

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Analytical results and sample locality map of
rock samples from the Cowboy Spring Wilderness Study Area,
Hidalgo County, New Mexico

By

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This report is preliminary and has not been reviewed for
conformity with U.S. Geological Survey editorial standards
and stratigraphic nomenclature.

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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 resource potential. 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 part of the Cowboy Spring (NM-030-007) Wilderness Study Area, Hidalgo County, New Mexico.

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SUMMARY

In March and April 1987, the U.S. Geological Survey conducted a geologic and geochemical survey of the Cowboy Spring Wilderness Study Area (NM-030-007), Hidalgo County, New Mexico. At the request of the U.S. Bureau of Land Management, we studied 6,699 acres of the wilderness study area which is about 15 mi north of the international border between the United States and Mexico (fig. 1). Elevations range from 4,920 ft to 6,601 ft. Access to the study area is provided by light-duty roads and 4-wheel drive trails.

Cretaceous and Tertiary sedimentary rocks and Tertiary volcanic rocks are found in the study area. The study area was included in the area mapped by Zeller and Alper (1965) and in a study of volcanic centers in southwestern New Mexico by Erb (1979). A survey of mining activity is given in Scott (1987) and a mineral resource potential study is in progress.

Analyses of unaltered and unmineralized rock samples provide background geochemical data for the individual rock units. Analyses of altered rocks, on the other hand, provide geochemical information on the alteration that has affected the rocks along a faulted zone in the eastern part of the study area (fig. 2). A correlation and list of map units are given on figure 3.

Rock-chip samples were collected from outcrops at the 14 localities shown on figure 2 and were analyzed using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their limits of determination are listed in table 1.

DESCRIPTION OF DATA TABLES

Analyses for rock-chip samples from the Cowboy Spring Wilderness Study Area are listed in table 2. The data are arranged so that the USGS-assigned sample numbers correspond to the numbers shown on the site location map (fig. 2). A letter "N" in the table indicates that a given element was analyzed for, but was not detected at the lower limit of determination. A letter "L" in the table indicates that a given element was detected, but was below the limit of determination.

In addition, rock type, alteration, and location for each sample site are given in table 3.

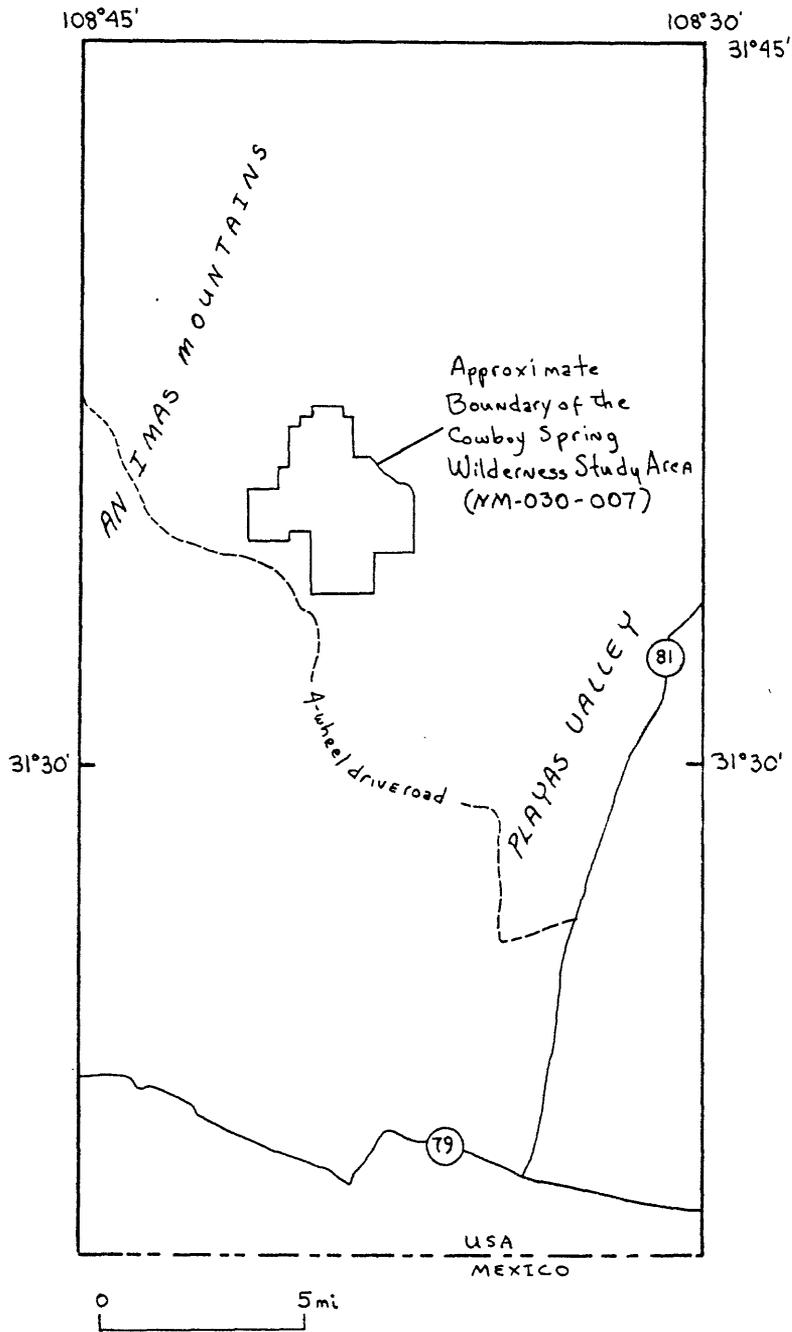
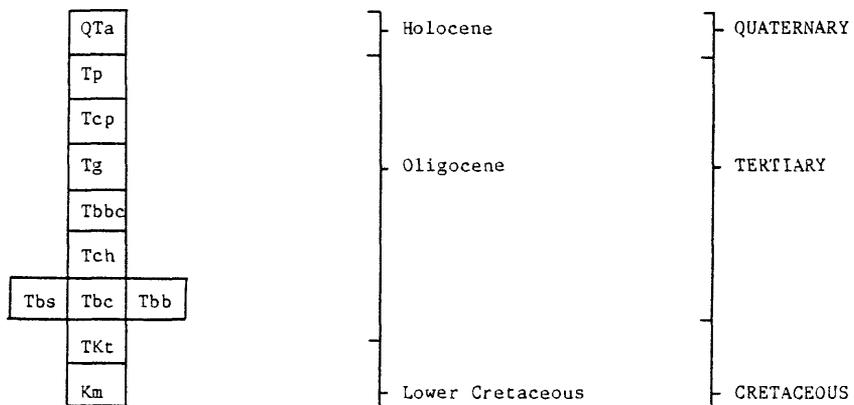


Figure 1.--Index map showing location of Cowboy Spring Wilderness Study Area, Hidalgo County, New Mexico.

CORRELATION OF MAP UNITS



LIST OF MAP UNITS

| | |
|------|---------------------------------------|
| QTa | Alluvium, undivided |
| Tp | Park Tuff |
| Tcp | Andesite of Center Peak |
| Tg | Gillespie Tuff |
| Tbbc | Tuff of Black Bill Canyon |
| Tch | Cedar Hill Andesite |
| Tbs | Tuff of Bennett Spring |
| Tbc | Tuff of Bluff Creek |
| Tbb | Bennett Creek Breccia |
| TKt | Cowboy Spring-Timberlake Conglomerate |
| Km | Mojado Formation |

- CONTACT--Dashed where approximately located or inferred
- FAULT--Dashed where inferred, dotted where concealed; ball and bar on downthrown side
- 25 Strike and dip of compaction foliation
- v - Vitrophyre
- Pyroclastic sand
- ²²⁷ ● - Geochemical sample locality and number

Detailed descriptions of map units may be found in Zeller and Alper (1965) and Erb (1979).

Figure 3.--Correlation and list of map units for the Cowboy Spring Wilderness Study Area, Hidalgo County, New Mexico.

Table 1.--Limits of determination for the spectrographic analysis of rocks,
based on 10-mg sample

| Element | Lower determination limit | Upper determination limit |
|-------------------|---------------------------|---------------------------|
| Percent | | |
| Iron (Fe) | 0.05 | 20 |
| Magnesium (Mg) | .02 | 10 |
| Calcium (Ca) | .05 | 20 |
| Titanium (Ti) | .002 | 1 |
| Parts per million | | |
| Manganese (Mn) | 10 | 5,000 |
| Silver (Ag) | 0.5 | 5,000 |
| Arsenic (As) | 200 | 10,000 |
| Gold (Au) | 10 | 500 |
| Boron (B) | 10 | 2,000 |
| Barium (Ba) | 20 | 5,000 |
| Beryllium (Be) | 1 | 1,000 |
| Bismuth (Bi) | 10 | 1,000 |
| Cadmium (Cd) | 20 | 500 |
| Cobalt (Co) | 5 | 2,000 |
| Chromium (Cr) | 10 | 5,000 |
| Copper (Cu) | 5 | 20,000 |
| Lanthanum (La) | 20 | 1,000 |
| Molybdenum (Mo) | 5 | 2,000 |
| Niobium (Nb) | 20 | 2,000 |
| Nickel (Ni) | 5 | 5,000 |
| Lead (Pb) | 10 | 20,000 |
| Antimony (Sb) | 100 | 10,000 |
| Scandium (Sc) | 5 | 100 |
| Tin (Sn) | 10 | 1,000 |
| Strontium (Sr) | 100 | 5,000 |
| Vanadium (V) | 10 | 10,000 |
| Tungsten (W) | 50 | 10,000 |
| Yttrium (Y) | 10 | 2,000 |
| Zinc (Zn) | 200 | 10,000 |
| Zirconium (Zr) | 10 | 1,000 |
| Thorium (Th) | 100 | 2,000 |

Table 2.--Analytical results of rock samples from the Cowboy Spring
Wilderness Study Area, Hidalgo County, New Mexico

| Field No. | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 |
|-----------|------|-------|------|-------|-------|------|------|------|------|------|------|-------|------|-------|
| Fe % | 1. | 1.5 | .7 | 2. | 1.5 | 1.5 | 1. | 2. | .5 | .3 | 3. | 3. | 2. | 5. |
| Mg % | .2 | .7 | .1 | .5 | .2 | .2 | .07 | .2 | .07 | .2 | .5 | 1.5 | .3 | .2 |
| Ca % | .3 | 2. | .1 | 2. | .5 | .2 | L | .07 | .05 | .2 | 1. | 2. | .2 | .15 |
| Tl % | .07 | .2 | .1 | .2 | .15 | .1 | .1 | .2 | .07 | .05 | .3 | .5 | .2 | .2 |
| Mn ppm | 200. | 1000. | 700. | 500. | 1000. | 200. | 10. | 100. | 30. | 50. | 300. | 1000. | 100. | 300. |
| Ag ppm | N | N | N | N | N | N | .5 | N | .5 | N | N | N | N | N |
| As ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | 300. |
| Au ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| B ppm | 15. | 10. | 15. | 15. | 20. | 15. | 10. | 20. | 10. | 50. | 15. | 10. | 70. | L |
| Ba ppm | 500. | 700. | 100. | 500. | 500. | 300. | 500. | 700. | 300. | 150. | 700. | 700. | 700. | 1000. |
| Be ppm | 1.5 | 1. | 3. | L | 1.5 | L | 1. | 1.5 | L | 1. | 1.5 | 1.5 | 1.5 | 1.5 |
| Bi ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Cd ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Co ppm | 5. | 7. | L | 7. | 10. | L | N | L | N | N | 10. | 15. | N | 5. |
| Cr ppm | N | N | N | L | L | N | N | N | N | N | N | 20. | N | N |
| Cu ppm | 5. | 7. | L | 10. | 5. | L | L | 5. | L | L | 7. | 7. | L | 5. |
| La ppm | 30. | 100. | 70. | 50. | 70. | 50. | 70. | 70. | 30. | 30. | 70. | 70. | 70. | 100. |
| Mo ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | 10. |
| Nb ppm | N | N | 30. | N | L | N | L | L | L | N | L | L | L | 20. |
| Ni ppm | L | N | N | 5. | 5. | L | L | L | L | L | 5. | 7. | N | 5. |
| Pb ppm | 15. | 70. | 50. | 15. | 30. | 30. | 20. | 30. | 15. | 15. | 30. | 30. | 30. | 30. |
| Sb ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Sc ppm | 5. | 7. | L | 7. | 5. | L | L | 7. | L | L | 10. | 15. | 7. | 7. |
| Sn ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Sr ppm | 200. | 300. | N | 1000. | 150. | L | N | 150. | L | 500. | 200. | 300. | 500. | 200. |
| V ppm | 15. | 50. | 10. | 50. | 30. | 20. | 20. | 50. | 15. | L | 70. | 70. | 20. | 50. |
| W ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Y ppm | 15. | 30. | 50. | 15. | 30. | 20. | 20. | 50. | 20. | 15. | 30. | 50. | 30. | 50. |
| Zn ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Zr ppm | 150. | 200. | 200. | 150. | 100. | 100. | 100. | 150. | 70. | 50. | 200. | 200. | 300. | 500. |
| Th ppm | N | N | N | N | N | N | N | N | N | N | N | N | N | N |

Table 3.--Alteration, rock type, and location of rock samples from the
Cowboy Spring Wilderness Study Area,
Hidalgo County, New Mexico

| Field No. | Alteration | Rock Type | Latitude | Longitude |
|-----------|------------|-----------|-----------|------------|
| 227 | H | X | 31°35'58" | 108°39'54" |
| 228 | - | S | 31°36' | 108°39'54" |
| 229 | - | S | 31°35'05" | 108°41'18" |
| 230 | C | T | 31°34'37" | 108°40'39" |
| 231 | H | S | 31°35'14" | 108°38'50" |
| 232 | H | S | 31°33'53" | 108°38'23" |
| 233 | - | S | 31°37'33" | 108°38'49" |
| 234 | C | S | 31°37'09" | 108°38'57" |
| 235 | C | S | 31°37'37" | 108°39'31" |
| 236 | C | S | 31°36'23" | 118°38'30" |
| 237 | H | T | 31°36'08" | 108°38'26" |
| 238 | - | T | 31°36'55" | 108°38'56" |
| 239 | H | S | 31°36'01" | 108°28'04" |
| 240 | H | S | 31°35'59" | 108°38'20" |

Alteration

- unaltered
H iron/manganese
C siliceous

Rock Type

S felsic igneous
T intermediate igneous
X chert or jasperoid

REFERENCES CITED

- Erb, E. E., 1979, Petrologic and structural evolution of ash-flow-tuff cauldrons and noncauldron-related volcanic rocks in the Animas and southern Peloncillo Mountains, Hidalgo County, New Mexico: Albuquerque, University of New Mexico, unpubl. Ph.D. dissertation, 286 p.
- Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.
- Scott, D. C., 1987, Mineral investigation of the Cowboy Spring Wilderness Study Area (NM-030-007), Hidalgo County, New Mexico: U.S. Bureau of Mines Open File Report MLA 68-87, 10 p.
- Zeller, R. A., and Alper, A. M., 1965, Geology of the Walnut Wells quadrangle, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 84, 105 p.