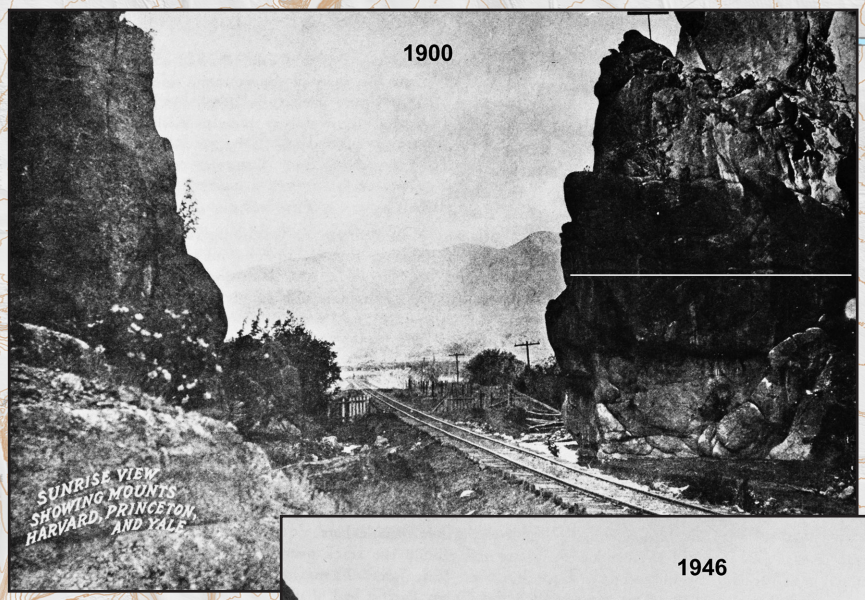
STORM FLOODS ON TROUT CREEK, CHAFFEE COUNTY, COLORADO

By Keenan Lee

Colorado Geological Survey
Open File 19-13



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DOI: https://doi.org/10.58783/cgs.of1913.djwx8634

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TROUT CREEK WATERSHED

Trout Creek is tributary to the upper Arkansas River near Buena Vista, Colorado. The creek drains a watershed of about 38,500 acres on the west slope of the Mosquito Range, and the southwest-flowing stream reaches the broad floor of the Arkansas River valley at the mouth of Box Canyon (**Fig. 1**). Beyond Box Canyon, however, Trout Creek does not continue southwest to the Arkansas River, nor has it done so for thousands of years. It does not, in fact, reach the Arkansas River at all.

Below Box Canyon, the ancestral Trout Creek flowed to the south and reached the Arkansas River near the town of Nathrop (**Fig. 2**). No drainage valley is apparent along this route today, however, only an anomalously flat surface composed of sand and fine gravel. This surface was created by flash floods in the Trout Creek watershed that carried vast amounts of sand and fine gravel and spread them out onto the Arkansas River valley floor. Many, and perhaps all, of these floods occurred in historical times.

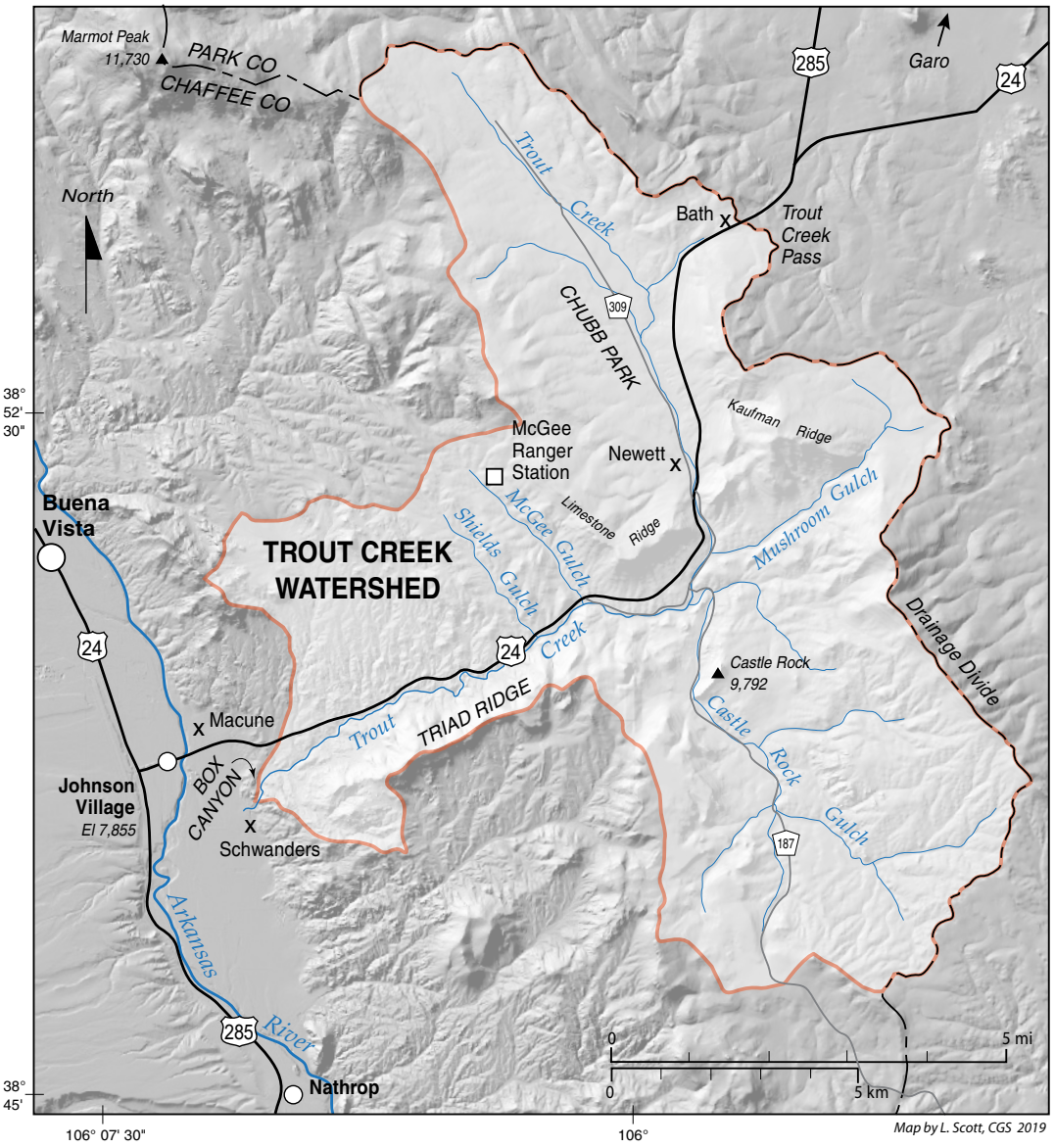
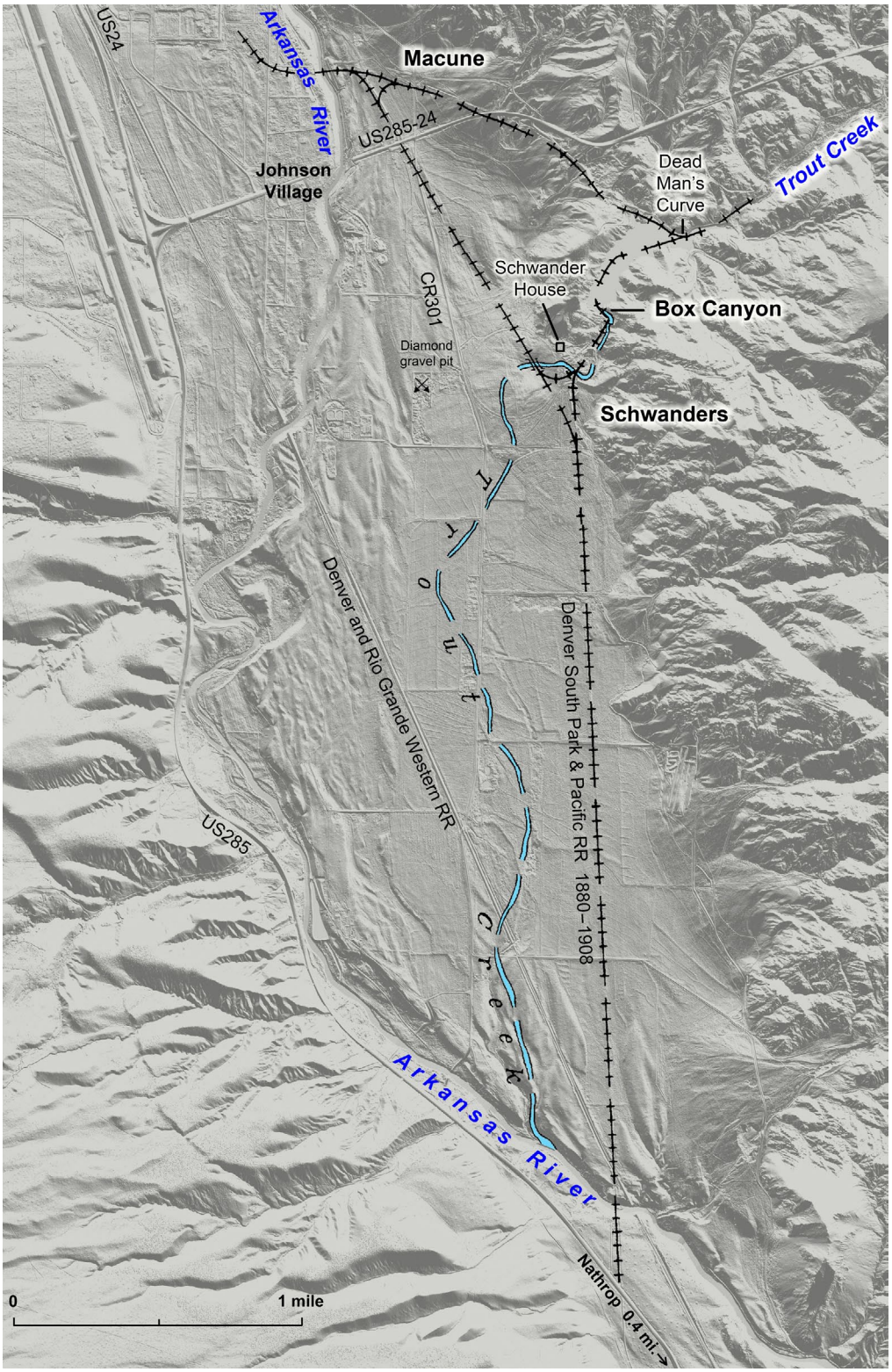


Figure 1 – Trout Creek watershed. "x" symbols indicate sites of abandoned railroad stations. Base map by author.

Most of the Trout Creek watershed has a maturely weathered surface of moderate relief developed on granite. In this environment of large temperature ranges and relatively little precipitation, granite tends to disaggregate, rather than decompose, producing thick aprons of loose sand and fine gravel, called grus (**Fig. 3**).

Trout Creek drainage basin is subject to intermittent severe rainstorms during the late summer monsoon season, and thunderstorms and supercell storms can dump copious amounts of rain (and commonly hail) on a very small area. Because the restricted tributary drainages in the headwaters of Trout Creek have short concentration times (time from start of precipitation to peak discharge), flash floods are the result. Such floods cause severe erosion, especially in unconsolidated material such as grus, and especially in areas that have been stripped of their natural vegetative protection.

Early anthropogenic modifications of the watershed severely depleted natural flood protection of Trout Creek and its headwaters (Keidel, 1999; Cogan, Joe, written communication).



In the late 19th Century, rangeland was overgrazed by local cattle and by trail herds, feral horses, and sheep. Numerous mountain meadows were cut and scarred by wagon roads and drained. Upland forests were denuded by timbering for railroad ties and to feed numerous charcoal kilns. Timber was skidded straight down slopes, cutting troughs that eroded to gullies. Lower Trout Creek was straightened and stripped of riparian vegetation by the Denver South, Park and Pacific Railroad, which laid tracks right in the bottom of the narrow valley in 1880.

> *One stretch of line that seemed to give continuous trouble over the years was that in Trout Creek Canyon, from… Trout Creek Pass down to the Arkansas River near Buena Vista. The line had been built in the bottom of the narrow little valley of Trout Creek, and after the protective timber had been cut over the barren watershed became subject to severe flash floods, which played havoc with the railroad line.* (Chappell and others, 1974, p. 130)

In 1884, the railroad rerouted the lower end of the line to go through Box Canyon—not a true box canyon, but a very narrow, granite-walled canyon that opens onto the floor of the Arkansas River valley (**Fig. 4**).

Figure 2 – Lidar image shows the area where Trout Creek passes through Box Canyon (site of the modern dam) and the anomalously flat floor of the Arkansas River valley beyond. The route of the abandoned Denver South Park and Pacific narrow-gauge railroad and the route of ancestral Trout Creek across the valley floor are shown c. 1884 (from Poor, 1976, unnumbered plate titled Buena Vista and Nathrop District).

Figure 3 – Source of sand and fine gravel in Trout Creek watershed.

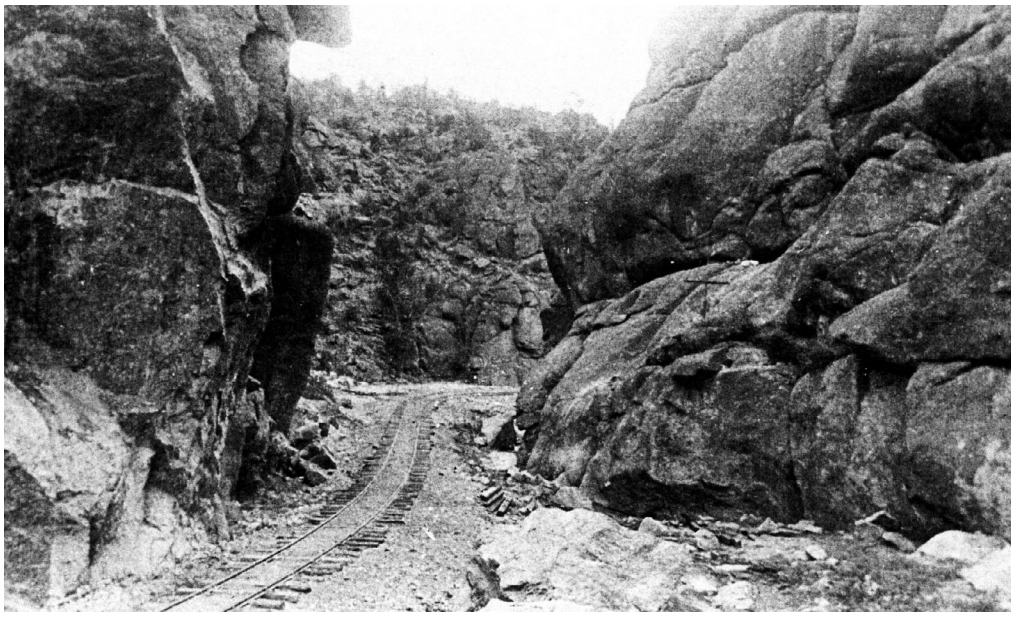


Figure 4 – Narrow-gauge tracks of the Denver South Park and Pacific Railroad in Box Canyon, 1888 (Digerness, 1977, p. 219).

TROUT CREEK FLOODS

Following the degradation of Trout Creek and its headwaters in the late 1800s, Trout Creek was the site of a series of severe floods in the late 1800s and early 1900s.

When first constructed, the right of way was practically immune from damaging floods, but as time passed some of the excessive rains commenced to play havoc with our little railroad…Regarding possible flood conditions along the canon, Mr. Hugh C. McLean, resident of Buena Vista, offers a good explanation of one of the major factors that eventually brought about a change in the creek's

behavior. Before civilization had advanced into this region, the slopes of the mountain sides along Trout Creek Canon were plentifully supplied with an abundance of timber and, as nature intended it, these densely timbered areas retained much of the water, thus preventing floods to a great extent. Construction of railroads through these regions created a heavy demand for ties and the South Park was no exception.

In addition to furnishing railroad ties, the timbered area in this vicinity was also exploited by some local interests who built some charcoal ovens near the mouth of the canon. To supply their demands, the tie contractors and charcoal interests cut away much timber, and to move this timber down into the canon, they had cut numerous trails up and down the mountain sides. Every tree the tie cutters and the charcoal operators removed lessened the forest's ability to retain the rains, and every trail they cut became a potential gully to carry these rains down to the canon floor below. (Poor, 1976, p. 304)

8 July 1890

The cloud burst of last Tuesday played havoc with property up Trout Creek. The South Park railroad had at least a half dozen bridges washed out, and the wagon road is a complete wreck and is now utterly impassable. The crops and fences of the ranchmen are greatly damaged besides a number of ditches being washed out. It was the worst storm known for years. (Buena Vista Democrat, July 10, 1890, p. 3)

Original railroad telegrams have been found that confirm this flood damage (Bryce Kelly, 2016, oral communication).

1 August 1900 and c. 16 August 1900

In 1900, I was firing for Andy Nelson on engine 62. On August 1st of that year we were at Schwanders ready to start up Trout Creek. As it was storming up the canon, I suggested that we walk up the track and around the curve to Box Canon and see just how the water was in there. Andy Nelson thought it was a good idea. Accompanied by Conductor Pete Newberry, we walked up to Box Canon and made an inspection and returned to our train. There was a little more water than usual but we thought it looked safe. Engineer Nelson whistled off and as we started I was watching very closely and saw the water coming. I yelled to stop and back up, which Nelson did. The flood came down through Box Canon and spread out over the flats and around the section house and office to a depth of three feet over the tracks.

We were there thirty days. The company went to work making repairs and were doing fine for about fifteen days, when down came another flood and took it all out again. This flood washed out about eleven miles of track between Newett and Schwanders. Box Canon was very narrow—just wide enough for a train to go through and make the turn. The narrow part was about 700 feet long. We measured the high water mark in the canon and it was 18 feet above the track level. There were about 32 bridges between Newett and Schwanders and nearly all of them were washed out. (William Cairns, in Poor, 1976, p. 368)

August 1901

... in August, 1901, there occurred, as Pres. Frank Trumbull described it, "unfortunate and almost unprecedented floods between Newett and Schwanders." (Chappell and others, 1974, p.130)

3 September 1906

Considerable damage was done in the Trout Creek country again Monday evening by the heavy rain which visited that section. (Colorado Republican, September 6, 1906)

1 August 1908

During the latter part of July, 1908, ominous clouds began to gather in this vicinity and soon the rains came. Peaceful little Trout Creek became a raging torrent, and Box Canon, which served as both the railroad's and the stream's outlet to the broad Arkansas Valley, formed a veritable funnel through which drained the entire water shed between Trout Creek Pass and the Arkansas River. The high perpendicular granite walls of Box Canon held its victim securely within its grasp. The flood reached its greatest intensity on August 1, 1908, and completely washed out over a mile of the main line between ... the old charcoal ovens ... and Schwanders... (Poor, 1976, p. 304).

A storm in 1908...or 1909...unleashed a torrent of sediment that covered the alluvial fan at the base of the watershed with 8-10 feet of sand. The entire first floor of the Swanders [sic] *house was filled, and the orchard trees looked like orchard bushes, Joe Cogan.* (Keidel, 1999, p.14)

October 1910

In October, 1910, floods in Trout Creek washed out a considerable amount of trackage between Bath and Macune. This was nothing new; for some years previous to this time, the stream had been doing much damage to the line, causing constant expense. This last flood was the straw

that broke the proverbial camel's back; the management gave up their battle with Trout Creek... they declined to make further repairs and abandoned the entire main line between Garos and Macune...[that] ended for all time service between Denver and that area. October, 1910, can be very appropriately termed the beginning of the end for the South Park railroad. (Poor, 1976, p. 391)

At least once every year Trout Creek seemed to become a raging and destructive torrent, as it drained a large area subject to occasionally heavy rains and cloudbursts. Trout Creek played an important part in management's decision to give up on through operations... Some washouts occurring that fall were left unrepaired. (Chappell and others, 1974, p. 132)

July 1914

Almost total destruction of the canyon line occurred in floods in July, 1914, so extensive that some bridges vanished and much of the track also vanished under washed down debris. When the line was dismantled much of the rail was not found. It is still there, often deeply buried. (Chappell, and others, 1974, p. 133)

During July and August, 1914, flood waters caused further damage to the remaining track in the canon, washing out additional sections of the line between Bath and Dead Man's Curve. Each succeeding year witnessed the disappearance of more and more trackage and right of way due to these seasonal floods. Dr. Frederick S. McKay, of Colorado Springs, writes: "For several years, along parts of the old South Park road-bed, sections of rails and ties could be seen hanging together like a ladder in midair across many washed out sections of the right of way between the top of the pass and the lower end of the gulch near Box Canon." (Poor, 1976, p. 391-392)

10 September 1919

The destructive cloudburst on September 10, 1919. Former Ranger Frame and the writer were camped at the McGee Ranger Station on the night of September 10, 1919 when the storm occurred. The intensity of the storm may best be visualized when it is known that the small drainage, to the rear and lower side of the cabin, ordinarily dry except for a small seepage from the spring... was flowing a stream of water with an estimated maximum depth of three feet and a width of 50 to 60 feet within ten minutes after it started to rain. Maximum flow continued for about ten minutes and then subsided rapidly, the heavy down pour having ceased. The next morning the drainage in question was free of any perceptible flow of water, as usual. The volume of water which fell may best be judged when it is known that the drainage area above the cabin would perhaps not exceed 50 to 100 acres.

Examination on September 11 disclosed that the flash flood of September 10 had wiped out practically everything in its path, between the McGee Ranger Station and Trout Creek. Part of the old Midland Railroad trestle… had been swept away; the Trout Creek road was washed out for perhaps 100 yards... and the entire bottom of McGee Gulch, formerly supporting sod, aspen and willows for much of its length, was a gulley... (Clark, 1939)

There was a 600 foot washin at Schwanders 2 to 4 feet deep (a continuing problem from Trout Creek)... (Chappell, and others, 1974, p. 154)

U.S. Forest Service photographs taken in 1921 document the severe erosion in Trout Creek (**Fig. 5**).

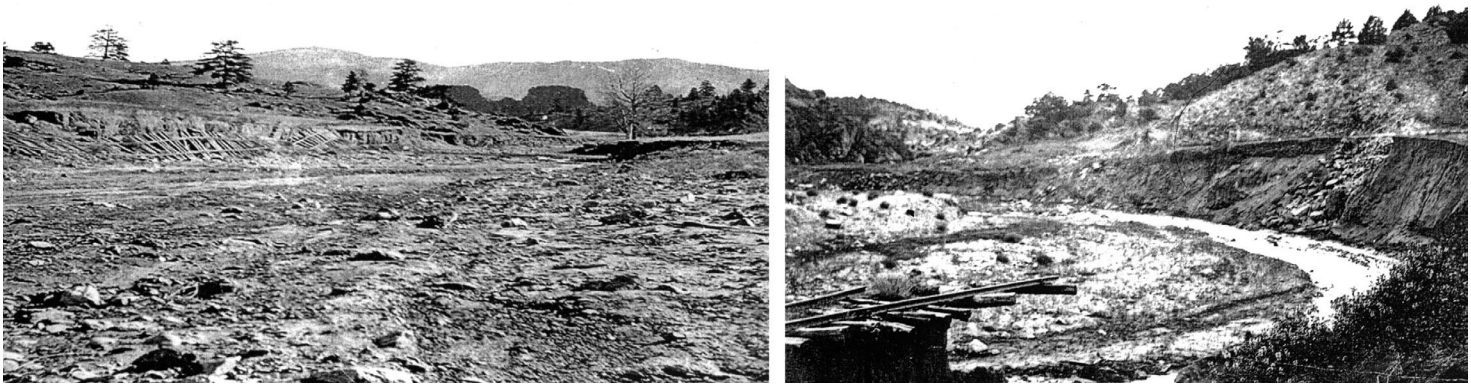


Figure 5 – Erosion and railroad damage in Trout Creek (U.S. Forest Service#160469, #156337, 1921).

25 July 1923

CLOUD BURST HIT ROADS — ROADS AND CROPS BADLY DAMAGED — STATE HIGHWAY WASHED OUT IN MANY PLACES — WATER IN TROUT CREEK GOES OUT OF ITS BANKS — HIGHEST IN YEARS

The Trout Creek section, Wednesday afternoon, was visited by one of the worst cloud bursts in years, when the entire watershed was in the grip of the storm for over an hour. Trout Creek, which in normal times is a small stream, was converted, in a few minutes, to a raging, muddy river, carrying huge boulders and trees to the low lands, destroying crops, blocking the C&S railroad at the old station of Schwanders, putting the county road out of commission and doing considerable other damage.

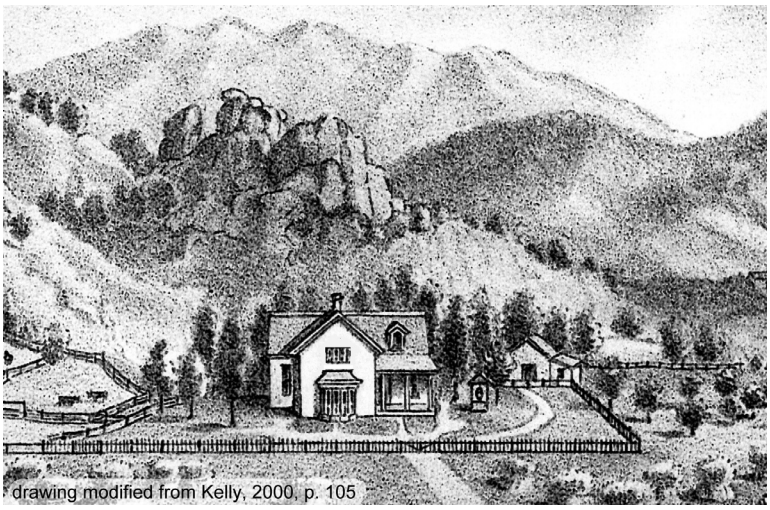
The greatest destruction occurred in the canon which is traversed by the state highway... In some places the road has been completely wiped off the map, and the raging torrent cut the banks away close to the rocky cliffs, and a new road will have to be built. (Chaffee County Republican, July 27, 1923, p.1)

1924

In 1924 a terrible cloud burst up on Trout Creek Pass came down. It washed out bridges and track of the Denver South Park and Pacific and the huge wall of water carried tons of sand. This water and sand flooded and filled the bottom of the [Schwander] *two story house. The orchard was also covered in three feet of sand. Gus Friskey and his mother were living in the house at the time. Gus tells that he and his mother only had time to run upstairs as the water and sand buried the lower level of the house. Everything in the ground floor of the house was covered with sand and debris.* (Kelley, 2000, p.106) (**see Fig. 6**)

[Author's Note: As of 2019, this date has yet to be confirmed. The account of track being washed out is at odds with railroad records, which indicate that all tracks were removed before 1924: *Finally, in 1922, the Garos-Macune section was completely dismantled and all rails removed. The work began August 7th, and was completed October 21, 1922* (Poor, 1976, p. 392); it also conflicts with the oral account of Joe Cogan (Keidel, 1999), see section "1 August 1908" earlier in the report.]

c. 1890 *– Two-story house was built by Benjamin Schwander in 1864. Schwander established an apple orchard and hay meadows. The Friskey family lived in the house when it was buried by flood sand and gravel.*



c. 1960 *– Sketch by Dale Kaiser (courtesy Suzy Kelly)*

2016 *– A few apple trees survive.*

Figure 6 – History of the Schwander house at the mouth of Box Canyon.

ca. 1932

A series of U.S. Forest Service photographs taken in 1932 and 1933 shows flood erosion in Trout Creek and in Mushroom Gulch from a storm in 1932 (**Fig. 7**).

TROUT CREEK FLOOD DEPOSITS

Historical floods in Trout Creek carried sand and fine gravel out onto the relatively flat floor of the Arkansas River valley below Box Canyon and spread this material throughout an extensive area down to the Arkansas River near Nathrop. Flood deposits can be recognized by the caliber of the material—sand and small pebbles, and lacking cobbles, and by the inclusion of pebbles of a distinctive volcanic rock—a dacitic ash-flow tuff that comes from Triad Ridge along Trout Creek (Fig. 1).

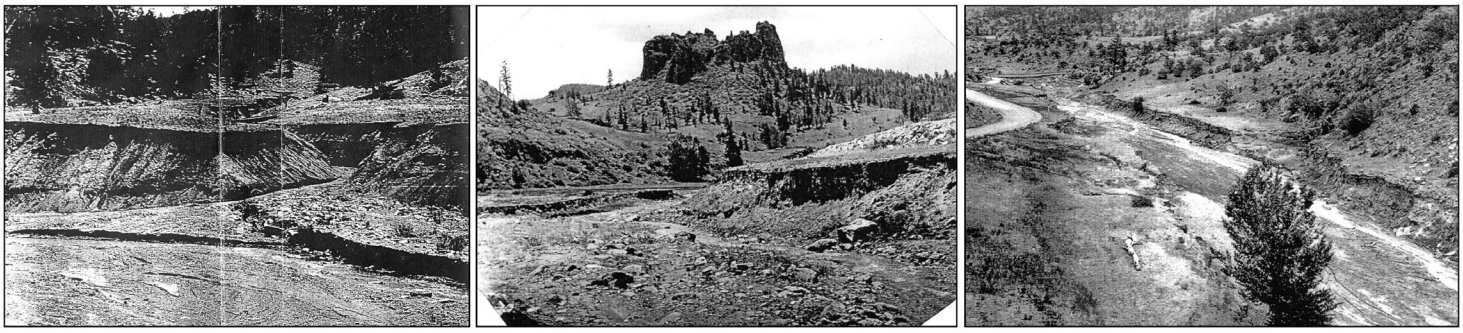


Figure 7 – Flood erosion in 1932 (U.S. Forest Service #279065, #279067, c. 1932).

TROUT CREEK FLOOD EROSION

Unchecked flood waters cut deep gullies in nearly all tributaries to Trout Creek and incised the floor of lower Trout Creek. This incision was well illustrated in the previous discussions of railroad washouts and in U.S. Forest Service photographs. It is still apparent, as shown in **Figure 8**. Published geologic maps further document this erosion: *modern stream-channel deposits of the tributaries to Trout Creek... are graded to a level about 10 ft above the modern stream level of Trout Creek.* (Keller and others, 2004, p. 8).

Figure 8 – Tributary alluvial fan in Trout Creek. The near part of the fan was truncated by flood waters in Trout Creek; lowering of Trout Creek caused the tributary to incise its fan about 12 ft. (Photograph 4 August 2016).

Trout Creek flood deposits cover almost 1,000 acres below Box Canyon. They are spread throughout an area about 3,000 ft wide and extend for 2½ miles down to the Arkansas River (**Fig. 9**). The flood deposits effectively filled in the ancestral Trout Creek drainage all the way to the Arkansas River. Flood deposits flattened the entire surface width of the drainage, so that the course of ancestral Trout Creek cannot be recognized today (**Fig. 10**). According to the railroad map of c. 1884 (Poor, 1976, unnumbered plate titled Buena Vista and Nathrop District), Trout Creek initially flowed west out of Box Canyon, but today that area is so flat that it is irrigated with a center-pivot sprinkler (Fig. 2).

Thickness of the flood deposits has not been determined. The deposits are estimated to be 18 ft thick in Box Canyon (**Fig. 11**). During construction of the Trout Creek dam in Box Canyon, rail-

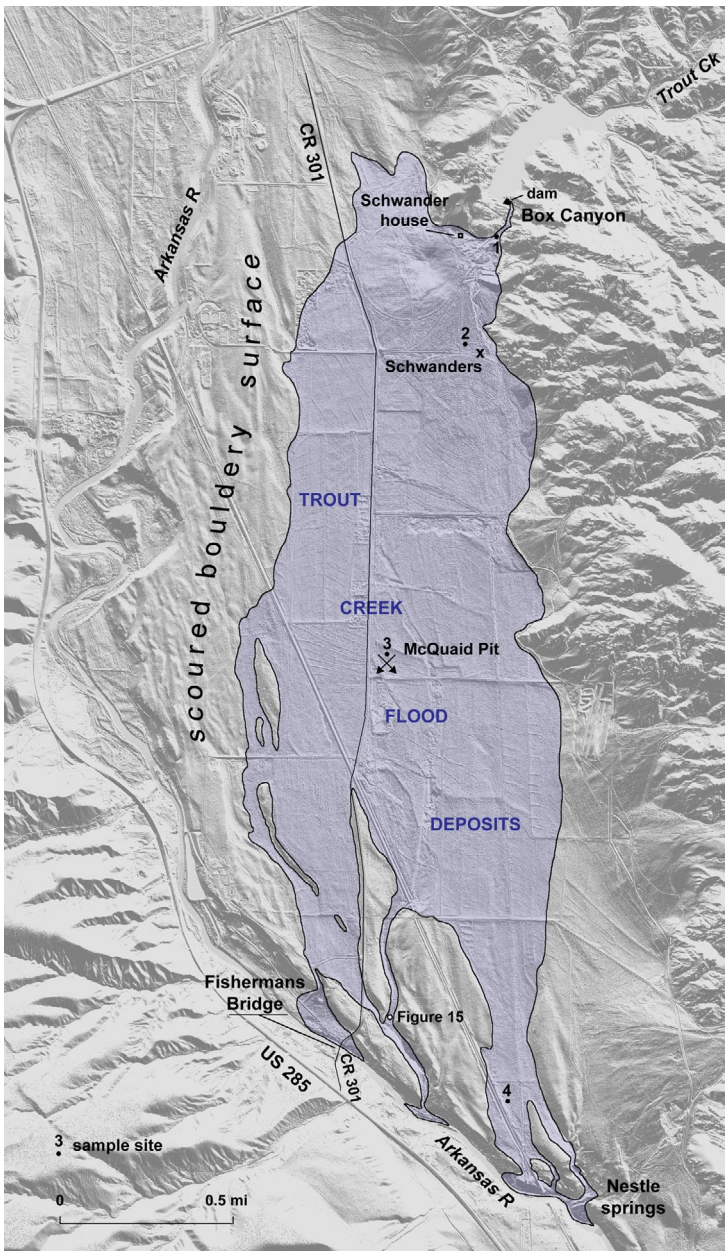


Figure 9 – Distribution of flood deposits below Box Canyon (the dam was completed in 2001).

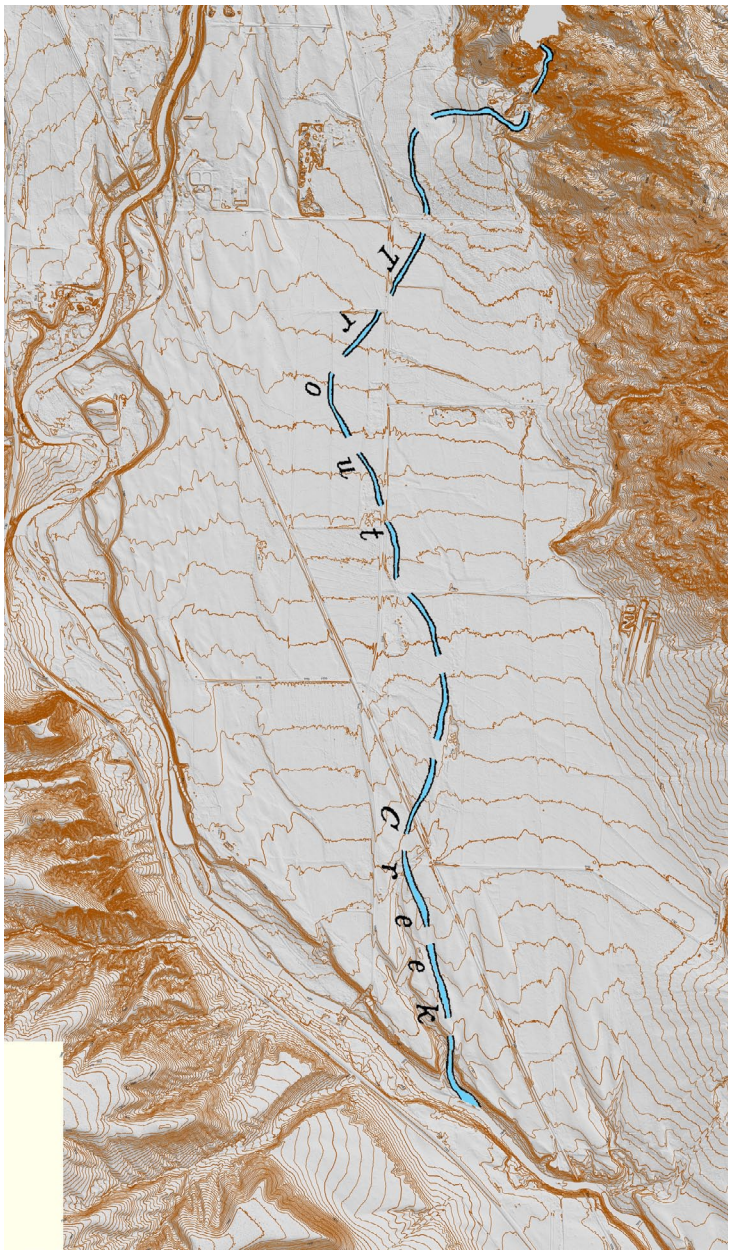


Figure 10 – Flood deposits from Trout Creek spread out over the Arkansas Valley floor to produce a very flat surface sloping to the south. Contour interval is 5 ft. Ancestral Trout Creek c. 1884 from Poor, 1976, base map by author.

road tracks were excavated at a depth of 13 ft (Paul Moltz, 2016, oral communication), and historical photographs support an estimate that the track bed was about 5 ft above the creek. The deposits that buried the Schwander house (see Fig. 6,) were estimated to be 8–10 ft deep (Woody, 1935), and a mile and a quarter south they are still more than 6 ft thick at the McQuaid Pit (**Fig. 12**).

Size of the material in the flood deposits decreases with distance from Box Canyon as well. In the canyon, the flood material is mostly sandy small pebbles, but it changes in a short distance to predominantly sand with small pebbles. At the distal end of the flood deposits, the material is sand and silt (**Figs. 9, 13**).

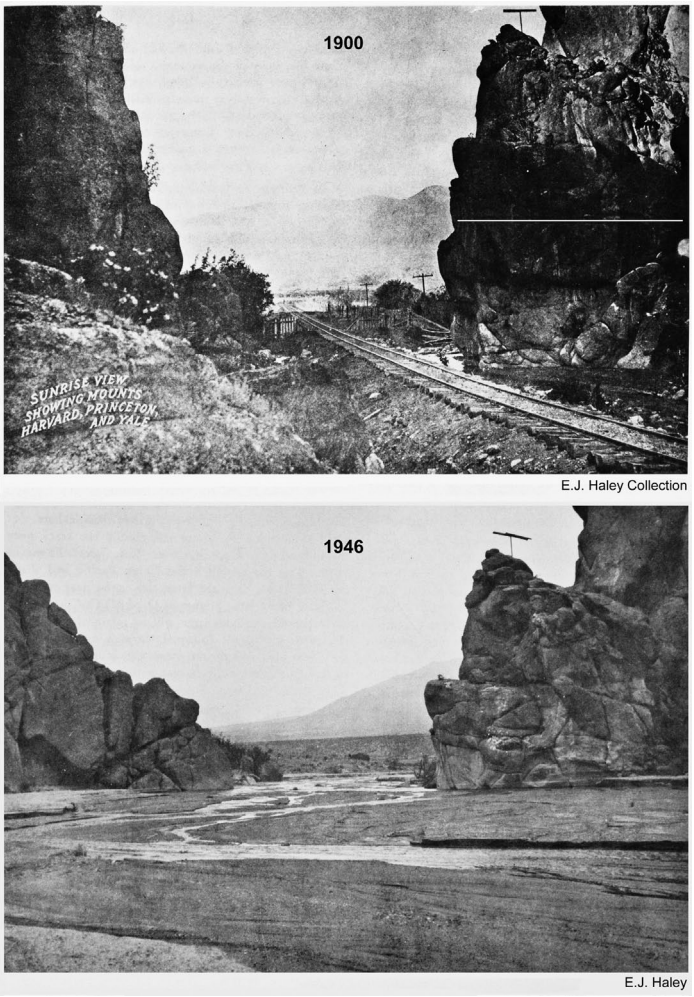


Figure 11 – Flood deposits in Box Canyon in 1946 were about 18 ft above the streambed of 1900. Horizontal line in upper photo indicates the level in 1946.

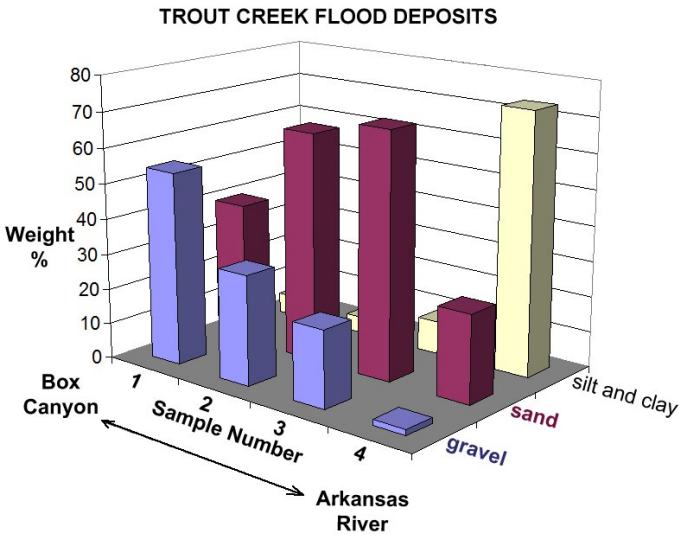


Figure 13 – Distribution of sediment sizes in flood deposits (sample locations are shown in Fig. 9).

The flood deposits consist of individual mineral grains of quartz and feldspar and small rock fragments (**Fig. 14**). This material is primarily grus (compare with Fig. 3), with added pebbles of ash-flow tuff from Triad Ridge.

Below Box Canyon, the historical flow of Trout Creek (in the 20th Century, before construction of the dam) followed a meandering path cut only a few feet into the flood gravel surface. Today, Trout Creek near its confluence with the Arkansas River is a dry ditch (**Fig. 15**).

Figure 12 – Flood deposit in McQuaid Pit is more than 6 ft thick, composed primarily of sand with fine gravel.

Figure 14 – Flood deposit at the Schwander house is primarily grus with pebbles of ash-flow tuff from Triad Ridge.

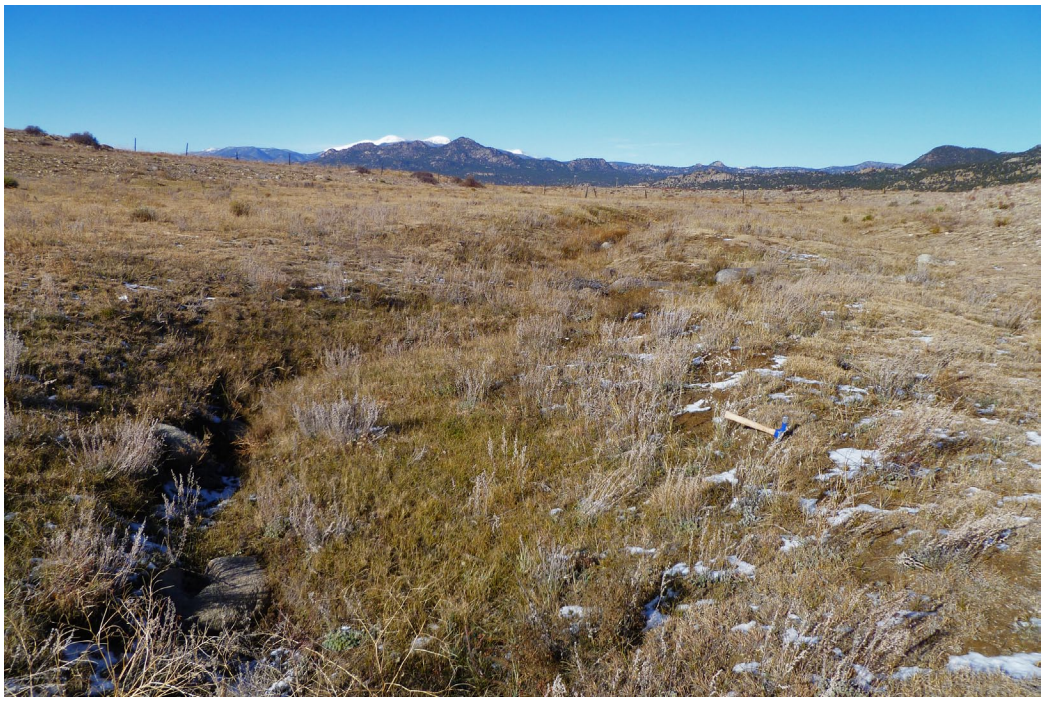


Figure 15 – Trout Creek today, about 1500 ft from its confluence with the Arkansas River (location shown in Fig. 9).

This scour surface is quite evident beyond the edges of the flood deposits (see Fig. 9). Relief on this surface is about 3–5 ft, so it would require only 3–5 ft of flood sediments to smooth out the scoured surface. As noted, in about the middle of the Trout Creek flood-deposit area, at the McQuaid Pit, the flood deposits are more than 6 ft thick.

Although prehistoric floods may have contributed some flood sediments, historical floods alone appear capable of delivering all of the mapped flood deposits.

AGE OF TROUT CREEK FLOOD DEPOSITS

When severe flooding began in Trout Creek is unknown. The historical accounts given above strongly suggest that the railroad activities themselves initiated the severe floods. Surely there were floods prior to this, albeit of less severe consequences. What appears clear, however, is that most of the flood material carried out onto the Arkansas River valley floor came from the historical floods.

In Box Canyon, historical flood sediments are about 18 ft thick, and they lie on only about 7 ft of older sediment (**Fig. 16**). Whether the older material consists of flood deposits or normal stream alluvium is unknown.

The Schwander house was buried by about 8–10 ft of flood sediment (Woody, 1935). Not far from Schwanders, a draft horse, still in harness, was completely buried (Joe Cogan, 2015, oral communication). At Schwanders, the Denver South Park and Pacific railroad tracks were covered with 2–4 ft of sand in one storm (Chappell and others, 1974, p. 154).

The Arkansas River valley floor below Box Canyon consists of Pleistocene flood gravels that were scoured by a catastrophic glacial outburst flood that came down the Arkansas River about 19,000 years ago (Lee, 2010; Lee, in press).

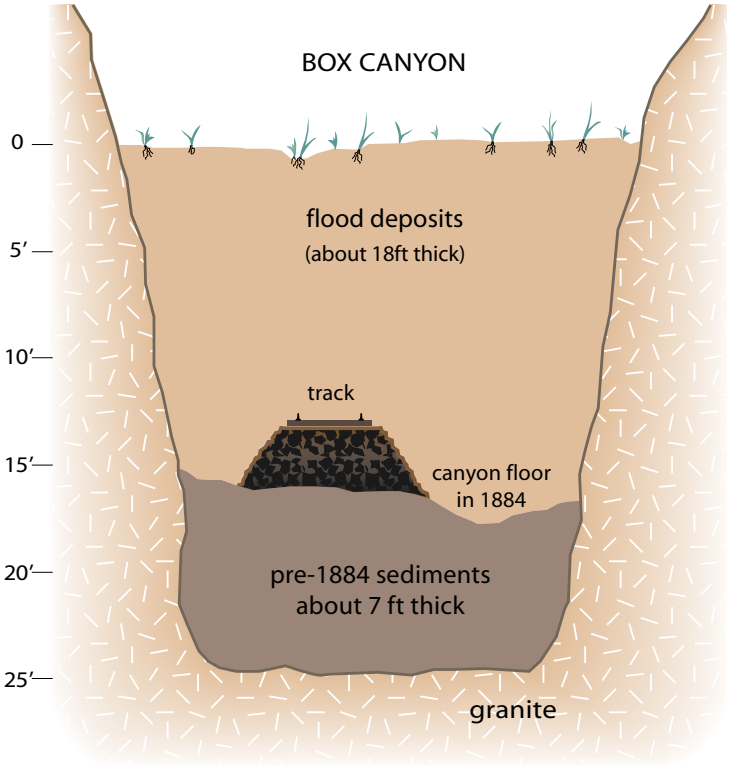


Figure 16 – Cross-section of Box Canyon based on information from damsite excavation (Paul Moltz , 2016, oral communication).

WATERSHED REMEDIATION

The U.S. Forest Service began restoration and remediation in the Trout Creek watershed in the early 1930s. Intensive work began in 1933 when a Civilian Conservation Corps camp was established in Castle Rock Gulch. Throughout the rest of the 1930s, the young men of this Corps, under the supervision of the U.S. Forest Service, installed some 54,000 check dams in gullies throughout the headwaters [Jauch, 1957].

Contour ditching, grass seeding, and planting of riparian vegetation and upland conifers successfully restored much of the damaged area. A flash flood occurred in Chubb Park on 1 September 2013; the very limited erosion that resulted demonstrates the success of these efforts (**Fig. 17**).

ACKNOWLEDGMENTS

I gained an initial insight into the nature of the Trout Creek storm flood deposits from discussions with Marilyn Diamond and Ed Anderle at the Diamond gravel pit. Additional understanding came when I asked longtime Buena Vista resident Ada Morrison about a flood from Trout Creek and she replied, "It buried a house!"

Joe Cogan gave me a tour of the Trout Creek watershed, pointing out evidence of the damage caused by human activities, and he allowed me to read his manuscript detailing this abuse. Paul Moltz guided me through Box Canyon and provided valuable reports on the nature of the flood deposits in Box Canyon. Suzy and Bryce Kelly discussed their knowledge of the floods. Tom Tomson was very helpful in providing historical documents at the Buena Vista Heritage Museum.

Sam Schroeder described for me the U.S. Forest Service remediation efforts and provided numerous historical photographs.

Many landowners in the area graciously provided access to their properties.

I thank Mary-Margaret Coates for her detailed review of this report and for her numerous suggestions for improved clarity. Matt Morgan and John Hopkins provided encouragement and guidance in the publication stage, and Larry Scott crafted some of the illustrations.

Lidar data acquired by the U.S. Geological Survey in 2010 were an invaluable aid in mapping the extent of flood deposits and creating accurate maps.

Figure 17 – Trout Creek at the bottom of Chubb Park shows very little erosion after the flash flood of 1 September 2013 (photo courtesy of Sam Schroeder, U.S. Forest Service).

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