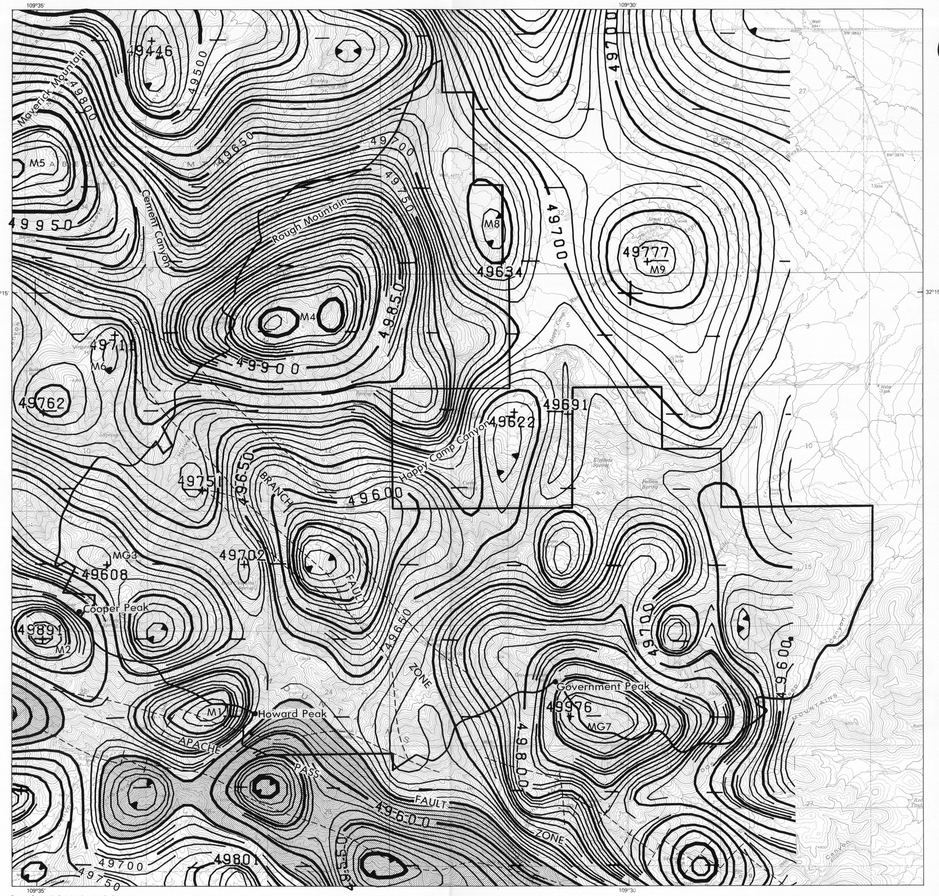


Base from U.S. Geological Survey, Bowie Mountain North, 1979; Dos Cabezas, 1974; and Luzena, 1979, 1:24,000

SCALE 1:24 000
1 MILE
1 KILOMETER
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP A.-AEROMAGNETIC MAP

EXPLANATION FOR MAP A

49800 — MAGNETIC CONTOURS--Showing totcl-intensity magnetic field of the earth in gammas with regional field removed. International Geomagnetic Reference Field (IGRF) 1975 updated to the time of acquisition. Contour intervals 10 gammas. Sawteeth indicate closed area of lower magnetic intensity

M9 — MAGNETIC ANOMALY

MG7 — MAGNETIC ANOMALY ASSOCIATED WITH GRAVITY ANOMALY

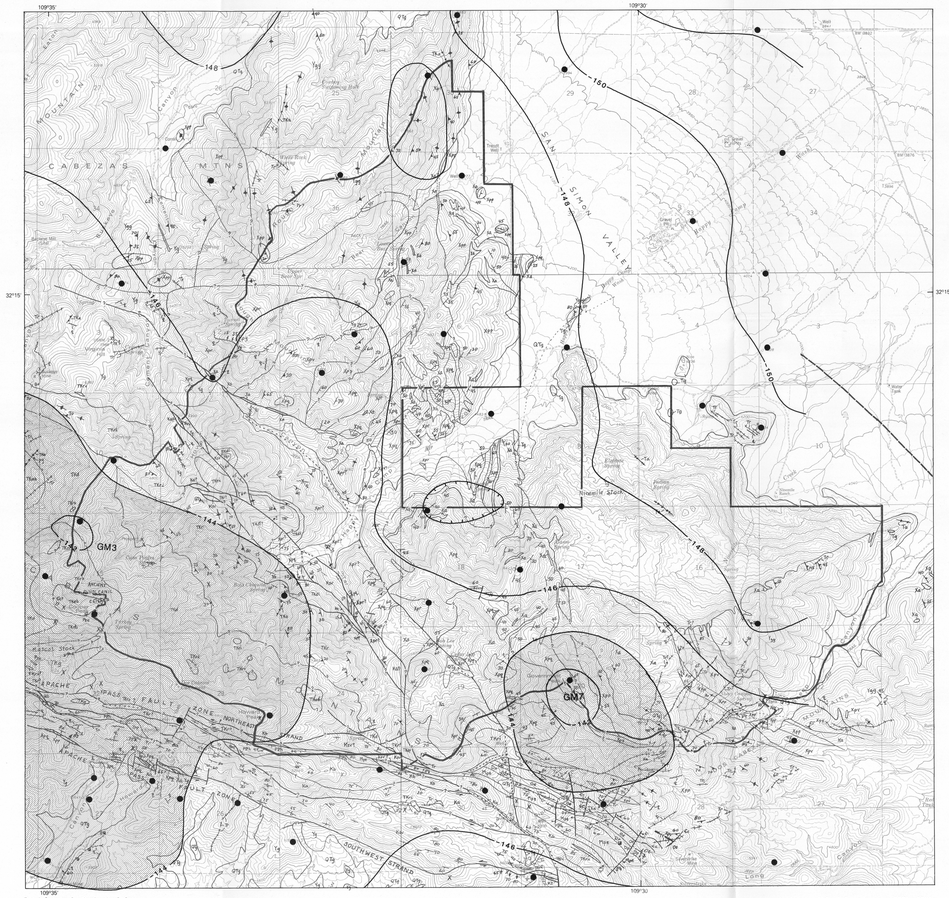
MAGNETIC LOW ASSOCIATED WITH APACHE PASS FAULT ZONE

FAULT

FLIGHT PATH

BOUNDARY OF DOS CABEZAS MOUNTAINS WILDERNESS STUDY AREA

Flown and compiled by AIRMAG SURVEYS INC., 1980. Flight lines flown east-west at 152 m (500 ft) mean terrain clearance spaced 1 km (0.6 mi) apart.



Base from U.S. Geological Survey, Bowie Mountain North, 1979; Dos Cabezas, 1974; and Luzena, 1979, 1:24,000

SCALE 1:24 000
1 MILE
1 KILOMETER
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology modified from Drewes, 1984, 1986; and Drewes and others, in press

MAP B.-BOUGUER GRAVITY MAP

The following correlation, description, and symbols are for the geologic base and are shown in gray

CORRELATION OF MAP UNITS

QTg			Holocene to Pliocene	QUATERNARY TO TERTIARY
Ta	Tr	Tg	Miocene and Oligocene(?)	TERTIARY
			Oligocene	
TKg	TKri	TKa		
TKrb	TKmb	TKeb		
		TKd	Paleocene or Upper Cretaceous	TERTIARY OR CRETACEOUS
		TKr		
		TKdi		
		Ka	Upper Cretaceous	CRETACEOUS
		Kav		
		Kb	Lower Cretaceous	
		Pea	Permian	PERMIAN
		PPh	Lower Permian and Pennsylvanian	PENNSYLVANIAN
	Pru	Mpe		MISSISSIPPIAN
		Dp	Upper Devonian	DEVONIAN
		Oe	Lower Ordovician	ORDOVICIAN
		6c	Upper Cambrian	CAMBRIAN
		Yg	Middle Proterozoic	PRECAMBRIAN
		Ygg		
		Xa	Early Proterozoic	
Xpp	Xpq	Xpr	Xpv	
		q	Unknown age	

LIST OF MAP UNITS

QTg — GRAVEL (HOLOCENE TO PLIOCENE)
YOUNG INTRUSIVE ROCKS (MIOCENE AND OLIGOCENE)
Ta — Andesite (Miocene and Oligocene?)
Tr — Rhyolite (Miocene and Oligocene?)
Tg — Granite or quartz monzonite (Oligocene)
MODERATELY OLD INTRUSIVE ROCKS (PALEOCENE OR UPPER CRETACEOUS)
TKg — Granodiorite or quartz monzonite
TKri — Rhyolitic rock
TKa — Andesite, dacite, and diorite
MODERATELY OLD INTRUSIVE TO EXTRUSIVE BRECCIAS (PALEOCENE OR UPPER CRETACEOUS)
TKrb — Rhyolitic breccia
TKmb — Mixed breccia
TKeb — Exotic breccia
MODERATELY OLD VOLCANIC ROCKS (PALEOCENE OR UPPER CRETACEOUS)
TKd — Dacitic to andesitic breccia
TKr — Rhyolite crystal-lithic welded tuff
TKdi — Dacite or latite
Ka — ANDESITE (UPPER CRETACEOUS)
Kav — SEDIMENTARY AND VOLCANIC ROCK (UPPER CRETACEOUS)
Kb — BISBEE GROUP (LOWER CRETACEOUS)
Pru — SEDIMENTARY ROCKS (PALEOZOIC)
Pea — EARP GROUP (LOWER PERMIAN)
PPh — HORQUILLA LIMESTONE (LOWER PERMIAN AND PENNSYLVANIAN)
Mpe — PARADISE FORMATION AND ESCABROSA LIMESTONE, UNDIVIDED (MISSISSIPPIAN)
Dp — PORTAL FORMATION OF SABINS (1957) (UPPER DEVONIAN)
Oe — EL PASO FORMATION (LOWER ORDOVICIAN)
6c — CORONADO SANDSTONE (UPPER CAMBRIAN)
OLD INTRUSIVE ROCKS (PRECAMBRIAN)
Yg — Granite and granodiorite (Middle Proterozoic)
Ygg — Gneissic granite and granodiorite (Middle Proterozoic)
Xa — Amphibolite (Early Proterozoic)
PIRAL SCHIST (EARLY PROTEROZOIC)
Xpp — Phyllite and schist member
Xpq — Metaquartzite member
Xpr — Metarhyolite member
Xpv — Metavolcanic member
q — QUARTZ VEINS (UNKNOWN AGE)

CONTACT--Dotted where concealed. Queried where uncertain

FAULT--Showing dip. Dotted where concealed. Queried where uncertain

Normal Fault--Ball and bar on downthrown side

Strike-slip fault--Arrows indicate relative movement

APPROXIMATE BOUNDARY OF DOS CABEZAS MOUNTAINS WILDERNESS STUDY AREA

STRIKE AND DIP OF BEDS
Inclined
Vertical
Overturned

STRIKE AND DIP OF FOLIATION
Inclined
Vertical

PROSPECT

ADIT

SHAFT

OUTCROP SITE WITHOUT WORKINGS

EXPLANATION FOR MAP B

GRAVITY STATION

146 — GRAVITY CONTOUR --Contour interval 2 milligals. Hachures indicate lower density

GM7 — GRAVITY ANOMALY ASSOCIATED WITH MAGNETIC ANOMALY

GRAVITY HIGH OF DOS CABEZAS MOUNTAINS

GEOPHYSICAL MAPS OF THE DOS CABEZAS MOUNTAINS WILDERNESS STUDY AREA, COCHISE COUNTY, ARIZONA

By

Gerda A. Abrams

1986

STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

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, 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 geophysical survey of the Dos Cabezas Mountains (AZ-060-065) Wilderness Study Area, Cochise County, Arizona.

INTRODUCTION

The Dos Cabezas Mountains Wilderness Study Area, Arizona, lies along part of the crest and northeast flank of the Dos Cabezas Mountains, Cochise County, near the southeast corner of Arizona (fig. 1). The U.S. Bureau of Land Management requested mineral surveys of about 11,921 acres of the approximately 15,000 acre wilderness study area. In this report "wilderness study area" refers to the 11,921 acres that were studied. The Dos Cabezas Mountains are in many ways a typical mountain range of the Basin-and-Range physiographic province. They are a northwest-trending block-faulted range separated from adjacent ranges by broad valleys. The range is about 22 mi long and 8 mi wide, and it reaches an elevation of 8,354 ft at Dos Cabezas Peaks, located about 2 mi west of the study area. The terrain of the area is rugged. Roadheads and trails provide adequate access for foot traverses.

In the Dos Cabezas Mountains the Apache Pass fault zone is the major structural feature, barely skirting the southeast side of the study area. It extends several miles to the northwest and tens of miles to the southeast, across the Chiricahua Mountains beyond Apache Pass. It is typically made up of a pair of bounding faults and some anastomosing faults between them. The study area is underlain by a variety of sedimentary, igneous, and metamorphic rocks that provide only a fragmentary record of geologic events between Precambrian and Holocene times. A suite of metamorphic and igneous (primarily crystalline) rocks forms the basement terrain. Paleozoic and Mesozoic sedimentary rocks and also Paleozoic and Mesozoic volcanic rocks overlie the basement rocks but are extensively eroded away and may be covered. A pile of volcanic rocks of Late Cretaceous and Paleocene age caps the older rocks in much of the study area. Mid-Tertiary intrusive rocks underlie the eastern part of the study area as well as some very small, widely scattered additional localities. Quaternary gravel deposits occur in the major valleys and along the mountain front.

GEOPHYSICAL METHODS

An aeromagnetic map and a gravity map were used in the mineral resource assessment of the Dos Cabezas Mountains Wilderness Study Area. The data for the aeromagnetic map (U.S. Geological Survey, 1980) were acquired from a flight elevation of 500 ft above terrain with east-west flight lines spaced at 1 km (0.62 mi) (map A). The magnetic contour interval is 10 gammas. The complete Bouguer gravity map (map B) was compiled from data from Wynn (1981) and from 67 newly occupied stations (Abrams and others, 1985). The coverage averages one station per square mile. The contour interval is 2 mgal and the reduction density is 2.67 g/cc. Klein (1986) interpreted the aeromagnetic and gravity data as part of a regional study.

RESULTS OF THE GEOPHYSICAL SURVEY

The geophysical data are analyzed for information on concealed lithology and structure to complement geologic mapping. In this study no magnetic and gravity anomalies are considered to be directly related to undetected mineralization, although, several anomalies coincide with areas of known mineralization and prospects.

In this region of the United States the typical magnetic surface anomaly has its expression located approximately half a mile south and west of its source due to the inclination and declination of the Earth's magnetic field. The gravity contours are relatively broad and indistinct; they generally decrease in intensity towards the San Simon Valley to the northeast.

The magnetic low southwest of the Apache Pass fault zone (map A) is probably due to a narrow belt of weakly magnetized Paleozoic and Mesozoic sedimentary rocks dipping southwest from its surface trace. The Apache Pass fault zone and its zone of branch faults may have provided a passage way for ore-bearing hydrothermal fluids to rise through deep level basement rock (Drewes and others, in press). The zone of magnetic contours marking the Apache Pass fault zone is offset by a small magnetic high (map A, M1) west of Howard Peak. This offset of magnetic contours is probably an expression of the cross faults shown on the geologic map (Drewes, 1984, 1986; Drewes and others, in press). This magnetic high (M1) combined with the surface occurrences of some small possibly weaker magnetic Cretaceous or Tertiary rhyolite bodies shown on the geologic map, suggests that there may be a granitic stock concealed near Howard Peak. The M1 magnetic high appears related to a similar high (map A, M2) near Cooper Peak. Both the M1 and M2 anomalies may indicate small intrusions which may have been sources for hydrothermal fluids (Drewes and others, in press). Mines and prospects are known to exist in these anomalous areas.

An elongate magnetic low (map A, MG3) just north of Cooper Peak and Howard Peak is centered in the eastern part of the Dos Cabezas Cretaceous or Tertiary volcanic section, the central part of which in general resembles a fault-bounded caldera (Drewes and others, in press). The volcanic rocks in the Dos Cabezas Mountains Wilderness Study Area include a rhyolite ash flow, lenticular in outcrop and estimated to be as thick as about 1,500 ft (Drewes and others, in press) throughout much of the wilderness study area. Magnetic low, MG3 (map A) is interpreted to be the reflection of reverse polarization of the ash-flow or of prophylitized or otherwise altered rock. The magnetic gradients of anomaly MG3 indicate a relatively thin (700-1,300 ft) layer; however, no measurements of the direction of magnetization have been made on these rocks.

Two magnetic highs, which appear related, are located over Precambrian rocks at Rough Mountain (map A, M4) and at Government Peak (map A, M5). The saddle between the anomalies M4 and M5 may be related to the terrain effects of Cement Canyon; both anomalies also appear to be related to the terrain. Magnetic low M6 is located at the southwest side of Rough Mountain (map A) over a wide fault zone (Drewes and others, in press). Magnetic anomaly M6 could be a reflection of a belt of alteration, and possibly associated mineralization, or it may be a reflection of subsurface extension of a broad rhyolitic dike along the northeastern margin of the volcanic field that extends into the study area from the northwest.

A zone of steep magnetic contours parallels the Apache Pass fault zone (map A) and branch faults that splay from the Apache Pass fault zone west of Government Peak (map A, MG7).

In the area of Government Peak there are gravity and magnetic highs that correlate with a topographic high. The gravity high (map B, GM7) remains with a Bouguer reduction density of 3.00 g/cc, which indicates the gravity anomaly is not caused solely by high terrain. These gravity and magnetic anomalies are inferred to be caused by a mass of relatively dense, strongly magnetic rock. The aeromagnetic map suggests that this strongly magnetic rock may also underlie part of the mid-Tertiary Misemille stock; this combined with the fact that there has been no detected gravity expression associated with the Misemille stock indicates the stock is a shallow still-like body rather than a deeply rooted one.

A gravity high (GM3) is also present over the volcanic field (map B). In fact, a large gravity high lies over the Dos Cabezas Mountains (patterned on map B); from Government Peak it stretches northwest over the volcanic field and Precambrian rocks suggesting the outline of a structurally high crystalline basement (Wynn, 1981; Klein, 1985). An interpretation is that regional gravity high, which could be caused by the branch faults of the Apache Pass fault (map B), appears in the Dos Cabezas Mountains Wilderness Study Area. In order to distinguish the gravity high (GM3) from a high that may have been caused by topography, additional Bouguer gravity maps and profiles across the volcanic pile were made at various reduction densities. These additional maps and profiles (G. A. Abrams, unpub. data, 1985) confirm the gravity high, which may reflect a shallow, dense crystalline basement.

Magnetic low M8 (map A) located at the east edge of the Rough Mountain, appears to lie along a wide fault zone. It is similar in expression to other fault zones found at mountain edges in the Basin-and-Range province.

Magnetic high M9 (map A) is interpreted to be a reflection of shallow Precambrian crystalline basement rocks in San Simon Valley.

An unlabeled, T-shaped magnetic low lies in the area where branch faults off the Apache Pass fault zone intersect the middle reaches of Happy Camp Canyon. The area is underlain mainly by Precambrian metasedimentary and metavolcanic rocks. The anomaly is probably a reflection of the combined effects of less magnetic rocks and high terrain clearance.

CONCLUSIONS

In conclusion, there appears to be a zone of weakly magnetized Paleozoic and Mesozoic sedimentary rocks dipping southwest from the Apache Pass fault zone, the major structural feature in the area, which could have provided a passage way for ore-bearing hydrothermal fluids. Small granitic stocks are most likely concealed near Howard Peak and Cooper Peak; these intrusions could have been sources for hydrothermal fluids. Southwest of Rough Mountain a belt appears which could reflect alteration and possible mineralization. Although any of these anomalies could be related to possible undetected mineralization, no direct evidence for such was found in this geophysical study.

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