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Preliminary geological and geochemical results from the Robinson Creek, Birthday, and Clouds Home Peak mineralized areas in the Washakie Wilderness, Wyoming

By

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Introduction

Anomalous metal concentrations were discovered in the Washakie Wilderness by the U.S. Geological Survey during mineral-evaluation studies of the area. The Washakie Wilderness includes the former South Absaroka Wilderness Area, the former Stratified Primitive Area, and several adjoining wilderness study areas in the Shoshone National Forest. The town of Cody, Wyoming, is located approximately 100 km northeast of the area. The three mineralized areas (fig. 1) described in this report are as follows:

(1) The Robinson Creek mineralized area; located on the Yellow Mountain and Younts Peak 7 1/2-minute topographic maps approximately 30 km from the road's end at the South Fork Ranger Station. It is accessible by a good horse trail along the South Fork of the Shoshone River to the mouth of Robinson Creek and then by foot or poor horse trail up Robinson Creek.

(2) The Birthday mineralized area; located on the Needle Mountain and Emerald Lake 7 1/2-minute topographic quadrangle maps approximately 20 km from the road's end at the South Fork Ranger Station. It is accessible by the South Fork of the Shoshone River trail to the mouth of Needle Creek and then by foot or horseback on game trails up Needle Creek.

(3) The Clouds Home Peak mineralized area; located on the Lake Creek and Clouds Home Peak 7 1/2-minute topographic quadrangles approximately 18 km from the junction of Ishawooa Creek and the South Fork of the Shoshone River. Access is by foot or horseback along the Ishawooa Creek trail to the base of Clouds Home Peak and then by game trails to the mineralized area near the top of Clouds Home Peak.

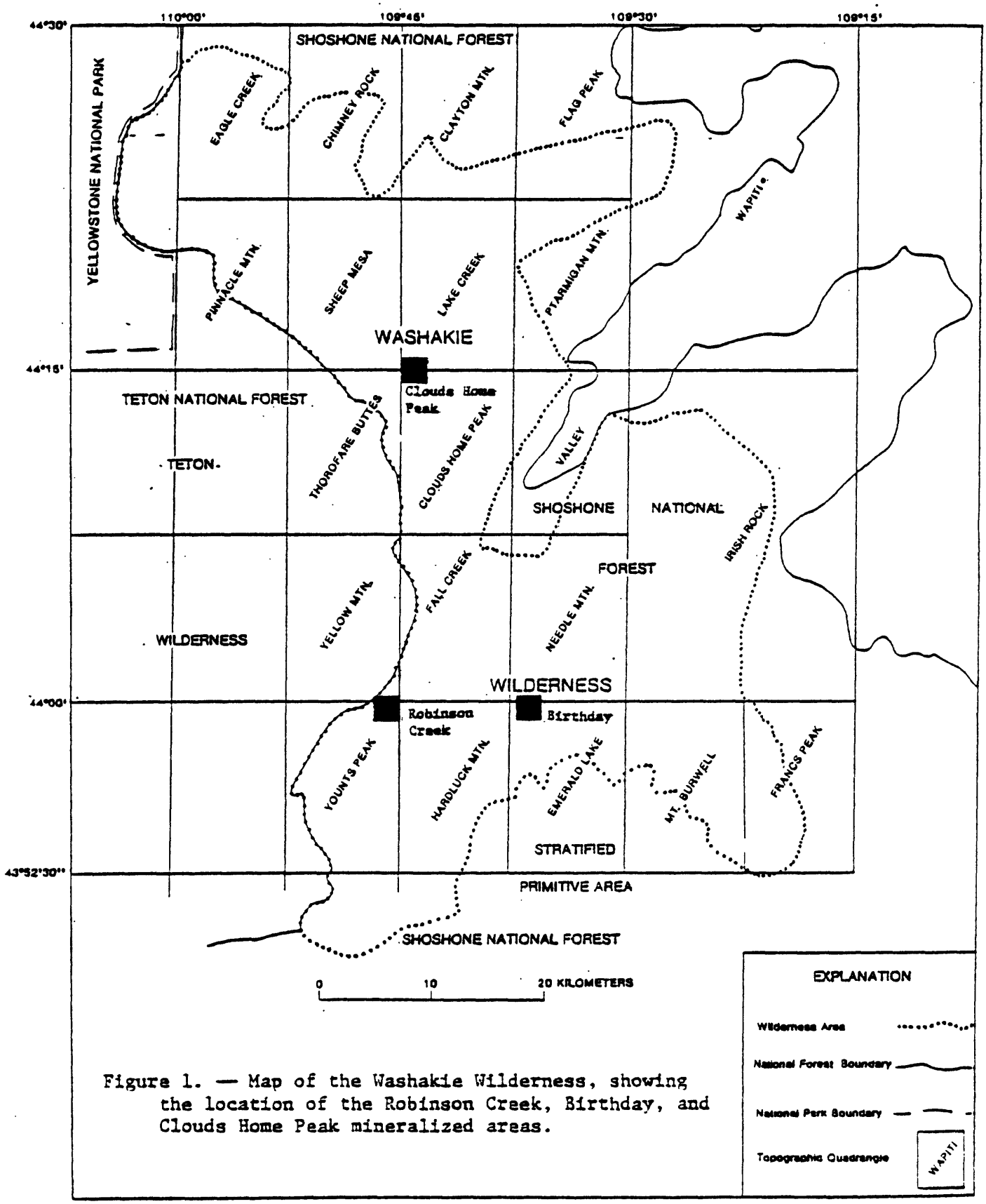

Figure 1. — Map of the Washakie Wilderness, showing the location of the Robinson Creek, Birthday, and Clouds Home Peak mineralized areas.

Rock samples from the three areas contain anomalous amounts of copper, lead, zinc, molybdenum, and silver (table 1). The magnitude of the anomalies, distribution of altered rocks, and the character of mineralized rocks in the three areas are similar to those associated with porphyry copper deposits elsewhere in the Absaroka Mountains (Fisher, 1972; Wilson, 1964).

The Robinson Creek area

In the Robinson Creek area an irregular-shaped pluton exposed over approximately 2 km^2 has been emplaced into flows and flow breccias of the Eocene Wiggins Formation (fig. 2). It ranges in composition from rhyodacite to dacite and in texture from porphyritic to nearly phaneritic. Phenocrysts comprise 20 to 80 percent of the rock and are composed of relatively large (2 to 8 mm) euhedral to subhedral crystals of plagioclase (An_{45-48}), and smaller (1 to 2 mm) crystals of biotite, quartz, and hornblende. The matrix consists of a felted mass of microlites composed of plagioclase, K-feldspar, and quartz.

Mineralized rocks are sporadically exposed in discontinuous outcrops within the pluton. Rocks in the mineralized zones have been extensively fractured and shattered with the major fracture zones trending from N. 20° W. to N. 60° W. and less developed fractures trending generally northeast. Chalcopyrite and malachite were the only ore minerals observed in outcrops, but some rock samples contained anomalous amounts of lead, zinc, molybdenum, and silver (table 1). The chalcopyrite occurs both as disseminated grains and as coatings on fracture surfaces with malachite. Chalcopyrite is also present in small (1 to 2 mm) veinlets with quartz and pyrite. Pyrite, in disseminated grains, as coatings on fracture surfaces, and in small quartz veinlets is common throughout the mineralized zones and ranges in abundance from 1 to 5 percent.

Table 1.--Geochemical summaries of rock samples taken from the Robinson Creek, Birthday, and Clouds Home Peak mineralized areas, Washakie Wilderness, Wyoming

	Number of Samples	Range	Mean	Median	Total % of samples with values > ( )	
			Robinson Creek			
Cu	98	0-1,000*	60	15	(50 ppm)	19%
Pb	98	0-100	26	20	(70 ppm)	2%
Zn	Detected in only 5 samples	0-700	--	--	(200 ppm)	3%
Mo	Detected in only 12 samples	0-100	--	--	(10 ppm)	7%
Au	Not detected	--	--	--	(--)	--
Ag	Detected in only 3 samples	0-2	--	--	(1.0 ppm)	2%
			Birthday			
Cu	126	0-15,000	260	20	(50 ppm)	19%
Pb	126	0-500	40	30	(70 ppm)	5%
Zn	Detected in only 3 samples	0-200	--	--	(200 ppm)	0%
Mo	Detected in only 26 samples	0-200	--	--	(10 ppm)	10%
Au	Not detected	--	--	--	(--)	--
Ag	Detected in only 9 samples	0-10	--	--	(1.0 ppm)	7%
			Clouds Home Peak			
Cu	108	0-5,000	172	20	(50 ppm)	14%
Pb	108	0-1,500	59	30	(70 ppm)	5%
Zn	Detected in only 2 samples	0-300	--	--	(200 ppm)	1%
Mo	Detected in only 24 samples	0-70	--	--	(10 ppm)	8%
Au	Not detected	--	--	--	(--)	--
Ag	Detected in only 9 samples	0-7	--	--	(1.0 ppm)	5%

*Note: All values are in parts per million.

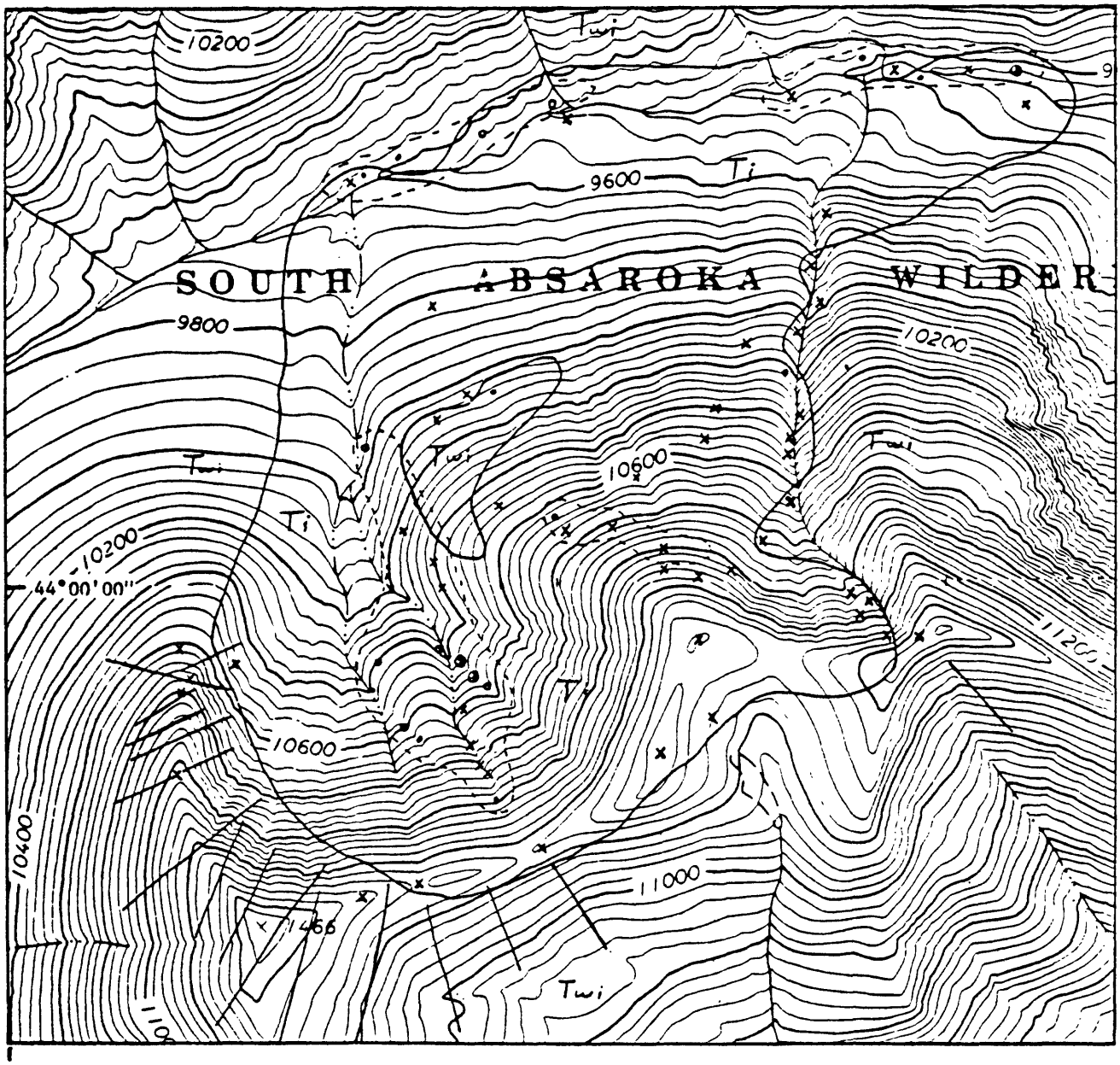

Figure 2.-- ROBINSON CREEK MINERALIZED AREA

Almost all of the rocks within and adjacent to the Robinson pluton have been propylitically altered to varying degrees. In areas where propylitization was weak, only the original hornblende crystals were affected; they have been partially replaced by chlorite and small amounts of epidote. Elsewhere, in areas of more intense propylitization, calcite and epidote are widespread and accompanied by lesser amounts of chlorite. Much of the original texture of the intensely propylitized rocks has been destroyed. Phyllically altered rocks, characterized by the development of secondary quartz, sericite, and pyrite, are approximately coextensive with the mineralized zones. Phyllic alteration was most intense in highly fractured and shattered rocks; there, the original mineralogy and texture of the rocks has been completely destroyed by newly crystallized sericite and quartz. In places where supergene argillic alteration has overprinted the phyllically altered rocks, clay minerals have replaced sericite; such supergene alteration is quite restricted in extent. Locally, pyrite-bearing rocks have been bleached and stained by supergene alteration to yellow, red, and bright-orange colors.

The Birthday area

In the Birthday area several small irregular stock-like plutons have been emplaced into lava flows and breccias of the Wiggins Formation (fig. 3). The largest pluton (about 1 km x 1/4 km) is granodioritic to dacitic in composition. Phenocrysts comprise between 50 and 80 percent of the rock and are composed of large (up to 1 mm) euhedral plagioclase (An_{40}) crystals and small crystals of subhedral biotite and anhedral quartz. In a few places hornblende phenocrysts are present. The matrix of these rocks is composed of anhedral grains of quartz, plagioclase, and potassium feldspar. Small (less than 1/4 km^2) andesitic plutons are also present in the area. These

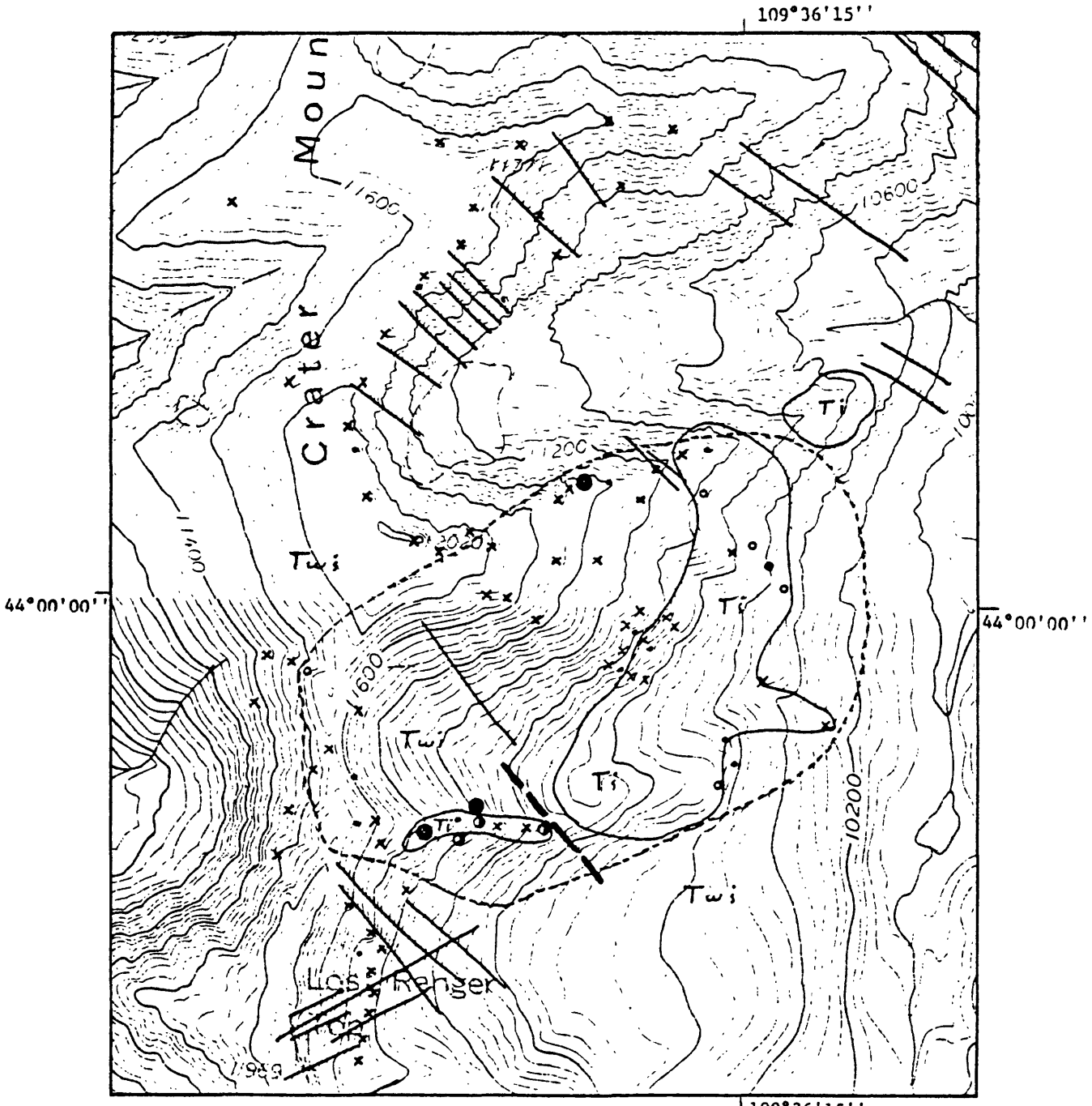

Figure 3 --BIRTHDAY MINERALIZED AREA

rocks contain subhedral to euhedral phenocrysts of plagioclase (An_{36-44}) and hornblende ranging in size from 0.3 to 2 mm. The matrix is composed of subhedral laths of plagioclase and anhedral quartz and, in places, minor amounts of potassium feldspar.

Mineralized rocks containing pyrite and in places lesser amounts of chalcopyrite are quite widespread in the Birthday area. Pyrite is present as disseminations, fracture coatings, and in quartz-pyrite veinlets. In a few areas it comprises as much as 10 percent of the rock. Chalcopyrite occurs in disseminated grains and in veinlets composed of quartz-pyrite-chalcopyrite, and also of actinolite/tremolite-magnetite-potassium feldspar-quartz-chalcopyrite. Copper-bearing veinlets are most common in two areas where extensive quartz stockworks are developed. These stockworks are northwest-trending zones from three to four meters wide that are developed in andesite dikes(?) and to a lesser extent in dacitic intrusive rocks. They may occupy large fault zones in which the rocks were shattered and then later sealed by deposition of extensive quartz-pyrite and quartz-pyrite-chalcopyrite veinlets. Mineralized quartz-pyrite-calcite veins and altered rocks also occur adjacent to many of the dikes in the area. Oxidation of pyrite-rich areas has formed considerable limonite and other iron-oxides; malachite and azurite are common in copper-rich zones. In addition to the anomalous amounts of copper (table 1), 10 percent of the rock samples from the Birthday area also contained anomalous molybdenum.

Propylitically altered rocks are common in the Birthday area and are characterized by the development of chlorite, calcite, epidote, saussurite, and pyrite. The intensity of propylitization varied, however, so that rocks adjacent to and within intrusive bodies and also within fracture zones have

been more highly altered. Phyllically altered rocks are present in scattered irregular patches, especially within fracture zones, adjacent to dikes and veins, and along faults. Variable amounts of sericite, pyrite, and secondary silica, all of which may be present in the matrix, replacing phenocrysts, or in small (less than 1 mm) veinlets are typical of the phyllically altered rocks. Potassic alteration occurred in two areas as indicated by clusters of veinlets up to 1 cm wide containing actinolite/tremolite, potassium feldspar, magnetite, quartz, and chalcopyrite. These veinlets are associated with areas of high copper concentrations (fig. 3) and zones of quartz stockworks.

The Clouds Home Peak area

A complex pluton exposed over an area of approximately 3 to 4 km^2 has been emplaced into flows and breccias of the Wiggins Formation in the Clouds Home Peak area (fig. 4). These intrusive rocks range in composition from porphyritic dacites and rhyodacites to equigranular granodiorites and quartz monzonites. Typically, they are composed of large (2 to 3 mm) euhedral plagioclase (An_{40}), and small (.2 to 1 mm) subhedral biotite and hornblende phenocrysts set in a matrix of fine-grained (.01 to .02 mm) anhedral quartz, potassium feldspar, and plagioclase. In some rocks large (2 mm) embayed, subhedral quartz phenocrysts are also present. The boundaries between the various rock types and their distribution within the intrusive complex are poorly known due to the generally poor exposures and gradational nature of the contacts.

Mineralized and altered rocks are sporadically exposed within the intrusive complex in an area approximately two km long by one km wide (fig. 4). Within this zone 3 to 5 percent pyrite and trace amounts of chalcopyrite occur as disseminations and as fracture coatings in rocks of

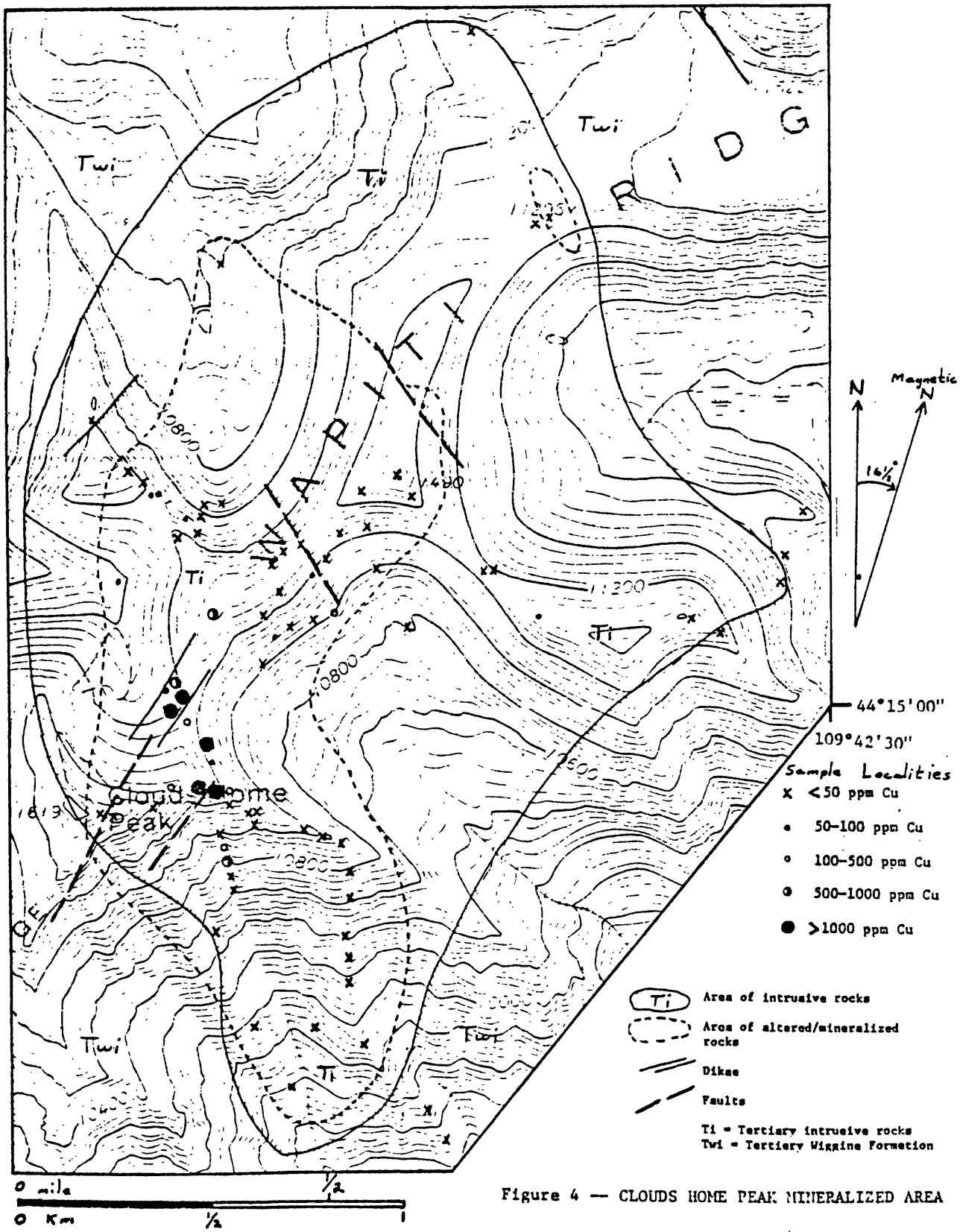

Figure 4 — CLOUDS HOME PEAK MINERALIZED AREA

the intrusive complex and also in some dikes. Mineralization also formed a few vuggy quartz veins up to 6 cm wide. These veins cut granodioritic rocks in a zone approximately one meter wide. They are composed of pyrite, chalcopyrite, rhodochrosite, and quartz. In addition some stockwork-like veins and veinlets occur in a zone about 10 meters wide. These contain malachite, azurite, chalcopyrite, pyrite, quartz, chlorite, and epidote. Samples from the area contain anomalous amounts of copper, molybdenum, lead, and zinc (table 1).

Propylitically altered rocks are widespread in the Clouds Home Peak area. They are characterized by epidote, calcite, chlorite, and sausserite. Phyllically altered and silicified rocks are present in scattered localities adjacent to veins, within shear zones, next to dikes, and along fractures. These rocks typically contain varying amounts of quartz, sericite, and pyrite. Oxidation has produced limonite staining and bleaching of rocks, especially in pyrite-rich rocks, and malachite and azurite in a few places where copper is present.

References

Fisher, F. S., 1972, Tertiary mineralization and hydrothermal alteration in the Stinkingwater Mining Region, Park County, Wyoming: U.S. Geological Survey Bulletin 1332-C, 33 p.

Wilson, W. H., 1964, The Kirwin mineralized area, Park County, Wyoming: Wyoming Geological Survey Preliminary Report 2, 12 p.