GEOLOGICAL SURVEY CIRCULAR 557

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LEAD, COPPER, MOLYBDENUM, AND ZINC GEOCHEMICAL ANOMALIES SOUTH OF THE SUMMITVILLE DISTRICT, RIO GRANDE COUNTY, COLORADO

By WILLIAM N. SHARP and JAMES L. GUALTIERI

Abstract

An extensive lead geochemical anomaly, as well as several smaller anomalies of copper, molybdenum, and zinc, have been found in a large area of altered volcanic and intrusive rocks south of the Summitville mining district. These geochemical anomalies, together with the geologic similarity to the productive Summitville district, make the area attractive for further exploration.

INTRODUCTION

A geologic and geochemical study of a large area of highly altered rocks in the volcanic and intrusive center around Summitville and Lookout Mountain in the eastern San Juan Mountains has revealed a possible exploration target near Lookout Mountain. This area was investigated as part of the Heavy Metals program of the U.S. Geological Survey to assess its resource potential for metal deposits. Summitville has produced significant quantities of gold, silver, and copper from a mineralized volcanic plug and is currently being developed for further mining. Other areas to the south have been widely prospected, but production has been negligible. The geologic similarity of the Summitville district and the area around Lookout Mountain to the south suggested that reconnaissance geochemical and hydrothermal alteration studies of the Lookout Mountain area might reveal evidence for the presence of hidden ore deposits.

GEOLOGY

The area studied is underlain by a thick series of lava flows representing several distinct periods of volcanic activity. The lowermost and most widespread flows are part of the Conejos Formation of Oligocene or older age (Steven, Mehnert, and Obradovich, 1967). These are overlain by later flows of rhyodacite, quartz latite, and rhyolite; and at Summitville, they are cut by numerous associated plugs which were called Fisher Quartz Latite by Steven and Ratté (1960). South of Summitville the Conejos Formation has been intruded by a large body of quartz monzonite (quartz monzonite of Klondike Mountain of Patton, 1917) and by a large dike of quartz latite porphyry and several smaller bodies of coarsely porphyritic quartz latite closely similar to the Fisher Quartz Latite at Summitville.

ROCK ALTERATION

A large mass of altered rock forms the northern side of the upper Alamosa Creek valley and includes Lookout Mountain (fig. 1). It extends over a northeast-trending area 4–5 miles long and about 2 miles wide and lies roughly astride the contact between volcanic rocks on the northwest and quartz monzonite to the southeast. The large dike and other small bodies of quartz latite porphyry that intrude the volcanic rocks also are altered. The altered rocks are exceptionally well exposed on the rugged east slope of Lookout Mountain.

Hydrothermal activity in one or two stages has converted the original drab-colored flows and intrusive rocks into conspicuous white, yellow, and red masses consisting largely of quartz, kaolinite, and illite. Rocks along a wide belt that includes the large quartz latite porphyry dike south and east of Lookout Mountain have been altered predominantly to quartz, alunite, and pyrophyllite. This assemblage is considered to represent a more advanced stage of hydrothermal alteration than the more wide-

spread quartz-kaolinite-illite assemblage, and the general parallelism of the quartz-alunite-pyrophyllite rocks to the dike suggests that they are genetically related to the dike.

GEOCHEMICAL ANOMALIES

More than 200 rock samples were collected throughout the area of altered rock (fig. 1); most were collected from intensely altered areas. Chemical analyses of these samples indicate zones of anomalously high content of lead, molybdenum, copper, and zinc (figs. 2–5). Neither gold nor silver was detected in the samples from the area around Lookout Mountain; the limits of detection of the analytical methods used were 0.1 ppm (part per million) for gold and 0.5 ppm for silver. Traces to appreciable amounts of both metals were detected in samples from the Summitville area.

The most pronounced geochemical anomalies are in a group east of Lookout Mountain. A lead anomaly nearly 2 miles long and as much as 0.6 mile wide encloses most of the large quartz latite porphyry dike and overlaps onto the quartz monzonite to the southeast. Within this anomalous area, all samples contain >100 ppm lead. The lead anomaly covers and is roughly parallel to the southeastern part of the zone of quartz-alunite-pyrophyllite alteration and extends into adjacent parts of the zone of quartz-kaolinite-illite alteration. Smaller anomalies of molybdenum, copper, and zinc are peripheral to the lead anomaly.

This arrangement of metal anomalies suggests that lead, being less mobile in a surface environment, may be accumulated more closely around the locus of mineralization, whereas the copper, molybdenum, and zinc were more easily moved through the rocks and thus were deposited farther from the center.

COMPARISON WITH THE SUMMITVILLE DISTRICT

The area of altered rocks discussed in this report is about 3 miles south of the Summitville district, and the similarities of the two areas in geologic relations, alteration pattern, and geochemical anomalies are noteworthy. In both areas, rock alteration is concentrated in the vicinity of intrusive bodies and volcanic plugs. The gold-silver-copper mineralization at Summitville was centered in the most strongly altered rocks in a plug of coarsely porphyritic quartz latite (Steven and Ratté, 1960) that lithologically resembles the large dike east of Lookout Mountain. Within the plug, mineralization was closely confined to a zone of quartz-alunite alteration within a wider body of more weakly altered rocks. An area with anomalously high lead content encloses the mineralized zone at Summitville, and local areas with high zinc and molybdenum content are peripheral to the area of high lead content.

CONCLUSIONS

The geologic relations, the alteration patterns, and the geochemical anomalies indicate that the area east of Lookout Mountain deserves careful consideration as an exploration target. The area around the northeast end of the lead anomaly seems to be the most favorable, inasmuch as geochemical anomalies of the other metals also occur there. In view of the possible secondary migration of metals downhill, the topographically higher parts of the target area near the porphyry dike should be tested first.

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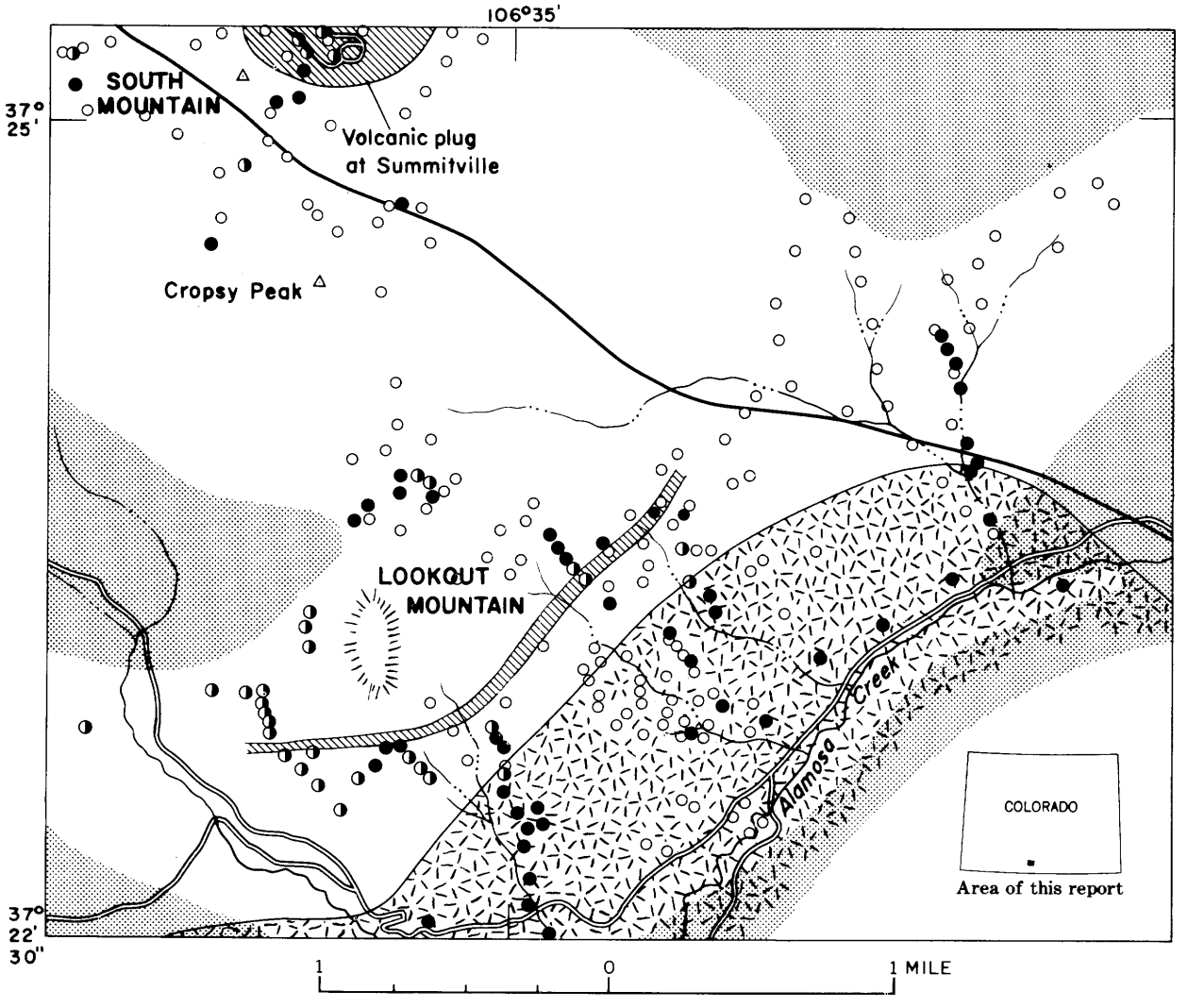


EXPLANATION

Quartz latite porphyry of Miocene age

Quartz monzonite of Miocene age

Conejos Formation and younger volcanic rocks, of Oligocene or older age

All rocks are altered except where stippled; stippling indicates unaltered rock

Fault

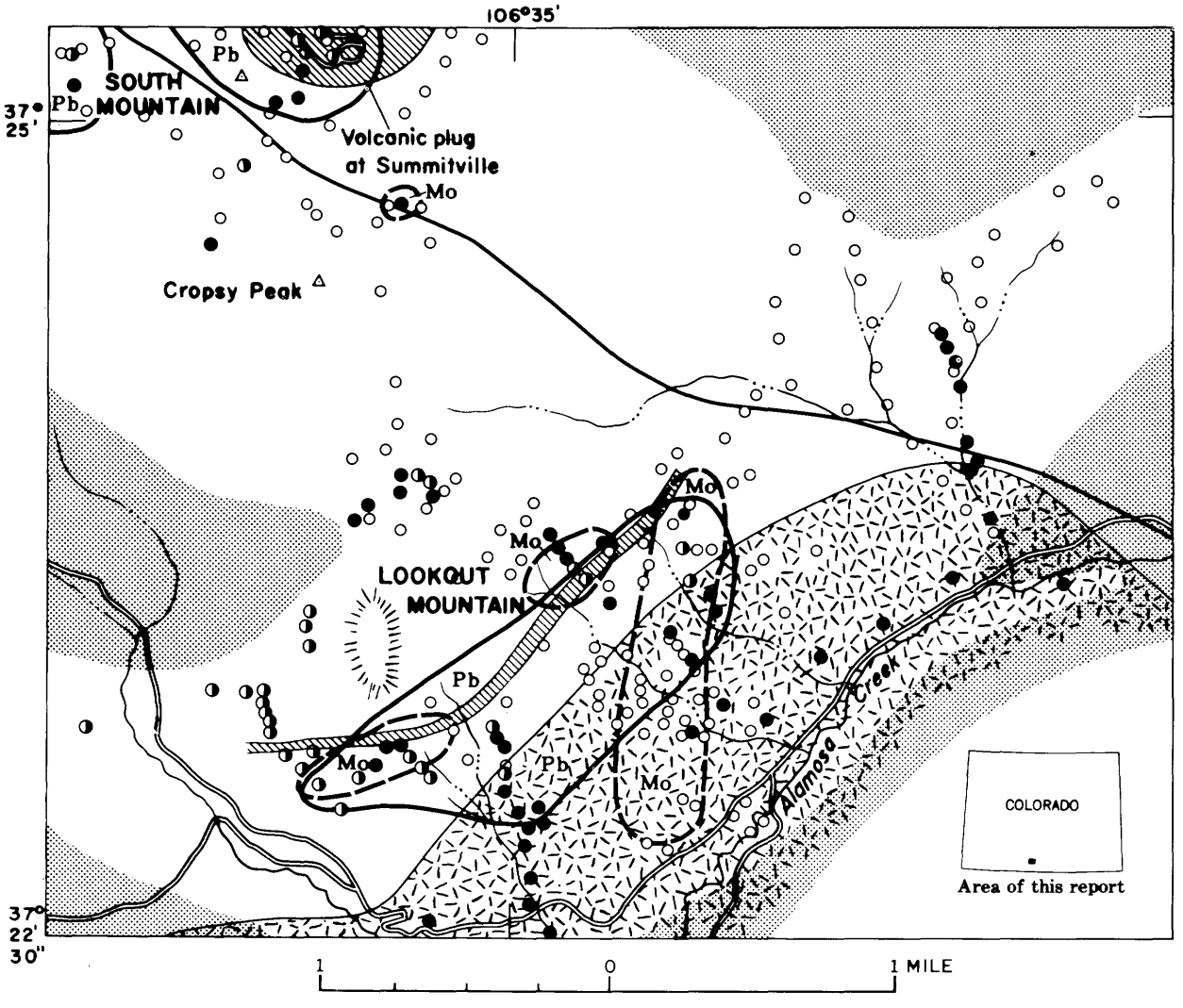
Alunite-bearing

Illite-kaolinite - bearing

Not differentiated

Sample localities, showing mineralogy of altered rocks

FIGURE 1.—Generalized geologic map of the Lookout Mountain-Summitville area.



EXPLANATION

Quartz latite porphyry of Miocene age

Quartz monzonite of Miocene age

Conejos Formation and younger volcanic rocks, of Oligocene or older age

All rocks are altered except where stippled; stippling indicates unaltered rock.

Fault

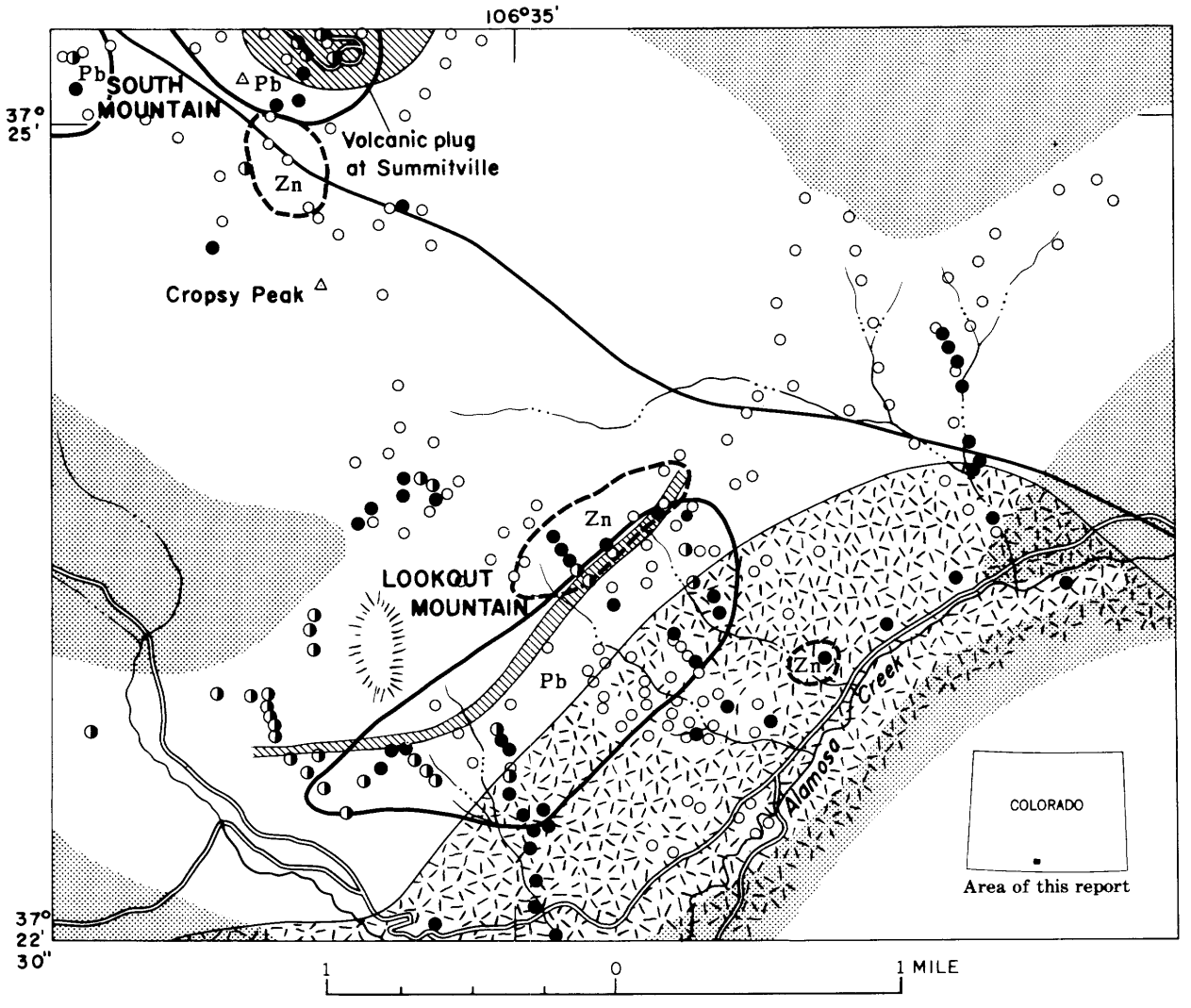
◑ Alunite-bearing

● Illite-kaolinite - bearing

○ Not differentiated

Sample localities, showing mineralogy of altered rocks

FIGURE 2.—Geochemical map showing areas with molybdenum values >10 ppm in relation to areas with lead values >100 ppm.



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Quartz monzonite of Miocene age

Conejos Formation and younger volcanic rocks, of Oligocene or older age

All rocks are altered except where stippled; stippling indicates unaltered rock.

Fault

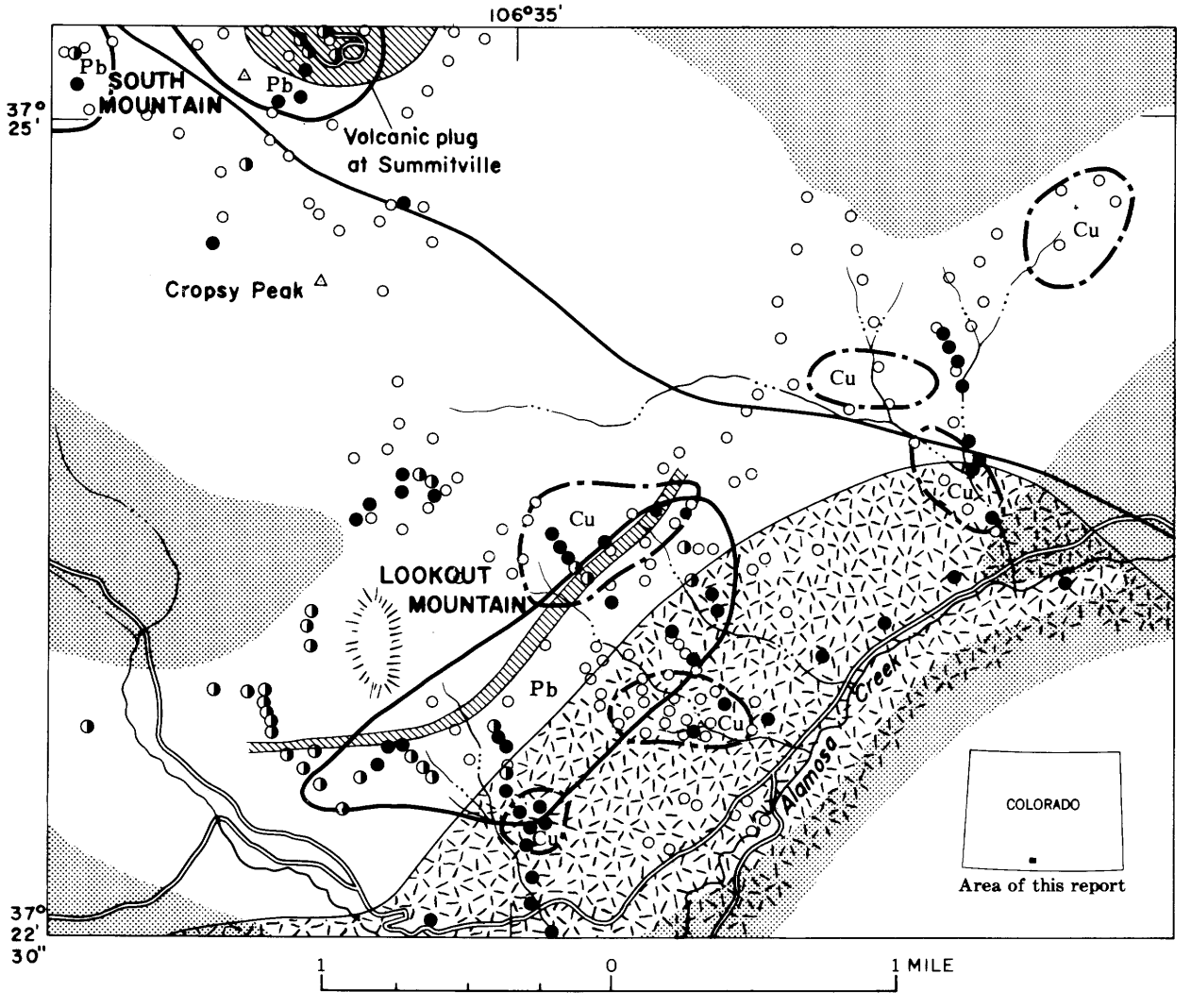
◑ Alunite-bearing

● Illite-kaolinite - bearing

○ Not differentiated

Sample localities, showing mineralogy of altered rocks

FIGURE 3.—Geochemical map showing areas with zinc values >100 ppm in relation to areas with lead values >100 ppm.



EXPLANATION

Quartz latite porphyry of Miocene age

Quartz monzonite of Miocene age

Conejos Formation and younger volcanic rocks, of Oligocene or older age

All rocks are altered except where stippled; stippling indicates unaltered rock

Fault

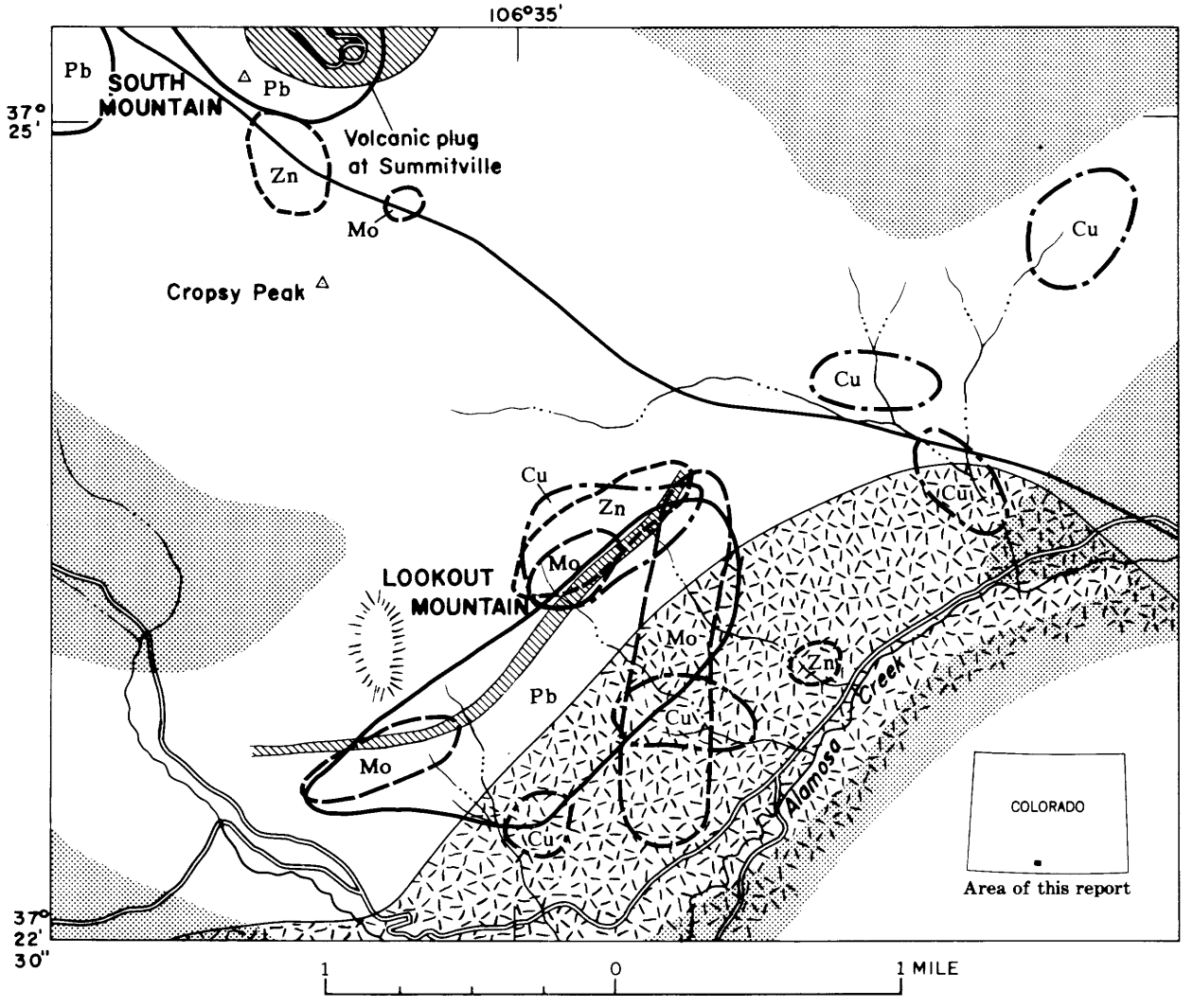
◑ Alunite-bearing

● Illite-kaolinite - bearing

○ Not differentiated

Sample localities, showing mineralogy of altered rocks

FIGURE 4.—Geochemical map showing areas with copper values >10 ppm in relation to areas with lead values >100 ppm.



EXPLANATION

Quartz latite porphyry of Miocene age

Quartz monzonite of Miocene age

Conejos Formation and younger volcanic rocks, of Oligocene or older age

All rocks are altered except where stippled; stippling indicates unaltered rock.

Fault

FIGURE 5.—Combined geochemical map showing relation of anomalous areas.