UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mineral investigation of the Black Rock Wilderness Study Area, Graham County, Arizona

U.S. Bureau of Mines Mineral Land Assessment
MLA 5-85
1985

By
Ryan, G.S.,

This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the U.S. Bureau of Mines editorial standards. Work on this study was conduced by personnel from Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

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MINERAL INVESTIGATION OF THE BLACK ROCK WILDERNESS STUDY AREA, GRAHAM COUNTY, ARIZONA

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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Area

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral values. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Black Rock Wilderness Study Area (AZ-040-008), Graham County, Arizona.

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By George S. Ryan, Bureau of Mines

SUMMARY

Several short surface cuts, adits, and shafts are located within the Black Rock Wilderness Study Area. The workings were associated with a mining hoax perpetrated in 1898. Some of the workings were located on small, localized fracture zones that contained quartz veinlets and the copper carbonate mineral malachite. Although high copper and silver values are present in some samples they represent small mineral occurrences of limited extent that have no development potential.

An intermittent fluorspar vein 0.5 mi outside the northeast WSA boundary has provided about 1,200 tons of ore.

INTRODUCTION

In 1983, the Bureau of Mines (Bureau) in conjunction with the U.S. Geological Survey (USGS), studied the mineral resources of the Black Rock Wilderness Study Area (WSA), Graham County, Arizona on lands administered by the Bureau of Land Management (BLM). Bureau personnel conducted surveys of mineral occurrences to evaluate reserves and identified subeconomic resources. The USGS assessed the potential for undiscovered mineral resources based on their geological, geochemical, and geophysical studies. This report presents the results of the study conducted by the Bureau.

The Bureau investigation included a review of available published material related to the mineral resources and mining activity of the Black Rock WSA and vicinity. Recent mining claim activity was determined from BLM recordation files. Field work included a fixed-wing aircraft reconnaissance followed by ground traverses to the observed workings. A total of 13 samples

was taken from workings within or adjacent to the WSA. All samples were fire assayed for gold and silver; a semiquantitative optical emmission spectrographic analysis for 40 elements (see Appendix) was run on all samples. Samples from a fluorspar vein were assayed for CaF^2.

Reports and maps available before the Bureau survey consisted of the BLM Draft Wilderness Environmental Impact Statement (DWEIS) and a geological map of the Mt Jackson 7 1/2' quadrangle prepared by the USGS (Blacet and Miller, 1978).

The BLM staff at Safford, Arizona provided assistance and area access information during this survey. Steve Knox, BLM Wilderness Coordinator, provided historical data pertaining to the WSA.

Location, size, and geographic setting

The Black Rock WSA (fig. 1) encompasses 6,590 acres on the eastern tip of the arcuate Santa Teresa Mountains and is immediately south of the Turnbull Mountains, in southeastern Arizona. The Santa Teresa and the Turnbull Mountains are separated by Black Rock Wash as it trends northeasterly through the northern portion of the WSA. The lowest point in the study area, 3,560 ft, is in Black Rock Wash where it crosses the northern WSA boundary. Jackson Mountain, near the eastern WSA boundary, is the highest point in the WSA at 5,892 ft. The total relief of the study area is 2,332 ft. The boulder-strewn surfaces of the study area are cut by numerous steep, incised canyons.

The study area is located 30 mi northwest of Safford, and 46 mi southeast of Globe, Arizona. Access to the northern part of the WSA is from U.S. Highway 70 at Fort Thomas; access to the southern part is by ranch and primitive roads. Except for a 1 mi stretch of primitive road along the western boundary there are no roads or established trails within the study area.

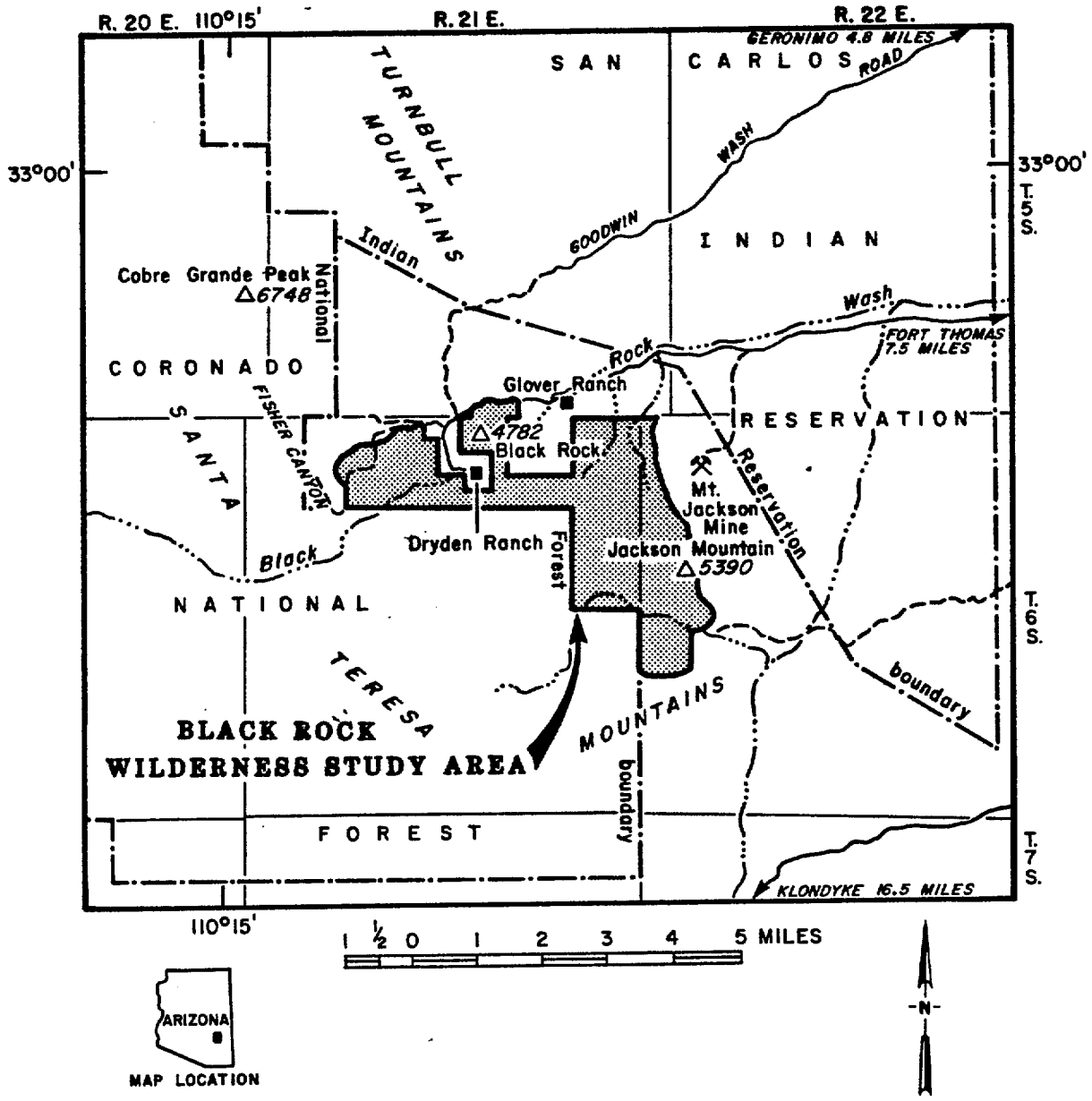

Figure 1. Index map of the Black Rock Wilderness Study Area and vicinity Graham County, Arizona.

Although temperature extremes of 20° F and 110° F are experienced in the WSA the average temperature is more moderate than the average temperature found in southwestern Arizona. Precipitation averages about 19 in. annually with half of the total occurring in July and August (Ross, 1925, p. 6). Vegetation consists of desert and mountain shrubs with denser stands of mesquite, scrub oak, and juniper found on the northern and western slopes of Jackson Mountain.

Geologic setting

The WSA is on the southeastern edge of a Laramide batholith, the Santa Teresa Granite, which is in contact with Precambrian Pinal Schist and Tertiary volcanics (Blacet and Miller, 1978). Between the Santa Teresa Granite on the west and a granite-gneiss phase of the Pinal Schist on the east, the north-central part of the WSA is underlain by Tertiary andesite and rhyolite. A prominent volcanic plug, Black Rock, consists of a rhyolite welded ash-flow tuff.

Mining activity

There are several small pits and adits in the WSA (fig. 2); some are associated with small fracture zones containing minor copper carbonates and quartz. Near the WSA there is a small copper prospect to the northwest and a fluorspar mine 0.5 mi east. There has been no oil or gas production in the southwest region of Arizona that includes the WSA.

The small workings within the WSA are believed to have been part of a mining promotion scheme promulgated in 1898 by a "Dr." Richard C. Flower (Ridgway, 1957, p. 34). Several of the workings examined during this survey contained no structures nor signs of alteration or mineralization.

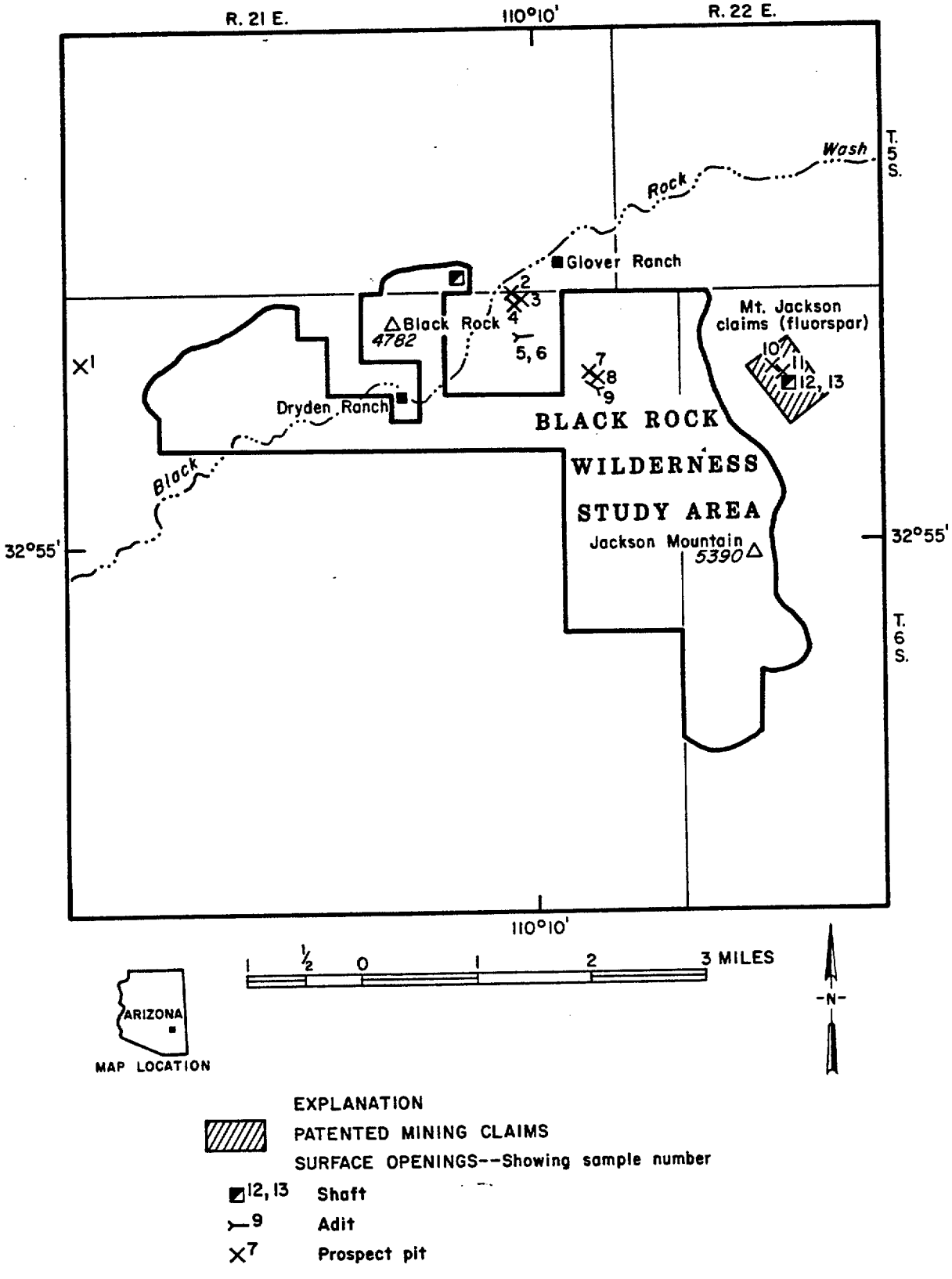

Figure 2. Map showing sample localities in and near the Black Rock Wilderness Study Area, Arizona.

A small caved adit in Fisher Canyon west of the WSA is a remnant of several small workings collectively known as Fisher Prospect. Ross (1925, p. 103) noted that the Fisher prospect was in an area that contained a number of aplitic dikes "rich in micropegmatites"; such dikes were rare in other parts of the batholith. There is no record of production from this prospect.

Fluorspar has been produced sporatically since 1950 from the Mt Jackson claims 1/4 mi east of the WSA (fig. 2). The BLM DWEIS reported that 1,200 tons of ore has been produced from these claims. Most of the ore was from the upper 200-ft-long trench and surface workings in the SE 1/4, sec. 6, T. 6 S., R. 22 E. The walls are 28 ft high at the face with some stulls and a caved stope in view under the face. The N 38° W striking vein (dip 75° N) supports a second trench 300 ft northwest of the first workings. Production from the second trench provided less than 20 tons of ore from surface workings only. A third work area is located 200 ft further along strike and is only a sidehill cut that was apparently an exploration effort only. The vein does not project into the WSA and no parallel structures were noted.

Oil and gas

There are no oil and gas leases or lease applications in the WSA; however, there are a number of such holdings north of the area and in the Dryden Ranch enclave (fig. 3). There are no known sedimentary formations in the WSA in which oil and gas might be expected to be present. There is no recorded production of oil and gas in southeastern Arizona despite recent deep drilling.

MINING DISTRICTS AND MINERALIZED AREAS

The Stanley and Aravaipa mining districts are located northwest and west of the WSA on the west side of the Tertiary Santa Teresa granite batholith. Both districts are characterized by production from vein and replacement

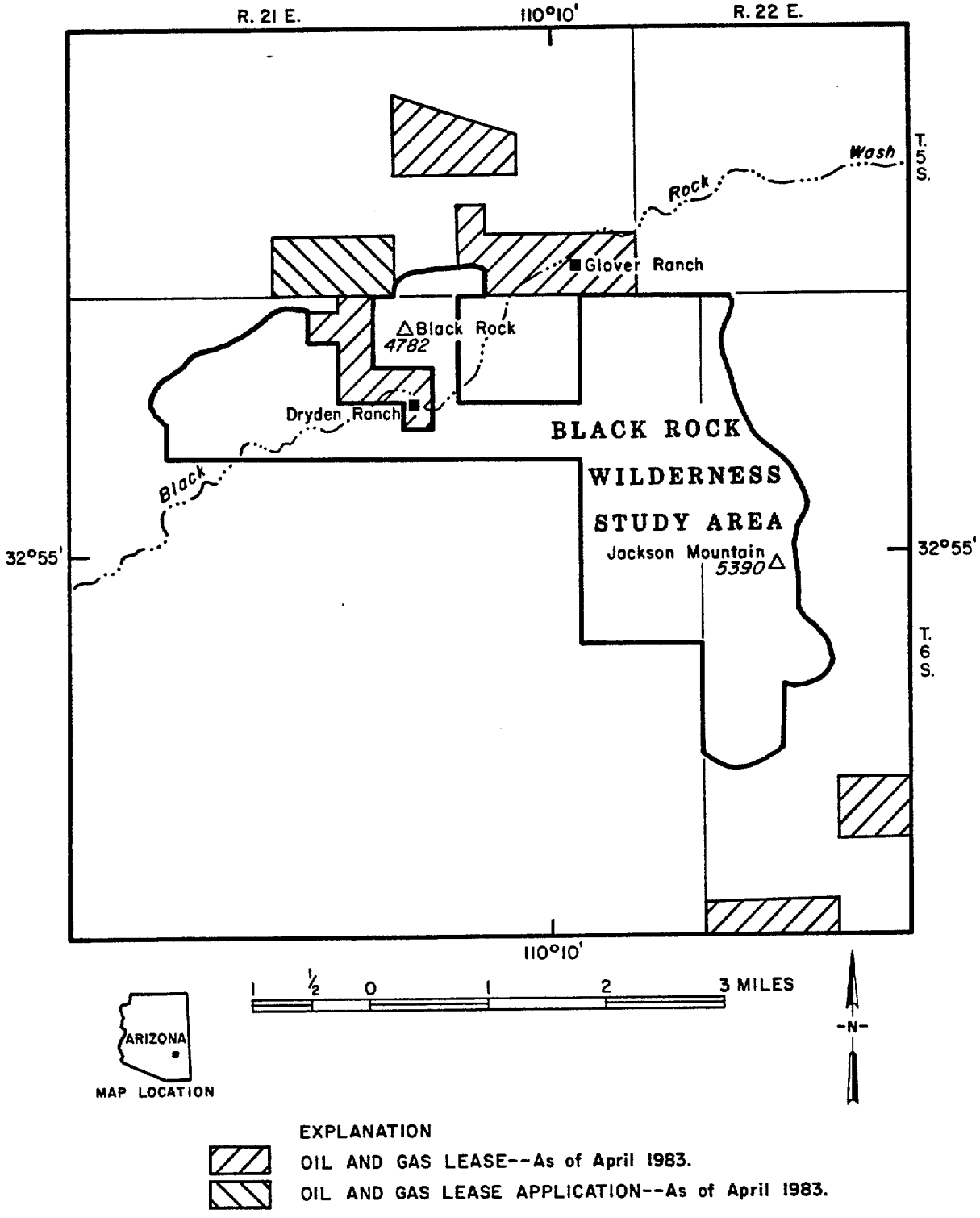

Figure 3. Oil and gas leases and lease applications in and near the Black Rock Wilderness Study Area, Arizona.

deposits located in Carboniferous age sediments. The granite itself exhibits only minor shows of mineralization as at the prospect in Fisher Canyon west of the WSA. Mineralization in the volcanics within the WSA is limited to malachite and limonite in small fractures with no surface expression or extensive alteration. The fluorspar vein east of the WSA is present in a granite-gneiss phase of the Pinal schist and is intermittently mineralized.

The Stanley mining district is located about 4 mi northwest of the WSA on the western slope of the Turnbull Mountains. Although most production was from veins and replacement bodies in the Carboniferous age Tornado Limestone there was also minor production from Cretaceous andesites and Tertiary volcanics (Ross, 1925, p. 105). Principal metals obtained were copper, lead, zinc, and silver.

The Aravaipa mining district is located south of the Stanley district and 6 mi west of the Black Rock WSA. Most of the mines in the Aravaipa district are located on the lower western slopes of the Santa Teresa Range. Although most production of lead, silver, and copper ores was from replacement ore bodies in the Carboniferous sediments a notable exception was the Grand Reef. The Grand Reef is a prominent outcrop composed of iron-stained, brecciated, and silicified igneous rock and vein material cemented with quartz (Ross, 1925, p. 81). The Grand Reef Mine and numerous smaller mines and prospects are located along the reef with mineral production from brecciated veins. According to Ross (1925,p. 4-5) very little ore was shipped from the Aravaipa district. However, Simons (1964, p. 132) reports there was about $7,538,000 worth of production in the Aravaipa district from 1926 to 1959. Since 1960 there has been only minor production but exploration and some development work has continued to the present. There are no structures similar to the Grand Reef on the east side of the batholith in the WSA.

Mineralization in the Tertiary granite west of the WSA was found in Fisher Canyon (fig. 2, sample 1). Malachite and limonite were noted along small fractures and along the aplite dike and granite contacts. Malachite was also found disseminated in the granite near the contacts. Trace amounts of other base metals were noted in the assay (Table 1, sample 1).

Copper carbonates were observed in a few of the workings near the Glover Ranch (Fig. 2, samples 2-9). All of the workings are in andesite and samples were taken across small fracture zones, where present, that generally were coated with limonite and contained up to 1/2-in. wide quartz veinlets. Two pits in a small canyon southeast of the Glover Ranch yielded anomalously high values of silver (to 3.6 oz/ton) and copper (to 7%); (Fig. 2; Table 1, samples 7-8). The fracture zone from which the samples were taken was 2-to-4 ft wide and contained limonite, quartz veinlets, copper carbonates, and minor chalcopyrite and bornite. The copper minerals occurred mainly as vug fillings in the quartz; some mineralization occurred as coatings along the fracture planes. The zone could not be traced on the surface nor did any alteration appear outside of the zone.

The fluorspar vein east of the WSA occurs in a granite-gneiss phase of the Precambrian Pinal Schist. The face in the upper workings discloses 2 distinct sections of vein material. The 6-ft wide hanging wall section of the vein (Table 1, sample 13) is composed of a dark, clayey material. The 4-ft-wide footwall section consists of a brecciated groundmass with pods of fluorite up to 1 ft in diameter (Table 1, sample 12). The 2 samples taken at the face yielded the same assay for fluorite, 44%. The vein at the second, or middle, working was only 3-ft wide and consisted of fluorspar stringers in the brecciated matrix (Table 1, sample 11). Production from this trench is estimated to have been no more than 20 tons of the reported 1,200 tons of

fluorspar ore produced. The third working, which appeared to be an exploration cut, exposed no distinct vein but contained gneissic boulders with fluorspar stringers and assayed 66% fluorite (Table 1, sample 10). Sample point localities are shown in figure 2.

CONCLUSIONS

Occurrences of minerals within the WSA are typical of southwestern Arizona. Leakage of mineralizing solutions from favorable intrusives along various types of conduits can distribute minerals over a large area. Unless the distribution system encounters favorable environments for deposition the fluid emanations leave evidence of passage but seldom make ore deposits. The Stanley and Aravaipa mining districts had the favorable Cretaceous carbonate beds that were reactive with mineralizing solutions from the Tertiary (Laramide) Santa Teresa batholith; the WSA area did not.

The Fisher Canyon mineralization is apparently a late phase pulse within the batholith that is restricted to the rare aplite dikes that are located mainly in that part of the batholith.

Mineralization in the small canyons south of the Glover Ranch is contained in slippage or fracture zones that are neither large nor extensive.

The fluorspar vein east of the WSA is intermittent in character and does not project into the WSA. It is probable that the fluorspar mineralization predates the batholith and no other such occurrences have been located within the Precambrian Pinal Schist that is extant within the WSA.

The presence of Laramide intrusives and Precambrian schists and gneisses preclude the possibility of the development of oil and gas resources within the WSA.

Table 1.--Data for samples from Black Rock WSA

(--, below detection limit; xxx, not applicable. Cu, Pb, and Zn were analyzed by atomic absorption spectrophotometry)
All assay results can be obtained from the Bureau of Mines,
Intermountain Field Operations Center, Denver Federal Center, Denver, Colorado 80225.

Sample No.	Type	Len.(ft)	Au oz/ton 1/	Ag 1/	CaF2 2/	Cu percent	Pb percent	Zn percent	Remarks
Fisher Canyon									
1	Random grab	xxx	--	--	xxx	0.10	< .002	0.006	Dump at caved adit, limonite on granite.
SW of Glover Ranch									
2	Select	xxx	Tr	0.1	xxx	.20	0.50	.10	Pit, 10-ft diam., 8-ft deep , limonite stained andesite, slickensides.
3	Chip	4.0	Tr	.1	xxx	2.00	< .005	.40	Pit, 10 ft X 15 ft X 12 ft, andesite with gouge, malachite, quartz on fault plane.
4	Select	xxx	--	--	xxx	.008	< .002	.002	Trench, 25 ft X 10 ft X 6 ft, limonite stained andesite, quartz.
5	Chip	1.0	--	.1	xxx	.004	.02	.10	Adit with double entry, junction sample, limonite on andesite, quartz.
6	Random grab	xxx	--	.3	xxx	.10	2.00	.60	Dump at No. 5. Andesite.
WSA									
7	Chip	4.0	Tr	1.6	xxx	7.00	.10	.20	Pit, 5 ft X 6 ft X 4 ft, with 4-ft fracture zone, andesite with quartz veinlets and malachite, trace bornite and chalcopyrite.
8	Chip	3.0	Tr	3.6	xxx	1.00	3.00	.30	Pit, 8 ft X 8 ft X 4 ft with 3-ft wide fracture zone, andesite with quartz veinlets, sparse malachite.
9	Chip	3.0	Tr	.30	xxx	.05	.01	.08	At portal of 22-ft long adit, andesite with random quartz veinlets, quartz vugs with malachite.
Fluorspar mine									
10	Grab	xxx	0.03	--	68	.02	.20	<.0001	Bank cut, gneiss, fluorspar veinlets.
11	Chip	3.0	.04	--	22	.05	<.002	.003	3-ft wide fluorspar vein at face of 50 ft X 10 ft X 12 ft trench.
12	Chip	4.0	.03	.4	44	.01	.30	.04	4-ft wide footwall vein with 1 ft fluorite pod at face of 200 ft X 10 ft X 28 ft trench.
13	Chip	6.0	.03	.2	44	.07	<.002	.04	6-ft wide hanging wall fracture zone that adjoins vein at No. 12.

1/ Fire assay.
2/ Special assay.

Table 1. Sample descriptions and assay values for selected minerals from Black Rock Wilderness Study Area, Graham County, Arizona.

REFERENCES

Blacet, P.M. and Miller, S.T., 1978, Reconnaissance geologic map of the Jackson Mountain quadrangle, Graham County, Arizona, U.S. Geological Survey MF-939, scale 1:62,500.

Ridgway, W.R., 1957, Spenazuma: Arizona Highways Magazine, V. 33, No. 1, p. 30-35.

Ross, C.P., 1925, Geology and ore deposits of the Aravaipa and Stanley mining districts, Graham County, Arizona: U.S. Geological Survey Bulletin 763, 120 p.

Simons, F.S., 1964, Geology of the Klondyke quadrangle, Graham and Pinal Counties, Arizona: U.S. Geological Survey Professional Paper 461, 173 p.

Appendix.-- Semiquantitative optical emission spectrographic analysis detection limits.
U. S. Bureau of Mines, Reno Research Center

Element	Detection limit (percent)	Element	Detection limit (percent)
Ag	.002	Mo	.0001
Al	.001	Na	.3
As	.01	Nb	.007
Au	.002	Ni	.0005
B	.003	P	.7
Ba	.002	Pb	.001
Be	.0001	Pt	.0001
Bi	.01	Re	.0006
Ca	.05	Sb	.06
Cd	.0005	Sc	.0004
Co	.001	Si	.0006
Cr	.0003	Sn	.001
Cu	.0006	Sr	.0001
Fe	.0006	Ta	.02
Ga	.0002	Te	.04
K	2.0	Ti	.03
La	.01	V	.005
Li	.002	Zn	.0001
Mg	.0001	Zr	.003
Mn	.001	Y	.0009

Revised October, 1984.

These numbers are to be used only as a guide.