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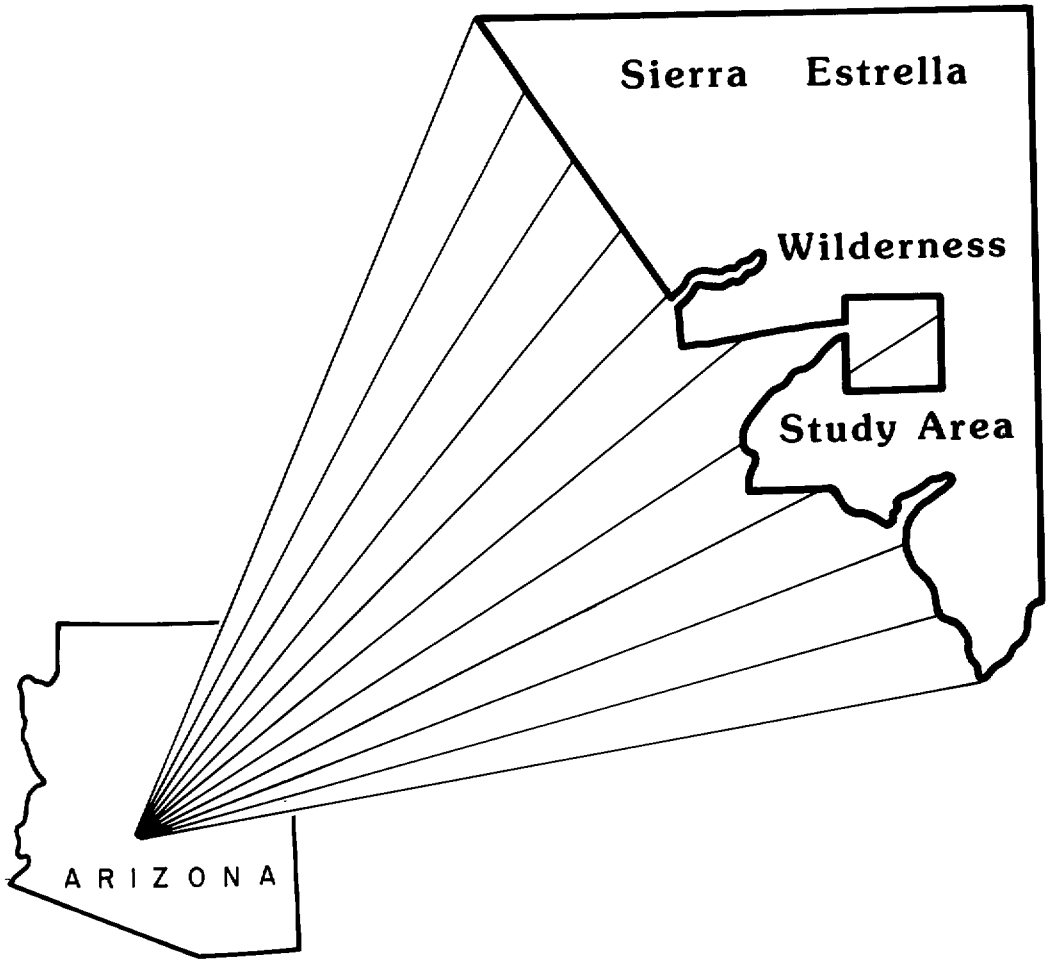
Mineral Investigation of the Sierra Estrella Wilderness Study Area (AZ-020-160), Maricopa County, Arizona



BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL INVESTIGATION OF THE SIERRA ESTRELLA WILDERNESS STUDY AREA (AZ-020-160), MARICOPA COUNTY, ARIZONA

by

Stanley L. Korzeb

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Intermountain Field Operations Center
Denver, Colorado

UNITED STATES DEPARTMENT OF THE INTERIOR
Donald P. Hodel, Secretary

BUREAU OF MINES
David S. Brown, Acting Director

PREFACE

The Federal Land Policy and Management Act of 1976 (Public Law 94-579) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the mineral values, if any, that may be present. 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 Sierra Estrella Wilderness Study Area (AZ-020-160), Maricopa County, Arizona.

This open-file report summarizes the results of a Bureau of Mines wilderness study. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. This study was conducted by personnel from the Branch of Mineral Land Assessment (MLA), Intermountain Field Operations Center, P.O. Box 25086, Denver Federal Center, Denver, CO 80225.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

yd^3	cubic yard
ppb	part per billion
ppm	part per million
oz/st	ounce per short ton
st	short ton

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SUMMARY

In April 1987, the Bureau of Mines conducted a mineral investigation of the Sierra Estrella Wilderness Study Area, Maricopa County, Arizona, on 14,190 acres of land administered by the Bureau of Land Management. The mineral investigation was requested by the Bureau of Land Management and authorized by the Federal Land Policy and Management Act of 1976 (Public Law 94-579).

No mineral resources were identified within the study area. Pegmatite dikes and pods inside and near the WSA contain flake mica and minor amounts of gold. A pegmatite outside the WSA was mined in the past for flake mica supplying a local market. The pegmatites inside the WSA are too small and sporadic to be flake mica and gold resources. Placer claims in the southwest part of the study area are reported to contain gold but more detailed subsurface work would be necessary to verify the reports.

INTRODUCTION

In April 1987, the Bureau of Mines, in a cooperative program with the U.S. Geological Survey (USGS), conducted a mineral investigation of the Sierra Estrella Wilderness Study Area (WSA), Maricopa County, Arizona, on lands administered by the Bureau of Land Management (BLM), Phoenix District Office, Phoenix, Arizona. The Bureau surveys and studies mines, prospects, and mineralized areas to appraise reserves and identified resources. The USGS assesses the potential for undiscovered mineral resources based on regional geological, geochemical, and geophysical surveys. This report presents the

results of the Bureau of Mines study. The USGS will publish the results of their studies. A joint report, to be published by the USGS, will integrate and summarize the results of both surveys.

Geographic setting

The Sierra Estrella WSA is 14 mi southwest of Phoenix, Arizona (fig. 1). A paved road extending south from State Highway 85 near Liberty, Arizona, provides access to gravel roads extending into the study area. The WSA covers 14,190 acres in the Sierra Estrella Mountains. Topographic features of the range include steep, deeply dissected mountains embayed in pediments. Elevations range from a high of 4,119 ft on Butterfly Mountain to about 1,400 ft on the west boundary.

Methods of investigation

Arizona Department of Mines and Mineral Resources and BLM records were reviewed for information regarding geologic investigations, patented and unpatented claims, and federal mineral and oil and gas leases in or near the study area. Two Bureau geologists spent one day examining the WSA. Four chip samples and one grab sample were taken from prospects; three samples (nos. 1, 2, 5) are from inside the WSA (fig. 2).

Sample analyses were made by Chemex Labs Inc., Sparks, Nevada. All five samples were analyzed by fire assay and atomic absorption for gold and silver, by inductively coupled plasma-atomic emission spectroscopy for copper, by neutron activation analysis for tantalum, and by x-ray fluorescence for niobium. Partial analytical results are shown on table 1 and complete analyses for all samples are available for public inspection at the U.S. Bureau of Mines, Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, Colorado.

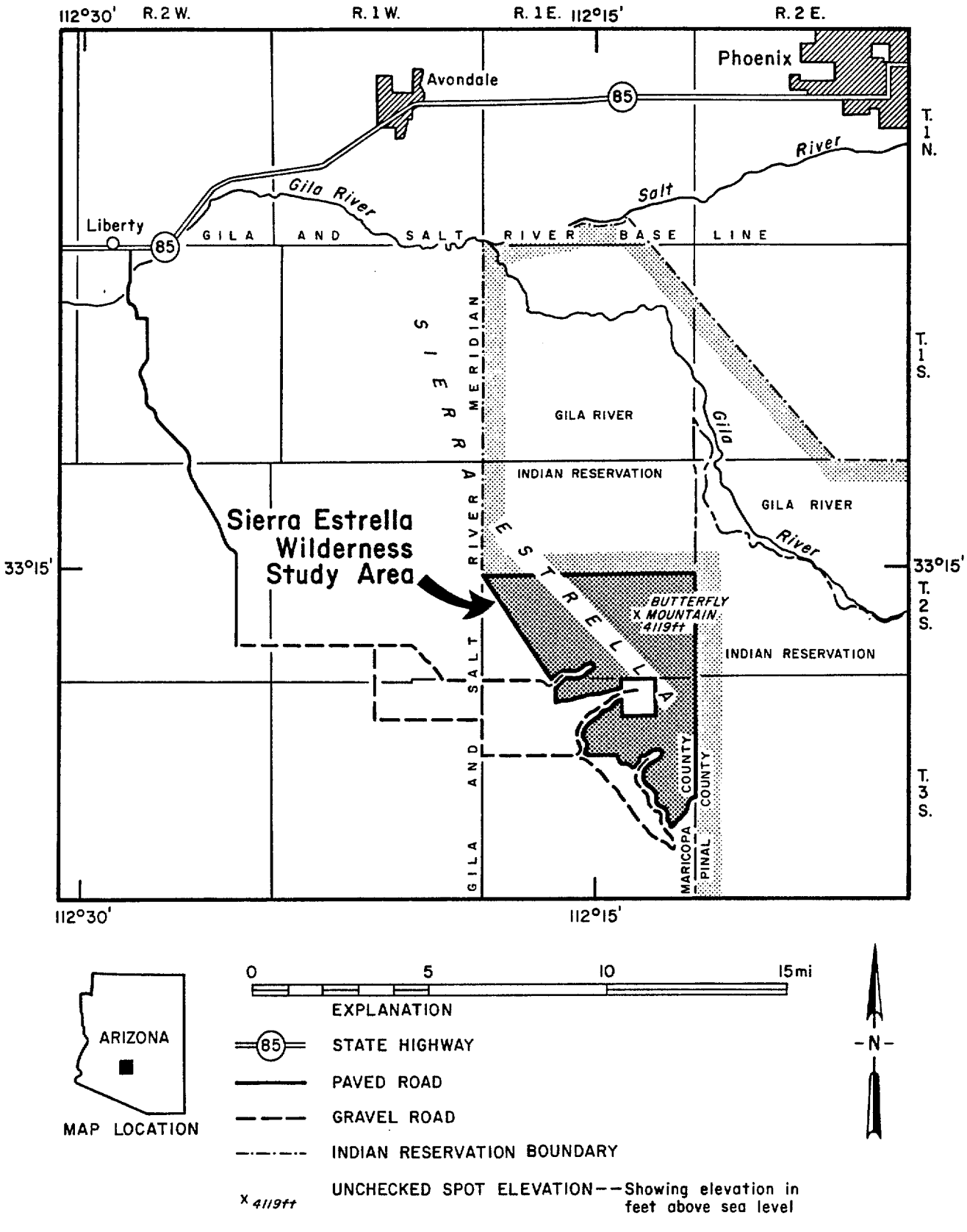

Figure 1.--Index map of the Sierra Estrella Wilderness Study Area, Maricopa County, Arizona.

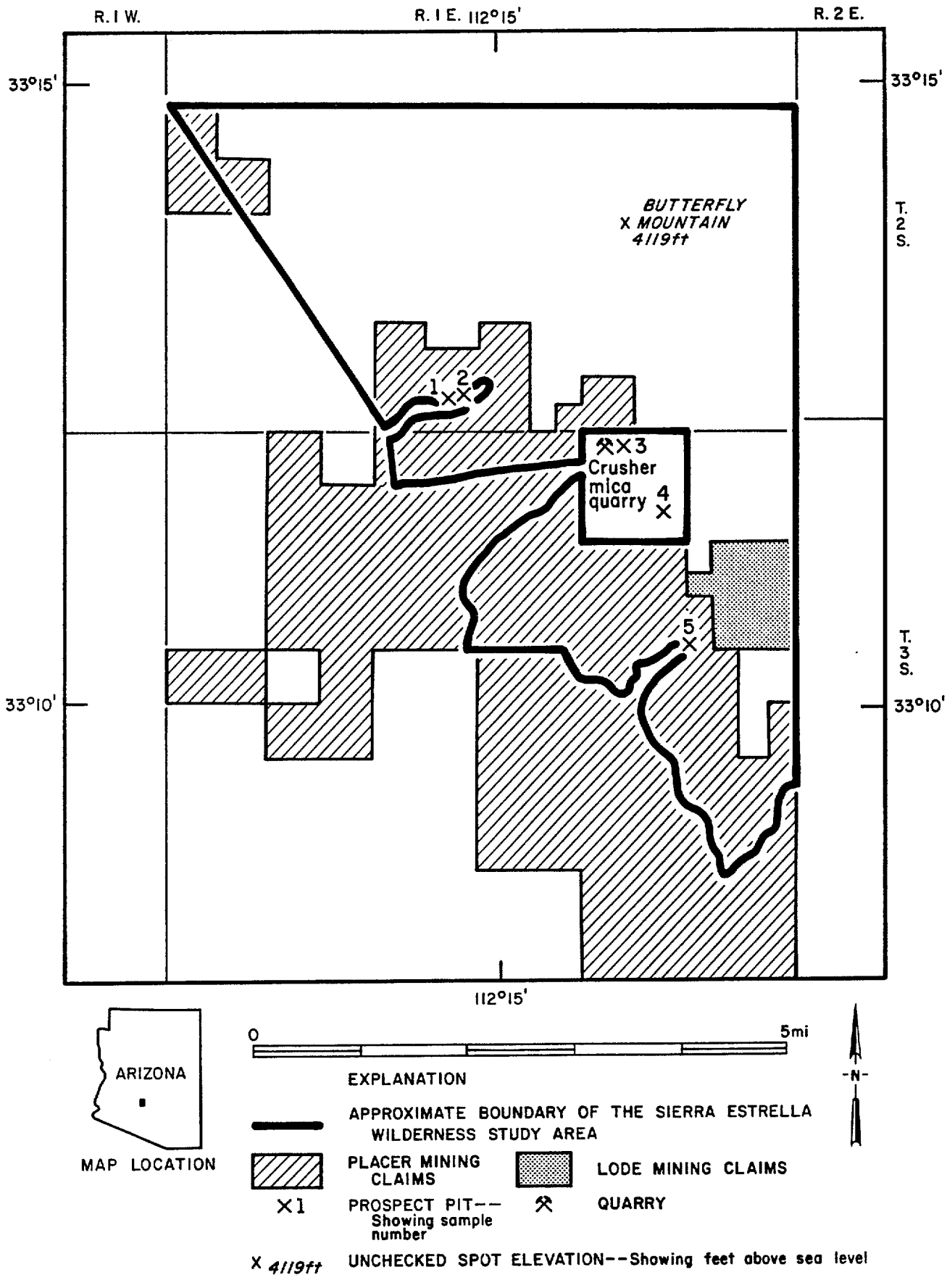

Figure 2.--Quarry and prospects in and near the Sierra Estrella Wilderness Study Area, Arizona.

GEOLOGIC SETTING

Most of the study area is underlain by Precambrian-age gneiss and schist; the southern tip of the area is underlain by Precambrian granite. Mesozoic-age (?) pegmatite dikes and pods are intruded into the gneiss and schists. Foliation of these rocks strikes northeast to east; dips range from 30° to vertical. Dip reversals indicate that the schist and gneiss were folded in earlier Precambrian time. The Precambrian rocks were also fractured providing channel ways for the intrusion of pegmatite dikes. (See Wilson, 1969, p. 20.) Pegmatite dikes and pods within the WSA can be classified as simple zoned pegmatites consisting mainly of feldspar, quartz, and varying amounts of muscovite (figs. 3-4). Ryder (1983, p. C19-C20) rated the WSA as having a low to zero potential for petroleum accumulations because the WSA is underlain by Precambrian granite, gneiss, and schist.

MINING HISTORY

The WSA is not within or adjacent to any established mining district. The Sierra Estrella Mountains were probably first explored prior to 1886 due to their proximity to transcontinental travel routes. Also, in 1886 several copper mines were reported to be present in the Sierra Estrella Mountains, but their location is unknown. In 1920, nine lode claims were located on the northeastern slopes of the range. These claims were developed by open cuts and had limited copper production. (See Wilson, 1969, p. 21.)

The Crusher mica quarry in sec. 2, T. 3 S., R. 1 E. was reported to be in operation in 1958 by the Arizona Department of Mines and Mineral Resources. An unrecorded amount of flake mica was produced from a pegmatite pod exposed in a 20 ft by 10 ft by 8 ft deep cut at the mine (Krason and others, 1982, p. 77). From 1980 to 1983, a number of placer claims was located within and near

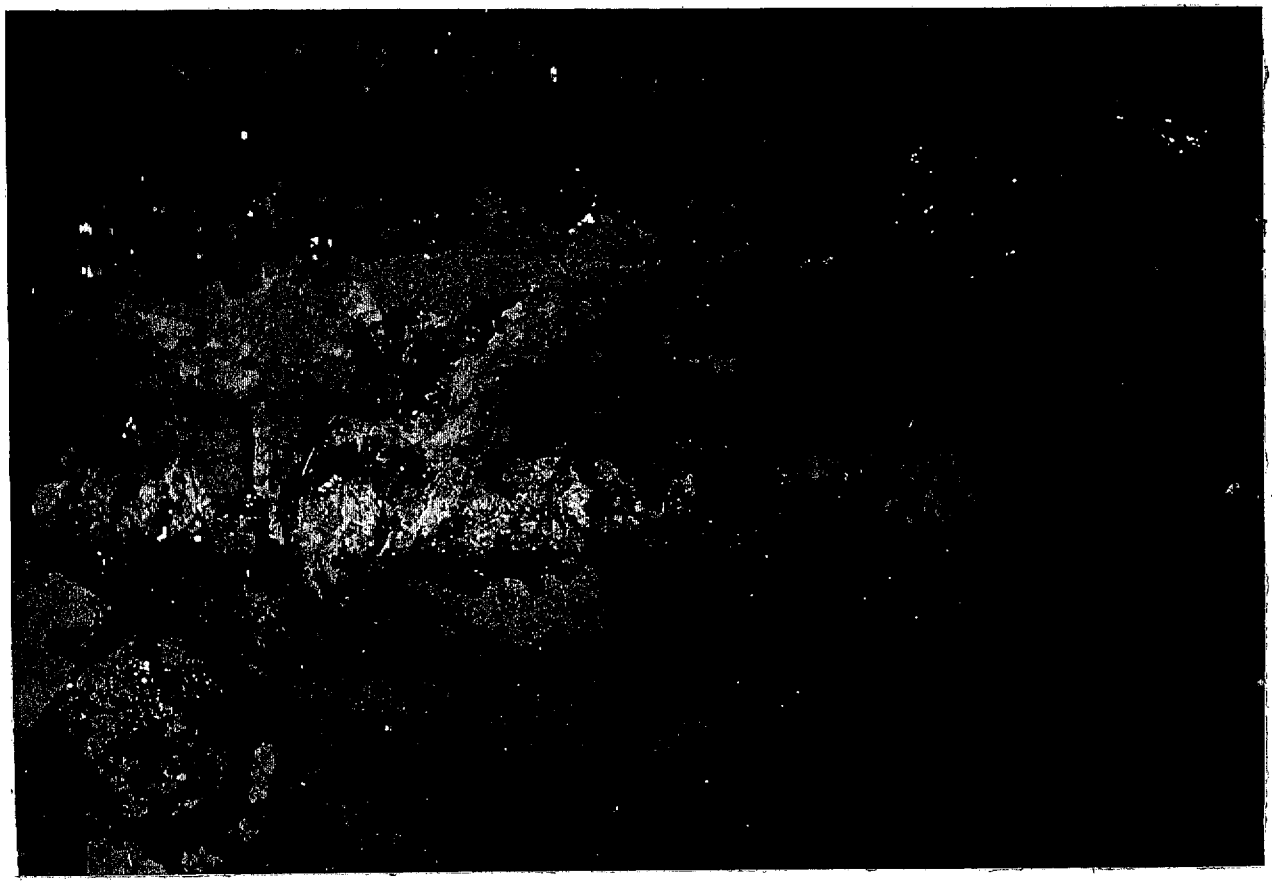

Figure 3.--Pegmatite hosted by muscovite schist, showing concentration of muscovite in outer zone near contact.

Figure 4.--Pegmatite pod of quartz and feldspar hosted by muscovite schist.

the west boundary of the WSA. In 1980, a block of lode claims was located in sec. 12, T. 3 S., R. 1 E. (fig. 2). No surface work was evident in the area of any of the claims.

RESULTS OF FIELD INVESTIGATION

No mineral resources were identified by field work but pegmatites similar to those mined for flake mica at the Crusher quarry occur within the study area. The pegmatites are small, occurring mostly as vertical dikes 6-in. to 2-ft wide, locally swelling into pods up to 20 ft; some dikes can be traced on the surface for 100 ft. The pegmatites consist mostly of feldspar, quartz, and muscovite, with minor magnetite, garnet, schorl, and secondary chrysocolla. When muscovite is present, it is confined to the outer zones of the pegmatite and occurs in books up to 4-in. across and 2-in. thick (fig. 3). The muscovite books are bent, ruled, and discolored making them unsuitable for sheet mica use but they can be used for flake mica. Flake mica is ground to a mesh size ranging from less than 80 to greater than 325. Depending on mesh size the ground mica is used in the manufacture of asphalt shingles, joint cement, oil-well drilling mud, paint, rubber goods, plastic, and welding rods. (See Lesure, 1973, p. 416.) Flake mica is valued at about $48.00 per ton. Locally, these sporadically distributed muscovite zones are estimated to contain up to 20% flake mica. The largest and highest grade muscovite zones can contain up to one ton of mica. Because of the low tonnage and sporadic distribution of the muscovite zones the pegmatites cannot be considered a resource for flake mica.

Muscovite schist hosting the pegmatites also contains flake mica. An analysis of this schist by Wilson (1969, p. 23) showed that it contained up to 21.8% muscovite. By comparison, commercial mica schist mined in South Dakota

by the Pacer Corporation contains 78-80% mica and has a unique "bridging property" that allows the mica flakes to lay flat when being rolled into asphalt shingles (Gene Reese, Pacer Corporation, Custer, South Dakota, oral commun., 1987). The muscovite schist found throughout the WSA is too low in grade to be considered a resource for commercial flake mica.

Analyses of samples from the pegmatites showed 15 ppb (0.0004 oz/st) to 0.662 oz/st gold, 50 ppm to 8,950 ppm copper and minor amounts of tantalum and niobium (table 1). Trace amounts of gold occur in the pegmatites with the exception of one sample that contained 0.662 oz/st (table 1, sample 4). The sample with the highest gold content contained pyrite and limonite. These minerals are not common in pegmatites making this a unique occurrence. No gold resources were identified in the pegmatites but they could be a source of gold reported in the placers located within the southwest part of the WSA.

Alvin C. Johnson, Jr. (Sevenmile Mining Association, Tempe, Arizona, oral commun., 1987) reported that gravels exposed on the surface of the placer claims contained less than 0.1 oz/st gold. Most samples from the gravels contain no gold but beds of clay discovered by drilling under the gravels reportedly can contain up to 0.25 oz/st gold. The placers were estimated to contain 30 million yd^3 or 45 million st of gravel from an assumed thickness of 10 ft. The thickness and extent of the underlying clay and the stratigraphic distribution of the gold is unknown. More detailed subsurface work such as trenching and drilling would be necessary to verify the report.

Sand and gravel in the WSA has no unique or special properties and no local market. Sand and gravel at other locations near markets is better suited for local use. The sand and gravel in the WSA therefore is not a resource.

CONCLUSIONS

No mineral resources were identified in the Sierra Estrella WSA. Pegmatites within the study area contain flake mica and traces of gold but their low tonnage and sporadic distribution making them unsuitable as a resource. The muscovite schist also is too low in grade to be considered a resource for flake mica. Gold has been reported from the placers in the WSA but the volume and concentration is unknown. The extent and distribution of the gold in the underlying clay bed also is unknown.

RECOMMENDATIONS

Further investigation of the placer deposits in the southwest half of the WSA, including trenching and drilling to bed rock, would be necessary to determine if sufficient gold is present to support a commercial mining operation.

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Ryder, R. T., 1983, Petroleum potential of wilderness lands, Arizona: U.S. Geological Survey Miscellaneous Series Map I-1537, scale 1:1,000,000 [Contains a copy of U.S. Geological Survey Circular 902-C, Petroleum potential of wilderness lands in Arizona, R. T. Ryder 22 p.]

Wilson, E. D., 1969, Mineral deposits of the Gila River Indian Reservation, Arizona: Arizona Bureau of Mines Bulletin 179, 34 p.

Table 1.--Analytical data and description of samples 1-5 from the Sierra Estrella Wilderness Study Area, Maricopa County, Arizona.

[Gold and silver determined by fire assay; copper determined by inductively coupled plasma-atomic emission spectroscopy; tantalum determined by neutron activation analysis; niobium determined by x-ray fluorescence. Au, gold; Ag, silver; Cu, copper; Ta, tantalum; Nb, niobium; ---, below detection limit; xx, not applicable. Detection limits: Au, 5 ppb; Ag, 0.1 ppm; Cu, 1 ppm; Ta, 2 ppm; Nb, 5 ppm.]

Sample			Assay data					
				Ag	Cu	Ta	Nb	
No.	Type	Length (in.)	Au	ppm				Sample description
1	Chip	60	30 ppb	0.2	3,000	---	15	Faulted and fractured pegmatite in chrysocolla-stained gneiss 5-ft-wide zone of stained gneiss.
2	do.	43	---	.4	3,800	---	12	Pegmatite pod in fractured and chrysocolla-stained gneiss.
3	Grab	xx	15 ppb	2.6	8,950	---	---	Chrysocolla-stained gneiss and pegmatite pod of white quartz.
4	Chip	24	0.662 oz/t	13.5	50	---	---	Pegmatite pod, abundant white quartz with pyrite, magnetite, and vugs filled with limonite.
5	do.	36	40 ppb	1.0	3,950	3	7	Pegmatite pod 8-ft wide pinches to 1-ft wide dike, minor chrysocolla staining, 2-in. muscovite books.