DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT 80-1057
POWDERHORN INSTANT STUDY AREA, COLORADO
SHEET 1 OF 3

Base from U.S. Geological Survey
County Map Series (Topographic)
Hinsdale Co. and Gunnison Co.

SCALE 1:50 000
3 MILES
5 KILOMETERS

Geology compiled by W.N. Sharp July 1979-Aug 1979

CORRELATION OF MAP UNITS

Surficial Deposits	Qs, Ql, Qf		Quaternary
Lavas	Tbb	Intrusive Rocks: Til	Miocene
Ash-Flow Sheets: Taf, Tigl, Taf	Ash-Flow Tuff	Tie	Oligocene
	Tpl		Tertiary
UNCONFORMITY			
	Jm		Jurassic
UNCONFORMITY			
	pC		Precambrian

DESCRIPTION OF MAP UNITS

QUATERNARY SURFICIAL DEPOSITS

Qs SURFICIAL DEPOSITS--Includes alluvium, colluvium, terrace gravel, and glacial deposits

Ql LANDSLIDE DEPOSITS--Ranges from chaotic, unsorted debris to coherent blocks of bedrock that slumped as units. Locally mixed with surficial deposits (Qs)

Qf EARTHFLOW--Consists mostly of clayey, altered bedrock that shows conspicuous characteristics of flow movement. Chevrons point in direction of flow

MIOCENE FLOOD BASALT LAVA FLOWS AND RELATED ROCKS

Tbb Basaltic to andesitic lava flows--Dominantly dark, fine grained, and vesicular; at places associated with light, basal rhyolitic tuff. Visible phenocrysts include biotite and feldspar. Part of the bimodal and mixed lava assemblage of Lipman, Steven, and Mehnert (1970). Dated as 18.6-14.0 m.y.

MIOCENE LATE INTRUSIVE ROCKS

Til INTRUSIVE QUARTZ MONZONITE TO RHYOLITE--Form subvolcanic plugs and related dikes. The Trout Creek plug is gray, medium-fine-grained, holocrystalline rock with phenocrysts of Na-K feldspar, amphibole, and quartz. Biotite is present as fine flakes. Dated as 24 m.y.

OLIGOCENE ASH-FLOW TUFF SHEETS

Taf WIDESPREAD RHYOLITIC TO QUARTZ LATITIC ASH-FLOW TUFF SHEETS--Moderately to densely welded, and commonly form cliffs or steep slopes. Contain conspicuous phenocrysts of sanidine, plagioclase, biotite, and magnetite; some rocks contain sphene, amphibole, and sparse pyroxene. Dated as 28-26 m.y.

Tigl INTRA-ASH-FLOW LAVAS AND VOLCANIC SEDIMENTS--Andesitic to rhyolitic composition. Exposed in southwest part of area; related to the Uncompahgre caldera

OLIGOCENE EARLY INTRUSIVE ROCKS

Tie INTRUSIVE MONZONITIC AND RHYOLITIC PORPHYRY PLUGS AND RELATED RHYOLITIC DIKES--Phenocrysts of feldspar and biotite are common. Dikes are altered and slightly mineralized at places. Intruded into early lavas in northwest part of area

OLIGOCENE PRE-ASH-FLOW LAVAS AND RELATED ROCKS

Tpl LAVAS, BRECCIAS, TUFFS, AND CONGLOMERATES--Mostly of andesitic composition. Dated as 35-30 m.y.

PRE-VOLCANIC ROCKS

Jm JURASSIC MORRISON FORMATION AND JUNCTION CREEK SANDSTONE--Form scattered remnants on an erosional surface on Precambrian crystalline rocks

pC PRECAMBRIAN GRANITE, GABBRO, METADIORITE, AND METAVOLCANIC ROCKS--Intruded by an alkalic igneous complex

FAULT--Dashed where approximate; dotted where covered. Bar and ball on downthrown side

U.S. GEOLOGICAL SURVEY SAMPLE LOCALITIES

- Stream-sediment sample
- Soil sample
- Rock sample

U.S. BUREAU OF MINES SAMPLE LOCALITIES

Sources of geologic data

Hedlund, D. C., and Olson, J. C., 1975, Geologic map of the Powderhorn Quadrangle, Colorado: U.S. Geological Survey Geologic Quadrangle Map GQ-1368, 1:24,000.

Lipman, P. W., 1976, Geologic map of the Lake City caldera area, western San Juan Mountains, southwestern Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-962.

Olson, J. C., 1974, Geologic map of the Rudolph Hill Quadrangle, Colorado: U.S. Geological Survey Geologic Quadrangle Map GQ-1177.

Olson, J. C., and Hedlund, D. C., 1973, Geologic map of the Cateview Quadrangle, Colorado: U.S. Geological Survey Geologic Quadrangle Map GQ-1071.

Steven, T. A., 1967, Geologic map of the Bristol Head Quadrangle, Colorado: U.S. Geological Survey Geologic Quadrangle Map GQ-631.

Steven, T. A., unpublished field sheets and data.

Map A- Geologic Map

MINERAL RESOURCES OF THE POWDERHORN INSTANT STUDY AREA, GUNNISON AND HINSDALE COUNTIES, COLORADO

by

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1980

Geology

By

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The Powderhorn Instant Study Area (51,000 acres) is located along the Gunnison-Hinsdale County boundary, Colorado, approximately 80 km (50 mi) southwest of Gunnison, and a few kilometers east of Lake City. Part of the area has been known as the Powderhorn Primitive Area. The mineral-resource potential of the study area has been appraised by the U.S. Geological Survey and U.S. Bureau of Mines; this appraisal consists of geologic, geochemical, and geophysical surveys by the Geological Survey and an economic appraisal by the Bureau of Mines.

The study area lies on the northern flank of the San Juan volcanic field, between the Lake Fork of the Gunnison River and Cebolla Creek. Nearby Lake City is a well-known mining and resort town. Topography ranges from plateau tops at altitudes of approximately 3,800 m to valley floors at altitudes of approximately 2,600 m. The study area is surrounded by well maintained county roads, but access to the interior is mostly by trail. Only one logging road and one dirt road to a campground on the north side extend to the area boundary. The west and east sides of the area are marked by precipitous slopes and vertical cliffs that flank the canyons of Cebolla Creek and the Lake Fork of the Gunnison River.

Geologic setting

The Powderhorn Instant Study Area lies on the northern flank of the San Juan volcanic field (fig. 1), an extensive region underlain by a thick accumulation of Tertiary volcanic rocks. Older, intermediate-composition stratovolcanoes, 35-30 m.y. old, are overlain by a widespread ash-flow tuff field that accumulated 30-22 m.y. ago. The sources for the ash-flow tuff sheets are marked by clusters of volcanic subsidence structures (calderas); the western San Juan calders complex lies southwest of the study area, and the central San Juan caldera complex south and southeast of the area (fig. 1). Flood basalt lava flows deposited after the period of ash-flow eruptions and caldera subsidences cap the high ridges in and near the study area. To the north, near Powderhorn, Colorado, erosion has cut through the volcanic cover to expose Precambrian crystalline rocks, which are believed to underlie most of the study area. The erosion surface between the Precambrian basement and the volcanic cover appears to dip a few degrees to the southwest, so that in combination with rising topography, the Tertiary volcanic pile ranges from approximately 450 m (1,500 ft) thick in the northeastern part of the area, to 1,500 m (5,000 ft) thick in the southwestern part of the area.

The older stratovolcanoes in the vicinity of the Powderhorn Instant Study Area consist of dark andesitic flows, flow breccias, and volcanic conglomerates (Map A, unit Tpl) that crop out on peripheral steep slopes. The overlying ash-flow tuff sheets, derived from cladera sources to the southwest and southeast (Map A, unit Taf), form widespread sheets of moderately to densely welded rocks that are exposed along extensive cliffs flanking valley walls on the south and east sides of the study area and along the deep, linear valleys that drain northward from the study area. Dark flood basalt lava flows cap the high plateau and associated ridges in the study area. These rocks (Map A, unit Tbb) are part of the Hinsdale Formation (Lipman and others, 1970), which consists of a bimodal assemblage of basalt lava flows and rhyolite lava flows and pyroclastic rocks.

Several small intrusive plugs marking former volcanic vents cut the older, intermediate-composition lava flows and breccias around the periphery of the Powderhorn Instant Study Area. The Trout Creek plug near the north edge of the study area (Map A), and the Larsen Creek plug just west of the valley of the Lake Fork of the Gunnison River are examples. A number of rhyodacitic dikes cut the volcanic edifices around these intrusive plugs. Areas adjacent to the intrusive centers and related dikes commonly were altered irregularly by hydrothermal activity during or after intrusion.

A number of late faults cut the volcanic rocks of the study area. Rocks along some of these faults are locally altered and show minor enrichment in several metals. None of the local mineralized areas along faults or near intrusive bodies in the Powderhorn Instant Study Area, however, appears to have a potential for containing significant mineral resources.

Reference cited

Lipman, P. W., Steven, T. A., and Mehnert, H. H., 1970, Volcanic history of the San Juan Mountains, Colorado as indicated by K-Ar dating: Geological Society of America, v. 81, no. 8, p. 2329-2352.

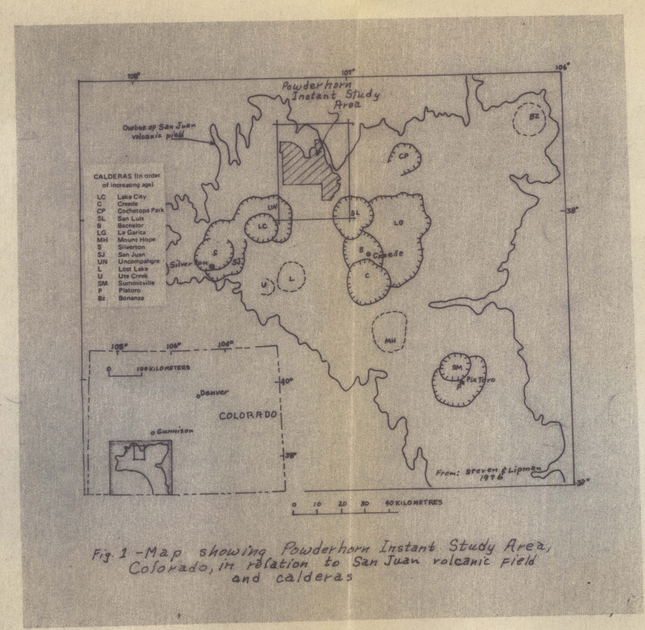

Fig. 1 -Map showing Powderhorn Instant Study Area, Colorado, in relation to San Juan volcanic field and calderas