

MONTROSE

RIDGWAY

NORWOOD

NATURITA

URAVAN

DELTA

GATEWAY

Welcome to Colorful Colorado! The roadside geology tour you are about to take will guide you through an enchanted land where barren shale "deserts" mee beautiful alpine meadows and mountains; where tumbling streams become torrents carving steep-walled canyons into ancient sediments; where major rivers left aban doned valleys, and other valleys never had rivers in them where the forces of nature raised towering mountains and tore them down, only to raise them again and carve deep canyons through them, showcasing a colorful panorama of the earth's history for you to see and enjoy.

This geologic tour guides you to the mountain ranges, canyon mazes, high country deserts, and river valleys in and around the Uncompangre Plateau in southwestern Colorado. Your tour begins in relatively barren Mancos Shale desert, but soon climbs to the crest of the Uncom pahgre Plateau, surrounded by grassy parks and towering volcanic mountains. The Uncompangre Plateau is a remnant of the Ancestral Rocky Mountains, once rising taller than, and to the west of the Rockies we now know This plateau and the overlying sediments were eroded down to sea level, then uplifted again about 66 million years ago. The red rock formations found along the flanks of the Plateau are derived from the material eroded from the highland, then deposited into ocean streams, and sandy deserts. The canyons on the wester side of the Uncompangre Plateau exhibit thick sections of rock sliced open by the forces of rivers, both presen and past. About 35 million years ago the volcanic Sar Juan Mountains formed to the south, erupting through the already uplifted Colorado Plateau, a vast area cover ing southwestern Colorado and extending into Utah,

Arizona, and New Mexico. Scenic and geologically exciting, this area is some of the most rugged country easily accessible to motorists. Before you plunge yourself into the geology, consider that facilities for food, water and gas in this area, as in much of the west, can be scarce. It is wise to keep you gas tank filled, to carry water, and to take advantage of opportunities to stop for food and other necessities in the towns along the route.

The road log begins in Montrose, but the tour and its mileages have been broken into segments so you can enter or leave it without recalculating mileages. Towns, especially those providing major entry or departure points to the tour, are shown on the diagram below and marked on the road log with a matching number for easy



Mileages have been provided in both directions, with the reverse mileage in italics. If you are going in the opposite direction, remember that features seen will be opposite to the way the road log is written. Abundant, markers such as county lines, highway mileage markers road intersections, towns, or bridges where streams inter sect the road are printed in bold type, so don't miss the scenery and geology by constantly watching your car For orientation, many features are described in terms of

a clock, so that, no matter which true direction you are facing, 12:00 is straight ahead of the car as you drive 6:00 is directly behind, 3:00 is to the right, and 9:00 is to the left. This is illustrated in the diagram



Rocks are deposited in layers, grouped into units called formations. Formation names are taken from type localities where the rock units were first desc Examples include the Mancos Shale, named after the rocks near the town of Mancos, and the Morrison Formation, named after the town near Denver. To simplify the map geology similar formations were consolidated. Only the largest faults, or faults directly affecting the geology you will see have been included on the map.

The stratigraphic column is a graphic representation of the formations in this area. Not all formations are now present in all localities, either because they were neve deposited or because erosion later removed them. On a stratigraphic column the youngest formations are at the top, and the oldest are at the bottom. Thicknesses and ages (in million years before present) are approximate. Also included with the map is a simplified geologic cross section showing how a slice through the tour area would look if we could separate the rocks for viewing.

interesting features are pointed out. For a full appreciation of the historical, cultural, and natural bounty of the area please refer to Uncompangre Canyons, another circle tour booklet available soon for this area The Uncompangre Plateau tour is readily accessible for those joining from Grand Junction, western Colorado's largest city, and U.S. Interstate 70. When embarking from any point on this tour, allow a full day to complete the 231 mile circle, so you can thoroughly appreciate the geologic and scenic wonders you will encounter.

This tour is primarily geologic, although a few other

MONTROSE TO RIDGWAY

0.0 (1) MONTROSE. Intersection of U.S. Highways 26.6 550 and 50 (Main Street) in Montrose, elevation 5794 ft. Start south on U.S. 550, Originally developed as a supply point for silver miners in the San Juan Mountains, the city is now the business and agricultural center of the Uncompangre Valley. Colorado's western slope orchards grow some of the finest fruit in the country, and fresh produce is available at many roadside stands during the summer and early fall.

1.6 Leaving Montrose. Visitor Information Center 25.0 on left. On the skyline ahead lie the volcanic San Juan Mountains. The highest peak is Mount Sneffels elevation 14.143 ft. The full panorama of the San

Juan Mountains unfolds further south.

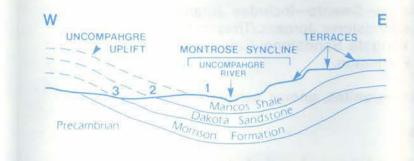
The highway follows the valley of the Uncor pahgre River southward along the Montrose Syncline. As you drive up the valley you won't actually see the syncline, but it affects the loca tion and direction of the valley and the river. A syncline is like an elongated layer cake of rock that sagged along the middle. In this case, the soft Mancos Shale lies in the center, and is easily eroded by the Uncompangre River, so the river flows along the axis of the syncline for the next 14 miles, leaving rounded hills and gentle valleys

The Mancos Shale was originally deposited as muds and clays in a large shallow ocean. That ancient sea was teeming with life, and many fossils can now be found in the shale. Because it has a high clay content and a strong tendency to swell when it gets wet, the Mancos Shale weathers deeply and falls apart readily. Hills formed in it are often bleak and bare, looking like lifeless "badlands"

- Museum, open in the summer, and a monument to the Ute Indian Chief Ouray and his wife Chipeta, lie on the west bank of the river. Several levels of river terraces are well devel oped in this area. They indicate previous levels of river flow and contain large deposits of debris washed from Ice-Age glaciers. These terraces consist of nearly horizontal plains above the present river level, with a final steep descent to the
- river. Try to spot more terraces. 6.2 Cross Montrose-Delta Canal. This water 20.4 comes from the Gunnison River through a trans basin diversion to the Uncompangre River where it then feeds into the canal. In the arid southwest
- canals are a vital source of water for farmers and ranchers, often better marked and containing more water than natural streams. 12.0 Ouray County line. Brownish-tan cliffs of the
- Dakota Sandstone will soon be seen.
- 14.0 East of the road, the tan Dakota Sandstone 12.6 appears rather abruptly from beneath the gray Mancos Shale on the north, and forms ridges on ooth sides of the Uncompangre River. The Dakota Sandstone was originally deposited as beach and near-shore ocean deposits, interngering with stream and swamp deposits. Coal beds are common in the Dakota Sandstone. An abandoned coal mine lies ahead on the right. Each time you see a contact between formations on this tour, or anywhere in the world, you are viewing a place where the surface of the earth once was exposed so new rocks could be deposited on it. Those rocks were themselves

then buried by even younger rock materials in a continuing process. Here, they were uplifted and sliced open for you to see. Rock layers are also called strata. The terms stratigraphy and stratigraphic column, refer to how given formations are arranged in relation to others in a geographic region.

As the road crosses formations that have been pushed up, causing younger layers to be eroded off, older rocks will be exposed. The diagram below shows how the rock layers (simplified) would look if you could view a slice through them. You began your drive in Mancos Shale along the Montrose Syncline (point 1), are now crossing into the Dakota Sandstone (point 2), and will move downward stratigraphically into older rocks like the Morrison Formation (point 3). This scenic tour around and across the very old Uncompangre Plateau will take you through these progressively older layers, then bring you back again to the younger rocks.



14.6 Now visible on both sides of the road is the Dakota Sandstone-Morrison Formation contact. The Morrison Formation is a series of red. green, and tan shales and sandstones originally deposited in streams and swamps during the age of dinosaurs, and now containing many dinosaur fossils. Colorfully distinctive in the entire region, the Morrison Formation is useful as one of several visual marker formations to orient yourself in the stratigraphic section.

16.3 River terrace gravels again indicate a previous 10.3 level of river flow. Cliffs of Dakota Sandstone rim the skyline on both sides of the valley.

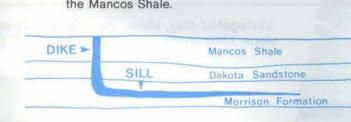
A greenish-gray sill intruded the Morrison Formation on the east side of the Uncompangre River to your left. A sill is a layer of rock formed when hot, liquid rock material (magma) was squeezed between layers of existing rocks, then cooled and



16.8 Bridge across the Uncompangre River.

18.0 A small hill, an erosional remnant of the Morrison 8.6 Formation lies on the west side of the highway at 3:00. At this point the sill in the Morrison Formation thickens and cuts through the bedding (layers) of Dakota Sandstone and Morrison For mation. Turning up abruptly the sill then trends northwest into the Mancos Shale as a dike. A dike is similar to a sill except that it cuts across the bedding instead of squeezing between the

layers. The heat of the dike at the contact baked



18.2 Ahead on your right is the Ridgway Dam 8.4 (Dallas Creek Project). This earth-fill dam is built in the relatively unstable Mancos Shale Whenever construction takes place in or near such a formation, potential problems of faulting and landsliding should be evaluated. The sill described above is well exposed in the

an outstanding view of Mount Sneffels on the skyline at 1:00. 19.0 For the next half mile note the grassy areas 7.6 along the right side of the road. These are two- to three-year-old landslides. Disturbed soil in the slide area retains more water than the more com-

cliffs on the west side of the valley. There is also

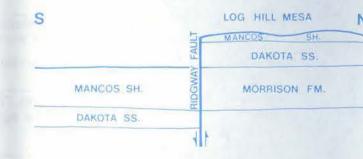
pacted surrounding rocks and soils, promoting the 19.7 Ridgway Reservoir provides domestic and municipal water for the Montrose-Delta area. Roadcuts in the Mancos Shale necessary for realignment of the highway along the eastern side along the right side of the road for the next half mile. The shale weathers easily, contains large amounts of clays that swell when wet, and is prone to movement by mass wasting, a process in which large masses of rock and earth material move by gravity downward from one place to another. The movement can be either slow or very

20.8 This road cut is in Mancos Shale. Rather 5.8 dramatic landslides are present in the next road cut to the right about a mile ahead. Then, Dakota Sandstone will be exposed.

22.5 Sign and turnout for scenic overlook. Look-4.1 ing to the south you will see a panoramic view of the majestic San Juan Mountains on the skyline. A series of Tertiary volcanic rocks erupted from the Silverton and Lake City volcanic calderas south of here about 30 to 35 million years ago. and now form most of those skyline mountains The highest, horn-shaped peak in the center is Mount Sneffels (14,143 ft); it is younger than the other mountains, only 20 to 25 million years old. The rocks forming Mount Sneffels intruded the older volcanic rocks, then cooled and solidified before reaching the surface. Erosion removed the overlying layers of volcanic material, leaving Mount Sneffels exposed. These mountains are examples of the two types of igneous rocks: extrusive or volcanic rocks that reached the surface and are usually fine-grained, and intrusive rocks that cooled below the surface of the earth and are usually coarser-grained.

Yellow-gray cliffs of Miller Mesa in the middle distance to the southwest (2:00) are in Mancos Shale. A group of shales and mudstones mixed with limestone form the resistant ledge in the middle. Younger volcanic rocks, conglomerates and mudflows can be seen above the Mancos Shale in the triangular cliff face.

Log Hill Mesa, immediately west of the Uncompahgre River, consists of Dakota and Morrison Formations with local patches of Mancos Shale preserved by a gravel cap. The south end of Log Hill Mesa marks the trace of the east-west trendng Ridgway fault. This fault is generally considered to be the southern edge of the Incompangre Plateau uplift. The south side of the ault here has dropped about 1500 ft, leaving the Morrison Formation and the Mancos Shale in con tact with each other. Recent studies have shown that this fault is still active. Several oil tests. drilled on the south side of the fault, encountered natural gas and flowing hot water.



The low, rounded ridge to the southwest (12:00), in the foreground, is a terminal moraine of the Wisconsinian (a subdivision of the Quaternary period, in this area about 10 to 73 thousand years ago) Uncompangre glacier. A terminal moraine is a large mound of boulders, gravel, sand, and clay deposited at the end of a melting glacier. This moraine was breached by the Incompandre River on the east and by Dallas Creek on the west. The original plan for the Dallas Creek dam project called for filling these two natural cuts, effectively recreating the glacial lake that probably existed about 10,000 years ago behind the end moraine (and inundating the town of Ridgway).

- 23.9 Good exposures of Morrison Formation are displayed in the road cut on the left (east). Dakota Sandstone forms the upper part of the ridge across the valley.
- 24.3 Cross Dry Creek Bridge. Just beyond the 2.3 bridge the Ridgway Fault crosses the valley. Junction with road to Owl Creek Pass and
- 1.8 Silver Jack Reservoir. Cimarron Ridge, forms the skyline to the east, showing jagged pinnacles of San Juan volcanics resting on older coal-bearing
- 25.6 Ridgway city limit. The road cut just inside 1.0 the Ridgway city limit is in the glacial terminal
- 26.6 Junction with Colorado 62 west into 0.0 Ridgway and over Dallas Divide. The town nestles in the valley just across the Uncompangre River.

RIDGWAY TO PLACERVILLE Keep looking in all directions. The scenery is some of the

0.0 (2) RIDGWAY. Turn right into town. This settlement was made into Fort Smith for the filming of the movie "True Grit". The highway winds its way up the the northeast flank of the Uncompahgre Plateau. Dakota Sandstone forms the rim of Log Hill Mesa at 3:00. You now cross the bridge over the Uncompangre River.

1.9 Log Hill Village turnoff. From the road you 21.8 see Mancos Shale to the left and Morrison For mation to the right, at the same apparent level. You are driving near the trace of the Ridgway Fault, which cuts through the valley, and brings these two formations together.

3.9 Mancos Shale lies ahead in the roadcuts and 19.8 on the rounded hills, and forms the gentle valleys.

9.7 A fine-grained igneous rock lies here in contact with the baked sediments it intruded. This and similar intrusives can be seen in several places along the next few miles. In the roadcut ahead on the right is black, baked Mancos Shale that looks like coal. 10.5 At the top of the hill, the sweeping panorama

and its grassy meadows stretching to the tower

ing, snow-capped San Juan Mountains is one o

the most photographed views in the state, ofte found in books and scenic calendars highlighting our nation's natural beauty. Be sure to stop at the ext turnout just beyond the San Miguel County 10.9 Dallas Divide. Good turnout for viewing the 12.8 area. At an elevation of 8970 ft, this is the crest of the southern end of the Uncompanare Plateau The peaks of the Sneffels Range of the San Juan

Mountains viewed to the south from Dallas Divide.

Mount Sneffels (the tallest), Mears Peak, Hayden

from east to west are: Whitehouse Mountain,

13.2 of the San Juan Mountains unfolds. Dallas Park

Peak, and North Pole Peak. Whitehouse Mountain Mount Sneffels

The Sneffels Range from Dallas Divide. These mountains were formed by a thick series of

volcanic rocks erupting from several large lifted area of the Colorado Plateau. If the volcanics were not there, the view would look much like the mesa and canyon country you are about to enter, because the underlying rocks are the same. As it is, you will see the best of both environments--with world class scenery. From here the highway will descend to the valley of the San Miguel River, via the valley of Leopard Creek 12.3 Last Dollar Road. Just beyond the turnoff is a 11.4 landslide on the right side of the road. Note the step-like terraces where the ground has failed. Watch for other recent slope failures in the next 15.7 A small fault in the roadcut at the right slightly

7.6 Formation can be seen in the road cut at the right. A large mudflow lies on the left across the creek. A mudflow is a downward flowing mass of fine-grained earth material mixed with water. 17.3 In the road cut at the right is the Entrada 6.4 Sandstone, a massive, white, cliff-forming sand stone, originally deposited as sand dunes. The Dolores Formation and its red, thin-bedded shales, siltstones, and sandstones, can be seen in several road cuts ahead, as you move downward through progressively older rocks. Those older

16.1 The Brushy Basin Member of the Morrison

8.0 offsets the exposed formations.

highland was worn away by erosion. 18.7 A recent landslide that slid across the road left the rocks, dirt and rubble at the side. Just ahead on the right the Alder Creek Fault brought white sandstones of the Entrada Sandstone on the east into contact with reddish sandstones and siltstones of the Brushy Basin Member of the Morrison Formation on the west, indicating many feet of movement.

rocks were deposited in deltas, floodplains, and

leserts surrounding the Ancestral Rockies as the

19.8 Bridge to left across river. Just ahead on the 3.9 right are remnants of the town of Leonard. Cliffs of white Entrada Sandstone, capped by the thin, dark gray Pony Express Limestone (the bottom member of the Wanakah Formation), lie on both sides of the highway. Little Cone, aptly named for its distinctive shape, is visible on the skyline ahead. Although shaped like a volcano, Little Cone is a mass of igneous rock that intruded surrounding rocks, which then eroded off, leaving the cone-shaped mountain.

20.3 A debris flow (similar to a mudflow but with 3.4 coarser material) on the right has blocked the road at this location in the recent past.

20.6 The remains of a vanadium mine in the 3.1 Entrada Sandstone can be seen to the right. Near the turn of the century vanadium was used to color glass and ceramics orange, but it is now used by the steel industry to harden steel. !!! ATTENTION !!! Old mines should never be entered. They are unsafe! Falling rocks and timbers, cave-ins, poisonous gases, lack of oxygen and the danger of becoming lost or falling down a

21.2 In the canyon on both sides you can see white 2.5 Entrada Sandstone, with red Dolores Formation below and Morrison Formation and Dakota Sandstone above. The Entrada Sandstone forms a bare, massive, rounded cliff of white or a dramatic salmon pink, often with a white "cap" visible for miles. The shape and bareness of the cliff has given rise to the formation's nickname of the slick rim" or "slick rock", and will help you to spot the Entrada Sandstone, regardless of color he Entrada Sandstone is an important marker bed for orienting yourself in the rock section.

shaft, provide many hazards.



22.9 Omega Mine Tramway at 3:00. The Omega 0.8 Mine high on the cliff to the left is in the Entrada Sandstone. Vanadium was produced from this

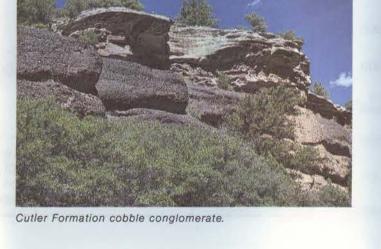
mine and numerous others in the area in the 1940's (a few as early as 1910). As foreign imports depressed the domestic vanadium market many mines in this region closed until the uranium boom of the 1950's, when vanadium became economically recoverable as a coproduct of uranium.

23.7 Junction of Colorado Highway 62 with Colorado Highway 145.

PLACERVILLE TO VANCORUM

0.0 (3) PLACERVILLE. The tour continues straight ahead (northwest) on Highway 145. The town of Placerville located less than a mile down the road to your left, received its name from nearby placer gold mining along the San Miguel River. In Placerville there is a hot spring (94° F), its sulfur bearing waters rising along a fault in the Cutler Formation. The spring is known by several names: Lemon Hot Springs, Geyser Warm Springs, and Placerville Hot Springs.

West of here numerous rock terraces can be seen, most of them north of the river. The river valley is notably asymmetrical. The rocks dip gently to the south, and the river flows along the south edge of the valley. The north edge of the wide valley is bounded by the west-trending Black King fault, where the north side moved down as much as 500 feet. Distinctive red sandstones and shales of the Cutler Formation are seen along the highway for the next several miles. Impressive in this area are pebble-, cobble-, and boulderconglomerates, 5 to 25 feet thick, common in the Cutler Formation and exposed along the road. These conglomerates are colorful reds and pur-



Morrison Formation have been dropped on the north side of this west-trending fault against the dark red Dolores Formation on the south side. Here along the valley wall the relative movement

wood, roughly paralleling the road.

is about 200 feet. This fault system continues

westward to a point a few miles south of Nor-

ples due to oxidation (rusting) of the iron in the

greenish-brown igneous dike is exposed at the

boxes with ridges on the bottom, to run river

water over the sands and gravels of the river

benches. This washed away lighter rock materials,

ding and the dramatic purple and white coloration

Watch the Entrada Sandstone to see the contact

along the beds of these former sand dunes.

between it and the red Dolores Formation.

Cutler Formation is exposed at the right near

tion will soon be prominent along the road.

placer mining operation across the river at 10:00

ust ahead. Dark red cliffs of the Dolores Forma-

left. The gravels of this valley fill were the site of

the remains of a wooden sluice extend downward

road swings to the left, and the channel will be on

fault trace is visible almost straight ahead to your

colored beds of the Salt Wash Member of the

left along the valley wall across the river. Lighter

Hayden Peak North Pole Peak

A

gold placer operations in the past. Just ahead,

from the old river bench where placering took

operations downstream for the next few miles.

road level. Observe the small, active (1984)

2.9 The road across the bridge to the left follows

36.4 Specie Creek. Purple-red conglomerate of the

4.3 Pre-Wisconsin valley fill about 100 feet thick

35.0 forms terraces across the river ahead and to your

place. Watch for evidence of other placer

5.1 Straight ahead is a well-exposed, gravel-filled

5.8 The road crosses the Black King Fault. The

your right.

34.2 abandoned channel of the San Miguel River. The

0.6 Between Mile Markers 77 and 78, a dark,

1.5 Cross beds in the Entrada Sandstone are

37.8 highly visible due to the large angles of the bed-

1.1 Old river terraces and sluice remnants are vis-

38.2 ible at 3:00. Miners used sluices, long troughlike

right in the road bend.

leaving the heavier gold.

formation. These conglomerates are worth slowing

6.4 Opposite mouth of Saltado Creek. The con-32.9 spicuous white bed on both sides of the river is the Entrada Sandstone. An equivalent of the Wingate Sandstone in the Dolores Formation forms the red sandstone cliff below it. Over the Entrada Sandstone is the talus-covered and treebearing slope of the Wanakah Formation. For several miles to the west the Salt Wash Member of the Morrison Formation makes prominent cliffs above the Wanakah Formation. The Salt Wash Member has a higher sandstone content here than in most of southwestern Colorado, and does not form the three or four discrete ledges com mon to the region. Just west of the mouth of Saltado Creek the Brushy Basin Member of the Morrison Formation is exposed. A heavy sandstone ledge at the top of the Morrison Formation is believed to be a thin, locally present, stringer of Burro Canvon Formation, The Dakota Sandstone forms the rim of the canyon, at the skyline. A mile ahead dark red Dolores Formation lies at road

8.4 The contact between the Entrada Sandstone 30.9 and the Wanakah Formation is about 10 feet above the road at the bend in the road. The Entrada Sandstone is the massive, now salmor ored rock forming the distinctive rounded cliff. The road travels stratigraphically downward and crosses the upper contact of the Entrada Sandstone just ahead.

9.6 Mile Marker 88. On your left lies the San Miguel River ranch resort. The Salt Wash Member of the Morrison Formation forms the prominent cliffs on both sides of the valley. The Brushy Basin Member lies above the Salt Wash Membe both capped by Dakota Sandstone. Notice the mines across the river and the mine dumps cascading down the cliffs. 12.0 The road crosses the San Miguel River at

eaves the San Miguel River valley to ascend Nor-

wood Hill. In the climb you will cross progressively younger formations as the road travels up the stratigraphic section. 12.8 Mile Marker 97 is in the Salt Wash Member 26.5 of the Morrison Formation. The road cut to the eft exposes the contact of the Salt Wash and Brushy Basin Members. The reddish sandston

27.3 the foot of Norwood Hill. The highway now

and shale ledges are part of the Salt Wash Memper. The Brushy Basin Member is easily seen as the distinctive, multicolored purple-green-white shales and sandstones 13.5 This is the base of the Burro Canvon Forma-25.8 tion, a massive, light-gray, conglomeratic sand stone overlain by thin sandstones interbedded

> ormation lies between the Morrison Formation below and the Dakota Sandstone above. Mile Marker 98 is posted in the Dakota Sandstone. Note the lens of coal in the Dakota Sandstone to your left. The coal filled a stream channel that at this point nearly destroyed the sandstone ledge that usually forms the base of the Dakota Sandstone. The base of the Dakota Sandstone is just below this coaly lens. The bank of wind-deposited silt and sand along

with gray and green mudstone. The Burro Canyon

the right side of the road as you near the top of the hill is characteristic of many mesa tops in southwestern Colorado. 14.2 Top of Norwood Hill. The nearly flat plain between here and Norwood is developed on the top of the resistant Dakota Sandstone, from which nost of the less resistant Mancos Shale has been stripped by erosion. Several mountains and ranges are now visible to the south and southeast. They were formed of

volcanic or other igneous rocks related to the San Juan volcanics, and are all of Tertiary age. 6:30 The Last Dollar Range of the San Juan 7:30 Sunshine Mountain, 12,960 ft; Mount to Wilson group, highest peak 14,246 ft; Little 8:30 Cone, 11,981 ft; Dolores peaks, highest

peak 12,595 ft. 9:00 Lone Cone, 12,613 ft. Looking then to the southwest, west, and northwest, you see:

11:30 East-dipping rocks on the east side of the Gypsum Valley anticline. 12:30 West-dipping rocks on the west side of the Paradox Valley anticline

Paradox Valley anticline in the near distance, the La Sal Mountains in the far 2:00 The low-lying hills are part of the Uncompahgre Plateau.

1:00 East-dipping rocks on the east side of the

Gypsum Valley and Paradox Valley are collapsed salt anticlines, formed when thick layers of salts, deposited millions of years ago by evaporation of ancient oceans, started to flow like putty upward along zones of weakness due to pressure from the rocks on the sides and top. As the salts pushed up the overlying sandstones, siltstones and shales they created arches called anticlines As the salts neared the surface, fresh waters from the surrounding rocks and from the surface began to dissolve the salt. When enough salt had been removed, the overlying rocks no longer had support, and the anticlines collapsed, forming the present valleys (see cross section with geologic

In many cases, no river has ever flowed through these valleys. Paradox Valley, on the other hand, has the Dolores River flowing across the valley. rather than along its length as might be expected. ed early visitors, and led to the valley's 17.1 (4) NORWOOD. Post Office in Norwood, one of

22.2 the larger towns in the western part of the tour area. For the next fifteen miles the road travels on Quaternary stream and windblown deposits overlying the Dakota Sandstone. The Uncompahgre Plateau lies on the skyline to the right. 18.7 The La Sal Mountains of Utah are visible on the 20.6 skyline at 12:00. "La Sal" is Spanish for "the salt", and it is believed the Indians used to trade

salt from the area surrounding the mountains for other goods. These mountains are Tertiary igneous intrusives dated as 23.5 million years old. hree groups of peaks, known as North Mountain, Middle Mountain, and South Mountain are easily recognized. Mount Peale, the highest peak at 12,721 ft, is part of the Middle Mountain group. 19.6 Montrose County line.

26.2 (5) REDVALE. Redvale Post Office. From town and the road north of here there is a good view of the southeast end of Paradox Valley. The steep face on the northeast flank of the valley is capped by Burro Canyon Formation. 27.9 The San Miguel syncline, a structural depression between the Paradox Valley anticline at 10:00

and the Uncompangre Plateau at 2:00, trends northwest at 12:00. Dakota Sandstone forms the center of the syncline, and Morrison Formation is exposed on both sides. 32.2 Mile Marker 116. Thin coal beds in the Dakota Sandstone are exposed in the road cut on

stone of the basal Dakota Sandstone and a lightgreen mudstone of the underlying Burro Canyon Junction with Colorado Highway 141. Continue straight ahead as the tour road

6.6 contact between a 10-foot conglomeratic sand-

32.7 Exposed in the road cut on the right is the

the right. The road now heads toward the San

Miguel River valley.

becomes Colorado Highway 141. Highway 141 to the left provides access to the Gypsum Valley and Slick Rock areas of the Uravan mineral belt of Colorado and Utah (one of the largest uranium mining areas in the United States).

33.3 This road cut is in the Burro Canyon Forma-6.0 tion, and the next road cut at the right exposes the contact between the Dakota Sandstone and the Burro Canyon Formation.

33.7 Colorado Highway 90 (to right) across the 5.6 Uncompandere Plateau to Montrose, Stay on Highway 141. Just ahead the road cuts through Dakota Sandstone. As the road enters the valley, you will descend stratigraphically into older

34.9 The base of the massive conglomeration 4.4 sandstone ledge at the right forms the contact between the Burro Canvon Formation and the underlying Brushy Basin Member of the Morrison 35.5 Cross Naturita Creek. Exposed are Dakota

36.5 (6) NATURITA. Naturita city limit. Just ahead to 2.8 the right is Colorado Highway 97 to Nucla. Stay on Highway 141.

Sandstone at the top of the canyon, Burro

Canyon Formation below that and the Brushy

Basin Member of the Morrison Formation at road

37.1 Naturita Post Office. This settlement is the 2.2 center of uranium mining in the Uravan mineral belt. Uranium was mined in many nearby canyons from the Brushy Basin and Salt Wash Members of the Morrison Formation. Uranium ore is contained in stream channel sandstones of these members, often closely associated with fine-grained organic matter and petrified wood. The canyon sides here are formed by the Morrison Formation, and capped by Burro Canyon Formation and Dakota 38.3 Southwestern Redimix mines sand and gravel

1.0 from terraces of the San Miguel River here. 39.3 Junction with Colorado Highway 90 leading 0.0 to Vancorum. The historic marker on the left com memorates the Dominguez and Escalante Expedition of 1776, which searched for a route to the California missions.

VANCORUM TO GATEWAY

0.0 (7) VANCORUM. Highway 90 to the left pro-49.4 vides access to Vancorum, Paradox Valley, and the La Sal Creek uranium mining area. Stay on Highway 141

0.6 An old coal mine can be seen near the top of the 48.8 hill in the Dakota Sandstone to your right. Near road level is the uranium buying station of General Electric's Nuclear Division. This station, closed due to poor uranium market conditions provided a market for independent miners. It is built on the site of the old Vanadium Corporation of America's Naturita mill which processed vanadium and/or uranium ores from 1939 to 1958. The mill tailings south of the station were removed in 1977-79 to a site in Paradox Valley and reprocessed to recover uranium and vanadium. As you view the canyon of the San Miguel River ahead, you see exposures of Dakota Sandstone, Burro Canyon Formation, and both members of

2.8 Distinctive large cobbles of river terraces, rest on 46.6 Morrison Formation. For about the next two miles several levels of terraces form the flat, grassy, and often cultivated surfaces of the valley floor. 3.0 Straight ahead, forming a ledge on the canyon rim

46.4 is the basal conglomeratic sandstone of the Burro

the Morrison Formation

vanadium deposits.

Canyon Formation. 4.2 The contact between the Brushy Basin Member 45.4 and the Salt Wash Member of the Morrison For mation lies near road level for about the next three miles. After that, for much of the distance to Urayan the road will pass between steep slopes and cliffs of the Salt Wash Member. The uppermost sandstone unit of the Salt Wash Membe forms a ledge about 100 feet above the river at the right. This is the principal uranium-vanadium bearing unit throughout southwestern Colorado. In this area, however, the sandstone beds are

light reddish-brown from oxidized iron (rust) and

ing the sandstones unfavorable for uranium and

contain only sparse carbonized plant debris, mak-

6.6 The Brushy Basin Member of the Morrison Forma-42.8 tion forms the variegated slope to your right, capped by the Burro Canyon Formation, For the next 20 miles or so the Dakota Sandstone is present above the Burro Canvon Formation, but is generally not visible from the road. The upper sandstone unit of the Salt Wash Member lies to your right. As the road drops stratigraphically you will pass through the Wanakah Formation. The next formation to watch for is the Entrada Sandstone (the "slick rock").



Morrison Formation, Uranium mine and dump in Brushy

10.1 At road level to your left lies the upper Entrada 39.3 Sandstone. The covered slope of the Wanakah Formation lies above it. The contact between the Salt Wash Member of the Morrison Formation and the thin, ledgy Wanakah Formation lies at the base of the lower sandstone ledge and above the covered slope at 2:00. 10.6 Thin, red shales and mudstones of the Wanakal

38.8 Formation lie at road level. A turnout at the right leads to a brush-covered trail to the river, and a good view of the Salt Wash and Brushy Basin Members of the Morrison Formation on the other side. The next road cut is in shale of the Morrison 11.7 The upper part of the Entrada Sandstone is

37.7 exposed both in the road cut at the left and near

stream level at 2:00. Ahead, high above road level, is the dump of the Rock Raven uranium 11.9 The road to the left enters east Uravan, then 37.5 proceeds up Hieroglyphic Canyon, so named because Indian petroglyphs (carvings and drawings on rock) resembling "hieroglyphics" are

found on the canvon walls formed in the Salt Wash Member of the Morrison Formation. 12.0 San Miguel River bridge. The road is near the 37.4 top of the Entrada Sandstone. There is a picnic ground to the left. Just ahead, the Club (uranium)

13.1 (8) URAVAN. This is a settlement for the 36.3 employees of Union Carbide Corporation who work in and near the uranium mines and mill here. The name Uravan is derived from the first syllables of the words "uranium" and "vanadium' The road ahead to the left will lead to the Uravan business district.

13.6 Entrada Sandstone forms the canvon wall to your 35.8 right. On the left, the Union Carbide Mill is the oldest operating uranium mill in the United States. It can process 1300 tons per day of uranium and vanadium ore. The vanadium concentrate is trucked to the company's vanadium mill in Rifle, Colorado, for further refining, Originally this was the site of a radium concentrator called the Joe Junior mill, built in 1914. Union Carbide Corporation (through the U.S. Vanadium Corporation) purchased the property in 1936 and since then except for short periods, has produced either uranium, vanadium, or both at this mill. The Uravan mineral belt here and to the west is

and one of the largest in the country. Ore from here supplied radium to Marie Curie in France, uranium for the atomic bombs in the 1940's, and now provides the raw materials for nuclear reactors to produce electric energy. Vanadium is produced as a coproduct. 14.0 Here, northwest of the plant, is the housing area 35.4 for Union Carbide employees. Dumps of the

Dolores Bench mines cascade down the Salt

Wash Member of the Morrison Formation.

Eroded boulder remnants of Entrada Sandstone.

the largest uranium mining district in Colorado.

sandstone with vertical joints lies at the base of lens of Navajo Sandstone, usually not found this far to the southeast. To the west it forms massive cliffs and exposures that look like petrified sand

15.4 Bridge over Atkinson Creek. Massive, salmon-34.0 colored cliffs on each side of the San Miguel River valley are recognizable as the "slick rock" of the Entrada Sandstone. Just ahead on the left is the bridge across the San Miguel River and the road following the Dolores River to the Paradox

At the right side of the road a light-colored

15.0 These are the evaporation ponds for liquid mill

15.8 Mile Marker 78. At 1:00 is the nearly vertical

dunes--and that is what they are.

the Entrada Sandstone cliff. This is probably a

33.6 cliff of the Entrada Sandstone, its irregular base channeling into the underlying red mudstone of the Kaventa Formation. This channeling indi cates the mudstones deposited by rivers and streams were at the surface of the earth when ancient channels and windblown sand began eroding into them, depositing sands that would later become sandstone. The story was preserved in the rock for us to view now, millions of years later. Good exposures of the Kayenta Formation are visible along the river below road level. For several miles to the northwest the road will follow the approximate upper contact of the Kayenta Formation, traveling on the same surface exposed to the sands millions of years ago.



32.6 the Morrison Formation down through the gentle, covered slope of the Wanakah Formation to the Entrada Sandstone cliff are well exposed ahead. several mine dumps lie at the base of the upper Salt Wash Member. Along the river canyon at 10:00 are good exposures of the Kayenta Forma tion. The Wingate Sandstone, also deposited as

desert sands blown along the sides of the

Uncompangre highland, forms the smooth cliff

16.8 Ledgy sandstones of the Salt Wash Member of

The Wingate Sandstone and many other cliffforming sandstones in the west are often covered with desert varnish, dark red, brown, and black, often shiny, coatings of manganese and iron that have leached out of the rock over many years. The darker the varnish is, the longer the rock face has been exposed.

18.5 This is your first view of Blue Mesa, so named 30.9 because of the blue shales forming the slopes of the mesa.

19.5 Hanging Flume sign and turnout. Remnants of 29.9 a wooden flume built in 1889-90 to carry water to the Lone Tree gold placers cling to the massive cliffs of the Wingate Sandstone. The flume provided water for hydraulic mining during 1891-93 until mining stopped because the gold-bearing gravel deposits proved less extensive than estimated. The sign at the turnout gives the history of the flume and related mining activities. 20.5 To the left is the confluence of the San Miguel

and Dolores Rivers. About five miles southwest of here, the Dolores River crosses the Paradox Valley, picking up approximately 200 tons of salt per day. The Dolores River is a tributary of the Colorado River, and this load of salt is one of the River. The Dolores River separates Martin Mesa on the west from Club Mesa on the east, both to the left of the highway. Atkinson Mesa lies to the right of the highway



Ahead is Blue Mesa, formed in blue and green shales of the Brushy Basin Member of the Morrison Formation, and capped by the Burro

21.3 On the left is an old coke oven built in the

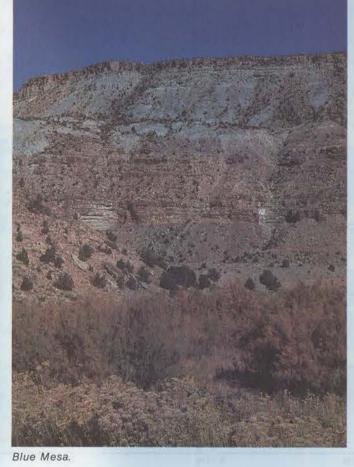
1880's to heat coal to produce coke, a combust ible material that burns practically smoke-free. 21.8 The gravel deposits on the right show evidence 27.6 of the mining activities of the old Bancroft gold placer. Across the river, on the left, similar gravels were recently removed by Union Carbide for use in tailings dam construction. Just ahead is the

23.5 Bridge over Mesa Creek. The gravel deposits on 25.9 the right are the Lone Tree Placers, worked for gold in 1891-1893. Similar gravels were also placered to the left of the road. Large cobbles are visible in the river terrace gravels for the next half

road to Carpenter Flats and Paradox Valley.

26.4 Bridge over Dolores River. Roc Creek canyon 23.0 enters to the left. Uranium was first discovered on the Colorado Plateau in the Roc Creek area in 1881. West of the Dolores River between Roc Creek and Salt Creek is Sewemup Mesa. It received its name from the activities of rustlers who would move cattle to this isolated mesa, cut out the existing brands, and sew the wounds back

A fault at 12:00 brings the Salt Wash Member of the Morrison Formation (south) in contact with the reddish-purple Kayenta Formation (north). The area of the fault is easily recognized because the red, ledgy sandstones of the Salt Wash Member are at the same apparent level as the Entrada Sandstone, from this point.



27.2 Here the road crosses the contact between the 22.2 Kayenta Formation and the massive cliffs of the sh-brown and brown-streaked Wingate Sandstone below. The Kayenta Formation is overlain by a thin section of Navajo Sandstone, typically cross-bedded, and in this area slightly lightercolored than the Entrada Sandstone above it. Evidence of gold placering lies to the left as you enter the Dolores River canyon just ahead, its walls formed by massive cliffs of Wingate Sandstone. You will catch glimpses of the Salt Wash Member of the Morrison Formation on the skyline in side canyons to the right. The road now crosses the contact between the

cliff of the Wingate Sandstone and the softer, bright-red shales, siltstones, and sandstones of the underlying Chinle Formation. Behind is your last glimpse of Blue Mesa. The road travels near the base of the Wingate Sandstone for several 29.6 A shady picnic area with a freshwater spring

ing to the Plateau's southeast end (you crossed bubbling out at the base of the Wingate adstone provides a nice stop. Cattlemen and farmers used this spring as a main stopover when traveling the canyon. 33.9 Enter Mesa County. Steep Wingate Sandstone 15.5 cliffs cap Chinle Formation slopes straight ahead.

Wingate Sandstone cliffs cap Chinle Formation slope.

35.3 Erosion by ice, water, and wind along a joint in 14.1 the rock ahead is creating a rock column that will eventually collapse, adding to the rocky slopes along the edges of the canyon. After i collapses, more rock columns will form; erosion time and the river below will continue to break down and carry away the rocks nearest the bottom. These canyons maintain a relatively constant slope through continual repetition of this process. 36.0 Blue Creek enters the Dolores River from the

13.4 east (right). The base of the Chinle Formation is about at river level. 37.4 The Moenkopi Formation forms the slightly

12.0 darker lower part of the red slope at road level with white patches of gypsum showing near its base. Gypsum (calcium sulfate) is a rock or mineral used to make drywall for building con struction. It is also used as a pH conditioner for acidic soils. Dissolved, it adds to the salinity of rivers. Gem quality gypsum is called alabaster and is carved to create ornaments. The upper part of the red slope is Chinle Formation. Wingate Sandstone forms the cliff, with ledges of Kayenta Formation on top. 39.5 Cross cattle guard and Salt Creek. The road to

9.9 the left leads to Sinbad Valley, another collapsed

northwest-trending salt anticline. The stratigraphic section from the Salt Wash Member of the Morrison Formation down to the Cutler Formation is exposed ahead and to the right on the west side of Flat Top Mesa. 39.9 Large cobbles from river terrace gravels

9.5 overlie finer-grained, unconsolidated material. 42.6 A large river terrace lies to the left.

44.1 Cattleguard. A small strip mine, currently 5.3 called the "Alabaster Box Mine" and last mined for aypsum, lies to your left in the Moenkopi Formation. Ahead is the Palisade at Gateway, an impiressive, often photographed mesa. Tenderfoo Mesa is on the skyline to the right.

44.4 This is a good turnout point for viewing the

5.0 Paliisade at Gateway. Formations from the Salt

Wash Member of the Morrison, with a small

uramium occurrence in it, down through the

Wanakah, Entrada, Kayenta, Wingate, Chinle,

Moenkopi and Cutler are exposed along the sides

of this long, narrow mesa 44.9 Herie the road crosses the Moenkopi-Cutler 4.5 Formation contact. The Cutler Formation is composied of the lighter-red, more resistant beds.

45.5 This road cut is in the Cutler Formation, capped 3.9 in this area by river terrace gravels. 46.1 Across the river to the right the Cutler Forma-3.3 tion forms the relatively resistant, rounded red beds. An impressive conglomerate lens in the Cutller Formation lies just ahead at 11:00.

48.8 Road to left goes up John Brown Canyon to

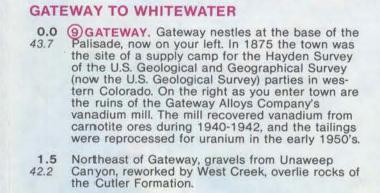
0.6 Beaver and Polar Mesas. Uranium and vanadium

mining for radium began about 1916 or 1917 Between 1948 and 1970, 1,225,000 tons of uranium and vanadium ore were produced. 49.2 Bridge over the Dolores River. At this point 0.2 the tour leaves the Dolores River Valley and enters West Creek Valley, leading to Gateway and

were discovered on Beaver Mesa in 1913, and

49.4 Enter Gateway, Colorado, elevation 4595 ft, 0.0 the lowest settlement in western Colorado.

Unaweep Canyon.



2.5 On the left large, dark-colored boulders are in 41.2 a good exposure of purple-red Cutler Formation The lighter-colored boulders are from thick Tertiary gravels overlying the Cutler Formation. 4.2 Road junction with Calamity Mesa Road. The 39.5 road crosses West Creek and leads to Outlaw

and Calamity Mesas.

4.6 This is the contact between siltstones and shales 39.1 of the Cutler Formation (about 245 million years old) and Precambrian granite (nearly 2 billion years old) in the gorge of West Creek. This contact marks the western boundary of the Uncom pahore Uplift and its major high-angle fault system (see the geologic cross section). The gramite is part of the Precambrian core of the Ancestral Rocky Mountains, uplifted again with the Uncompangre Plateau, along that large faul The Ancestral Rocky Mountains rose about 300 million years ago, then eroded, providing rock materials to form large parts of the Pennsylvania Permian, and Triassic formations of southwestern Colorado and southeastern Utah. All of these formatilons thin and lap out onto the Precambrian rocks to the east. Formations like the Navajo Sandstone and Kayenta Formation are often either thin or missing entirely in this area, but become very thick as you travel further west. By the Itime younger sedimentary formations covered the previously uplifted area, the mountains had worm down substantially. About 66 million years ago, a northwestern portion of this area began to be folded and uplifted to form the present Uncompangre Plateau, Subsequent uplift occurred

between 10 and 28 million years ago. 4.9 Bridlge over West Creek. The road now enters 38.8 the (gorge of West Creek (West Creek Narrows) here were once sediments, recrystallized by processes of heat and pressure (metamorphism producing metamorphic rocks) nearly 2 billion years ago. In spite of the great age, in places you can see banding that suggests the layers of the original sedimentary rock. Various igneous rocks (generally light-colored ones like granite) then intruded these metamorphic rocks about 1.5 billion years ago.

9.0 Bridlge over West Creek. River cobbles are visibile to the right where the valley is incised into coarse valley fill. Just ahead the road leaves the Wesit Creek Narrows, and the valley widens.

11.5 View of Unaweep Canyon, cut primarily into 32.2 Precambrian crystalline rocks, forming nearly ver tical cliffs 500 to 1000 feet high. This canyon is almost certainly the abandoned channel of a large river (probably either the Colorado River or the Guninison River or both). The two streams occupying the canyon now (and flowing in opposite directions) are much too small to have ever carvied this large channel. The main river probably abamdoned Unaweep Canyon about 2 million year's ago, during one of the major glacial periods n Ciolorado history. The canyon is broad and flatfloored with recent debris accumulated along the

12.4 Alluvial fans are deposits formed when small 31.3 streams drop the load of sand and gravel they have carried. Here they are heavily covered with scrulb oak and other bushes, coalescing on the valley floor, to form the gentle slopes at the right 16.9 The road now lies in Precambrian rocks, Ahead is 26.8 a good view of older Precambrian rocks cut by vounger Precambrian dikes and sills.

18.7 Ruins of the Driggs Mansion on right. A wealthy

skilled stone masons from the East to build him

an elegant summer home. It was never used.

25.0 man from New York, in 1916-1917 imported

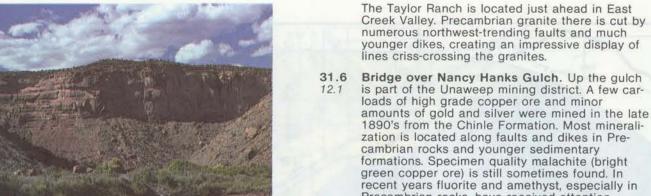
19.5 Unaweep Canyon. Here is an excellent view 24.2 of Ulnaweep Canyon, now a wind gap on the Uncompangre Plateau. A wind gap is a place where a river or stream once flowed, but no lon ger does. West-flowing West Creek has now dis appeared. The wind gap will continue for several miless, then the road will begin to follow eastflowiing East Creek. Unaweep is a Ute Indian word meaining "canyon with two mouths". One mouth (West Creek) empties into the Dolores River, while

the other mouth (East Creek) empties into the

23.5 Unaweep Divide, elevation 7048 ft. Cliffs of 20.2 Wingate Sandstone are present high on both sides of the canyon. Underlying the Wingate Sandstone is a layer of about 100 feet of Chink Formation (remember, these formations thinned as they were deposited against the Ancestral Rocky Mountain highland). The smooth surface of the Precambrian rocks under the Chinle Formation is evident on the south wall of the canvon and can be seen for about the next five miles 29.2 Divide Road turns off to the right, leading to 14.5 the top of the Uncompangre Plateau and extend-

Guninison River.

the southeast end at Dallas Divide). From Divide Road other roads branch off to Outlaw Mesa, Delta, Montrose, Nucla, and Norwood. Although the drive is impressive, it is recommended that it only be attempted in the summer.



formations. Specimen quality malachite (bright green copper ore) is still sometimes found. In recent years fluorite and amethyst, especially in Precambrian rocks, have received attention. The road is now on Precambrian rocks. Visible on both sides is the contact between Precambrian crystalline rocks and younger sedimentary formations. The formations here are the same ones found on the southwest side of the Uncompanare Plateau, with only slight differences in the rocks, but they are much thinner or totally missing here In the next two miles the road passes out of the Precambrian rocks and climbs through the Wingate, Entrada, and Wanakah Formations. 32.5 Bridge over East Creek. Just ahead on the left 11.2 is the site of the former settlement of Copper

City. In the late 1800's a matte smelter was built here to process the copper ores being mined, but the Unaweep mining district did not produce enough ore to be economic.

33.9 Cattle guard. Cross-bedded Wingate Sandstone 9.8 is now present on both sides of the road.

34.2 Bridge over Cactus Park drainage. The Cactus 9.5 Park fault crosses the highway just ahead, and fault gouge (whitish, ground-up rock where fault movement crushed the rocks against each other). is exposed in the road cut to the right. At the Cactus Park Road turn-off you can see how the fault brings Entrada Sandstone on the north (right) into contact with Wingate Sandstone on the south (seen across the road to the left).



35.5 This is about the top of Nine-Mile Hill. The

8.2 Brushy Basin Member of the Morrison Formation forms the slope up to the massive sandstone of the Burro Canyon Formation, with Dakota Sandstone cliffs crowning them. Across the Grand Valley of the Colorado River ahead are the Bookcliffs, etched in Mancos Shale and capped by andstones of the Mesaverde Formation. Below the Bookcliffs stretches the Mancos Shale esert" in the Grand, Gunnison, and L pangre Valleys. These valleys have long been known for their major fossil beds and many species of dinosaurs.

with rock rubble from the Burro Canyon and Dakota Formations. Softer shales of the Morrison Formation erode and wash away, leaving sandstone above unsupported to break off in blocks, and accumulate in the valley below. As you descend from the Uncompangre Plateau into the valley below, the road ascends strati-

graphically, until it reaches Mancos Shale in the

valley. The formations are all dipping down as

To the left is the valley of East Creek, choked

does the road, into the synclinal valley. 36.8 High on the right side of the cliff ahead is an old abily explored for veins of copper, gold,

5.8 part of the Salt Wash Member of the Morrison Formation near the bottom of the gorge. 40.8 Cattle guard. The road is now on the Brushy 2.9 Basin Member of the Morrison Formation. The cliffs to the left are carved in the Burro Canyon Formation and Dakota Sandstone rims the

37.9 East Creek Gorge to the left displays the upper

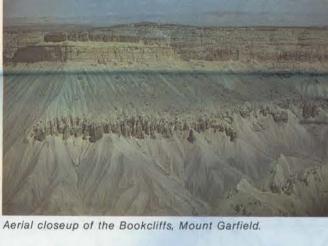
41.2 The road crosses the contact between the Mor-2.5 rison Formation shales and the massive, blocky sandstone of the Burro Canyon Formation.

42.3 Bridge over East Creek. To the right is Cotter 1.4 Corporation's crushing and sampling plant. In recent years uranium-vanadium ore from the com pany's mines in the Uravan mineral belt was trucked to this plant where it was sampled, stockpiled, and crushed. Crushed ore was then transported across the Gunnison River on a conveyer belt, and loaded onto railroad cars for shipping to Cotter's mill at Canon City on the eastern slope of the Rocky Mountains. This arrangement was unusual, in that most companies use mills relatively near their mines. Ahead is Grand Mesa, a broad, flat-topped erosional remnant of the Wasatch Formation, Mesaverde Formation and Mancos Shale, preserved because it is

capped by a resistant Tertiary lava flow. 42.6 This is the approximate contact between the

1.1 Burro Canyon and Dakota Formations. 43.3 Cross the Gunnison River. The Gunnison 0.4 River was originally known as the Rio Javier, or by the Indian name Tomichi, After the death of Captain John Gunnison, one of the last explorers for the U.S. Geographical and Topographical Survey (today's U.S. Geological Survey), in the fall of 853, it was renamed in his honor.

are eroded into Mancos Shale. Grand Mesa forms the skyline in the distance. 43.7 Whitewater, Junction of Colorado 141 and 0.0 U.S. Highway 50. Turn right (south) toward Delta the left, is the home of the Museum of Western Colorado, housing Dinosaur Valley, a new, permanent exhibit featuring life-like, moving, breathing, bellowing dinosaur replicas. The city also provides one entrance to Colorado National Monument.



WHITEWATER TO MONTROSE SEGMENT

0.0 (10) WHITEWATER. The tour proceeds south on 52.8 U.S. 50 toward Delta and Montrose. Grand Junction, western Colorado's largest city, lies to the north on U.S. Interstate 70. Colorado 141 to the right travels through scenic Unaweep Canyon to Gateway on the Dolores River. The agricultural communities of Delta and Montrose nestle in the valley ahead along the tour route. The Gunnison River, visible directly to your right has cut a shallow canyon on the northeastern flank of the Uncompangre uplift. This canyon parallels Highway 50 for the next 25 miles. 1.2 Along the road to the left in the Mancos Shale

concretions formed by chemical precipitation around a central nucleus, in or near the bottom of the ocean where the shales were deposited. The several times in the next few miles. 1.8 White patches to the right of the road for the 51.0 next half mile are salts leaching out of the Mancos Shale. A more resistant ridge of Mancos

51.6 are large, rounded limonite-stained (yellow and

orange iron oxide), carbonate nodules exposed in

two horizons most of the way to Delta. These

Shale is present on the left (east) side of the 2.7 Directly to your right are three radio towers 50.1 (KREX). Desert Reservoir is just beyond them to the south.

4.3 Lands End Road to the left climbs to the tor 48.5 of Grand Mesa (switchbacks at 9:00), a 10,000 ft. lava-capped plateau between the Colorado and Gunnison Rivers. The sides are etched in Wasatch Formation, Mesaverde Formation and Mancos Shale, Heavily forested, and with many well-stocked lakes, the Mesa is a favorite camping and fishing area. Around the slopes of Grand Mesa are four levels

of Pleistocene (Ice Age) pediments, A pediment is a sloping, nearly flat surface produced by erosion of bedrock, usually thinly covered with stream sediments. These pediments were cut into the Mancos Shale during the last several glacial advances, and are generally capped by 15 to 30 ft of poorly sorted gravel containing large amounts of basalt (dark-colored lava) pebbles from nearby volcanics. As the tour continues toward Delta the pediments will be quite evident east and northeast of Highway 50.

47.3 crest of the hill in the roadcut are pediment

valley of the North Fork of the Gunnison River to the coal-mining and fruit-growing towns of Hotchkiss and Paonia. Delta was founded at the junction of the Gur nison and Uncompangre Rivers and is supported primarily by agricultural activity. The highway will now travel in the broad Uncompangre River

Highway 50, bearing to the left.

4.6 2:00, is the highest point on the Uncompangre Plateau, located near its southeastern end.

49.1 North Mesa to your left, and Spring Creek Mesa 3.7 to your right are river terraces left by the Uncompahgre River as it cut its way into the valley.

52.8 Junction of U.S. 550 and U.S. 50 in Montrose 0.0 We hope you enjoyed your geologic tour and will

Pediments in Mancos Shale.

> ing for the next 18 miles or so. The monument (not shown on maps) is not sanctioned by any branch of the state or federal governments, but was created in 1979 by the "Friends of the Desert", a small group from Grand Junction. On Labor Day weekend, signs are put up to notify travelers of the monument's existence. A pamph let detailing all of the points of interest in the monument is available at the Fool's Hill rest area. East of here in the Indian Creek area archaeolo gists have recently reported finding ancient Indian camp areas and fire rings, exposed as nature erodes away rock and soil.

Ground. This slope graphically demonstrates the draping of the younger rocks as the ancient Uncompangre Plateau was pushed up and the Montrose syncline sagged. 10.2 Cross King Creek. Ahead to your left is 42.6 Indian Point (elevation 10,000 ft), one of two pro-

10.7 Basalt boulders from the Grand Mesa flows cover 42.1 the surface of another pediment exposed here in 12.1 Entering Delta County. Ahead and to your

and more prominent pediments in the valley. Notice the broad gentle valley between the Uncompanie uplift on the west and Grand Mesa on the east, generally following the line of the Montrose syncline, where the river has cut down into soft Mancos Shale. A distant panorama of the San Juan Mountains is

right shoulder of the highway ahead is a large

widened 20 years ago and now serves as the official forest preserve of the "Stinking Desert National Monument". 15.1 Directly to the left the roadcut exposes upper

15.3 Wells Gulch to the right exhibits exposures of 37.5 Dakota Sandstone, Burro Canyon Formation, and Brushy Basin Member of the Morrison Formation. This is a pretty little canyon, hidden among the barren flats of the Mancos Shale. 16.1 The road to the right leads down Wells Gulch

remnants of former pediment surfaces on the Mancos Shale. Eventually all of the pediments in this area will be eroded away, or covered over by other rocks, in an endless cycle, 18.6 Escalante Canyon. The road to the west

20.1 Dakota Sandstone is exposed at the heads of several canyons below road level to the right, with

below the sandstone cap. 20.9 Look to your left to see several pediments on the 31.9 southwest flank of Grand Mesa. The West Elk Mountains in the distance at 11:00 were formed by Tertiary intrusives. Precambrian rocks straight ahead were entrenched by the Gunnison River forming the Black Canyon of the Gunnison. Ahead and slightly to the right in the distance, Cimarron

22.4 Bridge over Alkali Creek. This is typical 30.4 weathered Mancos Shale.

along the Gunnison River. 25.3 Delta Speedway to the left. The road crosses a

25.8 Mountains, the northernmost part of the volcanic West Elk Mountains. Closer in, on your left, are several glacial outwash surfaces descending southward off of Grand Mesa.



valley, formed along the Montrose syncline. 33.0 Sweitzer Lake Road to the left leads to

overlying thin layer of gravel. 15.4 up a low river terrace.

39.9 Underground onion storage cellars lie to the

42.9 To your right are two alluvial terraces formed

48.2 Horsefly Peak (elevation 10,348 ft) seen at 1:00 in the distance is Dallas Divide, crossed by

aptly named High Mesa. 47.6 The deep road cut to your left is in the Mancos

the San Juan Mountains.

visit Colorado again!

minent basaltic lava arms of Grand Mesa.

40.7 right is Dominguez Canyon, cut by Big Dominguez Creek into the east side of the Uncompangre and the Wingate Sandstone.

visible on the skyline. 14.5 The uppermost Dakota Sandstone crops out in 38.3 the roadcut to the right. The road travels on top of the sandstone for the next half mile. On the

37.7 Dakota Sandstone and about 3 ft of coaly shale interbedded with sandstone and shale below it. Just ahead on the curve is more coal and coaly shale. At the other end of the road cut is a small

34.2 leads to the Gunnison River and Escalante Canyon beyond. This is the turn for the Fool's Hill rest area and information on the "Stinking

nulticolored sediments of the Morrison Formation

Ridge is capped by resistant Tertiary volcanic rocks erupted from the San Juan Mountains to your right.

28.9 into the eastern flank of the Uncompangre Plateau. Alluvial river terraces begin to appear

12.9 right, housing one of the valley's more important 41.1 (12) OLATHE. Junction with business route of

Where the Mancos Shale has weathered it is often a yellow color from oxidation (rusting) of iron in the sediments. The route continues along the pediment surface here covered by a one-pebble thick veneer of rounded basalt pebbles and cobbles. More pediments can be seen along the east side of the highway.

gravel excavation operation. Beneath the pedi-

ment gravels are several horizons of siltstone in

the Mancos Shale, commonly containing fossils

pelecypods). In this valley the Mancos Shale is

ften weathered to depths of 100 ft or more.

such as small pelecypods (clams and oysters are

47.0 the "Stinking Desert National Monument" stretch-

To your left is Paradox Mesa, one of the olde

juniper "Christmas Tree" decorated each holida season following a tradition started in the 1930's The tree was spared when Highway 50 was

Rounded hills and gentle valleys north of the river

27.5 deep arroyo cut into river-deposited sediments called alluvium. 27.0 At 11:00 in the distance are the Ragged

27.3 Two deep arroyos cut in alluvium are now 25.5 bridged by the road. 30.0 Bridge over Gunnison River. You are entering

19.8 Sweitzer State Recreation area, Just ahead you will again begin to see Mancos Shale and an 37.4 Entering Montrose County. The road climbs

5.8 Cross Indian Creek. The panorama ahead is of

7.0 The extensive slope from 1:00 to 4:00 of 45.8 Dakota Sandstone dipping off of the Uncom pangre Uplift is referred to as the Hunting

Uplift, exposing red rocks of the Chinle Formation

36.7 into Dominguez Canyon and the Gunnison River. 17.7 Three rounded hills at 11:00 represent dissected

Desert National Monument".

23.9 To your right the Gunnison River begins cutting

30.4 (1) DELTA. Junction of U.S. Highway 50 and 22.4 Colorado Highway 92. The tour continues straight ahead on Highway 50 to Montrose Colorado 92 to the left goes eastward up the

peak is capped and flanked by glacial deposits. At

5.5 The road climbs onto a pediment surface. At the gravels made up of well-rounded basalt cobbles and boulders. Just over the hill to the right is a

11.7 Highway 50 to the town of Olathe on the right. The tour route continues on the main route of 9.9 by the Uncompangre River. The highest terrace is

