STUDIES RELATED TO WILDERNESS
PRIMITIVE AREAS

SAWTOOTH, IDAHO

GEOLOGICAL SURVEY BULLETIN 1319-D

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Mineral Resources of the Sawtooth Primitive Area, Idaho

By THOR H. KILLSGAARD *and* VAL L. FREEMAN, U.S. GEOLOGICAL SURVEY
and by JOSEPH S. COFFMAN, U.S. BUREAU OF MINES

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An evaluation of the mineral potential of the area

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STUDIES RELATED TO WILDERNESS

PRIMITIVE AREAS

In accordance with the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Conference Report on Senate bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines are making 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. Areas classed as "primitive" were not included in the Wilderness System, but the act provides that each primitive area be studied for its suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. This bulletin reports the results of a mineral survey in the Sawtooth Primitive Area and vicinity, Idaho. The area discussed in the report includes the primitive area, as defined, and some bordering areas that may come under discussion when the area is considered for wilderness status.

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MINERAL RESOURCES OF THE SAWTOOTH PRIMITIVE AREA, IDAHO

By THOR H. KIILSGAARD and VAL L. FREEMAN,
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and

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SUMMARY

A mineral survey of the Sawtooth Primitive Area and vicinity, Idaho, was made in 1966, 1967, and 1968 by the U.S. Geological Survey and the U.S. Bureau of Mines. The area studied is in the rugged Sawtooth Range of south-central Idaho and consists of about 314 square miles of the officially designated Sawtooth Primitive Area, plus adjoining areas that aggregate an additional 120 square miles.

The Sawtooth Range is a tectonically uplifted block, bounded on the northeast and southwest sides by major faults. This uplifted block has been sculptured by glaciation and other erosion to the present distinctive land forms from which the range takes its name. The area is underlain almost entirely by granitic rocks of the older Idaho batholith and of the younger Sawtooth batholith. Metamorphic rocks, largely biotite schist, crop out in the northern part of the area. All of these rocks are intruded by swarms of igneous dikes of Tertiary age. Hydrothermally altered and mineralized rocks occur along these dikes and elsewhere in the area.

The mineral survy consisted of reconnaissance geologic mapping, extensive sampling, and studies of known mineral occurrences or areas considered favorable for mineral deposits. Stream-sediment samples were taken from all principal streams and from most tributaries. Panned-concentrate samples were taken along the principal streams to check for heavy minerals. Hydrothermally altered rocks were sampled, some extensively, as were rocks that showed any evidence of ore minerals. Altogether, more than 1,100 samples were collected and analyzed. Many localities were scanned for radioactivity by use of a scintillometer. An aeromagnetic survey was made of the area to search for geologic environments favorable for mineral deposition. Several hundred miles of foot and horseback traverses were made in the area. Access to the more inaccessible parts was made by helicopter. Altogether, more than 22 man months of time was spent in field investigations.

The Sawtooth Primitive Area is in a mineralized part of Idaho and is near or contiguous to six mining districts, none of which was producing ore at the

time of the study. County records show that nearly 700 mining claims have been located in the area studied, but only two mines are known to have produced ore, the value of which was in silver and gold and was estimated at about $50,000.

Most of the recorded mining claims have been located along the western side of the study area, outside the primitive area, on mineralized zones that are largely along the western or downthrown side of the Montezuma fault. Included in this vicinity are mines and prospects of the Little Queens River area, Black Warrior Creek area, and the western part of the Johnson Creek area. The area west of the Montezuma fault, between the Atlanta and Graham districts, has not produced much ore, but it is considered geologically favorable for mineral deposits. It has been prospected for silver and gold since the latter part of the 19th century and may be expected to be prospected further in the future. Many claims also have been located on several gold-silver veins in the Observation Peak area 2 miles northwest of the primitive area, including a block of 11 claims now held under patent. Sample data indicate these veins are too low in grade to be mined economically at present; however, the area is likely to be further explored.

Several mineralized deposits within the Sawtooth Primitive Area have been prospected, but only one, the Little Queens mine, has been explored to any extent. Gold-silver ore, reportedly valued at $10,000, has been produced from high-grade pockets in a quartz vein at the Little Queens mine. Other pockets of high grade ore probably exist in the vein. Quartz veins near the head of a tributary of Leggit Creek are estimated to contain 10,000 tons of material that ranges from 2 to 25 ounces of silver per ton and from 0.4 to 0.9 percent lead. An additional 100,000 tons of material in the veins may average 2 ounces of silver per ton. Other veins that contain silver and gold include those at the head of Mattingly Creek, west of the mouth of Ballentyne Creek, on Picket Mountain, and in the Johnson Creek area east of the Montezuma fault. None of the deposits are known to contain ore in grade and quantity sufficient to permit mining under present economic conditions, and the potential for future substantial production from them is considered to be slight.

The Sawtooth Primitive Area contains many localities of hydrothermally altered and mineralized rocks; most of them are near or along Tertiary dikes. Samples from these altered rocks commonly are anomalous in metal content, although few of the sampled rocks contained visible ore minerals. The altered areas, particularly those in the vicinity of the mouth of Rock Creek, Cramer Lakes, Hidden Lake, upper Hell Roaring Creek basin, Graylock Mountain, and McDonald Peak, are well exposed and some may be traced on the surface for more than a mile and for more than 1,000 feet vertically. Nowhere in these exposures were concentrations of ore minerals in minable quantity found, nor was there evidence of much prospecting in most of them. The absence of minable deposits at the surface, however, does not preclude the possible existence of ore bodies at depth. The mineral potential of some of the areas can be determined only through subsurface exploration.

Several localities within the primitive area are enriched in molybdenum. The best known prospect is near the mouth of Rock Creek, where molybdenite coats joints and is disseminated in altered granitic rocks. Hydrothermally altered rocks in the vicinity of Cramer Lakes, Hidden Lake, and in the upper basin of Hell Roaring Creek are anomalous in molybdenum, and stream-sediment samples from the headwaters of Iron Creek are also anomalous in molybdenum. None of the occurrences that were seen contained molybdenum in minable concentrations; however, considerable exploration is needed to assess their molybdenum potential.

Several hundred million cubic yards of alluvium along the South Fork Payette River contain niobium, rare earth minerals, and sparse quantities of gold. As a placer deposit, the alluvium is submarginal and cannot be mined economically at present prices.

Granite of the Sawtooth batholith contains unusual quantities of uranium in a form that may be recoverable by leaching if the demand ever necessitates such a source for radioactive elements. Natural leaching from the granite by surface and underground waters has produced concentrations of uranium in bog deposits rich in organic matter. The bog deposits, however, are too small and too low in grade to constitute a minable resource.

Beryllium is widely disseminated in the area, particularly in rocks of the Sawtooth batholith. None of the known occurrences contain sufficient beryllium to be of commercial value.

Lead, zinc, copper, bismuth, antimony and tin were also detected in many of the samples collected but the potential is low for appreciable quantities of these metals in the area. No combustible fuels are expected to underlie the area. Granite, for decorative stone, and sand and gravel could be produced from the area but these commodities are more readily accessible at other localities that are closer to markets.

INTRODUCTION

The area described in this report includes the officially designated Sawtooth Primitive Area, 200,960 acres (about 314 sq mi), and an additional 120 square miles of area, the study of which was requested by the U.S. Forest Service (fig. 1). The total area studied is about 278,000 acres. It is in south-central Idaho, in parts of Elmore, Blaine, Custer, Boise, and Camas Counties, and it includes parts of the Challis, Sawtooth, and Boise National Forests.

In this report, the terms "Sawtooth Primitive Area" or "Primitive Area" refer to the officially designated Sawtooth Primitive Area. The terms "Sawtooth area," "study area," or "area studied" refers to the overall area that was investigated.

The primitive area is accessible by several roads. From the east it is readily reached via U.S. Highway 93, an oil-surfaced all-year road that extends across Galena Summit from Ketchum, Idaho, about 54 miles to the southeast. Access roads from Highway 93 extend to Alturas Lake, Pettit Lake, Yellow Belly Lake, and Redfish Lake, all of which are along the eastern boundary. At Stanley, a small town about 3 miles from the northeast corner of the primitive area, U.S. Highway 93 connects to State Highway 21, which

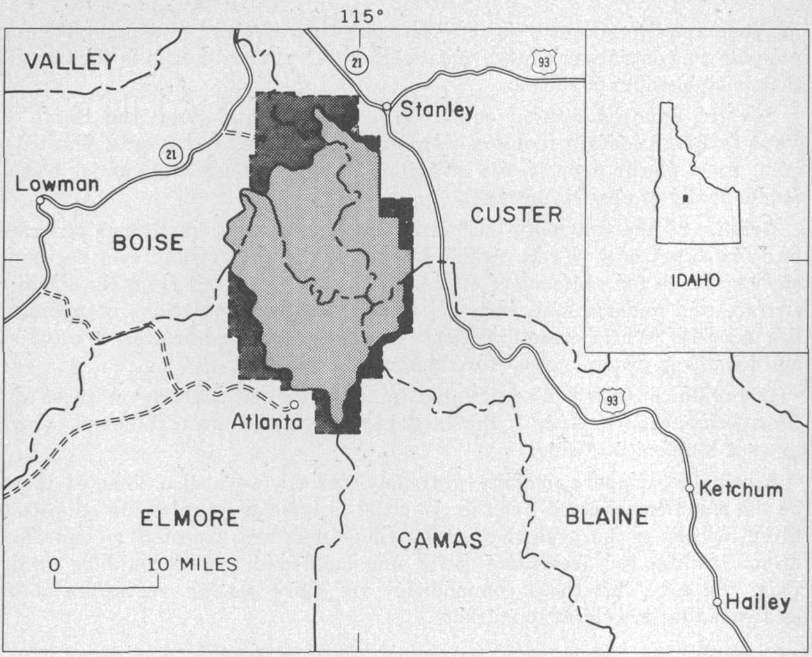


FIGURE 1.—Index map showing location of the Sawtooth Primitive Area, Idaho. The primitive area is indicated by light stipple and the additional area studied is indicated by dark stipple.

continues to Boise. An access road from this highway extends up Stanley Lake Creek, near the northern end of the primitive area. Another road from Highway 21 extends along the South Fork Payette River to the Grandjean campsite, in the northwest part of the area. The western side of the area also is accessible from a Forest Service road that extends from Highway 21 to the Graham Ranger Station on the North Fork Boise River. Atlanta, formerly an active mining town, is about 1 mile from the southwest boundary of the area. A jeep road along the Middle Fork Boise River extends from Atlanta into the area. A road up the Queens River, about 4 miles west of Atlanta, also extends into the area.

Improved Forest Service trails from road ends cross the area and usually follow the major streams except where they cross divides of the Sawtooth Range. These trails, usable by foot or horseback, usually from July to October, enable visitors to reach large parts of the area. Travel on foot away from the trails is difficult because of the extremely rugged terrain and the brush and fallen timber along the stream valleys.

The rugged Sawtooth Range, fittingly named because of its jagged skyline (fig. 2), provides some of the most spectacular alpine scenery in the United States. Relief in the area is about 5,800 feet, ranging from an elevation of 5,000 feet, where the South Fork Payette River leaves the area, to 10,830 feet at Thompson Peak, the highest peak in the range. Although the maximum relief is in the western part of the area the scenery is more spectacular along the eastern side, where the Sawtooth Range rises abruptly above the Stanley Basin. Some peaks and ridges of the range are so precipitous that they can be traversed only by properly equipped and experienced mountaineers.

FIGURE 2.—The Sawtooth Range, looking southwest. High-angle jointing in granitic rocks contributes to the formation of the angular outcrops that make the name of the range so appropriate. Photograph by Ernie Day.

The South Fork Payette River, the North Fork Boise River, and the Middle Fork Boise River drain the western side of the area (fig. 3). The southeast part is drained by the South Fork Boise River, and streams along the east side empty into the Salmon River.

The Sawtooth Range was intensely glaciated during Pleistocene time. Glacial features abound and contribute greatly to the spectacular scenery of the range. Glaciers carved typical U-shape val-

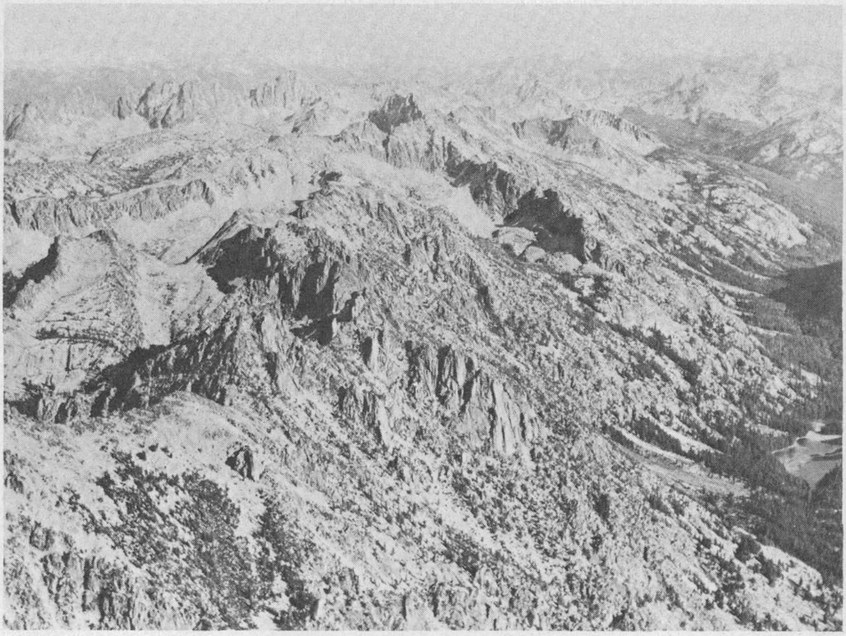


FIGURE 3.—The Sawtooth Range, looking southeast. Elk Lake is in the valley of the South Fork Payette River in right foreground. Southern part of the White Cloud Peaks is at left rear and Boulder Mountains are in center rear. Photograph by Ernie Day.

leys (fig. 4) and left many hanging tributaries. At the heads of the valleys were formed amphitheaterlike cirques, matterhorn peaks, arêtes, and cols. Polished and striated rock outcrops are common in the area once occupied by the glaciers. The more than 500 lakes in the primitive area are predominantly glacier-formed features. They occupy rock basins gouged by the glaciers at higher levels and they occur behind morainal dams at lower levels. The scenic Alturas, Pettit, Yellow Belly, Redfish, and Stanley Lakes along the eastern front of the Sawtooth Range are impounded by prominent lateral and terminal moraines.

The major valleys support dense stands of spruce and lodgepole pine. Lower slopes of ridges commonly are covered by sagebrush on the southern sides of ridges; pine and fir cover the northern sides. Magnificant yellow pine trees, some of which are more than 6 feet in diameter, grow along lower parts of the South Fork Payette River valley. Pine and fir also are common in higher parts of the area, although steeper slopes generally are bare rock.

The climate of the Sawtooth Range is severe. Snowfall in the

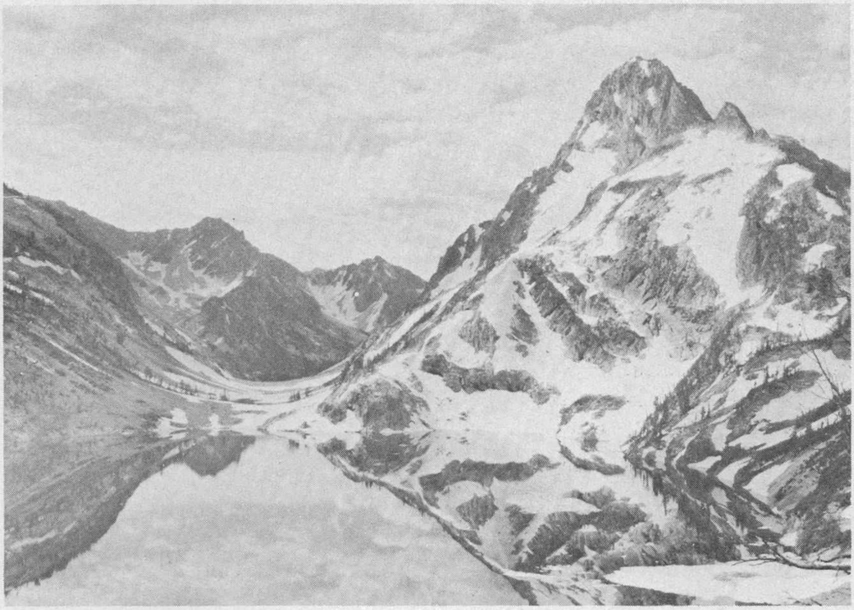


FIGURE 4.—View southeast across Sawtooth Lake toward the headwaters of North Fork of Baron Creek. Note the U-shaped profile of the glaciated divide at the head of the lake.

high country usually is deep and during some summers the snow never leaves the north slopes of the higher mountains. The Stanley Basin is well known for its low winter temperatures. Summers, on the other hand, are delightful and have warm sunny days and cool nights. The climate and scenery makes the area a summer paradise for tourists. The economy of the area is based principally on tourist trade.

PREVIOUS STUDIES

The geology of different parts of the Sawtooth Range and nearby areas has been studied by several geologists. Umpleby (1915) made a 12-day reconnaissance of the Sawtooth quadrangle. Ballard (1922) wrote a short report on the geology and ore deposits of the Alturas quadrangle, which covers part of the southeast corner of the primitive area. The Vienna district, which adjoins the southeast corner of the Alturas quadrangle was later studied by Ross (1927). Ballard (1928) mapped the Rocky Bar quadrangle, the northeast corner of which extends into the western side of the area. Anderson (1939) made a detailed study of the Atlanta mining district, which lies immediately southwest of the primitive area. Glacial geology of the Stanley Basin was studied by Williams (1961). The most extensive study of the Sawtooth Range—a study from which the present writers drew heavily—was made by Reid (1963). An unpublished study of the range by B .T. Gale and R. G. Plumb[1] also was helpful.

PRESENT INVESTIGATION AND ACKNOWLEDGMENTS

Investigations in the study area by the Geological Survey were made during the 1966 and 1967 field season by T. H. Kiilsgaard and V. L. Freeman assisted in 1966 by W. S. LaRue and in 1967 by D. D. Talbot and G. W. Quinn. C. W. Kiilsgaard ably provided volunteer assistance during both field seasons. A 1-week field check was made during the summer of 1968, and an aeromagnetic survey of the area was made in September 1968.

The Bureau of Mines searched for records of mining claims in the courthouses of Blaine, Boise, Camas, Custer, and Elmore Counties during the winter of 1966–67 and made field investigations in the primitive area during the summers of 1967 and 1968. This work was conducted by J. S. Coffman, who was assisted part time by R. V. Lundahl, J. M. Maxwell, and E. R. Bleak. Pattee, Van Noy, and Weldin (1968) of the U. S. Bureau of Mines had previously investigated beryl deposits in the area.

Altogether, more than 22 man months of time was spent in field investigations.

The fieldwork was accomplished mainly by several hundred miles of foot and horseback traverses through the area. Late in the summer of 1967 a helicopter was used for about 2 weeks to recheck points of interest and to gain access to high peaks and ridges that had not been reached by previous traverses.

The mineral survey included reconnaissance geologic mapping aimed primarily at checking and updating existing maps. Most of the field effort, however, was devoted to collecting samples. Stream-sediment samples were taken from all principal streams, and panned concentrates were taken from most of them. The common rock types were sampled, as were visibly altered rocks or rocks that displayed evidence of possible ore mineralization. Altogether, more than 1,100 samples were collected and analyzed. Most

[1] B. T. Gale and R. G. Plumb, 1964, Geology and minerals, Sawtooth Mountain area study: An administrative report prepared jointly by the U.S. Forest Service, Dept. of Agriculture, and the National Park Service, Dept. of the Interior.

of the spectrographic analyses recorded in this report were determined in a Geological Survey mobile laboratory under the direction of David J. Grimes. Petrographic studies of many samples collected by the U.S. Bureau of Mines personnel were made by L. L. Brown, U.S. Bureau of Mines. Data from the aeromagnetic survey were interpreted by M. Dean Kleinkopf, U.S. Geological Survey. All available information on previous exploration or mining activity in the area was collected, and all known prospects were sampled and mapped.

The mineral survey benefited greatly from assistance extended by numerous local residents, Forest Service officials, claim owners and others. In particular, we would like to acknowledge help received from Rangers G. L. Presley and W. W. James, Forest Service Ranger Station at Stanley, and Ranger R. C. Cisco, Forest Service Valley Ranger Station. Mr. G. R. Plumb, U.S. Forest Service provided much useful information, as did Mr. C. E. Newell, Boise, Idaho. We appreciate the aid offered by the J. R. Simplot Co. Packers Charley Snooks, Chester Powell, and Pat Reed gave faithful service. We also wish to acknowledge the cooperation by J. J. Davis, A. W. Murray, R. Knoblock, and W. L. Hill, owners of the Payette placer property. Thanks also are extended to Herb Mortz, helicopter pilot, and Lynn Christopherson, mechanic, for their efforts in making our helicopter flights successful.

GEOLOGY

SETTING

The Sawtooth area is underlain mostly by granitic rocks that are mainly a part of the vast Idaho batholith and the younger Sawtooth batholith (pl. 1). Metamorphic rocks of possible Precambrian age crop out in the northeastern part of the area. All of these rocks have been intruded by igneous dikes, members of swarms of dikes of Tertiary age that occur throughout central Idaho. Mineral deposits occur along these dikes in places; elsewhere in the State similar deposits along dikes have been mined.

The Sawtooth Range is a tectonically uplifted block, bounded on the northeast and southwest sides by major faults. This uplifted block has been sculptured by glacial ice and further eroded to its present distinctive form.

THOMPSON PEAK FORMATION OF REID (1963)

The Thompson Peak Formation of Reid (1963, p. 7), the oldest rock unit in the area, crops out on and in the vicinity of Thompson

Peak, the highest peak in the Sawtooth Range. Mica schist is the most common rock type in the Thompson Peak Formation. Some layers contain abundant biotite and also considerable amounts of pyrite. These layers weather to dark rusty-colored gossanlike outcrops, which have attracted prospectors, as, for example, in Upper Fishhook Creek. However, analyses of samples from them do not indicate an unusual content of ore minerals. The rusty biotite-rich rocks form dark folded bands that may be seen on the northeast face of Thompson Peak. Locally interlayered with the schist are metaclastic and metacarbonate rocks. The carbonate rocks have been intensely metamorphosed to hornfels or skarn near contacts with intrusive rocks of the Idaho batholith. Excellent outcrops of garnet-epidote skarn are to be seen south of Goat Creek.

The Thompson Peak Formation has been intruded by the Idaho batholith and therefore is older. Because of the high degree of metamorphism and deformation, Reid (1963, p. 12) has proposed that Thompson Peak rocks are Precambrian in age. The rocks are similar to other metamorphosed rocks in nearby parts of Idaho that also are regarded as Precambrian in age, such as the Hyndman Formation (Umpleby and others, 1930, p. 11) and schists in the Casto quadrangle (Ross, 1934, p. 22).

IDAHO BATHOLITH

GRANODIORITE, QUARTZ MONZONITE, AND QUARTZ DIORITE

Granitic rocks of the Idaho batholith underlie about one-half of the Sawtooth area (pl. 1). Elsewhere in central Idaho they crop out widely, covering an area of some 20,000 square miles.

In the study area, as elsewhere in Idaho, the batholith is composed mostly of granodiorite, quartz monzonite, and minor quartz diorite. Reid (1963, p. 7) mentions compositional zones within the batholith; he considers rocks east of a north-south line drawn through Alpine Lake to be largely quartz monzonite, rocks west of this line to a north-south line through Atlanta to be largely quartz diorite with subordinate granodiorite, and rocks west of Atlanta to be mixed quartz monzonite and granodiorite, as are rocks in the northern part of the area. These three types of granitic rocks and others were found in the area but no attempt was made to map them.

The granodiorite, quartz monzonite, and quartz diorite are composed of varying amounts of quartz, potassium feldspar, plagioclase, and biotite, and accessory magnetite, allanite, apatite, zircon, sphene, and tourmaline. All three types are granitoid in texture.

Generally, the quartz monzonite is light gray and is commonly studded with grains of flesh-colored potassium feldspar that are as much as 1 inch or more long. Biotite usually is sprinkled throughout the rock. The granodiorite and quartz diorite are difficult to distinguish in the field. Both tend to be darker gray than the quartz monzonite. The quartz diorite is distinguished by dominant striated plagioclase and lesser amounts of quartz, whereas the granodiorite has a higher content of potassium feldspar. Both rocks contain more biotite than does quartz monzonite, and commonly the biotite flakes are alined, resulting in faint to well-defined gneissic foliation. Abundant dikes of genetically related aplite and pegmatite invade all the granitic rocks.

In nearby areas of Idaho geologic inference has been used to date the Idaho batholith as Late Jurassic or Cretaceous. The quartz diorite has generally been considered to be the oldest rock, followed by granodiorite and then quartz monzonite. On the basis of lead-alpha determinations, Larson, Gottfried, Jaffee, and Waring (1958, p. 35) have dated the batholith as about 108 million years old, about the middle of the Cretaceous period.

LEUCOCRATIC (WHITE) QUARTZ MONZONITE

Leucocratic quartz monzonite was identified by Reid (1963, p. 8) in the upper Little Queens River area, upper North Fork Boise River, and in smaller areas in the northern part of the map. The light color makes the rock distinctive in the field, although it contains fine flakes of biotite, which, on weathered surfaces commonly weathers to a rusty color giving the surface a spotted or buff to reddish color. Also, the rock tends to be finer in grain size and to have a more even texture than the other granitic rocks. The white quartz monzonite appears to be more strongly jointed than are the other rocks; consequently, it breaks into smaller pieces on talus slopes and rubble covered surfaces.

Reid (1963, p. 13) describes the leucocratic monzonite as intruding other granitic rocks of the Idaho batholith, and he notes that it may be a late differentiate of the batholith. An intrusive contact that supports this observation was seen along the upper part of Stanley Lake Creek, where dikes of fine-grained leucocratic quartz monzonite cut granodiorite of the Idaho batholith. Xenoliths of granodiorite in the main body of leucocratic quartz monzonite also support Reid's observations.

SAWTOOTH BATHOLITH

PINK GRANITE

The most striking rock in the Sawtooth area is pink granite that crops out chiefly as a large continuous body in the central part of the area (pl. 1). Reid (1963, p. 8) has named this rock the Sawtooth batholith. The color of the rock contrasts strongly with that of granitic rocks of the Idaho batholith. The rock derives its distinctive color from perthitic orthoclase, which Reid (1963, p. 19) estimates as two-thirds of the total feldspar. Because of the albite content of the perthite, Reid chose to call the rock a quartz monzonite. The abundance of quartz and orthoclase and the unusually low content of calcium, as indicated in the semiquantitative spectrographic analyses of 17 samples of the rock (table 1); however, suggests that compositionally the rock is a granite. Texture of the pink granite is coarsely granitoid. The pink orthoclase weathers out of the rock and commonly forms gruss that thinly mantles the weathered slopes.

Rocks of the Sawtooth batholith are younger than those of the Idaho batholith. Near the eastern end of Farley Lake, dikes of pink granite intrude the gray quartz monzonite of the Idaho batholith, and at their contacts these dikes are chilled. Also, xenoliths of the older gray quartz monzonite of the Idaho batholith are found in the younger pink granite.

The age of the Sawtooth batholith is not known with certainty but is considered to be Tertiary. Reid (1963, p. 14) believes it was emplaced sometime after the onset of Challis volcanism. Ross (1934, p. 55) described a similar rock in the Casto quadrangle as red granite and estimated it as mid-Tertiary in age. He later (1962, p. 101) suggested that it was older and assigned an age of 59 million years to the rock. The Casto pluton is now known to cut Challis volcanic rocks and hence is probably middle Tertiary in age (Fred Cater, oral commun., 1970).

CHALLIS VOLCANICS

On the north-trending ridge that separates the head of the North Fork Boise River from the South Fork Payette River are three areas of red rhyolite porphyry. The rhyolite porphyry in the southernmost of these areas shows distinct flow banding that strikes N. 40° E. and dips 45° SE. Along the western side of the southern area, the rhyolite porphyry overlies a thin greenish tuff, which in turn rests on granitic rocks of the Idaho batholith.

The rhyolite porphyry and tuff are remnants of what probably was an extensive cover of volcanic rocks. Tentatively, the rhyolite porphyry and tuff are correlated with the Challis Volcanics that are widely exposed northeast of the primitive area. Challis volcanic rocks are regarded as ranging in age from Eocene(?) to Miocene(?).

TERTIARY DIKES

A multitude of dikes of various compositions and textures crop out in the study area; there are so many that only some of them are shown on the geologic map. The dikes are resistant to erosion and are usually darker in color than the enclosing country rock; thus, they often stand out distinctly on canyon walls and across ridges. They commonly occur as swarms a mile or more in width and several miles long, as along the ridge northeast of Greylock Mountain. Individually, the dikes range from a few inches to more than 1,000 feet in thickness, although thicknesses of 5 to 30 feet are most common. Most of them are from a few hundred to thousands of feet in length (fig. 5). One dike was traced for almost 14 miles. The majority of the dikes strike northeast, although many strike northwest as well as other directions. Most of the dikes dip steeply.

Some of the Tertiary dikes are older than the Sawtooth batholith and some are younger according to Reid (1963, p. 9). The older group consists of predominantly northeast-trending diorite, trachyandesite and quartz latite. The younger group consists of predominantly northeast-trending andesite, rhyolite, and lamprophyre, and northwest-trending diabase dikes.

Composite dikes with more than one type of rock within a single dike are common. Thus, rhyolite, trachyte, and andesite may be seen within a single dike, as though the dike fracture had been reopened at different times to admit different types of rock. Further evidence for different ages of dike intrusion is seen in the crosscutting relationship of dikes. Andesite dikes were found crosscutting rhyolite dikes. Diabase and basalt dikes were seen to crosscut all other dikes.

The dikes are typical of the great swarms of Tertiary dikes that are so widespread in central Idaho. In other areas they have been considered to be genetically associated with ore deposits (Anderson, 1947, p. 222; 1949, p. 20). In the Sawtooth area, dikes were found at several mineralized localities, particularly at the Newell

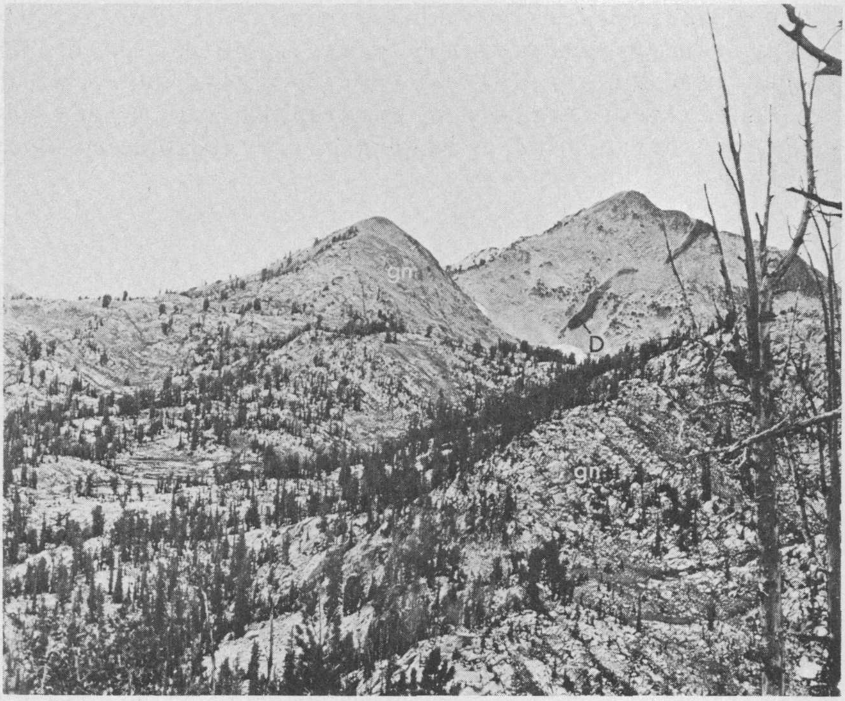


FIGURE 5.—Diabase dike (D) cutting pink granite (gn) of the Sawtooth batholith. Scoured outcrops and small tarns (lakes), left center, are typical products of glaciation. Photograph by Ernie Day.

claims at the mouth of Rock Creek. Sparse ore minerals were seen in the dikes at this locality but none of the analyses of the dike rocks indicated abnormal content of ore minerals. The rhyolite dikes, however, are distinctive in that they frequently contain considerable magnetite and pyrite, which oxidize to iron oxides that gives a rusty stain to the dikes. Some rusty rhyolite outcrops are visible from miles away and many have been prospected, although there is no evidence of any ore having been found in them. Sampling in and along the dikes failed to find any veins or strongly mineralized areas in the dike rocks; however, veins, mineralized areas, and altered zones are common in the granitic rocks alongside and parallel to the dikes. The occurrences suggest that fractures in the granite rocks, along which the dikes were intruded, were subsequently reopened to serve as channelways for mineralizing solutions. None of the mineralized areas found along the dikes could be classed as minable ore bodies.

TERTIARY(?) GRAVEL

Much of the ridge between the Middle Fork Boise River and Queens River, west of the Montezuma fault, is capped by a deposit of gravel (pl. 1). The base of the deposit is as much as 1,000 feet above the Middle Fork Boise River. The gravel appears to rest on a surface considerably more even than the present topography. Though poorly exposed, the deposit is estimated to be 1,000 to 1,200 feet thick and is composed of poorly sorted gravel and cobbles that average 6 to 8 inches in diameter in a matrix of buff-colored sand and minor clay that is stained locally by iron oxides. Boulders as much as 30 inches in diameter were seen locally. Rock types in the gravel are the same as those that crop out in the primitive area. Although the gravel probably is moderately consolidated beneath the surface, individual cobbles at the outcrop are free from the matrix. The deposit contains many deeply weathered cobbles, which together with the topographic location and the presence of younger glacial moraine along the northern side of the deposit, indicate it is at least early glacial or, more likely, preglacial (Tertiary) in age. The deposit is on the downthrown side of the Montezuma fault and probably predates the faulting. Bedding, of a fluviatile type, was seen only locally but the entire deposit is considered to be of stream origin.

QUATERNARY DEPOSITS

GLACIAL DEPOSITS

Glacial deposits of unsorted boulders, cobbles, sand, and clay occur along and near the mouths of some valleys and in some cirques of the Sawtooth Range. By far the largest and most striking of these deposits is the piedmont belt of coalescent moraines extending along the eastern front of the Sawtooths and rising more than 1,500 feet above the floor of the Stanley Basin. The moraines of the piedmont belt are covered by a thick stand of lodgepole pine; this, and their conspicuous topography, makes them readily identifiable, even at a distance. Williams (1961, p. 6) recognizes moraines of the piedmont belt as having formed during two glacial advances—the Bull Lake and Pinedale Glaciations. Moraines of the two glacial advances are not separated on plate 1.

Moraines of the older or Bull Lake Glaciation are the more extensive. They form broad morainal ridges on which the boulders are weathered, decayed, and rounded. Disintegrated morainal debris tends to form a thin cover of light brown soil. P. L. Williams' map (1961) shows most of the higher ridges north and south of Redfish Lake to consist of Bull Lake glacial deposits.

The younger Pinedale Glaciation deposited lateral and terminal boulder-strewn moraines along valley walls and at valley mouths. According to Williams (1961, p. 9) it is the Pinedale moraines or outwash from them that have dammed streams and formed the lakes like Stanley Lake (fig. 6) along the western side of Stanley Basin.

More recent and smaller hummocky moraines occur in some of the cirques. They consist largely of angular blocks and fragments of fresh unweathered rock. Talus cones and small rock glaciers mantle the slopes beneath cirque headwalls and the sides of steeper ridges and peaks. The angular blocks and slabs in these deposits are the result of frost wedging and gravitional fall, and this debris has been accumulating since the glaciers melted.

ALLUVIAL DEPOSITS

Alluvium in the area is of two general types: (1) outwash grav-

FIGURE 6.—Stanley Lake, looking south. McGowan Peak is in left center background. The lake is impounded by glacial moraine. U.S. Forest Service photograph.

els from glaciers and (2) thin alluvium along streams and in alluvial fans at the mouths of tributaries. The outwash gravels are mainly in terrace or bench deposits, such as those along the South Fork Payette River and the North Fork Boise River. The older terrace deposits are gradually being eroded and reworked by present streams.

STRUCTURE

FAULTS

The Sawtooth Range is an uplifted block between two more or less parallel major bounding faults (pl. 1). The Montezuma fault, on the western side, was first described by Anderson (1939, p. 17), who noted how the abrupt scarplike slope east of Atlanta separates the Sawtooth Range from the lower ridges on the west. The westward-dipping fault may be traced northwest beyond the limits of the mapped area. Throughout this interval it is particularly noticeable in ridge saddles where the rocks are brecciated and altered. The fault is of economic interest in that along the western or downthrown side from Atlanta to Graham numerous quartz veins and mineralized areas have been mined or prospected. By contrast, relatively few quartz veins are along the eastern or upthrown side of the fault. Field evidence suggests the area along the downthrown side of the fault was mineralized because it was broken and permeable to mineralizing solutions; however, this concept is not in accord with Anderson (1939, p. 17), who observed that the Montezuma fault cuts and displaces the Atlanta lode. Such displacement, however, could result from recurrent movement along the preexisting fault zone. If the fault was not activated until postmineral time, most of the veins in the uplifted block east of the fault must have been eroded away as little evidence of them remains.

Linearity of the eastern front of the Sawtooth Range, truncated spurs, the towering rise in elevation of the range above the floor of the Stanley Basin, and the aeromagnetic pattern (pl. 1) all indicate a major fault along the base of the range. The faulted nature of the range front has been briefly mentioned by Umpleby and Livingston (1920, p. 13) and is alluded to by Hamilton (1962, p. 512). Reid (1963, p. 11) mentions the fault and estimates that minimum displacement along it or a branch of it is likely to be more than 1,200 feet. In the area mapped in this study the fault is largely concealed by alluvium or glacial moraine. Alined tributary streams and swales in ridges along the foot of the range suggest the fault passes through them, but only on the ridge north of Crooked Creek was a limited exposure of brecciated rocks found that may have resulted from fault action.

Faults occur elsewhere in the area, but only a few were mapped (pl. 1). Some may be traced through alinement of altered rocks in saddles, but they generally show slight topographic expression. The faults could be delineated only by detailed geologic mapping beyond the scope of this study.

JOINTS

Granitic rocks in the Sawtooth Primitive Area are thoroughly jointed. Diverse sets of joints strike in several directions but the most common sets strike northeast and northwest. The joints in these sets dip steeply and generally are closely spaced. The jagged ridges that characterize the Sawtooth Range are traversed in large part by abundant joints that have made the rock susceptible to plucking of angular blocks by frost wedging. Locally, quartz veins and streaks of sulfide minerals follow joints, as at the molybdenite property at the mouth of Rock Creek and at many beryl occurrences.

MINERAL RESOURCES APPRAISAL

SETTING

The Sawtooth Primitive Area is in a highly mineralized part of Idaho, in which are numerous productive or formerly productive mining districts. Four mining districts are contiguous to the area and two others are close to it. No ore was being produced in these nearby districts at the time of our study.

The northeastern side of the primitive area is contiguous to the Stanley mining district. Placer gold was mined in this district for several decades, chiefly from deposits along Stanley and Kelley Creeks, about 5 to 9 miles northeast of the primitive area. These placers also are known to contain quantities of the uranium minerals brannerite and euxenite, although the placers have not been worked for their uranium content. Vein deposits of uranium were discovered in the area in 1958 and, to the end of 1960, had produced a total of 7,767 tons of ore with an average grade of 0.18 percent U_3O_8 (Choate, 1962, p. 40). The productive area is about 11 miles northeast of the primitive area.

The Sawtooth district borders the southeast side of the Sawtooth Primitive Area. Formerly productive mines in the district are within 3 miles of the primitive area boundary. Ballard (1922, p.

22–33) describes nine mines in the district, the principal one of which was the Silver King. The most active period of mining was in the 1880's, although exploration has continued intermittently since then and was underway at one property in 1966. Silver was the principal metal produced. According to Ballard (1922, p. 3–30) output of metal from the district was valued at about $1,000,000, although records of the early and more productive mining days are incomplete.

The first ore deposits in the Vienna district, about 8 miles southeast of the primitive area, were discovered in 1879. According to Ross (1927, p. 15) at least 15 mines have been worked in the district, with the most intensive period of operations in the 1880's. Umpleby (1915, p. 247) estimates the value of metal output, to 1914, at about $1,000,000, mostly from silver. Sporadic mining continued in the district until the 1930's.

Mines in the Atlanta gold-silver district are within 2 miles of the southwest boundary of the primitive area (fig. 7). Gold was discovered at Atlanta in 1864 and the district was mined intermittently from then until the early 1950's. Production records of the district are incomplete but Anderson (1939, p. 21) estimates that, to 1935, value from the Atlanta mines exceeded $6,000,000.

The Black Warrior Creek area lies just west of the Montezuma fault and just outside of the Sawtooth Primitive Area (fig. 7). Placer gold and lode gold and silver have been produced from the Black Warrior mines. Farther to the northwest, abandoned mines of the Graham district are about 2 miles west of the primitive area. Ballard (1928, p. 29) notes that the Graham camp closed down after a short period of operation. There are no production records from the Graham district but output probably was negligible.

Other mining districts within 20 miles of the primitive area include the Yankee Fork, Robinson Bar, Boulder Creek, East Fork, Big Smokey, Bear Creek, Gambrinus, Grimes Pass, Summit Flat, and Bear Valley districts.

Because the geologic environment of the above-mentioned districts is similar in many respects to that of the area studied, a careful study was made of all known mines and prospects in the area and of other potentially mineralized localities. Only two mines within the area studied, the Little Queens and the Overlook, are known to have produced ore, and the value of that ore is probably less than $50,000. The area studied, however, contains many mineralized outcrops and nearly 700 mining claims located mostly for

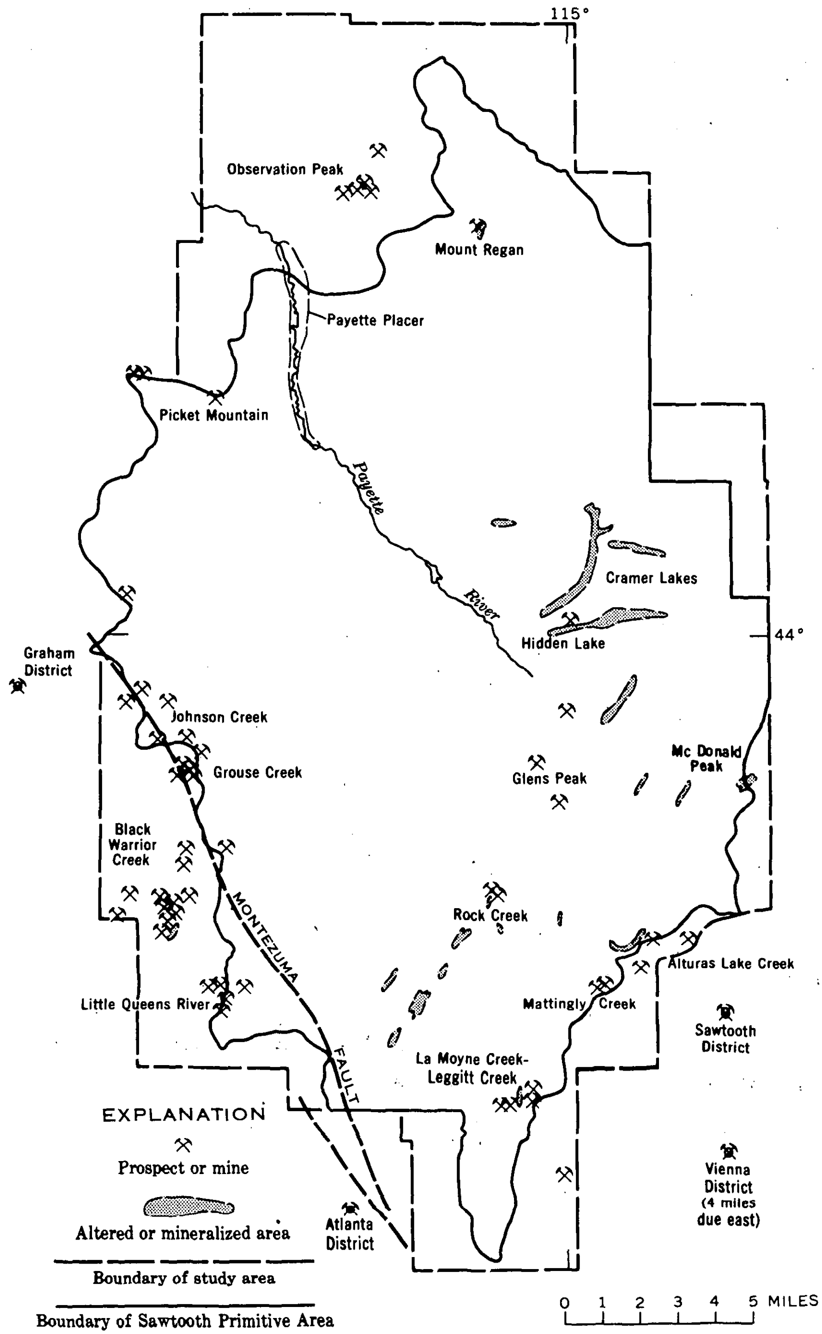


FIGURE 7.—Map showing mines, prospects, and larger areas of altered or mineralized rock in the Sawtooth Primitive Area, Idaho, and nearby mining districts.

gold and silver. In addition to gold and silver, other commodities, including molybdenum, lead, zinc, and beryllium are also present. The area is not considered a potential source for gas, oil, coal, or other commodities normally found in sedimentary rocks.

The methods used in investigating the potential of the area and descriptions of localities that were studied are described in the following sections of this report.

METHODS OF EVALUATION

In appraising the mineral resources of the Sawtooth area, special attention was given to all known mineral deposits and to hydrothermally altered areas considered favorable for mineral deposition. These areas were examined and sampled extensively. In addition, sample and production data, where available, were collected from claim holders and others familiar with the area. Mineral deposits outside the primitive area were studied for comparison with those within the primitive area. Reports dealing with mineral resources in or near the area were studied in detail. Sediment samples were taken along all major streams and most of their tributaries. Samples were panned from streams to check for concentrations of heavy minerals. The samples were analyzed either by spectrographic, chemical, or fire assaying methods, and many of them were checked by more than one analytical method. Many outcrops of country rock and altered areas were scanned with a scintilometer for abnormal radioactivity. An aeromagnetic survey was made of the entire area to search for geologic environments favorable for mineral deposition.

SAMPLING AND ANALYTICAL TECHNIQUES

The objective of sampling and analytical techniques used in the Sawtooth study was to obtain maximum information consistent with rapid coverage of the area. Sampling and analyzing of stream sediments was the principal geochemical method used. Stream sediments are representative of the weathering products of rock masses undergoing erosion. The metal contents of a sediment sample therefore reflects the metal contents of the various rock types or mineral deposits that are being eroded in a drainage basin. The sediment sampling procedure permits large areas to be tested quickly for their mineral potentialities and anomalous samples to be traced to their source.

All major streams and most of the tributaries in the Sawtooth area were sampled. More than 900 sediment samples were collected, the locations of which are shown on plate 2. Each sample consisted of a couple of handfuls of the finest grained portion of the stream sediment, preferably clay or silt, which tends to accumulate concentrations of the metal values. Many of the streams, however, have such steep gradients that the fine particles are swept away and only sand is to be found in the lee of boulders. Most of the sediment samples were dried and sieved; the plus 80-mesh portions were discarded and the finer portion was analyzed.

Sand and gravel were panned from the streams and the black sand thus concentrated was examined visually for gold, monazite, and zircon and was analyzed spectrographically.

Altered, mineralized, and other favorable rocks were sampled in an effort to obtain the highest metal values possible without regard to the quantity of rock represented by the sample. This high-grading sampling procedure was used deliberately to determine which metals have been added to the rocks. The analytical values therefore are indicative only. At most such localities, samples were taken of nearby nonmineralized parts of the vein or of unaltered wallrock to show the contrast in metal content. Samples that are representative of the veins and deposits also were taken; these were assayed and the results are given in the section on mines and prospects.

The localities of rock samples, except those that were assayed, are shown on plate 2 and the analytical results of these and other samples are listed in table 1.

The samples listed in table 1 were analyzed spectrographically for a wide variety of elements. The spectrographic determinations are semiquantitative and will include quantitative values only about 30 percent of the time. Irrespective of their absolute quantities, the semiquantitative values serve as guides to the metal content of the sample—high values indicate a concentration of the element, conversely, low values indicate minute quantities. Samples in the table that are followed by the letter A were analyzed by atomic absorption for gold, silver, zinc, lead, copper, and iron. Mercury analyses were made by instrumental determination. Fluorine, molybdenum, zinc, and tungsten determinations, followed by the letter C, were made by chemical analysis, as were citrate-soluble heavy metal (cxHM) determinations.

Semiquantitative spectrographic results are shown in table 1 in parts per million (ppm). In the section of this report that deals with mines, prospects, and anomalous areas, many of the analytical data have been converted to ounces per ton and values in percent. This is solely for the convenience of the reader, to enable him to make quick comparisons with the more common analytical determinations used in describing metal content of mineral deposits. These converted values should not be confused with assay values. The reader should be aware of the limitations of semiquantitative spectrographic determinations and should consider those determinations in table 1 accordingly. Table 2 is included for those who wish to contrast parts per million values to ounces per ton or percent, or vice versa.

TABLE 2.—*Conversion of parts per million to percent and to ounces per ton and vice versa*

[Conversion factors: 1 lb avoirdupois = 14.583 oz troy; 1 ppm = 0.0001 percent = 0.0291667 oz troy per short ton = 1 gram per metric ton; 1 oz per ton (Au or Ag) = 34.286 ppm = 0.0034286 percent]

Parts per million to percent to ounces per ton			Ounces per ton to percent to parts per million		
Ppm	Percent	Oz per ton	Oz per ton	Percent	Ppm
0.01	0.000001	0.0003	0.01	0.00003	0.3
.02	.000002	.0006	.02	.00007	.7
.05	.000005	.0015	.05	.00017	1.7
.10	.00001	.003	.10	.00034	3.4
.20	.00002	.006	.20	.00069	6.9
.30	.00003	.009	.30	.00103	10.3
.40	.00004	.012	.40	.00137	13.7
.50	.00005	.015	.50	.00171	17.1
.60	.00006	.017	.60	.00206	20.6
.70	.00007	.020	.70	.00240	24.0
.80	.00008	.023	.80	.00274	27.4
.90	.00009	.026	.90	.00309	30.9
1.0	.0001	.029	1.0	.00343	34.3
10.0	.001	.292	10.0	.03429	342.9
20.0	.002	.583	20.0	.06857	685.7
50.0	.005	1.458	50.0	.17143	1,714.0
100.0	.01	2.917	100.0	.34286	3,429.0
500.0	.05	14.583	500.0	1.71	17,143.0
1,000.0	.10	29.167	1,000.0	3.43	34,286.0
10,000.0	1.00	291.667	10,000.0	34.29	342,857.0

EVALUATION OF SAMPLE DATA

The objective of sample evaluation was to distinguish samples that were normal in metal content from those that were sufficiently above normal to be classed as anomalous. The anomalous samples then were appraised with respect to the geologic environment from which they came, type of sample, and analytical procedure used in the analysis. The samples were grouped according to geologic environment and for each of the more common elements shown in table 1, cumulative frequency data of the analytical findings were plot-

TABLE 3.—*Median and anomalous values, in parts per million, of selected metals in rocks and stream sediments from the Sawtooth area compared with contents of average felsic granites and granodiorites*

[N.d. =not detected]

Metal	Average felsic granite and granodiorite [1]	Unaltered rocks		Sediments from streams draining Idaho batholith				Sediments from streams draining Sawtooth batholith		Sediments from all streams of the Sawtooth area			
		Sawtooth batholith median [2]	Idaho batholith median [3]	Sieved [4]		Unsieved [5]		Sieved [6]		Sieved [7]		Unsieved [8]	
				Median	Anomalous	Median	Anomalous	Median	Anomalous	Median	Anomalous	Median	Anomalous
Lead	20	50	35	50	100	20	50	45	150	50	130	20	60
Zinc	60	15	25	80	150	60	150	90	200	80	200	60	130
Beryllium	5.5	6	1	2	15	2	5	15	50	2	30	2	8
Molybdenum	1	N.d.	N.d.	2	10	<2	N.d.	2	30	2	15	N.d.	N.d.

[1] From Parker (1967, table 19).
[2] 17 samples.
[3] 15 samples.
[4] 132 samples.
[5] 142 samples.
[6] 162 samples.
[7] 576 samples.
[8] 244 samples.

ted on log-normal probability paper to determine the range and geometric median of the values. Some curves showed a sharp upward inflection in the higher values; these values were considered anomalous. In curves where there was no upward inflection, the upper 5 percent of the sample values were considered anomalous. Median and anomalous values for several elements in stream sediments and in unaltered rocks of the Idaho and Sawtooth batholiths are shown in table 3.

Table 3 shows that median metal values of sieved sediment samples are higher than those of unsieved sediments. This is partly the result of dilution of the fine-grained fraction brought on by crushing the unsieved sample before taking a portion for analysis. The table also shows that sediment samples from streams draining the Sawtooth batholith have higher median and anomalous values than do streams draining the Idaho batholith. Although not enough samples were taken to be certain, comparison of analyses shows that Sawtooth batholith rocks are higher in tin, lead, beryllium, and niobium than are rocks of the Idaho batholith. Sawtooth batholith rocks also were found to be higher in equivalent uranium. Table 3 shows sediment samples from the Sawtooth batholith to be higher in zinc and molybdenum than are sediments from the Idaho batholith. On the other hand, table 1 shows that rock samples of the Idaho batholith are higher in vanadium, cobalt, and chromium content than are rocks of the Sawtooth batholith.

In contrast to the granitic rocks of the Sawtooth and Idaho batholiths, the unaltered dike rocks in the study area are lower in metal content (table 1), except for some andesite dikes that were higher in copper content as expected. Within the group of dike rocks the samples are arranged by increasing total content of iron, calcium, and magnesium; that is, from most acidic to most basic. This arrangement permits a rapid comparison of element content of the various rock types. Although the unaltered rocks show a wide range in the content of specific elements this variation is normal and is not in itself of economic significance.

Examination of the analytical data suggests that the mineral occurrences in the Sawtooth area can be grouped into two different assemblages on the basis of the elements they contain. The first, which is herein termed the "tin suite" includes deposits with tin, beryllium, molybdenum, uranium, niobium, bismuth, silver, copper, lead, and zinc. The second, which might be termed the "gold suite" includes deposits with gold or with gold and silver and minor amounts of lead and zinc. Occurrences of the "tin suite" are found principally in the Sawtooth batholith, although some occur outside the batholith, where they may have been derived from that batholith. Deposits of the "gold suite" are confined almost entirely to rocks of the peripheral Idaho batholith. Examples of the "tin suite" are the molybdenum deposit at the mouth of Rock Creek, the anomalous molybdenum areas at the head of Iron Creek, beryllium and uranium mineralization in the vicinity of Glens Peak, the altered areas that contain molybdenum, zinc, lead and silver in the vicinity of Cramer Lakes and Hidden Lake, and bismuth, copper, and silver of the Johnson Creek area (fig. 7). Examples of the "gold suite" include the anomalous zone near McDonald Peak, prospects along Alturas Lake Creek and in the Mattingly Creek divide area, as well as mines and prospects in the Black Warrior Creek area and prospects along Little Queens River and in the vicinity of Grouse Creek, Picket Mountain, and Observation Peak.

The anomalies of tin-suite elements in the Sawtooth batholith suggests that it is a "tin granite" (Sainsbury and Hamilton, 1968; Hosking, 1968; and C. L. Sainsbury, oral commun., 1967). No minable concentrations of tin, however, were seen in the area.

AEROMAGNETIC SURVEY AND INTERPRETATION

In September 1968, the U.S. Geological Survey made an aeromagnetic survey of the region between lat 43°45′ and 44°15′ N. and long 114°45′ and 115°15′ W., which includes the Sawtooth area. The purpose of the survey was to help evaluate the mineral potential of the area. Total intensity aeromagnetic data were obtained by use of a continuously recording fluxgate magnetometer flown at a barometric elevation of 12,000 feet above sea level. The traverses were oriented north-south at a flightline spacing of about 1 mile. The magnetic data were compiled at a scale of 1:62,500 and a contour interval of 20 gammas. No laboratory measurements of rock magnetic properties were made. The magnetic data were interpreted by M. Dean Kleinkopf, U.S. Geological Survey.

The magnetic pattern of the area is dominated by a broad positive magnetic anomaly that corresponds closely with the outcrop of the Sawtooth batholith (plate 1). The broad anomaly is bounded by nearly linear gradients that mark the major faults on the northeast and southwest and that mark the edge of the batholith on the southeast. A topographic effect probably accounts for some of the variations in magnetic intensity across the Sawtooth batholith, since many of the highest values occur over the ridges.

Within the broad anomaly over the Sawtooth batholith, a zone of high magnetic values extends southwestward from Cramer Lakes. This trend approximates that of the postbatholith dikes, but only locally, near Cramer Lakes, does it correspond with known mineralization. This suggests that alteration near Cramer Lakes has not been great enough to destroy the magnetism of the somewhat weakly mineralized rocks. In contrast, the northeast-trending dikes and mineralized rocks extending through Rock Creek correspond to a negative magnetic anomaly which may be showing alteration sufficient to lower the magnetic susceptibility of the rocks. The Atlanta district of gold and silver in quartz veins is on a gentle positive magnetic nose within a south-dipping gradient zone bounding the Sawtooth batholith. Southeast of the study area, the Vienna mining district, with widespread alteration, corresponds to a negative magnetic anomaly.

The magnetic gradient zones approximately along the boundaries of the Sawtooth batholith are believed to be indicative of the subsurface configuration of the batholith. Mapping shows that the southern contact of the Sawtooth batholith dips relatively gently southward; the magnetic pattern suggests that this dip of the roof continues for 2 to 3 miles possibly to a more nearly vertical contact that might be a bounding fault. The broad negative magnetic anomaly at Baron Creek at the north edge of the Sawtooth batholith may indicate a subcrop of metamorphic rocks similar to those that crop out at Thompson Peak.

The regional magnetic anomalies present in the area are not indicative of large concealed bodies of magnetic igneous rock of the type that might be expected to be associated with ore deposits. Also, the negative magnetic anomalies that might be expected to indicate widespread alteration appear to be limited to the south part of the area at Rock Creek.

Southeast of the study area, a broad negative anomaly corresponds to altered rocks of the Vienna mining district. A zone of negative magnetic anomalies that extends west-southwesterly from the Vienna district may warrant further investigation for evidence of alteration, particularly in secs. 11 and 12, T. 5 N., R. 13 E., and in the area between Little Bear Creek and Bass Creek near their junctions with the Ross Fork of the Boise River.

MINERAL COMMODITIES

ECONOMIC CONSIDERATIONS

The principal commodities found in the examination of mine and prospect workings in the study area are gold, silver, molybdenum, and radioactive black sand. There are numerous occurrences of other commodities, but none appear to occur in significant concentrations.

The industrial demand for gold throughout the world is increasing. Consumption by U.S. industry and the arts in 1969 was 6.7 million troy ounces, while domestic mine production was only 1.7 million troy ounces. The Republic of South Africa produces 67 percent of the world's total supply; other free world countries produce 19 percent; and the remaining 14 percent comes from the Communist bloc countries. A floor price of $35 per ounce has been established as a result of a recent agreement between the International Monetary Fund and the Republic of South Africa. The lode deposits in the study area must average more than 0.3 ounce of gold per ton to be mined economically.

Silver is produced mainly as a byproduct from base-metal ores. Domestic industry and the arts consumed about 141 million troy ounces in 1969, although domestic mine production was only about 40 million ounces. The United States, Canada, Mexico, and Peru account for about 60 percent of the total world production of approximately 275 million ounces. The price of silver is expected to remain firm or rise slightly because of strong industrial demand. The vein deposits within the study area would probably have to average more than 10 ounces per ton to be mined economically at present prices.

United States production of molybdenum has been increasing steadily for a number of years. Total production in 1969 was approximately 100 million pounds. Most is produced from large, low-grade deposits or as a byproduct from large copper mines. An adequate supply can be expected for many years from domestic deposits. The price of molybdenum concentrates (95 percent MoS_2) was $1.72 per pound in 1969.

Radioactive black sands occur in placer accumulations in the area. The only place where these occurrences may approach commercial concentrations is along the South Fork Payette River near Grandjean in the northwest part of the study area. Similar deposits in southern Idaho were a source for columbium, tantalum, uranium, and some rare-earth metals through a 10-year period dating from 1952.

MOLYBDENUM

Molybdenum anomalies are common in the Sawtooth Primitive Area, particularly in rocks of the Sawtooth batholith. While nor-

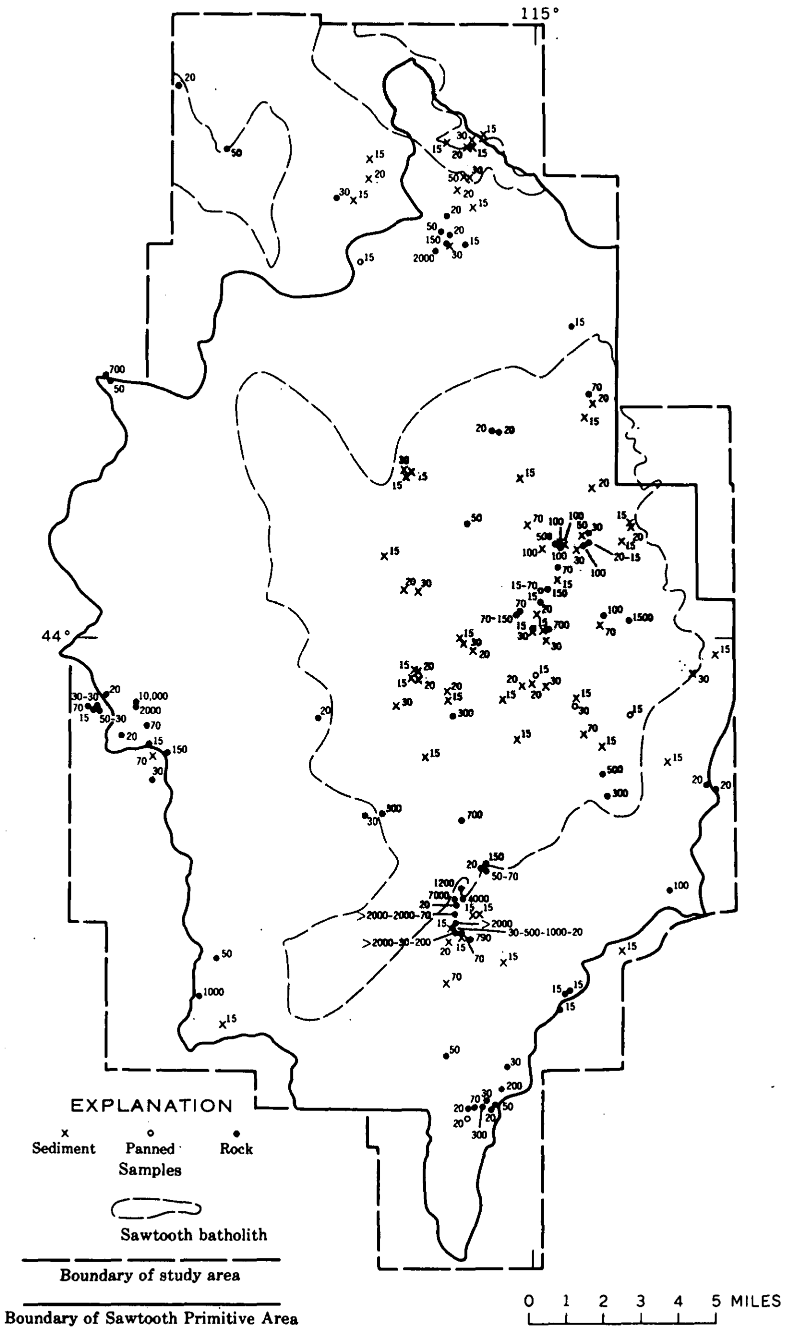


FIGURE 8.—Sawtooth area showing location of samples containing 15 ppm or more molybdenum.

mal granites contain only 1 ppm molybdenum (Parker, 1967, table 19) about one-third of the altered granite samples listed in table 1 contained 10 ppm or more molybdenum, as did a substantial number of the sieved sediment samples. In this report 15 ppm or more molybdenum is considered anomalous (fig. 8).

The best known molybdenum prospect in the area is on the mountainside north of the mouth of Rock Creek, where molybdenite coats fractures and is disseminated in granitic rock (fig. 7). Altered rocks in the vicinity of Cramer and Hidden Lakes also are anomalous in molybdenum, as are rocks near Mount Regan. Stream-sediment samples from the headwaters of Iron Creek in the northern part of the area were anomalous in molybdenum. Vein deposits in the La Moyne Creek-Leggit Creek area, Johnson Creek area, and near Observation Peak contain molybdenum.

Molybdenum is present in the area in strikingly anomalous amounts and molybdenite has been recognized locally in large altered zones. Surface sampling of these altered rocks has nowhere shown concentrations of molybdenum in minable tonnage and grade. In general, the topographic relief of the area is great and the rocks are well exposed so that any near surface ore bodies probably would have been found. The fact that no minable deposits are known at the surface does not preclude the presence of them at depth. To assess the molybdenum potential of these areas, particularly the large altered zones in the vicinity of Rock Creek and Cramer and Hidden Lakes, would require more exploration than has been done to date.

BERYLLIUM

Beryl, an uncommon mineral in most areas, is widespread in the central part of the Sawtooth Primitive Area. According to Parker (1967, table 19) the average abundance of beryllium ranges from 0.2 ppm in ultrabasic rocks to 5.5 ppm in felsic granites. The median beryllium content of unaltered granitic rocks of the Sawtooth batholith (table 3) is 6 ppm. By contrast, the medium beryllium content of rocks from the Idaho batholith is 1 ppm. Similarly the beryllium content of sediment samples from streams draining areas of Sawtooth batholith is appreciably higher than from areas of Idaho batholith. For the entire area, only those samples with a content of 20 ppm or more beryllium were considered anomalous (fig. 9).

Sample analyses outline a broad area of the southern and central Sawtooth batholith that is anomalous in beryllium. Outcrops con-

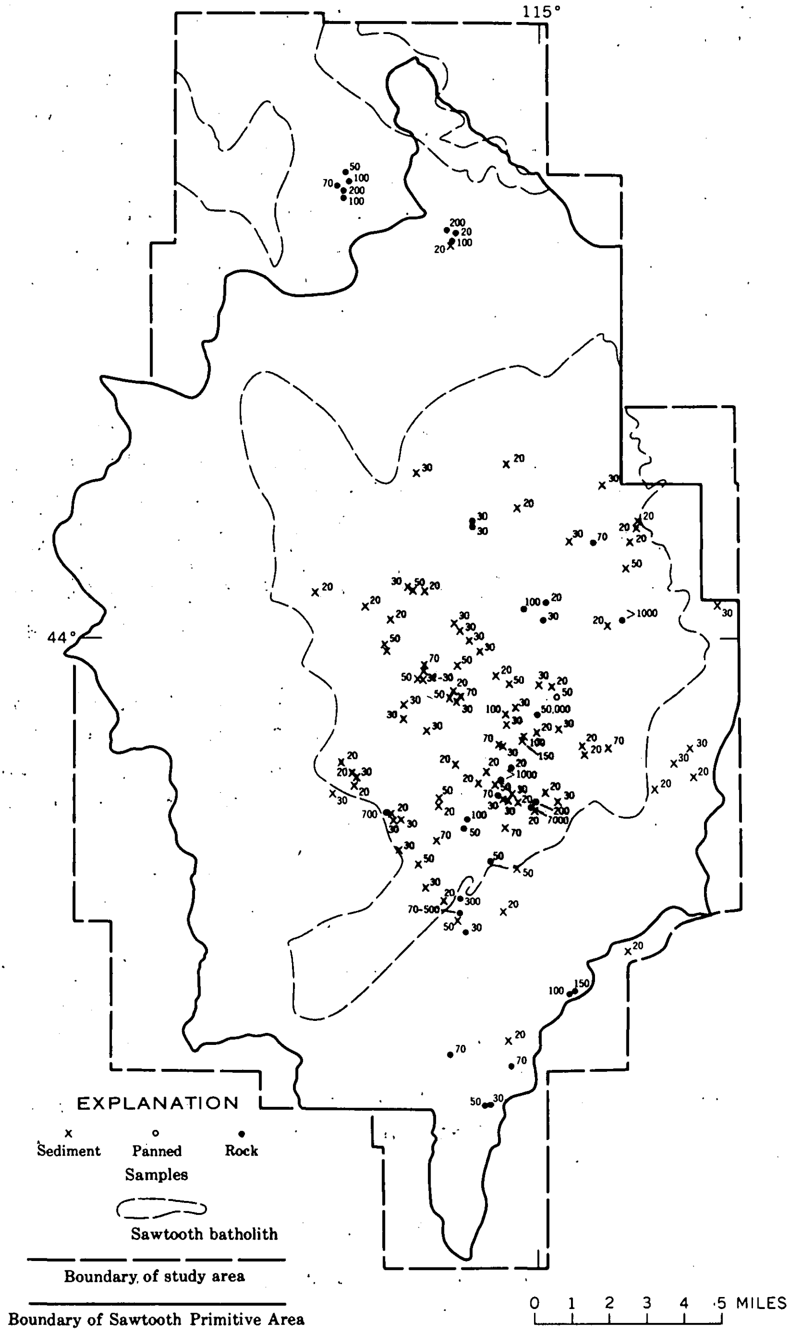


FIGURE 9.—Sawtooth area showing location of samples containing 20 ppm or more beryllium.

taining blue-green beryl (commonly known as aquamarine) are widespread in the Sawtooth batholith, many of which are shown in the Bureau of Mines report (Pattee and others, 1968, figs. 30 and 37). Some of these occurrences are described in a later section of this report. Elsewhere, outside the anomalous area, a few vein and altered rock samples contained beryllium, which was introduced into the rocks by mineralizing solutions, along with a variety of other metals. None of the beryl localities examined during this investigation or in the previous one by the Bureau of Mines contain sufficient beryllium to be of commercial value.

NIOBIUM

Niobium is present in the Sawtooth area but the anomalous samples do not indicate potentially minable concentrations except possibly in placer deposits. The conspicuous feature of the niobium is its content in the sawtooth batholith where its median sample value is about 70 ppm as compared with 20 ppm and 35 ppm in the average granite and syenite (Parker, 1967, table 19). The niobium is present in euxenite and possibly other accessory minerals of the granite.

The highest content of niobium found in an unaltered rock sample is 500 ppm from a pegmatite but samples of unaltered pink granite contain as much as 150 ppm, and five samples of altered rock contain 150 to 300 ppm. Samples of unaltered dikes contain as much as 100 ppm niobium.

Minerals containing niobium have weathered from granitic rocks and are concentrated in alluvial deposits. As would be expected, some stream-sediment samples and all panned concentrates from the area contain appreciable quantities of niobium, as well as the rare earth elements lanthanum and yttrium. These niobium concentrations are considered normal. The only alluvial deposit large enough to contain significant quantities of niobium and rare earth elements is along the lower part of the South Fork Payette River. This potential placer deposit is described in detail in a later section of the report.

URANIUM

An unexpected result of geochemical sampling in the Sawtooth Primitive Area was the discovery of concentrations of uranium in many stream-sediment samples as shown in table 4 and in figure 10. A high proportion of these samples came from the headwaters area of the South Fork Payette River, from streams draining

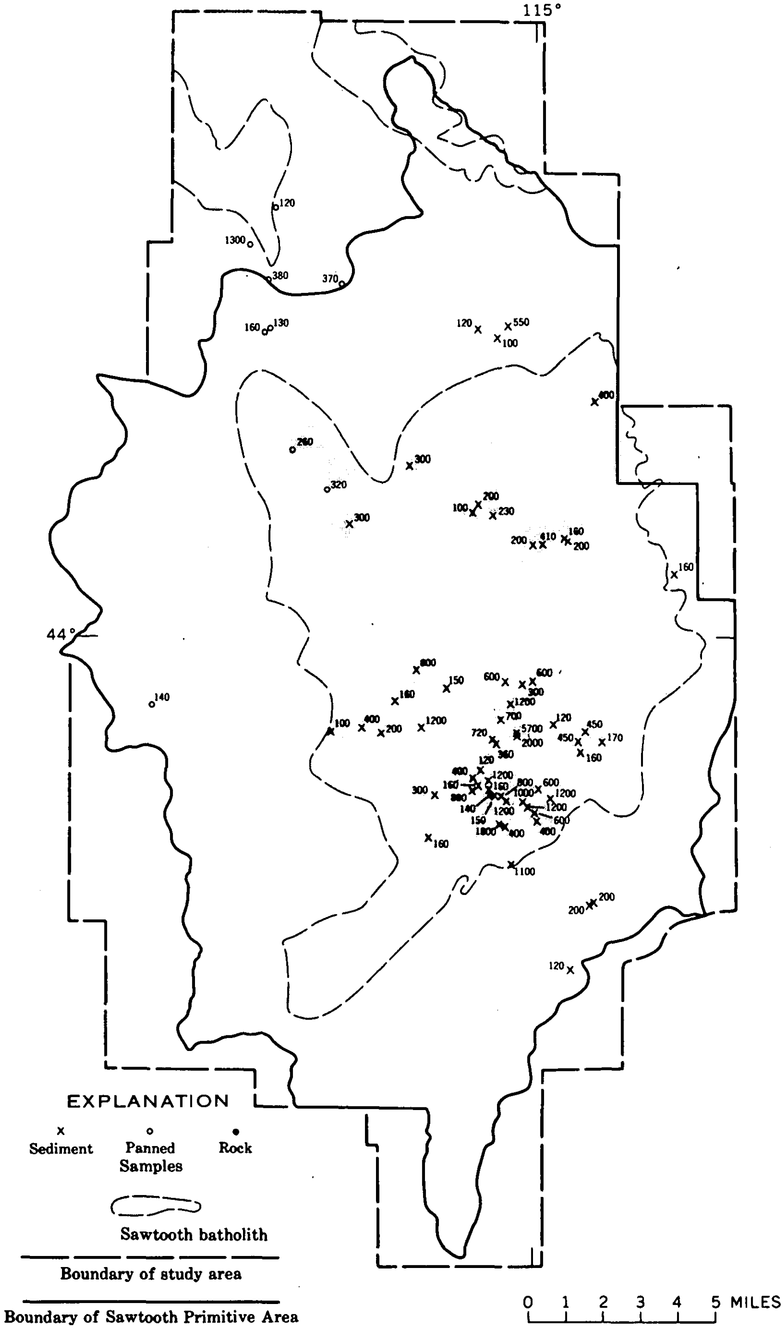


FIGURE 10.—Sawtooth area showing location of samples containing 100 ppm or more uranium.

rocks of the Sawtooth batholith. Visual and radiometric examination of Sawtooth outcrops disclosed minor showings of accessary minerals that possibly could contain uranium but no veins or concentrations of uranium-bearing minerals were seen. Radiometric traverses of the Sawtooth batholith rocks gave readings of 0.03 to 0.06 mr per hr (milliroentgens per hour). This is in contrast to readings taken at several localities in rocks of the Idaho batholith, where the average was 0.02 to 0.03 mr per hr.

TABLE 4.—*Uranium analyses, in parts per million, of samples from the Sawtooth area, Idaho*

[Sample data listed as eU were determined by beta-gamma counter, Up-c data were determined by paper-chromotography, and Uf data were determined by fluorimetric analysis. Values less than 60 ppm are not included unless useful to compare results of the different analytical methods. Analysts: fluorimetric, E. J. Fennelly; eU, J. M. Gardner, O. M. Parker, and E. J. Rowe; Paper-chromotography, A. L. Meier and G. W. Dounay, U.S. Geological Survey]

Sample	eU	Up-c	Uf	Sample	eU	Up-c	Uf
STREAM SEDIMENTS (SIEVED)				STREAM SEDIMENTS (SIEVED)—Continued			
20	-------	200	230	160	-------	800	1,100
21	80	200	130	161	-------	400	-------
22	60	40	100	162	-------	120	-------
27	60	20	90	163	-------	160	-------
28	-------	20	70	164	-------	160	-------
30	80	20	90	165	-------	800	410
31	70	20	60	166	-------	1,200	-------
36	80	200	130	167	-------	800	140
37	100	160	50	168	-------	600	100
38	60	40	70	169	-------	1,200	-------
39	400	300	410	171	-------	400	-------
40	100	200	120	172	-------	600	190
41	-------	20	70	173	-------	1,200	1,200
44	200	400	350	174	-------	400	-------
71	-------	20	70	175	-------	1,200	1,800
72	200	160	550	176	-------	200	-------
74	90	100	100	552	-------	80	-------
75	100	40	120	598	-------	160	-------
76	-------	20	10	602	-------	80	-------
79	-------	40	30	614	-------	80	-------
81	-------	20	20	619	-------	300	-------
83	200	80	450	623	-------	1,000	960
84	300	400	450	626	-------	1,200	570
85	100	40	170	628	-------	800	140
86	100	20	160	630	-------	160	-------
88	-------	20	120	632	-------	400	-------
90	200	200	700	844	-------	160	-------
91	600	160	720	932	-------	300	-------
92	200	160	360	1004	-------	80	-------
93	-------	160	2,000	1009	-------	600	-------
94	2,000	>2,000	5,700	1010	-------	300	-------
95	50	<20	<10	1011	-------	600	-------
101	100	40	80	1018	-------	1,200	-------
102	60	40	80	1024	-------	1,200	-------
103	-------	40	40	1203	-------	80	-------
111	-------	200	-------	1511	-------	300	-------
112	-------	200	-------	1533	-------	80	-------
117	-------	80	-------	1549	-------	80	-------

TABLE 4 —*Uranium analyses, in parts per million, of samples from the Sawtooth area, Idaho*—Continued

Sample	eU	UP–C	Uf
STREAM SEDIMENTS (SIEVED)—Continued			
1551	-------	150	-------
1553	-------	150	-------
1555	-------	80	-------
1556	-------	80	-------
STREAM SEDIMENTS (UNSIEVED)			
258	60	-------	-------
289	60	-------	-------
315	60	-------	-------
568	120	-------	-------
720	70	-------	-------
753	70	-------	-------
781	70	-------	-------
800	100	-------	-------
833	60	-------	-------
834	80	-------	-------
PANNED CONCENTRATES			
520	-------	20	90
521	-------	80	90
859	150	-------	30
897	140	-------	120
918	600	-------	380
921	520	-------	370
922	210	-------	130
924	260	-------	160
928	1,600	-------	1,300
934	510	-------	320
959	500	-------	260
973	240	-------	140
UNALTERED ROCK			
1557	190	-------	140
1567	50	-------	10
ALTERED ROCK			
108A	10	40	<10
472	50	-------	<10
514	30	40	<10
516	20	40	10
1032	120	-------	70
1562	70	-------	20
1569	50	-------	10
1581	30	-------	<10
VEIN			
906	50	-------	<10
939	50	-------	10
975	50	-------	10
976	20	-------	10
977	30	-------	10

Uranium in the Sawtooth batholith seems to be present partly in the mineral euxenite and probably also in some other form. Euxenite was tentatively identified as the fine-grained radioactive mineral found in a pegmatite within the Sawtooth batholith. The uranium in panned samples from the South Fork Payette River is also thought to be in euxenite as it seems to parallel the quantity of niobium and yttrium in these samples.

Another type of uranium occurrence is represented by the unusual amounts of uranium found in black muds and clays, and in bog samples high in organic matter. Typical is the area east of Spangle Lake, where a number of springs and small boggy meadows are underlain by the Sawtooth batholith. Radiometric traverses on outcrops above the springs and alongside the issuing streams gave rather constant readings of 0.045 to 0.06 mr per hr. By contrast, readings directly over the springs and streams ranged from 0.06 to 0.09 mr per hr, suggesting that uranium is being carried by the streams after being leached from the rocks by ground water. The presence of uranium in the downstream bogs indicates the dissolved uranium is removed from the water and trapped by organic-rich clayey material. This type of uranium deposition has been noted elsewhere (Klepper and Wyant, 1957, p. 123).

A test for the presence of easily soluble uranium in unaltered rocks of the Sawtooth batholith was run on two samples by Joseph Budinsky, U.S. Geological Survey. One gram of each sample was leached for 6 hours by $2NH_2SO_4$. The uranium contents of the insoluble residue and the original sample were determined and the percentages leached were calculated. Each of the two samples contained about 8 ppm uranium of which about 70 percent was leachable under conditions of the test. The test, although limited, indicates that enough soluble uranium is present in the Sawtooth granite to account for the high uranium content in the organic clays of the stream sediments.

Considerable study in the United States has been devoted to sources of radioactive elements when higher-grade deposits have been depleted. One source that has been considered is the very low grade uranium content of granites from which the uranium can be leached at normal temperatures. Brown and others (1963, table 2) briefly summarize the results of leaching tests on 17 granites and conclude that the Conway Granite of New Hampshire is of principal interest. Results of tests on 13 samples of Conway Granite (Brown and others, 1963, table 5) that were tested by leaching compare closely with the two samples of Sawtooth granite in leachable uranium. Leachable thorium, important in the Conway Granite, was not tested on the Sawtooth samples. If future demands in the United States for radioactive elements require serious consideration of granite as a source, the Sawtooth batholith may be expected to be tested more thoroughly. It should be emphasized that no concentrations of uranium were seen in granite of the Sawtooth batholith that even approached ore grade under present conditions.

The uranium potential of the organic-rich clays and bog deposits in the primitive area is considered to be very slight. Although some samples listed in table 4 are of ore grade, it should be noted that these represent sieved (—80 mesh) portions and that bulk samples from the areas would be much lower in grade. Furthermore, the bog areas are small and the quantity of clay along the rapidly downcutting streams is very small.

Available placer material along the lower part of the Payette River, containing radioactive black sands, is on the order of several hundred million cubic yards. A considerable quantity of uranium is contained in this material, although it is not considered economically minable at the present time.

GOLD AND SILVER

The Atlanta lode of rich gold and silver ores, less than 2 miles south of the Sawtooth Primitive Area, was discovered in 1864, by placer miners who had traced placer gold in the gravels along the South Fork Boise River. Subsequent production from lode mines in the vicinity of Atlanta made the district one of the rich gold-silver producers in Idaho. Mining activity at Atlanta led to much prospecting of nearby areas, including the Sawtooth Range. Records show that hundreds of mining claims were staked in the region, many within the primitive area. Quartz veins containing gold and silver were discovered at many localities including those near the head of Mattingly Creek, at the head of La Moyne Creek, and on the divide separating La Moyne Creek from Leggit Creek, along the Little Queens River, and on Browns Creek. Several veins also were found along the valley walls of Black Warrior Creek and along Grouse and Bayhorse Creeks. Further north, veins were found west of the mouth of Ballentyne Creek, on Picket Mountain, and in the vicinity of Observation Peak. All of the above-mentioned veins are within the study area, but many are outside the boundary of the Sawtooth Primitive Area. (See fig. 7 and plate 2.) Despite the many veins that were found, there is no recorded production of gold or silver from prospects in the area that was studied except from the Little Queens and the Overlook mines. The value of gold and silver from the Little Queens mine was reported locally to be $10,000, and values produced from the Black Warrior Creek area, mainly the Overlook mine, were at about $40,000. Only scant placer gold has been produced and the prospects for further placer production are not good.

Both gold and silver are found in most of the mineralized quartz veins of the area. The gold commonly is very fine grained and rarely can be seen by the unaided eye. In the Atlanta and Black Warrior Creek areas it was mined as native or free gold and as gold associated with other sulfide minerals, chiefly arsenopyrite and pyrite (Ballard, 1928, p. 17; Anderson, 1939, p. 23). In our geochemical sampling we considered only sediment samples with gold content of 0.1 ppm or more as anomalous. Because of the particulate nature of gold, our samples may not be representative

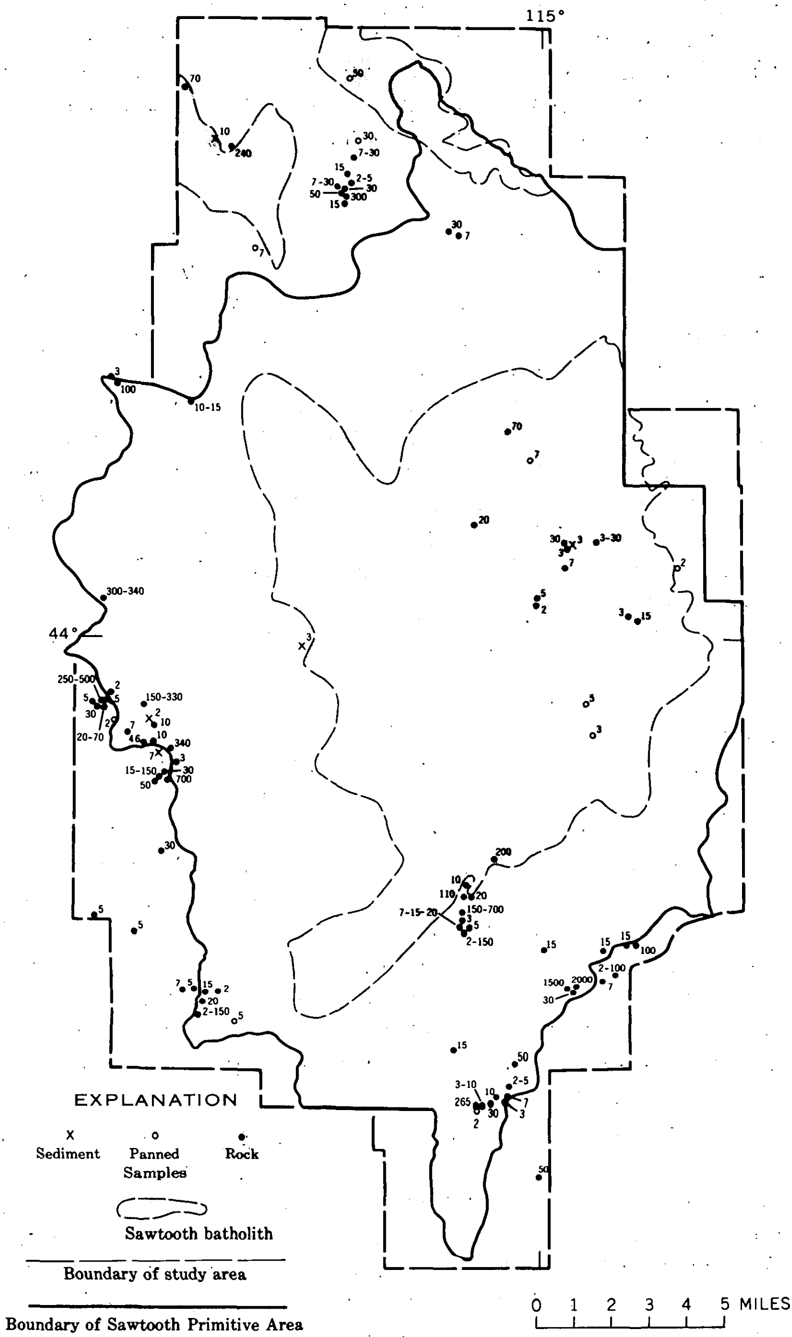


FIGURE 11.—Sawtooth area showing location of samples containing 2 ppm or more silver.

of the rock unit sampled, nor is the subsample analyzed in the laboratory necessarily representative of the bulk sample for the same reason. However, the atomic absorption technique used for the gold analyses listed in table 1 is believed to be a highly reliable measure of the gold content of the subsample actually analyzed.

Silver, in the vicinity of Atlanta, occurs in a variety of minerals (Anderson, 1939, p. 22). No attempt was made to identify all of the silver minerals in veins that were sampled, although tetrahedrite, ruby silver minerals, and some galena that contains abnormal amounts of silver were recognized. Sediment samples containing 2 ppm silver are considered anomalous (fig. 11). Most of the higher silver and gold analyses listed in table 1, the sample sites of which are shown on plate 2, are from known prospects. Some samples, however, are from outcrops that show no evidence of previous workings and at which no notices of mining claim locations were found. Typical of these are sites marked on plate 2 by sample numbers 1657 and 456 on Bear Creek; 24, 30, and 1593 near Cramer Lakes; 11, north of Alpine Lake; 276, south of Johnson Creek; 1601, west of Hell Roaring Creek; 115 on the South Fork Alpine Creek; 1572 from the upper part of Billy Creek; and sample 820 from Gold Run Creek southeast of and outside the study area. All of these mineralized localities are described in later sections of this report.

Prospecting in the Sawtooth Primitive Area has failed to develop any profitable gold and silver mines, although many conspicuous altered zones and quartz veins contain small quantities of gold and silver. Some of these altered zones and veins may be traced for considerable distances on the surface and across hundreds of feet of relief. It would be expected that previous prospecting of them would have led to discovery of profitable ore deposits, if such exist. The failure to find ore deposits in this area, however, cannot be taken as proof that none evist. Gold deposits in the area, to be minable economically, would have to contain large ore bodies that would average 0.30 ounce of gold per ton. Likewise, silver ore, to be minable economically, would probably have to average 10 ounces of silver per ton or more. Based on present knowledge, the gold and silver potential of the area cannot be assessed in terms of tons and grade. The potential must be considered as slight but it cannot be disregarded.

LEAD, ZINC, AND COPPER

Lead, zinc, and copper minerals occur chiefly in minor quantities in gold and silver veins in the study area and all samples were

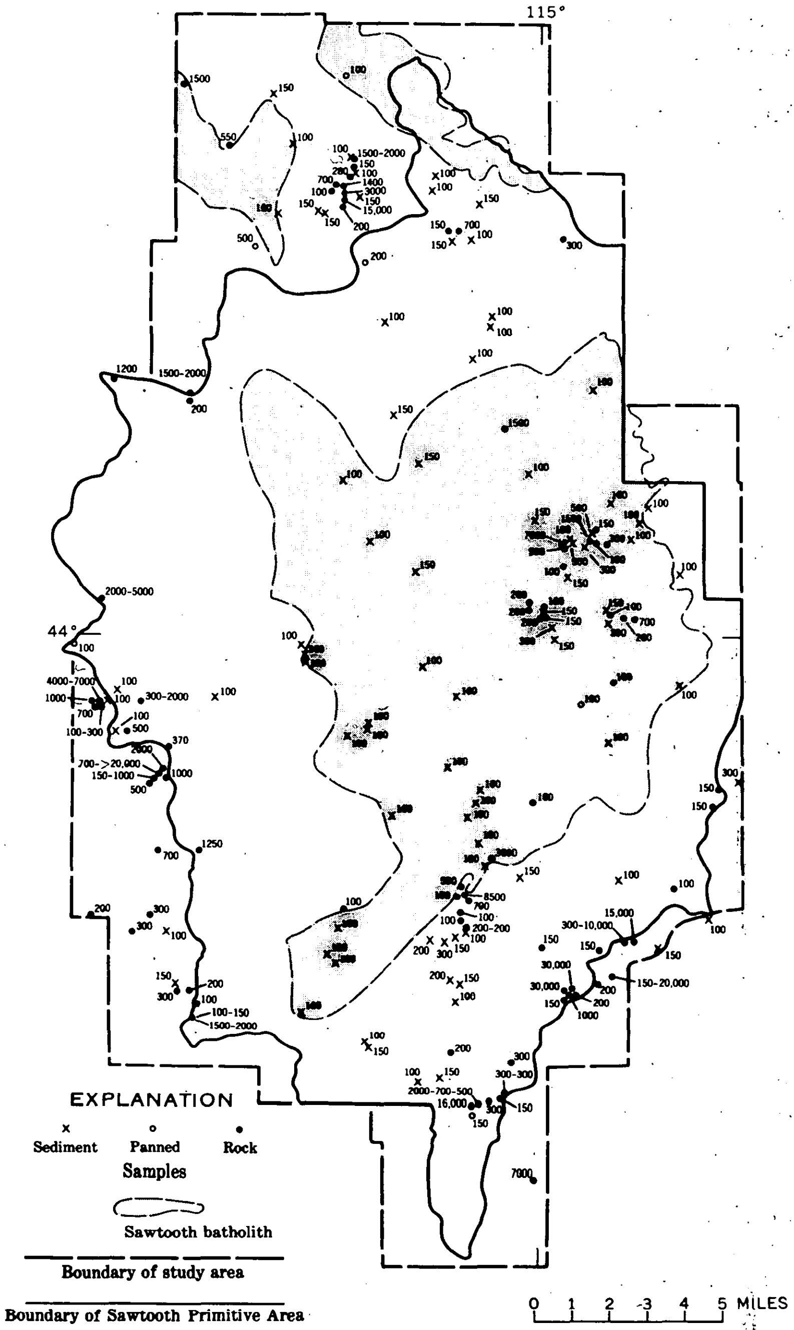


FIGURE 12.—Sawtooth area showing locations of samples containing 100 ppm or more lead.

tested for these metals. Stream-sediment samples containing 100 ppm lead, 200 ppm zinc, or 100 ppm copper are considered to be anomalous. Citrate-soluble heavy metals (cxHM) analyses listed in table 1 are tests mainly for combined zinc, lead, and copper, and they are considered anomalous when they exceed 14 ppm.

We found lead, zinc, and copper anomalies generally to coincide with areas anomalous in silver. The lead and zinc sulfides, galena and sphalerite, were detected only sparsely at the outcrop, and they were generally spotty and of no particular economic significance (fig. 12). Because of rapid erosion in the area, the oxidation of sulfides is confined generally to very shallow depths. A good showing of galena was seen at the Star Mountain prospect on Alturas Lake Creek, but the vein was narrow and the outcrop was discontinuous. Other showings included those on Leggit Creek, at the mouth of Rock Creek, Upper Grouse Creek, Bayhorse Pass, and near Observation Peak. Other anomalous lead and zinc analyses included those in the altered zones near Cramer and Hidden Lakes and one near McDonald Peak. Copper minerals were found in insignificant amounts. The highest copper analyses were on samples from the Johnson Creek area.

The lead, zinc, and copper potential of the area is considered to be insignificant.

OTHER COMMODITIES

Bismuth is a common byproduct of lead, zinc, and copper ores and traces of it were detected in many of the samples. It was particularly noticeable in samples from Johnson and Grouse Creeks, Rock Creek, and the Cramer Lake vicinity, the head of Mattingly Creek and on Leggit Creek, although in none of these areas was it found in economic quantity.

All samples listed in table 1 were tested for tungsten and several areas were scanned in the field with an ultraviolet lamp: no deposits were found.

Analyses high in arsenic content are given in the footnotes of table 1. None of the arsenic showings are considered to be of value but they are listed because arsenic often is associated with mineralized areas and as such may be used as a prospecting guide in searching for such areas. Analyses for antimony and cadmium are included on the footnotes of table 1 for the same purpose.

No evidence of combustible fuels was seen in the study area, and none would be expected in the igneous rocks that underlie the area.

Granite, for decorative stone work, and sand and gravel could be produced from the area, but these are readily accessible in other areas that are much closer to markets.

MINING CLAIMS

A search of county records in Blaine, Boise, Camas, Custer, and Elmore Counties disclosed a total of nearly 700 mining claims in the Sawtooth study area. The earliest claims were located in the 1880's. Most of the field investigations made by the Bureau of Mines were concentrated in areas of mining claims.

In most of the mineralized areas claims overlap or coincide with earlier claims that have been allowed to lapse. Court records, therefore, show a great many more claims than are indicated by workings. Undoubtedly, some claims were not found because of a lack of visible workings.

Evidence of recent mining activity was noted on a number of mining claims in the Leggit Creek, Rock Creek, Little Queens River, Johnson Creek, and Payette placer area. The only patented claims are in the Observation Peak area and are owned by the Greenback Mining Co., Los Angeles, Calif.

MINES, PROSPECTS, AND MINERALIZED AREAS

Information in this part of the report was collected by personnel of the Bureau of Mines and Geological Survey working independently and at different times. The information has been consolidated in the interest of brevity. The locations of samples collected by the Bureau of Mines are not shown on plate 2, but they are shown on other illustrations or are described in appropriate parts of the text. The Bureau samples were assayed, and assay values are referred to in the text and are so identified on illustrations. The locations of samples collected by the Survey are shown on plate 2, and some of them are also shown on other illustrations. These samples were not assayed but were analyzed by semiquantitative spectrographic analysis, except as noted in table 1. (See "Sampling and analytical techniques" and headnote to table 1.) For convenience of the reader and to allow comparison with Bureau assays, some of the Survey analytical data have been converted to ounces per ton or to percent.

Figure 7 shows many mines or prospects within the area studied but outside the boundaries of the Sawtooth Primitive Area. These properties are concentrated along the western side of the area, west of the Montezuma fault. They include mines and prospects along the Little Queens River, those in the Black Warrior Creek area, those on the west side of Grouse Creek, and the western prospects of the Johnson Creek area. The area has been prospected since the 1860's, and, from a geological standpoint, it is a likely site for future prospecting.

The Graham district, noted earlier in "Setting" under "Mineral resources appraisal," is west of the Montezuma fault and west of the study area. Because of the mineralized outcrops in the area and its nearness to the primitive area, it was examined briefly and several samples were taken. The sample sites are beyond the limits of plate 2 but the analyses are listed in table 1. Sample 965, containing about 44 ounces of silver per ton, was taken from an old ore bin at the smelter site and presumably represents vein material that was transported to the site for treatment. Sample 966 was taken across a 2.5-foot width of a quartz vein about 100 feet vertically above and slightly south of the head of the old aerial tramway that led to the Graham mill site. Sample 967, containing about 9 ounces of silver per ton, was taken near the portal of a caved adit, which is above the head of the old aerial tramway. The sample was taken across a 1.5-foot-wide quartz vein that strikes N. 40° E. and dips about 40° NW. Sediment sample 968 was taken from a small stream a few hundred feet east of and below the Graham mine workings. It did not contain anomalous quanties of metals. Likewise, sediment samples 1520 through 1525 from along Big and Little Silver Creeks and from other smaller streams draining from the Graham Peak area into the North Fork Boise River were not anomalous.

Prospects in the Observation Peak area also are outside of the primitive area. Many quartz veins crop out in this area; some are within the bounds of patented claims. Our sample data suggest that these veins are low in meal content; however, the veins have been prospected in the past and probably will be further explored in the future.

Southeast of the primitive area, mineralized outcrops were examined along the northern side of Alturas Lake Creek valley, on Gold Run Creek, and near the junction of the north and south forks of Ross Fork.

The Sawtooth and Vienna mining districts, which are southeast of the primitive area, were examined and sampled sparsely to afford a comparison with mineralized zones in the study area. The rich silver content of the Sawtooth district ores is emphasized by the high silver values in panned samples 541 and 542 taken from Beaver Creek (pl. 2, table 1). Panned sample 540 was taken at the site of the old Silver King mill and is contaminated in silver by jig tailings. Sampled sites in the Vienna district are shown on plate 2 and results of analyses are shown in table 1.

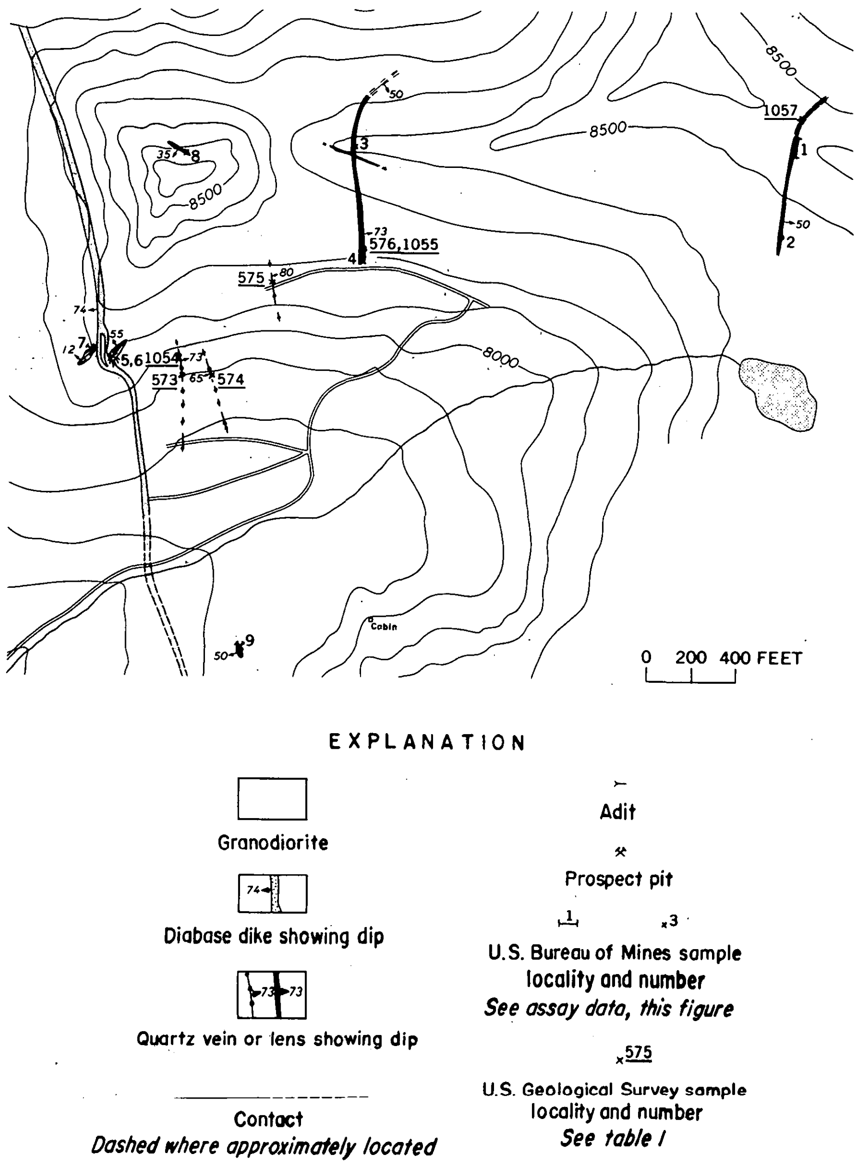


FIGURE 13.—Map showing geology and mine workings, Basin claims, Leggit Creek-La Moyne Creek area. Analytical data for samples indicated by underlined numbers are given in table 1; assay data for other samples are given in table on facing page.

LEGGIT CREEK-LA MOYNE CREEK AREA

Mineral deposits in the Leggit Creek area are high on the ridge separating Leggit Creek from La Moyne Creek. Elevations of prospect workings are 8,500 feet or more, and slopes are steep and covered with talus and scattered conifers. Granitic rocks of the Idaho batholith underlie the area. These rocks are cut by quartz veins and diabase dikes.

BASIN CLAIMS

The Basin claims (fig. 13) are in a cirque at the head of a southwest-flowing tributary of Leggit Creek, whose mouth is about 1 mile southeast of the mouth of Leggit Creek. A total of six claims (Basin Nos. 1–6), owned by Carl Paynter of Emmett, Idaho, cover most of the mineralized area in the cirque.

Access to the claims is by a rough 7.5–mile jeep road from Atlanta, Idaho. The section of road from the Middle Fork Boise River to the cirque gains 3,000 feet in elevation. The entire jeep road is in poor condition and would require considerable improvement to be usable for ore hauling.

Along the north wall of the cirque are several white quartz veins and lenses, which range from a few inches to more than 17 feet in thickness. Most of these trend roughly north and some form bold outcrops that stand several feet above the surface. Some may be traced on the surface for several hundred feet and through several hundred feet vertically. Most of the quartz is barren of visible ore minerals, but locally the quartz bodies contain disseminations and small pods of sulfide minerals, chiefly pyrite, galena, and sphalerite. In places, the quartz is cut by iron-stained fractures.

FIGURE 13.—Continued

Sample		Assay data			
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)	Lead (percent)	Zinc (percent)
1	50 (on strike)	Tr.	0.5		
2	6 (across vein)	Tr.	0.1		
3	13 (across vein)	Tr.	1.9	0.3	
4	6 (across vein)	Tr.	0.2		
5	26 (across vein)	Tr.	4.9	0.9	
6	1 (select)	Tr.	24.6	4.1	0.9
7	4 (across vein)	Tr.	2.6	.4	
8	8 (across vein)	Tr.	1.8	.3	
9	4 (across vein)	Tr.	3.8	.5	

The largest excavation on the claims and the site of most recent exploration work is a cut at the western side of the property. The benchlike cut is about 14 feet deep and 26 feet wide in a teardrop-shaped body of white quartz on the east side of a diabase dike (fig. 14). The benchlike cut, at sample sites 5, 6, and 1054 (fig. 13, pl. 2), is across the widest part of the quartz body. The body of quartz pinches out about 80 feet to the northeast. On the west side of the dike a similar body of quartz is slightly displaced from the first, but the two appear to have been originally one body. In the cut the quartz is highly fractured and iron stained along the fractures that trend mainly about N. 50° W. Disseminations, pods and small veinlets of sulfide minerals, chiefly pyrite, galena, and sphalerite are scattered throughout the quartz. One mineralized pod had a maximum width of 1 foot and was traced along a length of about 6 feet. Sample 6 across this pod assayed 24.6 ounces of silver per ton, 4.1 percent lead, and 0.9 percent zinc. Chip sample 1054 (table 1) across a 7-foot width of the quartz at the dike contact contained

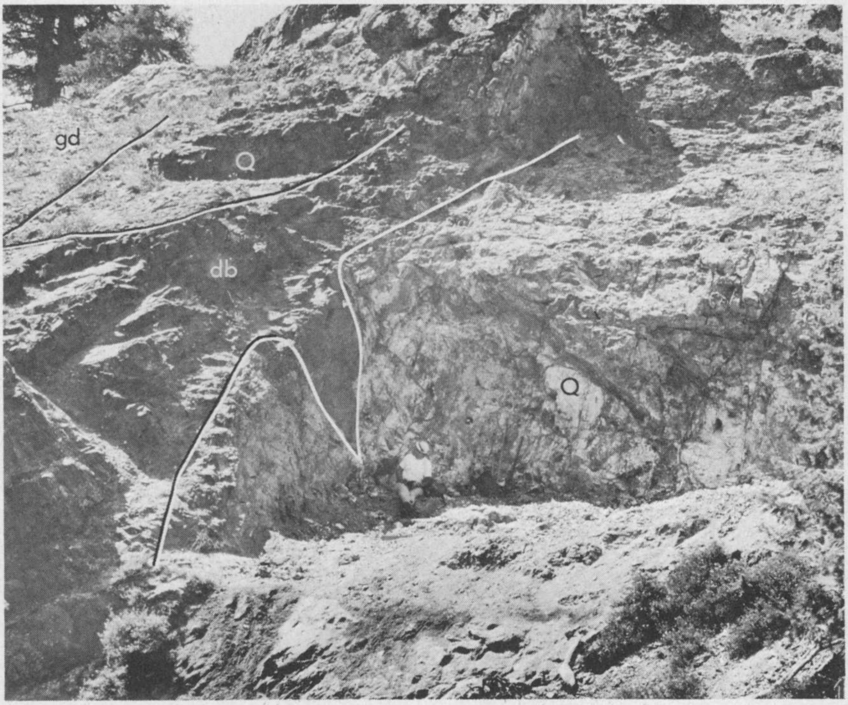


FIGURE 14.—Prospect bench in massive quartz body, Basin claims. A deposit of quartz (Q), in granodiorite (gd) country rock, has been cut by a younger dike of diabase (db).

7.7 ounces of silver per ton, 1.6 percent lead, and 0.4 percent zinc. This sample also contained some bismuth, tin and molybdenum.

The lens-shaped quartz body west of the dike strikes N. 30° E. and dips 12° W. It is 80 feet long and is estimated to be 20 feet thick. A small pit has been excavated at the northeast end of the lens. Chip sample 7 (fig. 13) down the wall of the pit assayed 2.6 ounces silver per ton and 0.4 percent lead.

About 800 feet to the north, a vein of white quartz, similar to others in the area, is exposed. It strikes about N. 60° W., and dips 35° SW. The width varies from 4 to 10 feet. A random chip sample (8, fig. 13) taken across the vein assayed 1.8 ounces silver per ton and 0.3 percent lead.

A quartz lens across the valley to the south trends N. 20° W., is 60 feet long and 30 feet wide, and is exposed in a pit to a depth of 15 feet. A 4–foot chip sample (9, fig. 13) across the face of the pit assayed 3.8 ounces silver per ton and 0.5 percent lead.

About 300 feet east of sample site 5, near the end of a bulldozed road, a 3-foot wide vein of iron-stained white quartz strikes north and dips steeply east. The quartz contains specks of pyrite, galena, and a fine-grained sulfide that may be tetrahedrite. A chip sample (No. 574) taken across a 3–foot width of the vein contained 0.3 ounce of silver per ton, 0.05 percent lead, and 0.04 percent zinc.

About 100 feet farther to the east is a silicifed shear zone about 15 inches wide that also strikes northerly and dips about 65° W. Pods of quartz along the zone are iron stained but no sulfide minerals were seen. A sample (No. 574) contained only trace amounts of metals.

A third quartz vein crops out still farther to the east, near the western end of the upper bulldozed road. This vein is about 10 inches thick and strikes N. 10° W. and dips 80° E. Above the road, the vein is offset about 15 feet to the east by a fault that strikes northwest. Sample 575, taken across the vein, contained only trace amounts of metals.

The most conspicuous quartz vein on the Basin claims is explored by a 15–foot adit, which is immediately above the uppermost bulldozed road (fig. 13) At the portal of the audit the vein is about 17 feet thick, strikes north, and dips steeply east. The vein may be traced north at least 300 feet beyond the crest of the ridge. Near the ridgecrest, the vein is cut by a diabase dike about 5 feet thick. South of the ridgecrest, the massive vein locally stands 6 to 10 feet above the surface. The quartz is iron stained along fractures. Only sparse crystals of pyrite were seen in the quartz. Three samples were taken in the adit. A 6–foot sample (4, fig. 13) of the vein contained 0.2 ounce of silver per ton. Sample 576 taken across a 5–foot width at the face, contained 0.01 ounce gold and 0.9 ounce of silver per ton, 0.2 percent lead, and anomalous amounts of tin and molybdenum. Sample 1055 taken about 3 feet from the face contained a trace of gold and 0.1 ounce silver per ton. A sample (3, fig. 13) taken at the crest of the ridge, where the vein is 13 feet wide, contained 1.9 ounces of silver per ton and 0.3 percent lead.

The easternmost vein, north of the lake, is exposed about 500 feet along strike and more than 200 feet vertically. The vein is as much as 6 feet thick at the outcrop. Samples 1 and 2 (fig. 13) taken from the vein assayed 0.5 and 0.1 ounce of silver per ton, respectively. A third sample (sample site 1057, fig. 13) at the ridgecrest contained 0.3 ounce silver per ton.

Only a small amount of exploration work has been done on the quartz veins of the area; thus, the mineral potential of them is speculative. Based on available information, the quartz veins are estimated to contain 10,000 tons of material that ranges from 2.6 to 24.6 ounces of silver per ton and 0.4 to 0.9 percent lead and more than 100,000 tons of material of about 2 ounces of silver per ton.

PILOT KNOB PROSPECT

The Pilot Knob prospect is at the head of La Moyne Creek. It is reached by jeep road from Atlanta to the mouth of Leggit Creek and from there by trail. Most of the trail follows an abandoned wagon road that was used for transporting equipment to the claims.

The claims were located in 1933 by C. C. Vre Non, and buildings were constructed at the property in 1937. The ruins of a mill building are near the head of La Moyne Creek. According to local reports, no ore was ever processed. It is possible that some high grade ore was carried out by packhorse.

Immediately behind the old mill building is an adit that is 81 feet long. No veins or mineralized material are present in the adit, and no ore was seen on the dump. Sample 1067 (pl. 2) taken from the dump contained no anomalous metal values.

A 98-foot long trench and a caved adit have exposed vein material at two places on the ridge about 0.5 mile southeast from the mill. The trench is 6 to 8 feet wide and is as deep as 7 feet. Most of the trench is caved but near the upper end is an iron-stained quartz vein that strikes N. 80° W. and dips 70° N. A chip sample across the vein contained no gold or silver.

The caved adit presumably was driven to intersect the vein at depth. Most of the dump is barren granodiorite but some is quartz darkened by fine-grained galena, sphalerite, and arsenopyrite. A selected dump sample (1060, pl. 2) contained 24 ppm gold, 7 ppm silver, 300 ppm lead, and 1,500 ppm zinc. There is no indication that any ore was mined from the adit.

Approximately 500 feet southwest of the caved adit, near the crest of the ridge, a vein is exposed in a 25–foot adit driven into the south slope of the ridge and in a 44–foot trench. The vein strikes N. 55° W. and dips vertically. It is exposed intermittently for 15 feet along strike in the trench and to a depth of 26 feet by the adit below. Exposed thickness is 0.5 foot in the adit and 2.3 feet in the trench. It is highly fractured and faulted in the adit and is terminated by faulting near the bottom of the adit face. Surface exposures indicate that the vein pinches out in the cliff to the west; it is covered by overburden to the east. The quartz contains as much as 1 percent of pyrite and galena combined but the average would be less than 0.5 percent. The sulfides occur in cubes as large as one-sixteenth of an inch. A sample from the face of the adit assayed 0.13 ounce of gold per ton and 0.1 ounce silver per ton. A 28–inch chip sample taken across the vein at the west end of the trench assayed 0.12 ounce gold per ton and no silver.

About three-fourths of a mile downstream from the mill, on the east side of La Moyne Creek, is a quartz vein outcrop in granodiorite. The vein is about 3 feet thick, strikes N. 15° E., and dips 75° NW. It may be a northern continuation of one of the veins that crop out near the head of the stream. Chip sample 1062 (pl. 2) taken across the vein contained 50 ppm silver and 300 ppm lead (table 1). Stream-sediment samples 136 and 137 taken near the outcrop did not contain anomalous metal values, but sample 134 taken farther downstream contained 200 ppm zinc.

VRE NON PLACER

The Vre Non placer was located in 1966 by A. B. Vre Non at the junction of Mattingly and La Moyne Creeks. Alluvium that is more than 50 feet thick locally extends for 700 feet along Mattingly Creek and covers an area of 3 to 4 acres along La Moyne Creek.

Workings at the property include two caved test pits and a trench. The main pit is 10 feet in diameter and is caved to within 4 feet of the surface. This pit was reportedly dug to a depth of 27 feet and contained good gold values but was discontinued because of large boulders.

Panned samples from creek gravel and from the main pit contained 1 and 6 cents of gold per cubic yard, respectively.

ROCK CREEK AREA

The Rock Creek area (fig. 7) is near the confluence of Rock Creek and the Middle Fork Boise River, about 15 miles by trail northeast of Atlanta. Most of the workings are on slopes 400 to 1,000 feet above the valley floor.

In the initial discoveries molybdenite was mistaken for lead but when the assays showed no lead the claims were dropped. Mineral specimens later were identified as molybdenite by the U.S. Bureau of Mines for Clarence E. Newell, who then staked eight claims in the area in 1963, consisting of the Lucky and Crooked Tree groups. In the summer of 1967 the claims were leased to J. R. Simplot Co., who later staked about 49 claims in the area and drilled three diamond drill holes. Results of the drilling are not known to the writers.

LUCKY GROUP

The Lucky group of claims is on the densely forested mountainside east of the Middle Fork Boise River. Recent prospecting of these claims has been confined largely to two prospect pits, the lower pit on claim No. 1 and the upper pit on claim No. 2.

The upper pit, shown at sample site 1034 (pl. 2), explores an aplite dike about 5 feet thick that strikes N. 25° W. and dips 80° SW. The dike cuts quartz diorite that contains blue-tinted feldspar. Near the face of the pit, the dike is cut by a fault that strikes N. 20° E. and dips 80° E. Molybdenite is visible in the dike at the pit and in surface float to the southeast, indicating the dike continues in that direction. The lower pit, about 300 feet lower in elevation than the upper pit, exposes similar rock. Mineralized rock also is found in old prospect pits, on the projected trend of the dike, as far as a quarter of a mile northwest of the upper pit. Overburden commonly is several feet deep along the northwest projected trend and outcrops are scarce.

In the upper pit, molybdenite occurs as disseminations and small pods 1 to 2 inches in length in the aplitic dike, although masses up to a foot wide and 2 inches thick have been reported by the claim owner. Molybdenite is also disseminated in the quartz diorite near the dike. Pyrite is scattered throughout the rocks but is oxidized at the surface. The richest concentration of molybdenite is in a 1-foot thickness in the footwall of the fault, where a sample assayed 0.5 percent molybdenum. Sample 1034 (pl. 2) taken across a 5–foot width of the aplite at the pit face contained 0.08 percent molybdenum. A 3–foot thickness of quartz diorite in the footwall of the fault assayed 0.2 percent molybdenum and a 1-foot section in the hanging wall assayed 0.08 percent molybdenum.

An outcrop 75 feet south of the upper pit reportedly contains molybdenite, although none was seen in hand specimens. A random 50–foot chip sample of apparently barren rock south of the pit assayed 0.08 percent molybdenum.

Several hundred feet northwest and lower than the No. 2 pit, on the approximate trend of the aplite dike, is a prospect pit at the base of a cliff of jointed quartz diorite. The pit explores a 14–inch wide quartz vein that strikes N. 60° W. and dips 60° NE., parallel to the jointing. No sulfide minerals were seen in the diorite, but pyrite and fine dark sulfides were seen in the quartz. Sample 1036, taken in diorite near the vein, contained anomalous amounts of lead and zinc. Sample 1037, taken across the quartz vein, contained 70 ppm (0.007 percent) molybdenum.

Three sediment samples (153, 154, and 1033) were collected from streams that drain the Lucky group area. All three samples were anomalous in molybdenum and samples 153 and 1033 were anomalous in lead.

CROOKED TREE GROUP

The Crooked Tree claims are on the steep mountainside between the Middle Fork Boise River and Rock Creek. Talus and overburden cover much of the area.

Granodiorite of the Idaho batholith forms the lower slopes and pink granite of the Sawtooth batholith crops out higher on the mountainside (pl. 1). These rocks are cut by a swarm of northeast-striking dikes, most of which are rhyolite. Dikes of andesite, dacite porphyry, aplite, and pegmatite also are present; these are cut by northwest-striking diabase dikes.

The location pit of the Crooked Tree No. 1 claim is about 600 feet above Rock Creek. The pit is excavated on a quartz vein as much as 3 feet thick that strikes N. 70° E. and dips 20° to 30° NW. The vein is exposed for 82 feet; faults terminate it at both ends and it is cut by an andesite dike. In the vein are disseminations and streaks of pyrite, galena, and molybdenite as much as 3 inches long and one-quarter to one-half an inch thick. A sample taken across a 12-inch thickness of the vein (sample 1028, pl. 2; table 1, "Altered granitic rocks"), on the northwest side of the pit,

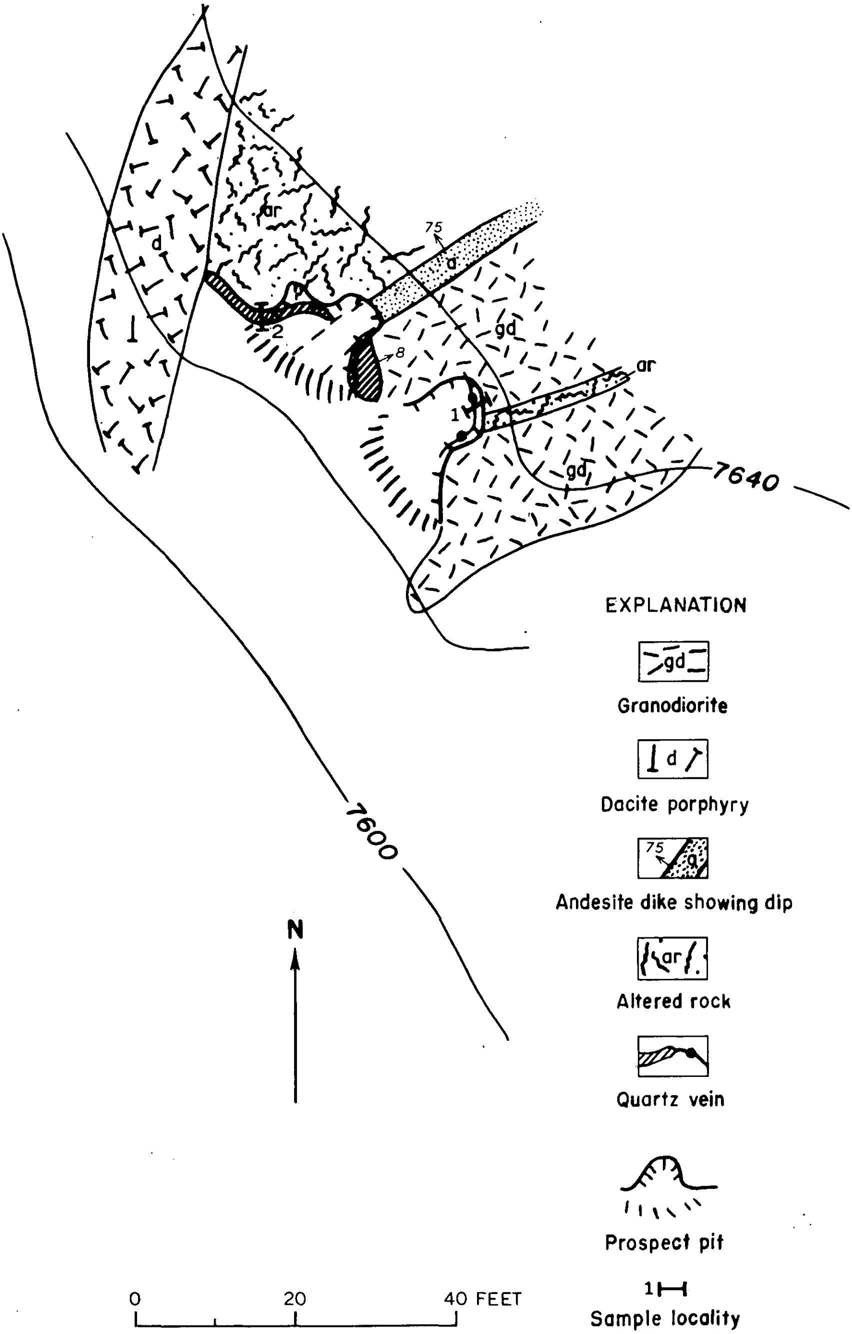


FIGURE 15.—Map of Crooked Tree No. 2 prospect, Rock Creek area. Assay data given in table on facing page.

contained 3.2 ounces of silver per ton, 0.85 percent lead, 0.7 percent molybdenum, and anomalous amounts of bismuth and beryllium. A chip sample taken along a strike length of 20 feet of the vein assayed 0.16 percent molybdenum.

Sample 1026 taken of the nearby andesite dike showed only traces of metals, as did sample 1025 of the granodiorite some distance down the mountain. Sample 1027 of bleached and altered granodiorite near the vein was slightly anomalous in lead and molybdenum.

The location pit for Crooked Tree No. 2 claim is about 500 feet north-northwest and 400 feet higher than the location pit on the No. 1 claim. The pit is in an altered zone that is exposed for a length of about 40 feet; the zone averages about 5 feet in thickness, strikes northwest, and dips 8° to 10° NE. (fig. 15). The zone is predominantly altered rock, quartz, and iron oxides. Sample 1 (fig. 15) taken across the zone, near the east end, assayed 0.52 percent molybdenum, 2.7 ouces of silver per ton, 1.2 percent lead, and a trace of zinc. Sample 2 near the west end assayed 0.46 percent molybdenum, 3.1 ounces of silver per ton, 0.5 percent lead, and a trace of zinc.

A quartz vein occurs 200 feet north of the pit, on the projected trend of the zone across a talus covered gully. The quartz is 2 feet thick and is exposed for about 50 feet. Molybdenite is disseminated through the quartz. A sample taken across the vein and near the slide assayed 0.17 percent molybdenum, 0.8 ounces of silver per ton, and 0.25 percent lead.

In a gulch about 600 feet east of the location pit on Crooked Tree No. 1 and about 100 feet north of a northwest-striking diabase dike that crosses the Middle Fork is a shallow prospect pit in granodiorite. Exposed in the pit are thin veinlets of quartz in which are finely crystalline dark sulfides that cannot be identified by the unaided eye. Sample 1032, taken across the veinlets, contained 0.6 ounces of silver per ton, 0.07 percent lead, and 0.4 percent molybdenum.

FIGURE 15.—Continued

Sample		Assay data			
No.	Length (feet)	Molybdenum (percent)	Silver (oz per ton)	Lead (percent)	Zinc (percent)
1	4	0.52	2.7	1.2	Tr.
2	4	.46	3.1	.5	Tr.

Molybdenum content in sediment samples 153, 154, 155, and 156 from streams draining the Crooked Tree and Lucky claims and nearby area range from 10 to 20 ppm. All samples except 156, which is from the mouth of Billy Creek east of the Crooked Tree group, are anomalous in molybdenum.

UPPER BILLY CREEK

About ½ to 1 mile northeast of the Crooked Tree claims, near the head of Billy Creek, altered and locally mineralized rocks lie within the same northeasterly-trending mineralized zone that has been explored at the Crooked Tree claims.

Sediment samples 1568 and 1570, taken from the head of Billy Creek, are anomalous in lead but not in molybdenum. Sediment samples 1563 and 1564, taken from the stream that drains northwest from the pass at the head of Billy Creek, also are anomalous in lead or citrate soluble heavy metals. Float sample 1562, taken north of the pass from a narrow train of manganese-coated talus fragments, contained a trace of gold and 0.07 percent molybdenum. Disseminations of beryl also were seen in the talus. Beryl and garnet were found in Sawtooth granite in the pass. Altered and iron oxide-stained outcrops were seen at sample sites 1569, 1572, and 1651. Altered rock samples 1569 and 1571 contained traces of gold and molybdenum. Samples 1651 and 1652 were taken in an altered zone in granitic rocks of the Idaho batholith, along a north-east-trending dike. The former sample contained 50 ppm molybdenum; the latter contained 70 ppm molybdenum. Float sample 1572, of quartz darkened by fine-grained sulfides, contained 0.003 ounces gold and 5.8 ounces silver per ton, 0.3 percent lead, more than 1 percent bismuth, and 0.015 percent molybdenum.

LITTLE QUEENS RIVER AREA

The Little Queens area in secs. 7, 8, and 17, T. 6 N., R. 11 E., is along the west boundary of the Sawtooth Primitive Area about 5 miles northwest of Atlanta. Several mineral deposits have been explored and mined at this locality. A good Forest Service road extends about 4 miles from the Middle Fork Boise River to the area.

Mineralized rock was recognized in this area by prospectors in the late 1800's, when several lode and a few placer claims were staked. There are many prospects in the area but the principal property is the Little Queens mine which contains more than 1,000 feet of underground workings and a number of exploration pits.

The mine is reported to have produced gold-silver ore valued at about $10,000.

LITTLE QUEENS MINE

The Little Queens mine is along the Little Queens River near the center of sec. 17, T. 6 N., R. 11 E. Workings consist of surface excavations (fig. 16), a main level with a winze, crosscut, and two raises (fig. 17), and two upper adits. The main level is open but the upper adits are caved at the portals. A bulldozed road extends from a gulley a little less than one-half mile north of the mine to the surface workings. The road also served as access to the upper workings of the mine and was extended to the top of the ridge to provide access for exploring for extensions of the vein. At a few places, the road has exposed weathered rock in shear zones. Minute pyrite cubes usually occur in these zones and in the adjacent unaltered rock. Sample 8 (fig. 16) from one of these altered zones assayed 0.02 ounce gold and 0.2 ounce silver per ton, respectively.

The main adit follows a quartz vein that strikes east and dips 45° to 65° N. (fig. 18). The vein is 14 inches thick at the portal but it thickens eastward to about 40 inches at the entrance to the north crosscut. About 210 feet from the portal, the vein is offset 10 feet to the north by a fault. About 25 feet east of the fault, the vein splits into small stringers each of which range from a fraction of an inch to a few inches in thickness. The adit follows the stringers until it reaches a second fault, 130 feet east of the first fault. The vein was not found east of the second fault.

The south raise, which was driven on the vein to the surface (fig. 18, section *B–B′*), leaves the main adit 155 feet east of the portal. From the same point, a crosscut was driven to the northeast. About 50 feet from the north wall of the main adit, the crosscut intersects an andesite dike 20 feet wide, the attitude of which is nearly parallel to that of the quartz vein in the main adit. A zone of rock several feet thick in the footwall of the dike is highly altered such that identity of the original rock is obscured. A quartz vein is on the hanging wall of the dike. The vein contains fragments of altered granodiorite and of dike rock, disseminated pyrite, and sparse spots of dark sulfide minerals. The vein was followed about 60 feet to the east. Near the end of the drift, the north raise was started on the vein, but most of its 135 feet of length was driven in the dike. The raise stopped near the surface and was reported to be in barren rock all the way. Sample 661 (fig. 18) across a 4–foot interval of altered dike and vein, taken in the

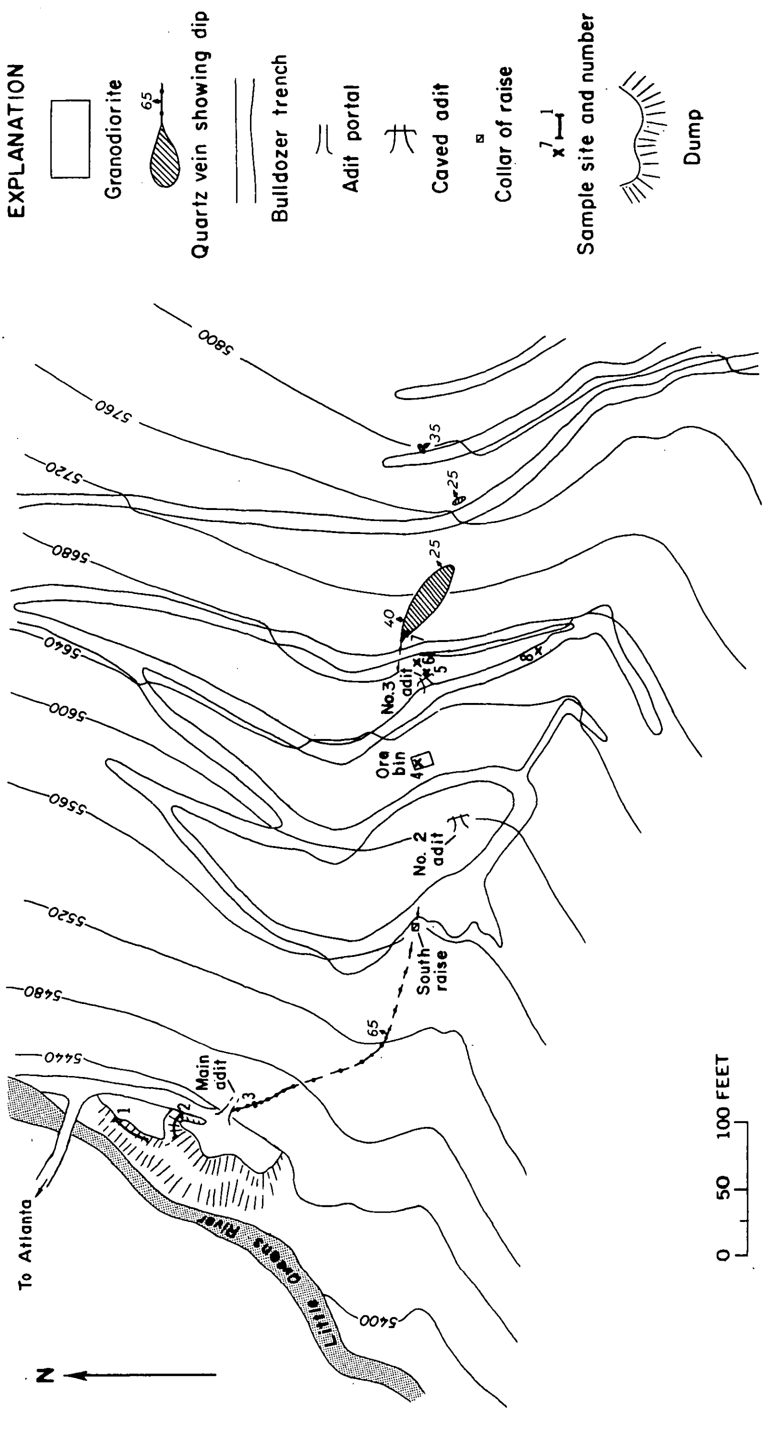


FIGURE 16.—Map of surface workings, Little Queens mine. Assay data given in table on facing page.

drift 8 feet west of the bottom of the raise, contained 0.01 ounce of gold per ton and only traces of other metals.

The vein in the main adit is widest in the interval from the winze to the offsetting fault, where it consists of quartz in which are fragments of granodiorite. Minor streaks of pyrite, galena, and sphalerite occur along fractures and are disseminated in the quartz. Irregular layers of quartz darkened by fine-grained sulfides as thick as 2 inches occur along the footwall and hanging wall of the vein. Near the vein, especially along the footwall, the country rock is highly altered. Two samples taken across the vein (654 and 655, fig. 18 and table 1) contained 0.07 and 0.16 ounce of gold per ton, respectively. A third sample (1, fig. 18) assayed no gold, 1.5 ounces of silver per ton, 1.9 percent lead, and 3.1 percent zinc.

In 1966, mining activity was centered in the winze, which is 55 feet east of the adit portal. The winze was sunk 85 feet, inclined distance. It followed the footwall of the quartz vein. The vein is about 30 inches thick near the collar of the winze, pinches to less than a foot thick 40 feet from the collar, and widens to 4 feet thick at the bottom of the winze. At the time of the examination, a small pocket of ore was being mined from the vein on the west side of the winze, 65 feet below the collar. At this site, the vein contained a high-grade pocket of coarse free gold in white quartz that extended beneath a hanging wall zone of quartz darkened by finely crystalline sulfides. A panned sample of crushed quartz from the pocket contained fragments of gold as much as ⅛ inch in diameter. Sample 668 (fig. 18), taken across an 8-inch thickness of the vein, contained 1.0 ounce of gold and 4.4 ounces of silver per ton. A little more than a ton of ore from the pocket reportedly was valued at more than $8,000 per ton. A dump sample of vein mate-

Sample		Assay data	
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)
1	Grab	0.18	1.8
2	do	.005	-------
3	4	.08	0.5
4	Grab	.06	-------
5	8	.04	-------
6	2	.02	-------
7	Random chip.	.03	.1
8	Grab	.02	.2

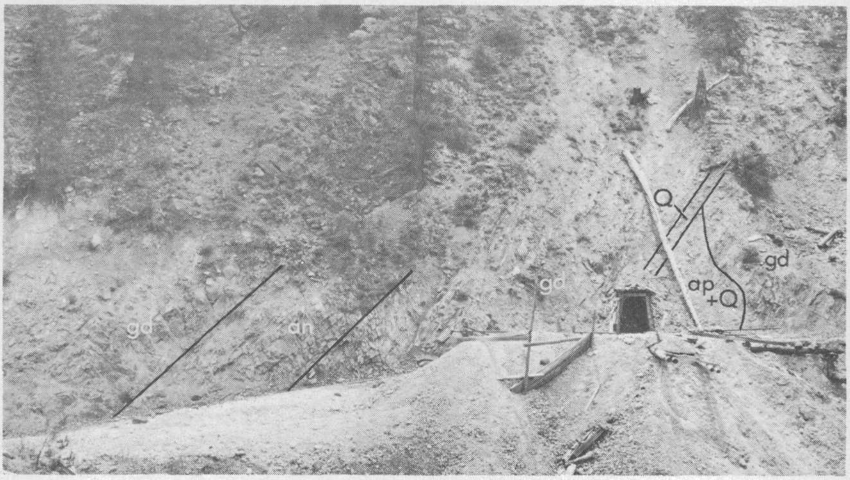


FIGURE 17.—Main adit portal and dump, Little Queens mine. The adit was driven along a quartz vein (Q) in granodiorite (gd) country rock. Aplite (ap) occurs locally. About 60 feet to the left of the portal is an andesite dike (an), which trends more or less parallel to the vein.

rial from the winze (sample 1, fig. 16) assayed 0.18 ounce of gold and 1.8 ounces silver per ton.

In the south raise, the vein is composed predominantly of quartz to an elevation of about 90 feet above the adit, where it grades into aplite (fig. 18, *B–B′*). Several parts of the vein have been stoped. The vein appears to pinch out in stopes west of the raise but it persists with a 3-foot average thickness in the stope to the east. Samples from the south raise and stopes contained from a trace to 0.15 ounce of gold per ton and 0.0 to 11.3 ounces of silver per ton. One contained 0.2 percent lead but none contained zinc. Miners report that about 10 tons of ore containing about 100 ounces of silver and 2 or 3 ounces of gold per ton was mined from the raise.

The No. 2 adit (fig. 16) is about 160 feet above the main adit. The adit is caved, but a company map of the workings is reproduced in figure 18. Scattered lead and zinc mineralization was reported in the vein. A sample of weathered aplite from the dump showed no metal values.

The No. 3 adit, about 210 feet vertically above the main adit, is also caved at the portal and no map or assay results from the adit are available. It was probably driven to explore a quartz lens that crops out about 50 feet to the east (fig. 16). The lens strikes N. 36° W., except at the northwest end where the strike is due west and the dip is 40° N. It is composed of massive white quartz in which are iron oxide-stained fractures. Minute scattered pyrite crystals were observed in one small streak. A 20–foot chip sample (7, fig. 16) across the northwest end of the lens assayed 0.03 ounce gold, and 0.1 ounce of silver per ton.

In a pit above the No. 3 adit is an aplite dike that is approximately on the projected strike of the andesite porphyry dike followed by the north raise (fig. 19). Positive correlation of the two showings is difficult because of faulting in the area. A sample (4, fig. 16) of aplite from an ore bin near the aplite outcrop assayed 0.06 ounce of gold per ton but no silver.

The average grade of the veins and dikes at the Little Queens mine is too low to be minable at present prices. Additional high-grade ore pockets such as those in the winze and south raise may exist in unmined parts of the veins, but the cost of finding them could well exceed their value.

FORD PROSPECT

The Ford prospect is about one-half mile north of the Little Queens mine, approximately 300 feet up the hill to the east from a ford on the Little Queens River road. A bulldozed road extends to the prospect.

The Little Queens Mining Co. explored a mineralized zone at this locality by bulldozing a trench in the summer of 1968. The zone strikes N. 30° W. and dips 30° E. and is well exposed in the bulldozed cut for 120 feet along the strike. It contains altered granodiorite, crushed limonite and manganese-stained masses of quartz and is cut by clayey, slickensided gouge zones. The quartz varies from white to dark gray and contains pyrite in small 1⁄16-inch crystals and in ⅛-inch thick veinlets. Minute pyrite crystals also occur in the weathered granodiorite. A quartz body 20 feet long and 8 feet wide is partly exposed in the floor of the pit. Four samples from the zone, in the floor of the pit, assayed no more than 0.02 ounce of gold per ton, 0.4 ounce of silver per ton, and no lead or zinc. Sample 686 (pl. 2) was taken from the mineralized zone, near its intersection with the road. The sample contained 0.01 ounce gold per ton and 0.6 ounce silver per ton.

No material of minable grade was disclosed at the prospect.

MONEY PROSPECT

The Money prospect is in the SW¼ sec. 8, T. 6 N., R. 11 E., at the end of the Little Queens River road about 1 mile upstream

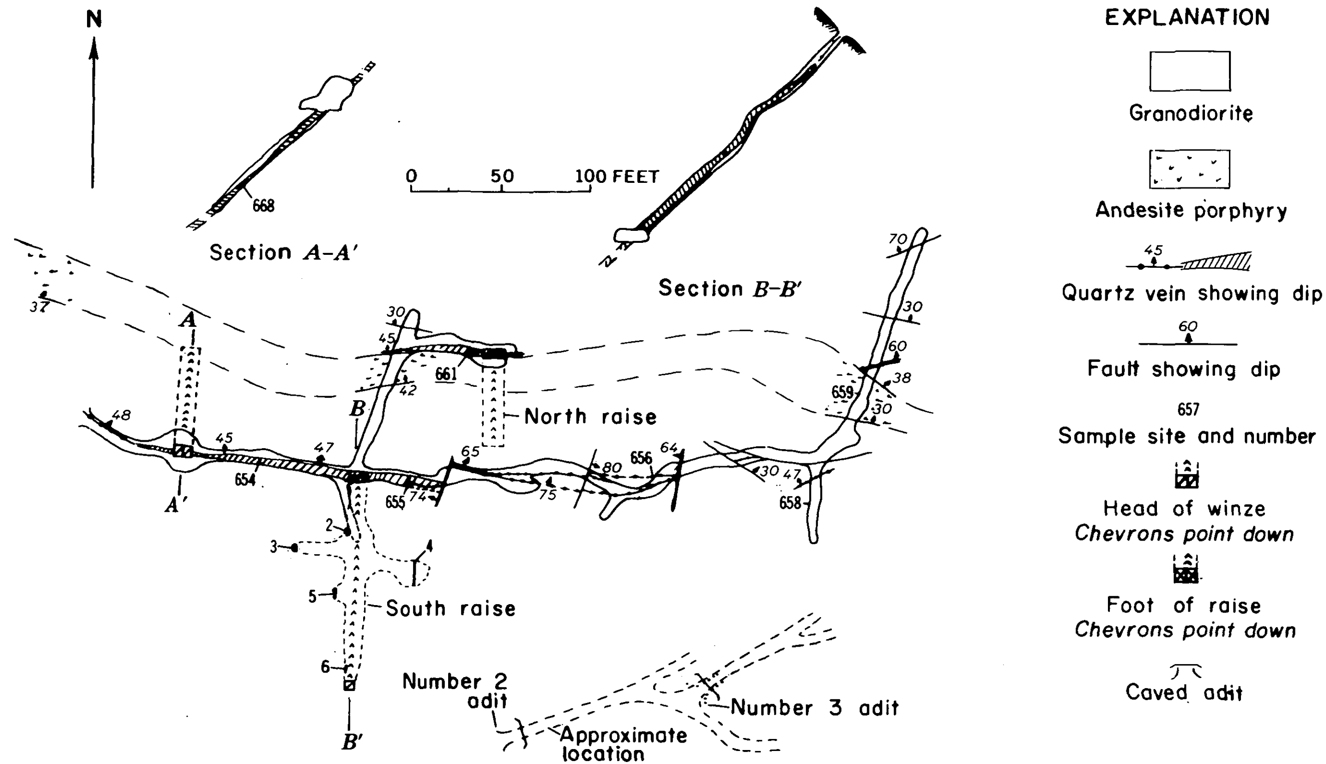


FIGURE 18.—Geologic map of main adit, Little Queens mine. Relative locations of two upper adits are shown approximately. Analytical data on samples 658 and 659 are given in table 1 under "Altered granitic rocks" and "Altered dike rocks," respectively; additional analytical data for samples 654, 656, 661, and 668 are given in table 1 under "Veins." Assay data given in table on facing page.

from the Little Queens mine. The property was developed by the late Mr. Earl Money. Mine development is reported to consist of two adits, two shafts, and one crosscut, all on the west side of the river. Total length of workings was reported in the "50th Annual Report of the Mining Industry, State of Idaho, 1948" as 965 feet. About 200 feet of this is in an adit and winze in the upper workings (fig. 20). The lower adit is caved.

The principal rock type of the area is granitic rock of the Idaho batholith. A number of north-dipping andesite and dacite porphyry dikes cross through the area and float from them mantles the base of the ridge near the lower mine workings.

The upper adit was driven along an andesite dike that is 4 to 6 feet thick. A silicified zone on the hanging wall of the dike contains no visible metallic minerals. Sample 1 (section *A–A′*, fig. 20), taken across the zone assayed only a trace of gold and silver. Along the footwall of the dike is a 6-inch zone of iron oxide-stained gouge, some quartz, and sparse pyrite. A sample across this zone (685, pl. 2 and fig. 20) showed only trace amounts of metals. About 15 feet in from the portal, a winze was sunk on the dike, and about 30 feet farther a short raise has been driven along the footwall of the dike. There is no evidence that ore was mined in either of these workings. A quartz veinlet 1 to 2 inches wide was cut by the adit 32 feet from the face. The vein strikes N. 81° W. and dips 66° NE. It is bounded on both walls by a thin selvage of gouge. A sample from this veinlet (684, fig. 20) contained 0.1 ounce gold and 0.14 ounce of silver per ton.

A partially collapsed mill remains on the property. Principal equipment consists of a three-stamp mill and a small amalgama-

Sample		Assay data			
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)	Lead (percent)	Zinc (percent)
1	1.5	--------	1.5	1.9	3.1
2	2.6	Tr.	--------	--------	--------
3	1.5	.03	Tr.	Tr.	--------
4	20	.05	.10	Tr.	--------
5	2.6	.01	Tr.	--------	--------
6	1.5	.15	11.3	.2	--------
654	2.7	.07			
655	3.0	.16			
656	.25	--------			
661	4.0	.02			
668	.70	1.01			

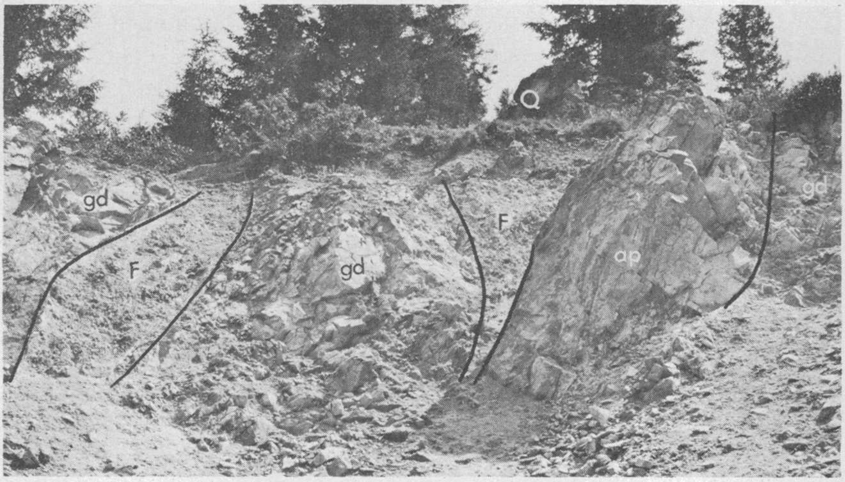


FIGURE 19.—Prospect pit in upper part of Little Queens workings showing typical rocks explored by underground workings. Aplite dike, ap; fault zones, F; quartz, Q; granodiorite, gd.

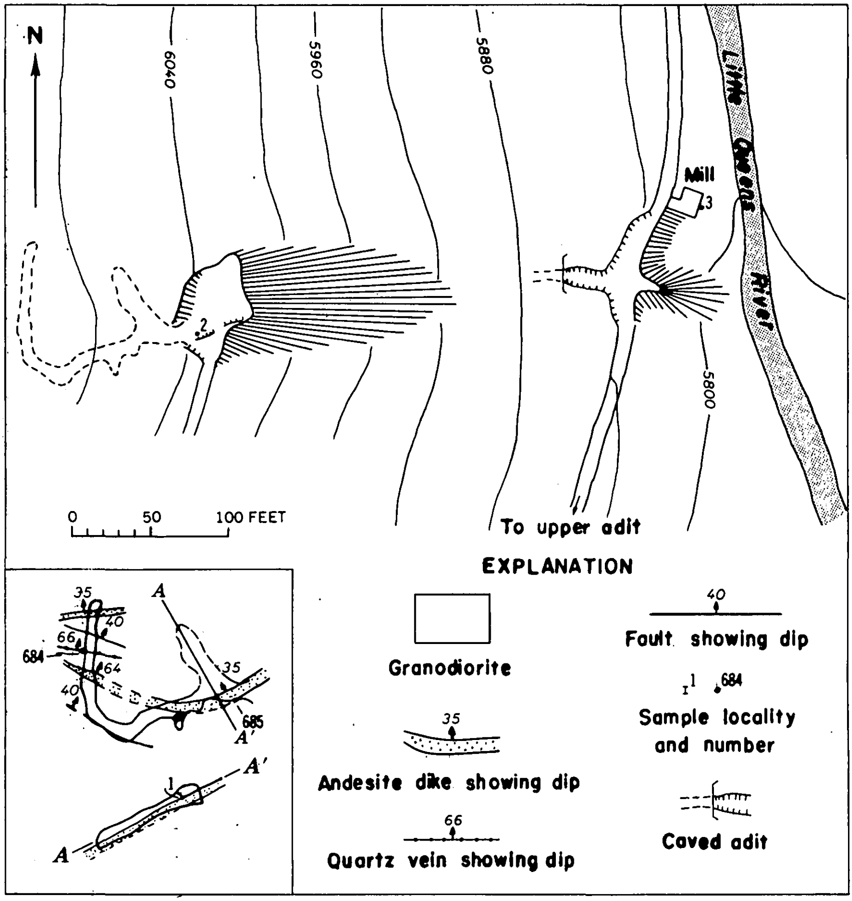
tion tank and table. Local reports state the mill was run on hand-picked high-grade material from other workings in the area. A few hundred pounds of fine particles remains around the table. An assay of this material (sample 3, fig. 20) showed 2.3 ounces of gold and 3.3 ounces of silver per ton.

BARGER GROUP

The Barger group of claims is in SE¼ sec. 8, T. 6 N., R. 11 E. It is about 1.5 miles north of the Little Queens mine and on the same ridge. Access is by road to the Money workings and then by about 0.5 mile by old bulldozed road to the workings.

The country rock is white quartz monzonite. A few small quartz veins and pegmatites are exposed in the roadcuts and iron oxide-stained float can be traced for 1¼ miles along the top of the ridge. This float zone has been explored by bulldozer trenches but no vein was seen in place.

A ridgetop bulldozed road extends about one-fourth mile south to a prospect trench that explores a 0.5- to 1-foot thick quartz vein for a distance of nearly 100 feet (sample site 680, pl. 2). The quartz is fractured and not continuous. The trench extends beyond the quartz to the southeast in a zone of highly weathered granitic rock and ends in a southwest-striking dike of andesite.



Sample		Assay data	
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)
1------	2.5	Tr.	0.1
2------	Grab	Tr.	Tr.
3------	-do-	2.3	3.3
684----	.10	.11	-------
685----	.50	Tr.	.9

FIGURE 20.—Map of the Money prospect, Little Queens River area. Surface map shows locations of mine workings and sample sites; inset shows geologic map and section of upper adit. See table 1, "Veins," for additional analytical data on samples 684 and 685.

A few samples from small pegmatites and quartz veins in this area were analyzed. The only values were in gold and they ranged from nil to 0.2 ounce per ton. Samples of quartz from the trench contained the highest values.

BROWNS CREEK PROSPECT

The Browns Creek prospect is in the SE¼ sec. 7, T. 6 N., R. 11 E., on the west side and near the top of the ridge between Browns Creek and the Little Queens River. The route to the prospect from the Little Queens River road is 0.9 mile up the Browns Creek trail and then east up the ridge to the prospect. The workings consist of three adits, the upper two of which are caved at the portal. A claim notice posted near the dump of the middle adit shows the prospect to be on the Sunset claim, located to 1948 by Harold M. Greenwald, William H. Launhardt, and H. L. Liston.

The northern adit appears to have been quite short and to have intersected a quartz vein that crops out above it. The vein strikes northwest and dips northeast. It trends along the wall of a large dacite porphyry dike. Sample 671 (pl. 2, table 1), across a 30-inch width of the vein, contained 0.02 ounce of gold per ton and 0.04 ounce of silver per ton. No evidence of ore minerals was seen on the dump.

The middle adit is about 200 feet southeast of the northern one. This adit explored a body of quartz exposed above the portal of the adit. The quartz body is at the contact between granodiorite and a dacite porphyry dike. An andesite dike intrudes the dacite porphyry at the west edge of the quartz. The quartz body is irregular in shape and is intermixed with aplite above the adit but grades to massive white quartz southeast along the contact. A small stockpile on the dump contains weathered, limonite-stained vein material in which are pyrite casts. A sample of weathered vein material from above the portal of the adit assayed 0.01 ounce gold and 0.7 ounce silver per ton. A sample from the dump assayed 0.04 ounce of gold per ton and 2.7 ounces of silver per ton. An 18-inch sample (672, pl. 2) taken across the vein, above the adit, contained 0.01 ounce of gold per ton and 0.2 ounce of silver per ton.

About 400 feet south of the middle adit is a third and lower adit that has been driven about 80 feet in a massive andesite dike. No mineralized material was seen in the adit.

Stream-sediment samples from tributaries along the western side of Browns Creek were not anomalous, nor were samples from the middle reach of the creek. Samples 665 and 666, from the headwaters of Browns Creek, were anomalous in zinc and sample 666 was anomalous in lead. The anomalous metal in the samples may have come from a strongly altered area that croses the ridge to the west, north of East Warrior Peak. This altered area is above the prospect workings of the Overlook mine. It was seen from a distance but not sampled.

MONEY QUARTZ PROSPECT

Near the junction of Neinmeyer Creek and the Little Queens River, NE$\frac{1}{4}$ sec. 28, T. 7 N., R. 11 E., on the west side of the river is the remnants of an old cabin, reported to have been built on a placer claim by Mr. Earl Money. Northeast from the cabin, about 200 feet vertically above the east bank of the river, is a sloughed prospect pit, about 20 feet long, that explores a massive white quartz vein from 8 to 10 feet thick. The vein strikes N. 45° E. and dips 65° NW. It is visible up the mountainside for at least 400 feet. Along the hanging wall of the vein, the enclosing white quartz monzonite country rock is stained red by iron oxides, as are a few discontinuous fractures in the quartz. Three samples were taken across the vein (1116, 1117, and 1118, pl. 2). The best sample contained 0.003 ounce of gold per ton, 0.03 ounce of silver per ton, and 0.12 percent lead. The three samples contained more mercury than normal for veins in the area, although they were all far below ore grade.

Mr. Money is reported to have produced some high-grade gold ore from this vicinity, which he packed out on horseback. Presumably, this material could have come from the above-described prospect pit, as no other workings were found in the area. The samples, however, and appearance of the quartz, suggest that further exploration of the vein would be unprofitable.

CHINA BASIN

An extensive deposit of Tertiary (?) gravel caps the ridge between the Queens River and the Middle Fork Boise River northwest of Atlanta. The western part of the deposit, in the vicinity of China Basin, has been placer mined for gold. The work reportedly was done by Chinese miners during the early days of placer mining in the Atlanta district. Large piles of placer tailings are present in some gulches, but there are no records of gold production. Panned samples 197, 198, 199, 200 and 202 (pl. 2) were taken at different localities in the deposit but none of them contained detectable quantites of gold. Placer gold, if present in the deposit, is probably minable only where erosion along tributary streams has removed large volumes of gravel and reconcentrated the gold. The yardage of such reworked gravel along those steeply flowing streams is small, and the potential for placer gold is nil.

BLACK WARRIOR CREEK AREA

The Black Warrior Creek area comprises a 3-mile section of the valley and ridges along Black Warrior Creek (fig. 21).

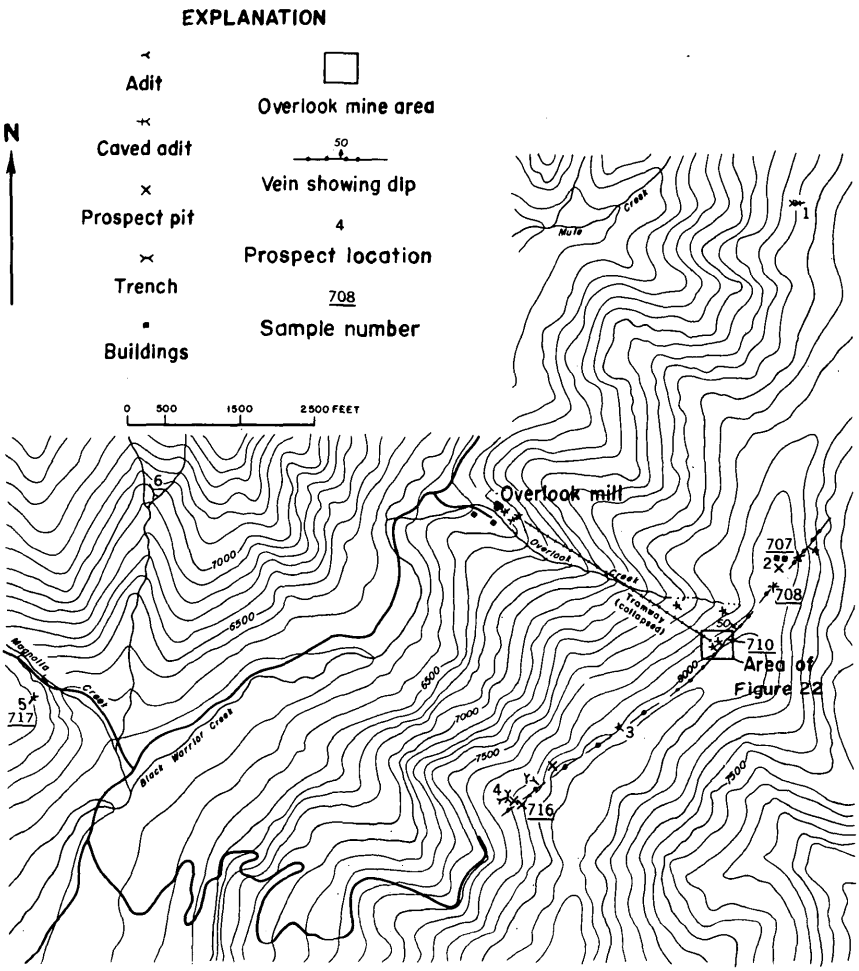
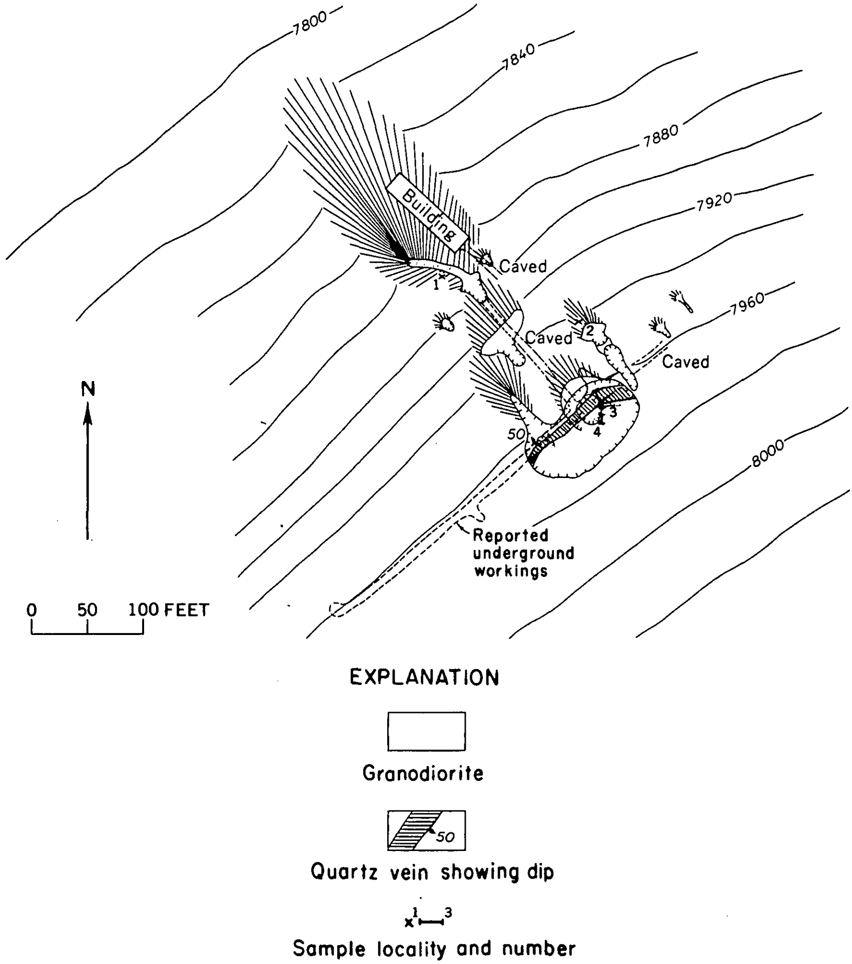


FIGURE 21.—Mines and prospects in upper part of the Black Warrior Creek area. Numbers 1 through 6 indicate locations described in text. Analytical data on samples (underlined numbers) are given in table 1 under "Veins."



Sample		Assay data	
No.	Length (feet)	Gold (ounce per ton)	Silver (ounce per ton)
1	Grab	0.16	0.1
2	Grab	.01	.1
3	15	.01	.1
4	5	Tr.	Tr.

FIGURE 22.—Map of main workings, Overlook mine, Black Warrior Creek area.

Access from the Middle Fork Boise River road is by a 7-mile jeep road up Black Warrior Creek. The principal workings include the Overlook mine (fig. 22) and excavations on Mule Creek and on Magnolia Creek (fig. 21).

Prospecting began in the Black Warrior Creek area shortly after the turn of the century when some rich ore was found in the vicinity of what is now the Overlook mine. A number of small deposits were exploited by 1914, typically on small amounts of rich ore in quartz veins and shear zones. Several arrastres are reported to have been built at various localities, and a three-stamp water driven mill was constructed at the junction of Wilson and Black Warrior Creeks (sample site 221, pl. 2). A 10-stamp mill was installed on Overlook Creek, a tributary of Black Warrior Creek, and a mile long aerial tramway was constructed to transport ore from the Overlook mine to the mill. As far as may be determined, the area has produced gold-silver ore valued at about $40,000; most of it was from the Overlook mine.

FIGURE 23.—Aerial view of the Overlook mine. The Montezuma fault extends along the front of the sharply-rising Sawtooth Range in the background.

OVERLOOK MINE

The Overlook mine is in sec. 32, T. 7 N., R. 11 E., on the ridge between Black Warrior Creek and Little Queens River (fig. 23). Remnants of mill buildings near Black Warrior Creek are accessible from the North Fork Boise River road by traveling 8.5 miles northward on the Black Warrior Creek road. Old abandoned trails lead east from the mill to the main mine workings near the crest of the ridge. In 1966, a rough road was being bulldozed from the Black Warrior Creek road, 1.2 miles southwest of the mill and east up the mountain slope (fig. 21). It stopped short of some old prospect pits that explore what may be the southwest extension of the Overlook vein. Both this road and the Black Warrior Creek road would need extensive repair to be used for haulage.

The main mine working on the Overlook vein is an open pit near the crest of the ridge. The pit is 110 feet long, 50 feet wide, and averages about 25 feet in depth. Three adits have been driven beneath the pit to explore the vein (fig. 22). Adits and trenches have been excavated near the ridgecrest for about one-half mile southwest and one-half mile northeast along the projected strike of the vein exposed in the main pit. Other adits have been driven between the mill and the pit. According to Weed (1925), there were 4,000 feet of underground workings at the mine in 1924.

Ballard (1928) reports that rich, free milling gold ore was mined from the main pit in the early days of operation. Slumping at the ends of the pit (fig. 22) probably is the result of the underground stoping.

The Overlook mine has been developed on a strong vein that strikes N. 40° E., dips about 50° NW, and may be traced discontinuously at the outcrop for more than a mile (fig. 21). The vein is principally massive quartz but parts contain stringers of aplite and altered granodiorite. The quartz is fractured, slightly limonite-stained, and contains cavities as long as 1 inch, some of which are lined with limonite or contain small pyrite cubes. Pyrite also occurs in small streaks in the quartz. A 10–foot thick section of altered granodiorite on the footwall side of the vein also contains scattered minute cubes of pyrite. Along the footwall is a 1–inch stringer of clear vitreous quartz, locally darkened by sulfide minerals too small to be recognized by the unaided eye. Five samples were taken near the open pit. Four of the sampled sites are shown in figure 22. Samples 1 and 2 were dump samples, sample 3 was taken across the vein and sample 4 was taken in the footwall of the vein. One sample (710, fig. 21 and pl. 2), taken across a 4–foot thickness of the vein at the north end of the pit, contained 0.03 ounce of silver per ton and 0.03 percent lead.

The main adit, which is caved at the portal (fig, 22), was driven to explore the vein at a point 100 feet below the open pit. The drift was locally reported to extend 335 feet south along the strike of the vein and for an unknown distance to the north. According to Ballard (1928, p. 38) the vein in this adit and in a small one just north of the pit was 25 to 30 feet thick but was much diminished in grade. The extent and grade of the oreshoots is not known.

Another adit, now caved, was driven into the ridge at the tramhouse. It is said to have intersected the vein and to have followed it north for 400 feet. The character of the vein in this adit is not known.

The 300 level adit is about 600 feet north of the main workings, and the 700 level adit is about 1,000 feet down the slope northwest of the main workings (fig. 21). Both adits were driven to intersect the vein and both are now caved. The 300 level is reported to be more than 400 feet long, and the 700 level is on the order of 1,500 feet long. According to Ballard (1928, p. 38) the results of work of these levels was "exceedingly discouraging," although A. E. Borden (written commun., 1914) stated that the vein structure was about 60 feet thick on the 700 level. The rock on both dumps is granodiorite, although some dark mafic dike material was seen on the 700 level dump. A few pieces of granodiorite contain fractures stained with limonite and hematite, but no mineralized material was observed on the dumps, which indicates that the vein was not intersected.

Several adits and a number of trenches have been excavated to explore for possible extensions of the vein to the northeast and to the southeast. Northeast from the main open pit, the vein crosses the ridgecrest near some old cabins (fig. 21, loc. 2). Near this site, two samples (707 and 708, pl. 2) were taken from prospect pits across 1–foot widths of the vein. Sample 707 contained 0.02 ounce gold per ton and 0.01 ounce per ton silver; sample 708 contained 0.01 ounce per ton gold and 0.03 ounce per ton silver. About one-fourth mile southwest of the main pit, a small amount of iron oxide-stained quartz was stockpiled on the dump of a caved adit (fig. 21, loc. 3). A sample of this quartz assayed 0.10 ounce silver per ton but contained no gold. About one-quarter mile farther to the southwest (fig. 21, loc. 4), a sample (716, fig. 21) of quartz from a vein cut in a prospect pit contained 0.5 ounce gold per ton, 0.15 ounce silver per ton, and 0.03 percent lead. This vein is believed to be a continuation of the Overlook vein. Another sample from a small stockpile at a hand-dug trench at this locality assayed 0.02 ounce of gold per ton and a trace of silver.

The Overlook millsite area contains three adits (fig. 21). Ballard (1928, p. 38) notes that the adit nearest the mill was reported to have been advanced on a 3-foot vein that contained free milling gold. The dump of this adit is mostly limonite stained granodiorite, in which are scatterd grains of pyrite. A sample of this rock assayed 0.01 ounce of gold and 0.10 ounce of silver per ton.

In 1925, the two adits (fig. 21) about 250 feet east of the Overlook mill had been driven about 200 feet, including a 10-foot drift on a gouge-filled fissure (Ballard, 1928, p. 38). An opening above the portal of the lower of the two adits was accessible in 1968. A fissure vein about 2 feet wide is exposed on the surface above the opening. The vein strikes NE and dips 70° SE. A sample taken along a 12-foot length of the vein zone, above the upper adit, assayed 0.01 ounce of gold per ton and 0.10 ounce of silver per ton. A 2-foot sample, taken across the vein above the lower adit, assayed trace gold and 0.10 ounce silver per ton.

The amount of ore produced from the mine is not known because of a lack of records. High-grade oxidized ore is said to have been mined from ore shoots in the vein, but the size and grades of these are unknown. The 10-stamp mill apparently was operated for only a short time. Remains of the mill are in a partially collapsed building. According to Gerry (1917, p. 543) the largest output from the mine was in 1915, when $15,021 in gold values and 252 ounces of silver was produced from 1,310 tons of ore. Production from the area was reported as late as 1931. About 15 tons of material remain in cyanide tanks at the mill and about the same tonnage remins nearby from an earlier amalgamation process.

Samples taken from vein outcrops and from dumps indicate the vein material is submarginal and could not be mined economically at present.

MULE CREEK PROSPECTS

Two prospects on Mule Creek are in sec. 29, T. 7 N., R. 11 E., (fig. 21, loc. 1). The southern prospect is about a mile north of the Overlook mine and about 300 feet lower than the crest of the ridge east of Black Warrior Creek. Two adits driven eastward into the ridge are caved at the portal but the dumps indicate that the adits total approximately 100 feet in length. No vein material is exposed on the surface nor on the dump of the lower adit, where only iron-stained granodiorite is to be seen. At the upper adit about 3 tons of vein material has been stockpiled and about 20 tons of material is in an old crib. Stockpiled quartz contains small limonite- and quartz-lined vugs. Some pyrite is present but most has been oxidized to limonite. A sample from the stockpile assayed 0.04 ounce gold and 0.20 ounce of silver per ton. A sample from the crib assayed 0.66 ounce of gold and 0.40 ounce of silver per ton.

The northern prospect is high on the ridge separating the two northern forks of Mule Creek (sample site 711, pl. 2). An adit, now caved at the portal, was driven N. 10° E. into the hillside, presumably to intersect a vein explored by a small prospect pit about 60 feet above the adit. A narrow diabase dike strikes east-west in the pit and a quartz vein follows the north wall of the dike. The pit is badly sloughed and the vein is not well exposed. Chips of quartz from the vein contained 0.17 ounce of gold and 0.9 ounce of silver per ton, and 0.07 percent lead (sample 711, table 1). There is no evidence that ore ever was produced from the prospect.

MAGNOLIA CREEK PROSPECT

The Magnolia Creek prospect (fig. 21, loc. 5; pl. 2, sample site 717) is in sec. 35, T. 7 N., R. 10 E., on a north-facing slope about 300 feet about Magnolia Creek, and is about half a mile from Black Warrior Creek.

The prospect was held by R. I. Shaffer, Boise, Idaho, in 1968, but it had been worked before he acquired it. Gold ore valued at $70 to $80 per ton reportedly was mined from the prospect and treated at a three-stamp mill at the mouth of Wilson Creek. Remnants of the mill could still be seen in 1968.

The principal mine working consists of a trench that has been dug across the crest of a small ridge along an aplite dike that cuts altered granodiorite. The trench was sloughed but was estimated to be about 15 feet deep. The dike may be traced for about 60 feet. A sample of the dike assayed 0.36 ounce of gold and 3.6 ounces of silver per ton. A sample (717, table 1) of altered, iron-stained granodiorite and vuggy quartz taken from a small stockpile on the dump of the trench contained 2.3 ounces of gold and 0.15 ounce of silver per ton.

NORTH BRANCH MAGNOLIA CREEK PROSPECT

Near the fork of the North Branch Magnolia Creek, sec. 35, T. 7 N., R. 10 E., an adit has been driven 110 feet in granodiorite (fig. 21, loc. 6). No mineralized rock is exposed in the adit or on the dump.

JOHNSON CREEK AREA

The Johnson Creek area includes prospects in the headwaters of Grouse Creek, on the ridge between Grouse and Johnson Creeks, near Bayhorse Pass, on Johnson Creek near the confluence of Grouse Creek, and on the north side of Johnson Creek east of Bayhorse Pass (pl. 2). The route to the area from Boise is 65 miles northeastward on U.S. Highway 20, 25 miles eastward on graveled road to the junction of the North Fork Boise River and Silver Creek, and 4 miles by trail. The graveled road is free of snow from July to October.

Relief in the area is about 800 feet. Most slopes are covered with scattered fir and pine; relatively small areas are covered with sagebrush and grass. Overburden obscures most of the bedrock, however, outcrops are present on steep slopes and on ridgecrests. A road could be constructed to the prospects with a small amount of blasting. Sufficient water for mining is readily available to most prospects.

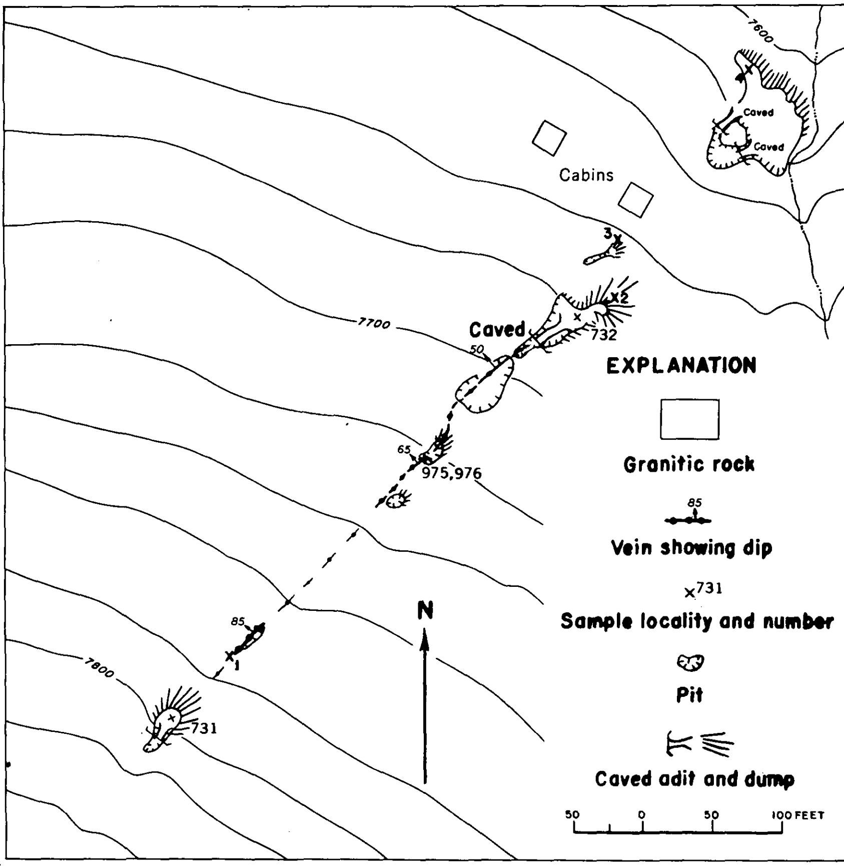
Granodiorite of the Idaho batholith underlies most of the area. North of Bayhorse divide and in the upper part of Grouse Creek, the country rock is principally leucocratic quartz monzonite. The Montezuma fault trends northwest through the area and cuts all of the rocks. Most of the prospects are near the fault.

A number of anomalous stream-sediment samples were taken from the Johnson Creek area. Most of these were from streams that drain mineralized localities near the Montezuma fault.

All of the prospects in the area are within a mile of the primitive area boundary and some are immediately west of and outside the primitive area. A few of the prospects contain submarginal material. Analyses from persistent and from scattered veins indicate a possibility for discovery of minable deposits.

UPPER GROUSE CREEK PROPERTY

The most developed mine workings in the upper Grouse Creek area are on the south side of the stream, sec. 17, T. 7 N., R. 11 E. (sample site 732, pl. 2), west of the primitive area. The workings consist of caved adits, trenches and pits extending along a vein zone for at least 1,000 feet and over a relief of at least 200 feet (fig. 24). The two principal adits, both caved at or near the portal are probably each about 200 feet long. Two log cabins, above the portals of the lower adits, are in poor condition.



Sample		Assay data	
No.	Type	Gold (oz per ton)	Silver (oz per ton)
1	Grab	0.79	0.9
2	Grab	0.11	0.9
3	Grab	0.15	0.3
4	Grab	0.14	0.5

FIGURE 24.—Map of upper Grouse Creek workings, Johnson Creek area. See table 1, "Veins," for analytical data on samples 731, 732, 975, and 976.

The adit about 30 feet south of the cabins was driven on a vein that strikes northeast and dips 45° to 85° NW. Because of the gentle slope of the hill, the adit was driven only a few feet below the surface and is now caved. About 120 feet from the portal, on the northeast side of what appears to be the top of a sloughed raise from the adit, the vein zone is about 4 feet wide. It consists of 2 to 4 inches of footwall gouge, above which is about 3 feet of altered leucocratic quartz monzonite in which all of the feldspars have been altered to clay. Above the altered interval is 10 inches of iron-stained quartz. Sample 975 taken across the 10-inch quartz vein (fig. 24) contained 0.8 ounce gold, 0.4 ounce silver, and a trace of lead and zinc. Sample 976 was taken across a 2-foot thickness of the altered footwall part of the vein. It contained only trace amounts of metal. On the dump of the adit are many iron-stained pieces of quartz from the vein. The quartz is vuggy and contains visible galena and sphalerite. Sample 732, of selected pieces of the dump material, contained 3.5 ounces of gold per ton, 4.4 ounces of silver per ton, more than 2 percent lead, and 0.15 percent zinc. Other samples of oxidized rock (fig. 24) assayed from 0.11 to 0.79 ounce gold per ton and from 0.3 to 0.9 ounce silver per ton.

Prospect pits along the trace of the vein indicate that it continues at least 1,000 feet to the southwest and at least 300 feet higher in elevation than the lower adits. About 500 feet southwest of the cabins a caved adit appears to have been driven on the vein. A sample of quartz from the dump of the adit (731, fig. 24) contained 0.6 ounce gold per ton, 1.5 ounces silver per ton, 0.1 percent lead and a trace of zinc. A possible extension of the vein was prospected by trenches about 500 feet farther to the southwest, on top of the ridge separating the north and south forks of Grouse Creek. The trenches are sloughed and no vein was seen in the highly altered granodiorite country rock. Small fragments of vein quartz were found on the dump. A sample (703, pl. 2) of the quartz fragments contained only trace amounts of gold and silver. A second sample of dump material from the trenches assayed 0.66 ounce gold per ton and 0.90 ounce silver per ton.

The vein is persistent and assays of vein material are encouraging. Further exploration could reveal ore bodies of commercial value.

GROUSE CREEK-BLACK WARRIOR CREEK RIDGE

Several prospect pits are located along the crest of the ridge between Black Warrior and Grouse Creeks. The Montezuma fault crosses this ridge west of the trail that connects the two creeks, and rocks in the vicinity of the fault are badly broken and crushed. No vein outcrops were seen on the ridge, but a grab sample of iron-stained quartz and altered rock from a pit about 8 feet in diameter and 3 feet deep, about 600 feet southwest of the trail, assayed 7.6 ounces of silver per ton. A second sample (738, pl. 2) of iron-stained, vuggy quartz from the pit contained 20 ounces of silver per ton. Samples from two pits 1,000 and 1,400 feet northeast of the trail did not contain any metal values.

Prospect pits also are scattered along the north side of the ridge, in the vicinity of the trail that descends into Grouse Creek. A pit at sample site 977 (pl. 2) is about 30 feet long, 7 feet wide, and 4 feet deep. It was driven along the side of a diabase dike, which is 2 feet wide and strikes N. 30° E. Altered and iron oxide-stained granodiorite is present in the pit, as are bunches of quartz, but no continuous vein was seen. Sample 977 (table 1), taken from quartz fragments on the dump, contained 1.2 ounces of gold per ton, 0.9 ounce of silver per ton, 0.2 percent lead, and 0.1 percent zinc. A check sample (1119, table 1), taken from the same dump, contained only trace quantities of gold and silver.

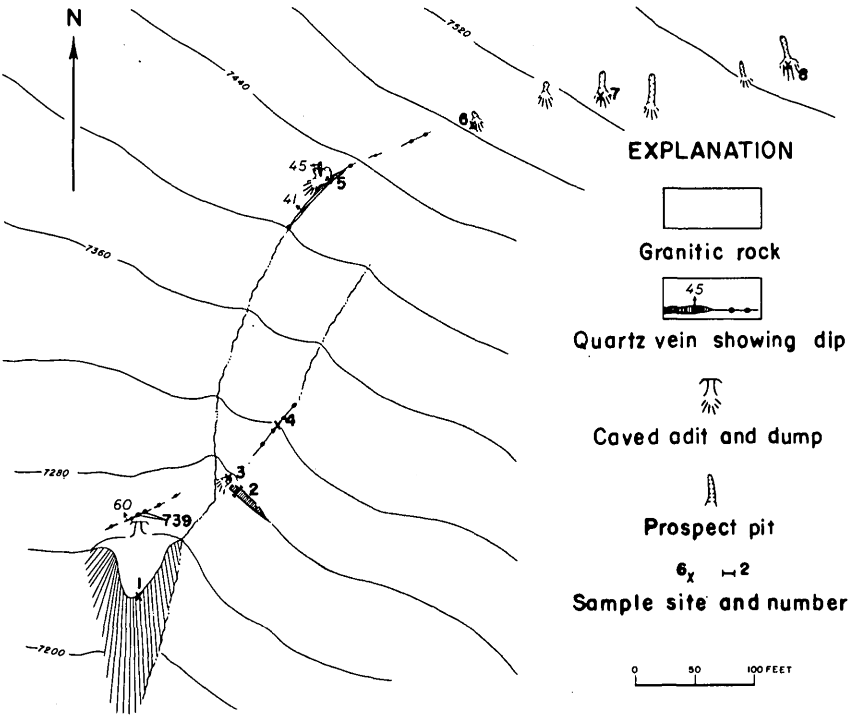
Farther north, on the ridge between Grouse Creek and Cahhah Creeks, are more prospect pits. Sample 249 (pl. 2), from a quartz-rich dike that strikes N. 70° E., contained a trace of gold and silver. A few hundred feet to the east are two shallow trenches that explore a narrow quartz vein that strikes N. 38° E. and dips 65 SE. along the side of an andesite dike about 15 feet wide. The country rock is altered granitic rock. Sample 978 (pl. 2), taken from the quartz vein, showed no metal values.

CORDER GROUP

The Corder group of claims are along the north rim of the Grouse Creek drainage basin in sec. 9, T. 7 N., R. 11 E. and sec. 8, T. 7 N., R. 11 E. The claims extend for more than a mile in an east-west direction and include much of the south face of the ridge between Grouse and Johnson Creeks. This area has been claimed several times by different persons. The latest claims were located by C. C. Corder, August 17, 1967.

The main vein is intermittently exposed for about 700 feet northeast from the main adit, which is caved at the portal but is probably about 100 feet long (fig. 25). Several sloughed pits which explore the vein have mineralized material on the dumps. The pits indicate that the vein or intermittent quartz lenses extend across the ridge to the northeast. The vein could not be traced to the southwest. Other veins crop out near the main vein.

The main vein is exposed just above the adit. It strikes N. 70° E., dips 60° NW., and is composed of several quartz veinlets that aggregate 2 feet in thickness. The granitic country rock is altered



Sample		Assay data	
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)
1------	Dump	Tr.	0.2
2------	11	Tr.	1.5
3------	2.5	Tr.	6.1
4------	1.5	-------	0.5
5------	4.0	Tr.	7.4
6------	Dump	Tr.	23.5
7------	do-------	Tr.	15.8
8------	do--------------		3.3

FIGURE 25.—Map of Corder group workings, Johnson Creek area. See table 1, "Veins," for analytical data on sample 739.

and quite siliceous. A 2-foot sample across the vein (739, fig. 25 and pl. 2) contained a trace of gold, 9.9 ounces of silver per ton, minor amounts of copper, lead and bismuth, and 0.01 percent molybdenum. Sample 1 (fig. 25) of dump dock assayed a trace of gold and 0.2 ounce of silver per ton.

The largest outcrop of the vein is 260 feet northeast of the adit. It is about 75 feet long and 3 to 4 feet thick. Sample 5 (fig. 25) of the vein assayed a trace of gold and 7.4 ounces of silver per ton. The quartz is highly limonite and hematite stained. The dumps of pits northeast of the largest outcrop contain malachite-stained rock. Samples 6, 7 and 8 (fig. 25) of vein material assayed 3.3 to 23.5 ounces of silver per ton but not more than a trace of gold.

Another lens of quartz in altered granitic rock is exposed about 75 feet east of the caved adit. The lens strikes N. 40° W. and dips vertically. Pyrite casts are present in the quartz and in adjacent altered country rock. The structure can be traced for 50 feet but pinches out at both ends. Chip sample 3 (fig. 25) taken across the most siliceous part of the rock assayed a trace of gold and 6.1 ounces of silver per ton.

Still another quartz stringer is 100 feet northeast of the adit. This stringer is a maximum of 1.5 feet thick and roughly parallels the main vein. Sample 4 (fig. 25) taken across the stringer assayed no gold and 0.5 ounce of silver per ton.

The crest of the ridge on the projected east trend of the main vein is capped by iron-stained granitic rock. The area of stained rock is 100 feet wide and extends 200 feet down the south slope. A random grab sample taken across the zone assayed no gold or silver. A select sample taken across the zone assayed no gold and 3.2 ounces of silver per ton.

On the north slope of the ridge and north of the stained zone, a pit explores a highly fractured quartz vein. Considerable limonite and hematite occur along fractures. The vein strikes N. 20° W. and dips steeply to the east. Float indicates that the vein may extend 120 feet to the northwest. The vein appears to pinch out to the southeast. A 6-foot chip sample taken across the pit assayed no gold and 0.04 ounce of silver per ton.

Other workings in this group of claims are approximately 1.5 miles to the west. They include a caved pit about 150 feet above the trail on the south side of the ridge and a pit and caved adit near the trail on the north side of the nose of the ridge. The pit on the south side of the ridge is a small excavation in leucocratic quartz monzonite. No veins or mineralized rock are present. Iron oxide-stained rock, however, occurs a short distance above the pit and may have been the object of the prospecting. A sample of the stained rock above the pit (740, pl. 2) contained 0.3 ounce of silver per ton.

The location notice of Corder No. 1 claim is near the pit on the north side of the ridge. An iron oxide-stained andesite dike is exposed in the pit. A random chip sample from the dike assayed a trace of gold and 2.6 ounces of silver per ton.

About 100 feet north of the crest of the ridge separating Grouse Creek from Johnson Creek, in NW¼ sec. 12, T. 7 N., R. 10 E., is an adit that was driven S. 40° E. into the hillside. It is caved at the portal, but judging from the dump, it is about 100 feet long and it followed a rhyolite dike. Also on the dump are large pieces of iron- and manganese-stained vuggy quartz from a vein that probably follows along the dike. Two samples were taken of the mineralized material on the dump. Sample 980 (pl. 2) contained 1.3 ounces of silver and 0.01 percent copper. A second sample assayed 2.2 ounces of silver per ton. Sample 741 (pl. 2), a piece of iron-stained quartz float in which were specks of chalcopyrite and galena, was taken from near the trail lower on the ridge. It may have come from the vein explored by the adit at sample site 980. The float sample contained trace amounts of silver, copper, lead, tin, and molybdenum. Sediment sample 981 (pl. 2), taken from a stream that drains the hillside on which the adit and float sample were taken, was anomalous in silver and lead content. This metal content probably came from the vein or veins at or near the adit locality.

No ore reserves are known on the Corder property. Further exploration of the veins could uncover ore bodies of commercial value.

BAYHORSE PASS PROSPECTS

Several mine workings lie on the southwest side of the Montezuma fault south of Bayhorse Pass. These workings are in sec. 2, T. 7 N., R. 10 E., close to but west of the primitive area boundary. The most conspicuous mine working is an adit, caved at the portal, which was driven southwest for an estimated 200 to 300 feet. The dump consists of highly altered white quartz monzonite. Pieces of rock from the dump contain a network of quartz and sulfide veinlets 1 to 3 inches wide that indicate the adit explored a vein that was brecciated by faulting and subsequently mineralized. Pyrite, chalcopyrite, sphalerite, and galena are the common sulfides; quartz, chlorite, and garnet are common gangue minerals. Some of the vein material on the dump contains from 10 to 50 percent pyrite. A dump sample (969, pl. 2) of the brecciated veinlet material contained 7.3 ounces of silver per ton, 0.3 percent copper, 0.4 percent lead, and 1.0 percent zinc. The sample also contained an abnormal amount of bismuth. A second sample of sulfide and oxidized material assayed a trace of gold and 3.8 ounces of silver per ton. A selected sample of mineral fragments from the dump (245) contained 14.6 ounces of silver per ton, 0.1 percent copper, 0.7 percent lead, 0.6 percent zinc, and 0.07 percent bismuth.

The vein believed to have been explored by the adit crops out about 40 feet above the dump. It has a maximum width of 21 inches where exposed for 7 feet of strike length; it strikes N. 40° W. and dips steeply to the southwest. The vein is predominantly iron oxide-stained quartz. Quartz float may be traced about 400 feet to the southeast, where a vein is explored by a shallow prospect pit. In the pit, the vein is 4 to 5 feet thick and is composed of vuggy quartz stained by iron oxides. The leucocratic country rock is strongly altered near the vein and slickensides in the vein walls suggest postmineral faulting. A random chip sample of the vein assayed a trace of gold and 0.7 ounce of silver per ton. Sample 970 (pl. 2), taken of dump material from the prospect pit, contained 2.1 ounces of silver per ton, 0.03 percent copper, 0.03 percent lead, and 0.05 percent zinc. The sample also contained abnormal quantities of bismuth.

North of the main adit dump, in the first large gully south of the pass, a short adit, now caved at the portal, was driven in quartz monzonite along a shear zone about 1 foot thick, which contains several small quartz veinlets. The shear zone is believed to be the same as one explored in the larger adit and prospect to the south. Quartz in the zone is brecciated and streaked with limonite, hematite, and manganese oxide. Crushed wallrock along the zone is pronounced. A sample taken across the zone assayed a trace of gold and 0.6 ounce of silver per ton.

About 300 feet up the hill, southwest of the main vein, is a parallel vein that has been tested by a prospect pit at the edge of a gulch. The vein is a series of quartz stringers in an altered zone 10 to 15 feet wide. The zone is bounded on the hanging wall by a basic dike. Sample 971 (pl. 2), taken from sulfide-bearing quartz stringers near the hanging wall of the altered zone, contained 0.001 ounce of gold per ton, 0.9 ounce of silver per ton, 0.02 percent copper, 0.07 percent lead, and 0.07 percent zinc.

Northeast from the dump and on the opposite hillside is a small prospect pit that explores an altered zone that strikes N. 60 ° W. and dips steeply northeast. A 4-foot chip sample (756, pl. 2) across the altered zone contained 0.06 ounce of silver per ton, 0.05 percent copper, and a trace of tin. About 2,000 feet east of sample site 756 is a strongly altered zone about 6 feet wide that strikes N. 40° E. and dips 78° SE. The zone is about 200 feet long and is chiefly altered granitic rock, but locally it is silicified and stained red by iron oxides. Near the northeast end, parts of the zone are stained green by malachite. A sample across the zone (758) contained 0.03 ounce of silver per ton and 0.03 percent copper. Sediment sample 759, from a small stream directly downstream from the altered zone, contained anomalous amounts of silver and copper.

Several stream-sediment samples were taken from the stream draining Bayhorse Pass and the different mineralized outcrops along it. As would be expected, all of the samples were anomalous either in identified metals or in cxHM (citrate soluble heavy metals).

Surface observations and sample data indicate that none of the veins in the Bayhorse Pass are minable at present prices and costs. The veins are unusual for the Sawtooth area, however, in that they contain more copper, bismuth, and tin than is found in other veins of the area.

JOHNSON CREEK PROSPECTS

Two small prospects are in sec. 11, T. 7 N., R. 10 E., a quarter mile west of Johnson Creek and about 0.3 mile north of the mouth of Grouse Creek (pl. 2). The prospects are in adjacent gullies about one-fourth mile apart. Both workings are in a 100-foot thick rhyolite dike that strikes northward and dips about 70° W.

The northern prospect is a pit in a highly iron oxide-stained zone in the rhyolite. There are no sulfide minerals visible. A sample contained a trace of gold and no silver.

The southern prospect is a caved adit that was probably about 30 feet long. The adit is in the rhyolite dike, but a small amount of dark gray, slickensided pyritic quartz is present in the stained rhyolite on the dump. A sample of the quartz assayed 0.02 ounce of gold and 0.4 ounce of silver per ton.

North of the trail along Johnson Creek, and a mile south of Big Buck Mountain in NE¼ sec. 1, T. 7 N., R. 10 E., is a small dump from a caved adit which may have been about 50 feet long. The adit was driven on a quartz vein 2 to 5 inches thick that strikes N. 30° E. dips 40° NW., along and parallel to the footwall of a basalt dike about 12 feet thick. Quartz stringers also follow along the hanging wall of the dike. The lower 2 inches of the footwall quartz vein contains chalcopyrite, galena, molybdenite, sparse sphalerite, and dark, finely crystalline unidentified sulfide minerals. Sample 974 (pl. 2), taken across a 4-inch thickness of the footwall vein, contained 0.004 ounce of gold per ton, 9.6 ounces of silver per ton, 1.0 percent copper, 0.2 percent lead, 0.07 percent zinc, 0.3 percent bismuth, trace tin, and 1.0 percent molybdenum. The vein may be traced up the hillside, but no other prospect workings were found on it.

Sediment sample 272 was taken downstream from the dump, from sand of an alluvial fan in an almost dry stream bed. It did not contain anomalous amounts of metals probably because no dissolved metals were trapped in the coarse sand.

In the southwest corner of sec. 5, T. 7 N., R. 11 E., high on the side of the valley, is a broad zone of altered granitic rock. The rocks are bleached white and are locally stained by iron oxides. A chip sample (276) taken in this area contained 10 ppm silver, 200 ppm copper, 70 ppm molybdenum, and 30 ppm tin. No mine workings were noted in the altered area. A sediment sample (271) taken about a quarter mile downstream in a small tributary to Johnson Creek that drains the altered area contained 2 ppm silver, 1,200 ppm zinc, and 217 ppm cxHM. The unusually high metal content of the sediment sample presumably came from the altered zone upstream.

OTHER OCCURRENCES

Sample 983 (pl. 2) was taken from a stream that drains south from Smoky Peak; it was anomalous in silver, copper, lead, and heavy metals. This small cascading stream drains an area crossed by a number of dikes and it may have acquired its metal content from the dike area, although this possibility was not checked.

Sample 234, taken from near the head of Johnson Creek, 0.5 mile west of Rock Island Lake, was anomalous in cxHM values. This anomalous content may have been obtained from an altered area high on the mountainside east of the sample site. The altered zone was not investigated.

PAYETTE PLACER AREA

The Payetter placer area is along the South Fork Payette River in the northwestern part of the study area (fig. 26). The deposit extends south from the mouth of Trail Creek about 6 miles upstream. The average width of the placer would probably be about half a mile (fig. 26); it covers parts of sec. 2, 11, 14, 23, 26, 35, and 36, T. 9 N., R. 11 E. The area is accessible by 22 miles of paved and 6 miles of graveled road from Lowman to Grandjean and then 2

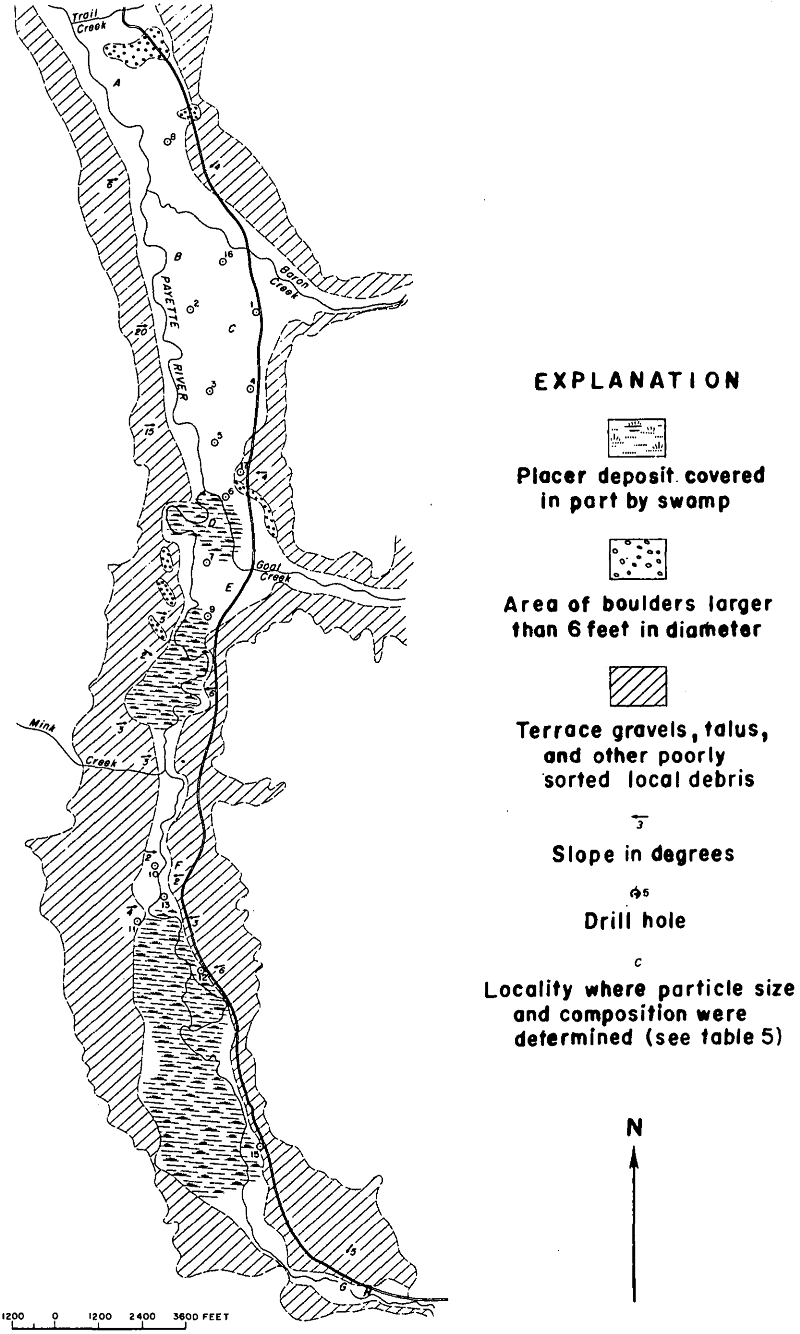


FIGURE 26.—Map of the Payette placer area.

miles of graveled road to Trail Creek. A dirt road traverses the deposit on the east side of the river.

The area is covered by placer claims owned by Messrs. Ward L. Hill, Boise, Idaho, Rich Knoblock, Caldwell, Idaho, and Joseph J. Davis and Andrew E. Murray, Baker, Oreg. The initial claims were staked in 1952 and additional claims were located during 1956–58. The area has been explored by 17 churn drill holes, from 40 to 177 feet deep, and by several bulldozer trenches. The property was leased in 1958 by Rare Metals Corp. of America, Salt Lake City, Utah, which put down churn drill holes 1 through 12 (fig. 26). The owners drilled holes 13, 14, and 15 at a later date; churn drill hole 14 was abandoned at a shallow depth because of a boulder near the surface. The samples from holes 13 and 15 were stored and later made available to the Bureau of Mines for experimental testing.

FIGURE 27.—View of the Payette placer area, looking north.

Holes 16 and 17 were drilled by the owners in 1967 and 1968, respectively, and the Bureau of Mines collected the drill cuttings for experimental processing. Radioactive black sand containing niobium, tantalum, and uranium were the object of the exploration for several years. Later, however, platinum was indicated by several commercial assays on material collected by the claim owners.

The deposit is in the glaciated valley of the South Fork Payette River, bounded on both sides by precipitous ridges as high as 3,000 feet (fig. 27). Stream alluvium and glacial material has accumulated in the valley to a depth of more than 180 feet and possibly to several hundred feet.

The gradient of South Fork Payette River is relatively constant in this deposit area; it averages a little less than 1 percent for a drop of approximately 300 feet in 6 miles. There are no falls or white water rapids. Main tributaries entering this section of the valley are Baron and Goat Creeks on the east and Mink Creek on the west. Both Baron and Goat Creek valleys are glaciated. Lateral moraine from the valley of Goat Creek is particularly evident in the valley of the South Fork. This moraine forms a ridge about 80 feet high on the north side of Goat Creek.

About one-half of the placer area has a relatively dense cover of pines, however, the trees are mostly small. The area between Baron Creek and Goat Creek contains mainly pines mostly less than 1 foot in diameter that are growing on very thin soil. South of Goat Creek the vegetation is thicker, but larger trees are sparse. Three grassy swamps with very little timber cover much of the area above Goat Creek. A stand of timber in the area between Trail Creek and Baron Creek was logged several years ago.

The placer material exposed on the surface is predominantly sand and gravel with boulders less than 1 foot in diameter. (See table 5.) Larger material has accumulated in some areas but it represents a small percentage of the total placer. More than 90 percent of the near-surface material is less than 1 foot in diameter. Some bank exposures, as much as 80 feet high, have a large concentration of boulders, because most of the fines (especially clay) have been washed away. The size and composition of the near-surface material are shown in figure 26. Boulders as large as 10 feet across have accumulated at several locations. These have apparently rolled off the ridges; some, such as those near the mouth of Trail Creek, probably were carried by the glaciers from more distant points.

Holes 1 through 12, drilled by Rare Metals Corp. of America,

TABLE 5.—*Size and composition of near-surface material, Payette placer area*

[Data in percent]

Location	Particle size (inches)				Rock type			Remarks
	¼	¼ to 1	1 to 6	6 to 12	Granodiorite	Quartz monzonite	Mafic rocks (andesite, basalt)	
A	30	30	20	20	80	10	10	40-foot bank. Occasional boulders 10 feet or larger in riverbed.
B	30	20	40	10	70	20	10	10-foot bank.
C	40	30	20	10	50	40	10	Gravel derived from Baron Creek.
D	50	30	20	—	70	10	20	Bank; soil as much as 5 feet thick.
E	30	20	20	30	60	20	20	Trench; occasional 1.5-foot boulders.
F	40	20	10	30	30	[1] 50	20	100-foot bank; occasional 2-foot boulders.
G	20	20	30	30	50	[1] 50	—	4-foot bank; 1.5 feet of soil.
H	50	30	20	—	10	[1] 80	10	Trench; occasional boulders as much as 1.5 feet in diameter.

[1] Pink granite.

are from 40 to 110 feet deep. Drill cuttings from these holes were concentrated by gravity methods and then run through a magnetic concentrator. Concentrates from the drill cuttings indicate that the area drilled contains an average of 11.16 pounds of black sand per cubic yard and 4.02 pounds of heavy but nonmagnetic material per cubic yard. The nonmagnetic fraction was analyzed for niobium, tantalum and uranium. The Nb_2O_5, Ta_2O_5, and U_3O_8 content of the placer deposit, weighted by length of sample, averaged 0.0320, 0.0015, and 0.0004 pounds per cubic yard, respectively. The niobium to tantalum ratio, as indicated above, is about 20:1. The sample data are shown in table 6.

The owners drilled holes 13 and 15 to a depth of 151 and 145 feet, respectively. The drill cuttings were given to the Bureau of Mines and samples from each hole were combined to form two samples that were then processed on a Wilfley table by Porter Bros. Corp., Boise, Idaho. The placer material in the vicinity of hole 13 was caclulated to contain 13 pounds of concentrates per cubic yard and the material near hole 15 was calculated to contain 18 pounds of concentrate per cubic yard. Results of concentration and analyses are shown in table 7.

The nonmagnetic fraction from hole 13 was examined petrographically by Larry Hammond, Bureau of Mines, Reno, Nev., and is

TABLE 6.—*Churn drill results, drill holes 1 through 12, Payette placer*

[Adapted from data furnished by property owners. N.d., not determined]

Churn drill hole	Interval (feet)	Nonmagnetic concentrates [1]						
		Pounds per cubic yard	Metal content					
			Percent			Pounds per cubic yard		
			Nb_2O_5	Ta_2O_5	U_3O_8	Nb_2O_5	Ta_2O_5	U_3O_8
1	0- 5	[2] 13.9	0.18	0.03	0.03	0.025	0.004	0.004
	5- 15	6.6	.43	.05	.07	.028	.003	.005
	15- 20	[2] 16.6	.16	.02	.03	.027	.003	.005
	20- 35	4.1	.80	.06	.13	.033	.002	.002
	35- 40	[2] 41.6	.12	.02	.02	.050	.008	.008
	40- 55	6.4	.63	.05	.08	.040	.003	.005
	55- 60	[2] 28.2	.21	.02	.03	.059	.006	.009
	60- 75	7.7	.64	.05	.08	.049	.004	.006
	75- 80	[2] 27.3	.15	.02	.03	.041	.005	.008
	80- 84	5.2	.66	.07	.09	.034	.004	.004
2	0- 5	5.52	1.12	.01	.06	.062	.000	.003
	5- 20	4.32	.80	.07	.09	.035	.003	.004
	20- 25	2.41	1.18	.01	.06	.028	<.001	.001
	25- 40	2.35	.92	.06	.10	.022	.001	.002
	40- 45	2.96	.60	.02	.05	.018	.006	.001
	45- 60	2.87	.86	.07	.13	.025	.002	.004
	60- 65	2.93	1.04	.01	.10	.030	<.001	.003
	65- 80	5.45	.64	.04	.09	.035	.002	.005
	80- 85	1.73	.93	.01	.08	.016	<.001	.001
	85-100	3.80	.41	.01	.06	.016	<.001	.002
	100-105	2.05	.81	.01	.05	.017	<.001	.001
	105-110	5.46	.40	.01	.03	.022	<.001	.002
3	0- 5	4.08	.91	.04	.13	.037	.002	.005
	5- 20	4.22	1.97	.09	.18	.083	.004	.008
	20- 25	1.44	1.93	.01	.17	.020	<.001	.002
	25- 40	2.06	.29	.04	.12	.019	.001	.003
4	0- 5	4.07	.85	.04	.11	.035	.002	.004
	5- 20	3.70	.90	.01	.11	.033	<.001	.004
	20- 25	3.97	.82	.02	.12	.033	.001	.005
	25- 40	2.62	1.23	.01	.15	.032	<.001	.004
5	0- 5	11.08	.32	.04	N.d.	.035	.004	
	5- 20	2.04	1.17	.01	.15	.024	<.001	.003
	20- 25	3.66	.74	.04	N.d.	.027	.001	
	25- 40	2.10	1.29	.01	.13	.027	<.001	.003
6	0- 5	7.52	.48	.02	N.d.	.036	.002	
	5- 20	2.01	1.06	.08	.14	.021	.002	.003
	20- 25	3.51	.73	.07	N.d.	.026	.002	
	25- 40	1.73	1.33	.05	.11	.023	.001	.002
7	0- 5	11.70	.50	.03	.07	.059	.004	.008
	5- 20	6.57	.40	.01	N.d.	.026	.001	
	20- 25	1.98	1.17	.01	.15	.023	<.001	.003
	25- 30	5.22	2.71	.01	N.d.	.141	.001	
	30- 40	3.04	2.66	.03	N.d.	.081	.001	
8	0- 5	Practically no heavy concentrates						
	5- 20	.83	1.10	.03	.01	.020	.001	<.001
	20- 25	Practically no heavy concentrates						
	25- 40	2.24	.54	.01	.07	.012	<.001	<.001

TABLE 6.—*Churn drill results, drill holes 1 through 12, Payette placer*—Continued

Churn drill hole	Interval (feet)	Pounds per cubic yard	Nonmagnetic concentrates [1] Metal content: Percent Nb_2O_5	Percent Ta_2O_5	Percent U_3O_8	Pounds per cubic yard Nb_2O_5	Pounds per cubic yard Ta_2O_5	Pounds per cubic yard U_3O_8
9	0- 20	2.07	.81	.05	N.d.	.017	.001	-------
	20- 40	1.09	4.00	.16	N.d.	.043	<.001	-------
10	0- 10	1.83	.49	.03	N.d.	.009	.001	-------
	10- 40	2.21	.55	.01	N.d.	.012	<.001	-------
	40- 60	1.26	.83	.12	N.d.	.010	<.001	-------
11	0- 15	1.39	.62	.03	N.d.	.009	<.001	-------
	15- 40	.80	.40	.14	N.d.	.003	.001	-------
	40- 60	1.73	.70	.03	N.d.	.012	.001	-------
12	0- 35	13.97	.48	.03	N.d.	.067	.004	-------
	35- 40	6.41	2.25	.08	N.d.	.144	.005	-------
	40- 55	4.65	2.06	.05	N.d.	.096	.002	-------
	55- 70	4.58	1.83	.04	N.d.	.084	.002	-------
	70- 90	8.86	1.59	.05	N.d.	.141	.002	-------
	90- 95	2.79	.82	.06	N.d.	.023	.002	-------

[1] Magnetic concentrates were not analysed for metal content.
[2] Includes magnetic concentrates.

TABLE 7.—*Results of mineral concentration and analysis, drill holes 13 and 15, Payette placer*

		Hole 13	Hole 15
Wifley table concentrate	pounds per cubic yard	13.0	18.0
Metal content:			
Nb_2O_5	percent	1.12	1.42
U_3O_8	do	.050	.065
ThO_2	do	.20	.24
Nb_2O_5	pounds per cubic yard	.156	.256
U_3O_8	do	.007	.012
ThO_2	do	.026	.045
Gold	ounces per ton	.058	.058
Platinum	do	[1] .03	[1] .04
Value:			
Platinum	cents per cubic yard	3.0	5.0
Gold	do	2.0	2.5
Magnetic fraction [2]	pounds per cubic yard	6.9	13.7
Nonmagnetic fraction	do	6.1	4.3

[1] Values reported by commercial assayer. Assays on several samples by Bureau of Mines and Geological Survey laboratories did not find detectable quantities of platinum.
[2] By hand magnet.

summarized as follows: Ferromagnesian and lighter colored silicates are dominant. The minerals include quartz, feldspars, biotite, pyroxenes, amphiboles, epidote, sphene, ilmenite-leucoxene, zircon, allanite, euxenite-polycrase, and pyrite.

A split of the nonmagnetic fraction was processed in a Franz magnetic separator to attempt to concentrate the niobium-bearing mineral without success.

Churn drill hole 16 was drilled to a depth of 166 feet in the summer of 1967. Samples from the hole were collected in 5- to 7-foot intervals by the Bureau of Mines. Clay size particles averaged 34 percent of the total sample from the hole. The samples were later processed on a Wilfley table and Stearns ring magnetic separator by the Metallurgy Research Center, Bureau of Mines, Albany, Oreg. Spectrographic analyses of the nonmagnetic part of the bulk table concentrates indicate a metal content as shown in table 8. Other metals, including aluminum, calcium, chromium,

TABLE 8.—*Semiquantitative spectographic analyses of nonmagnetic table concentrates, churn drill hole 16, Payette placer*

[Concentration ranges: C, 1–5 percent; D, 0.1–1.0 percent; E, 0.01–0.1 percent; F, 0.001–0.01 percent. N.s., no sample]

Sample No.	Interval (feet)	Pounds per cubic yard	Metal content (parts per million unless otherwise noted)									
			Ba	Pb	Ti	Zr	Nb	Yb	Nd	Ce	La	Y
1	0– 21	15.5	400	100	C	C	E	50	600	1,600	800	800
2	21– 26	28.3	400	50	C	D	E	100	600	------	500	400
3	26– 31	15.0	400	50	C	D	D	100	600	800	500	600
4	31– 36	26.7	400	100	C	D	D	100	600	1,600	900	400
5	36– 41	13.8	200	50	C	F	D	50	400	1,600	900	400
6	41– 46	20.1	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.
7	46– 51	26.0	400	100	C	F	D	50	600	1,600	1,200	600
8	51– 56	17.5	400	100	C	C	D	100	600	800	1,200	600
9	56– 61	28.2	400	100	C	F	D	50	900	800	500	400
10	61– 66	32.8	200	50	C	F	D	50	600	800	500	400
11	66– 71	7.5	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.
12	71– 77	17.3	200	100	C	F	D	50	900	1,600	900	400
13	77– 82	4.4	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.	N.s.
14	82– 87	23.6	400	50	C	F	C	50	900	1,600	900	400
15	87– 92	19.8	200	50	C	D	D	100	900	1,600	500	400
16	92– 97	20.8	200	50	C	D	D	200	1,500	1,600	1,700	1,600
17	97–102	14.9	200	200	C	D	D	50	400	800	900	400
18	102–108	15.6	200	200	C	D	E	50	900	1,600	600	600
19	108–113	15.4	200	----	C	D	C	50	900	1,600	900	600
20	113–119	24.2	400	50	C	D	D	50	900	1,600	900	500
21	119–124	31.5	400	50	C	D	E	50	600	800	500	400
22	124–129	15.0	400	----	C	D	D	50	900	4,000	1,700	400
23	129–134	14.5	400	50	C	D	D	100	1,700	4,000	1,700	800
24	134–140	19.7	200	50	C	D	D	50	400	800	900	400
25	140–145	27.7	400	50	C	D	D	50	600	1,600	900	400
26	145–150	18.9	400	50	C	D	D	100	900	800	900	800
27	150–155	13.2	400	100	C	D	C	100	1,700	1,600	1,700	1,200
28	155–161	27.8	200	50	C	D	D	100	1,700	1,600	1,700	1,600
29	161–166	25.1	200	50	C	D	D	100	900	1,600	1,700	1,600

iron, copper, magnesium, manganese, molybdenum, and nickel were detected, but not in unusual amounts. Spectrographic analyses of the magnetic part of the samples from hole 16 showed no unusual quantities of valuable metals.

The samples were further processed by combining in 20- to

22-foot intervals and separating the heavy minerals by heavy liquid media (sp gr=2.91). The heavy liquid sink product was analyzed for niobium, uranium, and thorium, as shown in table 9.

TABLE 9.—*Churn drill results, drill hole 16, Payette placer*

Sample No.	Interval (feet)	Heavy liquid concentrates							
		Pounds per cubic yard		Metal content, nonmagnetic fraction					
				Percent			Pounds per cubic yard		
		Magnetic [1]	Nonmagnetic	Nb_2O_5	U_3O_8[2]	ThO_2[2]	Nb_2O_5	U_3O_8	ThO_2
1	0- 21	3.8	5.8	0.90	0.065	0.170	0.052	0.004	0.010
2	21- 41	5.2	3.8	.90	.065	.170	.034	.002	.006
3	41- 61	5.4	4.5	.95	.070	.170	.043	< .001	.008
4	61- 82	5.2	3.3	.80	.031	.060	.026	.002	.002
5	82–102	5.1	4.8	.95	.070	.170	.046	.001	.008
6	102–124	5.6	5.6	.81	.016	.055	.045	.001	.003
7	124–145	6.0	5.8	.81	.018	.055	.047	.001	.003
8	145–166	6.3	4.7	.81	.023	.063	.038	.001	.003

[1] By Stearns ring magnetic separator.
[2] Radiometric analyses.

Hole 17 was drilled on a bench about one-fourth mile north of Goat Creek. The bench covers a relatively wide area and is from about 50 to 100 feet high. The hole location is in a small depression at the base of a narrow ridge of lateral moraine bordering Goat Creek. The ridge is capped by many boulders 6 to 15 feet in diameter. Boulders also were encountered in the hole to a depth of about 40 feet.

The gravel from the surface to 20 feet contains about 20 percent clay and silt size particles. The remainder of the hole to 85 feet probably contains less than 10 percent clay and slit size particles. About 10 percent of the material is between 1/4 and 3 inches in diameter, but the majority is medium to coarse sand. The character of the subsurface material is such that very little churning was required, therefore relatively few fines were produced.

Heavy minerals were extracted by gravity methods. A split of this product was separated magnetically (hand magnet) and the nonmagnetic part was further concentrated by hand panning and heavy liquid separation. Results of the concentration and analyses from hole 17 are shown in table 10.

The niobium, tantalum, uranium, and thorium found in the placer concentrates are believed to be mostly in euxenite. Significant amounts of the yttrium, cerium, and lanthanum were indicated by spectrographic analyses. The mineral or minerals that contain these elements was not positively identified.

The amount of available material in the Payette placer deposit is in the order of several hundred million cubic yards, the value of

TABLE 10.—*Churn drill results, drill hole 17, Payette placer*

Sample No.	Interval (feet)	Heavy liquid concentrates: Pounds per cubic yard		Metal content, nonmagnetic fraction: Percent			Pounds per cubic yard		
		Magnetic [1]	Nonmagnetic	Nb_2O_5	U_3O_8 [2]	ThO_2 [2]	Nb_2O_5	U_3O_8	ThO_2
1	0–20	34.8	15.3	0.65	0.04	0.13	0.099	0.006	0.019
2	20–30	14.6	9.1	.77	.05	.16	.070	.005	.015
3	30–40	35.9	8.5	.80	.05	.14	.068	.004	.012
4	40–50	30.8	14.7	.80	.05	.14	.120	.007	.021
5	50–60	18.9	5.9	.88	.06	.17	.052	.004	.010
6	60–70	22.3	7.1	.88	.05	.16	.062	.005	.011
7	70–85	22.8	6.3	.98	.07	.18	.062	.005	.011

[1] By hand magnet.
[2] Radiometric analyses.

which, based on niobium alone, would range from about 4 cents per cubic yard at the north end of the deposit to about 19 cents per cubic yard at the south end. About half of the niobium, however, is probably in ilmenite, which, under present technology is nonrecoverable and would reduce the value correspondingly. Total utilization of the niobium and rare earths could increase the estimated value to more than 40 cents per yard, but methods for their extraction would need to be developed.

OBSERVATION PEAK AREA

The Observation Peak area is at the head of the Stanley Lake Creek, Trail Creek, and Silver Creek, about 1.5 miles west of the Sawtooth Primitive Area (pl. 2, fig, 28). Access to the area is either by bulldozed road from Stanley Lake, about 6 miles to the Greenback mine, or by trail from Grandjean. The road would need considerable work to be adequate for mine use.

Many quartz veins crop out in the vicinity of Observation Peak. The veins have been prospected since before the turn of the century, but there is no evidence that ore has been mined from any of the workings. Sample data indicate the veins are too low in grade to be mined economically at present.

GREENBACK MINE

The Greenback mine is about a mile north of Observation Peak at an elevation of about 8,200 feet. The main workings consist of a shaft, a main adit, two short caved adits, and several prospect pits (fig. 28). The two-compartment shaft reportedly is 90 feet deep; it was flooded at a depth of 31 feet below the collar when examined in 1967. A hoisthouse and headframe at the shaft, a cabin about 400 feet south of the shaft and another cabin near the portal of the

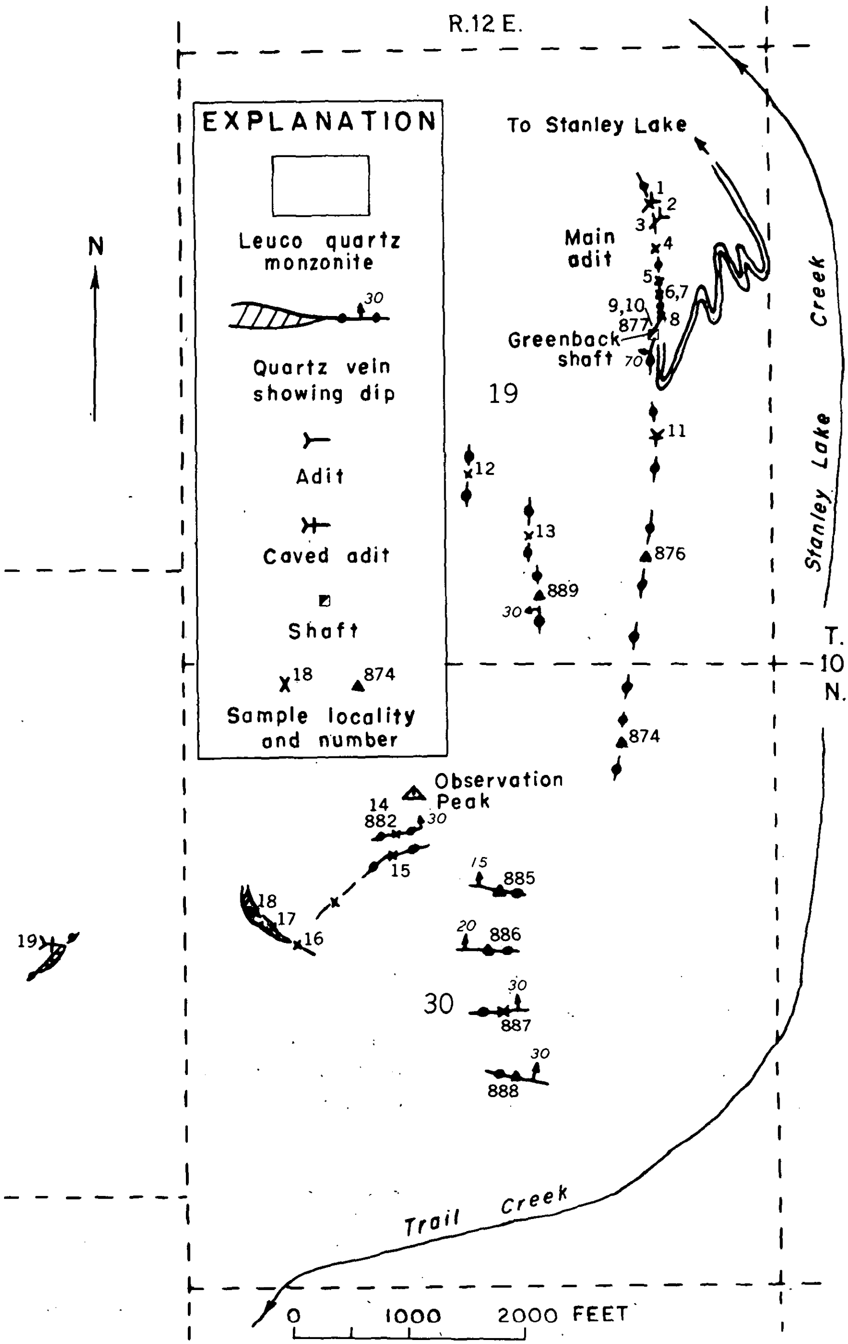


FIGURE 28.—Map of the Observation Peak area showing location of veins and samples. Analytical data for samples indicated by solid triangles are given in table 1; assay data for samples indicated by X are given in table on facing page.

main adit were constructed a number of years ago; all were in disrepair in 1967. Claims in the vicinity of the Greenback mine were recorded in 1903. Since then the area has been staked several times. The Greenback set of claims were located by H. G. Trainoff and J. C. Olsen in 1948. The greatest volume of work on the property was done after 1949 by the Greenback Mining Company. Patent was issued on 11 of the claims in 1955.

The main workings of the mine explore a strong quartz-bearing shear zone that strikes northerly, dips west, and may be traced discontinuously on the surface for more than 3,000 feet. The shear zone ranges from a few inches to several feet in thickness and consists of many small shears one-half an inch or more in thickness that cut altered leucocratic quartz monzonite. Discontinuous lenses and veins of massive and vuggy quartz occur along the shear zone; they range from a fraction of an inch to more than 16 feet thick. Locally, the quartz is frozen to the vein walls, but it often is broken by gouge-filled shears. Some of the partings in the quartz and many vugs are lined with limonite. Sparse pyrite is seen on freshly broken surfaces of the quartz.

A 5-foot thickness of quartz is exposed in the Greenback shaft. Sample 877, taken across the 5-foot thickness, 21 feet below the shaft collar, contained only trace amounts of gold and silver. Sam-

FIGURE 28.—Continued

Sample		Assay data	
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)
1	Dump	-------	1.6
2	do	Tr.	0.4
3	16	Tr.	1.3
4	6	-------	.4
5	8	Tr.	Tr.
6	Dump	Tr.	.7
7	do	-------	.3
8	12	Tr.	.5
9	Dump	Tr.	.6
10	do	-------	-------
11	do	0.01	-------
12	3	Tr.	-------
13	Dump	Tr.	.15
14	7	Tr.	1.5
15	6.5	Tr.	.6
16	Chip	.01	.4
17	do	.01	Tr.
18	5	.01	.7

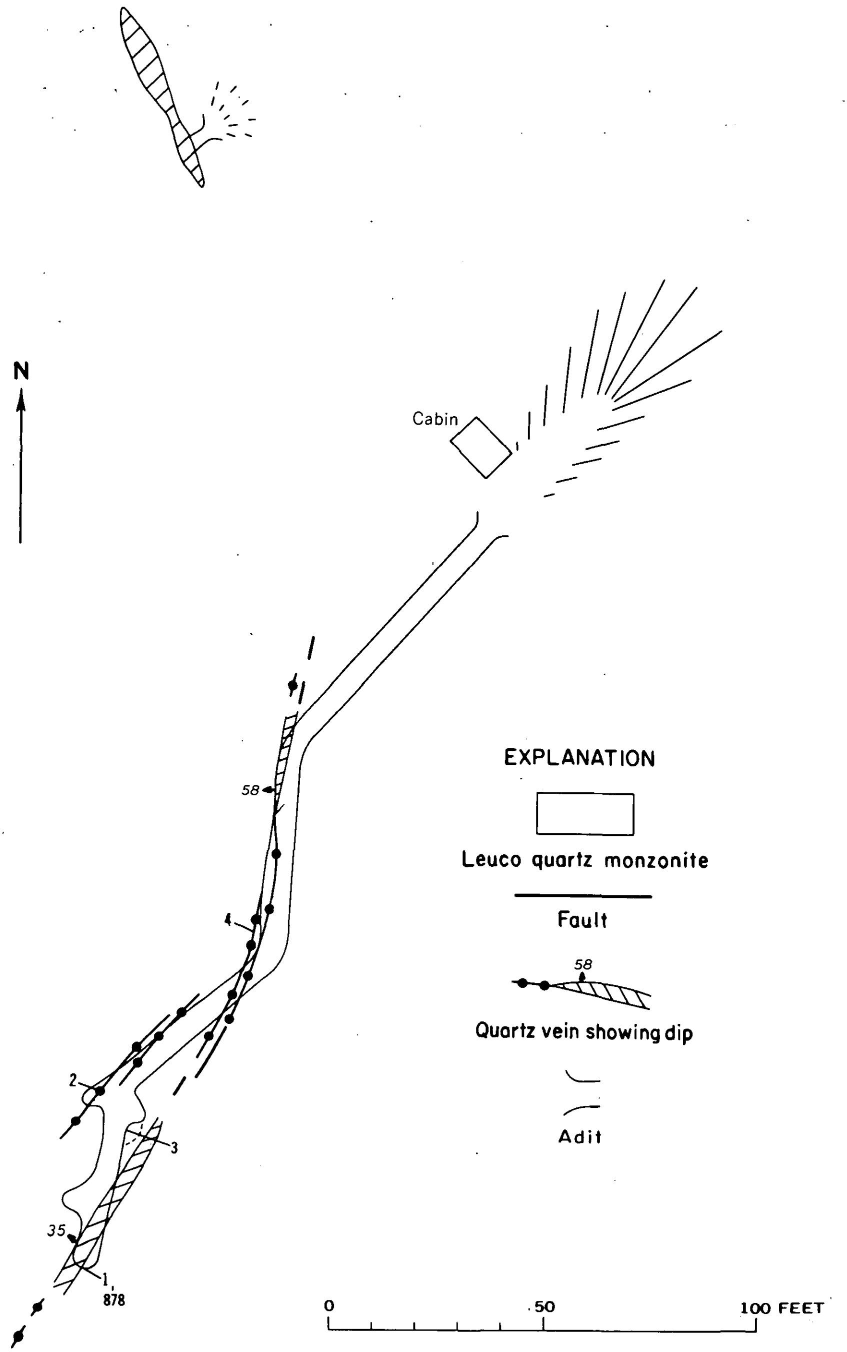


FIGURE 29.—Geologic map of the main adit, Greenback mine. See table 1 for analytical data on sample 878; assay data for other samples are given in table on facing page.

ples 9 and 10, of quartz from the dump of the shaft (fig. 28), assayed negligible quantities of gold and silver. Sample 8, taken across a 1.2-foot thickness of quartz from a prospect pit about 150 feet north and slightly east of the shaft, assayed minute quantities of gold and silver, as did samples 4, 5, 6, and 7 taken from prospect pits along the zone farther to the north (fig. 28).

The main adit, which is 950 feet north of the shaft and about 110 feet lower in elevation, intersects the zone about 70 feet from the portal and follows it about 130 feet southwesterly (fig. 29). Wallrock along the zone, particularly in the hanging wall is sheared and altered to kaolinite. Quartz in the zone is discontinuous. In places it occurs as narrow veinlets but it thickens at the face. Sample 878, taken across a 3-foot thickness of quartz at the face, contained low metal values (table 1), as did other samples taken along the vein (fig. 29).

A short adit about 20 feet along, partly caved at the portal, is located about 150 feet northwest of the portal of the main adit (fig. 29), The adit explores a lens of iron-stained quartz that is probably not along the main shear zone. Sample 1 (fig. 28) from the adit dump assayed 1.6 ounces of silver per ton.

Another short, caved adit is located along the main zone about 900 feet south of the shaft. Sample 11 (fig. 28), taken from the dump contained negligible amounts of gold and silver. Farther south along the zone, sample 876, taken across a 7-foot thickness of iron-stained vuggy quartz, and sample 874, taken across an 8-foot thickness of iron-stained quartz, also contained only minute quantities of gold and silver.

West of the main quartz-bearing shear zone are several subparallel quartz veins. The material in these veins is similar in all respects to that of the main zone. One of these veins is exposed in a small prospect pit about 2,000 feet southwest of the Greenback

FIGURE 29.—Continued

Sample		Assay data	
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)
1	3	Tr.	0.9
2	3	Tr.	.2
3	Grab	Tr.	.2
4	1.5		

shaft (fig. 28, sample 12). A 3-foot thickness of fractured quartz is exposed in the pit. Only a trace of gold was found in the quartz. Another quartz vein is near the creek that drains the lake northeast of Observation Peak (fig. 28, sample 13). It has been explored by a prospect pit about 5 feet in diameter and probably about 10 feet deep, although the depth could not be determined as the pit was flooded when examined. Neither a sample from the dump or a sample of what may be the same vein to the south (sample 889, table 1) contained appreciable gold or silver.

STANLEY LAKE CREEK

Many sediment and panned samples were taken from Stanley Lake Creek and its tributaries but few of these contained anomalous quantities of metals. Panned sample 533, from the mouth of the stream draining the southernmost of the three Hanson Lakes, contained 50 ppm silver and 1,000 ppm antimony. No vein outcrop was found along this tributary; however, a vein crops out on the southwest side of the ridge southwest of the southern Hanson Lake, in the NW¼ sec. 13, T. 10 N., R. 11 E. This vein strikes N. 40° E., dips 40° NW., is as much as 3 feet thick, and may be traced on the surface for about 100 feet. The vein consists principally of quartz, but it also contains pyrite, sphalerite, and galena. A northeast continuation of this vein into the southern Hanson Lake area could supply the metals identified in sample 533.

Sediment samples 875 and 879 were taken from tributaries that drain across quartz veins explored by the Greenback mine workings and both samples are anomalous in lead. Sediment samples 411 and 414, from streams draining the ridge east of the Greenback claims, contained 20 and 15 ppm molybdenum, respectively. No outcrops of molybdenum minerals were seen in the area.

Mr. Joel C. Olsen (written comm., 1960) has reported a quartz vein on the ridgecrest northeast of McGowan Lakes, from which samples assaying $17 a ton in gold have been taken. From that same vicinity he has reported columbite in a pegmatite dike cutting metamorphic rocks. Samples 419 and 420, taken in this area, each contain 0.03 ppm gold and negligible quantities of other metals.

TRAIL CREEK

Many quartz veins crop out along the steep southern side of Observation Peak, north of Trail Creek (fig. 28). A search of mining records indicates this vicinity was known as Omaha Gulch during the early days of prospecting and some of the earliest claims in the region were located here. Several pits were found along the veins, indicating that they were thoroughly prospected at the surface. The veins differ from those north of Observation Peak in that they strike easterly and dip at low angles to the north. Thin dikes of basalt follow along the quartz veins, either on the hanging or footwall sides of the veins. The dike rocks are unaltered, in contrast to the enclosing quartz monzonite which, locally, is highly altered and iron stained. Sparse to conspicuous pyrite is seen in the quartz as are spotty aggregations of galena and sphalerite. Some of the quartz is darkened by fine-grained sulfides.

The highest vein is about 200 feet below Observation Peak. It has been explored by an old prospect pit (fig. 28, samples 14 and 882). The quartz vein is about 7 feet thick in the pit; it may be traced along the outcrop for about 95 feet on both sides of the pit. The quartz is iron-stained and vuggy, and it contains some fine-grained sulfides. Two 7-foot chip samples were taken across the vein. Sample 14 assayed a trace of gold and 1.5 ounces of silver per ton. Sample 882 (table 1) contained a trace of gold and 0.8 ounce of silver per ton.

A 20-foot trench (fig. 28, sample site 15), about 200 feet south of sample site 14, exposes a shear zone that may be traced on the outcrop for about 1,000 feet. The zone consists of highly brecciated quartz and quartz monzonite and a large quantity of fault gouge. A 6.5-foot chip sample across the zone, in the trench, assayed a trace of gold and 0.6 ounce of silver per ton. Sample 884 (table 1) taken at the west end of the zone, from brecciated quartz and altered rhyolite dike material, contained only trace amounts of gold and silver.

About 1,700 feet from Observation Peak, down the crest of the ridge to the southwest, is a large lens of quartz that may be traced on the outcrop for about 1,000 feet. It is about 10 feet thick, where last seen on the west end, swells to a thickness of about 80 feet in the western part, and pinches out to the east. Random chip samples at sites 16 and 17 (fig. 28) contained 0.01 ounce gold, 0.4 ounce silver, and 0.01 ounce gold, and a trace of silver per ton, respectively. Near the base of the lens, on the west end, a prospect pit exposes a 1.5- to 2-foot zone of honeycomb quartz in an iron-stained zone about 8 feet thick. A 5-foot chip sample (fig. 28, sample 18) from the zone assayed 0.01 gold and 0.7 ounce silver per ton.

Four quartz veins were sampled on the steeper part of the mountainside south of Observation Peak. Other smaller quartz veins were seen but were not sampled. The four sample sites (sites 885, 886, 887 and 888) are shown in fig. 28 and the analytical results are shown in table 1.

At site 885 a quartz vein 18 inches thick may be traced about 200 feet along the hillside. Chip sample 886 was taken across a quartz vein 9 feet thick. The sample contained 1.5 ounces of silver per ton. At site 887 an adit has been driven about 10 feet into a quartz vein that is 12 feet thick and which may be traced about 200 feet along the hillside. Sparse pyrite and arsenopyrite are to be seen in freshly broken pieces of the quartz along with disseminated grains of galena. Country rock in the hanging wall of the vein is altered and partings in the quartz are coated with limonite. Chip sample 887, taken across 2 feet of the most mineralized part of the vein, contained 0.04 ounce gold, 8.7 ounces of silver, 1.5 percent lead, 0.15 percent zinc, and 2 percent arsenic. Quartz float below the vein, which may have come from it or from veins higher on the hillside, contained spotty bunches of galena and sphalerite as much as one-half inch in width. Sample 888 was taken across a quartz vein 1 foot wide. The sample contained negligible amounts of gold and silver. The vein is several hundred feet below the large vein at sample site 887.

Sediment samples taken along Trail Creek and at the mouths of tributaries that drain Observation Peak were anomalous in metal contents; they clearly demonstrate the use that may be made of this type of sampling in searching for mineralized areas. Panned sample 928, taken near the mouth of Trail Creek, was anomalous in gold and silver content. Sediment sample 867, taken from Trail Creek above its junction with Silver Creek, also was anomalous in gold and silver, and samples 870 and 872 from tributaries farther upstream were anomalous in lead content. By contrast, sediment samples from tributaries draining the south side of Trail Creek canyon, where no quartz veins were seen, were not anomalous.

SILVER CREEK

Early mining claim location records refer to several claims in the vicinity of Silver Creek, but only one prospect that had been worked was found in the Silver Creek drainage. No mineralized outcrops were seen along the creek, nor were there any pack trails or any evidence of prospecting. Our findings suggest that most of the claims were on the ridge separating Silver Creek from Trail

Creek and that they were predominately on the Trail Creek side of the ridge. The prospect that was found is located about 3,000 feet west of Observation Peak, near the crest of the ridge between Silver and Trail Creeks (fig. 28, sample site 19). The latest owner known to us (1949) was William E. Cooper. The claim was then designated "Plumb Bob." At the claim, a large quartz lens has been explored by an adit that is now caved and by three pits. The size of the dump indicates the adit was about 100 feet long. A cabin that is in fair condition is about 200 feet north of the adit.

The lens is about 220 feet long and is as wide as 45 feet; about 100 feet of the lens is exposed vertically. It is composed of white quartz with limonite- and hematite-stained fractures. Some vein material on the dump is more highly stained and contains a few small cavities; there is no evidence of sulfide minerals. A composite sample from the three pits and the dump of the adit assayed 0.09 ounce of gold per ton and 4.9 ounces of silver per ton.

The single sample indicates that the grade of the deposit, although encouraging, is not adequate to permit the lens to be mined economically at the present time. Construction of a road to the deposite from the Greenback mine would be difficult and would require considerable blasting.

Many sediment samples were taken along Silver Creek and its tributaries but none were found to be anomalous in metal content. Two panned samples contained traces of gold but not in anomalous quantities.

ALTURAS LAKE CREEK AREA

STAR MOUNTAIN PROSPECT

The Star Mountain prospect is on the north side of Alturas Lake Creek northwest of the mouth of Jakes Gulch, in the SE 1/4 sec. 32, T. 7 N., R. 13 E. In 1966 the prospect was held by three partners, Bob Summers, Kay Thurman, and Ken Washington, all of Idaho Falls, Idaho. They were working an opencut on the No. 1 claim. The cut was about 20 feet into the side of the mountain, where it intersects a quartz vein 9 inches thick, which strikes N. 75° W. and dips 58° NE. A 6-inch zone in the central part of the vein contains abundant galena and some sphalerite and pyrite. A sample (550, pl. 2) taken across an 8-inch thickness of the vein, at the face of the open pit, contained 0.1 ppm gold, 15 ppm silver, 10,000 ppm lead (about 1 percent), and 920 ppm zinc.

The vein is in quartz monzonite of the Idaho batholith, which has been altered to a 2-foot width on both sides of the vein. The potash feldspar in particular was bleached white and softened, probably to a clay mineral. A chip sample (551) of the altered wallrock, taken in the footwall of the vein, contained 1 ppm silver, 300 ppm lead, and 200 ppm zinc.

In the hanging wall of the vein, across a horizontal distance of 30 feet, are a total of 7 quartz veinlets, each from 1 to 3 inches thick, which contain specks of galena. The claim owners stated that they had traced the vein zone for 300 feet to the southeast and 200 to 300 feet northwest.

A small pit on the No. 3 claim, 930 feet due east from the opencut on the No. 1 claim, exposes a gossan-stained vein about 15 inches thick that strikes N. 84° W., dips 63° NE. and contains galena and pyrite. A sample (549) across the 15-inch thickness analyzed 100 ppm silver, 15,000 ppm lead, and 350 ppm zinc. Although the vein may be traced for only 60 feet along the strike, it likely is the same vein exposed in the opencut on the No. 1 claim.

Northwest of the pit on the No. 3 claim, and higher on the mountainside, are four northeast-striking quartz veins, ranging from 3 to 12 inches in thickness. All are iron stained. The highest of these veins is 550 feet distant and about 275 higher in elevation than the pit on the No. 3 claim. This vein strikes N. 80° E., dips 50° NW., and is about 12 inches thick. A 4-inch thickness of the vein contains some galena.

Quartz and galena float was found along the north canyon wall of Alturas Lake Creek angling down the slope southeast from the Star Mountain prospect to a point opposite from the mouth of Jakes Gulch. The float is similar to that found on the Star Mountain claim and is probably from the eastward continuation of the Star Mountain veins.

An intermittent stream flows across the outcrop of the vein zone explored at the opencut on the No. 1 claim, and two sediment samples (552 and 553) were taken along the stream at points 500 and 1,500 feet below the outcrop. The samples consisted of dry rock fragments and coarse sand; neither sample was anomalous.

NO. 1 OLE CLAIM

The No. 1 Ole claim is in the SE 1/4 sec. 33, T. 7 N., R. 13 E., on the north side of Alturas Lake Creek, directly north of the mouth of Jakes Gulch. The claim is explored by a prospect pit about 10 feet in diameter and 4 feet deep. A claim location notice at the pit states that the claim was staked in 1958 by Thure Olson and Paul Reed. Other claims in the nearby area are reported to be held by Olson, but these were not found.

The prospect pit was not dug deep enough to get through the overburden. A sample (839) of white vitreous quartz, taken from the dump, contained only trace amounts of metals.

SECTION 8 PROSPECT

At the center of sec. 8, T. 6 N., R. 13 E., on the north side of Alturas Lake Creek, is an abandoned, partly caved adit that is about 20 feet long. It explores a quartz vein about 1-foot thick that parallels a fault zone a few inches thick; the zone strikes N. 70° E. and dips 60° NW. About 4 feet into the footwall is another iron oxide-stained, vuggy quartz vein about 5 inches thick. The granitic country rock is bleached and altered for several inches on both sides of the vein. Pieces of rusty-stained quartz from the vein litter the dump. Some of the pieces are as much as 8 inches in diameter. In the quartz are stringers and blebs of pyrite, galena, and some sphalerite. Some of the quartz fragments are manganese stained. Sample 803, taken across a 16-inch width of the vein at the portal of the adit, contained trace amounts of silver and lead. Sample 804 was taken from mineralized quartz fragments on the dump; it contained 0.9 ppm gold, 100 ppm silver, 20,000 ppm lead, 1,000 ppm zinc, 50 ppm cadmium, and 2,000 ppm arsenic. The vein does not have a conspicuous outcrop and there were no other prospect workings in the nearby vicinity.

About half a mile southwest of the Section 8 prospect and several hundred feet higher in elevation is a strong silicified zone that strikes N. 45° E. and dips 75° SE. The zone extends 400 feet along the ridge and trends toward the Section 8 prospect. Extending through the central part of the zone is a strong quartz vein 3 to 4 feet thick. The quartz is milky, vuggy, and stained by oxides. Other than sparse pyrite no sulfide minerals were seen in it. Chip sample 1044 was taken along the quartz vein. It contained 0.12 ppm gold, 7 ppm silver, and 200 ppm lead. The vein appears to be too low in metal content to have attracted much attention by prospectors.

FAULT ZONE DEPOSIT

About 1,000 feet southwest of the divide between Alturas Lake Creek and Mattingly Creek, in the north-central part of sec. 18, T. 6 N., R. 13 E., is a brecciated fault zone about 20 feet wide that strikes N. 60° E. and dips steeply northwest. The broken granitic rock of the zone is altered and some broken areas are cemented by finely crystalline quartz and are stained by iron oxides. Finely crystalline pryite is seen locally. Chip sample 1039, taken in the zone, contained 0.27 ppm gold, 0.2 ppm silver and 15 ppm molybdenum. No prospect workings or location notices were seen along the fault zone.

ALTURAS LAKE CREEK-MATTINGLY CREEK DIVIDE AREA

On the divide between Alturas Lake Creek and Mattingly Creek are a number of large quartz veins in which a few shallow prospect pits were dug. Records show that claims were located there as early as 1886. Although a remnant of an old cabin stands near the Mattingly Creek trail, no underground workings were found and there is no evidence of ore having been mined.

MASSIVE QUARTZ DEPOSIT

East of the trail and immediately west of the Alturas Lake Creek-Mattingly Creek divide, along the east side of sec. 7, T. 6 N., R. 13 E., a large deposit of milky white quartz forms a ridge 600 feet long and about 100 feet wide; it rises about 40 feet above the surrounding terrain. The deposit strikes N. 20° W. and shear planes within it dip 70° SW. Locally, the deposit is stained by iron oxides but no ore minerals were seen in what appears to be barren quartz. No prospect workings were seen in the deposit. Chip sample 1043, taken of the quartz, contained only trace amounts of metals.

The deposit pinches at the northwest end but a silicified zone that appears to be an extension of it may be traced northerly for more than 1 mile. At sample site 1045, on the Alturas Lake Creek side of the divide, the zone is more than 100 feet wide. No ore minerals were seen in the quartz at this locality and only trace amounts of metals were detected in the sample. The silicified zone continues into the drainage basin of Alpine Creek, where it is believed to connect with a strong silicified zone that is south of the headwaters lake in the the southwest corner of sec. 32, T. 7 N., R. 13 E. Chip sample 115 taken across the zone, near this locality, contained 15 ppm silver and 150 ppm lead. Stream-sediment samples from Alpine Creek and its tributaries, which drain the area crossed by the silicified zone, did not contain significant content of metals nor did sediment samples from Mattingly Creek. The sediment samples, the chip samples, and the lack of visible ore minerals in the quartz indicate that the massive deposit is not of economic value as a source of metals.

ALPHABET GROUP

The Alphabet group of claims is on the divide between Alturas Lake Creek and Mattingly Creek, in the SE¼ sec. 7, T. 6 N., R. 13 E. Location notices for the C and D claims were found about 500 feet west of the Mattingly Creek trail. These notices were posted by Melvin Peterson and Bill Brooks in 1960. A prospect pit about 4 feet deep at the C and D location site exposes a large boulder of iron oxide-stained quartz. A sample of the boulder (806) contained minor quantities of metals. The boulder is part of a train of quartz float that trends west. The float leads to a conspicuous outcrop of a quartz vein on the west side of a small pond. The vein is about 12 feet thick, strikes N. 75° W., and dips 75° NE; it may be traced west to the top of the high ridge. The quartz is stained with iron oxides and contains sparse specks of pyrite but no other sulfide minerals were seen. Sample 805, taken across a 10-foot width of the vein, contained 30 ppm silver, 1,000 ppm lead, 15 ppm molybdenum, and 100 ppm beryllium.

Several hundred feet southwest of the outcrop at the pond, near the foot of the ridge, a large silicified zone strikes N. 60° W. and dips 70° NE. The zone is about 55 feet wide near the foot of the ridge, and from there it is visible for at least 1,000 feet to where it crosses the high ridge to the west. Quartz in the zone is highly stained by iron oxides; some pyrite is seen along fracture surfaces. Chip sample 1040, taken in the zone, contained 0.11 ppm gold and 150 ppm lead.

The barren appearance of the quartz in the two areas sampled, the low metal content of the samples, and the sparsity of prospect workings indicate that the veins are unattractive to prospecting.

THIS IS IT CLAIM

About 600 feet N. 20° W. from the Alphabet vein at the pond is small prospect pit on a large quartz vein that strikes N. 60° W. and dips 40° NE. The vein is from 4 to 6 feet thick and may be traced at least 1,000 feet on the outcrop. Quartz in the vein is vitreous, vuggy, and iron stained, and it contains fine-grained galena and fine-grained, unidentified dark sulfide minerals. Chip sample 1041, taken in the pit across a 16-inch width in the most promising appearing part of the vein, contained 0.09 ppm gold, 1,500 ppm silver (equivalent to 43.8 ounces of silver per ton), 30,000 ppm lead (3 percent), 3,000 ppm zinc, and 3,000 ppm bismuth. A location notice near the pit notes that the This Is It claim was located by Jay Koch and V. L. Newsom in 1946.

Several hundred feet to the southeast, on a heavily timbered and soil-covered slope, is an old prospect pit about 4 feet deep, on a quartz vein that may be a continuation of the vein exposed on the This Is It claim. The vein is poorly exposed in the wall of the sloughed pit but fragments of quartz on the dump contain fine-grained galena and dark fine-grained sulfide minerals that could not be identified in the hand specimens. Sample 1042, taken of selected dump material, contained 0.59 ppm gold, 2,000 ppm silver (equivalent to 58.4 ounces of silver per ton), 300 ppm copper, 30,000 ppm lead, 7,000 ppm zinc, 5,000 ppm bismuth, and 500 ppm tin.

Because of the extent of the veins and the metal content of the samples, further prospecting in the area is to be expected.

ALTERED ZONES

Downstream from the head of Mattingly Creek in the area south of Mattingly Peak, on the north side of the canyon, are several iron-stained altered zones; some of them are quite large. The zones are in strongly jointed granitic rocks that have been cut by andesitic dikes. There is considerable pyrite in freshly broken rocks of the areas, and oxidized pyrite has stained the rocks. Epidote is a common gangue mineral and is particularly prevalent as thin coatings along joint planes. One sample from the area (1573) contained a trace of gold and 0.4 ounce of silver per ton, but other samples were barren.

JOHNSON CREEK-ROSS FORK AREA

Most of the Johnson Creek-Ross Fork area is southeast of the study area. Nevertheless, stream-sediment samples were taken along these streams to check the mineral content of tributaries that drain the intervening ridge, which extends northwest into the southeast corner of the area. The sediment samples contained insignificant quantities of metals. Three prospects were examined in the area.

GOLD RUN CREEK PROSPECT

There is an abandoned prospect immediately east of the divide at the head of Gold Run Creek, in the SW¼ sec. 34, T. 6 N., R. 13 E. Exploratory effort at the property has been devoted chiefly to an adit that extends 70 feet in a N. 60° W. direction. The adit follows an altered zone in granitic rocks, which is 4 feet thick at the adit portal. The altered zone is laced with veinlets and lenses of quartz darkened by sulfide minerals too fine grained to identify with a hand lens. Dump fragments of quartz and granite from the adit show fine-grained pyrite and sparse specks of galena and sphalerite. Sample 1114, taken in the altered zone at the portal of the adit, contained 5 ppm gold, 2.1 ppm silver, and minor quantities of lead and zinc. The zone does not look promising and there is no evidence of ore having been mined from the adit.

GOLD RUN CREEK OUTCROP

Near the center of section 6, T. 5 N., R. 13 E., on the southwest side of the north fork of Gold Run Creek and about 50 feet above creek level, an iron oxide-stained quartz vein, 3 to 4 feet thick, strikes N. 80° W. and dips steeply northeast. The vein was traced on the outcrop for about 100 feet. Chip sample 820, taken across a 26-inch width of the vein contained 50 ppm silver and 1,500 ppm lead.

There is no evidence of prospect workings along the vein and no claim location notice was found at the mouth of Gold Run Creek.

Old placer dumps at the mouth of Gold Run Creek indicate the stream was worked for gold but how much, if any, was recovered is unknown.

D H D CLAIM

The D H D claim is on the South Fork of Ross Fork, about three-quarters of a mile west of the junction of the North and South Forks of Ross Fork. According to a location notice posted near the adit, the D H D claim was staked in July 1964, by Hilmer Lindberg, L. D. Lindberg, and Dean Eskridge. Apparently, this is a restaked claim as surface features indicate the adit was driven many years prior to 1964. The claim is accessible by a rough road from the Big Smoky Forest Service guard station up the South Fork Boise River, thence up Ross Fork.

An adit, now caved at the portal, was driven westerly into the foot of a talus covered mountainside, presumably to search for the downward continuation of veins that crop out above the talus, about 1,000 feet up the mountain slope. Judging from the dump, the adit was about 100 feet long. The adit apparently did not intersect the vein as there is no vein material in the dump. The outcrop at the head of the talus-covered slope consists of several narrow, closely spaced veinlets of quartz and pegmatite that parallel a diabase dike. The zone strikes N. 55° E. and dips 75° SE. Spots on the veinlets are stained by iron oxides and some of the quartz is darkened by fine-grained sulfides. Chip sample 827, taken across a 20-inch width of the zone, contained 0.7 ppm silver. Sample 826, taken from float near the adit portal, contained 50 ppm silver and 7,000 ppm lead.

The prospect is not promising, which is probably why it was not explored further.

Along the North Fork of Ross Fork, anomalously high cxHM values were obtained from a small tributary draining east from the Rossview Peak area (sample 834). Spectrographic analyses of the sample, however, do not indicate abnormal amounts of metal.

GLENS PEAK-UPPER PAYETTE RIVER AREA

A broad area of the Sawtooth batholith, from Rock Creek northwest to Pinchot Creek and extending northeast, is enriched in beryllium. Sediment samples from streams flowing south into the South Fork Boise River drainage and others from streams flowing into the upper part of the South Fork Payette River generally are high in beryllium content and many are anomalous (fig. 9).

Outcrops of the blue-green variety of beryl, commonly known as aquamarine, are widespread in the area and many were seen during the present investigation. Additional exposures are described by Pattee, Van Noy, Weldin (1968, pp. 65–84). The exposures are almost entirely in the coarse-grained pink granite of the Sawtooth batholith. Near the larger exposures the granite commonly is fine grained, is often white, and has been called alaskite by other writers. The beryl occurs as sparse disseminations and often occurs as only a single crystal exposed in a large area. It also forms radial aggregates or sunbursts of crystals, as crystals in vugs, as pods of crystals in the host rock or along joint planes, and as crystals and masses of crystals in pegmatite dikes that cut the country rock. The elongate crystals are well developed, particularly in vugs, where they are commonly associated with clear to smoky quartz crystals and coarsely crystalline feldspar. Pattee, Van Noy, and Weldin (1968, p. 74) note that most of the beryl is translucent and that the transparent gem-quality crystals are found only in vugs or as float. Beryl crystals seen during the present investigation commonly contained inclusions of other minerals, or they were cracked. These imperfections plus the translucent quality make them of little value as gem stones. At no place was beryl seen in sufficient quantity to be an economic source of beryllium metal.

GLENS PEAK PROSPECTS

Near Glens Peak the most conspicuous exposure of beryl is at sample site 1023, in sec. 12, T. 7 N., R. 12 E., on the ridge west of the peak, about 1,000 feet southeast of the trail from Spangle Lake to Ardeth Lake. The beryl is in a pegmatite dike about 2 inches thick along a flat-dipping joint plane where it forms radial clusters or sunbursts of crystals. Some of the crystals are a quarter of an inch in diameter and 2 inches long. Disseminated crystals also were seen in the pegmatite and in granite wallrock along with garnet. Grain measurements over an area 30 by 55 feet by Pattee, Van Noy, and Weldin (1968, p. 79) indicate that 0.13 percent of the surface of the pegmatite is aquamarine. Their sample of the country rock contained 0.002 percent BeO. Sample 1023, of fresh country rock near the pegmatite, contained 20 ppm beryllium (equivalent to 0.005 percent BeO).

At sample site 1559 on Glens Peak, beryl is exposed in a pegmatite dike about 2 inches thick containing quartz, feldspar, and garnet. The dike strikes N. 42° E. and dips 70° SE. A sample across the pegmatite contained more than 1,000 ppm beryllium (0.28 percent BeO).

BLUE CRYSTAL CLAIMS

The Blue Crystal claims are southeast of Glens Peak along the east side of Camp Lake near the head of Flytrip Creek. Location notices were found for three claims, the Blue Crystal 1, 2, and 3, staked by T. W. Vargarson, D. J. Vargarson, and Kenneth Liddiard in June 1960. The location pit of the Blue Crystal No. 1 is a few feet east of the south end of Camp Lake. The pit explores a lens that contains beryl crystals as long as one-quarter inch. The lens follows a joint that strikes N. 40° E. The lens is about 7 feet long and 6 to 8 inches wide. The beryl crystals have a pleasing color but are translucent and are too small and broken to be of gem quality. Other minerals in the lens include feldspar, quartz, garnet, and epidote. Sample 622, taken across a 6-inch width of the lens, contained 7,000 ppm beryllium (1.94 percent BeO).

Northeast from the location pit, individual crystals of beryl and small disseminations of crystals as large as three-fourths of an inch were seen at several localities, but at no place were they seen in sufficient quantities to be of value. Sample 624, taken of typical beryllium-enriched area, contained 200 ppm beryllium (0.05 percent BeO).

BLUE GEM CLAIMS

The Blue Gem No. 5 claim adjoins the Blue Crystal group at the northeast end. It is one of five Blue Gem claims held by Kenneth Liddiard and others. Pattee, Van Noy, and Weldin (1968, p. 75) note that the Blue Gem group also covers an area west of Camp Lake, where aquamarine occurs sporadically in an area approximately 1,400 feet long and 300 feet wide. Two concentrations of crystals were found in that area. One is a lens of pegmatite 300 feet west of the southwest tip of Camp Lake. The lens strikes N. 60° E. and is vertical. It is 9 feet long, 3.5 feet wide, and has a dip length of 6 feet. A 7-inch wide zone in the center of the lens consists of aquamarine, quartz, and orthoclase. Most of the aquamarine is massive but individual crystals as much as 1.3 inches long and 0.3 inch wide were seen. Crystals of aquamarine are scattered in host rock near the zone. A sample across the zone contained 6.7 percent BeO (Pattee and others, 1968, p. 75).

The second concentration is along a cliff a few hundred feet west of the northeast end of Camp Lake, about 100 feet higher in elevation. At this site, aquamarine is found filling small fractures and as disseminations in the area about 100 feet long and 50 feet wide. Pattee, Van Noy, and Weldin (1968, p. 75) made a grain measurement estimate of 400 square feet in the center of the area, which indicate a content of 0.3 percent aquamarine.

Sediment samples 168 and 169, from streams feeding Heart Lake and P.S. Lake contained anomalous amounts of beryllium, as did sample 173 from the stream draining Heart Lake.

INAMA PROSPECT

The Inama prospect is in sec 1, T. 7 N., R. 12 E., about three-fourths of a mile east of Ardeth Lake (pl. 2, sample 1020). At this site beryl occurs in pegmatite. At the north end of the prospect are pods of beryl and quartz crystals as much as 3 feet long and about 6 inches wide. The pegmatite may be traced along the strike for about 75 feet. It is composed chiefly of white feldspar and quartz, but it contains a biotite-rich zone along the walls. Quartz crystals in vugs in the pegmatite are as much as 3 inches in length. Sample 1020, of selected beryl crystals, contained 50,000 ppm beryllium (equivalent to 13.9 percent BeO). Sample 1021 of nearby fresh Sawtooth granite contained 10 ppm beryllium (about 0.03 percent BeO). Two vugs containing beryl, the larger of which is about 26 inches long and 6 inches wide, are west of the north end of the prospect. At the south end, beryl is exposed along a poorly defined zone of pods and lenses of pegmatite that strikes about N. 25° E. and dips 76° SE. Pattee, Van Noy, and Weldin (1968, p. 83) estimate that 100 to 150 pounds of aquamarine was visible at the prospect; none of it was of gem quality.

PINCHOT CREEK

Several sediment samples from the headwaters area of Pinchot Creek, secs. 25 and 36, T. 8 N., R. 11 E., are weakly anomalous in several metals. Samples 1630, 1632, and 1633 each contained 100 ppm lead. Sample 1633 also contained 3 ppm silver and sample 1630 contained 15 ppm beryllium. Farther downstream, sample 1635 contained 70 ppm copper, 100 ppm tungsten, and 20 ppm beryllium. Several igneous rocks are present in the headwaters area, including granitic rocks of the older Idaho batholith, the leucocratic quartz monzonite, and the younger pink granite of the Sawtooth batholith. All of these granitic rocks are cut by younger dikes and by a strong fault, the trace of which is followed by Pinchot Creek. Granitic rocks along the dikes are altered and it is possible that the anomalous metals in the sediment samples come from these altered rocks, although none were sampled. Scattered beryl crystals and small aggregates of crystals were seen in granitic rocks of the area. These scattered occurrences undoubtedly contributed the beryllium detected in the sediment samples. Garnets, some as large as an inch in diameter, were found in pegmatite dikes that cut aplitic rocks of the Sawtooth batholith in the headwaters area.

OTHER OCCURRENCES

Other exposures of beryl were seen on the ridge south of Little Spangle Lake, near the trail below Robert Jackson Lake, in the northern part of sec. 3, T. 8 N., R. 12 E., on the ridge west of Benedict Creek, on the ridge separating Queens River from Rock Creek, along the upper part of Pinchot Creek, and near Toxaway Lake. Pattee, Van Noy, and Weldin (1968, p. 80–83) also describe exposures in the Mt. Everly vicinity, along the divide between Queens River and Johnson Creek, along Fall Creek, on the east side of Pitchfork Creek, along Pinchot Creek, on the divide between Baron Creek and Goat Creek, in the Cramer Lake area, near Payette Peak, in the Imogene Lake-Hell Roaring Lake area, and near Alpine Lake.

Sediment samples 1008, 1009, and 1010 from streams draining north into the Payette River between Virginia Lake on the east and Tenlake Creek on the west, samples 627, 628, 630, and 1551 from the lower part of Benedict Creek, and samples 1014, 1016, 1534, and 1535 from along the Payette also are weakly anomalous in molybdenum. No outcrops containing molybdenite or altered areas that might be expected to contain molybdenite were seen in the area.

CRAMER LAKES AREA

Seven sediment samples were taken in the vicinity of Cramer Lakes and all were anomalous. Samples 36, 37, 1589, and 1595 were anomalous in silver, lead, zinc, and molybdenum. Sample 33 was anomalous in lead, sample 38 in silver and zinc, and 39 in molybdenum. The streams from which the samples were taken drain an extensive altered and mineralized area that crosses the larger of the Cramer Lakes and continues southwest across the ridge that separates Cramer Lakes from Hidden Lake Creek (pl. 2). Another mineralized and altered area starts in the Cramer Lakes drainage and continues more than a mile to the east into the Hell Roaring Lake drainage. The areas occur entirely within the Sawtooth batholith, which is cut by aplite and pegmatite dikes and by a few small dikes of rhyolitic to basaltic composition that trend mostly northeast. Only the general outlines of these altered areas are shown on plate 2. Within these altered areas are smaller more intensely altered zones ranging from a few inches to several feet in width and up to several hundred feet in length. At the scale of the map the various zones cannot be shown individually.

In the altered areas, fieldspars of the Sawtooth granite have been at least partly converted to clay minerals and the altered rocks have been stained by iron and locally, by manganese oxides. The altered rocks are not greatly different in weathering resistance from unaltered granite. A few small quartz veins and manganese-rich pods are present locally. In general, enrichment of metallic elements is greatest in the manganese-rich parts of the rocks. No metallic minerals were recognized in the field except pyrite and dull powdery manganese minerals.

Several samples of the altered rocks show that metal-bearing solutions passed through them. Sample 1591 was chipped across an altered and manganese-stained zone of fine-grained granite. It contained 1.5 ppm silver, 10 ppm bismuth, 50 ppm tin, and 100 ppm molybdenum. A nearby sample (1592) of manganese-enriched material contained 3 ppm silver, 100 ppm lead, 440 ppm zinc, and 50 ppm tin. Another nearby sample (1593) taken from three highly stained streaks, each 3 to 6 inches wide, contained 30 ppm silver (0.9 ounce per ton), 300 ppm lead, 6,600 ppm zinc, 150 ppm bismuth, 700 ppm tin, and 1,000 ppm tungsten.

No rock samples were taken from the second altered zone, which extends east into the drainage of Hell Roaring Lake. However, confirmation of the metallic content of this zone was found in sediment samples 1600, 1607, 1608, and 1610, all of which were anomalous in lead, zinc, and beryllium and all of which came from streams that drain the altered rocks.

No outcrops were seen in the vicinity of Cramer Lakes that suggest deposits that would support mining operations. Further exploration would be required to assess their mineral potential.

HIDDEN LAKE AREA

Hidden Lake Creek drains south into the South Fork Payette River. The stream and its tributaries cross two large altered and mineralized zones and several small ones. Sediment samples from the area are anomalous in lead, molybdenum, or zinc.

SOUTHERN ALTERED ZONE

The southern altered zone crosses Hidden Lake Creek at the head of the lake. It is a zone of iron oxide- and managanese-stained granite in which streaks, pods, and other small bodies contain ore minerals. The zone is about 50 feet wide above the trail on the west side of the lake. It continues to the top of the ridge to the west but was not seen farther to the west. The zone continues across the ridge east of the lake and into the upper basin of Hell Roaring Creek. Sediment samples 1201 and 1203 are from streams that drain the southern zone. Sample 1201 contained 300 ppm lead and 250 ppm zinc; sample 1203 contained 150 ppm lead, 300 ppm zinc, and 30 ppm molybdenum. A sample of the altered granite, from the east side of the lake (1202), contained a trace of gold, 700 ppm (0.07 percent) molybdenum, and 2000 ppm tungsten. A sample of altered granite from the west side of the lake contained only a trace of gold.

In the upper basin of Hell Roaring Creek, sediment sample 1600 is anomalous in zinc and sample 1611 is anomalous in lead, but both sample sites are along the upstream side of the altered rocks. Sediment sample 1598, from a stream the tributaries of which drain a broad part of the altered rocks, contained 300 ppm lead, 600 ppm zinc, 70 ppm molybdenum, and 20 ppm beryllium. Three rock samples were taken from an altered zone in the Hell Roaring

Creek basin. Sample 1597 was chipped from a veinlet that is 3 inches wide and strikes N. 80° W.; it contained 1.5 ppm silver, 100 ppm lead, 100 ppm molybdenum, and a trace of tin. Sample 1599 was from managanese-coated fragments of a small mineralized pod in altered granite; it contained 3 ppm silver, 200 ppm lead, and a trace of tin. Sample 1601 was chipped from granite in an altered zone about 200 feet wide in which there are fractures striking N. 65° E. A float fragment from the zone contained a quartz veinlet one-half inch wide in which were visible specks of molybdenite. The sample contained 15 ppm silver, 700 ppm lead, 50 ppm bismuth, 70 ppm tin, more than 1,000 ppm beryllium, and 1,500 ppm molybdenum.

None of the surface sites seen in the southern altered area contained ore minerals in economic quantity; however, the area is large and further prospecting would be needed to determine whether it contains economic deposits.

NORTHERN ALTERED ZONE

The trail from Hidden Lake to Cramer Lakes crosses a broad zone of altered and iron ozide-stained pink granite near the divide between the lakes. At that locality, the altered zone is about 400 feet wide. It may be traced southwest across the upper part of the upper lake near the head of Hidden Lake Creek and across the high ridge to the west. The altered area continues northeast into Cramer Lakes basin. On the east side of the high ridge west of the upper lake are five highly stained zones within the altered area, each of them 10 to 30 feet wide. Three chip samples were taken across the zone of altered rocks on the divide between Hidden Lake and Cramer Lakes. Sample 997 was chipped across a width of 300 feet. It contained trace amounts of gold and tin. Sample 999, taken across a 100-foot interval, contained traces of gold and tin and 150 ppm molybdenum. The altered granite contains films of specular hematite on joint surfaces and pyrite in freshly broken rocks. Andesitic dikes as much as 2 feet thick occur in the altered zone.

Four chip samples were taken in the northern altered zone on the high ridge west of Hidden Lake Creek. Sample 1585 is from two managanese-rich lenses, each of them 1 to 3 inches wide, 2 to 4 feet long, and about 25 feet apart. It contained traces of silver and lead and 150 ppm molybdenum. Sample 1586 was taken across a 100-foot width of altered iron oxide-stained fine-grained granite, in which there were no manganese-stained rocks nor quartz veins. The sample contained 70 ppm molybdenum. Quartz from a veinlet

1½ inches wide, in a zone of several quartz veinlets, was tested in sample 1587; it contained 70 ppm molybdenum. Sample 1588 was chipped from a lens of managese-coated and impregnated altered granite about 15 feet wide and 75 feet long. The sample contained 5 ppm silver, 200 ppm lead, 9,000 ppm zinc, and 100 ppm beryllium.

The northern and southern altered zones of the Hidden Lake area are conspicuous along strike lengths of more than a mile and a relief of more than 1,000 feet. Thus there is every reason to suspect they have been investigated by prospectors. The absence of prospect workings in the zones indicates they were found unattractive. Former prospectors, however, looked for deposits of higher grade ores, particularly for gold and silver. Material such as shown in the altered outcrops would have been of little interest to them. No outcrops were seen that would suggest deposits capable of sustaining mining operations. The present sample data indicates, however, that some localities within the altered rocks are mineralized, particularly those zones stained or impregnated with maganese. Determination of the mineral potential of these zones would require exploration beyond the scope of this investigation.

MANGANESE DEPOSIT

About one-quarter of a mile north of the north end of Hidden Lake, where the trail crosses the creek, there is a strong vein that is jet black at the outcrop and appears to be solid manganese oxide. The vein strikes N. 80° E. and dips 70° NW. Near the creek the vein is about 20 feet wide, and it has been explored by an old prospect pit. The vein maintains a 20-foot width for about 40 feet to the northeast, where it pinches out for about 30 feet before reappearing as a lens 5 to 10 feet wide and 30 feet long. Discontinuous pods and lenses of the vein may be traced about 300 feet to the northeast, where it pinches to an iron-stained stringer. The area west of the creek is covered by slide rock, but about part way up the western ridge is an outcrop about 300 to 400 feet long and 5 to 10 feet wide that probably is a continuation of the vein.

Fragments from the vein show that it is composed primarily of altered granite. The manganese oxide, so conspicuous at the outcrop, is largely a coating of the altered rock fragments and a filling material in fractures in the rock. Sample 1001 across a 10-foot interval of the vein near the prospect pit, contained traces of silver and lead, 975 ppm zinc, traces of tin, 300 ppm beryllium, and 18,000 ppm (1.8 percent) manganese. Sample 1002 taken across the vein about 30 feet east of the pit also contained traces of silver, 200 ppm lead, 2,750 ppm zinc, 20 ppm tin, and 49,000 ppm (4.9 percent) manganese.

NORTH FORK BOISE RIVER AREA

The North Fork Boise River and its tributaries were sampled, but none of the sediment samples contained anomalous amounts of metals. There are, however, several prospects in the area.

BALLENTYNE CREEK PROSPECT

The Ballentyne Creek prospect is in sec. 23, T. 8 N., R. 10 E., about 1,000 feet north of the mouth of Ballentyne Creek, on the west side of the North Fork Boise River, and 300 to 400 feet above the river level. The pit, which apparently was intended as the start of an adit, explores a strong fault zone that strikes N. 82° E. and dips 60° NW, is about 20 inches wide, and consists mainly of altered white quartz monzonite and stringers of quartz. Along the hanging wall of the fault is a 10- to 16-inch quartz vein. Some fracture surfaces in the quartz vein are stained red by iron oxides and others are stained green by malachite. Pyrite, azurite, and cerussite were found in vein material on the dump. A 12-inch sample (795) taken across the quartz vein contained a trace of gold, 9.9 ounces of silver per ton, 0.1 percent copper, and 0.2 percent lead. A selected sample (796) from the dump contained 8.8 ounces of silver per ton, 0.2 percent copper, and 0.5 percent lead. The vein was not found on the hillside above the prospect; however, the vein continues 150 feet northeast and lower on the hillside, where it has been explored by a small pit. No ore minerals were seen on the dump of the pit.

Several small pits in alluvium are directly below the prospect at the river level. The pits were probably dug to test for placer gold, although there is no evidence of placer mining in the area. A panned sample (964), taken near the mouth of Ballentyne Creek, did not contain anomalous amounts of gold, nor did other panned samples (963, 318, and 797), taken elsewhere along the North Fork Boise River.

PICKET MOUNTAIN PROSPECT

A caved shaft and several prospect pits (pl. 2, sample site 791) are located in sec. 28, T. 9 N., R. 11 E., about a quarter of a mile west of the top of Picket Mountain, at the crest of a broad grass-covered ridge. No vein crops out at the shaft site, but a train of quartz float leading away from the shaft indicates the vein strikes about N. 75° E. The shaft is inclined about 50° NW, and judging from the size of the dump, it went down about 50 feet. On the dump are fragments of quartz 6 to 8 inches across that are darkened by sulfide minerals too fine grained to be identified by the unaided eye. Pyrite and sparse crystals of arsenopyrite were seen on some fracture surfaces, and a yellowish green stain on some dump fragments may be scorodite. The quartz is vuggy and many pieces of it show conspicuous coxcomb crystals. Granitic country rock in the vicinity of the dump is altered and contains much sericite. Three samples were selected from the dump. Sample 791 contained 0.3 ounce of gold per ton, 0.3 ounce of silver per ton, 0.03 percent cooper, 0.15 percent lead, and 0.07 percent zinc. Sample 939, of selected mineralized specimens, contained 0.6 ounce of gold per ton, 0.4 ounce of silver per ton, 0.03 percent copper, and 0.2 percent lead. The random dump sample assayed 0.01 and 0.1 ounce of gold and silver per ton, respectively.

A second and parallel vein is about 600 feet S. 50° E. from the caved shaft. This vein has been prospected by a pit about 15 feet long and 5 feet deep. A sample (792) taken from a small pile of quartz on the dump contained only a trace of lead. Quartz float may be traced across the grass-covered slope, but no outcrop was seen.

Near the mouth of Arrastra Creek are the remnants of an old arrastra that may have been built to treat the ore from the shaft, but there is no dump nor evidence that any ore was processed. Although selected samples of the more mineralized dump material indicate a fairly good grade of ore, the overall appearance of vein material and the random-sample results suggest the property could not be mined economically at present.

RIDGE PROSPECTS

West of Picket Mountain, on the east slope of a thickly wooded hillside, are two sloughed prospect pits about 200 feet apart. Both pits are in typical leucocratic quartz monzonite. The rock is strongly jointed and is weathered at the surface to a sandy material. The easternmost pit is about 8 feet long and 4 feet deep. Iron oxide-stained rocks on the dump include small fragments of drusy, yellowish stained quartz, but no vein was seen in the pit. A sample (951) of the dump fragments contained a trace of gold, 2.9 ounces of silver per ton, 0.1 percent lead, and traces of bismuth and molybdenum. The second and higher dump to the west is about 12 feet long and 4 feet deep. At the bottom of the pit is a vuggy quartz vein, about 3 feet wide, that strikes N. 75° W. Fracture surfaces of the vuggy quartz are coated with iron oxides. Pryite was seen on fresh fractures of the quartz, but no other sulfides were seen. A sample (952) of quartz from the dump contained trace amounts of gold, silver, and molybdenum.

The lack of mineralized outcrops and sparse metal content of the samples indicates that the property has proved unattractive.

On the ridge followed by the Sawtooth Primitive Area boundary, south of the Ridge prospect pit, in the SW¼ sec. 36, T. 9 N., R. 10 E., is a train of brecciated quartz float and jasperiod that crosses the ridge in a N. 70° E. direction. It appears to mark the trend of a quartz vein, which, if it continued far enough to the northeast, would line up with the quartz vein explored by the shaft at the Picket Mountain prospect. A sample (793) from the quartz float contained only a trace of silver.

GRAYLOCK MOUNTAIN-BLIZZARD MOUNTAIN AREA

Along the serrated ridge from Graylock Mountain to Blizzard Mountain and extending northeastward is a great swarm of dikes, most of which are rhyolite, only a few of which were mapped. The dikes, which cut granitic rocks of both the Idaho and the Sawtooth batholiths, range from a few inches to more than 200 feet in thickness. The rhyolite contains abundant pryite, which is oxidized at the outcrop causing the dikes to show in places as red-stained areas. Locally, the dikes and adjoining granitic country rocks are altered.

No ore minerals were seen along the dikes in the interval from Graylock Mountain to Blizzard Mountain, but a few samples of the altered rocks and a few sediment samples from streams draining them contained anomalous amounts of metals. Sample 1618, taken from an altered rhyolite dike immediately north of the top of Graylock Mountain, contained 0.7 ppm silver, 250 ppm zinc, and 20 ppm cxHM. Samples 648, 649, and 650, collected from the mouths of stream draining into the Queens River from the northwest side of Graylock Mountain and the area from which sample 1618 was taken, all contained anomalous amounts of lead and zinc or cxHM. The metal content in these samples probably came from altered rocks in the vicinity from which sample 1618 was taken. Sediment samples 1619 and 1620, from the northeast side of Graylock Mountain near the crest, also were slightly anomalous, as was sample 592, taken at the mouth of a tributary draining the estern side of the moutain and emptying into the Middle Fork Boise River.

Northeast of Graylock Mountain, a conspicuous area of altered rocks near the head of Lynx Creek did not show any anomalous values. Samples 1087 and 1612, however, of altered rhyolite from the headwaters of Misfire Creek, contained 12 ppm cxHM and 0.5 ppm silver, respectively. Sediment sample 1088, taken from a fork of Misfire Creek that drains the altered rhyolite, was anomalous in silver, zinc, and heavy metals, and sediment sample 152, taken near the mouth of Misfire Creek, was anomalous in silver and lead. Metals in the stream sediments are probably from the altered rocks near the ridgecrest.

North of the ridge that bounds the north side of Misfire Creek, sediment samples 1613 and 1615 contained anomalous quantities of silver and lead. The stream from which these samples were taken also drains altered rocks along the mountainside west of the Middle Fork Boise River. Headwaters of the stream also drain the altered dikes that contributed to the anomalous metal content of Misfire Creek sediment samples.

A few sparse flecks of molybdenite were seen along joint fractures in rhyolite dikes, high on the mountainside west of the junction of Rock Creek and the Middle Fork Boise River. Films of specular hematite, which may be confused with molybdenite, are more plentiful and were seen at several places coating joint surfaces in the rhyolite. Samples of the rhyolite and nearby granitic rock were low in metal content.

No prospect workings or claim locations were seen in the Graylock Mountain-Blizzard Mountain area, nor were any quartz vein outcrops seen.

McDONALD PEAK AREA

On the ridgecrest about one-third of a mile south of McDonald Peak, in the SW¼ sec. 11, T. 7 N., R. 13 E. is an intensely altered zone in quartz monzonite that is more than 100 feet wide, several hundred feet long, and strikes N. 50° E. Within the zone are several small rhyolite dikes, brecciated and sheared rocks, and quartz veinlets. The rocks of the zone are heavily stained by iron oxides, so much so that the staining is visible from a distance of several miles. Chip sample 1070 (pl. 2), taken sporadically of selected stained fragments across a width of 40 feet in the zone, contained 70 ppm cooper, 150 ppm lead, 250 ppm zinc, and 20 ppm molybdenum. Sediment sample 1074 taken one-half mile east and several hundred feet lower, from a stream draining the altered area, contained 1.5 ppm silver, 300 ppm lead, 560 ppm zinc, and more than

90 ppm cxHM. Sediment sample 1080 taken about three-fourths of a mile to the northwest, from a tributary that drains northwest from the altered area, contained 500 ppm zinc and more than 45 ppm cxHM. The metal content of the two sediment samples is believed to have come from the altered zone on the ridgecrest.

No claim location notices or prospect pits were seen along the altered zone.

TOXAWAY LAKE-TWIN LAKES AREA

Near the crest of the ridge separating Toxaway Lake drainage from Twin Lakes drainage are two altered zones that strike N. 40° E. and are more or less parallel to a series of rhyolite dikes that cut the Sawtooth batholith. Rocks in the zones are bleached and fractures in them are stained by iron oxides. Samples 511 and 511A, taken along the fractures, did not contain anomalous quantities of metals. Sample 512, taken nearby, however, contained 300 ppm molybdenum. Sediment sample 85, taken from a small stream that drains the northeast end of the altered zones and which empties into Toxaway Lake, was faintly anomalous in zinc and heavy metals.

Scattered crystals and small aggregates of crystals of blue beryl were seen in the vicinity of Toxaway Lake. Some of these localities are shown by Pattee Van Noy, and Weldin (1968, fig. 37).

North of Toxaway Lake, along the western side of Sand Mountain, a series of northeast-trending rhyolite dikes intrude pink granite of the Sawtooth batholith. A strong fault zone, more or less parallel to the dikes, extends northeast through the pass traversed by the Toxaway Lake-Imogene Lake trail. Rocks along the fault zone are badly fractured, altered, bleached, and tinted to shades of red by oxidized pryite, which is prevalent in the dikes. Pods and lenses of magnetite and managanese minerals occur locally in the altered zone. The creek from Edith Lake drains the east side of the area and a panned sample (503) from the mouth of that creek contained 660 ppm zinc. A panned sample (507) from the head of the stream draining west from the altered area into Viriginia Lake contained 100 ppm lead and 30 ppm tin. These panned samples are not considered anomalous, although they do suggest above background mineralization upstream, probably from along the altered rocks in the faulted zone. A managanese-stained float sample (519) from the altered area, taken along the trail near the head of Imogene Lake, contained 5,000 ppm zinc, which also is indicative of mineralization in the area.

An unpublished map by B. T. Gale and G. R. Plumb[1] indicates an old mine in the vicinity of the altered area but it was not found by the writers. Conversation with residents of Stanley Basin, who were long familiar with the area, did not disclose any knowledge of claims or prospecting activity in the area.

Based on observations and sample data, prospecting in the northeast-trending altered zone is not likely to be rewarding.

BARON CREEK AREA

Several anomalous samples were collected along Baron Creek, particularly from tributaries that drain into it from the high ridge that bounds it to the north.

Panned samples from the lower reach of Baron Creek contained gold, and four sediment samples, two from streams flowing south into Baron Creek (492 and 493) and two from along the South Fork Baron Creek (484 and 485), were anomalous in gold. No attempt was made to trace the gold in these samples to its source.

Sediment samples 907, 908, and 909 are high in copper, and sample 466 is anomalous in gold, silver, and beryllium. These samples came from streams that flow south into the North Fork Baron Creek, south of Sawtooth Lake, and they suggest a common source area to the north. Crossing the trail at the pass immediately south of Sawtooth Lake is an andesite dike that is 40 feet thick. The dike strikes northeast and dips northwest. A sample (900) of this dike contained 700 ppm copper, an usually high copper content for rocks of the Sawtooth Range but not much higher than many andesite or other intermediate to basic dikes. The copper content of such dikes usually is tied up in silicate minerals and is not concentrated or amendable to separation and treatment as it is in coppper ore. The copper is released from the dike by weathering action and is taken into solution by water in streams flowing across the dike outcrop. The andesite dike at the pass is but one of a number of northeast-striking andesite dikes in the area, not shown on plate 1, but which were seen to project southwest across the area drained by the streams sampled at sites 907, 908, and 909. Consequently, the sample contents are not believed to have originated from outcrop of a mineral deposit but from the dikes.

MOUNT REGAN PROSPECT

Claims were filed in 1962 by James D. and Joseph P. Branson on

[1] B. T. Gale and R. G. Plumb, 1964, Geology and minerals, Sawtooth Mountain area study: An administrative report prepared jointly by the U.S. Forest Service, Dept. of Agriculture, and the National Park Service, Dept. of the Interior.

a deposit of massive quartz south of two small lakes along the east flank of Mount Regan. The quartz deposit occurs along the contact of the Idaho batholith and schists of the Thompson Peak Formation of Reid (1963). It forms a conspiuous ridge that stands as much as 20 feet high. At the northern end it merges into a quartz vein about 7 feet thick that strikes N. 50° E. and dips 50° NW., along an andesite dike. Sample 466 was taken from a stream that flows across the quartz deposit. Sample 904 was taken at the southwest end of the quartz outcrop. It contained a trace of gold, 0.9 ounce of silver per ton, and traces of lead, molybdenum and beryllium. Two other samples, 905 and 906, were taken of the quartz; both of them contained traces of gold, silver, lead, molybdenum and beryllium. A shallow prospect pit was found near the northern end of the massive deposit. The sample data and unmineralized appearance of the quartz indicates that it does not warrant further prospecting.

North of the quartz deposit, on the west side of the pass leading to Sawtooth Lake, is an extensive talus slope of large irregular granitic boulders that contain stringers of pegmatite, aggregates of garnets, and inclusions of schist. The mineral assemblage is typical of the contact of the granitic rocks with the Precambrian schists.

ALPINE LAKE AREA

Several small altered and iron oxide-stained areas occur in the basin north of Alpine Lake, in sec. 35, T. 9 N., R. 12 E. Fractures in this area trend northwest but the altered areas trend northeast. Three rock samples were taken in the area; sample 11 was a piece of float from a mineralized area about 10 by 30 feet in dimension. It contained 70 ppm silver (2 ounces per ton), 300 ppm copper, 1,500 ppm lead (0.15 percent), 700 ppm zinc, and 100 ppm tin. Sediment sample 5, from the stream that drains the altered area, contained 0.7 ppm silver and 20 ppm beryllium.

FISHHOOK CREEK AREA

Fishhook Creek drains part of the eastern side of the Sawtooth Range and empties into Redfish Lake Creek between Big and Little Refish Lakes. A number of claims have been staked in the basin of the North Fork Fishhook Creek and along the ridge between the North Fork and the headwaters of Meadow Crek. The latest group of clams in the vicinity was recorded in 1960.

Biotite schist of the Thompson Peak Formation of Reid (1963) underlines part of the headwaters area of Fishhook Creek. Locally, the schist contains beds of metamorphosed limestone and quartzite. Some schist is enriched in biotite, as for example near the outlet of the larger lake near the head of the North Fork and on the ridge between North Fork and Meadow Creek. These biotite-enriched rocks weather to a rusty red color, and the outcrops of them have attracted prospecting and claim staking. Samples of these rocks, however, did not contain anomalous quantities of metals, nor did sediment samples from streams that drain the outcrops. The metamorphosed limestones commonly contain flecks of graphite, which, to the unaided eye, may be mistaken for molybdenite. Rock samples 59, 61, and 65 (pl. 2) were tested for molybdenite but were found to contain only graphite.

IRON CREEK AREA

Iron Creek drains northeast from Sawtooth Lake and empties into Valley Creek about half a mile west of Stanley. Several stream-sediment samples taken along Iron Creek and its various tributaries contained anomalous amounts of molybdenum and lead. Noteworthy of these were sediment samples 378, 379, 1639, and 1640, taken from the South Fork Iron Creek and tributaries. These four samples contained 30, 50, 20, and 15 ppm lead. Sediment samples 380, 381, and 383, taken along Iron Creek east of Alpine Lake, contained 30, 20, and 15 ppm molybdenum respectively. No veins were seen in this vicinity, although it has been reported that float containing molybdenum and lead was found on the ridge between Sawtooth and Alphine Lakes.

In the vicinity of the molybdenum anomalies, metamorphic rocks of the Thompson Peak Formation of Reid (1963) are intruded by granitic rocks of the Idaho and the Sawtooth batholiths. Many pegmatites, mostly related to the Sawtooth batholith, crop out in the area, as do younger basic dikes that trend N. 20° to 40° W. Postdike joints also are common. Although repeated fracturing of the area is thus evident, there is little hydrothermal alteration or sulfide mineralization. Pyrite was seen in one dike and manganese coating was seen on some rock surfaces. Local areas of rusty colored rocks are mostly weathered biotite schists. Molybdenum in the sediments probably was weathered from the pegmatites and dikes.

GOAT CREEK AREA

No highly anomalous samples were taken along Goat Creek, which is tributary to the South Fork Payette River, nor were any mineralized outcrops seen in the area; nevertheless, some samples indicate there may be mineralized zones near the headwaters of the stream.

Panned sample 922, taken along the lower reach of the stream above the point where it plunges into the Payette Valley, contained 0.27 ppm gold, which is not considered anomalous for a panned sample. Farther upstream, sample 1506 (pl. 2), from the main stream, contained 150 ppm lead. Still further upstream, samples 1509, 1510, 1511, and 1512 are anomalous. Sample 1509 contained 25 ppm cxHM. Sample 1510 contained 150 ppm lead and 30 ppm cxHM. Sample 1511 contained 30 ppm molybdenum, and sample 1512 contained 280 ppm zinc and 30 ppm beryllium. All four of these samples came from an area in pink granite of the Sawtooth batholith, near its contact with the Idaho batholith. No vein outcrops were seen in this rugged area but the samples suggest that prospecting in the vicinities of Cony Lake, Meadow Lake, and north of McWilliams Lake might reveal mineralized areas.

BEAR CREEK AREA

Bear Creek drains south and empties into the South Fork Payette River about 2 miles west of the Grandjean campground. The Bear Creek drainage basin is underlain by granitic rocks of the Sawtooth and Idaho batholiths. Two sediment samples taken from this vicinity were anomalous in silver and gold. Sediment sample 460 (pl. 2) contained 10 ppm silver, the highest silver content of any sediment sample taken from the study area. Sample 457 contained 0.02 ppm gold, which is normally not considered anomalous; however, in this instance it is considered significant because on the ridge about 500 feet north of the sample site is an outcropping stockwork of narrow quartz veins, the general trend of which is N. 30° E. The quartz is stained by iron oxides and pyrite is visible on freshly broken surfaces. A chip sample across a 10-inch stained quartz vein (sample site 456, pl. 2) contained 22 ppm gold (0.6 ounce per ton) and 240 ppm silver (7.0 ounces per ton). The sample also contained lead and molybdenum.

The silver content of sample 460 may have come from a mineralized outcrop of granite from the Sawtooth batholith at the head of Bear Creek, from the site marked by sample 1657 (pl. 2). This sample site is on a divide, where the bedrock is largely mantled by surface debris. On aerial photographs, a strong lineament about 3 miles long and in places as much as 100 feet wide is seen passing through the sample site. Sample 1657 was chipped across a small rusty outcrop of altered and mineralized granite that projected a few inches above the soil. It contained 0.5 ppm gold, 70 ppm silver, 150 ppm copper, 1,500 ppm lead, and 900 ppm zinc. Also contained in the sample were notable quantities of bismuth, tin, and molybdenum.

Check samples 1658 and 1659, taken more than a mile downstream from sample site 1657 and upstream from sample site 460, were not anomalous.

No evidence of mining claims was found in the Bear Creek area, although the Bureau of Mines search of the Boise Country Courthouse records found that Mr. Walter Griffiths located six claims on the west side of Bear Creek in 1932, about a mile north of the Idaho Game Department cabin on Bear Creek. According to that description, Griffiths' claims would not cover either of the mineralized outcrops that were found. Our sample data indicate that the area warrants further prospecting.

APPRAISAL OF FINDINGS

No deposits of minable ore are known in the Sawtooth Primitive Area. Only one mine within the primitive area, the Little Queens mine, is known to have produced ore, the value of which has been reported at about $10,000. Gold and silver has been produced from the mine from pockets of high-grade ore in a quartz vein that continues below the deepest mining and which could contain other pockets of high-grade ore. As near as can be determined, the Black Warrior Creek area, which is outside the Sawtooth Primitive Area, has produced in the order of $40,000 in silver and gold values, most of which was produced from the Overlook mine.

The Sawtooth Primitive Area contains many localities of altered and mineralized rock; most of them are along or near Tertiary dikes. Many samples from these rocks are anomalous in metal content, but few of the sampled rocks contain visible ore minerals. Where seen, the ore minerals occur as thin coatings along fractures, as disseminated grains in mineralized zones of limited extent, as fine-grained sulfides that darken veinlets of quartz, and as small spotty aggregations of larger grains in quartz veins. Field evidence shows that mineralizing processes have been active in the area, but the questions is whether minable deposits are present at depth. This question cannot be answered definitively without substantial subsurface exploration. The evidence on hand indicates that concentrations of ore minerals could exist at depth in some of the altered zones but the search for minable deposits would be risky.

The most intensely altered and mineralized rocks are largely on the higher ridges of the uplifted and deeply eroded Sawtooth Range. Included are areas near the mouth of Rock Creek, those in the vicinity of Cramer Lakes, those near Hidden Lake and in the upper part of Hell Roaring Creek basin, those extending northeast from Graylock Mountain, those between Leggit Creek and the head of LaMoyne Creek, and those on the ridge south of McDonald Peak. These areas have well-exposed outcrops and some, such as in the vicinity of Cramer Lakes and Hidden Lake, may be traced on the surface for more than a mile and through a relief of more than 1,000 feet; yet, nowhere in the exposures are ore minerals concentrated in minable quantities, nor is there evidence of much exploration. Former propectors, however, looked for deposits of higher grade ores, particularly for gold and silver. Material that crops out in the altered rocks would have been of little interest to them. The altered areas are such, however, that exploration of them, particularly the Rock Creek area, is to be expected.

Quartz veins in the Basin group of claims near the head of a tributary of Leggit Creek are estimated to contain more than 100,000 tons of low grade silver-bearing material. This tonnage is estimated from a relatively small amount of exploration work; additional work might expose other mineralized bodies.

The Payette placer deposit contains several hundred million yards of placer material. Exploration indicates submarginal values of black sand minerals and gold in the placer, which are not minable at present but could be with improved technology or increased prices. Most of the placer deposit is within the Sawtooth Primitive Area.

Within the study area but largely outside the primitive area are a number of mineralized occurrences that have a potential for minable ore bodies and which may be expected to be explored further in the future. These mineralized localities are long the western or downthrown side of the Montezuma fault (fig 7). They include the Little Queens River, Black Warrior Creek, and Johnson Creek areas. The Observation Peak area, northwest of the primitive area boundary, contains numerous quartz veins in an area about one-half mile wide and 1.5 miles long. These veins contain gold and silver but the grade is too low to be mined at the present time. However, the veins probably will be further explored. Exploration also is to be expected in veins in the Alturas Lake Creek-Mattingly Creek divide area.

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TABLE 1

TABLE 1.—*Analyses of samples from*

[Samples were analyzed by six-step semiquantitative spectrographic analyses, except as follows: Au by atomic absorption detection; Ag, Zn, Pb, Cu, and Fe determinations, followed by the letter A, also by atomic absorption detection; Hg by instrumental determination; F and cxHM by chemical analysis; and Mo, Zn, and W determinations, followed by the letter C, also by chemical analysis. Results of the semiquantitative analyses are reported to the nearest number in the series 1, 0.7, 0.5, 0.3, 0.2, 0.15, and 0.1, which represent approximate midpoints of group data on a geometric scale. The assigned groups for the series will include the quantitative value about 30 percent of the time. The data should not be quoted without stating these limitations. Symbol's used are: ..., not looked for; >, with number, means more than the number shown; <, with number, means less than the number shown. The symbol, *, identifies a footnote located at the end of the table. In the location column,

		AA (ppm)	Semiquantitative spectrographic analyses (ppm)											
Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
						Stream sediments--sieved								
3	9-13-30	<0.1	<0.5	15	30	100A	<10	<10	0.28	7	<100	<5	3	15
5	9-12-35	--	.7	30	50	175A	<10	<10	--	<2	<100	10	7	20
6	8-12-2	<.1	<.5	15	30	100A	<10	<10	.5	7	<100	<5	2	15
7	9-12-35	<.1	<.5	15	50	130A	<10	<10	.16	5	<100	<5	5	10
8	9-12-35	<.1	<.5	15	30	89A	<10	<10	.28	<2	<100	<5	7	10
13	9-12-25	--	<.5	30	50	120A	<10	<10	--	<2	<100	<5	<2	7
14	9-12-25	<.1	<.5	20	30	72A	<10	<10	.95	3	<100	5	7	30
15	9-12-25	<.1	<.5	20	70	110A	<10	<10	.38	3	<100	7	10	20
16	9-12-26	<.1	<.5	20	15	95A	<10	<10	1.6	<2	<100	<5	2	10
17	8-12-12	<.1	<.5	3	20	190A	<10	<10	.05	2	<100	<5	2	7
20	8-12-11	--	<.5	10	15	190A	<10	<10	--	7	<100	<5	<2	10
21	8-12-11	<.1	<.5	10	20	60A	<10	<10	.16	3	<100	<5	2	15
22	8-12-11	<.1	<.5	15	50	180A	<10	<10	.12	10	<100	7	10	30
25	8-12-11	<.1	<.5	7	10	52A	<10	<10	.34	<2	<100	<5	<2	7
26	8-12-11	*<.1	<.5	15	70	200A	<10	10	.28	10	<100	<5	2	15
27	8-12-11	<.1	<.5	20	30	80A	<10	<10	.18	<2	<100	5	7	20
28	8-12-12	<.1	.7	20	20	150A	<10	<10	.24	3	<100	<5	3	15
29	8-12-1	--	<.5	7	100	74A	<10	<10	--	15	<100	<5	2	30
30	8-12-1	<.1	<.5	15	15	<25A	<10	<10	.1	5	<100	<5	<2	10
31	8-12-1	<.1	<.5	10	50	41A	<10	<10	.16	7	<100	5	3	20
33	8-13-18	<.1	<.5	10	150	167A	<10	<10	.09	15	<100	<5	3	10
36	8-13-7	<.1	3	70	500	960A	<10	<10	.26	100	<100	7	15	50
37	8-13-7	<.1	1	30	100	260A	<10	<10	.18	100	<100	<5	5	20
38	8-13-7	<.1	.5	20	30	850A	<10	<10	.24	10	<100	<5	2	20
39	8-13-7	<.1	<.5	20	50	130A	<10	<10	.5	100	<100	5	<2	7
40	8-12-13	<.1	<.5	20	30	135A	<10	<10	.16	5	<100	7	15	50
41	8-12-12	--	.7	30	150	100A	<10	<10	--	70	<100	20	20	150
42	9-13-29	--	<.5	10	30	400A	<10	<10	--	10	<100	<5	<2	7
43	9-13-29	--	<.5	30	20	125A	<10	<10	.14	15	<100	50	70	100
44	9-13-20	<.1	<.5	10	30	90A	<10	<10	.18	20	<100	<5	3	30
45	9-13-20	<.1	<.5	30	100	190A	<10	<10	.1	10	<100	<5	<2	7
46	9-13-30	<.1	<.5	15	70	72A	<10	<10	.12	10	<100	<5	2	20
47	9-13-30	--	<.5	5	30	27A	<10	<10	.07	2	<100	<5	<2	5
48	9-13-32	<.1	<.5	15	70	45A	<10	<10	.12	10	<100	<5	10	30
49	9-13-32	<.1	<.5	30	70	190A	<10	<10	.2	3	<100	5	10	30
50	8-13-5	<.1	<.5	20	50	230A	<10	<10	.24	10	<100	5	10	30
51	8-13-5	<.1	<.5	20	70	212A	<10	<10	.18	20	<100	7	15	50
54	10-13-31	<.1	<.5	30	30	140A	<10	<10	.2	<2	<100	15	30	50
57	10-12-36	<.1	<.5	50	30	120A	<10	<10	.12	<2	<100	30	70	150
58	9-13-6	<.1	<.5	30	20	100A	<10	<10	.1	3	<100	30	100	500
60	9-13-6	<.1	<.5	30	30	119A	<10	<10	.24	2	<100	15	30	150
62	9-12-12	<.1	<.5	50	50	80A	<10	<10	.1	2	<100	10	70	150
63	9-13-6	<.1	<.5	30	30	150A	<10	<10	.26	<2	<100	15	30	150
64	9-12-12	<.1	<.5	30	30	60A	<10	<10	.16	3	<100	10	30	150
68	9-13-18	<.1	<.5	15	20	96A	<10	<10	.24	<2	<100	5	2	20
69	9-13-18	<.1	<.5	20	20	99A	<10	<10	.28	2	<100	7	10	30
71	9-12-13	<.1	<.5	10	30	86A	<10	<10	<.01	7	<100	5	15	70
72	9-12-13	<.1	<.5	<2	<10	<25A	<10	<10	2.6	<2	<100	5	<2	5
73	9-12-14	--	<.5	20	50	80A	<10	<10	--	<2	<100	7	7	20
74	9-12-14	<.1	<.5	10	30	48A	<10	<10	.32	5	<100	<5	7	20

the Sawtooth study area, Idaho—

the number under T identifies the township, the number under R identifies the range, and the number under S, the section. Thus, T. 10 N., R. 8 E., sec. 36 is shown as 10–8–36. All samples were analyzed for Cd, Sb, As, and Mg. Those containing 50 ppm (parts per million) or more Cd, 200 ppm or more Sb, and 2,000 ppm or more As are shown in footnotes at the end of the table. Analyses for Sc, B, and Ga revealed no significant values, and no determinations are shown. Looked for in selected samples but not detected were Pt, Pd, Ta, Te, and Eu. Analysts: D. J. Grimes, E. J. Fennelly, G. Dounay, T. Roemer, S. Noble, J. C. Hamilton, V. E. Shaw, O. M. Parker, K. C. Watts, H. G. Neiman, R. Miller, Z. Stephenson, R. Tripp, S. Rickard, W. W. Janes, E. Martinez, A. Meir, V. James, L. R. Rader, Jr., G. D. Shipley, A. Toevs, J. A. Thomas, W. Campbell, J. Frisken, K. Murphy, H. King, T. Ging, and E. Rowe.]

Sample	Semiquantitative spectrographic analyses (ppm)									Percent				Chem. analyses ppm
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
							Stream sediments--sieved							
3	5	70	150	500	100	200	300	150	500	3	0.3	1.5	0.2	3
5	20	50	20	300	50	70	500	100	1,000	5	.3	1.5	--	3
6	10	50	10	150	70	150	300	70	500	2	.2	1.5	--	1
7	15	50	15	150	50	100	200	100	500	3	.3	1.5	--	3
8	7	50	30	200	70	100	300	100	500	2	.3	1.5	--	3
13	3	20	50	500	70	50	200	50	500	3	.3	1.5	--	1
14	5	50	30	300	70	100	500	300	700	5	.5	1.5	--	.5
15	15	50	30	200	100	70	500	200	700	5	.5	1.5	--	.5
16	7	30	<10	100	30	70	150	50	200	1	.2	1	--	2
17	5	30	30	150	20	7	30	50	300	1.5	.1	.7	--	1
20	15	30	10	100	20	70	150	<50	700	.7	.2	1.5	--	3
21	5	50	<10	200	30	50	300	300	500	1.5	.3	2	--	.5
22	10	70	10	300	20	50	500	300	500	2	.3	2	--	7
25	5	30	<10	100	<20	10	200	<50	200	.7	.2	1	--	3
26	15	20	150	1,000	100	70	200	150	1,000	3	.3	1	.05	2
27	15	50	50	500	50	30	300	150	500	2	.3	1.5	--	1
28	20	50	20	100	50	70	150	50	700	2	.2	1	--	4
29	15	30	70	700	200	70	300	100	1,000	3	.3	1	.03	4
30	1	50	300	700	300	150	300	300	1,000	3	.7	1.5	.17	.5
31	10	50	50	1,000	70	50	300	150	700	3	.5	1.5	--	9
33	15	30	70	300	100	>200	150	150	2,000	3	.3	1.5	--	17
36	10	70	10	200	100	>200	500	300	500	5	.5	1.5	--	40
37	30	70	30	200	50	>200	300	100	1,500	3	.5	1.5	--	40
38	15	50	10	150	100	150	300	150	300	1.5	.5	1.5	--	7
39	15	30	<10	30	30	200	100	<50	>5,000	2	.07	.7	--	>45
40	15	70	20	200	50	70	300	200	700	3	.5	1.5	--	3
41	10	100	100	500	70	100	300	150	1,500	7	1	1.5	--	5
42	2	20	30	700	200	70	50	50	700	5	.3	.7	--	4
43	3	200	70	700	300	70	200	500	1,000	15	>1	3	.05	2
44	5	50	30	500	70	100	200	200	500	2	.3	2	--	1
45	5	15	30	1,000	700	150	150	50	1,000	7	.5	1	--	.5
46	3	50	50	700	150	100	200	150	1,000	3	.3	1.5	--	11
47	3	20	30	500	150	50	150	50	300	1.5	.15	1	--	.5
48	3	50	30	700	70	50	300	200	500	.7	.3	1.5	--	1
49	15	50	20	200	50	70	500	150	1,000	2	.5	1.5	--	5
50	30	50	30	300	50	200	300	150	500	2	.7	1.5	--	7
51	15	50	20	200	50	200	300	150	1,000	3	.5	1.5	--	17
54	3	70	<10	100	20	7	300	100	700	2	.5	1.5	--	1
57	3	100	15	500	300	50	700	700	700	7	>1	3	--	2
58	1	100	10	500	30	30	500	700	1,000	7	>1	7	--	3
60	2	100	20	700	30	30	500	700	700	7	.7	3	--	.5
62	2	70	10	300	30	20	700	500	700	5	1	2	--	2
63	5	70	15	150	70	50	500	300	700	7	1	3	--	5
64	3	70	20	300	1,000	100	700	300	700	2	1	3	--	.5
68	7	50	10	200	30	20	200	150	700	2	.3	1.5	--	3
69	5	70	15	300	100	30	500	300	700	3	.5	1.5	--	.5
71	2	70	20	500	70	20	700	700	500	3	.5	2	--	.5
72	<1	30	<10	150	<20	10	150	<50	300	.3	.15	1.5	--	2
73	7	70	15	300	70	30	700	300	1,000	3	.3	1.5	--	3
74	2	50	10	200	70	15	700	1,000	500	2	.3	1.5	--	.5

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Semiquantitative spectrographic analyses (ppm)												
		Stream sediments--sieved--Continued												
75	9-12-14	<0.1	<0.5	15	30	68A	<10	<10	0.18	2	<100	<5	5	30
76	9-12-14	--	<.5	30	30	60A	<10	<10	.16	<2	<100	5	10	20
78	9-13-9	--	<.5	15	20	68A	<10	<10	.48	<2	<100	5	5	15
79	8-13-26	--	<.5	10	20	32A	<10	<10	.1	15	<100	<5	2	7
81	8-13-22	--	<.5	30	30	37A	<10	<10	--	<2	<100	7	10	20
83	7-13-6	<.1	<.5	15	30	46A	<10	<10	<.01	<2	<100	7	10	30
84	7-13-5	<.1	<.5	10	50	89A	<10	<10	.35	70	<100	5	7	70
85	7-13-5	<.1	.5	30	100	240A	<10	<10	.2	15	<100	<5	7	30
86	7-13-7	<.1	<.5	30	50	160A	<10	<10	.24	3	<100	5	10	20
87	7-13-6	<.1	<.5	20	20	21A	<10	<10	.1	<2	<100	5	15	70
88	7-13-6	<.1	<.5	10	10	78A	<10	<10	.24	<2	<100	<5	<2	15
89	7-12-12	<.1	<.5	30	20	130A	<10	<10	.1	2	<100	15	15	50
90	7-12-2	<.1	<.5	3	<10	61A	<10	<10	.2	<2	<100	<5	<2	7
91	7-12-11	<.1	<.5	15	20	260A	<10	<10	.22	10	<100	5	2	5
92	7-12-11	<.1	<.5	20	30	150A	<10	<10	.1	5	<100	7	10	20
93	7-12-12	--	<.5	20	30	<200	<10	<10	--	15	<100	10	7	20
94	7-12-12	<.1	<.5	15	10	51A	<10	<10	.26	3	<100	7	<2	5
95	7-13-17	<.1	<.5	15	30	52A	<10	<10	.1	<2	<100	5	7	20
96	7-13-16	<.1	<.5	15	20	<200	<10	<10	--	<2	<100	5	5	20
97	7-13-9	<.1	<.5	30	15	130A	<10	<10	<.01	2	<100	5	10	50
99	7-13-10	<.1	<.5	10	20	120A	<10	<10	.5	15	<100	5	2	7
100	7-13-3	<.1	<.5	10	70	200A	<10	10	.09	<2	<100	<5	3	7
101	7-13-3	<.1	<.5	15	20	150A	<10	<10	.4	3	<100	<5	2	5
102	7-13-3	<.1	<.5	7	50	210A	<10	<10	.03	3	<100	<5	3	20
103	8-13-35	--	<.5	5	30	120A	<10	<10	<.01	2	<100	<5	2	10
104	7-13-35	<.1	<.5	10	50	60A	<10	<10	.05	<2	<100	<5	2	10
105	7-13-27	<.1	<.5	10	50	40A	<10	<10	.02	<2	<100	<5	2	10
106	7-13-27	<.1	<.5	15	50	70A	<10	<10	.1	<2	<100	5	3	20
107	7-13-27	<.1	<.5	15	50	60A	<10	<10	.05	<2	<100	5	2	15
109	7-13-28	<.1	<.5	15	70	70A	<10	<10	.03	<2	<100	5	3	20
111	7-13-29	<.1	<.5	10	50	<200	<10	<10	.3	<2	<100	5	5	20
112	7-13-29	<.1	<.5	15	50	<25A	<10	<10	.2	7	<100	5	3	30
113	7-13-32	--	<.5	20	70	<200	<10	<10	.2	5	<100	30	20	150
114	7-13-32	--	.5	15	70	<200	30	<10	.1	<2	<100	<5	3	15
116	7-13-28	<.1	<.5	15	70	60A	<10	<10	.03	<2	<100	7	7	20
117	7-13-28	<.1	<.5	20	50	55A	<10	<10	.05	7	<100	7	5	50
118	7-13-29	<.1	<.5	10	100	50A	<10	<10	.02	<2	<100	<5	2	7
119	7-13-20	--	<.5	5	15	<200	<10	<10	.6	<2	<100	<5	2	30
121	7-13-20	<.1	<.5	20	30	95A	<10	<10	.3	<2	<100	5	15	30
122	7-13-20	<.1	<.5	15	30	35A	<10	<10	.2	<2	<100	5	7	20
123	7-13-20	<.1	<.5	15	30	85A	<10	<10	.3	<2	<100	<5	3	20
124	7-13-30	--	<.5	10	30	<200	<10	<10	.4	<2	<100	<5	2	20
125	7-13-30	--	<.5	20	50	<200	<10	<10	--	2	<100	7	10	50
127	7-13-29	<.1	<.5	7	10	<200	<10	<10	--	<2	<100	<5	<2	5
146	6-12-17	<.1	<.5	15	50	45A	<10	<10	.2	<2	<100	5	<2	20
147	6-12-17	--	<.5	10	50	75A	<10	<10	.2	3	<100	<5	<2	15
148	6-12-16	<.1	<.5	15	50	65A	<10	<10	.15	<2	<100	<5	<2	15
149	6-12-16	<.1	<.5	20	100	90A	<10	<10	.03	3	<100	7	3	30
150	6-12-9	<.1	<.5	15	70	80A	<10	<10	.11	3	<100	5	5	30
151	6-12-9	<.1	1	15	150	110A	10	<10	.08	5	<100	15	3	10
152	6-12-9	<.1	.7	15	200	120A	<10	<10	.3	70	<100	<5	7	30
153	6-12-4	<.1	<.5	15	150	125A	<10	<10	.3	20	<100	10	15	50
154	6-12-4	<.1	<.5	30	70	90A	<10	<10	.05	15	<100	30	70	300
155	7-12-35	<.1	<.5	20	70	100A	<10	<10	.05	15	<100	7	30	50
156	7-12-35	<.1	<.5	50	70	130A	<10	<10	.08	10	<100	10	20	70
157	7-12-35	<.1	<.5	30	50	80A	<10	<10	.2	10	<100	7	10	50
158	7-12-25	<.1	<.5	30	150	110A	<10	<10	.06	7	<100	7	20	50
159	7-12-25	<.1	<.5	30	30	130A	<10	<10	.2	5	<100	10	5	30
160	7-12-25	--	<.5	2	30	<200	<10	<10	--	<2	<100	<5	<2	20
161	7-12-14	--	<.5	15	30	<200	<10	<10	--	<2	<100	<5	2	20

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm) Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Percent Fe	Ti	Ca	F	Chem. analyses ppm cxHM
						Stream sediments--sieved--Continued								
75	7	70	10	200	50	30	700	200	700	3	0.5	2	--	1
76	2	100	15	300	50	15	700	150	1,500	3	.3	1.5	--	.5
78	3	50	30	300	100	10	700	500	700	3	.5	1.5	--	.5
79	5	30	30	150	20	30	100	100	700	1.5	.15	1.5	--	2
81	15	100	70	150	30	200	200	100	1,000	3	.3	1.5	--	1
83	20	70	50	200	30	70	500	150	700	3	.3	1.5	--	.5
84	5	50	30	200	30	150	300	300	1,000	3	.5	1.5	--	.5
85	70	70	15	300	50	100	300	150	1,500	5	.7	1.5	.09	14
86	20	50	30	200	30	50	300	150	700	3	.5	1.5	--	3
87	10	70	100	200	50	20	200	150	700	3	.5	1.5	.04	.5
88	30	30	<10	150	20	30	200	<50	300	.5	.2	.7	--	2
89	20	70	10	300	20	30	500	300	700	5	.7	1.5	--	2
90	30	30	10	150	30	30	150	50	200	.7	.3	1	--	3
91	70	30	10	100	50	150	200	<50	1,500	1.5	.3	1	.13	14
92	30	70	70	150	50	50	300	100	1,500	3	.3	1.5	.1	4
93	150	70	70	200	70	150	300	70	1,500	2	.3	1.5	--	1
94	100	20	20	200	30	150	150	70	700	1.5	.3	1.5	.19	5
95	15	100	10	200	30	20	700	700	500	3	.3	1.5	--	.5
96	5	50	10	200	50	15	1,000	700	300	2	.3	1.5	--	.5
97	20	70	10	200	20	20	500	150	500	3	.7	1.5	--	1
99	30	50	<10	150	30	15	500	150	700	1.5	.3	1.5	--	1
100	15	30	15	150	30	20	700	700	1,000	3	.3	1.5	--	14
101	30	30	15	100	20	15	300	150	700	1.5	.2	1.5	--	3
102	7	50	<10	100	70	10	500	300	700	2	.2	1.5	--	9
103	2	50	15	200	100	20	700	500	700	2	.3	1.5	--	5
104	1	30	15	200	100	15	1,500	1,500	500	3	.2	2	--	2
105	2	30	15	200	20	10	1,500	1,000	300	2	.2	1	--	1
106	2	30	15	300	30	20	1,500	1,500	1,000	5	.5	1.5	--	8
107	2	30	30	500	70	30	1,500	1,500	700	5	.7	2	--	3
109	2	50	20	500	30	15	1,500	1,500	700	5	.5	2	--	2
111	5	50	<10	300	100	20	1,000	1,000	300	3	.5	2	--	7
112	2	50	30	500	200	20	1,500	1,500	1,000	5	1	5	--	2
113	7	150	20	300	150	30	1,500	1,500	1,500	10	>1	7	--	3
114	5	50	15	200	150	20	1,500	1,500	700	5	.5	3	--	3
116	3	70	10	500	50	30	1,500	1,500	1,000	5	.7	1.5	--	2
117	5	70	30	700	150	30	2,000	2,000	700	7	.7	3	--	3
118	2	50	15	200	50	15	1,500	2,000	700	3	.3	1.5	--	2
119	5	50	<10	300	50	20	1,000	700	200	2	.3	1.5	--	2
121	2	70	10	200	30	20	700	300	500	5	.7	1.5	--	4
122	3	50	10	300	30	30	700	700	700	5	.7	3	--	.5
123	5	50	<10	100	30	15	300	50	300	2	.3	1	--	5
124	1	50	<10	200	20	30	700	200	200	2	.3	1.5	--	5
125	3	70	15	300	100	30	1,500	700	1,000	5	.7	1.5	--	--
127	1	30	<10	100	<20	15	200	50	150	.3	.3	1	--	3
146	3	50	10	100	30	20	1,500	500	700	3	.2	1	--	3
147	5	30	10	150	30	20	1,500	500	1,500	3	.3	1.5	--	5
148	1	30	10	150	70	30	1,500	1,000	1,000	5	.3	1.5	--	4
149	1	70	10	300	100	30	1,500	2,000	1,000	7	.7	3	--	2
150	10	50	10	150	50	20	1,500	500	1,500	5	.3	1.5	--	10
151	10	70	10	500	150	20	2,000	2,000	1,500	7	.7	5	--	3
152	15	50	15	200	70	20	700	300	1,500	3	.5	1.5	--	12
153	15	70	10	200	20	30	1,000	1,000	1,500	7	.7	3	--	2
154	7	100	10	300	150	20	1,500	2,000	1,500	10	1	7	--	1
155	10	70	20	300	70	20	2,000	2,000	1,500	7	1	7	--	2
156	15	100	30	200	30	50	700	500	2,000	7	.7	1	--	2
157	20	100	30	300	150	30	1,000	1,000	1,500	7	1	7	--	3
158	10	100	15	300	100	20	1,500	1,500	1,500	7	.7	3	--	2
159	10	100	15	500	70	15	1,500	2,000	1,000	7	.7	2	--	2
160	50	15	20	150	30	20	500	150	700	1	.3	1.5	--	--
161	20	20	<10	100	20	20	300	100	1,000	1.5	.3	1.5	--	3

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Stream sediments--sieved--Continued												
162	7-12-14	<0.1	<0.5	20	30	75A	<10	<10	0.14	<2	<100	7	3	20
163	7-12-14	--	<.5	7	20	<200	<10	<10	.3	<2	<100	<5	2	20
164	7-12-14	<.1	<.5	15	30	115A	<10	<10	.3	3	<100	<5	2	20
165	7-12-14	--	<.5	2	30	55A	<10	<10	.04	<2	<100	<5	<2	15
166	7-12-13	--	1	15	70	<200	<10	<10	--	<2	<100	5	<2	30
167	7-12-14	<.1	<.5	20	100	85A	<10	<10	--	<2	<100	5	15	30
168	7-12-13	<.1	<.5	20	30	80A	<10	<10	.3	<2	<100	7	5	30
169	7-13-18	--	<.5	15	50	60A	<10	<10	.5	<2	<100	5	10	20
170	7-13-18	<.1	<.5	20	30	85A	<10	<10	.2	<2	<100	5	7	30
171	7-12-24	<.1	<.5	15	20	55A	<10	<10	.15	<2	<100	<5	<2	20
172	7-12-24	<.1	<.5	10	20	<25A	<10	<10	.2	<2	<100	<5	<2	15
173	7-12-24	--	<.5	15	30	<200	<10	<10	--	<2	<100	<5	<2	20
174	7-12-24	<.1	<.5	10	30	65A	<10	<10	.4	<2	<100	<5	2	15
175	7-12-23	--	<.5	15	20	<200	<10	<10	--	<2	<100	<5	<2	20
176	7-12-8	<.1	<.5	10	50	70A	<10	<10	.2	2	<100	5	5	30
177	7-12-8	--	<.5	10	15	<200	<10	<10	--	<2	<100	<5	<2	20
178	7-12-8	--	<.5	15	20	<200	<10	<10	--	<2	<100	5	2	30
179	7-12-18	.1	<.5	10	20	150A	<10	<10	.6	<2	<100	<5	2	15
180	7-12-18	--	.5	30	70	85A	<10	<10	.4	10	<100	10	15	100
181	7-12-18	<.1	<.5	30	50	60A	<10	<10	.1	3	<100	5	10	30
182	7-12-18	<.1	<.5	20	30	<200	<10	<10	--	<2	<100	5	10	50
183	7-12-18	.1	<.5	20	30	30A	<10	<10	.1	<2	<100	<5	3	30
184	7-12-18	<.1	<.5	30	70	75A	<10	<10	.08	<2	<100	7	7	30
185	7-12-19	<.1	<.5	10	30	35A	<10	<10	.2	<2	<100	<5	7	30
186	7-12-19	.1	<.5	20	50	40A	<10	<10	.3	<2	<100	<5	5	30
187	7-12-31	<.1	<.5	20	70	55A	<10	<10	.06	<2	<100	5	15	300
188	7-12-31	<.1	<.5	10	70	30A	<10	<10	.03	<2	<100	<5	2	15
189	7-12-32	<.1	<.5	30	50	90A	<10	<10	.06	<2	<100	15	30	70
190	7-12-32	--	<.5	15	30	<200	<10	<10	.2	<2	<100	7	15	100
191	7-12-31	--	<.5	10	70	35A	<10	<10	.4	<2	<100	<5	5	50
192	7-12-30	<.1	<.5	15	30	45A	<10	<10	.1	<2	<100	<5	3	50
193	7-12-30	.1	<.5	15	70	65A	<10	<10	.06	<2	<100	<5	<2	15
194	7-12-30	--	<.5	15	50	55A	<10	<10	.2	<2	<100	5	<2	20
195	7-12-19	--	<.5	15	70	<200	<10	<10	.5	<2	<100	5	10	150
201	6-11-35	<.1	<.5	15	70	55A	<10	<10	.06	<2	<100	7	10	30
203	6-11-34	<.1	<.5	15	50	45A	<10	<10	.05	<2	<100	5	7	50
204	6-11-34	<.1	<.5	10	30	65A	<10	<10	.05	<2	<100	5	3	20
205	5-11-12	<.1	<.5	15	30	60A	<10	<10	.09	<2	<100	5	5	30
206	5-11-13	.2	<.5	15	30	75A	<10	<10	.14	<2	<100	7	3	50
207	5-12-18	<.1	<.5	15	30	50A	<10	<10	.14	<2	<100	5	2	70
208	5-12-17	<.1	<.5	15	50	50A	<10	<10	.08	<2	<100	<5	<2	20
209	5-12-18	<.1	<.5	15	50	65A	<10	<10	.03	<2	<100	7	5	50
210	5-12-18	<.1	<.5	20	30	50A	<10	<10	.13	<2	<100	<5	5	30
211	5-12-18	<.1	<.5	20	70	40A	<10	<10	.05	<2	<100	7	7	50
212	5-11-13	<.1	<.5	20	50	60A	<10	<10	.23	<2	<100	5	5	30
369	9-13-25	.2	<.5	20	50	51A	<10	<10	.34	<5	<50	<5	5	30
370	9-13-25	<.02	<.5	15	50	100A	<10	<10	.24	<5	<50	5	30	50
371	9-13-26	<.02	<.5	15	70	85A	<10	<10	.24	<5	<50	<5	15	10
373	9-13-28	<.02	<.5	30	50	100A	<10	<10	.22	<5	<50	5	30	30
374	9-13-28	<.1	<.5	20	30	160A	<10	<10	.54	<5	<50	<5	10	7
375	9-13-22	<.02	<.5	7	70	40A	<10	<10	.2	<5	<50	<5	5	10
376	10-12-14	.08	<.5	15	30	74A	<10	<10	.14	15	<50	5	10	15
377	10-12-23	<.02	<.5	20	50	92A	<10	<10	.17	15	<50	5	15	30
378	10-12-23	<.1	<.5	70	70	91A	<10	<10	.13	30	<50	7	30	70
379	10-12-22	<.02	<.5	30	70	120A	<10	<10	.24	50	<50	10	30	70
380	10-12-23	--	<.5	5	20	110A	<10	<10	.36	30	<50	<5	<2	5
381	10-12-22	--	<.5	7	30	60A	<10	<10	--	20	<50	<5	<2	15
382	10-12-15	<.1	<.5	30	70	78A	<10	<10	.14	<5	<50	5	10	30
383	10-12-22	<.02	<.5	15	70	74A	<10	<10	--	15	<50	<5	<2	15
384	10-12-13	<.1	<.5	10	30	37A	<10	<10	.17	<5	<50	<5	<2	15

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent				Chem. analyses ppm
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Stream sediments--sieved--Continued									
162	20	70	150	300	20	15	500	150	2,000	3	0.5	1.5	0.1	2
163	15	50	70	200	30	30	300	150	500	1.5	.2	1.5	--	2
164	10	70	20	200	50	70	500	150	700	2	.3	1.5	--	3
165	30	30	200	300	20	30	200	150	700	1.5	.3	1.5	.18	2
166	15	30	10	150	30	50	300	200	1,000	1.5	.2	1.5	--	4
167	15	70	30	200	50	20	700	300	1,500	5	.3	1.5	--	1
168	20	70	<10	300	30	100	500	300	1,500	2	.5	1.5	.38	2
169	30	50	70	200	70	70	300	200	1,500	5	.3	1	.28	2
170	15	70	<10	300	20	20	700	200	300	2	.3	1.5	--	2
171	7	30	<10	100	<20	20	300	100	70	1	.2	1	.22	2
172	5	20	<10	150	<20	20	300	100	50	.7	.2	1	.23	<.5
173	20	20	10	70	30	100	200	70	700	1.5	.15	.7	--	3
174	15	30	70	200	20	30	500	150	1,000	1.5	.3	1.5	.3	2
175	70	30	30	150	20	20	200	50	1,000	1.5	.15	.7	--	4
176	15	20	30	300	30	30	300	500	500	1.5	.2	1.5	--	2
177	15	30	30	300	20	20	300	100	300	.7	.2	1	--	2
178	10	30	<10	70	20	20	200	50	700	1.5	.15	.7	--	4
179	30	50	20	300	30	30	300	100	1,000	1.5	.2	1.5	--	12
180	20	50	30	200	50	30	700	300	1,500	5	.3	1.5	--	12
181	15	30	30	300	70	30	700	300	1,000	3	.3	1.5	--	5
182	1	30	15	200	50	15	1,000	700	1,000	3	.3	1.5	--	2
183	10	30	30	300	100	20	700	300	1,000	2	.5	1.5	--	2
184	10	70	10	200	30	15	1,000	300	1,000	3	.3	2	--	2
185	5	50	10	150	700	15	700	200	700	2	.3	1.5	--	2
186	15	50	70	700	200	20	700	500	3,000	3	.7	1.5	--	2
187	3	50	<10	200	70	15	1,500	1,000	700	3	.2	1.5	--	1
188	3	30	15	200	30	20	2,000	1,000	700	2	.2	1.5	--	<.5
189	15	100	10	300	50	20	700	200	700	7	.7	1.5	--	<.5
190	15	30	15	300	50	20	1,000	700	1,000	3	.3	1.5	--	5
191	5	50	15	200	50	20	1,500	1,000	1,000	3	.3	1.5	--	2
192	7	30	15	200	50	20	1,500	700	500	2	.3	3	--	3
193	3	30	15	200	70	20	1,500	1,000	700	3	.3	1.5	--	2
194	10	50	15	200	50	30	1,000	300	1,000	2	.3	1.5	--	4
195	10	50	20	200	50	20	1,000	700	1,000	3	.3	1.5	--	2
201	2	30	<10	300	100	20	3,000	2,000	1,000	5	.3	1.5	--	2
203	1	50	10	300	100	15	2,000	2,000	700	5	.5	1.5	--	.5
204	2	30	15	300	100	20	3,000	2,000	500	5	.5	1.5	--	1
205	2	50	30	200	70	20	1,500	1,500	500	3	.7	1.5	--	2
206	7	50	10	700	70	20	1,500	1,000	700	5	.7	2	--	2
207	5	30	15	300	50	20	3,000	2,000	500	3	.5	1.5	--	2
208	3	50	15	200	100	20	2,000	1,500	700	3	.5	1.5	--	2
209	2	50	10	300	50	15	3,000	2,000	1,000	3	.5	1.5	--	2
210	3	50	15	500	70	30	3,000	3,000	700	5	.5	2	--	1
211	5	70	20	500	70	20	3,000	3,000	700	5	.7	2	--	2
212	3	70	10	200	50	20	2,000	1,500	700	3	.3	1.5	--	2
369	7	15	150	1,000	100	20	100	70	700	1.5	.3	.3	--	9
370	5	30	70	300	30	20	150	70	700	3	.3	.3	--	9
371	7	30	70	150	30	20	150	70	1,500	2	.15	.3	--	2
373	2	50	30	150	20	20	300	150	1,000	3	.3	.7	--	2
374	5	30	20	100	70	70	150	<50	1,500	1.5	.15	.7	--	25
375	5	30	30	200	70	20	150	50	300	1.5	.15	.3	--	5
376	3	30	50	700	200	30	500	150	700	5	.5	.7	--	3
377	3	50	30	700	300	30	300	150	700	3	.5	.7	--	5
378	2	70	20	300	70	30	500	300	700	3	.5	.7	--	2
379	2	70	20	500	100	30	500	300	1,000	3	.7	1	--	7
380	1	50	<10	100	50	20	100	<50	5,000	3	.07	1	--	35
381	1	30	10	300	70	20	200	100	500	2	.15	.7	--	4
382	3	30	70	>1,000	300	70	500	200	1,000	3	.3	.7	--	4
383	1	20	<10	100	70	20	100	<50	1,500	.3	.07	.3	--	25
384	1	30	10	300	150	20	200	70	300	1.5	.2	.3	--	4

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
						Stream sediments--sieved--Continued								
385	10-12-13	<0.1	<0.5	15	30	72A	<10	<10	0.13	10	<50	5	5	15
386	10-12-15	<.1	<.5	20	50	110A	<10	<10	.22	<5	<50	<5	<2	15
387	10-12-15	<.02	<.5	30	30	44A	<10	<10	--	<5	<50	<5	2	15
388	10-12-15	<.02	<.5	20	50	88A	<10	<10	.11	<5	<50	15	2	15
389	10-12-15	<.1	<.5	30	30	75A	<10	<10	.1	<5	<50	15	2	15
390	10-12-15	<.02	<.5	30	30	83A	<10	<10	.03	<5	<50	10	3	30
391	10-12-10	<.02	<.5	30	50	83A	<10	<10	.03	<5	<50	7	7	30
392	10-12-10	<.02	<.5	20	50	74A	<10	<10	.04	<5	<50	5	5	30
393	10-12-4	<.02	<.5	30	70	80A	<10	<10	.03	<5	<50	7	5	30
394	10-12-4	<.02	<.5	15	30	49A	<10	<10	.06	<5	<50	5	<2	30
395	10-12-4	<.02	<.5	30	50	77A	<10	<10	.04	<5	<50	7	2	30
396	11-12-32	<.02	<.5	50	70	75A	<10	<10	.03	<5	<50	7	3	30
397	10-12-4	<.1	<.5	15	70	70A	<10	<10	.09	<5	<50	10	5	30
398	11-12-32	<.1	<.5	15	30	59A	<10	<10	.02	<5	<50	<5	2	30
399	10-12-6	<.02	<.5	30	70	40A	<10	<10	.07	<5	<50	<5	10	20
400	10-12-6	<.02	<.5	30	50	66A	<10	<10	.03	<5	<50	5	<2	15
401	10-12-7	<.02	<.5	30	70	80A	<10	<10	.03	<5	<50	5	3	20
402	10-12-7	<.02	<.5	30	70	60A	<10	<10	.04	<5	<50	<5	10	30
403	10-12-7	<.02	<.5	50	70	76A	<10	<10	.03	<5	<50	5	2	15
404	10-12-7	<.02	<.5	30	70	130A	<10	<10	.03	<5	<50	<5	5	20
405	10-12-7	<.02	<.5	20	70	70A	<10	<10	.02	<5	<50	5	10	30
406	10-12-29	<.02	.5	30	150	92A	<10	<10	.1	15	<50	5	10	50
408	10-12-29	<.02	<.5	20	70	56A	<10	<10	.03	5	<50	5	15	50
410	10-12-20	<.02	<.5	30	70	100A	<10	<10	.03	7	<50	7	20	50
411	10-12-20	<.02	<.5	20	50	110A	<10	<10	.06	20	<50	5	15	30
414	10-12-20	<.02	<.5	30	70	140A	<10	<10	.06	15	<50	5	20	70
415	10-12-20	<.02	<.5	20	30	120A	<10	<10	.04	7	<50	5	10	70
416	10-12-20	<.02	<.5	30	70	130A	<10	<10	.06	5	<50	<5	7	30
417	10-12-20	<.1	<.5	10	30	66A	<10	<10	.06	<5	<50	<5	3	30
418	10-12-20	<.1	<.5	15	30	72A	<10	<10	.07	<5	<50	5	7	30
422	10-12-29	<.02	<.5	30	70	28A	<10	<10	.06	7	<50	5	15	50
423	10-12-18	<.1	<.5	20	70	56A	<10	<10	.05	<5	<50	5	15	30
424	10-12-29	<.1	<.5	15	70	120A	<10	<10	.16	<5	<50	7	7	20
425	10-12-29	<.1	<.5	30	70	100A	<10	<10	.12	<5	<50	7	10	50
427	10-12-28	<.02	<.5	30	70	92A	<10	<10	.05	<5	<50	5	15	30
429	10-12-29	<.02	<.5	30	70	88A	<10	<10	.1	5	<50	7	20	30
430	10-12-29	<.02	<.5	20	50	96A	<10	<10	.05	<5	<50	5	10	30
431	10-12-29	<.02	<.5	30	70	120A	<10	<10	.09	<5	<50	5	20	50
433*	10-12-29	<.02	<.5	30	50	120A	<10	<10	.04	<5	<50	<5	7	30
435	10-12-28	<.02	<.5	15	100	74A	<10	<10	.05	<5	<50	<5	5	20
436	10-12-28	<.02	<.5	30	100	100A	<10	<10	.12	<5	<50	5	10	30
437	10-12-21	<.02	<.5	20	70	56A	<10	<10	.05	<5	<50	7	20	70
438	10-12-20	<.02	<.5	30	20	40A	<10	<10	.04	5	<50	<5	5	30
439	10-11-35	<.02	<.5	15	70	32A	<10	<10	.03	<5	<50	<5	2	15
440	10-11-34	<.02	<.5	30	70	86A	<10	<10	.04	<5	<50	10	15	30
441	10-11-34	<.02	<.5	30	70	74A	<10	<10	.04	<5	<50	7	7	20
442	10-11-34	<.02	<.5	30	70	64A	<10	<10	.01	<5	<50	10	5	20
446	10-11-14	<.02	<.5	20	150	180A	<10	<10	.03	<5	<50	10	2	15
447	10-11-11	<.02	<.5	30	50	86A	<10	<10	<.01	<5	<50	5	3	20
448	10-11-11	<.02	<.5	30	30	64A	<10	<10	.03	<5	<50	10	50	50
449	10-11-11	<.02	<.5	50	50	72A	<10	<10	.03	<5	<50	7	15	30
450	10-11-11	.02	<.5	20	70	80A	<10	<10	.04	<5	<50	5	7	30
451	10-11-11	<.02	<.5	50	50	64A	<10	<10	.12	<5	<50	7	20	50
452	10-11-2	.04	<.5	30	70	72A	<10	<10	.03	<5	<50	5	10	30
453	10-11-2	<.02	<.5	30	50	52A	<10	<10	<.01	<5	<50	5	10	30
454	10-11-14	<.02	<.5	20	20	50A	<10	<10	.04	<5	<50	7	15	30
455	10-11-14	.04	<.5	30	50	46A	<10	<10	.03	<5	<50	<5	10	30
457	10-11-22	.02	<.5	20	20	62A	<10	<10	.01	<5	<50	<5	10	20
458	10-11-22	<.1	<.5	30	50	50A	<10	<10	.04	<5	<50	5	7	20
459	10-11-22	<.02	<.5	30	50	76A	<10	<10	.03	<5	<50	5	2	20

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm) Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Percent Fe	Ti	Ca	F	Chem. analyses ppm cxHM
							Stream sediments--sieved--Continued							
385	2	30	50	1,000	700	50	500	200	1,000	5	0.7	0.7	--	3
386	1	50	20	700	200	30	300	150	3,000	3	.5	.7	--	25
387	2	30	50	>1,000	700	70	500	300	1,000	5	.7	.7	--	1
388	3	30	70	>1,000	700	70	300	300	1,500	15	1	.7	--	1
389	3	30	70	>1,000	700	100	300	300	1,500	10	.7	.7	--	.5
390	3	50	50	>1,000	500	100	300	200	700	7	.7	.7	--	.5
391	3	50	50	700	700	70	500	200	700	3	.3	1	--	1
392	2	30	20	700	1,000	50	500	300	700	3	.3	1	--	1
393	3	30	30	1,000	300	50	700	200	500	3	.5	.7	--	2
394	2	30	20	>1,000	200	20	300	200	500	2	.3	1	--	4
395	3	30	30	>1,000	700	100	300	200	700	3	.5	1	--	2
396	3	30	50	>1,000	150	70	700	300	500	3	.5	.7	--	.5
397	5	70	70	>1,000	700	150	300	150	500	3	.7	.7	--	.5
398	3	20	<10	150	20	15	500	150	700	1	.15	1	--	5
399	3	20	15	300	150	20	700	300	500	2	.2	.7	--	2
400	3	30	30	1,000	200	30	700	200	700	3	.3	.5	--	2
401	3	20	20	300	150	50	500	150	700	3	.2	.7	--	2
402	2	15	10	150	30	7	700	300	500	2	.15	.7	--	2
403	3	20	30	700	200	50	500	200	700	3	.3	1	--	1
404	1.5	50	10	300	30	7	700	100	1,000	2	.2	.5	--	25
405	3	50	70	>1,000	700	100	300	150	700	3	.5	.7	--	.5
406	5	30	150	500	70	30	1,000	300	700	3	.3	.7	--	9
408	5	30	70	300	150	50	700	500	700	2	.3	1	--	3
410	3	50	20	200	70	30	700	500	700	3	.3	1	--	3
411	3	50	15	300	70	50	700	300	700	3	.3	1	--	14
414	2	50	10	150	20	15	500	70	700	2	.2	.7	--	2
415	2	50	15	150	30	20	700	300	500	2	.2	1	--	9
416	3	30	10	100	50	30	700	150	700	1.5	.15	1	--	25
417	1.5	30	<10	100	30	15	500	150	700	.7	.15	1	--	9
418	2	30	30	150	70	20	700	300	500	1.5	.2	.5	--	7
422	1	50	15	300	30	15	500	300	300	2	.3	.7	--	2
423	3	20	100	200	150	30	700	500	700	1.5	.2	.7	--	5
424	3	30	20	200	150	15	300	100	1,000	1.5	.2	.7	--	14
425	3	50	30	300	150	20	700	300	700	2	.2	.7	--	9
427	3	50	20	200	100	20	500	200	500	2	.2	.7	--	4
429	3	50	15	150	70	15	500	200	700	2	.2	.7	--	5
430	2	30	50	200	30	20	500	150	700	2	.15	.7	--	5
431	3	50	15	200	50	20	300	300	700	2	.2	.5	--	17
433*	3	20	15	100	70	15	300	70	700	1	.15	.5	--	19
435	2	30	10	70	30	15	300	70	500	1	.1	.5	--	14
436	2	50	15	150	50	15	500	100	700	2	.15	.5	--	7
437	1	30	30	300	100	20	700	500	500	3	.3	.7	--	2
438	1.5	30	10	100	20	15	200	50	150	1	.15	.5	--	1
439	3	30	50	200	70	20	1,000	300	300	1.5	.15	.5	--	3
440	2	50	50	200	100	30	700	700	700	3	.3	.7	--	.5
441	2	30	50	200	100	50	700	700	700	3	.3	.7	--	4
442	2	70	50	700	150	30	700	700	700	3	.7	1	--	3
446	1.5	50	30	300	150	20	1,000	700	700	3	.5	.7	--	7
447	2	50	50	300	200	20	700	500	700	3	.5	.7	--	2
448	1	50	30	200	100	30	700	300	500	3	.5	.7	--	.5
449	2	50	50	300	150	20	700	300	700	3	.3	.7	--	.5
450	2	50	30	200	150	30	500	200	700	2	.3	.7	--	5
451	2	50	20	200	100	20	700	300	700	3	.3	1	--	2
452	2	50	50	30C	200	30	700	700	700	3	.5	1	--	3
453	2	30	30	200	100	15	1,000	700	500	2	.3	1	--	.5
454	2	30	20	100	70	15	1,500	700	700	3	.3	1	--	2
455	2	30	30	300	70	20	1,500	700	700	2	.2	1	--	2
457	2	30	50	200	150	30	1,500	700	700	3	.3	1	--	.5
458	2	30	50	300	150	30	1,000	700	700	3	.5	1	--	2
459	2	30	20	300	100	15	1,500	700	700	3	.5	1	--	.5

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
			Semiquantitative spectrographic analyses (ppm)											
				Stream sediments--sieved--Continued										
460	10-11-22	<.02	10	20	50	25A	<10	<10	0.01	<5	<50	<5	<2	15
461	10-11-21	<.02	<.5	20	50	48A	<10	<10	.03	<5	<50	<5	3	7
462	10-11-21	<.02	<.5	30	70	96A	<10	<10	.05	5	<50	10	30	70
463	10-11-28	<.02	<.5	30	50	40A	<10	<10	.03	<5	<50	5	15	70
464	10-11-28	<.02	<.5	15	50	56A	<10	<10	.03	<5	<50	5	<2	20
465	10-11-28	<.02	<.5	20	50	52A	<10	<10	.03	<5	<50	<5	3	10
466	10-12-34	.1	.5	30	150	200A	<10	<10	.04	10	<50	7	20	70
467	10-12-34	<.02	<.5	30	70	60A	<10	<10	.03	30	<50	5	20	70
468	10-12-34	<.02	<.5	30	100	80A	<10	<10	.07	5	<50	10	20	70
470	10-12-34	<.1	<.5	30	70	50A	<10	<10	.05	10	<50	7	30	70
471*	10-12-34	<.02	<.5	30	70	40A	<10	<10	.03	7	<50	5	20	70
473	10-12-33	<.02	<.5	30	70	88A	<10	<10	.04	<5	<50	7	10	70
474	10-12-33	--	<.5	20	30	96A	<10	<10	.03	<5	<50	5	2	50
475	10-12-33	--	<.5	15	15	42A	<10	<10	.14	<5	<50	<5	3	30
476	9-12-5	<.02	<.5	30	70	66A	<10	<10	.07	<5	<50	7	15	30
477	9-12-22	<.02	<.5	50	100	80A	<10	<10	.07	<5	<50	10	15	50
478	9-12-22	<.02	<.5	30	70	52A	<10	<10	.07	<5	<50	7	2	30
479	9-12-22	<.02	<.5	15	70	60A	<10	<10	.07	<5	<50	<5	3	30
480	9-12-22	<.1	<.5	30	50	42A	<10	<10	.03	<5	<50	5	3	15
481	9-12-22	<.1	<.5	20	20	44A	<10	<10	.09	<5	<50	<5	<2	15
482	9-12-21	<.02	<.5	70	70	88A	<10	<10	.04	<5	<50	20	70	100
483	9-12-16	<.02	<.5	30	50	62A	<10	<10	.04	<5	<50	7	3	30
484	9-12-16	.24	<.5	15	50	48A	<10	<10	.01	<5	<50	10	7	30
485	9-12-16	.1	<.5	20	70	64A	<10	<10	.01	<5	<50	10	10	50
486	9-12-9	<.02	<.5	7	30	52A	<10	<10	.03	<5	<50	5	5	15
487	9-12-9	.2	<.5	30	70	60A	<10	<10	.01	<5	<50	7	2	20
488	9-12-17	<.02	<.5	30	100	80A	<10	<10	.03	<5	<50	5	30	30
489	9-12-8	<.1	<.5	10	70	66A	<10	<10	.03	<5	<50	<5	3	20
490	9-12-8	<.02	<.5	20	70	66A	<10	<10	.03	<5	<50	5	15	20
491	9-12-8	<.02	<.5	20	50	68A	<10	<10	.04	<5	<50	<5	3	20
492	9-12-7	.4	<.5	20	70	76A	<10	<10	.04	<5	<50	5	5	20
493	9-11-12	.3	<.5	30	70	78A	<10	<10	.07	<5	<50	10	7	30
494	9-12-30	<.02	<.5	20	50	52A	<10	<10	.03	<5	<50	7	10	30
495	9-12-30	<.1	<.5	15	30	110A	<10	<10	.07	<5	<50	5	5	20
496	9-12-20	.04	<.5	15	20	140A	<10	<10	.16	<5	<50	<5	3	10
497	9-12-19	.1	<.5	10	30	58A	<10	<10	.01	<5	<50	<5	2	10
498	9-12-19	<.02	<.5	15	20	80A	<10	<10	.07	<5	<50	5	7	30
499	9-12-19	<.02	<.5	10	50	56A	<10	<10	.04	<5	<50	5	5	20
500	8-12-6	<.02	<.5	30	100	67A	<10	<10	.2	<5	<50	15	50	100
513	7-13-17	<.1	<.5	30	30	100A	<10	<10	.2	2	<100	15	15	70
515	7-13-16	<.1	<.5	30	50	54A	<10	<10	--	<2	<100	10	10	50
531	10-12-8	<.1	<.5	15	70	74A	<10	<10	.2	2	<100	15	3	15
532	10-12-7	<.1	<.5	30	70	83A	<10	<10	.24	<2	<100	10	5	30
535A	11-12-33	<.1	<.5	10	50	68A	<10	<10	.24	3	<100	5	2	30
544	8-13-34	<.1	<.5	15	70	70A	<10	<10	.3	<2	<100	7	3	50
545	8-13-34	<.1	.5	10	100	110A	<10	<10	.2	<2	<100	5	2	30
547	8-13-27	<.1	<.5	20	50	105A	<10	<10	.24	<2	<100	7	3	50
548	8-13-27	<.1	<.5	7	50	165A	<10	<10	.14	30	<100	<5	<2	15
552	6-13-5	<.1	<.5	10	20	165A	<10	<10	.23	15	<100	<5	2	20
553	6-13-9	<.1	<.5	5	30	160A	<10	<10	.19	<2	<100	5	5	20
554	6-13-9	<.1	<.5	15	30	90A	<10	<10	.08	<2	<100	5	3	15
555	6-13-4	<.1	<.5	7	50	80A	<10	<10	.03	<2	<100	5	3	15
556	6-13-4	<.1	<.5	20	150	275A	<10	<10	.06	<2	<100	7	7	50
557	7-13-34	<.1	<.5	5	15	65A	<10	<10	.39	<2	<100	<5	<2	15
558	7-13-35	<.1	<.5	15	100	110A	<10	<10	.06	<2	<100	<5	3	20
570	6-12-11	--	<.5	15	20	<200	<10	<10	--	10	<100	<5	<2	<5
592	6-12-29	<.1	<.5	15	100	65A	<10	<10	.09	<2	<100	5	7	30
593	6-12-29	<.1	<.5	15	70	40A	<10	<10	.06	<2	<100	<5	5	20
594	6-12-29	<.1	<.5	15	30	35A	<10	<10	.17	<2	<100	5	2	30
595	6-12-28	<.1	<.5	30	150	100A	<10	<10	.08	2	<100	10	<2	20

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent				Chem. analyses ppm
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Stream sediments--sieved--Continued									
460	1.5	30	70	300	200	30	1,000	700	700	3	0.3	0.7	--	0.5
461	3	15	20	150	<20	5	700	300	300	1	.07	.5	--	5
462	3	50	30	200	70	30	700	700	1,000	3	.7	1	--	7
463	2	30	20	300	50	20	1,000	500	700	1.5	.15	.7	--	2
464	2	50	30	300	150	20	1,000	500	700	3	.2	.7	--	2
465	3	30	20	150	50	15	700	700	700	1.5	.2	1	--	3
466	20	70	15	100	70	30	700	300	700	3	.3	1	--	40
467	5	50	30	150	50	20	1,000	700	700	2	.3	1	--	3
468	7	50	50	150	150	30	700	300	700	2	.2	.7	--	5
470	3	50	50	300	50	30	700	300	700	3	.3	1	--	2
471*	2	30	20	300	100	30	700	500	500	2	.3	1	--	2
473	5	70	30	200	70	20	700	500	700	3	.3	1	--	3
474	7	70	20	300	70	30	700	500	700	2	.5	1.5	--	--
475	1	30	10	50	70	20	300	70	300	.7	.1	.7	--	2
476	7	50	70	300	70	50	700	700	700	3	.5	1	--	3
477	3	50	30	300	100	20	700	500	1,000	3	.3	.7	--	3
478	3	30	20	700	150	30	1,000	700	700	3	.5	1	--	3
479	5	20	20	300	70	30	300	150	500	1.5	.3	1	--	2
480	3	20	20	700	150	30	1,000	500	700	3	.5	1	--	.5
481	2	30	15	300	50	15	300	100	500	1.5	.3	.7	--	2
482	2	100	30	500	100	30	700	700	1,000	3	1	1	--	3
483	1.5	50	70	500	200	100	700	700	700	3	.7	1	--	1
484	2	30	30	500	150	30	700	500	700	3	.5	1	--	.5
485	3	50	50	500	100	50	500	500	700	2	.5	1	--	3
486	2	30	30	300	50	20	700	500	500	2	.2	.7	--	1
487	3	30	50	500	100	30	700	700	700	2	.3	1	--	.5
488	2	50	70	300	100	30	700	700	700	2	.3	.7	--	3
489	3	50	30	300	70	30	700	700	500	2	.2	1	--	4
490	2	30	50	200	100	30	700	500	700	2	.3	.7	--	2
491	2	30	50	300	70	30	700	500	500	2	.2	.7	--	2
492	1.5	30	30	200	70	30	700	500	700	2	.2	.7	--	1
493	2	30	70	500	100	30	700	500	700	3	.3	.7	--	3
494	2	20	20	300	100	20	700	700	700	2	.3	.7	--	4
495	5	50	70	300	150	30	500	200	700	2	.3	.5	--	5
496	1	15	15	100	70	7	300	200	500	.7	.15	.5	--	45
497	2	20	30	150	70	20	700	700	500	1.5	.2	.5	--	1
498	2	30	30	150	70	30	300	300	500	1.5	.2	.7	--	7
499	3	30	70	300	150	30	700	500	700	2	.3	.5	--	.5
500	3	70	30	300	150	30	300	300	1,000	3	.3	1.5	--	2
513	7	100	10	300	20	30	700	500	1,000	5	.5	1.5	--	4
515	10	70	10	300	70	30	700	300	500	3	.5	2	--	.5
531	10	50	30	>1,000	300	100	700	500	500	7	1	1.5	--	.5
532	7	70	30	>1,000	1,000	100	700	500	700	7	.7	1.5	--	.5
535A	7	50	30	>1,000	200	50	700	500	500	3	.7	1.5	--	.5
544	5	70	15	700	200	70	2,000	1,500	1,000	5	.7	1.5	--	4
545	3	50	10	200	100	150	1,500	1,500	1,000	5	.3	1.5	--	7
547	5	70	15	>1,000	300	70	3,000	2,000	1,000	5	.5	2	--	8
548	10	20	50	200	50	50	300	150	500	3	.15	1	.11	8
552	20	70	<10	100	30	150	300	70	500	1.5	.2	1.5	--	2
553	1	70	10	300	70	20	1,500	1,000	1,000	5	.5	1.5	--	16
554	1	50	15	300	100	20	1,000	1,500	200	3	.3	1.5	--	2
555	2	50	<10	300	50	15	1,500	1,500	700	5	.5	1.5	--	2
556	1	50	10	300	70	20	1,500	2,000	1,000	7	.3	1.5	--	22
557	2	50	15	300	150	20	700	1,500	300	2	.3	1.5	--	4
558	1.5	70	10	150	100	20	2,000	3,000	500	5	.5	1.5	--	2
570	5	30	15	300	30	7	1,500	500	200	3	.3	1.5	--	--
592	2	30	15	100	20	15	2,000	2,000	700	5	.3	2	--	2
593	2	30	20	200	50	15	2,000	1,500	300	3	.3	1.5	--	.5
594	1	50	15	200	70	20	2,000	1,500	500	5	.5	1.5	--	2
595	10	70	15	700	150	20	1,000	700	1,000	5	.7	1.5	--	2

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Stream sediments--sieved--Continued												
596	6-12-21	<0.1	<0.5	10	50	110A	<10	<10	0.2	<2	<100	<5	<2	10
598	7-12-22	<.1	.7	20	20	55A	<10	<10	.39	5	<100	<5	2	20
600	7-12-29	<.1	<.5	50	30	75A	<10	<10	.28	7	<100	5	15	70
601	7-12-28	<.1	.5	20	30	90A	<10	<10	.39	2	<100	<5	3	30
602	7-12-28	<.1	<.5	30	50	125A	<10	<10	.35	<2	<100	7	10	30
603	7-12-28	<.1	<.5	30	50	100A	<10	<10	.39	10	<100	7	3	30
604	7-12-33	<.1	<.5	30	30	65A	<10	<10	.52	2	<100	<5	5	30
605	7-12-34	<.1	<.5	30	30	155A	<10	<10	.34	7	<100	<5	5	20
606	7-12-34	<.1	<.5	10	30	95A	<10	<10	.28	5	<100	5	3	30
608	7-12-35	<.1	<.5	50	50	110A	<10	<10	.14	10	<100	7	7	50
609	7-12-35	<.1	<.5	30	50	95A	<10	<10	.04	15	<100	10	10	30
610	7-12-36	<.1	<.5	30	50	100A	<10	<10	.19	5	<100	7	7	30
611	7-12-15	<.1	<.5	50	50	125A	<10	<10	.13	3	<100	15	30	100
612	7-12-10	--	<.5	20	30	<200	<10	<10	--	2	<100	<5	<2	20
613	7-12-10	<.1	<.5	50	50	135A	<10	<10	.2	10	<100	10	20	100
614	7-12-9	<.1	<.5	20	50	100A	<10	<10	.22	15	<100	7	20	100
615	7-12-9	<.1	<.5	30	30	80A	<10	<10	.29	<2	<100	5	20	50
616	7-12-16	<.1	<.5	50	30	120A	<10	<10	.37	3	<100	10	15	70
617	7-12-22	<.1	.5	20	30	85A	<10	<10	.52	<2	<100	5	10	50
618	7-12-15	<.1	<.5	15	50	110A	<10	<10	.23	<2	<100	5	10	30
619	7-12-15	<.1	<.5	20	20	210A	<10	<10	.33	<2	<100	5	7	50
623	7-12-13	--	<.5	10	20	<200	<10	<10	--	<2	<100	<2	<2	30
625	7-12-24	--	.7	20	50	<200	<10	<10	--	2	<100	5	5	30
626	7-12-4	<.1	<.5	20	30	140A	<10	<10	.24	3	<100	5	5	20
627	8-12-33	<.1	<.5	15	50	75A	<10	<10	.11	20	<100	15	15	150
628	8-12-33	<.1	.7	30	100	100A	<10	<10	.28	20	<100	7	7	30
629	8-12-33	<.1	<.5	30	70	270A	<10	<10	.33	15	<100	5	7	50
630	7-12-4	<.1	.5	15	70	125A	<10	<10	.16	30	<100	5	5	30
631	7-12-4	<.1	<.5	20	70	125A	<10	<10	.16	<2	<100	5	15	50
632	7-12-8	<.1	<.5	30	100	115A	<10	<10	.44	2	<100	10	10	50
633	7-12-7	<.1	<.5	20	100	95A	<10	<10	.16	<2	<100	7	10	50
634	7-12-7	<.1	<.5	50	70	245A	<10	<10	.32	<2	<100	5	10	50
635	7-12-18	<.1	<.5	15	30	95A	<10	<10	.16	5	<100	5	7	50
637	7-12-18	--	<.5	15	30	80A	<10	<10	.39	<2	<100	<5	5	20
638	7-12-18	<.1	<.5	50	50	115A	<10	<10	.2	<2	<100	5	5	30
639	6-11-1	<.1	<.5	15	20	65A	<10	<10	.17	3	<100	<5	7	70
640	6-11-1	--	<.5	20	100	200A	<10	<10	.19	<2	<100	10	20	300
641	6-11-1	<.1	<.5	15	30	125A	<10	<10	.13	<2	<100	<5	2	30
642	6-11-1	--	<.5	20	50	95A	<10	<10	.33	<2	<100	5	2	20
643	6-11-2	<.1	<.5	20	100	115A	<10	<10	.37	5	<100	7	7	30
644	6-11-12	--	1.5	20	100	125A	<10	<10	.33	7	<100	<5	7	50
645	6-11-11	<.1	<.5	30	70	165A	<10	<10	.16	<2	<100	7	5	30
646	6-11-11	<.1	<.5	15	50	145A	<10	<10	.08	<2	<100	5	5	30
647	6-11-15	--	.5	15	30	195A	<10	<10	.19	<2	<100	<5	2	30
648	6-11-14	--	<.5	15	100	<200	<10	<10	--	<2	<100	5	10	100
649	6-11-14	<.1	<.5	20	30	220A	<10	<10	.09	<2	<100	10	7	30
650	6-11-11	<.1	<.5	7	10	560A	<10	<10	.48	<2	<100	<5	<2	5
653	6-11-28	--	<.5	20	50	140A	<10	<10	--	<2	<100	7	10	30
662	6-11-18	--	<.5	10	30	155A	<10	<10	.23	<2	<100	<5	<2	15
663	6-11-7	<.1	<.5	20	50	140A	<10	<10	.05	<2	<100	5	5	20
664	6-11-7	<.1	<.5	30	70	200A	<10	<10	.09	<2	<100	7	10	30
665	6-11-6	<.1	<.5	30	70	315A	<10	<10	.03	<2	<100	5	3	7
666	6-11-6	--	<.5	15	100	205A	<10	<10	.19	<2	<100	10	7	50
667	6-11-7	<.1	1.5	20	150	215A	<10	<10	.06	<2	<100	10	7	50
673	6-11-18	--	.5	10	50	<200	<10	<10	--	<2	<100	<5	2	20
840	8-13-24	<.1	<.5	30	70	73A	<10	<10	.12	<5	<50	7	7	15
841	8-13-13	--	<.5	15	30	41A	<10	<10	.32	<5	<50	<5	2	20
842	8-13-23	.05	<.5	30	70	140A	<10	<10	.12	<5	<50	<5	3	20
844	8-13-15	<.02	<.5	30	100	90A	<10	<10	.03	<5	<50	<5	5	15
845	8-13-15	<.02	<.5	20	70	140A	<10	<10	.05	<5	<50	<5	3	20

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
Stream sediments--sieved--Continued														
596	10	50	10	300	100	20	700	200	700	1.5	0.3	2	--	22
598	70	30	15	150	30	70	200	70	1,500	2	.2	1.5	.16	12
600	15	50	15	200	100	30	1,000	700	500	3	.3	1.5	--	1
601	15	30	20	150	50	30	700	300	1,000	2	.3	1.5	--	5
602	30	50	50	200	100	30	700	300	1,500	3	.5	1.5	--	5
603	50	50	70	500	70	50	700	300	1,500	5	.5	1.5	.1	8
604	30	50	20	100	30	50	500	150	1,500	3	.3	1.5	--	8
605	20	50	15	300	50	30	500	300	1,000	3	.3	1.5	--	9
606	50	50	50	300	50	30	700	300	1,500	3	.5	1.5	.05	5
608	15	70	30	300	50	30	1,500	1,500	1,000	5	.7	3	--	4
609	15	70	30	500	100	30	2,000	2,000	1,000	7	.7	3	--	2
610	15	50	20	500	70	30	1,500	3,000	700	3	.7	3	--	3
611	15	70	15	300	50	200	700	700	1,000	7	.7	1.5	--	2
612	20	30	20	150	30	50	300	100	1,000	1.5	.3	1.5	--	5
613	15	70	15	300	30	30	700	500	1,000	7	.7	1.5	--	3
614	15	70	20	300	30	30	500	200	1,500	3	.5	1.5	--	4
615	15	50	10	300	30	30	700	300	500	2	.7	1.5	--	2
616	15	70	15	200	50	30	700	200	700	3	.5	1.5	--	2
617	15	50	15	300	30	50	700	300	500	3	.5	1.5	--	2
618	20	50	30	300	70	30	700	300	700	2	.3	1.5	--	2
619	50	50	30	200	50	30	500	200	1,500	2	.3	1.5	.16	12
623	7	30	10	100	30	30	500	150	200	1.5	.3	1.5	--	2
625	1	50	70	300	30	150	300	300	2,000	3	.3	1.5	--	--
626	30	50	15	150	50	100	500	100	700	3	.3	1.5	.16	1
627	30	50	100	200	70	50	500	500	5,000	5	.5	1.5	.07	2
628	20	50	30	200	70	50	700	200	5,000	3	.5	1.5	.13	5
629	50	50	150	500	50	30	300	300	1,500	3	.5	1.5	.14	8
630	30	50	300	200	50	50	300	300	3,000	3	.5	1.5	.08	3
631	30	50	50	200	70	50	300	500	1,500	2	.3	3	--	4
632	15	70	30	300	50	30	700	700	2,000	5	.5	1.5	.19	2
633	15	50	50	300	50	30	700	300	3,000	5	.5	1.5	--	2
634	20	50	70	300	70	30	1,000	700	1,500	3	.5	2	--	5
635	20	50	10	200	50	30	700	300	1,000	2	.5	1.5	--	4
637	15	50	15	200	30	15	700	500	1,000	3	.3	2	--	10
638	30	50	20	200	300	30	1,000	1,000	1,500	3	.5	2	--	8
639	3	50	<10	200	30	20	700	500	700	3	.5	2	--	2
640	3	50	15	200	70	30	1,000	700	1,500	5	.5	3	--	2
641	7	50	10	150	50	30	700	700	1,000	3	.3	3	--	4
642	5	50	50	500	100	30	1,000	500	1,000	3	.5	2	--	4
643	10	50	50	300	100	30	700	700	1,000	5	.5	3	--	5
644	7	50	30	300	70	30	1,500	700	500	2	.7	3	--	4
645	10	70	70	1,000	100	50	1,000	1,000	1,000	5	.7	3	--	2
646	10	50	20	200	50	30	1,000	500	1,500	3	.5	2	--	2
647	10	30	<10	100	30	50	300	200	500	1	.3	3	--	5
648	7	50	<10	200	70	30	700	700	2,000	5	.5	3	--	5
649	3	50	15	300	30	20	1,000	700	1,000	3	.5	3	--	8
650	1	15	<10	50	20	7	300	50	1,500	.3	.15	2	--	57
653	5	50	15	300	50	30	1,500	700	700	3	.5	1.5	--	2
662	2	30	15	300	70	30	700	500	700	1	.2	3	--	8
663	1	50	20	300	70	20	1,000	700	700	3	.3	2	--	2
664	1	50	15	200	50	15	1,000	700	1,000	3	.3	2	--	12
665	1	20	15	200	70	10	1,500	1,000	500	2	.3	1.5	--	.5
666	1	30	15	150	20	10	1,000	700	1,000	3	.3	1.5	--	2
667	2	30	30	300	30	20	1,000	1,000	700	5	.5	1.5	--	2
673	2	20	15	200	70	30	1,000	500	500	2	.2	3	--	2
840	7	20	50	300	50	30	150	100	2,000	2	.15	.5	--	25
841	30	20	15	150	30	30	150	50	300	1.5	.1	.5	--	17
842	30	15	10	70	100	70	100	70	1,000	1	.1	.7	--	>90
844	15	20	30	150	70	200	150	70	300	1.5	.15	.5	--	--
845	10	30	30	150	30	30	150	150	300	1.5	.15	.5	--	17

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
						Stream sediments--sieved--Continued								
847	10-13-19	0.04	<0.5	30	70	90A	<10	<10	0.04	<5	<50	15	50	70
848	10-13-30	<.02	<.5	20	20	67A	<10	<10	.03	<5	<50	<5	15	50
849	10-13-31	<.1	<.5	50	50	140A	<10	<10	.04	<5	<50	15	70	100
850	10-13-31	<.02	<.5	70	70	110A	<10	<10	.24	<5	<50	20	100	300
852	10-13-29	<.1	<.5	30	30	110A	<10	<10	.05	<5	<50	<5	20	30
853	10-12-24	--	<.5	10	15	68A	<10	<10	.04	<5	<50	<5	<2	5
854	10-12-24	<.1	<.5	30	20	77A	<10	<10	.05	<5	<50	<5	2	15
856	10-12-25	<.1	<.5	30	30	79A	<10	<10	.04	<5	<50	5	30	30
857	10-12-25	<.02	<.5	70	70	150A	<10	<10	.04	7	<50	15	70	70
858	10-12-23	--	<.5	30	70	66A	<10	<10	.05	<5	<50	<5	15	15
860	11-12-34	<.1	<.5	20	30	100A	<10	<10	.22	<5	<50	<5	2	30
861	11-12-34	<.02	<.5	30	50	40A	<10	<10	.12	<5	<50	7	5	70
862	11-12-35	--	<.5	15	20	70A	<10	<10	.16	<5	<50	<5	3	50
863	11-12-35	<.1	<.5	20	30	64A	<10	<10	.09	<5	<50	<5	7	30
864	10-12-2	<.02	<.5	20	50	32A	<10	<10	.05	<5	<50	5	2	30
866	10-11-35	<.02	<.5	15	100	52A	<10	<10	.03	<5	<50	5	2	15
867	10-11-35	.06	.7	7	70	44A	<10	<10	.03	5	<50	<5	<2	30
868	10-11-36	<.02	<.5	15	30	68A	<10	<10	.07	<5	<50	<5	3	50
869	10-11-36	<.1	<.5	5	<10	28A	<10	<10	.09	<5	<50	<5	2	30
870	10-11-36	<.1	<.5	15	150	100A	<10	<10	.07	<5	<50	<5	2	20
871	10-12-31	<.02	<.5	30	70	72A	<10	<10	.03	<5	<50	7	10	30
872	10-12-31	<.1	<.5	15	150	120A	<10	<10	.12	<5	<50	5	7	30
873	10-12-31	<.02	<.5	30	70	96A	<10	<10	.1	<5	<50	7	10	30
875	10-12-19	<.02	<.5	20	100	180A	<10	<10	.1	<5	<50	<5	7	20
879	10-12-19	.02	<.5	20	100	160A	<10	<10	.07	5	<50	5	10	30
890	10-11-24	<.02	<.5	15	100	54A	<10	<10	.07	<5	<50	5	10	30
891	10-11-24	<.02	<.5	20	70	60A	<10	<10	.05	<5	<50	5	7	30
892	10-11-24	<.02	<.5	20	50	80A	<10	<10	.07	<5	<50	<5	5	30
893	10-11-24	<.1	<.5	15	70	72A	<10	<10	.04	<5	<50	<5	2	15
894	10-11-24	<.02	<.5	30	70	68A	<10	<10	.03	<5	<50	<5	2	7
895	10-11-25	<.02	<.5	15	30	88A	<10	<10	.05	<5	<50	<5	3	15
896	10-11-35	<.02	<.5	10	50	58A	<10	<10	.04	<5	<50	<5	2	10
898	10-11-35	<.02	<.5	20	70	80A	<10	<10	.04	<5	<50	<5	10	20
899	10-12-28	<.02	<.5	30	70	54A	<10	<10	.12	<5	<50	<5	7	20
902	10-12-34	--	<.5	<2	10	110A	<10	<10	--	<5	<50	<5	2	5
907	10-12-33	<.02	<.5	70	70	120A	<10	<10	.04	<5	<50	7	2	30
908	10-12-33	.04	<.5	70	70	110A	<10	<10	.03	<5	<50	10	3	30
909	10-12-33	.04	<.5	70	70	76A	<10	<10	.03	<5	<50	7	3	50
910	10-12-32	<.02	<.5	30	70	120A	<10	<10	.09	<5	<50	7	7	50
912	9-12-5	<.02	<.5	30	70	110A	<10	<10	.09	<5	<50	10	3	30
913	9-12-5	<.02	<.5	50	50	60A	<10	<10	.03	<5	<50	7	5	50
915	9-12-17	<.02	<.5	30	50	60A	<10	<10	.04	<5	<50	7	3	30
919	9-11-11	<.02	<.5	30	50	60A	<10	<10	.04	<5	<50	7	3	30
920	9-12-7	<.02	<.5	70	70	60A	<10	<10	.05	<5	<50	7	5	30
923	9-11-13	<.02	<.5	50	50	56A	<10	<10	.05	<5	<50	7	5	30
925	9-11-14	<.02	<.5	30	50	44A	<10	<10	.03	<5	<50	5	7	30
926	9-11-14	.04	<.5	20	70	40A	<10	<10	.05	<5	<50	<5	7	15
927	9-11-11	<.1	<.5	15	30	<200	<10	<10	.18	<5	<50	<5	3	7
929	8-12-7	<.02	<.5	15	70	59A	<10	<10	.12	5	<50	<5	3	20
931	8-12-7	<.02	<.5	30	70	100A	<10	<10	.22	7	50	5	10	30
932	8-12-7	<.02	<.5	20	50	32A	<10	<10	.2	<5	<50	<5	<2	7
933	8-12-7	--	<.5	7	15	50A	<10	<10	.4	<5	<50	<5	<2	10
935	8-12-6	<.02	<.5	30	50	65A	<10	<10	.2	<5	<50	<5	15	15
936	9-11-36	<.02	<.5	30	70	120A	<10	<10	.16	<5	<50	7	15	30
937	9-11-23	<.02	<.5	30	50	60A	<10	<10	<.01	<5	<50	5	7	15
942	8-11-14	.05	<.5	10	30	70A	<10	<10	.36	<5	<50	<5	<2	10
943	8-11-13	<.02	<.5	20	70	44A	<10	<10	.3	<5	<50	<5	7	30
944	8-11-12	<.02	<.5	30	70	100A	<10	<10	.28	<5	<50	5	5	30
945	8-11-12	<.1	<.5	15	30	74A	<10	<10	.36	<5	<50	<5	<2	15
947	9-11-28	--	<.5	15	30	32A	<10	<10	--	<5	<50	<5	2	<5

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent				Chem. analyses ppm
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Stream sediments--sieved--Continued									
847	1	70	15	300	50	20	300	300	1,000	3	0.7	1	--	5
848	2	50	15	200	70	15	200	150	700	1.5	.3	1	--	7
849	2	70	15	200	70	20	200	150	700	2	.5	1.5	--	19
850	<1	100	10	100	50	20	150	150	1,000	5	1	3	--	7
852	1	20	10	70	20	15	150	50	700	1.5	.2	1	--	25
853	<1	15	<10	30	20	5	70	<50	1,000	.15	.05	1	--	--
854	2	30	<10	100	50	30	150	50	700	1	.15	1	--	25
856	1	70	10	100	50	20	150	100	500	1.5	.2	2	--	9
857	2	100	15	150	30	30	300	300	700	3	.3	1.5	--	5
858	1	30	<10	70	30	20	70	<50	700	1	.07	.5	--	25
860	1	20	<10	50	30	7	150	70	700	1.5	.15	.7	--	20
861	2	30	20	700	200	30	700	500	700	2	.7	1	--	2
862	3	20	<10	150	50	15	300	100	300	1.5	.2	.7	--	7
863	2	30	10	300	70	15	500	200	500	1.5	.3	1	--	7
864	3	20	30	700	150	50	700	300	700	2	.3	1	--	2
866	3	30	50	150	70	30	1,000	700	700	1.5	.2	.7	--	2
867	5	30	150	300	70	70	1,000	700	700	1.5	.2	.7	--	4
868	2	20	15	150	70	20	700	200	700	1.5	.1	.7	--	5
869	<1	15	<10	15	50	10	150	70	300	.2	.03	1	--	4
870	3	30	30	100	50	10	500	300	700	1.5	.15	.7	--	20
871	2	50	30	200	70	20	1,000	700	700	2	.3	.5	--	7
872	10	50	30	150	70	15	700	300	1,000	1.5	.2	1	--	30
873	3	50	30	150	70	30	700	300	1,000	2	.3	1	--	5
875	7	30	20	100	20	10	500	100	700	1.5	.15	.5	--	9
879	5	30	50	200	50	20	700	300	700	1.5	.15	.5	--	9
890	1	30	50	300	30	30	700	500	700	2	.2	.5	--	2
891	1.5	70	20	300	70	30	700	300	700	1.5	.3	.7	--	.5
892	1.5	50	15	150	50	20	700	300	700	1.5	.2	1	--	5
893	2	30	30	200	30	30	700	300	700	1.5	.2	.7	--	4
894	2	20	30	200	70	20	700	700	700	1.5	.15	.5	--	<.5
895	3	30	30	200	70	30	500	150	700	1	.1	1	--	5
896	5	30	50	150	50	30	700	500	500	1.5	.15	.7	--	2
898	2	30	50	300	70	20	1,000	700	700	2	.3	.7	--	5
899	3	30	15	150	20	10	500	150	300	1.5	.2	.5	--	2
902	1	20	<10	20	30	7	150	<50	500	.01	.07	.7	--	--
907	2	50	50	700	150	30	700	700	700	3	.5	1.5	--	1
908	2	50	30	700	100	30	1,000	700	700	3	.5	1.5	--	2
909	2	70	50	700	70	30	700	700	700	3	.5	1.5	--	1
910	3	70	30	500	100	30	700	700	700	2	.3	1	--	25
912	2	70	70	300	70	30	700	500	700	3	.3	1	--	9
913	2	70	70	700	100	50	700	700	500	3	.5	1	--	2
915	3	70	70	1,000	150	50	1,000	700	300	2	.5	1	--	1
919	2	70	100	700	150	100	700	700	500	3	.5	1	--	2
920	3	70	70	700	150	100	1,000	700	700	2	.5	1	--	1
923	3	70	100	700	200	70	700	700	700	3	.5	1	--	.5
925	5	30	150	500	200	50	700	300	700	1.5	.3	.7	--	2
926	2	30	20	200	70	15	700	500	300	1.5	.2	.5	--	2
927	1	30	<10	100	50	7	700	100	700	.3	.15	.7	--	45
929	15	30	150	300	70	30	70	50	1,500	2	.2	.5	--	3
931	15	30	300	300	150	30	300	200	1,500	1.5	.3	.5	--	19
932	7	20	50	300	150	30	70	70	1,000	1.5	.2	.3	--	5
933	5	15	<10	20	20	15	30	50	300	.1	.05	1	--	7
935	10	30	100	300	150	20	150	150	1,000	1.5	.3	.5	--	4
936	3	50	20	300	50	20	300	200	700	1.5	.3	.5	--	9
937	3	50	20	300	70	20	500	500	700	2	.3	.7	--	2
942	2	30	<10	50	<20	5	150	<50	700	.3	.1	.3	--	14
943	5	30	30	100	50	15	200	100	700	1.5	.15	.5	--	3
944	7	50	70	300	50	30	200	100	700	1	.3	.7	--	9
945	7	30	70	200	50	30	150	100	700	.7	.15	.7	--	19
947	2	15	<10	30	<20	<5	70	<50	100	.3	.07	.2	--	--

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm)												
		Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
					Stream sediments--sieved--Continued									
948	9-11-29	<0.02	<0.5	30	70	63A	<10	<10	0.18	<5	<50	5	7	30
949	9-11-29	<.1	<.5	20	30	62A	<10	<10	.45	<5	<50	7	5	20
950	9-10-25	<.02	<.5	50	50	72A	<10	<10	.05	<5	<50	5	10	15
954	9-10-24	<.1	<.5	30	70	47A	<10	<10	.18	<5	<50	<5	5	10
955	9-10-24	<.1	<.5	20	70	50A	<10	<10	.09	5	<50	<5	7	7
958	9-11-26	<.02	<.5	20	30	62A	<10	<10	.22	<5	<50	5	20	30
960	9-11-36	<.02	<.5	15	70	92A	<10	<10	.1	10	<50	7	20	30
962	9-11-23	<.02	<.5	15	50	54A	<10	<10	.1	5	<50	<5	10	15
968	8-10-33	<.1	<.5	15	70	44A	<10	<10	.1	<5	<50	<5	5	7
981	7-10-12	<.02	1.5	30	100	96A	<10	<10	.22	<5	<50	<5	15	30
982	7-11-3	<.02	<.5	70	50	73A	<10	<10	--	7	<50	<5	5	20
983	7-11-3	<.02	.7	100	100	110A	<10	<10	.13	10	<50	5	15	30
984	7-12-7	<.1	<.5	15	70	61A	<10	<10	.13	<5	<50	5	15	30
987	7-12-7	<.1	<.5	20	70	140A	<10	<10	--	<5	<50	<5	10	30
988	7-12-5	<.02	<.5	30	100	60A	<10	<10	.22	<5	<50	5	20	30
989	7-12-8	<.02	<.5	15	30	60A	<10	<10	.07	<5	<50	<5	<2	5
993	8-12-33	<.02	<.5	10	50	34A	<10	<10	.17	<5	<50	<5	2	15
995	8-12-33	--	<.5	5	10	30A	<10	<10	.11	<5	<50	<5	<2	<5
996	8-12-33	<.02	<.5	20	70	120A	<10	<10	.13	15	<50	5	15	30
1004	8-12-24	<.1	<.5	30	150	110A	<10	<10	.24	20	<50	5	15	50
1006	8-12-25	<.1	<.5	20	50	98A	<10	<10	.45	30	<50	<5	3	20
1007	8-12-25	<.02	<.5	15	50	99A	<10	<10	.14	7	<50	<5	2	15
1008	8-13-31	<.1	<.5	15	50	120A	<10	<10	.2	30	<50	<5	2	15
1009	8-12-36	<.1	<.5	30	50	65A	<10	<10	.26	20	<50	<5	3	20
1010	8-12-36	<.02	<.5	30	50	46A	<10	<10	.22	20	<50	<5	3	30
1011	8-12-36	<.1	<.5	30	70	80A	<10	<10	.45	<5	<50	<5	3	20
1013	8-12-35	<.02	<.5	30	30	77A	<10	<10	.26	10	<50	5	5	30
1014	8-12-26	.05	<.5	20	20	61A	<10	<10	.24	20	<50	<5	2	30
1016	8-12-26	<.02	<.5	15	70	92A	<10	<10	.18	30	<50	<5	2	15
1017	7-12-1	<.02	<.5	30	50	69A	<10	<10	.11	15	<50	15	20	30
1018	7-12-1	<.02	<.5	15	20	58A	<10	<10	.22	7	<50	<5	<2	30
1019	7-12-2	<.1	<.5	30	20	99A	<10	<10	.32	<5	<50	<5	<2	7
1022	7-12-1	<.02	<.5	50	50	66A	<10	<10	.14	<5	<50	10	20	70
1024	7-12-14	<.02	<.5	30	50	49A	<10	<10	.22	<5	<50	7	15	30
1033	6-12-4	<.02	<.5	50	100	70A	<10	<10	.16	15	<50	30	100	300
1047	6-12-11	<.1	<.5	15	50	68A	<10	<10	.7	15	<50	<5	<2	20
1048	6-12-11	<.1	<.5	20	70	74A	<10	<10	.26	5	<50	5	2	30
1052	6-13-14	.04	<.5	20	70	46A	<10	<10	.09	20	<50	10	5	15
1064	7-13-23	<.1	<.5	10	50	56A	<10	<10	.09	<5	<50	<5	3	15
1065	7-13-23	--	<.5	7	30	62A	<10	<10	.05	<5	<50	<5	3	20
1066	7-13-14	<.02	<.5	10	70	60A	<10	<10	.05	<5	<50	<5	2	15
1074	7-13-11	<.1	1.5	30	300	560A	<10	<10	.09	<5	<50	<5	3	15
1075	7-13-22	<.02	<.5	15	50	68A	<10	<10	.05	<5	<50	<5	3	20
1076	7-13-22	<.02	<.5	10	50	40A	<10	<10	.04	<5	<50	5	2	15
1077	7-13-22	<.1	<.5	15	70	46A	<10	<10	.03	<5	<50	<5	5	15
1078	7-13-15	<.1	<.5	7	15	64A	<10	<10	.07	<5	<50	<5	3	7
1079	7-13-15	<.1	<.5	10	70	70A	<10	<10	.05	5	<50	<5	2	15
1080	7-13-10	--	<.5	20	70	500	<10	<10	.05	<5	<50	<5	<2	15
1086	6-12-5	<.02	<.5	30	50	56A	<10	<10	.04	<5	<50	7	15	30
1088	6-12-5	<.1	.5	30	70	400A	<10	<10	.1	<5	<50	5	10	20
1093	7-12-20	--	<.5	20	70	<200	<10	<10	.12	<5	<50	5	<2	20
1095	7-12-20	<.02	1.5	50	70	80A	<10	<10	.05	<5	<50	7	20	30
1096	7-12-20	<.1	<.5	20	100	84A	<10	<10	.07	<5	<50	<5	7	15
1097	7-12-21	<.1	<.5	20	70	<200	<10	<10	.05	<5	<50	5	15	20
1098	7-12-20	<.1	<.5	15	70	84A	<10	<10	.05	<5	<50	5	10	30
1106	9-12-14	--	<.5	15	100	<200	<10	<10	--	<5	<50	<5	5	15
1107	9-12-14	--	<.5	20	100	<200	<10	<10	.09	<5	<50	5	7	30
1108	9-12-14	<.02	<.5	30	50	56A	<10	<10	.05	7	<50	5	5	20
1201	8-13-19	<.1	<.5	30	300	250A	<10	<10	.36	15	<50	<5	5	20
1203	8-13-30	<.1	<.5	15	150	300A	<10	<10	.24	30	<50	<5	5	15

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent				Chem. analyses ppm
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Stream sediments--sieved--Continued									
948	7	50	70	300	70	20	700	300	1,000	3	0.3	0.5	--	4
949	3	30	30	150	70	10	300	100	1,500	2	.15	.3	--	4
950	3	50	100	700	70	70	700	500	700	3	.3	.5	--	2
954	2	50	70	200	70	15	700	300	700	2	.2	.5	--	2
955	2	20	30	100	20	7	700	500	700	1.5	.1	.3	--	2
958	5	20	50	200	70	15	700	300	500	1.5	.3	.5	--	.5
960	15	30	70	100	100	20	300	200	1,000	1.5	.2	.3	--	4
962	7	50	100	500	70	30	300	200	700	1.5	.3	.5	--	2
968	3	30	20	150	50	20	700	300	500	1.5	.15	.5	--	2
981	2	30	15	100	50	10	700	300	700	1.5	.3	.5	--	17
982	3	50	10	150	70	30	300	150	700	1.5	.15	.7	--	--
983	7	50	20	150	70	30	500	300	700	2	.2	.7	--	25
984	5	70	30	150	50	30	300	200	500	1.5	.3	.7	--	2
987	7	30	15	100	50	20	150	70	700	2	.15	.3	--	9
988	10	70	50	150	30	20	200	150	700	2	.2	.3	--	2
989	10	15	30	100	30	15	100	70	300	.7	.1	.3	--	7
993	15	30	70	200	50	20	70	70	700	1	.15	.3	--	4
995	70	20	<10	70	70	70	70	<50	200	.3	.07	.7	--	7
996	30	70	30	150	70	30	200	100	1,000	2	.2	.5	--	7
1004	15	30	50	200	100	30	150	150	700	2	.2	.5	--	12
1006	7	30	<10	100	70	50	200	50	300	1.5	.15	.2	--	--
1007	7	30	15	150	70	50	200	50	300	1	.15	.3	--	--
1008	20	20	70	150	100	70	100	70	1,500	1.5	.15	.2	--	17
1009	30	30	<10	100	100	70	200	70	500	1.5	.15	.3	--	12
1010	15	50	20	100	70	30	300	70	300	1.5	.2	.3	--	2
1011	50	20	100	150	100	50	100	50	700	1	.15	.3	--	12
1013	20	50	30	150	200	200	150	70	500	1	.2	.3	--	12
1014	30	20	<10	30	150	70	70	70	300	.7	.07	.2	--	2
1016	15	20	100	200	100	30	100	50	1,000	1.5	.15	.15	--	17
1017	15	70	20	200	50	70	300	150	700	3	.3	.5	--	2
1018	30	20	15	100	50	50	100	50	700	1	.07	.3	--	9
1019	100	15	20	70	<20	20	70	<50	1,000	.7	.07	.15	--	17
1022	2	70	10	200	50	30	300	300	300	2	.3	.3	--	1
1024	50	70	300	300	70	50	150	100	1,500	2	.3	.3	--	3
1033	3	100	15	300	70	20	700	700	700	7	1	2	--	1
1047	5	30	10	150	30	15	300	150	300	1.5	.15	.5	--	2
1048	5	50	20	300	100	20	700	500	700	2	.3	1	--	9
1052	3	30	20	300	100	20	700	500	300	5	.3	.7	--	2
1064	2	30	15	150	50	10	500	300	200	1.5	.2	.5	--	4
1065	1.5	20	<10	100	70	10	500	150	200	1	.15	.7	--	3
1066	2	30	15	150	70	15	700	300	300	1	.15	.5	--	2
1074	3	20	10	100	100	20	300	150	300	.7	.15	.5	--	>90
1075	3	30	10	100	70	5	300	150	500	1	.15	.7	--	4
1076	5	30	10	100	70	10	500	300	300	1.5	.2	.7	--	2
1077	5	30	10	150	100	20	500	500	700	1.5	.2	.7	--	4
1078	3	15	<10	150	100	15	500	300	300	1	.15	.5	--	2
1079	3	15	15	100	70	15	500	300	500	1	.15	.5	--	12
1080	20	15	<10	30	50	20	200	200	500	.7	.1	.5	--	>45
1086	3	50	10	100	20	20	300	200	300	3	.3	.5	--	3
1088	15	30	<10	70	30	20	500	100	700	1.5	.15	.5	--	30
1093	5	20	<10	50	<20	15	150	50	3,000	1.5	.1	.3	--	--
1095	20	30	15	200	70	30	300	300	500	3	.3	.5	--	2
1096	30	20	150	300	70	20	200	150	1,000	1.5	.15	.5	--	1
1097	30	20	200	200	100	30	200	150	1,000	2	.2	.3	--	--
1098	15	20	15	200	30	20	300	300	700	1.5	.2	.5	--	3
1106	2	20	<10	50	30	15	150	<50	700	1	.1	.2	--	--
1107	1	20	<10	150	30	15	200	70	300	1	.2	.3	--	--
1108	3	30	<10	200	70	15	500	200	500	2	.3	.7	--	4
1201	7	30	70	150	70	50	150	70	1,000	1.5	.15	.3	--	45
1203	15	30	30	100	70	70	150	50	700	1.5	.15	.3	--	70

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
					Stream sediments--sieved--Continued									
1501	8-12-6	<0.02	<0.5	30	50	78A	<10	<10	0.08	5	<50	10	3	20
1502	9-11-36	<.02	<.5	30	50	52A	<10	<10	.15	<5	<50	15	50	50
1503	9-11-36	<.02	<.5	15	20	50A	<10	<10	.09	<5	<50	<5	30	30
1504	9-12-29	<.02	<.5	30	50	60A	<10	<10	.05	<5	<50	10	2	20
1505	9-12-29	<.02	<.5	15	30	92A	<10	<10	.2	5	<50	<5	3	15
1506	9-12-29	<.1	<.5	20	150	180A	<10	<10	.12	10	<50	<5	5	15
1507	9-12-33	<.1	<.5	15	30	78A	<10	<10	.2	7	<50	<5	<2	15
1508	9-12-33	<.1	<.5	15	50	61A	<10	<10	.07	10	<50	<5	2	10
1509	9-12-33	<.1	<.5	20	70	140A	<10	<10	.28	7	<50	<5	3	30
1510	8-12-4	--	<.5	10	150	180A	<10	<10	.36	15	<50	<5	<2	10
1511	8-12-4	<.1	<.5	30	70	47A	<10	<10	.18	30	<50	<5	3	20
1512	8-12-4	<.02	<.5	15	70	280A	<10	<10	.16	15	<50	<5	5	15
1513	9-11-20	<.1	<.5	30	70	58A	<10	<10	.09	<5	<50	5	15	20
1514	9-11-20	<.02	<.5	30	50	53A	<10	<10	.18	<5	<50	<5	3	7
1515	9-11-17	<.1	<.5	20	50	44A	<10	<10	.03	<5	<50	<5	7	20
1516	9-11-21	<.02	<.5	20	70	29A	<10	<10	.04	<5	<50	<5	5	15
1517	9-11-21	<.02	<.5	20	50	61A	<10	<10	.28	<5	<50	5	2	20
1518	9-11-21	<.02	<.5	30	50	88A	<10	<10	.14	<5	<50	5	5	20
1519	9-11-21	<.02	<.5	30	50	88A	<10	<10	.18	<5	<50	5	10	30
1520	8-10-31	<.02	<.5	15	30	40A	<10	<10	.15	5	<50	<5	2	10
1521	8-10-29	<.02	.5	30	30	40A	<10	<10	.3	<5	<50	<5	3	7
1522	8-10-29	<.02	<.5	30	30	43A	<10	<10	.4	5	<50	<5	5	15
1523	7-10-4	<.02	<.5	20	50	62A	<10	<10	.55	<5	<50	<5	5	10
1524	7-10-4	<.02	<.5	30	50	53A	<10	<10	.55	5	<50	<5	7	10
1525	7-10-20	<.02	<.5	50	30	65A	<10	<10	.15	<5	<50	<5	2	15
1527	8-12-17	<.02	<.5	15	100	64A	<10	<10	.11	<5	<50	5	20	20
1528	8-12-17	<.02	<.5	30	70	53A	<10	<10	.4	<5	<50	<5	15	15
1529	8-12-17	<.02	<.5	7	15	200A	<10	<10	4.6	<5	<50	<5	7	5
1530	8-12-17	.02	<.5	20	70	92A	<10	<10	.15	15	<50	5	10	20
1531	8-12-16	<.02	<.5	20	70	34A	<10	<10	.28	<5	<50	10	10	15
1532	8-12-16	<.02	<.5	30	150	92A	<10	<10	.34	5	<50	<5	10	20
1533	8-12-21	<.02	<.5	20	70	100A	<10	<10	.6	7	<50	5	10	30
1534	8-12-21	<.02	<.5	30	70	130A	<10	<10	.12	20	<50	<5	10	30
1535	8-12-21	<.02	<.5	30	70	48A	<10	<10	.06	30	<50	<5	7	30
1536	8-12-22	<.1	<.5	70	70	110A	<10	<10	.09	<5	<50	7	20	30
1537	8-12-22	<.02	<.5	10	70	53A	<10	<10	.1	<5	<50	<5	<2	7
1538	8-12-27	<.1	<.5	30	50	72A	<10	<10	.09	<5	<50	<5	10	20
1539	8-12-27	--	<.5	15	30	130A	<10	<10	.22	<5	<50	<5	5	30
1540	8-12-27	<.1	<.5	30	70	80A	<10	10	.09	15	70	<5	<2	15
1541	8-12-27	<.02	<.5	30	70	44A	<10	<10	.06	10	<50	5	15	50
1542	8-12-34	<.1	<.5	10	15	110A	<10	<10	.1	7	<50	5	5	10
1543	8-12-33	<.1	<.5	15	30	100A	<10	<10	.13	10	<50	<5	2	30
1548	7-12-3	<.02	<.5	30	70	66A	<10	<10	.04	10	<50	5	10	20
1549	7-12-3	<.02	<.5	30	100	77A	<10	<10	.09	15	<50	5	7	30
1550	7-12-3	--	<.5	20	70	88A	<10	<10	.07	7	<50	5	3	15
1551	8-12-34	<.02	<.5	30	50	44A	<10	<10	.06	20	<50	5	7	30
1553	7-12-14	<.02	<.5	30	70	44A	<10	<10	.1	<5	<50	7	7	30
1555	7-12-13	<.02	<.5	20	50	50A	<10	<10	.09	<5	<50	5	<2	15
1556	7-12-13	.1	<.5	30	70	47A	<10	<10	.1	<5	<50	7	15	30
1558	7-12-14	<.02	<.5	30	70	46A	<10	15	.04	<5	100	7	5	30
1561	7-12-23	<.02	<.5	70	100	90A	<10	<10	.06	<5	<50	10	30	50
1563	7-12-22	<.02	<.5	30	100	78A	<10	<10	.06	7	<50	7	15	30
1564	7-12-22	<.1	<.5	30	70	90A	<10	<10	.24	<5	<50	5	2	30
1568	7-12-26	<.02	<.5	70	100	82A	<10	<10	.06	<5	<50	10	20	30
1570	7-12-26	.2	<.5	30	100	87A	<10	<10	.11	<5	<50	<5	10	15
1578	6-12-11	<.02	<.5	50	70	68A	<10	<10	.06	<5	<50	5	3	30
1579	6-12-14	.06	.5	30	50	66A	<10	<10	.07	<5	<50	7	5	20
1580	6-12-11	<.02	<.5	30	70	91A	<10	<10	.06	<5	<50	10	20	20
1584	6-13-6	<.1	<.5	30	70	88A	<10	<10	.09	<5	<50	<5	2	20
1589	8-13-7	<.02	1	70	300	620A	<10	<10	.07	30	<50	10	20	50

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent				Chem.-anal-yses ppm
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Stream sediments--sieved--Continued									
1501	3	50	50	700	200	70	700	300	700	5	0.7	0.7	--	3
1502	3	70	50	150	30	10	700	700	700	3	.3	.7	--	.5
1503	1	30	30	150	50	10	700	500	700	1.5	.3	.5	--	.5
1504	3	30	30	300	100	30	700	300	700	3	.5	1	--	1
1505	3	50	20	100	70	15	150	70	700	1.5	.3	.5	--	9
1506	7	50	70	300	100	70	300	150	700	2	.3	.5	--	12
1507	7	20	70	500	150	70	150	100	700	1.5	.3	.5	--	--
1508	5	20	50	300	70	30	150	100	700	1.5	.2	.3	--	12
1509	7	30	30	200	100	30	150	70	700	1.5	.2	.3	--	25
1510	10	30	50	300	70	30	150	70	1,000	1	.15	.3	--	30
1511	10	20	100	150	100	30	100	50	1,500	1.5	.15	.3	--	9
1512	30	30	30	150	30	30	150	50	1,500	1.5	.15	.2	--	30
1513	3	30	20	300	70	20	700	500	1,500	2	.3	.7	--	4
1514	3	20	30	150	20	10	700	300	500	1.5	.2	.3	--	3
1515	3	30	15	200	70	15	700	700	700	2	.3	1	--	2
1516	3	20	30	700	70	30	700	500	700	3	.3	.5	--	2
1517	3	50	20	500	70	15	500	300	700	2	.3	.7	--	2
1518	3	50	15	300	70	20	500	300	1,000	3	.3	1	--	2
1519	3	70	15	300	70	15	500	300	700	2	.3	1	--	3
1520	2	30	20	300	70	20	700	300	500	1.5	.15	.3	--	2
1521	2	30	15	150	30	10	1,000	700	300	1.5	.15	.3	--	2
1522	2	30	15	150	150	30	1,000	300	500	1.5	.15	.5	--	2
1523	1.5	30	20	150	150	30	1,000	500	500	2	.15	.5	--	2
1524	2	20	20	150	70	10	1,000	500	500	2	.15	.5	--	1
1525	2	20	30	300	150	30	1,000	500	700	2	.2	.3	--	1
1527	15	30	100	200	100	30	150	100	1,000	3	.2	.3	--	7
1528	7	30	70	200	70	30	70	150	1,000	1.5	.15	.5	--	3
1529	15	20	20	70	<20	15	70	<50	700	.3	.07	.2	--	25
1530	15	30	70	300	100	30	150	150	700	1.5	.15	.5	--	19
1531	10	30	150	300	100	30	100	70	1,500	2	.15	.5	--	7
1532	15	30	70	300	100	50	100	70	1,500	1.5	.15	.3	--	7
1533	30	50	50	200	70	30	150	150	1,000	1.5	.2	.7	--	12
1534	50	30	70	200	100	50	150	100	700	1.5	.15	.3	--	7
1535	20	50	70	200	70	30	150	100	1,000	1.5	.2	.5	--	5
1536	7	20	70	150	30	15	150	70	1,500	3	.3	.3	--	2
1537	15	15	300	300	70	30	30	<50	1,500	3	.15	.1	--	7
1538	30	30	70	200	70	50	100	50	1,000	1.5	.15	.3	--	4
1539	30	30	15	100	70	30	150	<50	1,500	1	.15	.2	--	7
1540	30	20	300	300	100	50	70	<50	1,500	3	.3	.2	--	4
1541	15	20	70	150	70	30	150	150	700	1.5	.2	.5	--	3
1542	50	20	50	100	20	50	70	<50	1,000	.3	.1	.3	--	20
1543	30	30	10	70	70	30	100	<50	1,000	1.5	.07	.3	--	17
1548	50	30	50	150	100	30	150	150	1,000	2	.2	.5	--	9
1549	30	30	70	150	70	30	150	100	1,000	1.5	.15	.5	--	17
1550	70	30	30	150	70	30	100	<50	1,000	.7	.1	.5	--	17
1551	20	50	20	200	30	15	300	150	500	1.5	.2	.5	--	4
1553	30	30	70	150	100	70	150	100	1,000	1.5	.15	.5	--	7
1555	30	30	20	150	150	50	70	<50	700	.7	.15	.3	--	5
1556	20	50	100	150	50	30	300	150	1,000	1.5	.3	.5	--	5
1558	15	20	1,000	300	150	150	100	50	2,000	3	.3	.3	--	5
1561	5	50	15	150	50	15	300	150	700	2	.3	.3	--	3
1563	10	50	15	150	50	30	300	150	700	2	.3	.3	--	5
1564	3	30	<10	70	50	20	150	<50	700	1	.1	.2	--	19
1568	7	70	30	150	50	30	300	150	700	2	.3	.3	--	5
1570	15	30	70	300	70	30	150	50	1,000	2	.15	.3	--	7
1578	7	50	20	300	300	30	700	500	300	2	.3	.3	--	2
1579	7	50	15	200	100	30	700	500	700	2	.3	.3	--	2
1580	3	50	15	200	150	20	700	700	700	2	.3	.5	--	4
1584	5	50	10	150	70	20	700	300	1,000	3	.15	1	--	2
1589	1.5	100	20	300	70	50	500	300	700	5	.7	.7	--	5

TABLE 1.—*Analyses of samples from the*

		Semiquantitative spectrographic analyses (ppm)												
Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
				Stream sediments--sieved--Continued										
1595	8-13-7	<0.02	1	30	500	840A	<10	70	0.05	50	70	5	10	30
1598	8-13-20	<.02	<.5	50	300	600A	<10	<10	.12	70	<50	10	10	30
1600	8-13-20	<.02	<.5	10	50	560A	<10	<10	.04	<5	<50	<5	2	20
1602	8-13-17	<.02	<.5	30	70	88A	<10	<10	.09	<5	<50	7	15	30
1603	8-13-17	<.02	<.5	15	70	270A	<10	<10	.09	7	<50	<5	3	20
1604	8-13-5	<.02	<.5	30	100	160A	<10	<10	.09	10	<50	5	10	30
1605	8-13-9	<.02	<.5	30	70	180A	<10	<10	.09	7	<50	5	10	30
1606	8-13-9	--	<.5	7	70	160A	<10	10	.05	<5	<50	<5	2	10
1607	8-13-9	<.02	<.5	50	100	280A	<10	<10	.09	15	<50	5	10	30
1608	8-13-4	--	<.5	15	50	250A	<10	<10	.09	15	<50	<5	2	20
1609	8-13-9	<.02	<.5	30	100	88A	<10	<10	.05	20	<50	<5	10	30
1610	8-13-4	<.02	<.5	20	100	260A	<10	<10	.09	10	<50	<5	10	20
1611	8-13-20	<.1	<.5	15	150	100A	<10	<10	.04	7	<50	<5	5	15
1613	6-12-5	<.02	.7	30	200	110A	<10	<10	.05	5	<50	7	15	30
1615	6-12-4	<.1	.7	20	300	160A	<10	<10	.07	7	<50	7	15	30
1619	6-11-24	<.02	<.5	30	150	84A	<10	<10	.09	<5	<50	15	20	50
1620	6-11-24	<.02	<.5	30	100	110A	<10	<10	.09	<5	<50	10	15	30
1621	7-12-6	<.02	<.5	15	70	32A	<10	<10	.03	<5	<50	<5	3	15
1622	8-12-32	<.02	<.5	20	70	40A	<10	<10	.04	<5	<50	<5	5	20
1623	8-12-32	<.02	<.5	20	70	32A	<10	<10	.05	<5	<50	<5	5	15
1624	8-12-29	<.02	<.5	30	70	110A	<10	<10	.12	<5	<50	5	7	20
1625	8-12-29	<.1	<.5	20	70	40A	<10	<10	.04	<5	<50	<5	5	15
1626	8-12-29	<.1	<.5	30	50	66A	<10	<10	.14	<5	<50	<5	2	20
1627	8-12-29	<.02	<.5	30	70	150A	<10	<10	.14	<5	<50	5	5	30
1628	8-12-29	<.02	<.5	15	70	<25A	<10	<10	.04	10	<50	<5	3	15
1629	8-12-20	<.02	<.5	50	70	140A	<10	<10	.12	<5	<50	<5	3	20
1630	8-11-36	<.02	<.5	30	100	84A	<10	<10	.07	7	<50	<5	3	30
1632	8-11-36	<.02	<.5	30	100	68A	<10	<10	.05	<5	<50	7	5	50
1633	8-11-25	<.1	3	30	100	160A	<10	<10	.1	<5	<50	5	15	30
1634	8-11-25	<.02	<.5	20	70	25A	<10	<10	.05	7	<50	<5	5	20
1635	8-11-24	<.02	<.5	70	70	50A	<10	<10	.04	<5	100	<5	3	20
1636	8-11-24	<.02	<.5	15	70	56A	<10	<10	.07	5	<50	5	20	20
1637	8-11-24	<.1	<.5	30	70	140A	<10	<10	.09	<5	<50	<5	<2	30
1639	10-12-27	<.02	<.5	50	70	84A	<10	<10	.1	20	<50	15	2	50
1640	10-12-26	<.02	<.5	100	150	110A	<10	<10	.14	15	<50	7	20	70
1641	10-12-10	<.1	<.5	30	70	36A	<10	<10	.04	<5	<50	<5	15	15
1647	6-14-33	<.02	<.5	30	30	56A	<10	<10	.04	<5	<50	7	10	50
1648	6-14-33	<.02	2	30	100	52A	<10	<10	.07	<5	<50	10	3	70
1649	6-14-33	.1	<.5	30	50	160A	<10	<10	.75	<5	<50	<5	10	15
1650	6-14-33	.08	<.5	30	50	92A	<10	<10	.05	<5	<50	7	7	20
1653	10-10-1	<.02	<.5	20	30	110A	<10	<10	.05	<5	<50	7	20	70
1654	10-11-4	<.02	<.5	20	50	96A	<10	<10	.04	<5	<50	5	7	15
1655	10-11-4	<.02	<.5	20	70	110A	<10	<10	.05	<5	<50	5	7	30
1656	10-11-9	<.02	<.5	10	70	88A	<10	<10	.05	<5	<50	5	10	15
1658	10-11-16	<.02	<.5	30	70	92A	<10	<10	.07	<5	<50	5	5	10
1659	10-11-16	<.02	<.5	30	50	100A	<10	<10	.05	<5	<50	5	3	7

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent				Chem. analyses ppm
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
							Stream sediments--sieved--Continued							
1595	15	50	70	300	70	50	150	50	5,000	2	0.2	0.3	--	45
1598	20	50	70	300	150	200	300	70	5,000	2	.3	.7	--	>90
1600	10	20	30	150	70	70	150	<50	300	1	.15	.5	--	17
1602	15	50	50	300	50	50	200	100	700	3	.3	.5	--	4
1603	50	30	50	300	70	100	150	50	1,000	1.5	.1	.3	--	19
1604	7	70	15	200	50	30	300	150	300	2	.5	.7	--	25
1605	15	50	30	150	50	50	300	100	500	2	.3	.7	--	14
1606	10	15	70	300	20	30	100	50	500	1.5	.15	.3	--	19
1607	20	50	20	300	70	70	300	70	500	2	.3	.5	--	14
1608	20	20	15	70	50	70	150	<50	700	1	.1	.5	--	25
1609	20	30	100	300	70	70	200	100	500	1.5	.3	.5	--	14
1610	15	30	50	300	30	50	150	70	700	2	.2	.5	--	35
1611	15	20	70	200	50	30	70	50	700	1.5	.15	.3	--	7
1613	7	20	20	200	50	30	700	300	700	2	.3	.7	--	9
1615	10	30	30	150	100	30	500	150	700	1.5	.2	1	--	17
1619	2	50	15	150	70	20	1,000	700	700	3	.3	.7	--	2
1620	3	50	10	150	70	20	700	200	700	2	.2	.7	--	3
1621	3	10	70	300	100	30	100	50	500	1.5	.15	.3	--	2
1622	10	30	50	150	70	20	150	70	500	1.5	.15	.3	--	2
1623	10	30	150	300	70	30	300	200	700	1.5	.15	.5	--	1
1624	50	50	70	200	100	30	300	100	1,500	2	.2	.5	--	2
1625	15	20	70	200	70	20	200	100	700	1.5	.15	.5	--	2
1626	15	30	30	300	70	20	300	50	500	1.5	.15	.3	--	2
1627	50	50	50	200	100	30	300	70	2,000	1.5	.2	.3	--	2
1628	20	30	100	300	100	30	300	100	1,000	1.5	.15	.3	--	<.5
1629	20	30	20	150	50	20	200	50	700	1	.15	.5	--	12
1630	15	50	70	300	100	30	700	300	700	2	.3	.5	--	3
1632	3	50	20	300	70	15	1,000	700	700	2	.2	.7	--	2
1633	5	30	15	100	70	20	700	500	1,000	1.5	.2	.7	--	19
1634	10	30	100	300	150	20	200	150	1,000	1.5	.2	.5	--	1
1635	20	20	2,000	700	150	70	200	150	3,000	2	.3	.3	--	4
1636	5	30	50	200	70	15	700	500	700	2	.3	.3	--	1
1637	7	30	30	70	30	15	300	150	700	1	.15	.7	--	35
1639	5	70	30	300	50	20	500	300	500	3	.3	.5	--	2
1640	3	70	15	100	50	20	500	150	700	2	.3	.3	--	4
1641	5	30	50	>1,000	500	50	300	200	700	2	.3	.3	--	4
1647	3	50	20	300	100	20	700	700	500	3	.5	.5	--	.5
1648	2	70	20	300	100	20	700	700	700	5	.3	.7	--	1
1649	2	50	30	300	150	20	700	700	300	3	.5	.7	--	30
1650	2	70	20	700	100	30	700	700	700	3	.5	1.5	--	<.5
1653	1.5	50	30	150	70	15	1,500	1,000	300	3	.3	.5	--	2
1654	2	30	30	300	150	20	700	700	500	2	.3	.7	--	2
1655	1.5	30	30	200	150	15	1,500	700	700	3	.3	.7	--	7
1656	1.5	20	15	150	30	10	1,500	700	700	2	.2	.5	--	5
1658	1.5	30	15	200	100	15	1,000	1,000	700	2	.3	1	--	1
1659	2	30	30	200	200	15	1,500	700	700	2	.3	1	--	1

TABLE 1.—*Analyses of samples from the*

		Semiquantitative spectrographic analyses (ppm)												
Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
						Stream sediments--not sieved								
130	6-12-20	<0.1	<0.5	5	50	180A	<10	<10	0.015	<2	<50	<5	<2	<5
131	6-12-28	<.1	<.5	<2	50	120A	<10	<10	<.001	<2	<50	<5	<2	10
132	6-12-21	<.1	<.5	5	50	120A	<10	<10	<.001	<2	<50	<5	<2	20
134	6-12-22	<.1	<.5	5	20	200A	<10	<10	<.001	<2	<50	<5	<2	20
135	6-12-23	<.1	<.5	<2	20	120A	<10	<10	<.001	<2	<50	<5	<2	20
136	6-12-23	<.1	<.5	<2	20	80A	<10	<10	.015	<2	<50	<5	<2	30
137	6-12-23	<.1	<.5	<2	15	30A	<10	<10	<.001	<2	<50	<5	<2	20
213	6-11-19	<.1	<.5	5	20	40A	<10	<10	<.001	<2	<50	<5	<2	10
214	6-11-19	<.1	<.5	<2	15	100A	<10	<10	<.001	<2	<50	<5	<2	<5
215	6-11-20	<.1	<.5	5	15	40A	<10	<10	<.001	<2	<50	<5	<2	<5
216	6-10-25	<.1	<.5	<2	20	80A	<10	<10	<.001	<2	<50	<5	<2	5
217	6-10-23	<.1	<.5	5	30	40A	<10	<10	<.001	<2	<50	<5	<2	10
218	6-10-23	<.1	<.5	<2	30	140A	<10	<10	<.001	<2	<50	<5	<2	10
219	6-10-23	<.1	<.5	5	20	25A	<10	<10	<.001	<2	<50	<5	<2	20
220	6-10-2	<.1	<.5	<2	15	40A	<10	<10	<.001	<2	<50	<5	<2	20
221	6-10-2	<.1	<.5	<2	20	40A	<10	<10	.015	<2	<50	<5	<2	10
222	6-10-2	<.1	<.5	<2	20	<25A	<10	<10	<.001	<2	<50	<5	<2	5
223	6-10-11	<.1	<.5	5	20	60A	<10	<10	.015	<2	<50	<5	<2	20
224	7-11-33	<.1	<.5	<2	20	30A	<10	<10	.12	<2	<50	<5	<2	10
225	7-11-28	<.1	<.5	<2	30	80A	<10	<10	.1	<2	<50	<5	<2	10
226	7-11-14	<.1	<.5	<2	20	140A	<10	<10	<.001	<2	<50	<5	<2	100
227	7-11-23	<.1	<.5	<2	20	30A	<10	<10	.03	<2	<50	<5	<2	<5
228	7-11-22	<.1	<.5	<2	20	40A	<10	<10	<.001	<2	<50	<5	<2	<5
229	7-11-22	<.1	<.5	3	20	<25A	<10	<10	.015	<2	<50	<5	<2	<5
230	7-11-22	<.1	<.5	2	20	<25A	<10	<10	.03	<2	<50	<5	<2	10
231	7-11-23	<.1	<.5	5	20	50A	<10	<10	.025	<2	<50	<5	<2	<5
232	7-11-23	--	<.5	20	10	25A	<10	<10	.18	<2	<50	<5	<2	20
233	7-11-9	<.1	<.5	2	20	<25A	<10	<10	<.001	<2	<50	<5	<2	30
234	7-11-9	<.1	<.5	10	20	50A	<10	<10	<.001	<2	<50	<5	<2	30
235	7-11-9	<.1	<.5	2	20	100A	<10	<10	.015	<2	<50	<5	<2	50
236	7-11-9	<.1	<.5	2	10	120A	<10	<10	.06	<2	<50	<5	<2	10
237	7-11-9	<.1	<.5	3	10	60A	<10	<10	<.001	<2	<50	<5	<2	10
238	7-11-15	<.1	<.5	2	20	25A	<10	<10	<.001	<2	<50	<5	<2	<5
239	7-11-15	<.1	<.5	3	20	180A	<10	<10	.03	<2	<50	<5	<2	<5
240	7-11-21	<.1	<.5	2	15	25A	<10	<10	<.001	<2	<50	<5	<2	<5
241	7-10-26	<.1	<.5	<2	10	30A	<10	<10	<.001	<2	<50	<5	<2	10
242	7-10-26	<.1	<.5	3	20	40A	<10	<10	.015	<2	<50	<5	<2	5
243	7-10-26	<.1	<.5	5	20	30A	<10	<10	.05	<2	<50	<5	<2	10
246	7-10-2	<.1	5	20	100	70A	20	<10	.025	<2	<50	<5	<2	10
247	7-10-1	<.1	<.5	30	50	50A	<10	<10	.025	<2	<50	<5	<2	20
248	7-10-1	<.1	<.5	30	70	120A	<10	<10	<.001	<2	<50	<5	<2	20
251	7-11-16	<.1	<.5	<2	15	40A	<10	<10	.05	<2	<50	<5	<2	20
252	7-11-16	<.1	<.5	5	20	50A	<10	<10	.025	<2	<50	<5	<2	20
253	7-11-9	<.1	<.5	2	15	30A	<10	<10	<.001	<2	<50	<5	<2	<5
254	7-11-9	<.1	<.5	2	10	100A	<10	<10	<.001	<2	<50	<5	<2	5
255	7-11-5	<.1	<.5	2	20	70A	<10	<10	<.001	<2	<50	<5	<2	20
256	7-11-5	<.1	<.5	10	20	<25A	<10	<10	<.001	<2	<50	<5	<2	5
257	7-11-4	<.1	<.5	30	70	120A	<10	<10	.025	<2	<50	<5	<2	10
258	8-11-33	<.1	<.5	20	20	40A	<10	<10	.025	<2	<50	<5	<2	<5
259	8-11-33	<.1	<.5	10	10	50A	<10	<10	.05	<2	<50	<5	<2	10
260	7-11-4	<.1	<.5	2	30	90A	<10	<10	.015	<2	<50	<5	<2	5
261	7-11-4	<.1	<.5	15	20	50A	<10	<10	<.001	<2	<50	<5	<2	5
262	7-10-13	<.1	<.5	3	30	60A	<10	<10	<.001	<2	<50	<5	<2	5
263	7-10-12	<.1	<.5	3	20	50A	<10	<10	<.001	<2	<50	<5	<2	<5
265	7-10-22	<.1	<.5	3	20	60A	<10	<10	.015	<2	<50	<5	<2	10
266	7-10-22	<.1	<.5	20	30	50A	<10	<10	.015	<2	<50	<5	<2	10
267	7-10-14	<.1	<.5	2	15	60A	<10	<10	<.001	<2	<50	<5	<2	<5
268	7-10-14	<.1	<.5	5	20	40A	<10	<10	<.001	<2	<50	<5	<2	<5
269	7-10-11	<.1	<.5	2	20	60A	<10	<10	.015	<2	<50	<5	<2	<5
270	7-10-11	<.1	<.5	20	20	100A	<10	<10	.025	<2	<50	<5	<2	<5

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Stream sediments--not sieved									
130	1	20	15	150	<20	10	2,000	700	500	2	0.15	1	--	<1
131	1	15	15	150	50	5	2,000	700	700	2	.2	1	--	2.4
132	5	30	20	150	100	30	2,000	1,000	500	2	.5	1	--	4.7
134	5	20	15	200	50	10	2,000	1,000	500	2	.3	.7	--	1
135	20	30	15	200	70	10	1,000	1,000	500	2	.2	1	.12	1
136	10	20	15	300	50	<5	2,000	1,000	500	2	.3	1	.21	2.4
137	5	20	15	200	50	<5	2,000	1,000	500	2	.3	.5	--	1.7
213	2	15	10	150	<20	<5	2,000	700	500	2	.2	.7	--	1.7
214	2	15	10	200	20	<5	2,000	700	300	1.5	.2	1	--	1.7
215	1	15	10	200	20	<5	2,000	700	700	1.5	.15	.7	.01	2.4
216	<1	20	15	200	20	<5	2,000	700	500	2	.3	1	--	1.7
217	1	20	15	200	100	20	2,000	700	1,000	2	.2	1	--	2.4
218	1	20	15	200	50	5	2,000	700	1,000	2	.2	1	--	8.5
219	<1	20	15	200	70	5	2,000	700	500	2	.2	1	--	3.2
220	1	20	15	150	20	<5	2,000	700	500	1.5	.2	1	--	2.4
221	2	20	15	150	20	<5	1,500	700	500	1	.2	1.5	--	160
222	2	20	15	150	<20	<5	1,500	700	300	1	.15	1	--	2.4
223	2	30	15	150	<20	<5	2,000	700	500	1.5	.2	1	--	2.4
224	2	20	15	150	30	20	1,500	700	500	1.5	.2	1.5	.1	6.2
225	2	20	15	300	70	10	1,500	700	300	1.5	.2	1	.03	3.2
226	1	50	10	200	70	<5	1,500	1,000	500	2	.3	1	--	<1
227	1	20	15	150	50	<5	1,500	700	500	1.5	.2	1	--	3.2
228	1	20	15	150	70	<5	1,500	700	500	1.5	.2	1	--	5.5
229	2	20	15	100	30	<5	1,000	500	200	2	.2	.7	--	1
230	2	20	10	70	20	<5	1,000	500	100	1	.2	1	--	3.2
231	1	15	10	70	30	<5	1,500	500	200	1	.2	.5	--	1.7
232	2	20	10	100	<20	<5	500	100	200	1	.2	.5	.02	8.5
233	2	20	10	100	50	5	1,000	500	200	1.5	.3	.5	--	2.4
234	2	20	15	100	20	5	1,000	500	200	2	.3	.5	.11	38
235	2	20	15	70	<20	5	1,000	700	150	2	.3	.5	.03	2.4
236	2	20	10	100	30	<5	1,000	300	100	2	.2	.5	--	2.4
237	2	20	10	150	30	<5	1,000	300	200	1	.3	.5	--	1.7
238	2	20	15	100	30	<5	1,000	500	150	1.5	.2	.5	--	1.7
239	2	20	10	100	30	<5	1,000	500	200	1.5	.15	.5	--	2.4
240	1	20	30	150	20	<5	1,000	500	200	1.5	.15	.2	--	5.5
241	2	15	10	100	<20	<5	1,000	500	200	1	.15	.2	--	1
242	2	20	10	100	20	<5	1,000	500	200	1	.15	.2	--	2.4
243	2	20	10	150	30	10	1,000	500	700	1.5	.2	.2	--	3.9
246	1	15	15	150	<20	<5	1,000	200	1,000	1.5	.15	.1	--	48
247	2	30	15	100	100	10	1,000	1,000	700	1.5	.2	.5	.03	26
248	2	20	15	100	30	10	1,000	500	500	2	.2	.2	--	32
251	2	20	10	200	30	10	1,000	500	200	2	.2	.2	--	<1
252	1	20	20	100	20	<5	1,000	500	500	2	.15	.2	--	2.4
253	2	10	10	100	20	<5	1,000	500	200	2	.15	.2	--	2.4
254	2	20	10	70	20	<5	1,000	500	300	1.5	.2	.2	--	2.4
255	2	50	15	300	30	10	1,000	500	500	2	.2	.5	--	2.4
256	2	20	15	150	100	5	1,500	700	500	1.5	.3	1	--	2.4
257	2	30	15	100	70	10	1,500	500	500	5	.3	1	--	10
258	1	15	30	100	20	10	1,000	300	500	2	.2	.7	.02	2.4
259	2	20	10	70	20	10	1,000	200	500	2	.3	.7	.01	3.2
260	2	20	15	100	30	10	1,000	700	500	2	.2	1	--	1.7
261	5	20	15	100	50	5	1,500	500	500	1.5	.5	1	--	1
262	2	15	15	100	50	15	1,500	500	500	1.5	.3	1	.07	2.4
263	2	15	50	100	50	15	1,500	300	500	1.5	.3	.5	--	18
265	2	20	15	150	30	20	1,500	500	1,000	1.5	.5	1.5	--	3.2
266	2	15	20	150	100	20	1,500	700	500	1.5	.3	1	--	2.4
267	2	15	10	100	100	15	1,500	300	1,000	3	.2	.5	--	1.7
268	2	15	15	100	70	10	1,500	1,000	700	2	.2	1	--	2.4
269	5	20	20	100	20	10	1,500	300	1,000	2	.2	.5	--	3.2
270	3	30	30	100	30	10	1,500	500	1,000	2	.3	.7	.03	4.7

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Stream sediments--not sieved--Continued												
271	7-11-5	<0.1	2	100	30	1,200A	<10	<10	0.04	<2	<50	<5	<2	<5
272	7-10-1	<.1	<.5	20	20	100A	<10	<10	.015	<2	<50	<5	<2	<5
275	7-10-2	<.1	<.5	2	20	50A	<10	<10	.015	<2	<50	<5	<2	<5
277	8-10-34	<.1	<.5	30	30	70A	<10	<10	.015	<2	<50	<5	<2	10
278	8-10-23	<.1	<.5	5	30	90A	<10	<10	<.001	<2	<50	<5	<2	20
279	8-10-26	<.1	<.5	2	15	70A	<10	<10	<.001	<2	<50	<5	<2	<5
280	8-10-23	<.1	<.5	<2	20	80A	<10	<10	<.001	<2	<50	<5	<2	<5
281	8-10-23	<.1	<.5	<2	20	70A	<10	<10	.025	<2	<50	<5	<2	5
283	8-10-23	<.1	<.5	<2	20	90A	<10	<10	.025	<2	<50	<5	<2	5
284	8-10-24	<.1	<.5	2	20	60A	<10	<10	<.001	<2	<50	<5	<2	<5
286	8-10-14	<.1	<.5	2	50	40A	<10	<10	<.001	<2	<50	<5	<2	5
287	8-10-13	<.1	<.5	3	50	50A	<10	<10	<.001	<2	<50	<5	<2	<5
288	8-10-26	<.1	<.5	<2	10	40A	<10	<10	<.001	<2	<50	<5	<2	5
289	8-10-26	<.1	<.5	10	50	30A	<10	<10	<.001	<2	<50	<5	<2	<5
290	8-10-26	<.1	<.5	<2	20	90A	<10	<10	.1	<2	<50	<5	<2	5
291	8-11-20	<.1	<.5	3	70	90A	<10	<10	<.001	<2	<50	<5	<2	5
292	8-11-20	<.1	<.5	2	50	70A	<10	<10	<.001	<2	<50	<5	<2	10
293	8-11-21	<.1	<.5	2	20	60A	<10	<10	.03	<2	<50	<5	<2	10
294	8-11-21	<.1	<.5	<2	50	70A	<10	<10	<.001	<2	<50	<5	<2	10
295	8-11-21	<.1	<.5	15	30	100A	<10	<10	.015	<2	<50	<5	<2	20
296	8-11-21	<.1	<.5	3	30	80A	<10	<10	.08	<2	<50	<5	<2	20
297	8-11-22	<.1	<.5	2	30	70A	<10	<10	.06	<2	<50	<5	<2	<5
298	8-11-22	<.1	<.5	5	50	90A	<10	<10	.07	<2	<50	<5	<2	<5
299	8-11-22	<.1	<.5	2	70	60A	<10	<10	.015	<2	<50	<5	<2	5
300	8-11-27	<.1	<.5	2	70	100A	<10	<10	<.001	<2	<50	<5	<2	<5
301	8-11-27	<.1	<.5	10	70	90A	<10	<10	.025	<2	<50	<5	<2	15
302	8-11-27	<.1	<.5	30	70	80A	<10	<10	<.001	<2	<50	<5	<2	10
303	8-11-22	<.1	<.5	5	50	60A	<10	<10	<.001	<2	<50	<5	<2	7
304	8-11-22	<.1	<.5	20	20	100A	<10	<10	.015	<2	<50	<5	<2	7
305	8-10-24	<.1	<.5	3	20	60A	<10	<10	<.001	<2	<50	<5	<2	<5
306	8-10-24	<.1	<.5	5	20	90A	<10	<10	.03	<2	<50	<5	<2	<5
307	8-10-24	<.1	<.5	2	10	50A	<10	<10	.025	<2	<50	<5	<2	<5
308	8-11-4	<.1	<.5	<2	20	30A	<10	<10	.015	<2	<50	<5	<2	<5
309	8-11-4	<.1	<.5	<2	20	30A	<10	<10	.15	<2	<50	<5	<2	10
310	9-11-32	<.1	<.5	<2	20	70A	<10	<10	.03	<2	<50	<5	<2	<5
312	8-11-4	<.1	<.5	3	20	50A	<10	<10	.015	<2	<50	<5	<2	10
313	8-11-9	<.1	<.5	<2	15	90A	<10	<10	.025	<2	<50	<5	<2	10
314	8-11-9	<.1	<.5	2	20	50A	<10	<10	.025	<2	<50	<5	<2	10
315	8-11-9	<.1	<.5	2	20	100A	<10	<10	<.001	<2	<50	<5	<2	10
316	8-11-15	<.1	<.5	2	20	50A	<10	<10	.015	<2	<50	<5	<2	10
317	8-11-15	<.1	<.5	2	15	50A	<10	<10	<.001	<2	<50	<5	<2	10
319	8-10-13	<.1	<.5	2	15	30A	<10	<10	<.001	<2	<50	<5	<2	20
320	8-10-23	<.1	<.5	15	10	30A	<10	<10	<.001	<2	<50	<5	<2	15
559	6-13-8	<.1	<.5	15	20	80A	<10	<10	<.001	<2	<50	<5	<2	10
560	6-13-8	<.1	<.5	15	20	70A	<10	<10	<.001	<2	<50	<5	<2	10
561	6-13-17	<.1	<.5	3	15	60A	<10	<10	.015	<2	<50	<5	<2	10
562	6-13-17	<.1	<.5	3	15	30A	<10	<10	.025	<2	<50	<5	<2	10
563	6-13-17	<.1	<.5	15	20	40A	<10	<10	.015	<2	<50	<5	<2	10
564	6-13-18	<.1	<.5	3	20	50A	<10	<10	.015	<2	<50	<5	<2	10
565	6-13-18	<.1	<.5	5	20	40A	<10	<10	<.001	<2	<50	<5	<2	20
566	6-13-18	<.1	<.5	5	70	50A	<10	<10	.04	<2	<50	<5	<2	10
567	6-13-7	<.1	<.5	10	70	70A	<10	<10	.025	<2	<50	<5	<2	10
568	6-13-7	<.1	<.5	2	<10	60A	<10	<10	.03	<2	<50	<5	<2	10
569	6-13-6	<.1	<.5	3	10	50A	<10	<10	<.001	<2	<50	<5	<2	10
572	6-12-15	<.1	<.5	5	50	70A	<10	<10	.03	<2	<50	<5	<2	30
577	6-12-34	<.1	<.5	2	50	70A	<10	<10	.025	<2	<50	<5	<2	20
579	6-12-34	<.1	<.5	3	30	50A	<10	<10	<.001	<2	<50	<5	<2	20
580	6-12-34	<.1	<.5	15	20	140A	<10	<10	.05	<2	<50	<5	<2	10
581	5-12-5	<.1	<.5	2	20	50A	<10	<10	.025	<2	<50	<5	<2	15
582	5-12-5	<.1	<.5	5	20	40A	<10	<10	.05	<2	<50	<5	<2	15

Sawtooth study area, Idaho—Continued

Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
	Stream sediments--not sieved--Continued													
271	10	20	20	100	30	15	1,500	500	1,000	1.5	0.3	1	0.07	217
272	1	20	15	200	100	10	1,500	700	1,000	3	.3	1	--	6.2
275	2	20	30	100	20	15	1,500	300	1,500	1.5	.2	.5	--	2.4
277	5	50	10	100	50	15	1,500	700	1,000	1.5	.3	1	--	4.7
278	2	30	20	150	50	15	1,500	700	1,000	2	.3	1	--	2.4
279	1	20	15	100	30	10	1,500	500	500	1.5	.2	.7	--	2.4
280	1	20	15	100	<20	<5	1,500	300	500	1.5	.2	.7	--	2.4
281	1	15	15	100	20	<5	1,500	500	500	1.5	.2	.7	--	2.4
283	<1	15	15	100	<20	<5	1,500	500	500	1	.2	.5	--	2.4
284	<1	20	15	100	<20	<5	1,000	300	200	1.5	.2	.2	.01	2.4
286	<1	20	15	100	20	<5	1,500	500	200	2	.2	.5	--	1
287	1	20	30	100	20	5	1,000	300	200	2	.2	.5	--	1.7
288	3	15	10	100	50	5	2,000	500	200	1	.15	1.5	--	1.7
289	1	15	15	100	20	<5	2,000	500	200	2	.2	1	.09	1.7
290	1	30	10	100	50	5	1,500	500	1,000	1.5	.2	1	--	8
291	1	20	10	100	20	5	1,000	500	1,000	2	.2	.7	--	15
292	1	30	15	100	50	5	1,000	500	500	1.5	.2	1	--	4.7
293	1	30	15	100	50	15	500	200	500	1.5	.2	1	.12	5.5
294	1	20	15	100	30	10	1,000	500	500	2	.15	.7	--	3.2
295	<1	20	15	150	100	10	1,000	700	500	3	.3	1.5	.04	8
296	2	30	15	100	100	20	1,000	500	500	2	.2	1	--	6.2
297	5	20	15	100	100	20	700	200	200	1.5	.15	.5	--	4.7
298	10	20	15	150	100	30	700	200	500	2	.2	.5	.13	8
299	10	30	30	200	150	30	700	300	500	2	.2	1	.07	6.2
300	2	20	50	200	100	20	1,000	300	500	1.5	.2	.5	--	5.5
301	2	50	20	200	100	15	1,000	700	500	2	.3	1	--	6.2
302	2	30	15	150	50	15	1,000	700	500	2	.3	1	--	6.9
303	2	30	20	150	50	10	1,000	500	500	1.5	.2	.7	--	2.4
304	2	30	20	200	100	15	1,000	500	700	2	.3	.7	--	3.9
305	2	30	15	100	20	5	1,000	500	500	1.5	.2	.7	.03	4.7
306	1	20	15	70	20	5	1,000	500	500	1.5	.1	.7	--	16
307	1	20	20	100	20	10	1,000	500	500	1.5	.2	.7	--	2.4
308	2	20	15	100	<20	5	1,000	500	200	1.5	.2	.7	--	2.4
309	2	20	20	100	<20	5	1,500	300	200	1.5	.15	.7	--	4.7
310	2	30	10	150	20	5	1,000	500	200	2	.2	.7	--	1
312	2	20	15	150	20	10	1,500	700	200	2	.2	1	--	3.9
313	2	20	15	150	20	10	1,000	300	200	1.5	.15	.7	--	4.7
314	5	20	30	150	30	20	1,000	500	200	1.5	.3	1	--	3.9
315	1	15	15	100	20	10	1,000	500	200	1.5	.2	.7	.09	1
316	2	20	30	100	100	20	1,000	300	200	1.5	.3	1	.02	2.4
317	1	20	15	100	<20	10	1,000	500	200	1.5	.3	1	--	2.4
319	1	20	15	100	20	<5	1,000	500	200	1.5	.2	.7	--	2.4
320	2	20	10	100	30	20	1,000	500	200	1.5	.2	1	.22	3.9
559	1	20	10	150	30	15	1,000	500	200	2	.3	.5	--	3.9
560	2	30	10	150	50	10	1,000	500	500	2	.3	1	--	3.2
561	2	30	10	200	100	15	1,000	300	200	2	.3	1	--	2.4
562	2	20	10	200	50	10	1,000	500	200	2	.2	.7	--	2.4
563	2	20	10	150	50	20	1,000	500	200	2	.3	.5	--	2.4
564	2	20	10	150	50	10	1,000	500	500	2	.2	.7	--	3.9
565	1	20	15	150	50	10	1,000	500	500	2	.3	.5	.03	2.4
566	2	20	10	150	70	20	1,000	500	200	2	.3	.5	--	3.2
567	5	20	10	150	70	15	1,000	500	100	2	.3	.5	--	5.5
568	<1	15	<10	50	20	<5	100	<50	200	.5	.05	.7	.04	9
569	2	50	<10	150	50	10	700	700	500	2	.2	.7	--	2.4
572	10	100	15	200	70	10	1,000	1,000	500	5	.3	1	.25	1
577	5	50	15	150	50	15	1,000	700	500	3	.3	.7	--	3.9
579	3	50	15	200	100	10	1,000	1,000	500	3	.3	1	--	3.2
580	3	30	10	100	50	20	1,500	700	700	1.5	.2	.3	.04	3.9
581	2	30	10	150	50	5	1,000	1,000	500	3	.2	.7	--	1
582	2	30	15	150	20	10	1,000	700	300	2	.3	.5	.12	2.4

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Semiquantitative spectrographic analyses (ppm)												
					Stream sediments--not sieved--Continued									
583	5-12-4	<0.1	<0.5	2	15	70A	<10	<10	0.025	<2	<50	<5	<2	20
584	5-12-9	<.1	<.5	15	50	30A	<10	<10	.06	<2	<50	<5	<2	30
586	5-12-6	<.1	<.5	2	50	60A	<10	<10	.06	<2	<50	<5	<2	15
587	5-12-6	<.1	<.5	3	50	70A	<10	<10	.025	<2	<50	<5	<2	20
588	5-12-6	<.1	<.5	3	30	40A	<10	<10	.03	<2	<50	<5	<2	20
589	6-12-32	<.1	.5	3	50	60A	<10	<10	.015	<2	<50	<5	<2	20
590	6-11-36	<.1	<.5	<2	30	30A	<10	<10	<.001	<2	<50	<5	<2	<5
591	6-12-32	<.1	<.5	3	30	50A	<10	<10	.03	<2	<50	<5	<2	5
674	6-11-18	<.1	<.5	<2	20	60A	<10	<10	.015	<2	<50	<5	<2	<5
675	6-11-18	<.1	<.5	2	50	50A	<10	<10	<.001	<2	<50	<5	<2	5
676	6-11-18	<.1	<.5	<2	50	50A	<10	<10	<.001	<2	<50	<5	<2	<5
677	6-10-13	<.1	<.5	<2	50	60A	<10	<10	<.001	<2	<50	<5	<2	10
678	6-10-13	<.1	<.5	<2	30	60A	<10	<10	.07	<2	<50	<5	<2	5
679	6-11-8	<.1	<.5	10	70	140A	<10	<10	.04	<2	<50	<5	5	10
681	6-11-9	<.1	<.5	5	20	50A	<10	<10	.07	<2	<50	<5	<2	20
682	6-11-9	<.1	<.5	3	30	40A	<10	<10	<.001	<2	<50	<5	<2	15
683	6-11-9	<.1	<.5	3	30	60A	<10	<10	.15	<2	<50	<5	<2	5
688	6-11-5	<.1	<.5	2	50	60A	<10	<10	<.001	<2	<50	<5	<2	10
689	6-11-5	<.1	<.5	2	50	40A	<10	<10	<.001	<2	<50	<5	<2	10
690	6-11-5	<.1	<.5	3	50	50A	<10	<10	.04	<2	<50	<5	<2	10
691	6-11-5	<.1	<.5	2	20	40A	<10	<10	<.001	<2	<50	<5	<2	50
692	6-11-5	<.1	<.5	3	30	40A	<10	<10	.015	<2	<50	<5	<2	20
693	6-11-6	<.1	<.5	5	50	40A	<10	<10	.26	<2	<50	<5	<2	20
694	6-11-6	<.1	<.5	3	30	40A	<10	<10	.025	<2	<50	<5	<2	5
695	7-11-33	<.1	<.5	3	50	50A	<10	<10	.025	<2	<50	<5	<2	20
697	7-11-34	<.1	<.5	2	20	40A	<10	<10	<.001	<2	<50	<5	<2	5
698	7-11-34	<.1	<.5	2	20	40A	<10	<10	<.001	<2	<50	<5	<2	5
699	7-11-33	<.1	<.5	3	50	50A	<10	<10	.025	<2	<50	<5	<2	20
700	7-11-35	<.1	<.5	2	20	25A	<10	<10	.24	<2	<50	<5	<2	5
701	7-11-26	<.1	<.5	5	70	90A	<10	<10	.06	<2	<50	<5	<2	20
703	7-11-26	<.1	<.5	3	50	80A	<10	<10	.03	<2	<50	<5	<2	20
704	7-11-26	<.1	<.5	2	20	40A	<10	<10	.2	<2	<50	<5	<2	10
705	7-11-27	<.1	<.5	2	30	60A	<10	<10	.025	<2	<50	<5	<2	10
713	7-11-21	<.1	<.5	15	30	50A	<10	<10	.025	<2	<50	<5	<2	20
714	7-10-36	<.1	<.5	10	50	70A	<10	<10	.04	<2	<50	<5	<2	20
715	6-10-2	<.1	.5	10	30	50A	<10	<10	.025	<2	<50	<5	<2	10
718	7-10-35	<.1	<.5	2	20	50A	<10	<10	<.001	<2	<50	<5	<2	10
719	7-10-35	<.1	<.5	2	20	80A	<10	<10	.06	<2	<50	<5	<2	5
720	7-10-36	<.1	<.5	2	20	70A	<10	<10	.15	<2	<50	<5	<2	15
721	7-10-36	<.1	<.5	2	20	80A	<10	<10	.16	<2	<50	<5	<2	10
722	7-10-36	<.1	<.5	3	50	80A	<10	<10	<.001	<2	<50	<5	<2	20
723	7-10-36	<.1	<.5	10	20	50A	<10	<10	.09	<2	<50	<5	<2	5
724	7-10-25	<.1	<.5	15	20	60A	<10	<10	.1	<2	<50	<5	<2	10
725	7-10-25	<.1	<.5	5	20	70A	<10	<10	<.001	<2	<50	<5	<2	5
726	7-10-25	<.1	<.5	3	20	60A	<10	<10	.03	<2	<50	<5	<2	10
727	7-10-25	<.1	<.5	5	20	60A	<10	<10	<.001	<2	<50	<5	<2	10
728	7-11-21	<.1	<.5	2	10	60A	<10	<10	.09	<2	<50	<5	<2	10
729	7-11-16	<.1	<.5	2	10	40A	<10	<10	.1	<2	<50	<5	<2	10
733	7-11-8	<.1	<.5	2	20	50A	<10	<10	.05	<2	<50	<5	<2	10
734	7-11-8	<.1	7	100	50	200A	50	<10	.06	70	<50	<5	<2	5
742	7-11-2	<.1	<.5	2	10	50A	<10	<10	.09	<2	<50	<5	<2	15
744	7-11-2	<.1	<.5	<2	10	50A	<10	<10	.24	<2	<50	<5	<2	10
745	7-11-2	<.1	<.5	2	30	60A	<10	<10	.05	<2	<50	<5	<2	10
746	7-11-11	<.1	1	2	20	60A	<10	<10	.04	<2	<50	<5	<2	15
747	7-11-11	<.1	<.5	2	15	40A	<10	<10	.05	<2	<50	<5	<2	10
748	7-11-3	<.1	<.5	5	15	60A	<10	<10	.09	<2	<50	<5	<2	10
749	7-11-3	<.1	<.5	5	10	100A	<10	<10	.09	<2	<50	<5	<2	15
750	7-11-3	<.1	<.5	30	<10	50A	<10	<10	.15	<2	<50	<5	<2	15
751	7-11-3	<.1	<.5	30	<10	50A	<10	<10	.13	<2	<50	<5	<2	5
752	7-11-3	<.1	<.5	5	<10	80A	<10	<10	.28	<2	<50	<5	<2	10

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. anal-yses ppm
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Stream sediments--not sieved--Continued									
583	5	30	15	150	50	10	1,500	1,000	500	3	0.3	0.5	--	2.4
584	5	30	20	150	50	20	1,500	500	500	5	.3	.5	.18	3.2
586	3	30	15	150	20	10	1,000	500	500	2	.3	.7	--	3.9
587	3	50	15	150	30	10	1,000	1,000	500	3	.3	1	--	1.7
588	3	50	15	150	50	10	1,000	700	500	2	.3	.7	--	3.9
589	5	30	15	200	50	10	1,000	1,000	500	2	.3	.7	--	2.4
590	1	20	15	200	<20	5	1,500	1,000	200	1.5	.2	1	--	<1
591	2	30	15	100	<20	5	1,500	500	500	2	.2	.7	--	2.4
674	2	20	15	100	30	5	1,000	500	300	2	.1	.5	.04	6.2
675	2	20	15	150	<20	5	1,000	700	300	1.5	.15	.7	--	2.4
676	1	20	10	100	<20	<5	1,000	700	500	1.5	.15	.7	--	2.4
677	1	20	15	150	<20	5	1,000	700	500	2	.2	1	--	3.2
678	1	20	15	100	<20	5	1,000	500	500	2	.2	.7	--	3.2
679	1	20	15	100	20	10	2,000	700	500	1	.15	.3	--	3.2
681	2	15	15	100	70	10	1,000	200	1,000	1.5	.3	1	--	3.2
682	<1	20	15	100	70	10	1,500	700	500	2	.2	1	--	2.4
683	3	20	20	150	50	20	1,000	300	1,000	2	.2	1	--	5.5
688	1	20	15	100	50	15	2,000	500	1,000	2	.15	.7	--	3.9
689	1	20	15	100	<20	5	1,500	500	200	2	.15	.7	--	3.2
690	1	20	70	150	30	10	1,000	300	500	2	.2	1	.13	2.4
691	<1	20	15	100	50	10	1,500	700	500	2	.2	1	--	1.7
692	2	20	15	150	30	10	1,000	500	500	2	.15	.7	--	2.4
693	2	20	15	150	70	15	1,000	500	1,000	2	.2	2	--	3.9
694	2	20	20	200	50	15	1,000	300	1,000	2	.2	1	--	3.9
695	5	20	15	150	70	15	1,500	500	1,000	2	.2	1	--	2.4
697	2	20	15	200	<20	10	1,500	300	500	1.5	.15	.7	--	2.4
698	2	20	15	100	20	10	1,500	300	500	1.5	.15	.7	--	2.4
699	1	20	15	150	<20	5	1,500	500	1,000	2	.2	.7	--	3.2
700	1	20	15	100	30	5	1,500	300	500	1	.15	1	.01	4.7
701	1	30	15	150	<20	10	2,000	1,000	1,000	2	.2	1	--	2.4
703	1	30	30	100	<20	5	1,500	500	1,000	2	.2	1	--	3.9
704	2	30	10	100	<20	10	1,000	300	500	1.5	.2	.7	.09	3.2
705	2	20	15	100	70	10	2,000	700	1,000	2	.2	1	--	2.4
713	3	30	30	200	100	30	2,000	1,500	1,000	2	.2	1	--	2.4
714	1	30	20	100	50	20	2,000	1,000	2,000	2	.15	1	--	3.9
715	1	30	15	100	100	10	1,000	500	1,000	1.5	.15	1	--	2.4
718	1	15	10	70	50	10	1,000	700	500	2	.15	.5	--	1
719	2	20	10	100	20	5	1,500	700	500	1	.1	.7	--	5.5
720	1	30	10	70	100	20	700	300	500	1.5	.15	.7	.06	5.5
721	1	20	10	70	<20	<5	700	300	1,500	1.5	.15	.5	.03	7.5
722	2	30	15	100	20	10	1,500	500	1,000	3	.2	1	--	3.2
723	1	20	15	70	70	10	1,000	200	500	1.5	.2	.7	--	2.4
724	3	20	15	100	70	10	1,000	200	500	1.5	.3	.7	--	3.2
725	1	20	15	100	50	10	1,000	700	200	2	.2	1	--	2.4
726	2	15	15	100	50	10	1,000	500	500	2	.2	.7	--	3.2
727	2	20	15	100	50	10	1,000	700	500	2	.2	1	--	2.4
728	1	20	10	100	70	5	1,000	300	1,000	1	.2	.5	--	3.9
729	1	15	15	150	70	10	1,000	500	500	1.5	.3	.7	--	2.4
733	2	15	10	150	70	10	1,000	300	200	1.5	.3	.7	--	2.4
734	1	15	10	150	50	5	1,000	500	500	2	.2	.5	--	14.5
742	1	20	20	200	150	10	1,000	300	500	2	.3	1	--	2.4
744	2	15	10	100	<20	5	700	200	500	.5	.1	1	--	4.7
745	2	20	10	100	20	15	1,000	500	500	1.5	.2	1	--	2.4
746	2	20	10	100	50	10	1,000	700	500	2	.2	.7	--	2.4
747	1	15	15	100	200	10	1,000	500	500	1.5	.2	.5	--	2.4
748	1	20	10	100	<20	5	1,000	700	500	1.5	.2	1	.17	3.2
749	3	20	10	150	20	10	700	200	500	1.5	.3	.7	.03	8.5
750	1	15	10	100	<20	5	1,000	300	500	2	.2	.7	--	3.9
751	3	15	<10	70	<20	10	700	200	200	1	.2	.5	--	3.9
752	1	15	<10	50	100	20	300	150	500	1	.15	1	--	8.5

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Semiquantitative spectrographic analyses (ppm)												
		Stream sediments--not sieved--Continued												
753	7-11-3	<0.1	<0.5	30	10	70A	<10	<10	0.13	<2	<50	<5	<2	10
754	7-11-4	<.1	<.5	<2	50	80A	<10	<10	.025	<2	<50	<5	<2	5
755	8-10-35	<.1	.5	70	70	80A	<10	<10	.015	<2	<50C	<5	<2	15
757	7-10-1	<.1	.5	50	100	140A	<10	<10	.07	<2	<50	<5	<2	10
759	7-10-1	<.1	.5	70	70	120A	<10	<10	.07	<2	<50	<5	<2	70
760	8-11-8	<.1	<.5	10	30	60A	<10	<10	<.001	<2	<50	<5	20	100
761	8-11-4	<.1	<.5	30	30	50A	<10	<10	.04	<2	<50	<5	<2	10
763	8-11-5	<.1	<.5	15	15	50A	<10	<10	.1	<2	<50	<5	<2	15
764	8-11-5	<.1	<.5	10	20	50A	<10	<10	.015	<2	<50	<5	<2	10
765	8-11-5	<.1	<.5	10	20	40A	<10	<10	.015	<2	<50	<5	<2	10
766	8-10-12	<.1	<.5	5	20	60A	<10	<10	.04	<2	<50	<5	<2	10
767	8-10-12	<.1	<.5	5	30	50A	<10	<10	.03	<2	<50	<5	<2	20
768	8-10-2	<.1	<.5	15	30	60A	<10	<10	.04	<2	<50	<5	<2	30
769	8-10-2	<.1	<.5	5	50	30A	<10	<10	.025	<2	<50	<5	<2	10
770	8-10-11	<.1	<.5	10	20	40A	<10	<10	.025	<2	<50	<5	<2	10
771	8-10-11	<.1	<.5	10	20	60A	<10	<10	.015	<2	<50	<5	<2	10
772	8-10-2	<.1	<.5	10	15	40A	<10	<10	.1	<2	<50	<5	<2	5
773	8-10-1	<.1	<.5	5	20	50A	<10	<10	.1	<2	<50	<5	<2	5
774	9-11-29	<.1	<.5	30	15	70A	<10	<10	.015	<2	<50	<5	<2	20
775	9-10-25	<.1	<.5	20	50	60A	<10	<10	.08	<2	<50	<5	<2	10
776	9-10-25	<.1	<.5	15	30	50A	<10	<10	.015	<2	<50	<5	<2	20
777	9-11-32	<.1	<.5	15	20	100A	<10	<10	.1	<2	<50	<5	<2	30
778	9-11-32	<.1	<.5	10	30	70A	<10	<10	.015	<2	<50	<5	<2	30
779	9-11-32	<.1	<.5	5	20	120A	<10	<10	.05	<2	<50	<5	<2	10
780	9-11-33	<.1	<.5	50	30	60A	<10	<10	.04	<5	<50	<5	10	<5
781	9-11-34	<.1	<.5	5	30	50A	<10	<10	.05	<2	<50	<5	<2	30
782	9-11-34	<.1	<.5	2	20	70A	<10	<10	.23	<2	<50	<5	<2	10
783	8-11-10	<.1	<.5	2	30	50A	<10	<10	.04	<2	<50	<5	<2	20
784	8-11-10	<.1	<.5	2	10	40A	<10	<10	.15	<2	<50	<5	<2	30
785	8-11-3	<.1	<.5	3	15	50A	<10	<10	.03	<2	<50	<5	<2	10
786	8-11-3	<.1	<.5	5	20	60A	<10	<10	.015	<2	<50	<5	<2	20
787	8-11-4	<.1	<.5	20	30	160A	<10	<10	.06	<2	<50	<5	5	10
788	9-11-33	<.1	<.5	<2	15	100A	<10	<10	.05	<2	<50	<5	<2	10
789	9-11-27	<.1	<.5	5	10	100A	<10	<10	.04	<2	<50	<5	<2	15
790	9-11-34	<.1	<.5	10	10	50A	<10	<10	.15	<2	<50	<5	<2	10
798	7-11-1	<.1	<.5	2	10	60A	<10	<10	.18	<2	<50	<5	<2	10
800	7-12-7	<.1	<.5	20	30	80A	<10	<10	.06	<2	<50	<5	<2	20
807	6-13-20	<.1	<.5	2	10	50A	<10	<10	.025	<2	<50	<5	<2	10
808	6-13-20	<.1	<.5	3	15	50A	<10	<10	.015	<2	<50	<5	<2	10
809	6-13-21	<.1	<.5	2	10	50A	<10	<10	.04	<2	<50	<5	<2	10
810	6-13-21	<.1	<.5	2	20	40A	<10	<10	.04	<2	<50	<5	<2	5
811	6-13-29	<.1	<.5	3	15	60A	<10	<10	.03	<2	<50	<5	<2	10
812	6-13-29	<.1	<.5	3	15	70A	<10	<10	.015	<2	<50	<5	<2	15
813	6-13-28	<.1	<.5	2	15	120A	<10	<10	.03	<2	<50	<5	<2	15
814	6-13-28	<.1	<.5	5	15	200A	<10	<10	.05	<2	<50	<5	<2	10
815	6-13-27	<.1	<.5	5	50	80A	<10	<10	.03	<2	<50	<5	<2	10
816	6-13-34	<.1	<.5	2	10	70A	<10	<10	.07	<2	<50	<5	<2	5
817	5-13-4	<.1	<.5	10	10	70A	<10	<10	.06	<2	<50	<5	<2	20
818	5-13-8	<.1	<.5	2	<10	70A	<10	<10	.11	<2	<50	<5	<2	5
819	5-13-6	<.1	<.5	2	20	40A	<10	<10	.015	<2	<50	<5	<2	10
821	5-12-1	<.1	<.5	10	10	90A	<10	<10	.025	<2	<50	<5	<2	5
822	5-12-15	<.1	<.5	10	10	50A	<10	<10	.03	<2	<50	<5	<2	10
823	5-12-10	<.1	<.5	2	10	90A	<10	<10	.04	<2	<50	<5	<2	5
824	5-12-2	<.1	<.5	15	15	140A	<10	<10	.025	<2	<50	<5	5	15
828	5-12-3	<.1	<.5	20	30	70A	<10	<10	.03	<2	<50	<5	2	20
829	5-12-3	<.1	<.5	2	20	80A	<10	<10	.025	<2	<50	<5	<2	10
830	5-12-2	<.1	<.5	15	10	60A	<10	<10	.025	<2	<50	<5	2	15
831	5-12-2	<.1	<.5	5	20	80A	<10	<10	.03	<2	<50	<5	<2	30
833	6-12-35	<.1	<.5	<2	<10	50A	<10	<10	.2	<2	<50	<5	<2	5
834	6-12-35	<.1	<.5	2	15	1C	<10	<10	.5	<2	<50	<5	<2	10

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent				Chem. anal- yses ppm
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
	Stream sediments--not sieved--Continued													
753	5	20	10	150	30	15	500	200	500	1.5	0.3	0.5	0.12	3.9
754	2	20	10	100	30	10	700	300	1,000	1.5	.2	.7	--	4.7
755	2	30	15	150	50	10	1,500	500	500	2	.2	.7	--	4.7
757	3	30	15	300	70	15	1,000	500	1,000	1.5	.3	1	--	14.5
759	3	20	10	100	30	10	1,500	500	700	2	.2	1	--	8.5
760	2	20	20	100	20	15	1,500	500	1,500	2	.2	1	--	3.2
761	1	15	30	150	20	10	1,000	500	500	1.5	.2	1	.02	2.4
763	5	20	10	100	<20	20	500	100	1,000	1.5	.2	.2	--	4.7
764	3	20	15	200	20	15	1,500	<50	500	2	.2	1	--	2.4
765	3	20	15	70	30	10	1,000	<50	500	1.5	.2	1	--	2.4
766	3	30	30	100	20	20	1,000	70	1,000	1.5	.2	1	--	3.9
767	2	20	20	70	30	10	1,000	50	500	1.5	.2	1	--	2.4
768	3	30	20	300	30	20	1,000	<50	1,000	2	.3	1	--	2.4
769	3	20	50	150	<20	15	1,000	<50	700	2	.2	1	--	2.4
770	5	50	15	100	50	20	1,000	50	500	1.5	.2	1	--	2.4
771	3	30	20	200	30	15	1,000	50	1,000	2	.2	1	--	3.9
772	5	15	20	70	<20	10	1,000	50	700	1.5	.15	.5	--	3.2
773	5	20	30	150	<20	10	1,000	100	500	1.5	.2	1	--	3.2
774	7	50	20	500	20	10	1,000	100	500	2	.3	1	--	2.4
775	3	30	20	100	30	15	1,000	50	500	2	.2	.7	--	<1
776	5	30	50	200	30	30	1,000	50	1,000	2	.3	1	--	1
777	7	50	20	200	50	15	1,000	<50	700	2	.5	1.5	--	1
778	5	30	20	200	20	15	1,000	50	500	2	.3	1	--	1
779	3	50	20	150	20	20	1,000	700	500	1.5	.2	1	--	3.2
780	5	50	15	200	50	10	1,000	1,000	700	1.5	.5	1.5	--	1
781	5	20	30	200	70	20	1,000	70	1,000	2	.3	1	.07	3.9
782	2	20	15	150	70	15	500	200	1,000	1.5	.2	.5	--	4.7
783	2	20	30	100	<20	10	1,000	700	500	2	.2	.7	--	3.2
784	2	15	10	70	20	10	500	200	100	1	.2	1	--	7.5
785	2	15	10	100	<20	5	1,000	300	200	1	.15	1	--	3.9
786	2	20	20	70	<20	20	1,000	500	150	2	.2	.5	--	1.7
787	1	20	15	150	<20	10	1,500	700	500	.5	.15	.3	.04	2.4
788	3	70	10	200	50	10	700	700	500	1.5	.2	.5	--	1
789	2	15	10	200	<20	10	1,000	700	200	3	.2	1	--	1.7
790	2	15	10	150	<20	10	1,000	300	2,000	1.5	.2	.7	--	3.9
798	2	15	10	150	<20	<5	1,000	300	200	1.5	.2	.5	--	3.9
800	3	30	15	100	30	30	500	200	150	2	.3	.7	.17	3.2
807	5	20	15	150	70	5	1,000	500	300	2	.2	.3	--	2.4
808	2	20	15	150	20	10	1,000	500	200	2	.2	.3	--	<1
809	2	20	15	150	30	10	1,500	700	200	1.5	.2	.5	--	<1
810	1	20	15	150	50	5	1,000	700	200	2	.15	.5	--	1
811	2	20	15	150	30	5	1,000	500	200	2	.2	.5	--	1
812	2	20	15	200	70	15	1,500	1,000	500	3	.2	.7	--	1
813	2	15	15	200	70	10	1,000	1,000	500	2	.2	.5	.06	1
814	2	15	15	200	50	15	1,000	700	700	2	.2	1	--	2.4
815	2	20	15	200	30	15	1,000	500	700	2	.2	.7	--	5.5
816	2	20	15	300	20	5	1,000	300	500	2	.2	.5	--	1
817	2	50	15	200	20	10	1,000	700	500	2	.2	1	--	<1
818	5	30	10	200	20	5	1,000	300	500	1.5	.2	1	--	3.9
819	3	30	20	300	50	15	1,000	500	500	3	.2	.7	--	1
821	3	20	15	200	30	5	1,000	500	200	2	.2	.5	--	1
822	2	50	10	200	30	15	1,000	500	700	1	.2	1	--	1
823	3	30	<10	100	50	<5	700	200	700	1	.15	.5	.09	3.9
824	2	50	<10	100	50	10	1,000	1,500	500	2	.2	.7	--	1
828	3	30	10	150	30	5	1,500	700	700	1	.3	.5	--	3.2
829	5	50	<10	150	20	10	1,000	300	500	1	.2	.3	--	1.7
830	2	30	10	200	50	10	1,000	700	500	1	.2	.5	--	1.7
831	3	50	10	200	50	20	1,000	1,000	500	2	.3	.5	--	2.4
833	3	20	<10	10	20	10	500	200	500	.5	.07	1.5	.21	4.7
834	3	30	10	150	50	20	700	300	500	1	.15	.5	.06	>90

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Semiquantitative spectrographic analyses (ppm)												
		Stream sediments--not sieved--Continued												
835	6-13-30	<0.1	<0.5	5	30	80A	<10	<10	<0.001	<2	<50	<5	<2	15
836	6-13-30	<.1	<.5	15	20	70A	<10	<10	<.001	<2	<50	<5	<2	30
837	6-13-19	<.1	<.5	10	20	80A	<10	<10	.015	<2	<50	<5	<2	20
838	6-13-19	<.1	<.5	5	15	70A	<10	<10	.06	<2	<50	<5	<2	10
		Soil samples--sieved												
80	8-13-26	<.1	<.5	30	30	57A	<10	<10	.12	3	<100	10	20	50
372	9-13-27	<.02	<.5	50	70	120A	<10	<10	.13	<5	<50	7	30	30
510	8-13-31	<.1	<.5	20	30	160A	<10	<10	.3	15	<100	<5	7	20
621	7-12-15	<.1	<.5	70	100	90A	<10	<10	<.01	2	<100	20	30	70
843	8-13-22	<.02	<.5	70	70	130A	<10	<10	.03	<5	<50	10	30	30
846	10-13-19	<.1	<.5	50	70	130A	<10	<10	.03	<5	<50	15	50	70
855	10-12-25	<.02	<.5	100	30	72A	<10	<10	.07	<5	<50	50	70	70
881	10-12-19	<.02	<.5	30	70	76A	<10	<10	.05	<5	<50	10	15	30
883	10-12-30	.12	<1	1	30	<200	<10	<10	.03	<3	<100	5	<3	3
940	8-11-2	<.02	<.5	100	20	60A	<10	<10	.1	<5	<50	30	100	70
992	7-12-5	<.02	<.5	30	70	51A	<10	<10	.26	<5	<50	<5	15	30
		Soil samples--not sieved												
696	6-11-5	<.1	<.5	3	30	80A	<10	<10	.26	<2	<50	<5	<2	10
712	7-11-21	<.1	<.5	15	30	70A	<10	<10	.025	<2	<50	<5	<2	50
737	7-11-17	<.1	<.5	2	30	60A	<10	<10	.015	<2	<50	<5	<2	20
762	8-11-5	<.1	<.5	10	20	40A	<10	<10	.1	<2	<50	<5	<2	10
		Panned concentrates												
4	9-12-36	--	7	20	50	98A	<10	50	.12	<2	<100	<5	2	70
196	7-12-30	--	<.5	20	50	<200	<10	<10	--	<2	<100	<5	3	30
197	6-11-21	<.1	<.5	30	30	32A	<10	<10	<.01	10	<100	7	2	150
198	6-11-20	<.1	<.5	10	20	20C	<10	<10	<.1	<5	<20C	5	5	30
199	6-11-29	<.1	<.5	20	30	<25A	<10	<10	.03	<2	<100	<5	<2	15
200	6-11-33	<.1	<.5	30	30	46A	<10	<10	<.01	3	<100	5	<2	30
202	6-11-22	<.1	<.5	15	50	<25A	<10	<10	.04	<2	<100	<5	2	7
264	7-10-1	<.1	2	30	50	20C	<10	<10	<.1	<5	<20C	<5	5	20
311	8-11-4	<.1	<.5	10	30	<10A	<10	<10	<.1	<5	<20C	<5	5	7
318	8-10-12	<.1	<.5	2	20	<10C	<10	<10	<.1	<5	<20C	<5	5	5
407	10-12-29	.03	<1	7	50	<200	<10	<10	.16	5	<100	3	5	10
409	10-12-29	.02	<1	2	30	<200	<10	<10	.07	3	<100	5	7	15
501	7-13-4	--	<.5	2	30	<200	<10	<10	--	<2	<100	<5	5	<5
502	8-13-33	--	<.5	2	30	51A	<10	<10	.12	15	<100	<5	<2	<5
503	8-13-33	<.1	<.5	3	70	660A	<10	<10	--	7	<100	<5	2	<5
504	7-13-6	--	3	7	70	51A	<10	<10	.07	5	<100	<5	7	150
507	8-13-31	--	5	10	100	100A	<10	30	--	30	<100	<5	2	10
508	8-12-36	<.1	.7	<2	30	57A	<10	<10	<.01	15	<100	<5	2	<5
509	8-13-31	--	<.5	3	30	75A	<10	<10	.05	<2	<100	<5	3	<5
517	8-13-32	--	<.5	15	50	69A	<10	70	.03	2	<100	7	5	30
520	8-13-29	<.1	.5	10	30	92A	<10	30	.05	<2	<100	15	70	1,000
521	8-13-29	--	<.5	2	30	58A	<10	150	.03	<2	<100	5	20	500
522	8-13-21	--	<.5	<2	30	130A	<10	<10	<.01	<2	<100	<5	<2	<5
523	8-13-16	--	<.5	5	50	200A	<10	20	.03	<2	<100	<5	<2	<5
524	8-13-16	--	<.5	<2	20	150A	<10	<10	--	2	<100	<5	2	<5
525	8-13-16	--	.5	10	20	<200	<10	<10	--	<2	<100	<5	<2	<5
526	8-13-15	--	2	3	30	<25A	<10	150	.07	<2	150	<5	3	<5
529*	10-12-18	--	30	20	70	<25A	<10	<10	.14	<2	<100	<5	5	15
530	10-12-18	--	<.5	2	50	56A	<10	<10	<.01	<2	<100	<5	<2	30
533*	10-12-7	<.1	50	20	100	130A	<10	<10	.26	<2	<100	<5	2	30
534	10-12-5	--	<.5	15	20	110A	<10	10	.07	<2	<100	<5	<2	70
535	11-12-33	--	3	<2	<10	31A	<10	<10	.09	<2	<100	5	<2	15
538	6-13-9	--	<.5	20	20	95A	<10	<10	--	3	<100	<5	<2	100
540*	6-13-13	--	5,000	3,000	1,000	*	<10	<10	--	<2	<100	10	3	5
541*	6-13-24	--	30	20	30	71A	<10	<10	.34	2	<100	5	<2	20

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
						Stream sediments--not sieved--Continued								
835	2	30	<10	200	50	15	1,500	1,000	500	1.5	0.15	0.7	0.09	2.4
836	2	50	15	500	100	20	1,000	1,000	500	2	.3	.5	--	<1
837	3	50	10	200	50	20	1,500	1,500	500	1	.2	.1	--	1
838	3	50	10	200	150	20	1,000	300	500	1	.15	.3	--	2.4
						Soil samples--sieved								
80	2	70	15	500	<20	20	500	300	700	5	.5	1.5	--	.5
372	3	50	30	150	50	30	300	300	1,500	3	.5	1	--	1
510	5	70	<10	150	50	150	300	100	300	2	.3	.15	--	2
621	10	70	20	200	50	30	700	500	1,500	5	.7	1.5	--	--
843	5	70	20	300	30	15	300	300	3,000	3	.5	1	--	9
846	1.5	70	20	300	30	15	500	300	2,000	3	.7	1	--	5
855	<1	70	<10	100	20	30	200	500	700	5	.5	3	--	2
881	2	70	30	200	30	20	700	300	1,500	2	.3	.5	--	1
883	3	30	30	300	100	15	2,000	150	700	3	.3	.15	.1	<.5
940	<1	150	10	100	30	20	300	300	1,000	15	>1	2	--	2
992	7	30	100	300	70	50	150	70	700	3	.2	.2	--	.5
						Soil samples--not sieved								
696	2	15	10	100	<20	10	1,000	200	1,000	1.5	.2	.5	.08	8.5
712	<1	50	15	200	70	15	2,000	1,000	1,000	2	.5	1	--	2.4
737	2	30	15	150	50	10	1,000	500	1,000	2	.3	.5	--	1
762	1	30	<10	70	<20	<5	300	50	1,000	1	.3	.2	.15	3.9
						Panned concentrates								
4	5	30	2,000	>1,000	1,000	>200	100	<50	5,000	7	>1	.7	--	--
196	7	30	70	200	200	200	1,000	500	2,000	3	.7	1.5	--	--
197	5	100	100	>1,000	300	150	1,500	1,000	2,000	20	>1	1.5	--	--
198	1	100	700	1,000	100	50	700	200	5,000	15	1	.5	.01	--
199	1	100	30	500	70	20	3,000	1,500	700	10	1	1	--	--
200	5	100	20	1,000	300	20	2,000	1,500	700	15	1	1.5	--	--
202	1	50	20	200	50	10	3,000	700	700	5	.3	1	--	--
264	<1	150	>1,000	1,000	200	70	700	300	3,000	20	.5	.5	--	--
311	2	20	50	200	20	<10	500	500	200	2	.15	.7	--	--
318	1	50	100	300	20	10	700	500	300	2	.2	.7	--	--
407	7	20	500	200	100	70	1,500	200	700	2	.5	.7	.03	1
409	2	50	100	150	150	70	1,500	500	700	3	.5	3	.07	<.5
501	5	50	30	300	20	7	1,000	1,500	300	3	.3	1	--	--
502	15	30	100	300	<20	15	50	<50	1,000	3	.2	.15	--	--
503	10	20	50	200	20	20	150	<50	5,000	3	.15	.15	--	--
504	15	50	300	1,000	30	30	100	50	2,000	5	.5	1.5	--	--
507	15	50	200	>1,000	1,000	200	150	<50	2,000	7	.7	.2	--	--
508	2	20	150	100	20	5	50	<50	700	3	.2	.7	--	--
509	50	15	100	100	30	5	70	<50	500	.5	.3	.7	--	--
517	10	70	2,000	>1,000	1,000	150	70	<50	5,000	15	>1	1.5	--	--
520	1	100	1,500	700	20	70	100	200	1,500	10	.5	7	--	--
521	5	30	2,000	>1,000	20	100	30	100	1,500	3	.2	1.5	--	--
522	3	10	100	1,000	<20	15	15	<50	300	1.5	.07	.7	--	--
523	15	10	500	>1,000	<20	50	20	<50	500	5	.2	.7	--	--
524	2	10	300	1,000	<20	30	30	<50	300	3	.2	.7	--	--
525	3	10	150	300	20	20	30	<50	300	3	.15	.7	--	--
526	15	<10	300	1,000	<20	30	15	<50	100	1	.1	3	--	--
529*	1	30	1,000	300	150	200	1,500	700	700	5	.5	1.5	--	--
530	1	50	300	700	50	50	1,500	1,500	500	5	.3	1.5	--	--
533*	<1	50	10	150	<20	5	1,500	1,000	500	7	.2	1.5	--	--
534	3	200	150	>1,000	>1,000	>200	300	300	1,000	15	>1	2	--	--
535	<1	50	300	>1,000	1,000	>200	300	500	300	7	1	1.5	--	--
538	1	300	150	1,000	1,000	>200	700	300	500	20	1	1.5	--	3
540*	1	30	10	200	20	5	100	<50	150	7	.2	.5	--	24
541*	1	200	100	1,000	100	50	1,000	700	300	10	.7	1	--	--

TABLE 1.—*Analyses of samples from the*

		Semiquantitative spectrographic analyses (ppm)												
Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Panned concentrates--Continued												
542*	6-14-7	<0.1	.15	20	30	<25A	<10	<10	0.16	<2	<100	<5	<2	20
578	6-12-34	<.1	2	20	150	20C	<10	20	<.1	20	20C	20	5	15
585	6-12-33	.6	<.5	5	50	80A	<10	<10	.025	<2	<50	<5	<2	50
636*	7-12-18	<.1	<.5	30	50	33A	<10	<10	1.5	<2	<100	<5	10	150
657	6-11-16	<.1	5	20	30	70A	<10	<10	.05	2	<100	5	7	150
736	7-11-28	--	<.5	20	50	20C	<10	<10	<.1	<5	<20C	5	10	20
743	7-11-2	<.1	<.5	20	30	30C	<10	<10	<.1	<5	<20C	5	10	50
797	8-10-26	--	<.5	50	100	<200	<10	<10	--	<5	<50C	5	10	100
825	5-12-2	<.1	1	15	70	10C	<10	10	<.1	<5	<20C	<5	7	10
832	5-12-2	.1	<.5	10	30	20C	<10	<10	<.1	<5	160C	10	5	50
859	10-12-24	.13	<1	<2	20	<200	<10	15	.04	<3	<100	15	10	30
865	10-11-35	.58	<.2	<10	<25	<25A	--	--	--	--	--	--	--	--
897	10-11-35	.61	<1	7	50	<200	<10	<10	.08	<3	<100	7	3	3
903	10-12-34	.04	<1	10	30	<200	<10	<10	.05	3	<100	5	10	50
911	9-12-5	.47	<1	70	200	<200	<10	30	--	15	<100	<15	15	300
914	9-12-17	.04	1	15	70	<200	<10	<10	.07	3	<100	10	10	20
916	9-12-17	<.02	<1	2	20	<200	<10	<10	.03	<3	<100	5	5	15
917	9-11-11	.02	<.2	<10	80	<25A	--	--	--	--		--	--	--
918	9-11-11	.02	<1	15	30	<1,000	<10	<15	.05	<3	<100	10	5	50
921	9-12-7	.03	<1	30	70	<1,000	<10	30	.05	<3	<100	15	15	70
922	9-11-14	.27	<1	3	30	<1,000	<10	10	.05	<3	<100	7	7	20
924	9-11-14	.06	<1	7	70	<1,000	<10	15	.06	<3	<100	7	<3	15
928	9-11-2	3.9	7	50	500	<1,000	<10	15	.08	<3	150	15	5	15
930	8-12-7	.03	<1	3	50	1,000	50	70	.1	<3	200	<3	3	7
934	8-12-6	.03	<1	3	30	<1,000	<10	50	.02	<3	<100	<3	5	7
938	9-11-23	.05	.6	<10	<25	<25A	--	--	--	--	--	--	--	--
946	8-11-12	.23	--	--	--	--	--	--	--	--	--	--	--	--
957	9-11-26	.32	.6	<10	<25	32A	--	--	--	--	--	--	--	--
959	9-11-36	.03	<1	7	30	<200	<10	50	.05	<3	<100	15	7	20
961	9-11-23	.47	.5	<10	50	35A	--	--	--	--	--	--	--	--
963	8-11-4	<.02	.4	<10	<25	30A	--	--	--	--	--	--	--	--
964	8-10-23	.02	<1	3	30	<200	<10	10	.04	<3	<100	10	7	30
972	7-10-2	<.02	--	--	--	--	--	--	--	--	--	--	--	--
973	7-11-5	.02	<1	7	30	1,000	<10	<20	.13	<3	<100	15	7	30
985	7-12-18	<.1	<.5	30	70	80A	<10	30	.03	<5	<50	7	3	200
986	7-12-18	<.02	<.5	15	30	28A	<10	<10	.03	<5	100	<5	15	20
990	7-12-4	--	<.5	30	30	<200	<10	70	.03	<5	<50	5	2	70
994	8-12-33	<.1	<.5	50	20	<200	<10	20	.04	<5	<50	<5	3	70
1003	8-12-24	<.1	<.5	30	70	<200	<10	70	.04	<5	<50	30	2	100
1012	8-12-36	--	<.5	15	20	<200	<10	30	.05	<5	<50	<5	5	7
1015	8-12-26	<.02	<.5	10	30	68A	<10	<10	.03	5	<50	5	3	15
1049	6-12-11	2.3	--	--	--	--	--	--	--	--	--	--	--	--
1053	6-12-21	.08	<.5	30	70	72A	<10	<10	.07	7	<50	50	10	30
		Unaltered granitic rocks of the Sawtooth batholith												
321	9-12-36	<.1	<.5	2	50	10C	<10	<10	<.1	<5	<20C	<5	<5	<5
325	8-12-11	<.1	.5	3	50	10C	<10	<10	<.1	<5	<20C	<5	5	<5
330	9-13-32	<.1	<.5	.5	30	<10C	<10	10	<.1	<5	<20C	<5	5	<5
356	7-12-24	<.1	<.5	5	70	<10C	<10	10	<.1	<5	<20C	<5	5	<5
546	8-13-34	<.1	<.5	2	50	32A	<10	<10	.03	<2	<100	<5	<2	<5
624	7-12-13	--	<.5	5	50	<25A	<10	<10	.04	<2	<100	<5	<2	<5
802	7-13-6	<.1	<.5	5	50	10C	<10	10	<.1	<5	<20C	<5	5	<5
991	7-12-5	<.02	<.5	15	70	30A	<10	10	.1	<5	<50	<5	5	<5
1021	7-12-1	<.02	<.5	3	70	<25A	<10	<10	.09	<5	<50	<5	<2	<5
1023	7-12-12	<.02	<.5	15	50	26A	<10	<10	.07	<5	<50	<5	3	<5
1546	7-12-3	<.02	<.5	30	70	<25A	<10	<10	.03	<5	<50	<5	<2	5
1547	7-12-3	.06	<.5	100	70	26A	<10	<10	.01	<5	<50	<5	2	<5
1554	7-12-14	.02	<1	<1	70	<200	<10	<10	.03	<3	<100	<3	<3	<1
1557*	7-12-14	<.02	<1	3	20	1,100A	<10	100	<.01	<3	<100	<3	<3	<1
1560*	7-12-14	<.02	<1	1	30	60A	<10	30	<.01	<3	<100	<3	<3	<1
1566*	7-12-23	<.02	<1	<1	30	40A	<10	10	<.01	<3	<100	<3	<3	<1
1567	7-12-23	.02	<1	<1	<50	<200	<10	<10	.03	<3	<100	<3	<3	1

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm) Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Percent Fe	Ti	Ca	Chem. analyses ppm F	cxHM
						Panned concentrates--Continued								
542*	<1	150	70	1,000	200	30	1,000	1,000	300	10	1	1.5	--	--
578	2	200	500	700	500	100	700	500	500	20	>1	1	--	--
585	10	30	30	200	200	30	1,000	1,000	300	7	.7	1.5	--	2.4
636*	2	50	200	>1,000	700	200	1,000	500	>5,000	10	>1	1.5	--	--
657	5	30	500	700	500	200	300	300	5,000	7	>1	1.5	--	--
736	<1	200	>1,000	1,000	500	100	700	300	3,000	20	1	.5	.33	--
743	1	200	1,000	>1,000	1,000	150	700	200	5,000	15	>1	2	--	--
797	<1	100	>1,000	>1,000	700	200	500	200	5,000	20	>1	2	--	--
825	1	100	200	500	500	100	1,000	500	700	10	>1	2	--	--
832	1	500	200	>1,000	500	100	500	200	700	>20	1	1	--	--
859	3	100	150	3,000	7,000	700	700	150	3,000	7	1.5	7	.19	<.5
865	--	--	--	--	--	--	--	--	--	--	--	--	--	--
897	3	30	700	300	200	200	1,500	500	700	10	.3	1	.11	.5
903	2	70	70	150	300	100	1,500	700	1,500	3	.7	>10	.04	<.5
911	2	150	5,000	5,000	3,000	3,000	300	200	7,000	>10	5	>10	--	--
914	2	70	300	700	1,500	300	1,500	500	700	7	1	7	.29	<.5
916	3	50	150	500	300	70	1,500	700	500	3	1	3	.13	<.5
917	--	--	--	--	--	--	--	--	--	--	--	--	--	--
918	<1	300	2,000	1,500	1,000	500	70	30	1,000	>10	1.5	1.5	.15	.5
921	1.5	300	2,000	3,000	3,000	1,000	500	500	3,000	>10	5	>10	.31	.5
922	<1	300	500	1,500	700	150	100	50	1,000	>10	1.5	2	.12	1
924	<1	150	1,000	1,000	700	150	100	30	2,000	>10	1.5	.5	.13	4
928	<1	100	7,000	3,000	700	1,500	200	50	7,000	>10	1	.7	.19	5
930	1.5	50	3,000	700	700	300	15	10	7,000	>10	1	.15	.15	5
934	1	70	2,000	700	700	150	70	30	5,000	>10	1	.2	.12	.5
938	--	--	--	--	--	--	--	--	--	--	--	--	--	--
946	--	--	--	--	--	--	--	--	--	--	--	--	--	--
957	--	--	--	--	--	--	--	--	--	--	--	--	--	--
959	2	150	2,000	1,500	1,500	500	100	30	10,000	>10	3	1	.13	1
961	--	--	--	--	--	--	--	--	--	--	--	--	--	--
963	--	--	--	--	--	--	--	--	--	--	--	--	--	--
964	1	100	1,000	1,500	1,500	500	1,000	700	7,000	>10	1.5	1.5	--	.5
972	--	--	--	--	--	--	--	--	--	--	--	--	--	--
973	<1	700	700	1,000	700	300	150	70	3,000	>10	1.5	.7	.11	2
985	1	70	>2,000	>1,000	700	>200	500	200	>5,000	15	>1	.7	--	2
986	5	10	2,000	1,000	300	70	150	70	2,000	2	.7	.5	--	<.5
990	2	10	>2,000	>1,000	700	>200	30	70	>5,000	5	>1	.5	--	--
994	3	15	>2,000	>1,000	300	150	70	70	>5,000	3	>1	.3	--	--
1003	7	100	>2,000	>1,000	300	150	70	<50	5,000	10	>1	1.5	--	--
1012	3	<10	2,000	1,000	150	70	15	<50	>5,000	3	.7	.07	--	--
1015	7	30	2,000	>1,000	500	200	30	<50	1,000	15	>1	.07	--	2
1049	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1053	5	150	100	>1,000	1,000	200	500	300	500	15	>1	3	--	2
					Unaltered granitic rocks of the Sawtooth batholith									
321	2	10	50	300	70	15	300	<100	500	2	.15	.2	--	--
325	3	<10	50	50	150	20	20	<100	300	1	.05	.1	--	--
330	5	<10	50	30	30	10	50	<100	300	.7	.05	.05	--	--
356	3	10	150	100	30	10	50	<100	1,000	1.5	.05	.1	--	--
546	5	10	30	70	20	30	30	<50	300	1	.05	.2	--	--
624	200	15	15	300	50	15	200	70	1,000	2	.1	.5	.15	--
802	5	<10	150	150	50	20	20	<100	1,000	1.5	.1	.15	.36	--
991	7	<10	70	150	30	5	30	<50	1,000	1.5	.07	.1	--	14
1021	10	<10	70	150	70	7	15	<50	1,000	1	.07	.1	--	2
1023	20	<10	70	100	20	7	15	<50	700	1	.05	.1	--	5
1546	7	<10	70	150	30	7	15	<50	700	.7	.1	.2	--	5
1547	5	<10	70	70	20	10	15	<50	1,000	.7	.07	.2	--	9
1554	7	<7	100	70	50	15	100	15	1,000	1.5	.07	.15	.24	2
1557*	70	15	70	1,500	1,500	150	30	10	15,000	>10	.1	.05	--	--
1560*	7	<7	500	300	50	20	20	<5	7,000	.7	.05	.03	--	--
1566*	3	<7	150	70	<30	20	50	5	7,000	.7	.05	.15	--	--
1567	5	<7	150	150	30	20	30	<5	700	.5	.02	.15	.19	4

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Semiquantitative spectrographic analyses (ppm)												
		Unaltered granitic rocks of the Idaho batholith												
339	9-13-18	<0.1	<0.5	10	30	20C	<10	10	<0.1	<5	<20C	<5	5	5
346	7-13-28	<.1	<.5	10	20	30C	<10	<10	<.1	<5	<20C	<5	<5	5
352	6-12-27	<.1	<.5	10	30	<10C	<10	10	<.1	5	<20C	7	10	15
353	6-12-27	<.1	<.5	3	30	<10C	<10	<10	<.1	<5	<20C	<5	5	<5
358	5-12-17	<.1	<.5	3	20	10C	<10	<10	<.1	<5	<20C	5	10	15
412*	10-12-20	<.02	<.5	15	70	58A	<10	<10	.1	<5	<50	<5	70	5
413	10-12-20	<.02	<.5	15	30	100A	<10	<10	.07	<5	<50	7	5	7
426*	10-12-29	<.02	<.5	500	50	270A	<10	20	.1	<5	<50	<5	10	15
528	10-12-19	<.1	<.5	15	30	59A	<10	<10	.36	<2	<100	5	2	7
539	6-13-9	<.1	<.5	7	20	38A	<10	<10	<.01	<2	<100	<5	2	<5
543	8-13-34	<.1	<.5	15	30	29A	<10	<10	.04	<2	<100	<5	2	<5
709	7-10-36	<.1	<.5	5	30	<10C	<10	<10	<.1	<5	<20C	5	10	20
801	7-11-1	<.1	<.5	5	20	<10C	<10	<10	<.1	<5	<20C	<5	5	<5
901*	10-12-28	<.02	<.5	50	70	<25A	<10	<10	.36	<5	<50	<5	2	7
1642	5-14-5	<.02	<.5	50	30	64A	<10	<10	.05	<5	<50	<5	<2	7
		Unaltered leucocratic granitic rocks of the Idaho batholith												
359	5-12-17	<.1	<.5	5	50	<10C	<10	<10	<.1	<5	<20C	<5	5	<5
360	7-11-23	<.1	<.5	7	70	<10C	<10	<10	<.1	<5	<20C	<5	5	<5
651	7-11-31	<.1	<.5	<2	100	25A	<10	<10	.03	<2	<100	<5	<2	<5
953	9-10-24	<.02	<.5	10	30	<25A	<10	<10	.04	<5	<50	<5	5	5
		Metamorphic rocks												
56	10-13-31	<.1	<.5	20	15	45A	<10	<10	.16	<2	<100	<5	5	70
59	9-13-6	<.1	<.5	10	20	53A	<10	<10	.07	<2	<100	15	30	150
61	9-13-6	<.1	<.5	15	20	33A	<10	<10	.1	<2	<100	<5	10	100
65	9-12-12	<.1	<.5	20	15	34A	<10	<10	.12	<2	<100	10	50	150
331	10-13-31	<.1	<.5	5	20	20C	<10	<10	<.1	<5	<20C	<5	<5	5
332	10-13-31	<.1	<.5	<2	<10	<10C	<10	<10	<.1	<5	<20C	<5	<5	5
333	10-13-31	<.1	<.5	50	<10	20C	<10	<10	<.1	<5	<20C	50	150	150
334	10-13-31	<.1	<.5	30	<10	20C	<10	<10	<.1	<5	<20C	50	150	1,000
421	10-12-20	.02	<.5	10	15	90A	<10	30	.09	<5	<50	<5	30	150
428	10-12-29	.04	<1	7	15	700	<10	<10	.05	10	<100	7	70	30
851	10-13-31	<.02	<.5	70	<10	<25A	<10	<10	.16	<5	<50	150	300	3,000
		Unaltered dike rocks												
1067	7-13-14	<.02	<.5	30	30	<25A	<10	<10	.04	<5	<50	<5	<2	<5
343	8-13-22	<.1	<.5	3	70	30C	<10	<10	<.1	<5	<20C	<5	<5	<5
367	8-11-27	<.1	<.5	5	30	<10C	<10	<10	<.1	<5	<20C	<5	5	5
669	6-11-7	--	<.5	10	10	<25A	<10	<10	<.01	2	<100	<5	7	5
506	8-13-31	<.1	<.5	2	30	<25A	<10	<10	.05	7	<100	<5	2	<5
349	7-13-29	<.1	<.5	5	30	10C	<10	<10	<.1	<5	<20C	<5	5	<5
956*	9-11-34	<.02	<.5	10	50	42A	<10	15	.09	<5	<50	<5	<2	<5
1071	7-13-11	<.02	<.5	50	70	57A	<10	<10	.16	20	<50	<5	<2	5
1030	7-12-27	<.02	<.5	20	70	27A	<10	<10	.05	5	<50	<5	3	<5
340	9-13-7	<.1	<.5	5	50	20C	<10	<10	<.1	<5	<20C	<5	<5	<5
348	7-13-29	<.1	<.5	5	50	30C	<10	<10	<.1	5	<20C	<5	5	<5
341	9-12-14	<.1	<.5	3	20	20C	<10	<10	<.1	<5	<20C	<5	<5	5
1026	7-12-34	<.02	<.5	20	30	62A	<10	30	.03	<5	<50	<5	2	<5
351	6-12-27	<.1	<.5	5	50	10C	<10	10	<.1	<5	<20C	<5	<5	<5
1031*	7-12-26	<.02	<.5	20	50	27A	<10	<10	.09	7	<50	<5	3	<5
941	8-11-11	<.02	<.5	15	20	79A	<10	<10	.07	<5	<50	10	10	15
1069	7-13-14	<.02	<.5	50	30	80A	<10	<10	.1	<5	<50	15	50	70
336	10-13-31	<.1	<.5	10	50	20C	<10	<10	<.1	<5	<20C	<5	5	10
364	7-10-1	<.1	<.5	10	30	10C	<10	10	<.1	<5	<20C	5	7	20
342	9-12-14	<.1	<.5	20	30	20C	<10	<10	<.1	<5	<20C	5	10	5
327	8-13-7	<.1	<.5	20	30	20C	<10	<10	<.1	<5	<20C	10	50	100
338	9-13-18	<.1	<.5	10	20	<10C	<10	<10	<.1	<5	<20C	5	5	5
347	7-13-28	<.1	<.5	15	30	30C	<10	<10	<.1	<5	<20C	<5	<5	<5
355	7-13-18	<.1	<.5	20	50	10C	<10	<10	<.1	<5	<20C	7	5	5
1544	7-12-4	<.02	<.5	70	30	48A	<10	<10	.03	<5	<50	50	150	700

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Unaltered granitic rocks of the Idaho batholith									
339	1	50	10	200	70	<10	1,500	700	500	3	0.3	1	--	--
346	2	70	15	200	50	15	500	700	500	3	.2	2	--	--
352	2	70	20	50	<20	<10	300	200	1,000	5	.5	2	.39	--
353	1	15	<10	50	20	<10	500	300	100	.5	.05	2	--	--
358	1	100	20	200	30	15	1,500	500	1,000	5	.5	3	--	--
412*	2	10	70	10	<20	10	300	150	500	2	.2	.2	--	12
413	1	50	15	150	70	30	700	700	1,000	3	.7	1.5	--	5
426*	1	30	200	<10	<20	5	300	150	1,500	15	>1	.2	--	2
528	2	50	10	200	20	20	1,500	1,000	500	3	.5	.3	--	--
539	<1	20	<10	100	20	20	2,000	1,500	500	1.5	.15	1.5	--	--
543	3	20	15	150	30	15	1,000	500	300	1.5	.2	1.5	--	--
709	1	70	30	200	50	15	1,000	300	500	5	.5	1	--	--
801	1	30	<10	100	<20	<10	1,500	1,000	200	2	.1	2	.22	--
901*	7	<10	150	200	<20	200	100	100	5,000	2	.03	.3	--	5
1642	2	50	20	300	100	15	700	700	300	2	.3	1.5	--	2
					Unaltered leucocratic granitic rocks of the Idaho batholith									
359	1	10	10	70	<20	<10	2,000	500	200	1.5	.05	1	--	--
360	1	10	10	100	<20	<10	1,500	500	200	1	.05	1	--	--
651	2	10	<10	20	<20	<5	1,500	700	150	1	.05	.7	--	--
953	1.5	<10	50	100	20	<5	300	150	300	1	.1	.5	--	1
					Metamorphic rocks									
56	<1	30	<10	70	20	15	150	200	300	.2	.07	20	--	--
59	<1	150	10	150	<20	30	500	2,000	1,000	7	.5	>20	--	--
61	2	50	10	150	<20	10	700	1,000	500	5	.3	>20	.09	--
65	1	50	10	200	20	15	700	700	300	5	.3	15	--	--
331	2	<10	70	500	100	30	20	<100	700	2	.15	.1	--	--
332	<1	10	10	100	20	<10	200	<100	50	.2	.1	.05	.01	--
333	<1	300	20	100	30	20	300	500	1,000	10	>1	5	--	--
334	<1	500	10	50	<20	20	200	<100	2,000	15	1	7	--	--
421	1	50	70	70	30	70	70	300	3,000	3	.15	15	--	25
428	1.5	300	<10	100	<30	20	1,000	200	1,500	7	.15	>10	.11	1
851	<1	200	<10	50	<20	15	100	300	1,500	15	.5	7	--	2
					Unaltered dike rocks									
1067	7	<10	70	300	30	20	150	150	300	.7	.07	.07	--	3
343	2	10	100	100	70	20	50	<100	700	1	.1	.2	--	--
367	2	<10	30	150	50	20	300	<100	500	1	.1	.2	.01	--
669	1.5	15	<10	50	<20	5	150	<50	150	1	.03	.05	--	--
506	3	10	30	150	50	20	150	<50	200	1	.15	.3	--	--
349	3	20	100	200	50	10	300	100	700	1	.15	.2	--	--
956*	3	<10	50	300	30	7	30	<50	200	1.5	.07	.05	--	14
1071	3	10	50	300	<20	20	150	100	150	1.5	.07	.15	--	5
1030	2	15	70	150	30	10	150	100	300	1.5	.2	.1	--	7
340	1	<10	50	300	150	30	30	<100	700	2	.1	.2	--	--
348	2	10	100	300	70	30	200	<100	700	2	.15	.2	--	--
341	1	50	50	300	70	20	500	150	500	2	.2	.2	--	--
1026	5	<10	50	500	150	30	150	150	700	3	.15	.1	--	14
351	1	<10	50	300	50	30	1,000	100	500	3	.2	.1	--	--
1031*	3	30	50	300	150	15	700	150	500	3	.3	.15	--	1
941	1	30	15	150	50	7	1,500	700	700	3	.3	.15	--	1
1069	2	70	10	150	70	15	1,000	300	700	3	.3	.5	--	4
336	1	50	100	300	70	20	700	200	1,000	3	.3	.7	--	--
364	2	50	50	300	70	20	1,500	300	500	3	.2	1	--	--
342	<1	50	20	700	100	30	2,000	300	700	5	.5	1	.07	--
327	1	70	30	200	70	20	700	200	1,000	5	.5	1	.08	--
338	<1	50	20	1,000	70	20	2,000	300	1,000	5	.5	2	--	--
347	<1	50	15	500	100	20	2,000	300	700	5	.5	2	.05	--
355	2	150	100	500	100	30	1,500	500	1,500	7	.7	2	--	--
1544	<1	150	10	200	70	15	700	700	1,000	3	.5	3	--	2

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm)												
		Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
						Unaltered dike rocks--Continued								
350	7-13-29	<0.1	<0.5	30	50	40C	<10	<10	<0.1	<5	<20C	10	20	20
344	7-13-10	<.1	<.5	70	20	30C	<10	<10	<.1	<5	<20C	20	100	200
329	9-13-32	<.1	<.5	30	10	20C	<10	<10	<.1	<5	<20C	20	200	500
335	10-13-31	<.1	<.5	30	10	20C	<10	<10	<.1	<5	<20C	20	10	20
326	8-12-11	<.1	<.5	30	10	20C	<10	<10	<.1	<5	<20C	30	150	300
900	10-12-27	<.02	<.5	700	70	82A	<10	70	.1	<5	<50	150	200	300
345	7-13-28	<.1	<.5	70	10	30C	<10	<10	<.1	<5	<20C	30	20	50
363	7-11-16	<.1	<.5	20	30	10C	<10	<10	<.1	<5	<20C	50	100	500
354	6-12-21	<.1	<.5	20	20	10C	<10	<10	<.1	<5	<20C	30	5	10
357	7-12-8	<.1	<.5	50	10	10C	<10	<10	<.1	<5	<20C	50	50	100
323	9-12-36	<.1	<.5	70	<10	20C	<10	<10	<.1	<5	<20C	50	50	100
337	9-13-6	<.1	<.5	70	10	20C	<10	<10	<.1	<5	<20C	70	200	500
365	7-10-1	<.1	<.5	10	<10	20C	<10	20	<.1	<5	<20C	70	200	300
366	8-10-23	<.1	<.5	20	10	10C	<10	<10	<.1	<5	<20C	70	200	1,000
						Altered granitic rocks								
1	9-12-36	<.1	<.5	10	50	29A	<10	<10	.01	<2	<100	<5	2	<5
9	9-12-35	<.1	1	7	50	120A	<10	<10	.05	20	<100	<5	<2	<5
10	9-12-35	<.1	.5	15	70	110A	<10	50	.04	<2	<100	<5	<2	<5
11	9-12-35	<.1	70	300	1,500	700A	50	100	.07	20	<100	<5	<2	5
12	9-12-36	<.1	<.5	7	20	47A	<10	70	.1	<2	<100	<5	<2	<5
18	8-12-11	<.1	<.5	10	50	56A	<10	<10	.03	<2	<100	<5	2	<5
23	8-12-11	<.1	<.5	10	30	140A	30	<10	.03	50	<100	<5	<2	<5
32	8-13-18	<.1	7	20	100	60A	10	<10	.12	70	<100	<5	<2	<5
34	8-13-7	<.1	3	15	500	1,800A	<10	10	.09	100	<100	<5	<2	<5
52	8-13-5	<.1	<.5	10	50	<25A	<10	<10	.1	2	<100	<5	<2	<5
66	9-13-7	<.1	.7	150	30	28A	<10	<10	.18	15	<100	7	50	150
82	8-13-22	<.1	<.5	<2	30	37A	<10	<10	.1	<2	<100	<5	<2	<5
98	7-13-16	<.1	<.5	10	20	<25A	<10	<10	.09	10	100	<5	<2	<5
126	7-13-19	<.1	<.5	7	50	47A	<10	<10	.04	<2	<100	<5	<2	7
128	7-13-29	<.1	<.5	3	30	53A	<10	<10	.03	<2	<100	15	<2	10
129	7-13-27	<.1	1.5	10	100	32A	<10	<10	.05	100	<100	<5	<2	15
133	6-12-21	<.1	15	20	200	110A	20	500	.07	50	<100	<5	3	10
140	6-12-27	--	.7	10	30	<200	<10	<10	--	<2	<100	<5	2	5
141	6-12-20	<.1	<.5	10	30	42A	<10	<10	<.01	<2	150	<5	<2	<5
142	6-12-18	<.1	<.5	20	50	<25A	<10	<10	.09	3	<100	<5	<2	<5
143	6-12-18	--	<.5	20	20	<25A	<10	<10	.07	<2	<100	<5	<2	<5
144	6-12-18	--	.5	50	30	<25A	<10	<10	.18	5	<100	<5	2	<5
145	6-12-17	<.1	<.5	7	10	<25A	<10	<10	.03	5	<100	<5	<2	<5
249	7-11-9	<.1	3	30	70	10C	10	<10	<.1	<5	<20C	<5	5	5
250	7-11-9	<.1	.7	20	20	20C	<10	<10	<.1	<5	<20C	<5	5	5
276	7-11-5	<.1	10	200	20	20C	20	30	.1	70	<20C	<5	<5	5
282	8-10-23	<.1	.5	5	30	<10C	10	<10	<.1	5	<20C	<5	5	<5
322	9-12-35	<.1	<.5	3	10	10C	<10	<10	<.1	<5	<20C	<5	5	<5
324	9-12-35	<.1	<.5	2	15	20C	<10	<10	<.1	<5	<20C	<5	5	<5
328	9-13-20	<.1	<.5	2	50	20C	<10	<10	<.1	70	<20C	<5	<5	<5
361	7-11-16	<.1	<.5	3	20	<10C	<10	<10	<.1	<5	<20C	<5	7	<5
419*	10-12-21	.03	<1	2	15	<200	<10	<10	.06	<3	<100	5	7	1
434*	10-12-21	<.02	<1	3	30	<200	<10	<10	.03	<3	<100	30	20	30
472*	10-12-34	<.02	<1	20	50	<200	<10	<10	.03	2,000	<100	10	5	30
511	7-13-8	<.1	<.5	15	20	<25A	<10	<10	.1	7	<100	<5	<2	7
511A	7-13-8	<.1	<.5	10	30	<25A	<10	<10	.1	2	<100	<5	<2	<5
512	7-13-17	<.1	<.5	10	15	45A	<10	<10	.04	300	<100	<5	3	<5
514	7-13-17	<.1	<.5	2	20	28A	<10	<10	.05	2	<100	<5	2	5
516	7-13-8	<.1	<.5	30	30	<25A	<10	<10	.45	500	<100	<5	<2	<5
518	8-13-32	<.1	1	15	100	160A	<10	<10	.03	<2	<100	5	15	30
519	8-13-29	--	<.5	5	30	5,000	<10	70	--	<2	<100	<5	<2	<5
551	7-13-32	<.1	1	<2	300	220A	<10	<10	.16	<2	<100	<5	<2	<5
571	6-12-11	<.1	<.5	10	20	70A	<10	<10	<.001	<2	<50	<5	<2	20
652	6-11-34	<.1	<.5	<2	30	26A	<10	<10	.04	<2	<100	<5	<2	5
658	6-11-17	--	7	20	30	60A	<10	<10	<.01	<2	<100	5	2	5

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
					Unaltered dike rocks--Continued									
350	1	200	30	200	70	30	1,000	700	1,500	7	1	3	--	--
344	<1	300	10	100	30	15	700	1,000	1,500	7	.7	3	--	--
329	<1	200	20	700	100	20	1,500	700	1,000	7	.7	3	--	--
335	<1	500	20	200	50	20	700	500	1,000	10	>1	5	--	--
326	<1	300	20	300	50	<10	700	700	1,500	10	1	3	--	--
900	<1	150	<10	100	<20	15	200	700	1,500	10	.7	5	--	14
345	<1	500	10	100	20	30	300	200	1,500	10	1	5	--	--
363	<1	300	50	300	70	30	1,000	700	2,000	10	1	5	--	--
354	1	200	50	200	50	50	700	500	2,000	15	>1	5	--	--
357	<1	500	10	200	50	30	500	200	2,000	15	>1	5	.04	--
323	<1	500	<10	200	20	20	300	200	1,500	15	1	5	--	--
337	<1	500	20	300	20	20	500	500	1,500	15	>1	5	.09	--
365	1	500	20	500	30	20	300	500	3,000	15	1	7	--	--
366	<1	500	10	300	30	20	1,000	700	5,000	15	1	7	--	--
					Altered granitic rocks									
1	1.5	15	30	200	50	30	300	70	300	1.5	.2	1	--	--
9	2	10	50	200	<20	30	20	<50	500	1.5	.07	.07	--	--
10	2	10	70	300	<20	50	15	<50	1,000	2	.05	.5	.23	--
11	7	10	50	150	<20	30	20	<50	>5,000	7	.05	<.05	--	--
12	3	10	15	150	20	30	150	150	700	3	.07	.5	--	--
18	2	15	30	100	<20	7	150	<50	1,000	1	.1	.1	--	--
23	30	15	70	150	<20	7	15	<50	700	2	.07	.1	.11	--
32	5	10	70	200	<20	10	30	<50	>5,000	2	.07	.1	.03	--
34	3	10	70	500	70	7	100	<50	3,000	2	.1	<.05	.25	--
52	2	10	70	100	<20	20	70	<50	300	1	.1	.15	.06	--
66	1	1,000	<10	100	<20	100	>5,000	500	1,000	10	.2	7	--	--
82	2	10	30	200	<20	20	<5	<50	70	1.5	.07	.15	--	--
98	<1	50	15	300	20	5	1,000	1,000	150	3	.2	.3	--	--
126	15	20	30	500	30	15	1,000	700	300	5	.2	1	.13	--
128	1	20	10	200	20	20	2,000	1,000	500	7	.2	.7	--	--
129	2	10	20	500	20	20	500	50	300	3	.2	.15	--	--
133	70	50	20	200	30	10	1,500	700	300	5	.7	.7	.24	--
140	1	10	<10	50	<20	5	150	50	70	2	.2	1.5	--	--
141	1	15	15	100	<20	7	700	50	70	1.5	.1	.05	--	--
142	3	<10	30	300	<20	20	150	<50	100	3	.15	.07	--	--
143	2	20	50	300	<20	10	700	50	300	5	.15	.2	--	--
144	1	20	30	200	<20	7	5,000	300	100	5	.2	.15	--	--
145	2	<10	30	200	<20	15	50	<50	150	2	.15	<.05	--	--
249	1.5	10	15	70	<20	<10	500	<100	700	1	.1	.05	--	--
250	1	10	10	100	<20	<10	500	150	1,500	1	.2	.05	.04	--
276	2	<10	70	70	<20	10	100	<100	150	7	.02	<.05	--	--
282	<1	<10	<10	70	<20	70	500	200	200	1	.03	.2	.03	--
322	3	<10	100	150	20	20	20	<100	200	1	.02	.05	.01	--
324	2	<10	50	150	50	30	50	<100	200	1.5	.1	.1	--	--
328	10	<10	100	200	50	20	20	<100	700	.7	.07	.2	--	--
361	2	10	50	200	30	15	500	100	300	1.5	.1	.1	--	--
419*	1.5	15	10	150	70	15	700	30	300	3	.07	.07	.04	<.5
434*	2	100	15	200	70	20	500	300	1,000	7	1	3	.14	<.5
472*	2	70	20	200	30	30	7,000	1,000	1,000	7	.3	7	.21	<.5
511	3	70	15	300	30	10	1,500	1,500	300	3	.2	1.5	--	--
511A	5	50	15	150	<20	7	1,000	1,000	200	2	.2	1.5	--	--
512	2	70	10	150	<20	20	700	700	150	20	.15	.7	--	--
514	2	50	10	200	70	20	700	1,500	200	3	.3	1.5	--	--
516	3	50	15	200	<20	10	700	300	150	15	.15	.1	--	--
518	15	20	70	200	50	200	100	150	1,000	3	.2	2	.1	1
519	10	15	30	200	30	30	30	100	>5,000	5	.2	.3	--	--
551	3	15	10	200	20	7	700	300	500	2	.3	1	--	--
571	5	30	15	200	70	15	1,500	700	200	2	.5	.7	--	1
652	2	30	10	150	30	5	700	700	150	1.5	.15	.7	--	--
658	1	10	15	300	150	50	1,500	1,500	1,500	7	.5	1.5	--	--

Table 1.—*Analyses of samples from the*

		Semiquantitative spectrographic analyses (ppm)												
Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
					Altered granitic rocks--Continued									
660	6-11-17	<0.1	2	20	70	82A	<10	<10	0.04	<2	<100	<5	5	15
702*	7-11-26	<.1	<.5	10	50	<10C	<10	<10	<.1	<5	<20C	<5	7	15
730	7-11-17	1.9	.7	15	500	350A	<10	<10	.1	<2	<100	<5	<2	<5
756	7-10-2	<.1	2	500	30	10C	<10	20	<.1	20	<20	<5	<5	5
758	7-10-1	<.1	1	300	30	<10C	<10	30	<.1	5	<20C	<5	<5	5
794	9-10-36	<.1	<.5	10	20	10A	<10	<10	<.1	<5	<20C	<5	<5	<5
799	7-12-6	<.1	1	50	50	<10C	<10	<10	<.1	20	<20C	<5	<5	<5
834A	6-13-30	<.1	5	20	200	10C	10	150	<.1	10	<20C	<5	5	<5
874	10-12-30	.03	2.5A	20A	280A	110A	<10	<10	.03	<3	300	<3	<3	1
979	7-10-12	.11	<1	30	30	300	<10	<10	.04	3	<100	<3	<3	2
997	8-12-24	.02	<1	3	70	<200	10	20	.03	70	<100	<3	<3	1
998	8-12-24	.03	<1	<1	20	<200	<10	15	.04	15	<100	<3	<3	<1
999	8-13-18	.02	<1	<1	30	<200	<10	10	.03	150	<100	<3	<3	<1
1005	8-12-25	.05	<1	1	30	<200	<10	<10	.03	15	<100	<3	<3	<1
1025	7-12-34	<.02	<1	1	50	18A	<10	<10	.015	7C	<100	<3	<3	<1
1027	7-12-34	<.02	<1	10	100	77A	<10	15	.015	22C	<100	<3	<3	10
1028	7-12-34	.2	110A	30A	8,500A	130A	700	10	.06	7,000	<100	15	3	5
1029	7-12-34	.04	10	30	500	97A	30	30	.015	1,200C	<100	<3	<3	7
1032	7-12-34	<.02	20	20	700	40A	100	20	<.01	4,000C	<100	<3	<3	2
1036	6-12-4	<.02	<1	7	200	278A	<10	20	.015	14C	<100	3	3	15
1037	6-12-4	<.02	5	7	200	<200	30	<10	.03	70	<100	<3	<3	2
1038	6-13-17	.02	<1	1	30	<200	<10	<10	.03	3	<100	<3	3	2
1039	6-13-18	.27	.2A	30	30A	<25A	<10	<10	.02	15	<100	<3	<3	1
1046	6-12-11	<.02	<.5	30	20	34A	<10	<10	.07	7	50	<5	7	<5
1056	6-12-27	<.02	.5	15	30	31A	<10	20	.16	<5	50	<5	3	5
1058	6-12-27	<.02	.7	30	30	<25A	<10	<10	.05	20	<50	<5	2	<5
1061	6-12-27	.08	<.5	70	30	88A	<10	<10	.1	<5	<50	10	2	10
1070	7-13-11	<.02	<.5	70	150	250A	<10	<10	.12	20	<50	<5	<2	<5
1073	7-13-14	.04	<.5	50	30	36A	<10	<10	.07	<5	<50	<5	<2	<5
1081	7-12-33	<.02	<.5	100	50	40A	<10	10	.04	10	<50	<5	<2	7
1083	6-12-4	<.02	<.5	70	70	32A	<10	<10	.55	<5	<50	<5	<2	7
1085	6-12-5	.02	<.5	50	70	27A	<10	<10	.04	<5	<50	<5	<2	<5
1089	6-12-8	.02	<.5	30	50	<25A	<10	<10	.03	<5	<50	<5	<2	7
1091	7-12-20	<.02	<.5	70	70	52A	<10	<10	.01	30	<50	<5	<2	7
1094	7-12-20	<.02	<.5	70	50	1,000A	<10	15	.04	300	<50	<5	<2	5
1115	9-12-11	<.02	<.5	30	50	120A	<10	<10	.05	<5	<50	<5	2	5
1202	8-13-19	.05	<1	7	50	<200	<10	<10	.03	700	2,000	<3	<3	2
1545	7-12-3	<.02	<.5	7	30	<25A	<10	<10	.01	<5	<50	<5	2	<5
1552*	7-12-3	<.02	<.5	5	50	46A	<10	<10	<.01	300	<50	<5	<2	<5
1562*	7-12-22	.08	<1	7	70	300	30	15	.06	700	<100	<3	<3	<1
1565	7-12-22	<.02	<1	<1	30	35A	<10	<10	<.01	<3	<100	<3	<3	<1
1569	7-12-26	.02	<1	5	30	<200	<10	<10	.05	5	<100	<3	<3	5
1571	7-12-26	.07	<1	2	50	<200	<10	<10	.03	20	<100	<3	<3	5
1573	6-12-2	.17	15	10	150	<200	100	<10	.04	3	<100	<3	<3	2
1574	6-12-2	.02	<1	3	15	<200	10	<10	.02	<3	<100	<3	<3	2
1575	6-12-2	<.02	<1	7	15	<200	<10	<10	.04	<3	<100	<3	<3	2
1576	6-12-2	<.02	<.5	30	70	22A	<10	<10	.13	<5	<50	<5	<2	<5
1581	6-12-2	.02	<1	15	15	<200	<10	10	.03	5	3,000	5	<3	2
1582	6-12-2	.02	<1	2	20	<200	<10	<10	.02	<3	<100	3	<3	1
1585	8-12-24	<.02	2	7	200	97A	<10	<10	<.01	150	<50	<5	<2	<5
1586	8-12-24	<.02	<.5	7	20	23A	<10	<10	.01	70	70	<5	<2	<5
1588*	8-12-24	<.02	5	30	200	9,000A	15	<10	.01	<5	<50	<5	<2	<5
1590	8-13-7	<.02	<.5	30	1,500	600A	<10	<10	.03	<5	<50	<5	2	<5
1591	8-13-7	<.02	1.5	20	70	146A	10	50	<.01	100	70	<5	3	7
1592	8-13-8	<.02	3	30	100	440A	10	50	.2	20	300	<5	<2	<5
1594	8-13-8	<.02	.7	10	150	700A	<10	15	.45	30	<50	<5	2	<5
1599*	8-13-20	<.02	3	50	200	1,100A	15	150	1.6	7	70	<5	<2	<5
1601	8-13-21	<.02	15	50	700	140A	50	70	.16	1,500	700	<5	<2	5
1614	6-12-4	<.02	<.5	50	30	<25A	<10	<10	.06	<5	<50	<5	2	7
1616	6-12-8	<.02	<.5	50	50	25A	<10	<10	.07	7	<50	5	30	30

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
							Altered granitic rocks--Continued							
660	1	15	10	70	30	15	1,500	1,000	700	3	0.3	1.5	--	--
702*	1	50	200	200	50	30	2,000	500	200	5	.2	1	--	--
730	2	30	15	200	50	7	1,000	200	700	3	.2	.1	--	--
756	1	70	20	100	<20	<10	2,000	300	200	15	.2	.07	.03	--
758	1	50	50	500	50	<10	2,000	500	200	7	.5	.15	--	--
794	1.5	20	70	150	<20	10	1,000	100	700	2	.1	.05	--	--
799	1.5	10	20	100	<20	<10	300	100	150	7	.07	.1	--	--
834A	3	20	10	50	<20	<10	300	100	70	2	.15	.1	--	--
874	100	<7	30	70	<30	<10	1,000	150	700	.7	.03	.7	.73	2
979	2	15	20	150	<30	10	3,000	500	300	1.5	.1	.3	.07	.5
997	3	<7	70	150	50	<10	100	10	500	3	.07	.07	.83	<.5
998	15	7	70	150	70	<10	100	15	300	1.5	.07	.07	.28	<.5
999	5	<7	70	200	70	10	100	15	300	2	.07	.07	.16	<.5
1005	7	<7	70	200	70	<10	100	15	150	1.5	.07	.1	.14	<.5
1025	1	7	70	70	<30	15	300	100	100	.61A	.05	.1	<.01	5
1027	10	70	70	150	70	20	5,000	1,500	500	7.15A	.3	1.5	.01	7
1028	300	70	15	30	100	100	2,000	2,000	3,000	>10	.07	7	.22	>90
1029	3	50	50	200	50	20	2,000	1,000	1,000	5.15A	.15	1.5	.23	22
1032	2	20	200	1,000	<30	100	700	200	200	3.7A	.15	.5	.04	>90
1036	5	100	20	150	70	30	1,500	1,000	1,500	4.6A	.7	2	.38	9
1037	30	<7	30	10	<30	10	300	15	150	.7	.03	.15	.08	5
1038	3	30	10	300	100	10	2,000	500	300	2	.3	.15	.11	2
1039	5	15	10	150	<30	10	1,500	200	150	1.5	.1	.07	.11	<.5
1046	1	50	15	150	70	20	1,500	700	500	3	.5	1	--	12
1056	50	30	<10	150	100	10	1,500	700	200	3	.5	.5	--	12
1058	10	30	10	150	20	7	700	300	150	2	.5	.07	--	2
1061	3	50	<10	150	<20	5	300	300	300	1.5	.15	1	--	5
1070	3	30	15	150	70	5	700	100	300	1.5	.15	.1	--	40
1073	3	30	10	150	20	<5	700	300	200	2	.15	.15	--	5
1081	2	<10	50	150	70	20	70	<50	300	1.5	.1	.05	--	17
1083	5	50	10	300	70	15	700	300	300	2	.3	.3	--	2
1085	2	20	50	100	30	15	100	<50	200	1	.1	<.05	--	1
1089	1.5	15	15	70	<20	<5	300	50	70	.5	.07	.07	--	2
1091	7	30	30	200	30	20	1,000	500	700	5	.3	1	--	1
1094	700	20	30	70	20	15	300	150	>5,000	1.5	.15	.3	--	9
1115	5	<10	100	150	20	20	150	100	500	1.5	.05	.3	--	2
1202	3	<7	150	150	70	15	150	15	500	1.5	.07	.15	.21	.5
1545	3	<10	70	150	50	10	50	300	700	.7	.07	1	--	3
1552*	10	<10	70	100	50	5	70	<50	>5,000	1	.07	.1	--	45
1562*	100	<7	150	70	70	50	150	70	30,000	1.5	.05	.07	.32	>90
1565	50	<7	50	70	<30	<10	70	15	1,000	.7	.05	.15	--	--
1569	3	30	15	300	150	15	500	100	300	2	.2	.2	.2	1
1571	2	50	30	200	70	<10	1,000	300	200	7	.3	.2	.37	.5
1573	2	20	10	100	50	15	1,000	500	200	5	.1	5	.16	1
1574	1	30	10	200	100	15	1,500	300	150	3	.2	5	.03	<.5
1575	3	30	10	200	70	15	1,000	700	300	3	.2	7	.22	<.5
1576	7	15	70	150	20	10	700	500	300	1.5	.15	.5	--	2
1581	3	30	30	150	70	15	1,000	300	200	7	.15	1.5	.17	2
1582	2	20	10	200	70	10	7,000	700	200	1.5	.2	1	.27	.5
1585	5	10	70	300	70	15	70	<50	>5,000	1.5	.1	<.05	1.9	100
1586	5	10	30	200	20	<5	70	<50	300	1.5	.07	.1	.04	12
1588*	100	15	50	300	70	20	150	<50	>5,000	7	.07	.05	.08	>90
1590	5	10	50	150	50	10	100	<50	>5,000	1.5	.1	.1	.09	>90
1591	7	10	50	150	30	10	30	<50	500	2	.1	.1	.1	17
1592	10	10	70	200	70	20	70	<50	1,000	3	.1	.1	.09	20
1594	15	<10	70	100	20	20	50	<50	2,000	1.5	.07	.1	.08	80
1599*	>1,000	<10	70	150	70	15	15	<50	>5,000	3	.07	<.05	.1	30
1601	5	<10	70	150	50	30	15	<50	1,500	1.5	.05	.15	1.4	45
1614	2	15	30	300	100	10	500	150	300	2	.15	.2	--	1
1616	2	20	30	300	50	15	200	100	700	2	.15	.2	--	3

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
						Altered granitic rocks--Continued								
1617	6-12-8	<0.02	0.5	50	70	92A	<10	<10	0.07	<5	<50	<5	2	7
1638	10-12-27	<.02	<.5	15	30	30A	<10	<10	.03	5	<50	<5	3	5
1644	5-14-5	<.02	<.5	10	15	<25A	<10	<10	4.5	30	<50	<5	30	15
1645*	5-14-5	.04	7	50	70	<25A	<10	<10	.95	50	<50	<5	5	<5
1651	7-12-26	<.02	.4A	1.5	50A	47A	<10	10	3.5	50	<100	<3	<3	10
1652	7-12-26	<.02	<.5	20	70	44A	<10	<10	.05	70	<50	<5	2	30
1657	10-11-9	.5	70	150	1,500	900A	70	100	.65	20	<50	<5	3	5
						Altered metamorphic rocks								
53	10-13-31	<.1	<.5	70	20	87A	<10	<10	.14	<2	<100	15	30	300
55	10-13-31	<.1	<.5	100	20	60A	<10	<10	.12	<2	<100	15	50	200
77	9-12-14	<.1	<.5	15	20	135A	<10	<10	.3	5	<100	10	30	200
432*	10-12-29	<.02	<1	10	15	<200	<10	<10	.03	<3	<100	7	20	70
1099	9-12-1	<.02	<.5	30	30	54A	<10	<10	.01	5	<50	5	20	100
1101	10-12-36	<.02	<.5	30	30	75A	<10	<10	<.04	<5	<50	5	50	150
1103	10-12-36	<.02	<.5	50	20	35A	<10	<10	.01	<5	<50	10	50	200
1104	10-13-31	<.02	1.5	70	300	180A	<10	<10	.01	<5	<50	10	50	100
1105	10-13-31	<.02	<.5	30	50	27A	<10	<10	.01	<5	<50	<5	3	30
						Altered dike rocks								
70	9-13-7	<.1	<.5	70	70	60A	<10	<10	.28	7	<100	20	30	300
108A	7-13-28	<.1	<.5	70	<10	70A	<10	<10	.03	<2	<100	50	30	150
108C	7-13-28	<.1	<.5	7	20	<25A	<10	<10	.03	<2	<100	<5	<2	<5
274	7-10-2	<.1	5	200	1,000	<10C	10	20	<.1	70	<20C	<5	<5	5
362	7-11-16	<.1	<.5	50	20	10C	<10	<10	<.1	<5	<20C	50	100	500
505	7-13-6	<.1	<.5	3	20	<25A	<10	<10	.07	7	<100	<5	3	<5
527	7-13-6	<.1	<.5	5	20	94A	<10	<10	.26	<2	<100	<5	2	<5
607	7-12-34	--	<.5	30	100	<25A	<10	10	.03	70	<100	<5	2	15
659	6-11-17	--	3	15	20	42A	<10	<10	<.01	<2	<100	5	3	10
1063	7-13-14	<.02	<.5	70	30	45A	<10	<10	.07	<5	<50	<5	<2	<5
1068	7-13-14	<.02	<.5	50	150	70A	<10	20	.03	10	<50	<5	<2	<5
1072	7-13-11	.02	<.5	70	50	56A	<10	<10	.03	<5	<50	<5	<2	5
1082	6-12-5	<.02	<.5	70	70	82A	<10	<10	.07	<5	<50	<5	<2	<5
1084	6-12-4	<.02	<.5	70	50	41A	<10	<10	.04	7	<50	<5	<2	<5
1087	6-12-5	<.02	<.5	70	70	25A	<10	<10	.05	<5	<50	<5	<2	<5
1090	6-12-8	<.02	<.5	70	30	<25A	<10	<10	.07	7	<50	<5	<2	<5
1092	7-12-20	<.02	<.5	70	70	30A	<10	<10	.04	<5	<50	<5	<2	<5
1526	9-11-16	<.02	<.5	15	50	25A	<10	<10	.05	<5	<50	<5	<2	5
1577	6-12-11	.06	<1	10	20	<200	<10	10	.03	3	150	<3	<3	1
1583	6-12-2	<.02	<1	3	15	<200	<10	<10	.03	<3	<100	<3	<3	<1
1612	6-12-5	<.02	.5	70	70	48A	<10	<10	.02	7	<50	<5	2	7
1618	6-11-24	<.02	.7	70	70	250A	<10	<10	.03	<5	<50	<5	5	7
						Veins								
2	9-12-36	<.1	<.5	10	<10	<25A	<10	<10	.04	<2	<100	<5	3	<5
19	8-12-11	--	<.5	10	20	83A	<10	<10	.34	<2	<100	<5	3	5
24	8-12-11	<.1	20	20	150	220A	500	50	.07	7	200	<5	<2	<5
35*	8-13-7	<.1	30	200	7,000	375A	<10	<10	.1	500	<100	<5	2	5
67	9-13-7	<.1	<.5	15	70	39A	<10	<10	.06	5	<100	5	30	70
108B	7-13-28	<.1	<.5	15	<10	<25A	<10	<10	.07	<2	<100	7	7	30
110	7-13-29	<.1	<.5	15	50	70A	15	<10	<.01	<2	<100	5	2	10
115	6-13-5	<.1	15	15	150	60A	30	<10	.18	10	<100	<5	5	15
120	7-13-20	<.1	<.5	20	30	53A	<10	<10	.03	<2	<100	10	20	100
138	6-12-27	<.1	2	15	70	<25A	<10	20	.22	200	100	20	5	15
139*	6-12-27	3.2	5	10	300	53A	<10	<10	.12	2	<100	<5	2	5
244	7-10-2	<.1	20	150	100	35C	20	<10	<.1	50	<20C	<5	5	30
245*	7-10-2	<.1	500	1,000	7,000	6,000C	700	<10	.6	30	<20C	50	<5	5
273*	7-10-1	<.1	150	*	300	2,000C	200	100	.3	2,000	<20C	10	20	10
285	8-10-14	<.1	.5	50	30	10C	<10	<10	<.1	<5	<20C	<5	5	5
420*	10-12-21	.03	<1	1.5	20	<200	<10	<10	.05	<3	<100	<3	<3	1
456*	10-11-22	22	240A	20A	550A	56A	<10	<10	.06	50	<100	5	<3	3
469*	10-12-34	.08	<1	150	20	<200	<10	<10	.04	15	<100	7	50	50
549	7-13-33	<.1	100	5	15,000	350A	200	<10	2.2	10	<100	<5	2	<5
550*	7-13-32	.1	15	7	10,000	920A	<10	<10	4.2	<2	<100	<5	<2	<5

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
						Altered granitic rocks--Continued								
1617	3	10	50	100	30	15	200	50	500	2	0.1	0.05	--	4
1638	1.5	20	20	70	150	7	1,500	300	300	.7	.1	.1	--	5
1644	3	20	10	150	50	10	300	<50	500	1.5	.1	.07	--	1
1645*	2	<10	10	10	150	20	300	<50	100	.7	.03	.15	--	<.5
1651	15	50	30	100	50	15	3,000	700	200	5	.5	.2	.32	--
1652	15	70	70	200	50	7	700	700	500	5	.5	.3	--	2
1657	1	<10	10	20	<20	<10	200	<50	150	7	.02	.05	--	>90
						Altered metamorphic rocks								
53	1	70	15	700	20	20	200	150	700	7	>1	7	--	--
55	1	100	15	500	20	30	300	700	700	7	>1	7	--	--
77	1	200	15	70	50	15	700	300	700	5	.5	.7	--	--
432*	3	100	15	150	50	50	1,000	300	3,000	7	.5	>10	.19	<.5
1099	2	150	10	100	30	10	700	300	300	3	.3	5	--	2
1101	2	150	<10	100	20	10	700	200	500	3	.3	5	--	7
1103	1	100	15	300	30	15	300	300	500	5	1	3	--	4
1104	1	150	20	200	50	15	700	150	700	3	.7	1.5	--	40
1105	2	70	15	150	50	10	1,500	700	300	2	.3	2	--	9
						Altered dike rocks								
70	<1	150	30	500	<20	30	700	300	500	7	>1	1.5	--	--
108A	1	200	<10	150	<20	20	500	500	2,000	15	>1	15	--	--
108C	1	50	<10	100	<20	7	1,500	1,000	300	7	.2	1.5	--	--
274	2	50	20	200	<20	<10	300	<100	700	3	.15	.1	--	--
362	<1	200	30	300	50	20	2,000	700	2,000	10	1	3	.07	--
505	2	10	30	200	20	10	100	<50	150	1	.2	.3	--	--
527	7	10	15	200	30	15	30	100	>5,000	7	.1	3	--	--
607	5	30	70	200	<20	>200	700	500	200	3	.3	1	--	--
659	1	15	10	70	20	5	3,000	1,500	700	3	.3	1.5	--	--
1063	3	<10	30	300	20	30	150	50	200	1.5	.07	<.05	--	14
1068	5	15	50	200	50	20	150	150	200	1	.07	.15	--	25
1072	2	15	50	200	30	30	70	70	300	1	.07	.05	--	4
1082	7	15	70	150	70	20	70	<50	200	1.5	.15	<.05	--	2
1084	5	30	50	300	100	30	500	100	200	2	.3	.07	--	1
1087	1.5	10	70	100	30	5	100	<50	100	1.5	.1	<.05	--	14
1090	<1	15	30	300	20	<5	70	<50	70	1.5	.1	<.05	--	1
1092	5	<10	50	300	70	30	15	<50	300	1	.07	.1	--	2
1526	3	10	30	300	100	15	500	<50	700	.7	.1	.07	--	1
1577	3	50	30	200	100	20	1,500	500	200	5	.3	3	.08	3
1583	1	20	10	200	70	10	1,500	500	150	1.5	.2	1	.1	35
1612	3	20	30	300	70	20	300	150	300	1.5	.15	.15	--	9
1618	2	<10	10	50	20	5	1,500	500	700	1	.07	.2	--	20
						Veins								
2	<1	20	<10	<10	<20	<5	5	<50	50	<.05	<.002	<.05	--	--
19	1	15	15	50	<20	5	100	<50	300	1	.03	.07	--	--
24	30	<10	70	150	<20	5	7	<50	1,500	3	.1	.05	1.5	--
35*	5	15	50	500	300	200	300	<50	>5,000	3	.1	.07	--	--
67	1	50	15	1,000	50	15	700	500	500	2	.3	.7	--	--
108	1	70	<10	50	<20	10	70	300	300	3	.3	15	--	--
110	2	30	15	>1,000	300	30	2,000	1,000	1,500	7	.7	1.5	--	--
115	5	30	20	150	<20	7	700	50	700	5	.3	.7	--	--
120	2	70	15	300	70	20	5,000	3,000	1,500	7	.7	5	--	--
138	5	100	15	500	200	30	700	700	300	7	1	1.5	--	--
139*	2	10	10	100	<20	7	300	<50	50	2	.2	1.5	--	--
244	1	10	10	20	<20	<10	50	<100	300	5	.07	.05	--	--
245*	2	10	<10	20	<20	<10	100	150	1,500	>20	.01	1	--	--
273*	3	30	10	30	<20	10	300	<100	500	20	.1	1	--	--
285	<1	10	70	30	<20	<10	100	<100	300	5	.05	<.05	--	--
420*	1	<7	15	200	<30	20	200	100	300	2	.07	3	.05	<.5
456*	<1	15	10	15	<30	<10	200	15	30	7	.01	.07	.04	<.5
469*	1	150	<10	150	<30	15	5,000	150	700	7	.3	7	.25	.5
549	3	20	10	150	30	5	700	50	200	7	.15	<.05	--	--
550*	1	10	<10	<10	<20	5	30	<50	50	1	.01	<.05	--	--

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Semiquantitative spectrographic analyses (ppm) Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
					Veins--Continued									
573	6-12-27	<0.1	10	30	500	440A	20	50	0.07	7	<100	<5	2	7
574	6-12-27	<.1	1.5	2	70	90A	<10	<10	.04	<2	<100	<5	<2	<5
575*	6-12-27	<.1	<.5	10	50	70A	<10	<10	.07	<2	100	<5	<2	<5
576	6-12-27	.4	30	10	2,000	86A	70	700	.1	300	<100	<5	2	5
597*	6-12-4	--	3	15	100	71A	<10	15	.45	>2,000	<100	15	5	30
622	7-12-13	<.02	<.5	2	100	<200	<10	30	.14	<2	<100	<2	<2	<5
654*	6-11-17	2.4	2	30	150	52A	<10	<10	.6	<2	<100	<5	2	7
655*	6-11-17	5.6	7	5	2,000	540A	<10	<10	.65	<2	<100	<5	<2	<5
656*	6-11-17	--	3	10	100	25A	<10	<10	.07	7	<100	<5	<2	<5
668	6-11-17	34.6	150	20	1,500	930A	<10	<10	2.5	<2	<100	5	2	<5
661*	6-11-17	.4	<.5	10	50	39A	<10	<10	.09	5	<100	<5	<2	<5
670	6-11-7	--	.5	10	50	50A	<10	<10	.07	5	<100	<5	3	<5
671	6-11-7	.6	1.5	7	10	<25A	<10	<10	<.01	2	<100	<5	2	<5
672	6-11-7	.5	7	15	300	<25A	<10	<10	.14	<2	<100	<5	2	<5
680	6-11-8	7.8	2	7	50	29A	<10	<10	.04	<2	<100	<5	2	<5
684	6-11-8	3.9	5	20	200	120A	<10	<10	.14	10	<100	5	<2	7
685	6-11-8	<.1	.5	20	50	32A	<10	<10	.55	<2	<100	<5	<2	10
686*	6-11-17	.5	20	7	100	56A	<10	<10	.18	<2	<100	<5	<2	<5
706	7-11-20	<.1	<.5	10	70	39A	<10	<10	.04	<2	<100	<5	5	10
707	7-11-32	.7	.5	2	30	56A	<10	<10	.04	<2	<100	<5	<2	<5
708	7-11-32	.4	1	10	70	96A	<10	<10	.07	5	<100	<5	<2	10
710	7-11-32	<.05	1A	30	300	<200	<10	<10	.54	<2	<50	<5	<2	2
711	7-11-29	5.8	30	10	700	48A	<10	<10	.2	3	<100	<5	3	<5
716	6-10-1	17	5	5	300	10C	<10	<10	<.1	<5	<20C	<5	5	<5
717	7-10-35	78.9	5	15	200	42A	<10	<10	<.01	<2	<100	<5	2	<5
731	7-11-17	20.4	50	100	1,000	220A	70	<10	.6	2	<100	<5	<2	5
732*	7-11-17	119.6	150	300	*	1,500A	50	<10	1.6	<2	<100	<5	2	<5
738	7-11-17	.6	700	200	1,000	40C	700	<10	1	5	<20C	<5	5	5
739	7-11-9	<.05	340A	700	370A	40A	700	30	.13	150	<50	<5	<2	1
740	7-11-8	<.1	10	15	20	<10C	10	10	<.1	15	<20C	<5	10	<5
741	7-10-12	<.1	7	300	500	40C	15	100	<.1	20	<20C	<5	5	<5
791	9-11-28	10	10A	300A	1,500	700	30	<10	1.3	<2	<50	7	<2	3
792	9-11-28	<.1	<.5	20	200	<10A	<10	<10	<.1	<5	<20C	<5	<5	5
793	9-10-25	<.1	.5	5	15	<10A	<10	<10	<.1	<5	<20C	<5	<5	<5
795	8-10-23	.05	340A	1,200	2,000	<200	20	<10	.11	<2	<50	<5	<2	2
796	8-10-23	<.1	300	2,000	5,000	30C	20	<10	<.1	<5	<20C	<5	<5	<5
803	6-13-8	.06	2A	7	150A	150A	<10	<10	.08	<2	<50	<5	<2	2
804*	6-13-8	.9	100	30	20,000	1,000C	50	<10	.4	<5	80C	<5	5	5
805	6-13-7	<.1	30	30	1,000	30C	50	50	<.1	15	40C	<5	5	<5
806	6-13-7	<.1	1	15	200	<10C	<10	20	<.1	15	80C	<5	5	<5
820	5-13-6	<.1	50	10	1,500	20C	150	30	<.1	<5	<20C	<5	5	<5
826	5-12-2	<.1	50	10	7,000	20C	200	20	<.1	<5	<20C	<5	<5	<5
827	5-12-3	<.1	.7	10	70	<10C	<10	20	<.1	<5	<20C	<5	5	<5
839	7-13-33	<.1	<.5	10	10	10C	<10	<10	<.1	<5	<20C	<5	5	<5
876	10-12-19	.11	1	<1	70	<200	10	<10	.03	10	<100	<3	<3	1
877	10-12-19	.21	7	3	1,500	<200	30	<10	.03	10	<100	<3	<3	1
878*	10-12-19	.1	30	7	2,000	<200	70	<10	.04	<3	<100	<3	<3	1
882	10-12-30	.3	30	10	700	<200	70	<10	.12	<3	<100	<3	<3	1
884	10-12-30	.14	<1	2	100	<200	<10	<10	.03	<3	<100	<3	<3	1
885	10-12-30	.33	30A	20A	1,400A	72A	100	<10	.04	<3	<100	<3	<3	1
886	10-12-30	.03	50	30	3,000	700	50	<10	.03	<3	<100	<3	<3	1
887*	10-12-30	1.3	300	70	15,000	1,500	700	<10	.75	30	<100	<3	<3	1
888	10-12-30	.16	15	2	200	<200	15	<10	.05	3	<100	<3	<3	1
889	10-12-19	.04	15	3	150	<200	30	<10	.06	<3	<100	<3	<3	1
904	10-12-34	.03	30	5	150	<200	150	<10	.05	50	<100	<3	3	1
905	10-12-34	.04	7	5	700	<200	15	<10	.05	20	<100	3	5	50
906	10-12-34	.17	<1	<1	70	<200	10	<10	.03	150	<100	3	3	20
939	9-11-28	22	15	300	2,000	500	50	<10	.75	3	<100	3	<3	3
951	9-10-24	.1	100A	50A	1,200A	190A	500	<10	.7	50	<100	<3	<3	2
952	9-10-23	.15	3	70	70	<200	<10	<10	.16	700	<100	<3	<3	2

Sawtooth study area, Idaho—Continued

	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
Sample	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
							Veins--Continued							
573	10	50	15	300	50	10	700	300	500	5	0.7	1.5	--	--
574	<1	<10	<10	10	<20	5	100	<50	50	1	.03	.1	--	--
575*	10	10	20	500	20	7	700	300	150	3	.5	.3	--	--
576	30	20	15	200	<20	5	700	50	100	5	.2	1	1.18	--
597*	2	50	15	100	20	15	500	200	300	5	.3	1	--	--
622	7,000	7	30	70	30	15	70	15	1,000	1	.05	.15	.53	--
654*	1	10	<10	50	<20	5	100	150	70	3	.07	.1	--	--
655*	<1	10	<10	30	<20	<5	200	200	30	7	.05	<.05	--	--
656*	2	10	<10	70	20	<5	200	300	500	5	.07	1.5	--	--
668	2	10	<10	<10	<20	20	50	<50	100	1	.007	.3	--	--
661*	1	<10	<10	30	<20	5	200	<50	50	.5	.05	.15	--	--
670	3	10	30	500	150	50	1,500	700	700	5	.2	1.5	--	--
671	1	10	<10	70	<20	5	150	<50	70	1	.07	<.05	--	--
672	2	10	10	150	<20	7	500	<50	70	2	.1	.07	--	--
680	1	10	10	70	<20	5	1,000	50	100	1	.1	.1	--	--
684	7	50	<10	200	100	30	1,500	500	500	7	.3	.7	--	--
685	2	10	10	50	<20	15	500	150	500	5	.07	3	--	--
686*	1	10	15	200	20	10	1,500	150	100	2	.15	.1	--	--
706	1	30	<10	150	<20	5	1,000	500	700	1.5	.2	.3	--	--
707	1	20	20	300	30	7	1,000	100	100	3	.2	.07	--	--
708	5	10	20	150	<20	7	700	50	150	3	.1	.07	--	--
710	<1	7	15	--	<20	<5	700	70	150	.7	.07	.03	.05	--
711	3	10	10	50	<20	5	700	<50	1,000	2	.1	.05	--	--
716	1	10	50	50	<20	10	700	100	200	2	.05	.05	--	--
717	<1	<10	10	150	30	15	1,000	150	200	3	.1	.05	--	--
731	5	15	30	150	<20	7	700	<50	200	7	.3	.05	--	--
732*	1	10	<10	70	<20	7	300	150	70	1	.07	.1	--	--
738	2	20	10	100	20	<10	300	<100	50	10	.05	<.05	--	--
739	<1	15	15	--	<20	<5	1,500	150	150	7	.07	.015	.04	--
740	3	<10	30	100	<20	15	1,000	<100	500	.7	.03	<.05	--	--
741	3	<10	50	100	<20	10	100	<100	500	5	.05	<.05	--	--
791	3	30	15	--	50	15	700	30	300	3	.15	.07	.12	--
792	3	50	20	300	50	<10	500	<100	1,000	3	.3	<.05	--	--
793	3	20	10	70	20	<10	300	<100	200	1	.07	<.05	--	--
795	<1	15	15	--	<20	<5	300	30	300	3	.05	.05	.01	--
796	<1	50	10	20	<20	<10	100	<100	100	5	.02	<.05	.02	--
803	3	20	10	--	<20	<5	300	30	300	1.5	.15	.07	.12	--
804*	1	<10	10	30	20	<10	200	100	50	15	.03	.05	.02	--
805	100	50	10	100	<20	<10	500	100	30	3	.1	1	.8	--
806	150	50	20	200	<20	<10	700	100	20	2	.1	.3	.74	--
820	15	30	20	100	<20	<10	700	150	50	2	.2	.05	--	--
826	2	10	30	200	<20	<10	500	100	70	3	.2	.5	.05	--
827	1	10	20	50	<20	<10	300	100	30	2	.1	.2	--	--
839	2	20	20	300	30	<10	200	<100	50	2	.2	.05	--	--
876	<1	<7	<10	<10	<30	<10	70	15	30	.2	.0015	7	2.67	1
877	1.5	<7	30	70	<30	10	700	70	150	.7	.02	1.5	1.01	19
878*	<1	<7	10	30	<30	<10	300	30	50	.7	.02	.7	.57	20
882	1	<7	<10	<10	<30	<10	100	15	70	3	.002	3	1.53	>90
884	7	7	70	150	50	15	1,000	70	300	1.5	.15	.05	.45	3
885	200	<7	<10	<10	<30	<10	100	15	500	.5	.002	5	1.51	80
886	<1	<7	<10	30	<30	10	300	30	150	2	.01	3	1.6	>90
887*	100	<7	<10	<10	<30	<10	50	10	30	>10	.0005	.03	.22	>90
888	15	<7	<10	<10	<30	<10	70	10	70	.5	.003	2	1.25	9
889	50	<7	<10	<10	<30	<10	200	20	70	.7	.005	.5	.51	1
904	200	<7	<10	10	<30	<10	70	<5	30	1.5	.003	.03	.09	2
905	20	20	70	150	<30	10	1,500	100	150	1	.2	.2	.5	5
906	100	30	30	150	<30	10	1,500	300	70	1.5	.15	2	1.51	1
939	5	50	15	200	70	<10	1,500	70	300	7	.3	.07	.5	12
951	<1	<7	10	30	<30	<10	70	10	70	7	.015	.02	.12	5
952	<1	<7	<10	<10	<30	<10	100	5	150	10	.007	.03	.09	<.5

TABLE 1.—*Analyses of samples from the*

Sample	Location T. R. S.	Au	Ag	Cu	Pb	Zn	Bi	Sn	Hg	Mo	W	Co	Ni	Cr
		Semiquantitative spectrographic analyses (ppm)												
						Veins--Continued								
965	8-10-33	1	1,050	<10	25	43A	<10	<10	0.28	70	<100	<3	<3	1
966	8-10-33	.04	15	1	20	<200	<10	<10	.03	15	<100	<3	<3	1
967	8-10-33	.17	300	3	70	<200	<10	<10	.14	500	<100	<3	<3	1
969*	7-10-2	<.02	250A	3,200A	4,000A	10,000A	500	<10	.03	30	<100	30	5	2
970	7-10-2	.02	70	300	300	500	150	15	.06	30	<100	<3	5	50
971	7-10-2	.05	30	200	700	700	70	<10	.05	15	<100	3	7	20
974*	7-10-1	.13	330A	*	2,000A	700A	3,000	150	.07	10,000	<100	30	10	3
975	7-11-17	26	15	100	700	300	<10	<10	.09	30	<100	3	<3	1
976	7-11-17	.19	<1	30	150	300	<10	<10	.03	7	<100	<3	<3	1
977	7-11-17	42	30	70	2,000	1,000	70	<10	1.6	5	<100	15	<3	1
978	7-11-9	.03	<1	3	50	<200	<10	<10	.03	<3	<100	<3	<3	1
980	7-10-12	.08	46A	110A	25A	<25A	<10	<10	.03	7	<100	<3	<3	3
1000	8-12-24	<.02	<1	<1	100	300A	<10	30	.025	15	<100	<3	<3	<1
1001*	8-12-25	<.02	1	15	150	975A	<10	10	.06	<3	<100	<3	<3	<1
1002*	8-12-25	<.02	1	7	200	2,750A	10	20	.03	<3	<100	<3	<3	<1
1020	7-12-1	--	<1	7	20	50A	<10	50	.015	<3	<100	<3	<3	<1
1034	6-12-3	<.02	<1	30	30	27A	<10	10	<.01	790C	<100	<3	<3	2
1035	6-12-3	<.02	<1	1.5	20	18A	<10	<10	<.01	8C	<100	<3	<3	<1
1040	6-13-18	.11	<1	5	150	<200	<10	<10	.04	<3	<100	<3	<3	2
1041*	6-13-7	.09	1,500	300	30,000	3,000	3,000	<10	.25	<3	<100	<3	<3	<1
1042*	6-13-7	.59	2,000	300	30,000	7,000	5,000	500	.07	3	<100	<3	5	2
1043	6-13-7	.06	<.5	15	15	<25A	<10	<10	.1	<5	<50	<5	20	30
1044	6-13-8	.12	7	3	200	<200	30	<10	.04	10	<100	<3	<3	2
1045	6-13-8	.04	<1	15	30	<200	<10	<10	.03	3	<100	<3	10	70
1050	6-13-23	.2	150	30	20	39A	<10	<10	.45	<5	<50	<5	2	<5
1051*	6-13-15	.5	150	30	200	61A	<10	<10	.26	<5	<50	<5	2	<5
1054*	6-12-27	.2	265A	12A	16,000A	3,840A	1,000	70	5	20	<100	<3	<3	<1
1055	6-12-27	<.02	3	5	700	61A	30	30	.03	70	<50	<5	2	<5
1057	6-12-27	<.02	10	20	300	79A	30	10	.07	30	<50	<5	5	<5
1059	6-12-27	.04	3	30	150	<25A	<10	<10	.12	50	50	<5	2	<5
1060*	6-12-27	24	7	50	300	1,500A	<10	<10	.16	<5	<50	<5	<2	5
1062	6-12-23	.04	50	50	300	51A	700	15	.05	30	300	<5	<2	<5
1100	10-12-36	<.02	<.5	10	<10	<25A	<10	<10	<.01	<5	<50	<5	<2	<5
1102	10-12-36	<.02	<.5	30	50	73A	<10	<10	.12	<5	<50	20	70	30
1111	5-13-1	1.6	215A	22A	350A	52A	<10	<10	2.7	<3	<100	<3	<3	1
1112*	5-13-1	1.6	66A	17A	150A	40A	<10	<10	>6	<3	<100	<3	<3	1
1113	5-14-6	2	40A	26A	450A	72A	<10	<10	.3	3	<100	<3	<3	1
1114*	6-13-34	5	2.1A	12A	50A	55A	<10	<10	>6	10	<100	<3	<3	1
1116	7-11-28	.1	1.2A	2	1,250A	75A	<10	<10	>6	5	<100	<3	<3	1
1117	7-11-28	<.02	.3A	<1	10	15A	<10	<10	4	<3	<100	<3	<3	<1
1118	7-11-28	.1	.6A	<1	10	22A	<10	<10	1.5	<3	<100	<3	<3	1
1119	7-10-12	5	2.7A	1.5	270A	308A	<10	<10	.65	<3	<100	<3	<3	<1
1559	7-12-14	<.1	<.5	70	30	40A	<10	20	<.01	<5	<50	<5	<2	<5
1572*	7-12-26	.09	200	150	3,000	<200	*	15	.04	150	<100	3	<3	7
1587	8-12-24	<.02	<.5	10	<10	<25A	<10	<10	.01	70	<50	<5	<2	<5
1593	8-13-8	<.02	30	70	300	6,600A	150	700	.04	15	1,000	<5	<2	<5
1596	8-13-7	<.02	1	15	50	85A	150	30	.38	<5	150	<5	<2	5
1597	8-13-20	<.02	1.5	30	100	42A	<10	50	.5	100	200	<5	<2	5
1643	5-14-5	<.02	<.5	50	30	32A	<10	<10	>6	<5	<50	<5	<2	10
1646*	5-14-5	.2	5	50	150	600A	<10	<10	.6	7	<50	<5	2	5

Sawtooth study area, Idaho—Continued

Sample	Semiquantitative spectrographic analyses (ppm)									Percent			Chem. analyses ppm	
	Be	V	Nb	Zr	La	Y	Ba	Sr	Mn	Fe	Ti	Ca	F	cxHM
							Veins--Continued							
965	<1	7	<10	50	<30	<10	300	30	70	0.7	0.03	0.07	0.1	<0.5
966	2	10	10	30	<30	20	300	30	100	1	.07	.05	.23	<.5
967	1.5	7	<10	70	<30	<10	500	20	100	.7	.03	.03	.06	.5
969*	3	<15	10	10	<30	<10	300	100	1,500	>10	.015	1.5	.1	>90
970	<1	<15	<10	30	<30	<10	200	15	300	7	.03	.07	.08	5
971	1.5	15	10	70	<30	10	1,500	200	1,000	7	.07	.2	.07	45
974*	<1	30	10	100	50	<20	1,000	150	150	>10	.15	<.005	.11	1
975	2	10	10	70	<30	<10	1,500	30	150	7	.07	.03	.14	5
976	3	15	10	200	50	15	1,500	200	500	1.5	.15	.1	.17	9
977	3	15	20	150	<30	<10	1,500	70	200	10	.07	.03	.15	7
978	3	15	30	150	50	10	3,000	200	200	2	.15	.07	.15	.5
980	3	7	30	70	<30	15	300	15	200	.7	.02	.03	.12	<.5
1000	20	<7	50	100	<30	15	200	15	650	10A	.1	.01	<.01	--
1001*	30	<7	20	100	70	50	50	50	*	1.65A	.1	.3	.16	--
1002*	7	<7	30	150	100	70	30	50	*	2.35A	.15	.07	.01	--
1020	50,000	7	<10	<10	<30	<10	70	5	700	2	.05	.01	--	--
1034	3	20	70	100	<30	15	700	300	300	1.6A	.1	1.5	.37	22
1035	1	<7	10	70	<30	10	2,000	500	500	.85A	.05	1	.15	<.5
1040	10	30	20	200	<30	15	5,000	700	30	3	.15	.1	.02	3
1041*	<1	<7	<10	<10	<30	<10	70	<5	5	3	.001	.15	.11	>90
1042*	<1	<7	<10	<10	<30	<10	100	5	30	7	.0015	.02	.02	>90
1043	2	30	<10	150	<20	5	300	50	300	1.5	.15	.05	--	1
1044	3	10	10	150	<30	<10	1,000	100	150	1	.15	.03	.19	45
1045	3	30	<10	70	<30	<10	500	50	150	1.5	.15	.07	.14	7
1050	2	30	20	200	150	15	500	70	30	2	.2	.05	--	1
1051*	1	<10	<10	150	<20	7	200	<50	70	1	.07	.07	--	7
1054*	<1	<7	<10	10	<30	<10	200	150	30	.7	.015	.5	.22	--
1055	7	20	30	100	<20	5	300	70	50	2	.1	.7	--	14
1057	1	10	<10	30	<20	<5	150	<50	20	1.5	.05	<.05	--	30
1059	2	30	<10	100	<20	<5	700	300	150	1.5	.15	.07	--	.5
1060*	3	30	10	150	30	5	300	70	150	1.5	.2	.1	--	40
1062	70	30	10	200	20	<5	500	200	150	1.5	.2	.3	--	25
1100	<1	<10	<10	50	<20	<5	150	<50	70	.07	.05	.15	--	3
1102	1	30	20	150	70	5	1,500	300	300	1.5	.3	.7	--	14
1111	<1	<7	<10	100	<30	<10	500	5	15	.5	.07	.02	.06	--
1112*	1	7	<10	70	<30	10	1,500	30	30	1	.07	.015	.16	--
1113	1.5	10	<10	150	30	<10	700	10	100	1	.15	.03	.12	--
1114*	<1	7	<10	100	<30	<10	500	15	20	5	.07	.02	.06	--
1116	<1	<7	10	30	<30	<10	1,500	70	70	1.5	.02	.03	<.01	--
1117	<1	<7	<10	50	<30	<10	1,500	70	30	.2	.015	.05	<.01	--
1118	<1	<7	50	30	<30	<10	1,500	70	50	1	.015	.03	<.01	--
1119	1	7	10	70	<30	<10	2,000	70	100	3	.05	.03	.05	--
1559	>1,000	10	15	50	<20	10	15	<50	>5,000	1.5	.03	.2	--	19
1572*	50	15	70	100	50	<10	70	30	700	5	.3	.15	.29	17
1587	1.5	<10	70	100	70	<5	30	<50	300	.7	.1	<.05	.06	2
1593	70	<10	70	150	50	20	20	<50	2,000	5	.07	.1	1.27	80
1596	15	15	30	70	<20	5	20	<50	1,000	1.5	.05	<.05	--	14
1597	15	<10	70	200	<20	7	15	<50	700	1.5	.05	<.05	.08	12
1643	<1	30	20	300	70	5	150	<50	50	1.5	.3	.05	--	2
1646*	1.5	15	10	70	30	7	200	<50	700	2	.07	.05	--	17

35. Contains 200 ppm Cd.
139. Contains 10,000 ppm As.
245. Contains 200 ppm Cd.
273. Contains 50 ppm Cd and >5,000 ppm Cu.
412. From pegmatite dike.
419. Contains 2,000 ppm As.
420. Contains 2,000 ppm As.
426. Composed of accessory minerals from Idaho granite and pegmatite.
432. Contains 2,000 ppm As.
433. Contains 2,000 ppm As.
434. Contains 2,000 ppm As.
456. Contains 2,000 ppm As.
469. Composed of quartz from vein and of mica schist and andesite; contains 2,000 ppm As.
471. Contains 2,000 ppm As.
472. From talus blocks of Idaho granite and metamorphic rocks.
529. Contains 700 ppm Sb.
533. Contains 1,000 ppm Sb.
540. Contains >10,000 ppm Zn, 100 ppm Cd, >10,000 ppm Sb, and 5000 ppm As.
541. Contains 700 ppm Sb.
542. Contains 200 ppm Sb.
550. Contains 5,000 ppm As.
575. Contains 7,000 ppm As.
597. Ore specimen from prospector's camp.
636. Contains 10,000 ppm As.
654. Contains 10,000 ppm As.
655. Contains >10,000 ppm As.
656. Contains 5,000 ppm As.
661. Contains 3,000 ppm As.
686. Contains 7,000 ppm As.
702. Composed of Idaho granite adjacent to diabase dike.
732. Contains >20,000 ppm Pb.
804. Contains 500 ppm Cd and 2,000 ppm As.
878. Contains 2,000 ppm As.
887. Contains 20,000 ppm As.
901. From garnet-bearing pegmatite.
956. From flow-banded extrusive rhyolite.
969. Contains 200 ppm Cd.
974. Contains >10,000 ppm Cu.
1001. Contains 18,000 ppm Mn.
1002. Contains 49,000 ppm Mn.
1031. Composed of talus fragments of andesite and rhyolite.
1041. Contains 2,000 ppm As.
1042. Contains 2,000 ppm As and 150 ppm Cd.
1051. Contains 3,000 ppm As.
1054. Contains 70 ppm Cd.
1060. Contains 5,000 ppm As.
1112. Contains 5,000 ppm As.
1114. Contains 5,000 ppm As.
1552. From rock glacier boulders with Mn minerals coating joints.
1557. Composed of black accessory minerals from pegmatite.
1560. From garnet-bearing pegmatite.
1562. From talus coated with Mn minerals.
1566. From garnet-bearing pegmatite.
1572. Float from quartz vein, contains >10,000 ppm Bi.
1588. Contains 200 ppm Cd.
1599. From small pod of manganese minerals in altered zone.
1645. From small open cut, sample includes loose piece of sulfide not seen in place; contains >10,000 ppm Sb.
1646. Contains 1,000 ppm Sb.

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