

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

BOULDER RANGER DISTRICT

December 30, 1993

by

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This Final Summary Report supersedes previous "interim" reports for this district received by USFS personnel. Information from Interim Report 1, Interim Report 2, and the 1993 Report are all contained within this report.

This document summarizes the sites *of concern* to the USFS - Boulder Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2). It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS managed lands. Private (patented) land inholdings were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS managed lands.

A **priority listing** of the most important environmental degradation sites and the most important physical mine hazard sites is given on the next page. Because of the sheer number of physical mine hazards in the Boulder Ranger District, not all of the serious hazards are included in this priority listing, but the most severe hazards are listed.

Site descriptions of individual mine features, which comprise the bulk of this report, follows on page 3. These are not listed in order of priority, but are listed by: 1) Quadrangle Name and 2) Site Number.

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Numerical Summary:

- 839** mine openings inventoried (includes collapsed or filled openings)
- 16** mine features have Environmental Degradation Ratings of 1, 2, or 3.
- 128** mine openings have Mine (Physical) Hazard Ratings of 1 or 2.

PRIORITY SITES

Environmental Degradation

- 1) **Upper Castle Gulch - Golden Age Mine**, Quad Name: Boulder, Site #: 469-4440-1.103
- 2) **Tip Top Mine**, Quad Name: Nederland, Site #: 454-4414-1.100/200/201/202
- 3) **East Bueno Mountain Gulch**, Quad Name: Gold Hill, Site #: 465-4440-2.103
- 4) **North Gilpin Hill**, Quad Name: Nederland, Site #: 455-4414-1.105
- 5) **Black Rose Mine**, Quad Name: Gold Hill, Site #: 465-4437-2.100
- 6) **Private Gamble**, Quad Name: Nederland, Site #: 455-4416-3.100/101/102
- 7) **Gully west of Nugget Gulch**, Quad Name: Boulder, Site #: 468-4437-3.102
- 8) **Upper Castle Gulch - Golden Age Mine**, Quad Name: Boulder, Site #: 469-4440-1.203
- 9) **Northwest Golden Age Hill**, Quad Name: Boulder, Site #: 468-4441-1.106
- 10) **Upper Castle Gulch**, Quad Name: Boulder, Site #: 469-4440-1.108
- 11) **Upper Castle Gulch**, Quad Name: Boulder, Site #: 469-4440-1.102
- 12) **Hill Gulch**, Quad Name: Boulder, Site #: 468-4441-3.100
- 13) **South of Balarat Site**, Quad Name: Raymond, Site #: 465-4444-1.105
- 14) **Golden Flint Vein**, Quad Name: Central City, Site #: 454-4413-1.103
- 15) **Golden Queen Tunnel; Davis #1**, Quad Name: Central City, Site #: 456-4413-2.100/200
- 16) **Perigo**, Quad Name: Nederland, Site #: 454-4414-2.105

Physical Hazards

- 1) **South Lost Lake, East Side**, Quad Name: Nederland, Site #: 447-4421-2.104
- 2) **Phoenix Area, Champion Mine**, Quad Name: Nederland, Site #: 453-4419-1.102
- 3) **FR-2008, East Overland Mtn.-unnamed gulch**, Quad Name: Raymond, Site #: 465-4441-1.104
- 4) **Buffalo Gulch**, Quad Name: Gold Hill, Site #: 467-4440-1.101
- 5) **Buffalo Gulch**, Quad Name: Gold Hill, Site #: 467-4440-1.102
- 6) **Between Lump Gulch and Colorado Creek**, Quad Name: Central City, Site #: 455-4413-2.100
- 7) **North Spring Gulch Pass**, Quad Name: Gold Hill, Site #: 461-4436-1.106
- 8) **Bear Gulch**, Quad Name: Gold Hill, Site #: 459-4430-2.102
- 9) **Bear Gulch**, Quad Name: Gold Hill, Site #: 459-4430-2.104
- 10) **Pomeroy Mountain (Pandora Mine)**, Quad Name: Nederland, Site #: 450-4426-1.100
- 11) **Points East Ridge/Upper Left Hand Canyon**, Quad Name: Gold Hill, Site #: 459-4434-2.104
- 12) **Near Ridge Rd. (County Road-128E)**, Quad Name: Tungsten, Site #: 458-4424-1.101
- 13) **West Tall Timbers**, Quad Name: Boulder, Site #: 468-4428-1-102
- 14) **Mudd Bros. unpatented claim, Upham Gulch on Sugarloaf Rd**,
Quad Name: Gold Hill, Site #: 461-4428-1.104
- 15) **South of Balarat site, Pine Shade Vein**, Quad Name: Raymond, Site #: 465-4444-1.106

There are many other very serious physical hazards not mentioned above with ratings of 2. Many of these are open shafts not as easily accessible as those mentioned above. Many are open adits (tunnels) that don't represent a "fall-in" hazard, but are open and possibly near well travelled roads and paths. We recommend that, at least, all physical hazards with a rating of 1 or 2 be capped. Also, many adits with a rating of 3 are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Boulder

Site #: 468-4437-3.102

Site Name: Gully west of Nugget Gulch

Environmental Degradation Rating: 2

Description and pertinent facts: This adit is on private property, but there is water associated with the mine that may, at times, drain onto USFS managed land. When the site was visited in mid-June standing water was found ponded at the adit entrance. The water was significantly degraded with pH=3.78 and conductivity=1,110 μ S. A gully in the dump is evidence that this water does flow over the dump during periods of high runoff volume. This adit is also a physical hazard-see Physical Hazard section.

Quad Name: Boulder

Site #: 468-4441-1.106

Site Name: Northwest Golden Age Hill

Environmental Degradation Rating: 3

Description and pertinent facts: This was a main adit for a very large mine; it possibly is connected to the Golden Age Mine workings. The PBS maps indicate that the mineral vein is patented, but the adit portal and dump fall on USFS managed lands. Water depositing orange ferric hydroxide precipitate with a pH=2.7 and conductivity=2890 μ S is seeping (less than 0.1 gpm), not flowing, out of the adit portal in early June. This water is contained within the ore-cart rails extending onto the dump and seeps into the dump entirely before reaching the dump's slope. Orange staining of a very narrow path across the dump outside of the rails is evidence of minor flow from the portal during periods of higher runoff volume. There is no erosion of the dump associated with this narrow stained path which indicates that flow volumes from the adit are fairly minor and never large. Nevertheless, this water is highly degraded and may be indicative of a larger groundwater problem in this area. Contamination of surface flow is probably only a minor problem with the small amount of water draining from this adit. The adit is about 2500 feet from the nearest flowing stream. No water samples were taken for analysis. Also, a blue steel barrel with unknown contents stands inside the adit portal.

Quad Name: Boulder

Site #: 468-4441-3.100

Site Name: Hill Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This adit is significant as evidenced by the dump size of 2250 cubic yards. The adit is on USFS managed land, but the mine appears to have been worked recently (recent mining equipment on site) and is probably on an unpatented claim. An intact drain pipe is inside the adit and exits the dump on the south slope. No water was draining from it in mid-June. Standing water inside the portal is significantly degraded with pH=3.55 and conductivity=1367 μ S. Orange ferric hydroxide precipitate lies under the standing water in the portal. A nearby

homeowner said she has never seen water flow out of the portal and over the dump and there is no physical evidence indicating water flow out of the adit portal. The dump appears to contain abundant microcrystalline pyrite. The homeowner said she has a well on her property (which she doesn't use for drinking water) that produces water high in dissolved metals. This could indicate groundwater contamination, but the sources of the metal contamination could be many and various. Other significant mines on private land occur in the area, and some degradation could be natural.

Quad Name: Boulder

Site #: 469-4440-1.102

Site Name: Upper Castle Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This collapsed adit is on private land, but it is seeping poor quality water down Castle Gulch onto USFS land. The mine drainage was just seeping at the end of October, but there is abundant evidence that water flow increases significantly in Springtime. Ferric hydroxide precipitate is abundant along the course of the site drainage. The water has **pH=5.21 and a conductivity=534 μ S**.

Quad Name: Boulder

Site #: 469-4440-1.103

Site Name: Upper Castle Gulch - Golden Age Mine

Environmental Degradation Rating: 1

Description and pertinent facts: This site is the most serious environmental problem site in the entire Boulder Ranger District. The Golden Age Mine was one of the most prolific gold producers in the Jamestown District. The producing vein itself is patented, but this adit portal is on USFS land south of the claim and appears to have been the main access to the vein and the main exit for the mine's waste rock. All ground water entering the mine subsequently flows out of this adit. About 5 to 10 gpm were flowing out of the adit portal at the end of October, so the flow is rarely less than this and would be much greater in the Springtime. The mine drainage pathway was lined with orange ferric hydroxide precipitate and the water was field tested, giving a **pH=3.54 and a conductivity=1525 μ S**. The mine water then flows over the top of the dump material, eventually seeping into the dump itself. The receiving gulch was dry in late Autumn and Castle Gulch had only a few spots where water was flowing at the surface, so most of the degraded water is either entering the fractured bedrock aquifer or moving as interflow in the alluvial/colluvial material of Castle Gulch. Where water did rise to the surface in Castle Gulch, it tested with pH's in the 4 to 5 range and conductivities of 400 to 800 μ S. Since the Golden Age Mine lies at the headwaters of Castle Gulch, it probably contributes to the poor water quality along the entire length of the gulch. Filtered (45 μ) water samples were taken of the mine drainage water and were submitted for laboratory analysis. Elevated levels of the following constituents were found:

Factor Above Colorado Basic Standards

<u>Constituent</u>	<u>Concentration</u>	<u>for Aquatic Life and Domestic Use</u>
SO ₄	910 mg/L	➤ 3.6X domestic water MSL
Al	2600 μ g/L	➤ 80X aquatic life MCL
Cd	9.0 μ g/L	➤ 1.8X domestic water MCL, 3X aquatic life MCL
Cu	89 μ g/L	➤ 2.6X aquatic life MCL, under domestic MCL
Fe	13000 μ g/L	➤ 43X domestic MCL, 13X aquatic life MCL

Mn	35000 µg/L	➤ 700X domestic MCL, 35X aquatic life MCL
U	37 pCi/L	➤ about equal to MCL (40 pCi/L)
Zn	8200 µg/L	➤ 1.6X domestic MCL, 26.8X aquatic life MCL

Quad Name: Boulder

Site #: 469-4440-1.203

Site Name: Upper Castle Gulch - Golden Age Mine

Environmental Degradation Rating: 3

Description and pertinent facts: This is the main mine dump for the Golden Age Mine. It is huge--roughly **40,000 cubic yards of waste rock**. It toes down into an unnamed gulch at the headwaters of Castle Gulch which was dry in late October, but probably runs in the Springtime. The dump is heavily eroded with gullies and rills and these transport dump material into the gulch below. Acid mine drainage travels over the dump for a distance of at least 180 feet and eventually totally seeps into the dump. The dump possibly contributes significant amounts of dissolved solids to this water. No seeps were found coming from the side of the dump, so this water probably contributes to ground water contamination in the area.

Quad Name: Boulder

Site #: 469-4440-1.108

Site Name: Upper Castle Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This site appears to be an unpatented claim as there is a house and two tool/storage sheds on site. The adit (incorrectly marked as a shaft on the PBS quad) is seeping poor quality water in early November. The mine drainage has a **pH=3.59 and a conductivity=453 µS**, with ferric hydroxide precipitate lining the course of the seep.

^^ New Quad ^^^

Quad Name: Central City

Site ID#: 454-4413-1.103

Site Name: Golden Flint Vein

Environmental Degradation Rating: 3

Description and pertinent facts: There are no obvious signs of environmental degradation at this site, but the dump is very large (approx. 5500 c.y.) indicating extensive underground workings associated with this shaft. Therefore, there is significant potential for groundwater degradation near the site. There is no water draining from this site and the dump is relatively "high and dry." The mine is situated near the upper reaches of Gamble Gulch.

Quad Name: Central City

Site #: 456-4413-2.100/200

Site Name: Golden Queen Tunnel; Davis #1

Environmental Degradation Rating: 3

Description and pertinent facts: The Golden Queen Tunnel (adit) had standing water inside the portal, but was inaccessible for field testing the water quality. A minor seep did appear below the associated dump and this water tested at a pH=4.78 and a conductivity=204 μ S. The flow of this water was too small to be measured. The degraded water seeps into Colorado Creek, but has virtually no immediate effect on the creek waters (pH=7.13, Conductivity=55 μ S). The dump at this site is very close to the creek but doesn't appear to toe into the stream. A storm event could potentially erode the dump toe.

^^ New Quad ^^^

Quad Name: Gold Hill

Site #: 465-4437-2.100

Site Name: Black Rose Mine-(on private-abandoned)

Environmental Degradation Rating: 2

Description and pertinent facts: Water draining from the open tunnel and over the dump has a pH of 3.84 and conductivity of 635 μS . The draining water is going directly into Gillespie Gulch, but at a low volume (<0.01 cfs). The mine is on private property, and appears to have been abandoned.

Quad Name: Gold Hill

Site #: 465-4440-2.103

Site Name: East Bueno Mountain Gulch

Environmental Degradation Rating: 2

Description and pertinent facts: The water sampled at the mouth of the adit was not flowing on 9/21/92, but appears to flow earlier in the year. The smallish pool of standing water had a pH of 3.76 and conductivity of 2,440 μ S. This feature is just inside of the private property boundary, according to the Forest Service map.

^^ New Quad ^^^

Quad Name: Nederland

Site #: 454-4414-1.100

Site Name: Tip Top Mine

Environmental Degradation Rating: 1

Description and pertinent facts: A large spring exists in the adit opening (about 0.5 cfs). About 10 cells have been created to lower the pH of the water. The pH is not affected at this time by the cells. The spring water has a pH of 3.24, and conductivity of 955 μ S. The Gamble Gulch stream has a drop in pH of 1.45 and a rise in conductivity of 161.3 μ S due to the influence of this water. The people living about 0.5 miles downstream from the Tip Top just put in a pond (7/92), which is turquoise blue in color (significant amounts of copper in water). Their tap water has a pH of 5.2 and conductivity of 200 μ S. The PBS map shows this on USFS land, but we ran into a prospective buyer of this same property. He had plat map showing numerous claims on the land containing this mine and the path of the mine drainage.

Quad Name: Nederland

Site #: 454-4414-2.105

Site Name: Perigo

Environmental Degradation Rating: 3

Description and pertinent facts: The sheer size of this adit/stope complex - over 600' long and 60-100' deep where the stope has collapsed - is what prompts the rating of 3 here. Much of the adit/stope length is open to the atmosphere due to stope collapse. (see same mine under Physical Hazards)

Quad Name: Nederland

Site #: 455-4414-1.105

Site Name: North Gilpin Hill

Environmental Degradation Rating: 2

Description and pertinent facts: This mine is on private property. Water is emerging from the collapsed adit as a seep/rivulet, depending on how recently it has rained. The water exhibits orange precipitate, has pH of 3.19, and conductivity of 807 μS . The mine is on a hill overlooking the town of Gilpin, and the water may effect the lakes and streams nearby.

Quad Name: Nederland

Site #: 455-4416-3.100/101/102

Site Name: Private Gamble

Environmental Degradation Rating: 2

Description and pertinent facts: Three mines on private property here. After a heavy rain, a trickle of water runs along the road beneath dump #200. A heavy orange precipitate is associated with the trickle which has a pH of 3.62 and a conductivity of 556 μS . It is not clear, which of the three mines are causing the acid drainage.

^^ New Quad ^^^

Quad Name: Raymond

Site #: 465-4444-1.105

Site Name: South of Balarat Site

Environmental Degradation Rating: 3

Description and pertinent facts: This adit has been intentionally reclaimed by being backfilled. Two ponds planted with cattails were created on the associated dump. These might be a result of mine drainage coming to the surface or just a collection of surface water. The water has a slight orange color, but no significant FeOH_3 precipitate is present. The water was very high in dissolved solids (conductivity=1452 μS), but the pH of 6.62 is well within the natural range. Plants and water insects are living in the water. These factors indicate a slight to potentially significant environmental degradation problem here.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Allenspark

Site #: 455-4450-1.101

Site Name: Fox Creek Mines

Physical Hazard Rating: 2

Description and pertinent facts: This adit is within a region experiencing heavy foot and horse traffic. The adit forms a cave-like feature, open along the base of the dike outcropping here. The tunnel entrance has many footprints into the feature. Large blocks of fallen rock (>1' diameter) litter the entrance. A trail crosses the dump adjacent to the opening. Year-round residences are within about 500' of this mine.

Quad Name: Allenspark

Site #: 455-4450-1.104

Site Name: Fox Creek Mines

Physical Hazard Rating: 2

Description and pertinent facts: This adit is within a region experiencing heavy foot and horse traffic. A large 5'x4' opening is easily accessible from a horse trail that crosses the associated dump. The adit is intact and extends back more than 25'. Year-round residences are within about 500' of this mine.

Quad Name: Allenspark

Site #: 456-4449-1.100

Site Name: Rock Creek

Physical Hazard Rating: 2

Description and pertinent facts: The open adit here has a 5'x3' portal and extends 35' into the mountain where it is collapsed. Roof collapse is possible elsewhere in the tunnel. A heavily used horse/hiking trail crosses the associated dump adjacent to the tunnel adding to the jeopardy.

^^ New Quad ^^^

Quad Name: Boulder

Site #: 468-4428-1.100

Site Name: West Tall Timbers

Physical Hazard Rating: 2

Description and pertinent facts: These mines lie about 0.5 miles from the Tall Timbers Subdivision accessed by Sugarloaf Road. This adit has a 4'x4' portal and extends back greater than 30', beyond view. There is evidence of human occupation (sleeping bags, cooking ware). Rockfall events from the roof are also evident along tunnel floor.

Quad Name: Boulder

Site #: 468-4428-1.102

Site Name: West Tall Timbers

Physical Hazard Rating: 1

Description and pertinent facts: These mines lie about 0.5 miles from the Tall Timbers Subdivision, which is reached by Sugarloaf Road. This vertical shaft intersects a drift (tunnel) floor about 20 feet below the surface. The drift extends east and west from the shaft, but dead-ends to the east. It continues out of the line-of-sight to the west, where it also deepens.

Quad Name: Boulder

Site #: 468-4437-2.102 & 202

Site Name: Nugget Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This feature lies along private property boundary lines in Nugget Gulch and is probably on private property. Both the shaft and dump pose hazards. About 15' in diameter at the surface, the shaft drops vertically to a partial plug at about 25 feet down, where there may be standing water beneath the debris plug. The dump is actively failing into the shaft. The slope of the dump material is over-steepened and sloughs-off into the shaft. It is possible for a person standing on the dump material to cause slope failure into the shaft. It is unknown, however, what mass the material would withstand before failure.

Quad Name: Boulder

Site #: 468-4437-3.102

Site Name: Gully west of Nugget Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This adit has a small portal opening of 2'x3' and extends back beyond line of sight (over 30 feet). A housing development and the village of Glendale are only about 0.3 miles away. An environmental component of this feature is described in the environmental degradation section above.

Quad Name: Boulder

Site #: 468-4437-3.103

Site Name: Gully west of Nugget Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This adit extends beyond line of sight (about 30 feet) into the mountain and has a portal of 4'x3'. It is just south of adit 102 described above and is close (<0.3 miles) to housing developments and the village of Glendale.

Quad Name: Boulder

Site #: 468-4439-1.100

Site Name: James Creek SE of Jamestown on CR-94

Hazard Rating: 2

Description and pertinent facts: This adit is right next to the Jamestown Rd. (CR-94) on the north side and is intact, open, and very conspicuous. Access is extremely easy, so it should be capped.

Quad Name: Boulder

Site #: 468-4441-1.103

Site Name: Northwest Golden Age Hill

Hazard Rating: 2

Description and pertinent facts: This shaft is next to an unmapped 4WD road. A crude headframe is intact on top of the 6'x6' shaft with some collar timbers that are not structurally sound. The shaft appears to be over 50 ' deep. Loose material around the collar and a partially fallen barbed-wire fence(trip-wire!) contribute to the dangerous nature of this shaft.

Quad Name: Boulder

Site #: 468-4441-3.100 & 101

Site Name: Hill Gulch

Physical Hazard Rating: 2

Description and pertinent facts: These two features are adits along the same mineral vein. They are only about 1000' from some year-round residences. Adit 100, the lower level, is much larger and has significant workings judging from the 2,250 cubic yard dump adjacent to it. It has been worked more recently than the upper level adit 101. Both adits have portals that are 7'x6' in size. Adit 100 is greater than 100' long and adit 101 extends greater than 50'. Adit 100 has an open door at the portal and the rock around the portal appears fairly competent. Intact piping for hydraulic/air lines extends into the adit and air ventilation equipment sits just outside the portal. Adit 100 has environmental considerations as described in the Environmental Degradation section above. An old load-out structure is standing outside the portal of adit 101.

Quad Name: Boulder

Site #: 468-4441-3.102

Site Name: Hill Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This adit is just north of those described above, but is significantly different. It appears to be a very old and relatively small prospect adit. The portal is 8'x5' and extends back over 30', but judging from the dump size, it probably only extends a total of 50-60'. There is some recent rockfall around the portal of this adit and it is within 1000' of a year-round residence.

Quad Name: Boulder

Site #: 469-4437-2.101

Site Name: Glendale - Private Mines

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is on private property. It is along the abandoned mining road that originates at Glendale and ends at the Sunshine Canyon Road. The road crosses both private property and National Forest land. The shaft is 18'x12' at the surface and drops more than 55' to the bedrock floor. It appears to access the tunnel of feature #100. No dump material surrounds the shaft so there is no visual warning of the shaft's location. It is just off a trail and is less than 0.3 miles from the village of Glendale.

Quad Name: Boulder

Site #: 469-4438-1.100

Site Name: Northwest Lazy Acres

Physical Hazard Rating: 2

Description and pertinent facts: This potentially dangerous open adit lies about 0.3 miles from CR-81 and within 0.1 miles of a dwelling. It is more than 30' deep and the portal dimensions are 3'x4'. Lazy Acres subdivision lies just across the valley. Due to the numerous people living in the area the mine is rated a 2 instead of a 3.

Quad Name: Boulder

Site #: 469-4438-1.101

Site Name: Northwest Lazy Acres

Physical Hazard Rating: 2

Description and pertinent facts: This potentially dangerous open adit lies about 100 yards from CR-81 and within several hundred yards of a dwelling. The adit extends back greater than 30' beyond the line of sight and has a 5'x4' portal. It occurs downhill of adit 100 described above. Lazy Acres subdivision lies just across the valley. Due to the numerous people living in the area the mine is rated a 2 instead of a 3.

Quad Name: Boulder

Site #: 469-4440-1.110

Site Name: Upper Castle Gulch - North of Grand Central Mine

Hazard Rating: 2

Description and pertinent facts: This shaft has a 15'x9' opening and is 18' deep. It intercepts an adit at this depth. It is only about 100' from the Castle Gulch 4WD road (FR-287).

Quad Name: Boulder

Site #: 470-4439-1.102

Site Name: East of Castle Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is less than a quarter mile from permanent residences along James Creek. It appears to be on a patented claim according to the PBS maps, but the dump extends onto USFS-managed land. It is only 5' from an unmarked 4WD road, has a surface opening of 12'x8', and extends vertically down more than 50'. The shaft is dug into competent rock, but there is also loose colluvium near the collar. Pigeons live in the shaft. The associated dump is about 1,200 cubic yards in volume indicating the shaft is probably much deeper than 50' and probably has associated drifts, etc.

Quad Name: Boulder

Site #: 470-4440-1.100

Site Name: Upper Buckingham Park

Physical Hazard Rating: 2

Description and pertinent facts: This is an open tunnel with a 3'x3' portal that extends over 30' into the mountain with evidence of recent human activity (occupancy?) inside. The adit lies along a heavily used 4 wheel-drive road from Buckingham Park.

Quad Name: Boulder

Site #: 470-4440-2.100

Site Name: Upper Mine-Buckingham Park

Physical Hazard Rating: 2

Description and pertinent facts: An open tunnel with a 2'x6' portal extends over 30' into the mountain. The entrance is partially obscured by rockfall debris. The interior of the adit is relatively intact, and the floor is damp. This adit lies along a heavily used 4 wheel-drive road from Buckingham Park.

Quad Name: Boulder

Site #: 470-4440-2.101

Site Name: Upper Mine-Buckingham Park

Physical Hazard Rating: 2

Description and pertinent facts: Some cribbing is still visible along the relatively small portal opening (2'x3') which accesses an adit that extends beyond line-of-sight (over 25 feet). This adit lies along a heavily used 4 wheel-drive road from Buckingham Park.

^^ New Quad ^^^

Quad Name: East Portal

Site #: 445-4417-1.100

Site Name: Northeast Portal

Hazard Rating: 2

Description and pertinent facts: This open, accessible tunnel on unmarked private property, is adjacent to the heavily visited CR-117, and is therefore recorded. Water is draining from the roof of the tunnel into the standing water covering the floor of the mine.

^^ New Quad ^^^

Quad Name: Eldorado Springs

Site #: 468-4426-2.103

Site Name: West Magnolia Ridge

Physical Hazard Rating: 2

Description and pertinent facts: This is an open adit within the Magnolia mining district. Most open mines in this area have been safeguarded by the Inactive Mine Program of the Division of Minerals and Geology (DMG). This tunnel is within 0.1 miles of permanent dwellings. The 4'x3' portal is relatively small, but the tunnel extends greater than 25', beyond the line-of-sight.

^^ New Quad ^^^

Quad Name: Gold Hill

Site #: 458-4435-1.103

Site Name: Upper Spring Gulch

Hazard Rating: 2

Description and pertinent facts: This open tunnel is found adjacent to FR-2102, several miles from Ward. The opening is relatively small (2'x3') but the tunnel continues back for an unknown distance.

Quad Name: Gold Hill

Site #: 458-4435-1.104

Site Name: Upper Spring Gulch

Hazard Rating: 2

Description and pertinent facts: This tunnel is adjacent to adit #103 and is also open and accessible. The mining traces are less at this site however, due to the fact that the dump has been largely incorporated into the dirt road.

Quad Name: Gold Hill

Site #: 458-4435-1.108

Site Name: Upper Spring Gulch

Hazard Rating: 2

Description and pertinent facts: This feature is part of a site where a mill of some sort may have been. There are stone foundations adjacent to the adit, as well as the ruins of a cabin. The tunnel is open and accessible. There is a shaft nearby, see comments on #109.

Quad Name: Gold Hill

Site #: 458-4435-1.109

Site Name: Upper Spring Gulch

Hazard Rating: 2

Description and pertinent facts: This shaft, or air tunnel, appears to access the same tunnel that is entered through the adit #108. The shaft is found at the top of the mill foundation works. It is not especially deep (about 25').

Quad Name: Gold Hill

Site #: 458-4437-1.102

Site Name: Chipmunk Gulch

Hazard Rating: 2

Description and pertinent facts: This shaft is relatively remote. However, there are houses within about 1/4 mile of the feature, and FR-2104 goes by it about 50 feet away. The shaft remains open for about 20 feet, dropping away at a slight incline. Recent rockfall was observed at the base. This shaft is possibly on private property; the property line goes through the area where it occurs.

Quad Name: Gold Hill

Site #: 459-4429-1.101

Site Name: Area of FR-2089 and FR-2090, north of Sugarloaf Rd.

Hazard Rating: 2

Description and pertinent facts: This shaft is a definite fall-in hazard and is just off FR-2090. It is 26' deep and is intact with a 9'x6' opening. This shaft probably intersects adit 102. It is relatively close to a residential area (0.3-0.4 miles).

Quad Name: Gold Hill

Site #: 459-4429-1.103

Site Name: Area of FR-2089 and FR-2090, north of Sugarloaf Rd.

Hazard Rating: 2

Description and pertinent facts: This shaft is only 20 yds. from FR-2089. It is only 20' deep, but is still a fall-in hazard, especially since unconsolidated dump material surrounds the 10'x6' opening. It is right next to shaft 104.

Quad Name: Gold Hill

Site #: 459-4429-1.104

Site Name: Area of FR-2089 and FR-2090, north of Sugarloaf Rd.

Hazard Rating: 2

Description and pertinent facts: This shaft is only 25 yds. from FR-2089. It is only 20' deep, but is still a fall-in hazard, especially since unconsolidated dump material surrounds the 8'x8' opening. It is right next to shaft 103.

Quad Name: Gold Hill

Site #: 459-4429-1.106

Site Name: Area of FR-2089 and FR-2090, north of Sugarloaf Rd.

Hazard Rating: 2

Description and pertinent facts: This intact shaft is dangerous, but is not near a path of any kind; it could only be found by "orienteering". The shaft is greater than 27' deep because standing water occurs in the shaft at that depth. The opening is 10'x6'.

Quad Name: Gold Hill

Site #: 459-4429-1.107

Site Name: Area of FR-2089 and FR-2090, north of Sugarloaf Rd.

Hazard Rating: 2

Description and pertinent facts: This shaft is close to a residential area, but is difficult to find. It is not near a path. It has an opening of 8'x7' and a depth of 20'.

Quad Name: Gold Hill

Site #: 459-4430-2.102

Site Name: Bear Gulch

Hazard Rating: 1

Description and pertinent facts: The shaft opening is large (10'x10') and is sheer sided and dangerous. It drops visibly for an estimated 80' or so, before angling off sharply to the NW. There is a fence around the opening which discourages entrance, but does not seal the opening from entrance, and it is quite possible to slip and fall in beneath the fence.

The dump from this mine is highly visible and can be seen from many points in the surrounding hills. This, coupled with trails and an old road to the shaft itself, makes this a regularly visited feature.

Quad Name: Gold Hill

Site #: 459-4430-2.103

Site Name: Bear Gulch

Hazard Rating: 2

Description and pertinent facts: This tunnel is along the road up Bear Gulch, and has a trail to the

opening. The tunnel has tracks into it and appears to be extensively visited. The feature may partially be on private property.

Quad Name: Gold Hill

Site #: 459-4430-2.104

Site Name: Bear Gulch

Hazard Rating: 1

Description and pertinent facts: This shaft is found adjacent to the road in Bear Gulch. Although it has a fence around it, it remains accessible and dangerous and its proximity to the road makes it a highly visited feature. It may be partially on private property.

Quad Name: Gold Hill

Site #: 459-4431-1.101

Site Name: Lower Pennsylvania Gulch

Hazard Rating: 2

Description and pertinent facts: This feature can readily be made secure, as there is a steel door and concrete walls comprising the Adit. Merely locking the door would seal the entrance. The tunnel is located approximately 1/4 of a mile from the village of Sunset at the end of Four Mile canyon.

Quad Name: Gold Hill

Site #: 459-4431-1.103

Site Name: Lower Pennsylvania Gulch

Hazard Rating: 2

Description and pertinent facts: This shaft is on private property along the north ridge of Pennsylvania Gulch. There are no fences or signs indicating this, however. It is a dangerous, but relatively remote opening.

Quad Name: Gold Hill

Site #: 459-4431-1.105

Site Name: Lower Pennsylvania Gulch

Hazard Rating: 2

Description and pertinent facts: Although this shaft may be on private property, it is deep and dangerous (about 80'). It is fairly remote, but an old road does go up the ridge from the village of Sunset.

Quad Name: Gold Hill

Site #: 459-4434-1.104

Site Name: Points East Ridge/ Upper Left Hand Canyon

Hazard Rating: 1

Description and pertinent facts: This large shaft opening is one of eight mines along the ridge and in the valley to the south. This particular mine is on private property, and is the most dangerous of all the features here, due to its depth, vertical nature, and the fact that a dirt road which sees a lot of recreational traffic occurs adjacent to the shaft.

Quad Name: Gold Hill

Site #: 460-4429-1.101

Site Name: SW of Bald Mtn.

Hazard Rating: 2

Description and pertinent facts: This shaft is near the Switzerland Trail, but not visible from it, nor does a path lead to it. Therefore, it is rarely visited, but still dangerous. It is about 0.3 miles from the Silver Springs subdivision. The shaft is more than 35' deep with an opening of 6'x7'. Water fills the shaft at the 35' level. Loose gravel and soil surround the opening. It is adjacent to shaft 102.

Quad Name: Gold Hill

Site #: 460-4429-1.102

Site Name: SW of Bald Mtn.

Hazard Rating: 2

Description and pertinent facts: This shaft is near the Switzerland Trail, but not visible from it, nor does a path lead to it. Therefore, it is rarely visited, but still dangerous. The shaft is not very deep, but if one fell in there would be no escape. It is about 0.3 miles from the Silver Springs subdivision. This shaft is 22' deep with an opening of 7'x8'.

Quad Name: Gold Hill

Site #: 461-4428-1.104

Site Name: Mudd Bros. unpatented claim, Upham Gulch on Sugarloaf Rd

Hazard Rating: 2

Description and pertinent facts: This is a large shaft with a 15'x15' surface opening and a depth greater than 75'. Wire mesh is laid over most of the opening, but the shaft can still be accessed through an opening on the east side. An old ladder is attached to the same east side of the shaft. This would definitely be tempting and deadly to the curious. The only reason it is not an extreme hazard(rating=1) is that it is about 1.5 miles to the nearest residence.

Quad Name: Gold Hill

Site #: 461-4430-2.100

Site Name: Northeast Bald Mtn. Gulch

Hazard Rating: 2

Description and pertinent facts: This tunnel has a fairly small opening (4'x2') but it exists adjacent to the extensively travelled Switzerland Trail, is visible and easily accessible. The tunnel extends beyond line-of-sight.

Quad Name: Gold Hill

Site #: 461-4430-2.101

Site Name: Northeast Bald Mtn. Gulch

Hazard Rating: 2

Description and pertinent facts: This small (3'x3') opening is cave-like, and does not have a dump associated with it. The dump was incorporated into the Switzerland trail. Its proximity to the extensively travelled Switzerland Trail makes it noteworthy.

Quad Name: Gold Hill

Site #: 461-4430-2.105

Site Name: Northeast Bald Mtn. Gulch

Hazard Rating: 2

Description and pertinent facts: This large (4'x4') tunnel is easily accessible from the Switzerland Trail, which lies about 60' above the open tunnel. It is possible to walk upright (>6') for over 30'. Campfires and other evidence of human occupation can be seen within the mine.

Quad Name: Gold Hill

Site #: 461-4430-2.106

Site Name: Northeast Bald Mtn. Gulch

Hazard Rating: 2

Description and pertinent facts: This dramatic and large tunnel (8'x5') is open immediately adjacent to the Switzerland Trail. Human occupancy has occurred as evident from the nature of the refuse in the far reaches of the visible tunnel, as well as numerous campfire remains scattered throughout the visible portion of the tunnel.

Quad Name: Gold Hill

Site #: 461-4436-1.100

Site Name: North Spring Gulch Pass

Hazard Rating: 2

Description and pertinent facts: This tunnel is open at the headwall of the collapsed adit. Trenching has occurred up the hill from the feature.

Most of the mines rated a 2 in this area are relatively small features, but all are open tunnels or

shafts. The fact that this mined ridge lies along a road that appears to get moderate to heavy recreational use, with paths and trails to the open features, is what makes them especially hazardous.

Quad Name: Gold Hill

Site #: 461-4436-1.101

Site Name: North Spring Gulch Pass

Hazard Rating: 2

Description and pertinent facts: The adit entrance is still standing, and the tunnel is open and accessible. The shaft #102 provides daylight into the further recesses of the tunnel creating an especially interesting and compelling feature.

Most of the mines rated a 2 in this area are relatively small features, but all are open tunnels or shafts. The fact that this mined ridge lies along a road that appears to get moderate to heavy recreational use, with paths and trails to the open features, is what makes them especially hazardous.

Quad Name: Gold Hill

Site #: 461-4436-1.102

Site Name: North Spring Gulch Pass

Hazard Rating: 2

Description and pertinent facts: This shaft may have simply been an air-hole for the tunnel that it accesses below. It drops 25' or so into the tunnel below.

Most of the mines rated a 2 in this area are relatively small features, but all are open tunnels or shafts. The fact that this mined ridge lies along a road that appears to get moderate to heavy recreational use, with paths and trails to the open features, is what makes them especially hazardous.

Quad Name: Gold Hill

Site #: 461-4436-1.103

Site Name: North Spring Gulch Pass

Hazard Rating: 2

Description and pertinent facts: This open and accessible tunnel may only go back 20 to 30 feet. Most of the mines rated a 2 in this area are relatively small features, but all are open tunnels or shafts. The fact that this mined ridge lies along a road that appears to get moderate to heavy recreational use, with paths and trails to the open features, is what makes them especially hazardous.

Quad Name: Gold Hill

Site #: 461-4436-1.106

Site Name: North Spring Gulch Pass

Hazard Rating: 1

Description and pertinent facts: This interesting feature combines a shaft and an adit at the surface opening. What makes it especially hazardous, is that in the afternoon sun, all that is visible at first, is the tunnel extending back into the rock. What is not so obvious is the vertical shaft dropping away just inside the entrance. There were many footprints leading to this feature the day I was there.

Most of the mines rated a 2 in this area are relatively small features, but all are open tunnels or shafts. The fact that this mined ridge lies along a road that appears to get moderate to heavy recreational use, with paths and trails to the open features, is what makes them especially hazardous.

Quad Name: Gold Hill

Site #: 461-4436-1.107

Site Name: North Spring Gulch Pass

Hazard Rating: 2

Description and pertinent facts: This open tunnel is accessed by the shaft of #106, and daylight coming from that shaft illuminates the further recesses of the tunnel. There is evidence that people go into this tunnel.

Most of the mines rated a 2 in this area are relatively small features, but all are open tunnels or shafts. The fact that this mined ridge lies along a road that appears to get moderate to heavy recreational use, with paths and trails to the open features, is what makes them especially hazardous.

Quad Name: Gold Hill

Site #: 461-4436-1.109

Site Name: North Spring Gulch Pass

Hazard Rating: 2

Description and pertinent facts: Fairly small (2'x2'), open tunnel which may only extend back 15 to 20 feet.

Most of the mines rated a 2 in this area are relatively small features, but all are open tunnels or shafts. The fact that this mined ridge lies along a road that appears to get moderate to heavy recreational use, with paths and trails to the open features, is what makes them especially hazardous.

Quad Name: Gold Hill

Site #: 462-4428-1.101

Site Name: Lower Peewink Mine

Hazard Rating: 2

Description and pertinent facts: This shaft is on the lower east slope of Peewink Mtn. which is

near the village of Switzerland Park. Families with children live in the village and the shaft is only about 500' from a year-round residence. The opening is 7'x6' and is 19' deep.

Quad Name: Gold Hill

Site #: 462-4428-2.100

Site Name: Peewink Mtn.

Hazard Rating: 2

Description and pertinent facts: This shaft is only about 20' deep, but the sides are vertical and there would be no escape if a person fell into it. The surface dimensions are 9'x6'. It is only 100' north of FR-332, which is passable with a 2WD vehicle.

Quad Name: Gold Hill

Site #: 462-4428-2.101

Site Name: Peewink Mtn., Blowout Mine

Hazard Rating: 2

Description and pertinent facts: This incline shaft is especially dangerous because it is easily accessible. It is partially collapsed with surface dimensions of about 12'x12' and opening dimensions of 2'x2'. The collapse has taken out half the width of FR-332, so this could be a hazard to vehicles also. The ultimate depth is unknown, but it is greater than 30' deep.

Quad Name: Gold Hill

Site #: 462-4428-2.102

Site Name: Peewink Mtn., Blowout Mine

Hazard Rating: 2

Description and pertinent facts: This is another shaft of the Blowout Mine and is just up the hill from incline shaft 101. The opening is large (12'x10') and the mine is 36' deep. Loose grus (weathered granite) occurs around the collar adding to the hazard.

Quad Name: Gold Hill

Site #: 462-4428-2.105

Site Name: Peewink Mtn.

Hazard Rating: 2

Description and pertinent facts: This feature is a large open stope, 50'x150'. It appears to have been intentionally "daylighted" because there is no evidence of a natural collapse. The sidewalls of the stope are sheer and up to 36' in height. The significant hazards are the presence of two mine openings in the base of the stope: an incline shaft occurs in the NE corner and an adit occurs in the SE corner. The lower part of this stope is on private land and this possibly includes the mines at the base, but the upper part is definitely on USFS.

Quad Name: Gold Hill

Site #: 462-4435-1.100

Site Name: Near unnamed USFS campground on Left Hand Creek

Hazard Rating: 2

Description and pertinent facts: This is an adit that is directly adjacent to, and highly visible from, the Left Hand Creek Rd. (CR-106). The portal is only 15' north of the road. A USFS campground is located just across the road from the adit portal. Recent beverage cans indicate frequent visitors to this mine. Rock around the adit generally appears competent, but some fractured rock above the portal could fall.

Quad Name: Gold Hill

Site #: 463-4430-2.100

Site Name: West Sugarloaf Mountain

Hazard Rating: 2

Description and pertinent facts: The adit itself is open for several tens of feet before becoming choked in debris. Beyond this, the tunnel is accessible at the headwall of the collapsing feature, and the tunnel extends beyond the line of sight.

Quad Name: Gold Hill

Site #: 462-4430-1.100

Site Name: East Bald Mtn. Gulch

Hazard Rating: 2

Description and pertinent facts: This open tunnel lies about 80 feet below the busy Switzerland Trail. The tunnel recedes approximately 25 feet before turning to the SW. There is a footpath to the tunnel. The interior of the tunnel is wet, yet there is no standing water.

Quad Name: Gold Hill

Site #: 462-4430-1.107

Site Name: East Bald Mtn. Gulch

Hazard Rating: 2

Description and pertinent facts: The adit structure itself is still open for about 15 feet. It appears that the walls of the adit have collapsed at this point. There is a door standing ajar, which is partially buried in silt. Water is draining out of the mine.

Quad Name: Gold Hill

Site #: 462-4431-1.103

Site Name: Potato Hill

Hazard Rating: 2

Description and pertinent facts: This feature was the true elevator shaft to the mine along this ridge. There is a road that is faint at first, extending beyond the Switzerland Trail both into the

gulch and up onto the side of the ridge. The mines along the ridge are easily seen from the Switzerland Trail, and there is some evidence of people at these mines. (Based on footprints). The only reason this shaft is rated a 2, rather than a 1, is because it is found further down the ridge line from where the road ends, and there is no path to it. However, it is not immediately discernable, and makes an abrupt opening along the rocky ridge. It is sheer sided and deep (about 25 feet) with the surface opening being 5 by 4 feet, making a potentially very dangerous opening.

Quad Name: Gold Hill

Site #: 462-4438-1.100

Site Name: Southwest Upper James Creek

Hazard Rating: 2

Description and pertinent facts: This open and accessible adit lies at the end of the road up James Creek. There is a footpath leading into the tunnel which is about 4 x 4 feet and extends beyond line of sight into the mountain.

Quad Name: Gold Hill

Site #: 463-4431-1

Site Name: North Base Sugarloaf Mountain

Hazard Rating: 2

Description and pertinent facts: This adit occurs at the base of a hill along the floodplain. It is greater than 15' deep with a portal opening of 5'x10'. There is a door on the front of the portal, but it is open and is not a deterrent to access. Water is draining from the adit (pH=7.84, conductivity=510 µS). Significant rockfall hazard at the portal makes this a serious hazard.

Quad Name: Gold Hill

Site #: 463-4432-1.105

Site Name: East Potato Hill

Hazard Rating: 2

Description and pertinent facts: Large (6'x4') opening into a tunnel that extends into the hill for at least 30 feet. This is located near the end of the Long Gulch road where other tunnels such as this one have been lived in.

Quad Name: Gold Hill

Site #: 463-4432-3.109

Site Name: Middle Long Gulch

Hazard Rating: 2

Description and pertinent facts: This large (7'x9') opening accesses a tunnel that has been, or is being lived in. Stove, refuse, fire ring and fire wood are all visible within the tunnel. The tunnel extends beyond the line of sight. Both the tunnel and the dump are readily visible from the road going up Long Gulch.

Quad Name: Gold Hill

Site #: 464-4428-1.100

Site Name: Near North Boulder Creek

Hazard Rating: 2

Description and pertinent facts: The shaft opening is 10'x6', but is cratered at the surface with crater dimensions of 15'x20'. Shaft depth is greater than 30'. Unconsolidated material surrounds the shaft contributing to its hazardous nature. Access to this site is somewhat limited, but houses are not too far away (1500'). This shaft may be on private land.

Quad Name: Gold Hill

Site #: 464-4431-1.100

Site Name: Base Long Gulch

Hazard Rating: 2

Description and pertinent facts: This open tunnel lies south of Four Mile Creek, at the base of Long Gulch. It is rated a 2 because the tunnel is visible from a cluster of homes along the road. The site was not physically investigated due to the numerous hostile dogs in the area.

Quad Name: Gold Hill

Site #: 465-4437-3.100

Site Name: Upper Slaughterhouse Gulch

Hazard Rating: 2

Description and pertinent facts: The cribbing about the shaft has been distorted so that the shaft itself is not noticeable until looking straight down into it. The 3'x4' opening drops for about 30 feet into water. The 4WD road goes around this opening and immediately adjacent to it.

Quad Name: Gold Hill

Site #: 465-4437-3.102

Site Name: Upper Slaughterhouse Gulch

Hazard Rating: 2

Description and pertinent facts: The road ends at this mine where the open, intact adit lies. extending into the mine tunnel. There is a steel door at the portal, which is open.

Quad Name: Gold Hill

Site #: 465-4440-2.101

Site Name: East Bueno Mountain Gulch

Hazard Rating: 2

Description and pertinent facts: Although the adit entrance is closed and locked, there is an opening on the west side of the adit which makes it very easy to access the tunnel. There is evidence that the public has gone into the mine this way. (A spray painted sign on the locked door brags that the individual had gone in over a thousand feet.)

Quad Name: Gold Hill

Site #: 465-4440-2.103

Site Name: East Bueno Mountain Gulch

Hazard Rating: 2

Description and pertinent facts: This adit was inventoried because of the acid mine drainage at its opening. However, it is on private property. The adit has a door which was unlocked and open on 9/23/92.

Quad Name: Gold Hill

Site #: 466-4428-1

Site Name: Black Tiger Gulch West

Hazard Rating: 2

Description and pertinent facts: This shaft is not in a place that gets a lot of general public foot traffic, but a path (old mining road) does pass very close to it. It's opening is 10'x6' at the surface and it is greater than 75' in depth. At the surface the shaft has steep sides of unconsolidated colluvium that accentuate the "fall-in" hazard. This shaft may be on private land -- a "borderline" case.

Quad Name: Gold Hill

Site #: 467-4429-1.101

Site Name: Black Tiger Gulch East

Hazard Rating: 2

Description and pertinent facts: This open shaft is over 20' deep with surface dimensions of 15'x13'. Standing water fills shaft at 20' below grade. Houses are being built to the north (on top of the hill at the head of Black Tiger Gulch) only about 300 yds. away from this site.

Quad Name: Gold Hill

Site #: 467-4429-1.102

Site Name: Black Tiger Gulch East

Hazard Rating: 2

Description and pertinent facts: This intact and open shaft has surface dimensions of 18'x8' and is filled with water at a depth of 25'. Loose material surrounds the collar of the untimbered shaft adding to the hazard. This site is only about 1500' from houses.

Quad Name: Gold Hill

Site #: 467-4437-1.100

Site Name: South Nugget Hill

Hazard Rating: 2

Description and pertinent facts: A very rough 4WD road leads to this mine, going up from the little village of Rowena that is along CR-106. The 4WD road goes past a large private mine, at

which point it becomes very difficult to drive. The portal is about 5'x3' and the adit extends beyond the line of sight. This adit is open and easy accessible. There are numerous homes within 1/4 of a mile of this mine, and three or more in the gulch itself. The terrain is very steep, and mountainous, yet this mine has visitors based upon the tracks and refuse at the site.

Quad Name: Gold Hill

Site #: 467-4437-2.101

Site Name: Southeast Nugget Hill

Physical Hazard Rating: 2

Description and pertinent facts: We were alerted by local homeowners of the hazardous nature of this shaft. It is on private property, but in an area heavily used by hikers accessing the National Forest land that lies beyond. The shaft diameter at the surface is 15'. The hole is about 55 feet deep and lies immediately adjacent to a foot-trail off the uppermost mining (4WD) road on Nugget Hill.

Quad Name: Gold Hill

Site #: 467-4437-2.102

Site Name: Southeast Nugget Hill

Physical Hazard Rating: 2

Description and pertinent facts: This adit is actually part of a large mining feature in which shaft 103 (described below) is also found. The adit portal is intact at the headwall of the mining feature. The portal measures 5'x5' and extends greater than 30'. The area is used by hikers from Glendale and Rowena. This opening is likely part of a larger mine complex in this area.

Quad Name: Gold Hill

Site #: 467-4437-2.103

Site Name: Southeast Nugget Hill

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is part of a large mining feature and occurs just below adit 102, described above. It is unclear whether the feature is actually a true shaft or a collapse feature. At the time of investigation it was about 25' deep and had a surface opening of 5'x4'. The area is used by hikers from Glendale and Rowena. This opening is likely part of a larger mine complex in this area.

Quad Name: Gold Hill

Site #: 467-4439-1.100

Site Name: McCorkle Gulch

Hazard Rating: 2

Description and pertinent facts: This shaft is close to the private/public land boundary. The shaft opening is covered fairly well, yet the shaft can be accessed by crawling beneath the cover. Free fall depth is about 15 feet at which point standing water fills the shaft.

Quad Name: Gold Hill

Site #: 467-4439-1.102

Site Name: McCorkle Gulch

Hazard Rating: 2

Description and pertinent facts: Small (2'x2') opening on private land, which goes into the hillside at least 20 feet. Roof above tunnel is very thin (>1') for perhaps the first 5 feet or so.

Quad Name: Gold Hill

Site #: 467-4439-1.103

Site Name: McCorkle Gulch

Hazard Rating: 2

Description and pertinent facts: This large (12'x10') adit opening, which is on private land, (no signs, fences, gates, etc.) only goes into the hillside about 15 feet or so, yet it forms a cavernous feature. Loose rock on the sides, and the roof make it hazardous. Dirt road, and footpath go into the feature. Abundant blue colored minerals exist in the country rock and the radiation count here is over 3,000, which is about 10 times higher than the background radiation in the area.

Quad Name: Gold Hill

Site #: 467-4440-1.100

Site Name: Buffalo Gulch

Hazard Rating: 2

Description and pertinent facts: Large (8'x10'), open adit, that is a few hundred feet from CR-94 at the east end of Jamestown. This feature may still be on the private land adjacent to the road. The tunnel extends, open, beyond the line of sight.

Quad Name: Gold Hill

Site #: 467-4440-1.101

Site Name: Buffalo Gulch

Hazard Rating: 1

Description and pertinent facts: Open, unmarked and unrestrained shaft, 10'x5' in diameter, which drops about 25 feet into standing water. The shaft is a short distance (about 1/4 mile) from homes on east end of Jamestown.

Quad Name: Gold Hill

Site #: 467-4440-1.102

Site Name: Buffalo Gulch

Hazard Rating: 1

Description and pertinent facts: This 10'x10' shaft opening twists its way down for about 25 feet before encountering the tunnel floor. Various aspects of the tunnel and shaft cribbing can be seen

near the bottom of the shaft. The shaft is a short distance (about 1/4 mile) from homes on east end of Jamestown.

Quad Name: Gold Hill

Site #: 467-4441-1.100

Site Name: SE Porphyry Mtn.

Hazard Rating: 2

Description and pertinent facts: This shaft is about 1000' away from FR-2020, but has a path (old mining road) that leads directly to it. The intact shaft has an opening of 6'x6' and a depth of 30'. No houses are currently close to the site, but nearby land is for sale and Californians are looking to buy! Mountain lion tracks found on path to this mine.

Quad Name: Lyons (and Boulder)

Site #: 468-4441-2.103

Site Name: Northwest Golden Age Hill

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is located right next to an old 4WD road that connects to FR-2020. The 4WD road appears to be relatively unused now. The shaft collar opening is 6'x6' at the surface with loose material around it. It is over 50' deep and therefore, is very dangerous. The site is not often visited.

Quad Name: Lyons

Site #: 468-4442-1.103

Site Name: Denver Public School Mine

Physical Hazard Rating: 2

Description and pertinent facts: This is a shaft on USFS managed land that is near private land signed as Denver Public School Property. The shaft collar measures about 10'x8', dropping vertically about 25 feet to the bedrock floor. This shaft lies adjacent to an unmarked 4WD road which skirts south of the Denver Public School camp property.

^^ New Quad ^^^

Quad Name: Monarch Lake

Site #: 444-4428-1.100

Site Name: North Fork Middle Boulder Creek

Hazard Rating: 2

Description and pertinent facts: This large and remote mine is one of two mines (the other is the Fourth of July Mine) that occur within the Indian Peaks Wilderness. It has an open tunnel which is large (8'x10') and easily accessible. Two people entered the tunnel while I was working at the mine, and based upon the trail and tracks to the mine, other people go into it as well. The dump is readily visible from forest trail # 404, and forest trail # 975 goes to the mine.

Quad Name: Nederland

Site #: 447-4421-2.104

Site Name: South Lost Lake, East Side

Hazard Rating: 1

Description and pertinent facts: There is a stream flowing into this shaft, which re-emerges at the base of the dump. The vegetation along the stream partially obscures the "hole" into which the stream enters. The shaft is between 60-100 feet deep, estimated by timed rock falls into the opening. This is a very dangerous opening for several reasons: it is hidden in shrubbery, a path leads right into the shaft, it has no access restraints, its sides are slippery and wet, the drop is straight down into a pool of water, and there are numerous people frequenting the area. (At least four per day during the week of July 17th).

Quad Name:Nederland

Site #: 448-4422-1.100

Site Name: East HESSIE Falls

Hazard Rating: 2

Description and pertinent facts: This open adit is about 10'x12' and extends beyond line of sight. It cut into solid bedrock, which appears competent and enhances the cave-like appearance of the feature. Standing water (about 6 inches deep) is slowly draining from the mine. Some debris extends in the first 20 feet, as a bridge apparently, into the mine.

The mine occurs on the south side of the South Fork of Middle Boulder Creek, along a popular footpath to the waterfalls above the old townsite of HESSIE. This area is heavily visited by people in the summer months.

Quad Name:Nederland

Site #: 448-4424-1.100

Site Name: East Chittenden Mountain

Hazard Rating: 2

Description and pertinent facts: This large (10'x15') tunnel is open, accessible, and has a footpath into the feature. It lies on the west side of the North Fork of Middle Boulder Creek, which is difficult to access, due to private property and the infrequent bridges crossing the creek. Private land lies, on the east side of the creek, which includes several cabins. A footbridge from the private land connects with a path leading to the mine dump and into the mine itself.

Quad Name: Nederland

Site #: 450-4415-1.100

Site Name: West Jenny Lind Gulch

Hazard Rating: 2

Description and pertinent facts: This open and accessible tunnel is in competent country rock. It is adjacent to a popular hiking and ski trail, which goes up the gulch along an old mining road.

Quad Name: Nederland

Site #: 450-4426-1.100

Site Name: Pomeroy Mountain (Pandora Mine)

Hazard Rating: 1

Description and pertinent facts: The shaft opening has been partially nailed shut; however, there remains two large (4'x2') openings into the shaft. The shaft is open to an estimated depth of 60'-90' at which point water is encountered. This is a very popular region for 4WD recreation, and a 4WD road goes out onto the dump of the mine. The shaft is in a depression adjacent to the dump, and is inspected frequently, based upon tracks and the number of people encountered in the two different days I was there.

Quad Name: Nederland

Site #: 450-4426-1.102

Site Name: Pomeroy Mountain (Pandora Mine)

Hazard Rating: 2

Description and pertinent facts: The shaft cover has collapsed into the shaft, which is open for an estimated 25', where it is plugged.

Quad Name: Nederland

Site #: 451-4414-1.100

Site Name: Jenny Lind Gulch

Hazard Rating: 2

Description and pertinent facts: This shaft is 15 to 20 feet deep, and is partly filled with wood debris. It is immediately adjacent to a trail frequented by hikers, mountain bikers, and cross-country skiers, and is partly obscured visually by a large pine tree. Snow bridging occurs at times in the winter, creating an especially hazardous feature.

Quad Name: Nederland

Site #: 451-4421-2.100

Site Name: Terror Mine/ East Spencer Mountain

Hazard Rating: 1

Description and pertinent facts: The Terror mine is on private property, and is being actively worked. There is an open shaft with a "No Trespassing" sign on it. An unmarked road from CR-140 goes through Forest Service property and ends up at the Terror Mine.

Quad Name: Nederland

Site #: 452-4415-2.103

Site Name: Upper Moon Gulch

Hazard Rating: 2

Description and pertinent facts: This collapsed shaft is immediately adjacent to, and below the road. The oversteepened slope that the shaft creates below the road indicates that the road will fail at this spot. The shaft is currently being used as a trash dump.

Quad Name: Nederland

Site #: 453-4413-2.100

Site Name: North nose of Dakota Hill

Hazard Rating: 2

Description and pertinent facts: This is a shaft with an 8'x4' surface opening and a depth greater than 120'. It is on private land (PBS quad), but is only 50' from a four-wheel-drive road and no deterrent to mine access exists. Very stout, competent timbers still form the cribbing of the shaft.

Quad Name: Nederland

Site #: 453-4416-2.109

Site Name: Middle Moon Gulch #2

Hazard Rating: 2

Description and pertinent facts: This partially collapsed adit is on private property immediately adjacent to the road. An opening about 2 feet in diameter leads to a pool of water about 2 to 3 feet deep that extends into the hillside for an unknown distance.

Quad Name: Nederland

Site #: 453-4418-3.100

Site Name: Grand Union Mine

Hazard Rating: 2

Description and pertinent facts: The upper end of the collapsed adit has an opening large enough for a child or pet to enter the tunnel. Water is pooled at the base of the sloping entrance into the tunnel, about 10 feet from the opening. People are living about 40 feet away, and expressed concern about the open tunnel.

Quad Name: Nederland

Site #: 453-4419-1.102

Site Name: Phoenix Area, Champion Mine

Hazard Rating: 1

Description and pertinent facts: The shaft is open yet obscured by the ruins of the hoist structure. The shaft extends at least 75 feet down and caving around the surface has created a very dangerous opening. The site is very historic, and near roads frequented by fishermen, four-wheelers, and YMCA camp groups.

Quad Name: Nederland

Site #: 453-4419-1.105

Site Name: Phoenix Area

Hazard Rating: 2

Description and pertinent facts: This shaft is in the trees 15 feet northeast of the Lone Star Mine. The shaft is open and 20 to 25 feet deep. Many people visit this area.

Quad Name: Nederland

Site #: 454-4414-2.105

Site Name: Perigo

Hazard Rating: 2

Description and pertinent facts: The mine dump is on Forest Service land, while the tunnel extends into private land. The tunnel has collapsed, creating a stope collapse feature that extends perhaps 200 yards up the hill. One area, about 100 feet long, is up to 75 feet deep, 25 feet across, with loose soil and rocks ringing the feature. The sides are sheer and dangerous.

Quad Name: Nederland

Site #: 454-4414-3.100

Site Name: Lower Dakota Hill

Hazard Rating: 2

Description and pertinent facts: The shaft hoist tower remains intact and the opening into the shaft is boarded up within the building. However, due to erosion and collapse around the original opening, the shaft is exposed from the dump, extending down 25 to 30 feet.

Quad Name: Nederland

Site #: 454-4414-3.103

Site Name: Lower Dakota Hill

Hazard Rating: 2

Description and pertinent facts: The adit portal has collapsed, but at the headwall of the collapse feature is an opening into the tunnel. About 10 feet inside of the opening is a pool of water. The tunnel extends back an unknown distance.

Quad Name: Nederland

Site #: 454-4418-1.100

Site Name: Johnson Mine

Hazard Rating: 2

Description and pertinent facts: The Johnson mine is located behind three homes along County Road 16. One of the homes has many small cabins that are rented out to weekend users. The tunnel is in solid rock and is 6 feet by 5 feet. Rockfall on the floor along with an unstable looking roof indicate a dangerous, yet accessible opening.

Quad Name: Nederland

Site #: 454-4418-2.101

Site Name: Rollinsville Quarry

Hazard Rating: 2

Description and pertinent facts: The collapsed adit is difficult to distinguish from the road because of the quarry. At the headwall of the collapse feature is a small opening (about 2 feet in diameter) which extends back into the tunnel. The tunnel extends an unknown distance into the hillside.

Quad Name: Nederland

Site #: 454-4419-1.100

Site Name: North Rollinsville Work Center

Hazard Rating: 2

Description and pertinent facts: The timber framing and roof are partially intact at the adit opening. Beyond this is an open tunnel, which is easily accessible, and extends an unknown distance through solid rock.

^^ New Quad ^^^

Quad Name: Raymond

Site #: 463-4443-1.101

Site Name: Cannon Mtn.

Hazard Rating: 2

Description and pertinent facts: This shaft is on private land and lies between two adits just downhill from Overland Rd.(CR-94). It lies just 20' away from marked USFS land. The opening is 12'x6' and water fills the shaft at 23' below grade.

Quad Name: Raymond

Site #: 465-4441-1.101

Site Name: FR-2008, East Overland Mtn.- unnamed gulch

Hazard Rating: 2

Description and pertinent facts: This is an intact shaft with a surface opening of 10'x4' and a depth of greater than 17' because water fills the shaft at that depth. It is not cratered and is timbered to the surface. Many tracks are on the dump of this shaft indicating many visitors to the site. The shaft is on a well defined 4WD road. The water filling the shaft is slightly degraded (pH=6.30, Conductivity=855 μ S).

Quad Name: Raymond

Site #: 465-4441-1.104

Site Name: FR-2008, East Overland Mtn.- unnamed gulch

Hazard Rating: 1

Description and pertinent facts: This is a large shaft which is cratered at the surface to dimensions of 24'x21'. The actual excavated shaft is 10'x10' at 25' below grade. Loose material surrounds the shaft adding to the hazard. A 4WD road (FR-2008) passes just 25' to the west of the shaft. There are no access deterrents around the shaft.

Quad Name: Raymond

Site #: 465-4444-1.104

Site Name: South of Balarat site

Hazard Rating: 2

Description and pertinent facts: This shaft has water filling it at a depth of 18' and has a surface opening of 12'x7'. It is close to FR-2014. A small dump implies that the shaft is probably not much deeper than 18'.

Quad Name: Raymond

Site #: 465-4444-1.106

Site Name: South of Balarat site, Pine Shade Vein

Hazard Rating: 2

Description and pertinent facts: This is a very large shaft with a depth greater than 80'. The actual shaft dimensions are 15'x9', but it is cratered at the surface to approximately 40'x40'. Loose dump material surrounds the shaft adding to the hazard. The 3000 cubic yard dump indicates the shaft may be significantly deeper. A fence around the shaft discourages access to the shaft, but does not prohibit access nor diminish the hazard. There are signs at the site reading "Private Property" and "Danger". These seem to indicate it might be an unpatented claim. This shaft is likely connected to adit 105. This site would have a hazard rating of 1 (extreme danger), but for its remoteness.

Quad Name: Raymond

Site #: 465-4444-1.107

Site Name: South of Balarat site

Hazard Rating: 2

Description and pertinent facts: This shaft is partially collapsed with opening of only 1'x1'; the depth is unknown. The partial collapse appears to be only a shallow bridge.

^^ New Quad ^^^

Quad Name: Tungsten

Site #: 458-4415-1.100

Site Name: County Road 13

Hazard Rating: 2

Description and pertinent facts: This is a partially collapsed shaft with a surface opening of 4'x4' and a depth of 15'+. The cribbing has collapsed into the shaft so the real depth is unknown. This is a serious hazard because homes surround this area. This shaft could be easily back-filled to eliminate the problem.

Quad Name: Tungsten

Site #: 458-4420-1.100/101/103

Site Name: Kelly-Dahl Campground

Hazard Rating: 2

Description and pertinent facts: These are three open adits that occur just outside the campground. An old road/path leads directly to the mines which are not safeguarded in any way. Adit 100 is partially collapsed with an opening of 5'x4' (large enough to access mine) and it probably extends back over 50'. Feature 101 is a subsidence feature associated with adit 100 and has a surface opening of 12'x8' with a depth of about 10'. Adit 102 is intact with an opening of 5'x4' and it extends back greater than 40'.

Quad Name: Tungsten

Site #: 458-4421-1.100

Site Name: Windy Tunnel

Hazard Rating: 2

Description and pertinent facts: This adit may be on private land - another "borderline" case. This adit is intact, has a 6'x7' opening, and its depth is unknown, but literature indicates it to be about a few thousand feet in length. It provides access to the Elsie and Black Rover veins. It is located right next to State Highway 72 and is easily accessible. A broken wooden gate is fitted inside the adit, but it provides no real deterrent.

Quad Name: Tungsten

Site #: 458-4424-1.101

Site Name: Near Ridge Rd. (County Road-128E)

Hazard Rating: 1

Description and pertinent facts: The shaft is greater than 40' deep with surface dimensions of 13'x7'. It is unmarked and is easily accessible. This shaft occurs in a growing residential area and a house is less than 1000' away. The dump is well vegetated and inconspicuous.

Quad Name: Tungsten

Site #: 458-4424-2.102

Site Name: North of Barker Reservoir, SW Hurricane Hill

Hazard Rating: 2

Description and pertinent facts: This adit may be on private, but is another "borderline" case. It occurs in a residential area near Nederland -- houses are within 1000' of the mine. The mine is a double adit (two drifts, one opening) with one drift only extending 15' and the other, main adit extending an unknown distance greater than 25'.

Quad Name: Tungsten

Site #: 460-4427-1.102

Site Name: Near High Noon Claim

Hazard Rating: 2

Description and pertinent facts: This shaft is adjacent to the High Noon claim which now has an inhabited cabin on it only about 1000' away from the shaft. The shaft opening is 6'x5' and is at least 25' deep. Standing water fills the shaft at the 25' depth.

Quad Name: Tungsten

Site #: 461-4426.100

Site Name: Near St. Anton Highlands Subdivision

Hazard Rating: 2

Description and pertinent facts: This shaft is 25' deep with surface dimensions of 9'x4'. The site is fenced off and has warning signs, but the shaft is open and intact. It occurs near a residential subdivision and is easily accessible by a trail that leads directly to it. This may have been an air vent for a mine.

Quad Name: Tungsten

Site #: 461-4427-1.100

Site Name: unknown

Hazard Rating: 2

Description and pertinent facts: This shaft is very easy to get to since it is adjacent to a four-wheel-drive road. In fact, the topography is flat enough to allow passenger cars to reach the site.

The shaft opening is 10'x8' and is 20' deep. It may have only been a large prospect pit. An old wooden cap with an open center hole is on top of the opening, but this is falling apart creating a hazard itself! This could be easily and cheaply back-filled.

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USFS-ABANDONED MINE LAND INVENTORY PROJECT-SUMMARY REPORT

CLEAR CREEK RANGER DISTRICT

May 6, 1993

by

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Colorado Geological Survey

USFS-ABANDONED MINE LAND INVENTORY PROJECT - SUMMARY REPORT CLEAR CREEK RANGER DISTRICT

This document summarizes the sites *of concern* to the USFS - Clear Creek Ranger District. It does not include all the mine sites visited during the inventory of the district. The Summary Report includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2).

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

These site descriptions are not listed in order of priority, but are listed by, first, Quadrangle(Quad) Name and, second, Site Number(#). A priority listing of the ten most important environmental degradation sites and ten most important mine hazard sites is given in the Appendix.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district is available in the digital database.

Sites Exhibiting Environmental Degradation

Quad Name: BERTHOUD PASS

Site #: 10-7-13:426/4403-1.100,200

Site Name: DOCTOR MINE, SCOTT TUNNEL

Environmental Rating : 3

Physical Hazard Rating: 5

Description and pertinent facts: Drainage from the Doctor Mine adit (100) is an estimated 2.5 cfs and this is the major reason for its rating of "potentially significant environmental degradation" (3) as it is a significant contributor to West Fork Clear Creek. There is a slight amount of orange $\text{Fe}(\text{OH})_3$ precipitate in the mine drainage. The mine drainage water tested as fairly good quality with $\text{pH}=7.33$ and conductivity=210. Moss was observed growing in the drainage. The adit historically extended 1,160 ft. in length and this is why so much water is draining from it (Lovering & Goddard, 1950). A water sample was taken for lab analysis in *November 1991* and the results are as follows:

Constituent	Concentration	Factor Above Colorado Basic Standards for Aquatic Life (chronic) and Domestic Use
SO ₄	400 mg/L (TRec)	➤ 1.6 x domestic water MSL
Fe	500 µg/L "	➤ below total recoverable (TRec), but 1.6 x dissolved stream numeric standard
Mn	620 µg/L "	➤ below total recoverable (TRec), but 12.4 x dissolved stream numeric standard
Zn	140 µg/L "	➤ 2 x aquatic standard (<i>assuming</i> dissolved=TRec and hardness=150 mg/L CaCO ₃)

The mine waste dump (200) for the Doctor Mine was also was rated as a potentially significant environmental problem because almost all the mine drainage water runs over the surface of the dump. The volume of dump material is about 2,300 yds³. This situation could allow for leaching of metals from the dump into the water, although measurement of pH and conductivity of the water draining over the dump material indicates this is not presently happening as the pH increases to 7.85 and the conductivity drops to 177 μ S.

[illegible]

Quad Name: CENTRAL CITY

Site #: 10-7-13:452/4410-1.102

Site Name: SILVER CREEK; GOLD CHIEF MINE (CGS Bull.40, Nelson-Moore, et al, 1978)

Environmental Rating : 3**Physical Hazard Rating: 5**

Description and pertinent facts: The acid mine drainage emanating from this adit portal has a pH=3.36 and a conductivity=1264 μS indicating very poor water quality. At the time of the site

visit (9/24/91) water was only seeping from the portal and then percolating into the dump, but there is Fe(OH)₃ precipitate staining over the dump indicating significantly greater discharge from the adit in springtime. There were no obvious effects on the receiving stream, Silver Creek, which had a pH=7.05 and a conductivity=67 µS. We were unable to attain a water sample for lab analysis because discharge volume was too small.

Quad Name: CENTRAL CITY

Site #: 10-7-13:452/4413-1.102,202

Site Name: DAKOTA HILL; NYE METALS

Environmental Rating : 3

Physical Hazard Rating: 5

Description and pertinent facts: Nye Metals has an unpatented claim on Dakota Hill northwest of the Apex townsite. Molybdenite was being mined here and the mine appears to be inactive, but not abandoned. The mine adit (102), whose portal occurs inside a large shed, is collapsed and is draining approximately 1.0 cfs of water at pH=8.67 and conductivity=300 µS (October 1, 1991). Most of the water is transported by piping away from the adit and site buildings to the dump (202) where the piping ends and the water is left to travel over the surface of the dump material. The mine drainage occurs about 0.5 miles away from the closest receiving stream, which is Pine Creek, but is also one of the headwater sources for the creek. Vegetation is healthy in the mine drainage below the dump. Water samples were taken for laboratory analysis based on the alkaline nature of the water and the significant discharge. One sample was taken adjacent to the collapsed portal and one was taken in the drainage path below the dump. Analyses revealed no significant difference between the samples. Results of the sample adjacent to the portal follow:

<u>Constituent</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standards for Aquatic Life (chronic) and Domestic Use</u>
SO ₄	83 mg/L (TRec)	➤ below domestic water MSL
Mn	80 µg/L "	➤ below Total Recoverable (TRec) stream numeric standard
Pb	3 µg/L "	➤ below aquatic and domestic standards
Mo	1500 µg/L "	➤ no standards published (see discussion below)

Analyses for cadmium, copper, iron, and zinc were all below detection limits. Currently, Colorado has no Minimum Contaminant Level (MCL) numeric standards for molybdenum in either surface or ground water. During research to establish groundwater standards an MCL of 150 µg/L was being considered for Agricultural Standards, but it was decided that the existing information on the effects of molybdenum was inadequate "to support any specific numerical standard at this time" (Basic Standards for Ground Water, 3.11.0, 5 CCR 1002-8, 10/17/91, p.59). Some agricultural studies have indicated that high concentrations of molybdenum can adversely affect cattle. Since the molybdenum concentrations (total recoverable) in water draining from this mine are 10 times the concentration that was being considered for an MCL, it is very likely that this mine drainage will be out of compliance should any future molybdenum standards be promulgated.

The dump is rated as a potentially significant source of environmental degradation because of its large size of 20,000 yds³ and the fact that all of the mine drainage flows over and through the dump

Quad Name: CENTRAL CITY

Site Name: KING MINE

Physical Hazard Rating : 3

[illegible]

Quad Name: EMPIRE

Site Name: MINNESOTA MINES

Physical Hazard Rating: 1

4

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:454/4398-2.200

Site Name: WEST GOLD UPPER TUNNEL (Harrison & Wells,1959)

Environmental Rating : 3

Physical Hazard Rating: 3

Description and pertinent facts: This is a steeply sloping mill tailings dump which appears to be mostly on forest land and spills onto private property near SH-109 along Chicago Creek. The property adjoining this site is an educational center for disturbed youth. Students are between 5 and 15 years of age and are in classrooms with sliding glass doors opening onto the dump. Ingestion of the tails could pose a threat to the health of the students. These tailings and the associated adits and shafts were also rated as physical hazards. (see description in physical hazard summary)

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:454/4398-3.203

Site Name: UNKNOWN

Environmental Rating : 3

Physical Hazard Rating: 5

Description and pertinent facts: This is the waste rock dump for adit #103. The dump was placed directly in the adjacent gully and has been partially washed away by storm waters. Loose material has been eroded downstream in the gully and the fine fraction of the dump material has probably been carried into Chicago Creek.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:456/4396-1.100,200

Site Name: LITTLE BEAR CREEK

Environmental Degradation Rating: 2

Physical Hazard Rating: 3

Description and pertinent facts:

This is the worst site of environmental degradation in the Clear Creek Ranger District that is strictly on USFS land. The degradation stems from both the mine opening and its associated dump. The mine opening is intact and is draining very poor quality water. In October this water had a pH=3.85, a conductivity=1500 μ S, and was draining at about 2 gpm. In and along the path of drainage was abundant ferric hydroxide ($\text{Fe}(\text{OH})_3$) precipitate and sulfo-salt deposits. A secondary dry path lined with precipitate is evidence that flow is significantly greater in springtime. No plant life occurred along the drainage path or on most of the dump material. The mine drainage flows over the dump for about 50' before it empties directly into Little Bear Creek. The following lists the significant data from lab analyses of mine drainage water samples taken *in November*:

<u>Constituent</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standards for Aquatic Life (chronic) and Domestic Use</u>
SO ₄	860 mg/L (TRec)	➤ 3.4 x domestic water MSL
Cd	52 µg/L "	➤ 10 x domestic water MCL, about 26 x aquatic life MCL
Cu	54 µg/L "	➤ below domestic MCL, 2.5 x aquatic life MCL
Fe	35000 µg/L "	➤ 35 x stream numeric standard
Mn	15000 µg/L "	➤ 15 x stream numeric standard
Pb	<6 µg/L "	➤ below standards
Zn	13000 µg/L "	➤ 65 x stream numeric standard

The creek is slightly impacted by the mine drainage as indicated by lab analyses of water samples taken *in November*. Sulfate (SO₄) increases from 210 mg/L upstream of the site to 230 mg/L downstream of the site, iron (Fe) increase from 0.2 to 0.3 mg/L, manganese (Mn) increases from 0.02 to 0.06 mg/L, and zinc (Zn) increases from below detection limits to 0.04 mg/L. These are all below stream standards. Other heavy metals were below detection limits.

The mine dump consists of waste rock from the mining operation and is approximately 330' in length, 40' wide, with a volume of 5700 cubic yards. It is in contact with Little Bear Creek and is being significantly and constantly eroded by the creek for all of its length. The slope towards the creek is oversteepened to greater than 45 degrees and is dangerously unstable. Extreme gullyng and rilling occur on this slope. Extreme erosion occurs during storm events as evidenced by debris flows at the dump toe. The environmental concern is that metal-laden dump material is being deposited in the stream bed and then is subject to constant dissolution into the stream waters. Also, since the acid mine drainage runs over the surface of the mine dump, leaching of metals from the dump material adds to the environmental problems at the site.

Samples of the dump material were taken for lab analyses by the Colorado Dept. of Health for the Clear Creek Superfund Site, Phase II Remedial Investigation. The results of these analyses are contained in the Appendix.

The city of Idaho springs did have a municipal water intake in Little Bear Creek about 0.5 miles downstream of this site (just before the confluence with Soda Creek), but it was abandoned in the recent past.

Sites Exhibiting Physical Hazards

Quad Name: CENTRAL CITY

Site #: 10-7-13:446/4407-1.100

Site Name: LOMBARD MINE & MILL

Environmental Rating : 4

Physical Hazard Rating: 2

Description and pertinent facts: This is a large mill site with a 150 foot long partially covered mine working. The workings are surrounded by steep slopes and due to heavy use of the site as a shooting range could pose a hazard if someone fell in. Also the mill workings themselves are unstable and could collapse onto ill-fortuned individuals.

Quad Name: CENTRAL CITY

Site #: 10-7-13:447/4408-1.104

Site Name: YANKEE HILL

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This open and intact shaft is only 10' from an unmarked 4WD road that branches off of FR-175 about 3 miles west of Pisgah Lake. The shaft is 6' x 6' and has no dump material around the opening which would signal its presence from a distance. Consequently, it would be easy for someone hiking or in a recreational vehicle to come upon the shaft with no warning. The shaft was probably a ventilation shaft for adit #105. This shaft appears to be on a PRIVATE CLAIM according to the PBS maps, but may need to be surveyed to ascertain land ownership.

Quad Name: CENTRAL CITY

Site #: 10-7-13:448/4403-1.101,104,105

Site Name: PIONEER TUNNEL & REXALL ADIT (Hawley & Moore,1976)

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This is the Pioneer Tunnel (#101). A jeep road has been built directly above the opening which is slowly collapsing under the weight of overburden and traffic. A serious danger of collapse exists at this site. The jeep road is passable, but is in disrepair and does not appear to be used much. A barrier placed near the junction with Mill Creek Road (CR-261) could mitigate this hazard. A collapsed stope trends uphill from the opening and could be hazardous to the unwary hiker. Feature #104 nearby is a collapsed adit in the jeep road. The hole should at least be filled or barricades constructed. Feature #105 is a 60 foot deep shaft just up the hill from the road and #104. It has a broken down wire fence around it which does not deter access and could cause a person to trip and fall into the hole.

Quad Name: CENTRAL CITY

Site #: 10-7-13:448/4408-1.103,104

Site Name: UNKNOWN, FOREST ROAD 175

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: These two vertical shafts are about 40' apart, greater than 30' in depth, and are immediately next to Forest Road 175. These shafts are probably connected by a drift at depth. Shaft 103 is partially collapsed and has surface dimensions of 17 x 17'. Shaft 104 is intact with surface dimensions of 20' x 20'. This is not a well travelled portion of road, but these shafts are dangerous to hunters, motorcycles, ATV's, and the curious. There are no rock waste dumps surrounding the shafts to warn of their presence, which adds to the jeopardy associated with these mines. These shafts are probably on private property.

Quad Name: CENTRAL CITY

Site #: 10-7-13:449/4404-1.100

Site Name: WOODPECKER GULCH

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This is an open adit situated about 100 feet above Fall River Road. Proximity to tourist traffic makes this otherwise harmless adit a possible threat to the safety of curious individuals entering the tunnel.

Quad Name: CENTRAL CITY

Site #: 10-7-13:452/4411-1.104

Site Name: OREGON HILL

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This shaft may have been a vent for the mine workings at this site. The shaft collar is 4' x 6' and has slumping soil around it. The shaft is 20' deep with sheer walls. There would be no escape for a person who fell into the shaft. It occurs adjacent to a former 4WD road which has been blocked with a soil and rock barrier about 800' to the north. The barrier prevents automobile access to the site, but motorcycles and ATV's are able to pass it. This shaft is dangerous to the curious, hikers, bikers, and cross-country skiers.

Quad Name: CENTRAL CITY

Site #: 10-7-13:453/4411-1.101

Site Name: SNOWDEN VEIN (Bastin & Hill, 1917)

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is easily accessed and conspicuous as it is near a large mine site just off of a 4WD road on the upper reaches of Silver Creek. The shaft opening is 3' x 3' and is intact to a depth of 35', but collapsed below this depth. The shaft occurs in the middle of a 16,000 cubic yard dump. Snow was still in the bottom of the shaft in late September.

Quad Name: EMPIRE

Site #: 10-7-13:439/4401-1.100

Site Name: EMPIRE AREA, TRAILER PARK - WEST OF EMPIRE ON HWY 40

Environmental Rating : 5

Physical Hazard Rating: 1

Description and pertinent facts: This adit is standing open and has no current access deterrents. Unconsolidated material has sloughed in front of the portal, but the adit is intact behind the portal and extends back approximately 60 feet. A tourist campground is located nearby and is connected to the site by a road. The back of this mine is in unconsolidated overburden and susceptible to collapse. This mine is extremely dangerous due to its proximity to a privately-owned tourist facility, which is a family camping area.

Quad Name: EMPIRE

Site #: 10-7-13:441/4403-2.100

Site Name: MINNESOTA MINES

Environmental Rating : 2**Physical Hazard Rating: 2**

Description and pertinent facts: ALL DATA IS FROM THE 1980 MINED LAND RECLAMATION DIVISION INVENTORY. This feature is an open adit that extends over 100'. Portal dimensions are 10' x 8'. Poor quality water is draining out of the adit, but it is still accessible to the curious. At the time of the 1980 inventory there were lots of people entering the Minnesota Mines area, but now there are gates preventing vehicular access. This feature may be on private property, but some USFS-managed land is nested among the private claims.

Quad Name: EMPIRE

Site #: 10-7-13:441/4403-2.101

Site Name: MINNESOTA MINES

Environmental Rating : 4

Physical Hazard Rating: 1

Description and pertinent facts: ALL DATA IS FROM THE 1980 MINED LAND RECLAMATION DIVISION INVENTORY. This feature is a water-filled shaft of unknown depth. Poor quality water fills the shaft that has surface dimensions of 10' x 8'. At the time of the 1980 inventory there were lots of people accessing the Minnesota Mines area, but now there are gates preventing vehicular access. This feature may be on private property, but some USFS land is nested among the private claims.

Quad Name: EMPIRE

Site #: 10-7-13:446/4411-1.103

Site Name: PILE HILL

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This large pit appears to have resulted from subterranean collapse of mine workings. It has areal dimensions of 20' x 30' and is 25' deep with sheer vertical walls. It is immediately adjacent to FR-353 which leads to James Peak and is in an area which is actively used by recreationists including tourists, hikers, and motorcyclists. This pit could be very hazardous under certain conditions.

Quad Name: GEORGETOWN

Site #: 10-7-13:436/4390-1.100

Site Name: SIDNEY TUNNEL

Environmental Rating : 4**Physical Hazard Rating: 2**

Description and pertinent facts: This adit has a 4' x 4' portal opening with no timbers to support a 40' standing highwall above the opening. Material perched above portal is unstable. Sloughing of this highwall has dammed the mine drainage behind, giving evidence that it is not composed of very competent rock. The adit extends back a large, but unknown distance. This adit is very near a 4WD recreation area.

Quad Name: GRAY'S PEAK

Site #: 10-7-13:430/4391-1.100

Site Name: GRIZZLY MINE, SAN JUAN & GRIZZLY TUNNELS

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This feature is an intact and open incline shaft. The shaft collar dimensions are 10' x 6' with the shaft inclined about 70 degrees from horizontal. No fencing or other access deterrents limit access to the shaft. Shaft depth extends greater than 30' where standing water is encountered.

Quad Name: GRAY'S PEAK

Site #: 10-7-13:432/4390-1.100

Site Name: STEVEN'S GULCH

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This adit portal is on private property, but the tunnel which is standing open may extend under USFS land. Portal timbers are intact around a 6' x 6' opening and the tunnel extends back past view. This is a dangerous hazard because of its proximity to the heavily used USFS Road 189. No water is draining from the adit and no deterrents to public access exist at the site.

Quad Name: GRAY'S PEAK

Site #: 10-7-13:434/4388-1.102

Site Name: SANTIAGO MINE PERIPHERALS

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This is an open shaft which has partially collapsed, but still has a 4' x 4' opening -- enough to gain access. The ground surrounding the opening is fairly unstable. The shaft is estimated to be approximately 75-100' deep. This shaft is less than 0.2 miles from the Argentine Pass Road (USFS Road 248) and has no deterrents to public access.

[illegible]

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:446/4395-1.101

Site Name: MID-CASCADE CK

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This is a very dangerous shaft that is visible from and only about 30 ' from an unmarked 4WD road. There is no caving around shaft opening which has an intact timber lined collar with dimensions of 7' x 3'. The shaft is greater than 50' in depth. The only

reason this shaft does not get a hazard rating of extreme (1) is that it appears this 4WD road is not well travelled. Still, it is a real danger to hunters and the curious.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:446/4395-1.106

Site Name: MID-CASCADE CK

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This is a large open shaft in very competent rock. Water fills the shaft about 30' below surface grade. It is probable that the shaft does not extend any deeper as the dump surrounding it is only 20 cubic yards in volume. The collar is not timbered and measures 12' x 5'. Public visitation of this shaft is rare as there are no paths or roads to it and it is kept from view by dense vegetation. Claim markers appear onsite and, if they are in the correct position, it appears as if part of the site is on private and part on USFS land. The claim marker is a wood stake with orange top and reads, "shaft location-Plymouth Rock."

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:448/4395-1.100

Site Name: LOWER UTE CK

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This is historically the Big Flat Shaft (Harrison and Wells, 1959) and it is on private land, but is zero feet from the Ute Creek road (County Road 118) and is actually impinging on the road surface. This situation is a serious hazard, but actual visitation to the shaft is rare as it is fairly well hidden and is not obvious to the casual observer. The shaft opening is 8' x 6' and appears to be only 12' deep, but it is possible that the material at 12' deep is only a plug of collapsed rock and the shaft actually extends much deeper.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:448/4395-1.102

Site Name: LOWER UTE CK

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This feature is historically called the "Q" Shaft (Harrison and Wells, 1959). This shaft has surface dimensions of 10' x 8' and is filled with water at a depth of about 15'. It is only 100' from the well travelled Ute Creek road (County Road 118), but it is up a very steep slope so access is not easy.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:450/4396-1.100,101

Site Name: GOLDEN GLEN TNL, KING WILLIAM TNLS

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: These two features are only 30' apart and are probably part of the same mine workings, historically called the King William Tunnels (Harrison and Wells, 1959). Mine feature 100 is an adit with a horizontal extent greater than 50' and a portal opening of 5' x 6'. The adit has a vertical winze which is water filled just inside portal. Mine feature 101 is a shaft filled with water to just 3' below ground surface, so its total depth is unknown. The shaft collar measures 8' x 5'. These two mine features are only about 150' northwest of State Highway 103 with fairly easy access on a gravel road from the highway to the site. A tourist trout farm is just across the highway from these mine sites, increasing the frequency of visitation. These mine openings should be capped, filled, or closed in some way.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:450/4396-1.104

Site Name: GOLDEN GLEN TNL, KING WILLIAM TNLS

Environmental Rating : 4

Physical Hazard Rating: 2

Description and pertinent facts: This adit is the Golden Glen Tunnel (Harrison and Wells, 1959). The adit extends back over 40' and the portal is 4' x 5'. Water is seeping from the adit, but entry into the mine is still possible. This adit is not far from State Highway 103 and a gravel road provides easy access to the site. Therefore, the site probably has many visitors. Also there are many concrete mill structure foundations in the immediate vicinity. These are built on steep slopes and could be hazardous themselves as people explore them.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:453/4397-1.103,104

Site Name: BEAVER MINE AREA, SUNNY SOUTH TNL

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: These shafts are twin shafts being only about 8' apart. Shaft 103 is 15' deep with collar dimensions of 5' x 3' and shaft 104 is 30' deep with a 5' x 4' opening. There is no road or path leading to these shafts, but they are only about 600' from State Highway 103, visible on the hillside north of the highway.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:454/4397-1.100

Site Name: LOWER BARBOUR FK

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This adit is partially filled with sloughed slope material in front of the portal so that the actual opening is only 1' x 2'. The adit is intact behind this material though with 6' x 5' dimensions. The adit appears to be greater than 30' in length. The adit is rated as dangerous (2) because it lies only 15' off the well-travelled Soda Creek road (County Road 140) at the same elevation as the road itself. No dump material is adjacent to the adit; it may have been incorporated into the road base.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:454/4397-1.101

Site Name: LOWER BARBOUR FK

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This adit has a 5' x 4' portal and is greater than 20' deep. It occurs only 10' off Soda Creek road (County Road 140). The adit is rated as dangerous (2) because it lies so close to the well-travelled Soda Creek road and is at the same elevation as the road itself. No dump material is in front of the adit; it may have been incorporated into the road base. There is some dump material above the adit, but its origin was not apparent.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:454/4397-1.102

Site Name: LOWER BARBOUR FK

Environmental Rating : 4

Physical Hazard Rating: 2

Description and pertinent facts: This adit has a large portal of 6' x 8' and extends back greater than 30'. It is situated only 30' from Soda Creek road (County Road 140). The adit is rated as dangerous (2) because it lies so close to the well-travelled Soda Creek road and is at the same elevation as the road itself. Shallow standing water appears in the adit with orange $\text{Fe}(\text{OH})_3$ precipitate. The water is slightly degraded with a pH=6.00 and a conductivity=491. The Barbour Fork has some orange precipitate 50' upstream and downstream from adit. This may be from the dump material having been incorporated into the road base during its construction.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:454/4398-2.101,102

Site Name: WEST GOLD UPPER TUNNEL (Harrison & Wells, 1959)

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: A very large pit (#101) is just uphill from an educational center for disturbed youth. It appears to be a collapsed stope which is 150 feet long, 50 feet wide and 50 feet deep. Evidence of hiking around this hole indicates that people are coming up to this site often and walking around the feature. Feature #102 is on the same strike as #101 and appears to be a continuation of #101. These features could be hazardous to hikers venturing too close or could continue to collapse and should at least be secured with fence and sign.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:455/4395-1.100

Site Name: UPPER WARREN GULCH

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #100 is on private land but is adjacent to USFS Trail #47 and near an unmarked 4WD road that accesses the upper part of Warren Gulch. The shaft has a cratered opening of 20' x 20' and is over 50' deep. This is a very serious hazard due to its proximity to the road and trail. The ground around the shaft is unconsolidated and unstable. Fallen barbed-wire fencing surrounds part of the site and adds to the hazard because of the danger of tripping over it. This shaft should at least be re-fenced and signed.

Quad Name: IDAHO SPRINGS

Site #: 10-7-13:456/4396-2.100

Site Name: LITTLE RICHARD MINE

Environmental Rating : 5

Physical Hazard Rating: 2

Description and pertinent facts: This inclined shaft is adjacent to CR-155 and about 150 feet from a year-round dwelling with children. The shaft opening is 10' x 6' and is plugged with rock material at 35' deep. The PBS map indicates that the shaft is on USFS managed-land, but the nearby resident says that her husband owns it. Some sort of access deterrent would be appropriate as well as resolution of the ownership question. Proximity to a dwelling and 4WD traffic, combined with the depth of the hole, make this site a dangerous hazard.

Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.

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APPENDIX

**USFS-ABANDONED MINE LAND INVENTORY PROJECT - SUMMARY REPORT
CLEAR CREEK RANGER DISTRICT**

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site #	EDR
1) Little Bear Creek	Idaho Springs	10-07-456/4396-1.100,200	2
2) Minnesota Mines	Empire	10-07-441/4403-2.100, 101, 200	2
3) Waldorf Mines	Gray's Peak	10-07-434/4387-1.201	3
4) Silver Creek	Central City	10-07-452/4410-1.102	3
5) West Gold Upper Tunnel	Idaho Springs	10-07-454/4398-2.200	3
6) Doctor Mine	Berthoud Pass	10-07-426/4403-1.100,200	3
7) Nye Metals	Central City	10-07-452/4413-1.102,202	3
8) Steven's Mine	Gray's Peak	10-07-432/4389-1.101	4
9) Grizzly Mine	Gray's Peak	10-07-430/4391-1.102	4
10) Lombard Mine and Mill	Central City	10-07-446/4407-1.100	4

Hazards

Site Name	Quad Name	Site Number	PHR
1) Trailer Park, west of Empire	Empire	10-7-13:439/4401-1.100	1
2) Minnesota Mines	Empire	10-7-13:441/4403-2.100,101	2,1
3) West Gold Upper Tunnel	Idaho Springs	10-7-13:454/4398-2.101,102	2,2
4) Pile Hill	Empire	10-7-13:446/4411-1.103	2
5) Golden Glen	Idaho Springs	10-7-13:450/4396-1.100, 101, 104	2,2,2
6) Upper Warren Gulch	Idaho Springs	10-7-13:455/4395-1.100	2
7) Little Richard Mine	Idaho Springs	10-7-13:456/4396-2.100	2
8) Lower Ute Creek	Idaho Springs	10-7-13:448/4395-1.100,102	2,2
9) Grizzly Mine	Gray's Peak	10-7-13:430/4391-1.100	2
10) Sidney Tunnel	Georgetown	10-7-13:436/4390-1.100	2

USFS-ABANDONED MINED LAND INVENTORY PROJECT-SUMMARY REPORT

ESTES-POUDRE RANGER DISTRICT

May 6, 1993

by Matthew A. Sares

Colorado Geological Survey

USFS-ABANDONED MINED LAND INVENTORY PROJECT - SUMMARY REPORT ESTES-POUDRE RANGER DISTRICT

This document summarizes specific sites *of concern* to the USFS - Estes-Poudre Ranger District and does not include all the mine sites inventoried in the district. Usually, only sites with Environmental Degradation Ratings of 1, 2, or 3 and Mine Hazard Ratings of 1 or 2 are included in the summary reports as sites of concern. In the Estes-Poudre Ranger District the highest Environmental Degradation Rating given was 4, indicating only slight degradation. Since **this ranger district is remarkably free of environmental problems**, the two sites receiving this rating are summarized here for informational purposes. A number of sites were given Mine (Physical) Hazard ratings of 1 or 2 and are summarized below. We recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way.

Sites Exhibiting Environmental Degradation

Quad Name: Crystal Mountain

Site #: 10-4-463/4491-1.100/101

Site Name: Eureka Group

Environmental Degradation Rating: 4

Description and pertinent facts: This site is on the north side of the Buckhorn Canyon Road (County Road(CR)-44H) about 0.4 miles west of the Crystal Mountain Road. It is not readily visible as it lies about 250 ft. above the road and therefore draws few, if any, visitors. Two bench quarries occur at this site. Quarry 100 has an 18' highwall and its bench is approximately 150' x 30'. Quarry 101 has a 15' highwall and its bench is approximately 45' x 20'. These quarries were mined in 1941 for uranium. Reportedly, 6 tons of uranium ore were produced at the site, with the primary mineral being uranophane (Nelson-Moore, et al, 1978; Colorado Geological Survey Bulletin 40). The ore occurs in fractures along the contact of Precambrian mica schist and a pegmatite vein. Radiometric readings (primarily reflecting gamma radiation) were up to 5000 counts per second (cps) in the highwall of quarry 100 and up to 5200 cps in the highwall of quarry 101. Normal background readings in the mica schist are 65 to 75 cps. Therefore, these peak readings represent up to an 80 fold increase in radiation at the site. The quarries' waste rock ranges from large gravel to boulder in size and has radiometric readings of 150 to 2000 cps. Since the site is a natural uranium occurrence and no processing took place at the site, little can be done to mitigate the radiation hazard at this site. The radiation exposure of site visitors could be a concern, but visitors are rare. The particle size of the waste rock and the absence of water at the site preclude any significant movement of uranium laden material from the site. These factors combine to make this only a slight environmental problem.

Quad Name: Pingree Park

Site #: 10-4-450/4491-1.100

Site Name: USFS Gravel Pit near Tom Bennett Campground

Environmental Degradation Rating: 4

Description and pertinent facts: This site is an open, shallow gravel pit with areal dimensions of 150' x 300' and a depth of about 23' near the center. The only problem here is that it appears there has been some dumping of trash into the old part of the gravel pit. Most of the trash is relatively innocuous (i.e. inert material such as wood, cloth, or metal), but included in this are some old barrels, paint cans, oil cans, and aerosol cans which may have contained environmentally hazardous chemicals. This site is not suited to be a landfill because of the porous nature of the underlying glacially deposited till which also serves as an unconfined aquifer in the area. There is a potential impact to local groundwater and surface water if this gravel pit is used as a landfill. Any water wells in Tom Bennett Campground could be affected. The probability of water contamination is slight now, but measures should be taken to stop all dumping into this gravel pit immediately.

Sites Exhibiting Physical Hazards

Quad Name: Big Narrows

Site #: 10-4-466/4501-1.100

Site Name: Hole-in-the-Wall Mine, Skin Gulch

Hazard Rating: 2

Description and pertinent facts: This adit is located on the west side of Skin Gulch approximately 0.5 miles south of the gated entrance to Skin Gulch where it intersects the Stove Prairie Road. The adit opening is intact and is 5' high by 6' wide and extends back greater than 50'. The adit is immediately adjacent to the Skin Gulch road (FR-341) and is therefore easily accessible to the public -- there is in fact a campsite on the dump material of the adit. The adit is given a rating of 2 (dangerous) because of its ease of access to the public.

Quad Name: Big Narrows

Site #: 10-4-466/4501-1.101

Site Name: Hole-in-the-Wall Mine, Skin Gulch

Hazard Rating: 2

Description and pertinent facts: This adit is the Hole-in-the-Wall Mine and is located right next to Polly Brinkhoff's cabin. The adit portal is 6'x4' but appears to extend back only about 40'. This depth seems reasonable as no dump material is evident near the site. The rock surrounding the portal appears very competent giving little risk of structural failure. Polly Brinkhoff said this was a copper mine, but there is no active mining going on at present. She uses the mine as a refrigerator! The adit is given a rating of 2 because of Polly Brinkhoff's frequent entry, but the competency of the rock around the portal is a mitigating factor.

Quad Name: Crystal Mountain

Site #: 10-4-465/4488-1.100

Site Name: Crystal Mountain Road Mica Mine

Hazard Rating: 2

Description and pertinent facts: This mica mine (quarry) measures 78' long by 15' wide and 25' deep. The quarry walls are sheer. It appears that the mine was initially an underground tunnel that was later opened to the ground surface or "daylighted." This quarry is especially dangerous because it occurs very close to the Crystal Mountain Road (FR-344) which is frequently travelled and accessible to 2WD passenger cars. It is only about 35' east of the road and can easily be seen from the road. Also, an unofficial camp site is immediately next to the quarry and appears to get occasional use. A crude fence composed of fallen timber nailed into standing trees above the highwall was constructed in the past, but it is dilapidated and ineffectual in limiting access to the quarry. These factors combine to make this a dangerous mine hazard. The hazard could be mitigated by blasting the walls of the quarry.

Quad Name: Crystal Mountain

Site #: 10-4-468/4487-1.100

Site Name: Buckhorn Mica Mine

Hazard Rating: 2

Description and pertinent facts: This mine is difficult to get to because all 4WD access roads pass through private land with locked gates, even though the site is on USFS property. It lies on the northeast side of Boiler Hill. This mica mine is a quarry that is 130' long, only 15' wide, and up to 30' deep. The 30' sheer vertical highwall at the northwest end of this trench is the main reason for the Mine Hazard Rating of 2 (dangerous). Most of the quarry has a 15'-20' highwall. The highwall could be blasted to mitigate the hazard.

Quad Name: Drake

Site #: 10-4-468/4475-1.100/101

Site Name: Perry Sullivan Mine, Sullivan Park

Hazard Rating: 2

Description and pertinent facts: This site contains two shafts located in Sullivan Park about 1500' east of the Crossier Mountain Trail (931). Shaft 100 is 10'x6' and is filled with water at a depth of 9'. Shaft 101 is 8'x7' and is filled with water at a depth of 18'. Both shafts have shear walls and are dug into competent pink granite with malachite ($\text{Cu}_2\text{CO}_3(\text{OH})_2$) and some minor fluorite (CaF_2) filling small fractures. The PBS map shows a trail through Sullivan Park and continuing south down Sullivan Gulch that passes within 200' of the shafts, but this trail was not found during the site visit.

Quad Name: Glen Haven

Site #: 10-4-467/4476-1.100

Site Name: Quigley Mine, Crossier Mountain Trail (931)

Hazard Rating: 2

Description and pertinent facts: This mine is located right next to the Crossier Mountain Trail (#931) about 0.8 miles from the trailhead on the southwest side of the North Fork Big Thompson River and CR-43. This trail gets frequent use, therefore, this adit should be sealed. The adit portal dimensions are 7'x7' and expand to 8'x7' inside the adit which extends back about 40'. The adit is dug into relatively competent pink mica-rich granite with malachite ($\text{Cu}_2\text{CO}_3(\text{OH})_2$) filling small vugs. The trail goes over a small (100 yd^3) dump in front of the adit. A fire ring and beverage cans in front of the portal are evidence of frequent visitation to the site.

Quad Name: Long's Peak

Site #: 10-4-453/4463-1.100

Site Name: Lily Mountain east of Aspen Brook

Hazard Rating: 2

Description and pertinent facts: This shaft is located on the west facing slope of Lily Mountain east of Aspen Brook. There are no trails to the shaft, but a group of 5 cabins occur about 2000' to the northwest on recently acquired Rocky Mountain National Park land. It appears the cabins get some use. The shaft opening is 15'x12' and is 22' deep. A recently constructed barbed wire fence surrounds the shaft and discourages access and partially mitigates the hazard, but a significant hazard remains, especially if the fence fell into disrepair in the future. The entire hazard could be eliminated by backfilling the shaft, which would likely cost \$2,000 or less. This shaft is close to the border of Rocky Mountain National Park and may be on their land. It is difficult to determine the mining objective from the dump material; there appears to be some manganese and copper mineralization. A possible uranium prospect?

Quad Name: Rustic

Site #: 10-4-456/4499-1.100

Site Name: Near Camman Spring off FR-127

Hazard Rating: 2

Description and pertinent facts: This shaft is located adjacent to FR-127 and only 1300' from the Pingree Park road (CR-131) in an area frequently used as a campground, although it is not formally designated as such. Numerous fire rings occur on the west side of a barbed wire fence and the shaft is immediately on the east side of the fence. This seems to indicate that the shaft is on private property, but a cadastral survey would need to be done to determine exact ownership. The shaft is 14'x9' at the surface and is 17' deep. The barbed wire fence can be easily straddled and does not effectively discourage access to the shaft. Backfilling the shaft would mitigate the hazard and would probably cost less than \$1500.

Quad Name: Rustic

Site #: 10-4-457/4498-1.100

Site Name: Near FR-4008, near site of proposed campground

Hazard Rating: 2

Description and pertinent facts: This shaft is about one mile east of the Pingree Park road (CR-131) off of Forest Road (FR) 4003. FR-4003 has been closed to vehicular access and is now just a trail. The shaft is dug into competent rock and has dimensions of 12'x12' with a depth of 21'. It was most likely a large prospect shaft with beryl or radioactive minerals as the mining target. This is a dangerous hazard because it is relatively close to a trail and there would be no escape if someone fell into the shaft. A proposed new campground off the Pingree Park road would increase the use of trails in the area and the frequency of visitation to the shaft.

The next two entries are technically within the borders of the Redfeather Ranger District, but are supplied to the Estes-Poudre Ranger District because they actually manage the Poudre River Canyon area.

Quad Name: Boston Peak

Site #: 10-5-432/4502-1.100

Site Name: Lucky Strike (west of Spencer Heights) [Nelson-Moore, 1978, CGS Bulletin 40]

Hazard Rating: 2

Description and pertinent facts: This adit is right next to State Highway 14 about 1.1 miles west of the town of Spencer Heights. The portal is 7'x6' and extends only about 30' into the hillside. There is easy access to the curious, so this adit should be capped. Literature indicates this adit was a uranium prospect and high radiometric readings (2000 cps) in the mined vein confirm the presence of radioactive minerals. No dump material was found at the site. It may all have been sent to a processing facility or may have been moved by road construction after mining.

Quad Name: Poudre Park

Site #: 10-5-472/4504-1.100

Site Name: unknown; West of Poudre Park on the Poudre River

Hazard Rating: 3

Description and pertinent facts: This adit was not directly visited, but was viewed across the Poudre River from State Highway 14. It is located 0.5 miles west of the town of Poudre Park. The adit portal is about 6'x6' and a local landowner indicated it was only about 25' deep. This seems reasonable because the dump appears to be only about 90 cubic yards in volume. The adit's situation across the stream from SH-14 limits access to the general public, but it is conspicuous. The "local" said it could be reached by walking on a footpath which starts near the bridge over the Poudre River on the west side of Poudre Park.

Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.

Priority Ranking of Mine Hazard Sites

- 1) **Site Name: Crystal Mountain Road Mica Mine**
Site #: 10-4-465/4488-1.100 **Quad Name:** Crystal Mountain
- 2) **Site Name: Quigley Mine, Crossier Mountain Trail (931)**
Site #: 10-4-467/4476-1.100 **Quad Name:** Glen Haven
- 3) **Site Name: Lucky Strike (west of Spencer Heights)**
Site #: 10-5-432/4502-1.100 **Quad Name:** Boston Peak
- 4) **Site Name: Near Camman Spring off FR-127**
Site #: 10-4-456/4499-1.100 **Quad Name:** Rustic
- 5) **Site Name: Skin Gulch**
Site #: 10-4-466/4501-1.100 **Quad Name:** Big Narrows
- 6) **Site Name: Hole-in-the-Wall Mine**
Site #: 10-4-466/4501-1.101 **Quad Name:** Big Narrows
- 7) **Site Name: Buckhorn Mica Mine**
Site #: 10-4-468/4487-1.100 **Quad Name:** Crystal Mountain
- 8) **Site Name: Near FR-4008, near site of proposed campground**
Site #: 10-4-457/4498-1.100 **Quad Name:** Rustic
- 9) **Site Name: Perry Sullivan Mine, Sullivan Park**
Site #: 10-4-468/4475-1.100/101 **Quad Name:** Drake
- 10) **Site Name: Lily Mountain east of Aspen Brook**
Site #: 10-4-453/4463-1.100 **Quad Name:** Long's Peak

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USFS-ABANDONED MINED LAND INVENTORY PROJECT

RED FEATHER RANGER DISTRICT

CLOSE-OUT REPORT

November 24, 1992

**USFS-ABANDONED MINED LAND INVENTORY PROJECT / CLOSE-OUT
RED FEATHER RANGER DISTRICT**

Sites Exhibiting Environmental Degradation

Quad Name: Haystack Gulch

Site ID#: 10-05-458-4522-1.100-103; 200-203

Site Name: Copper King Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The Copper King mine, located immediately adjacent to Larimer County road 179 on Prairie Divide, was opened during World War I in an unsuccessful attempt to mine copper and zinc ores. In 1949 the mine was reopened and mined for uranium until 1953. Approximately 3000 cubic yards of on-site waste materials consist of oxidized metallic sulfides and uranium minerals. Gamma counts taken on these waste piles are 9X over background values for this area, indicating a high concentration of radioactive minerals in residence. This waste material is partially contained by rotted cribbing but is currently being spread on the county road by periodic highway maintenance. Gamma levels diminish rapidly 50 feet beyond the site in either direction on the road however. There does not appear to be appreciable off-site transport of metals due to storm erosion at this time. This site is hazardous to human visitation due to elevated levels of radiation. Groundwater quality at this site could not be determined by the limited scope of 1992 site-visit.

Sites Exhibiting Physical Hazards

Description and pertinent facts: This open-standing adit is located just off Poudre Canyon road (Colorado 14) on the northwest side of Dutch George Flats. A steel bulkhead which used to cover the tunnel entrance has been breached rendering the mine highly accessible. Recent tourist visits underground in this abandoned mine are indicated by numerous footprints leading into tunnel at time of 1992 site visit. This mine is currently quite dangerous due to possibilities of rock-fall or bad air.

[illegible]

Description and pertinent facts: An open-standing adit adjacent to State Highway 14. Access to this site is extremely easy and visible. This mine was apparently a uranium prospect and although not extensive, could pose a physical hazard.

[illegible]

Description and pertinent facts: The Copper King minesite contains two vertical shafts which at present are dangerous. The main hoist shaft (#100) is currently intact and is inadequately safeguarded with barbed-wire and a crude wooden shaft plug. This feature should be properly sealed with Polyurethane Foam (PUF) or backfill. A shaft located across County Road 179 to the southeast (#103) is also intact. This feature is currently closed with an 8'X 4' steel plate which is being eroded at the edges, rendering this shaft accessible at this time. This feature should be adequately safeguarded with concrete panel or backfill closure techniques.

Quad Name: Livermore

Site ID#: 10-05-482-4511-1.103

Site Name: Bonner Springs Ranch

Hazard Rating: 2

Description and pertinent facts: This small exploration tunnel was driven approximately 60 feet into granite bedrock, at an angle of 20 degrees off of the horizontal. The portal is currently standing open in fairly rotten ground. A sizeable highwall above the portal could release rocks on unsuspecting prospectors below. This mine is located on a USFS inholding surrounded by a subdivision. This mine should be safeguarded and highwall slope reduced because of the close proximity of houses.

[illegible]

Quad Name: Poudre Park

Site ID#: 10-05-473-4506-1.100

Site Name: Hewlett Gulch/Bidwell Lode

Hazard Rating: 2

Description and pertinent facts: The Bidwell Lode consists of two developments, a collapsed tunnel on the west side of Hewlett Gulch and an open standing adit on the east side of the stream. This open standing mine tunnel goes back 300 feet according to old reports and appears to be fully intact at this time. The tunnel has been driven into competent ground but the extent of the excavation and the ease of access render this mine hazardous. This mine should be safeguarded by bulkhead/locking grate closure techniques. The mine working on the adjacent side of Hewlett Gulch has been caved in for a number of years and poses no threat at this time.

[illegible]

Quad Name: Rustic

Site ID#: 10-05-449-4507-1.100-103

Site Name: Prendergast/Sevenmile Creek

Hazard Rating: 2

Description and pertinent facts: The Prendergast was the strongest gold producing mine in the Manhattan Mining District. It has been developed through a series of tunnels and one shaft. The lowermost and most extensive tunnel (#103) is over 300 feet long and is currently standing open with no access deterrents. Water drainage from this tunnel is controlled by an earthen dam at the portal. This portal should be safeguarded with an access-retained mine closure as it is presently inviting to tourist driving along the Sevenmile 4 X 4 road. Three small adits, which are standing open some 100 feet uphill (#s 100-102), and a shaft which has been backfilled comprise the remaining mine workings of this site. These features should all be safeguarded as they are potentially dangerous due to the incompetence of the ground into which they have been driven.

Quad Name: Rustic

Site ID#: 10-05-448-4508-1.101

Site Name: Colorado/Searchlight

Hazard Rating: 2

Description and pertinent facts: The Searchlight shaft is an open standing, vertical, rectangular shaft with an estimated depth of 90 feet. The shaft walls are barren rock with no remaining cribbing. This shaft most likely connects to the Colorado mine below. The collar of this shaft is composed of loose mine dump material rendering the feature quite hazardous because of the possibility of loss of footing. The location of this feature is somewhat remote but this shaft should be safeguarded as a fall could prove fatal.

Quad Name: Rustic

Site ID#: 10-05-448-4510-1.100

Site Name: Virginia City (Site)

Hazard Rating: 2

Description and pertinent facts: The shaft at the site of Virginia City is currently protected by a decaying barbed-wire fence. The shaft was recently backfilled but visual inspection indicates the backfill is partially failed. Local reports state that this mine has claimed a number of lives in the past. This shaft should be properly safeguarded with concrete panels or proper backfill methods.

USFS-ABANDONED MINED LAND INVENTORY PROJECT-SUMMARY REPORT

SULPHUR RANGER DISTRICT

January 21, 1993

USFS-ABANDONED MINED LAND INVENTORY PROJECT - SUMMARY REPORT SULPHUR RANGER DISTRICT

This document summarizes the sites *of concern* to the USFS - Sulphur Ranger District. These include only sites that were given Environmental Degradation Ratings of 1, 2, or 3 or Mine (Physical) Hazard Ratings of 1, 2, or 3. Only one site exhibited any environmental degradation - the Parkview Mountain site. This site is not a major problem, but is potentially significant. The sites listed with Mine Hazards are in order of priority. We recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. Even though mines with a rating of 3 are not necessarily recommended for closure, they are open and represent a threat to those who choose to enter them.

Sites Exhibiting Environmental Degradation

Quad Name: Parkview Mtn.

Site #: 10-8-404/4465-1.101

Site Name: Parkview Mtn.

Environmental Degradation Rating: 3

Description and pertinent facts: This site is at the terminus of the Parkview Mtn. road (gravel) which comes off State Highway 125. Degraded water is draining out of a standpipe in the ground, but the situation is peculiar because there is no specific mining feature associated with the water drainage. The ground around the pipe has been disturbed and graded and it probably represents an exploratory drill hole that was improperly abandoned by the operator. The standpipe has probably tapped natural groundwater and allowed it to flow to the surface. The water is flowing approximately 1 to 2 gpm with a pH=6.73 and a conductivity=563 μ S. Abundant ferric hydroxide (FeOH_3) precipitate coats the path of the water drainage. The pH is within natural limits, but the conductivity is moderately high for this elevation. The precipitate probably indicates high concentrations of metals in this water. There are no significant "target populations" immediately downstream from this site. There is a collapsed adit about 50 yards east of the standpipe location which is not draining water. Whether the genesis of the metal content of the water is mining related or a natural phenomenon is undetermined, but the reddish color of the surrounding surficial geology indicates the area is a metal sulfide alteration zone and, therefore, naturally high in metal content.

Sites Exhibiting Physical Hazards

Quad Name: Monarch Lake

Site #: 10-8-436/4436-1.100

Site Name: High Lonesome Mine

Hazard Rating: 2

Description and pertinent facts: This is the only shaft occurring in the High Lonesome group of mine openings. The High Lonesome Trail (USFS trail #7) passes 1000' to the east of the mine site, but does not lead directly to it. Neither can the mine site be seen from the trail because of the dense forest. The shaft is intact with timbers lining the collar. Standing water occurs at 20' below the surface grade. There are no access deterrents around the shaft collar.

Quad Name: Monarch Lake

Site #: 10-8-436/4436-1.103

Site Name: High Lonesome Mine

Hazard Rating: 3

Description and pertinent facts: This adit is the uppermost mine opening of the High Lonesome group. It is partially collapsed with a 3'x4' opening and is greater than 20' deep. The adit is only a hazard to the curious who choose to enter it.

Quad Name: Monarch Lake

Site #: 10-8-440/4430-1.101

Site Name: Caribou Trail - Indian Peaks Wilderness

Hazard Rating: 3

Description and pertinent facts: This partially closed adit is only about 150' northeast of the Caribou Trail and is easily seen from the trail. Colluvium from the slope above has mostly covered the portal to the adit, leaving only a 1'x4' opening, but the well timbered adit remains intact behind this with dimensions of 6'x4'. This would be a hazard to those who choose to enter.

Other areas in the Sulphur Ranger District were inventoried, but turned up no significant physical hazards or environmental degradation related to mining. These areas include: the Gilsonite Mine area along Sherman Creek, the Wolverine Mine area in the Never Summer Wilderness on Bowen Mountain, both on the Bowen Mountain 7.5" quadrangle, and the Kalinowski unpatented mining claim on Trail Creek on the Trail Mountain 7.5" quadrangle.

USFS-ABANDONED MINE LAND INVENTORY PROJECT

ARAPAHO/ROOSEVELT NATIONAL FOREST

SULPHUR RANGER DISTRICT

ADDENDUM to the SUMMARY REPORT

April, 1998

by

Clarence E. Ellis

Colorado Geological Survey

LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
μg/L	micrograms per liter
μ	microns
μS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS - ABANDONED MINE LAND INVENTORY PROJECT
ARAPAHO/ROOSEVELT NATIONAL FOREST -- SULPHUR RANGER DISTRICT
ADDENDUM to the SUMMARY REPORT**

INTRODUCTION

This document summarizes **additional sites of concern** to the USFS - Sulphur Ranger District which were inventoried during the 1997 field season. Previously a **Final Summary Report** dated January 21, 1993, was transmitted to the USFS. After that report was released, additional sites were inventoried in an area previously administered by the Middle Park Ranger District of Routt National Forest.

This report does not include all of the newly inventoried mine sites visited, although they are all included in the numerical summary. Just as in the **Final Summary Report**, it includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); or sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1), or dangerous (2). Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 10 (Arapaho/Roosevelt National Forest), and Ranger District 08 (Sulphur Ranger District).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. None of the newly inventoried sites had PHRs of 1 or 2. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these adits that are open and represent a threat to those who choose to enter them.* If funds are available, these mines should also be closed.

Water Sampling

Filtered (0.45µ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are available upon request. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

Geology in the Sulphur Ranger District is complex, and a detailed description is beyond the scope of this addendum. The bibliography gives the most important sources of detailed information. Rocks exposed in the two mining districts of the inventoried area are Precambrian-age gneisses and Silver Plume granite.

La Plata Mining District

The La Plata district is in the extreme southern part of the Sulphur Ranger District. The mining district straddles Jones Pass and includes the world-class Henderson molybdenum mine (Neubert, 1994). Only the part of the district west of Jones Pass is discussed in this report. Mining activity began in 1866 and essentially ceased by 1943, although minor production occurred in 1958 and exploration drilling took place in 1986-1987 (Neubert, 1994). Production was mostly silver and lead, with minor gold and zinc. Sulfide minerals are only locally abundant in the La Plata district west of Jones Pass, thus acid mine drainage is generally not a problem. There is one priority site in the La Plata district.

Blue Ridge Mining District

The Blue Ridge district is about 13 miles south of Kremmling on Copper Mountain. Mining activity took place between about 1900 and 1923. A small amount of copper ore was produced (Neubert, 1994). Sulfide minerals are sparse in the Blue Ridge district; consequently the mine drainage is not acidic. There are no priority sites in the Blue Ridge District.

USFS ABANDONED MINE LAND INVENTORY PROJECT
ARAPAHO/ROOSEVELT NATIONAL FOREST SULPHUR RANGER DISTRICT
ADDENDUM to the SUMMARY REPORT

NUMERICAL SUMMARY

- 10** field forms
- 26** mine openings inventoried (includes collapsed or filled openings)
- 17** mine dumps, tailings piles, highwalls, etc.
- 7** mine features have Environmental Degradation Ratings of 1, 2, 3, or 4.

Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 1
Number of features with EDR of 3 = 0
Number of features with EDR of 4 = 6
Number of features with EDR of 5 = 36

- 6** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 0
Number of features with PHR of 2 = 0
Number of features with PHR of 3 = 6
Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
Number of features with PHR of 5 = 37

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Byers Peak

Site #: 422/4401-1.100

Site Name: Jones Pass, Bobtail Mine area

Environmental Degradation Rating: 2

Description and pertinent facts: The Bobtail Mine is on the west side of Bobtail Creek, about a hundred feet from the creek. The mine is patented, but discharges slightly acid water into the creek, which is part of the Denver Water Board water collection system. The adit is caved, but discharges about 8 gpm water with a **pH averaging 6.12** (two test dates). **Conductivity averages 103 μ S**. The water flows down the edge of a pyritic dump, but pH rises and conductivity is unchanged by the dump exposure. Results of sample #422/4401-1.304 taken of the effluent show manganese and zinc concentrations to significantly exceed state standards, and iron concentration is slightly above standards.

Sample number 422/4401-1.304; hardness of effluent sample = 84 mg/L.

Lab Analyses (dissolved unless noted)	Concentration \div (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	5	50 (acute)	below standard
Iron (trec)	780	1,000	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	1,000	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	0.59	0.99	below standard
Calcium (as CaCO ₃)	30 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	10	below standard
Fluoride	0.79 mg/L	2 mg/L*	below standard
Iron	420	300	1.4 x standard
Lead	<1	3	below standard
Magnesium	2.2 mg/L	no standard	n/a
Manganese	2,000	50	40 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	84	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.06 (on 3/2/98)	below detection limit

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Sodium	1.8 mg/L	no standard	n/a
Sulfate	20 mg/L	250 mg/L	below standard
Zinc	990	91	10.9 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

**GRAND MESA NATIONAL FOREST
GRAND JUNCTION RANGER DISTRICT**

April, 1998

by

John Neubert

Colorado Geological Survey

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
GRAND MESA NATIONAL FOREST -- GRAND JUNCTION RANGER DISTRICT**

This document summarizes the sites *of concern* to the USFS - Grand Junction Ranger District. It does not include all the mine sites visited during the inventory of the district. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried.

Our inventory process revealed no sites exhibiting environmental degradation. Concerning physical hazards, we found one feature given a Physical Hazard Rating of 3 (potentially dangerous). Other inventoried features had ratings of 5 (no significant hazard).

The only potentially dangerous feature observed is a highwall (feature #200) at a shale pit on the north side of Grand Mesa (inventory area #04-02-751/4328-1 on the Mesa Lakes quadrangle). The highwall is about 60' high and is cut into a steep, heavily wooded, brushy hillside. This feature may not be easily recognized by someone descending the slope, which could lead to a significant fall. We recommend fencing and signing the slope above the highwall, at a minimum.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database. A **Numerical Summary** of the inventory results follows.

- 6 field forms
- 7 mine openings inventoried (includes collapsed or filled openings)
- 3 mine dumps, tailings piles, highwalls, etc.
- 0 mine features have Environmental Degradation Ratings (EDR) of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 0
 - Number of features with EDR of 4 = 0
 - Number of features with EDR of 5 = 10
- 1 mine feature has a Mine (Physical) Hazard Rating (PHR) of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 0
 - Number of features with PHR of 3 = 1
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 9

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

GUNNISON NATIONAL FOREST

CEBOLLA RANGER DISTRICT

December 30, 1996

by

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Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (when used with dimensions) or times (when used in tables)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
Trec	Total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
GUNNISON NATIONAL FOREST -- CEBOLLA RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Cebolla Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. Features were inventoried for any of the following reasons: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) shown on a published topographic map. Features not meeting at least one of these criteria are considered innocuous and were not inventoried. Details on the rating systems and limits of the inventory are given in Appendix A.

The **Priority Sites** tables show the most important environmental degradation sites and the most important physical mine hazard sites, and follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 04 (Gunnison), and Ranger District 07 (Cebolla).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and natural waters in order to better determine environmental effects of mine drainage. Samples were analyzed for total recoverable (Trec) and dissolved constituents as shown on tables in the following text. Numeric standards are based on stream classifications and water quality standards provided by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations. In some areas standards are based on total recoverable metals, but the sample was tested for dissolved metals. In those instances, the sample result should be considered the minimum metal content. Total recoverable metals may be significantly higher. Field water sampling protocols are in Appendix B.

Geology and Mining Districts

The Cebolla Ranger District covers a large area of southwestern Colorado, and therefore includes many geologic settings and ore deposit types. Only areas with numerous inventoried features are discussed in the following paragraphs. Many of the large, past-producing mines are on private land and were not inventoried.

The area near Lake City includes numerous mining districts, but most production was from BLM-administered land or private patented claims. Several inventoried features are located on the Finger Mesa quad, in the Carson mining district. Mines from the district yielded minor amounts of silver and gold from numerous discontinuous veins. The veins cut Tertiary intermediate-composition volcanic and intrusive rocks associated with the Carson volcanic center. The most productive veins contained barite, quartz, enargite, pyrite, chalcopryrite, sphalerite, galena, and marcasite (Larsen, 1910). Of these minerals, only quartz, pyrite and barite were observed during the inventory on public land.

Several small mines and prospects, and a moderate-sized mine associated with a mill, were examined and/or inventoried in the Capitol City area, on the Uncompahgre Peak and Wetterhorn Peak quads. Mines near Capitol City had minor production of silver, lead, gold, copper, and zinc. Mineral occurrences are in discontinuous, narrow veins. Mineralization is associated with emplacement of intermediate-composition intrusive rocks into volcanic fill material within the Uncompahgre caldera. Veins generally consist of quartz, with variable quantities of galena, sphalerite, pyrite, chalcopryrite, and tetrahedrite. Uranium minerals are associated with rhyolite intrusions northeast of Capitol City. (See Steven and others, 1977, p. E37-42, E83-85; Irving and Bancroft, 1911, p. 72-81.) Pyrite and chalcopryrite were the only metallic minerals identified on dumps during the inventory.

Further east, in and close to the La Garita Wilderness, several small mining features were examined and/or inventoried, mostly on the Stewart Peak and San Luis Peak quads. No production is reported. Numerous discontinuous veins cut the altered intracaldera volcanic fill of the San Luis caldera in this area. Most veins consist primarily of quartz and pyrite, but sphalerite, galena, and

chalcopyrite may occur. (See Steven and Bieniewski, 1977, p. 13; Scott, 1985, p. 5-20.) Pyrite, galena, and sphalerite were observed at the Bondholder Meadows site.

Numerous inventory sites are east of Gunnison, along tributaries of Tomichi Creek on the north and south sides of U.S. Highway 50. Several workings, including the Akron Mine, were examined and/or inventoried in the Tomichi (Whitepine) mining district, on the Whitepine and Garfield quads. At least three ore deposit types have been identified in the Whitepine area, including replacement deposits in carbonate rocks, contact metamorphic deposits adjacent to intrusive rocks, and veins. All deposit types are associated with Tertiary-age quartz monzonite intrusions. The largest mines produced lead, silver, and zinc, although lesser quantities of gold and copper were produced at some locations. (See Vanderwilt, 1947, p. 112.)

Further west, several mines and prospects were examined mostly on the Pitkin, Cumberland Pass, and Fairview Peak quads. Three mining districts lie within this region. Boundaries are indistinct, especially between the Gold Brick and Quartz Creek mining districts. The largest mine inventoried in this area is the Roosevelt Mine, within the Box Canyon mining district. In the Box Canyon district, gold and silver were produced from quartz lenses in Precambrian schist. This mining district lies in the mountainous terrain between Waunita Hot Springs and Pitkin, and the Roosevelt Mine was a failed attempt to crosscut past-producing, mineralized lenses at depth. The Gold Brick district, northeast of the town of Ohio, produced gold, silver, and lead, with minor amounts of copper. Ore is hosted in small, high-grade quartz veins that cut Precambrian granite and schist. The Quartz Creek district is about 1 to 4 miles northeast of Pitkin and is associated with Tertiary quartz monzonite intrusions that cut Precambrian granite and schist, and Paleozoic dolomite. Silver, lead, and gold were the principal commodities, although minor amounts of copper were produced, and molybdenite occurs in some of the quartz veins. (See Vanderwilt, 1947, p. 98, 103-104.)

The Pitch Mine, which is mostly on patented land, and numerous smaller uranium mines and prospects on public land, are in the Marshall Pass mining district, mainly on the Pahlone Peak quad. Uranium minerals are hosted in veins associated with the Chester fault zone, and in permeable layers in Paleozoic sedimentary rocks. Veins are hosted in Paleozoic sedimentary rocks and Precambrian igneous and metamorphic rocks, especially where faulting is accompanied by extensive brecciation. Harding Quartzite is the most susceptible unit for stratabound occurrences. Source of the uranium for both deposition types was probably nearby Tertiary siliceous volcanic rocks, which have been eroded in much of the district. (See Olson, 1988, p. 24-41.)

USFS ABANDONED MINE LAND INVENTORY PROJECT
GUNNISON NATIONAL FOREST -- CEBOLLA RANGER DISTRICT

NUMERICAL SUMMARY

- 121** field forms
- 638** mine openings inventoried (includes collapsed or filled openings)
- 329** mine dumps, tailings piles, highwalls, etc.
- 46** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 2
Number of features with EDR of 3 = 15
Number of features with EDR of 4 = 30
Number of features with EDR of 5 = 863
- 101** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 3
Number of features with PHR of 2 = 35
Number of features with PHR of 3 = 66
Number of features with PHR of 5 = 806

USFS ABANDONED MINE LAND INVENTORY PROJECT
GUNNISON NATIONAL FOREST -- CEBOLLA RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=04; District=07	EDR
1) Akron Mine	Whitepine	378/4266-1.200; 100	2; 3
2) Bon Ton Mine	Cumberland Pass	371/4282-1.200; 100	2; 3
3) Carson Camp Area	Finger Mesa	291/4192-1.103, 104, 203, 205	3
4) Roosevelt	Pitkin	365/4270-1.200; 100	3; 4
5) Pitch Mine	Pahlone Peak	386/4251-1.100	3
6) Sawmill Gulch	Cumberland Pass	370/4280.107, 207	3
7) Capitol City Mill and Mine	Uncompahgre Peak	282/4210-1.101	3
8) Graveyard Creek	Whitepine	377/4265-1.201	3
9) Bondholder Meadows	Stewart Peak	326/4209-1.100	3
10) West of Harry Creek	Pahlone Peak	387/4250-1.100, 200	3
11) Robbins Creek	Garfield	381/4269-1.100, 200	4
12) Alwilda Mine	Whitepine	378/4267-1.101	4

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=04; District=07	PHR
1) Cochetopa Pass	North Pass	358/4224-1.100	1
2) Sawmill Gulch	Cumberland Pass	370/4280-1.100	1
3) Gold Creek	Fairview Peak	362/4278-1.106; 102, 104, 205	1 2
4) Carson Camp Area	Finger Mesa	291/4192-1.101	2
5) Jackson Gulch	Fairview Peak	368/4280-1.103, 104	2
6) West Point Hill	Whitepine	379/4265-1.102	2
7) Brittle Silver Basin	Whitepine	380/4273-1.102, 106	2

Site Name	Quad Name	Site # Forest=04; District=07	PHR
8) Lower Little Percent Gulch	Pitkin	364/4270-1.100	2
9) Brown Derby Mines	Parlin	358/4266-1.103	2
10) Ohio City	Pitkin	359/4270-1.102	2
11) Roosevelt	Pitkin	365/4270-1.201	2
12) South Halls Gulch	Cumberland Pass	370/4277-1.100	2
13) Lower Lincoln	Pitkin	368/4270-1.101	2
14) Southeast Sheep Mountain	Fairview Peak	363/4277-1.103	2
15) Hicks Gulch	Whitepine	370/4265-1.100	2
16) Granite Mountain	Whitepine	379/4271-1.102, 100	2
17) Central Mountain	Whitepine	379/4273-1.103, 102	2
18) Northeast Granite Mountain	Whitepine	379/4272-1.102	2
19) Mingo Gulch	Pitkin	366/4268-1.107, 109	2
20) Jones Gulch	Pitkin	362/4274-1.100	2
21) Dutch Gulch	Pitkin	361/4273-1.105, 106	2
22) West Mountain	Pitkin	365/4274-1.100	2
23) FR 765.3A	Cumberland Pass	372/4283-1.103	2
24) Fish Hatchery Gulch	Pitkin	365/4271-1.100	2
25) Lookout Mountain	Pitkin	365/4268-1.100	2
26) East Flick Creek	Parlin	356/4271-1.100	2
27) North Porcupine Ridge	Whitepine	379/4267-1.106	2
28) South of Cambeltown	Pitkin	363/4274-1.101	2
29) North Dutch Gulch	Pitkin	361/4273-2.102	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Cumberland Pass

Site #: 370/4280-1.107, 207

Site Name: Sawmill Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This collapsed adit is on USFS-managed land just to the east of a 4WD road and is easily accessible. A large 100'x 100' scarp surrounds the collapsed adit. The mine is draining less than 1 gpm of heavily stained water onto the 1,300-cubic-yard dump. The effluent ponds on the dump bench, which is stained with red precipitate. Most of the dump is heavily iron-stained granitic rock (monzonite?) with possibly epidote, but no apparent sulfides. The ponded water and the water discharging from the adit had **pH values in the 4.2 to 4.3** range. The **conductivities were about 80 μ S**. A dry channel that leads across and off the dump is evidence that the flow volume increases in the spring or during higher runoff. Sawmill Gulch is approximately 100' to the southwest of the site and is most likely affected by the degraded mine discharge during periods of higher flow volume. Sawmill Gulch upstream of the site had a **pH of 5.84**, and Sawmill Gulch downstream of the site had a **pH of 6.26**. These numbers suggest that some natural degradation is occurring, because no significant mines are known upstream in this high basin. The low volume of mine drainage does not appear to be affecting the water quality of the stream at present time. No water samples were taken.

Quad Name: Cumberland Pass

Site #: 371/4282-1.100; 200

Site Name: Bon Ton Mine

Environmental Degradation Ratings: 3; 2

Description and pertinent facts: The Bon Ton Mine is on USFS-managed land north of and immediately adjacent to FR-765.3. The site consists of a collapsed adit and a 7,000-cubic-yard dump. The adit is at the bottom of a 25'-high by 40'-wide scarp that was produced by erosion around the portal. Adit #100 is draining about 10 gpm water, which has produced a large gully with red precipitate along its flow path. Water draining from the collapsed adit has a **pH of 5.7**. Major degradation occurs as the water flows across the full length of dump #200. This dump is yellow in color and contains abundant pyrite and molybdenite within an intensely altered granitic rock. At the toe of the dump, mine effluent has a **pH of 3.9** and a decreased flow rate of 4 gpm. The **conductivity increases from 180 μ S at the adit to 202 μ S at the toe of the dump**. The flow volume quickly decreases when it reaches the natural soil, and the effluent completely infiltrates just below the dump's toe. North Quartz Creek flows about 400' to the south of the site, and mine effluent may reach the creek at the surface during periods of higher flow volumes. Storm runoff has eroded a few large gullies on the dump. Two collapsed wooden structures are on the dump, and the eastern structure has a concrete foundation. No tailings were found in the area.

Two water samples were collected at the site: at the collapsed portal and at the toe of the dump. Laboratory results, shown on the tables below, indicate that concentrations of aluminum and copper increase, and iron concentration decreases as the effluent crosses and reacts with dump #200. Both

samples greatly exceed state standards in copper and significantly exceed standards in aluminum, iron, cadmium, manganese, and zinc concentrations.

Sample number 371/4282-1.302; hardness of effluent at caved adit #100 = 87 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	450	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	9200	1000	9.2 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	160	87*	1.8 x standard
Cadmium	6.2	1	6.2 x standard
Calcium (as CaCO ₃)	29 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	960	10.5	91 x standard
Fluoride	0.53 mg/L	2 mg/L* (Trec)	below standard
Iron	7200	300	18 x standard
Lead	<1	3.2	below standard
Magnesium	3.5 mg/L	no standard	n/a
Manganese	860	50	17 x standard
Nickel	<20	86	below standard
Potassium	1.9 mg/L	no standard	n/a
Silver	<0.2	0.26 (acute)	below standard
Sodium	7.1 mg/L	no standard	n/a
Sulfate	76 mg/L	250 mg/L	below standard
Zinc	490	94	5.2 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Sample number 371/4282-1.303; hardness of effluent at toe of dump #200 = 89 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	600	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	2700	1000	2.7 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	540	87*	6.2 x standard
Cadmium	7	1	7 x standard
Calcium (as CaCO ₃)	30 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	1100	10.8	102 x standard
Fluoride	0.58 mg/L	2 mg/L* (Trec)	below standard
Iron	1700	300	5.7 x standard
Lead	<1	3.3	below standard
Magnesium	3.5 mg/L	no standard	n/a
Manganese	890	50	17.8 x standard
Nickel	<20	87	below standard
Potassium	1.9 mg/L	no standard	n/a
Silver	<0.2	0.27 (acute)	below standard
Sodium	7.2 mg/L	no standard	n/a
Sulfate	73 mg/L	250 mg/L	below standard
Zinc	490	96	5.1 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11	below standard
Copper	<4	43	below standard
Fluoride	0.61 mg/L	2 mg/L* (Trec)	below standard
Iron	24000	300	80 x standard
Lead	8	33	below standard
Magnesium	36 mg/L	no standard	n/a
Manganese	7200	50	144 x standard
Nickel	31	299	below standard
Potassium	1.9 mg/L	no standard	n/a
Silver	<0.2	1	below standard
Sodium	6.7 mg/L	no standard	n/a
Sulfate	720 mg/L	250 mg/L	3 x standard
Zinc	850	378	2.3 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Aluminum, iron, and manganese concentrations greatly exceeded state standards; sulfate and zinc concentrations exceeded standards to lesser extents. The effluent seeped into dump #203. A precipitate-coated gully in the dump, and precipitate in the dry ravine adjacent to the dump, indicate that surface runoff occurs at least intermittently. The dump is mostly light yellow fines and emits a strong sulfurous odor. Although well-cemented, rills and the gully described above have formed.

Feature #: 104

Environmental Degradation Rating: 3

This is a completely caved adit with a water discharge of about 5 gpm. The drainage channel has a light coating of red ferric hydroxide precipitate, and green and red algae is growing in it. The red algae probably results from ferric hydroxide precipitates intermixing with the algae. The effluent has **pH = 6.25 and conductivity = 336 µS**, flows alongside the small dump, and has caused some erosion of the fine-grained dump material.

Adit #104 may intercept the surface flow from the main ravine about 75' to the north. The ravine had water flowing at about 3 gpm to about 40' vertically above the adit, but then the surface flow disappeared relatively abruptly. This natural water had **pH = 7.65 and conductivity = 202 µS**. If the measurements are valid, it is probable that surface water from the ravine is being diverted into

Quad Name: Pahlone Peak

Site #: 387/4250-1.100, 200

Site Name: West of Harry Creek

Environmental Degradation Ratings: 3

Description and pertinent facts: Access to this site from Sargents, about 10 miles to the west, is via Marshall Pass Road (FR-243) and FR-843 (1½ mile 4WD trail). The 4WD trail has several rough creek crossings that may pose a problem for construction vehicles, especially in the spring. This abandoned uranium mine site consists of 300-cubic-yard dump #200, caved adit #100, and a small, 2-cubic-yard processing area. Radiation levels on the dump ranged from 170 to 300 cps, or about 4 times area background levels. Pyrite was found on dump #200, which is 10' from Harry Creek and in the flood plain. In early October, water draining from the adit into Harry Creek at 4 gpm had **pH = 6.68 and 7.12; and conductivity = 305 and 320 µS**. Water from the adit was sampled for analysis because of the radiation levels on the dump. Although the effluent contained significant uranium and zinc concentrations, state standards were not exceeded in any of the tested parameters.

Sample number 387/4250-1.302; hardness of effluent = 152 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	1	6.0*	below standard
Arsenic (Trec)	8	50 (acute)	below standard
Iron (Trec)	18	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	1.0	1.58	below standard
Calcium (as CaCO ₃)	28 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	17	below standard
Fluoride	0.28 mg/L	2 mg/L* (Trec)	below standard
Iron	<10	300	below standard
Lead	<1	7	below standard
Magnesium	20 mg/L	no standard	n/a

at the portal, and upstream and downstream of the mine site are presented in the tables below. None of the samples exceeds state standards in any of the tested parameters.

Sample number 365/4270-1.303; hardness of mine effluent = 210 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	<10	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	<0.25	2	below standard
Calcium (as CaCO ₃)	61 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	22	below standard
Fluoride	0.39 mg/L	2 mg/L* (Trec)	below standard
Iron	<10	300	below standard
Lead	1	11	below standard
Magnesium	14 mg/L	no standard	n/a
Manganese	<4	50	below standard
Nickel	<20	170	below standard
Potassium	1.2 mg/L	no standard	n/a
Silver	<0.2	1.15 (acute)	below standard
Sodium	5.5 mg/L	no standard	n/a
Sulfate	26 mg/L	250 mg/L	below standard
Zinc	<8	200	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Sample number 365/4270-1.304; hardness of Quartz Creek upstream of mine = 216 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	120	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	<0.25	2.1	below standard
Calcium (as CaCO ₃)	74 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	23	below standard
Fluoride	0.14 mg/L	2 mg/L* (Trec)	below standard
Iron	62	300	below standard
Lead	<1	12	below standard
Magnesium	7.5 mg/L	no standard	n/a
Manganese	8	50	below standard
Nickel	<20	172	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	1.2 (acute)	below standard
Sodium	2.2 mg/L	no standard	n/a
Sulfate	9 mg/L	250 mg/L	below standard
Zinc	46	204	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Sample number 365/4270-1.305; hardness of Quartz Creek downstream of mine = 216 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	120	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	<0.25	2.1	below standard
Calcium (as CaCO ₃)	74 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	23	below standard
Fluoride	0.12 mg/L	2 mg/L* (Trec)	below standard
Iron	56	300	below standard
Lead	<1	12	below standard
Magnesium	7.5 mg/L	no standard	n/a
Manganese	9	50	below standard
Nickel	<20	172	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	1.2 (acute)	below standard
Sodium	1.8 mg/L	no standard	n/a
Sulfate	28 mg/L	250 mg/L	below standard
Zinc	<8	204	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

A large, impressive stamp mill is a few hundred feet to the east of dump #200, but only about 1 cubic yard of mill tailings were observed in the area. Because the mill is quite large and unstable, it is discussed in the **Physical Hazards** section of this report.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum	<50	87*	below standard
Cadmium	<0.25	2.5	below standard
Calcium (as CaCO ₃)	93 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	27.5	below standard
Fluoride	1.0 mg/L	2 mg/L* (Trec)	below standard
Iron	830	300	2.8 x standard
Lead	<1	16	below standard
Magnesium	9.1 mg/L	no standard	n/a
Manganese	770	50	15.4 x standard
Nickel	<20	200	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	1.8	below standard
Sodium	4.9 mg/L	no standard	n/a
Sulfate	190 mg/L	250 mg/L	below standard
Zinc	72	245	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

The mine effluent flowed along the west side of dump #201, but did not appear to be causing erosion. Effluent tested just below the dump had red precipitate and algae, and had **pH = 7.76 and conductivity = 569 µS**. About 150' northwest of the dump, a pond was constructed, apparently to catch the mine effluent. Although some effluent drained into the pond, more than half seeped into the ground prior to reaching the pond, and the pond had no discharge. Pond water tested had **pH = 7.81 and conductivity = 554 µS**. Another man-made pond was adjacent and below the pond just described. No surface inflow or discharge was observed, and the water had **pH = 7.37 and conductivity = 552 µS**. Neither pond had precipitate or other visible evidence of environmental degradation. No mine water reached North Fork Henson Creek at the surface.

deep erosional breach in the tailings immediately to the south of the pond indicates that the pond discharges intermittently.

Because of the size of dump #200, and the abundance of surface water, numerous water tests and samples were collected. The average of three effluent tests near the portal revealed **pH = 7.25 and conductivity = 340 μ S** on a flow of about 100 gpm. Effluent tested near the toe of dump #200, just above the confluence with Tomichi Creek, had **pH = 7.76 and conductivity = 339 μ S**. Water from Galena Creek above the Akron Mine had **pH = 7.92 and conductivity = 260 μ S** on a flow of about 100 gpm. The small amount of creek water that crossed the entire width of dump #200 was tested at the toe, just above the confluence with Tomichi Creek, and had **pH = 8.21 and conductivity = 261 μ S** on a flow of about 15 gpm. Pond water on the south end of the tailings pile had **pH = 7.92 and conductivity = 1,534 μ S**. Tomichi Creek was tested and sampled above and below the Akron Mine. The average of two tests above the mine had **pH = 7.65 and conductivity = 134 μ S** on a 800 gpm flow. Below the mine, two tests of the creek averaged **pH = 7.77 and conductivity = 163 μ S**. None of the water associated with this mine showed visible evidence of toxicity.

Water samples taken for lab analyses were collected from the adit effluent, and from Tomichi Creek upstream and downstream of dump #200. None of the samples contained metals in concentrations above stream standards. Zinc was close to the limit in the mine effluent and in the downstream sample.

Two samples of the effluent were averaged and are shown on the table below. The upstream and downstream sample results are on the two tables below the effluent sample table.

Samples #378/4266-1.307 and #378/4266-1.310; average hardness of effluent samples = 328 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50	below standard
Iron (Trec)	38	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	<0.25	2.9	below standard
Calcium (as CaCO ₃)	110 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	33	below standard
Fluoride	0.12 mg/L	2 mg/L* (Trec)	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Iron	<10	300	below standard
Lead	<1	22	below standard
Magnesium	13 mg/L	no standard	n/a
Manganese	24	50	below standard
Nickel	<20	230	below standard
Potassium	1 mg/L	no standard	n/a
Silver	<0.2	2.5	below standard
Sodium	2.0 mg/L	no standard	n/a
Sulfate	60 mg/L	250 mg/L	3.6 x standard
Zinc	280	290	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Sample number 378/4266-1.308; hardness of Tomichi Creek above the Akron Mine = 131 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50	below standard
Iron (Trec)	220	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	<0.25	1.4	below standard
Calcium (as CaCO ₃)	48 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	15	below standard
Fluoride	0.19 mg/L	2 mg/L* (Trec)	below standard
Iron	140	300	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Lead	<1	5.4	below standard
Magnesium	2.6 mg/L	no standard	n/a
Manganese	23	50	below standard
Nickel	<20	115	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.5	below standard
Sodium	1.8 mg/L	no standard	n/a
Sulfate	26 mg/L	250 mg/L	below standard
Zinc	9	130	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Sample number 378/4266-1.309; hardness of Tomichi Creek below the Akron Mine = 164 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50	below standard
Iron (Trec)	170	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	0.72	1.7	below standard
Calcium (as CaCO ₃)	59 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	18	below standard
Fluoride	0.18 mg/L	2 mg/L* (Trec)	below standard
Iron	92	300	below standard
Lead	2	8	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Magnesium	4.1 mg/L	no standard	n/a
Manganese	20	50	below standard
Nickel	<20	140	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.8	below standard
Sodium	1.9 mg/L	no standard	n/a
Sulfate	28 mg/L	250 mg/L	below standard
Zinc	160	161	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Dump #200 has an EDR of 2, mainly because it toes into Tomichi Creek for a long distance and is certainly adding sediment and possibly zinc, especially during high runoff periods. In addition, Galena Creek runs partly across and mostly through(?) or under(?) the dump. Although the mine effluent does not exceed water quality standards in metals, adit #100 has an EDR of 3 because the discharge is adding a significant zinc load to Tomichi Creek. More water sampling is needed to determine the proportions of downstream zinc concentration attributable to mine effluent and/or creek contact with the dump. At a minimum, Galena Creek should be diverted around the site, or channelized to minimize contact with dump #200. Mine effluent should be controlled, at least to the extent of protecting the dump slopes from further erosion. The dump should be regraded, especially the tailings piles and the steep slopes toeing into Tomichi Creek.

Quad Name: Whitepine

Site #: 378/4267-1.101

Site Name: Alwilda Mine

Environmental Degradation Rating: 4

Description and pertinent facts: Although the EDR is 4, this site is discussed because a water sample was collected. The Alwilda Mine is about 0.2 miles from Tomichi Creek and the north end of the town of Whitepine. Adit #101 is caved and is discharging water from white PVC pipes. A set of pipes apparently carried mine discharge to a water tank on the south end of the dump, but those pipes were not connected during the examination. It is not clear if the water tank, which is fairly large, is part of the Whitepine water supply. Another set of pipes carries the effluent to the west side of dump #201. This 15-gpm discharge runs alongside the northwest and north sides of the dump, eventually seeping into the ground after about 200', about 700' from Tomichi Creek. Surface flow from the adit may reach the creek during snowmelt or heavy rains, and subsurface flow certainly enters the creek most of the year. Moderate amounts of orange precipitate have been deposited by the effluent. Averaging two tests of the effluent revealed **pH = 7.06 and conductivity**

= **310 µS**. A sample of the effluent exceeded state standards in manganese and zinc concentrations, and was close to the standard in cadmium concentration, as shown on the table below.

Sample number 378/4267-1.301; hardness of effluent = 146 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	240	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	2	50	below standard
Iron (Trec)	970	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	1.5	1.52	1 x standard
Calcium (as CaCO ₃)	51 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	16	below standard
Fluoride	0.14 mg/L	2 mg/L* (Trec)	below standard
Iron	99	300	below standard
Lead	<1	6	below standard
Magnesium	4.5 mg/L	no standard	n/a
Manganese	780	50	15.6 x standard
Nickel	<20	126	below standard
Potassium	1.7 mg/L	no standard	n/a
Silver	<0.2	0.6	below standard
Sodium	5.1 mg/L	no standard	n/a
Sulfate	92 mg/L	250 mg/L	below standard
Zinc	300	146	2.1 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Cumberland Pass

Site #: 370/4277-1.100

Site Name: South Halls Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This inclined shaft is immediately adjacent to FR-766.1C on the north side of the road. This remote 4WD road is not heavily traveled, but it is used to access a few private cabins further up. A 20'-high scarp funnels into the shaft, increasing the hazard potential. The partly collapsed, 2'x 4' opening extends to a depth of at least 10', but the bottom is not visible. It appears that a person could crawl back out if necessary. Because the road runs between the shaft and its dump, this feature is easily recognized.

Quad Name: Cumberland Pass

Site #: 370/4280-1.100

Site Name: Saw Mill Gulch

Physical Hazard Rating: 1

Description and pertinent facts: This shaft is located only a few hundred feet to the northeast of a 4WD road that provides access to many private cabins in the area. One of these seasonal cabins is only a few hundred feet from the shaft. The collar is filled with abundant timbers that partly block the opening. It has belled out from its original dimensions, but the ground still appears fairly stable. A local resident explained that a landowner placed the timbers in an effort to make the shaft safer. The timbers partially mitigate the hazard, but a safety problem still exists. The opening size is 10'x 8', and the depth is at least 20'. According to the PBS quad, this shaft is near the boundary of public and private land and could possibly be entirely on private land.

Quad Name: Cumberland Pass

Site #: 372/4283-1.103

Site Name: FR-765.3A

Physical Hazard Rating: 2

Description and pertinent facts: This shaft has wooden planks that seem to seal it effectively. The planks appear competent, but it is not known for certain. The collar craters out to a pit that is 20'x 25' and is 8' in depth. The depth below the wood planking is not known, but a dump size of approximately 50 cubic yards suggests that the shaft is probably relatively shallow. The shaft might connect with collapsed adit #102 of the same inventory area, which is downslope to the southwest. A fairly new wooden tripod straddles shaft #103, and steps have been carved into the dirt that lead down to the planking. The new tripod and the dirt steps indicate that someone repeatedly accesses shaft #103. According to the PBS map, it is on USFS-managed land. The dump from this shaft can be seen to the south of 4WD road FR-765.3A, and the site is easily accessible. The area is remote and not heavily used by the public.

Quad Name: Fairview Peak

Site #: 362/4277-1.103

Site Name: Southeast Sheep Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This inclined shaft is 18' deep with an opening of 7'x 4'. It is located about 600' west of FR-771 from the bottom of Hills Gulch. Private property lies between the shaft and FR-771. Year-round residences are located all along FR-771, a moderately used road.

Quad Name: Fairview Peak

Site #: 362/4278-1

Site Name: Gold Creek

Description and pertinent facts: This inventory area is located 5.5 miles north of Ohio City on FR-771. Several year-round residences are in the area, and the Gold Creek Campground is 0.6 miles to the north. Several hazardous mine features are located in this area.

Feature #: 102

Physical Hazard Rating: 2

Description and pertinent facts: This open adit is more than 25' long with an opening of 4'x 4'. The entrance is partly caved, but access is not inhibited. This adit is located 1,800' west of FR-771.

Feature #: 104

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is 31' deep with an opening of 45'x 19'. It is located just northwest of adit #102.

Feature #: 106

Physical Hazard Rating: 1

Description and pertinent facts: This open adit is more than 25' long with an opening of 7'x 8'. It is located within 500' to the west of FR-771.

Feature #: 205

Physical Hazard Rating: 2

Description and pertinent facts: This 25'-high highwall is associated with shaft #104.

Quad Name: Fairview Peak

Site #: 368/4280-1

Site Name: Jackson Gulch

Feature #: 103

Physical Hazard Rating: 2

This open adit has unstable timbers that extend 20' back to a metal gate that does not appear to be locked. A locked gate is irrelevant because the bars of the gate are widely spaced and do not serve as an access deterrent. The 7'x 7' opening appears to extend back a great distance, but the actual depth is unknown. Adit #103 is draining water at 60 gpm, which could increase the danger for anyone who might enter. A remote, but rather smooth, FR-766.1B accesses this site. The quite obvious and large 3,000-cubic-yard associated dump may attract curious travelers.

Feature #: 104

Physical Hazard Rating: 2

This partly filled, 15'-deep shaft has steep walls with rotten cribbing. It would be extremely difficult to climb out, if someone fell in. A large plug of snow lies at the bottom and obstructs the view of anything that might lie underneath. The ground around the 7'x 4' opening appears fairly stable. Although shaft #104 is located at the end of FR-766.1B and is easily accessible, this is not a high-use area for the public.

^^ New Quad ^^^

Quad Name: Finger Mesa

Site #: 291/4192-1.101

Site Name: Carson Camp Area

Physical Hazard Rating: 2

Description and pertinent facts: General information regarding this inventory area is provided in the **Environmental Degradation** section. This feature is a timbered shaft that is caved 10' below the surface and has a 7'x 7' collar. The public can easily access this site by FR-568.

^^ New Quad ^^^

Quad Name: North Pass

Site #: 358/4224-1.100

Site Name: Cochetopa Pass

Physical Hazard Rating: 1

Description and pertinent facts: This shaft is over 50' deep, and its opening (18'x 20') is covered with a combination of logs and wire fencing which discourages, but does not completely prevent, access. The opening is 300' to the north of FR-750 (a well-maintained gravel road). Two inviting warning signs are located on FR-750 just below the dump. Cochetopa Pass, a popular hunting and 4WD area, is 0.5 miles east along FR-750.

^^ New Quad ^^^

Quad Name: Parlin

Site #: 356/4271-1.100

Site Name: East Flick Creek

Physical Hazard Rating: 2

Description and pertinent facts: This small shaft lies adjacent to an unmarked, remote, and rough 4WD road. The opening is 8'x 8', and vertical walls extend 15' to the shaft bottom. A few small aspens are falling into the opening. This shaft would be difficult to escape.

Quad Name: Parlin

Site #: 358/4266-1.103

Site Name: Brown Derby Mines

Physical Hazard Rating: 2

Description and pertinent facts: This feature is a narrow, open adit that appears to go back for more than 20' and has a 5'x 3' opening. It is located immediately above the unnamed 4WD road leading to the Brown Derby Mines from FR-831. Much of the surrounding land is private, which may reduce the number of visitors.

^^ New Quad ^^^

Quad Name: Pitkin

Site #: 359/4270-1.102

Site Name: Ohio City

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is 18' deep with an opening of 10'x 8'. It is located on a hilltop about 0.5 miles northwest of the intersection of CR-162 and FR-771. The site is surrounded by private property, which limits traffic in this area.

Quad Name: Pitkin

Site #: 361/4273-1

Site Name: Dutch Gulch

Feature #: 105

Physical Hazard Rating: 2

This small, mostly collapsed adit has a 2'x 3' opening that is surrounded by incompetent rock. The present opening is inclined because of the collapse of the main portal. The small associated dump suggests that the adit length is not much further than the 20' to 30' that were visible. Its dump is visible by looking north from FR-771.1B, a fairly remote, but occasionally used, 4WD road.

Feature #: 106

Physical Hazard Rating: 2

This adit is similar to adit #105, described above. It has a 1'x 2' opening in incompetent rock and is at least 15' deep. The associated dump is small and is not visible from FR-771.1B.

Quad Name: Pitkin

Site #: 361/4273-2.102

Site Name: North Dutch Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This inclined shaft is remote and could be on a private mining claim. It has a 2'x 3' opening in incompetent rock and is at least 25' deep. The angle of the opening is steep, but it is still possible to climb up. No trails lead to the site.

Quad Name: Pitkin

Site #: 362/4274-1.100

Site Name: Jones Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This open adit has a large, 4'x 6', partly collapsed opening in unstable rock. The face is not visible, but adit #100 is at least 30' long. The associated dump is barely visible to the north of FR-771.2A. This 4WD road receives a moderate amount of traffic because of the old abandoned mining town of Cambeltown (which is misspelled "Cameltown" on the PBS map) nearby. An old road grade off FR-771.2A accesses the site.

Quad Name: Pitkin

Site #: 363/4274-1.101

Site Name: South of Cambeltown

Physical Hazard Rating: 2

Description and pertinent facts: This open adit is on private property. The portal has collapsed to a 1'x 2' opening. The large associated dump indicates that it is much deeper than 20'. Rock around the portal is extremely incompetent. A network of unmarked 4WD roads is in the area, and the dump is visible from one of these roads. The public frequents this area because of the old mining town of Cambeltown.

Quad Name: Pitkin

Site #: 364/4270-1.100

Site Name: Lower Little Percent Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This adit is visible to the north of SH-162. It has a stable, 5'x 4'

opening that extends back 20' and splits into two passageways. The right drift extends only 10', but the left drift curves, and its face is not visible. Although the host rock appears stable, the unknown depth and the close proximity to the road warrant concern.

Quad Name: Pitkin

Site #: 365/4268-1.100

Site Name: Lookout Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This 17'-deep shaft is on a ridge leading to Lookout Mountain and is about 1¼ mile from FR-802.1A and 1 mile from FR-899. Both roads are rough 4WD trails and would be difficult to traverse for construction vehicles. The 18'-diameter collar is in loose dump material. The shaft narrows to a 4'x 6' cribbed area for the bottom 5'. Although this shaft poses a physical hazard, it is unlikely that it would receive frequent visitation.

Quad Name: Pitkin

Site #: 365/4270-1.201

Site Name: Roosevelt Mine

Physical Hazard Rating: 2

Description and pertinent facts: This feature is a large, deteriorating stamp mill adjacent to the Roosevelt Mine. Because the mill is on steep ground, the top of the mill is accessible via wooden planks that extend from an old road grade. This situation is dangerous because of the instability of the entire structure. Abundant timbers and concrete debris throughout the site increase the hazard to the public. The mill is visible looking south from SH-162, but access is deterred because of the large flow in Quartz Creek. During periods of low flow, a 4WD road might access the site.

Quad Name: Pitkin

Site #: 365/4271-1.100

Site Name: Fish Hatchery Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This adit is about 3 miles northwest of Pitkin. SH-162 and about 1 mile of 4WD road (FR-899) lead to within 0.2 miles of adit #100. An old, overgrown mine road continues the remaining distance from FR-899. The adit is intact and extends more than 25'. A large, 6'x 5' opening, partly collapsed to 4'x 5' at the portal, provides easy access.

Quad Name: Pitkin

Site #: 365/4274-1.100

Site Name: West Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This 14'-deep shaft, inclined at about 70°, is 2 miles northwest

surface could not be reached for testing. Shaft #100 is located about 1.8 miles north of Waunita Hot Springs, along FR-769, and lies between FR-769 and Hicks Gulch.

Quad Name: Whitepine

Site #: 379/4265-1.102

Site Name: West Point Hill

Physical Hazard Rating: 2

Description and pertinent facts: This feature consists of two adjacent shafts with a thin fin of rock between them. The shafts are connected at depth by a 4'x 6' opening. The shaft collars are both 5'x 10', and the depth of each is about 35'. Steep ground above the openings presents a serious hazard to individuals descending the slope. Although the public does not extensively use this remote area, an old road grade accesses the site. Feature #102 is close to the boundary of public and private land and could be entirely on private property.

Quad Name: Whitepine

Site #: 379/4267-1.106

Site Name: North Porcupine Ridge

Physical Hazard Rating: 2

Description and pertinent facts: This open ventilation(?) shaft may connect to adit #105 below. The shaft has a 6'x 3' collar, is 15' deep, and would be difficult to climb from if someone fell in. Shaft #106 is above and close to a 4WD road that accesses adit #105. The 4WD road branches from CR-888 about 0.5 miles below these features.

Quad Name: Whitepine

Site #: 379/4271-1

Site Name: Granite Mountain

Description and pertinent facts: This inventory area is located west of FR-882.2, about 4 miles north of the town of Whitepine. A trail from FR-882.2 leads to feature #100. Feature #102 is about 1,900' upslope (west) from feature #100. The trails in this area appear lightly used, suggesting a low incidence of traffic.

Feature #: 100

Physical Hazard Rating: 2

Description and pertinent facts: This adit with rails is more than 30' long and has a 6'x 4' opening. Water drips from the ceiling into a standing pool about 10' inside the adit. Old machinery and empty fuel containers litter the site.

Feature #: 102

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is more than 30' deep and has a 14'x 6' opening. Shaft #102 contains standing water 11' below the ground surface. A long, black plastic tube extends from

upslope into the standing water. Trash is floating in the water, and an old cabin is just to the east of the shaft.

Quad Name: Whitepine

Site #: 379/4272-1.102

Site Name: Northeast Granite Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is more than 25' deep and has a 11'x 8' opening. Standing water is 25' below the ground surface. Shaft #102 is about 2,000' west of FR-882.2 and about 0.5 miles south of Tomichi Pass. No trails access the shaft, suggesting low exposure to the public.

Quad Name: Whitepine

Site #: 379/4273-1

Site Name: Central Mountain

Description and pertinent facts: This site is located just south of Tomichi Pass along FR-882.2, which is heavily used by motorcycles, ATV's, and 4WD vehicles.

Feature #: 102

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is 23' deep and has an 11'x 6' opening. Standing water is 7' below the ground surface. The water had **pH = 6.0 and conductivity = 0 µS**. Shaft #102 lies within 10' to the west of FR-882.2.

Feature #: 103

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is more than 20' deep and has an opening of 12'x 14'. Standing water, which could not be tested, is 16' below the ground surface. Shaft #103 is roughly 35' east of FR-882.2.

Quad Name: Whitepine

Site #: 380/4273-1

Site Name: Brittle Silver Basin

Feature #: 102

Physical Hazard Rating: 2

This adit is at least 40' long and has a 5'x 7' opening driven in relatively competent rock. Adit #102 is only about 120' east of FR-882.2, a frequently used 4WD road. Water drains from the adit at 10 gpm, which may increase the physical hazard underground.

Feature #: 106

Physical Hazard Rating: 2

A trail leads to this partly collapsed adit that is only a few hundred feet east of FR-882.2. Adit #106 is at least 25' long. The portal is 4'x 5' and appears unstable.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
SUMMARY REPORT**

for the

GUNNISON NATIONAL FOREST

PAONIA RANGER DISTRICT

January 31, 1998

by

Douglas A. Fehlmann

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
FT	Forest Trail
4WD	four-wheel drive
gpm	gallons per minute
<	less than
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
GUNNISON NATIONAL FOREST -- PAONIA RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Paonia Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 04 (Gunnison), and Ranger District 08 (Paonia).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mineral Setting

This section is summarized from a variety of sources listed in the **References** at the end of this report. In addition, some authors are cited in this summary when the material is specifically drawn from that individual reference.

The West Elk and Ruby Ranges are along the western edge of the Colorado Mineral Belt. This mineral belt (described by Tweto and Sims, 1963) contains the majority of the state's mining districts. Mining districts within the Paonia Ranger District are situated around porphyry intrusive centers of late Cretaceous and Tertiary age.

Most of the significant metal mine features within the Paonia Ranger District are in the Ruby Range. These mines are in areas where rich base-metal sulfide veins crop out. The yellow dumps contain large volumes of waste rock and are visible to the public. Rich base-metal veins that extend from the Tertiary stocks of the Ruby Range tend to be limited in linear extent and were the major sources of mineral production from within the ranger district. The majority of mine features are accessed fairly easily via 4WD roads, however, some large mines occur in remote areas that are difficult to reach. This is especially true along the upper slopes of the Ruby Range, in the eastern part of the Raggeds Wilderness, and the western part of the Oh-Be-Joyful Wilderness.

The Raggeds Wilderness contains significant mine features in remote locations such as Gabarfeich, Swan, Buck, Gold, Silver Basins, and on the western flanks of Augusta Mountain. Some of these mines and/or their associated dumps may be sources of degraded water. At least two apparently natural springs, emerging in areas of intense regional alteration, discharge low pH, metal-rich water. These springs are in Gold Basin (inventory site #314/4307-01 on the Marcellina Mountain quad) and an unnamed basin at the headwaters of the Middle Fork of Anthracite Creek.

The western portion of the Oh-Be-Joyful Wilderness, which lies within the Paonia Ranger District near Irwin, contains abundant hard rock mine features. Water from mines near the crest of the Ruby Range has **conductivity levels that range from <50 μ S to 400 μ S and pH levels that range from 5.5 to 7.5**. Mine sites in Robinson Basin generally have **low conductivity levels (100 to 300 μ S) and pH values that average 6.5**. Most of these mine sites are located along brecciated and mineralized fault fissures.

The West Elk and Anthracite Ranges, are poorly mineralized and have few mine workings. Metal mine features consist mainly of shallow prospect pits and short adits. The majority of the dumps contain less than 50 cubic yards of waste rock. In general, mine features occur in isolated areas away from public activity and are accessed by foot trail. Water tested at mine sites within the West Elk Wilderness and within the Paonia Ranger District, usually had **conductivity levels of <50 μ S and pH levels of >7.0.**

Within the Paonia Ranger District, mine features in the Somerset and Coal Creek coal districts are localized and widely scattered along coal outcrops of the Mesaverde Group. The mines of the Coal Creek district were hard to locate, and only two coal adits were observed. Water did not emanate from any of the observed coal mine features. The environmental impact of abandoned coal mine features located on Forest Service-managed land within the Paonia Ranger District is minimal.

Stratigraphy

The Paonia Ranger District contains rocks that range in age from Carboniferous to Quaternary. Mine features are found principally in the upper Cretaceous- and early Tertiary-age rocks. Discussion of the stratigraphy will be limited to these strata.

Mancos Shale Formation

Having a thickness of about 3,000 feet, the Mancos Shale encompasses a suite of rocks that overlie the massive conglomeratic sandstone of the Dakota Sandstone and are overlain by the Rollins Sandstone of the Mesaverde Group. The Mancos Shale includes the basal Benton Shale, the middle Niobrara Limestone, and the upper Pierre Shale. In general, the Mancos Shale consists of gray to buff shale that varies little in physical character. Benton shale is carbonaceous, with coal beds and thin layers of flinty sandstone. The Niobrara includes brittle, yellow, earthy, fossiliferous limestone. Fissile carbonaceous shale occurs above this zone and weathers into outcrops of dark-gray to black bluffs. The upper middle portion of the Mancos consists of buff to light-yellow, fossiliferous shale that weathers into rounded, barren hills. The Pierre Shale consists of layers of sandy shale that grade upwards to the base of the massive Rollins Sandstone. The Mancos Shale occurs throughout all of the coal districts of the Grand Mesa coalfield. This formation disappears east of Coal Creek, beneath a cover of younger intrusive centers of the West Elk Range. The beds reappear east of the West Elk Mountains, cropping out in the Floresta coalfield.

Mesaverde Group

The Cretaceous-age Mesaverde Group overlies the Mancos Shale and underlies the Tertiary Ohio Creek Conglomerate. This group is 600 to 3,000 feet in thickness. Lee (1909) subdivided the formation (now a group) into four members. These members include: 1) the Rollins Sandstone, a basal marine member; 2) the Bowie Shale, a coal-bearing, marine and brackish-water member; 3) the Paonia Shale, a coal-bearing, fresh-water member; and 4) the Barren Member, which consists principally of sandstone and is not known to contain coal of commercial quantity.

The Rollins Sandstone is a cliff-forming unit that consists of white to buff, medium- to fine-grained, cross-bedded sandstone. This member is 60 to 125 feet thick within the Grand Mesa coalfield, but is thinner in the West Elk Range. The lower portions grade from thick, continuous sandstone beds into thin-bedded sandstone layers that are separated by dark-gray, silty to shaly, laminated beds. The upper portion of this member has continuous sandstone beds which lack crossbedding. Cliffs of this sandstone are visible on slopes above the North Fork of the Gunnison River.

The Bowie Shale contains a sequence of interbedded shale and sandstone that reaches a maximum thickness of 450 feet. Seven prospected coal beds occur within the carbonaceous shale. The North Fork area contains at least three coal beds that are more than 3-feet thick. These beds are described and named by Lee (1909) and in ascending order are Old King or "A" bed, Somerset B or "B" bed, and Bear or "C" bed. The Coal Creek area contains two principal coal beds. They are named the lower or Snowshoe bed, and the upper or Bear bed. An unconformity separates the Bowie and Paonia Members.

Thickness of the Paonia Shale varies from less than 200 feet to about 475 feet in the Grand Mesa field, and from 75 feet to 200 feet in the West Elk region. The Paonia Shale consists of lenticular sandstone and platy shale beds. The Minnesota Creek area contains three workable coal beds. In ascending order, they are the "D" bed, the Oliver or "E" bed, and the Hawksnest or "F" bed. These beds are upturned and crop out along the southwestern flanks of Coal Mountain. Compared to the Bowie coals, these coals are softer, produce a lower fuel value, contain a higher amount of "bone" and inorganic matter, and have a tendency to deteriorate more rapidly on exposure.

The Barren Member, which lies above the Hawksnest coal bed, consists of thick massive sandstone layers that are separated by shale. Total thickness is estimated at about 1,500 feet.

Ohio Creek Conglomerate

The upper Cretaceous to early Tertiary Ohio Creek Conglomerate unconformably overlies the Barren Member of the Mesaverde Group. It is a conglomeratic sandstone that has a thickness ranging from 100 to 200 feet. Eldridge (1894) first described and named this formation, whose type locality is along the headwaters of Ohio Creek, south of Ohio Creek Pass. Good exposures of the conglomerate occur along the north flanks of Mount Gunnison, in Coal Creek Canyon, and as isolated patches on mesa tops. The basal portion contains chert pebbles, jasperoid, quartz, and several kinds of igneous rocks including granodiorite, andesite, and rhyolite. The Sawatch Range is the source area for the pebbles of fine-grained igneous rock (Obradovich, 1969).

Wasatch "Ruby" Formation

The Wasatch "Ruby" Formation of Paleocene and Eocene age unconformably overlies the Ohio Creek Conglomerate in some areas and in other places rests on the Mesaverde Group. This formation, named by Whitman Cross in 1892, includes the metamorphosed ruby-colored sediments that compose the rocks of the Ruby Range and crop out near the town of Irwin. Attaining a maximum thickness of 1,800 feet, these sediments are found on the flanks of Mount Owens and Ruby Peak. The upper 1,200 feet consist of white to medium-gray, greenish, purplish and bluish-gray, fine- to coarse-grained, lenticular, and evenly bedded sandstone, and varicolored siltstone and mudstone. In the Ruby Range, the beds are locally metamorphosed to quartzite, argillite, and silty and argillaceous hornfels. The lower 600 feet consist of bluish, greenish, purplish, and reddish-gray, fine- to coarse-grained, feldspathic sandstone and siltstone. The lower sequence of strata also contains greenish-gray, brownish, and purplish-gray conglomeratic sandstone and mudstone. Conglomerates occupy numerous horizons within the lower parts of the formation and generally are only a few feet thick. The conglomerates are composed of Precambrian basement, Paleozoic sedimentary, and volcanic rock fragments that were derived from the Sawatch Range. Constituent minerals such as biotite, hornblende, augite, and magnetite were usually decomposed within the igneous pebbles. Hydrated oxides of iron were deposited in the spaces left by the original crystals or were formed in the matrix of the conglomerates.

Oxidation of iron has produced beautiful hues of purple and red in the rocks of this formation. Iron-bearing silicates, such as epidote, produce a greenish tint throughout the shale beds. Some red beds contain green nodular masses of epidote. These masses are locally found in Green Lake Basin as hollow, irregular-shaped cavities that occur within black to dark-purple slate. Where the iron has leached out, bedrock is white. The southern flanks of Marcellina Mountain contain heulandite, a dark-red mineral found in the altered sedimentary beds that surround a granodiorite intrusion. Elsewhere, granodiorite and quartz monzonite dikes have intruded the Ruby Formation and metamorphosed the finer-grained beds, rich in iron, into dense red rocks.

Wasatch Formation

The Wasatch Formation covers most of Grand Mesa and a good portion of the valleys and slopes of the northern West Elk Range. This formation reaches a maximum thickness of about 2,000 feet and consists of variegated claystone, siltstone, and shale, with local lenses of sandstone, volcanic sandstone, and basal conglomerate. The claystone, siltstone, and mudstone layers produce hues of red-brown, light-green, purple, yellow, orange, and rust.

Igneous Rocks

Within the Paonia Ranger District, igneous rocks occur in the West Elk and Ruby Ranges and are grouped under four general modes of occurrence, which include: 1) laccoliths, stocks, plutons, and intrusive sheets; 2) dikes, plugs, and sills; 3) extensive masses of volcanic breccias, tuffs, and semiconglomerates known as the West Elk Breccia; and 4) surface lava flows.

The Ruby Range consists of small igneous stocks of intermediate to felsic composition (granodiorite to granite) that were formed during the Oligocene. These stocks intrude sedimentary beds ranging in age from the Cretaceous to the Eocene. Rhyolite dikes, sills, and breccia pipes of late Miocene to early Pliocene age cut the Oligocene granodiorite porphyries. The stocks of the Ruby Range form the summit of most of the mountain peaks and are interconnected by a maze of dikes and sills. Disseminated sulfide deposits containing lead, zinc, silver, iron, copper, nickel, gold, and molybdenum occur within the granodiorite stocks of the Ruby Range and were formed during the middle Tertiary plutonic episode.

The West Elk Mountains consist of more than 20 asymmetrical to bell-shaped laccoliths, stocks, sills, dikes, and plug-like hypabyssal bodies which intrude predominately Cretaceous-age sedimentary rocks in the northern part of the range and Tertiary-age volcanic rocks in the southern part of the range. During the middle Tertiary, volcanism in the West Elk Mountains produced an extensive field of andesite and dacite, agglomerated tuffs and breccias. A series of dacite porphyry dikes and fissures extend northeast from the West Elk volcanic center and connect with a system of dikes and fissures in the Ruby Range. The dacite porphyry dikes cut granodiorite porphyry plutons in the southern portion the Ruby Range and also cut the West Elk breccia. Most igneous rocks in the West Elk Range are not appreciably altered. Exceptions are at Sheep Mountain and Coal Mountain, where disseminated pyrite is abundant. In the past, claims have been staked in Red Gulch near Sheep Mountain. No mine workings are known at either of these altered intrusions, although the existence of small exploration pits can not be dismissed.

Mines and Mineral Setting of the Ruby Range

Mineral development first occurred in 1872 at a location just northeast of the town of Irwin. Irwin (originally known as Ruby Camp) was founded in 1879 and became the center of extensive mining and prospecting activity for the district (Herrick, 1981). The camp and district were named after the most valuable mineral commodity, ruby silver. The majority of lead and silver production from the mines of the Ruby Range occurred prior to 1910.

Ore deposits of the Ruby Range are most frequently hosted by altered sedimentary rocks adjacent to Tertiary stocks. The sedimentary rocks are typically highly fractured and shattered near or at the contact with intrusions. Mineral occurrences are more numerous in the siliceous, rather than in the argillaceous beds. Most occurrences are in the sandstone and siliceous shale of the Mesaverde, Ohio Creek, and Ruby Formations. Little mineralization has affected the unaltered shale beds of the Mancos Formation.

Stocks, dikes, sills, and associated fault and breccia zones of the Ruby Range are locally mineralized. The felsic Tertiary stocks of Mount Owens, Augusta Mountain, Ruby Peak, and Afley Peak crop out along the crest of the Ruby Range (Ellis, 1983; Kness, 1984). Ellis (1983) makes the statement that "veins in these stocks, except for the Augusta vein, are small and weakly mineralized". Stocks of Richmond Mountain and Purple Peak also contain mineralized veins. Dikes occurring within and adjacent to these are generally enriched with varying amounts of base metals. Most of the stocks and dikes have been hydrothermally altered. The Augusta Mountain and Ruby Peak stocks are concentrically zoned (Mutschler, 1968, p. 211-214). Mutschler describes the zoning as ranging from high-temperature disseminated sulfides in the

center, to low-temperature ruby silver veins at the margins of the stocks. Molybdenum occurs in trace amounts within the stocks and associated veins of the Ruby Range, and molybdenite was found in a drill hole located at feature #101 in inventory site 315/4307-01. Sedimentary rocks of the Mesaverde and Wasatch Formations surround the stocks and have been metamorphosed and recrystallized into quartzite and hornfels. Both the intrusions and metamorphosed rocks host silver-rich, base-metal sulfide veins. The veins, according to Kness (1984), were formed by open-space filling and occur along northeast-, northwest-, and west-striking faults and fractures.

Areas of intense mineral activity in the Ruby Range and within the Paonia Ranger District include: Irwin, Robinson Basin, Richmond Mountain, Augusta Mountain, and Oh-Be-Joyful-Ruby Peaks.

Irwin

According to Kness (1984), the Ruby Chief Mine was driven along a 10-foot-wide fault that had a strike of N.80°W. This fault extends westwards along the surface for a distance of several hundred feet beyond the underground workings. Gaskill and Godwin (1966), and Gaskill and others (1967), mapped and projected this fault westward for a distance of 1.5 miles into the Raggeds Wilderness. Gold, lead, silver, and zinc were the principal metals extracted from the vein. In 1882, a snowslide shut down the Ruby Chief Mine.

Ore deposits of the Irwin area predominately occur in fault fissures. Veins within the fault fissures consist of a series of thin, parallel sheets of mixed country rock and metallic minerals (Emmons, 1894).

Mineralization in the vicinity of Irwin occurred in several stages. Contact mineralization was limited in areal extent during the early stages of magmatic activity when laccoliths, dikes, sills, and stocks were emplaced. Socolow (1955) attributes this lack of mineralization along the contact zones to heat loss in the shallow environment of the intrusions. The initial phase of mineralization began when thermal waters, emanating from the magmatic source, permeated the igneous and sedimentary rocks of the Ruby Range and Irwin area. The thermal waters altered the plagioclase feldspars to sericite.

A second episode of regional mineralization and alteration occurred in the sedimentary beds surrounding these intrusions during the peak of the high-temperature hydrothermal alteration phase. At this time, secondary minerals developed in areas adjacent to the magmatic source and were dispersed in solution to peripheral zones of the intrusions and adjacent country rock. Here, the secondary minerals of quartz and calcite crystallized into open spaces within fault fissures. Quartz originated from magmatic silica, and calcite originated from solutions that migrated through underlying Mississippian limestone. Major fracture systems were developed during a time when faulting reached its climax.

The third phase involves late, low-temperature, fluid-rich and sulfide-rich hydrothermal solutions. These solutions deposited ore-forming minerals into open channels within the major fractures. This low-temperature mineralization altered the country rock for distances of up to 30 feet from the walls of the fault fissures.

Robinson Basin

In Robinson Basin, a group of quartz diorite dikes are emplaced along a set of eastward-trending faults. These dikes are dark to grayish-green and are composed of medium-grained, holocrystalline rock of uniform character. Plagioclase, quartz, biotite, hornblende, and augite form the groundmass. The lower portion of Robinson Basin is cut by numerous brecciated and fault fissure zones that strike to the northeast, northwest, and west. Veins of base-metal sulfides, quartz, and calcite are associated with some of these zones. The veins have abundant blackjack sphalerite, pyrite, and galena. The brecciated veins were first filled with quartz, followed by base-metal enrichment, and later calcite and another quartz phase.

Richmond Mountain

Several rich, northwest-trending silver veins occur on the flanks of Richmond Mountain, the sites of the Saint Elmo, Domingo, and Richmond Mines. The Saint Elmo Mine lies near the crest of the Ruby Range and was driven in diorite. The Domingo vein crosses diorite sheets and altered Mesaverde sandstone. The Richmond vein occurs in the upper part of the Mesaverde Group. The veins of these mines were worked extensively in the early 1900's, producing ore rich in lead-zinc-copper and silver sulfides. Two rare minerals, locally known as "Mineral wool", were reported by Emmons (1894). The minerals are sulphantimonites of lead and are called warrenite (jamesonite) and treieslebenite (owyheeite). Warrenite occurs in the Saint Elmo and Domingo veins. Treieslebenite occurs in mines located high on the western slopes of Baxter Basin.

Intrusive activity at Richmond Mountain is the probable source for rich silver-lead-zinc veins which include the Big, Excelsior, Jacob Straeder, Domingo, and Richmond. According to Ellis (1983), the Domingo vein contains quartz, sphalerite, pyrite, and silver. The northwest-striking vein extends westward for an estimated distance of 1,200 feet within the Raggeds Wilderness.

The northwest-striking Richmond vein extends in a westerly direction for a projected distance of 3,000 feet into the Raggeds Wilderness. Site #316/4314-01 is in the upper portion of Gabarfeich Basin. Mine features #101, #102, and #106 were driven in the Richmond vein. Ellis (1987) described the Richmond vein as brecciated, with traces of sulfides and moderate amounts of silver. It is exposed along a 360-foot drift at the back of feature #101.

Augusta Mountain

The Augusta stock, according to Emmons (1894), consists of diorite. Dikes and sheets of diorite from the stock, together with white quartz porphyritic dikes, cut altered sediments of the Mesaverde Group. Mineralization of the Augusta stock is varied and complex, and a molybdenum deposit may exist at depth. The stock of Augusta Mountain is exposed near the summit and is surrounded by metamorphosed shale and sandstone of the Mancos and Mesaverde Group.

According to Emmons (1894), the Augusta Mine adit is 400-feet long and follows a fault fissure that trends N.75°E. at its eastern end and trends S.60°W. at its western end. The ore consists of

sphalerite, pyrite, chalcopyrite, tetrahedrite (gray copper), and ruby silver. The vein is 1- to 4-feet wide, and base-metal minerals cement the brecciated diorite. Emmons (1894) traced the vein to a depth of 165 feet below the level of the adit, and the ore shoot had a length of about 200 feet.

Surface workings are near the summit and on the north side where rich base-metal veins crop out at an elevation of 12,400 feet. Other veins of the Augusta stock occur along northeast- and northwest-striking faults. According to Ellis (1983), the Augusta vein extends for at least 1,000 feet into the Raggeds Wilderness, and contains more galena, less sphalerite, more gold, and possibly more silver, than the Domingo and Richmond veins. The Augusta Mine and mill were buried repeatedly by avalanches, forcing the facilities to close in the early 1900's. Rich deposits of base-metal sulfides still remain where the Augusta vein extends into the Ragged Wilderness.

Dump material from workings high on the west side of Augusta Mountain (inventory area #317/4315-02) is scattered along a dry stream. Mineralized rock from this dump contains tungsten, argentiferous galena, some black sphalerite, abundant chalcopyrite, pyrite, tennantite, tetrahedrite, and bornite. Molybdenite was not found on this dump, however, Ellis (1983) reported this mineral in at least one prospect in upper Augusta Basin. The granitic host rock contains large amounts of iron-rich quartz and brown calcite.

Oh-Be-Joyful and Ruby Peaks

Buck and Silver Basins are along the western flanks of the Afley Peak and Mount Owens stocks. Gold and Dike Creek Basins occur on the western flanks of the Ruby Peak stock. Inventoried mine features within these basins are found in the stocks, porphyry dikes, and metamorphosed sediments of the Ohio Creek and Wasatch Formations. Northeast-striking faults, fractures, and quartz veins hosted in quartz monzonite and sandstone contain minor amounts of copper, silver, gold, lead, and zinc. These weakly mineralized structural features extend for a few thousand feet into the Raggeds Wilderness. The Ruby Peak stock may also contain a buried, low-grade molybdenum occurrence.

Coal

Coalfields in Paonia Ranger District are within the southeastern part of the Unita Coal Basin. Two coalfields, the Grand Mesa and Floresta (Ruby or Irwin) are within the ranger district, but only the Grand Mesa field has workings on public land.

Coal in the Paonia Ranger District is mostly in the lower 450 feet of the Mesaverde Group and ranges in composition from anthracite to semianthracite to bituminous. Non-coking bituminous coals are essentially unmetamorphosed and occur in portions of the Somerset coal district of the Grand Mesa coalfield. Coking coals are slightly metamorphosed and occur in the Floresta coalfield. Anthracite occurs only in those areas of intense regional metamorphism where large igneous intrusions are in contact with coal-bearing rocks. Small anthracite deposits are in the Floresta coalfield, on the northern slopes of the Anthracite Range.

Grand Mesa Coalfield

The Paonia Ranger District lies within the eastern portion of the Grand Mesa field and includes parts of the Somerset and Coal Creek coal districts.

The Somerset coal district contains coal beds that crop out along the North Fork of the Gunnison River and Minnesota Creek. This district covers 75 square miles of mostly BLM-managed and private land. Four coal beds occur in the Paonia Shale, and seven beds occur in the Bowie Shale. The coal is high-volatile "B" and "C" bituminous in rank, and the beds range up to 9 meters in thickness.

Lee (1912) describes coal seams throughout the Somerset district. At the southern end of the Somerset coal district, coal-bearing strata are in horizontal to upturned beds (having an overall dip of 35°N) that lie along the flanks of Mount Gunnison. Other coal seams, with a maximum thickness of 6 feet, occur in different portions of Little Coal Creek in the Somerset coal district. These beds have an average dip of 37° to the southwest and are exposed on the southwestern flank of Coal Mountain. At these locations, the coal is generally crushed and is irregular in thickness, pinching out higher on the slopes.

Elsewhere in the Somerset coal district, isolated exposures of coal-bearing rocks occur on the western slopes of Mount Gunnison. The Mount Gunnison granodiorite laccolith intruded the Mesaverde Group, raising large blocks of tilted sedimentary rocks. Within these blocks, coal beds are irregular in character. A few prospect pits and shallow underground workings were driven in these coal seams.

The Coal Creek coal district includes Coal Creek Canyon. The majority of coal outcrops and mine features of this coal district occur on USFS-managed lands within the Paonia Ranger District. The Coal Creek coal district has an areal extent of 105 square miles. The western flanks of West Beckwith Mountain (Mount Lombard in the report by Lee, 1912), the eastern and southeastern flanks of Mount Gunnison, the western flanks of Moseley Ridge, and the slopes below the Cliff Creek sill all contain metamorphosed and disturbed coal-bearing rocks of the Mesaverde Group. Coal beds occur at a maximum altitude of 10,300 feet along the north flanks of West Elk Peak and dip northward to an elevation of 7,000 feet in Coal Creek Canyon.

The distance of the coal beds from the intrusive masses of the West Elk Range determines the character of the coal. Coal varies from being a soft bituminous variety to anthracite. Massive sandstone layers occur within the coal-bearing rocks, however, most coal seams are in beds of soft shale beneath cliff-forming sandstone layers. Eight coal beds, measured and described by Lee (1912), occur throughout the Bowie and Paonia Members of the Mesaverde Group.

Lee (1912) described numerous coal outcrops and prospects in the Coal Creek district. Some of those localities correspond to inventory areas. Unfortunately, most of the locations that Lee described were searched for but not found during this inventory. It is assumed that the workings are small, caved, and pose no serious environmental or physical hazards.

Floresta Coalfield

The Floresta (or Ruby or Irwin) coalfield derives its name from the coal mining town of Floresta,. The old townsites of Floresta and Lily Lake are accessed by FR #730.1E and FR #830.1A from FR #730. The field is small, covering approximately 17 square miles near the headwaters of Ruby Anthracite Creek. A 6-mile-long outcrop of coal-bearing Mesaverde Group rocks are upturned against the northern flanks of the Anthracite Range. Only one seam of minable thickness exists in the field, and the bed dips 18° to 24° north. The coal seam has variable thickness, but averages 4 feet. The coal is hard, black anthracite with vitreous luster, conchoidal fracture, and a fine, banded texture. It contains low percentages of moisture and ash, has a high heating value, burns readily, and is highly prized as a domestic fuel.

The Ruby-Anthracite Mine, the major mine in this field, is located on patented mining claims. The mine entrance is on the north slope of the Anthracite Range in section 16, T.14S., R.88W. at an altitude of 10,000 feet. Coal adits and prospects do not occur on Forest Service-managed lands within the Floresta field.

USFS ABANDONED MINE LAND INVENTORY PROJECT
GUNNISON NATIONAL FOREST -- PAONIA RANGER DISTRICT

NUMERICAL SUMMARY:

- 61** field forms
- 217** mine openings inventoried (includes collapsed or filled openings)
- 161** mine dumps, tailings piles, highwalls, etc.
- 54** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 4
 - Number of features with EDR of 3 = 12
 - Number of features with EDR of 4 = 38
 - Number of features with EDR of 5 = 324
- 74** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 2
 - Number of features with PHR of 2 = 13
 - Number of features with PHR of 3 = 59
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 304

USFS ABANDONED MINE LAND INVENTORY PROJECT
GUNNISON NATIONAL FOREST -- PAONIA RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=04;District=08	EDR
Summit of Augusta Mtn. (Paonia R.D.)	Oh-Be-Joyful	317/4315-02.102, 200, 201; 100, 202	2, 2, 2; 3, 3
Garbarfeich Basin West of Angel Pass	Oh-Be-Joyful	316/4314-01.101; 106	2; 3
Green Lake Basin	Oh-Be-Joyful	315/4307-01.100, 200	3, 3
Summit of Green Lake Basin, between Ruby Pk. and Mount Owen	Marcellina Mountain	315/4307-02.201	3
Upper Silver Basin, Central and Southern Flank Portions	Marcellina Mountain	315/4309-01.100, 101, 201, 106	3, 3, 3, 3
Adits and shafts on the East Flanks of Robinson Basin	Oh-Be-Joyful	317/4307-03.100	3
Robinson Basin No. 1	Oh-Be Joyful	317/4308-01.100	3
Dike Creek Basin, West Flank of Ruby Peak	Marcellina Mountain	*314/4307-01.100, 200	4, 4

*Water sample collected at this site.

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=04; District=08	PHR
Campground No. 1	Oh-Be-Joyful	317/4305-02.107	1
Legal (M.S. 4149)	Oh-Be-Joyful	318/4306-02.100	1
Gold Basin	Marcellina Mountain	314/4307-02.100	2
Upper Silver Basin, Central and Southern Flank Portions	Marcellina Mountain	315/4309-01.100, 106	2, 2
Adits and Shafts Southeast of Green Lake	Oh-Be-Joyful	316/4307-02.100, 103	2, 2
Adits and Shafts on East Flanks of Robinson Basin	Oh-Be-Joyful	317/4307-03.104, 106	2, 2
Anthracite Creek No. 1	Oh-Be-Joyful	317/4305-03.100, 101	2, 2
Robinson Basin No. 1	Oh-Be-Joyful	317/4308-01.102	2
Little Jessie and Temple	Oh-Be-Joyful	318/4306-01.100	2
Irwin No. 7	Oh-Be-Joyful	318/4306-03.100	2
Irwin No. 5	Oh-Be-Joyful	318/4307-02.100.	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Marcellina Mountain

Site #: 04-08-314/4307-01.100, 200

Site Name: Dike Creek Basin, West Flank of Ruby Peak

Environmental Degradation Ratings: 4

Description and pertinent facts: The inventory area encompasses the upper western flanks of Ruby Peak and an unnamed stream whose source is just below a saddle between Ruby Peak and Mount Owens. The unnamed stream is referred to as the "South Fork of Gold Creek" throughout the description of this inventory site. The South Fork of Gold Creek merges with Gold Creek just west of where FT #830 crosses both streams.

The inventory area is accessed by an old mining road in Green Lake Basin. Green Lake Basin is not named on the topo, but this name is used for reference purposes. The mine road branches from FR #826.1E extension and switchbacks up the northwestern flanks of the talus-covered basin. The road is reduced to a foot trail as it passes through numerous talus slopes and terminates at the saddle. From the saddle, it is a short descent to the headwaters of South Fork of Gold Creek. The source of this creek is a spring emerging in a deep, V-shaped gulch. Runoff from the steep, talus-covered slopes of both mountain peaks discharges into the creek bed. The lower portion of the creek has a steep gradient, and the side slopes consist of unstable, mineralized talus. All features in this inventory site are located on USFS-managed lands.

The headwaters of South Fork of Gold Creek are surrounded by the Ruby Peak stock. The stock consists of light-gray, porphyritic quartz monzonite that is highly fractured along iron-stained joints. Feature #100 is shown as a prospect pit on the geologic map and occurs in a ferruginous breccia deposit. The breccia consists of angular, quartz monzonite talus that has been cemented by hydrous iron oxides. The creek has cut into the deposit, locally producing cliffs that are 10- to 25-feet high. The cliffs are undercut on the south side by the creek. Feature #100 is a partly filled prospect pit excavated at the base of an 18-foot-high cliff of ferruginous breccia. This pit is 5-feet long by 5-feet wide, 4-feet deep, and is 5 feet from the south side of the creek.

Feature #200 is the associated dump, which contains unconsolidated and recemented breccia. It measures 10-feet long by 12-feet wide and has an estimated volume of 20 cubic yards. The face is 15-feet long and has a slope angle of 18°. The waste rock contains veinlets of cubic pyrite crystals.

Clear spring water emerges from the depression and at the foot of the dump. The water flows down the northwest flank of the dump and enters the creek. Bright orange ferric hydroxides coat the creek bed and portions of the waste rock. Sludge deposits up to 1/4-inch thick accumulate in the creek. From the confluence of the pit water and the creek, the creek bed is stained bright orange for over a mile and continues to show staining where FT #834 crosses the creek. Part of the waste rock from dump #200 has been removed by snowslides and stream erosion. Talus and exposed beds of Wasatch Formation shale in the upper reaches of South Fork are stained brilliant red-brown to yellow-orange from oxidizing disseminated pyrite.

Water test #300 was taken in the South Fork of Gold Creek about 250 feet below the toe of dump #200. Test values were **4.03 for the pH and 300 µS for the conductivity**. At this test location,

the rocks and plants along the banks are stained bright orange from ferrous hydroxide precipitates. Green moss grows along the water's edge, and patches of grass show yellowing in the leaves. Water test #300 was taken on 7/23/96, when the flow rate of the creek was 15 gpm. The creek water was clear and supported no aquatic insects or macroinvertebrates.

Water test #301 was taken from South Fork above the confluence with the spring water from pit #100. Test values were **2.98 and 400 μ S**, and the rate of flow was 12 gpm. At this location, the water in the creek is clear, and the rocks are slightly orange stained. The low pH, high conductivity, and staining are probably because of the large amount of disseminated-pyrite-rich talus and country rock in the drainage basin above this test site. Talus fills the creek bed just above feature #100, forcing the creek to flow beneath the talus.

Water test #302 was taken at the toe of dump #200, of water from the spring at pit #100. Test results produced a **pH of 3.12 and a conductivity of 300 μ S**. The spring water flows down a V-shaped channel, over the northwest flank of dump #200, and enters the creek at the toe of this dump. White salt deposits occur on the surface of the saturated waste rock and continue to form at the high water mark all along the banks for a downstream reach of over 400 feet. The spring had a flow rate of 5 gpm.

Water sample #04-08-314/4307-01.303 was taken on 10/2/96 approximately 15 feet below the toe of feature #200, just below the confluence of where the spring water enters the creek. The **pH was 3.02 and the conductivity was 1,477 μ S**. The flow rate had dropped from 15 gpm to 6 gpm. The spring water contained high levels of dissolved metals, resulting in a high conductivity reading. Lab results are provided in tabular form at the end of this paragraph. The creek water greatly exceeded state standards in aluminum, cadmium, copper, iron, manganese, and zinc concentrations. Aquatic life was not found in the water or under the rocks for a stream reach of well over 800 feet. Only a few mosquito larvae were observed where FT #834 crosses the South Fork of Gold Creek. Low pH levels in the creek are probably the result of runoff draining the mineral-rich slopes of the Ruby Peak stock. This stock has large exposures of quartz monzonite with abundant pyrite in veins and disseminated. The low pH levels are also in part produced from iron oxidizing from pyrite seams hosted in the underlying, fractured and altered shale of the Wasatch Formation.

Sample #04-08-314/4307.01.303; hardness = 469 mg/L; North Fork Gunnison River segment #1

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	17,000	87**	195 x standard
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	27,000	1000	27 x standard
Thallium (trec)	<1	0.5**	below detection limit
Cadmium	110	3.8	29 x standard
Calcium (CaCO ₃)	150 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	2,000	44	45 x standard
Fluoride	0.78	2 mg/L**	below standard
Iron	26,000	300	87 x standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Lead	12	35	below standard
Magnesium	23 mg/L	no standard	n/a
Manganese	12,000	50	240 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	309	below standard
Potassium	1.3 mg/L	no standard	n/a
Silver	0.6	1.1 (on 3/2/98)	below standard
Sodium	4.0 mg/L	no standard	n/a
Sulfate	720 mg/L	250 mg/L	2.9 x standard
Zinc	11,000	393	28 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Marcellina Mountain

Site #: 04-08-315/4307-02.201

Site Name: Summit of Green Lake Basin, Between Ruby Peak and Mount Owen

Environmental Degradation Rating: 3

Description and pertinent facts: This inventory site is near a ridge that forms a saddle between Ruby Peak on the south and Mount Owens on the north. The lowest part of the saddle is at an elevation of 12,030 feet. The site is accessed by a talus-covered foot trail that once was a mine road. This trail switchbacks up the northwestern flanks of Green Lake Basin. The trail joins FR #826.1E, a 4WD road that originates at the Lake Irwin campground and traverses Robinson Basin. All of the inventoried features are above timberline on Forest Service-managed lands.

The pits (features #100 through #103) are in gray, fractured porphyritic quartz monzonite of the Ruby Peak stock (Gaskill and others, 1966). The quartz monzonite and surrounding fractured, black to dark-purple shale of the Wasatch Formation are limonite stained to brilliant hues ranging from light-orange-yellow to red-brown. A spur ridge just north of the saddle separates Gold Basin from the basin of South Fork of Gold Creek. This ridge is stained dark yellow-brown, and its scree slopes are stained bright red-orange to orange-brown. A light-yellow clayey soil is produced from the weathering of the scree material. Light-yellow, clay-rich deposits are found in the saddle, occur on the north side of feature #201, and are exposed in the cut banks of the old mine road. These deposits are rich in disseminated pyrite, chalcopyrite, and tennantite, and are produced from the weathering of the Mount Owens granodiorite stock. The deposits emit a strong smell of hydrogen sulfide when saturated with water.

Feature #101 is on the north half of the saddle and may be a back-filled open pit that was filled and leveled by heavy equipment. Heavy equipment, including a drill rig, once traveled up the old mining road from FR #826.1E. The old road leads to the north side of the filled pit (feature #101) and stops about 10 feet north of a drill hole, where a 4-inch-diameter metal pipe protrudes 1.5 feet out of the ground in the middle of the disturbed area. Drilling was done during molybdenum exploration. The disturbed area measures approximately 180-feet long by 70-feet wide. Its surface is barren of vegetation and contains clayey, light-yellow soil with abundant disseminated pyrite and chalcopyrite.

Several benches are on the face of associated dump #201, and the toe spreads out into three well-defined drainage channels. Estimated measurements for this feature are a length of 45 feet, a width of 63 feet, and a volume of 455 cubic yards. This large volume includes the waste rock that accumulated on the slopes below the saddle, and the waste rock that was used to fill feature #101. The face of dump #201 has a steepest slope length of 57 feet, and its slope angle is 31°. Waste rock is clay- to sand-size and contains crystalline pyrite, chalcopyrite, and cuprite in an iron-stained matrix of biotite-rich white granodiorite. Dry portions of the dump have a hard crust at the surface.

During rainstorms and snowmelt, runoff flows over the waste rock of feature #201, eventually reaching Green Lake. Snow drifts accumulate on the leeward side of the saddle and cover the dump material until late summer. Numerous gullies have formed in dump #201 below the receding snow line. Much of the snowmelt water seeps into and completely saturates the waste rock, seeping out at the toe.

Water test #300 was taken approximately 50 feet below the toe of feature #201. Values from this test were **pH of 4.18 and conductivity of 400 μ S**. The test site was where three drainage channels merge into one main channel, and the flow rate was 8 gpm. When this test was taken, water from melting snow was flowing over the face of dump #201 and accumulating in the main drainage channel. Runoff from dump #201 and the surrounding areas may degrade Green Lake. The runoff is murky with sediment, and the channel is stained yellow from precipitating ferric hydroxides. Sediments transported by the runoff have accumulated where the mine road crosses the lower face of feature #201. Several other portions of the face of dump #201 were tested for water quality and **pH values ranged from 3.17 to 4.33. Conductivity ranged from 100 μ S to 500 μ S**.

Quad Name: Marcellina Mountain

Site #: 04-08-315/4309-01.100, 101, 201, 106

Site Name: Upper Silver Basin, Central and Southern Flank Portions

Environmental Degradation Ratings: 3

Description and pertinent facts: Silver Basin is one of several remote basins on the western flanks of the Ruby Range. The inventory area comprises the upper central and southern portions of this basin. Several perennial creeks drain the upper sub-alpine parts of the basin and merge to form the headwaters of Silver Creek. The lower part of the basin is covered with dense stands of conifer, and the upper part is characterized by patchy stands of conifer surrounded by grassy meadows with bedrock benches. Talus slopes cover the highest reaches.

The lower portions of Silver Basin are accessed by FT #834 and FT #835. These well-marked trails are frequently used by backpackers, hunters, and equestrians. Numerous unmarked trails access the upper reaches of Silver Basin. All of the features occurring within the inventory site are on Forest Service-managed lands.

Numerous porphyritic dikes of quartz monzonite (Gaskill and Godwin, 1966) and diorite intrude the purple to green shale of the Wasatch Formation. This shale forms benches and intermittent cliffs in the upper parts of the basin. Part of the Mount Owens biotite granodiorite stock crops out as a light-gray cliff and forms part of a ridge. This ridge separates Silver Basin on the north

from Gold Basin on the south. All of the inventoried features occur in or near quartz monzonite porphyry outcrops. The geologic map of the Marcellina Mountain quad (Gaskill and Godwin, 1966) shows these as parallel dikes trending N.43°W. The dikes extend in a southwesterly direction into Gold Basin and northeastwards into Buck Basin. Dip-slip and strike-slip faults crosscut the dikes and follow along their contact with the shale and sandstone beds.

A total of ten mine features and nine dumps are within the inventory site, at elevations of 10,520 to 10,900 feet. Feature #100 is an intact shaft sunk in a brecciated fault zone in quartz monzonite. A pyritized quartz vein, having an average width of 1 foot, occurs in a fault zone that trends S.44°W. on the hill above the shaft entrance. The vertical walls of the shaft are lined with log cribbing, starting 6 feet below the ground surface. The surface opening measures 8-feet long by 4-feet wide and tapers to an inner opening of 4-feet long by 5-feet wide. The inner workings are flooded and are 53-feet deep. A flat area, consisting of leveled dump material, surrounds the shaft opening and measures 37-feet long by 28-feet wide. This leveled area may have supported a headframe and hoist, because pieces of rotten beams and boards are partly embedded in the dump material. Opaque water with aquatic larvae occurs 7 feet below the surface opening of feature #100. The walls below the water surface are stained orange-brown from oxidation of pyritized quartz veins. Clumps of bright green moss grow on the shaft walls above the water line. Water test #300 was taken from feature #100 and provided a **pH of 4.8 and a conductivity of 200 μ S.**

An estimated volume of 370 cubic yards of yellow to bright orange waste rock of feature #200 fans out around the northwest and south sides of the shaft. The bulk of the waste rock lies on the west-facing slope, and the face of dump #200 is quite visible from lower parts of the basin. Dump material consists of pyrite veinlets cutting through porous quartz veins. A vertically walled perennial stream channel cuts into the top of the dump, along a west-trending, vertical dike face of quartz monzonite. Water test #301 was taken in the perennial creek that flows past the north flank of dump #200. This test was taken a short distance above the dump, where the creek yielded a **pH of 6.7 and a conductivity of <50 μ S.** A variety of macroinvertebrates thrives in and under the black, algae-covered rocks of the creek bed. Lush growths of phreatophytes, grass, and moss carpet the banks.

Feature #101 is an adit that bears S.53°E. into the hillside at the base of the same quartz monzonite dike that crops out at feature #100. A 20-foot-long, V-shaped trench connects the collapsed entrance to the top of one of the two waste rock piles that compose feature #201. Water test #302 was from the V-shaped trench that receives mine effluent draining at 10 gpm from collapsed adit #101. Values recorded were **pH 6.5 and conductivity 100 μ S.** At this site, the bottom of the 20-foot-long trench is lined with phreatophytes and moss. The trench merges with the perennial creek mentioned above.

At feature #201, the northern dump forms a 47-foot-long linear pile of waste rock that extends from the trench. Mine water runs over the top of the 25-foot-wide pile, flows down its northern flank, and enters the creek. Several channels cut the top of feature #201, caused by the mine water fanning out from the end of the trench. In addition, the toe of dump #201 has been eroded by the perennial stream. Yellow waste rock from the northern dump pile contains crumbly vein material composed of quartz and seams of crystalline pyrite. The southern dump pile is 2/3 bluish-gray quartz monzonite, and its middle 1/3 is yellow, iron-stained, altered quartz monzonite. The midsection of the southern dump pile contains white quartz veins with stringers

the north and west flanks of Green Lake Basin. The trail terminates in a saddle along a ridge crest. This trail connects Ruby Peak to the south, with Mount Owens to the north.

Feature #100 is an adit located 15 feet from the west side of the old road bed. The top of feature #200 rests on the east side of the road bed. Adit #100 is collapsed, and the entrance is filled with yellow-orange colluvium. The colluvium consists of disseminated pyrite and chalcopyrite contained within a porphyritic groundmass of quartz monzonite of the Ruby Peak stock. Clear water drains at 2 gpm from the entrance of the adit, runs across the roadway, and spills over the top and runs down along the southern flank of dump #200. Water test #300 was taken at the adit entrance and yielded a **pH of 4.3 and a conductivity of 100 μ S**.

Feature #200, which is visible from Green Lake, is a 30-cubic-yard dump with a 17-foot-long top and 23-foot-wide body. Forty percent of the waste rock contains a mixture of silt- to clay-size particles. The surface of the dump, when dry, forms a hard crust and contains numerous shallow gullies. The face is 12-feet long and has a slope angle of 18°. Dump material consists of iron-stained, yellow, brecciated quartz monzonite. Crystals of pyrite and chalcopyrite are visible. They are disseminated throughout the brecciated groundmass and are found in veinlets of up to 1/4-inch in width.

Water test #301 was taken in a creek channel that receives effluent draining from adit #100. The test site was about 70 feet below the toe of dump #200. This test yielded a **pH of 4.1 and a conductivity of 100 μ S** on a flow of 4 gpm. Clear water in the creek precipitates out yellow ferric oxides, producing a thick film that coats the rocks of the creek bed.

Quad Name: Oh-Be-Joyful

Site #: 04-08-316/4314-01.101; 106

Site Name: Gabarfeich Basin West of Angel Pass

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: The inventoried mine features are in Gabarfeich Basin, west of Angel Pass and between Augusta Mountain and Richmond Mountain in a remote part of the Raggeds Wilderness Area. This basin is not named on the Oh-Be-Joyful 7.5-minute quad. This area has steep, talus-covered slopes and rugged, jagged ridgelines. Avalanches are common, and much of the upper slopes of the basin are devoid of brush and trees. One of the main tributaries of Middle Fork of Anthracite Creek begins here.

Access to the inventory site is by an unmarked and narrow foot trail that originates at the north side of the old mine road leading from Poverty Gulch to the Augusta Crosscut. The Augusta Crosscut is mistakenly labeled the Augusta Mine on the Oh-Be-Joyful 7.5-minute quad. The trail begins at a rock cairn located on the north side of the mine road and then switchbacks up the loose, talus-covered slopes on the north flanks of Augusta Basin. The trail travels above and on the north side of a lower, unnamed lake and crosses below the outlet of an upper, unnamed lake. The trail splits, and the south fork goes over a saddle and into Baxter Basin. The west fork ascends the southwest flanks of upper Augusta Basin and connects with Angel Pass. The trail splits again on a narrow and highly mineralized ridge crest that separates Gabarfeich Basin on the south from an unnamed basin on the west flank of Augusta Mountain. At the junction, the south fork switchbacks down the northern flanks of Gabarfeich Basin. The north fork switchbacks

down the talus-covered slopes of the unnamed basin and connects to another trail that leads to inventory site #04-08-316/4315-01.

The "Geologic Map of the Oh-Be-Joyful Quadrangle" shows the inventory area to be in a complex geologic setting. The upper-central portions and southern flanks of Gabarfeich Basin are crosscut by biotite granodiorite, granodiorite porphyry, and white quartz porphyry dikes that have a general trend of N.50°E. (Gaskill and others, 1967). The central portion of the basin and its flanks are covered with thick deposits of highly fractured, iron-stained shale. The black shale is stained orange-brown, and iron oxides fill the bedding planes, parting zones, and fracture zones in the shale and quartz monzonite of the Augusta Mountain stock.

Feature #101 is an intact adit with a bearing of S.50°W. driven into the base of a cliff of highly fractured and altered sandstone and silty slate. Feature #101 is referred to by Ellis (1983) as the "Richmond Adit". Adit #101 extends for more than 270 feet before intersecting the Richmond vein, which Ellis (1983) describes as "being exposed along a 360-foot drift". The Richmond vein was described as consisting of "brecciated quartz, with only traces of sulfides and small to moderate amounts of silver". The entrance to feature #101 measures 6-feet high by 5-feet wide, and the adit floor has puddles of standing water that are a few inches deep. The entire floor is stained orange and is coated with ferrous hydroxide precipitates up to 1/2-inch thick. Orange precipitates also coat the walls to a height of 6 inches above the floor. The walls are wet, and the ceiling contains numerous fibrous growths of white crystals growing in botryoidal masses. The underground workings follow a brown vein that is 6- to 8-inches wide with numerous veinlets of chalcopryite. Water drips from the ceiling in numerous locations. Water also seeps out from various places on the walls. Water did not flow out of the entrance when this feature was inventoried on 9/11/96, however, mine water may flow out when groundwater is more abundant. Water test #300, taken from standing water 30 feet inside adit #101, yielded a **pH of 8.38 and a high conductivity value of 800 μ S**. A small amount of effluent was seeping from the entrance during the inventory. Effluent discharges from the adit and flows across the top portion of feature #201 during times of higher groundwater flow.

A collapsed cabin is on top of feature #201. Rock weathers and falls from the cliff faces directly above the adit entrance and accumulates on top of dump #201, forming a 2.5-foot-high berm at the entrance of adit #101. A jumbled pile of boards, a bunk bed, mattress, stovepipe, sheet metal, and a 2-foot-diameter wooden spool are all that remains of the cabin and its furnishings. The face of this 240-cubic-yard dump is visible from a distance and appears as an elongate streak of buff to light-gray waste rock. Numerous pieces of boards from the cabin clutter the face. The unconsolidated face has an estimated length of 210 feet and a slope angle of 35°. Waste rock consists of white dolomite that has been stained dark brown. The dolomite is impregnated with veins of crystalline covellite, chalcopryite, and silver and zinc sulfides. Country rock consists of unaltered slate and siltstone that are stained with iron and contain veinlets of chalcopryite and galena. The top of dump #201 is stained orange where mine water has flowed over the waste rock.

Feature #102 was not examined during this inventory. According to Ellis (1983), this feature (shown as a prospect on the topo) is a shaft that connects to a raise in the Richmond adit (feature #101). At the surface, a vertical distance of about 200 feet separates these features. Feature #202 is a 25-cubic-yard dump of light-gray waste rock spread out on the talus-covered slope.

Feature #106 is an intact adit with a bearing of S.66°W. It was driven into the base of a cliff that is over 350-feet high. The entrance measures 6-feet high by 5-feet wide and has a 3-foot-high berm of scree material. Water drips from the ceiling at numerous locations throughout the inner workings and supports a green carpet of moss near the portal. Streaks of white salts coat the walls and the ceiling throughout the 55-foot-long adit. Puddles of water lie on the floor and reach a maximum depth of 4 inches. Water test #302 was taken 10 feet inside adit #106 and provided values of **pH 3.38 and conductivity 400 µS**. The floor is covered with bright-orange ferric hydroxide precipitates and suspended solids, which settle in pools of clear water. The entrance is about 320 feet from the south bank of the creek. A 6-inch-wide vein cropping out above the entrance stains the ceiling orange with ferric hydroxides. An 18-foot-wide and 25-foot-long trench connects the entrance to the top of feature #206.

Feature #206 is an inconspicuous, 43-cubic-yard dump that is difficult to distinguish from the background of dark-brown talus. Waste rock is almost entirely composed of scree from the cliff faces with smaller amounts of vein material consisting of chalcopyrite, pyrite, sphalerite, and galena. Wall rock is porous, and the fractures are filled with iron oxides and veinlets of soft, gray clay.

Water test #303 was obtained from the clear water of the main creek that drains all of Gabarfeich Basin. Test values were **pH 7.10 and conductivity <50 µS**. The rate of flow was estimated at 35 gpm. Vegetation along the creek banks appears healthy. This test was taken in the upper portion of the basin, where the creek lies within a grassy corridor flanked on both sides by steep talus slopes. The rocks in the creek bed are not stained. Aquatic insects are found in the water and lie beneath the rocks.

Quad Name: Oh-Be-Joyful

Site #: 04-08-317/4307-03.100

Site Name: Adits and Shafts on East Flanks of Robinson Basin

Environmental Degradation Rating: 3

Description and pertinent facts: Located along the eastern flanks of the lower part of Robinson Basin, this inventory site contains four adits, two shafts, and a prospect pit. Features #100, #200, #103, #203, #104, and #204 are on patented mining claims. Features #106 and #206 are on the border of public land and patented claims. Features #101, #201, #102, #202, #105, and #205 lie entirely on Forest Service-managed lands.

An unnumbered, well-traveled foot trail follows Robinson Creek and comes within 300 feet of the toe of feature #200. To the south of features #100 and #200, the trail connects to a private dirt road that leads to the Lake Irwin Lodge. This private road branches from FR #826.1E and travels a distance of 1.2 miles before reaching the lodge.

All of the features within the inventory site were driven on or near dacite porphyry dikes. These dikes have a general trend of N.80°E. (Gaskill and others, 1967). An iron-stained breccia zone branches from a dacite dike. The zone is located above and to the east of feature #100 and follows a fault zone. The fault zone trends N.72°E. and extends up the east flanks of Robinson Basin, terminating at "Scarp Ridge". Scarp Ridge is a series of vertical cliff faces of Mesaverde shale and sandstone that crop out along the southern flanks of Peeler Basin. The dacite dike at feature #100 intrudes into the surrounding Ohio Creek Conglomerate. This formation consists of

porous, gray sandstone, irregularly enriched with iron along the contact with the dike. Enrichment is especially evident within the brecciated fault zone. Veins of pyrite stain the sandstone yellow to orange where the fault zone crops out. Another mineralized area occurs along the westerly extension of the fault, on the west side of Robinson Creek, about 300 feet across from the toe of dump #200. At the fault zone, the creek makes an abrupt change in course, following the fault for approximately 60 feet in an easterly direction, before resuming its southerly course. A series of prospect pits and several shafts explore this mineralized zone. Their dumps contain abundant pyrite, staining the waste rock bright yellow to orange-red.

Feature #100 is a collapsed adit. The entrance bears N.84°E. into the conifer-covered hillside. A 25-foot-long, V-shaped trench connects the entrance to the top of dump #200. Water is discharging through the caved portal, flows along the trench, and down alongside the south flank of dump #200. Water test #300 was taken at the entrance of adit #100. Values were **pH 5.1 and conductivity 300 µS** on a flow of 2 gpm. The mine water supports a lush green growth of moss and dense clumps of willows that line the trench. Effluent seeps into the forest floor just beyond the toe of dump #200.

Feature #200 is an elongated and conical 175-cubic-yard dump whose face extends in a westerly direction from the end of the trench. Waste rock is mostly yellow to yellow-brown, iron-stained sandstone. Mineralized rock consists of a matrix of orthoquartzite cut by 2- to 5-inch-wide veins of marcasite (white iron) and 1/2-inch- to 1-inch-wide veins of pyrite and galena. Other mineralized rock is composed of quartz veins filled with veinlets of pyrite, hosted in flaky and fractured, gray, coarse-grained sandstone. Feature #200 has more iron sulfide than the other features in the inventory area.

Quad Name: Oh-Be-Joyful

Site #: 04-08-317/4308-01.100

Site Name: Robinson Basin No. (1)

Environmental Degradation Rating: 3

Description and pertinent facts: Features #100, #101, #102, #103, #200, #201, and #202 of this site were initially inventoried by U.S. Bureau of Mines personnel on 8/6/95. Features #104, #105, #203, #204, and #205 were inventoried by Colorado Geological Survey personnel on 7/9/96.

The inventory site is at the head of Robinson Basin, which runs in a northeasterly and southwesterly direction. The head of the basin is on the south flank of Scarp Ridge. Scarp Ridge consists of a series of vertical cliffs extending from Purple Peak to Gunsight Pass.

Mine features are accessed by a well-marked foot trail that starts at FR #826.1E and follows the west side of Robinson Creek into Robinson Basin. This trail leads to and joins another trail that follows along the crest of Scarp Ridge.

Bedrock in Robinson Basin is the Ohio Creek Conglomerate, overlain by Wasatch shale on the slopes of the basin (Gaskill and others, 1967). A series of yellow-stained, mineralized faults occur on the northeast side and at the head of Robinson Basin. Located mostly along dry intermittent streams, fault zones extend to Scarp Ridge and are visible from upper portions of Robinson Basin. Features #100 and #103 are located along one of the fault zones. Features

#101, #102, #104, and #105 were driven into a prominent quartz monzonite porphyritic dike that laterally crosscuts the upper portion of the basin.

Feature #100 is an intact adit that trends N.18°W. into a mineralized vein. A 6-inch-wide to 1-foot-wide quartz vein is exposed above the entrance. The vein is surrounded by 8 feet of brecciated sandstone that is iron stained to a red-orange color. The entrance measures 6-feet high by 5-feet wide, and the underground workings have a total length of 125 feet. Clear mine water is dammed to a depth of 1 foot by a 2.5-foot-high berm. Water test #304 was taken inside adit #100, approximately 10 feet behind the berm. Test results yielded values of **pH 6.7 and conductivity 100 µS**. This berm consists of detached roof rock and colluvium. The colluvium was derived from sloughing directly above the entrance. About 30 feet from the entrance, roof rock has detached from the ceiling, creating a pile of debris that fills 2/3 of the adit. Running water can be heard from behind the caved area. Green moss lines the walls and ceiling, and yellow to green algae grows in the mine water at the entrance. Mine water seeps out beneath the berm, flows across a 20-foot-long trench, and percolates through the top of feature #200. The mine water filters through the 65 cubic yards of yellow to orange waste rock. Orange ferric hydroxide precipitates and sludge deposits accumulate on the adit floor. Water flowing down the walls stains them with streaks of bright orange-red precipitates. The mine water is clear but emits a strong odor of iron.

The face, flanks, and toe of dump #200 show no evidence of seepage, suggesting that the effluent is percolating through the waste rock and into the underlying colluvium. Sheetwash erosion has affected the face and flanks. The toe is made up of loose, cobble-size rock that spreads out onto a grassy meadow. The toe is approximately 430 feet from the north bank of a perennial creek originating in Mount Owens Basin. Mineralized rock on dump #200 consists of veinlets of pyrite and galena hosted in a white to gray, vuggy quartz matrix.

Quad Name: Oh-Be-Joyful

Site #: 04-08-317/4315-02.102, 200, 201; 100, 202

Site Name: Summit of Augusta Mountain (Paonia R.D. Side)

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: This inventory site includes three adits and their corresponding dumps. The inventory area lies on highly mineralized and steep, talus-covered slopes on the west side of Augusta Mountain. The area is accessed from the south by a trail that traverses Garbarfeich Basin. The trail splits on the ridge crest separating Garbarfeich Basin, to the south, from an unnamed basin lying on the western flanks of Augusta Mountain. The trail ends on the lower flanks of dump #200. Features #100-#102 were driven high on the sides of precipitous slopes.

All of the inventoried features are hosted in highly fractured and iron-enriched shale of the upper Mancos Formation. These features are adits that lie along a dry, intermittent stream. The stream channel is extremely steep, follows along a fault zone, is lined with loose talus, and the upper portions are flanked on both sides by cliffs. A portion of the Augusta vein crops out in the cliff on the east side of the creek. The vein outcrop lies approximately 300 feet below and west of adit #100. The underground workings of the three adits cut into the Augusta vein at elevations ranging from 11,920 feet to 12,440 feet. These adits are difficult and dangerous to reach because

of steep slopes, loose talus, and fractured country rock. In addition, the adits are in an area subject to frequent rockfalls and avalanches.

Adit #100 is the most difficult to access and can only be reached by climbing up a steep slope below and west of the adit. The adit opening is completely filled with iron-stained slate and bears N.78°E. into a vertical rock face. A bench measuring 28-feet long by 12-feet wide lies on the west side of the entrance. The bench was blasted out of the surrounding wall of rock and was constructed to support the foundation of a structure enclosing the adit entrance. All that remains of this structure is a pile of boards. Several rounded solid steel rods are mixed in with the lumber. These rods have a diameter of 1 inch and one of the ends is formed into a loop. The rods were used as supports for a one-inch-diameter braided cable. The rods were driven into rock outcrops, and the cable was strung through the loop of each rod, producing a cable handrail for miners. Corrugated sheet metal and strap iron also litters the bench. Water does not flow or seep from the adit entrance. The bench is adjacent to the south side of the upper part of the steep intermittent stream.

Feature #200 is of immense size, estimated to be at least 4,500 cubic yards. The barren, light-yellow to orange-brown dump is clearly visible on an aerial photo with a scale of about 1:24,000. Some of the waste rock produced from adit #101 is mixed with dump #200 on the upper flanks and top. The top measures 14-feet long by 30-feet wide. Runoff has cut channels on the top of this dump. The majority of the waste rock has rolled down the narrow stream channel. The body has a length exceeding 1,800 feet, and its main portion averages 150 feet in width. The upper, steeper slope is 550-feet long and rests at an angle of 37°. Waste rock on the top and upper face is well cemented with sand- to clay-size material rich in disseminated pyrite. Loose, mineralized talus and some boards cover the cemented dump. The majority of waste rock lying in the stream channel is saturated with water during the spring snowmelt. The lower portion of the stream widens and forms V-shaped channel. A perennial creek may flow beneath the talus in this portion of the channel. About 85% of the waste rock is composed of shale. The remaining 15% is a mixture of quartz monzonite porphyry and biotite granodiorite. Abundant mineralized rock is mixed with the waste rock. The iron, copper, lead, and zinc sulfides of the mineralized rock may be oxidized, leached, and transported down the stream into the upper Middle Fork of Anthracite Creek. The presence of these sulfides justifies an EDR of 2 for this dump. Most of the mineralized rock is dark brown, is fine-grained, and contains abundant lime and quartzite. The matrix contains crystalline pyrite, cuprite, and chalcopyrite. Veins, up to 8 inches in width, contain argentiferous galena, arsenopyrite, chalcopyrite, bornite, tennantite, tetrahedrite, marcasite, and sphalerite. A small amount of wire silver occurs in pockets and as thin veins.

Adit #101 lies about 280 feet below a saddle on the ridge that is south of the summit of Augusta Mountain. The entrance is completely filled with shale, lies within the fault zone, and has a bearing of due east. A vertical wall of fractured shale containing disseminated pyrite and veins of iron oxides surrounds the entrance. The rounded steel rods, discussed previously in this site description, are protruding from outcrops on the south side of the bench. The rods continue up the southwestern face and stop at the ridge crest. The underground workings to adits #100 and #101 are connected by winzes. These features are also connected with shaft #101 and adit #102 from inventory area #04-09-317/4315-01 on the southeastern flank of Augusta Mountain, in the Taylor River Ranger District. The easiest access to adit #101 is by descending the steep slopes from the saddle. A bench, blasted out of the rock face, lies on the west side of the entrance. It

measures 47-feet long by 12-feet wide and supports the foundation to a structure. This structure, now destroyed, enclosed the adit entrance.

Feature #201 also fills the stream channel. The volume of dump #201 was estimated to be 90 cubic yards of light-yellow to orange-brown waste rock. Its top is on the south side of the channel, at the head of the stream. The top measures 18-feet long by 23-feet wide. The face extends for more than 330 feet. The slope of the face has an average angle of 38°. Most of the waste rock is moderately to well cemented, has a strong odor of H₂S, and is covered with a thick layer of loose talus. This dump is also completely barren of vegetation. The top and upper parts of the face receive a tremendous amount of runoff and are grooved and subjected to sheet wash erosion. Boards lie on the face. A large portion of the waste rock has rolled and washed down the stream channel to the top of dump #200. A small pile of high-grade ore lies on the south side of the entrance. The dump material also contains abundant mineralized rock. No water tests were obtained from this area because of the lack of surface water during the inventory on 9/23/97.

Feature #102 is an open adit bearing N.62°E. into a fault-controlled breccia zone. This zone is exposed on the blasted rock face surrounding the 5-foot-high by 4-foot-wide adit opening. The zone is 5.5 feet in width, is composed of angular pieces of shale cemented by iron oxides, and contains a 2.5-foot-wide vein composed of gray quartz. The vein lies directly above the opening. The underground workings follow this vein for 42 feet. Veins of pyrite up to 3/4-inch wide are exposed on the walls and ceiling, and the air has a strong odor of hydrogen sulfide. A 5-foot-high berm of loose shale has accumulated in front of the opening. The berm lies within a 6-foot-long by 5-foot-wide by 4-foot-deep, V-shaped trench. Underground, water drips from the ceiling, flows down the walls, and collects into pools reaching a maximum depth of 15 inches. The walls are stained yellow to orange-red with ferric hydroxides. Deposits of orange sludge accumulate on the bottom of the pools and attain a maximum depth of 1¼ inches. Water was seeping from beneath the berm during the inventory. Water test #300 was taken from standing water within adit #102 and yielded a **pH of 3.11 and a conductivity of 537 µS**. Access to adit #102 is difficult. Loose talus slopes and rockfall along the ravines when approaching the mine from below are serious hazards.

Feature #202 is a 73-cubic-yard dump located on the west side of adit #102. Part of the top is damp from effluent from adit #102. Its elongated body is covered with thick deposits of loose, iron-stained slate and some granodiorite and quartz monzonite. The top measures 10-feet long by 15-feet wide. The 265-foot-long face has a uniform slope angle of 37°. The face and flanks of the lower portion fan out and cover the entire width of the slope. This slope is bounded on both sides by vertical spires of highly fractured slate. The toe extends to a scree-filled side stream. The upper face mostly contains yellow, gravel- to sand-size material that is well cemented and forms a hard crust. Mineralized rock is mixed with talus and waste rock and contains veins of pyrite, galena, chalcopyrite, and some sphalerite. Runoff may leach base metals from the mineralized rock and from the pyrite-rich host rock. This runoff would combine with similar runoff from dumps #200 and #201.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Marcellina Mountain

Site #: 04-08-314/4307-02.100

Site Name: Gold Basin

Hazard Rating: 2

Description and pertinent facts: Gold Basin is situated on the west side of the Ruby Range, along the southwestern flanks of Mount Owen, and about 1.5 miles within the Raggeds Wilderness. The lower part of the basin is reached by taking FT #830 from Horse Ranch Park, and then branching onto FT #834. The start of FT #834 is just inside the wilderness boundary, and the trail heads north until it crosses Gold Creek. The upper part of Gold Basin and the mine features are accessed by a well-traveled, unmarked trail. This trail branches from FT #834 where a side creek comes in from the north. The unmarked trail travels along the north side of the creek for a short distance before veering away and switchbacking up through dense stands of conifer and aspen. The trail terminates in a large meadow at the northwestern edge of the upper basin. All features in the inventory site are in the upper portion of Gold Basin, on the lower flanks of Mount Owens. Feature #100 is shown as a prospect pit on the topo map and on the "Geologic map of the Marcellina Mountain Quadrangle" (Gaskill and Godwin, 1966). The other inventoried features of this site are not shown on these maps.

Upper Gold Basin consists of shale and sandstone of the Wasatch Formation, which have eroded into a series of benches and stair-stepped cliff faces that are covered in places by talus. Several large talus slopes extend into the central and northern flanks of the upper basin. Feature #100 occurs 210 feet north from the toe of one of these lobes.

Feature #100 is a dangerous shaft within this inventory area. This feature is accessed by walking in an easterly direction through the central portion of the basin. The surface opening to this shaft is triangular and measures 8-feet long and 5-feet wide. Its measured depth is 21 feet. Clear, standing water occurs at a depth of 10 feet below the ground surface. The inner walls are vertical, and the only way to climb out is with the aid of a rope. The top of the shaft is recessed inside a cave-like opening which measures 12-feet high and 10-feet wide. The walls and ceiling of the cave are composed of highly fractured Wasatch Formation shale and are stained red-brown from iron enrichment. A 4-inch-wide quartz vein runs up the back, west-facing wall of the cave. The cave entrance has a bearing of S.26°E. and occurs within a mineralized zone that is 25 feet in width. Light-blue sandstone and dark-purple shale of the Wasatch Formation surround the mineralized zone.

Feature #200 is a 35-cubic-yard dump of yellow waste rock placed on the west side of shaft #100. The top is 12-feet long by 15-feet wide, and the face is 27-feet long and has a slope angle of 23°. Fracture planes within the shale of the waste rock are filled with iron oxides and stringers of pyrite. Microcrystalline pyrite occurs throughout the shale. Mineralized rock is composed of veins of pyrite in a vuggy matrix of white quartz. If not for the presence of dump #200, shaft #100 would be difficult to locate.

Quad Name: Marcellina Mountain

Site #: 04-08-315/4309-01.100, 106

Site Name: Upper Silver Basin, Central and Southern Flank Portions

Hazard Ratings: 2

Description and pertinent facts: The inventory site includes three creeks that compose the headwaters of Silver Creek. Located in the upper-central and southern portions of Silver Basin, this site comprises ten mine features and nine dumps. Two of these features (#100 and #106) are especially dangerous to the public. Features #100 and #106 are accessed by a number of game trails that connect to FT #834. Hunters and backpackers occasionally visit these features. Old footprints occur on dumps #200 and #206.

All of the features of the inventory site occur within two acres and are clustered around outcrops of quartz monzonite porphyritic dikes (Gaskill and Godwin, 1966). Numerous fault zones are associated with the contact between the dikes and the surrounding Wasatch Formation sandstone and iron-stained shale. The fault zones contain rich deposits of iron, lead, and zinc sulfides.

Feature #100 is an open shaft with a surface opening of 8-feet long by 4-feet wide. Log cribbing lines the walls starting at a depth of 6 feet below the ground surface. The inner opening within the cribbed walls measures 4-feet long by 5-feet wide. Standing water occurs 7 feet below the surface of this shaft and floods all of the lower workings. The measured depth is 53 feet. Upper portions of the cribbing are slippery and covered with algae. The vertical rock walls above the cribbing provide few horizontal ledges that are wide enough to support a person. A rope would have to be employed for a person to climb out of this shaft.

The elongated face, the colorful waste rock, and the large surface area of dump #200 all assist in locating this feature. Most of the 370 cubic yards of yellow to brown waste rock spills over the top of a quartz monzonite dike. The waste rock accumulates on the lower-lying and west-facing slopes of this dike. The top of the dump has a length of 54 feet, the body has a width of 35 feet, the face is 55 feet in length, and its steepest slope angle is 31°.

Feature #106 is an open shaft sunk in a mineralized fault zone that trends S.63°E. The fault averages 3 feet in width and contains a quartz vein that crosscuts a dike. This dike is composed of quartz monzonite porphyry and trends in a north-south direction. The surface of shaft #106 contains an irregular and uneven surface, and the south side is 6 feet lower than the north side. A 4-inch-wide quartz vein is exposed on the east wall. Standing water occurs 5-feet below the southern side of the shaft. The sides of all the walls are vertical and provide no areas for firm footing. This 20-foot-deep shaft is not visible until a person is within 15 feet of the southern side, and is only visible on the northern side from a point directly above the north wall.

The top of feature #206, which is a 25-cubic-yard dump of yellow to orange-brown waste rock, occurs on the west side of the south wall of the shaft. The top measures 17 feet in length, the body has a width of 10 feet, the face measures 16-feet long, and its slope angle is 15°. The toe is about 75 feet from the north side of a perennial creek.

measures 5-feet long by 4-feet wide. Clear, standing water completely floods the shaft, however, water from the shaft does not flow into the trench or over the dump. Shaft #103 is dangerous to the public, for the vertical walls do not provide horizontal ledges for handholds or footholds for a person to climb out of the water. The top of the trench is obscured from view by 12- to 15-foot-high shale beds. One cannot look down and see the shaft or see the top of the trench. The back wall of the trench is only visible from directly east of and on top of another bench of shale.

Feature #203 is visible from portions of the old mine road which leads to the summit of Green Lake Basin. The 20-foot-long face of dump #203 is also visible from the upper reaches of FR #826.1E. The top is 12-feet long, and the 10-foot-wide body contains 27 cubic yards of brown to orange waste rock that fans out over a grassy hillside.

Quad Name: Oh-Be-Joyful

Site #: 04-08-317/4305-02.107

Site Name: Campground No. 1

Hazard Rating: 1

Description and pertinent facts: This feature is about 200 to 300 feet south of FR #826, near the popular Lake Irwin campground. Shaft #107 is 8 feet by 6 feet at the collar and is 50-feet deep. The shaft is hidden under a pine tree and is partly covered with collapsed timber. Two small dumps are associated with it; one at the collar and one 50 feet downslope. This shaft is extremely dangerous because of its concealed nature and its proximity to a heavily used area.

Quad Name: Oh-Be-Joyful

Site #: 04-08-317/4305-03.100, 101

Site Name: Anthracite Creek No. 1

Hazard Ratings: 2

Description and pertinent facts: These shafts are west of the Lake Irwin Lodge, on the south side of FR #826, and on the east side of Anthracite Creek. Shaft #100, which is shown on the topo, is about 150 feet from the road and is flooded to within 4 feet of the collar. It has an opening of 8 feet by 4 feet and is more than 10-feet deep. Shaft #101 is just south of shaft #100 and is not shown on the topo. It has an opening of 8 feet by 4 feet and is 10-feet deep. Water fills the shaft to 5 feet below the collar.

Quad Name: Oh-Be-Joyful

Site #: 04-08-317/4307-03.104, 106

Site Name: Adits and Shafts on the East Flanks of Robinson Basin

Hazard Ratings: 2

Description and pertinent facts: This inventory area consists of five mine features and their corresponding dumps. Shafts #104 and #106 are especially dangerous. Shaft #104 is on patented mining claims and shaft #106 is on the border between patented claims and public land.

An unmarked, well-traveled foot trail that follows Robinson Creek originates from the private road that leads from FR #826.1E to Lake Irwin Lodge. The trail provides access to upper Robinson Basin and a series of picturesque falls that attract the public. The public seldom visits these mine features, mostly staying on the main trail.

A series of benches and cliffs lie along the eastern flanks of Robinson Basin. These topographic features are hosted in eastwardly-dipping beds of Ohio Creek Conglomerate sandstone and Wasatch Formation shale. These beds are intruded by a N.80°E.-trending diorite porphyry dike (Gaskill and others, 1967). This dike is continuous across the entire width of Robinson Basin. A prominent dip-slip fault occurs just north of the dike, placing sandstone on top of shale beds. An 8- to 15-foot-wide intensely mineralized breccia zone occurs along this fault.

Feature #104 is an intact shaft with a measured depth of 16 feet. The last 5 feet are submerged in clear water. The surface opening measures 10-feet long by 5-feet wide. The vertical walls are slippery, contain clumps of moss, are stained orange-brown, and provide few ledges for a person to climb on. Red flagging tied to two mature sub-alpine firs marks the northern and southern sides of the shaft. A 30-foot-long section of 1/2-inch-diameter yellow plastic rope is tied to a spruce branch and the other loose end is in the shaft water. These markers do not prevent the public from falling into the shaft, but do provide sufficient warning of a dangerous mine feature. Loose rock from dump #204 lies around the western side of shaft #104, creating an additional hazard.

Feature #204 contains 23 cubic yards of light-gray to yellow-brown waste rock. The top and flanks are partly revegetated by woody plants and conifer saplings. The top measures 4 feet in length, the body is 14-feet wide, the face is 28-feet long, and the steepest slope angle is 26°. Waste rock consists of gravel- to cobble-size, iron-stained sandstone. Pyrite stringers occur within the fracture planes of the sandstone. Mineralized rock consists of white quartz and gray-brown marcasite veinlets.

Feature #106 is an intact shaft that has a surface opening 7-feet long by 6-feet wide. The depth is 12 feet, and brown water 5-feet deep is at the bottom. The walls contain horizontal ledges of sandstone, which could provide a person with sufficient footing for climbing out. Some portions of the walls are recessed while other sections protrude into the interior of the shaft. Climbing out of this feature would be difficult without the aid of a rope. Faded, orange strips of flagging are tied to three spruce trees. The flagging marks the north and east sides of the shaft and acts as a warning to the public. This flagging becomes visible from about 15 to 25 feet from the edge of the shaft.

Feature #206 is a crescent-shaped, 25-cubic-yard dump that surrounds the west and south sides of shaft #106. This dump has a top length of 10 feet, a body width of 18 feet, a face length of 6 feet, and a slope angle of 22°. Waste rock consists of platy, cobble-size, light-gray sandstone. Iron stains the sandstone orange-brown along bedding and fracture planes. Mineralized rock consists of vugs, veins, and cavities that are filled with well-terminated, clear, quartz crystals. Some of these crystals attain lengths of up to 1.5 inches.

Water test #304 was taken from clear, standing water within shaft #104. The **pH was 6.65 and the conductivity was <50 µS**. Water test #305 was obtained from standing water within shaft #106. It yielded a **pH of 6.86 and a conductivity of <50 µS**.

Quad Name: Oh-Be-Joyful

Site #: 04-08-317/4308-01.102

Site Name: Robinson Basin No. 1

Hazard Rating: 2

Description and pertinent facts: Initially inventoried by Bureau of Mines personnel on 8/6/95, the site was revisited by Colorado Geological Survey personnel on 7/9/96. Located in the upper reaches of Robinson Basin, the inventory site contains an adit, two shafts, and three prospect pits. The most hazardous of these features is shaft #102. Feature #102 is accessed by a well-marked foot trail that is frequently traveled by hikers coming to see waterfalls. These spectacular falls are located on the northwest side of Robinson Basin, east of FR #826.1E. Robinson Basin is also a popular area for snowmobile recreation. The current manager of Lake Irwin Lodge related an incident in which he almost drove his snowmobile into a shaft during the previous winter. Robinson Basin contains numerous shafts, mostly on patented claims. These shafts are especially dangerous during the winter months when there are no surface indications of their presence. In addition, a few shafts that are located on patented claims in Robinson Basin have no associated dump to provide warning of an existing and dangerous open mine feature.

Feature #102 is a shaft sunk on the south side of a quartz monzonite porphyry dike. This dike crosscuts the upper part of the basin and intrudes the surrounding Ohio Creek Conglomerate (Gaskill and others, 1967). The surface opening of the shaft has a measured length of 6 feet, a width of 5 feet, and a depth of 27 feet. The west side of the shaft has a 9-foot-high mineralized wall above the collar, and the east side is level with the top of feature #202. The shaft walls are vertical, with few ledges for footholds and handholds. A rope would be necessary a person to climb out. The bottom is moist, but has no standing water. Loose waste rock from the dump creates unstable footing on the east side of the opening, adding to the danger.

Footprints on the face of the 40-cubic-yard dump lead to the east edge of the shaft opening. Feature #202 has a 25-foot-wide, conical body, a 12-foot-long top, a 24-foot-long face, and its slope angle is 26°. Waste rock consists of variegated sandstone and shale. Mineralized rock contains vuggy quartz veins with a few pyrite veins. The toe is approximately 40 feet from the west bank of a perennial creek. The gray to red-brown dump face is visible from the trail, and the trail comes within 20 feet of the toe.

Features #100 and #101 also pose a physical mine hazard to the public. Feature #101 is an open shaft approximately 250 feet northeast of shaft #102. Located north of an outcrop of quartz monzonite and about 270 feet from the perennial creek, shaft #101 has a surface opening which measures 5-feet long by 4-feet wide. Its depth is 12 feet. Clear, standing water 3-feet deep is at the bottom. A 20-cubic-yard dump (feature #201) lies on the south side of the shaft. This dump indicates to the public that a mine feature exists.

Adit #100 is at the head of and in the middle of Robinson Basin. A mineralized breccia zone, 15 feet in width, surrounds the entrance. The breccia contains numerous open fractures that have been filled with iron minerals. The adit follows a 6-inch- to one-foot-wide, fine-grained quartz vein that trends N.18°W. Roof fall has built a 2.5-foot-high berm at the entrance. Roof material also clutters the floor. The ceiling is unstable, and slabs of rock may fall at any time. The floor is flooded with water up to 1-foot deep. The flooded nature of this adit discourages most people from entering. The entrance measures 6-feet high by 5-feet wide, and the floor length is over 125 feet. The ceiling has caved 33 feet from the entrance, filling 2/3 of the interior. This blockage has caused mine water to accumulate to a depth of 2 feet.

Feature #200 is on the south side of adit #100. It is a highly visible, 63-cubic-yard dump consisting of yellow to orange waste rock. The dump has a 12-foot-long top and an 18-foot-wide body. The face of the body fans out for more than 85 feet on the grassy slopes of upper Robinson Basin. The face of the dump has a maximum slope angle of 34°. Host rock consists of brecciated and iron-cemented sandstone of the Ohio Creek Conglomerate. Mineralized rock contains veinlets of pyrite and galena, surrounded by a white to gray matrix.

Quad Name: Oh-Be-Joyful

Site #: 04-08-318/4306-01.100

Site Name: Little Jessie and Temple

Hazard Rating: 2

Description and pertinent facts: This inventory area is northeast of Lake Irwin. Open adit #100 has a portal 6-feet high by 5-feet wide and is about 20-feet long. Although the open adit is dangerous, the presence of a winze (underground shaft) provides for increased risk. The winze appears caved at a depth of about 10 feet and has standing water about 3-feet deep at the bottom.

Quad Name: Oh-Be-Joyful

Site #: 04-08-318/4306-02.100

Site Name: Legal (M.S. 4149)

Hazard Rating: 1

Description and pertinent facts: This feature is northeast of Lake Irwin. Shaft #100 may be on patented land, but represents an extreme danger to the public. The collar is 8 feet by 8 feet, and water reaches to 6 feet below the surface. Total depth is unknown. Although ropes and ribbons mark the collar, snow could obscure those warning devices. The shaft is about 50 feet from a trail, and this slope is popular for skiing in the winter.

Quad Name: Oh-Be-Joyful

Site #: 04-08-318/4306-03.100

Site Name: Irwin No. 7

Hazard Rating: 2

Description and pertinent facts: This inventory area is northeast of Lake Irwin, and this shaft is shown on the topo. Shaft #100 has a 10-foot by 5-foot collar and is 15-feet deep. Ropes and ribbon mark the collar, but these warning devices may be obscured by snow in the winter, when this slope is frequented by skiers.

Quad Name: Oh-Be-Joyful

Site #: 04-08-318/4307-02.100

Site Name: Irwin No. 5

Hazard Rating: 2

Description and pertinent facts: This inventory area in north of Lake Irwin. Feature #100 is an open adit with a portal 4-feet high by 6-feet wide. This adit is more than 50-feet long and is flooded with 1 to 2 feet of standing water.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

GUNNISON NATIONAL FOREST

TAYLOR RIVER RANGER DISTRICT

April 1, 1998

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
GUNNISON NATIONAL FOREST -- TAYLOR RIVER RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Taylor River Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 04 (Gunnison), and Ranger District 09 (Taylor River).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

Numerous Colorado Geological Survey personnel inventoried mines in the Taylor River Ranger District during the summers of 1996 and 1997. In addition, U.S. Bureau of Mines personnel inventoried some of the mine sites near Irwin during the summer of 1995. Data from the U.S. Bureau of Mines inventory (they used Colorado Geological Survey forms) is included in this

summary report if the features meet the rating criteria described above. A comprehensive, detailed account of all the mine sites inventoried for the Ranger District will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of statewide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

Most of the largest mines and related environmental degradation and physical hazards are confined to the northwestern part of the Taylor River Ranger District. In addition, small mines and prospects are widespread throughout the remainder of the Ranger District. Most have no significant environmental degradation or safety hazards associated with them.

The northwestern part of the Taylor River Ranger District is the most mineralized, and has numerous closely spaced mine workings. Portions of the Irwin, Ruby, and Elk Mountain mining districts are within this part of the Ranger District. The Irwin district is a subdistrict of the Ruby mining district. The Ruby district encompasses most of the Ruby Range and extends eastward to about the Slate River. The poorly defined Elk Mountain mining district includes mines near Gothic and probably covers the area from the Slate River eastward to about Pearl Pass. (See Vanderwilt, 1947; Ellis, 1983.)

Geologically, these mining districts share many similarities. In general, sedimentary rocks have been intruded by Tertiary-age felsic to intermediate composition igneous rocks. In the Ruby Range, most of the sedimentary rocks are Cretaceous or Tertiary in age; however, older sedimentary rocks crop out east of East River. During Laramide time, the sedimentary rocks were complexly folded and faulted, and intruded by igneous rocks.

Tertiary-age igneous rocks are widespread in the northwestern part of the Ranger District. The crest of the Ruby Range comprises a series of stocks, with related sills, dikes, and laccoliths. Other Tertiary-age intrusive rocks in this region are the Paradise stock and the White Rock pluton. Alteration and mineralization associated with the intrusions is common, and metallic minerals occur in veins, stockworks, and as disseminations. Mineralization extends beyond the stocks, into surrounding sedimentary rocks that were metamorphosed by the heat of the nearby intrusions.

Silver, lead, zinc, and copper were the principal commodities, and gold was a byproduct. Molybdenite is a common constituent in some of the mineral occurrences, especially in the Ruby Range. (See Vanderwilt, 1947; Ellis, 1983.)

Most of the inventory sites with significant environmental degradation and/or dangerous mine features are in this part of the Ranger District, especially on the Oh-Be-Joyful and Mount Axtell quads.

East of Pearl Pass, mining activity was considerably less, and mine features and mining districts are widely spaced. Numerous miners' cabins, mill ruins, and a wide variety of mining equipment give this region significant historical interest.

Tincup was the largest mining district in the eastern part of the Ranger District. The following description of the the Tincup mining district is taken from field observations, and the excellent work of Rosenlund (1984) and Goddard (1936).

The Tincup mining district lies within the Sawatch Mountains and is defined as the area between Cumberland Pass to the south and the Taylor Park region several miles north of the town of Tincup. This includes the headwaters and tributaries of Willow Creek, which flow west and north of the Continental Divide into Taylor Reservoir. Except during winter, FR-765 provides access to this area. The town of Tincup, at about 10,200', is the lowest point within the district. Cumberland Pass to the south rises to 12,018' in a region of rugged and steep terrain.

This district and its modern topography are the result of the uplift of Precambrian gneissic granite and Cambrian- through Permian-age sedimentary rocks that have been intruded on multiple occasions by stocks, sills, and dikes during the Tertiary. Pleistocene glaciation resulted in large cirques and rock glaciers at the headwaters of the west and east branches of Willow Creek, and moraines along the river valleys.

Gold, discovered in placer deposits by James Taylor in the summer of 1861, was mined for 18 years. The Gold Cup ore body, discovered in the spring of 1878, was a lead-zinc-silver-gold replacement deposit in the Leadville Limestone. This discovery, followed by others, established Tincup as the leading mining town of Gunnison County by 1880. Successful production continued until the silver bust of 1893. Another mining boom occurred during the years between 1904 and 1912. Dings and Robinson (1957) estimated the total value (in 1957 dollars) of silver, gold, copper, lead, and zinc from the Tincup district at over 3 million dollars.

Ore bodies occur at limestone-dolomite contacts, in fault fissures, in veins, and at contacts between porphyries and sedimentary rocks. Rosenlund (1984) recognized three stages of faulting: pre-intrusive, post-intrusive, and post-mineralization. Both pre- and post-intrusive faulting provided conduits for hydrothermal fluids and subsequent mineralization. He also recognized four types of mineral deposits: skarn magnetite, stockwork, vein, and replacement manto. Multiple episodes of mineralization resulted in zoning of molybdenum, tungsten, copper, zinc, and silver concentrations. (See Rosenlund, 1984.)

Hubernite and molybdenite were mined from quartz veins during World War 1, but production was small. Molybdenum and tungsten, although sparse, occur consistently in vein deposits, encouraging modern exploration drilling by AMAX, Napoleon Mines, Inc., and Molycorp. No mines are active at this time, and summer homes and recreation are the main uses for the mining district.

No significant environmental degradation is associated with mines on public land in this mining district. Some of the workings have physical hazards.

The Dorchester (Taylor River) mining district is south and west of Taylor Park, but is otherwise poorly defined. The district includes the Forest Hill and Paymaster Mines along the drainage divide between Italian Creek and Trail Creek, not far from Lily Pond. Mines further west, around Taylor Peak, Mount Tilton, Italian Mountain, and American Flag Mountain, are probably within the district, which also may include some small mines north of Matchless Mountain. Lead, zinc, silver, and gold were the commodities of interest. Tertiary-age porphyritic intrusions mineralized Precambrian granite and overlying Paleozoic sedimentary rocks. Metallic minerals, including sulfides, occur in small replacement deposits in carbonate rocks, and in veins in all of the rock types. (See Vanderwilt, 1947.) This rather large, but sparsely mined, district has physical hazards and/or environmental degradation associated with a few mine features. Although much of the area around the Forest Hill and Paymaster Mines was patented, the USFS has acquired many of the claims.

The Spring Creek mining district is along Spring Creek, west of Taylor Park. The Doctor Mine, in Doctor Gulch, was the primary producer. Silver, lead, and zinc minerals were produced from narrow replacement deposits hosted in altered dolomite. (See Vanderwilt, 1947.) In addition, some manganese was probably produced at Manganese Gulch about 2 miles to the southwest. The Doctor Mine is privately owned and was not inventoried. Within this mining district, no significant environmental degradation was observed, and no workings were given PHRs of 2.

USFS ABANDONED MINE LAND INVENTORY PROJECT
GUNNISON NATIONAL FOREST --TAYLOR RIVER RANGER DISTRICT

NUMERICAL SUMMARY

160 field forms

849 mine openings inventoried (includes collapsed or filled openings)

636 mine dumps, tailings piles, highwalls, etc.

254 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.

Number of features with EDR of 1 = 1

Number of features with EDR of 2 = 21

Number of features with EDR of 3 = 57

Number of features with EDR of 4 = 175

Number of features with EDR of 5 = 1231

283 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 7

Number of features with PHR of 2 = 61

Number of features with PHR of 3 = 215

Number of features with PHR of 4 = n/a (see Field Guide, appendix A)

Number of features with PHR of 5 = 1202

USFS ABANDONED MINE LAND INVENTORY PROJECT
GUNNISON NATIONAL FOREST --TAYLOR RIVER RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=04;District=09	EDR
01) Standard Metals Mine and Surrounding Area	Oh-Be-Joyful	*319/4305-02.100; 200	1; 2
02) Lower Redwell Creek Basin-Part 1	Oh-Be-Joyful	*321/4307-01.103, 203, 105, 205; 106, 207	2, 2, 2, 2; 3, 3
03) Daisy Mine and East Side of Redwell Basin	Oh-Be-Joyful	*321/4306-02.105, 205	2, 2
04) Basin Southwest of Rustler Gulch	Maroon Bells	328/4318-01.101, 201	2, 2
05) Upper Redwell Basin	Oh-Be-Joyful	*321/4306-03.101, 201; 102, 202, 104, 105, 106, 107	2, 2; 3, 3, 3, 3, 3, 3
06) Upper Elk Basin-Central Part 2	Oh-Be-Joyful	320/4305-03.103, 203, 204; 109, 110, 206, 207, 209	2, 2, 2; 3, 3, 3, 3, 3
07) Baxter Basin - Part 2	Oh-Be-Joyful	317/4313-01.100, 200; 101, 201, 102, 202, 204	2, 2; 3, 3, 3, 3. 3
08) Elk Basin-Upper Northeast Flank	Oh-Be-Joyful	320/4305-05.203;103, 104	2; 3, 3
09) Baxter Basin - Part 1	Oh-Be-Joyful	318/4313-01.101, 201	2, 2
10) Lower Redwell Basin-Part 2	Oh-Be-Joyful	321/4307-02.100, 200	2, 2
11) Paymaster Mine Area	Italian Creek	358/4309-1.108, 207, 208, 202, 101, 201	3, 3, 3, 3, 3, 3
12) Lower Redwell Basin-Part 3	Oh-Be-Joyful	321/4307-03.200, 201	3, 3
13) Adits South of Remediated Tailings Ponds in vicinity of AMAX Water Treatment Facility	Mt. Axtell	322/4303-01.100, 200	3, 3
14) Headwaters of East River, South of Emerald Lake	Snowmass Mountain	*323/4318-02.102, 201, 104, 205, 206	3, 3, 3, 3, 3
15) Lower Augusta Basin-Part 1	Oh-Be-Joyful	*318/4314-02.201, 205	3, 3

Site Name	Quad Name	Site # Forest=04;District=09	EDR
16) Summit of Augusta Mountain (Taylor River R. D. Side)	Oh-Be-Joyful	317/4315-01.202	3
17) Adits Northwest of Keystone Tunnel, North of FR-732	Mt. Axtell	322/4304-01.100, 200	3, 3
18) Sylvanite Mines and Basin	Gothic	*330/4317-01.101, 201	3, 3
19) Baxter Basin - Part 3	Oh-Be-Joyful	317/4314-02.100, 200	3, 3
20) Cascade Mountain, Northwest Flank	Oh-Be-Joyful	318/4314-01.200	3
21) Basin on Northeast Flank of Mt. Axtell	Mt. Axtell	322/4301-01.100, 200	3, 3
22) Lower Rustler Basin, East Side	Maroon Bells	328/4320-01.100, 200, 104, 204	3, 3, 3, 3
23) Lower Augusta Basin- Part 2	Oh-Be-Joyful	317/4314-01.110, 210	3, 3
24) Purple Mountain Basin, West Flank	Oh-Be-Joyful	317/4315-03.101	3
25) Upper Italian Creek	Italian Creek	348/4312-1.103	3
26) West Side of Redwell Basin	Oh-Be-Joyful	321/4306-01.103, 110	3, 3
27) Area Northeast of Avery Peak Picnicground	Gothic	*327/4316-01.106	4

* = water sample collected.

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=04;District=09	PHR
01) Stewart Mine Area	Italian Creek	349/4311.1.100	1
02) Upper Redwell Basin	Oh-Be-Joyful	321/4306-03.105; 111	1; 2
03) Lower Elk Basin-Part 2	Mt. Axtell	319/4303-03.108	1
04) Upper Queen Basin	Gothic	331/4314-01.102	1
05) Headwaters of East River, South of Emerald Lake	Snowmass Mountain	323/4318-02.102	1
06) Lower Rustler Basin, East Side	Maroon Bells	328/4320-01.105	1
07) Area Northeast of Avery Peak Picnicground	Gothic	327/4316-01.103, 107, 110	2, 2, 2
08) Jimmy Mack Mine Area	Cumberland Pass	370/4284-2.101, 103	2, 2
09) Paymaster Mine Area	Italian Creek	358/4309-1.101, 102, 108	2, 2, 2
10) Headwaters of East River	Snowmass Mountain	324/4318-01.100	2
11) Silver Spruce Adits	Snowmass Mountain	325/4320-01.100	2
12) Lower Redwell Basin-Part 2	Oh-Be-Joyful	321/4307-02.103	2
13) Lower Redwell Creek Basin- Part 1	Oh-Be-Joyful	321/4307-01.200	2
14) Democrat Basin	Oh-Be-Joyful	317/4311-02.101	2
15) Baxter Basin – Part 2	Oh-Be-Joyful	317/4313-01.100	2
16) Elk Basin-Upper Northeast Flank	Oh-Be-Joyful	320/4305-05.201	2
17) Southwest Flank of Cinnamon Mountain	Oh-Be-Joyful	319/4317-01.103	2
18) Mines North of CR-12, Across from Splains Gulch	Mt. Axtell	320/4302-01.105	2
19) Lower Wolverine Basin	Oh-Be Joyful	322/4307-01.100	2
20) Lower Virginia Basin	Gothic	328/4315-01.100, 102	2, 2
21) Shafts North of CR-12 and Coal Creek	Mt. Axtell	318/4302-01.108, 109, 111	2, 2, 2
22) Little Anna Mine	Fairview Peak	367/4282-2.100, 106	2, 2
23) Upper Elk Basin-Central Part 1	Oh-Be-Joyful	320/4305-04.102, 115	2, 2
24) Upper Elk Basin-Central Part 2	Oh-Be-Joyful	320/4305-03.103, 110	2, 2
25) Ruby No. 1 and No. 3	Oh-Be Joyful	317/4311-01.100, 101, 102, 104	2, 2, 2, 2
26) Bonanza King and Number	Oh-Be Joyful	320/4305-01.100	2

Site Name	Quad Name	Site # Forest=04;District=09	PHR
Seven			
27) Summit of Augusta Mountain, (Taylor River R. D.)	Oh-Be-Joyful	317/4315-01.107	2
28) Purple Mountain Basin, West Flank	Oh-Be-Joyful	317/4315-03.102	2
29) Forest Queen Mine and Surrounding Area	Mt. Axtell	318/4304-02.100	2
30) Sun Creek Manganese Deposits	McIntosh Mountain	319/4270-01.102	2
31) Irwin No. 1	Oh-Be Joyful	318/4305-01.100	2
32) Upper Taylor River	Pearl Pass	344/4315.105	2
33) Headwaters of Slate Creek	Oh-Be-Joyful	319/4315-01.100	2
34) Richardson Mine, West Side of FR-737	Mt.Axtell	324/4295-01.104	2
35) Ruby Queen/Little Frank Area	Mt. Axtell	319/4303-02.105	2
36) Adits NW of Keystone Tunnel, North of FR-732	Mt. Axtell	322/4304-01.100	2
37) Anna Dedrika Mine	Fairview Peak	368/4282-1.100	2
38) Lower Sanford Basin	Tincup	371/4292-1.104	2
39) North Matchless	Matchless Mtn	356/4301-1.100	2
40) Tellurium Creek Area	New York Peak	355/4321-1.102, 103	2, 2
41) West Side of Redwell Basin	Oh-Be-Joyful	321/4306-01.110; 102, 103, 105	*1; 2, 2, 2
42) Jawcracker	Oh-Be Joyful	319/4306-03.100, 101	2, 2
43) Little Frank Area	Mt. Axtell	319/4303-01.100	2
44) Upper Peeler Lakes	Oh-Be-Joyful	320/4306-01.101	2
45) Middle Brush Creek and Cumberland Basin	Pearl Pass	337/4315-1.101	2
46) West Drainage of Magdalene Gulch	Mount Harvard	380/4305-1.100	2
47) West Brush Creek	Gothic	333/4315-1.101	2
48) Browns Pass	Mount Yale	381/4301-1.102	2

* = feature has been mitigated.

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Gothic

Site #: 327/4316-01.106

Site Name: Area Northeast of Avery Peak Picnicground

Environmental Degradation Rating: 4

Description and pertinent facts: This inventory site is discussed because a water sample was collected at the entrance of adit #106 by Paula Lehr on 2/27/96. This adit is the source of drinking water used by Paula and Art Mears. The mine water is piped directly to their nearby home.

Adit #106 and surrounding mines are on patented mining claims that were purchased by the Forest Service from Wilderness Land Trust in 1996. All inventoried mine features and their corresponding dumps are located just inside the Maroon Bells-Snowmass Wilderness boundary and are accessed by an old mine road.

Feature #106 is an intact adit bearing N.72°E. into steeply dipping beds of iron-stained Mesaverde Group sandstone. The opening to adit #106 is 6' high by 5' wide and is surrounded by a wooden headframe. This frame structure extends 12' underground and provides support to the ceiling and walls. Clear mine water drains from the entrance at an estimated rate of 270 gpm. This water spreads out and flows northward down the mine road for a distance of 50' before joining the water draining from adit #105. Effluent produced from adits #105 and #106 combines with water in a perennial creek, and all of this water flows down the road to the top of dump #205. Part of this water runs over dump #205, and the other part continues for another 40' down the road before turning to the west and traveling down the north face of the lower level to dump #206

Feature #206 consists of two piles of waste rock on different levels. They are separated by a distance of 40' and have a combined volume of 680 cubic yards. The upper dump is on the west side of adit #106. A collapsed structure made up of logs, boards, and corrugated sheet metal is partly buried in the upper portion of the face. The lower dump of feature #206 is on the west side of the road. Its northern flank and top are deeply grooved by running water. Waste rock on both levels contains veins of pyrite, galena, chalcopyrite, and marcasite. The veins are surrounded by quartz and are hosted in sandstone.

Water test #301 came from a perennial creek that runs along the bottom of the northern flank and travels around the toe of dump #204. This is downstream in the same creek that receives effluent from adits #105 and #106. Values of this test were **pH=7.90 and conductivity=147 µS**. The clear water of this creek flows at the estimated rate of 140 gpm, supports a lush growth of phreatophytes, and contains abundant aquatic life. Water test #302, taken inside the headframe at the entrance to adit #105, yielded values of **pH=7.35 and conductivity=136 µS** on a flow of 17 gpm. The entire face of the filled entrance is draining water, suggesting that the inner workings are completely submerged. Water test #303 was conducted about 20' inside of adit #106, and

values for the clear mine water were **pH=7.58 and conductivity=145 μ S** on a flow of 270 gpm. Long strands of green filamentous algae are on the flooded floor. Brown and green gelatinous masses and strands of algae are within the effluent that flows over the mine road. Green marsh grass, thick carpets of bright green moss, and dense clumps of willows grow alongside and on the road. Numerous aquatic insects live in the flooded road bed. Effluent from adits #105 and #106 does not precipitate iron oxides. Data obtained from water sampled by Paula Lehr at the entrance to adit #106 is provided on the table below. The sample exceeds state aquatic life standards in lead, but is below the state standard for lead in drinking water, which is 50 μ g/L.

Sample #956003; hardness = 196 mg/L; Upper Gunnison River segment #2

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Antimony (trec)	none detected	6**	below standard
Arsenic (trec)	none detected	50 (acute)	below standard
Barium (trec)	79	1,000	below standard
Beryllium (trec)	none detected	4	below standard
Cadmium (trec)	none detected	1.9	below standard
Calcium (CaCO ₃ , trec)	72 mg/L	no standard	n/a
Chromium (trec)	none detected	11	below standard
Copper (trec)	16	21	below standard
Cyanide (trec)	none detected	5	below standard
Fluoride (trec)	none detected	2 mg/L**	below standard
Iron (trec)	120	300	below standard
Lead (trec)	21	10	2.1 x standard
Magnesium (trec)	3.6 mg/L	no standard	n/a
Manganese (trec)	6	50	below standard
Mercury (trec)	none detected	0.1	below standard
Molybdenum (trec)	none detected	no standard	n/a
Nickel (trec)	none detected	160	below standard
Selenium (trec)	none detected	10	below standard
Sodium (trec)	0.19 mg/L	no standard	n/a
Sulfate (trec)	13 mg/L	250 mg/L	below standard
Thallium (trec)	none detected	0.5 mg/L	below standard
Zinc (trec)	58	190	below standard

* Numeric standards are μ g/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

Quad Name: Gothic

Site #: 330/4317-01.101, 201

Site Name: Sylvanite Mines and Basin

Environmental Degradation Ratings: 3

Description and pertinent facts: The largest mine and associated dump in this inventory area and in Sylvanite Basin are adit #101 and dump #201. All mine features of this inventory area are on public land within the Maroon Bells-Snowmass Wilderness.

The inventory area is at the base of the lower, southern portion of Sylvanite Basin. This basin is easily accessible by following FR-739 from the town of Gothic. FR-739, also known as Copper Creek trail, is an old mine road that travels northeast up Copper Creek valley. This road crosses Copper Creek twice before increasing its grade and making a series of switchbacks up to Sylvanite Basin. Jerry Alf, the owner of patented claims in upper Sylvanite Basin, maintains and occasionally drives this road, which is closed to motorized vehicles to the public. Roy Carpenter was the former owner of a group of patented mining claims located on the upper northwestern flanks of Sylvanite Basin (oral communication with Adam Poe, president of Western Land Group). These claims, together with some of the claims owned by Jerry Alf, were exchanged to the Forest Service and are now public land. Because Colorado Geological Survey personnel were not aware of the land exchange, some mine workings on the exchanged claims were not inventoried.

Steep, talus-covered slopes border Sylvanite Basin on the north and west sides. The bottom of the basin contains several shallow, large ponds connected by a creek (referred to as Sylvanite Creek). Sylvanite Creek flows out of the southern portion of its basin, travels down a narrow and incised V-shaped corridor, and merges with the upper part of Copper Creek. Effluent flowing from adit #101 is a major source of water for Sylvanite Creek. Several thousand feet of underground mine workings are in upper and lower Sylvanite Basin. Adit #101 drains most of the workings in the northern and western portions of the basin (oral communication with Steven Zahony).

Another source of effluent that drains into Sylvanite Creek is an adit on the north side of the lower southern part of Sylvanite Basin. This adit is on a patented mining claim (MS #15082), and is on the north side of the extension of FR-739. Talus fills the adit entrance, which discharges clear water at an estimated rate of 15 gpm. The adit is at an elevation of 11,500', about 400' north of adit #101.

Gaskill and others (1991), and Zahony (1985, 1986) describe the geology pertaining to the Sylvanite Mines. Intrusion of the northern extension of the White Rock pluton is strongly related to mineralization in Sylvanite Basin

The geology of Sylvanite Basin is complex. The lower part of the basin is composed of white to light-gray granodiorite of the White Rock pluton. Brecciated granodiorite is prevalent along fracture and shear zones and also is common where dikes contact Paleozoic metasedimentary rocks. The breccia contains inclusions of hornfels, marble, and quartzite derived from the Gothic

and underlying Belden Formations. The breccia has undergone chloritic and pyritic alteration, and is also bleached and weakly silicified in places. Matrix surrounding the inclusions contains abundant calcite and barite.

Banded, multicolored beds of the upper Gothic Formation form cliffs on the southern and western sides of the southern part of Sylvanite Basin. The Gothic Formation is irregularly intruded by the pluton and the beds are locally metamorphosed to hornfels, granofels, quartzite, and marble. Altered beds of the Maroon Formation are high on the western flanks of the northern part of Sylvanite Basin. The upper flanks and head of the northern part of Sylvanite Basin contain banded cliffs of the Morrison Formation.

Mineralized fissure veins and faults cut dikes, sills, and the pluton. Rocks of the pluton contain more mineralized veins than the metasedimentary rocks. S. G. Zahony states that the "best grades of mineralization" are usually in metasedimentary rocks directly above their contact with the pluton (Gaskill and others, 1991). The fissure veins contained within the metasedimentary rocks are enriched in quartz, barite, pyrite, sulfosalts, and native silver. The most productive veins occur in argillized wall rock and are enriched in quartz, carbonate, arsenopyrite, and pyrite. Less productive veins are in chloritized wall rock and are enriched in quartz, barite, and pyrite. Thomas (1972) suggests the source of mineralization for the fissure veins and faults was a rhyolitic intrusion that is younger than the White Rock pluton.

Feature #101 is an open adit with a portal 7' high by 6' wide. The opening is framed with 2-inch-thick by 6-inch-wide boards. A set of metal doors once were bolted to the frame and probably served to keep the public out of the inner workings. The doors are presently lying in front of the entrance and are partly covered by mine water. The inner workings are in competent granodiorite and extend for more than 500' along a bearing of S.87°W. The floor is completely covered with running water, and water drips from the ceiling and runs down the walls in several locations.

The highly visible body of feature #201 contains several levels and can be seen from portions of FT-983 and FT-981. The dump contains an estimated 2,380 cubic yards of light-yellow to orange waste rock. Heavy equipment leveled the top, which is 57' long by 63' wide. The length of the face is 73' and its slope angle is 33°. A wooden structure once stood on the north side of adit #101. Wooden beams, mine track, nails, pipe, sheet metal, and long strands of wire are on top of the dump. A lower level to the dump is approximately halfway down the face.

Waste rock on dump #201 is composed mostly of altered, light-gray granodiorite. Dark-gray quartzite, dark-green sandstone, dark-brown diorite, red-brown rhyolite, and granodiorite breccia are also present. Metallic minerals occur in several rock types. Quartzite contains quartz veins with pyrite and marcasite. Breccia contains veins of chalcopyrite and specular hematite. Sandstone hosts veins of chalcopyrite and an unidentified silver-gray mineral that lies adjacent to veins of white tabular barite.

Effluent from adit #101 runs down the entire north flank of dump #201, then flows into a shallow pond. This pond is connected to two other ponds via a well-defined drainage channel. A second shallow pond is at the toe on the south side of the dump. The southern pond contains blue-green

water and its bottom has a layer of light-yellow iron oxides. A large portion of dump #201 is saturated with effluent from adit #101, and water drains from the toe into the southern pond. Bright orange sludge deposits of ferric hydroxide occur where water emerges from the toe. Bright green moss carpets the area where dump seepage enters the pond. Deposits of white salts coat the surfaces of the rocks around the southern pond.

Water test #302 was taken about 50' inside adit #101. Values were **pH=6.19 and conductivity=510 μ S** on an estimated flow of 385 gpm of clear, cold water. The floor and walls of the adit show no salt deposits or coatings of orange iron-oxide precipitate. Outside of adit #101, the effluent channel is lined with a light-yellow and thin film of precipitate. Abundant mosquito larvae swim in the pond that receives most of the mine drainage. Water test #303 was taken from this pond, which has a light blue color, and showed **pH=4.21 and conductivity=513 μ S**. Water test #304 was taken from the pond at the southern toe of dump #201. Water was emerging from the toe at an estimated rate of 25 gpm and draining into this pond. Values were **pH=4.36 and conductivity=511 μ S**. Water sample #330/4317-01.305 was collected at the portal of adit #101 on 9/18/97. When the sample was collected, the effluent had **pH=7.80 and conductivity=592 μ S**, and the measured flow rate was 190 gpm. Lab results, shown on the table below, indicate that the mine water is relatively clean, with only sulfate concentration approaching state standards. Additional water tests conducted on 9/18/97 from the ponds receiving effluent from adit #101 showed **pH values of about 6.7 and conductivities of about 400-500 μ S**. The pH values from the later tests are considerably higher than those obtained during the initial inventory (tests #302-304). Additional tests may reveal the reasons for this discrepancy.

Water test #300 was taken in Sylvanite Creek, about 50' below the toe of dump #200. This test sampled the clear water draining from the entire north and south portions of Sylvanite Basin, including most of the largest mines. The test yielded a **pH of 5.74 and a conductivity of 279 μ S** on an estimated flow of 370 gpm. Sylvanite Creek supports abundant aquatic life and lush growths of phreatophytes and willows. Dark-green to black moss and algae cover the rocks in the creek bed. Water test #301 was taken from the north fork of Sylvanite Creek, about 75' upstream and north of the inlet to the uppermost shallow pond that receives effluent from adit #101. This test indicates the background condition of Sylvanite Creek above this inventory area, but below numerous uninventoried adits and mine dumps located upstream and on the west side of the creek. The upstream mine workings are on patented claims, many which have been recently reconveyed to the public domain. Effluent drains from some of these features and enters the north fork, therefore, water test #301 incorporates any contaminants from these mines. The test showed **pH=4.41 and conductivity=354 μ S** on a flow rate of 47 gpm. The creek bed has no orange precipitate or white salt deposits. The water is clear, however, moss and lichens do not grow in the creek bed. The creek banks support a lush growth of phreatophytes. Minute aquatic worms are abundant on and beneath the rocks.

Jim Berry (Minerals Specialist for the Taylor River Ranger District) reports that USFS personnel collected a sample of adit #101 effluent prior to the acquisition of the "Tunnel Lode" property. Results of this sample are not known.

Sample #330/4317-01.305; hardness = 685 mg/L; Upper Gunnison River segment #2

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	19	1,000	below standard
Selenium (trec)	2	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	<8	5,000	below standard
Aluminum	<50	87**	below standard
Cadmium	<0.25	5.1	below standard
Calcium (CaCO3)	260 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	<4	61	below standard
Fluoride	0.30	2 mg/L**	below standard
Iron	16	300	below standard
Lead	<1	59	below standard
Magnesium	8.5 mg/L	no standard	n/a
Manganese	<4	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	413	below standard
Potassium	<1 mg/L	no standard	n/a
Selenium	<1	5**	below standard
Silver	<0.2	2.1 (on 3/2/98)	below standard
Sodium	1.8 mg/L	no standard	n/a
Sulfate	250 mg/L	250 mg/L	1 x standard
Zinc	<8	541	below standard

* Numeric standards are $\mu\text{g/L}$, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Italian Creek

Site #: 348/4312-1.103

Site Name: Upper Italian Creek

Environmental Degradation Rating: 3

Description and pertinent facts: This is an open adit with timbering around the portal. At the time of the inventory, standing water was at the mouth of the feature. It is quite possible that this feature and features adjacent to it (directly to the west) are on private land. Because there were

no survey markers and the accuracy of the GPS monitor is questionable, the feature was inventoried, despite being close to the public/private land boundary. Two water tests revealed **pH=7.84 and conductivity=530 µS** at the adit, and **pH=7.42 and conductivity=600 µS** alongside the dump.

Quad Name: Italian Creek

Site #: 358/4309-1

Site Name: Paymaster Mine area

Description and pertinent facts: Features #101, #201, and #202 are accessed by Lily Pond Road (FR-760 according to a road sign, FR-760.1A according to the PBS quad). Lily Pond Road is a popular 4WD, ATV, and dirt bike road. Features #107, #207, #108, and #208 are along Lily Pond Road. Both FR-760 and FR-760.1A cross private land. At one time, many of these mine features were on private land. A new land survey and USFS acquisitions established public ownership of some of these mines. Mine features along FR-760 drain into a tributary of Trail Creek. This inventory area is also discussed in the **Physical Hazards** section of the report.

Features #: 101, 201

Environmental Degradation Ratings: 3

Feature #101 is a water-filled two compartment shaft. Water flowing from the shaft at 8.5 gpm had **pH=4.06 and conductivity=67.6 µS**. The water only flows about 200' past the end of the dump and never reaches Trail Creek, 3,000' away. Red ferric hydroxide precipitate is most abundant closest to the shaft. The 1,000-cubic-yard dump (feature #201) is iron and sulfur stained and contains abundant pyrite. Both the dump and effluent have potential for groundwater degradation near the site. Results of water sample #358/4309-1.304 collected at the shaft are shown on the table below. The water exceeds state standards significantly in concentrations of dissolved aluminum, iron, lead, and zinc, and marginally in concentrations of total iron, cadmium, and manganese. Because the water has so little hardness, the state standards for copper and silver are below the detection limits of the lab.

Sample #358/4309-1.304; hardness = 15 mg/L; Upper Gunnison River segment #4

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	430	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	1,400	1,000	1.4 x standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	99	2,000**	below standard
Aluminum	430	87**	4.9 x standard
Cadmium	0.34	0.25	1.4 x standard
Calcium (as CaCO ₃)	4.8 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11**	below standard

Copper	<4	2.3	below detection limit
Fluoride	0.11 mg/L	2 mg/L**	below standard
Iron	1,400	300	4.7 x standard
Lead	3	0.26	11.5 x standard
Magnesium	0.84 mg/L	no standard	n/a
Manganese	86	50	1.7 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	22	below standard
Potassium	1.6 mg/L	no standard	n/a
Silver	<0.2	0.003 (on 3/2/98)	below detection limit
Sodium	2.4 mg/L	no standard	n/a
Sulfate	20 mg/L	250 mg/L	below standard
Zinc	100	21	4.8 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

Feature #: 202

Environmental Degradation Rating: 3

Feature #202 is the 5,000-cubic-yard dump of the Forest Hill Mine. According to Jim Berry (USFS-Gunnison), the mine is on USFS-managed land and is adjacent to private land. This iron- and sulfur-stained dump contains abundant pyrite and has potential for groundwater degradation near the site. Vegetation doesn't grow on this dump, and sheet wash has adversely affected vegetation below. Trail Creek is 1,000' downstream of this feature.

Feature #: 207

Environmental Degradation Rating: 3

Feature #207 is the iron- and sulfur-stained dump of the Paymaster Mine. This 2,500-cubic-yard dump contains abundant microcrystalline pyrite. Although the mine is on private property, it is only about 200' upstream from the USFS boundary. Water flows at 10 gpm from the base of the dump just above the road and enters a tributary to Trail Creek 150' away. This water had **pH=4.69 and conductivity=98.8 µS**. Minor ferric hydroxide precipitate is evident near the source.

Features #: 108, 208

Environmental Degradation Ratings: 3

Feature #108 is a flooded adit, and #208 is the associated dump. These features are on newly acquired USFS-managed land. Water flowing from the adit at 21 gpm had **pH=6.04 and conductivity=143.8 µS**. This effluent reaches Trail Creek, 400' from the adit. Minor ferric hydroxide precipitate is evident in the trench that leads from the adit portal. No obvious signs of environmental degradation are associated with the 1,300-cubic-yard dump, but it is iron and sulfur stained, contains pyrite, and is near a creek. Results of water sample #358/4309-1.303, collected near the portal, are shown on the table below. The effluent exceeds state standards in cadmium, manganese, and zinc concentrations.

Sample #358/4309-1.303; hardness = 75 mg/L; Upper Gunnison River segment #4

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	60	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	580	1,000	below standard
Thallium (trec)	<1	0.5**	below detection limits
Zinc (trec)	210	2,000**	below standard
Aluminum	<50	87**	below standard
Cadmium	3.0	0.9	3.3 x standard
Calcium (as CaCO3)	19 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11**	below standard
Copper	<4	9.2	below standard
Fluoride	0.24 mg/L	2 mg/L**	below standard
Iron	46	300	below standard
Lead	<1	2.6	below standard
Magnesium	6.8 mg/L	no standard	n/a
Manganese	390	50	7.8 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	77	below standard
Potassium	<1 mg/L	no standard	n/a
Selenium	<1	10 (trec)	below standard
Silver	<0.2	0.05 (on 3/2/98)	below detection limits
Sodium	6.1 mg/L	no standard	n/a
Sulfate	51 mg/L	250 mg/L	below standard
Zinc	210	83	2.5 x standard

* Numeric standards are $\mu\text{g/L}$, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Maroon Bells

Site #: 328/4318-01.101, 201

Site Name: Basin Southwest of Rustler Gulch

Environmental Degradation Ratings: 2

Description and pertinent facts: This inventory area is located in an unnamed basin on the southwest side of Rustler Basin. The easiest access to the mine features follows along the main perennial creek. This creek is in the lower central portion of the unnamed basin and splits into two streams in the upper central part of the basin. None of the mine features within the inventory site are marked on the Maroon Bells PBS quad or on the geologic map of the Maroon Bells

Quadrangle (GQ-788). All features are on public land within the Maroon Bells-Snowmass Wilderness. A well-defined game trail curves around the upper central portion of the basin and accesses adit #101.

Altered Mancos Shale crops out mostly on the northern and eastern portions of the upper basin. Dakota Sandstone has been altered to orthoquartzite enriched in iron oxides and crops out as tilted beds. These beds resist erosion and form cliffs along the upper southern portion of the basin. Adit #101 is in slates and shales of the Mancos Formation.

In general, this unnamed basin is pristine. Runoff from the mineralized Dakota Sandstone beds does not significantly impact the plant and animal life thriving in the water and growing along the banks of the south fork of the main perennial creek. Trout live in the lower portion of the perennial creek, and the upper portion supports abundant aquatic macroorganisms. However, the north fork of the upper basin receives effluent draining from features #101 and #201, and aquatic life is significantly affected.

Feature #101 is the only mine of the inventory site discharging water. This adit is completely caved, and the entrance is marked by a conical depression measuring 18' in height by 12' wide. The inner workings are flooded to an undetermined extent. Clear water flows from the caved entrance at an estimated rate of 20 gpm. An 11'-long, V-shaped trench connects the entrance with the top of dump #201. The bottom of this trench and the top and the upper northern flank of associated dump #201 are carpeted with green to yellow moss. Several badly rusted sections of 2½-lb.-gauge mine track are in front of the entrance and are partly buried within the upper face. White salt deposits coat the surface of this track. Water test #300 was conducted at the entrance of adit #101. At the test site, white salt deposits up to 1/8-inch thick coat the bottom of the drainage channel. Values from this test were a **pH of 5.01 and a conductivity of 1,099 µS**.

Feature #201 is an 85-cubic-yard dump whose waste rock is almost entirely composed of light-gray shale. The top is 14' long by 21' wide. The bare face is highly visible from a section of FR-317.2B, has a length of 113', a slope angle of 31°, and is deeply eroded by running water. Effluent from adit #101 is currently eroding a portion of the north flank, and waste rock has been transported down the face and deposited into the creek bed. The saturated portion of the dump shows salt deposits, which also coat the bottom and sides of the creek bed for a downstream reach exceeding 300'. The waste rock contains mostly gravel-size material, and it is moderately to well cemented. Numerous white calcite stringers and veins crosscut the shale partings, and sulfides are not visible. Aquatic life does not occur in the effluent draining over the top and north flank of the dump. Water test #301, taken 50' below the toe of dump #201, showed the **pH was 4.92 and the conductivity was 1,105 µS**.

The entire length of the north fork stream that receives the effluent from adit #101 is devoid of aquatic life. The mosses, lichens, and willows bordering along the banks show some signs of yellowing in their foliage. Water test #302 was taken about 380' below the confluence of the north and south forks. Values from this test were **pH=6.06 and conductivity=231 µS**. The estimated rate of flow for the clear creek water was 55 gpm. The creek bed is clean, shows no

signs of white salt deposits, and the water supports aquatic insects and larvae of various types. A lush, green growth of phreatophytes and moss lines the banks.

Quad Name: Maroon Bells

Site #: 328/4320-01

Site Name: Lower Rustler Basin, East Side

Description and pertinent facts: Several open adits are within this inventory area, and all of the inventoried mine features are on public land.

Rustler Basin is accessed by an old mine road, FR-317.2B. FR-317.2B is limited to 4WD travel and usually is passable only when its surface is dry. The road starts at FR-317, then crosses Rustler Creek and travels up the northern side of the creek to a locked gate at the boundary of the Maroon Bells-Snowmass Wilderness. The road continues, but is limited to foot or horseback travel. The well-traveled mine road mostly follows the northern side of Rustler Creek. Debris from alluvial fans covers several portions of the road. The mine road ends at the base to upper Rustler Basin.

The lower northern flank of the basin has a series of parallel benches separated by outcrops of light-pink to purple-red Maroon Formation sandstone and siltstone. The central part of the basin contains isolated outcrops of the Gothic Formation, surrounded by unconsolidated Holocene deposits. Prominent white cliffs of granodiorite are on the east side of upper Rustler Basin. Sandstone and black shale of the Dakota Sandstone, Mesaverde Group, and Mancos Shale underlie the central and western portions of the upper basin. The granodiorite makes a sharp contact with the sedimentary beds. The majority of the mine features are in or along mineralized fault zones clustered near the Elk Range thrust fault.

Feature #: 100, 200

Environmental Degradation Ratings: 3

Feature #100 is an intact adit bearing N.38°E. into the base of a mineralized outcrop of Maroon Formation sandstone. The inner workings follow a 6-inch-wide vein for more than 85'. Clear mine water drains from the entrance at an estimated rate of 15 gpm. Water runs down the adit walls in several locations. A 2'-high berm of colluvium is at the entrance and dams water to a maximum depth of 1.5'. Bright-green algae is in the mine water, and moss and lichens grow on the walls and ceiling. Water test #300, taken inside adit #100 about 10' from its entrance, showed the **pH was 8.05 and the conductivity was 713 μ S**. The mine water flows around the north side of the berm, travels along the bottom of a 12'-long drainage corridor, and spreads out over the top of dump #200. Most of the effluent is channeled down the north flank of the dump and drains into Rustler Creek. The drainage corridor and the top of the dump are lined with a thick spongy mat of green moss and dense clumps of dark-green willows.

Feature #200 is a 185-cubic-yard dump that is on the west side of adit #100 and is barren of vegetation. The light orange-yellow to gray waste rock is highly visible from the trail and the old mine road. Its top has a length of 15' and a width of 20'. The face is 190' long and has a

maximum slope angle of 34°. The fan-shaped body spreads out over the steep, partly vegetated hillside. The waste rock is moderately cemented with fines, and iron oxides are found on the middle to lower portions of the face. The upper face and top are well cemented. The southern flank borders a deep V-shaped intermittent drainage corridor. This corridor is subjected to periods of high runoff and avalanche scouring, and some of the waste rock has been transported downstream for a distance of 300' to 500'. The upper face has gullies and shows evidence of sheet wash erosion. Waste rock consists of iron-stained sandstone and limestone. Mineralized waste rock contains veins of black, massive hematite and specular hematite. The hematite is laced with veinlets of white calcite and barite. Some high-grade ore is spread along the southern flank of the dump and in the bottom of the adjacent drainage corridor. The toe is about 220' from the east bank of Rustler Creek.

Feature #: 104, 204

Environmental Degradation Ratings: 3

Feature #104 is an intact adit whose entrance is in a blasted face of light-gray to white granodiorite. Its inner workings follow a bearing of N.55°E. for more than 450'. Partly dammed with large granodiorite boulders, the first 180' of the floor is flooded with clear water that reaches a maximum depth of 1.5' near the entrance. Effluent flows from the entrance at an estimated rate of 35 gpm. Water test #302, taken at the entrance to adit #104, showed a **pH of 8.11 and a conductivity of 537 µS**. The effluent drains over the top of dump #204 and is diverted along the southern flank into a deep V-shaped intermittent stream bed. The effluent then flows beneath the talus that partly fills the stream bed. This stream merges with another intermittent stream that runs along the south side of features #100, #102, #200, and #202. No precipitate is associated with the effluent, and algae and moss are growing in the drainage channels.

Most of the effluent runs down the upper face of dump #204, cutting deep grooves. The face also is subjected to severe sheet wash erosion. Feature #204 contains an estimated volume of 1,820 cubic yards of orange granodiorite. The top is 30' long and 52' wide. The very elongated body has a length of 310' and the face has a slope angle of 36°. The dump is on steep slopes that are covered with loose talus. The upper face is moderately cemented with iron oxides and fine-grained material. The lower face and toe regions have more mineralized rock and loose talus. The face is quite visible from a long distance. The toe is approximately 330' above and on the eastern side of Rustler Creek. A pile of high-grade ore, containing veins of crystalline pyrite, hematite, and marcasite is on top of the dump. The veins are in a matrix of white calcite and barite. Host rock is altered, iron-rich granodiorite.

Rock surfaces in Rustler Creek are clean and have no iron-oxide or salt precipitates. The clear water of this creek supports a healthy population of brook trout and macroinvertebrates, and moss and willows line the banks. Dark-brown algae is in the water. Water test #303 was taken in the drainage corridor that receives the combined flow of 40 gpm of effluent produced at adits #100, #103, and #104. This test site is about 500' downstream from adit #104 and about 50' from the east bank of Rustler Creek, and the water had **pH=7.33 and conductivity=303 µS**. Water test #305 was taken from Rustler Creek below the discharging mines of this inventory area. The flow was estimated at 2,200 gpm, and **pH=7.56 and conductivity=122 µS**.

Quad Name: Mt. Axtell

Site #: 322/4301.100, 200

Site Name: Basin on Northeast Flank of Mt. Axtell

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory site lies at the base of the northeastern side of Mount Axtell. The mine features are approximately 1.2 miles south of CR-12, along the west fork of an unnamed perennial creek. Most of this creek is visible from CR-12.

This inventory area is in the most mineralized part of the Mt. Axtell laccolith, which rises abruptly from gently sloping tablelands composed of Mesaverde sedimentary rocks. Most of the laccolith is barren of mineralized rock. Isolated areas with veined or disseminated pyrite are exposed in deeply cut gulches on the north and east slopes.

Adit #100 is on the side of an extremely steep intermittent stream corridor. This corridor is subjected to frequent avalanches and periodic floods. The sides and bottom are devoid of vegetation, are stained a brilliant yellow color, and are composed of a friable, clay-like material. This stream originates high on the northeast flank of the Mt. Axtell laccolith and follows the trace of a highly pyritic fault zone. Red-orange porous breccia crops out sporadically in the stream corridor.

Feature #100 is a partly caved adit that is dangerous and unstable, and should be grated or closed to prevent entry. The opening is 5' high by 5' wide, and the length of the adit was estimated to be 33'. It is on the south side of and lies about 5' above the bottom of a highly mineralized gulch. The inner workings trend S.12°E. and are driven in soft, clay-like material derived from the fault. Material sloughed from the ceiling has accumulated on the floor and fills about 1/2 of the opening. Wall and ceiling rock can be removed easily with a rock pick and this material has partly caved throughout the length of the inner workings. The walls are wet, and water drips from the ceiling onto a flooded floor. Mine water reaches a maximum depth of 1.5'. Water test #300 was taken from clear standing water 15' underground in adit #100. The **pH was 3.37 and the conductivity was 400 µS**. Effluent seeping from adit #100 flows across the dump, beneath some alluvial and debris fans, and resurfaces downstream along the west fork of the unnamed perennial creek. The gulch was dry during the inventory.

Feature #200 is a partly eroded dump located about 30' north of and downstream from adit #100. The whole body of yellow-orange waste rock is in the gulch and 2/3 of it has been transported downstream for more than 280'. Waste rock is spread out over the surface of the alluvial fan downstream of the dump. The face and northern flank have been greatly oversteepened and grooved by erosion. Boulders of mineralized rock are in the stream bottom, along with pieces of red-orange breccia and cobbles of iron-stained quartz monzonite. Host rock is fine-grained granodiorite. Material derived from the fault zone is very soft when wet and is laced with veins of iron oxides. Some of the breccia contains angular pieces filled with disseminated pyrite.

The east fork of the perennial creek starts at the base of a saddle lying just north of Green Lake, and merges with the west fork above a large beaver pond. Water test #301 was taken in the east fork slightly above its confluence with the west fork. Values from this test were a **pH of 7.01 and a conductivity of < 50 μ S** on a flow estimated at 25 gpm. This water is clear and supports abundant aquatic life. Rocks in the creek bed are covered with dark-green to black algae, and moss and phreatophytes line the banks. Rocks of this stream bed are primarily a mixture of sandstone and gray, aphanitic monzonite.

Water test #302 sampled the clear water of the west fork, about 150' upstream of its confluence with the east fork, and below the mines of this inventory area. The **pH was 6.88, conductivity was <50 μ S**, and flow rate was estimated to be 45 gpm. Rocks in this creek bed are coated with brown to black algae. Phreatophytes, moss, willows, and grass grow along the banks, and abundant aquatic larvae, snails, worms, and insects thrive in the water.

Quad Name: Mt. Axtell

Site #: 322/4303-01.100, 200

Site Name: Adits South of Remediated Tailings Ponds in the Vicinity of AMAX Water Treatment Facility

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area includes two adits (features #100 and #101) and their corresponding dumps. The mine features lie along the southwestern edge of an area where large tailings ponds that received effluent from the Keystone Tunnel have been reclaimed by AMAX Corporation.

Both adits are on the north side of an old mine road that parallels the north side of CR-12. A portion of the waste rock of dumps #200 and #201 was used as fill for the mine road. Numerous orange-red springs and shallow ponds surround both dumps. This color is probably caused by high concentrations of iron oxides in the colluvial, terrace, and glacial deposits that underlie this site. The high iron concentration does not cause a "yellowing" effect in the vegetation, rather, the grasses, forbs, and lodgepole pines are dark green. Several parts of the roadcuts on the north side of CR-12 are stained bright orange-red by water draining from springs and ponds. This water is channeled beneath the road through corrugated metal pipes, flows down steep drainage channels stained red-orange, and then discharges into Coal Creek. Riparian areas affected by degraded water from the reclaimed tailings are characterized as follows: the bottoms of beaver ponds have a build-up of gelatinous sludge; thick coatings of red-brown suspended and jelly-like masses of solids cover the marsh grass; and water in the ponds and draining into the creek is tinted dark-brown.

Feature #100 is a partly caved adit driven on a breccia zone that bears N.24°W. The entrance is supported by a 5' high by 5' wide wooden beam frame. Water test #300, taken inside adit #100, yielded a **pH of 3.84 and a conductivity of 310 μ S**. Clear water drains from the entrance at an

estimated rate of 2 gpm and collects in a pool lined with sludge and a thick coating of bright-orange ferric hydroxide precipitates.

A large semicircular area surrounds the entrance. This area was excavated by heavy equipment, and the waste rock produced from the excavation was mixed with material on dump #200. The material was spread out in front of and south of the entrance. Approximately 1/2 of this area is saturated with a combination of effluent from adit #100 and water emerging from springs at the base of the excavated area. Dark-green to brown mats of moss and marsh grass grow on top of dump #200. Shallow puddles lie on the periphery of the top of the dump and in the leveled-off area.

Effluent from the adit flows along the western edge of the leveled-off area and into a circular depression. Water test #301 was taken of clear, blue-green water that is in this 3'-deep depression on top of and on the western edge of dump #200. The **pH value was 3.61 and the conductivity was 365 μ S**. Orange precipitate coats the sides of the depression. Water from the depression flows into a wooden culvert that spans the mine road, then travels along the western flank of the dump. This same effluent then runs along a drainage channel for about 500' before being diverted beneath CR-12 and discharging into Coal Creek.

Water test #302 was taken where water emerging from the toe of dump #200 was entering the drainage channel that runs down the face. Values from this test were **pH of 3.57 and conductivity of 375 μ S**. At this test site, water was flowing in the orange-stained channel at an estimated rate of 5 gpm.

The southern portion of the reclaimed area is about 400' above adit #100. A ditch at the southern edge of the reclaimed tailings area transports runoff and groundwater from the tailings to a series of large, shallow ponds to the west. The ponds discharge into another ditch that carries the water into Coal Creek. All of the ponds, and both ditches, are lined with red-orange iron-oxide precipitates, and the water is a dark-brown color.

The combined volume of waste rock produced from adit #100 and from the excavated area around its entrance is about 1,350 cubic yards. The leveled-off area, including the top of the dump, is 125' long and 133' wide. The dump face is 37' long and its steepest slope angle is 33°. Lodgepole pine saplings are revegetating portions of the dump. Waste rock consists of quartz monzonite.

Quad Name: Mt. Axtell

Site #: 322/4304-01.100, 200

Site Name: Adits Northwest of Keystone Tunnel, North of FR-732

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory site lies on public land just beyond a group of patented mining claims held by AMAX Corporation. Access to the site is by FR-732, which branches from CR-12 just inside the USFS boundary. Although a locked gate crosses FR-732

Adit #100 is about 20' above FR-732. A partly collapsed wooden beam frame is in front of the 5'-high by 5'-wide entrance. The entrance is in colluvium cemented by a red-brown, iron-rich, gravel matrix. Open fractures and abundant roof fall indicate that the ceiling in this adit is unstable. Debris has sloughed at the entrance, creating a 4.5'-high berm that dams clear mine water to a depth of 1.5'. Beyond the berm, the inner workings trend N.22°W. for an estimated distance of over 250'. Orange gelatinous clumps of suspended solids float in the mine water and orange-brown ferric hydroxide precipitates coat the walls and ceiling. Water drips from the ceiling and runs down the walls in numerous locations. Water test #300, taken inside adit #100, yielded a **pH of 6.64 and a conductivity of 100 µS**.

Feature #200 contains 370 cubic yards of yellow, red-orange, and orange-brown iron-rich waste rock. The body fans out to a width of 31', and the leveled-off top forms a platform that is 43' long by 35' wide. The face is 30' long, and its slope angle is 33°. Waste rock consists of highly fractured, medium-grained sandstone with angular clasts of dark-gray to black shale. The fracture planes are filled with black to red-brown iron oxides. Quartz veins up to 1-inch thick are in the disseminated-pyrite-rich sandstone.

^^New Quad^^

Site Name: Baxter Basin-Part 2 (West side)

Description and pertinent facts: This inventory site in Baxter Basin is accessed easily by FR-552. Stair-stepped outcrops in the lower, southern and western portions of the basin consist of metamorphosed shale, siltstone, and sandstone of the Mesaverde Group. Sandstone and conglomerate of the Ohio Creek Formation cap the ridges around the southern portion. Talus derived from igneous rocks of the Augusta stock covers the upper western flanks.

Feature #: 100, 200

Environmental Degradation Ratings: 2

Feature #100 is an open adit bearing N.44°E. into a granodiorite dike that follows a fault cutting diagonally across the northwestern portion of the basin. A number of mine features explored this fault, and the majority of ore production from Baxter Basin came from rich base-metal veins lying within this fault zone. The inner workings of adit #100 follow a 1.5'- to 3'-wide quartz vein for more than 230'. The quartz vein is part of the Domingo Lode, which contains abundant crystalline lead, copper, zinc, silver, and iron sulfides.

The opening to adit #100 is 8' high by 7' wide.. Portions of the ceiling are stoped, which is discussed in the **Physical Hazards** section of this report. Water drips from many places throughout the entire length of the ceiling. Water runs down portions of the walls, staining them with orange iron-oxide precipitates. Parts of the floor are covered with up to 1' of standing water. A water test conducted about 50' underground showed **pH=5.10 and conductivity=422 µS**. A strong odor of H₂S fills the air inside the adit and emanates from the waste rock of dump #200. Water level in the mine fluctuates on a daily basis, and is partly controlled by the water level in shaft #101, which connects to adit #100, and partly controlled by rainfall.

A 27'-long trench links the opening with the top of feature #200. This trench reaches a maximum depth of 10' and has a width of 8'. Effluent discharges from the mouth of adit #100, flows along the bottom of the yellow-stained trench, and soaks into the top of dump #200.

Dump #200 is highly visible and contains about 495 cubic yards of well-cemented waste rock stained yellow, dark-brown, orange, and black. Waste rock is highly fractured, iron-rich granodiorite that is crosscut by numerous quartz veins. The face has gullies and shows evidence of sheet wash. In addition, heavy equipment was used to excavate several U-shaped cuts, up to 6' deep, in the face. Bright orange effluent emerges from the toe, flows down a portion of a spur road, and enters the headwaters of Baxter Creek.

Feature #: 101, 201

Environmental Degradation Ratings: 3

Feature #101 is a partly filled shaft whose lower cribbed workings connect to the inner workings of adit #100. The upper workings of this shaft are intact and filled with water up to 4' below the ground surface. A water test of the blue-tinted water of the shaft showed **pH=5.88 and conductivity=139 µS**. The surface opening is 6'x 4', and the measured depth to the top of the waste rock that fills the lower workings is 17'.

Feature #201 is a semicircular 45-cubic-yard dump whose light-yellow and well-cemented waste rock is on the south side of the shaft. The waste rock contains a mixture of fractured sandstone,

granodiorite, and slate, all of which are enriched with iron. Mineralized rock consists of porous quartz veins hosting smaller veins of sphalerite, pyrite, and chalcopyrite.

Feature #: 102, 202

Environmental Degradation Ratings: 3

Feature #102 is an open adit bearing S.56°W. into an outcrop of fractured and iron-stained shale. A 3.5'-wide brecciated fault zone is directly above the entrance. This zone contains an 8-inch-wide base-metal-bearing quartz vein. The inner workings follow this vein for more than 85'. The opening is 6' high by 5' wide. A 5'-high berm, composed of loose talus, is in front of and extends inside the entrance. Puddles of clear water are throughout the entire floor length and reach a maximum depth of 6 inches. Water tested about 35' inside adit #102 had **pH=3.86 and conductivity=197 µS**. Sludge deposits consisting of iron oxides accumulate at the bottom of the puddles. Water drips from the ceiling in numerous locations. Most of the walls are wet and ferric hydroxide precipitates coat the walls where water seeps or runs. The air of this adit is warm (about 70°F) and has a musty smell.

A trench connects the opening of adit #101 to the top of feature #202. The trench is 13' long by 5.5' wide and reaches a maximum depth of 12'.

Feature #202 is a highly visible fan-shaped dump. Its 345 cubic yards of bright-yellow to orange waste rock can be seen from several locations along FR-552. The upper part of the face is well consolidated, and the lower flanks consist of dark-brown and unconsolidated slate. Baxter Creek has eroded part of the toe. The top of dump #202 is 10' long and 17' wide, and the 110'-long face has a maximum slope angle of 35°. Veins of argentiferous galena, chalcopyrite, pyrite, and some barite occur in the mineralized waste rock. Baxter Creek was tested just above and just below the toe of dump #202. Results were **pH=5.57 and 5.19, and conductivity=146 µ and 183 µS**, respectively, on a flow of about 85 gpm.

Feature #: 204

Environmental Degradation Rating: 3

Feature #104 is an adit whose entrance is filled by colluvium. The entrance is at the base of dark-brown and orange-red vertical cliffs composed of iron-enriched and highly fractured sandstone and siltstone. Mineralized material eroded from the cliffs rests on top of dump #204, especially on the southern flank. Effluent flowing from adit #104 at a rate of 10 gpm had **pH=5.33 and conductivity=167 µS**. The effluent spreads out over the northern part of the top of the dump, and is funneled into a main channel on the northern flank. Below the toe of dump #204, the effluent had **pH=5.20 and conductivity=207 µS**. The mine water discharges into an intermittent stream that extends 280' before merging with a tributary of Baxter Creek.

Quad Name: Oh-Be-Joyful

Site #: 317/4314-01.110, 210

Site Name: Lower Augusta Basin - Part 2

Environmental Degradation Ratings: 3

Description and pertinent facts: Features of this inventory site are on the north side of the lower lake and scattered around the upper lake of Augusta Basin. All mine features of this inventory site are on USFS-managed lands.

Access to all mine features is from an unmarked foot trail. This trail branches from FR-734.2A approximately 200' from the entrance of the Augusta Crosscut Tunnel (feature #105 of inventory area #318/4314-02). The trail makes a series of switchbacks across talus-covered slopes on the southern flanks of Mineral Point. The trail then curves to the south, crosses Augusta Creek below the outlet to the upper lake, and then switchbacks up above this lake. The trail traverses the upper southwestern sides of the basin to the crest, and climbs up the ridge towards the summit of Augusta Mountain. The public uses this trail occasionally to access Augusta Mountain and Purple Peak.

Feature #110 is an intact adit whose entrance is 5' high by 4' wide and contains a 3.5'-high berm. The inner workings follow a mineralized 4- to 6-inch-wide vein trending N.58°E. for a distance of over 30'. An 8'-wide by 5'-deep by 25'-long trench connects the entrance to the top of dump #210. Mine water seeps at a rate of <1 gpm beneath the berm, travels down the trench, percolates through the waste rock, and emanates from the toe, before discharging into a creek. Water test #304 was taken of the effluent in the trench, and the **pH was 6.11 and the conductivity was 100 µS**.

Feature #210 is a 53-cubic-yard dump that lies partly in the creek. The dump top is 17' long, the body fans out to a width of 31', the western flank is 25' long, and the slope angle is 29°. The yellow-brown to orange waste rock is composed of altered, iron-rich granodiorite. Vein material contains massive, dense deposits of chalcopyrite, pyrite, and sphalerite.

Water test #305 was conducted 50' below the toe of dump #210, in the creek that receives effluent draining from the toe. At this test site, a coating of white salts begins to appear on the rock surfaces in the creek bed. The **pH was 6.48 and the conductivity was 400 µS** on a 13 gpm flow.

Quad Name: Oh-Be-Joyful

Site#: 317/4314-02.100, 200

Site Name: Baxter Basin-Part 3 (Upper Northern Part)

Environmental Degradation Ratings: 3

Description and pertinent facts: All mine features of this inventory area are on public land. The majority of mine features are on patented mining claims that were recently purchased by the USFS.

All features are near FR-552. This 4WD road starts from FR-734.2A, crosses Poverty Gulch Creek, and makes its way up the southern portion of Baxter Basin. FR-552 crosses Baxter Creek several times, passes the trailhead to FT-404, and then travels up along the western portion of the

basin before ending at the toe of dump #200. A spur road branches off this road and leads to adit #100.

The lower central portion of Baxter Basin has stair-stepped outcrops of baked shale and quartzite of the Mesaverde Group that are cut by granodiorite and quartz monzonite dikes. Scree derived from the Augusta stock covers the upper western flanks of Baxter Basin.

Feature #100 has the most extensive underground workings and the largest associated dump (feature #200) of this inventory area. This adit has an easily accessible entrance and is frequently visited by the public. The opening is 6' high by 5' wide and is driven into an iron-stained quartz monzonite dike. A 4.5'-wide breccia zone containing several quartz/base-metal veins is directly above the entrance. The inner workings follow the veins along a bearing of N.62°E. for more than 185'. A 3.5'-high berm composed of colluvium is at the entrance. Puddles of water containing orange gelatinous deposits of sludge occur all along the floor and reach a maximum depth of 1'. Water runs down the iron-stained walls and drips from the ceiling in many locations. Water test #300, taken 30' inside adit #100, revealed a **pH of 6.15 and a conductivity of 387 μ S**.

The volume of feature #200 was estimated to be 435 cubic yards. The top has a length of 19' and a width of 44'. Effluent from adit #100 has cut grooves into the 37'-long face, which is partly stained orange-yellow and has a maximum slope angle of 35°. Most of the waste rock is rich in pyrite and is moderately to well cemented. A portion of the face has been excavated, leaving several deep V-shaped trenches. A stockpile of rich ore is on the west side of the toe. The ore contains quartz veins with a limy, dark-brown to black material, and crystalline pyrite and chalcopryite. Ore also contains massive veins of argentiferous galena; abundant pyrite; some sphalerite, hematite, and bornite; and minor tetrahedrite, barite, and rhodochrosite. Some of the ore has a yellow surface stain, but most has a black, metallic luster. Runoff significantly affects this dump during heavy rains and snowmelt.

Clear water drains from beneath the berm of adit #100, flows through an 8'-long trench, and fans out over the eastern portion of dump #200. A portion of the effluent soaks into the waste rock, but most runs down the face of the dump and empties into a shallow pond. The pond on the south side of the dump is 64' long, 42' wide, and reaches a maximum depth of 2.5'. A layer of orange to red-brown sludge covers the bottom. The red-brown water of this pond is in contact with highly mineralized waste rock at the toe of dump #200. Effluent also drains from the toe and discharges into this pond. An outlet from the pond is on its eastern side. An intermittent stream at the outlet descends a steep-sided drainage corridor for approximately 680' before merging with the headwaters of Baxter Creek. Water test #301 was taken from the pond at the toe of dump #200 and showed **pH=6.71 and conductivity=406 μ S**. Aquatic life does not occur in the pond or in the intermittent stream flowing from the pond.

Quad Name: Oh-Be-Joyful

Site #: 317/4315-01.202

Site Name: Summit of Augusta Mountain (Taylor River R. D. side)

Environmental Degradation Rating: 3

Description and pertinent facts: The inventory site is on the upper, eastern flanks of Augusta Mountain. All features are on lands managed by the USFS. Trails are the only means of access to the features. The shortest but very strenuous route begins near the entrance to the Augusta Crosscut tunnel at the end of FR-734.2A and ascends the northern flanks of lower Augusta Basin along a poorly marked trail.

The sides of both unnamed basins separating Augusta Mountain from Mineral Point comprise vertical outcrops of mineralized shale and sandstone of the Mancos Shale Formation, cut by dikes radiating from the Augusta Mountain stock. In general, the rocks of Augusta Mountain and Mineral Point are iron rich and host numerous, extremely rich base-metal-bearing quartz veins. These veins are along brecciated fault zones or are next to dikes. Features #101 and #102 were part of the original workings that developed the silver-rich Augusta Lode.

Feature #102 is an adit whose entrance was filled from above with waste rock from dump #201. The inner workings follow a mineralized granodiorite dike trending N.38°E., and connect to the workings of shaft #101, located about 80' above.

Dump #202 contains an estimated 685 cubic yards of waste rock on two levels. The top to the upper level lies on the east side of adit #102 and is 15' long by 43' wide. A pile of partly buried boards and logs is all that remains of a wooden structure that once stood on this level.

The lower level is about 1/3 of the way down the face of the upper dump. The top to this level is surrounded by a U-shaped depression and is 20' long by 14' wide. This level once supported a tram terminal, but all that remains are some old boards, mine track, nails, scraps of iron, and a 4.5'-diameter grooved wheel that moved the tram cable. Several tram buckets, gears, and some 1/2-inch-diameter metal pipe are on top of the foundation of the lower level of the dump. The tram was suspended across Poverty Gulch and ended at a mill on the east side of Poverty Gulch.

The combined face length of both levels of dump #202 is 277'. The upper level contains steeper upper slopes that reach a maximum angle of 36°. The width of the dump is more than 180'. The face to both levels is visible from the town of Crested Butte, a distance of over 12 miles. The mineralized waste rock is very rich and contains up to 10-inch-wide veins laden with base metals. The veins include a mixture of sphalerite, pyrite, tetrahedrite, marcasite, chalcopryite, and argentiiferous galena.

Feature #101 is a filled shaft above adit #102, approximately 170' below the ridge leading up the southern side of Augusta Mountain. A cone-shaped depression surrounds the outer opening. The inner opening is 6'x 4'. The depth from the ground surface to the present bottom of the shaft is 8'. The apparent bottom of the shaft may be a false bridge of waste rock. The lowermost workings of shaft #101 and adit #102 connect to and are drained by the Augusta Crosscut Tunnel.

A light-yellow, 85-cubic-yard dump (feature #201) is on the east side of the shaft. Its face has gullies and shows evidence of sheet wash erosion. The face is 95' long and has a slope angle of

36°. The top is 12' long by 25' wide. The upper face is well solidified and the waste rock emits a strong odor of H₂S. Loose scree covers the lower flanks and has filled the entrance to adit #102. Waste rock is granodiorite with abundant disseminated pyrite. Mineralized waste rock comprises fine-grained dark-brown calcite or siderite hosting crystalline chalcopyrite.

Effluent does not seep from adit #102, but the lower portion of feature #202 is discharging water into a scree-filled drainage channel that extends southeastward. This channel is the main drainage leading into the upper lake of Augusta Basin. Water test #301 was taken about 150' below and east of the toe of dump #202, from the scree-covered drainage corridor. Abundant white salt deposits throughout the length of this drainage channel may be due to the high sphalerite content of the waste rock. The **pH was 4.16 and the conductivity was 910 µS** on a 5 gpm flow. Aquatic life does not occur in the clear water of the channel, but mosquito larvae live in the upper lake.

Quad Name: Oh-Be-Joyful

Site #: 317/4315-03.101

Site Name: Purple Mountain Basin, West Flank - Part 1

Environmental Degradation Rating: 3

Description and pertinent facts: Purple Mountain Basin is an unnamed basin on the PBS Oh-Be-Joyful quadrangle map. This name was assigned for reference purposes only and is frequently mentioned throughout this report. Two major perennial creeks drain Purple Mountain Basin, which lies on the southern flanks of Purple Mountain. South fork of Purple Mountain Creek drains a small, unnamed basin in the southwestern portion of Purple Mountain Basin. North fork of Purple Mountain Creek starts at the head of the main basin and joins the south fork at the southern end of Purple Mountain Basin. The combined flow of both forks has eroded deeply into the black shale of Poverty Gulch. Most of Purple Mountain Basin is pristine, with little evidence of mineralization and past mining activity; however, the southern portion of Purple Mountain Basin and the smaller unnamed basin are highly mineralized by dikes radiating from the Augusta Mountain stock. The sedimentary beds in the southern part of Purple Mountain Basin are also fractured, faulted, and enriched with iron.

The main access route to the inventory area starts at one of the switchbacks on FR-734.2A east of the Augusta Crosscut Tunnel. The route follows several unmarked trails along the tops of broad, sloping benches. The benches lie above and west of the inner steep slopes of Poverty Gulch. The trails merge into a well-marked trail in an open area located just south of the confluence of the two forks of Purple Mountain Creek. This trail leads up to and stops at feature #106 of inventory site #317/4315-01.

Feature #101 is an open adit bearing N.44°E. into the base of vertical spires comprising iron-stained shale. A curving 8'-long trench is on the west side of the entrance. Iron oxides stain the vertical walls of the trench and the adit walls. A brecciated fault zone, containing veins of pyrite and exhibiting a vivid yellow color, is directly above the entrance. The inner workings follow these veins for an estimated length of 33'. The opening is 5' high by 4' wide. The floor slopes

steeply down into the inner workings for 15', then levels. The inner workings are partly flooded to a maximum depth of 2'. Water test #302 was taken from standing water 17' underground in adit #101 and yielded a **pH of 3.75 and a conductivity of 501 μ S**. Water seeps from the walls in some locations, and the ceiling contains white crystalline salt deposits. The air inside the adit has a strong odor of iron and H₂S gas.

Feature #201 is on the west side of the trench and consists of 55 cubic yards of yellow shale. A thick layer of scree covers the face and flanks. Mineralized waste rock contains vuggy quartz veins laden with stringers and veins of pyrite.

Quad Name: Oh-Be-Joyful

Site #: 318/4313-01.101, 201

Site Name: Baxter Basin-Part 1

Environmental Degradation Ratings: 2

Description and pertinent facts: Baxter Basin is easily accessed by FR-552. This 4WD road branches off FR-734.2A on the east side of Poverty Gulch and travels a distance of about 2.1 miles before ending at adit #100 of inventory area #317/4314-02. FR-552 is still passable by 4WD vehicles, but its surface is extremely rough where the road crosses talus slopes. The steepest and roughest section of this road is where it crosses Poverty Gulch and ascends along the eastern flanks of Cascade Mountain. The surface of FR-552 could be bladed by a bulldozer to provide a much easier and safer access route to the inventory site.

The Geologic Map of the Oh-Be-Joyful Quadrangle (Gaskill, 1967) shows Mesaverde Group strata to underlie most of the basin. Altered sandstone and metamorphosed shale crop out as benches, mostly in the northern and western portions of the basin. The southeastern and middle portions of the basin contain dacite porphyry and quartz monzonite porphyry dikes. Several mineralized faults cut the basin's midsection, and the northern flanks leading up to Cascade Mountain host a series of parallel faults. Most of the exploratory adits and prospect pits are along faults containing pyrite-bearing quartz veins. Mineralized veins are also near the contact of granodiorite and the sedimentary rocks.

Adit #101 is directly in line with and about 120' below adit #100. A mineralized granodiorite dike crops out directly above the 5' high by 4' wide opening. About 10' from the entrance, the inner workings split, and drifts head into opposite directions along a 2.5'- to 4'-wide, N.75°E.-trending quartz vein for a distance far exceeding 65'. Some of the floor is flooded, and water reaches a maximum depth of 2.5'. Deposits of orange sludge form on the floor and accumulate to a maximum thickness of 0.5 inch. Orange iron oxides precipitate on the walls and ceilings. Water test #300, taken at the intersection of the drifts inside adit #101, yielded a **pH of 3.77 and a conductivity of 389 μ S**. This clear water has a strong odor of iron and hydrogen sulfide. White and yellow salts, and green moss cover the walls and ceiling near the entrance.

A 1.5'-high berm is at the opening, and water was seeping beneath this berm during the inventory. The effluent probably discharges at a higher rate when the groundwater level is

higher. The effluent then flows over the top of dump #201, runs down its west flank, and enters an intermittent stream channel. White salts stain the bottom and sides of this channel downstream to Baxter Creek, a reach of 480'.

Feature #201 contains a combined estimated volume of 265 cubic yards on two levels. The top is 15' long and the width is 38'. The 81'-long face is grooved from effluent runoff, has a slope of 33°, and is highly visible from the lower portion of Baxter Basin. The yellow-orange to black waste rock is well cemented and emits a strong odor of H₂S. The upper level contains the major portion of waste rock. The lower level lies crosswise in the intermittent stream bed and receives runoff and seepage from the upper level. The mixture of granodiorite and black slate on both levels of this dump contains about 65% sulfides. Mineralized waste rock is stained black and consists of quartz with veins of galena, bornite, sphalerite, chalcopyrite, marcasite, tetrahedrite, and pyrite. Mineralized rock is thoroughly mixed with the waste rock and lines the banks of the stream. A small shallow pond lies northwest and is at the head of this drainage. Water discharges from the pond during high levels of runoff and snowmelt.

Quad Name: Oh-Be-Joyful

Site #: 318/4314-01.200

Site Name: Cascade Mountain - Northwest Flank

Environmental Degradation Rating: 3

Description and pertinent facts: In 1996, the Wilderness Land Trust purchased the majority of patented mining claims in the Cascade Mountain, Mineral Point, Augusta Basin, Poverty Gulch, and Baxter Basin areas. Later the same year, the USFS purchased these claims from the Wilderness Land Trust. U.S. Bureau of Mines MLA 81-83 report describes the geology and mines in this area and the neighboring Richmond Mountain area (Ellis, 1983).

The inventory site is in the lower portions of Augusta Basin, on the northeastern flanks of Cascade Mountain and west side of Poverty Gulch. The site is accessed by FR-734.2A, which connects to FR-734 at the old coal mining town of Pittsburg.

Feature #200 consists of a combination of waste rock, yellow mill tailings, and smelter slag at a mill site on Poverty Gulch. The total area of the piles is about 130' by 35', and the estimated volume is 580 cubic yards. The mill tailings are the most environmentally degrading aspect of this site. The tailings are crushed to sand- to gravel-size and are rich in sulfides, including pyrite, sphalerite, and galena. Secondary salts have formed on the tailings surface, which is well cemented in most places. Small evergreen trees have begun to revegetate the toe of the tailings.

Waste rock piles comprise mostly slate and granodiorite country rock. Smelter slag was dumped on top of some of the waste rock piles. Waste rock piles are probably not environmentally significant.

Water test #304 from Poverty Gulch below the mill site showed **pH=7.82 and conductivity<50 µS** on an estimated flow of 780 gpm. The test was conducted during dry weather in September,

1996. During snowmelt or storm runoff, metals in the tailings may dissolve and migrate to the creek.

Quad Name: Oh-Be-Joyful

Site #: 318/4314-02

Site Name: Lower Augusta Basin - Part 1

Description and pertinent facts: The inventory site lies in the lower part of Augusta Basin and is accessed by FR-734.2A, a rough 4WD road that travels up the northern side of Poverty Gulch. This road branches from FR-734 in the townsite of Pittsburg and terminates at the Augusta Crosscut Tunnel (feature #105). Talus covers the last 1.2 miles of the road, which is inaccessible for 4WD use. In the past, a large diameter culvert placed in Poverty Gulch Creek allowed motorized vehicles to cross the creek and reach the tunnel. The culvert has washed out and a 50' section of the road does not exist where the culvert once lay. Although patented mining claims covered much of this area, the USFS has purchased most of these claims.

Previously, the Colorado Division of Mined Land Reclamation did reconnaissance in this area. This information can be found on "Colorado Inactive Mine Inventory Problem Area Data Form" #08-051-0929-18/14-01. Features #47 and #48 described on the PAD form correspond to features #101 and #105, respectively, of this inventory site.

Geologic Quadrangle Map GQ-578 (Gaskill and others, 1967) shows the geology for the Augusta Basin area. Altered and highly fractured beds of the Mancos Formation underlie most of the inventory site. A number of quartz monzonite and granodiorite porphyritic dikes radiate from the quartz monzonite Augusta stock. The dikes crosscut and intrude into Mesaverde and Mancos sedimentary rocks.

Feature #: 201

Environmental Degradation Rating: 3

Features #101, #102, and their common dump #201, are on private land, but water affected by these features flows onto public land. Feature #101 is an open adit driven in an 8'-wide iron-stained breccia zone. Host rock is black slate and shale. A 6-inch- to 8-inch-wide vein with chalcopyrite, black sphalerite, and galena is exposed above the 5'x 5' entrance. The inner workings trend S.42°W. for a distance of 17', passing by internal shaft #102. A 1.5'-high berm at the entrance of adit #101 partly dams mine water, which is dripping from the ceiling and flowing from shaft #102. White salts coat the walls and ceiling. About 0.5 gpm mine water seeps through the berm and percolates into dump #201.

The 4'x 4' opening of shaft #102 is on the floor about 3' inside adit #101. The shaft is 21' deep and is completely flooded with milky water with **pH=5.18 and conductivity=100 µS**.

Dump #201 is about 35 cubic yards of waste rock stained bright orange-red. The top is 8'x 15', and the face is 140' long and has a slope angle of 35°. The toe extends into Augusta Creek, and a small amount of water seeps from the toe and enters Augusta Creek.

Feature #: 205

Environmental Degradation Rating: 3

Ellis (1983) describes the Augusta vein, mine, and crosscut. The name "Augusta Mine" is on the Oh-Be-Joyful quad at the location of the Augusta Crosscut Tunnel. The Augusta Crosscut Tunnel connects to six upper levels. The total length of the underground workings is 2,500' of crosscut and 3,000' of drifts. The vein reportedly contains native silver, quartz, arsenopyrite, galena, and sphalerite.

Feature #105 is the Augusta Crosscut Tunnel. The entrance is 6' high by 6' wide and is at the base of a 30'-high wall of highly fractured and iron-stained rock. This adit is in competent rocks, follows the contact between black Mesaverde shale and a 25'-wide quartz monzonite dike, and trends along a bearing of N.30°W. for a distance of more than 1,000'. The Augusta vein strikes N.65°E. to N.70°E., dips 80°E., and comes in at a skewed angle to the dike. Timbering supports the ceiling beginning 255' from the entrance. The ceiling and walls are stained orange and are covered with white crusts of salts. A foot of running water covers the entire length of the floor. Water test #304, taken inside adit #105, yielded a **pH of 7.92 and a conductivity of 200 µS**. This water drains from the entrance at a rate of about 40 gpm, fans out over the southern portion of the top of dump #205, merges with a small creek that runs along its southern flanks, and eventually discharges into Augusta Creek. This crosscut adit probably drains virtually all of the workings of the Augusta vein above this point.

Feature #205 is a 2,680-cubic-yard dump visible for a great distance. The top is 56' long, the body is 78' wide, the face is 110' long, and the slope angle is 36°. Waste rock varies in composition from quartz monzonite to black shale and slate, and an assortment of sulfide minerals occur. Brown waste rock has a mosaic appearance with base metals occurring in a matrix of white dolomite. Two-inch- to 8-inch-wide pyrite veins are surrounded by a porous crumbly material in monzonite country rock. Some of the shale hosts argentiferous galena and 4-inch-wide veins of marcasite containing inclusions of pyrite. A few small pockets of native silver occur throughout the waste rock. The waste rock has an overall yellow to orange-brown color.

Water emerges from the toe of dump #205 in several separate effluent channels that have an average flow rate 15 gpm. These channels merge, and the effluent flows along a 220'-long moss-covered corridor and combines with the effluent from adit #105. White salts coat pyrite, chalcopyrite, and galena that are in direct contact with the clear water that drain from the toe. Water test #303, from the dump effluent before it merged with the adit discharge, showed **pH=7.90 and conductivity=200 µS**. Aquatic life is under some of the rocks at the test site. Water sample #318/4314-02.306 was collected about 100' below the toe of dump #205, just below the confluence of adit #105 effluent with the discharge from the toe of dump #205. The **pH=7.54 and the conductivity=287 µS** on a measured flow of 200 gpm. Lab results, shown on the table below, indicate that none of the measured parameters exceeds state standards, and that the water is relatively clean.

A 40' long and 25' wide platform is below the top of the dump next to the southern flank. The platform supported the frame for an aerial tram tower. Ore produced from the various levels of the Augusta Mine was loaded into buckets, transported down the tram system, and off-loaded into bins at the mill. The mill site, which is discussed in the previous site description, is at the end of the tram on the east side of Poverty Gulch.

Sample #318/4314-02.306; hardness = 131 mg/L; Upper Gunnison River segment #10

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	8	50 (acute)	below standard
Iron (trec)	300	1,000	below standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	<50	87**	below standard
Cadmium	<0.25	1.4	below standard
Calcium (CaCO ₃)	47 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	<4	15	below standard
Fluoride	0.60	2 mg/L**	below standard
Iron	<10	300	below standard
Lead	<1	6	below standard
Magnesium	3.2 mg/L	no standard	n/a
Manganese	40	50	below standard
Molybdenum	72	no standard	n/a
Nickel	<20	117	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.1 (on 3/2/98)	below detection limit
Sodium	2.5 mg/L	no standard	n/a
Sulfate	88 mg/L	250 mg/L	below standard
Zinc	38	133	below standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

Quad Name: Oh-Be-Joyful

Site #: 319/4305-02.100; 200

Site Name: Standard Metals Mine and Surrounding Area

Environmental Degradation Ratings: 1; 2

Description and pertinent facts: This inventory site contains some of the most highly polluted areas and most severely degraded riparian corridors of Elk Basin. Four USFS roads access this

inventory area, FR-732.1C, FR-732, FR-826.1D, and FR-585. FR-732.1C approaches from the west via Independence Basin. FR-732 and FR-732.1B come in from the south. FR-826.1D approaches from the southwest via Copley Lake, and FR-585 comes in from the northeast via Evans Basin. Until the summer of 1997, all roads leading into Elk Basin were blocked by locked gates on private land or by naturally occurring landslides and/or avalanches. During the early part of July of 1997, the power company for the town of Crested Butte removed the log jam that was blocking a section of FR-732, which is the most direct route to the Standard Metals Mine. Elk Basin receives a minimal amount of public visitation. Most public use of Elk Basin is by hikers and equestrians, although some ATV's and motorcyclists visit the inventory site.

Personnel from the Colorado Division of Mined Land Reclamation visited the Standard Metals Mine on 8/14/80. Information regarding their findings is included in the "Colorado Inactive Mine Inventory Problem Area Data (PAD) Form" #051-0929-20/05-01. Feature #100, discussed below, corresponds to feature #47 of the PAD form. The PAD form also provides information under the "Drainage/Water Sample" heading for water sample #75, collected in 1980. This sample represents water flowing from adit #100 and draining through a pipe that is located above the largest tailings pond, about 200' from Elk Creek. Estimated rate of flow was 0.3 cubic feet per second and the **pH was 5.0**. Precipitates and sludge deposits were in the site drainage and receiving stream.

Features #100 and #200 are on patented mining claims currently held by Standard Metals Corporation. Water tests #300-#305 were conducted on patented claims and provide background data pertaining to water degradation. Water test and sample #307 was from public land.

Feature #100 is an open adit trending N.64°E. along the Micawber Lode. The lode is within a brecciated fault zone about 25' wide. The adit opening is 6' high by 6' wide, and the inner workings comprise several levels and extend for well over 880'. Timbering at the portal extends 25' underground. Water discharges from the mine at an estimated rate of 10 gpm. Water test #303, taken inside adit #100, yielded a **pH of 6.74 and a conductivity of 400 µS**. Deposits of orange, jelly-like masses of suspended solids are in the water, and ferric hydroxide precipitates up to 4-inches deep cover the floor.

A small containment pond below and just to the north of a tram line is the first to receive effluent from adit #100. This pond has a diameter of about 120' and reaches a maximum depth of 8'. The water has a blue-green hue and is up to 4' deep. Water from the small pit flows from the southern section of its dam, travels along an orange-stained corridor for a distance of 75', and then drains into a larger pond.

The larger containment pond has a diameter of about 300' and is 15' deep. The water level in this pond reaches a maximum depth of 4'. An orange "bathtub" ring lines the inside walls of this pond, indicating that the water level once reached a maximum depth of 10'. Sludge 8- to 15-inches thick covers the pond bottom. Water test #300 was taken in the large settling pond and showed **pH=4.18 and conductivity=300 µS**.

Neither pond is lined with plastic or rubber materials. Both ponds, to some degree, precipitate out dissolved metals and settle out suspended solids. The larger pit contains most of the contaminated water, however, some of the mine effluent percolates through the waste rock and emerges at several seeps along the toe of the dam, then discharges directly into Elk Creek. Water test #301, taken along the toe of the larger settling pond, represents six areas where water was seeping through the waste rock of the dam. Values for the **pH ranged from 3.19 to 3.25, and the conductivity ranged from 800 μ S to 1000 μ S** on 1 to 2 gpm flow rates. All of the seepage areas are deep red to dark-orange, and ferric hydroxides have precipitated to depths of 3 to 6 inches. The east bank of Elk Creek is stained orange from the effluent draining from the toe of the dam. The remaining creek bed contains white salt deposits. Aquatic life is absent from the water.

Feature #200 is the combined waste rock at this site. Because the waste rock is separated into distinct areas, this feature has been subdivided into features #200-A, #200-B, and #200-C with a combined volume of 3,450 cubic yards. Feature #200-A is an elongated dump that is on the west side of Elk Creek and still has mine track on its top. Elk Creek has eroded the eastern flank of dump #200-A. Feature #200-B consists of a series of large dumps on the east and north sides of the large containment pond. Some of this material is rich in sulfides. Feature #200-C consists of several large piles of waste rock whose tops have been leveled by a bulldozer.

All of the dump material of feature #200 has a very strong H_2S odor, and the odor is especially strong where the waste rock is saturated with, or is in contact with, mine or creek water. Waste rock includes the following minerals: sphalerite, bornite, chalcopyrite, marcasite, pyrite, and galena. These minerals occur in veinlets, seams, and pockets hosted in highly altered quartz sandstone and rhyolite.

Elk Creek was tested above, at, and below the Standard Metals Mine. Water test #305 taken in Elk Creek upstream of the mine showed the **pH was 7.25 and the conductivity was < 50 μ S** on a flow of 5 gpm. The creek bed is free of white salt deposits and iron precipitates. Apparently healthy riparian plants grow along the banks. Aquatic insects and larvae live beneath the rocks and swim in the clear water. A few pieces of mineralized rock are in the creek bed. Water test #302 was taken in Elk Creek near where the effluent seeps merge. This test yielded **pHs ranging from 6.12 to 6.35 and an average conductivity of 300 μ S**. Where the creek is in direct contact with dump #200-A, white salt deposits stain its bed. The salts leach out of the waste rock, coat the lower flanks of dump #200-A, and mark the level at which water seeps from the toe. The opaque to cloudy water of Elk Creek flows at a rate of 20 gpm. Water test #307 and sample #319/4305-02.307 were collected on public land about 250' downstream from the southern edge of the large settling pond. The **pH was 6.36, the conductivity was 319 μ S**, and the rate of flow was estimated to be 12 gpm. Orange ferric hydroxide precipitates stain the creek bed and a white film coats the rock surfaces. Aquatic insects and larvae do not live in the water. Lab analyses of the sample, shown on the table below, indicate concentrations of cadmium, manganese, and zinc greatly exceed state standards. Iron, copper, and lead concentrations are also above standards.

Wilderness Land Trust is in the process of buying the patented claims that include the Standard Metals Mine. This mine is the largest source of degraded water affecting Elk Creek, and the reach of Elk Creek below dump #200 downstream to the confluence of Elk and Coal Creeks does not support aquatic life. For this reason, the USFS is hesitant to purchase the claims from Wilderness Land Trust.

Sample #319/4305-02.307; hardness = 130 mg/L; Upper Gunnison River segment #10

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	1,000	1,000	1 x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	<50	87**	below standard
Cadmium	42	1.4	30 x standard
Calcium (CaCO ₃)	45 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	39	15	2.6 x standard
Fluoride	0.14	2 mg/L**	below standard
Iron	660	300	2.2 x standard
Lead	8	6	1.3 x standard
Magnesium	4.2 mg/L	no standard	n/a
Manganese	1,700	50	34 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	117	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.1 (on 3/2/98)	below detection limit
Sodium	2.1 mg/L	no standard	n/a
Sulfate	140 mg/L	250 mg/L	below standard
Zinc	8,000	133	60 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

Quad Name: Oh-Be-Joyful

Site #: 320/4305-03

Site Name: Upper Elk Basin - Central Part 2

Description and pertinent facts: Upper Elk Basin is in a fairly remote location that few people ever visit. FR-732 accesses Elk Basin from the southeast via Evans Basin. To use this route, it is necessary to acquire permission to pass through two locked gates on private property owned by

Cyprus Minerals. FR-826.1D accesses Elk Basin from the southwest, passing by Copley Lake and through some private land. A locked gate blocks this road above the Forest Queen Mine. Most people who enter Elk Basin come by foot, ATV, motorcycle, or horseback.

An intensely mined area is in the upper central portion of the basin. This inventory site includes mine features that explored rich lead, silver, and copper veins with a general trend of N.30°E. Features #103, #203, #104, #204, #106, #206, #107, and #207 are on patented mining claims. The remaining features that were inventoried within this site are on public land.

Feature #: 103, 203

Environmental Degradation Ratings: 2

Feature #103 is a partly caved adit with a 5'x 5' opening and a length of more than 270'. An iron-stained drainage corridor extends from the adit entrance, crosses some mine tracks, follows an old mine road on the east side of dump #203, and also follows the west flank of dump #203. The drainage corridor was dry during the inventory in late August, 1996. During snowmelt and other times of higher groundwater levels, this drainage corridor apparently transports degraded water from adit #103 to Elk Creek, which is about 500' away. Two subsidence features are above this adit, and are discussed in the **Physical Hazards** section of this report.

Dump #203 contains about 450 cubic yards of yellow and red-brown waste rock with abundant black sphalerite, galena, chalcopryite, and pyrite. A strong sulfurous odor emanates from the dump, which is nearly barren of vegetation. Ferric hydroxide precipitates occur at the toe of the dump where seeps emerge during wetter periods. The seeps were dry during the inventory, and no water tests were obtained.

Feature #: 204

Environmental Degradation Rating: 2

Dump #204 is associated with another long adit, is directly above adit #103, and contains about 600 cubic yards of waste rock similar to that of dump #203. Vegetation is sparse on this dump, which emits a strong sulfurous odor. Erosion has oversteepened the south face, and a yellow-stained drainage corridor borders the west flank. Although dry during the inventory, the staining suggests that during times of surface runoff, this drainage corridor transports degraded water toward Elk Creek.

Feature #: 206, 207

Environmental Degradation Ratings: 3

Dumps #206 and #207 are associated with adjacent shafts above adit #104, and the dumps are somewhat mixed. The combined volume is about 90 cubic yards, and both dumps have abundant sulfides. Vegetation is sparse on both dumps. Dump #206 is mostly gravel- and sand-size material with quartz-pyrite veins and a strong sulfurous odor. Dump #207 is mostly cobble-size, orange- and black-stained material with abundant black sphalerite, galena, pyrite, and chalcopryite.

Feature #: 109, 209

Environmental Degradation Ratings: 3

Feature #109 is a 6'-long adit that connects to shaft #110. This adit follows a 1'-wide vein that trends N.56°E. Rhyolite hosts the vein, which contains abundant copper, lead, zinc, and iron sulfides. A 55'-long trench connects the entrance to the top of dump #209. A 10'-high wall on the west side of this trench is covered with veins and smears of crystalline pyrite. An orange-red stream of effluent flows from adit #109, travels down the trench, and fans out onto a portion of dump #209.

Dump #209 includes waste rock from adit #109 and shaft #110. The yellow waste rock has been spread out and leveled by heavy equipment, and FR-585 crosses the toe and southern portion of this dump. An elongated pile of ore has been stockpiled along the eastern edge of the trench. Two smaller ore stockpiles are at the southern end of the trench. Numerous small (<10 cubic yards) piles of waste rock lie along the southern edges of the leveled-off top and are positioned along the toe. The top is 120' long, the body is 95' wide, the face is 15' long, the slope angle is 20°, and the volume is about 320 cubic yards. A natural drainage channel is along and cuts across the eastern portion of the dump. Several shallow ponds are in this drainage channel along the eastern flank of the dump. During precipitation events and spring runoff, the large surface area of feature #209 accelerates the process of base metals leaching from the rich ore and waste rock. This large area also provides a long corridor for mine water to flow across and interact with waste rock.

Water test #307, conducted within adit #109, yielded a **pH of 6.58 and 200 µS**. This water seeps through the entrance berm and into the trench at a rate of 1 gpm. Orange precipitate stains the sides of the trench, and deposits of sludge accumulate on its bottom to depths of 1 to 3 inches. Orange deposits of sludge also occur in the drainage channel that cuts across the eastern flank of dump #209. Aquatic life is absent in water flowing from adit #109 and in the nearby creek.

Orange precipitates stain a portion of FR-585 and part of the toe of dump #209. Ferric hydroxides coat the surrounding marsh grass, and standing water on the road has a blue metallic sheen on its surface. Water test #308 was taken below dump #209, south of FR-585, from clear water in the small drainage channel that passes along the toe of dump #209. Values for this test were **pH=7.14 and conductivity=300 µS** on a flow of 2 gpm. This drainage channel is part of the headwaters of Elk Creek.

Water test #309 came from the natural stream that flows parallel to and is along the east side of dump #209. The flow rate was about 3 gpm, and **pH=7.37 and conductivity<50 µS**. Brown algae lines the bottoms of the natural stream channel and surrounding shallow ponds.

Feature #: 110

Environmental Degradation Rating: 3

Shaft #110 is 14' above and connects to adit #109. This shaft ends at the floor of adit #109. Rock has sloughed in the shaft opening and has calved from the shaft walls, building a berm to dam mine water to a depth of 10 inches in adit #109.

Quad Name: Oh-Be-Joyful

Site #: 320/4305-05

Site Name: Elk Basin - Upper Northeast Flank

Description and pertinent facts: . This inventory site is on the upper eastern flanks of Elk Basin. Access to these features is via FR-585 and FR-732.1B. Elk Basin is a northeast- to southwest-trending feature whose upper reaches start along the southern slopes of Scarp Ridge. This basin is the headwaters of Elk Creek, a major tributary of Coal Creek. Elk Creek receives water draining from several mine sites, and the upper 2/3 of the creek does not support macroinvertebrates. Portions of the creek bed contain white salt deposits, and orange ferric hydroxides stain the majority of the creek bed. Elk Creek discharges directly into Coal Creek, which constitutes the municipal water supply of Crested Butte.

Elk Basin contains a number of parallel and transform faults trending along a general bearing of N.37°W. They displace sedimentary rocks, dikes, and intrusive sheets in the upper half of the basin. Base-metal-bearing veins follow these faults, and the majority of prospects and mine features are located along the veins. The upper central portions of the basin contain large outcrops of gently dipping, glaciated Ohio Creek Formation conglomerate. The conglomerate is blue-green and contains red subrounded pebbles of jasper. Several sills of quartz monzonite porphyry are offset by faults and crop out in the central portions and western flanks. Deposits of iron oxides generally lie along the contact zone formed by the monzonite intruding into the sedimentary layers. The head and upper flanks of Elk Basin contain altered, banded layers of Wasatch Formation shale, siltstone, and mudstone.

The major mineralized fault-fissure systems of Elk Basin include the Micawber, Elk, and Silver Deal Lodes (Hallowell, 1883), and most mine features are along these lodes. Features #103, #203, and #204 are on public land

Feature #: 103; 203

Environmental Degradation Ratings: 3; 2

Feature #103 is an open adit with a rounded entrance that is 5' high by 5' wide. The inner workings extend more than 350' along a 2'-wide vein that trends N.72°E. Old, rotten log beams lying on the floor were once used as roof supports. Water runs down the adit walls and covers the floor to a depth of 1.5'. Water test #300, taken inside adit #103, yielded a **pH of 6.62 and a conductivity of 100 µS**. Yellow to orange deposits of sludge and suspended solids are in the water. Green moss carpets the walls and ceiling near the entrance. Mine water drains from the adit at a rate of 5 gpm, travels along an 8-inch-wide drainage channel for 23', and then fans out over the top of dump #203. Deposits of sludge are in the drainage channel, and bright orange to yellow ferric hydroxides stain the top of the dump.

Feature #203 includes two adjacent and partly mixed dump piles. The piles share a common top, which is 45' long and slopes gently to the west. The combined width is 37', the steepest slope face is 45' long, the slope angle is 32°, and the combined volume is about 580 cubic yards. The southern dump is blue-gray and contains few base-metal minerals. The northern dump is yellow-

orange to dark-brown to black and contains massive amounts of chalcopyrite, pyrite, pockets of galena, and veins of black sphalerite.

Mine water fans out over the top of both dump piles and seeps into their upper faces. Mine water saturates most of both dumps, and the waste rock from the northern dump emits a strong odor of hydrogen sulfide. Water emerges from the dump toes, which are approximately 150' north of FR-585, flows across the road, and drains into a large grassy marsh. Water test #301 came from the toe of the north dump pile of feature #203 and yielded a **pH of 4.52 and a conductivity of 200 μ S** on an estimated flow rate of 4 gpm. Ferric hydroxides stain portions of the road where the water flows. The marsh receiving effluent from adit #103 is to the west of the toe. Patches of the marsh grass are stained orange, and a blue metallic sheen coats the surface of the water.

Feature #: 104

Environmental Degradation Rating: 3

Feature #104 is a vertical prospect pit on the east side of an old road that leads to adit #103. This pit is 6'x 4'x 11' deep. One foot of dark brown water is at the bottom of the pit. On the west wall, sandstone hosts a 3-inch-wide quartz vein. The sandstone is highly fractured, is stained orange with iron oxides, and is barren of base-metal enrichment. Water test #302, taken in the standing water in pit #104, showed **pH=4.98 and conductivity<50 μ S**. Green algae grows below the water surface and covers the walls and bottom of the pit. This pit water does not support aquatic life, nor do orange precipitates form on the walls.

Quad Name: Oh-Be-Joyful

Site #: 321/4306-01

Site Name: West Side of Redwell Basin

Description and pertinent facts: The inventory site is in the middle of Redwell Basin. All mine features are on USFS-managed land. The site is accessed by FR-585, which branches from FR-734, crosses Slate River, and makes a series of switchbacks up lower Wolverine Basin until rounding a precipitous ridge and entering Redwell Basin.

The inventory site is within altered shale, mudstone, and sandstone of the Mesaverde Group. Mancos Shale underlies the northern part of the inventory site and lower portion of Redwell Basin. Most of the mine features explored fault-controlled, base-metal-enriched quartz veins.

Feature #: 103

Environmental Degradation Rating: 3

Feature #103 is a vertical shaft that is at an elevation of 10,700'. The shaft lies approximately 85' above and directly in line with adit #102. The bottom is partly filled with colluvium and submerged under 4' of clear water. Orange precipitates stain the walls and floor and no aquatic life was observed in the water. Water test #302, obtained from shaft #103, yielded a **pH of 3.69 and a conductivity of 100 μ S**.

Feature #203 is an 18-cubic-yard dump. The top is 5' long by 12' wide. The face is 55' long, has a slope of 34°, toes out in the trench in front of adit #102, and shows evidence of sheet wash and gully erosion. The yellow-orange, gravel-size waste rock has a hard crust on the surface and contains abundant lead, zinc, and iron sulfides. Sandstone outcrops adjacent to the dump are stained bright yellow from runoff flowing over the surface of dump #203.

Feature #: 110

Environmental Degradation Rating: 3

Feature #110 is a 27'-deep vertical and partly filled shaft whose bottom is submerged under 8' of clear blue-green water. Shaft #110 is about 130' north of FR-585 and has an 8'x 5' surface opening. A 6-inch-wide quartz-pyrite vein is on the west wall. Water test #303 came from shaft #110 and showed **pH=3.89 and conductivity=100 µS**. The conductivity was lower than expected, considering the abundant sulfide minerals that are in contact with the water.

Feature #210 is a bright yellow-orange 45-cubic-yard dump that is easily visible from the road. The top is 8' long, the body is 16' wide, the face is 33' long, and the slope is 27°. Disseminated pyrite is abundant, along with 3- to 6-inch-wide quartz veins containing 0.5- to 2-inch-wide veins of massive crystalline pyrite. Some veins of black sphalerite occur alongside the pyrite.

On 10/2/96, Daryl Gusey (USFS geologist) supervised the backfilling of feature #110 with waste rock from dump #210. This shaft has been reclaimed and the 8' of standing water was absorbed into the fill material.

Physical hazards regarding this inventory area are discussed in the **Physical Hazards** section of this report.

Quad Name: Oh-Be-Joyful

Site #: 321/4306-02.105, 205

Site Name: Daisy Mine and East Side of Redwell Basin

Environmental Degradation Ratings: 2

Description and pertinent facts: This inventory site is on the middle eastern slopes of Redwell Basin and is accessed by FR-585. The site includes two areas, each containing a cluster of abandoned mine features. The northern area contains three adits (features #100, #104, and #105) on patented mining claims. The upper portions of dumps #200, 201 and #205 are on patented claims, but the lower portions appear to be on public land.

Additional information pertaining to the upper and lower adits (features #104 and #105, respectively) of the Daisy Mines can be found on PAD form #08-051-0929-21/06-01 done by the Colorado Division of Mined Land Reclamation in 1980. Comments in section #85 of the PAD form pertain to feature #105 of this inventory site and report the **pH for effluent from adit #105 was 3.5** Comments also stated "Redwell Basin should be looked at carefully-there are a number of large holes at the Daisy Mine, some of which the operators were bulldozing closed".

The public frequently used FR-585 during the summer of 1996. This road is a favorite route for 4WD enthusiasts, motorcycles, backpackers, and mountain bikers. A 4WD vehicle can only travel part of the way up Redwell Basin before being stopped by fallen trees and scree that cover the road. In the upper bowl of the basin, scree covers most of the road, which is reduced to a foot trail. The public has visited several of the adits of this inventory area, for the mines contain footprints in their inner workings and on the top and face of some of the dumps. Access to the mine features is fairly easy, for numerous side roads branch from FR-585 and traverse the various levels of the eastern flanks of the basin.

Redwell Basin is in a varied and complex geologic setting. The lower portions of the basin are mostly composed of alternating layers of Mesaverde Group sandstone, siltstone, and shale, locally metamorphosed to slate and hornfels. Quartz monzonite breccia zones cut these sedimentary rocks, which are highly fractured and faulted, and a rhyolite plug is near the southern flank of the Mount Emmons stock. The shale and slate range from dark-gray to blue-black, and the sandstone and siltstone are gray, light-green, and buff. Fractures in the sedimentary rocks are enriched with iron oxides. Mesaverde Group rocks on the eastern flanks and in the upper central portions of the basin are much more enriched in iron than those of the western and lower central portions. The majority of the rich base-metal veins crop out on the eastern side of Redwell Basin, consequently, this area was more intensely mined.

Many of the mine sites in this inventory area contribute to environmental degradation of surface and groundwater in Redwell Creek. Details of features not discussed below are available in the database. Features discussed below are only the most significant. Features on private land are only discussed if "significant" or "potentially significant" degradation attributed to them extends onto public land.

Feature #105 is the lower level of the Daisy Mine. Most of the water from the upper levels of this mine discharges from the filled opening of adit #105. Material from dump #204, the upper Daisy adit, fills the portal of adit #105.

Feature #205 is a massive bi-level dump containing an estimated volume of 1,350 cubic yards. The waste rock is mixed with material produced from the construction of the road and with talus. The upper and lower levels of the face have a combined slope length of 170' and an average slope angle of 36°. The toe fans out onto the basin floor. The top of the dump forms a wide platform that is 40' long by 83' wide. Several piles of gray mineralized rock with abundant pyrite, possibly ore stockpiles, are on dump #205. Effluent discharging from adit #105 is in contact with and saturates these piles, resulting in a strong iron sulfide odor. Ore consists of boulder- to cobble-size pieces of shale containing massive amounts of disseminated galena and veins of pyrite, sphalerite, and chalcopyrite.

Clear water flows at about 1 gpm from the filled entrance of adit #105 onto the top of dump #205. Water test #300, taken at the entrance of adit #105, yielded a **pH of 2.39 and a conductivity of 900 µS**. The effluent flows over the upper face, across FR-585 for 30', down the face of the lower level of dump #205, then combines with degraded red-orange water that is

seeping from the toe. The combined effluents travel down a braided channel for approximately 350' to Redwell Creek.

On 8/8/96, water test #301 was taken from a drill hole that is cased in 4-inch-diameter white PVC pipe. Values of this test were **pH of 2.48 and conductivity of 500 μ S**. The drill hole originally had 1.5' of pipe protruding from the ground and had a protective cap cemented to the top. This section of pipe was probably broken off by a vehicle, because the broken off section of pipe lies in the cutbank of FR-585, about 10' from the drill hole. Clear water flows from the pipe at an estimated rate of 5 gpm, fans over the road, and travels down a drainage channel for about 400' before merging with Redwell Creek. A mushroom-shaped, 8-inch-high ferrosinter mound on the north side of the hole was produced by iron oxides precipitating out of solution. Precipitates from this drill hole effluent stain the road and drainage channel a deep red-brown color. On 10/3/96, another water test was conducted at the drill hole, and water sample #321/4306-02.302 was collected. The **pH=2.98 and the conductivity=784 μ S**. Lab results, shown on the table below, indicate concentrations of **cadmium, copper, iron, lead, and zinc exceed state standards by 2 or more orders of magnitude**. Aluminum, manganese, and copper concentrations exceed standards by more than an order of magnitude, and arsenic and fluoride concentrations are at or slightly above standards. It is unclear if this metal-rich water is completely natural, or is a mixture of natural and mine-affected groundwater.

The upper bowl and eastern flanks of Redwell Basin are major sources for both natural and mining-related water degradation in this watershed. Runoff flowing over the weathered pyrite-rich felsite and altered sedimentary rocks may lower the pH in Redwell Creek. Base-metal contamination and increased conductivity levels in the creek may be attributed to the many mines and dumps.

Sample #321/4306-02.302; hardness = 24 mg/L; Upper Gunnison River segment #10

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	3,900	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	52	50 (acute)	1 x standard
Iron (trec)	54,000	1,000	54 x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	4,000	87**	46 x standard
Cadmium	94	0.38	247 x standard
Calcium (CaCO ₃)	7.1 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	570	3.6	158 x standard
Fluoride	2.0	2 mg/L**	1 x standard
Iron	54,000	300	180 x standard
Lead	1,200	0.55	2182 x standard
Magnesium	1.6 mg/L	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Manganese	1,600	50	32 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	33	below standard
Potassium	2.0 mg/L	no standard	n/a
Silver	<0.2	0.01 (on 3/2/98)	below detection limit
Sodium	0.88 mg/L	no standard	n/a
Sulfate	220 mg/L	250 mg/L	below standard
Zinc	7,400	32	231 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

Quad Name: Oh-Be-Joyful

Site #: 321/4306-03

Site Name: Upper Redwell Basin

Description and pertinent facts: All mine features of this inventory site are easily accessed by various levels of FR-585. Features #105 and #205 are on patented claims, and features #104 and #204 may be on patented mining claims. Other features are on public land.

Feature #: 101, 201

Environmental Degradation Ratings: 2

Feature #101 is an open adit that is 5' long by 4' wide by 14' long. The inner workings are steeply inclined (about 70°) and are surrounded by a wedge-shaped opening. The bottom contains an undetermined amount of dump material. The surface opening trends south along a 6-inch-wide vein composed of black, oxidized, dense mineralized rock. The vein contains pyrite, pockets of chalcopyrite, black masses of sphalerite, and disseminated galena. The vein is within a 4.5'-wide breccia zone containing angular pieces of felsite cemented with iron oxides.

Feature #201 is a 65-cubic-yard bi-level dump containing bright-yellow waste rock. Its top is 17' long, the body is 21' wide, the face is 60' long, and the slope is 31°. The upper level to feature #201 has a well-cemented surface and consists of gravel-size light-orange waste rock. The lower dump is mostly cobble-size material that is stained red-brown from precipitating iron oxides.

The lower face and flanks of dump #201 are saturated, and red-brown water emerges from the northwest part of the toe of the upper level. Water test #301 was taken at the toe of the upper level and showed the **pH was 3.76 and the conductivity was 200 µS** on a 0.5 gpm flow. Surrounding waste rock was stained bright orange, and the saturated area was stained dark red-brown. The water seeping from the toe suggests that the lower workings of the adit may be flooded. This highly degraded water emerging at the toe travels 25' before entering a drainage channel containing clear water. This channel drains an area of iron-stained colluvium, and the head of the channel lies just south of and is uphill from the upper level of dump #201. After the

two water sources merge, the combined water flows over a portion of the road and over the top and face of the lower level of feature #201. Water test #300 was taken from the creek below the toe of the lower level of dump #201 and yielded values of **pH=4.75 and conductivity< 50 μ S** on an estimated flow of 3.5 gpm. Abundant ferric hydroxide precipitates cover the waste rock in the lower level of the dump and surrounding colluvium. Green moss grows along the banks of the creek, however, the water does not contain insects or aquatic larvae.

Approximately 30' from the toe of the lower dump, the combined waters merge with a third source of water. Water in this third source originates at feature #102 (discussed below) and flows down a drainage channel that is thoroughly stained white with mineral salts.

The stream channel that receives all three sources of water represents the headwaters of Redwell Creek. Its banks and stream bed continue to be coated with a layer of white salts for a downstream reach of approximately 450', until Redwell Creek merges with a side creek that is stained with bright-orange ferric hydroxides. White precipitates do not occur in Redwell Creek below the confluence with the orange-stained tributary, but brilliant orange staining continues for a downstream reach of well over 3,500' to the confluence with Oh-Be-Joyful Creek.

The **average pH value for this 3,500' reach of Redwell Creek is about 3.7 (range was 3.37 to 3.88) and the average conductivity was 275 μ S (range was <50 to 400 μ S)**. The entire length of Redwell Creek supports a few macroinvertebrates. Aquatic larvae were not found in upper Redwell Creek, and yellow patches occur in the leaves of willows and grasses growing along the creek banks.

Feature #: 102, 202

Environmental Degradation Ratings: 3

Feature #102 is a large round prospect pit 47' in diameter and 5' deep. A semicircular dam of dump material blocks the northern side of the pit and backs up blue-green water to a maximum depth of 4.5'. The dam has been breached, and running water has cut a 1.5'-deep, V-shaped trench. Clear water with no associated precipitate flows into the pit from the south; however, salt deposits up to 1/4-inch thick line the outlet. Aquatic life does not occur in the pit water.

Feature #202 is composed of 155 cubic yards of iron-stained quartz monzonite waste rock and forms the dam mentioned above. The inner sides of the dam and those areas in contact with the contained water do not contain any salt deposits. Salt deposits accumulate only at the outlet and along the drainage corridor below the dam.

Water test #302 came from the stream (flowing at a rate of 15 gpm) that enters prospect pit #102. This stream drains the iron-stained colluvium of the upper bowl and also receives drainage from features #104, #105, #106, #107, and their associated dumps. Water test #302 yielded a **pH of 6.79 and a conductivity of <50 μ S**. Water test #303 was taken from the stream (flowing at a rate of 25 gpm) about 30' downstream of pit #102, and values were **pH=6.62 and conductivity<50 μ S**. Downstream of the pit, the creek bed and the moss and willows growing along the banks are stained a chalk-white color from precipitating salts. The moss growing

within the creek is black, however, it grades into a bright-green color higher on the creek banks. The creek bed up to the high water mark is stained white for a downstream reach of at least 500'.

On 10/3/96, water sample #321/4306-03.308 was obtained from the clear standing waters of pit #102. Approximately 8 to 12 inches of fresh snow surrounded the test site, and 1 inch of slush covered the surface of the pit water. The water, which was sampled about 1' below the surface, had **pH of 6.29 and conductivity of 77 μ S**. Lab results, shown on the table below, show zinc and lead concentrations are about 4 times state standards; other tested parameters fall within standards.

Sample #321/4306-03.308; hardness = 31 mg/L; Upper Gunnison River segment #10

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	<10	1,000	below standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	<50	87**	below standard
Cadmium	0.09	0.4	below standard
Calcium (CaCO ₃)	11 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	<4	4.3	below standard
Fluoride	0.13	2 mg/L**	below standard
Iron	<10	300	below standard
Lead	3	0.7	4 x standard
Magnesium	0.93 mg/L	no standard	n/a
Manganese	<4	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	37	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.01 (on 3/2/98)	below detection limit
Sodium	1.2 mg/L	no standard	n/a
Sulfate	31 mg/L	250 mg/L	below standard
Zinc	190	39	4.8 x standard

* Numeric standards are μ g/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

Feature #: 104

Environmental Degradation Rating: 3

Feature #104 is an open adit that drifts in 55' along a bearing of S.4°W. Outcrops of sandstone, shale, and mudstone of the Mesaverde Group surround the entrance. These beds were fractured,

altered, and enriched with iron during emplacement of a nearby felsic intrusion. The parallelogram-shaped opening to adit #104 is 4' high by 3' wide, and clear water discharges at an estimated rate of 3 gpm. The mine water is 8-inches deep and carries a significant amount of suspended solids. The adit floor and outcrops adjacent to the adit have coatings of precipitates and deposits of sludge accumulating to a depth of 1.5 inches. Water tested inside adit #104 had **pH=3.67 and conductivity=100 µS**. The mine effluent was tested again in a ditch about 10' from adit #104 and showed **pH=3.57 and conductivity=200 µS** on a 3 gpm flow.

Debris that has fallen through shaft #105 (discussed below) covers the floor of adit #104 just beyond the point where the shaft meets the adit. Water is dammed to an undetermined depth beyond the debris pile, suggesting the remaining estimated 30' of adit #104 is flooded.

Feature #204 is an 85-cubic-yard dump. Its top has a length of 20', the body is 37' wide, the face is 33' long, and the slope is 22°. The yellow waste rock is moderately to well cemented, contains abundant disseminated pyrite, and is barren of vegetation. Mineralized waste rock is iron-cemented breccia cut by quartz veins (averaging 0.5-inch wide) with galena, sphalerite, and pyrite. The breccia is derived from altered green sandstone. Effluent from adit #104 flows beneath a road base composed of scree and then flows over the top of and down through the waste rock of feature #204. The toe of dump #204 is not saturated and does not discharge water, suggesting that the mine effluent percolates into the underlying scree-covered slope.

Feature #: 105

Environmental Degradation Rating: 3

Feature #105 is an intact vertical shaft. It has a measured depth of 18', and loose debris around the lip has sloughed in and piled up on the floor of adit #104. During times of runoff, water from the surrounding area is funneled into the opening of shaft #105.

Feature #205 is a 10-cubic-yard dump with a 17'-long face and a slope of 29°. Its light-gray waste rock spreads out down the hill, past the west side of adit #104, and terminates at the top of dump #204. Much of this waste rock was moved during road construction and is mixed with the waste rock of dump #204.

Feature #: 106, 107

Environmental Degradation Ratings: 3

Feature #106 is an open 10'-long adit that follows a 6'-wide breccia zone trending S.16°W. Twelve-foot-high vertical walls of breccia surround the entrance. A 20'-long trench connects the adit with the top of dump #206. This trench receives clear water draining from adit #106 at an estimated rate of 3 gpm. A lush green carpet of moss lines the entire length of the trench. Water drips from the ceiling and runs down the moss-covered walls of the adit. An open shaft (feature #107) is within adit #106, about 6' from the entrance. The top of the shaft is level with the floor of the adit, and the shaft's inner workings are lined with log cribbing and completely flooded. Clear water flows out from the shaft at an estimated rate of 1 gpm. The water then flows over the floor of adit #106, follows the bottom of the trench, and drains out over the top of dump #206. Water test #307 came from shaft #107 and showed a **pH of 3.57 and a conductivity of 200 µS**.

Feature #206 includes waste rock from both adit #106 and shaft #107. Having an estimated volume of 50 cubic yards, the cone-shaped dump has a top that is 12' long, a body that is 25' wide, a face whose length is 23', and a slope angle that is 30°. The brecciated host rock contains veins of white quartz and stringers of pyrite. Mineralized waste rock has veinlets of pyrite and chalcopyrite housed in 6-inch-wide quartz veins. The quartz occurs as a fused mass of crystals. Some of the host rock contains vugs lined with iron-stained, needle-like quartz crystals with an iridescent sheen. Other waste rock consists of gray quartz with vugs lined with crystalline pyrite.

Quad Name: Oh-Be-Joyful

Site #: 321/4307-01

Site Name: Lower Redwell Creek Basin-Part 1

Description and pertinent facts: This inventory site is located in the middle and central portions of Redwell Basin. Features #103 and #203 are near the boundary between public land and patented mining claims. The remaining mine features discussed in this report are on public land. All features within this inventory site are easily accessed by hiking a relatively short distance from FR-585.

Feature #: 103, 203

Environmental Degradation Ratings: 2

Adit #103 has a collapsed and scree-filled entrance that bears S.44°E. into the hillside. The scree is composed of altered and highly fractured Mesaverde Group shale, siltstone, and sandstone. Secondary iron fills the fractures and joint planes, staining the rock surfaces red-orange. About 4 gpm of clear water discharges from the entrance and leaves a bright orange corridor on the top of dump #203. Water test #303, taken inside adit #103, yielded a **pH of 3.08 and a conductivity of 600 µS**. The degraded water flows down between two dump piles belonging to feature #203 before merging with another drainage channel that comes in from the northeast part of the toe.

Feature #203 consists of two dumps that have a combined volume of 980 cubic yards. The larger of the two dumps is on the northwest side of the entrance to adit #103. The top has been leveled into a broad flat bench 47' long by 63' wide. The top consists of gray gravel-size material that contains 70% disseminated pyrite. Host rock is altered quartz-cemented sandstone. Boulder- to cobble-size chunks of mineralized rock contain 6- to 8-inch-wide pyrite veins. These veins also contain a mixture of sphalerite, galena, and chalcopyrite.

Portions of the top and face of this larger dump are saturated with mine water, show secondary sulfur precipitate, and emit a strong odor of hydrogen sulfide. Iron oxides stain the remaining areas of the dump orange. Water test #302 was taken along the northeastern portion of the toe of dump #203 and showed **pH=2.73 and conductivity=800 µS**. Highly degraded water emerges from the saturated area at an estimated rate of 7 gpm. This water contains green filamentous algae and flows in a red-orange corridor of precipitating ferric hydroxides. The precipitates accumulate to a thickness of up to 1.5 inches. Plants, grass, and moss do not grow within the water or along this corridor, and needles on nearby fir trees have yellow patches.

The smaller dump of feature #203 is on the southwest side of the adit. Its top is 19' long by 24' wide. The steepest slope length for both dumps is 47', and the steepest slope angle is 28°. Waste rock for this smaller dump consists mostly of iron-rich sandstone and sparse mineralized rock.

The two dumps of feature #203 lie along the flanks of a very large talus slope. Much of the talus consists of waste rock from feature #201 of inventory site #321/4307-03.

Feature #: 105, 205

Environmental Degradation Ratings: 2

Feature #105 represents Redwell Spring, from which this basin takes its name. This feature is 30' west of Redwell Creek and 45' below a point where three streams converge. The interior of this natural pit contains overhangs of sandstone, and the bottom is rounded. The pit is 12' by 7' by 5' deep and is filled with translucent blue-green water that discharges over most of the circular lip. Air bubbles that form on the bottom and sides of the pit float to the surface. Green moss, willows, and grass grow on the southern and western edges of the lip, and the eastern and northern edges have orange deposits of sludge covered with long, yellow strands of filamentous algae. Several seeps drain clear water into the southern and western edges of the pit. The water from these seeps has a blue iridescent surface sheen. A strong odor of iron comes from the precipitates forming on the surfaces of plant material and rocks. Water test #305, taken in the translucent, blue-green waters of Redwell Spring, revealed a **pH of 3.59 and a conductivity of 200 µS**. On 10/3/96, water sample #321/4307-01.308 was obtained from Redwell Spring. Six inches of fresh snow had just fallen, so the sample was collected about 1' below the surface. The water had **pH=3.51 and conductivity=304 µS**. Sample results, shown on the following table, reveal extremely high concentrations of lead and zinc. Aluminum, cadmium, manganese, iron, and copper concentrations also significantly exceed state standards. Aquatic life was not found in the waters of this natural spring.

Feature #205 is a crescent-shaped, 55-cubic-yard mound that is 24' long, 18' wide, and 10' in height. The face is 18' long, and the slope angle is 12°. This mound represents a "ferrosinter" deposit where ferric hydroxides have precipitated from the spring water. The mound is on the northern and eastern sides of the pit. Water flows over most of the face and supports filamentous algae and patches of brown moss.

Sample #321/4307-01.308; hardness = 21 mg/L; Upper Gunnison River segment #10

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	3,900	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	12	50 (acute)	below standard
Iron (trec)	23,000	1000	23 x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	3,900	87**	45 x standard
Cadmium	61	0.33	183 x standard
Calcium (CaCO ₃)	5.3 mg/L	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Chloride	<10 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	14	3.1	4.5 x standard
Fluoride	1.4	2 mg/L**	below standard
Iron	23,000	300	77 x standard
Lead	1,600	0.4	3,700 x standard
Magnesium	1.9 mg/L	no standard	n/a
Manganese	1,900	50	38 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	29	below standard
Potassium	1.6 mg/L	no standard	n/a
Silver	<0.2	0.005 (on 3/2/98)	below detection limit
Sodium	0.82 mg/L	no standard	n/a
Sulfate	100 mg/L	250 mg/L	below standard
Zinc	6,900	28	244 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

Feature #: 106

Environmental Degradation Rating: 3

Feature #106 is an intact adit driven a distance of 23' along a yellow 1'-wide vein that trends S.50°E. into highly altered and fractured sandstone and shale. The fractured bedrock has numerous joints filled with white salts. A 4'-high berm is in front of the entrance and lies within a 19'-long trench that leads to the top of dump #206. At the adit entrance, water drips from the ceiling and flows over the berm. In addition, water from the floor may be flowing beneath the berm and percolating through the waste rock. Rubble litters the entire length of the floor, and green moss lines the walls and ceiling of the adit for 10'. Water test #307, taken inside adit #106, showed a **pH of 3.25 and a conductivity of 500 µS**. Less than 1 gpm of clear water was seeping through the berm onto the top of dump #206.

Feature #206 is an elongated, black-to orange-stained dump comprising shale and iron-stained sandstone and mudstone. The dump has a volume of 187 cubic yards, the top is 31' long, the body is 13' wide, the face is 43' long, and the slope angle is 30°. The toe is moist, suggesting mine water flows through part of the dump material and is seeping into the colluvium that underlies this feature. Vein material is yellow to orange, porous quartz with limonite-filled cavities. Wall rock contains veins of pyrite, sphalerite, and some chalcopyrite, surrounded by a sandstone matrix.

Feature #: 207

Environmental Degradation Rating: 3

Dump #207 is associated with caved adit #107 and contains about 85 cubic yards of well-cemented material. About 70% of the dump is yellow, gravel-size material rich in pyrite and

emits a strong odor of hydrogen sulfide. Mineralized rock includes pyrite, with lesser amounts of galena and chalcopyrite. The toe of the dump is dark gray and lies in the floodplain of Redwell Creek. Rills show on the 33' long face, which is barren of vegetation.

Additional Water Tests

Redwell Creek was tested in several locations in this inventory area. The furthest upstream was water test #304, taken 50' below the toe of dump #204, in one of three tributaries that constitute the headwaters of Redwell Creek. The test was from the middle creek, about 30' upstream of the confluence of the three tributaries. The creek was flowing at an estimated rate of 15 gpm and had a **pH of 6.45 and a conductivity of <50 μ S**. Dark-brown moss lines the creek bed and grows on the banks. The associated riparian corridor contains thick clumps of green willows and patches of subalpine fir saplings. Aquatic larvae live beneath the rocks and swim in the clear water of this tributary. Orange precipitates are not present.

The next downstream test was #306, taken just below the confluence of the streams mentioned above. The **pH was 3.75, the conductivity was 100 μ S**, and the combined flow rate was estimated to be 45 gpm.

Water test #301 was obtained from Redwell Creek downstream of features #104 and #105, just below where FT-404 crosses this orange creek bed. The **pH was 3.86, the conductivity was 100 μ S**, and the flow rate was estimated at 40 gpm.

The origin of the three tributaries is as follows: the easternmost stream originates at a 4-inch diameter PVC pipe on the south side of FR-585 (inventory site #321/4306-02, discussed previously in this report); the middle stream starts with runoff from the upper bowl of Redwell Basin; and the westernmost stream starts at two prospect pits draining water that precipitates white salts (inventory site #321/4306-03, discussed previously in this report).

Quad Name: Oh-Be-Joyful

Site #: 321/4307-02.100, 200

Site Name: Lower Redwell Basin-Part 2

Environmental Degradation Ratings: 2

Description and pertinent facts: This inventory site straddles Redwell Creek in the lower portion of Redwell Basin. An old spur road, now just a trail, branches off FR-585 and provides an easy access route. This spur road also connects to the trailhead of FT-404. All features are on public land.

Feature #100 is an adit whose entrance is filled with mineralized colluvium derived from outcrops above the portal. An elongated concave depression marks the entrance. Clear mine water drains from adit #100 at a rate of 1 gpm, flows through a trench, and enters Redwell Creek.

A 21'-long and 6'-deep trench connects adit #100 to Redwell Creek. Clumps of brown moss are on the lower, bottom portions of this trench. Several piles, consisting of 80% crystalline pyrite,

are on the top and southern side of the trench. Pyrite crystals have cemented together, forming a hard, 2- to 4-inch-thick layer that is in direct contact with the creek. Chunks of pyrite-rich rock are dispersed along the creek bed for more than 100'.

Feature #200 is a yellow, 43-cubic-yard dump that is located above and on the east side of adit #100. The top is 10' long, the body is 12' wide, the partly eroded face is 18' long, and its slope is 31°. The lower flanks and northwestern portion of the toe have been eroded away. Mineralized waste rock contains pockets of black sphalerite housed in a matrix of porous pyrite, with lesser amounts of galena and chalcopyrite. Maximum vein width is 2'. Wall rock is porous, brecciated sandstone stained dark red to yellow-orange. Waste rock emits a strong odor of hydrogen sulfide.

Three water tests were obtained in Redwell Creek within this inventory area. These tests are discussed starting with the furthest upstream test of this inventory area and ending with the lowest test. Water test #300, obtained from just below the toe of dump #200, yielded a **pH of 3.87 and a conductivity of 100 µS**. Clear water was flowing at an estimated rate of 100 gpm. The rocks in the creek bed and the plants growing along the banks are stained orange from iron-oxide precipitates. Aquatic life did not occur in the water or beneath the rocks. Water test #303, from about 50' below the toe of dump #214, showed **pH=3.86 and conductivity=100 µS** on a 120 gpm flow. Clear water, orange-stained rocks, lack of aquatic life, and green willows and spruce/fir saplings are items that characterize this test site. Water test #302 was taken below the toe of dump #210 and just above a series of falls. The **pH was 3.96 and the conductivity was 100 µS**. Clear creek water was flowing at an estimated rate of 120 gpm. Orange ferric hydroxides stain the creek bed and its banks. A good, green vigor is in the growth of the riparian plants, but, aquatic life does not exist in the water.

Quad Name: Oh-Be-Joyful

Site #: 321/4307-03

Site Name: Lower Redwell Basin-Part 3

Description and pertinent facts: The inventory site is halfway up the eastern flank of Redwell Basin. Two short adits (features #100 and #101) are on the east side of FR-585, in a frequently visited area. Because of the popularity of this road, these features should be grated or backfilled for public safety.

Around the adits, bedrock consists of fractured shale and sandstone. Secondary iron oxides fill the fracture and joint planes, staining the surfaces various shades of yellow, brown, orange, rust, and red. The intense alteration and mineralization is probably related to a nearby porphyry intrusion. The large volume of mineralized talus, the abundant vein material, and a large surface area of orange waste rock, all contribute to lower the pH and increase the conductivity in the surrounding area.

Feature #: 200

Environmental Degradation Rating: 3

Site #: 323/4318-02

Site Name: Headwaters of East River, South of Emerald Lake

Description and pertinent facts: FR-317 leads to the inventory site from the town of Gothic. A short section of an old mine road branches off FR-317 and curves down the slope towards the west to end on top of dump #201. This road is blocked at its beginning, however, it would be easy to regrade the surface to provide access for equipment. Adits #104-#106 are accessed from and are downslope from FT-401 (Trail Riders Trail).

All mine features, except for adits #104-#106, are in orthoquartzites of the Dakota Sandstone. Features #104 and #106 are in the Fort Hays Limestone Member of the Mancos Shale. Feature #105 is just below a large outcrop of granodiorite. Most mine features were driven in fault-controlled mineralized fracture zones.

Water standing in or draining from adits #101, #102, #104, and #105 may have a significant impact to the surrounding environment. Dump #201 contains a high concentration of base-metal-sulfides in the waste rock. Highly degraded water stands inside adit #104, however, very little seeps out into a nearby intermittent stream. Highly degraded water seeps from the north flank of dump #205 and enters the same intermittent stream that lies along the north flank of dump #204. Water in a perennial creek that flows by dump #206 has low pH and high conductivity.

Feature #: 102, 201

Environmental Degradation Ratings: 3

Features #101 and #102 are open twin adits separated by a 2.5'-wide pillar of quartzite. Both adits have an initial bearing of N.47°E. Adit #101 is on the north side of the pillar, and its entrance is 6' high by 5' wide. The inner workings extend a measured length of 27' and follow a well-defined fault zone. The floor is completely flooded, and the water level reaches a maximum depth of 1.5'. Water test #301 was taken from clear standing water inside adit #101 and yielded values of **pH=6.21 and conductivity=247 µS**. A thin film of orange sediment covers the floor.

Adit #102 is on the south side of the rock pillar, and its opening is 6' high by 12' wide. The inner workings extend more than 180' and follow the south side of the mineralized fault zone. Flowing water covers the entire length of the adit, and this effluent composes the bulk of the mine water produced from both of these adits. The combined effluent discharges into East River, about 100' away. Water runs down the walls and drips from the ceiling of both adits. Secondary white growths of crystals hang from the ceiling, and orange precipitate covers parts of the walls in adit #102. Water test #302 was from running water (estimated 20 gpm flow rate) about 50' inside adit #102. Values for this test were **pH of 6.58 and conductivity of 238 µS**. Brown algae grows in the mine water along the floor.

Effluent emanating from both adits flows down a vertically walled 33'-long trench. This trench is 14' wide and has a maximum depth of 18'. Veins of sphalerite, pyrite, and chalcopyrite crop out on the north wall. Oxidized copper minerals stain part of this wall a dark-blue to turquoise color, and orange iron precipitates stain portions of the trench walls and floor. The bottom of the

trench contains sludge deposits of ferric hydroxide. Bright green moss carpets the areas adjacent to the flowing water.

Water sample #323/4318-02.311 was collected on 9/18/97 from the trench approximately 100' east of East River and about 10' west of adits #101 and #102. This sample represents the combined effluent from both adits. Lab results, shown on the table below, show the water to be somewhat high in zinc, but still within state standards. Other tested parameters were well within standards.

Sample #323/4318-02.311; hardness = 307 mg/L; Upper Gunnison River segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	12	1,000	below standard
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	250	5,000	below standard
Aluminum	<50	87**	below standard
Cadmium	1.5	2.7	below standard
Calcium (CaCO ₃)	120 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium VI	<10	11	below standard
Copper	7	31	below standard
Fluoride	0.19	2 mg/L**	below standard
Iron	<10	300	below standard
Lead	3	19	below standard
Magnesium	1.6 mg/L	no standard	n/a
Manganese	<4	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	225	below standard
Potassium	<1 mg/L	no standard	n/a
Selenium	<1	5**	below standard
Silver	<0.2	0.5 (on 3/2/98)	below standard
Sodium	0.79 mg/L	no standard	n/a
Sulfate	32 mg/L	250 mg/L	below standard
Zinc	250	275	below standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on statewide standard.

The effluent flows out of the trench and fans out over the top and northern flank of dump #201, then enters the East River. The drainage corridor that runs down the face of dump #201 is

stained bright orange with ferric hydroxide precipitate. This corridor has cut into and eroded part of the face. Water from the two adits also seeps from several locations on the lower face of dump #201. Just below its confluence with the mine effluent from adits #101 and #102 and the seepage from dump #201, the river has no orange ferric hydroxide precipitates, and the water is clear.

Water test #303 was from the East River 20' upstream from where the effluent from adits #101 and #102 merges with the river. The river water is clear and supports a healthy population of trout and aquatic life. Values of this test were **pH=7.65 and conductivity=202 μ S** on an estimated flow of 320 gpm.

Waste rock from adit #102, adit #101, and the trench was combined into a single dump and is categorized as feature #201. The total volume is estimated to be 375 cubic yards of light-gray to yellow waste rock. The top is 27' long, and the width is 46'. The face has a length of 41', and the slope is 33°. The top, which was leveled by heavy equipment, was once part of a mine road that connected to FR-317. East River is in contact with, and has severely eroded, the lower face. The waste rock contains a high percentage (>60%) of pyrite and emits a strong odor of H₂S. Mineralized rock includes abundant veins and pockets of pyrite, sphalerite, chalcopyrite, and argentiferous galena, which was the major ore mineral. Several large, sulfide-rich boulders are on top of the dump and in the river bed.

Feature #: 104

Environmental Degradation Rating: 3

Adit #104 is about 450' from the river, and sloughing black shale has nearly covered its portal. The inner workings are 5' high by 4' wide and more than 40' long. The adit follows an 8-inch-wide pyrite vein that trends N.82°E. Clear mine water on the adit floor reaches a maximum depth of 1.5'. Water test #307, taken inside adit #104, yielded a very low **pH of 1.30 and a conductivity of 442 μ S**. The walls and floor of adit #104 are not stained orange, but the air inside smells foul and has a strong odor of H₂S. Mine water seeps through the sloughed entrance, flows down a 10'-long, V-shaped trench, and soaks into the waste rock of dump #204. Moss and lichens carpet the bottom of the trench, and dark-green willows and moss mantle the top of the dump

Water seeps out of the lower part of the northern flank and toe regions of 75-cubic-yard dump #204. This water enters an intermittent stream and flows down the channel for about 50' before soaking into alluvium. The face of dump #204 is devoid of vegetation, and erosion and avalanches have removed 2/3 of the northern flank. Dark-gray to black fissile shale constitutes about 90% of the volume, and the remainder of the waste rock consists of white and iron-stained quartz monzonite. Pyrite stringers and veinlets occur in the monzonite, and veins of pyrite are mostly hosted in the shale. Pyrite-rich rock is in the dry stream.

Feature #: 205

Environmental Degradation Rating: 3

Feature #105 is a caved adit whose entrance is filled with sloughing black shale. No water seeps from the adit. The entrance is 10' from the south side of the same intermittent stream that passes

by adit #104, which is about 350' below and directly in line with adit #105. The inner workings of both adits may be connected, because vein material on dumps #204 and #205 is similar.

Dump #205 is on the west side of adit #105 and consists mostly of dark-gray to black shale. The estimated volume is 135 cubic yards. Its top, which is 12' long and 28' wide, is severely grooved and channeled. The 87'-long face has a slope angle of 35°. One-third of the northern flank has been eroded away, and the oversteepened lower portion of the northern flank is darkened and saturated by water. This water seeps out of the dump and moistens a 14' reach of the dry stream bed. Much mineralized rock lies in the stream and consists of 8-inch-wide quartz-pyrite veins. Most of this vein material comprises crumbly and crystalline pyrite, with lesser amounts of white quartz laced with pyrite veinlets and surrounded by a matrix of dark-red to dark-brown iron oxides. This matrix is 2- to 3-inches thick and very porous in nature. Salt deposits coat the waste rock at the water seeps and coat the stream channel starting below dump #205.

Water test #308 was taken just below the north flank of dump #205 and yielded values of **pH=1.22 and conductivity=537 μ S**. The test was from the intermittent creek that receives effluent from the lower northern flank at a rate of approximately 1/4 gpm. This flow rate is probably much higher during the spring months. The intermittent stream bed is coated with white salts, however, there are no orange ferric hydroxides precipitates. Lush green vegetation lines the banks, and green moss carpets the creek bottom.

Feature #: 206

Environmental Degradation Rating: 3

Feature #106 is an open adit that trends N.28°W. alongside an outcrop of white quartz monzonite. The opening is 6' high by 5' wide, and the inner workings extend for more than 35' along a quartz-pyrite vein. A 5.5'-high berm is in front of the entrance. A large chunk of roof rock has detached from the ceiling and lies on top of this berm. The inner workings are still accessible, and the floor is damp but has no standing water.

What remains of feature #206 is south of adit #106 and has a volume of 35 cubic yards of light-yellow waste rock. An unnamed perennial stream has washed away most of the dump. The severely eroded top is 2' long and 13' wide. The oversteepened and highly grooved face has a length of 53' and a slope of 36°. Most of the mineralized rock consists of pyrite-bearing quartz veins, and this material is found along the creek bed for a reach of over 200'. Much of this mineralized rock is in direct contact with running water. An outcrop of gray limestone is above and west of adit #106.

Water test #304 was from the perennial creek that flows past the south side of dump #206. This creek was tested about 15' from its confluence with the East River and yielded a **pH of 7.69 and conductivity of 221 μ S** on a flow of about 35 gpm. The test site is directly below a section of narrow and confined stream channel flanked by vertical walls of fractured and iron-stained shale. The clear creek water supports aquatic life, and a rich green growth of riparian plants line the banks. Water test #309 is from just below the toe of dump #206 in this same perennial creek. Values of this test were **pH=3.18 and conductivity=205 μ S** on an estimated 40 gpm flow. The creek bed shows no white salts or orange staining. Aquatic life is in the water, and green moss

and phreatophytes line the banks. Water test #310 is from where FT-401 crosses the same creek above dump #206. Values of this test were **pH=4.01 and conductivity=196 μ S** on an estimated flow rate of 40 gpm.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Cumberland Pass

Site #: 370/4284-2

Site Name: Jimmy Mack Mine Area

Description and pertinent facts: The Jimmy Mack Mine area is along FR-765 (Cumberland Pass Road), about 1 mile north of Cumberland Pass.

Feature #: 101**Physical Hazard Rating: 2**

Description and pertinent facts: This inclined shaft lies on private property adjacent to the Cumberland Pass Road, from which it is highly visible. A pallet partly blocks the opening, but otherwise the feature is open. Depth of the shaft is unknown, but it goes at least 15' before dropping beyond line of sight. This shaft is part of a series of shafts and adits that lie along the road in this area. Several of the other features have been sealed, with this feature being the exception.

Feature #: 103**Physical Hazard Rating: 2**

This deep (~40') shaft is located adjacent to, and is visible from, the heavily used 4WD road that goes between the Cumberland Pass Road and Duncan Hill. Some debris is caught at about 20' into the shaft, but otherwise it is a free fall to the bottom. Climbing out after a fall is unlikely (should the victim be so able after such a fall). The shaft is sheer sided and vertical with no surface indication that it is deep and treacherous. Numerous nearby pits are shallow and pose no hazard. Mitigation of the hazard could include using the adjacent dump material to fill the shaft.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Fairview Peak

Site #: 367/4282-2

Site Name: Little Anna Mines

Description and pertinent facts: The Little Anna Mine and associated workings are near the Anna Dedrika Mine, discussed below, and they are accessed the same way.

Feature #: 100**Physical Hazard Rating: 2**

This shaft and its dump material lie along the top of the highest glacial bench in this cirque and are visible from the higher surroundings. The shaft is only about 15' deep, but has sheer sides and would be difficult, if not impossible, to climb out of after a fall in. The dump material is on fairly level ground and blends in with the general shape of the landscape, contributing to the false sense of security in proximity to the shaft. The opening appears suddenly when being approached and poses

splits near feature #103. A locked gate just above and within the northern portion of the picnicground prevents the public from using motorized vehicles to access the inventory site.

All of the inventoried mine features within this site explored fault zones hosted in Dakota Sandstone or Morrison Formation (Gaskill and others, 1991). These fault zones have a general trend of about N.40°E. Orange-red to white beds of the Maroon Formation crop out on the upper southwestern flanks of Avery Peak. These beds have a steep dip of 35° to 45° to the southwest, and the tilted surfaces of the exposed bedrock funnel runoff into the steep and incised Avery Creek drainage corridor. A large and active fluvial/avalanche fan surrounds Avery Peak Picnicground. The head of the fan lies at the mouth of the constricted portion of Avery Creek.

Feature #: 103

Physical Hazard Rating: 2

Feature #103 is an open shaft whose eastern side connects to a trench bearing S.80°E. into a mineralized outcrop of sandstone. This outcrop contains a 1.5'-wide vein. The trench is 16' long, has a width of 5', and a depth of over 8'. The bottom of the trench slopes down from its eastern end into the inner workings of the shaft. The outer entrance of the shaft is 17'x 8', and the inner opening is 6'x 5'x 35' deep. Waste rock covers the bottom of the shaft, but the lower workings probably connect to adit #102. Shaft #103 has four vertical walls, and a rope would be necessary to climb out of this feature. It is 23' from the bottom of the shaft to the top of its western side. It is another 12' from the top of the shaft's west side to the top of the trench.

Dump #203 is 55 cubic yards and is on the west side of the shaft. The lower level of the old mine road ends at the top of this dump and provides the public easy access to this shaft. The top is 8' long by 17' wide, and the face is 53' long and has a slope angle of 35°. Mineralized waste rock consists of 4-inch- to 8-inch-wide quartz veins containing microcrystalline pyrite and galena.

Feature #: 107

Physical Hazard Rating: 2

Feature #107 is an intact adit with a 3'-high berm of sandstone rubble and a length of more than 55'. This berm lies directly in front of the 5'x 5' entrance. The inner workings trend N.80°E. along a 1'-wide vein rich in copper and silver. The opening to an extremely dangerous shaft lies along the south wall of the inner workings of adit #107. Because it is 26' underground from the entrance, the shaft was not assigned a feature number and is incorporated under adit #107. Water from the back of adit #107 runs along the floor and flows into the shaft opening at an estimated rate of 80 gpm. The mine water travels through the entire 56'-deep shaft to the floor and out of the entrance of adit #106. Turquoise-colored veins composed of copper carbonates are in the ceiling and walls of the adit and shaft. Log cribbing lines the lower shaft walls. The shaft opening is 6'x 5', and the measured depth is 56'. The area around the top of the shaft and the shaft walls are slippery. A person could very easily lose their footing and fall into the inner workings.

Feature #207 is a 45-cubic-yard dump whose 10'x 15' top is on the west side of the entrance to the adit. Its 66' long, yellow face has a slope angle of 35°. The iron-stained sandstone waste

rock is moderately to well cemented with iron oxides. Mineralized rock consists of dense, black, crystalline, silver- and copper-sulfides contained in a matrix of chrysocolla and sandstone. Quartz veins contain smears of azurite and malachite. The uppermost level to the old mine road stops at the top of dump #207.

Feature #: 110

Physical Hazard Rating: 2

Feature #110 is an open adit bearing N.62°E. into a steeply dipping series of sandstone beds. The inner workings follow a quartz-pyrite vein for a measured distance of 63'. A U-shaped, 8'-long trench connects the adit with the top of its dump. A very dangerous shaft lies within adit #110, about 15' from the entrance. The adit entrance is 5' high by 4' wide, and the shaft opening is 6'x 6'. The measured depth of the shaft is 59'. Water drains into the adit from its ceiling and walls, flows along the floor, and then most of the water drains into the shaft. The inner workings of the shaft are flooded. The water level is 21' below the floor of the adit, leaving 38' of submerged workings. Detached ceiling rock has accumulated into piles on the floor of the adit.

Feature #210 is a 250-cubic-yard dump consisting mostly of iron-stained sandstone. It is on the west side of adit #110, and its bright-orange waste rock spreads out onto the face of a very steep slope. The sloping top is 10' long by 13' wide. The highly eroded face is 255' long and has a slope angle of 36°. Most of the waste rock is below the surface of the old mine road. Mineralized rock contains veins of pyrite and marcasite housed in a matrix of porous and vuggy quartz.

Quad Name: Gothic

Site #: 328/4315-01

Site Name: Lower Virginia Basin

Physical Hazard Ratings: 2

Description and pertinent facts: This site consists of four adits: features #100, #101, #103, and #104; and one shaft: feature #102. All of these mine features and their dumps are on public land except for adit #103 and dump #203, which are on a patented claim.

This site is accessed by FR-739.1A, which connects to FR-739 on private land owned by Rocky Mountain Biological Laboratory. FR-739.1A is reached by following FR-739, which branches from the east side of FR-317 about 0.8 mile north of Gothic. FR-739 is a 4WD road that is heavily traveled by the public during the summer months. A locked gate at the trailhead to FT-401 (Trail Riders Trail) blocks vehicular access, and the remainder of FR-739 must be walked to the junction with FR-739.1A. A well-marked trail starts at the end of this road and follows the south side of Virginia Creek up to the lower portion of Virginia Basin. This trail then crosses to the north side of the creek and ends in a basin on the southern flanks of Avery Peak. During the summer, the public frequently uses FR-739.1A and the foot trail to climb Avery Peak.

Virginia Basin is an elongated, east-west trending basin underlain by dark-gray to black carbonaceous Mancos Shale. The overlying Dakota Sandstone is altered to orthoquartzite and

forms prominent cliffs on both sides of the lower basin. All of the mine features of this inventory site are excavated in Dakota Sandstone.

Feature #: 100

Physical Hazard Rating: 2

Feature #100 is an intact adit whose entrance trends along an initial bearing of N.38°W. for a distance of 18'. The inner workings then deviate from this bearing and follow a heading of N.87°W. along a 1.5'-wide vein for an additional 56'. The adit opening is 6' in height, 5' wide, and its inner workings have a length of 104'. The roof rock at the entrance is unstable, and numerous open fractures occur in the orthoquartzite beds that compose the walls and ceiling. Several large blocks of quartzite have detached from the ceiling and have slid partly down the walls. The blocks are on the second heading, about 27' from the entrance. The remaining portion of the ceiling and parts of the walls contain open fractures, making the entire adit unsafe for entry. The floor is damp but has no standing water. This adit is at the base of cliffs, in an area of many rock falls. A 12'-long and 8'-wide trench connects the entrance to the top of dump #200. This trench is partly filled with talus derived from the cliffs. The public does visit adit #100 on an infrequent basis, and "fresh-looking" footprints are on the floor, on the bottom of the trench, and on top of dump #200.

Feature #200 is a 145-cubic-yard dump whose bright, red-orange to orange-brown face is visible from the middle and upper portions of Virginia Basin. The top of the dump is 16' long by 12' wide, and the face is 43' long and has a slope angle of 31°. The dump toe is about 75' from the trail. Waste rock is mostly composed of gravel-size material that is moderately to well cemented with fines saturated in iron oxides. The orthoquartzite waste rock has abundant vugs and open fractures lined with quartz crystals. The mineralized rock contains pockets of black, crystalline sphalerite hosted in quartz veins. Veins of pyrite and marcasite lie next to the quartz.

Feature #: 102

Physical Hazard Rating: 2

Feature #102 is an intact and very dangerous shaft. The square opening is 5' on each side, and the shaft is 35' deep. A 16'-long trench trends N.38°E. The shaft is on the west end of this trench, and the open and eastern end of the trench connects to the top of the dump. Short, horizontal ledges protrude from the shaft walls. The bottom is dry and partly filled with waste rock. A person might be able to climb out of this feature, however, most people would need a rope. It is 22' from the floor of the trench to the bottom of the shaft. No trails access this shaft.

Feature #202 is a 165-cubic-yard dump consisting mostly of black, shaly, gravel-size waste rock. The top of this dump is 8' long by 15' wide, and its face has a length of 51' and a slope angle of 32°. Iron-stained orthoquartzite cobbles cover the lower face, flanks, and toe. The dump is on the west side of the trench, about 210' from Virginia Creek.

Quad Name: Gothic

Site #: 331/4314-01.102

Site Name: Upper Queen Basin

Physical Hazard Rating: 1

Description and pertinent facts: The inventory area is in the upper central portion of Queen Basin. All inventoried features are on public land except for shaft #102 and a portion of dump #202. Features #102 and #202 may lie within or are near the border of patented claims.

Queen Basin can only be accessed by foot or by horse because it is within the Maroon Bells-Snowmass Wilderness area. The mine features of this site are about 1.3 miles south of Copper Creek Trail (FR-739). FR-739 is a 4WD road whose bed has been washed out in many places by runoff from side drainages and avalanches. John Alf currently owns a number of patented mines in Sylvanite Basin and has a permit to drive and maintain FR-739.

At least two routes lead from FR-739 to upper Queen Basin. An unmarked, but well-established, foot trail starts on the south side of FR-739 approximately 1,800' east of where the road first crosses Copper Creek. This trail diagonally traverses up along the steep, southern slopes of Copper Creek Valley at a continuous grade and does not make any switchbacks. The trail disappears where it crosses the upper reaches of an active avalanche and landslide corridor. Beyond the avalanche chute, this trail enters the lower, northwestern portion of Queen Basin.

Another much shorter route follows an old 4WD road which branches from FR-739 about 800' from where Queen Creek crosses the road bed. The intersection of the two roads is obscured from view, however, a foundation to an old log cabin is approximately 250' south of the intersection and is visible from FR-739. The old mine road stops at a mine and mill site that is bordered on the west by a large, leveled and cleared area. A foot trail on the east side of this cleared area heads east to the west side of Queen Creek. A person must then ascend the very steep slopes above the end of this trail until reaching the well-marked foot trail that was previously described.

After the routes have merged, this trail crosses one of two perennial creeks that converge above a series of falls and below lower Queen Basin. The trail follows the western side of the second perennial creek to the upper portion of Queen Basin.

All of the inventoried mine features are in the Gothic Formation, usually along mineralized faults.

Feature #102 is an intact shaft surrounded by an adit-like entrance. The opening of the adit is 6' high by 4.5' wide, and the inner workings extend for 15'. The shaft has a 5'x 5' surface opening and is 85' deep. The shaft is flooded to within 23' below the floor of the adit. Several steep benches on the floor of the adit are covered with loose rock and descend toward the shaft. A person could very easily lose their footing on this loose material and slide into the shaft. This is an extremely dangerous shaft for anyone who chooses to enter the adit, however this feature's remote location is a mitigating factor. The public does visit Queen Basin occasionally. Numerous fresh-looking footprints are on the trail in the central portion of upper Queen Basin.

Shaft #102 is directly above and lies about 120' up the slope from the entrance to adit #104. The lower levels of the shaft may connect to the inner workings of adit #104.

Feature #202 is a 50-cubic-yard dump whose waste rock is brown to gray limestone. The top of the dump is 6' long by 17' wide, and the face is 103' long and has a slope angle of 36°. The toe of the dump surrounds the entrance to adit #104. Mineralized rock has a groundmass of hematite cut by veins of white aragonite and calcite. Smears and veinlets of malachite and azurite occur in a matrix of radial aragonite crystals. Some veinlets of pyrite and chalcopyrite occur within the calcite veins.

Quad Name: Gothic

Site #: 333/4315-1.101

Site Name: West Brush Creek

Physical Hazard Rating: 2

Description and pertinent facts: Feature #101 is a vertical shaft located near the head of West Brush Creek, 0.5 mile south of White Rock Mountain. The shaft has a 6'x 4' collar and is 12' deep. Climbing out would be difficult without assistance. No roads or trails access this shaft, which is located on a steep slope in the Maroon Bells-Snowmass Wilderness. Access is best from the end of FR-438.2A, about 3 miles away. This shaft is unlikely to have many visitors because it is in a remote area, and no trails are nearby.

^^ New Quad ^^^

Quad Name: Italian Creek

Site #: 349/4311-1.100

Site Name: Stewart Mine area

Physical Hazard Rating: 1

Description and pertinent facts: This vertical shaft is over 40' deep and has a 10'x 10' opening. A collapsed log cabin surrounds the shaft and helps prevent vehicles from falling in. Located on public land, this shaft is next to Italian Creek Road (FR-759). Italian Creek Road is used by 4WD enthusiasts and provides access to fishing, hunting, camping, sightseeing areas, and private property. A dirt bike trail and a short mine road (200') access the shaft from FR-759.

Quad Name: Italian Creek

Site #: 358/4309-1

Site Name: Paymaster Mine area

Description and pertinent facts: Shafts #101 and #102 are accessed by Lily Pond Road (FR-760 according to a road sign, FR-760.1A according to the PBS quad). This road is a popular 4WD, ATV, and dirt bike route to Lily Pond. Adit #108 is near the end of FR-760 (according to

The adit trends N.45°E. into a 2.5'-wide, iron-rich vein. The adit opening is 5' high by 4' wide, and the drift follows the vein for about 30'. A 15'-long by 8'-wide trench connects the adit with 63-cubic-yard dump #205. The trench walls slope in and attain a maximum height of 8'.

^^ New Quad ^^^

^^New Quad^^

A shorter and more direct route follows CR-858 to the Steinbergen and Steuben Ranches. In order to connect to FR-859, however, permission from both ranch owners is required before passing through their private lands and locked gates.

The ore occurs in several forms: as a black, botryoidal, mammillary or ropy deposit; as a massive, compact, steel-gray vein; and as black, vitreous veins and stringers in a matrix of white to red-brown rhyolite. Locally, yellow oxides coat the surfaces of the ore.

Feature #202 is a dark-brown to black, 305-cubic-yard dump with a length of 28', a width of 33', a slope length of 65', and a slope angle of 33°. This dump is quite visible and is only 50' from FR-859. The toe is 15' east of Sun Creek, and erosion of the dump has resulted in black sand deposits along the banks of the creek. The face is undergoing natural revegetation by aspens.

^^New Quad^^

Description and pertinent facts: The inventory area consists of ten shafts, two adits, and a few prospects. Features in the southern portion of this site are on steep slopes draining into the north

side of Coal Creek. Mine features in the northern portion are on gentle slopes on the southeast side of a prominent knoll. An unnumbered 4WD road intersects FR-826.1D east of Copley Lake and accesses the central part of the inventory site before ending at a private home. The private home is on a patented claim block that contains numerous dangerous shafts. All inventoried mine features and their dumps are on public land except for feature #111. Feature #111 may be on the border or within private land. All mine workings are excavated in granodiorite or quartz monzonite (Gaskill and others, 1987).

Feature #: 108

Physical Hazard Rating: 2

Feature #108 is a 32'-deep shaft that is 40' west of, and 30' above, an unnamed perennial creek. The shaft has vertical walls and is flooded to 9' below the south edge of the opening. Green algae covers the flooded walls, making it very difficult for a person to climb out. The west side of the opening has a vertical wall 12' higher than the southern edge of the shaft. The surface opening is 8'x 6'. The north wall of the shaft has two parallel quartz veins 5' apart. These veins contain some iron oxides that have stained the host rock red-brown and yellow-orange. The stagnant brown water standing in this shaft had **pH of 6.62 and conductivity of 31 μ S**.

Feature #208 is a 40-cubic-yard dump on the east and south sides of the shaft, and its light blue-gray waste rock consists of quartz monzonite. The eastern flank toes into a perennial creek bed. The top is 5' long by 30' wide, and the face is 55' long and has a slope angle of 37°.

Feature #: 109

Physical Hazard Rating: 2

Feature #109 is also an intact shaft, and its north wall exposes a 1'-wide, iron-rich breccia zone that strikes N.20°E. All walls of this shaft are vertical and are not reinforced. The outer opening is 5'x 4', and the inner workings taper down to a 4' square opening. The south side of the shaft opens out toward its dump, and the north side has a 12'-high vertical wall. Except for the presence of this wall, the shaft opening is mostly obscured from view until a person is within 10'. The inner workings are flooded to 14' below the south side of the shaft opening. The measured depth is 45'. Green moss covers the shaft walls above the water line, and the stagnant water has a dark-brown to black color. Water test #304, taken from the shaft water, yielded a **pH of 6.74 and a conductivity of 54 μ S**.

Feature #209 is a 53-cubic-yard dump containing light-gray, iron-stained quartz monzonite. The top is 17' long by 22' wide, and the face is 43' long, has a slope angle of 33°, and is partly revegetated with grass.

Feature #: 111

Physical Hazard Rating: 2

Feature #111 is an open shaft lying on the east edge of a frequently used, unnumbered 4WD road. Yellow waste rock is piled around the shaft opening to a maximum height of 5' above the road, alerting passersby of the presence of this dangerous shaft. A bulldozer removed most of the waste rock of dump #211, leaving a narrow berm of loose rock around the shaft. One must climb up over the loose waste rock to view the inner workings. The berm of waste rock somewhat

deters the public of getting close to the edge of the shaft and falling into the inner workings. Conversely, the loose waste rock and steep inner slopes of this berm make it more likely for a person to lose their footing and fall into the shaft. The inner workings are flooded to within 4' of the surface, and algae-covered cribbing reinforces the vertical walls. It would be impossible for a person to climb out without a rope.

Dump #211 consists of about 50 cubic yards of altered and crumbly granodiorite that contains microcrystalline pyrite in a porous quartz matrix. The waste rock has a strong odor of H₂S. A collapsed miners' cabin is 30' northeast of shaft #111.

Additional features in this inventory area are potentially dangerous to the public. Information regarding the potentially dangerous features (PHR of 3) and the other features of this site are available in the database.

Quad Name: Mt. Axtell

Site #: 318/4304-02.100

Site Name: Forest Queen Mine and Surrounding Area

Physical Hazard Rating: 2

Description and pertinent facts: The Forest Queen Mine (feature #100) is shown on the Mt. Axtell quad as an adit, but is actually a shaft at least 250' deep. Socolow (1955) and Ellis (1983) describe the underground workings and discuss the geology and mineral occurrences of the Forest Queen and associated mines. The Forest Queen Mine was the richest silver producer of the Ruby mining district. The PBS quad shows this mine to be on public land, but the workings and large dumps may be on patented mining claims. The underground workings are extensive, for Ellis (1983) reports that the mine contains nine levels, three shafts, and 7,300' of drifts. The Forest Queen operated from 1875 to 1970, with most production during 1879 to 1897.

Feature #100 is the Forest Queen Mine, which is accessed by FR-826.1D. This road connects to CR-12 and passes through a portion of the town of Irwin. The surrounding private lands are rapidly being subdivided into lots, and new summer homes are being built. Old junk cars, a boiler, several sheds, a flotation system, and miscellaneous mining equipment surround the shaft. A 30'-high, wooden beam headframe still stands above the shaft opening. Several "No Trespassing, Keep Out" metal signs are nailed to the headframe, to the sides of the standing sheds, and to a nearby A-frame house that was once the mine office. John Hahn, the current owner of the Forest Queen Mine and surrounding properties, lives in a newly constructed home on the west side of FR-826.1D, just south of the intersection with the main road to Irwin. The Wilderness Land Trust is attempting to buy the Forest Queen Mine from Mr. Hahn, with the ultimate goal of returning the property to public ownership.

The surface opening of the shaft is 5'x 5', and the vertical walls are cribbed for their entire length. Running water (estimated flow to be greater than 15 gpm) is at the bottom of the shaft. The depth of this water was estimated to be greater than 30', and the lowermost drifts may be entirely flooded with mine water. Three large dumps (features #200-A, #200-B, and #200-C) are west of

the shaft and have a combined estimated volume of 1,220 cubic yards of light-yellow sandstone waste rock. These dumps are visible from many locations within the Irwin townsite.

A 4'-square metal bucket is attached to a 1-inch-diameter cable that in turn is connected to a hoist drum. This bucket rests on wooden planks on top of the shaft. The ore bucket resting over the top of shaft #100, and boards used as siding along two sides of the headframe, generally deter individuals from accidentally falling into this very deep shaft.

Personnel from the Colorado Division of Mined Land Reclamation visited the Forest Queen Mine and other nearby shafts and prospect pits on 8/14/80. Their descriptions of these mine features are included in the "Colorado Inactive Mine Inventory Problem Area Data (PAD) Form #08-051-0986-18/04-01". According to the comments section of this form, John Hahn has driven a 100' drainage tunnel to the old workings of the Forest Queen Mine from Coal Creek. The status of the drainage tunnel, which is on private land, is unknown. Additional reconnaissance is needed before the mining properties are acquired.

Quad Name: Mt. Axtell

Site #: 319/4303-01.100

Site Name: Little Frank Area

Physical Hazard Rating: 2

Description and pertinent facts: This inventory site is on a south-facing slope north of CR-12 and southeast of Irwin. None of the features are shown on the topo map.

Feature #100 is a partly caved shaft near the top and on the south side of a southeast-trending ridge. The collar is 8' by 5', and the depth is 20'.

Quad Name: Mt. Axtell

Site #: 319/4303-02.105

Site Name: Ruby Queen/Little Frank Area

Physical Hazard Rating: 2

Description and pertinent facts: This inventory area is adjacent to, and north of, the previously described inventory area. It is on the same south-facing slope on the southeast-trending ridge north of CR-12 and southeast of Irwin.

Feature #105 is a partly flooded shaft. The collar is 10' by 5', and the depth is unknown. Water fills the shaft to within 10' of the surface. Dump #205 is about 30 cubic yards, suggesting that the shaft is not extensive.

Quad Name: Mt. Axtell

Site #: 319/4303-03.108

Site Name: Lower Elk Basin-Part 2

Physical Hazard Rating: 1

Description and pertinent facts: The inventory site lies along the lower stretches of Elk Creek. The mine features are accessed by FR-732, FR-826.1D, and an old mining road (not shown on the Mt. Axtell quad) that originates at CR-12. The easiest access is by following FR-732 from where it branches from CR-12, then passing through private land and a water treatment plant owned and operated by AMAX Corporation.

Shaft #108 is the most dangerous mine feature in this inventory area. It is above and west of Elk Creek. The shaft is within a group of mines not shown on the Mt. Axtell PBS quad. This shaft is located within and at the end of a 47'-long adit (feature #107). The surface opening to this vertical shaft is level with the adit floor and is 5'x 5'. The measured depth is 51', and the water level is 37' below the floor of adit #107. Several horizontally placed poles span the shaft opening. It would be impossible to climb out of this shaft without a rope. The shaft is especially dangerous because the back portion of the adit is poorly illuminated, and the shaft opening is difficult to see.

The entrance to adit #107 is 5' high by 4' wide and has loose, unstable roof rock. The adit trends N.87°W. and is at the base of quartz monzonite cliffs. The ceiling has numerous open fractures, and roof fall covers the first 15' of the floor.

The face to feature #207 is highly visible from across the valley and from a portion of FR-732. This dump contains an estimated 150 cubic yards of light, blue-white quartz monzonite host rock. Portions of it are stained yellow to orange from mine water that periodically drains from adit #107. The top of the dump is 22' long by 30' wide. The dump face is 85' long, and its slope angle is 36°. Footprints are on top of the dump, which is about 150' above and 300' west of an old mining road that is now a popular mountain bike trail.

Quad Name: Mt. Axtell

Site #: 320/4302-01.105

Site Name: Mines North of CR-12, Across from Splains Gulch

Physical Hazard Rating: 2

Description and pertinent facts: Four shafts (features #100-#103) and two adits (features #104 and #105) were inventoried within this site. All of the mine features, except adit #105 and its dump, are on the north slopes of upper Coal Creek. All of the shafts were assigned a PHR of 3, and one of the adits (feature #105) was given a PHR of 2. Adit #105 was given this more hazardous rating because the entrance is next to well-traveled FR-885. This 4WD road travels in a southerly direction up Splains Gulch and provides access to a large unnamed lake at the headwaters of Splain Creek. This lake has become a favorite spot for fishing, hunting, and recreation. All mine features are on public land.

Adit #105 is on the northern flank of a laccolith and is approximately 500' up the southern slope from Coal Creek. Adit #105 was driven in a quartz- and pyrite-rich breccia zone that is 3' to 4' wide and contains several 6-inch- to 8-inch-wide porous quartz veins. The breccia zone is within a fault that trends N.17°W. Abundant iron oxides enrich the brecciated host rock.

The entrance to adit #105 is 5'x 5', and the inner workings trend due south along the fault zone for more than 180'. Some of the host rock is fractured, and small roof falls litter the floor. Water drips from the ceiling and runs down the walls, staining them bright orange. The water accumulates into pools up to 1' deep. A film of orange iron oxides coats most of the floor. A 2.5'-high berm composed of colluvium is inside a shed at the adit entrance. This berm prevents mine water from directly flowing onto the road. A 2.5-inch-diameter metal pipe drains the inner workings. Water test #305, taken inside adit #105, yielded a **pH value of 7.04 and a conductivity value of 430 µS.**

A shed constructed of logs and sided with boards is in front of and encloses the entrance. The logs are set into and lean against a vertical, 15'-high wall of rock. The shed is 20'x 14'x 15' high and has a corrugated metal roof that slopes out from the rock face towards the road. An intact pair of 7½-lb.-gauge mine track lies on the floor, travels across the road, and extends over the top of dump #205.

Feature #205 has an estimated volume of 385 cubic yards of buff waste rock. The dump lies on the north side of FR-885, and its top is an extension of the roadbed and is used as a parking space. The top is 27' long by 15' wide, and the face has a measured length of 53' and a slope angle of 33°.

No signs warn the public of the possible danger that exists from this feature. Details regarding other features of this inventory area are available in the database.

Quad Name: Mt. Axtell

Site #: 322/4304-01.100

Site Name: Adits NW of Keystone Tunnel, North of FR-732

Physical Hazard Rating: 2

Description and pertinent facts: Access and general information regarding this inventory area is discussed in the **Environmental Degradation** section of this report.

Adit #100 is about 20' above FR-732. A partly collapsed, wooden beam frame is in front of the 5'-high by 5'-wide entrance. The entrance is in colluvium cemented by a red-brown, iron-rich, gravel matrix. Open fractures and abundant roof fall indicate that the ceiling in this adit is unstable. Debris has sloughed at the entrance, creating a 4.5'-high berm that dams clear mine water to a depth of 1.5'. Beyond the berm, the inner workings follow a bearing of N.22°W. for an estimated distance of over 250'. The inner workings are accessible by climbing over the berm. The air inside adit #100 has a strong odor of iron. Mine props composed of wooden beams are

further inside the workings, and some of them are leaning, have fallen, or are partially supporting the ceiling.

Quad Name: Mt. Axtell

Site #: 324/4295-01.104

Site Name: Richardson Mine, West side of FR-737

Physical Hazard Rating: 2

Description and pertinent facts: All mine features are on USFS-managed land in Carbon Creek valley on the west side of FR-737. Shaft #104 is about 450' west of FR-737. No road or marked foot trail connects shaft #104 to FR-737; however, the public frequently visits Carbon Creek, which supports a healthy population of trout for fishermen.

Feature #104 is a dangerous shaft whose surface opening is obscured from view by serviceberry and gooseberry bushes. The opening is on the north side of dump #204, about 20' east of Carbon Creek. The upper 10' of the shaft has steep sides mantled with loose rock where colluvium has sloughed in. Cribbing lines the inner workings, which are flooded to within 12' of the south edge of the shaft. The surface opening is 8'x 6', and the measured depth is 55'. An individual would need a rope to climb out of this feature.

Feature #204 is a 65-cubic-yard dump composed mostly of light-gray quartz monzonite to granodiorite waste rock. The top is 5' long and 22' wide. Its face has been greatly oversteepened, and 2/3 of the waste rock has been eroded away by the stream. The face has a length of 20' and a slope angle of 38°. A layer of black anthracite is on the top of the dump. The face is only visible from areas south of the dump.

^^ New Quad ^^^

Quad Name: Mount Harvard

Site #: 380/4305-1.100

Site Name: West Drainage of Magdalene Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This site is in the northeast corner of the Taylor River Ranger District, within the Collegiate Peaks Wilderness, on the slopes west of Magdalene Gulch. This remote shaft is about 10' deep and was sunk on a flat rock surface. The shaft cribbing is mostly intact with some caving on one side. There are no trails to this site and no indications that hikers visit this area. However, this feature poses risk for a sudden fall, especially in snowy conditions when the feature could snow bridge. It is the only hazardous site in the area and could easily be filled with the rock rubble at hand.

^^ New Quad ^^^

Quad Name: Mount Yale

Site #: 381/4301-1.102

Site Name: Brown's Pass

Physical Hazard Rating: 2

Description and pertinent facts: Adit #102 is open and extends at least 30' underground. Ore car rails protrude from the entrance. Dump material associated with this feature is about 40 cubic yards; however this may not accurately reflect the volume of rock removed from this working. A small stamp mill just over the hill from this mine has about 100 cubic yards of associated tailings, and some of that material may have originated from adit #102. Although this feature is in a wilderness area and seems very remote, many day hikers coming up from the Cottonwood Pass Road traverse the Brown's Pass area. Also, Brown's cabin is a destination point for overnight trips, and trails from both the pass and the cabin lead to this mine. Footprints and evidence of campsites indicate that the mine is visited frequently. This mine's peril is in part due to its remoteness, for a person in trouble underground would be difficult to locate unless it was known that they were in the mine.

^^ New Quad ^^^

Quad Name: New York Peak

Site #: 355/4321-1

Site Name: Tellurium Creek Area

Description and pertinent facts: This area is near the terminus of FR-584 and the headwaters of Tellurium Creek. FR-584 and most of the mines in this inventory area have been "cherry-stemmed" out of the Collegiate Peaks Wilderness Area. Both features described below are easily accessed and visible from FR-584, a moderately used 4WD road.

Feature #: 102

Physical Hazard Rating: 2

Although this intact adit has a locked door, access could be obtained from above and behind the door, where minor caving has opened a hole. The adit is at least 30' long, and the small associated dump (#202) has a relatively new compressor and hose lying on it. A sign along FR-584, about 100' from the mine, states "Halcyon Mining Co."

Feature #: 103

Physical Hazard Rating: 2

This is an open stope, slightly above and to the south of #102. It probably connects to #102. The opening is 10'x 8', and the steeply inclined stope descends for about 30'. A broken and collapsed wire fence does little to prevent entry, either accidental or intentional.

Description and pertinent facts: The inventory area is on USFS-managed lands within the Oh-Be-Joyful Wilderness. Democrat Basin is easily accessed by FR-754. FT-404 starts from the end of this road and traverses up the slope and bench topography of the central part of the basin. This trail is well marked and frequently used by hikers, big game hunters, and horseback riders.

Gaskill (1967) shows the central portion of the basin to contain Mesaverde Group sandstone altered to quartzite and shale altered to slate. Granodiorite porphyry crops out as broad glaciated benches and cliffs in the lower- and upper-central parts. The upper and steeper slopes of Democrat Basin are cliffs composed of banded sandstone, shale, and conglomerate of the Ohio Creek Formation. Numerous quartz monzonite dikes trend in a northeasterly direction across the basin. These dikes have altered the sedimentary rocks, enriching them with iron oxides and some base metals. A continuous dike of dacite porphyry cuts diagonally across the central part of the basin and extends into Baxter Basin and into Poverty Gulch. Numerous faults displace the dikes and sedimentary layers. Ore produced from the mine features of this inventory site is primarily composed of quartz and pyrite, with minor amounts of chalcopyrite and sphalerite.

Shaft #101, within adit #100, presents a serious hazard to the public. These features are about 540' east of FT-404. Feature #100 is an open adit bearing N.56°W. into the base of a quartz monzonite ridge. The irregularly shaped opening is 7' high by 7' wide. A 3.5'-high berm composed of loose light-gray monzonite is in front of the entrance. A large cavernous room, just inside the entrance, surrounds the opening to shaft #101 and encompasses the entire extent of adit #100. This room is 16' wide, 13' long, and 8' in height. The ceiling contains open fractures between slabs of roof rock. Portions of the roof caved and accumulated on the adit floor and in the shaft.

Shaft #101 has an opening 7' long and 5' wide. The total depth is 16', of which the last 9' are flooded with clear water. The vertical and smooth walls to the shaft provide few horizontal ledges to act as handholds. A person falling into the standing water may drown due to hypothermia before climbing out. A rope would be necessary to escape.

Feature #200 is an elliptically shaped dump on the east side of adit #100. Its top is 8' long by 12' wide, and the body spreads out onto a wide bench of monzonite. The face has an average length of 10' and a slope angle of 22°. Most of the waste rock is unconsolidated cobble-size pieces of monzonite. Minor amounts of iron enrich the waste rock, and the only base metals present occur in veinlets containing small amounts of chalcopyrite.

Water test #301 was taken from standing water inside shaft #101. The **pH was 6.55, and the conductivity was 133 µS.**

Quad Name: Oh-Be-Joyful

Site #: 317/4313-01.100

Site Name: Baxter Basin - Part 2, West Side

Physical Hazard Rating: 2

Description and pertinent facts: This inventory site is easily accessed from FR-552. The geology for this site was previously described in the Environmental Degradation section of this report.

Feature #100 is an open adit bearing N.44°E. into a granodiorite dike that follows a fault cutting diagonally across the northwestern portion of Baxter Basin. A number of mine features included in this site and also in site #317/4314-02 were driven into this fault. Shaft #101, which is partly caved, connects to this adit.

The inner workings to adit #100 exceed a measured distance of 230' and follow a 1.5'- to 3'-wide, base-metal-bearing quartz vein. The adit opening is 8' high by 7' wide. Open fractures occur in a number of places throughout the ceiling, and pieces of roof rock clutter the floor.

Several narrow, irregular, vertical stopes penetrate the ceiling. Stope openings reach a maximum length of about 27' and are 2' to 10' wide. Cross-braced logs add support to the walls in all of the stopes. A depression is on the grassy slope about 75' directly above the inner workings of adit #100. This depression is a subsidence feature that connects to one of the stopes. The opening to this caved stope is 5'x 3'x 7' deep, and logs lean against the walls. The bottom of the caved stope may be a false bridge consisting of loose rock, soil, logs, etc. The weight of a person could collapse this bridge and result in a serious fall to the lower inner workings of adit #100.

Caved material from shaft #101 has blocked almost 2/3 of adit #100 approximately 85' from the entrance. This caved area has dammed mine water to a maximum height of 1'. Water flows through this waste rock and along the adit floor before discharging into a 27'-long trench and onto the top of dump #200. Water also flows down the walls of the stopes and seeps out of the walls of the adit.

Feature #200 is a highly visible dump containing an estimated 495 cubic yards of well-cemented waste rock. A spur road from FR-552 leads to the top, which has been leveled with a bulldozer. The top is 31' long by 36' wide, and the face has several lobes. The face is stained with a highly visible, bright red-orange plume of effluent produced from adit #100. Iron oxides stain the granodiorite host rock orange, dark-brown, yellow, and black. Mineralized rock lies on the lower face and flanks and consists of quartz with veins of galena, sphalerite, chalcopyrite, tetrahedrite, and pyrite.

It is recommended that the entrance to adit #100 be grated and its effluent diverted around dump #200. The caved stope above the adit should be fenced off. In addition, other features in this inventory area are potentially dangerous and should be mitigated if possible. Details regarding the other features are available in the database.

Quad Name: Oh-Be-Joyful

Site #: 317/4315-01.107

Site Name: Summit of Augusta Mountain-(Taylor River R. D. Side)

Physical Hazard Rating: 2

Description and pertinent facts: This site is located in a remote portion of the Ruby Range; however, it is frequently visited by the public. Shaft #107, which is inside adit #104, is on the north flanks of an unnamed basin. The best route to these features starts at Angel Pass and follows the narrow ridge leading to the summit of Augusta Mountain. A trail branches off the main route at feature #101 and heads north across the steep talus-covered, upper slopes of an unnamed basin. At a saddle, this trail connects to another trail leading to Mineral Point. This saddle is about 40' above and south of features #104 and #107.

The geology of this inventory area is discussed in the **Environmental Degradation** section of this report.

Feature #104 is an open adit with shaft #107 at the end of its underground workings. The opening to adit #104 is 5' high by 5' wide. Just inside the entrance, open fractures line the ceiling. Adit #104 is located in a narrow drainage corridor filled with loose talus that has sloughed over the entrance and accumulated into a 4'-high berm. The adit is 15' long and follows a base-metal-bearing quartz vein trending S.66°W along a granodiorite dike. Iron precipitates stain the adit walls orange. Water drips from the ceiling, runs down the walls and adit floor, and drains into shaft #107. Water test #300, taken from the standing waters of the shaft, yielded a **pH of 3.38 and a conductivity of 439 µS**.

The 5'x 5' opening of shaft #107 is at the back of adit #104 and is flush with the top of the adit floor. Water completely fills the shaft, which is 23' deep. The water is quite cold, and a person may succumb to hypothermia and drown before pulling themselves out of the shaft. The vertical walls are very slippery and lined with algae. Loose rock surrounds the opening, and a person could easily lose their footing and fall into the shaft.

Feature #204 is a 65-cubic-yard dump composed mostly of light-yellow granodiorite waste rock on the north side of adit #104. Most of the waste rock has slid down a steep drainage corridor. The top of the dump is 12' long by 15' wide. Its 135'-long face has gullies and has a slope angle of 37°. The toe fans out onto a talus-covered bench. Host rock comprises 70% granodiorite and 30% black shale, both which are highly fractured and stained with iron oxides. Mineralized waste rock consists of gray quartzite with veins of pyrite and sphalerite.

Details regarding other potentially dangerous features in this inventory area are available in the database.

Quad Name: Oh-Be-Joyful

Site #: 317/4315-03.102

Site Name: Purple Mountain Basin, West Flank (Part 1)

Physical Hazard Rating: 2

Description and pertinent facts: All features within this inventory site are on land managed by the USFS. Feature #102 has a PHR of "2" and presents the highest level of mine hazard to the

public. Details regarding features #100 and #101, which are potentially dangerous to the public, are available in the database. The access and geology of this area are discussed in the **Environmental Degradation** section of this report.

Feature #102 is an intact shaft sunk at the base of a quartz monzonite dike on the lower western slopes of an unnamed basin. The 5'-square opening is excavated in loose black Mancos Shale. The inner workings are 20' deep, and clear water fills the bottom 7' of workings. A person would need a rope to climb out of this shaft. Pyrite veins crop out along the vertical walls; however, iron oxides stain only a small portion of the inner workings.

Feature #202 is a black, highly visible dump that reveals the presence of shaft #102. The body has a high profile, and the face greatly protrudes from the shaly scree slopes. The top is 8' long by 17' wide, and the face is 22' long and has a slope angle of 34°. The toe extends into a dry, U-shaped depression. Mineralized waste rock consists of pyrite veins housed in a matrix of black shale and slate.

Quad Name: Oh-Be-Joyful

Site #: 318/4305-01.100

Site Name: Irwin No. 1

Physical Hazard Rating: 2

Description and pertinent facts: The inventory site is about 0.5 miles east of Lake Irwin along a trail shown on the topo. The Irwin corporate boundary is less than 1,000' away.

Shaft #100 is completely flooded and is discharging water at a rate of 3 gpm. The shaft opening is 8'x 4', and the depth is at least 5'. Total depth was not determined, but the dump is less than 50 cubic yards, implying relatively shallow underground workings. The shaft water was tested and had **pH=7.3 and conductivity=022 µS**. This flooded shaft is close to Irwin and represents a hazard in this heavily used area.

Quad Name: Oh-Be-Joyful

Site #: 319/4306-03.100, 101

Site Name: Jawcracker

Physical Hazard Ratings: 2

Description and pertinent facts: The inventory site is northeast of Irwin, in the upper part of Independence Basin. FR-732.1C is about 800' east of the most dangerous features and is the best access route to the inventory area.

Feature #: 100

Physical Hazard Rating: 2

Shaft #100 has an 8'x 5' collar and is more than 10' deep. Water fills the shaft to within about 5' of the collar. Dump #200 is about 60 cubic yards, suggesting the shaft may be 30' to 50' deep. This shaft shows on the topo.

Feature #: 101

Physical Hazard Rating: 2

Shaft #101 has an 8'x 6' collar and is 10' deep. This shaft is about 400' south-southwest of shaft #100 and is shown as a prospect on the topo.

Quad Name: Oh-Be-Joyful

Site #: 319/4315-01.100

Site Name: Headwaters of Slate Creek

Physical Hazard Rating: 2

Description and pertinent facts: No roads or marked trails lead to the inventory area. The most extensive workings are at the head of an unnamed basin. The easiest way to access this area is by following the north side of the only perennial creek that drains the entire basin. Adit #100 may be on a patented mining claim, but it was included in this report because of the uncertainty of its location. All mine features of this inventory area expose Mancos Shale.

Adit #100 has an opening 6' high by 4' wide and is 18' long. An open pit surrounds and is on the west side of the entrance. The pit is 12' long, 9' wide, 13' deep, and is partly filled with loose waste rock. A 4.5'-high berm is in front of the entrance. Roof fall created this berm, which dams clear mine water to a depth of 1'. The ceiling is extremely unstable, and numerous tightly spaced fractures are present. The inner workings follow a 1.5-inch-wide pyrite-sphalerite vein. This vein is enclosed by a zone of porous iron oxides and trends along a bearing of N.36°E. Water test #300, from standing water inside adit #100, yielded a **pH of 5.53 and a conductivity of 89 µS**. Moss and brown algae line the walls, and brown algae and fibrous fan-shaped aquatic plants grow on the floor.

Feature #200 is a 145-cubic-yard dump that is visible from most areas within the basin and from a portion of FR-734. The body and face are spread out along the west side of the pit, and the toe extends into a dry stream channel. The top is 13' long by 23' wide, and the 28'-long face has a slope of 30°. The yellow-orange waste rock consists of 90% altered granodiorite and 10% dark-gray hornfels.

A partly caved shaft lies about 400' above adit #100 on private land. The shaft is 12' deep, but the 80-cubic-yard dump suggests a much deeper opening. The false bottom to this shaft may be a serious hazard to the public, and if remediation is done in this inventory area, this feature should be included.

Quad Name: Oh-Be-Joyful

Site #: 319/4317-01.103

Site Name: Southwest Flank of Cinnamon Mountain

Physical Hazard Rating: 2

Description and pertinent facts: The inventory area encompasses the southern and western flanks of Cinnamon Mountain and is accessed by FT-2083, which receives a tremendous amount of foot travel by the public. Early miners constructed this trail as a road for transporting silver ore to Marble. Power poles connected by strands of copper wire remain on the south side of the trail. Portions of the old mine road are reduced to a narrow path.

Adit #100 and its internal shaft #103 are near the boundary of public land and patented mining claims. Access is difficult because the opening is obscured from FT-2083, and one must climb up a loose scree slope and cross a dangerous, dry, and very steep drainage corridor. Adit #100 lies approximately 680' up the drainage corridor on the north side of FT-2083.

Feature #100 is an intact adit that trends N.2°E. into the base of a series of cliffs consisting of altered, shattered, and iron-enriched quartz monzonite of the Paradise stock (Gaskill and others, 1967). The inner workings follow a 6-inch- to 8-inch-wide vein composed of white orthoquartzite with veinlets of pyrite and sphalerite. A 4'-high berm of talus partly blocks access to the inner workings. The adit opening is 2.5' high by 5' wide, and the interior of the adit is 6' high by 5' wide. The estimated length is 40'. The ceiling contains loose slabs of rock and open fractures, and roof debris clutters portions of the floor.

Two shafts are in the floor. The first shaft (feature #103) is approximately 18' from the entrance. The 21'-deep, vertical shaft has an opening of 6'x 4.5'. Standing water submerges the last 4' of shaft #103. Loose rock around the opening makes this shaft especially dangerous. Access to the remaining portion of adit #100 is impossible because of shaft #103.

The second shaft is 33' from the entrance. This shaft was not assigned a feature number because it cannot be accessed. Its opening is 7'x 5', and its depth is undetermined.

About 90% of the yellow waste rock belonging to dump #200 has slid or rolled down a very steep, V-shaped drainage corridor that is part of an avalanche chute. The top of dump #200 is 12' long by 17' wide. The volume of dump #200 was difficult to estimate because the waste rock is mixed with talus. A minimum volume was estimated to be 240 cubic yards of unconsolidated, light-yellow to orange waste rock. The barren face is severely eroded, contains numerous small gullies, has a length of about 330', and a slope of 35°. Mineralized waste rock comprises orthoquartzite with veins of pyrite and sphalerite and veinlets of molybdenite.

The drainage corridor associated with these mine features extends down the southern flanks of Cinnamon Mountain, passes FT-2083, and ends at a perennial creek. This creek drains an unnamed basin and is one of the major tributaries to the upper Slate River.

Quad Name: Oh-Be-Joyful

Site #: 320/4305-01.100

Site Name: Bonanza King and Number Seven

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is in upper Elk Basin and is accessed by FR-732.1C. Shaft #100 has a 5'x 5' opening and is at least 20' deep with vertical walls. Water with **pH=7.24 and conductivity<50 μ S** fills the shaft to within 1' of the collar. Dump #200 is about 60 cubic yards, suggesting a depth of 30' to 50' is possible.

This shaft is especially dangerous because it is visible and easily accessed from frequently used FR-732.1C. A drop in the water level would make this feature even more hazardous.

Quad Name: Oh-Be-Joyful

Site #: 320/4305-03

Site Name: Upper Elk Basin-Central Part 2

Description and pertinent facts: This inventory site is in the upper central part of Elk Basin and is accessed via FR-732, which comes up from the lower part of Evans Basin. Mine feature #103 is on a patented mine claim, and feature #110 is on USFS-managed land. The public frequently visits these features on a seasonal basis.

Personnel from the Colorado Division of Mined Land Reclamation examined some of the same mine features of this inventory site on 8/14/80. Their findings are reported on "Colorado Inactive Mine Inventory Problem Area Data (PAD) Form #051-0929-20/05-01". Features #103 and #110 of this inventory site correspond to features #49 and #55, respectively, from the PAD form.

Feature #: 103

Physical Hazard Rating: 2

Feature #103 is a partly caved adit whose entrance is 5' high by 4' wide. The entrance is very unstable, and numerous open fractures occur in the sandstone blocks of the ceiling. The inner workings trend N.26°E. and follow the Micawber Lode for more than 270'.

Adit #103 has caved to the surface in two areas directly above the entrance. The caved area closest to the entrance is 15' north of the opening. This subsided area consists of a vertical hole exposing colluvium and several mine timbers. Another caved area lies 28' north of the previously described hole. This subsidence feature appears as an inverted cone-shaped depression.

An 80'-long trench extends in a southerly direction from the entrance of adit #103 and connects to the top of a 450-cubic-yard dump. A loading platform, constructed of wooden beams, is next to the face of the dump. A wooden shed sided with corrugated sheet metal once enclosed the entire trench.

Feature #: 110

Physical Hazard Rating: 2

Feature #110 is an open shaft that is 5' north of adit #109. The top of this shaft is about 14' above the floor of this adit, and its opening is 5'x 4'. The inner workings have a depth of 15' and connect to the floor of adit #109. Waste rock from the shaft is combined with dump #209 and has been spread out over a large area by a bulldozer. Approximately 320 cubic yards of waste rock are on the south side of adit #109. Shaft #110 is about 40' north of FR-585.

Quad Name: Oh-Be-Joyful

Site #: 320/4305-04

Site Name: Upper Elk Basin-Central Part 1

Description and pertinent facts: The upper central part of Elk Basin is accessed by an old mining road that is no longer in use. This road connects to FR-585, FR-732, and FR-732.1C, which are 4WD roads. The two most dangerous features of this inventory site are shafts #102 and #115. Both of these mine features are on land managed by the USFS.

The majority of mine features lie along fault zones containing localized and base-metal-bearing quartz veins. Most of the mine features are driven in the Ohio Creek and Wasatch Formations. A prominent dike of felsite cuts diagonally across the upper central portion of the basin and connects to a felsite intrusive body underlying the northwestern flank of Mount Emmons. This dike crops out in numerous locations and is the source of intense alteration and iron-enrichment of sedimentary layers.

Feature #: 102

Physical Hazard Rating: 2

Feature #102 is an open, 18'-deep vertical shaft with a 4'x 4' opening. Its walls are smooth and slippery, and the bottom is wet. There are few ledges to act as footholds and handholds, and a rope would be necessary to climb out. The old mining road passes within 50' of the shaft. Three small, iron-stained dump piles with a total volume of 25 cubic yards lie on the south and east sides of the shaft.

Feature #: 115

Physical Hazard Rating: 2

Feature #115 is an open, 18'-deep vertical shaft with water 11' below the surface. The surface opening is 5'x 5'. Some horizontal ledges that extend from the shaft walls may be suitable for use as handholds and footholds, but in most cases, a rope would be needed to climb out of this feature. The dump contains about 50 cubic-yards of blue-gray to orange-brown waste rock spread out in a fan shape around the edge of the shaft. The face is devoid of vegetation and is highly visible, alerting the public to the presence of a dangerous mine feature.

Quad Name: Oh-Be-Joyful

Site #: 320/4305-05.201

Site Name: Elk Basin-Upper Northeast Flank

Physical Hazard Rating: 2

Description and pertinent facts: This inventory site is along the uppermost and northeastern portions of Elk Basin, near Scarp Ridge. The inventory area is accessed by driving up FR-585 as far as one can, and then walking the rest of the way over a talus-covered road to Gunsight Pass. At Gunsight Pass, a well-traveled foot trail follows a narrow ridge crest and ends up at the most eastern extent of Scarp Ridge. Feature #201 is near the edge of a patented mining claim. Geology of this area is discussed in the **Environmental Degradation** section of this report.

Feature #101 is a partly filled prospect pit whose surface opening is 14' long and 7' wide. Its dump, feature #201, is on the north side of the pit, and most of the waste rock has been pushed over the edge of a 500'- to 800'-high cliff face. The remaining yellow- to black-stained waste rock is unconsolidated, and someone could easily slip and fall over the edge of Scarp Ridge.

Information regarding "potentially hazardous" (PHR of 3) open adits in this inventory area is available in the database.

Quad Name: Oh-Be-Joyful

Site #: 320/4306-01.101

Site Name: Upper Peeler Lakes

Physical Hazard Rating: 2

Description and pertinent facts: The easiest and shortest way of accessing Peeler Basin is via FT-404 from FR-585 in Redwell Basin. Feature #101 lies approximately 150' west of an intermittent creek that drains directly into the upper lake in the easternmost part of the basin. Features #100, #101, #200, and #201 are on a patented mining claim that was purchased through the Wilderness Land Trust by the USFS in 1996.

Peeler Basin is a glaciated, northwest-trending basin. Granodiorite porphyry crops out as large benches, smoothed and striated by glaciers. The upper and lower groups of Peeler Lakes are in low areas partly surrounded by lateral and terminal moraines. Mancos Shale, in the form of slate and sandstone, underlies most of the basin. Peeler Peak and Scarp Ridge consist of banded layers of conglomerate, siltstone, shale, and mudstone belonging to the Ohio Creek Formation.

A prominent quartz monzonite dike cuts diagonally across the upper, central portions of the basin. Iron oxides, and disseminated and veinlets of pyrite, occur along the contact zone between the dike and the sedimentary rocks. Most base-metal mineralization is confined to veins that lie within dip-slip and normal faults displacing Wasatch and Ohio Creek sedimentary rocks on the northern face of Scarp Ridge. Another cluster of mineralized faults is on the northeastern flanks of Peeler Peak. All mine features within this inventory site are along a well-defined fault in the southeastern portion of the basin. This fault contains a 4.5'-wide breccia zone that contains rich deposits of sphalerite and chalcopyrite with little quartz.

Feature #101 is a wedge-shaped shaft whose walls slope down at a steep angle to meet the underground workings of adit #100. The surface opening is 10'x 4', and the depth exceeds 27'.

The southwest wall exposes a mineralized zone that is stained orange from iron oxides and contains a 6-inch-wide vein that trends S.62°W. The bottom to an upper level of the shaft is dry; however, the lower chambers contain standing water. Log cribbing is partly exposed in the lower inner workings. A rope would definitely be needed for a person to climb out of this dangerous feature.

Feature #201 is a 35-cubic-yard conical dump on the northwest side of the shaft. Its top is 12' long by 16' wide. The face is grooved from runoff, is 18' long, and has a slope angle of 29°. The toe is in a dry stream bed. Iron oxides have stained the sandstone waste rock yellow to black. Brecciated sandstone and black mudstone with numerous quartz stringers contain disseminated pyrite and pockets of galena.

Feature #100 is also discussed in this report because its inner workings connect to shaft #101. The entrance to this adit has collapsed and is filled with colluvium. An 18'-long, V-shaped trench connects the entrance with the top of its dump. Shaft #101 is about 25' uphill and northwest from adit #100.

Feature #200 is a 240-cubic-yard dump lying on the northwest side of adit #100. The top is 57' long by 33' wide, and the eroded barren face is 22' long and has a slope angle of 25°. The body to this dump lies in the bottom of a dry stream bed and is easily visible from upper Peeler Lakes and from a section of FT-404. The waste rock is composed of white and blue-green sandstone, some of which has been altered to quartzite, and blocky pieces of conglomerate. Mineralized rock on dumps #200 and #201 contains abundant copper sulfides.

The public frequently visits this inventory site. Squashed beer cans are on the western side of shaft #103, and several campfire rings, rusted cans, metal straps, and gloves are near dump #203. Information regarding "potentially hazardous" features in this inventory area, most notably caved shaft #103, is available in the database.

Quad Name: Oh-Be-Joyful

Site #: 321/4306-01

Site Name: West Side of Redwell Basin

Description and pertinent facts: The inventory area is on the western side of the middle of Redwell Basin. This basin is accessed by FR-585, which ascends from the Slate River valley, passes through the lower portions of Wolverine Basin, and enters the eastern side of Redwell Basin. All mine features of this inventory site are located on unpatented mining claims. Local geology is discussed in the **Environmental Degradation** section of this report.

Feature #: 102

Physical Hazard Rating: 2

Feature #102 is an intact adit that has an entrance 5' high by 4' wide. The inner workings extend for more than 75' and trend N.77°W. Colluvium sloughing from above produced a 3.5'-high berm at the entrance. This berm dams mine water to a depth of 2.5'. Mine water seeps beneath the berm, flows on the bottom of a rubble-filled trench for a distance of 14', and then soaks into

the top of feature #202. The floor gently slopes downward into the inner workings, thus flooding most of the adit. About 15' from the entrance, approximately 90% of the adit is filled with mine water. Numerous open fractures occur in the ceiling, and pieces of roof rock litter the floor.

Feature #202 is a 95-cubic-yard dump composed of pyrite-rich, yellow waste rock lying on the east side of adit #102. The top is 16' long by 21' wide. The surface of the 43'-long face is highly grooved, has a hard crust, is subjected to sheet wash erosion, and has a slope of 30°. The face is devoid of vegetation, and mineralized shale talus covers the lower flanks and toe. Waste rock produced from shaft #103 has rolled down the steep slopes and mixed with the material lying on dump #202.

Feature #: 103

Physical Hazard Rating: 2

Feature #103 is a shaft with walls that slope away from the hillside. The surface entrance is 6'x 4', and the total depth is 20'. The north and east walls have mostly rotten log cribbing that is partly buried beneath colluvium and waste rock. Water 4' deep submerges the shaft bottom. The upper portions of the walls are very unstable and are the source area for material to slough off and accumulate on the bottom of this shaft. If a person fell in, a rope would be needed to climb out of this shaft. The inner workings of this shaft connect to adit #102.

The yellow dumps (features #202 and #203) are highly visible from FR-585, and the toe of dump #203 is approximately 320' west of this road. Feature #203 consists of approximately 20 cubic yards of light-yellow shale and sandstone waste rock. Its top is 5' long by 12' wide. The 55'-long face is barren of vegetation, is grooved, and is subjected to sheet wash erosion due to its slope being 34°.

Feature #: 105

Physical Hazard Rating: 2

Feature #105 is a vertical shaft that is partly filled with waste rock, boards, and logs. The surface opening is 7'x 5', and the depth of open workings is 15'. The frame of a 12'-wide by 18'-long log cabin is on the east side of the shaft, and a platform surrounds the surface opening to the shaft. This platform is composed of rotten, hand-carved 12-inch-wide by 12-inch-thick beams. Shaft #105 is accessed by a trail that follows a ridge crest on the west side of Redwell Basin. This ridge connects on the south to FR-585 and trends northwards, separating Redwell Basin on the east from an unnamed basin on the west. The log cabin is about 250' from this ridge and is surrounded by a dense stand of conifer.

Feature #205 contains 135 cubic yards of dark, brecciated waste rock. The dump material is composed of angular black slate crosscut by white quartz veins. Veins of galena and chalcopyrite occur in a matrix of quartz. The top is 16' long by 25' wide, and the 70'-long face is littered with junk. The dump lies on the west side of the shaft, and the slope to the face is 28°. The public rarely visits feature #105, for the large dump is obscured from view when standing on FR-585.

Feature #: 110

Physical Hazard Rating: 1

Feature #110 is an intact shaft whose lower 8' are submerged in translucent blue-green water. The total depth is 27', and the surface opening is 8'x 5'. Loose waste rock surrounds the opening, and one could easily lose their footing and fall into this feature. The walls are vertical and are not supported by log cribbing. This shaft is about 130' north of and below FR-585. Fresh footprints are around the shaft collar.

Feature #210 is a 45-cubic-yard dump lying on the north and east sides of the shaft. The sandstone waste rock contains abundant disseminated pyrite, is stained light-yellow to orange-brown, and is highly visible from FR-585. The top is 8' long by 16' wide. The 33'-long face has a hard crust of fine-grained material, is mostly barren of vegetation, and has a slope angle of 27°. Mineralized rock contains quartz veins ranging from 3-inches to 6-inches wide. Veins of almost pure crystalline pyrite parallel the quartz and range from 0.5-inch to 2-inches wide.

After this feature was inventoried, Daryl Gusey (USFS geologist) supervised the backfilling of feature #110 on 10/2/96. Waste rock from dump #210 provided the necessary material to fill this shaft. The physical hazard at this shaft has been mitigated, and the 8' of standing water was absorbed into the fill material. This feature no longer has a PHR of 1. A PHR of 5 would probably be more appropriate.

Quad Name: Oh-Be-Joyful

Site #: 321/4306-03

Site Name: Upper Redwell Basin

Description and pertinent facts: Situated in the upper middle reaches of Redwell Basin, this inventory site is accessed by FR-585. This basin is popular for mountain bikers, motorcyclists, and hikers. Two mine features are especially dangerous to the public. Feature #105 is at the edge of and is located on a patented mining claim. Feature #111 is entirely on public land. This inventory area is also discussed in the **Environmental Degradation** section of this report.

Feature #: 105

Physical Hazard Rating: 1

Feature #105 lies about 30' above a talus-covered spur road that branches from FR-585 on the west side of the basin. This vertical shaft is 18' deep and has a surface opening of 3'x 3'. The inner workings connect to the floor of adit #104. Waste rock, produced from the excavation of this shaft, and colluvium have accumulated on the floor of adit #104. Standing at the entrance to this adit, one can see light coming in from the shaft and shining down on a segment of the floor and walls. If a person should happen to fall into shaft #105, they could possibly crawl over the berm of debris and travel on their hands and knees along the floor of the adit to its entrance. A more practical way is for one to climb out of the shaft using a rope.

Feature #205 is a 10-cubic-yard dump on the northwest side of the shaft. The top is 5' long by 9' wide. The 17'-long face has a slope of 29° and toes out west of adit #104. Most of the sandstone waste rock produced from the shaft is incorporated into dump #204.

Feature #: 111**Physical Hazard Rating: 2**

Feature #111 is a partly open shaft whose lower portion is filled with waste rock. The shaft lies at the toe of a talus slope, approximately 400' west of where FR-585 makes a switchback and starts climbing the central portion of the basin to Gunsight Pass. The surface opening is 5'x 4', and the measured depth is 17'. Narrow ledges of sandstone protruding into the shaft could act as footholds and handholds for a person to climb out of this feature, however, a rope would probably be needed to safely exit the shaft.

Feature #211 is a 65-cubic-yard dump on the east side of shaft #111. The conical body is visible from a portion of FR-585 and is easily accessed by walking across a grassy meadow at the head of an unnamed basin. The top is 15' long by 28' wide. The face contains unconsolidated, black waste rock, has a measured length of 40', and a slope of 28°. Host rock is porous and vuggy sandstone with a surface staining of black iron oxides. Mineralized rock contains pockets lined with needle-like quartz crystals. Some disseminated and stringers of pyrite occur along the contact with quartz veins.

Quad Name: Oh-Be-Joyful

Site #: 321/4307-01.200

Site Name: Lower Redwell Creek Basin-Part 1

Physical Hazard Rating: 2

Description and pertinent facts: FR-585 accesses this inventory area from the east, after passing through Wolverine Basin. Feature #200 is the first significant and the most prominent dump feature visible in Redwell Basin. The yellow waste rock produced from the excavation of adit #100 fans out and makes a long, comet-shaped dump on a very steep (38°) slope. Features #100 and #200 are on public land and are accessed from FR-585 by a spur road that terminates at the trailhead to FT-404.

Colluvium and caved roof rock fill the entrance to adit #100. This adit trends N.82°W. into a talus-covered hillside and lies at the base of mineralized cliffs of altered, fractured, and highly iron-enriched slates and sandstones belonging to the Mesaverde Group. The rock face surrounding the entrance is stained with black and yellow iron oxides and contains a quartz vein. The entrance lies about 45' below a ridge crest and is reached with difficulty by climbing up the face of dump #200. A 16'-long, U-shaped trench connects the entrance to the top of the dump.

Feature #200 is a 66-cubic-yard dump with a hard and crusty light-yellow surface composed of fine-grained material covered with a loose and unconsolidated layer of black-stained waste rock. The top is 15' long by 22' wide, and the 240'-long face has a slope angle of 38°. The surface of the upper 3/4 of dump #200 has formed into a hard crust that covers loose rock. Footholds in the face of the dump must be excavated with a pick. Because of the hard crust on the steep dump face, rocks roll and bounce along the entire length of the face, stopping at the lower toe or in the drainage corridor just below the toe. A large scree slope composed of loose waste rock has

formed at the toe and along its south side, and the drainage corridor below the toe has accumulated large volumes of orange waste rock.

Waste rock consists of altered and highly fractured, gray to light-green sandstone with iron staining along the fracture planes. White stringers of quartz and pyrite crosscut the sandstone. Bright-orange iron oxides have precipitated onto the surfaces of rocks lining the dry drainage corridor at the toe of the dump.

Details regarding other "potentially hazardous" mines in this inventory area are available in the database. This site is also discussed in the **Environmental Degradation** section of this report.

Quad Name: Oh-Be-Joyful

Site #: 321/4307-02.103

Site Name: Lower Redwell Basin-Part 2

Physical Hazard Rating: 2

Description and pertinent facts: Feature #103 is a dangerous open shaft on public land. The opening is within 25' of FT-404, a popular route for hikers and mountain bikers on their way to Peeler Basin. This inventory area is also discussed in the **Environmental Degradation** section of this report.

The inner workings to 25'-deep shaft #103 are well preserved. Algae-covered log cribbing supports the vertical walls for the lowest 19'. A funnel-like conical pit composed of waste rock surrounds the surface opening to the shaft. Yellow waste rock lines the steep unstable slopes of this pit, ending at the top of the log cribbing. The conical pit measures 12'x 10' and is 6' deep. The surface opening to the cribbed inner workings is 5'x 2.5'. A small drainage channel diverts water around the outer edges of the dump, but water fills the shaft to within 5.5' of the surface.

Because of the slippery, algae-covered cribbing and the lack of solid handholds on the steep unconsolidated slopes of the conical outer pit, this shaft would be very difficult to escape. A rope and/or another person would be needed to pull someone from the water of this shaft. The conical outer opening could act as a funnel, enhancing the danger of someone slipping into the shaft.

Feature #203 is formed as a doughnut around shaft #103 and contains 63-cubic yards of highly visible, yellow to red-brown waste rock. Its length is 40', and the average width is 8'. The steepest slope length is 5', and the slope angle is 10°. Waste rock consists of gray sandstone with disseminated pyrite, cut by seams of porous white quartz with veins, pockets, and crusts of pyrite. Dump material saturated by the shaft water emits a strong odor of H₂S.

Information regarding "potentially dangerous" features in this inventory area is available in the database.

Quad Name: Oh-Be-Joyful

Site #: 322/4307-01.100

Site Name: Lower Wolverine Basin

Physical Hazard Rating: 2

Description and pertinent facts: Feature #100 of this inventory site is quite visible and is very close to where FR-585 initially crosses Wolverine Creek. This road is frequently used, and visits to this adit are inevitable.

Adit #100 is partly caved, has an entrance 5' high by 4' wide, and is more than 100' long. A "No Trespassing" sign is posted at the caved wooden beam portal. About 15' beyond the caved portal, another caved area allows access to the adit. The entrance is in colluvium and is very unstable. Underground workings are in horizontally bedded shale and siltstone, which are generally incompetent rocks for adit support. Additional caving at the entrance and within the adit should be expected.

Dump #200 is about 200 cubic yards of mostly unmineralized material and toes into Wolverine Creek.

^^ New Quad ^^^

Quad Name: Pearl Pass

Site #: 337/4315-1.101

Site Name: Middle Brush Creek and Cumberland Basin

Physical Hazard Rating: 2

Description and pertinent facts: This vertical shaft is less than 500' feet from the trail along Middle Brush Creek in the Maroon Bells–Snowmass Wilderness Area. This shaft, located about 100' north and uphill of adit #100, was sunk in competent bedrock and extends to a depth of at least 40'. Sharp rocks protrude from the walls, and severe injury or death would likely occur if someone fell in. It would be nearly impossible to get out without assistance.

Quad Name: Pearl Pass

Site #: 344/4315-1.105

Site Name: Upper Taylor River

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #105 is on the north side of the upper Taylor River and is about 0.5 miles east of the summit of Star Peak. During the inventory in early September, this vertical shaft had standing water about 40' below the ground surface. If someone fell in, serious injury or death would likely occur. It is difficult to see and is in close proximity to a moderately used hiking and biking trail.

According to the geologic map of the Snowmass Mountain Quadrangle (GQ-853), adit #100 lies at the intersection of several well-developed fault systems. Mancos Shale crops out on the west side, and Dakota Sandstone is on the east side of adit #100.

Feature #100 is an open adit on the north side of an avalanche chute. The adit bears N.34°W. into the base of an iron-stained outcrop of sulfide-rich orthoquartzite. The opening to the entrance is 5' high by 4' wide. The inner partly flooded workings follow a quartz zone for more than 33'. Thick brush and scrubby conifers grow in a conical depression at the adit entrance. A water-soaked, rotten frame constructed of logs and boards is inside the entrance. Underground, the ceiling is highly fractured, and roof rock clutters part of the floor. Clear mine water is backed up by a 2'-high berm and attains a maximum depth of 1.5'. Water test #300 sampled this pool and yielded a **pH of 5.33 and a conductivity of 385 μ S**. Water drips from the ceiling and runs down the walls, which are streaked with orange and orange-red ferric hydroxide precipitates. A dense mat of lichens and moss lines the walls near the entrance.

A 20'-long, V-shaped trench connects the entrance with the top of dump #200. Cobbles of waste rock line the bottom of the trench, which receives effluent from adit #100.

Located on the east side of the adit and visible from FR-317, dump #200 has an estimated volume of 40 cubic yards of orange waste rock. The top is 10' long by 17' wide. The face is 28' long, has a slope angle of 27°, and is vegetated with grass and thick brush. The waste rock is moderately cemented with iron oxides and consists of orthoquartzite and fine-grained quartz-cemented sandstone. Numerous white quartz veins, up to 8-inches wide, crosscut both rocks types and contain sphalerite and bright, shiny pyrite. Pockets and smaller veins of galena also occur throughout the waste rock. The top and south flank of dump #200 is saturated with mine water and emits a strong odor of H₂S.

Quad Name: Snowmass Mountain

Site #: 325/4320-01.100

Site Name: Silver Spruce Adits

Physical Hazard Rating: 2

Description and pertinent facts: This inventory area contains five adits and their corresponding dumps. All features, except adit #101 and the upper part of dump #201, are on public land, and the inventory area is within the Maroon Bells-Snowmass Wilderness.

All features are accessed from various levels of an old mine road, FR-569. The public visits the lower adits (features #100-#102) on a regular basis. FR-569, also known as the Mount Bellview Road, intersects FR-317.2B about 2.4 miles from adit #100. Both roads are passable only when their surfaces are dry. FR-569 is drivable to the Wilderness boundary, then becomes a hiking trail. Several areas of the road in the Wilderness are washed out, but for the most part, the road remains in fairly good condition. FR-569 crosses over a small intermittent stream and makes several switchbacks up the grassy and steep hillside before reaching adit #100.

Dark-gray, carbonaceous Mancos Shale crops out on the lower southern and eastern flanks of Mt. Bellview. Cliffs on the upper flanks and summit of this mountain comprise Oligocene felsite porphyry that forms as sills, dikes, and a breccia pipe. Mutschler (1970) describes this porphyry as a white to yellowish-gray aphanitic rock containing quartz and altered feldspar phenocrysts. The quartz and alkali feldspar groundmass locally exhibits flow banding. Waste rock produced from adits #100 and #101 contains hornfels, granodiorite, and felsite.

Feature #100 is the most dangerous adit within this inventory site. Its entrance is extremely unstable and could very easily collapse on a person! A partly collapsed frame encloses the entrance, and loose rock is precariously perched over the remaining portion of the frame. The adit is still accessible; however, if a board or rock is moved, the loose overburden material could slide and completely seal the entrance. The inner workings trend S.84°W. for more than 210'. The floor is damp, but has no standing water for at least 120'. Timbers and boards reinforce the ceiling and walls for 20' just inside the entrance. A large rectangular room is inside and near the entrance of adit #100. This room is 7' high by 12' wide by 9' long.

A 30'-high rock face is exposed directly above the entrance. This blasted-out face of rock consists of shale and siltstone beds crosscut by calcite veins. Iron oxides occur within the parting planes of the shale.

Feature #200 is a light-gray dump that is on the south side of adit #100. It has an estimated volume of 315 cubic yards, the top is 33' long and 40' wide, and the highly visible face is 230' long and has a slope angle of 34°. The toe is in a very steep, V-shaped drainage corridor. This corridor is unvegetated and frequently scoured by avalanches. Most of the dump comprises moderately to well-cemented, gravel-size hornfels, sandy limestone, and shale, covered with loose granodiorite. White crystalline calcite occurs in veins up to 6-inches wide and in stringers. Waste rock consisting of orange to brown brecciated limestone contains porous veins of hematite. Some of the calcite contains crystals of chalcopyrite, and some of the limestone contains pockets of chalcopyrite.

The only other partly open adit of this inventory site belongs to feature #102. Details regarding this feature are available in the database.

^^ New Quad ^^^

Quad Name: Tincup

Site #: 371/4292-1.104

Site Name: Lower Sanford Basin

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #104 is in the remote, densely wooded, lower part of Sanford Basin. A 4WD road with a locked gate in the valley winds its way to cabins at the Seeton Mine. At the cabins, the road splits into several branches. The road that accesses shaft #104 goes uphill, rather than traversing the hill.

Shaft #104 is flooded to 20' below the collar. The total depth is unknown, but the 30-cubic-yard dump suggests that the shaft is not much deeper. A large, partly ruined shaft house surrounds the shaft. Within the shaft house ruins, an A-frame building, hinged to allow both sides to open, protects the shaft opening and discourages entry. Escape from this shaft without assistance would be difficult or impossible. During this inventory, numerous hunters were in the vicinity.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

PIKE – SAN ISABEL NATIONAL FOREST

COMANCHE NATIONAL GRASSLAND

May, 1998

by

John Neubert

Colorado Geological Survey

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
PIKE – SAN ISABEL NATIONAL FOREST – COMANCHE NATIONAL GRASSLAND**

This document summarizes the results of an inactive mine inventory of Comanche National Grassland. It does not include all the mine sites examined during this inventory. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried.

Regarding metal mining, several abandoned copper mines are on private land immediately west of the National Grassland. Information regarding these mines is available in U.S. Bureau of Mines Information Circular 7740, written by John Soule in 1956. The deposits are sandstone-hosted, and this Mesozoic-age sandstone unit underlies and is exposed in the National Grassland. Within the Grassland, exposures are limited to canyon walls, usually in areas inaccessible to vehicles. Air photos were examined and possible disturbed areas were visited on the ground. No copper prospects were found on public land. These findings match the information received from local residents, none of whom had knowledge of prospects on public land.

Mining activity on the public land is limited to gravel extraction and flagstone quarrying. Our inventory process revealed one feature exhibiting slight environmental degradation. The feature with slight degradation is a gravel pit within site #12-6-719/4124-1. This gravel pit (feature #100) is in an area of unstable, sandy soil. The regraded pit walls are nearly barren of vegetation and have deep rills and gullies. Although the eroded material is not toxic and does not leave the pit, headward erosion of the rills and gullies is probably affecting the fragile or nonexistent soil around the perimeter of the pit. The southwest highwall (feature #200) of the pit has not been regraded and is steep and barren of vegetation. The base of the pit holds a shallow waterhole used by deer, antelope, doves, and quail.

Within the Grassland, the only other site that was recorded on an inventory form was a flagstone quarry above Holt Canyon (site #12-6-696/4101-1). This quarry is not shown on the Comanche National Grassland map, but is on the 7.5-minute topographic map. The quarry had no associated environmental degradation or physical hazards.

Most of the inactive gravel pits located on public land were examined, but none had associated environmental degradation or physical hazards; and no forms were filled out for these innocuous sites.

Copies of the field forms are included in this summary report.

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

SAN ISABEL NATIONAL FOREST

LEADVILLE RANGER DISTRICT

December 31, 1996

by

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (when used with dimensions) or times (when used in tables)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
Trec	Total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
SAN ISABEL NATIONAL FOREST -- LEADVILLE RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Leadville Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. Features were inventoried for any of the following reasons: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) shown on a published topographic map. Features not meeting at least one of these criteria are considered innocuous and were not inventoried. Details on the rating systems and the limits of the inventory are given in Appendix A.

The **Priority Sites** tables show the most important environmental degradation sites and the most important physical mine hazard sites, and follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are the same throughout this report. These sites are all in Forest 12 (San Isabel) and Ranger District 01 (Leadville).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and natural waters in order to better determine environmental effects of mine drainage. Samples were analyzed for total recoverable (Trec) and dissolved constituents as shown on tables in the following text. Numeric standards are based on stream classifications and water quality standards provided by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations. In some areas standards are based on total recoverable metals, but the sample was tested for dissolved metals. In those instances, the sample result should be considered the minimum metal content. Total recoverable metals may be significantly higher. Field water sampling protocols are in Appendix B.

Geology and Mining Districts

Much of the information summarized in this section is from the references listed at the end of the report. Field observations and personal knowledge are included as well.

The Leadville Ranger District encompasses parts of the Gore, Mosquito, and Sawatch Ranges in central Colorado. The District is situated near the center of the Colorado Mineral Belt, a northeast-trending zone of intrusive porphyries and shear zones, and associated mineral deposits of Laramide age. The Colorado Mineral Belt contains most of the major metal mining districts in Colorado.

The Sawatch and Mosquito Ranges form a broad anticline of Laramide-age, called the Sawatch Uplift. The ranges are cored by Precambrian metamorphic and granitic rocks, which were intruded by Tertiary plutons, overlain by Tertiary volcanic rocks, and flanked on all sides by Paleozoic and younger sedimentary rocks. Both ranges consist predominately of Precambrian rocks.

The Arkansas Valley cuts through the center of the anticline in the northern part of the Forest, but swings through the eastern side of the anticline between Buena Vista and Salida. The Arkansas Valley is a rift graben considered to be the northern extension of the Rio Grande Rift of New Mexico.

The Leadville Ranger District includes parts of several mining districts. The most notable is the Leadville mining district, east of the town of Leadville. Mineral deposits in this district compose one of the world's largest polymetallic replacement deposits. More than \$5.4 billion (1989 prices) of gold, silver, lead, and zinc have been mined from the district. The majority of mines and mineralized areas in this district are on private land and outside the Forest boundary.

Another notable district partly in the Forest is the Alicante mining district (also referred to as the Kokomo-Tenmile district), home to the world's largest molybdenum deposit at Climax. Production from the Climax Mine has amounted to more than 1.9 billion pounds of molybdenum concentrate. Similar to the Leadville district, the majority of the mining and mineralized areas in the Alicante district are on patented claims or outside the Forest boundary. A number of abandoned mine sites

on Forest land were inventoried in this district and south to the Forest boundary in Birdseye Gulch, toward the Leadville district, but most of the features were small prospects with little or no production. The rock in this area consists of Precambrian gneiss, granulite, and migmatite that have been intruded by Precambrian granite. Paleozoic sedimentary rocks overlie the basement rocks.

Forest land west of the Alicante district, west of SH-91 to Tennessee Pass, was prospected heavily due to its proximity to and similarity in geology to the Leadville, Alicante, and Gilman mining districts. A number of abandoned mine sites were inventoried between Buckeye Gulch and East Tennessee Creek. The Tennessee Pass mining district includes the northern part of this area. The largest producing mine was the Jennie June Mine which produced more than 5,000 ounces of gold from a fissure vein, as much as 1' thick, in the Leadville Limestone. Gold placer deposits were also worked along East Tennessee Creek below the Jennie June Mine. Other inventoried mine features were less significant in terms of size and production.

The Homestake mining district is in the northeastern part of the Leadville Ranger District and is partly within the Holy Cross Wilderness. The Homestake Mine is the most notable feature inventoried in this district and was the principal producer. Production data are incomplete for the district, but from 1909 to 1941 the district produced about 3 ounces gold, 850 ounces silver, 250 pounds copper, and 5,500 pounds lead. The main vein at the Homestake Mine, traceable for nearly 3,900', is a pyritized, silicified, altered shear zone that attains widths up to 20'. Precious metals occur in quartz veins up to 4' thick. Most of the rocks that crop out in this district are Precambrian biotite gneiss, schist, and migmatite.

The mining district with the most abandoned mine sites in the Forest is the St. Kevin district north of Turquoise Lake. The Sugarloaf mining district adjoins the St. Kevin district to the south and is south of Turquoise Lake. Metal production from these districts is estimated to be \$10 - \$15 million, with the majority of production from mines on patented claims and from mines outside the Forest boundary. At today's metal prices the production value would be several times greater. The primary commodity was silver, with lesser amounts of gold, lead, zinc, and copper. Most production came from quartz-pyrite veins in fissure zones. The veins are from 1' to 10' thick and extend along strike for as much as a few thousand feet. Pyrite is abundant in most of the mine dumps in this area. Precambrian granite, quartz monzonite, schist, gneiss, and pegmatite make up most of the bedrock in these districts.

South of the Sugarloaf district, near Halfmoon Creek, four adits were inventoried. The largest adit has over 1,000' of workings and was driven on a large calcite vein in a fault fissure in Precambrian gneiss. There are no production records for these workings, but a small amount of gold and silver may have been produced. Near the head of Halfmoon Creek, to the west, is the well-known Champion Mine and Mill. The mine was a moderate producer of gold with some silver. All the mine workings and the mill are on patented claims.

The Twin Lakes mining district is a large area surrounding Twin Lakes and contains both lode and gold placer deposits. Most of the lode deposits and associated mines are northwest of Twin Lakes Reservoir and are on patented claims. The features inventoried on Forest land were small and had little or no production. The district is in the Precambrian core of the Sawatch Range. Bedrock comprises gneiss and granodiorite that has been intruded by the Tertiary-age Twin Lakes batholith. These rocks were cut by later rhyolite dikes, plugs, and mineralized quartz veins, also Tertiary in

age. Most of the lode production has come from small quartz-sulfide veins. Production records are incomplete, but records from 1907 to 1968 show production of approximately 830 ounces gold, 2,500 ounces silver, 48,000 pounds lead, and 3,400 pounds copper. Compared to Leadville, this was a small mining district.

Placer deposits near Twin Lakes occur from Cache Creek north to Box Creek. Placer mining involved considerable dredging and hydraulic cuts. Only two inventory sites are associated with the placers because the majority of these deposits are on patented claims or outside the Forest boundary. The Cache Creek gravels are reported to have produced approximately \$1 million worth of gold. The Derry and Hayden Ranch placer, including the valley of Box and Corske Creeks, produced about 68,800 ounces of gold from 1915 to 1950. The Lake Creek placers, at the mouth of Lake Creek, produced about \$55,000 worth of gold from 1860 to 1867.

Several small mines and possibly naturally degraded springs in the Leadville Ranger District are associated with the Grizzly Peak caldera, south of Independence Pass and near Peekaboo Gulch. The severely degraded Peekaboo Gulch spring is located northwest of the stream about 0.5 mile below its headwaters. The spring emerges near a fault separating Oligocene Grizzly Peak Tuff southeast of the fault from older Oligocene caldera collapse breccias and lavas northwest of the fault. This is an inner ring fault that experienced reverse movement during resurgent doming of the caldera. Estimated throw on the resurgent fault is 3,000' to 4,000'. Late-resurgent intrusions caused extensive hydrothermal alteration and metal-sulfide emplacement in the Peekaboo Gulch area. Red Mountain, named for the distinctive red color that results from the alteration, forms the western slope of Peekaboo Gulch. Although it is possible that small dry mines to the west affect water from the Peekaboo Gulch spring, the geologic setting and the dry adits indicate that the spring produces predominately natural water. More details, and water sample and test results, are discussed in the Red Mountain and Peekaboo Gulch site descriptions in the **SITES EXHIBITING ENVIRONMENTAL DEGRADATION** section.

The Winfield, or La Plata, district is adjacent to and south of the Twin Lakes district and Peekaboo Gulch. The largest working in the district is the Banker Mine, which produced a few tons of gold, silver, and lead ore. Mines and prospects in the district explored quartz veins hosted by Tertiary-age Twin Lakes porphyry. In addition to gold, silver, and lead, minor amounts of copper and molybdenum occur in some veins

The semi-active Lienhart Mine, about 3.5 miles west of U.S. Highway 24 and 6 miles south of Clear Creek Reservoir, is in no known mining district. This site is significant because of acid mine drainage. The mine has more than 1,600' of development that follows a massive sulfide vein in Tertiary granodiorite. No production records exist for the mine, but it is reported the last 400' of the mine has extensive sulfide mineralization containing gold, silver, copper, lead, and zinc.

A number of sites were inventoried on the western slope of the Mosquito Range, between the Leadville and Weston Pass districts. In the Weston Pass district, all of the large mines are outside the Leadville Ranger District or are on patented claims. North of Weston Pass, sites were inventoried along Union Creek, Little Union Creek, Gold Basin, Little Union Gulch, Empire Hill, Empire Gulch, up to the northern Forest boundary near the Leadville district and Long and Derry Hills. Some places, such as Little Union Gulch, were intensely prospected. Most of these mines and prospects were small, and any production was minor. Larger mines are either outside the

Forest boundary or on patented claims. Paleozoic- and Mesozoic-age sedimentary rocks overlie Precambrian basement rocks. Folding and faulting has been extensive, making the geology complex in places.

Numerous scattered small mines and prospects were inventoried in areas not discussed above. Any production from these prospects was small.

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN ISABEL NATIONAL FOREST -- LEADVILLE RANGER DISTRICT

NUMERICAL SUMMARY

- 130** field forms
- 767** mine openings inventoried (includes collapsed or filled openings)
- 319** mine dumps, tailings piles, highwalls, etc.
- 133** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 2
 - Number of features with EDR of 2 = 4
 - Number of features with EDR of 3 = 65
 - Number of features with EDR of 4 = 62
 - Number of features with EDR of 5 = 936
- 171** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 7
 - Number of features with PHR of 2 = 31
 - Number of features with PHR of 3 = 133
 - Number of features with PHR of 5 = 898

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN ISABEL NATIONAL FOREST -- LEADVILLE RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=12; District=01	EDR
1) South of Wilkes Barre Tunnel	Homestake Reservoir	381/4350-1.100, 200; 102, 202, 101, 201	1, 1; 3, 3, 3, 3
2) Lienhart Mine	Mount Harvard	391/4310-1.102, 202, 203	2, 2, 2
3) Lulu Gulch and Banker Mine	Winfield	373/4313-1.100; 200	2; 3
4) South shore of Turquoise Lake	Homestake Reservoir	379/4347-1.100, 200, 101, 201, 102, 202, 103, 203, 105, 205	3, 3, 3, 3, 3, 3, 3, 3, 3, 3
5) Workings north of Turquoise Lake (within 1 mile of May Queen Campground)	Homestake Reservoir	377/4348-1.200, 103, 203, 207, 112, 212, 113, 213	3, 3, 3, 3, 3, 3, 3, 3
6) Near mouth of St. Kevin Gulch	Leadville North	382/4349-1.207, 205, 200	3, 3, 3
7) Temple Gulch - Gleason Gulch	Leadville North	382/4351-1.204, 206, 202, 102	3, 3, 3, 3
8) Champion Mill	Mt. Champion	370/4332-1.200	3
9) Halfmoon Creek	Mt. Massive	371/4333-1.205	3
10) Area labeled prospects on topo, north of Turquoise Lake, south of FR-104	Homestake Reservoir	379/4348-1.203, 104, 204, 105, 205	3, 3, 3, 3, 3
11) Workings north of Turquoise Lake, 2 miles east of May Queen Campground	Homestake Reservoir	380/4348-1.100, 203, 207	3, 3, 3
12) Homestake Mine & area	Homestake Reservoir	377/4356-1.104, 105, 205	3, 3, 3
13) Workings near Rosse Tunnel	Homestake Reservoir	380/4350-1.101, 201	3, 3
14) South of Delmonica Gulch	Climax	393/4354-1.112	3

Site Name	Quad Name	Site # Forest=12; District=01	EDR
15) Red Mountain	Independence Pass	362/4319-1.112	3
16) Lackawanna Gulch	Independence Pass	367/4340-1.100	3
17) Echo Canyon South	Mount Elbert	372/4326-1.101, 201	3, 3
18) Hamilton	Winfield	373/4310-1.200	3
19) Grey Copper Creek	Mount Elbert	373/4317-1.101	3
20) Peekaboo Gulch	Independence Pass	363/4319-2.106, 107, 207	3, 3, 3
21) South Fork Lake Creek Central	Independence Pass	364/4319-1.111, 211, 104, 105, 205, 106	3, 3, 3, 3, 3, 3
22) Independence Pass	Independence Pass	366/4330-1.100	3
23) Parry Peak	Mount Elbert	377/4326-1.103	3
24) La Plata Gulch	Mount Elbert	370/4319-1.101, 201	3, 3

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=12; District=01	PHR
1) Workings north of Turquoise Lake, within 1 mile of May Queen Campground	Homestake Reservoir	377/4348-1.101, 103, 107, 108; 104, 204, 207, 109, 110, 111, 112, 114	1, 1, 1 1; 2, 2, 2, 2, 2, 2, 2
2) Jennie June Mine	Leadville North	388/4354-1.105; 104	1; 2
3) Area labeled prospects on topo north of Turquoise Lake, south of FR-104	Homestake Reservoir	379/4348-1.104	1
4) South Pine Creek Trail	Mt. Harvard	486/4312-1.101; 100	1; 2
5) Radio Tower	Leadville North	388/4348-1.107, 106	2, 2
6) Homestake Mine & area	Homestake Reservoir	377/4356-1.104, 105	2, 2

Site Name	Quad Name	Site # Forest=12; District=01	PHR
7) Temple Gulch - Gleason Gulch	Leadville North	382/4351-1.102	2
8) Workings north of Turquoise Lake, 2 miles east of May Queen Campground	Homestake Reservoir	380/4348-1.100	2
9) Sugarloaf Mountain area	Homestake Reservoir	377/4346-1.102, 202	2, 2
10) Little Union Creek	Leadville South	390/4336-1.103	2
11) East of Galena Mountain	Homestake Reservoir	379/4351-1.103	2
12) Middle Mountain	Independence Pass	363/4319-1.100	2
13) Buffalo Creek	Harvard Lakes	396/4314-1.100	2
14) McNasser Gulch	Independence Pass	363/4322-1.100	2
15) Sayres Gulch Central	Independence Pass	366/4319-1.102	2
16) Sayres Gulch North	Independence Pass	366/4321-1.101, 103	2, 2
17) Parry Peak	Mount Elbert	377/4326-1.115	2
18) South end of FR-102	Leadville North	386/4352-1.100	2
19) Parry Peak Campground	Mount Elbert	378/4324-1.103, 105	2, 2
20) Winfield Peak	Winfield	372/4315-1.100	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Climax

Site #: 393/4354-1.112

Site Name: South of Delmonica Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This collapsed adit is on USFS-managed land about 100' upstream from BLM-managed land. Access would be difficult for construction vehicles and would require road construction for about 0.8 miles from SH-91 or 0.6 miles from the Buckeye Gulch 4WD road. Leadville is about 6 miles by road from the area. Mine drainage forms the head of an unnamed creek that flows for a distance of 0.8 miles to the Arkansas River. In late July, water was flowing from the adit at about 1 gpm. Abundant ferric hydroxide precipitate lined the course of the drainage channel across the dump. The water has **pH = 6.45 and conductivity = 113.5 μ S**. Rocks on the dump are quartzite and shale that probably contain finely disseminated pyrite.

^^ New Quad ^^^

Quad Name: Homestake Reservoir

Site #: 377/4348-1

Site Name: Workings north of Turquoise Lake, within 1 mile of May Queen Campground

Description and pertinent facts: This inventory site is between the north shore of Turquoise Lake and FR-104, between 1/3 and 1 mile east of the May Queen Campground. A popular hiking/biking trail parallels the lakeshore, and the majority of the mine features are adjacent to or visible from this trail. Eight out of 24 features in this site were given an EDR of 3 because of abundant pyrite, discharging water close to Turquoise Lake, and/or dump material in contact with the lake. Water was tested at six adits, and all the tests showed low pHs and elevated conductivities.

Feature #: 200**Environmental Degradation Rating: 3**

This feature is a 140-cubic-yard dump from a caved adit and is about 200' from Turquoise Lake. Abundant pyrite is in the dump. The adit shows evidence of discharge that drains into or runs across the dump during wet periods.

Feature #: 103, 203**Environmental Degradation Ratings: 3**

Feature #103 is an open adit that drains acid mine water through and over associated dump #203. The dump has abundant pyrite in it and was estimated to be 400 cubic yards. In mid-July, water was draining from the adit at an estimated rate of 5 gpm. The water was seeping into the ground just below the dump, but a gully below the dump reveals that surface flow may at times reach Turquoise Lake, about 200' below. A reddish precipitate occurs where the effluent flows. Effluent tested at the portal had **pH = 4.2 and conductivity = 56 μ S**, and water tested below the dump had similar values. In August, the flow from the adit had diminished to a slow seep. A test at the portal

revealed **pH = 4.0 and conductivity = 71 μ S**. Effluent sampled at the portal in August exceeded stream standards in aluminum, copper, and iron, and was close to the standards in cadmium and zinc. Results for silver and lead are inconclusive, as shown on the table below.

Hardness of water sample #377/4348-1.305 = 16 mg/L

<u>Parameter and Lab result** \div</u>	<u>Numeric Standards**</u>	<u>= Factor Above Stream Standards</u>
Aluminum (Trec) 380	no standard	n/a
Antimony (Trec) <1	6.0*	below standard
Arsenic (Trec) <1	50 (acute)	below standard
Iron (Trec) 800	1,000	below standard
Thallium (Trec) <1	0.5*	below detection limit
Aluminum 330	87*	3.8 x standard
Cadmium 0.27	0.27*	1.0 x standard
Calcium 5.6 mg/L	no standard	n/a
Chloride <10 mg/L	250 mg/L*	below standard
Chromium <10	11*	below standard
Copper 18	2.5*	7.2 x standard
Fluoride 0.35 mg/L	2.0 mg/L* (Trec)	below standard
Iron 690	300	2.3 x standard
Lead <1	0.29*	below detection limit
Magnesium 0.50 mg/L	no standard	n/a
Manganese 5	50	below standard
Molybdenum <10	no standard	n/a
Nickel <20	24*	below standard
Potassium <0.1 mg/L	no standard	n/a
Silver <0.2	0.01*	below detection limit
Sodium 1.9 mg/L	no standard	n/a
Sulfate 22 mg/L	250 mg/L	below standard
Zinc 25	23*	1.1 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in μ g/L, and are dissolved concentrations unless noted. **Numeric**

standards are chronic values unless noted.

Feature #: 207

Environmental Degradation Rating: 3

This feature is a 250-cubic-yard dump associated with two open adits and a possible shaft (now capped). The bottom of the dump is in Turquoise Lake, and the Turquoise Lake hiking trail crosses the top of the dump. This feature has an EDR of 3 because of contact with Turquoise Lake and the abundant pyrite in the dump.

Feature #: 112, 212

Environmental Degradation Ratings: 3

Features #112 and #212 are an open adit and dump between the Turquoise Lake Trail and Turquoise Lake. The bottom of the dump borders the lake. In mid-July the adit was mostly filled with water, and acidic water was draining from the adit, alongside the dump, and into the lake at an estimated rate of 3 gpm. There was a rusty-red precipitate where the water was flowing. A water test at the portal had **pH = 3.0 and conductivity = 288 μ S**, and a water test below the dump had **pH = 2.9 and conductivity = 460 μ S**. This site was visited again in mid-August to collect a water sample for laboratory analyses. At this time the water flow from the adit had diminished to a measured rate of 0.4 gpm. A water test at the portal had values similar to the previous test. The results of a sample of the effluent are listed in the table below. Iron, aluminum, cadmium, copper, lead, manganese, and zinc exceed state standards.

Hardness of water sample 377/4348-1.306 = 65 mg/L.

<u>Parameter and Lab result** ÷</u>		<u>Numeric Standards**</u>	<u>= Factor Above Stream Standards</u>
Aluminum (Trec)	6,800	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	1,900	1,000	1.9 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	6,700	87*	77 x standard
Cadmium	0.97	0.81*	1.2 x standard
Calcium	20 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard
Chromium	<10	11*	below standard
Copper	47	8.2*	5.7 x standard
Fluoride	0.5 mg/L	2.0 mg/L* (Trec)	below standard
Iron	1,800	300	6 x standard

<u>Parameter and Lab result</u> ** ÷		<u>Numeric Standards</u> **	= <u>Factor Above Stream Standards</u>
Lead	4	2.1*	1.9 x standard
Magnesium	3.6 mg/L	no standard	n/a
Manganese	970	50	19 x standard
Molybdenum	<10	no standard	n/a
Nickel	26	69*	below standard
Potassium	2.7 mg/L	no standard	n/a
Silver	<0.2	0.15*	below detection limit
Sodium	2.1 mg/L	no standard	n/a
Sulfate	140 mg/L	250 mg/L	below standard
Zinc	340	73*	4.7 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in µg/L, and are dissolved concentrations unless noted. **Numeric standards** are chronic values unless noted.

Feature #: 113, 213

Environmental Degradation Ratings: 3

Features #113 and #213 are a caved adit and dump about 150' west of feature #112, also between the Turquoise Lake hiking trail and Turquoise Lake. Pyrite is present in the dump, and the lower end of the dump is submerged in the lake. In mid-July, a slow trickle of water estimated at 0.1 gpm was emerging from the caved adit and seeping into the upper end of the dump. A test of the water showed **pH = 3.1 and conductivity = 382 µS**.

Quad Name: Homestake Reservoir

Site #: 377/4356-1.104, 105, 205

Site Name: Homestake Mine and area

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory site, which is accessible by a good hiking trail, includes the Homestake Mine at the headwaters of West Tennessee Creek. The Homestake Mine was given an EDR of 3 because of the presence of sulfide minerals in the mine and dump (estimated at 600 cubic yards), and because the headwaters of West Tennessee Creek flow into the mine through a raise that intersects the stream at the surface. The stream then flows through the mine, out the portal, and over the dump. The stream was estimated to have a flow rate of 2,000 gpm in mid-July and was tested at three places: above the mine, at the portal, and below the dump. The tests showed no significant degradation of the water. The test above the mine had **pH = 6.5 and conductivity = 16 µS**. The water at the portal tested **pH = 6.8 and conductivity = 18 µS**, and the water below the dump tested virtually the same.

Quad Name: Homestake Reservoir

Site #: 379/4347-1

Site Name: South shore of Turquoise Lake

Description and pertinent facts: This inventory site includes mine features in an area 1.4 miles long, adjacent to the south shore of Turquoise Lake and FR-104, about midway between Sugarloaf Dam and the lake inlet. Five adits and dumps were given EDRs of 3 because of the presence of pyrite and the proximity to Turquoise Lake. Water was flowing from adit #105 into the lake.

Feature #: 100, 200

Environmental Degradation Ratings: 3

This feature is a caved adit with a dump estimated to be 100 cubic yards. The dump contains pyrite, and the base of the dump is about 50' from Turquoise Lake.

Feature #: 101, 201

Environmental Degradation Ratings: 3

This feature is just below feature #100 and is a caved adit with a dump estimated to be 240 cubic yards. Abundant pyrite is present in the dump. Gullies extending from the base of the dump to Turquoise Lake suggest erosion of dump material into the lake during periods of runoff. An iron-oxide-stained area on top of the dump indicates the adit may drain water during wet periods.

Feature #: 102, 202

Environmental Degradation Ratings: 3

This feature is a caved adit and dump about 125' east of #101. The dump was estimated to be 75 cubic yards, contains pyrite, and extends into Turquoise Lake.

Feature #: 103, 203

Environmental Degradation Ratings: 3

This feature is a caved adit and dump about 125' east of #102. The dump was estimated to be 300 cubic yards, contains abundant pyrite, and extends more than 10' into Turquoise Lake. An iron-oxide-stained gully in the dump originates above the caved adit.

Feature #: 105, 205

Environmental Degradation Ratings: 3

This feature is an open adit and dump about 75' west of #101. The dump is about 50 cubic yards, contains pyrite, and is in contact with Turquoise Lake. The adit is flooded with water to within about 3' of the roof. In late July, water was draining from the adit at an estimated rate of 30 gpm. The water joined a small creek about 5' from the portal and flowed over the dump and into Turquoise Lake. The water flow of the creek was estimated at 10 gpm, and the flow entering Turquoise Lake was estimated at 50 gpm. Water was tested at 3 locations: 1) creek just above the adit - **pH = 3.5, conductivity = 335 μ S**; 2) portal - **pH = 6.6, conductivity = 264 μ S**; 3) below dump - **pH = 4.0, conductivity = 112 μ S**. This site was visited again in late August to collect a water sample for laboratory analyses. A water test at the portal showed **pH = 3.3 and conductivity = 244 μ S**. Analytical results of water sample #379/4347-1.303 collected at the portal are in the following table. The sample significantly exceeded standards in concentrations of copper, iron,

manganese, and zinc; and slightly exceeded standards in lead and cadmium. Hardness of sample = 29 mg/L.

<u>Parameter and Lab result** ÷</u>	<u>Numeric Standards**</u>	<u>= Factor Above Stream Standards</u>
Aluminum (Trec) 2,100	no standard	n/a
Antimony (Trec) <1	6.0*	below standard
Arsenic (Trec) 2	50 (acute)	below standard
Iron (Trec) 6,900	1,000	6.9 x standard
Thallium (Trec) <1	0.5*	below detection limit
Aluminum 2,000	87*	23 x standard
Cadmium 0.59	0.43*	1.4 x standard
Calcium 9.5 mg/L	no standard	n/a
Chloride <10 mg/L	250 mg/L*	below standard
Chromium <10	11*	below standard
Copper 50	4.1*	12 x standard
Fluoride 0.53 mg/L	2.0 mg/L* (Trec)	below standard
Iron 6300	300	21 x standard
Lead 2	0.66*	3 x standard
Magnesium 1.2 mg/L	no standard	n/a
Manganese 350	50	7 x standard
Molybdenum <10	no standard	n/a
Nickel <20	37*	below standard
Potassium 1.5 mg/L	no standard	n/a
Silver <0.2	0.04*	below detection limit
Sodium 2.4 mg/L	no standard	n/a
Sulfate 53 mg/L	250 mg/L	below standard
Zinc 420	37*	11 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in µg/L, and are dissolved concentrations unless noted. **Numeric standards** are chronic values unless noted.

Quad Name: Homestake Reservoir

Site #: 379/4348-1.203, 104, 204, 105, 205

Site Name: Area labeled prospects on topo, north of Turquoise Lake, south of FR-104

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory site is between the north shore of Turquoise Lake and FR-104, about 1.5 miles east of May Queen Campground. A popular hiking/biking trail parallels the lakeshore, and some of the mine features are visible from this trail. Three dumps, a caved adit, and a shaft were given EDRs of 3 because of abundant pyrite, discharging or standing water, and proximity to Turquoise Lake. These mine features are adjacent to each other. Features #104/204 are a shaft and dump. The shaft was measured to be over 100' deep and is filled with water to about 30' below the surface. This shaft is about 300' above the lake, and the water likely contributes to groundwater entering Turquoise Lake. Water in the shaft could not be tested. Dump #204 was estimated to be 110 cubic yards and contains abundant pyrite. Feature #203 is a dump with abundant pyrite estimated to be 180 cubic yards. The base of the dump is in contact with a caved adit, feature #105. In mid-July, water was discharging from caved adit #105 at an estimated rate of 0.5 gpm and was seeping into its dump, feature #205. Dump #205 contains abundant pyrite and was estimated to be 250 cubic yards. Water draining from caved adit #105 was tested and had **pH = 3.3 and conductivity = 230 μ S**. Gullies provide evidence that discharge is greater during wet periods when water from the adit flows over and alongside the dump. The base of the dump is about 125' from Turquoise Lake.

Quad Name: Homestake Reservoir

Site #: 380/4348-1

Site Name: Workings north of Turquoise Lake, 2 miles east of May Queen Campground.

Description and pertinent facts: This site is between the north shore of Turquoise Lake and FR-104, about 2 miles east of May Queen Campground. Three dumps were given EDRs of 3 because the dumps contain pyrite and are in contact with water.

Feature #: 100

Environmental Degradation Rating: 3

Feature #100 is an open adit adjacent to the Turquoise Lake hiking trail. A small dump from the adit contains pyrite, and part of the dump is submerged in Turquoise Lake.

Feature #: 203

Environmental Degradation Rating: 3

Feature #203 is the 200-cubic-yard dump of a caved adit. The dump has abundant pyrite in it, and part of the dump is submerged in Turquoise Lake. The Turquoise Lake hiking trail crosses the top of the dump.

Feature #: 207

Environmental Degradation Rating: 3

Feature #207 is a 30-cubic-yard dump of a caved adit. The dump contains pyrite and is in contact with an unnamed stream that drains into Turquoise Lake. Part of the dump has been eroded by the

stream, which was flowing at an estimated rate of 500 gpm in mid-July. Stream water was tested both above and below the dump. The test above the dump showed **pH = 6.4 and conductivity = 28 µS**, and the test below the dump showed **pH = 6.8 and conductivity = 30 µS**, indicating no significant degradation of stream water.

Quad Name: Homestake Reservoir

Site #: 380/4350-1.101, 201

Site Name: Workings near Rosse Tunnel

Environmental Degradation Ratings: 3

Description and pertinent facts: This site is in upper St. Kevin Gulch. Some of the mine features are northwest from the Rosse Tunnel and can be accessed by FR-103 and a trail; other features are south of the Rosse Tunnel and are accessible from FR-107. One adit and associated dump in St. Kevin Gulch were given EDRs of 3. A solidly cribbed portal and mine supplies on and adjacent to the dump indicate that this mine is semi-active. The dump was estimated to be 650 cubic yards, and a small stockpile on the dump contained abundant pyrite. In mid-July, water flowed from the adit at an estimated rate of 15 gpm. Part of the water was seeping into the dump, and the rest was flowing alongside the dump into a marshy area adjacent to St. Kevin Gulch. A test of the water at the portal showed **pH = 5.2 and conductivity = 148 µS**. The St. Kevin Gulch stream was tested above and below the adit and dump. Results of the test above the adit were **pH = 6.5 and conductivity = 24 µS**. The test below the adit had values of **pH = 6.8 and conductivity = 25 µS**, suggesting that water from the adit was having no significant effect on the stream. In mid-August, the flow had diminished, and a water sample was collected from standing water at the portal. A test of the standing water had **pH=5.0 and conductivity=198 µS**. Lab results of water sample #380/4350-1.303 indicate that standards were exceeded in aluminum, cadmium, manganese, and zinc. Hardness of sample = 132 mg/L.

<u>Parameter and Lab result** ÷</u>		<u>Numeric Standards**</u>	<u>= Factor Above Stream Standards</u>
Aluminum (Trec)	220	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	140	1,000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	210	87*	2.4 x standard
Cadmium	9	1.4*	6.4 x standard
Calcium	41 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard

<u>Parameter and Lab result** ÷</u>		<u>Numeric Standards**</u>	= <u>Factor Above Stream Standards</u>
Chromium	<10	11*	below standard
Copper	5	15*	below standard
Fluoride	0.24 mg/L	2.0 mg/L* (Trec)	below standard
Iron	110	300	below standard
Lead	4	5.8*	below standard
Magnesium	7.2 mg/L	no standard	n/a
Manganese	1,300	50	26 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	118*	below standard
Potassium	1.4 mg/L	no standard	n/a
Silver	<0.2	0.52*	below standard
Sodium	3.4 mg/L	no standard	n/a
Sulfate	80 mg/L	250 mg/L	below standard
Zinc	1,100	134*	8.2 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in µg/L, and are dissolved concentrations unless noted. **Numeric standards** are chronic values unless noted.

Quad Name: Homestake Reservoir

Site #: 381/4350-1

Site Name: South of Wilkes Barre Tunnels

Description and pertinent facts: This site is adjacent to the intersection of St. Kevin and Shingle Mill Gulches and is accessible by FR-103. This is the most serious environmental problem site inventoried in the Leadville Ranger District and is the only site with EDRs of 1. Acid mine water with low pH and high conductivity drains directly into St. Kevin Gulch, causing a prominent rusty red precipitate in the stream.

Feature #: 100, 200

Environmental Degradation Ratings: 1

These features are a caved adit and its associated 1,100-cubic-yard dump. The dump has prominent sulfur staining and a strong smell of sulfur, and abundant pyrite is present in the dump. On August 20, 1996, water was draining from the adit at a rate of about 2 gpm, but the flow is likely much higher in the spring. The water was both seeping through and flowing alongside the dump, and surface runoff was channeled at five places into a plastic pipe below the dump. The water then

flowed through the plastic pipe and emptied directly into the St. Kevin Gulch stream, depositing a prominent rusty-red precipitate on the bottom and sides of the streambed. A water test at the portal revealed **pH = 3.3 and conductivity = 2,130 µS**. A test of water flowing out at the bottom of the dump showed **pH = 3.2 and conductivity = 2,380 µS**. Where the water discharged from the pipe into the stream, discharge rate was measured at 8.5 gpm, **pH = 3.2, and conductivity = 2,140 µS**. These values show that mine water is significantly degraded. Water from St. Kevin Gulch just upstream from the mine discharge point tested at **pH = 5.3 and conductivity = 145 µS**, showing that stream water is somewhat degraded at this point. A test from St. Kevin Gulch 1,500' downstream from the mine discharge showed **pH = 4.09 and conductivity = 167 µS**, suggesting the mine discharge has a significant effect on the stream. The following day a water sample was collected from the pipe. A second water test of the discharge showed **pH = 2.8 and conductivity = 2,090 µS**. Lab results from sample #381/4350-1.308 show the mine water to be extremely degraded and many times over the stream segment or state standards for the following parameters: iron, aluminum, cadmium, copper, manganese, sulfate, and zinc. Hardness of sample = 611 mg/L.

<u>Parameter and Lab result** ÷</u>	<u>Numeric Standards**</u>	<u>= Factor Above Stream Standards</u>
Aluminum (Trec) 1,700	no standard	n/a
Antimony (Trec) <1	6.0*	below standard
Arsenic (Trec) 8	50 (acute)	below standard
Iron (Trec) 100,000	1,000	100 x standard
Thallium (Trec) <1	0.5*	below detection limit
Aluminum 17,000	87*	195 x standard
Cadmium 480	4.7*	102 x standard
Calcium 200 mg/L	no standard	n/a
Chloride <10 mg/L	250 mg/L*	below standard
Chromium <10	11*	below standard
Copper 450	55*	8.2 x standard
Fluoride 1.7 mg/L	2.0 mg/L* (Trec)	below standard
Iron 100,000	300	333 x standard
Lead 6	51*	below standard
Magnesium 27 mg/L	no standard	n/a
Manganese 51,000	50	1020 x standard
Molybdenum <10	no standard	n/a
Nickel 77	378*	below standard

<u>Parameter and Lab result** ÷</u>		<u>Numeric Standards**</u>	= <u>Factor Above Stream Standards</u>
Potassium	<1.0 mg/L	no standard	n/a
Silver	0.4	7.2*	below standard
Sodium	5.3 mg/L	no standard	n/a
Sulfate	1,100 mg/L	250 mg/L	4.4 x standard
Zinc	93,000	491*	190 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in µg/L, and are dissolved concentrations unless noted. **Numeric standards** are chronic values unless noted.

Feature #: 101, 201

Environmental Degradation Ratings: 3

Feature #101 is a caved adit on private land. Water flows from the adit and into St. Kevin Gulch. Two dumps are associated with this adit. The upper dump is on private land, but part of the lower dump appears to be on public land and is in contact with the Shingle Mill Gulch stream. The dump is about 60 cubic yards and has abundant pyrite.

Feature #: 102, 202

Environmental Degradation Ratings: 2

Features #102 and #202 are the lower Wilkes Barre Tunnel (an adit) and dump. The adit is on private land, but the lower part of the dump is on public land. On August 20, 1996, water was draining from the adit at an estimated rate of 4 gpm and seeping into the ground alongside the dump. A gully indicates that during wetter periods the surface flow reaches the creek. A test at the portal showed that the water is slightly degraded, with **pH = 5.8 and conductivity = 463 µS**. The dump was estimated to be 800 cubic yards, and the base is in contact with the Shingle Mill Gulch stream. The dump is highly sulfur stained and contains abundant pyrite.

^^ New Quad ^^^

Quad Name: Independence Pass

Site #: 362/4319-1.112

Site Name: Red Mountain

Environmental Degradation Rating: 3

Description and pertinent facts: This feature is a small collapsed adit on the lower slopes of Red Mountain. A small spring (flow rate approximately 2 gpm) emerges from the base of the collapsed portal, flows across the dump, and seeps into the hillside below the dump. The stream has **pH = 3.23 and conductivity = 319 µS**. Although this stream contributes to the degradation of surface water and groundwater in Peekaboo Gulch, its low flow rate is inconsequential compared to the natural, low pH, high conductivity springs in this valley.

The severely degraded Peekaboo Gulch spring flows at about 25 gpm and is located northwest of the stream, downslope and 700' southwest from feature #112. Four small prospect adits and one moderately sized adit are located about 1/4 mile west and upslope of the sampled spring. Three of the mine dumps are less than 50 cubic yards, one is about 270 cubic yards, and the largest is about 1,100 cubic yards. None of these mines were draining water when inventoried (July, 1994). Although it is possible that these small workings affect the Peekaboo Gulch spring, the geologic setting and the fact that these adits were dry strongly suggests that the spring produces predominately natural water.

Water sample #362/4319-1.301 was collected from the Peekaboo Gulch spring. Comparing the water sample analyses to the state-wide chronic aquatic life standards indicates concentrations of dissolved metals to be over the standards by *factors* of: 1,724 for aluminum, 42 for cadmium, 1,640 for copper, 100 for iron, about 6 for silver, and 21 for zinc. In addition, the spring water exceeds domestic water supply standards by factors of almost 5 for manganese and 6 for sulfate. Above its confluence with this spring, Peekaboo Gulch contains clear water with relatively neutral pH (6-7). Below this the water becomes red with iron hydroxide precipitate and is very acidic (pH = 3.5). Hardness of spring sample = 27 mg/L.

<u>Parameter and Lab result** ÷</u>		<u>Aquatic life standards**</u>	<u>= Factor Above Stream Standards</u>
Aluminum	150,000	87*	1,724 x standard
Arsenic	<1	6* (Trec)	below standard
Barium	<10	1,000	below standard
Cadmium	16	0.38*	42 x standard
Chromium	<50	11*	below detection limit
Copper	6,000	3.7*	1,640 x standard
Iron	100,000	1,000	100 x standard
Lead	<5	0.6*	below detection limit
Manganese	240	1,000 (Trec)	below standard
Molybdenum	<50	no standard	n/a
Nickel	<100	34*	below detection limit
Silver	0.2	0.03*	6 x standard
Sulfate	1,500 mg/L	no standard	n/a
Zinc	710	33*	21 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in µg/L, and are dissolved concentrations unless noted. **Aquatic life standards** are chronic values unless noted.

Quad Name: Independence Pass

Site #: 363/4319-2

Site Name: Peekaboo Gulch

Feature #: 106

Environmental Degradation Rating: 3

This feature is an open adit with a small pool of standing water 2' below the entrance. This mine is part of the "Three Cabins" site of Howell (1919). The water has **pH = 7.4 and conductivity = 324 μ S**. Although the pH is nearly neutral, significant quantities of metals that may be dissolved in the water could be flushed out of the mine during periods of high runoff. A collapsed building adjoining the adit has an engine and drum in the debris. The drum is labeled "cleaning solvent" and may represent a hazardous waste problem. The contents of the drum are unknown. Several other drums of various sizes are present throughout the "Three Cabins" site.

Feature #: 107, 207

Environmental Degradation Ratings: 3

This is a collapsed adit with a small stream emanating from the base. The stream has **pH = 3.67 and conductivity = 163 μ S**. The nearby mountain stream has **pH = 6.51 and conductivity = 125 μ S**. The mine stream has significantly lower pH but the dissolved metals content may be relatively unchanged. The mine stream has a low flow rate of about 0.1 gpm and seeps into the 350-cubic-yard dump. Dump #207 contains iron-stained volcanic rocks with traces of pyrite. The low-pH effluent may dissolve metals in the dump, especially during periods of higher flow. The dump adjoins a swift mountain stream and probably erodes into this stream periodically.

Quad Name: Independence Pass

Site #: 364/4319-1

Site Name: South Fork Lake Creek Central

Feature #: 104

Environmental Degradation Rating: 3

This is one of a series of adjoining collapsed adits with degraded discharges. The effluent from this adit has a flow rate of about 1 gpm, **pH = 7.1, conductivity = 206 μ S**, and it flows across dump #204 (see below). This adit is probably on a private, patented claim, but the stream flows onto public land. Typical pH in this area should about 7-8, and conductivity should be below 100 μ S.

Feature #: 105

Site Name: South Fork Lake Creek Central

Environmental Degradation Rating: 3

This collapsed adit is just east of #104, also on patented land. The stream from this adit has a small flow rate of 0.1 gpm, **pH = 7.3, conductivity = 209 μ S**, and it flows across dump #204 (see below).

Feature #: 204

Environmental Degradation Rating: 3

This dump is common to adits #104 and #105 and is probably on private land. The dump consists of iron-stained volcanic rocks with a trace of pyrite. Marginally degraded streams from #104 and #105 flow across the dump and seep into it. This effluent merges with effluent from adit #106 in a boggy area just north of the site. The combined effluent streams ultimately flow onto public land.

Feature #: 106

Environmental Degradation Rating: 3

This collapsed adit on private, patented land is discharging about 2 gpm of water with **pH = 7.05 and conductivity = 167 μ S**. The dump for adit #106 is small but probably interacts with and further degrades the mine discharge. The effluent flows northward on to public land.

Feature #: 111, 211

Environmental Degradation Ratings: 3

Feature #111 is a boarded-up, open adit discharging about 1 gpm of water that seeps into 350-cubic-yard dump #211. The effluent has **pH = 7.63 and conductivity = 237 μ S**. Because it is low on the flank of the mountain, adit #111 has the potential to drain a large area and thus discharge a substantial volume of degraded water. Dump #211 consists of iron-stained, altered volcanic rocks and has potential to further degrade mine effluent and groundwater.

Quad Name: Independence Pass

Site #: 366/4330-1.100

Site Name: Independence Pass

Environmental Degradation Rating: 3

Description and pertinent facts: This site is the Eureka Mine. The open adit is boarded-up and partly flooded. Effluent drains from this adit at about 10 gpm and has **pH = 7.9 and conductivity = 255 μ S**. A swiftly flowing mountain stream on the north side of the adit has **pH = 7.23 and conductivity = 52 μ S** on a 40 gpm flow. The effluent merges with the stream in the gully below the adit. Either the associated dump was largely eroded away by the stream, or the bulk of the dump material was transported by aerial tram to the valley floor, 900' below. Several earthen dams are present along North Fork of Lake Creek below the Eureka Mine. These dams may have been constructed from dump material.

Quad Name: Independence Pass

Site #: 367/4340-1.100

Site Name: Lackawanna Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This privately owned mine is near the junction of Lackawanna Gulch and North Fork Lake Creek. A lock on a chain across the access road was stamped "Climax Molybdenum". This collapsed adit is seeping water with **pH = 7.75 and conductivity = 564 μ S**. The mine discharge soaks into the access road between the mine and the associated dump. Field

^^ New Quad ^^^

Site #: 382/4349-1

Description and pertinent facts: This site is along FR-103, about 5 miles by road from Leadville. Mine features include three caved adits, two caved shafts, two areas of tailings, and the remains of an old mill. All of the features are within 700' of St. Kevin Gulch Creek. Abundant ferric hydroxide precipitate lines the entire course of the creek as it flows through the site. Features in this site appear to have little additional effect on the environmental degradation of St. Kevin Creek. Water near the upper part of the site had **pH = 4.09 and conductivity = 167 μ S**, which was not much different than water below the site, where **pH = 4.12 and conductivity = 169 μ S**.

Environmental Degradation Rating: 3**Feature #:** 205

This abandoned mill site contains at least 30 cubic yards of finely crushed tailings. When the mill was in operation, additional tailings may have been dumped into St. Kevin Creek, which is only 50' from the bottom of the mill. Pyrite is a common mineral in this area, therefore, the tailings probably contain crushed pyrite with potential to degrade groundwater at the site.

Environmental Degradation Rating: 3

Quad Name: Leadville North

Site Name: Temple Gulch - Gleason Gulch

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caved adits, two prospect pits, and associated dumps. The features with potential environmental degradation are within 600' of Temple Gulch Creek. Water in Temple Gulch Creek above the mine features had **pH = 6.88 and conductivity = 39.9 μ S**, which was not much different than creek water below feature #204, where **pH = 7.05, conductivity = 40.9 μ S**.

Feature #: 102, 202

Environmental Degradation Ratings: 3

This 60'-deep shaft and associated 150-cubic-yard dump contain abundant pyrite. In early July, the shaft was flooded to within 13' of the collar and could not be tested, however, an erosion gully near the shaft suggests possible drainage earlier in the spring. Water seeping from a nearby caved adit onto dump #202 had **pH = 6.9 and conductivity = 170.8 μ S**. The dump is about 10' from the main creek in Temple Gulch. A storm event could erode the dump.

Feature #: 204

Environmental Degradation Rating: 3

Fine pyrite, a common mineral in nearby mine dumps, is probably present in this 275-cubic-yard mill-tailings pile. Vegetation is sparse or absent on the thicker areas of tailings. Although the mill tailings are not in contact with nearby Temple Gulch Creek, they are in the flood plain.

Feature #: 206

Environmental Degradation Rating: 3

This 3,500-cubic-yard dump is mainly on private land. Only the western side appears to be on USFS-managed land. The dump material apparently came from two locked shafts on private land. Although no water was draining from the dump, the large amount of dump material with abundant pyrite has potential for contaminating groundwater, especially during spring snowmelt and periods of rainfall. The bottom of the dump is only 30' from the main creek in Temple Gulch.

^^ New Quad ^^^

Quad Name: Mt. Champion

Site #: 370/4332-1.200

Site Name: Champion Mill

Environmental Degradation Rating: 3

Description and pertinent facts: Access to this site is by FR-110, which becomes a rough 4WD trail 2.5 miles before the site. A locked cable across the road prevents driving the last 0.1 mile. This large area of mill tailings (3,800 cubic yards) is from the Champion Mill. The Champion Mill is on private land, however, the tailings are mainly on USFS-managed land. The fine, yellow-stained tailings probably contain abundant pyrite. A few pieces of coarse pyrite in quartz were found in the upper tailings pile. The tailings are in three parts: two upper parts are divided by the 4WD road leading to the mill, and the lower part is in contact with Halfmoon Creek. Standing water on the upper pile north of the 4WD trail had **pH = 7.71 and conductivity = 41 μ S**. In August, water seeping from the lower part of the tailings into Halfmoon Creek had **pH = 6.69 and conductivity = 92 μ S**. The low flow of seepage from the tailings apparently had little effect on the large volume of water in Halfmoon Creek (\approx 1,000 gpm). Upstream creek water had **pH = 7.7 and**

^^ New Quad ^^^

Hardness of sample 391/4310-1.300 from the portal = 78 mg/L.

<u>Parameter and Lab result** ÷</u>	<u>Numeric Standards**</u>	<u>= Factor Above Stream Standards</u>
Aluminum (Trec) 510	no standard	n/a
Antimony (Trec) <1	6.0*	below standard
Arsenic (Trec) 2	50 (acute)	below standard
Iron (Trec) 3,900	1,000	3.9 x standard
Thallium (Trec) <1	0.5*	below detection limit
Aluminum 440	87*	5.1 x standard
Cadmium 11	0.91	12.1 x standard
Calcium 29 mg/L	no standard	n/a
Chloride <10 mg/L	250 mg/L*	below standard
Chromium <10	11*	below standard
Copper 310	9.3*	33 x standard
Fluoride 0.35 mg/L	2.0 mg/L*	below standard
Iron 890	300	3.0 x standard
Lead 110	2.6*	42 x standard
Magnesium 1.4 mg/L	no standard	n/a
Manganese 220	50	4.4 x standard
Molybdenum <10	no standard	n/a
Nickel <20	76*	below standard
N-Nitrate/Nitrite <0.5 mg/L	10 mg/L*	below standard
Phosphate (Trec) <0.05 mg/L	no standard	n/a
Potassium 1.3 mg/L	no standard	n/a
Silver <0.2	0.20*	1 x standard
Sodium 3.4 mg/L	no standard	n/a
Sulfate 57 mg/L	250 mg/L	below standard
Zinc 2,000	83*	24 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in µg/L, and are dissolved concentrations unless noted. **Numeric standards** are chronic values unless noted.

Hardness of sample 391/4310-1.303 from 750' below the portal = 74 mg/L.

<u>Parameter and Lab result** ÷</u>		<u>Numeric Standards**</u>	= <u>Factor Above Stream Standards</u>
Aluminum (Trec)	<50	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	18	1,000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	3.4	0.93*	3.8 x standard
Calcium	28 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard
Chromium	<10	11*	below standard
Copper	9	9.2*	below standard
Fluoride	0.26 mg/L	2.0 mg/L*	below standard
Iron	<10	300	below standard
Lead	<1	2.6*	below standard
Magnesium	1.0 mg/L	no standard	n/a
Manganese	8	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	76*	below standard
N-Nitrate/Nitrite	<0.5 mg/L	10 mg/L*	below standard
Phosphate (Trec)	<0.05 mg/L	no standard	n/a
Potassium	1.4 mg/L	no standard	n/a
Silver	<0.2	0.2*	1 x standard
Sodium	3.0 mg/L	no standard	n/a
Sulfate	19 mg/L	250 mg/L	below standard
Zinc	500	83*	6.0 x standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in µg/L, and are dissolved concentrations unless noted. **Numeric standards** are chronic values unless noted.

^^ New Quad ^^^

Quad Name: Mount Massive

Site #: 371/4333-1.205

Site Name: Halfmoon Creek

Environmental Degradation Rating: 3

Description and pertinent facts: Access to the site is by FR-110 which becomes a rough 4WD trail about 2 miles before the site. This 1,200-cubic-yard, mill-tailings pile was actively being eroded by Halfmoon Creek in August, 1996. Water tested upstream (**pH = 7.76 and conductivity = 69 μ S**) was nearly the same as downstream (**pH = 7.84 and conductivity = 69 μ S**) from the tailings. This is probably a result of the large volume of water flowing in Halfmoon Creek (\approx 1,000 gpm) and may reflect minimal environmental degradation caused by the tailings during dry weather. Degradation may increase dramatically during snowmelt and storm events.

^^ New Quad ^^^

Quad Name: Winfield

Site #: 373/4310-1.200

Site Name: Hamilton

Environmental Degradation Rating: 3

Description and pertinent facts: This 475-cubic-yard dump is in the South Fork of Clear Creek. Dump material extends into the creek, forcing the creek to flow around it. Water seeping from the north side of the dump has **pH = 7.12 and conductivity = 387 μ S**. The source of this water is either the stream or groundwater from the hillside west of the dump. The stream south of the dump (upstream) has **pH = 7.68 and conductivity = 67.4 μ S**. No drainage was observed associated with the collapsed adit at this location. Uncharacteristically large amounts of algae grow in the beaver ponds near dump #200.

Quad Name: Winfield

Site #: 373/4313-1.100; 200

Site Name: Lulu Gulch and Banker Mine

Environmental Degradation Rating: 2; 3

Description and pertinent facts: The Banker Mine (#100) and associated dump #200 are on private land near the South Fork of Clear Creek. Effluent drains from the collapsed adit at a rate of about 10 gpm and has **pH = 7.37 and conductivity = 671 μ S**. The effluent flows along the south margin of dump #200 and eventually soaks into the ground. On the north side of dump #200, degraded water with **pH = 7.66 and conductivity = 642 μ S** seeps to the surface for a short distance before soaking back into the ground. Similar seepage, with **pH = 8.07 and conductivity = 631 μ S**, occurs just beyond the dump toe to the west, possibly on public land. Combined volume of both seeps is much less than the volume of effluent emerging from the Banker Mine. Dump #200

contains abundant pyrite and other metal sulfides. South Fork Clear Creek has **pH = 7.93** and **conductivity = 79.9 μ S**. A water sample collected at the Banker Mine portal slightly exceeded state standards for manganese.

Hardness of effluent sample $373/4313 - 1.300 = 330$ mg/L.

<u>Parameter and Lab result** ÷</u>		<u>Numeric standards**</u>	= <u>Factor Above Stream Standards</u>
Alkalinity	96 mg/L	no standard	n/a
Aluminum	<50	87*	below standard
Arsenic	2	6* (Trec)	below standard
Barium	9	1,000	below standard
Cadmium	<0.25	2.9*	below standard
Chromium	<10	11*	below standard
Copper	<4	33*	below standard
Iron	<10	300	below standard
Lead	<5	21*	below standard
Manganese	67	50	1.3 x standard
Molybdenum	13	no standard	n/a
Nickel	<20	237*	below standard
Silver	<0.2	2.5*	below standard
Sulfate	220 mg/L	250 mg/L	below standard
Zinc	<8	291*	below standard

* No stream segment standard given, based on state-wide standards.

** All ion concentrations are in μ g/L, and are dissolved concentrations unless noted.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Harvard Lakes

Site #: 396/4314-1.100

Site Name: Buffalo Creek

Physical Hazard Rating: 2

Description and pertinent facts: This adit is more than 25' deep with an opening of 6'x 4'. It is located near the end of an access road off CR-371. There were several campsites observed in the immediate vicinity. The adit was positioned at the head of a bulldozed trench.

^^ New Quad ^^^

Quad Name: Homestake Reservoir

Site #: 377/4346-1.102, 202

Site Name: Sugarloaf Mountain area

Physical Hazard Ratings: 2

Description and pertinent facts: This site is on the slope of Sugarloaf Mountain, south of FR-104, and east and north of FR-105A. Feature #102 is a shaft with sides sloping 10' down to cribbing, and then a vertical drop of 25' to water. The depth of the shaft below water level is uncertain. The feature is about 800' from FR-105A and the Colorado Trail, on the west slope of Sugarloaf Mountain. This feature has a PHR of 2 because of the proximity to a popular 4WD and hiking trail, and because dump #202 surrounding the shaft opening has steep sides, is undercut, and is caving into the shaft.

Quad Name: Homestake Reservoir

Site #: 377/4348-1

Site Name: Workings north of Turquoise Lake, within 1 mile east of May Queen Campground

Description and pertinent facts: This site is adjacent to a very popular hiking and biking trail that parallels Turquoise Lake. The western trailhead is at the May Queen Campground, also a very popular campground. Three open adits, and one shaft and dump, have PHRs of 1 because of dangerous conditions at the openings and proximity to the trail. Five more adits, a shaft, and a dump have PHRs of 2 because of proximity to the trail.

Feature #: 101**Physical Hazard Rating: 1**

This feature is a 65'-deep shaft that is filled with water 32' below the surface. The shaft has loose, sloughing walls. It is about 300' above the Turquoise Lake hiking trail.

Feature #: 103

Physical Hazard Rating: 1

This feature is an open adit with loose rock, dirt, and support timbers at the portal. The dump of the adit is about 100' above the hiking trail.

Feature #: 104, 204

Physical Hazard Ratings: 2

Features #104 and #204 are a shaft and dump. The shaft is partly caved 15' below the surface and has loose dump material around the sides. It is about 200' uphill from feature #103 and about 400' from the Turquoise Lake hiking trail.

Feature #: 107, 108

Physical Hazard Ratings: 1

Features #107 and #108 are open adits adjacent to the Turquoise Lake hiking trail. The extent of the adits is unknown. Both adits have loose and dangerous rock at the portals. A concrete slab, which may cap a shaft, is between the adits.

Feature #: 207

Physical Hazard Rating: 2

This feature is the dump from adits #107 and #108, and possibly from a capped shaft. The Turquoise Lake hiking trail crosses over the top of the dump. Just below the trail, the dump has eroded into a steep slope that drops toward Turquoise Lake.

Feature #: 109, 110, 111

Physical Hazard Ratings: 2

Features #109 and #110 are open adits about 120' uphill from adit #107, and feature #111 is an open adit about 120' uphill from adits #109 and #110. The extent of the adits is unknown. All three adits seem to have fairly stable portals. A PHR of 2 was given to these adits because of the proximity to the Turquoise Lake hiking trail.

Feature #: 112

Physical Hazard Rating: 2

Feature #112 is a partly open adit just below the Turquoise Lake hiking trail. The extent of the adit is unknown, and the adit is mostly flooded.

Feature #: 114

Physical Hazard Rating: 2

This feature is an open adit that is just below and undercuts the Turquoise Lake hiking trail. Subsidence could cause the trail to collapse into the adit. The adit is about 30' east of Bear Creek.

Quad Name: Homestake Reservoir

Site #: 377/4356-1.104, 105

Site Name: Homestake Mine and area

Physical Hazard Ratings: 2

Description and pertinent facts: This site is accessible by a good hiking trail and includes the Homestake Mine at the headwaters of West Tennessee Creek. The Homestake Mine (adit #105) has several hundred feet of underground workings. According to literature, loose rock and unstable ground exist inside the adit. A raise from adit #104 intersects the surface at trench #104, and the headwaters of West Tennessee Creek flow down the raise, through the adit, and out the portal. This mine has a PHR of 2 because of the risk of someone falling down the raise (or shaft).

Quad Name: Homestake Reservoir

Site #: 379/4348-1.104

Site Name: Area labeled prospects on topo, north of Turquoise Lake, south of FR-104

Physical Hazard Rating: 1

Description and pertinent facts: This site is between the north shore of Turquoise Lake and FR-104, about 1.5 miles east of May Queen Campground. A popular hiking/biking trail parallels the lakeshore, and some of the mine features are visible from this trail. Feature #104 is a vertical shaft measured to be greater than 100' deep and filled with water to about 30' below the surface. The shaft is partly covered with rotten boards and is about 300' uphill from Turquoise Lake and the hiking trail.

Quad Name: Homestake Reservoir

Site #: 379/4351-1.103

Site Name: East of Galena Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This site includes features near the heads of St. Kevin, Shingle Mill, and Temple Gulches. Feature #103 is an 18'-deep, vertical shaft near the head of St. Kevin Gulch and near an unmarked 4WD trail off FR-107.

Quad Name: Homestake Reservoir

Site #: 380/4348-1.100

Site Name: Workings north of Turquoise Lake, 2 miles east of May Queen Campground

Physical Hazard Rating: 2

Description and pertinent facts: This site is between the north shore of Turquoise Lake and FR-104, about 2 miles east of May Queen Campground. Feature #100 is an open adit adjacent to the Turquoise Lake hiking trail. The adit extends at least 25'.

Feature #: 106

Physical Hazard Rating: 2

This vertical shaft has a 15'x 20' opening and is 35' deep. The nearest road, 0.1 miles to the west, is not shown on the base map. Loose material and partial undercutting around the collar make this shaft hazardous.

Feature #: 107

Physical Hazard Rating: 2

This 13'-deep, vertical shaft has a 5'x 8' opening cut into fairly competent limestone. The shaft is adjacent to a road not shown on the base map. It is about 0.2 miles southwest of shaft #106, described above.

Quad Name: Leadville North

Site #: 388/4354-1

Site Name: Jennie June Mine

Description and pertinent facts: Two hazardous shafts are in this site. Both shafts are adjacent to a 4WD road a short distance off FR-102. FR-102 appears to be moderately used by 4WD enthusiasts and horseback riders, and as access for fishing and hunting. Snowmobilers and cross-country skiers use FR-102 in the winter. Horses are available for rent about 3 miles down FR-102 near U.S. Highway 24, and Cooper Hill ski area is at the top of FR-102.

Feature #: 105

Physical Hazard Rating: 1

This shaft has an 8'x 10' opening and is over 100' deep. It is inside a partly collapsed log cabin and next to a 4WD road. Debris from the cabin partly conceals the shaft. Material sloughing around the shaft collar makes it particularly unstable.

Feature #: 104

Physical Hazard Rating: 2

This shaft has a 23'-diameter opening and is over 25' deep. The shaft is next to a 4WD road that cuts through the dump. Loose material around the shaft increases the hazard.

^^ New Quad ^^^

Quad Name: Leadville South

Site #: 390/4336-1.103

Site Name: Little Union Creek

Physical Hazard Rating: 2

Description and pertinent facts: This 35'-deep, vertical shaft is adjacent to FR-111, a good dirt road accessible by a 2-wheel-drive vehicle. Dump material is higher than the shaft and sloughs into the 4'x 6' wooden cribbed opening. Shaft #103 is about 2 miles northeast of the Mt. Massive Lakes subdivision and 3 miles east of U.S. Highway 24.

^^ New Quad ^^^

Quad Name: Mount Elbert

Site #: 377/4326-1.115

Site Name: Parry Peak

Physical Hazard Rating: 2

Description and pertinent facts: This small open adit is on public land. Its entrance is 6' high by 4' wide, and a winze penetrates the floor about 30' from the entrance. The depth of the winze is unknown. Although the mine is not on a road or trail, it is in an area with numerous other mines (both public and private) that may attract attention to it.

Quad Name: Mount Elbert

Site #: 378/4324-1

Site Name: Parry Peak Campground

Feature #: 103

Physical Hazard Rating: 2

This open shaft is about 1,000' east of SH-82, and the Parry Peak Campground is on the west side of the highway. Shaft #103 has a 3'x 5' surface opening, is about 100' deep, and has a pool of water at the bottom. The shaft is located in the floor of a partly collapsed cabin in a densely wooded area.

A large granodiorite outcrop with numerous climbing bolts is 100' to 200' north of the shaft. While campers are unlikely to find this obscure feature, rock climbers are likely to encounter it.

Feature #: 105

Physical Hazard Rating: 2

Shaft #105 is along an obscure dirt road northeast of shaft #103 (see above). This shaft is intact, but is partly plugged by an old bedspring and other trash. The shaft opening is visible through the bedspring. The thickness and structural integrity of the plug is unknown. The depth of the shaft is also unknown, but dump size suggests a depth of about 60'. Several backcountry campsites are adjacent to the dirt road in the immediate vicinity of the site. A 14'-deep prospect is about 100' south of shaft #105. This area is popular for rock climbing.

^^ New Quad ^^^

Quad Name: Mt. Harvard

Site #: 386/4312-1

Site Name: South Pine Creek Trail

Feature #: 100

Physical Hazard Rating: 2

This adit is at least 20' long and has a 5'x 3' portal with rails leading out. Frozen snow blocked the

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USFS-ABANDONED MINE LAND INVENTORY PROJECT-SUMMARY REPORT

PIKE'S PEAK RANGER DISTRICT

February 16, 1994

by

Matthew A. Sares

Colorado Geological Survey

USFS-ABANDONED MINE LAND INVENTORY PROJECT - SUMMARY REPORT PIKE'S PEAK RANGER DISTRICT

This document summarizes the sites *of concern* to the USFS - Pike's Peak Ranger District. It does not include all the mine sites visited during the inventory of the district. The Summary Report includes sites that were given Environmental Degradation Ratings of extreme (1), significant (2), potentially significant (3), or slight (4) and sites given Physical Mine Hazard Ratings of extreme danger (1) or dangerous (2). Usually we include only sites with Environmental Degradation Ratings from 1 to 3, but there are so few significant environmental problems in this ranger district that ratings of 4 were included in this summary.

It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS managed lands. Private (patented) land inholdings would only be investigated when evidence indicated that environmental degradation emanating from these sites affected USFS managed lands.

A **priority listing** of the seven most important environmental degradation sites and twelve most important physical mine hazard sites is given on the next page. Mine sites exhibiting slight environmental degradation solely because of erosion problems were not included in the priority list. They are included in the site descriptions that follow. The **site descriptions** in this document are not listed in order of priority, but are listed by: 1) Quadrangle Name and 2) Site Number.

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they (open adits, highwalls) represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

Comprehensive, detailed information about all the mine sites inventoried for the ranger district will be available in the digital database.

**USFS-ABANDONED MINE LAND INVENTORY PROJECT - SUMMARY REPORT
PIKE'S PEAK RANGER DISTRICT**

Numerical Summary:

- 51** field forms
- 107** mine openings inventoried (includes collapsed or filled openings)
- 68** mine dumps, tailings piles, highwalls, etc.
- 16** mine features (includes dumps) have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 1
Number of features with EDR of 3 = 2
Number of features with EDR of 4 = 13
Number of features with EDR of 5 = 159
- 57** mine features (includes dumps, highwalls) have Physical Mine Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 2
Number of features with PHR of 2 = 10
Number of features with PHR of 3 = 45
(There is no rating of 4)
Number of features with PHR of 5 = 118

Note: 12 of the PHR=3 features are quarry highwalls

PRIORITY SITES
PIKE'S PEAK RANGER DISTRICT

Environmental Degradation

Site Name	Quad Name	Site #	EDR
1) Ice Cave Creek Road (FR-324) Quarries	Mount Deception	12-9-499/4329-1.103	2
2) Crystola Processing Area	Woodland Park	12-9-498/4311-1.201	3
3) North of Glen Cove near Pike's Peak Highway	Woodland Park	12-9-493/4303-1.100	3
4) South Mount Rosa	Mount Big Chief	12-9-504/4288-1.102,202	4
5) Hillside Park Claims	Manitou Springs	12-9-508/4289-1.102,202	4
6) Gould Creek	Mount Big Chief	12-9-502/4288-1.100,200	4
7) Clyde Area	Big Bull Mountain	12-9-498/4257-1.100	4

Physical Mine Hazards

Site Name	Quad Name	Site #	PHR
1) Waldo Canyon Shaft	Cascade	12-9-504/4303-1.100	1
2) Signal Butte Shaft	Signal Butte	12-9-481/4324-1.100	1
3) Rocky Mountain Mennonite Camp Area	Divide	12-9-488/4303-1.100	2
4) South Mount Rosa	Mount Big Chief	12-9-504/4288-1.100	2
5) Oil Creek Tunnel	Pike's Peak	12-9-494/4301-1.100	2
6) St. Peter's Dome - Northern Duffield Claims	Mount Big Chief	12-9-507/4287-1.104	2
7) Middle Duffield Claims	Mount Big Chief	12-9-507/4287-2.100	2
8) Middle Duffield Claims	Mount Big Chief	12-9-507/4287-2.101	2
9) West of Gould Creek	Mount Big Chief	12-9-500/4288-1.100	2
10) SW Bald Mountain	Woodland Park	12-9-497/4314-1.100	2
11) Auriety Lode	Mount Deception	12-9-491/4322-1.101	2
12) Ridge East of St. Peter's Dome	Manitou Springs	12-9-508/4288-1.101	2

Sites Exhibiting Environmental Degradation

Quad Name: Big Bull Mountain

Site #: 12-9-498/4257-1.100

Site Name: Clyde Area

Environmental Degradation Rating: 4

Description and pertinent facts: This shaft occurs right next to Gold Camp Road just west of the old Clyde townsite. The slight environmental degradation problem here is due to the shaft being filled with household trash. The amount of trash filling the shaft is unknown as the depth could not be determined. The small (60 c.y.) dump indicates the shaft is probably not very deep though.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Divide

Site #: 12-9-486/4303-1.100

Site Name: Gravel Pits near State Highway 67

Environmental Degradation Rating: 4

Description and pertinent facts: These gravel pits are very large and are partly on private and partly on USFS-managed land. The total area disturbed is approximately 1600' x 220'. The highwall is about 100' in vertical height, but slopes predominately at a 45-degree angle. Historically, the gravel pits were developed by the local railroad to Cripple Creek for its own use. A local resident indicated the gravel operation ceased in 1948. Extensive erosion at this site is a problem that causes slight environmental degradation. Revegetation would help solve this. A sewage leach field has been constructed on the excavated bench, but appears to be on private land at the north end of the site. Still, the granitic grus material underlying the gravel pit may not be adequate for leaching the sewage. Consequently, organic, nitrogen, and other contamination could eventually show up downstream in the tributary of Fourmile Creek next to Highway 67.

^^New Quad^^

Quad Name: Manitou Springs

Site #: 12-9-508/4289-1.102,202

Site Name: Hillside Park Claims

Environmental Degradation Rating: 4

Description and pertinent facts: This was an open-pit uranium ore excavation site. A large amount of material was removed from the excavation which is 260' x 72' in areal extent and 6' deep. A black radioactive mineral (uraninite?) was identified in outcrop on the site that gave a radiometric reading of 3000 cps. There is 150 c.y. of loose material forming a bench on site that had radiometric readings ranging from 700-1500 cps. Background readings are 150 cps. Sheet erosion is evident at the site, but the nearest stream is 600' away. Erosion and migration of radioactive material off-site is the main concern here. Revegetation of the excavation and loose material would probably mitigate erosion problems.

Quad Name: Mount Big Chief

Site Name: Gould Creek

Description and pertinent facts: Site characteristics indicate this was a multi-bench uranium prospect. The site occurs about 0.5 miles west of Mount Big Chief on Gould Creek. The excavation dimensions are about 150' x 70' and consists of several benches cut into a steep hillside immediately adjacent to Gould Creek. Sheet and gully erosion are transporting granitic grus material from the excavated area into Gould Creek. The erosion itself is a slight environmental problem, but also some elevated radiometric readings of 700 cps were recorded while at the site (background= approx. 120 cps). cursory testing of water quality just downstream does not indicate degraded conditions (pH=7.15, conductivity=43.5 μ S).

Site #: 12-9-503/4288-1.203

Site Name: North of Rosemont Reservoir

Environmental Degradation Rating: 4

Description and pertinent facts: This site is an open pit excavation or a collapsed adit (rails found on site) that appears to have had hundreds of cubic yards of material removed. It is possibly another uranium prospect, but radiometric readings were not significantly elevated, at 200 cps. The 800 c.y. dump transects a dry drainage, but appears to be significantly eroded by storm events. The nearest perennial stream is about 1000' away. No obvious economic metallic minerals were found in the dump material; it consists mostly of quartz and feldspar. Regrading and revegetation of the site would help stop the erosion problem.

Site #: 12-9-504/4288-1.102.202

Site Name: South Mount Rosa

Environmental Degradation Rating: 4

Description and pertinent facts: This site is a large open pit, multi-bench excavation for uranium ore on the south side of Mount Rosa. Its areal dimensions are approximately 600' x 270'. Erosion of the site is significant during storm events as evidenced by rilling and gullyng on the slopes between the benches, but the eroded material does not directly enter a flowing stream. Radiometric readings in the excavated area generally ranged from 300-700 cps. One localized area in the excavation gave a reading of 1200 cps. Background radiometric readings were approximately 150 cps. There was no milling at the site to concentrate the radioactive material, so the radioactive anomaly is a natural occurrence and probably cannot be mitigated. Erosion combined with elevated levels of radioactive minerals are causes of slight environmental degradation at this site. Revegetation of the site would help to control erosion and migration of the grus material off site.

Quad Name: Mount Big Chief

Site #: 12-9-507/4287-1.103

Site Name: St. Peter's Dome - Northern Duffield Claims, Leyte Open Pit

Environmental Degradation Rating: 4

Description and pertinent facts: This site was formerly known as the Leyte Open Pit. The large trench pit was an excavation of a fluorite vein and is on patented property. Nevertheless, the public has unrestricted access to the area for use of two USFS-marked shooting ranges. The only environmental problem here is significant erosion of the pit area during storm events. Eroded material can be seen migrating hundreds of feet downslope from the pit.

Quad Name: Mount Big Chief

Site #: 12-9-507/4287-1.204

Site Name: St. Peter's Dome - Northern Duffield Claims

Environmental Degradation Rating: 4

Description and pertinent facts: This feature is actually the dump material, not of a mine, but of a tunnel constructed for an old abandoned road. The dump material actually forms the road grade on the east side of this tunnel. The only problem is the extreme erosion on the dump/road grade material caused by storm events. Large gullies and rills characterize the dump slope. Revegetation would be difficult because of the steep 35 degree slope on the loose, gravelly dump material.

Quad Name: Mount Big Chief

Site #: 12-9-507/4287-2.202

Site Name: Middle Duffield Claims

Environmental Degradation Rating: 4

Description and pertinent facts: This feature is a dump of a large open-pit quarry that probably mined out a fluorite vein. The site occurs south of Rock Creek and Old Stage Road near the western gate of the closed portion of Gold Camp Road. The dump slope inclines at 33 degrees, is 25' long, and toes directly into Rock Creek. Sheet, rill and gully erosion is evident on the dump slope. A significant amount of dump material is constantly eroding into the creek. Water pH and conductivity downstream of this dump were indicative of good quality water (pH=7.66, conductivity=66 µS), so physical erosion and sedimentation are the only problems here.

Quad Name: Mount Deception

Site Name: Ice Cave Creek Road (FR-324) Quarries

Description and pertinent facts: This large quarry is 156' long, 45' wide, and 21' deep with a 16' vertical highwall. It is immediately adjacent to Ice Cave Creek Road. There was a strong diesel smell at the head (west end) of the quarry and it appears that loose gravel on the floor of the quarry here is contaminated with diesel fuel. This situation could be contaminating groundwater in the area, although the site is remote from potential target populations. Further site investigation, removal of the contaminated gravel, and possibly other remediation measures should take place. State regulatory agencies (Health Dept.) should be consulted to determine the course of action.

Quad Name: Woodland Park

Site Name: North of Glen Cove near Pike's Peak Highway

Description and pertinent facts: This site appears to be a reclaimed gravel pit. The reclamation work appears to have been done very recently (Spring, 1993?) as straw still covers some of the site and vegetation is sparse. A black plastic (HDPE) liner has been put underneath the gravel/soil fill of the old gravel pit. The site has surface water flowing over it and this water has a distinct **sewage smell**. The site may have been reclaimed as an infiltration gallery for the restrooms at the Glen Cove Inn. The Glen Cove Inn is directly uphill from this site on the same unnamed gully. The plastic liner may have been installed to protect groundwater quality in the area. Still, it seems this may be a potentially significant environmental problem -- albeit unrelated to mining -- since the strong sewage smell is in surface water accessible to wildlife and the public.

Site Name: Gravel Pit on tributary to South Catamount Reservoir

Description and pertinent facts: A very large area around this unnamed creek at the northern end of South Catamount Reservoir has excessive erosion of the adjacent slopes. The exact mining activity is unknown, but it most likely was a gravel pit at one time. Gravel mining left oversteepened slopes that are susceptible to erosion. The gravel was probably used in the construction of the Pike's Peak Highway.

Quad Name: Woodland Park

Site #: 12-9-498/4311-1.201

Site Name: Crystola Processing Area

Environmental Degradation Rating: 3

Description and pertinent facts: This feature is the maintenance shed portion of a processing site for industrial minerals - probably decorative stone (black amphibolite, feldspar, white quartz). The potentially significant environmental degradation rating is due to the trash and numerous oil cans strewn over the site. An aluminum quonset hut and wooden shed (circa 1950-60's) are littered inside with trash, also. Unidentified cans (one leaking) are on site near the quonset hut and should be investigated for hazardous substances. This site is just a few hundred feet from the nearest houses in the town of Crystola and is probably visited by children in the area.

Sites Exhibiting Physical Hazards

Quad Name: Cascade

Site #: 12-9-504/4303-1.100

Site Name: Waldo Canyon Shaft

Hazard Rating: 1

Description and pertinent facts: This shaft is just off the Sam B. Dilts - Waldo Canyon Trail accessed from U.S. Hwy. 24. About 0.3 miles from the trailhead a prominent white quartz outcrop knob is reached. The shaft is on the east side of this knob along the quartz outcrop about 400' from the trail. The shaft is 6' x 6' at the surface and is greater than 45' deep. Backfilling or capping this shaft is recommended because of the high amount of use this trail receives. The shaft is on private property; nevertheless, since a USFS trail is nearby it is of concern to the USFS.

^^New Quad^^

Quad Name: Divide

Site #: 12-9-488/4303-1.100

Site Name: Rocky Mountain Mennonite Camp Area

Hazard Rating: 2

Description and pertinent facts: This shaft occurs on USFS managed land about 0.4 miles south of the Rocky Mountain Mennonite Camp. There is a hiking trail leading directly to the shaft from the camp and camp personnel said the site does get visited. The shaft forms an 18' x 18' opening at the surface and is 32' deep. Alan Bartel (director of the camp) said that the shaft was deeper at one time, but has partially collapsed; therefore the bottom of the shaft may only be a "bridge". As a minimum, a fence should be put around the shaft, but backfilling would be a better option.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Manitou Springs

Site #: 12-9-508/4288-1.101

Site Name: Ridge East of St. Peter's Dome

Hazard Rating: 2

Description and pertinent facts: This prospect shaft is only about 300' up a hill west of the closed portion of Gold Camp Road (on the southern border of the Manitou Springs Quad). The shaft is 18' deep with a surface opening of 17' x 7'. Loose dump material is piled around the opening adding to the hazard. No escape for a fall-in victim.

Quad Name: Mount Big Chief

Site Name: West of Gould Creek

Description and pertinent facts: This prospect shaft is immediately adjacent to an unmarked trail 0.5 miles north of Gold Camp Road just west of Gould Creek. The shaft opening is 9' x 9' and is 11' deep. The shaft cribbing is collapsed and material has sloughed off the sidewalls causing the ground surface to overhang the mine void. This situation is very dangerous for an unsuspecting visitor that walks to the edge of the shaft. It appears this trail is used extensively by hikers, hunters, and ATV's. Backfilling the shaft would eliminate the hazard.

Site Name: South Mount Rosa

Description and pertinent facts: This is a fairly deep prospect shaft just 20' off of FR-381 (Trail-624) about 0.5 miles north of Wye campground. The shaft has a 9' x 6' opening and drops down 30' with sheer walls. Loose grus at the surface adds to the hazard. Again, a simple backfilling operation would mitigate the hazard.

Site Name: St. Peter's Dome - Northern Duffield Claims

Description and pertinent facts: This large open tunnel appears to have been an old road tunnel. This site is signed as a "Shotgun Range" and therefore gets many visitors. Access to the site is very easy on a closed 4WD road. The west portal of the tunnel is 20' high by 14' wide. The tunnel length is unknown but it is greater than 100'. The east portal of the tunnel appears to be collapsed. Granite cobbles and grus have sloughed around the west portal indicating possible structural weakness. Because of frequent visitation this portal should be closed. (See dump #204 of same feature in Environmental Degradation section)

Quad Name: Mount Big Chief

Site #: 12-9-507/4287-2.100

Site Name: Middle Duffield Claims

Hazard Rating: 2

Description and pertinent facts: This is another old road tunnel that remains partially open at both ends. It is located on a patented claim near the western gate of the closed portion of Gold Camp Road. Old Stage Road passes only 500' to the west. The western portal is 18' x 16' and the tunnel length is about 120' to the eastern portal. This site is visited frequently as evidenced by broken bottles and cans inside the tunnel. The surrounding rock appears competent, but some material is sloughing around the portals. This tunnel should probably be closed because the area is extensively used by the public.

Quad Name: Mount Big Chief

Site #: 12-9-507/4287-2.101

Site Name: Middle Duffield Claims

Hazard Rating: 2

Description and pertinent facts: This prospect shaft is located just north of the east portal of the old road tunnel (#100) described above. It is located on a patented claim, but it is in a heavily frequented area and there are no access deterrents to the shaft. The shaft opening is 7' x 6' and drops 11' with sheer sides. There would be no escape if someone fell in.

^^^New Quad^^^

Quad Name: Mount Deception

Site #: 12-9-491/4322-1.101

Site Name: Auriety Lode

Hazard Rating: 2

Description and pertinent facts: This site is adjacent to Rule Creek, south of South Meadow Campground. Posted claim (unpatented) markers listed it as the Auriety Lode by James L. Banuelos, 1/5/91. The site actually consists of a shaft (100) and an adit (101). Wooden slat walls and a wooden frame/pig-wire cap have been constructed around the shaft. These are a significant access deterrent, limiting the hazard of the shaft. The associated adit, though, is intact and has no access deterrent. It is located just below the shaft where the hill slope comes down to the flat alluvial deposits of Rule Creek. The adit has a small 4' x 4' portal and appears to be plugged by collapsed rock about 42' back. The adit was dry during the site visit in October, but probably drains water in the Spring. Frequently used trails on both sides of Rule Creek near the site offer easy access to the adit. Ease of access and evidence of tunnel collapse conspire to make this adit dangerous.

Quad Name: Pike's Peak

Site Name: Oil Creek Tunnel

Description and pertinent facts: The Oil Creek Tunnel is located on the north side of Pike's Peak, just below the timberline, at the headwaters of North Fork French Creek. The mine is the destination of USFS Trail-652, which starts near the Pike's Peak Highway and is well marked with signs. This was the most extensive underground mining feature found in the Pike's Peak Ranger District. The adit portal is 6' x 5' and extends back an unknown distance greater than 100'. There are no access deterrents. The large dump of 2500 c.y. indicates this site was a major operation at one time. The dump consists of typical Pike's Peak Granite and no economic minerals were observed, so the reason for this mine is unknown. Water flows from the adit at about 20 gpm and this is probably the major headwater source for North Fork French Creek. The water appears to be of good quality with a pH=7.22, conductivity=58 μ S, and no physical evidence of degradation. An old steam boiler is located on top of the dump and is in good condition. Also some dilapidated cabins occur about 0.1 miles below the adit adjacent to Trail-652. The adit appears to be on a patented claim according to the PBS map, but it is very close to USFS land on the western border of the claim. The Oil Creek Tunnel is judged dangerous because it is open and receives frequent visitation.

Quad Name: Signal Butte

Site Name: Signal Butte Shaft

Description and pertinent facts: This shaft is located about one-half mile northeast of Signal Butte, and only a few hundred feet southeast of Trail Creek Road (FR-200). It occurs 14' south of an east-west fence line dividing USFS land (south) from private land (north). The shaft has surface dimensions of 25' x 20' and is about 50' deep. Some cratering of the shaft at the surface indicates erosion of loose material around the shaft opening, adding to the hazard here. An old mine cabin, dilapidated barn, and corral occur on the adjacent private land and could entice the curious to the mine site. A simple backfill operation could mitigate the physical hazard here.

Quad Name: Woodland Park

Site Name: SW Bald Mountain

Description and pertinent facts: This is a small exploratory adit located on the southwestern side of Bald Mountain, east of U.S. Hwy. 24, and 1.5 miles north of Crystola. The partially collapsed portal is 2' x 4' and the adit extends back only 18'. The portal is dug into loose colluvium and, thus, is very susceptible to falling rock or even collapse. This is very near a residential area and hikers and children frequent the area of this adit. Backfilling this small adit would eliminate the problem.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

SAN ISABEL NATIONAL FOREST

SALIDA RANGER DISTRICT

January 28, 1997

by

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (when used with dimensions) or times (when used in tables)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
Trec	Total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
SAN ISABEL NATIONAL FOREST -- SALIDA RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Salida Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. Features were inventoried for any of the following reasons: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) shown on a published topographic map. Features not meeting at least one of these criteria are considered innocuous and were not inventoried. Details on the rating systems and the limits of the inventory are given in Appendix A.

The **Priority Sites** tables show the most important environmental degradation sites and the most important physical mine hazard sites, and follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are the same throughout this report. These sites are all in Forest 12 (San Isabel) and Ranger District 02 (Salida).

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed.

In the Salida Ranger District, substantial variations in climate and topography are important factors regarding the results of this inventory. Primarily because of a moister climate, most of the mines with significant environmental problems are in mining districts and mineralized areas in the Sawatch Range, west of the Arkansas River. East of the river, the climate is drier and topography is not as severe. This combination encouraged the use of shafts for exploration. Also, the dry climate helps preserve mine openings because erosion is slower and country rock is generally not as severely weathered. Although serious physical hazards are scattered throughout the Ranger District, most are in mining districts and mineralized areas east of the Arkansas River.

A comprehensive, detailed account of all the mine sites inventoried will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and natural waters in order to better determine environmental effects of mine drainage. Samples were analyzed for total recoverable (Trec) and dissolved constituents as shown on tables in the following text. Numeric standards are based on stream classifications and water quality standards provided by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either drinking water supply or aquatic life standards. Most drinking water standards are based on total recoverable metals, and most aquatic life standards are based on hardness of the water and dissolved ion concentrations. In some areas, standards are based on total recoverable metals, but the sample was tested for dissolved metals. In those instances, the sample result should be considered the minimum metal content. Total recoverable metals may be significantly higher. Field water sampling protocols are in Appendix B.

Geology and Mining Districts

The Salida Ranger District has a large number of mining districts and a wide variety of mineral occurrence types. Much of the following discussion is from Vanderwilt (1947). In some districts, information was summarized from documents listed in the **SELECTED REFERENCES** section of this report.

The Chalk Creek mining district is about 15 miles west of Nathrop and includes the Alpine, St. Elmo, and Romley subdistricts. The district was a significant producer of gold, silver, copper, lead, and zinc, especially in the 1930's. Most production came from the Mary Murphy Mine. Veins in granitoid rocks of the Mt. Princeton Tertiary-age batholith host the ore. This district and region contain the most mines with significant and potentially significant environmental problems, in part because water drains from many of the underground workings. Several mines in this district have been reclaimed as part of a program administered by the Colorado Division of Minerals and Geology. In many cases, physical hazards were addressed, with less emphasis on environmental concerns. However, some of the worst environmental problems were mitigated, and mine and natural waters in this mining district are tested regularly in a monitoring program.

The Garfield-Monarch mining district straddles U.S. Highway 50, west of Salida, and north and northeast of Monarch Pass. During the 1930's and 1940's, the district was a significant producer of lead, silver, and zinc, with lesser amounts of gold and copper. Intensely folded and faulted Paleozoic sedimentary rocks, including the Leadville Limestone, overlie Precambrian granite. Tertiary-age quartz monzonite and quartz monzonite porphyries intruded all of these rocks. Because of a favorable geologic setting, numerous ore deposit types are exposed. Deposit types include limestone replacements, contact metamorphic, and veins. Other than the Chalk Creek area, which is similar in topography, elevation, climate, and precipitation, this district contains the most

significant sites regarding environmental degradation. As is the case at Chalk Creek, most of the environmental problems are mine-drainage related.

The Cottonwood mining district is southeast of Cottonwood Pass and west of Buena Vista. Numerous small mines explored veins containing lead, silver, and gold minerals. Many of the veins are hosted in Precambrian granite and schist, but are probably related to Tertiary igneous activity.

The Calumet mining district is on the east side of the Arkansas River about 8 miles north-northeast of Salida. Leadville Limestone was contact metamorphosed during intrusion of a Tertiary-age granodiorite sill, resulting in replacement of the limestone by magnetite, epidote, actinolite, tremolite, garnet, pyrite, and chalcopyrite. Veins and stringers containing gold, silver, and copper minerals occur in and adjacent to the sill.

The Turret Creek mining district is 7 miles north of Salida. Copper-zinc sulfide ores are hosted in Precambrian gneiss and schist. The deposits may be either skarns related to Precambrian igneous intrusions or Precambrian volcanogenic exhalative deposits. In either case, the ore and host rocks were subjected to intense post-depositional, regional metamorphism. The district also has gold-bearing quartz-pyrite veins that have yielded some production.

The Trout Creek mining district, just south of Trout Creek Pass, was a small producer of lead, gold, silver, and copper.

The Futurity area lies between the Turret Creek and Trout Creek mining districts. The area has numerous underground workings, which are probably related to precious metal exploration.

Placer gold activity occurred on most of the tributaries of the Arkansas River. Most placer sites are not recognizable and have no permanent structures associated with them, hence could not be inventoried.

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN ISABEL NATIONAL FOREST -- SALIDA RANGER DISTRICT

NUMERICAL SUMMARY:

198 field forms

1155 mine openings inventoried (includes collapsed or filled openings)

513 mine dumps, tailings piles, highwalls, etc.

158 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.

Number of features with EDR of 1 = 2
Number of features with EDR of 2 = 18
Number of features with EDR of 3 = 49
Number of features with EDR of 4 = 89
Number of features with EDR of 5 = 1465

360 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 12
Number of features with PHR of 2 = 96
Number of features with PHR of 3 = 250
Number of features with PHR of 5 = 1263

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN ISABEL NATIONAL FOREST -- SALIDA RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=12; District=02	EDR
1) Almost in St. Elmo	St. Elmo	382/4283-2.100, 200, 201, 101	1,1,2,3
2) Southwest of Hoffman Park	Garfield	384/4269-3.100, 200	2,2
3) Chalk Creek Headwaters	St. Elmo	381/4275-1.100, 200, 103	2,2,3
4) Chalk Creek North	St. Elmo	382/4283-1.100, 101, 102, 200, 202, 201, 203, 204, 205	2,2,2,2 2,3,3,3 3,
5) Middle Columbus Gulch	Garfield	386/4269-1.104, 204, 203	2,2,3
6) Hoffman Park	Garfield	385/4270-1.103, 203	2,2
7) Chalk Creek	St. Elmo	381/4281-1.107, 207, 200, 205	2,2,3,3
8) Baldwin Lake	St. Elmo	386/4278-1.202, 100, 101, 201	2,3,3,3
9) Shaft Boulevard	St. Elmo	382/4282-1.200	2
10) Middle Mary Murphy	St. Elmo	381/4280-2.200, 201, 205	3,3,3
11) Madonna Mine; C.F.&I. Limestone Quarry	Garfield	385/4265-1.202, 100, 102, 200	3,4,4,4
12) Hancock Road	St. Elmo	381/4278-1.100, 200, 201	3,3,3
13) West Pomeroy Gulch	St. Elmo	382/4278-1.100, 200, 201, 202	3,3,3,3
14) Garfield Mine Area	Garfield	388/4268-1.200	3
15) Camptown	St. Elmo	381/4280-1.200	3
16) Middle Pomeroy Gulch	St. Elmo	382/4279-1.201, 202	3,3
17) Iron Chest Mine Area	St. Elmo	382/4280-1.102	3
18) Hunt's Lake	Garfield	383/4268-1.101, 201	3,3
19) Billings Lake	Garfield	384/4275-2.100, 200, 108, 208	3,3,3,3
20) East Hancock	St. Elmo	381/4277-1.104, 204	3,3
21) Above Camptown	St. Elmo	381/4279-1.202, 200, 201, 204, 206	3,3,3,3 3

Site Name	Quad Name	Site # Forest=12; District=02	EDR
22) Newett	Castle Rock Gulch	413/4300-1.208	3
23) Cottonwood Gulch North	Salida East	417/4269-1.205	3
24) Grizzly Gulch - 2	St. Elmo	383/4284-2.200, 202	3,3
25) Long's Gulch West	Salida West	411/4273-1.201, 202	3,3
26) Grizzly Gulch - 4	St. Elmo	383/4281-4.205	3
27) Grizzly Gulch North	St. Elmo	383/4283-5.203	3
28) Golf Tunnel/Mary Murphy Reclamation Area	St. Elmo	381/4282-1.105, 204, 205	4,4,4

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=12,District=02	PHR
1) Williamsburg Mine	Salida East	417/4274-3.100, 101, 102, 104, 105	1,2,2,2 2
2) Turret Road East	Cameron Mountain	415/4275-1.103, 104	1,1
3) Cutler Spring Area	Salida East	417/4274-1.109, 213, 110, 111, 112, 114	1,1,1,2 2,2
4) Homestake Mine	Cameron Mountain	416/4275-1.100	1
5) Futurity	Cameron Mountain	416/4287-1.103, 104, 100, 101	1,1,2,2
6) Fourmile Creek Central	Harvard Lakes	400/4309-1.101	1
7) Shaft Boulevard	St. Elmo	382/4282-1.100	1
8) Baldwin Lake	St. Elmo	386/4278-1.102, 104	1,2
9) Ute Trail	Cameron Mountain and Salida East	417/4274-4.102, 105, 106, 111	2,2,2,2
10) North Marble Quarry Gulch	Cameron Mountain	415/4277-1.100	2
11) Railroad Ridge	Nathrop	412/4276-1.100, 101	2,2
12) Turret North	Cameron Mountain	413/4277-1.101, 106, 107, 111	2,2,2,2
13) Turret Road West	Cameron Mountain	414/4275-1.100, 101, 103	2,2,2

Site Name	Quad Name	Site # Forest=12,District=02	PHR
14) South of Cat Gulch	Cameron Mtn.	413/4276-1.102	2
15) Stafford Gulch Area	Cameron Mtn.	413/4277-2.100, 104, 105	2,2,2
16) East Reef	Nathrop and Cameron Mountain	412/4277-1.100, 102, 106, 108, 109, 111	2,2,2,2 2,2
17) Graphite Ridge	Cameron Mountain	416/4278-1.100, 107, 109	2,2,2
18) The Reef	Nathrop	411/4277-1.101, 103	2,2
19) Pride of the West Mine Area	St. Elmo	384/4275-1.100, 107, 108	2,2,2
20) Two Creek	Jack Hall Mtn.	429/4274-1.111	2
21) Willow Creek	Gribbles Park	424/4278-1.105, 108, 110	2,2,2
22) Above Camptown	St. Elmo	381/4279-1.101, 102, 103, 104, 105	2,2,2,2 2
23) East Hancock	St. Elmo	381/4277-1.101, 105, 106	2,2,2
24) Boss Lake Reservoir	Garfield	385/4268-1.100, 102	2,2
25) Trout Creek View	Castle Rock Gulch	415/4302-1.102, 105	2,2
26) Madonna Mine	Garfield	385/4265-1.101	2
27) Garfield Mine Area	Garfield	388/4268-1.103, 204	2,2
28) West Columbine Gulch	Castle Rock Gulch	413/4292-1.100	2
29) Pass Creek	Mount Ouray	396/4259-1.100, 104	2
30) Shavano	Maysville	394/4272-1.100	2
31) Shield's Gulch West	Buena Vista East	408/4300-1.102	2
32) Shield's Gulch	Buena Vista East	409/4299-1.105	2
33) Long's Gulch Center	Salida East	413/4273-1.101, 102	2,2
34) The Crater	Salida East	419/4267-1.100	2
35) Black Diamond Spring East	Salida East	420/4274-1.106, 107	2,2
36) Golden Wonder East	Cameron Mountain	416/4277-1.100	2
37) Greens Creek Trail	Maysville	395/4262-2.102	2
38) Long's Gulch West	Salida West	411/4273-1.100	2

Site Name	Quad Name	Site # Forest=12,District=02	PHR
39) Hancock Pass	Garfield	380/4275-1.104, 105	2,2
40) Little Jimie 5	Maysville	392/4265-1.101	2
41) Willow Creek 1	Maysville	395/4262-1.103	2
42) Ridge East of Monarch Ridge near Fooses Creek	Garfield	388/4265-1.105, 107	2,2
43) East of Clover Mountain	Garfield	384/4269-1.103	2
44) Hoffman Park	Garfield	385/4270-1.101	2
45) North of Island Lake	Garfield	384/4274-1.105	2
46) Banning Cabin Gulch	Gribbles Park	425/4275-1.107	2
47) Jennings Creek and Hunkydory Gulch	Garfield	388/4274-1.103	2
48) Iron Chest Mine Area	St. Elmo	382/4280-1.101, 103, 104	2,2,2
49) Middle Columbus Gulch	Garfield	386/4269-1.103	2
50) Newett	Castle Rock Gulch	413/4300-1.100, 200	2,2
51) Cutler Springs North	Salida East	417/4274-2.200	2
52) Alpine Lake	St. Elmo	386/4286-1.101	2
53) Grassy Gulch	Tincup	379/4291-1.105	2
54) Cyclone Mountain	St. Elmo	387/4276-1.101	2
55) Badger Creek	Jack Hall Mountain	426/4265-1.100	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Castle Rock Gulch

Site #: 413/4300-1.208

Site Name: Newett

Environmental Degradation Rating: 3

Description and pertinent facts: This site is on the east side of Limestone Ridge along U. S. Highway 285 and consists of numerous quarries in the Leadville Limestone. Several of the dumps are large and fill the local drainage channels. Although no water was flowing in early July, these channels may carry significant flows during spring runoff or following heavy summer storms. Most of the dumps consist primarily of cobbles and boulders of limestone and should not significantly impact the sediment load of any stream flow. Mostly fines and a few coarser rock fragments compose dump #208, which is about 1,000 cubic yards and fills the floor of a nearby drainage channel. Rills have eroded into the downstream side of the dump, which is the waste material from the calcining of limestone in adjoining ovens. Some metals may have been concentrated during the limestone processing.

^^ New Quad ^^^

Quad Name: Garfield

Site #: 383/4268-1.101, 201

Site Name: Hunt's Lake

Environmental Degradation Ratings: 3

Description and pertinent facts: Collapsed adit #101 was not draining during the inventory, but a wet channel leads from the former portal to standing water with minor amounts of red precipitate on the dump. A small erosional gully leads away from the adit, over the top of dump #201, and down the slope adjacent to the dump. This dry gully is evidence that the adit drains water during higher runoff periods. A water test of the standing water adjacent to the adit showed **pH = 4.6 and conductivity is <50 µS**. A stream that drains the basin of the Hunt's Lake site is just 80' away from this adit, and this stream flows into Boss Lake about 1 mile to the east. A water test of this receiving stream downstream of the adit revealed **pH = 7.1 and conductivity is <50 µS**. The water associated with this feature is definitely degraded compared to natural surface flow. During higher runoff periods, water draining from adit #101 probably negatively affects the water quality in this area. The degree of this degradation is dependent on the unknown flow rate during these higher runoff periods.

Quad Name: Garfield

Site #: 384/4269-3.100, 200

Site Name: Southwest of Hoffman Park

Environmental Degradation Ratings: 2

Description and pertinent facts: This site is located next to FR-230 on the north side of the road

and 2.3 miles from the town of Garfield. Feature #100 is a collapsed adit draining about 15 gpm of water from the collapse rubble (July 20, 1994). The water flows over dump #200, crosses FR-230, and continues to flow at the surface for about 900' until it infiltrates the ground just before entering the Middle Fork South Arkansas River. The entire drainage path contains abundant, soft, iron hydroxide precipitate. Effluent at the portal had **pH = 6.0 and conductivity = 100 μ S**. A water test of this effluent after flowing over the dump indicated a slight increase in **pH to 6.1 and no change in conductivity**.

Dump #200 contains about 1,400 cubic yards of yellow, pyrite-rich material. Seeps emanating from the toe of the dump were tested and had **pH = 4.3**, significantly more acidic than the water flowing from the adit portal. This is due to seepage through and greater residence time in the sulfide-rich dump material. The **conductivity remained 100 μ S**. Total flow from the seeps was about 6 gpm. When this flow commingled with the adit effluent below the dump, **pH was only 4.5 with conductivity of 100 μ S**.

Water tests were taken in the Middle Fork South Arkansas River upstream and downstream of the area where the mine effluent infiltrates and surface flow ends. Acidity increases downstream from **pH = 7.0 to pH = 6.9**. **Conductivity is less than 50 μ S** at both locations. Flow of the river was estimated at 20 cubic feet per second.

A water sample was collected at the adit portal for laboratory analyses. Results indicate aluminum, cadmium, copper, iron, lead, manganese, and zinc to be above state standards, as shown on the table below.

Sample number 384/4269-3.300.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	<10 mg/L	no standard	n/a
Aluminum	3000	87*	34 x standard
Arsenic	<1	50 (Trec, acute)	below standard
Barium	10	1000 (Trec)	below standard
Cadmium	7	0.7	10 x standard
Chromium	<10	11*	below standard
Copper	9	6.7	1.3 x standard
Hardness	52 mg/L	no standard	n/a
Iron	2600	300	8.7 x standard
Lead	5	1.5	3.3 x standard
Manganese	970	50	19 x standard
Nickel	<20	58	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Silver	<0.2	0.11	below detection limit
Sulfate	68 mg/L	250 mg/L	below standard
Zinc	1800	60	30 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: Garfield

Site #: 384/4275-2

Site Name: Billings Lake

Description and pertinent facts: This site is adjacent and above Billings Lake, near the headwaters of North Fork South Arkansas River. It is accessed by FR-240.

Feature #: 100, 200

Environmental Degradation Ratings: 3

This collapsed adit is surrounded by strip mine #101 of the same inventory area. Water is draining from the adit at a rate of 0.4 gpm. Although the water is translucent, it has a red color, and the rocks in the effluent channel are stained red. Some of the rocks also have a thin coating of salt around them. Mine effluent has **pH = 7.3 and conductivity = 200 µs**, a high conductivity for alpine terrain. The discharge flows for 112' over dump #200 and into Billings Lake. The 3,900-cubic-yard dump, composed of material from adit #100 and strip mine #101, contains pyrite, chalcopyrite, malachite, and possibly manganite. Mine effluent could be dissolving metals from the dump and adding metals into Billings Lake. Tests in Billings Lake showed **pH = 7.3 and conductivity = 100 µS**. Flow from adit #100 probably increases in the spring, possibly augmenting the contamination process.

Feature #: 108, 208

Environmental Degradation Ratings: 3

This partly collapsed adit is discharging water at a rate of 0.1 gpm, and this effluent seeps into the top of 70-cubic-yard dump #208. No water was found seeping from the toe of the dump, although dense bushes growing at the toe prevented a thorough examination. A water test adjacent to the adit revealed **pH = 6.9**, but a conductivity reading was not obtained because of an instrument malfunction. No symptoms of toxicity were observed in the mine discharge. A small erosional gully has formed in the dump and leads into the bushes at the toe, indicating that during higher runoff periods the effluent may flow at the surface for 200' into Billings Lake. The slightly acidic pH of the effluent is evidence that it may contribute to degradation of Billings Lake (see adit #100, above, for water test results of Billings Lake).

Quad Name: Garfield

Site #: 385/4265-1

Site Name: Madonna Mine

Description and pertinent facts: This inventory area is located east of U.S. Highway 50 about 3 miles north of Monarch Pass. It is very visible from the road as it includes the large C.F.&I. Limestone Quarry and the red clapboard portal structure of the Madonna Mine. A locked gate on the mine access road from U.S. Highway 50 acts as a deterrent to the general public, but the site is still accessible from other 4WD roads.

The site has numerous patented mining claims, and the position of the mine features in relation to these claims is somewhat unclear. The Forest Service PBS map (Garfield quad) location of patented claims differs significantly from a larger scale map of the site provided by Rich Moorhead of the Monarch Ski Area. Nevertheless, slivers of USFS-managed, unpatented land contain portions of the mine dumps and possibly the mine openings. If any work is done on the site, a detailed survey of claim boundaries is necessary.

It appears that remedial action is not warranted, as the data indicate this site to be environmentally benign. Features given an EDR of 4 (slight) are described because of the size and location of the site on the South Arkansas River, and because a water sample was collected. This inventory area was examined on August 11, 1994.

Feature #: 100, 200

Environmental Degradation Ratings: 4

This is the main adit and dump of the Madonna Mine. A red clapboard building stands in front of the portal and is conspicuously signed "Madonna Mine." The portal appears collapsed behind this building, but literature indicates that this adit extends over 2,000'. Water drains from the adit at about 3 gpm through a wooden flume that passes underground and exits on the south side of dump #200. This effluent, having **pH = 8.4 and conductivity = 100 μ S**, flows directly into the South Arkansas River. No precipitate appears in the effluent. Dump #200 has approximately 2,600 cubic yards of material. It is sulfide-rich, containing pyrite, bornite, chalcopyrite, and sphalerite, but the entire surface of the dump is covered with limestone from the adjacent quarry. This dump was dry during the inventory and does not toe into the South Arkansas River, but a "blowout" on the north side of the dump provides ample evidence that water flows through the dump during periods of high runoff.

Feature #: 102

Environmental Degradation Rating: 4

This adit is a lower tunnel level of the Madonna Mine. It is situated slightly south and below the upper tier of dump material. Large boulders have sloughed in front of the portal, damming water inside the adit. An intact adit can be seen behind the sloughed rock. Water drains from the adit at an estimated 80 gpm and flows directly into the South Arkansas River. This effluent had the same **pH (8.4) and conductivity (100 μ S)** readings as effluent from adit #100, suggesting they are hydraulically connected. No precipitate was forming in this effluent. A water sample was collected because of the large flow from this adit. None of the constituents analyzed by the lab exceeded state standards for this stream segment, as shown on the table below.

Sample number 385/4265-1.301.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	100 mg/L	no standard	n/a
Aluminum	<50	87*	below standard
Arsenic	<1	50 (Trec, acute)	below standard
Barium	3	1000 (Trec)	below standard
Cadmium	<0.25	1.05	below standard
Chromium	<10	11*	below standard
Copper	<4	11	below standard
Hardness	95 mg/L	no standard	n/a
Iron	<10	300	below standard
Lead	<5	3.5	below detection limit
Manganese	<4	50	below standard
Nickel	<20	91	below standard
Silver	<0.2	0.3	below standard
Sulfate	<5 mg/L	250 mg/L	below standard
Zinc	30	100	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #: 202

Environmental Degradation Rating: 3

This is the dump for adit #102. It is approximately 2,100 cubic yards, contains sulfides (pyrite, bornite, chalcopyrite, and sphalerite), and its surface is mantled with limestone from the adjacent quarry. The unfortunate aspect of this dump is that it toes into a ponded area of the South Arkansas River. A collapsed loadout structure lies on the toe of the dump. Conductivity and pH tests of the river above and below this dump indicate no degradation of the water. Other dump material has been pushed into the riparian area upstream (southwest) of this dump, but this area is probably on patented land.

Quad Name: Garfield

Site #: 385/4270-1.103, 203

Site Name: Hoffman Park

Environmental Degradation Ratings: 2

Description and pertinent facts: This open adit drains about 0.5 gpm water with **pH = 4.4 and conductivity = 200 μ S** at the portal. A yellow-red precipitate is found in the drainage path of the discharge, which was seeping into a 7'-deep gully on the side of the 900-cubic-yard dump. A test at the infiltration point revealed **pH = 4.3 and conductivity = 300 μ S**, indicating that the effluent may degrade further as it crosses this pyrite-rich dump. Dump material has been transported at least 400' downslope to the stream below, suggesting that flow rate of the effluent is probably dramatically higher in the spring and during heavy rains. Because of poor water quality and significant dump erosion, these features warrant an EDR of 2.

Quad Name: Garfield

Site #: 386/4269-1

Site Name: Middle Columbus Gulch

Description and pertinent facts: Columbus Gulch contains numerous mine features, but most are on patented land (according to the PBS map). Three features in this inventory area that exhibit environmental degradation are located on patented land, but may have an effect on downstream water quality in the gulch. The area is about 1.5 miles northwest of Garfield and is accessed via a rough 4WD road spur off of FR-230.

Feature #: 203

Environmental Degradation Rating: 3

This small dump is only 50 cubic yards, but is being eroded by sheetwash down an old mine road. The dump contains abundant pyrite and other sulfide minerals. A natural spring is situated about 50' east of the dump along the old mine road. Water emanating from the spring at 3 gpm is of good quality with **pH = 8.4 and specific conductivity < 50 μ S**, but this could be adversely affected by the pyritic dump during storm runoff.

Feature #: 104, 204

Environmental Degradation Ratings: 2

This collapsed adit drains water at 1 gpm. Red iron oxy-hydroxide precipitate and white salt deposits line the effluent channel. The **pH is neutral at 7.1, but conductivity is elevated for this alpine stream at 400 μ S**. It is obvious from precipitate staining that flow from this adit is much greater during spring runoff.

The mine dump (#204) of this adit has abundant pyrite, sphalerite, and other sulfide minerals. The dump is about 170 cubic yards and has a strong sulfur odor. It appears extreme erosion occurs during spring runoff and storm events. Material has been transported at least 100' past the normal toe of the dump. Water from the adit flows on the east side of the dump and then infiltrates. At the point of infiltration, the effluent **pH has dropped to 6.1, and conductivity has increased to 500 μ S**.

Quad Name: Garfield

Site #: 388/4268-1.200

Site Name: Garfield Mine Area

Environmental Degradation Rating: 3

Description and pertinent facts: This 4,600-cubic-yard dump is along CR-228, north of the town of Garfield. The toe of the dump and gullies on the dump slope extend into the bottom of Taylor Gulch, which was dry at the time of the inventory. Malachite, azurite, and pyrite occur in moderate amounts. Associated feature #100 is an adit draining 1 gpm of effluent with **pH = 7.5 and conductivity = 100 μ S**. This discharge ponds and seeps into the dump, but during higher runoff periods this effluent probably reaches Taylor Gulch at the surface. Where the effluent was ponded, **pH = 7.3 and conductivity = 700 μ S**. Fragments of marble have been placed adjacent to the adit, on and adjacent to the dump, and in Taylor Gulch, apparently in an effort to neutralize potentially contaminated water.

^^ New Quad ^^^

Quad Name: Salida East

Site #: 417/4269-1.205

Site Name: Cottonwood Gulch North

Environmental Degradation Rating: 3

Description and pertinent facts: This feature consists of two tailings piles entailing about 15 cubic yards, and the ruins of an oven along the banks of Cottonwood Gulch. Two small adits nearby were the source of limestone for calcining in the oven. The tailings have clearly been eroded by Cottonwood Gulch during periods of high flow. The limestone processing may have concentrated metals in the tailings.

^^ New Quad ^^^

Quad Name: Salida West

Site #: 411/4273-1

Site Name: Long's Gulch West

Description and pertinent facts: This site lies in a small, dry, side wash on the north side of Longs Gulch, about 6 miles north of Salida. Several copper mines are in the vicinity.

Feature #: 201**Environmental Degradation Rating: 3**

This 650-cubic-yard dump occupies about half of the floor of the dry wash and has been eroded during high flow and spring runoff. Malachite is abundant, and minor quantities of white precipitate at the toe of the dump indicate occasional seepage.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Lead	<1	3.5	below standard
Manganese	2600	50	52 x standard
Nickel	<20	90	below standard
Silver	<0.2	0.29	below standard
Sulfate	64 mg/L	250 mg/L	below standard
Zinc	2400	100	24 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #200 is a 1,300-cubic-yard dump that is crossed by a public road and by effluent from adit #100. Apparently, only minor amounts of mine discharge seep into the dump. Standing water on the downhill part of the dump periphery had **conductivity = 1,200 µS and pH = 2.9** on July 17, 1995. However, on the day that the adit effluent was sampled, the standing water was completely gone. Nonetheless, the degraded water parameters suggest that feature #200 has potential for serious environmental impact. The dump does not directly contact the stream, except at extreme flood stage, which is why this feature has an EDR of 2.

Feature #: 103

Environmental Degradation Rating: 3

Feature #103 is an adit with a 2 gpm water discharge. The drainage channel contains some brown precipitates, but the effluent seeps into the ground before contacting the dump. Measured water parameters are **conductivity = 000 µS and pH = 5.7**. The absence of significant and apparent toxicity and the low conductivity suggest an EDR of 3.

Quad Name: St. Elmo

Site #: 381/4277-1.104, 204

Site Name: East Hancock

Environmental Degradation Ratings: 3

Description and pertinent facts: This site is near timberline at the bottom of talus slopes along the west flank of a ridge trending north from Pomeroy Mountain. Local, muskeg-like riparian areas are present throughout the site. Access is mostly poor, but a poorly maintained 4WD trail across private land provides access to the north end, where features #104 and #204 are located.

Feature #104 is an adit with water ponded behind collapsed or slumped material at the portal. Flow from the adit is only 5 gpm, but **conductivity of 300 µS and pH of 6.3**, coupled with a fetid odor coming from the adit, suggest poor water quality. Feature #204 is a 500-cubic-yard dump situated directly in front of adit #104. A seep from the dump had **conductivity = 100 µS and pH = 5.4**. Water tests show that the receiving intermittent stream is not significantly degraded, however, high snowfall and rain levels may have effectively diluted and reduced the reaction time of the effluent.

Some sulfides are in the dump, which may lead to environmental degradation as they react with air and water.

Significant physical hazards exist within this inventory area. A physical-hazard mitigation program might also be able to address environmental degradation, or vice-versa.

Quad Name: St. Elmo

Site #: 381/4278-1.100, 200, 201

Site Name: Hancock Road

Environmental Degradation Ratings: 3

Description and pertinent facts: Features described here are part of a significant past mining operation. A grill-and-door closure at adit #100 prevents access to all but the most tenacious investigator. CR-295 lies on an abandoned railroad grade and crosses between 15,000-cubic-yard dump #200 and 11,000-cubic-yard dump #201. The railroad provided service to Hancock and continued through the Alpine tunnel. Access to the site is excellent.

On July 19, 1995, adit #100 was draining water through collapsed material at the portal at about 20 gpm. The effluent channel had some medium-brown precipitate and algae. Effluent parameters were **pH = 5.4 and conductivity = 300 μ S**. Field evidence indicates that mine discharge flows across much of the top of dump #200 occasionally. During the inventory, effluent was draining southward, with minimal contact with the dump. The mine discharge joined with an estimated 40 gpm intermittent stream adjacent to, but not contacting either dump. The toes of dumps #200 and #201 were dry, and both dumps contain minor amounts of sulfides as pyrite and sphalerite.

The adit discharge was sampled on another visit, August 2, 1995. Laboratory results are shown on the table below. During the sampling trip, the intermittent stream adjacent to the dumps was damp, but was not flowing. The presence of water that exceeds state standards in manganese concentrations and the presence of sulfides suggest an EDR of 3 for these features.

Water sample 381/4278-1.100.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	60 mg/L	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (Trec, acute)	below standard
Iron (Trec)	110	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	50	87*	below standard
Cadmium	<0.25	2.0	below standard
Chromium	<10	11*	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Copper	<4	22	below standard
Hardness	210 mg/L	no standard	n/a
Iron	53	300	below standard
Lead	<1	11	below standard
Manganese	450	50	9 x standard
Nickel	<20	170	below standard
Silver	<0.2	1.1	below standard
Sulfate	160 mg/L	250 mg/L	below standard
Zinc	78	200	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: St. Elmo

Site #: 381/4279-1.200, 201, 202, 204, 206

Site Name: Above Camptown

Environmental Degradation Ratings: 3

Description and pertinent facts: This site is located on the southwest side of Pomeroy Gulch, across from the Mary Murphy mine. Access is extremely poor. No existing roads were found, and only small pack and game trails were present. A fast-flowing, unnamed stream occupied Pomeroy Gulch during the inventory in July, 1995.

Mine features #200 (100 cubic yards), #201 (150 cubic yards), #202 (235 cubic yards), #204 (520 cubic yards), and #206 (80 cubic yards) are prominent yellow-brown, medium- to fine-grained dumps, with minor quantities of sulfides. Sulfide species are typically pyrite and sphalerite, with possible traces of galena and tetrahedrite. All of the dumps were dry and located well above Pomeroy Gulch. Dump #202 contains the most sulfides.

Numerous physical hazards are present within the site. Any remediation program considered should address both the physical and environmental problems.

Quad Name: St. Elmo

Site #: 381/4280-1.200

Site Name: Camptown

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area is located directly across Pomeroy Gulch

from a geology field camp near the Mary Murphy mine. Mine feature #200 is a 1,200-cubic-yard dump that is in contact with a stream in Pomeroy Gulch. Dump material ranges from coarse to fine grained in size, is gray to yellow-brown, and contains $\leq 3\%$ pyrite, with less chalcopyrite and possible tetrahedrite. Localized orange precipitate associated with sulfides suggests possible arsenic oxides. A mossy, 5 gpm seep with **pH = 6.1** discharges from the dump almost at stream level. The presence of sulfides in a dump close to an active stream, but nearly neutral pH seepage suggests an EDR of 3.

Access to the site is excellent up to the field camp location, but no stream crossing exists. If remediation is attempted, a late-season program when stream flows are low might minimize impacts to the natural drainage paths.

Quad Name: St. Elmo

Site #: 381/4280-2

Site Name: Middle Mary Murphy

Description and pertinent facts: This inventory area is characterized by an extremely large dump and apparent mine effluent mitigation measures. The site lies along the Mary Murphy Mine Road above the townsite of Romley. Numerous historic structures are present, including tram towers, a tram transfer/top sheave station, and several bunkhouses or utility buildings. Access is excellent, along a well-traveled 4WD road. Physical hazards at this site have apparently been mitigated.

Feature #: 200

Environmental Degradation Rating: 3

Feature #200 is 25,000 cubic yards and is the largest dump in the immediate vicinity. It probably received most of the waste rock from the upper levels of the mine via associated adit #100. The dump is mostly non-oxidized waste, but localized pockets of quartz-pyrite-sphalerite vein material are present. Effluent from adit #100 is channeled away from #200, northward to a settling pond, and then flows down the hill toward #201. At #100, the discharge had **pH = 6.0 and conductivity = 200 μS** ; and settling pond water on the north side of #200 had **pH = 6.4 and conductivity = 300 μS** . The pH is of less concern than the conductivity, which supports an EDR of 3.

Feature #: 201

Environmental Degradation Rating: 3

Mine dump #201 is 1,500 cubic yards and is similar in composition to #200. A settling pond to the north receives the discharge from the pond adjacent to #200. This feature has been assigned an EDR of 3 for the same reasons as #200.

Feature #: 205

Environmental Degradation Rating: 3

Dump #205 is 200 cubic yards, but contains more sulfides than #200 and #201, and is being undercut by the stream flowing in Pomeroy Gulch. Adit #105 is collapsed and is discharging 20 gpm water with **pH = 7.2 and conductivity = 100 μS** . A 10 gpm seep at the dump toe has **pH = 7.4 and conductivity 000 μS** . Nonetheless, the presence of sulfides and the stream erosion warrant an EDR of 3.

Quad Name: St. Elmo

Site #: 381/4281-1

Site Name: Chalk Creek

Description and pertinent facts: This site is located on the northwest side of Chalk Creek on CR-294, about 0.5 miles north of the old Romley townsite. Feature #200 is directly opposite the Chalk Creek Non-Point Source Project.

Feature #: 107, 207

Environmental Degradation Ratings: 2

This adit has standing water inside, and the sound of a steady drip can be heard. The adit is along the strike of a fault, and the ceiling is thoroughly fractured. These open fractures encourage drainage through the adit. Also, the adit appears to open up substantially once inside the partly collapsed entrance. Inside the adit, a vein of massive pyrite is visible. Dump #207 is 150 cubic yards, contains abundant massive pyrite at the surface, and burnt-orange sediment below the surface.

Less than 1 gpm of red-orange water drains from the adit across the surface of the dump. The effluent flows down the dump slope in a rill. At an intermediate point on the slope the discharge seeps into the dump. Effluent on the surface of the dump was 1-inch deep and had **pH of 5.2 and conductivity of 200 μ S**. Grass was thriving in the effluent channel.

Feature #: 200

Environmental Degradation Rating: 3

This 65-cubic-yard dump is associated with shaft #100 and toes directly into Chalk Creek. The dump is lemon-yellow colored and contains pyrite and other sulfides. Immediately adjacent to the dump, Chalk Creek had **pH = 7.5 and conductivity = <50 μ S**. On the day of the measurements, the flow of the creek was quite high due to snowmelt. This accounts for the neutral pH and low conductivity; however, with the sulfide content of the dump in contact with the creek, potential for environmental degradation exists.

Feature #: 205

Environmental Degradation Rating: 3

This yellow and orange dump is about 350 cubic yards, with sulfides and iron staining present. The cobble-size fraction is composed of granitic material. A small trickle of water flows from the adit down the dump slope. Sparse weeds grow on the dump surface, and the slope is essentially barren of vegetation.

Quad Name: St. Elmo

Site #: 381/4282-1

Site Name: Golf Tunnel/Mary Murphy Reclamation Area

Description and pertinent facts: This site is between Chalk Creek and CR-2954, about 1.5 miles south of St. Elmo. The features are within the Golf Tunnel/Mary Murphy tailings reclamation area. Construction work has been completed to consolidate and cap mill tailings and dumps, and

remediate mine effluent. Monitoring of the area has been set up under the Chalk Creek non-point source water quality improvement project by the State of Colorado, U.S. Environmental Protection Agency, USFS, Chaffee County, U.S. Bureau of Reclamation, U.S. Bureau of Mines, and Volunteers for Outdoor Colorado. In addition, the site is being used to continue research in developing and defining hard-rock mine hydrologic characterization techniques. Although this site received no worse than an EDR of 4, it is discussed in this report because of its size and because of the major reclamation project.

Feature #: 105, 205

Environmental Degradation Rating: 4

Adit #105 has a 6'-diameter culvert for a portal and a locked gate a few feet inside the culvert. Water with **pH = 6.0 and conductivity = 400 μ S** drains at 45 gpm from the adit to a settling pond on the upper surface of dump #205. The effluent channel has a light brown stain. From the settling pond, the effluent flows along the south edge of the dump toward Chalk Creek, which is about 500' away. Before reaching the creek, the effluent is dispersed into a swampy, wetlands area. Tests of the estimated 1,000 gpm flow of Chalk Creek above and below its confluence with the effluent reveal little change, with **pH = 6.4 above, and pH = 6.3 below. Conductivity was 300 μ S** at both locations.

Dump #205 has two tiers and totals about 2,000 cubic yards. The mine effluent flows along the toe of the dump on the south side, and gullies have been cut on the dump slopes during storm events.

Feature #: 204

Environmental Degradation Rating: 4

Dump #204 originated from the Golf Tunnel (adit #102). The dump is about 30,000 cubic yards and has been regraded and revegetated. Although the revegetation has been moderately successful, erosional gullies cut the dump in a few places. The toe of the dump is close to Chalk Creek.

Quad Name: St. Elmo

Site #: 382/4278-1

Site Name: West Pomeroy Gulch

Description and pertinent facts: One adit and three dumps represent the potentially significant environmental degradation sites in this inventory area. The site is located on the southwest side of Pomeroy Gulch just below timberline. Access is poor for construction equipment. No existing roads extend to the site.

Feature #: 100, 200

Environmental Degradation Ratings: 3

Feature #100 is an adit with dammed water behind a partly collapsed portal and damp ground in front. Water parameters could not be safely measured. Associated dump #200 is 80 cubic yards, yellow-brown in color, contains minor pyrite, and is dry. However, potential environmental degradation is suggested by the presence of water and sulfides.

Feature #: 201, 202

Environmental Degradation Ratings: 3

Features #201 and #202 are 250 and 1,500 cubic yards, respectively, and are located in a riparian area. The entire toe of #202 is situated in a seep, although not all of the water is coming through the dump. Water parameters measured at three locations along the toe range from **pH = 4.8 to 5.8 and conductivity = 000 to 100 µS**. The seeps are very humic and contain peat. Dump material is typically ≤2% sulfides. The presence of sulfides in a riparian area results in an EDR of 3.

Quad Name: St. Elmo

Site #: 382/4279-1

Site Name: Middle Pomeroy Gulch

Description and pertinent facts: The Middle Pomeroy Gulch inventory area is south of the Mary Murphy Mine. Access to feature #201 is good via an established road. Access to feature #202 is poor, involving no established roads and entailing a stream crossing.

Feature #: 201

Environmental Degradation Rating: 3

Feature #201 is a 700-cubic-yard dump derived from a shaft that was closed during the Chalk Creek project (OSM 8-127), a project designed to alleviate physical hazards in this area. The shaft has standing water 2' below the surface, suggesting that the lower part of the dump is saturated. Furthermore, the dump lies within a riparian area, with the Pomeroy Gulch stream flowing about 20' to the southwest. Dump material is yellow-brown, contains fragments of quartz vein with pyrite, hematite, kaolinite(?), and sericite. A 0.1 gpm seep on the opposite side of the dump from the creek has **pH = 3.4 and conductivity = 100 µS**, however, this seep did not reach the stream at the surface.

Feature #: 202

Environmental Degradation Rating: 3

Dump #202 is 1,100 cubic yards and is in contact with the Pomeroy Gulch stream. Water parameters measured about 50' upstream of dump #202 are **pH = 6.1 and conductivity = 000 µS**, exactly the same as those measured at a 2 gpm seep on the downstream toe of the dump. Material in dumps #202 and #201 are similar.

Quad Name: St. Elmo

Site #: 382/4280-1.102

Site Name: Iron Chest Mine Area

Environmental Degradation Rating: 3

Description and pertinent facts: The Iron Chest mine site lies entirely on private land and was examined only for hazards and environmental degradation affecting public lands. Shaft #102 had standing water with **pH = 3.3 and conductivity = 100 µS**. Acid water may be present throughout the working. Mitigation efforts regarding the Golf Adit effluent were in progress during the inventory. Several water tests were conducted throughout this site, and none indicated degraded water with respect to natural waters.

If the present road is cleaned up and modified in a few key places, it would be passable for large construction equipment. This road could access several other sites requiring environmental and physical hazard remediation work.

Quad Name: St. Elmo

Site #: 382/4282-1.200

Site Name: Shaft Boulevard

Environmental Degradation Rating: 2

Description and pertinent facts: This site is located about halfway up the road/trail to the Iron Chest Mine. Shaft #100, from which dump #200 is derived, encroaches on the road, making it difficult to overlook.

The 1,500-cubic-yard-dump is rusty yellow-brown, contains $\leq 10\%$ pyrite in medium- to coarse-grained clots, and is dry. Significant staining and a tree mortality zone are present along the downhill margins of the dump. The obvious negative effects of the dump on the local ecosystem indicate that the environmental degradation is significant.

A modest road repair and maintenance program would allow construction equipment to gain access to this and other sites requiring remediation further up the road.

Quad Name: St. Elmo

Site #: 382/4283-1

Site Name: Chalk Creek North

Description and pertinent facts: This site is on the northwest side of Chalk Creek and CR-294.

Feature #: 100, 200

Environmental Degradation Ratings: 2

This adit is 5' high by 3' wide and has a depth of at least 20'. The adit has several inches of orange-colored, standing water on its floor. In addition, orange precipitate covers the rocks that are submerged in the water.

Dump #200 is approximately 1,500 cubic yards. Dump material is yellow, indicating the presence of sulfides, and pyrite is visible on the surface. Also, orange iron oxides coat some of the material. An ore loader is in the center of the dump near the top of the slope. Pale yellow sulfosalts are precipitating on the ore loader. Dump #200 is barren of vegetation. The size of the dump, along with its abundant sulfides, is justification for an EDR of 2.

Feature #: 101, 201

Environmental Degradation Ratings: 2, 3

This adit is 6'x 6' with a depth of at least 20'. A nearby homeowner stated that adits #100 and #101 are connected. The adit has 6 inches of standing water and less than 1 gpm discharge. A steady

drip can be heard inside the adit. Field measurements of the effluent yielded a **pH of 7.1 and conductivity of 400 µS**. Adit #101 is just east of adit #100.

Dump #201 is 150 cubic yards and is composed of granitic and altered granitic rocks. Sandy and fine material on the surface of the dump are reddish orange, indicating the presence of iron oxides. Sparse aspen are growing in the dump material. Rills show that effluent from adit #101 periodically flows down the dump slope.

Feature #: 102, 202

Environmental Degradation Ratings: 2

These features are east of adit #101. The portal of adit #102 is 6'x 6', but it is the only part of the adit that is still standing. Adit #102 drains about 11 gpm of orange water with **pH = 7.4 and conductivity = 600 µS**. Grass thrives in the effluent. Dump #202 has a volume of about 1,700 cubic yards and contains granitic and altered granitic rocks. Localized areas of yellow and/or orange iron-oxide material and a small quantity of pyrite are on the surface. Drainage from adit #102 has eroded a large gully in the middle of dump #202.

Water sample 382/4283-3.102 was collected from effluent near the portal; laboratory results are shown on the table below. Analyses reveal that iron and manganese concentrations exceed state standards for drinking water. Alkalinity and hardness are also high.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	140 mg/L	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (Trec, acute)	below standard
Iron (Trec)	660	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	<0.25	3.3	below standard
Chromium	<10	11*	below standard
Copper	<4	38	below standard
Hardness	390 mg/L	no standard	n/a
Iron	430	300	1.4 x standard
Lead	<1	27	below standard
Manganese	1200	50	24 x standard
Nickel	<20	270	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Silver	<0.2	3.4	below standard
Sulfate	240 mg/L	250 mg/L	below standard
Zinc	120	335	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #: 203

Environmental Degradation Rating: 3

This dump has a volume of about 250 cubic yards. It is yellow and red-orange colored, contains sulfides, especially pyrite, and has iron-oxide coatings on some of the sediments. Water that flows across the dump at 10 gpm has **pH = 7.35 and conductivity = 100 µS**. The dump is devoid of vegetation and has gullies, indicating periodic drainage from associated adit #103. Dump #203 is west of adit #100.

Feature #: 204

Environmental Degradation Rating: 3

This feature is located just above dump #203. It is 120 cubic yards in volume, and it is yellow and orange colored. Pyrite and other sulfides occur, and iron oxides coat some of the sediments. Sparse aspen grow on the dump slope. Gullies on the dump indicate periodic drainage.

Feature #: 205

Environmental Degradation Rating: 3

This feature is a yellow-orange dump of 100 cubic yards. Pyrite and other sulfides occur, and iron oxides coat some of the sediments. No water was draining during the inventory, but rills on the dump slope indicate that runoff periodically flows across and down the dump. Vegetation consisted of sparse aspen trees.

Quad Name: St. Elmo

Site #: 382/4283-2

Site Name: Almost in St. Elmo

Description and pertinent facts: This site spans a pair of switchbacks located on the road/trail to the Iron Chest Mine and is highly visible from the road. All of the features are on private land, but affect public land. The significant and obvious effects of mining on local conditions support EDRs of 1 for some of these features. Other sites in need of remediation are nearby, and a large mitigation program could address numerous problems simultaneously. Adit #100 was identified for the Chalk Creek Closure program (OSM 8-127), but was deleted from the program. Private land may have been an issue.

Feature #: 100, 200

Environmental Degradation Ratings: 1

This pair of mine features is characterized by extreme degradation. Parameters from water dammed

up in adit #100 are **pH = 5.1 and conductivity = 200 µS**. The effluent degrades rapidly as it flows at 15 gpm over the south edge of dump #200. Less than 100' downstream from the portal, and just before the discharge seeps into the ground, **pH = 4.0 and conductivity = 300 µS**. The 800-cubic-yard dump is rusty yellow-brown and contains ≤15% pyrite, with local pockets of ≤80% pyrite in medium- to coarse-grained clots. Moderate to extensive cementation suggests development of clays and other sulfide weathering products in the dump. Significant staining and a tree mortality zone occur along the downhill margins of dump #200.

Feature #: 101, 201

Environmental Degradation Ratings: 3, 2

A lower pair of mine features contains less pyrite, but has greater water flow. Adit #101 was inventoried and effluent tested on July 26, 1995, and a water sample was collected on August 9, 1995. Effluent volume and quality decreased between the site visits. During the inventory, effluent was flowing at 25 gpm and had **pH = 7.1 and conductivity = 400 µS**. When sampled, the effluent was flowing at 20 gpm and had **pH = 6.45 and conductivity = 600 µS**. Effluent greatly exceeded state standards in manganese and zinc concentrations and also exceeded standards in cadmium and iron (Trec), as shown by the laboratory results tabulated below. Variation in pH and conductivity suggests that high seasonal flow may dilute poor quality water and decrease residence/reaction time, resulting in water showing less degradation. Metals loading by effluent discharging into nearby streams may not change appreciably, however.

Effluent from adit #101 flowed across dump #201, but did not measurably degrade. Material within the 500-cubic-yard dump is ≤5% pyrite and is yellow-brown to dark brown in color. A 1 gpm seep near the toe was slightly degraded with **pH = 6.7 and conductivity = 500 µS**.

Sample 382/4283-2.101

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	100 mg/L	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (Trec, acute)	below standard
Iron (Trec)	3600	1000	3.6 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	8	2.0	4 x standard
Chromium	<10	11*	below standard
Copper	<4	22	below standard
Hardness	210 mg/L	no standard	n/a
Iron	<10	300	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Lead	<1	11	below standard
Manganese	3000	50	60 x standard
Mercury	<0.2	0.01	below detection limit
Nickel	<20	170	below standard
Silver	<0.2	1.1	below standard
Sulfate	250 mg/L	250 mg/L	1 x standard
Zinc	3500	200	17.5 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: St. Elmo

Site #: 383/4281-4.205

Site Name: Grizzly Gulch - 4

Environmental Degradation Rating: 3

Description and pertinent facts: This orange-yellow dump is located 0.1 miles from the Grizzly Gulch Road (FR-280) and 0.15 miles from the stream in the gulch. Dump #205 has a volume of about 150 cubic yards and contains large pieces of massive sulfide. The dump face is barren of vegetation. Associated adit #105 trends into a patented claim, but dump #205 is on public land. Neither of these features shows evidence of drainage. The EDR of 3 is a result of the fragments containing massive sulfide.

Quad Name: St. Elmo

Site #: 383/4283-5.203

Site Name: Grizzly Gulch North

Environmental Degradation Rating: 3

Description and pertinent facts: This site is located roughly 0.15 miles east of the Grizzly Gulch Road. Yellow- and gray-colored dump #203 is approximately 300 cubic yards and contains pyrite on its surface. The dump is barren of vegetation, and two large pine trees on its slope are dead. No water was draining during the inventory, but gullies cutting the dump indicate flow in the past.

Quad Name: St. Elmo

Site #: 383/4284-2

Site Name: Grizzly Gulch - 2

Description and pertinent facts: This site is near the mouth of Grizzly Gulch and straddles the

Grizzly Gulch Road.

Feature #: 200

Environmental Degradation Rating: 3

This dump is located on a dead-end fork off of FR-280 near CR-292. It is roughly 400 cubic yards in volume, and it runs parallel to and borders the stream in Grizzly Gulch. Sulfides, especially pyrite and chalcopyrite, are abundant. Moderate growth of weeds and pine trees has occurred, however, gullies in the dump indicate periodic runoff. Tests of water in the 600 gpm stream adjacent to dump #200 yielded **pH = 8.0 and conductivity = 600 µS**. A water sample was collected from the stream adjacent to dump #200. Lab results, shown on the table below, indicate that despite the presence of sulfides, the water quality is quite high.

Sample number 383/4284-2.100/200

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	26 mg/L	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (Trec, acute)	below standard
Iron (Trec)	19	1000	below standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	<0.25	0.21	below detection limit
Chromium	<10	11*	below standard
Copper	<4	1.9	below detection limit
Hardness	12 mg/L	no standard	n/a
Iron	<10	300	below standard
Lead	<1	0.19	below detection limit
Manganese	<4	50	below standard
Nickel	<20	19	below detection limit
Silver	<0.2	0.01	below detection limit
Sulfate	19 mg/L	250 mg/L	below standard
Zinc	<8	18	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #: 202

Environmental Degradation Rating: 3

This dump is located along a trail that heads east from FR-280 just after FR-280 crosses the stream and heads due south. Dump #202 has a volume of 200 cubic yards and contains sulfides (pyrite) and iron oxides. The dump is sparsely vegetated with pine trees. No water is associated with the feature, but it received an EDR of 3 because of its size and the presence of pyrite.

Quad Name: St. Elmo

Site #: 386/4278-1

Site Name: Baldwin Lake

Description and pertinent facts: This site is located on the west-northwest side of Baldwin Creek and extends from just below timberline to much higher elevations of tundra and talus. Baldwin Creek is an excellent trout fishery. Access is moderate with 4WD equipment, but some features are on talus slopes and require hiking.

Feature #: 100

Environmental Degradation Rating: 3

Feature #100 is small prospect pit located in semi-tundra. Standing water in the pit had **pH = 3.2** and **conductivity = 000 μ S**.

Feature #: 101, 201

Environmental Degradation Ratings: 3

Adit #101 is partly collapsed and has water behind a dam of rockfall and snow. The adit water, which was probably diluted by snowmelt, was discharging at 0.1 gpm and had **pH = 3.7** and **conductivity = 100 μ S**. Discharge from the adit did not extend beyond the trench in front of the portal. Associated dump #201 is about 1,400 cubic yards and contains $\leq 3\%$ sulfides, as pyrite, sphalerite, and galena in quartz vein fragments. The dump is gray to yellow-brown in color, with a plume of staining extending out from the dump toe. The dump was dry during the inventory.

Feature #: 202

Environmental Degradation Rating: 2

Dump #202 originated from a shaft, is dry, and is situated on a steep slope above a dry stream channel. Ore material containing $\leq 10\%$ sulfides as pyrite and chalcopyrite in quartz vein fragments fills a loadout structure. Dump #202 and the associated loadout area are on a steep slope. Because of the steep slope, the overall dump volume (1,000 cubic yards) seems small when compared to the areal extent of the feature. A lengthy downslope stain indicates notable transport of potentially acid-forming materials and suggests significant environmental degradation.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Buena Vista East

Site #: 408/4300-1.102

Site Name: Shield's Gulch West

Physical Hazard Rating: 2

Description and pertinent facts: This feature is an intact, open adit that is directly accessible from FR-376.1A. The adit is not visible from the main road, but a short, 4WD spur road provides access. The portal is 5'x 4', and the adit extends at least 50'. No one lives in the area, but above the adit is an abandoned pegmatite quarry that is visible from the main road and may attract people to this site.

Quad Name: Buena Vista East

Site #: 409/4299-1.105

Site Name: Shield's Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This open shaft is 400' north of FR-315, and the dump is visible from the road. The shaft collar is 11'x 9' at the surface, and the shaft is at least 25' deep. Bedrock is weathered granite gneiss that is somewhat unstable at the collar. No year-round residents live in the vicinity.

^^New Quad^^

Quad Name: Cameron Mountain

Site #: 412/4277-1.108

Site Name: East Reef

Physical Hazard Rating: 2

Description and pertinent facts: This shaft has standing water about 25' below the 4'x 8' surface opening. The timber cribbing and ladder have collapsed into the shaft. These aspects and the incompetent nature of the wall rock justify a PHR of 2. This shaft would rate a PHR of 1 if it were closer to public access, but it is about 0.5 miles to the nearest road (CR-184). Most of this inventory area is on the Nathrop quadrangle, and several dangerous features are discussed in the Nathrop section.

Quad Name: Cameron Mountain

Site #: 413/4276-1.102

Site Name: South of Cat Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is apparently on private land, but the site is near and very visible from the unmarked 4WD road that connects with CR-184 about 0.5 miles to the east.

Many tourists and mine enthusiasts drawn to the Turret area, which is just 0.5 miles north of this site, might venture up this 4WD road. The 4'x 8' collar opens to a shaft that is greater than 30' deep. It would be impossible to climb out of this feature.

Quad Name: Cameron Mountain

Site #: 413/4277-1

Site Name: Turret North

Feature #: 101

Physical Hazard Rating: 2

This adit is approximately 15' east of CR-184. The small associated dump is slightly visible from the road. The portal is 3'x 4', and the adit ends about 20' into the hillside. Country rock at the entrance and inside the adit appears incompetent and unstable.

Feature #: 106

Physical Hazard Rating: 2

This 25'-deep shaft is partly filled with trash and rock debris and is just 10' from a 4WD road. The opening is 3'x 8'. This shaft is easily accessed, and the 4WD road is not far from CR-184, a moderately traveled, gravel road. Escape from this shaft would be difficult, especially after a 25' fall.

Feature #: 107

Physical Hazard Rating: 2

This shaft is easily accessible from an unnumbered 4WD road and is partly filled with trash and rock debris. The opening is 4'x 8', but the depth was indeterminable because of water about 25' below the surface. The water was tested just after a rare afternoon rain shower and had **pH of 7.1 and conductivity of 100 μ S**. A small dump is associated with this feature, but a large dump only 100' away is quite visible from the road and may attract visitors to shaft #107. Escape from this shaft without equipment is unlikely.

Feature #: 111

Physical Hazard Rating: 2

This large adit has a 5'x 8' portal and extends for a distance greater than 60'. A 200-cubic-yard dump associated with this adit is an attractive marker to the entrance and is visible from an unmarked 4WD road. Although the country rock appears fairly stable, dangerous aspects of this adit include its accessibility, depth, and the possibility of a winze in the underground workings.

Quad Name: Cameron Mountain

Site #: 413/4277-2

Site Name: Stafford Gulch area

Description and pertinent facts: This inventory area is approximately 0.5 miles north of Turret.

Feature #: 100

Physical Hazard Rating: 2

Shaft #100 is located about 300' east of CR-184. It is not visible from the road, but the shaft is over 30' deep, enough to warrant concern. Unstable cribbing and an old ladder at the 5'x 8' opening increase the risk of a fall.

Feature #: 104

Physical Hazard Rating: 2

This shaft is located about 0.2 miles west of CR-184 in an area that does not appear to have much public use. The shaft is near the border of private (patented) land. It is 18' deep, has a 6'x 4' collar, and contains timber cribbing support. The shaft has a bell-shaped bottom, and the size of the shaft at the base is unknown. The bell-shaped bottom of this shaft may be indicative of lateral workings at this level or unstable sidewall collapse.

Feature #: 105

Physical Hazard Rating: 2

The dump from this 20'-deep shaft is visible from CR-184, which is less than 100 yards away. Because of erosion of material into the shaft, the 7'x 4' opening craters to the surface, increasing the fall-in hazard. The cribbing is unstable, and an untrustworthy ladder descends the shaft. Similar to shaft #104 described above, this shaft is bell-shaped at the bottom. The dimensions at the base are unknown.

Quad Name: Cameron Mountain

Site #: 414/4275-1

Site Name: Turret Road West

Feature #: 100

Physical Hazard Rating: 2

This 3'x 6' shaft opening is 30' south of CR-184. It is only about 15' deep, but its exposure to public interaction makes this shaft dangerous. The associated dump is small, but could attract visitors. This shaft could be easily backfilled.

Feature #: 101

Physical Hazard Rating: 2

If shaft #100 (described above) is visited by the public, this shaft will probably also be visited. It is 3'x 6' at the surface and 22' deep, is close to a 4WD spur road off of CR-184, and is about 300 yards southeast of shaft #100. The shaft is a significant physical hazard, but could be mitigated easily by backfilling with the associated dump material.

Feature #: 103

Physical Hazard Rating: 2

Although this feature is somewhat remote (0.3 miles south of CR-184), it warrants a PHR of 2 because it is a large open pit, roughly 20' in diameter and 25' deep with vertical sides. Unassisted escape for a fall-in victim is impossible.

Quad Name: Cameron Mountain

Site #: 415/4275-1

Site Name: Turret Road East

Feature #: 103

Physical Hazard Rating: 1

This shaft is extremely dangerous. It is only 60' from well-traveled CR-184, and a campfire ring next to the shaft suggests frequent public visitation. The opening is 4'x 8' at the surface, but the sides of the opening crater out to 8'x 10' in the surrounding dump material. Because the cratered sides are very unstable, even the most sure-footed visitor could slide into the shaft. The shaft is about 30' deep, and the walls are unstable rock with no supporting timbering.

Feature #: 104

Physical Hazard Rating: 1

This 5'x 8'x 30' shaft is extremely dangerous and is situated less than 100' west of shaft #103 (described above). It is visible from CR-184, which is only 40' away. Cratering walls that could fail at any time widen the shaft collar. A campfire ring only 20' away suggests that this site is frequently visited. Injury is probable if someone falls. This shaft is a high risk to health and life!

Quad Name: Cameron Mountain

Site #: 415/4277-1.100

Site Name: North Marble Quarry Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This adit is approximately 40' east of the heavily used intersection of CR-185 and CR-185.2A. The associated dump has an intact loadout structure, increasing visitation to the site by the curious. The adit is in intensely fractured marble that has collapsed around much of the opening. The portal is currently 3'x 3', but rockfall debris could easily be moved to create better access. The adit extends over 30', and the size of the dump indicates extensive workings.

Quad Name: Cameron Mountain

Site #: 416/4275-1.100

Site Name: Homestake Mine

Physical Hazard Rating: 1

Description and pertinent facts: This large quarry receives frequent visitation because it is adjacent to CR-185. A small lake at the quarry's base attracts tourists that use CR-185. The quarry is roughly 700' long and contains many dangerous highwalls up to 120' in height. The quarry is in a skarn deposit and has fairly stable sides, but because of its size, vertical relief, accessibility, and human interaction, it creates an extremely dangerous situation.

Quad Name: Cameron Mountain

Site #: 416/4277-1.100

Site Name: Golden Wonder East

Physical Hazard Rating: 2

Description and pertinent facts: This is a moderately deep shaft, roughly 120' from an unmarked 4WD road accessed from CR-185. Standing water was present about 15' below grade, and a local resident reported that the water was approximately 45' deep. A meager barbed-wire fence surrounds the 4'x 8' collar. A year-round local resident will not allow access to this feature and others on "his" property (the PBS map showed this as USFS-managed land, but he claimed it was his private property.) He did not allow water tests or photographs at this shaft.

Quad Name: Cameron Mountain

Site #: 416/4278-1

Site Name: Graphite Ridge

Feature #: 100

Physical Hazard Rating: 2

This shaft is 50' from an unmarked 4WD road extending east from CR-185.2A. The small dump associated with the 4'x 8'x 25' shaft makes the feature visible and increases the hazard by supplying loose material around the shaft collar. Probable injury awaits any fall-in victim, and escape would be difficult without assistance. This shaft could be easily backfilled.

Feature #: 107

Physical Hazard Rating: 2

Although probably on private land, this adit is over 25' in length and is easily accessible. An old road grade starting from the well-traveled CR-185 leads directly to the site. The 2'x 3' adit opening could be easily widened to allow human entry. A winze occurs about 25' into the adit, increasing the hazard.

Feature #: 109

Physical Hazard Rating: 2

Adit #107 (described above) and this adit are associated, and the combination of the two dumps is highly visible from CR-185 below. Adit #109 is probably on private land also. The portal is the size of an average doorway (7'x 4'), and the adit extends into fairly competent rock. The length of adit #109 (over 40') and the high probability of a winze near the face create a dangerous situation.

Quad Name: Cameron Mountain

Site #: 416/4287-1

Site Name: Futurity

Description and pertinent facts: The greatest danger regarding this inventory area, is the proximity of the Elk Ranch guest ranch in the valley below (about 900' away). Elk Ranch has

developed hiking and horse trails that access most of the mines, greatly increasing the number of visitors, and thereby increasing the probability of accidents.

Feature #: 100

Physical Hazard Rating: 2

This adit is over 20' long and penetrates fairly unstable rock. The portal is mostly collapsed, but access is still possible through a 1'x 2' opening.

Feature #: 101

Physical Hazard Rating: 2

This shaft is greater than 30' deep and is inclined to the north at roughly 40°. Entry into the 3'x 4' surface opening is easy. A deceptively steep slope and incompetent wall rock with abundant malachite could lead to injuries or possible death for curious visitors. A trail from the Elk Ranch guest ranch crosses the large associated dump, passing close to the shaft opening.

Feature #: 103

Physical Hazard Rating: 1

This shaft is 225' from a trail established by the Elk Ranch guest ranch, but its dump is easily visible. The shaft is over 20' deep with a 3'x 4' opening. Any visitor intrigued by mining features would be curious about this site. The shaft is extremely dangerous because of rotten wall rock, vertical sides, and cratering, erosion, and instability at the collar. The incompetence of the wall rock is evident by the collapsed timbering that formerly supported the sides and opening of this shaft.

Feature #: 104

Physical Hazard Rating: 1

The town of Futurity, although very small, is a tourist attraction as a mining ghost town. Adit #104 is the largest mine in Futurity. The adit has a 2'x 4' portal that is easily entered and is over 30' deep. Incompetent country rock and the partly collapsed portal create high danger levels. Massive underground workings are indicated by the large associated dump that extends nearly the entire length of the town and leads directly to the portal. Traffic is increased by the presence of foot/horse trails from Elk Ranch guest ranch, which is just over the hill to the south.

Quad Name: Cameron Mountain

Site #: 417/4274-4

Site Name: Ute Trail

Description and pertinent facts: Feature #111 of this inventory area is located on the Salida East quadrangle and is discussed later in this report.

Feature #: 102

Physical Hazard Rating: 2

This shaft has two openings and is located about 600' east of CR-175. At the surface, the openings are about 20' apart and are both approximately 25'x 12'. The shafts merge roughly 20' below grade, and the bridge of land between them is very unstable. Loose rock surrounds both openings. Shaft depth is unknown, but it is greater than 30'. An abandoned, seldom-used road leads to shaft #102.

Physical Hazard Rating: 2**Feature #:** 106**Physical Hazard Rating: 2**

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Castle Rock Gulch

Site #: 413/4292-1.100

Site Name: West Columbine Gulch

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #100 and its dump are highly visible. They are only about 100' north of CR-184.3E, increasing the jeopardy to passersby. The shaft has a 3'x 6' collar and is more than 30' deep. The shaft walls are lined with timbers that appear to be in good condition.

Quad Name: Castle Rock Gulch

Site #: 413/4300-1.100, 200

Site Name: Newett

Physical Hazard Ratings: 2

Description and pertinent facts: This inventory area contains several large quarries in the Leadville Limestone. The quarries are dangerous because of the associated highwalls. Many large blocks of limestone lie at the base of the 35' highwall (feature #200) and are scattered around the floor of quarry #100. These blocks may be evidence of rockfall from unstable highwall #200. The quarry is visible from U. S. Highway 285 and is accessible via FR-309. A locked chain prevents vehicular access, but does not adequately discourage foot traffic. A 4WD trail bypasses the locked chain on the access road and passes a few tens of feet from the top of the highwall. Firepits and aluminum cans indicate occasional human visitation.

Quad Name: Castle Rock Gulch

Site #: 415/4302-1

Site Name: Trout Creek View

Description and pertinent facts: A fence along U.S. Highway 285 deters people from accessing this group of mines situated less than 0.3 miles east of the highway.

Feature #: 102**Physical Hazard Rating: 2**

Shaft #102 is over 40' deep and is very dangerous. Unstable, loose rock surrounds the 5'x 8' collar. Cribbing and a ladder in the shaft extend about 30' below the ground surface. It would be easy for an unsuspecting person to slip into this shaft. An old 4WD road provides easy hiking for curious individuals.

Feature #: 105**Physical Hazard Rating: 2**

Shaft #105 has a 3'x 6' collar and drops vertically more than 60'. It is closer to U.S. Highway 285 than shaft #102 (described above) and is near the 4WD road that accesses this group of mines. Shaft #105 is about 100 yards east of a private property line and "No Trespassing" signs along the road might deter visits to this feature.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Garfield

Site #: 380/4275-1

Site Name: Hancock Pass

Description and pertinent facts: This inventory area has two dangerous adits within 150' west of FR-299. The adits are visible from this rough 4WD road that is moderately used by the public. Construction equipment for mitigation work could easily reach these features from FR-299.

Feature #: 104**Physical Hazard Rating: 2**

This partly collapsed adit has a 3'x 1' opening that is very unstable. The adit depth is unknown, but it extends at least 20'. Dump size suggests that it probably does not extend much further. The instability of the portal is of particular concern.

Feature #: 105**Physical Hazard Rating: 2**

This partly collapsed adit is just to the northeast of adit #104. It has a 4'x 3' opening that extends to a depth of 40'. Rock at the portal is slightly unstable. Standing water just inside of the adit could not be reached for testing. Evidence is lacking to suggest that the adit drains significant volumes of water during high runoff periods.

Quad Name: Garfield

Site #: 384/4269-1.103

Site Name: East of Clover Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This shaft has a 9'x 6' opening and vertical walls. Standing water is at a depth of 15', but it appears the shaft is at least 20' deep. Starting at a depth of 8', timber cribbing extends into the water. The ground around the collar is loose and dangerous. This shaft is not frequently visited because of its remote location, 0.3 miles southwest and 600' above FR-230.

Quad Name: Garfield

Site #: 384/4274-1.105

Site Name: North of Island Lake

Physical Hazard Rating: 2

Description and pertinent facts: This adit has a portal of 5'x 3' and extends at least 20'. Its most dangerous attribute is a winze in the adit floor about 10' from the portal. Although the depth is unknown, the winze could be a significant hazard, and the adit requires a PHR of 2. Talus from the steep slopes above the adit is accumulating above the portal, presenting an additional hazard. Although a 4WD road is about 200 yards away, this area is remote and not frequented by the public.

Quad Name: Garfield

Site Number: 385/4265-1.101

Site Name: Madonna Mine

Physical Hazard Rating: 2

Description and pertinent facts: Feature #101 is a ventilation shaft for the Madonna Mine (feature #100) and is situated about 40' directly uphill from the adit portal. The collar is 3'x 3', and the shaft drops 43'. The shaft is completely intact with wood plank cribbing, wood plank ladder, and aluminum ventilation ductwork. This inventory area is very visible, and U.S. Highway 50 is adjacent to its south side. A locked gate restricts vehicular access from Highway 50. Land ownership at this site is unclear. The PBS Garfield quadrangle map shows this as unpatented land, but officials of the Monarch Ski area provided claim maps showing the Madonna Mine, including this shaft, on the patented Great Republic claim (Mineral Survey #2491).

Quad Name: Garfield

Site#: 385/4268-1

Site Name: Boss Lake Reservoir

Feature #: 100

Physical Hazard Rating: 2

This large prospect is located east of Boss Lake Reservoir and adjacent to FR-235, a 4WD road. The associated dump is easily visible from the road. The surface opening is 12'x 8', and the pit has

vertical walls that extend to a depth of 16'. Fishing and marked trails in the Boss Lake area increase the probability of visitation to this feature.

Feature #: 102

Physical Hazard Rating: 2

This vertical shaft has standing water of unknown depth 16' below the collar. The collar is 13'x 4', but it craters at the surface to 18'x 13', increasing the fall-in hazard. This shaft is less than 300' southeast of Forest Trail #1420.

Quad Name: Garfield

Site #: 385/4270-1.101

Site Name: Hoffman Park

Physical Hazard Rating: 2

Description and pertinent facts: Although this 25'-deep vertical shaft is remote, it is above treeline and is easily sighted. An unmarked 4WD road ends about 0.3 miles south of the 7'x 6' opening. A fall-in victim would have no chance of escape.

Quad Name: Garfield

Site #: 386/4269-1.103

Site Name: Middle Columbus Gulch

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is on patented land according to the PBS map, but was inventoried because it is only about 150' northwest of the unmarked 4WD road accessing this area. The shaft has an 8'x 4' collar and is filled with rock debris to a depth of 13'. The rock debris is probably a false bottom. It is adjacent to an old, slightly revegetated mine road. Hiking access to this shaft is easy via the old mine roads.

Quad Name: Garfield

Site #: 388/4265-1

Site Name: Ridge East of Monarch Ridge near Fooses Creek

Description and pertinent facts: This inventory area is situated north of Fooses Creek and southeast of the Garfield townsite. It has good 4WD road access via FR-225.2A, but one must hike to the most dangerous features, shafts #105 and #107. Other potentially dangerous (PHR=3) shallow shafts and prospects are in this inventory area.

Feature #: 105

Physical Hazard Rating: 2

This shaft poses a hazard, but no trail leads to the site. Human visitation would be unusual, but possible. The shaft exposes limestone to a depth of 25' and has a 13'x 9' surface opening. No access is available for construction vehicles.

Feature #: 101

Physical Hazard Rating: 2

This inclined shaft extends to an unknown depth, but is deeper than 25'. The surrounding country rock is moderately weathered and slightly unstable. Timbering around the 3'x 5' opening has collapsed. This shaft would definitely rate a PHR of 1 if it were more accessible.

Quad Name: Nathrop

Site #: 412/4277-1

Site Name: East Reef

Description and pertinent facts: The East Reef inventory area straddles the Nathrop and Cameron Mountain quads and contains numerous dangerous features. Feature #108 is described in the Cameron Mountain section of this report.

Feature #: 100

Physical Hazard Rating: 2

Adit #100 is only 30' from an unnumbered 4WD road that parallels Cat Gulch. The entrance is small (1.5'x 2'), but one can see about 30' back, and the associated dump indicates more extensive workings. Despite the small entrance, someone has been in this adit within the past 5 years, as a large box of food is about 15' inside the hole (too far to have been thrown there). It is possible that someone has been living here. The country rock is moderately altered granite or granodiorite. The partly collapsed portal indicates instability and therefore danger.

Feature #: 102

Physical Hazard Rating: 2

This shaft is fairly remote, about 0.4 miles north of an unmarked 4WD road, but is very dangerous. The 3'x 8' shaft collar is stable, but the shaft depth of over 100' and moderately rotted timbering are reasons for concern. This feature is not visible from any road, but is visible from most points on the adjacent hillsides because of its dump. This shaft would rate a PHR of 1 if it were closer to public access.

Feature #: 106

Physical Hazard Rating: 2

Standing water is about 12' below the surface of this remote shaft. The collar is 4'x 8'. Deeper workings are possible, but not likely, because the water in the shaft is apparently about 1 foot deep. Wall rock is weathered and crumbly, making escape difficult if one was to fall. Backfilling of this shaft would easily mitigate this hazard.

Feature #: 109

Physical Hazard Rating: 2

This 15'-deep shaft has a 6'x 2', cratered, surface opening that is still unstable. The timber cribbing remaining in the lower part of the shaft appears to be rotten. The shaft appears relatively shallow, but the apparent bottom may only be a "bridge" of collapsed material, and the shaft may be deeper.

Physical Hazard Rating: 2

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Site #: 413/4273-1

Site Name: Long's Gulch Center

Physical Hazard Rating: 2**Feature #:** 102**Physical Hazard Rating: 2**

This open adit is located at the end of a short spur road off FR-183. The adit is partly collapsed, but still has a 3'x 5' opening and a small subsidence hole above the entrance. Although the mine is not visible from FR-183, evidently the site is used as a camp periodically. The full extent is not known, but the dump is 60 cubic yards, suggesting that the adit does not extend much beyond the 25' that is visible from the portal.

Quad Name: Salida East

Site #: 417/4274-1

Site Name: Cutler Spring Area

Feature #: 109,213

Physical Hazard Ratings: 1

Hazardous feature #109 is a large circular pit that is 65'x 70' and has mostly vertical, 45' highwalls (feature #213). The bottom of the pit has three adits that are discussed in the following paragraphs. This pit is extremely dangerous because of its steep sides and the allure of the adits at the bottom. The intensely hydrothermally altered bedrock is loose and unstable, increasing the danger. A good dirt road leads from CR-185 to the pit. CR-185 is heavily used, and the old mining town of Turret is just a mile away. A local resident stated that his children climbed into the pit, and outside assistance was required to get them out.

Feature #: 110

Physical Hazard Rating: 1

This tunnel is at the bottom of open pit #109, described above. It extends 40' underground, then reaches the surface outside and on the south side of the pit. The portal is 4'x 7', and the tunnel is completely cribbed. The cribbing is warped and cracked in many places and appears unstable. Because adit #110 leads into the pit, it is an attractive but extremely dangerous passage for people to use.

Feature #: 111

Physical Hazard Rating: 2

This adit is also in open pit #109, but it only extends about 25' into the wall of the pit. The portal is 6'x 4', and the rock appears stable. Because it is at the bottom of the pit, a PHR of 2 was given.

Feature #: 112

Physical Hazard Rating: 2

This is the smallest adit located inside open pit #109. The portal is 4'x 3' and appears stable, and the adit is only 10' long. Because of its location inside the pit, it was given a PHR of 2.

Feature #: 114

Physical Hazard Rating: 2

This adit is located in the dump of open pit #109 and is only about 400 yards from CR-185. The portal is partly collapsed and is now 1'x 3'. A person could still squeeze into the adit, which extends to a depth of 20'.

Quad Name: Salida East

Site #: 417/4274-2.200

Site Name: Cutler Springs North

Physical Hazard Rating: 2

Description and pertinent facts: This feature is a highwall associated with quarry #100. It is approximately 90' long and 40' high, with an overhang of 20'. Wallrock appears stable, but much rockfall debris lies below the overhang. The site is situated at the end of a well-maintained 4WD road that extends north of CR-185. Ease of access and the probability of continuing rockfall events make this quarry highwall a significant hazard.

Quad Name: Salida East

Site #: 417/4274-3

Site Name: Williamsburg Mine

Description and pertinent facts: This cluster of shafts has dumps that are visible from CR-175. A 4WD road from CR-175 passes near these mines, so this area is easily accessible. Jeep tours frequently stop at these mines, but the passengers are not allowed out of the vehicles.

Feature #: 100

Physical Hazard Rating: 1

This shaft has a collar of 6'x 3', and it is 36' deep. The cribbing and the adjacent ground seem stable, but the depth and location of the shaft make it extremely dangerous.

Feature #: 101

Physical Hazard Rating: 2

This inclined shaft and the following described mine features in this inventory area are associated with unstable ground, possibly due to the linkage of these workings at depth. The collar is 2'x 7', partially collapsed, and appears very unstable. Shaft #101 is greater than 20' deep and appears to split into two directions at 15' in depth. The 25° slope is shallow enough for a person to climb out.

Feature #: 102

Physical Hazard Rating: 2

This 12'-deep inclined shaft starts as a 6'x 5' opening that funnels down to a partially collapsed 1'x 2'. The area around this shaft and nearby workings appears very unstable.

Feature #: 104

Physical Hazard Rating: 2

This inclined shaft also appears unstable. An 8'x 6' collar leads to nearly vertical walls that are 9' in depth. The shaft eventually splits into two branches that both appear to be collapsed, but may have small openings that a person could fall through.

Feature #: 105

Physical Hazard Rating: 2

This inclined shaft has 6' vertical walls. The opening of 8'x 5' narrows and flattens into two inclined adits that are partly collapsed. One of the openings is large enough for a person to fit through. The ground in this area is like "swiss cheese" and could subside at any time.

Quad Name: Salida East

Site #: 417/4274-4.111

Site Name: Ute Trail

Physical Hazard Rating: 2

Description and pertinent facts: The 130-cubic-yard dump associated with shaft #111 is visible from several miles away. The site is 0.5 miles east of CR-175, but an abandoned road leads to the site. The 100'-deep shaft is cribbed with rotten timbers, and the remains of the headframe lie in ruins over and adjacent to the 4'x 8' surface opening. Rock around the opening is unstable and loose. Features #102, #105, and #106 of this inventory area are discussed in the Cameron Mountain section of this report.

Quad Name: Salida East

Site #: 419/4267-1.100

Site Name: The Crater

Physical Hazard Rating: 2

Description and pertinent facts: This is a deep, funnel-shaped shaft in shale and sandstone of the Minturn Formation. Unstable bedrock makes the top of the shaft very dangerous. The surface opening is 9'x 6', and the shaft is over 30' deep. Shaft #100 is about 200' east of FR-181.2A, an infrequently used 4WD road. The closest dwelling is a seasonal residence about 1 mile south of the site.

Quad Name: Salida East

Site #: 420/4274-1

Site Name: Black Diamond Spring East

Description and pertinent facts: This site is reached by a 4WD trail spur from FR-182, but a locked gate 0.5 miles south of the inventory area discourages access. The site is on public land, but is surrounded on three sides by private land.

Feature #: 106**Physical Hazard Rating: 2**

This intact shaft is 9'x 5' at the surface and 20' deep. Dump size (550 cubic yards) suggests that numerous drifts have been driven from this shaft below the surface. The upper half of a wooden ladder is still present in the shaft. Two ruined buildings are present, one on each side of the shaft. There are no inhabitants in the immediate vicinity.

Feature #: 107**Physical Hazard Rating: 2**

This feature consists of a trench and collapsed adit just south of shaft #106 (see above). A small subsidence hole, 1'x 2' across and 5' above the former portal, allows access to the adit. The adit extends more than 10' feet. A small dump in front of adit #107 suggests that this adit may be a "back door" to shaft #106. It could also lead to other hazardous underground workings.

^^New Quad^^

Quad Name: Salida West

Site #: 411/4273-1.100

Site Name: Long's Gulch West

Physical Hazard Rating: 2

Description and pertinent facts: This is an intact, open adit just south of FR-183. The mine is shown on published maps and is only 100' from the road. The entrance is 6'x 5', and the adit extends over 40'. Dump size (300 cubic yards) indicates significant workings beyond what is visible from the portal. Because FR-183 is at the bottom of Long's Gulch, this mine is not visible from the road. There are no inhabitants in this area.

suggesting the original depth was significant, and the present bottom is false. Any impact on the present bottoms of these shafts may cause additional caving and possible injury or death. However, no road or marked trail leads directly to the workings, and some effort is required to reach them. Access is extremely poor; no existing roads were found, and only small pack and game trails were present. Environmental problems within this area are described in the **Environmental Degradation** section of this report. If environmental problems are mitigated in this inventory area, many of these physical hazards could be addressed at the same time.

Feature #: 101

Physical Hazard Rating: 2

Shaft #101 is steeply inclined (70°) and has a surface opening of 10'x 8'. It is greater than 20' deep and is filled with water to within 2' of the surface.

Feature #: 102

Physical Hazard Rating: 2

Shaft #102 is inclined, with a partly cribbed 6'x 5' opening, and is over 10' deep. It has standing water 4' below grade.

Feature #: 103

Physical Hazard Rating: 2

Inclined shaft #103 appears small, 6' deep with a 3'x 3' opening, but it is partly caved. It shares a common dump with shaft #102. Standing water in shaft #102 is 5' below grade.

Feature #: 104

Physical Hazard Rating: 2

Its associated 520-cubic-yard dump indicates that shaft #104 was probably a major production shaft. The collar is 10'x 12', and the shaft descends vertically. Its total depth is unknown because it is filled with water 6' below the surface.

Feature #: 105

Physical Hazard Rating: 2

Feature #105 is an adit with a 6'x 10' winze opening about 5' inside the portal. Water fills the winze to 10' below the adit grade. The winze represents a serious a fall-in hazard to anyone unprepared for underground work.

Quad Name: St. Elmo

Site #: 382/4280-1

Site Name: Iron Chest Mine Area

Description and pertinent facts: The Iron Chest Mine area lies **entirely on private land** and was examined only for hazards and environmental degradation affecting public lands. All three mine features listed are shafts shown on public maps. Shafts #101, #103, and #104 could have false bottoms. The remoteness and apparently sparse traffic to the site suggest that the shafts are dangerous, but not extremely dangerous. Construction equipment access is good if the unmarked 4WD road to this area is cleaned up and modified in a few key places. This road accesses several

other sites requiring work, too. This inventory area has environmental problems (discussed in the **Environmental Degradation** section) that could be addressed at the time of hazard mitigation.

Feature #: 101

Physical Hazard Rating: 2

Partially collapsed shaft #101 is small, slightly over 10' deep, but it has unstable sides. The surface opening is 12'x 6', which funnels down to a 4'x 5' timber-cribbed opening. The shaft is filled with water 3' below surface grade.

Feature #: 103

Physical Hazard Rating: 2

This large, timbered, three-compartment shaft is located at the top of a large dump and is probably the Tressa C. shaft. The collar measures 12'x 6', and the shaft drops 18' to a snow and ice plug. The shaft probably extends much deeper.

Feature #: 104

Physical Hazard Rating: 2

Mine feature #104 is a small, 10'-deep shaft with unstable sides. The surface opening is 12'x 18', but this narrows with depth to 5'x 8' in competent rock. Above the competent rock, rock is sloughing from the unstable shaft walls.

Quad Name: St. Elmo

Site #: 382/4282-1.100

Site Name: Shaft Boulevard

Physical Hazard Rating: 1

Description and pertinent facts: This area is located about halfway up the unmarked road/trail to the Iron Chest Mine. Shaft #100 encroaches on the road, making it difficult to overlook.

The shaft has a 14'x 12' surface opening, is 12' deep, and its sides are actively sloughing. A crude and ineffective log barricade warns of the danger. The large size of the associated dump (1,500 cubic yards) and the absence of standing water suggest the shaft may still be open at depth. The present bottom at 12' may only be a bridge of sloughed material. If so, additional caving is possible. These factors and the proximity to the road indicate an extremely dangerous situation and a PHR of 1.

A little work in key locations along the road would enable construction equipment to access several sites needing mitigation in this general area. Dump material from shaft #100 is discussed in the **Environmental Degradation** section of this report.

Quad Name: St. Elmo

Site #: 384/4275-1

Site Name: Pride of the West Mine Area

Feature #: 100

Physical Hazard Rating: 2

A 4WD road (FR-240) leads to the front of the Pride of the West Mine. Two partly collapsed stone buildings on each side of the mine and the large 10'x 7' portal attract hikers and others to this location. Because the mine is above treeline, it is quite visible. During the inventory, two men entered the portal and surfaced about 20 minutes later. They stated that the mine was about 600' long, then branched off into two tunnels each about 100' in length. They also said the wall rock seemed stable. Water is draining from the adit, but not enough to be physically hazardous. Due to its extreme length and frequent public use, this adit received a PHR of 2.

Feature #: 107

Physical Hazard Rating: 2

This adit is adjacent to a 4WD road that is a spur from FR-240, which is east of this feature. Public interaction is frequent. The portal size is 5'x 4', and the adit extends to a depth of 10' where it bends 45° to the right. The depth beyond this point is difficult to determine, but adit #107 continues beyond subsidence feature #108 (described below), which is at least 30' from the portal. Subsidence feature #108 proves that the ground above the adit is not stable.

Feature #: 108

Physical Hazard Rating: 2

This subsidence feature is a 4'x 4' opening that drops at a near vertical angle for 8' into adit #107. This subsidence hole is 20' upslope and slightly to the north of adit #107 (described above). A small amount of water was draining into the hole, suggesting that water was most likely the cause of this ground failure.

Quad Name: St. Elmo

Site Number: 386/4278-1

Site Name: Baldwin Lake

Description and pertinent facts: This inventory area is located on the west-northwest side of Baldwin Creek. Mine features range in elevation from just below timberline to higher terrain of tundra and talus. Baldwin Creek is an excellent trout fishery. Access for construction vehicles is fair by 4WD equipment, but some features are on talus slopes and are not directly accessible.

Feature #: 102

Physical Hazard Rating: 1

Shaft #102 occurs at the base of a rock cliff with a steep slope below. The eroded surface opening is 12'x 10', but the shaft narrows to 6'x 6' at 10' below the surface and extends to a depth of 30'. The shaft sides are unstable, especially at the surface. Snow covered the bottom of shaft #102 at the time of the site visit. The snow is probably a false bottom. Shaft #102 represents a dangerous situation because it is very visible from, and 600' north of, FR-277 in Pomeroy Gulch.

Physical Hazard Rating: 2

Quad Name: St. Elmo

Site Name: Alpine Lake

Physical Hazard Rating: 2

Quad Name: St. Elmo

Site Name: Cyclone Mountain

Physical Hazard Rating: 2

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Tincup

Site Name: Grassy Gulch

Physical Hazard Rating: 2

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**USFS - ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

SAN ISABEL NATIONAL FOREST

SAN CARLOS RANGER DISTRICT

April, 1999

by

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
SAN ISABEL NATIONAL FOREST -- SAN CARLOS RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites of *concern* to the USFS - San Carlos Ranger District. It does not include all the mine sites visited during the inventory of the district. This summary report includes only *selected* sites that were given Environmental Degradation Ratings (EDRs) of slight (4); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1), or dangerous (2). It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 8' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried.

No sites within the San Carlos Ranger District exhibited significant environmental degradation. The Verde Creek region of the Sangre de Cristo Mountains was the only area where potential for environmental degradation was found. In this area, mine effluent with orange and red precipitate drains from various adits directly into streams. Although pH and conductivity levels were normal, two water samples were collected and analyzed for metals and other inorganic constituents. Water sample results indicate that no significant environmental degradation was occurring at the time of sampling in August 1994.

At the time of water sampling, water discharge was extremely low (much less than 1 gpm) in all but one of the draining mines. Therefore, the flow in Verde Creek was sampled about 100 feet below the lowest seeping mine. Much further downstream than the Verde Creek sample, another mine (Strip Mine Ridge) draining about 3 gpm was sampled at the portal.

There are a number of physical hazards associated with abandoned mines in the San Carlos Ranger District. It should be noted that most of these mines are very remote, yet often trails and/or roads pass nearby. All open shafts that exceeded 8 feet in depth were given a dangerous physical hazard rating (2) regardless of remoteness. This was done in part because of the low number of these features, as well as the very real hazard they pose to the unwary.

Adits that were intact and open, but remote, were given a potentially dangerous physical hazard rating (3). These features are hazardous because they are open, yet pose no immediate threat to life. This rating should be upgraded if public access increases near one of these features.

There are many insignificant mining features in the San Carlos Ranger district. Of the mines inventoried, most were exploration pits and adits of no real consequence. All the features that could be located from literature, air photos, and reasonable field reconnaissance were inventoried.

The immense geographic area of this district makes it likely that there are other mining features of little consequence not found during this inventory.

The Priority Sites tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features compose the bulk of this report, and follow the Priority Sites tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. These sites are all in Forest 12 (San Isabel National Forest), and Ranger District 03 (San Carlos Ranger District).

The sites exhibiting environmental degradation may eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary report. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45μ) water samples for laboratory analyses were collected from mine effluent and from a stream below some draining mines in order to better determine environmental effects of mine drainage. At the lab, samples were analyzed for dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Control Commission. Where stream numeric standards are not available, the most stringent of statewide are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mineralized Areas

The San Carlos Ranger District of San Isabel National Forest is in south-central Colorado. The Ranger District is large, and encompasses many types of geology. The east side of the Sangre de Cristo Range, the Culebra Range including Spanish Peaks, and the Wet Mountains are within the Ranger District. In general, only minimal mining has been attempted in this Ranger District.

East Side of Sangre de Cristo Mountains

From the crest of the range eastward, the Sangre de Cristo Mountains lie within San Carlos Ranger District. The Sangre de Cristo Mountains trend north-northwest and are fault-bounded. The Sangre de Cristo fault, a component of the Rio Grande rift, forms the southwest side of the range. Within San Carlos Ranger District, the Alvarado fault bounds the range on the northeast. (See Ellis and others, 1983, p. 3.)

The mountains between the faults comprise mostly Precambrian-age igneous and metamorphic rocks, overlain by red beds of late Paleozoic-age. Within San Carlos Ranger District, the Sangre de Cristo Formation predominates. It consists of clastic rocks with grain sizes varying from conglomerates to siltstones. Older Minturn Formation red beds and younger Mesozoic-age rocks crop out in isolated localities. (See Tweto, 1979.) A Tertiary-age granitic stock is exposed in Cloverdale Basin (Ellis and others, 1983, p. 13).

From north to south, most of the mines inventoried on the east side of the Sangre de Cristo Mountains are located in Cloverdale Basin, near Rito Alto, near Verde Creek, near Middle Taylor Creek, near South Colony Creek, and in Shaft Draw.

In Cloverdale Basin, the Rito Alto granitic stock has intruded the Minturn and Sangre de Cristo Formations. The stock is cut by quartz veins and a rhyolite dike, and has been prospected for molybdenum and copper resources. The Cloverdale Mine was a futile effort to intersect a copper-bearing vein in the Minturn Formation. (See Ellis and others, 1983, p. 13.)

Near Rito Alto, small amounts of copper, silver, and gold were produced in the early 1900's. Barite- and chalcopryrite-bearing quartz veins occur along bedding planes and joints in sandstone and siltstone of the Sangre de Cristo Formation. The mineralization may be related to the Rito Alto stock, exposed at the surface about 2 miles to the west. (See Ellis and others, 1983, p. 14.)

A group of mines that produced prior to 1900 is located in the Verde Creek area. Near Verde Creek, the Sangre de Cristo Formation is in fault contact with Precambrian-age granite to the east. Quartz veins containing chalcopryrite and minor galena and barite cut the granite and the sandstone. Granitic rocks are more mineralized, and apparently serve as better host rocks. Some of the workings have sandstone and granite on the dumps, indicating the mines transected the fault. (See Ellis and others, 1983, p. 18; Tweto, 1979.)

Throughout much of the eastern side of the Sangre de Cristo Mountains, Paleozoic-age red beds host small copper occurrences with malachite stains, sparse chalcopryrite, and barite. The occurrences are usually associated with small faults. Most prospects were too small to inventory, but larger workings were excavated in Middle Taylor Creek and near South Colony Lakes. (See Ellis and others, 1983, p. 20.)

Gray siltstone near the top of the Minturn Formation hosts low-grade and localized uranium mineralization. The largest mines related to these occurrences are in South Colony Creek. (See Ellis and others, 1983, p. 19.)

On the north side of Blanca Peak, several mines explore the Courthouse vein system. All of the workings of significant size are on private land, and were not inventoried. The vein system trends north to north-northwest and is hosted in Precambrian-age granodiorite and gneiss. The vein consists mainly of quartz, with variable amounts of pyrite, chalcopyrite, iron oxides, and gouge. (See Ellis and others, 1983, p. 23-24 and related tables.)

Wet Mountains

Precambrian-age gneiss and granite compose most of the core of the Wet Mountains. In the northern part of the range, Cambrian-age alkalic stocks have intruded the Precambrian metamorphic and igneous rocks. Further south, the Precambrian rocks are flanked on the southwest and east by Paleozoic- through Mesozoic-age sedimentary rocks. Tertiary-age clastic sedimentary rocks overlie the Precambrian rocks in a few areas in the interior of the range. Tertiary-age alkalic stocks and associated extrusive rocks crop out in the southern and south-central parts of the Wet Mountains. (See Tweto, 1979.)

All of these rocks are cut by numerous faults, most which strike northwest. Several northeast-trending faults are also mapped, especially in the northern part of the range. (See Tweto, 1979.)

Within the San Carlos Ranger District, the Wet Mountains are not intensely mineralized, and mine workings are generally small and widely scattered. Many of these widely scattered workings were driven on weakly mineralized shears or fracture zones, often parallel to foliation, in igneous and metamorphic Precambrian-age rocks.

In the northern part of the range, sheared Precambrian-age igneous and metamorphic rocks host a narrow belt of lead-carbonate occurrences near Oak Creek. Mineralized rock occurs in zones of numerous, closely spaced veinlets containing cerussite, chert, chalcedony, limonite, and manganese staining. (See Vandervilt, p. 69.) Also in the northern part of the Wet Mountains, quarries and underground workings were driven to develop Precambrian-age pegmatites containing feldspar and possibly tantalite.

An area of closely spaced, but mostly small mine workings is southeast of Deer Peak, near the headwaters of East Williams and Ophir Creeks. Most of the workings are driven in Tertiary-age Deer Peak andesite. A few of the dumps are yellow, suggesting the presence of oxidized sulfides. Presumably, gold and silver were the exploration targets.

West of Deer Peak, and southwest of Antelope Mountain, the Jocomo Mine produced fluorite from a vein deposit hosted in Precambrian-age, coarse-grained granite.

At Maes Creek, a few small workings explore Precambrian-age gneiss and granitic gneiss. A few prospects in the Custer Creek drainage basin expose sheared and weakly mineralized zones that parallel foliation in biotite gneiss and biotite schist. Specular hematite and quartz occur. Precious metals were probably the targets. (See Baskin, 1983, p. 4-5.)

Inclined shafts near Pole Creek were driven parallel to foliation in Precambrian rocks and expose weakly mineralized zones containing malachite.

Just south of Badito Cone, several prospects explored the contact between a Tertiary-age alkalic stock and Cretaceous-age Dakota Sandstone. Fluorite-uranium-vanadium minerals are disseminated in the sandstone and occur in veinlets in the sandstone and in the stock. (See Baskin, 1983, p. 5.)

Culebra Mountains

In general the Culebra Mountains, which lie south of La Veta Pass, are unmineralized and have a few widely scattered mine workings in the San Carlos Ranger District. Most of the western part of the range is a north-trending overthrust belt, with Precambrian- and Paleozoic-age rocks on the west thrust over Paleozoic- and Mesozoic-age sedimentary rocks to the east. Tertiary-age stocks and dikes occur throughout the range. (See Tweto, 1979.)

In terms of mineralization and mine workings, the most important part of the range encompasses the Tertiary-age Spanish Peaks. West Spanish Peak is composed of augite-diorite intrusive rocks; East Spanish Peak is granite porphyry. Both intrusions have numerous associated radial dikes. The intrusions and associated dikes have cut surrounding Tertiary-age Cuchara and Huerfano Formation clastic sedimentary rocks. Mineralization occurs in the igneous and sedimentary rocks, but is best developed in the metamorphosed sedimentary rocks adjacent to the intrusions. Veins comprise quartz, calcite, barite, galena, chalcopyrite, sphalerite, silver, and siderite. (See Vanderwilt, 1947, p. 118-119; Tweto, 1979.)

Steeply dipping, Paleozoic-age Sangre de Cristo Formation conglomerate was mined for uranium in Hope Gulch. A few small and widely scattered prospects, probably excavated in search of uranium, occur other places in this part of San Carlos Ranger District.

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN ISABEL NATIONAL FOREST -- SAN CARLOS RANGER DISTRICT

NUMERICAL SUMMARY

- 58** field forms
- 206** mine openings inventoried (includes collapsed or filled openings)
- 119** mine dumps, tailings piles, highwalls, etc.
- 15** mine features have Environmental Degradation Ratings of 1, 2, 3, or 4.

Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 0
Number of features with EDR of 3 = 0
Number of features with EDR of 4 = 15
Number of features with EDR of 5 = 310

- 47** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 1
Number of features with PHR of 2 = 13
Number of features with PHR of 3 = 33
Number of features with PHR of 4 = n/a
Number of features with PHR of 5 = 278

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN ISABEL NATIONAL FOREST--SAN CARLOS RANGER DISTRICT

Priority Sites

Environmental Degradation

Site Name	Quad Name	Site #	EDR
1) Strip Mine Ridge	Beckwith Mountain	12-03-447/4220-2.100	4
2) Lower Verde Creek	Beckwith Mountain	12-03-447/4220-3.303	4

Physical Mine Hazards

Site Name	Quad Name	Site #	PHR
1) Tanner Trail Mine	Curley Peak	12-03-478/4246-1.100	1
2) First Gulch South of Gibson Creek	Beckwith Mountain	12-03-447/4220-1.102	2
3) Bear Creek Shaft	Beck Mountain	12-03-457/4194-1.100	2
4) South Oak Creek	Rockvale	12-03-479/4238-1.101	2
5) Pole Creek Trail	Bear Creek	12-03-485/4196-1.100, 101	2, 2
6) Forest Road #309 Pegmatite Quarries	Rockvale	12-03-478/4243-1.100, 200	2, 2
7) Unknown	Badito Cone	12-03-494/4190-1.104	2
8) Second Northwest Drainage Ophir Creek	Deer Peak	12-03-486/4209-1.108	2
9) Ophir Creek Shaft	Deer Peak	12-03-486/4209-6.102, 108	2, 2
10) Marion Mine	San Isabel	12-03-491/4203-1.100	2
11) Ophir Creek Homestead	Deer Peak	12-03-487/4209-1.102	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Beckwith Mountain

Site #: 12-03-447/4220-2.100

Site Name: Strip Mine Ridge

Environmental Degradation Rating: 4

Description and pertinent facts: Water drains from this collapsed adit at about 3 gpm. Orange precipitate covers the bottom of the adit collapse feature. Water from the adit flows around the dump, through a series of meadows, crosses Forest Road #173, then finally joins Verde Creek.

Analysis of a grab sample collected August 17, 1994, suggests that the effluent meets water quality standards. Ionic concentrations are well below acceptable limits for most of the analyzed constituents. Iron levels (350 µg/L) are slightly above the secondary (aesthetic) standards required for the development of drinking water (300 µg/L average for 30-day period). A full characterization of this water should take into account the variation in constituent concentrations throughout the year. Laboratory results are shown below.

Constituent	Lab Results	Chronic Standard
Alkalinity	240 mg/L	no standard
Aluminum	<50 µg/L dissolved	87 µg/L dissolved
Arsenic	3.2 µg/L dissolved	50 µg/L total recoverable
Barium	69 µg/L dissolved	1000 µg/L dissolved
Cadmium	<0.25 µg/L dissolved	2.1 µg/L dissolved
Chromium	<10 µg/L dissolved	11 µg/L dissolved
Copper	<4 µg/L dissolved	23.2 µg/L dissolved
Total Hardness	220 mg/L	no standard
Iron	350 µg/L dissolved	300 µg/L dissolved
Lead	<5 µg/L dissolved	11.9 µg/L dissolved
Manganese	35 µg/L dissolved	1000 µg/L dissolved
Nickel	<20 µg/L dissolved	174 µg/L dissolved
Silver	<0.2 µg/L dissolved	0.29 µg/L dissolved
Sulfate	27 mg/L dissolved	250 mg/L dissolved
Zinc	<8 µg/L dissolved	207 µg/L dissolved

Quad Name: Beckwith Mountain

Site #: 12-03-447/4220-3.303

Site Name: Lower Verde Creek

Environmental Degradation Rating: 4

Description and pertinent facts: Three mines were seeping water into Verde Creek within this inventory area. The flow from the mines was generally much less than 1 gpm. Verde Creek was sampled below the seeping mines, and below the dumps that the creek flows over and through.

Laboratory analysis of the water sample indicates that metal concentrations of Verde Creek were well below acceptable limits on August 17, 1994. All constituents of concern were below detection limits, except for barium, iron, and sulfate. Laboratory results are shown below.

Constituent	Lab Results	Chronic Standard
Alkalinity	140 mg/L	no standard
Aluminum	<50 µg/L dissolved	87 µg/L dissolved
Arsenic	<1 µg/L dissolved	50 µg/L total recoverable
Barium	230 µg/L dissolved	1000 µg/L dissolved
Cadmium	<0.25 µg/L dissolved	1.5 µg/L dissolved
Chromium	<10 µg/L dissolved	11 µg/L dissolved
Copper	<4 µg/L dissolved	15.8 µg/L dissolved
Total Hardness	140 mg/L	no standard
Iron	10 µg/L dissolved	300 µg/L dissolved
Lead	<5 µg/L dissolved	6.3 µg/L dissolved
Manganese	<4 µg/L dissolved	1000 µg/L dissolved
Nickel	<20 µg/L dissolved	123 µg/L dissolved
Silver	<0.2 µg/L dissolved	0.13 µg/L dissolved
Sulfate	5.6 mg/L dissolved	250 mg/L dissolved
Zinc	<8 µg/L dissolved	141 µg/L dissolved

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Badito Cone

Site #: 12-03-494/4190-1.104

Site Name: Unknown

Hazard Rating: 2

Description and pertinent facts: This 30'-deep shaft has an eroded cone-shaped opening that is 20' in diameter at the surface, but narrows to 10' by 10' at depth. Cribbing is intact within the shaft, and a ladder composed of rotten wood starts at a depth of 10' and extends below. The shaft is hidden partly by oakbrush. This shaft exposes an altered fracture system that roughly parallels the first unnamed creek north of Maes Creek. Access is difficult because private landholder permission is required. The land belongs to the Naropa Institute Retreat Center, so visitation is probable. This feature would be dangerous to an unsuspecting cross-country skier or hiker.

^^New Quad^^

Quad Name: Bear Creek

Site #: 12-03-485/4196-1.100

Site Name: Pole Creek Trail

Hazard Rating: 2

Description and pertinent facts: This inclined shaft lies close to the Pole Creek Trail, and is about 3' by 4' wide and 85' deep. The bottom of the shaft is not visible from the top. Although in a remote location, this feature is dangerous because of its depth and steep walls. The dump is visible from Forest Road #404.

Quad Name: Bear Creek

Site #: 12-03-485/4196-1.101

Site Name: Pole Creek Trail

Hazard Rating: 2

Description and pertinent facts: This shaft is similar to feature #100 described above. It is 2' by 4' wide and 85' deep, and the bottom is not visible. The shaft is inclined about 33° from horizontal and is driven in metamorphic and igneous rock. This is a remote location, yet the shaft is close to the Pole Creek Trail and is a dangerous feature because of its steepness and depth.

were not present near the site. The target mineral was not ascertained, but may have been tantalite. This shaft should have a constructed cap.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Deer Peak

Site #: 12-03-486/4209-1.108

Site Name: Second Northwest Drainage Ophir Creek

Hazard Rating: 2

Description and pertinent facts: This shaft lies within a cluster of pits and small adits on a hillside above a large mine dump and mill site in a drainage northwest of Ophir Creek. The shaft is several hundred feet uphill from the Gardner Road (Forest Road #634). Although not often visited by the public, it is fairly deep and should be considered dangerous. The shaft collar measures 6' by 3'. The opening is vertical for about 12', then angles steeply to a total depth of about 20'. Additional drifts may be present at the bottom of this shaft.

Quad Name: Deer Peak

Site #: 12-03-486/4209-6.102

Site Name: Ophir Creek Shaft

Hazard Rating: 2

Description and pertinent facts: This open adit is the largest mine working of the multitude of pits, adits, and shafts that dot the hillside along Ophir Creek. The portal is about 6' high and 3' wide, and the adit winds its way into the mountain about 40 feet before reaching a caved or sealed ending. The associated 2,000-cubic-yard dump suggests that this adit is the partially sealed (or collapsed) main haulageway of a much deeper mine. The short, remaining accessible adit is dangerous in that it will inevitably collapse without continual maintenance. Furthermore, the many footprints in the working indicate that it is visited and entered often. This mine is easily visible from the Gardner Road (Forest Road #634) and is adjacent to heavily fished beaver ponds within Ophir Creek.

Quad Name: Deer Peak

Site #: 12-03-486/4209-6.108

Site Name: Ophir Creek Shaft

Hazard Rating: 2

Description and pertinent facts: This shaft lies along a faint road trace that originates at a cabin and trailer adjacent to the Gardner Road (Forest Road #634). The feature is cribbed to form a double-compartment shaft that is covered with rotting timber doors. The two 4' by 4' shaft compartments are both about 20' deep, where they are plugged with a variety of trash and debris. Depth below the plug is not known.

Quad Name: Deer Peak

Site #: 12-03-487/4209-1.102

Site Name: Ophir Creek Homestead

Hazard Rating: 2

Description and pertinent facts: This inclined shaft (20° from horizontal) is about 4' by 3' wide, with standing water about 10' into the feature. The depth of the shaft below the water is unknown. The mine is several hundred feet uphill from the Gardner Road (Forest Road #634), in an area that campers and fishermen frequently use. This shaft is probably visited often because it is easily accessed by a footpath originating from a mine and associated cabins next to the road.

^^New Quad^^

Quad Name: Rockvale

Site #: 12-03-478/4243-1.100, 200

Site Name: Forest Road #309 Pegmatite Quarries

Hazard Ratings: 2

Description and pertinent facts: This is a combination adit and quarry (#100) with a significant highwall (#200). The features were excavated into a quartz and potassium feldspar pegmatite. The adit was driven first, then the quarry was excavated, intersecting and removing part of the adit. The adit is now a 46'-long tunnel that leads into the quarry. The front portal of the adit is 8' by 8', and the quarry-side opening is 19' by 13'. The quarry's horizontal dimensions are 60' by 27' with a highwall on its east side up to 35' tall. Inevitable rockfall episodes from the roof of the adit tunnel and the highwall are serious hazards. The possibility of a fall from the top of the highwall is also a significant hazard. Forest Road #309 branches from the Oak Creek Grade about 5 miles south of Cañon City, so this site likely has frequent visitation from the general public.

Quad Name: Rockvale

Site #: 12-03-479/4238-1.101

Site Name: South Oak Creek

Hazard Rating: 2

Description and pertinent facts: This shaft (winze) is underground in an adit in a remote region and is probably not frequently visited. A 1993 mining claim notice is attached to a nearby tree. The shaft (winze) is accessed by an adit that is about 4' by 4' wide at the portal. The shaft is in the adit floor, about 18' from the portal. The depth of this shaft is unknown because standing water is encountered about 4 feet below the adit floor.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

PIKE/SAN ISABEL NATIONAL FOREST

SOUTH PARK RANGER DISTRICT

February 27, 1995

by

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Colorado Geological Survey

**USFS ABANDONED MINE LAND INVENTORY PROJECT
PIKE/SAN ISABEL NATIONAL FOREST -- SOUTH PARK RANGER DISTRICT**

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USFS-ABANDONED MINE LAND INVENTORY PROJECT
PIKE/SAN ISABEL NATIONAL FOREST -- SOUTH PARK RANGER DISTRICT

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - South Park Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2). It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS managed lands. Private (patented) land inholdings were only investigated when evidence indicated that either the environmental degradation emanating from these sites affected USFS managed lands or the physical hazard danger was in very close proximity to USFS public use (i.e. trails, USFS roads) through patented lands..

Priority listing of the most important environmental degradation sites and the most important physical mine hazard sites were compiled based on the ratings and the judgements of the field geologist. Because of the large number of physical mine hazards in the South Park Ranger District, not all of the serious hazards are included in this priority listing, but the most severe hazards are listed.

Site descriptions of individual mine features, which compose the bulk of this report, follow in Section 5 for the Environmental Summary and Section 6 for the Physical Hazard Summary. These are not listed in order of priority, but are listed by: 1) Quadrangle Name and 2) Site Number. See Table of Contents.

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane, radon gas), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

USFS ABANDONED MINE LAND INVENTORY PROJECT
PIKE/SAN ISABEL NATIONAL FOREST -- SOUTH PARK RANGER DISTRICT

NUMERICAL SUMMARY

212 field forms

934 mine openings inventoried (includes collapsed or filled openings)

569 mine dumps, tailings piles, highwalls, etc.

Quad Map	Physical Hazard Rating			Environmental Hazard Rating			
	1	2	3	1	2	3	4

Alma:	8	18	79	0	2	22	117
53 inventory areas							
Climax:	1	21	54	1	4	19	111
26 inventory areas							
Como:	0	4	4	0	0	3	14
7 inventory areas							
Copper Mtn.:	0	0	3	0	0	0	2
1 inventory area							
Breckenridge:	0	0	0	0	0	0	0
2 inventory area							
Black Mtn.:	0	1	0	0	0	0	0
2 inventory areas							
Boreas Pass:	0	2	3	0	0	0	1
10 inventory areas							
Dick's Peak:	0	0	0	0	0	2	0
2 inventory areas							
Fairplay West:	0	11	14	0	0	2	0
16 inventory areas							
Jones Hill:	0	3	1	0	0	0	0
3 inventory areas							
Marmot Peak:	0	2	4	0	0	0	3
4 inventory areas							
Mount Sherman:	1	4	7	0	0	0	1
7 inventory areas							
South Peak:	0	0	1	0	0	0	0

<div>2 inventory areas</div> Quad Map	Physical Hazard Rating			Environmental Hazard Rating			
	1	2	3	1	2	3	4
<hr/>							
Jefferson: 1 inventory area	0	0	0	0	0	0	0
Tarryall: 39 inventory areas	0	41	47	0	0	2	6
Glentivar: 10 inventory areas	1	3	5	0	0	1	0
Hackett Mtn.: 5 inventory areas	0	0	1	0	0	0	0
Lake George: 5 inventory areas	0	3	2	0	0	0	1
Elevenmile Canyon: 9 inventory areas	3	8	8	0	0	0	3
McCurdy Mtn.: 8 inventory areas	0	10	7	0	0	0	2
TOTALS	14	131	240	1	6	51	261

USFS ABANDONED MINE LAND INVENTORY PROJECT
PIKE/SAN ISABEL NATIONAL FOREST -- SOUTH PARK RANGER DISTRICT

PRIORITY SITES

Environmental Degradation Sites

The sites listed below are considered to have the most potential for significant degradation of the environment. Inspections of these sites revealed notable degradation or an inherent capacity for environmental degradation due to size. The report summary contains the details of these inventory sites.

<u>Site Name</u>	<u>Quad Name</u>	<u>Site #</u>	<u>EDR</u>
Kentucky Belle Mine	Climax	12-10-402/4354-1.103,203,204	1
North London Mine and Mill	Climax	12-10-400/4349-1.200	2
Buckskin Joe Mine	Alma	12-10-405/4349-2.106,204	2
Iron Mine	Como	12-10-414/4358-1.101,201,104	2,3
Mineral Park Mill Tailings	Alma	12-10-406/4352-1.205	2
Sweet Home Mine	Alma	12-10-403/4351-1.209	2
Champaign Mine	Climax	12-10-399/4351-1.102,202	2
Unknown, west side of Platte Gulch	Climax	12-10-402/4356-2.103,203	3
London Extension Mine	Climax	12-10-401/4347-1.200	3
Unknown, East of Kite Lake	Alma	12-10-403/4354-1. 100,200,106,206	3
East Leadville Smelter; Horseshoe Campground Area	Fairplay West	12-10-405/4339-1.208	3

Physical Hazard Sites

The physical hazard priority sites are those inventory sites that are considered to pose the greatest threat to the public. They are sites with open and dangerous mine openings, predominantly shafts, that are close to roads, trails, campground, homes, etc. There are many other dangerous mine openings in somewhat less accessible areas within this district that are included in the Physical Hazard Rating summary of this report. Bear in mind that many other open mines were inventoried in this district that are not included in the report summary. Most open adits not immediately adjacent to public access routes were given a PHR of 3 and not included. Of the total mines and prospects inventoried in the South Park District 41% were to some degree open and potentially dangerous. Please refer to the numerical summary for the count pertaining to each quad map.

<u>Site Name</u>	<u>Quad Name</u>	<u>Site #</u>	<u>PHR</u>
USFS lands between Orphan Boy and Hock Hocking Mines	Alma	12-10-404/4347-1.100,101,103	1,2,1
Unknown, North of Cooper Creek	Alma	12-10-404/4348-1.101	2
Buckskin Joe Area	Alma	12-10-405/4349-1. 100,101,102,107	2,2,2,1
Buckskin Joe Mine	Alma	12-10-405/4349-2.108	1
Windy Ridge/Bristlecone Pine	Alma	12-10-407/4352-1.101	1
Magnolia Mine area	Alma	12-10-407/4357-1. 102,107,108,109	2,1,1,1
Unknown, Purgatory Gulch Area	Alma	12-10-413/4356-1.100	2 (1)
Champaign Mine/Cooney Lake	Climax	12-10-399/4351-1.102, 105	2,1
Northeast Champaign Mine area	Climax	12-10-400/4351-1.103	2
Wilkerson Pass (Be) Mine	Glentivar	12-10-455/4321-1.105	1
St. Joe Group, East	Tarryall	12-10-458/4320-1.103,104	2
Clothin House, June, and Violette P. Claims	Tarryall	12-10-458/4329-1.100	2

<u>Site Name</u>	<u>Quad Name</u>	<u>Site #</u>	<u>PHR</u>
South Tarryall Area	Tarryall	12-10-459/4329-1.102	2
Lower Marksbury Gulch Area	Tarryall	12-10-460/4326-2.100,101	2
South China Wall	Tarryall	12-10-460/4327-1.100,101.102	2
China Wall	Tarryall	12-10-460/4329-1.100,102	2
A & C Claims	Tarryall	12-10-460/4330-1.103	2
Unknown, On FR 90 west of intersection with CR 9	Elevenmile Canyon	12-10-461/4319-1. 100,101,102,104,106,107,108	1,2
Weston Pass	Mt. Sherman	12-10-398/4331-1.107	1
Southwest Sheep Ridge; Garvie London Mine	Fairplay West	12-10-405/4335-1.100,103	2
Salt Creek Trail Shaft	Marmot Peak	12-10-408/4317-1.100	2
Watrous Gulch Mine	Jones Hill	12-10-403/4329-1.100	2
Upper north end of Sheep Mtn.	Fairplay West	12-10-404/4338-1.101,103,104	2
South slope Black Mountain	Black Mtn.	12-10-440/4284-1.100	2
Southwest of Warm Springs Sub.	Fairplay West	12-10-407/4335-1.100	2
South of Watrous Gulch	Jones Hill	12-10-403/4327-1.102	2
Middle Fork Salt Creek	Marmot Peak	12-10-407/4312-1.106	2
Southwest side of Sacramento Creek Valley near subdivision	Fairplay West	12-10-403/4343-1.100	2

USFS ABANDONED MINE LAND INVENTORY PROJECT
PIKE/SAN ISABEL NATIONAL FOREST -- SOUTH PARK RANGER DISTRICT

GEOLOGY/MINE DISTRICT SUMMARY

The South Park Ranger District encompasses three main mining districts and other smaller peripheral areas. The main mining districts with the majority of the abandoned mine inventory areas are the Alma District, the Beaver/Tarryall Creeks District, and the Lake George/Tarryall/Badger Flats District.

The Alma District includes all areas from the Continental Divide east to the Middle Fork South Platte River and south to Sacramento Creek. Smaller districts continue south along the continental divide of similar geology and ore genesis such as Horseshoe and Weston Pass Districts. Alma district is characterized by high altitude mine workings with a seasonal wet environment. The geology of the area is typically lower Paleozoic formations dipping to the east overlying Precambrian metamorphic and igneous terranes, which have both been extensively intruded by later igneous “porphyries.” The area has many faults, of which many have localized ore mineralization. The topography of the area has been extensively altered by Pleistocene glaciation. The area is a historic gold and silver mining district with a high density of patented land inholdings. The ore contains primarily metal sulfide minerals in mostly vein, fault shear, and blanket replacement deposits. Much of the lower valleys’ glacial and river deposits have been mined for placer gold. The climate is characterized by winter snowpack and spring run-off. The geochemical reaction of sulfide minerals in the mine workings and dump material with percolating surface waters can result in acid water drainage with high metal concentrations. The only current operating mine is the Sweet Home Mine within the Buckskin Creek Valley, being worked for collector-grade rhodochrosite mineral specimens. The many historic mine roads in the area are now popular recreational dirt and 4WD roads and trails which has created easy access for the public to most larger mine workings.

The Beaver/Tarryall Creeks District in the Pike National Forest South Park Ranger District encompasses that region bound by the Continental Divide to the north, Beaver Ridge to the west, and the boundary of the South Platte Ranger District to the east. The majority of the mine workings occur between Mt. Silverheels and Boreas Pass within the Beaver Creek and Tarryall Creek drainage basins. This district is also characterized by high altitudes and seasonal snow pack with spring run-off. The geology of the area is Late Paleozoic and Mesozoic sedimentary strata dipping to the east, heavily intruded by small to large stocks, sills, and dikes of Tertiary age. The sedimentary rock has been intensely contact metamorphosed near these intrusions which correspond with areas of principal mineralization. This area has also been influenced by Pleistocene glacial activity. There are both placer and hard-rock underground mine workings in this district. A large part of the mine workings near Iron Mountain are restricted from public vehicular access by locked gates on USFS roads near the confluence of Deadwood and Montgomery Gulches.

The Tarryall/Lake George/Badger Flats District is located south of the Lost Creek Wilderness

Area, north of Elevenmile Reservoir, east of the Puma Hills, and west of the South Platte River. The old townsite of Tarryall is roughly centered within this district. The topography of the site is foothills and surrounding flat rolling land. The environment is predominantly semi-arid. The geology is predominantly Precambrian metamorphic and igneous terranes. The Pikes Peak granites occupy the eastern portion of this area. Exploration in this district was originally for gold and silver but later prospecting and production in the 1940's to the 1960's was in beryllium, and lesser amounts of tin, tungsten, copper, uranium, and fluorite. Prospecting within steeply dipping metamorphic skarns and greisen pipes has resulted in many open dangerous shafts in the district. The relatively dry nature of the area has resulted in limited mine drainage and little environmental degradation.

USFS ABANDONED MINE LAND INVENTORY PROJECT
PIKE/SAN ISABEL NATIONAL FOREST -- SOUTH PARK RANGER DISTRICT

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Alma

Site #: 12-10-407/4357-1, 105, 106

Site Name: Magnolia Mine

Environmental Degradation Rating: 3

Description and pertinent facts: Site #105 is an open adit that extends inward for over 25 feet. Immediately below the opening is a wood cribbed shaft, site 106. While the adit floor was dry at the time of inspection on August 11, 1992, evidence that standing water does occur can be seen by a red-orange precipitate on the floor. The shaft below the adit had standing water 10 feet below ground level. This water was not tested. Ground water at this location will eventually migrate to Montgomery Reservoir on the Middle Fork of the South Platte River.

AAAAAAAAAA

Site #: 12-10-403/4357-1. 102, 202

Site Name: Highland Princess Lode

Environmental Degradation Rating: 3

Description and pertinent facts: This site's name was taken from a claim sign on the log cabin at the mine. The mine workings are at an elevation of 12000'. Adit 102 is intact and while no water was flowing on the day of inspection, August 13, 1992, red-yellow staining indicates that flow onto and into the dump does occur. Seepage was observed from the base of the dump. The standing water within the adit tested at a pH of 3.7 and a conductivity of 250 μ S. Heavy red-orange precipitate occurs on the floor and salt deposits can be seen on the walls and ceiling. The seepage water at the base of the dump tested at a pH of 4.8 and a conductivity of 100 μ S. Some distress occurs to the alpine vegetation at the base of the 150 c.y. dump. The seep disappears into the soil about 700 feet upslope from the Middle Fork of the South Platte River.

AAAAAAAAAA

Site #: 12-10-403/4354-1

Site Name: Unknown, East of Kite Lake

Description and pertinent facts: This inventory area is above the treeline 1500 feet east to northeast of Kite Lake Campground. Three mine sites within this inventory area exhibited significant degradation on the inspection date: August 4, 1994.

Features #: 100,200

Environmental Degradation Rating: 3

Mine #100 is a collapsed adit that is discharging water at an estimated rate of 2 to 3 gpm. The discharge was tested at a pH of 7.1 and conductivity of 200 μ S. The adit is only 50 feet from the

Buckskin Creek headwaters. The 3000 c.y. dump indicates substantial underground workings. This dump, feature #200, has completely dammed the creek, forming a small pond reservoir. Water infiltrates through and discharges from the base of the dump at about 200 gpm. This water was tested at a pH of 6.9 and conductivity of 100 μ S.

Feature #: 101

Environmental Degradation Rating: 3

Feature #101 is a collapsed adit that drains water at times. The adit was not draining water at the time of inspection but yellow-red staining in the drainage path and damp ground was observed. The 300 c.y. dump would indicate some depth of mine workings.

Features #: 106, 206

Environmental Degradation Rating: 3

This site is on patented land but was included in the inventory because of impact to USFS lands. An apparently open shaft is filled with water at 4 feet below ground level. The shaft is only 15 feet from a natural drainage gully. The standing water in the shaft was tested at a somewhat deviated pH of 6.2 and a conductivity of 100 μ S. The mine dump has a high sulfide mineral content. Pyrite and galena are the most common sulfide minerals. The dump is about 220 c.y. in size and is highly stained. The flank of the dump is in contact with the water flowing in the natural gully. Seepage, while not seen, is inferred from the dump into the natural soils below by a halo or zone of dead and distressed alpine vegetation down gradient of the dump. Inspection date: August 4, 1994.

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Site #: 12-10-406/4354-2. 101, 201

Site Name: Quartzville Creek

Environmental Degradation Rating: 3

Description and pertinent facts: This feature is a partially collapsed adit that has a sizable dump (1000 \pm c.y.). The adit floor was damp and moss was seen there and at the base of the dump. The environmental degradation observed here was some alpine vegetation distress at the base of the mine dump, indicating some diminishing of ground water quality. Inspection date: September 9, 1992

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Site #: 12-10-406/4352-1.205

Site Name: Mineral Park Mill Tailings

Environmental Degradation Rating: 2

Description and pertinent facts: The Mineral Park Tailings ponds lie within the Bristlecone Pine Scenic Area. At the time of inspection the ponds were dry. The USFS has indicated that the ponds are acidic when they contain water. There are no pond liners. All that remains of the mill is the concrete foundation across FR 415. The mill tailings area has been separated into individual bermed ponds. A soil sample of the tailing fines was taken. The sample was taken from 6" to 18" below the surface. Analysis results by the Colorado Department of Health Inorganic Chemistry Lab were:

Aluminum	1200	μ g/g
Arsenic	U 20	μ g/g

Barium	330	ug/g
Cadmium	U 5	ug/g
Chromium	11	ug/g
Copper	91	ug/g
Iron	8400	ug/g
Lead	1500	ug/g
Manganese	190	ug/g
Mercury	U 0.15	ug/g
Nickel	U 10	ug/g
pH	7.9	
Silver	29	ug/g
Zinc	830	ug/g

U values = less than

^^^^^^^^^^

Site #: 12-10-403/4351-1

Site Name: Sweet Home Mine area

Description and pertinent facts: The inventory area is a patchwork of patented mine lands and USFS lands at or near Buckskin Creek. There has been recent work to improve the road to some of the adit sites on private land in the area. This inventory site includes the historic Sweet Home Mine, which is the only working mine in the area. The mine has been reopened to recover museum and collector-quality rhodochrosite mineral specimens.

Feature #: 100, 200

Environmental Degradation Rating: 3

This mine has a 400 c.y. dump barren of vegetation which contains abundant metal sulfide minerals. Much of the fines are crystalline pyrite. The edge of the dump is covered by a snow bank and a natural drainage passes over and through the dump. The adit adjacent to the natural drainage exceeds 40 feet in depth and also drains water at an estimated flow of 5 gpm. This water was tested (item #300) where it drains onto the pyritic dump and had a somewhat deviated pH of 6.1 and a conductivity of 50 to 100 μ S. This site was given a rating of 3 because of the sulfide minerals and the constant percolation of water into and through the dump. The mine is 1300 feet from Buckskin Creek.

Feature #: 209

Environmental Degradation Rating: 2

The major degradation occurring here has its source on patented land at the main Sweet Home mine tunnel and historic dump. Two separate drainages are occurring here flowing into the Buckskin Creek. The first is seepage from the base of the historic large mine dump, feature #209, whose toe extends to the creek. This dump exceeds 6000 c.y. in size. The area next to the creek has been heavily stained with red-orange precipitate. Seepage flow rates into the creek could not be estimated. The water tested (item #304) at a pH of 6.9 and a conductivity of 500 μ S. The second drainage is a flow from the working mine (8 gpm \pm) which crosses FR 416 to enter the creek. No staining was

observed but the water tested (item #305) at a pH of 7.8 and a conductivity of 600 μ S. Buckskin Creek has been and will continue to be affected by these drainages to some degree.

Feature #: 107

Environmental Degradation Rating: 3

Feature #107 is an open adit to a depth exceeding 75 feet with standing water on the adit floor. The standing water was tested (item #107) at a depressed pH of 4.6 and conductivity of 100 μ S. There is some iron staining at the site. The adit evidently does drain during the spring run-off. The 400 c.y. dump has a rather steep slope and gulying has occurred by run-off. This adit is 1000 feet from Buckskin Creek.

^^^^^^^^^^

Site #: 12-10-403/4351-1.101,103

Site Name: Sweet Home Mine, southeast area.

Description and pertinent facts: This inventory site exists on the north side of Buckskin Creek valley. Two adits at this site drain water at times.

Feature #: 101

Environmental Degradation Ratings: 3

Feature #101 is about 1000 feet south of the working Sweet Home Mine, about 400 feet from Forest Road 416. At the time of inspection, October 16, 1992 the adit was discharging water onto the dump at an estimated rate of 7 gpm. White precipitate deposits were observed along the drainage course. The water was tested at a pH of 7.1 and a conductivity of less than 100 μ S. Conductivity increased greatly if the white precipitate material in the water was disturbed or mixed.

Feature #: 103

Environmental Degradation Ratings: 3

This adit has much more extensive underground workings than other features in this inventory site. Its location is farther up the valley side, about 1900 feet from Buckskin Creek. The dump size is 2100 c.y. The adit was not flowing water at the time of this inspection, August 5, 1994, but seepage is occurring. The adit does flow at times. There is 1 foot of standing water on the floor of the adit, dammed by debris at the portal. The standing water was tested at a pH of 7.3 and a conductivity of 300 μ S. There is white precipitate material in the water.

^^^^^^^^^^

Site #: 12-10-405/4350-1.108, 208

Site Name: Criterion Mine

Environmental Degradation Rating: 3

Description and pertinent facts: No obvious environmental degradation was observed at this site but some basic assumptions indicate that ground water quality is potentially affected. The mine site is adjacent to FR 416. Feature 108 is a large shaft that is not easily accessed. The size of the dump (21,000 c.y.) indicates extensive underground mine workings. The mine opening is on the side of a steep rocky slope. A gully from above flows water at a rate of over 50 gpm to a waterfall directly into the shaft opening. From the base of debris covering the front of the mine entrance, a peripheral seep flows onto and into the top of the mine dump. This water tested at a pH of 8.3. The test is

more an indication of the pH of the water flowing from the gully, not mine discharge waters.

AAAAAAAAAA

Site #: 12-10-405/4349-2

Site Name: Buckskin Joe Mine

Environmental Degradation Rating: 2

Description and pertinent facts: Buckskin Joe Mine is predominantly on patented lands. Heavily mined, the site has significant environmentally degraded areas. The main tunnel portal, feature #106 is located on a 250' by 250' USFS inholding within patented lands. Above the portal is a subsidence hole, feature #107, and a dangerous shaft, feature #108, which facilitate additional water infiltration into the underground workings. Except for the small portion within the USFS inholding, the underground workings and mine drainage courses to Buckskin Creek are on patented lands. Three of the mine drainage courses into Buckskin Creek on patented lands were tested for water quality. Test #300 showed a pH of 3.6 and a conductivity of 200 μ S, Test #301 - pH 3.7/conductivity 200 μ S, and Test #302 had a pH of 5.5 and conductivity of 500 μ S. No USFS lands occur below this point along Buckskin Creek. This degraded site is the responsibility of the patented land holder(s).

A small mill on USFS lands occurs across Buckskin Creek from the main mine workings. This mill has two small tailing ponds, feature #204, that are currently dry. A soil sample was taken of the tailings from 6" to 18" in depth. Analysis was done by the Colorado Department of Health Inorganic Chemistry Lab. The analysis results are:

Aluminum	9000	ug/g
Arsenic	U 20	ug/g
Barium	97	ug/g
Cadmium	78	ug/g
Chromium	8	ug/g
Copper	440	ug/g
Iron	29000	ug/g
Lead	7800	ug/g
Manganese	8000	ug/g
Mercury	0.93	ug/g
Nickel	U 10	ug/g
pH	7.2	
Silver	U 5	ug/g
Zinc	14000	ug/g

U values = less than

While it is difficult to relate metal concentrations in tailings to environmental degradation these ponds are unlined and the analysis indicates high levels of aluminum, cadmium, copper, lead, mercury, and zinc. All these metals impact aquatic life. Buckskin Creek is only about 120 feet from the tailing ponds. A drainage pipe is located at the lower pond if a water level were to approach the

A decorative horizontal separator consisting of approximately 80 small, upward-pointing triangles arranged in a continuous row.

Description and pertinent facts: The main Champaign mine tunnel, feature #102 was draining about 100 gpm on August 24, 1994, the day of this site's inspection. The 3600 c.y. dump, feature #202, indicates substantial underground workings. The discharging mine water was tested at a pH of 8.3 and a conductivity of 100 uS. This site was given a rating of 2 because, though no evidence of toxicity was seen and the conductivity recorded was low, the rate of mine discharge was high and in the published record, high rates of radon gas were found within the tunnel. It was reported that 25,000 pCi /l were measured in the tunnel after it was sealed all winter by snow.

△△△△△△△△△△

A photograph of a steep, eroded hillside. A drainage channel runs down the slope, showing significant staining and erosion. In the foreground, a wooden structure, possibly a fence or barrier, is partially collapsed. The soil appears dark and moist, with some lighter patches of exposed earth or rock. The overall scene suggests a site of environmental concern, such as a dump or a mining area.

5-6

drainage occurs from the dump to Mosquito Creek during spring run-off. The drainage course is stained for about 1000 feet below the dump. A soil sample of the heavily stained fines from the gully bottom was taken and analyzed by the Colorado Department of Health Inorganic Chemistry Lab. The analysis results were:

	Aluminum	6000	ug/g
	Arsenic	44	ug/g
	Barium	61	ug/g
	Cadmium	15	ug/g
	Chromium	U 10	ug/g
	Copper	2800	ug/g
	Iron	130000	ug/g
	Lead	1500	ug/g
	Manganese		
400	ug/g		
	Mercury		
0.88	ug/g		
	Nickel		
35	ug/g		
	pH		
6.6			
	Silver		
U 10	ug/g		
	Zinc		
2600	ug/g		

U values = less than



The high levels of copper, iron, lead, and zinc impact aquatic life, specifically native and sport fish. This site was given a rating of 2 (significant environmental degradation) because it is likely that surges of waters with high metal concentrations occur every spring from this drainage into Mosquito Creek when it is flushed by run-off. The dump supplies new fines annually, recharging metal concentrations into the drainage.

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Site #: 12-10-401/4347-1.200

Site Name: London Extension Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The London Extension Mine has the largest dump on USFS lands within the South Park District. A small portion is on patented lands while the bulk lies on USFS land. 110,000 c.y. were calculated to be on USFS land alone. The dump has common metal sulfide mineralization and there is scattered red iron staining on the dump material. The dump is on the

southeastern flank of London Mountain and not in any defined drainage course. Left essentially high and dry there was no notable degradation to the native ground below the dump toe. The site was nonetheless given a rating of 3 (potentially significant) because of the huge size of the dump and the certainty that ground water is being degraded as water percolates through the dump material during the spring melt. The toe of the dump is about 700 feet from South Mosquito Creek. Inspection date: July 29, 1994.

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Site #: 12-10-402/4348-2

Site Name: Unknown, Site near confluence of Mosquito and South Mosquito Creeks.

Description and pertinent facts: This inventory site exists near the confluence of Mosquito and South Mosquito Creeks at the turn off to the London Mine from County Road 12 (Mosquito Pass Road). Two draining adits and their dumps are within 100 feet of Mosquito Creek. Both sites are easily accessed from an old mine dirt track from Forest Road 419, the road to London Mine. Inspection date: July 29, 1994

Feature #: 102

Environmental Degradation Ratings: 3

Adit #102 drains water through debris that fills the portal at a rate of ½ gpm. The seep soaks into the dump material 100 feet from Mosquito Creek. The majority of the dump has been removed, probably reprocessing or use as fill. The drainage water was tested at a pH of 8.3 and a conductivity of 300 μ S.

Features #: 103,203

Environmental Degradation Ratings: 3

Adit #103 is 120 feet west of #102. This adit is also collapsed with water draining out the wood portal at an estimated rate of 5 gpm only 50 feet from Mosquito Creek. This water was tested at a pH of 8.4 and a conductivity of 200 μ S at the point where it soaks into the dump. The north bank and a portion of the toe of the dump have been washed away by Mosquito Creek. Chunks and slabs of concrete are being used as rip-rap to partially protect the bank and dump base from further erosion.

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Site #: 12-10-402/4352-1.103,105

Site Name: Unknown, south of Kite Lake.

Environmental Degradation Rating: 3

Description and pertinent facts: This inventory site is centered 3000 feet south of Kite Lake Campground on the southwest flank of the Buckskin Creek valley. Two sites show some signs of environmental degradation. **Feature #103** is a prospect adit that drains water at 1 gpm, has some red iron staining on the floor, and has a small dump (60 c.y.) with a high sulfide mineral content. The draining water was tested at a pH of 6.7 and conductivity less than 100 μ S. **Feature #105** is also an adit with substantially more underground workings judging by it's 1500 c.y. dump. The tunnel portal has collapsed but water does drain through the debris onto the dump. This water was tested at a depressed pH of 5.7 and conductivity less than 100 μ S. Because of the distance from Buckskin

Creek, 1,100 feet for #103 and 2,500 feet for #105, these two sites were barely given ratings of 3. The inspection date was late enough in the summer, July 20, 1994, so it is highly probable that both adits have surges in rates of water discharge in the spring.

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Site #: 12-10-402/4353-1

Site Name: Kite Lake

Environmental Degradation Rating: 4

Description and pertinent facts: This inventory site was included because it was noticed that the fill used to regrade and improve the gravel road to Kite Lake was apparently waste rock taken from mine dumps, possibly the large Sweet Home Mine dump next to the road. Further examination seems to indicate that dump material has been used for fill in several sections of Forest Road 416 from Kite Lake Campground to the Sweet Home Mine. In isolated areas on the road one can see iron staining.

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Site #: 12-10-402/4354-1

Site Name: Kentucky Belle Mine area

Description and pertinent facts: This inventory site is 2500 feet to the north of Kite Lake Camp and Picnic grounds, highly visible from the parking lot. The main access trail for the fourteeners Mt. Democrat, Mt. Lincoln, and Mt. Bross passes through the inventory site. This inventory site contains the worst environmental hazard recorded impacting USFS lands in the South Park District. Though the majority of the mine features in this inventory area are on patented mine lands they directly impact USFS lands and the water quality of Kite Lake and Buckskin Creek.

Features #103, #203, and #204:

Environmental Degradation Rating: 1

The main Kentucky Belle tunnel, **feature #103**, is draining copious amount of mine water. Drainage rates were estimated at over 50 gpm. These estimates were made on August 2, 1994 so do not reflect spring surges. The waters draining from the adit were tested, (item #302), at a deviated pH of 4.6 and a conductivity of 100 μ S. The adit portal has partially collapsed to the point where the tunnel is dammed to within a foot of the ceiling. The dammed waters are flowing through and over this portal debris. The drainage flows over and around the main 2000 c.y. (**feature #203**) dump. The majority of the flow diverts to the east where it flows over and infiltrates into **feature #204** which is over 300 c.y. of sand and gravel sized tailings from what appears to be an adjacent collapsed stamp mill. The entire extent of the mine drainage path is heavily iron stained and is barren of all vegetation. At the point where the drainage waters completely infiltrate the heavily stained mixed native scree and tailing fines, a second water test (item #301) was done that revealed a pH of 4.3 and conductivity of 200 μ S. A water sample was taken for analysis at this point. The results were:

Alkalinity tot	U 10	mg/l
Aluminum	1100	ug/l
Arsenic	U 1	ug/l

Barium	21	ug/l
Cadmium	3	ug/l
Chromium	U 10	ug/l
Copper	990	ug/l
Hardness, tot. *	77	mg/l
Iron	120	ug/l
Lead	0.015	mg/l
Manganese	710	ug/l
Nickel	U 20	ug/l
Silver	0.2	ug/l
Sulfate	84	mg/l
Uranium	11	pCi/l
Zinc	570	ug/l

U values = less than

* as CaCO₃

These drainage waters re-emerge as seeps below that discharge into the natural drainage gully then to Kite Lake 1000 feet down slope. A seep outlet directly below the mine was tested (item #304) at a pH of 5.4 and a conductivity of 100 μ S. Mine affected waters have stained the northern shore of Kite Lake where they discharge into it. The analysis above indicates several metal concentrations exceeding stream standards for this area. Aluminum, zinc, and copper are particularly high. While this analysis was conducted on mine drainage effluent there is no doubt that it is adversely impacting aquatic life in Kite Lake and Buckskin Creek. This site was given an environmental degradation rating of 1.

Features #106, #206:

Environmental Degradation Rating: 3

This adit and dump are located about 400 feet southwest of site #103. This site was given a rating of 3 because the adit discharges water and the dump size, 2700 c.y., would seem to indicate substantial underground workings. The discharge rate was estimated from 5 to 10 gpm and the water was tested (item #303) at a pH of 6.6 and conductivity less than 100 μ S. It is likely that discharge rates increase during the spring run-off.

Feature #201:

Environmental Degradation Rating: 3

This feature is a small dump immediately adjacent to the drainage gulch. The dump material is rich in metal sulfide minerals and a third to half of the dump has been washed away by the stream. Near the area there are small ore piles that have degraded and killed the alpine vegetation in their immediate proximity.

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Site #: 12-10-402/4356-1.200,201,202,203

Site Name: Unknown, Upper Platte Gulch, Mt. Democrat cirque

Environmental Degradation Rating: 3

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Environmental Degradation Rating: 3[illegible]

Quad Name: Como

Site #: 12-10-414/4358-1

Site Name: Iron Mine

Description and pertinent facts: This area is located up the Little French Gulch, centered 3000 feet west of Iron Mountain. The site is accessed by County Road 50 from Como. Public vehicular traffic is restricted to this site by a locked gate at the confluence of Deadwood and Montgomery Gulches where Tarryall Creek begins. Several adits are within this inventory site. Two were actively draining water while a third had a stained dry drainage. The inventory area also includes a few old collapsed mine buildings (i.e. cabins, ore processing chutes, mill).

Features #101, 201:

Environmental Degradation Rating: 2

Feature 101 is the main tunnel of this mine. The mine dump contains a high percent of metal sulfide mineralization and iron staining and salt deposit crusts were observed that indicate seepage of water in the dump material. The 3900 c.y. size shows substantial underground workings. The tunnel portal has collapsed but water drains from the portal debris at an estimated rate of 4 to 5 gpm. A well-defined drainage path with heavy iron staining extends to Little French Gulch. The gulch is 80 feet from the adit with the dump toe almost in contact with the stream. The mine drainage was tested at a pH of 7.2 and conductivity of 300 μ S. A sample was taken for analysis.

Alkalinity tot	20	mg/l
Aluminum	500	ug/l
Arsenic	1	ug/l
Barium	13	ug/l
Cadmium	49	ug/l
Chromium	U 10	ug/l
Copper	U 4	ug/l
Hardness, tot. *	110	mg/l
Iron	990	ug/l
Lead	0.005	mg/l
Manganese	330	ug/l
Nickel	U 20	ug/l
Silver	U 0.2	ug/l
Sulfate	82	mg/l
Zinc	4600	ug/l

U values = less than

* as CaCO_3

Quad Name: Dick's Peak

Site #: 12-10-442/4289-1.100.200

Site Name: Hass 1-12 Claims

Environmental Degradation Rating: 3

Description and pertinent facts: This site was identified as the Hass 1-12 Claims by Nelson-Moore, et al, 1978 (CGS Bulletin 40). Feature 100 is a moderate size open-pit uranium mine that is about 0.4 miles east of Thirtyone Mile Creek and is directly accessed by Forest Road 264 (FR-264). The areal dimensions of the open-pit are 222 x 150 feet and it's greatest depth is 26 feet. The site produced 16 tons of uranium ore at a grade of 0.10% U_3O_8 . The mineralization was autunite. The highest radiometric reading was 2600 counts per second (cps), about 45 times background of 50-60 cps. This occurred near the center of the pit area just north of an east-west trending trench. Most of the excavated area ranged from 100-1000 cps, or 2-22 times background. The highest readings came from the yellow-orange Tallahassee Creek Conglomerate while readings from adjacent dark-gray volcanic rocks were much lower (60-250 cps). Dump material (feature 200) is scattered in separate piles around the site. Total volume of the dump material is estimated to be 300 cubic yards (c.y.). Most of the radiometric readings of this dump material ranged from 60-500 cps (up to 10 times background), but one spot reached 1500 cps.

No milling of the uranium ore was done at this site so the radiation is essentially natural. No surface water runs through the site so the only hydrologic concern here would be precipitation runoff and snowmelt. If reclamation is deemed necessary, material from the adjacent dark-gray volcanic terrain could be used in grading the open pit. As a minimum, the site should probably be marked with signs as an area of high radiation.

Most of the highwall is eroding into gravel- and sand-size debris and this material has assumed the angle of repose. Consequently, there is no physical hazard from the highwall.

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**Quad Name: Marmot Peak**

**Site #:** 12-10-405/4313-1.100,200

**Site Name:** Parkdale Iron Pit, Amrine and Perrigue Claims (Lady Elk No. 1)

### Environmental Degradation Rating: 3

**Description and pertinent facts:** This shallow open-pit uranium mine (feature 100) is located about 0.4 miles west of the head of Middle Fork Salt Creek. The site is directly accessed by FR-436, a moderately rough 4WD road. The pit area measures 110 x 110 feet, is 12 feet deep at its deepest, and has sloping sidewalls. The potentially significant environmental hazard here is the elevated radioactivity of the site. No concentration or milling of the uranium ore was done here, so the elevated radioactivity emanates from a natural concentration of radioactive minerals. The highest radiometric reading was 1800 cps in iron-rich chert near the center of the open pit, almost 28 times background readings of 65 cps. Iron content of the ore is due to hematite and limonite. The ore is probably from the Ordovician-age Harding Quartzite. Dump material (feature 200) was scattered in small piles mostly inside the pit with a total estimated volume of 400 c.y. Most of the dumps had radiometric readings of 200-500 cps, but some iron-rich rubble gave 1500 cps.

This site would be difficult to backfill because the soils are very thin in the surrounding area. The site should probably be posted with signs as an area of high radiation.

[illegible]

**Quad Name: Glentivar**

**Site #:** 12-10-455/4321-1. 200

**Site Name:** unknown, ½ mile east of Wilkerson Pass area.

**Environmental Degradation Rating: 4**

**Description and pertinent facts:** Feature #100 was the main shaft at this mine. Judging by the volume of the mine dump (4450 c.y.) it serviced extensive underground workings. The dump contains abundant sulfide minerals and on certain portions of the dump a strong sulfur odor was detected. It is barren of vegetation. The toe of the dump extends to a dry runoff gulch. Erosion has been occurring from the dump to the gulch because water borne sand size dump material is present. The area was dry at the time of inspection. No features at this mine site had any draining or standing water.

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Quad Name: Tarryall

Site #: 12-10-460/4326-1.200, 201

Site Name: Lake George Industries

Environmental Degradation Rating: 2

Description and pertinent facts: A mill operation existed at this site that appeared to cease operation abruptly. Trash is strewn about the site and roughly 5000 c.y. of ore, apparently trucked in, is still on the processing area, site #200. Site #201 is the tailings basin, 500 by 100 feet in area, that is next to the mill. Two berms (earthen dams) prevent the tailings from entering the natural drainage and these appear to be effective. The tailings pond was dry at the time of inspection and mud cracks were common on the surface. The material was fine enough that windblown contamination could occur to the immediate surroundings. No dust outside of the basin was seen. A cursory examination of dated reports within the mill building indicated that beryllium was the primary product. Of particular concern are several 50 gal. drums of unknown chemicals at this site. Some of these drums appear to have leaked substances into the soil.

USFS ABANDONED MINE LAND INVENTORY PROJECT
PIKE/SAN ISABEL NATIONAL FOREST -- SOUTH PARK RANGER DISTRICT

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Alma

Site #:12-10-403/4345-1.100

Site Name: Bonanza Group (?) Area

Hazard Rating: 2

Description and pertinent facts: This inventory area is found on the lower southeast flank of Pennsylvania Mountain overlooking the Sacramento Creek Valley. Collapsed adits, prospects, and one shaft are included in the site. The shaft, feature #100, is filled or bridged at a depth of 16 feet. Cratered at the surface to a 12' by 8' hole, the shaft becomes 6' by 3' where timber siding begins at 12 feet. The site is above the tree line on a moderately smooth tundra slope location. The shaft dump is easily seen. This site was given a hazard rating of 2 (dangerous) because of its visibility, the crumbling edges of the hole, and the difficulty one would have extracting themselves if they were to fall into it.

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Site #:12-10-403/4348-2.101

Site Name: Unknown, Cooper Creek Area

Hazard Rating: 2

Description and pertinent facts: Feature #101 in this inventory area is a shaft. The site is located above Cooper Creek and this feature lies within its drainage basin. Wood cribbing supports the top 5 feet of the shaft and snow and ice has partially bridged across the opening at a 12-foot depth. A weighted tape measure was advanced beyond the snow/ice bridge to a total depth of 38 feet. The wood cribbing at the top of the shaft is of questionable stability and could fail, resulting in cratering of the hole. If one were to fall into this shaft, even stopping on the ice/snow bridge, they could not get out alone. Global positioning has placed this site right on a border with patented inholdings so the feature may be on private property. There is no direct road access to this site. The closest mine road ends approximately 1400 feet away, down near Cooper Creek. Feature #101 is above the tree line on moderately smooth tundra slopes so the mine dump is easily seen.

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Site #:12-10-403/4351-1. 103

Site Name: Sweet Home Mine Area

Hazard Rating: 2

Description and pertinent facts: This inventory area includes the area west and across Buckskin Creek of the main Sweet Home Mine tunnel, one of the few working mines in the district at the time of this report. Several open adits were inventoried. Obvious recent work has been done to improve

the access road up the valley side to this area and other patented property in the immediate area. Feature 103 is a shaft situated 45 feet above feature 102, an open adit. The shaft is intact, vertical, and open to a depth exceeding 30 feet. This site is in a popular area and the public uses the 4WD mine road as access for recreation. Fire pits occur in the area. This mine site is quite visible as the mine road goes right by the base of the mine dump. The shaft, feature 103, was given a hazard rating of 2 (dangerous) because it is open and intact and in close proximity to public access and usage.

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Site #:12-10-403/4352-2

Site Name: Unknown, inventory area southeast of Kite Lake

Description and pertinent facts: This inventory area is located near FR 416 which is the popular road to Kite Lake Campground and the main trailhead for hiking to Mt. Democrat, Mt. Bross, and Mt. Lincoln. The inventory area consists of mine adits and their dumps less than 200 feet from the road. The features are easily seen from the road and commonly visited by hikers.

Feature #: 101

Hazard Rating: 2

Adit 101 has a portal in rock 5.5 feet high and 4 feet wide, is intact, and extends to a depth of 70 feet. This feature was given a hazard rating of 2 (dangerous) due to its visibility, depth, and proximity to public use areas.

Feature #: 102

Hazard Rating: 2

Adit 102 has a portal in rock 5 feet high and 3.5 feet wide, is intact, and extends to a depth exceeding 75 feet. This feature was given a hazard rating of 2 (dangerous) due to its visibility, depth, and proximity to public use areas.

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Site #:12-10-403/4354-1.106

Site Name: Unknown, East of Kite Lake Campground

Hazard Rating: 2

Description and pertinent facts: Feature #106 is an open 3.6' by 6.5' shaft with a timber cribbing liner. The shaft is on patented land but is near Kite Lake Campground. The shaft has standing water at 4 feet below grade. Total depth is not known because of the high standing water and the unavailability of a weighted tape measure.

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Site #:12-10-403/4358-1

Site Name: Unknown, southeast from Wheeler Lake

Description and pertinent facts: This inventory area contains five open adits with depths from 18 to 40 feet or more. The adit sites are near the confluence of Platte Gulch and the runoff from Wheeler Lake where the drainages become the Middle Fork South Platte River. The site is also near Forest Road 408, the popular hiking, mountain biking, and 4WD road to Wheeler Lake. Four of the

five adits are within 400 feet of the trail/road and are easily seen.

Feature #: 103

Hazard Rating: 2

Site #103 adit was given a rating of 2 because its location is only 50 feet from the trail/road. The 6.5' by 4' portal is clear of debris and the adit extends to a depth of 40 feet. The remaining adits in this inventory area were given ratings of 3 because they were further from the road and less likely to be entered.

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Site #:12-10-404/4347-1

Site Name: Unknown, USFS lands between Orphan Boy and Hock Hocking Mines

Description and pertinent facts: This inventory area exists in a portion of USFS land north of Mosquito Creek between patented lands that contain the historic Orphan Boy and Hock Hocking Mines. This site was on the South Park District list (#15) of known mine sites requiring reclamation. The majority of the mine features at this site are from 100 to 250 feet from County Road 12 (Mosquito Pass Road).

Feature #: 100

Hazard Rating: 1

Feature #100 is a dangerous open shaft. The shaft has cratered to a 9' by 12' hole at the surface and reduces to a vertical 3.5' by 5' shaft when it enters rock 5 feet down. The crater edges of the shaft hole are unstable and rock and soil are prone to ravel (detach) and fall into the shaft. The shaft has partially filled but was still measured at a total depth of 20 feet. This shaft is only 100 feet from Mosquito Pass Road. This feature was given a hazard rating of 1 (extremely dangerous) because of the depth of the shaft, its unstable margins, and its proximity to the road.

Feature #: 101

Hazard Rating: 2

Feature #101 is also a dangerous shaft, very similar to #100. The shaft has cratered to an unstable 10' by 12' hole at the surface then becomes 3' by 6' where the timber cribbing liner begins. It has partially bridged with timbers, rock, and soil at a depth of 17 feet. The entrance of the shaft contains scattered timbers bridging the opening. This site is about 250 feet from Mosquito Pass Road and has a old mine trail to it that begins next to the London Mine sign.

Feature #: 103

Hazard Rating: 1

Feature #103 is a dangerous shaft with unstable cratered borders. This site is approximately 200 feet from the road and 100 feet from feature #100. The shaft has cratered to a 10' by 10' hole at the surface. The edges of the crater are unstable and failure could occur if somebody stood there. At a depth of nine feet a 4' by 4' wood liner of the shaft begins. A weighted tape measure was advanced to a depth of 30 feet where timbers have possibly bridged the shaft opening. Standing water exists in the shaft at a measured depth of 27 feet. One can see a portion of the bridging timbers that possibly bridged sticking above the water level. This mine had a single strand wire "fence" around it at one time but half is now missing because it fell into the shaft as the cratered hole widened over the years.

AAAAAAAAAA

Site #:12-10-404/4348-1

Site Name: Unknown, North of Cooper Creek

Description and pertinent facts: This inventory area encompasses USFS land inholdings within predominantly patented mine lands at the base of Loveland Mountain. The site is at the edge of the tree line and is accessed by Forest Road 192 from Buckskin Creek and Forest Road 450 from Mosquito Creek. There are several underground mine workings in the area, on and off USFS lands. Remains of mine buildings and log cabins exist in the area. Public usage of the area includes 4WD driving and camping. Fire pits can be seen in the immediate area.

Feature #: 101

Hazard Rating: 2

Feature #101 is an open adit. The 4' by 5' adit portal is supported by timbers and open to a depth over 100 feet. The adit dump is easily seen from Forest Road 450, a popular 4WD mine road. This adit was given a hazard rating of 2 (dangerous) because of the depth of the mine workings and ease of access.

Feature #: 102

Hazard Rating: 2

Feature #102 is a dangerous open shaft between adit #101 and Forest Road 450. The intact shaft is open to 5' by 6' at the surface. At 13 feet the shaft reduces to 3' by 5' where a timber cribbing liner begins. The vertical shaft's total depth was measured at 26 feet. The mine dump makes this site highly visible from the road.

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Site #:12-10-404/4351-1. 106

Site Name: Unknown, site 8,000' due south of Mt. Bross

Hazard Rating: 2

Description and pertinent facts: This inventory area is accessed by FR 285 via FR 857 from the Mineral Park/Bristlecone Pine Scenic Area; both popular 4WD roads. The inventory area contains many underground openings and their dumps, the majority being adits whose portals have collapsed.

A portion of this inventory area is on private inholdings. Feature #106 is a shallow prospect shaft in rock that extends to a depth of 16 feet. The shaft sides are vertical and a person would be injured and unable to get out if he or she fell in. Feature is approximately 200 feet into private inholdings at this area but its small dump is easily seen because the site is above the tree line.

AAAAAAAAAA

Site #:12-10-405/4349-1

Site Name: Buckskin Joe Area

Description and pertinent facts: This inventory area includes USFS tracts surrounded by patented land which contained the historic mining camp Buckskin Joe. This inventory area is separated from the historic Buckskin Joe Mine, which exists to the south across FR 413 and, for the most part,

across Buckskin Creek. This inventory area is in a forested area bound by FR 413 and FR 415 with two rough unnamed 4WD mine access routes into the area. The majority of the sites are mine shafts.

Feature #: 100

Hazard Rating: 2

Feature #100 is an open shaft that is only 35 feet from the road. The shaft is supported by 3' by 6' timber lining and was measured with a weighted tape to a depth of 20 feet. Standing water existed within the shaft at a 7-foot depth from ground level at the time of inspection.

Feature #: 101

Hazard Rating: 2

Feature #101 is an open shaft that is 120 feet east of #100 and 40 feet from the road. The shaft is supported by 3' by 7' timber lining and was measured with a weighted tape to a depth of 20 feet. Standing water existed within the shaft at a 9-foot depth from ground level at the time of inspection.

Feature #: 102

Hazard Rating: 2

Feature #102 is an open shaft that is 108 feet west of #100. The shaft is self-supported in bedrock and was measured with a weighted tape to a depth of 19 feet. Standing water existed within the shaft at a 9 foot depth from ground level at the time of inspection.

Feature #: 107

Hazard Rating: 1

Feature #107 is an open shaft about 120 feet from FR 416, the main road along Buckskin Creek to Kite Lake Campground. The shaft is supported by 4.5' by 7' timber lining. It's depth exceeded 50 foot, which was the length of the weighted tape measure. Standing water existed within the shaft at a 9-foot depth from ground level at the time of inspection. This shaft was given a higher hazard rating of 1 (extremely dangerous) because of its proximity to a popular public use road.

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Site #: 12-10-405/4349-2

Site Name: Buckskin Joe Mine

Description and pertinent facts: The historic Buckskin Joe Mine is predominantly on private land but there are some USFS inholdings that have had some mining activity. Some of the sites within the inventory area are possibly on private property but were included because of inherent danger and proximity to the Forest Service road.

Feature #: 106

Hazard Rating: 2

Feature #106 is the main adit for the Buckskin Joe Mine. While the mine dump is entirely on private patented mine property the adit portal lies within a 200' by 200' USFS inholding within the patented land. The old mine includes outbuildings and 150(±) feet of timber covered portal with ore cart rail. The mine entrance into the hillside has collapsed and subsidence features occur in the hillslope above. Though this site has "No Trespassing" signs, there is no gate limiting access. The site is commonly visited and people explore the unstable ruins.

Feature #: 108

Hazard Rating: 1

Feature #108 is a dangerous open cratered shaft above the main Buckskin Joe Mine adit (#106). The shaft has cratered in soil to form a 25' by 30' hole with a 15-foot high vertical rim. Seventeen feet from the rim is Forest Road 192. The shaft is funnel shaped below the rim to about 30 feet where a 6' by 6' hole continues to a depth exceeding 40 feet. For the size and depth of the crater and amount of soil and rock material that entered the shaft it must be connected to the main Buckskin Joe Mine underground workings. This feature is near the borderline of USFS and private property.

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Site #:12-10-405/4350-1.108

Site Name: Excelsior and Criterion Mine Area

Hazard Rating: 2

Description and pertinent facts: This inventory area encompasses a small portion of USFS land south of patented Paris Mine property. The site is adjacent to FR 415, the access to Windy Ridge/Bristlecone Pine Scenic Area. Feature #108 is within private inholdings but its 21,000 c.y. dump is on USFS land. The mine opening is a shaft located within a rock cleft on a steep cliffy slope. Access is easily gained by the switchback trail up the large dump. The opening depth is not known because mine hoist debris is in the way.

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Site #:12-10-407/4352-1. 101

Site Name: Windy Ridge/Bristlecone Pine Scenic Area

Hazard Rating: 1

Description and pertinent facts: This area is a popular public use area and is accessed by FR 415. The Forest Service has constructed a parking area here for visitors. The one mine site on public property, #100, is a mine shaft that is either filled or bridged over. The size of the dump indicates a small operation. The dangerous feature, #101, is just north of the designated scenic area on private property. This mine is a shaft that has cratered to a 30 by 30 foot opening with dangerous raveling slopes. Judging by the size of the mine dump the measured depth of 24 feet is a false bottom. Debris has probably bridged within the originally much deeper shaft. A person could not extract himself from the shaft if he slid into it from the cratered slope. The mine dump is highly visible from anywhere on Windy Ridge and a jeep road, closed to vehicles and now used as a trail, goes right by the mine site from the Bristlecone Pine Scenic Area parking lot. This shaft was given a hazard rating of 1 (extremely dangerous) because of its danger, high visibility, and immediate proximity to the scenic public use area.

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Site #:12-10-407/4357-1

Site Name: Magnolia Mine

Description and pertinent facts: The Upper Magnolia Mine area contains workings on both private and USFS lands. The area is easily accessed by FR 188 and FR 189 near 11,900 feet in

elevation. Both are popular 4WD recreational roads that begin one mile away at Hoosier Pass. They are used year round for hiking, mountain biking, four-wheel driving, cross country skiing, and snowmobiling.

Feature #: 102

Hazard Rating: 2

Site 102 is on USFS property about 100 yards from FR 188. A deep open shaft exists with deteriorating wood cribbing. Its dump is easily seen from the road and is obviously visited by summer and winter recreational vehicles. Standing water exists at a depth of 25 feet. The total depth is not known.

Feature #: 107, 108, 109

Hazard Ratings: 1

Sites 107, 108, 109 are also open shafts and daylighted stopes(?) and, while on private property, are immediately next to FR 189. Site #108 cratering is beginning to encroach into the edge of the road. These three sites have single strand barb wire fencing around them but they are deteriorating and the



deterrent effect is minimal. These features were given hazard ratings of 1 (extremely dangerous) because of their immediate proximity to the public 4WD road. These sites are narrow enough at the surface that winter snow pack could conceivably bridge across at times creating lethal traps.

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Site #:12-10-411/4350-1.101

Site Name: Miller and Sheldon Placer/Lucky Step Lode Mine

Hazard Rating: 2

Description and pertinent facts: This inventory area is located adjacent to Beaver Creek and FR

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The feature is a prospect shaft only 100 feet from the road. The 6' by 4.5' shaft extends vertically to a depth of 13. Deep enough that injury would result if someone fell in and would be unable to get out without help. If, in the future, public vehicular access is gained to this area the hazard rating for this feature would be increased to 2 because site visits would substantially increase.

[illegible]

Quad Name: Climax

Site #:12-10-399/4351-1

Site Name: Champaign Mine/Cooney Lake Area

Description and pertinent facts: This area is centered just east of Cooney Lake. Extensive mining has occurred in this area with much of it on patented mine claims and BLM lands to the south. This inventory area includes 7 adits, 3 shafts, and 1 prospect. Several insignificant prospects were not included as inventoried features. Access to this area is gained by Forest Road 856 from below and Forest Road 452 from above. Both are 4WD mine roads that turn off of Mosquito Pass Road. All three roads are popular recreational roads.

Feature #: 102

Hazard Rating: 2

Feature #102 is the main Champaign Mine adit. A spur off of Forest Road 856 goes directly to the site. A 6' by 5' adit portal is timber supported and open to an unknown depth beyond 100 feet. The size of the dump (3,600± c.y.) indicates extensive further underground workings. A mine building exists on the dump next to the mine. The mine dump and cabin are easily seen from Mosquito Pass road and visited often. A couple groups of people were seen visiting this site while the Colorado Geological Survey was conducting site investigations in this and nearby inventory areas. This tunnel should be sealed or the portal gated because of its depth and reported high radon gas levels inside. See environmental hazard section.

Feature #: 105

Hazard Rating: 1

Feature #105 is a extremely dangerous open shaft that declines 65° from horizontal to a depth over 60 feet. Forest Road 452 passes right next to this mine on its way up to Cooney Lake. It appears a headframe stood over the shaft at one time but only a wood foundation still exists with scattered timber rafters in the area. A timber shaft collar is still in place but is partially undermined by the cratering of the shaft below to an 8' by 12' hole. Mine dump material is about 1 foot thick on the collar timbers and you cannot see the undercutting of the collar without moving to the opposite side of the shaft. A dangerous situation is created because what appears competent ground next to the shaft is, in fact, a one foot thick, 3 foot wide overhang of bridged collar timbers and soil. People in 4WD vehicles visited this site during our site inspection and evaluation. The mine dump and existing timbers from the original mine structures are so close to the road that this site is a curiosity most people will stop to investigate.

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Site #:12-10-399/4352-1

Site Name: Unknown, Mosquito Creek headwaters

Description and pertinent facts: This inventory area is located within the glacial bowl below the Continental Divide within the Mosquito Creek Valley. Centered along a line equidistant from Treasurevault and Buckskin Mountains, the site was inventoried with 5 adits, 3 shafts, and one

prospect pit. Several small insignificant prospects were not included in the inventory listing. Access to the site is gained by Forest Road 856, a rugged 4WD jeep road, that forks off of Mosquito Pass Road.

Feature #: 102

Hazard Rating: 2

Feature #102 is a dangerous 4' by 5' shaft that was measured 22 feet deep. The actual depth may be deeper because snow and ice have partially filled and bridged the opening at 15 feet. The site is 1,500 feet from FR 856.

Feature #: 104

Hazard Rating: 2

Feature #104 is also an open dangerous 4' by 4.5' shaft that was measured to a depth of 20 feet. The bottom of this shaft also holds snow and ice and may be deeper than that measured. This site is approximately 1,800 feet from the 4WD road, FR 856.

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Site #:12-10-400/4349-1

Site Name: North London Mine and Mill

Description and pertinent facts: This inventory area encompasses the area between the historic North London Mine and its Mill below next to Mosquito Creek. An old aerial cable tram, running from the mill to the ore processing structure at the mine dump, is in ruins. The main North London Mine tunnel is on patented land inside BLM holdings but over half of the 44,000[±] c.y. of dump and the ore processing building are on USFS lands. Several smaller mine workings are also in the area. A total of 10 adits, 8 prospect pits and trenches, and 2 shafts were inventoried at this site. Other lesser prospect pits not marked on the Climax quadrangle map, while investigated, were not included as inventoried features. The inventory area is centered 2,500 feet due north of London Mountain and is immediately accessible by County Road 12 (Mosquito Pass road) which passes right next to the mine. Both mine and mill structures are visited daily by recreational 4WD vehicles. Almost all vehicles that travel the Mosquito Pass road to or from Fairplay stop at this site.

Feature #: 101

Hazard Rating: 2

Feature #101 is a shallow shaft just below the North London Mine dump, feature #200, about 100 feet from Mosquito Pass Road. The prospect shaft has the remains of a 7' by 4.5' timber collar at the surface and drops vertically in rock to a depth of 8 feet where it is filled with timbers. These timbers are probably bridged and represent a false bottom. This site was given a hazard rating of 2 (dangerous) because it is in a high public use area and the 8-foot depth is sufficient to create a hazard.

Feature #: 108

Hazard Rating: 2

Feature #108 is also a prospect shaft. A 6' by 7' shaft drops vertically in rock to a bottom depth of 17 feet. The dump of this mine, though small (<50 c.y.), can be seen from the road which is about 300 feet away.

Feature #: 116, 117, 118

Hazard Ratings: 2

These three features are open adits that are grouped within 350 feet of each other about 500 feet west of the North London Mine Mill a short distance up the slope. All are open to dangerous depths and have dumps of sufficient size to be easily visible from the mill. Adit #116 has a 5' by 4.5' portal and extends over 60 feet into the hillside. The size of dump (600[±] c.y.) indicates significant additional depth. Adit #117 has a 5' by 3.5' entrance and extends to 35 feet where the ceiling has completely collapsed. Adit # 118 has a 7' by 4' opening and extends into the hillside over an observed 80 feet. The size of its dump (630[±] c.y.) indicates additional depth not determined at this time for safety reasons.

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Site #:12-10-400/4351-1

Site Name: Northeast Champaign Mine Area

Description and pertinent facts: This area is located northeast of the main Champaign mine within the uppermost Mosquito Gulch area. The site is accessed by Forest Road 856 and an unnamed mine road that forks off of it. The inventory area is centered 7,200 feet east of Treasurevault Mountain and 4,800 feet south to southwest of Mount Buckskin. Six adits, 2 shafts, and 2 prospect holes were inventoried in the area. Two old mine cabins also exist within this inventory area.

Feature #: 103

Hazard Rating: 2

Feature #103 is an open adit. The total depth of the adit is unknown but can be seen to extend more than 40 feet into the hillside. The portal and adit roof within the first 25 feet is entirely in soil that has bridged 9 feet in width and 5 feet in height. The opening reduces to 5' by 4' at 25 feet when it enters competent bedrock. The soil portal and 25 feet of soil roof is not supported and is inherently dangerous to anyone inside the adit or standing on its roof. Collapse of the soil tunnel could occur at any time.

Feature #: 108

Hazard Rating: 2

Feature #108 is an open shaft. The shaft is only about 60 feet from the unnamed Champaign Mine access road where it crosses the Mosquito Creek, about 250 feet north of the turnoff from Forest Road 856. The shaft was measured with a weighted tape as 22 feet deep. Standing water level was 15 feet. There is no collar but the shaft is lined with timber cribbing to below the water level. Original shaft dimensions are 2.5' by 5' but an old steel mine boiler was thrown into the shaft. It is stuck at the top of the shaft, obstructing most of the hole except an accessible 2.5' by 1.2' hole on one side.

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Site #:12-10-401/4351-1

Site Name: Unknown, South of Mount Buckskin in Mosquito Gulch Drainage

Description and pertinent facts: This inventory area is centered 3,000 feet south of Mount

Buckskin on the western flank of the ridgeline between Mount Buckskin and Loveland Mountain. Inventoried in this area were 13 adits, 5 prospect pits, and 1 shaft. Several minor prospects were also located and inspected but were not included in the inventory unless marked on the Climax map. The site is accessed by Forest Road 856, originally a mine road, now a popular rugged 4WD road. The majority of the features within the inventory area are located 1,500 to 2,000 feet away from the road.

Feature #: 105

Hazard Rating: 2

This mine feature is an open adit. Though the remoteness of this adit would not normally result in a hazard rating of 2 this adit extends into the mountain the deepest of those in this inventory area. The 6' by 3' portal is in good competent rock and completely open. Though actual depth is unknown, one can see from just inside the portal that the tunnel advances into the mountain over 40 feet.

Feature #: 107

Hazard Rating: 2

Feature #107 is a 6' by 3.5' prospect shaft that has been excavated vertically into rock to a measured depth of 17 feet. Standing water level within the shaft was at 12 feet. Though relatively shallow, the vertical shaft walls, no way to climb out, and potential serious injury or death if someone were to fall in justifies a hazard rating of "dangerous". The location is on a moderately smooth grassy tundra slope so the dump is easily seen.

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Site #:12-10-401/4353-1

Site Name: Unknown, Lake Emma Area

Description and pertinent facts: Lake Emma is a cirque lake that is the beginning of Buckskin Creek. The inventory area is centered 1,700 feet south of the lake. A unnamed trail exists from Kite Lake Campground to Emma Lake through this inventory area. The site also includes some patented mine claims. Inventoried at this site were 7 adits and 2 shafts. The two features with noteworthy hazard ratings were both positioned on patented lands close to the Lake Emma trail. Portions of their underground workings are on USFS land. The other mine features within the inventory area include shallow adits, adits with collapsed portals, shallow prospect shafts, and prospect pits. No deterrent sign or fence is noted in the area.

Feature #: 103

Hazard Rating: 2

Feature #103 is an adit. The 5 by 3.5 foot portal is intact and access underground is very easy. The adit extends into the mountainside over 50 feet. The size of the mine dump (2,000 c.y.) indicates substantial underground workings beyond the 50 foot depth observed from the portal. This site is only 60 feet from the trail so the dump is very noticeable.

Feature #: 104

Hazard Rating: 2

Feature #104 is also an open adit. This site is about 100 feet west of site #103. The 6 by 3.5 foot adit is intact and extends into the mountainside 70 feet. These sites were given the hazard rating of 2 (dangerous) because the sites are above the treeline and hence very visible, open, easily accessible,

and close to public use (trail).

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Site #:12-10-402/4348-1.100

Site Name: Loveland Mtn. ridgeline above Mosquito Creek.

Hazard Ratings: 2

Description and pertinent facts: Feature #100 is one of four features in this inventory area that are mapped on the east edge of the Climax quadrangle map on Loveland Mountain at the edge of Mosquito Creek Valley. The feature is an open 5' by 3' shaft that drops vertically to a depth of 18 feet. Twenty feet from the shaft is a cabin on USFS land that is still being maintained. If this is a cross-country ski hut, the hazard is even more significant. No road goes to the site. Closest access is 1,000 feet northeast where Forest Road 450 reaches the upper eastern flank of Loveland Mountain.

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Site #:12-10-402/4348-2.100

Site Name: Confluence of Mosquito and South Mosquito Creeks.

Hazard Ratings: 2

Description and pertinent facts: The feature at this inventory area is an adit right on Mosquito Pass Road. It appears that the adit was there before the road was widened and improved. The 5' by 3' adit extends 20 feet deep into the roadside rockface. The road rockcut comprises the headwall of the adit portal now. Small rock failures have and could still occur over the easily accessible adit portal.

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Site #:12-10-402/4350-1

Site Name: Loveland Mountain

Description and pertinent facts: The inventory area is on the southeastern flank of Loveland Mountain where it broadens out from the narrow ridge above and further north. Features inventoried at the site include 3 shafts, 2 adits, and 4 mapped prospects. The site is accessed by Forest Road 450, a popular 4WD mine road now used for recreation.

Features #: 101, 102

Hazard Ratings: 2

These two features are prospect shafts that were filled with ice and snow so that true depths could not be determined. As snow and ice depths change these shafts could become deep enough to be dangerous. Shaft #101 has a 4.5' by 2.4' opening that drops vertically to 11[±] feet where it is filled or bridged with snow. Shaft #102 has a 6' by 4' opening that drops to 6 feet where standing water begins. True depth at feature #102 could not be determined because of an ice plug on the water. The size of the dump (100[±] c.y.) and the timber cribbing inside the shaft seems to indicate much deeper workings below the ice plug.

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Site #:12-10-402/4352-1.105

Site Name: Unknown, South of Kite Lake

Hazard Rating: 2

Description and pertinent facts: This inventory area is centered 3,500 feet south of Kite Lake across from Buckskin Creek. Inventoried in this area were 7 adits. Some, while open, were not given a hazard rating of 1 or 2 because of their remoteness from road or trail. One site, #105, is a collapsed adit that has had some recent mining work done. A recent claim dated 5/2/87 by Mr. Louise W. Maulking of 1260 Can St., Lakewood, CO 80215 refers to this mine as the "AJAX No. 1". It appears that work was done to begin re-entering the adit. Of particular concern was the discovery, 200 feet north of the adit, of a blue plastic bucket that contained unsecured explosives (ammonium nitrate and dynamite sticks) near two steel equipment boxes grouted in place and locked. This material was shielded from view from below the mine, but is easily seen from above.

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Site #:12-10-402/4354-1

Site Name: Kentucky Belle Mine

Description and pertinent facts: The Kentucky Belle Mine occupies an area along the flank of Mt. Democrat above Kite Lake. The inventory area is centered 3,500 feet southeast of Mt. Democrat and 2000 feet north of Kite Lake Campground. The main trail from the campground parking lot to Mt. Democrat, Mt. Lincoln, and Mt. Bross pass through this inventory area. Several mine features occur in the site on patented and USFS lands. Since this site is above the tree line the mines are in plain view from the campground. Total features inventoried at this site included 5 adits and a stope. There were no access deterrents at this location.

Feature #: 105

Hazard Rating: 2

Feature #105 is a planar stope that declines 55° into the mountainside. Approximately 300 feet long, it appears that a 6 foot wide vein was mined out from the surface to a 30-40 foot depth, possibly deeper. The hanging wall of this planar excavation is now unsupported and is in various forms of collapse. There are still several openings and holes into this mined area that are quite dangerous. The danger is enhanced by this feature's proximity to popular public recreational use areas.

Feature #: 106

Hazard Rating: 2

Feature #106 is a deep open adit. The portal roof and sidewalls have partially collapsed but an easily accessible 3' by 4.5' hole remains. Behind the collapse debris, an intact 5' by 5' adit tunnel extends over 50 feet into the mountainside. Total depth is not known. The dump of this mine is easily seen from the campground and trail to the "fourteeners". Global positioning places this adit right on the border of a patented mine claim with the underground workings on USFS land.

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Site Name: Unknown, marked adit mine on west side of Platte Gulch

Description and pertinent facts: Centered 4,000 feet due east of Traver Peak this inventory area encompasses USFS land and several 250 foot wide strips of patented mine claims along an unnamed tributary gulch within the Upper Platte Gulch drainage. Several mine openings and an intact mining cabin occur within this area on both private and public lands. Site #104 is a deep open inclined shaft with a depth exceeding 50 feet. The inclination is only 10° from vertical so a fall would still be essentially straight down. There are no warning signs or fence at the site. The shaft is excavated into competent rock at the surface so no cratering has occurred. This shaft was given a hazard rating of 2 instead of a 1 because even though it is open, deep, and unmarked, its location is fairly remote.

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Quad Name: Como

Site #:12-10-414/4356-1.101

Site Name: Silverheels Mine area.

Hazard Ratings: 3 (2 if public vehicular access is gained)

Description and pertinent facts: This feature was placed in the Silverheels Mine inventory area. The actual Silverheels mine that is marked on the Como quadrangle map is on patented property 1900 feet west of this feature and while investigated was not inventoried. Adit #101 is open with no access deterrents and appears to have been maintained relatively recently. The adit extends into the hillside a depth of 180 feet where a vertical winze exists. This underground shaft of unknown depth is partially blocked by a winze hoist frame. The site is easily accessible by an old mine road that turns off of Forest Road 405 in Montgomery Gulch. Though on USFS lands, public vehicular access is prevented to this site by a locked gate on Forest Road 405 (County Road 50) at patented land near the confluence of Deadwood and Montgomery Gulches (where Tarryall Creek begins). This mine site was given a hazard rating of 3 (potentially dangerous). If, in the future, public vehicular access is gained to this area, the hazard rating for this feature would be increased to 2 because site visits would increase substantially.

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Site #:12-10-415/4356-1.100

Site Name: Link Mine

Hazard Ratings: 3 (2 if public vehicular access is gained)

Description and pertinent facts: The historic Link Mine is accessible from an unnamed mine road from Forest Road 405, within the upper reaches of Australia Gulch. The adit opening and underground workings are on patented land but the mine dump, ore processing chute, and 3 old mine cabins are on USFS lands. Feature 100 is the lower adit whose dump encroaches on USFS property. Public vehicular access is prevented to this site by a locked gate on Forest Road 405 (County Road 50) at lands near the confluence of Deadwood and Montgomery Gulches (where Tarryall Creek begins). The adit portal side walls and roof have partially collapsed leaving an easily accessible 3.5' by 4' hole into intact 5' by 4' adit tunnel to a depth exceeding 70 feet. The size of dump (1,400± c.y.) indicates substantial additional underground workings beyond the safely observable 70 feet. If, in the future, public vehicular access is gained to this area, the hazard rating for this feature would be increased to 2 because site visits would increase substantially.

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Site #:12-10-417/4353-1

Site Name: Unknown

Hazard Ratings: Unknown

Description and pertinent facts: This inventory area is on the saddle between Little Baldy Mountain and the eastern flank of Mount Silverheels. The site was on the USFS South Park District list of known hazardous mine sites. One to three shafts are supposedly in the area. The saddle is a

thickly forested area and neither the shafts nor mine dumps were located in the cover during our field investigation of the area; only prospect pits were found.

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Site #:12-10-417/4356-1.101

Site Name: Unknown

Hazard Ratings: 2

Description and pertinent facts: The inventory site is along a ridge and saddle between Silverheels and South Tarryall Creeks and is centered 9,000 feet north of Little Baldy Mountain. Feature #101 is a shaft descending 25 feet in depth. Cratered at the surface to a 6.5' by 7.5' hole the shaft becomes 3.5' by 3.5' at an 8-foot depth where a wood cribbing liner begins. A log cabin exists near the shaft. A trail, mapped as Forest Trail 614 and Forest Road 196, diverts from the Gold Dust Trail and passes within 160[±] feet of the mine.

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Quad Name: Fairplay West

Site #: 12-10-403/4341-1.104

Site Name: Mudsill Springs / Sacramento Area

Hazard Rating: 2

Description and pertinent facts: This is an intact exploratory shaft on the east end of the top of the hill south of Mudsill Spring. The shaft opening measures 11 x 10 feet and total depth is 26 feet. The untimbered shaft walls appear competent, dug into a gray limestone with algal mat sedimentary structure. This spot does not get frequent visitation, yet the depth of the shaft makes it a dangerous feature. It could be backfilled with the adjacent dump material (70 c.y.). There is also a partially open adit (feature 103) just below the shaft that is potentially dangerous (PHR=3). The adit is intact (6 x 4 feet) behind the partially collapsed portal (2 x 3 feet). Depth of the adit is greater than 15 feet. If work is done on the shaft this adit should also be backfilled with its dump material. It is possible that the shaft and this adit are connected workings.

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Site #: 12-10-403/4343-1.100

Site Name: Southwest side of Sacramento Creek Valley near subdivision

Hazard Rating: 2

Description and pertinent facts: This intact prospect shaft is only about 800 feet west of a newly developed subdivision. As of Autumn 1993 no houses had been built in this new subdivision. The shaft is 17 feet deep and has a surface opening of 6 x 4 feet. This shaft could easily be backfilled. There is no trail to the shaft, but access for construction equipment is still good because the hill is not very steep and trees are relatively sparse.

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Site #: 12-10-404/4338-1.101,103,104

Site Name: Upper north end of Sheep Mountain

Hazard Rating: 2

Description and pertinent facts: Mine features 101, 103, and 104 are all open adits. These adits are rated as dangerous because they occur about one mile southwest of Horseshoe Campground and are easily accessed from Trail 691 which leads from the campground up the northeast slope of Sheep Mountain. Adit 101 occurs on the upper end of the trail and just below the trail. The adit is only slightly open as the portal has mostly collapsed leaving a 1 x 2-foot opening. Behind the portal the adit is intact and extends over 25 feet back beyond line of sight. Adits 103 and 104 occur at the head of a drainage that is accessed by a side trail leading south off of Trail 691. Adit 103 is on the east side of this drainage and is a large open tunnel with an 8 x 5 foot portal opening extending beyond sight, over 80 feet into the mountain. Some timbers are scattered on the 393 c.y. dump at the mouth of this tunnel. Adit 104 is partially collapsed with many timbers in the portal leaving only a 3 x 4 foot opening. Behind this, the tunnel appears to be intact and extends beyond sight at least greater than 15 feet. Galena (PbS) and barite (BaSO₄) are found in the dump at this location.

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Site #: 12-10-405/4335-1.100,103

Site Name: Southwest Sheep Ridge; Garvie London Mine

Hazard Rating: 2

Description and pertinent facts: The most dangerous mine feature in this inventory area is shaft 103. This shaft is on the upper part of the west slope of Sheep Ridge. It is situated in an area of the slope that is conspicuously absent of trees, probably from a former fire. The shaft occurs inside a small cabin. The shaft is timbered, has a surface opening of 8 x 3 feet, and is 31 feet deep. There is no trail leading to the shaft, but the cabin is visible looking upslope from FR-426 (which leads to the Garvie London Mine). Abundant bear "sign" was noted inside the cabin, so this could possibly be a den (?).

The largest mine in this inventory area is the Garvie London Mine adit (mine feature 100). FR-426 leads directly to it, so it does get relatively frequent visitation. The adit portal opens into a mostly intact cabin (50 x 20 feet). The adit portal measures 7 x 6 feet and extends back at least 30 feet. A large subsidence depression is located about 30 feet uphill from the portal. It appears that this subsidence has cut off any further access to the adit. The subsidence also highlights the structural instability of the adit and with the ease of access to the mine site conspires to make this a dangerous physical hazard.

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Site #: 12-10-405/4339-1.101

Site Name: Lower north end of Sheep Mountain near Horseshoe Campground

Hazard Rating: 2

Description and pertinent facts: This adit's portal is partially filled with sloughed material from above, but is still intact behind this material. The opening measures only 1 x 3 feet, but opens up to 6 x 4 feet behind the sloughed material and extends past sight more than 20 feet in depth. A dilapidated cabin sits next to the dump. The dump consists of Leadville Limestone with some "zebra rock." There is no trail leading to the adit, but it occurs only about 400 feet south of Trail 691, whose trailhead is in Horseshoe Campground. Several other collapsed adits occur in this inventory area.

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Site #: 12-10-407/4335-1.100

Site Name: Southwest of Warm Springs Subdivision

Hazard Rating: 2

Description and pertinent facts: This prospect shaft is located just 500 feet south of the nearest house in the Warm Springs Subdivision. The house is located at the southern extent of Lamb Mountain Road. No trails lead to the shaft, but the dump is visible from the area of the house. The shaft is 20 feet deep with a surface opening of 11 x 10 feet. Loose unconsolidated colluvium forms

Quad Name: Black Mountain

Site #: 12-10-440/4284-1.100

Site Name: South slope Black Mountain

Hazard Rating: 2

Description and pertinent facts: This intact 40 foot deep shaft is adjacent to FR-272 and about 2 miles west of county road 88. This is a dangerous shaft because of its depth and the fact that sloughing of the walls of the shaft have caused bedrock at the surface to overhang the eroded opening. This is called "bell-shaped" erosion and causes the ground surrounding the shaft to be structurally unstable. The only reason this shaft did not get a Physical Hazard Rating (PHR) = 1 is that it is fairly remote, is accessed via a moderately rough 4WD road, and therefore, does not get visited often. Nevertheless, the shaft is right next to FR-272 on the southwest side. The shaft is dug into a conglomerate (Tallahassee Creek Conglomerate) composed of clasts of scoriaceous tuff up to cobble size. Weathering of the soil and conglomerate around the shaft leave rounded pebbles and cobbles around the shaft collar causing insecure footing. This is assumed to be a uranium prospect, but radiometric readings are equal to background levels of 50-60 cps. The dump contains no obvious ore minerals.

Quad Name: Mount Sherman

Site #: 12-10-398/4331-1.107

Site Name: Weston Pass

Hazard Rating: 1

Description and pertinent facts: This shaft is in the Weston Pass area which receives much tourist traffic and frequent visitation to the mines in the area. Shaft 107 lies just southwest of the headwaters of the South Fork South Platte River. It can be easily accessed from the Weston Pass Road (FR-5). The cribbed shaft has a surface opening of 8 x 4 feet and contains standing water at a depth of 20 feet. The shaft's full depth is not known, but if the dump is indicative of shaft size, the shaft depth should be about 25 feet. Some of the cribbing timbers have fallen in the shaft and there is some sidewall collapse that is currently being retained by cribbing. This shaft is extremely dangerous because of frequent public interaction. Two people were at this mine during our inventory work. If the shaft is not much deeper than the estimated 25 feet, backfilling this shaft with dump material is recommended.

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Site #: 12-10-398/4331-1.110

Site Name: Weston Pass

Hazard Rating: 2

Description and pertinent facts: This is the main adit of the Ruby Mine and it is on a patented claim(s). This site was inventoried because it was draining water across the mine site onto USFS managed land. Water test pH and conductivity indicated no environmental degradation of this water. A significant physical hazard does exist for this open adit. This adit is over 80 feet long and likely has hundreds of feet of mine workings. The portal with dimensions of 5 x 4 feet is large enough for easy entrance. The draining water is not a significant deterrent since it was estimated at 1 gallon per minute in September. This adit should be capped because of frequent tourist visitation. Other open mine features are present on the patented claims that were not inventoried. Any mine closure work on this land would need to be negotiated with the claim holders.

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Site #: 12-10-398/4338-1.102

Site Name: Peerless Mine / Leavick Tarn

Hazard Rating: 2

Description and pertinent facts: This shaft is next to a trail marked on the PBS base map, but not numbered. The trail leads from FR-422 near the Peerless Mine to Horseshoe Gulch. The shaft appears to be on private land as indicated on the PBS base map. The shaft is cribbed, 18 feet deep, and has a collar size of 15 x 10 feet. Water fills the bottom 5 feet of the shaft. There would be no escape if someone fell into this mine.

Two other mine adits in this inventory area are rated as potentially hazardous (PHR=3). Adit 100 is

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Quad Name: Boreas Pass

Site #:12-10-415/4359-1.100

Site Name: Unknown, East of Deadwood Gulch

Hazard Ratings: 2

Description and pertinent facts: The inventory area is on the ridgeline between Deadwood Gulch to the west and North Tarryall Creek to the east. Feature #100 is an open shaft that descends 49[±] feet in depth. The shaft is collared with wood cribbing at the dimensions 7' by 4'. The wood cribbing liner extends to a depth of 18 feet and unsupported rock continues to a depth of 49 feet where snow and ice occur. It is unknown whether the ice and snow is the actual bottom or a false bottom of the shaft. The site is accessed by a 4WD track that follows the ridgeline down. The road was not followed so its alignment is not precisely known. It most likely follows the ridgeline and meets either Forest Road 199 or Forest Road 405 (County Road 50).

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Site #: 12-10-420/4365-1.100

Site Name: Johnson Creek Shaft

Hazard Rating: 2

Description and pertinent facts: This is a fairly remote shaft on top of a hill south of Johnson Creek. The site is most easily accessed by FR-805, which has been blocked by an earthen barrier at its intersection with CR-54 (Michigan Creek Road), but no roads or trails directly access the mine. This intact shaft is over 75 feet deep and has surface dimensions of 18 x 10 feet. There appears to be a drift off the west side of the shaft about 25 feet below surface grade. The shaft is dug into sandstone and shale, possibly of the Hygiene Sandstone Member of the Cretaceous Pierre Shale. Bornite appears to have been the target mineral of the shaft, but it is not very abundant.

[illegible]

Quad Name: Glentivar

Site #: 12-10-452/4322-1.100

Site Name: unknown, west flank of Badger Mountain, north of Highway 24.

Hazard Rating: 2

Description and pertinent facts: This inventory area is centered 1.5 miles northwest of the Wilkerson Pass Visitor Center and 1,000 feet north of Highway 24. The site contains several prospect pits, trenches and one open, inclined, prospect shaft, feature #100, that was measured to a depth of 27 feet. Partial remains of the 5' by 5' wooden collar are still in place. While the dump is small, 50 c.y., it is visible from the highway.

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Site #: 12-10-455/4321-1

Site Name: Wilkerson Pass (Be) Mine, ½ mile east of Wilkerson Pass area.

Description and pertinent facts: These particular mine workings are easily seen from State Highway 24 and the Wilkerson Pass Visitor Center. Two dirt roads access the mine workings from the highway. Two other features at this mine site, #100 and #106, have been capped or sealed by the Colorado MLRD. This area is periodically visited by the public.

Feature #: 105

Hazard Rating: 1

Feature #105 is an open shaft 24 feet deep, with what appears to be a horizontal heading at the bottom. This feature, only 350[±] feet from the highway, was given a rating of 1 (extremely dangerous) due to its high visibility from the highway and close proximity to the Visitor Center.

Feature #: 102

Hazard Rating: 2

Feature #102 is on patented land but it's dump is easily seen from the mine access road, about 100 feet away. The 6' by 8' foot shaft drops vertically to 12 feet where a horizontal drift begins to an unknown depth. An old wooden ladder is in the shaft. The shaft is timber lined. This lining has begun to bulge inward at the portal and could fail.

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Site #: 12-10-455/4330-1.101

Site Name: unknown, south of Webber Park

Hazard Rating: 2

Description and pertinent facts: This inventory area is located midway between Thorpe Gulch and Webber Park along the ridgeline. Forest Road 232 passes through the inventory area. Feature 101 is an open shaft about 300 feet from the road. The top 2.5 feet of the shaft has cratered to 9' by 7'. Eight vertical feet of 3.5' by 5' timber cribbing supports the shaft walls below the cratered collar section. The shaft drops an additional 17 vertical feet in rock to a total depth of 25 feet where wood debris is either plugging or on bottom of the shaft.

[illegible]

Quad Name: Tarryall

Site #: 12-10-457/4320-2. 100

Site Name: St. Joe Group, West

Hazard Rating: 3

Description and pertinent facts: The inventory area includes two shafts and two adits. The site is 1800 feet north of Highway 34 and is accessed by a dirt road. Fire pits in the area indicate the immediate area is used for camping and picnicking. The main St. Joe Tunnel (feature #100) has two bulkheads, a steel culvert segment, and a locked steel grate installed by the Colorado MLRD. Subsequent vandalism of the outside bulkhead has opened a passage behind the locked grate in the annulus between the adit and the installed culvert. The back bulkhead appears undamaged and access to the main underground workings is still prevented. A mine trail from St. Joe Tunnel starts up the hill to the east to the St. Joe Group, East inventory area.

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Site #: 12-10-458/4320-1

Site Name: St. Joe Group, East.

Description and pertinent facts: This inventory area is located just east of the West St. Joe site. The site is on the lower southeastern flank of Badger Mountain. The site is 2,000 feet from Highway 34 and is accessible by a dirt road that passes within 400 feet of some of the mine features. Six shafts and 3 adits were inventoried in this area. Patented land is included within the inventory area and some of the mine openings may be on private land.

Features #: 103, 104

Hazard Ratings: 2

Features #103 and #104 are shafts spaced only 50 feet from each other. They share the same 1,300 c.y. dump that is visible from the highway. Feature 103 is an intact 4' by 8' timber lined shaft in moderately good condition. Its depth is 39 feet. Feature 104 is a 4' by 7' unlined shaft that is badly cratered at the surface to a raveling 11 by 16 foot hole. The shaft depth exceeds 75 feet. The trail from St. Joe Tunnel goes to this mine. These sites may be on private property.

Feature #: 107

Hazard Rating: 2

Shaft #107 is on a hill slope on the far east side of the inventory area. No apparent trail leads to it. The 4' by 7' intact shaft has a timber liner and descends vertically to a depth of 21 feet.

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Site #: 12-10-458/4329-1

Site Name: Clothing House, June, and Violette P. Claims

Description and pertinent facts: The inventory area is centered 3000 feet southwest of Tarryall and 2,300 feet from the intersection of Forest Road 31 and County Road 77. Forest Road 31 passes through the center of the inventory area. Three shafts and scattered prospect pits occur in this area.

Feature #: 100

Hazard Rating: 2

This feature is an open shaft at the end of an exposed fault gouge filled vein. The vein is easily seen from RE 31, 270 feet away. The shaft is cratered to a 10' by 9' hole at the surface. The 7' by 3.5' shaft drops vertically to a depth of 24 feet where trash has either bridged or is on the bottom. A double wire fence partially around the feature is ineffective as a deterrent and has been undermined by the cratering of the hole.

Feature #: 102

Hazard Rating: 2

Feature #102 is about 800 feet southeast of FR 31 on the opposite side from feature #102. The shaft has a timber collar but it is beginning to fail and the hole has started to crater. The 6' by 3' shaft descends vertically to 17 feet where debris has filled.

AAAAAAAAAA

Site #: 12-10-458/4330-1.100

Site Name: Nix Group prospects

Hazard Rating: 2

Description and pertinent facts: The Nix Group prospects include prospect shafts, pits, and trenches. The inventory area is 0.6 miles west of Tarryall. One shaft, feature 100, is on top of a small hill 400 feet from FR 233, which runs to Webber Park. The 8' by 8' shaft drops vertically to a total depth of 23 feet. It is a dangerous open hole.

AAAAAAAAAA

Site #: 12-10-459/4321-1.100

Site Name: Unknown, marked mine location on map

Hazard Rating: 2

Description and pertinent facts: This inventory area is located 1.4 miles west of Round Mountain. Three shafts were recorded in this inventory area. Feature #100 is an open intact 5' by 8' shaft that descends vertically 29 feet. The dump is visible about 3500 feet to the north of Highway 34. The shaft entrance is cut into a ledge of pegmatite rock. Thick bushes growing on the dump have completely hidden the hole from view. Bat guano is believed to have been found at this site. The site is accessed by an old mine road that approaches within 200 feet of the mine. This road is now a popular 4WD recreation and hunting road. A single-track trail runs to the mine.

AAAAAAAAAA

Site #: 12-10-459/4325-1.100

Site Name: Unknown

Hazard Rating: 2

Description and pertinent facts: This site is located 2,500 feet west of the abandoned Lake George Industries Beryllium Mill and 500 feet north of Forest Road 896. One shaft and several prospect pits

and trenches occur within the inventory area. The 5' by 8' shaft drops vertically to a depth of 24 feet. There is vehicular access to this site and fire pits indicate that camping/public use occurs here.

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Site #: 12-10-459/4329-1.102

Site Name: Unknown, South Tarryall Area

Hazard Rating: 2

Description and pertinent facts: The inventory area is centered 3,000 feet south of Tarryall with County Road 77 passing through the western side. Five shafts were recorded in this area, three have been capped by the Colorado MLRD. Feature 102 is an open prospect shaft that drops vertically 18 feet. This shaft is only about 200 feet from County Road 77 and 2,400 feet from Tarryall. Its dump is clearly seen from the road.

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Site #: 12-10-460/4326-2

Site Name: Unknown, Lower Marksbury Gulch area

Description and pertinent facts: Two dangerous open prospect shafts lie within this inventory area. The site is located at the lower part of Marksbury Gulch, 0.4 miles west of County Road 77. The shafts are located close to an unnamed dirt road that runs from the abandoned Lake Industries Beryllium Mill (site # 12-10-460/4326-1) to the Marksbury Gulch road, FR 213.

Feature #: 100

Hazard Rating: 2

This shaft is located 50 feet west of the unnamed road. Its dump is easily seen on the side of the hill. The vertical shaft has the remains of a wood collar on one side but has cratered to an 8' by 9' hole at the surface. The portal has been partially bridged by furniture thrown into the shaft leaving a 2' by 4' hole on one side to a measured depth of 23 feet.

Feature #: 101

Hazard Rating: 2

This shaft is located up the hill from #100, about 100 feet away. Its location is about 80 feet west of the road. This dangerous intact shaft measures 3.5' by 8' in rock and was measured to a depth of 23 feet. The upper 4 feet has cratered to a 10' by 13' hole.

^^^^^^^^^^

Site #: 12-10-460/4327-1

Site Name: South China Wall geographic location

Description and pertinent facts: A group of 3 shafts and an adit comprise this inventory area. The area is centered 750 feet from County Road 77, 2.1 miles south of Tarryall. The features are on the steep western slope of the southern end of the China Wall. The mine dumps are clearly seen from the road below.

Feature #: 100

Hazard Rating: 2

This 4' by 7' vertical shaft is timber lined and descends to a total depth of 33 feet. An intact ladder of questionable strength is still in the shaft.

Feature #: 101

Hazard Rating: 2

This 3' by 7' shaft is timber lined and drops vertically for 15 feet where the timber cribbing ends and the shaft inclines 30° from vertical in unsupported rock to an unknown depth exceeding 50 feet. A dangerous wood ladder is affixed to the timber liner.

Feature #: 102

Hazard Rating: 2

A 5' by 8' unlined shaft descends to an 18 feet depth. The collar has some support by 3 feet of timber cribbing but the edge of the hole is beginning to crater.

AAAAAAAAAA

Site #: 12-10-460/4329-1

Site Name: China Wall

Description and pertinent facts: This inventory area is accessed by the 4WD FR 212 from County Road 77. The turn-off is 4200 feet south of Tarryall. Inventoried are five shafts. Three are grouped together in a line only 25 feet from each other near the 4WD road.

Feature #: 100

Hazard Rating: 2

This 6' by 3' vertical shaft is timber lined to a total depth of 26 feet. The 4WD road passes within 30 feet of this open shaft. This is a dangerous hole near a popular 4WD road that needs to be filled or capped.

Feature #: 102

Hazard Rating: 2

This inclined shaft, 55° from horizontal, exceeds 60 feet in depth. It is separated from shaft #100, 50 feet away, by the partially filled shaft, #101. A 6' by 3' timber liner exists from the collar to a 10-foot depth where the shaft continues in rock to an unknown depth. This also is a dangerous hole that needs to be filled or capped.

Feature #: 103

Hazard Rating: 2

This feature is also a shaft that is farther north of the first group of three across the 4WD road. The dump of this shaft is easily seen from the road as it approaches China Wall ridge from the flat below.

This shaft has cratered at the surface to an 11-foot diameter hole with incompetent perimeter material. The shaft is intact in rock below the cratering, is vertical, and drops to a measured depth of 17 feet.

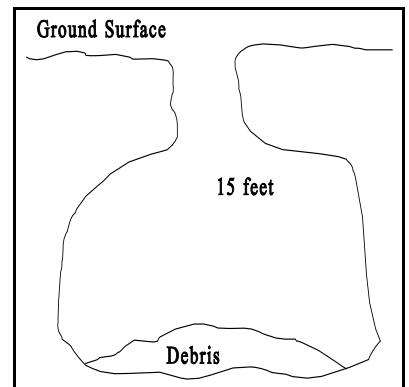
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Site #: 12-10-460/4330-1

Site Name: A & C Claims, North China Wall area.

Description and pertinent facts: The A & C Claims are a group of shafts and prospect trenches,

pits, and adits. The area is centered 0.9 miles east of Tarryall. Access is provided by FR 212 at a turn-off 4200 feet south of Tarryall on CR 77. An unnamed road forks off of FR 212 at inventory area 12-10-460/4329-1 to the mine location. This road has been closed by the USFS but, judging by tire tracks, the road is in continued use with 4WD vehicles bypassing the closure sign and bulldozed trench. While several mine features were given potentially dangerous ratings two features were assigned a rating of 2 (dangerous).



Feature #: 100

Hazard Rating: 2

Feature #100 is a shallow prospect shaft that drops vertically to a measured depth of 15'. The sheer vertical sides in rock are such that one could not get out if one accidentally fell in. This site is only 100 feet from the mine access road.

Feature #: 103

Hazard Rating: 2

This shaft is particularly dangerous because of its immediate proximity to the mine access road and the morphology of the mine itself. The shaft, while only 15 feet in depth opens to a mined out area with horizontal headings that has left a “room” with the shaft in the middle. The surface near the shaft collar is now undermined and is susceptible to collapse into the hole. See figure.

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Site #: 12-10-461/4319-1.100

Site Name: Unknown

Hazard Rating: 2

Description and pertinent facts: This inventory area includes only one shaft, feature #100. The mine is located west to southwest of Round Mountain Campground, 2,200 feet south of Highway 34.

An unnamed forest access dirt road passes within 1,700 feet of the mine. The 2.5' by 6', intact, timber lined, shaft descends vertically to a 30 foot depth. The wood cribbing at the collar is beginning to fail and bulge inward and could crater at any time.

^^^^^^^^^^

Site #: 12-10-461/4325-1

Site Name: Boomer Mine area

Description and pertinent facts: The Boomer Mine is one of the most extensively mined area in the Tarryall/Badger Flats mining district. Three adits and seven shafts were inventoried at this site on USFS lands. Several more mine openings occur on patented lands. Many prospect pits and trenches are scattered throughout the area. Four of the shafts inventoried have been sealed or capped by the Colorado Division of Minerals and Geology (DMG), Inactive Mine Program.

Feature #: 104

Hazard Rating: 2

Feature #104 is a shaft located 1,600 feet northeast from the main Boomer mineshaft marked on the map. The shaft has cratered at the surface to a 10' by 9' opening within the dump material. The edges of the crater are unstable. A timber liner begins 3 feet down and extends vertically to the bottom of the shaft at 33 feet.

Feature #: 105**Hazard Rating: 2**

This feature is located about 300 feet southwest of #104. The shaft has a timber collar that supports the dump material at the surface. The 5' by 5' shaft drops vertically to a depth of 23 feet.

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Site #: 12-10-463/4324-1.107

Site Name: Mary Lee Mine area

Hazard Rating: 2

Description and pertinent facts: The Mary Lee Mine area is a well-known mining area of the Tarryall/Badger Flats district. The site is centered 1.3 miles east to southeast of the Boomer Mine and is accessed by Forest Road 287. Nine mine openings were inventoried at this site, the majority of which have been sealed or capped by the Colorado DMG. Feature #107 was given a closure number during the DMG project but evidently was omitted or forgotten. This 3' by 7' intact shaft has timber lining to a depth of 11 feet and a total depth of 23 feet. A dangerous wood ladder still exists inside the shaft.

^^^^^^^^^^

Site #: 12-10-463/4327-1

Site Name: Redskin Gulch Area (Redskin, Minerva, and Black Prince mines)

Description and pertinent facts: The inventory area lies within Redskin Gulch basin. The area is located northeast of Landis Ranch centered about 3,500 feet from Tarryall Creek. Vehicular access to the mine sites is only through the usually locked Landis Ranch Estates gate. Seven shafts were inventoried at this site. Many prospect pits are also in the area.

Feature #: 102**Hazard Rating: 2**

The Black Prince Mine main shaft is collared and lined with timbers. The wooden hoist frame and ore chute have collapsed. The 3.5' by 7' shaft is intact and drops vertically to a depth exceeding 50 feet (the length of the weighted tape measure). Standing water in the shaft was measured at 39 feet.

Feature #: 105**Hazard Rating: 2**

The Minerva "J" shaft is also collared and lined with timbers to 14 feet. The 4' by 7.5' shaft drops vertically to 20 feet where standing water occurs. Total actual depth is not known. An old dangerous wooden ladder is still in the shaft. The shaft has been partially covered with wood planks. These planks are rotten and would probably break if stood upon.

^^^^^^^^^^

Site #: 12-10-464/4319-1.102

Site Name: Unknown

Hazard Rating: 2

Description and pertinent facts: This inventory area is one mile south of Hayman Site and is accessed by an unnamed forest road that turns off of FR 208 and doubles back to the site. The inventory area is on a small ridge only 700 feet from Highway 34. Three shafts were inventoried at this site. Two have been backfilled and sealed by the Colorado MLRD. Feature 102 is about 500 feet from the others. This dangerous, intact, 3' by 7' shaft has a timber collar and liner to 10 feet. It's total depth is 27 feet. An old wood ladder is affixed to the liner.

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Site #: 12-10-464/4324-1.100

Site Name: Badger Gulch area southwest of County Road 77

Hazard Rating: 2

Description and pertinent facts: The inventory area is easily accessed from County Road 77 but the access is restricted by private property. A longer access is available from Forest Road 225 along Badger Gulch but that unnamed road has been closed to motorized vehicles. Feature #100 is a 4' by 7' prospect shaft that drops vertically to 22 feet where relatively recent trash lies.

^^^^^^^^^^

Site #: 12-10-465/4317-1

Site Name: Unknown, Lower Pulver Gulch, west side.

Description and pertinent facts: This inventory area is 2.7 miles southeast of the turn-off to Round Mountain Campground along Highway 34. Five shafts and one prospect pit were inventoried. The mine sites trend roughly linear, northeast to southwest, on a ridgeline. A few cabin remains near Highway 34 were probably the old mine camp. Access to the upper (southwestern) portion of the ridge is by an old 4WD mine road in the draw south of the ridge. There is a gate in the right-of-way fence along Highway 34. This track deteriorates quickly and becomes undriveable towards the top.

Feature #: 100

Hazard Rating: 2

Feature #100 is a 3' by 6' intact vertical unlined shaft that exceeds 35 feet in depth. Its location is 1000 feet from Highway 34.

Feature #: 101

Hazard Rating: 2

This feature is another 1,200 feet farther up the ridge from #100. It is an open unlined shaft that inclines 20° from vertical and exceeds 100 feet in depth. The 4' by 6' shaft has cratered at the surface to a 10' by 13' hole with an unstable perimeter.

Feature #: 104

Hazard Rating: 2

This feature is also farther up the ridgeline, about 1100 feet above #101. Inclined at 10° from vertical this shaft is also intact. The 4' by 6' inclined shaft is open to a 50 foot depth where a drift begins of unknown length. The old head frame has collapsed and a cable still enters the shaft. The shaft has cratered at the surface to a 10' by 10' hole with unstable edges.

Feature #: 105**Hazard Rating: 2**

This mine is clearly seen from shaft #104 downhill 200 feet away. The shaft is open to a depth of 27 feet. The bottom 11 feet has a 3' by 7.5' timber liner. The top 16 feet opens up gradually to a 7' by 9' crater at the surface with a dangerous incompetent perimeter.

Feature #: 106**Hazard Rating: 2**

This shaft is near the top of the ridge an additional 200 feet uphill from #105. The shaft is inclined slightly from vertical. The 4.5' by 7' unlined shaft has cratered at the surface to a 12' by 15' foot hole. The cratered material has partially filled the shaft at 30 feet leaving a remaining 3' by 4.5' hole to an unknown depth exceeding 50 feet.

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Site #: 12-10-466/4318-1

Site Name: Unknown, lower Pulver Gulch area, east ridge behind Noble property.

Description and pertinent facts: This inventory area is accessible through the Noble property or an around-about way on unnamed USFS dirt roads from the north and east. Six shafts and one adit were inventoried at this site, the majority are intact and dangerous. The site is centered 2.5 miles southeast from the Round Mountain Campground turn-off along Highway 24 and 1,500 feet east of the highway along the ridgeline.

Feature #: 100**Hazard Ratings: 2**

Feature #100 is an intact open shaft. The top 5 feet has a 3' by 6.5' timber collar. The collar has begun to fail on the west side. The vertical shaft was measured at a depth of 36 feet.

Feature #: 101**Hazard Ratings: 2**

This shaft is located 50 feet from #100. The shaft has cratered at the surface to a 10-foot diameter hole within dump material. Four feet down the 3.5' by 6' shaft enters competent rock and drops vertically to a measured depth of 19 feet.

Feature #: 103**Hazard Ratings: 2**

Feature #103 is also a shaft, located about 110 feet farther up the hill from #101. This shaft is collared with a 2.5 by 4.5' timber liner to a depth of 4 feet. It drops vertically for 18 feet then inclines at 40° to an unknown depth. A weighted tape measure was thrown into the hole to a depth of 58 feet. The total depth could not be verified from the surface because of the dog-leg in the hole. An old rotten wood ladder is still in place in the vertical section of the shaft.

Feature #: 104

Hazard Ratings: 2

This mine feature is about 250 feet northeast of #103. The shaft is similar to #103 in that it drops vertically with a 2.5' by 7' wooden liner to 11 feet where the liner ends and the shaft becomes inclined. Total depth beyond 22 feet is unknown because of the bend in the hole. The surface has begun to crater above the liner to an 8-foot diameter hole. There is also a rotten wood ladder still in place through the vertical section of the shaft.

Feature #: 105

Hazard Ratings: 2

On the top of the hill opposite the other mine sites, about 1,200 feet to the southeast, another dangerous intact shaft exists. This shaft has a 3.5' by 7' wood collar and drops vertically to a measured depth of 25 feet.

AAAAAAAAAA

Site #: 12-10-467/4317-1

Site Name: Unknown, lower Pulver Gulch area, east ridge.

Description and pertinent facts: This inventory area occurs along a ridgeline on the east side of Pulver Gulch and Highway 34, 3.2 miles down the road from the Round Mountain Campground. Four shafts were included in the inventory area. Three shafts, #100, #101, and #103 are grouped within 50 feet of each other. All three are intact and dangerous and were given the hazard rating 2.

Feature #: 100

Hazard Ratings: 2

This 6' by 4' unlined shaft drops vertically 21 feet. A portion of the original timber collar is still in place but the majority of the shaft has begun to crater at the surface.

Feature #: 101

Hazard Ratings: 2

This shaft declines 38° from horizontal and extends to a depth beyond 70 feet. One can see wood timber supports inside the mine. The 4' by 6' inclined shaft has cratered to 15' by 24' at the surface.

Feature #: 102

Hazard Ratings: 2

This 4' by 6' vertical unlined shaft descends to a 41 foot depth. It also has cratered at the surface to a 10' by 12' hole. Some old timbers still bridge across the shaft.

AAAAAAAAAA

Site #: 12-10-467/4324-1.100

Site Name: Lucky Boy Mine

Hazard Rating: 2

Description and pertinent facts: This site is centered 4,000 feet east of Tappan Mountain about 1.5 miles up an unnamed Forest access road from County Road 77. Three shafts, two adits, and two prospect pits were inventoried. Many other prospect pits and trenches are scattered in the area. The main shaft, feature #100, is immediately adjacent to the road. The 8' by 8' shaft has cratered at the

Gaps in the debris shows that the shaft is still open to an unknown depth. Standing water in the shaft was at 15 feet. A poorly maintained wire fence surrounds the shaft. The hole has started to crater beyond the fence line.

[illegible]

Quad name: McCurdy Mountain

Site #: 12-10-457/4332-1.100,101

Site Name: Unknown, south of Spring Gulch

Hazard Ratings: 2

Description and pertinent facts: This inventory area is centered 2,000 feet south of Spring Gulch. The site is accessed by Forest Road 214. An unmarked road with a USFS road closure sign forks off of FR 214 to the south. This track passes feature #100, an adit marked on the McCurdy Mountain quadrangle map. The adit is within 50 of the road. The adit is still open to an unknown depth beyond 50 feet. The adit has a side drift that forks off at about 25 feet. Feature #101 is southeast, across the hill, from #100. This feature is an open dangerous shaft. The shaft has opened at the surface to an unstable 9' by 11' crater with unstable edges. The shaft was measured to a depth of 40 feet. This shaft was brought to our attention by USFS personnel.

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Site #: 12-10-457/4335-1.100

Site Name: Bradley Peak area

Hazard Rating: 2

Description and pertinent facts: This site is rather remote and does not have a public vehicular access. It was still given a hazard rating of 2 because it is a 4.5' by 6.5' vertical prospect shaft that descends to a measured depth of 17 feet. The site is 1700 feet from County Road 77 on the southeastern flank of Bradley Peak.

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Site #: 12-10-458/4330-2.101

Site Name: Unknown, northwest of Tarryall

Hazard Rating: 2

Description and pertinent facts: Feature #101 is one of three mine sites within this inventory area. The site is 2000 feet northwest of the homes in Tarryall. The mine is an inclined prospect shaft. The shaft has a 4' by 8' timber collar but the hole is beginning to crater outside the cribbing and undermining it. The shaft was measured to a depth of 23 feet.

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Site #: 12-10-458/4332-1

Site Name: Unknown, south of Spring Gulch near County Road 77.

Hazard Rating: 2

Description and pertinent facts: This inventory area contains two shafts. The site is 0.6 miles south of the Twin Eagle Picnic Area, centered 1,500 feet south, from the curve of County Road 77. The mine sites are accessed by a dirt track not shown on the quadrangle map. Both mines are dangerous intact prospect shafts.

Feature #: 100

This mine is 200 feet east of the unmarked 4WD road that runs north to where Spring Gulch meets County Road 77 and Tarryall Creek. The shaft has partially cratered at the surface. Depth was measured at 18 feet.

Feature #: 101

Cratered at the top 3 feet to an 11-foot diameter hole, this 5' by 7' hole descends vertically to a total depth of 20 feet. The mine is about 750 feet from the dirt track and 1,200 feet from CR 77.

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Site #: 12-10-458/4336-1

Site Name: Bearcat Mines

Description and pertinent facts: The Bearcat Mines are marked on the McCurdy Mountain map. The inventory area included other sites to the south of the marked mine. The majority of the workings were large trenches. Also inventoried were one shaft, an adit, and a stope associated with the adit. An old mine access road, marked as Forest Road 218, runs to the mines. Public vehicular access is prevented by locked gates at the private property in the bottomlands adjacent to Tarryall Creek.

Feature #: 100

Hazard Rating: 2

Feature #100 is a prospect shaft 2,300 feet south of the marked Bearcat Mine location on the map. The dump is easily seen because the area has been clear-cut logged. The shaft has cratered at the surface to a 13-foot diameter hole with unstable edges. Below the cratering of the upper 5 feet, the 4' by 5' shaft descends vertically to a measured depth of 26 feet.

Features #: 103, 104

Hazard Rating: 2

This site contains an adit and stope within the deeply incised trench at the Bearcat Mine location shown on the map. A trench is deeply cut into the hillside, as much as 27 feet deep with vertical sides. Where it ends a shallower trench begins. On this shallower trench there are two holes that have opened to narrow underground workings, feature #103, along the same trend as the deep trench.

An adit, feature #104, was probably advanced from the bottom of the deep trench and stoped upwards. Evidence of this adit is buried under slough material from the trench. The holes on top, one 2' by 1.5' and the other 2.5' by 1.5' reveal a linear, timber supported, drift; 1.5 feet wide, 25 feet deep, and 50 feet or so long.

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Site #: 12-10-458/4337-1.100

Site Name: Unknown, north of Bearcat Mine inventory area.

Hazard Rating: 2

Description and pertinent facts: This site includes shafts and one prospect adit that was marked on the USGS PP 608-B. The site is centered 4,000 feet north of the Bearcat Mines inventory area center. There is an old mine trail that begins from Bearcat Mines to the site. All of the shafts have

collapsed and filled except for feature #100. This shaft still has a 5.5' by 5.5' timber liner near the surface. One side of the liner has begun to fail and the surface has cratered to a 13-foot diameter hole. The shaft has filled to a 16-foot depth. The lower 10' of shaft is near vertical in rock.

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Site #: 12-10-459/4334-1.107

Site Name: Unknown, east of Twin Eagles Picnic Area

Hazard Rating: 2

Description and pertinent facts: This inventory area lies just across the footbridge from the Twin Eagles Picnic Area. The site is accessed by Forest Trail 607 and an old mine road that passes through private property. Nine shafts and a prospect pit were inventoried in this area on February 3, 1995. All but one are in various degrees of collapsed. Some are still open but were given hazard ratings below 2. Only one site, feature #107, was given a hazard rating of 2. The site is a prospect shaft that descends vertically 15 feet. While not very deep, the hole sides are sheer and vertical such that one could not get out if they fell in. The feature is within 60 feet of the road.

[illegible]

Quad name: Elevenmile Canyon

Site #: 12-10-461/4319-1

Site Name: Unknown

Description and pertinent facts: This inventory area is centered 0.9 miles west from the intersection of County Road 92 and Forest Road 90. Ten shafts and one adit were inventoried along 3,000 feet of hillslope parallel and immediately adjacent to Forest Road 90. Many of the mine dumps can be seen from the main road. A forest/mine access road runs up to the top of the hill that passes very close to some of the holes. Two additional open shafts also occur on private property.

Feature #: 100

Hazard Rating: 1

This shaft is only 200 feet from FR 90. The intact unlined 5' by 5' shaft descends vertically to 22 feet. At the surface the shaft has cratered to an 11' by 15' hole with unstable edges.

Feature #: 101

Hazard Rating: 2

Shaft #101 is also about 200 feet from the road but higher up on the slope in relation to the road, as the road moves down into the steeper draw. The intact unlined 5' by 6' shaft drops vertically to a depth of 28 feet.

Feature #: 102

Hazard Rating: 2

This shaft has the largest dump of the mines inventoried at this site. The depth was measured to 48 feet. A 4' by 7' timber liner begins at 22 feet. The surface has cratered badly to a 16' by 19' hole with unstable crumbly edges.

Feature #: 104

Hazard Rating: 1

Cratering has occurred at this shaft forming a 12' by 16' wide hole within the mine dump. At the 4 foot depth the 4' by 8' unlined shaft enters bedrock and descends 19 feet. This mine feature was given a rating of 1 because of its close proximity to a forest access road at the top of the hill.

Feature #: 106

Hazard Rating: 2

This feature is a shaft that inclines 15° from vertical. The 5' by 5' unlined shaft has cratered badly at the surface to a 15' by 16' wide hole. The depth was measured at 37 feet.

Feature #: 107

Hazard Rating: 1

Feature #107 is right next to the same road as #104, but located 1,300 feet to the west. The 5' by 5' unlined shaft descends to a measured depth of 20 feet. The top 5 feet in soil and dump material has cratered to an 8' by 11' opening. As with #104 this mine was given a rating of 1 because of its proximity to the road.

Feature #: 108

Hazard Rating: 2

No. 108 is farther down the slope from #107 about equidistant from the upper access road and the

main FR 90. This unlined 3' by 6' shaft was measured at a depth of 21 feet.

△△△△△△△△△△

Site #: 12-10-462/4309-1

Site Name: Springer Gulch area, Park Co. claim # 18827

Description and pertinent facts: This inventory area is accessible from Forest Road 246 via County Road 92 to a 4WD dirt track that does not show on the map. This site was patented at one time but deeded back to the Forest Service. Six shafts were inventoried at this site. There are old mine cabin and foundation remains at the site. The site is also easily accessible by hiking from Springer Gulch Campground 3,500 feet away.

Features #: 100

Hazard Rating: 2

This feature is a shaft next to the foundation remains of the blacksmith shop as shown on the claim plat. The shaft is 4' by 7' in rock but has cratered at the top 4 feet to a 17-foot diameter hole at the surface. The measured depth was 18 feet.

Features #: 101**Hazard Rating: 2**

This shaft is right next to the access 4WD track. The shaft was measured to 17 feet where recent trash has either bridged or is on the bottom of the hole. A 3.5' by 6.5' timber liner exists from 5 feet to 11 feet below grade. The shaft has cratered, above the liner, to an 11-foot diameter hole at the surface. An old wood ladder still descends into the shaft.

Features #: 104

Hazard Rating: 2

Feature #104 is also a shaft, situated halfway between the 4WD track and the old cabin remains. The shaft portal has cratered forming a 9' diameter hole at the surface. Once in competent rock the unlined 4' by 7' shaft descends to a measured depth of 23 feet.

^ ^ ^ ^ ^ ^ ^ ^ ^

Site #: 12-10-463/4312-1.100

Site Name: Unknown

Hazard Rating: 2

Description and pertinent facts: This inventory area includes only one mine feature -- a shaft. The site is accessible by Forest Road 251 from County Road 92. The site is just off FR 251.1B about 400 feet north of the road intersection with FR 251 and 500 feet south of gated private property. The shaft declines 48° from horizontal. The 4' by 8' unlined shaft is partially bridged 12 feet down by an old refrigerator, leaving a 2' by 3' hole past it to a depth exceeding 30 feet.

[illegible]

Quad name: Lake George

Site #: 12-10-469/4308-1

Site Name: Blue Mountain

Hazard Rating: 2

Description and pertinent facts: Blue Mountain is located 3.5 miles south of Lake George. The site is accessed by the Blue Mountain Road (FR 61) which turns off of Elevenmile Canyon Road (FR 96). Three shafts and one adit were cataloged in the inventory area. Several prospects were also investigated along the flanks of the mountain. The main mine is a tunnel, feature #100, which is about 700 feet away from Blue Mountain Road. An overgrown mine road goes to the site.

Features #: 101

Hazard Rating: 2

Above the tunnel portal, about 120 feet upslope a shaft exists. Probably a raise from the tunnel because there is no dump at the shaft opening. This 3' by 3.5' hole descends over 70 feet to the tunnel level. A barbed 4-wire fence encircles the raise opening which provides some access deterrence.

Features #: 102

Feature #102 is a shaft that was reported to the Survey by USFS personnel a few hundred feet north of the main tunnel and feature #101. The shaft was reportedly open and dangerous. The feature was searched for, but not found in the forested area.

[illegible]

PIKE/SAN ISABEL NATIONAL FOREST --SOUTH PARK RANGER DISTRICT

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USFS-ABANDONED MINED LAND INVENTORY PROJECT

SOUTH PLATTE RANGER DISTRICT

SUMMARY REPORT

January 4, 1993

USFS-ABANDONED MINED LAND INVENTORY PROJECT / SUMMARY REPORT

SOUTH PLATTE RANGER DISTRICT

Introduction

This document summarizes the sites *of concern* to the USFS - South Platte Ranger District. It does not include all the mine sites visited during the inventory of the district. The Summary Report includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3) or sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2). The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. We recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

NUMERICAL SUMMARY:

- 36** field forms
- 57** mine openings inventoried (includes collapsed or filled openings)
- 32** mine dumps, tailings piles, highwalls, etc.
- 16** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 1
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 3
 - Number of features with EDR of 4 = 12
 - Number of features with EDR of 5 = 73
- 27** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 6
 - Number of features with PHR of 3 = 21
 - (There is no rating of 4)
 - Number of features with PHR of 5 = 62

**USFS-ABANDONED MINED LAND INVENTORY PROJECT / SUMMARY REPORT
SOUTH PLATTE RANGER DISTRICT**

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site #	EDR
1) Iron Clad Claims-Geneva Creek /Josephine Creek Bog Iron Deposits	Montezuma	12-11-429-4380-2.300 and 12-11-430-4379-1.300	1
2) Revenue Mountain Drainage-Baltic/Revenue Mine	Montezuma	12-11-430-4380-1.300	2
3) Upper N. Fork S. Platte River / Hall Valley-Whale & Missouri Mines	Montezuma	12-11-427-4374-1.300	3
4) Sill Mine	Montezuma	12-11-428-4380-1.300,302	3
5) Northeast of Lininger Lake, Gem (Jim) Dandy Claim	Jefferson	12-11-433/4367-1.102,202	3

The priority sites listed here exhibit environmental degradation related to mining. Certain areas within the North Fork of the South Platte River watershed exhibit degraded water quality where no mining or very limited mining has taken place. The hydrothermally altered geologic terrane appears to naturally be causing increased acidity and elevated metal concentrations in surface waters of these areas. **Areas exhibiting this "natural degradation" are not listed in the above priority sites.** In addition, some of the sites listed above may have a significant component of natural degradation in addition to mine-generated degradation.

A priority listing of sites exhibiting physical hazards is not given because only two mine features were rated as dangerous (Hazard Rating=2) in this district. They are described on page 15.

**USFS-ABANDONED MINED LAND INVENTORY PROJECT / SUMMARY REPORT
SOUTH PLATTE RANGER DISTRICT**

Sites Exhibiting Environmental Degradation

Quad Name: Jefferson

Site ID#: 12-11-430-4370-1.300

Site Name: Handcart Gulch-water sample

Environmental Degradation Rating: 2

Description and pertinent facts: This full-suite water quality sample was taken from Handcart Gulch approximately 600 feet above its confluence with the North Fork South Platte River. The sample was taken on 7/29/92 from an estimated flow of 15 cfs with a recorded pH of 3.5 and measured conductivity of 500 uS. At this locality, visible orange precipitates are abundant in the stream bed. Analysis of this preserved and filtered water sample reveals elevated levels of the following metals in this portion of Handcart Gulch:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Class 1 Aquatic Life</u>	
Cadmium	0.52 ug/L	1.30	X
Copper	170 ug/L	34.0	X
Iron	13000 ug/L	13.0	X
Zinc	190 ug/L	3.80	X

The cause of large volume acid-metal drainage in Handcart Gulch is natural drainage from highly fractured, sulfide-rich rock mantles which blanket the slopes of Red Cone Peak. Surface and groundwater are degraded by the initial oxidation of iron sulfide controlled by Reaction 1 (see next page). This reaction is propagated by the extremely large available surface area of sulfide exposed to natural waters in the Red Cone rock mantles.

Large volume of acid-metal laden water which emerges from private claims on the east side of Handcart Gulch is related to two large faults which transect Red Cone Peak and cross the valley in this vicinity (see geologic map). Prospect adits driven into these fault zones do not effectively increase flow rates from these structural features.

Additional acid generation is realized as free ferrous iron in surface waters is further oxidized to ferric iron by the action of bacteria in the extensive bog-iron deposits accumulating in the valley floor. The reaction responsible for this second phase of acid generation is shown on the following page (Reaction 2).

Quad Name: Montezuma

Site ID#: 12-11-427-4374-1.300

Site Name: Upper N. Fork S. Platte River/Hall Valley-Whale & Missouri Mines

Environmental Degradation Rating: 3

Description and pertinent facts: This full-suite water quality sample taken from N. Fork S. Platte River in Upper Hall Valley, immediately below Missouri/Whale mine complex. This area was extensively mined for silver/base metals prior to 1900. All mine workings are currently inaccessible. Direct mine drainage was observed emerging from a recent exploration tunnel driven in below the historic Whale Mine workings, and from the lower portal of the Missouri Mine. The old workings of the Whale Mine appear to be above the water table at this time. This sample was collected to monitor off-site migration of metals from these mines. Sample was collected from wetlands below the Missouri Mine. At the time of site-visit on 7/23/92, recorded pH was 6.5 with a conductivity of 100 uS. Analysis of filtered-preserved water samples shows elevated levels of one metal:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Class 1 Aquatic Life</u>
Copper	21.0 ug/L	4.20 X

The portal below the historic Whale workings was sampled 8/90 and reveals elevated levels of: aluminum, cadmium, copper, iron, manganese, and zinc. The Missouri Mine complex was sampled also 8/90 and shows elevated levels of: copper and zinc. Currently, a strong wetland immediately adjacent to the Missouri Mine is responsible for an 80 % reduction in total copper.

Quad Name: Montezuma

Site ID#: 12-11-428-4374-1.300

Site Name: Upper Handcart Gulch/Webster Pass-Red Cone

Environmental Degradation Rating: 3

Description and pertinent information: This full-suite water quality sample collected at junction of two upper tributaries of the headwaters of Handcart Gulch, immediately above extensive, privately held mining claims laid out in the valley bottom. This stream drains Handcart Peak, Webster Pass, and Red Cone. Mining in this basin has been limited to placering of the large bog-iron deposits on the valley floor. Historically, native copper was panned out of these bog deposits and erroneously reported as "red gold". Visible degradation is limited in this area to minor iron oxide staining in the stream bed. At the time of the site-visit on 8/6/92, an estimated flow of 3 cfs had a recorded pH of 3.8 and a conductivity of 100 uS. Analysis of filtered & preserved water sample shows elevated levels of these metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Class 1 Aquatic Life</u>
Cadmium	0.44 ug/L	1.10 X
Copper	5.00 ug/L	Threshold
Iron	5600 ug/L	5.60 X
Zinc	120 ug/L	2.40 X

Quad Name: Montezuma

Site ID#: 12-11-428-4380-1.300,302

Site Name: Sill Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The main adit of the Sill Mine is currently collapsed and is not draining any water. The surface flow of Upper Geneva Creek, which heads high on the northeast slopes of Santa Fe Peak, is somewhat degraded as it enters the Sill Mine site. This degradation is undoubtedly caused by sulfide mineralization in contact with groundwater in the upper mine workings of the Silver Wave mine on Santa Fe Peak. Surface flow estimated at less than 0.1 cfs in upper Geneva Creek had a recorded pH of 5.5 and a conductivity of 100 uS, in the vicinity of the Sill Mine, as of 8/7/92. Immediately adjacent to the collapsed portal of the Sill Mine, this reach of Upper Geneva Creek becomes groundwater near the main mine dumps. Some 900 feet to the east of the Sill Mine, a point of strong groundwater emergence is noted at the base of an extremely large slope of rock-mantle or talus. Flow rate estimates as of 8/7/92 for this groundwater were 0.75 cfs with a recorded pH of 4.3 and conductivity of 100 uS. It is not known at this time if there is communication between this groundwater and that in the vicinity of the Sill Mine. Increased flow rates and acidity in areas of no disturbance from mining suggest a substantial component of groundwater influx effecting water quality. No water quality sample collected this site.

Quad Name: Montezuma

Site ID#: 12-11-429-4380-2.300 and 12-11-430-4379-1.300

Site Name: Iron Clad Claims-Geneva Creek/Josephine Creek Bog Iron Deposits

Environmental Degradation Rating: 1

Description and pertinent facts: The Geneva Creek/Josephine Creek bog iron deposits are naturally forming iron sediments precipitated most likely by the action of bacteria in organic material on the valley bottom. Acidic metal laden waters have deposited iron and manganese oxides, and possibly native copper, in these bog deposits. Site visits on 8/20/92 and again on 9/15/92 revealed surface and groundwater of pH 3.4-3.9 with conductivities of 600-700 uS, draining over an extensive area of this 100 acre private inholding. A full-suite water quality sample collected from the northernmost bog deposit complex (2.300-Geneva Creek) was taken from groundwater flow emerging from a test hole drilled into the northern bog deposit. This reach drains the northeast slopes of Santa Fe Peak. The full-suite water quality sample collected from the south bog complex (1.300-Josephine Creek) was taken from surface flow. Josephine Creek heads on the east slopes of Sullivan Mountain. In both samples pH and conductivity were similar. Water quality degradation is assumed to be related to a combination of mining and natural components. Analysis of these samples is as follows:

Sample:429-4380-2.300:

Metal Concentration

Cadmium	8.60	ug/L
Chromium	32.0	ug/L
Copper	660	ug/L
Iron	100	mg/L
Manganese	4100	ug/L
Nickel	130	ug/L
Zinc	1500	ug/L

Factor Above Colorado Basic

Standard for Class 1 Aquatic Life

21.5	X
1.28	X
132	X
100	X
4.10	X
2.60	X
30.0	X

Sample:430-4379-1.300:

Metal Concentration

Aluminum	33.0	mg/L
Cadmium	13.0	ug/L
Copper	140	ug/L
Iron	31.0	mg/L
Lead	6.0	ug/L
Manganese	3100	ug/L
Nickel	75.0	ug/L
Zinc	1700	ug/L

FactorFactor Above Colorado Basic

Standard for Class 1 Aquatic Life

330	X
32.5	X
28.0	X
31.0	X
1.50	X
3.10	X
1.50	X
34.0	X

Quad Name: Montezuma

Site ID#: 12-11-430-4375-1.300

Site Name: Upper Buno Gulch

Environmental Degradation Rating: 3

Description and pertinent information: This full-suite water quality sample was collected from the left-hand upper tributary of Buno Creek, which shows visible signs of degradation. This reach drains the northeast slope of Red Cone and a section of the Continental Divide, both of which have seen no impact from mining to date. This fact would elicit suggestions for the use of Upper Buno Creek as a likely area for baseline chemical studies of natural water quality degradation in an area of mineralization and subsequent impacts of historical mining. The right-hand tributary of Upper Buno Creek shows no sign of current metal transport or acidity. The impact on the left-hand tributary of Upper Buno Creek is assumed to be attributable to acidity and dissolved metals acquired by groundwater in contact with mineralized fractures and/or shear-alteration zones in the vicinity of Red Cone. A site-visit on 9/10/92 revealed a pH of 5.5 with a conductivity of 0 uS for this reach. Analysis of water samples show elevated levels of these metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Over Colorado Basic Standard for Class 1 Aquatic Life</u>
Aluminum	1300 ug/L	13.0 X
Cadmium	0.4 ug/L	Threshold
Copper	13.0 ug/L	2.60 X
Zinc	87.0 ug/L	1.74 X

Quad Name: Montezuma

Site ID#: 12-11-430-4380-1.300

Site Name: Revenue Mountain Drainage-Baltic/Revenue Mine

Environmental Degradation Rating: 2

Description and pertinent facts: This full-suite water quality sample was taken from surface flow on drainage from Revenue Mountain, immediately above the point where this reach crosses Forest Road 119. This tributary of Geneva Creek drains the south slopes of Revenue Mountain. At the time of site-visits on 8/5/92 and again on 9/15/92, this drainage was observed to originate from ground water seeps which most likely have their origin in the vicinity of extensive workings of the Baltic/Revenue mines high on the slopes of Revenue Mountain. The Baltic/Revenue mine was initially developed by a vertical shaft located on the Continental Divide and subsequently by the Britannic Tunnel, which is now inaccessible. Mine maps show extensive stoping on the Baltic vein below the level of the Britannic Tunnel (12,125 ft.) in the vicinity of this headwaters of this reach. Recorded pH of this surface flow is 4.5 with a conductivity of 100 uS. Water degradation of this reach is assumed to be related to residence time of waters in the Baltic/Revenue mine workings controlled by fluctuations in the water table. Analysis reveals elevated levels of the following metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Class 1 Aquatic Life</u>
Aluminum	3400 ug/L	34.0 X
Cadmium	3.00 ug/L	7.50 X
Copper	83.0 ug/L	16.6 X
Manganese	2500 ug/L	2.50 X
Zinc	680 ug/L	13.6 X

Quad Name: Montezuma

Site ID#: 12-11-433-4379-1.300

Site Name: Geneva Creek just above confluence of Smelter Gulch

Environmental Degradation Rating: 2

Description and pertinent facts: This full-suite water quality sample taken from Geneva Creek just above the confluence of Smelter Gulch. Flow was estimated at 4 cfs at the time of site visit on 8/20/92. Recorded pH at that time was 3.3 with a conductivity reading of 200 uS. This sample was taken from visibly degraded water, characterized by orange precipitates in suspension and in the stream-bed, to monitor downstream migration of metals from Upper Geneva Basin. Sample location is approximately 2 miles down watershed from currently forming bog iron deposits in Upper Geneva Basin. Analysis is as follows:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Over Colorado Basic Standard for Class 1 Aquatic Life</u>
Cadmium	2.10 ug/L	5.25 X
Copper	53.0 ug/L	10.6 X
Iron	2900 ug/L	2.90 X
Manganese	1200 ug/L	1.20 X
Zinc	410 ug/L	8.20 X

Quad Name: Montezuma

Site ID#: 12-11-435-4375-1.300

Site Name: Lower Buno Gulch

Environmental Degradation Rating: 3

Description and pertinent information: This full-suite water quality sample collected from Buno Gulch at the point of termination of vehicular access into the upper valley. Water pH and conductivity recorded at the time of site visit on 8/26/92 were 8.2 and 0 uS respectively. Analysis of water sample reveals elevated levels of cadmium, as shown below.

<u>Metal</u>	<u>Concentration</u>	<u>Factor Over Colorado Basic Standard for Class 1 Aquatic Life</u>
Cadmium	0.9 ug/L	2.25 X

Quad Name: Mount Evans

Site ID#: 12-11-436-4375-1.300

Site Name: Geneva Park Campground-Geneva Creek

Environmental Degradation Rating: 3

Description and pertinent facts: This full-suite water quality sample taken from Geneva Creek, above confluence with Duck Creek, in the vicinity of Geneva Park Campground. Estimated flow recorded on 8/28/92 was 6 cfs with a pH of 5.1 and a conductivity of 100 uS. Water is visibly of good quality and no stream-bed precipitates were observed. However, analysis of this sample reveals elevated levels of the following metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Class 1 Aquatic Life</u>
Cadmium	1.50 ug/L	3.75 X
Copper	24.0 ug/L	4.80 X
Iron	1100 ug/L	1.10 X
Zinc	210 ug/L	4.20 X

Quad Name: Mount Logan

Site ID#: 12-11-437-4367-1.300

Site Name: N. Fork S. Platte River @ US Highway 285

Environmental Degradation Rating: 3

Description and pertinent facts: This full-suite water sample was collected from the North Fork South Platte River just above the confluence of Kenosha Gulch. The sample was taken on 7/23/92 with an estimated flow of 13-15 cfs. The recorded pH at this time was 5.7 and conductivity was low at 100 uS. Precipitates of iron are still observable in the stream-bed but are somewhat diminished compared with concentrations up-watershed. Only one metal in this sample exceeds Colorado Basic Standards for Class 1 Aquatic Life:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Class 1 Aquatic Life</u>
Copper	12.0 ug/L	2.40 X

Sites Exhibiting Physical Hazards

Quad Name: Montezuma

Site ID#: 12-11-426-4374-2.102

Site Name: Upper Hall Valley/Prospects

Hazard Rating: 2

Description and pertinent information: This exploration tunnel is over 100 feet long and is currently open-standing without access deterrents. Portal of excavation is in unconsolidated overburden and/or fractured bedrock and recent collapses are evident. Initial timber sets have been exposed by sloughing of material at tunnel entrance. This mine is located just below the main Upper Hall Valley jeep road and is quite accessible to the curious. This tunnel should be properly safeguarded by backfill mine closure techniques.

Quad Name: Montezuma

Site ID#: 12-11-428-4380-1.101,102

Site Name: Sill Mine

Hazard Rating: 2

Description and pertinent facts: Two minor exploration tunnels which are associated with the Sill Mine complex are currently open-standing and pose a physical hazard to site visitors. The main mine workings of the Sill Mine are naturally collapsed and are inaccessible at this time. The two hazardous excavations in question are located less than 50 feet in elevation above the mine site and immediately adjacent to the Upper Geneva Basin jeep road. Both excavations are driven into unstable looking ground which show signs of possible collapse. The tunnels are both over 50 feet deep and could contain bad air as well as the obvious physical hazards. Both of these features should be properly backfilled as this area is popular with users of recreational vehicles.

USFS-ABANDONED MINE LAND INVENTORY PROJECT

SOUTH PLATTE RANGER DISTRICT

ADDENDUM to the SUMMARY REPORT

by Matthew A. Sares

COLORADO GEOLOGICAL SURVEY

January 11, 1995

USFS-ABANDONED MINE LAND INVENTORY PROJECT
SOUTH PLATTE RANGER DISTRICT
ADDENDUM to the SUMMARY REPORT

This document summarizes **additional sites** *of concern* to the USFS - South Platte Ranger District which were inventoried during the 1994 field season. (Previously, a Summary Report dated January 4, 1993 was transmitted to the USFS) During our investigation of mining in the South Park Ranger District we found and inventoried additional sites within the South Platte Ranger District. Most of these sites are on the Jefferson 7.5' quadrangle north of Kenosha Pass and south of Hall Valley. One site is near the Custer Cabins on the Hackett Mountain 7.5' quadrangle.

This addendum does not include all the newly inventoried mine sites. Just as the Summary Report, it includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3) or sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2). The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. We recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
SOUTH PLATTE RANGER DISTRICT
ADDENDUM TO THE SUMMARY REPORT**

Sites Exhibiting Environmental Degradation

Quad Name: Jefferson

Site ID#: 12-11-433/4367-1.102 & 202

Site Name: Northeast of Lininger Lake, Gem (Jim) Dandy Claim

Environmental Degradation Rating: 3

Description and pertinent facts: This mine feature is an open pit trench excavation for uranium-bearing ore. The trench is approximately 250 feet long and 25 feet wide, with variable depth, 12 feet deep at its deepest. Radiometric scintillometer readings in the trench range up to 3100 counts per second (cps) which is at least 31 times background radiation (70-100 cps). Readings of dump material spread in several small piles around the trench range from 300-1000 cps. Nelson-Moore, et al (CGS Bull.40, 1978) states that 372 tons of uranium ore had been mined from this location at a grade of 0.21% U_3O_8 and 0.01% V_2O_5 . No concentrating of ore was done here, so this is a naturally occurring radioactive site. As such, little can be done to mitigate the radioactivity at this location. Signs could be posted about the radioactive nature of the site and the trench could be backfilled with the surrounding dump material. This would make the site less curious to visitors and minimize any collection of water in the trench during storm events and Spring snowmelt. The mine site is less than 0.2 miles east of FR-124, and less than 0.4 miles northeast of Lininger Lake, which has a number of (about 30) seasonal cabins around it.

Sites Exhibiting Physical Hazards

Quad Name: Hackett Mountain

Site ID#: 12-11-471/4330-1.100

Site Name: Custer Cabin Area

Hazard Rating: 2

Description and pertinent information: This is an intact prospect adit about 0.2 miles southwest of the Custer Cabins (mouth of Metberry Gulch with the South Platte River). The adit extends about 25 feet back into the hill. Sloughing of unconsolidated material into the portal has restricted the opening to 3 x 4 feet. The area contains informal camping grounds and these are immediately adjacent to the adit, causing an increased level of public interaction with this mine, thus a Physical Hazard Rating = 2. An additional concern is that the floor of the adit is covered with garbage from campers. This adit should be backfilled or capped. Forest Road 205 leads to the site and provides decent access for construction vehicles.

Quad Name: Jefferson

Site ID#: 12-11-431/4367-1.100

Site Name: Northwest of Lininger Lake

Hazard Rating: 2

Description and pertinent information: This shaft is over 17 feet deep; timed rock drops indicate the full depth is approximately 30 feet. The shaft collar measures 4 x 4 feet. The shaft is easily accessed by foot on a barricaded 4WD road (old mine access road) and is less than 0.2 miles from FR-123. This shaft should be backfilled.

Quad Name: Jefferson

Site ID#: 12-11-433/4367-1.103

Site Name: Northeast of Lininger Lake

Hazard Rating: 2

Description and pertinent information: This is a deep shaft with a cratered ground surface opening of 16 x 14 feet which narrows to 5 x 6 feet at about 10 feet below grade. This was probably a fluorite prospect shaft. A loose 2-strand barbed-wire fence is around the shaft as an access deterrent, but is relatively ineffective and could eventually become a hazard itself. Colluvium around the shaft collar is subject to further erosion and could prove unstable. The shaft is only 0.4 miles from FR-124. This shaft should be capped and the site has relatively good access for construction equipment.

USFS ABANDONED MINE LAND INVENTORY PROJECT

SUMMARY REPORT

RIO GRANDE NATIONAL FOREST--CONEJOS PEAK RANGER DISTRICT

February 23, 1995

prepared by

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Colorado Geological Survey

**USFS ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST--CONEJOS PEAK RANGER DISTRICT**

INTRODUCTION

This document summarizes the results of the 1993 field work performed in the Conejos Peak Ranger District, Rio Grande National Forest by the Colorado Geological Survey (CGS) for the USFS Abandoned Mine Land Inventory (AMLI) Project. For most inventory work only those sites on or immediately adjacent to USFS land, and those on private land that cause environmental degradation to USFS lands are inventoried. However, a complete inventory of all land in the Alamosa River Basin outside of the Summitville mining district was conducted during this study to assess the relative contributions of naturally occurring degradation and mining-related degradation.

A field form was prepared for all visited mine sites, and each mine feature was assigned ratings based on both the environmental degradation and the physical hazard of the feature. Field forms were also completed for areas where only naturally occurring environmental degradation was investigated, but ratings are not given for the naturally occurring problems. Each inventory area and its associated mine features and water tests have been plotted on PBS quadrangle maps.

A brief description of the mine sites **of concern** to the USFS Conejos Peak Ranger District from both environmental degradation and physical hazards aspects are listed in this summary. The Summary Report describes all inventory areas that were assigned Environmental Degradation (ED) Ratings of extreme (1), significant (2), or potentially significant (3), and also those sites with Physical Hazard (PH) Ratings of extreme danger (1) or dangerous (2). Note that there are twenty-one additional sites with ED Ratings of slight (4) and twenty-nine sites with PH Ratings of potentially dangerous (3) within the Conejos Peak Ranger District. Mining sites that rank lower and those that contain only naturally occurring degradation, are not described in the Summary Report.

The Alamosa River drainage basin has been the subject of several previous water quality investigations and numerous on-going studies related to environmental problems at the Summitville mine. Currently available reports are described in the accompanying list of references. Analytical data contained within these references will not be repeated in this summary, except where needed for comparative purposes.

Twenty-five water samples were collected during this investigation and submitted for laboratory analysis: seventeen samples were obtained from draining adits, one was collected from a dump seep, two were collected from Iron Creek above and below the inflow from the Pass-Me-By mine, and five were obtained from naturally occurring acidic metal-rich springs (NOAMS). Several of these samples were analyzed by the Colorado Department of Health (CDH) laboratory and were paid for by USFS funds as part of the AMLI project. Other samples were analyzed for gratis by the U.S. Geological Survey (USGS), Branch of Geochemistry, while others were run by the USGS, Water Resources Division, as part of the joint USGS/CDMG/EPA investigation of the Alamosa River basin. Dissolved water samples were filtered using a 0.45 um filter, unless indicated otherwise. Most samples were tested for a variety of metals, but generally only those which exceeded the detection limits are specifically described herein. The complete analyses will be provided later with the mine inventory database.

A priority listing of the nineteen most important sites with environmental degradation (includes ratings of 1, 2, and 3) and the fifteen most important sites with physical hazards (rating of 2) is provided on page 5. Note that none of the sites within this ranger district had a PH Rating of 1. Four of the sites with ED Ratings of 2 (the Guadaloupe, Watrous, Ferrocrete, and Lower Burnt

Gulch) were only marginally more significant than the eleven sites with an ED Rating of 3. The summary descriptions, which comprise the bulk of this Summary Report, are not listed in order of priority, but rather are grouped first by quadrangle name and then by site number within the quadrangle.

Comprehensive, detailed information for all inventoried mine sites within the ranger district will be available at a later date in the digital database.

One very large, surface mining operation and five moderately large, underground mines are present within the Conejos Peak Ranger District. The Summitville mine situated in the headwaters of Wightman Fork is a very large, recently active open pit mine with associated heap leach pad. The operator of the Summitville mine has filed for bankruptcy, and the EPA has taken over the site. The mine is presently the subject of a complex CERCLA investigation and no attempt was made during this investigation to inventory the Summitville mine area.

Three of the moderately sized abandoned mines, the Pass-Me-By, Miser, and Euridice mines, are within the Alamosa River drainage basin. A fourth moderately sized mine, the Mammoth Revenue mine, is within the Conejos River drainage basin, while the fifth, the Swab mine, is located within the Sangre de Cristo Range. The Pass-Me-By mine is apparently the most significant source of iron and aluminum contamination related to abandoned mines in the district. A large quantity of water discharges from the collapsed portal of the Miser mine near Jasper, but the water, fortunately, is not severely degraded. This mine appears to contribute the greatest zinc and manganese loadings of all the sampled mining sources, yet even these loads are much less than that released by a single, nearby NOAMS on Burnt Creek. The only mill site within the Alamosa River drainage basin is associated with the Miser Mine. Mine drainage from the Miser mine portal flows into a series of beaver ponds before reaching the Alamosa River, and, based on our field tests, may be partially remediated by the beaver ponds. The Euridice mine near Stunner and the Swab mine near Tobin Creek are fair-sized mines, but neither appears to be a significant source of environmental degradation. The Pass-Me-By, Miser, and Euridice mines are situated on private lands.

The Mammoth Revenue mine was not inventoried during this investigation because it lies entirely within private lands, and it is an active, permitted mineral exploration operation. Runoff from the mine may have degraded Wayne's Creek, a small tributary to the Conejos River. The mine must meet the discharge requirements of its NPDES permit, and they have undertaken reclamation to assure that their runoff meets the requirements. A pre-permit tailings pond resultant from former activities at this site may need to be addressed by the current operator to facilitate attainment of their discharge requirements.

Naturally occurring environmental degradation is locally common within the Alamosa River drainage basin. Most natural degradation appears to be associated with unvegetated, intensely hydrothermally altered rocks that crop out in the vicinity of Lookout Mountain, Sheepshead, Elephant Mountain, and in upper Burnt Creek. Numerous NOAMS were observed and tested during this inventory project. The pH of water issuing from these NOAMS was as low as 1.4, and their conductivity was as high as 8900 uS/cm. Several of the NOAMS have built up impressive ferrosinter mounds, some of which have unique eco-systems that have adapted to the highly acidic waters.

No direct evidence of mining-related environmental degradation was observed within Alum or Bitter Creeks, which suggests that the poor quality water discharging from these watersheds is a result of naturally occurring environmental degradation. Mineral exploration drilling activities have been conducted in Alum Creek, and associated grading work may arguably contribute to the degradation in a very minor way. Mining-related pollution is present in both Iron and Burnt Creeks. Within Burnt Creek the degradation due to mining is

inconsequential compared to the naturally occurring pollution. Most metal loadings from the mining sources are only about 1% of that resulting from a single natural spring, the Burnt NOAMS. Dissolved copper loadings from the mining sources do, however, amount to 13% of that contributed by Burnt NOAMS. In Iron Creek effluent from the Pass-Me-By mine portal imparts significant loadings of iron and aluminum. The headwaters of the Alamosa River in the segment between Iron Creek and Wightman Fork are severely degraded by iron, aluminum, and to a lesser extent manganese, which are in part attributable to the Pass-Me-By mine. Metals such as copper and zinc do not become problematical in the Alamosa River until downstream of the inflow from Wightman Fork.

The greatest increase in metal concentrations and loadings in the headwaters of the Alamosa River above the confluence with Wightman Fork occurs in the segment that extends from below Iron Creek to below Alum Creek (see Table 2). Metal loadings and concentrations continue to rise in the section of the river from below the Alum Creek inflow to below the confluence with Bitter Creek, but concentrations and loads remain relatively constant in the segment downstream of Bitter Creek and upstream of Wightman Fork, based on data in USGS, CDMG, and USEPA, (1994). Wightman Fork appears to contribute the majority of the copper and zinc loadings and also adds considerably to the manganese, iron, and aluminum loadings.

Remediation of the drainage from the Pass-Me-By mine could perhaps result in significant improvement to the iron and aluminum loadings in Iron Creek and also perhaps to the Alamosa River in the section immediately below its confluence with Iron Creek, but it would have little or no effect on the river below its confluence with Wightman Fork and perhaps not even in the segment below the inflow from Alum Creek.

Based on water samples collected from other draining mines and dump seeps within this ranger district, metal loadings from these sources are relatively insignificant when compared to the metal loadings resultant from natural degradation and from the Pass-Me-By and Miser mines. Other abandoned mines within the Alamosa River basin that contribute appreciable metal loadings include the Guadalupe and Ferrocrete mines. The only abandoned mine within the Conejos River basin that contributes significantly to metal loadings in the Cranky mine, which drains into the Lake Fork of the Conejos at Big Lake. Although the Cranky mine is worthy of further investigation, it is interesting to note that the Lake Fork supports an apparently healthy population of trout and is currently proposed for a Rio Grande cutthroat trout fishery.

A conservative estimate of the maximum possible contribution of mining to the degradation of the Alamosa River above the confluence with Wightman Fork can be made if it is assumed that all dissolved metal associated with draining mines and dump seeps in the area is entirely resultant from mining and that it eventually reaches the river and stays in solution. Under this scenario the abandoned mines could be responsible for nearly 11% of the iron and almost 18% of the aluminum, but only around 1% of the copper, manganese, and zinc in the river above the confluence with Wightman Fork at the time of sampling, with the balance of these dissolved constituents being attributable to natural degradation. The relative loading due to mining probably varies seasonally and with precipitation.

USFS ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST--CONEJOS PEAK RANGER DISTRICT

SUMMARY TOTALS

TOTAL NUMBER OF FIELD FORMS = 117

NUMBER OF INVENTORIED MINE OPENINGS = 372

NUMBER OF INVENTORIED MINE DUMPS, TAILINGS PILES, AND SETTLING PONDS = 219

NUMBER OF WATER TESTS = 357

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 1 = 1

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 2 = 5

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 3 = 13

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 4 = 21

TOTAL OF 40 INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION

NUMBER OF INVENTORY AREAS WITH PHYSICAL HAZARD RATING OF 1 = 0

NUMBER OF INVENTORY AREAS WITH PHYSICAL HAZARD RATING OF 2 = 15

NUMBER OF INVENTORY AREAS WITH PHYSICAL HAZARD RATING OF 3 = 29

TOTAL OF 44 INVENTORY AREAS WITH PHYSICAL HAZARDS

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 1 = 1

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 2 = 5

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 3 = 19

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 4 = 53

TOTAL OF 78 FEATURES WITH ENVIRONMENTAL DEGRADATION

NUMBER OF FEATURES WITH PHYSICAL HAZARD RATING OF 1 = 0

NUMBER OF FEATURES WITH PHYSICAL HAZARD RATING OF 2 = 21

NUMBER OF FEATURES WITH PHYSICAL HAZARD RATING OF 3 = 57

TOTAL OF 60 FEATURES WITH PHYSICAL HAZARDS

17 HAZARDOUS FEATURES ON USFS LAND HAVE BEEN SAFEGUARDED BY THE CDMG AML PROGRAM

5 HAZARDOUS FEATURES ARE SCHEDULED FOR CLOSURE BY THE CDMG AML PROGRAM IN 1994

USFS ABANDONED MINED LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST-CONEJOS PEAK RANGER DISTRICT

PRIORITY INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATINGS OF 1, 2, OR 3

RATING 1:

PASS-ME-BY MINE: 09-03-357/4138-4; Summitville Quadrangle

RATING 2:

MISER MINE: 09-03-369/4142-1; Jasper Quadrangle
GUADALOUPE MINE: 09-03-369/4141-1; Jasper Quadrangle
WATROUS CLAIMS: 09-03-363/4138-1; Summitville Quadrangle
FERROCRETE MINE: 09-03-361/4138-1; Summitville Quadrangle
LOWER BURNT GULCH: 09-03-370/4143-1; Jasper Quadrangle

RATING 3:

EASTERN STAR TUNNEL: 09-03-361/4138-2; Summitville Quadrangle
GRAPE MINE: 09-03-361/4143-1; Summitville Quadrangle
GLOBE MINE: 09-03-360/4137-2; Summitville Quadrangle
BIG LAKE: 09-03-364/4131-1; Platoro Quadrangle
SCHINZEL FLATS: 09-03-355/4140-1; Elwood Pass Quadrangle
GILMORE MEADOW: 09-03-359/4136-1; Platoro Quadrangle
RED MOUNTAIN TUNNEL NO. 1: 09-03-362/4139-2; Summitville Quadrangle
SMUGGLER MINE: 09-03-360/4137-3; Summitville Quadrangle
LOWER ORINOCO: 09-03-361/4137-1; Summitville Quadrangle
GRANDVIEW: 09-03-362/4139-1; Summitville Quadrangle
ASIATIC MINE: 09-03-356/4137-1; Summitville Quadrangle
SHEEPSHEAD DRAINAGE: 09-03-357/4138-1; Summitville Quadrangle

PRIORITY INVENTORY AREAS WITH PHYSICAL HAZARD RATINGS OF 1 OR 2

RATING 1: NONE

RATING 2:

UPPER FISHER GULCH: 09-03-369/4134-1; Red Mountain Quadrangle
SE OF SHILLINGS SPRING: 09-03-385/4136-1; Terrace Reservoir Quadrangle
SHILLINGS SPRING AREA: 09-03-385/4136-2; Greenie Mountain Quadrangle
LOWER WILLOW CREEK: 09-03-384/4139-1; Greenie Mountain Quadrangle
TERRACE RESERVOIR" MINE: 09-03-384/4136-1; Terrace Reservoir Quadrangle
MERRIMACK: 09-03-363/4134-1; Platoro Quadrangle
SOUTH OF MOSCA GULCH #2: 09-03-456/4175-2; Mosca Pass Quadrangle
WILKER'S MINE: 09-03-367/4133-2; Red Mountain Quadrangle
SWAB MINE DISTRICT: 09-03-452/4154-1; Twin Peaks Quadrangle
WATROUS CLAIMS: 09-03-363/4138-1; Summitville Quadrangle
GRAND VIEW: 09-03-362/4139-1; Summitville Quadrangle
SMUGGLER MINE: 09-03-360/4137-3; Summitville Quadrangle
MISER MINE: 09-03-369/4142-1; Jasper Quadrangle
NORTH SIDE MOSCA CREEK: 09-03-457/4175-2; Mosca Pass Quadrangle
SOUTH MOSCA GULCH #1: 09-03-456/4175-1; Mosca Pass Quadrangle

Sites Exhibiting Environmental Degradation (only ratings of 1 to 3)

Quad Name: Elwood Pass

Site #: 09-03-355/4140-1.101

Site Name: Schinzel Flats

Environmental Degradation Rating: 3

Description and pertinent facts: Near where the jeep road up Iron Creek crosses the creek in Schnizel Flats is a collapsed prospect adit (101) which was issuing about 0.5 gpm of water that had a pH of 3.7 and conductivity of 195 uS/cm. Based on the dump size, the extent of underground workings is probably very limited at this prospect. It is likely that the low pH water represents the quality of naturally occurring ground water that happened to be intercepted by the short tunnel. The pH of Iron Creek dropped from 7.0 to 6.5 below this feature, but its conductivity slightly improved from 48 to 46 uS/cm, suggesting that the water quality in the creek is still fairly good at this location.

^^NEW QUAD^^

Quad Name: Jasper

Site #: 09-03-369/4142-1.100, 202

Site Name: Miser Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The Miser mine is located on private land across the Alamosa River from Jasper. The site includes one feature which has ED Rating of 2 (adit 100) and one with a rating of 3 (pile 202), both of which are on private land. Adit 100 was discharging 126 gpm of pH 5.9 water with a conductivity of 620 uS/cm when visited in August. The water had a strong hydrogen sulfide odor. It issued out of collapse debris about 15 feet above the approximate level of the original roof of the portal, suggesting the mine was flooded to at least this elevation. The drainage from the Miser adit (100) was sampled by Kirkham and Holm (1989) in 1986, at which time the water contained the following total recoverable metals: 0.1 mg/L of aluminum, 1.5 mg/L of iron, 0.3 mg/L of manganese, 0.01 mg/L of copper, 0.05 mg/L of zinc, and 0.02 mg/L of chromium. A sample collected in 1993 by U.S. Geological Survey (1994) contained similar metal concentrations for both total and dissolved (0.2 um filter) samples.

Water discharging from the Miser adit flows along dump 202 before entering an upper beaver pond that backs up against the dump. A plume of iron precipitate was observed in the zone where the mine drainage mixes with the water in the pond. Water seeping out of the upper beaver pond flows into a lower beaver pond before reaching the river. Water seeping out the toe of the lower beaver pond had a pH of 7.4, but its conductivity was still 639 uS/cm.

Although metal concentrations are relatively low in the mine drainage, probably because the wall rock appears to be propylitically altered, the drainage is assigned an ED rating of 2 because of the volume of water discharging from the adit, and because additional samples should be collected for analysis before conclusively assessing the environmental consequences of the drainage.

Sites Exhibiting Environmental Degradation (continued)

09-03-369/4142-1, Miser Mine (continued)

Metal loadings for the drainage from the Miser mine and for selected other mines and NOAMS in the district are shown in Table 1. Based on our data the Miser mine contributes greater loadings of zinc and manganese to the basin than does the Pass-Me-By mine, however the loadings from these metals are less than that generated by Burnt NOAMS.

Pile 202 is the only known mill tailings pile in the Alamosa River basin outside of the Summitville district. It lies on the floodplain of the river, and is exposed to erosion during periods of flooding by the river. The pile could be severely eroded should the river establish a new channel through the pile.

Quad Name: Jasper

Site #: 09-03-369/4141-1.100

Site Name: Guadalupe Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The Guadalupe mine is on private land on the south side of the Alamosa River a short distance downstream from the Miser mine. The site includes a collapsed adit (100) that drains the underground workings. When visited in August the mine drainage had a pH of 6.39, conductivity of 962 uS/cm, and flowed at 1.9 gpm. A sample was collected and submitted to the USGS for analysis. It contained the following total recoverable and dissolved metal concentrations, respectively: iron = 25 mg/L and 22.2 mg/L, aluminum = 1.6 mg/L and 0.3 mg/L, manganese = 3.3 mg/L and 3.5 mg/L, copper = 0.2 mg/L and 0.1 mg/L, and zinc = 2.4 mg/L and 2.5 mg/L (Walton-Day, 1993).

The mine drainage discharges from collapsed debris about 20 feet above the probable roof of the original portal, suggesting the mine workings are at least partially flooded. The drainage flows across dump 200 and then infiltrates into alluvium in the floodplain of the Alamosa River before reaching the river. A heavy layer of iron precipitate has been deposited by the water as it exits the collapsed debris and flows over the top of the dump.

Quad Name: Jasper

Site #: 09-03-370/4143-1.105, 206

Site Name: Lower Burnt Creek

Environmental Degradation Rating: 2

Description and pertinent facts: A number of small mines and exploration pits are found primarily on private land in Lower Burnt Creek north of Jasper. Adit 105 was discharging an estimated 1 gpm of pH 3.3 water with conductivity of 1228 uS/cm on July 7. The discharge rate was adequate to allow for the mine drainage to surface flow into Burnt Creek at that time. The site was revisited on August 31, at which time the flow rate had diminished to only an estimated 0.1 gpm. The pH was 3.1 and the conductivity was 649 uS/cm when tested during the second visit. Due to the low flow rate and the fact that it promptly infiltrated into colluvium and alluvium upon issuing out of the collapsed portal, it was not possible to measure the flow rate with our cutthroat flume. A sample collected

Sites Exhibiting Environmental Degradation (continued)

09-03-370/4143-1, Lower Burnt Creek (continued)

for laboratory analysis during the second visit contained the following respective total and dissolved metal concentrations: iron = 7.0 and 5.0 mg/L, aluminum = 6.0 and 5.0 mg/L, manganese = 0.49 and 0.46 mg/l, copper = 0.12 and 0.10 mg/L, zinc = 0.088 and 0.058 mg/L (USGS, 1994).

Water issues from the toe of dump 206. On July 7, the seep was flowing at an estimated 2 gpm, and had a pH of 5.2 and conductivity of 264 uS/cm. On August 31 the flow rate was measured at 2.6 gpm using a flume, while the pH was 4.8 and conductivity was 589 uS/cm. A sample collected for analysis and sent to the USGS contained less than 1 mg/l of total and dissolved iron, 2.0 mg/L of total and dissolved aluminum, 0.49 mg/l of total manganese and 0.46 mg/L of dissolved manganese, 0.04 mg/L of total copper and <0.04 mg/L of dissolved copper, and 0.08 mg/L total zinc and 0.07 mg/L of dissolved zinc (USGS, 1994), suggesting the dump seep is not a major source of metals.

An estimated 1.5 gpm of water with a pH of 4.6 and conductivity of 417 uS/cm was discharging from talus and/or collapse debris immediately below the portal of adit 108. The floor of the adit was damp, and there was a little water dripping off the roof of the adit. The water seeping out from the slope below the adit could be mine drainage, but it more likely is a natural spring.

Burnt Creek is severely impacted by naturally occurring degradation. The creek had a pH of 3.7 and conductivity of 1617 uS/cm above the uppermost known mine in the basin. An impressive NOAMS flowing at 18 to 25 gpm adjacent to Burnt Creek in the upper end of this inventory area has built up a large ferrosinter mound. The pH of the water issuing from the NOAMS ranged from 3.2 to 3.8 while its conductivity varied from 2040 to 2340 uS/cm. A sample of the water discharging from this NOAMS contained the following respective total and dissolved metal concentrations: iron = 75 and 72 mg/L, aluminum = 30 and 31 mg/L, manganese = 4.3 and 4.2 mg/L, 0.10 and 0.11 mg/L of cobalt, 0.054 and 0.058 mg/L of copper, and 0.72 and 0.81 mg/L zinc (USGS, 1994). Several small NOAMS were observed and tested in Upper Burnt Creek, but no evidence of mining was noted (see site 370/4146-1), suggesting that the water in the upper reaches of Burnt Creek is naturally degraded.

Table 1 lists selected metal concentrations and loadings for three sources of environmental degradation in Burnt Creek. Iron, aluminum, manganese, and zinc loadings from both the draining adit and the dump seep in Burnt Gulch were at most only about 1% of the loadings from a single natural source, the Main Burnt NOAMS. The copper concentration in the drainage from adit 105 exceeded that of the Main Burnt NOAMS, yet the copper loadings due to both sampled mining sources were only 13% of the copper loadings from this NOAMS.

Burnt Creek typically loses much of its surface flow to infiltration as it crosses the large debris fan on which the town of Jasper is situated. The creek frequently is dry where it crosses FR 250. When visited in July, the creek had an estimated flow of up to 300 gpm within the bedrock canyon above the fan, but its flow rapidly diminished as it crossed the fan. A short distance below the

Sites Exhibiting Environmental Degradation (continued)

09-03-370/4143-1, Lower Burnt Creek (continued)

fan head the discharge rate of the creek was estimated at only 20 gpm, and it was completely dry where it crossed FR 250. Ground water within bedrock in the vicinity of Jasper is at least locally severely degraded, as is reported by Hamilton (1989). It would be interesting to investigate the quality of ground water within the fan alluvium to assess whether it impacts the Alamosa River.

^^NEW QUAD^^

Quad Name: Platoro

Site #: 09-03-359/4136-1.100

Site Name: Gilmore Meadow

Environmental Degradation Rating: 3

Description and pertinent facts: This site is located on USFS land near Gilmore meadow, which is accessed by the road with the locked gate that leads off of FR 250 from the base of Stunner Pass, just below where FR 250 crosses Globe Creek. The adit has been safeguarded by CDMG using a grated culvert with a PVC drain pipe. On August 6 the discharge from the pipe was measured using a cutthroat flume at 0.8 gpm. The drainage had a pH of 5.3 and conductivity of 276 uS/cm. It flowed across part of dump 200 and then entered an unnamed stream. The stream pH changed from 5.9 to 5.8 and its conductivity slightly increased from 135 to 148 uS/cm below this inflow.

A sample of water collected from this adit in 1989 by CDMG contained total recoverable concentrations of 0.9 mg/L of iron, <0.1 mg/L of aluminum, 0.5 mg/L of manganese, 0.04 mg/L of zinc, and 0.01 mg/L of nickel. Dissolved metal concentrations in the sample collected on August 6 during this investigation included 2.9 mg/L of iron, 0.1 mg/L of aluminum, 0.2 mg/L of manganese, 0.01 mg/L of copper, 0.15 mg/L of zinc, and 0.28 ug/L of cadmium.

Quad Name: Platoro

Site #: 09-03-364/4131-1.100, 103

Site Name: Big Lake

Environmental Degradation Rating: 3

Description and pertinent facts: Several abandoned mines occur near Big Lake on the Lake Fork of the Conejos River, which is a gold medal fishing stream. Two of the adits found here discharge water. The Cranky mine (adit 100) was discharging an estimated 35 gpm of pH 8.3 water with a conductivity of 139 uS/cm into Big Lake when visited in August. This adit appears to be on private land.

The drainage from the Cranky mine was issuing from recently fallen colluvial material that has buried a PVC drain pipe installed as part of the closure work done by CDMG. When sampled on September 7, 1989 by the CDMG, this mine was draining about 2 gpm of water with a pH of 6.5 and conductivity of 253 uS/cm that contained total recoverable metal concentrations 0.05 mg/L of iron, <0.1 mg/L of aluminum, 3.0 mg/L of manganese, 0.02 mg/l of zinc, 0.01 mg/L of both nickel and chromium. A sample collected during this investigation on August 30

Sites Exhibiting Environmental Degradation (continued)

09-03-364/4131-1, Big Lake (continued)

had dissolved concentrations of <0.05 mg/L of aluminum, 4.5 mg/L of iron, 2.3 mg/L of manganese, and 0.12 mg/L of zinc. Loadings of manganese and iron from the Cranky mine are appreciable, however, the Lake Fork apparently supports a healthy trout population and has been proposed for use as a Rio Grande cutthroat trout fishery.

It has been suggested that adit 100 physically connects to the underground workings at the Mammoth Revenue mine, and that the water draining from the Cranky could be actually be from the Mammoth Revenue. Available data on the extent of mining does not support this statement. Bill Payne, manager of the Mammoth Revenue mine stated that he was not aware of any interconnection of the workings at the two mines, and the chemistry of the waters in the two mines is very dissimilar. The two mines were driven into the same fault zone, hence it is possible that the water in the two mines could be hydrologically interconnected, but it is unlikely that the workings of the two mines are in direct physical contact.

Adit 103, which appears to be on USFS land, was discharging about 0.5 gpm of pH 3.7 water which conductivity of 260 uS/cm when visited on August 30. The water was ponded up behind collapse debris at the adit, but was able to seep through the collapse debris and flow across part of the dump before infiltrating into the dump about 30 feet from Big Lake. Based upon iron staining, the discharge does at times surface flow to Big Lake. Water draining from adit 103 had dissolved metal concentrations of 17.0 mg/L of iron, 5.1 mg/L of manganese, 1.5 mg/L of aluminum, 0.37 mg/L of zinc, 0.008 mg/L of copper, and 0.33 ug/L of cadmium when sampled in 1993. Although the iron, manganese, and aluminum concentrations are high, loadings are relatively low because of the low discharge rate at the time of sampling.

Since the Lake Fork of the Conejos River is considered a prime fishery, it may be worthwhile to further investigate the impact of these draining mines on water quality in this area.

^^^NEW QUAD^^^

Quad Name: Summitville

Site #: 09-03-356/4137-1.100

Site Name: Asiatic Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The Asiatic mine near Lake DeNolda includes one collapsed adit on private land that was discharging 5.8 gpm of pH 6.0 water with a conductivity of 480 uS/cm. The water was collected in a metal box with pipes leading from it, which suggests the water is being transported by the pipe for use at another location. The pipe was not followed to its end. A sample of the mine drainage was collected by Geoff Plumlee and others for analysis (USGS, 1994). It contained the following respective total and dissolved (0.2 um filter) metal concentrations: 0.84 and 0.79 mg/L of iron, <1.0 and 1.0 mg/L of

Sites Exhibiting Environmental Degradation (continued)

09-03-356/4137-1.100, Asiatic Mine (continued)

aluminum, and 0.49 and 0.42 mg/L of manganese. Other metals were below the detection threshold. This analysis is similar to the total recoverable metal concentrations reported by Kirkham and Holm (1989) for a sample collected from this mine drainage in 1986.

Quad Name: Summitville

Site #: 09-03-357/4138-1.100

Site Name: Sheepshead Drainage

Environmental Degradation Rating: 3

Description and pertinent facts: This site is situated on private land on the creek that drains the east flank of Sheepshead immediately above its confluence with Iron Creek. Adit 100 is an open tunnel that was dry when visited on 8/5/93, but had a heavy deposit of iron precipitate on its floor and in the drainage channel that leads to the creek. The creek had a pH of 3.4 and conductivity of 302 above the adit, which appears to be entirely the result of naturally occurring pollution, so even when this adit discharges water, it likely only aggravates an already degraded creek.

Quad Name: Summitville

Site #: 09-03-357/4138-4.100, 200

Site Name: Pass-Me-By Mine

Environmental Degradation Rating: 1

Description and pertinent facts: The Pass-Me-By mine is located on private land east of Iron Creek. Included within the site is a draining adit (#100) and a dump (#200) with a seep at its base. Adit 100, which is the main entrance to the Pass-Me-By mine, has collapsed shut, but an estimated 1 gpm of water with a pH of 3.2 and conductivity of 1410 uS/cm was discharging out of the collapse debris about 3 feet above the original portal floor on August 5. About 25 feet in front of the collapsed portal water was bubbling up out of dump material beneath the channel carrying the drainage which issued from the collapse debris. The water bubbling up from the dump material had essentially the same pH and conductivity as the water issuing from the collapsed debris and was assumed to represent mine drainage that was following a drain tile or pipe along the haul track.

Kirkham and Holm (1989) reported total recoverable metal concentrations for water discharging from the Pass-Me-By mine on September 16, 1986 of 151 mg/L of iron, 51.2 mg/L of aluminum, 0.34 mg/L of manganese, 0.09 mg/L of copper, 0.2 mg/L of zinc, 0.05 mg/L of molybdenum, 0.11 mg/L of nickel, 0.02 mg/L of cadmium, 0.18 mg/L of lead, and 0.03 mg/L of chromium. When we visited this site on August 11 with the USGS, the seepage from the collapsed debris had ceased (the area was damp, but there was no surface flow), but water was still bubbling up through the dump material in front of the collapsed portal. A sample of this water contained the following total recoverable and dissolved (0.2 um filter) metal concentrations: iron = 115 and 140 mg/L, aluminum = 56

Sites Exhibiting Environmental Degradation (continued)

09-03-357/4138-4, Pass-Me-By mine (continued)

and 59 mg/L, manganese = 0.33 and 0.31 mg/L, copper = 0.12 and 0.08 mg/L, zinc = 0.19 and 0.18 mg/L, cobalt = 0.11 and 0.12 mg/L, and nickel = 0.09 and 0.10 mg/L (USGS, 1994). The total concentrations reported by Kirkham and Holm (1989) and by USGS (1994) are very similar. Discharge from the Pass-Me-By mine flows down the hillslope across an impressive ferrosinter mound along which most trees have died, before it enters Iron Creek.

A small seep discharged an estimated 0.4 gpm from the toe of dump 200. The water was very acid (pH 2.5) and had high conductivity (2430 uS/cm), but the flow infiltrated into the ground a short distance below the dump. A prominent zone of dead trees and a deposit of ferricrete extends below the dump. The dump seep may have discharged greater amounts of water during the past, but it is also possible that the drainage from adit 100 may have been directed this way in former years (local landowners verbally confirmed this).

Iron Creek is degraded by naturally occurring pollution above the inflow from the Pass-Me-By mine. Major sources of degraded water include the tributary which drains the saddle between Cropsy and Lookout Mountains and the Upper Iron NOAMS. Major sources of naturally degraded water that enter Iron Creek below the inflow from the Pass-Me-By mine include the tributary which drains the east flank of Sheepshead and the Lower Iron NOAMS. Numerous other smaller sources of naturally degraded water discharge into Iron Creek throughout the entire region west and southwest of Lookout Mountain.

Iron Creek experienced a slight pH drop from 4.25 to 4.22 and an increase in conductivity from 181 to 210 uS/cm in August, 1993 as a result of the inflow from the Pass-Me-By mine. Kirkham and Holm (1989) describe total recoverable metal concentrations in Iron Creek above and below the Pass-Me-By mine inflow on September 16, 1986 as follows: aluminum increased from 2.8 to 3.5 mg/L and iron increased from 4.2 to 5.6 mg/L, but other metal concentrations remained constant and some even decreased. Dissolved water samples were collected during this inventory project on August 5, 1993 from Iron Creek above and below the inflow from the Pass-Me-By mine and submitted to the CDH for analysis (see Table 1). The dissolved concentration of iron in Iron Creek increased from 0.88 to 2.7 mg/L and aluminum increased from 1.9 to 3.0 mg/L, but manganese and zinc showed only slight increases from 0.14 to 0.15 mg/L and 0.028 to 0.030 mg/L, respectively. Other tested metals (arsenic, barium, cadmium, chromium, copper, lead, nickel, and silver) either remained constant or were below detection limits. Similarly, iron and aluminum loads in Iron Creek increased dramatically below the Pass-Me-By mine, while loadings for manganese, copper, and zinc remained constant or had slight increases.

For comparative purposes it is interesting to examine the quality of water issuing from the Upper Iron NOAMS and from the Lower Iron NOAMS to the drainage from the Pass-Me-By mine (see Table 1). On August 5, 1993 the Upper Iron NOAMS was discharging a combined flow of 6.7 gpm of pH 2.5 water with a conductivity of 2590 uS/cm. The water was analyzed by the CDH laboratory and found to contain the following dissolved metal concentrations: iron = 160 mg/L, aluminum

Sites Exhibiting Environmental Degradation (continued)

09-03-357/4138-4, Pass-Me-By mine (continued)

= 120 mg/L, manganese = 0.24 mg/L, copper = 0.99 mg/L, and zinc = 0.26 mg/L. On August 27, 1993, a day when it was raining heavily, an estimated 20 gpm of pH 2.9 water with a conductivity of 622 uS/cm was issuing from the Lower Iron NOAMS. A water sample collected from the Lower Iron NOAMS was analyzed by the USGS, which reported the following total recoverable and dissolved metal concentrations: iron = 45 and 26 mg/l, aluminum = 11 and 9 mg/L manganese = 0.86 and 0.65 mg/L, copper = <0.04 and <0.04 mg/L, and zinc = 0.17 and 0.13 mg/L. Based on these analyses, the Pass-Me-By mine contributes appreciably more iron and aluminum to the system than does either of the NOAMS; it even exceeds the combined loads from both NOAMS for these metals. The Pass-Me-By mine provides about an equal amount of zinc as do the two NOAMS, but the NOAMS are responsible for greater manganese and copper loadings.

If one assumes that all of the dissolved iron and aluminum contained in the drainage from the Pass-Me-By mine enters Iron Creek and remains in solution until the creek reaches the Alamosa River, then the iron and aluminum loadings in the mine drainage could account for 21.0 to 30.8% of the dissolved iron and 7.7 to 12.2% of the dissolved aluminum in the creek at its mouth, based on the July and October samplings of Iron Creek by the USF&WS and USEPA (1994). This estimate is, of course, a maximum amount, since part of the dissolved iron from the mine likely drops out as it passes across the ferrosinter mound actively forming between the collapsed portal of the mine and the creek, and additional iron oxides form deposits of ferroconglomerate along Iron Creek downstream from the inflow of the mine drainage.

As shown on Table 2, which was prepared using the August 10 and 11 data in the USGS, CDMG, and USEPA (1994) report, metal concentrations and loadings in the Alamosa River, particularly for iron, aluminum, and manganese, increase significantly below the inflow of Iron Creek. An even greater increase in metal concentrations and loadings occurs in the segment of the Alamosa River that extends from below Iron Creek to below Alum Creek (see Table 2). Metal loadings and concentrations continue to rise in the section of the river from below the Alum Creek inflow to below the inflow from Bitter Creek, but concentrations and loads remain relative constant between the inflows of Bitter Creek and Wightman Fork, based on data in USGS, CDMG, and USEPA, (1994). Available data suggest the inflow of Wightman Fork causes major increases in copper and zinc concentrations and loadings in the Alamosa River, and it also tends to increase the loadings and sometimes the concentrations of other metals, although the dissolved aluminum concentrations and loads for the August sampling are contrary to this trend. The headwaters of the Alamosa River between Iron Creek and Wightman Fork are severely degraded by iron and aluminum, and to a lesser extent by manganese, but it is not until below Wightman Fork that copper, zinc, and manganese become excessive.

To better understand the role of the drainage from the Pass-Me-By mine in the degradation of the upper Alamosa River, a comparison between the dissolved metal loads of Iron, Alum, and Bitter Creeks and that of the mine drainage should be

Sites Exhibiting Environmental Degradation (continued)

09-03-357/4138-4, Pass-Me-By mine (continued)

made. Analytical results and calculated loadings for samples collected by the USF&WS and USEPA (1994) in August and October at the mouths of these tributaries is shown in Table 3. Metal loads in Alum and Bitter Creeks appear to be due entirely to naturally occurring degradation, while that in Iron Creek is a result of both natural and mining-related degradation.

A worst case estimate of the relative contribution of the Pass-Me-By mine drainage upon the Alamosa River can be developed by comparing the loads in the mine drainage to the loads in the mouths of Iron, Alum, and Bitter Creeks. Under such a scenario, the dissolved iron loading in the Pass-Me-By mine drainage amounts to about 3.1 to 4.3% of the combined dissolved iron from the three tributaries. For dissolved aluminum, the Pass-Me-By mine drainage comprises around 2.8 to 3.3% of the combined loadings from the three tributaries. Dissolved manganese, copper, and zinc loadings from the mine amount to only 0.2%, 0.4 to 0.7%, and 0.6 to 1.5%, respectively, of the combined loadings from the three tributaries. A similar comparison using total metal loadings results in even lower percentages.

Another interesting comparison can be made between the dissolved metal loadings in the Pass-Me-By mine drainage and those in the Alamosa River above Wightman Fork using the data reported for August by the USGS, CDMG, and USEPA (1994). The dissolved iron loading from the Pass-Me-By mine drainage is equal to 10.5% of the dissolved iron load in the Alamosa River above Wightman Fork at station AR-45.5; for dissolved aluminum the ratio is 2.4%; for dissolved manganese it is 0.2%; for dissolved copper it is 1.2%; and for dissolved zinc it is 0.7%. If the Pass-Me-By mine drainage was eliminated as a source of metals, the loads in the Alamosa River could at best be improved only by about these amounts, and it is likely that significantly less improvement would result. Degradation of the river resulting from the inflow of Wightman Fork further diminishes the potential benefit of remediating the Pass-Me-By mine drainage.

Remediation of the drainage from the Pass-Me-By mine could perhaps result in significant improvement to the iron and aluminum loadings in Iron Creek and also perhaps to the Alamosa River in the section immediately below its confluence with Iron Creek, but it would have little or no effect on the river below its confluence with Wightman Fork and perhaps not be relevant even in the segment below the inflow from Alum Creek.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Summitville

Site #: 09-03-360/4137-2.100, 200

Site Name: Globe Mine

Environmental Degradation Rating: 3

Description and pertinent facts: Globe mine appears to be on USFS land adjacent to Globe Creek and beneath FR 250 where it heads up Stunner Pass. Adit 100 was safeguarded by CDMG using a large diameter, grated culvert with a drain pipe. The outlet end of the drain pipe has been vandalized, and rib failure beyond the culvert has buried the inlet end of the pipe, causing the mine drainage to bypass the drain pipe and flow through the culvert.

When visited in August the mine was discharging 1.5 gpm of water which had a pH of 6.4 and conductivity of 304 uS/cm. A sample of the water draining from adit 100 had dissolved metal concentrations of 0.8 mg/L of iron, 0.06 mg/L of aluminum, 1.0 mg/L of manganese, and 0.24 mg/L of zinc.

Dump 200 is adjacent to Globe Creek and has been partially removed by stream erosion. Globe Creek appears to drop in pH from 6.5 to 5.3 and increase in conductivity 128 to 389 uS/cm in the section where the drainage from 100 enters the creek and where dump 200 borders the creek. Part of the increase in conductivity may be due to an inflow from a small tributary.

Adit 101 was draining about 0.1 gpm of pH 5.6 water with a conductivity of 389 uS/cm that flows into Globe Creek. The creek appeared to improve as a result of this inflow, since its pH rose from 5.3 to 6.0 and its conductivity fell from 141 to 137 uS/cm in the section where the drainage from 101 entered the creek.

Quad Name: Summitville

Site #: 09-03-360/4137-3.101, 102

Site Name: Smuggler Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The Smuggler mine is on private land across the Alamosa River from and slightly downstream of Stunner Campground. 0.2 gpm of pH 6.1 water with a conductivity of 361 uS/cm was issuing from collapsed debris that has sealed adit 101. The mine drainage flows for only a few feet beyond the collapsed debris before infiltrating into the ground. A sample of the drainage was collected and submitted to the USGS for analysis. It had the following total recoverable and dissolved metal concentrations: 4.1 and 2.2 mg/L of iron, 0.24 and 0.13 mg/L of aluminum, and 0.34 and 0.34 mg/L of manganese (Walton-Day, 1993). Other tested metals were below the detection limit.

Shaft 102 was water-filled at a depth of 10 feet below ground level. A water test was not run on the water, because to test the water in this shaft one will need a sampling device that can reach down to the water, or they will need to physically enter the shaft.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Summitville

Site #: 09-03-361/4137-1.100

Site Name: Lower Orinoco

Environmental Degradation Rating: 3

Description and pertinent facts: The Lower Orinoco site is located along Euridice Creek above the Euridice mine. It includes a collapsed adit (#100) that appears to be on USFS land from which an estimated 1.5 gpm of pH 7.4 water with conductivity of 442 uS/cm was seeping. The water leaks out through the debris at the collapsed portal of this adit on a very steep hillside. The drainage flows down the steep hillside and directly into Euridice Creek. It was not possible to install a flume to measure the flow rate, but it might be possible to construct some type of catchment system by which the flow rate could be more accurately measured. The acidity of Euridice Creek appears to decrease in the reach where this mine inflow occurs, since the pH increases from 7.0 above the adit to 8.2 below it. Conductivity of the creek increases from 201 uS/cm above the adit to 356 uS/cm below it.

An analysis of the mine drainage indicates that the water had the following respective amounts of total recoverable and dissolved metals: 4.1 and 2.1 mg/L of iron, <0.04 and <0.04 mg/L of aluminum, 0.92 and 0.94 mg/L of manganese, and 0.02 and <0.01 mg/L of zinc when sampled on August 17 (Walton-Day, 1993).

Quad Name: Summitville

Site #: 09-03-361/4138-1.101

Site Name: Ferrocrete Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The "Ferrocrete" mine is located north of FR 250 and east of Alum Creek. The name of the mine was arbitrarily selected because the adit was originally driven into a ledge of ferricrete which probably had formed at a NOAMS. It appears to be on USFS land according to the PBS map, but is very near the boundary. When visited on August 12, 0.8 gpm of pH 4.0 water with a conductivity of 682 uS/cm was discharging from the partially open portal. The water flowed across part of dump 201 before emptying into the unnamed tributary that drains the saddle between Big Red and Little Red Mountains. Plastic pipes laying in the water on the dump were being actively encased in iron precipitate that was dropping out of solution from the mine drainage. The role of the pipe is not known for certain, but it is suggestive that someone was attempting to utilize the water for some purpose. A sample of the mine drainage was submitted to the CDH, who reported the following dissolved metal concentrations: 61 mg/L of iron, 11 mg/L of aluminum, 2.4 mg/L of manganese, 0.25 mg/L of zinc, 0.03 mg/L of nickel, and 0.79 ug/L of cadmium.

At the time of our site visit the mine drainage formed the headwater flow in the unnamed tributary. The tributary was tested where it crosses FR 250, and at that location it had an estimated flow of 1.5 gpm with a pH of 3.4 and conductivity of 439 uS/cm.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Summitville

Site #: 09-03-361/4138-2.101

Site Name: Eastern Star Tunnel

Environmental Degradation Rating: 3

Description and pertinent facts: This site is situated along the Alamosa River between the Euridice mine and Bitter Creek. It includes one collapsed adit on USFS land that was discharging 1.1 gpm of water which had a pH of 6.9 to 7.0 and conductivity of 784 to 912 uS/cm (the drainage was tested twice during this investigation). The portal of this adit, which has been informally called the "adit under FR 250", appears to have been buried by fill used to construct FR 250. Its dump appears to extend out from underneath the road fill, and the mine drainage issues from the base of the road fill. The location is fairly easy to spot, in that it is one of the few locations along this section of the road where there are highly visible remnants of mine buildings immediately below the road.

The water contains the following total recoverable and dissolved metals, according to an analysis of a sample collected on August 27 (Walton-Day, 1993): 12.1 and 17.0 mg/L of iron, 1.4 and 0.6 mg/L of aluminum, 1.1 and 1.1 mg/L of manganese, 0.03 and <0.01 mg/L of zinc, 0.011 and <0.006 mg/L of chromium, <0.05 and 0.07 mg/L of molybdenum, and <0.05 and 0.06 mg/L of lead.

Quad Name: Summitville

Site #: 09-03-361/4143-1.102

Site Name: Grape Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The Grape mine, which was formerly worked by Mr. Lucky Miles, is located along the Wightman Fork below Summitville. It appears to be on or very near the USFS boundary. The adit was discharging 0.7 gpm of pH 5.7 water with a conductivity of 277 uS/cm on August 10 when it was sampled. It was also tested on July 22, at which time a pH reading of 7.4 and conductivity of 615 was recorded. The water issues from beneath a wooden door which deters entrance into the mine, flows alongside the small dump associated with the mine, and then enters the Wightman Fork. No significant change was noted in the pH or conductivity of the creek resultant from this inflow. Dissolved metal concentrations in the water issuing from the Grape mine include 0.22 mg/L of iron, <0.1 mg/L of aluminum, 0.12 mg/L of manganese, 0.002 mg/L of copper, and 0.37 mg/L of zinc.

Quad Name: Summitville

Site #: 09-03-362/4139-1.100, 103

Site Name: Grandview

Environmental Degradation Rating: 3

Description and pertinent facts: The Grandview site is located at the west end of Government Park. It includes two draining adits (#100 and 103), both of which are on USFS land. Adit 100 discharged only an estimated 0.1 gpm of water

Sites Exhibiting Environmental Degradation (continued)

09-03-362/4139-1, Grandview (continued)

which had a pH of 6.9 and conductivity of 2060 uS/cm. Iron precipitate dropping out of the water has created a small mound with an oily scum on it. The flow was promptly infiltrating into the dump when visited, but based on the distribution of iron precipitate it may flow further at other times. It did not appear to surface flow to the river, based on the extent of the precipitate.

Adit 103 is believed to be the Queen Bird tunnel described by Patton (1917). Water was issuing from the open portal of this adit at a rate of 0.4 gpm on August 20, when it was sampled. The drainage infiltrated into dump 203 about 40 feet from the portal. The mine drainage had a pH of 5.3 to 5.5 and conductivity of 410 to 476 uS/cm (in addition to being tested in August, it was also tested during July). Walton-Day (1993) reported total recoverable and dissolved concentrations of 2.3 and 0.6 mg/L of iron, 1.0 and 0.1 mg/L of aluminum, 0.5 and 0.4 mg/L of manganese, 0.052 and 0.048 mg/L of zinc, and 0.015 and <0.001 mg/L of copper for samples submitted to her from adit 103.

Quad Name: Summitville

Site #: 09-03-362/4139-2.100

Site Name: Red Mountain Tunnel No. 1

Environmental Degradation Rating: 3

Description and pertinent facts: The Red Mountain tunnel no. 1 is situated on USFS land on the north side of FR 250 next to a prominent outcrop of weathered altered rock about a quarter of a mile upstream from the bridge on Bitter Creek. 2.3 gpm of pH 6.6 water with a conductivity of 991 uS/cm was issuing from collapse debris at the portal of this tunnel when the water was sampled on August 27. The drainage had a pH of 6.7 and conductivity of 1198 uS/cm when visited on July 20. The drainage seeps out of the collapsed debris at about the roof level of the mine tunnel, suggesting a part of the workings may be flooded. The mine drainage flows alongside the dump until reaching the floodplain of the Alamosa River, at which point it infiltrates into re-deposited dump material and alluvium. A major part of the dump associated with this mine appears to have been removed by erosion, perhaps by a surge event out of the adit.

In 1987 the water draining from the Red Mountain tunnel had total recoverable metal concentrations of 26.5 mg/L of iron, 0.6 mg/L of aluminum, 2.1 mg/L of manganese, and 0.05 mg/L of zinc, and 0.02 mg/L of nickel (Kirkham and Holm, 1989). A sample collected from this mine drainage our 1993 inventory contained total recoverable and dissolved metal concentrations of 18.6 and 17.9 mg/L of iron, 0.33 and 0.42 mg/L of aluminum, 1.58 and 1.54 mg/L of manganese, and <0.01 and 0.04 mg/L of zinc, respectively (Walton-Day, 1993). The total metal concentrations for both samplings were very similar.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Summitville

Site #: 09-03-363/4138-1.114

Site Name: Watrous Claims

Environmental Degradation Rating: 2

Description and pertinent facts: The Watrous Claims lie on the steep hillside south of the Alamosa River near Government Park. The site was named based on claim information contained in Patton (1917). A number of small mines and prospects are found within this site, including one adit (#114) with standing water within it that was assigned an ED Rating of 2, and five other adits with drainage or standing water that were rated as 4's. Adit 114 is found in a highly unusual location on the east bank of Acme creek, a perennial stream that drains the basin between Lily and Kerr Lakes on the south side of the Alamosa River. The adit is on a steep slope adjacent to an interesting 20 feet high waterfall, hence the name Watrous waterfall mine for this adit. There is a great exposure of a 10 to 12 feet wide vein in the bedrock at the portal of this adit, and there appear to be stalactites hanging off the roof of the tunnel a short distance underground. Most of dump 214 has been erosionally removed by Acme Creek.

The adit has partially collapsed shut, and when inventoried on August 20 there was standing water behind the collapse debris, but no surface flow to the creek. Based on iron precipitate found on the debris below the adit, it does surface flow to the creek at times. Standing water inside the adit had a pH of 3.1 and conductivity of 846 uS/cm. An analysis of the water by the CDH revealed dissolved concentrations of 35.0 mg/L of iron, 3.2 mg/L of aluminum, 0.47 mg/L of manganese, 1.4 mg/L of copper, 0.16 mg/L of zinc, 0.015 mg/L of lead, and 0.93 um/L of cadmium. The pH of Acme Creek slightly dropped from 7.14 to 7.06 below this adit, while conductivity slightly increased from 71 to 74 uS/cm. This site should be revisited at a time when water is discharging from adit 114.

Sites Exhibiting Physical Hazards (only ratings of 1 or 2)

Quad Name: Greenie Mountain

Site #: 09-03-384/4139-1.100

Site Name: Lower Willow Creek

Hazard Rating: 2

Description and pertinent facts: Lower Willow Creek site is located at the lower end of Willow Creek near its confluence with Cat Creek. The site includes a shaft (#100) with a PH Rating of 2 and also a prospect pit with a PH Rating of 3. Shaft 100 is water-filled at a depth of 15 feet below ground level, but its total depth is not known. It was not feasible to test the water without the use of some type of sampler that could be lowered down the shaft. Forest Road 237.1A passes within about 30 feet of shaft 100.

Quad Name: Greenie Mountain

Site #: 09-03-385/4136-2.104, 105

Site Name: Shillings Spring Area

Hazard Rating: 2

Description and pertinent facts: This site includes mine features in close proximity to Shillings Spring, two of which have PH Ratings of 2 and four that have ratings of 3. Feature 104 is a prospect pit about 20 feet deep that is located along the fence line extending northwest from the spring. Shaft 105 is water-filled at a depth of about 12 feet below ground level. Its total depth is not known. Both features 104 and 105 are scheduled to be safeguarded by CDMG during 1994, as is feature 103, which has a PH rating of 3.

^^NEW QUAD^^

Quad Name: Jasper

Site #: 09-03-369/4142-1.102

Site Name: Miser Mine

Hazard Rating: 2

Description and pertinent facts: The Miser mine is located on private land on the south side of the Alamosa River near the town of Jasper. The site includes a shaft(?) (#102) with a PH Rating of 2 and also an adit with a rating of 3. Feature 102 is located near the foundation for the mill structure. It appears to be a shaft or hand dug well that has standing water 7 feet below ground level. Total depth of the hole appears to be about 10 feet.

^^NEW QUAD^^

Sites Exhibiting Physical Hazards (continued)

Quad Name: Mosca Pass

Site #: 09-03-456/4175-1.103

Site Name: South Mosca Gulch #1

Hazard Rating: 2

Description and pertinent facts: This site is situated in a fairly remote location in a tributary to Mosca Creek southeast of Great Sand Dunes National Monument. The site includes one adit with a PH Rating of 2 and a shaft rated at 3. Adit 103 is at least 30 feet deep and is likely visited fairly frequently since it is close to the National Monument.

Quad Name: Mosca Pass

Site #: 09-03-456/4175-2.103

Site Name: South of Mosca Gulch #2

Hazard Rating: 2

Description and pertinent facts: This site lies in a tributary to Mosca Creek southeast of Great Sand Dunes National Monument. One hazardous shaft (#103) is included in the site. The shaft is about 20 feet deep, and situated on a ridge line about 0.4 miles from the heavily traveled Mosca Pass trail.

Quad Name: Mosca Pass

Site #: 09-03-457/4175-2.100, 101

Site Name: North Side Mosca Creek

Hazard Rating: 2

Description and pertinent facts: This site is found immediately north of the trail that leads up Mosca Pass, southeast of Great Sand Dunes National Monument. Two hazardous adits are included within the site (#100 and #101). Adit 101 may be a prospect adit only 40 or 50 feet long, but it is adjacent to the Mosca Pass trail and its portal is unstable and threatened by falling debris. Adit 100 is about 200 feet above the trail but is not readily visible from it. However, it is open, and accessible, and has an unstable portal 4 feet high and 8 feet wide.
*****NEW QUAD*****

Quad Name: Platoro

Site #: 09-03-363/4134-1.102

Site Name: Merrimack

Hazard Rating: 2

Description and pertinent facts: The Merrimack site lies along the unmarked, but popular trail that leads from the dam at Platoro Reservoir to the town of Platoro. Shaft 102 has a very unstable collar and extends about 20 feet vertically downward to where drifts lead off from the shaft. The opening was fenced not too long ago, but it is in disrepair and does not constitute an effective deterrent. The shaft appears to be just slightly on the private land side of the boundary. This site also includes a prospect pit (#103) with a PH Rating of 3.

Sites Exhibiting Physical Hazards (continued)

^^^NEW QUAD^^^
Quad Name: Red Mountain

Site #: 09-03-367/4133-2.102, 103

Site Name: Wilker's Mine

Hazard Rating: 2

Description and pertinent facts: This site is situated on the west bank of the Conejos River about 2 1/2 miles south of Platoro. Two adits (102 & 103) with PH Ratings of 2 are included in this site, as is one prospect with a rating of 3. Opening 102 appears to be on Forest Service land, which adit 103 may be on private land. Adit 102 extends underground beyond the line of sight, and its portal is partially obscured by rockfall debris. Adit 103 has nearly collapsed shut, leaving only a 1' X 2' opening into the workings, which appear to be about 5 feet high by 8 feet wide where the tunnel is intact. The adit extends underground beyond the line of sight, and water can be heard dripping inside the adit.

Quad Name: Red Mountain

Site #: 09-03-369/4134-1.100, 102

Site Name: Upper Fisher Gulch

Hazard Rating: 2

Description and pertinent facts: Upper Fisher Gulch site lies in a tributary drainage to Fisher Gulch below where FR 260 crosses Fisher Gulch. Included within the site are an adit (100) and shaft (102) with PH Ratings of 2. The site also includes a prospect pit with a PH Rating of 3. Adit 100 has standing water inside of it, backed up behind collapse debris at the portal. Water drips from the roof of the adit, and the portal area contains overhanging, loose, dangerous rocks. The adit extends back underground beyond the line of site.

^^^NEW QUAD^^^

Quad Name: Summitville

Site #: 09-03-360/4137-3.102

Site Name: Smuggler Mine

Hazard Rating: 2

Description and pertinent facts: The Smuggler mine is located on private land across the Alamosa River from Stunner Campground. One hazardous shaft is present at this site. Shaft 102 is only about 15 feet deep, and it has standing water about 10 feet below ground level. It has a wooden collar which is inviting to stand on, and the unwary visitor could slip and fall into the opening or the collar could fail. Proximity to the campground is a factor that increases the hazard of this shaft.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Summitville

Site #: 09-03-362/4139-1.103

Site Name: Grand View

Hazard Rating: 2

Description and pertinent facts: The Grand View site is situated at the west end of Government Park south of FR 250 across the river from the road. The site includes one adit (103) with a rating of 2 and also one with a rating of 3. Adit 103 is probably the Queen Bird tunnel. The adit is 5 feet high and 4 feet wide with a trickle of water draining out of it. There appears to have been grading work recently performed on the dump in front of adit 103.

Quad Name: Summitville

Site #: 09-03-363/4138-1.110

Site Name: Watrous Claims

Hazard Rating: 2

Description and pertinent facts: The Watrous Claims are found south of the Alamosa River in the vicinity of Government Park. One adit with a PH rating of 2 (#110) is contained within this site, along with three other adits that have ratings of 3. Adit 110 is an open adit at the far west end of Government Park. There is standing water in the adit and wet ground in front of it. The portal is pretty much intact, and extends underground beyond the line of site.

^^^NEW QUAD^^

Quad Name: Terrace Reservoir

Site #: 09-03-384/4136-1.100

Site Name: Terrace Reservoir Mine

Hazard Rating: 2

Description and pertinent facts: The "Terrace Reservoir" mine lies on the north side of Terrace Reservoir, immediately adjacent to FR 250. One adit (100) with a PH Rating of 2 is within this site, as is a subsidence feature (101) rated at 3. Adit 100 appears to be on private land. Its timbered entrance is inviting, and there is considerable evidence of visitation. The adit is partially collapsed shut about 50 feet in from the portal, and it is water-flooded a short distance beyond the collapsed debris. Subsidence feature 101 is on USFS land. It appears to overlie the collapsed debris which partially blocks the tunnel, and may correspond to a partially collapsed shaft, in that cribbing and a pipe were observed above the collapsed debris beneath the feature inside the tunnel. The feature is about 12 by 18 feet in plan and about 12 feet deep. Future subsidence may be anticipated in this area, in view of the void space between the collapse debris in the tunnel and the overlying broken rubble within the subsidence feature that forms a plug above the tunnel. The adit is scheduled for closure by CDMG in 1994, but not the subsidence feature.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Terrace Reservoir

Site #: 09-03-385/4136-1.100

Site Name: SE of Shillings Spring

Hazard Rating: 2

Description and pertinent facts: This site is found along the south side of FR 251 between the junction with FR 250 and Shillings Springs. One shaft (100) with a PH Rating of 2 is included in this site. Shaft 100, which is about 30 feet deep, is visible from FR 251. It is scheduled for closure by CDMG during 1994.

^^NEW QUAD^^

Quad Name: Twin Peaks

Site #: 09-03-452/4154-1.104

Site Name: Swab Mine District

Hazard Rating: 2

Description and pertinent facts: The Swab mine is located in a small, unnamed valley near Tobin Creek, north of Blanca in the Sangre de Cristo Mountains. The site includes one adit (#104) with a PH Rating of 2 and also another rated at 3. Adit 104 is a dangerous tunnel that extends underground over 100 feet before it bends and continues on out of site. Although this is a fairly remote location, it appears to be frequently visited, based on the amount of modern trash left at the site and the well traveled trail that leads to it. The tram which leads to this mine can be seen even from the town of Blanca. Large blocks of rockfall debris lie at the portal of the mine.

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TABLE 1
METAL CONCENTRATIONS AND LOADINGS AT SELECTED MINES AND NOAMS
IN ALAMOSA RIVER BASIN.

Total or Dissolved Concentration in mg/L or Load in g/day	Pass-Me- By Mine Drainage ¹	Iron Creek Above Pass-Me- By Mine ²	Iron Creek Below Pass-Me- By Mine ²	Upper Iron NOAMS ²	Lower Iron NOAMS ³	Miser Mine Drainage ¹	Burnt Adit Drainage ⁴	Burnt Dump Seep ⁴	Main Burnt NOAMS ⁴
Diss. Fe conc.	140.0	0.88	2.70	160.0	26.0	1.5	5.0	<1.0	72.0
Diss. Fe load	20,524.	7,194.	22,072.	5,842.	2,834.	1,030.	2.73	<14.17	7,063.
Total Fe conc.	115.0				45.0	2.6	7.0	<1.0	75.0
Total Fe load	16,859.				4,905.	1,785.	3.82	<14.17	7,357.
Diss. Al conc.	59.0	1.90	3.00	120.0	9.0	<1.0	5.0	2.0	31.0
Diss. Al load	8,649.	15,532.	24,525.	4,381.	981.	<686.	2.73	28.34	3,041.
Total Al conc.	56.0				11.0	<1.0	6.0	2.0	30.0
Total Al load	8,209.				1,199.	<686.	3.27	28.34	2,943.
Diss. Mn conc.	0.31	0.14	0.15	0.24	0.65	0.28	0.46	0.22	4.2
Diss. Mn load	45.45	1,144.	1,226.	8.76	70.85	192.	0.25	3.12	412.
Total Mn conc.	0.33				0.86	0.27	0.49	0.25	4.3
Total Mn load	48.38				93.7	185.	0.27	3.54	422.
Diss. Cu conc.	0.08	0.012	0.012	0.99	<0.04	<0.04	0.10	<0.04	0.058
Diss. Cu load	11.73	98.10	98.10	36.15	<4.36	<27.47	0.05	<0.57	5.69
Total Cu conc.	0.12				<0.04	<0.04	0.12	0.04	0.054
Total Cu load	17.59				<4.36	<27.47	0.07	0.57	5.30
Diss. Zn conc.	0.18	0.028	0.03	0.26	0.13	0.041	0.06	0.067	0.81
Diss. Zn load	26.39	228.9	245.3	9.49	14.17	28.15	0.03	0.95	79.46
Total Zn conc.	0.19				0.17	0.053	0.088	0.08	0.72
Total Zn load	27.86				18.53	36.40	0.05	1.13	70.63
Discharge (gpm)	26.9	1500 e	1500 e	6.7	20 e	126.0	0.1	2.6	18 e

¹ sample collected on 8/11/93 and analyzed by USGS (1994)

² sample collected on 8/5/93 by CGS and analyzed by CDH

³ sample collected on 8/27/93 by CGS and analyzed by USGS (1994)

⁴ sample collected on 8/31/93 by CGS and analyzed by USGS (1994)

e = discharge estimate

TABLE 2

IN-STREAM CONCENTRATIONS AND LOADINGS IN THE ALAMOSA RIVER.
(From USGS, CDMG, and USEPA, 1994)

Total or Dissolved Concentration in mg/L or Load in g/day	AR-49.5: Above Iron Creek on 8/11/93	AR-49.4: Below Iron Creek on 8/11/93	AR-48.1: Below Alum Creek on 8/11/93	AR-46.9: Below Bitter Creek on 8/10/93	AR-45.5: Above Wightman Fork on 8/10/93	AR-45.4: Below Wightman Fork on 8/10/93
Diss. Fe conc.	0.009	0.430	1.70	1.80	1.60	1.60
Diss. Fe load	462.	29,500.	141,800.	193,300.	195,300.	273,800.
Total Fe conc.	0.040	0.930	4.00	4.90	5.50	7.40
Total Fe load	2,054.	63,860.	333,500.	526,100.	671,400.	1,266,000.
Diss. Al conc.	0.010	0.030	0.25	0.63	0.40	0.16
Diss. Al load	513.4	2,060.	20,850.	67,640.	48,830.	27,380.
Total Al conc.	0.040	0.880	2.00	2.10	2.20	4.00
Total Al load	2,054.	60,430.	166,800.	225,500.	268,600.	684,500.
Diss. Mn conc.	0.004	0.066	0.18	0.23	0.22	0.85
Diss. Mn load	205.4	4,532.	15,010.	24,690.	26,860.	145,500.
Total Mn conc.	<0.010	0.070	0.18	0.26	0.24	0.89
Total Mn load	<513.4	4,807.	15,010.	27,910.	29,300.	152,300.
Diss. Cu conc.	<0.001	0.001	0.007	0.008	0.008	0.500
Diss. Cu load	<51.34	68.67	583.7	858.9	976.6	85,570.
Total Cu conc.	<0.001	0.003	0.009	0.010	0.010	0.520
Total Cu load	<51.34	206.0	750.5	1,074.	1,221.	88,990.
Diss. Zn conc.	<0.003	0.007	0.026	0.031	0.033	0.250
Diss. Zn load	<154.0	480.7	2,168.	3,328.	4,029.	42,780.
Total Zn conc.	<0.010	<0.010	0.020	0.030	0.030	0.250
Total Zn load	<513.4	<686.7	1,668.	3,221.	3,662.	42,780.
Discharge (gpm)	9420	12,600	15,300	19,700	22,400	31,400

TABLE 3

IN-STREAM METAL CONCENTRATIONS AND LOADINGS IN TRIBUTARIES TO THE ALAMOSA RIVER.
(From USF&WS and USEPA, 1994)

Total or Dissolved Concentration in mg/L or Load in g/day	Iron Creek Above Alamosa River		Alum Creek Above Alamosa River		Bitter Creek Above Alamosa River	
	7/8/93	10/27/93	7/8/93	10/27/93	7/8/93	10/27/93
Diss. Fe conc.	1.89	7.56	107.0	178.0	3.99	15.0
Diss. Fe load	60,570.	97,650.	570,300.	304,600.	37,840.	69,730.
Total Fe conc.	2.70	20.40	106.0	174.0	4.32	17.6
Total Fe load	86,520.	263,500.	565,000.	297,800.	40,970.	81,820.
Diss. Al conc.	2.22	8.71	41.4	65.2	2.39	7.89
Diss. Al load	71,140.	112,500.	220,700.	111,600.	22,660.	36,680.
Total Al conc.	2.34	8.21	40.9	65.9	2.37	7.98
Total Al load	74,990.	106,000.	218,000.	112,800.	22,470.	37,100.
Diss. Mn conc.	0.245	0.505	2.45	4.78	0.438	1.37
Diss. Mn load	7,851.	6,523.	13,060.	8,180.	4,154.	6,369.
Total Mn conc.	0.244	0.460	2.37	4.53	0.423	1.33
Total Mn load	7,819.	5,942.	12,630.	7,752.	4,011.	6,183.
Diss. Cu conc.	0.010	0.023	0.228	0.29	0.017	0.020
Diss. Cu load	320.5	297.1	1,215.	496.3	161.2	92.98
Total Cu conc.	0.009	0.023	0.231	0.287	0.013	0.021
Total Cu load	288.4	297.1	1,231.	491.1	123.3	97.63
Diss. Zn conc.	0.030	0.092	0.580	1.02	0.055	0.148
Diss. Zn load	961.4	1,188.	3,091.	1,746.	521.6	688.0
Total Zn conc.	0.029	0.078	0.544	0.924	0.052	0.126
Total Zn load	929.3	1,007.	2,900.	1,581.	493.1	585.8
Discharge (gpm)	5880	2370	978	314	1740	853

USFS ABANDONED MINED LAND INVENTORY PROJECT
SUMMARY REPORT
RIO GRANDE NATIONAL FOREST-CREEDE RANGER DISTRICT

Prepared by Robert M. Kirkham
Colorado Geological Survey
February 17, 1993

**HIGH PRIORITY MINE SITES WITH PHYSICAL HAZARDS OR ENVIRONMENTAL
DEGRADATION**

RIO GRANDE NATIONAL FOREST

CREEDE RANGER DISTRICT

High Priority Sites with Environmental Degradation:

Commodore and Amethyst Mines--09-04-330/4192-1.100/201/202
Midwest Mine--09-04-330/4195-2.202
Beartown area, which includes the following sites:
 Gold Bug Mine--09-04-276/4176-1.100/200
 North of Hunchback Pass--09-04-277/4176-1.100/102/103
 Kankakee Mine--09-04-278/4176-1.101/200
 Sylvanite Mine--09-04-278/4176-2.100/200
North of Piedra Pass--09-04-323/4160-1.100/200
Ace Mine--09-04-326/4191-1.100
Central Upper Lost Trail Creek Area--09-04-291/4191-1.101/201
East Willow Creek area, which includes the following sites:
 Phoenix Park Mill Site--09-04-331/4196-1.200/201
 Outlet Mine--09-04-331/4195-1.200
 Solomon Mine--09-04-331/4194-2.100/200
 Below Solomon Mine--09-04-331/4193-1
 Mammoth Tunnel--09-04-331/4192-1.102

High Priority Sites with Physical Hazards:

The following list assumes that closure work planned for 1994 by the Colorado Division of Minerals and Geology proceeds as scheduled, and that several of the existing mine sites found on USFS land which have significant physical hazards are safeguarded by this project.

Southeast of Resurrection Tunnel--09-04-331/4191-4.100
Lower Sawmill Gulch--09-04-327/4189-2.100
Holy Moses--09-04-331/4195-2.103
Resurrection Tunnel--09-04-331/4191-2.100
Southeast Side of Nelson Mountain--09-04-330/4197-1.102
Near Stony Pass--09-04-275/4185-1.100/101
North of Midwest Mine--09-04-330/4196-2.104
Kankakee Mine--09-04-278/4176-1.104/105
Northwest of Resurrection Tunnel--09-04-331/4191-3.100

USFS ABANDONED MINED LAND INVENTORY PROJECT

RIO GRANDE NATIONAL FOREST

CREEDE RANGER DISTRICT

Total number of field forms/mine sites = 134

Approximate number of inventoried mine openings = 478

Number of sites with physical hazards (ratings of 1 or 2) = 25

Hazardous openings previously safeguarded by CDMG = 15

Hazardous openings (ratings of 1 or 2) = 29

Hazardous openings proposed to be safeguarded by CDMG in 1994 = 8

Remaining hazardous openings, assuming 1994 CDMG project is completed = 21

Number of sites with environmental degradation (ratings of 1, 2 or 3) = 21

Number of sites with environmental degradation rating of 1 = 1

Number of sites with environmental degradation rating of 2 = 4

Number of sites with environmental degradation rating of 3 = 16

USFS ABANDONED MINED LAND INVENTORY PROJECT
SUMMARY REPORT
RIO GRANDE NATIONAL FOREST-CREEDE RANGER DISTRICT

Sites Exhibiting Environmental Degradation (only ratings of 1 to 3)

Quad Name: Howardsville

Site #: 09-04-275/4185-1.100/200

Site Name: Near Stony Pass

Environmental Degradation Rating: 3

Description and pertinent facts: About 5 gpm of water drains out of adit 100. Even in August, there is considerable snow melt flowing into the adit near the portal, yet the mine drainage pH is 5.61 and conductivity is 122 uS. There is also a tiny seep at the toe of the dump which leaves red precipitate. The pH of the unnamed, small receiving stream drops about 0.25 units as a result of the mine drainage, but it still is 7.41, suggesting the mine drainage does not severely degrade the stream. Conductivity of the stream does increase significantly below the mine. The water in this small unnamed stream originates at a melting snow bank a short distance upstream from the mine.

[illegible]

Quad Name: Storm King Peak

Site #: 09-04-276/4176-1.100/200

Site Name: Gold Bug Mine

Environmental Degradation Rating: 2

Description and pertinent facts: Environmental problems at this site may involve mining and naturally occurring pollution. About 8 gpm of water with a pH of 4.5 and conductivity of 181 uS discharges from the collapsed portal of the Gold Bug mine (100), runs over part of dump 200, and then flows directly into Kite Lake, which reportedly does not support fish. The toe of the Gold Bug dump (200) extends into the lake, and this also may contribute to the environmental degradation of the lake. The flow rate at which mine water discharges out adit 100 varies greatly. Based on the distribution of precipitate on the dump, this adit has had significantly higher discharge rates in the past. However, during a site visit on 10/19/87 the adit was not flowing water. During periods of lower discharge it is possible that the mine water seeps through the dump, and that the flow rate is insufficient to support surface flow through the collapsed debris.

An unnamed creek that drains the basin north of Hunchback Mountain flows into the southwest corner of Kite Lake. At the time of our site visit on 8/9/92 the water in this tributary had a pH of 4.75

and conductivity of 113 uS, which is only slightly better than the mine drainage. The water in this tributary flows at about 10 gpm over a cliff face, but rapidly infiltrates into a debris fan below the cliff. There was no surface flow into Kite Lake on 8/9/92. A number of small mines occur on private land north of this unnamed creek. These mines were not visited in the field during this investigation because of their apparent private ownership, but they were viewed through binoculars from the Hunchback Pass area. None of the private mines appeared to discharge mine drainage, and surface runoff from this area looked as though it flowed easterly straight into Kite Lake, not southerly into the unnamed tributary. Prominent red-orange precipitate was noted in the unnamed tributary extending from its headwaters to Kite Lake as it was viewed through binoculars from the Hunchback Pass area, but no mines were detected in its headwaters. Thus, the poor water quality in this unnamed creek may be a naturally occurring phenomenon.

Reddish-orange precipitate is visible around the perimeter of Kite Lake. It is detectable not only from the ground, but also on aerial photographs. The pH of the water discharging from the lake, which constitutes the beginnings of Bear Creek, was 5.4 and the conductivity was 87 uS. An iron-rich peat bog may be present below Kite Lake. Water samples for laboratory analysis were collected from the draining Gold Bug adit and from the outlet of Kite Lake, but the final results have not yet been received.

During the winter months following the field season it was discovered that Ted and Mary Mueller had conducted a water quality investigation in this area for the USFS during 1985. A test performed on water collected on July 27, 1985 from Bear Creek where it crosses FR 506 below Kite Lake had a pH of 5.6 and conductivity of 40 uS. A sample was collected from this same location on September 1, 1985 had a pH of 4.7, conductivity of 64 uS, and alkalinity of 1.7. Metal concentrations of this unfiltered sample were 0.03 ppm of silver, 0.07 ppm of zinc, 0.04 ppm of copper, and 35 ppb of aluminum. Cadmium, cobalt, lead, and iron were below their detection limits. These investigators also analyzed a sample from Bear Creek where it crosses FR 506, which is upstream of the confluence with the unnamed creek that drains the Hunchback Pass/Sylvanite mine area. At this location on September 1, 1985 the pH was 6.4, conductivity was 42, and all metals except aluminum were below the detection threshold, suggesting metal concentrations were decreasing downstream. There was only 12 ppb of aluminum in the creek at this location.

During 1987 the Colorado Division of Minerals and Geology, formerly called the Colorado Mined Land Reclamation Division, conducted a brief investigation of this area as part of a state-wide study of water quality problems related to mining. A sample collected from Kite Lake adjacent to the Gold Bug dump on 10/19/1987 had a pH of 4.8, conductivity of 68 uS, and metal concentrations of 0.5 mg/l of aluminum, 0.07 mg/l of iron, 0.10 mg/l of manganese, and 0.04 mg/l

of zinc. Adit 100 was not discharging water at this time. A sample collected at the outlet of Kite Lake had a pH of 4.6, conductivity of 56 uS, and metal concentrations similar to that from the other end of the lake. A water sample collected from Bear Creek above its confluence with the unnamed tributary that drains the Hunchback Pass/Sylvanite mine area had a pH of 6.3, conductivity of 61 uS, 0.8 mg/l of aluminum, 0.19 mg/l of iron, and 0.05 mg/l of manganese, which indicates the concentrations of some metals decreased downstream, while others increased.

The water problems at this site involve fairly acidic water, but the metal concentrations appear to be relatively low. The limiting factors for fish in Kite Lake may be related to pH or perhaps to winter climatic conditions. If further investigations are conducted at this site, it is recommended that the mines on private land located on the elevated bench west and above Kite Lake be inspected for environmental problems and/or hazards. Opening 105 is very near the USFS boundary, and it especially should be visited.

Quad Name: Storm King Peak

Site #: 09-04-277/4176-1.100/101/102/103

Site Name: North of Hunchback Pass

Environmental Degradation Rating: 2

Description and pertinent facts: This interesting area lies north of Hunchback Mountain and east-southeast of Kite Lake. A small, unnamed stream heads on a flat surface underlain by bedrock that is near to and at about the same elevation as Kite Lake. The unnamed creek receives poor quality water not only at this site, but also at the Kankakee and Sylvanite mines downstream.

Feature 100 appears to be a very small, collapsed adit that extends underground only a short distance, based on the size of its associated dump. About 15 gpm of pH 4.33 water having a conductivity of 346 uS discharges through the collapsed debris at the portal. A distinctive stain and precipitate has formed what appears to be a sinter mound on the small dump below 100. The sinter mound has mostly green coloration near the portal, while reddish colors occur on the perimeter of the mound and near its base. Prospect pit 101 has a tiny seep flowing out of it that was insufficient to test for pH or conductivity.

Feature 102 is a series of springs with a combined flow of about 5 gpm. The spring water has a pH of 3.71 and conductivity of 482 uS, and this discharge also appears to have formed a small sinter mound. No evidence of mining was noted near this feature.

Feature 103 was detected on aerial photographs while working in the office during the winter. This anomalous looking feature appears to be a nearly flat bench with very steep, near vertical walls that

grade up to a more natural looking, rounded ridge top. The feature could be natural, but it has a suspicious, man-made appearance when viewed on aerial photographs. The bench has some vegetation on it, but much of it appears to be blanketed by talus deposits derived from the highwall. The bench may effectively catch drifting snow during winter months, and allow for increased infiltration of snow melt into the ground during spring thaw, which may explain the amount of water discharging from features 100 and 102. If the bench is a natural feature, then the water pollution is primarily a naturally occurring phenomenon. If the bench is man-made, it probably represents a very old, perhaps pre-hispanic mine, in that there is no evidence of a road or trail leading to it. This site should be revisited with an archaeologist to determine the origin of feature 103.

The unnamed creek has a pH of 6.53 and conductivity of 33 uS above this site, whereas the pH is 4.15 and conductivity is 174 uS below the site. Water samples for laboratory analysis were collected from the discharge at feature 100 and from the receiving stream above and below the site, but the final analytical results are not yet available.

Quad Name: Storm King Peak

Site #: 09-04-277/4177-2.100/102/201

Site Name: Cornelius Mine

Environmental Degradation Rating: 3

Description and pertinent facts: Water was backed up into adit 100 behind a snow drift which partially blocked the portal. No surface flow was noted beyond the snow drift. The water had a pH of 4.5 and conductivity of 32. About 5 gpm of pH 3.8 water with a conductivity of 562 uS discharges from adit 102, which appears to be on private land. Seepage was observed at the toe of dump 202, where it created a small pond that did not have any detectable surface outflow. Above the site the unnamed creek had a pH of 7.1 and conductivity of 147, while a test run on creek water below the site had a pH of 7.1 and conductivity of 146, suggesting this site does not cause severe degradation.

Quad Name: Storm King Peak

Site #: 09-04-278/4176-1.101/200

Site Name: Kankakee Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The unnamed creek which originates north of Hunchback Mountain and east-southeast of Kite Lake flows through this site. The creek is degraded by poor quality water from another site above the Kankakee mine, and additional degradation probably occurs at the Kankakee mine site.

About 2 gpm of pH 4.38 water with a conductivity of 105 uS flows out of adit 101, which is collapsed shut. At the time of the site visit the mine drainage infiltrated into the ground prior to reaching the creek. A sample of the mine drainage has been submitted for laboratory analysis, but the final results have not yet been received.

Quad Name: Storm King Peak

Site #: 09-04-278/4176-2.100/200

Site Name: Sylvanite Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The unnamed creek which originates north of Hunchback Mountain and east-southeast of Kite Lake flows through the Kankakee mine area and then past the Sylvanite mine. The creek probably receives additional contaminants at the Sylvanite mine, where about 1 gpm of water discharges out of adit 100. Water is backed up behind collapsed debris at the portal of adit 100, and there is standing water in shaft 103 in front of the adit. The mine water has a pH of 6.25 and conductivity of 266 uS. As it flows across dump 200 the mine water infiltrates into the dump material. No seeps were observed at the toe of the dump, which rests on permeable alluvial deposits. The mine water probably percolates downward through the dump directly into the shallow, unconfined aquifer within the alluvial deposits associated with this unnamed creek. The creek has a pH of 3.90 and conductivity of 181 uS above the Sylvanite mine and a pH of 3.88 and conductivity of 163 uS below it. A sample of creek water from below the Sylvanite mine was submitted for laboratory analysis, but the final results have not yet been received.

While working in the office during the winter months it was discovered that Ted and Mary Mueller had previously conducted a water quality study in this region for the USFS during 1985. Samples were collected from the unnamed creek below the Sylvanite mine on July 27 and on September 1, 1985. During the initial sampling the creek had a pH of 3.8, conductivity of 60 uS, 0.03 ppm of zinc, and 57 ppb of aluminum. Measurable concentrations of copper, cadmium, and lead were recorded when a solvent was added to release suspended metal solids. At the time of the later sampling the creek had a pH of 3.5, conductivity of 180 uS, 117 ppb of aluminum, 0.05 ppm of zinc, 0.04 ppm of copper, and the addition of a solvent released detectable levels of lead. These analyses suggest the creek is acidic, but that it has relatively low metal concentrations. The Mueller's also sampled this creek about 1800 feet below the Sylvanite mine and found that there were minor improvements to water quality at that location. Bear Creek was sampled about 1500 feet below the confluence with this unnamed creek on September 1, 1985. The pH rose to 6.5, but copper and cadmium concentrations slightly increased at this location.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Finger Mesa

Site #: 09-04-291/4190-1.102/200

Site Name: South Central Upper Lost Trail Creek area

Environmental Degradation Rating: 3

Description and pertinent facts: A small amount of water (1 gpm) that drains out of the collapsed adit 102 has a pH of 3.97 and conductivity of 701 uS, but it infiltrates into the dump before reaching a flowing stream. The seepage out of the toe of dump 200 has an even lower pH (3.51) and higher conductivity (1056 uS), but it infiltrates into the bed of an intermittent creek long before reaching any surface water.

Quad Name: Finger Mesa

Site #: 09-04-291/4191-1.101/201

Site Name: Central Upper Lost Trail Creek area

Environmental Degradation Rating: 3

Description and pertinent facts: About 10 gpm of water drains out of the collapsed adit 101. It has a pH of 4.98 and conductivity of 207 uS. The water flows over dump 201, and then enters an unnamed perennial stream. The stream heads above the site on private land, where it originates at a seep area which may contain an iron bog. Another metals bog may be present at the lower end of this site.

A sample from the unnamed, perennial stream above the adit drainage tested at pH 5.61 and conductivity 466 uS. The stream flows over a portion of dump 200, where a small amount of water seeps out of the toe of the dump. Below 101 and 201 the creek has a pH of 4.63 and conductivity of 226 uS. The creek merges with an unnamed creek that drains area 292/4191-2 about 400 feet below the site. Upstream of this confluence the creek that drains this site has a pH of 4.78 and conductivity of 202 uS. The tributary which drains site 292/4191-2 has a pH of 5.89 and conductivity of 240 uS above the confluence. Below the confluence the combined flows have a pH of 5.74 and conductivity of 208 uS.

Samples for laboratory analysis were collected from the adit 101 and from the creek below the confluence, but the final results have not yet been received. Ted and Mary Mueller sampled Lost Trail Creek above and below where this tributary flows into Lost Trail Creek. Their data suggest Lost Trail Creek is not significantly affected by the surface water leaving the Carson mining district within the Creede Ranger district.

Quad Name: Workman Creek

Site Name: Tributary to East Trout Creek

Description and pertinent facts: While visiting the Sulfur Tunnel, poor quality water was noted in a creek as it flowed across trail 810. The drainage basin of this creek was examined on aerial photographs for evidence of mining, and a brief field reconnaissance was conducted, but no features related to mining were detected. The creek was followed upstream to a series of small seeps, and the creek bed was dry above this point. The seeps had a combined flow of about 0.5 gpm, pH of 3.69, and conductivity of 1250 uS. Stream discharge gradually increased downstream to about 20 gpm as it followed into East Trout Creek. At that location the pH was 3.88 and the conductivity was 744 uS. East Trout Creek dropped from pH 6.91 to 6.62 and its conductivity increased from 38 to 55 uS as a result of the drainage in this tributary. This is probably an example of naturally occurring contamination in an area underlain by highly mineralized rocks. An individual familiar with this area reported that the dozer road up this basin was constructed to provide access for an exploration drill rig, and he was unaware of any mine workings in this basin.

[illegible]

Site Name: North of Piedra Pass

Description and pertinent facts: A strong flow of about 0.15 cfs discharges from collapsed adit 100 and flows across dump 200, leaving a heavy coating of red and yellow precipitate. The water has a pH of 4.73 and conductivity of 243 uS. It merges with a small tributary and then flows through a wetlands before discharging into one of the perennial streams in the headwaters of Red Mountain Creek. The small tributary creek had a pH of 6.78 and conductivity of 143 uS above the confluence with the mine drainage. Minor evidence of metal precipitation was noted in the wetlands. After passing through the wetlands the stream pH was 5.17 and conductivity was 161 uS. The perennial stream that drains the north side of Piedra Pass had a pH of 6.77 and conductivity of 229 uS in its headwaters. The creek then flows through a canyon cut into highly altered, exposed rock. Just below the canyon, but above the draining adit 100, at a location where the creek crosses the trail to Piedra Pass, pH was 5.86 and conductivity was 212 uS. Below the confluence with the stream carrying the mine drainage the

Sites Exhibiting Environmental Degradation (continued)

Quad Name: San Luis Peak

Site #: 09-04-329/4194-1.200

Site Name: Chance Dump

Environmental Degradation Rating: 3

Description and pertinent facts: The lower end of the very large (50,000 cy) Chance dump lies on USFS land adjacent to West Willow Creek. Specimens of galena, pyrite, and sphalerite were found in the creek adjacent to and below this dump. The creek pH is 7.71 above the dump and 7.83 below it, while the conductivity is 92 and 85 uS above and below the dump, suggesting that environmental degradation is not significant. Immediately below this site the creek flows through the Amethyst mine, where serious degradation occurs. It is possible that Chance dump may degrade West Willow Creek, but any effect on water quality might not show up in the creek until well below the dump, perhaps in the reach containing the Amethyst mine, which is mostly on private land.

Quad Name: San Luis Peak

Site #: 09-04-330/4195-2.202

Site Name: Midwest Mine

Environmental Degradation Rating: 3

Description and pertinent facts: Dump 202 at the Midwest mine essentially fills the valley floor of Nelson Creek. At the time of our site visit surface flow in the creek ceased about 800 feet upstream of the mine. Through the mine site the creek was dry, but seepage of about 15 gpm from the toe of dump 202 went directly into the creek, where it created surface flow that extended downstream about 300 feet. There were two very small ponds adjacent to the road through the site. About 10 gpm of water flowed from the upper to the lower pond, but there was no surface flow out from the lower pond. The hydrologic significance of the ponds is not accurately known at this time. No evidence of mine drainage was noted at any portal at this site. Above the Midwest mine Nelson Creek had a pH of 6.4 and conductivity of 39 uS. Water in the ponds had a pH of 6.5 and conductivity of 40 uS. Immediately below the dump the creek had a pH of 3.6 and conductivity of 133 uS.

During their Nonpoint Source study of Willow Creek the Colorado Water Quality Control Division sampled Nelson Creek just below the Midwest mine and also just above the confluence with West Willow Creek on April 12, 1990. The sample immediately below the Midwest mine had 0.2 ug/l of silver, 2500 ug/l of aluminum, 2.9 ug/l of cadmium, 40 ug/l of copper, 3500 ug/l of iron, 16 ug/l of lead, 130 ug/l of manganese, and 320 ug/l of zinc. Just above the confluence with West Willow Creek, Nelson Creek had a flow of 0.03 cfs and contained 1.8 ug/l of cadmium, 19 ug/l of copper, 370 ug/l of iron,

7 ug/l of lead, and 220 ug/l of zinc, suggesting that the Midwest mine is a source of metals in the Willow Creek basin, but it is probably not a major source of metal loads since its discharge is low and sporadic. The possibility of a plume of contaminated ground water travelling in the alluvium beneath Nelson Creek was not evaluated.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: San Luis Peak

Site #: 09-04-331/4193-1

Site Name: Below Solomon Mine

Environmental Degradation Rating: 2

Description and pertinent facts: There is USFS land in the north and south ends of this area, but most of the site is privately owned. On the north end the USFS land nearly touches the south end of the Solomon dump. Mine and mill tailings placed in the Ridge and Solomon dumps have been eroded by the creek and deposited in downstream areas that include USFS land. Some of the environmental problems in this area have been remediated by the East Willow Creek Nonpoint Source Project initiated in 1991 by the Colorado Division of Minerals and Geology (CDMG), formerly known as the Colorado Mined Land Reclamation Division, and the Colorado Water Quality Control Division (CWQCD).

The Willow Creek Nonpoint Source Study, conducted by the CWQCD and released on April 19, 1991, reported on the quality of the Willow Creek drainage basin prior to the Nonpoint Source Project. This report suggested that metal loading in East Willow Creek occurred at the Solomon mine and in the reach between the Solomon mine and Mammoth tunnel. Above the Solomon mine the creek had a pH of 8.03, 21 ug/l of lead, 20 ug/l of zinc, and 0.32 ug/l of cadmium. The Solomon adit discharges up to about 12 gpm of pH 4.88 water containing 76 ug/l of cadmium, 28 ug/l of copper, 190 ug/l of iron, 550 ug/l of lead, 4000 ug/l of manganese, and 19,000 ug/l of zinc. The mine water used to infiltrate into the dump prior to flowing into East Willow Creek. Samples collected by the CWQCD from East Willow Creek immediately below the draining adit suggested moderate increases in selected contaminants and a pH drop to 7.1. Dissolved metal concentrations included 0.88 ug/l of cadmium, 40 ug/l of lead, and 120 ug/l of zinc. Since the mine drainage infiltrated into the dump, they could not be certain where the subsurface contaminant plume entered the creek, so another sample was collected from below the Solomon dump. At this location the pH was 6.98 and dissolved metal concentrations included 1.3 ug/l of cadmium, 59 ug/l of lead, and 180 ug/l of zinc.

A water sample collected from East Willow Creek above the Mammoth tunnel had a pH of 7.12, 3.7 ug/l of cadmium, 48 ug/l of lead, and 560 ug/l of zinc. Soil samples collected by the CDMG from the Solomon, Ridge, and Outlet mine dumps were compared to a sample collected from a trench excavated across the floodplain near the southern end of this inventory area. The amount of soluble metals in the floodplain sediments was very similar to that in the mine dumps. Since the floodplain sediments are typically saturated year round, they probably contribute more metals to the creek than do the dumps, which, with the exception of the mine drainage out of the Solomon adit, were generally unsaturated most of the year.

Visual inspection of the mine dumps indicated that the Solomon and Ridge dumps had and were continuing to experience significant erosion by the creek. Eroded tailings were subsequently deposited downstream in an area that includes USFS land. This erosive process was an ongoing problem capable of providing a renewed supply of leachable materials to the floodplain downstream.

The CDMG and CWQCD initiated a Nonpoint Source Project in East Willow Creek in 1991 to address the environmental degradation caused by historic mining. A major long term problem related to erosion of the Solomon and Ridge dumps and the subsequent deposition of the eroded materials in the floodplain downstream. To correct this problem the creek and road were rebuilt such that the road protects the dumps from erosion by the creek. Downstream from the Solomon mine the creek was reconstructed in its pre-mining location, large boulders were installed to improve fish habitat, the floodplain was topsoiled and revegetated, and willow sprigs were planted along the creek. A passive mine drainage treatment system (PMDTS) was constructed to treat the discharge from the Solomon adit. It consisted of an anoxic limestone drain installed inside the adit and a three-celled constructed wetlands containing hay, wood chips, and mushroom compost. Preliminary results suggest the PMDTS is capable of removing much of the metal in the mine drainage, and the creek below the project area now contains 60 to 80% less metal than before the project. The Colorado Division of Wildlife will initiate water quality and biologic monitoring of this area in 1993 to fully assess the success of the Nonpoint Source Project.

Quad Name: San Luis Peak

Site #: 09-04-331/4194-2.100/200

Site Name: Solomon Mine

Environmental Degradation Rating: 2

Description and pertinent facts: According to the USFS quad map a thin inlier of USFS land is present at this site. Prior to a recent Nonpoint Source Project, environmental problems at this site related to mine drainage at the Solomon adit (100) and to leaching and erosion of its dump (200). Both the portal of the adit and the dump appear to be on private land, but the draining adit does pass through the USFS inlier in the subsurface. This area has been addressed by the Colorado Division of Minerals and Geology/Colorado Water Quality Control Division Nonpoint Source Project. Please refer to the summary and field form for site 09-04-331/4193-1 for additional descriptions of the problems and solutions implemented at the Solomon mine site.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: San Luis Peak

Site #: 09-04-331/4195-1.200

Site Name: Outlet Mine

Environmental Degradation Rating: 3

Description and pertinent facts: A large dump (200) at the Outlet mine is adjacent to East Willow Creek. Water tests taken during this study reported pH values of 7.6 and 7.2 and conductivities of 48 and 44 above and below the dump. Water samples collected on August 8, 1988 by the Colorado Division of Minerals and Geology, formerly called the Colorado Mined Land Reclamation Division, contained 0.08 mg/l of total iron above the Outlet dump and 0.06 mg/l below it. Other metals were below detection limits. Water samples collected by the Colorado Water Quality Control Division on April 12, 1990 found no detectable metal above this dump and 0.34 ug/l of dissolved cadmium below it. Thus, it appears that the Outlet mine is not a major source of metal loads in East Willow Creek.

Quad Name: San Luis Peak

Site #: 09-04-331/4196-1.200/201

Site Name: Phoenix Park Mill Site

Environmental Degradation Rating: 3

Description and pertinent facts: A fairly recently active mill site with two tailings ponds (200, 202) are present. The mill reportedly processed ore hauled up from the Solomon mine. No surface seepage from the ponds into East Willow Creek was observed. The ponds had a pH of 7.4 and 6.5 with conductivities of 285 and 475 uS. Tests run on East Willow Creek above and below the ponds had a pH of 7.7 and 7.6 and conductivities of 22 and 38 uS, respectively, suggesting the ponds have only minor impact on the quality of East Willow Creek. Water samples collected by the Colorado Water Quality Control Division in 1991 above and below the Phoenix Park mill site did not contain any metal that exceeded the detection limits.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Creede

Site #: 09-04-326/4191-1.100

Site Name: Ace Mine

Environmental Degradation Rating: 3

Description and pertinent facts: About 7 gpm of water drains out of adit 100. It leaves a heavy stain of red-orange precipitate, yet has a pH of only 7.51 with a conductivity of 335 uS. The mine drainage flows into Miners Creek, where it causes a pH drop from 8.12 to 7.81 and only a minor change in conductivity, probably because of the considerable dilution that occurs when it mixes with the several cfs of water in the creek.

This adit drainage was sampled in 1989 by the Colorado Division of Minerals and Geology, previously known as the Colorado Mined Land Reclamation Division. At that time the pH was 6.3, the conductivity was 326, and it had metal concentrations of 0.7 mg/l of aluminum, 0.06 mg/l of iron, 0.25 mg/l of manganese, 0.08 mg/l of copper, 0.04 mg/l of zinc, 0.03 mg/l of nickel, 0.05 mg/l of molybdenum, 0.01 mg/l of cadmium, 0.06 mg/l of chromium, and 0.15 mg/l of lead. Samples collected upstream and downstream on Miners Creek had metal concentrations similar to that of the mine drainage, which was quite surprising in light of the good appearance of the creek and the absence of reported problems. Because of the apparently contradictory nature of the existing data, additional water samples were collected during this investigation for laboratory analysis, but the final results have not yet been received.

Quad Name: Creede

Site #: 09-04-327/4189-1.100/200

Site Name: Big Six Mine

Environmental Degradation Rating: 3

Description and pertinent facts: Adit 100 drains about 1 gpm of pH 7.77 water that has a conductivity of 1100 uS. The water flows into a hole excavated into dump 200, and then appears to infiltrate through the dump. It probably seeps into the underlying and/or adjacent alluvial aquifer, since no evidence of seepage was noted at the base of the dump. A detailed study of the water quality of Miners Creek and its associated alluvial system might determine if or locate where this mine drainage impacts that system. In view of the low flow rate from the adit, it is unlikely to have a significant influence on the creek.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Creede

Site #: 09-04-329/4191-1.200

Site Name: Bulldog Mine-9360 level

Environmental Degradation Rating: 3

Description and pertinent facts: A very large mine dump (200) which serves as a staging area for this mine lies adjacent to Windy Gulch. The creek flow is generally low (estimated at 10 gpm at the site visit), and is carried by a buried culvert through most of the mine area. The creek had a pH of 6.6 and conductivity of 488 uS where it flowed into the culvert, and a pH of 6.5 and conductivity of 639 downstream from the dump and about 300 feet below the lower end of the culvert. Homestake has recently initiated final reclamation at this site, which should reduce or eliminate the potential for environmental degradation at this site.

Quad Name: Creede

Site #: 09-04-330/4192-1.100/201/202

Site Name: Commodore and Amethyst Mines

Environmental Degradation Rating: 1

Description and pertinent facts: Most of this area is privately owned, patented claims. There is a very small inlier of USFS land below the Commodore mine and a large tract between the Amethyst and Commodore mines. Both USFS tracts are along the creek, and it is likely that mine and mill waste which was eroded from the dumps has been deposited in the creek bed on USFS land. The southern end of the large Amethyst dump (201) is on USFS land. This dump is adjacent to and being eroded by West Willow Creek. Locals have suggested that there once was a timber dam across the creek in the lower end of the Amethyst dump, but it was breached at some time in the past. Considerable amounts of mine and mill tailings may have been released during such a breach event. The location of the former tailings dam could have been on or very near the USFS land.

The Commodore dump (202) has filled the valley floor of West Willow Creek, which is confined to a wooden flume or steel pipe where it crosses this dump. The wooden flume is slowly being squeezed shut. Failure of the flume could allow for water to back up behind the dump or to bypass the flume, perhaps creating a hazardous condition where a sudden release of water could erode a significant portion of the dump. This eroded material would be transported downstream and could potentially cause a significant effect on the Rio Grande.

Willow Creek has been the subject of several previous water quality investigations, copies of which are available in the CGS project

files. It has been reported that there are no fish in West Willow Creek below the Amethyst mine. The most recent investigation of Willow Creek was conducted by the Colorado Water Quality Control Division, with the results being reported in "Willow Creek Nonpoint Source Study", dated April 19, 1991. Water samples were collected from West Willow Creek on April 12 and September 10, 1990 from West Willow Creek at five locations: one just below the Equity mine, a second below the Amethyst mine and the confluence of Nelson Creek, a third from just above the Commodore mine, a fourth from 200 yards below the Commodore mine, and the fifth from just above the confluence with East Willow Creek.

The upper sampling station below the Equity mine had a pH of 8.17 during the spring, and the only detectable metal was 110 ug/l of total iron. During the fall sampling the pH had dropped to 6.19, and only dissolved cadmium, at 2.6 ug/l exceeded the detection limit. At the sample site below the Amethyst mine West Willow Creek had a pH of 7.17 during the spring sampling and the following dissolved metal concentrations: 10 ug/l of cadmium, 8 ug/l of copper, 32 ug/l of lead, and 570 ug/l of zinc. During the fall this site had a pH of 6.15, 6.2 ug/l of cadmium, 16 ug/l of lead, and 280 ug/l of zinc. Water samples collected from West Willow Creek above the Commodore mine yielded similar results, indicating metal concentrations remained relatively constant through the tract of USFS land between the Amethyst and Commodore mines.

The Nelson tunnel (303), which is the drain tunnel for much of the underground workings on the Amethyst and Bulldog veins, discharges collected mine water on private land near the Commodore mine. Although the tunnel discharges water with high concentrations of zinc (15000 to 17000 ug/l), manganese (4100 to 5500 ug/l), and cadmium (54 to 80 ug/l), it was flowing at only 0.03 cfs during the spring sampling and 0.04 cfs during the fall, suggesting it is not the major source of metal loads in West Willow Creek.

Immediately below the Commodore mine West Willow Creek still had a moderate pH of 6.76 in the spring, with dissolved metal concentrations of 0.2 ug/l of silver, 47 ug/l of cadmium, 17 ug/l of copper, 46 ug/l of lead, 630 ug/l of manganese, and 7300 ug/l of zinc, suggesting that much of the metal contamination in West Willow Creek occurs in the vicinity of the Commodore mine, probably as a result of leaching of the dump materials which fill the valley floor at this location. Metal concentrations decreased only slightly between the Commodore mine and the confluence with East Willow Creek.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Creede

Site #: 09-04-331/4192-1.102

Site Name: Mammoth Tunnel

Environmental Degradation Rating: 3

Description and pertinent facts: An estimated 0.25 cfs of mine drainage intermittently surges out of a broken plastic pipeline that leads out of the Mammoth Tunnel (102). The water infiltrates into a rocky talus slope before reaching East Willow Creek. This water was formerly carried by pipeline to the old inlet works for the Creede water supply, where it was poured over the valves to prevent freezing during the winter. The Colorado Division of Minerals and Geology (CDMG) sampled this adit discharge in 1989 and found that the water had a pH of 6.3 and conductivity of 67 uS, with 0.7 mg/l of aluminum, 0.04 mg/l of iron, 0.01 mg/l of manganese, 0.08 mg/l of copper, 0.02 mg/l of nickel, 0.04 mg/l of molybdenum, 0.01 mg/l of cadmium, 0.05 mg/l of chromium, and 0.14 mg/l of lead. It was again sampled on April 13, 1990 by the Colorado Water Quality Control Division (CWQCD) during the Nonpoint Source Study of Willow Creek Basin. At this time the flow was estimated at 0.11 cfs, the pH was 7.18, and no detectable metals were present. Because of the latter analysis, this mine drainage was not addressed by the CDMG/CWQCD Nonpoint Source Project. When visited on May 21, 1992 during this investigation, the mine water had a pH of 7.1 and conductivity of 90 uS. This adit reportedly did not intersect any significant mineralized veins, so the apparently good quality of its mine discharge is not surprising.

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Sites Exhibiting Physical Hazards (continued)

Quad Name: San Luis Peak

Site #: 09-04-330/4196-2.104

Site Name: North of Midwest Mine

Hazard Rating: 2

Description and pertinent facts: This shaft lies in the trees about 1600 feet from the nearest road and is probably not frequently visited. The shaft collar is unstable, having cratered out to form an opening of about 25X30 feet at the surface. It necks down to a wood lined 4X6 shaft, and has standing water in it at a depth of 29 feet. The depth to the apparent bottom of this shaft is 35 feet.

Quad Name: San Luis Peak

Site #: 09-04-330/4197-1.102

Site Name: Southeast Side of Nelson Mtn

Hazard Rating: 2

Description and pertinent facts: This shaft lies in a small drainage on or very near the USFS boundary line. Snow was present at a depth of 40 feet in the shaft, hence its total depth is not known. There's a remnant of a log structure around the shaft, but most of the structure appears to have fallen into the shaft.

Quad Name: San Luis Peak

Site #: 09-04-331/4194-2.102

Site Name: Solomon mine

Hazard Rating: 2

Description and pertinent facts: According to the USFS quad map, there is a thin sliver of USFS land at this site. This inlier appears to be a maximum of 40 feet wide and 700 feet long. Several mine openings associated with the Solomon mine occur in this area, but none appear to be on the USFS land based on the quad map. Opening 100 has been safeguarded by the Colorado Mined Land Reclamation Division with a bulkhead seal with locking grate. 103 has been safeguarded by CMLRD with a steel grate installed about 10 feet below ground level. 103 appears to be closer to USFS land than the other openings. Feature 102 is the only hazardous mine opening remaining at this site. It is located on a seldom visited, very steep hillside and had partially collapsed shut.

Quad Name: Creede

Site #: 09-04-325/4188-1.100

Site Name: Between Shallow Creek and Sawmill Gulch

Hazard Rating: 2

Description and pertinent facts: This 20 feet deep shaft is located on a steep hillside about 1000 feet from a 4WD road. It is proposed for backfilling by CDMG during their Spar City project, planned for 1994.

Quad Name: Creede

Site #: 09-04-327/4189-2.100

Site Name: Lower Sawmill Gulch

Hazard Rating: 2

Description and pertinent facts: This inclined shaft is about 30 feet deep and is located a couple of hundred feet up a steep hillside, but there are homes in the general vicinity. The shaft collar has partially collapsed, leaving a 1X3 feet opening in the debris.

Quad Name: Creede

Site #: 09-04-327/4191-2.106

Site Name: Between Rat Creek and Bulldog Mtn

Hazard Rating: 2

Description and pertinent facts: A hazardous shaft at least 40 feet deep is present in this area. It is on a steep hillside with poor access about 500 feet from a 4WD road. It is scheduled for backfilling during the CDMG Spar City project, which is planned for 1994.

Quad Name: Creede

Site #: 09-04-328/4189-1.100

Site Name: Northeast of Monon Mine

Hazard Rating: 2

Description and pertinent facts: This dangerous shaft with eroding collar is on or very near the USFS boundary. It is 46 feet deep and is found on a steep hillside with poor vehicular access, but there are summer and permanent homes in this area. It is proposed to be backfilled in 1994 by CDMG during their Spar City project.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Creede

Site #: 09-04-328/4189-2.103

Site Name: Northeast of Monon Hill

Hazard Rating: 2

Description and pertinent facts: A 30 feet deep shaft with very unstable wooden collar occurs in this area about 150 feet from a 4WD road. It is included in the CDMG Spar City project and should be backfilled during 1994.

Quad Name: Creede

Site #: 09-04-328/4190-1.103

Site Name: North of Monon Hill

Hazard Rating: 2

Description and pertinent facts: Adit 103 is barely visible from the road. It has an extremely unstable portal, but does not appear to be very deep. The roof has collapsed for the first 25 or so feet, and at that point there appears to be an opening through the exposed timbers by which the underground workings are accessible. There are also three other adits at this site which were assigned hazard ratings of 3.

Quad Name: Creede

Site #: 09-04-328/4190-3.100

Site Name: Southwest of Bulldog Mine

Hazard Rating: 2

Description and pertinent facts: There is a 26 feet deep shaft with a small dump out in a meadow that is visible from the Bachelor Tour Loop. The shaft may be on private land. It is proposed for backfilling by CDMG during their Spar City project in 1994. Adit 110 has been previously backfilled, but the placed fill has settled and a small, 2X3 feet opening that provides access underground has developed. This adit is very near the USFS boundary. Bob Boppe said he re-backfilled this adit late in 1992.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Creede

Site #: 09-04-330/4192-1.100/201/202

Site Name: Commodore and Amethyst Mines

Hazard Rating: 2

Description and pertinent facts: Much of this area is private land, but there is a very small inlier of USFS land below the Commodore mine and a fairly large tract between the two mines. There is an adit with dangerous portal located on USFS land near Burro Bridge on the Bachelor Tour Loop. It is barely visible from the road. The CDMG has scheduled this adit for closure in their Spar City project during 1994. Dump 202, which is on private land, poses potential stability and/or flood problems. As this dump was constructed, it completely filled the creek bottom with waste material. West Willow Creek was confined to a wooden flume and steel culvert as it passed through the dump area. The wooden flume is rapidly deteriorating and being squeezed shut by downhill movement of the dump. If the flume fails and water is backfilled up behind the dump, a water break-through could occur, whereby a torrent of backed up water could be released, which could severely erode the dump and perhaps cause flooding in Creede. Dump 201 is being actively eroded and undercut by West Willow Creek, causing the dump to become unstable. Only the southernmost end of dump 201 is on USFS land.

Quad Name: Creede

Site #: 09-04-331/4190-2.102

Site Name: Along Todilto Road East of Creede

Hazard Rating: 2

Description and pertinent facts: This 20 feet deep shaft is adjacent to the "Todilto" road, which has restricted vehicular access. Hikers sometimes use this road to reach Inspiration Point. There is a drift which runs to the east off the bottom of the shaft.

Quad Name: Creede

Site #: 09-04-331/4191-2.100

Site Name: Resurrection Tunnel

Hazard Rating: 2

Description and pertinent facts: This tunnel was recently utilized by Todilto Mining Company for exploration purposes. There is a wooden door over the portal, but it has been vandalized and the mine can be readily entered. Vehicular access on the road to this mine is restricted, but hikers and hunters can visit this site on foot. Adit 102, which appears to be situated on USFS land but is

close to private land on either side, was given a ranking of 3. It's portal has collapsed, leaving two openings about 2X2 feet in the collapsed debris which appear to allow access underground. Based on the size of the dump, the adit is probably shallow.

Quad Name: Creede

Site #: 09-04-331/4191-3.100

Site Name: Northwest of Resurrection Tunnel

Hazard Rating: 2

Description and pertinent facts: This 20 feet deep shaft is directly adjacent to the old foot trail used to access the mines in this area. The trail also appears to receive a fair amount of foot and horse traffic. The shaft collar is unstable and in danger of collapse.

Quad Name: Creede

Site #: 09-04-331/4191-4.100

Site Name: Southeast of Resurrection Tunnel

Hazard Rating: 2

Description and pertinent facts: A shaft approximately 50 feet deep is present in this area on a steep hillside between two switchbacks on the "Todilto" road. The collar of the shaft has collapsed, creating a 6X8 feet opening at the surface which necks down to a 4X5 feet opening at 8 feet below ground level.

Quad Name: Creede

Site #: 09-04-331/4195-2.103

Site Name: Holy Moses Mine

Hazard Rating: 2

Description and pertinent facts: The walls around this extremely hazardous stope complex are beginning to collapse, creating a very dangerous situation. The stope complex appears to be mostly on private land, but part of it may be on USFS land. The stopes are up to 40 feet wide, and one is at least several hundred feet deep. The ground surface is underlain by rocky soil material which is slowly but surely caving into the stope. A barbed wire fence was constructed around the stope by the Colorado Mined Land Reclamation Division (CMLRD) in 1991, but this does not prevent someone from climbing over the fence and falling into the stope. The CMLRD safeguarded two other shafts located on private property at this site. One was the original discovery shaft where Nicholas Creede made the first silver strike. A cast-in-place concrete shaft was installed in this shaft about 15 feet below ground level and a thin layer of fill was placed over the cap. Thus, the original discovery shaft still exists at the ground surface, it just isn't very deep or hazardous. Because of the historic significance of this site, it experiences frequent visitation.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Spar City

Site #: 09-04-327/4172-1.100

Site Name: Denver Tunnel

Hazard Rating: 2

Description and pertinent facts: This 748 feet long tunnel has been recently retimbered by the Larson family, who have the unpatented claims at this site. There is vehicular access to the site, otherwise it would have received a hazard rating of 3.

Quad Name: Spar City

Site #: 09-04-327/4173-5.100

Site Name: Headlight Mine

Hazard Rating: 1

Description and pertinent facts: This very hazardous shaft is immediately adjacent to and below FR 555.1. A small vehicle could possibly fall into the shaft if it went off the road at this point. The shoulder of the road is in danger of collapsing into the shaft. The shaft is very near the USFS boundary, but appears to be on the private side of the boundary. The shaft is scheduled for backfilling by CDMG during their Spar City project in 1994.

[illegible]

Quad Name: Wagon Wheel Gap

Site #: 09-04-341/4181-1.100

Site Name: North of Blue Creek Lodge

Hazard Rating: 2

Description and pertinent facts: The portal of this adit has partially collapsed shut, but access to the underground workings is still possible. The adit is near Blue Creek Lodge, and is sometimes visited by guests who stay at the lodge.

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

RIO GRANDE NATIONAL FOREST

DEL NORTE RANGER DISTRICT

May 2, 1995

by
Robert G. Benson
Matthew A. Sares

Colorado Geological Survey

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
RIO GRANDE NATIONAL FOREST
DEL NORTE RANGER DISTRICT**

This document summarizes the sites *of concern* to the USFS-Del Norte Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only the sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2). It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS managed lands. Private (patented) land inholdings were only investigated when evidence indicated that environmental degradation from these sites affected USFS managed lands.

A **priority listing** of the most important environmental degradation sites and the most important physical mine hazards is given on the next page.

Site descriptions of individual mine features, which comprise the bulk of this report, follows on page 3. These are not listed in order of priority, but are listed by: 1) Quadrangle Name and 2) Site Number.

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed permanently in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Numerical Summary:

- | | |
|-----|---|
| 120 | mine openings inventoried (includes collapsed or filled openings) |
| 2 | mine features have an Environmental Degradation Rating of 3 or higher |
| 22 | mine openings have Mine (Physical) Hazard Ratings of 1 or 2. |

PRIORITY SITES
DEL NORTE RANGER DISTRICT

Environmental Degradation

Site Name	Quad Name	Site #	EDR
1) Southwest Embargo	Pine Cone Knob	09-05-365/4184-2.210	2
2) Central Embargo	Pine Cone Knob	09-05-366/4184-1.105	3

Physical Mine Hazards

Site Name	Quad Name	Site #	PHR
1) Extreme South Embargo	Pine Cone Knob	09-05-365/4184-1.100	1
2) Extreme South Embargo	Pine Cone Knob	09-05-365/4184-1.104	1
3) SW Embargo	Pine Cone Knob	09-05-365/4184-2.100	1
4) Central Embargo	Pine Cone Knob	09-05-366/4184-1.108	1
5) Park Creek Quarry	Elwood Pass	09-05-354/4144-1.100	2
6) Baughman Creek Mine	Pine Cone Knob	09-05-364/4184-1.100	2
7) Baughman Creek Mine	Pine Cone Knob	09-05-364/4184-1.102	2
8) Extreme South Embargo	Pine Cone Knob	09-05-365/4184-1.105	2
9) SW Embargo	Pine Cone Knob	09-05-365/4184-2.101	2
10) SW Embargo	Pine Cone Knob	09-05-365/4184-2.102	2
11) SW Embargo	Pine Cone Knob	09-05-365/4184-2.111	2
12) Northwest Embargo	Pine Cone Knob	09-05-365/4185-2.103	2
13) South-central Embargo	Pine Cone Knob	09-05-366/4183-1.101	2
14) South-central Embargo	Pine Cone Knob	09-05-366/4183-1.102	2
15) Central Embargo	Pine Cone Knob	09-05-366/4184-1.103	2
16) Central Embargo	Pine Cone Knob	09-05-366/4184-1.105	2
17) Central Embargo	Pine Cone Knob	09-05-366/4184-1.106	2
18) Central Embargo	Pine Cone Knob	09-05-366/4184-1.107	2
19) Cyclone Mountain	Pine Cone Knob	09-05-367/4185-1.100	2
20) Cyclone Mountain	Pine Cone Knob	09-05-367/4185-1.102	2
21) Cyclone Mountain	Pine Cone Knob	09-05-367/4185-1.103	2
22) SW Twin Mountains SE	Twin Mountains SE	09-05-380/4181-1.100	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-2.210

Site Name: Southwest Embargo

Environmental Degradation Rating: 2

Description and Pertinent Facts: This site is apparently within a small inlier of private, patented land. However, the drainage directly below the site is clearly on USFS land. The drainage contains a plume of yellow-brown stain most intense at the toe of the dump tapering downstream for approximately 200 yards. This mine dump is the largest dump observed in the district with an estimated volume of 4000 yd³. It is characterized by distinct yellow to orange-brown colors and sulfide odor. The dump forms three lobes in a dry drainage. The associated production workings are completely caved, but appear to have started with a large decline on the north and uphill side of the dump. Finely to coarsely-crystalline subhedral pyrite is present, often associated with quartz vein(?) material. Pyrite is locally $\leq 35\%$, typically 2% in dump material. Mudcracks in depressions on top of the dump suggest standing water during rainy periods, but when the site was visited in June, no standing water was present. The presence of standing water on the dump surface suggests that water infiltration of the dump does occur, causing degraded water flows to emanate from the dump toe at times. Timbers still standing in dump and on dump slopes show a soft precipitate layer ≤ 1 in. thick associated with severe rot for about 6 inches above the dump surface.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4184-1.105

Site Name: Central Embargo

Environmental Degradation Rating: 3

Description and Pertinent Facts: This mine adit is partially caved at its portal. The portal dam has a 1" HDPE(?) pipe placed in it. The pipe is siphoning water into a stock tank approximately 40 ft. from the portal on the top of associated mine dump (mine feature #205). Silica and carbonate encrustations are present at the pipe faucet and on the edges of the tank. Seepage through the dam and overflow from the stock tank channels down the north edge of the dump at the dump-soil contact. The flow extended about 100 feet from the stock tank when the site was visited in June. Test parameters at the discharge from the pipe were conductivity of 1500 μ S and pH of 7.3. Water sample 09-05-366/4184-1.105 was taken and the analytical results are included in the appendix. The results indicate that the high conductivity of the water is attributed to major cations and anions (hardness=880 mg/L as CaCO₃) and not high metals concentrations. The sulfate concentration of 830 mg/L is significantly elevated. This could be a water quality concern as the State's water quality standard for sulfate is 250 mg/L. Water from this

infiltrates into the ground about 100 feet from an intermittent tributary to Seitz Creek. This adit is also a dangerous physical hazard and is described in the Physical Hazards section of this report.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Elwood Pass

Site #: 09-05-354/4144-1.100

Site Name: Park Creek Quarry

Physical Hazard Rating: 2

Description and Pertinent Facts: The mine feature is a mined rock face immediately adjacent to Forest Road (FR) 380, a heavily-travelled tourist route to the Summitville area. The rock face is approximately 120 ft. high, with three well-defined bench faces of 30 ft. each, and a less-defined top bench. The catch bench widths are ≤ 10 ft. and all are nearly full of rockfall debris. The bottom bench has evidence of rockfall. Numerous overhanging boulders are present in the upper benches. The overall pit slope is $\sim 55^\circ$. Access is by a short spur from FR 380. Extreme visibility from the heavily travelled road and the high rockfall frequency support a Physical Hazard Rating (PHR) of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-364/4184-1.100

Site Name: Baughman Creek Mine

Physical Hazard Rating: 2

Description and Pertinent Facts: This large adit is in competent rock and has an unlocked, wooden-plank door. Dimensions of the adit opening are 7 ft. high by 6 ft. wide. The adit interior is accessible for at least 100 ft. The interior of the adit is slightly damp with local puddles. No air movement was observed and bad air may be present. The size of the adit, remnant steel, and associated mine features 200, 201, and 102 of same inventory area suggest significant production from this locality. The feature is immediately adjacent to a short spur road off FR 648 and is very visible from the road. Transporters for tracked construction equipment could unload very close to the area. Rubber-tire equipment should also have good access to the adit. Accessibility into the feature, visibility from FR 648, and proximity to a road support a hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-364/4184-1.102

Site Name: Baughman Creek Mine

Physical Hazard Rating: 2

Description and Pertinent Facts: This mine feature is an adit with a 3 ft. square opening and interior accessible for at least 100 ft. in competent rock. The portal is only slightly caved. The adit is directly above feature 100 of same inventory area, and it is probably connected to it through winzes or stopes. The feature is near a short

spur road off FR 648 and is very visible from the road. Transporters for tracked construction equipment could unload very close to the area. Accessibility into the feature, visibility from FR 648 road, and proximity to a road support a hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-1.100

Site Name: Extreme South Embargo

Physical Hazard Rating: 1

Description and Pertinent Facts: This shaft has a 10 ft. square opening and is 26 ft. deep. It is located near a ridge at the end of an unmarked jeep trail off a spur road connected to FR 649. The cribbing has caved and bridged the shaft opening 8 ft. below surface. The shaft is probably open to the 26 ft. measured depth. The apparent target was a limonite-quartz vein in silicified and argillized andesite(?). The associated dump is small, suggesting, minor production, if any. Depth of feature, visibility from FR 649, and position adjacent to a 4WD road support a hazard rating of 1 (extreme danger). Access for construction equipment is excellent.

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-1.104

Site Name: Extreme South Embargo

Physical Hazard Rating: 1

Description and Pertinent Facts: This shaft has an 8 ft. square collar, is partially cribbed, and is 22 ft. deep, with crude planking across the opening. The shaft is immediately adjacent to an unmarked but obvious spur road off FR 649. The shaft opening is partly cratered in surface alluvium, but shaft walls appear to be solid at ≥ 10 deep. Access for construction equipment is excellent. Depth of feature, visibility from the road, and very close proximity to the road support hazard rating of 1 (extreme danger).

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-1.105

Site Name: Extreme South Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: The mine feature is a partially-caved decline (inclined shaft) that dips 60° below horizontal. The shaft has a 15 ft. square surface opening and is 20 ft. deep. The cribbing has shifted, and the physical hazard is more from additional caving if the cribbing is disturbed while moving about the inside of the decline, than from depth of the feature. The condition of the decline, and very close proximity to a 4WD spur road off FR 649 support a hazard rating of 2. Access for construction equipment is excellent.

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-2.100

Site Name: SW Embargo

Physical Hazard Rating: 1

Description and Pertinent Facts: This is a 40 ft. deep, cribbed, vertical shaft with a fenced, 14 ft. square surface opening. The shaft is immediately adjacent to an unmarked but well-travelled spur road off FR 649. The shaft cribbing has shifted and the shaft is partially caved, indicating unstable shaft walls. Access for tracked and rubber-tire construction vehicles is good. The shaft depth, visibility, and very close proximity to the road support a hazard rating of 1 (extreme danger).

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-2.101

Site Name: SW Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: This feature is an adit of apparently small production. The partially caved portal opening is only 1 by 2.5 ft., but the adit is still readily accessible for at least 100 ft. Access for tracked construction vehicles is good. Accessibility into the feature, visibility, and proximity to FR 649 support a hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-2.102

Site Name: SW Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: As above, this is an adit of apparently small production. The portal is 2 by 3 ft and is partially caved, but the adit is still readily accessible for at least 100 ft. inside. Access for tracked construction vehicles is good. Accessibility into the feature, visibility, and proximity to FR 649 support a hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-365/4184-2.111

Site Name: SW Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: The mine feature is an 8 ft square shaft, 30 ft. deep, and is nearly completely enclosed by cribbing and decking. It is apparently on private/patented land with unclear boundaries. The shaft is close to feature 210 of the same inventory area described previously under Environmental Degradation. A cover with skip bucket trap-door is still in place, as well as a manway. No caving is visible at the surface up to the cribbing/sides, but some caving beneath the cribbing is visible through holes in the cribbing on the opposite side. The shaft is directly adjacent to a jeep

trail off a well-travelled spur road from FR 649. Access for tracked construction vehicles is good and is moderate for rubber-tired construction vehicles. The depth of the shaft, its visibility from FR 649, and its very close proximity to a jeep trail support a hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-365/4185-2.103

Site Name: Northwest Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: This is a 20 ft. deep shaft in hard rock, with a 10 ft. by 6 ft. opening. The upper 4 feet of the shaft consists of alluvium. The shaft is partially obscured by trees and brush. Dump material is darker than typical for the district. No path leads directly to the shaft. Access by tracked construction vehicles would be difficult, mostly because trees would need to be cut to allow passage. The depth of the feature and low visibility of the shaft support PHR of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4183-1.101

Site Name: South-central Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: This is an 18 ft. deep, cribbed shaft through alluvium, which apparently bottomed at bedrock. The surface opening is 6 ft. by 3 ft. and is unfenced. The cribbing has shifted somewhat and is no longer stable. Access for tracked construction vehicles is good, but is through over 750 ft. of sagebrush and a ravine. The depth of the feature, visibility from, and proximity to FR 649 support PHR of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4183-1.102

Site Name: South-central Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: This cribbed shaft has a poorly-fenced, 6 by 4 ft. opening, and is 33 ft. deep, through alluvium. The shaft apparently bottomed at bedrock. The shaft is directly adjacent to FR 649. The cribbing has shifted somewhat and is no longer stable. Access for tracked construction vehicles is good. The shaft depth, visibility from, and proximity to FR 649 support PHR of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4184-1.103

Site Name: Central Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: This feature is a 7 ft. by 4 ft., cribbed vertical shaft about 45 ft. deep, with a visible dump situated immediately above mine feature 104 of the same inventory area. This feature is probably a vent shaft. The shaft is about 500 ft. from FR 649 and is only accessible to tracked construction vehicles. The depth of the feature, visibility from road FR 649, and proximity to the road support a physical hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4184-1.105

Site Name: Central Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: This adit is partially caved at the portal, but the opening (3 ft. x 2 ft.) is wide enough to allow a person to crawl in. The adit is filled with about 18" of water as far as visibility allows. Other than the portal, little caved material is visible on the floor. The ribs and back of the adit appear to be stable. No circulating air was felt coming from, or going into the adit, suggesting the possibility of bad air. This feature is also described in the "Environmental Degradation" portion of this report, as it has an EDR = 3. The adit is easily reached via a spur road from FR 649. Accessibility into the feature, visibility the from road, and proximity to the road support a hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4184-1.106

Site Name: Central Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: The feature is a 40 ft. deep, cribbed shaft with a 5 ft. square collar opening. The shaft probably had little or no production. A barb-wire fence discourages access. The associated dump is visible from the road. A cluster of junipers obscure the opening. Access to the feature is possible by four-wheel drive or tracked construction vehicles across about 550 ft of sage and a dry drainage. Depth of feature, visibility from road, and proximity to road support hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4184-1.107

Site Name: Central Embargo

Physical Hazard Rating: 2

Description and Pertinent Facts: This feature is a 20 ft. deep, 3 ft. by 5 ft., cribbed shaft with little or no production. The apparent target was a 10 to 15" stockwork of

quartz \pm pyrite. A barb-wire fence discourages access. The associated dump is visible from the road. A cluster of pines partially obscure the opening on the northwest side. The feature is about 1000 ft. from FR 649. Access by tracked construction vehicles is moderate to poor because of the steepness of the terrain. Depth of feature, visibility from FR 649, and proximity to the road support hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-366/4184-1.108

Site Name: Central Embargo

Physical Hazard Rating: 1

Description and Pertinent Facts: This shaft is greater than 40 ft. deep with an opening 12 ft. by 14 ft. funneling down to a 6 ft. by 4 ft. cribbed shaft in bedrock. It is immediately above adit 105 in same inventory area. The shaft is probably a vent raise, but no air appeared to be circulating when the site was visited in June. A 60 yd³ dump is associated with the shaft and is visible from road FR 649. The shaft is about 600 ft. from FR 649 and is only accessible to tracked construction vehicles. The shaft is partially caved and cribbed. Depth of feature, visibility from road, and proximity to road support hazard rating of 1.

Quad Name: Pine Cone Knob

Site #: 09-05-367/4185-1.100

Site Name: Cyclone Mountain

Physical Hazard Rating: 2

Description and Pertinent Facts: The mine feature is a partially collapsed adit, with a present opening of 3 ft wide by 1 ft high, with the hard-rock interior opening up to 4 ft. wide by 5 ft. high. The adit is at least 100 ft. deep. No cribbing remains intact from the former portal back to competent rock. A deep trench with vertical to overhanging sides in moderately-consolidated and poorly-sorted alluvium is present where old cribbing held the adit open. The trench opens directly onto a well-used but unnumbered spur road off FR 649. Access for tracked and rubber-tired construction vehicles is excellent. Poor slope stability of the trench walls, and position near a well-used road support a hazard rating of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-367/4185-1.102

Site Name: Cyclone Mountain

Physical Hazard Rating: 2

Description and Pertinent Facts: This mine feature is a cribbed, 10 ft. deep shaft with a 4 ft. square opening, possibly related to Mine Feature 100 of the same inventory area (described above). There is very little dump material associated with the shaft and it looks very much like a small, shallow prospect except on close inspection. Access to tracked vehicles is good; moderate for rubber-tired vehicles. The feature is about 250 ft.

from feature 100. The depth of the feature and absence of significant danger signs support PHR of 2.

Quad Name: Pine Cone Knob

Site #: 09-05-367/4185-1.103

Site Name: Cyclone Mountain

Physical Hazard Rating: 2

Description and Pertinent Facts: This feature is a 4 ft square-opening, 20 ft. deep, cribbed shaft, possibly related to Mine Feature 100 of the same inventory area, and is virtually identical to 102 of same inventory area, described above. There is very little dump material associated with the shaft and it looks very much like a small, shallow prospect pit except on close inspection. Access to tracked vehicles is good and moderate for rubber-tired vehicles. The feature is about 350 ft. from feature 100 described above. Depth of the shaft and absence of significant danger signs support PHR of 2.

Quad Name: Twin Mountains SE

Site #: 09-05-380/4181-1.100

Site Name: SW Twin Mountains SE

Physical Hazard Rating: 2

Description and Pertinent Facts: This feature is a 20 x 20 ft. shaft opening in alluvial material in a relatively flat area used for grazing. The shaft is 17 feet deep. It has partially caved and has some remnant timbers. A string of small prospect pits trends north-northwest from the feature. The feature may have been an old water well. Egress from the feature would be difficult due to the unconsolidated walls and width of the opening. Construction vehicle access to the shaft is not difficult from road FR 665.

SELECTED REFERENCES

Vanderwilt, J. W, 1947, Part I, Metals, Nonmetals, and Fuels, *in* Mineral Resources of Colorado, State of Colorado Mineral Resources Board, 547 p.

Del Norte Ranger District files, Rio Grande National Forest, Del Norte, Colorado

Abandoned Mine Land Inventory - Rio Grande NF - Del Norte Ranger District

USFS ABANDONED MINE LAND INVENTORY PROJECT

SUMMARY REPORT

RIO GRANDE NATIONAL FOREST--SAGUACHE RANGER DISTRICT

KERBER CREEK DRAINAGE BASIN

April 26, 1994

prepared by

Robert M. Kirkham

Colorado Geological Survey

USFS ABANDONED MINE LAND INVENTORY PROJECT

SUMMARY REPORT

RIO GRANDE NATIONAL FOREST--KERBER CREEK DRAINAGE BASIN

This document summarizes the results of the 1993 field work performed by the Colorado Geological Survey for the USFS Abandoned Mine Land Inventory Project within the Kerber Creek watershed of the Saguache Ranger District, Rio Grande National Forest. Only those sites on or immediately adjacent to USFS land, and those on private land that cause environmental degradation to USFS lands were inventoried during the project. Sites exclusively on private land, but which impact USFS land were examined only in a reconnaissance manner. A field form was completed for all visited sites, and each mine feature was assigned ratings based on the environmental degradation and physical hazard of the feature. Each inventory area and its associated mine features and water tests have been plotted on PBS quadrangle maps.

A brief description of the priority sites *of concern* to the USFS Saguache Ranger District from both environmental degradation and physical hazards aspects are listed in this summary. The summary does not include all mine sites visited during the inventory of this part of the district. The Summary Report describes sites that were assigned Environmental Degradation (ED) Ratings of extreme (1), significant (2), or potentially significant (3), along with sites given Physical Hazard (PH) Ratings of extreme danger (1) or dangerous (2). Note that there are ten additional sites with ED ratings of slight (4) and eight sites with PH ratings of potentially dangerous (3) within the Kerber Creek drainage basin which are not described in the Summary Report.

Water quality data for several of the sites inventoried during this investigation is contained in a number of references and will not be duplicated in this summary report. The references were briefly reviewed for our study and are in part summarized in the descriptions of some sites. Additionally Geoff Plumlee and others, with the U.S. Geological Survey, Branch of Geochemistry, collected water samples at several locations within the inventory area. The results of these analyses are not yet available, so only their sample locations are described.

A priority listing of the twelve most important sites with environmental degradation and fifteen most important sites with physical hazards is provided on the following page. The summary descriptions contained in the remainder of this document are not listed in order of priority, but rather are grouped first by quadrangle name and then by site number within the quadrangle.

Comprehensive, detailed information for all inventoried mine sites within the ranger district will be available at a later date in the digital database.

**USFS ABANDONED MINED LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST--KERBER CREEK DRAINAGE BASIN**

PRIORITY SITES WITH ENVIRONMENTAL DEGRADATION RATINGS OF 1, 2, OR 3

RATING 1:

RAWLEY 12: 09-06-400/4240-3; Bonanza Quadrangle
RAWLEY 3 and 4: 09-06-401/4241-2; Whale Hill Quadrangle

RATING 2:

MINNIE LYNCH MINE: 09-06-400/4240-2; Bonanza Quadrangle
MAYBELLE MINE AREA: 09-06-401/4243-2; Bonanza Quadrangle
SOSTHENES MINE AREA: 09-06-400/4242-1; Bonanza Quadrangle
SUPERIOR MILL: 09-06-399/4242-2; Bonanza Quadrangle
ST. LOUIS MINE: 09-06-401/4239-1; Bonanza Quadrangle
LIBERTY MINE: 09-06-400/4239-1; Bonanza Quadrangle
NORTH OF ROSALIE MINE: 09-06-402/4240-2; Whale Hill Quadrangle

RATING 3:

CONFLUENCE OF SQUIRREL, RAWLEY, & KERBER CREEKS: 09-06-399/4240-3; Bonanza Quad.
COCOMONGO MINE: 09-06-399/4240-1; Bonanza Quadrangle
UPPER COPPER GULCH: 09-06-402/4240-3; Whale Hill Quadrangle

PRIORITY SITES WITH PHYSICAL HAZARD RATINGS OF 1 OR 2

RATING 1:

EAGLE MINE: 09-06-401/4235-1; Bonanza Quadrangle
BELOW COCOMONGO MINE: 09-06-399/4240-2; Bonanza Quadrangle
MAYBELLE MINE AREA: 09-06-401/4243-2; Bonanza Quadrangle
UPPER EAGLE GULCH: 09-06-402/4236-1; Whale Hill Quadrangle

RATING 2:

MIDDLE GREENBACK GULCH: 09-06-402/4235-1; Whale Hill Quadrangle
EAST OF SUPERIOR MINE: 09-06-401/4241-1; Whale Hill Quadrangle
BETWEEN CHLORIDE GULCH AND GREENBACK GULCH: 09-06-402/4235-2; Whale Hill Quad.
SUPERIOR MINE: 09-06-400/4241-1; Bonanza Quadrangle
LOWER RAWLEY GULCH: 09-06-400/4240-1; Bonanza Quadrangle
CENTER RIDGE: 09-06-406/4235-1; Whale Hill Quadrangle
UPPER COPPER GULCH: 09-06-402/4240-3; Whale Hill Quadrangle
UPPER RAWLEY GULCH: 09-06-402/4242-1; Whale Hill Quadrangle
LOWER EAGLE GULCH: 09-06-400/4235-1; Bonanza Quadrangle
CONFLUENCE OF SQUIRREL, RAWLEY, & KERBER CREEKS: 09-06-399/4240-3; Bonanza Quad.
RAWLEY 12: 09-06-400/4240-3; Bonanza Quadrangle

SITES EXHIBITING ENVIRONMENTAL DEGRADATION (only ratings of 1 to 3)

Quad Name: Bonanza

Site #: 09-06-399/4240-1.205/208

Site Name: Cocomongo Mine

Environmental Degradation Rating: 3

Description and pertinent facts: Several mine dumps and mill tailings piles associated with the Cocomongo and Bonanza mines are adjacent to or near Kerber Creek at this site. Two of the features, 205 and 208, are assigned an ED rating of 3 because both are comprised of tailings materials and are very near the creek. A portion of pile 205 is on USFS land, and all of pile 208 appears to be on USFS land. Six other features (200, 202, 203, 204, 209, and 210) were given ED ratings of 4. These features occur on both private and/or USFS land. Feature 205 is a small pile of tailings at the toe of the main Cocomongo mine dump (200) that is adjacent to Kerber Creek. A small pool of water next to the toe of dump 205 had a pH of 5.9 and conductivity of 340 μ S/cm. Feature 204 is an earthen dam built across the creek that appears to have been constructed from fairly inert materials.

The pH of Kerber Creek above the site was 7.2, while below the site it was 7.4. Conductivity of the creek above the site was 87 μ S/cm, whereas below the site it was 83 μ S/cm. These data suggest the Cocomongo may have only very limited impact on the quality of surface water in Kerber Creek, a somewhat surprising conclusion in light of the size and location of the various dumps that occur adjacent to the creek.

Prior water analyses relevant to this site are described by Moran and Wentz (1974), Kirkham and Holm (1989), McCulley, Frick & Gilman (1994), and Colorado Department of Health (CDH) (1994). Analysis of a water sample collected by Kirkham and Holm (1989) in August, 1988 from just above this site indicated the creek carried the following total recoverable metals at that time: aluminum = 0.2 mg/L, iron = 0.26 mg/L, and manganese = 0.01 mg/L. Copper, zinc, nickel, molybdenum, cadmium, chromium, and lead concentrations were below detection limits. Data reported by McCulley, Frick & Gilman (1994) and by CDH (1994) indicate that the concentrations of only a few metals increase in Kerber Creek below the Cocomongo and Bonanza mine sites.

Quad Name: Bonanza

Site #: 09-06-399/4240-3.201

Site Name: Confluence of Squirrel, Rawley, and Kerber Creeks

Environmental Degradation Rating: 3

Description and pertinent facts: Relatively clean water in Kerber Creek is severely impacted by inflows from Squirrel Gulch and Rawley Gulch in this area. Feature 201 includes tailings and dump materials eroded from the Rawley 300, 400, and 1200 levels (and perhaps the Minnie Lynch mine and other sites) that have been deposited along Kerber Creek and its tributaries within this inventory area. The deposited tailings material have been assigned an ED rating of 3 due to their potential contributive effect to water quality problems in Kerber Creek. The deposited tailings (201) occur on both USFS and private lands, and are also found along the creek for miles downstream. The relative

Sites Exhibiting Environmental Degradation (continued)

09-06-399/4240-3, Confluence of Squirrel, Rawley, and Kerber Creeks (continued)

contributions to metal concentrations and loads resulting from leaching of the deposited tailings has not yet been quantified, but it could perhaps be significant.

The impact of inflows from Squirrel and Rawley Gulches is indicated by field tests involving pH and conductivity, and by changes in the visual qualities of the stream. Above its confluence with Squirrel Creek, Kerber Creek had a pH of 7.5 and conductivity of 66 $\mu\text{S}/\text{cm}$. Kerber Creek appears to be a fairly healthy stream above its confluence with Squirrel Creek. Squirrel Creek had a pH of 6.6 and conductivity of 598 $\mu\text{S}/\text{cm}$ above the confluence and was loaded with iron precipitates and suspended materials. Below the confluence with Squirrel Creek, the pH of Kerber Creek dropped to 7.1 and the conductivity increased to 153 $\mu\text{S}/\text{cm}$. Iron precipitates are common below the confluence. Kerber Creek appears to be dead and sterile below its confluence with Squirrel Creek.

The pH of Kerber Creek appears to drop slightly in the reach between its confluences with Squirrel and Rawley Gulches. Immediately above the confluence with Rawley Gulch, Kerber Creek had a pH of 6.9 and conductivity of 152 $\mu\text{S}/\text{cm}$. Below the confluence with Rawley Gulch, the pH of Kerber Creek fell to 6.4, and the conductivity increased to 178 $\mu\text{S}/\text{cm}$. Rawley Gulch had a pH of 4.2 and conductivity of 436 $\mu\text{S}/\text{cm}$ above its confluence with Kerber Creek. The appearance of Kerber Creek worsened below the confluence with Rawley Gulch.

Moran and Wentz (1974), McCulley, Frick & Gilman (1994), and CDH (1994) report on water chemistry at this site.

Quad Name: Bonanza

Site #: 09-06-399/4242-2.202/203/204/205

Site Name: Superior Mill

Environmental Degradation Rating: 2

Description and pertinent facts: The tailings pond at the Superior mill (feature #202) appears to contribute to water quality problems in Squirrel Creek, and has been assigned a ED rating of 2. Three associated settling ponds were assigned ED ratings of 3, but they may actually help to alleviate the environmental problems at this site by retaining waste material eroded from this site. The breach in tailings dam 202 had been repaired, and there were diversion ditches above the pond which intercepted ground water and reduced the inflow into and out of the pond. When visited on July 2, 1993, there was still standing water within the tailings pond, but there was no surface flow out of the pond. The primary sources of water that enter the tailings pond now appear to be precipitation, springs which discharge from the bedrock hillside north of and below the mill building, and perhaps ground water in the alluvial aquifer of Bear Creek. A test run on the spring water yielded a pH of 6.9 and conductivity of 189 $\mu\text{S}/\text{cm}$. Water standing in the pond had a pH of 3.9 and conductivity of 982 $\mu\text{S}/\text{cm}$ when tested this year, suggesting water quality degrades while being retained by the tailings pond.

Sites Exhibiting Environmental Degradation (continued)

09-06-399/4242-2, Superior Mill (continued)

Squirrel Creek had a pH of 8.1 and conductivity of 184 $\mu\text{S}/\text{cm}$ above the site and a pH of 7.8 and conductivity of 257 $\mu\text{S}/\text{cm}$ below it. Bear Creek, which flows adjacent to the site, had a pH of 7.3 and conductivity of 279 $\mu\text{S}/\text{cm}$ above the site and a pH of 7.8 and conductivity of 283 $\mu\text{S}/\text{cm}$ below the site, suggesting it is not significantly affected by the site. Reports by Moran and Wentz (1974), Kirkham and Holm (1989), and McCulley, Frick & Gilman (1994) contain water analyses relevant to this site. Kirkham and Holm (1989) indicate that in 1988 the effluent discharging through the former breach had a near neutral pH and conductivity of around 330 $\mu\text{S}/\text{cm}$. It is curious that the pH appears to have decreased and the conductivity to increase between the 1988 and 1993 testings. Total recoverable metals concentrations in the effluent in 1988 ranged from about 1.0 to 1.2 mg/L of iron, 1.1 to 1.9 mg/L of manganese, 0.05 to 0.1 mg/L of copper, and 0.9 to 1.5 mg/L of zinc. Samples collected by Kirkham and Holm (1989) in August of 1988 from Squirrel Creek above and below the millsite suggested the total recoverable concentrations of iron increased from 0.07 to 0.65 mg/L, while manganese went from 0.05 to 0.97 mg/L, and zinc increased from 0.04 to 0.55 mg/L. Other tested metals were relatively unchanged. Analyses by McCulley, Frick & Gilman (1994) indicate that similar increases in total iron, manganese, and zinc occurred below the Superior mill during their low-flow sampling in 1993. CDH (1994) reports comparable concentrations for their 1993 sampling effort.

Quad Name: Bonanza

Site #: 09-06-400/4239-1.200

Site Name: Liberty Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The Liberty mine site includes five mine dumps which degrade water quality in Copper Gulch. One of the dumps (#200) had seepage discharging from its toe at a rate of about 0.1 gpm. The seepage had a pH of 2.7 and conductivity of 2030 $\mu\text{S}/\text{cm}$ when tested in June. The dump appears to be on private land, but is very near the USFS boundary. The other four dumps were assigned ED ratings of 4 and are not believed to be very significant.

Beavers have been very active in Copper Gulch. One recent beaver pond is adjacent to dump 200. Water backed up by this beaver pond may be percolating through the dump and seeping out the toe of the dump. When this site had been visited during previous years, there was no seepage noted from dump 200, and there was not a beaver pond there either. Another beaver pond had backed water against dump 205. The water had spread across a portion of the dump, and could possibly spill over and erode the dump, if the beavers raised the dam crest.

What appeared to be a natural seep (#305) discharged at about 1 gpm from the hillside on the north side of the creek at the lower part of this site. The seep water had a pH of 5.9 and conductivity of 293 $\mu\text{S}/\text{cm}$. It was carried beneath FR 865 by a plastic pipe.

Sites Exhibiting Environmental Degradation (continued)

09-06-400/4239-1, Liberty Mine (continued)

The Empress Josephine mine occurs on private land immediately above this site. Water was seeping from the toe of one of the dumps at this mine and flowing into Copper Gulch. The dump seep was tested immediately above its confluence with Copper Gulch. The flow was estimated at 3 gpm, its pH was 3.2, and its conductivity was 1110 μ S/cm. The pH of Copper Gulch dropped from 6.9 to 6.5 as a result of this inflow, but conductivity remained relatively unchanged.

The pH and conductivity of Copper Gulch were similar above and below the Liberty mine site, suggesting that although there is a mining-related source of very acid water with high conductivity within the site, the overall effect of the site on the creek is not great.

Moran and Wentz (1974) and McCulley, Frick & Gilman (1994) provide analytical water chemistry data for Copper Gulch near its confluence with Kerber Creek that indicates the creek has moderately elevated levels of lead, zinc, nickel, iron, manganese, and copper. CDH (1994) sampled the headwaters of Copper Gulch and found it to be generally low in metals. The CDH sample collected from near the mouth of Copper Gulch in 1993 had considerably higher concentrations for several metals than the other studies.

Quad Name: Bonanza

Site #: 09-06-400/4240-2.100/102/201/202

Site Name: Minnie Lynch Mine

Environmental Degradation Rating: 2

Description and pertinent facts: This area contains two draining adits and two dumps seeps. The lower adit at the Minnie Lynch mine (102) was discharging about 3 gpm of pH of 6.4 water with a conductivity of 1064 μ S/cm. Previous total recoverable analyses of this drainage by Kirkham and Holm (1989) in 1986 indicated this water contained nearly 6 mg/L of iron, 34 mg/L of manganese, 0.4 mg/L of copper, 11.6 mg/L of zinc, 0.07 mg/L cadmium, 0.34 mg/L lead, and detectable chromium, nickel, and molybdenum.

The discharge from adit 102 infiltrated into dump 202 and the natural hillside below the adit. There was a small seep issuing about 1 gpm of pH 3.9 water with conductivity of 1178 μ S/cm at the toe of the dump below a prominent loadout, but this also promptly infiltrated back into dump material. A short distance downstream a series of seeps (#306) issue from re-deposited dump material and from the natural hillside. These seeps provided a continuous source of water creating perennial flow in the small unnamed creek, which will herein be referred to as Minnie Lynch Creek. The seeps flowed at a combined rate estimated at 5 gpm on June 24, 1993, and had a pH of 3.7 and conductivity of 1405 μ S/cm.

Discharge from adit 100 enters Minnie Lynch Creek about midway between seeps 306 and Rawley Gulch. Adit 100 appears to be a only small prospect, but it was discharging about 3 gpm of pH 6.2 water with a conductivity of 617 μ S/cm. There

Sites Exhibiting Environmental Degradation (continued)

09-06-400/4240-2, Minnie Lynch Mine (continued)

is an impressive mound of iron precipitate in front of the adit which forms a dam and backs the mine drainage up into a small pool. Minnie Lynch Creek increased in pH from 3.8 to 4.8 and its conductivity improved from 1180 to 921 $\mu\text{S}/\text{cm}$ as a result of the inflow from adit 100. There were visually apparent geochemical changes in the unnamed creek due to the inflow from adit 100 which are worthy of further detailed study.

Another potential problem associated with this site relates to a prominent swath of dead trees extending downhill from the Minnie Lynch mine to Rawley Gulch. The dead trees coincide with an area blanketed by re-deposited dump material that has been eroded from dump 202 at the Minnie Lynch mine. It is unknown whether the death of the trees was related to toxicity or to burial of their base by the deposited material.

Kirkham and Holm (1989) sampled the drainage from the Minnie Lynch adit (#102), but called it the Warwick #5 adit, as was indicated on the PAD form originally prepared for the site during the 1980 Colorado Abandoned Mine Land Program inventory. Their analysis indicated the mine drainage had total recoverable concentrations of 33.8 mg/L of manganese, 11.6 mg/L of zinc, 5.85 mg/L of iron, 0.4 mg/L of copper, and detectable levels of nickel, molybdenum, cadmium, and chromium. Kirkham and Holm (1989) also sampled drainage from adit 100 in 1986. At that time it had total recoverable metal concentrations of 14.5 mg/L of iron, 16.3 mg/L of manganese, 3.1 mg/L of zinc, and detectable levels of nickel, cadmium, and chromium. Samples collected from Minnie Lynch Creek above and below adit 100 indicated that the concentrations of most metals dropped or remained fairly constant below this adit. Iron, which jumped from 0.3 to 7.4 mg/L, is the only metal that increased in concentration below the adit. Aluminum concentrations fell from 7.0 to 6.5 mg/L, manganese dropped from 45 mg/L to 33 mg/L, copper remained fairly constant at just under 4 mg/L, zinc dropped from 34 to 22 mg/L, cadmium went from 0.18 to less than 0.01 mg/L, and nickel fell from 0.09 to 0.05 mg/L.

Plumlee and others (USGS unpublished data) collected samples of the drainage from both adits 100 and 102, the seepage from below dump 202 at location near to our test 306, and from Minnie Lynch Creek above and below the drainage from adit 100. They also sampled the creek and a seep in the dead tree zone below adit 100. The results from these samples are not yet available. McCulley, Frick & Gilman (1994) may have sampled adit 100, but it is not clear exactly which draining adit corresponds to their sample RGA-1.

Quad Name: Bonanza

Site #: 09-06-400/4240-3.100/104/200/202/203

Site Name: Rawley 12

Environmental Degradation Rating: 1

Description and pertinent facts: This site is likely the primary source of mining-related pollution within the Kerber Creek drainage basin. Discharge from the Rawley 12 adit (feature 100) provides a year around inflow of metal-laden

Sites Exhibiting Environmental Degradation (continued)

09-06-400/4240-3, Rawley 12 (continued)

water to Squirrel Creek and is assigned an ED rating of 1. Other sites within Kerber Creek drainage basin likely are significant contributors to the environmental degradation of the creeks seasonally, but the discharge from the Rawley 12 adit persists at a relatively high flow rate throughout the year. The large tailings pile (feature 203) also is given an ED rating of 1. Mine dumps 200 and 202, along with seepage that occurs at a poorly understood feature that has been suggested as being a collapsed adit (feature 104) have ED ratings of 2.

This site has been the subject of numerous water quality studies by the USGS, CSMRI, CDMG, CDH, and McCulley, Frick & Gilman (1994). Please refer to these investigations for water quality analyses for this site.

The Rawley 12 adit (100) is the drain tunnel for the extensive underground workings associated with the Rawley mine and has long been recognized as a major environmental problem. Water discharges from collapsed debris at the portal of the adit at around 0.5 cfs. Discharge rates probably vary seasonally, and the recently installed flume should provide information on the seasonal fluctuation of the discharge rate. When visited on July 2, 1993 the flow rate of the Rawley 12 drainage was about 200 gpm. The water had a pH of 5.7 and conductivity of 1510 μ S/cm.

It has been suggested that considerable water is backed up behind the collapsed debris at the portal of the Rawley 12. Water discharging from the Rawley 4 level has led several investigators to believe that the mine is flooded for 800 vertical feet. If this is true, a tremendous amount of water is contained within the mine, a fact that must be incorporated into the remediation plan for this site. If the water draining from the Rawley 12 was under 800 feet of head, one would expect that it would issue from the collapse debris under considerable obvious pressure. The discharge out the collapsed debris does not appear to be under extreme pressure, suggesting that the amount of head is not great. It is recommended that testing be undertaken to evaluate the hydrostatic conditions of the mine drainage prior to designing or implementing a remedial effort for this feature.

Squirrel Creek is severely degraded by the inflow from the Rawley 12. Our testing indicated the pH of Squirrel Creek dropped from 7.5 to 6.6 and its conductivity increased from 304 to 791 μ S/cm as a result of this inflow. Below the Rawley 12 inflow Squirrel Creek passes through a canyon bordered by mine waste material and mill tailings. Erosion and leaching of tailings pile 203 and mine dumps 200 and 202 will need to be addressed for a remediation project to be completely successful.

A few hundred feet below the Rawley 12, seepage with a pH of 3.1 and conductivity of 1062 μ S/cm issued at about 1 gpm from the toe of dump 200 at a wooden structure (feature 104). Some investigators have suggested that the wooden structure is a portal structure at a collapsed adit, which would indicate the seepage is probably mine drainage. The configuration of the wooden structure, however, is not similar to portal structures with which I am

Sites Exhibiting Environmental Degradation (continued)

09-06-400/4240-3, Rawley 12 (continued)

familiar. Mill end lumber has been nailed to the exterior of the structure in a near vertical orientation. On the portal end of the structure this could be explained as being installed to seal the portal when the mine was closed. The walls of the portal structure, however, should be lined with horizontally placed lagging. The top of the vertically aligned mill ends on the walls of the portal structure have been cut at an angle that nearly parallels the slope of the dump. If lagging, they should parallel the roof of the adit. It seems unlikely that this seepage represents mine drainage from a collapsed portal. The seep could result from precipitation that percolates through the pile, it might represent the discharge point of a spring buried beneath the dump, or it could result from Rawley 12 mine drainage that infiltrates into the dump and re-surfaces at this location.

Tailings pile 203 is probably the second most significant contributor to environmental degradation at this site. Three log retaining dams are associated with dump 203. Portions of each of the three dams have failed or been intentionally breached, resulting in the release of tremendous amounts of tailings that were carried downstream and deposited in the stream channel and on its floodplain. Future failure of the lowermost log dam would likely result in a major release of additional tailings materials, further aggravating environmental problems in Kerber Creek and probably increasing the cost of future remedial efforts. Such a dam failure could also perhaps create flooding hazards downstream. Surface runoff and piping have carved impressive gullies into tailings pile 203. These processes erode tailings material from the pile during spring runoff and during summer thunderstorm events. Calcanthite crystals presently forming in clay layers within pile 203 indicate that copper is being leached, transported, and re-crystallized within the pile.

A series of weak seeps were noted at the base of pile 203 along its contact with Squirrel Creek. The seeps appear to be associated with a prominent zone of yellow precipitate. Only one of the seeps at the base of pile 203 was large enough to readily test. This seep was situated at the upstream end of the pile, immediately below the uppermost log dam. The seep had a pH of 3.0 and conductivity of 1445 $\mu\text{S}/\text{cm}$. It may indeed represent seepage out of pile 203, but it could also relate to the seepage at feature 104.

A field test run on Squirrel Creek below the site had a pH of 6.0 and conductivity of 891 $\mu\text{S}/\text{cm}$, suggesting further degradation of the creek occurs in the segment containing the tailings pile and mine dumps.

The Rawley 12 site has been recently surveyed by the USFS, and this work should be used to determine ownership of the various features on the site. Mine drainage issuing from the Rawley 12 is on USFS land. Seepage at feature 104 appears to be on private land. Dumps 200 and 203, along with tailings pile 203 occur on both private and USFS land.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Bonanza

Site #: 09-06-400/4242-1.103/100/200

Site Name: Sosthenes Mine Area

Environmental Degradation Rating: 2

Description and pertinent facts: The Sosthenes mine area includes two draining adits and several mine dumps. The primary sources of environmental degradation at this site appear to involve a draining adit and dump on private land. Adit 103, which is assigned an ED rating of 2, is the drainage tunnel for the Sosthenes mine. It has been safeguarded by CDMG using a grated culvert. About 2 gpm of pH 6.5 water with a conductivity of 503 $\mu\text{S}/\text{cm}$ flowed out the drain pipe for the adit. The water flowed a short distance across a dump before infiltrating into it, leaving behind a prominent deposit of iron precipitate.

Water emerges from the bottom of the dry stream bed about 150 feet below the base of the lower dump at the Sosthenes mine. This seepage, which is located on private land, had a pH of 3.6 and conductivity of 1190 $\mu\text{S}/\text{cm}$. It probably represents the re-emergence of drainage from the Sosthenes mine, which apparently is further degraded as it percolates through the dump. Stream flow in Sosthenes Gulch was intermittent between this location and the next mine downstream, where another draining adit (100) was found. This lower mine is probably the Merrimac or May Queen, and it is given an ED rating of 3. It appears to be on private land, but is very near the USFS boundary.

Adit 100 was discharging about 3 gpm of pH 6.6 water with a conductivity of 638 $\mu\text{S}/\text{cm}$, but the flow infiltrated into dump 200 and into natural ground before reaching Sosthenes Gulch. The creek was dry immediately adjacent to dump 200, but it began to flow about 200 feet below the Merrimac/May Queen dump. Stream flow was estimated a 5 gpm at this location, and it had a pH of 4.3 and conductivity of 932 $\mu\text{S}/\text{cm}$. There was heavy iron precipitate in the creek for several hundred feet downstream, then it changed to a striking white precipitate that contrasted dramatically with green algae/moss growing in the stream. Stream pH was 5.7 and conductivity was 619 $\mu\text{S}/\text{cm}$ immediately below where the white precipitate initiated.

The segment of Sosthenes Creek below this location was not investigated in detail, but an additional test was run at the confluence of Sosthenes and Squirrel Creeks (see site 09-06-399/4242-1). At this confluence Sosthenes Creek had a pH of 6.8 and conductivity of 609 $\mu\text{S}/\text{cm}$. Squirrel Creek experienced a slight pH drop from 7.6 to 7.4 below the confluence, and conductivity increased from 227 to 244 $\mu\text{S}/\text{cm}$. Surface flow in Sosthenes Creek immediately above Squirrel Creek is seasonal.

This site warrants further study, as it likely is the source of the metal loadings noted by Kirkham and Holm (1989) and by McCulley, Frick & Gilman (1994) in Sosthenes Creek at its confluence with Squirrel Creek, particularly during the high-flow sampling by McCulley, Frick & Gilman (1994).

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Bonanza

Site #: 09-06-401/4239-1.102/202/203/204

Site Name: St. Louis Mine

Environmental Degradation Rating: 2

Description and pertinent facts: Adit 100 at the St. Louis mine was assigned an ED rating of 2, while mine dumps 202, 203, and 204 were rated at 3. Adit 100 appears to be on private land, but is very near the USFS boundary. It apparently was backfilled not too long ago, but is now slightly open. It was draining about 0.5 gpm of pH 3.3 water that had a conductivity of 1010 μ S/cm. The mine drainage had deposited iron precipitate on the ground and in the adjacent beaver pond, which also had a blue, copper-like color to it. A small seep with similar flow rate was noted along the old road downstream from the adit. This seep had a pH of 3.0 and conductivity of 1630 μ S/cm, and it appears to be on private land very near the USFS boundary. Drainage from adit 100 was sampled by Kirkham and Holm (1989) in 1986. Total recoverable metal concentrations at that time included 3.3 mg/L of aluminum, 31 mg/L of iron, 8.3 mg/L of manganese, 1.5 mg/L of copper, 10.7 mg/L of zinc, and low, but detectable levels of nickel, molybdenum, cadmium, and chromium.

Dump 202 is adjacent to and being eroded by Copper Gulch. A beaver pond has been built using the dump as an abutment, causing water within the pond to lap against the dump. Dump 202 appears to be on private land, but is very near the USFS boundary. Dump 203 is the large, very pyritic dump on private land associated with the main shaft at the St. Louis mine. It is being eroded by sheetwash, rilling, and gullying, and may be prone to stream erosion during periods of flooding on Copper Gulch. Dump 204, which appears to be on the FS boundary, lies adjacent to Copper Gulch. Beavers have also utilized it for dam building purposes, causing water to be ponded up against it.

Copper Gulch changes from pH 7.7 to 6.5 below the St. Louis mine, and its conductivity rises from 177 to 219 μ S/cm. There is a light coating of pale red-orange precipitate in the creek below the mine. Analytical data in Kirkham and Holm (1989) indicate that metal concentrations in Copper Gulch increase significantly below the St. Louis mine, particularly for iron, manganese, and zinc. McCulley, Frick & Gilman (1994) and CDH (1994) report that several metal concentrations increase below the mines in Copper Gulch, and it is likely that at least part of the degradation is related to the St. Louis mine.

Quad Name: Bonanza

Site #: 09-06-401/4243-2.100/200/201/208

Site Name: Maybelle Mine Area/Shawmut Drainage Adit

Environmental Degradation Rating: 2

Description and pertinent facts: The drainage tunnel for the Shawmut mine (adit 100) and dump 200 were assigned an ED rating of 2, while dumps 201 and 208 received ratings of 3. Discharge out the Shawmut drainage tunnel constituted the headwater flow of Bear Creek when visited in late June, 1993. The tunnel appears to be on private land, but is near the FS boundary. It has been safeguarded by CDMG with a grated culvert, but the drain pipe for the closure

Sites Exhibiting Environmental Degradation (continued)

09-06-401/4243-2, Maybelle Mine Area/Shawmut Drainage Adit (continued)

has plugged or been blocked by collapse debris. The drainage was issuing from the culvert at about 3 gpm when visited, there was prominent iron precipitate, and it had a pH of 5.3 and conductivity of 680 $\mu\text{S}/\text{cm}$. The water flowed across dump 200 which appeared to be at least partly on USFS. Immediately below dump 200 the stream had a pH of 3.1 and conductivity of 1380 $\mu\text{S}/\text{cm}$, and the flow appeared to be slightly increased, suggesting dump 200 may play an important role in the environmental degradation at this site.

Dump 201, which is associated with the Maybelle mine immediately above the Shawmut drainage tunnel, is adjacent to and is subject to erosion during periods of flooding in the headwaters of Bear Creek.

Bear Creek continues to be very poor in quality for at least a few hundred feet downstream. At the downstream end of the site the creek flows over and erodes dump 208. A water test run on the creek just below dump 208 indicated the creek had a pH of 3.2 and conductivity of 1160 $\mu\text{S}/\text{cm}$ at this location. The creek apparently improves in quality between this site and the Bradbury claims in the SW/4 of section 7 (see 09-06-400/4243-1), for at this location the pH is 7.1 and conductivity is 285 $\mu\text{S}/\text{cm}$. I did not walk out the entire length of Bear Creek below the Shawmut adit, so am uncertain whether the creek cleans itself up or is diluted by good quality inflows. Since the discharge rate of the creek increases considerably between these two sites, the water quality improvement is likely due to the inflow of good quality of waters.

^^NEW QUAD^^

Quad Name: Whale Hill

Site #: 09-06-401/4241-2.100/200/201

Site Name: Rawley 3 and 4

Environmental Degradation Rating: 1

Description and pertinent facts: Several mine-related problems occur in the vicinity of the Rawley 3 and 4 adits in Rawley Gulch, but all are on private land. The site is included in the inventory and the Summary Report because it is perhaps the second most significant source of acidity and heavy metals in upper reaches of the Kerber Creek basin, and the environmental degradation generated at this site extends onto USFS land. The area was not fully inventoried, and no water tests were performed within the inventory area during this study.

Rawley Gulch is of fairly good quality above the Rawley 3 and 4 area (CDH, 1994). During spring runoff there is generally continuous flow in the creek from its headwaters to its confluence with Kerber Creek, but during much of the remainder of the year, the continuous flow in the creek does not initiate until at or below the Rawley 3 dump (201). When visited in July with the USGS team, the creek was flowing above the Rawley 3 dump, and a prominent seep issued from the dump from near one of the loadout structures. Plumlee and others sampled

Sites Exhibiting Environmental Degradation (continued)

09-06-401/4241-2, Rawley 3 and 4 levels (continued)

the seep as it issued from the dump, and also the creek above and below the seep inflow. When visited by Kirkham and Holm (1989) in September of 1986 the seep at the base of dump 201 was dry, and surface flow in Rawley Gulch initiated at a spring located in the bottom of the stream channel (which was eroded into mine waste material) adjacent to the Rawley 4 portal.

The Rawley 4 tunnel (#100) is assigned an ED rating of 1 because of the water which discharges out of it. The original portal of the adit has been daylighted and backfilled by CDMG, and a 6 inch diameter PVC drain pipe was installed such that the inlet end extends beyond the fill used to seal the adit. The outlet end of the pipe approximately coincides with the original portal location. An alternative access route into the Rawley 4 tunnel was created by CDMG at the request of the property leasee, Solution Gold, Inc. A collapsed shaft that originally extended to the Rawley 4 tunnel near a sharp turn in the tunnel was opened up, and a steeply inclined steel culvert with locking door was installed in the former shaft's position.

The source of the water draining out of the Rawley 4 is not definitively known. The adit does extend under Rawley Gulch, so ground water within the Rawley Gulch alluvial aquifer is at least partially intercepted by the tunnel. The adit may also drain part of the underground workings in the upper levels of the Rawley mine.

Kirkham and Holm (1989) sampled the drainage from the Rawley 4 adit in 1986 before the tunnel was daylighted and backfilled. At that time the drainage had a pH of 3.7 and conductivity of 620 $\mu\text{S}/\text{cm}$. It had total recoverable metal concentrations of 3.3 mg/L of iron, 19.1 mg/L of manganese, 2.3 mg/L of copper, 15.5 mg/L of zinc, 0.13 mg/L of lead, and detectable levels of nickel, molybdenum, cadmium, and chromium. When sampled by McCulley, Frick & Gilman (1994) it had a pH of 5.34 and conductivity of 404 $\mu\text{S}/\text{cm}$. The total metal concentrations were fairly similar to that reported by Kirkham and Holm (1989).

The Rawley 3 dump (201) and Rawley 4 dump (200) are assigned ED ratings of 2 because of their position in the channel and floodplain of Rawley Gulch, and because of the seeps which at least seasonally issue from them. Mine drainage from the Whale Mine and the seepage which occurs on the slope below it, are found on the south bank of the gulch near the original Rawley 4 portal. This problem is not described herein nor on the field form for the area, but it should receive consideration when studying the sources of contamination in Rawley Gulch.

Analyses by Moran and Wentz (1974), Kirkham and Holm (1989), McCulley, Frick & Gilman (1994), and CDH (1994) all indicate that Rawley Gulch is a significant source of metal loadings to Kerber Creek, particularly during periods of low-flow. Degradation occurring at the Rawley 3 and 4 are comprises a significant portion of the problem.

Sites Exhibiting Environmental Degradation (continued)

Quad Name: Whale Hill

Site #: 09-06-402/4240-2.100

Site Name: North of Rosalie Mine

Environmental Degradation Rating: 2

Description and pertinent facts: A small, but very acidic seep flowing at about 0.2 gpm was noted at a collapsed adit (100) just northeast of where the Rosalie mine is shown on the 7.5 minute quadrangle map. This draining adit is on private land found on the hillside well above the creek. The drainage has a pH of 2.8 and conductivity of 1860 μ S/cm, but it infiltrates into the ground long before reaching Copper Gulch.

Quad Name: Whale Hill

Site #: 09-06-402/4240-3.100/200

Site Name: Upper Copper Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This site located in the headwaters of Copper Gulch includes a draining adit and dump, both of which were assigned ED ratings of 3. About 25 gpm of pH 7.7 water with a conductivity of 155 μ S/cm flows out of adit 100 near where the Copper Gulch road switchbacks across the creek and climbs up the south valley wall. Dump 200 lies adjacent to Copper Gulch and a portion of the dump has been erosionally removed by the creek. The mine drainage constitutes a significant portion of the stream flow, but stream pH drops by less than 0.1 unit and its conductivity changes from 150 to 175 μ S/cm, suggesting the site is not a major source of pollutants. Both the creek and mine drainage do, however, leave a very light reddish-orange precipitate on the rocks.

SITES EXHIBITING PHYSICAL HAZARDS (only ratings of 1 or 2)

Quad Name: Bonanza

Site #: 09-06-399/4240-2.104

Site Name: Below Cocomongo Mine

Hazard Rating: 1

Description and pertinent facts: A very hazardous shaft (104) is present near FR 862 at what may be the Exchequer mine. The site is situated along Kerber Creek below the Cocomongo mine. The shaft is located in mine dump material near the base of dump 103. Its position is somewhat unusual, and someone travelling on the dump could easily slip, slide down the dump, and fall into the shaft, which is about 40 feet deep. According to the PBS map, this feature is on private land, but there is an inlier of USFS land in the middle of this site. If the boundaries shown on the PBS map are even slightly off (and based on the recent survey work at the Cocomongo and Bonanza mines just north of here, it is likely that the boundaries are different), this very hazardous shaft could be on USFS land.

Shaft 108, which is across the road from 104, appears to be plugged shut at a depth of about 15 feet below ground level, but would be quite hazardous if the material constitutes a false bottom. This feature appears to be on private land.

Quad Name: Bonanza

Site #: 09-06-399/4240-3.100

Site Name: Confluence of Squirrel, Rawley, and Kerber Creeks

Hazard Rating: 2

Description and pertinent facts: Across Kerber Creek and just downstream from its confluence with Rawley Gulch is a partially collapsed adit (100) above a very small dump. The opening through the collapsed debris is only about 2 feet high by 3 feet wide, and based on the size of the dump the extent of underground workings are probably limited. Its close proximity to FR 862 and its unstable portal warrant a PH rating of 2.

Quad Name: Bonanza

Site #: 09-06-400/4235-1.100

Site Name: Lower Eagle Gulch

Hazard Rating: 2

Description and pertinent facts: This site is situated in lower Eagle Gulch along FR 867 in a readily accessible location. Adit 100 has a 5 feet high by 5 feet wide entrance and has partially collapsed shut. The portal area is very unstable, and subsidence features above the adit suggest it is probably collapsed about 30 to 50 feet in from the portal. According to the PBS map adit 100 is just barely on the private side of the Forest boundary. However, it is well west of the fence line that marks the boundary, and thus would appear to be on private land.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Bonanza

Site #: 09-06-400/4240-1.104

Site Name: Lower Rawley Gulch

Hazard Rating: 2

Description and pertinent facts: This site is accessed by a 4WD road which heads south off of FR 890 below the first switchback encountered on the Rawley Gulch road. Shaft 104 is a shallow, log cribbed shaft about 20 feet deep. It is in a fairly remote location well above the prominent dump visible from FR 890. To reach the shaft, follow the 4WD road to its end, walk on the footpath that leads from the end of the road to adit 103, then head uphill to the south of a pair of mine dumps. A PH rating of 3 was assigned to feature 102, which is thought to be a 10 feet deep shaft.

Quad Name: Bonanza

Site #: 09-06-400/4240-3.203

Site Name: Rawley 12

Hazard Rating: 2

Description and pertinent facts: Tailings pile 203 at the Rawley 12 mine is assigned a PH rating of 2 due to the unstable slopes adjacent to the creek. Sections of the pile are prone to failure when undercut by the creek, posing a threat to anyone on or below the pile when the failure occurred. Failure of its lowermost log dam or any blockage of the creek caused by slumps or slides of the piles might generate serious flooding hazards downstream.

This site also includes one adit (105) and two dumps (202 and 203) with PH ratings of 3.

Quad Name: Bonanza

Site #: 09-06-400/4241-1.100

Site Name: Superior Mine

Hazard Rating: 2

Description and pertinent facts: This site is located north of Minnie Lynch mine and is accessed by the same 4WD road that leads to the Minnie Lynch mine. Feature 100 is a 30 feet deep shaft found at the second dump below the third switchback encountered after turning off of FR 890. It is situated on the ridge crest, and there is a deteriorated wooden ladder in the shaft.

This site also includes dump 203, which is assigned a PH rating of 3 due to the existence of a very unstable loadout structure on it.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Bonanza

Site #: 09-06-401/4235-1.102/104/101/108

Site Name: Eagle Mine

Hazard Rating: 1

Description and pertinent facts: This site includes two shafts with PH ratings of 1 and one shaft and one adit with ratings of 2 that are associated with the Eagle mine. The site is easily accessible by 4WD vehicle. Shaft 102 is 33 feet deep and has a very unstable collar, particularly on its southwest side. There is standing water in shaft 102 about 29 feet below ground level. Shaft 104 is a very hazardous, double compartment shaft over 100 feet deep that is likely the main entrance to the Eagle mine. The shaft appears to lie on private land, but it is near the USFS boundary. Shaft 101 was originally a 4 feet by 6 feet timber lined shaft whose collar has failed. The shaft now has an apparent bottom at a depth of 30 feet, and there is a wooden ladder dangling off the wall of the shaft. Feature 108 is an adit that extends underground for at least 100 feet beyond the portal. It is probably the Peterson tunnel, and appears to be on or very near the USFS boundary. This site also includes a shallow, 12 feet deep shaft (103) with a PH rating of 3.

Quad Name: Bonanza

Site #: 09-06-401/4243-2.105/107

Site Name: Maybelle Mine Area/Shawmut Drainage Adit

Hazard Rating: 1

Description and pertinent facts: This site lies in the headwaters of Bear Creek, and is accessed by an unmarked 4WD road that leads off of FR 890 above the Rawley mines in Rawley Gulch. The site includes one very dangerous shaft (105) with a Physical Hazard rating of 1, another shaft (107) with a rating of 2, and a shaft (102) and adit (109) which have ratings of 3. The collar of shaft 105 has failed, causing its shaft house to fall into and partially block the shaft. At first glance the shaft appears to be collapsed shut, but upon close examination it becomes apparent that the shaft is wide open below the lumber that partially blocks the shaft. Shaft 105 is at least 30 feet deep, and is considered extremely dangerous due to lumber plug that obscures the open shaft. Shaft 105 appears to be on private land, but it is very near the USFS boundary.

Shaft 107 looks like a shallow prospect pit filled with logs from a collapsed structure, but there appears to be open void beneath the logs that extends underground for at least 20 feet. The feature was not inspected in greater detail due to its very hazardous condition. Shaft 102 was safeguarded by CDMG using a polyurethane closure with access culvert. Fill around the culvert has settled, giving the appearance that the closure may be unstable. Adit 109 is open for a distance of about 30 feet from its portal, but its roof is very unstable. At that point collapse debris associated with prominent subsidence features appears to seal the tunnel. Also included in this site are a shaft (102) and adit (109) which have PH ratings of 3.

Sites Exhibiting Physical Hazards (continued)

^^NEW QUAD^^

Quad Name: Whale Hill

Site #: 09-06-401/4241-1.101

Site Name: East of Superior Mine

Hazard Rating: 2

Description and pertinent facts: This site lies east of the Superior mine and is within the headwaters of Copper Gulch. To access the site continue past the Superior mine on FR 890.2B, or travel west on the road from Whale Hill. The site includes one very hazardous shaft (101) that lacks road or trail access and is hidden in the trees. The shaft is found within a prominent shaft house with large headframe. It drops about 20 feet vertically and then changes to a very steeply inclined shaft that is at least another 50 feet deep. The shaft would have received a PH rating of 1 had it been more accessible.

Quad Name: Whale Hill

Site #: 09-06-402/4235-1.100

Site Name: Middle Greenback Gulch

Hazard Rating: 2

Description and pertinent facts: Shaft 100 is located within a log shaft house adjacent to an unmarked 4WD road that leads off of FR 888 in Greenback Gulch. It is a steeply inclined shaft whose wooden cribbing is beginning to fail. The shaft is partially plugged about 30 feet below ground level by timbers, soil, and snow. It would be classified with a PH rating of 1 had it been located in a more accessible area.

Quad Name: Whale Hill

Site #: 09-06-402/4235-2.100

Site Name: Between Chloride Gulch and Greenback Gulch

Hazard Rating: 2

Description and pertinent facts: This site is located on the southern edge of the ridge between Chloride Gulch and Greenback Gulch about 500 feet north of FR 889. The shaft appears to be plugged about 15 feet below ground level, where a funnel-shaped depression necks down. However, a wood-lined, open shaft continues on down below this point. The intact shaft is about 4 feet by 6 feet, and a rock dropped down it bounces off the shaft walls until it can no longer be heard. This is a very dangerous shaft that would be rated as a 1 if it were less remote. The shaft appears to be directly on the USFS boundary.

Sites Exhibiting Physical Hazards (continued)

Quad Name: Whale Hill

Site #: 09-06-402/4236-1.109

Site Name: Upper Eagle Gulch/Oregon Mine

Hazard Rating: 1

Description and pertinent facts: One shaft (109) with a PH rating of 1 is included in this site in the headwaters of Eagle and Chloride Gulches. Shaft 109 is an extremely dangerous, steeply inclined shaft that is 26 feet deep. Its collar is highly unstable and in danger of failing at any time. While examining this feature an 8 inch diameter subsidence hole was noted above the hanging wall of the incline in what otherwise looks a like perfectly safe viewing point, indicating that failure of this portion of the collar is imminent.

This site also includes two adits (100 and 107) with PH ratings of 3.

Quad Name: Whale Hill

Site #: 09-06-402/4240-3.100

Site Name: Upper Copper Gulch

Hazard Rating: 2

Description and pertinent facts: This site in upper Copper Gulch contains an adit (100) with a partially collapsed portal, behind which water is backed up about one foot deep. The adit is open for over 100 feet, but the roof appears to be unstable. The adit is located on the east side of Copper Gulch immediately above the switchback in FR 865, where it climbs up out of the bottom of Copper Gulch.

Quad Name: Whale Hill

Site #: 09-06-402/4242-1.102

Site Name: Upper Rawley Gulch/Rainbow Mine

Hazard Rating: 2

Description and pertinent facts: Adit 102 has a partially collapsed portal, is at least 50 feet deep, and looks very hazardous inside. It is in a fairly accessible location in upper Rawley Gulch. This site also includes two adits and a shaft with PH ratings of 3.

Quad Name: Whale Hill

Site #: 09-06-406/4235-1.100

Site Name: Center Ridge

Hazard Rating: 2

Description and pertinent facts: This site is located in a remote spot on the crest of Center Ridge near its southern end. A shaft (100) found within the remains of a log shaft house poses a threat to unwary travelers. The shaft is a steep decline which dips at about 75° to the east. The shaft collar has partially collapsed, causing the shaft house to partly fall into the hole. The shaft is partially covered by the collapsed wood, creating a hazardous condition. The feature would have a Physical Hazard rating of 1 if it were less remote. The shaft is surprisingly deep, considering the size of the dump.

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APPENDIX A.

**USFS ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST--KERBER CREEK DRAINAGE BASIN**

SUMMARY TOTALS

TOTAL NUMBER OF FIELD FORMS = 52

NUMBER OF INVENTORIED MINE OPENINGS = 226

NUMBER OF INVENTORIED MINE DUMPS, TAILINGS PILES, AND SETTLING PONDS = 154

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 1 = 2

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 2 = 7

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 3 = 3

NUMBER OF INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION RATING OF 4 = 10

TOTAL OF 22 INVENTORY AREAS WITH ENVIRONMENTAL DEGRADATION

NUMBER OF INVENTORY AREAS WITH PHYSICAL HAZARD RATING OF 1 = 4

NUMBER OF INVENTORY AREAS WITH PHYSICAL HAZARD RATING OF 2 = 11

NUMBER OF INVENTORY AREAS WITH PHYSICAL HAZARD RATING OF 3 = 8

TOTAL OF 23 INVENTORY AREAS WITH PHYSICAL HAZARDS

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 1 = 3

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 2 = 15

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 3 = 13

NUMBER OF FEATURES WITH ENVIRONMENTAL DEGRADATION RATING OF 4 = 37

TOTAL OF 68 FEATURES WITH ENVIRONMENTAL DEGRADATION

NUMBER OF FEATURES WITH PHYSICAL HAZARD RATING OF 1 = 5

NUMBER OF FEATURES WITH PHYSICAL HAZARD RATING OF 2 = 13

NUMBER OF FEATURES WITH PHYSICAL HAZARD RATING OF 3 = 23

TOTAL OF 41 FEATURES WITH PHYSICAL HAZARDS

**16 OF THE INVENTORIED HAZARDOUS FEATURES WERE SAFEGUARDED BY CDMG AML
PROGRAM**

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

RIO GRANDE NATIONAL FOREST

**SAGUACHE RANGER DISTRICT
EAST AND WEST PARTS
(EXCLUDING KERBER CREEK DRAINAGE BASIN)**

June 2, 1998

by

**Robert G. Benson
Matthew A. Sares**

USFS - ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST - SAGUACHE RANGER DISTRICT EAST AND WEST PARTS

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USFS - ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST - SAGUACHE RANGER DISTRICT EAST AND WEST PARTS

LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
yd ³	cubic yard(s)
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
ft	feet
FR	Forest Road
FT	Forest Trail
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	greater than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

1. Introduction

This document summarizes the sites of concern to the USFS - Saguache Ranger District, but excludes the Kerber Creek drainage basin, which is on the west side of the ranger district. The Kerber Creek (Bonanza) mining district has been intensely mined and is the subject of a separate, earlier report (USFS Abandoned Mine Inventory Project, Summary Report, Rio Grande National Forest--Saguache Ranger District, Kerber Creek Drainage Basin, by Robert M. Kirkham, Colorado Geological Survey).

This report is subdivided into two parts, east and west, recognizing the distinct geographical and geological differences of each part. The east part of the Saguache Ranger District includes the west flank of the Sangre de Cristo Mountains and is east of Poncha Pass. The west part of the district lies west of Poncha Pass and lies within the San Juan Mountains. This summary report does not include all the mine sites visited during the inventory of the district, but includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3); and sites given Physical Hazard Ratings of extreme danger (1), or dangerous (2). Inventory work was limited to those mine sites on or immediately adjacent to USFS-managed land. Private and patented land inholdings were only investigated when evidence indicated that either the environmental degradation emanating from mine sites affected USFS-managed land, or the physical hazard danger was in very close proximity to USFS public-use areas (i.e., trails, USFS roads, etc.).

Priority listings of the most important environmental degradation sites and the most important physical mine hazard sites were compiled.

Site descriptions of individual mine features, which comprise the bulk of this report, follow in Section 5 for environmental degradation sites and Section 6 for physical hazard sites. Site descriptions are not in order of priority, but are listed by 1) quadrangle name, and 2) site number.

The sites exhibiting environmental degradation will undergo further investigation through the Regional Office. We recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or sealed in some way. Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, many of these features are open and represent a threat to those who may chose to enter them, due to "bad air" (e.g., carbon monoxide, carbon dioxide, methane, radon gas, etc.), fall-through hazard related to mining activity (e.g., winzes, stopes, declines, etc.), collapse, and other hazards. If funds are available, these mines should also be closed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district is available in the digital database.

USFS - ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST - SAGUACHE RANGER DISTRICT EAST AND WEST PARTS

2. Numerical Summary

Saguache Ranger District, East Part

Quadrangle name	Quadrangle mine feature totals	Physical Hazard Rating				Environmental Degradation Rating				
		1	2	3	5	1	2	3	4	5
Bushnell 5 inventory areas	18		1	3	14				3	15
Coaldale 1 inventory area	2		1		1					2
Crestone 3 inventory areas	27		3	12	12				2	25
Crestone Peak 1 inventory area	12			6	6			3	9	
Liberty 1 inventory area	2			1	1			1	1	
Mirage 2 inventory areas	27		8	4	15			1	8	18
Poncha Pass 3 inventory areas	6			1	5					6
Rito Alto Peak 6 inventory areas	31		2	13	16			2	6	23
Valley View Hot Springs 5 inventory areas	35	2	4	10	19			1	8	26
Wellsville 2 inventory areas	5			1	4				2	3
totals of East Part of the Saguache Ranger District	165	2	19	51	93			8	39	118

Saguache Ranger District, West Part

Quadrangle name	Quadrangle mine feature totals	Physical Hazard Rating				Environmental Degradation Rating				
		1	2	3	5	1	2	3	4	5
Bonanza 3 inventory areas	21		11		10				1	20
Klondike Mine 9 inventory areas	86		3	8	75				3	83
Lake Mountain 1 inventory areas	2				2					2
Lookout Mountain 2 inventory areas	10	1		5	4				1	9
Mesa Mountain 2 inventory areas	4				4					4
Whale Hill 17 inventory areas	114		10	15	89	1	8	15	20	70
totals of West Part of the Saguache Ranger District	237	1	24	28	184	1	8	15	25	188

USFS - ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST - SAGUACHE RANGER DISTRICT EAST AND WEST PARTS

3. Priority Sites

3.1. *Environmental Degradation Sites*

The sites listed below are considered to have the most potential for significant degradation of the environment. Examination of these sites revealed notable degradation or an inherent capacity for environmental degradation due to size. The report summary contains the details of these inventory sites.

3.1.1. Saguache Ranger District, East Part

Priority ordered listing

Site Name	Quad Name	Site Number	EDR
Major Canyon Mines	Valley View Hot Springs	9-6-430/4224-1.200	3
East Copperhead Mine	Mirage	9-6-431/4218-1.202	3
Mill Creek	Rito Alto Peak	9-6-435/4210-1.200	3
Dimick Gulch	Rito Alto Peak	9-6-438/4208-1.205	3
Pole Canyon	Crestone Peak	9-6-448/4193-1.100, 200, 204	3, 3, 3
Short Creek	Liberty	9-6-449/4191-1.200	3

3.1.2. Saguache Ranger District, West Part

Priority ordered listing

Site Name	Quad Name	Site Number	EDR
Joe Wheeler Mine	Whale Hill	9-6-403/4245-1.100	1
Morning Star Mine Area	Whale Hill	9-6-401/4244-2. 202, 100, 203	2, 3, 3
Golden Age Mine Area	Whale Hill	9-6-402/4244-2.200	2
Upper Spring Creek Mine	Whale Hill	9-6-404/4242-1.202, 203, 204, 200, 201	2, 2, 2, 3, 3
Spring Creek Mines	Whale Hill	9-6-405/4242-1.100, 200, 202	2, 3, 3
Alder Creek Mines	Whale Hill	9-6-406/4245-1.101, 200, 201	2, 3, 3
Villa Grove Turquoise Mine	Whale Hill	9-6-407/4239-1.100	2
NE Morning Star	Whale Hill	9-6-402/4244-1.202, 103, 200, 203	3, 3, 3, 3
Little Darling Mine Area	Whale Hill	9-6-402/4246-1.100, 200	3, 3
Manitou Sunlight Mine Area	Whale Hill	9-6-403/4244-1.201	3

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3.2. *Physical Hazard Sites*

These physical hazard priority sites pose the greatest threat to the public. They are sites with dangerous and accessible mine openings, especially shafts and adits with underground workings that are fall-in hazards and are close to trails, roads, campgrounds, etc. Other potentially dangerous, open mines were inventoried in this district, but are not included in this summary report. These are usually open adits not immediately adjacent to public access routes and were given a Physical Hazard Rating (PHR) of 3.

3.2.1. Saguache Ranger District, East Part

Priority order listing

Site Name	Quad Name	Site Number	PHR
Major Canyon Mines	Valley View Hot Springs	9-6-430/4224-1.100, 101, 102, 103	2, 2, 1, 1
East Copperhead Mine	Mirage	9-6-431/4218-1.100, 101, 103	2, 2, 2
Wild Cherry Creek	Mirage	9-6-432/4216-1.101, 103, 104, 105, 106	2, 2, 2, 2, 2
No Name Lead Mine	Coaldale	9-6-424/4237-1.100	2
Burnt Gulch	Crestone	9-6-440/4205-1.104	2
Wilcox Gulch	Crestone	9-6-442/4204-1.103, 104	2, 2
Garner Creek	Valley View Hot Springs	9-6-430/4225-1.102, 105	2, 2
Dimick Gulch	Rito Alto Peak	9-6-438/4208-1.102	2
Oak Springs	Bushnell Peak	9-6-423/4237-1.102	2
Mill Creek	Rito Alto Peak	9-6-435/4210-1.101	2

3.2.2. Saguache Ranger District, West Part

Priority order listing

Site Name	Quad Name	Site Number	PHR
Middle Fork Carnero Creek	Lookout Mountain	9-6-375/4197-1.106	1
Twins Mine Area	Bonanza	9-6-393/4235-1.100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110	2, 2, 2, 2, 2, 2, 2, 2, 2, 2
Villa Grove Turquoise Mine	Whale Hill	9-6-407/4239-1.100, 101, 103	2, 2, 2
Colorado Belle Area	Whale Hill	9-6-402/4244-3.100	2
Little Darling Mine Area	Whale Hill	9-6-402/4246-1.100	2
Chicago Mine Area	Whale Hill	9-6-404/4241-1.101, 103	2, 2
Klondike Mine	Klondike Mine	9-6-395/4226-1.102, 104	2, 2
Joe Wheeler Mine	Whale Hill	9-6-403/4245-1.105	2
Upper Spring Creek Mine	Whale Hill	9-6-404/4242-1.103	2
NE Morning Star	Whale Hill	9-6-402/4244-1.101	2
Spook City #2	Klondike Mine	9-6-396/4232-2.102	2

4. Geology/Mine District Summary

4.1. *Saguache Ranger District, East Part*

The East Part of the Saguache Ranger district lies within the Sangre de Cristo Mountains. The Sangre de Cristo Mountains form the eastern side of the Rio Grande Rift in the San Luis Valley, and the west-facing slope is where most known mineral occurrences are found. Precambrian metamorphic rocks, cropping out over roughly 60% of the district, consist of Early to Middle Proterozoic metadiorite to quartz monzonite compositions (Johnson, et al., 1984).

Approximately 40% of the district contains Ordovician and younger sedimentary rocks. Unconformably overlying Proterozoic rocks are Ordovician through Mississippian Manitou Limestone, Harding Sandstone, Fremont Dolomite, Chaffee Group dolomite and quartzite, and Leadville Limestone. Unconformably overlying Ordovician through Mississippian-age rocks are Pennsylvanian Minturn and Belden Formations and Permo-Pennsylvanian Sangre de Cristo Formation. Unconformably overlying Permian and older rocks are the Upper Triassic Morrison Formation and Middle Jurassic Entrada Sandstone (Johnson, et al., 1984).

Eocene to Pliocene granite to granodiorite stocks, dikes, and sills intrude parts of the district (Johnson, et al., 1984). Oligocene and Miocene extrusive rocks are present on the east side of the Sangre de Cristo Mountains (Johnson, et al., 1984). Oligocene andesite crops out in the study area southeast of Mount Blanca (Tweto, 1979).

The west side of the Sangre de Cristo Mountains is bounded by rift-related faults (Johnson, et al., 1984). Brister and Gries (1994) believe these faults to be high-angle normal faults. Jones and Benson (1994) have suggested that these faults are low-angle normal or detachment faults. Detachment faulting is probably a significant control on mineralization along the eastern margin of the rift, on the western flank of the Sangre de Cristo Mountains (Jones and Benson, 1994; Benson, in progress).

Mineralized rock occurs throughout the Sangre de Cristo Mountains, and mining is ongoing at the San Luis gold deposit well to the south of the district (Vanderwilt, 1947; Ellis, et al., 1983; Johnson, et al., 1984; Benson and Jones, 1994). Numerous mining towns were active throughout the Sangre de Cristo Range, but most are not inhabited. Crestone, Villa Grove, and Valley View Hot Springs are the only towns still functioning and are shown on present-day maps. Valley View Hot Springs is a small resort on an active geothermal site adjacent to the abandoned, patented Orient iron mine. The abandoned mining townsites of Liberty, Duncan, and Music lie on the privately owned Baca Land Grant near the Great Sand Dunes National Monument (Vanderwilt, 1947). Lexam Explorations (USA), Inc., is developing an oil resource on private land immediately south and adjacent to the district (Watkins, personal communication). No active mining is present beyond the activities described above (Ellis, et al., 1983; Benson and Jones, 1994; Watkins, personal communication).

4.2. *Saguache District, West Part*

The geology of the west part of the Saguache District is dominated by 30- to 35-million-year-old andesite to quartz latite tuffs, breccias, flows, and conglomerates. The west part of the district lies entirely within the San Juan Mountains.

Vanderwilt (1947) refers to only two mining districts within or near the west part of the Saguache Ranger District. Crystal Hill lies just outside of the district on BLM-administered land, and no activity related to the district is contained in this report. According to Vanderwilt (1947), the district is 2 miles southwest of La Garita on Carnero Creek. However, the district lies on what is labeled as Beidell Creek on recent U.S. Geological Survey maps. Vanderwilt (1947) states that although considerable development was accomplished, reported production is minimal. In recent years, mining companies have conducted numerous exploration drilling and evaluation programs, but no activity is ongoing.

The Kerber Creek (Bonanza) district has been the site of intense mining and is the subject of a separate, earlier report (USFS Abandoned Mine Inventory Project, Summary Report, Rio Grande National Forest--Saguache Ranger District, Kerber Creek Drainage Basin, by Robert M. Kirkham, Colorado Geological Survey).

Numerous small mining areas are present throughout the west part of the Saguache Ranger District, but production was small, or production records have been lost. Hydrothermal alteration and sulfide mineral assemblages suggest that most of the mineral occurrences are epithermal and related to volcanic activity.

5. Environmental Degradation Summary

5.1. *Saguache Ranger District, East Part*

Quad Name: Crestone Peak

Site Numbers: 9-6-448/4193-1.100, 200, 204

Site Name: Pole Canyon

Environmental Degradation Ratings: 3, 3, 3

Description and pertinent facts: This site was not visited because of its remoteness, and because the adjoining landowner refused permission to cross the San Luis Maria de Baca Grant No. 4 to gain efficient access. Information regarding mine openings was obtained from Ellis, et al. (1983). Estimates of mine waste volumes are conservative and assume a 30% swell factor. Environmental degradation is assumed to be at least 3. None of the mine workings and dumps are situated in streams. A study was conducted in about 1992 by the USFS for hazardous material content in the Pole Canyon area. Jim Krugman, District Ranger, Saguache District, did not describe any serious problems discovered during the study. A copy of that report is available in the Saguache Ranger District office and at the Rio Grande National Forest Supervisor's office in Monte Vista, Colorado.

Several mine features are present in the Pole Canyon area, but only three features had potentially significant environmental degradation (EDR=3) based on the available information. The dumps described here received EDRs of 3 based on mineralogical description of samples in Ellis, et al. (1983). Dumps #200 and #204 were given EDRs of 3 because of the presence of pyrite, chalcopyrite, and associated oxides. Volume estimates were based on maps of underground workings and are 323 yd³ for dump #200 and 750 yd³ for dump #204.

Sulfides are also present in most of the underground workings, but no drainage from the workings was reported during the hazardous materials study described earlier. Because of the length of adit #100 (110 ft) and the presence of small stopes and cutouts underground, it is assumed that this adit may drain water occasionally. Therefore, this adit received an EDR of 3.

Although this site was not visited, the combination of data described above provides a reasonable estimate of environmental degradation in Pole Canyon. Any reclamation or restoration activities would be difficult to start, given the current access problems. No estimates of equipment accessibility or best type of equipment are given here.

Quad Name: Rito Alto Peak

Site Number: 9-6-435/4210-1.200

Site Name: Mill Creek

Environmental Degradation Rating: 3

Description and pertinent facts: This site is accessed by a wide foot trail along Mill Creek to an old townsite with several cabin remains. From the townsite, a wide trail is cut into a hillside for about 0.5 mile to dump #200. At the beginning of the trail that is cut into the hillside, a compressor plant, water-power station, or some other type of facility was present. The area of the facility is overgrown with thick vegetation, but is visible from a built-up wall or loading area in the trail.

Feature #200 is a large dump (6500 yd³) situated in a dry stream. This dump is associated with extensive underground workings driven on a 18- to 24-inch-wide quartz vein. The dump shows evidence of slumping, contains mostly metamorphic rock lithologies, has yellowish-brown color in some places, and locally contains sulfide, oxides, and minor carbonates. Principal sulfide minerals are pyrite and chalcopyrite, which compose ≤3% of dump material. Oxide minerals, such as malachite and specular hematite, occur in similar proportions. The potential for dump slope failure into the stream during heavy rains, presence of sulfides and carbonates, and the sheer size of the dump suggest that some environmental degradation is possible.

Access to the site would be easy by ATV, however, heavy equipment could not access the site directly without significant construction work.

Quad Name: Rito Alto Peak

Site Number: 9-6-438/4208-1.205

Site Name: Dimick Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: Feature #205 is a moderate-sized, 750-yd³ dump near an intermittent stream, Dimick Gulch, that was flowing about 1200 gpm during the site visit in May, 1995. Some dump material was in direct contact with the stream water, but no water tests were taken because of the high flow. The resulting parameters would not have been representative of normal conditions.

Dump #205 is broadly and thinly spread over a steep slope. The dump toe is about 10 ft above the bottom of Dimick Gulch, but some dump material was in the water and on the opposite side of the gulch. Minor pyrite is present, and specular hematite and goethitic limonite occur on fracture surfaces and as local matrix replacements. Carbonate minerals were not observed here, although they occur in several other dumps in this inventory area.

Access to the western part of the inventory area is by FR 881, a moderate to good 4WD trail. However, careful sidehill operation of track-mounted equipment is necessary to gain access to dump #205 for reclamation work.

Quad Name: Valley View Hot Springs

Description and pertinent facts: Several mine features are closely juxtaposed in this inventory area. Three dumps are present, two of them directly on a marked and well-used trail. The trail, which is shown on the PBS quad map, runs up the Major Creek drainage basin to the inventory area. However, a large parcel of private land lies across the mouth of Major Canyon and Major Creek, blocking direct public access to the trail. A road crosses this parcel of land to slightly east of the National Forest boundary. Public entry to Major Canyon is by a marked trail that starts on public land well to the north and is restricted to foot or horseback travel only.

None of the dumps in this inventory area are in direct contact with Major Creek, even during the period of high runoff when the site was visited. Feature #200 is the largest dump in this area at 260 yd³, but it is not the closest one to Major Creek. It has greater evidence of hydrothermal mineralization (i.e., quartz vein boxworks and open-space vein filling) than the dump closest to the creek, giving it more potential for environmental degradation. Additionally, dump #200 has locally white to gray precipitates suggestive of sulfide breakdown. Some carbonate occurs as caliche. Ellis, et al. (1983) report anomalous silver, arsenic, gold, copper, iron, and molybdenum concentrations in samples from workings associated with this dump. No evidence of site toxicity was observed, nor was there any flowing or standing water onsite.

If access is available across the private land at the mouth of Major Canyon, then light to moderate construction vehicles, especially tracked vehicles, can readily reach the site. Because this site also has a significant physical hazard (see **Physical Hazard Summary**), it may be worth acquiring a temporary easement across the private land. Elimination of the physical hazards would also consume most of the dump material.

5.2. *Saguache Ranger District, West Part*

In the west part of the Saguache Ranger District, all mines exhibiting environmental degradation or potential environmental degradation are on the Whale Hill quad, therefore the quad name is omitted from the labels accompanying the site descriptions.

Site Numbers: 9-6-401/4244-2.100, 202, 203

Site Name: Morning Star Mine Area

Environmental Degradation Ratings: 3, 2, 3

Description and pertinent facts: Access to this inventory area for construction vehicles is moderately good directly from FR 890 on a short spur. Some mine closure work has been done in the vicinity on relatively new roads.

Feature #100 is a collapsed adit with a 5-gpm water discharge that supports growth of normal green algae. Water test parameters are **pH 6.8 and 200 μ S conductivity**. The associated dump has some sulfides. Presence of water discharge from adit, slightly abnormal water parameters, and sulfides suggest an EDR of 3.

Feature #202 is a 2000-yd³, yellow-brown mine dump. Dump #202 has abundant pyrite, locally as high as 50%. A significant halo of dead trees is present around the toe of the dump. The halo is up to 75 ft wide. The presence of sulfides and apparent toxicity to the trees near the dump suggests an EDR of 2. Dump sample #09-06-401/4244-1.202 was collected and showed high potential acidity and moderate metals concentrations. Complete analytical results are in Appendix B at the end of the report.

Feature #203 is a 1750-yd³, yellow-brown mine dump, very similar to #202. The feature has no significant halo of dead trees around it, but vegetation is sparse adjacent to the dump toe. No water was present during the inventory, but some small erosion channels leading from the associated collapsed adit trench suggest water flows across the dump during some parts of the year.

Site Numbers: 9-6-402/4244-1.103, 200, 202, 203

Site Name: NE Morning Star Mine Area

Environmental Degradation Ratings: 3, 3, 3, 3

Description and pertinent facts: Access to this inventory area for construction vehicles is poor, from FR 890 on an old road, 0.4 miles south.

Feature #103 is a collapsed adit with a 10-gpm water discharge that supports growth of normal green algae. Water test parameters are **pH 8.4 and 100 μ S conductivity**. Associated dump #203 has abundant sulfides and affects water quality (see description below). The large volume of water draining from the adit and the presence of sulfides suggest an EDR of 3, although water parameters are alkaline.

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Feature #200 is a 260-yd³ dump with ≤10% sulfides as matrix replacements or associated with open space textures. Yellow-green to brown, iron oxides coat fractures and locally replace the matrix. Dump #200 has a strong sulfide-decay odor. No erosion channels or water were present at dump #200 at the time of the site visit. Presence of sulfides and odor suggests an EDR of 3.

Feature #202 is a 160-yd³ dump similar to #200. Presence of sulfides and odor suggests an EDR of 3.

Feature #203 is a 160-yd³ dump similar to #200, with ≤10% coarse- to fine-grained sulfides (pyrite ± chalcopyrite ± sphalerite) as matrix replacement or associated with open space textures. Yellow-green to brown, iron oxides coat fractures and locally replace the matrix. Dump #203 has a strong sulfide-decay odor. Effluent from associated adit #103 crosses the dump in several places (see description of adit #103 above). Test parameters of the effluent upstream of dump #203 are **pH 7.9 and 100 µS conductivity**. Parameters at two test sites adjacent to dump #203 are **pH 7.8 and 100 µS conductivity and pH 7.4 and 100 µS conductivity**. Effluent downstream of dump #203 has **pH 7.8 and 100 µS conductivity**. Apparent slight effect of this dump on water quality, presence of sulfides, and odor suggest an EDR of 3.

Site Number: 9-6-402/4244-2.200

Site Name: Golden Age Mine Area

Environmental Degradation Rating: 2

Description and pertinent facts: Neither dump #200 nor its associated adit appear on the PBS map. The dump is close to a patented land survey corner, but lies on USFS-managed land. Feature #200 is a 1000-yd³ dump with abundant sulfides and consists predominantly of quartz vein and silicified andesitic(?) material. Vegetation is sparse or absent across an average 10-ft width at the dump toe. Locally, massive sulfides are exposed on the dump surface. No water was present during the inventory. High acid-generation potential and apparent floral mortality support an EDR of 2. Construction vehicle access is poor from FR 890, which is about 0.25 miles to the north of the area.

Site Numbers: 9-6-402/4246-1.100, 200

Site Name: Little Darling Mine Area

Environmental Degradation Ratings: 3, 3

Description and pertinent facts: Construction vehicle access to this inventory area is good via FR 876.

Feature #100 is a shaft of uncertain dimensions that has apparently collapsed to the level of an adjacent creek. The creek is about 20 ft south of the shaft and may extend to the shaft during flood stages. No flow was observed from the shaft at the time of the site

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visit. Disturbance of the site may cause flow from the shaft, leading to possible environmental degradation.

Feature #200 is a 100-yd³ dump related to the above shaft. Clover Creek is immediately adjacent and in contact with the dump. No flow from the dump was observed, and the dump was not saturated at the time of the site visit. Dump is a yellow-brown, iron-oxide color in places, suggesting the presence of sulfides. Water test parameters immediately above dump #200 in Clover Creek are **pH 7.2 and 100 µS**. Test parameters immediately below dump #200 in Clover Creek are **pH 7.0 and 100 µS**. Environmental degradation is not greatly evident, but the presence of possibly sulfidic dump material in contact with a perennial stream suggests an EDR of 3.

Site Number: 9-6-403/4244-1.201

Site Name: Manitou Sunlight Mine

Environmental Degradation Rating: 3

Description and pertinent facts: Construction vehicle access is very poor from FR 890, which is about 1.5 miles to the north-northeast.

Feature #201 is a 580-yd³ dump fanned out immediately above the confluence of two streams that eventually flow into Alder Creek. Dump toe is in contact with the southern stream. Most of dump #201 is oxidized to a yellow-reddish brown, iron-oxide color, and pyrite is scattered on the surface. No sulfide-decay odor was present at the time of site visit. Water parameters measured above dump #201 are **≤50 µS and pH 7.4**. Parameters measured at the discharge from associated adit #101 are **100 µS and pH 6.7**. Parameters measured below dump #201 are **≤50 µS and pH 6.6**. Test results show a significant addition of acidity that may affect the stream's buffering capacity downstream. Water tests and the contact of sulfide-bearing dump material with a flowing stream suggest an EDR of 3.

Site Number: 9-6-403/4245-1.100

Site Name: Joe Wheeler Mine

Environmental Degradation Rating: 1

Description and pertinent facts: Construction vehicle access to adit #100 is fair via FR 890.

Feature #100 is an intact adit with 5-ft square opening and a 1.5-gpm discharge of murky, orange-brown water. The adit is reported to be 1100 ft long. Water test parameters are **pH 3.30 and 989 µS** at the adit portal. Parameters are **pH 5.51 and 496 µS, and pH 6.24 and 494 µS** downstream from the feature. Test parameters are **pH 7.15 and 236 µS** upstream from the feature. Bright orange-brown precipitate and green filamentous algae are in the effluent channel from the adit. Dump material within the effluent channel may contribute to water degradation. The volume of orange-brown precipitate diminishes downstream, disappearing about 300 ft below adit #100's associated dump. USFS

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personnel collected a water sample in July, 1993. Sample results, shown below, reveal concentrations of copper, lead, manganese, silver, and zinc exceed state standards by more than two orders of magnitude. Aluminum, cadmium, chromium, and iron concentrations exceed standards by more than an order of magnitude. Below normal pH and extremely high metal concentrations associated with visible stream load and precipitates support an EDR of 1

Sample number 403/4245-1.300; hardness of effluent sample = 91 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
pH	3.36 standard units	6.5 standard units	too acidic
Acidity	195 mg/L	no standard	n/a
Conductivity	860 µS/cm	no standard	n/a
Aluminum	3573	87*	41 x standard
Cadmium	60	1.1	57 x standard
Calcium (as CaCO ₃)	34.6 mg/L	no standard	n/a
Chromium	212	11*	19 x standard
Copper	1223	10.9	112 x standard
Iron	9036	300	30 x standard
Lead	382	3.4	112 x standard
Magnesium	1.1 mg/L	no standard	n/a
Manganese	8681	50	174 x standard
Nickel	56	89	below standard
Potassium	1.3 mg/L	no standard	n/a
Silver	6.4	0.06 (on 3/2/98)	100 x standard
Sodium	6.4 mg/L	no standard	n/a
Strontium	144	no standard	n/a
Sulfate	332 mg/L	250 mg/L	1.3 x standard
Zinc	14039	98	143 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Site Numbers: 9-6-404/4242-1.200, 201, 202, 203, 204

Site Name: Upper Spring Creek Mine

Environmental Degradation Ratings: 3, 3, 2, 2, 2

Description and pertinent facts: Access to this inventory area for construction vehicles is poor, by 4WD trail from FR 875. Dumps #202-204 are closely spaced and related to each other.

Feature #200 is a light yellow-brown to orange-brown, sulfide-bearing, 235-yd³ dump. Some yellowish surface staining extends downhill for about 20 ft. This staining probably results from sheetwash transporting dump material downhill. Healthy trees surround dump #200, but presence of sulfides, downhill staining, and odor suggest an EDR of 3.

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Feature #201 is a light yellow-brown to orange-brown, 245-yd³ dump with ≤15% sulfides. No significant erosion is evident. Dead trees stand near dump #201, but do not form a continuous halo, suggesting some infiltration of toxins into the adjacent soils. Possible toxicity to trees, presence of sulfides, and oxidation suggest an EDR of 3.

Feature #202 is a conical, light yellow-brown to orange-brown, 100-yd³ dump with ≤15% sulfides. Dump #202 is adjacent to shaft #103, described in the **Physical Hazard Summary** in this report. Yellow-brown stain, which extends directly downhill on a talus slope dotted with dead trees for several hundred feet, probably results from erosion of dump material. No vegetation existed on dump #202 at the time of the site visit. Possible toxicity to trees, presence of sulfides, and oxidation suggest an EDR of 2.

Feature #203 is a light yellow-brown to orange-brown, 76-yd³ dump with ≤15% sulfides. Dump #203 is adjacent to shaft #103 and dump #202 and contributes to the stained area below dump #202. A sample of apparent ore concentrates is numbered 09-06-404/4242-1.203. The sample had a low pH and contained high concentrations of zinc, iron, arsenic, copper, lead, silver, and cadmium. Complete analytical results are shown in Appendix B at the end of this report. Presence of sulfides, abundant metals, similarity to dump #202, and oxidation suggest an EDR of 2.

Feature #204 is a smaller, light yellow-brown to orange-brown dump with ≤15% sulfides and a building foundation. No mill tailings are evident. Dump #204 is adjacent to dumps #203 and #202 and contributes to the downslope staining described above. Presence of sulfides, similarity to dumps #202 and #203, and oxidation suggest an EDR of 2.

Site Numbers: 9-6-405/4242-1.100, 200, 202

Site Name: Spring Creek Mines

Environmental Degradation Ratings: 2, 3, 3

Description and pertinent facts: Access for construction vehicles is poor, by 4WD trail from FR 875. Many of the upper areas could only be reached with new road construction or track-mounted equipment.

Feature #100 is a completely collapsed adit with a slight seep of standing water outside the portal. Water parameters adjacent to adit #100 are **pH 3.0 and 500 µS conductivity**. This water may infiltrate into the associated dump, passing into shallow groundwater (see description for dump #200 below). In addition, acidic water may be dammed behind the collapsed portal, filling the mine workings. The potential of dammed acidic water in adit #100 suggests an EDR of 2.

Feature #200 is a light-brown to yellow-brown, 1500-yd³ dump with localized areas of ≤10% sulfides. Dump material is predominantly silicified/sericitized andesite breccia associated with fault gouge. Timber remains in contact with dump #200 are corroded and rotted. The dump surface emits a moderate sulfide odor when stepped on. Footprints do

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not fill with water, but dump #200 seems damp below the surface, possibly because of infiltration of effluent from adit #100. Presence of sulfides, odor, and dampness indicate an EDR of 3.

Dump #202 is similar in composition and appearance to #200, but has less gouge. Dump #202 has a sulfide odor, but lacks erosion channels. Presence of sulfide, odor, and dampness indicate an EDR of 3.

Site Numbers: 9-6-406/4245-1.101, 200, 201

Site Name: Alder Creek Mines

Environmental Degradation Ratings: 2, 3, 3

Description and pertinent facts: Access from FR 890 is poor for all vehicles. However, roads entering the area from upstream may connect to private or USFS roads.

Feature #101 is a completely collapsed adit. The adit is about 10 ft higher than the beaver ponds in Alder Creek. The trench leading to the collapsed portal has standing water. Test parameters of the water are **conductivity 1500 μ S and pH 2.9**. Associated dump material is rich in sulfides, suggesting that low pH and high conductivity water may occur throughout the underground workings.

Feature #200 is a large, four-lobe dump extending out into beaver ponds in Alder Creek. Associated adit #100 has an EDR of 4 and is not described here. Dump #200 contains about 6000 yd³, and the sulfide content is $\leq 20\%$, predominantly pyrite \pm chalcopyrite \pm sphalerite. The dump toe adjacent to the beaver ponds is soggy and saturated about 12 inches above the water surface, and locally thick grass grows on dump #200. Parameters of the water adjacent to the dump are **conductivity 100 μ S and pH 7.4**. High sulfide content indicates potential degradation.

Feature #201 is a large, three-lobe dump that also extends out into beaver ponds in Alder Creek. Dump #201 originated from adit #101, described above, and contains about 4000 yd³ of waste material. Typical sulfide content is $\leq 20\%$, predominantly pyrite \pm chalcopyrite \pm sphalerite. The dump toe adjacent to the beaver ponds is soggy and saturated about 12 inches above the water surface, and thick grass grows locally on dump #201. High sulfide content suggests potential degradation. Soil sample #09-06-406/4245-1.201 (misabeled by the lab as #09-06-406/4245-1.202) was collected, and the results are shown in Appendix B. Dump #201 has high potential acidity and has moderately high concentrations of lead and zinc. Parameters of pond water adjacent to dump #201 are **conductivity 100 μ S and pH 7.8**. In July, 1994, a water sample was collected from the beaver pond in Alder Creek, immediately adjacent to dump #201. Sample results, shown below, reveal that manganese concentration significantly exceeds state standards. Aluminum, copper, and zinc concentrations are very close to the standards.

Sample number 406/4245-1.304; hardness of pond water = 77 mg/L.

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Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	40 mg/L	no standard	n/a
Aluminum	94	87*	1.1 x standard
Arsenic	<1	50 (acute, trec)	below standard
Barium	28	1000 (trec)	below standard
Cadmium	0.3	0.9	below x standard
Chromium	<10	11*	below standard
Copper	9	9.3	below standard
Iron	180	300	below standard
Lead	<5	34	below standard
Manganese	320	50	6.4 x standard
Nickel	<20	77	below standard
Silver	<0.2	0.05 (on 3/2/98)	below detection limit
Sulfate	43 mg/L	250 mg/L	below standard
Zinc	73	83	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Site Number: 9-6-407/4239-1.100

Site Name: Villa Grove Turquoise Mine

Environmental Degradation Rating: 2

Description and pertinent facts: This inventory area is easily accessed by FR 874. Feature #100 is a moderately large, open-pit copper mine. A large pond of emerald-green to pale blue water is at the bottom of the pit, held in by a low, poorly maintained dam on the west end of the pond. Water parameters at the west end are **pH 3.1 and 1400 µS conductivity**, indicating significantly degraded water. A water sample was taken in July, 1994, and the lab results are shown below. The sample greatly exceeded state standards in concentrations of aluminum, copper, and manganese. Sulfate and iron concentrations also exceeded standards.

Sample number 407/4239-1.300; hardness of pit water sample = 460 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Alkalinity	<10 mg/L	no standard	n/a
Aluminum	44000	87*	506 x standard
Arsenic	<1	50 (acute, trec)	below standard
Barium	3	1000 (trec)	below standard
Cadmium	1.8	3.8	below x standard
Chromium	<10	11*	below standard
Copper	2700	44	62 x standard
Iron	1900	300	6.3 x standard
Lead	<5	34	below standard

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Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Manganese	1700	50	34 x standard
Nickel	120	305	below standard
Silver	0.3	1 (on 3/2/98)	below standard
Sulfate	790 mg/L	250 mg/L	3.2 x standard
Zinc	210	386	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

6. Physical Hazard Summary

6.1. *Saguache Ranger District, East Part*

Quad Name: Bushnell Peak

Site Number: 9-6-423/4237-1.102

Site Name: Oak Springs

Physical Hazard Rating: 2

Description and pertinent facts: The inventory area name comes from a spring that is heavily used by campers, hunters, and others. Prospect shaft #102 is located in a dry creek and is immediately adjacent to a well-used, unmarked trail in the creek basin. The inventory area is low on the range front.

Feature #102 is a partly obscured, 9 ft by 4 ft, cribbed shaft that is 8 ft deep. Oakbrush partly covers the surface opening on the uphill side. The associated dump is not distinctly colored in comparison to the surrounding soil and is not readily visible. The cribbing is mostly intact, but has shifted and partly caved. Some erosion channels/rills, less than 2 inches deep, show where water has run into the shaft opening. The shaft was dry at the time of the site visit in mid-May. Unassisted exit from the shaft would be difficult, even if uninjured, given that the shaft walls are potentially unstable.

Tracked equipment should have no difficulty accessing the site along the sandy creek bottom north from Oak Spring. A small, wheeled backhoe with a skilled operator would also be able to negotiate the way to the site.

^^New Quad^^

Quad Name: Coaldale

Site Number: 9-6-424/4237-1.100

Site Name: No Name Lead Mine

Physical Hazard Rating: 2

Description and pertinent facts: The inventory area straddles FR 976, the Hayden Pass Road, that crosses from the east side of the San Luis Valley into the western Arkansas River Valley. The road is heavily used by 4WD vehicles when it is passable. Most construction equipment could easily access this feature.

Feature #100 is an adit that is 5 ft wide by 6 ft high. Ellis, et al. (1983) mapped the adit, and the face at the time of their visit was at least 90 ft from the portal. Unconsolidated dump material partly blocks the portal. A USFS "stay out" sign is posted on the closure. No material has been pushed into the adit, and the interior of the adit is easily accessed by

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climbing over the top of the pile. Water that was dammed behind the “closure” pile was seeping through the toe of the pile and crossing the road. Conductivity and pH did not indicate degraded water quality. Bad air is not very likely, given the circulation of apparently good water. This open mine’s proximity to a well-used road is a serious danger.

^^New Quad^^

Quad Name: Crestone

Site Number: 9-6-440/4205-1.104

Site Name: Burnt Gulch

Physical Hazard Rating: 2

Description and pertinent facts: Burnt Gulch lies immediately east of the town of Crestone, on a road that is frequently used by mountain bike riders. A visible trail leads from a lower trail of heavier use to the area of shaft #104, at an elevation of about 9000 ft.

Feature #104 is an open, uncribbed shaft with a 10 ft by 12 ft opening. The shaft's mining target was apparently an extensively faulted quartz vein about 24 inches wide. The shaft is 35 ft deep. The dimensions of the shaft preclude an unassisted exit if one were to survive a fall. The edges of the shaft opening are sloped inward and are unstable, but do not appear to be undercut.

A tracked vehicle might be able to climb directly up the hill to the feature, but all other equipment access would be very difficult. The associated dump for the shaft is widely scattered, making fill scarce without disturbing additional ground.

Quad Name: Crestone

Site Numbers: 9-6-442/4204-1.103, 104

Site Name: Wilcox Gulch

Physical Hazard Ratings: 2, 2

Description and pertinent facts: Wilcox Gulch is a tributary of South Crestone Creek. Several mine features are present within the inventory area, and the general layout suggests that each mine working was pursuing similar mining targets. The inventory area is accessed by FR 949 and trails TR 865 and TR 949.

Adit #103 apparently advanced on the upper parts of the same vein that adit #102 was mined on. Adit #102 is not a serious mine hazard and will not be further discussed. However, #103 is a dangerous feature, in that the portal is completely unobstructed, and a deep winze (interior shaft) is present in the floor about 15 ft inside. Ellis, et al., (1983) describe the winze as 30 ft deep, but a timed stone drop suggests that the winze is considerably deeper. Given the position of #103 above #102, the two adits may be

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Shaft #100 has a 10 ft by 5 ft surface opening and dips slightly to the west, to a minimum depth of 15 ft. The shaft is on a ridge that is drivable, and therefore, presents a drive-in hazard as well as a fall-in hazard. No indication of standing water is present, suggesting that the shaft may be open at depth, or may be filled with highly permeable, coarse rock. The location and the possibility of a false bottom support a PHR of 2.

Shaft #101 has an 8 ft by 10 ft opening and a minimum depth of 14 ft. The shaft is immediately adjacent to a road and presents a fall-in hazard. The orientation of shaft #103's long direction is parallel to feature #102, suggesting they may be connected. This feature may be only a trench, but a lack of standing water implies that the feature may be open at depth, or is filled with highly permeable, coarse rock. The location and the depth of possibly more than 14 ft support a PHR of 2.

Feature #103 is an adit with an unlocked door. The adit opening is 6 ft by 4 ft, becoming slightly larger inside. An undated Atlas explosives box was immediately inside the portal, in addition to numerous empty oil cans, filters, and trash. The floor was dry, with no signs of water. The easy access and the possibility of explosives support a PHR of 2.

The presence of a large adit beneath possible shafts suggests that the upper workings may be plugged at present depths, but could fail or collapse to much greater depths. This group of mine features has a PHR of 2 because of this relationship. A bulldozer and a backhoe could easily secure these features.

Quad Name: Mirage

Site Numbers: 9-6-432/4216-1.101, 103, 104, 105, 106

Site Name: Wild Cherry Creek

Physical Hazard Ratings: 2, 2, 2, 2, 2

Description and pertinent facts: The inventory area is adjacent to an old townsite (Pike or Pyke) and is close to a well-used, marked trail (TR 961). FR 961 crosses the western part of the area.

Shaft #101 has a 10 ft by 15 ft surface opening that funnels to a 3 ft by 5 ft, cribbed opening about 5 ft below the surface. The shaft is 23 ft deep and dry, located on a ridge above Pike. Brush partly obscures the opening. The location of the shaft on a ridge that is easily walked, its depth, caving of the sides, and partial obstruction support a PHR of 2.

Mine features #103, #104, and #105 are very close to each other. Feature #103 is an adit with a 4 ft by 4 ft portal and a visible length of at least 10 ft. Ellis, et al., (1983) mapped #103 to a length of about 55 ft. Feature #104 is a 3 ft by 6 ft, cribbed shaft that is 36 ft deep and immediately outside the portal of #103. Both features are hard to see when approached from above. Both #103 and #104 have PHRs of 2, given their proximity, the likelihood of interconnected workings, and the possibility of serious injury or death resulting from falling into #104, even while exploring #103.

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Feature #102, which lies about 20 to 30 ft directly above #100, is a large, open stope that is accessible from the southeast. The dimensions are 14 ft high by 10 ft wide at the entrance. The stope is somewhat larger on the inside. Numerous large slabs, also known as “widowmakers”, are present across the back of the stope, poised to collapse. The entrance, which is partly filled with coarse, mined material to ground level on the outside, rapidly slopes downward to an unknown depth.

Feature #103, at first glance, is a small depression immediately outside and in line with #102. However, no evidence of standing water was observed, and the east part of the depression consists of coarse, uncompacted material and interstitial openings up to 6 inches in size. These characteristics, and its association with feature #102, strongly suggest partial fill, caving, or bridging-over of a stope that has breached the surface to form a glory hole. Features #102 and #103 represent significant physical hazards that could result in death or serious injury. Surface appearances provide little warning of the danger of collapse, either from material in-place above, or from the ground giving way beneath. As such, features #102 and #103 have been rated as extreme hazards (PHR = 1).

If the road on private land is accessible, then light to moderate construction vehicles, especially tracked vehicles, could readily reach the site. Since this site also has a “potentially significant” environmental degradation rating, work in this area may be worth a temporary easement across private land. Backfilling or covering with concrete panels may be methods to address the stope and glory hole hazards, but the underground extent of each feature would need to be determined.

Quad Name: Valley View Hot Springs

Site Numbers: 9-6-430/4225-1.102, 105

Site Name: Garner Creek

Physical Hazard Ratings: 2, 2

Description and pertinent facts: The Garner Creek inventory area is accessed by a marked trail (TR 752) on Garner Creek. A parcel of private land lies across the mouth of Garner Creek, but an easement allows road travel across the private land to USFS-administered land on FR 964. The inventory area is about 0.5 miles upstream from the end of FR 964.

Features #102 and #105 are located on the north side of Garner Creek. Feature #102 is an inclined shaft (decline) at 70° below horizontal, with interior dimensions of 6 by 8 ft and a minimum depth of 36 ft. The decline is nearly closed off by caved material at 36 ft, but continues to an unknown depth.

Feature #105, located on an open ridge to the north and above Garner Creek, is a shaft with a 10 by 12 ft, partly caved surface opening. The opening necks down to 1 by 1 ft at 7 ft below the surface. Feature #105 is about 40 ft higher and directly above adit #104. Shaft #105 has an associated dump, suggesting that 1) most of the dump material is from

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the shaft and the opening is bridged over, and 2) the shaft may connect to adit #104. Remnant timber framing is present in #105. The apparent instability and possible collapse and fall-in hazard of shafts #102 and #105 are tempered only by their remoteness, which is why they are rated as serious hazards instead of extreme hazards.

Shaft #105 could be reached with minimal environmental impact by a trackhoe traveling up the ridge. Shaft #102 is on a steep slope and could not be easily reached with any motorized equipment. Buckets, shovels, and dynamite could be transported to the site. Large equipment would have great difficulty negotiating the Garner Creek trail (TR 752).

6.2. *Saguache Ranger District, West Part*

Quad Name: Bonanza

Site Numbers: 9-6-393/4235-1.100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110

Site Name: Twins Mine Area

Physical Hazard Ratings: 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2

Description and pertinent facts: The Twins Mine area is accessed by a well-maintained road (FR 880) from both the Kerber Creek and the Klondike Mine drainage basins. Old mine buildings are easily seen from FR 880, and patented land is present in the area. Previous attempts at shaft closures are not adequate.

Feature #100 is an apparent stope that is partly collapsed, but has an opening in back. Size of stope area is 30 by 18 ft, with no estimate of depth. The position of this feature immediately above the vertical workings of shaft #101, and the absence of any dump, suggest mining was by stoping, creating a possible fall-through hazard. The hazard supports a PHR of 2. Poor access for construction vehicles is along FT 764 for about 1 mile from FR 880 at the Tuttle Creek crossing.

Feature #101 is a partly filled shaft with headframe. Shaft opening is 6 by 6 ft, and it is partly filled with caved timbers, dirt, and brush to 8 ft below the surface. The bottom of the debris is likely a "false" bottom. Potential failure of the false bottom and unknown depth support a PHR of 2. Poor access for construction vehicles is along FT 764 for about 1 mile from FR 880 at the Tuttle Creek crossing.

Feature #102 is a cribbed shaft with a slight incline to a depth of 16 ft. Shaft opening is 8 by 7 ft, and it is loosely covered by planks. Cribbing has shifted, indicating unstable sides. The presence of an open hazard, public access, unstable wall support, and shaft depth support a PHR of 2. Shaft is immediately adjacent to a short spur road off the west side of FR 880, providing excellent access to construction vehicles.

Feature #103 is a cribbed shaft with hoist decking still in place. This feature is actually in the road and does not look like a shaft until examined carefully. Shaft opening is 9 by 5 ft on the surface, which narrows down within cribbing at a 10-ft depth. This depth may represent a "false" bottom. Cribbing has shifted, indicating unstable sides. Shaft is on a short spur road off the east side of FR 880. Open hazard, public access, unstable wall support, and depth support a PHR of 2.

Feature #104 is a pile of sheet metal and planking that is too heavy to move by hand. Given the style of "closures" in this area, a reasonable assumption is that this material may cover a shaft. "Shaft" #104 is immediately adjacent to a short spur road off the east side of FR 880. Until proven otherwise, a PHR of 2 is prudent.

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Feature #105 has a 10 ft by 10 ft surface opening around a square-set, cribbed, 8 by 6 ft, 33-ft-deep shaft with loose planking thrown over the top. Shaft #105 may be partly caved or bridged by debris at depth, preventing an estimate of true depth. Cribbing has shifted. Shaft #105 is on a spur road off FR 880. A hoist house and shop are still standing, with ineffective "no trespassing" signs. Open hazard, public access, unstable wall support, and depth support a PHR of 2.

Adit #106 has a 1 ft by 2.5 ft opening and extends at least 30 ft back. Possible winzes and stopes connected to shaft #105 may be present. Adit is on a spur road off FR 880. Open hazard, public access, and depth support a PHR of 2.

Shaft #107 has a 10 ft by 10 ft surface opening, is 20 ft deep, and has a stout log covering. Brush covers the bottom, making depth estimates difficult. No cribbing is present. The shaft walls have sloughed, indicating instability. Shaft #107 is adjacent to FR 880. The open hazard, public access, unstable walls, and depth support a PHR of 2.

Shaft #108 has a 15 ft by 12 ft surface opening, is 30 ft deep, and has a stout log covering. Brush covers the bottom, making depth estimates difficult. No cribbing is present. The shaft walls have sloughed, indicating instability. Shaft #108 is adjacent to FR 880. The open hazard, public access, unstable walls, and depth support a PHR of 2.

Shaft #109 has a 15 ft by 15 ft surface opening, is 30 ft deep, and has a stout log covering. No cribbing is present. The shaft walls have sloughed and caved. Trash and brush partly fill shaft #109, which is adjacent to FR 880. The open hazard, public access, unstable walls, and depth support a PHR of 2.

Shaft #110 has a 15 ft by 10 ft surface opening, is 10 ft deep, and has a stout log covering. No cribbing is present. The shaft walls have sloughed and caved. Trash and brush partly fill shaft #110, which is adjacent to FR 880. Open hazard, public access, unstable walls, and depth support a PHR of 2.

^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^

Quad Name: Klondike Mine

Site Numbers: 9-6-395/4226-1.102, 104

Site Name: Klondike Mine

Physical Hazard Ratings: 2, 2

Description and pertinent facts: Shaft #102 is partly caved, has a surface opening of 7 ft by 7 ft, and is at least 20 ft deep. Associated dump #202 is about 65 yd³, suggesting shaft #102 is not much deeper than the apparent bottom.

Adit #104, which may be on private land, is the largest mine in this inventory area. It has an open, 6 ft by 4.5 ft, concrete portal and is timbered for at least 30 ft. Associated dump

#204 is about 2500 yd³, indicating extensive underground workings. Several ladders are scattered near the portal and on the dump. The ladders suggest that winzes or raises may exist within the adit, increasing the danger. A trail from FR 880 accesses adit #104.

Description and pertinent facts: Shaft #102 is partly filled and has a crude timber overlay that may be the remains of a headframe. The surface opening is 15 ft by 16 ft, and the shaft is 10 ft deep. The opening at the bottom is 6 by 6 ft. No evidence of standing water suggests that the shaft bottom may be bridged, with open space beneath. The shaft is adjacent to FR 857, providing excellent access to construction vehicles. Public access, the uncertainty of the depth, and proximity to a road suggest a PHR of 2.

Description and pertinent facts: Shaft #106 has a cribbed, 9 ft by 5 ft opening from the surface down to 20 ft. The shaft continues uncribbed in rock to 67 ft. The shaft bottom is muddy, but has no standing water. The associated dump is visible from FR 690. Shaft #106 is easily accessed by a game trail. The cribbing is intact, but material around the sides appears unstable. Access to within 1000 ft of the shaft is excellent for all vehicles on FR 690. Getting equipment to the shaft would require crossing the Middle Fork of Carnero Creek, then climbing a steep slope through moderately dense trees. Tracked equipment, such as a trackhoe or D6-equivalent dozer might be the best suited. Depth of shaft, visibility from road, and difficult escape if able to survive fall, support a PHR of 1.

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is 10 ft below and has a large dump may have functioned as a production level. This suggests that the shaft may be quite deep. Access for construction vehicles is poor on an old spur road off FR 890. Possibility of collapse and unknown depth support a PHR of 2.

Quad Name: Whale Hill

Site Number: 9-6-402/4244-3.100

Site Name: Colorado Belle Area

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #100 has a 10 by 12 ft surface opening and a depth of 10 ft. The shaft is partly caved by collapsed cribbing 2 ft below the surface. The actual depth may be greater. Access for construction vehicles is good, as site is 400 ft south of FR 890 on level, open ground. Public access, depth, and instability of feature support a PHR of 2.

Quad Name: Whale Hill

Site Number: 9-6-402/4246-1.100

Site Name: Little Darling Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #100 has a 5 by 5 ft surface opening, a toppled headframe, and a present depth of 3 ft, which is probably a bridge of collapsed material. Several small, shallow subsidence features are near shaft #100, and FR 876 partially crosses one of them. Shaft #100 has a damp bottom and cribbing that has shifted. Access from FR 876 for construction vehicles is excellent. Possibility of collapse, proximity to FR 876, and unknown depth support a PHR of 2.

Quad Name: Whale Hill

Site Number: 9-6-403/4245-1.105

Site Name: Joe Wheeler Mine

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #105 is partly filled, has an opening of 5 ft by 5 ft by 6 ft deep, and has a small headframe. Associated dumps #205 and #206 are 180 and 500 yd³, respectively, implying a significant depth to shaft #105. The present bottom is probably a false bottom that could collapse at any time. Shaft #105 and the associated dumps are visible from and adjacent to FR 890.

Quad Name: Whale Hill

Site Numbers: 9-6-404/4241-1.101, 103

Site Name: Chicago Mine Area

Physical Hazard Ratings: 2, 2

Description and pertinent facts: Adit #101 is open, has a 5 by 4 ft portal, and is at least 30 ft long. The back of the adit was not visible. The portal is cribbed and supported by weak timbers. Access to within 1000 ft on a short spur road from FR 875 is moderately good for construction vehicles. Reaching the site would require tracked equipment. The area is sparsely timbered on talus. Possibility of bad air, collapse, together with visibility and accessibility from FR 875, support a PHR of 2.

Feature #103 is a cratered shaft with a 10 by 10 ft surface opening that funnels down to a 10 ft depth. No signs of water collection are present, suggesting that water may drain to an open shaft below. Access to within 1000 ft on a short spur road from FR 875 is moderately good for construction vehicles. Reaching the site would require tracked equipment. The possibility of collapse and unknown depth support a PHR of 2.

Quad Name: Whale Hill

Site Number: 9-6-404/4242-1.103

Site Name: Upper Spring Creek Mine

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #103 has a surface opening of 12 by 16 ft and a depth of 6 ft. The shaft is partly filled, with no signs of standing water. The bottom of the shaft is likely a false bottom of bridged material. Access for construction vehicles is good, by a spur road off FR 875. Easy public access and possible collapse support a PHR of 2.

Quad Name: Whale Hill

Site Numbers: 9-6-407/4239-1.100, 101, 103

Site Name: Villa Grove Turquoise Mine Area

Physical Hazard Ratings: 2, 2, 2

Description and pertinent facts: Feature #100, also known as the Villa Grove Turquoise Mine, is a moderately large, open pit, with many benches and ramps, a contained pond (see description in the **Environmental Degradation Summary**), and minimal access deterrent. The primary access road is gated and signed by the USFS. Secondary roads are bermed. Although it was not attempted, vehicle access is possible. There are no deterrents to foot travel. A highwall, at least 100 ft tall with an overall slope angle of 55°, is open and not barricaded. All faces and benches show some degree of failure. Most ramps are not bermed where truncated, presenting a drive-in danger. Rockfall hazard is extreme, and slope failure hazard is significant. All of the above

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factors support a PHR of 2. Access for construction vehicles is excellent on a short spur road off FR 874.

Adit #101 has a 2.5 by 1.5 ft opening and a depth of at least 30 ft. The back of the adit was not visible. After the slump restriction at the portal, adit #101 opens to a 5 by 6 ft passage. The restricted opening could be easily widened. Large, ore-car rails suggest extensive underground workings. Access to the public, visibility from the spur road, fame of the area as a mineral-collecting locality, apparent size of the mine, and possible bad air suggest a PHR of 2.

Shaft #103 has an 8 by 10 ft collar and a depth of 21 ft. The shaft walls are vertical, but appear unstable. Shaft #103 is cribbed to a 4 by 6 ft passage 7 ft below the surface, but the cribbing has shifted. Proximity to an access road and instability and depth of the opening support a PHR of 2.

7. Selected References

(references cited-- some are annotated, and some are of general interest for the entire district)

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Burbank, W. S., 1932, Geology and Ore Deposits of the Bonanza Mining District, Colorado, U.S. Geological Survey Professional Paper 169.

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Joe Wheeler Mine: AKA known as the Golden Wave Mine, shows production at publication (1928), owned by the Joe Wheeler Mining and Milling Company (1928).

Colorado Belle Mine was described as completely inaccessible by the shaft in 1927 and is one of the oldest mines in the district. Patented in 1887.

Manitou Sunlight Mine is one of the older mines in the district, had some limited production, and is reported to have 650 ft of workings to intersect Little Manitou vein.

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APPENDIX A--General information regarding prospects and mines throughout the ranger district, from USFS 2800-series files

Spook City, claim holder in USFS files, additional information attached to inventory forms:

Carter Boggus

Ed Hollister

Val D'Or LTD

POB 654

Saguache, CO 81149

Last operation in 1988 approx. Note the extensive amounts of workings on private land.

Also note past involvement by Freeport (1987) and Pegasus (1991) and Timber Wolf.

Villa Grove Turquoise Mine

George Musick

POB 202

Villa Grove, CO 81155

Active in 1994? Rumored to have something going on.

Antora Meadows area: EXXON Minerals
 POB 120
 Denver, CO 80201

Saguache Park area, "moss rock" or agate mining proposal. Nothing found in area described. Contact is:

Joseph V. Dodge

1226 Elm Ave

Canon City, CO 81212

Apparently, area was used for "moss rock" removal

Klondike Mine Area

EXXON Minerals

POB 120

Denver, CO 80201

USFS - ABANDONED MINE LAND INVENTORY PROJECT
RIO GRANDE NATIONAL FOREST - SAGUACHE RANGER DISTRICT EAST AND WEST PARTS

Unpatented claims:

KLON #1-13 CMC 200420-200432

KLON #14-40 CMC 200691-200718

KLON #41-46 CMC 201695-201700

owned by: WEBBCO-VULCON
 c/o W. N. McNulty, Jr.
 6328 Monarch Dr.
 El Paso, TX 79912

Patented claims:

Klondyke MS 17785

Cyclops same

Lizzie same

Wedge same

Kathleen

Crown Point

Homestake

Snowflake

Lost Tide

Keystone

Eldorado

Gulch

Goff

El Paso M.S. same

Alder Creek Mine Area, C. J. Mundell, no address found, Double Cross
Double Cross #1- 6 located in NE1/4 of Sec 3, T47N, R8E.

Sky City Mines:

Some claims are described as Mary claims south of Sky City Mines, Sec 4, T42N,
R3E. Area was visited and nothing found.

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Appendix B.--Dump sample results

Lab Analyses	Morning Star Mine #401/4244-1.202	Upper Spring Creek #404/4242-1.203	Alder Creek Mines #406/4245-1.201
pH of saturated paste	2.51 standard units	2.5 standard units	4.91 standard units
Potential acidity (tons H ⁺ /1000 tons soil)	0.62	not analyzed	0.63
Potential acidity (tons CaCO ₃ equivalent/1000 tons soil)	30.6	not analyzed	31.2
Neutralization potential (tons CaCO ₃ equivalent/1000 tons soil)	<0.1	not analyzed	2.1
Net acid base potential (tons CaCO ₃ equivalent/1000 tons soil)	-30.6	not analyzed	-29.2
Iron (%)	3.2	8.2	2.8
Chromium (ppm)	<5	not analyzed	<5
Arsenic (ppm)	30	2300	25
Mercury (ppm)	0.13	3.9	0.07
Copper (ppm)	185	3400	259
Lead (ppm)	447	1100	1580
Zinc (ppm)	168	110000 (11%)	1618
Silver (ppm)	9.3	270	22.8
Nickel (ppm)	6	<20	4
Manganese (ppm)	211	420	373
Strontium (ppm)	134	not analyzed	50
Cadmium (ppm)	<0.5	450	7.5
Bismuth (ppm)	38	not analyzed	22
Vanadium (ppm)	77	not analyzed	8
Calcium (%)	0.27	not analyzed	0.54
Phosphorus (%)	0.069	not analyzed	0.0007
Magnesium (%)	0.49	not analyzed	0.10
Titanium (%)	0.45	not analyzed	0.11
Aluminum (%)	8.07	0.022	5.04
Potassium (%)	3.59	not analyzed	2.00
Yttrium (ppm)	12	not analyzed	7
Beryllium (ppm)	<2	not analyzed	<2
Barium (ppm)	not analyzed	<10	not analyzed

**USFS - ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

ROUTT NATIONAL FOREST

HAHNS PEAK RANGER DISTRICT

April, 1998

by

Clarence E. Ellis
Robert H. Wood II

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
ROUTT NATIONAL FOREST -- HAHNS PEAK RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites of *concern* to the USFS - Hahns Peak Ranger District. It does not include all the mine sites visited during the inventory of the district. This summary report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1), or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The Priority Sites tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. The tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the Priority Sites tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 11 (Routt National Forest), and Ranger District 03 (Hahns Peak Ranger District).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Control Commission. Where stream numeric standards are not available, the most stringent of statewide are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

Geology in the Hahns Peak Ranger District is complex, and a detailed description is beyond the scope of this summary report. The bibliography gives the most important sources of detailed information. Rocks exposed in the district range in age from Precambrian to the Pliocene-age stock forming Hahns Peak. The Precambrian rocks are gneisses and intrusive rocks. Mesozoic-age sedimentary rocks are found on the periphery of Hahns Peak. The mining districts in the Ranger District are the Hahns Peak district, which includes Hahns Peak and workings to the east, north, and west; the Elkhorn district northwest of the Hahns Peak district; the Slavonia district in the Mt. Zirkel Wilderness Area; and the Greenville mining area between the Hahns Peak mining district and Steamboat Springs. In addition, there are isolated workings which are not included in any of the mining districts. None of the districts were major producers.

Hahns Peak Mining District

The Hahns Peak mining district extends from Hahns Peak east to Farwell Mountain, north to King Solomon Creek, and west to Iron Mountain. Placer gold, discovered in the vicinity of Hahns Peak in the 1860's, accounted for the majority of the production. Placer production continued intermittently until 1941. Lode gold mining began about 1880 and continued until 1967. There was exploration for molybdenum in the 1970's and 1980's, and for disseminated gold in the 1980's (Neubert, 1994).

Hahns Peak is a latite porphyry which intruded Cretaceous-age sedimentary rocks still visible on the north and west flanks of the peak. Much of the lode production was from the breccia zone in the sedimentary rocks immediately surrounding the intrusion (Neubert, 1994). Precambrian gneisses host most of the mineral occurrences peripheral to Hahns Peak.

Major workings in the district include the 2,900' Royal Flush Mine on the west side of Hahns Peak (the largest producer); the 1,700' 7D adit on the east side of the peak; the 900' Southern Cross adit on the south side of the peak; the 800' adit at the Farwell Mine on Beaver Creek; the

700' Price Tunnel on the east side of Hahns Peak (another producer); and the 500' Campbell Tunnel on a branch of Beaver Creek west of the Farwell Mine.

Sulfide minerals are sparse in the Precambrian rocks surrounding Hahns Peak, thus major workings such as the Farwell Mine and the Campbell Tunnel do not drain acid water, although they do discharge water. Visible sulfides, mainly pyrite, are rare on Hahns Peak, but this is because the exposed pyrite has been oxidized, and the resultant iron oxide subsequently leached away. The major workings penetrate the unoxidized pyrite zone, and consequently, the 7D and Southern Cross adits discharge acid water. The Royal Flush discharges nearly neutral water, no doubt due to the buffering action of the sedimentary rocks in which much of the working was driven. There are three environmental degradation and two physical hazard priority sites in the Hahns Peak mining district.

Elkhorn Mining District

The Elkhorn mining district is a one-mine district on the southeast side of Elkhorn Mountain. Mineralization is found in a Precambrian gabbro. Mining activity began in 1896 and continued until 1938. Production was a small amount of silver, lead, and zinc, with minor copper and gold (Neubert, 1994). The main working is a shaft, now water-filled and covered by a heavy steel grate.

Sulfide minerals are present at the Elkhorn Mine, but the water in the shaft has neutral pH, and none of the other workings have water discharge. It is unknown whether the sulfide minerals are too sparse to create acid water, or if the gabbro buffers any acid formed. The Elkhorn area has one physical hazard priority site.

Slavonia Mining District

The Slavonia district is believed to date to 1910 or earlier. It may have produced small amounts of copper, lead, zinc, and silver, but no production is recorded (Neubert, 1994). Workings are clustered near the junction of Gilpin and Gold Creeks, with isolated workings in the upper Gold Creek and upper Gilpin Creek drainage basins. Mica prospects east of Mica Lake are included in the Slavonia district.

Rocks in the Slavonia district are Precambrian gneisses, locally intruded by pegmatites, as at the Mica Basin prospects. Mineral occurrences near the junction of Gold and Gilpin Creeks are localized by faults and/or calc-silicate lenses in the gneiss. Replacement of the calc-silicate lenses seems to produce the richest mineralization. The Slavonia Mine, on upper Gold Creek, is also on a calc-silicate lens.

Sulfide minerals are present on Gilpin Creek and at the junction of Gold and Gilpin Creeks, and sulfides are plentiful at the Slavonia Mine. The Slavonia Mine has no water discharge, and

numerous springs near the adit are not acid, possibly due to buffering by the calc-silicate minerals in the gneiss. There are no priority sites in the Slavonia district.

Greenville Mine Area

The Greenville Mine is on Greenville Creek, just east of Clark. Mining began in the late 1800's and continued until the 1960's. Zinc, copper, lead, and silver were produced in small quantities, and sub-economic reserves remain. Host rocks are Precambrian gneiss and schist (Neubert, 1994).

The Greenville shaft has been reclaimed, and the adits are either collapsed or grated. Sulfide minerals are sparse, and the discharge from the adits is not acid. There are no priority sites in the Greenville area.

USFS ABANDONED MINE LAND INVENTORY PROJECT
ROUTT NATIONAL FOREST -- HAHNS PEAK RANGER DISTRICT

NUMERICAL SUMMARY

- 32 field forms
- 124 mine openings inventoried (includes collapsed or filled openings)
- 74 mine dumps, tailings piles, highwalls, etc.
- 20 mine features have Environmental Degradation Ratings of 1, 2, 3, or 4.

Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 2
Number of features with EDR of 3 = 2
Number of features with EDR of 4 = 16
Number of features with EDR of 5 = 178

- 28 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 0
Number of features with PHR of 2 = 10
Number of features with PHR of 3 = 18
Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
Number of features with PHR of 5 = 170

USFS ABANDONED MINE LAND INVENTORY PROJECT
ROUTT NATIONAL FOREST--HAHNS PEAK RANGER DISTRICT

Priority Sites

Environmental Degradation

Site Name	Quad Name	Site # Forest=11;District=03	EDR
1) Iron Springs Mine Area	Hahns Peak	337/4522-1.100; 200	2; 3
2) Ways Gulch Placer/ Southern Cross Mine	Hahns Peak	337/4521-1.102	2
3) West Side Hahns Peak	Hahns Peak	336/4522-1.102	3

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=11;District=03	PHR
1) Elkhorn Mine	Elkhorn Mountain	335/4538-1.202	2
2) Master Key Mine Area	Hahns Peak	335/4425-1.101	2
3) Farwell Mine Area	Hahns Peak	340/4523-1.102	2
4) Upper Independence Peak	Hahns Peak	334/4525-1.102, 107	2, 2
5) Creek West of Rock Creek	Clark	340/4508-1.100, 101	2, 2
6) Little Red Park	Hahns Peak	338/4525-1.109	2
7) Upper Part of King Solomon Creek	Farwell Mountain	342/4524-1.101	2
8) Northeast of Columbine	Hahns Peak	333/4525-1.100	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Hahns Peak

Site #: 336/4522-1.102

Site Name: West side Hahns Peak

Environmental Degradation Rating: 3

Description and pertinent facts: The Royal Flush Mine is located at the western base of Hahns Peak, just off, but not visible from FR-490. A locked gate prevents vehicle access; it is signed to permit foot traffic. A cabin on a claim not involved in the pending land exchange is just west of the mine. The adit and dump have been bulldozed over, apparently as intentional reclamation, although revegetation has not been attempted. The dump material is predominantly black Mancos Shale.

Most of the discharge from the adit is localized near the former portal location, and seeps just to the west of this probably originate from the adit. The effluent fills a shallow pond, which supports a growth of subsurface weed heavily coated with iron oxide. The discharge from this pond is essentially clear and flows into a larger pond within 1/4 mile. The larger pond apparently supports normal aquatic life. The average of three water tests taken over 2 months is **pH=6.45 and conductivity=408 μ S**. In September, the discharge had decreased to about 50 gpm. Small clots of iron oxides or iron-oxide-coated material emerge from the discharge point frequently enough to make water sampling difficult without including some of this material in the sample. In water sample #336/4522-1.301, collected near the former portal, the total recoverable iron is over twice the dissolved iron, supporting this interpretation. Both total and dissolved iron concentrations, and manganese concentration are above stream standards as shown on the table below. These are not toxic metals, but do degrade the appearance and taste of drinking water. Most of these metals are probably deposited in the pond on the dump, but storms may flush the accumulated metals into the receiving stream.

Sample number 336/4522-1.301; hardness of effluent sample = 386 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	160	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	10	50 (acute)	below standard
Iron (trec)	1,400	1,000	1.4 x standard
Selenium (trec)	1	10	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	21	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	<0.25	3.3	below standard
Calcium (as CaCO ₃)	120 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Chromium	<10	11*	below standard
Copper	<4	37	below standard
Fluoride	1.0 mg/L	2 mg/L*	below standard
Iron	590	300	2.0 x standard
Lead	<1	26	below standard
Magnesium	21 mg/L	no standard	n/a
Manganese	180	50	3.6 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	267	below standard
Potassium	2.4 mg/L	no standard	n/a
Silver	<0.2	0.8 (on 3/2/98)	below standard
Sodium	1.4 mg/L	no standard	n/a
Sulfate	81 mg/L	250 mg/L	below standard
Zinc	13	333	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: Hahns Peak

Site #: 337/4521-1.102

Site Name: Ways Gulch placer/Southern Cross Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The Southern Cross Mine is at the intersection of FR-417, FR-490, and FR-411. Dump #202 contains about 10,000 cubic yards, some of which may be from road building. It is also possible that some of the dump was used for road construction. The Southern Cross adit is filled, but discharges acid water across the road. The main discharge goes into a small pool just to the right of the adit. Pale, blue-gray precipitate or sediment coats the pool. Pale yellow precipitate lines the effluent channel between the adit and pool. Pool outflow crosses FR-490, flows a short distance down and crosses FR-417, and soaks into the ground. In June, July, and September, the **pH was 3.33, 3.38, and 2.79**, respectively. **Conductivity went from 305 µS to 315 µS to 333 µS**. Discharge decreased from about 30 gpm to about 10 gpm. Results of sample #337/4521-1.301, collected in July, are shown below and indicate that the mine effluent is highly degraded. Concentrations of aluminum, iron, manganese, copper, nickel, cadmium, lead, silver, and zinc exceed stream standards.

Sample number 337/4521-1.301; hardness of effluent sample = 22 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	18,000	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	2	50 (acute)	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Iron (trec)	1,400	1,000	1.4 x standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	260	2,000*	below standard
Aluminum	18,000	87*	207 x standard
Cadmium	4	0.35	11.4 x standard
Calcium (as CaCO ₃)	7.4 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	60	3.2	18.8 x standard
Fluoride	<0.10 mg/L	2 mg/L*	below standard
Iron	1,400	300	4.7 x standard
Lead	3	0.45	6.7 x standard
Magnesium	0.94 mg/L	no standard	n/a
Manganese	350	50	7 x standard
Molybdenum	<10	no standard	n/a
Nickel	67	30	2.2 x standard
Potassium	4.5 mg/L	no standard	n/a
Silver	0.2	0.005 (on 3/2/98)	40 x standard
Sodium	1.6 mg/L	no standard	n/a
Sulfate	130 mg/L	250 mg/L	below standard
Zinc	270	29	9.3 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: Hahns Peak

Site #: 337/4522-1

Site Name: Iron Springs Mine area

Description and pertinent facts: The Iron Springs Mine area is on the southeast side of Hahns Peak along FR-490. The Iron Springs Mine is marked on the topographic map, but does not exist and was probably obliterated by later road building. The main features in this area are the 7D adit and associated dump.

Feature #: 100

Environmental Degradation Rating: 2

The 7D adit is filled, but is discharging acid water across FR-490B and down the face of dump #200. The main discharge is from the portal area, with a much smaller discharge several feet to the left of the portal. In June and July, **pH=3.36 and 3.37**, respectively. In September, when the flow rate was significantly reduced, **pH=2.57**. The average **conductivity=249 µS**, increasing from **164 µS** in June to **287 µS** by September. The flow rate was about 50 gpm in June and 10 gpm in September. The effluent deposited a yellow-brown precipitate. Results of water sample

#337/4522-1.302, collected in July, indicate that the effluent is highly degraded. Concentrations of aluminum, copper, lead, silver, iron, manganese, nickel, cadmium, and zinc exceed state standards as shown on the table below.

Sample number 337/4522-1.301; hardness of effluent sample = 15 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	9,400	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	1,600	1,000	1.6 x standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	380	2,000*	below standard
Aluminum	9,400	87*	108 x standard
Cadmium	3	0.26	11.5 x standard
Calcium (as CaCO ₃)	5.0 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	54	2.3	23 x standard
Fluoride	<0.10 mg/L	2 mg/L	below standard
Iron	1,600	300	5.3 x standard
Lead	70	0.26	269 x standard
Magnesium	0.52 mg/L	no standard	n/a
Manganese	95	50	1.9 x standard
Molybdenum	<10	no standard	n/a
Nickel	51	23	2.2 x standard
Potassium	3.9 mg/L	no standard	n/a
Silver	0.2	0.003 (on 3/2/98)	67 x standard
Sodium	2.7 mg/L	no standard	n/a
Sulfate	88 mg/L	250 mg/L	below standard
Zinc	380	21	18 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #: 200

Environmental Degradation Rating: 3

The dump from the 7D adit is very large, about 25,000 cubic yards, and is yellow from oxidizing pyrite and elemental sulfur. The adit discharge flows over the dump and soaks into the dump about 100' down. The discharge probably affects Beaver Creek.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Clark

Site #: 340/4508-1.100, 101

Site Name: Creek West of Rock Creek

Physical Hazard Ratings: 2

Description and pertinent facts: Two open adits are above the unnamed creek west of Rock Creek. Glen Eden is along the Elk River within one mile of these adits. Glen Eden and the nearby town of Clark are in a resort area offering lodging, food, and horseback rides, as well as other outdoor activities. One of the popular horse trails is near these adits. Two groups rode past during this inventory in approximately one hour. Both adits have 4'x 5' openings, and adit #101 is reportedly about 150' long. Adit #100 is in gneiss, and the roof appears unstable. Adit #100 is next to the creek across from the trail. The opening is visible from the trail although the small overgrown dump makes it less obvious than adit #101, which is about 80' above. Its 130-cubic-yard dump makes adit #101 more visible from the trail below.

^^ New Quad ^^^

Quad Name: Elkhorn Mountain

Site #: 335/4538-1.202

Site Name: Elkhorn Mine

Physical Hazard Rating: 2

Description and pertinent facts: This site is on FR-508 about 2 miles from the heavily traveled FR-550. The feature is a dump with no visible associated opening. When visited in June, snow covered part of the dump. When revisited 8 days later, a hole in the dump was visible. The hole appeared to be subsidence related rather than an excavation. Part of dump #202 adjacent to FR-508 was bulldozed in the past. During the earth moving, a shaft associated with dump #202 may have been covered and filled to a bulkhead or a plug of mine timbers. The present opening, which is about 5'x 5' and 5' deep, indicates that the plug is no longer fully intact. Dump size indicates a few hundred feet of workings, probably a combination of vertical shaft and one or more levels of horizontal drifts along a vein. If the hole is a subsidence feature, further subsidence during spring snowmelt is likely. A funnel-shaped surface opening with a new debris plug at the bottom will probably result. Human death or injury is possible. This feature may be on patented land; a survey would be required for positive determination.

^^ New Quad ^^^

Quad Name: Farwell Mountain

Site #: 342/4524-1.101

Site Name: Upper Part of King Solomon Creek

Physical Hazard Rating: 2

Description and pertinent facts: This vertical shaft is a few hundred feet north of King Solomon Creek and one mile below Farwell Mountain Road (FR-409). The dimensions are 8'x 6' and 12' deep. Climbing out of this shaft without assistance would be difficult; however, this shaft is not likely to have many visitors because of the remote location and lack of trails. Hunters and fishermen are the most likely visitors to this area.

^^ New Quad ^^^

Quad Name: Hahns Peak

Site #: 333/4528-1.100

Site Name: Northeast of Columbine

Physical Hazard Rating: 2

Description and pertinent facts: This water-filled shaft is within one mile of Columbine and is best accessed by private roads off of FR-129. The dimensions are 10'x 10' and 19' deep, with standing water 6' below the collar. Dense vegetation and a small dump (<50 cubic yards) make this feature difficult to find. This shaft is most hazardous to small children that live nearby.

Quad Name: Hahns Peak

Site #: 334/4525-1

Site Name: Upper Independence Peak

Description and pertinent facts: Both of these shafts are about one mile north of Columbine near FR-129, just past the end of the blacktop. FR-129 has moderate amounts of traffic.

Feature #: 102

Physical Hazard Rating: 2

This partly caved shaft measures 32'x 30' and is 20' deep. Although the sides are steep, most people could climb out without help. The large, 500-cubic-yard dump suggests that this feature was much more extensive at one time and could reopen if the plug failed. Warning signs and a barbed wire fence around the surface opening provide some protection from accidentally falling in. FR-129, about 400' below, is visible from the dump.

Feature #: 107

Physical Hazard Rating: 2

This vertical shaft is 10'x 10' and is 13' deep. It would be difficult climbing out of this shaft without assistance. Although the shaft is fully visible and only 100' away from FR-129, it is across Independence Creek. Crossing the creek was not feasible at the time of this investigation. The nearest crossing is about 800' south of the shaft. This may discourage some would-be visitors. Children were living about 0.2 miles south of this feature.

Quad Name: Hahns Peak

Site #: 335/4525-1.101

Site Name: Master Key Mine area

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is only a few feet from FR-550, and the dump is adjacent to and fully visible from the road. The site is just outside the village of Columbine. The apparent depth of the shaft is only 15', and the hole is not too steep to climb from; however, dump size indicates the shaft is actually much deeper. Shaft #101 may have been intentionally bulkheaded or possibly caved in on collapsed timbering. In either case, the supporting timbers will eventually rot away, and the current plug will fall further into the shaft. If human activity triggers this collapse, it could have fatal results for those involved.

Quad Name: Hahns Peak

Site #: 338/4525-1.109

Site Name: Little Red Park

Physical Hazard Rating: 2

Description and pertinent facts: This partly caved and water-filled shaft is about 1,000' south of FR-550. Most of the roads on Hahns Peak appear to be popular for 4WD and ATV enthusiasts. The shaft is 15'x 15' and is 12' deep (6' to the water level). Associated dump #209 is 250 cubic yards, suggesting that this shaft was much more extensive.

Quad Name: Hahns Peak

Site #: 340/4523-1.102

Site Name: Farwell Mine area

Physical Hazard Rating: 2

Description and pertinent facts: This open shaft is less than 1/4 mile from FR-414, FR-409, and an old cabin under renovation. The shaft is 5'x 8' and nearly vertical. Depth exceeds 50', and there are no access deterrents. Anyone falling in would be injured or killed, and even if uninjured, the shaft walls are too steep to climb.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

ROUTT NATIONAL FOREST

THE PARKS RANGER DISTRICT

April, 1998

by

Clarence E. Ellis
Robert H. Wood II

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
FT	Forest Trail
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
ROUTT NATIONAL FOREST -- THE PARKS RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites of *concern* to the USFS – The Parks Ranger District. It does not include all the mine sites visited during the inventory of the district. This summary report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1), or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The Priority Sites tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. The tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the Priority Sites tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 11 (Routt National Forest), and Ranger District 04 (The Parks Ranger District).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these adits that are open and represent a threat to those who choose to enter them due to “bad air” (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Control Commission. Where stream numeric standards are not available, the most stringent of statewide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

Geology in the North Park area is complex, and a detailed description is beyond the scope of this summary report. Rocks exposed in the various mining districts in The Parks Ranger District are a variety of gneisses and granites of Precambrian age. Mining districts surround North Park and include the Northgate district on the north and northeast side, the Teller district on the southeast side, the Crystal district on the west side, and the Pearl district on the northwest side. Only the Northgate district was an important producer.

Northgate Mining District

The Northgate district is not well defined. Significant production was from patented land just north of Three-Way. In general, the district lies just south of the Wyoming border from the North Platte River eastward to the crest of the Medicine Bow Mountains.

Mining activity began in the late 1800's and continued until 1973, when Ozark-Mahoning shut down their fluorite mines north of Three-Way. Fluorite was the only commodity produced in significant volumes, although silver, copper, and vermiculite were prospected and minor production is likely (Neubert, 1994).

Rocks in the district are Precambrian gneiss and granite. None of the inventoried mines and prospects had more than traces of sulfide minerals, rendering the possibility of acid mine drainage close to nil. Large fluorite mines on patented land just north of Three-Way were not inventoried.

Vermiculite and traces of copper are present in the mine workings northwest of Three-Way. Copper and silver were the metals of interest along the Medicine Bow Mountains east of State Highway 127. There are no priority sites in the Northgate district.

Teller Mining District

The Teller mining district is mostly in the Jack Creek drainage basin, with a few sites in the Illinois River drainage basin. The Endomile Mine was the largest producer, and its production was small. Silver and copper, with minor lead and zinc, were the principal commodities. Activity began in the early 1880's and continued intermittently until 1963. Exploration for molybdenum took place from the 1970's to 1983, with the target being a buried intrusion of Tertiary age. Size, grade, or depth of the occurrence made further activity unattractive (Neubert, 1994).

Rocks exposed in the district are Precambrian gneisses that have been intruded by Tertiary-age dikes and sills of intermediate composition. A buried rhyolite plug, discovered by drilling for molybdenite, underlies the Jack Creek drainage. The district straddles the north-trending Never Summer thrust fault. North-trending faults of small displacement cut all the rocks, and some of these faults host the mineralization in the Teller district (Neubert, 1994). Sulfide minerals including pyrite, galena, sphalerite, and chalcopyrite, are locally plentiful, and have potential to generate acid mine drainage. There are three priority sites in the Teller district.

Crystal Mining District

The Crystal mining district is west of Delaney Buttes and mostly south of Red Canyon. The road that accesses most of the district crosses patented land and has a locked gate.

Small quantities of fluorite were produced between the 1920's and 1973, and exploration was conducted for uranium. Rocks exposed in the district are mostly Precambrian granite. The granite is cut by Tertiary-age fluorite veins (Neubert, 1994). Sulfide minerals are uncommon, although pyrite is present locally. Acid mine drainage is not a factor in the district.

Pearl Mining District

The part of the Pearl mining district within Routt National Forest is south of Pearl and includes the remains of a smelter that is on private property. Mining began in the Pearl district about 1900. The smelter was built in 1905, but never operated. The district produced copper, gold, silver, and lead, and most production was during World War I. Reserves have been defined east of the National Forest, but none are known within the Forest (Neubert, 1994).

Rocks exposed in the district are Precambrian gneisses that are cut by pegmatites. Pyrite- and chalcopyrite-bearing quartz lenses occur in calc-silicate layers of the gneiss (Neubert, 1994). These sulfide mineral concentrations make acid mine drainage possible. No acid mine drainage was noted, but runoff from the dump at the Wolverine Mine could be an occasional problem. There is one priority site in the Pearl district.

USFS ABANDONED MINE LAND INVENTORY PROJECT
ROUTT NATIONAL FOREST -- THE PARKS RANGER DISTRICT

NUMERICAL SUMMARY

- 17** field forms
- 47** mine openings inventoried (includes collapsed or filled openings)
- 35** mine dumps, tailings piles, highwalls, etc.
- 8** mine features have Environmental Degradation Ratings of 1, 2, 3, or 4.

Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 2
Number of features with EDR of 3 = 4
Number of features with EDR of 4 = 2
Number of features with EDR of 5 = 74

- 23** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 0
Number of features with PHR of 2 = 3
Number of features with PHR of 3 = 20
Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
Number of features with PHR of 5 = 59

USFS ABANDONED MINE LAND INVENTORY PROJECT
ROUTT NATIONAL FOREST -- THE PARKS RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=11;District=04	EDR
1) Teller District-Illinois River	Mt. Richthofen	415/4470-1.100; 101	2; 3
2) Wolverine Mine	Pearl	367/4534-1.202; 201	2; 3
3) Upper Jack Creek	Mt. Richthofen	419/4473-1.100, 200	3, 3

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=11;District=04	PHR
1) Wolverine Mine	Pearl	367/4534-1.100	2
2) Teller District-Illinois River	Mt. Richthofen	415/4470-1.101	2
3) Jack Creek	Mt. Richthofen	417/4472-1.107	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Mount Richthofen

Site #: 415/4470-1

Site Name: Teller District/Illinois River

Description and pertinent facts: This site is just off FR-750 and is readily accessible by 4WD trail and foot. The Silver King adit (feature #100) is reached by a foot trail along the creek and is less than 0.5 mile from the locked gate. The Hi-Ho shaft (feature #101) is on the 4WD trail about 0.5 mile beyond the locked gate. This area receives frequent use by the public. Feature #101 is discussed in the Physical Hazards section of this report.

Feature #: 100

Environmental Degradation Rating: 2

The Silver King adit is open and discharging acid water that leaves a thick orange precipitate between the adit and the creek, about 25' away. The **pH averaged 3.42 and the conductivity averaged 346 μ S** on the two occasions the effluent was tested. Discharge rate is only about 0.5 gpm. The receiving stream has a **pH of 6.59 above and 3.66 below** the convergence with the contaminated water. **Conductivity is 52 μ S above and 53 μ S below.** The receiving stream has a flow of a few hundred gallons per minute and has no precipitate. Results of water sample #415/4470-1.305, collected near the portal, are shown below. Concentrations of iron, manganese, and aluminum, and thallium greatly exceed standards. Arsenic, cadmium, copper, fluoride, and zinc also exceed standards, but by smaller factors. The standards for arsenic and thallium are based on domestic-water-supply regulations, implying that this water is not safe to drink. There are no known users of this water in this area, and no residences are nearby.

Sample number 415/4470-1.305 ; hardness of effluent sample = 147 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	1,000	no standard	n/a
Antimony (trec)	3	6.0*	below standard
Arsenic (trec)	150	100	1.5 x standard
Iron (trec)	12,000	1,000	12 x standard
Thallium (trec)	3	0.5*	6 x standard
Zinc (trec)	470	2,000*	below standard
Aluminum	1,000	87*	11.5 x standard
Cadmium	1.5	1.5	1 x standard
Calcium (as CaCO ₃)	36 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	18	16	1.1 x standard
Fluoride	2.7 mg/L	2 mg/L*	1.4 x standard
Iron	10,000	300*	33 x standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Lead	<1	6.7	below standard
Magnesium	14 mg/L	no standard	n/a
Manganese	1,900	50*	38 x standard
Molybdenum	<10	no standard	n/a
Nickel	42	128	below standard
Potassium	1.9 mg/L	no standard	n/a
Silver	<0.2	0.15 (on 3/2/98)	below detection limit
Sodium	1.5 mg/L	no standard	n/a
Sulfate	130 mg/L	250 mg/L	below standard
Zinc	480	147	3.3 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #: 101

Environmental Degradation Rating: 3

The Hi-Ho shaft is in the creek bed, but the creek has been diverted around it. The shaft is open and discharges about 0.5 gpm of water. The discharge had minor associated precipitate, but Forest Service personnel stated that more precipitate was present the previous fall. Water in the shaft had **pH 6.33**, which increased to **pH 6.66** immediately above the receiving stream 50' away. At the shaft, **conductivity was 56 µS**, and just above the receiving stream, **conductivity was 168 µS**. Sample #415/4470-1.306 from the shaft showed concentrations of iron, manganese, and arsenic significantly exceed standards. Fluoride concentration is slightly above standards. There are no known users of the water in this area.

Sample number 415/4470-1.306; hardness of effluent sample = 157 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	290	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	400	100	4 x standard
Iron (trec)	9,500	1,000	9.5 x standard
Selenium (trec)	<2	5	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	<8	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	<0.25	16	below standard
Calcium (as CaCO ₃)	50 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L*	below standard
Chromium	<10	11*	below standard
Copper	<4	17	below standard
Fluoride	2.4 mg/L	2 mg/L*	1.2 x standard
Iron	300	300*	1 x standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Lead	<1	7.4	below standard
Magnesium	7.7 mg/L	no standard	n/a
Manganese	400	50*	8 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	135	below standard
Potassium	1.8 mg/L	no standard	n/a
Silver	<0.2	0.16 (on 3/2/98)	below detection limit
Sodium	2.0 mg/L	no standard	n/a
Sulfate	23 mg/L	250 mg/L	below standard
Zinc	<8	155	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: Mount Richthofen

Site #: 419/4473-1

Site Name: Upper Jack Creek

Description and pertinent facts: This site is about 1/2 mile from FR-758, over 1/4 mile stream distance from Jack Creek, and is not visible from any road or trail.

Feature #: 100

Environmental Degradation Rating: 3

This adit is filled, but discharges about 1 gpm of water with **pH of 4.95 and conductivity of 59 µS**. The discharge flows down the side of the dump into a swampy area.

Feature #: 200

Environmental Degradation Rating: 3

This dump contains about 400 cubic yards of pyritic rock. The mine effluent could degrade further through contact with this pyrite-rich dump. The effluent merges with three small seasonal streams, flows into a marsh, and emerges from the marshy area just above a ruined cabin. Adjacent to the cabin, **pH is 3.89, but the conductivity has dropped to 17 µS**. Mine water was piped to the cabin for domestic use. Although the mine discharge is acid, and rotting vegetation in the marsh decreases the pH, the conductivity also drops by contact with the marsh. The low conductivity, seasonal nature of the flow, and distance from Jack Creek suggest that the effluent is not a severe problem. Erosion and runoff from large, pyrite-rich dump #200 may be a more serious environmental threat.

Quad Name: Pearl

Site Name: Wolverine Mine

Feature #: 201**Environmental Degradation Rating: 3****Feature #:** 202**Environmental Degradation Rating: 2**

This is the main dump from the Wolverine shaft. The dump has a distinct sulfide odor, although no sulfide minerals were identified. The dump contains about 2,000 cubic yards of material and is only a few hundred feet from the creek. It is larger, closer to the creek, and has a stronger sulfide odor than dump #201, and has a very iron-stained portion indicative of recently oxidized sulfides.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Mount Richthofen

Site #: 415/4470-1.101

Site Name: Teller District/Illinois River

Physical Hazard Rating: 2

Description and pertinent facts: This feature is the Hi-Ho shaft, described previously in the Environmental Degradation section of this report. The shaft is open and water-filled. Timbers at the shaft collar have water around them, and to the uninformed, may appear to be logs floating in a small pool in a little creek. A person inclined to wade in the water could blunder into the shaft not realizing it was there. The timbers are rotten and might break loose if someone tried to climb out, thus preventing the victim from getting a hold on anything to pull themselves out.

Quad Name: Mount Richthofen

Site #: 417/4472-1.107

Site Name: Jack Creek

Physical Hazard Rating: 2

Description and pertinent facts: This open, water-filled shaft is near a rather new cabin that logically must be on a patented claim. The shaft may be on the same claim. FR-758 is a short distance above the shaft. The cabin owners are no doubt aware of the shaft and have their driveway posted, but a hiker could blunder into the shaft unawares. If the cabin owners or guests have small children, they might want to play in the water unaware of the danger.

^^New Quad^^

Quad Name: Pearl

Site #: 367/4534-1.100

Site Name: Wolverine Mine

Physical Hazard Rating: 2

Description and pertinent facts: As previously described in the Environmental Degradation section, the Wolverine Mine is just off FR-600 and is reached by a 4WD trail. A fence with a locked gate encloses the main shaft and mill buildings. Just uphill from the fenced area is shaft #100 and its fully visible associated dump. Shaft #100 is at least 20' deep, but the dump size indicates that the apparent bottom is a plug covering a much deeper opening. The shaft walls are vertical and not climbable. The Wolverine Mine is a local attraction, but the major physical hazard of this inventory site is not fenced. Although the rickety buildings around the main shaft are fenced, and the main shaft has a steel grate as an additional access deterrent, open shaft #100 is easily accessible and has neither a fence nor grate.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

**SAN JUAN NATIONAL FOREST
COLUMBINE RANGER DISTRICT**

April 1, 1997

by

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
SAN JUAN NATIONAL FOREST -- COLUMBINE RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Columbine Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. Five water samples not attached to any inventoried mining features are also addressed. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are given in Appendix A.

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most important sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 13 (San Juan), and Ranger District 01 (Columbine).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

The Columbine Ranger District was inventoried during the 1995 and 1996 field seasons. Snowpack during the Spring of 1995 was significantly above normal and hampered identification of some smaller mine sites, especially those in or near avalanche chutes. Also, runoff of snowmelt

probably affected the flow rate and quality of mine effluent during the 1995 field season. Peak runoff in 1995 did not occur until July. Therefore some mines described in this report have significantly higher flow rates during July, when water samples were collected, than during the initial site visit in June.

Water and Dump Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents as shown on table 1. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

In the upper reaches of Mineral Creek and Middle Fork Mineral Creek, where water quality is exceptionally poor, state standards are defined to be "existing ambient quality for all metals as of 2/14/95" until at least 3/2/98. Water sample results from those areas are compared to standards for the adjacent downstream segment, from just above the confluence of Mineral Creek and South Fork Mineral Creek to the confluence of Mineral Creek and the Animas River. After 3/2/98, water quality standards will probably be more restrictive than "ambient quality" for these streams.

At the Bonner, Ruby Trust, and Paradise Mine, along Middle Fork Mineral Creek, Colorado Division of Minerals and Geology collected water samples which were not duplicated during this study. Sample results from their efforts are shown on table 2.

Samples from dumps or tailings were collected during this inventory at the Bedrock Creek Millsite, the Imogene Mine, and the Brooklyn Mine. In all cases, the sample was composited from numerous locations around the dump or tailings pile. At the lab, samples were prepared according to E.P.A. Method 1312, in which a leachate is derived from the soil, and the leachate is then analyzed. Sample results are near the end of table 1.

Geology and Mining Districts

The western 2/3 of the Columbine Ranger District lies within the Colorado Mineral Belt. Significant mineralized areas in the Ranger District are the La Plata Mountains, the area west and northwest of Silverton, and the Needle Mountains. With few exceptions, almost all of the sites inventoried are in these areas. Some notable exceptions include uranium mines at Elk Park and the Graysill Mine, near the headwaters area of Hermosa Creek; small base- and precious-metal mines driven on veins in Whitehead Gulch; and small silver-copper-lead mines exposing veins and replaced limestone near Tuckerville and Cave Basin. The Graysill Mine is one of the most significant sites in the Ranger District, both for environmental degradation and physical hazards.

La Plata Mountains

The modern mining era began in the La Plata Mountains in 1873, although Father Escalante reported mining activity in 1776. Unlike most districts in Colorado, most of the larger deposits were not discovered until after 1900. The district has produced about 2 million ounces silver, 200,000 ounces gold, 300,000 pounds copper, 750,000 pounds lead, and 8,000 pounds zinc.

The La Plata Mountains are a mineralized domal feature about 15 miles in diameter. Sedimentary rocks exposed in the district include Pennsylvanian Hermosa Formation up through Cretaceous Mancos Shale, with Cutler Formation rocks being the most common. All of these rocks were affected by multiple episodes of igneous activity, probably during early Tertiary time. Igneous rock types include diorite, monzonite, and syenite, and they were intruded as stocks, laccoliths, sills, and dikes. During emplacement of the intrusive rocks, sedimentary host rocks were folded, fractured, metamorphosed, and mineralized to varying extents. Strata closer to the igneous activity were more affected than those on the margin.

Most mineral production from the La Plata Mountains originated from quartz veins hosted in small displacement fault zones. Minor production came from replacement deposits, usually in Pony Express Limestone Member of the Wanakah Formation. Bedrock Creek hosts a porphyry copper deposit at the surface, and a few other places in the district are highly altered and have disseminated pyrite and anomalous gold concentrations. Throughout the district, quartz, and to a lesser extent, calcite and barite are the prevalent gangue minerals. Pyrite, galena, chalcopyrite, sphalerite, and arsenopyrite are the most common sulfides. Sulfosalts such as tetrahedrite, proustite, and pyrargyrite are abundant and widespread. Telluride minerals, including native tellurium, and mercury minerals, including natural amalgam (precious metal-mercury mixture), occur in most of the largest ore bodies.

In general, mines on public land in this district are generally dry, or have low flows of moderate-quality water. However, many of the workings are dangerous and are easily accessible to the public.

Silverton Area

Recorded prospecting activity began near Silverton in 1860, but major efforts to produce minerals were delayed until 1873, when the U.S. purchased the area from the Ute Indians. Many of the largest mines in the Silverton area are on private or BLM-administered land, outside of the Columbine Ranger District, but production from within the boundary of the Ranger District, including patented land, is estimated at more than 20,000 ounces gold, 1.4 million ounces silver, 5 million pounds copper, 13 million pounds lead, and 7 million pounds zinc.

Pennsylvanian Hermosa Formation through Tertiary Telluride Conglomerate sedimentary rocks are exposed in this area. Sedimentary strata are exposed west of Mineral Creek, especially along South Fork Mineral Creek. Further north, these rocks are covered by Tertiary volcanic rocks of the San Juan Formation, Silverton Volcanic Group, and Potosi Series. These extrusive rocks are intermediate to felsic in composition, and consist of breccias, flows, and tuffs. All of these rocks have been intruded by younger Tertiary monzonite porphyry stocks, sills, and dikes. Most of the intrusive bodies are relatively small, but larger ones occur at Sultan Mountain and Rolling

Mountain. Quaternary-age ferricrete, or bog-iron, deposits have formed on terraces along some of the drainages. These ferricrete deposits are usually downstream from large altered areas where disseminated pyrite is common.

Structurally, the major feature is the Silverton caldera, which lies east of Mineral Creek. Silverton Volcanic Group and Tertiary intrusive rocks are exposed in the caldera. Large areas within and on the margin of the caldera are intensely altered and contain abundant disseminated pyrite and anomalous concentrations of precious metals.

Past mining efforts focused on deposits hosted in faults and breccia pipes within the caldera, and in radial fractures associated with, but outside of the caldera. Recent prospecting and drilling programs have sought large-tonnage low-grade base- and precious-metal deposits in the highly altered areas. In addition to sulfides such as pyrite, galena, chalcopyrite, and sphalerite, sulfosalts such as tetrahedrite, enargite, proustite, and pyrargyrite are common. Less common are tungsten-bearing huebnerite and various telluride minerals. Gangue is predominately quartz, but barite is common.

Many mines on public land are discharging significant quantities of poor-quality water. In addition, natural water is also poor quality in some areas, especially below the highly altered localities. Cooperative studies to determine how to address this complex hydrologic system are in progress by agencies at the state and federal level. Regarding physical hazards, many of the mines are caved but some open and easily accessible mines exist, as well.

Needle Mountains

Most of the \$12,000 of production from the Needle Mountains mining district came prior to 1900, during the late 1800's. Gold and silver were the primary commodities, but minor amounts of base metals were also probably produced.

In the heart of the district, in Chicago Basin, Precambrian granitic rocks have been intruded by a Tertiary intrusive plug. The plug intruded during at least 3 episodes, and mineralogy and alteration types are associated with specific episodes. Mineralized faults and fissures are related to this intrusive activity, and can be found up to 6 miles to the west, in and near the West Needle Wilderness Study Area.

Production has come from quartz-sulfide veins in the mineralized fissures which surround and are associated with the plug. Because of the intensity and types of surface alteration, including abundant disseminated pyrite, this area was prospected and drilled for a stockwork molybdenum deposit. Metallic minerals commonly associated with the vein deposits of this district include pyrite, galena, sphalerite, chalcopyrite, and tetrahedrite. Significant quantities of uranium minerals, especially pitchblende, occur in some of the vein systems. Molybdenite is sparse.

Most mines in this district are small, and have low flows of moderate-quality water. Because of the popularity of this area for hiking, serious physical hazards exist, especially at shafts.

USFS ABANDONED MINE LAND INVENTORY PROJECT
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NUMERICAL SUMMARY

- 161** field forms
- 767** mine openings inventoried (includes collapsed or filled openings)
- 412** mine dumps, tailings piles, highwalls, etc.
- 213** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 5
Number of features with EDR of 2 = 12
Number of features with EDR of 3 = 51
Number of features with EDR of 4 = 145
Number of features with EDR of 5 = 966
- 244** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 7
Number of features with PHR of 2 = 36
Number of features with PHR of 3 = 201
Number of features with PHR of 5 = 935

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- COLUMBINE RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=13;District=01	EDR
01) Brooklyn	Silverton	261/4193-1.104, 204	1, 1
02) Paradise Mine Area	Ophir	256/4191-1.100, 101, 102, 103	1, 2 3, 3
03) Graysill Mine	Hermosa Peak	243/4177-1.113; 112, 204, 212; 104, 106, 107, 108, 109, 110, 111, 114, 206, 208, 210, 211	1;2,2,2 ;3,3,3, 3,3,3,3 ,3,3,3, 3,3
04) Bandora Mine	Ophir	253/4185-1.104	1
05) Bonner Mine	Silverton	258/4191-2.100, 200, 201	2, 2 2
06) Ruby Trust - MC-17a	Ophir	257/4192-1.100	2
07) Ensle Tunnel/Burbank Portal	Ophir	255/4189-1.103, 100	2, 3
08) Southside Chattanooga Curve	Silverton	259/4195-2.100	2
09) Bedrock Creek Millsite	La Plata	759/4142-7.203, 200, 201	2, 3, 3
10) Upper Browns Gulch	Silverton	261/4193-2.102, 202	2, 2
11) North of Imogene - Ferricrete Area	Silverton	260/4194-1.104, 204	3, 3
12) Imogene Mine	Silverton	259/4193-1.101, 201	3, 3
13) West of Burro Bridge	Silverton	259/4192-3.104, 103	3, 4
14) Allard Mine	La Plata	757/4143-1.100	3
15) Sierra 1-3 Claims	La Plata	759/4142-5.200, 204, 205	3, 3, 3
16) Silver Crown	Silverton	258/4194-1.100, 200	3, 3
17) East of Burro Bridge	Silverton	260/4192-1.100, 101	3, 3
18) Cumberland Basin	La Plata	764/4148-1.101, 103	3, 3
19) Lower Ice Lake Basin North	Ophir	253/4188-1.101, 201	3, 3

Site Name	Quad Name	Site # Forest=13;District=01	EDR
20) First NW Drainage Middle Fork Mineral Creek	Silverton	259/4192-2.100, 101	3, 3
21) Eagle Pass West	La Plata	764/4144-1.100, 101, 200	3, 3, 3
22) Northeast Chicago Basin	Columbine Pass	269/4165-1.109	3
23) 1st Mine 1st NW Drainage Middle Mineral Creek	Silverton	259/4192-1.100	3
24) Chattanooga	Silverton	260/4194-2.104	3
25) First Southwest Drainage Middle Fork Mineral Creek	Silverton	258/4191-1.100	3
26) Tom Sawyer	La Plata	760/4141-1.101	3
27) Lower Browns Gulch #1	Silverton	260/4193-2.100, 201	3, 3
28) Adit Underneath US 550	Silverton	260/4191-1.100	3
29) Porphyry Basin	Ironton	258/4195-2.200	3
30) Lower South Park	Ophir	253/4184-1.100	3
31) Comstock (Toll House)	La Plata	758/4140-1.200	3
32) Eldorado Lake Area	Storm King Peak	275/4176-1.107	3
33) Bessie G East	La Plata	764/4147-1.100	4
34) U.S. Basin #1	Ironton	263/4195-1.201	4
35) Sally Bowman	Snowdon Peak	262/4169-1.100	4
36) Mountain Lily and vicinity; Greenhorn-Hope	La Plata	761/4146-1.305	n/a
37) U.S. Basin #2	Silverton	262/4195-1.300	n/a
38) Columbine Lake	Columbine Pass	270/4164-1.304	n/a
39) Needle Creek-at mouth	Mountain View Crest	262/4167-1.300	n/a
40) Elk Creek-at mouth	Snowdon Peak	266/4178-1.300	n/a

USFS ABANDONED MINE LAND INVENTORY PROJECT
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PRIORITY SITES

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=13;District=01	PHR
01) Graysill Mine	Hermosa Peak	243/4177-1.108, 114; 109, 112, 113	1, 1; 2,2,2
02) Bessie G West	La Plata	764/4146-1.100	1
03) Rockwood Limestone Quarry	Hermosa	251/4152-1.100,101	1
04) Bedrock Creek Copper Mine	La Plata	759/4142-3.101, 102	1, 2
05) Clear Cut Deep Shaft	Monument Hill	239/4148-1.100	1
06) Nigger John's Hole	Bayfield	275/4116-1.100	2
07) Northeast Chicago Basin	Columbine Pass	269/4165-1.109, 110, 111	2, 2, 2
08) Eldorado Lake Area	Storm King Peak	275/4176-1.100, 107	2, 2
09) Silver Mesa; Pittsburgh Shaft	Columbine Pass	270/4161-1.100, 103	2, 2
10) Unknown	Monument Hill	238/4148-1.102	2
11) Bandora Mine Area	Ophir	253/4185-1.100, 101, 112, 113	2, 2, 2, 2
12) Bonner Mine	Silverton	259-4191-2.100, 102, 103	2, 2, 2
13) Neptune Creek	La Plata	759/4141-1.101, 102, 104	2, 2, 2
14) Boren Creek	La Plata	759/4143-1.103	2
15) Vallecito Basin	Columbine Pass	270/4163-1.100, 117	2, 2
16) South of Madden Creek	La Plata	758/4141-1.100, 101	2, 2
17) Silver Crown (area)	Silverton	258-4194-1.103	2
18) Snowslide Gulch Mines	Silverton	259/4188-2.100	2

Site Name	Quad Name	Site # Forest=13;District=01	PHR
19) Forest Road 585 Exploration Adits	Silverton	259/4188-3.100, 101	2, 2
20) Honeydew	La Plata	760/4143-1.109	2
21) Ensle Tunnel/Burbank Portal (area)	Ophir	255/4189-1.101	2
22) Lower South Park	Ophir	253/4184-1.100	2
23) Purgatory Flats	Engineer Mountain	253/4168-1.101	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Columbine Pass

Site #: 269/4165-1.109

Site Name: Northeast Chicago Basin, Little Jim Mine

Environmental Degradation Rating: 3

Description and pertinent facts: This inventory area occurs in the Weminuche Wilderness Area, so access is limited to horse or foot travel. Mine feature #109 is the patented Little Jim Mine. The adit is marked "Mine" on the PBS quadrangle. Although the adit is on a patented claim, much of the dump and mine drainage extend onto USFS-managed land. Forest Trail #504, which is the well-used trail to Columbine Pass, leads directly to the adit portal and crosses the dump. This appears to be the largest mine in the Chicago Basin/Vallecito Basin mining area.

The adit portal is open and is intact beyond line of sight. It was draining water at 8 gpm with **pH of 5.5** and **conductivity of 192 μ S** (test #308, 9/12/95). The pH is within background conditions in this alpine basin, but the conductivity is markedly higher than background (usually <50 μ S). A black precipitate covers rocks along the drainage path of the mine effluent. This black coating appears botryoidal in places and could possibly be the barium-manganese oxide mineral psilomelane. The effluent flows around the north side of the 1,100 cubic yard dump, discharging directly into wetlands in the riparian area of Needle Creek. As the effluent flows around the dump, **pH increases to 6.35 and conductivity is unchanged**, indicating the dump does not further degrade the water. The combination of significant discharge, elevated conductivity, and effluent precipitate indicate potentially significant environmental degradation.

This site is also discussed in the Physical Hazards Section.

Quad Name: Columbine Pass

Site #: 270/4164-1

Site Name: Columbine Lake

Description and pertinent facts: This site is in a cirque on the east side of Columbine Pass, within the Weminuche Wilderness Area. Although no features received EDRs of 3, this inventory area is discussed because a water sample was collected. The sample was collected from standing water in Columbine Lake, which catches runoff from several small mine features. On 9/12/95, only 2 of the mines were draining; both less than 1 gpm. The lake had **pH = 5.88 and conductivity = 19.3 μ S**. Lab analyses reveal low metal concentrations, with the exception of zinc, which has moderate concentration (table 1, sample 270/4164-1.304). The state water quality standards for many metals in this area are related to hardness of the water. Because the hardness of this sample is only 6 ppm, the table value standards for several metals are extremely low. Cadmium, lead, and zinc concentrations exceed state standards. In addition, the pH is below the state standard of 6.5.

locations: at the portal **pH = 5.27 and conductivity = 579 μ S**, on the upper dump bench **pH = 5.13 and conductivity = 611 μ S**, and at the toe of the lower dump, on public land, **pH = 5.56 and conductivity = 547 μ S**. A water sample was collected at the toe of the lower dump, and the lab results are shown in table 1. The effluent exceeded state standards in concentrations of the following constituents by a factor shown in parentheses: total recoverable iron (50x), manganese (4.6x), fluoride (3.4x), and sulfate (1.1x).

Quad Name: La Plata

Site #: 758/4140-1.200

Site Name: Comstock (Toll House)

Environmental Degradation Rating: 3

Description and pertinent facts: This 170 cubic yard dump is definitely on patented land. The adjoining underground workings have been sealed by the Colorado Division of Minerals and Geology, but the dump is still of concern. It is cut by Root Creek, a seasonal stream. The creek enters public land within 100' of the toe of the dump. Of specific concern are the sand and gravel components of the dump as they may be readily transported, broken down, or dissolved by the creek. These sands and gravels contain pyrite, sphalerite, covellite, and tetrahedrite. The dump is accessible from a short foot trail from the Kroeger campground, or by a private driveway exiting CR-124 a few feet north of the campground exit.

Quad Name: La Plata

Site #: 759/4142-5.200, 204

Site Name: Sierra 1-3 Claims

Environmental Degradation Ratings: 3

Description and pertinent facts: These two dumps are approximately 80' apart and are similar in size of materials and mineralogy. Dump #200 contains 300 cubic yards and dump #204 contains slightly more than 200 cubic yards. Both dumps have abundant massive pyrite, iron and manganese oxides, and traces of secondary copper minerals. The dumps are adjacent to and partly removed by an avalanche run which is seasonally occupied by a small stream. The dumps are accessible from the La Plata City campground by crossing the La Plata River and proceeding 0.2 miles along an unimproved road to a main portal and dump (features #105, #205). From this mine, a narrow undriveable drill road or path leads approximately 500' to the features.

Quad Name: La Plata

Site #: 759/4142-5.205

Site Name: Sierra 1-3 Claims

Environmental Degradation Rating: 3

Description and pertinent facts: This main dump contains more than 700 cubic yards of sand- and gravel-sized material. The material has abundant pyrite (>10%), and iron and manganese oxides. Traces of chalcopyrite and secondary copper minerals were noted. The dump is circumnavigated by mine effluent with **pH of 5.56 and conductivity of 412 μ S**. This drainage may cross or cut the dump in early summer when flow rates are much greater than the 3 gpm observed in

August, 1995. If water comes in contact with the dump, acid will probably be generated. The dump area is 0.2 miles via an unmarked road from the La Plata City campground across the La Plata River.

Lab analyses of the mine effluent (table 1, sample 759/4142-5.305) show concentrations of manganese (8x), copper (3x), zinc (4.5x), and cadmium (4.5x) to exceed state water quality standards by factors shown in parentheses.

Quad Name: La Plata

Site #: 759/4142-7.200, 201

Site Name: Bedrock Creek Millsite (Kelly Green's Millsite)

Environmental Degradation Ratings: 3

Description and pertinent facts: These two concrete mill foundations are on either side of feature #203, the common tailings pile. Each foundation is larger than 2000 square feet. Although evidence of hazardous material is lacking, it is possible that some leftover processing chemicals are present. Both of these features were primary milling sites, complete with ball mills and flotation cells. It is not known if cyanide was utilized, but it is likely. These features are located on the north bank of Bedrock Creek just west of CR-124. Follow-up detailed soil sampling of this locale is desirable.

Quad Name: La Plata

Site #: 759/4142-7.203

Site Name: Bedrock Creek Millsite (Kelly Green's Millsite)

Environmental Degradation Rating: 2

Description and pertinent facts: This former flotation millsite is located approximately 0.5 miles south of La Plata City along Bedrock Creek west of CR-124. The 1000 cubic yards of mill tailings are of environmental interest because of their fine-grained silty nature, their proximity to Bedrock Creek, the mineralogy of the parent ore material, and the possibility of processing chemical residue. The parent ore consisted of tellurides of mercury, gold, and silver. Sulfides of mercury, silver, iron, copper, platinum, palladium, antimony, and possibly arsenic are known to exist.

Another potential environmental concern centers around the recent and on-going activities of the claimant. Mr. Kelly Green is allegedly attempting to recover precious metals from this tailings pile. The types and quantities of chemicals he might use are not known to the author.

Because Bedrock Creek is the only tributary to the La Plata River identified as a serious environmental concern, 3 water samples and a tailings sample were collected from this inventory area. A composite tailings sample was prepared by combining 4 core samples from different areas of the tailings pile. At the lab, a leachate from the tailings sample was obtained using a modified E.P.A. Method 1312. Lab analyses of the leachate do not indicate a highly reactive dump (table 1, sample 759/4142-7.203). At the time of the water sampling, 10/95, the creek was flowing at about 100 gpm and was not actively cutting the toe of the pile. Downstream **conductivity was 140 μ S versus 230 μ S** above the pile. Upstream **pH was 5.59 compared to 5.48** below the tailings. Metal concentrations are similar in the upstream and downstream samples. Aluminum (7.5x), copper

(50x), manganese (1.5x), and zinc (2.5x) concentrations exceed state water quality standards by the approximate factors shown in parentheses. Sample results are ambiguous, especially the downstream samples, one of which was a replicate sample (table 1, samples 759/4142-7.300, 301, 302). In samples 759/4142-7.301 and 759/4142-7.302, many of the filtered sample results are higher than the raw sample results. In addition, many of the replicate sample results differ significantly from the original, especially in nickel, copper, and filtered iron. The replicate sample was not a sample split or duplicate, but it was collected separately from approximately the same location and within a few minutes of the original sample. Explanation of the puzzling results could be as simple as lab errors in numbering, or the filtered and raw samples were switched. The difference between the original and its replicate may be caused by a pulse of water with different constituents, the slight variation in the time and location of the sample, or lab error (such as a misplaced decimal point in the case of nickel).

The millsite has no apparent effect on water quality in Bedrock Creek. Metal concentrations in Bedrock Creek near the millsite probably represent background values inherent with the draining of the intensely altered and mineralized porphyry copper deposit exposed near the Allard Mine. Water sample results from the Allard Mine and Bedrock Creek near the millsite provide evidence supporting this conclusion. The only significant mine discharge in Bedrock Creek is from the Allard Mine. Drainage from the Allard is very high in iron and has elevated manganese levels, but concentrations of these elements are significantly lower in Bedrock Creek at the millsite. In contrast, the millsite samples contain much higher levels of aluminum, copper, and zinc than Allard Mine drainage. In the millsite samples, high concentrations of aluminum, copper, and zinc are probably attributable to natural drainage from the porphyry copper deposit exposed near the Allard Mine.

Quad Name: La Plata

Site #: 760/4141-1.101

Site Name: Tom Sawyer Mine

Environmental Degradation Rating: 3

Description and pertinent facts: This 4'x 3' portal drains its greater than 100' length and workings above. Field tests indicate **pH of 5.23 and conductivity of 213 μ S**, and a late summer flow of 2 gpm. Because of the low discharge rate, no water sample was collected. Potential environmental degradation is indicated by the mineralogy of this deposit. The mine was developed in a stockwork zone within a diorite host. Abundant iron oxide and pyrite provide a readily available source for acid generation. Furthermore, arsenopyrite and copper oxides are present in minor amounts. The site is located 4.6 miles from La Plata City via unimproved gravel road FR-571F and local drill roads. The area is not accessible until after spring runoff as FR-571F crosses the La Plata River at a ford.

Quad Name: La Plata

Site #: 761/4146-1.305

Site Name: Mountain Lily and vicinity; Greenhorn-Hope

Description and pertinent facts: This site is located along CR-124, about 2 miles north of the town of La Plata. Although no features in this inventory area received EDRs of 3 or worse, this site

is described because a water sample was collected. Mine effluent was discharging from an adit on private land, flowed down the dump, and was sampled where it crossed the right-of-way for CR-124. When sampled, the effluent flow was 18 gpm, **pH = 5.35, and conductivity = 84 μ S**. Results of the lab analyses indicate that although the effluent is slightly acidic, metal concentrations are low and do not exceed state water quality standards (table 1, sample 761/4146-1.305). Because they are privately owned, and the effluent is low in metals, the adit and associated dump were neither inventoried nor rated.

Quad Name: La Plata

Site #: 764/4144-1.100, 101, 200

Site Name: Eagle Pass West

Environmental Degradation Ratings: 3

Description and pertinent facts: This mine consists of 2 adits approximately 50' apart. Both adits are on patented ground but drain onto public land. Field pH and conductivity tests of the portal effluents indicate potential environmental degradation. The **pH ranged from 3.8 to 4.1 with conductivities from 250 to 360 μ S** on flows of 3 to 5 gpm. Potential for surface contamination exists, as an oily air compressor is in a nearby open-air shed. Features #100 and #101 share a common dump (#200). It is unclear whether the 1800 cubic yard dump is on patented ground. Iron oxides dominate the dump material. Access to the site is difficult because of a locked gate across FR-060. The mine is about 2 miles up Lewis Creek from its confluence with the La Plata River along an unimproved 4WD road.

Quad Name: La Plata

Site #: 764/4147-1.100

Site Name: Bessie G East

Environmental Degradation Rating: 4

Description and pertinent facts: This is the patented east portal of the Bessie G Mine, and is located at the head of Heffernan Gulch. The mine opening is 8'x 8' and effluent with **pH = 8.4 and conductivity = 146 μ S** is draining at a rate of about 5 gpm. The effluent was sampled for lab analyses and contained 2x the statewide drinking water standard for antimony (table 1, sample 764/4147-1.300). Antimony is not listed for this basin in the stream segment water quality standards, and is not considered a serious environmental threat in this area. The small flow from this mine is quickly diluted downstream, especially after mixing with Junction Creek.

Quad Name: La Plata

Site #: 764/4148-1

Site Name: Cumberland Basin (Northumberland?)

Description and pertinent facts: The mine is a short hike east from the Cumberland Mill located in Cumberland Basin near the terminus of CR-124. The workings are driven along veins in shear zones in the Cutler Formation. Metallic minerals occurring in the veins include tetrahedrite, coloradoite (HgTe), cinnabar (HgS), sylvanite (AgAuTe₄), calaverite (AuTe₂), gold, and electrum. Tetrahedrite is susceptible to weathering, which could have environmental consequences. It is

concentrations of uranium, at 32 µg/L for filtered and 34 µg/L for raw samples. Although high, these concentrations are within state standards.

Quad Name: Ophir

Site #: 253/4185-1.104

Site Name: Bandora Mine Area

Environmental Degradation Rating: 1

Description and pertinent facts: This site is located along South Fork Mineral Creek, about 6 miles upstream from its confluence with Mineral Creek. Water flowing from a collapsed adit (feature #104) is orange and is depositing an orange precipitate. The effluent drains from the adit, through a ditch to the east, before flowing over the dump and down into ponded water with red-stained rocks just above South Mineral Creek. Water tests on 6/20/95 revealed **conductivity = 820 µS and pH = 5.81** on a 10 gpm flow. Tests on 7/19/95 show **conductivity = 618 µS and pH = 6.21** on a 32 gpm flow.

A water sample was collected on 7/19/95 (table 1, sample 253/4185-1.300). Lab results indicate the effluent exceeds state standards in the following parameters by factors shown in parentheses: cadmium (37x), copper (5x), dissolved iron (37x), total recoverable iron (21x), manganese (>100x), total recoverable lead (3x), zinc (69x), and sulfate (1.2x).

Quad Name: Ophir

Site #: 253/4188-1.101, 201

Site Name: Lower Ice Lake Basin

Environmental Degradation Ratings: 3

Description and pertinent facts: This patented site is along the drainage between Island Lake and Lower Ice Lake Basin, and is accessed from Forest Trail #505. Adit #101 is draining about 4 gpm of water that has **pH of 3.54 and conductivity of 488 µS**. The effluent infiltrates the dump, then re-emerges on the dump downslope and flows into the stream below Island Lake. At the discharge point on the dump downslope, the effluent flows at about 1 gpm and has **pH = 4.03 and conductivity = 406 µS**. The stream below Island Lake enter public land about 1200' downstream from these features, in Lower Ice Lake Basin.

Quad Name: Ophir

Site #: 255/4189-1

Site Name: Ensle Tunnel/Burbank Portal (area)

Description and pertinent facts: This site is on the east side of Clear Creek, and is accessed from FR-815. Sedimentary rocks exposed in South Mineral Creek include the Dolores Formation through the Telluride Conglomerate.

Feature #: 100

Environmental Degradation Rating: 3

At the Ensle Tunnel, milky water is draining from under the snow where the adit is thought to be, and is depositing orange precipitate. On 8/17/95, the water draining was tested and had **pH = 4.74 and conductivity = 61 μ S** on a 2 gpm flow. A week later the water was tested and sampled and had **pH = 2.89 and conductivity = 470 μ S** on a flow of less than 1 gpm (table 1, sample 255/4189-1.303). Lab results show the water exceeds state standards in the following metals by factors shown in parentheses: aluminum (36x), arsenic (1.2x), copper (7x), cadmium (11x), dissolved iron (60x), total recoverable iron (41x), manganese (7x), lead (8x), and zinc (25x).

Feature #: 103

Environmental Degradation Rating: 2

This intact adit with a locked grate is the Burbank Portal, which discharges at about 164 gpm according to the flume that has been permanently set to gauge the large flow cascading down the hill into Clear Creek. On 8/17/95, the mine effluent had a high **pH (7.00)** as compared to other mines in South Mineral Creek drainage, (i.e. the Bandora). **Conductivity was 700 μ S**. The **pH of the water increases to 8.53** as it flows over the exposed rock formations between the mine and the creek. In Clear Creek, the **pH increases from 6.91 to 7.30 and conductivity increases from 86 to 167 μ S** because of the influence of the mine effluent.

On 8/24/95, effluent was sampled for laboratory analyses (table 1, sample 255/4189-1.304). The **pH was 5.99 and conductivity was 734 μ S**. Water samples reveal that the following parameters exceed state standards by factors shown in parentheses: dissolved iron (12x), total recoverable iron (4.6x), manganese (20x), and sulfate (1.3x).

Quad Name: Ophir

Site #: 256/4191-1

Site Name: Paradise Mine Area

Description and pertinent facts: This inventory area is located along Middle Fork Mineral Creek, at the confluence of the drainages from Paradise Basin and Crystal Lake. Paradise Basin is the major headwater area for Middle Fork Mineral Creek. The mine site is accessed from the Ophir Pass road, FR-679.

Bureau of Mines MLA Report 2-92 indicates two mines in southeast Paradise Basin at about 12,200 feet. One adit is shown to be open, but it is not known if either one of the adits is draining. These features were not observed at the time of this inventory, perhaps due to snow cover. They were looked for and not seen in Paradise Basin at a time when snow fields still existed. Because no evidence of draining mines was observed in Paradise Basin, a water test from above the Paradise group of mines and below Paradise Basin probably represents natural water of Middle Fork Mineral Creek. The water tested had **pH = 7.34 and conductivity = 191 μ S** on an estimated flow of 10 cubic feet per second.

Water that drains from Crystal Lake and Ophir Pass basin joins Middle Fork Mineral Creek just above the Paradise Mine group. This water was tested and had **pH = 7.04 and conductivity = 81**

μS on an estimated flow of 6 cubic feet per second. Although some small prospects are in this basin, none are known to be draining, and the water from this area appears to be high quality.

Middle Fork Mineral Creek was tested below the Paradise Mine and had **pH = 6.00 and conductivity = 326 μS** on an estimated flow of 17 cubic feet per second, suggesting that the mines cause a drop in the pH and an increase in the conductivity, significantly degrading water quality. Colorado Division of Minerals and Geology sampled effluent from 4 mines in this inventory area. Lab results are shown on table 2 and are briefly discussed below. State water quality standards for this area are vague, so sample results are compared to standards for the adjacent downstream segment of Mineral Creek.

Feature #: 100

Environmental Degradation Rating: 1

This is the largest and most environmentally damaging mine feature in this inventory area. A nearby patented mining claim was surveyed in 1995 by Paul Beaber of San Juan National Forest. The portal of adit #100 is on private land, but most of the dump and effluent path are on public land. Collapsed adit #100 was discharging water at an estimated rate of 400 gpm. The water is cloudy, with a “milky” color, and leaves a white precipitate which is visible from the Ophir Pass road. The mine effluent has **pH = 5.43 and conductivity = 1815 μS** . Effluent from the portal area was sampled (table 2, Paradise Portal sample #1) and lab analyses show aluminum (82x), iron (11x), and manganese (4.6x) exceed state standards for the adjacent downstream segment of Mineral Creek by the factors shown in parentheses. This sample was extremely high in calcium, magnesium, and sodium which accounts for some of the high conductivity.

Feature #: 101

Environmental Degradation Rating: 2

At this collapsed adit, clear water bubbles up and flows onto the dump material at about 1 gpm. The water leaves a dark red and orange precipitate, then infiltrates the dump prior to reaching Middle Fork Mineral Creek. The **pH of the effluent is 5.39 and the conductivity is 1318 μS** . Effluent from the portal area was sampled (table 2, Paradise Portal sample #2) and lab analyses show aluminum (38x), and manganese (1.2x) exceed state standards for the adjacent downstream segment of Mineral Creek by the factors shown in parentheses. This sample also contained high concentrations of calcium and sodium.

Feature #: 102

Environmental Degradation Rating: 3

The water draining from this collapsed adit is clear, and leaves an orange precipitate. Filamentous algae grows in the water, and moss grows along the sides of the flow. The water flows at about 10 gpm and has a **pH of 7.30 and conductivity of 564 μS** . Effluent from the portal area was sampled (table 2, Paradise Portal sample #3) and lab analyses show all parameters fall within state standards for the adjacent downstream segment of Mineral Creek.

Feature #: 103

Environmental Degradation Rating: 3

Clear water, that leaves an orange precipitate, emerges from the hillside at about 30 gpm, and cascades down to Middle Fork Mineral Creek. Ore-cart rails protrude from the hillside at the top of the cascade, which is visible from the Paradise Mine. The water is flowing at about 30 gpm and has a **pH of 6.70 and a conductivity of 487 μS** . Effluent from the portal area was sampled (table

show the following metals exceed state standards for the adjacent downstream segment by factors shown in parentheses: aluminum (63x) and total recoverable iron (7.5x).

Within this inventory area, a natural drainage flows from a basin of hydrothermally altered volcanic rock, and enters Middle Fork Mineral Creek from the southwest about 800' west and upstream of adit #100. Rocks exposed above timberline in this drainage are red and orange, presumably because of the oxidation of pyrite. Although snow fields covered parts of the basin floor throughout the field season of 1995, neither reconnaissance nor literature search revealed past mining activity. Furthermore, tributaries of this natural basin drainage, where it could be visually confirmed that no mines existed, had lower pH readings than the main stem. Near the mouth of the natural drainage from the altered basin, the stream bed is heavily caked with orange precipitate. Deposits of ferricrete occur along the south side of Middle Fork Mineral Creek from this confluence to the Bonner Mine. No ferricrete deposits were observed on the north side of Middle Fork Mineral Creek in this same reach.

Immediately above its confluence with Middle Fork Mineral Creek, water from the altered basin had **pH of 3.82 and conductivity of 571 μ S** on a flow of about 500 gpm. About 1500' upstream from the confluence, this water flowed at about 500 gpm and had **pH of 3.66 and conductivity of 553 μ S**. Orange precipitate, green algae, moss, and insect life were observed along the creek. Water samples collected from this natural water, about 1500' upstream from its confluence with Middle Fork Mineral Creek show the following parameters exceed state standards for the adjacent downstream segment by factors shown in parentheses: aluminum (>115x), total recoverable iron (5x), sulfate (1.3x), and cadmium is at the standard (table 1, sample 258/4191-1.309).

The several cubic feet per second flow in Middle Fork Mineral Creek above the confluence with this 1st SW Drainage of the Middle Fork of Mineral Creek (from the altered basin), had **pH of 6.26 and conductivity of 491 μ S**. Below the confluence with the natural water from the altered basin, and also below feature #100, Middle Fork Mineral Creek had **pH of 4.75 and conductivity of 498 μ S**. Thus, the **pH of Middle Fork Mineral Creek drops from 6.26 to 4.75 and the conductivity stays relatively constant, (491 and 498 μ S)**, as a result of the 500 gpm inflow of natural water with **pH of 3.82 and conductivity of 571 μ S**. The only mine in this reach, feature #100, seeps less than 1 gpm degraded water into the creek. Results of water tests and samples indicate that the significant drop in pH of Middle Fork Mineral Creek is due primarily to the natural water (no mining activity) discharging from the altered basin at the head of the 1st SW Drainage of the Middle Fork of Mineral Creek. Ferricrete deposits along the south side of Middle Fork Mineral Creek are also probably related to the influx of the low pH, aluminum- and iron-rich water from the natural drainage.

Quad Name: Silverton

Site #: 258/4191-2

Site Name: Bonner Mine

Description and pertinent facts: This site is located about 0.5 mile west of the confluence of Middle Fork Mineral Creek and Mineral Creek, on the south side of Middle Fork Mineral Creek. Several large adits and about 5000 cubic yards of dump material are at this site. Effluent flows from some mines, but the flow is highly variable, and flow paths change according to flow rates, ground saturation, and other factors. Natural waters from above further complicate the hydrology

by mixing with the mine effluent and by flowing through, across, or adjacent to the dumps. Seeps are numerous, and in many instances it is difficult to determine the origin of the seep.

Colorado Division of Minerals and Geology collected 5 water samples from mine effluent and seeps in this inventory area. Lab results are shown on table 2 and are briefly discussed below. State water quality standards for this area are vague, therefore, sample results are compared to standards for the adjacent downstream segment of Mineral Creek.

Feature #: 100

Environmental Degradation Rating: 2

Clear water flowing from this open adit leaves an orange-red precipitate and has green moss growing in it. Water is flowing at about 10 gpm and has **pH of 3.15 and conductivity of 1050 μ S**. Lab analyses of the effluent show concentrations of sulfate (2x), aluminum (101x), cadmium (17x), copper (3x), iron (2.3x), manganese (5.7x), and zinc (10x) exceed state standards for the adjoining downstream segment by the factors shown in parentheses (table 2, Bonner Mine sample #3).

Feature #: 200

Environmental Degradation Rating: 2

This is the lowermost dump of the Bonner group, and contains about 800 cubic yards of material. Water flows across and around this dump, as well as infiltrating the top of the dump. The flow below the dump was about 1 gpm and had **pH of 3.01 and conductivity of 925 μ S**. Although the flow is not large, the discharge eventually drains into Middle Fork Mineral Creek. The seep was sampled and lab analyses show concentrations of sulfate (1.8x), aluminum (115x), cadmium (21x), copper (3.9x), iron (1.1x), manganese (5.7x), and zinc (12x) exceed state standards for the adjacent downstream segment by the factors shown in parentheses (table 2, Bonner Mine sample #4).

A water sample was collected by Division of Minerals and Geology from a spring below and to the west of this dump. Judging by recorded flow rates, it was probably a mixture of mine effluent and natural water which had seeped through the dumps and had been diverted westward along its subsurface path. Lab analyses show concentrations of sulfate (1.6x), aluminum (106x), cadmium (15x), copper (3.2x), manganese (4.2x), and zinc (9x) exceed state standards for the adjoining downstream segment by the factors shown in parentheses (table 2, Bonner Mine sample #5).

Feature #: 201

Environmental Degradation Rating: 2

This 1200 cubic yard dump has a seep depositing a mound of orange, and red precipitate on its downslope. Evidence from the literature indicates that an adit may have been buried by this dump (Colorado Inactive Mine Inventory-1980). The water is flowing at about 3 gpm and has **pH of 3.35 and conductivity of 750 μ S**. Lab analyses of the effluent show concentrations of sulfate (1.7x), aluminum (184x), cadmium (40x), copper (7.7x), iron (2.2x), lead (1.4x), manganese (10x), and zinc (24x) exceed state standards for the adjoining downstream segment by the factors shown in parentheses (table 2, Bonner Mine sample #1).

This effluent seeped into and flowed over dump #204, and some of it reappeared at a seep a few feet west of dump #200, below the mine access road. Lab analyses of this water show concentrations of sulfate (1.3x), aluminum (107x), cadmium (19x), copper (5.1x), iron (1.1x), lead (1.1x), manganese (4.7x), and zinc (12x) exceed state standards for the adjoining downstream segment by the factors shown in parentheses (table 2, Bonner Mine sample #2).

Quad Name: Silverton

Site #: 258/4194-1.100, 200

Site Name: Silver Crown

Environmental Degradation Rating: 3

Description and pertinent facts: Water flows at about 50 gpm from open adit #100 onto 3400 cubic yard dump #200. Two tests of the effluent at the portal averaged **pH = 7.4 and conductivity = 400 μ S**. A water sample and replicate sample were collected at the portal (table 1, samples 258/4194-1.306; 258/4194-1.307). Dissolved manganese exceeded state standards by a factor of 1.3x; other parameters were well within standards.

This effluent ponds on and infiltrates the dump material. Precipitate is forming along the flow path. During the initial inventory in June, 1995, at least 5 seeps and springs emerged along the face of the dump, although by July many of these seeps were dry. Orange precipitate occurs at 3 of the seeps and springs. Directly downslope from the pond of effluent on top of the dump, the largest spring (30 gpm) appeared to be piping effluent through the dump. Sources of water for the other seeps and springs are not obvious.

The seeps and springs were tested where they emerged from the dump and **pH ranged from 7.43 to 4.35 and conductivity ranged from 141 to 228 μ S**, with flows ranging from 5 to 30 gpm. Most of this flow enters Mill Creek as surface flow, although some re-infiltration into the dump is likely.

Quad Name: Silverton

Site #: 259/4192-1.100

Site Name: 1st Mine 1st NW Drainage Middle Mineral Creek

Environmental Degradation Rating: 3

Description and pertinent facts: This site is on the north side of Middle Fork Mineral Creek, across from the Bonner Mine, and is privately owned according to the PBS map. Water flowing from the collapsed adit at a measured rate of 5 gpm has **pH = 5.55 and conductivity = 190 μ S**. The effluent joins with the flow of the easternmost northwest-trending tributary of Middle Fork Mineral Creek. Lab analyses of effluent (table 1, sample 259/4192-1.303) revealed the following metals exceed state standards for the adjacent downstream segment by the factors shown in parentheses: aluminum (1.8x), total recoverable iron (2x), and manganese (1.4x).

Quad Name: Silverton

Site #: 259/4192-2

Site Name: First NW Drainage Middle Fork Mineral Creek

Environmental Degradation Rating: 3

Description and pertinent facts: This site is north of and adjacent to site #259/4192-1, discussed above.

Feature #: 100

Environmental Degradation Rating: 3

This collapsed adit was driven on a highly fractured vein and is draining water at a rate of about 4 gpm. The effluent is clear, but has deposited an several-inch-thick orange precipitate. Water tests taken on 6/27/95 and 7/19/95 are similar, with **pH = 6.2 and conductivity = 275 μ S**. Mine effluent was sampled (table 1, sample 259/4192-2.306) and lab analyses revealed that the following metals exceed state standards for the adjacent downstream segment by the factors shown in parentheses: aluminum (1.6x) and total recoverable iron (1.8x).

From the mine, the water flows above ground into the easternmost northwest-trending tributary of Middle Fork Mineral Creek. Just above its confluence with this tributary, the effluent is clear, no precipitate is evident, and it had **pH = 6.70 and conductivity = 169 μ S**.

Feature #: 101

Environmental Degradation Rating: 3

This adit entrance is almost completely filled, except for a 1'x 2' hole at the top of the portal. Water of an unknown depth has dammed up behind the caved portal, but was not discharging. Water from the adit was tested and had **pH = 4.80 and conductivity = 32 μ S**.

A <1 gpm seep with **pH = 5.67 and conductivity = 30 μ S** exists along contour in the ravine to the west from this dammed up water. Over 10' of standing head is estimated to exist between this seep and the water in the adit, assuming a hydrologic connection between them. No surface flow occurs on the hillside above this seep.

Quad Name: Silverton

Site#: 259/4192-3

Site Name: West of Burro Bridge

Description and pertinent facts: This site is on the west side of Mineral Creek, the north side of Middle Fork Mineral Creek, just west of Burro Bridge on FR-679.

Feature #: 103

Environmental Degradation Rating: 4

Caved adit #103 is about 1000' north of adit #104, described below. Although this feature has an EDR of 4, it is discussed because a water sample was collected (table 1, sample 259/4192-3.303). Water was discharging at a measured rate of 71 gpm and had **pH = 6.51 and conductivity = 242 μ S** when it was sampled. About a month earlier, **pH = 5.06 and conductivity = 211 μ S** on a 10 gpm estimated flow rate. No precipitate is associated with this mine effluent, and lab results show it to be within state water quality standards for the constituents analyzed.

Feature #: 104

Environmental Degradation Rating: 3

A jeep trail (FR-820) heading north from FR-679 passes within 150' east of associated dump #204. The adit has a 6'x 8' portal and is more than 20' long. Water discharging from the portal at a rate of 15 gpm had **pH = 5.44 and conductivity = 118 μ S**. The effluent has deposited abundant precipitate in a series of small terraces. Below the dump the effluent had **pH = 5.65 and**

conductivity = 121 μ S. The effluent seeps into colluvium within 100' of the dump. About 1 month later, the adit discharge was tested (**pH = 6.07 and conductivity = 251 μ S**) and sampled (table 1, sample 259/4192-3.304). Lab analyses revealed that the following metals exceed state standards for the adjacent downstream segment by the factors shown in parentheses: cadmium (4x), total recoverable iron (1.6x), dissolved manganese (2x), and zinc (1.1x).

Quad Name: Silverton

Site #: 259/4193-1.101, 201

Site Name: Imogene Mine

Environmental Degradation Ratings: 3

Description and pertinent facts: The Imogene Mine is on the west side of Mineral Creek about one mile south of the old mining town of Chattanooga. This area has an abundance of natural ferrirete deposits, some of which are still in the process of forming. The water draining from the Imogene adit has effectively closed the adit by forming a ferrirete "cap" at the portal. The adit is also partly covered by slope failure from above. Water is draining from the portal in two places, from the original entrance and from a 6-inch diameter steel pipe. The combined flow from these two sources is 113 gpm. The water discharging from the adit has **pH of 5.85 and conductivity of 247 μ S**. A water sample (table 1, sample 259/4193-1.304) was taken for laboratory analyses. The mine water exceeded state standards for the adjacent downstream segment for the following metals by factors shown in parentheses: aluminum (3x) and total recoverable iron (1.8x). The analyses results and the large flow indicate an EDR of 3.

Dump #201 has a volume of approximately 4300 cubic yards, indicating relatively extensive underground workings. The dump surface consists of mostly fines in the upper part with cobble-sized material lower on the downslope. Massive pyrite within silicified vein material and abundant iron oxides are evident throughout the dump.

Significant amounts of dump material have washed downslope as a result of the high effluent flow from adit #101. As the effluent crosses the dump, it deposits red precipitate and the drainage channel is solid ferrirete. When the effluent reaches a flatter gradient lower on the dump, it begins to seep into the ground, and it has completely infiltrated by the end of the dump. The effluent stream ends about 300' west of Mineral Creek. Tests of effluent near the base of the dump show **pH of 4.8 and conductivity of 300 μ S**, suggesting that the dump is further degrading the mine water. A composite soil sample (table 1, sample 259/4193-1.201) was collected by compositing material from several locations on the dump. At the lab, a leachate from this dump sample was obtained using a modified E.P.A. Method 1312. Lab analyses of the leachate do not indicate a highly reactive dump. Degradation of the mine effluent by the dump and the probability that the effluent is reaching Mineral Creek via groundwater results in an EDR of 3.

Quad Name: Silverton

Site #: 259/4195-2.100

Site Name: Southside Chattanooga Curve

Environmental Degradation Rating: 2

Description and pertinent facts: From this collapsed adit, clear water flows leaving a several-inch-thick cake of orange precipitate. Moss growth can be observed along the sides of the flow channel, and in the ponded water. The effluent flows over and around the dump. Precipitate occurs all along the flow channels and in ponded areas above and adjacent to Mill Creek.

An effluent sample collected from the 59 gpm flow at the portal had **pH = 5.56 and conductivity = 432 μ S** (table 1, sample 259/4195-2.303). Lab analyses revealed that concentrations of the following metals exceed state standards by the factors shown in parentheses: aluminum (6.8x), dissolved iron (10x), total recoverable iron (3.1x), dissolved manganese (20x), and zinc (approximately 1x).

The 500 gpm flow of Mill Creek was tested about 200' downstream from the point where the mine effluent joins the creek, and **pH = 6.63 and conductivity = 754 μ S**. Orange precipitate can be seen on the rocks in the creek. Mill Creek above the mine was clear and free of precipitate and had **pH = 6.81 and conductivity = 525 μ S**. A slight decrease in pH and increase in conductivity is noted in Mill Creek below this mine. The pH decrease may be directly attributable to the adit discharge. Because the conductivity of the effluent is lower than that of the creek, reasons for the conductivity increase are not apparent.

Quad Name: Silverton

Site #: 260/4191-1.100

Site Name: Adit Underneath US 550

Environmental Degradation Rating: 3

Description and pertinent facts: This site along U.S. Highway 550 is about 0.5 mile south of the Ophir Pass road turnoff. As the name implies, this adit extends eastward directly underneath U.S. Highway 550. The entrance is a steel culvert of about 6' in diameter supported by wooden posts. It appears that the culvert was installed to prevent possible collapsing of the highway. About 3 inches of water is pooled inside the adit, and this water is slowly draining out of the adit and down the northern side of the dump at an estimated rate of 0.1 gpm. The dump is about 50 cubic yards and consists of altered volcanics and minor sulfides. Adit discharge seeped into the dump about 3/4 of the way down and did not reappear. Tests of the effluent showed **pH of 3.25 and conductivity of 658 μ S**. Small amounts of orange-red precipitate were in the drainage channel, and this channel was large enough to assume that at times the flow is greater. It is probable that this mine water is entering Mineral Creek via groundwater. This adit received an EDR of 3 because of the high conductivity and low pH of its discharge.

Quad Name: Silverton

Site #: 260/4192-1

Site Name: East of Burro Bridge

Description and pertinent facts: This site is sandwiched between FR-679 and U.S. Highway 550, on the east side of Mineral Creek. Because of the vagueness of stream standards for this area, water samples from this site are compared to standards for the adjacent downstream segment.

Feature #: 100

Environmental Degradation Rating: 3

This feature is an intact adit located adjacent to the Ophir Pass road, (FR-679). The portal is 3' tall and 5' wide and is framed by partly collapsed timbers. The adit extends under U.S. Highway 550 in an easterly direction. Associated dump #200 is approximately 2000 cubic yards and consists of altered Tertiary volcanics with quartz and minor amounts of sulfides. About 3 inches of water is pooled in the adit and is draining at 4.7 gpm. The discharge flows over the dump to the road where it runs in a small ditch alongside the road before seeping into the ground about 50' before it reaches Mineral Creek. The effluent drainage channel is coated with orange precipitate, and salt deposits coat the adjoining rocks. Abundant moss and algae grow in the channel, and the water supports insect life. The mine water has **pH of 6.08 and conductivity of 957 μ S**. A water sample was collected at the portal (table 1, sample 260/4192-1.304). Lab analyses revealed that concentrations of the following parameters exceed state standards for the adjacent downstream segment by the factors shown in parentheses: total recoverable iron (1x), manganese (1.9x), and sulfate (2.2x). This site was given an EDR of 3 because of its proximity to Mineral Creek and moderately high dissolved ion concentrations in the effluent.

Feature #: 101**Environmental Degradation Rating: 3**

An adit existed at this location but it has been covered by talus; possibly during construction of U.S. Highway 550, which is located about 100' above. The mine dump, which toes into Mineral Creek, is still visible. Dump #201 is about 100 cubic yards and consists of altered volcanics and both massive and disseminated sulfides. At the location of the covered adit, water is seeping from the talus at an estimated rate of 2 gpm. The water flows across the dump and directly into Mineral Creek. Where the water is flowing, large amounts of orange/red precipitate and salts cover the adjoining rocks. Moss and algae grow at the top of the dump, but no insect or aquatic life was visible. The effluent has **pH of 6.24 and conductivity of 965 μ S**. A sample was collected at the discharge point (table 1, sample 260/4192-1.305). Lab analyses revealed that concentrations of the following parameters exceed state standards for the adjacent downstream segment by the factors shown in parentheses: total recoverable iron (1.8x), manganese (1.2x), and sulfate (2.3x). Because of moderately high dissolved ion concentrations in the effluent, and its direct flow into Mineral Creek, this feature was given an EDR of 3.

Quad Name: Silverton

Site #: 260/4193-2

Site Name: Lower Brown's Gulch #1

Description and pertinent facts: This site is near the intersection of U.S. Highway 550 and FR-825, and straddles the lower portion of Browns Gulch. Because of the vagueness of stream standards for this area, the water sample from this site is compared to standards for the adjacent downstream segment.

Feature #: 100**Environmental Degradation Rating: 3**

Adit #100 is located directly adjacent to FR-825, just above its junction with U.S. Highway 550. The adit is 6' high by 4' wide, and it has been partly closed by the flow of talus over and around it. The blockage of the portal by talus has caused standing water to accumulate in the adit. Water seeps through the talus at a location equivalent to the original base of the adit. Tests of this water

revealed **pH = 5.51 and conductivity = 1184 μ S**. This effluent pools at the top of the dump where it supports a small community of green moss and algae. The estimated 1 gpm flow seeps into the dump before reaching a live stream. Lab analyses of a sample collected of the discharge reveal aluminum (6.7x), total recoverable iron (2.5x), dissolved manganese (2.1x), and sulfate (3.5x) concentrations exceed state water quality standards for the adjacent downstream segment by factors shown in parentheses (table 1, sample 260/4193-2.302). Calcium, magnesium, sodium, and strontium were also quite high, and probably account for much of the high conductivity. The mine's proximity to Mineral Creek may enable the effluent to reach Mineral Creek through groundwater channels. It is this possibility, and the high ion concentrations in the effluent, that result in an EDR of 3.

Feature #: 201

Environmental Degradation Rating: 3

This 200 cubic yard dump is about 700' east of adit #100, on the south side of Browns Gulch. It contains quartz, tetrahedrite, and abundant iron oxides. Browns Gulch stream is actively eroding the toe of this dump.

Quad Name: Silverton

Site #: 260/4194-1.104, 204

Site Name: North of Imogene - Ferricrete Area

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area is located just north of the Imogene mine and southwest of the old townsite of Chattanooga. Open adit #104 and its small dump (#204) are adjacent to an unnumbered jeep road that parallels Mineral Creek on its west side. The portal is 5'x 8', and the adit is more than 15' long. Water is discharging from this adit at a measured rate of 242 gpm, indicating that the adit probably intersected a significant subsurface water course. The discharge had **pH = 5.33 and conductivity = 541**. Lab analyses of effluent collected at the portal reveal aluminum (8.4x), total recoverable iron (2.9x), and dissolved manganese (2x) concentrations exceed state water quality standards for the adjacent downstream segment by factors shown in parentheses (table 1, sample 260/4194-1.302).

Dump #204 is 31' wide, 26' long, 11' thick and contains about 100 cubic yards of pebble- to cobble-sized material. The toe of this dump is in wetlands adjacent to Mineral Creek. Some copper mineralization is evident in the dump, but it mostly consists of altered volcanics and iron oxides. Effluent from adit #104 flows over this dump, depositing massive amounts of orange/red precipitate. The precipitate deposition extends beyond the end of the dump. A test of the effluent below the dump revealed **pH of 5.72 and a conductivity of 453 μ S**.

Because of large quantities of effluent with moderately high metal concentrations and their proximity to Mineral Creek and associated wetlands, these features were assigned an EDR of 3.

Quad Name: Silverton

Site #: 260/4194-2.104

Site Name: Chattanooga

Environmental Degradation Rating: 3

Description and pertinent facts: This inventory area lies just to the east of the abandoned mining town of Chattanooga. Adit #104 is about 1/3 of the way up an east-trending unnamed gulch. The portal has collapsed and is partly overgrown, but water is seeping from the adit at an estimated rate of 2 gpm. Large amounts of yellow-orange precipitate are evident wherever the water is flowing. The effluent has **pH of 6.19 and conductivity of 987 μ S** at the discharge point, then flows along the west side of dump #204 until it reaches the stream flowing down the unnamed gulch. This stream drains into Mineral Creek, about 1200' away. Lab analyses of effluent collected at the discharge point reveal total recoverable iron (1.1x), dissolved manganese (1.5x), and sulfate (2x) concentrations exceed state water quality standards for the adjacent downstream segment by factors shown in parentheses (table 1, sample 260/4194-2.301). Unusually high concentrations of calcium, magnesium, sodium, and strontium contribute to the conductivity of the effluent. Elevated ion concentrations in the effluent and its surface connection with gulch water which reaches Mineral Creek result in an EDR of 3.

Dump #204 is about 35 cubic yards and consists of altered volcanics, disseminated sulfides, and quartz vein material. Because the water is flowing alongside the dump, not directly over it, the dump does not appear to be degrading the mine effluent.

Quad Name: Silverton

Site #: 261/4193-1.104, 204

Site Name: Brooklyn Mine

Environmental Degradation Ratings: 1

Description and pertinent facts: The Brooklyn Mine site is one of the largest mine sites on public land on the Silverton quadrangle. The inventory area consists of 10 adits, 1 shaft, a glory hole, several minor prospects, and associated dumps, concentrators, and other mining-related objects. The mine has been worked within the last 20 years, and the 3 main buildings on the site are in relatively good condition. Access to the area is by FR-825, a popular jeep trail. Adjacent to the road at the top of the inventory area lies adit #104, which received an EDR of 1. Adit #104 is 10' tall by 8' wide, and is enclosed in a garage-like sheet-metal building. The door of the building is closed and is partly blocked by rock debris. Orange-red water is draining from the adit at a measured rate of 20 gpm. Tests of the water indicated **pH = 3.15 and conductivity = 1006 μ S**. Lab analyses of the discharge collected near the portal reveal aluminum (26x), cadmium (21x), copper (14x), total recoverable iron (13x), dissolved manganese (>5x), lead (4x), zinc (13x), and sulfate (2x) concentrations exceed state water quality standards for the adjacent downstream segment by factors shown in parentheses (table 1, sample 261/4193-1.306). This effluent drains across the jeep road, leaving moderate amounts of orange-red precipitate, then flows down dump #204. After the effluent crosses the dump, it flows directly into the unnamed stream that drains Browns Gulch. This unnamed stream flows directly into Mineral Creek.

Dump #204 is the largest of the 6 dumps on the Brooklyn Mine site. It is 120' wide, 700' long, contains approximately 13,000 cubic yards, and toes into the Browns Gulch stream. The material ranges from granule to boulder size and consists of altered volcanics and massive sulfides. Pyrite is the predominant sulfide mineral. The dump is barren of vegetation and is littered with scrap metal, timbers, oil drums and other typical mine garbage.

Effluent from adit #104 flows down this dump at a rate of 20 gpm to a small bench where it was flumed and measured. Below the bench, the effluent channel braids into 2 main streams and a few smaller ones. Red-orange precipitate can be found in varying amounts along effluent channels on the dump. A water test taken at the base of the dump resulted in a **pH of 2.81 and a conductivity of 1047 µS**. Comparison of these values with those measured from adit #104 suggest that the dump is adversely affecting the water quality. As a result, both a soil sample and a water sample were collected from the dump.

The water sample was a composite sample taken from the 2 largest effluent streams near the base of the dump. Lab analyses show aluminum (72x), cadmium (25x), copper (14x), total recoverable iron (11x), dissolved manganese (>5x), lead (2.7x), zinc (15x), and sulfate (2x) concentrations exceed state water quality standards for the adjacent downstream segment by factors shown in parentheses (table 1, sample 261/4193-1.307). Compared to effluent sampled near the portal, concentrations of most ions were similar, however aluminum and zinc increased and total recoverable iron decreased significantly.

The soil sample was composited from 10 locations around the dump. At the lab, a leachate from this dump sample was obtained using a modified E.P.A. Method 1312. Analyses of the leachate show high concentrations of aluminum, arsenic, calcium, cadmium, copper, iron, magnesium, manganese, and zinc (table 1, sample 261/4193-1.204). This test reveals the highly reactive nature of the dump material.

Water and soil samples indicate that significant quantities of metals are transported from the Brooklyn Mine site to downstream areas by mine effluent and by drainage from the dump, especially during periods of runoff. Because their size, the nature of the effluent, and the probability of offsite metal contamination, adit #104 and associated dump #204 have EDRs of 1.

Quad Name: Silverton

Site #: 261/4193-2.102, 202

Site Name: East of Brooklyn Mine--Upper Brown's Gulch

Environmental Degradation Ratings: 2

Description and pertinent facts: Adit #102 is on a patented claim on the east side of FR-825, about 1/3 mile north of the Brooklyn Mine. Because it affects public land, the site was inventoried. This partly collapsed adit is about 5' tall and 4' wide, and at the time of the inventory it was mostly obscured by snow. Water from the adit flows both over and around dump #202, then runs into a steep side gully before joining the stream draining Browns Gulch. On 7/7/95, the estimated 3 gpm discharge from the adit had **pH of 2.99 and conductivity of 596 µS**. At the toe of the dump the effluent had **pH = 2.96 and conductivity = 693 µS**. Immediately above its confluence with Browns Gulch stream, the effluent, which apparently mixes with water in the side gully, had a 13 gpm flow rate and **pH = 3.57 and conductivity = 566 µS** on 7/20/95. Water tests of the 200 gpm Browns Gulch stream above and below its confluence with effluent were used to determine if mine drainage from this patented property affected public land. Above the confluence Browns Gulch had **pH of 5.21 and conductivity of 66 µS**; below the confluence it had **pH of 4.71 and conductivity of 75 µS**. Lab analyses of effluent collected on 7/20/95 from the side gully just above the confluence with Browns Gulch reveal silver (5x), aluminum (22x), cadmium (6x), copper (5x), total recoverable iron (5x), dissolved manganese (1.2x), lead (44x), and zinc (2x) concentrations

exceed state water quality standards for the adjacent downstream segment by factors shown in parentheses (table 1, sample 261/4193-2.305).

Dump #202 is located directly below adit #102. The dump is 38' long, 32' wide, 15' thick, and contains approximately 300 cubic yards of material. The material is mostly granule sized, and consists almost entirely of weathered massive sulfides and clays. No vegetation grows on the dump.

High metal concentrations and low pH in the effluent, and its drainage path across the sulfide-rich dump strongly suggest metal contamination of downstream areas, especially Mineral Creek. Because of the high probability of offsite contamination, these features were given EDRs of 2.

Quad Name: Silverton

Site #: 262/4195-1.300

Site Name: U.S. Basin #2

Description and pertinent facts: This site is in the upper part of U.S. Basin. Although all the features in this inventory area received EDRs of 5, this site is described because a water sample was collected (table 1, sample 262/4195-1.300). Water from a patented claim was sampled where it reached public land. The water was depositing precipitate and was flowing at about 19 gpm. A test of the water showed **pH = 5.08 and conductivity = 512 µS**. Lab analyses results are somewhat ambiguous. The raw and filtered samples may have been inadvertently switched by the lab, because for many constituents the filtered sample concentrations are higher than the raw. Regardless of any possible mislabeling or transposing of sample results, manganese exceeds state standards by a factor of 2.9. Assuming the results are transposed, the sample falls within standards for the other measured parameters.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Snowdon Peak

Site #: 262/4169-1.100

Site Name: Sally Bowman Mine

Environmental Hazard Rating: 4

Description and pertinent facts: This inventory area is on the east side of the Animas River, just south of the Needleton water tank along the Durango-Silverton railroad tracks. Although this feature has an EDR of 4, it is discussed because a water sample was collected. This caved adit was seeping less than 1 gpm of clear water with **pH = 7.66 and conductivity = 606 μ S**. A water sample collected of the discharge revealed ion concentrations within state standards for the tested parameters (table 1, sample 262/4169-1.300).

Quad Name: Snowdon Peak

Site #: 266/4178-1.300

Site Name: Elk Park

^^New Quad^^

Site #: 275/4176-1.107

Environmental Hazard Rating: 3

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SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Bayfield

Site #: 275/4116-1.100

Site Name: Nigger John's Hole

Physical Hazard Rating: 2

Description and pertinent facts: Nigger John's Hole is located just beyond the Forest Service gate closing FR-123 to motor vehicles. The "hole" is actually a shaft about 10' in diameter dropping vertically more than 50' into poorly consolidated colluvium. The ground at the mouth of the shaft appears extremely unstable, and there is evidence of widening of the hole by sloughing of the shaft walls. A barbed wire fence surrounds the shaft, but it is in poor condition and is falling apart. A well-traveled footpath passes next to the shaft. Other well worn and wider paths nearby indicate that this is a popular recreation area. This site receives a PHR of 2 because of the possibility of ground failure and ease of access.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Columbine Pass

Site #: 269/4165-1

Site Name: Northeast Chicago Basin

Description and pertinent facts: This inventory area is in the Weminuche Wilderness Area, so access is limited to horse or foot travel. The area has several intact adits relatively accessible to the public. Adits #109, #110, and #111 are very accessible as they are located on Forest Trail #504, a frequently used trail that leads to Columbine Pass. All of these adits are on patented claims according to the PBS map. Nevertheless, the USFS may want to close these mines because the trail is a designated USFS trail.

Feature #: 109**Physical Hazard Rating: 2**

This is the patented Little Jim Mine. The adit is marked "Mine" on the PBS quadrangle. Forest Trail #504, which is the well-used trail to Columbine Pass, leads directly to the adit portal and crosses the dump. This appears to be the largest mine site in the Chicago Basin/Vallecito Basin mining area. The adit portal is 4' high by 6' wide and narrows to 4'x 5' inside. The adit is intact beyond line of sight (over 20'). Water drains at about 8 gpm, which may discourage some visitors from exploring the mine.

Feature #: 110**Physical Hazard Rating: 2**

This prospect adit is on patented land, but lies directly adjacent to the Columbine Pass trail (Forest Trail #504) about 1500' southwest of the Little Jim Mine. Adit #110 is open with portal dimensions of 6'x 7' and a depth of 20'. Water was dripping from its ceiling during the inventory.

Feature #: 111

Physical Hazard Rating: 2

This large adit is on patented land adjacent to the Columbine Pass trail and about 50' southwest of adit #110. The portal measures 7'x 7' and the adit extends at least 40', beyond line of sight. This adit is a serious physical hazard to those who enter; rockfall has buried the rails inside the adit and near the portal. A small gully passes on the southeast side of the adit.

Quad Name: Columbine Pass

Site #: 270/4161-1

Site Name: Silver Mesa; Pittsburgh Shaft

Description and pertinent facts: This inventory area is fairly remote. It is in the Weminuche Wilderness Area, so access is limited to horse or foot travel. The mine features within it are seldom visited, even by backpackers. Even so, mine shafts #100 and #103 are hazardous by virtue of their physical attributes. Forest Trail #541 is difficult to follow over the rocky terrain, but it passes within 50' of both features and is marked on the PBS quadrangle map. Both shafts are on patented inholdings.

Feature #: 100

Physical Hazard Rating: 2

Shaft #100 lies just on the southeast side of Forest Trail #541, about 75' southeast of the Pittsburgh Mine shaft. It is a prospect shaft, but its 20' depth is enough to severely hurt someone if they fell. Climbing out would be very difficult because of the vertical sidewalls. The collar measures 12'x 7'.

Feature #: 103

Physical Hazard Rating: 2

This is the Pittsburgh Mine shaft. It is situated just northwest of Forest Trail #541. The collar dimensions are 8'x 7' and the vertical shaft remains intact beyond a depth of 50'. Timed rock-drops indicate the shaft is water-filled approximately 60' to 90' below the surface. The old wood-plank shaft house is totally collapsed and adds to the hazard as boards are scattered around the shaft. The shaft hoist spool remains on site.

Quad Name: Columbine Pass

Site #: 270/4163-1.100

Site Name: Vallecito Basin

Physical Hazard Rating: 2

Description and pertinent facts: This mine feature is a shaft with surface dimensions of 10'x 6' and it is greater than 20' deep. The shaft has standing water about 20' below the surface and has vertical walls. It would be difficult, if not impossible, to climb out of this shaft. It is recommended that the dump material be used to backfill this dangerous feature.

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Quad Name: La Plata

Site #: 759/4141-1.101

Site Name: Neptune Creek

Physical Hazard Rating: 2

Description and pertinent facts: The adit portal is 6' by 4', and the working is estimated to be over 50' in length. The portal is unstable, with loose overhanging blocks of sedimentary rock. Some sloughing has already occurred. This site is a serious hazard because it is directly adjacent to FR-571F. Access to this adit by the public should be prevented, possibly by a locked gate. Accessibility is difficult during periods of high runoff because the mine access road fords the La Plata River shortly after branching from CR-124 at La Plata City.

Quad Name: La Plata

Site #: 759/4141-1.102

Site Name: Neptune Creek

Physical Hazard Rating: 2

Description and pertinent facts: This site is about 500' above feature #101, one switchback farther up FR-571F. Similarly, this adit is 6'x 4' at the portal, is over 30' in length and lies adjacent to FR-571F. The instability of the roof and portal suggest a constructed closure is appropriate.

Quad Name: La Plata

Site #: 759/4141-1.104

Site Name: Neptune Creek

Physical Hazard Rating: 2

Description and pertinent facts: This 6'x 3' portal is approximately 1 mile beyond features #101 and #102, and is adjacent to FR-571F. The adit extends more than 35' along a flat-lying sill. Similar to the other features, this adit has an unstable roof. This portal should have a constructed closure.

Quad Name: La Plata

Site #: 759/4142-3.101

Site Name: Bedrock Creek Copper Mine

Physical Hazard Rating: 1

Description and pertinent facts: This is one of the most dangerous features in the Columbine Ranger District. The mine here is a glory hole in excess of 50' in diameter. The glory hole is at least 50' deep. Although this hazard is approximately 1 mile from CR-124 on a rough road, many hikers, hunters, and mountain bikers visit the site yearly. The opening is obvious upon approach from the south and west but is hidden to approach from the north and east. The wall rock is pervasively fractured and unstable, increasing to the hazard. The glory hole should be clearly posted and fenced at a minimum.

Quad Name: La Plata

Site #: 759/4142-3.102

Site Name: Bedrock Creek Copper Mine

Physical Hazard Rating: 2

Description and pertinent facts: This 5'x 6' portal extends over 30' into the large open glory hole (feature #102), an extremely hazardous situation. This adit is accessible by the glory hole access road described above. Because this adit provides access to the glory hole, it receives a PHR of 2. This adit should be grated and locked.

Quad Name: La Plata

Site #: 759/4143-1.103

Site Name: Boren Creek

Physical Hazard Rating: 2

Description and pertinent facts: This inventory area is located adjacent to Boren Creek about 0.2 miles west of its crossing with CR-124. Shaft #103 was excavated on an unnumbered jeep trail that parallels Boren Creek on the north. Shaft #103 is circular, about 15' in diameter and about 20' deep. The shaft was sunk in the north side of the road. Although there is enough room for one vehicle to drive around it, the possibility of a careless person driving into this shaft, along with the heavy use that La Plata Canyon jeep trails receive, result in a PHR of 2.

Quad Name: La Plata

Site #: 760/4143-1.109

Site Name: Honeydew

Physical Hazard Rating: 2

Description and pertinent facts: This adit is one of many adits adjacent to a camping area and within 0.3 miles of La Plata City. The area is easily accessed by CR-124. Adit #109 has a portal 4' high by 6' wide. Dump size indicates at least 25' of underground workings. The adit was driven at the base of a sill of diorite porphyry which is locally brecciated. The tabular nature of the wall rock coupled with its extensive and pervasive fracturing make the workings inherently unstable. Ore minerals identified on the dump include galena, sphalerite, chalcopryite, and tetrahedrite. Quartz and pyrite are abundant gangue minerals along with lesser amounts of calcite.

Quad Name: La Plata

Site #: 764/4146-1.100

Site Name: Bessie G West

Physical Hazard Rating: 1

Description and pertinent facts: The western portal of the Bessie G mine is accessible via 9.3 miles of improved gravel roads (CR-124 and FR-498) from Mayday. The mine is at the end of FR-498 at an elevation of 11,600'. This is a rather famous mining site and as such, attracts a large number of tourists, locals, and rock hounds. The mine should be signed, gated, and kept locked as the 8'x 8' portal leads to over 2000' of very hazardous workings. The mine has been left in an

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

^^New Quad^^

The portal is in the process of caving, but the adit remains easily accessible. This area is visited frequently by people in vehicles and on foot. The Rico-Silverton trail passes by this site and the meadow adjacent to the mine is extensively used as a campground.

Quad Name: Ophir

Site #: 253/4185-1.100

Site Name: Bandora Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: This open, inclined shaft is 7'x 5' at the surface, and extends about 100' before angling down out of view. It is possible that this inclined shaft descends to and intersects open adit #101, which ramps up towards #100. (See description of #101 below). Shaft #100 is in highly fractured, loose blocks of rock which represent a serious rock fall hazard. South Mineral Campground lies about 2 miles down the 4WD road from the Bandora Mine Area and many campers hike or drive to this site. As many as a dozen jeeps came up the road each day during the mine inventory. This site is easily accessed and frequently visited, and fresh footprints encircled the shaft opening at the time of the inventory.

Quad Name: Ophir

Site #: 253/4185-1.101

Site Name: Bandora Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: This portal is about 2' by 4'. Beyond the rock debris at the opening, the adit is intact with dimensions of about 6' by 5'. About 20' underground, it angles upwards an unknown distance. This feature is frequently visited.

Quad Name: Ophir

Site #: 253/4185-1.112

Site Name: Bandora Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: This open adit is accessible by a rather difficult scramble up the unnamed stream flowing down the southeast side of Fuller Peak. The adit extends beyond line-of-sight, and the partly caved portal is about 4'x 4'.

Quad Name: Ophir

Site #: 253/4185-1.113

Site Name: Bandora Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: Ore cart rails protrude from this open adit, which is hidden from below by shrubs growing in water seeping from the feature. The adit is about 5'x 4' at the entrance, and it extends over 100'. Visitation to this partly hidden feature is less frequent than visitation to the more accessible and visible features of this inventory area.

Quad Name: Ophir

Site #: 255/4189-1.101

Site Name: Ensle Tunnel/Burbank Portal (area)

Physical Hazard Rating: 2

Description and pertinent facts: This is an open adit about 80' above the Ensle Tunnel (#100). Ore-cart rails can be seen extending from adit #101. The portal is about 5'x 5' and the adit curves out of sight about 35' underground. Timbers, rails, an ore cart, and various other debris cover the floor of the mine. Large numbers of people fish at nearby Clear Lake and fresh footprints are at all the features in this area. Therefore, it is recommended that the adit be sealed.

^^New Quad^^

Quad Name: Silverton

Site #: 258/4191-2

Site Name: Bonner Mine

Physical Hazard Rating: 2

Description and pertinent facts: This inventory area is on the south side of Middle Fork Mineral Creek, near its confluence with Mineral Creek. This site has several open adits and it is quite noticeable from U.S. Highway 550 and the Ophir Pass road. The Bonner Mine area is heavily impacted by tourists using the Ophir Pass road, and the Bonner Mine road is used as access for camping. Openings at the Bonner Mine should be sealed. Some features of the Bonner Mine are discussed in the **Environmental Degradation** section of this report.

Feature #: 100**Physical Hazard Rating: 2**

This open adit is about 3' high by 4' wide, and it extends over 40' before passing beyond the line of sight. Water is flowing from the adit.

Feature #: 102**Physical Hazard Rating: 2**

This adit has an opening of about 5'x 5', and it extends over 50' before passing beyond line of sight. Rock at the portal is highly fractured and shows evidence of instability and recent rockfalls. Water is dripping from the roof but there is no ponded or standing water in the tunnel.

Feature #: 103**Physical Hazard Rating: 2**

This adit is 5' high by 4' wide at the opening, and it extends over 50' before passing beyond line of sight. The portal is in unstable, fractured rock and is in the process of caving. The adit roof is highly fractured rock. Water drips from the roof and is ponding at places on the floor.

Quad Name: Silverton

Site #: 258/4194-1.103

Site Name: Silver Crown (area)

Physical Hazard Rating: 2

Description and pertinent facts: This small adit (not the Silver Crown Mine) is open, 4' high by 3' wide and over 25' deep. The feature is visible from U.S. Highway 550 and is adjacent to the access road to the Silver Crown. This access road is heavily used by tourists in jeeps during the summer months.

Quad Name: Silverton

Site #: 259/4188-2.100

Site Name: Snowslide Gulch Mines

Physical Hazard Rating: 2

Description and pertinent facts: This open adit is adjacent to, and on the south side of South Mineral Creek. The adit is about 5' high by 4' wide at the opening, and is at least 25' long. This area is heavily used by tourists and it is recommended that this visible and accessible adit be sealed.

Quad Name: Silverton

Site #: 259/4188-3

Site Name: Forest Road 585 Exploration Adits

Description and pertinent facts: This site is on the south side of South Mineral Creek, almost 2 miles west of the intersection of U.S. Highway 550 and FR-585. These features are quite visible and accessible from FR-585, and are in a heavily used area.

Feature #: 100**Physical Hazard Rating: 2**

This open adit has a portal about 5' high by 8' wide and is over 20' deep.

Feature #: 101**Physical Hazard Rating: 2**

This adit is about 3' high by 4' wide at the portal, and it is over 20' deep.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Storm King Peak

Site #: 275/4176-1.100

Site Name: Eldorado Lake Area

Physical Hazard Rating: 2

Description and pertinent facts: This dangerous vertical shaft is about 0.1 mile west of the Continental Divide, on the Eldorado Lake side. It is 6'x 3' at the collar and 30' deep, and is about 100' from the trail to Eldorado Lake that originates at Kite Lake. This trail is frequently used by

fishermen coming from the 4WD road that ends at Kite Lake. Several rusting mining implements are visible from the trail. If someone fell in this shaft, it would be difficult or impossible to escape.

Quad Name: Storm King Peak

Site #: 275/4176-1.107

Site Name: Eldorado Lake Area

Physical Hazard Rating: 2

Description and pertinent facts: This is an adit with a 6'x 5' opening and a depth of at least 100'. The adit and an associated cabin are alongside the Colorado Trail, and this is a popular camping area. Adit closure is recommended because of the large numbers of backpackers who camp near the mine.

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USFS-ABANDONED MINE LAND INVENTORY PROJECT

SAN JUAN NATIONAL FOREST

COLUMBINE RANGER DISTRICT

ADDENDUM to the SUMMARY REPORT

April, 1998

by

Robert H. Wood II
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Colorado Geological Survey

LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- COLUMBINE RANGER DISTRICT
ADDENDUM to the SUMMARY REPORT

INTRODUCTION

This document summarizes **additional sites** *of concern* to the USFS-Columbine Ranger District which were inventoried during the 1997 field season. Previously, a **Final Summary Report** dated April 1, 1997, was transmitted to the USFS. After that report was released, additional sites were inventoried on the Silverton, Howardsville, Storm King Peak, La Plata, and Granite Peak quads.

This addendum does not include all of the newly inventoried mine sites, although they are all included in the numerical summary. Just as in the **Final Summary Report**, it includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3), or sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2). The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. We recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- COLUMBINE RANGER DISTRICT
ADDENDUM to the SUMMARY REPORT

NUMERICAL SUMMARY

- 8** field forms
- 40** mine openings inventoried (includes collapsed or filled openings)
- 24** mine dumps, tailings piles, highwalls, etc.
- 12** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 0
Number of features with EDR of 3 = 3
Number of features with EDR of 4 = 9
Number of features with EDR of 5 = 52
- 11** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 0
Number of features with PHR of 2 = 1
Number of features with PHR of 3 = 10
Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
Number of features with PHR of 5 = 53

USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- COLUMBINE RANGER DISTRICT
ADDENDUM TO THE SUMMARY REPORT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=13;District=01	EDR
1) Irene Mines	Silverton	262/4191-1.100, 200	3, 3
2) Whitehead Gulch	Howardsville	269/4181-1.202	3

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=13;District=01	PHR
1) Whitehead Gulch	Howardsville	269/4181-1.102	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Howardsville

Site #: 269/4181-1.202

Site Name: Whitehead Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: Feature #202 is within the Weminuche Wilderness. This site is only accessible by trails: 5 miles from Silverton on the Whitehead Trail, or 4 miles from the end of Cunningham Gulch Road on the Highland Mary Lakes Trail. Whitehead Trail crosses the dump only 20' from the shaft. The entire 75' length of the 100-cubic-yard, pyrite-rich dump is in contact with a small creek that drains into Whitehead Gulch. Results of water tests above and below the dump were nearly identical, with **pH=7.76 both places, and conductivity=97 & 107 μ S**, respectively. This site is also discussed in the Physical Hazards section of this report.

^^ New Quad ^^^

Quad Name: Silverton

Site #: 262/4191-1.100, 200

Site Name: Irene Mines

Environmental Degradation Rating: 3

Description and pertinent facts: This site is near the head of Niagara Gulch, just below private property where additional mine features are present. A 1-mile trail on the north side of Niagara Gulch leads directly to this mine. Area maps do not show the trail or a short 4WD access road off of SH-110. Silverton is about 3 miles by road from the area. Water seeping from caved adit #100 had **pH=3.16 and conductivity=1,225 μ S**. Water tested in the upper tributaries of Niagara Gulch had **pHs ranging between 2.79 & 4.38, and conductivities ranging between 828 & 29.5 μ S**. Most streams in this area do not appear to support plant or animal life.

An absence of vegetation provides evidence of environmental degradation associated with 800-cubic-yard dump #200. Dump #200 is iron and sulfur stained and contains microcrystalline pyrite. Water from Niagara Gulch erodes the dump toe and seeps beneath the dump.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Howardsville

Site #: 269/4181-1.102

Site Name: Whitehead Gulch

Physical Hazard Rating: 2

Description and pertinent facts: Access to this inventory area within the Weminuche Wilderness is discussed in the **Environmental Degradation** section of this report. Shaft #101 has a surface opening of 6'x 4' and is 20' deep. Whitehead Trail crosses dump #202 only 20' from this hazardous vertical shaft.

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

**SAN JUAN NATIONAL FOREST
DOLORES/MANCOS RANGER DISTRICT**

April, 1998

by

Robert G. Benson
Peter W. Nichols

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

x	by (in dimension measurements) or times (when factoring ion concentrations)
°	degree
÷	divided by
=	equals
ft	feet
<, ≤	less than, less than or equal to
±	plus or minus
>	greater than
≥	greater than or equal to
4WD	four-wheel drive
μ	microns
μS	micro-Siemens (conductivity)
#	number
%	percent
ATV	all-terrain vehicle
BLM	United States Department of Interior - Bureau of Land Management
cps	counts per second
CR	County Road
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
FR	Forest Road
FT or TR	Forest Trail
gpm	gallons per minute
μg/L	micrograms per liter
mg/L	milligrams per liter
Mt.	Mount
n/a	not applicable
no.	number
p.	page(s)
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
USGS	United States Geological Survey
v., vol.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
SAN JUAN NATIONAL FOREST -- DOLORES/MANCOS RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Dolores/Mancos Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest #13 (San Juan), and Ranger District #02 (Dolores/Mancos).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

The geology of the Dolores/Mancos Ranger District of the San Juan National Forest is dominated by Mesozoic to Upper Paleozoic sedimentary rocks in the western and southern parts, Tertiary intermediate to felsic volcanic rocks in the northeast part, and Precambrian metamorphic, sedimentary, and igneous rocks in the east (Neubert, et al, 1992). Mineralized areas are located in the southwest extreme of the Colorado Mineral Belt, a regional northeast trend of mineralization that contains most of the major mining districts of the state. Inventory areas described in this report mostly lie within three mining districts: Rico, Dunton, and La Plata.

Rico mining district: The Rico district is the largest of the three districts described in this report. The town of Rico, Colorado, is located near the center of the district, with the majority of past mining activity located to the east of the town on Newman Hill, NBH Hill, and CHC Hill. The Dolores River flows southward through the town. Silver Creek flows westward between CHC and NBH Hills, joining the Dolores River just north of Rico. The largest mines in the district are located on patented land, outside of the scope of this inventory. Three exceptions to this are the Mountain Spring Mine (inventory area #761/4177-1), the Wellington Mine (#762/4177-1), and the Revenue Mine (#762/4175-1). The Mountain Spring Mine and the Wellington Mine are part of the same mineralized area (McKnight, 1974) and lie just outside of patented land. At both mines, environmental degradation affects public land significantly. The Revenue Mine lies on a claim fraction on public land and is surrounded by patented land.

Mine production started in 1872 with small amounts of “bullion” (Neubert, et al, 1992). Total recorded production from the district from 1879 to 1968 is 83,045 ounces gold; 14,513,288 ounces silver; 5,637 tons copper; 83,847 tons lead; 82,717 tons zinc; and 316,108 tons of commercial-grade sulfuric acid. A sub-economic molybdenum resource, with associated base metals, is present at depth below the district (Neubert, et al, 1992).

Massive pyrite is abundant and is the dominant sulfide mineral throughout the district. Chalcopyrite, sphalerite, galena, and other base-metal sulfides occur in substantial quantities, too (Neubert, et al, 1992). Pyrite occurs in coarse-grained pyrite veins and in associated fine-grained, massive replacement deposits in calcareous rocks.

Throughout the USFS-managed portions of the Rico mining district, evidence of intentional reclamation is common. Shafts depicted on historical maps are frequently backfilled, and in many

cases, mine drainage was partly mitigated through use of settling ponds. Much of this work was done by Anaconda Corporation in cooperation with the USFS, or solely by the USFS (John Reidinger, Dolores Ranger District, verbal communication, 1997).

Dunton mining district: The town of Dunton, Colorado, is located at the north end of the mining district. The majority of past mining activity is located immediately south of town, adjacent to the West Fork of the Dolores River. Most of the Dunton mining district sites described in this report are on the east side of the West Fork of the Dolores River. The most significant mine located on public land in the district is the Rosebud Mine (#753/4177-1). Mineralization at the Rosebud Mine consists of pyrite, sphalerite, chalcopyrite, galena, rhodochrosite, rhodonite, and quartz. Production data from the Dunton district are sketchy and are not directly attributed to a specific mine (Neubert, et al, 1992).

La Plata mining district: The town of Mancos, Colorado, is located about 15 miles southwest of the La Plata district. Within the Dolores/Mancos Ranger District, most mining activity in the La Plata mining district was on patented land in Rush Basin at the headwaters of the East Mancos River. The East Mancos River shows apparent environmental degradation in the form of iron-oxide coatings on the river bottom, but major sources of degradation were not located. An exception to this is the Thunder Mine (#754/4142-1). The Thunder Mine did not drain directly into the East Mancos River during the inventory, but showed potential for water degradation.

Production data from the area are limited, but are estimated at 3,500 ounces gold; 181 ounces silver; and 97 pounds copper (Neubert, et al, 1992). Mineralization is mostly pyrite replacement of limestone and sandstone host rock.

**USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- DOLORES/MANCOS RANGER DISTRICT**

NUMERICAL SUMMARY

- 46** field forms
- 186** mine openings inventoried (includes collapsed or filled openings)
- 116** mine dumps, tailings piles, highwalls, etc.
- 84** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 1
Number of features with EDR of 2 = 8
Number of features with EDR of 3 = 39
Number of features with EDR of 4 = 36
Number of features with EDR of 5 = 218
- 58** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 3
Number of features with PHR of 2 = 14
Number of features with PHR of 3 = 41
Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
Number of features with PHR of 5 = 244

**USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- DOLORES/MANCOS RANGER DISTRICT**

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=13; District=02	EDR
01) Mountain Spring Mine	Rico	761/4177-1.200; 100; 201, 202	1; 2; 3, 3
02) Nora Lily Mine	Rico	761/4176-1.100, 200; 201, 204	2, 2; 3, 3
03) Thunder Mine	Rampart Hills	754/4142-1.102, 202	2, 2
04) Revenue Mine Area	Rico	762/4175-1.203; 200, 201, 202	2: 3, 3, 3
05) ABG Mine	Rico	761/4178-1.200; 100	2; 3
06) Johnny Bull Mountain	Rico	756/4177-1.206; 106	2; 3
07) West End of Horse Gulch	Rico	757/4176-1.100; 101	3, 3
08) Aztec Mine and Gulch	Rico	760/4176-1.100, 101, 201, 103, 203	3, 3, 3, 3, 3
09) Middle CHC Hill	Rico	762/4177-1.200, 206	3, 3
10) Rosebud Mine	Rico, Clyde Lake	753/4177-1.101, 104, 201, 202, 203, 204	3, 3, 3, 3, 3, 3
11) North of Horse Creek	Rico	758/4177-1-.101; 103; 107; 108; 110	3, 3, 3, 3, 3
12) Sambo Mine Area	Rico	761/4177-2.100; 103	3, 3
13) South of Aztec Gulch – North of Bemis Flats	Rico	760/4176-2.100	3
14) Owen Basin	La Plata	755/4146-1.100, 101, 102, 103, 104, 203	3, 3, 3, 3, 3, 3
15) Bridgehead Mines	Rico	762/4180-1.102	3
16) Sulphur Creek	Clyde Lake	749/4177-1.100, 101	4, 4

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=13; District=02	PHR
01) Calico Peak	Rico	756/4176-1.101; 102	1; 2
02 Rush Basin	La Plata	755/4144-1.101, 103; 105	1, 1; 2
03) Rosebud Mine	Rico, Clyde Lake	753/4177-1.104	2
04) North of Horse Creek	Rico	758/4177-1.102	2
05) Little Silver Mine	Clyde Lake	745/4180-1.101	2
06) Sambo Mine Area	Rico	761/4177-2.103	2
07) South of Aztec Gulch – North of Bemis Flats	Rico	760/4176-2.105; 106	2, 2
08) Mountain Spring Mine	Rico	761/4177-1.102	2
09 Jones Mine Area	Rico	760/4174-1.104	2
10) Revenue Mine Area	Rico	762/4175-1.100	2
11) East Helmut Peak	La Plata	753/4143-1.100, 101, 102	2, 2, 2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Clyde Lake

Site #: 749/4177-1

Site Name: Sulphur Creek

Description and pertinent facts: This inventory area is about 1 mile south of the West Fork of the Dolores River, along Sulphur Creek. Native sulfur was produced from open pit mines along the creek. These features are discussed because water samples were collected from both open pits and an area of natural(?) leaching.

Feature #: 100

Environmental Degradation Rating: 4

This shallow open pit is about 900 ft long and 100 ft wide and straddles Sulphur Creek. Native sulfur is exposed in the pit, and a strong sulfur smell is present. The pit surface shows rills and gullies from surface runoff. Standing water in the pit had **pH 2.79 and conductivity of 1,900 μ S**. In June, 1997, water with **pH 6.62 and conductivity of 1,390 μ S** was emerging at the upper end (southeast) of the pit at an estimated rate of 2 gpm. Gray and white precipitate and gaseous emanations are present where the water emerges. In early October, 1997, this water was tested again and had **pH 6.16 and conductivity of 1,708 μ S** with a 0.5 gpm estimated flow. Results of a water sample collected from the test site are shown on the table below and indicate that manganese concentration significantly exceeds state standards. Iron, aluminum, and sulfate concentrations also exceed standards. The high hardness of the water undoubtedly increases the conductivity at this test site.

Sample number 749/4177-1.311; hardness of sample = 2,184 mg/L.

Lab Analyses (dissolved unless noted)	Concentration \div (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	3,200	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	2,300	1,000	2.3 x standard
Molybdenum (trec)	<20	no standard	n/a
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	<16	2,000**	below standard
Aluminum	350	87**	4 x standard
Cadmium	<0.25	13	below standard
Calcium (as CaCO ₃)	800 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<20	11**	below detection limit
Copper	<8	165	below standard
Fluoride	0.28 mg/L	2 mg/L**	below standard
Iron	2,200	300	7.3 x standard
Lead	<1	307	below standard
Magnesium	45 mg/L	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Manganese	880	50	17.6 x standard
Nickel	<40	996	below standard
Potassium	8.9 mg/L	no standard	n/a
Selenium	<1	5**	below standard
Silver	<0.2	15 (on 3/2/98)	below standard
Sodium	6.2 mg/L	no standard	n/a
Sulfate	540 mg/L	250 mg/L	2.2 x standard
Zinc	<16	1,446	below standard

* Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Feature #: 101

Environmental Degradation Rating: 4

This shallow pit adjoins Sulphur Creek and is about 135 ft long by 90 ft wide. Numerous rills and gullies cut the pit bottom, and a strong sulfur odor is present. In June, standing water in the pit was tested to have **pH 3.87 and conductivity of 720 µS**. In early October, this water was sampled and retested and showed **pH 2.45 and conductivity of 3,440 µS**. Sample results, shown on the table below, indicate that concentrations of iron and aluminum greatly exceed state standards. Manganese and sulfate concentrations also exceed standards.

Sample number 749/4177-1.309; hardness of sample = 495 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	8,300	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	2	50 (acute)	below standard
Iron (trec)	6,900	1,000	6.9 x standard
Molybdenum (trec)	<10	no standard	n/a
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	12	2,000**	below standard
Aluminum	7,800	87**	90 x standard
Cadmium	<0.25	4	below standard
Calcium (as CaCO ₃)	180 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11**	below standard
Copper	<4	46	below standard
Fluoride	0.13 mg/L	2 mg/L**	below standard
Iron	6,900	300	23 x standard
Lead	2	38	below standard
Magnesium	11 mg/L	no standard	n/a
Manganese	480	50	9.6 x standard
Nickel	<20	322	below standard
Potassium	6.3 mg/L	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Selenium	<1	5**	below standard
Silver	<0.2	1.2 (on 3/2/98)	below standard
Sodium	5.6 mg/L	no standard	n/a
Sulfate	630 mg/L	250 mg/L	2.5 x standard
Zinc	42	410	below standard

* Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Additional water tests and samples: A highly leached outcrop on the east side of Sulphur Creek and between the open pits had standing water at its base. Orange and white precipitate along the drainage channel indicates that during wetter periods, this apparently degraded water flows into Sulphur Creek. In June, the standing water had **pH 3.37 and conductivity of 2,100 µS**. In October, this murky standing water had **pH 2.89 and conductivity of 2,650 µS** and was sampled. Results, shown on the table below, reveal iron, aluminum, and manganese concentrations greatly exceed state standards. Sulfate concentration also exceeds standards. High hardness contributes to the high conductivity at this test site.

Sample number 749/4177-1.310; hardness of sample = 2,615 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	12,000	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	2	50 (acute)	below standard
Iron (trec)	40,000	1,000	40 x standard
Molybdenum (trec)	<20	no standard	n/a
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	51	2,000**	below standard
Aluminum	12,000	87**	138 x standard
Cadmium	<0.25	15	below standard
Calcium (as CaCO ₃)	920 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<20	11**	below detection limit
Copper	<8	192	below standard
Fluoride	0.35 mg/L	2 mg/L**	below standard
Iron	39,000	300	130 x standard
Lead	3	397	below standard
Magnesium	77 mg/L	no standard	n/a
Manganese	2,700	50	54 x standard
Nickel	<40	1,142	below standard
Potassium	19 mg/L	no standard	n/a
Selenium	<1	5**	below standard
Silver	0.3	21 (on 3/2/98)	below standard
Sodium	5.4 mg/L	no standard	n/a

Environmental Degradation Rating: 3**Feature #:** 102**Environmental Degradation Rating: 3****Feature #:** 103, 203**Environmental Degradation Ratings: 3**

Feature #203 is a 150-cubic-yard dump with three lobes, one of which is oxidized and has an intense reddish-orange color on rock fragment surfaces. Dump material contains no carbonate and minor pyrite. The discharge from adit #103 flows into a locally reddish-orange channel on dump #203. Effluent flowing on the dump had become more acidic, with **pH 4.6 and conductivity 000 µS**.

Feature #: 104**Environmental Degradation Rating: 3**

^^New Quad^^

Quad Name: Rampart Hills

Site #: 754/4142-1.102, 202

Site Name: Thunder Mine

Environmental Degradation Ratings: 2

11

Feature #202 is a mine dump directly in front of and downhill from adit #102. The dump is 400 cubic yards, fills a natural ravine, and covers a talus slope. The dump material contains abundant marcasite and possible arsenopyrite. At the time of the site visit, only the western channel from adit #102 across the surface of the dump was damp, with the effluent apparently seeping through the dump and into the talus. Water parameters at the time of the site visit in late July were **pH 3.2 and conductivity 400 μ S**. The stained drainage channel below the dump was dry during the inventory; however, heavy rain during the night and following morning produced flow with water parameters of **pH 2.7 and conductivity 900 μ S** where the effluent channel crosses FR-567.

Quad Name: Rico, Clyde Lake

Site Name: Rosebud Mine

Feature #: 101, 201

This feature is a completely collapsed adit of uncertain dimensions, with remnant haulage rails and ties jutting from the collapsed portal area. An iron-stained drainage channel at the base of the portal continues across the surface of associated feature #201. The channel was dry at the time of the site visit (late June).

Feature #201 is a 2,000-cubic-yard, light yellowish gray to pale-red, mine dump extending from adit #101 into and along Silver Creek. The creek is in contact with dump for of about 100 feet. Parameters of the creek water immediately upstream from the dump were **pH 7.4 and conductivity 200 µS**. Stream flow was estimated to be 200 gpm. The dump contains quartz-vein material ± pyrite ± chalcopyrite ± tetrahedrite-tennantite(?) in an intensely argillized/sericitized sandstone or felsic intrusion. The dump had a strong H₂S odor at the time of the site visit. A small seep at the toe of the dump had water parameters of **pH 6.9, conductivity 1,100 µS**, and an estimated flow of 0.5 gpm.

Feature #: 202

Environmental Degradation Rating: 3

This feature is a 450-cubic-yard, light yellow-gray to dark yellow, mine dump associated with completely caved adit #102. The dump extends into Silver Creek and is in contact with the creek for about 40 feet. The dump contains quartz + calcite vein material ± pyrite ± chalcopyrite(?).

Feature #: 203

Environmental Degradation Rating: 3

This feature is an 800-cubic-yard, chalky yellow to gray, mine dump not associated with any evident underground workings. Dump #203 extends into and along Silver Creek and is in contact with the creek for about 80 feet. The dump had a localized H₂S odor and contains quartz + calcite vein material with no evident sulfide minerals. Silver Creek below the dump had water parameters of **pH 7.4, conductivity 200 µS**, and an estimated flow of 200 gpm.

Feature #: 104, 204

Environmental Degradation Ratings: 3

This partly collapsed adit has a timbered and partly gated portal with an accessible opening 5 ft high by 3 ft wide. The adit is open for at least 10 ft, and roof fall lies on the floor in places. Haulage rails are largely intact from the portal out and across associated dump #204. As described above, the principal hazard associated with this feature is H₂S gas. Warning signs are present, and small bird and ground rodent corpses were lying immediately in front of the adit at the time of the first site visit. Scavengers apparently removed these corpses, as they were not observed at the time of the second site visit when water samples were collected. In June, water parameters immediately adjacent to the portal were **pH 7.4, conductivity 1,100 µS**, and an estimated flow of 20 gpm. In August, the measured flow was 30 gpm, and **pH = 6.38 and conductivity = 1,300 µS**. Water sample data, shown on the table below, reveal manganese concentration greatly exceeds state standards. Iron and sulfate concentrations also exceed the standards.

This effluent flows into a series of three treatment ponds, then discharges into Silver Creek. Water parameters at the lowest settling pond outlet were **pH 7.4, conductivity 900 µS**, and estimated flow of 10 gpm.

Feature #204 is a 3,000-cubic-yard, pale yellow to gray, bi-lobate dump extending from adit #104 into Silver Creek. The dump contains calcite + quartz, pyrite, tetrahedrite-tennantite(?), and rhodochrosite-rhodonite in an intensely argillized and/or sericitized and brecciated sandstone and felsic intrusion matrix. Silver Creek is in contact with dump #204 for about 300 feet. Creek water parameters immediately upstream from the dump were **pH 7.4 and conductivity 200 µS** on an estimated flow rate of 200 gpm.

Sample number 753/4177-1.306; hardness of effluent sample = 1,743 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	260	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	1	50 (acute)	below standard
Iron (trec)	2,600	1,000	2.6 x standard
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	<16	2,000**	below standard
Aluminum	<100	87**	below detection limit
Cadmium	<0.25	11	below standard
Calcium (as CaCO ₃)	640 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<20	11**	below detection limit
Copper	<8	136	below standard
Fluoride	0.36 mg/L	2 mg/L**	below standard
Iron	2,500	300	8.3 x standard
Lead	<1	223	below standard
Magnesium	35 mg/L	no standard	n/a
Manganese	4,300	50	86 x standard
Molybdenum	<20	no standard	n/a
Nickel	<40	839	below standard
Potassium	3.1 mg/L	no standard	n/a
Silver	<0.2	10 (on 3/2/98)	below standard
Sodium	10 mg/L	no standard	n/a
Sulfate	380 mg/L	250 mg/L	1.5 x standard
Zinc	<16	1,194	below standard

* Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Additional water tests and samples: A sample was collected from natural spring water in this inventory area. The spring was downstream of the Rosebud Mine on the north side of the creek and was visible from the trail. Spring water had **pH 7.81 and conductivity of 300 µS** and was emerging at about 2 gpm. The spring water had deposited a large greenish-yellow mound of precipitate. Sample results, shown on the table below, reveal that none of the tested parameters exceed state standards, and the water is relatively hard.

Sample number 753/4177-1.307; hardness of spring sample = 616 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	3	6.0**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	<10	1,000	below standard
Selenium (trec)	<1	10	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	<8	2,000**	below standard
Aluminum	<50	87**	below standard
Cadmium	<0.25	5	below standard
Calcium (as CaCO ₃)	220 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11**	below standard
Copper	<4	56	below standard
Fluoride	0.18 mg/L	2 mg/L**	below standard
Iron	<10	300	below standard
Lead	<1	51	below standard
Magnesium	16 mg/L	no standard	n/a
Manganese	<4	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	381	below standard
Potassium	1.2 mg/L	no standard	n/a
Silver	<0.2	1.7 (on 3/2/98)	below standard
Sodium	3.0 mg/L	no standard	n/a
Sulfate	51 mg/L	250 mg/L	below standard
Zinc	<8	495	below standard

* Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Rico

Site #: 756/4177-1.106; 206

Site Name: Johnny Bull Mountain

Environmental Degradation Ratings: 3; 2

Description and pertinent facts: This inventory area is located on the southeast side of Johnny Bull Mountain and is reached by either the Calico Trail or the Johnny Bull Trail. The Calico Trail is an extensively used stock trail and provides good ATV access. Most of the inventory area lies at or above treeline and is visible from CHC and NBH Hills to the east, above the town of Rico. The mines are about 4,000 ft west of the Dolores River.

Feature #106 is a completely collapsed adit. The large size of associated dump #206 suggests extensive underground workings. About 10 gpm water with **pH 5.9 and conductivity 500 µS** flowed from the adit into an orange-stained channel. Iron rail fragments and wood ties lie near the collapsed portal and on dump #206. Degraded water parameters and the presence of oxidized drainage channels suggest an EDR of 3.

Feature #206 is a 350-cubic-yard dump extending into a deeply incised natural gully. Runoff in the gully has eroded and undercut the toe of the dump. Effluent from adit #106 flows across the dump for about 30 ft and turns northward to the gully. In the gully below the dump, where flow was about 30 gpm, water parameters were **pH 3.2 and conductivity 600 µS** in late July. Water at this

test site is significantly degraded and has a higher flow rate compared to the effluent at the portal. Water is likely traveling subsurface through the dump, which further degrades it. Significantly degraded water parameters compared to the test at adit #106, and the presence of oxidized drainage channels, suggest an EDR of 2.

Quad Name: Rico

Site #: 757/4176-1

Site Name: West end of Horse Gulch

Description and pertinent facts: Features in this area are accessible by driving to the end of a 4WD road in Horse Gulch, then following the hiking trail along Horse Creek several miles further. In June, many areas towards the upper and west end of Horse Gulch were still snow covered.

Feature #: 100

Environmental Degradation Rating: 3

Water trickles from the mouth of this caved adit and down the sides of the associated dump. The highly vegetated dump contains abundant quartz and specular hematite. The bottom/toe of the dump is cut off by Horse Creek. Numerous rocks in the stream channel, presumably the dump material associated with adit #100, were stained with a thick, orange precipitate.

Feature #: 101

Environmental Degradation Rating: 3

This is a caved adit with standing water (**pH = 6.99 and conductivity = 210 μ S**) in the mouth. During the inventory in mid-June, snow was covering part of the adit, and orange precipitate was visible on many of the rocks around the caved adit.

Quad Name: Rico

Site #: 758/4177-1

Site Name: North of Horse Creek

Description and pertinent facts: Features in this area are accessible by taking a 4WD road up Horse Gulch approximately 1.25 miles until the road becomes a hiking trail. Most of the features in this mountainous terrain are accessible and visible from the hiking trail in Horse Gulch. The area is densely vegetated, mainly with aspen, pine, scrub-type vegetation, grass, and weeds. There is no evidence of intentional reclamation of the mine features, except for the water diversion apparatus located on and around feature #108.

Feature #: 101

Environmental Degradation Rating: 3

This is a collapsed adit that had water seeping during the inventory in early June, 1997. A water test revealed **pH = 3.10 and conductivity = 330 μ S**. Thick vegetation was growing around the portal.

Feature #: 103

Environmental Degradation Rating: 3

This is a caved adit, located high on a hillside, barely visible from the hiking trail nearly 1,000 vertical feet below. At the time of the initial inventory in early June, about 75 gpm of mine effluent flowed down both sides of the dump, cutting drainage channels. Two water tests were taken, one along the west side of the dump, and the other along the east side. The tests revealed **pH = 5.17 and 5.23, respectively, and conductivity = 50 µS** (for both locations). The dump contains moderate amounts of pyrite, sphalerite, and galena, and has a pungent sulfurous odor. In October, 1997, a water sample was to be collected, but the feature was no longer discharging. The two drainage channels, though dry, still existed along each side of the dump.

Feature #: 107

Environmental Degradation Rating: 3

This is a caved adit that was discharging about 20 gpm water in mid-June. A water test revealed **pH = 7.41 and conductivity = 160 µS**. Caved adit #106 is above and roughly in line with adit #107. Apparently, water draining from adit #106 is flowing beneath the surface and emerging from adit #107.

Feature #: 108

Environmental Degradation Rating: 3

This is a caved adit near the boundary of public and private land. During the inventory in June, 1997, the adit was discharging about 10 gpm of water with **pH = 7.63 and conductivity = 200 µS**, most of which was piped into a holding basin of approximately 100 gallons. A thin hose carried most of the basin discharge down the face of the dump, although a small amount of the basin water was overflowing and seeping into the top of the dump. The hose directed the mine water into a 10 ft x 10 ft pond further down the hillside, just above the 4WD road. Although most of this hillside is grassy or barren, a small area of dense vegetation surrounds the pond. A collapsed wire fence around the holding basin suggests that someone may have assumed that this area is private land.

Quad Name: Rico

Site #: 760/4176-1

Site Name: Aztec Mine and Gulch

Description and pertinent facts: This inventory area is about 0.5 miles northwest of Rico, on the west side of the Dolores River. All of the described features are along Aztec Gulch, and effluent from them drains into the gulch.

Feature #: 100

Environmental Degradation Rating: 3

This caved adit is discharging about 5 gpm water that flows through associated dump #200 and emerges near the toe. At the dump toe, the water had **pH = 6.7 and conductivity = 1,100 µS**. Orange precipitate is present. Dump #200 is about 50 cubic yards and contains sulfides.

Feature #: 101, 201

Environmental Degradation Ratings: 3

This feature is the Aztec Mine, which is caved and was discharging about 10 gpm water with **pH = 6.88 and conductivity = 750 μ S** in June, 1997. The effluent was sampled and was tested to have **pH 5.6 and conductivity of 790 μ S** on a measured flow of 3.9 gpm in August. Orange precipitate lines the drainage channel. Lab results, shown on the table below, indicate extremely high concentrations of zinc. Manganese concentration significantly exceeds state standards, and iron and cadmium concentrations slightly exceed standards.

Effluent from adit #101 flows across 1,500-cubic-yard, crescent-shaped dump #201 and into Aztec Gulch. Dump #201 contains abundant sulfides.

Sample number 760/4176-1.305; hardness of sample = 1,207 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	4	50 (acute)	below standard
Iron (trec)	3,200	1,000	3.2 x standard
Selenium (trec)	2	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	3,200	2,000**	1.6 x standard
Aluminum	<50	87**	below standard
Cadmium	11	8	1.4 x standard
Calcium (as CaCO ₃)	450 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11**	below standard
Copper	<4	99	below standard
Fluoride	0.24 mg/L	2 mg/L**	below standard
Iron	410	300	1.4 x standard
Lead	<1	133	below standard
Magnesium	20 mg/L	no standard	n/a
Manganese	1,100	50	22 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	634	below standard
Potassium	1.2 mg/L	no standard	n/a
Silver	<0.2	5.5 (on 3/2/98)	below standard
Sodium	2.3 mg/L	no standard	n/a
Sulfate	130 mg/L	250 mg/L	below standard
Zinc	2,900	875	3.3 x standard

* Numeric standards are μ g/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Feature #: 103, 203

Environmental Degradation Ratings: 3

This caved adit is discharging about 5 gpm of water with **pH = 6.9 and conductivity = 400 μ S**. The effluent flows onto and alongside associated 950-cubic-yard dump #203, then discharges into Aztec Gulch. Orange precipitate lines the effluent channel. Specular hematite, pyrite, malachite, and manganese oxides are common on the dump.

Quad Name: Rico

Site #: 760/4176-2.100

Site Name: South of Aztec Gulch - North of Bemis Flats

Environmental Degradation Rating: 3

Description and pertinent facts: This is a caved adit covered with debris that has slid from above. In mid-June, water with a **pH = 6.58 and a conductivity = 780 μ S** was flowing from the adit at about 40 gpm. Rocks in the channel, as well as the channel itself, were coated with thick, orange precipitate. In October, the effluent had **pH 5.35 and conductivity of 800 μ S**, but was only flowing at a measured rate of 2 gpm. A water sample collected in October shows manganese and iron concentrations exceed state standards. Zinc concentration is relatively high, but because of the high hardness of the water, it still falls within state standards.

Sample number 760/4176-2.301; hardness of sample = 1,069 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	2	50 (acute)	below standard
Iron (trec)	3,300	1,000	3.3 x standard
Molybdenum (trec)	<10	no standard	n/a
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	500	2,000**	below standard
Aluminum	<50	87**	below standard
Cadmium	0.62	7	below standard
Calcium (as CaCO ₃)	390 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11**	below standard
Copper	<4	90	below standard
Fluoride	0.48 mg/L	2 mg/L**	below standard
Iron	2,800	300	9.3 x standard
Lead	<1	112	below standard
Magnesium	23 mg/L	no standard	n/a
Manganese	3,600	50	72 x standard
Nickel	<20	579	below standard
Potassium	2.0 mg/L	no standard	n/a
Selenium	<1	5**	below standard
Silver	<0.2	4.4 (on 3/2/98)	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Sodium	2.7 mg/L	no standard	n/a
Sulfate	210 mg/L	250 mg/L	below standard
Zinc	510	830	below standard

* Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Rico

Site #: 761/4176-1

Site Name: Nora Lily Mine

Description and pertinent facts: The Nora Lily Mine is located immediately adjacent to a series of large settling ponds on the east side of the Dolores River. The inventory area is just north of Rico and is reached by a well-maintained dirt road that splits from SH-145 on the east side of the highway bridge. Several drilling roads crosscut the area. Many of the mines have been closed, presumably by previous operators. Water drains from one adit, and three dumps have significant volumes of sulfide minerals.

Feature #: 100, 200

Environmental Degradation Ratings: 2

Feature #100 is an intact, gated, signed, and barricaded 4 ft x 4 ft adit at least 20 ft long. In mid-June, the mine was discharging approximately 1 gpm of water with parameters of **pH 2.8 and conductivity of 780 µS**. The highly degraded water, and the proximity of the Dolores River and the town of Rico, suggest an EDR of 2.

Associated dump #200 is only about 70 cubic yards, shows extensive red-brown oxidation, and emits a locally strong sulfurous odor. Ashy humus accumulates in low spots. These characteristics suggest potential for acid-generation from weathering of sulfides.

Feature #: 201

Environmental Degradation Rating: 3

This feature is a relatively small mine dump of 150 cubic yards, with localized red-brown to yellow oxidation, some vegetation, and a locally strong sulfurous odor. Dump #201 has a terrace-like surface with a ferricrete crust that is breakable with a hammer. These characteristics suggest potential for acid-generation from weathering of sulfides.

Feature #: 204

Environmental Degradation Rating: 3

Feature #204 is a mine dump of 350 cubic yards spread thinly on a steep slope above the previously described features. The face has numerous deep gullies and was reworked during construction of post-mining roads. Dump #204 is oxidized a brown to yellow color, emits a locally strong sulfurous odor, and supports some vegetation. These characteristics suggest potential for acid-generation from weathering of sulfides.

Quad Name: Rico

Site #: 761/4177-1

Site Name: Mountain Spring Mine

Description and pertinent facts: The Mountain Spring Mine inventory area encompasses public and private land, but environmental degradation related to the mines extends onto public land and may extend to the Dolores River. An unnumbered road through the settling pond complex immediately north of Rico accesses the area. An exceptionally large, sulfide-rich mine dump that has a distinctive topographic outline and absence of vegetation on the Rico topo map is the dominant feature. None of the mine dumps described below have significant drainage. The predominant sulfide is pyrite, which averages 35%, but locally is 100% of the waste rock volume. Underground workings that produced the dump material are not open, but significant quantities of water discharge from them. These workings are probably related to and interconnected with much larger mines that underlie CHC Hill.

Feature #: 100; 200

Environmental Degradation Ratings: 2; 1

Shaft #100 is completely flooded and was discharging an estimated 30 gpm of water in mid-June, 1997. The effluent flows across and adjacent to associated dump #200. In June, 1997, water parameters were **pH 3.6 and conductivity of 2,500 μ S**. When this effluent was sampled in early August, water parameters were **pH 3.73 and conductivity of 2,270 μ S** on a measured flow of 8 gpm. Approximately 2,000 ft downstream along the effluent channel, parameters were **pH 3.1 and conductivity of 1,800 μ S** in June. This effluent seeped underground prior to reaching the Dolores River. Abundant red staining along the drainage path beyond the surface-flow limit suggests that live flow of effluent reaches the river occasionally. Certainly, effluent reaches the river through groundwater in this alluvial valley. Results of a water sample collected in August, shown on the table below, indicate severely degraded water emerges from the Mountain Springs shaft. Concentrations of aluminum, cadmium, copper, fluoride, manganese, and zinc are unusually high and greatly exceed state standards. Iron and sulfate concentrations also exceed standards. Chloride, lead, nickel, and silver were also unusually abundant. Concentrations of lead, nickel, and silver fall within aquatic life standards because of the high water hardness. Concentrations of cadmium (5 μ g/L), copper (1,000 μ g/L), iron (300 μ g/L), manganese (50 μ g/L), nickel, (100 μ g/L), and zinc (5,000 μ g/L) all exceed standards for drinking water supply (drinking water standards are shown in parentheses). Sulfate and fluoride standards for drinking water are shown on the table and are also exceeded.

Dump #200 is 85,000 cubic yards of pyrite-rich material from a replacement-type deposit. Waste rock surfaces are oxidized to a bright yellow. The original host rock was likely carbonate, but no carbonate was observed in the dump. A marshy area immediately below the toe was saturated with water, presumably from shaft #100. Standing water on the dump surface had parameters of **pH 3.6 and conductivity of 3,600 μ S**. A 2 gpm seep at the dump toe had parameters of **pH 3.5 and conductivity of 3,200 μ S**. About 70 ft further downstream, water parameters were **pH 2.7 and conductivity of 1,900 μ S**.

Sample number 761/4177-1.305; hardness of effluent sample = 2,049 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	150,000	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	410	1,000	below standard
Selenium (trec)	3	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	34,000	2,000**	17 x standard
Aluminum	150,000	87**	1,724 x standard
Cadmium	290	12	24 x standard
Calcium (as CaCO ₃)	590 mg/L	no standard	n/a
Chloride	130 mg/L	250 mg/L	below standard
Chromium	<20	11**	below detection limit
Copper	12,000	156	77 x standard
Fluoride	27 mg/L	2 mg/L**	13.5 x standard
Iron	360	300	1.2 x standard
Lead	45	281	below standard
Magnesium	140 mg/L	no standard	n/a
Manganese	34,000	50	680 x standard
Molybdenum	<20	no standard	n/a
Nickel	320	949	below standard
Potassium	2.2 mg/L	no standard	n/a
Silver	2	14 (on 3/2/98)	below standard
Sodium	1.7 mg/L	no standard	n/a
Sulfate	1,900 mg/L	250 mg/L	7.6 x standard
Zinc	34,000	1,369	25 x standard

* Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Feature #: 201

Environmental Degradation Rating: 3

This mine dump is adjacent to and northeast of dump #200. Dump #201 contains 800 cubic yards, has no observed water drainage, and sulfides compose about 10% of the rock volume. Effluent from shaft #100 crosses the toe of this dump.

Feature #: 202

Environmental Degradation Rating: 3

This mine dump is adjacent to and west of dump #200. It has a volume of 2,500 cubic yards, has no observed water drainage, and sulfides compose about 15% of the rock volume. The presence of sulfides and the large volume suggest an EDR of 3.

Quad Name: Rico

Site #: 761/4177-2

Site Name: Sambo Mine Area

Description and pertinent facts: Most features in the Sambo Mine inventory area are located along FR-231. Several small, old 4WD roads, not shown on the topo and just below FR-231, separate some of the underground workings from their associated dumps. The apparent old age of the mines, and the reworking of some of this area during road construction, make designation of the features, and their relation to each other, difficult to determine.

Feature #: 100

Environmental Degradation Rating: 3

About 10 gpm of water with **pH = 6.87 and conductivity = 670 μ S** drains from the mouth of this caved adit. In mid-June, white precipitate coated some of the rocks in the effluent channel.

Feature #: 103

Environmental Degradation Rating: 3

This partly caved adit has an intact headframe and a 3 ft x 3 ft opening. Just behind the headframe, the adit is caving noticeably. Less than 1 gpm of water with **pH = 7.3 and conductivity = 400 μ S** seeps from the entrance.

Quad Name: Rico

Site #: 761/4178-1.100; 200

Site Name: ABG Mine

Environmental Degradation Ratings: 3; 2

Description and pertinent facts: This inventory area spans the Dolores River about 2 miles north of Rico. Access is through the settling pond area adjacent to the Dolores River immediately north of Rico, then along a power line maintenance road.

Feature #100 is a completely collapsed adit immediately below a power line on the east side of the Dolores River. During the inventory in mid-June, the collapsed adit was discharging 28 gpm of water with parameters of **pH 6.6 and conductivity of 300 μ S**. A yellow-orange precipitate is present in the drainage channels.

Associated dump #200 is 10,000 cubic yards of gray and locally red-brown to yellow-orange material situated in riparian habitat and in direct contact with the Dolores River. Water parameters were measured at several points around the dump. Test #302, from a small seep at the dump toe about 1 foot above the river, had the most degraded parameters of **pH 2.6 and conductivity of 900 μ S**. Other test sites showed **pHs from 6.6 to 7.4 and conductivities from 000 to 600 μ S**. The proximity of the Dolores River and the character of the dump suggest an EDR = 2.

Quad Name: Rico

Site #: 762/4175-1

Site Name: Revenue Mine Area

Description and pertinent facts: The Revenue Mine is located on the south side of Silver Creek immediately east of Rico. Three dumps have EDRs of 3 based on dump size, sulfide content, and/or the presence of water flowing across the dumps. A possible mill tailings area with fine-grained pyrite is conspicuously barren of vegetation.

Feature #: 200

Environmental Degradation Rating: 3

This 750-cubic-yard dump has locally high concentrations of sulfide minerals and is dry.

Feature #: 201

Environmental Degradation Rating: 3

This feature is a 1,750-cubic-yard dump. About 18 gpm of water drains from adit #101, crosses dump #201, and runs down the face toward dump #202. Dump #201 has locally high concentrations of sulfide minerals, especially pyrite. Water flowing across this dump had **pH 6.44 and conductivity of 346 μ S**. Results of a water sample collected from the portal of adit #101 in August, 1997, are shown on the table below. This effluent does not reach Silver Creek at the surface, but certainly reaches it through groundwater. Cadmium and zinc concentrations exceed both aquatic life and drinking water standards.

Sample number 762/4175-1.302; hardness of effluent sample = 482 mg/L.

Lab Analyses (dissolved unless noted)	Concentration \div (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Aluminum (trec)	130	no standard	n/a
Antimony (trec)	<1	6.0**	below standard
Arsenic (trec)	<1	100 (acute)	below standard
Iron (trec)	83	1,000	below standard
Selenium (trec)	2	10	below standard
Thallium (trec)	<1	0.5**	below detection limit
Zinc (trec)	2,100	2,000**	1.1 x standard
Aluminum	<50	87**	below standard
Cadmium	15	5	3 x standard
Calcium (as CaCO ₃)	180 mg/L	no standard	n/a
Chloride	6.8 mg/L	250 mg/L	below standard
Chromium	<10	11**	below standard
Copper	26	45	below standard
Fluoride	0.15 mg/L	2 mg/L**	below standard
Iron	<10	300	below standard
Lead	<1	36	below standard
Magnesium	7.8 mg/L	no standard	n/a
Manganese	360	1,000	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	316	below standard
Potassium	<1 mg/L	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Silver	<0.2	4.8 (on 3/2/98)	below standard
Sodium	1.1 mg/L	no standard	n/a
Sulfate	65 mg/L	250 mg/L	below standard
Zinc	2,100	1,000	2.1 x standard

* Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Feature #: 202

Environmental Degradation Rating: 3

This feature is a 1,900-cubic-yard dump. About 0.5 gpm of water, with **pH 6.4 and conductivity of 600 µS**, seeps from caved adit #102 and moistens the top of dump #202 for about 20 ft before disappearing. This dump has locally high concentrations of sulfides, mainly pyrite.

Feature #: 203

Environmental Degradation Rating: 2

This feature is 350 cubic yards of suspected mill tailings with no observed drainage. The tailings contain abundant, fine-grained (milled?) sulfide minerals, especially pyrite. Little vegetation grows on the tailings, and aspens peripheral to this feature show signs of mortality. The apparently toxic effect on vegetation of this fine-grained, sulfide-rich material implies significant environmental degradation.

Quad Name: Rico

Site #: 762/4177-1

Site Name: Middle CHC Hill

Description and pertinent facts: This inventory area includes the Wellington Mine, which has similar characteristics and is located immediately to the east and uphill from the Mountain Springs Mine. Underground workings of this inventory area are probably connected to the network that includes the Mountain Springs Mine.

Feature #: 200

Environmental Degradation Rating: 3

Dump #200 is associated with the Wellington Mine and contains 50,000 cubic yards of yellow to orange waste rock. Water flows from adit #100 (Wellington Mine) onto dump #200 for a short distance, but no water was observed elsewhere on the dump, nor were any signs of drainage evident around the toe. This dump has locally high concentrations of sulfide minerals, mainly pyrite.

Feature #: 206

Environmental Degradation Rating: 3

This feature is a yellow to orange, 750-cubic-yard aggregate of several dumps with no observed water drainage. These dumps may have originated from a haulage level connected to the extensive underground workings of this area. Feature #206 has locally high concentrations of sulfides, especially pyrite.

Quad Name: Rico

Site #: 762/4180-1.102

Site Name: Bridgehead Mines

Environmental Degradation Rating: 3

Description and pertinent facts: Adit #102 is located above several reclaimed adits (John Reidinger, USFS, verbal communication, 1997). About 1 gpm of effluent from the adit mixes almost immediately with a natural stream of 60 gpm. Water parameters of the effluent are **pH 3.3 and conductivity of 500 μ S**, and the natural stream water has **pH 8.0 and conductivity of 100 μ S**. Downstream of the mixing point, water parameters are **pH 7.1 and conductivity of 200 μ S** in a flow of 60 gpm. The impact of the mine effluent on the natural stream suggests an EDR = 3.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Clyde Lake

Site #: 745/4180-1.101

Site Name: Little Silver Mine

Physical Hazard Rating: 2

Description and pertinent facts: This inventory area straddles a public/private land boundary and is accessed by a poorly signed, cabled spur road off FR-535 along the West Fork of the Dolores River. This inventory area contains abundant relict machinery and equipment, including a locked steel explosives box of uncertain content. The most significant hazard is 10-ft-wide by 5-ft-high adit #101, excavated into subhorizontal strata for a distance of at least 60 ft. The roof is marginally supported by poorly placed rock bolts and loosely fitting strap steel. Adit #101 is well lit by natural light, inviting exploration into a mine that appears ready to cave or collapse.

^^New Quad^^

Quad Name: La Plata

Site #: 753/4143-1

Site Name: East Helmut Peak

Description and pertinent facts: This inventory area is reached by a spur road off FR-567, the Rush Basin access road. The upper part of the area is accessible by an exploration drilling road on the west side of Helmut Peak. No significant environmental degradation is associated with these mines, but the lower workings are visible from FR-567 and present an exploration temptation to tourists.

Feature #: 100

Physical Hazard Rating: 2

This feature may be a completely collapsed adit or a shaft, but it was completely snow covered during the inventory on 7/27/97. Dump #200 is quite large, suggesting the possibility of extensive workings with associated hazards. As such, feature #100 has a PHR of 2 until proven otherwise. At the time of the site visit, lightning was also a significant physical hazard.

Feature #: 101**Physical Hazard Rating: 2**

This feature is a dry, 6 ft x 6 ft, intact adit. At a depth of 20 ft, the adit splits into two apparently intact passages of uncertain extent. No air currents were detected entering or exiting the portal. Adit #101 is readily accessible by a good road and presents an entry hazard, especially because of the possibility of bad air.

Feature #: 102**Physical Hazard Rating: 2**

This feature is a 6-ft-wide by 10-ft-long by 20+-ft-deep stope above collapsed adit #103. The stope opening has sloughed and caved, indicating unstable margins and a significant fall-in hazard. From

FR-567, the area of feature #102 is visible and accessible by ATV. Numerous ATV tracks from previous visitors approach nearby adit #103. As such, feature #102 has a PHR of 2.

Quad Name: La Plata

Site #: 755/4144-1

Site Name: Rush Basin

Description and pertinent facts: This inventory site lies in a historic mining area with numerous patented claims. Many of the workings on private land present hazards, but are not described in this report. The main access road is FR-567. All of the physical hazards are shafts that present little chance of escape if accidentally entered. Furthermore, the shafts appear to have only recently become visible from beneath the snow, increasing the hazard to off-season travelers during the late Fall to early Spring.

Feature #: 101

Physical Hazard Rating: 1

This 5 ft x 7 ft shaft is at least 70 ft deep and has no associated dump to reveal its presence. Shaft #101 lies above and north of the largest mine in Rush Basin and is easily accessed by ATV or foot. Accidental entry would likely result in death or serious injury.

Feature #: 103

Physical Hazard Rating: 1

This feature is a 10 ft x 10 ft shaft at least 5 ft deep. The opening is probably bridged and may have significant open space below. Abundant heavy hoisting equipment and a large dump are present in the immediate vicinity. Shaft #103 lies at the same elevation and east of the largest mine in Rush Basin and is easily accessed by ATV or foot. Accidental entry would likely result in death or serious injury, especially because of caving material if the bridged-over area collapsed beneath someone.

Feature #: 105

Physical Hazard Rating: 2

This feature is mapped as a shaft (Neubert, et al, 1992) but was mostly covered by snow at the time of the site visit. Until proven otherwise, this feature is assumed to have a PHR of 2.

^^^New Quad^^^

Quad Name: Rico, Clyde Lake

Site #: 753/4177-1.104

Site Name: Rosebud Mine

Physical Hazard Rating: 2

Description and pertinent facts: The Rosebud mine is located along Silver Creek approximately 4 miles from the western trailhead of the Johnny Bull Trail on the West Fork of the Dolores River. Access to the area by foot trail is only moderately strenuous, but access is difficult for all but the smallest mechanized equipment. Feature #104 should be approached with extreme caution because significant volumes of H₂S(?) gas emanate from the partly caved portal. Appropriate respirators

and air monitoring equipment are highly recommended. Feature #104 is a partly collapsed adit with a timbered and partly gated portal. The accessible opening is 5 ft high by 3 ft wide. Adit #104 is open for at least 10 ft, and roof fall covers the floor in places. Haulage rails from the portal are largely intact across associated dump #204. As described above, the principal hazard associated with this feature is H₂S gas. Warning signs are present, and small bird and ground rodent corpses lay in front of the adit at the time of the first site visit. Scavengers apparently removed these corpses, as they were absent during the second site visit when water samples were collected.

Quad Name: Rico

Site #: 756/4176-1

Site Name: Calico Peak

Description and pertinent facts: This inventory area is on the south side of Calico Peak and is accessed by the Calico and Horse Creek Trails.

Feature #: 101

Physical Hazard Rating: 1

Shaft #101 is at least 20 ft deep and lies about 6 ft east of the Calico Trail. The 8 ft by 8 ft surface opening funnels through unconsolidated soils to a 5 ft by 5 ft inner opening supported by partly collapsed cribbing. The proximity of shaft #101 to a well-traveled trail, in conjunction with its depth and unstable sides suggest a PHR of 1.

Feature #: 102

Physical Hazard Rating: 2

Shaft #102 has a 6 ft by 6 ft surface opening. Water fills the shaft to within 6 ft of the collar. This opening is about midway between the Calico and Horse Creek Trails, about 200 ft from both.

Quad Name: Rico

Site #: 758/4177-1.102

Site Name: North of Horse Creek

Physical Hazard Rating: 2

Description and pertinent facts: This is a steel-grate-covered, intact shaft that is located several feet from the main hiking trail in Horse Gulch. The grate was bowing downwards in the center, however, a mound of rocks completely covering the perimeter of the grate successfully prevented access. Shaft #102 is at least 30 ft deep and probably connects to adit #101 along Horse Creek. Water can be heard trickling and dripping through the bottom section of the shaft.

Quad Name: Rico

Site #: 760/4174-1.104

Site Name: Jones Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: This is a partly intact shaft with fallen trees covering some of the top of the shaft pit. Trickling water could be heard approximately 15 ft below the surface during the inventory in mid-June. A vent pipe extended from the shaft area. Shaft #104 was given a PHR of 2 because if someone fell in, which is a possibility due to its steep sides and proximity to a 4WD road, it would be difficult to escape. The dump has several lobes and contains quartz, galena, sphalerite, pyrite, and hematite.

Quad Name: Rico

Site #: 760/4176-2

Site Name: South of Aztec Gulch - North of Bemis Flats

Description and pertinent facts: This inventory area is located slightly northwest of Rico, between Iron Draw and Aztec Gulch. These features are accessed by driving west up the dirt road that branches from SH-145 just north of the Dolores River bridge north of Rico. Follow the dirt road south past several residences (some under construction during the summer of 1997), and park at the intersection of the residential road with a 4WD road that extends further south. Hike north along the residential driveway (the one at the highest elevation that overlooks the road just traveled upon), and head up the hill until reaching a small, almost indiscernible hiking path in between the dense aspen and scrub-type growth.

Feature #: 105

Physical Hazard Rating: 2

This is an intact adit at least 30 ft long. A partial, thin headframe stands at the portal.

Feature #: 106

Physical Hazard Rating: 2

This is an intact adit at least 20 ft long. The 85-cubic-yard dump contains a moderate amount of pyrite and mica, with malachite and turquoise in trace amounts. Adit #106 is almost directly above adit #105.

Quad Name: Rico

Site #: 761/4177-1.102

Site Name: Mountain Spring Mine

Physical Hazard Rating: 2

Description and pertinent facts: Feature #102 is a 20 ft x 12 ft shaft funneling down through soil to a 4 ft x 8 ft bottom at a depth of 12 ft. "Test" boulders rolled into the feature produced a hollow sound at impact, suggesting that the feature is a bridged-over shaft. No evidence of standing water was observed, also suggesting that shaft #102 is open below.

Quad Name: Rico

Site #: 761/4177-2.103

Site Name: Sambo Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: This is a partly collapsed adit with an opening of approximately 3' x 3' and an unknown depth. An old, partly overgrown 4WD road, which separates adit #103 from associated dump #203, is located just above the primary 4WD road. The secondary 4WD road apparently receives moderate pedestrian use, and thus makes this adit quite accessible to the public.

Quad Name: Rico

Site #: 762/4175-1.100

Site Name: Revenue Mine Area

Physical Hazard Rating: 2

Description and pertinent facts: Shaft #100 has a 40 ft x 40 ft surface opening that funnels down through soil to an 8 ft x 8 ft bottom at a depth of 35 ft. Walls at the bottom expose bedrock. "Test" boulders rolled into the shaft produced a hollow sound at impact, suggesting that the bottom is bridged, and additional open shaft lies below. No evidence of standing water was observed, also indicating a false bottom to the shaft. Because of its proximity to a well-traveled 4WD road, in conjunction with the previously described characteristics, shaft #100 has a PHR of 2.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

SAN JUAN NATIONAL FOREST

PAGOSA RANGER DISTRICT

April, 1998

by

Robert G. Benson

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

°	degree
÷	divided by
=	equals
'	feet
<, ≤	less than, less than or equal to
>	greater than
≥	greater than or equal to
4WD	four-wheel drive
μ	microns
μS	micro-Siemens (conductivity)
#	number
%	percent
ATV	all-terrain vehicle
BLM	United States Department of Interior - Bureau of Land Management
cps	counts per second
CR	County Road
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
FR	Forest Road
FT or TR	Forest Trail
gpm	gallons per minute
μ	microns
μg/L	micrograms per liter
mg/L	milligrams per liter
Mt.	Mount
n/a	not applicable
no.	number
p.	page(s)
ppm	parts per million
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
USGS	United States Geological Survey
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
SAN JUAN NATIONAL FOREST -- PAGOSA RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Pagosa Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1), dangerous (2), or potentially dangerous (3). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 13 (San Juan), and Ranger District 06 (Pagosa Ranger District).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database. The field form for the site with potential environmental degradation and physical hazard is included at the back of the report, after the appendices.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

The geology of the Pagosa Ranger District is dominated by Mesozoic- to Upper Paleozoic-age sedimentary rocks in the western and southern parts; Tertiary-age intermediate to felsic volcanic rocks in the northeastern part; and Precambrian-age metamorphic, sedimentary, and igneous rocks in the east (Neubert, et al, 1992). Mineralized areas are located in the southeast extreme of the Colorado Mineral Belt, a regional northeast-trending zone of mineralization that contains most of the major mining districts of the state.

The inventory area described in this report is within the Crater Creek mining district. Other areas were examined for mining activity and related physical or environmental hazards, but in many cases, the workings were not located or were on patented land with no effect on public land. The area of the Blacks Mine (inventory area #325/4145-1) was not accessible due to high river flows at the time of the site visit, but no evidence of any mining activity was observed on air photos. Furthermore, Glen Raby of the Pagosa Ranger District concurred with these findings of little mining activity.

Throughout the public land within the Crater Creek mining district, no evidence of intentional reclamation was observed, with the exception of a series of very small settling ponds.

Mineralization throughout the Crater Creek mining district is dominated by small amounts of pyrite in a gangue of quartz. Neubert, et al, (1992) also report anomalous amounts of indium and gallium. The presence of indium and gallium suggests a more complex sulfide mineralogy.

**USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- PAGOSA RANGER DISTRICT**

NUMERICAL SUMMARY

- 6** field forms
- 16** mine openings inventoried (includes collapsed or filled openings)
- 8** mine dumps, tailings piles, highwalls, etc.
- 10** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
- Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 6
 - Number of features with EDR of 4 = 4
 - Number of features with EDR of 5 = 14
- 3** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
- Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 0
 - Number of features with PHR of 3 = 3
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 21

**USFS ABANDONED MINE LAND INVENTORY PROJECT
SAN JUAN NATIONAL FOREST -- PAGOSA RANGER DISTRICT**

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=13; District=06	EDR
Crater Creek	Elwood Pass	348/4141-1.100, 200,103, 203, 107, 202	3, 3, 3, 3, 3, 3

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=13; District=06	PHR
Crater Creek	Elwood Pass	348/4141-1.101, 103, 106	3, 3, 3

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Elwood Pass

Site #: 348/4141-1

Site Name: Crater Creek

Description and pertinent facts: This area is located at the terminus of a very poor quality spur road that branches from the Elwood Pass Road along the East Fork of the San Juan River. A small A-frame summer cabin, apparently on private land, has been vandalized. Numerous historical structures and relict pieces of mining equipment are present throughout the area.

Feature #: 100, 200

Environmental Degradation Ratings: 3

This feature is a completely collapsed adit draining about 2 gpm of clear water into a series of very small settling ponds coated with thick reddish to yellowish slime. A ferricrete crust is present in the drainage channel. The site is approximately 300' from Crater Creek, a tributary to Elwood Creek. The effluent was tested in early July, 1997, and had **pH = 4.3 and conductivity = 500 μ S**. When the effluent was sampled in August, 1997, it had **pH = 4.18 and conductivity = 560 μ S** on a measured flow of 3.4 gpm. Sample results, shown on the table below, indicate that aluminum, iron, and manganese concentrations significantly exceed state standards. Zinc and sulfate concentrations slightly exceed standards.

Associated dump #200 is about 100 cubic yards of predominately gravel-size, yellow oxide-coated rock that is partly overlain by clay-rich soil. Effluent from adit #100 seeps into this dump. Water tested at the lowest of the small settling ponds on dump #200 had **pH = 3.2 and conductivity = 600 μ S**. Because of the potential for environmental degradation, the site was assigned an EDR = 3.

Sample number 348/4141-1.307; hardness of effluent sample = 428 mg/L.

Lab Analyses (dissolved unless noted)	Concentration \div (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	5,500	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	31,000	1,000	31 x standard
Thallium (trec)	<1	0.5*	below detection limit
Aluminum	5,700	87*	66 x standard
Cadmium	1.3	3.6	below standard
Calcium (as CaCO ₃)	150 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	9	41	below standard
Fluoride	0.61 mg/L	2 mg/L*	below standard
Iron	32,000	300	107 x standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Lead	<1	31	below standard
Magnesium	13 mg/L	no standard	n/a
Manganese	1,400	50	28 x standard
Nickel	21	289	below standard
Potassium	1.0 mg/L	no standard	n/a
Silver	<0.2	0.9 (on 3/2/98)	below standard
Sodium	3.9 mg/L	no standard	n/a
Sulfate	290 mg/L	250 mg/L	1.2 x standard
Zinc	490	363	1.3 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #: 103, 203

Environmental Degradation Ratings: 3

Feature #103 is a completely collapsed shaft(?) draining about 30 gpm of clear water. The effluent channel splits, and some of the discharge seeps into mine dumps #202 and #203. Reddish to yellowish slime coats the drainage channels. This site may be a natural spring and is approximately 400' from Crater Creek, a tributary to Elwood Creek. Water emerging from the shaft/spring(?) had **pH = 5.0 and conductivity = 600 µS**.

Dump #203 is approximately 250 cubic yards of mostly gravel-size, yellow oxide-coated rocks and is nearly barren of vegetation. Some of the water draining from feature #103 seeps into this dump. Water that did not seep into either dump #202 or dump #203 was tested below the dumps and had **pH = 4.3 and conductivity = 600 µS** on an estimated flow of 10 gpm. Because of the sparse vegetation and the presence of water, these features were assigned an EDR = 3.

Feature #: 107

Environmental Degradation Rating: 3

This feature is a completely collapsed adit draining about 10 gpm of clear water across associated dump #207. Reddish to yellowish slime coats the drainage channel, which is choked with algae and is devoid of insect life. The site is approximately 100' from Elwood Creek, upstream from the confluence with Crater Creek. The effluent had **pH = 7.0 and conductivity = 900 µS**. Because of the relatively high flow and conductivity of the effluent, the seepage of some of the effluent into dump #207, and the proximity to a major stream, the site was assigned an EDR = 3.

Feature #: 202

Environmental Degradation Rating: 3

This mine dump is about 190 cubic yards of mostly gravel-size, yellow oxide-coated rocks and is nearly barren of vegetation. Some of the water emerging from feature #103 seeps into this dump. Because of the sparse vegetation and the presence of water, this feature was assigned an EDR = 3.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Elwood Pass

Site #: 348/4141-1

Site Name: Crater Creek

Description and pertinent facts: This area is discussed in the **Environmental Degradation** section of this report.

Feature #: 101

Physical Hazard Rating: 3

This partly collapsed and gated/fenced adit is visible from a dirt road that traverses this area. No air was observed circulating through the adit. The size of associated dump #201 suggests large underground workings. The gate/fence effectively discourages access, but could easily be pried open. Because of the public access, the easily negated deterrent, lack of air circulation, and the potential of underground collapse, adit #101 has a PHR = 3.

Feature #: 103

Physical Hazard Rating: 3

This mine feature is a partly collapsed shaft(?) that may have significant depth, based on the size of associated dump #203. The nature of the shaft is not completely clear, but water flows from the feature. Because of the easy public access, lack of obvious hazard, and the potential for collapse of the working, feature #103 has a PHR = 3.

Feature #: 106

Physical Hazard Rating: 3

Description and pertinent facts: This mine feature is an intact adit at least 20' long, but it is not readily visible from a dirt road through the area. No air was observed circulating from the adit. The size of the associated dump, which is less than 50 cubic yards, suggests relatively shallow underground workings. Because of the easy public access and the potential of collapse, adit #106 has a PHR = 3.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

UNCOMPAHGRE NATIONAL FOREST

NORWOOD RANGER DISTRICT

December 31, 1996

J.T. Neubert
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Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (when used with dimensions) or times (when used in tables)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
=	equals
'	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
Trec	Total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
UNCOMPAHGRE NATIONAL FOREST -- NORWOOD RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Norwood Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. Features were inventoried for any of the following reasons: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) shown on a published topographic map. Features not meeting at least one of these criteria are considered innocuous and were not inventoried. Details on the rating systems and the limits of the inventory are given in Appendix A.

The **Priority Sites** tables show the most important environmental degradation sites and the most important physical mine hazard sites, and follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are the same throughout this report. These sites are all in Forest 04 (Uncompahgre) and Ranger District 05 (Norwood).

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed.

A comprehensive, detailed account of all the mine sites inventoried will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and natural waters in order to better determine environmental effects of mine drainage. Samples were analyzed for total recoverable (Trec) and dissolved constituents as shown on tables in the following text. Numeric standards are based on stream classifications and water quality standards provided by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either drinking water supply or aquatic life standards. Most drinking water standards are based on total recoverable metals, and most aquatic life standards are based on hardness of the water and dissolved ion concentrations. In some areas, standards are based on total recoverable metals, but the sample was tested for dissolved metals. In those instances, the sample result should be considered the minimum metal content. Total recoverable metals may be significantly higher. Field water sampling protocols are in Appendix B.

Geology and Mining Districts

Geology of the Norwood Ranger District varies from gently dipping sedimentary rock overlying Precambrian basement on the Uncompahgre Plateau, to the geologically complex, highly mineralized, San Miguel Mountains. Mining districts with significant numbers of inactive mines within or adjacent to the Norwood Ranger District are in the San Miguel Mountains, and include Telluride (upper San Miguel), Ophir (Ames), Mount Wilson, and Placerville (lower San Miguel). Minor past mining or prospecting activities are evident in a few isolated locations outside of the major mineral districts.

Telluride Mining District

The Telluride mining district extends from the headwaters of the San Miguel River to a few miles west of Telluride. Most previous mining activity has been on private land east, northeast, and south of Telluride. Many of the significant features inventoried near the heart of the mining district are included in the Argentine, Japan, Smuggler, Ingram Basin North, and Near Bullion inventory sites. Most of these sites are at least partly on private land.

Geology of the Telluride mining district was summarized by Burbank in Vanderwilt (1947, p. 421). Vhay (1962) describes mineral resources and geologically mapped areas south and southeast of Telluride. Burbank and Luedke (1966) mapped the geology of the Telluride 7.5-minute quadrangle. Previously, the geology of the Telluride 15-minute quadrangle was mapped and described by Cross and Purington (1899). Mineral evaluations of the Uncompahgre Wilderness and surrounding areas by Fischer and others (1968), and Steven and others (1977) discuss resources in the eastern heart and northern periphery of the district.

Paleozoic- to Tertiary-age sedimentary rocks are exposed in the lower elevations. They are overlain by Tertiary-age volcanic rocks of the San Juan Formation and Silverton Volcanic Group. All are cut by late Tertiary dikes and veins related to nearby igneous features, which nearly surround the district. The northeast and north are bounded by the Mount Sneffels-Stony Mountain composite

stock and a similar intrusion north of Campbell Mountain. The Silverton caldera and related intrusive stocks and plugs lie to the east and southeast, and the Ophir stock and related intermediate composition intrusive rocks are exposed to the south. Most precious- and base-metal mines developed veins emplaced within faults and fractures, primarily in the volcanic rocks. Coal and a sandstone quarry are hosted in the sedimentary strata west of Telluride. (See Vanderwilt, 1947, p. 421; Vhay, 1962, plate 16; Fischer and others, 1968, plate 1; Burbank and Luedke, 1966; Burbank and Luedke, 1964; Steven and others, 1977, p. E65-66.) Many vein types and orientations occur in the district. Locations and geology of various deposit types are generalized and summarized in the following paragraphs. Exceptions in mineralogy and vein trends are common throughout the district.

Three major types and ages of mineralized vein sets are recognized in the most productive part of the district, east and northeast of Telluride. Veins adjacent to dikes are the oldest and can extend into the sedimentary rock below the volcanics. This type of vein often curves, but in general they strike north-northwest. A later vein set with shallower dips trends northwest and probably pinches out at the base of the San Juan Formation or in the underlying Tertiary-age Telluride Conglomerate. The youngest and least productive vein type strikes north to northeast, concentric to the Silverton caldera. In the most productive mines, veins exhibit multiple stages of mineralization, with each successive stage containing fewer sulfides and more quartz and calcite. Sulfides found in varying quantities in most of the veins include pyrite, sphalerite, galena, and chalcopyrite. Gangue is dominated by quartz, with calcite, rhodonite, and rhodochrosite. (See Vanderwilt, 1947, p. 423.) Major exceptions to the generalized vein mineralogies listed above occur at and near the Liberty Bell Mine, northeast of Telluride. These veins are relatively depleted in sulfides, and contain tetrahedrite, stephanite, argentite, and gold in a quartz-carbonate gangue (Vanderwilt, 1947, p. 423-424).

South of the largest producers of the district, and south and southeast of Telluride to a line roughly between Prospect Basin on the west and Blue Lake on the east, gold occurs with or without substantial quantities of pyrite and generally sparse base-metal sulfides in west- to west-northwest-trending quartz veins. Significant sites inventoried in this area include Blue Lake, La Junta, Nellie Mill, Bridal Veil Creek and Trail, and Royal Mine. Further south, to the north edge of the Ophir district, productive veins trend north or northeast and are rich in silver and base-metal sulfides, including chalcopyrite, tetrahedrite, galena, and sphalerite with gangue of quartz, impure carbonates, and barite. The veins trend north to northeast in the Bridal Veil Basin area, but further west, strikes of the veins are much more variable. (See Vhay, 1962, p. 280-285.) Significant sites inventoried in this area include Lewis Mine and Mill, Black Warrior Mine, East Fork Bear Creek, Delta, and Upper Bridal Veil Basin.

Ophir Mining District

The Ophir mining district includes the drainage basin of Howard Fork, Gold King Basin, and the Alta area. The Ophir mining district contains the most severely degraded sites inventoried in the Norwood Ranger District, including Carbonero, Lower Swamp Canyon, New Dominion, several sites in and near Chapman Gulch, and Upper Howard Fork. Many of these sites have adits discharging metal-rich effluent.

Geology of the Ophir mining district was summarized by Varnes in Vanderwilt (1947, p. 425). Bromfield (1967), and Bromfield and Williams (1972), discuss the geology and mineral resources of the western part of the district in detail. Vhay (1962) describes mineral resources and geologically mapped areas north of Howard Fork of the San Miguel River. Previously, the geology of the Telluride 15-minute quadrangle, including the Ophir mining district, was mapped by Cross and Purington (1899).

In the district, the Ophir stock, and several smaller felsic to intermediate composition stocks and plugs have intruded Mesozoic and Tertiary sedimentary rocks and Tertiary volcanic rocks of the San Juan Formation and Silverton Volcanic Group. Large areas have been intensely hydrothermally altered, probably during emplacement of the intrusive rocks. (See Vanderwilt, 1947, p. 425-426; Vhay, 1947, plate 16; Bromfield and Williams, 1972, plate 1.)

Most of the larger mines developed east- to northeast-trending, silver-rich base-metal veins containing one, and usually more, of the following sulfides, in varying proportions: galena, sphalerite, pyrite, chalcopyrite, and tetrahedrite. Low-grade gold is usually present. Gangue is dominated by quartz, but barite, ankerite, rhodochrosite, and/or gypsum may occur in lesser quantities. Many of the most productive veins are found in an east-trending belt extending from San Bernardo Mountain to Chapman Gulch, on both sides of Howard Fork. (See Vhay, 1962, p. 286; Vanderwilt, 1947, p. 426.)

Smaller mines were developed throughout the district on a variety of deposit types described briefly below. Intersecting sets of northeast- and northwest-trending precious-metal veins occur in the Alta area. The veins contain at least one, but usually several, of the following metallic minerals: chalcopyrite, galena, sphalerite, pyrite, and tetrahedrite. Gangue is mostly quartz, impure carbonates, and barite (Vhay, 1962, p. 285, 291). Gold deposits occur on Silver Mountain, in the area between the Gold King and Suffolk Mines. Numerous randomly oriented quartz stringers and veins cut altered, pyritic volcanic rocks. Gold is found with the quartz and disseminated in the country rock (Vhay, 1962, p. 286; Vanderwilt, 1947, p. 426). A silver-rich replacement deposit occurs in the Pony Express Limestone Member of the Wanakah Formation at the Crown Point Mine. Sulfides include tetrahedrite, galena, and chalcopyrite (Vhay, 1962, p. 286-287). West- to northwest-trending, gold-bearing quartz-pyrite veins occur near and east of Chapman Gulch. These veins also contain clay and sparse base-metal sulfides (Vhay, 1962, p. 287-288). Several north- and north-northeast-trending rhodochrosite-galena veins with silver occur on the ridge between Ophir Needles and the lake in Gold King Basin (Vhay, 1962 p. 279, 285-286). A large, intensely altered area west of Chapman Gulch is rich in disseminated pyrite, accompanied by low-grade base-metal sulfides (Vhay, 1962, p. 287-288).

Mount Wilson Mining District

The Mount Wilson mining district straddles the crest of the San Miguel Mountains, roughly within a 3-mile radius of Wilson Peak, and includes part of the Dolores Ranger District of San Juan National Forest. The major producer of the district, the Silver Pick Mine, is on patented land within the Norwood Ranger District. Significant sites inventoried include San Bernardo Mine, Clara, and Morningstar.

Geology of the Mount Wilson mining district was summarized by Varnes in Vanderwilt (1947, p. 428). Bromfield (1967), and Bromfield and Williams (1972), discuss the geology and mineral resources in detail. Bush and Bromfield (1966) geologically mapped the western part of the district. Many of the mine names used in this report are from Cross and Purington (1899).

The Wilson Peak composite stock is the dominant geologic feature and is almost certainly the source of the ore deposits. The stock was intruded into Triassic- to Tertiary-age sedimentary rocks which are capped by Tertiary volcanics of the San Juan Formation and Silverton Volcanic Group. Past mining efforts were restricted to vein occurrences within or immediately adjacent to the stock. (See Bromfield, 1967, p. 1, 81.)

Two types of occurrences were foci for exploration: gold and silver-lead veins. Gold veins are composed primarily of quartz and pyrite, with lesser amounts of chalcopyrite and arsenopyrite. Minor quantities of galena and sphalerite may be present. Gangue may include small amounts of carbonate minerals and barite. Gold veins occur in Silver Pick Basin and at the head of Elk Creek in the Norwood Ranger District. (See Bromfield, 1967, p. 82.)

Sulfur-bearing minerals in the silver-lead veins include: galena, sphalerite, and pyrite, with lesser quantities of chalcopyrite and tetrahedrite-tennantite. Gangue is mostly quartz, with some calcite, impure brown carbonates, barite, and rhodochrosite. Generally, gold is present in quantities of less than 0.10 ounces per ton. This type of vein is found along Bilk Creek and in upper Bilk Basin. (See Bromfield, 1967, p. 83.)

Placerville Mining District

The Placerville mining district was originally a placer gold district, but the gravels of the San Miguel River were low grade, and gold production has been small. Most of the district's production originated from numerous vanadium mines on BLM-managed or private land, outside of the Norwood Ranger District. In addition to a few vanadium mines and prospects, limestone, coal, metallic minerals, and possibly uranium have been mined and/or prospected on National Forest lands between Placerville and Telluride, on both sides of the San Miguel River. Most mines and prospects are in sedimentary rocks that crop out in the canyons of the San Miguel River and its major tributaries. The most significant inventoried site in this mining district is Deep Creek.

The vanadium deposits of the district have been described by Fischer and others (1947, p. 117-134) and by Fischer in Vanderwilt (1947 p. 451-456). Some of the metal mines and prospects, and a limestone quarry on the north side of the San Miguel River, are discussed by Steven and others (1977, p. E64-E67). The Placerville mining district is included on geologic maps by Bush and others (1956, 1959, 1961).

The Placerville district is composed of gently dipping sedimentary strata of Paleozoic and Mesozoic age. Small stocks, sills, laccoliths, and dikes of Tertiary age intruded these rocks. Faults cut the sedimentary and igneous rocks. Vanadium deposits are probably roll-front type deposits and are found exclusively in the Jurassic-age Entrada Sandstone, immediately below the Pony Express Limestone Member of the Wanakah Formation. Workings in the Entrada along Big Bear Creek extend into the Ranger District; and near Sawpit inactive mines are concentrated within a few

hundred feet of the National Forest. Limestone was mined from the Pony Express near the junction of Deep Creek and the San Miguel River. Coal in the Cretaceous-age Dakota Sandstone has been mined or prospected along Bilk and Fall Creeks. Metallic minerals occur in veins hosted by the igneous rocks of Last Dollar Mountain, and as replacements in the Pony Express Limestone near Deep Creek. Uranium(?) mines are hosted in the Jurassic-age Morrison Formation along Deep Creek. (See Fischer, 1947, p. 121, 125; Bush and others, 1961; Steven and others, p. E64-E67.)

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NUMERICAL SUMMARY

87 field forms

504 mine openings inventoried (includes collapsed or filled openings)

229 mine dumps, tailings piles, highwalls, etc.

82 mine features have Environmental Degradation Ratings of 1, 2, 3, or 4.

Number of features with EDR of 1 = 0
Number of features with EDR of 2 = 1
Number of features with EDR of 3 = 36
Number of features with EDR of 4 = 45
Number of features with EDR of 5 = 651

117 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 1
Number of features with PHR of 2 = 20
Number of features with PHR of 3 = 96
Number of features with PHR of 5 = 616

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UNCOMPAHGRE NATIONAL FOREST -- NORWOOD RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=04; District=05	EDR
Carbonero Area	Ophir	252/4194-1.104; 101, 201	2; 3
San Bernardo	Mount Wilson	245/4192-1.102, 200, 201, 203, 204, 205	3
Lower Swamp Canyon	Ophir	253/4192-1.101	3
New Dominion	Ophir	251/4193-1.100, 102	3
Chapman Gulch	Ophir	253/4194-1.100, 101	3
Upper Howard Fork	Ophir	253/4192-2.101	3
North Chapman Gulch	Ophir	254/4194-1.101	3
Drill hole – Chapman Gulch	Ophir	253/4194-3.100	3
North South Lookout Peak	Ophir	254/4192-1.100, 102	3
Blue Lake	Telluride	257/4197-1.206, 208	3
Argentine	Telluride	258/4201-1.200, 201	3
Clara and Atlas	Mount Wilson	245/4191-1.100, 200	3
Smuggler	Telluride	256/4204-1.200, 203	3
Silver Bell	Ophir	247/4193-1.100	3
Lewis Mine and Mill	Telluride	256/4195-2.207	3
Montezuma Mine	Ophir	250/4193-1.204, 207	3
Gold King Mine	Ophir	250/4195-1.203	3
Northwest Yellow Mountain	Ophir	247/4192-1.204, 213	3
North Yellow Mountain	Ophir	249/4193-1.201	3
Japan Mine	Telluride	258/4202-1.200	3
La Junta Basin	Telluride	253/4197-1.206	3

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=04; District=05	PHR
Upper Bridal Veil Basin	Telluride	254/4195-1.100	1
Bridal Veil Creek and Trail	Telluride	255/4196-1.109, 209	2
Deep Creek	Gray Head	243/4205-1.101	2
Near Bullion Mine	Telluride	256/4202-1.100	2
Ingram Basin North	Ironton	258/4199-1.100	2
Nellie Mill	Telluride	252/4197-2.110, 111	2
Royal Mine	Telluride	256/4198-1.101, 102, 103	2
Delta	Telluride	252/4197-1.100	2
Morningstar	Mount Wilson	240/4194-1.100	2
East Fork Bear Creek	Telluride	253/4196-1.102	2
Lewis Mine and Mill	Telluride	256/4195-2.103	2
Northwest Yellow Mountain	Ophir	247/4192-1.100	2
La Junta Basin	Telluride	253/4197-1.103, 104	2
Black Warrior Mine	Telluride	249/4195-2.100	2
Sneffels Highline Trail	Telluride	254/4206-1.100	2
Smuggler	Telluride	256/4204-1.102	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

The bulk of past mineral production in and near the Norwood Ranger District has come from patented lands, mostly owned by Idarado Mining Company. Because they are private, many of the largest mines were not inventoried. Reclamation and environmental remediation efforts by Idarado were evident at several locations, especially in Marshall and Savage Basins.

Quad Name: **Mount Wilson**

Site #: 245/4191-1.100, 200

Site Name: Clara and Atlas

Environmental Degradation Ratings: 3

Description and pertinent facts: The Clara Mine is visible and accessed from SH-145 about 1 mile north of Trout Lake. New homes have been built within about 900' north of this abandoned mine and associated dump.

Red ferric hydroxide precipitates cover the top and part of the sides of dump #200 and fill about 60% of adit #100. Where the dump is exposed, pyrite is abundant. During the inventory, water discharging from adit #100 flowed across and down the north side of dump #200. The average of two tests of effluent showed **pH = 2.57 and conductivity = 729 μ S**. The mine was discharging at a rate of about 2.5 gpm, and the effluent seeped into colluvium near the toe of the dump. Because of the low flow, a syringe was used to collect a sample, and some weakly attached precipitate may have been included in the sample. This could explain the unusually large concentrations of metals in the raw-acidified split, from which the (Trec) analyses are derived. As shown on the table below, iron, cadmium, manganese, and zinc concentrations greatly exceeded stream standards; copper and sulfate concentrations were slightly above the standards.

Sample number 245/4191-1.302; hardness of effluent sample = 807 mg/L.

Lab Analyses (dissolved unless noted)	Concentration \div (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	2500	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	23	50 (acute)	below standard
Iron (Trec)	25000	1000	25 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<50	87*	below standard
Cadmium	2.4	0.4 (acute, Trec)	6 x standard
Calcium	300 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Chromium	<10	11*	below standard
Copper	6	5 (acute, Trec)	1.2 x standard
Fluoride	0.86 mg/L	2 mg/L* (Trec)	below standard
Iron	4500	300	15 x standard
Lead	<1	4 (acute, Trec)	below standard
Magnesium	14 mg/L	no standard	n/a
Manganese	3200	50	64 x standard
Nickel	<20	50 (acute, Trec)	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.1 (acute, Trec)	below detection limit
Sodium	5.6 mg/L	no standard	n/a
Sulfate	370 mg/L	250 mg/L	1.5 x standard
Zinc	500	50 (acute, Trec)	10 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Quad Name: Mount Wilson

Site #: 245/4192-1

Site Name: San Bernardo Mine

Description and pertinent facts: These features are the large dumps on the side of San Bernardo Mountain, about 1.5 miles north of Trout Lake, and are visible from SH-145. The mine access road passes through a housing development to the lowest of the mines. This mine is shown as private on the PBS quad sheet and is signed as such. It has a locked gate and a significant discharge of water depositing red precipitate. A live bat floated out of the portal and climbed onto a board while we were parked at the site. Beaver ponds in the privately owned valley adjacent and below have a reddish color, probably attributable in large part to the discharge from this portal.

The features inventoried require hiking up the mountainside, sometimes on old trails. Features #100-#105 and their associated dumps are shown to be public by only about 100' on the PBS quad. A slight offset of the private land overlay could be critical as far as ownership of the mines is concerned. A detailed survey is necessary to determine the boundaries. All of the workings showing potential environmental degradation border a dry gulch.

Feature #: 200

Environmental Degradation Rating: 3

Dump of a caved adit is approximately 5,000 cubic yards and covers a large area on a steep slope, extending into the dry gulch mentioned above. Pyrite is abundant. Because of the steepness, the dump is almost certainly creeping downhill at an appreciable rate. A tram terminal is on the south side of this dump.

Feature #: 201

Environmental Degradation Rating: 3

Dump of a caved adit is about 4,000 cubic yards and borders the dry gulch. This dump has numerous fines, and pyrite and limonite are abundant. During the inventory, and after about 1 hour of steady downpour, this dump, as well as dumps #203-#205, began discharging water from their faces at several locations. A water test of the murky reddish water revealed **pH = 3.30 and conductivity = 688 μ S**. The water from all of the seeps on this dump and dumps #203-#205 flowed into the main gulch for a short distance, then disappeared into the alluvium. When the rain stopped, the seeps stopped within minutes, leaving rills on the dump faces.

Feature #: 102

Environmental Degradation Rating: 3

This is a subsidence feature almost directly in the middle of the main gulch. The "crater" is about 40'x 40', and 15' deep. Some of the crater walls are oversteepened despite the location in the gulch. Sediment transported in the gulch would rapidly fill any minor subsidence feature. These observations indicate that subsidence is probably occurring on a continuing basis.

Feature #: 203

Environmental Degradation Rating: 3

This 1,500-cubic-yard dump has no evidence of an associated adit, which may be covered by dump #205. This dump had four seeps similar to that described in #201 during the rainstorm.

Feature #: 204

Environmental Degradation Rating: 3

Dump of a caved adit is approximately 2,500 cubic yards and extends into the main gulch. Pyrite and manganese oxides are abundant.

Feature #: 205

Environmental Degradation Rating: 3

Dump of a caved adit is about 12,000 cubic yards and nearly fills the main gulch. This dump is mostly shale and has moderate amounts of pyrite and manganese oxides.

^^ New Quad ^^^

Quad Name: **Ophir**

Site #: 247/4192-1

Site Name: Northwest Yellow Mountain

Description and pertinent facts: The two features on the north side of this area are easy to see but

difficult to access. The trail is hidden by the thick vegetation, but can be picked up 100' west of the Silver Bell Mine.

Feature #: 204

Environmental Degradation Rating: 3

Dump #204 is approximately 2,500 cubic yards but is very spread out. The adit and workings are on private land, but the dump is on public land. The dump is mostly grey with disseminated pyrite. No mine drainage is associated with this feature, however, a significant amount of sheetwash does occur, as evidenced by vegetation knocked down by dump material.

Feature #: 213

Environmental Degradation Rating: 3

This dump is approximately 400 cubic yards but is spread over a larger area than dump #204. It has the same erosion problems as feature #204.

Quad Name: **Ophir**

Site #: 247/4193-1.100

Site Name: Silver Bell

Environmental Degradation Rating: 3

Description and pertinent facts: This mine and mill site at the intersection of SH-145 and the Ophir Pass Road is easily accessible to the public. According to Steve Wells of the U.S. Forest Service, this site was part of a land exchange and is now almost entirely private land. A small segment of the easternmost part of the tailings pile west of SH-145 is public, according to Wells. During the inventory, the tailings pile west of the highway was believed to be entirely private and was not closely examined. The tailings pile is huge, sulfide-laden, and toes into Howard Fork. Any clean-up effort will require accurate surveying to determine ownership, and probably a joint effort by government and private owners.

On the east side of SH-145, most of the site that was inventoried has been reclaimed. Dumps have been regraded, covered with topsoil, and seeded. Adit #100 is gated, and the mine discharge has been channeled and diverted to minimize contact with the dump. Water flowing from adit #100 at an estimated 450 gpm rate showed no evidence of toxicity and had **pH = 6.54 and conductivity = 972 μ S**.

Quad Name: **Ophir**

Site #: 249/4193-1.201

Site Name: North Yellow Mountain

Environmental Degradation Rating: 3

Description and pertinent facts: Access to this feature is from the west side of Waterfall Creek, on the trail that leads to the Montezuma Mine. The trail continues west past the Montezuma until it reaches this site. The dump is approximately 900 cubic yards and has abundant coarse-grained pyrite and minor galena. Evidence of sheetwash and seepage suggests that contaminated water could originate from the dump during snowmelt and storm events.

Quad Name: **Ophir**

Site #: 250/4193-1

Site Name: Montezuma Mine

Description and pertinent facts: These sites are difficult to access because of the dense cover surrounding the trails. The trails are on the north-facing slope west of Waterfall Creek and can be reached from the Waterfall Creek Road. Where the road ends on a private mine dump on the west side of a creek, hike up the old road and straight up the slope until the trail is found.

Feature #: 204

Environmental Degradation Rating: 3

Dump #204 is approximately 2,500 cubic yards, and pyrite and chalcopryrite are abundant. The associated adit is collapsed. No water drains from adit #104 or across dump #204, however, dump #204 is exposed to rainfall. Runoff could potentially contaminate Howard Fork, which lies below.

Feature #: 207

Environmental Degradation Rating: 3

This dump can easily be seen from the Ophir Pass Road on the west side of Ophir. It appears to be an avalanche path on the 7.5-minute Ophir topo map. Large gullies have formed, and drainage from dump #205 flows into Howard Fork during precipitation events. This dump is approximately 7,000 cubic yards and has abundant sulfides. At the time of inventory, the capped adit was not draining, but it is grated to allow effluent to discharge.

Quad Name: **Ophir**

Site #: 250/4195-1.203

Site Name: Gold King Mine

Environmental Degradation Rating: 3

Description and pertinent facts: This dump is located in the upper part of Gold King Basin and is reached by trail from the end of the road. Dump #203 is approximately 2,000 cubic yards and has abundant sulfides. Snow covered the adit and top of the dump; it was unclear if adit #103 was draining water onto the dump.

Quad Name: **Ophir**

Site #: 251/4193-1

Site Name: New Dominion

Description and pertinent facts: These features are easily accessible from short access roads through private land, or by short walks from the public Ophir Pass Road. Residential buildings are in the Ophir annex development, within 1,000' of the features. Beaver ponds below the Ophir Pass Road, on private land, have a reddish, murky appearance.

Feature #: 100

Environmental Degradation Rating: 3

This open adit is nearly filled with red precipitate deposited by mine effluent. Most of the discharge flows along the west side of the dump, into beaver ponds on private land on the south side of the Ophir Pass Road. The discharge is clear, but red precipitate coats the length of the effluent channel, and the beaver ponds are murky and have a reddish hue. The mine discharge rate was about 224 gpm, and the average of three water tests revealed **pH = 6.30 and conductivity = 1,585 μ S**. Two water samples were collected from the same location; the average results are shown on the table below. Iron and sulfate exceed standards by significant amounts. Hardness is also high. These factors probably account for most of the high conductivity.

Sample numbers 251/4193-1.303; 251/4193-1.304; hardness of effluent sample = 2200 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<100	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	2	50 (acute)	below standard
Iron (Trec)	7350	1850	4 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<100	87*	below detection limit
Cadmium	<0.25	1.5 (Trec)	below standard
Calcium (as CaCO ₃)	870 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard
Chromium	<20	11*	below detection limit
Copper	<8	42 (Trec)	below standard
Fluoride	1.7 mg/L	2 mg/L* (Trec)	below standard
Iron	7100	300*	23.7 x standard
Lead	<1	75 (Trec)	below standard
Magnesium	11 mg/L	no standard	n/a
Manganese	1400	1000	1.4 x standard
Nickel	<40	50 (Trec)	below standard
Potassium	<2 mg/L	no standard	n/a
Silver	<0.2	0.1 (Trec)	below detection limit
Sodium	8.5 mg/L	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Sulfate	895 mg/L	250 mg/L*	3.6 x standard
Zinc	52	330 (Trec)	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Feature #: 102

Environmental Degradation Rating: 3

This adit is enclosed in a locked snowshed. Water discharging from the portal at a rate of about 300 gpm flowed along the east side of the dump, crossed an unmarked forest road below, and disappeared. The flow may divert or seep into adit #100, described above. The effluent is clear, but yellow-red-gray precipitate coats the channel. At the portal, the effluent had **pH = 5.21 and conductivity = 586 µS**. A test of the discharge where it crossed the forest road, about 250' south of the portal, showed **pH = 5.87 and conductivity = 511 µS**.

A cabin on the west side of the dump appears to be inhabited, but no one was home at the time of the inventory. Numerous "no trespassing" signs have been posted, although this is marked as public land on the PBS quad.

Quad Name: **Ophir**

Site #: 252/4194-1.101, 201; 104

Site Name: Carbonero area

Environmental Degradation Ratings: 3; 2

Description and pertinent facts: The Carbonero Mine and associated features are reached by traveling about 1.5 miles east of Ophir on the Ophir Pass Road, then heading north on a 4WD road with numerous switchbacks. The access road does not exactly match the road shown on the PBS quad. The Carbonero Mine is patented and was not inventoried. A large volume of water drains from the portal, and the gulch below the Carbonero has been deeply eroded, presumably by the mine discharge. The effluent is not discolored, nor is precipitate in evidence. The steep-walled gulch, which has cut through soil and colluvium, is in sharp contrast to the grassy hillsides and shallow gullies more common on this south-facing, steep mountain. This severe erosion extends onto public land, and sediment is transported onto public land each time the oversteepened gully walls collapse. The erosional scar is feature #104 with an EDR of 2.

Features #101 and #201 are a caved adit and associated dump with EDRs of 3. The adit may be on private land, depending on the accuracy of the PBS quad. Adit #101 had a 150 gpm discharge that flowed across the dump and eventually seeped into colluvium in the wooded area below. At the portal, the effluent had deposited a mound at least 10' high of red ferric hydroxide precipitate. Precipitate covered much of dump #201 and the stream channel below the dump. Two tests of the effluent revealed average values of **pH = 5.49 and conductivity = 885 µS**. A sample of the effluent contained abundant iron. Concentrations of aluminum, manganese, sulfate, and zinc also exceeded standards as shown on the table below.

Sample number 252/4194-1.302; hardness of effluent sample = 884 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	960	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	25000	1850	13.5 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	830	87*	9.5 x standard
Cadmium	1.1	1.5 (Trec)	below standard
Calcium (as CaCO ₃)	340 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard
Chromium	<10	11*	below standard
Copper	<4	42 (Trec)	below standard
Fluoride	1.7 mg/L	2 mg/L* (Trec)	below standard
Iron	24000	300*	80 x standard
Lead	2	75 (Trec)	below standard
Magnesium	8.2 mg/L	no standard	n/a
Manganese	1900	1000	1.9 x standard
Nickel	<20	50 (Trec)	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.1 (Trec)	below detection limit
Sodium	6.9 mg/L	no standard	n/a
Sulfate	430 mg/L	250 mg/L*	1.7 x standard
Zinc	350	330 (Trec)	1.1 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Features #101 and #201 are upslope and about 1,300' north of privately owned Iron Springs, a natural secondary iron deposit once mined by a crayon manufacturer because of its deep red color (Camille Farrell, Colorado Department of Health, oral communication, 1996). The Iron Springs deposit suggests that iron-rich groundwater has been a phenomena of this area for thousands of

years. Adit #101 apparently intercepts a portion of this groundwater, releasing it to the surface for a few hundred feet before it returns to subsurface flow. At least one adit was observed, but not inventoried, on private land between adit #101 and Iron Springs. This adit had a similar discharge that also seeped into colluvium before reaching Howard Fork.

Quad Name: Ophir

Site #: 253/4192-1.101

Site Name: Lower Swamp Canyon

Environmental Degradation Rating: 3

Description and pertinent facts: This caved adit is located in Swamp Canyon on public land. Access is difficult from the road adjacent to the site because of a steep slope and an impassable creek during spring runoff. The easiest access is from the meadow south of the feature, then descend on the east side of the creek.

Water draining from the adit at an average rate of about 120 gpm is depositing red precipitate. The average of two effluent tests revealed **pH = 6.71 and conductivity = 1,398 μ S**. A sample of mine effluent was collected and analyzed. Iron, manganese, and sulfate concentrations exceeded allowable limits, as shown on the table below. Calcium, and therefore hardness, are also high and probably contribute significantly to the high conductivity. Pony Express Limestone, which was observed in the streambed and in dump #201, is probably the source for much of the calcium in the mine discharge. Tests in Swamp Creek immediately above and below the mine yielded results of **pH = 7.07 and conductivity = 187 μ S**, and **pH = 6.87 and conductivity = 210 μ S**, respectively, on an estimated flow of 4,500 gpm. Test results suggest that effluent from adit #101 does not significantly affect the large volume of water in Swamp Canyon.

Sample number 253/4192-1.303; hardness of effluent sample = 1853 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<100	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	1	50 (acute)	below standard
Iron (Trec)	9600	1000	9.6 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<100	87*	below detection limit
Cadmium	<0.25	0.4 (acute, Trec)	below standard
Calcium (as CaCO ₃)	720 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<20	11*	below detection limit

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Copper	<8	5 (acute, Trec)	below detection limit
Fluoride	1.4 mg/L	2 mg/L* (Trec)	below standard
Iron	9000	300	30 x standard
Lead	<1	4 (acute, Trec)	below standard
Magnesium	13 mg/L	no standard	n/a
Manganese	710	50	14.2 x standard
Nickel	<40	50 (acute, Trec)	below standard
Potassium	<2 mg/L	no standard	n/a
Silver	<0.2	0.1 (acute, Trec)	below detection limit
Sodium	8.1 mg/L	no standard	n/a
Sulfate	780 mg/L	250 mg/L	3.1 x standard
Zinc	18	50 (acute, Trec)	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Quad Name: **Ophir**

Site #: 253/4192-2.101

Site Name: Upper Howard Fork

Environmental Degradation Rating: 3

Description and pertinent facts: This caved adit is located in a small avalanche chute and basin on the south side of Howard Fork. Adit #101 discharged about 20 gpm of water in June and 4 gpm in August. The effluent was clear, but red precipitate coats the drainage channel. Vegetation lines the channel, and some algae grows in the effluent. In June **pH was 6.7 and conductivity was 1,028 µS**; in mid-August **pH was 5.68 and conductivity was 1,050 µS**. A sample of the effluent exceeded state standards in iron, manganese, and sulfate concentrations, as shown on the table below.

Sample number 253/4192-2.304; hardness of effluent sample = 1395 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<100	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	4300	1000	4.3 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<100	87*	below detection limit
Cadmium	<0.25	0.4 (acute, Trec)	below standard
Calcium (as CaCO ₃)	550 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard
Chromium	<20	11*	below detection limit
Copper	<8	5 (acute, Trec)	below detection limit
Fluoride	1.9 mg/L	2 mg/L* (Trec)	below standard
Iron	4000	300	13.3 x standard
Lead	<1	4 (acute, Trec)	below standard
Magnesium	4.8 mg/L	no standard	n/a
Manganese	500	50	10 x standard
Nickel	<40	50 (acute, Trec)	below standard
Potassium	<2 mg/L	no standard	n/a
Silver	<0.2	0.1 (acute, Trec)	below detection limit
Sodium	6.3 mg/L	no standard	n/a
Sulfate	580 mg/L	250 mg/L	2.3 x standard
Zinc	27	50 (acute, Trec)	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

The effluent flows into a series of turquoise-colored beaver ponds. The highest and easternmost of the ponds is above confluence with the mine discharge and also has a turquoise hue. In June, the natural stream in the avalanche chute above all known mines was flowing at about 350 gpm, and **pH was 4.7 and conductivity was 320 µS**. The uppermost pond, which was receiving no effluent from adit #101, about a 1 gpm from adit #100, and 350 gpm from the avalanche chute, had **pH of**

4.7 and conductivity of 350 μS . Test results indicate that water in this drainage basin may be naturally acidic, but additional sampling is necessary to accurately determine the natural water characteristics.

Quad Name: **Ophir**

Site #: 253/4194-1

Site Name: Chapman Gulch

Description and pertinent facts: These features are easily accessible from the Ophir Pass Road. Chapman Gulch exposes highly altered volcanic rocks and isolated ferricrete deposits.

Feature #: 100

Environmental Degradation Rating: 3

A caved adit is on the south side of, and about 20' below, the Ophir Pass Road. The exact location of the adit is difficult to ascertain because of vegetation and debris moved during road construction. About 80 gpm of water depositing red precipitate emerges from the slope about halfway between the dump and the road. The effluent and associated ferric hydroxides follow the east side of dump #200 to Chapman Gulch. Moderate amounts of precipitate line Chapman Gulch below the confluence with the effluent, but the quantity of precipitate diminishes rapidly downstream. The average of two tests at the effluent source revealed **pH = 5.80 and conductivity = 1,215 μS** . Effluent immediately above the confluence with Chapman Gulch had **pH = 6.70 and conductivity = 1,236 μS** . Chapman Gulch was tested above and below feature #100. Upstream **pH = 6.80 and conductivity = 974 μS** ; downstream **pH = 7.15 and conductivity = 1,036 μS** on flows of 200 and 260 gpm, respectively. Results of lab analyses of effluent sampled at the source are in the table below. Iron concentration is significantly above, and sulfate and zinc are slightly above state standards. High calcium concentration may explain the neutral pH and contributes to the high conductivity.

Sample number 253/4194-1.307; hardness of effluent sample = 1630 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ ($\mu\text{g/L}$ unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<100	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Iron (Trec)	7200	1850	3.9 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<100	87*	below detection limit
Cadmium	0.89	1.5 (Trec)	below standard
Calcium (as CaCO_3)	640 mg/L	no standard	n/a
Chloride	19 mg/L	250 mg/L*	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Chromium	<20	11*	below detection limit
Copper	<8	42 (Trec)	below standard
Fluoride	1.3 mg/L	2 mg/L* (Trec)	below standard
Iron	7100	300*	23.7 x standard
Lead	<1	75 (Trec)	below standard
Magnesium	7.4 mg/L	no standard	n/a
Manganese	970	1000	below standard
Nickel	<40	50 (Trec)	below standard
Potassium	<2 mg/L	no standard	n/a
Silver	<0.2	0.1 (Trec)	below detection limit
Sodium	5.7 mg/L	no standard	n/a
Sulfate	680 mg/L	250 mg/L*	2.7 x standard
Zinc	390	330 (Trec)	1.2 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Feature #: 101

Environmental Degradation Rating: 3

Adit #101 is on the northwest side of Chapman Gulch and north of the Ophir Pass Road. The portal is posted with "No Trespassing" and Colorado Division of Mines warning signs. A 10 gpm discharge with minor amounts of red precipitate flows from the portal, across part of dump #201, and into alluvial deposits of Chapman Gulch. Most of the effluent seeps into this alluvium prior to reaching the surface flow of the gulch. The average of two tests near the portal show **pH = 6.90 and conductivity = 934 µS**. Results of a water sample, shown below, reveal iron and sulfate concentrations exceed state standards.

Sample number 253/4194-1.308; hardness of effluent sample = 1184 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<100	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	4	50 (acute)	below standard
Iron (Trec)	4400	1850	2.4 x standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<100	87*	below detection limit
Cadmium	<0.25	1.5 (Trec)	below standard
Calcium (as CaCO ₃)	460 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard
Chromium	<20	11*	below detection limit
Copper	<8	42 (Trec)	below standard
Fluoride	1.6 mg/L	2 mg/L* (Trec)	below standard
Iron	2900	300*	9.7 x standard
Lead	<1	75 (Trec)	below standard
Magnesium	8.2 mg/L	no standard	n/a
Manganese	800	1000	below standard
Nickel	<40	50 (Trec)	below standard
Potassium	<2 mg/L	no standard	n/a
Silver	<0.2	0.1 (Trec)	below detection limit
Sodium	5.6 mg/L	no standard	n/a
Sulfate	450 mg/L	250 mg/L*	1.8 x standard
Zinc	39	330 (Trec)	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Quad Name: Ophir

Site #: 253/4194-3.100

Site Name: Drill hole - Chapman Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This site is on the west side of a 4WD road that accesses the west side of Chapman Gulch, north of the Ophir Pass Road. Feature #100 is an angled drillhole spewing water up to 1' above the top of the pipe at a rate varying from 100 gpm in June, to 30 gpm in August. Red and light-red precipitate has been deposited on the pipe and in areas where the water flows. The water has no true channel, but ponds around the drill pipe and on nearby adjacent old roads and drilling pads, then seeps into the ground. The average of two water tests showed **pH**

was **6.62** and conductivity was **2,170 μ S**, the highest conductivity measured in this Ranger District. Drill hole effluent exceeded state standards in concentrations of iron, sulfate, fluoride, and silver, as shown on the table below. Calcium was the highest measured in the Ranger District.

Sample number 253/4194-3.302; hardness of drillhole effluent sample = 3541 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	<250	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	<1	50 (acute)	below standard
Beryllium (Trec)	<1	4.0*	below standard
Iron (Trec)	9400	1850	5.1 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<250	87*	below detection limit
Cadmium	<0.25	1.5 (Trec)	below standard
Calcium (as CaCO ₃)	1400 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard
Chromium	<50	11	below detection limit
Copper	<20	42 (Trec)	below standard
Fluoride	2.4 mg/L	2 mg/L* (Trec)	1.2 x standard
Iron	9400	300*	31.3 x standard
Lead	<1	75 (Trec)	below standard
Magnesium	10 mg/L	no standard	n/a
Manganese	840	1000	below standard
Nickel	<100	50 (Trec)	below detection limit
Potassium	<5 mg/L	no standard	n/a
Silver	0.2	0.1 (Trec)	2 x standard
Sodium	5.6 mg/L	no standard	n/a
Sulfate	1300 mg/L	250 mg/L*	5.2 x standard
Zinc	73	330 (Trec)	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are μ g/L, are dissolved concentrations, and are chronic values unless noted.

Quad Name: **Ophir**

Site #: 254/4192-1

Site Name: North South Lookout Peak - upper Swamp Canyon

Description and pertinent facts: These features are reached from the Ophir Pass Road by taking a 4WD road up Swamp Canyon, then hiking. Highly altered volcanic rocks crop out in the unnamed gulch on the north side of South Lookout Peak from Swamp Canyon to the unmined basin at the headwaters. Ferricrete deposits line the unnamed creek, both below and above areas affected by mining.

Feature #: 100

Environmental Degradation Rating: 3

This is a sealed adit with no visible brass cap. The adit is draining about 0.3 gpm of effluent that is depositing orange-red precipitate along its channel across the dump and in the forest below the dump. The discharge infiltrated the forest floor before reaching the surface flow of the unnamed gulch or Swamp Canyon. A test at the portal revealed **pH = 6.00 and conductivity = 644 μ S**. A test at the toe of the dump showed little change, with **pH = 6.65 and conductivity = 649 μ S**. The adjacent unnamed gulch was tested twice and sampled just above adit #100. In June, the flow was estimated at 1,000 gpm, **pH = 4.78, and conductivity = 403 μ S**; in August, the flow was measured to be 86 gpm with **pH = 3.35 and conductivity = 515 μ S**. Stream water, virtually unaffected by mining with only a few small mining features above the sample site, exceeded state standards in iron, aluminum, manganese, and zinc concentrations, as shown on the table below. The stream had a light red precipitate in August. The basin between this gulch and the surface flow in Swamp Canyon is swampy and has several beaver ponds with bluish hues and significant quantities of white precipitate. The precipitate may be a result of the ponds being fed with aluminum-rich groundwater originating from this gulch.

Sample number 254/4192-1.306; hardness of stream water sample = 286 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	6300	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	1	50 (acute)	below standard
Iron (Trec)	2600	1000	2.6 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	6100	87*	70 x standard
Cadmium	0.4	0.4 (acute, Trec)	at standard
Calcium (as CaCO ₃)	100 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Chromium	<20	11	below detection limit
Copper	<8	5 (acute, Trec)	below detection limit
Fluoride	0.47 mg/L	2 mg/L* (Trec)	below standard
Iron	2500	300	8.3 x standard
Lead	<1	4 (acute, Trec)	below standard
Magnesium	8.8 mg/L	no standard	n/a
Manganese	1400	50	28 x standard
Nickel	<40	50 (acute, Trec)	below standard
Potassium	<2 mg/L	no standard	n/a
Silver	<0.2	0.1 (acute, Trec)	below detection limit
Sodium	4 mg/L	no standard	n/a
Sulfate	210 mg/L	250 mg/L	below standard
Zinc	160	50 (acute, Trec)	3.2 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

Feature #: 102

Environmental Degradation Rating: 3

This caved adit drains about 0.2 gpm of effluent which has deposited orange-red precipitate along its channel. The discharge seeped into the ground prior to reaching the surface flow of the adjacent unnamed gulch. A test at the portal revealed **pH = 3.24 and conductivity = 884 µS**. Stream water tested above this working showed **pH = 3.79 and conductivity = 390 µS** on a flow of about 300 gpm in June. Because of the unusual chemistry in this basin, a water test was taken from the stream above all known mines, near the mouth of a large alpine basin. The test result was **pH = 3.88 and conductivity = 288 µS** on a flow of about 300 gpm in June. Although more testing and sampling is necessary to quantify the situation, clearly this unnamed gulch is naturally acidic and is high in iron, aluminum, manganese, and zinc. Mine waters with higher conductivity probably have higher metals concentrations. The low discharge rate at the two draining mines probably minimizes any ill effects they might contribute to this naturally degraded stream.

Quad Name: **Ophir**

Site #: 254/4194-1.101

Site Name: North Chapman Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: This open adit is reached by a 4WD road that accesses the west and northwest sides of Chapman Gulch, north of the Ophir Pass Road. Adit #101 is shown as public, but most of the dump is private property according to the PBS quad. Adit #101 is flooded and is the headwaters for surface flow in Chapman Gulch. Mine discharge flowed along the east side of the dump and down a steep slope into Chapman Gulch, which was dry above this feature. The effluent had deposited abundant orange precipitate, especially at the adit level, and to a lesser extent, in Chapman Gulch. Two tests of the 520 gpm discharge averaged **pH = 6.85 and conductivity = 1,270 μ S**. A sample of the effluent exceeded state standards in iron, manganese, and sulfate concentrations, as shown on the table below.

Sample number 254/4194-1.301; hardness of effluent sample = 1657 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (Trec)	160	no standard	n/a
Antimony (Trec)	<1	6.0*	below standard
Arsenic (Trec)	3	50 (acute)	below standard
Iron (Trec)	2700	1850	1.5 x standard
Thallium (Trec)	<1	0.5*	below detection limit
Aluminum	<100	87*	below detection limit
Cadmium	<0.25	1.5 (Trec)	below standard
Calcium (as CaCO ₃)	620 mg/L	no standard	n/a
Chloride	<10 mg/L	250 mg/L*	below standard
Chromium	<20	11	below detection limit
Copper	<8	42 (Trec)	below standard
Fluoride	0.67 mg/L	2 mg/L* (Trec)	below standard
Iron	1500	300*	5 x standard
Lead	<1	75 (Trec)	below standard
Magnesium	26 mg/L	no standard	n/a
Manganese	2200	1000	2.2 x standard
Nickel	<40	50 (Trec)	below standard

The collar of the shaft was not accessible because the headframe has partially collapsed. A subsidence feature about 15' in diameter and 8' deep is on the bench of the dump about 70' northwest of the shaft.

Some of the most dangerous features of this site are discussed in the **Physical Hazards** section below.

Quad Name: **Telluride**

Site #: 256/4204-1

Site Name: Smuggler

Description and pertinent facts: These features are in Marshall Basin and are accessed by a 4WD road branching off the Imogene Pass Road. A locked gate is located a short distance up the road, and the combination may be obtained from the office at the Idarado Mine near Telluride. The PBS quad shows these features to be on the borderline between public land and patented mining claims owned by Idarado. An ownership map in the Idarado office shows no public land in this area, so record searching and surveying is necessary to determine ownership. In the basin below these features, Idarado has done considerable reclamation work, mostly in the realm of drainage control. Several concrete diversion ditches have been recently constructed, apparently to minimize surface water contact with the many large, sulfide-laden dumps in Marshall Basin. An open stope at this site is discussed in the **Physical Hazards** section.

Feature #: 200

Environmental Degradation Rating: 3

This dump is approximately 2,000 cubic yards and is composed mostly of sulfide-bearing fines and fragments of quartz-pyrite-sphalerite vein. The dump was spread across a major ravine, which has led to severe erosion by intermittent flow.

Feature #: 203

Environmental Degradation Rating: 3

This 500-cubic-yard dump originates from a caved shaft. The dump contains abundant pyritic vein material and has been severely eroded by two intermittent streams.

Quad Name: **Telluride**

Site #: 257/4196-1

Site Name: Blue Lake

Description and pertinent facts: These features are most easily accessed by hiking around the west side of Blue Lake. They are located adjacent to the inlet stream on the south side of the lake.

Feature #: 206

Environmental Degradation Rating: 3

This dump is approximately 1,000 cubic yards and is located on the east side of the Blue Lake headwaters. Approximately 300 cubic yards were submerged by the lake during the inventory, but

higher water lines are present on the slope of the dump. The dump consists of a reddish-brown, fine-grained volcanic rock with several sulfides present. Water with **pH 6.89 and conductivity 0 μ S** drains from the adit at 6 gpm, crosses the dump, and flows into Blue Lake. Red precipitate has formed in the effluent channel on the dump surface.

Feature #: 208

Environmental Degradation Rating: 3

About 2 gpm of water with **pH of 5.8 and conductivity of 200 μ S** drains from adit #108 and deposits orange precipitate. The effluent is not in contact with the dump for more than 30', as it quickly drops into the main stream channel. Dump #208 is approximately 750 cubic yards and is also partly submerged by Blue Lake. Although similar, this dump has more fines and clay than #206. Sulfides are abundant, and significant amounts of granular pyrite are in the dump.

Quad Name: **Telluride**

Site #: 258/4201-1

Site Name: Argentine

Description and pertinent facts: These features are in Savage Basin adjacent to the Imogene Pass Road, at the abandoned mining town of Tomboy. The PBS quad shows these features to be on a block of public land nearly surrounded by patented mining claims owned by Idarado. Surveys are necessary to determine ownership boundaries accurately. Idarado has constructed numerous concrete drainage ditches in Savage Basin, and within the boundaries of this site, in efforts to minimize surface water contact with the many large dumps and tailings piles in the Tomboy area.

Feature #: 200

Environmental Degradation Rating: 3

This dump originated from a covered shaft and contains approximately 8,000 cubic yards of mostly of gray-green San Juan breccia, with lesser amounts of quartz-chalcopyrite vein fragments and sparse galena, sphalerite, pyrite, slag, and malachite. Savage Creek bisects and has partly eroded dump #200. Material on the south side of the creek has been regraded to a smooth slope, possibly to lessen the effects of high water and surface runoff. Water tests of Savage Creek upstream and downstream of this dump revealed **pH = 6.26 and conductivity = 085 μ S, and pH= 6.74 and conductivity = 120 μ S**, respectively, on a flow of about 1,000 gpm.

Feature #: 201

Environmental Degradation Rating: 3

This dump is from a snowfilled adit and caved shaft, contains approximately 30,000 cubic yards, and consists of nearly equal amounts of San Juan breccia and quartz vein fragments with all or some of the following metal-bearing minerals: pyrite, chalcopyrite, galena, sphalerite, and malachite. The northwest toe of the dump was discharging water at a rate of about 4 gpm. Small amounts of white precipitate have been deposited, and the water had **pH = 5.24 and conductivity = 560 μ S**. The discharge seeped into the ground about 70' downstream near some smelter(?) ruins and mill tailings. A discharge from the southwest side of the mill tailings had **pH = 6.38 and conductivity = 172 μ S** with a 15 gpm flow. Feature #201 is rated 3 because of its large size, abundance of sulfides, and the small amount of precipitate-depositing seepage.

Quad Name: **Telluride**

Site #: 258/4202-1.200

Site Name: Japan Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The Japan Mine is in Savage Basin near the Tomboy ruins. The workings are patented, but the dump is on public land according to the PBS quad. The Idarado Mining Company completed some reclamation on dump #200, suggesting it may be patented also. Two concrete culverts intended to carry the natural drainage and storm runoff have been built. The culverts allow water to pass over the dump without contacting the waste rock, which has abundant sulfides. This dump is approximately 25,000 cubic yards and is susceptible to rain-induced sheetwash despite the reclamation efforts. Water tests of the surface water above and below the mine, dump, and culverts had **pH = 7.10 and pH = 7.00**, respectively. Both tests had **0 μ S conductivity** on 150 gpm flow. Test results indicate no contamination of surface water during dry weather.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: **Gray Head**

Site #: 243/4205-1.101

Site Name: Deep Creek

Physical Hazard Rating: 2

Description and pertinent facts: This shaft is accessed from the Deep Creek Road and is easily accessible to tourists and local residents. A cylindrical steel wall 12' in diameter, which appears to be a tank from the side, surrounds the collar of shaft #101. The top of the cylinder is open to the shaft, which has water about 15' below the top of the cylinder. Because no ladder is in the main part of the cylinder, if someone fell in, it would be impossible to scale the sheer walls to get out. According to Steve Wells of the Forest Service, this site has a current permit and is not liable for reclamation or closure activities while considered "active." Nevertheless, this site is dangerous to the public.

^^ New Quad ^^^

Quad Name: **Mount Wilson**

Site #: 240/4194-1.100

Site Name: Morningstar

Physical Hazard Rating: 2

Description and pertinent facts: This open adit is accessed by the Bilk Basin trail and is about 2 miles from the trailhead. The trail is a popular route into the Lizard Head Wilderness, and the mine is near the edge of the Wilderness. The portal is 8'x 8' with fractured rocks that appear unstable. Depth of the adit is at least 20', and the 1,000-cubic-yard dump suggests it is considerably more. This is the lowest, most visible, and most easily accessed of the open adits at this site.

^^ New Quad ^^^

Quad Name: **Ironton**

Site #: 258/4199-1.100

Site Name: Ingram Basin North

Physical Hazard Rating: 2

Description and pertinent facts: This adit is adjacent to Ingram Lake, a popular camping spot for summer recreationists traveling on Black Bear Road. The adit is 7'x 4', is 75' deep, and is driven in San Juan Formation rocks.

^^ New Quad ^^^

Quad Name: **Ophir**

Site #: 247/4192-1.100

Site Name: Northwest Yellow Mountain

Physical Hazard Rating: 2

Description and pertinent facts: Adit #100 is located close to the Matterhorn Drifts. It has a small dump, but is partly collapsed and is driven in incompetent Telluride Conglomerate or San Juan breccia. The opening is 4'x 7', and the adit is at least 30' deep. It is located near an old road and well-worn hiking trail used to access the Yellow Mountain area.

^^ New Quad ^^^

Quad Name: **Telluride**

Site #: 249/4195-2.100

Site Name: Black Warrior Mine

Physical Hazard Rating: 2

Description and pertinent facts: This adit is east of Wild Boy Lake on an old 4WD trail that can be accessed from Alta. It is not draining any water and appears to be in competent rock. The adit has a large, unlocked gate across the opening, which is 9'x 10' and at least 100' deep. Adit #100 received a PHR of 2 because of its proximity to the town of Alta, a high public use area.

Quad Name: **Telluride**

Site #: 252/4197-1.100

Site Name: Delta

Physical Hazard Rating: 2

Description and pertinent facts: This open adit has a 4'x 3' portal and is at least 15' deep. It is located near the intersection of the immensely popular Bear Creek trail and a trail from Gold Hill. The portal is quite visible and is driven in fractured, weathered, unstable rock. Other open adits at this site are either further from trails, not easily visible or accessible, have more stable portals, or have a combination of those characteristics.

Quad Name: **Telluride**

Site #: 252/4197-2

Site Name: Nellie Mill

Description and pertinent facts: Both of these features are within 50' of the popular Bear Creek trail that originates in Telluride. The features are in the upper basin just below the confluence of the Lena Basin drainage and East Fork.

Feature #: 110

Physical Hazard Rating: 2

Adit #110 is in the stream channel, but the water is diverted around the adit and dump. The portal is 5'x 3', and the adit is 40' deep and is driven in incompetent rock.

Feature #: 111

Physical Hazard Rating: 2

This shaft or subsidence feature probably resulted from caving of the thin overburden above adit #110. The dimensions are 6'x 6' and 8' deep. The feature is well hidden by the surrounding vegetation and would not be anticipated by most hikers.

Quad Name: **Telluride**

Site #: 253/4196-1.102

Site Name: East Fork Bear Creek

Physical Hazard Rating: 2

Description and pertinent facts: This open, but partly caved adit has a 5'x 8' portal and is 20' deep. It is easily visible and accessed from the popular Wasatch trail. The portal has several loose, large slabs that pose a serious danger to anyone who might enter.

Quad Name: **Telluride**

Site #: 253/4197-1.103, 104

Site Name: La Junta Basin

Physical Hazard Rating: 2

Description and pertinent facts: Two prospect pits with small dumps are in upper La Junta Basin close to the western stream channel. Feature #103 is 5'x 10' and 10' deep, and #104 is 4'x 8' and 6' deep. Both prospects are hazards to backcountry skiers and unaware hikers.

Quad Name: **Telluride**

Site #: 254/4195-1.100

Site Name: Upper Bridal Veil Basin

Physical Hazard Rating: 1

Description and pertinent facts: Feature #100 is an open shaft on a moderate slope in upper Bridal Veil Basin. This site is accessible by 4WD vehicle, and Bridal Veil Basin is frequently hiked and probably skied in the winter. Water lies approximately 10' below the 12'x 8' collar. This feature cannot be seen until you are within 5' of the collar. Old timbers floating in the water, combined with degrading walls, enhance the danger.

Quad Name: **Telluride**

Site #: 254/4206-1.100

Site Name: Sneffels Highline Trail

Physical Hazard Rating: 2

Description and pertinent facts: In Pack Basin, the recently built and popular Sneffels Highline Trail comes within 50' of open adit #100. Although the surrounding rock looks competent, the adit remains dangerous to hikers who decide to venture inside. The portal is 5'x 4', and the adit is at least 50' deep.

Quad Name: **Telluride**

Site #: 255/4196-1.109, 209

Site Name: Bridal Veil Creek and Trail

Physical Hazard Ratings: 2

Description and pertinent facts: Features #109 and #209 are an open shaft and highwalls, respectively. These features are located close to the 4WD road coming from Blue Lake and are close to the dump for the Dorrit Mine. Shaft #109 has water 5' below the 6'x 4' collar. Parallel 10' vertical highwalls (feature #209) of equal length are on opposite sides of the shaft. These are serious hazards in this frequently hiked area.

Another open shaft exists downstream, close to dump #205 of this inventory area. This shaft is on private land and was not inventoried, but should be mentioned. It is 5'x 8' at the collar and tapers down to nothing about 40' below the surface.

Quad Name: **Telluride**

Site #: 256/4195-2.103

Site Name: Lewis Mine and Mill

Physical Hazard Rating: 2

Description and pertinent facts: This open adit has a 4'x 5' portal and is 50' deep. It is easily visible and accessed from the Lewis Lake trail in Bridal Veil Basin, and it is close to the Lewis Mill.

Although on private land and not inventoried, the Lewis Mill is within this inventory area. The mill is a historic site, with much of the original equipment still recognizable. The exterior is in fairly good repair, but the interior should be considered dangerous because of rotting floors with considerable vertical drops below them. Broken barrels with light tan crystals and marmot remains are located on one level. According to Eric Jacobsen, owner of the Bridal Veil Falls power station, the barrels contained cyanide salts used in the milling process. Because of its historical stature and the picturesque surroundings, this area is frequented by hikers, history buffs, and mining enthusiasts.

The dump associated with the shaft at the Lewis Mine is discussed in the **Environmental Degradation** section.

Quad Name: **Telluride**

Site #: 256/4198-1.101, 102, 103

Site Name: Royal Mine

Physical Hazard Ratings: 2

Description and pertinent facts: According to the PBS quad, this series of open adits is on public land, and a series of adits within 70' to the north are on private land. Accurate surveying is necessary to determine which workings, if any, are on public land. Dumps for these workings are easily visible and accessible by the popular Bridal Veil trail. The adit openings range from 8' to 10' in height, and 4' to 6' in width, and appear to have been driven to intersect a vein lying about 60' to the north. All of the adits are at least 30' long, but the actual depths could not be determined from the surface. Any closure efforts should include the adits on adjacent private land. Eric Jacobsen, owner of the nearby Bridal Veil Falls power station, expressed concern that bears hibernate in some of the adits in the region, and that future closures could have adverse impacts on the bears.

Quad Name: **Telluride**

Site #: 256/4202-1.100

Site Name: Near Bullion Mine

Physical Hazard Rating: 2

Description and pertinent facts: This open adit has a 5'x 6' portal and is at least 50' long. It is easily visible and accessed from the popular Imogene Pass Road. Although the portal looks stable, strong air flow suggests that this mine has multiple levels and at least one additional opening to the surface. A winze within the adit could pose a serious danger to unaware explorers with inadequate lights.

Quad Name: **Telluride**

Site #: 256/4204-1.102

Site Name: Smuggler

Physical Hazard Rating: 2

Description and pertinent facts: This feature in Marshall Basin appears to be an open stope with a 15'x 4' opening. It is at least 15' deep and has a snowbank that obscures parts of the floor. The stope is shown on the PBS quad to be on the borderline between public land and patented mining claims owned by Idarado. An ownership map in the Idarado office shows no public land in this area, so record searching and surveying is necessary to determine ownership. Although a locked gate near the Imogene Pass Road prevents the public from driving close to the site, Marshall Basin does receive moderate foot travel. Because feature #102 has no associated dump and vertical side walls, this stope is not easily visible until an individual is quite close.

Other features in this inventory area are discussed in the **Environmental Degradation** section.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
SUMMARY REPORT**

for the

UNCOMPAHGRE NATIONAL FOREST

OURAY RANGER DISTRICT

January, 1997

by

Douglas A. Fehlmann

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle	
x	by (in dimension measurements) or times (when factoring ion concentrations or	radioac
cps	counts per second	
CR	County Road	
°	degree	
÷	divided by	
DMG	Division of Minerals and Geology (Colorado Department of Natural Resources)	
EDR	Environmental Degradation Rating	
E.P.A.	Environmental Protection Agency	
=	equals	
'	feet	
FR	Forest Road	
FT	Forest Trail	
4WD	four-wheel drive	
gpm	gallons per minute	
<	less than	
µg/L	micrograms per liter	
µ	microns	
µS	microSiemens	
mg/L	milligrams per liter	
Mt.	Mount	
Mtn	Mountain	
NST	non-system trail	
n/a	not applicable	
no.	number	
#	number	
p.	page(s)	
ppm	parts per million	
%	percent	
PHR	Physical Hazard Rating	
PBS	Primary Base Series	
quad	quadrangle (7.5-minute)	
St.	Saint	
SH	State Highway	
topo	topographic map	
trec	total recoverable	
U.S.	United States	
USFS	United States Department of Agriculture - Forest Service	
BLM	United States Department of Interior - Bureau of Land Management	
v.	volume	

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
SUMMARY REPORT
UNCOMPAHGRE NATIONAL FOREST -- OURAY RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Ouray Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are identical for the first 4 digits, which represent the Forest and Ranger District. These sites are all in Forest 04 (Uncompahgre), and Ranger District 06 (Ouray).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered (raw) water samples for laboratory analyses were collected from selected mine discharges and natural waters in order to better determine environmental effects of mine drainage. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

Except where specific references are cited, most of the geologic information in this report is summarized from several sources that are listed in the **Selected References** section at the end of this report.

The geology of the Ouray Ranger District consists of Paleozoic and Mesozoic sedimentary rocks overlain by volcanic and volcanic-derived sedimentary rocks of Tertiary age. Intrusive dikes, sills, and laccoliths of pre-Tertiary and early Tertiary age are also present in the area. Two phases of mineralization are recognized in the district. The older phase is associated with pre-Tertiary intrusive rocks; and the younger, more economically important phase is identified with structural features and fluids that accompanied emplacement of the Tertiary volcanic sequence (Burbank and Luedke, 1968).

Cambrian rocks include quartzites and slates of the Uncompahgre Formation, exposed in Uncompahgre Gorge. The quartzites and slates are unconformably overlain by a late Paleozoic sequence: the Ouray Limestone of Devonian age; the Leadville Limestone of Mississippian age; the Pennsylvanian Molas and Hermosa Formations; and the Cutler Formation of Permian age. These formations crop out in Uncompahgre Canyon, along Ralston Creek, near Ouray, and in Canyon Creek.

Unconformably overlying the Paleozoic sequence are the Wanakah and Morrison Formations of Jurassic age, and the Cretaceous Dakota Formation. These rocks are exposed on the valley walls of Canyon Creek, the Uncompahgre River, Cutler Creek, Dexter Creek, Corbett Creek, and Oak Creek.

Pre-Tertiary intrusive rocks include dikes of andesite or diabase that intruded the quartzites and slates of the Uncompahgre Formation near the Uncompahgre River and Red Mountain Creek. A granitic sill, also of pre-Tertiary age, crops out near the confluence of Curran and Red Mountain Creeks. A late Mesozoic- to early Tertiary-age quartz monzonite laccolith porphyry, nicknamed the "Ouray Stock", occurs west of Ouray Amphitheater and is unconformably overlain by the Telluride Conglomerate and San Juan tuff. Dikes and sills of Early Tertiary age are composed of rhyolite, andesite, and latite.

In Tertiary time, the Telluride Conglomerate of Oligocene age (Burbank and Luedke, 1969), was deposited on a plateau of generally low relief. The Telluride Formation is widespread throughout the northern San Juan Mountains, where it caps older sedimentary rocks and has eroded into pinnacles and sharp ridges. The volcanic activity that formed the numerous calderas of the San Juans began in the vicinity of the Ouray Ranger District with eruption of the San Juan Tuff, of rhyodacitic composition. This was followed by the Silverton Volcanic Group, which includes the Picayune Formation. Tuffs of the Picayune crop out in and around Engineer Pass, Abrams, Hayden, and Brown Mountains, Mineral Point, and in upper Poughkeepsie Gulch. Overlying the Silverton Volcanic Group, the Potosi Volcanic Group consists of rhyolite and latite flows. These rocks are exposed on Engineer Mountain and along tributaries of the Uncompahgre River.

Limited deformation occurring in pre-Tertiary time consisted of domal uplift that produced monoclinical folds and faults in late Paleozoic time. Uplift took place again in late Mesozoic and early Cenozoic time, with structures following previously established trends. Widespread volcanic activity, intrusion, faulting, and formation of the San Juan cauldron complex occurred during the Tertiary (Burbank and Luedke, 1969). In the vicinity of the Ouray Ranger District, the complex consists of the San Juan and Uncompahgre Calderas, which were later overprinted by the Silverton and Lake City Calderas. The Eureka Graben is a northeast-trending tensional feature related to resurgent doming of the two older calderas. The graben formed at roughly the same time as collapse of the Silverton Caldera, but before formation of the younger Lake City Caldera (Steven and Lipman, 1976).

The following types of mineral deposits are found in the Ouray Ranger District: 1) vein, fissure or cavity fillings; 2) breccia-chimney; 3) breccia-dike; and 4) replacement. These deposits resulted from two periods of mineralization. Laccoliths in the late Mesozoic and early Cenozoic are associated with weakly mineralized fissures and blanket replacements. A later, more productive, period of mineralization occurred after caldera formation had caused widespread faulting. Vein deposits have been the most economic. Chimneys are found mostly in the ring fault zone of the Silverton Caldera. Few sedimentary replacement deposits are economic, except in the Telluride mining district.

Ouray Mining District

The Ouray mining district lies on the northern edge of the San Juan volcanic field. Some of the mines lie in and adjacent to the Ouray quartz monzonite stock and associated latite dikes and sills. Other mines have produced from the Paleozoic and Mesozoic sedimentary rocks and from Tertiary volcanic rocks. Most of the mines are located above the town of Ouray in Uncompahgre Canyon.

Near Ouray, production was mainly from sedimentary formations. The most favorable formations are: the top portion of the Leadville Limestone, the basal portion of the Molas Formation, the Pony Express Limestone Member of the Wanakah Formation, and the sandstone in the basal portion of the Morrison Formation. Metallic minerals were deposited in zones of high permeability, especially at contacts of porous formations with shales, and in veins and dikes that crosscut the sedimentary rocks.

Some mineral occurrences near Ouray formed from contact metamorphism and range from low-sulfide magnetite and lime-silicate ores to massive pyrite bodies that contain galena and sphalerite. Where carbonate rocks host replacement deposits, the extent of the replacement depends on the permeability that was created by the attack of hydrothermal solutions on the host rock. Oxidized ores are stained with limonite, goethite, and lepidocrocite.

Mines north of Ouray contain pyrite, sphalerite, galena, chalcopyrite, and tennantite in replaced Dakota Sandstone.

South of Ouray, most of the mines are located in the andesite tuffs and breccias of the San Juan Formation. This formation is a more favorable host rock than the Potosi Rhyolite Formation because its greater permeability and open fracture patterns facilitated hydrothermal fluid migration. Silver-lead-zinc minerals, along with argentiferous copper and ruby silver minerals, were the principal ore.

Red Mountain Mining District

The Red Mountain mining district is located in a setting of steep mountain slopes, precipitous peaks, and "U-shaped" glaciated valley floors. Most ore deposits are located in the mineral belt associated with the San Juan volcanic field and the Silverton Caldera complex. Ironton Flats separates the Red Mountain district from the Ouray mining district.

The Red Mountain mining district is located in the center of a structural basin that is termed the "Red Mountain Sag". This basin is bounded on the north by Ironton Park, on the south by Red Mountain Pass, on the west by Red Mountain and North Mineral Creeks, and on the east by the lower slopes of Red Mountains No. 2 and 3. Most of the mines in the district are located within or adjacent to the Silverton Caldera, and ore was produced mainly from the Henson and Burns Formations. Localized quartz latite porphyritic intrusions were emplaced within the two formations. Both these formations and the San Juan Formation are composed primarily of rhyodacitic flows, breccias, and tuffs. The San Juan Formation also contains the Gilpin Peak quartz latite tuff.

The Silverton and surrounding calderas provided the structural control for mineralization of the quartz latite porphyry intrusions. The calderas produced numerous zones of weakness by the action of subsidence and associated faulting and fracturing in the roofs of the magma chambers. These zones of weakness were the sites of recurrent igneous activity and related mineralization.

Chimneys and veins in igneous intrusions hosted significant ore deposits. These intrusions are a series of isolated volcanic pipes, centered mainly along a belt of altered and fractured rock in a zone of ring faults. The faults lie along the west and northwest sides of the Silverton Caldera. Igneous breccia pipes were also extensively mined. Ore shoots within the pipes and chimneys occur as irregularly shaped lenses and pods. They are composed of massive sulfides that were formed by open space filling in the upper cavernous parts of the pipes, and by hydrothermal replacement at depth. Vertical zoning of mineralization occurred in and around the pipes. Increasing with depth, mineral assemblages are lead-rich to copper-silver rich to pyritic copper-arsenic ores. Principal sulfide minerals found in the deposits include pyrite, enargite, chalcopyrite, covellite, bornite, sphalerite, and galena. Associated economic minerals are

pyrargyrite, proussite, stromeyerite, tennantite, and free gold. Gangue minerals include alunite, barite, fluorite, zunyite, diaspore, and pyrophyllite. Silicified rocks grade to argillic rocks and then to quartz-illitic rocks with increasing depth within the pipes.

Lead, iron, and zinc sulfides and sulfates, silver sulfosalts, and sulfobismuthates were concentrated within the faults and fracture zones. Rich veins containing these minerals were mined on the northwest side of the caldera. Typically, iron-bearing minerals such as marcasite, pyrite, chalcopyrite, pyrrhotite, pentlandite, cobaltite, enargite, tetrahedrite, and arsenopyrite are more abundant in the Red Mountain mining district than in surrounding districts. Some of these minerals are more reactive to chemical, physical, and biological weathering than other base metal sulfides.

**USFS ABANDONED MINE LAND INVENTORY PROJECT
UNCOMPAHGRE NATIONAL FOREST -- OURAY RANGER DISTRICT**

NUMERICAL SUMMARY:

138 field forms

658 mine openings inventoried (includes collapsed or filled openings)

590 mine dumps, tailings piles, highwalls, etc.

341 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.

Number of features with EDR of 1 = 3

Number of features with EDR of 2 = 71

Number of features with EDR of 3 = 133

Number of features with EDR of 4 = 134

Number of features with EDR of 5 = 908

275 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 2

Number of features with PHR of 2 = 38

Number of features with PHR of 3 = 235

Number of features with PHR of 4 = n/a (see Field Guide, Appendix A)

Number of features with PHR of 5 = 973

**USFS ABANDONED MINE LAND INVENTORY PROJECT
UNCOMPAHGRE NATIONAL FOREST -- OURAY RANGER DISTRICT**

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site #; *=water sample collected. All sites in Forest 04; District 06	EDR
1) Upper Corkscrew Basin, Southwest Side	Iron-ton	*265/4198-1.100, 200; 103	1, 1; 2
2) Gray Copper Falls Adits	Iron-ton	266/4200-1.105; 205, 104, 204; 103	1; 2, 2, 2; 3
3) Adits Northwest of Virginus Mine	Telluride	*255/4206-1.204	2
4) Stopes and Adit East side of SH 550, North of Radium Spgs. Hot Pool	Ouray	*265/4212-1.100, 200	2,2
5) Morning Star Mine	Ouray	*264/4212-1.104, 105, 107; 102, 201, 204, 206, 207	2, 2, 2; 3, 3, 3, 3
6) Hawkeye Mine	Iron-ton	259/4206-2.100	2
7) Adits South of Crystal Lake, West Side of Red Mtn. Creek	Iron-ton	*265/4203-1.203; 102	2; 3
8) R.E. Lee Claims and area to the Northwest	Iron-ton	260/4198-1.200; 100, 101, 201	2; 3, 3, 3
9) Adits Between Lower Albany & Brooklyn Gulches	Iron-ton	266/4202-1.101; 201	2; 3
10) Bowl Area East of Red Mountain No. 2	Iron-ton	264/4198-4.104	2
11) Carbonate King Mine and Vicinity	Iron-ton	264/4198-3.104; 102, 202, 206, 107, 207, 209	2; 3, 3, 3, 3, 3, 3
12) Gray Copper Creek Basin, (East Side)	Iron-ton	266/4198-1.102, 103, 104, 106; 105	2, 2, 2, 2; 3
13) Vernon Mine & Vicinity	Iron-ton	266/4199-1.101, 201, 102, 110; 100, 200, 204	2, 2, 2, 2; 3, 3, 3
14) Upper Hendrick Creek (Guadalupe & Dallas Mines)	Iron-ton	267/4204-2.100, 200, 101, 201, 103; 202, 203	2, 2, 2, 2, 2; 3, 3
15) Michael Breen Adits	Iron-ton	*268/4206-1.200; 100, 101, 201	2; 3, 3, 3
16) Upper Diamond Creek Adits	Iron-ton	*269/4206-1.101; 201	2; 3
17) Eurades Mine	Handies Peak	270/4205-2.100, 200	2, 2
18) Lower McIntyre Gulch	Iron-ton	*263/4201-1.100, 104, 200, 204	2, 2, 2, 2
19) Silver Mountain Mine and Vicinity	Iron-ton	*266/4201-1.103, 201, 203; 101	2, 2, 2; 3
20) Adits and Shaft East of Topeka Mine	Iron-ton	267/4201-2.103, 203	2, 2
21) Lower Gray Copper Creek	Iron-ton	265/4201-1.105, 205, 106, 206; 108, 208	2, 2, 2, 2; 3, 3

Site Name	Quad Name	Site #; *=water sample collected. All sites in Forest 04; District 06	EDR
22) West of Mineral Point Area, NST #11, Part 2	Handies Peak	270/4203-1.105, 106, 107, 110, 210; 104, 204, 205, 206, 207, 109, 209, 111, 211, 112	2, 2, 2, 2, 2; 3, 3, 3, 3, 3, 3, 3, 3, 3
23) Mineral Point, Part Three	Handies Peak	270/4203-2.100, 101, 102, 103, 110; 105, 111	2, 2, 2, 2, 2; 3, 3
24) Lower Poughkeepsie Gulch	Handies Peak, Ironton	*269/4204-2.103, 104, 105, 205; 102, 106, 203	2, 2, 2, 2; 3, 3, 3
25) Letcher Creek	Ironton	268/4203-2.101, 202; 102, 200, 201	2, 2; 3, 3, 3
26) Canadian Lake and Vicinity	Handies Peak	269/4202-2.104, 105, 110; 107, 207, 210, 114	2, 2, 2; 3, 3, 3, 3
27) Lower Silver Creek	Ironton	269/4202-1.105, 110; 101, 102, 103, 107	2, 2; 3, 3, 3, 3
28) Adits on Corkscrew Creek, Just Downstream of the Midnight Mine	Ironton	265/4199-3.100, 101; 201	2, 2; 3
29) Area North of Larson Brothers Mine	Ironton	265/4202-1.102, 202	2, 2
30) Chief Ouray Mine	Ouray	266/4212-2.200, 201	3, 3
31) Adits Nearest Cascade Ck.	Ouray	267/4212-1.201, 202	3, 3
32) Dumps Below Bachelor Mine on Dexter Creek	Ouray	*266/4216-2.100, 200, 201	3, 3, 3
33) Speedwell Mine/Twin Peaks Trail (FT # 208.1A)	Ouray	264/4212-2.200	3
34) Chrysolite/North Star Mines	Ironton	*267/4206-2.105, 202, 203, 204	3, 3, 3, 3
35) Connie Mines	Ironton	267/4206-1.100, 200	3, 3
36) Adits North of Mineral Farms	Ouray	*264/4210-1.101, 201	3, 3
37) Dunmore Mine	Ironton	266/4206-1.102	3
38) Adits on North Side of Knoll above headwaters of Sneffels Creek	Telluride	256/4208-1.105, 205	3, 3
39) Richmond Basin	Ironton	261/4203-1.102, 202	3, 3
40) Mines West of Silver Paint Mine	Ironton	266/4208-2.100	3
41) Upper Sneffels Creek Above Columnar Jointed Canyon	Telluride	256/4207-2.100	3
42) Spruce Box Mine and Vicinity	Ironton	267/4207-2.100	3
43) Adits & Prospect Pits North of McIntyre Gulch	Ironton	263/4202-1.103, 104, 203, 204	3, 3, 3, 3

Site Name	Quad Name	Site #; *=water sample collected. All sites in Forest 04; District 06	EDR
44) Lower Full Moon Gulch	Ironton	265/4203-2.102, 105, 106, 202, 206	3, 3, 3, 3, 3
45) Lost Day Mine and Vicinity	Ironton	267/4201-1.200, 201, 203	3, 3, 3
46) Adits on FR #886, Above the Town of Ironton	Ironton	265/4202-2.104	3
47) Midnight Mine and Vicinity	Ironton	265/4199-1.202, 203, 204	3, 3, 3
48) Sunset Mine and Vicinity Along NST #12	Handies Peak	271/4205-1.100, 200, 103, 104, 108, 208	3, 3, 3, 3, 3, 3
49) Adits West of Junction of FR #878 and FR #876	Ironton	268/4205-1.101, 105, 106, 107, 207	3, 3, 3, 3, 3
50) Maid of the Mist and Surrounding Area	Handies Peak	269/4204-1.102, 104	3, 3
51) Unnamed Drainage South of Moose Creek	Ironton	268/4203-3.100	3
52) Silver Creek Basin/ Upper Silver Creek	Ironton	268/4201-1.100, 200, 101, 201	3, 3, 3, 3
53) Old Lout Mine Water Tests	Ironton, Handies Peak	*269/4203-1.100, 200	3, 3
54) Corkscrew Basin, North Side	Ironton	264/4198-1.202, 203	3, 3
55) Red Mountain No. 1 Pass Area	Ironton	266/4198-2.101	3
56) Area North of R.E. Lee Claims on Unnamed Drainage "A"	Ironton	261/4198-1.102, 202, 204	3, 3, 3
57) Blaine Basin	Mount Sneffels	255/4211-1.100, 200	3, 3
58) Genessee and Dread Not Claims	Telluride	*256/4208-2.100, 201, 105	3, 3, 3
59) Adits just West of Eurades Mine along FR #878.1	Handies Peak	270/4205-3.100, 200, 102	3, 3, 3
60) Mineralized Area in Steep Canyon, South of Oak Creek Trail	Ouray	263/4210-1.201	3
61) Champion Mine	Ouray	265/4216-2.202	3
62) Sequin Mine and Vicinity	Ouray	262/4214-1.200	3
63) Adits Along Upper Sneffels Creek in Yankee Boy Basin	Telluride	*256/4207-1.103	4
64) Upper Bear Trail Above Yellow Jacket Mine	Handies Peak	*271/4207-1.300 (water sample)	n/a

Physical Mine Hazards

Site Name	Quad Name	Site # All sites in Forest 04, District 06	PHR
1) Maid of the Mist and Surrounding Areas	Handies Peak	269/4204-1.102	1
2) Gray Copper Creek Basin, East Side	Ironton	266/4198-1.103; 106, 107	1; 2, 2
3) Chief Ouray Mine	Ouray	266/4212-2.101	2
4) Plezy Mine	Ouray	265/4218-1.100	2
5) Cutler Creek (Northwest)	Ouray	265/4218-2.105	2
6) Stopes & Adit East Side of SH #550, North of Radium Springs Hot Pool	Ouray	265/4212-1.100	2
7) Speedwell Mine/Twin Peaks Trail (FT # 208.1A)	Ouray	264/4212-2.100	2
8) West of Box Canyon Area	Ouray	264/4210-2.102	2
9) Spruce Box Mine and Vicinity	Ironton	267/4207-2.101	2
10) Silver Mountain Mine and Vicinity	Ironton	266/4201-1.101	2
11) Adits and Shaft East of Topeka Mine	Ironton	267/4201-2.101	2
12) Lower Gray Copper Creek	Ironton	265/4201-1.108	2
13) Gray Copper Falls Adits	Ironton	266/4200-1.103	2
14) Adits on FR #886, above the Town of Ironton	Ironton	265/4202-2.103	2
15) Adits West of Junction of FR #878 and FR #876, on South Side of Uncompahgre River	Ironton	268/4205-1.105	2
16) Area West of Mineral Point, NST #11, Part 2	Handies Peak	270/4203-1.107, 110, 112	2, 2, 2
17) Mineral Point, Part Three	Handies Peak	270/4203-2.110	2
18) Letcher Creek	Ironton	268/4203-2.200	2
19) Canadian Lake and Vicinity	Handies Peak	269/4202-2.104	2
20) Upper Hendrick Gulch (Guadalupe & Dallas Mines)	Ironton	267/4204-2.100, 101	2, 2
21) Blaine Basin	Mount Sneffels	255/4211-1.100, 104	2, 2
22) Vernon Mine and Vicinity	Ironton	266/4199-1.100, 110	2, 2

Site Name	Quad Name	Site # All sites in Forest 04, District 06	PHR
23) Gray Copper Creek Basin, West Side	Iron-ton	266/4199-2.103	2
24) Bowl Area East of Red Mountain No. 2	Iron-ton	264/4198-4.102	2
25) Chrysolite/Northstar Mines	Iron-ton	267/4206-2.104	2
26) Pony Express Mines	Ouray	265/4215-1.102, 103	2, 2
27) Dumps Below Bachelor Mine on Dexter Creek	Ouray	266/4216-2.100	2
28) Daniel Bonanza Mine	Iron-ton	266/4208-1.101	2
29) Hawkeye Mine	Iron-ton	259/4206-2.100	2
30) Intermittent Drainage on Southeast Flank of U.S. Mountain	Iron-ton	260/4203-1.101	2
31) Grizzly Bear Mine	Iron-ton	267/4208-1.102	2
32) South Mineral Farms	Ouray	265/4209-1.100	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Handies Peak

Site #: 04-06-269/4202-2.104, 105, 110; 107, 207, 210, 114

Site Name: Canadian Lake and Vicinity

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: Canadian Lake and the cirque above it are accessed by NST #10. The foot trail switchbacks up the west-facing slope of Poughkeepsie Gulch and continues onto the north side of Canadian Creek. Features #100 to #105 and the respective dumps are located below the outlet of the lake on USFS-managed lands. The host rock in the area is rhyodacitic ash flow tuff of the Eureka Formation.

Feature #104 is an intact shaft measuring 7' long by 5' wide and 13' deep. The bottom 3' are filled with clear water. Water test #300 of the clear standing water inside feature #104 yielded a **pH of 4.2 and a conductivity of 100 μ S**. This shaft lies on the northwest side of the lake, 10' from the outlet. Feature #204 is a semi-circular dump containing 30 cubic yards of yellow waste rock. This dump is on the northwest side of the shaft and toes out next to Canadian Lake.

Several rich veins of pyrite and galena are exposed along Canadian Creek just below the lake outlet. Several exploratory adits explore these veins, which are found along both creek banks.

Feature #105 is one of these adits and is located about 30' above the south side of the creek. This adit has an intact entrance, and the drift extends over 35' along a quartz vein. An 18'-long trench connects the entrance to the top of a bi-level dump (feature #205), which contains about 90 cubic yards of waste rock. Clear water stands on the floor of the adit to a height of 8 inches, and then flows over the dump. Water test #301, taken inside feature #105, yielded a **pH of 4.3 and a conductivity of 100 μ S**. Part of the dump material from the lower level has slid over a 20' vertical wall of rock into Canadian Creek. The waste rock contains veins of galena and pyrite in a yellow-stained matrix.

Features #107 to #112 and the associated dumps are along the north slope that drains into the lake. Feature #107 is an intact adit with yellow moss and grasses growing in the 7'-long trench that connects the entrance to the top of dump #207. Mine water seeps out of the entrance and percolates through the 60 cubic yards of yellow waste rock before emptying into a channel that leads to the lake. A 2'-high berm at the entrance to adit #107 backs up clear mine water for a total length of 30' at a height of 2'. Water test #302, taken inside the entrance of feature #107, provided a **pH of 5.1 and a conductivity of 100 μ S**. Green filamentous algae and mosses can be found within the standing water and along the walls. Some orange precipitates occur on the walls, and thin deposits of sludge are present on the floor. Dripping water can be heard farther inside this adit. Feature #207 contains significant quantities of chalcopyrite, sphalerite, galena, and marcasite, along with minor amounts of rhodonite. The toe of the dump reaches the edge of a stream that flows into the lake from the east.

Feature #110 is directly above prospect pit #112, and they explore the same 4'-thick, black-stained mineralized vein. Adit #110 has an intact entrance, in which standing water is present to a height of 2.5', blocked by a slight berm. Scattered orange precipitates and sludge deposits can

be found on the floor and walls. Water test #303, taken from the clear standing water inside adit #110, yielded a **pH of 4.4 and a conductivity of 100 µS**. Mine water seeps out along an 8'-long trough before flowing out onto dump #210, which contains 40 cubic yards of rock. Effluents were seeping from the toe of the dump.

Feature #114 is an intact exploratory adit located 380' south and above the inlet to the lake. Water was draining out of the entrance at a rate of 0.5 gpm. The floor has standing water to a depth of 9 inches along the entire length of the adit, which is 17' to 20'. Green moss and pockets of orange precipitates occur above and within the mine water. Water test #305, taken inside feature #114, yielded a **pH of 5.9 and a conductivity of <50 µS**. Effluents run out over the top and face of 35-cubic-yard dump #214, and then into a drainage channel. This dump is completely stained red-brown from oxidizing iron sulfides, and the waste rock contains quartz veins. No other base metals were observed.

Canadian Creek flows into the lake at about 214 gpm. The riparian growth along the creek above the inlet shows some signs of yellowing in the grasses. NST #10 continues along the north and east slopes above the lake, then makes a series of switchbacks into Canadian Basin. This basin contains a cirque that is surrounded by scree slopes. In the center of the cirque lies a large dump and open adit which are on BLM-managed lands. A good portion of the headwaters of Canadian Creek originates from this adit. The peripheral edges of Canadian Lake, especially at the inlet, show orange staining in the shallow water, which is less than 3' deep. Although no trout were observed, this lake supports a healthy population of ferry shrimp. Water test #306 was taken at the outlet and showed the lake waters to have a **pH of 6.6 and a conductivity of <50 µS**.

Quad Name: Handies Peak

Site #: 04-06-269/4204-1.102, 104

Site Name: Maid of the Mist and Surrounding Area

Environmental Degradation Ratings: 3

Description and pertinent facts: Features that are discussed in this inventory area are located on USFS-managed lands along an unnamed drainage that discharges into the upper Uncompahgre River. The area is accessible by NST #11, either from Mineral Point or from FR #876.2 in Poughkeepsie Gulch. The inventoried features are hosted in blue-gray to blue-green, platy, banded latite flows of the Burns Formation.

Feature #102 is an open, intact shaft whose walls are lined with cribbing starting at a depth of 10' below the surface and extending down the total measured depth of 45'. At this point, an ice plug obstructs the bottom, preventing further access. The bottom may be some depth below this ice plug. This shaft was given an EDR of 3 based on the metal content of the waste rock of feature #202. Surface water flows into the shaft, although no water was seen nor heard at the bottom, suggesting that the underground workings drain at a lower level.

Feature #202 is a 340-cubic-yard dump that contains rock rich in disseminated marcasite, chalcopyrite, sphalerite, and pyrite. The face has deep gullies, and white streaks of salt deposits cover the toe and a 50' high series of benches and talus-mantled cliffs. The runoff from feature #202 filters through the scree material and enters the creek. The streambed shows no orange discoloration, although meadow grass below the toe of the dump is light yellow.

Feature #104 is a prospect pit located in a densely wooded conifer forest, about 220' from the east bank of the perennial creek. Orange-stained, vertical walls up to 14' in height occur on the northeast and west sides of feature #104. The bottom of this pit contains clear standing water to a depth of 1'. The pit is connected to a 17'-long trench that leads to the top of feature #204. Feature #204 contains 40 cubic yards of yellow waste rock of gravel- to cobble-size material. The bottom of the trench and the top of the dump are stained orange. Water test #301 was taken from the standing water of feature #104 and yielded a **pH of 5.7 and a conductivity of 200 µS**.

Quad Name: Handies Peak, Ironton

Site #: 04-06-269/4204-2.103, 104, 105, 205; 102, 106, 203

Site Name: Lower Poughkeepsie Gulch

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: All features of this inventory area are on USFS-managed lands. The inventory area consists of two clusters of adits located on both the east and west slopes of lower Poughkeepsie Gulch. Mine water from some of these adits flows into well-defined side drainages, which then converge with the upper waters of the Uncompahgre River. The features are fairly accessible and are within clear view of FR #876.2. FR #876.2 is a rough 4WD road that crosses Mineral Creek a short distance beyond the junction with FR #873. From this point on, FR #876.2 remains on the east side of the river until it crosses onto BLM-managed lands. Country rocks in the area are porphyritic andesite flows of the Burns Formation.

Feature #102 is a partly collapsed adit in which the entrance has been 2/3 blocked by material from feature #201. A partly filled, 12'-long trough extends from the entrance to the top of feature #202. A berm at the portal backs up clear mine waters to a height of 1.5'. Mine water seeps under the berm and flows along the trench to the top of feature #202. Buried mine timbers support the entrance to the adit and stabilize the ceiling against collapse. Intact mine timbers were laid beneath a pair of rusted track for the entire floor length of over 30'. Orange precipitates stain the walls and have accumulated on the floor. Water from the ceiling can be heard dripping into standing water farther back in this adit. Water test #302, taken inside feature #102, yielded a **pH of 6.0 and a conductivity of 200 µS**.

Feature #201 is a dump that contains 53 cubic yards of rock. A dense mat of bright green moss and conifer saplings grows on top of this dump. No water could be seen seeping from the toe. The yellow gravel- to cobble-size waste rock is composed of about 60% base metals consisting of chalcopyrite mixed in veins of pyrite.

Feature #103 is an intact adit containing a 20'-long, wooden beam headframe at the entrance. A 2' high berm has backed up mine waters to a depth of 6 to 8 inches over a length of 45'. Water test #303 was taken inside feature #103 and provided a **pH of 4.0 and a conductivity of 200 µS**. Water sample #04-06-269/4204-2.310 was taken inside adit #103 on 8/15/95. Lab results, shown on the table below, reveal concentrations of aluminum, cadmium, copper, iron, lead, manganese, and zinc significantly exceed state standards. Mine water drains out from the berm and flows at a rate of 3 gpm down the trench and out onto the top of feature #203. The sidewalls and floor of this adit are stained red-orange, and the interior produces a strong odor of hydrogen sulfide. Some mine water seeps through the dump material, although the major portion flows down an

incised orange-stained drainage channel located on the face of feature #203 and out over FR #876.2. Feature #203 is a dump that contains about 70 cubic yards of rock. The top of feature #203 is almost entirely stained orange-red, and two drainage channels run down the face. The distance from the toe to the river is about 220'. The waste rock is mostly gravel- to cobble-size material consisting of marcasite, pyrite, and chalcopyrite.

Feature #104 is a partly filled 40' adit with the entrance 1/2 filled by colluvium. The clear water inside this adit is backed up over a distance of 15' to a height of 3 to 6 inches. Water test #304 was taken inside feature #104 and yielded a **pH of 3.9 and a conductivity of 300 µS**. Throughout most of this adit, water drips onto the floor and runs down the walls, staining them orange. Abundant green lichens and moss grow on the floor and along the walls. Feature #204 is a dump that contains about 60 cubic yards of mostly of gravel- to cobble-size material rich in disseminated pyrite. Mine water drains over the dump via several severely eroded gullies, then flows into a perennial creek, staining its channel orange for a distance of over 30'. Rocks on the dump face and in effluent channels are also stained bright orange from mine water. Riparian growth along the banks of the perennial creek is healthy, and some aquatic life was noted on the surface waters. Water test #304 was taken 50' below the toe of dump #204, in the clear waters of the perennial creek. Results were **pH 6.7 and conductivity <50 µS**. Water test #305 was taken downstream in the same perennial creek, about 380' from the west side of the Uncompahgre River. Test results were **pH 6.7 and conductivity <50 µS**.

Feature #105 is a partly collapsed 80' adit. A berm at the entrance backs up mine water to a depth of 1.5'. Suspended orange solid masses are present at the top of the standing water, which also emits a very strong odor. The walls of this adit and the top of feature #205 are stained orange-yellow. Orange sludge has accumulated on the floor to a depth of 2 inches. Water test #306 was taken from standing water inside feature #105 and yielded a **pH of 5.7 and a conductivity of 200 µS**.

Feature #205 consists of 80 cubic yards of yellow waste material that was excavated from shattered and platy andesitic tuff containing about 40% disseminated pyrite. The upper face and top of dump #205 has a thick carpet of bright green moss and a dense thicket of green willow clumps. Several orange drainage channels are incised on the top and face of feature #205. Seven gpm mine effluent flows in these channels for a distance of 210' before entering the creek. At this point the streambed is stained an orange-red color for a distance of 350'. Water test #307 was taken in the side creek, adjacent to the toe of feature #205 and above where the mine waters converge into the creek. Results from the clear waters of the creek were **pH 7.0 and conductivity 50 µS**. The creek was flowing at a rate of 30 gpm, and no aquatic life was observed below the point where the mine effluent enters. Water test #309 was taken from the creek 200' below the toe of dump #205 and showed a **pH of 6.8 and a conductivity of 100 µS**. Red-brown mineralized outcrops occur above this point on the south side of the creek. Upstream, yellow veins crosscut outcrops of Telluride Conglomerate.

Feature #106 is a prospect pit (measuring 6' long by 5' wide by 15' deep) that contains blue-green standing water 5' deep. A 4' wide mineralized zone with pyrite veins crops out on the west wall and upslope. Abundant mosquito larvae live in the pit water. Water test #308, taken from feature #106, yielded a **pH of 6.5 and a conductivity of 100 µS**. Feature #206 is an elongated yellow dump containing 40 cubic yards of friable red-brown waste rock that was deposited in a dry gulch.

Features #100 to #103 and the associated dumps are located on the west-facing slope of Poughkeepsie Gulch, surrounded by dense stands of conifer. Mine waters from these features quickly dissipate into the porous soils and colluvium. The remaining features are located on the east side of Poughkeepsie Gulch, mostly on grassy rocky slopes over which mine waters flow directly into perennial creeks.

Sample #04-06-269/4204-1.310; hardness=77 mg/L; Uncompahgre River Basin segment #2

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	8	50 (acute)	below standard
Iron (trec)	21,000	1,000	21 x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	1,400	87**	16 x standard
Cadmium	4	0.92	4.3 x standard
Chromium VI	<10	11	below standard
Copper	140	9.5	15 x standard
Iron	20,000	300	67 x standard
Lead	12	2.7	4.5 x standard
Manganese	410	50	8.2 x standard
Nickel	<20	79	below standard
Silver	<0.2	0.05 (on 3/2/98)	below detection limit
Sulfate	170 mg/L	250 mg/L	below standard
Zinc	1,100	120	9.2 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Handies Peak

Site #: 04-06-270/4203-1.105, 106, 107, 110, 210; 104, 204, 205, 206, 207, 109, 209, 111, 211, 112

Site Name: West of Mineral Point Area, NST #11, Part 2

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: Features in this inventory area are accessible by NST #11 from Mineral Point or from Poughkeepsie Gulch. Most of NST #11 was once an old wagon road that provided access to the large mines located farther to the southwest, on BLM-managed lands, and also the adits of the rich Maid of the Mist silver mine.

The inventory area lies on the northwest portion of a large park, characterized by grassy meadows and sporadic ponds and marshes that are separated by small wooded ridges. All these features occur in green to light bluish-gray banded latite flows of the Burns Formation. The rock exposures contain numerous quartz veins with seams of black oxidized material rich in sphalerite, galena, marcasite, and pyrite. Many exploratory holes tested these veins, as shown by the density of prospect pits in the area and the closely spaced mine symbols on the Handies Peak

quad. Miners Creek, which bisects the park, drains most of the area and channels the runoff into a narrow gorge that contains several 30' to 60' high falls. The water then merges into Mineral Creek.

Feature #104 is an intact adit that is located on patented mining claims, although the water draining from feature #204 discharges into a pond on USFS-managed lands. The toe of dump #204 is also on USFS-managed lands. An ice plug at the north-facing entrance to adit #104 complicated measurements, although the floor of the adit was found to be approximately 20' long. Orange precipitates and sludges occur on the floor and in 6 inches of standing water underground. Feature #204 contains 52 cubic yards of waste rock that has massive amounts of iron sulfides. The toe and flanks of the dump are in contact with a surrounding marshy area. Red-orange precipitates have been deposited on the floor of the ponds and have coated the marsh grasses orange. Water test #304 was taken on USFS-managed lands from water flowing at a rate of 2 gpm on the east side of dump #204. The test yielded a **pH of 6.0 and a conductivity of 100 μ S**.

Feature #105 is an intact adit located on patented claims. Clear water flows from the adit, but leaves precipitates of orange ferrous hydroxide sludge on the floor of the adit, on dump #205, and in an adjacent pond. The mine water flows at a rate of 3 gpm over the top and down the northwest flank of feature #205, and into the pond. Feature #205 contains 45 cubic yards of gravel- to boulder-size waste rock high in iron, lead, and zinc sulfides. The toe of dump #205 extends into the pond. Water test #305 was taken in the pond located near the toe of dump #205 and showed a **pH of 4.0 and a conductivity of 100 μ S**.

Feature #106 is an intact adit containing a 3'-high berm at the entrance. This berm dams clear mine water for a distance of 20' and a depth of 2'. Orange precipitates have accumulated to a thickness of 1.5 inches on the floor and walls, and suspended solids occur in the mine waters. Water test #306 was taken in the standing water of adit #106 and provided a **pH value of 4.3 and a conductivity of 200 μ S**. Effluents that seep under the berm flow along an 18' trench and saturate the top of dump #206. Water drains from the flanks of dump #206 (estimated at 35 cubic yards) and into a meadow.

Feature #107 is an intact adit with a north-facing entrance. The adit is connected to a 55'-long, "V-shaped" trench that leads to the top of feature #207 (an elongate dump containing about 430 cubic yards). A perennial creek runs along the eastern flank of the dump. A smaller dump of about 10 cubic yards of high-grade marcasite and silver ore is piled along the eastern flank of feature #207 and is in contact with the creek. The entrance to adit #107 is partly blocked by sloughing of colluvium, damming mine water up to a depth of 1.5'. Water test #307 was taken in the clear water of adit #107 and provided a **pH of 5.1 and a conductivity of 100 μ S**. Mine water flows out of this adit on the east side of the berm at a rate of 5 gpm and discharges into the creek. Water enters the adit from a 2.5'-wide vein that crops out above the entrance. Feature #107 follows this vein more than 75' along a bearing of S.26°W. The streambed at the toe of the dump is lined with orange precipitates for a distance of 400' downstream. Water from the creek is clear and flowed at a rate of 25 gpm. Water test #308 was taken on the west bank of the creek below the toe of feature #207. Results were **pH 4.2 and conductivity <50 μ S**. Yellow grasses line the banks and lower marshy meadow. No signs of aquatic life were observed under the rocks or in the water of this creek. Farther downstream, ponds that are fed by this creek contain abundant mosquito larvae.

Feature #109 is an adit located south and farther up the same creek that flows adjacent to feature #207. The ceiling to this adit is partly collapsed 10' from the entrance, and debris dams mine water to a height of 1.5' for more than 25'. Water test #309 was taken inside adit #109, in a pool of clear water that contains orange precipitates and sludge deposits. Test results were **pH 4.0 and conductivity 100 µS**. The clear mine water flows over the top of feature #209 (a 45-cubic-yard dump) at a rate of 1.5 gpm, creating an orange-stained corridor on the face of this dump and staining the creek bank red-orange for a distance of 200' downstream. Rich veins of botryoidal marcasite and cuprite occur in the yellow rock found on dump #209.

Feature #110 is a partly collapsed 18'-deep shaft with intact cribbing. The shaft probably exposes the same vein mined at adit #109. Snow-covered timbers obscured the bottom of the shaft. Feature #210 contains about 110 cubic yards of yellow waste rock consisting of blue latite with numerous veins of marcasite within a vuggy quartz matrix. The latite is badly fractured and stained yellow-brown. Clear water flowing from the toe of feature #210 has stained this area and the streambed red-brown. Water test #310 was taken at the toe of dump #210 and yielded values of **pH=4.0 and conductivity=200 µS**.

Feature #111 is a circular prospect pit (16' long by 11' wide by 4' deep) that contains standing, brown water 2' deep. Water test #311 was taken from prospect pit #211 and provided a **pH of 4.7 and a conductivity of 100 µS**. A crescent-shaped yellow dump (feature #211) surrounds the pit and measures 18' long by 4' wide. Feature #211 contains approximately 15 cubic yards of disseminated iron sulfide-rich waste rock and is adjacent to a marshy meadow.

Feature #112 is a circular prospect pit (5' long by 5' wide by 12' deep) that contains vertical walls and has standing water to a depth of 4' to 5'. Water test #312 from the pit showed a **pH of 4.5 and a conductivity of 100 µS**. Orange precipitates coat the walls of this pit. Dump #212 contains 35 cubic yards of rock with veins of galena, marcasite, and pyrite in a black-stained quartz matrix.

Quad Name: Handies Peak

Site #: 04-06-270/4203-2.100, 101, 102, 103, 110; 105, 111

Site Name: Mineral Point Part 3

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: This inventory site encompasses a cluster of prospect pits and one shaft. These features lie on the northwestern portion of a large grassy park on USFS-managed lands. This park contains outcrops of platy, banded latite flows of the Burns Formation that have locally undergone intense fracturing, alteration, and mineralization.

Prospect pits #100 and #101 share a common mineralized outcrop, rich in marcasite and pyrite. Pit #100 is 12' deep, and #101 is 8' deep. The rocks in dumps #200 and #201 show a black metallic sheen, and some are stained yellow-orange. The black staining may be from manganese. Feature #200 contains 25 cubic yards, and feature #201 contains 15 cubic yards. Clear, standing water occurs in pits #100 and #101 to heights of 4' and 1.5', respectively. Orange suspended solids and precipitates are in the water and have stained the walls of both pits bright orange. Water test #301 was taken from pit #101 and yielded values of **pH 3.8 and conductivity 100 µS**.

Mosquito larvae were observed in the standing water of pit #100. Water test #300 was taken from pit #100 and yielded values of **pH 3.5 and conductivity 400 µS**. The surface water in the adjacent meadow is in contact with both dumps.

Feature #102 is a rectangular pit filled with brown water to a depth of 5'. Water test #302, taken from the standing water, provided a **pH of 4.2 and a conductivity of 100 µS**. Feature #202 is a dump that contains 15 cubic yards of yellow rock that has disseminated marcasite and pyrite. The sidewalls of this pit are stained orange along their entire length. Sludge deposits have built up around the lip of this pit and have stained the top of dump #202. Feature #102 lies 200' from the east bank of a creek.

Feature #103 is an elliptical prospect pit that is filled with orange-brown water to a depth of 2'. It is 450' from the east bank of the creek mentioned above. Mosquito larvae were observed in the stagnant waters of feature #103. Water test #303, taken from pit #103, yielded a **pH of 5.3 and a conductivity of <50 µS**.

Feature #105 is a circular pit located on a north-facing slope. The north and east slopes of this pit are stabilized by logs, and the south and east walls are vertical and are 5' to 7' high. Brown, standing water 2.2' deep reaches to 1' below the lip of this pit. Water test #304, taken from feature #105, provided a **pH reading of 5.6 and a conductivity of <50 µS**. The water level fluctuates, indicated by orange staining that occurs up to 8 inches above the present level. At higher levels, the pit water flows out over the top of feature #205 and stains it orange. Feature #205 contains 65 cubic yards of gravelly waste rock, rich in marcasite and disseminated pyrite.

Feature #110 is an open intact shaft located southeast and upstream along an unnamed stream, approximately 800' above the cluster of previously described features. The estimated depth of the shaft is 25', and water fills the shaft to within 3' of the surface. Water test #306 was taken from shaft #110 and yielded a **pH of 4.9 and a conductivity of 100 µS**. A decayed log frame supports the shaft walls, which are stained orange. The toe region of feature #210 is also stained orange, suggesting water from the shaft is seeping out before it enters a dry gulch.

Feature #111 is an intact prospect pit with three 8' vertical walls. Clear, standing water is present to a depth of 15' and was seeping over the lip of the pit and saturating the top of feature #211. Water test #307, obtained from the water of feature #111, yielded a **pH of 4.9 and a conductivity of <50 µS**. Orange sludge has accumulated around the lip of the pit and has stained the walls below the water surface. Water is seeping out of the toe of feature #211, a dump which contains 30 cubic yards of yellow, gravelly rock rich in pyrite.

Feature #112 is an intact adit with an ice plug at its entrance. A vein of marcasite and chalcopyrite (estimated width of 6 inches) occurs above the entrance, and a drift, estimated at 25' in length, follows this vein along a bearing of S.32°E. Clear water drains out along the orange-stained floor at a rate of 3 gpm and into a perennial creek located 50' to the southwest. Water test #308, taken at the entrance of feature #112, showed **pH of 4.5 and conductivity of 200 µS**. Mine water flows over the top and along the southwest flank of feature #212 and discharges into the creek, staining the banks for a distance of 75' downstream. The creek was flowing at a rate of 25 gpm.

Quad Name: Handies Peak

Site #: 04-06-270/4205-2.100, 200

Site Name: Eurades Mine

Environmental Degradation Ratings: 2

Description and pertinent facts: The Eurades Mine and the surrounding adits in an unnamed drainage basin are found north of FR #878.1. The workings are hosted in banded latite flows of the Burns Formation. Collapsed adit #100 and most of associated dump #200 are situated on patented mining claims. A wedge of USFS-managed lands is along the toe of this dump, surrounded by patented claims. The USFS-managed lands encompass part of the stream corridor along Mineral Creek. Water tests were taken at several places along the toe of the dump. Water tests were also taken in Mineral Creek at locations above and below where effluent is entering the creek. A water test was taken at the entrance of feature #100 for comparison purposes.

The entrance to feature #100 is collapsed, and some portions of the headframe are exposed beneath the rubble. Clear water flows from the Eurades adit (feature #100) and deposits yellow and black sludge in the nearby stream. Water flows at a rate of 25 gpm during the spring, when this site was first inventoried, and was estimated to be 15 gpm during the fall. Water test #304, taken at the adit entrance, yielded values of **pH=3.8 and conductivity=400 µS**.

Feature #200 contains an estimated volume of 1,200 cubic yards of waste rock. The large dump size suggests extensive underground workings that may interconnect with drifts from adits located farther up an unnamed perennial stream. North of adit #100, five other adits and associated dumps are present in or along the flanks of this stream. Metal pipes (2.5 inches diameter), mine track, boards, and sheet metal lie on top of feature #200. Approximately 70% of the waste rock found on feature #200 consists of gravel- to sand-size yellow material enriched in pyrite.

Mine water from feature #100 flows over the top of the three interconnecting dump piles of dump #200, and into channels on the east and west sides of the dump. Yellow precipitates coat the drainage corridor and the top of the dump. Water tests were taken in the effluent channels. Water test #303 from a channel on the eastern flank yielded a **pH of 4.8 and the conductivity level was 200 µS**. Water test #302 from a channel on the western flank yielded a **pH of 6.4 and a conductivity reading of 100 µS**. The effluent channels then traverse FR #878.1 and converge in a marshy area just north of Mineral Creek. Water from springs along the cut bank troughs on the north side of FR #878.1 mixes with mine effluent. In addition, water emanates from the toe of the dump #200 in several locations. Water tests #300 and #301 were taken at the toe of the dump, where FR #878.1 runs parallel to it. Results of these two tests were **pH 6.1 and 3.9, conductivity 100 µS and 400 µS**, on flows of 5 and 3 gpm, respectively. White crusts of salt deposits form on the road surface and on the grasses, bushes, and shrubs growing in the marsh. Yellow and orange solids, and patches of frothy foam collect in the braided drainage corridors that discharge into the marsh.

Water test #303 was taken below this marsh. This test location is about 15' from the north bank of Mineral Creek, and the water had **pH of 4.8 and conductivity of 200 µS**. Riparian plants showed yellowing and signs of being stressed. The yellowed riparian corridor starts at the marshy area and continues downstream into Mineral Creek for a distance of over 200'.

Upstream of the confluence with mine water from adit #100, Mineral Creek contains clear water and supports a healthy population of aquatic life. The mosses, grasses, willows, and conifers that grow within the riparian corridor are green, as is the foliage that grows along the creek banks. Water test #305 was taken along the north bank of Mineral Creek, approximately 300' upstream of the confluence with the mine water. This test yielded a **pH of 7.2 and a conductivity of <50 µS**.

Quad Name: Handies Peak

Site #: 04-06-270/4205-3.100, 200, 102

Site Name: Adits just West of Eurades Mine along FR #878.1

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area straddles Mineral Creek below its confluence with Miners Creek and above a box canyon. Adit #100 may be on patented land, and adit #102 almost certainly is.

Adit #100 is an open adit over 30' long with 2' of standing water on the floor. About 0.4 gpm water is seeping from the portal and draining across and seeping into associated dump #200. Water in the mine had **pH=5.3 and conductivity<50 µS**.

Dump #200 is about 30 cubic yards and is adjacent to Mineral Creek. Water seeping from the toe at 1.5 gpm had **pH=5.0 and conductivity=100 µS**.

Adit #102 is open and inclined steeply downward inside the portal. The adit is at least 25' long and has standing water 1' deep at the bottom. The walls and floor have orange-red precipitate. The water in the adit had **pH=5.0 and conductivity=200 µS**.

Quad Name: Handies Peak

Site #: 04-06-271/4205-1.100, 200, 103, 104, 108, 208

Site Name: Sunset Mine and Vicinity along NST #12

Environmental Degradation Ratings: 3

Description and pertinent facts: The inventory area consists of a series of adits and prospect pits that are located on USFS-managed lands along two parallel perennial creeks that drain a south-facing slope. Both creeks discharge into Mineral Creek. All of the features are in grassy, terraced terrain covered by sub-alpine tundra vegetation. The inventoried features can be accessed by NST #12, for which the trailhead is located on the east side of FR #878.2. The host rock is andesitic tuff of the Burns Formation.

Feature #100 is a collapsed adit. The entrance may have been intentionally blasted shut. Clear water was flowing at 3 gpm along a set of buried mine tracks and over the top and west flank of dump #200. The effluent contained black precipitates, but mosses, phreatophytes, and grasses within the drainage corridor are a healthy green color. Water test #302 was taken at the entrance to adit #100 and yielded a **pH of 5.0 and a conductivity of 200 µS**. Dump #200 consists of 720 cubic yards of waste rock. Red-orange precipitates have been deposited by clear water that is flowing from the toe of feature #200 at a rate of 2 gpm and discharging into a pond. Water test

#301 was taken in the pond, which contains red-brown suspended solids and which is located at the southwest portion of the toe of dump #200. Values for this test are **pH 4.8 and conductivity 200 µS**. Approximately 370' below dump #200, the water draining from the pond joins with one of the perennial creeks. At this location the creek contains moderately stained orange sediments. Water test #300 was taken in a perennial creek that flows at 20 gpm along the eastern side of dump #200, from just below the toe. Test #300 yielded a **pH of 5.7 and a conductivity of <50 µS**.

Feature #103 is an intact adit that extends for 35' and contains about 6 inches of standing clear water on the floor. Orange precipitate was not found in this mine water or along the walls of the adit. Test #303 was taken from the water of adit #103 and provided a **pH of 5.3 and a conductivity of 100 µS**. Dump #203 contains low concentrations of base metals.

Feature #104 is an intact adit where clear water is draining at a rate of 7 gpm. The floor and walls are stained with black precipitates to a height of 8 inches above the floor. Water test #305 was taken inside adit #104 and yielded a **pH of 4.9 and a conductivity of 200 µS**. Outside, the mine water flows over the top of dump #204, down the eastern face, and joins the perennial creek, which was flowing at a rate of 15 gpm at this location. This is the same creek that flows past feature #200. Feature #204 contains 360 cubic yards of bright yellow gravel- to cobble-size waste rock. Metallic minerals on the dump consist of tetrahedrite, pyrite, and silver sulfides in a matrix of vuggy quartz contained in a host rock of banded tuffaceous andesite. This dump produces a strong odor of hydrogen sulfide and is saturated with effluents from adit #104. Some slumping is present at the toe of the dump, from which springs are flowing at a rate of 5 gpm. The springs have stained the streambed bright orange. Water test #304 was taken at the toe of feature #204 and yielded a **pH of 5.0 and a conductivity of 300 µS**. Green moss and riparian growth line the drainage banks below dump #204; however, no aquatic life was observed downstream of the toe of this dump for over 500'.

Feature #108 is a collapsed adit whose entrance is marked by a conical depression that is partly filled with colluvium derived from upslope sloughing. Dump #208 contains about 50 cubic yards of waste rock. Clear water drains from the entrance of the adit at a rate of 2 gpm and flows over the top and west face of feature #208 into a second perennial creek. Water test #307 was taken at the entrance to adit #108 and provided a **pH of 5.0 and a conductivity of 100 µS**. Dump #208 is located 10' from the eastern bank of the perennial creek. Water also drains from the toe of dump #208, suggesting that most of the waste rock is saturated with mine water. Test #308 was obtained from water draining out of the toe of dump #208 and yielded values of **pH 4.8 and conductivity 200 µS**.

The adits in this inventory area follow localized veins (8 inches to 2' wide) consisting of highly fractured, laminated, iron-stained, andesitic host rock. The veins are exposed in the two perennial streams. Features #102, #106, and #109 are exploratory pits and associated small yellow dumps that mark the locations of these veins. The two perennial streams are mostly in open grassy slopes, but the lower reaches of these creeks expose large areas of orange-brown mineralized rock.

Quad Name: Handies Peak

Site #: 04-06-271/4207-1.300

Site Name: Upper Bear Trail Above Yellow Jacket Mine (water sample only)

Environmental Degradation Rating: n/a

Description and pertinent facts: This inventory area lies along both sides of FT #241.1 (Bear Creek Trail) above the confluence with Horsethief Creek and FT #215 (Horsethief Trail). This inventory site comprises features on both sides of Bear Creek, near its headwaters in a large basin below Engineer Pass (elevation 12,800'). The basin contains the north and south forks of Bear Creek. NST #12 joins FT #241 in the central part of the basin, between the forks. The basin is covered with alpine grasses and low-lying flowering plants.

The water of Bear Creek is partly cloudy until it merges with Horsethief Creek. The distance of stream reach from the headwaters to where Bear Creek merges with Horsethief Creek is about 2 miles. At water sample site #04-06-271/4207-1.300 (collected on 8/13/94), the water of the north fork is milky, and the streambed is covered with white precipitates. The streambed of the south fork is also stained white. White salt deposits form as crusts on the rocks and grasses along the creek banks up to the high water mark. White salt deposits are present on the rock surfaces approaching feature #101, at which point Bear Creek begins to clear, and the white precipitates begin to disappear.

Several prospect pits are on both sides of the north fork, on BLM-managed lands above the water sample site. These pits do not discharge water into the creek.

A large rock glacier toes out above and on the north side of these pits. Surface water runs over and percolates through the scree material of this rock glacier. Several small streams of milky water emerge from the toe of the rock glacier and flow into the north fork.

Rhyodacitic tuff of the Burns Formation forms cliffs along both sides of the north fork. Springs were observed on the cliff faces, staining the tuffaceous flows white with precipitates.

Water sample #04-06-271/4207-1.300 was taken on USFS-managed lands in the north fork of Bear Creek, approximately 220' below where FT #241 crosses the north fork drainage. The sample site is approximately 30' below feature #205, about 50' below the cliffs along the north fork, and approximately 130' below the springs on the cliff faces. This sample is not associated with any mine features, yielded a **pH of 4.6 and a conductivity of 400 μ S**, and represents the quality of water to be found in the north fork Bear Creek basin. Lab results for the water sample are shown below. This natural stream water contains high levels of dissolved aluminum and manganese, and also exceeded state standards for copper and zinc concentrations.

Sample #04-06-271/4207-1.300; hardness=160 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Arsenic (trec)	<1	50 (acute)	below standard
Aluminum	17,000	87**	195 x standard
Cadmium	0.04	1.6	below standard
Chromium VI	<10	11	below standard
Barium	22	1,000** (trec)	below standard
Beryllium	2	4** (trec)	below standard

Description and pertinent facts: The features of this inventory area are located in hummocky and terraced terrain in the vicinity of NST #21 and an unnamed stream designated as "B". The following described features are on USFS-managed lands and are adjacent to patented claims. The host rock consists of bedded, rhyolitic flows of the Burns Formation.

The entrance to adit #100 is filled. The adit trends N.44°W. along an 8'-wide zone of highly fractured, orange, mineralized breccia. Mine water drains from the entrance at a rate of 1 gpm over dump #200, which is coated with orange ferric hydroxides. Water test #300, taken at the entrance of adit #100, yielded a **pH of 5.2 and a conductivity of 400 µS**.

Dump #200 contains about 280 cubic yards of clay- to gravel-size waste rock that has a high pyrite content and seams of galena and sphalerite that are stained a red-brown color. Several yellow-stained drainage channels occur on the face and the flanks of this dump, suggesting the flow rate of effluent from adit #100 may be quite high at times. Green moss lines the drainage channels and part of the top of the dump. A strong sulfur odor emanates from the dump. Mine water drains from the northwest flank and toe of the dump and flows into a grassy "U-shaped" depression before emptying into a series of shallow ponds. The ponds drain into stream channel "B", where the streambed is stained bright red-orange for a distance of 150'. The upper two ponds receive fines transported in the mine water, while the grassy meadow appears to trap most of the larger size particles. The ponds that receive a major portion of seepage from adit #100 contain yellow and red-orange sludge deposits 2 to 6 inches thick. Water test #301 was taken from the lower pond and showed **pH of 4.3 and conductivity of 600 µS**.

Feature #101 is an adit that has a collapsed entrance and was driven in a yellow-orange mineralized zone. This feature is upstream of adit #100, along the orange-stained perennial creek "B". The entrance is 25' from the south bank of the creek. Water test #303 was taken from the water that flows out of feature #101 at a rate of 3 gpm and yielded a **pH of 5.4 and a conductivity of <50 µS**.

Dump #201 contains about 65 cubic yards of rock. The top and northeast flank of the dump are stained orange from the mine water from adit #101. One well-established drainage channel diverts most of the flow into stream "B". Patches of green moss grow along the length of the effluent corridor. Aquatic life was not found in stream "B". Water test #302 was taken 50' below dump #201 within stream "B". Results from this test were **pH 5.5 and conductivity 100 µS**.

Quad Name: Ironton

Site #: 04-06-261/4198-1.102, 202, 204

Site Name: Area North of R. E. Lee Claims on Unnamed Drainage "A"

Environmental Degradation Ratings: 3

Description and pertinent facts: Features #102 and #202 are on USFS-managed lands. Feature #102 is an adit with an entrance filled with colluvium. The entrance lies 90' from the south bank of the perennial stream designated as stream "A". This entrance is densely covered with phreatophytes that grow in a concave depression 5.5' wide by 8' long by 6' deep. Clear mine water seeps out of the entrance and deposits orange precipitates on top of feature #202, which contains approximately 48 cubic yards of gravel- and cobble-size rock saturated with mine water

rich in iron oxides. Water test #301 was taken adjacent to the portal of adit #102 from a small pool containing orange suspended solids. The **pH value was 5.2 and the conductivity level was 200 μ S.**

Feature #204 contains 890 cubic yards and is located on patented mining claims. The waste rock contains galena and sphalerite veins and microcrystalline pyrite stringers within blue-gray platy rhyolitic breccia of the Henson Formation. No water was draining from adit #104. The toe and southeastern flank of dump #204 are in contact with several shallow ponds located about 100' north of stream "A". Red-orange precipitates and sludge are present on the floor of the ponds and as crusts on the marsh grass. Water test #300 was taken in one of the ponds on public lands and yielded a **pH of 4.9 and a conductivity of 100 μ S.**

Quad Name: Ironton

Site #: 04-06-261/4203-1.102, 202

Site Name: Richmond Basin Adits

Environmental Degradation Ratings: 3

Description and pertinent facts: The entrance to adit #102 is filled with talus and flanked by 6' to 10' vertical walls of Picayune volcanic rocks. A mineralized outcrop of stained quartz and pyrite is exposed on the north wall in front of the adit. Red-brown water with **pH=3.5 and conductivity=400 μ S** flows from the adit at 1.5 gpm, then filters through the waste rock of dump #202 before entering Richmond Creek.

Dump #202 contains approximately 42 cubic yards of partly cemented, fine-grained quartz that is highly pyritized. Richmond Creek contains clear water and shows no signs of precipitate staining the rocks. Mineralized rock cropping out in the streambed upstream of feature #102 is stained red-brown and the staining continues along the streambed to Richmond Pass. This staining probably results from leaching of iron oxides from volcanic country rock. A water test from Richmond Creek, just below dump #202, yielded values of **6.2 for pH and 100 μ S for conductivity.** Richmond Creek has an overall **pH of 7.1.**

Quad Name: Ironton

Site #: 04-06-263/4201-1.100, 104, 200, 204

Site Name: Lower McIntyre Gulch

Environmental Degradation Ratings: 2

Description and pertinent facts: This site was originally inventoried on 6/21/95 and was revisited on 8/15/95. Features #100 and #200 are located on USFS-managed land. Features #104 and #204 are near the borders of patented mining claims.

Feature #100 is located 25' from the north side of McIntyre Gulch. Upstream, the gulch is steep sided (36° to 44°), and yellow-brown to orange-red mineralized rock is exposed. The area is bare of vegetation along the slopes and creek banks, and aquatic life is absent in the creek. Below adit #100, an alluvial fan spreads out into an aspen grove with willows lining the banks. Here, water from the creek is clear, although rocks have been stained orange-red. Water flow was estimated to be 570 gpm.

Adit #100 was driven into a friable, platy mineralized zone, rich in galena, sphalerite, and pyrite. Underground workings are extensive and may branch out into side drifts that drain the highly fractured country rock. The entrance to adit #100 contains partly collapsed portal beams and colluvium derived from upslope sloughing. Milky effluents are flowing from feature #100 at a rate of 8 to 10 gpm. Water test #300 was taken at the entrance to adit #100 and showed a **pH of 6.1 and a conductivity of 700 μ S**. The open adit contains orange sludge deposits that have accumulated to a thickness of 2 to 4 inches at the portal and on the surface of associated dump #200. A partial berm, caused from roof failure and upslope sloughing, has dammed mine water inside adit #100 to a height of 1.5'. Water can be heard and seen dripping from the ceiling and running down the walls, staining them orange.

Dump #200 contains an estimated volume of 2,310 cubic yards of light yellow to cream-colored gravel- to clay-size waste rock. A log framework that acted as a support structure for mine track has stabilized most of the dump. Ore cars dumped waste rock out over the top of this structure. When a spur road was built off the main road to lead to the entrance of adit #100, the top of feature #200 was leveled, causing the structure to be partly buried.

Mine water fans out over 1/3 of the top of this dump, transforming it into a marshy area. Yellow, orange, and gray-white areas appear in and adjacent to the marshy area, and yellow and bright green mosses grow in mats along the periphery. White salts have precipitated and coat the dump material, especially along the main effluent drainage channel that advances down the face of the dump. Water test #301 was taken in the main drainage channel on top of dump #200 and yielded values of **pH 5.5 and conductivity 800 μ S**. Water sample #04-06-263/4201-1.306 was collected on 8/15/95 from the same channel as water test #301, but just below the toe of dump #200. Lab analyses show iron concentration greatly exceeds state standards, and sulfate concentration is slightly over the standard. Ephemeral drainage channels along the flanks of the dump also contain white salt deposits. In addition, drainage channels that flank the dump are stained bright orange, and yellow filamentous algae is growing in all drainage corridors that transport mine water away from #100.

The slopes along the southern face of dump #200 have been scored and steepened due to the undercutting action of McIntyre Creek. Increased levels of erosion occur during cloud bursts and spring runoff. A man-made berm (4' to 6' high) was built along the south portion of dump #200 and borders the eastern edge of McIntyre Creek. This berm diverts most of the mine water from flowing directly into the creek, which is only 30' away. Effluent has breached the berm in several places during periods of increased mine flow. Some of the seepage from the toe and southern portions of the lower face of dump #200 enters directly into the creek. Most of the effluent flows down an orange-stained corridor for approximately 800' before reaching the west side of SH #550. About 50' from the west side of SH #550, the precipitates in the effluent stream remain a brilliant orange color after having flowed approximately 850' from the entrance of adit #100. Water test #305 was taken 50' from the west side of SH #550 and showed a **pH of 4.9 and a conductivity of 500 μ S**. The degraded water then flows under the highway and ultimately merges with Red Mountain Creek. Aspen leaves show no signs of yellowing, however, grasses and phreatophytes show signs of stress within a 2'- to 4'-wide corridor paralleling the drainage channel.

Adit #104 has a collapsed entrance with iron-rich, orange-colored water emerging at a rate of about 4 gpm. Water test #304 was taken at the entrance of #104 and provided results of **pH 6.7 and 400 µS conductivity**. Water from this adit continues to deposit orange precipitates along its channel, into a marshy area at the toe of dump #204, and to the west side of SH #550. This water is then diverted by a culvert, flows underneath the highway, and continues 400' downstream to Red Mountain Creek. Sludge deposits are 2 to 4 inches thick at the entrance to the adit and are continuous across FR #895 and along the southeast side of feature #204. Strong hydrogen sulfide and metallic iron odors are coming from the entrance of adit #104. The clear water from this adit has built up a 2' to 2.5' high ferrosinter deposit at the entrance. Rotten beams from the portal are buried within this deposit.

Dump #204 is composed of approximately 65 cubic yards of pyritized gravel- to cobble-size rock consisting of brecciated and altered San Juan Tuff. Precipitates settle out of the single drainage channel that runs over the face and into a marshy area at the toe of the dump. The top and southwest flank are saturated with effluents and have gullies carved by mine water. A 3-inch-diameter metal pipe, which is now clogged with sediment, protrudes 6' over the dump and once served to drain and divert effluents under the 4WD road. Effluent fans out over FR #895, flowing at a rate of 4 gpm, before draining over the top of dump #204.

Water tests were conducted in McIntyre Gulch above and below the mines in this inventory area. Water test #303 was taken from the creek above adit #101 and yielded values of **pH 7.3 and <50 µS conductivity**. Water test #302 was taken from the creek below feature #200 and provided a **pH of 7.2 and conductivity of <50 µS**.

Sample #04-06-263/4201-1.306; hardness = 490 mg/L; Uncompahgre River Basin segment #6¹

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards* ¹	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	100	below standard
Iron (trec)	14,000	1,100	13 x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	<50	87**	below standard
Cadmium	0.29	4.0	below standard
Chromium VI	<10	11	below standard
Copper	7	46	below standard
Iron	7,200	300**	24 x standard
Lead	<1	37	below standard
Manganese	580	1,000	below standard
Nickel	<20	320	below standard
Silver	<0.2	1.2 (on 3/2/98)	below standard
Sulfate	430 mg/L	250 mg/L**	1.7 x standard
Zinc	44	407	below standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

¹ No numeric standards are available for stream segment #6; numeric standards are taken from the next downstream segment, segment #3.

Quad Name: Ironton

Site #: 04-06-263/4202-1.103, 104, 203, 204

Site Name: Adits and Prospect Pits North of McIntyre Gulch

Environmental Degradation Ratings: 3

Description and pertinent facts: All features of this inventory area are on USFS-managed lands. At the time that this site was inventoried, the entrance to feature #103 was covered with snow, and it was impossible to determine if the portal was intact or collapsed. Water flowed out from beneath the snow bank at a rate of 2.5 gpm and ran over the top and face of dump #203, where yellow-orange iron oxides have precipitated.

Dump #203 consists mostly of iron-stained, clay- to gravel-size quartz and brecciated San Juan Tuff with a high percentage of microcrystalline disseminated pyrite occurring throughout the entire volume of 45 to 50 cubic yards. The dump has an overall elongated and elliptical shape, and the entire western face has been severely eroded. This area has been undercut, oversteepened, and subjected to a high degree of sheetwash erosion. The southwest face and flank of this dump is saturated, and runoff is channeled into a drainage corridor for 480' until it merges with the headwaters of McIntyre Creek. Water in the drainage channel is clear, however, orange precipitate stains the channel bed for a distance of 200' below the dump. Green grasses and clumps of mosses are growing on top of the dump in contact with the effluent. Water test #300 was conducted at the toe of the dump, along the southwest side, in the drainage channel that receives water coming off the dump face. Test results were **pH=4.6 and conductivity=100 µS**.

Feature #104 is a collapsed adit whose entrance has been filled with colluvium. It is located along the north side of the headwaters of McIntyre Gulch, 350' upslope from the streambed. Clear water was flowing at an estimated rate of 10 gpm from the conical-shaped depression at the entrance of adit #104. Black sludge and precipitates present at the entrance changed to yellow and then orange residues farther from the source. Mine water was observed running over the top and western flank of associated dump #204. Lush green riparian foliage and a mat of moss mantle the top of this dump and grow along the effluent channel. The west face is approximately 115' long and is in contact with mine effluent. The effluent channel is orange and remains this color as the effluent fans out before entering McIntyre Gulch. Shallow ponds containing orange-red suspended solids are present in this area. Water was not observed draining from the toe of dump #204. However, the top portion was saturated with mine water that produced a strong smell of hydrogen sulfide as evaporation took place. Water test #301, taken at the entrance of feature #104, yielded **pH of 6.7 and conductivity of 100 µS**. Water test #302 was taken of effluent from adit #104 below the toe of dump #204 and showed **pH of 7.6 and conductivity of 200 µS**.

Farther downstream McIntyre Creek drops steeply in a series of short falls. Side slopes above the streambed are bare of vegetation and are badly eroded and deeply incised, exposing yellow-brown mineralized rock of the San Juan Tuff. Natural leaching of base metals occurs in the lower part of the gulch.

Quad Name: Ironton

Site #: 04-06-264/4198-1.202, 203

Site Name: Corkscrew Basin, North Side

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area is within the upper bowl portion of Corkscrew Basin, just below the crescent-shaped, highly mineralized talus slopes of Red Mountain No. 1. The talus and vertical rock outcrops are yellow, orange, pink, red-brown, and cream to buff. The outcrops line the knife-edge ridges that connect Red Mountain No.1 to Red Mountain No.3 and separate Corkscrew Basin from Dry Gulch Basin. Runoff channels are stained orange. The north and south forks of Corkscrew Creek constitute the two main sources for the headwaters of upper Corkscrew Creek. Water test #300, taken 480' below the confluence of the north and south forks, and below most of the features of this inventory area, provided a **pH of 3.1 and a conductivity of 600 μ S**. From this confluence, Corkscrew Creek becomes orange stained along the streambed and remains such for the entire length of Corkscrew Gulch. Corkscrew Creek supports very little aquatic life.

Features #202 and #203 are on USFS-managed lands. The associated adits (features #102 and #103) have collapsed entrances that are filled with mineralized rhyolitic breccia of the Henson Formation. Feature #202 contains 50 cubic yards of waste rock that straddles the south fork and is 380' upstream of the confluence with the north fork. No water was observed to be draining from the collapsed entrance of feature #102. The creek has cut a channel 8' deep and 12' wide through dump #202 and has stained the gray gravel-size waste rock a light yellow. Slopes on both sides of the creek are steep (36°), show evidence of sheetwash and gully erosion, and are undercut along the banks. A strong smell of hydrogen sulfide comes from the saturated portion of dump #202 that is in contact with the creek.

Farther up the south fork, feature #203 is along the west bank, just south of a side drainage channel that is dry. Dump #203 contains about 35 cubic yards of gray gravel-size waste rock with abundant disseminated pyrite and a strong hydrogen sulfide odor. The toe and west flank have been partly removed by erosion. The south fork contains clear water that shows no signs of stressed riparian growth. Water test #301, taken 220' above feature #203, yielded a **pH of 4.8 and a conductivity of <50 μ S**. Red-brown breccia deposits, rich in iron, crop out on both slopes above this test site.

Water from the north fork flows in the vicinity of a large dump and intact adit that are on patented mining claims. No water could be seen draining from the toe of this dump, or from the collapsed and filled entrance of the associated adit (see descriptions for adit #100 and dump #200 on USFS/AMLI form #04-06-265/4198-1). Water test #302 was taken in the north fork, 150' below the patented mine workings. Values for test #302 were **pH 2.9, and conductivity 900 μ S**. This water is clear and devoid of aquatic life. Water test #303 was taken 470' above water test #302, and above the patented mine workings, in a flat area where the north fork meanders through rubble that has accumulated at the foot of talus slopes. This flat area is stained red-brown and contains several iron-rich brecciated outcrops. The surface of the water shows a metallic sheen, and **pH=2.9 and conductivity=900 μ S**.

Quad Name: Ironton

Site #: 04-06-264/4198-3.104; 102, 202, 206, 107, 207, 209

Site Name: Carbonate King Mine and Vicinity

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: All features within this inventory area are on patented mining claims that are currently held by Frank Baumgartner. The inventory was requested by the USFS in anticipation that the patented claims would be acquired sometime in the future. Surface runoff from all of the features drains into a major unnamed creek that enters Corkscrew Creek from the west. Data obtained from these features are a valuable source of information in helping to assess the environmental condition of the local area. All features of this inventory area occur in highly altered rhyolitic breccia zones of the Henson Formation.

Feature #102 is a prospect hole located on a north-facing slope. Three of the walls have a vertical height of 8', and the total depth is 15'. The bottom 4' contains standing, brown water whose surface is 1' below the top of a trench that leads to the top of feature #202. Water test #300, taken from the standing water of feature #102, yielded a **pH of 4.3 and a conductivity of <50 µS**. This dump contains 45 cubic yards of rock that stretches along the hillside and also fills an intermittent stream. The light gray iron-rich waste rock dams water to a depth of 5' in this stream. Water flows over and through this dam, staining the waste rock a red-brown color. Water test #301, taken 50' above dump #202 in the intermittent stream, yielded a **pH of 5.3 and a conductivity of <50 µS**. Water test #303, taken 100' below the toe of feature #202, provided a **pH of 4.3 and a conductivity of 100 µS**.

Feature #104 is a partly collapsed adit whose entrance is 2/3 filled with colluvium and debris, including a buried wooden pole headframe and a "V-shaped" trough. The 10'-long trough connects the entrance with the top of dump #204. The debris has dammed mine water to a height of 2.5' for a distance of over 100'. The distance from the entrance to the streambed is approximately 80'. The walls and floor of adit #104 are stained red-orange with ferric hydroxides. Water can be heard dripping into the standing water. Water test #303, taken inside feature #104, yielded a **pH of 4.0 and a conductivity of 400 µS**. Feature #204 contains 85 cubic yards of yellow stained rhyolitic and brecciated host rock with disseminated pyrite.

Feature #106 consists of an open 12' by 12' grate covering a shaft 50' deep. This shaft is the Carbonate King Mine (see PAD form #64/99-1 from DMG for further details on remedial work). The opening to this shaft measures 4' by 4', and log cribbing is intact on all four sides. Standing water occurs at an undetermined depth above the bottom, and the 1/2-inch mesh grate prevented obtaining a water test. Dump #206 contains 175 cubic yards of gravel-size gray waste rock. The dump has a 34° face and toes out into an intermittent tributary, which continues 120' to the confluence with the unnamed perennial creek. A strong hydrogen sulfide odor emanates from the dump material. Water in the intermittent stream is clear, and the rocks and grass are not stained. Water test #304 was taken above feature #206, in the intermittent tributary, and provided values of **pH 4.5 and a conductivity of <50 µS**.

Feature #107 is a collapsed adit that is located 25' northeast of the toe of feature #206. This adit is 15' from the east bank of the intermittent stream and 58' from the south bank of the unnamed perennial creek. Clear mine water drains from the entrance of adit #107 at a rate of 4 gpm and flows over the top and along the southeastern flank of dump #207. Water test #305, taken at the entrance of adit #107, provided a **pH value of 3.9 and a conductivity level of 100 µS**. Orange-brown mineralized outcrops occur on both sides and above the entrance to this adit, and along the

steep (60°) side slopes of the perennial creek. Dump #207 contains 75 cubic yards of light yellow waste rock. The west flank of the dump, which borders the creek, is severely eroded. The waste rock contains veins of chalcopyrite and marcasite in a quartz matrix. Water test #307 was taken in the side intermittent stream, 20' above the confluence with the perennial creek and 25' below feature #207. This test site was where water from dump #207 enters the intermittent stream. Values for this test were **pH 3.5 and conductivity 300 µS**.

Feature #109 is a remediated shaft with a 15' by 15' metal grate over the top of the log-cribbed walls. Standing water occurs at the bottom of this 60' deep opening, although the mesh size (1/2 inch) was too small to obtain a water test. The surface opening measured 4' long by 4' wide. Feature #209 contains a volume of 1,850 cubic yards of yellow to gray mineralized waste rock with veins of black tetrahedrite, sphalerite, and gray galena in a barite matrix, and disseminated pyrite and marcasite. Located west and south of the shaft, the face of this dump is steep (35°), and the toe has been undercut and partly removed by the unnamed perennial creek. Material from feature #209 occurs in the streambed for a distance of 320' downstream. Dump material located above the north creek bank is moist. Water from the creek is clear and contains no staining from ferric oxide precipitates, although no aquatic life was observed. Water test #306, taken from the creek at the toe of dump #209, yielded a **pH of 3.8 and a conductivity of 200 µS**. A green growth of vegetation is found in the riparian zone.

Quad Name: Ironton

Site #: 04-06-264/4198-4.104

Site Name: Bowl Area East of Red Mountain No. 2

Environmental Degradation Rating: 2

Description and pertinent facts: All features of this inventory site are located on USFS-managed lands, and explore brecciated zones of rhyolite tuff of the Henson Formation. An old 4WD road (FR #1A) connects to adit #104 and FR #886, although portions of FR #1A have been blocked by talus slides and rock avalanches.

Feature #104 is an intact adit driven more than 250' into a 30'-high vertical face of laminated rhyolitic tuff. Adit #104 has an elliptical opening that measures 5.5' by 3.5'. The wall rock inside this feature is competent and is not stained. Approximately 250' into the adit, waste rock from feature #105 has completely filled a portion of the interior of adit #104. Feature #105 is a vertical ventilation shaft that rises above the floor of adit #104 and has been partly filled with waste rock from above. It was possible to view the adit on the other side of this blockage area from an opening near the ceiling, and it was observed that feature #104 continues beyond the ventilation shaft along the same bearing of S.25°W. for an undetermined distance. An undetermined depth of dammed mine water lies beyond the blockage of material from feature #105.

Near the portal, the floor of adit #104 has standing water to a height of 6 inches, and water flows out over the top and north face of dump #204 at a rate of 1 gpm. The mine water is clear, does not stain the dump orange, and flows into a tributary of the unnamed perennial creek that merges with Corkscrew Creek about 0.8 mile downstream from the entrance of this adit. Water test #300, taken inside adit #104, yielded a **pH of 3.4 and a conductivity of 300 µS**.

Dump #204 contains 490 cubic yards of light yellow to gray waste rock with abundant disseminated pyrite, galena, and veins of enargite in an opalized matrix. A strong smell of hydrogen sulfide gas emanates from the saturated portions of dump #204.

Quad Name: Ironton

Site #: 04-06-265/4198-1.100, 200; 103

Site Name: Upper Corkscrew Basin, Southwest Side

Environmental Degradation Ratings: 1; 2

Description and pertinent facts: Water tested in the Upper Corkscrew Basin inventory area had the **lowest pH and the highest conductivity levels** encountered in the Red Mountain mining district. The headwaters of the north fork of Corkscrew Creek receive mine effluent from open adit #100, which is located on patented mining claims. This adit is situated at the base of a blasted section that contains a vertical wall of rock 45' high located along the lower 2/3 of the talus slope that covers most of Corkscrew Bowl. The portal measures 6' high by 5' wide. Clear water 10 inches deep is inside the adit, and the floor is covered with 3 inches of sludge. Light yellow precipitates coat the floor and the walls up to a height of 15 inches. There is a highly sulfurous odor to the effluents that drain out of this adit at a rate of 20 gpm. Water test #301 was taken inside adit #100 and yielded a **pH reading of 2.2 and a conductivity level of 5,600 µS**.

Dump #200 is on patented claims and contains about 5,700 cubic yards of waste rock. Mine water flows over the top and percolates through the dump and into the adjacent talus, then spreads out onto the basin floor before entering the headwaters of the north fork of Corkscrew Creek. Filamentous algae was not observed in the drainage channel on top of the dump or at the entrance of adit #100. Mine water has stained the dump material light yellow, and some white salts appear as crusts on the rocks. Metallic minerals consist of microcrystalline disseminated pyrite and pockets of galena in vugs. Water test #300, taken at the toe of dump #200 on the south flank, yielded a **pH of 2.2 and a conductivity of 5,700 µS**.

A second adit, also on patented claims, is located 320' upslope and to the west of adit #100. It probably is connected to adit #100, which contains well over 350' of underground workings. The associated dump is elongate in shape, as waste rock has been dumped over a steep (37°) and unstable talus slope for a distance of 280'. Material from this dump is rich in gray copper minerals (tennantite and tetrahedrite) and bands of gray-black enargite. Vuggy pockets of galena occur at the entrance to the prospect adit, along the facing walls, in several prospect holes, and in the cliffs above the entrance. These features are probably exploring the same vein that runs vertically up the southern side of Corkscrew Bowl. The host rock is a red-brown, platy, rhyolitic breccia of the Henson Formation.

The Geology Department at Mesa State College confirmed enargite as the gray-black mineral found in most of the dumps in Corkscrew Basin. Enargite is an arsenic sulfide and is most likely the source of arsenic that was detected in water sample #04-06-265/4198-1.303, collected on USFS-managed land on 9/6/95 from effluent below dump #200. The **pH was 2.3 and the conductivity was 5,700 µS**. The sample was obtained from the main channel where mine water flows at a rate of 12 gpm off the southern flank of dump #200. Lab results, shown on the table below, show extremely high concentrations of arsenic, aluminum, copper, iron, sulfate, and zinc.

Some other metals may be above state standards, but the high dilution required to analyze the sample makes precise comparisons impossible.

Features #103 and #203 are located on USFS-managed lands. Feature #103 is found 2/3 of the way up the steep (37° to 40°), talus-covered slopes of the southwestern portion of Corkscrew Bowl. These slopes are highly mineralized with iron sulfides and oxides that produce a brilliant array of colors on exposed rock surfaces. Cliffs of red-brown host rock crop out above the entrance and extend to the ridge top. Feature #103 is an intact adit that extends more than 180' and has an entrance that measures 5' high by 4' wide. A 2.5'-high berm was created by scree material that has slid over the entrance and dams mine water to a height of several inches. The floor slopes downwards towards the entrance. Most of the floor is damp and stained orange-red, as are the walls. Dripping water can be heard farther back inside this adit. This feature follows a vein of gray ore that is highly fractured and stained orange along the joint planes. Dump #203 contains 85 cubic yards of yellow waste rock with brown vesicular pumice and porous material that originated from a mineralized volcanic breccia pipe deposit. A milky-white, caliche-like substance fills the pores of the porous waste rock. Disseminated pyrite is found in gray host rock that occurs adjacent to the altered areas. Water from adit #103 is contained by the berm. Water test #302 was taken in the clear pool of standing water that occurs at the entrance of adit #103 and yielded a **pH of 2.7 and a conductivity of 1,200 µS**.

Sample #04-06-265/4198-1.303; hardness <42 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Antimony (trec)	<25	6**	below detection limit
Arsenic (trec)	830	50 (acute)	17 x standard
Iron (trec)	130,000	1,000	130 x standard
Thallium (trec)	<100	0.5**	below detection limit
Aluminum	420,000	87**	4,800 x standard
Barium	<200	1,000**(trec)	below standard
Cadmium	<25	0.5	below detection limit
Chromium VI	<1,000	11	below detection limit
Copper	30,000	5	6,000 x standard
Lead	<100	1	below detection limit
Manganese	4	50	below standard
Nickel	<2,000	45	below detection limit
Silver	<20	0.02 (on 3/2/98)	below detection limit
Sulfate	5,130 mg/L	250 mg/L	21 x standard
Zinc	2,400	51	47 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Ironton

Site #: 04-06-265/4199-1.202, 203, 204

Site Name: Midnight Mine and Vicinity

Environmental Degradation Ratings: 3

Description and pertinent facts: The entire inventory area is on patented mining claims that are currently held by Frank Baumgardner. The site was inventoried with the intentions that the Forest Service might acquire the patented claims in the future.

Feature #200 is a large dump containing an estimated 780 cubic yards of waste rock produced from the Midnight Mine. The rock consists mostly of yellow gravel-size pieces of altered rhyolitic breccia of the Henson Formation. The toe of the dump rests on top of an iron-cemented breccia deposit with angular clasts. This deposit has calved in several places, creating hollowed out depressions. Groundwater flows beneath the dump into one of these depressions, which measures 10' long by 8' wide by 4' deep. The water then drains through the porous rock and enters Corkscrew Creek, located about 40' to the east.

The angular breccia crops out on the south side of FR #886 within a cutbank, 60' from the western side of the toe of feature #200. Springs are present that have deposited orange-brown precipitates that stain the surrounding country rock and the drainage paths. The drainage channels merge into one channel that crosses and then parallels the west borrow ditch of FR #886 for a distance of 500', where it ultimately crosses the road and enters Corkscrew Creek. Iridescent films coat the surface of the spring water.

Features #201, #202, #203 and #204 are along both sides of an unnamed stream that merges with Corkscrew Creek from the south. Each of the dumps project into the stream and have been partly removed by erosion. Feature #202 contains 530 cubic yards of yellow gravel- to boulder-size waste rock, rich in pyrite.

Water tests #303 and #304 were taken from bubbling springs near the toe of dump #200. Water test #303 had a **pH of 3.5 and conductivity of 1,200 μ S**. Water test #304 had a **pH of 3.6 and a conductivity of 1,300 μ S**. Flow rates at tests #303 and #304 were 4 gpm and 7 gpm, respectively. Water test #300 was taken in the stream at the toe of feature #202. The **pH was 4.8 and the conductivity was <50 μ S**.

Water test #301 was taken in a different tributary that enters Corkscrew Gulch from the east. The gulch is an active avalanche track and is extensively mineralized. The stream water is clear, and the flow rate was estimated at 50 gpm. Some of the stream water originates in an intact adit that is located on patented mining claims. The flow rate at the adit was estimated at 10 gpm. This water flows over a large (estimated 1,300 cubic yards) dump, down the western flank, and into the tributary. The waste rock in this dump is rich in lead and zinc sulfides. Water test #301 was taken in the tributary 200' below the dump and provided results of **pH 4.9 and conductivity 200 μ S**.

Water test #302 was taken on public land in Corkscrew Creek, at a point above the mines of this inventory area. This test yielded a **pH of 4.4 and a conductivity of 400 μ S**.

Quad Name: Ironton

Site #: 04-06-265/4199-3.100, 101; 201

Site Name: Adits on Corkscrew Creek Just Downstream of the Midnight Mine

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: The inventory area encompasses an area of Corkscrew Creek where several sources produce water that flows directly into the creek. All features of this inventory site occur in tuffaceous rhyolitic flows of the Henson Formation, which is locally brecciated. Features #100, #200, #101, and #201 are on patented mining claims.

Feature #100 is an intact adit with a 50' drift that trends S.45°W. The wall rock contains iron-rich mineralized veins in a highly brecciated and fractured conglomerate, which is quite porous and allows water from above to enter the underground workings. Seepage from this adit flows from a 3'-high berm for a distance of 35' before entering the east side of the creek. Dump #200 contains approximately 30 cubic yards of rock and is located 55' from adit #100 along the east side of Corkscrew Creek.

Feature #101 is an intact adit driven in highly fractured and iron-stained host rock. Orange precipitates and sludge deposits (4 to 9 inches thick) cover the floor and the drainage channel that exits the adit. A metallic appearing oil residue is present on the surface of the mine water. Contaminated water flows from the adit at a rate of 5 gpm and travels a distance of 25' before merging with Corkscrew Creek.

A spring flows along the east edge of FR #886. Clear water was bubbling and flowing over the edge of a 2.5'-diameter cavity into Corkscrew Creek at a rate of 4 gpm. The cavity is lined with red-orange precipitates, and the bottom contains sludge deposits. Suspended solids also occur in the water within this cavity. Green moss is present at the edge of the cavity and lines the drainage channel to the creek. The spring flows out into the middle of the road and leaves a stain of red-brown ferric hydroxides. This spring emerges in one of the many iron-cemented conglomeratic layers that crop out along Corkscrew Gulch.

Six water tests were taken to gauge the quality of water that enters the creek. Water test #300 was taken in the creek, on public lands approximately 400' below feature #200. This test yielded values of **4.5 pH and a conductivity of 300 µS**. Water test #301 was taken in the dammed waters of adit #100 (the water level depth was 2'). The test results were **pH 4.3 and conductivity 700 µS**. Water test #303 was obtained from the dammed milky waters of feature #101 (the water level depth was 3'). Test results were **pH 4.5 and conductivity 900 µS**. Water test #302 was taken from the spring that emerges along the east edge of FR #886. This test yielded a **pH value of 4.4 and a conductivity of 500 µS**. Water test #304 was taken on public lands within the drainage corridor that connects to the entrance to adit #101. Taken approximately 10' from the east side of the creek, this test yielded values of **pH=4.5 and conductivity=900 µS**. Water test #305 was taken in Corkscrew Creek on public land about 300' upstream of adit #101. Values for this test were **pH 4.5 and conductivity 300 µS**. At this inventory site, the streambed is stained bright orange. The creek waters were clear and were flowing at a rate of approximately 500 gpm. However, no aquatic life was observed. Grasses growing along the banks are yellowed.

Quad Name: Ironton

Site #: 04-06-265/4201-1.105, 106, 205, 206; 108, 208

Site Name: Lower Gray Copper Creek

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: The inventory area is located along the lower part of Gray Copper Gulch on a densely wooded conifer slope that faces north. The side slopes of this gulch are steep (33° to 44°) and are stair-stepped at various elevations. No aquatic life occurs in the Gray Copper Gulch from this inventory area downstream to Red Mountain Creek. The stream banks along Gray Copper Creek are severely stained with bright orange iron oxides, and vegetation in the riparian corridor shows signs of yellowing.

Features #105 and #205 are on USFS-managed lands. Feature #105 is a collapsed adit on a ridge that overlooks Gray Copper Creek. The entrance is located 20' from a side drainage channel and 75' from the streambed, along the eastern edge of an avalanche track. Adit #105 explored a mineralized zone in the Henson Formation. Water that is seeping from the mineralized rock that blocks the entrance to this adit has left a corridor of orange-brown ferric hydroxide precipitates on the top and southern flank of associated dump #205. Water test #300 was taken of the 0.1 gpm seepage at the entrance to adit #105, where iron oxides and iron sulfates are abundant. The test yielded a **pH of 3.6 and a conductivity of 700 µS**.

Dump #205 has a volume of 50 cubic yards of light yellow waste rock that consists mostly of sand-to gravel-size material. The dump has a conical shape, and the toe extends into the side drainage channel. Part of the toe has been removed by erosion. Water does not seep out of the toe or flanks of this dump. No orange precipitate was observed in the side drainage channel. It is possible that during periods of higher flow from adit #105, the effluent seeps through the dump material and into the colluvial slopes that mantle the gulch, entering Gray Copper Creek at a point downstream.

Features #106 and #206 lie on patented mining claims. The effluent from these features discharges directly into Gray Copper Creek and then onto public lands. Orange water flows out at three places located in front of the collapsed entrance to adit #106, at an average rate of 8 gpm. Ferrosinter deposits have formed at each of these exit points. Water test #301 was taken near a ferrosinter deposit at the entrance to adit #106 and yielded a **pH reading of 3.5 and a conductivity level of 800 µS**. These three water channels merge to form a single channel over the top and face of dump #206. A 6'- to 8'-wide stretch of saturated waste rock occurs on both sides of this drainage channel, but most of the dump has a hard crust. Feature #206 consists of 30 cubic yards of spongy clay- to gravel-size, iron-stained material with galena veinlets. Water drains from the interior of this dump, through the toe, and into the creek.

Feature #108 is an open shaft that is 150' upslope of adit #106, near the boundary of public lands. The shaft has a partly collapsed entrance and timbering in the interior. Approximately 8' below the collar of this shaft, a horizontal drift runs along the south wall for at least 20', following a 4'-wide vein of sphalerite and iron/copper sulfides. The floor of this drift is flooded with water to a depth of 3 to 6 inches. The water ultimately flows into the shaft. The depth of shaft #108 was measured at approximately 100'. Surface water drains down the steep slopes (40° to 48°) located above the shaft and then is funneled into the shaft. Adit #106 probably connects to feature #108. No water tests were taken in the tunnel and the shaft because of hazardous access.

Associated dump #208 is on patented claims. It contains a long and steep face (240' and 38°) that is deeply scoured and eroded by runoff. Fines are washed down the face and deposited on the top of dump #206. Dump #208 contains 280 cubic yards of white to light yellow, fine-

grained clayey material that is enriched with disseminated pyrite. A partly buried platform lies at the toe of the dump.

Water test #302 was taken on public land in Gray Copper Creek, upstream of where the effluent from adit #106 and dump #206 merge and enter into the south bank of the creek. This test yielded a **pH of 5.0 and a conductivity of 100 µS**. Water test #303 was taken on public land in Gray Copper Creek, 400' downstream of dump #206. Test results showed a **pH of 5.2 and a conductivity level of 200 µS**. Water test #304 was taken in Gray Copper Creek, approximately 1/8th mile below this inventory area, just upstream of where FR #884 crosses the creek. Values for this test were **pH = 4.7 and conductivity = 300 µS**. The increased degradation of Gray Copper Creek at test #304 may be caused by the addition of effluent from the Silver Mountain Mine and Kentucky Giant adits.

Quad Name: Ironton

Site #: 04-06-265/4202-1.102, 202

Site Name: Area North of Larson Brothers Mine

Environmental Degradation Ratings: 2

Description and pertinent facts: This inventory area is on the southwest side of Ironton Park and northwest side of Monument Gulch. This mine (adit #102) may be on private land.

Adit #102 is open, at least 20' long, and has a portal 5' high and 4' wide. The portal has a metal grate, preventing access to the underground workings. About 1 gpm of effluent is discharging from the portal, flowing across the mine access road, over associated dump #202, and into Ironton Park. Mine water tested at the portal had **pH=3.3 and conductivity=600 µS**. The entire length of the effluent channel is coated with abundant orange precipitate.

Dump #202 is about 35 cubic yards and is cut by a gully. The dump toes into a marshy and orange-stained area of Ironton Park.

Quad Name: Ironton

Site #: 04-06-265/4202-2.104

Site Name: Adits on FR #886 Above the Town of Ironton

Environmental Degradation Rating: 3

Description and pertinent facts: This inventory area is above the north side of Corkscrew Gulch on USFS-managed lands. The site is located on a northwest-facing slope that is densely vegetated with a mixed forest of aspens and conifers. The area lies below a series of switchbacks on an alternate 4WD road that connects to FR #886. This alternate route was created to bypass a section of FR #886 that is constantly subjected to active landsliding, slumping, and debris flows. A strong odor of hydrogen sulfide gas comes from the water-saturated material that is contained within the slide area. The rock in the vicinity of the slide is rich in iron sulfides that are a by-product of the fumerolic vent system of Red Mountains Nos. 1-3. The local mines worked vein-type deposits that contain base-metal deposits high in sulfur content.

Features #100 and #101 are located next to and above FR #886, in vein-type deposits occurring in brecciated fracture zones of the Henson Formation. The deposits are stained yellow. A perennial stream flows along the southern flank of dump # 200, which contains approximately 63 cubic yards of material. Water test #300 was taken below the toe of feature #200. The test values were **pH 4.9 and conductivity 100 µS**.

Adit #104 had 1.5' of clear, standing water along the 20' length of floor. A partial berm, 3' high at the entrance, serves to contain the mine water. Minor orange precipitate occurs on the floor and walls of the adit. Water test #301 was taken inside adit #104 and yielded a **pH of 5.1 and a conductivity of 300 µS**.

A perennial stream of clear water flows between features #203 and #204 at a rate of 20 gpm. Feature #203 contains 340 cubic yards and feature #204 contains 33 cubic yards of waste rock. Both dumps contain extremely crumbly material rich in marcasite. The perennial stream receives dissolved iron sulfides that leach from both dumps. Water test #302 was taken in the stream between the east flank of dump #204 and the west flank of dump #203. Values from this test were **pH 4.8 and conductivity 300 µS**. Farther downslope, this stream merges with a larger stream that ultimately discharges into the mouth of Corkscrew Creek. Orange precipitates do not form along the sides or in the drainage channel at sites #203 and #204.

Tests from numerous tributaries of Corkscrew Creek have average **pH readings of 4.8 and conductivity levels of 300 µS**.

Quad Name: Ironton

Site #: 04-06-265/4203-1.203, 102

Site Name: Adit south of Crystal Lake, West side of Red Mountain Creek

Environmental Degradation Ratings: 2: 3

Description and pertinent facts: Adit #102 and dump #202 are on patented mining claims, but are mentioned in this report because of the contaminated mine effluents that drain into the high groundwater table of Ironton Park. Features #103 and #203 are on public lands.

The mine features of this site are located at the northern edge of Ironton Park, which is a broad, glaciated valley that has received glacial-fluvial fill from the eroded slopes of Red Mountain Nos. 1-3. The area south of this site is regionally mineralized and altered, which has resulted in red-brown and yellow oxidation of the San Juan Tuff. Ironton Park sediments derived from the mineralized San Juan Tuff contain high amounts of oxidized iron, forming alternating red-orange and black layers in the soil profile. In general, Red Mountain Creek water has **pH values ranging from 3.0 to 5.6 and conductivity values ranging from 100 µS to 300 µS**.

Water depositing a bright orange ferric hydroxide precipitate is draining out of the talus that completely covers the entrance to adit #102. This effluent flows at 1.5 gpm into a "V-shaped" trough, crosses a 4WD road, flows over associated dump #202, and ultimately discharges to the privately owned Crystal Lake, to the north. A water test conducted at adit #102 shows **pH of 6.6 and conductivity of 200 µS**.

Adit #103 and associated dump #203 lie south of the features described above. The entrance to adit #103 is covered with talus and is discharging 1 gpm water. The effluent crosses and filters through dump #203, drains into a channel, and flows into a nearby pond. The channel and western flank of the pond contain thick deposits of black and orange sludge. Orange staining occurs on the willows and marsh grass 6 inches above ground level, indicating the high water mark during periods of maximum runoff. Water in the channel had **pH=3.7 and conductivity=600 µS**. Water sample #04-06-265/4203-1.301 was obtained from the channel on 8/22/94. Analytical results, shown below, reveal concentrations of iron, aluminum, and manganese greatly exceed state standards. Sulfate concentration is slightly above standards.

Sample #04-06-265/4203-1.301; hardness = 260 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	10 mg/L	no standard	n/a
Aluminum	1,700	87**	20 x standard
Barium	13	1,000**(trec)	below standard
Beryllium	<1	4**(trec)	below standard
Cadmium	<0.25	2.4	below standard
Chromium VI	<10	11	below standard
Copper	<4	26	below standard
Iron	14,000	300	47 x standard
Lead	5	15	below standard
Manganese	660	50	13 x standard
Mercury	<0.2	0.1	below detection limit
Molybdenum	<10	no standard	n/a
Nickel	<20	195	below standard
Selenium	<1	5	below standard
Silver	<0.2	0.39 (on 3/2/98)	below standard
Sulfate	290 mg/L	250 mg/L	1.2 x standard
Uranium	<3	4,150**	below standard
Zinc	49	235	below standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Ironton

Site #: 04-06-265/4203-2.102, 105, 106, 202, 206

Site Name: Lower Full Moon Gulch

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area is at the mouth of the steep sided (35° to 40°) Full Moon Gulch. Features #102, #106, #202, and #206 lie within avalanche paths. All but features #103 and #203 are on the south side of Full Moon Creek. The streambed consists of numerous stair-stepped falls as the gradient becomes steeper with increasing elevation. The lower gulch contains side slopes that expose large outcrops of iron-rich altered and mineralized San Juan Tuff. Calving of the tuff formed several cavernous areas in the cliffs. A stratum of dark orange-brown, iron-rich porous material crops out on the south side of the gulch, above and

to the west of feature #102. Rock in this stratum is friable, contains soluble iron oxides, and acts as a conduit for groundwater. Iron-rich springs emerge from this layer and flow down the slopes of Ironton Park.

Feature #102 is a collapsed adit from which clear water flows at a rate of 10 gpm. Water test #300 was taken at the entrance to adit #102 and yielded a **pH of 6.0 and a conductivity of 300 μ S**. Ferric oxides precipitate out of this water and form an orange corridor along the entire west flank of associated dump #202. Willows adjacent to this corridor are stained orange and mark the highest level of effluent flow during spring runoff. A mat of green moss grows on top of dump #202 and above the entrance to adit #102. Water is probably backed up to some unknown depth inside this adit and has reached a high enough level to discharge through the colluvium. Groundwater from the iron-rich stratum above may be draining into the underground working through natural fractures and breccia zones in the host rock.

Most of the effluent from adit #102 stays within the drainage channel as it travels 190' along the western flank of dump #202 and then disappears beneath a dense growth of shrubs and willows above the creek. Due to the steepness of the face (34°), most of the runoff and mine waters do not soak into the waste rock and are deflected away from the face of the dump.

Feature #202 has an estimated volume of 1,000 cubic yards. The white, gravel-size waste rock of feature #202 is rich in fine-grained disseminated pyrite. No water was observed seeping from the toe of feature #202, but water may percolate through the dump material and underlying colluvium before entering Full Moon Creek.

Feature #105 is a collapsed adit with mineralized rock cropping out above the portal. Water exiting the rubble at a rate of 7 gpm flows directly to the creek. Water test #301 was taken at the entrance of adit #105 and provided values of **pH 4.7 and 400 μ S conductivity**. Although the water is clear, orange minerals precipitate along the length of the effluent channel.

Dump #205 consists of white, gravel- to cobble-size, pyrite-rich rock that emits a strong hydrogen sulfide odor. The toe of this dump has been removed, and the face has been steepened by creek erosion. Feature #205 is not located at the entrance to adit #105, but rather, the top of the dump is located 250 feet downslope and lies directly above the streambed. Veins of pyrite and a small amount of galena occur within the waste rock of the dump.

Feature #106 consists of a collapsed adit that is located below the toe of dump #202. A dense cover of willows and scrub brush surrounds it. Clear water flows from a slightly concave-shaped depression that marks the entrance to this adit. Water test #302 was taken from adit #106 and yielded a **pH of 4.6 and a conductivity of 300 μ S**. The effluent runs over the top and along the flanks of associated dump #206. Iron oxides have precipitated on both sides of the dump. On 6/23/95, the flow rate for water exiting adit #106 was estimated at 5 gpm.

Dump #206 contains about 230 cubic yards of light yellow waste rock, from which surface water is leaching metals. Water may also be draining from the toe of the dump, although the thick layer of brush and willows makes it difficult for visual confirmation. Effluent channels on both sides of the dump have levels of orange staining 6 to 8 inches above the present water level, indicating higher flow rates from adit #106 during the spring.

Quad Name: Ironton

Site #: 04-06-266/4198-1.102, 103, 104, 106; 105

Site Name: Gray Copper Creek Basin (East Side)

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: This inventory area is located along the northeast flank of Red Mountain No. 1 and lies within a bowl-shaped basin in which the headwaters of Gray Copper Creek originate. Several shallow ponds are near the top of the pass along FR #889. This 4WD road connects to the main dirt road that heads north out of the old mining town of Gladstone. All features occur in rhyolitic tuffaceous beds and breccia zones of the Burns Formation.

Features #102 and #202 are located on USFS-managed lands. Feature #102 is a prospect pit (8' long by 6' wide by 10' deep) that contains 1' of clear water in the bottom and yellow mineralized outcrops on the edges. The floor and walls do not show any orange staining. Water test #300 was taken from the water at the bottom of the prospect pit and yielded a **pH of 3.4 and a conductivity of 200 μ S**. Feature #202 is a 20-cubic-yard dump with disseminated pyrite throughout the gray waste rock.

Features #103 and #203 are on BLM-managed lands about 250' northwest of the Uncompahgre National Forest sign. These features were included in this inventory area because of the physical danger that is presented by the open shaft, which is compounded by the proximity to FR #889, and because of the poor quality of water that stands in the bottom of feature #103. Feature #103 is an intact shaft that has a depth of 30'. The walls of the shaft are lined with rotten log cribbing, and clear standing water is present at a depth of 18' below the ground surface. Water test #301 represents water from feature #103 and yielded a **pH of 3.6 and a conductivity of 500 μ S**. This shaft is located 20' north of FR #889 and is easily accessible to the public. Aquatic larvae and orange precipitates do not occur within the water. Dump #203 contains 65 cubic yards of yellow waste rock that contains finely disseminated pyrite in a friable volcanic host rock.

Features #104 and #204 are on USFS-managed lands. Feature #104 is an intact adit situated 150' from the north bank of upper Gray Copper Creek. A 2'-high berm has dammed mine water to a height of 1.5' for a distance of 120'. This berm was produced from rocks spalling from steep slopes and cliffs above the portal. A vein about 6 inches wide is exposed on the cliff face above the entrance. Orange ferric hydroxides line the walls and ceiling, and sludge deposits occur on the floor of this adit. Mine water was not seen seeping from beneath the berm or flowing over feature #204. Test #302, taken from cloudy water inside feature #104, had **pH 2.9 and conductivity 500 μ S**. Dump #204 is located along the north bank of one of the tributaries to Gray Copper Creek. The dump contains 190 cubic yards of cobbles and gravel of yellow to red-brown waste rock with few base-metal minerals.

Features #105 and #205 are on USFS-managed lands. Feature #105 is a circular prospect pit 10' from the south bank of Gray Copper Creek. Two feet of clear water stands at the bottom of this pit, which also contains aquatic larvae and insects. Water test #303 was taken in the standing water of the pit and yielded a **pH of 4.7 and a conductivity of <50 μ S**. Orange-brown sediments have accumulated on the floor and slopes. Rock from dump #205 consists of approximately 40% microcrystalline pyrite in a light yellow, highly fractured rhyolitic host rock. Red-brown staining coats the rocks and banks of Gray Copper Creek. Aquatic insects and larvae

live in the creek, and the riparian growth is healthy and green. Water test #304 was taken 30' below the toe of dump #205 in Gray Copper Creek. Values were **pH 4.5 and conductivity <50 µS**.

Features #106 and #206 are on USFS-managed lands. Feature #106 is an intact adit located 20' below FR #889. A 2.5'-high berm of roof fall has mounded in front of the entrance, damming milky water to a height of 10 inches for a distance of 70'. Orange precipitates stain the walls up to 1.5' above the floor. Patches of green moss cling to the walls and ceiling and are found along the moist areas adjacent to the entrance. Water test #305 was taken inside adit #106 and yielded a **pH of 3.6 and a conductivity of 300 µS**. Dump #206 contains 55 cubic yards of iron-rich waste rock. The subsurface material is damp, and parts of the surface are saturated with water, suggesting mine water is seeping from below the berm into the dump. No water was seeping from the toe.

Features #107 and #207 may be on or adjacent to patented mining claims. Feature #107 is an intact adit that follows a mineralized zone for over 200' along a bearing of S.20°E. The underground workings of this feature may connect to three other adits that are aligned on this slope along the same mineralized zone in a dry gulch. The floor to adit #107 is damp but contains no standing water, although orange staining occurs on the walls up to a height of 8 inches. This stain suggests that mine water may at times drain out and flow over the top and northeast flank of dump #207.

Feature #207 has the largest volume and richest metal content of any of the four dumps. It consists of 475 cubic yards of yellow to gray waste rock containing approximately 70% pyrite, veined sphalerite, chalcopyrite, and gray copper sulfides. Minor enargite is present, and some white caliche was observed. Dry streams on both flanks of this dump merge directly below the toe and extend into the main tributary of Gray Copper Creek. During periods of heavy runoff and spring melt, these dry streams may receive surface and subsurface water from feature #207 and from the three dumps above dump #207.

Quad Name: Ironton

Site #: 04-06-266/4198-2.101

Site Name: Red Mountain No. 1 Pass Area

Environmental Degradation Rating: 3

Description and pertinent facts: This inventory area is at the summit of Red Mountain Pass No. 1, on the Cement Creek side of the drainage divide. Features from this site are located on USFS-managed lands and occur in the brecciated rhyolite tuffs of the Henson Formation.

Feature #101 is an intact adit 55' long with an opening of 4' wide by 4' high. Standing, clear water that covers the entire floor length to an average height of 1' is dammed by a 2.5'-high berm composed of fallen roof material. Orange precipitates coat the floor and walls with ferric hydroxides to a height of 1.5' from the floor. Water test #301 was taken inside feature #101 and yielded a **pH of 3.4 and a conductivity of 200 µS**. Some seepage is draining from the berm to a nearby ditch. The ditch does not have precipitate.

Feature #201 is located in the ditch 20' downstream from adit #101. This dump contains 40 cubic yards of yellow to gray-white waste rock that exudes a strong hydrogen sulfide smell. Some of the waste rock has seams of massive pyrite and pockets of black sphalerite. Water test #300 was taken in a side perennial creek that extends from below the pass to the north fork of Corkscrew Creek. Water from this test site is derived from the several shallow lakes situated at the top of the pass. The results for water test #300, collected in the side creek, were **pH 4.2 and conductivity <50 µS**. The lakes are sterile, but show no signs of orange staining on the rocks. Water from these lakes is channeled into an incised streambed on the west side of the switchbacks adjacent to FR #886. The streambed contains loosely cemented colluvium locally mineralized with pyrite.

Quad Name: Ironton

Site #: 04-06-266/4199-1.101, 201, 102, 110; 100, 200, 204

Site Name: Vernon Mine and Vicinity

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: The Vernon Mine and its surrounding workings are accessed from the southeast by a 4WD road and are reached from the northwest by FT #889. The Ironton PBS quad shows the Vernon Mine shaft located on USFS-managed lands. However, 150' northwest of the old shaft entrance there was evidence of current habitation, including a well-equipped locked cabin, a shed (used to store mining equipment), and another smaller shed. The presence of these structures, along with modern equipment and provisions, suggests the Vernon Mine shaft and connecting adits may be on patented mining claims and are active. All features occur in the tuffaceous flows of the Burns Formation. The shafts and adits developed vein-type deposits containing high-grade gray copper sulfides.

Feature #100 is an intact shaft with a wooden ladder leading to underground workings well over 50' deep. The current owner of the Vernon Mine has posted "Danger Keep Out" signs around the top of the shaft, although no fences or other barricades are present to deter or discourage entry. Water was draining into the shaft entrance. The surface opening measures 12' by 15'. No water test could be obtained from this shaft. The bottom of the shaft may be flooded, as falling water could be heard cascading into a pool of standing water lower in the shaft. A concrete platform (30' by 20') on the south side of the shaft contains threaded anchor bolts that may have been used to attach a winch and cable to a hoist.

Dump #200 contains 2,760 cubic yards of rock that has been leveled by a bulldozer. This dump consists of several contiguous piles of waste rock. One pile contains mostly host rock with veins of pyrite, barite, and sphalerite. Another pile consists of white massive barite, marcasite, tetrahedrite, and tennantite. Several gullies cut the face and toe of the dump. The toe is in contact with Gray Copper Creek.

Features #101 and #201 are located 370' south of the shaft and may connect to the underground workings of feature #100. Feature #101 is an intact adit that is over 40' long and is located 30' from the east bank of the creek. Clear water was draining from the entrance into the creek at a rate of 3 gpm. Mine water was dammed to a height of 1.5'. Water test #300, taken from the standing water inside feature #101, yielded a **pH of 4.2 and a conductivity of 200 µS**. Bright orange iron-oxides occur along the walls and form in the drainage channel that leads to the creek.

Gray Copper Creek bed is stained orange from this source of water for a downstream reach of over 500'. Mine water was flowing over feature #201, which contains approximately 430 cubic yards of iron-, magnesium-, and copper-rich sulfide rock. This dump is located along the east bank of Gray Copper Creek, which has eroded part of the west-facing flank. A strong odor of hydrogen sulfide gas emanates from the entrance of adit #101 and from the wet waste rock on dump #201. Material from this dump includes abundant gray copper minerals and disseminated pyrite.

Feature #102 is an intact 60'-long adit located approximately 300' from the west bank of Gray Copper Creek, adjacent to patented claims. Orange precipitates occur on the walls up to a height of 8 inches above the floor. When this adit was inventoried, low-lying portions of the floor contained standing water to a depth of 1', and water was dripping from the ceiling in several places. Water test #302, taken from inside feature #102, yielded a **pH of 3.2 and a conductivity of 800 μ S**. A strong smell of hydrogen sulfide emanates from this adit and from the waste rock of feature #202. Green patches of moss carpet the entrance floor and walls.

Feature #202 is a light yellow to orange-brown dump consisting of 55 cubic yards of mostly gravel-size, pyrite-rich waste rock. Mine water was flowing over a portion of the top of dump #202, leaving a broad orange-red surface. Several shallow (2 to 4 inches deep) drainage channels occur on the face of this dump, suggesting increased flow at certain times.

Feature #204 contains 310 cubic yards of rock rich in iron, copper, and arsenic sulfides. This dump is located along the east bank of Gray Copper Creek, and part of the waste rock is mixed with material from feature #201. A strong smell of hydrogen sulfide comes from the portion of dump #204 that is in contact with the creek.

Feature #110 is an open shaft located 40' due north of the cabin. Cribbing is still intact, and the water level is 4' below the collar. Water test #305, obtained from the standing water of shaft #110, yielded a **pH of 4.1 and a conductivity of 400 μ S**. The claim owner has thrown cans, bottles, and trash into this feature. Dump #210 contains 30 cubic yards of gravel-size material consisting of yellow disseminated pyrite in a rhyolitic breccia host rock. A strong smell of hydrogen sulfide comes from the waste rock. Most of the dumps in this inventory area contain abundant (60%) iron, copper, magnesium, and arsenic sulfides in a barite matrix.

Water test #301 was taken in Gray Copper Creek, about 10' upstream of the confluence with the mine water from adit #101. The **pH was 3.1 and the conductivity was 900 μ S**. These values suggest other mines are contaminating the creek farther upstream.

Quad Name: Ironton

Site #: 04-06-266/4200-1.105; 205, 104, 204; 103

Site Name: Gray Copper Falls Adits

Environmental Degradation Ratings: 1; 2; 3

Description and pertinent facts: The inventory area contains the beautiful Gray Copper Falls. The cliff behind and adjacent to the falls is highly mineralized and is crosscut by yellow-brown veins of iron, lead, zinc, and arsenic sulfides that occur in the fractured zones of the Henson

Formation. The area is accessible by a fairly well marked foot trail that traverses Gray Copper Gulch from FR #884 (not a 4WD road shown as FR #889 on the Ironton Quad).

Feature #103 is a caved shaft that lies on patented claims. Water draining from this shaft forms orange precipitates at the toe of feature #203. Water test #301 was taken in the clear shaft water and had **pH=5.1 and conductivity= 300 µS**. Dump #203 contains 70 cubic yards of yellow to blue-gray waste rock that receives effluent from feature #103. The effluent flows through the dump and discharges into the creek.

Feature #104 is located on public lands and consists of a filled adit with an entrance marked by a deposit of cobble-size rubble. A 2'-wide yellow vein of pyrite and altered wall rock occurs above the entrance to the adit. A spring of clear water bubbles out of the rubble at a rate of 1.5 gpm. Water test #302 from this effluent had **pH=6.9 and conductivity=600 µS**. Orange precipitates from this water stain its drainage channel, which contains long strands of green filamentous algae. Water in this channel flows over the top of dump #204, down the face, and over the eroded toe into the creek. Thick mats of bright green moss carpet the banks of this channel. Feature #204 contains 45 cubic yards of yellow waste rock that is highly enriched in chalcopyrite and marcasite. Water test #303, taken from Gray Copper Creek 50' upstream of the toe of dump #204, produced a **pH of 3.5 and conductivity of 700 µS**.

Features #105 and #205 are on patented mining claims. These features are located at the base of 120' to 150' cliffs that occur 15' above the south bank and approximately 300' from the base of Gray Copper Falls. Most of the metals entering Gray Copper Creek from this inventory area are carried in water exiting adit #105. The mine water has deposited orange precipitates and sludge on top of and along the south flank of dump #205. The mine effluent emerges from a cone-shaped depression of talus at a rate of 25 gpm and flows down an incised drainage channel directly into the creek. Water test #304 was taken at the caved portal of adit #105 and yielded a **pH of 7.0 and a conductivity of 1,000 µS**. Dump #205 contains about 60 cubic yards of waste rock, but it appears that most of the southern flank has been eroded. Green moss blankets the edges of the drainage channel and forms a dense carpet on top of the dump. White salt deposits have accumulated on top of and on the face of the dump at locations where the effluent saturates the waste rock. The waste rock contains veins of chalcopyrite and pyrite. Water test #305 was taken at the toe of dump #205, in Gray Copper Creek, and yielded a **pH of 3.5 and a conductivity of 700 µS**.

The waters of Gray Copper Creek are acidic both upstream and downstream of the falls. The **pH levels average 5.2 and conductivity levels average 800 µS** for the creek water at this inventory site. Water test #306 was taken in the creek at a point approximately 500' above dump #203, on public lands above the falls. At the test site the creek flows at 350 gpm and the water is clear, but the streambed is lined with a thick deposit of orange ferric hydroxide precipitates, and no aquatic life was observed. The low **pH level of 3.6 and the high level of conductivity of 500 µS** from this test may be caused by effluent from the Vernon Mine workings, 800' upstream of this test site. Contaminated water is also flowing from tributaries which drain iron-rich altered rhyolitic breccia zones of the Henson Formation. The scree slopes of Red Mountain No 2 and Red Mountain No 1 are stained yellow-brown and red-orange from this iron.

Quad Name: Ironton

Site #: 04-06-266/4201-1.103, 201, 203; 101

Site Name: Silver Mountain Mine and Vicinity

Environmental Degradation Ratings: 2: 3

Description and pertinent facts: All features at this site occur in mineralized portions of the Burns Formation. Features #101 and #201 are located on USFS-managed lands south of FR #884 and approximately 1,700' from the north bank of Gray Copper Creek. The area includes four cabins, a wooden beam support for the mine track, and a collapsed mill site.

The Silver Mountain Mine (feature #101) has a partly collapsed entrance supported by a massive wooden beam. Timbers, track, and iron pipe sections lie on the flooded floor. Clear water flows from the adit at a rate of 10 gpm. Water test #300 was taken inside adit #101, where black to light yellow precipitates and sludge deposits occur. The water yielded a **pH of 6.9 and a conductivity of 400 μ S**. The mine water spreads out over the entire top of dump #201, leaving yellow to orange-red precipitates that have built up sludge deposits on the dump surface and below the toe. Suspended solids float in shallow puddles. The effluent flows along both flanks of the dump and merges at a spot several hundred feet below the toe.

Feature #201 contains about 1,700 cubic yards of light gray to yellow rock that contains seams of purple fluorite, sphalerite, ferberite, enargite, marcasite, galena, and finely disseminated pyrite. A strong hydrogen sulfide odor surrounds the saturated dump material. An orange-yellow corridor of precipitates occurs in the effluent drainage channel as it meanders through aspen and conifer forests toward Gray Copper Creek. At the toe and on the lower part of the face of the dump, effluent has percolated through the waste rock and has emerged as springs in several locations. Water test #301 was taken below these springs and produced results of **pH=4.1 and conductivity=600 μ S**. Water sample (#04-06-266/4201-1.304) was collected on 8/16/95 below the toe of dump #201, in an area where all of the effluent channels merge. The water sample had **pH=7.3 and the conductivity was 400 μ S**. Lab results of the sample, shown on the table below, reveal iron, manganese, and sulfate concentrations to equal or exceed the state standards.

Below these springs, a series of stair-stepped ponds contain filamentous algae, suspended solids, and thick (2 to 8 inch) deposits of sludge. The ponds are lined with green moss. Dead conifers stand and vegetation is sparse along a 2'- to 6'-wide corridor paralleling the drainage channels. Several rusting 55-gallon drums have spilled their contents into the drainage channels, which has produced an iridescent metallic film on top of the red-orange sludge deposits.

Although the collapsed adit of the Topeka Mine (feature #103) may lie on patented mining claims, its effluent ultimately drains onto public lands. The adit is located at the base of a scree slope, and a partly buried headframe marks its entrance. Clear water is flowing from a pipe (4 inches in diameter) and through the scree material at a rate of 5 to 7 gpm, then is channeled to the southeast, flooding the upper level of dump #203. Water test #303 was taken at the entrance to adit #103 and yielded a **pH of 6.9 and a conductivity of 200 μ S**. The drainage channel from adit #103 is lined with black sludge. The channel staining grades to a pale yellow after flowing for a distance of 30', and then quickly alters to a orange-red color.

Two roads connecting to FR #884 lead to both levels of dump #203, which contains approximately 2,570 cubic yards of material with abundant lead, zinc, copper, and iron sulfides. Yellow to green filamentous algae grows in the effluent drainage channel and in puddles located

on top of both dump levels. Green, yellow, and orange-red mosses grow along the drainage channels. Mine water drains over the east face of the upper level and is diverted along the peripheral eastern edge of the lower level. Springs emerge from both levels, suggesting that much of the waste rock is saturated with mine water. Below the lower level, the mine water forms an orange corridor 470' in length before entering Gray Copper Creek, which is lined with an orange coating of precipitates. Water test #302 was taken below the toe of the lower level of feature #203 in one of two established effluent channels. Test values were **pH=4.1 and conductivity=500 µS**.

Gray Copper Creek receives large quantities of degraded water from adits located upstream and from the many tributaries that carry oxidized iron-rich waters from the slopes of Red Mountain Nos. 1 and 2. No aquatic life was observed in Gray Copper Creek except at the headwaters. Other mine features such as the Kentucky Giant adits and the Vernon Mine workings are also major sources for significant volumes of degraded water. Most of the dumps within Gray Copper Gulch are saturated with mine water.

Sample #04-06-266/4201-1.304; hardness = 320 mg/L; Uncompahgre River Basin segment #7

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	48 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	1,300	1,300	1x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	<50	87**	below standard
Cadmium	1	2.8	below standard
Chromium VI	10	11	below standard
Copper	8	32	below standard
Iron	20	300	below standard
Lead	<1	20	below standard
Manganese	850	640	1.3 x standard
Nickel	<20	240	below standard
Silver	<0.2	0.6 (on 3/2/98)	below standard
Sulfate	250 mg/L	250 mg/L	1 x standard
Zinc	270	284	below standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Ironton

Site #: 04-06-266/4202-1.101; 201

Site Name: Adits Between Lower Albany and Brooklyn Gulches

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: This inventory area lies within a triangular window of USFS-managed land that is completely surrounded by patented mining claims. This site is accessible from the south by an old 4WD road that branches off FR #884 (Brown Mountain Road) and from

the north by a 4WD road that advances from the St. German Foundation and cabins that are owned by Idarado Mining Co. The road from the north is blocked by a metal gate that is on the east side of SH #550. Features #101 and #201 are located on alluvial fans on the eastern edge of Ironton Park.

Feature #101 is situated 215' from the north bank of an unnamed perennial creek where a flow of 65 gpm was estimated during September. The entrance to this adit is intact and contains a wooden beam portal support that measures 5' high by 5' wide. A "V-shaped" trench 60' long by 6' deep connects the entrance to the south side of associated dump #201. This trench is stained orange up to a height of 16 inches from the bottom. The entrances to adits #100 and #101 are in iron-rich colluvium derived from the fractured and altered San Juan Tuff Formation.

Albany Creek is located approximately 900' north of adit #101. Mine water flows from adit #101, along the bottom of the trench, and over the south side of dump #201 at a rate of 2 gpm before entering the creek. Twenty feet beyond the entrance, the roof of adit #101 has collapsed, and debris blocks 3/4 of the opening. Mine water has backed up to an undetermined depth and filters through the debris pile, covering the 20'-long stretch of floor to a height of 8 inches. A thick (3 to 4 inch) orange ferric hydroxide sludge covers the adit floor. Water test #301 was taken inside feature #101 and yielded a **pH of 3.7 and a conductivity of 600 μ S**.

Feature #201 contains 420 cubic yards of iron-rich, angular, brecciated waste rock that produces a strong odor of hydrogen sulfide gas. Some waste rock contains seams of cubic pyrite crystals in a matrix of white quartz crystals. The streambed below dump #201 is stained bright orange with iron oxides, and this color extends along the streambed until it merges with the highly iron-stained banks of Red Mountain Creek. Leaf litter from aspens and pine needles are stained orange on the surface, and the substrate is stained black where the perennial creek weaves its way through a dense grove of aspens and conifers. Patches of yellow occur in the plants growing along the creek banks. Aquatic life was not observed. Water test #300 was taken in the unnamed creek 100' below the toe of dump #201, and values were **pH 4.6 and conductivity 200 μ S**. Water test #302, taken 250' upstream from dump #201, provided a **pH of 3.5 and a conductivity of 700 μ S**.

Feature #200 is a dump that contains about 980 cubic yards of rock. The waste rock from dumps #200 and #201, and from three other dumps that are located on Albany Creek on patented claims, consists of brecciated rock with abundant disseminated pyrite. All of the Albany Gulch area is thoroughly mineralized, and the creek has cut into and exposed the bedded welded tuff and brecciated mineralized zones of the San Juan Tuff. Albany and Brooklyn Gulches are stained orange.

The old Saratoga Smelter and surrounding collapsed buildings are now in ruins. This smelter processed ore from nearby mines and produced a black slag dump of approximately 1,200 cubic yards. Partial walls of fire-brick still stand around several boilers. Fire-bricked furnaces are partly intact, and parts of iron works clutter the road, slopes, and platform where the buildings once stood. The buildings are 230' from the north bank of Albany Creek.

Quad Name: Ironton

Site #: 04-06-266/4206-1.102

Site Name: Dunmore Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The Dunmore Mine (adit #102) lies on patented claims and is located 30' above the north bank of Silver Gulch, which runs parallel to an exposed massive fault system that contains high concentrations of iron, zinc, and ruby silver. Country rock is Uncompahgre orthoquartzite, which forms steep to vertical cliff faces. Silver Gulch is extremely steep and contains slope wash consisting of mineralized boulders. This gulch discharges metal-rich water along a 500' reach of Red Mountain Creek. Red Mountain Creek does not contain any aquatic organisms and has a prominent "bath tub ring" of orange ferric hydroxide up to the high water mark. This staining of the creek, which occurs from the summit of Red Mountain Pass to below the town of Ouray, is a result of natural runoff and mine drainage.

Adit #102 was driven in the basal portion of the fault. Some water from the upper portions of Silver Gulch is diverted through the higher levels of the underground mine workings and through fractures in the fault zone, then discharges from #102 at a rate of about 0.5 gpm. Yellow-brown precipitate has stained the inside walls of this adit up to 10 inches above the adit floor. Effluent at the entrance of adit #102 had a **pH of 6.0 and a conductivity of 400 μ S**.

This effluent flows over the western side of dump #202. Orange-yellow iron staining covers much of the dump and continues to color the slope face until it reaches Silver Gulch. No water discoloration occurs in the gulch. Water draining off the dump is clear and yields a **pH of 7.5 and a conductivity of 500 μ S**. The creek undercuts the toe of dump #202 during times of high runoff.

Quad Name: Ironton

Site #: 04-06-266/4208-2.100

Site Name: Mines West of Silver Paint Mine and SH #550

Environmental Degradation Rating: 3

Description and pertinent facts: This site includes five closely spaced adits on public and private land. Bedrock consists of fractured orthoquartzite of the Uncompahgre Formation.

Adit #100 contains water 6 inches deep with **pH=4.5 and conductivity=300 μ S** that discharges at a rate of 0.1 gpm. This water is clear inside the adit and does not leave any precipitate or discoloration on the floor or sidewalls. Shaft #101 is 25' upslope of this adit and contains standing clear water. The ore body that the adit and shaft expose consists primarily of lead minerals and sphalerite, with only small amounts of pyrite and chalcopyrite. The paucity of iron minerals may account for the lack of iron oxides and orange to yellow precipitates.

Bright green moss and grass grow in the water that drains across the top of dump #200. The toe and flanks of this dump did not show signs of seepage, suggesting that the water is filtering through the porous colluvium and possibly entering the groundwater.

Quad Name: Ironton

Site #: 04-06-267/4201-1.200, 201, 202

Site Name: Lost Day Mine and Vicinity

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area includes approximately 10 acres of disturbed ground. The country rock is part of the Henson Formation that is clayey and mineralized with disseminated pyrite. The hillside has been contoured in a series of wide benches and steep slopes, partially from the excavation at the entrance to adits #101 and #102. The slopes have slumped and have been severely eroded by gullies. Regrading and seeding of the benches and outslopes would reduce runoff and erosion. A series of switchbacks and benches with roads connect to FR #884 at different levels. Fill from the construction of these roads has been pushed off the benches, causing oversteepened side slopes. This disturbed area shows up noticeably on the color 1:24,000 scale aerial photos. These photos, flown on 9/23/88, have the following flight path numbers: #1088-84 and #1088-83.

The Lost Day Mine (feature #100) and two other adits (features #101 and #102) have collapsed entrances and are not draining. Dumps are hard to distinguish from the surrounding bedrock. Because of the relatively high clay content in the colluvium, the well-defined drainage channel that separates dump #200 from dump #202 has been silted up and choked with sediment. Spring runoff and intense summer storms have caused overflow from this channel, allowing sediments to fan out into adjacent areas.

Feature #201 is at the base of several 50'- to 60'-high vertical slopes. These slopes have been deeply incised and subsequently filled with colluvium. Evidence of avalanches is present. Dump #201 is rich in base metals. Veins of galena and black sphalerite crystals occur in the yellow host rock. Several erosional channels cut the lower portion of this dump, but no discoloration was observed. Water test #300 was taken from the natural stream just below the toe of the lowest dump (feature #201). The results were **pH=6.3 and conductivity=200 µS**. This water test is representative of surface water that flows across each of dumps #200, #201, and #202.

Quad Name: Iron-ton

Site #: 04-06-267/4201-2.103, 203

Site Name: Adits and Shaft East of Topeka Mine

Environmental Degradation Ratings: 2

Description and pertinent facts: The site is located on the north slope of Gray Copper Gulch, approximately 650' above Gray Copper Creek. Feature #103 is the only adit in this inventory area from which water is draining. This water is clear and flows from a partly collapsed entrance at a rate of 12 gpm. Water test #300 was taken at the entrance of adit #103 and had **pH=5.0 and conductivity=200 µS**. Orange precipitate lines the drainage channel, and a 4-inch-diameter metal pipe protrudes from the scree material at the entrance. An 8-inch-diameter metal pipe also projects from the entrance and diverts part of the flow to the east side of feature #203.

Feature #203 contains about 550 cubic yards of waste rock. Where the above-mentioned 8-inch diameter pipe ends, a series of ferrosinter terraces have formed on top of the upper level of the dump. Most of the eastern and mid-section of the top of this dump is flooded or saturated with mine water. The face of the upper level is cut by several channels that transport water down to flood the top of the lower level. Water has ponded in several places on top of the lower level and

on an old road bed which connects to FR #884. Green, yellow, and bright red patches of moss grow adjacent to the flooded areas on both levels. The orange-stained drainage channels merge below the toe of the lower level. Some orange precipitates surround areas where springs seep out at the base of the upper level and at the toe of the lower level. Water test #301 was taken at the toe of the upper level of dump #203 within one of the shallow ponds. This test yielded a **pH of 4.8 and a conductivity of 500 μ S**.

Shafts #101 and adit #102 are above feature #103. Underground workings of these two features probably connect with adit #103, and it is likely that water from the upper mines drains through adit #103.

Feature #104 is 25' above FR #884 and 370' west of feature #103. The entrance is collapsed and is filled with bluish-gray rhyolitic tuffaceous scree derived from the Burns Formation. A small natural stream runs in front of the entrance, over the top of the upper level of feature #204, across the road, and down along the eastern side of the lower level. The upper level contains yellow mineralized waste rock, and the lower level contains mostly blue-gray host rock. Roads connect to both levels of feature #204. Water test #302 was taken at the toe of the lower level of dump #204, from the stream which runs near the portal. The water was clear and showed no precipitate. Results from this test were **pH=6.8 and conductivity=100 μ S**.

Quad Name: Ironton

Site #: 04-06-267/4204-2.100, 200, 101, 201, 103; 202, 203

Site Name: Upper Hendrick Creek (Guadalupe and Dallas Mines)

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: This inventory area includes all of the mines whose surface runoff or effluents drain into Hendrick Creek, including the area above the Lucky 20 Mine (see USFS-AMLI field data form #04-06-267/4204-1). Hendrick Gulch is an extremely steep, sometimes vertically walled gulch that exposes highly mineralized and hydrothermally altered San Juan Tuff overlain by rhyodacitic tuff of the Burns Formation. FT #24 is the only access to the upper mines in this gulch. FT #26 ends in an area of steep, grassy slopes above mineralized vertical spires 200' to 400' high and does not reach the Guadalupe Mine, as shown on the Ironton Quad. The mines and dumps are difficult to access because the trail leading to them has been washed away in numerous locations. Much of the ore from the mines was transported out via mule along FT #24.

Feature #100 is a partly collapsed adit with a portal framed by 8-inch by 8-inch beams. This adit extends over 200' along a vein trending N.50°E. Outside the adit, 8'- to 25'-long upright wooden beams and poles are connected to cables anchored in the rock face above the portal. These poles may have served as a frame supporting an aerial tram or may have been part of a building that enclosed the entrance and top of feature #200. Clear water, smelling of hydrogen sulfide, flows from the entrance of the adit at a rate of 5 gpm into several deeply eroded channels in the face of dump #200. One-inch- to 4-inch-thick deposits of bright orange sludge occur along the mine track that extends from the entrance onto the top of the dump. Water test #300, taken at the entrance of adit #100, provided a **pH of 4.4 and a conductivity of 400 μ S**.

Dump #200 contains about 1,200 cubic yards, and the top has abundant wood debris. Water drains from the toe, empties into a gully beside the dump, and flows 20' before emptying into Hendrick Creek. Avalanches have scoured the sides of Hendrick Gulch and removed the toe of dump #200. The dump face has been steepened (38°) and deeply incised by runoff and mine effluent. The waste rock contains vuggy quartz and seams of chalcopyrite, galena, and pyrite. Polished seams of base metals occur all along the streambed, from the toe of the uppermost dump to the alluvial fan near Red Mountain Creek.

Feature #101 is the Guadalupe Mine, located on patented mining claims. This feature is an intact adit that extends over 50' and from which clear water flows at a rate of 3 gpm. Six- to 8-inch-thick deposits of orange sludge occur along the floor, and the walls are coated with ferric hydroxides. Mine water stands at a depth of 2' behind a 3'-high berm that has been breached on the east side.

Dump #201 contains about 550 cubic yards, and water flows over the top and along the east face within a deeply eroded gully. Water test #304-A, taken on USFS-managed lands, is representative of water that drains from dump #201. Test values were **pH 4.6 and conductivity 400 µS**. Water test #304 was also taken on USFS-managed lands, above the confluence where water from dump #201 enters Hendrick Creek. Values for test #304 were **pH 4.7 and conductivity 300 µS**. The face of the dump is moderately to well cemented, probably because of the abundant clay- and silt-size particles within the yellow, pyrite-rich waste rock. The toe of the dump extends into Hendrick Creek. Rock in the dump contains seams of pure galena.

Feature #102 is an adit with a blocked entrance. It is located on USFS-managed lands about 20' from the east side of the gully adjacent to dump #201, described above. No water flows from the entrance. Feature #202 contains 320 cubic yards of well-cemented, yellow, sulfide-rich waste rock, much of which has been removed by erosion. Waste rock consists of disseminated pyrite, sphalerite, and galena in a fine-grained matrix that is part of a hydrothermally altered breccia zone in the Burns Formation. Water test #302, taken in the side drainage channel below the toe of dump #202 and above adit #101, yielded a **pH of 4.9 and a conductivity of 300 µS**.

Feature #103 is the Dallas Mine adit. Colluvium nearly fills the portal, and clear water 1' deep is inside the entrance. The mine floor is covered with a 1-inch-thick layer of orange ferric hydroxide sludge. Mine water does not drain from the entrance. Water test #303, taken inside adit #103, provided a **pH of 4.8 and a conductivity of 300 µS**. Feature #203 is a well-cemented dump containing 175 cubic yards of mostly gravel-size, yellow waste rock with disseminated pyrite. The toe and lower face have been partly eroded by runoff and avalanches. Large, mineralized boulders have spalled from the rock faces in the side drainage channel and from above the north slope of Hendrick Gulch, then rolled into the creek.

Water test #305 was taken in Hendrick Creek, on USFS-managed lands, approximately 50' above the confluence with Red Mountain Creek on the west side of SH #550. The values were **pH 5.0 and conductivity 100 µS**. Orange staining does not occur along the streambed at this test location, and willows, grasses, and phreatophytes are not discolored. Aquatic larvae and insects are sparse under rocks and within ponded areas of Hendrick Creek. At the time of this test, the rate of flow for Hendrick Creek was about 70 gpm. Approximately 1,400' of stream reach is between the discharge point of the uppermost mine dump and the site of water test #305.

Quad Name: Ironton

Site #: 04-06-267/4206-1.100, 200

Site Name: Connie Mines

Environmental Degradation Ratings: 3

Description and pertinent facts: The adits of the Connie Mines are reached by a rough road that branches from FR #878 and ascends a narrow gulch. The adits are interconnected by a series of stopes that produced from the east side of a mineralized fault zone in the San Juan Tuff.

The lowest adit, feature #100, receives drainage from the upper mine workings. Clear water exits this adit at a rate of 2 gpm, leaving a heavy sludge of black to red-brown precipitate that coats the floor. An orange-red stain is 6 to 8 inches above the floor of the adit. A test of the adit water showed **pH=7.8 and conductivity=300 μ S**.

Effluent from adit #100 flows over the top and most of the face of dump #200. The entire dump, which contains abundant pyrite and galena, is saturated with water. Red-orange precipitate covers most of the surface of this dump. Moss, phreatophytes, and leaves of willow bushes are yellow from being in contact with the water. Below dump #200, the effluent has **pH=7.4 and conductivity=200 μ S**, then flows into an unnamed stream that merges with the Uncompahgre River.

Quad Name: Ironton

Site #: 04-06-267/4206-2.105, 202, 203, 204

Site Name: Chrysolite/North Star Mines

Environmental Degradation Ratings: 3

Description and pertinent facts: This site includes features from the Chrysolite and North Star Mines. Mineralization occurs in Uncompahgre Formation orthoquartzite and is characterized by highly pyritized quartz veins, with associated galena and sphalerite. Dumps show the effects of sheetwash and gully erosion. Runoff from the site flows into narrow channels before discharging to Red Mountain Creek.

The Chrysolite shaft #102 and dump #202 (850 cubic yards) are on patented mining claims. The head of dump #202 is at the top of a narrow and vertically sided gulch. This dump is stained red-brown and broadens lower down, fanning out on a talus slope. Part of the toe was removed during construction of SH #550, and yellow precipitate is being deposited at a 1 gpm seep at the toe. This effluent runs along the east side of SH #550 for 85', is diverted under the roadway, and flows into Red Mountain Creek. A water test conducted at the toe of dump #202 showed **pH=6.5 and conductivity=1,500 μ S**.

The North Star Mine, which is also on patented mining claims, includes adit #103 and shaft #104. These features are associated with heavily pyritized dumps #203 and #204. Dumps #203 and #204 are stained yellow with ferric hydroxide, and most of the runoff from dumps #202-#204 drains south into a steep, narrow, "V-shaped" gully, and discharges into Red Mountain Creek. Yellow precipitate coats the gully

Water is also emerging from fractured zones within and adjacent to adit #105. Water flows from this adit at 1 gpm and from adjacent rock faces at 3 gpm. Adit #105 is on the east side of SH #550, next to the borrow ditch. A yellow-orange precipitate coats the floor, sides, and adjacent rock faces. **Conductivity and pH values of 1,500 μ S and 7.1**, respectively, are representative for the waters of adit #105 and the surrounding seeps. Results of water sample #04-06-267/4206-2.301, collected inside this adit on 8/22/94, are shown on the table below. Sulfate exceeds standards, but metal concentrations are low.

Sample #04-06-267/4206-2.301; hardness = 1100 mg/L; Uncompahgre River Basin segment #6¹

Lab Analyses (dissolved unless noted)	Concentration \div (μ g/L unless noted)	Numeric Standards* ¹	= Factor Above Stream Standards
Total Alkalinity	80 mg/L	no standard	n/a
Aluminum	<100	87**	below detection limit
Arsenic	3.3	100 (trec)	below standard
Barium	13	1,000** (trec)	below standard
Beryllium	<1	4**(trec)	below standard
Cadmium	<0.25	7.5	below standard
Chromium VI	<20	11	below detection limit
Copper	<8	92	below standard
Iron	280	1,100 (trec)	below standard
Lead	<5	116	below standard
Manganese	67	1,000	below standard
Mercury	<0.2	0.01	below detection limit
Molybdenum	<20	no standard	n/a
Nickel	<40	591	below standard
Selenium	<1	5	below standard
Silver	<0.3	4.6 (on 3/2/98)	below standard
Sulfate	1,000 mg/L	250 mg/L**	4 x standard
Uranium	<3	21,100**	below standard
Zinc	<16	808	below standard

* Numeric standards are μ g/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

¹ No numeric standards are available for stream segment #6; numeric standards are taken from the next downstream segment, segment #3.

Quad Name: Ironton

Site #: 04-06-267/4207-2.100

Site Name: Spruce Box Mine and Vicinity

Environmental Degradation Rating: 3

Description and pertinent facts: Features #100 and #101 are shafts situated above cliffs on the south side of the Uncompahgre River, at about the same elevation as FR #878 (Engineer Pass Road), which is located above cliffs on the north side of the river. The shafts are near the border of USFS-managed lands and private lands and may be on patented mining claims. Country rock consists of Uncompahgre Formation orthoquartzite, with pockets containing 50% to 70% base metals.

Feature #100 is an open, vertical shaft that is filled with water to within 1' of the collar. Some orange-brown staining is on the walls below the surface of the water. A decayed wooden ladder is leaning upright against the east wall. Test #300 of the shaft water showed **pH=5.7 and conductivity=100 µS**.

Feature #101 is a dangerous open shaft about 75' to 90' deep that is next to an overhang 45' above the Uncompahgre River. Two wooden ladders and sections of mine track serve as steps and hand rails for accessing the lower section of the shaft. Shaft #101 exposes a vein of porous quartz with sphalerite, galena, and pyrite. Water dripping down the vertical shaft walls has stained them orange-yellow. Most of the dump material (feature #201) has been pushed over the overhang and has accumulated along the river banks.. Cliff walls and fast water in the river prevent access to test effluent seeping from the base of feature #201.

Quad Name: Iron-ton

Site #: 04-06-268/4201-1.100, 200, 101, 201

Site Name: Silver Creek Basin/Upper Silver Creek

Environmental Degradation Ratings: 3

Description and pertinent facts: The features of this inventory area are on USFS-managed lands adjacent to patented mining claims. Feature #100 is an intact adit located 70' south of an old 4WD road that makes a large curved path along the lower part of Silver Creek Basin. The portal is 5' from the north bank of Silver Creek, and the mine workings extend beneath the streambed for a distance of 20'. Water test #300, taken inside feature #100, provided a **pH of 6.4 and a conductivity of 100 µS**. Clear creek water flows over and along the south side of the portal at a rate of 300 gpm.

Associated dump #200 contains about 25 cubic yards of yellow waste rock that are spread out over two levels. Pyrite and sphalerite veinlets and disseminated galena are present. Water from the creek is flowing over the toe of feature #200. Water test #301 was taken in Silver Creek about 100' below the toe of this dump and yielded a **pH of 6.6 and a conductivity of <50 µS**.

Feature #101 is located 30' from the west bank of a side creek that merges into the south side of Silver Creek and is 320' upstream of feature #100. Feature #101 has an intact entrance located at the foot of a red-brown outcrop of brecciated rhyolite of the Henson Formation. The rhyolite has a platy cleavage and is thoroughly stained with iron oxides. Base metals occur within a 4-inch-wide vein of quartz exposed above the entrance. Inside the adit, green moss blankets the ceiling and walls. Mine water flows over the moss and drains through an 8'-wide connecting trench before reaching the dump. Water test #302, taken inside adit #101, had a **pH of 4.3 and a conductivity of 200 µS**.

Dump #201 contains about 45 cubic yards of rock. Mine water was draining over the top of the dump, down its flanks, and into the side drainage at a rate of 3 gpm. Areas of standing water are present on top of this dump, and water flows out of the toe at a rate of 4 gpm. Water flows in the side creek at a rate of 8 gpm. Water test #303 was taken in the side creek 15' below the toe and yielded a **pH of 5.8 and a conductivity of 100 µS**. Red-brown staining occurs along the streambed for a distance of 50' downstream and on the surface of the waste rocks at the toe of

this dump. Dump material consists of quartz veins filled with crystalline galena, black sphalerite, and pyrite.

Motorized access to this site would be possible if the old 4WD road was graded from where it branches off the main road on the east side and below Ross Lake. The road advances over the saddle, down a series of switchbacks, across Alaska Basin, and into the upper part of Silver Creek Basin. Two full-size former school buses were parked adjacent to an actively worked shaft that is located in Alaska Basin. The mine owners used the school buses as shelter facilities for many years. Numerous quartz veins crosscut Alaska Basin, and the exposed country rock is stained with a metallic black luster. Most of the mineralized outcrops in Alaska Basin are patented.

Quad Name: Ironton

Site #: 04-06-268/4203-2.101, 202; 102, 200, 201

Site Name: Letcher Creek

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: Letcher Creek is a perennial stream that drains a cirque and an incised mineralized gulch located adjacent to the west flank of Poughkeepsie Gulch. The bed of Letcher Gulch contains iron-stained rocks, although the stream water is clear. Water flow was estimated at 180 gpm, high enough to transport a heavy load of sediments. The creek banks have a narrow corridor of green riparian growth, but the gulch walls are bare. This is partly because of steep (38° to 45°) slopes that are composed of unstable, mineralized, yellow-brown to black rhyodacitic tuff of the Burns Formation. The upstream portion of the creek contains yellow to brown mineralized spires on steep slopes. Fine sand- to clay-size sediment remains in the streambed from the eroded bedrock.

Feature #100 is the patented Free Gold Mine, a filled adit that may have been blasted shut. Dump #200 contains about 170 cubic yards. The upper portion is on patented claims, and the lower portion is on public land. The face of this dump is steep (37° to 39°), and much waste rock has slid down the south slope of Letcher Gulch. The toe and 2/3 of the dump have been transported into Letcher Creek and onto a braided colluvial/alluvial fan. The material in feature #200 is orange to yellow and has a particle size ranging from clay to coarse gravel. Most of the toe consists of cobble- to boulder-size waste rock that has been deposited in and along the streambed. The creek banks have 4'- to 6'-high linear berms of material rich in chalcopyrite and pyrite. Some waste rock contains 80% marcasite and pyrite.

Feature #101 is an intact adit 10' to 15' above the north bank of Letcher Creek. Upslope material has sloughed over the entrance, forming a 3'-high berm that dams clear mine water to a depth of 1.5'. The adit floor is lined with filamentous algae, and orange precipitates occur on the moss-carpeted walls above the water line. Water test #300 was taken in standing water from feature #101 and yielded a **pH of 3.9 and a conductivity of 300 µS**. Mine water seeps under and flows over the berm, staining the top of associated dump #201 an orange color. Dump #201 contains about 30 cubic yards of rock. Surface runoff and flash flooding have removed the toe and undercut the side slopes, steepening the face of the dump. Below the toe of the dump, the streambed is stained orange from oxidation of iron sulfides that have leached from waste rock on

dumps #200 and #201. Riparian growth shows no signs of yellowing. Water test #301 was taken 200' below the toe of feature #201. The test results were **pH 6.3 and conductivity <50 µS**.

Feature #102 is an intact adit located on patented claims farther up the north-facing slope of Letcher Gulch. The entrance to the adit is about 480' from the creek. Orange precipitate occurs on the floor and to a height of 1.5' along the walls. Standing water is present to a depth of 1' inside the 60'-long adit. Water test #302, taken inside adit #102, yielded a **pH of 4.2 and a conductivity of 100 µS**. Some roof material has calved from the ceiling and built up a low pile of debris at the entrance. Mine water flows through this pile and out over the top of associated dump #202 at a rate of 1 gpm, then flows onto USFS-managed lands before entering the creek. The blue-white host rock that surrounds adit #102 contains numerous quartz veins that are filled with pyrite stringers having a width of up to 2 inches. The host rock is stained yellow-orange. A large, exposed section of mineralized platy tuff occurs above this adit. The tuff is stained red-orange, is very friable, and is highly fractured.

Dump #202 contains about 190 cubic yards and is mostly composed of white, gravel-size material, although cobble-size, yellow-brown rock containing numerous stringers of pyrite is present on the flanks. A strong odor of hydrogen sulfide comes from those areas that are saturated by mine water.

Quad Name: Iron-ton

Site #: 04-06-268/4203-3.100

Site Name: Unnamed Drainage South of Moose Creek

Environmental Degradation Rating: 3

Description and pertinent facts: This inventory area straddles both sides of a steep gulch with an unnamed perennial creek that drains a portion of the south-facing slope of Poughkeepsie Gulch. The inventoried features are on USFS-managed lands. Country rock consists of rhyodacitic tuffaceous flows of the Burns Formation that are highly fractured and mineralized with base metals. Aquatic life was found in this creek, and riparian foliage appeared healthy.

Feature #100 lies on the south-facing slope of an unnamed gulch. The entrance is almost completely filled with colluvium. A 2.5'-high berm has dammed mine water to a depth of 10 inches. An orange layer of precipitates and sludge deposits covers the walls and floor, although the mine water is clear. Water drains out of the berm and flows over the top of associated dump #200 at a rate of 1 gpm. A bright green carpet of moss grows in the seepage area.

Feature #200 consists of 105 cubic yards of light yellow to white, gravel-size waste rock, with red-brown to yellow, cobble- to pebble-size material along the periphery. The waste rock contains approximately 65% pyrite with quartz stringers. The toe of the dump lies in a U-shaped corridor located 30' from the north side of the creek bank. Mine water is channeled down the midsection of the face of feature #200 before it seeps into the toe. Surface runoff from this dump does not flow into the unnamed creek, although it may seep through the colluvium and enter the creek at some distance downstream.

Water test #301 was taken in the creek about 150' below the toe of the dump. Test results were **pH 6.9 and conductivity <50 µS**. At this test location, the rock surfaces are stained gray-white.

Water test #300 was taken inside feature #100 and yielded a **pH of 6.2 and a conductivity of 100 μ S**.

Quad Name: Ironton

Site #: 04-06-268/4205-1.101, 105, 106, 107, 207

Site Name: Adits West of the Junction of FR #878 and FR #876

Environmental Degradation Ratings: 3

Description and pertinent facts: All features of this inventory area are on public lands on the south side of the Uncompahgre River, below the confluence with Mineral Creek. Features #104, #204, #106, and #206 border patented mining claims. The site is located on a north-facing slope near the base of cliffs of San Juan Tuff that are overlain by spires of rhyodacitic tuff of the Burns Formation. Mineral exploration focused on narrow (1' to 3' wide) lead- and zinc-rich veins of porous quartz with accessory fluorite. The veins occur along tightly fractured faults.

Feature #101 is a partly collapsed adit where most of the entrance has been filled with colluvium. A berm has dammed clear mine water to a depth of 2' for about 35'. Orange precipitates coat the floor and walls, but no mine water was seeping through the berm. Water test #300 was taken from standing water inside adit #101 and yielded a **pH of 5.6 and a conductivity of 300 μ S**. Seams of sphalerite, pyrite, and galena occur in the waste rock of feature #201, which contains an estimated 80 cubic yards of yellow, cobble- to boulder-size material. The steep (38°) slope of the 40'-long face extends down the north-facing slope to the river. The toe has been removed by erosion.

Feature #105 is a vertical shaft that measures 10' long by 8' wide and has a depth of over 10'. A large cavernous room surrounds this shaft. A vertically walled trench that extends 17' in an easterly direction connects the shaft to features #205 and #206. The entire shaft and the orange floor of the room is flooded with milky water. Approximately 6 inches of water is present on the adit floor, although no water was observed to be draining into the trench. Logs, probably fallen cribbing that supported the walls, float in the water. Adit #106 is west of shaft #105, is about 15' long, and has standing water. Water test #301 was taken from shaft #105 and yielded a **pH of 5.7 and a conductivity of 200 μ S**. Water in adit #106 yielded **identical pH and conductivity values**. The tops of features #205 and #206 (a combined volume of 80 cubic yards) are stained orange from water draining from features #105 and #106 during times of increased flow. These dumps are contiguous, but vary in coloration and base-metal content.

Feature #107 is an open adit with 2' of clear water that is dammed for a length of over 25'. Thick deposits of bright orange precipitates coat the walls and floor, and suspended solids occur as floating masses mixed with air bubbles. Water test #302 was taken inside feature #107 and provided a **pH of 4.8 and a conductivity of 400 μ S**. A 3'-high berm dams the entrance, but mine water was seeping from beneath this berm, through the 40-cubic-yard dump #207, and emerging from the lower 1/3 of the face, which is mostly stained orange. The toe of the dump has been largely removed by erosion. Water test #303 was taken at the toe of dump #207 in an effluent stream that is flowing at a rate of 2 gpm and is precipitating orange compounds. Test values were **pH 4.7 and conductivity 500 μ S**. The east bank of the Uncompahgre River is also stained orange for a distance of 15' by water draining from the dump. Because of the swift

current and large volume of water in the river, riparian growth is hardly affected by the contaminated water discharging from feature #207.

Quad Name: Ironton

Site #: 04-06-268/4206-1.200; 100, 101, 201

Site Name: Michael Breen Adits

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: Two adits on patented mining claims compose the upper and lower levels of the Michael Breen Mine. The upper adit (feature #101) is in a steep (38°) "V-shaped" gully that exposes a 4.5'-wide, sulfide-rich vein occurring in the San Juan Tuff Formation. Gully erosion has removed about 1/2 of associated dump #201, which still contains an estimated volume of 350 cubic yards of yellow waste rock.

Feature #100 is an intact adit where bright orange water stains its walls and floor and the surface of the associated dump. Feature #200 contains about 1,300 cubic yards that is mostly intact, although, the western face has been severely eroded by the drainage described above. Stream erosion has removed waste rock from both dumps, transporting the material down the gulch, across FR #878, and into the Uncompahgre River. Effluent from adit #100 flows at a rate of 25 to 30 gpm and has saturated most of the material in dump #200. The water seeps into the top, percolates through the gravel-to cobble-size fill, and emerges from the toe as a series of springs. Effluent from the partly eroded toe of dump #200 flows about 10', then discharges into the north side of the river. Yellow filamentous algae, yellow to black sludge (2- to 6-inches thick), and yellow-orange precipitate stain most of the top of dump #200.

Material from dumps #200 and #201 consists of massive sulfide waste rock that contains disseminated pyrite, seams of galena, and pockets of sphalerite, with lesser amounts of dark blue-gray volcanic host rock. Dump #200 includes four adjacent piles of waste rock. The piles vary in color and base-metal content. Two of the piles are composed of gravel- to sand-size, finely crushed, yellow waste rock that is rich in iron sulfides. The other two piles contain boulders and cobbles of rock with abundant galena, sphalerite, pyrite, and chalcopyrite.

Water test #300 was conducted at one of the springs emerging from dump #200, just before the effluent enters the river. Test results showed **pH=3.3 and conductivity=200 µS**. Water test #301 was conducted at the river, 20' upstream of where the uppermost effluent spring enters, and the results were **pH=6.9 and conductivity=<50 µS**. Water test #302 was 250' downstream of where the lowermost effluent spring enters the river and yielded values of **pH=7.2 and conductivity=<50 µS** on a flow of about 2,600 gpm. Water test #303 was obtained at the entrance of adit #100 and showed **pH=6.2 and conductivity=300 µS**. Water test #304 was taken on top of dump #200 and provided values of **pH=6.7 and conductivity=100 µS**. Lab results of water sample #04-06-268/4206-1.300, collected from a spring at the base of dump #200 on 6/8/95, are shown below. Lead and manganese concentrations are more than 100x state standards, and concentrations of aluminum, cadmium, zinc, iron, copper, and silver also significantly exceed the standards.

Sample #04-06-268/4206-1.300; hardness = 64 mg/L; Uncompahgre River Basin segment #2

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	2,400	1,000	2.4 x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	1,800	87**	21 x standard
Cadmium	34	0.80	43 x standard
Chromium VI	<10	11	below standard
Copper	210	8.1	2.6 x standard
Iron	2,100	300	7 x standard
Lead	380	2.1	184 x standard
Manganese	5,300	50	106 x standard
Mercury	<0.2	0.01	below detection limit
Nickel	<20	68	below standard
Silver	0.22	0.03 (on 3/2/98)	6.3 x standard
Sulfate	100 mg/L	250 mg/L	below standard
Zinc	5,700	73	78 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Ironton

Site #: 04-06-269/4202-1.105, 110; 101, 102, 103, 107

Site Name: Lower Silver Creek

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: Silver Creek Gulch is on the west side of Poughkeepsie Gulch and drains all of Silver Creek Basin. The lower portion of the gulch contains several falls and extremely steep to vertical side slopes that are devoid of vegetation and are heavily mineralized. A well-defined foot trail starts just west of two "A-frame" cabins (located 55' from the west bank of the Uncompahgre River), and switchbacks up the benched slopes to the foot of Silver Creek Basin. At this point, the trail connects to an old 4WD road that traverses around the basin, across a scree slope, over a saddle, and connects to mines in Alaska Basin. This road ascends the north-facing slope of Alaska Basin, crosses over another saddle, and connects to a 4WD road that advances from Gladstone and passes by the eastern side of Ross Lake. All features are on USFS-managed lands and border patented mining claims.

The entrance to feature #102 is caved and filled with colluvium. Mine water was draining through the debris at a rate of 2 gpm, then flowed over dump #202, which is stained orange. Water test #302 was taken in the clear water that was seeping from the debris at the entrance of feature #102 and yielded a **pH of 5.1 and a conductivity of 100 µS**. Dump #202 contains about 270 cubic yards of waste rock consisting of altered rhyodacitic tuff of the Burns Formation. Base-metal mineralization includes pyrite, sphalerite, and stringers of galena. Mine water percolates through the dump, down a 38° slope, and emerges at the toe where it flows 55' before discharging into Silver Creek. The toe of the dump extends into the streambed.

Feature #103 is next to the foot trail on the north side of Silver Creek. The entrance is collapsed, but mine water was draining from the caved adit at a rate of 0.5 gpm. Water test #303 was taken at the entrance of adit #103 and provided values of **pH 5.0 and conductivity 100 µS**. This water seeps through a mat of bright green moss that lines an 8' trench, then percolates through the top of associated dump #203. This dump contains 212 cubic yards of yellow-brown waste rock that includes about 70% pyrite, galena, and sphalerite. No water appears to drain from the toe of the dump, which is located on a bench 22' above the creek.

Feature #105 is a partly collapsed adit whose entrance is 2/3 filled with colluvium. The berm at the entrance dams mine water to a height of 2' for a distance of over 30'. Red-orange precipitate has accumulated in stair-stepped fashion along the walls. Orange sludge deposits, up to three inches thick, occur on the floor. Water inside this adit contains an oil film on the surface and is stained a red-brown color. Water test #304 was taken inside adit #105 and yielded a **pH 4.7 and a conductivity 300 µS**. Water seeps through the berm and drains over the top of associated dump #205. This dump contains 70 cubic yards of lead-zinc rich material consisting of veins of sphalerite up to 3 inches wide and veinlets of pyrite, all contained within 6- to 9-inch veins of white quartz. Mineralization occurs within a breccia zone that crops out above the adit.

Feature #107 is a collapsed adit located along the east-facing slope above Silver Creek. The adit contains a partly buried wooden beam at the portal. Mine water was observed draining through the rubble and over the top of associated dump #207 at a rate of 1 gpm. Water test #305 was taken in the drainage channel in the vicinity of dump #207 and provided a **pH of 4.9 and a conductivity of 100 µS**. The light-yellow water that emerges from beneath the rubble flows over a thick mat of green moss and has formed a drainage channel that contains a dense growth of green filamentous algae. Dump #207 contains 370 cubic yards of well-cemented light-yellow waste rock with black sphalerite, galena, and pyrite in a quartz matrix. The toe is 25' from the south bank of Silver Creek. No visible surface water was draining or seeping from the toe.

Feature #110 is an intact adit located at the base of vertical 200'-to 300'-high outcrops of the Henson Formation, which consists of brecciated zones of rhyolitic tuff. This adit follows a 4'-wide mineralized zone that contains a 2-inch wide vein of high-grade ore. A concentrated amount of galena and sphalerite (45%) occurs within the main vein, which is exposed at the portal and on the ceiling of adit #110. Talus from the slopes below the cliffs has formed a berm 4.5' high at the entrance, damming mine water to a height of 1' for a distance of at least 45'. Orange precipitates do not occur on the walls or on the floor, although orange-brown sludge is present on the rocks and floor of this adit. Water test #306 yielded a **pH of 4.3 and a conductivity of 100 µS** from the standing water inside feature #110. Mine water was observed seeping through the berm onto a portion of the top of associated dump #210. This dump contains about 75 cubic yards and has an elongated shape with a steep face (37°).

Quad Name: Iron-ton, Handies Peak

Site #: 04-06-269/4203-1.100, 200

Site Name: Old Lout Mine (Patented Claims) Water Tests

Environmental Degradation Ratings: 3

Description of pertinent facts: This inventory site lies along the east side of the headwaters of the Uncompahgre River, within Poughkeepsie Gulch. Old Lout Mine (feature #100) and the associated dump (feature #200) are on patented mining claims. The mine workings are driven in rhyodacitic welded ash flow tuffs of the Eureka Formation that have undergone fracturing, alteration, and mineralization.

Feature #100 is an intact adit with a 6'-high by 6'-wide timbered portal. Underground workings are extensive (greater than 1,000' in length) and reportedly include several levels of drifts and interconnecting shafts. During the site visit, clear water flowing at a rate of 420 gpm emerged from the entrance, ran along a "V-shaped" trench for 25' into a deep "V-shaped" drainage trough that is incised in the top and the face of dump #200. Water test #300 was taken at the entrance to feature #100 and yielded a **pH of 6.7 and a conductivity of 400 μ S**. The mine water then flowed over FR #876.2 and spread out over the fan-shaped toe of the dump. Portions of the toe contained ponded water, moss-covered areas, and saturated grass- and willow-covered areas. Mine water draining over the toe entered the river in numerous locations along the eastern bank. The trough where water test #300 was obtained was lined with yellow to green moss and contains long strands (more than 12-inches long) of yellow-green filamentous algae.

Feature #200 contains about 2,580 cubic yards of waste rock. This dump has been eroded into two main piles by the large volume of mine effluent from adit #100. Throughout its 320' length, beginning at the adit entrance and extending to the dump toe, the effluent channel is a series of stair-stepped short falls and benches, covered with yellow to orange sludge deposits. Filamentous algae and moss are abundant. Portions of the dump contain buried scrap iron, sheet metal, iron pipe, and boards. The waste rock contains approximately 60% disseminated pyrite, and also includes veins of galena, sphalerite, chalcopyrite, marcasite, and tetrahedrite. Water test #301 was taken on patented claims, 20' from the east side of FR #876.2, on feature #200, within the drainage channel. Values for this test were **pH 6.8 and conductivity 400 μ S**. Water test #306 was taken in this same location at a later date and provided values of **pH 8.2 and conductivity 500 μ S**. The flow rate within the drainage channel had dropped from 420 to 360 gpm between the times of the readings.

Water test #302 was taken from the river on USFS-managed land 200' below the lowermost point where effluent from features #100 and #200 enters the river. Test values were **pH 7.2 and conductivity 400 μ S**. At this test site, orange precipitates coat the rocks and vegetation along the east bank for a downstream reach of 100'. Upstream of features #100 and #200 and their effluent effects, white precipitates coat the rocks and also form crusts on plants and rocks. Water test #303, from public land, was conducted 300' upriver of the point where the uppermost channel flows off dump #200 and enters the east bank. This test was taken in the river, where the water was milky colored and the flow rate was an estimated 2,380 gpm. Results from test #303 were **pH 7.0 and conductivity <50 μ S**. The following water samples were both collected on 8/15/95 from the Uncompahgre River on USFS-managed lands. Water sample #04-06-269/4203-1.304 was obtained 350' upstream of the toe of dump #200 and provided values of **pH 6.7 and conductivity 100 μ S**. Water sample #04-06-269/4203-1.305 was collected approximately 500' below the toe of dump #200 and provided values of **pH 7.4 and conductivity 100 μ S**. Lab results of the samples are shown on the tables below.

Upstream sample

Sample #04-06-269/4203-1.304; hardness = 49 mg/L; Uncompahgre River Basin segment #2

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	<10	1,000	below standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	<50	87**	below standard
Cadmium	1.4	0.65	2.1 x standard
Chromium VI	<10	11	below standard
Copper	10	6.4	1.6 x standard
Iron	14	300	below standard
Lead	3	1.4	2.1 x standard
Manganese	130	50	2.6 x standard
Nickel	20	55	below standard
Silver	0.2	0.02 (on 3/2/98)	10 x standard
Sulfate	46 mg/L	250 mg/L	below standard
Zinc	260	120	2.2 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Downstream sample

Sample #04-06-269/4203-1.305; hardness = 71 mg/L; Uncompahgre River Basin segment #2

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	16 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	<10	1,000	below standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	<50	87**	below standard
Cadmium	1.3	0.86	1.5 x standard
Chromium VI	<10	11	below standard
Copper	<4	8.8	below standard
Iron	<10	300	below standard
Lead	<1	2.5	below standard
Manganese	150	50	3 x standard
Nickel	<20	70	below standard
Silver	<0.2	0.04 (on 3/2/98)	below detection limit
Sulfate	59 mg/L	250 mg/L	below standard
Zinc	200	120	1.7 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Iron-ton

Site #: 04-06-269/4206-1.101; 201

Site Name: Upper Diamond Creek Adits

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: Collapsed adits #100, #101, and #102, are located on private and public land along the upper stretches of Diamond Creek, north of the upper Uncompahgre River. Snowslides have scoured the creek banks and streambed. Bent trunks of aspens can be seen growing along both sides of Diamond Creek Gulch. The inventory area is accessed by a poorly marked foot trail that is delineated by faded orange flagging. This trail is a popular route from which to observe the spectacular scenery of the upper reaches of Diamond Creek Gulch. Diamond Creek has cut a narrow, sometimes vertical-walled gulch that is devoid of vegetation.

Adit #101 was driven into a 3.5'- to 4'-wide yellow vein containing pyrite and porous, vuggy, crystalline quartz. The vein is surrounded by a brecciated fracture zone in blue-gray rock of the San Juan Tuff Formation. Feature #101 was the only adit with flowing water. The water is bright red-orange and flows at a rate of 1 to 2.5 gpm across associated dump #201 before merging with Diamond Creek. Effluent at adit #101 had **pH=6.2 and conductivity=200 µS** (water test # 302). This adit was revisited at a later time (8/15/95) to obtain water sample #04-06-269/4206-1.305. Results of the sample, shown on the table below, reveal that concentrations of manganese, iron, copper, zinc, cadmium, and aluminum exceed state standards.

Feature #201 is a dump containing 50 to 60 cubic yards. The surface material is stained bright orange, and water is seeping from the toe. Water test #304, from 150' below the toe of dump #201 in Diamond Creek, provided results of **pH=7.7 and <50 µS conductivity**.

A perennial creek flows over the collapsed entrance of adit #100, crosses the top and face of associated dump #200, and empties into Diamond Creek. The face of dump #200 is severely eroded by sheetwash and has deep grooves. During times of high water flow or spring runoff, standing water that ultimately spills over the eastern flank covers the entire top of dump #200. Part of the toe has been undercut, and the lower portion of the face has been oversteepened (36°) by flash flooding and spring melt waters. Rock from dump #200 has been deposited in the streambed for at least 400' downstream. Water test #303 was conducted at the toe of dump #200 and provided a **pH of 7.6 and a conductivity of 200 µS**. Water test #301 was performed above dump #200 in Diamond Creek and yielded values of **pH=7.6 and <50 µS conductivity**. Water test #300 was taken at the entrance of adit #100 and yielded values of **pH=7.4 and 100 µS conductivity**.

Sample #04-06-269/4206-1.305; hardness = 140 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	10 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	2,900	1,000	2.9 x standard
Thallium (trec)	<1	0.5**	below detection limit
Aluminum	160	87**	1.8 x standard
Cadmium	5	1.5	3.4 x standard

Blaine Mine and the adits that are located farther upslope on the west side of the basin produced ore rich in silver bromide sulfides. The same black sheen observed on rocks from feature #200 occurs on rocks from dumps associated with adits #102, #103, and #104. The Mountain Monarch Mine (feature #102) and adits #103 and #104, which are located on either side of it, worked the same vein. The vein consists of highly fractured and laminated iron-stained ore minerals surrounded by a 6'- to 10'-wide alteration zone. This zone is yellow-orange and crops out along the face of the vertical spires 20' above the entrance to adit #102. The Blaine Mine produced from this same vein at a lower elevation.

^^New Quad^^

Site #: 04-06-262/4214-1.200

Environmental Degradation Rating: 3

Dump #200 is associated with trench (or possibly caved adit) #100. The dump is about 40 cubic yards and is composed of unconsolidated gravel- to cobble-size material placed at a steep angle (35°). The toe of the dump extends down to FT #209, and the outslope appears unstable and may slide.

Site #: 04-06-263/4210-1.201

Environmental Degradation Rating: 3

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Feature #201 contains about 250 cubic yards of clay and yellow-orange sand. Most of the dump has slid and eroded down the steep bare slope below adit #101 to an unnamed south-flowing intermittent stream. Material from dump #201 has spread at least 500' downhill and downstream in this intermittent stream. Abundant salts and secondary sulfur have precipitated onto the somewhat dispersed waste rock.

Quad Name: Ouray

Site #: 04-06-264/4210-1.101, 201

Site Name: Adits North of Mineral Farms

Environmental Degradation Ratings: 3

Description and pertinent facts: This site is accessible by a private 4WD road which branches off CR #361. The inventory area is on USFS-managed land that borders private mining claims. Private lands just to the south of this area have been extensively mined for gold, and shafts, adits, and dumps are numerous. Barite is abundant, along with galena, sphalerite, wolframite, tetrahedrite, chalcopyrite, azurite, malachite, and quartz crystals that line large vuggy pockets. A large mill site, now reduced to a concrete platform, is located due south of this site.

Dump #201 has abundant pyrite and marcasite, about 70-85%. No lead minerals or sphalerite were found on the dump. Two- to eight-inch-thick veins occur within the main ore body, which is hosted in the Leadville Limestone. Metals in the waste rock have been oxidized by water seeping out of adit #101 and filtering through dump #201. A deeply rusted pair of ore car tracks is submerged below a three- to six-inch-deep layer of standing water inside the adit. Adit #101 contains a 0.5- to 1.5-inch-thick sludge on the floor, and bright orange staining occurs along the sidewalls for the entire length of approximately 50'. This staining has a maximum height of 1.5' above the floor, suggesting water backs up during the spring months. Standing water in the adit has **pH=6.4 and conductivity=500 μ S**. Results of water sample #04-06-264/4210-1.300, collected from adit #101 on 8/21/94 show iron, cadmium, and lead concentrations significantly exceed state standards; copper concentration is virtually at the standard..

Spring runoff and storm surges produce large quantities of water that drain from the dump and are channeled down a gulch into Canyon Creek. Two piles, containing volumes of 10 and 15 cubic yards, of highly pyritized rock occur on wooden log platforms located above the north bank of the gulch and at the toe of the dump.

Sample #04-06-264/4210-1.300; hardness = 61 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Aluminum	75	87**	below standard
Arsenic	21	50 (acute, trec)	below standard
Barium	9	1,000** (trec)	below standard
Beryllium	<1	4**(trec)	below standard
Cadmium	5	0.77	6.5 x standard
Chromium VI	<10	11	below standard
Copper	8	7.8	1.0 x standard
Iron	10,000	300	33 x standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Lead	9	1.9	4.7 x standard
Manganese	8	50	below standard
Mercury	<0.2	0.01	below detection limit
Molybdenum	<10	no standard	n/a
Nickel	<20	63	below standard
Selenium	<1	5	below standard
Silver	<0.2	0.03 (on 3/2/98)	below detection limit
Sulfate	79 mg/L	250** mg/L	below standard
Uranium	<3	870**	below standard
Zinc	44	70	below standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Ouray

Site #: 04-06-264/4212-1.104, 105, 107; 102, 201, 204, 206, 207

Site Name: Morning Star Mine

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: This inventory area is on USFS land in the Uncompahgre Valley north of Ouray. The site consists of a cluster of adits and dumps just south of the privately owned Rock of Ages Mine.

Host rock is nearly horizontal, permeable Dakota Sandstone, which is 30' to 150' thick and forms cliffs in this area. Nearly vertical, mineralized veins, some of which contain about 90% pyrite, cut the host rock. The veins are highly fractured, providing conduits for groundwater to oxidize and leach pyrite. Adits #102-105 and #107 have orange ferric oxide lining the bottom and sidewalls. Levels of water seasonally fluctuate within each adit, as indicated by the higher levels of orange staining that occur on the walls of the adits and form as fan-shaped orange precipitates deposited on the surface of dumps #201, #204, #206, and #207. Surface runoff from these dumps flows over the cliff faces of the Wanakah and Cutler Formations and into the Uncompahgre River. Contaminated groundwater may also reach the Uncompahgre River.

Water tests conducted inside the adits show overall readings of low pH and high conductivity: **#102, pH=2.7 and conductivity=1,700 µS; #104, pH=2.8 and conductivity=1,700 µS; #105, pH=2.7 and conductivity=1,700 µS; #107, pH=6.5 and conductivity=500 µS.** Dump #207 was the only dump with enough water to test, and the test revealed **pH=6.8 and conductivity=300 µS.** Water sample #04-06-264/4212-1.300 was collected from adit #102 on 8/21/94. Concentrations of aluminum, cadmium, copper, iron, and zinc significantly exceed state standards. Lead and sulfate concentrations are slightly above the standards, as shown on the table below. During storm surges and spring runoff, these mines contribute significant quantities of metals to surface and ground water.

Sample #04-06-264/4212-1.300; hardness = 190 mg/L; Uncompahgre River Basin segment #3

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Aluminum	1,300	87**	14.9 x standard
Arsenic	1.4	100 (trec)	below standard
Barium	15	1,000** (trec)	below standard
Beryllium	1	4** (trec)	below standard
Cadmium	54	1.9	28.4 x standard
Chromium VI	<10	11	below standard
Copper	1,500	20.4	73.5 x standard
Iron	20,000	1,100 (trec)	18.2 x standard
Lead	18	9.7	1.9 x standard
Manganese	990	1,000	below standard
Mercury	<0.2	0.01	below detection limit
Molybdenum	<10	no standard	n/a
Nickel	<20	156	below standard
Selenium	<1	5	below standard
Silver	0.2	0.23 (on 3/2/98)	below standard
Sulfate	320 mg/L	250** mg/L	1.3 x standard
Uranium	<3	3,042**	below standard
Zinc	12,000	183	65.6 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Ouray

Site #: 04-06-264/4212-2.200

Site Name: Speedwell Mine/Twin Peaks Trail #208.1A

Environmental Degradation Rating: 3

Description and pertinent facts: This site is easily accessed by the popular Twin Peaks Trail (FT #208). Dump #200 is located in a steep (38°) "V-shaped" drainage trough. This 240-cubic-yard dump has a long linear distance (500') that is exposed to runoff, resulting in gully and sheetwash erosion. The upper portion of this dump consists of fine gravels and sand-size yellow fragments of pyritized rock.

Pyritized rock is in contact with perennial running water in the drainage trough and at several springs, where a strong hydrogen sulfide smell is evident. Oxidation of pyrite is indicated by red-orange staining on the volcanic country rock of the San Juan Tuff Formation. **Conductivity readings increase from 100 µS to 500 µS, and pH values drop from 8.2 to 6.8** as creek water drains over and percolates through the entire length of the dump. However, no staining was visible at the toe of the dump.

Quad Name: Ouray

Site #: 04-06-265/4212-1.100, 200

Site Name: Stopes and Adit on East Side of SH #550 and North of Radium Springs (Public Hot Springs Pool)

Environmental Degradation Ratings: 2

Description and pertinent facts: This area was previously inventoried as site #65/12-1 by DMG. This site is located next to a filling station and motel, 400' east of SH #550. During the 1995 summer field season, this land was conveyed to private ownership.

A metal grate covers the entrance of the adit to prevent entry, and a sign on this grate warns the public of the hazard of rockfall in the immediate area. Rocks and talus that dislodge from mine dumps located upslope roll down a V-shaped drainage corridor and accumulate on top of dump #200. Runoff from upslope mines is funneled down this drainage corridor, too, particularly during storm surges and periods of high snow melt. This runoff spills over the overhang located above adit #100, then flows across or leaches through dump #200, and drains into an intermittent tributary of the Uncompahgre River.

Adit #100 was discharging effluent with **pH=8.2 and conductivity=1,400 μ S** at the rate of about 0.5 gpm. The effluent was red-orange to blue-green and was depositing sludge of similar hues. Higher flow rates occur, as indicated by the presence of an orange ferric hydroxide line that is 6 to 10 inches above the present water level. Results of a water sample (#04-06-265/4212-1.300) collected on 8/20/94 near the portal are tabulated below. Aluminum and sulfate concentrations significantly exceeded state standards; copper, iron, and manganese concentrations were slightly high.

Dump #200 is about 105 cubic yards and has abundant pyrite and other sulfides. The surface of the dump is stained orange, probably from the oxidation of the sulfides. This dump is continually being leached by effluent from adit #100 and is intermittently affected by runoff from the higher mines.

Sample #04-06-265/4212-1.300; hardness = 1,100 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration \div (μ g/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	210 mg/L	no standard	n/a
Aluminum	620	87**	7.1 x standard
Arsenic	2.1	50 (acute, trec)	below standard
Barium	7	1,000** (trec)	below standard
Beryllium	<1	4**(trec)	below standard
Cadmium	<0.25	7.5	below standard
Chromium VI	<10	11	below standard
Copper	150	92	1.6 x standard
Iron	520	300	1.7 x standard
Lead	7	116	below standard
Manganese	67	50	1.3 x standard
Mercury	<0.2	0.01	below detection limit
Molybdenum	37	no standard	n/a
Nickel	<20	591	below standard
Selenium	<1	5	below standard
Silver	0.4	4.6 (on 3/2/98)	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Sulfate	920 mg/L	250 mg/L	3.7 x standard
Uranium	3.9	21,100**	below standard
Zinc	<8	808	below standard

*Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Ouray

Site #: 04-06-265/4216-2.202

Site Name: Champion Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The Champion Mine inventory area is along and on the north side of Dexter Creek and is accessed by FR #871. Adit #102 and associated dump #202 are high above the road near the base of a cliff near a dry intermittent stream.

Dump #202 is about 150 cubic yards and contains moderate quantities of sulfides, including pyrite, chalcopyrite, galena, and marcasite. Most of the waste rock is brecciated silicified sandstone and shale, both cut by quartz veinlets. Sulfides are concentrated in the veinlets and disseminated in the sandstone. The dump outslope is steep and unstable.

Quad Name: Ouray

Site #: 04-06-266/4212-2.200, 201

Site Name: Chief Ouray Mine

Environmental Degradation Ratings: 3

Description and pertinent facts: Chief Ouray Mine (#100) is along Cascade Creek on USFS-managed lands that are surrounded by patented claims. Intact adit #101 emits poisonous air, but is difficult to access. It is reached by following a narrow game trail that leads north from some mine shacks, crosses a talus slope, and then climbs up precipitous slopes to the entrance.

Runoff flows down the steep (45°) slopes of dumps #200 and #201 and is funneled into a V-shaped channel that discharges to Cascade Creek. A yellow ferrous hydroxide precipitate coats the dumps and forms a thin sludge that mantles the rock surfaces, especially in those areas where springs emerge. Dump material contains abundant copper, iron, lead, and zinc minerals that have oxidized over an elongated surface area of the dumps. Water from the dumps ultimately drains to Cascade Creek. Groundwater contaminated by the dumps may flow through the underlying porous sandstones of the Cutler and Hermosa Formations and discharge into lower Cascade Creek. Cascade Creek has partly eroded, and is in contact with, the toe of dump #200. The surface of both dumps show accelerated levels of sheetwash and gully erosion, and very little vegetation grows on the dumps. However, riparian growth exists on both sides of Cascade Creek just above and below dump #200, and aquatic organisms flourish in the creek.

Dumps #200 and #201 contain a combined volume of 757 cubic yards and extrude a strong smell of H₂S, which is especially noticeable near seeps. A water test of seepage at the toe of dump #200 yielded **pH of 6.2 and conductivity of 500 µS**.

Quad Name: Ouray

Site #: 04-06-266/4216-2.100, 200, 201

Site Name: Dumps below Bachelor Mine on Dexter Creek

Environmental Degradation Ratings: 3

Description and pertinent facts: This site was once part of the town of Ash, which contained a mill, boarding houses, and extremely large dumps. The dumps were derived from various levels of underground workings at the Bachelor Mine. A severe flood in the early 1900s completely washed away the town of Ash and the sulfide-rich rock that was contained on these dumps. Dump material can be found in the stream gravels of Dexter Creek for several miles downstream. Dispersed material from the dumps and mill site probably contributes metals to Dexter Creek.

All of the inventoried adits and dumps of this site are on patented claims, although all of the water samples and tests were taken on USFS lands. The mine dumps contain abundant sulfide minerals, especially lead-bearing minerals with traces of silver and platinum. Runoff from most of the dumps is funneled into "V-shaped" channels. Large piles (greater than a total volume of 500 cubic yards) of waste rock still line the banks of Dexter Creek, and each spring runoff erodes and undercuts the toes of these dumps.

Water exiting adit #100 has **pH=7.4 and conductivity=500 µS** and flows at a rate of 0.5 gpm. The floor of this adit is coated with a thick (0.5 to 0.25 inch) deposit of black sludge topped with an oxidized orange film. The yellow-orange water flows into a narrow channel located between two lobes of 5,000-cubic-yard dump #200, then flows across FR #871 into Dexter Creek. Below dump #200, the effluent had **pH=7.6 and conductivity=500 µS**. Results of an effluent sample (#04-06-266/4216-2.304) collected on 8/21/94 below dump #200, about 20' west of FR #871, are shown on the table below. Manganese, zinc, and cadmium concentrations greatly exceed state standards; sulfate concentration is slightly above the standards.

In addition to the effluent stream discussed above, a marshy area below the entrance to adit #100 contains a mantle of yellow moss. Marsh drainage percolates through dump #200, leaving a path of stressed yellowing plants. However, Dexter Creek has dense riparian growth on the creek banks, both above and below the massive dumps, and the creek water is clear and contains abundant aquatic organisms. A **pH of 7.9** was recorded in the creek below the confluence with effluent from adit #100.

Water flowing at 20 gpm drains from the main portal of the Bachelor Mine (feature #101) and discharges to Dexter Creek. A water test at this portal shows **pH=7.4 and conductivity=100 µS**. Dump #201 is about 2,500 cubic yards, contains abundant fresh and oxidized pyrite, and lies adjacent to Dexter Creek.

Sample #04-06-266/4216-2.304; hardness = 310 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
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Quad Name: Telluride

Site #: 04-06-255/4206-1.204

Site Name: Adits Northwest of Virginus Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The Virginus and Humbolt Mines lie at the head of Governor Basin. Both mines have extensive underground workings driven on veins that are rich in silver and gold. Runoff from the dumps and effluent from the adits contribute substantial volumes of water to Governor Creek, which flows into Canyon Creek. The slopes of Governor Basin are covered with thick deposits of talus. The morphology of the basin has changed from the addition of waste rock and fines derived from the large dumps. Tailings and waste rock have been transported from higher levels by snowslides and alluvial action onto the lower flats on the basin floor. Mine water drains from the adits of the Virginus and Humbolt Mines and flows over and through the dump piles, which were placed in stair-stepped fashion on the flanks of the basin. Bright orange and red-brown precipitates coat the rocks along the drainage corridors extending from beneath the Virginus and Humbolt dumps.

Dump #204 is a three-level feature associated with the multi-level, patented Virginus Mine. Part of the 38,000-cubic-yard dump extends onto public land. Effluent from the Virginus Mine flows onto the dump and seeps in, emerging in several places along the toe.

Water tests were taken in two drainage channels on public land. Water test #300, conducted at an unnamed channel downstream of the Humboldt Mine and dump, yielded values of **pH 5.8 and conductivity 100 µS** on a flow of 15 gpm. Water test (#301), conducted below and on the north side of dump #204, showed **pH 3.6 and conductivity 500 µS** on a flow of 5 gpm. Water sample #04-06-255/4206-1.301 was collected on 7/15/94 at test site #301, and the results are shown on the table below. The sample contained severely degraded water, exceeding state standards by more than an order of magnitude in aluminum, cadmium, copper, iron, lead, manganese, and zinc concentrations.

Sample #04-06-255/4206-1.301; hardness = 130 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Aluminum	2,600	87**	30 x standard
Barium	10	1,000** (trec)	below standard
Beryllium	1	4**(trec)	below standard
Cadmium	42	1.4	30 x standard
Chromium VI	<10	11	below standard
Copper	340	15	23 x standard
Iron	16,000	300	53 x standard
Lead	160	5.6	28 x standard
Manganese	24,000	50	480 x standard
Mercury	<0.2	0.01	below detection limit
Molybdenum	<10	no standard	n/a
Nickel	<20	115	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Molybdenum	<10	no standard	n/a
Selenium	<1	5	below standard
Silver	<0.2	0.12 (on 3/2/98)	below detection limit
Sulfate	250 mg/L	250 mg/L	1 x standard
Uranium	<3	2,000**	below standard
Zinc	9,000	132	68 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Telluride

Site #: 04-06-256/4207-1.103

Site Name: Adits Along Upper Sneffels Creek in Yankee Boy Basin

Environmental Degradation Rating: 4

Description and pertinent facts: The inventory site consists of several clusters of mine features located mostly along the south side of Sneffels Creek in lower Yankee Boy Basin. This area is accessed by FR #853.1B. Features #103, #203, #104, and #204, and the associated water test locations are on USFS-managed lands.

Feature #100 is an intact adit on patented mining claims. A chain-link fence crosses the entrance, which is framed out by wooden beams measuring 6-inches thick by 10-inches wide. Orange-brown water was seeping from the entrance, but larger flows of up to 8 gpm have been observed during the spring thaw. Water test #300, taken in front of feature #100, yielded a **pH of 7.7 and a conductivity of 200 µS**. The mine waters drain into a creek that runs through features #200a and #200c and then merges with Sneffels Creek. Water test #301, taken in the creek above dumps #200a and #200c, provided a **pH of 7.1 and a conductivity of <50 µS**. Water test #302 was taken below these dumps in the same creek, just above its confluence with Sneffels Creek, and provided a **pH of 7.3 and a conductivity of 100 µS**. Features #200a through #200c consist of three adjacent dump piles with a total estimated volume of 400 cubic yards. The western flanks of the piles are in contact with standing and flowing water. The waste rock contains seams of chalcopyrite, galena, and pyrite in granodiorite of the Stony Mountain intrusive stock.

Feature #103 is an intact adit that measures 4' high by 5' wide. Mine waters exiting the adit at 0.5 gpm are clear, but deposit an orange precipitate over a 25' portion of feature #203 before entering Sneffels Creek. Standing water up to 8 inches deep is present in the adit for more than 50'. This water contains suspended solids. A carpet of bright green moss grows in the drainage corridor and at the entrance to the adit. Water sample #04-06-256/4207-1.304 was taken inside feature #103 on 7/12/94. The water had **pH of 7.2 and conductivity of 100 µS**. Lab results, shown on the table below, reveal the mine water exceeds state standards in aluminum, cadmium, copper, iron, lead, manganese, and zinc concentrations.

A bulldozer has leveled out the surface of feature #202 (a 380-cubic-yard dump) over a distance of 130'. The waste rock from feature #203 is combined with that of feature #202, and the two dumps are counted as one and catalogued as feature #202. Material from dump #202 is spread

out along the south bank of Sneffels Creek. The waste rock is rich in barite, galena, and pyrite. Host rock is fine-grained rhyodacite of the San Juan Tuff Formation.

Feature #104 is a partly filled shaft that is very dangerous. The inner walls are framed out with log cribbing that extends to a depth of 20'. The total measured depth was 30'. Surface water drains into the lower workings. Adit #103 connects to the lower workings of this shaft.

Within and below this inventory area, Sneffels Creek is clear and flows at an average rate of 40 to 50 gpm. This creek supports stonefly and mayfly larvae, worms, and leeches. Grasses, willows, and moss growing along the banks are healthy. Rock surfaces in the streambed are stained red-brown. Water test #303 was taken in Sneffels Creek, about 300' above its confluence with the creek that is originating at features #200a and #200c, but below features #101-#104 and their associated dumps in this inventory area. Results were **pH 7.8 and conductivity <50 µS**. Water test #305 was taken at a location 50' above the confluence where the water from adit #103 enters the south bank of Sneffels Creek, but below features #105 and #205. Values were **pH 7.7 and conductivity <50 µS**.

Sample #04-06-256/4207-1.304; hardness = 120 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	<10 mg/L	no standard	n/a
Aluminum	3,000	87**	34 x standard
Arsenic	<1	50 (trec)	below standard
Barium	18	1,000** (trec)	below standard
Beryllium	2	4**(trec)	below standard
Cadmium	11	1.3	8.4 x standard
Chromium VI	<10	11	below standard
Copper	84	14	6 x standard
Iron	2,000	300	6.7 x standard
Lead	6	5	1.2 x standard
Manganese	12,000	50	240 x standard
Mercury	0.2	0.01	20 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	110	below standard
Selenium	<1	5	below standard
Silver	<0.2	0.1 (on 3/2/98)	below detection limit
Sulfate	190 mg/L	250 mg/L	below standard
Uranium	<3	1,800**	below standard
Zinc	2,100	124	17 x standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

Quad Name: Telluride

Site #: 04-06-256/4207-2.100

Site Name: Upper Sneffels Creek above Columnar Jointed Canyon Walls

Environmental Degradation Rating: 3

Description and pertinent facts: Adit #100 is on patented mining claims along with dumps #200-#203. Water from this adit flows at a rate of 10 gpm into upper Sneffels Creek. Adit #100 contains a thick, orange sludge that coats the walls and floor. Rocks at the entrance are also mantled with a 1/4-inch-thick, black to orange deposit of sludge. Eight inches of clear water cover the floor and submerge the mine track. Moss, algae, willows, grass, and riparian plants exposed to the mine water show signs of yellowing. The mine water has a **pH value of 7.6 and a conductivity of 600 μ S**. About 120' downstream, below the confluence of the effluent and Sneffels Creek, the conductivity is **100 μ S and the pH is 7.9**. Because adit #100 is on patented claims, water samples were not collected.

A combined volume of about 220 cubic yards was produced from adit #100, and most of it contains a high percentage of sulfide minerals. A strong smell of hydrogen sulfide gas surrounds the dump material. This site also contains a considerable amount of rusting pipe, ore track, and mine equipment that is in direct contact with Sneffels Creek. Approximately half of the dumps in the immediate area contain gravel- to sand-size aggregate, which adds to the sediment load of Sneffels Creek.

Outcrops of fractured, brecciated volcanic rocks on both sides of Sneffels Creek are rich in iron sulfides. Erosion by Sneffels Creek has steepened the slopes, exposing this mineralized area of the San Juan Tuff Formation. The mineralized slopes make an abrupt transition to columnar jointed, vertical, 40'-high walls that are formed from a rhyolite intrusion.

Quad Name: Telluride

Site #: 04-06-256/4208-1.105, 205

Site Name: Adits on North side of Knoll above the Headwaters of Sneffels Creek

Environmental Degradation Ratings: 3

Description and pertinent facts: This site is on public land that borders on patented mining claims. The entrance to adit #105 is partly collapsed because of water-saturated unstable soils above. Approximately 1.5' of water covers the floor of the adit and drains out through the rubble that fell from the ceiling. This rubble has formed a 2'-high berm. Vertical rock walls in front of the adit are stained orange from mine waters. Iron staining was observed six inches above the present level of the mine water, suggesting that there are seasonal fluctuations in the rates of flow. At the time of the site visit, the rate of discharge was 0.8 gpm. Water test #302 is from adit #105 and yielded a **pH of 7.6 and a conductivity of 300 μ S**.

Dump #205 straddles and is in contact with Sneffels Creek. Effluent from adit #105 flows over the portion of dump #205 that is located along the south bank of Sneffels Creek. On this side of the dump, green moss grows on top of the orange-stained rocks. Portions of this 15-cubic-yard dump have been removed and carried downstream during periods of spring runoff and flash flooding. Waste rock includes abundant disseminated pyrite in fractured, quartz-rich porphyritic gabbro and coarse-grained granodiorite. Precipitates also coat the rocks along Sneffels Creek approximately 200' below dump #205. Test #303, taken in Sneffels Creek above features #105 and #205, yielded a **pH of 8.2 and a conductivity of 0 μ S**.

Quad Name: Telluride

Site #: 04-06-256/4208-2.100, 201, 105

Site Name: Genessee and Dread Not Claims (Yankee Boy Basin)

Environmental Degradation Ratings: 3

Description and pertinent facts: This inventory area is on the north side of FR #853.1B, approximately 1/2 mile east of the trailhead sign to Blue Lakes Trail (FT #201). All of the features within this inventory site are on patented mining claims. At the request of the Forest Service, the inventory data table (p. 2 of the USFS-AML! Field Data Form) was completed for each feature, and water quality was tested at the dumps, in adit #105; and at adit #100. Daryl Gusey (Forest Geologist) and Tim Sutton (Minerals Specialist) were present to assist in the inventory. A water sample was taken from below dump #201 to assess the quality of water that was flowing onto USFS-managed lands.

Feature #100 is a collapsed adit discharging clear water at a rate of 12 gpm. A 120'-long trench connects the entrance of the adit to FR #853.1B. Black precipitates stain the drainage channel. At a distance of 80' from the entrance, yellow precipitates and sludge deposits line the drainage channel, and at a distance of 110' from the entrance, orange precipitates have stained the rock surfaces. Water test #302 was taken at the entrance to adit #100 and provided results of **pH 5.7 and conductivity 200 µS**.

After crossing FR #853.1B, effluent from adit #100 runs along the east side of 220-cubic-yard feature #200. Water test #301, taken in the mine effluent drainage corridor at the top of the mill site on the east flank of feature #200, yielded a **pH of 6.9 and a conductivity of 100 µS**. Feature #200 may represent a stockpile that was placed adjacent to and at the top of the American Girl Mill site for processing. Mine water then flows over the lower concrete foundation of the American Girl Mill and meanders through a marshy meadow that is filled with willows before entering the north side of Sneffels Creek. The distance from the adit to the creek is about 250'. Water test #300 was taken near feature #200 in a shallow pool of water that contained some orange precipitates. Results from this test were **pH 5.6 and conductivity 100 µS**.

Feature #101 is an adit with a filled entrance. Feature #201 is a large dump that contains 865 cubic yards of yellow waste rock and blue-gray platy, tuffaceous host rock derived from the San Juan Tuff Formation. Waste rock includes veins of galena and sphalerite within a matrix of tabular barite crystals. A bulldozer has leveled the top of this dump, and waste rock was pushed over the western flank, steepening the side slopes to about a 37° angle. These slopes are severely incised, and portions are undercut by an unnamed stream. Part of this stream runs beneath the dump material and emerges on the southeastern flank and toe area. Flow rates in the stream channels ranged from 15 gpm to 25 gpm. It is in this area that water tests #303 and #304, and water sample #04-06-256/4208-2.307, were taken. Water tests #303 and #304 yielded **pH values of 5.5 and 5.4, respectively, and the conductivity levels were both <50 µS**. Lab results for water sample #04-06-256/4208-2.307, shown on the table, indicate that the water emerging from the toe is relatively clean. It slightly exceeds state standards in zinc concentrations, but most parameters are below detection limits.

The entrances of adits #102 and #103 are collapsed and fairly dry. Dumps #202 and #203 are above feature #201, farther up the unnamed stream. Both dumps have faces of 36° to 38° that are badly eroded and incised. Stream erosion has removed the toes of the dumps, and rock sliding is

active. The streambed shows no signs of staining or buildup of orange precipitate deposits. Green vigor is present in the riparian growth, and aquatic insects were found under the rocks at this test site. Water test #305, taken from the unnamed stream above feature #103, provided a **pH of 5.5 and a conductivity of <50 µS**.

Feature #105 is an intact, 30'-long adit that contains a 2'-high berm of roof debris at the entrance. The clear mine water flowing from the entrance contains no orange precipitates or sludge deposits. Water test #306, taken from the standing water inside feature #105, yielded a **pH of 5.0 and a conductivity of 100 µS**. The mine water varies from a height of 9 inches to 12 inches. A side drainage channel flows along the northern flank of feature #205. Feature #205 contains about 40 cubic yards of red-brown stained, gravel- to cobble-size waste rock impregnated with microcrystalline pyrite.

Sample #04-06-256/4208-2.307; hardness = 21 mg/L; Uncompahgre River Basin segment #5

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards*	= Factor Above Stream Standards
Total Alkalinity	12 mg/L	no standard	n/a
Antimony (trec)	<1	6**	below standard
Arsenic (trec)	3	50	below standard
Thallium (trec)	<1	0.5**	below detection limit
Cadmium	<0.25	0.33	below standard
Chromium VI	<10	11	below standard
Copper	<4	3.1	below detection limit
Iron	<10	300	below standard
Lead	<1	0.5	below detection limit
Manganese	<4	50	below standard
Nickel	<20	28	below standard
Silver	<0.2	0.005 (on 3/2/98)	below detection limit
Sulfate	<5 mg/L	250 mg/L	below standard
Zinc	31	28	below standard

* Numeric standards are µg/L, are dissolved concentrations, and are chronic values unless noted.

** No stream-specific standard available. Based on state-wide standard.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Handies Peak

Site #: 04-06-269/4202-2.104

Site Name: Canadian Lake and Vicinity.

Hazard Rating: 2.

Description and pertinent facts: All features within this inventory area are on USFS-managed lands. Adits with intact entrances below the outlet to Canadian Lake, west of this inventory area, are on patented mining claims and pose a danger to the public because of unstable roof rock. All features were driven in pyroxene andesite tuff of the Henson Formation.

Turquoise-colored Canadian Lake is the main attraction to this inventory area. From FR #876.2, an overgrown foot trail (NST #10) begins a switchback course up the eastern slope of upper Poughkeepsie Gulch. The trail follows the north side of Canadian Creek, crosses several large scree slopes (rock glaciers), circles above the northeastern part of the lake, and switchbacks up into the cirque that forms Canadian Basin. The side slopes of the bowl area are bare and have numerous rockslides and cliffs. A large dump and adit exist in the upper basin and headwaters of the creek. Most of the upper basin is on BLM-managed lands and patented mining claims.

Below Canadian Lake, a group of open adits are on both sides of the creek within vertical walls of mineralized rock. Adits and prospect trenches are predominantly on the northeastern talus slopes above the lake. A cluster of prospect pits is present in the mineralized veins in the cirque. Most of the dumps near the lake are highly visible from the trail.

Feature #101 is an intact adit with a 2.5'-high berm of colluvial debris at the entrance. Detached material from the roof clutters the damp floor. The entrance measures 5' high by 4' wide and follows a brecciated mineralized zone for over 40' along a bearing of N.72°E.

Feature #104 consists of an open shaft 17' from the outlet to Canadian Lake. The foot trail circles around the northwestern edge of the shaft. This 13'-deep shaft/pit is very dangerous because of its vertical walls. In addition, standing water is present in the bottom 3'. The surface opening measures 7' long by 5' wide. There are no deterrents or signs around this feature to warn the public.

Feature #105 is an intact adit located about 280' below the outlet to the lake, on the south side and about 30' above the streambed. An 18'-long trench with 12'- to 15'-high vertical walls connects the entrance to the top of feature #205. This dump is steep, multi-leveled, and contains about 90 cubic yards of gravel- to cobble-size waste rock. Water stands at a height of 8 inches above the floor. The walls of this adit are in competent rock. Mine timbers are present 50' into the adit and continue for the remaining 35'.

Feature #106 is a partly caved exploratory adit located 90' north of the foot trail. A 3'-high berm in front of the entrance has formed from upslope sloughing. The overall entrance opening measures 4' high by 4' wide, and the adit is 15' long.

Features #107, #108, and #110 are adits on the northeast slope above Canadian Lake. Feature #107 contains an intact entrance that measures 5' high by 4' wide. A 2'-high berm backs up mine water for over 30' to a height of 1.5' to 2'. Feature #108 contains a filled-in entrance from which effluents are seeping out and draining over the top of the dump, which contains about 50 cubic yards of rock. Feature #110 is an intact adit that bears N.60°E. Mine water stands at a height of 2.5' to 3' above the floor for a length of over 25'. The entrance measures 6' high by 5' wide and has unstable roof rock that has fallen and accumulated as a 3'-high berm.

Feature #114 is an intact adit located 270' from the south edge of the inlet. Water is draining from the entrance into Canadian Creek. The adit (measuring 5' high by 3' wide) follows a mineralized vein exposed above the entrance along a bearing of S.47°E. for more than 15'.

Another area that warrants discussion is the intact and open entrance to the patented Alabama Mine. The claims contain two modern "A-frame" cabins with signs saying "Explosives Keep Away". The cabins are 30' from the west side of the Uncompahgre River. A modern, wooden-beam bridge crosses the river to access these cabins. The entrance to the Alabama Mine is 5' east of FR #876.2 and approximately 300' east of the cabins. Many people drive past this adit to access upper Poughkeepsie Gulch and the pass to Lake Como. Water is draining from the mine at a rate of 2 gpm. The walls are in laminated, banded latite of the Burns Formation. Portions of the floor are flooded. No barricades, fence, grate, or signs are posted at the entrance to warn the public to keep out of this adit. It seems unusual that this highly accessible adit would not have some kind of grate across the entrance to prevent access. This adit is more than 170' long.

Quad Name: Handies Peak

Site #: 04-06-269/4204-1.102

Site Name: Maid of the Mist Mine and Surrounding Areas

Hazard Rating: 1

Description and pertinent facts: This site is located on both sides of an unnamed creek that merges with the upper Uncompahgre River. The features are surrounded by a dense, mature conifer forest and are accessed from NST #11. The Maid of the Mist Mine and mill site, together with adits that are located below a 120'-high cliff, are on patented mining claims. These mines produced from veins that were rich in silver-lead sulfides. The Maid of the Mist adit has a collapsed entrance that may have been dynamited shut. The mill site is on a wide bench, and the lower adit is at the foot of the vertical cliffs on a scree slope. Most of the original machinery has been removed from the stamp mill, but a cable drum hoist, a partial headframe, several lengths of stamps and rods, pulleys, a centrifugal pump, and a forge remain. Sections of metal pipe, scrap iron, and sheet metal clutter the face and are buried in the bilevel dump, which contains an estimated volume of 1,420 cubic yards of yellow waste rock. The winch, cables, and pulleys may have been used to raise ore up the cliffs from the dump (estimated volume of 230 cubic yards) that was located next to the lower adit. The mill site is dangerous, as loose rock lies on top of boards that were part of the housing that enclosed the mill. Wooden beams sticking out from the waste rock mark the locations of several levels to the mill and are surrounded by open void spaces. The foot trail goes along the western side of the mill and up over the entrance to Maid of the Mist Mine.

Features #102 and #103 are on USFS-managed lands. Feature #102 is a shaft located above the mill site, on the north side of an unnamed creek that flows from the western end of Mineral Park. A foot trail branches off NST #11 and leads up to the edge of this feature. The depth of shaft #102 is over 40', and it is probably **the most dangerous feature in the Ouray Ranger District**. The shaft is located above a vertical outcrop of jointed volcanic rock of the Burns Formation. The surface opening measures 6' wide by 6' long and tapers inwards to a 4' by 4' opening below 25'. An ice plug was encountered at a measured depth of 40', so the total depth is unknown. A framework of rotten logs (measuring 12' wide by 15' long) surrounds the surface opening and extends out on top of the associated dump (feature #202). This foundation may have supported a structure and draw works at one time, as a partly buried piece of cable is exposed on the face of this dump. A frame to a 14' by 18' log cabin is found 175' southwest of the shaft. Twelve feet below the surface of the shaft, water was emerging from the shaft walls. The walls were carved in competent rock and are carpeted with green moss and algae. This feature is remotely located away from NST #11 and is obscured from the foot trail. The elongated face of feature #202 contains about 340 cubic yards of yellow to gray waste rock that extends out over the bench and slides down to the base of the cliff. No signs or barricades are around these features or around any of the other inventoried features.

Quad Name: Handies Peak

Site #: 04-06-270/4203-1.107, 110, 112

Site Name: Area West of Mineral Point, NST #11, Part 2

Hazard Ratings: 2

Description and pertinent facts: Adits, prospect pits, and one shaft compose this inventory site, which straddles NST #11 and several unnamed streams. NST #11 has an unmarked trailhead that starts on the east side of FR #876.2 in lower Poughkeepsie Gulch. The trail switchbacks up the southeast side of an unnamed stream and traverses several steep, conifer-covered slopes before reaching the top of the eastern edge of Poughkeepsie Canyon. From the top of the canyon, the trail crosses several benches, then enters the grassy meadows that mark the western end of Mineral Park. Within the park, the foot trail turns into a faint wagon road that was used to transport rich silver ore to FR #878 (Engineer Pass Road). The inventory area encompasses the western end of this park.

Feature #107 is on USFS-managed lands. Feature #107 is an intact adit that contains a 55'-long, "V-shaped" trench that leads to the top of the elongated 430-cubic-yard dump #207. The colluvium lying above the entrance to the adit is unstable, and part of it has slid down into the trench, partly blocking the portal. The colluvium consists of iron-stained, cobble- to boulder-size unconsolidated material, which has formed a 2.5'-high berm that dams mine water to a height of 1.5'. A 3'-wide vein, containing abundant marcasite, silver sulfides, and black sphalerite, occurs above the entrance, and water emerges from this vein into this adit. The entrance measures 5' high by 5' wide, and it drifts more than 75' along a bearing of S.26°W.

Feature #110 is an open shaft with intact vertical walls. This feature is on BLM-managed lands, about 530' south of the National Forest boundary. The shaft is easily accessed by several foot trails that traverse the hilly terrain and grassy slopes. Patches of glaciated volcanic bedrock with numerous pyritic quartz veins surround this feature. Log cribbing lines the walls of shaft #110 to the bottom, where standing water was encountered. The distance from the top to the surface of

the water is 27', and 12' of the shaft is below water. Red-brown water is draining from the bottom of the dump (feature #210). The outer opening of the shaft measures 14' long by 16' wide, and the inner, vertically walled opening measures 6' wide by 6' long. This feature is difficult to see until one is within 10' to 15'.

Feature #109 is an intact adit on BLM-managed lands, located 70' northeast of shaft #110. This adit and feature #110 may have interconnected underground workings. Ten feet inside the entrance, spalled roof material has formed a 3'-high pile of rock, and water fills the entrance to a height of 1.5'. The opening contains open fractures within the volcanic host rock of the Burns Formation. The entrance is 5' wide by 4' high, and the drift extends about 65' along a bearing of S.56°E. Feature #209 contains an estimated 50 cubic yards of waste material. Although features #110, #210, #109, and #209 are on BLM-managed lands, these features present a significant physical mine hazard to the public because of the easy access.

Feature #112 is a circular pit located on USFS-managed lands. Dump material lies around the peripheral edges of the inward sloping sides. The sides are unstable and dangerous because of loose rock. The total depth is over 15'. Four to 5' of standing water occurs in the bottom. The inner opening measures 5' long by 5' wide.

Two intact adits (features #104 and #105) are on patented mining claims. They are located in a grassy meadow next to several ponds, and the entrances face the south side of NST #11. Roof material has fallen in several places along the floor of feature #105. Both entrances measure 5' wide by 4' high and are estimated to be 20' to 25' long.

Feature #106 is also an intact adit on USFS-managed lands, located about 1,500' northeast of feature #107. The entrance measures 4' high by 4' wide and has a 2.5'-high berm that dams standing water for more than 25' to a height of 2'. No obvious deterrents were around any of the inventoried features. The absence of human impact and the natural state of NST #11 suggest that this inventory site is rarely visited by the public.

Quad Name: Handies Peak.

Site #: 04-06-270/4203-2.110

Site Name: Mineral Point, Part 3

Hazard Rating: 2

Description and pertinent facts: All features of this inventory area are on USFS-managed lands within the Burns Formation. Conifer-covered benches and open meadows with meandering creeks characterize the site. The dumps of most of the features within the inventory area are small in volume, ranging from 10 to 60 cubic yards, suggesting the underground workings are not extensive. The inventoried features have no deterrents that might warn the public of possible mine hazards. A cluster of prospect pits and their yellow- to black-stained dumps (features #100-#104 and #200-#204) are in a meadow on the north side of a large marshy area. These occurrences are quartz veins with marcasite and manganese sulfides.

Feature #110 is found approximately 330' from the eastern edge of a creek bank, near its headwaters. This open shaft contains vertical, bare walls of rock and is filled with water to 3' below the ground surface. The surface opening measures 6' long by 5' wide and has a measured

Feature #112 is an intact adit located several hundred feet east of the shaft. An ice plug at the entrance effectively prevents people from entering the inner workings.

Quad Name: Ironton

Site Name: Hawkeye Mine

Description and pertinent facts: Adit #100 is located on patented mining claims, and the dump (feature #200) occurs on USFS-managed lands. The Hawkeye Mine is accessed by a private road that has been washed out in several places and switchbacks up slopes cut into the brecciated San Juan Tuff Formation. This road connects to CR #361, and about 370' from this juncture, there is a metal pole gate with a lock. Access to the mine by vehicle is not possible, but numerous footprints can be seen along the private road. A metal grate at the entrance to the mine was open at the time of this inventory. The entrance to adit #100 is framed out by a partly collapsed structure of wooden planks and beams that has subsided because of roof collapse. The entrance is extremely unstable, as indicated by the open fractures in the roof rock and by the exposed roots of trees. Soil above the mine has slid down and made a berm in front of the adit. The steep hillslope (48°) above the adit entrance contributes to rock sliding.

Site #: 04-06-260/4203-1.101

Site Name: Intermittent Drainage on Southeast Flank of United States Mountain

Description and pertinent facts: This site lies 35' above FR #869, a frequently traveled road used by people visiting Imogene Pass. Adit #101 borders on patented mining claims and may be located on private land. The adit is situated in a steep (37°) "V-shaped" intermittent stream that originates near the southeast summit of United States Mountain. This stream discharges runoff into Imogene Creek. Runoff from the stream is undercutting the top of the dump #201 and the entrance to adit #101. The entrance to this adit is partly blocked by boulders of friable and mineralized rock that occur within a fault zone. These boulders have fallen from the roof and upslope areas above the entrance. Loose soil and rock that has separated from the exposed roots of spruce trees have slid down in front of the entrance and into the stream below. Void spaces of up to 6 inches occur between boulders that hang down from the ceiling, creating a situation where the roof may cave in by just touching one rock.

Quad Name: Ironton

Site #: 04-06-264/4198-4.102

Site Name: Bowl Area East of Red Mountain No. 2

Hazard Rating: 2

Description and pertinent facts: All features in this inventory area are on USFS-managed lands and were driven in the Henson Formation. The inventory site is located along the talus slopes found on the southeastern flanks of Red Mountain No. 2. A bowl-shaped basin in this area is drained by a single creek, which is the major source for the headwaters of Corkscrew Creek. Several large dumps (including the Carbonate King workings) and a series of smaller dumps and their adits lie along both sides of the unnamed creek, exposing rich quartz veins that contain gray copper, lead, and zinc sulfides. This gulch, which contains bare, steep slopes (35° to 42°) and evidence of an avalanche track, exposes highly mineralized, rhyodacitic tuff flows. The streambed is stained orange from precipitating ferrous hydroxides. Access to the lower part of the gulch is from FR #886, which extends for 2 miles from Ironton Park to the north side of Corkscrew Gulch. Access to the upper part of the inventory site is by FR #1A, a side road which is not maintained. FR #1A crosses the unnamed creek above the Carbonate King Mine. A road branches from FR #1A from the west and connects to feature #104. The road continues above feature #104, past #105, and ends at a group of adits located on patented claims.

Shaft #102 is north of the terminus of the mine road discussed above, on the north side of a intermittent creek. The shaft is 4' wide by 4' long by 25' deep, with cribbing beginning at the base of a conical depression at the surface. The ground around the opening is unstable, and the cribbing is rotten. If someone fell in, they would not be able to escape.

Feature #104 is an open intact adit that drifts at a bearing of S.25°W. The volcanic rock contains distinct bedding planes that dip 83° southeast. The rock is competent, tightly fractured, and stained red-orange along the bedding planes. Some mine props occur over a floor length of 250' before the caved-in debris of feature #105 seals the drift. The opening to this adit is 5.5' high by 3' wide. The floor is damp, and 1 gpm of mine water drains out from the entrance and over the north side of feature #204, which contains 490 cubic yards of rock. A very strong smell of hydrogen sulfide gas emanates from the dump and adit.

Feature #105 is a circular pit/shaft that is 16' long by 13' wide and 18' deep. This shaft connects to adit #104. The walls of the feature are unstable, and the bottom may have a bridge of rock and timber ready to collapse if a person should happen to walk into this pit. This feature may have been used as a ventilation shaft for the adit.

Feature #106 is an exploratory intact adit with a bearing of N.52°W. for a distance of at least 15'. The opening measures 4' high by 3' wide and contains a partial berm of scree slope material derived from vertical outcrops of iron-stained, highly fractured angular breccia. This unstable rock occurs above the entrance and all along the upper slopes, creating a rockfall hazard.

Farther up the talus slope and to the south, feature #107 lies in an area of similar rockfall hazard. The entrance to feature #107 is filled in by talus. Material from feature #207 has thoroughly been mixed in with the talus, suggesting that part of this dump has slid downslope.

Feature #108 is an intact adit that is located at the same elevation (12,330') as feature #107, about 270' further southeast on the talus slopes of Red Mountain No.2. Mining debris is inside the adit. The ceiling and walls of the adit are in a tightly fractured breccia with veins (up to 1 inch thick) of enargite. The floor is dry. The entrance measures 5' high by 4' wide, and the adit drifts in for 80' along a bearing of S.32°W. The upper face of feature #208 is steep (36°), and the flanks of this 60-cubic-yard dump are covered with scree.

There are no foot trails leading up to features #106 through #108. The area surrounding these features is extremely hard to traverse because of loose talus and steep slopes. The cliffs above the talus create a rockfall hazard.

Quad Name: Ironton

Site #: 04-06-265/4201-1.108

Site Name: Lower Gray Copper Creek

Hazard Rating: 2

Description and pertinent facts: Features #101, #107, and #108 are on USFS-managed lands. Features #102, #106, and #208 are on patented claims. The country rock at this inventory site is part of the Henson Formation. The features belonging to this site are obscured from FT #889 and FR #884 and are not easily accessed from FT #889.

Feature #101 is an intact adit, having a large opening (measuring 14' long by 10' wide by 18' high) 25' above the south bank of Gray Copper Creek. In places, boards and cross poles support mine track. The route of ore transport was over a wooden bridge to the north bank of the creek, and then along a roadbed that ultimately connects to FR #884. Just upstream of this feature, the gulch becomes narrow and is characterized by mineralized cliffs that are 35' to 50' high. Roof fall from the ceiling of feature #101 has been deposited at the entrance. The large room narrows to a smaller passageway (measuring 5.5' wide by 6' high) as the drift follows a mineralized vein that trends S.14°E.

Feature #102 is a collapsed and filled shaft that follows the northern portion of this vein. This feature is a vertically excavated area that lies at the top of a narrow drainage corridor along the base of the cliffs. It is possible that the upper workings contain a false bridge of beams and debris, while the lower workings remain intact.

The remaining features of this inventory area are approximately 0.2 mile farther up Gray Copper Creek. Feature #108 is a partly collapsed entrance to a shaft that is located 130' upslope of the caved-in entrance to feature #106. The dimensions to this shaft are 12' in length, 8' in width, and 100' in estimated depth. Intact log cribbing stabilizes the inner walls. A horizontal drift extends from the south wall of the shaft and follows a vein that trends S.36°E. The drift measures 4' wide by 5' high and extends 35' from the entrance. The opening of feature #108 trends S.46°E. along the excavated vein. Water from above the shaft drains into the entrance and runs down along the south wall. The horizontal drift has a dry floor. Adit #106 connects to and is draining feature #108. The unstable face of dump #208 has an upper portion of deeply grooved and cemented gravelly material, while the lower portion contains cobble- to block-size waste rock. Material from feature #208 has rolled and slid down the steep face (36° to 38°) into Gray Copper Creek.

Feature #107 is an intact adit that is located directly across from Gray Copper Creek and across from the entrance of adit #106. The entrance consists of a narrow opening that measures 7' high by 4' wide, and the adit trends N.18°W. for a distance of 15'. The floor is dry, and open fractures occur in the ceiling.

Quad Name: Ironton

Site #: 04-06-265/4202-2.103

Site Name: Adits on FR #886 Above the Town of Ironton

Hazard Rating: 2

Description and pertinent facts: All features in this inventory area are located on USFS-managed lands in rock that is part of the Burns Formation. Feature #103 is reached from a 4WD road that branches southwest from FR #886, approximately 0.8 mile from the point where FR #886 (Corkscrew Gulch Road) merges with FR #884 (Brown Mountain Road). This 4WD road serves as an alternate route to circumvent the dangerous section of Corkscrew Gulch Road that contains active landslides and debris flows.

Feature #103 is on the northwest side of the 4WD road, approximately 530' from the junction with FR #886. This feature is an open adit with an internal shaft about 30' from the entrance. The adit entrance measures 7' high by 6' wide and trends N.80°E. for a distance of over 100' before the floor becomes inclined, and then extends another 200'. The host rock is highly fractured and is very porous. The wall rock is not competent and must be supported by timbers. Roof fall litters the damp floor. Mine timbers support the roof at the entrance in a boxed shape framework and continue to support the roof as vertical beams throughout the entire length of this adit. The mine props do not look sound and may eventually fail to support the walls and roof. A 2'-high berm of debris is piled up at the entrance. A group of logs lies along the south edge of the partly collapsed internal shaft, which measures 5' long by 5.5' wide and is over 50' deep.

Feature #102 is located 380' to 450' below feature #103. Feature #102 trends S.35°E. and may connect to the lower workings of the shaft found in adit #103. The associated dump (feature #202) contains an estimated volume of 1,880 cubic yards of block- to boulder-size yellow waste rock. Based on the large size of dump #202, it is probable that adit #102 contains extensive workings.

A log frame cabin (20' long by 18' wide) lies 25' from the west side of the road and 60' southwest of the entrance to feature #103. Intact exploratory adit #104 is located 35' below this cabin and contains standing water to a height of 1.5' above the floor. The entrance to feature #104 measures 5' high by 4' wide, and it extends 20' along a bearing of S.52°E. into competent rock.

Quad Name: Ironton

Site #: 04-06-266/4198-1.103; 106, 107

Site Name: Gray Copper Creek Basin, East Side

Hazard Ratings: 1; 2

Description and pertinent facts: The inventory area is at the headwaters of Gray Copper Creek, along both sides of FR #889, which is not maintained. The easiest way to access this area

is by taking CR #110 from Silverton to the Gladstone millsite, then turn and head 3.2 miles north along Cement Creek until reaching a fork in the road. A boulder on the right side of the road has red spray-paint stating "No motorized vehicles beyond this point", and this is the beginning of BLM-managed lands. This 4WD road crosses a saddle and then drops into the upper part of Gray Copper Basin and the headwaters of Gray Copper Creek. The other more scenic, longer, and physically demanding route is FT #889 from FR #884, past Gray Copper Falls and the Vernon Mine site. The main tributary to Gray Copper Creek originates at several ponds that are located near the summit of a tundra-covered pass dotted with prospect pits. In this saddle, BLM-managed lands are to the east (taking in most of the ponds), and USFS-managed lands are to the west.

Feature #100 is an intact adit on USFS-managed lands and is located several hundred feet above and on the northeast side of FR #889. Colluvium has slid down in front of the entrance, creating a 4'-high berm. The floor and walls are damp and moss covered. The entrance measures 5' high by 4' wide. The adit trends along a bearing of N.85°E. for a distance of 20'. The entrance is unstable, as it has been excavated in friable and platy seams of loosely cemented volcanic rock. Feature #200 contains 35 cubic yards of yellow waste rock that toes out into a dry gulch.

Feature #103 is an open intact shaft located 25' above the northeast side of FR #889 on BLM-managed lands. This feature is approximately 400' from a wooden sign post inscribed "Entering Uncompahgre National Forest". This shaft is included in the inventory because of its easy access and close proximity to the road, and there are no signs or deterrents of any kind posted to warn the public of the danger of falling into this dangerous feature. Intact log cribbing occurs throughout the total measured depth of over 30'. The cribbing is covered with moss and is stained orange. Yellow dump material surrounds the surface opening, which measures 10' long by 6' wide. Standing water occurs in the bottom of the shaft 18' below the ground surface. Most of feature #203 is visible from the road, where the 66 cubic yards of waste rock toe out.

Features #104 and #204 are on USFS-managed lands. Feature #104 is an intact adit that trends N.78°E. into a vertical cliff of tightly fractured volcanic rock. A 2'-high berm produced from spalling rock partly blocks the portal, damming water to a height of 1.5'. A 6-inch-wide vein crops out at the entrance, which is located 280' from the eastern side of FR #889. The opening measures 6' high by 4' wide, and the adit extends for more than 120'. Wooden beams on the ceiling are attached to upright supports placed next to the walls. Feature #204 is a highly visible dump with 200 cubic yards of gravel waste rock that fans out above the eastern edge of Gray Copper Creek. A "V-shaped" trench that measures 6' wide by 10' long by 12' deep connects the adit to the top of the dump. Feature #104 is easily accessed by foot from the road.

Features #106 and #206 are on USFS-managed lands. Feature #106 is an adit located 30' below FR #889. This adit contains an unstable entrance with a 2.5'-high berm that has been built up by roof fall. The entrance shows open fractures and voids in the ceiling, and rotten beams brace the ceiling and weakly support the walls. Ten inches of cloudy water stand on the floor. Patches of green moss grow on the orange-stained walls and ceiling. Orange ferric hydroxides have formed sludge deposits on the floor. A wooden ladder lies inside the entrance, suggesting a shaft may penetrate the floor at some distance farther inside the 70'-long adit. The entrance measures 3' high by 3' wide, which expands to an interior opening of 5' high by 4' wide. A collapsed wooden structure, 18' long by 15' wide, rests on top of feature #206 near the northeast side of #106. This structure may have served to house mining equipment or miners. Metal debris clutters the top,

face, and flanks of the dump, which contains 55 cubic yards of rock. The yellow, blocky dump material is highly visible from the road and is surrounded by open grassy meadows.

Feature #107 is an intact adit that follows a mineralized vein along a bearing of S.20°E. for more than 200'. Four other adits that are aligned above the entrance of this feature may have interconnected underground workings via shafts. Feature #107 appears to be located on the border of patented mining claims and may be on private land. Original timbering and mine track are still intact. The entrance measures 6' high by 5' wide. Detached roof rock lies on the dump floor, and a strong hydrogen sulfide odor emanates from the interior of the adit, as well as the surface of the dump. A 35'-long, "V-shaped" trench (8' wide by 15' high) connects the entrance to the flattened top of feature #207 and cuts through a red-brown mineralized outcrop. Feature #207 is the largest dump in Gray Copper Basin, containing about 480 cubic yards of yellow to gray, fractured volcanic rock that is extremely rich in chalcopyrite, marcasite, tetrahedrite, tennantite, and pyrite. This dump is highly visible and lies at an elevation of 11,740', approximately 530' from the west side of FR #889.

Quad Name: Ironton

Site #: 04-06-266/4199-1.100, 110

Site Name: Vernon Mine and Vicinity

Hazard Ratings: 2

Description and pertinent facts: The inventory area consists of a series of adits and several shafts located around the Vernon Mine workings, which occur in the Burns Formation. An intact cabin, well stocked with cooking, mining, and living provisions, and two open-ended sheds that are built with poles, lumber, and sided with corrugated sheet metal, are included in the inventory area. These structures are shown to be on public land on the Ironton PBS quad. The area is accessed from the northwest by FT #889 and from the southeast from the old 4WD road FR #889, which is still passable. It is approximately 1.6 miles, via FR #889, from the cabin to the junction with an unnamed road that leads down to the old mining town of Gladstone. A locked metal pole gate with a cable attached to two upright metal poles (one on either side of the cable) deters motorized vehicles from entering the patented mining claims and accessing these structures. There are signs staked on both the gate and sides of the cabin warning the public of "Danger, Keep Out, Private Property". Also a sign post and writing on a boulder advises the public of "No motorized vehicles beyond this point". This writing on the boulder is on BLM-managed lands, at the junction of FR #889 and the unnamed 4WD road that leads to Gladstone.

Feature #100 is the main shaft that leads down into the original Vernon Mine workings. It is now abandoned, and numerous boards are in the collapsed entrance. The walls are cribbed, and a ladder is leaning on and leading down the west wall. This ladder is unsafe and should not be used to access the interior. The measurements of the shaft opening are 12' long by 15' wide by over 50' deep. Water is draining over and down the eastern wall. The bottom is not visible. A dozer has leveled the top and surrounding area. An anchored concrete platform, measuring 18' long by 23' wide, lies on the south side of the shaft opening. This platform may have supported the headframe and hoist. A metal sign, located near the edge, warns the public of "Danger, keep away". The underground workings of feature #100 probably connect to feature #101.

The top of feature #200 has been leveled, and the face consists of four adjoining piles of waste rock. Several dry drainage corridors run between these piles. The face is cluttered with lumber, sheet metal, pipe, and mining equipment. The toe is in contact with the north bank of Gray Copper Creek.

Feature #101 is an intact adit, trending N.84°E. towards the shaft. Mine effluent has deposited orange, ferric hydroxide precipitates on the floor as sludge and on the walls and ceiling as coatings. The mine water runs over feature #201 before entering Gray Copper Creek. The entrance to feature #101 measures 5' high by 4' wide, and the adit is over 40' in length. The water level is backed up to a height of 1.5' inside this adit.

Feature #102 is an intact adit that drifts S.54°W. for a distance of 55'. The walls are stained orange to a height of 8 inches above the floor, which contains shallow pools of water. The entrance is located approximately 210' from the western bank of Gray Copper Creek and borders on patented claims. Water drips from the ceiling and runs down the walls. Isolated piles of debris have accumulated on the floor because of roof failure. A strong odor of hydrogen sulfide gas emanates from the adit and from feature #202. The entrance to the adit measures 5' high by 4' wide.

Feature #103 is a 15' adit driven due west along a quartz vein and is 42' northwest of feature #102. The portal measures 4' high by 4' wide, and the floor of the adit is dry and with small amounts of roof fall.

Feature #104 is an intact adit that appears to be intermittently operated. A headframe constructed of 6-inch by 6-inch beams supports the entrance. A side road leads down from the above-mentioned cabin and ends at a leveled out area in front of the entrance along the north side of Gray Copper Creek. Twenty feet inside the adit, a drift branches due east from the main passageway and extends a distance of 35'. The main adit bears N.52°E. for more than 100'. Mine track, a 55-gallon drum, boards, and metal sheeting lie in the main drift, just beyond the junction with the exploratory drift. Yellow blasting wire and intact timbering are along the walls. The main drift may join up with the old workings and may be following the same vein that is present in shaft #100. The floors to both drifts are damp but have no standing water. No signs, or deterrents (such as a fence or grate across the entrance of this adit) discourage the public from entering. Metal and plastic piping are scattered and stacked up along feature #204 and on the face and top of feature #201. Mine track, sheet metal, and boards clutter the surface of dump #204. The waste rock emits a strong odor of hydrogen sulfide.

Features #105, #106, and #107 are prospect pits that follow veins. These pits are located on USFS-managed lands and are open and escapable. Features #108 and #109 are 5' and 18' adits, respectively. They are on public land along a foot trail that heads northeasterly from the cabin to a basin. The trail is unnamed, but is shown on the Iron-ton topo. The entrances to these adits overlook lower Gray Copper Creek Basin. Wall rock is friable, laminated volcanic material that easily breaks and has accumulated on the floors of both adits. Feature #109 is unsafe to enter because of the flaking nature of the wall rock.

Feature #110 is an open shaft with water 4' below the ground surface. This feature is currently being used as a trash pit. Cribbing lines the shaft walls for a measured depth of over 30'. The surface opening measures 6' long by 5' wide. The white to light yellow material of feature #210

was placed on the west side of this shaft and has a strong hydrogen sulfide odor. Feature #110 is located approximately 120' uphill and east of the cabin. Signs or other deterrents are not present on or around this feature.

Quad Name: Ironton.

Site #: 04-06-266/4199-2.103

Site Name: Gray Copper Creek Basin, West Side

Hazard Rating: 2

Description and pertinent facts: All features of this inventory area are on USFS-managed lands and are found in the Henson Formation. Well-defined drainage corridors with visible avalanche tracks occur along the western talus slopes of Gray Copper Basin and channel water into Gray Copper Creek. The area is in a large, bowl-shaped depression characterized by lower slopes that are covered with grasses and patches of conifer, and upper reaches that are barren of vegetation. Oxidation of iron-rich outcrops has stained the upper slopes beautiful hues of pink, salmon, red, orange, yellow, and pastel. Some of these outcrops form spires and walls of brecciated volcanic material, all of which is stained dark red-brown to red-black colors. Streambeds in the western part of Gray Copper Basin are stained to a brilliant red-orange color by oxidizing iron sulfides. These creeks carry high levels of ferric hydroxides into the upper tributaries of Gray Copper Creek and have **pH readings that average 3.0 to 3.5**. Two shafts excavated in the red-brown, iron-rich outcrops are on the western slopes, above one of the side drainages corridors.

Feature #100 is a filled adit with an entrance located in a conical-shaped depression that measures 5' long by 3' wide and 5' deep. The dump (feature #200) contains 35 cubic yards of yellow-stained waste rock, which is composed of yellow-orange, highly fractured, crumbly volcanic host rock with seams of pyrite.

Feature #101 lies on a talus-covered side slope, approximately 65' southeast and below the upper adit (feature #100). The overall gradient of the side slopes flanking the intermittent creek is 34°. The entrance measures 5' high by 4' wide, and the adit exposes a quartz vein that trends N.87°W. for a distance of over 40'. The floor is dry and contains lumber debris. Feature #201 contains 60 cubic yards of waste rock that is 40% pyrite. The crystals are cemented in a buff-colored matrix and occur within brecciated host rock. The length of the dump is 130', and its face is unstable. The dump contains unconsolidated gravel- to cobble-size material that toes out into a dry gulch. Dumps #200 and #201 are located at elevations of 11,920' to 11,950', respectively, and are visible from FR #889.

Feature #102 is an intact adit 35' above the west bank of a different side creek and was driven into a highly mineralized outcrop. The rock faces and slopes of this outcrop are stained a bright red color and the streambed is stained a vivid orange color. Severely rusted iron handles, scrap metal, and nails are present inside this adit, and the remains of an old stove are on the dump. The floor contains a set of parallel 2-inch by 4-inch planks that were used to transport waste rock in a sled to the 75-cubic-yard dump (feature #202). The floor is dry and contains isolated pieces of detached roof rock. The entrance measures 5' high by 3' wide.

Feature #103 is a prospect pit located 50' from and 25' above the eastern bank of the same side creek that contains feature #102. This pit has vertical walls that extend to a depth of 20', of which the last 6' are submerged in clear water. These walls have very slippery surfaces and provide little footing for a person to climb on. A person could easily fall into this pit, due to the loose rock around its edges. The toe of feature #203 has been removed by erosion and provides little support for the 30'-long face and the remaining 20 to 30 cubic yards of unconsolidated waste rock.

The easiest access to the features of this inventory site is by following the ridge tops that separate the side creeks. The slopes and creek bottoms are difficult to traverse and climb over because of loose boulders, talus, and slippery algae-covered rocks in the streambeds.

Quad Name: Ironton

Site #: 04-06-266/4200-1.103

Site Name: Gray Copper Falls Adits

Hazard Rating: 2

Description and pertinent facts: Features #103 and #203 are on USFS-managed lands in rock that is part of the Henson Formation. The inventory site, located both above and below the 80'-to 100'-high Gray Copper Falls, is approached on FT #889 from the north and by an extension of this trail to the south that connects to an old 4WD road at the Vernon Mine. The Ironton quad shows FT #889 as a 4WD road, although the actual road stops south of the Silver Mountain Mine, where it becomes a poorly marked foot trail that ultimately ends at the Vernon Mine. This trail is the only easy access to the spectacular falls and to the upper reaches of Gray Copper Basin.

Feature #103, located approximately 280' south of the head of the falls, lies within 8' of the east side of the trail. This feature is a partly caved shaft that lies 30' above the west bank of Gray Copper Creek. The opening to feature #103 measures 12' long by 16' wide by an estimated depth of more than 25'. The walls around the opening have collapsed into the interior. Some partly buried boards and logs are found in the waste rock 6' below the surface of the shaft opening. The sidewalls and interior contain cavities, indicating an unstable nature. The bottom of the shaft could not be assessed because of obstruction by snow. An 8-inch-diameter pipe located 30' from the southeast edge of the shaft opening may represent the top of an air duct that connects to the lower workings of the shaft. Caution should be exercised when approaching the edge of this shaft, as the peripheral area may collapse under the weight of a person.

The yellow, copper-rich rock of feature #203 has been dumped over the vertical walls that surround the creek, forming a steep (42°) unconsolidated scree slope. This dump contains 170 cubic yards of rock. A very narrow, intact exploratory adit (3.5' wide by 4' high) lies on patented claims across from feature #203. This adit is just above the top of the falls and drifts to the northwest along a quartz vein for a distance of 22'. There are no signs, fences, or other deterrents around the surrounding area or the inventoried features.

Quad Name: Ironton

Site #: 04-06-266/4201-1.101

Site Name: Silver Mountain Mine and Vicinity

Hazard Rating: 2

Description and pertinent facts: The inventory area is reached from FR #884 (Brown Mountain Road), a seasonally maintained 4WD road that branches from SH #550. All discussed features occur on USFS-managed lands mapped as the Burns Formation. The site contains the intact adit of feature #101 that represents the Silver Mountain Mine, and feature #201, a dump that contains 1,785 cubic yards. The surrounding area also contains three standing wooden structures and a partly buried log tram. The Topeka Mine and its dump (features #103 and #203) and features #104 and #204 are located farther up FR #884. Adits #103 and #104 have collapsed entrances. Features #100 and #200 are a collapsed adit and a 25-cubic-yard dump that are located along the north side of FR #884, approximately 460' west of feature #101.

Adit #101 drifts along a bearing of N.18°W. for approximately 85', at which point roof fall blocks the passage. The entrance appears unstable, as rotten horizontal wooden beams have become partly detached from their upright supports. Rubble from above the entrance has formed a 2.5'-high berm that backs up mine water to a depth of 9 to 15 inches. Mine tracks are present in places on the floor. Debris piles have formed along the entire floor length, suggesting the roof is unstable. Timbering can be seen farther back in the adit, although with the flooded condition of the floor, the timbering is probably rotten. The entrance is in colluvium with a dense cover of conifer.

Quad Name: Ironton

Site #: 04-06-266/4208-1.101

Site Name: Daniel Bonanza Mine Area

Hazard Rating: 2

Description and pertinent facts: Shaft #101, which measures 14' long by 8' wide and over 40' deep, lies on patented mining claims and is accessible by a trail that extends from a private 4WD road. Although this trail is not visited frequently, it has been recently cleared of brush and fallen trees. Adit #100 may connect with shaft #101. Springs emanate from the west wall, and water runs down the sides of feature #101 and drains onto a flooded floor. All of the sides are smooth, vertical walls, and a rope would be needed for egress of this shaft if one should fall in. This shaft was excavated in competent orthoquartzite of the Uncompahgre Formation. The height of water above the bottom is approximately 4'.

Quad Name: Ironton

Site #: 04-06-267/4201-2.101

Site Name: Adits and Shaft East of the Topeka Mine

Hazard Rating: 2

Description and pertinent facts: All features of this inventory site are found on USFS-managed lands. The site lies along a 4WD road that branches from FR #884. FR #884 starts at SH #550 (located on the eastern side of Ironton Park) and leads up to the Lost Day Mine and the trailhead to Brown Mountain summit. A collapsed adit (feature #104) and dump (feature #204) are encountered along the north side of a spur road on one of the switchbacks on FR #884, which

is seasonally maintained. Features #100-#102 and the associated dumps are along this spur road and are located approximately 580' south of the junction with FR #884. No signs, fences, barricades, or deterrents of any kind warn the public to keep away from these features.

Feature #101 is a partly collapsed shaft with an opening that measures 12' long by 8' wide and is over 20' deep. The bottom of this shaft is not visible. No water drains into the opening, and it cannot be determined if the lower workings are flooded. If one should fall into this shaft, the vertical walls would make the climb out difficult. This shaft is located 45' downslope of collapsed adit #100.

The caved adit of feature #103 is 33' downslope of feature #102. Feature #103 may have underground levels that connect to both adits #100 and #102. The collapsed entrance of feature #103 discharges orange effluent at a rate of 12 gpm. This adit is approximately 370' east of the shaft and probably drains most of the underground workings of features #100, #101, and #102. An old 4WD service road switchbacks up the slope from adit #103 and leads to the shaft and the three other adits. The public frequently visits this inventory site by foot.

Quad Name: Ironton

Site #: 04-06-267/4204-2.100, 101

Site Name: Upper Hendrick Creek (Guadalupe & Dallas Mines)

Hazard Ratings: 2

Description and pertinent facts: Hendrick Gulch is extremely steep and has unstable side slopes (36° to 43°). The gulch is in an avalanche track that is subject to flash flooding. Country rock consists of spires and pinnacles of the San Juan Tuff, which is impregnated with iron sulfide and veins rich in galena, chalcopyrite, and sphalerite. A mineralized area occurs at the head and along the north slope of the gulch. This area is very unstable, and the side gullies are full of boulders and unconsolidated slope wash material that have spalled from the cliff faces. The lower part of the gulch contains the Lucky 20 Mine adit and large dump (see USFS-AMLI form #04-06-267/4204-1 for more information on this mine), which were once accessed by a 4WD road. This road starts at the St. German Foundation (the standing buildings along SH #550) and switchbacks up the south side above the inner gulch, across the creek to the mine entrance. That portion of the road bed that crosses the creek is now washed out and all traces are completely gone.

The Dallas Mine (feature #103) lies 280' upslope of the north side of the access foot trail and is located in a side creek that is full of boulders and unconsolidated material. The material is unstable and has been undercut all along the creek banks. This feature lies on patented claims and has a partly collapsed entrance that measures 5' high by 4' wide. The adit drifts into alluvial fill for at least 10' before being blocked by roof fall.

Feature #102 is west of the Dallas Mine and is reached by climbing up the steep and incised face of dump #202 (estimated volume of 320 cubic yards). The entrance, which is completely filled in, is located 10' from the western bank of another side gulch. Part of this dump has been removed by stream erosion that has steepened (37°) the face and eastern flank. The surface has a hard crust and is difficult to traverse.

Feature #101 is along the foot trail west of feature #102. Similar to feature #102, it is located below a series of cliffs and spires that produce a zone of active spalling material. This material has fallen in front of the adits and has collected in the steep side creeks and in the boulder-strewn bed of Hendrick Creek. This adit has an intact entrance that lies on patented claims and has an opening that measures 4' high by 3' wide. The drift advances over 50' along a bearing of N.70°E. and contains standing water to a height of 2'. The mine water flows over 6- to 8-inch-thick deposits of orange sludge, then over the top and eastern flank of dump #201. This dump contains 550 cubic yards of severely eroded and incised yellow, clay-rich waste rock that has been steepened by undercutting from the nearby side creek. This dump is also unstable and is hard to traverse. A portion of the trail has been washed away by the side creek that separates feature #101 from feature #102.

Feature #100 is the last adit located along the foot trail. The entrance and dump are on public land and are located at the base of 200'- to 300'-high cliffs of mineralized tuffaceous outcrops. The entrance is partly blocked by a number of collapsed boards and sheet metal that obscure the interior. Water is draining over the intact mine track and fans out over the top of feature #200. Rotten mine timbers loosely support the ceiling and walls, and water drips down onto the timbers from open fissures and veins. The opening measures 5' high by 4' wide and follows a vein bearing N.50°E. for more than 200'. Above the entrance, rock bolts and some wooden beams are anchored into the vertical rock face.

Boards, cable, nails, mining equipment, and corrugated sheet metal are scattered on top of dump #200. This collection of man-made debris may be the collapsed structure that once covered the entrance to the adit and the top of the dump. The structure probably served as part of a tram system which transported rich lead-zinc-copper ore down Hendrick Gulch via ore buckets. A standing, wooden-beam structure on the south side of the gulch, below the old road grade that extended to the Lucky 20 Mine, may have served as an aerial support for the cable and ore buckets. An estimated 1,200 cubic yards of yellow, sulfide-rich waste rock has settled on a steep incline (38°) over an estimated distance of 310' before entering Hendrick Creek. The toe of the dump has been steepened by removal of material and is the site for several springs that emanate from the clay-rich material. The face is deeply incised. The entire eastern flank is steepened and has been partly removed by an adjacent side creek. This dump and the dumps of features #201 and #202 are readily visible from a section of SH #550.

Access via the streambed to the upper dumps in this inventory site is difficult. The climb is over falls that flow over slippery bedrock, and the unstable material along the banks must be crossed. The features are most easily accessed by NSTs #24 and #25; however, it takes more than 1 hour and 40 minutes to reach feature #100 from the St. German Foundation site, and the climb is strenuous. Because of the long trail distance and the remote location, the public rarely visits these features. Physical and environmental hazard levels are high for this inventory area and warrant discussion.

Quad Name: Ironton

Site #: 04-06-267/4206-2.104

Site Name: Chrysolite/Northstar Mines

Hazard Rating: 2

Description and pertinent facts: The Chrysolite dump #202 is located on patented mining claims. The dump contains waste rock that was placed on an unstable, natural talus slope. Vertical cliffs, 50' to 130' high, rise above this talus slope, and rock constantly spalls from the cliff faces. The talus slope is continuous without a break in slope over a length of 550' to 800'. It extends down to SH #550 and runs out at the bottom onto Red Mountain Creek. This slope is unstable to walk on, and the area is prone to frequent rockslides.

This site also contains the hazardous North Star shaft #104, which is on USFS-managed lands. This shaft has a rectangular (15' by 6' wide and 20' deep) opening and has vertical walls and cribbing in the lower 7'. Rock from the walls is highly fractured with open joints and bedding planes. Egress would be difficult without a rope. Access to this area is by a foot trail, and the route is difficult from the highway. Few people would venture to this site because of its remoteness and steep slopes.

Quad Name: Ironton

Site #: 04-06-267/4207-2.101

Site Name: Spruce Box Mine and Vicinity

Hazard Rating: 2

Description and pertinent facts: This inventory area is located approximately 370' from the south side of FR #878 (Engineer Pass 4WD Road) and 0.4 mile from SH #550. The site includes two shafts and a prospect pit that are located 60 vertical feet above the south bank of the Uncompahgre River, which has cut vertical walls in orthoquartzite of the Uncompahgre Formation.

Feature #100 is a shaft that is 25' deep and is completely filled with brackish brown water. An old wooden ladder leads down the east wall along the vertical cribbing. The opening measures 10' long by 7' wide. This shaft is located 80' and N.60°W. from feature #101.

Shaft #101 is 100' deep with vertical walls and an opening that measures 12' long by 5' wide. Sections of mine track are vertically placed and embedded into the walls by anchor bolts. The bearing of this elongate opening is N 60° W. Feature #101 follows a vein of porous quartz with abundant pyrite and sphalerite. Water flows at a rate of 12 gpm over the vertical walls above this feature, and down the south wall of the shaft. The eastern side of the surface of this shaft juts out over the river. Besides being extremely unstable, this area has a precipitous cliff face, and the river has undercut the bottom as it makes a bend. The bottom of the shaft contains water. The inner workings comprise a series of benches that connect to irregularly spaced sections of vertically mined-out rock. A lower opening, occurring at the base of this shaft, could neither be seen nor located from the top of this feature. The lower opening was also invisible from across the canyon, on the Engineer Pass Road.

Shafts #100 and #101 may be on the border of patented mining claims, although the prospect pit (feature #102) occurs on USFS-managed lands. The inventory area is accessed by a foot trail that switchbacks up the benched terrain along the south side of the Uncompahgre River. The foot trail connects to SH #550. No signs or fences are around or adjacent to the two shafts.

Quad Name: Ironton

Site #: 04-06-267/4208-1.102

Site Name: Grizzly Bear Mine

Hazard Rating: 2

Description and pertinent facts: This site is located on patented mining claims and public land. Feature #102 is accessible by a foot trail that descends a south-facing slope from FT #241 (Bear Creek Trail). Feature #102 contains several shafts in a large vertically mined-out cavity that measures 25' high by 8' wide and 45' deep. Several benches split the main shaft body into three distinct levels, each containing a horizontal adit. Feature #102 is located in an avalanche track surrounded by a talus slope with numerous sheared off spruce trees. Loose rock is present at the entrance to the shaft, and water is draining down the vertical sides. The bottom was out of view, but it may be submerged, because it does not appear that this working is connected to adits below. Bear Creek has undercut the toe of the talus slope, making the upper slopes extremely unstable. Loose rock and soil frequently calve into the streambed.

Quad Name: Ironton

Site #: 04-06-268/4203-2.200

Site Name: Letcher Creek

Hazard Rating: 2

Description and pertinent facts: Letcher Creek is a major perennial stream that enters the western side of Poughkeepsie Gulch, merging with the upper stretches of the Uncompahgre River. The mine features are located along both sides of the creek and are accessed by an old 4WD road that crosses the river below Old Lout Mine and connects to FR #876.2. Rapid erosion along Letcher Creek has produced steep banks and several vertical falls. The barren side slopes expose mineralized and altered banded latite flows of the Burns Formation. Quartz veins crosscut the brecciated and laminated host rock, which is colored yellow-brown, orange-red, and metallic black.

Adits above the inner gulch explored mineralized rock outcrops. Feature #100 belongs to the Free Gold Mine, which lies on patented mining claims. The portal has been blasted shut, although mine track extends from the rubble. A 40' cliff face, rich in pyrite, occurs above the entrance, and active spalling of the cliff deposits rocks onto the face of dump #200 and into the streambed. Dump #200 contains an estimated volume of 265 cubic yards. The lower part of this dump is located on public land. Most of the southern flank of the dump has slid into the gulch and has been distributed along both banks of Letcher Creek and onto an alluvial fan. The face of this dump is incised, steep (38°), and is undergoing active landsliding. The entire length (155') is devoid of vegetation and treacherous to walk. The upper 2/3 of the face contains fine-grained, white material that forms a hard crust when dry and a slippery surface when wet. Vertical columns of red-brown, iron-rich bedrock have eroded from the gully sides and face of the dump.

Feature #101 is an intact adit located across from dump #200 on USFS-managed land. It has an opening that measures 4' high by 5' wide and a drift length of over 50' along a bearing of N.52°W. Mine water with abundant orange precipitate floods the floor to a height of 6 to 8 inches. Two more intact adits are farther up on the south slope of Letcher Gulch. They are reached by an unmarked foot trail.

Feature #102 is on patented claims and has an unstable entrance that contains open fractures in the wall rock. The opening measures 5' high and 3' wide. Standing water is at a height of 1' above the floor for a length of 60'. The walls and floor are stained bright orange from water that is flowing from a 10-inch-wide vein that bears N.52°W.

Feature #103 is located directly above the entrance of feature #102 on USFS-managed lands. The entrance measures 4' high by 4' wide, and the adit has several debris piles from roof falls along the entire floor length of 25'. This adit also follows a quartz vein that trends N.70°W., and water has at one time flooded the damp floor and flowed out over the 30-cubic-yard associated dump.

The Free Gold Mine is sometimes visited by curious people who follow the old 4WD road grade up to the mine entrance. People should be warned to keep away from the edge of the gulch, as the edges along the top of feature #200 are composed of unconsolidated material and may give way. Warning signs and barricades are not present around any of the inventoried features. All features are highly visible from across the valley and can be viewed from FR #876.2.

Quad Name: Iron-ton

Site #: 04-06-268/4205-1.105

Site Name: Adits West of Junction of FR #878 and FR #876, on the South Side of the Uncompahgre River

Hazard Rating: 2

Description and pertinent facts: All features discussed are on public land on the south side of the upper Uncompahgre River. The features of this inventory site are localized around narrow mineralized veins that formed along vertical fault systems in the San Juan Tuff.

Features #105 and #106 are located about 65' from the east edge of a drainage channel. They share a common entrance that connects to a vertically walled trench measuring 8' wide by 15' high by 27' long. A 3-inch-wide pyritic vein crops out in the roof of feature #106. Feature #105 is an intact shaft on the east side of open adit #106. The shaft has vertical walls and is completely filled with water. The entrance of shaft #105 is 8' long by 10' wide, and it is about 37' deep. Logs from cribbing are floating at the surface. A cavernous room, measuring 18' high by 27' wide by 18' long, surrounds the shaft.

Feature #106 is an exploratory adit that makes a "Y" with the cavernous room and is located at the end of the trench. The entrance to this 15' adit measures 8' high by 5' wide. Six inches of water stands on the floor of this adit. The competent wall rock is a tight, well-cemented conglomerate with a friable zone that contains vuggy quartz crystals and veins of pyrite, sphalerite, and some galena. The entrance to the trench is obscured from view by a clump of willows. Access to the entrance of features #105 and #106 is moderately difficult and requires crossing the river (there are no bridges in the area) and climbing up unstable scree slopes through a dense tangle of willows and aspen saplings.

Several other intact adits lie east of these features. Feature #100 is an intact opening that measures 4' high by 4' wide and follows a vein for over 30' along a bearing of due west. A 1.5'-

Feature #107 is directly across from the toe of dump #201 and is located 45' above the northeast bank of the Uncompahgre River. A dense undergrowth of tangled bushes and conifer saplings and poles are in front of the entrance and on top of dump #207. An indistinct foot trail descends from FR #878 to the 4'-high by 4'-wide entrance. A 1.5'-high berm dams orange mine water for a distance of over 20' to a height of 1'.

^^New Quad^^

Feature #100 (Blaine Mine) is located 350' from the west bank of Blaine Creek. It is an intact adit driven in platy granodiorite and has an opening which measures 6' high by 5' wide. Cliffs that are several hundred feet high occur above the entrance. Rock spalls off these cliffs and accumulates on a talus slope on both sides of the entrance. A stack of air drills and hammers is partly buried by the talus on the north side, 12' from the entrance. Mine track rests on cross-lain timbers that are submerged in clear water. Rotten mine props are standing upright and lie on the floor. The standing timbers are about 50' from the entrance and throughout the remaining distance of over 500'. The adit follows a general bearing of S.84°W. A blower, pump, and rusted 2-inch-diameter pipe sections used to drain the underground workings, are near the entrance and throughout the length of the adit.

Features #102-#104 are three adits that are on patented mining claims approximately 350' upslope and to the southwest of the Blaine adit (feature #100). They were driven in unstable talus slopes, and rock from the vertical spires and cliffs of granodiorite has fallen in front of their entrances. Feature #102 belongs to the caved Mountain Monarch Mine. In front of the entrance, hand-lain rock sidewalls served as support features to prevent the loose talus from burying the entrance. This entrance contains a wooden headframe, now mostly buried, and a set of mine rails on the floor that leads out to the top of feature #202. Feature #202 is the largest of the three patented dumps, with an estimated volume of 260 cubic yards of unconsolidated material. The waste rock is stained black, contains veins of barite, and is rich in silver sulfides.

^^^^^^^^^^^^^^^^^^^^New Quad^^^^^^^^^^^^^^^^^^^^

Quad Name: Ouray

101

Site Name: Speedwell Mine/Twin Peaks Trail

Hazard Rating: 2

Description and pertinent facts: This site is located on public land. Adit #100 is particularly dangerous for several reasons. FT #208.1A (Twin Peaks Trail) passes in front of the entrance to this adit, presenting a temptation for hikers. The roof is extremely unstable, and the floor of the adit is cluttered with boulders and cobbles from roof fall. Open joints occur in the propped up sidewalls and ceiling.

The adit trends due west for more than 150', and an odor of hydrogen sulfide is present. The floor is dry near the entrance, although moisture seeping in from the nearby creek has moistened the inner portion of this adit. A stope, located farther inside the adit, may connect to adit #101, which is located 650' upslope and west of adit #100. Country rock at this site is part of the San Juan Tuff Formation.

Quad Name: Ouray

Site #: 04-06-265/4209-1.100

Site Name: South Mineral Farms Area

Hazard Rating: 2

Description and pertinent facts: This site is on public land directly below a private road and contains a cavernous opening that measures 12' high by 16' wide and 15' long. Adit #101 is located on the south side of the cavern, and shaft #100 is on the north side. A bridge of bedded limestone of the Elbert Formation supports the ceiling of these two features. Large logs (measuring 25' long and 12 inches in diameter), which are now lying on the floor, once supported the cavern. Roof material has spalled and built up a partial berm at the entrance. Shaft #100 is approximately 30' deep, 8' wide, and 7' long, and the bottom is covered with milky water. Cribbing supports the lower half of this feature. A rotted wooden ladder constructed of poles and planks lies on the west edge of this shaft. The ladder is about 25' in length and was used to access the lower workings of the shaft. Adit #101 is horizontal and is more than 30' long. Ceiling rocks that have spalled clutter the floor. Water dripping from ceiling fractures of the cavern and adit has deposited secondary calcite growths.

Quad Name: Ouray

Site #: 04-06-265/4212-1.100

Site Name: Stopes and Adit on East Side of SH #550 and North of Radium Hot Springs (Public Pool)

Hazard Rating: 2

Description and pertinent facts: The entrance to adit #100 is located approximately 370' from the edge of SH #550 and can be seen from the highway. Several nearby businesses operate on the opposite side of the highway to the south. This site is visited frequently by the public.

Adit #100 is open, has a grated entrance 35' high by 12' wide, and is 200' long. Although the grate effectively prevents access to the underground workings, a high degree of risk from rockfall exists. Slopes above the adit are extremely steep, and boulders from previous rockfalls litter the area around the portal. A sign on the grate warns the public of "Extreme Danger-Rock Fall".

The toe of dump #200 has been removed and is continually being excavated by the county highway department. The unconsolidated nature of the waste rock and steep slopes (50°) above the mine make this site a likely area for rockfalls and/or slides to occur. There is no fence around the perimeter of this dump, although a metal sign warns the public of extreme danger and rockfall. Country rock is the Hermosa Formation.

Quad Name: Ouray

Site #: 04-06-265/4215-1.102, 103

Site Name: Pony Express Mines

Hazard Ratings: 2

Description and pertinent facts: The features discussed in this inventory area are on USFS-managed land. Five closely spaced adits exposed limestone of the Pony Express Member of the Wanakah Formation (Late Jurassic). The porous nature of the brecciated limestone, coupled with angular shaly partings, creates solution calving of large fragments that detach from the cliff face and ceilings of these adits. Adits #102 and #103 are the most hazardous because of their large cavernous rooms and interconnecting passageways. The upper chamber of adit #102 connects with adit #103. Mine timbers brace and hold up the open, jointed roof rock. Several stopes were driven in the ceiling of adit #102. Adit #103 contains a large cavernous room that measures 25' high by 20' wide and 50' long. The back of this room has two drifts extending from it. The floors of all interconnected passageways and the adits are damp from water dripping from the ceilings. There is easy access to this group of adits via FR #871.2B. An old road (now a wide pathway) connects the adits to the Forest Road.

Quad Name: Ouray

Site #: 04-06-265/4218-1.100

Site Name: Plezy Mine

Hazard Rating: 2

Description and pertinent facts: Features #100 and #200 lie on USFS-managed land. Adit #100 has a wooden frame and padlock on a door located in front of and enclosing its entrance. Subsidence occurred approximately 270' from the entrance causing a conical depression to develop at the surface. At the base of the depression, a vertical shaft or open stope descends to the floor of this adit. The bottom of the shaft or stope is partly filled with rock and soil, and mine timbers line its walls. The slopes of the upper depression are extremely unstable, as noted by the freshly exposed bare roots of woody plants and trees. Boulders and cobbles are precariously perched above the lip of the depression. The inner shaft or stope is approximately 15'-18' deep, and the upper conical-shaped depression is 12' to 15' deep. One could fall into this depression and be unable to climb out, or could be buried by the unstable overhanging soils and rock.

Access to this site is by FR #872, a dirt road that passes within 450' of the adit entrance. Hikers, hunters, and outdoor recreationalists who are seeking access to FT #212 and FT #217 frequently use this road. A sign posted at the entrance of the adit states "Danger - Keep Out". A barbed wire fence partly encompasses the elongated dump, although, these deterrents do not prevent

people from circumventing the area closest to the road and reaching the hazardous subsided area behind the entrance.

Quad Name: Ouray

Site #: 04-06-265/4218-2.105

Site Name: Cutler Creek Northwest

Hazard Rating: 2

Description: Features #105 and #205 are on USFS-managed land. This site is easily accessible by an ATV trail (once a 4WD road), which is a westward extension of FR #872. This road appears to continue along the contours of the south-facing slope above Cutler Creek, but it actually ends abruptly just below feature #105. Feature #105 is a vertical shaft that is framed out by 4-inch-diameter juniper logs. A small exploratory adit located on the west side of the upper portions of the shaft trends due west for a distance of 15'. Large unstable boulders of Dakota Sandstone overhang the shaft entrance, and the bottom is partly filled with material that has detached from the ceiling of the overhang. The bottom of the shaft appears to be dry. Footprints and a well-traveled trail lead to the lip of the shaft.

Quad Name: Ouray

Site #: 04-06-266/4212-2.101

Site Name: Chief Ouray Mine Area

Hazard Rating: 2

Description and pertinent facts: This popular site is visited frequently by hikers traveling FT #213 from the Ouray Amphitheater campground. Mine reclamation work at the Chief Ouray Mine includes the installation of a bolted grate across the entrance to adit #100. All other adits in the immediate area remain open and intact. Adit #101, which lies northwest of adit #100, is accessible only by a foot trail that crosses an unstable scree slope. Adit #101 contains poisonous air and has a considerable amount of roof fall and debris piled up at the entrance. Numerous open fractures occur in the ceiling and cliff face. A crusty deposit of yellow-green sulfur occurs on the damp floor and adds to the overall hydrogen sulfide odor inside the adit. This adit may be on patented mining claims, but borders public land. Country rock includes Dakota Sandstone and granodiorite porphyry.

Quad Name: Ouray

Site #: 04-06-266/4216-2.100-200

Site Name: Dumps below Bachelor Mine on Dexter Creek

Hazard Rating: 2

Description and pertinent facts: This site is on USFS-managed land. Adit #100 is easily reached by walking 250' north from FR #871. This adit is located above a clearing where many people park their vehicles to access the Dexter Creek Trail (FT #205). Although on patented claims, people frequently visit this adit via a trail that ascends from the parking lot to this adit. Two 2-inch by 4-inch boards are nailed together in an "X" and were placed at the entrance. Material from the roof and upslope area have sloughed off and built up a partial berm at the

entrance. The roof has open fractures and void spaces due to natural spalling and settling, and a considerable amount of water is dripping from the ceiling and running down the walls. The boards act as a partial deterrent, although there is no sign at the entrance to inform people of the extreme danger of subsidence and roof collapse.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

WHITE RIVER NATIONAL FOREST

ASPEN RANGER DISTRICT

April, 1998

by

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FR	Forest Road
FT	Forest Trail
4WD	four-wheel drive
gpm	gallons per minute
GPS	Global Positioning System
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
WHITE RIVER NATIONAL FOREST -- ASPEN RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Aspen Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 15 (White River), and Ranger District 01 (Aspen).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45 μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

The Aspen Ranger District lies within the Colorado Mineral Belt, and several mining districts are in this region. The Elk Mountains are west and south, and the Sawatch Range is east and south of the town of Aspen. Most mineral deposits are related to Laramide- and Tertiary-age igneous activity associated with the uplift of these mountains.

Mining districts with significant quantities of abandoned mines on public land in the Sawatch Range include the Independence and Ruby districts. The Elk Mountains include the Columbia-Ashcroft and Taylor Peak districts, and scattered clusters of mines along Conundrum and East Maroon Creeks. The Aspen mining district lies close to the junction of the mountain ranges.

Aspen mining district

The Aspen mining district was a major producer of silver, lead, and zinc. Copper and gold were byproducts. Most production came from the lower Belden and Leadville Formations where the host rocks were replaced by mineralizing solutions. The deposits are associated with large faults, such as the Aspen (or Contact) Fault. Small cross faults related to the larger faults are brecciated, which provided channels for metal-bearing solutions. Tertiary intrusions were probably the source of the mineralizing fluids. (See Kreidler in Brown, 1990.)

Most of the largest mines are either outside the Forest boundary, or are patented, and were not examined. Sites inventoried on public land were mostly small exploration workings. Northeast of Aspen, along Hunter Creek and in Van Horn Park, numerous shafts were sunk in efforts to explore the Belden and Leadville Formations. These are mostly shallow and caved. Workings are concentrated south of Aspen, especially on the west side of Aspen Mountain and Richmond Hill. The largest workings, such as the Hope Mine and Highland Tunnel appear to be crosscuts or haulageways, designed to intersect veins or stopes deep underground. On the ski area, workings have been reclaimed to the extent that it is difficult to recognize most.

Independence mining district

The Independence district is along SH-82, about 15 miles southeast of Aspen. It is a gold district which was most active between 1879 and 1899. Silver, copper, and lead were produced in small quantities. Minor production occurred until 1951, but most later production was limited to reworking mill tailings and processing low-grade ore stockpiled in stopes during the 1930's. Early production was confined almost entirely to high-grade gold ore. Newberry (1891) estimated that only 50% of the gold and almost none of the silver were recovered by the crude milling process available during the peak period. Production ceased when sulfide ore was encountered at depth and recovery dropped significantly. (See Ludington and Ellis, 1981.)

Rocks exposed in the district are almost entirely Precambrian gneisses. Dump material shows mineralization in Cretaceous- to Tertiary-age granitic dikes that are probably related to intrusive activity along the north margin of the Grizzly Peak caldera. Significant production was from three west- to northwest-striking, subparallel quartz veins just north of SH-82, and one similar vein (Mt. Hope) a half mile south of the highway and 3/4 mile west of the north workings. The latter vein may be an extension of the main Independence Vein. Reserves remain in both veins. (See Ludington and Ellis, 1981.)

The veins north of the highway dip slightly steeper than the mountain slope, thus the main vein outcrop is trenched at about 11,350' elevation and accessed by crosscuts ranging from about 15' in length at elevation of 11,300' to perhaps 100' in length at the Brown and Little Tillie Tunnels, just above the highway. Mostly collapsed workings are exposed in three shallow gullies. At one time, all of the workings between 11,300' and 11,100' elevation were interconnected (Ellis, unpublished, 1981), but due to the shallow depth the workings were highly unstable, and most are collapsed. Subsidence is occurring where the miners' trail crosses the Intermediate Level, and an open stope is higher on the hillside. These are the Forest Service priority sites in the Independence district, although additional physical hazards are on the adjacent private land.

Mine workings in the Independence district were mostly in the oxide zone, thus few sulfide minerals are present in the workings, and acid drainage is not a major concern. Seeps from the Brown Tunnel and from unmined areas, and the flow down the center gully, had pH of about 6.5 and low conductivities.

Ruby mining district

The Ruby area is along Lincoln Creek in the Sawatch Range and is near the center of the Grizzly Peak caldera. This Tertiary-age caldera covers about 85 square miles of the Sawatch Range and has been the site of multiple intrusions and mineralizing episodes. Several areas in the caldera are intensely altered, with the slope above the Ruby Mine being a good example. Mines in the area produced lead and silver primarily, with lesser amounts of copper and gold. Stockwork molybdenum also occurs. The only significant producer was the Ruby Mine. (See Brown, 1990.)

With the exception of the Ruby Mine, mines inventoried in this area were mostly small exploration workings with few physical hazards. Additional physical hazards may exist on the private land in this district. Lincoln Creek is severely degraded in the Ruby area, probably a result of natural and mine drainage. This site is discussed in detail in the **Environmental Degradation** section of this report.

Columbia-Ashcroft mining district

The Columbia-Ashcroft mining district lies about 10-15 miles south of Aspen, along Castle Creek. The district was the first in the area to be explored, mainly because of large outcrops of Leadville Limestone that attracted prospectors from Leadville. Although geologically similar to Aspen, i.e., Leadville and Belden Formation rocks are common; this district lacks the numerous faults, and Tertiary intrusive rocks are generally sparse in the vicinity of the replaceable rocks. The Montezuma Mine is the only mine with recorded production. Silver, lead, and zinc were the major commodities, but production was minimal. (See Kreidler in Brown, 1990.) Most inventoried workings in this district were small, and many were caved. Some physical hazards remain, however.

Taylor Peak mining district

The Taylor Peak mining district includes the Pitkin Iron Mine, on the northwest slope of Taylor Peak, about 18 miles south of Aspen. Magnetite and hematite, with minor pyrite, has replaced marbleized limestone of the Belden Formation. This deposit was a major producer, active until the mid-1980's. (See Kreidler in Brown, 1990). Most recent production has been from a multiple-level open cut. Much of this site is private, but public land is present as blocks and slivers between patents.

Miscellaneous occurrences

Other mineralized areas with abandoned mine workings driven on quartz-pyrite veins are scattered along Conundrum Creek and East Maroon Creek. Some of these veins contain moderately high concentrations of zinc, lead, silver, and gold. The veins are associated with a molybdenite anomaly centered on Hunter Peak and may represent the base and precious metal halo around stockwork molybdenum occurrences. Mineralization is hosted in the Tertiary-age White Rock pluton and in Paleozoic-age Maroon Formation rocks that have been upwarped and contact metamorphosed. Pyritic alteration is widespread, especially along veins. (See Kreidler in Brown, 1990; Weisner and Bieniewski, 1984.) A few environmental and physical hazards occur at these widely scattered workings, which are deep within the Maroon Bells-Snowmass Wilderness Area.

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST --ASPEN RANGER DISTRICT

NUMERICAL SUMMARY

60 field forms

342 mine openings inventoried (includes collapsed or filled openings)

215 mine dumps, tailings piles, highwalls, etc.

73 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.

Number of features with EDR of 1 = 0

Number of features with EDR of 2 = 3

Number of features with EDR of 3 = 11

Number of features with EDR of 4 = 59

Number of features with EDR of 5 = 484

101 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 2

Number of features with PHR of 2 = 14

Number of features with PHR of 3 = 85

Number of features with PHR of 4 = n/a (see Field Guide, appendix A)

Number of features with PHR of 5 = 456

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST --ASPEN RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=15;District=01	EDR
1) Hope Mine	Hayden Peak	341/4331-1.200; 100	2; 3
2) Pitkin Iron Mine	Hayden Peak	345/4318-1.100; 200	2; 3
3) Ruby Area	Independence Pass	360/4319-1.106; 101	2; 3
4) Highland Tunnel	Aspen	340/4332-1.100	3
5) West of Hunter Peak along East Maroon Creek	Maroon Bells	333/4324-1.100	3
6) Lower workings along East Maroon Creek	Maroon Bells	334/4328-1.101	3
7) Conundrum Creek, West Side	Maroon Bells	336/4324-1.100, 200, 202, 203	3, 3, 3, 3
8) Sandy Creek	Hayden Peak	340/4325-1.202	3
9) Montezuma Mine Area	Hayden Peak	339/4319-1.100	4

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=15;District=01	PHR
1) Upper Keno Gulch	Aspen	341/4337-1.109; 103	1; 2
2) Hill South of Van Horn Park	Aspen	347/4342-1.108	1
3) West Aspen Mountain	Aspen	341/4335-1.116, 123	2, 2
4) Independence Mine Area	Independence Pass	360/4329-1.107, 123	2, 2
5) Upper East Maroon	Maroon Bells	332/4319-1.102, 104	2, 2
6) South Side Hunter Creek	Aspen	345/4340-1.102, 103	2, 2
7) Highland Tunnel	Aspen	340/4332-1.100	2
8) Lower Ruby	Independence Pass	360/4320-1.104	2
9) Grizzly Lake	Independence Pass	362/4323-1.100, 101	2, 2
10) Lower workings along East Maroon Creek	Maroon Bells	334/4328-1.104	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Aspen

Site #: 340/4332-1.100

Site Name: Highland Tunnel

Environmental Degradation Rating: 2

Description and pertinent facts: This open adit is located about 4.5 miles south of SH-82, along the Castle Creek Road. According to the PBS quad, the portal is on public land, but the dump is private. The working was apparently driven as a crosscut to intersect veins on the west side of Richmond Hill. On 9/16/97, effluent with **pH=7.42 and conductivity=1,644 μ S** was emanating from the portal at a measured rate of 70 gpm. Orange-red precipitate lined the channel of the effluent stream. This effluent flowed onto private land, across the regraded and seeded dump, and into two settling ponds. No discharge was observed at the lower of the ponds. Water sample #340/4332-1.301, collected at the portal, exceeded state standards in sulfate concentration as shown on the table below. The high conductivity is apparently caused mostly by high concentrations of calcium and sulfate.

Sample number 340/4332-1.301; hardness of effluent sample = 2,148 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	280	1,000	below standard
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	<16	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	<0.25	13	below standard
Calcium (as CaCO ₃)	720 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	163	below standard
Fluoride	0.12 mg/L	2 mg/L*	below standard
Iron	<10	300	below standard
Lead	<1	300	below standard
Magnesium	85 mg/L	no standard	n/a
Manganese	28	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	983	below standard
Potassium	1.6 mg/L	no standard	n/a
Selenium	<1	5*	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Silver	<0.2	15 (on 3/2/98)	below standard
Sodium	2.6 mg/L	no standard	n/a
Sulfate	680 mg/L	250 mg/L	2.7 x standard
Zinc	<8	1,425	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

This mine is also discussed in the **Physical Hazards** section of this report.

^^ New Quad ^^^

Quad Name: Hayden Peak

Site #: 339/4319-1.100

Site Name: Montezuma Mine area

Environmental Degradation Rating: 4

Description and pertinent facts: This partly open adit is along an unnamed tributary of Castle Creek, on the southwest side of Malamute Peak. Water was flowing from the adit and possibly a seep in an adjacent cliff face. It is difficult to determine the origin of the discharge because of abundant wood debris and snow banks at the site. In July, 1997, the flow was estimated at 20 gpm, **pH=7.36 and conductivity=1,130 µS**. The effluent flowed across part of the dump before seeping in. Shortly before disappearing, the 2 gpm flow had **pH=8.01 and conductivity=1,080 µS**. In September, the flow near the adit was estimated at 7 gpm and **pH=6.79 and conductivity=1,151 µS**. During both visits, orange and gray precipitate lined the effluent channel, which was somewhat braided. A water sample (#339/4319-1.302) was collected in September, and the results are shown on the table below. Some precipitate was probably inadvertently collected from the very shallow effluent stream, which probably accounts for the high iron (trec). The effluent greatly exceeded state standards in cadmium, manganese, and zinc concentrations, and slightly exceeded standards in sulfate. This site was given an EDR of 4 because of the low flow, and because the flow does not reach live surface flow.

Sample number 339/4319-1.302; hardness of effluent sample = 1,657 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	460	no standard	n/a
Antimony (trec)	1	6.0*	below standard
Arsenic (trec)	14	50 (acute)	below standard
Iron (trec)	32,000	1,000	32 x standard
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	20,000	2,000*	10 x standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum	<50	87*	below standard
Cadmium	96	10	9.6 x standard
Calcium (as CaCO ₃)	640 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	7	130	below standard
Fluoride	0.21 mg/L	2 mg/L*	below standard
Iron	41	300	below standard
Lead	2	208	below standard
Magnesium	14 mg/L	no standard	n/a
Manganese	3,000	50	60 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	807	below standard
Potassium	2.4 mg/L	no standard	n/a
Selenium	<1	5*	below standard
Silver	<0.2	9.4 (on 3/2/98)	below standard
Sodium	1.3 mg/L	no standard	n/a
Sulfate	670 mg/L	250 mg/L	2.7 x standard
Zinc	10,000	1,144	8.7 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: Hayden Peak

Site #: 340/4325-1.202

Site Name: Sandy Creek

Environmental Degradation Rating: 3

Description and pertinent facts: Feature #202 is a dump of a caved adit located within the Maroon Bells-Snowmass Wilderness near the head of Sandy Creek. No trails or roads access this site. American Lake trail (FT-1985) is about 1.5 miles to the east and is accessed from FR-102, one mile south of Ashcroft. At the time of the inventory, the caved adit was discharging water at a rate of about 15 gpm. Effluent crosses the dump and enters Sandy Creek about 50' from the portal area. Water tested near the portal had **pH=7.31 and conductivity=100 µS**. Heavy rains at the time of the investigation could have affected discharge rate and water quality. Pyrite, barite, and iron oxides are abundant on this 100-cubic-yard dump.

Quad Name: Hayden Peak

Site #: 341/4331-1.100; 200

Site Name: Hope Mine

Environmental Degradation Ratings: 3; 2

Description and pertinent facts: This caved adit and associated subsidence is located about 7 miles from Aspen, on the west side of the Castle Creek Road about 1 mile south of the Highland Tunnel. On 9/16/97, about 60 gpm of water was flowing from the caved adit and was depositing a gray-black precipitate in a pool on the east side of the mine access road. Water in the pool had **pH=7.16 and conductivity=1,474 μ S** and was sampled (#341/4331-1.305). Sample results shown on the table below reveal the water exceeds state standards slightly in manganese and sulfate. Most of the conductivity is probably a result of the high hardness. About 2/3 of the effluent flowed beneath the mine access road through a square culvert, then into a gully in dump #201 (southern of two dumps associated with this adit.) After crossing a natural wetlands, the effluent merged with Castle Creek. The remaining 1/3 of the mine effluent flowed into a pipe with a stuck valve. A resident of a mine cabin about 200' south of the adit stated that the pipe carried water northward to a downstream ranch house. He did not know if the pipeline was still functional.

Sample number 341/4331-1.305; hardness of effluent sample = 2,114 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	760	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	560	1,000	below standard
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	<16	2,000*	below standard
Aluminum	<100	87*	below detection limit
Cadmium	<0.25	12	below standard
Calcium (as CaCO ₃)	790 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<20	11*	below detection limit
Copper	<8	160	below standard
Fluoride	0.12 mg/L	2 mg/L*	below standard
Iron	<20	300	below standard
Lead	<1	294	below standard
Magnesium	34 mg/L	no standard	n/a
Manganese	58	50	1.2 x standard
Molybdenum	<20	no standard	n/a
Nickel	<40	971	below standard
Potassium	<2 mg/L	no standard	n/a
Selenium	<1	5*	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Silver	<0.2	14 (on 3/2/98)	below standard
Sodium	2.7 mg/L	no standard	n/a
Sulfate	770 mg/L	250 mg/L	3.1 x standard
Zinc	<16	1,406	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

The northern of the two dumps (#200) is composed primarily of black shale and is being actively eroded by Castle Creek. The outslope of the dump is severely oversteepened, and in June, 1997, several seeps emerged from near the base of the oversteepened outslope and flowed directly into Castle Creek. The largest of the seeps, flowing at an estimated 15 gpm in June, had **pH=7.24 and conductivity=1,665 µS**. Of serious environmental concern at dump #200 is the oversteepened outslope combined with the presence of seeps. Shale has little internal strength, and with seeps lubricating the pile, a sizable failure of the 3,000-cubic-yard dump is possible. Although the shale does not appear to contain significant quantities of metallic minerals, a slide could add hundreds of tons of sediment to Castle Creek. It is quite likely that the seeps in #200 are the result of the pipeline described above being broken or clogged.

In June, the effluent from the adit and the seeps had little effect on the runoff-swollen Castle Creek. Upstream Castle Creek had **pH=8.46 and conductivity=266 µS**; downstream **pH=8.25 and conductivity=254 µS** on an estimated 15,000 gpm flow.

Quad Name: Hayden Peak

Site #: 345/4318-1.100; 200

Site Name: Pitkin Iron Mine

Environmental Degradation Ratings: 2; 3

Description and pertinent facts: This open pit mine, and associated spoil piles and dumps, are about 4 miles south of Ashcroft, near the headwaters of Cooper Fork of Cooper Creek. Most of the disturbed area is private land, but according to the PBS quad, parcels of public land are included, especially at some of the pit levels. The mine is accessed by FR-121, which is a well-graded and maintained road closed to the public for motor vehicles.

This marbleized-limestone-hosted, iron-oxide deposit was actively mined as late as the mid-1980's. In addition to the pit and spoil piles, the disturbed area includes numerous roads, benches, old adits and shafts, etc. Some of the extraneous roads and spoil piles have been regraded and seeded.

Feature #100 is the pit. It has multiple benches, each generally about 100'x 100' horizontally, with varying vertical dimensions. Overall, the excavations extend at least 300' vertically on the mountainside. Feature #200 includes the spoil piles in the immediate area of the pit. Hematite- and magnetite-rich rocks dominate the spoil piles. Marble, limestone, pyrite, and chalcopyrite

are abundant, too. Features #100 and #200 remain nearly barren of vegetation. Because the pit and related spoil piles are on an extremely steep slope at 12,000' elevation, reclamation will be difficult.

On 9/20/97, about 27 gpm water with **pH=7.81 and conductivity=1,399 μ S** was emerging from a road cut adjacent to the lowest of the large spoil piles, near the lowest pit level. Gravel and cobbles, cemented by red, iron-rich tufa, lined the effluent channel. This same location was tested on 7/29/97 and had **pH=7.80 and conductivity=1,054 μ S** with an estimated flow of 80 gpm. On 7/29/97, this flow was also tested about 500' west, and 200' below, just above where it crosses the mine access road. The lower test site showed **pH=7.56 and conductivity=1,208 μ S**. On 9/20/97, a water sample (#345/4318-1.302) was collected at the upper test site; the results are on the table below. High conductivity is probably a function of high hardness and sulfate concentrations, rather than metal loading.

Sample number 345/4318-1.302; hardness of effluent sample = 1,952 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	25	1,000	below standard
Selenium (trec)	3	10	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	90	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	0.46	12	below standard
Calcium (as CaCO ₃)	720 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	150	below standard
Fluoride	0.13 mg/L	2 mg/L*	below standard
Iron	<10	300	below standard
Lead	<1	262	below standard
Magnesium	37 mg/L	no standard	n/a
Manganese	<4	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	914	below standard
Potassium	2.5 mg/L	no standard	n/a
Selenium	3	5*	below standard
Silver	<0.2	12 (on 3/2/98)	below standard
Sodium	2.2 mg/L	no standard	n/a

east bank of the creek had an obvious coating of white precipitate for several hundred feet downstream. No precipitate was seen in Lincoln Creek above this confluence. Water from the spring was sampled (#360/4319-1.313), and the results show concentrations of aluminum, copper, and manganese significantly exceed, and concentrations of cadmium and zinc slightly exceed state water quality standards.

Sample number 360/4319-1.313; hardness of spring sample = 119 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	10,000	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	100	1,000	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	240	2,000*	below standard
Aluminum	11,000	87*	126 x standard
Cadmium	2.1	1.3	1.6 x standard
Calcium (as CaCO ₃)	41 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	870	14	62 x standard
Fluoride	0.10 mg/L	2 mg/L*	below standard
Iron	94	300	below standard
Lead	<1	5	below standard
Magnesium	4.1 mg/L	no standard	n/a
Manganese	340	50	6.8 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	109	below standard
Potassium	1.0 mg/L	no standard	n/a
Silver	<0.2	0.10 (on 3/2/98)	below detection limit
Sodium	1.5 mg/L	no standard	n/a
Sulfate	120 mg/L	250 mg/L	below standard
Zinc	240	123	2 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Feature #: 106

Environmental Degradation Rating: 2

This caved adit is the Ruby Mine. According to Al Grimshaw, USFS, the portal of the adit is on public land, but the dump is private. Effluent depositing abundant orange-red precipitate flows from the caved portal, along the south side of the dump, and into natural wetlands where the flow is dispersed, mixed with natural water, and eventually enters Lincoln Creek. The average of two tests of the effluent reveal **pH=6.21 and conductivity=1,280 µS** on a flow of about 15 gpm. Results of an effluent sample (#360/4319-1.311) collected near the portal reveal iron and

manganese concentrations greatly exceed, and aluminum and sulfate concentrations also exceed state standards, as shown on the table below.

Sample number 360/4319-1.311; hardness of effluent sample = 1,248 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	1,200	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	1	50 (acute)	below standard
Iron (trec)	79,000	1,000	79 x standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	340	2,000*	below standard
Aluminum	500	87*	5.7 x standard
Cadmium	4.2	8.2	below standard
Calcium (as CaCO ₃)	460 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	37	102	below standard
Fluoride	1.2 mg/L	2 mg/L*	below standard
Iron	76,000	300	253 x standard
Lead	<1	139	below standard
Magnesium	24 mg/L	no standard	n/a
Manganese	3,200	50	64 x standard
Molybdenum	<10	no standard	n/a
Nickel	20	651	below standard
Potassium	5.5 mg/L	no standard	n/a
Silver	<0.2	5.8 (on 3/2/98)	below standard
Sodium	11 mg/L	no standard	n/a
Sulfate	610 mg/L	250 mg/L	2.4 x standard
Zinc	320	900	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

The effluent was tested again about 400' downstream from the portal, just above where it crosses the Lincoln Creek Road. Red precipitate was abundant, flow rate was about 7 gpm, and **pH=6.54 and conductivity=1,204 µS**. A test from Lincoln Creek, downstream and adjacent to the influx of effluent from #106 and about 800' downstream from the influx of effluent from adit #101, revealed **pH=6.49 and conductivity=102 µS**. No precipitate was observed at this location in Lincoln Creek.

Discussion and preliminary conclusions: A significant flow of water was draining from the heart of the altered area, above all known mines. This stream channel is lined with abundant red-brown ferricrete. In addition, an unmined area, roughly an acre in size, adjacent to and north of the active stream channel has numerous intermittent seeps, and ferricrete and brown, powdery,

iron-rich precipitate is common. A water test from the stream during July runoff revealed **pH=2.70 and conductivity=2,460 μ S** on an estimated flow of 100 gpm. Another test and sample (#360/4319-1.310) from the same location in September showed **pH=3.18 and conductivity=2,180 μ S** on a measured flow of 48 gpm. Sample results are shown on the table below. The water contained incredible quantities of metals. Aluminum, copper, and iron concentrations exceed state standards by more than two orders of magnitude. Cadmium, chromium, manganese, nickel, sulfate, and zinc concentrations also exceed state standards.

Sample number 360/4319-1.310; hardness of stream sample = 133 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	160,000	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	4	50 (acute)	below standard
Iron (trec)	200,000	1,000	200 x standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	850	2,000*	below standard
Aluminum	160,000	87*	1839 x standard
Cadmium	3.9	1.4	2.8 x standard
Calcium (as CaCO ₃)	27 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	23	11*	2.1 x standard
Copper	6,300	15	420 x standard
Fluoride	0.19 mg/L	2 mg/L*	below standard
Iron	210,000	300	700 x standard
Lead	<1	6	below standard
Magnesium	16 mg/L	no standard	n/a
Manganese	370	50	7.4 x standard
Molybdenum	<20	no standard	n/a
Nickel	180	119	1.5x standard
Potassium	<2 mg/L	no standard	n/a
Silver	<0.2	0.12 (on 3/2/98)	below detection limit
Sodium	1.7 mg/L	no standard	n/a
Sulfate	1,500 mg/L	250 mg/L	6 x standard
Zinc	760	135	5.6 x standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are μ g/L, dissolved concentrations, and chronic values unless noted.

This natural stream flows westward, just to the north of the Ruby Mine, and crosses the Lincoln Creek Road between the Ruby Mine and some mill ruins. Ferricrete is still abundant, and the stream was tested between the main road and Lincoln Creek. Estimated flow was 120 gpm, and **pH=2.77 and conductivity=2,350 μ S**. Where this natural stream enters Lincoln Creek, abundant red precipitate coats the rocks, but immediately upstream of this confluence precipitate is minor or nonexistent. Red precipitate grades into reddish-yellow precipitate downstream.

Precipitate deposits continue for more than 1 mile downstream, but the complete downstream extent was not determined. Water tests from Lincoln Creek about 300' downstream of the confluence showed **pH=4.10 and conductivity=373 µS** on an estimated 3,000 gpm flow in July; and **pH=4.49 and conductivity=265 µS** on an estimated flow of 1,200 gpm in September. Results from a sample (#360/4319-1.314) collected in September are shown below. Concentrations of aluminum, copper, and iron greatly exceed state standards. Manganese concentration is elevated slightly.

Sample number 360/4319-1.314; hardness of creek sample = 74 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	9,900	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	9,200	1,000	9.2 x standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	60	2,000*	below standard
Aluminum	9,400	87*	108 x standard
Cadmium	0.38	0.90	below standard
Calcium (as CaCO3)	26 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	380	9	42 x standard
Fluoride	<0.10 mg/L	2 mg/L*	below standard
Iron	3,600	300	12 x standard
Lead	<1	2.5	below standard
Magnesium	2.3 mg/L	no standard	n/a
Manganese	66	50	1.3 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	75	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.04 (on 3/2/98)	below detection limit
Sodium	1.0 mg/L	no standard	n/a
Sulfate	100 mg/L	250 mg/L	below standard
Zinc	64	82	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Two tests of Lincoln Creek from above all significant mine workings, and above all areas of obvious alteration, show **pH=6.75 and conductivity=033 µS** on estimated flow of 2,000 gpm in July; and **pH=8.03 and conductivity=051 µS** on estimated flow of 800 gpm in September. Significant pH differences in the tests may be the result of the heavy contribution of snowmelt, which can be slightly acidic, during July. Results from water sample #360/4319-1.312 collected in September are shown on the table below.

Sample number 360/4319-1.312; hardness of creek sample = 46 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	11	1,000	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	<8	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	<0.25	0.6	below standard
Calcium (as CaCO ₃)	17 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	6	below standard
Fluoride	<0.10 mg/L	2 mg/L*	below standard
Iron	<10	300	below standard
Lead	<1	1.3	below standard
Magnesium	0.86 mg/L	no standard	n/a
Manganese	<4	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	109	below standard
Potassium	<1 mg/L	no standard	n/a
Silver	<0.2	0.02 (on 3/2/98)	below detection limit
Sodium	0.66 mg/L	no standard	n/a
Sulfate	<5 mg/L	250 mg/L	below standard
Zinc	<8	53	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

The stream draining the area between Red Mountain and Garfield Peak, north of the most intensely altered rocks, was tested near the Lincoln Creek Road. The estimated 200 gpm flow had **pH=6.67 and conductivity=105 µS**, suggesting no severe metal loading in this tributary. In July, two water tests were conducted downstream in Lincoln Creek in the adjacent inventory area (inventory area #360/4320-1, Lower Ruby). A test about 800' downstream of the lowest sample site (sample #360/4319-1.314), and just above the confluence with the tributary from Ruby Lakes, showed **pH=4.16 and conductivity=146 µS** on an estimated flow of 2,000 gpm. Another test about 1/2 mile further downstream, just below the confluence with the Petroleum and Anderson Lakes tributary, revealed **pH=5.16 and conductivity=075 µS** on an estimated flow of 2,500 gpm.

Visual observations and water test and sample results indicate that Lincoln Creek is severely degraded in the Ruby area. It also appears that although effluent from mine features #101 and

^^ New Quad ^^^

Site #: 333/4324-1.100

Environmental Degradation Rating: 3

Sample number 333/4324-1.301; hardness of effluent sample = 341 mg/L.

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Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Calcium (as CaCO ₃)	130 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L*	below standard
Chromium	<10	11*	below standard
Copper	95	34*	2.8 x standard
Fluoride	0.18 mg/L	2 mg/L*	below standard
Iron	33	300*	below standard
Lead	<1	22*	below standard
Magnesium	4.0 mg/L	no standard	n/a
Manganese	34	50*	below standard
Molybdenum	60	no standard	n/a
Nickel	<20	243*	below standard
Potassium	1.7 mg/L	no standard	n/a
Selenium	3	5*	below standard
Silver	<0.2	0.6* (on 3/2/98)	below standard
Sodium	1.2 mg/L	no standard	n/a
Sulfate	110 mg/L	250 mg/L*	below standard
Zinc	<8	300*	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: Maroon Bells

Site #: 334/4328-1.101

Site Name: Lower workings along East Maroon Creek

Environmental Degradation Rating: 2

Description and pertinent facts: This caved adit is within the Maroon Bells-Snowmass Wilderness, about 400' above the East Maroon Creek Trail and 2 miles from the trailhead. A measured flow of 560 gpm of water was discharging from the caved adit, and at the time of the initial inventory, this effluent was the only water flowing in the adjacent stream channel. The effluent drains alongside the dump, which contains moderate quantities of pyrite and malachite, and abundant iron oxides. The effluent channel splits and crosses the trail in two places, then enters a pond along East Maroon Creek 500' downstream from the portal. White to rust-colored precipitate is common in the effluent and is intergrown with the abundant moss. Two water tests from near the portal averaged about **pH=7.2 and conductivity=1,456 µS**. Results of water sample #334/4328-1.302 are shown on the table below. East Maroon Creek is a stream segment where the stream standards simply state "NO DEGRADATION ALLOWED". No specific standards are given, so this sample will be compared to state-wide standards. None of the parameters analyzed exceeded standards. High conductivity is probably a function of the high hardness of the water.

Sample number 334/4328-1.302; hardness of effluent sample = 2,124 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<100	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)*	below standard
Iron (trec)	89	1,000*	below standard
Selenium (trec)	<1	20*	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	73	2,000*	below standard
Aluminum	<100	87*	below detection limit
Cadmium	0.51	12*	below standard
Calcium (as CaCO ₃)	820 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L*	below standard
Chromium	<20	11*	below detection limit
Copper	<8	161*	below standard
Fluoride	0.25 mg/L	2 mg/L*	below standard
Iron	40	300*	below standard
Lead	<1	296*	below standard
Magnesium	18 mg/L	no standard	n/a
Manganese	27	50*	below standard
Molybdenum	<20	no standard	n/a
Nickel	<40	975*	below standard
Potassium	3.4 mg/L	no standard	n/a
Selenium	<1	5*	below standard
Silver	<0.2	14* (on 3/2/98)	below standard
Sodium	2.4 mg/L	no standard	n/a
Sulfate	92 mg/L	250 mg/L*	below standard
Zinc	73	1,412*	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Quad Name: Maroon Bells

Site #: 336/4324-1

Site Name: Conundrum Creek, West Side

Description and pertinent facts: These features are above FT-1981 to Conundrum Hot Springs. This trail gets heavy use all year around. The features are about 4.5 miles from the trailhead, thus in range of day hikers who do not intend to go to the hot springs.

Feature #: 100

Environmental Degradation Rating: 3

This is an open adit discharging about 6 gpm of water. The **pH is 7.04**, which is neutral, however the **conductivity is 761 µS**, which is quite high. The effluent is depositing a pale

yellow precipitate on the dump, and a pale-colored aquatic plant grows in the effluent channel. The mine discharge infiltrates the dump, but probably has some impact on Conundrum Creek, about 800' distant.

Feature #: 200

Environmental Degradation Rating: 3

This is the dump associated with adit #100. It is a large dump of about 6,000 cubic yards and is somewhat pyritic. Dump #200 is barren of vegetation and slightly rilled. Storm runoff or snow avalanche could transport dump material to Conundrum Creek.

Feature #: 202

Environmental Degradation Rating: 3

This 80-cubic-yard dump is very pyritic and is only a few feet from Conundrum Creek. During spring runoff it contributes material to the creek.

Feature #: 203

Environmental Degradation Rating: 3

This 2,000-cubic-yard dump is above and is similar in composition to dump #200. Avalanches or storm runoff could transport this dump material. Although further from Conundrum Creek than dump #200, a summer thunderstorm could possibly wash much of the dump far downslope.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Aspen

Site #: 340/4332-1.100

Site Name: Highland Tunnel

Physical Hazard Rating: 2

Description and pertinent facts: This open adit is located about 4.5 miles south of SH-82, along the Castle Creek Road. According to the PBS quad, the portal is on public land, but the dump is private. The working was apparently driven as a crosscut, to intersect veins on the west side of Richmond Hill. An unlocked "jailhouse" barred gate is at the portal, but access to the underground workings is not hindered. A 70-gpm flow of water may discourage some explorers; however, this working shows on the topo map and can be driven to easily. Year-round residents are less than 1/2 mile away. Because of its easy accessibility, the Highland Tunnel represents a danger to the public. This mine is also discussed in the **Environmental Degradation** section of this report.

Quad Name: Aspen

Site #: 341/4335-1

Site Name: West Aspen Mountain

Description and pertinent facts: This inventory area is located west of Bell Mountain and Tourtellotte Park, adjacent to the Aspen Ski area. This inventory area is riddled with mine features, several of which are significant with respect to physical hazards. Because of the large number of mine features and a lack of GPS readings, all features are plotted relative to other features, with estimated distances on the inventory forms (USFS - AMLI Field Data Form). Permission to access this area may be gained through the Aspen Ski Company, who has a key to the gate at the base of the ski area, just east of the main gondola building. The Midnight Mine Road also provides access.

Feature #: 116

Physical Hazard Rating: 2

This is a partly collapsed shaft that is approximately 22' deep. At the time of the site examination in late July, the shaft was partly filled with snow. It would be difficult to escape if someone was to fall in. Shaft #116 is located just outside the Aspen Ski Area boundary in an area of dense vegetation, mainly pines.

Feature #: 123

Physical Hazard Rating: 2

This shaft is inclined at approximately 40° and extends more than 10' into the bedrock. It was given a PHR of 2 because of its unknown dimensions and steepness. The dump of approximately 50 cubic yards is visible from the road.

Quad Name: Aspen

Site #: 341/4337-1

Site Name: Upper Keno Gulch

Description and pertinent facts: This inventory area is at the head of Keno Gulch, on the west side of Aspen Mountain, adjacent to and west of the ski area. Access is from roads within the ski area, or from a road in Keno Gulch. A large landslide has removed part of the road just north of feature #100.

Feature #: 103

Physical Hazard Rating: 2

This partly caved adit has a portal of 4'x 4' and is at least 20' long. The portal appears extremely unstable. Although not easily seen, this adit is only about 20' below a road and is quite accessible.

Feature #: 109

Physical Hazard Rating: 1

This open stope or shaft is 10'x 5' at the collar and is at least 50' deep. It is slightly inclined, but too steep to climb from, and the bottom is not visible. Virtually no dump is associated with feature #109, making it difficult to spot. The opening is out of the trees, on a brushy, rocky slope. Although not in an area frequented by many hikers, the ski area boundary is only a few hundred feet away, and the open nature of this slope may appeal to "out of bounds" skiers. Because of its inconspicuous nature and the proximity of the ski area, feature #109 is extremely dangerous.

Quad Name: Aspen

Site #: 345/4340-1

Site Name: South Side Hunter Creek

These features are near Aspen on a popular mountain bike trail. During the time required to fill out forms on the two features, at least 6 mountain bikers went by.

Feature #: 102

Physical Hazard Rating: 2

This shaft is more than 20' deep, funnel-shaped, and may have an unstable plug in the apparent bottom, as the dump size indicates a much deeper shaft. It would be possible to fall down the sides of the shaft and not be injured. Some people, if uninjured, might be able to climb out unassisted. The shaft is located just past a hairpin curve on the mountain bike trail. It is easy to visualize a biker approaching the curve too fast and steering up the slight incline onto the dump, and then falling into the shaft before they could stop.

Physical Hazard Rating: 2

Quad Name: Aspen

Site Name: Hill South of Van Horn Park

Description and pertinent facts: This vertical shaft is in shale and limestone, measures 15'x 15' at the collar, and is 28' deep. The 700-cubic-yard dump suggests that the shaft was either much deeper or intersects a drift. A PHR of 1 was assigned to this feature because it is in an area with a high degree of public exposure. Aspen is only about 3 miles away from the popular hiking, biking, and cross-country skiing trails and roads near this working. One of these trails and FR-130 are clearly visible and only 1,000' from this shaft #108.

^^ New Quad ^^^

Site Name: Lower Ruby

Description and pertinent facts: This inventory area is along Lincoln Creek, about 8 miles above its confluence with the Roaring Fork River. It is accessed by a rough, but heavily used, 4WD road that parallels Lincoln Creek. The northern part of the ghost town of Ruby and associated private land are included in this area; however mines on private land were not inventoried. Water tests from this inventory area are mentioned in the **Environmental Degradation** section of this report, in the Ruby Area inventory paragraphs (Site #360/4319-1).

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Quad Name: Independence Pass

Site #: 360/4329-1

Site Name: Independence Mine area

Description and pertinent facts: This inventory area is at the abandoned mining town of Independence, adjacent to SH-82 and about 15 miles from Aspen. Numerous sightseers frequent this easily accessible area. Three subparallel quartz veins were intensely prospected and mined on this hillside. Although only two features were assigned PHRs of 2, subsidence could initiate almost anywhere above the shallow workings on this hillside.

Feature #: 107

Physical Hazard Rating: 2

This feature, which is not on the main miners' trail, is an open stope just to the east of caved adit #106. It is above and slightly west of subsidence feature #123, described below. The opening is 8'x 3', and it is at least 40' deep. This stope may lead to many levels in this multiple-level mine, and it has only a minimal dump to reveal its position.

Feature #: 123

Physical Hazard Rating: 2

This is a small active subsidence feature in a densely mined area. It is reached by an old miners' trail beginning at SH-82 at a small parking area just east of the Brown Tunnel dump (#200). The trail climbs east across the center gully, switchbacks left on the Little Tilley dump (#222), crosses the eroded Intermediate Level dump (#214), goes nearly to the west gully, switchbacks right, and goes below the toe of Tam O'Shanter Tunnel dump (#203). The active subsidence (#123) is along the trail before it recrosses the center gully above the Intermediate Level crosscut (#114). The crosscut is at about 11,100' elevation and the trail is at about 11,160' elevation. It is uncertain whether the subsidence is over the crosscut or over a drift or stope. If it is over the crosscut, the maximum subsidence would be confined to a small area and probably extend no more than 10' in depth. If it is over a drift or stope, subsidence could cover a larger area and extend deeper, but probably not to the Intermediate Level because the subsiding material would fill the working below. The subsidence feature is about 5'x 5', and it is only 1' deep, suggesting that it overlies the crosscut. Subsidence will probably be intermittent, depending upon soil moisture, and feature #123 could stabilize for periods of years.

Quad Name: Independence Pass

Site #: 362/4323-1

Site Name: Grizzly Lake

Description and pertinent facts: This inventory area is within the Collegiate Peaks Wilderness Area and along the Grizzly Lake trail, about 1/2 mile northeast of Grizzly Lake and about 3 miles from the trailhead. The trailhead is on the east side of Grizzly Reservoir, along the Lincoln Creek Road. This trail is heavily used by the public.

oxide stained and clearly visible from this popular trail. Fractured limestone above the 3'x 4', partly collapsed portal appears unstable. Depth of the adit is at least 25', and the 1,100-cubic-yard dump suggests that it is considerably more.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

WHITE RIVER NATIONAL FOREST

BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

April, 1998

by

John Neubert
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Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FT	Forest Trail
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Blanco, Eagle, and Rifle Ranger Districts. It does not include all the mine sites visited during the inventory of the districts. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. This mine inventory was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites by ranger district, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary, also arranged by ranger district.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Ranger District 2) Quadrangle Name and 3) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical within the individual ranger districts. These sites are all in Forest 15 (White River), and Ranger District 02 (Blanco), 04 (Eagle), or 08 (Rifle).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Geology and Mining Districts

Blanco Ranger District

Most of the Blanco Ranger District lies on the White River Plateau, a broad dome about 35 miles long and 20 miles wide. The dome consists of Precambrian schist, gneiss, and granite overlain by Cambrian- through Cretaceous-age sedimentary rocks. Cenozoic-age basalt flows and sedimentary deposits cap the sequence. Most of the bedded rocks are flat-lying or dip gently, except at the margin of the dome. Few mines are located in this region. The only mining district in the Blanco Ranger District is Uranium Peak, which overlaps the northwestern part of the National Forest northeast of Meeker. Mines in the district produced vanadium and uranium from the Salt Wash Member of the Morrison Formation. (See Wood in Brown, 1990.) On Forest-Service-administered land, a couple of moderate-sized open pits and some adits east of Uranium Peak are the workings of concern. Most of the workings are shallow pits or bulldozer trenches.

Eagle Ranger District

The Eagle Ranger District encompasses the northern part of the Sawatch Range and the eastern part of the White River Plateau. Most past mining has occurred southeast of Eagle, beginning near Fulford and extending eastward to the ranger district boundary. A few prospects and a shaft were inventoried on the White River Plateau, in the Carbonate mining district.

The Fulford mining district lies about 20 miles southeast of the town of Eagle and is centered on New York Mountain. Gold was the major commodity, but minor amounts of silver and base metals were also produced. Recorded production was small and occurred prior to 1919. Gold occurs in veins along faults and as replacements in dolomitic lenses near the upper contact of the Sawatch Quartzite. Emplaced north and west of the mineralized area, the Laramide-age Fulford quartz monzonite stock was probably the source of the mineralizing fluids. (See Brown, 1990.)

East and southeast of the Fulford district, several small workings are scattered throughout the Holy Cross Wilderness Area. These workings were primarily gold prospects exploring vein-type occurrences in Precambrian granite, gneiss, and migmatite. Quartz and pyrite compose the veins, and galena, chalcopyrite, and malachite may occur. The Ohio and Discovery Tunnels, along East Lake Creek, were the largest workings in this area. (See Brown, 1990.)

The Carbonate mining district is loosely defined and covers much of the southern part of the White River Plateau. Total production has been a few tons of gold, silver, and zinc ore. Lead is generally present as well. Most of the occurrences are veins and fissures hosted in Paleozoic-age limestone and/or Precambrian-age granite. (See Wood in Brown, 1990.)

Rifle Ranger District

Past mining activity in the Rifle Ranger District is sparse and mostly limited to the Rifle Creek and Carbonate mining districts. The Rifle Creek mining district is along East Rifle Creek, and a few workings from this district are on the margin of Forest-Service-administered land west of West Elk Creek. Within the Forest, less than 1,000 pounds of vanadium-uranium was produced from small workings in the Entrada Sandstone or Morrison Formation. (See Wood in Brown, 1990.)

In the Carbonate mining district (described above), a few mines are open and have some degree of physical hazard. Most are small, caved, and/or are located in seldom-visited areas, and are not serious environmental or physical threats.

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

NUMERICAL SUMMARY

Blanco Ranger District

- 8 field forms
- 43 mine openings inventoried (includes collapsed or filled openings)
- 11 mine dumps, tailings piles, highwalls, etc.

- 12 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 3
 - Number of features with EDR of 4 = 9
 - Number of features with EDR of 5 = 42

- 12 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 5
 - Number of features with PHR of 3 = 7
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 42

Eagle Ranger District

- 13 field forms
- 59 mine openings inventoried (includes collapsed or filled openings)
- 37 mine dumps, tailings piles, highwalls, etc.

- 10 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 1
 - Number of features with EDR of 4 = 9
 - Number of features with EDR of 5 = 86

- 21 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 2
 - Number of features with PHR of 3 = 19
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 75

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

NUMERICAL SUMMARY

Rifle Ranger District

- 5** field forms
- 24** mine openings inventoried (includes collapsed or filled openings)
- 6** mine dumps, tailings piles, highwalls, etc.

- 4** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 0
 - Number of features with EDR of 4 = 4
 - Number of features with EDR of 5 = 26

- 8** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 1
 - Number of features with PHR of 3 = 7
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 22

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

PRIORITY SITES

Environmental Degradation

Ranger District Site Name	Quad Name	Site # Forest=15	EDR
Blanco Ranger District		District=02	
1) Butterfly	Sawmill Mountain	272/4444-1.200, 103	3, 3
2) Burrell Claims	Sawmill Mountain	272/4444-2.101	3
Eagle Ranger District		District=04	
1) Discovery Tunnel Area	Grouse Mountain	366/4374-2.205	3

Physical Mine Hazards

Ranger District Site Name	Quad Name	Site # Forest=15	PHR
Blanco Ranger District		District=02	
1) Butterfly	Sawmill Mountain	272/4444-1.201, 100, 102,	2, 2, 2
2) Burrell Claims	Sawmill Mountain	272/4444-2.100	2
3) Upper Coal Creek	Sawmill Mountain	273/4443-1.104	2
Eagle Ranger District		District=04	
1) Discovery Tunnel Area	Grouse Mountain	366/4374-2.103	2
2) New York Mountain	Fulford, Grouse Mtn	360/4375-1.106	2
Rifle Ranger District		District=08	
1) Carbonate	Carbonate	298/4401-1.101	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Blanco Ranger District

Quad Name: Sawmill Mountain

Site #: 272/4444-1

Site Name: Butterfly

Description and pertinent facts: This inactive uranium mine is reached by FR-235 (according to PBS quad), and is along a tributary of Coal Creek, about 20 miles from Meeker. It is easily accessible to the public. This site was active at least into the 1970's and is included in Mineral Survey #20917. The highwall and associated adits are discussed in the **Physical Hazards** section of this report.

Feature #: 103

Environmental Degradation Rating: 3

This feature is an open pit measuring about 300'x 250', with a highwall (feature #201) up to 60' high. The pit has two benches with a wooden office(?) building, a corrugated-metal core shack, and various pieces of mine equipment and junk. Scintillometer readings on the upper bench averaged about 100 cps, with a high of about 700 cps near the core shack. The lower bench averaged about 400 cps with a high of about 1,800 cps near a grizzly. At the time of the inventory, snowmelt was accumulating and probably seeping into the pit bench.

Feature #: 200

Environmental Degradation Rating: 3

This 5,000-cubic-yard dump is associated with pit #103 and adits #100-102. It is hard to distinguish the boundary between the dump and the bench, but the dump is about 300'x 40' with an outslope of about 110'. Gullies cut the outslope where water has drained from the pit benches. Average scintillometer readings are 500 cps. Because of its size, and lack of vegetation compared to the surrounding area, dump #200 is quite visible to the public. Erosion of the outslope indicates that some of the slightly radioactive dump material is being transported from the site.

Quad Name: Sawmill Mountain

Site #: 272/4444-2.101

Site Name: Burrell Claims

Environmental Degradation Rating: 3

Description and pertinent facts: This uranium mine is adjacent to the southeast side of inventory area #272/4444-1, discussed above. It shares the mine access road with the Butterfly Mine and is included in Mineral Survey #20917. Feature #101 is a large pit bench, about 300'x 200'. Scintillometer readings on the bench vary widely, from 40 cps in several places to 1,000

cps just to the east of rails that once served adit #100. Adit #100 is discussed in the **Physical Hazards** section of this report.

Eagle Ranger District

Quad Name: Grouse Mountain

Site #: 366/4374-2.205

Site Name: Discovery Tunnel Area

Environmental Degradation Rating: 3

Description and pertinent facts: This 15,000-cubic-yard dump is deep within the Holy Cross Wilderness, near the East Lake Creek Trail (FT-1880) and about 5-6 miles from the trailhead. Most of the dump is granitic gneiss, but minor pyrite and traces of galena are present. Outslopes of the dump show evidence of sheetwash, and a sparse regrowth of vegetation, primarily pines, is gradually occurring. Minor amounts of dump material are probably transported from this large dump during rain storms. Shaft #103 of this inventory area is discussed in the **Physical Hazards** section of this report.

SITES EXHIBITING PHYSICAL HAZARDS

Blanco Ranger District

Quad Name: Sawmill Mountain

Site #: 272/4337-1

Site Name: Butterfly

Description and pertinent facts: This inactive uranium mine is reached by FR-235 (according to PBS quad), and is along a tributary of Coal Creek about 20 miles from Meeker. It is easily accessible to the public. This site was active at least into the 1970's, and is included in Mineral Survey #20917. The pit and associated dump are discussed in the **Environmental Degradation** section of this report.

Feature #: 100

Physical Hazard Rating: 2

This partly caved adit has a timbered portal. An opening of 3'x 5' is behind the caved timbers, and roof bolts are in place holding the adit open for at least 30'. This adit is in pit #103, at the base of highwall #201. Neither the caved opening nor the highwall above the opening are stable. Radon gas may occur underground.

Feature #: 102

Physical Hazard Rating: 2

This feature includes two adjacent open adits sharing a common portal. A powderhouse excavated into the highwall adjacent to and west of the adits is nearly full from rockfall. An opening of 5'x 8' extends at least 30' underground. The eastern adit has standing water about 10' inside, and the western adit has a bird nest. A scintillometer reading of 900 cps was obtained at the portal, and the presence of radon gas is likely.

Feature #: 201

Physical Hazard Rating: 2

This feature is a highwall that is 400' long and is nearly vertical in places. It varies in height from about 30' to 60'. An unstable mixture of interbedded blocky sandstone and weathered shale compose the highwall. This geologic condition results in large blocks of sandstone being undercut, then failing as the underlying shale erodes. Sandstone blocks up to 6' on a side litter the base of the highwall. During the inventory, which was on a windy day, shale was actively being eroded. In addition, the access road approaches within about 20' of the top of the southeast part of the highwall. Instability and easy access by the public create a dangerous situation, especially at adits #100 and #102 at the base of the highwall.

Quad Name: Sawmill Mountain

Site #: 272/4444-2.100

Site Name: Burrell Claims

Physical Hazard Rating: 2

Description and pertinent facts: This uranium mine is adjacent to the southeast side of inventory area #272/4444-1, discussed above. It shares an easily accessible mine road with the Butterfly Mine and is included in Mineral Survey #20917. Adit #100 is 5'x 8' at the portal and is at least 30' deep. The adit is partly caved at the portal, and the caving is worse about 20' underground. The incompetent nature of the soft, sandstone bedrock and the likelihood of radon gas underground create a dangerous situation. The pit bench associated with this mine is discussed in the **Environmental Degradation** section of this report.

Quad Name: Sawmill Mountain

Site #: 273/4443-1.104

Site Name: Upper Coal Creek

Physical Hazard Rating: 2

Description and pertinent facts: This small, open uranium mine is about 1.5 miles southeast of the Butterfly and Burrell Mines, along FR-235 (according to the PBS quad). This adit has a portal of 6'x 5' and is about 20' long. Several large rock slabs have fallen from the roof. The highest scintillometer measurement near adit #104 was 400 cps. This adit is adjacent to open cut #105, which has been used as a campsite. Instability of the adit roof, combined with the easy accessibility to the public, create a dangerous situation.

Eagle Ranger District

Quad Name: Fulford

Site #: 360/4375-1.106

Site Name: New York Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This is an open shaft just east of FT-2221, above the Polar Star Mine. The shaft is vertical, over 15' deep, and is partly timbered with rotten timbers. It might be possible for a person to fall in and not be seriously injured, and it might be possible for the person to climb out unassisted. Such a sequence of events is not likely, however. The trail appears to be used frequently in the summer by people hiking up New York Mountain. There are many shallow, collapsed workings in the area, and the unwary could become nonchalant about approaching openings. A person standing at the edge of this shaft could be caught in sudden collapse of the shaft walls, as the old timbers no longer support the shaft walls.

^^ New Quad ^^^

Quad Name: Grouse Mountain

Site #: 366/4374-2.103

Site Name: Discovery Tunnel area

Physical Hazard Rating: 2

Description and pertinent facts: This is an open shaft immediately below an unmarked trail. This feature is reached from FT-1880 by crossing a very nice footbridge and following the unmarked trail, which is quite obvious. The shaft is very steeply inclined and more than 20' deep. A fall into the shaft would surely result in injury. The rock walls of the shaft are sound, but too steep to be climbed by even an uninjured person (highly skilled rock climbers excepted). The shaft is less than 20' from the trail and fully visible. The Discovery Tunnel dump (#205) is discussed in the **Environmental Degradation** section of this report.

Rifle Ranger District

Quad Name: Carbonate

Site #: 298/4401-1.101

Site Name: Carbonate

Physical Hazard Rating: 2

Description and pertinent facts: This open shaft is near the boundary of public and private land according to the PBS quad. It is on the White River Plateau, adjacent to the ghost town of Carbonate, now the site of a few seasonal cabins. The shaft has a 14'x 5' collar and descends vertically for 15' to water. Depth below the water is unknown. Bushes partly obscure the collar, but the 120-cubic-yard dump is obvious. Pistachio shells littering the dump indicate that the public visits this feature at least intermittently.

SELECTED REFERENCES

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USFS-ABANDONED MINED LAND INVENTORY PROJECT

DILLON RANGER DISTRICT

FINAL SUMMARY REPORT

by

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September 1, 1994

USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
DILLON RANGER DISTRICT

This Final Summary Report supersedes previous "interim" reports for this district received by USFS personnel. Information from Interim Report 1 is contained within this report.

This document summarizes the sites of concern to the USFS - Dillon Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings of extreme (1), significant (2), or potentially significant (3) and sites given Mine (Physical) Hazard Ratings of extreme danger (1) or dangerous (2). It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS managed lands. Private (patented) land inholdings were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS managed lands.

A **priority listing** of the most important environmental degradation sites and the most important physical mine hazard sites is given on the next page. Because of an abundance of potentially hazardous mines (Hazard Rating 3) in the Dillon Ranger District, not all of the hazards are included in this priority listing, but the most severe hazards are listed.

Site descriptions of individual mine features, which comprise the bulk of this report, follows on page 3. These are not listed in order of priority, but are listed by: 1) Quadrangle Name and 2) Site Number.

The sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Mine Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Even so, they are open and represent a threat to those who choose to enter them. If funds are available, these mines should also be closed.*

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Numerical Summary:

684 mine openings inventoried (includes collapsed or filled openings)

11 inventory areas have Environmental Degradation Ratings of 1, 2, or 3.

7 mine openings have Mine (Physical) Hazard Ratings of 1 or 2.

174 mine openings have Mine (Physical) Hazard Ratings of 3.

PRIORITY SITES

Dillon Ranger District

ENVIRONMENTAL DEGRADATION

Site Name	Quad Name	Site#	Rating
Excelsior Mine/Mill	Frisco	404-4380-1.202	2
Governor Mine	Breckenridge	409-4360-1.200	2
Hamilton Mine	Keystone	414-4374-1.100	2
Jessie Mine	Frisco	412-4373-1.100	2
Saints John Mine	Keystone	424-4380-1.302	2
Silver Spoon	Montezuma	430-4382-1.100/101/105	2
Warden Gulch	Montezuma	428-4383-1.101	3
Lower Climax Mine	Montezuma	428-4378-1.100	2
Willard Tunnel	Breckenridge	412-4369-1.107/108	2
Wellington/Oro Mine	Breckenridge	412-4370-2.200	2
IXL/Royal Tiger	Keystone	417-4374-2.301	3

PHYSICAL MINE HAZARDS

Site Name	Quad Name	Site#	Rating
General Teller Mine	Keystone	424-4378-1.100	1
Little Fool Mine	Breckenridge	407-4361-1.101	2
Crystal Lake	Breckenridge	407-4358-1.100	2
Solitary/Big B	Breckenridge	404-4364-1.103	2
Wild Irishman Mine	Keystone	424-4379-1.103	2
Boston Mine	Copper Mtn.	401-4363-2.100	2
Jessie Mine	Frisco	412-4373-1.101	2

USFS-ABANDONED MINED LAND INVENTORY PROJECT / SUMMARY REPORT
DILLON RANGER DISTRICT

Sites Exhibiting Environmental Degradation

Quad Name: Breckenridge

Site ID#: 15-10-409-4360-1.200

Site Name: Governor Mine

Environmental Degradation Rating: 2

Description and pertinent facts: The Governor mine is located 1.5 miles south of Blue River townsite on the west side of State Highway 9. Environmental degradation at this site is due to a sizeable quantity of spent motor oil which has been dumped onto the ground in the vicinity of a plywood shack at the toe of the mine dump. It is suspected that an unpatented mining claim covers this site. Oil was observed seeping out from the south wall of a tool shed at the time of the site visit in May 1994. The ground around the parking area is also fairly saturated with oil. This is a significant environmental hazard due to the proximity of this site to the Blue River, which is potentially receiving oil via ground water flow.

Quad Name: Breckenridge

Site ID#: 15-10-412-4369-1.107 & 108

Site Name: Illinois Gulch/Willard Tunnel

Environmental Degradation Rating: 2

Description and pertinent facts: The Willard Tunnel and associated mine site is located at the foot of the Boreas Pass road on private property. This tunnel was driven to access the Puzzle/Gold Dust mine. This site is currently discharging highly degraded water onto USFS property located immediately below. At the time of a site visit in May, 1994, water tested at the point of egress onto USFS property had an estimated flow rate of 10 gpm with a pH of 3.0 and TDS of 600 uS. Another water test some taken 450 ft north, also on USFS property, had an estimated flow rate of 15 gpm with pH of 3.2 and TDS of 500 uS. This second USFS parcel is also being effected by degraded water originating from private claims on Little Mountain. Although USFS is not directly responsible for this degradation, the effect is substantial. The Willard Tunnel site has been investigated by the State of Colorado DMG-Mined Land Reclamation Division and may receive attention in the future. There are many new residences with children in close proximity to this degraded surface flow. USFS property is highly accessible to potential targets.

Quad Name: Breckenridge

Site ID#: 15-10-412-4370-1.200

Site Name: Wellington/Oro Mine-French Gulch

Environmental Degradation Rating: 2

Description and pertinent facts: The Wellington/Oro is one of the largest mines of French Gulch and is the current major contributor to degradation of surface water in this drainage. A 1 acre, triangular shaped, parcel, located on the unpatented Johannesburg Placer, is partly covered by a pile of mill roaster tailings and mine waste. This parcel is USFS administered. Mill roaster tailings and waste rock on this site most likely contribute to acid/metal degradation in French Gulch. A very large component of degraded water is from the mine workings themselves, all located on private ground. An on-going State of Colorado-Dept. of Minerals and Geology-Inactive Mine Program investigation of the site will continue to develop a comprehensive remediation plan for this site. Site remediation has been hampered by complex hydrologic conditions in the subsurface. Dillon Ranger District personnel have been briefed on this project.

Quad Name: Frisco

Site ID#: 15-10-404-4380-1.202

Site Name: Excelsior Mine and Millsite/Ten Mile Canyon

Environmental Degradation Rating: 2

Description and pertinent facts: The Excelsior mine was a moderately sized precious/base metal operation which was active before the turn of the century. There was also a processing facility or millsite active at this site. Milling of ore at this site has left an estimated 3000 cubic yards of fine-grained, metallic sulfide rich tailings which are currently subject to erosion by storm run-off and wind. Eroded mill tailings and acid/metal degraded water were draining into Ten Mile Creek via a culvert under Interstate 70 at the time of the initial site visit in June, 1993. The source of surface water is run-off from Wichita Mtn. At a subsequent site visit in July, 1993, the watertable had subsided considerably and a 1 foot deep pit was required to acquire a water sample from the drainage gulley which cuts the east side of the tailings pile. Surface water in contact with mill tailings had a measured flow of 1 gallon/minute, with a reorded pH of 4.1 and a conductivity of 400 uS, as measured in June, 1993. A filtered and preserved water sample collected in July, 1993 reveals elevated levels of the following metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Aluminum	6600 ppb	66X
Cadmium	230 ppb	575X
Copper	1200 ppb	240X
Iron	1800 ppb	1.80X
Lead	58 ppb	14.5X
Manganese	5600 ppb	5.60X
Zinc	30 ppm	600X

Quad Name: Frisco

Site ID#: 15-10-412-4373-1.100

Site Name: Jessie Mine/Gold Run Gulch

Environmental Degradation Rating: 2

Description and pertinent facts: The Jessie mine is located in Gold Run Gulch immediately adjacent to Forest Road 300. This mine was active into the 1940's and has opened a pyrite/gold deposit in granitic rocks. The site includes a historic millsite, several collapsed adits, and a large open-stope, or glory hole. USFS land holdings encompass the millsite, lower waste rock piles and wetlands complex, and the upper open-stope. Mine dumps on the south end of the site are on private ground. At the time of the site-visit in August, 1993, a small amount (0.2 gallons/minute) of visibly degraded water was seeping out of adit #100. This drainage did not appear to migrate off-site during the August visit. The pH of drainage from adit #100 measured near neutral (7.1), but showed a high conductivity (1800 uS). This site should be monitored during spring run-off as filtered/preserved water samples showed elevated levels of the following metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Copper	<80 ppb	<2.0X
Iron	3400 ppb	3.4X
Manganese	8600 ppb	8.6X
Zinc	32 ppm	53.3X

Quad Name: Keystone

Site ID#: 15-10-414-4374-1.100

Site Name: Hamilton Mine/Summit Gulch

Environmental Degradation Rating: 2

Description and pertinent facts: The Hamilton mine is located in

Summit Gulch above recent residential improvements in the valley of Swan River. The Hamilton mine produced gold and silver from pyritic mineralization in granitic rocks. The site was visited in August, 1993, at which time the lowermost adit was observed to be discharging visibly degraded water at a rate of 3 gallons/minute. Recorded pH was near neutral (7.3), with a measured conductivity of 500 uS. This site should be monitored during Spring run-off to check for potential off-site migration of metals into Summit Gulch. A strong potential for environmental degradation is indicated by elevated levels of the following metals in a filtered/preserved water sample taken from adit #100:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Iron	1600 ppb	1.60X
Manganese	2400 ppb	2.40X
Zinc	2200 ppb	7.30X

Quad Name: Keystone

Site ID#: 15-10-417-4374-2.301

Site Name: IXL Royal Tiger Mine

Environmental Degradation Rating: 3

Description and pertinent facts: The IXL/Royal Tiger mine and millsite are located on private property on the south side of the Swan River. This site is currently discharging degraded water at a rate of 40-50 gpm out across mill-tailings and into Swan River. Although this site is privately owned and has been investigated by the State of Colorado-Dept. of Mines and Geology-Mined Land Reclamation Division, a water sample was collected during this study at a point below the site to monitor potential off-site migration of acidity and/or metals. The pH of surface flow emerging from this site was near neutral at 8.0 and showed a somewhat elevated conductivity of 500 uS. A filtered and preserved water sample taken at this point revealed elevated levels of the following metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Zinc	1.7 ppm	5.67X

Quad Name: Keystone

Site ID#: 15-10-424-4380-1.302

Site Name: Saints John Mine/ Saints John Creek

Environmental Degradation Rating: 2

Description and pertinent facts: The Saints John mine and smelter site, located in 1864, was one of the first silver mines operated in Colorado. This entire site, including the unincorporated townsite of Saints John, is on private property. A visit to the site in August, 1993, revealed some off-site migration of degraded water through a breached sediment dam onto USFS land. A surface flow of 80 gallons/minute was recorded below the site with a pH of 7.5 and a conductivity of 300 uS. This site should be monitored during Spring run-off to determine if USFS lands are adversely effected. A filtered/preserved water sample revealed elevated levels of the following metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Cadmium	6.0 ppb	1.20X
Manganese	1400 ppb	1.40X
Zinc	1900 ppb	19.0 X

Quad Name: Montezuma

Site ID#: 15-10-428-4378-1.100

Site Name: Lower Climax Mine/Sullivan Mountain

Environmental Degradation Rating: 2

Description and pertinent facts: The Climax mine is located on the lower slopes of Sullivan mountain. An open standing adit (Feature #100) was discharging visibly degraded water at a rate of 3.0 gallons/minute at the time of the site visit in August, 1993. The recorded pH of this drainage was 4.5 with a conductivity of 400 uS. There may be a substantial component of natural drainage from Sullivan Mtn. effecting water quality at this site. Filtered and preserved water samples taken from this adit showed elevated levels of the following metals:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Cadmium	1.35 ppb	3.40X
Copper	12 ppb	2.40X
Iron	11 ppm	11.0X
Manganese	2.7 ppm	2.70X
Zinc	1.2 ppm	24.0X

Quad Name: Montezuma

Site ID#: 15-10-428-4383-1.101

Site Name: Warden Gulch

Environmental Degradation Rating: 3

Description and pertinent facts: Warden Gulch is a tributary stream of Peru Creek which drains the north slopes of the continental divide. This area has been shown from previous studies to be effected by naturally occurring acid-metal degradation from altered rocks on Santa Fe Peak and Silver Mountain. Adit #101 is located midslope in the basin between Brittle Silver and Collier Mountains, just east of Warden Gulch. At the time of a site visit in September, 1993, this adit was draining water at a rate of 2.5 gpm. The recorded pH was 3.7 with a conductivity of 800 uS. This adit is being actively sealed by deposits of terraced ferricrete or other iron/silica precipitants which are accumulating in the portal. It has not been determined at this time if both natural and mining related processes are occurring at this site and if so, the relative contributions of each. The site is potentially significant due to elevated levels of the following metals in a filtered and preserved water sample:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Cadmium	55.0 ppb	55.0X
Copper	16.0 ppb	1.60X
Iron	69.0 ppm	69.0X
Manganese	9.90 ppm	9.90X
Zinc	5.30 ppm	106.0X

Quad Name: Montezuma

Site ID#: 15-10-430-4382-1.100, 101, & 105

Site Name: Silver Spoon/Cinnamon Gulch

Environmental Degradation Rating: 2

Description and pertinent facts: Cinnamon Gulch drains the north slopes of the Continental Divide in the vicinity of Revenue and Silver Mountains. The Silver Spoon mine proper is at the head of Cinnamon Gulch and is on private property. A dozen or so adits, some of which appear to be on USFS property, are located below the Silver Spoon in Cinnamon Gulch and in an unnamed tributary which enters from the east. A 3 gallon/minute flow of degraded water was discharging from the Silver Spoon adit at the time of a visit to the site in September, 1993. Recorded pH was 3.0 with a conductivity of 300 uS. The Silver Spoon is a major point-source

contributor of acidity and metals into Cinnamon Gulch and as such has a definite impact on USFS land down watershed. It is, however; difficult to assess impacts from individual mine features on drainages as a whole in this area of the Continental Divide due to substantial naturally occurring acid-metal drainage (See Streufert, 1993). The following mine features and associated water quality data are from Cinnamon Gulch adits which appear to be on USFS property:

Feature #100: 1.5 gpm; pH=3.2; conductivity=700uS; ferricrete terraces:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Cadmium	68 ppb	68X
Copper	450 ppb	45X
Iron	51 ppm	51X
Manganese	20 ppm	20X
Nickel	160 ppb	1.6X
Zinc	11 ppm	220X

Feature #101: 1.5 gpm; pH=3.5; conductivity=500uS:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Cadmium	33 ppb	33X
Copper	370 ppb	37X
Iron	12 ppm	12X
Manganese	13 ppm	13X
Nickel	130 ppb	1.3X
Zinc	6 ppm	120X

Feature #105: located in unnamed east tributary of Cinnamon Gulch; 2.5 gpm; pH=6.0; conductivity=200uS:

<u>Metal</u>	<u>Concentration</u>	<u>Factor Above Colorado Basic Standard for Aquatic Life</u>
Cadmium	9 ppb	22.5X
Copper	70 ppb	14X
Iron	2.9 ppm	2.9X
Lead	160 ppb	40X
Manganese	2 ppm	2X
Zinc	940 ppb	18.8X

USFS-ABANDONED MINED LAND INVENTORY PROJECT / SUMMARY REPORT
DILLON RANGER DISTRICT

Sites Exhibiting Physical Hazards

Quad Name: Breckenridge

Site ID#: 15-10-404-4364-1.103

Site Name: Solitary/Big Bonanza Mines

Physical Hazard Rating: 2

Description and pertinent facts: The Solitary/Big Bonanza mine site is located in the vicinity of Upper Crystal Lake at the headwaters of Crystal Creek. The area is frequented by day-hikers from Breckenridge and probably less so by skiers in the winter months. Feature number 103 in this area is a very dangerous open shaft. Sloughing of the shaft walls has created an especially hazardous condition at the surface of this feature. The shaft shows some bell-shaped collapse and is widening with depth. This feature had standing water some 15 feet below the surface at the time of a site visit in September 1993. The depth of this shaft is probably 100+ feet. This feature could most likely be backfilled, however; access for construction vehicles could prove problematic. Another option would be construction of a mesh surface closure.

Quad Name: Breckenridge

Site ID#: 15-10-407-4358-1.100

Site Name: Crystal Lake/North Star Mountain

Physical Hazard Rating: 2

Description and pertinent facts: The adit located directly west of Crystal Lake is easily accessed by a 4X4 road from Hoosier Pass. This mine is over 300 feet deep and passes through some loose unstable ground. This mine tunnel was inspected and mapped in detail by CGS personnel in 1984, at which time the mine was accessible for 300+ feet. This mine should be safeguarded by a bulkhead with locking grate door.

Quad Name: Breckenridge

Site ID#: 15-10-407-4361-1.101

Site Name: Little Fool Mine

Physical Hazard Rating: 2

Description and pertinent facts: The Little Fool minesite is located on the north side of McCullough Gulch and is accessible by a good gravel road from the valley below. Feature number 101 is a

partially open shaft located just uphill from the lower portal (Feature #100). At the time of a site visit in September, 1993, this shaft was accessible through an open stope via a ramp of loose and rotten rock. The surface ramp has a pitch of over 30 degrees and it is likely that unsuspecting visitors could slide on loose footing into the shaft which is 30+ feet deep. This feature should be backfilled as it is very close to a frequently used 4X4 road.

Quad Name: Copper Mountain

Site ID#: 15-10-401-4363-2.100

Site Name: Boston Mine/Mayflower Gulch

Physical Hazard Rating: 2

Description and pertinent facts: The Boston mine was operated for base metals in the early 20th Century by the Boston Mining & Milling Company. A 4ft by 4ft open-standing adit is located on USFS property immediately adjacent to Forest Road 1178. This adit is driven into fairly unstable looking ground. The depth of the mine tunnel is unknown but is suspected to be of sufficient extent as to pose a threat to forest visitors. The valley of Mayflower Gulch is frequently visited and this mine feature is highly accessible. This mine feature should be backfilled

Quad Name: Frisco

Site ID#: 15-10-412-4373-1.101

Site Name: Jessie Mine/Gold Run Gulch

Physical Hazard Rating: 2

Description and pertinent facts: The Seminole open-stope (gloryhole) was an area in which a large, near-surface ore deposit was open-pit mined. This surface stope was also connected to the underground workings of the Jessie Mine via a vertical shaft. At the time of the site visit in August, 1993, no evidence of this connecting shaft was observed in the floor of the open-stope. This connecting shaft may still be intact and may manifest itself in the floor of the excavation at any time, compounding the physical hazard potential of this site. The Seminole open-stope is excavated into highly fractured rock which renders the walls of the pit unstable. Rockfall potential at this site is quite high, especially during storm events. The hazard from falling rock, coupled with the hazard posed by a fall into the feature (30+ feet) itself from the rear high-wall, demands a hazard rating of 2. This site should at the very least be fenced off as physical remediation could prove costly.

Quad Name: Keystone

Site ID#: 15-10-424-4378-1.100

Site Name: General Teller Mine/Glacier Mtn.

Physical Hazard Rating: 1

Description and pertinent facts: The General Teller mine is located immediately adjacent to Forest Road 275, a frequently traveled 4X4 road on Glacier Mountain. The double compartment General Teller shaft is currently open-standing with loose, unstable ground surrounding the collar. This 10 ft by 5 ft shaft is extremely dangerous at this time due to the possibility of a 40+ foot unrestricted fall down onto unstable looking shaft-fill debris. This debris is quite possibly bridged across additional void below 40 ft. The intact, still-standing steel headframe at this mine is currently being undercut by erosion of surface material into the shaft and poses a threat from collapse, further adding to the physical hazard at this site. At the time of a visit to this site in July, 1993, there was evidence of frequent tourist visitation to this site. This shaft should be backfilled and the historic headframe stabilized.

Quad Name: Keystone

Site ID#: 15-10-424-4379-1.103

Site Name: Wild Irishman Mine

Physical Hazard Rating: 2

Description and pertinent facts: The Wild Irishman mine is located directly on Forest Road 275, a popular jeep road up Glacier Mountain from Saints John gulch. Feature number 103 at this site is an open-standing shaft which was filled to 2 feet above cribbing level with water at the time of a visit to the site in July, 1993. The depth from ground surface to cribbing level is about 10 feet. Due to standing water, the true depth of this shaft is unknown at this time. Judging from the volume of waste rock nearby the shaft is at least 50 ft. deep. A fall into this feature could result in physical injury, drowning, or both. Due to the ease of access, a hazard rating of 2 is assessed this site. This shaft could be easily backfilled.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

WHITE RIVER NATIONAL FOREST

BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

April, 1998

by

John Neubert
Clarence Ellis

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FT	Forest Trail
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Blanco, Eagle, and Rifle Ranger Districts. It does not include all the mine sites visited during the inventory of the districts. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. This mine inventory was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites by ranger district, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary, also arranged by ranger district.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Ranger District 2) Quadrangle Name and 3) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical within the individual ranger districts. These sites are all in Forest 15 (White River), and Ranger District 02 (Blanco), 04 (Eagle), or 08 (Rifle).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Geology and Mining Districts

Blanco Ranger District

Most of the Blanco Ranger District lies on the White River Plateau, a broad dome about 35 miles long and 20 miles wide. The dome consists of Precambrian schist, gneiss, and granite overlain by Cambrian- through Cretaceous-age sedimentary rocks. Cenozoic-age basalt flows and sedimentary deposits cap the sequence. Most of the bedded rocks are flat-lying or dip gently, except at the margin of the dome. Few mines are located in this region. The only mining district in the Blanco Ranger District is Uranium Peak, which overlaps the northwestern part of the National Forest northeast of Meeker. Mines in the district produced vanadium and uranium from the Salt Wash Member of the Morrison Formation. (See Wood in Brown, 1990.) On Forest-Service-administered land, a couple of moderate-sized open pits and some adits east of Uranium Peak are the workings of concern. Most of the workings are shallow pits or bulldozer trenches.

Eagle Ranger District

The Eagle Ranger District encompasses the northern part of the Sawatch Range and the eastern part of the White River Plateau. Most past mining has occurred southeast of Eagle, beginning near Fulford and extending eastward to the ranger district boundary. A few prospects and a shaft were inventoried on the White River Plateau, in the Carbonate mining district.

The Fulford mining district lies about 20 miles southeast of the town of Eagle and is centered on New York Mountain. Gold was the major commodity, but minor amounts of silver and base metals were also produced. Recorded production was small and occurred prior to 1919. Gold occurs in veins along faults and as replacements in dolomitic lenses near the upper contact of the Sawatch Quartzite. Emplaced north and west of the mineralized area, the Laramide-age Fulford quartz monzonite stock was probably the source of the mineralizing fluids. (See Brown, 1990.)

East and southeast of the Fulford district, several small workings are scattered throughout the Holy Cross Wilderness Area. These workings were primarily gold prospects exploring vein-type occurrences in Precambrian granite, gneiss, and migmatite. Quartz and pyrite compose the veins, and galena, chalcopyrite, and malachite may occur. The Ohio and Discovery Tunnels, along East Lake Creek, were the largest workings in this area. (See Brown, 1990.)

The Carbonate mining district is loosely defined and covers much of the southern part of the White River Plateau. Total production has been a few tons of gold, silver, and zinc ore. Lead is generally present as well. Most of the occurrences are veins and fissures hosted in Paleozoic-age limestone and/or Precambrian-age granite. (See Wood in Brown, 1990.)

Rifle Ranger District

Past mining activity in the Rifle Ranger District is sparse and mostly limited to the Rifle Creek and Carbonate mining districts. The Rifle Creek mining district is along East Rifle Creek, and a few workings from this district are on the margin of Forest-Service-administered land west of West Elk Creek. Within the Forest, less than 1,000 pounds of vanadium-uranium was produced from small workings in the Entrada Sandstone or Morrison Formation. (See Wood in Brown, 1990.)

In the Carbonate mining district (described above), a few mines are open and have some degree of physical hazard. Most are small, caved, and/or are located in seldom-visited areas, and are not serious environmental or physical threats.

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

NUMERICAL SUMMARY

Blanco Ranger District

- 8 field forms
- 43 mine openings inventoried (includes collapsed or filled openings)
- 11 mine dumps, tailings piles, highwalls, etc.

- 12 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 3
 - Number of features with EDR of 4 = 9
 - Number of features with EDR of 5 = 42

- 12 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 5
 - Number of features with PHR of 3 = 7
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 42

Eagle Ranger District

- 13 field forms
- 59 mine openings inventoried (includes collapsed or filled openings)
- 37 mine dumps, tailings piles, highwalls, etc.

- 10 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 1
 - Number of features with EDR of 4 = 9
 - Number of features with EDR of 5 = 86

- 21 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 2
 - Number of features with PHR of 3 = 19
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 75

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

NUMERICAL SUMMARY

Rifle Ranger District

- 5** field forms
- 24** mine openings inventoried (includes collapsed or filled openings)
- 6** mine dumps, tailings piles, highwalls, etc.

- 4** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 0
 - Number of features with EDR of 4 = 4
 - Number of features with EDR of 5 = 26

- 8** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 1
 - Number of features with PHR of 3 = 7
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 22

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

PRIORITY SITES

Environmental Degradation

Ranger District Site Name	Quad Name	Site # Forest=15	EDR
Blanco Ranger District		District=02	
1) Butterfly	Sawmill Mountain	272/4444-1.200, 103	3, 3
2) Burrell Claims	Sawmill Mountain	272/4444-2.101	3
Eagle Ranger District		District=04	
1) Discovery Tunnel Area	Grouse Mountain	366/4374-2.205	3

Physical Mine Hazards

Ranger District Site Name	Quad Name	Site # Forest=15	PHR
Blanco Ranger District		District=02	
1) Butterfly	Sawmill Mountain	272/4444-1.201, 100, 102,	2, 2, 2
2) Burrell Claims	Sawmill Mountain	272/4444-2.100	2
3) Upper Coal Creek	Sawmill Mountain	273/4443-1.104	2
Eagle Ranger District		District=04	
1) Discovery Tunnel Area	Grouse Mountain	366/4374-2.103	2
2) New York Mountain	Fulford, Grouse Mtn	360/4375-1.106	2
Rifle Ranger District		District=08	
1) Carbonate	Carbonate	298/4401-1.101	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Blanco Ranger District

Quad Name: Sawmill Mountain

Site #: 272/4444-1

Site Name: Butterfly

Description and pertinent facts: This inactive uranium mine is reached by FR-235 (according to PBS quad), and is along a tributary of Coal Creek, about 20 miles from Meeker. It is easily accessible to the public. This site was active at least into the 1970's and is included in Mineral Survey #20917. The highwall and associated adits are discussed in the **Physical Hazards** section of this report.

Feature #: 103

Environmental Degradation Rating: 3

This feature is an open pit measuring about 300'x 250', with a highwall (feature #201) up to 60' high. The pit has two benches with a wooden office(?) building, a corrugated-metal core shack, and various pieces of mine equipment and junk. Scintillometer readings on the upper bench averaged about 100 cps, with a high of about 700 cps near the core shack. The lower bench averaged about 400 cps with a high of about 1,800 cps near a grizzly. At the time of the inventory, snowmelt was accumulating and probably seeping into the pit bench.

Feature #: 200

Environmental Degradation Rating: 3

This 5,000-cubic-yard dump is associated with pit #103 and adits #100-102. It is hard to distinguish the boundary between the dump and the bench, but the dump is about 300'x 40' with an outslope of about 110'. Gullies cut the outslope where water has drained from the pit benches. Average scintillometer readings are 500 cps. Because of its size, and lack of vegetation compared to the surrounding area, dump #200 is quite visible to the public. Erosion of the outslope indicates that some of the slightly radioactive dump material is being transported from the site.

Quad Name: Sawmill Mountain

Site #: 272/4444-2.101

Site Name: Burrell Claims

Environmental Degradation Rating: 3

Description and pertinent facts: This uranium mine is adjacent to the southeast side of inventory area #272/4444-1, discussed above. It shares the mine access road with the Butterfly Mine and is included in Mineral Survey #20917. Feature #101 is a large pit bench, about 300'x 200'. Scintillometer readings on the bench vary widely, from 40 cps in several places to 1,000

cps just to the east of rails that once served adit #100. Adit #100 is discussed in the **Physical Hazards** section of this report.

Eagle Ranger District

Quad Name: Grouse Mountain

Site #: 366/4374-2.205

Site Name: Discovery Tunnel Area

Environmental Degradation Rating: 3

Description and pertinent facts: This 15,000-cubic-yard dump is deep within the Holy Cross Wilderness, near the East Lake Creek Trail (FT-1880) and about 5-6 miles from the trailhead. Most of the dump is granitic gneiss, but minor pyrite and traces of galena are present. Outslopes of the dump show evidence of sheetwash, and a sparse regrowth of vegetation, primarily pines, is gradually occurring. Minor amounts of dump material are probably transported from this large dump during rain storms. Shaft #103 of this inventory area is discussed in the **Physical Hazards** section of this report.

SITES EXHIBITING PHYSICAL HAZARDS

Blanco Ranger District

Quad Name: Sawmill Mountain

Site #: 272/4337-1

Site Name: Butterfly

Description and pertinent facts: This inactive uranium mine is reached by FR-235 (according to PBS quad), and is along a tributary of Coal Creek about 20 miles from Meeker. It is easily accessible to the public. This site was active at least into the 1970's, and is included in Mineral Survey #20917. The pit and associated dump are discussed in the **Environmental Degradation** section of this report.

Feature #: 100

Physical Hazard Rating: 2

This partly caved adit has a timbered portal. An opening of 3'x 5' is behind the caved timbers, and roof bolts are in place holding the adit open for at least 30'. This adit is in pit #103, at the base of highwall #201. Neither the caved opening nor the highwall above the opening are stable. Radon gas may occur underground.

Feature #: 102

Physical Hazard Rating: 2

This feature includes two adjacent open adits sharing a common portal. A powderhouse excavated into the highwall adjacent to and west of the adits is nearly full from rockfall. An opening of 5'x 8' extends at least 30' underground. The eastern adit has standing water about 10' inside, and the western adit has a bird nest. A scintillometer reading of 900 cps was obtained at the portal, and the presence of radon gas is likely.

Feature #: 201

Physical Hazard Rating: 2

This feature is a highwall that is 400' long and is nearly vertical in places. It varies in height from about 30' to 60'. An unstable mixture of interbedded blocky sandstone and weathered shale compose the highwall. This geologic condition results in large blocks of sandstone being undercut, then failing as the underlying shale erodes. Sandstone blocks up to 6' on a side litter the base of the highwall. During the inventory, which was on a windy day, shale was actively being eroded. In addition, the access road approaches within about 20' of the top of the southeast part of the highwall. Instability and easy access by the public create a dangerous situation, especially at adits #100 and #102 at the base of the highwall.

Quad Name: Sawmill Mountain

Site #: 272/4444-2.100

Site Name: Burrell Claims

Physical Hazard Rating: 2

Description and pertinent facts: This uranium mine is adjacent to the southeast side of inventory area #272/4444-1, discussed above. It shares an easily accessible mine road with the Butterfly Mine and is included in Mineral Survey #20917. Adit #100 is 5'x 8' at the portal and is at least 30' deep. The adit is partly caved at the portal, and the caving is worse about 20' underground. The incompetent nature of the soft, sandstone bedrock and the likelihood of radon gas underground create a dangerous situation. The pit bench associated with this mine is discussed in the Environmental Degradation section of this report.

Quad Name: Sawmill Mountain

Site #: 273/4443-1.104

Site Name: Upper Coal Creek

Physical Hazard Rating: 2

Description and pertinent facts: This small, open uranium mine is about 1.5 miles southeast of the Butterfly and Burrell Mines, along FR-235 (according to the PBS quad). This adit has a portal of 6'x 5' and is about 20' long. Several large rock slabs have fallen from the roof. The highest scintillometer measurement near adit #104 was 400 cps. This adit is adjacent to open cut #105, which has been used as a campsite. Instability of the adit roof, combined with the easy accessibility to the public, create a dangerous situation.

Eagle Ranger District

Quad Name: Fulford

Site #: 360/4375-1.106

Site Name: New York Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This is an open shaft just east of FT-2221, above the Polar Star Mine. The shaft is vertical, over 15' deep, and is partly timbered with rotten timbers. It might be possible for a person to fall in and not be seriously injured, and it might be possible for the person to climb out unassisted. Such a sequence of events is not likely, however. The trail appears to be used frequently in the summer by people hiking up New York Mountain. There are many shallow, collapsed workings in the area, and the unwary could become nonchalant about approaching openings. A person standing at the edge of this shaft could be caught in sudden collapse of the shaft walls, as the old timbers no longer support the shaft walls.

^^ New Quad ^^^

Quad Name: Grouse Mountain

Site #: 366/4374-2.103

Site Name: Discovery Tunnel area

Physical Hazard Rating: 2

Description and pertinent facts: This is an open shaft immediately below an unmarked trail. This feature is reached from FT-1880 by crossing a very nice footbridge and following the unmarked trail, which is quite obvious. The shaft is very steeply inclined and more than 20' deep. A fall into the shaft would surely result in injury. The rock walls of the shaft are sound, but too steep to be climbed by even an uninjured person (highly skilled rock climbers excepted). The shaft is less than 20' from the trail and fully visible. The Discovery Tunnel dump (#205) is discussed in the **Environmental Degradation** section of this report.

Rifle Ranger District

Quad Name: Carbonate

Site #: 298/4401-1.101

Site Name: Carbonate

Physical Hazard Rating: 2

Description and pertinent facts: This open shaft is near the boundary of public and private land according to the PBS quad. It is on the White River Plateau, adjacent to the ghost town of Carbonate, now the site of a few seasonal cabins. The shaft has a 14'x 5' collar and descends vertically for 15' to water. Depth below the water is unknown. Bushes partly obscure the collar, but the 120-cubic-yard dump is obvious. Pistachio shells littering the dump indicate that the public visits this feature at least intermittently.

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USFS-ABANDONED MINED LAND INVENTORY PROJECT

HOLY CROSS RANGER DISTRICT

SUMMARY REPORT

by

Randall K. Streufert
Colorado Geological Survey

June 2, 1998

LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
ft	feet
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	greater than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

USFS-ABANDONED MINE LAND INVENTORY PROJECT - SUMMARY REPORT HOLY CROSS RANGER DISTRICT

This document summarizes the sites *of concern* to the USFS - Holy Cross Ranger District. It does not include all the mine sites visited during the inventory of the district. The Summary Report includes sites that were given a Physical Mine Hazard Ratings of: extreme danger (1), and/or dangerous (2). The Holy Cross Ranger District was found to contain one site with potential for Environmental Degradation (Rating 3).

It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings would only be investigated when evidence indicated that environmental degradation emanating from these sites affected USFS managed lands. This was not found to be a factor in this ranger district.

A **priority listing** of the most important physical mine hazard sites is given on the next page. The **site descriptions** in this document are not listed in order of priority, but appear alphabetically by quadrangle name and by site number.

Concerning physical hazards, we recommend that all mine openings with a Physical Mine Hazard Rating of 1 (extreme) or 2 (dangerous) be capped, filled, or closed in some way. *Mines with a hazard rating of 3 (potentially dangerous) are not included in this summary. Generally, these are open adits in remote areas or mines which are reported as open, but could not be located during the inventory. Even so, many if these mine features (open adits, highwalls) represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards. If funds are available, these mines should also be closed.*

Comprehensive, detailed information about all the mine sites inventoried for the ranger district will be available in the digital database.

Numerical Summary:

77 mine openings inventoried (includes collapsed or filled openings)

1 mine feature has an Environmental Degradation Rating of 3.

5 mine openings have Physical Mine Hazard Ratings of 1 or 2.

24 mine openings have Physical Mine Hazard Ratings of 3.

PRIORITY SITES

Holy Cross Ranger District

ENVIRONMENTAL DEGRADATION

<u>Site Name</u>	<u>Quad Name</u>	<u>Site ID#</u>	<u>E.D.R.</u>
Holy Cross City	Holy Cross	15-07-372/4363-1.200	3

PHYSICAL MINE HAZARDS

<u>Site Name</u>	<u>Quad Name</u>	<u>Site ID#</u>	<u>P.H.R.</u>
Holy Cross City	Holy Cross	15-07-372/4363-1.101	1
Yoder Park	Holy Cross	15-07-381/4363-1.100	2
Gold Park	Holy Cross	15-07-377/4362-1.102	2
Holy Cross City	Holy Cross	15-07-372/4363-1.100	2
Fancy Lake	Holy Cross	15-07-371/4362-1.100	2

USFS ABANDONED MINED LAND INVENTORY PROJECT / SUMMARY REPORT
HOLY CROSS RANGER DISTRICT

Sites Exhibiting Environmental Degradation

Quad Name: Mount of the Holy Cross

Site ID#: 15-07-372/4363-1.200

Site Name: Holy Cross City

Environmental Degradation Rating: 3

Description and pertinent facts: The Holy Cross City mine and mill complex contains a moderately sulfide-rich waste pile of an estimated 8,000 cubic yards (feature #200). Two small seeps at the toe of the pile and a 1 gallon per minute drainage from the adit/stope complex (feature #100) constitute the water at this site. Drainage from the adit/stope complex has a **neutral pH and shows conductivity less than 50 μ S**. Feature #200 is a moderately sulfide-rich waste pile which could produce acidity if sufficiently saturated. At the time of the site visit only two small seeps were observed emerging from the toe of the waste pile. Both seeps were similar to that of the adit/stope complex in that **pH was neutral with recorded conductivity less than 50 μ S**. Visible iron staining of currently dry drainage channels at this site suggests potential acid/metal generation during high water table periods. This site should be monitored in the future, although metal loading is expected to be minimal.

**USFS-ABANDONED MINED LAND INVENTORY PROJECT / SUMMARY REPORT
HOLY CROSS RANGER DISTRICT**

Sites Exhibiting Physical Hazards

Quad Name: Mount of the Holy Cross

Site ID#: 15-07-371/4362-1.100

Site Name: Fancy Lake

Physical Hazard Rating: 2

Description and pertinent facts: An open-standing adit located below Fancy Lake and 600 ft northeast of the Fancy Creek trail (Forest Trail #2006) is rated as dangerous. This mine tunnel is reportedly open for 240 feet and was sampled by U.S. Bureau of Mines personnel in 1986. The adit is caved at the portal, but is fully accessible behind the portal berm. The current opening is 4 ft x 4 ft. This site is visible from the trail and receives numerous visitors. A historic cabin on-site is intact. This feature should be safeguarded by backfill technique due to the extent and accessibility of the mine tunnel.

Quad Name: Mount of the Holy Cross

Site ID#: 15-07-372/4363-1.100

Site Name: Holy Cross City

Physical Hazard Rating: 2

Description and pertinent facts: Feature #100 is the lowermost mine tunnel at this site. It is currently open and accessible. This tunnel connects to an open stope above (feature #101) where ore was removed to surface level. The mine tunnel is intact and is an estimated 200 feet in length. Surface dimensions of this adit are 2 ft x 3 ft. This area is adjacent to Forest Road #759, and the site is visited by a number of people. The open stope located on this site (feature #101) is somewhat unstable rendering this tunnel dangerous from rockfall hazard. This adit could be safeguarded by installation of a locked mine door or other constructed closure.

Quad Name: Mount of the Holy Cross

Site ID#: 15-07-372/4363-1.101

Site Name: Holy Cross City

Physical Hazard Rating: 1

Description and pertinent facts: Feature #101 is an area where ore has been mined from a vein deposit 6 feet in width. This open-cut, or stope, is connected at depth for a length of 40 feet with the mine tunnel accessed by feature #100, as well as being open to the surface. At the time of the site visit, a snow bridge was observed concealing the potential fall into this feature. This situation is especially hazardous, as an unsuspecting visitor may be lured out onto the snow. A fall of 100

feet is most likely into the mine tunnel below. This site is adjacent to Forest Road #759 and sees moderate visitation. This feature should be safeguarded by welded grate or backfill techniques.

Quad Name: Mount of the Holy Cross

Site ID#: 15-07-377/4362-1.102

Site Name: Gold Park Campground

Physical Hazard Rating: 2

Description and pertinent facts: This mine site is located on a block of unpatented claims at the current time. The claimant has an access road to the mine directly behind Gold Park Campground. Feature #102 is an open-standing adit located downhill from the cabin on site. The easily accessible, open portal of this mine is approximately 4 ft by 4 ft and is dangerous due to unstable ground. The underground working is estimated to be over 150 feet long, judging by the amount of waste material piled outside the adit. This feature is just less than one mile hiking distance from Gold Park Campground, which is frequented by forest visitors. The current mine claimant should safeguard this feature by installation of a locked mine door.

Quad Name: Mount of the Holy Cross

Site ID#: 15-07-381/4363-1.100

Site Name: Yoder Park

Physical Hazard Rating: 2

Description and pertinent facts: A 40-foot-deep prospect shaft on the north side of Yoder Park is rated as dangerous. This shaft is not an expected feature in this area and may be dangerous to a child or dirtbike rider. This prospect shaft has surface dimensions of 9 ft by 4 ft and is located 600 ft north of Forest Road #705. Yoder Park is accessible by 4 wheel drive vehicle. This shaft could easily be safeguarded by backfilling with dump material located on site.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

WHITE RIVER NATIONAL FOREST

BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

April, 1998

by

John Neubert
Clarence Ellis

Colorado Geological Survey

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FT	Forest Trail
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Blanco, Eagle, and Rifle Ranger Districts. It does not include all the mine sites visited during the inventory of the districts. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. This mine inventory was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites by ranger district, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary, also arranged by ranger district.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Ranger District 2) Quadrangle Name and 3) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical within the individual ranger districts. These sites are all in Forest 15 (White River), and Ranger District 02 (Blanco), 04 (Eagle), or 08 (Rifle).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Geology and Mining Districts

Blanco Ranger District

Most of the Blanco Ranger District lies on the White River Plateau, a broad dome about 35 miles long and 20 miles wide. The dome consists of Precambrian schist, gneiss, and granite overlain by Cambrian- through Cretaceous-age sedimentary rocks. Cenozoic-age basalt flows and sedimentary deposits cap the sequence. Most of the bedded rocks are flat-lying or dip gently, except at the margin of the dome. Few mines are located in this region. The only mining district in the Blanco Ranger District is Uranium Peak, which overlaps the northwestern part of the National Forest northeast of Meeker. Mines in the district produced vanadium and uranium from the Salt Wash Member of the Morrison Formation. (See Wood in Brown, 1990.) On Forest-Service-administered land, a couple of moderate-sized open pits and some adits east of Uranium Peak are the workings of concern. Most of the workings are shallow pits or bulldozer trenches.

Eagle Ranger District

The Eagle Ranger District encompasses the northern part of the Sawatch Range and the eastern part of the White River Plateau. Most past mining has occurred southeast of Eagle, beginning near Fulford and extending eastward to the ranger district boundary. A few prospects and a shaft were inventoried on the White River Plateau, in the Carbonate mining district.

The Fulford mining district lies about 20 miles southeast of the town of Eagle and is centered on New York Mountain. Gold was the major commodity, but minor amounts of silver and base metals were also produced. Recorded production was small and occurred prior to 1919. Gold occurs in veins along faults and as replacements in dolomitic lenses near the upper contact of the Sawatch Quartzite. Emplaced north and west of the mineralized area, the Laramide-age Fulford quartz monzonite stock was probably the source of the mineralizing fluids. (See Brown, 1990.)

East and southeast of the Fulford district, several small workings are scattered throughout the Holy Cross Wilderness Area. These workings were primarily gold prospects exploring vein-type occurrences in Precambrian granite, gneiss, and migmatite. Quartz and pyrite compose the veins, and galena, chalcopyrite, and malachite may occur. The Ohio and Discovery Tunnels, along East Lake Creek, were the largest workings in this area. (See Brown, 1990.)

The Carbonate mining district is loosely defined and covers much of the southern part of the White River Plateau. Total production has been a few tons of gold, silver, and zinc ore. Lead is generally present as well. Most of the occurrences are veins and fissures hosted in Paleozoic-age limestone and/or Precambrian-age granite. (See Wood in Brown, 1990.)

Rifle Ranger District

Past mining activity in the Rifle Ranger District is sparse and mostly limited to the Rifle Creek and Carbonate mining districts. The Rifle Creek mining district is along East Rifle Creek, and a few workings from this district are on the margin of Forest-Service-administered land west of West Elk Creek. Within the Forest, less than 1,000 pounds of vanadium-uranium was produced from small workings in the Entrada Sandstone or Morrison Formation. (See Wood in Brown, 1990.)

In the Carbonate mining district (described above), a few mines are open and have some degree of physical hazard. Most are small, caved, and/or are located in seldom-visited areas, and are not serious environmental or physical threats.

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

NUMERICAL SUMMARY

Blanco Ranger District

- 8 field forms
- 43 mine openings inventoried (includes collapsed or filled openings)
- 11 mine dumps, tailings piles, highwalls, etc.

- 12 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 3
 - Number of features with EDR of 4 = 9
 - Number of features with EDR of 5 = 42

- 12 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 5
 - Number of features with PHR of 3 = 7
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 42

Eagle Ranger District

- 13 field forms
- 59 mine openings inventoried (includes collapsed or filled openings)
- 37 mine dumps, tailings piles, highwalls, etc.

- 10 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 1
 - Number of features with EDR of 4 = 9
 - Number of features with EDR of 5 = 86

- 21 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 2
 - Number of features with PHR of 3 = 19
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 75

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

NUMERICAL SUMMARY

Rifle Ranger District

- 5** field forms
- 24** mine openings inventoried (includes collapsed or filled openings)
- 6** mine dumps, tailings piles, highwalls, etc.

- 4** mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.
 - Number of features with EDR of 1 = 0
 - Number of features with EDR of 2 = 0
 - Number of features with EDR of 3 = 0
 - Number of features with EDR of 4 = 4
 - Number of features with EDR of 5 = 26

- 8** mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.
 - Number of features with PHR of 1 = 0
 - Number of features with PHR of 2 = 1
 - Number of features with PHR of 3 = 7
 - Number of features with PHR of 4 = n/a (see Field Guide, appendix A)
 - Number of features with PHR of 5 = 22

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST
BLANCO, EAGLE, AND RIFLE RANGER DISTRICTS

PRIORITY SITES

Environmental Degradation

Ranger District Site Name	Quad Name	Site # Forest=15	EDR
Blanco Ranger District		District=02	
1) Butterfly	Sawmill Mountain	272/4444-1.200, 103	3, 3
2) Burrell Claims	Sawmill Mountain	272/4444-2.101	3
Eagle Ranger District		District=04	
1) Discovery Tunnel Area	Grouse Mountain	366/4374-2.205	3

Physical Mine Hazards

Ranger District Site Name	Quad Name	Site # Forest=15	PHR
Blanco Ranger District		District=02	
1) Butterfly	Sawmill Mountain	272/4444-1.201, 100, 102,	2, 2, 2
2) Burrell Claims	Sawmill Mountain	272/4444-2.100	2
3) Upper Coal Creek	Sawmill Mountain	273/4443-1.104	2
Eagle Ranger District		District=04	
1) Discovery Tunnel Area	Grouse Mountain	366/4374-2.103	2
2) New York Mountain	Fulford, Grouse Mtn	360/4375-1.106	2
Rifle Ranger District		District=08	
1) Carbonate	Carbonate	298/4401-1.101	2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Blanco Ranger District

Quad Name: Sawmill Mountain

Site #: 272/4444-1

Site Name: Butterfly

Description and pertinent facts: This inactive uranium mine is reached by FR-235 (according to PBS quad), and is along a tributary of Coal Creek, about 20 miles from Meeker. It is easily accessible to the public. This site was active at least into the 1970's and is included in Mineral Survey #20917. The highwall and associated adits are discussed in the **Physical Hazards** section of this report.

Feature #: 103

Environmental Degradation Rating: 3

This feature is an open pit measuring about 300'x 250', with a highwall (feature #201) up to 60' high. The pit has two benches with a wooden office(?) building, a corrugated-metal core shack, and various pieces of mine equipment and junk. Scintillometer readings on the upper bench averaged about 100 cps, with a high of about 700 cps near the core shack. The lower bench averaged about 400 cps with a high of about 1,800 cps near a grizzly. At the time of the inventory, snowmelt was accumulating and probably seeping into the pit bench.

Feature #: 200

Environmental Degradation Rating: 3

This 5,000-cubic-yard dump is associated with pit #103 and adits #100-102. It is hard to distinguish the boundary between the dump and the bench, but the dump is about 300'x 40' with an outslope of about 110'. Gullies cut the outslope where water has drained from the pit benches. Average scintillometer readings are 500 cps. Because of its size, and lack of vegetation compared to the surrounding area, dump #200 is quite visible to the public. Erosion of the outslope indicates that some of the slightly radioactive dump material is being transported from the site.

Quad Name: Sawmill Mountain

Site #: 272/4444-2.101

Site Name: Burrell Claims

Environmental Degradation Rating: 3

Description and pertinent facts: This uranium mine is adjacent to the southeast side of inventory area #272/4444-1, discussed above. It shares the mine access road with the Butterfly Mine and is included in Mineral Survey #20917. Feature #101 is a large pit bench, about 300'x 200'. Scintillometer readings on the bench vary widely, from 40 cps in several places to 1,000

cps just to the east of rails that once served adit #100. Adit #100 is discussed in the **Physical Hazards** section of this report.

Eagle Ranger District

Quad Name: Grouse Mountain

Site #: 366/4374-2.205

Site Name: Discovery Tunnel Area

Environmental Degradation Rating: 3

Description and pertinent facts: This 15,000-cubic-yard dump is deep within the Holy Cross Wilderness, near the East Lake Creek Trail (FT-1880) and about 5-6 miles from the trailhead. Most of the dump is granitic gneiss, but minor pyrite and traces of galena are present. Outslopes of the dump show evidence of sheetwash, and a sparse regrowth of vegetation, primarily pines, is gradually occurring. Minor amounts of dump material are probably transported from this large dump during rain storms. Shaft #103 of this inventory area is discussed in the **Physical Hazards** section of this report.

SITES EXHIBITING PHYSICAL HAZARDS

Blanco Ranger District

Quad Name: Sawmill Mountain

Site #: 272/4337-1

Site Name: Butterfly

Description and pertinent facts: This inactive uranium mine is reached by FR-235 (according to PBS quad), and is along a tributary of Coal Creek about 20 miles from Meeker. It is easily accessible to the public. This site was active at least into the 1970's, and is included in Mineral Survey #20917. The pit and associated dump are discussed in the **Environmental Degradation** section of this report.

Feature #: 100

Physical Hazard Rating: 2

This partly caved adit has a timbered portal. An opening of 3'x 5' is behind the caved timbers, and roof bolts are in place holding the adit open for at least 30'. This adit is in pit #103, at the base of highwall #201. Neither the caved opening nor the highwall above the opening are stable. Radon gas may occur underground.

Feature #: 102

Physical Hazard Rating: 2

This feature includes two adjacent open adits sharing a common portal. A powderhouse excavated into the highwall adjacent to and west of the adits is nearly full from rockfall. An opening of 5'x 8' extends at least 30' underground. The eastern adit has standing water about 10' inside, and the western adit has a bird nest. A scintillometer reading of 900 cps was obtained at the portal, and the presence of radon gas is likely.

Feature #: 201

Physical Hazard Rating: 2

This feature is a highwall that is 400' long and is nearly vertical in places. It varies in height from about 30' to 60'. An unstable mixture of interbedded blocky sandstone and weathered shale compose the highwall. This geologic condition results in large blocks of sandstone being undercut, then failing as the underlying shale erodes. Sandstone blocks up to 6' on a side litter the base of the highwall. During the inventory, which was on a windy day, shale was actively being eroded. In addition, the access road approaches within about 20' of the top of the southeast part of the highwall. Instability and easy access by the public create a dangerous situation, especially at adits #100 and #102 at the base of the highwall.

Quad Name: Sawmill Mountain

Site #: 272/4444-2.100

Site Name: Burrell Claims

Physical Hazard Rating: 2

Description and pertinent facts: This uranium mine is adjacent to the southeast side of inventory area #272/4444-1, discussed above. It shares an easily accessible mine road with the Butterfly Mine and is included in Mineral Survey #20917. Adit #100 is 5'x 8' at the portal and is at least 30' deep. The adit is partly caved at the portal, and the caving is worse about 20' underground. The incompetent nature of the soft, sandstone bedrock and the likelihood of radon gas underground create a dangerous situation. The pit bench associated with this mine is discussed in the Environmental Degradation section of this report.

Quad Name: Sawmill Mountain

Site #: 273/4443-1.104

Site Name: Upper Coal Creek

Physical Hazard Rating: 2

Description and pertinent facts: This small, open uranium mine is about 1.5 miles southeast of the Butterfly and Burrell Mines, along FR-235 (according to the PBS quad). This adit has a portal of 6'x 5' and is about 20' long. Several large rock slabs have fallen from the roof. The highest scintillometer measurement near adit #104 was 400 cps. This adit is adjacent to open cut #105, which has been used as a campsite. Instability of the adit roof, combined with the easy accessibility to the public, create a dangerous situation.

Eagle Ranger District

Quad Name: Fulford

Site #: 360/4375-1.106

Site Name: New York Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This is an open shaft just east of FT-2221, above the Polar Star Mine. The shaft is vertical, over 15' deep, and is partly timbered with rotten timbers. It might be possible for a person to fall in and not be seriously injured, and it might be possible for the person to climb out unassisted. Such a sequence of events is not likely, however. The trail appears to be used frequently in the summer by people hiking up New York Mountain. There are many shallow, collapsed workings in the area, and the unwary could become nonchalant about approaching openings. A person standing at the edge of this shaft could be caught in sudden collapse of the shaft walls, as the old timbers no longer support the shaft walls.

^^ New Quad ^^^

Quad Name: Grouse Mountain

Site #: 366/4374-2.103

Site Name: Discovery Tunnel area

Physical Hazard Rating: 2

Description and pertinent facts: This is an open shaft immediately below an unmarked trail. This feature is reached from FT-1880 by crossing a very nice footbridge and following the unmarked trail, which is quite obvious. The shaft is very steeply inclined and more than 20' deep. A fall into the shaft would surely result in injury. The rock walls of the shaft are sound, but too steep to be climbed by even an uninjured person (highly skilled rock climbers excepted). The shaft is less than 20' from the trail and fully visible. The Discovery Tunnel dump (#205) is discussed in the **Environmental Degradation** section of this report.

Rifle Ranger District

Quad Name: Carbonate

Site #: 298/4401-1.101

Site Name: Carbonate

Physical Hazard Rating: 2

Description and pertinent facts: This open shaft is near the boundary of public and private land according to the PBS quad. It is on the White River Plateau, adjacent to the ghost town of Carbonate, now the site of a few seasonal cabins. The shaft has a 14'x 5' collar and descends vertically for 15' to water. Depth below the water is unknown. Bushes partly obscure the collar, but the 120-cubic-yard dump is obvious. Pistachio shells littering the dump indicate that the public visits this feature at least intermittently.

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**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT**

for the

WHITE RIVER NATIONAL FOREST

SOPRIS RANGER DISTRICT

April, 1998

by

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LIST OF ABBREVIATIONS AND SYMBOLS WHICH MAY BE USED IN THIS REPORT

ATV	all-terrain vehicle
x	by (in dimension measurements) or times (when factoring ion concentrations or radioactivity)
cps	counts per second
CR	County Road
°	degree
÷	divided by
EDR	Environmental Degradation Rating
E.P.A.	Environmental Protection Agency
=	equals
'	feet
FT	Forest Trail
FR	Forest Road
4WD	four-wheel drive
gpm	gallons per minute
<	less than
≤	less than or equal to
µg/L	micrograms per liter
µ	microns
µS	microSiemens
mg/L	milligrams per liter
>	more than
Mt.	Mount
n/a	not applicable
no.	number
#	number
p.	page(s)
ppm	parts per million
%	percent
PHR	Physical Hazard Rating
PBS	Primary Base Series
quad	quadrangle (7.5-minute)
St.	Saint
SH	State Highway
topo	topographic map
trec	total recoverable
U.S.	United States
USFS	United States Department of Agriculture - Forest Service
BLM	United States Department of Interior - Bureau of Land Management
v.	volume

**USFS-ABANDONED MINE LAND INVENTORY PROJECT
FINAL SUMMARY REPORT
WHITE RIVER NATIONAL FOREST -- SOPRIS RANGER DISTRICT**

INTRODUCTION

This document summarizes the sites *of concern* to the USFS - Sopris Ranger District. It does not include all the mine sites visited during the inventory of the district. This Summary Report includes only sites that were given Environmental Degradation Ratings (EDRs) of extreme (1), significant (2), or potentially significant (3); and sites given Mine (Physical) Hazard Ratings (PHRs) of extreme danger (1) or dangerous (2). Sites with EDRs of slight (4) or none (5) are only discussed if a water sample was collected. It should be noted that this inventory work was limited to those mine sites on or immediately adjacent to USFS-managed lands. Private (patented) land inholdings, which often contain the largest mines, were only investigated when evidence indicated that environmental degradation emanating from these sites affected USFS-managed lands. The inventory includes features with any of the following characteristics: 1) environmental degradation 2) physical hazard 3) openings at least 10' deep 4) dumps at least 50 cubic yards 5) features shown on a published topographic map. Features not meeting at least one of these criteria are considered insignificant and were not inventoried. Details on the rating systems and limits of the inventory are shown in the Field Guide (Appendix A).

The **Priority Sites** tables are rankings showing the most important environmental degradation sites and the most important physical mine hazard sites, with the most serious sites listed higher on the tables. These tables follow the introductory information and numerical summary.

Site descriptions of individual mine features comprise the bulk of this report, and follow the **Priority Sites** tables. These are not discussed in order of priority, but are organized according to: 1) Quadrangle Name and 2) Site Number. Site numbers are listed without the first 4 digits, which represent the Forest and Ranger District, because these numbers are identical throughout this report. These sites are all in Forest 15 (White River), and Ranger District 03 (Sopris).

Sites exhibiting environmental degradation will eventually undergo further investigation through the Regional Office. Concerning physical hazards, we recommend that all mine openings with a Physical Hazard Rating of 1 or 2 be capped, filled, or closed in some way. *Mines with PHRs of 3 (potentially dangerous) are not included in this summary. Even so, many of these are adits that are open and represent a threat to those who choose to enter them due to "bad air" (e.g. carbon monoxide, carbon dioxide, methane), winzes (internal shafts) to other mine levels, mine collapse, and other hazards.* If funds are available, these mines should also be closed. Mines with PHRs of 5 (no significant hazard) are not discussed.

A comprehensive, detailed account of all the mine sites inventoried for the ranger district will be available in the digital database.

Water Sampling

Filtered (0.45μ) and unfiltered water samples for laboratory analyses were collected from selected mine discharges and/or natural waters in order to better determine environmental effects of mine drainage. Water sampling protocols are in Appendix B. At the lab, samples were analyzed for total recoverable (raw) and dissolved (filtered) constituents. Analytical results were compared to stream-segment standards established by the State Water Quality Control Commission. Where stream numeric standards are not available, the most stringent of state-wide standards are used, usually either domestic-water-supply or aquatic-life standards. Most domestic-water-supply standards are based on total recoverable metals, and most aquatic-life standards are based on hardness of the water and dissolved ion concentrations.

Geology and Mining Districts

The eastern part of the Sopris Ranger District is in the Sawatch Mountain range, and the western part is in the Elk Mountains. Few workings are located east of the Roaring Fork River, and environmental degradation is virtually nil. Numerous metal mines on public land are in the western part of the Ranger District, mostly in the Crystal River mining district. The Spring Butte (Avalanche) mining district hosts a few small mines.

The Crystal mining district encompasses the drainage basin of the Crystal River from Marble to its headwaters. Various other names have been used in older literature to describe subdistricts within this large area. Zinc, lead, and silver, with minor amounts of copper and gold, were produced in small quantities compared to a district such as Aspen. (See Kreidler in Brown, 1990.)

Precambrian-age gneiss and Cambrian- through Cretaceous-age sedimentary rocks have been intruded, folded, faulted, and mineralized. Tertiary-age intermediate to felsic composition intrusions crop out at Treasure Mountain and in Paradise Basin, and dikes associated with these intrusions are common. These intrusive rocks are probably the source of mineralization throughout the district. Sedimentary rocks surrounding the intrusions have been metamorphosed, especially around Treasure Mountain. The marble deposits south of Marble are a result of this metasomatism.

Geology of this region is complicated by several major structural features that are subparallel and trend from north to northwest. From west to east, the largest features are the Treasure Mountain dome, Schofield Syncline, and the Elk Range Thrust Fault. Smaller faults associated with these large features have been mineralized and have acted as conduits allowing mineralizing fluids to replace adjacent reactive sedimentary rock. (See Kreidler in Brown, 1990.)

Most of the mines on public land were small and caved, presenting few environmental or physical hazards. Water in Paradise Basin appears degraded by natural and mine drainage, and upper Yule Creek and Lost Trail Creek have mines with water discharges. A few open workings presenting safety hazards are scattered throughout the mining district.

The Spring Butte (Avalanche) mining district is south of Mt. Sopris, along Avalanche and Bulldog Creeks and the Crystal River. Small amounts of lead, copper, and silver were produced from Hermosa Limestone near the margin of a granodiorite intrusion. (See Kreidler in Brown, 1990.) A few small workings are on public land.

Coal mines hosted in the Mesa Verde Group extend from just west of Marble to the northwest boundary of the Ranger District. The largest of the coal mines on public land are in Coal Basin and are being reclaimed.

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST -- SOPRIS RANGER DISTRICT

NUMERICAL SUMMARY

36 field forms

164 mine openings inventoried (includes collapsed or filled openings)

97 mine dumps, tailings piles, highwalls, etc.

38 mine features have Environmental Degradation Ratings of 1, 2, 3 or 4.

Number of features with EDR of 1 = 0

Number of features with EDR of 2 = 1

Number of features with EDR of 3 = 8

Number of features with EDR of 4 = 29

Number of features with EDR of 5 = 223

66 mine features have Mine (Physical) Hazard Ratings of 1, 2, or 3.

Number of features with PHR of 1 = 0

Number of features with PHR of 2 = 6

Number of features with PHR of 3 = 60

Number of features with PHR of 4 = n/a (see Field Guide, appendix A)

Number of features with PHR of 5 = 195

USFS ABANDONED MINE LAND INVENTORY PROJECT
WHITE RIVER NATIONAL FOREST -- SOPRIS RANGER DISTRICT

PRIORITY SITES

Environmental Degradation

Site Name	Quad Name	Site # Forest=15;District=03	EDR
1) Upper Yule Creek	Snowmass Mtn	317/4318-1.102; 201	2; 3
2) Coal Basin	Placita	297/4341-1.200, 201, 205, 209, 213	3, 3, 3, 3, 3
3) Lost Trail Creek Workings	Marble	314/4327-1.103	3
4) Paradise Basin	Oh-Be-Joyful	321/4318-1.203; 109	3; 4

Physical Mine Hazards

Site Name	Quad Name	Site # Forest=15;District=03	PHR
1) Baroni Mine Area	Snowmass Mtn	322/4321-1.105, 101	2, 2
2) Schofield	Snowmass Mtn	321/4323-1.103	2
3) Hat Mountain	Marble	313/4326-1.100	2
4) West Lead King Basin	Snowmass Mtn	318/4326-1.102, 104	2, 2

SITES EXHIBITING ENVIRONMENTAL DEGRADATION

Quad Name: Marble

Site #: 314/4327-1.103

Site Name: Lost Trail Creek Workings

Environmental Degradation Rating: 3

Description and pertinent facts: This is an open adit, most likely on a patented claim, although the PBS map shows it just off the claim. There is a summer cabin on the dump. The adit was discharging about 90 gpm of water with **pH of 7.11 and conductivity of 992 μ S** when tested in September, 1997. When initially tested in June, the **pH was 6.81 and conductivity was 1,038 μ S**. Minor red precipitate lines the effluent channel. Lost Trail Creek, 500' distant, shows no evidence of toxicity where the discharge enters. Given the rate of discharge, it is possible this affects the water supply in some of the summer cabins in the area, and possibly the water supply for Marble. Results of two water samples (#314/4327-1.305; #314/4327-1.306) collected near the portal in September are shown on the tables below. Effluent slightly exceeds state standards in sulfate concentrations, but metal concentrations are well below the standards. It appears that most of the high conductivity is a function of the high hardness and sulfate concentration.

Sample number 314/4327-1.305; hardness of effluent = 1,417 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (μ g/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	460	1,000	below standard
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	130	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	0.89	9	below standard
Calcium (as CaCO ₃)	560 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	11	114	below standard
Fluoride	0.72 mg/L	2 mg/L*	below standard
Iron	91	300	below standard
Lead	2	5	below standard
Magnesium	4.2 mg/L	no standard	n/a
Manganese	48	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	717	below standard
Potassium	1.2 mg/L	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Silver	<0.2	7 (on 3/2/98)	below standard
Sodium	5.1 mg/L	no standard	n/a
Sulfate	580 mg/L	250 mg/L	2.3 x standard
Zinc	140	1,002	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Sample number 314/4327-1.306; hardness of effluent = 1,442 mg/L.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	460	1,000	below standard
Selenium (trec)	<1	10	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	130	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	0.84	9	below standard
Calcium (as CaCO ₃)	570 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	5	116	below standard
Fluoride	0.74 mg/L	2 mg/L*	below standard
Iron	110	300	below standard
Lead	<1	5	below standard
Magnesium	4.1 mg/L	no standard	n/a
Manganese	44	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	726	below standard
Potassium	1.1 mg/L	no standard	n/a
Silver	<0.2	7 (on 3/2/98)	below standard
Sodium	5.0 mg/L	no standard	n/a
Sulfate	490 mg/L	250 mg/L	2 x standard
Zinc	120	1,017	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Iron (trec)	28	1,000	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	200	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	1.1	2.3	below standard
Calcium (as CaCO ₃)	90 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	8	25	below standard
Fluoride	0.14 mg/L	2 mg/L*	below standard
Iron	<10	300	below standard
Lead	<1	13.5	below standard
Magnesium	4.0 mg/L	no standard	n/a
Manganese	48	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	186	below standard
Potassium	<1 mg/L	no standard	n/a
Selenium	2	5*	below standard
Silver	<0.2	0.34 (on 3/2/98)	below standard
Sodium	0.72 mg/L	no standard	n/a
Sulfate	61 mg/L	250 mg/L	below standard
Zinc	190	223	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Sample number 321/4318-1.305; hardness of effluent = 241 mg/L

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	13	1,000	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	190	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	1.1	2.3	below standard
Calcium (as CaCO ₃)	90 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	7	25	below standard
Fluoride	0.15 mg/L	2 mg/L*	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Iron	<10	300	below standard
Lead	<1	13.5	below standard
Magnesium	4.0 mg/L	no standard	n/a
Manganese	48	50	below standard
Molybdenum	<10	no standard	n/a
Nickel	<20	186	below standard
Potassium	<1 mg/L	no standard	n/a
Selenium	1	5*	below standard
Silver	<0.2	0.34 (on 3/2/98)	below standard
Sodium	0.72 mg/L	no standard	n/a
Sulfate	61 mg/L	250 mg/L	below standard
Zinc	200	223	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

A test and sample just below the pond outlet, but above the confluence of the small acidic stream, showed **pH=7.29 and conductivity=142 µS** on a measured flow of 23 gpm. Results of sample #321/4318-1.306 are shown on the table below. With the notable exception of iron, concentrations of most constituents decreased significantly compared to the adit effluent.

Sample number 321/4318-1.306; hardness of pond discharge = 132 mg/L

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	<50	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	81	1,000	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	26	2,000*	below standard
Aluminum	<50	87*	below standard
Cadmium	<0.25	1.4	below standard
Calcium (as CaCO ₃)	50 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	<4	15	below standard
Fluoride	0.11 mg/L	2 mg/L*	below standard
Iron	36	300	below standard
Lead	<1	5.8	below standard
Magnesium	1.8 mg/L	no standard	n/a
Manganese	35	50	below standard
Molybdenum	<10	no standard	n/a

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Nickel	<20	118	below standard
Potassium	<1 mg/L	no standard	n/a
Selenium	<1	5*	below standard
Silver	<0.2	0.12 (on 3/2/98)	below detection limit
Sodium	0.77 mg/L	no standard	n/a
Sulfate	40 mg/L	250 mg/L	below standard
Zinc	24	134	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

A test and sample of the large, precipitate-lined creek, above its confluence with the combined flow from the pond and small acid stream, showed **pH=4.93 and conductivity=394 µS** on a measured flow of 170 gpm. Results of sample #321/4318-1.307 are shown on the table below. This sample, collected from a creek with no known mines discharging into it, significantly exceeded state standards in aluminum, copper, and manganese, and slightly exceeded standards for fluoride.

Sample number 321/4318-1.307; hardness of creek water = 399 mg/L

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Aluminum (trec)	1,700	no standard	n/a
Antimony (trec)	<1	6.0*	below standard
Arsenic (trec)	<1	50 (acute)	below standard
Iron (trec)	<10	1,000	below standard
Thallium (trec)	<1	0.5*	below detection limit
Zinc (trec)	230	2,000*	below standard
Aluminum	1,200	87*	13.8 x standard
Cadmium	1.8	3.4	below standard
Calcium (as CaCO ₃)	140 mg/L	no standard	n/a
Chloride	<5 mg/L	250 mg/L	below standard
Chromium	<10	11*	below standard
Copper	220	39	5.6 x standard
Fluoride	2.7 mg/L	2 mg/L*	1.4 x standard
Iron	<10	300	below standard
Lead	1	28	below standard
Magnesium	12 mg/L	no standard	n/a
Manganese	390	50	7.8 x standard
Molybdenum	<10	no standard	n/a
Nickel	<20	274	below standard
Potassium	<1 mg/L	no standard	n/a
Selenium	<1	5*	below standard

Lab Analyses (dissolved unless noted)	Concentration ÷ (µg/L unless noted)	Numeric Standards**	= Factor Above Stream Standards
Silver	<0.2	0.8 (on 3/2/98)	below standard
Sodium	1.5 mg/L	no standard	n/a
Sulfate	190 mg/L	250 mg/L	below standard
Zinc	230	343	below standard

* No stream-specific standard available. Based on state-wide standard.

** Numeric standards are µg/L, dissolved concentrations, and chronic values unless noted.

Water test and sample results suggest that natural runoff from the altered rocks of Paradise Basin is responsible for the majority of any degradation of surface water in this area. The small contribution from adit #109 is negligible, in terms of both metal concentrations and flow volume.

Feature #: 203

Environmental Degradation Rating: 3

This feature is the dump of a caved adit and is only a few feet from Paradise Creek. Dump #203 is very pyritic, and galena, sphalerite, and molybdenite are common. Dump material washes into Paradise Creek during heavy storm runoff.

^^ New Quad ^^^

Quad Name: Placita

Site #: 297/4341-1.200, 201, 205, 209, 213

Site Name: Coal Basin

Environmental Degradation Ratings: 3

Description and pertinent facts: Coal Basin is a heavily mined area which affects several tributaries of the Crystal River, west of Redstone. Large tracts of private land, primarily coal patents, have been, or are in the process of being reconveyed to public domain. The entire basin is currently being reclaimed under the supervision of the Colorado Division of Minerals and Geology (DMG). According to Steve Renner of DMG, all of the underground openings have been sealed to prevent public access. Reclamation of surface disturbances is ongoing. Features #200 and #201 are coal refuse piles near the preparation plant. Features #205, #209, and #213 are large coal dumps that still have not been reclaimed. Measures to control sedimentation from these piles and dumps have been implemented. Water monitoring is in progress.

This site was not visited because of the large volumes of data already collected by other agencies, including water samples. Also, the area is currently being reclaimed under the scrutiny of another state agency, and maps and other data are readily available.

^^ New Quad ^^^

Quad Name: Snowmass Mountain

Site #: 317/4318-1

Site Name: Upper Yule Creek

Description and pertinent facts: This mine is reached by an unmarked trail that begins at Yule Pass. Although unmarked, it was once a road and is a better trail than FT-2083, which goes down the opposite side of Yule Creek. The unmarked trail ends at the mine.

Feature #: 102

Environmental Degradation Rating: 2

This short adit, which is below the main working, drains acid water at a rate of about 0.5 gpm. The **pH of the discharge is 2.67, and the conductivity is 1,031 μ S**. The effluent leaves a red precipitate.

Feature #: 201

Environmental Degradation Rating: 3

This dump includes material from adit #102 and from the much larger adit #101. Effluent from adit #102 flows across the top of dump #201, then sinks into the dump several feet down the side. Dump #201 is about 100' from the receiving stream and contains pyrite. Much of the dump material is limestone, and calc-silicate skarn minerals are common; thus the slight volume of effluent may be buffered, rather than further degraded, by contact with the dump.

SITES EXHIBITING PHYSICAL HAZARDS

Quad Name: Marble

Site #: 313/4326-1.100

Site Name: Hat Mountain

Physical Hazard Rating: 2

Description and pertinent facts: This open adit is 20' from FR-315 and one mile from Marble. The portal is clearly visible from the road. Although FR-315 is open only during the summer months, it is a well-traveled 4WD road between the towns of Marble and Crystal. The portal is 4'x 6' in fractured rocks that appear unstable. Length of the adit is at least 25'. This adit has a small dump; however, some of the dump material was used for road construction, and this working could be more extensive than dump size indicates.

^^ New Quad ^^^

Quad Name: Snowmass Mountain

Site #: 318/4326-1

Site Name: West Lead King Basin

Description and pertinent facts: This inventory area is west of the North Fork of the Crystal River, about 1 mile from the small seasonal town of Crystal. Access is by FR-314 from the south or FR-315 from the west. Both are rough 4WD roads.

Feature #: 102**Physical Hazard Rating: 2**

This partly caved adit has an unstable portal of 4'x 4' and is at least 20' long. Standing water is inside the adit. Adit #102 is on public land adjacent to an old road that leads to the private Winchester Mine. A cable with no lock is near the junction of this road and FR-315, about 500' north of adit #102. This mine is easily accessible to the public.

Feature #: 104**Physical Hazard Rating: 2**

The Winchester Mine has a portal of 8'x 6' and is at least 50' long. About 8 gpm water flowing from adit #104 may discourage entry, but the large opening is enticing. The portal and interior appear reasonably stable from the surface, but stopes and/or winzes may be present beyond line of sight. According to the PBS quad, the adit is virtually on the border of public and private land, and it is accessed by the cabled road mentioned above. An intermittently occupied cabin is about 100' away.

Quad Name: Snowmass Mountain

Site #: 321/4323-1.103

Site Name: Schofield

Physical Hazard Rating: 2

Description and pertinent facts: This open shaft is on a hillside about 800' north of Schofield, a former mining camp that now hosts numerous seasonal homes. It is most easily accessed from the south, by the Schofield Pass Road. The shaft has a collar of 12'x 6' and is about 40' deep. A moderately used trail shown on the topo map is about 300' to the east. The 180-cubic-yard dump is easily visible from the road, trail, and homes, and may attract visitors. This shaft probably connects to caved adit #102 below.

Quad Name: Snowmass Mountain

Site #: 322/4321-1

Site Name: Baroni Mine Area

Description and pertinent facts: This inventory area is located in Schofield Park, north of Schofield Pass along South Fork of the Crystal River. Both of these features are easily visible from the well-traveled Schofield Pass Road.

Feature #: 101

Physical Hazard Rating: 2

This is a short open adit that extends 18' beyond the portal of 12'x 5'. Numerous, large slabs of fractured rock hang from the adit roof and could fall at any time. A PHR of 2 was given because of the proximity to the Schofield Pass Road and the dangerous conditions underground.

Feature #: 105

Physical Hazard Rating: 2

This intact adit is at least 30' long and has an 8' x 6' portal. Within 20' of the well-traveled Schofield Pass Road, adit #105 is quite visible and easily accessible to the public. The adit roof has some fractured rocks, but does not appear as unstable as the roof in adit #101, described above. The associated dump is less than 50 cubic yards.

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