

**MINERAL RESOURCE POTENTIAL AND GEOLOGIC MAP  
OF THE CABALLO AND POLVADERA ROADLESS AREAS,  
LOS ALAMOS AND RIO ARRIBA COUNTIES, NEW MEXICO**

By

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**STUDIES RELATED TO WILDERNESS**

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Caballo (03104) and Polvadera (03102) Roadless Areas, Santa Fe National Forest, Los Alamos and Rio Arriba Counties, New Mexico.

**MINERAL RESOURCE POTENTIAL  
SUMMARY STATEMENT**

A mineral resource potential study was conducted for the Caballo and Polvadera Roadless Areas, Los Alamos and Rio Arriba Counties, New Mexico, in 1980. These areas, consisting of 24,280 acres in the Jemez Mountains, are in the Santa Fe National Forest north of Los Alamos. The rocks in the areas studied are mainly volcanic, with minor volcanoclastic sedimentary rocks.

The mineral resource potential is low. There has been no mining activity within the study areas, and chemical analyses of stream-sediment samples show no significant anomalous concentrations of metal elements. Near the Polvadera area there has been some exploration for geothermal resources.

**INTRODUCTION**

The Caballo and Polvadera Roadless Areas, in the Santa Fe National Forest, northern New Mexico, were studied in 1980 to determine their mineral resource potential. The Caballo area, consisting of 8,800 acres (3,563 ha), is in the northwestern part of Los Alamos County near the town of Los Alamos. The Polvadera area, consisting of 15,480 acres (8,267 ha), is in Rio Arriba County about 6 mi (9.6 km) north of the Caballo area.

The roadless areas are in the Jemez Mountains, an isolated mountain range in north-central New Mexico, and are, in large part, heavily timbered and dissected by several steep-walled canyons that contain perennial streams. Elevations range from 7,300 ft (2,225 m) to 11,232 ft (3,426 m). The Jemez Mountains are remnants of a large, complex volcanic field that was active between 0.5 and 12 m.y. ago. Rocks in the study areas are chiefly mafic to felsic domes and flows, ash-flow tuffs, and volcanoclastic rocks derived from the volcanic highlands.

The Jemez Mountains have been the focus of extensive investigations by R. L. Smith and his

colleagues in the U.S. Geological Survey. Their geologic map of the area (Smith and others, 1970) and a report on the stratigraphic nomenclature (Bailey and others, 1969) were used without reservation in preparing this report and map, although age designations for rock units have been changed to conform with currently accepted boundaries of the Miocene-Pliocene at 5 m.y. and Pliocene-Quaternary at 2 m.y. or have been changed where additional radiometric ages are available. Additional geologic data in the Los Alamos area are from Griggs (1964).

No mining activity has taken place within the study areas. Nearby mining activity includes pumice and diatomaceous earth operations 11 mi (18 km) to the east, and the Bland or Cochiti mining district 12 mi (20 km) to the south, where gold, silver, lead, and copper were produced from volcanic rocks of the Jemez volcanic field between 1894 and 1948 (Elston, 1967).

**GEOLOGY AND GEOCHEMISTRY**

The Jemez Mountains volcanic field overlies sedimentary rocks of Permian to Miocene age along

the western margin of the Rio Grande rift. The volcanic rocks have been subdivided into three groups (Bailey and others, 1969); the Keres, Polvadera, and Tewa Groups. The oldest group, the late Miocene Keres, is exposed primarily in the southern part of the volcanic field outside the map area but includes one formation, the Paliza Canyon Formation, which is exposed in the southwestern part of the map area.

Most of the rocks in the study areas belong to the Tschicoma Formation of the late Miocene to Pliocene Polvadera Group. The rocks of this formation are predominantly dacitic to quartz latitic. Also included within the Polvadera Group is the El Rechueles Rhyolite, represented by three small domes in the Polvadera area, and the lava flows of the Lobato Basalt, which are exposed north and northeast of the Polvadera area.

The Puye Formation, a sedimentary sequence in part contemporaneous with the Polvadera Group, is exposed locally along the east sides of the study areas. It is composed of detrital material derived chiefly from the concurrent erosion of the Tschicoma Formation.

Rocks of the younger, Quaternary Tewa Group include many rhyolites and ash-flow tuffs that represent the terminal stages of volcanism in the Jemez Mountains. These rocks record the formation of two calderas, the Toledo and Valles, which largely overlap one another, and the subsequent intracaldera domes. Rocks from this group are exposed in parts of the margins of the areas and contribute abundant quartz and sanidine phenocrysts to the stream sediments.

In 1980 the Caballo and Polvadera areas were assessed for mineral resource potential. Although no additional geologic mapping or geophysical surveys were considered necessary, a geochemical stream-sediment investigation was conducted. Fifteen stream-sediment samples were collected from major drainages in the Caballo Roadless Area and twenty-six from the Polvadera Roadless Area. The maximum concentrations for some metals are shown in table 1.

Table 1.—Maximum metal concentrations for some elements in stream-sediment samples from the Caballo and Polvadera Roadless Areas

Samples were sieved to 1/2 mm (sand and clay) in the field and analyzed by the U.S. Geological Survey, using semi-quantitative spectrographic methods, for Fe, Mg, Ca, Ti, Mn, Ag, As, Au, B, Ba, Be, Bi, Cd, Co, Cr, Cu, La, Mo, Nb, Ni, Pb, Sb, Sc, Sn, Sr, V, W, Y, Zn, Zr, and Th. Analyses showed no significant anomalous concentrations of metals

Element	Concentration (ppm)	Sample No.	Level of Detection (ppm)
Cu	30	P25	5
Mo	10	C15, P13, P17, P18.	5
Pb	150	C2	10
Sn	10	P17	10
Zn	200	C15	200

Samples having values of 5-10 ppm molybdenum cluster in the South and West Forks of Polvadera Creek (samples P13, P16-P19). The weakly anomalous molybdenum, tin, and lead values in a few samples probably reflect intrinsically high metal concentrations in some of the late rhyolitic rocks and are not considered significant.

#### MINING DISTRICTS AND MINERALIZATION

No mining districts are located within the two areas studied. Courthouse records were examined at Los Alamos (Los Alamos County) and Tierra Amarilla (Rio Arriba County), and no claim records were found. There are no known mineralized areas within the roadless areas.

There has been some interest in geothermal resources near the Polvadera area. AMAX Exploration Inc. has drilled eight geothermal holes near the southwest part of the area, and several geothermal leases extend into the study area (fig. 2).

#### ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The potential for mineral resources in the Caballo and Polvadera Roadless Areas is considered low. The Jemez Mountains volcanic field is probably a bimodal volcanic center, but values of the commonly associated metals, beryllium, molybdenum, tin, and possibly silver and gold, are not anomalous in the study areas. Base metals are not a likely association in these areas. A slight concentration of a maximum of 10 ppm molybdenum is present in samples from the west edge of the Polvadera area.

#### REFERENCES

- Bailey, R. A., Smith, R. L., and Ross, C. S., 1969, Stratigraphic nomenclature of volcanic rocks in the Jemez Mountains, New Mexico: U.S. Geological Survey Bulletin 1274-P, 19 p.
- Elston, W. E., 1967, Summary of the mineral resources of Bernalillo, Sandoval, and Santa Fe Counties, New Mexico (exclusive of oil and gas): New Mexico Bureau of Mines and Mineral Resources Bulletin 81, 81 p.
- Griggs, R. L., 1964, Geology and ground-water resources of the Los Alamos area, New Mexico, with a section on Quality of water, by J. D. Hem: U.S. Geological Survey Water-Supply Paper 1753, 107 p.
- Smith, R. L., Bailey, R. A., and Ross, C. S., 1970, Geologic map of the Jemez Mountains, New Mexico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-571, scale 1:250,000.

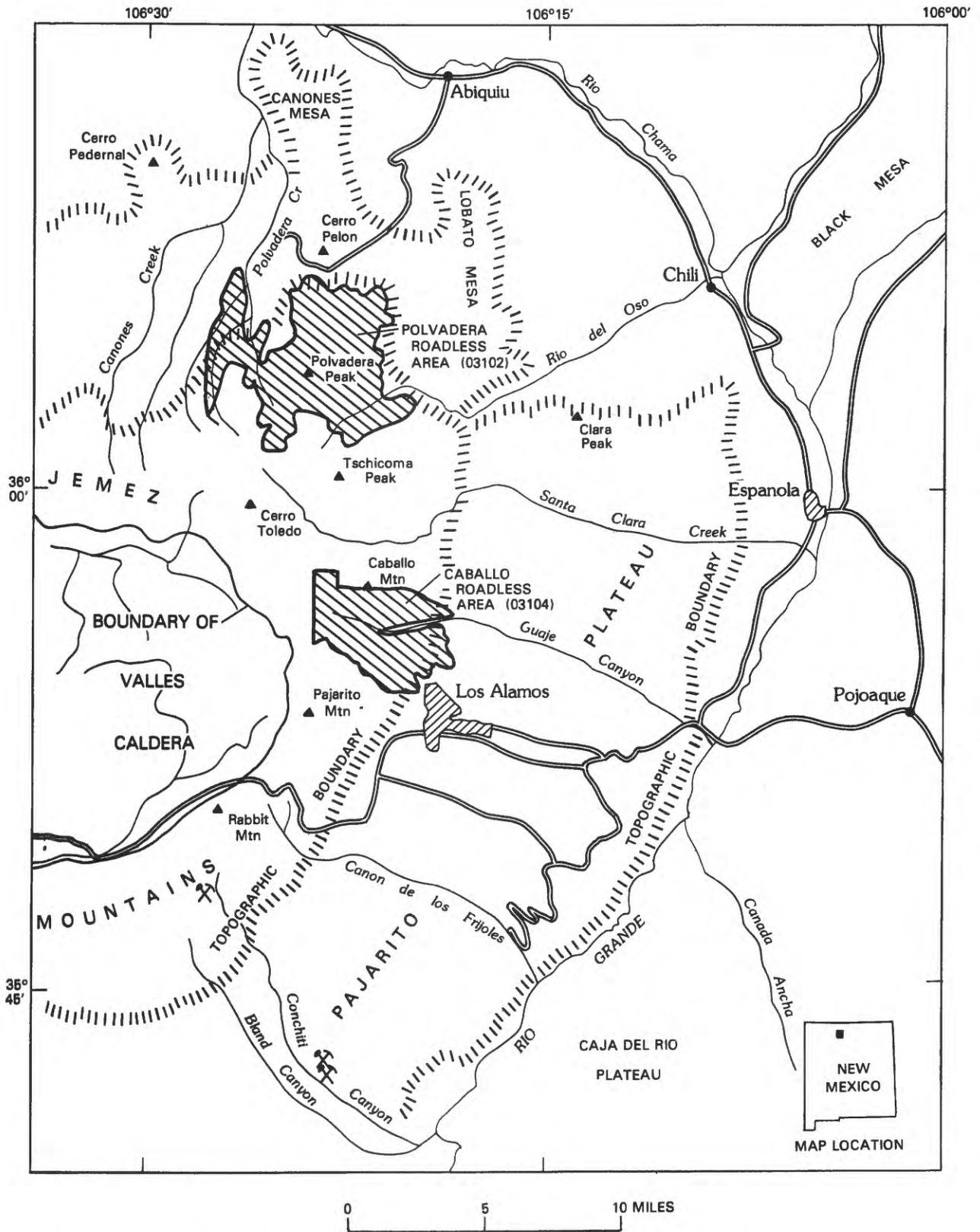
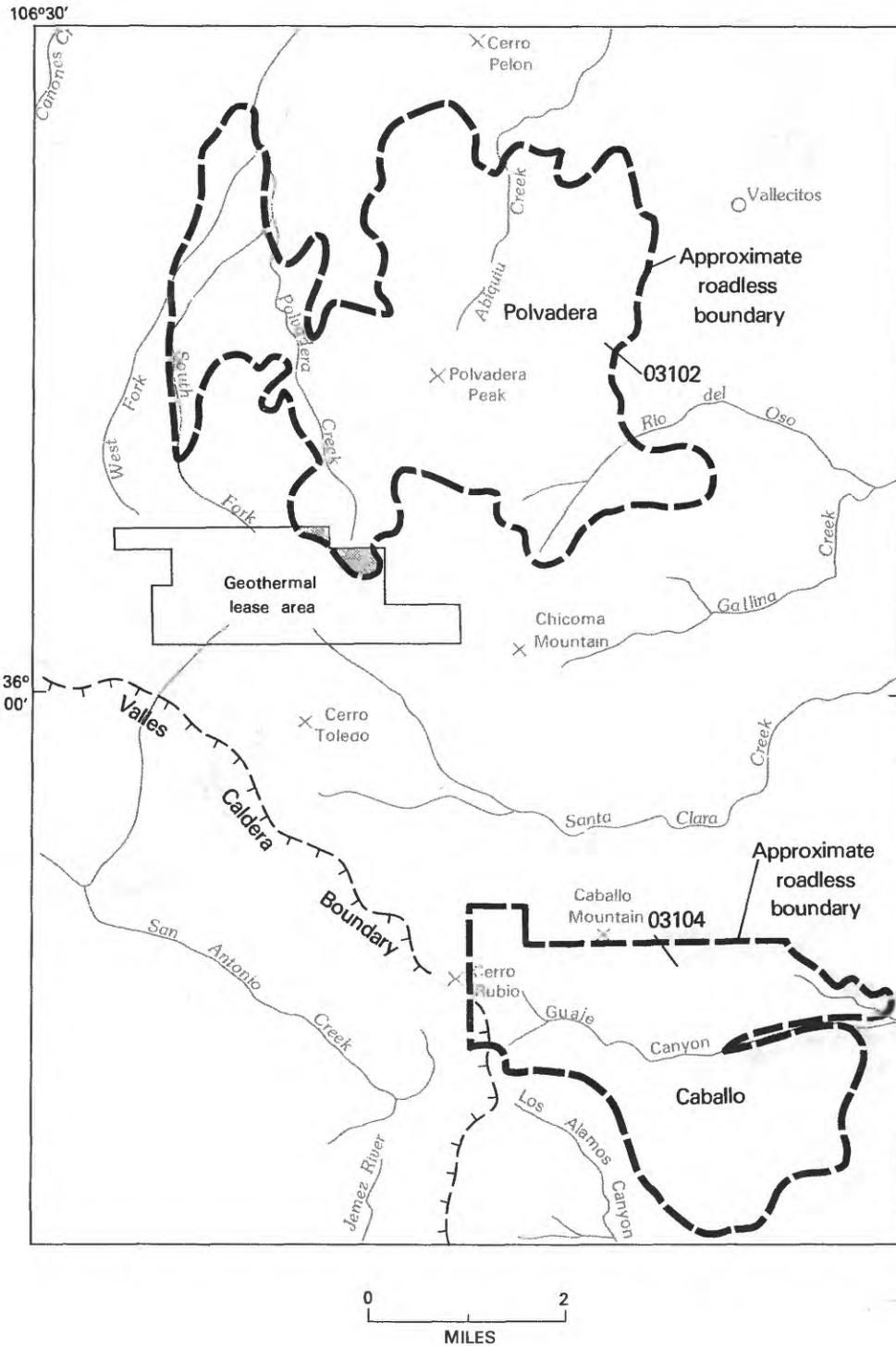


Figure 1.--Index map showing the location of the Caballo (03104) and Polvadera (03102) Roadless Areas, New Mexico.



**EXPLANATION**

 AREA OF LOW GEOTHERMAL RESOURCE POTENTIAL

Figure 2.--Mineral resource potential map of the Caballo and Polvadera Roadless Areas, New Mexico.