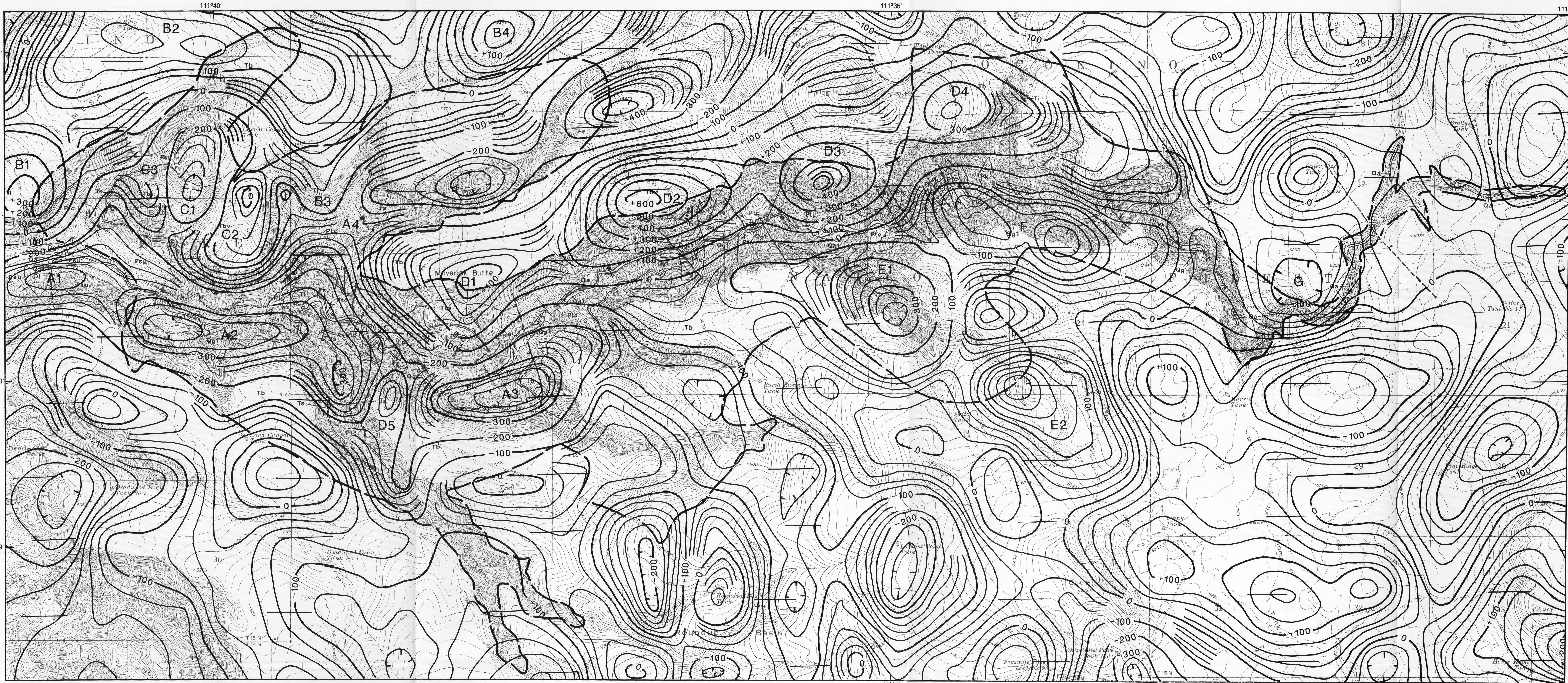
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1558-C



Base from U.S. Geological Survey
Casner Butte, 1965; Apache Maid Mountain, 1965

SCALE 1:24 000
1 ½ 0 1 MILE
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology from Ulrich and others (1983)

EXPLANATION

—— -100 —— MAGNETIC CONTOURS--Total intensity of the Earth's magnetic field, in gammas. Contour interval 20 gammas. Hachures indicate closed areas of low magnetic intensity

G ANOMALY--Discussed in text

FLIGHT PATH--Flight level 1,000 ft above ground level; flight line spacing 0.5 mi

APPROXIMATE BOUNDARY OF ROADLESS AREA

(Note: The following correlation, description of map units, and list of symbols are for the geologic base map shown in gray.)

CORRELATION OF MAP UNITS

Map units	Age	Period
Qa, Ql	Holocene and Pleistocene	QUATERNARY
Qgl	Pleistocene	QUATERNARY
UNCONFORMITY		
Tb, Tbv, Ti	Pliocene(?) and Miocene	TERTIARY
Ts	Miocene or older	TERTIARY
UNCONFORMITY		
Pk, Ptc, Psu	Lower Permian	PERMIAN

DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (QUATERNARY)--Modern flood-plain deposits and lower terrace gravels; silt, sand, and gravel in main Wet Beaver Creek drainage

Ql LANDSLIDE DEPOSITS (QUATERNARY)--Slump block or loose rubble; mostly basaltic debris

Qgl GRAVEL (PLEISTOCENE)--Primarily basaltic pebbles, cobbles, and boulders as large as 2 ft in diameter; generally 10-30 ft above flood plain

Tb BASALT FLOW(S) AND PYROCLASTIC DEPOSITS (TERTIARY)--Basalt flows, tuff, cinders, and spatter. Tuff commonly occurs at base of thick sequence of flows; as much as 1,000 ft thick

Tbv BASALT VENT MATERIAL (TERTIARY)--Cinder cone, scoria, tuff, spatter, and small flows

Ti INTRUSIVE BASALT (TERTIARY)--Dikes and plugs; probable feeders for eroded basaltic vents. Dikes shown on map as open-ended due to indefinite extensions in outcrop

Ts SEDIMENTARY ROCKS (TERTIARY)--Conglomerate, sandstone, limestone, and gravel; locally contains abundant lower Paleozoic and Precambrian clasts. Maximum thickness is 140 ft

Pk KAIBAB FORMATION (LOWER PERMIAN)--Very pale orange, grayish-orange, and pale-yellowish-orange cherty dolomite, sandy dolomite, and limestone; 280 ft thick

Ptc TOROWEAP FORMATION AND COCONINO SANDSTONE, UNDIVIDED (LOWER PERMIAN)--Crossbedded, light-gray to yellow-gray sandstone; 500 ft thick

Psu SUPAI FORMATION, UPPER (LOWER PERMIAN)--Orange-red siltstone, sandstone, and shale; interbedded light-gray sandstone tongues in upper part. Exposed thickness is 550 ft

Gray limestone and shale marker bed, probably the Fort Apache Limestone Member of the Supai. Unit is 5-15 ft thick and occurs about 350 ft below top of formation

CONTACT--Dashed where approximately located; short-dashed where inferred; dotted where concealed

FAULT--Short-dashed where inferred; dotted where concealed. Ball and bar on downthrown side

4 STRIKE AND DIP OF BEDS

STRIKE OF VERTICAL JOINTS

VERTICAL SHEAR ZONE ALONG PROMINENT JOINT--No apparent displacement

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. The results must be made available to the public and be submitted to the President and the Congress. This report presents the results of an aeromagnetic survey of the Wet Beaver Roadless Area (03045), Coconino National Forest, Coconino and Yavapai Counties, Arizona. The Wet Beaver Roadless Area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

INTRODUCTION

The Wet Beaver Roadless Area includes 9,890 acres (15.4 mi^2) of the Coconino National Forest and is in T. 15 N., Rs. 6, 7, and 8 E., Yavapai and Coconino Counties, central Arizona. Camp Verde, the nearest major population center, is about 13 mi southwest of the roadless area.

The area boundary closely follows the rim of the steep-walled canyon cut by Wet Beaver Creek into the gently westward sloping surface of the Colorado Plateau. The mouth of the canyon and the western boundary of the roadless area are near the Mogollon Rim, an escarpment that marks the southwestern margin of the Colorado Plateau. Here, the plateau surface falls off sharply in the Verde Valley, and Wet Beaver Creek flows 12 mi farther west where it joins the Verde River, the master stream of the region.

The maximum elevation within the area, just east of Hog Hill, is 6,470 ft. The lowest point, at 4,000 ft, is the stream bed of Wet Beaver Creek near the western area boundary. Topographic relief within the area ranges from 1,200 ft near the mouth of the canyon at Casner Butte to about 150 ft at the eastern boundary.

Perennial springs, located south of Hog Hill, discharge about 1,200-1,500 gallons of water per minute into Wet Beaver Creek (Twenter and Metzger, 1963, p. 94).

The western boundary of the roadless area and the mouth of Wet Beaver Creek canyon are accessible by Forest Service roads from either Camp Verde or the Sedona interchange on Interstate Highway 17. Various points along the canyon rim and the area boundary can be reached by unimproved roads, jeep trails, and pack trails. The canyon floor is accessible only on foot; in several places, deep pools require a swim or steep climb and descent for traverse of the canyon.

AEROMAGNETIC SURVEYS

An aeromagnetic survey of the roadless area and vicinity was conducted to help identify geologic environments that might be associated with buried mineral deposits. In sedimentary terranes, aeromagnetic anomalies generally are caused by buried or exposed igneous rocks that are strongly magnetic in contrast with surrounding sedimentary rocks.

A low-altitude aeromagnetic survey was drape flown with a mean terrain clearance of 1,000 ft and the data compiled by High Life-QEB, Inc., under contract to the U.S. Geological Survey in May 1981. The regional magnetic field was removed, IGRF 1975 (Barraclough, 1978) updated to month flown, and the data were contoured to an arbitrary datum base. Short-wavelength magnetic anomalies caused by rocks at or near the surface are accentuated by low-altitude surveys and may mask long-wavelength anomalies that have deeper sources. The aeromagnetic contour map drawn from the low-altitude data is generally characterized by magnetic lows over the canyon floors where Paleozoic sedimentary rocks are exposed and by steep-gradient magnetic highs along the canyon rims where Tertiary basaltic rocks are exposed. Paleozoic rocks across the study area have a cumulative thickness of about 1,650 ft and are overlain by basalts that range from 300 to 1,500 ft thick (Ulrich and others, 1983).

A regional aeromagnetic survey (Sauck and Sumner, 1970) was flown at 9,000 ft barometric elevation, and the magnetic anomalies with sources that are relatively small in horizontal dimension are less evident. Because the small anomalies are attenuated, broad, closed magnetic lows occur over areas where the sedimentary rocks are exposed or only thinly covered by basalt. The magnetic basaltic terrane may cause spurious magnetic anomalies in the regional survey because the widely spaced flight paths (3 mi) may not adequately define separate intrusive basalts whose dimensions are smaller than the flight-path spacing.

MAGNETIC INTERPRETATION OF THE LOW-ALTITUDE SURVEY

Magnetic intensities are low at the west end of the roadless area, over Wet Beaver Creek (A1, A2, A3) and the canyon leading to North Rim Tank (A4), (1) because sedimentary rocks having low magnetic susceptibility are the dominant outcropping rock or are under less basalt flow (Tb) cover because of erosion, (2) because of magnetic edge effects--magnetic lows that result from the susceptibility contrast between the truncated basalts on the canyon rims and the air, and (3) because the magnetometer probably was more than 1,000 ft above the canyon floors.

Magnetic intensities increase over the basaltic rocks that rim the canyons. The broad magnetic high (B1, B2, B3, B4) that extends from White Mesa eastward along the northwest boundary of the study area is probably caused by basalt flows (Tb). The magnetic peaks within this high are over areas where the basalt flows are thickest--that is over the topographic highs.

Magnetic intensity over the basalt vent material (Tbv) terrane in the vicinity of Casner Butte (C1) is lower than the magnetic intensity over the basalt flow (Tb) terrane, but higher than the magnetic intensity over the Paleozoic sedimentary rocks (Pk, Ptc, Psu). The circular magnetic low pattern over the basalt vent material (Tbv) terrane denotes an area where erruption occurred. The magnetic low closure (C1) is over a topographic depression and reflects that areas's low elevation and sections of both basalt vent material (Tbv) and basalt flows (Tb) that are thin relative to sections outside the depression. The two magnetic highs (C2, C3) within the Tbv terrane are over topographic peaks of basalt vent material. Mafic rocks in the subsurface may enhance magnetic highs C2 and C3; a basalt plug and dikes (Ti) crop out near the perimeter of the basalt vent material (Tbv) terrane.

The magnetic high (D1, D2, D3, D4) extending east from Maverick Butte parallels the north wall of Wet Beaver Creek canyon and probably is primarily caused by basalt flows (Tb) along the canyon rim. The magnetic high closure (D1) is offset to the north from the peak of Maverick Butte suggesting that the anomaly source is both the basalt vent material (Tbv) surrounding Maverick Butte and the basalt flows (Tb) that cap the mesa. The magnetic high D1 over the basalt vent material (Tbv) at Maverick Butte is caused by both the topographic peak and the rock with higher magnetic susceptibility than the Paleozoic sedimentary rocks exposed in the canyon floor. Basalt dikes (Ti) within the basalt vent material (Tbv) terrane may also partially cause the magnetic high over Maverick Butte. The apex of magnetic anomaly D1 is over basalt flow terrane that is topographically lower than Maverick Butte; the apex reflects basalt flows that have higher magnetic susceptibility than the basalt vent material (Tbv) on Maverick Butte.

The apex of anomaly D2 is over high topography and basalt vent material (Tbv) on the north rim of Wet Beaver Creek canyon. The primary anomaly source is probably the topographic placement of the basalt vent material (Tbv), but the anomaly may be enhanced by the swarm of basalt dikes (Ti) cropping out southeast of the apex of the anomaly.

The apex of anomaly D3 lies over a topographic nose along the steep north wall of Wet Beaver Creek canyon and within an uplifted fault block. The topographic nose is capped with basalt flows (Tb) that are the primary cause of the magnetic anomaly. Basalt vent material (Tbv) north of the anomaly apex and Paleozoic sedimentary rocks exposed to the south over the uplifted fault block both have lower magnetic susceptibility than the basalt flows (Tb) capping the topographic nose.

Aeromagnetic anomaly D4 is elongated along the north rim of Wet Beaver Creek canyon and is probably primarily caused by the high topographic rim and the basalt flows (Tb) capping the rim. Thin basalt flows (Tb) in the canyon wall, Paleozoic sedimentary rocks (Pk, Ptc) in the canyon floor, and basalt vent material (Tbv) exposed west of the anomaly apex all have lower magnetic susceptibility than the thick basalt flows (Tb) capping the canyon rim. Exposed intrusive basalt dikes (Ti) within the area of anomaly D4 may stem from subsurface mafic feeder bodies that may also lend to the shape and amplitude of the anomaly.

The small magnetic high (D5) southwest of Maverick Butte between Long Canyon and Wet Beaver Creek is over a narrow topographic high covered with basalt flows (Tb). A single flight line crosses the narrow topographic high while adjacent flight lines are over sedimentary rocks or thinned basalt flows in the canyon floors. The anomaly is caused by the basalt flows (Tb) at high elevation.

The broadened outcrop of the Permian section (Pk, Ptc) along the West Beaver Creek canyon floor south of anomaly D3 locally results from an uplifted block or horst. The magnetic lows to the southeast (E1, E2) may reflect an extension of the uplifted fault block where basalt flows (Tb) have been thinned by erosion in the canyon floors; magnetic edge effects from outcropping basalt flows in the canyon walls possibly lend to the anomalies.

Magnetic low F occurs over the south wall of Wet Beaver Creek canyon. The low reflects the exposed sedimentary rocks in the canyon floor, thin basalt flow (Tb) along the canyon's south wall, and the magnetic edge effects from the eroded basalt flows. A low-amplitude magnetic high occurs between anomalies E1 and E2 and F. The high is over a topographic ridge between two canyons and probably reflects a thicker section of basalt flow (Tb) as well as topographic edge effects.

The magnetic gradient south of aeromagnetic low anomaly G may reflect magnetic edge effects of the basalt flows (Tb) exposed in the canyon walls and the magnetometer probably being more than 1,000 ft above the canyon foor because of the direction of flight relative to the topography; however, magnetic intensity at the apex of anomaly G relative to magnetic intensity in the canyon both east and west of the apex suggests that the anomaly is only partially related to topography. Anomaly G conforms to the configuration of Wet Beaver Creek canyon, especially where the creek trends northwest, and may reflect unexposed structure, possibly a tilted fault block, where rocks that have contrasting magnetic susceptibilities are juxtaposed.

CONCLUSIONS

Magnetic anomalies can generally be correlated with the mapped geology and topography of the study area except possibly for magnetic anomaly G. Magnetic intensities are low over Paleozoic sedimentary rocks exposed in the canyon floors and high over the canyon walls and rims where the rocks are dominantly Tertiary volcanics. Although the dissected vent areas (Tbv) generally contain basalt dikes (Ti), the vent areas have lower magnetization than the basalt flows (Tb). Aeromagnetic anomalies over the Tertiary volcanics are caused by topography as well as relative magnetic susceptibility of the rocks. Anomaly G is probably related to topographic placement of the basalt flows (Tb), but also may reflect unexposed structure.

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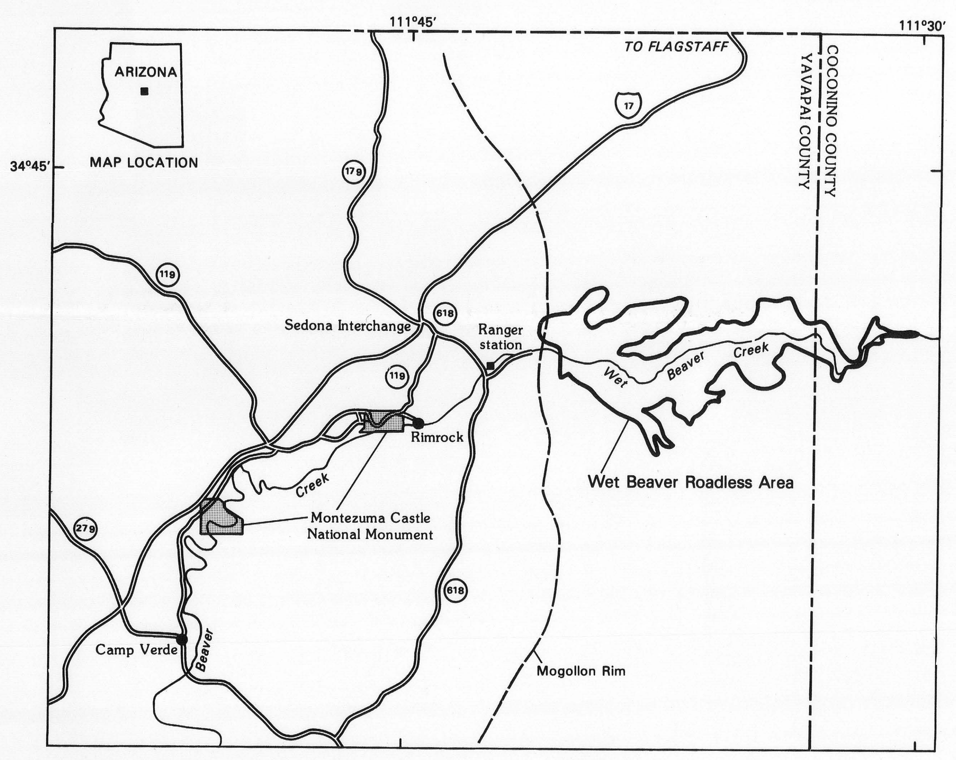

INDEX MAP SHOWING LOCATION OF THE WET BEAVER ROADLESS AREA (U.S. FOREST SERVICE NUMBER 03045), COCONINO AND YAVAPAI COUNTIES, ARIZ.

AEROMAGNETIC MAP OF THE WET BEAVER ROADLESS AREA, YAVAPAI AND COCONINO COUNTIES, ARIZONA

By
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