

GRAND CANYON NATURE NOTES



MARCH 1934

VOLUME 8

NUMBER 12

GRAND CANYON NATURAL HISTORY ASSOCIATION

ADVISORY COUNCIL

Educational Development:

- Dr. John C. Merriam, President Carnegie Institution.
- Dr. Homer LeRoy Shantz, President University of Arizona.
- Dr. Harold S. Colton, Director Museum of Northern Arizona.

Geology:

- Dr. David White, U. S. Geological Survey.
- Mr. Francois E. Matthes, U. S. Geological Survey.

Paleontology:

- Dr. Charles E. Resser, U. S. National Museum.
- Dr. Charles W. Gilmore, U. S. National Museum.

Mammalogy:

- Dr. Vernon Bailey, U. S. Biological Survey.

Ornithology:

- Mrs. Florence M. Bailey, American Ornithological Union.

Herpetology:

- Mr. L. M. Klauber, San Diego Museum of Natural History.

Botany:

- Dr. Forrest Shreve, Desert Laboratory, Carnegie Institution.

Entomology:

- Dr. Frank Lutz, American Museum of Natural History.

Ethnology:

- Dr. Clark Wissler, American Museum of Natural History.

Archaeology:

- Dr. Harold S. Gladwin, Gila Pueblo.
- Mr. Jesse L. Nusbaum, Director Laboratory of Anthropology.

BOARD OF DIRECTORS

- | | |
|-------------------|--------------------|
| Victor Patrosso, | Mrs. E. J. Kirwan, |
| James V. Lloyd, | Emery C. Kolb, |
| Frank C. Spencer, | L. G. Carr, |
| M. R. Tillotson. | |

TREASURER

B. G. Carson, M.D.

EXECUTIVE SECRETARY

Edwin D. McKee, Park Naturalist

GRAND CANYON NATURE NOTES

Volume 8, Number 12.
March 1934.

Office of National Parks,
Buildings and Reservations,
Grand Canyon National Park.

Grand Canyon Natural
History Association
Grand Canyon, Arizona

This publication is issued monthly for the purpose of recording observations and of making known the results of research and scientific investigation in the Grand Canyon region in the fields of natural history, history and related subjects. It is published by the Natural History Association for the Grand Canyon National Park. Membership in this Association is \$1.00 per year and includes a subscription to Nature Notes. Additional copies of Nature Notes may be obtained at 10¢ each by addressing the Grand Canyon Natural History Association, Grand Canyon, Arizona

M. R. Tillotson,
Superintendent.

Edwin D. McKee,
Park Naturalist

Table of Contents

The Grandview Copper Project

- I History of Grandview Mine. Page 250
- II Geology of Grandview Mining Area Page 255
- III Mining Methods at Grandview. Page 257
Hugh H. Waesche, Blacksburg, Virginia
- An Unseasonable Season Page 259
Junior Naturalist D. E. McHenry
Illustrations by Florence Satterwhite.

THE GRAND VIEW COPPER PROJECT

By H. H. Waesche*, Dept. of Geology,
Virginia Polytechnic Institute.

I. HISTORY OF GRANDVIEW MINE.

THE Grandview Copper Mine is located in Grand Canyon, two thousand five hundred feet below the South Rim. It is in the upper part of the Redwall limestone where that stratum forms a great promontory known as the Horseshoe Mesa. The mine is located at the southern end of that mesa and the camp site nearby may be readily seen from Grandview Point. It is one and one half miles north of Grandview and four miles by trail from it.

The story of the mining property is linked with that of the Grandview Hotel, and with the name of Pete Berry, one of the "old timers" of the Grand Canyon Region. Berry came to the Grand Canyon in February, 1890, where, after locating mining property, he started building the famous Bright Angel trail the following fall. In July 1892 Mr. Berry started work on the Grandview trail. In the fall of the same year he erected out of native logs the first building, one hundred and ninety three feet in length, at Grandview, and also constructed a cistern in conjunction with the log structure. Several years later a three story building was constructed at the same locality by the Canyon Copper Company and used as a hotel. Mr. Berry was in charge of the hotel from 1897 to 1902. He gave up this work in 1903. At that time a frame building was put up and used for guests until October 1907 when it was closed, but Mr. Berry and his wife continued to

* Data obtained largely from Mr. P. D. Berry in July, 1932. Mr. Berry was then quite ill, and the material was given in a rather disconnected manner. Grandview Copper mine was visited by the writer in July, 1932.

② Abandoned machinery -
Grand View Mine.

③ Laboratory of the Grand
View Mine.



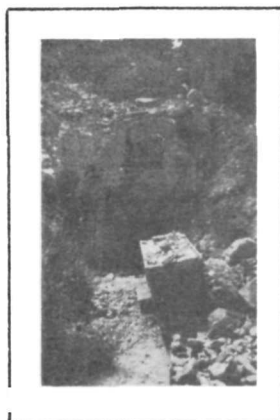
④ Supai formation -
showing fold - looking
west from Grand View Mine.

Dump at lower level, ⑤
Grand View Copper Mine.



① Cabin at the Grand
View Mine.

②



③

⑥ Drift entrance at
lower level of
Grand View Mine.

④



serve meals for the Fred Harvey company until late spring of 1908. Early in 1910 Mr. Smith, the general manager of the Canyon Copper Company, called on Mr. Berry to discuss disposition of the hotel and mining property. Berry offered to keep the hotel open for one thousand dollars a year and the offer was accepted, operation being resumed in 1911. On the first of October Mr. Berry gave Mr. William Randolph Hearst an option on his share of the property. A deed closing the deal was finally drawn up in 1913, Milt Powers, a banker of Flagstaff, assisting in this matter. The property now belongs to Mr. Hearst.

Mr. Berry had such faith in the value of Grandview property that as a special inducement to his friends, he offered to give anyone of them a lot if he would build a two-thousand dollar residence on it and put in a cistern. No one seemed inclined, however, to accept this offer until after it was too late and the property had been transferred to Mr. Hearst. Mr. Berry stayed at Grandview until January 1917 to finish up some business, and at the same time to be near his son Ralph Berry who lived at what is now known as the Berry Ranch, about ten miles to the southeast. It was about this time that the son died, and Mr. Berry moved to the ranch where he remained until his death in 1932.

It was in April, 1890, that Mr. Berry located the Grandview Copper Mine and worked on its assessments. It was one of five mining prospects which he had discovered, three of which were patented and were within the Grand Canyon. A fourth was at Grandview Point and was later patented as a mill site and supply center. Among those interested in patenting and locating the mines were Ralph and Miles Cameron, Bo Ferguson, McMillan, a rancher, and Pete Berry. McMillan put up the grub stakes and was later paid for his share. Ferguson was soon ruled out, as he refused to do his share of the work. Ralph Cameron is probably the only one of these men now alive. Contentions within this group separated its members so that in years later they did not keep in touch with each other.

About 1900 the property at Grand View was sold to the Canyon Copper Company. The rights included both the hotel and the mine. The Canyon Copper Company was organized in Vermont

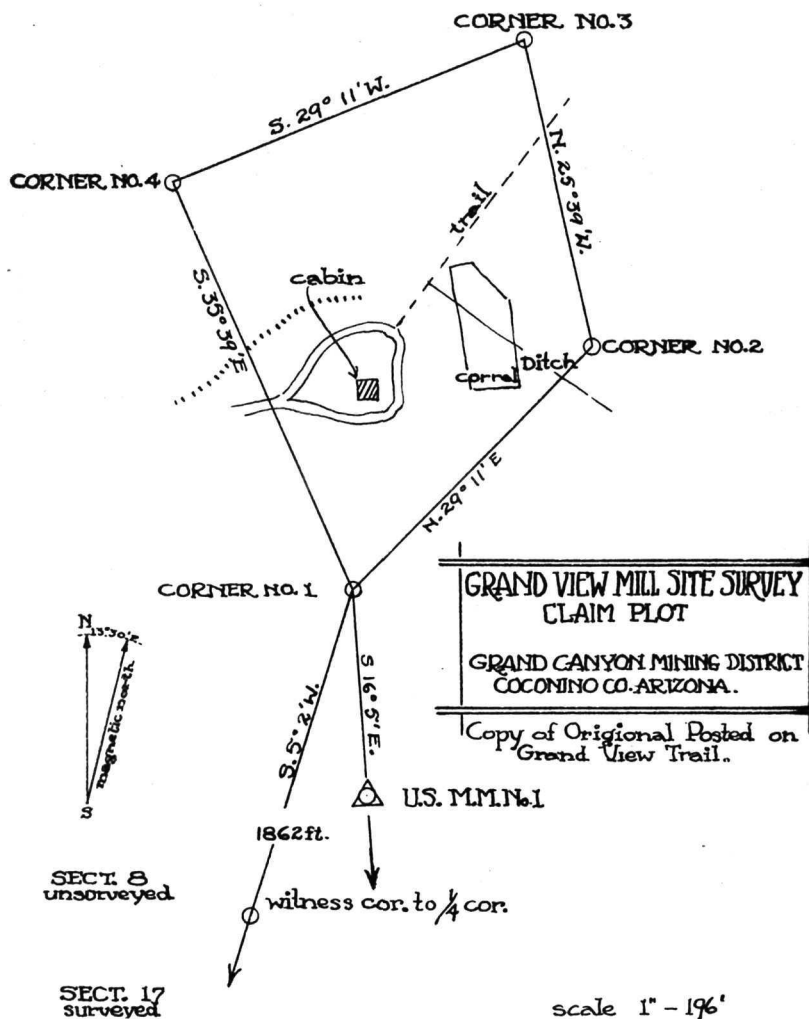
and was composed of a group of eastern men. One of the chief organizers of the company was a man whose name could not be recalled by Mr. Berry. It seems that this man had run into a bad deal through the purchase of some land known as the X B property, now known as the Buggeln Ranch, and his help was part of a plan to even up on his previous losses. Apparently he succeeded, after which he severed relations with the Canyon Copper Company. He later became quite prominent in the mining and smelting industry in Arizona, and was responsible for the construction of the smelter at Humbolt.

John H. Page was made President of the Canyon Copper Company, and Harry Smith became general manager of the mine and hotel property. Mr. Page is still living and makes his home in Phoenix, Arizona. Mr. Smith died about four years ago. It was from this company that Mr. Hearst obtained the property through Mr. Berry's negotiations.

The Grandview trail which was completed in 1893 was primarily intended to be used in working the Grandview Copper Claim, however, it was used also as a route over which to take tourists from the hotel down into the Canyon. Many people from all over the world made this trail trip, under the guidance of Captain John Hance, famous guide and story teller. The last party taken down by Mr. Berry was in 1916. It was composed of a group from Phoenix, among whom was Charley Schultz.

Ore from the Grandview mine was brought up the trail by mules and burros. Each mule carried a load of about two hundred pounds and could average a trip and a half per day. A mule train consisted of from eight to ten mules. The cost of building and keeping up the Grandview trail during the time it was used was estimated by Mr. Berry to have been about twelve thousand dollars.

A copy of the original survey plat and a description of the mine and mill site, dated 1919, give an idea of their location. The plat is posted just off the Grandview trail in a prospect hole a few hundred feet from the tunnel entrance to the lower level. (See accompanying copy)



GEOLOGY OF GRANDVIEW MINING AREA.

From brief examination it is concluded that, although in a different stratum, the origin of the Grandview ore is similar to that of the copper carbonates found on the Coconino Plateau at Anita¹. The probable influence of structures was also similar in these two localities. The Grandview ores are found in the upper beds of the Redwall limestone of the Mississippian age. The Redwall is underlain by the Muav limestone of Cambrian age which in turn is underlain by the Bright Angel shale and Tapeats sandstone successively, of the same period. Rocks of Algonkian age are missing in this locality, but are present directly across the Colorado River. Separated by a great unconformity from the Tapeats sandstone is the Vishnu schist of Archean age. The Supai formation, the Hermit shale, the Coconino sandstone and the Kaibab limestone normally overlying the Redwall have been removed by erosion during the formation of the Grand Canyon. The Redwall in this part of Grand Canyon is about five hundred feet thick, and is a fairly pure limestone.

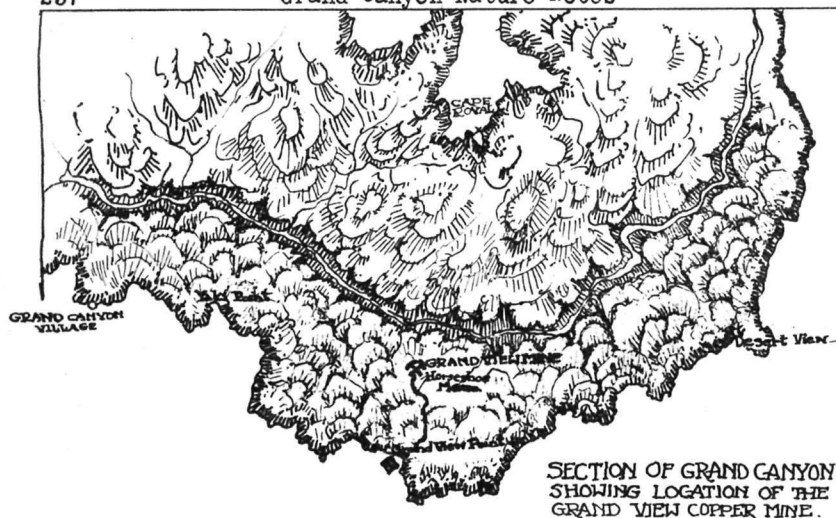
In general the rocks composing the walls and buttes of the Grand Canyon are nearly flat-lying, forming a plateau surface on either side of the great gorge, but doming very slightly north and south. Transverse to the direction of flow of the river there are a number of faults such as the Bright Angel. At Grandview there is a very definite fold of a monoclinal nature. The strike of this fold is N.65°E. with the crest running to the south of the Grandview mine. Some minor faulting and zones of brecciated material which are parallel to its axis, are present in the Redwall where it has been affected by the deformation. It is quite likely that this flexing of the otherwise undisturbed sediments has had a direct bearing on the origin of the copper ores.

The ore minerals at the Grandview mine are almost exclusively the copper carbonates - azurite and malachite. Associated with these minerals are calcite, cuprite, dendritic manganese and some galena. These ores are found filling veins in the limestone.

It seems very probable that the copper bearing solutions

may have gained access to the Redwall along the channels created by the faulting, folding and consequent brecciation of the sediments. These solutions have replaced the soluble limestone along these fissures leaving small lenses and stringers of carbonate ore. The ore is richest along the brecciated zones. Mineralization extends downward several hundred feet, but concentration diminishes at lower levels. The source of this ore is doubtful. It is hardly possible that it could have been derived directly from magmas. The pre-Cambrian granite intrusion of the Vishnu schist and the forming of diabase sills in the Algonkian rocks occurred long before the Paleozoic sediments were deposited, and no later igneous activity is known in the immediate vicinity. Furthermore the minerals themselves indicate that the ore is not related to igneous activity, for none such as fluorite, tourmaline or apatite have been observed. Likewise there are no arsenic or antimony compounds present, which would further suggest that the source was not magmatic. Chalcopyrite, which is found in surface deposits of the plateau, may have been derived from oxidized sulfate solutions brought down from overlying strata or it may have been derived from concentration of copper present in the Redwall itself. It is possible that chalcopyrite was the original copper mineral present, and was later oxidized to form the existing ores. The distribution of the replacements suggest that they were deposited in the limestone by descending meteoric waters. The veins of copper follow brecciation zones which are vertical or steeply inclined, but which branch and assume a more horizontal position as they descend.

The idea of deposition by descending waters is supported by the fact that Triassic sediments which are present to the north of Grand Canyon and which at one time extended over the Kaibab Plateau are known to be copper bearing². From this it would seem that at some period after the Triassic sediments had been deposited above the Kaibab formation, the region was subjected to deformation resulting in the doming of the plateau as well as the faulting and folding evidenced. The fracture zones which resulted from this disturbance would have offered easy access to meteoric waters carrying the copper-bearing solutions from the Triassic sandstone to the Paleozoic strata below.



MINING METHODS AT GRANDVIEW.

Mining methods at Grandview were on a small scale. Crosscuts were run from two drifts which had been driven into the face of the Redwall. A shaft was sunk to these drifts which were about one hundred feet apart vertically and small stopes were extended from the crosscuts. Ore was raised from the drifts to the top of Horseshoe Mesa by means of a mule-operated hoist. Waste was dumped into the canyon from the lower drift. Transportation in the mine was probably largely by wheelbarrow, although on the lower level a light, narrow-gauge track led to the dump. Pick and shovel were the mining tools most used, and the ore no doubt was shot down by some form of explosive. Little evidence remains to tell the story of the operations within the mine. Most of the development was done after the property had been taken over by the Canyon Copper Company.

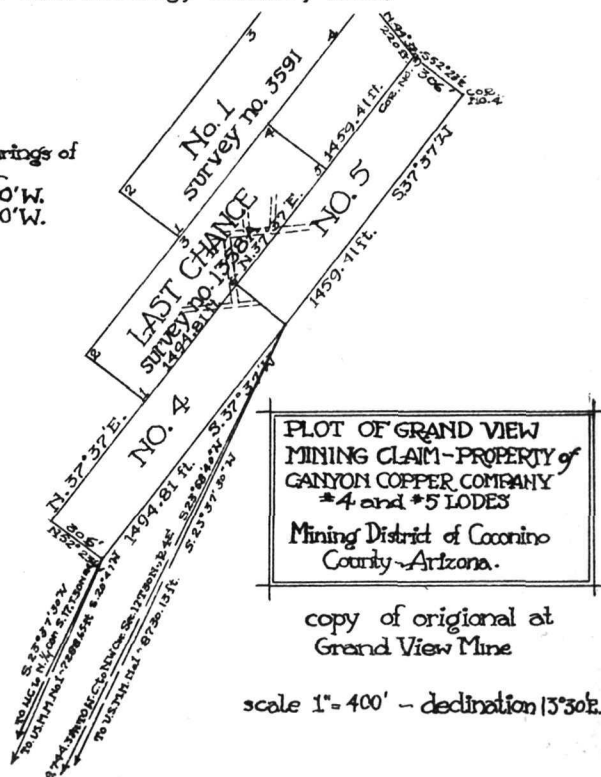
The greater part of the ore taken from the mine and shipped to El Paso was hauled in wagons to Apex, the nearest railroad point. Work was discontinued in this mine in 1907 because of the decline in the price of copper which was a direct result of the discovery of methods of handling the large bodies of low grade ores so extensively distributed in Arizona and Utah. The Grandview ores, however, were of high

quality. One piece of ore, on analysis, was shown to have contained seventy per cent copper. It weighed over seven hundred pounds and was on exhibit at the World's Fair in Chicago in 1893.

Very little work has been done on the ores of the plateau and Grand Canyon region, but they offer an opportunity for some interesting study in the future. It is hoped that sometime soon a careful examination of these deposits will be made.

1. The Anita Copper Mines, by H. H. Waesche, Grand Canyon Nature Notes, Vol. 7, No. 11, pp 108-112, Feb. 1933.
2. Copper Deposits of the Kaibab Plateau, Arizona, by E. P. Jennings, Salt Lake City, Utah. Transactions of the A.I.M.E., New York meeting, October, 1903.

Approximate Bearings of
Existing Tunnels—
Lower ~ S. 76° 30' W.
Upper ~ N. 25° 30' W.



AN UNSEASONABLE SEASON

By Donald Edward McHenry, Junior Naturalist.

NOW the weather has joined the category of unusual features at the Grand Canyon. Seldom has there been a winter season with such a consistent succession of spring-like days. One old timer in the region, Dan Hogan, tells us, however, that in 1890 and in 1901 the winter seasons were somewhat like the present one as we have experienced it to date. On November 30, 1933, Thanksgiving Day, there was a light snowfall of three inches, and December 16 and January 2 have been the only other days during which we have had any snow during the period considered. Then the snow was only four inches and two inches respectively. There have been five days during which we have had precipitation in the form of rain, which altogether has totaled .25". Otherwise the weather has been clear and mild to date.

It is not surprising then that some of our wild flowers are in blossom at this time of the year when the ground is normally completely covered with mid-winter snows. On January 31, the writer discovered a plant of Filaree (*Erodium cicutarium*) in flower and fruit outside Yavapai Observation Station. On February 3, a wild carrot was found blooming beside Wayside Museum, and on the next day another flower of this family was seen at Yavapai Point. All along the South Rim the Cliff Roses and Fern Bushes are green with new leaves. Here and there, crouched close to the ground and usually in sheltered places, one discovers the first green of some low perennials. February 14, the Cottonwood trees at Phantom Ranch at the bottom of the canyon began to show color of new leaves, visible even from Yavapai Point. On February 19, Ranger Ed Laws, as he was eating lunch in the open on the South Rim, found a Horned Toad (*Phrynosoma douglassii*) sunning itself.

Such evidences as these are decidedly out of season and in strong contrast to the severe winter being experienced in the eastern United States and in some other parts of the continent. It is noteworthy also that one of the mildest of our

winters should come so close on the heels of one of the most severe ones ever experienced in this region. The winter weather of 1932-33 began with a snowfall on Armistice Day, and from then until near the end of March the ground was continuously covered with snow. During the present winter, snow has remained on the ground for the most part only in more or less inconspicuous patches scattered in protected spots beneath trees.

Such weather as we have had to date this winter, although most delightful for visitors to Grand Canyon, nevertheless presents a serious threat to the moisture necessary for the coming growing season. Our spring moisture is largely derived from melting snows. Under the present circumstances it is not likely that we will see the usual number of spring flow-ers which add much beauty to the slopes and rims of the Canyon. There is, of course, the possibility that we may have as unusual weather during the coming spring season as we are having this winter. In that case we may have moisture from rains at a time when rains are not usually expected.

The following table gives comparative meteorological data for the last three winters on the South Rim, including a period from November 11 to February 20 in each case. The winter of 1931-32 is given as an example of a severe winter at the Grand Canyon, that of 1932-33 as an average, and the present season of 1933-34 as an unusually open season. This meteorological data was furnished by Ranger Robert R. Williamson - weather observer for Grand Canyon.

	1931-32	1932-33	1933-34
Total snowfall	87.9"	67.4"	10.5"
Greatest single snowfall	11.5"	8.0"	4.0"
Average monthly mean temperature	27.5°	32.2°	37.8°
Average monthly mean Max. temperature	41.2°	45.8°	49.7°
Average monthly mean Min. temperature	19.4°	18.9°	26.0°
Absolute maximum temperature	60.0°	65.0°	64.0°
Absolute minimum temperature	5.0°	14.0°	2.0°

