

Geology and Mineralization of the Whipple Mountains

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Location

The Whipple Mountains are located due north of Parker, Arizona and about 40 Miles south of Needles. The range is oriented roughly east – west, and extend a distance of about 30 miles west from the Colorado River to US Highway 95. On the east side of the range are two reservoirs which are part of the Metropolitan Water District water project; Gene Wash and about 2½ miles to the west, Copper Basin Reservoirs. Just west of the Copper Basin Reservoir is Monument Peak, a prominent pinnacle that is visible for miles. On the west side of the range, Savahia Peak rises over 1,000 feet from the area surrounding it. Elevations range from about 400 feet along the Colorado River near Parker, Arizona to 4,130 at a bench mark named Axtel.

Geology

Davis and Anderson (1994, p. 25) consider the Whipple Mountains “the best exposed Tertiary metamorphic core complexes in the U. S. Cordillera.” The structure of the Whipple Mountains is dominated by a low-angle detachment fault of Tertiary age. This fault, the Whipple Mountains detachment fault, separates a lower plate exposed in the core of the range from an upper plate exposed around the flanks. Studies in nearby areas suggest that the detachment fault has considerable vertical offset, as well as unknown horizontal offset, and juxtaposes rocks that were originally at different levels in the crust.

In the Whipple Mountains, rocks below the fault are comprised largely of Proterozoic metamorphic and plutonic rocks. The Proterozoic rocks have a gently dipping mylonitic foliation associated with Cretaceous and Tertiary granitic sheet intrusions. Petrologic studies suggest that the granitic sheets were emplaced at depths exceeding 6 miles. Lower plate crystalline rocks above the mylonite front are intruded by Tertiary dikes of diabase to dacite composition in the Chambers Well dike swarm.

The upper plate is composed of crystalline rocks unconformably overlain by fanglomerate and basalt of Miocene age, and estuarine clay, silt, sand, and marl of Miocene and Pliocene age of the Bouse Formation. These virtually undeformed and unmineralized rocks, deposited across the deformed terrain, demonstrate that most deformation had ended by 13 million years ago.

The geology depicted on Map 1, is a synthesis of work by Howard et. al. (1994 p.27), Carr, 1991, and Marsh et. al., 1988.

Mineralization

During the 1980s, the mineral resource potential of the Whipple Mountains was evaluated by U. S. Geological Survey and U. S. Bureau of mines personnel as required for lands under Wilderness Review (Marsh, et. al., 1988).

Fifty-five mines and prospects were identified during this evaluation. A total of 693 rock samples, 57 alluvium samples, and 31 petrographic samples were collected from 55 sites. Chip samples were collected from mineralized structures when possible, and grab samples were collected from mine dumps where underground workings were inaccessible; these samples were fire assayed for gold and silver. Quantitative amounts of visible or anomalous minerals or elements were determined by atomic-

absorption, colorimetric, or X-ray fluorescence methods. At least one sample from each location was analyzed for 42 elements by semiquantitative spectrometry.

Within the Whipple Mountains, the detachment fault often crops out as a ledge of impermeable micro breccia. Below the fault is a chlorite breccia zone, up to 400 feet thick, whose rocks have been altered, faulted, and brecciated. Brecciated clasts within this zone have a matrix of chlorite, epidote, silica, and sulfide minerals, especially pyrite; the alteration and mineralization render the chlorite breccia zone hard and relatively impermeable.

The copper silicate, chrysocolla is pervasively associated with the Whipple Mountains detachment fault. Chrysocolla occurs in rocks from lower plate mylonitic and nonmylonitic assemblages to the upper plate Tertiary section, and occurs as thin coatings to small lensoid bodies up to a few inches thick. Usually chrysocolla is associated with earthy hematite, quartz, specular hematite, limonite, calcite, barite, chlorite, epidote, and sericite. Barite and calcite are more prevalent in upper plate rocks. Spotty, low-grade, gold and silver values are associated with the chrysocolla-hematite assemblage.

A mineralization halo in Proterozoic rocks at Copper Basin is related to intrusion of nearby Cretaceous granite on the basis of like potassium-argon ages of the granite and the altered rocks. The upper-plate Tertiary volcanic rocks are andesite, basalt, and tuff, which are typically altered and secondarily enriched in potassium.

On the west and north portions of the range mineralization in the lower plate rocks appears to be related to near-surface dike swarms localized along late normal faults that cut both upper and lower plate rocks.

Mining History

Reportedly soldiers first worked copper prospects in Copper Basin on the east end of the Whipple Mountains in 1862. Soon rich showings attracted the attention of prospectors, and in March 1863 the Chimawavo Mining District was established with L. B. Williams elected as recorder. The district contained rich copper ore with some silver, and one report claimed the ore was “so rich in copper that it can be pared off with a pen knife.” In November 1863 the “Chimawave Consolidated Mining Company” was working on the Union and the Colorado lodes, and a bar of metal weighing almost 6 pounds had been sent to San Francisco, smelted from 14 pounds of ore.

In 1875, John S. Jennings came to Copper Basin, and found one white man, Pete McGuire mining there. Four years later McGuire and the Levi Brothers of Signal purchased the Black Metal mine from the Chemehuevi Indian who had discovered it. Thousands of dollars’ worth of high grade ore, grossing \$200 to \$400 per ton was shipped from Black Metal Landing, where it was loaded onto a river steamboat, eventually bound for Swansea, Wales. One local resident and author, Charles Battye, recalled that “During his brief season of prosperity, Pete declared his intentions to equip his faithful burro with silver shoes, but whether or not he did so is not now remembered.”

In 1881, there was a store and a saloon at Black Metal Landing as well as a thriving mining camp. Also, around that time the Grand Central Mine was located in the Copper Basin and a five-stamp mill was installed, but the ore proved too refractory for amalgamation and the mill was later moved to the Blossom Mine near Yuma.

Around 1886, Pete McGuire, and Needles residents, Charley Monaghan, Frank Murphy and Pete Murphy owned the Black Metal Mine and did a small amount of work on it until 1890. During January, 1889, ore from the mine supposedly assayed an unbelievable 2,442 ounces of silver and 41 percent copper per ton.

About 1887 Colonel I. R. Dunkelberger had a “large stamp mill” installed at his Rincon Copper Mine, by Mr. J. C. Hoy of Needles. The Rincon was on the river about 5 miles north of the Black Metal Landing. The ill-fated ten-stamp mill only ran a short time.

Early in the 1900s mining activity picked up in Copper Basin, and on the southwest end of the range near Savahia Peak. Modest underground exploration occurred near Savahia Peak the American Eagle and D & W Mines.

No account of mining in the Whipple Mountains would be complete without mention of the famous lawman, Wyatt Earp. Earp settled in Vidal, just across the river from Parker and prospected a mine until his death in 1929 at the age of

During the late 1960s claims were staked in Copper Basin and a drilling program was initiated by the CL & E Corporation. Seventeen claims were surveyed for patent (Mineral Survey 6827). But were never patented. Marsh et. al. (1988, p.D35) state “From 7 to 11 million tons of 1 to 2 percent copper are estimated... and are currently (1986) subeconomic.”

The following table is reproduced from Marsh et. al. (1988). These mines and prospects are mostly inside the original proposed Whipple Mountains Wilderness Area, but a few are outside. The USGS topo maps show numerous additional mines and prospects that were apparently not examined. Plate 1, of Wright et. al. (1953) also shows additional mines outside of the Wilderness Area.

Using a georeferenced copy of Plate 1 from Marsh et. al (1988) and the data from US Geological Survey’s Mineral Resources Data System, I attempted to find all of the mines in Table 1, using high resolution imagery. However some of these mines were clearly mislocated. Some of the mines in this table are not in the original reported location. Mine #56, the Black Metal Mine, was not included in Marsh et. al. (1988) however I included it here because I referred to it earlier in this paper.

Too late to be included in this paper, I contacted Phil Moyle, a coauthor of Marsh et. al. (1988) to try and discover where the field notes from the U. S. Bureau of Mines investigation would have stored following the closure of the agency in 1995. Moyle was unsure but suggested I start my search with the USGS in Spokane, Washington. For future researchers this quest reminds me of the final scene in *Raiders of the Lost Ark*.

1. Stewart mine 34.3832 -114.3893	2. War Eagle mine (old Roth, Virginia) 34.3564 -114.443	3. Sleepy Burro (Whipple Mountain) 34.3228 -114.5048
4. New American Eagle mine 34.3061 -114.4941	5. Prospect 34.3007 -114.4949	6. Prospect 34.3014 -114.4897
7. Prospect 34.3037 -114.4852	8. Prospect 34.3019 -114.4864	9. D&W mine 34.2953 -114.4897
10. Atkinson group (patented) 34.2933 -114.4826	11. Bluebird prospect 34.2736 -114.4589	12. Dickie prospect 34.2407 -114.4268
13. Turk Silver mine 34.2313 -114.4295	14. Twin Lode mine 34.2259 -114.4246	15. Decorative stone property (prospect) 34.2254 -114.4207
16. Riverview (Tuscarora, Ethel Leona) 34.2163 -114.3984	17. Prospect 34.2526 -114.4022	18. Prospect 34.2585 -114.4051
19. Double M No. I prospect 34.2645 -114.4122	20. Lucky Green group (mine) 34.2712 -114.4042	21. Thunderbird prospect 34.2822 -114.3922
22. Black Mesas prospect 34.2849 -114.3800	23. Lizard group (mine) 34.2645 -114.3682	24. Golden Arrow group (prospect) 34.2465 -114.3829
25. Prospect 34.2297 -114.3555	26. Blackjack group (prospect) 34.2328 -114.3299	27. Blue Cloud mine 34.2378 -114.3229
28. Red Eagle prospect 34.2539 -114.3065	29. Prospect 34.2701 -114.2940	30. Prospect 34.2711 -114.2860

31. Sunday Brass prospect 34.2648 -114.2715	32. Prospect 34.2741 -114.2840	33. Nickel Plate mine 34.2742 -114.2774
34. Ruthie prospect (Homer claims) 34.2801 -114.2853	35. Prospect 34.2835 -114.2974	36. Van Horn mine 34.2897 -114.3024
37. Monarch mine 34.2897 -114.2949	38. Manganese King mine 34.2944 -114.2984	39. Monument King mine 34.3001 -114.3072
40. Prospect 34.2992 -114.2900	41. Helen prospect 34.2893 -114.2830	42. Prospect 34.3313 -114.2915
43. Crescent mine (patented) 34.3186 -114.2788	44. Venus prospect 34.3106 -114.2633	45. Copper Basin mine 34.2928 -114.2549
46. Copper Crest group (prospect) 34.3194 -114.2564	47. Outpost claim (prospect) 34.3140 -114.2470	48. Quadrangle Copper group (prospect) 34.3129 -114.2420
49. Lortie group (prospect) 34.3093 -114.2255	50. Peacock Copper group (prospect) 34.3083 -114.2113	51. Gold Crown group (prospect) 34.3122 -114.2141
52. Blue Heaven group (prospect) 34.3211 -114.2309	53. Blue Heaven Extension (prospect) 34.3311 -114.2460	54. Bonus group (prospect) 34.3450 -114.2488
55. Klondike group (prospect) 34.3562 -114.2696	56. Black Metal 34.3281 -114.2244	

Table 1
Mines and Prospects of the Central Whipple Mountains

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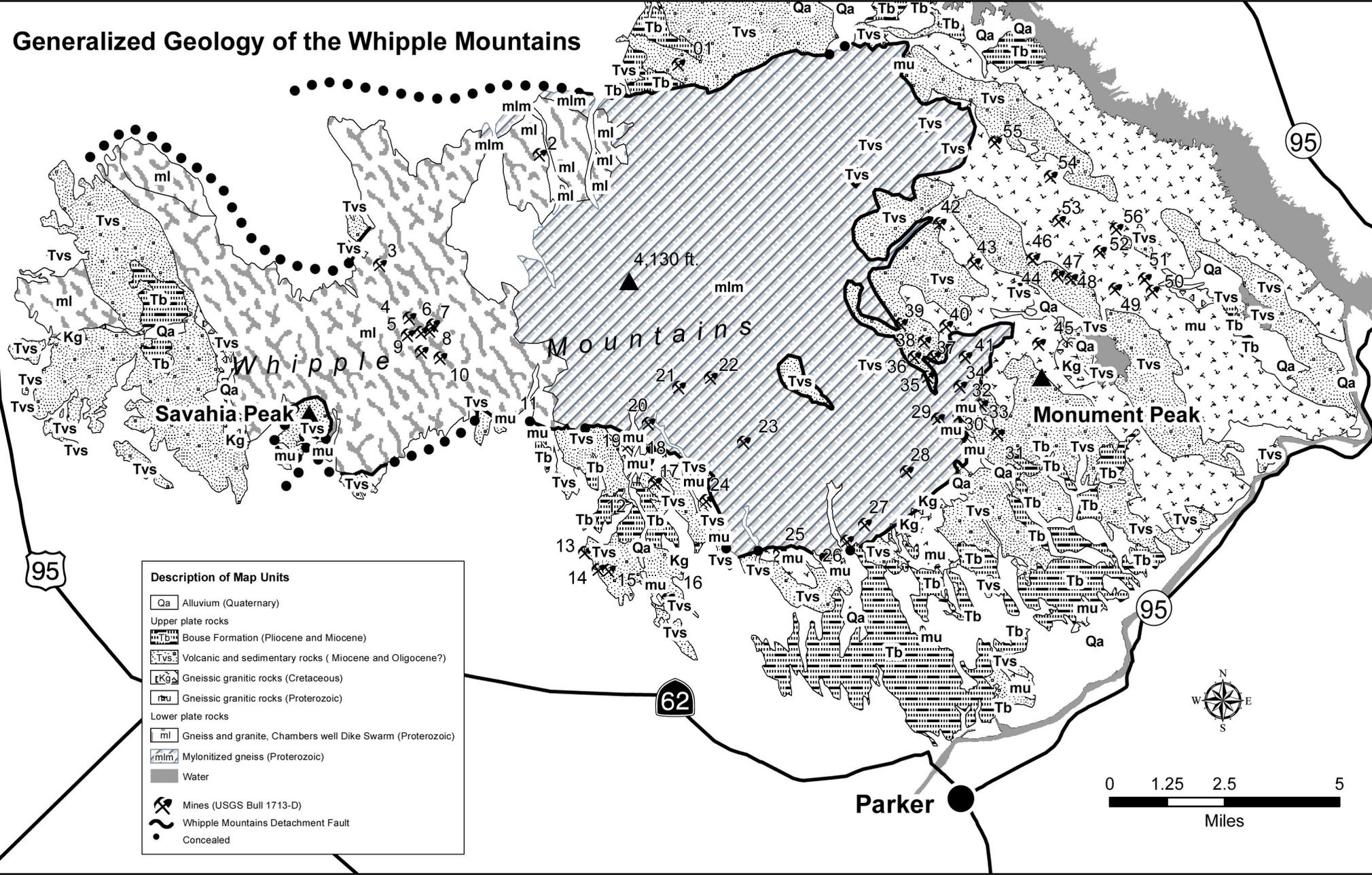
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Generalized Geology of the Whipple Mountains



Description of Map Units

- Qa Alluvium (Quaternary)
- Upper plate rocks
- Tb Bouse Formation (Pliocene and Miocene)
- Tvs Volcanic and sedimentary rocks (Miocene and Oligocene?)
- Kg Gneissic granitic rocks (Cretaceous)
- rbr Gneissic granitic rocks (Proterozoic)
- Lower plate rocks
- ml Gneiss and granite, Chambers well Dike Swarm (Proterozoic)
- mlm Mylonitized gneiss (Proterozoic)
- Water
- Mines (USGS Bull 1713-D)
- Whipple Mountains Detachment Fault
- Concealed