Mineral Resources of the Idaho Primitive Area and Vicinity, Idaho

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With a section on the THUNDER MOUNTAIN DISTRICT
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STUDIES RELATED TO WILDERNESS — PRIMITIVE AREAS

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STUDIES RELATED TO WILDERNESS

PRIMITIVE AREAS

In accordance with the provisions of the Wilderness Act (Public Law 88-577, Sept. 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 provided that each primitive area should 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 of the Idaho Primitive Area, Idaho, and some adjoining national forest lands that may come under discussion when the area is considered for wilderness designation.

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MINERAL RESOURCES OF THE IDAHO PRIMITIVE AREA AND VICINITY, IDAHO

By F. W. CATER, D. M. PINCKNEY, W. B. HAMILTON, and R. L. PARKER,
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SUMMARY

A mineral survey of the Idaho Primitive Area and vicinity was made during 1966-71 by the U.S. Geological Survey and the U.S. Bureau of Mines. The area is in the central part of the vast highlands of central Idaho. It consists of the officially designated Idaho Primitive Area, totaling about 1,915 square miles, plus four adjoining areas that aggregate 272 square miles. In this report the term "Idaho Primitive Area" refers to the officially designated area, whereas "primitive area" or "study area" refers to the entire area investigated.

The appraisal of the mineral resource potential of the primitive area involved reconnaissance geologic mapping, extensive sampling of rocks and of stream sediments, and studies of all known mineral occurrences and areas considered favorable for mineral deposits. Many thousands of miles of foot traverses were made, and several thousand samples were taken and analyzed; altogether, more than 540 man-months of time was spent in field investigations. An aeromagnetic survey of the area was also made to help evaluate geologic environments favorable for ore deposits.

The primitive area is underlain by rocks ranging in age from Precambrian to Cenozoic. The oldest Precambrian rocks are intensively metamorphosed schist and gneiss that crop out principally in the northeastern part of the area. Younger Precambrian rocks, consisting of sedimentary beds, were subjected only to low-grade metamorphism; these were intruded by complex upper Precambrian bodies of gabbro and syenite; all these rocks are exposed, mainly in a belt across the central part of the area. Granitic rocks of the Idaho batholith of Cretaceous age underlie much of the northern part and some of the southern part of the area. A thick pile of Eocene volcanic rocks covers much of the central part of the primitive area, and these volcanic rocks have been intruded by a small granitic batholith, also of Eocene age. All these rocks have been subjected to several periods of deformation.

The study area is surrounded by a highly mineralized part of Idaho. Mining districts within and contiguous to the Idaho Primitive Area have yielded more than $95 million worth of gold, silver, copper, lead, zinc, tungsten, antimony, cobalt, nickel, and mercury ore. About $1,671,500 worth of gold, silver, copper, lead, zinc, and tungsten ore has been extracted from deposits inside the study area. County records show that approximately 5,400 mining claims have been located in the study area.

To facilitate field investigations and the evaluation of the mineral potential, the Idaho

Primitive Area was divided into 11 "districts," and the four adjacent areas studied were then designated as "additions." (See fig. 16.) Six districts and one addition have a record of mineral production, and they have a small to modest mineral resource potential. These districts and the addition are along the west and south sides of the primitive area.

The Thunder Mountain district has a recorded production of 22,379 ounces of gold and 12,376 ounces of silver, mostly from two mines, the Dewey and the Sunnyside. Reserves blocked out by mine workings and drilling total a few million tons of material of marginal grade. Three other mines near these two have been developed, but their recorded yield is small. The geology of the area of these five mines, however, indicates more extensive gold and silver mineralization than has been proved by exploration and development, and the area very likely has a potential for an additional resource of moderate tonnage of low-grade material. Shallow exploration is necessary to determine the mineral potential. Very few, if any, of the other 84 lode prospects in the district seem to have a potential for the discovery of resources of precious or base metals, and no significant concentrations of gold or other economic placer minerals were found. An undeveloped rare-earth deposit, however, is estimated to have a potential resource of 95,000 tons of rock containing an average of 7.2 pounds per ton of rare-earth elements.

The Ramey Ridge district has a record of yielding $270,063 worth of gold, silver, copper, and lead ore, mostly from veins at the Snowshoe mine in the late 1930's and early 1940's. Although numerous other veins occur in the district and many claims have been staked, very little exploration has been done. Some exploration has been done on a few properties in recent years, though. Most veins are small lenticular bodies of quartz, valued chiefly for gold and silver, but the grade of the ore is low. The veins at the Copper Camp property, however, are composed mostly of quartz and magnetite with copper minerals of marginal grade. Because of the low grade and discontinuous character of the veins, the resources of precious and base metals in lode deposits in the district probably do not exceed a few million tons of material of marginal and submarginal grade. One prospect may contain a small resource of antimony. Moderate quantities of gravel occur along some streams in the district, but the gold content of most placer samples is too low for these gravels to be of economic interest.

The Greyhound Ridge addition has a recorded production of nearly $325,000 of precious- and base-metal ore, mostly from the Mountain King mine, but deposits just south of the addition have yielded about $1 million worth of ore. The valuable minerals in some of the deposits are chiefly lead, zinc, and silver, whereas in other deposits they are mainly gold and copper. The minerals and associated gangue occur as fissure-filling and replacement bodies. The results of sampling indicate that the ore bodies are small and spotty in distribution. Resource estimates total about 100,000 tons of rock of varied grade but low in average grade.

The Pistol Creek district has yielded $465,226 worth of metals; more than half of this total was in tungsten ore, taken in the early 1950's from the Springfield Scheelite mine, and the rest was in gold, silver, copper, and lead ore, most of which was from the Lucky Lad and the nearby Cougar mines between 1935 and 1941. The ore body at the Springfield Scheelite mine consists of an uneroded remnant of an irregularly shaped body at the contact of the Idaho batholith and the country rock. Available resources are estimated to contain several times as much tungsten as has been produced, but the average grade is estimated to be about half that needed for current mining. The recovered precious and base metals came from high-grade oxidized ore in small bodies along veins at or near the surface. Resources in the area of the Lucky Lad and Cougar mines and three nearby prospects are estimated to total nearly 100,000 tons of low-grade material. A small amount of gravel in one stream deposit might be worked for placer gold, but other placer deposits are of no economic interest.

The Edwardsburg district yielded a recorded production of gold and silver from lode deposits of about $44,000, all from the Golden Hand mine. The reported amount of placer gold recovered is negligible, but the actual recovery is estimated to be between $70,000 and $100,000. Lode deposits are mostly thin, discontinuous quartz veins that average a low content of gold and silver, but which probably contain small pockets of high-grade ore. Estimated resources in these lode deposits total about 200,000 tons of submarginal material. About 17,000,000 cubic yards of gravel that averages 10 cents in gold per cubic yard (at a price of $47.85 per ounce) is along Smith Creek. Although this is a submarginal resource, small quantities of the gravel may be of sufficient grade to be worked at a profit.

The Middle Fork district has yielded a small amount of gold from both lode and placer deposits. Lode deposits are scattered and mostly consist of thin discontinuous quartz veins with a little gold and other metals. Traces of gold are in gravel deposits along the Middle Fork Salmon River.

The Monumental Creek district yielded a few ounces of placer gold many years ago, and recently about $1,000 worth of opal. Placer deposits in the district have a very low average gold content. The opal deposit has the potential for a continuing small production. Very small low-grade lode deposits of precious and base metals occur in quartz veins and silicified shear zones. A low-grade copper deposit is in the Copper Mountain area.

The other five districts and three additions have no record of metal production except for a small amount of placer gold from an operation in the South Fork addition. Each district and addition, however, contains known vein deposits that have been prospected for precious and base metals. Nevertheless, they have a very low resource potential. A fluorite-bearing vein in the Indian Creek district, on the other hand, has marginal reserves of about 26,000 tons of fluorspar, about half of it acid grade. Samples indicate that all placer deposits in these districts and additions have minor amounts of gold.

Many thermal springs are in the primitive area, especially in the southern part. Data on the geology indicate they have a moderately low potential for geothermal energy.

INTRODUCTION

The Idaho Primitive Area covers about 1,915 square miles of the central part of the vast highlands of central Idaho (fig. 1). This report describes the geology and evaluates the economic mineral potential of the primitive area and of the adjacent study areas added in 1967, which total another 272 square miles. In this report the term "Idaho Primitive Area" refers to the officially designated area, whereas "primitive area" or "study area" refers to the entire area investigated.

ACCESS, USE, AND GENERAL CHARACTER

The primitive area is remote from paved roads. It is reached from the east by about 60 miles of unpaved roads, the last 10 miles steep and narrow, from U.S. Highway 93 near Challis and Salmon. The west side is reached by rough Forest Service roads from Big Creek, Yellow Pine, and Landmark — small communities 40-70 miles via graded roads from McCall or Cascade, which are on State Highway 55. Trails, accessible only by four-wheel-drive vehicles, extend short distances into the primitive area along Big and Monumental Creeks. The south side of the primitive area is reached by Forest Service roads to the headwaters of Rapid River, to the divide between Loon and Little Loon Creeks, and to the divide overlooking Cache Creek; all of these are 25 miles or more from pavement. A graded road down the north side of the Salmon River from North Fork parallels the northeast boundary of the primitive area to a point a few miles below the mouth of the Middle Fork Salmon River, but it is not feasible to cross the Salmon River into the primitive area except by boat or by the footbridge at

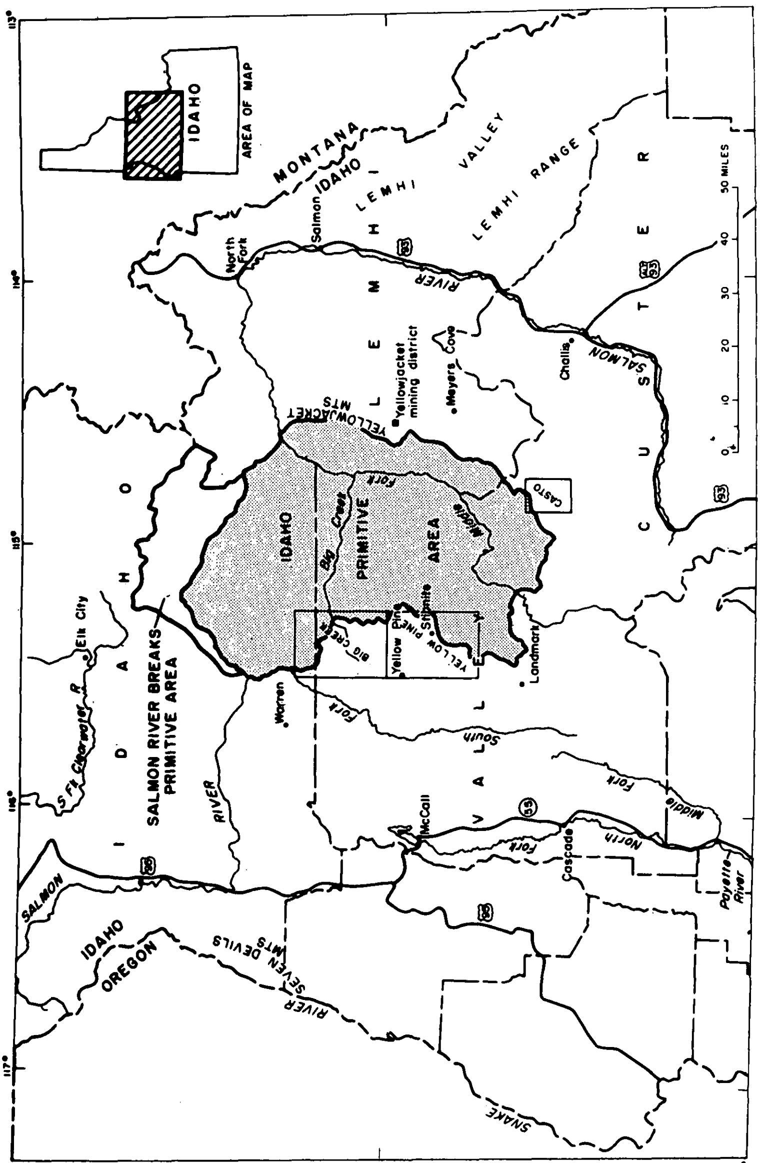

FIGURE 1. — Index map of part of Idaho, showing location of Idaho Primitive Area.

FIGURE 2. — Lower part of the canyon of the Middle Fork Salmon River. View is toward the south.

the mouth of the Middle Fork. Short landing strips, usable by small aircraft, are in Chamberlain basin and on a few gravel benches of the Salmon River, the Middle Fork, and Big Creek.

Most of the primitive area is spectacularly rugged. Altitudes range from

10,082 feet atop Mount McGuire, near the northeast corner, to about 2,030 feet at the junction of the Salmon River and its South Fork, at the northwest corner of the area. Dominating the primitive area, and in substantial part responsible for its survival as wilderness, are the mighty canyons of the Salmon River and its Middle Fork (fig. 2). Through considerable parts of their lengths, these canyons are deeper than 6,000 feet and, hence, are among the deepest on the continent. Until recent years, only a few audacious boatmen ventured down either river, but now, from late spring through early fall each year, thousands of people float the Middle Fork on rubber rafts or run the main river on rafts or power boats.

FIGURE 3. — Glaciated headwaters of West Fork Monumental Creek. View is to the south.

Most of the primitive area is rugged terrain of sharp ridges with crestal altitudes of 7,000-9,000 feet and narrow canyons 3,000-4,000 feet deep. The upper reaches of canyons that head above 8,000 feet are glaciated and have U-shaped cross sections (fig. 3), but most canyons are V-shaped. Slopes are steep and range from nearly bare to heavily timbered, and most canyon bottoms are choked by brush. Much of this terrain is accessible only with difficulty; trails are few, and many are poorly maintained and, in part, inaccurately located on available maps.

Particularly attractive scenically is the area of the Bighorn Crags, east of the Middle Fork. Here are the highest peaks, and glaciation controls the

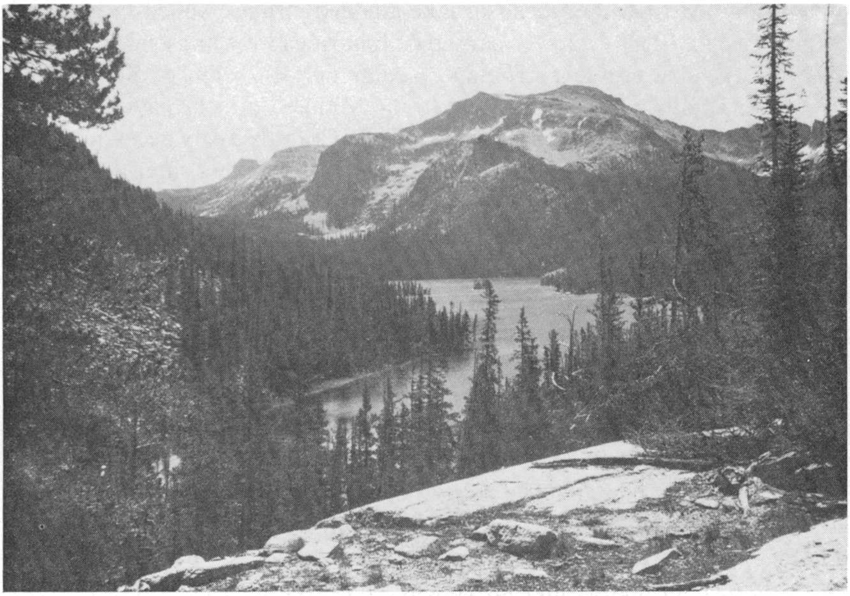

FIGURE 4. — View east across Ship Island Lake at the Bighorn Crags. Rocks in foreground and on ridge beyond lake are glaciated quartz monzonite of the Crags pluton.

FIGURE 5. — View to the east, up the canyon of Ship Island Creek. Cliffs in left foreground are of Precambrian gneiss and schist; the rest of rocks are quartz monzonite of the Crags pluton.

topography. Most valleys head in lake-studded cirques walled-in by great cliffs of granite (fig. 4). Flower-carpeted alpine meadows are strewn through dark forests of evergreens. The spectacular outlet stream of Ship Island Lake (fig. 5) falls 4,600 vertical feet to the Middle Fork through 5 miles of spire-rimmed gorge. The northern part of the Crags is easily accessible over a system of well-maintained trails, and many backpackers enter the area in summer, but no trails traverse the southern part.

Chamberlain basin, the large area drained mostly by Chamberlain Creek and its tributaries, is, by contrast, a gentle terrane. Heavily timbered rolling hills have a relief of generally less than 1,000 feet, and many of the valleys are characterized by open meadows (fig. 6). Chamberlain basin supports a large elk herd and draws many hunters into the area each fall. More dispersed hunters seek elk, goats, and mountain sheep in many other parts of the primitive area.

The primitive area, which has a total relief of 8,000 feet, has a considerable range in climate. The bottom of the Salmon River canyon is mild in winter and hot in summer, and midday summer temperatures frequently exceed 100°F. In most of the rest of the area, summers are delightful, with warm days, cool nights, and infrequent rains. Winters, however, are long and severe, and spring and fall tend to be wet and chilly.

Unlike most other officially designated primitive and wilderness areas in the national forests, there are some privately owned lands and a few year-round residents in the Idaho Primitive Area. The private lands mostly were established as cattle ranches on benches along the Salmon River, the Middle Fork, and Big Creek, and in Chamberlain basin, but many of these holdings are now used primarily for dude ranches and hunting camps.

PREVIOUS INVESTIGATIONS

Numerous reports have been published on the geology of various parts of the study area, but most are brief, and much of the area was almost unknown before the present reconnaissance. Ross (1934) mapped the 30-minute Casto quadrangle, which covers most of the southeastern part of the area, and his report is the most comprehensive of any dealing with sizable parts of the area. Studies of mining districts in and near the primitive area were made by Anderson (1953), Cooper (1951), Ross (1927, 1930, 1933a, b), Shenon and Ross (1936), Umpleby and Livingston (1920), and White (1940). B. F. Leonard in 1953 began a detailed study of the Big Creek and Yellow Pine quadrangles, the eastern parts of which extend into the primitive area. That study is still underway, but reports on various aspects of the geology have been published (Leonard, 1962, 1963, 1965; Leonard and others, 1968).

PRESENT INVESTIGATION

Investigations by the U.S. Geological Survey are based on a review of earlier studies, unpublished official records, and on fieldwork by the authors

FIGURE 6. — Alluvium-filled open meadows. View northwest across Cold Meadows and Chamberlain basin.

and others in 1966, 1967, and 1969. F. W. Cater, B. F. Leonard, W. B. Hamilton, R. L. Parker, and E. V. Post were assisted by R. M. Breckenridge, W. P. McKay, W. M. Pennell, and F. J. Sage in the summer of 1966. Cater, Post, Hamilton, and L. C. Craig studied the canyons of the Salmon River and Middle Fork from boats in the spring of 1967. In the summer of 1967, Cater, Leonard, Hamilton, and D. M. Pinckney were assisted by Breckenridge, H. E. Ehrenspeck, and Michael Martin. Cater, Hamilton, Leonard, and Pinckney spent about 3 weeks in 1969 field checking geochemical anomalies and geologic mapping. W. L. Lembeck, assisted by Fred Marshall in 1966, and G. A. Nowland, assisted by Charles Hershey in 1967, analyzed stream-sediment and other samples in a Geological Survey mobile laboratory.

The fieldwork consisted principally of reconnaissance geologic mapping and stream-sediment sampling. Existing maps of various parts of the area were checked and updated, but most of the geologic map (pl. 1) is the result of mapping done during this investigation. Several thousand miles of foot traverses were made. Some mapping was performed from helicopter, and included numerous landings to inspect outcrops; this method was found to be both rapid and fairly accurate. Common rock types were sampled, and all visibly altered rocks that might possibly be associated with metallization were both sampled and analyzed. Geochemical anomalies that were found were investigated in detail, in part, by the use of portable soil-analyzing kits.

Investigations by the U.S. Bureau of Mines were made during six field seasons, 1966-71. This work was conducted by R. D. Weldin (project leader), 1966-71; T. J. Close, 1967-71; D. W. Lockard, 1967-68; E. G. Hoffman, 1968-69; N.T. Zilka, 1970-71; E. T.Tuchek, and R. M. Van Noy. D. C. Holt assisted with placer evaluations during the first two field seasons and conducted laboratory work on placer samples taken during the remaining field seasons. E. G. West, a part-time employee, provided field assistance during four summers. A total of 44 college students were employed during the summer months as field assistants. Those working two or more summers were D. H. Vice, J. C. Mitchel, J. A. Baldwin, P. R. Dawson, D. J. Decker, E. D. Edwards, R. A. Edwards, S. R. Murray, and P. A. Pierce. Altogether, more than 250 man-months were spent in U.S. Bureau of Mines field investigations.

Fieldwork involved several thousand miles of foot traverse, in the search for mines, prospects, and related mineralized outcrops. Jet boats were used for access along the main Salmon River, and packhorses were used occasionally, when heavy equipment or large quantities of samples were involved. A helicopter was used during the last four field seasons to transport men and equipment to and from remote prospects and isolated base camps.

All available information on previous mining or exploration activities in the area was collected, and all known mines and prospects were sampled, mapped, and evaluated. Petrographic studies of many lode and placer samples were made by L. L. Brown, U.S. Bureau of Mines. Much of the analytical work was directed by H. H. Heady, U.S. Bureau of Mines, Reno, Nev.

ACKNOWLEDGMENTS

The aid and cooperation of local residents, claim owners, and Forest Service personnel were of great help to us. We particularly appreciate the help and information received from Earl Dodds, District Ranger at Big Creek, and from residents Glen Harper, Wilbur Wiles, Lafe Cox, Jack Walker, Dewey Moore, Claude Elliot, Leon Simons, and Fred Basic, who supplied information on mining activity and aided us in finding some of the old mineral prospects. We are indebted to R. B. Tripp and W. R. Marsh for laboratory mineral separations.

GEOLOGIC APPRAISAL

By F. W. Cater, D. M. Pinckney, W. B. Hamilton, and R. L. Parker,
U.S. Geological Survey

The Idaho Primitive Area consists geologically of four contrasting parts. The largest, and northernmost, part is underlain by granitic rocks of the Cretaceous Idaho batholith, and by coarsely crystalline schist and gneiss (pl. 1). South of these plutonic rocks is a belt, trending west-northwestward, of relatively low grade Precambrian metasedimentary rocks, intruded by complexes of gabbro and syenite of late Precambrian age. The central part of the primitive area is underlain by a thick pile of Eocene volcanic rocks. South and east of these volcanic rocks are more rocks of the Idaho batholith and, also, a small batholith, the Casto pluton, of Eocene granite and quartz monzonite that intrudes the volcanic rocks. The region has been deformed repeatedly. The exposed rock units are described briefly in the following text.

PRECAMBRIAN ROCKS

Rocks assigned to the Precambrian in the primitive area differ widely in lithology and history. The youngest of these rocks form intrusive complexes that are virtually unmetamorphosed, whereas all the others are metamorphosed, many highly so. Most of the metamorphic rocks were derived from sediments. The Precambrian age of most rocks is established, but that of some rocks is only inferred, and doubt clouds correlations between some masses assigned to the same map units.

GNEISS AND SCHIST

High-grade metamorphic rocks, thought to be at least in part of early Precambrian age, crop out along and near the Salmon River, the lower reaches of the Middle Fork, and elsewhere. The large Middle Fork mass of these rocks contains perhaps 80 percent of schist and gneiss, and 20 percent of granitic, aplitic, and pegmatitic material, all mostly concordant and gneissic (fig. 7). Proportions of schist, gneiss, and granitic rocks differ widely, sizable areas being dominated by any one of them, but we made no attempt to map units within the complex. The schist is coarsely crystalline, and the dominant type consists largely of biotite, muscovite, plagioclase, and quartz. The gneisses consist mostly of quartz, plagioclase, microcline, and biotite, but hornblende, garnet, or muscovite are abundant in many places, and sillimanite was observed locally. Thin layers of quartzite, variably pure to micaceous and feldspathic, are intercalated in the schist and gneiss. Small masses of amphibolite were also seen. The rocks are strongly folded and foliated throughout (fig. 8), and dips are mostly steep. Time did not permit mapping of even the largest folds, but those that were seen are tightly compressed, and axial planes are marked by zones of extreme distortion and rodding. Superposed on the major folds in many places are small-scale crossfolds, ranging from a fraction of an inch to several feet across, with axes parallel to and down the dip of the foliation. The spectacular chasm of the lower Middle Fork is cut along the general strike of the gneiss and coarse schist, and the grandeur of the canyon is due, in part, to the control of erosion exercised by lithology and structure of these rocks; some of the imposing cliffs are dipslopes stripped along foliation planes.

Other, smaller masses of similar rocks elsewhere in the primitive area are given the same designation on the geologic map (pl. 1), but less is known about them. The mass on the Salmon River at the mouth of Chamberlain

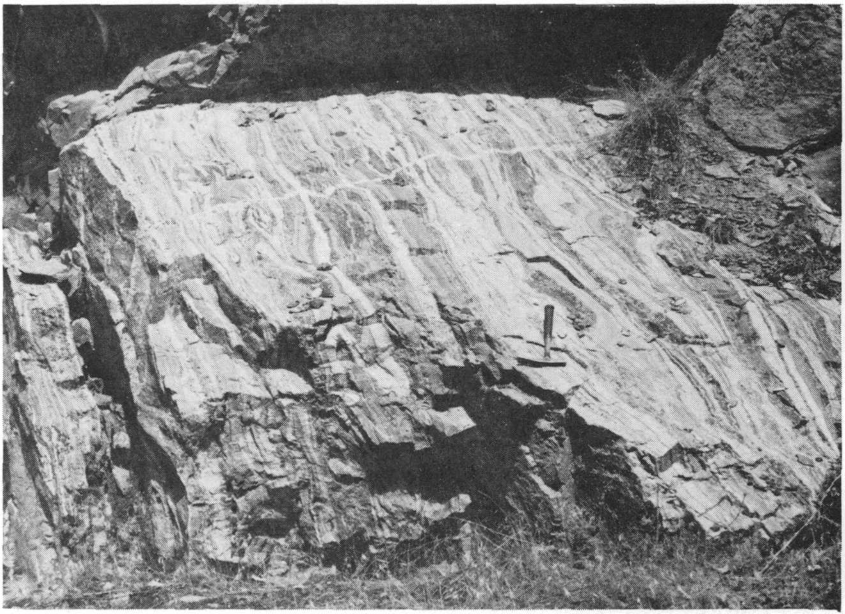

FIGURE 7. — Schist and gneiss containing granitic material, Salmon River canyon.

Creek contains much more intruded granitic material at river level than higher on the canyon walls.

The gneiss and schist have yet to be dated directly. No large masses of low-grade metamorphic rocks from which the gneiss and schist could have been derived by isochemical metamorphism are known to occur in the region. The low-grade rocks of the primitive area are dominated by relatively pure quartzite (assigned to the Hoodoo Quartzite) and by impure quartzite and mostly quartz-rich siltite (Yellowjacket Formation); the Precambrian age of the Hoodoo and Yellowjacket of the large belt along Big Creek is established by the known late Precambrian age of syenite and gabbro which cuts them. The large Middle Fork mass of gneiss and schist is separated from the low-grade rocks of the Big Creek belt by only a few miles of quartz monzonite of the Idaho batholith. There is no reason to believe, however, that the high-grade metamorphism of the gneiss and schist is related to intrusion of the batholith, inasmuch as the batholith only formed thin zones of hornfels along contacts of the Yellowjacket and formed migmatite with gneiss and schist.

We suggest, accordingly, that the gneiss and schist represent the basement complex upon which the Hoodoo and Yellowjacket were deposited in late Precambrian time. Plutonic metamorphic rocks near Elk City, within the Idaho batholith region about 20 miles northwest of the north tip of the primitive area, have been dated as about 1,500 m.y. (million years) old by the zircon lead-uranium method by Reid, Greenwood, and Morrison (1970); and rocks of middle and early Precambrian age, some as old as 3.1 b.y. (billion years), form the basement of southwestern Montana (Giletti, 1966). Some of these old rocks resemble the gneiss and schist of the primitive area.

DOLOMITIC MARBLE

Isolated masses of dolomitic marble, of unknown age (but probably Precambrian) enclosed in Tertiary granite, crop out along the Middle Fork near the mouth of Cub Creek. The rock is medium grained, white, and completely recrystallized. No rocks from which these masses could be derived are known in the area, but their proximity to a large mass of old gneiss suggests them to be of similar age.

QUARTZITE, GNEISS, AND SCHIST

Micaceous quartzite and biotitic gneiss and schist are intercalated in masses in the northwestern part of the primitive area, along the Salmon River and near Sheepeater Mountain. The dominant rock type is micaceous quartzite, variably feldspathic; intercalated throughout with this are biotite gneiss and schist, and injected into them are abundant granitic sheets. Partly within these masses (and distinguished from them on the geologic

FIGURE 8. — Mica schist in Salmon River canyon. The schist contains a few thin layers and knots of granitic material.

map where data permit) and partly in isolated masses elsewhere in the primitive area is coarsely crystalline white quartzite. These various high-grade rocks could be derived from the Hoodoo and the Yellowjacket by metamorphism, but this seems unlikely; nevertheless, they differ in aspect from the gneiss and schist described previously. Weis, Schmitt, and Tuchek (1972, p. C12) suggest that the quartzitic assemblage was derived by metamorphism of rocks of the Prichard Formation in the Belt Supergroup.

YELLOWJACKET FORMATION

The Yellowjacket Formation of the Belt Supergroup consists of argillite, siltite, impure quartzite, and metavolcanic rocks. The formation was named by Ross (1934, p. 16) for exposures in the Yellowjacket mining district, just east of the primitive area. Almost half of the belt of Precambrian rocks that trends east-southeastward across the primitive area, along the canyons of Big and Wilson Creeks, is assigned to the Yellowjacket. Small isolated masses of metamorphic rocks in the southern part of the primitive area also are assigned to the Yellowjacket.

The Yellowjacket in the primitive area is dominated by argillite, siltite, and quartzite that is mostly impure and fine grained. The argillite and siltite are medium- to dark-gray fine-grained aggregates of quartz, biotite, and muscovite. Bedding and other sedimentary structures are visible in many outcrops (fig. 9) despite the complete recrystallization and the common presence of a distinct cleavage. The intercalated quartzites are lighter colored, coarser, variably white to medium gray, and, also, are composed mostly of quartz, biotite, and muscovite, although they have markedly more quartz than do the argillite and siltite. Calcareous interbeds in the formation are abundant only on the ridge between Little Marble Creek and the settlement of Big Creek at the west edge of the area. There the beds consist of calcareous quartzite and quartzose marble containing calcite, quartz, and variable but generally small amounts of phlogopite, biotite, epidote, chlorite, actinolite, and plagioclase.

The Yellowjacket has been most closely studied in the Big Creek and Yellow Pine quadrangles, which include the west edge of the southern two-thirds of the primitive area, by Leonard (1962; unpub. data). Despite obscuration by faulting, isoclinal folding, and flowage accompanying metamorphism, Leonard regards the Yellowjacket there as divisible into three units. The lower unit, at least 5,000 feet thick, consists of thin- to thick-bedded argillite and siltite with scattered interlayers of fine- to medium-grained argillaceous quartzite. The middle unit, about 2,500 feet thick, consists of interbedded sandy carbonate and quartzite. The upper unit, about 500 feet thick, consists of three subunits of metavolcanic rocks. In sequence upward, these subunits are (1) porphyroblastic hornblende schist, (2) interlensed hornblende and biotite schists (derived from lavas ?) and hornfels (from volcanic siltstone ?), and (3) metamorphosed volcanic breccia and conglomerate.

Just east of the primitive area, Ross (1934, p. 16) measured a section in rocks, metamorphosed only slightly, which displayed ripple marks and crossbeds, indicating the stratigraphic top. He found, there, a lower, calcareous unit, of which he saw about 1,700 feet, and an upper unit of argillaceous quartzite, about 7,000 feet thick, overlain in turn by Hoodoo Quartzite.

Nothing is known about the internal stratigraphy of the Yellowjacket in the Precambrian belt along Big and Wilson Creeks, which connects the areas studied by Leonard and Ross. The Yellowjacket of the belt consists mostly of argillite, siltite, and impure quartzite, and corresponds lithologically to Leonard's lower unit and to Ross' upper one. Leonard's calcareous middle unit might correspond to Ross' lower unit. Either the Yellowjacket lacks a consistent stratigraphy through the region, or that stratigraphy has yet to be defined, or the rocks designated as Yellowjacket represent similar lithologies in a thick stratigraphic section consisting of alternating quartzites (Hoodoo) and finer grained sediments (Yellowjacket).

The base of the Yellowjacket has not been recognized in the primitive area or elsewhere. B. F. Leonard (unpub. data), in the west, and Ross (1934, p. 16) in the east, both regard the Yellowjacket as being overlain

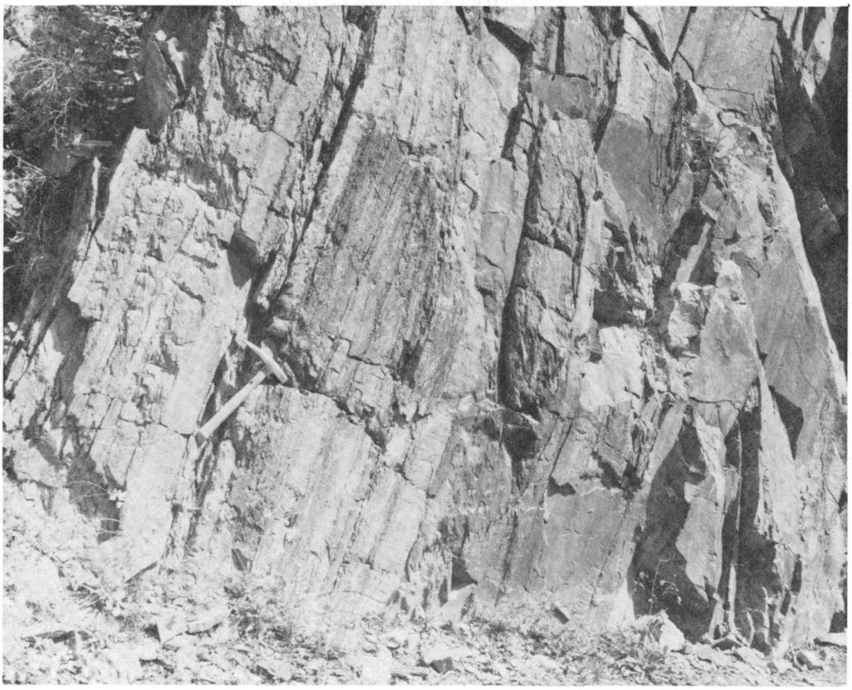

FIGURE 9. — Interbedded agrillite, siltite, and quartzite of Yellowjacket Formation, Big Creek.

stratigraphically by the Hoodoo, but, as just noted, this order need not represent a single succession.

HOODOO QUARTZITE

Masses of quartzite assigned to the Hoodoo Quartzite of the Belt Supergroup are interspersed with masses of finer grained rocks assigned to the Yellowjacket throughout the Big Creek-Wilson Creek Precambrian belt. The Hoodoo was named by Ross (1934, p. 18), for exposures along Hoodoo Creek just east of the primitive area. The Hoodoo is dominated by massive fine- to medium-grained vitreous quartzite that is white or nearly white. Bedding and crossbedding are seldom seen, having been obliterated by metamorphism in most of the formation. Interlocking quartz grains form most of the rock, but grains of plagioclase, potash feldspar, sericite or muscovite, biotite, and chlorite may total as much as 25 percent of the rock. The quartzite is resistant to erosion and, so, tends to form ridges and knobs. But it is closely jointed, and surfaces underlain by it are mostly covered by angular fragments. Quartzite containing faintly visible pebbles, also of white quartzite, was seen in numerous places. Dark phyllite and siltite form interlayers in parts of the formation.

AGE AND STRATIGRAPHIC RELATIONSHIP OF YELLOWJACKET AND HOODOO FORMATIONS

Both the Yellowjacket Formation and the Hoodoo Quartzite are intruded in the Big Creek-Wilson Creek belt of Precambrian rocks by syenite and other igneous rocks, discussed subsequently and known to be of late Precambrian age. Both Yellowjacket and Hoodoo are thus also Precambrian.

Near the west edge of the primitive area, Leonard (unpub. data) studied in detail the Yellowjacket and the Hoodoo, which lies above it in a syncline. He concluded that the relationship of cleavage, minor folds, large folds, and bedding there indicates that the Hoodoo lies stratigraphically, as well as structurally, above the Yellowjacket. He further inferred that the contact is probably an unconformity, although structural complications could, instead, have caused the lithologic and structural discordances observed. Ross (1934, p. 16) studied a section just east of the primitive area where the direction of younger beds is indicated by crossbeds and ripple marks and found that the Hoodoo there apparently also overlies the Yellowjacket. The Yellowjacket and Hoodoo each represent a single formation, and, apparently, the Hoodoo is the younger. Neither the base nor the top of the combined Yellowjacket-Hoodoo section has yet been recognized.

The Yellowjacket and Hoodoo occur in large and small masses interspersed throughout the Big Creek-Wilson Creek belt (pl. 1). Our reconnaissance mapping suggests that the contrasted types, in places, are interfolded isoclinally about steep-dipping planes but provides no basis for identifying synclines, anticlines, or stratigraphic successions. Neither the

Yellowjacket nor the Hoodoo represents a particularly distinctive lithology, and, as noted previously, the little information available on the internal stratigraphy of the Yellowjacket at opposite ends of the Precambrian belt leads to contradictory conclusions. The possibility should thus be kept in mind that the Yellowjacket and the Hoodoo may represent not single formations, but contrasted lithologies in a series of formations of the two types in alternation.

The Yellowjacket and Hoodoo have long been assumed (as, by Ross, 1934) to be part of the Belt Supergroup, which is widespread over western Montana and northern Idaho. Specific correlations with other formations in the Belt Supergroup cannot yet be made, but according to E. T. Ruppel (oral commun., 1971), the Yellowjacket is similar to, and probably correlates with, the lower part of a very thick sequence of Precambrian sedimentary rocks extensively exposed in the northern part of Lemhi Range, 40 or 50 miles east of the primitive area. Obradovich and Peterman (1968) found the Belt in western Montana to span the age interval from about 900 to 1,300 m.y. ago; so, presumably, the Yellowjacket and Hoodoo would fall within this age span.

INTRUSIVE COMPLEXES

The youngest known Precambrian rocks of the primitive area are complex intrusions into the Yellowjacket and Hoodoo Formations of the Big Creek-Wilson Creek belt. Each of the four intrusive masses within the belt is dominated by syenite and quartz syenite and contains subordinate hornblendite and syenite contaminated by very coarse grained amphibolite. All but the westernmost mass contain also much gabbro and some pyroxenite. The various rock types occur in part as discrete masses of considerable size and in part as intricate small-scale mixtures of varied types. The westernmost intrusive mass was called the Ramey Ridge Complex by Leonard (1963).

The quartz syenite and syenite generally are coarse grained and differ only in the presence or absence of quartz. Microantiperthite is by far the most abundant feldspar, but microperthite and nonperthitic microcline occur locally. Biotite is generally more abundant than hornblende. Magnetite, apatite, zircon, titanite, fluorite, and allanite are accessory. Chevkinite, a complex Ce-Ti silicate, was recognized by Leonard in the westernmost mass. Syenites contaminated by amphibolite are characterized by large but varying amounts of hornblende, and such rocks grade into nearly pure hornblendite.

Medium-grained gabbro is common in the three eastern masses and consists mostly of labradorite, clinopyroxene, and uralitic hornblende. Magnetite, biotite, and titanite are accessory, and actinolite and epidote are secondary. Pyrite is present but sparse.

The pyroxenite is nearly black and coarse grained and consists largely of clinopyroxene that has been partly replaced by uralitic hornblende and fibrous actinolite. Apatite is abundant, magnetite is less so.

Discordant lead-uranium and lead-thorium age determinations for rocks of the westernmost complex, the Ramey Ridge, indicate a minimum age of 680 m.y. (Leonard and Stern, 1966). The most likely age is about 725 m.y. The syenites of the other three complexes resemble those of the dated one, and, presumably, all are of similar age.

CRETACEOUS ROCKS

Granitic rocks of the Cretaceous Idaho batholith are exposed over at least a third of the primitive area and over much of the rest of central and northern Idaho. The batholith is a composite of distinct plutons and gneissic complexes. Within the primitive area, biotite quartz monzonite is the most abundant rock type, and biotite granodiorite is also common; quartz diorite, hornblende diorite, and hornblende and biotite gabbro are uncommon. Gneissic, leucocratic biotite quartz monzonite is abundant. The various granitic rocks are poorly exposed, except along the major canyons and in the higher mountains, and only locally were contacts observed and plutons delineated.

GNEISSIC LEUCOCRATIC QUARTZ MONZONITE

The northern part of the primitive area is dominated by gneissic leucocratic quartz monzonite. This rock is mostly nearly white and medium grained; it consists of subequal amounts of unzoned oligoclase, potash feldspar, and quartz, plus a little biotite and, commonly, some muscovite. Very small amounts of hornblende are present locally. Magnetite, zircon, titanite, and allanite are commonly present. Foliation is distinctly developed, but outcrops mostly are massive, rather than flaggy (fig. 10). Lenticular inclusions are common, abundant, and frequently large near contacts with the old gneisses of the lower Middle Fork area.

The few contacts seen between the gneissic quartz monzonite and massive granitic rocks are sharp and crosscutting. Whereas the massive rocks are characterized by patchy zoned plagioclase, indicative of crystallization during long-distance upward migration of magma (Vance, 1965), the gneiss shows subuniform plagioclase indicative of near-equilibrium crystallization in place. The gneiss apparently represents both deeper levels and older ages of formation than do the adjacent massive granitic rocks.

MIGMATITE

Extensive contact migmatites that developed between the gneissic quartz monzonite and the old gneiss and schist unit are west of Stoddard Creek Point, west of the Middle Fork; they were mapped separately (pl. 1). The migmatite consists of intricately intermixed and interlayered gneiss and quartz monzonite, which occurs also as crosscutting dikes and irregular masses. A mass of similar migmatite occurs west of lower Yellowjacket Creek, in the east-central part of the primitive area, where it lies between

Tertiary and Cretaceous granitic rocks and is no longer in contact with nonmigmatitic metamorphic rocks.

QUARTZ MONZONITE, GRANODIORITE, AND QUARTZ DIORITE

Massive granitic rocks, mostly quartz monzonite and granodiorite, of presumed late Mesozoic (Cretaceous) age form a belt trending west-northwestward in the northern part of the primitive area between the Precambrian rocks in the Big Creek belt and the gneisses along the Salmon River, and they also underlie a large area in the southwestern part of the primitive area and small areas elsewhere. The rocks are mostly leucocratic and composed of oligoclase or andesine, potash feldspar, quartz, biotite, and in some places hornblende. Nearly half of the granitic rock is conspicuously porphyritic with rectangular phenocrysts of potash feldspar,

FIGURE 10. — Massive gneissic biotite quartz monzonite, Salmon River canyon.

which locally reach lengths of 6 inches, although their common maximum size is 2 inches. Accessory minerals are magnetite, apatite, titanite, zircon, and allanite. Inclusions are only locally plentiful.

The quartz monzonites and granodiorites are very poorly exposed both in the broad uplands of Chamberlain basin to the north and in the canyon country to the southwest. Some of the textural and compositional variations recognized undoubtedly reflect the presence of distinct plutons of diverse rock types, but it was not feasible during the present reconnaissance to map such plutons.

Quartz diorite dominates the granitic masses shown on the map (pl. 1) in the Camas Creek-Yellowjacket Creek area, south of the center of the east edge of the area. Small masses of quartz diorite (not mapped separately) occur along Queen Creek and on the ridge north of Sheepeater Mountain lookout. These quartz diorites are mostly gray, medium grained, and massive. They consist of andesine, quartz, biotite, and hornblende, and contain accessory opaque minerals, apatite, titanite, and zircon. They contain only minor amounts of potash feldspar. Porphyritic quartz monzonite, containing phenocrysts of plagioclase, occurs around the mouth of Yellowjacket Creek.

Small masses of hornblende and biotite gabbro are in the northern part of the area near Hungry Creek, near the headwaters of Dillinger Creek, and on the upper West Fork Chamberlain Creek. None are mapped separately on plate 1. The rocks are dark colored and medium grained and consist of labradorite, hornblende with or without biotite, and very little augite. Small bodies of diorite were seen, also, and differ from the gabbros mainly in containing andesine rather than labradorite. Ross (1934, p. 40-41) described a diorite mass on Loon Creek.

MIXED ROCKS

Mixed rocks consisting of different proportions of granitic material — largely alaskite — and metasedimentary and metavolcanic rocks were mapped in two localities on and near Mosquito Ridge and in the upper drainage areas of Indian and Little Pistol Creeks. In both appearance and mode of occurrence, the mixed rocks differ from the somewhat similar migmatites previously described. The migmatites are confined to contact zones between batholithic rocks and the ancient schists and gneisses, whereas the mixed rocks form discrete belts and masses, some of considerable size. The intrusive material in the migmatite consists of the normal quartz monzonite and granodiorite; that of the mixed rocks is an alaskite. The metamorphic rocks in the mixed-rock units range from large bodies to small inclusions and wispy schlieren. Tabular and lenticular masses of the country rock alternate with grossly concordant sheets of alaskite connected by short narrow dikes. Alaskite commonly makes up 50 to 90 percent of the mixed-rock unit. The larger alaskite bodies are a few hundred feet wide and hundreds of feet long; the dimensions of the country-rock masses may be comparable but are commonly smaller. The country rock is of high metamorphic grade but rarely shows lit-par-lit injection by the granitic component. The metamorphic rocks intruded by the alaskite are derived mainly from the Yellowjacket and Hoodoo Formations, but some are of indeterminate origin. Fragments of metavolcanic rocks are commonly biotite hornfels that resemble diorite. Inclusions in some of the mixed rocks consist almost entirely of Yellowjacket Formation, in others the inclusions are of Hoodoo Quartzite or of metavolcanic rocks; the rest contain mixtures of these various rock types. No attempt was made to show these varieties of mixed rocks separately on the geologic map (pl. 1).

The alaskite of the mixed-rock unit is nearly white or pale pink, fine to medium grained, and either foliate or nonfoliate; it consists of quartz, twice as much oligoclase as orthoclase, and locally some muscovite. Dark minerals, mostly biotite, constitute less than 2 percent of the rock. In places the mica is alined and defines a vague foliation.

AGE OF GRANITIC ROCKS

Two large plutons of quartz monzonite, discussed subsequently, are known to be of Tertiary age because one cuts Eocene volcanic rocks, and the other has been dated radiometrically. None of the other granitic rocks can be dated closely from evidence within the primitive area. The broad belt of massive granitic rocks north of Big Creek cuts metamorphic rocks of Precambrian age and is overlain unconformably by lower Tertiary volcanic rocks. The massive granitic rocks of the southwestern part of the primitive area also are overlain by the young volcanic rocks. The quartz monzonitic gneisses along the Salmon River cut older gneiss complexes of Precambrian age, and in turn are cut by massive granitic rocks.

The granitic rocks not known to be of Tertiary age are inferred here to be of Cretaceous age, and are so designated on the geologic map (pl. 1), from the reconnaissance radiometric dating that has been done elsewhere in the Idaho batholith. Larsen and Schmidt (1958, table 5) presented 14 lead-alpha ages, ranging from 90 to 135 m.y., determined from zircons in widely separated central Idaho rocks. Thirteen potassium-argon determinations by F. W. McDowell on minerals from other widely separated samples of the batholith were interpreted by McDowell and Kulp (1969) to indicate that there were important intrusive episodes during the Late Jurassic and Early Cretaceous, the Late Cretaceous, and the Eocene; but so much Eocene reheating was indicated that these conclusions are very tentative. R. L. Armstrong (written commun., 1967) found that Eocene reheating and magmatism have greatly complicated interpretation of the potassium-argon ages.

TERTIARY ROCKS

Tertiary volcanic rocks form a large central part of the primitive area, and a Tertiary batholith intruding these volcanic rocks crops out widely to the east and southeast of them. Another Tertiary pluton underlies much of the Bighorn Crags. Small masses of Tertiary granitic rocks and innumerable dikes, nearly all silicic, are scattered more widely about the area. Sedimentary rocks are limited to thin lake beds intercalated in volcanic rocks.

CHALLIS VOLCANICS

The intermediate and silicic Challis Volcanics of Eocene age form a thick and broad volcanic pile in the central part of the primitive area and occur, also, in smaller remnants mostly east and south of that pile. The formation

FIGURE 11. — Challis Volcanics at Rainbow Peak. View is toward the south-southeast.

was named by Ross (1934) for the town of Challis, southeast of the study area. The formation within the primitive area consists of welded tuffs, pyroclastic rocks, and lava flows. Lake beds, formed mainly of ash and volcanic detritus, are present locally. The rocks generally are not particularly resistant to erosion and tend to form fairly smooth slopes (fig. 11), but where layers contrast considerably in hardness the slopes tend to be cliffy (fig. 12). Dips are gentle to moderate. No attempt was made to trace in-

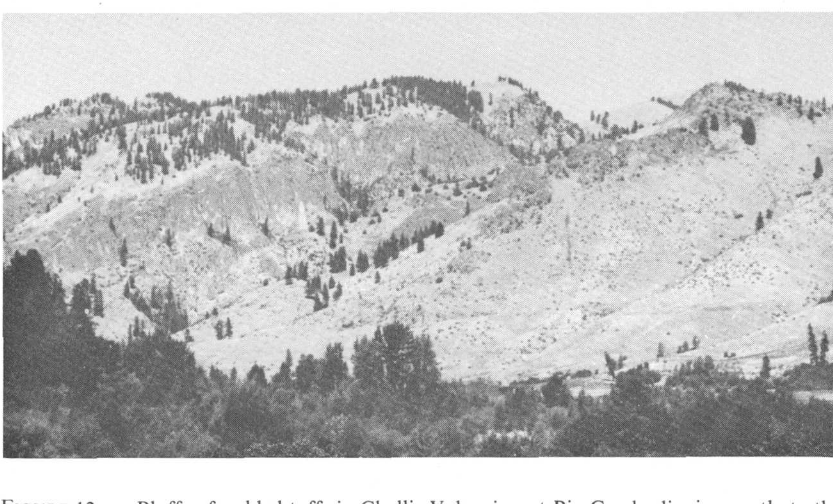

FIGURE 12. — Bluffs of welded tuffs in Challis Volcanics, at Big Creek, dipping gently to the left (west).

dividual volcanic units through the poor exposures that characterize the formation, and the structure is incompletely understood. Local relief on the volcanic rocks — hence, the minimum thickness — reaches 4,000 feet. If no major faults duplicate the section in the large area of dominantly northwestward dips west of middle and upper Marble Creek, the thickness of the volcanic rocks preserved there is about 10,000 feet.

The lower part of the volcanic pile, in parts of the primitive area, consists of rocks more mafic than those of the upper part. These lower rocks are mostly gray or greenish-gray agglomerates, lithified tuffs, welded tuffs, and lava flows. They consist of variably altered phenocrysts of oligoclase or andesine with or without alkali feldspar and of biotite or hornblende, or both, in a matrix of devitrification products and variable amounts of secondary chlorite, epidote, sodic plagioclase, calcite, and fine-grained micaceous material. Quartz is sparsely present as phenocrysts in some of these rocks. Chemical analyses of these rocks in and west of the west-central part of the primitive area show them to be mostly latites (B. F. Leonard, written commun., 1971). The bulk composition of the rocks elsewhere has not been established.

The rest of the volcanic pile is dominated by light-colored silicic rocks, principally welded and unwelded tuffs. The proportions of welded and unwelded tuffs vary considerably from place to place; welded tuffs are particularly abundant in and adjacent to the Thunder Mountain area. These silicic rocks are variably light gray, light greenish gray, pinkish, and cream colored. They range from abundantly porphyritic to nonporphyritic, and some are almost chertlike in appearance. Phenocrysts of oligoclase, alkali feldspar, quartz, and biotite typically lie in a fine-grained matrix of the same minerals, variably devitrified glass, and secondary minerals. Shiny blades of hornblende occur in some units. Some glass remains in the least altered rocks, but most of the rocks are considerably altered and contain chlorite, epidote, iron oxides, micaceous minerals, and calcite. Chemical analyses show that at least in the western part of the main volcanic pile, these rocks are rhyolites that contain generally more K_2O than Na_2O and have very low contents of CaO (B. F. Leonard, oral commun., 1971).

In a few places, as at Rainbow Peak west of upper Monumental Creek, pervasive solfataric(?) alteration has argillized the volcanic rocks and given them variously near-white and bright red and yellow colors.

The Challis Volcanics probably erupted from several major centers; but only one center, the Thunder Mountain caldron, is known to lie within the study area. This caldron, which is 6 to 8 miles across, has been much eroded; but the existence of complex structures, lake beds, local economic mineralization, widespread solfataric(?) alteration, and a strong circular magnetic anomaly mark its site. A vague topographic high, bounding the area on the south, may be inherited from the rim of this caldron. Other sources, the evidence for which have been removed by erosion, may have existed above the small Tertiary batholith exposed in the southeastern part of the area. We made no attempt to relate individual tuff or flow units in the Challis to possible source areas.

A single volcanic neck was recognized in the primitive area. It is exposed about 3 miles southwest of Sleeping Deer Mountain, east of Loon Creek.

The Challis forms vast numbers of dikes and small irregular intrusive masses of the same compositions as the layered rocks they cut. The intrusives are commonly more coarsely and abundantly porphyritic.

Axelrod (1966) reported a whole-rock potassium-argon age determination of 49.0 m.y. (early or middle Eocene) for rhyolite welded tuff in the Thunder Mountain district of the primitive area and a feldspar age of 45.5 m.y. (middle or late Eocene) for a quartz latite near Salmon, east of the primitive area. Axelrod (1968) regarded all known fossil floras from the Challis as of Eocene age. These floras include subalpine conifer assemblages and lower altitude conifer and hardwood assemblages. Axelrod (1968) evaluated the climatic significance and areal distribution of these floras and concluded that in Eocene time central Idaho consisted of highlands about 4,000 feet high, which became lower eastward to 2,000 feet or so near the Wyoming border. Additonal radiometric age determinations are needed to confirm whether the Challis is indeed entirely of Eocene age.

Ross (1934) assigned much of what we now know to be the Challis Volcanics to another unit, the "Casto Volcanics," which he assumed to be much older (Permian?) because the rocks in question are, in general, much more altered than are those of the Challis elsewhere. He suggested that the "Casto" might be correlative with dated Permian metavolcanic rocks, the Seven Devils Volcanics, in the Seven Devils Mountains at the west edge of Idaho. According to our findings, Ross' "Casto" is simply that part of the Challis which is near, and altered by, the Tertiary granite that intrudes it. Broad gradations exist between highly altered and unaltered rocks in the Challis, and mappable boundaries are not present. We crossed contacts drawn by Ross between Challis and "Casto" in many places and regard them as nonexistent, and we found places where Ross had mapped the same unit as "Casto" on one hilltop and as "Challis" on the next. In view of these facts, the name "Casto Volcanics" is hereby abandoned.

GRANITIC ROCKS

Two Tertiary batholiths are exposed in the primitive area. The older of these, the Crags pluton, forms most of the Bighorn Crags in the northeastern part of the area, and the younger, the Casto pluton, is exposed in the canyons of the middle reaches of the Middle Fork and its tributaries.

CRAGS PLUTON

The Crags pluton consists of medium-grained to coarsely porphyritic biotite quartz monzonite that locally grades into granodiorite. The rock is light gray to cream colored where fresh and is massive, widely jointed, and resistant to erosion. It forms spires, high peaks, and cliffs in glaciated areas (figs. 5, 13), and large, rounded exfoliated knobs surrounded by deep grus in upland areas that were not covered by ice in the late Pleistocene. A narrow, unmapped zone of migmatite similar to those developed between rocks of the Idaho batholith and the old gneiss and schist unit formed along the contact between the Crags pluton and the old gneiss and schist below Ship Island Lake, east of the Middle Fork.

The Crags pluton cuts rocks of the Idaho batholith, and three radiometric

FIGURE 13. — Quartz monzonite of Crags pluton near outlet of Ship Island Lake. Note high-angle jointing.

ages as determined by the potassium-argon method on micas (R. L. Armstrong, written commun., 1971) range from 44.2 to 47.5 m.y.

CASTO PLUTON

The Casto pluton differs considerably in both appearance and composition from the Crags pluton. The pluton consists mostly of medium- to coarse-grained pink granite and subordinate pink quartz monzonite.

The rock consists of potash feldspar (mostly micropherthite), quartz, oligoclase or sodic andesine, a little biotite, and, locally, hornblende; the potash feldspar is typically at least twice as abundant as the plagioclase. A sizable mass of hornblende granite, markedly more mafic than most of the batholith, crops out along Marble Creek below Canyon Creek. The batholith was intruded upward into a roof of Challis Volcanics and, so, is of Eocene age or younger. The lateral contacts of the Tertiary batholith are against pre-Challis granitic rocks of the Idaho batholith and against various metamorphic rocks. A single potassium-argon determination on mica (R. L. Armstrong, written commun., 1971) yielded an age of 42.7 m.y.

RELATIONSHIP BETWEEN TERTIARY PLUTONS AND CHALLIS VOLCANICS

The Casto pluton is intruded upward into the Challis Volcanics and, hence, is younger than the Challis. The Casto has markedly altered the Challis over a broad area beyond the exposed contact. The Casto pluton probably underlies the eastern part of the main outcrop mass of the Challis and, also, the smaller preserved mass of Challis in the Loon Creek-Cache Creek sector of the southeast edge of the primitive area. The contact between batholith and volcanic rocks is irregular in detail but generally is gently undulating; the Challis forms a subhorizontal roof upon the batholith which intruded it. As Ross (1934, p. 67) noted, granite porphyry and porphyritic granophyre are abundant near the contact between volcanic and granitic rocks; the prophyritic rocks may represent roof facies of the batholith. The relation of the Crags pluton to the Challis Volcanics is not known, for they are not in contact within the study area.

These observations accord with interpretation by Hamilton and Myers (1967) that many batholiths typically are roofed only by thin covers of their own volcanic ejecta. Detailed information regarding the absolute ages of granitic and volcanic rocks and the location of the calderas from which the volcanic rocks were erupted is needed before this concept can be adequately tested here.

MINOR INTRUSIONS

Dikes of rhyolitic and granitic porphyries are widespread in the primitive area, and small, irregular intrusions of these and other rock types are present more locally.

The silicic dikes occur throughout the primitive area south of a vague line about 10 miles south of, and parallel to, the Salmon River. The dikes cut old metamorphic rocks, the pre-Challis granitic rocks of the Idaho batholith, the Challis Volcanics, and the Tertiary batholith (fig. 14). The dikes have common thicknesses of several tens of feet and tend to occur in swarms of

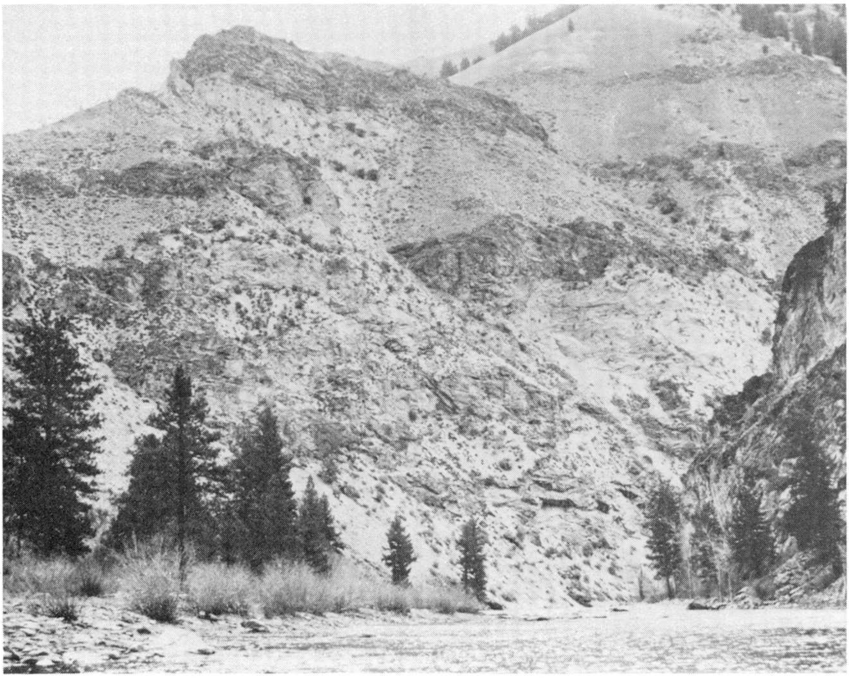

FIGURE 14. — Flat-lying dikes of rhyolite porphyry (dark bands) cutting granite of the Casto pluton. Middle Fork Salmon River at Warm Spring Creek.

subparallel steep or moderately dipping sheets, some of which are noted on the geologic map (pl. 1). The dike rocks are mostly buff, pink, or gray porphyries, containing large tabular phenocrysts of pink or cream-colored potash feldspar and smaller phenocrysts of white sodic plagioclase, in fine-grained groundmasses. The rocks commonly show moderate alteration. Leonard (1965) described briefly a dike swarm in the southwest corner of the primitive area. Potassium-argon determinations on minerals from a dike near Big Creek settlement, just west of the primitive area, yielded ages of 30 m.y. for biotite and 42 m.y. for sanidine, according to B. F. Leonard (oral commun., 1971). The marked discordance leaves the age of the dike much in doubt. Leonard also reports that the dikes, the Challis rhyolites, and the Tertiary batholith are almost identical chemically; all might be of almost the same age.

A mass of dark dacite porphyry with an outcrop area of about 1 square mile cuts the Tertiary granite between the Middle Fork and Middle Fork Peak. This conspicuously spotted rock has white phenocrysts of andesine enclosed in a black aphanitic groundmass. Sparse and inconspicuous phenocrysts of biotite and quartz are present also.

Rhyodacite porphyry occurs as a dense complex of intersecting dikes and small irregular masses at the south edge of the primitive area, where it is shown on the geologic map (pl. 1) as a single large mass. The granitic wallrocks show only as slivers and blocks between the young intrusives. The rhyodacite is abundantly but finely porphyritic, the phenocrysts consisting of numerous andesine laths 1-3 mm long and a little potash feldspar; it is variably altered to chlorite, sericite, clay minerals, and epidote.

SILICIFIED ROCKS

One large zone and one small zone of silicified rocks crop out in the headwaters of Indian Creek. Neither zone is well exposed, but float and available outcrops indicate that the two zones differ in degree and type of silicification. Related and similar silicified zones have been described by Leonard, Mead, and Conklin (1968) close to the settlement of Big Creek near the northwestern part of the primitive area, and Leonard has supplied the information on the silicified zones herein described.

The large zone is the southward extension of the silicified zone that was mined for antimony and gold at the Meadow Creek mine at Stibnite (Cooper, 1951). North of Big Chief Creek, the zone consists of granodiorite and alaskite which are veined and locally permeated by finely crystalline quartz and chalcedony. No large masses of quartz were found, and, therefore, this part of the zone is interpreted as a stockwork of quartz veinlets. Most of the quartz and some of the granitic rock is stained red or yellow, and some of the granitic rock is mylonitic.

South of Big Chief Creek, the large zone crops out as a cliff-forming ledge of massive quartz and as roches moutonnées of silicified rocks. The zone in this area has been prospected by a sizable adit, now caved, and by smaller workings. Rock at the portal of the main adit consists of fine-grained white replacement quartz that is locally crackled and stained yellow brown; nearby outcrops are of bleached, chalky alaskite and porphyritic granodiorite. To the south the zone ends against a fault zone intruded by dikes.

The small zone of silicified rocks is poorly exposed near the edge of the primitive area about 2½ miles east of the main zone. The rock exposed in old prospect pits consists of vuggy quartz in brecciated, limonite-stained, locally silicified biotite granodiorite. Wallrocks are relatively fresh. The zone follows a northeast-striking fault or system of faults along which a sliver of Challis Volcanics (too narrow to be mapped) has been dropped into granodiorite.

BLACK LATITE

Remnants of a sequence of a few lava flows of columnar-jointed black latite cap three ridges east of Monumental Creek (pl. 1) and lie unconformably upon Challis Volcanics. The rock is black, fine grained, and notably glassy, and is shown by chemical analysis to be latite (B. F. Leonard, written commun., 1971). A whole-rock potassium-argon age determination 28.4±1.4 m.y. (late Oligocene or earliest Miocene) was made for one specimen by R. F. Marvin (written commun., 1967).

QUATERNARY SURFICIAL DEPOSITS

Surficial deposits are widespread in the primitive area, but most are small and are not shown on the geologic map. Talus is abundant on the lower slopes in steep terrain. Till occurs as discontinuous veneers in alpine areas and as moraines at middle altitudes in valleys draining cirques. A little alluvium occurs along stream courses. Large gravel terraces are locally preserved along Big Creek, the Middle Fork, and the Salmon River; all of these have been prospected for placer gold, which has been found only in amounts of little economic value.

The largest quantities of alluvium and gravel occur in the broad valleys of the mature, rolling upland between Big Creek and the Salmon River. The flat meadowlands along the middle reaches of Chamberlain Creek and elsewhere are underlain by thick gravels. These gravels of Chamberlain Creek consist of locally derived materials, mostly decomposed granitic rocks, and have been little reworked. There has been little concentration of heavy minerals in these gravels.

STRUCTURE

STRUCTURE OF PRECAMBRIAN ROCKS

The older rocks of the primitive area display the most complex structure. Foliation and compositional layering are parallel in the gneiss and schist of the mass along the lower reaches of the Middle Fork. Conspicuous rodding and mineral lineations are widespread. Isoclinal-fold axes are only locally obvious, but presumably the entire mass is intensely isoclinal internally. Small-scale crumpling, crinkling, and small folding are conspicuous in many outcrops. Ptygmatic contortion of early veins of granitic material is common.

Bedding and either cleavage of foliation are not commonly both visible in outcrops of the Yellowjacket Formation or the Hoodoo Quartzite, but where both are seen they tend to be parallel or to intersect at low angles. We infer that the formations are generally tightly and in places perhaps isoclinally folded, even though very few fold axes were seen. The irregular variations in dips in parts of the formations are attributed to faulting and more open folding superimposed on these older structures. B. F. Leonard (oral commun., 1969) believes that in the Big Creek and Yellow Pine quadrangles, which he has mapped in detail, an early set of northwest-trending folds has been crossfolded by northeast-trending structures. A similar pattern may explain the distribution of Precambrian rocks in the belt along Big and Wilson Creeks. The belt trends west-northwestward, and the presence along it of syenite intrusions suggests that the trend is of Precambrian age; yet, the attitudes of bedding and foliation tend to lie in the quadrant from northwest to northeast.

STRUCTURE OF CRETACEOUS ROCKS

Few faults were recognized in the plutonic Cretaceous rocks of the primitive area. The presence of numerous faults within the younger Challis Volcanics suggests, however, that minor faults are common within the Mesozoic rocks also, where they went unrecognized because of the lack of distinctive rock units and good exposures.

The large Bargamin Creek fault, along the northwest edge of the area, produces a lineament that is conspicuous on aerial photographs and that controls the courses of several creeks. The displacement on the fault must be large, for it juxtaposes large masses of dissimilar crystalline rocks. The large displacement and the straightness of the fault through the primitive area, and beyond it to the northeast in the Salmon River Breaks Primitive Area mapped by P. L. Weis (oral commun., 1967), indicate that it may be a strike-slip fault.

STRUCTURE OF TERTIARY ROCKS

The Challis Volcanics display gentle to moderate dips resulting from deformation by open folds and normal faults. The faults recognized in the field, which are conspicuous also as lineaments on topographic maps, have a dominantly northeastward trend.

The dikes in the Tertiary dike swarms also have dominantly northeastward to north-northeastward trends, whatever the rocks into which they were injected. The region apparently was undergoing northwestward extension during the early Tertiary time of dike injection. Much of the northeast-trending normal faulting of the Challis Volcanics presumably reflects this same extension.

UPLIFT AND EROSION

The primitive area had an altitude of about 4,000 feet during Eocene time, according to Axelrod's (1968) paleoclimatic analysis. The present crestal altitudes of about 8,000 feet thus require uplift of about 4,000 feet during middle and late Cenozoic time. Canyon cutting and, hence, perhaps late uplift in the west-central part of the area postdates the eruption of the Oligocene latite.

Part of the relative uplift of the region must be attributed to erosion itself. Incision of the canyons, which has steadily lowered the average altitude relative to the crestal altitude, must have been accompanied by compensatory isostatic rise of the region. The great canyon of the Salmon River, within the primitive area as across the rest of central Idaho, has a rim, its crest 5-8 miles from the river and 1,000 feet or so higher than the country farther back from the river. The river appears to be flowing along the crest of an anticline. Hamilton (1962) attributed this to the isostatic rise of a belt, centered on the river and at least 20 miles wide, owing to the erosion of the canyon.

MINERAL RESOURCES

Mineralized areas, some of them very important economically, surround the Idaho Primitive Area. The Yellow Pine mine (2 miles north of Stibnite; pl. 1) and its forerunner, the Meadow Creek mine at Stibnite, on what was virtually an extension of the same ore body, are about 4 miles west of the primitive area boundary; the ore body at these mines was for a time during World War II the largest domestic source of tungsten and was, until operations ceased in 1952, the country's largest producer of antimony. These mines were also the largest gold producers in Idaho during their time of operation. The Hermes mine (pl. 1) about 2 miles east of the Yellow Pine mine and within a mile or two of the primitive area boundary, was in some years the second largest producer of mercury in the country. The Blackbird cobalt mine in the Blackbird mining district (fig. 15) is about 11 miles east of the primitive area boundary and was the largest producer of cobalt in the country, although difficulties with the refinery caused operations to shut down several years ago. The Yellowjacket district (fig. 15) 2-4 miles east of the primitive area has yielded more than $200,000 worth of metals, mainly gold (Anderson, 1953). Small quantities of ore have been shipped from several other properties in or bordering the study area, such as the Seafoam district (fig. 15) and Greyhound Ridge addition (fig. 16) along the south border.

Gold and tungsten account for most of the value of metals produced in the study area, but small quantities of silver, lead, zinc, and copper have also been recovered. Most of the gold came from the Thunder Mountain district, which in 1902 was the scene of one of the last "gold rushes" in the Western States. The district produced $518,707 of gold, most of it from the Dewey and Sunnyside mines (fig. 17, Nos. 44, 15). The only other significant gold mine in the primitive area is the Snowshoe mine (fig. 30, No. 64) on Crooked Creek; this mine closed down in 1943 after having produced about $270,000 of gold and small quantities of copper, lead, and silver. The Springfield Scheelite mine (fig. 62, No. 1) in the Pistol Creek district produced about 5,940 short ton units of WO_3, during 3 years of operation, ending in 1955. Although prospect pits and short adits are fairly common in many localities, particularly in the western and southwestern parts of the primitive area, few expose ore that could be considered commercial. Small quantities of placer gold have been washed intermittently from gravels of the larger streams, principally the Salmon River, the Middle Fork Salmon River, and Monumental Creek.

The primitive area is in a region that has yielded tens of millions of dollars of metals and has a large potential for future yield; the area itself has produced more than $1,600,000 worth of metals. For some commodities, such as fossil fuels (coal, gas, and oil), an evaluation is simple — no rocks potentially productive of these commodities exist in the area. For other commodities, notably precious and base metals, an evaluation is far more difficult. Favorable geologic structures and rock types occur throughout the area, but unless ore-bearing solutions reached them, no ore deposits could have formed. An evaluation, then, hinges in large measure in determining the former presence of ore-bearing solutions. Large visible ore bodies are not likely to have escaped prior discovery by prospectors. The former presence or passage of ore-bearing solutions in a rock mass should be indicated by such features as altered rocks, leached rocks that may have formerly contained ore, or geochemical halos.

Sand and gravel and structural stone could be produced from the area, but these are readily obtainable in other areas that are much closer to market.

GEOCHEMICAL SURVEY

SAMPLING PROGRAM

To test and appraise the area, more than 3,000 samples were collected and analyzed. Samples were of several types, as described below, and the analytical results are presented in the accompanying tables and in discussions of individual mineral deposits or prospects.

Mineralized material and veins. — Samples of mineralized material and veins were collected wherever such material was seen. The material most likely to contain the highest concentrations of metals was sampled, with the plan to reexamine those sites where high concentrations of metal were found. Most were grab samples from available outcrops or from dumps of prospects, but those collected by the U.S. Bureau of Mines also included systematic samples across veins and lodes wherever these were exposed in workings or in outcrops, and these are discussed in greater detail elsewhere in this report.

Unaltered rock. — Samples characteristic of various types of unaltered rock were collected and analyzed spectroscopically for comparison with altered and mineralized varieties of the same rocks and for the determination of the background content of valuable metals. All analyzed specimens were examined microscopically in thin section to check for evidence of alteration.

Altered rock. — Because ore-bearing or mineralized rock is commonly enclosed by or associated with altered rocks, altered rocks serve as larger exploration targets than do the ore bodies themselves. Altered rocks were sampled and analyzed to determine whether anomalous quantities of valuable metals had been added during the alteration process. Large areas, however, are underlain by Challis Volcanics exhibiting a pervasive solfataric alteration that has little direct relation to metalization and, so, is of little value as a guide to ore. These rocks are brightly colored, many of them red or yellow, and are conspicuous in Rainbow Peak. They commonly contain small though anomalous quantities of valuable metals. Most samples of Challis Volcanics which were classified as "altered" belong in this category and were collected for comparison with other types of altered volcanic rocks.

Stream sediment. — Reliance in evaluating the mineral potential of the study area was placed mostly on a stream-sediment sampling program. This method permits gaining of maximum information consistent with rapid coverage of the area, not only because such samples are representative of the erosional detritus from the upstream rock masses, but also because the finer grained fraction adsorbs metallic ions from the stream waters. The higher the metallic content of the stream waters, the higher the amount of metal adsorbed by silt and clay particles. A few streams with very steep gradients contain little fine-grained material, but, in general, no difficulty was experienced in collecting adequate samples.

All larger streams and their side drainages were sampled except for some short, precipitous, and almost impassable creeks tributary to the Salmon River and the Middle Fork. These were sampled where they entered the rivers and, wherever possible, also in their headwaters. Streams draining areas of known mineralized rocks peripheral to the study area were sampled for comparison and test purposes.

Soils. — Some sizable areas lack running streams, and to provide adequate geochemical coverage of such areas samples of soil were collected. An attempt was made to collect only transported soils from depressions or intermittent drainages rather than residual soils representative solely of the immediately underlying rock. The background metallic content of soil samples was generally higher than that of stream sediments.

Panned concentrates. — Sand and gravel from the major streams and their larger tributaries were panned, and the concentrates were examined microscopically for gold and other potentially valuable heavy minerals, such as zircon and monazite, but were not otherwise analyzed.

ANALYTICAL TECHNIQUES AND RESULTS

Almost all the samples except panned concentrates were analyzed by semiquantitative spectrographic methods for many different elements. In addition, all sediment and soil samples, and some altered and mineralized rocks, were analyzed chemically for copper, arsenic, and citrate-soluble heavy metals, and some were analyzed for cobalt. Many samples of mineralized and vein material were analyzed also for precious metals and for lead, copper, and zinc. Quantitative spectrographic analyses were made of samples found to contain large amounts of rare-earth elements. Analyses for mercury were made but were rejected because of inability to get consistent results from the equipment available in the mobile laboratories used in the field at the time. Other analyses were made over a 4-year period by different analysts in several Geological Survey laboratories. During that time analytical techniques were modified and refined, and detection limits for some elements were changed; consequently, results shown in the tables are not strictly comparable, but variations are not large enough to significantly affect the overall evaluation of the mineral resources potential.

Differences of background values for some elements differ greatly in some of the rock units, such as between the Precambrian intrusive complexes and the younger intrusive rocks. On the other hand, sediments from streams draining terranes underlain by different kinds of rocks differed little in backgrounds of the metals for which field chemical tests were made. Spectrographic analyses generally corroborated the results of chemical analyses, but some sediment samples produced marked differences in results. These differences seem to result from the fact that the spectrographic analyses measure the total content of the element in question, whereas the chemical methods are biased by the amount of the surface-adsorbed element.

Anomalous concentrations of metals are defined as those that are significantly larger than apparent background values. Values reported for both the semiquantitative spectrographic and the chemical analyses are figures that are midpoints for small ranges of values. It is not possible to predetermine an arbitrary percentage of sample values that will be treated as anomalous, for such percentages would not include all samples of a given reporting value and eliminate all those in the next lower step. Values that are considered anomalous differ from element to element but commonly fall within the upper 5 or 10 percent of the values reported. More than 2,000 stream-sediment samples were analyzed. To reduce the table of analyses to a reasonable size, only those samples are tabulated that are anomalous in any one or more of the following elements: Copper, lead, zinc, cobalt, molybdenum, arsenic, bismuth, tin, silver, gold, and citrate-soluble heavy metals. Cutoff values were selected, as follows: Spectrographic copper, 50 ppm (parts per million); copper by chemical test, 3 ppm; citrate-soluble heavy metals, 5 ppm; molybdenum, 15 ppm; cobalt, 50 ppm; arsenic, 40 ppm; lead, 70 ppm; and any detectable amount of tin, bismuth, or silver. Collection localities of all stream-sediment samples are plotted on plate 2, but only those samples reported in table 1 are numbered. (Analyses of samples of all other types are included in their respective tables, whether considered anomalous or not.)

Single samples anomalous in one or more metals are from various parts of the study area, but none of them were found to be indicative of significant mineralization. Groupings of anomalous samples, on the other hand, occur only in areas previously known to be mineralized or in which visible evidence of mineralization was found after sampling indicated an anomaly to exist. The stream-sediment sampling program seems to have been successful in delineating areas where metallization, even of very low intensities, occurred, and thereby lends credence to the result of this appraisal. Although small masses of mineralized rock might easily not have been detected, it is unlikely any large near-surface masses of mineralized rock were missed. Furthermore, except in Chamberlain basin, the local relief throughout the area is greater than most mines are deep, and, so, a three-dimensional picture of the area is visible.

The study area is too large to be considered as a unit in describing and appraising its mineral resources; therefore, these resources are described and appraised both by districts and by individual commodities. Some repetition results from this procedure, but the convenience of doing so outweighs the disadvantages.

Our study of all aspects of the mineral resources leads us to conclude that some localities in the primitive area contain or may contain a few small minable metal deposits. Possibly some worthwhile deposits exist beneath the thick sequence of Challis Volcanics, but they would be extremely difficult and prohibitively costly to find.

SALMON RIVER DISTRICT

The Salmon River district (fig. 16) stretches across the north end of the primitive area along the great canyon of the Salmon River. Along the canyon the district is extremely rugged and difficult of access, but back from the canyon, relief is moderate, and some of the country is only gently rolling. The district is underlain by rocks of the Idaho batholith and various Precambrian metamorphic rocks.

A small but unknown amount of gold has been recovered from gravels along the Salmon River, but there is no record of other mineral production. A few old prospect pits are scattered over the district, but only the workings at Painter mine (fig. 100, No. 2) near the mouth of Little Fivemile Creek and prospects south of Sheepeater Mountain exposes any mineralized material. Upstream from Bargamin Creek which enters the Salmon River from the north, a few stream-sediment samples are slightly anomalous in copper, but downstream from Bargamin Creek most samples are slightly anomalous, mainly in copper. These minor anomalies seem to be associated with the large Bargamin fault, as does the scanty mineralization at the Painter mine. Nowhere, however, were any extensive altered areas seen, nor are the anomalies of size to suggest any worthwhile deposits. The mineral resources potential of the district is judged to be very low.

CHAMBERLAIN DISTRICT

The Chamberlain district is an area of low to moderate relief drained by Chamberlain Creek and its tributaries. The district is heavily forested, except for grassy, partly swampy meadows along some of the valley bottoms. Outcrops are scarce over much of the district, but most of the district is underlain by the Idaho batholith, although a roof pendant of Precambrian metamorphic rocks caps the ridge along the western margin of the district.

There has been no recorded mineral production from the district, but a few small veins have been prospected in the roof pendant south of Sheepeater Mountain and near the West Fork Chamberlain Creek (Shenon and Ross, 1936, p. 33). The veins south of Sheepeater Mountain attain a visible maximum thickness of about 15 feet, but average much thinner. They contain a little galena, sphalerite, pyrrhotite, pyrite, and arsenopyrite; they are said to contain some gold. The deposits near the West Fork Chamberlain Creek contain pyrite, chalcopyrite, chalcocite, and gold (Shenon and Ross, 1936, p. 33). None of these deposits offers hope for significant quantities of metal.

The gravels in the alluvium-filled valley of Chamberlain Creek have been tested for gold (Shenon and Ross, 1936, p. 44; tables 35 and 36, this report), but results are not encouraging. The gravels in this and other valleys in the district consist almost entirely of disintegrated granitic rock locally derived. The material has been scarcely reworked, and there has been little concentration of heavy minerals. There are, furthermore, few gold-bearing veins in the area drained by Chamberlain Creek, and it seems unlikely that the gravels in the district offer much hope for placer concentrations of gold or other valuable minerals.

In two localities, on Queen Creek and on McCalla Creek below Moose Jaw Creek, some stream sediments contain small but anomalous amounts of copper and cold extractable heavy metals. The metals in the sediments on Queen Creek apparently were derived from sheared, slightly iron stained rather mafic granodiorite. In one place, a silicified zone 18 inches thick was seen, but the rock contained no visible metallic minerals. The mafic minerals have been altered to chlorite and epidote. There is little evidence to indicate the presence of worthwhile deposits in the area.

The reason for the anomaly on McCalla Creek could not be determined. Outcrops are scarce, but those seen are unaltered. The area has been the site of numerous camps, and the stream sediments may have been contaminated by metallic debris.

SOUTH FORK ADDITION

The South Fork addition, an area of extreme ruggedness with a local relief of more than 5,000 feet, occupies the east wall of the South Fork Salmon River Canyon. Because of the precipitous nature of the terrain, the rocks are exceptionally well exposed. Rocks consist mostly of various facies of the Idaho batholith, but small areas are underlain by Tertiary intrusive rocks, Hoodoo Quartzite, and Yellowjacket Formation.

No productive lode deposits are known in the area, although a little placer gold has been recovered along the South Fork. Stream-sediment samples indicate weak geochemical anomalies at both ends of the addition. The anomaly in the northern part probably reflects weak metallization associated with rocks near the large Bargamin Creek fault, whereas the one to the south is related to metallization responsible for the small deposits in the Edwardsburg mining district at the edge of the primitive area. The mineral potential of the addition, however, is low; the rocks are well exposed, no mineralized float or vein material was seen during our investigation, and it seems unlikely that any worthwhile deposits have escaped detection. Mineral occurrences could exist at depth, but the fact that numerous occurrences do exist at present erosional levels in nearby areas suggests that any worthwhile deposits which are present should be evident.

EDWARDSBURG DISTRICT

The Edwardsburg district lies north of the settlement of Big Creek in an area of fairly rough topography with a total relief of about 3,000 feet. The district is readily accessible by roads up Smith Creek and to the Golden Hand mine (fig. 73, No. 4). Bedrock consists of Yellowjacket Formation, Hoodoo Quartzite, mixed rocks related to the Idaho batholith, and small amounts of Challis Volcanics and Tertiary intrusives. Numerous deposits in the district, both lode and placer, have been worked; but so far as is known, only one lode deposit, the Golden Hand, and the placers have been productive. Geochemical anomalies in the district as indicated by stream-sediment samples are rather closely restricted to the vicinity of the worked deposits, and existence of any other sizable deposits in the district seems unlikely.

RAMEY RIDGE DISTRICT

The Ramey Ridge district occupies the entire drainage of Big Ramey Creek and parts of the drainage areas of Beaver and Crooked Creeks. The northern part of the district is an area of low relief and rolling terrain, but the southern part is fairly steep and rugged. Rocks of the Idaho batholith underlie the northern part of the area; to the south, Yellowjacket Formation, Hoodoo Quartzite, Precambrian intrusive complexes, Challis Volcanics, and Tertiary intrusive rocks crop out.

The Ramey Ridge district is unusual in this part of the primitive area because some of the deposits are notable for their copper content, rather than their precious metals. Many of the deposits, both copper and precious metals, have been prospected or worked, including one of the most productive mines in the primitive area, the Snowshoe gold mine (fig. 30, No. 64) on Crooked Creek. There are no records of any production from these copper deposits.

The known copper deposits are in the vicinity of Copper Camp north of Big Creek. They consist of roughly parallel quartz-magnetite veins containing some pyrite and chalcopyrite, though generally in small amounts. Some of the veins are as much as 10 feet thick locally, but most have average thicknesses that do not exceed 5 feet and are commonly considerably less. None of them are rich, the copper content ranging from less than 1 percent to 3.5 percent. The size and grade of the veins are insufficient to support more than small, marginal mining operations. The lack of intensive or widespread alteration does not give much hope for discovery of large deposits.

Several gold deposits, in addition to the Snowshoe gold mine, have been prospected in the district. These consist of lenticular quartz veins, few of which are more than 3 feet thick and several tens of feet long, although the vein on the Orofino mine (fig. 30, No. 36) is as much as 10 feet thick and traceable for about 1,200 feet (Shenon and Ross, 1936, p. 31). Metallic minerals are not abundant in these veins; in addition to gold, there is some pyrite and lesser amounts of magnetite, chalcopyrite, galena, sphalerite, and stibnite. Reported assay values for gold range between wide limits, but the grade is low. (See table accompanying fig. 35.) The vein at the Snowshoe mine is the most impressive that was seen in the district, and if the ore mined there is fairly representative of other gold deposits in the district, the average gold content in the veins is probably less than half an ounce per ton. Thus, although small veins are rather numerous in the district, the outlook for substantial production does not seem to be very encouraging. Neither are the veins very rich nor the potential reserves of ore large.

BIG CREEK DISTRICT

The Big Creek district occupies the lower part of the Big Creek drainage area and the headwaters of Trail Creek. Except for a strip along its north edge, the district is exceptionally rugged and locally has a relief exceeding more than 5,000 feet. North of Big Creek the district is underlain mostly by rocks of the Idaho batholith; south of the batholith the bedrock consists of Yellowjacket Formation, Hoodoo Quartzite, Precambrian intrusive complexes, small stocks related to the Idaho batholith, Challis Volcanics, and Tertiary intrusive rocks.

There has been no recorded mineral production from the district, but, possibly, small amounts of placer gold have been recovered from some of the streams. Analyses of samples indicate the district to be virtually devoid of any mineral potential, although some stream-sediment samples from Rush Creek are slightly anomalous in arsenic, and some samples from upper Trail Creek, in citrate-soluble heavy metals. The probable source of the anomalous content of heavy metals on Trail Creek is a series of north-northeast-trending limonite-stained shear zones near the ridge crest south of Shell Rock Peak. The limonite in these shear zones is largely derived from small amounts of pyrite, but samples of the sheared material are not significantly enriched in valuable metals. Except for the shear zones, exposed rocks in the district are little altered.

MIDDLE FORK DISTRICT

The Middle Fork district nearly coincides with the Middle Fork Canyon and is, therefore, extremely rugged and picturesque, particularly the northern part. Most of the rock units exposed in the primitive area crop out somewhere in the district, and, consequently, the geology is more varied than in other districts. Because of the ruggedness of the district, outcrops are excellent and nearly continuous.

Small but unknown amounts of placer gold have been taken from the Middle Fork and possibly from tributary streams, and $186 of lode gold has been produced, but no other metals have been mined. A few slight geochemical anomalies are scattered about the district, but none seem to offer much promise. Between Puddin Mountain and Wilson Creek in the Bighorn Crags, a layer of pyrite-bearing quartzite in the Yellowjacket Formation forms a prominent limonite-stained stripe across the face of the Crags. Some stream sediments derived from this layer contain slightly anomalous amounts of citrate-soluble heavy metals but little else, except for samples 5792 and 5794 which contained about 1 ppm silver. Some stream-sediment samples from the tributary of Brush Creek draining off Two Point Peak contain small but anomalous amounts of copper, lead, zinc, and citrate-soluble heavy metals. These metals are probably derived from the limonite-stained shear zone near Shell Rock Peak that was described in the Big Creek district. The only other grouping or concentration of anomalous samples is from the southwest end of the district in the vicinity of Little Soldier Mountain where most rock samples contain higher than normal amounts of lead. No discernible source for the lead was found unless it is from the swarm of porphyry dikes in the area.

At several places along the Middle Fork from Pistol Creek to Loon Creek and from Sheep Creek to Bernard landing field (fig. 81) are sizable deposits of stream terrace gravels; in some places these gravels have been placered, but apparently they were not rich enough to have encouraged large-scale or long-sustained mining. The tests of these gravels by the U.S. Bureau of Mines confirmed that they contain little gold.

Conceivably, worthwhile deposits are concealed beneath the Challis Volcanics, but there is no feasible way to sample or test these deeply covered rocks, and until methods are developed to economically test deeply buried rocks, the Middle Fork district offers little promise of an appreciable mineral potential.

MONUMENTAL CREEK DISTRICT

The Monumental Creek district includes the drainage areas of Little Marble Creek and the lower part of Monumental Creek. The terrain is rugged, but it lacks the local relief of areas bordering the trunk streams. The northern part of the district is accessible from the road to Crooked Creek down Big Creek. Rocks in the district are fairly well exposed and consist of the Yellowjacket Formation, Hoodoo Quartzite, Precambrian intrusive complexes, Challis Volcanics, and small bodies of Tertiary intrusive rocks. The southeast corner of the district lies within the Thunder Mountain caldron.

Small but unrecorded amounts of gold have been washed from the gravels along Monumental Creek, and several lode deposits have been prospected, but there has been no recorded production from any of these. Some of the stream-sediment samples contain slightly anomalous amounts of one or more metals, as do some of the samples from the headwaters of the West Fork of Monumental Creek. Sample Q633 from within the caldron on the southeast edge of the district contained distinctly anomalous quantities of citrate-soluble heavy metals.

The gold deposits in the district are similar to those in the Ramey Ridge district and consist of lenticular quartz veins and pods along shears in Precambrian rocks. Individual quartz veins or lenses are rarely more than 2 or 3 feet thick and are seldom traceable for more than a few tens of feet along the outcrop. Typical of the deposits is the Nat lode (fig. 94, No. 1) on the west side of Monumental Creek a short distance above its confluence with Big Creek. The deposit consists of somewhat vuggy quartz lenses as much as 3 feet thick in sheared syenite. A little carbonate is mixed with the quartz. Ore minerals are sparse pyrite, stibnite, free gold, and possibly other sulfides in very small amounts. The vein is only traceable for a few tens of feet on the surface, and it is doubtful that reserves are appreciable. Also on Monumental Creek a mile or two above Snowslide Creek are the Iron Clad groups of claims (fig. 94, Nos. 10, 11). According to Shenon and Ross (1936, p. 36): "There are several roughly parallel quartz lenses, two of which are followed by tunnels * * * . The vein quartz introduced along the shear planes was deposited by replacement. In both tunnels the quartz contains rather sparsely disseminated, partly oxidized chalcopyrite and pyrite. Some of the adjoining quartzite is cut by closely spaced sheeting lined with green biotite bands about an eighth of an inch wide, with small amounts of chalcopyrite in the intervening quartzite." Samples tested by the U.S. Bureau of Mines (fig. 95) indicate the grade of mineralized material is low. On the ridge above these quartz lenses a prospect pit exposes sheared Hoodoo Quartzite that carries a few scattered grains of sulfides. Sample Q671 from this pit contained only slightly anomalous amounts of molybdenum and cobalt.

Intensive search would undoubtedly reveal other deposits similar to those just described, but in view of the lack of sizable geochemical anomalies, finding any large deposits is unlikely, with the possible exception of the part lying within the Thunder Mountain caldron.

MARBLE CREEK DISTRICT

The Marble Creek district occupies the lower drainage area of Marble Creek and the watersheds of a few short streams that drain directly into the Middle Fork. Although the local relief is little more than 3,000 feet, the district shares the rugged topography common to most of the primitive area. Most of the district is underlain by Challis Volcanics, but in the southern part Yellowjacket Formation, Idaho batholithic rocks, and Tertiary intrusives crop out. Except in the steeper canyon walls exposures are rather poor, particularly of the Challis.

There is no recorded mineral production from the Marble Creek district, although a few old placer workings can be seen here and there along the course of Marble Creek. Ross (1934, p. 131) described veinlets of quartz and fluorite in a breccia zone at 7,000 feet east of the lower part of Marble

Creek. Very few geochemical samples from the district contain anomalous quantities of any valuable metals, and those few contain so little that the areas from which they came hold little promise. The mineral resource potential of the area is probably insignificant.

CRAGS ADDITION

The Crags addition lies along the east flank of the Bighorn Crags and is less rugged and scenically spectacular than the crest of the range. Except for about 1 square mile underlain by Precambrian gneiss and schist, the addition is entirely within the Crags pluton. No minerals have been produced in the district. Rocks in the district are unaltered, and the geochemical samples are nearly devoid of anomalous quantities of valuable metals.

CAMAS CREEK ADDITION

The Camas Creek addition includes the lower part of the watershed of Yellowjacket Creek and all that of Woodtick Creek. The addition is very rugged and precipitous. The well exposed rocks include Precambrian gneiss and schist, granodiorite of the Idaho batholith and related migmatites, Challis Volcanics, and granites of the Tertiary Casto pluton.

The scant gravels of Yellowjacket Creek and probably of Camas Creek have been placered from time to time, but the amount recovered is not known. A few miles upstream on Yellowjacket Creek from the study area boundary, more than $200,000 of metal, mainly gold, was produced from veins, lodes, and stockworks of the Yellowjacket district (Anderson, 1953, p. 18), as well as a small amount of placer gold. Apparently, mineralization does not extend into the study area, for the stream-sediment samples from tributaries of Yellowjacket Creek in the study area are barren. The samples along Yellowjacket Creek, though, are decidedly anomalous in several metals — a reflection, at least in part, of the mill tailings dumped into the creek from the Yellowjacket mill. A few scattered stream-sediment samples from the Woodtick Creek drainage yielded anomalous citrate-soluble heavy metals possibly from small prospects mentioned by Ross (1934, p. 125), but he had noted that they " * * * do not look sufficiently promising to warrant much development." The anomalies are low and are not considered to be significant. The mineral resources potential of the addition is probably inconsequential.

INDIAN CREEK DISTRICT

The Indian Creek district occupies the Indian Creek watershed, a rugged area having a local relief of nearly 4,000 feet. Most of the district is underlain by Challis Volcanics, but in the western part of the district, granodiorite of the Idaho batholith and related mixed rocks and silicified rocks crop out; in the lower drainage of the creek, a Tertiary intrusive plug and a small mass of Yellowjacket Formation are exposed. Innumerable Tertiary dikes cut the fairly well exposed rocks in the district, particularly in the western part.

No mineral production has been recorded from the district, but a few test pits are visible in the gravels along Indian Creek, and the silicified zones in the western part of the district have been prospected by adits (now caved) and prospect pits. The larger of the silicified zones is the southern extension of the zone mined for antimony and gold at the Meadow Creek mine about 3 miles north of the primitive area boundary of the Indian Creek district (pl. 2). North of Big Chief Creek the silicified zone consists of stockworks of finely crystalline quartz and chalcedony in fractured and, in places, mylonitic granodiorite and alaskite. South of the creek the zone is mostly massive quartz. According to Leonard (written commun., 1971) molybdenite intergrown with powellite, a little jarosite, and unidentified brown alteration products form sparse small patches on joints in quartz veinlets; at one of the prospect pits, the dump contained a little azurite- and malachite-stained amphibole schist. Gary C. Curtin and Harley D. King (unpub. data) of the U.S. Geological Survey found antimony and gold in anomalous quantities in samples of forest duff in the zone south of Big Chief Creek, and soil samples there contain anomalous mercury. Sediment samples Q854 and Q884 from streams draining the zone are anomalous in arsenic and copper. Prospect pits on the smaller silicified zone expose some vuggy quartz in brecciated limonite-stained, locally silicified granodiorite; the wallrocks are relatively fresh. Sediment samples from the stream draining this zone were not anomalous. On the Middle Fork Salmon River at the mouth of Pungo Creek, a fluorite vein containing quartz and scattered specks of limonite is exposed in an opencut (figs. 115, 116). The vein was not traceable for any significant distance and reserves are small.

A considerable number of stream-sediment samples elsewhere in the district are anomalous; those to the south of Indian Creek are slightly above background in arsenic or lead, whereas those north of the creek are high in lead and citrate-soluble heavy metals. Two of these latter samples, R280 and R268, are appreciably anomalous; however, little else in the areas represented by these samples suggests significant mineralization. The rocks are mostly fresh, and there is a lack of mineralized material in either area.

PISTOL CREEK DISTRICT

The Pistol Creek district in the southwest corner of the primitive area includes the entire drainage of Pistol Creek and a small area draining directly into the Middle Fork. Most of the district is underlain by the Idaho batholith and related mixed rocks, but Challis Volcanics crop out along the north edge and locally elsewhere. Small masses of Yellowjacket Formation and Hoodoo Quartzite are scattered through the district, mostly as inclusions in the batholith. Tertiary dikes are numerous and widespread. A road to some mines roughly follows the south edge of the district, and another road, now closed, to the Springfield Scheelite mine (fig. 62, No. 1) provides access to the northwest corner of the district.

Numerous deposits, both placer and lode, have been worked in the Pistol

Creek district, the most productive being the Springfield Scheelite mine, which was active during 1953-55. About 25,200 tons of colluvium containing about 0.35 percent of WO_3, were mined from this deposit; this material yielded concentrates containing about 5,940 short ton units of WO_3. The ore body beneath the colluvium is a scheelite-pyrrhotite deposit which B. F. Leonard (U.S. Geological Survey, 1964, p. A4) described as "a high-temperature replacement of garnet-pyroxene skarn developed from carbonate rocks included within the alaskitic facies of the Idaho batholith." After the ore-grade colluvium was depleted, the deposit was drilled, but the mineralized rock was found to be much less than ore grade. Possibly the ore-grade colluvium was enriched by leaching of more soluble non-ore materials. Leonard (U.S. Geological Survey, 1964, p. A4) studied the deposit after it had been drilled, and he thinks that the deposit may be an elongate shoot on the crest of a small easterly trending, plunging anticline and suggests that this hypothesis could be tested by geophysical methods, if the tungsten and copper content of the deposit proves of interest.

The number of anomalous stream-sediment samples in the district suggests widely dispersed low-level mineralization by solutions that failed to deposit economic concentrations of metals. Thus, silicified rocks in the western part of the district form the distal end of the intensely mineralized zone exploited by the highly productive Meadow Creek and Yellow Pine mines. The mineral resources potential of the district, although greater than that of most of the districts in the study area, is considered to be low.

Along the south border of the district on the ridge above Pistol Creek, many deposits have been prospected, and ore has been shipped from a few of them. The most productive of these, the Lucky Lad (fig. 62, No. 23), is partly in and partly outside the primitive area. The deposit consists of a small vein or veins near the contact between the alaskite that contains inclusions of Hoodoo Quartzite and the alaskite that contains inclusions mainly of contorted calc-silicate gneiss from the Yellowjacket Formation (Leonard, oral commun., 1972). Ore minerals are pyrite, pyrrhotite, arsenopyrite, and small amounts of chalcopyrite and sphalerite. At best, the deposit is small. About 1½ miles north-northwest of the Lucky Lad is the Franklin D. mine (fig. 62, No. 21). There a quartz vein, 1 foot in observed maximum thickness, follows a shear zone in granodiorite. Gold and silver valves, however, occur through a thicker zone. Ore minerals seen in dump specimens consist of pyrite, arsenopyrite, and a little sphalerite. The deposit has been explored by several cuts and an adit several hundred feet long. Reserves are small. The Cougar mine (fig. 62, No. 19), about a mile north of the Franklin D., is partly in a large inclusion in the Idaho batholith. Pyrite, arsenopyrite, galena, molybdenite, and chalcopyrite occur in a gangue of calc-silicate rocks and quartz. Like the other deposits in this area, the Cougar offers little promise of large production.

A large number of stream-sediment samples in the district are anomalous, mostly in arsenic and lead. The upper part of Little Pistol Creek is anomalous in arsenic; samples from streams draining the area where the Lucky Lad, Franklin D., and Cougar mines are located are anomalous mostly in lead, but some samples contain other metals. Sample R209, collected downstream from the Springfield Scheelite mine, is anomalous in a variety of metals. The district has been the site of rather widespread, low-intensity metalization, but the fact that the largest stream-sediment sample anomalies come from areas of known deposits indicates slight likelihood for discovery of major deposits.

GREYHOUND RIDGE ADDITION

The Greyhound Ridge addition, along the south edge of the study area, includes parts of the watersheds of Loon Creek, Little Loon Creek, and the Rapid River. Bedrock consists mostly of intrusive rocks of either the Idaho batholith or the Tertiary Casto pluton, but Challis Volcanics crop out extensively in the eastern part and along the south edge of the addition and cap a number of ridges elsewhere. A sliver of the Yellowjacket Formation enters the district near Sheep Mountain and trends northwestward across Rapid River. Roads to the headwaters of Greyhound Creek past the Greyhound mine and to Sheep Mountain, and bulldozer trails to mines and prospects near Sheep Mountain, provide access to parts of the addition.

The Greyhound addition has been the scene of intermittent mining activity, both placer and lode, since the 1880's. Gravels, particularly in Loon Creek, have been placered, but most of the mining has been upstream from the study area, where the gravels are apparently richer. In the vicinity of Sheep Mountain, several deposits have been worked; of these, the most productive is the Mountain King (fig. 50, No. 3), from which handpicked ore has been shipped intermittently since 1884 (Ross, 1930, p. 6). All known deposits in this area are in dolomitic marble, quartzite, and schist of the Yellowjacket Formation; there, rocks have been irregularly intruded by quartz monzonite or granodiorite and porphyry dikes. The deposits consist of veins and replacements containing galena, sphalerite, chalcopyrite, and pyrite. All the ore-grade material is in metasedimentary rock, but a little finely disseminated galena and pyrite occur locally in the quartz monzonite and granodiorite. The Mountain King vein has a maximum stoped width of about 8 feet, but most of the visible vein is only about 2 feet thick. Where exposed in the workings, the center of the vein consists of sphalerite, and borders consist of nearly pure galena. Somewhat similar deposits occur on Lead-Metals group claims (fig. 50, No. 5). Here, a northwest-trending silicified shear zone several tens of feet thick occurs near and along a contact between porphyry and silicified metasediments. Coarse sphalerite, galena, chalcopyrite, siderite, and a little arsenopyrite occur in small veins within the shear zones. The Blackjack mine (fig. 50, No. 8) on Rapid River has produced more than $100,000 from a mineralized shear zone and skarns that contain sphalerite, galena, and a little chalcopyrite. Sediment samples from streams draining the Sheep Mountain area are all anomalous, some of them highly anomalous, particularly in lead, zinc, copper, and citrate-soluble heavy metals.

In the addition's southwest corner, in the headwaters of Greyhound Creek are considerable mineralized rock and a silicified and altered zone in granodiorite nearly a quarter of a mile wide. The silicified zone is highly shattered, and limonite stains line fractures. Scattered through the zone are lenticular masses that contain considerable limonite, but visible sulfides are rare. These rocks all are roughly on strike with the deposit at the Greyhound mine about 1 mile outside the study area. Cuts, pits, and adits explore replacement veins in the area, some of which are as much as 30 feet thick, but the sulfide-bearing parts of these veins are only 2 or 3 feet thick. Arsenopyrite is the most abundant ore mineral, followed by pyrite, pyrrhotite, and sphalerite. No copper minerals were seen, and all samples from the area are low in copper. Ross (1930, p. 5) found no sulfides other than pyrite in the Greyhound mine, but he stated that the ore was reported to contain 20 to 30 ounces of silver per ton.

Intensive prospecting may well reveal other deposits comparable in size and grade to those already known in the addition, but the chances for discovery of a large deposit in either the Sheep Mountain or the Greyhound area are remote. Elsewhere in the addition, the lack of anomalous stream-sediment samples suggests that the rest of the addition offers even less promise of discovering large deposits.

THUNDER MOUNTAIN DISTRICT

By B. F. LEONARD, U.S. Geological Survey

The exploited part of the Thunder Mountain district is a triangular area of about 15 square miles, bounded on the west by Annie and Monumental Creeks, on the east by the divide between Marble and Rush Creeks, and on the south by an imaginary latitudinal line about halfway between Lightning Peak and the divide north of Cottonwood Creek (fig. 17). The Dewey and Sunnyside gold mines (fig. 17, Nos. 44 and 15, respectively) represent the only productive bedrock deposits of the district.

STRATIGRAPHY AND STRUCTURAL SETTING

Geologically, the district is in the Thunder Mountain caldron, which was one of the main sources of the Challis Volcanics. The Challis of this area comprises three main stratigraphic units: a lower, latitic unit about 3,000 feet thick; an upper, rhyolitic unit perhaps 1,000 to 1,500 feet thick; and an uppermost unit several hundred feet thick, which because of its location in the caldron is here termed the central unit. The lower and upper units were described previously in this report. The central unit is described in this section.

The gross structure of the caldron is that of a saucerlike pile of pyroclastic rocks, formerly provided with a shallow sump filled with stream, lake, and swamp deposits and capped with latite flows. The southeast edge of the caldron was bowed up by emplacement of the Casto pluton, and the whole terrane has been cut into small blocks by myriad faults. The former sump containing the exploited part of the Thunder Mountain district was downdropped more than 300 feet to form a triangular graben.

STRATIGRAPHY OF THE CENTRAL UNIT

The gold deposits are in the central unit of the caldron. Because the gold deposits seem to be strata related if not stratabound, local stratigraphy is the key to their understanding. The following brief account of the central unit omits many bits of evidence from which a tentative stratigraphic sequence has been inferred.

The division between the widespread rhyolitic upper unit of the caldron and the central unit is an arbitrary one when applied locally. Within the exploited part of the district, the uppermost part of the rhyolitic unit is a white to buff rhyolite tuff overlain by rocks here informally named the rhyolite of Sunnyside which forms the lower part of the central unit.

The rhyolite of Sunnyside is a heterogeneous crystal-rich body restricted to the exploited part of the district and to the area northeast along Monumental Creek. Its basal part, probably no more than 20-30 feet thick, is black to very dark green perlitic obsidian preserved only in narrow fault slivers. Its upper part, perhaps 30-50 feet thick, is a nonwelded, white or light-gray to slightly greenish or bluish rhyolite tuff, locally poor in crystals that cannot be distinguished from the nonwelded top of the white rhyolite unit that underlies the Sunnyside. The rhyolite of Sunnyside is probably a local ash flow, originating perhaps from a satellite caldron, which is now the semicircular basin in which the buildings of the Sunnyside mine were erected.

Above the rhyolite of Sunnyside is 50-300(?) feet of volcaniclastic sedimentary rocks with laminae of carbonaceous shale and thin beds of lignite. This subunit is well exposed only at the Dewey mine, within the open pit, and on the southwest slope of Dewey Hill. (See fig. 18.) The continuous section is perhaps 38 feet thick, but neither top nor bottom is exposed. The 38-foot section is probably repeated by faulting, giving a total vertical exposure of about 300 feet on the slope of Dewey Hill. If the section has not been repeated by faulting, the volcaniclastic unit may be as much as 300 feet thick.

Volcaniclastic rocks like those at the Dewey mine are exposed at several other places in the district, in prospect holes and isolated outcrops. Evidently, the showings and float of volcaniclastic rocks were sought out with care by the early prospectors in their search for another deposit like the Dewey. All showings are in small fault blocks and fault slivers.

Black breccia interpreted as an indurated ancient mudflow of volcanic origin is exposed at the Dewey mine; it is also reported to occur in stopes of the Sunnyside mine, and it is found as sparse float in the tuff-derived soil just west of the saddle that is 3,200 feet east-northeast of the Dewey mine. The breccia is dark gray, unsorted, and coherent and consists of fragments of various volcanic rocks and carbonized wood and plants that are moderately silicified with chalcedony in a matrix of extremely fine quartz, sanidine, sodic plagioclase, and clay minerals, pigmented with brown charcoal dust and a little goethite, and sporadically replaced by chalcedony. Discontinuous joints in the rock are stained greenish yellow to brown by jarosite and goethite.

The stratigraphic position and relative age of the black breccia are important to know because the subunit is ore bearing. The breccia is certainly younger than part of the volcaniclastic subunit and perhaps older than the latite flows.

The latite flows that constitute the uppermost bedrock of the caldron filling are well exposed as caprock on the mesa north of the Dewey mine, and outliers of the flows occur in small fault blocks south of the mine and on the upper spurs and main ridge east of Marble Creek. The latite, called basalt in earlier reports, is dark gray and aphanitic, weathering pale yellowish brown and yielding a powdery brown soil.

INTRUSIVE ROCKS

A body of highly altered porphyritic rhyolite, bounded by faults, is poorly exposed 4,000-7,000 feet south of the mouth of Threemile Creek. The body, a questionable stock, was found after the map of the Idaho Primitive Area was completed. The rock is conspicuously and pervasively stained brown by limonite, the surfaces of its abundant joints and fractures are coated with black oxidation products, and the internal structure is completely obscured. There is no evidence that the mapped part of this body has been prospected, in spite of its iron-rich, locally gossanlike appearance. Spectrographic analyses of two samples of the rhyolite showed no anomalous concentrations of minor elements, including silver. Gold was not detectable at the 0.02 ppm level by atomic absorption analysis. The economic significance of the altered rhyolite body cannot be adequately assessed.

Dikes are rare in the district. A narrow dike of latite crops out at the base of the spur south of the mouth of Safety Creek, and Cater and H. E. Ehrenspeck report the presence of feeder dikes near the latite flow north of the head of Safety Creek.

LOCAL STRUCTURE

Structurally, the exploited part of the district is a jumble of fault blocks. Three narrow grabens, like the legs of a triangle, bound the highly faulted upland block of Thunder Mountain and the mesa north of the Dewey mine. Relative to these linear grabens or rifts, the upland block is a horst, but relative to the gross structure of the caldron, it is a graben.

The fault blocks range in size from about 200 by 500 feet to about 3,500-4,000 feet on an edge. Vertical displacement along the faults is only a few millimeters in laminated volcanic siltstone at the Dewey mine, but along

Marble Creek the total throw might be as much as 2,500 feet. Commonly, the range of vertical separation is 20 to 200 feet.

PRINCIPAL DEPOSITS

DEWEY MINE

The Dewey mine (fig. 17, No. 44) was formerly worked underground. Intermittently since the 1930's(?), it has been worked from a small open pit. Parts of the underground working were accessible during the 1950's and were sampled by G. E. Ziegler, for his engineering study of the mine (written commun., 1956). Ziegler concluded that the deposit contained about 1,430,000 tons of measured ore averaging 0.11 troy ounce of gold per ton and 0.65 troy ounce of silver per ton. His sample map and a sample map prepared by mine superintendent H. Haug in 1905-1906 showed that gold was unevenly distributed in the deposit. To estimate tonnage, Ziegler was obliged to extrapolate his sample data, obtained on the lowest mine level, through a vertical interval of 200-250 feet. The erratic gold distribution shown on the sample maps suggests that the "measured" ore reserve represents, at best, an indicated tonnage.

The black breccia has yielded most of the anomalously high gold values among the samples collected by the U.S. Geological Survey and U.S. Bureau of Mines in the Dewey mine area. The assays of 7 samples, averaging 0.11 troy ounce of gold per ton and 0.25 troy ounce of silver per ton, cluster about the value of $4.50 per ton reported by owner R. O. Nelson (oral commun., 1967) as representative for Dewey ore. The black breccia may have been the source of some of the charred logs and wood fragments, rich in gold, that have been recovered at the Dewey mine, though one gold-bearing charred log was found in material that R. J. McRae (written commun., 1966) described as a light-colored tuff or breccia flow.

A sample of black breccia, examined in detail, showed no gold megascopically or microscopically, but the separated nonmagnetic heavy fraction yielded 20-30 small particles of argentian gold (electrum) accompanied by sparse pyrite, a few crystals of anatase, goethite, hematite (specularite), ilmenite, and rutile, and a few milligrams of other minerals, mainly fluorite, jarosite, and zircon.

The black breccia is exposed only on the west side of the pit. Here it resembles a channel filling, but it might be a downdropped fault block, or a channel whose margins have been faulted. If the black breccia reported by Shenon and Ross (1936) to occur in the stopes of the Sunnyside mine is part of the black breccia body exposed in the pit of the Dewey mine, the intervening ground is a suitable area to prospect for a concealed and very likely faulted extension of the breccia body, part of which may now be obscured by the 1909 mudflow. Better definition of the character and extent of the breccia body at the Dewey mine is needed, for this body seems to be the most likely source of ore in the immediate area.

The volcaniclastic rocks in the mine area contain some gold and silver,

NOTE. — Although the gold and silver content of recently sampled volcaniclastic rocks of the Dewey mine is generally low, particles of gold perched on and replacing bedded volcanic grit are easily seen in the U.S. National Museum's only generally of less than ore grade. Forty-nine samples carefully collected and documented by the U.S. Bureau of Mines (table accompanying fig. 19) indicate that on the whole the volcanisclastic rocks contain significantly less gold and silver than the black breccia. See note below.

The precious-metal content of six samples collected by the U.S. Bureau of Mines from the 1909 mudflow is negligible. Included blocks of volcaniclastic rock contained a trace to 0.03 troy ounce of gold per ton; clay and decomposed rock sampled from 22- to 42-inch auger holes contained no detectable gold or only a trace. Silver was not detected in any of the samples. The physical properties of the mudflow are probably of more interest than its metal content. When water-saturated, the 1909 mudflow is an ephemeral hazard to the continued mining of the breccia body at the Dewey mine, and remobilization of the mudflow by torrential rains is a future hazard that may be supposed, if not predicted.

SUNNYSIDE MINE

The Sunnyside deposit (fig. 17, No. 15) was mined underground. The workings are now inaccessible, drill core from the exploration in the 1930's has not been found, and the stored sludge from churn-drill holes is no longer of value, owing to spillage and contamination in the storage shed. This account of the deposit is therefore based on the published report of Shenon and Ross (1936) and on studies by G. E. Ziegler, then consulting mining engineer of the Dewey Mining Co. and Sunnyside Consolidated Mining Co., and by R. J. McRae, mining engineer and former owner and operator of the property (written commun., 1967). Their unpublished data were kindly made available by Mr. Howard Hollingsworth, the present owner of the Sunnyside. Production data are reported separately by the U.S. Bureau of Mines.

The report by Shenon and Ross (1936) indicates that a low-grade body of free-milling gold ore had been mined from somewhat argillized and silicified rhyolite, the welded tuff of the rhyolite of Sunnyside. Shenon and Ross's map (their fig. 19), cross sections, and text indicate that the mined ore body was blanketlike, and that it occurred beneath a body of dark-gray mud containing unsorted rock fragments, carbonized wood, pebbles, and boulders. They referred to this body as a "mud-flow of uncertain origin."

The heterogeneous "mud-flow of uncertain origin" now seems best interpreted as small slivers of volcaniclastic rock and black breccia faulted down into contact with the nonwelded top of the rhyolite of Sunnyside and literally mixed with the tuffaceous products of the ash-flow top, the mixing having occurred by slumping, ground-water action, and perhaps repeated faulting.

The area on the northwest projection of the mine workings has been drilled. The ore found by drilling was generally at an altitude of about 50 feet lower than that of the ore previously mined and was of somewhat lower grade.

specimen of gold ore from the district. The specimen, donated in 1902 by Victor Heikes, is identified merely as "gold ore, Thunder Mountain, Idaho County [now Valley County, in part], Idaho." I infer that the specimen came from the Dewey mine.

The drilled ore body apparently is crudely conformable with the planar structure of the host rock and lies at a slight but variable distance below the nonwelded top of the Sunnyside, a "tuff" when dry but a "blue clay" when wet with drilling water or water adsorbed from melting snow.

The absence of nonwelded tuff from most of the area suggests that most of the sporadically mineralized block is a small horst; accordingly, deeper drilling within the horst would have a low probability of encountering an ore body belonging to the zone exploited on the south and proved by drilling to the north.

AREAS OF ALTERED ROCK

White alteration is conspicuous at several places in the district, notably along the mudflow at the head of Mule Creek, on the slope north of Safety Creek, and north of the district in the basin at the head of Milk Creek (fig. 94). Other areas, such as the lower reaches of Annie Creek and the hummocky terrain west of Mule Creek, have mine dumps that look rich in argillic material. Helicopter reconnaissance and foot traverses indicate that intense alteration of volcanic rocks of the primitive area is effectively confined to the Thunder Mountain district.

Two main kinds of alteration were detected, zeolitic and argillic, both derived mainly from nonwelded rhyolite tuff.

Zeolitic alteration is characteristic of the Milk Creek area, north of the exploited part of the district, and is inferred to have resulted from the percolation of fault-controlled ground water through originally porous tuff.

Argillic alteration is characteristic of most other areas studied, and despite the highly argillized appearance of the field samples, the clay fraction in all of them is sparse. The unaltered rock minerals of the clay fraction are common, regionally distributed devitrification products of the original glass particles of the rhyolite tuffs. With two exceptions, anomalous metal values have not been detected in these altered samples or in the stream-sediment samples from their source areas and environs. Arsenic to the extent of 700 ppm is present in a sample from an old prospect dump east of Annie Creek. Gold is reported from the area north of Safety Creek, but none was detected in the samples we collected from streams and bogs in the area.

Several other kinds of alteration are in the district: bleaching and clay-zeolite(?) alteration of scoriaceous latite; development of opal in rhyolite tuffs and latites; development of tridymite in intrusive(?) rhyolite; and a complex type of alteration found at the Dewey mine. Of these, only the altered material at the Dewey mine seems to be associated with any metals of economic interest.

Complex clay-mineral alteration was found at the Dewey mine and not seen elsewhere, though it should be pointed out that specimens of ore from the Sunnyside mine were not available for study. Kaolinite is the distinctive clay mineral in the Dewey deposit, where it occurs as a chalky mixture with montmorillonite, sparse clinoptilolite, and chalcedony, and as a wet, plastic mixture of kaolinite, montmorillonite, and an unidentified zeolite(?) that grows out of a thin lignite bed poorly exposed just south of the mine workings.

Jarosite is another alteration product in the Dewey deposit where it occurs with goethite as coatings on joints of the volcaniclastic rocks and black breccia. Jarosite is also present as minute, disseminated crystals in the matrix of the black breccia and as a filling or replacement of the cells in some carbonized plant fragments. Some of the jarosite is antimonian; some is common jarosite.

ECONOMIC POTENTIAL

The reserve of measured low-grade gold-silver ore combined in the Dewey and Sunnyside deposits is about 2,000,000 tons, according to the estimates of McRae and Ziegler. The existence of this much measured, unmined ore demonstrates that the district has a potential for production.

The district was intensively searched, panned, and sampled during and after the Thunder Mountain boom; aside from the rare find of a gold-rich charred log at the Dewey mine, high-grade gold ore has not been found since the boom days.

The chance of finding vein or replacement deposits of gold ore associated with zones of conspicuous clay-mineral alteration seems slight. True clay minerals are considerably less abundant in carefully studied samples of altered material than the field aspect of these samples suggests; the suite of clay minerals in conspicuously altered zones is different from that at the Dewey mine; no anomalous metal values were detected in samples collected on a reconnaissance of the altered areas; and no significant gold strikes have been reported as a result of company prospecting of the altered areas in 1968.

The chance of finding vein deposits of gold concealed beneath the latite flows north of the Dewey mine and associated with a hypothetical buried intrusive seems slight. No vein deposits of gold are exposed in the district, and a hypothetical vein concealed beneath 200 feet of latite would be difficult to locate.

The chance of finding additional low-grade, strata-related gold deposits within the district seems moderately good, but the chance of finding similar deposits outside the district but within the Thunder Mountain caldron seems slight because no other area exposes an exact equivalent of the district's geology. Areas favorable for search include extension of known deposits, such as the possible southeastward extension of the ore-bearing black breccia of the Dewey deposit, and the possible northward extension of an ore shoot of the Sunnyside deposit and new ground where local stratigraphy and geologic structures similar to those at the Dewey and Sunnyside mines occur.

Gold deposits similar to the Sunnyside may be sought in four areas.

1. On the ridge south and southwest of the Sunnyside mine. The belt of nonwelded tuff of the rhyolite of Sunnyside extends southwest from

the Sunnyside mine to the Standard mine (fig. 17, No. 20) overlies and conceals the stratigraphic zone that carries ore at the Sunnyside mine.

2. On the ridge south of the Venable mine (fig. 17, No. 11), and the gentle slope northeast of the mine. This area has been prospected by shallow pits that penetrate nonwelded rhyolite tuff, but probably without getting far into the welded zone beneath.
3. The area, about 1.2 square miles in extent, beneath the latite flows on the mesa north of the Dewey mine. This outlier of fault-bounded flows should overlie the rhyolite of Sunnyside unless this rhyolite was eroded from the area prior to extrusion of the latite. The flows might be concealing the largest area of potentially ore-bearing ground in the district.
4. The area southwest of Lightning Peak. In this area, centering 1,500 feet southeast of Thunder Mountain, the slope of the land seems nearly coincident with the dip of a downdropped block of nonwelded tuff that overlies and conceals the favorable stratigraphic zone.

For gold deposits similar to the black breccia at the Dewey mine favorable areas are much more difficult to specify, but float of black breccia is visible just west of the divide between Holy Terror Creek and the east fork of Mule Creek, and indurated mudflow debris comparable to the black breccia at the Dewey mine might be concealed beneath the fault-bounded latite flows on the mesa north of Dewey mine. For volcaniclastic deposits like those at the Dewey mine, only the fault-bounded flow-topped block of ground in this area could provide a sizable concealed volume of unexplored ground.

The gold potential of other bedrock stratigraphic units of the district appears from reconnaissance sampling to be negligible.

AEROMAGNETIC INTERPRETATION

By W. E. Davis, U.S. Geological Survey

An airborne magnetic survey of the region between lat 44°30′ N. and 45°35′ N. and long 114°30′ W. and 115°30′ W. was made by the U.S. Geological Survey to assist in studying the distribution of igneous rocks and evaluating the mineral potential of the primitive area. Total intensity magnetic data were obtained along north-south flightlines flown about 1 mile apart at an average barometric elevation of 11,000 feet above sea level. These data were reduced to an arbitrary datum and compiled at a scale of 1 : 125,000, using contour intervals of 20 and 100 gammas.

Interpretation of the magnetic anomalies is based on results of geologic mapping and general knowledge of the magnetic properties of the rocks involved.

MAGNETIC FEATURES

The magnetic pattern consists both of broad small-amplitude anomalies over the batholithic rocks in the northern part and along the southwest margin of the area and of a series of local highs and lows scattered over the complex assemblage of exposed sedimentary, metamorphic, intrusive, and volcanic rocks in the central and eastern parts of the district. Many anomalies seem to be augmented by topography and are grouped as though caused locally by a single rock type. The magnetic features are superimposed on a northeastward geomagnetic gradient of about 8 gammas per mile.

The broad magnetic high in the northern part of the area lies over the upland between Salmon River and Chamberlain Creek. The anomaly includes granitic rocks in the upland and Precambrian gneiss of Arctic Point. Though intensified by topographic effects, the anomaly indicates that the gneiss and batholithic rocks in this area are more magnetic than parts of the batholith to the south and west, which are characterized by low magnetic relief.

About 3 miles west of Big Ramey Creek a positive anomaly having an amplitude of almost 200 gammas lies over rocks of the Precambrian syenite-gabbro-amphibolite intrusive complex that crop out on the ridge. A weak high that may be an extension of this anomaly lies to the south. This high indicates that the Yellowjacket Formation and Hoodoo Quartzite on the northern part of Center Mountain are thin and are underlain by part of the intrusive complex or, perhaps, by the northward extension of Tertiary intrusive rocks that crop out along Snowslide Creek. A prominent positive anomaly of about 600 gammas occurs over the mafic intrusive rocks of a Precambrian syenite-gabbro-amphibolite complex that form Acorn Butte. Because of topography, maximums of the feature lie over the butte and over part of the ridge to the northwest. A narrow part of the anomaly extends southeast to Rush Creek Point, where similar rocks crop out. This extension indicates that the mafic rocks continue beneath the Challis Volcanics to join those of the complex exposed on the point. Another anomaly also centers over the mafic rocks near Middle Fork Peak. A complementary magnetic low marks the north margin of the Precambrian intrusive rocks and is associated partly with nonmagnetic Hoodoo Quartzite. On the west, these quartzites are indicated by a weak magnetic low.

A high-gradient anomaly of more than 100 gammas lies over part of a ridge northwest of the town of Big Creek, on the west margin of the area. It is probably caused by mafic metavolcanic rock of the Yellowjacket Formation. Gradients on the northeast flank of the anomaly indicate that the contact between the Yellowjacket Formation and granitoid intrusive rocks is steep and perhaps partly faulted. A magnetic ridge connects this high with a magnetic high to the southeast that is centered near the head of Little Marble Creek. This magnetic maximum seems to be associated mainly with Tertiary volcanic rocks, but northeastward the anomaly includes rocks of the Yellowjacket Formation at the head of Wild Horse Creek.

East of Monumental Creek in the west-central part of the area, magnetic highs and lows are associated with the Thunder Mountain caldron in the

Challis Volcanics. A maximum centered north of the mouth of Monumental Creek's West Fork indicates a dome in the caldron, but the high to the south is centered over black latite. Magnetic highs also are associated with the other two exposures of black latite in this area. Other prominent highs along the upper part of Marble Creek may represent hypabyssal intrusive rocks, as may other positive anomalies that occur over the upland between Marble Creek and Trail Creek, near the head of Norton Creek, and south of Brush Creek in the east part of the area underlain by volcanic rocks.

Southward, irregularities in the contours indicate a high over Pistol Creek a few miles south of Chinook Mountain. The anomaly includes Walkers Peak to the south and part of Pistol Creek Ridge to the west.

South of the Middle Fork of the Salmon River a magnetic high of 120 gammas lies over Little Soldier Mountain. The cause of this anomaly is not known.

In the east part of the area a zone of moderate intensity extends southward from Salmon River into the Bighorn Crags. The zone reaches amplitudes of more than 100 gammas near the crest of the mountains, and in the northwest part of the zone, a magnetic maximum lies over the contact between granodiorite and metamorphic rocks on Twin Peak. Northeastward the crest of the zone continues to Nolan Lookout Tower, where it swings southeast toward Goat Mountain. Gneiss and schist on the west slopes of Goat Mountain are marked by an arcuate magnetic maximum. Rocks in this zone include Precambrian gneiss and schist, quartzites of the Yellowjacket and Hoodoo Formations, and quartz monzonite and granodiorite of the Crags pluton. The gneiss and schist and the Crags pluton may be the main sources of the higher intensity.

To the south a V-shaped maximum occurs over mountain crests near Aggipah Peak, Puddin Mountain, and Mount McGuire. Except for the vertex near Puddin Mountain, which is capped by quartzite of the Yellowjacket Formation, the maximum is associated with Crags granitoid rocks. The granitoid rocks form several of the higher crags and probably produced the anomaly.

The zone of moderate magnetic intensity continues southward into the Yellowjacket Mountains, where the pronounced high over Middle Fork Peak marks the mafic Precambrian intrusive complex. The source of the anomalous spur extending northwestward to Sheep Horn Mountain is considered to be the intrusive rocks that form the upland in this area. The small maximum in the southern part of the mountains occurs over the contact between granodiorite and volcanic rocks on the northwest side of Yellowjacket Creek.

Dual magnetic maximums occur south of Camas Creek; the one to the northeast is partly on a quartz dioritic facies of the Idaho batholith, and the other is on Precambrian gneiss, quartz diorite, and Tertiary granite. On the west flank of the southwest high, irregularities in the contours indicate a narrow positive anomaly which corresponds to a northwest extension of Tertiary intrusive rocks in the Challis Volcanics.

To the south a small magnetic high lies over gneiss on Woodtick Creek. At the head of Pole Creek a prominent anomaly occurs over Challis Volcanics near their contact with Tertiary granitic rocks. Mafic flows or narrow intrusive masses along the mountain crests are probably the source of the anomaly.

On the southeast edge of the area a magnetic high occurs southwest of Loon Creek. The anomaly occurs over an arcuate ridge underlain by the Tertiary granitic rocks between Cougar Creek Ranch and Falconberry Guard Station on Loon Creek whose magnetic response is augmented by topography. The main maximum is near the contact between volcanic and granitic rocks and may reflect more mafic rocks in the contact zone.

MAGNETIC FEATURES AND MINERAL DEPOSITS

Metalliferous deposits in the district are mostly along shear zones and in quartz veins in batholithic rocks and are also in the older metamorphic rocks of various derivations and in the younger volcanic sequence. The dikes and other intrusive bodies that may have served as sources for mineralizing solutions in the country rock may be indicated by magnetic anomalies.

South of Rock Rabbit Point, Ramey Ridge district, the mineralized rock in the Precambrian intrusive complex contains considerable magnetite (Shenon and Ross, 1936, p. 31); this intrusive is indicated by a positive anomaly of about 200 gammas. The trend of the anomaly suggests that the complex continues southward into sedimentary rocks on Center Mountain. Possibly the rocks included by the anomaly are favorable targets for prospecting.

In the southern part of the area, mineral deposits occur in the Yellowjacket Formation on Sheep Mountain and in batholithic rocks on Greyhound Mountain, Greyhound Ridge addition. These localities are on the flank of a broad zone of low magnetic intensity and are not indicated noticeably in the magnetic pattern. Apparently the deposits are related to intrusive rocks of low magnetic susceptibility — perhaps, rocks in which the magnetic minerals have been destroyed by widespread alteration.

ECONOMIC APPRAISAL

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U.S. Bureau of Mines

SETTING

Recorded mineral production from 16 mining districts within or adjacent to the Idaho Primitive Area had a total value of $95,232,000 (fig. 15 and table 2). Although the two most important, the Yellowpine and Blackbird mining districts, border the primitive area on the west and east, respectively,

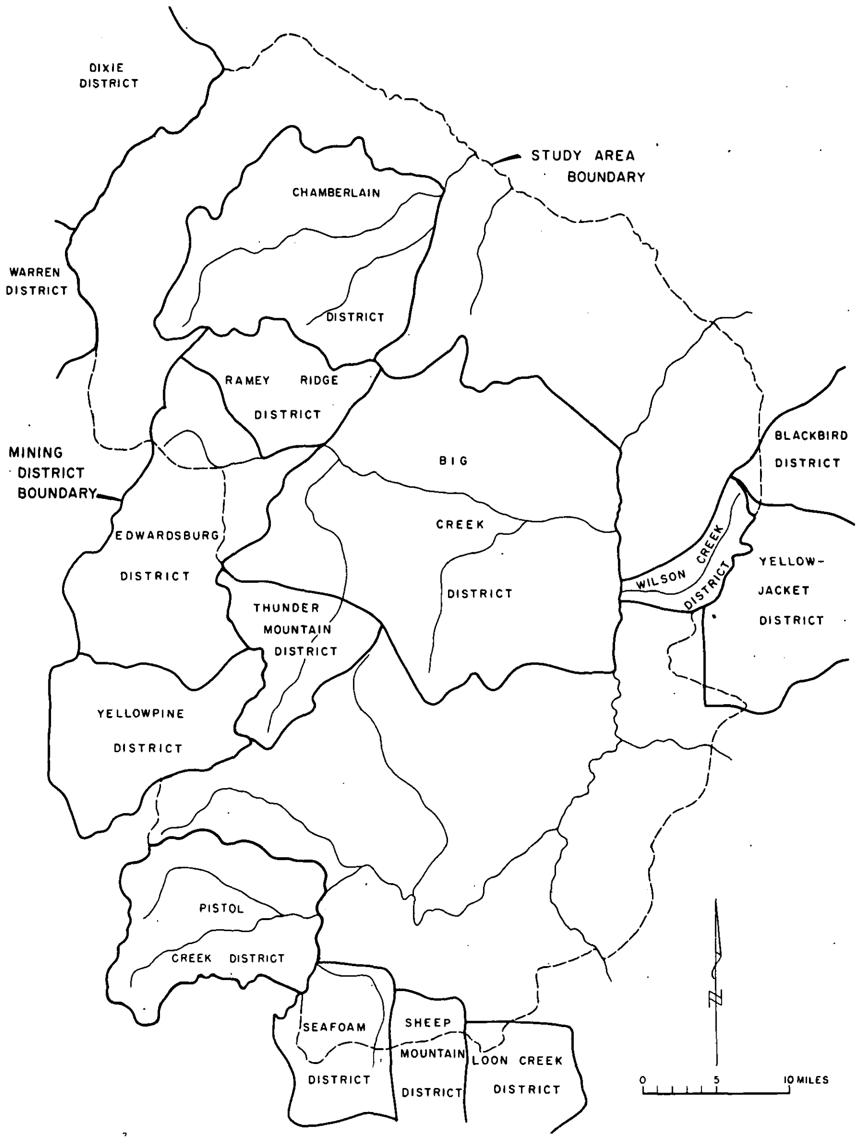


FIGURE 15. — **Mining districts within or contiguous to the Idaho Primitive Area.**

six districts lie completely within the primitive area: the Thunder Mountain, Ramey Ridge, Big Creek, Wilson Creek, and Chamberlain mining districts described by Ross (1941) and the Pistol Creek mining district.

Past productive mines within the study area are the Dewey and Sunnyside mines, Thunder Mountain district (fig. 17, Nos. 44 and 15); Lucky Lad (Lucky Boy), Cougar, and Springfield Scheelite mines, Pistol Creek district (fig. 62, Nos. 23, 19, and 1); Golden Hand mine and Smith Creek-Big Creek

TABLE 2. — *Recorded metal production from mining districts within or contiguous to the Idaho Primitive Area*

[Mining districts as described by Ross (1941), except Pistol Creek. Production figures from U.S. Geol. Survey Mineral Resources of the United States; U.S. Bur. Mines Minerals Yearbooks, other published reports; and U.S. Bur. Mines production records]

Mining district	Principal commodities	Principal productive years	Total recorded production (dollar value at time produced)
Yellowpine	Antimony, tungsten, gold, mercury, silver.	1932-52	$52,645,682
Blackbird	Copper, cobalt, gold, silver, nickel	1951-68	36,110,946
Warren	Gold, silver, lead, copper, zinc	1901-42	3,462,137
Loon Creek	Gold, copper, silver	1903-41	710,424
Thunder Mountain	Gold, silver	1902-42	[1]526,603
Pistol Creek	Tungsten, gold, silver	1935-55	[1]465,226
Dixie	Gold, silver, lead, copper	1901-49	271,579
Big Creek[2]	Gold, copper, silver, lead	1935-43	[1]265,379
Sheep Mountain	Lead, zinc, silver, gold, copper	1945-54	324,117
Yellowjacket	Gold, silver, copper, lead	1910-65	247,964
Edwardsburg[3]	Tungsten, gold, lead, silver, copper	1907-50	97,485
Seafoam	Silver, gold, lead, zinc, copper	1910-58	49,194
Ramey Ridge[4]	Gold, silver	1932-41	[1]47,126
Profile[5]	Silver, gold, antimony, lead, copper	1914-46	7,993
Wilson Creek	Gold	1902, 1912	[1]186
Chamberlain	Gold, silver	---	[1]None recorded

[1]Total production from within the Idaho Primitive Area.
[2]Nearly all recorded production from the Snowshoe mine; described in the Ramey Ridge district of this report.
[3]Includes Profile mining district, sometimes shown separately.
[4]Ramey Ridge district described in this report encompasses more area than the one described by Ross (1941).
[5]Sometimes shown as part of the Edwardsburg district; not shown separately in figure 15.

placers, Edwardsburg district (fig. 73, Nos. 4 and 32); Snowshoe mine, Ramey Ridge district (Ross' Big Creek mining district) (fig. 30, No. 64); and the Mountain King and Greyhound mines, Greyhound Ridge addition (fig. 50, No. 3, and pl. 1). Total recorded metal production from mines inside the Idaho Primitive Area and its proposed additions is probably $1,671,490. Most of the recorded production was from early gold mining, but significant amounts of tungsten and silver and small amounts of copper, lead, and zinc have also been mined. Production from inside the study area for the past few years has been limited to a small tonnage of silver-lead ore from the Greyhound Ridge addition, about a thousand pounds of gold-silver concentrates from the Ramey Ridge district, and a few hundred pounds of yellow opal from the Monumental Creek district. Potential resources of gold, silver, copper, tungsten, lead, zinc, fluorspar, antimony, titanium, uranium, opal, and rare-earths are within the Idaho Primitive Area and its proposed additions.

METHODS OF EVALUATION

In appraising the mineral resources of the Idaho Primitive Area, the Bureau of Mines gave special attention to all prospects, mines, and mineral occurrences. Reports dealing with mineral resources in or near the area were studied in detail. County records were searched to determine the location of all mineral properties within the area. Data on production, history, reserves, and geology were collected from claim holders, past operators, and other sources. Mines and prospects were mapped, examined, and sampled.

SAMPLING AND ANALYTICAL TECHNIQUES

Bureau of Mines evaluation was done to provide the maximum results consistent with rapid coverage. About 3,000 lode samples and 2,500 placer samples were collected.

Three types of lode samples were taken: chip, a series of unit volume per unit length chips of rock across or along an exposure; grab, an unselected assortment of rock pieces from a rockpile or point on the exposure; and select, handpicked material of the highest grade rock available. In general, at least one sample from a propsect was analyzed by semiquantitative spectrographic methods. Those samples showing unusual amounts of an element or known to contain mineral values were analyzed by chemical, fire assay, or atomic absorption methods. All samples were laboratory checked for radioactivity and fluorescence. A selected number were studied petrographically.

Placer sample sites were chosen to give representative results over areas of near equal influence. In general, two methods were used: a channel down the wall of a hand-dug pit or trench (usually a cubic foot per foot of depth), and one backhoe bucket per specified depth from a backhoe pit. Some reconnaissance pan samples were taken. Samples were screened, concentrated in a motor-driven vibrating sluice box, and further cleaned on a laboratory-size Wilfley table. Table concentrates were treated with sodium hydroxide and were amalgamated to determine recoverable gold. After amalgamation, the residual material was fire assayed for total gold. The mineral composition of selected black sand concentrates was determined.

MINERAL COMMODITIES

ECONOMIC CONSIDERATIONS

The principal commodities found during the examination of mines and prospects in the Idaho Primitive Area and adjacent study areas are gold, silver, copper, lead, zinc, tungsten, antimony, fluorite, rare-earths, titanium, and yellow opal. For further information on the mineral demand forecasts, the reader should consult the current Bureau of Mines Yearly Commodity Data Summaries, Yearly Minerals Yearbook, and Mineral Facts and Problems, Bulletin 650, 1970.

Approximately 38 percent of domestic gold is produced as a byproduct of base-metal mining. Production in the United States is increasing slightly each year, but domestic production in 1970 (1.79 million troy ounces) represented only about one-sixth of domestic demand. The most current world market price for gold, February 7, 1972, was $47.85 per ounce (Metals Week). Low-grade disseminated deposits such as those in the Thunder Mountain district would need to contain at least 0.30 ounce of gold per ton to be minable at the above price. Smaller vein deposits would require about 1.0 ounce gold per ton.

Domestic silver consumption was 136 million troy ounces in 1970, while domestic mine production was about 44 million ounces, produced mainly as a byproduct from base-metal ores. The price of silver has been variable over the last few years but was \$1.54 per ounce February 7, 1972 (Metals Week). The price is expected to rise in the future, because of increased industrial demand. Vein deposits if mined for silver alone in the study area would require at least 20 ounces per ton to be minable. Silver in the study area, however, normally is associated with other metals — such as gold, lead, zinc, and (or) copper — and might be produced as a coproduct metal.

The production of copper in the United States in 1970 was the highest in the world and totaled 1.715 million short tons, but additional amounts were imported. Domestic copper demand is forecast to expand at an annual rate of 3.7-5.2 percent and will be met by increasing both production and imports. Price per pound has increased over the last few years and was \$0.50 per pound in January 1972. Vein deposits in the Idaho Primitive Area would need to contain about 3-4 percent copper to be minable.

In 1970, domestic mine production of lead was 584,000 short tons, and production of zinc was 555,000 short tons. Changes in transportation technology and increased reclamation of scrap material will affect the future supply-and-demand balance. Price as of January 1972 was \$0.14 per pound for lead and \$0.17 per pound for zinc. Considering the average ratio of coproduct silver and minor byproduct copper and gold normally associated with lead-zinc deposits in the study area, about 7-8 percent combined lead and zinc would be required to be minable.

Domestic mine production of tungsten in 1970 totaled 10 million pounds, up slightly from 1969. Production is expected to increase only slightly while demand increases 5 percent annually. Domestic prices will probably remain stabilized by the current sales policy, but world prices will probably increase. Price in January 1972 was \$55 per short ton unit of WO_3. Disseminated deposits in the Idaho Primitive Area would require about 0.5 percent WO_3 to be minable.

Domestic mine production of antimony was 1,294 short tons in 1970. Average price for ore in January 1972 was \$9.32 per short ton unit equivalent of antimony. Narrow vein deposits, such as those in the Ramey Ridge district, contain byproduct gold and silver and would require about 3.0 percent antimony to be minable.

Mine production of fluorspar in the United States in 1970 (275 million tons) was not as high as in some previous years and did not meet demands. Chief supplier to domestic markets was Mexico. Average annual growth rate for fluorine demand is expected to range from 3.6 to 4.6 percent. The January 1972 long-ton price, \$78.50 to \$85, for acid-grade fluorspar will probably increase. The Pungo Creek Fluorspar prospect in the Indian Creek district (fig. 115, No. 20) and other fluorite deposits in the primitive area are in remote areas. The Pungo Creek fluorite is of minable grade, but road construction costs would make mining uneconomical.

The United States is self-sufficient in many of the rare-earth elements, but the complex interrelationship among the rare-earth elements and their occurrence is likely to continue to cause supply-and-demand imbalances and price fluctuations. Domestic mill production of uranium totaled 12,800 short tons of uranium oxide. Price as of February 1972 was set at $8 per pound for U_3O_8. Rare-earth and uranium prospects in the study area do not contain resources approaching minable grade but represent areas for potential.

Titanium demand in the United States is expected to increase between 4.7 and 9.3 percent per year, if increased development in aerospace and desalination projects continue. Rutile is the more commonly processed mineral, but ilmenite is an equally satisfactory source. Price in January 1972 was $20 to $21 per ton ilmenite. Alluvial deposits along Big Creek, the best in the primitive area, contain about one-tenth as much ilmenite as deposits currently being mined.

Output of gem stones, both natural and synthetic, in the United States has been stable at $2.4 million. Most collecting of natural gem stones is by individuals as a hobby or recreation. The majority of gem work is done in foreign countries, and with greater acceptance of synthetic gems the domestic market for natural gems is expected to diminish. Prices are extremely variable. At present, opal from the Monumental Creek district is hand-mined and sold for $12 to $24 per pound.

Data on the thermal springs in the Idaho Primitive Area represent a moderately low potential resource. In general, the most important geothermal product is electric power stimulated recently by national concern for the environment. The Congress in 1970 passed the Geothermal Steam Act providing for the controlled classification, leasing, and development of Federal lands containing a geothermal reserve potential. Standards were set for the classification of public lands valuable for geothermal steam and associated geothermal resources (Godwin and others, 1971). To date, 1,786,612 acres of public land had been classed as "known geothermal resource areas," and 95,719,000 acres, as "geothermal resource provinces." Hot spring localities in the Idaho Primitive Area are in a geothermal resource province, but areas of better potential in Idaho exist outside the primitive area.

GOLD

An estimated 36,295 ounces of gold has been produced from the study area, primarily from the Thunder Mountain, Ramey Ridge, Edwardsburg, and Pistol Creek districts. Potential for future gold production is also best in these districts. Gold occurs in the study area in disseminated, vein, and placer deposits.

The most important and only significant disseminated deposits are those in the Thunder Mountain district. Marginal reserves at the Dewey and Sunnyside mines (fig. 17, Nos. 44 and 15) total 3,719,000 tons averaging 0.13-0.18 ounce gold per ton.

Relatively high grade gold values occur in isolated vein deposits in the Middle Fork district; potential resources total about 45,000 tons and range from 0.33 to 1.14 ounce gold per ton. Vein deposits in the Pistol Creek district contain an estimated 87,550 tons of material, with gold values ranging from 0.2 to 1.0 ounce per ton; they contain some byproduct silver and lead. Vein deposits in the Ramey Ridge district are generally narrow and low grade (ranging from 0.02 to 0.6 ounce gold per ton), but some were mined prior to World War II. Minor silver and copper values are associated with gold veins in the Ramey Ridge district. Vein deposits in the Edwardsburg and Big Creek districts are generally lower grade deposits representing a combined estimated resource of 250,000 tons, with grades ranging from 0.02 to 0.66 ounce gold per ton.

Placer deposits are in all the districts, but those on Smith Creek in the Edwardsburg district are most significant. Others, except for small concentrations, do not approach minable grade. A resource of 17 million cubic yards averaging about 10 cents in gold per cubic yard (gold at $47.85 per ounce) is estimated for deposits along Smith Creek. Best placer values in the study area were found near the mouth of Smith Creek, where estimated resources of 1,022,000 cubic yards average 64.3 cents per cubic yard (gold at $47.85 per ounce).

SILVER

Small amounts of silver are associated with most metal deposits in the study area, but rarely does silver constitute the principal commodity. An estimated 177,188 ounces of silver has been produced from the study area, primarily as a byproduct of gold from the Thunder Mountain, Ramey Ridge, and Pistol Creek districts and as a coproduct of lead and zinc from the Greyhound Ridge addition.

Silver occurs in the disseminated gold resources of the Thunder Mountain district in amounts ranging from 0.21 to 0.36 ounce per ton. It is associated with gold, copper, and antimony vein deposits of the Ramey Ridge district in amounts from 0.03 to 0.6 ounce per ton. Some veins in the Pistol Creek and Middle Fork districts mined chiefly for gold average more than 1.0 ounce silver per ton. Resource estimates for gold vein deposits in the Edwardsburg and Big Creek districts customarily include 0.13-0.5 ounce silver per ton.

Silver is a major constituent of the (lead-zinc) replacement deposits in the Greyhound Ridge addition, where average composition of the estimated resources ranges from 0.9 to 2.56 ounces per ton.

Resources containing silver as the principal commodity were found only in the Salmon River district. Veins containing silver and associated lead and zinc at Sheepeater and Little Sheepeater prospects (fig. 100, Nos. 5 and 3) represent combined potential resources of 96,000 tons containing average silver values that range from 1.24 to 8 ounces per ton.

COPPER

Deposits containing minor amounts of copper are found throughout the study area. About 143,495 pounds of copper has been produced as a byproduct, mostly from the Snowshoe mine, Ramey Ridge district (fig. 30, No. 64).

Copper Camp in the Ramey Ridge district (fig. 30, No. 51) is currently being explored by diamond drilling. If the quartz-magnetite veins extend as inferred, which is questionable, and grade increases with depth, as indicated by preliminary diamond drilling, a reserve of 5.5 million tons averaging as much as 3 percent copper is estimated at Copper Camp. Elsewhere in the Ramey Ridge district, low-grade gold veins contain minor copper averaging 0.02-0.68 percent.

Four prospects in the Copper Mountain area of the Monumental Creek district (fig. 94, Nos. 5, 6, 10, and 11) and one property in the Big Creek district (fig. 113, No. 5), respectively, constitute potential resources of 222,000 tons containing about 0.6 percent copper and 2,250 tons containing 3.2 percent copper.

LEAD AND ZINC

Approximately 1,406,000 pounds of lead and 9,612 pounds of zinc have been produced from the study area. Most lead-zinc production has been credited to the Mountain King mine, Greyhound Ridge addition (fig. 50, No. 3), but some lead has been recovered as a byproduct of gold mining from Lucky Lad and Cougar mines, Pistol Creek district (fig. 62, Nos. 23 and 19), and Snowshoe mine, Ramey Ridge district (fig. 30, No. 64).

The largest lead-zinc deposits occur associated with silver and minor amounts of gold and copper in the Greyhound Ridge addition.

Gold vein deposits in the Pistol Creek district contain as much as 8 percent lead. Other vein deposits in the Ramey Ridge and Salmon River districts have potential for production of byproduct lead.

TUNGSTEN

Scheelite is found locally disseminated in calcareous rocks in the Pistol Creek, Indian Creek, Middle Fork, and Edwardsburg districts. It has also been found in anomalous amounts (up to 1 percent) in black sand concentrates.

The only important tungsten deposit occurs at the Springfield Scheelite mine in the Pistol Creek district (fig. 62, No. 1). The property has produced about 5,940 short ton units of WO_3 and has an estimated resource of 178,000 tons averaging 0.27 percent WO_3.

ANTIMONY

Trace amounts of antimony were detected in samples from several prospects, but significant stibnite was found only at the Mulligan prospect, Ramey Ridge district (fig. 30, No. 43). A resource of 3,000-15,000 tons of material containing 1.3 percent antimony is estimated at the Mulligan prospect.

FLUORSPAR

The Pungo Creek property in the Indian Creek district (fig. 115, No. 20) is the best-developed fluorite occurrence in the Idaho Primitive Area. Resources are estimated to be 26,000 tons of fluorspar. A few narrow quartz-fluorite veins occur (1) in the Salmon River district, as probable extensions of the Smothers Fluorite (Salmon River Breaks Primitive Area), (2) on the east side of the Marble Creek district, and (3) near Aparejo Creek in the Middle Fork district (fig. 89).

Wilbur Wiles, a resident of the Big Creek area, reports a fluorite occurrence within the Idaho Primitive Area but declines to disclose its location. He described the occurrence as consisting of at least four separate parallel veins in granite country rock. The largest vein is 40-50 feet wide, exposed for an outcrop length of about 100 feet, and composed of 2- to 3-foot-wide zones of nearly pure fluorite making up 50 percent of the vein material. He said the other three veins are nearly pure fluorite 2-12 feet wide and 200 feet long. A sample submitted by Mr. Wiles assayed 95 percent CaF_2.

RARE-EARTH AND RADIOACTIVE ELEMENTS

A rare-earth deposit was found in the Idaho Primitive Area by the Geological Survey at Monumental Summit, Thunder Mountain district. The Monumental Summit prospect (fig. 17, No. 92) has a potential resource of 95,000 tons containing 7.2 pounds rare-earth metals per ton. Anomalous amounts of radioactive elements were found only at the Sullivan Uranium prospect in the Middle Fork district (fig. 81, No. 39).

MOLYBDENUM

Molybdenum in the Idaho Primitive Area occurs as disseminated grains in sulfide deposits associated with calcareous roof pendants. Occurrences, all of low grade and limited size, were found in the Indian Creek and Pistol Creek districts and Greyhound Ridge addition. The highest grade samples, 0.5 percent molybdenum, were from the Blackjack group in the Greyhound Ridge addition (fig. 50, No. 8).

TITANIUM

Anomalous amounts of ilmenite exist in all the placer bars along Big Creek. In the Ramey Ridge district ilmenite content of the 1,265,000 cubic yards of alluvium along Big Creek is 7-9 pounds per cubic yard. Ilmenite also occurs in small placer deposits of the Big Creek district but only in amounts of 3 pounds per cubic yard. A titanium content of as much as 3.0 percent was found in samples from the Precambrian intrusive complexes underlying parts of the Ramey Ridge and Big Creek districts.

GEM STONES

Semiprecious opal occurs as veinlets within certain layers and structures of the Tertiary volcanics. Although opal is known in the Marble Creek and Big Creek districts, development has been restricted to a deposit in the Monumental Creek district from which about 200 pounds of cobbed yellow opal in 1970 sold for $12-$24 a pound. A reserve of 9,600 pounds and a possible resource of 800,000 pounds is estimated to occur at this site.

OTHER COMMODITIES

Bismuth is a common byproduct of lead, zinc, and copper ores, and traces were detected in many of the samples, especially those from the Valentine, Lead-Metals, and Orofino properties, where tenors of up to 0.1 percent were found.

Arsenic is commonly associated with mineralized areas and was detected in several samples. The largest amount is 0.17 percent in a sample from the Monumental Summit rare-earth prospect (fig. 17, No. 92).

Iron ore does not occur in the Idaho Primitive Area, but a high iron content is common in some vein deposits. The magnetite-bearing veins at Copper Camp, Ramey Ridge district (fig. 30, No. 51), average about 33 percent iron, and an estimated 2.4 million tons of magnetite may be recovered as byproduct of copper mining; this large figure is questionable, however.

Cadmium exists in many of the lead and zinc ore bodies. Most samples contained trace amounts, but a sample at the Mountain King mine (fig. 50, No. 3) assayed 0.07 percent cadmium.

Barite, a common gangue mineral in metallic veins was found in unusual amounts at the Barite prospect, Monumental Creek district (fig. 94, No. 9), and Franklin D. and Cougar mines, Pistol Creek district (fig. 62, Nos. 21 and 19).

Mercury is a rare commodity in the Idaho Primitive Area, and only trace amounts were detected in a few samples. As much as 1 percent cinnabar was found in some black sand concentrates from the Chamberlain district, but the source is unknown.

Granite for decorative stonework, 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 Idaho, Lemhi, Valley, and Custer Counties disclosed about 5,400 recorded mining claims in the study area. The earliest claims were located in the 1890's. Most were located in the Thunder Mountain, Ramey Ridge, Pistol Creek, Monumental Creek, and Edwardsburg districts and the Greyhound Ridge addition. Field investigations made by the Bureau of Mines were concentrated in the areas of mining claims.

In most of the mineralized areas, claims overlap or coincide with earlier locations. Courthouse records, therefore, show a great many more claims than are indicated by workings. Undoubtedly, some were not found.

Evidence of recent mining activity was noted on many mining claims. Sixty claims have been patented, and many more were surveyed for patent.

Fifty-eight of the patented claims totaling 857 acres are in the Thunder Mountain district. Present ownership of some patented claims could not be determined. There are also many homesteads within the primitive area, most of them along major drainages. Several were prospected as placers before being patented as homesteads.

DISTRICTS AND ADDITIONS

To facilitate fieldwork and evaluation of the mineral potential, the Idaho Primitive Area is divided into 11 districts, and the 4 adjacent study areas are designated as additions (fig. 16). The 15 arbitrary districts and additions are described in approximate order of decreasing importance.

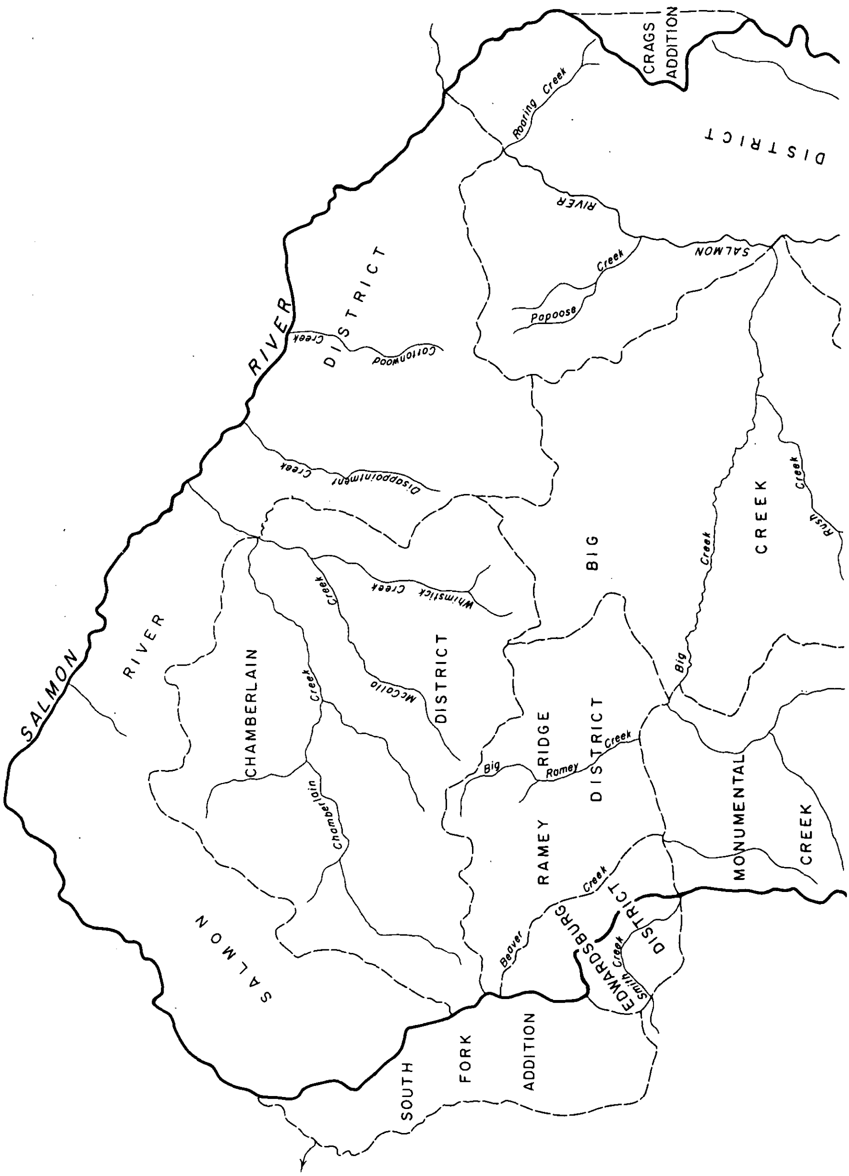
THUNDER MOUNTAIN DISTRICT

The Thunder Mountain district (fig. 17), judging from past production and potential resources, is the most important gold-silver district in the Idaho Primitive Area. This district has an area of 53 square miles; it is slightly smaller than the Thunder Mountain mining district (fig. 15) described by Ross (1941, p. 96) but includes all the mines and important prospects of that district.

Gold was first discovered in the Thunder Mountain district in 1896 by the Caswell Brothers, who placered surface material at the Dewey mine site (fig. 17, No. 44) and later located claims at the site of the Sunnyside mine (No. 15). Exaggerated reports of the gold discovery brought a rush of 2,000-3,000 prospectors into the district. The towns of Roosevelt and Belleco were established. Nearly all the area within a 1-mile radius of Thunder Mountain, as well as much of the surrounding area that makes up the district, was staked. Many of the early mining claims located in surrounding districts were the direct result of the Thunder Mountain boom. The gold rush ended with the closing of the Dewey and Sunnyside mines. Closing resulted from the low tenor of the ore, high transportation costs, and flooding of the town of Roosevelt, caused by the damming of Monumental Creek by a mudflow down Mule Creek. The district was almost inactive until 1926, when the mines were gradually reopened, producing sporadically until World War II. Production records show occasional placer mining activity through 1962, but most activity since 1948 has been confined to exploration work.

Approximately 1,700 mining claims have been recorded in the Thunder Mountain district. Bureau of Land Management records show 14 groups of patented mining claims, totaling 857 acres.

The Thunder Mountain district has produced more than $500,000 in gold and silver, mostly from the Dewey and Sunnyside mines (table 3). Old underground mine maps and churn-drill data indicate potential resources of 3,719,000 tons containing 0.13-0.18 ounce gold per ton. Additional resources are available if the Sunnyside ore continues under surrounding mines. A potential resource of 95,000 tons, averaging 7.2 pounds rare-earth


CRAGS ADDITION
DISTRICT
Roaring Creek
RIVER
SALMON
Creek
Papoose
SALMON RIVER
DISTRICT
Cottonwood Creek
Disappointment Creek
BIG CREEK
Big Creek
Rush Creek
Whimstick Creek
Creek
McCalla
DISTRICT
CHAMBERLAIN
Creek
Chamberlain
RIVER
SALMON
BIG RIDGE DISTRICT
Big
Ramey Creek
RAMEY
MONUMENTAL CREEK
Creek
Beaver
EDWARDSBURG DISTRICT
Smith Creek
SALMON
SOUTH FORK ADDITION

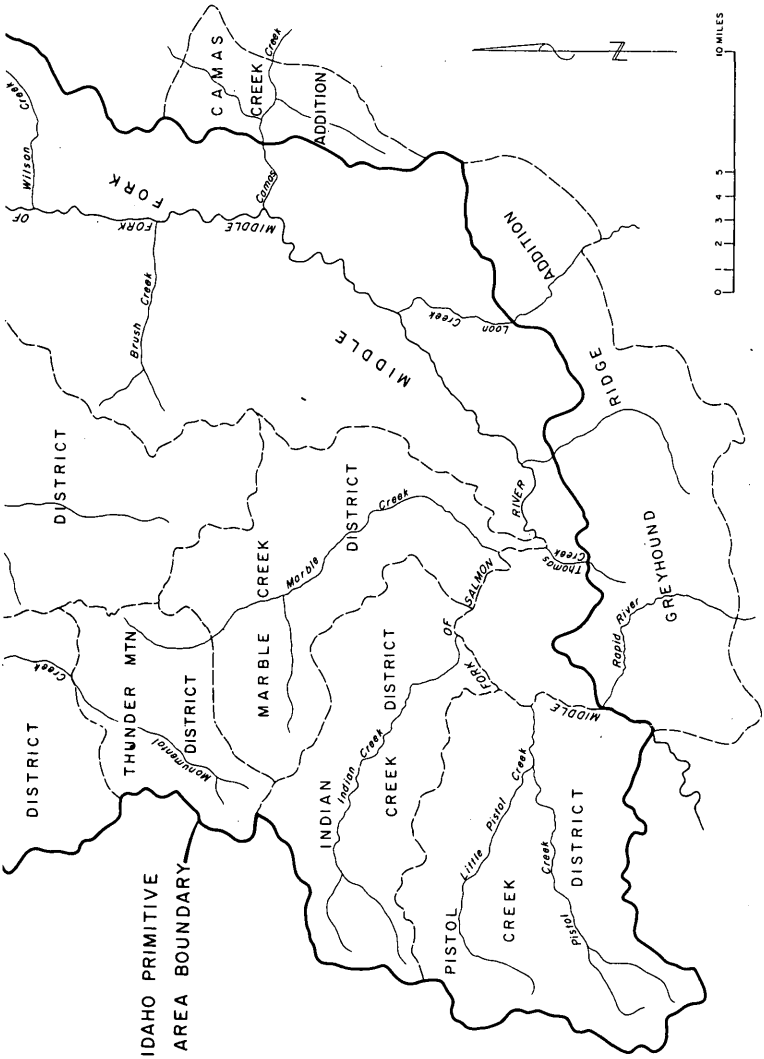


FIGURE 16. — Study districts and additions, Idaho Primitive Area.

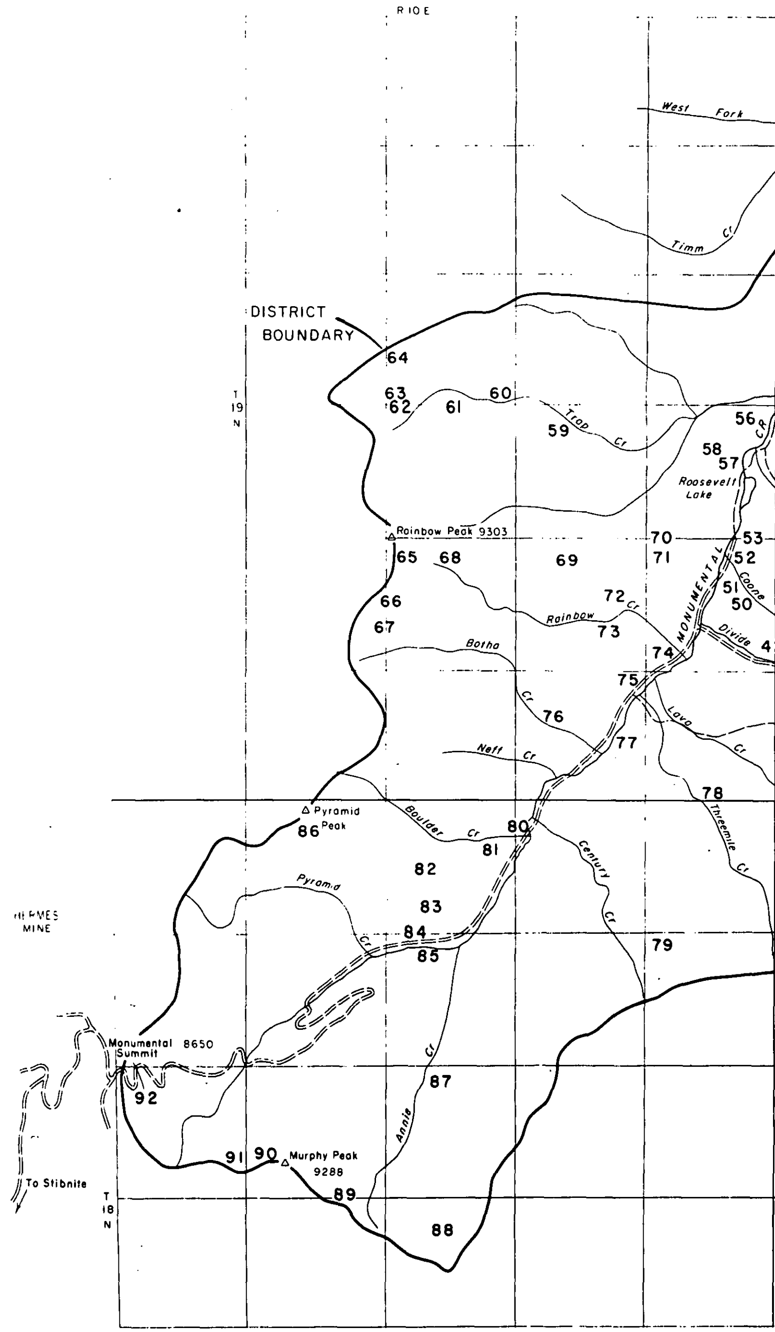
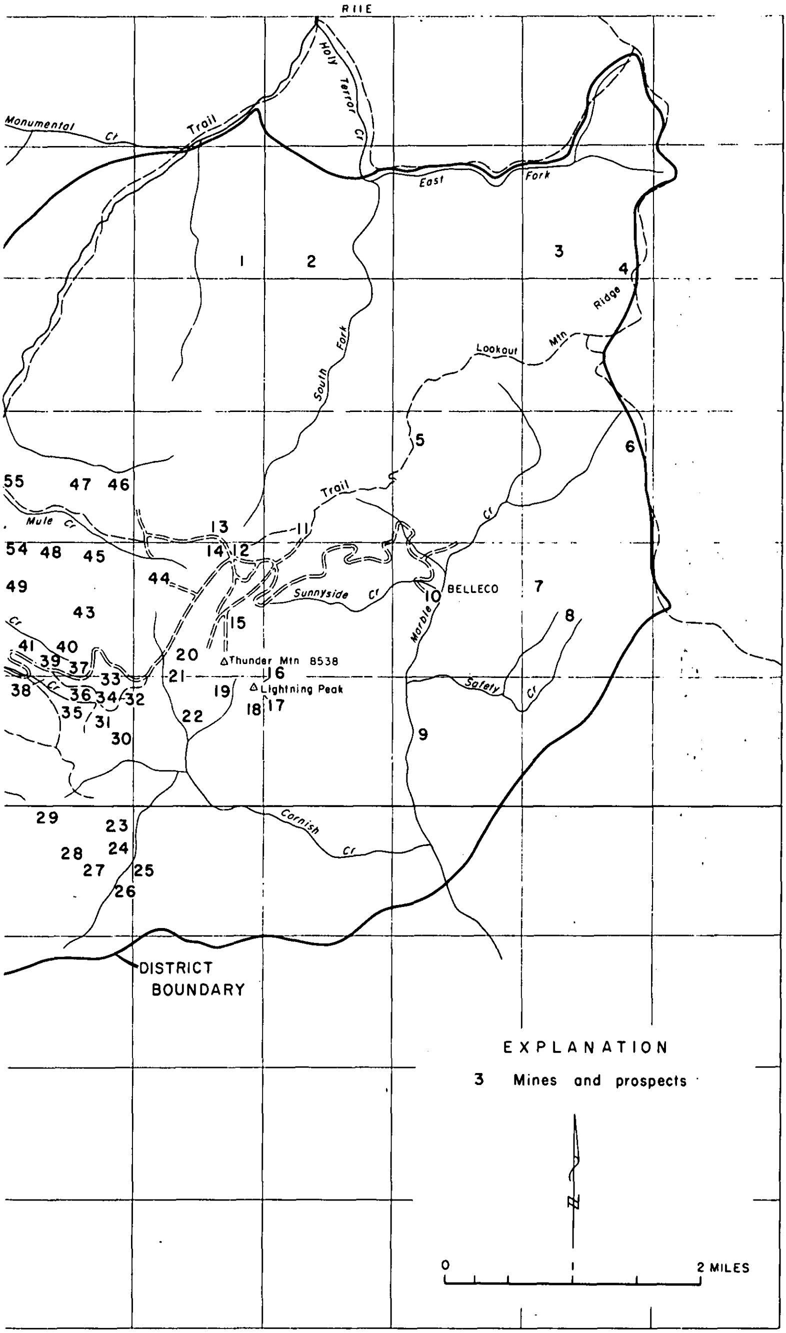


FIGURE 17. — Mines and prospects,



Thunder Mountain district.

Mines and prospects shown in figure 17

1. Cheapman-Wanderer group
2. Consolidation prospect
3. Pearl prospect
4. Lookout Ridge prospect
5. Evenstone prospect
6. New Hope prospect
7. Bold Ruler group
8. Safety Creek prospect
9. Marble Creek placers
10. Blanche E prospect
11. Venable mine
12. Jumbo group
13. Rising Star prospect
14. Short Line group
15. Sunnyside mine
16. Terrible Teddy prospect
17. Ethal B. prospect
18. Cinnamon Bear prospect
19. Red Bird group
20. Standard mine
21. H-Y mine
22. North Fork prospect
23. Gold Nugget prospect
24. Morning prospect
25. Lark prospect
26. Hold Out prospect
27. Little Joe prospect
28. Pearl prospect
29. Gold Dike prospect
30. Golden Coin group
31. Mollie prospect
32. Bullion group
33. Hurricane Eagle prospect
34. Climax group
35. Golden Giant prospect
36. Big Buck prospect
37. Bill Timm group
38. Golden Lode prospect
39. White Oak prospect
40. Colson prospect
41. Coone prospect
42. Golden Chimney prospect
43. Tempiute group
44. Dewey mine
45. Payboy group
46. Lion prospect
47. Minerva group
48. Bluebird prospect
49. Coone Creek prospect
50. Good Luck prospect
51. Junction prospect
52. Roosevelt prospect
53. Monumental prospect
54. Cumberland group
55. Mule Creek prospect
56. Golden Gate prospect
57. Agnes prospect
58. Phonolite group
59. Trap Creek prospect
60. Red Bluff group
61. Buckhorn prospect
62. First National prospect
63. Nice Boy prospect
64. Panhandle group
65. Red Girl prospect
66. Winter King prospect
67. Shoshone prospect
68. Central prospect
69. Eldorado group
70. Big Duluth prospect
71. South Fork group
72. Telluride prospect
73. Hermit prospect
74. Leap Year prospect
75. Twentieth Century group
76. Advance prospect
77. Monumental Creek placers
78. Three Mile prospect
79. Century prospect
80. Doctor prospect
81. Dorothy prospect
82. Boulder Creek prospect
83. Green Goode prospect
84. Daisy G. prospect
85. Daisy prospect
86. Pyramid prospect
87. Buffalo group
88. Wonderful prospect
89. Confidence prospect
90. Eureka prospect
91. Independence prospect
92. Monumental Summit prospect

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metals per ton, has been estimated for the Monumental Summit rare-earth prospect.

Hundreds ot small prospect pits and short adits were dug in the district during the Thunder Mountain boom. Most do not expose bedrock, because nearly all are now caved or badly sloughed. Few samples of altered or iron-stained volcanic rocks sorted from dumps or stockpiles at these small prospects contain more than trace amounts of gold and silver. The small, scattered prospects are, therefore, not described but merely tabulated. No significant concentration of gold or other economic detrital minerals was found at the old placer claims that covered all the alluvial deposits along Monumental and Marble Creeks.

THUNDER MOUNTAIN MINES

The Dewey (fig. 17, No. 44), Sunnyside (No. 15), Venable (No. 11), Standard (No. 20), and H-Y (No. 21) mines — the only mines in the Thunder Mountain district — are within about 1 mile of Thunder Mountain, mostly along its upper north slope.

Of the recorded gold-silver production, nearly all — $526,603 — is credited to the Dewey and Sunnyside mines. The Venable, Standard, and H-Y mines have a moderate amount of exploration and development but yielded only slight production. The five properties occupy a surface area of about 1 square mile, mostly patented land. The area contains all the estimated gold-silver potential resources for the district and has a very good potential for discovery of additional resources. Potential gold-silver resources are estimated at more than 35 times the value of past production.

DEWEY MINE

The Dewey mine (fig. 17, No. 44) is near the head of Mule Creek on the northwest slope of Thunder Mountain, at an altitude of 7,500 feet. The mine (fig. 18) is about 30 miles by road east of Yellow Pine, Idaho. Present owners (1972) are R. O. Nelson and L. M. Bettis of Boise, Idaho.

The property was discovered in 1896 by the Caswell Brothers, who

TABLE 3. — *Recorded gold and silver production, Thunder Mountain district*

[Production data from U.S. Geol. Survey Mineral Resources of the United States and U.S. Bur. Mines Minerals Yearbooks, unless indicated otherwise]

Year	Tons of ore	Gold		Silver		Mine
		Ounces	Dollars	Ounces	Dollars	
1885-1901	--------	1,935.17	40,000.00	--------	--------	Dewey (placer).[1]
1902	3,162	711.63	14,709.39	394	208.82	Dewey.[2]
1903	4,123	1,030.00	21,290.10	--------	--------	Do.[2]
1904	8,636	3,939.00	81,419.13	2,239	1,298.62	Do.[2]
1905	10,464	3,171.48	65,554.41	2,092	1,276.12	Do.[2]
1906	11,786	3,089.95	63,869.27	2,126	1,447.68	Do.[2]
1907	8,920	1,784.73	36,860.37	1,248	823.68	Dewey and Standard.[2]
1909	--------	128.53	2,656.72	--------	--------	Unspecified (placer).
1911	732	296.22	6,122.87	154	81.62	Unspecified.
1912	--------	179.62	3,712.75	93	57.20	Unspecified (placer).
1913	--------	661.07	13,664.32	48	28.99	Do.
1914	--------	120.95	2,500.04	64	35.39	Do.
1915	--------	-------	-------	--------	--------	Dewey (placer).[3]
1916	--------	132.09	2,730.30	122	80.28	Dewey and Sunnyside (placer).
1918	--------	211.19	4,365.30	139	139.00	Dewey (placer).
1919	--------	93.45	1,931.61	57	63.84	Do.
1920	--------	-------	-------	--------	--------	Dewey (placer).[3]
1921	--------	-------	-------	--------	--------	Do.
1923	--------	-------	-------	--------	--------	Do.
1926	690	339.20	7,011.26	226	141.02	Undistributed (lode and placer).
1928	500	97.59	2,017.19	95	55.58	Dewey (placer) and Sunnyside (lode).
1929	1,000	206.67	4,271.89	195	103.94	Sunnyside.
1930	800	177.96	3,678.43	170	65.85	Do.
1931	500	152.12	3,144.32	150	43.50	Do.
1935	1,685	353.34	12,366.90	253	181.65	Do.
1936	655	137.60	4,816.00	89	68.93	Do.
1937	1,700	464.00	16,240.00	--------	--------	Do.
1938	3,600	686.00	24,010.00	676	436.97	Do.
1939	--------	48.00	1,680.00	50	33.94	Three unspecified placers.
1940	14	145.00	5,075.00	135	95.99	Sunnyside and three unspecified placers.
1941	9,300	949.00	33,215.00	838	595.82	Dewey and unspecified placers.
1942	9,500	987.00	34,545.00	640	455.04	Dewey, Sunnyside, and two unspecified placers.
1943	--------	2.00	70.00	--------	--------	One unspecified placer.
1948	2,500	139.00	4,865.00	74	66.97	Dewey and one unspecified placer.
1956	--------	-------	-------	--------	--------	Unspecified.[3]
1962	--------	9.00	315.00	9	9.77	Dewey (placer).
Total	80,267	22,378.54	518,707.57	12,376	7,896.21	

[1]Ross (1927, p. 589).
[2]Shenon and Ross (1936, p. 38).
[3]Some placer production but amount not reported.

worked the property as a placer. They sluiced the unconsolidated material from the surface and recovered an estimated $40,000 worth of placer gold prior to 1900 (Ross, 1933a, p. 588). Messrs. Dewey and Barnsdall installed a 10-stamp mill and worked the Dewey mine from 1902 until 1907. An 80-percent recovery was made by amalgamation. The operation was closed down in 1907 because the company had difficulties keeping millheads above 0.25 ounce gold per ton — their cutoff grade to meet expenses. A production of $265,670 (gold at $20.67 per ounce) from 43,700 tons of ore was reported for 1902-07.

Sporadic activity by leasers, from 1907 to 1926, consisted of mining the high-grade stopes and placering surface material. Production of $42,500 in gold and silver is estimated for this period. Gold Reef Mining Co. mined approximately 20,000 tons by open-pit methods during 1941 and 1942. The ore was trucked to the Sunnyside mill, where 2,083 ounces of gold and 1,613 ounces of silver were recovered having a value of $73,852. War Production Board Order L-208 closed the mine in October 1942. Some placering of the old dumps and surface material was reported in 1948 and 1962. Total gold and silver production for the Dewey mine is estimated at more than

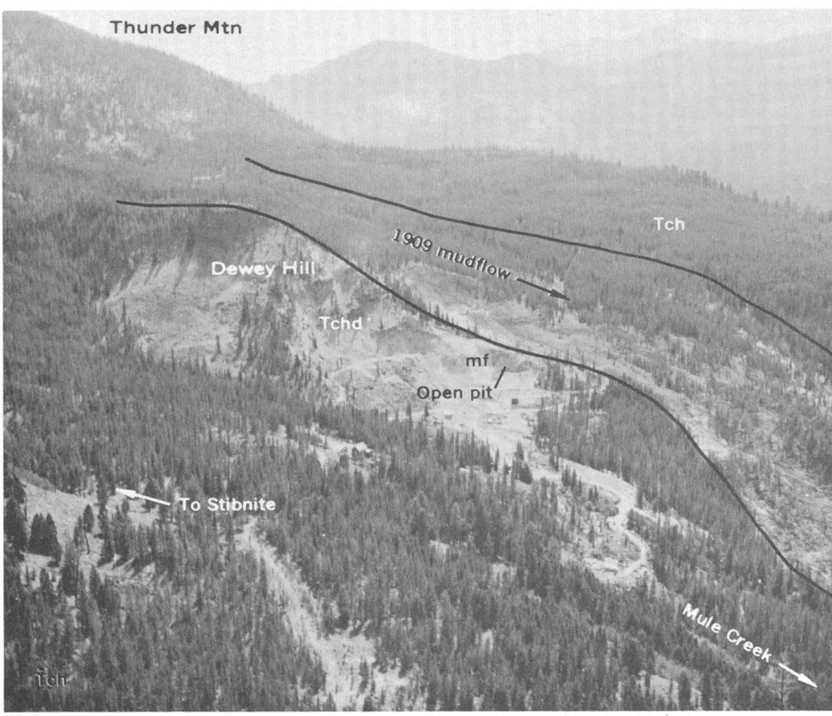


FIGURE 18. — Dewey mine, view looking south. Tch, Challis Volcanics; Tchd, sandstone of the Challis Volcanics; mf, carbonaceous mudflow breccia.

$445,000, mostly prior to 1908 at the gold price of $20.67 per ounce.

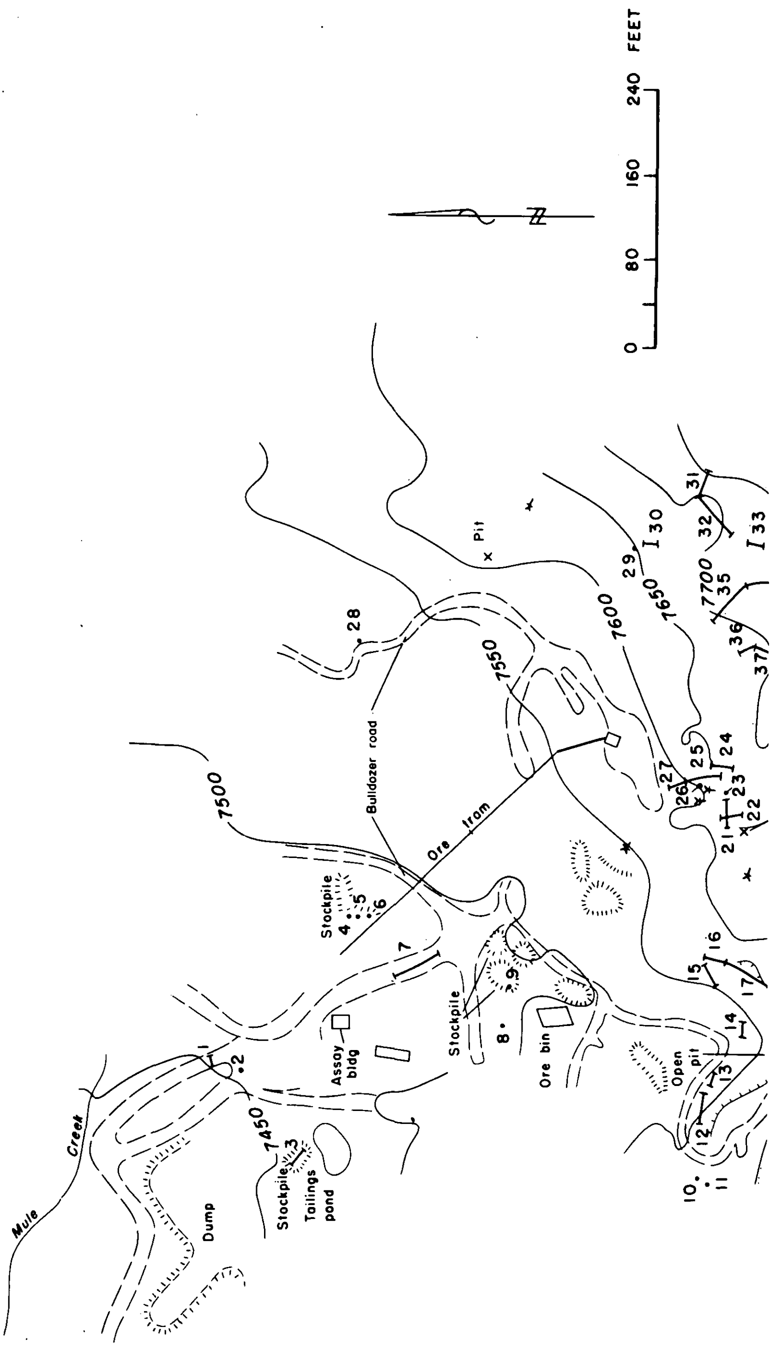
Rocks in the Dewey mine area consist of tuffaceous sedimentary rocks of the Challis Volcanics capped by black latite. Southwest of the Dewey mine a 1909 mudflow covers a rather large area (fig. 19). The sedimentary rocks are an estimated 300 feet of interstratified tuffaceous sandstone, volcanic conglomerate, and carbonaceous zones of either carbonaceous sandstone or lignitic shale. The distribution of gold and silver seems to be related to rock type. Samples composed predominantly of volcanic conglomerate average slightly more than a trace of gold but carry consistent silver values averaging 0.4 ounce per ton. Samples composed predominantly of volcanic sandstone averaged 0.012 ounce gold and 0.19 ounce silver per ton. Samples composed mainly of carbonaceous material averaged only slightly more than 0.01 ounce gold per ton and not more than a trace of silver. Samples classed as predominantly carbonaceous volcanic sandstone, however, averaged about 0.05 ounce gold and 0.32 ounce silver per ton. Samples composed predominantly of carbonaceous mudflow breccia averaged 0.05 ounce gold and 0.18 ounce silver per ton.

Production came from underground workings, which now have been caved for many years. Consultant mining engineers R. J. McRae and G. E. Ziegler (written communs., 1956) compiled old mine maps, assay plans, records on mining and milling methods, and data on reserve estimates. Their data are freely used in the following descriptions.

Samples taken by Ziegler in 1954 from the mine workings (fig. 20) contained significantly higher gold and silver values than those obtained recently by surface sampling. Ziegler classified host rocks as rhyolite, tuff, sandstone, and black breccia. Rock classified as black breccia is assumed to be the same as the black carbonaceous mudflow breccia exposed on the surface. Most of the underground mining was in this rock type. Underground samples classified as black breccia had a weighted average value of 0.19 ounce gold per ton, and samples classified as "shelly" rhyolite and hard or silicified rhyolite or tuff also carried high gold values.

Selectively mining the higher grade carbonaceous volcanic sandstone beds is not economically feasible, and the average grade for all sediments at the Dewey mine — 0.02 ounce gold and 0.23 ounce silver per ton — is too low to be mined as a total unit. Past mining operations, however, were by selective methods. One area for future selective mining is outlined by samples 23-27 (fig. 20); it represents a resource of 25,000 tons, averaging 0.09 ounce gold and 0.50 ounce silver per ton.

Underground workings at the Dewey mine consist of two main haulage levels, two intermediate levels, and several adits that total more than 2,000 feet (fig. 21). Ziegler's estimates, based on 1905 and 1906 mine maps, and samples taken when part of the workings were open in 1956 total 1,428,000 tons of indicated material averaging 0.13 ounce gold per ton. This material



0
80
160
240 FEET
N
Mule Creek
Dump
Stockpile
Tailings pond
Assay bldg
Stockpile
Ore bin
Open pit
Stockpile
Bulldozer road
Ore tram
Pit
7450
7500
7550
7600
7650
7700

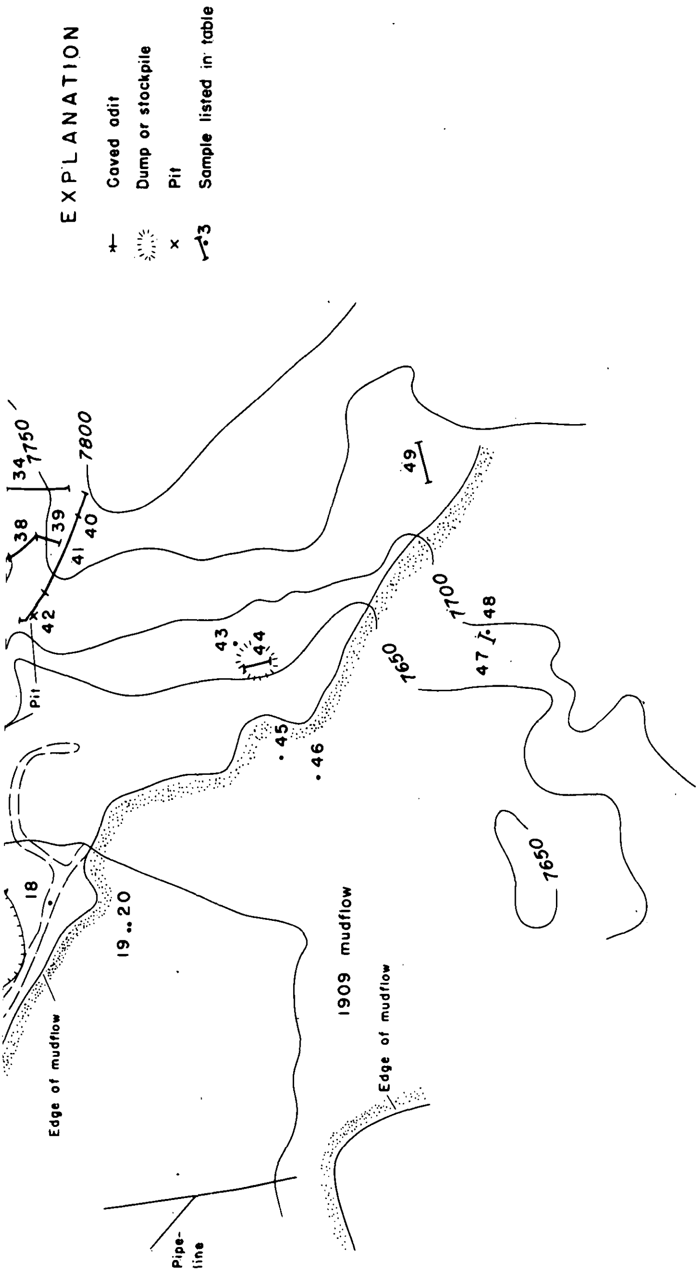


FIGURE 19. — Dewey mine.

Data for samples shown in figure 19

[Tr, trace]

Sample No.	Sample Type	Locality or length (feet)	Gold (oz per ton)	Silver (oz per ton)	Predominant rock type[1]
1	Grab	Dump	0.04	0.25	Undifferentiated.
2	do	do	.01	.14	Do.
3	do	Stockpile	.07	.23	Do.
4	do	do	.02	.50	Do.
5	do	do	.07	.70	Do.
6	do	do	.42	1.36	Do.
7	do	45	.03	0	Carbonaceous mudflow breccia.
8	do	Talus	.01	.41	Volcanic sandstone.
9	do	Stockpile	.15	.56	Carbonaceous mudflow breccia.
10	Chip	6	.02	.02	Volcanic sandstone.
11	do	3	.02	0	Carbonaceous volcanic sandstone.
12	do	20	.04	.4	Carbonaceous mudflow breccia.
13	do	10	.10	.18	Do.
14	do	30	.02	Tr	Unconsolidated carbonaceous material.
15	do	40	.03	.34	Carbonaceous volcanic sandstone.
16	do	20	.08	0	Volcanic sandstone.
17	do	15	.03	0	Unconsolidated carbonaceous material.
18	do	2	Tr	.04	Carbonaceous mudflow breccia.
19	Auger hole	3.5	0	0	Mudflow.
20	do	3.5	0	0	Do.
21	Chip	20	0	1.33	Volcanic conglomerate.
22	do	25	Tr	.24	Do.
23	do	3	.07	.24	Carbonaceous volcanic sandstone.
24	do	20	.05	.44	Do.
25	do	30	.05	.46	Volcanic sandstone.
26	do	6	.07	.72	Carbonaceous volcanic sandstone.
27	do	9	.11	.74	Do.
28	do	3	Tr	Tr	Carbonaceous material.
29	do	8	.05	.22	Carbonaceous volcanic sandstone.
30	do	12	Tr	.22	Volcanic conglomerate.
31	do	80	.01	.14	Volcanic sandstone.
32	do	42	0	.51	Do.
33	do	17	0	.12	Do.
34	do	90	.01	.11	Undifferentiated.
35	do	100	Tr	.28	Volcanic sandstone.
36	do	20	Tr	.41	Volcanic conglomerate.
37	do	20	Tr	0	Carbonaceous material.
38	do	50	Tr	.41	Volcanic conglomerate.
39	do	40	Tr	0	Carbonaceous volcanic sandstone.
40	do	20	.03	.19	Volcanic conglomerate.
41	do	35	Tr	.05	Do.
42	do	95	0	0	Volcanic sandstone.
43	do	8	.03	.15	Carbonaceous volcanic sandstone.
44	Grab	Dump	Tr	0	Undifferentiated.
45	Auger hole	2	Tr	0	1909 mudflow.
46	do	2	Tr	0	Do.
47	Chip	12	Tr	0	Carbonaceous material.
48	do	6	.03	0	Volcanic sandstone.
49	do	Talus	.05	.6	Undifferentiated.

[1]Sample containing volcanic sandstone, volcanic conglomerate, and carbonaceous material in approximately equal proportions is classed as undifferentiated. Other samples, on the basis of field classifications, are listed by the rock type making up the greatest proportion of the sample.

occurs along a carbonaceous breccia zone 765 feet long, 200 feet wide, and 140 feet thick.

The Dewey mine has good potential for future production, but on the basis of present economic conditions, it is considered a marginal deposit.

SUNNYSIDE MINE

The Sunnyside mine (fig. 17, No. 15) is at the head of Sunnyside Creek, on the northeast slope of Thunder Mountain, at an approximate altitude of 8,000 feet (fig. 22).

The property was originally located by the Caswell Brothers in 1899. The Lightning Peak Gold and Silver Mining and Milling Co. bought the property in 1901 and reorganized as the Belle of Thunder Mountain Mining and Milling Co. in 1902. They completed about 7,000 feet of underground development work and some churn drilling. Favorable indications resulted in the construction of a 40-stamp mill at Belleco, near the mouth of Sunnyside Creek, and the building of 8,000 feet of tramway by 1904. Only about $5,000 worth of gold was recovered on a test-run basis. High costs of transportation, owing to the area's remoteness, and poor gold recovery (less than 70 percent by amalgamation) forced closure of the mine in 1908. The property was relocated in 1924 by D. C. and R. J. McRae and R. A. Davis. In 1926, a 10-stamp mill was erected at the mine. The mill was operated for about 4 months each summer from 1927 to 1936, and 9,000 tons averaging 0.28 ounce gold per ton was milled. From 1936 until 1938, when mining ceased, about 8,000 tons was milled averaging 0.22 ounce gold per ton. According to R. J. McRae, total production during 1926-38 was probably $115,000. No ore has been mined since 1938. Approximately 20,000 tons of ore from the Dewey mine was treated at the Sunnyside mill during 1941 and 1942. During the 1950's considerable near-surface exploration work, including trenching and churn drilling, was done by Bradley Mining Co., Yuba Mining Co., and J. R. Simplot Co. R. J. and Grace C. McRae and Warren Brown patented eight lode claims in 1962, covering 185 acres in the Sunnyside mine area.

Data for samples shown in figure 20

[Tr, trace. From G. E. Ziegler (written commun., 1956)]

Sample		Average value		Predominant rock type
No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	
1	25	0.06	0.35	"Shelly" rhyolite.
2	30	.11	.42	Do.
3	18	.38	.90	Do.
4	20	.06	.70	Hard rhyolite.
5	20	.12	.75	Rhyolite and charcoal.
6	10	.12	.80	Tuff.
7	10	.04	.35	Brecciated rhyolite, sandstone, etc.
8	40	.10	.50	Rhyolite and tuff.
9	13	.04	Tr	Hard siliceous tuff.
10	30	.18	.55	Hard rhyolite.
11	35	.13	.80	Black breccia.
12	86	.15	.70	Hard, dark, silicified rock.
13	40	.04	1.34	Black breccia.
14	50	.03	.37	Soft tuff.
15	30	.03	.35	Tuff and rhyolite.
16	15	.06	.85	Hard, siliceous rock.
17	80	.09	.54	Black breccia.
18	56	.26	.54	Do.
19	10	.03	2.40	Tuff.
20	10	.06	.70	Tuff and rhyolite with pyrite.
21	20	.04	.50	Rhyolite with pyrite.
22	10	.05	1.00	Tuff with pyrite.
23	40	.11	.60	Rhyolite, tuff, sandstone, etc.
24	47	.29	.17	Black breccia.
25	38	.34	.72	Do.
26	16	.29	1.10	Do.
27	10	.22	.60	Black breccia with pyrite.
28	20	.23	.58	Tuff with pyrite.
29	20	.18	.63	Tuff and rhyolite with pyrite.

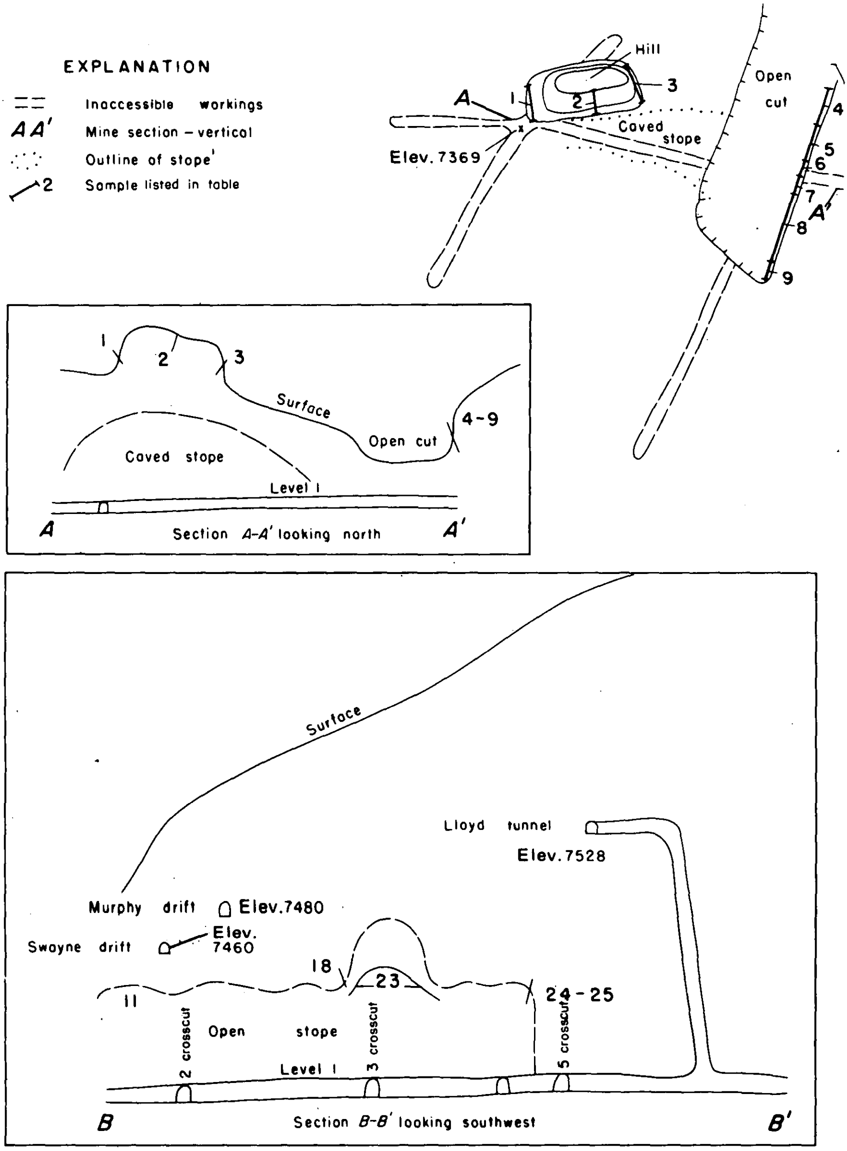
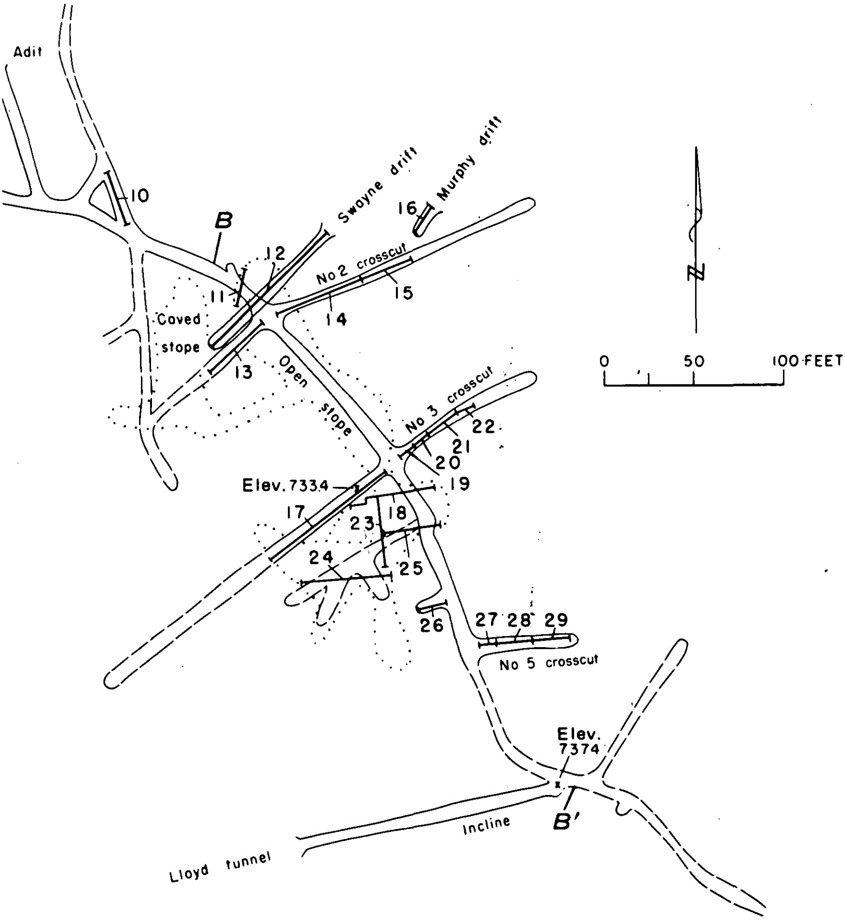


FIGURE 20. — Surface and underground



workings in 1954, Dewey mine.

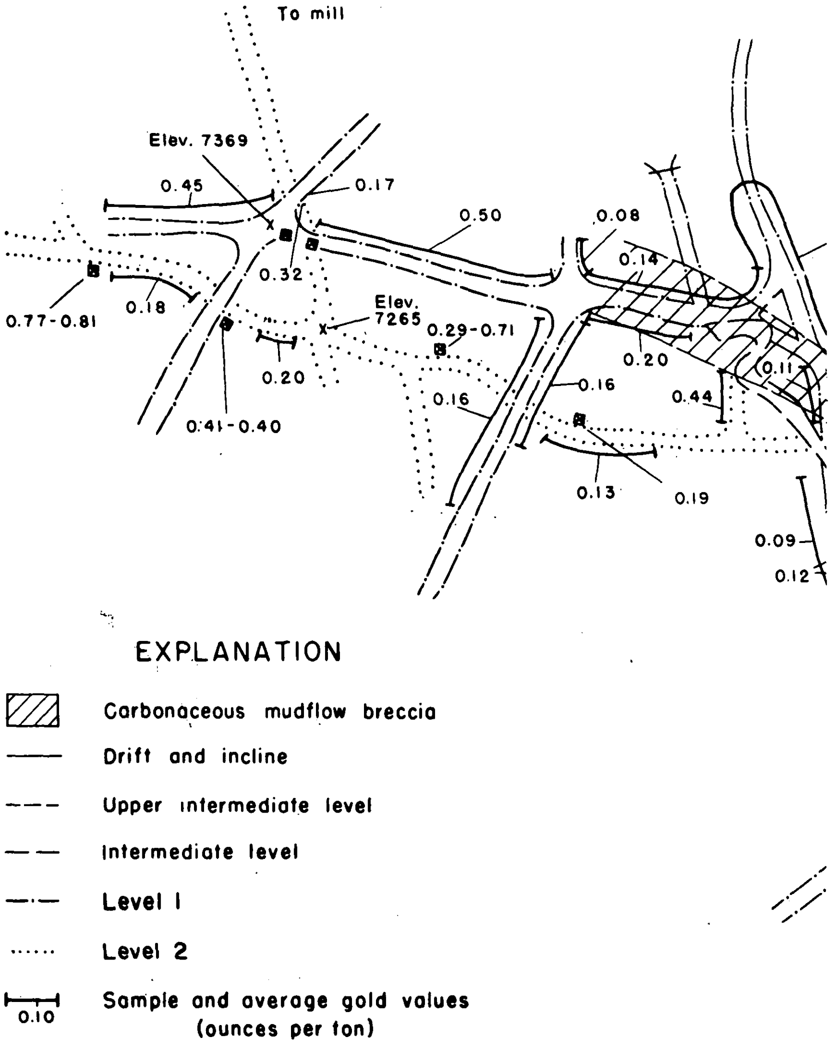
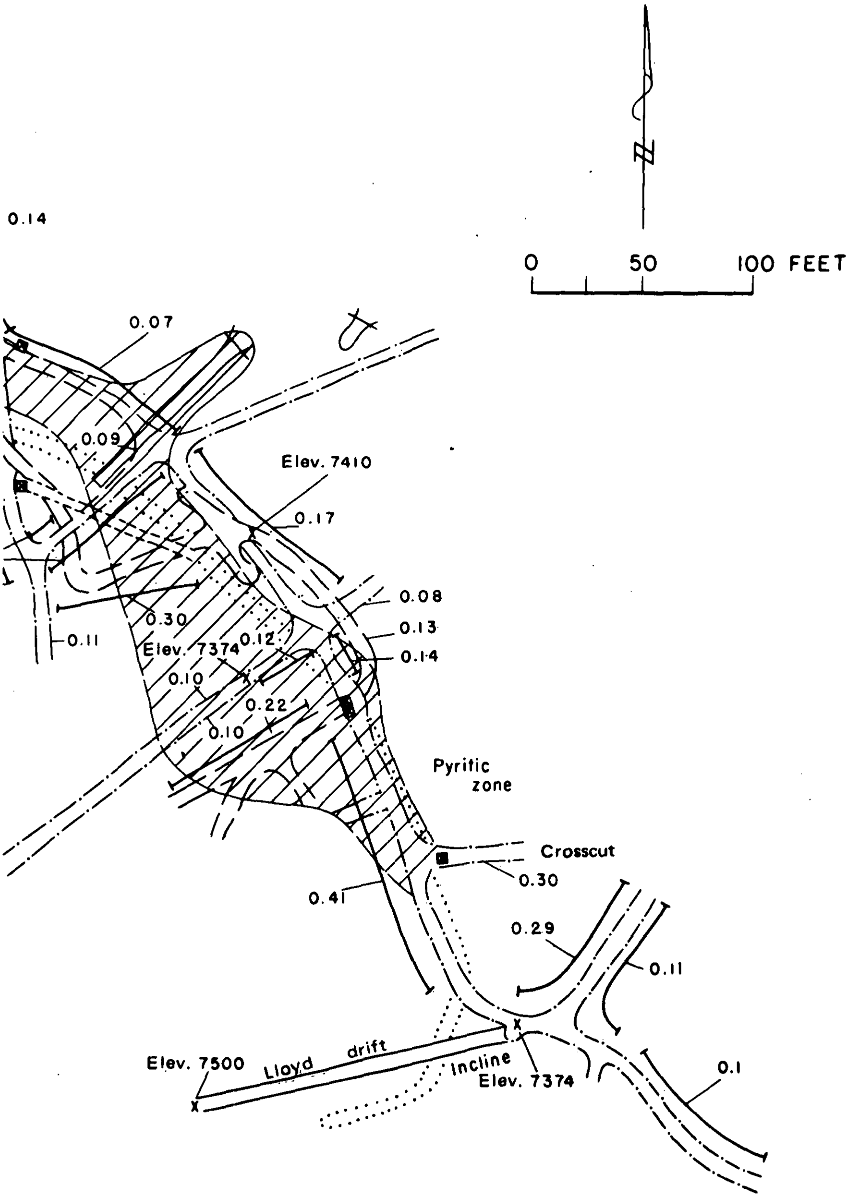


FIGURE 21. — Underground workings



in 1905, Dewey mine.

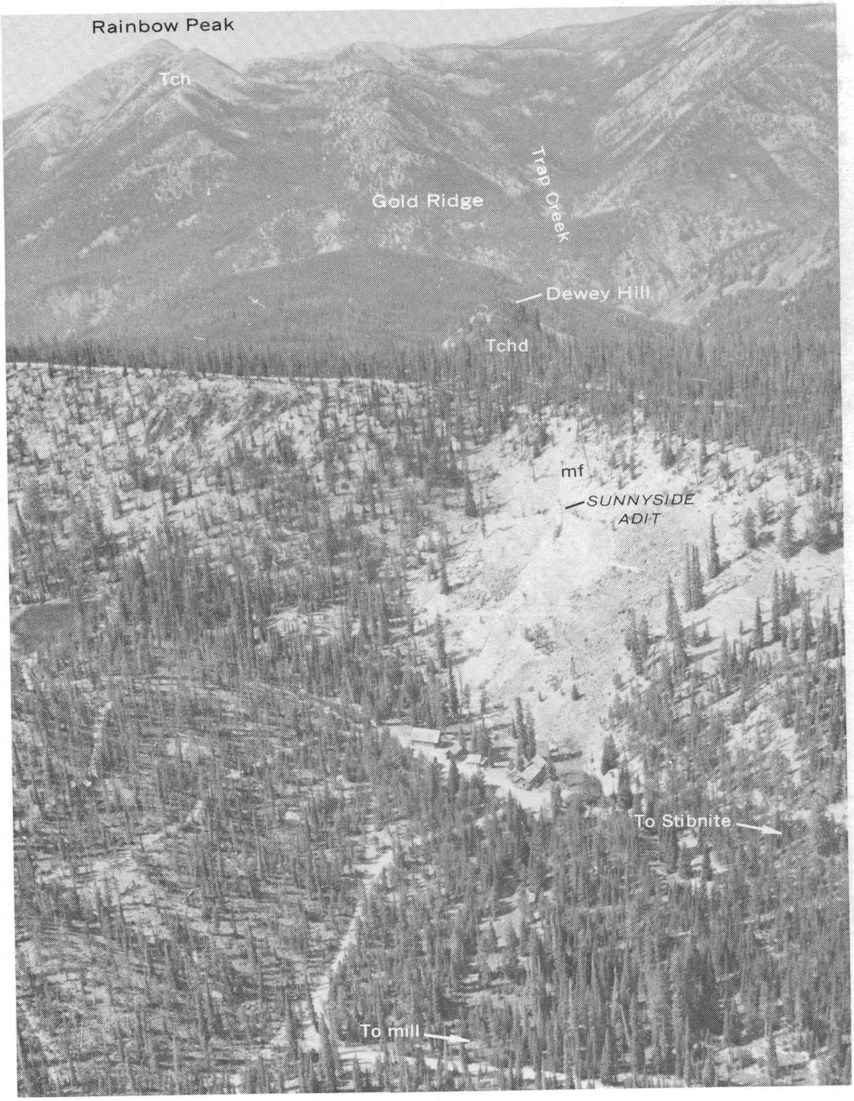


FIGURE 22. — Sunnyside mine, looking westward. Tch, Challis Volcanics; Tchd, sandstone of the Challis Volcanics; mf, mudflow.

Underground workings at the Sunnyside mine total about 9,000 feet. The principal ore shoots are developed by about 6,000 feet of workings on three main levels. Workings in the ore deposit are now inaccessible, and therefore our appraisal of the property is based on reports of previous investigators (Shenon and Ross, 1936, p. 40-42; R. J. McRae and G. E. Ziegler, written communs., 1956).

The Sunnyside ore body is reported to be a blanket deposit in the top 20-

30 feet of a flat-lying to gently dipping bed of rhyolite flow breccia overlain by interbedded sandstone, shale, angular conglomerate, and mudflow. Samples taken from outcrops of all three rock types mostly contain not more than a trace of gold and silver (fig. 23). Fifteen grab samples taken randomly from surface dumps of the old underground workings contain as much as 0.06 ounce gold and 1.5 ounces silver per ton and average 0.02 and 0.29 ounce gold and silver per ton, respectively. Spectrographic analyses indicate as much as 400 ppm copper and 200 ppm molybdenum, but in most samples these elements were not detected.

The principal ore body exposed in the underground workings is reportedly confined to a highly fractured zone near the top of a rhyolite flow breccia that is capped by an overlying mudflow breccia unit 30-70 feet thick. The gold apparently was deposited beneath the mud, which acted as a dam to upward-moving solutions (Shenon and Ross, 1936, p. 41). Ore limits, not readily visible, were determined from sample assays. Average grade and extent of the ore zone are not well defined because development work was directed along the higher grade ore shoots (fig. 24). Workings and churn drilling have explored the principal ore zone for 1,500 feet north, downdip, and 300-700 feet in an east-west direction. Ten samples taken by Shenon and Ross (1936, p. 42) from the Sunnyside and intermediate levels had an unweighted average gold and silver content of 0.22 and 0.56 ounce per ton, respectively.

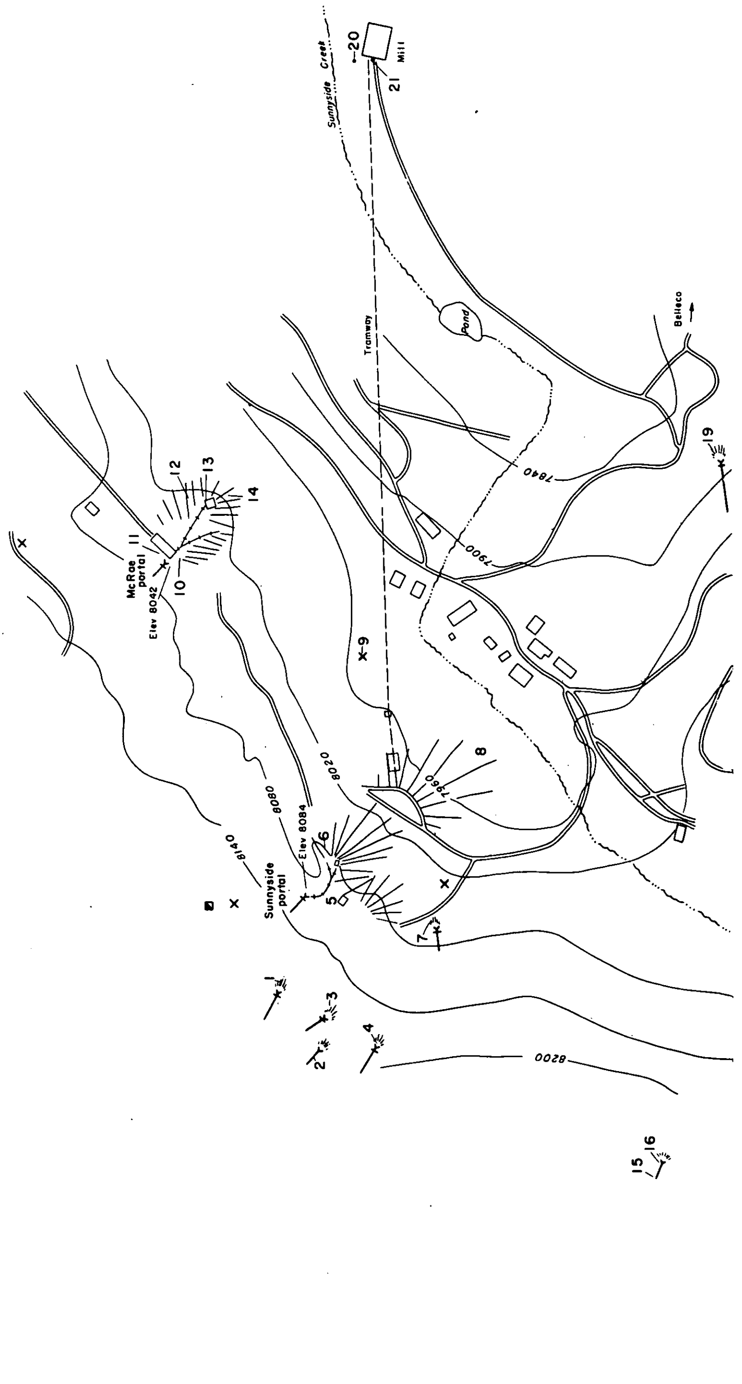
R. J. McRae (written commun., 1956) estimated 2,107,000 tons of marginal ore reserves at the Sunnyside mine ranging from 0.16 to 0.18 ounce gold per ton. G. E. Ziegler (written commun., 1956) estimated a similar amount of proved and probable material and an additional 25 million tons of possible ore.

McRae divided the Sunnyside marginal ore body into six blocks of

Data for samples shown in figure 23

[Tr, trace]

Sample		Locality or length (feet)	Gold (oz per ton)	Silver (oz per ton)
No.	Type			
1	Grab	Dump	0.02	0.20
2	Chip	20	.015	.15
3	Grab	Dump	.03	.4
4	do	do	Tr	0
5	do	do	.045	.05
6	do	do	.015	.05
7	do	do	0	Tr
8	Select	do	.06	.95
9	Grab	do	Tr	0
10	do	do	0	0
11	do	do	Tr	0
12	do	do	Tr	Tr
13	do	do	.045	1.5
14	do	do	Tr	Tr
15	Chip	4	0	0
16	do	30	Tr	0
17	Grab	Dump	Tr	0
18	do	do	Tr	0
19	do	do	0	0
20	do	do	.01	.6
21	do	do	Tr	.1


Sunnyside Creek
Mill
20
21
Pond
Tramway
Belleco
7840
7900
7960
8020
8080
8140
8200
McRae portal
Elev 8042
Sunnyside portal
Elev 8084
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
19

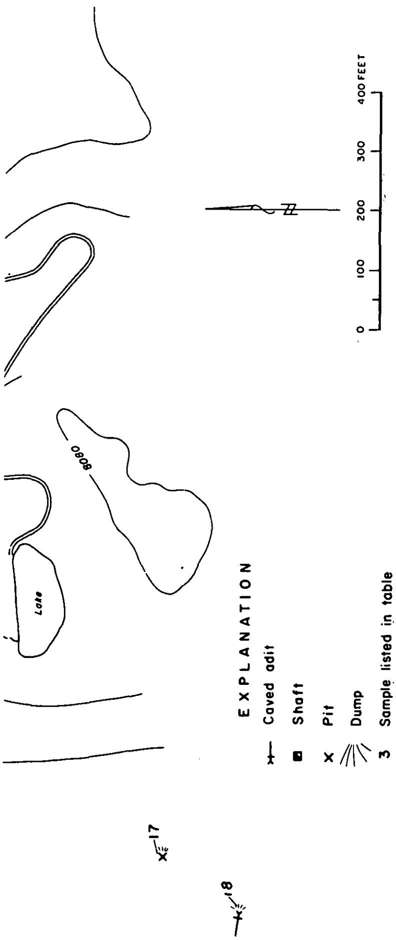


FIGURE 23. — Sunnyside mine.

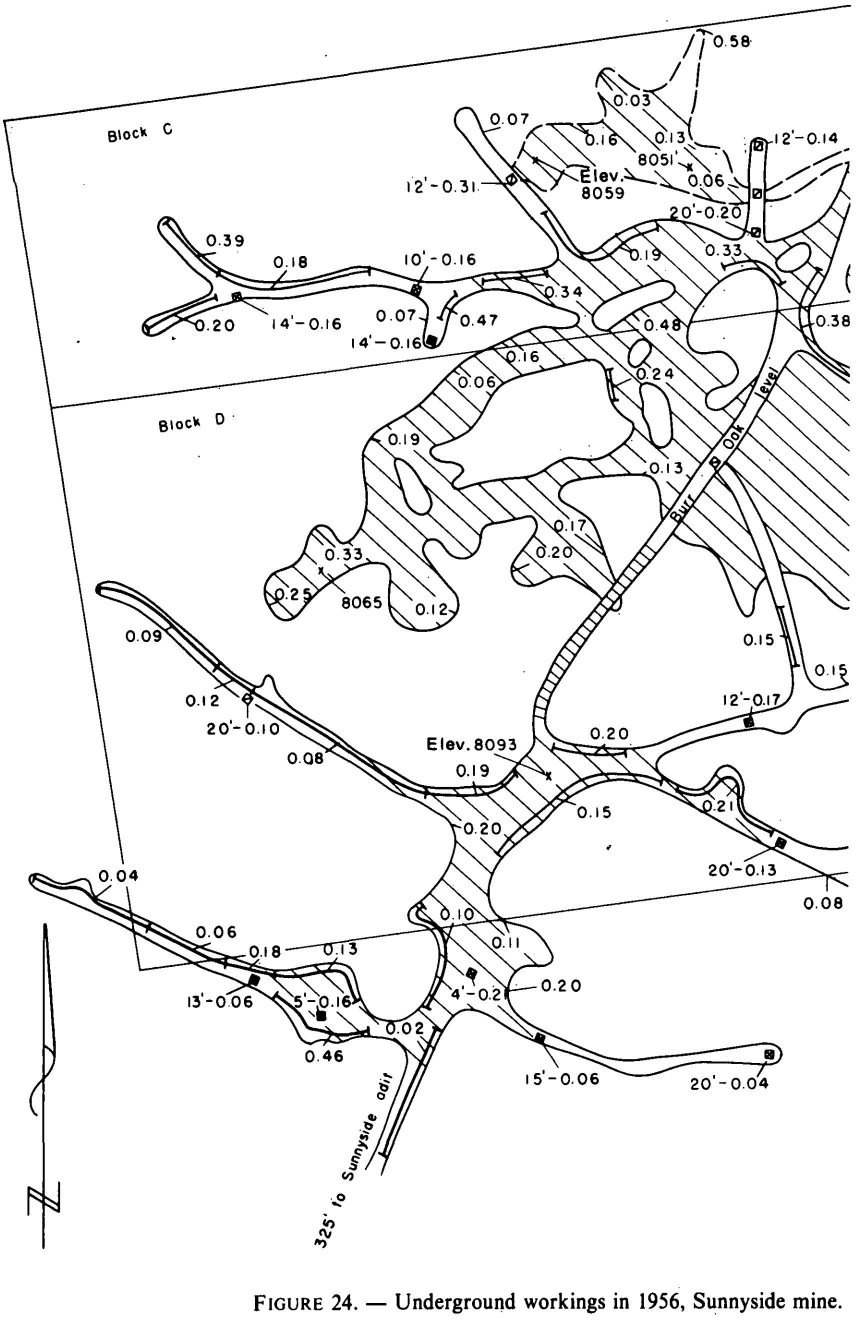
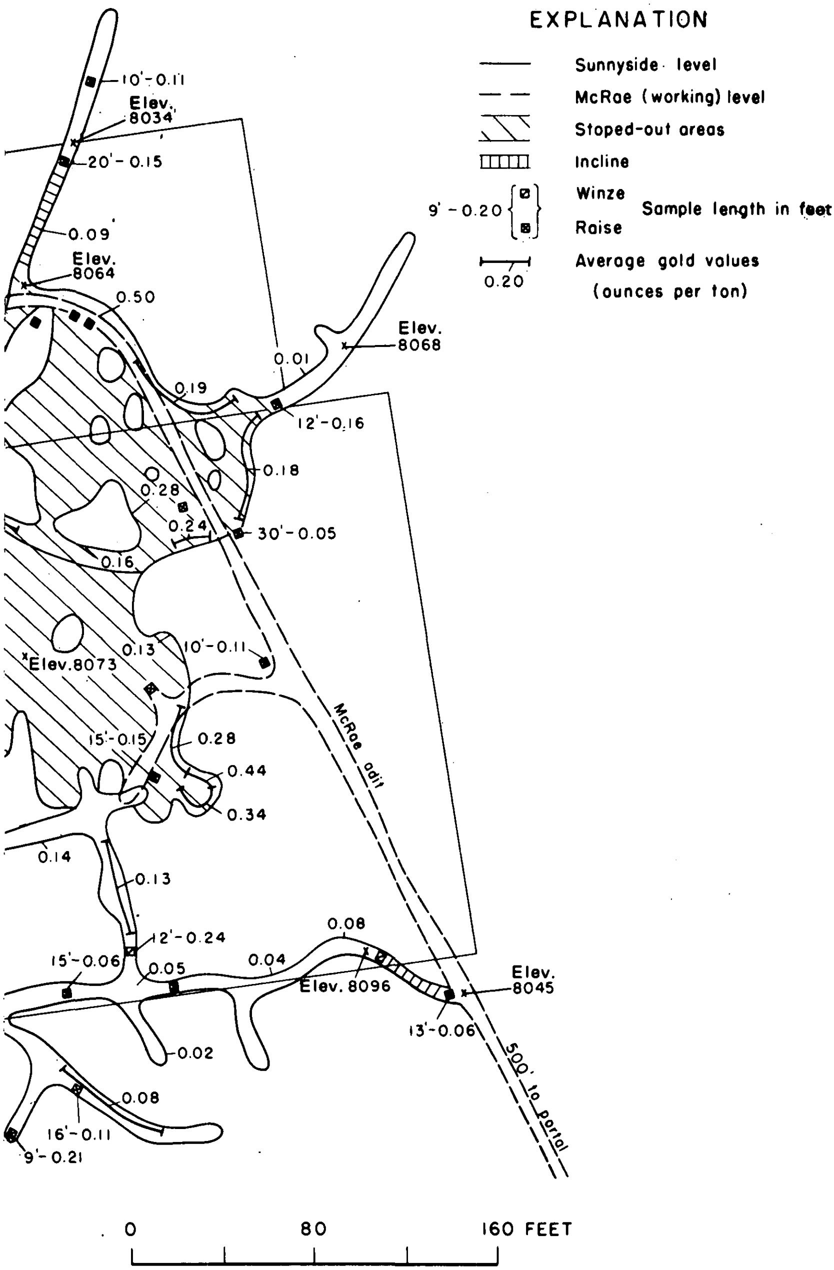


FIGURE 24. — Underground workings in 1956, Sunnyside mine.



Modified from R. J. McRae (written commun., 1956).

probable ore and described three other areas of possible ore (fig. 2[illegible]). Blocks A through E total 621,000 tons of probable ore averaging 0.18 ounce gold per ton. These blocks are outlined by underground workings, drill holes, and a shaft. The ore body dips 5°-7° N., averages 20 feet in thickness, has an average of 58 feet of overburden, and thus has a 3-to-1 stripping ratio. The sixth block of probable ore, area S, southwest of the mine, is estimated to contain 136,000 tons averaging 0.16 ounce gold per ton. This block is estimated to average 13 feet thick and is essentially free of overburden. Area S was outlined by bulldozer cuts in 1951 and 1952. McRae assigned 610,000 tons of possible ore to the areas just east and west of blocks A through E. Another area 1,200 feet east of the developed ore zone was reportedly outlined by bulldozer cuts in 1952. McRae estimated at least 600,000 tons for this possible ore zone, which is at least 450 feet long and 15-30 feet thick and has an average overburden thickness of 40 feet. He further assigned 140,000 tons of possible ore to an area bordering area S. Probable and possible ore calculated by McRae totals 2,107,000 tons, presumably averaging 0.18 ounce gold per ton.

Reserve estimates by the Bureau of Mines, using virtually the same data as McRae's but with some additional churn-drill data, are 491,000 tons indicated and 1,800,000 tons inferred totaling 2,291,000 tons averaging about 0.14 ounce gold and 0.36 ounce silver per ton. The Sunnyside "blanket" ore horizon can be assumed to underlie a much greater area than that blocked out.

The Sunnyside mine has good potential for future production but under present economic conditions is considered marginal.

VENABLE MINE

The Venable mine (fig. 17, No. 11) adjoins the north side of the Sunnyside property and is reached by a short access road from the main Thunder Mountain road. The property was located by J. M. Venable in the early 1900's and was developed by the Venable Bonding and Leasing Co. The mine was acquired later by George W. Lovell, who patented four lode claims and a millsite in 1930, totaling about 62 acres. Fred Gardner of Cascade, Idaho, now owns the patented land.

Development work, scattered over a surface area 2,400 feet long and 900 feet wide, consists of a few caved adits, more than 40 sloughed pits and trenches, a caved shaft, and five old buildings. Equipment consists of a boiler, steam engine, and Chilean ball mill. The principal adit, near the mill, was reported to be several hundred feet long; it trends S. 35° E. (Shenon and Ross, 1936, p. 42). The presence of milling equipment and the extent of development work suggest that ore was mined and treated, but recorded production consists of only a few tons of ore in 1909.

Samples taken from dumps of the old workings contain no more than trace amounts of gold, lead, and copper and as much as 0.8 ounce silver per ton. Rock from the Chilean ball mill assayed a trace gold, 0.08 ounce silver per ton, and 0.1 percent lead. Samples taken almost entirely from the dumps of old workings contain no economic minerals, but neither do samples taken from dumps at the Sunnyside mine. The proximity to the Sunnyside mine and the similarity of rock types indicate that the Sunnyside ore zone may underlie the Venable property.

STANDARD MINE

The Standard mine (fig. 17, No. 20) was located in 1903 by J. E. Cawley and Joseph Chatham and was later sold to the Standard Mining Co. (Shenon and Ross, 1936, p. 43). An undisclosed, but presumably small, amount of production was recorded in 1903. Workings consisting of four adits and at least 10 prospect pits and trenches, now caved, are predominantly in rhyolite flow breccia. Principal workings are along the base of a steep fault scarp. Rocks on the west, or downdropped side of the fault, include some volcanic flows and volcanic sediments similar to those exposed at the Dewey mine. Rock exposures on the east side of the fault are stratigraphically lower, consisting predominantly of rhyolite flow breccia and mudflow breccia, similar to those at the Sunnyside mine.

More than 30 samples were taken of the various rock types, and all assayed a trace gold. More than half the samples contained as much as 0.18 ounce silver per ton; those containing silver values were mostly mudflow breccia.

Underground workings at the Standard mine are in rocks very similar to those associated with the Sunnyside ore. According to Shenon and Ross (1936, p. 43), ore mined from the contact zone between silicified mud and rhyolite flow breccia at the Standard mine assayed from $4 to $5 a ton when gold sold for $20 an ounce. These values could not be duplicated by our surface sampling. Proximity to the Dewey and Sunnyside mines and similarity of rock types indicate possible potential.

H-Y MINE

The H-Y property (fig. 17, No. 21) was originally located in 1901 by Messrs. Fuller, Lawrence, and Ferrington, who sold it in 1902 to the H-Y Mining Co. (Shenon and Ross, 1936, p. 43). There is no recorded production.

Exploration work, consisting of 6 caved adits, a shaft, and more than 20 sloughed pits, was apparently done in the early 1900's. The principal workings are two adits at the head of Cornish Creek and a shaft near the mine camp. According to Shenon and Ross (1936, p. 43) one adit, called the Dakota, is at least 300 feet long, and the shaft, sunk in 1903, is 260 feet deep and has two crosscuts. One crosscut was reportedly driven 300 feet eastward toward the Standard, and the other was driven to the south. The shaft was sunk entirely in mudflow material consisting of mud with numerous boulders of sandstone, shale, flow breccia, basalt, and carbonaceous wood (Shenon and Ross, 1936, p. 43). A sample taken from the dump of the shaft

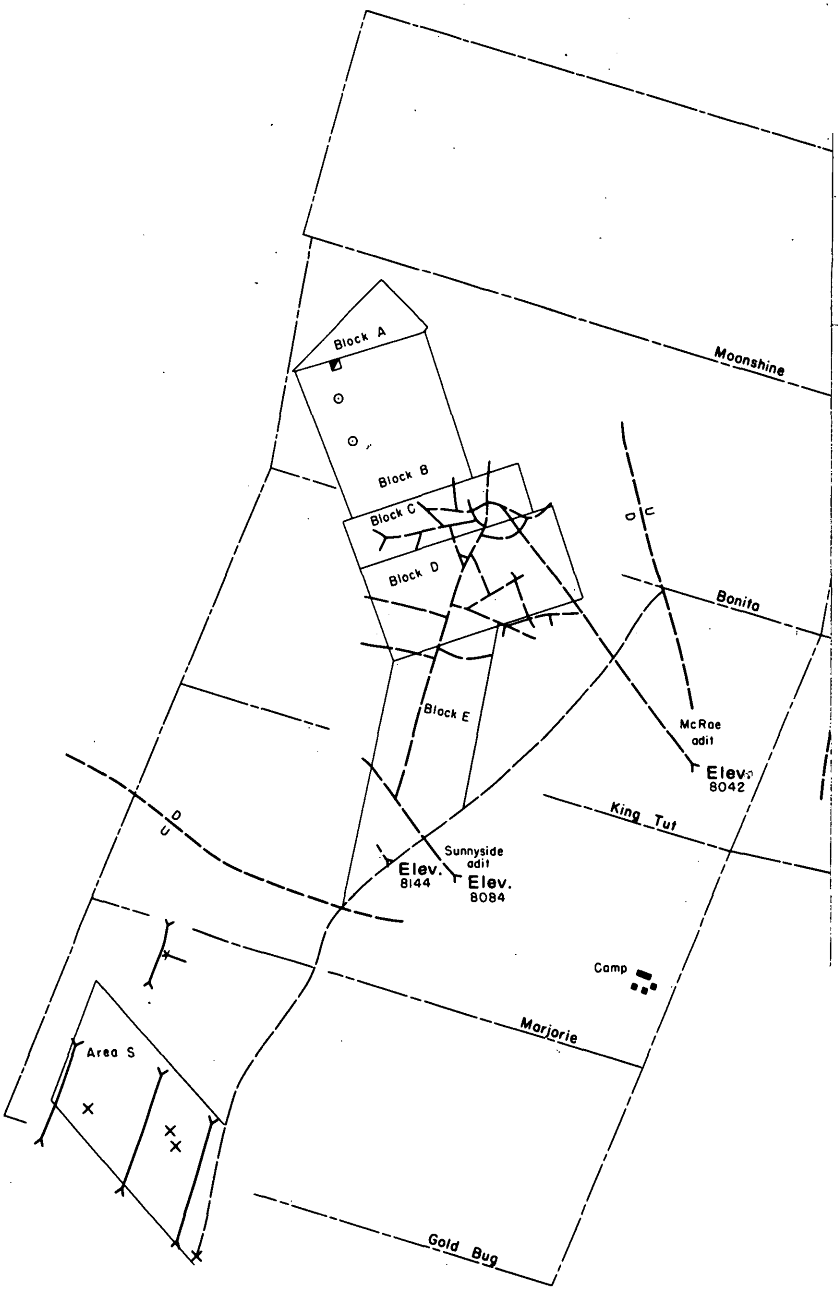
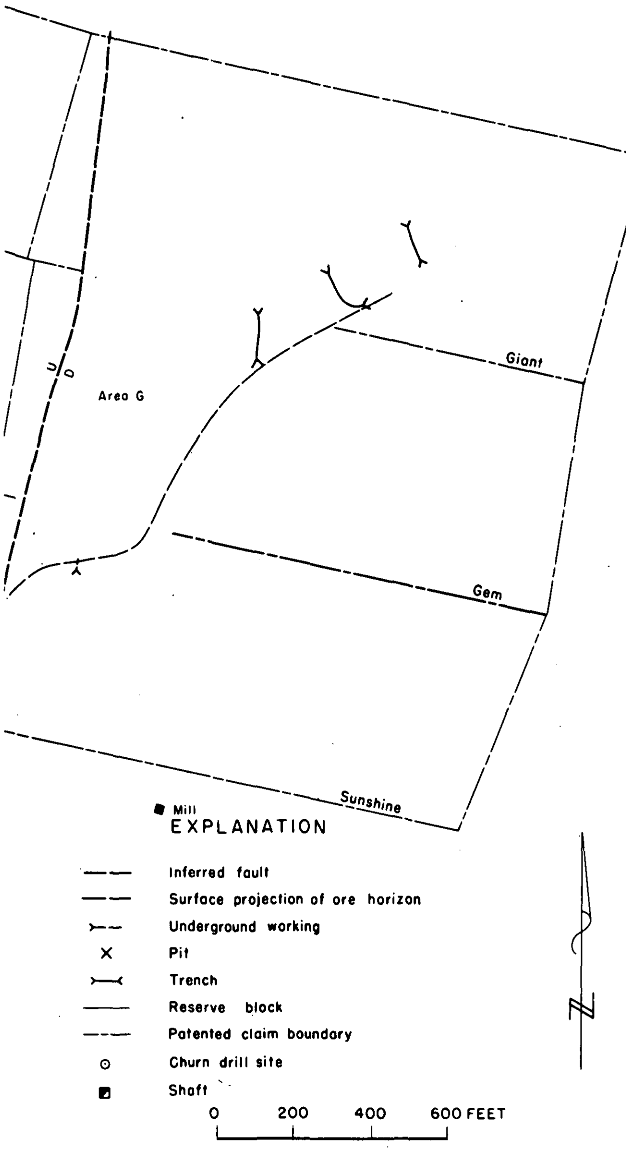


FIGURE 25. — Marginal ore blocks, Sunnyside mine. Claim boundaries are



approximately located. Modified from R. J. McRae (written commun., 1956).

contained only traces gold and silver. A sample of iron-stained rhyolite flow breccia taken from a small outcrop near the caved Dakota adit assayed 0.04 ounce gold and 0.59 ounce silver per ton. The only other bedrock exposure observed on the property is at the portal of a short caved adit, 400 feet north and 170 feet higher in elevation than the Dakota. A sample of that rhyolite exposure contained only a trace gold and no silver. Eleven other samples taken from dumps of prospect workings contained a trace to 0.01 ounce gold per ton and a maximum of 0.12 ounce silver per ton. All surface material sampled is well below minable grade, but the H-Y mine should have a potential for discovery of deposits similar to those at the Sunnyside mine.

MONUMENTAL SUMMIT-MURPHY PEAK AREA

The Monumental Summit-Murphy Peak area covers much of the headwaters of the Monumental Creek drainage. Rhyolite and welded tuff, typical of the Thunder Mountain district, are the predominant rocks. Precambrian metasedimentary rocks, probably in fault blocks, occur at Monumental Summit and along the west side of Murphy Peak. The Monumental Summit rare-earth prospect (fig. 17, No. 92) occurs along a shear-zone contact between Challis Volcanics and the Yellowjacket Formation. The Eureka and Independence gold prospects (fig. 17, Nos. 90 and 91), on the west side of Murphy Peak, are also underlain by metasedimentary rocks. Pits at the Eureka are along a highly iron-stained contact zone between quartzite and rhyolite. The Independence prospect is on a 1-foot-wide quartz vein in schist and quartzite. No more than trace amounts of gold were detected at any prospect. Only the samples taken at the Monumental Summit rare-earth prospect contain values approaching economic significance.

MONUMENTAL SUMMIT RARE-EARTH PROSPECT

The rare-earth prospect (fig. 17, No. 92) is at the head of Monumental Creek, at altitudes of 8,300-8,600 feet, and 3 miles east of the deserted mining town of Stibnite by way of the Thunder Mountain road. The road cuts through overburden and exposes the rare-earth zone about one-fourth mile east of Monumental Summit.

Rare-earths were discovered in 1966 by the U.S. Geological Survey as a result of routine sampling in connection with the Idaho Primitive Area investigation. A few old prospect pits had been dug previously, apparently in search of gold or extensions of the mercury deposits west of Monumental Summit. The rare-earth mineral rhabdophane was described by Adams (1968). Yellow Hills Mining Co., Salt Lake City, Utah, located the deposit in 1969. They conducted a near-surface sampling and drilling program during the summer of 1971; results are not yet available.

The rare-earth zone occurs within an apparent downdropped fault block of Precambrian metasedimentary rocks of the Yellowjacket Formation consisting of quartzite, schist, and calcareous rock (fig. 26). At the prospect the block of Precambrian rocks is less than one-fourth mile wide and is bounded on the north, east, and south by Tertiary Challis Volcanics and on the west by Cretaceous granitic rocks of the Idaho batholith. Rare-earth mineralization was apparently confined to tactite of the calcareous unit, mostly near the southwest contact with quartzite (fig. 27). Best rare-earth values were obtained from along and east of the roadcut. Because of thick soil cover, the calcareous unit was delineated mostly from float and the typical reddish to yellow-brown color of the soil. The calcareous unit was traced and sampled for about a mile west of Monumental Summit (primitive area boundary), but no significant rare-earth elements were detected. Mercury deposits (Hermes and Fern mines, pl. 1), about a mile west of Monumental Summit, occur in similar metamorphosed calcareous rocks along a quartzite contact. No rare-earths have been reported at the mercury mines, and no more than 7.5 ppm mercury was detected in samples from the Monumental Summit rare-earth zone. The shear zone containing rare-earth elements was delineated by the exposure in the roadcut and a few auger holes and pits.

Adams (1968) identified the rare-earth mineral as rhabdophane, a hydrated phosphate of the cerium group elements. His analyses show the Monumental Summit rhabdophane to be deficient in cerium in relation to other lanthanides. Samples taken by Adams, for analytical and

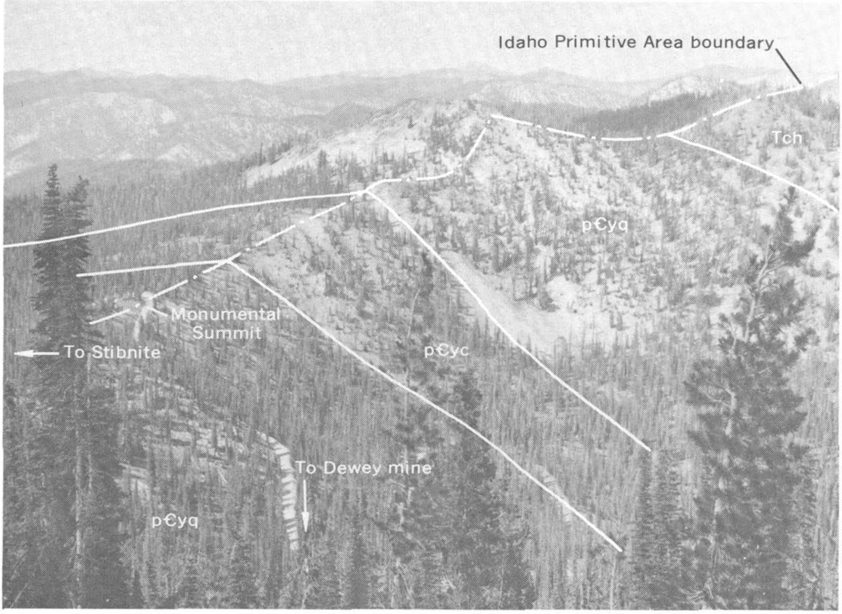
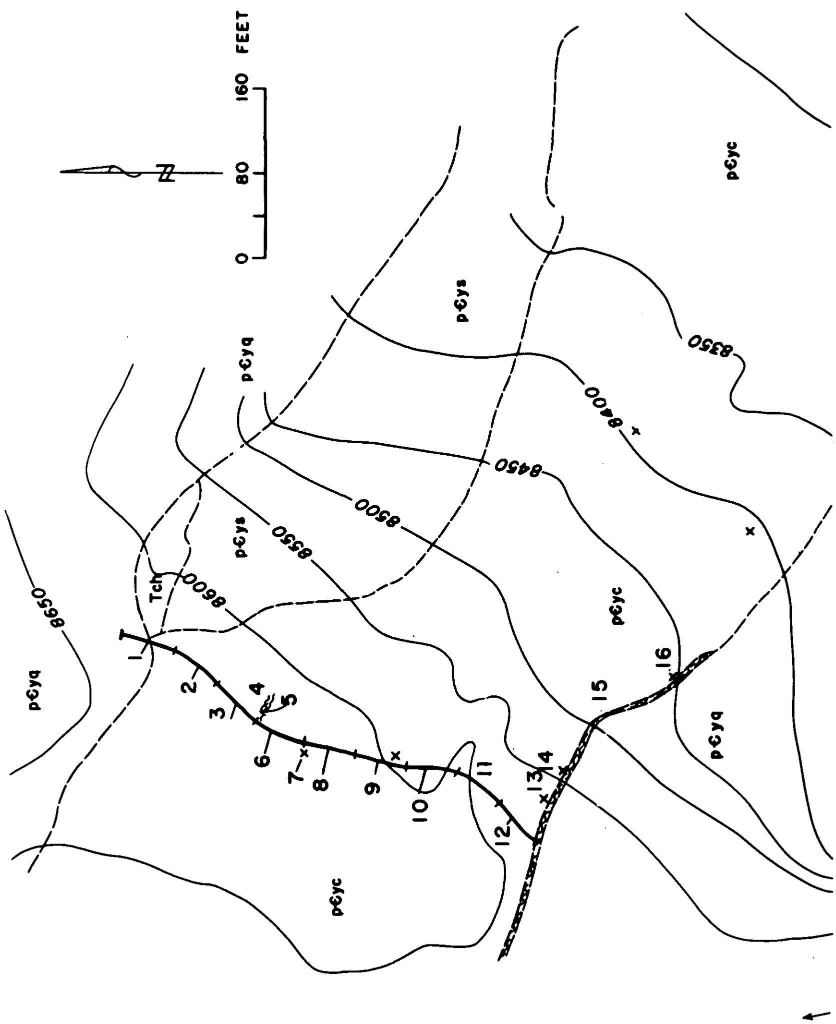


FIGURE 26. — Steeply dipping Precambrian Yellowjacket Formation and Tertiary Challis Volcanics at Monumental Summit; view northwestward. Tch, Challis Volcanics; Yellowjacket Formation: p€yq, quartzite and schistose quartzite, and p€yc, calcareous rocks.


0
80
160 FEET
N
pЄyq
pЄys
pЄyc
Tch
8650
8600
8550
8500
8450
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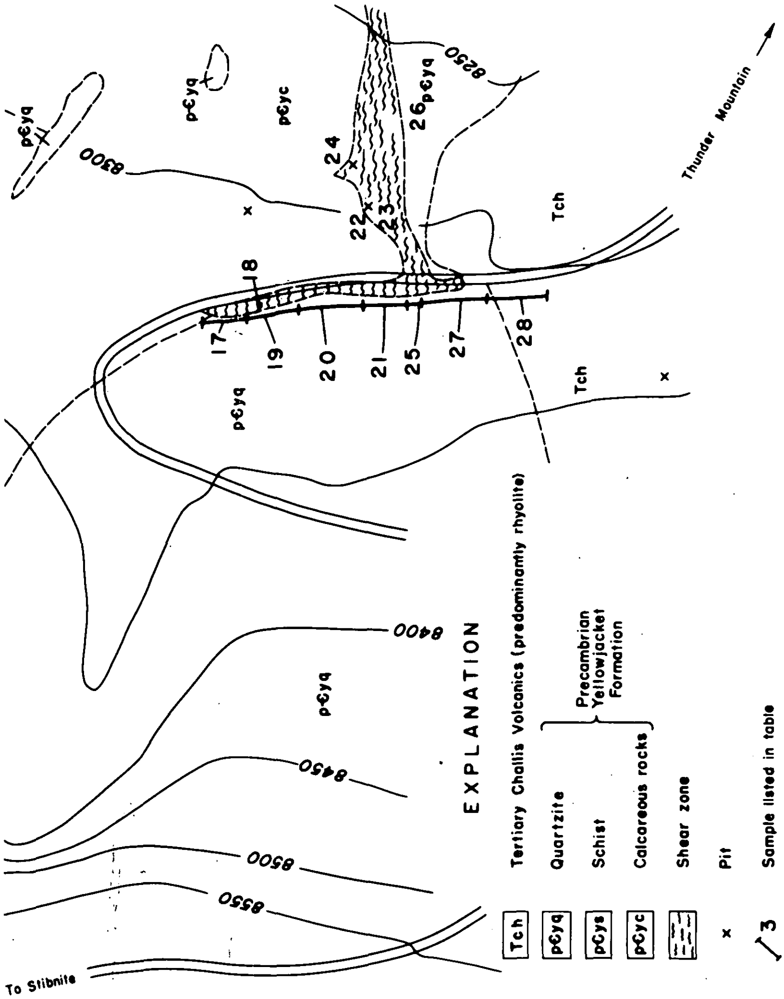


FIGURE 27. — Monumental Summit rare-earth prospect.

Data for samples shown in figure 27

[Tr, trace; M, greater than 10 percent; N, not detected; *, chemical analysis]

Sample		Length	Percent									Parts per million							
No.	Type	(feet)	Al	As	Ca	Fe	Mg	Mn	Si	Ti	Zn	Ba	Be	Co	Cr	Cu	Ga	Mo	Nb	Ni
1	Chip	70	0.7	N	M	0.7	M	0.07	2.0	0.015	N	30	N	N	7	7	N	N	N	5
2	do	50	.1	N	M	.7	10	.07	7.0	.005	N	20	N	N	7	7	N	N	N	7
3	do	50	.2	N	M	.7	M	.07	2.0	.007	N	20	N	N	7	5	N	N	N	5
4	do	2.3	3.0	N	M	1.5	10	.15	7.0	.07	N	100	N	5	30	30	7	N	N	15
5	do	4	.5	N	M	.7	M	.15	5.0	.075	N	50	N	N	7	7	N	N	N	7
6	do	50	.5	N	M	1.5	10	.15	M	.02	N	70	N	7	15	50	N	N	N	10
7	do	2	5.0	N	M	1.5	10	.2	M	.15	N	100	1.5	7	50	20	7	N	N	20
8	do	50	2.0	N	M	2.0	M	.5	7.0	.07	N	70	N	7	20	200	7	N	N	20
9	do	50	.7	N	M	1.0	M	.15	2.0	.03	N	30	N	3	10	100	N	N	N	8
10	do	50	.3	N	M	.7	M	.1	3.0	.015	N	15	N	7	15	7	N	N	N	5
11	do	50	.1	N	M	.7	10	.07	2.0	.007	N	10	N	N	3	8	N	N	N	7
12	do	50	.3	N	M	1.0	M	.07	5.0	.015	N	15	N	5	5	15	N	N	N	7
13	do	1.5	1.0	N	M	3.0	M	.05	10.0	.05	N	150	N	7	7	10	N	N	N	30
14	do	4	.7	*0.15	0.15	M	.07	*.5	7.0	.02	*N	100	2	15	5	20	7	N	N	70
15	do	2.5	10	*.43	.7	7.0	.7	*2.2	M	.07	*N	500	7	50	15	20	7	N	N	700
16	do	4.1	N	*.02	.5	10.0	.7	*.1	M	.15	*N	1500	7	100	15	50	7	N	N	1000
17	do	43	3.0	*.23	.3	M	.5	*2.0	M	.1	*Tr	500	15	30	20	30	15	N	N	50
18	Auger	18	7.0	*.1	.15	M	.3	*3.6	M	.1	*Tr	500	3	70	30	70	15	N	10	70
19	Chip	51	7.0	*.17	.2	7.0	.3	*3.1	M	.2	*0.1	500	30	50	50	70	15	N	10	70
20	do	63	7.0	*.08	.15	7.0	.3	*1.0	M	.3	*N	500	7	20	30	50	15	N	10	50
21	do	43	7.0	*.08	.2	7.0	.5	*.5	M	.2	*N	300	3	15	30	30	10	N	10	30
22	Auger	7.5	10	N	.07	M	.15	.2	M	.07	.7	300	10	15	15	50	10	5	N	30
23	Chip	4	3.0	N	.03	M	.03	.2	3.0	.03	.7	70	7	10	7	20	10	10	N	15
24	do	6	3.0	*.12	.2	M	.15	*.8	5.0	.07	*N	20	10	30	10	70	15	10	N	15
25	do	13	7.0	*.12	.07	7.0	.15	*.6	M	.3	*N	100	7	15	30	50	15	7	15	20
26	Auger	3.5	5.0	*.03	.015	5.0	.3	*1.0	M	N	*N	500	3	7	20	20	15	N	10	15
27	Chip	65	7.0	*.13	.1	7.0	.3	*1.1	M	N	*N	300	3	15	30	30	15	N	10	30
28	do	65	3.0	N	M	7.0	10	.07	10.0	.007	N	50	N	N	7	7	7	N	N	5

Sample No.	Sample Type	Length (feet)	Pb	Sb	Zr	V	Ce	La	Y	Nd	Pr	Yb	Sm	Ge	Dy	Ho	Er	Lu	Percent: Total rare-earths
			Parts per million — Continued																
1	Chip	70	N	N	30	7	N	N	N	N	N	N	N	N	N	N	N	N	N
2	do	50	N	N	15	7	N	N	N	N	N	N	N	N	N	N	N	N	N
3	do	50	N	N	20	7	N	N	N	N	N	N	N	N	N	N	N	N	N
4	dp	2.3	15	N	80	15	N	N	15	N	N	1.5	N	N	N	N	N	N	0.002
5	do	4	N	N	20	N	N	N	N	N	N	N	N	N	N	N	N	N	N
6	do	50	150	N	100	10	N	N	7	N	N	N	N	N	N	N	N	N	.0007
7	do	2	N	N	300	20	N	N	15	N	N	1.5	N	N	N	N	N	N	.002
8	do	50	N	N	70	15	N	N	15	N	N	1.5	N	N	N	N	N	N	.002
9	do	50	N	N	20	N	N	N	N	N	N	N	N	N	N	N	N	N	N
10	do	50	N	N	50	N	N	N	N	N	N	N	N	N	N	N	N	N	N
11	do	50	N	N	15	N	N	N	N	N	N	N	N	N	N	N	N	N	N
12	do	50	N	N	50	N	N	N	N	N	N	N	N	N	N	N	N	N	N
13	do	1.5	N	N	200	N	N	N	15	N	N	1.5	N	N	N	N	N	N	.002
14	do	4	N	150	50	N	N	N	15	N	N	10	N	N	N	N	N	70	.009
15	do	2.5	N	N	150	10	100	70	100	100	N	10	N	N	N	N	N	N	.04
16	do	4.1	N	150	150	15	N	30	100	N	N	10	N	N	N	N	N	70	.02
17	do	43	N	N	100	10	1000	1500	500	700	300	30	150	150	N	N	N	70	.44
18	Auger	18	N	N	100	30	2000	300	70	300	N	7	N	N	N	N	N	N	.27
19	Chip	51	N	N	200	20	1500	5000	1000	5000	1000	50	700	500	30	50	100	70	1.50
20	do	63	N	N	300	30	700	500	200	300	N	10	N	70	N	N	N	70	.19
21	do	43	N	N	300	30	700	300	100	300	N	7	N	N	N	N	N	70	.15
22	Auger	7.5	N	N	100	10	1500	700	200	700	150	15	150	100	N	N	N	70	.36
23	Chip	4	N	N	50	N	300	100	50	100	N	5	N	N	N	N	N	100	.07
24	do	6	N	N	100	N	700	150	100	150	N	10	N	N	N	N	N	100	.12
25	do	13	10	N	200	30	200	150	70	150	N	7	N	N	N	N	N	70	.06
26	Auger	3.5	20	0.2	300	15	300	150	50	150	N	5	N	N	N	N	N	N	.07
27	Chip	65	N	0.3	200	20	300	150	50	150	N	5	N	N	N	N	N	N	.07
28	do	65	20	N	100	7	N	N	N	N	N	N	N	N	N	N	N	N	N

mineralogical studies, differ slightly from more extensive samples taken for mineral-resource evaluation purposes. The two groups of samples differ noticeably in average cerium and lanthanum content (table 4).

TABLE 4. — *Rare-earth composition and distribution, Monumental Summit prospect*

Element and symbol[1]	Average distribution of rare-earth elements[2] (percent)	Average content of shear zones (lb per ton)	Total estimated resource in shear zones (lb)
Cerium (Ce)	28.03 (12.82)	2.02	192,000
Lanthanum (La)	27.16 (43.43)	1.96	186,000
Neodymium (Nd)	24.09 (26.72)	1.73	164,000
Yttrium (Y)	7.95 (4.38)	.57	54,000
Praseodymium (Pr)	4.23 (5.96)	.30	29,000
Samarium (Sm)	2.92 (3.16)	.21	20,000
Gadolinium (Gd)	2.39 (2.16)	.17	16,000
Lutetium (Lu)	2.22 ([3])	.16	15,000
Ytterbium (Yb)	.48 (.23)	.04	4,000
Erbium (Er)	.29 ([3])	.02	2,000
Holmium (Ho)	.15 (.16)	.01	1,000
Dysprosium (Dy)	.09 (1.26)	.01	1,000
Europium (Eu)	[3] (.27)	----	-----
Thulium (Tm)	[3] ([3])	----	-----
Total	100.00 -----	7.2	684,000

[1]Current commercial usage of the term "rare-earth elements" includes the elements listed.
[2]Figures in parentheses are based on the average composition of 10 samples, taken by Adams (1968, p. 50) for analytical and mineralogical studies.
[3]Probably present, but below the detection limits of 50 ppm for thulium and 100 ppm for lutetium and erbium.

Spectrographic analyses show the content of several other metals, such as arsenic, manganese, iron, and zinc, to be much higher in the shear zones than in the adjacent calcareous rocks. Samples from the rare-earth shear zones also contained considerably more silica and barium and much less calcium and magnesium than those from the surrounding calcareous rocks. Adams (1968, p. 51) assumed that the rhabdophane is an alteration product of some preexisting rare-earth mineral and speculated that it was formed during the same hydrothermal activity that introduced the other metals.

Estimated tonnage for the rare-earth shear zone, exposed by the roadcut, is 45,000 tons averaging 0.54 percent combined rare-earth metals. The inferred rare-earth shear zone east of the roadcut is covered by soil and is poorly exposed by pits and auger holes. About 50,000 tons containing 0.19 percent rare-earth metals is estimated for that area. Total resources are estimated at 95,000 tons averaging 7.2 pounds rare-earth elements per ton. Shear-zone material also contains about 1.2 percent manganese which might be recoverable as a byproduct. Judging from present resource estimates and the anticipated high cost of beneficiation and recovery of the rare-earth compounds, the deposit cannot now be mined profitably.

MISCELLANEOUS LODE PROSPECTS

Small prospect pits and adits are scattered throughout the Thunder Mountain district. Most of them were dug during the Thunder Mountain boom in the early 1900's, and bedrock is not exposed because nearly all of them are caved or sloughed. The prospects are in Challis Volcanics, and those less than 1¼ miles from Thunder Mountain have a good potential for discovery of gold resources.

Eight prospects — Cheapman-Wanderer, Jumbo, Short Line, Bullion, Hurricane Eagle, Bill Timm, Tempiute, and Cumberland (fig. 17, Nos. 1, 12, 14, 32, 33, 37, 43, and 54) — appear to be underlain by rocks similar to those at the Dewey mine. Overburden is extensive at all the prospects, sometimes tens of feet thick. Except for a 220-foot-long adit at the Cheapman-Wanderer group, old workings are caved; most samples were taken from the various dumps. Few contained more than a trace gold or silver.

Spectrographic analyses revealed trace amounts of molybdenum and copper in a few samples. Highest concentrations of molybdenum (0.018 percent) were in a sample of rhyolite tuff at the Climax prospect (fig. 17, No. 34). Highest copper values (0.02 and 0.05 percent) were in two dump samples of carbonaceous volcanic sediments taken at the Bullion prospect.

In the northeastern part of the district two selected samples of highly iron-stained rhyolite sorted from the dumps of the Pearl prospect (fig. 17, No. 3) assayed 0.02 and 0.11 ounce gold per ton, and a grab of dump material from the Consolidation prospect (fig. 17, No. 2) assayed 0.01 ounce gold per ton.

Gold was detected in samples from the Red Bird (fig. 17, No. 19) and Ethal B. (fig. 17, No. 17) prospects near Lightning Peak. Most dump samples from the Red Bird assayed a trace to 0.02 ounce gold per ton. One sample contained 0.09 ounce gold and 1.45 ounces silver per ton; it consisted of purple and greenish-gray rhyolite porphyry showing quartz veinlets less than 1 inch wide and considerable iron stain. No sulfide minerals were observed. The only bedrock exposed on the Red Bird property consists of greenish-gray rhyolite porphyry; a sample from the exposure assayed a trace gold and 0.06 ounce silver per ton. A sample of iron-stained, silicified, and brecciated rhyolite sorted from the dump of a small pit at the Ethal B. prospect contained 0.06 ounce gold and 0.4 ounce silver per ton.

In the Safety Creek area, prospects are along zones of fracturing, silicification, and iron staining. Recently a few erratic gold assays were obtained from white or bleached zones near the head of Safety Creek. Numerous claims were staked during the summers of 1967 and 1968 before the gold assays were labeled as erroneous. Systematic surface sampling of the white zones revealed no more than trace amounts of gold. Molybdenum Corp. of America diamond drilled a "white zone" near the head of Safety Creek in 1968 and reported no economic mineralization. The best-developed lode prospect in the area was recently relocated as the Bold Ruler (fig. 17, No. 7). Assay results obtained from samples of iron-stained silicified rhyolite contained no more than 0.02 ounce gold and 0.13 ounce silver per ton. Only the Bold Ruler prospect appears to have a potential for mineral discovery, and surface exposures there are far below economic grade.

Geodes of low-quality lapidary material occur in the vicinity of the Panhandle group of claims (fig. 17, No. 64) about 1¼ miles north of Rain-

TABLE 5. — *Summary of miscellaneous small lode prospects in the Thunder Mountain district*

[Tr, trace]

Prospect		Development work	Samples collected		Range of values	
No. (fig. 17)	Name		No.	Type	Gold (oz per ton)	Silver (oz per ton)
1	Cheapman-Wanderer group.	One 220-ft-long adit, one caved adit, 16 discovery pits, and 1 cabin.	5	Bedrock, chip	0 to Tr	0 to Tr
			4	Dump, grab	0 to Tr	0 to Tr
2	Consolidation	One pit	1	do	.01	0
3	Pearl	One 65-ft-long caved adit and 1 pit	2	Dump, select	.02 to 0.11	Tr
4	Lookout Ridge	Three pits	1	Dump, grab	0	0
5	Evenstone	do	3	do	Tr	Tr to 0.2
6	New Hope	One pit	1	Bedrock, chip	Tr	0
7	Bold Ruler group	One open pit 180 by 70 by 20 ft, 2 caved adits, and 7 prospect pits.	4	do	Tr to .02	.05 to .13
			2	Dump, grab	0 to Tr	Tr to .13
8	Safety Creek	Shallow diamond drill holes	5	Bedrock, chip	0 to Tr	0
10	Blanche E	Three caved adits	3	Dump, grab	Tr	.1 to .3
12	Jumbo group	One 50-ft-long caved adit, 4 pits, and 1 trench.	3	do	0	Tr
13	Rising Star	One 72-ft-deep shaft	1	do	Tr	0
14	Short Line group	Two 40- to 60-ft-long caved adits, 3 trenches, and 1 15-ft-deep shaft.	4	do	Tr	0
16	Terrible Teddy	One 100-ft-long adit	1	Bedrock, chip	.01	Tr
17	Ethal B.	One pit	1	Dump, select	.06	.4
18	Cinnamon Bear	One trench	1	Dump, grab	0	0
19	Red Bird group	Eight caved adits and 3 pits	6	do	Tr to .02	Tr to .15
			1	do	.09	1.45
			1	Bedrock, chip	Tr	.06
22	North Fork	One 30-ft-long caved adit and 1 trench	2	do	0	Tr
23	Gold Nugget	do	1	do	0	Tr
24	Morning	One pit	1	do	0	Tr
25	Lark	do	1	do	0	Tr
26	Hold Out	Two pits	1	Dump, grab	0	Tr
27	Little Joe	One trench	1	do	0	Tr
28	Pearl	Two pits	2	do	0	Tr
29	Gold Dike	One caved shaft and 1 trench	2	do	0	Tr
30	Golden Coin group	One 30- to 60-ft-long caved adit, 5 pits, 1 trench, and 2 cabins.	3	do	0 to Tr	0 to Tr
31	Mollie	One 60-ft-long caved adit	1	do	Tr	0
32	Bullion group	Two 40- to 60-ft-long caved adits, 2 pits, and 1 cabin.	4	do	Tr	Tr to .05
33	Hurricane Eagle	One 50- to 60-ft-long caved adit and 1 trench	2	do	Tr	Tr
34	Climax group	One 40-ft-long adit, 1 80-ft-long caved adit, and 5 pits	3	Bedrock, chip	.01	0
35	Golden Giant	One caved adit less than 100 ft long	1	do	Tr	0
36	Big Buck	Two 50- to 70-ft-long caved adits and 8 pits	5	Dump, grab	Tr	0 to .12
37	Bill Timm group	Two 20- to 60-ft-long caved adits, 5 pits, 2 trenches, and 2 cabins.	1	Stockpile, grab	.02	.05
			3	Dump, grav	Tr	.06

Prospect		Development work	Samples collected		Range of values	
No. (fig. 17)	Name		No.	Type	Gold (oz per ton)	Silver (oz per ton)
38	Golden Lode	One 50-ft-long caved adit	1	do	0	0
39	White Oak	One 40-ft-long caved adit, 1 trench, and 1 pit	2	do	0	0
40	Colson	One trench and 1 pit	2	Bedrock, chip	0	0
41	Coone	One pit	1	do	0	0
42	Golden Chimney	One caved adit and 4 pits	5	do	Tr	0 to .08
43	Tempiute group	Four 40- to 100-ft-long caved adits, 1 pit, 1 trench, and 1 cabin.	4	Dump, grab	Tr	.07 to .10
45	Payboy group	Three caved adits less than 100 ft long	3	do	Tr	Tr
46	Lion	One caved shaft	1	Dump, grab	Tr	Tr
47	Minerva group	Two caved adits, 12 pits, and 1 trench	6	do	0	0 to Tr
48	Bluebird	One caved shaft	1	do	Tr	Tr
49	Coone Creek	One pit	1	do	Tr	Tr to .1
50	Good Luck	Two caved adits less than 80 ft long	2	do	0	0
51	Junction	One 40-ft-long caved adit and 1 trench	2	Bedrock, chip	Tr	Tr
52	Roosevelt	One pit	1	Dump, grab	0	0
53	Monumental	do	1	do	0	0
54	Cumberland group	Three 50- to 60-ft-long caved adits, 2 pits, and 1 cabin.	3	do	Tr	Tr
55	Mule Creek	Two trenches and 10 pits	5	do	Tr	Tr
56	Golden Gate	One trench	1	do	0	0
57	Agnes	One 60-ft-long caved adit and 1 cabin	1	do	0	0
58	Phonolite group	Two 40- to 100-ft-long caved adits, 15 pits and trenches, and 1 cabin.	9	do	0 to Tr	0 to .06
59	Trap Creek	Two pits	2	do	0	0
60	Red Bluff group	Four 50- to 80-ft-long caved adits, 2 pits and 2 buildings.	6	Bedrock, chip	0 to Tr	0 to .05
			4	Dump, grab	0 to .02	0 to .1
61	Buckhorn	Two pits	2	do	0	0
62	First National	One pit	1	do	0	0
63	Nice Boy	One trench	1	do	Tr	0
64	Panhandle group	15 pits, and trenches	5	do	0	.05
65	Red Girl	One pit and 1 cabin	1	do	0	0
66	Winter King	One pit	1	Dump, grab	0	0
67	Shoshone	do	1	do	0	0
68	Central	Three pits	3	do	0	0
69	Eldorado group	Seven pits and 1 cabin	3	do	0	0
70	Big Duluth	One caved adit less than 100 ft long and 4 pits	3	do	Tr	0
71	South Fork group	Three caved adits less than 100 ft long and 1 pit	3	do	0	0
72	Telluride	One caved adit less than 100 ft long	1	do	0	0
73	Hermit	One pit	1	do	0	0
74	Leap Year	do	1	do	0	0
75	Twentieth Century group.	One dismantled mill, 4 50- to 70-ft-long caved adits, and 4 pits.	7	do	0 to Tr	0 to Tr
76	Advance	Two 100-ft-long caved adits and 1 cabin	2	do	0 to Tr	Tr to .5
78	Three Mile	One caved adit less than 100 ft long	1	do	0	.05
79	Century	One 60-ft-long caved adit	1	do	Tr	Tr
			2	Bedrock, chip	Tr	Tr

TABLE 5. — *Summary of miscellaneous small lode prospects in the Thunder Mountain district* — Continued

Prospect		Development work	Samples collected		Range of values	
No. (fig. 17)	Name		No.	Type	Gold (oz per ton)	Silver (oz per ton)
80	Doctor	One 50- to 70-ft-long caved adit	1	Dump, grab	Tr	0
81	Dorothy	One pit	1	Bedrock, chip	0	0
82	Boulder Creek	Five pits	1	do	Tr	0
			2	Dump, grab	Tr	0
83	Green Goode	One pit	1	Bedrock, chip	Tr	0
84	Daisy G	One caved adit less than 100 ft long	2	Dump, grab	0	0
85	Daisy	One caved adit about 700 ft long	1	Grab	0	0
86	Pyramid	Two pits	3	Bedrock, chip	0 to Tr	0 to Tr
			3	Dump, grab	0	0
87	Buffalo group	Four caved adits 100-200 ft long, 1 pit, and 2 collapsed cabins.	4	Grab	Tr to 0	0
88	Wonderful	One 15-ft-long adit	1	Shear zone, chip	0	0
89	Confidence	One 50-ft-long caved adit	1	Grab	0	0
90	Eureka	Two pits	3	Chip	Tr to 0	0
91	Independence	Three pits	1	Quartz vein, chip.	Tr	0

bow Peak. The geodes are 2-8 inches in diameter and occur in a reddish rhyolite zone. The zone is exposed for one-third mile along the ridge crest. Geodes are composed of an outer shell of banded purple and white chalcedony surrounding a hollow interior lined with inward-projecting quartz crystals.

High on the ridge between Pyramid and Boulder Creeks, at the Pyramid prospect (fig. 17, No. 86), the iron-stained volcanics are cut by numerous short pinch-and-swell quartz veins. The veins have a maximum width of 4 inches, contain trace amounts of finely disseminated pyrite, and crop out over an area 100 feet long and 50 feet wide. Samples across the zone contain 0.04-0.08 percent zinc, and traces of silver, copper, and lead, but no gold. Most other prospects in the area are covered by 1-6 feet of overburden. Samples of iron-stained rhyolite taken from dumps of caved workings contain no more than a trace gold and 0.5 ounce silver per ton.

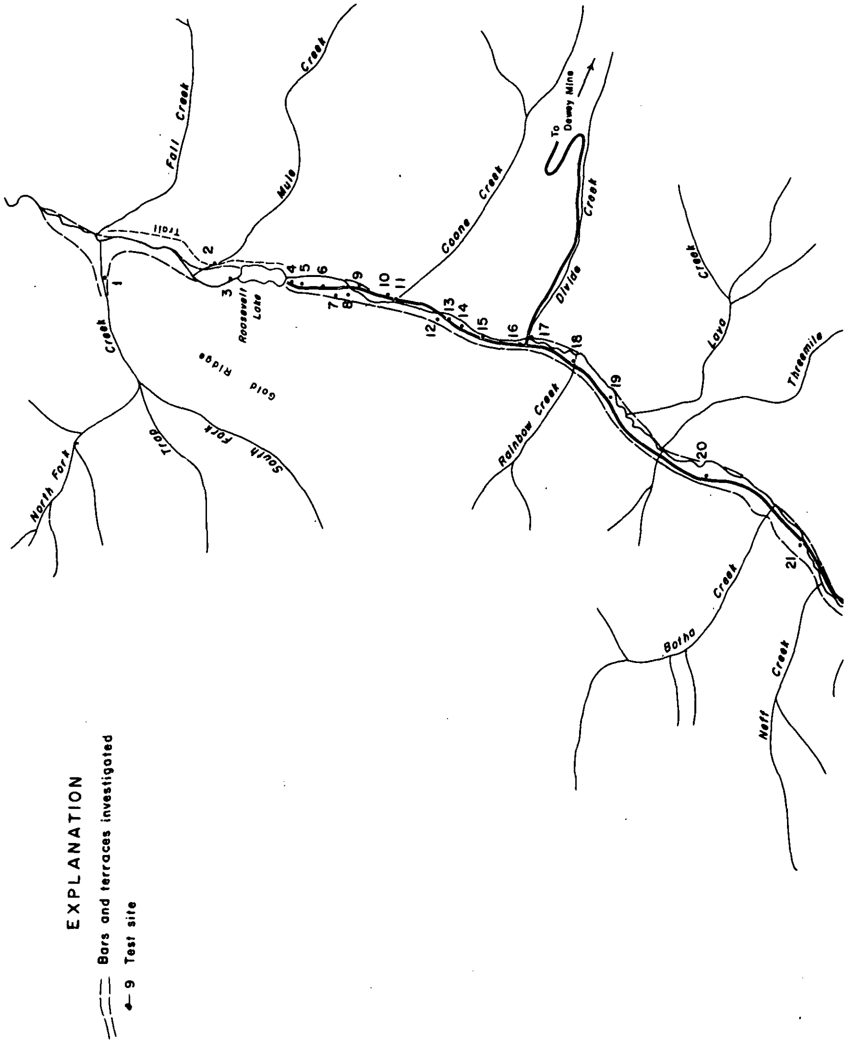
The miscellaneous small prospects in the Thunder Mountain district are listed in table 5.

MONUMENTAL CREEK PLACERS

Most of Thunder Mountain district is drained by Monumental Creek. The 5-mile stretch of the creek with potential placer deposits extends from near the mouth of Pyramid Creek to slightly below the mouth of Trap Creek. Most deposits are covered by dense brush and stands of small conifers up to 1 foot in diameter. All alluvial deposits along this section of the creek were located as placer claims during the Thunder Mountain boom, but none have been relocated in recent years. A few of the placer claims were surveyed for patent in the early 1900's, but no patents were issued. All recorded placer production from the Thunder Mountain district has been credited to sluicing unconsolidated material at the Dewey and Sunnyside mines. A few ounces, however, may have been recovered from Monumental Creek.

Stream gradient along this section of Monumental Creek averages slightly more than 100 feet per mile. Alluvial deposits vary from 100 to 500 feet wide and are estimated to average 20 feet thick. Total alluvium is estimated at 6 million cubic yards. Composition of the alluvium is 95 percent Challis Volcanics and 5 percent combined metasedimentary and granitic rocks. About 5 percent of the subrounded boulders are more than 6 inches across, and 50-60 percent will pass through a 1-inch screen.

Seventy samples were taken from 30 test sites (fig. 28). Gold values ranged from a trace to 6.8 cents per cubic yard and averaged less than 0.7 cent per cubic yard (table 6). Gold values do not increase with depth. Best gold values came from near-surface samples taken at the mouth of Mule Creek and downstream, an indication that the Dewey mine or other Thunder Mountain lodes are the principal sources of placer gold. Particles of placer gold are extremely small, requiring 300-1,000 colors or more to equal a value of 1 cent. Because of the small size of gold particles, the steep


Fall Creek
Mule Creek
Coone Creek
To Dewey Mine
Divide Creek
Lava Creek
Threemile
Trail
Roosevelt Lake
Gold Ridge
Creek
South Fork
North Fork
Rainbow Creek
Botha Creek
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EXPLANATION
Bars and terraces investigated
9 Test site

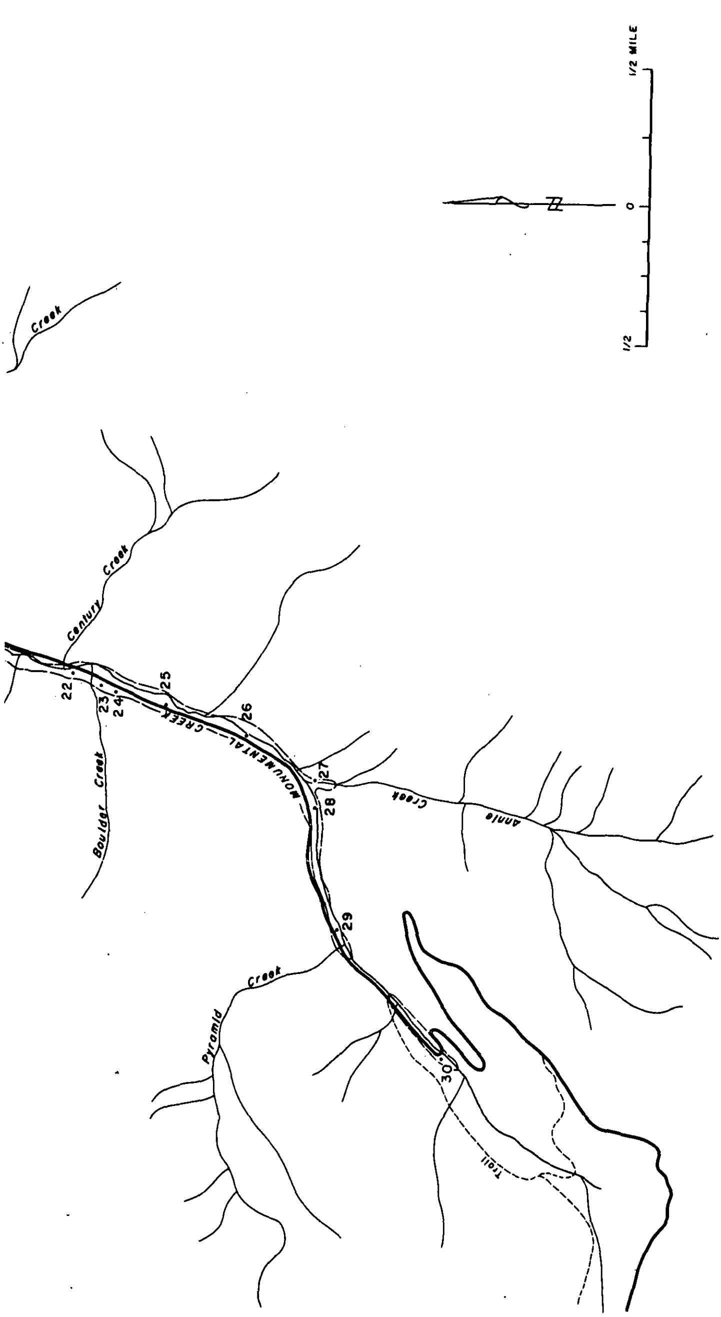


FIGURE 28. — Monumental Creek placer area.

gradient of Monumental Creek and its tributaries, and the heavy spring runoffs, most of the placer gold is probably scattered downstream.

Samples taken from the 30 test sites contained less than 2 pounds of black sand concentrates per cubic yard, which averaged about 35 percent ferromagnesian silicates, 27 percent magnetite, 21 percent ilmenite, 4 percent each anatase and zircon, 3 percent each apatite and hematite, 1 percent tourmaline, less than 1 percent altered pyrite, and less than 0.5 percent each of epidote, rutile, garnet, and topaz.

Placer gold and other valuable heavy detrital minerals do not occur in sufficiently high concentrations to be mined profitably.

TABLE 6. — *Sample data for Monumental Creek placers*

[Sample sites shown in fig. 28. Tr, trace; N.d., not determined; N, not detected]

Site No.	Depth interval (feet)	Sample volume (cu ft)	Gold content		Black sands (lb per cu yd)
			Colors[1]	Value (cents per cu yd)[2]	
1	0- 0.5	0.9	N.d.	Tr	1.5
2	0- .5	.5	N.d.	3.4	2.2
3	0- .5	.8	N.d.	6.8	3.7
4	0- 3	3.0	4f.	Tr	.5
	3- 6	3.0	2f.	Tr	.4
	6- 9	3.0	2v.f.	Tr	.3
5	0- 4	2.0	N.d.	.7	1.0
6	0- 9	12.0	31f.	Tr	.7
7	0- 5	5.3	N.d.	Tr	.5
	5- 6	2.5	N.d.	1.4	1.0
	6- 7.5	1.5	N.d.	Tr	1.4
8	0- 4	5.0	N.d.	Tr	.6
9	0- 3	3.0	2f.	Tr	.3
	3- 6	3.0	9f.	Tr	.5
	6- 9	3.0	20f.	Tr	.7
	9-11	2.0	8f.	Tr	.6
10	0- 3	3.0	1f.	Tr	.5
	3- 6	3.0	3f.	Tr	.4
	6- 9	3.0	5f., 1m.	Tr	.6
	9-11.5	3.0	5f.	Tr	.5
11	0-10	4.0	N.d.	Tr	.8
12	0- 3	3.0	16f.	Tr	.7
	3- 6	3.0	20v.f.	Tr	.7
	6- 8	3.0	20v.f.	Tr	.7
13	0- 5	2.0	N.d.	Tr	1.0
14	1- 6	2.5	N.d.	0.7	1.4
	6- 8	2.0	N.d.	Tr	1.0
15	0- 5	2.5	N.d.	Tr	1.0
16	0- 3	3.0	5v.f.	Tr	.7
	3- 6	3.0	2f.	Tr	.7
	6- 9	3.0	5f.	Tr	.7
	9-11.5	3.0	31v.f.	0.7	.6
17	0- 0.5	2.0	N.d.	0.7	.7
18	0- 6	2.8	N.d.	Tr	.7
19	0- 3	3.0	27v.f.	Tr	.7
	3- 6	3.0	5f.	Tr	.4
	6- 9	3.0	6f.	Tr	.4
	9-10.5	3.0	22v.f.	Tr	.7
20	0- 3	3.0	2v.f.	Tr	.3
	3- 6	3.0	2v.f.	Tr	.4
	6- 9	3.0	6v.f.	Tr	.4
	9-11	3.0	5f.	Tr	.4
21	0- 3	3.0	3v.f.	Tr	.7
	3- 6	3.0	N.d.	Tr	1.4
	6- 9	3.0	16m.	1.4	1.0
	9-11.3	3.0	N.d.	Tr	.8
22	0- 3	3.0	9f.	Tr	1.0
	3- 6	3.0	4v.f., 10f.	Tr	.9

TABLE 6. — *Sample data for Monumental Creek placers* — Continued

Site No.	Depth interval (feet)	Sample volume (cu ft)	Gold content		Black sands (lb per cu yd)
			Colors[1]	Value (cents per cu yd)[2]	
23	0- 5	2.9	N.d.	Tr	0.6
24	0- 4	.3	N.d.	Tr	1.8
25	0- 3	3.0	12v.f.	Tr	.4
	3- 6	3.0	8v.f.	Tr	.7
	6- 9	3.0	14v.f.	Tr	.7
	9-11	3.0	20v.f.	Tr	.8
26	0- 3	3.0	N.d.	N	.1
	3- 6	3.0	N.d.	N	.5
	6- 9	3.0	N.d.	N	.5
27	0- 2.5	1.0	N.d.	Tr	.7
28	0- 3	3.0	N	N	.5
	3- 6	3.0	N	N	.9
	6- 9	3.0	N	N	.5
	9-11.5	3.0	N	N	.5
29	0- 3	3.0	N	N	.6
	3- 6	3.0	2f.	Tr	.5
	6- 9	3.0	1f.	Tr	1.4
	9-11.2	3.0	2f.	Tr	.6
30	0- 3	3.0	N	N	.5
	3- 6	3.0	N	N	.5
	6- 9	3.0	N	N	.4
	9-11.5	3.0	N	N	.4

[1]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300-1,000 colors to equal 1 cent; m. (medium) requires 10-300 colors to equal 1 cent.
[2]Gold values are based on a price of $47.85 per troy ounce.

MARBLE CREEK PLACERS

Potential placer ground along Marble Creek in the Thunder Mountain district extends from the mouth of Sunnyside Creek 2 miles downstream to the mouth of Cornish Creek (fig. 17, No. 9). The total area underlain by alluvial deposits is estimated to be 54 acres. The area has sparse cover of brush and small trees. Valley County records indicate that this section of Marble Creek was blanketed by placer mining claims during the Thunder Mountain boom, but there is no recorded production. The remains of several old cabins were observed less than one-fourth mile south from the mouth of Sunnyside Creek.

Stream gradient is about 100 feet per mile. Alluvial deposits, derived entirely from the Challis Volcanics, average about 150 feet in width and 10 feet in depth. Five percent of the material is larger than 1 foot in diameter and 60-70 percent is less than 1 inch.

Twenty-one samples (table 7) taken from nine test sites (fig. 29) contain no more than a trace of gold and average less than 2 pounds black sand concentrates per cubic yard. No other heavy detrital minerals were found in economic concentrations.

RAMEY RIDGE DISTRICT

As judged from past mining activity, concentration of mining claims, and current prospecting activity, the Ramey Ridge district (fig. 30) is one of the

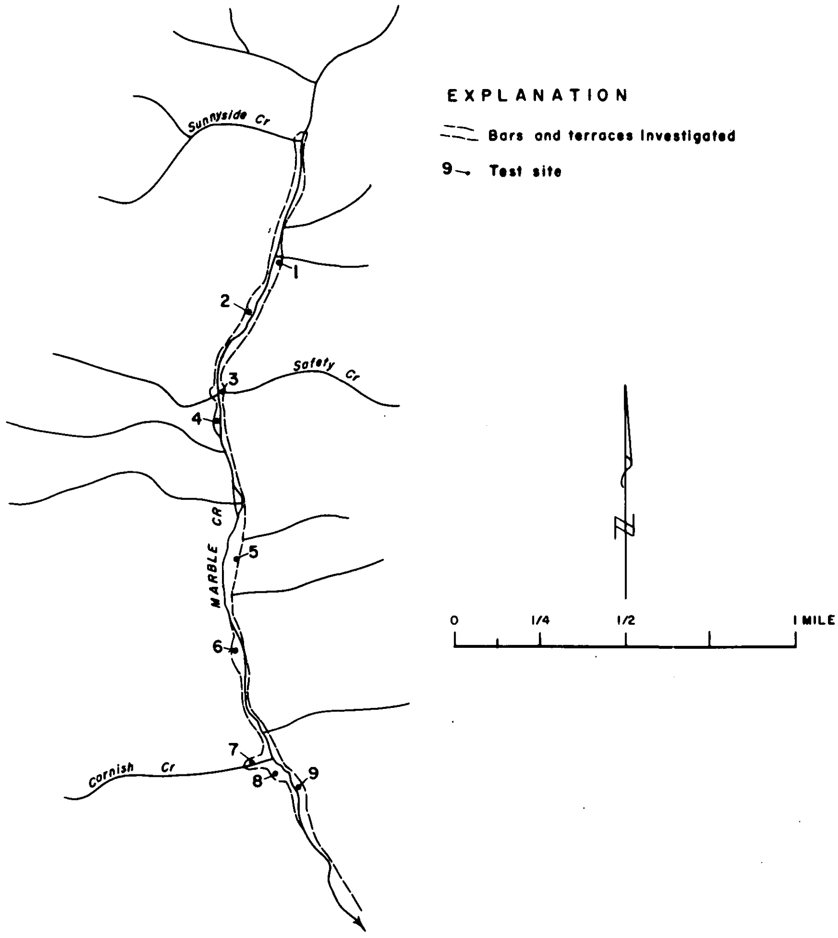


FIGURE 29. — Marble Creek placer area.

most important districts in the Idaho Primitive Area. Significant quantities of gold, silver, copper, and antimony minerals occur at several properties. The district is one of the few in the primitive area that is accessible by road.

Sufficient timber of suitable size is available for mining. Water is generally available in sufficient amounts to support mining operations.

Total recorded metal production (table 8) from the district is $270,063, most of it from the Snowshoe mine (fig. 30, No. 64). The amount of early placer gold production is not known but is thought to have been small. No significant mineral production has been reported since World War II, when the Snowshoe mine was shut down.

Mining in the Ramey Ridge district started in the late 1890's in conjunction with the Thunder Mountain mining boom. Copper Camp (fig. 30, No. 51), located before 1900, is probably the oldest lode prospect in the district.

Later, during the Thunder Mountain boom, the Snowshoe mine was located by the Jensen brothers. The property, now known as the Orofino (fig. 30, No. 36), was discovered by T. G. Thomas in 1906 (Shenon and Ross, 1936, p. 31).

County records indicate that lode mining claims were staked as early as 1890 in the vicinity of Copper Camp. The period 1902-07 was one of intensive claim staking, and nearly all the mineralized areas described in this section of the report were originally located prior to 1912. Most of the recent activity has been at the Snowshoe mine area on Crooked Creek, the Copper Camp and Golden Bear properties adjacent to Big Creek, and the Orofino mine on Ramey Ridge (fig. 30, Nos. 64, 51, 59, and 36). Placers were apparently worked in the late 1800's or early 1900's, primarily confined to the Beaver Creek area near the mouth of Hand Creek. Courthouse records indicate that approximately 600 mining claims, or groups of claims, have been located in the Ramey Ridge district during the past 80 years. Many of these are actually relocations of older claims, even though the names are different and their location descriptions do not exactly agree.

A diamond drilling program was started at Copper Camp in the fall of 1969 and continued through the summer of 1971. Other recent activity in the district has been mainly assessment work.

Lode deposits of the district are primarily fissure-filling quartz veins, with minor alteration and replacement of wallrock. Aside from the magnetite veins at Copper Camp, the lode deposits are all rather similar. Most are lenticular bodies of vein quartz, rarely over 3 feet wide, valued chiefly for their gold and silver content. Pyrite is the dominant sulfide mineral; chalcopyrite, galena, or stibnite is the principal ore mineral at some lodes.

TABLE 7. — *Sample data for Marble Creek placers*

[Sample sites shown in fig. 29. Tr, trace; N, not detected]

Site No.	Depth interval (feet)	Sample volume (cu ft)	Gold content		Black sands (lb per cu yd)
			Colors[1]	Value (cents per cu yd)[2]	
1	0.0- 3.3	3.3	9f.	Tr	1.4
	3.3- 5.1	1.8	3v.f.	Tr	1.3
	5.1- 6.7	1.6	8v.f.	Tr	1.5
2	0.0- 3.2	3.2	7f.	Tr	1.6
	3.2- 6.2	3.0	15f.	Tr	1.2
	6.2-10.0	3.8	3f.	Tr	.9
3	0.0- 2.7	2.7	1f.	Tr	.7
	2.7- 4.3	1.6	2v.f.	Tr	.7
	4.3- 6.3	2.0	Tr	Tr	.7
4	0.0- 3.6	3.6	N	N	.5
	3.6- 6.3	2.7	N	N	.5
	6.3- 9.0	2.7	N	N	.4
5	0.0- 4.3	4.3	3v.f.	Tr	1.1
6	0.0- 3.6	3.6	4f.	Tr	.7
7	0.0- 2.9	2.9	1f.	Tr	.3
	2.9- 5.6	2.7	4f.	Tr	.3
8	0.0- 1.6	1.6	3f.	Tr	.3
	1.6- 5.3	3.7	2v.f.	Tr	.3
	5.3- 9.4	4.1	18v.f.	Tr	.4
9	0.0- 2.0	2.0	2f.	Tr	.4
	2.0- 4.7	2.7	18v.f.	Tr	.8

[1]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300-1,000 colors to equal 1 cent.
[2]Gold values are based on a price of $47.85 per troy ounce.

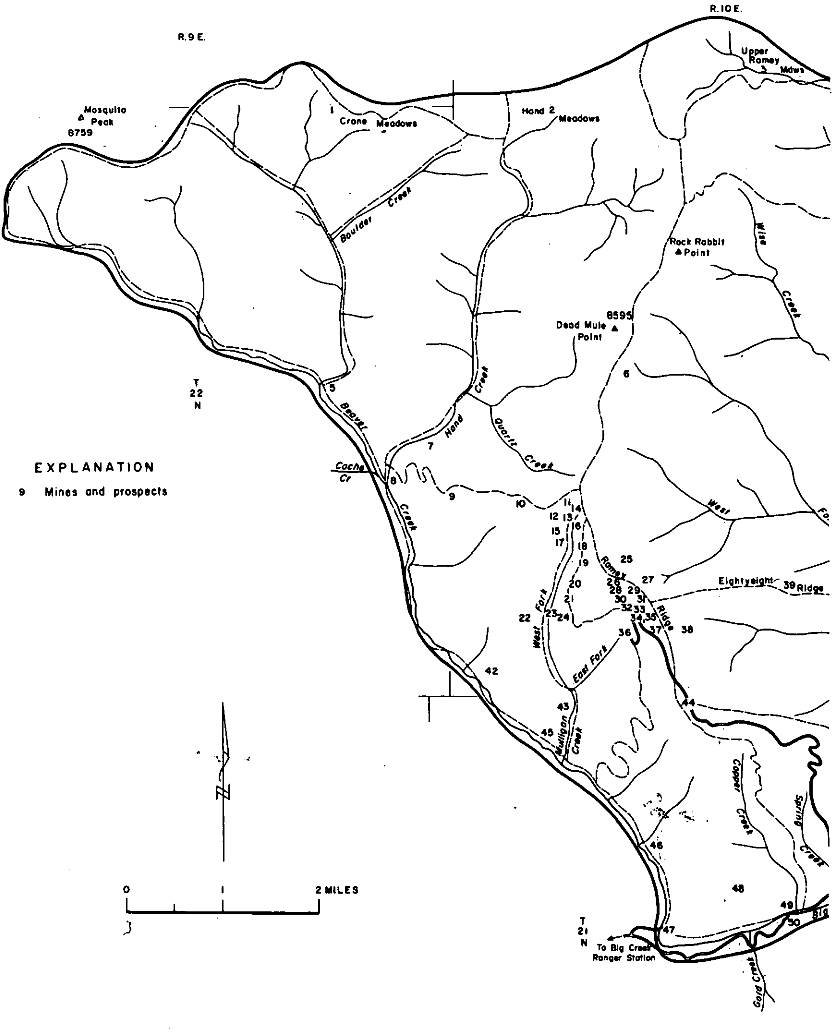
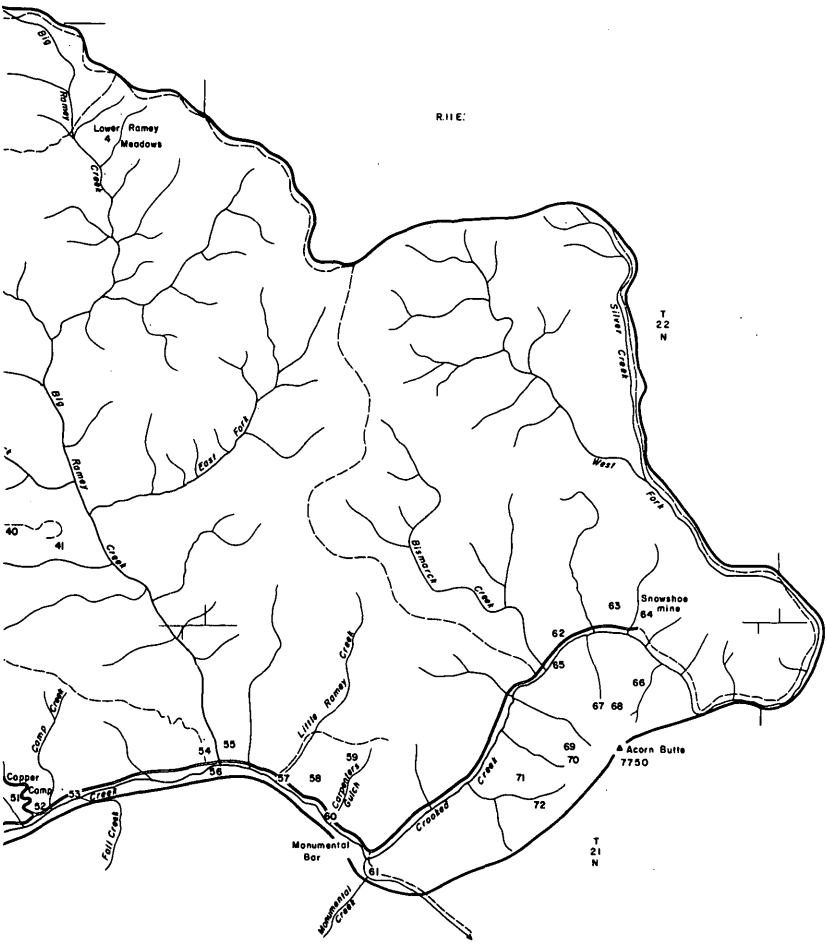


FIGURE 30. — Mines and prospects,

Mines and prospects shown in figure 30

1. Crane Meadows placer
2. Hand Meadows placer
3. Upper Ramey Meadows placer
4. Lower Ramey Meadows placer
5. Boulder Creek placer
6. Colorado claim
7. Hand Creek placer
8. Beaver Creek basin
9. Gold Dollar group
10. Mohawk group
11. Luzon claim
12. Valley View claim
13. Gold Bug Cabin prospect
14. Lewiston Fraction claim
15. Badger claim
16. Gold Bug prospect
17. Happy Jack prospect
18. Gold Slide group
19. Pharmacist claim
20. Gold Reef group
21. Mother Lode prospect
22. Beaver Ridge prospect
23. Mahan group
24. Little Gem No. 7 claim
25. Portland prospect
26. Avenger prospect
27. North Mildred claim
28. Protection claim
29. Goldfield group
30. Florence "A" group
31. B. J. prospect
32. Ajax group
33. Paymaster prospect
34. Submarine claim
35. Gold Crown group
36. Orofino mine



Ramey Ridge district.

Mines and prospects shown in figure 30 — Continued

37. Schley No. 3 group
38. Virginia group
39. Betty Jane claim
40. Gold Bug Nos. 1-4 prospect
41. Gold Bug No. 5 prospect
42. Wild West group
43. Mulligan group
44. Lucky Strike claim
45. Sulfide prospect
46. Last Chance claim
47. Beaver Creek placer
48. Gold King group
49. Copper Creek placer
50. Crossing Bar placer
51. Copper Camp mine
52. Copper Camp Flat placer
53. Fall Creek placer
54. Big Sunflower claim
55. Black and White prospect
56. Big Ramey Creek placer
57. Little Ramey Creek placer
58. Sunlight group
59. Golden Bear group
60. Carpenters Gulch placer
61. Monumental Bar placer
62. Yellow Jacket group
63. Idaho-Rainbow group
64. Snowshoe mine
65. Crooked Creek placer
66. Galena prospect
67. Acorn Butte No. 1 prospect
68. Acorn Butte No. 2 prospect
69. Silver Dome claim
70. Acorn Butte No. 3 prospect
71. Acorn Butte No. 4 prospect
72. Brown Bear prospect

TABLE 8. — *Recorded metal production, Ramey Ridge district, 1913-47*

[From U.S. Bur. Mines records]

Year	Tons of ore	Gold		Silver		Copper		Lead		Property
		ounces	value	ounces	value	pounds	value	pounds	value	
1913	87	29.81	$616.71	8	$ $4.83	----	----	----	----	Unknown.
1914	20	11.32	233.98	7	3.87	----	----	----	----	Do.
1916	22	24.96	515.92	5	3.29	----	----	----	----	Snowshoe.
1917	30	24.68	510.14	6	4.94	----	----	----	----	Do.
1918	12	14.51	299.92	7	7.00	----	----	----	----	Do.
1924	1	5.03	103.97	15	10.05	----	----	----	----	Unknown.
1926	1	.81	16.74	----	----	----	----	----	----	Mahan.
1932	54	55.22	1,880.79	26	27.16	----	----	----	----	Three unnamed prospects.
1935	250	128.60	4,501.00	334	240.05	3,530	$292.99	150	$6.00	Snowshoe.
1936[1]	----	----	----	----	----	----	----	----	----	Do.
1937	2,400	611.00	21,385.00	2,159	1,669.97	12,025	1,455.03	2,678	158.00	Do.
1938	5,238	2,298.00	80,430.00	9,086	3,933.99	74,350	7,286.30	11,575	532.45	Do.
	4	19.00	665.00	3	2.03	----	----	----	----	Orofino.[2]
1939	4,125	1,603.00	56,105.00	2,900	1,968.23	22,200	2,308.80	3,253	152.89	Snowshoe.
	5	26.00	910.00	10	6.75	----	----	----	----	Orofino.[2]
1940	1,137	402.00	14,070.00	509	361.90	5,270	595.51	----	----	Snowshoe.
	3	17.00	595.00	11	7.82	----	----	----	----	Orofino.[2]
1941	2,500	816.00	28,560.00	771	548.18	6,600	778.80	----	----	Snowshoe.
	51	15.00	525.00	9	6.39	----	----	----	----	Orofino[2] and Idaho(?).
1942	3,000	825.00	28,875.00	219	155.71	1,123	136.49	----	----	Snowshoe.
1943	1,170	187.00	6,545.00	27	19.20	----	----	----	----	Do.
1947	1	1.0	35.00	----	----	----	----	----	----	Orofino.[2]
Total	20,103	7,114.94	$247,378.63	16,112	$8,981.36	125,098	$12,853.92	17,656	$849.34	

[1]Some production but amount not reported.
[2]Known as the Estep mine at the time of production.

Major rock units of the district, all Precambrian, are Hoodoo Quartzite, Yellowjacket Formation, and a syenite-gabbro intrusive, the Ramey Ridge Complex. Tertiary dikes varying in composition from rhyolite to lamprophyre are numerous and have a close relationship to ore deposition. All the major rock types served as host rocks for ore mineralization and are cut by Tertiary dikes. Rocks of the Precambrian intrusive complex are the host for numerous small gold-quartz veins on Ramey Ridge, as well as for the better developed gold-bearing veins at the Snowshoe and Orofino mines. At Copper Camp, magnetite-bearing veins with copper minerals occur in quartzite and argillite of the Yellowjacket Formation, as do some of the small gold-quartz veins in the district.

Extensive overburden and vegetation cover are the principal obstacles to prospecting for new lode deposits or extending the district's known lode limits.

Virtually every potential placer site along the major drainages (Beaver Creek, Big Creek, and Crooked Creek) has been claimed. Recorded placer gold production from the district is negligible, and evidence of past placer mining is restricted to a few shallow exploration pits and trenches. All potential placer sites, containing substantial yardage, were sampled for gold and other economic detrital minerals. The average gold value in placer samples taken in the district is less than 1 cent per cubic yard. Only the samples from Monumental Bar contained significant gold values.

Black sand concentrates from placer samples in the Big Creek area contain the highest concentrations of ilmenite in the Idaho Primitive Area, and deposits are a potential titanium resource. Trace amounts of scheelite were found in most placer samples taken along Big Creek. No lode occurrences of scheelite are known in the Ramey Ridge district, but the tungsten occurrences near the head of Smith Creek (Edwardsburg district) may be the source of the scheelite along this section of Big Creek.

Because of their areal geologic and geographic similarities, both lode and placer properties are listed and described by the following general areas: (1) Beaver Creek area, (2) Ramey Ridge area, (3) Big Creek area, and (4) Crooked Creek area.

BEAVER CREEK AREA

Prospects in the Beaver Creek area are easily accessible from the well-maintained Forest Service trails that parallel Beaver and Hand Creeks. They include a few small lode prospects east of Beaver Creek and potential placer "ground" on upper Beaver Creek near the junctions with Hand, Cache, and Boulder Creeks.

Lode deposits consist of quartz veins, a few inches to 5 feet wide, and are exposed for no more than a few hundred feet along their strike. Most veins occur in a Precambrian syenite intrusive complex and are closely associated with Tertiary mafic dikes. They were prospected primarily for gold, but only the antimony-gold-bearing vein at the Mulligan prospect is known to

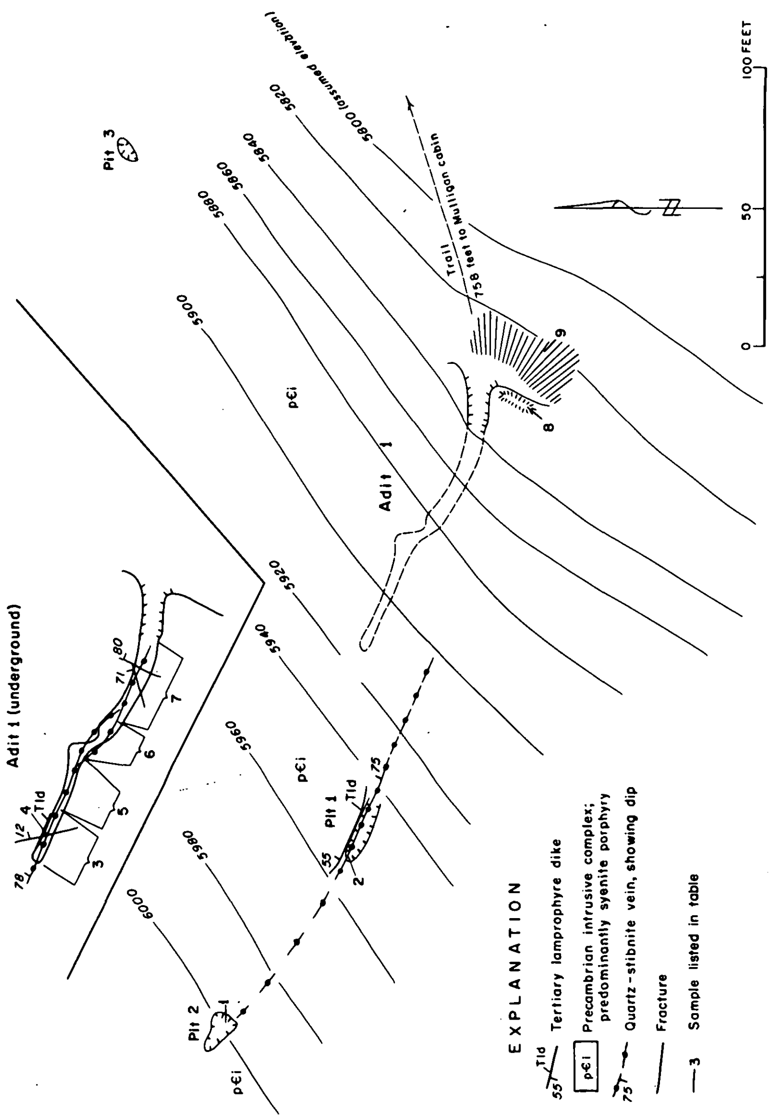


FIGURE 31. — Mulligan group.

contain values of possible economic interest. Extensive overburden covers most of the Beaver Creek area, but considerable quartz float indicates other buried quartz veins or possible extensions of the known exposures.

None of the samples taken from potential placer sites in the Beaver Creek area contained economically minable amounts of gold or other minerals.

MULLIGAN GROUP

The Mulligan group (fig. 30, No. 43) is in the NW¼ sec. 5, T. 21 N., R. 10 E., about one-half mile up Mulligan Creek. County claim records indicate that the prospect was originally located in 1904 by William Banner as the Deer Lodge group. John S. Roberson of Yellow Pine, Idaho, located the property in 1948 and is apparently the present claim owner. There is no record of production, and recent development has been limited to assessment work.

The country rock at the prospect is part of the Precambrian intrusive complex, predominantly syenite porphyry. Fractures are steeply dipping and trend northeast and northwest.

A 90-foot-long adit and small pit (fig. 31) expose a quartz-stibnite fissure vein that strikes N. 60°-70° W. and dips from near vertical to 75° NE. A lamprophyre dike nearly parallels the vein near the face of the adit and cuts the vein exposed in the end of pit 1. The dike strikes approximately N. 45° W. and dips 48° NE

The vein averages 1 foot in width and is exposed to a depth of 6 feet in pit 1 (fig. 32). It is partially zoned; the highest concentration of stibnite occurs as a 3- to 4-inch-wide band through the central part. The vein exposure along the back of the adit varies in width from 0.5 to nearly 3 feet. Mineral composition of the exposed vein varies erratically from 70 to 90 percent quartz, from 5 to 25 percent stibnite, and trace to 5 percent pyrite. The stibnite occurs as massive pods and stringers with some euhedral crystals. Small amounts of assimilated wallrock and gouge occur in parts of the vein. Samples, cut across the full width of the adit to determine average grade of a minable thickness, averaged 0.2 percent antimony, 0.05 ounce gold per ton, and 0.2 ounce silver per ton.

Total resources are estimated to be 3,000-15,000 tons of material with an average grade of 0.1 ounce gold per ton, 0.32 ounce silver per ton, and 1.3

Data for samples shown in figure 31

Sample No.	Sample Type	Locality or length (feet)	Gold (oz per ton)	Silver (oz per ton)	Antimony (percent)
1	Grab	Stockpile	0.03	0.4	13.3
2	Chip	1.3	.03	.4	1.8
3	Random chip	20.0	.13	.4	.4
4	Chip	2.0	.11	.3	.5
5	Random chip	20.0	.11	.3	.1
6	do	20.0	.08	.3	.3
7	do	30.0	.13	.2	2.8
8	Grab	Stockpile	.09	.3	11.9
9	do	Dump	.06	.3	1.0

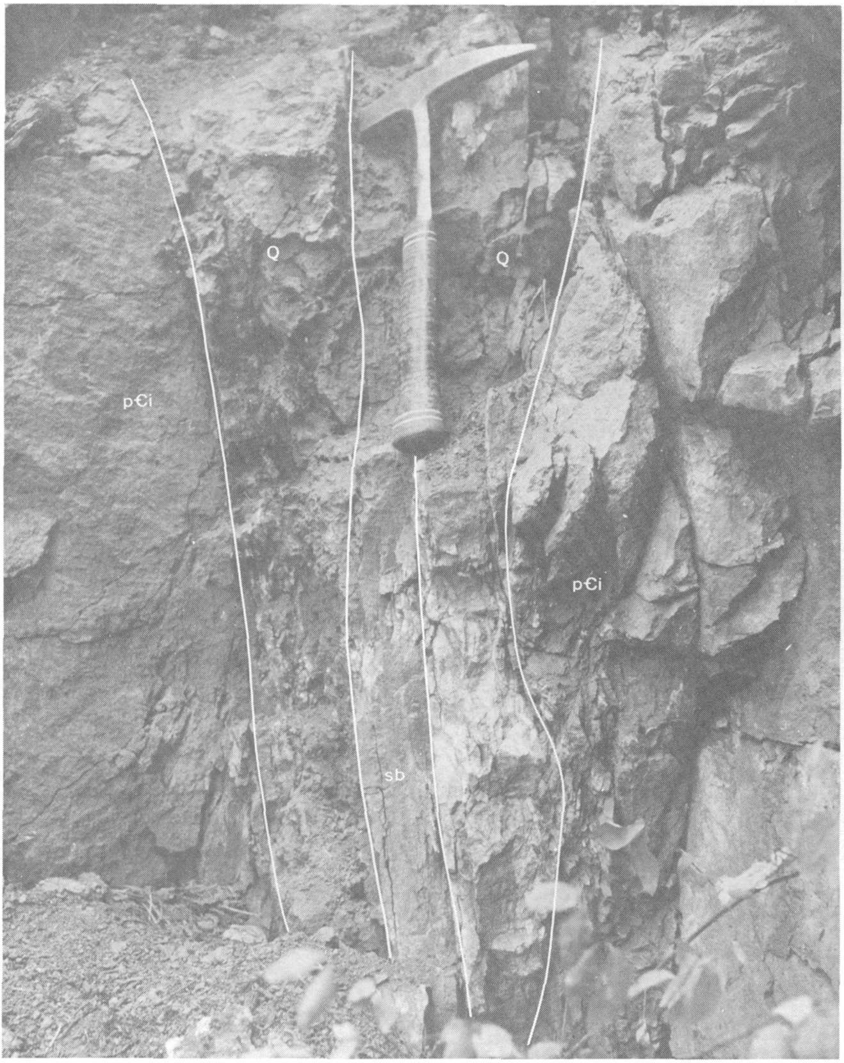


FIGURE 32. — Mulligan group, pit 1, showing massive antimony stringer (sb) in quartz vein (Q). p€i, Precambrian intrusive complex.

percent antimony. Quartz-stibnite float is scarce, even in the immediate area of the known showings. However, the ground between the antimony vein and the strong vein showing at the Sulfide prospect (fig. 30, No. 45), one-half mile to the south, has potential for discovery of additional resources. The antimony-gold deposit is a potential resource.

OTHER LODE PROSPECTS

Sulfide prospect. — The Sulfide prospect (fig. 30, No. 45) was located in

TABLE 9. — *Sample data for Beaver Creek placers*

[Sample sites shown in fig. 33. Tr, trace]

Site No.	Depth interval[1] (feet)	Gold content: Colors[2]	Gold content: Value (cents per cu yd)[3]	Black sands (lb per cu yd)
1	0 -3.2	9f.	Tr	0.9
	3.2-5.8	7f.	Tr	2.0
2	0 -2.8	7f.; 1m.	Tr	4.3
	2.8-5.4	8f.	Tr	7.3
	5.4-6.9	3f.	Tr	3.2
3	0 -2.8	4v.f.; 2m.	Tr	1.7
	2.8-6.5	2f.; 2m.	Tr	1.3
4	0 -3.1	9f.	Tr	1.4
5	0 -1.8	2f.	Tr	1.4
	1.8-5.6	4v.f.	Tr	1.5
	5.6-9.2	2f.	Tr	1.0
6	0 -2.9	25v.f.; 2 f.	1.4	1.4
	2.9-5.3	10f.	Tr	1.2
	5.3-7.5	22f.; 3m.	1.4	2.4
7	0 -3.0	31v.f.; 3m.	.7	1.8
	3.0-6.0	5f.; 1m.	Tr	.6
	6.0-8.8	9f.	Tr	1.0
8	0 -3.3	7f.	Tr	12.5
	3.3-6.5	15f.; 3m.	1.4	14.9
9	0 -2.5	3f.	Tr	10.0
	2.5-5.1	4f.	Tr	13.1
	5.1-7.3	4f.; 1m.	Tr	16.9
10	0 -2.8	3f.	Tr	3.7
	2.8-3.8	0	0	6.2

[1]All samples are 1 cubic foot in volume per foot of depth.
[2]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300-1,000 colors to equal 1 cent; m. (medium) requires 10-300 colors to equal 1 cent.
[3]Gold values based on a price of $47.85 per troy ounce.

1938 by Messrs. Irwin, Roberson, and Chambers. It may now be part of the Mulligan group held by John S. Roberson of Yellow Pine, Idaho. Three parallel quartz veins, 6 inches to 5 feet wide, are partly exposed in and near the main prospect pit. The veins strike N. 30°-50° E. and dip 60°-65° SE. The quartz vein material contains about 5 percent iron oxides (after pyrite) and less than 1 percent pyrite. No economic minerals were observed. The average value of four samples of vein material was only a trace gold, 0.1 ounce silver per ton, a trace molybdenum, and no lead, copper, or antimony.

Several shallow prospect pits were observed between the main prospect pit and the top of the ridge, a distance of a few hundred feet.

Wild West group. — The Wild West group of four unpatented lode claims (fig. 30, No. 42) is currently held by Messrs. Roberson and Kofoed of Yellow Pine, Idaho, and is on the east side of Beaver Creek about 1¼ miles above the mouth of Mulligan Creek. Prospect workings are on a steep southwest-facing slope about 250 feet above Beaver Creek.

Iron-stained quartz veins, stringers, and pods occur as fissure fillings in quartzite and schist of the Yellowjacket Formation at and near the contact with rocks of the Precambrian intrusive complex. The veins strike N. 60°-70° W., dip 30°-50° NE., and contain minor pyrite and trace amounts of chalcopyrite. They have been partly exposed by a few small exploration pits and two adits, 130 and 250 feet long. The best exposures are in the shorter upper adit and a pit at about the same elevation and 75 feet to the southeast. The pit exposure is 16 inches wide and assays 0.01 ounce gold per ton and a trace silver. The upper adit crosscuts a parallel quartz vein, or offset segment of the same vein, that ranges in width from 1.5 to 3 feet, and assays a trace gold, 0.01 ounce silver per ton, and 0.01 percent copper. Only narrow quartz stringers are exposed by the lower adit and prospect pits, and they contain only traces gold, silver, and copper.

Last Chance claim. — The Last Chance claim (fig. 30, No. 46) was staked by John S. Roberson and R. H. Nissoula in 1961 and is located on the east side of Beaver Creek about 1.5 miles north of its junction with Big Creek. Exploration work consists of a 75-foot-long cut paralleling and about 150 feet east of the creek. The high bank of the trench is 6 feet deep and reveals a 50-foot-wide zone of syenite interlaced with quartz veinlets. The veinlets, about one-half inch in average width, generally strike N. 20° E., dip 35°-40° E., and contain a few percent pyrite. Samples taken across the exposure contain only trace amounts gold and silver.

Beaver Creek Placer Area

Beaver Creek is a major tributary of Big Creek. Earliest placer claims were staked along Beaver Creek near the mouths of Hand and Cache Creeks in 1895 by J. M. Hand and associates. Some claims were staked further up Hand Creek and at the mouth of Boulder Creek. About 20 groups of placer claims were located along Beaver Creek during 1899-1903, indicating that a minor gold rush developed after discovery. Few claims were located after 1906, and now there is very little evidence to indicate that the area was mined or prospected.

Most of the early activity was confined to Beaver Creek basin (fig. 30, No. 8), an area along Beaver Creek extending 1½ miles north and one-half mile south from the confluence of Hand Creek with Beaver Creek. North and south of Beaver Creek basin the canyon steepens and narrows, and there are very few places for sizable alluvial deposits to form. Most of the old placer claims and activity in Beaver Creek basin were within a few hundred yards of the mouths of Hand or Cache Creeks. In the present investigation, eight test pits were dug in the immediate area (fig. 33), and two others were dug one-half mile above and three-fourths mile below the mapped area. The test pits, hand dug, averaged 6.6 feet in depth. Gold was found from top to bottom, but no sample contained more than 1.4 cents gold per cubic yard (table 9).

The black sand content of the placer samples averaged 4.65 pounds per cubic yard. Average percentage estimates of the mineral constituents of two black sand concentrates, by petrographic methods, were: 34 percent magnetite, 41 percent ilmenite, 8 percent apatite, 1.5 percent zircon, 0.5 percent epidote, 13 percent ferromagnesian silicates, and traces rutile, garnet, scheelite, allanite, and altered pyrite.

The mapped area contains more than 2 million cubic yards of gravel, and the total alluvium contained in the area of Beaver Creek basin may exceed 4 million cubic yards. No significant gold was found, and the lack of old mine workings indicates that very little was discovered in the past. The deposit is not a potential resource of black sand minerals.

Four 1-cubic-foot near-surface reconnaissance alluvium samples were taken at one-half-mile intervals in the area claimed along lower Hand Creek

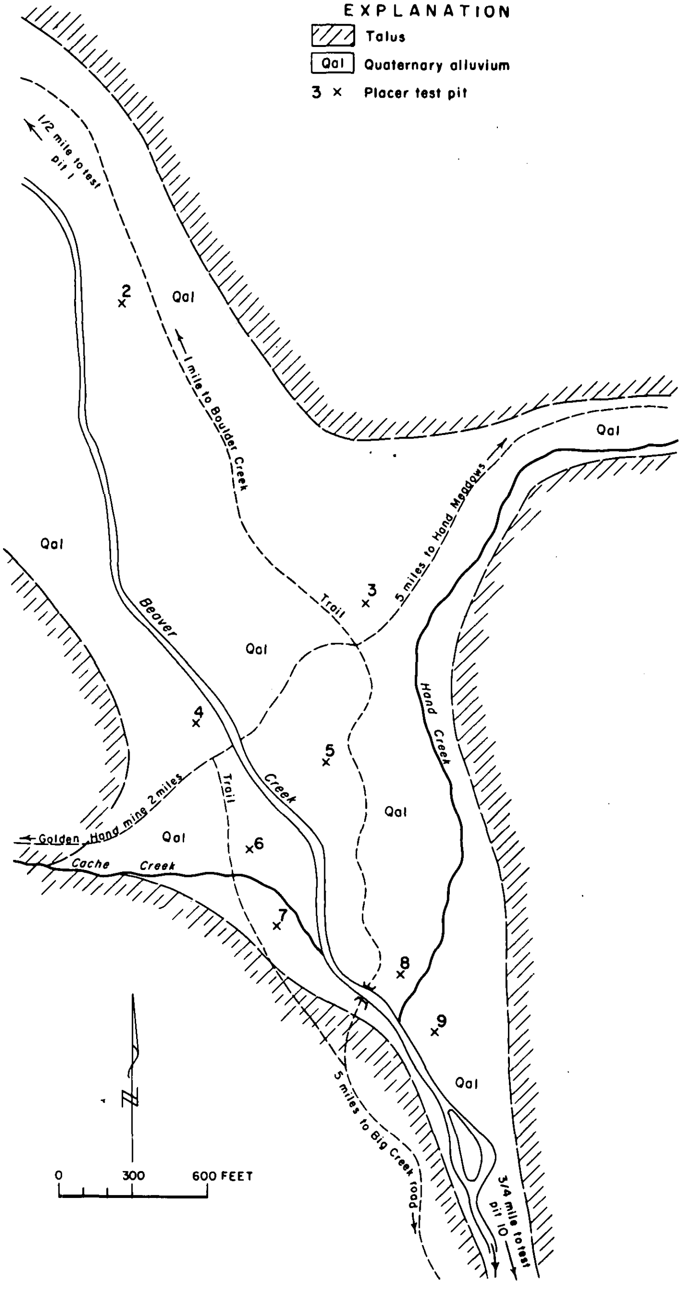


FIGURE 33. — Beaver Creek placer area.

TABLE 10. — *Reconnaissance placer samples from Hand Creek and Boulder Creek*

[Tr, trace]

Depth interval (ft)	Sample volume (cu ft)	Gold content: Colors[1]	Gold content: Value (cents per cu yd)[2]	Black sands (lb per cu yd)	Sample locality
0-1	1.0	1v.f.	Tr	6.3	One-half mile up Hand Creek.
0-1	1.0	3v.f.	Tr	1.0	One mile up Hand Creek.
0-1	1.0	4v.f.	Tr	4.6	1½ miles up Hand Creek.
0-1	1.0	12v.f.; 2m.	0.7	7.6	Two miles up Hand Creek.
0-1	.5	1v.f.	Tr	5.9	At the mouth of Boulder Creek.
0-1	.5	1v.f.	Tr	1.6	One-half mile up Boulder Creek.

[1]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300-1,000 colors to equal 1 cent; m. (medium) requires 10-300 colors to equal 1 cent.
[2]Gold values based on a price of $47.85 per troy ounce.

(fig. 30, No. 7). Two similar ½-cubic-foot samples were taken in the claimed area near the mouth of Boulder Creek (fig. 30, No. 5). None contained significant amounts of gold or other economic minerals (table 10).

RAMEY RIDGE AREA

Ramey Ridge area includes the high mountainous areas bounded roughly by Beaver, Big Ramey, and Big Creeks. Ramey Ridge, the principal topographic feature in the vicinity, extends for several miles in a north-south direction and reaches its maximum elevation of 8,595 feet at Dead Mule Point. Outcrops are few, but quartz-vein float is common in the overburden and talus slopes.

The Ramey Ridge area contains one of the highest concentrations of individual lode mining claims in the Idaho Primitive Area. Most of the past exploration activity was near the headwaters of the East and West Forks of Mulligan Creek. The area was most actively prospected during the years from the early 1900's until the start of World War II.

Small amounts of gold have been produced from two small stamp mills at the Mahan prospect (fig. 30, No. 23) and a ball mill at the Orofino property (fig. 30, No. 36), but reliable production data are not available. Recent activity has been mainly assessment work.

Hundreds of shallow exploration pits and short adits have been dug to better expose quartz veins, to search for the source of quartz float, and to test for possible extensions of known lodes. Most of the old workings are now caved or sloughed with overburden, so mineralogy and structure were inferred from dump sampling and orientation of prospect workings.

Lode deposits in the Ramey Ridge area consist of small discontinuous quartz veins, occurring most frequently in syenite porphyry of the Precambrian intrusive Ramey Ridge Complex or near its contact with quartzite, argillite, and schist of the Yellowjacket Formation. The quartz veins range in width from a few inches to 25 feet and rarely are exposed for more than a few hundred feet along their strikes. Most veins strike northeast, and all dip steeply. Most are stained with iron and manganese oxides and contain a few percent of pyrite and a little chalcopyrite and malachite. Assays as high as

1.7 ounces gold per ton and 14.4 ounces silver per ton were recorded, indicating that high-grade pockets exist. Total potential resources for lodes in the Ramey Ridge area might be a few million tons. Estimated average grade is 0.02-0.09 ounce gold per ton, 0.03-0.11 ounce silver per ton, and trace to 0.15 percent copper. Mineral resources of the Ramey Ridge area are mostly submarginal, but some vein exposures and prospect areas have a potential for the discovery of minable deposits.

Principal lode properties in the area are the Orofino, Mohawk, Mahan, and Beaver Ridge. Several individual prospects, apparently related to a structure referred to as the Little Gem shear zone, may also have production potential.

Placer claims in the Ramey Ridge area are confined to four high mountain meadows. These meadows contain an estimated 13.6 million cubic yards of alluvium. No gold or other economic detrital minerals occur in sufficient concentrations to be a potential mineral resource. Black sand concentrates, uneconomic to recover, average about 5.0 pounds per cubic yard and contain about 10 percent zircon.

Orofino (Estep, Mildred) Mine

The Orofino mine (fig. 30, No. 36) is the most extensively developed prospect in the Ramey Ridge area. It is in sec. 32, T. 22 N., R. 10 E., at the headwaters of the East Fork of Mulligan Creek. Workings are at altitudes ranging from 6,500 to nearly 8,000 feet. The claims are accessible by 5-6 miles of steep four-wheel-drive vehicle road from Copper Camp. This road is normally cleared by mine owners each summer. Total road distance from Big Creek Ranger Station is about 14 miles, but 2 hours' driving time may be required to reach the property when the road is in poor condition.

T. G. Thomas reportedly discovered the deposit in 1906; it was known as the Mildred until relocated by Walter Estep (Shenon and Ross, 1936, p. 31). John Roberson and Guy Kofoed relocated the claims as the Arrastre group in the 1950's and later changed the name to the Orofino group. Ray Nissoula and Lew Morgan are reportedly the latest partners in the mining venture.

The first recorded production was made by T. G. Thomas, who recovered $37 in gold (at $20 an ounce) from a test lot of 1,800 pounds of ore run through an arrastre (Shenon and Ross, 1936, p. 32). During 1938-41 recorded metal production was $2,718 in gold and silver (table 8). Guy Kofoed and Lew Morgan reportedly recovered about 1,000 pounds of concentrates in 1967 by tabling. The ore was apparently sorted from the old dumps and small stockpiles, because little development work has been done in recent years. Presumably, small amounts of ore are periodically processed at a small ball mill on the property.

Country rock consists of coarse-grained syenite and dark-colored argillite, quartzite, and schist. Outcrops are few. Overburden is normally at least a foot deep. Soil and vegetation cover most of the ridgetops, and rock

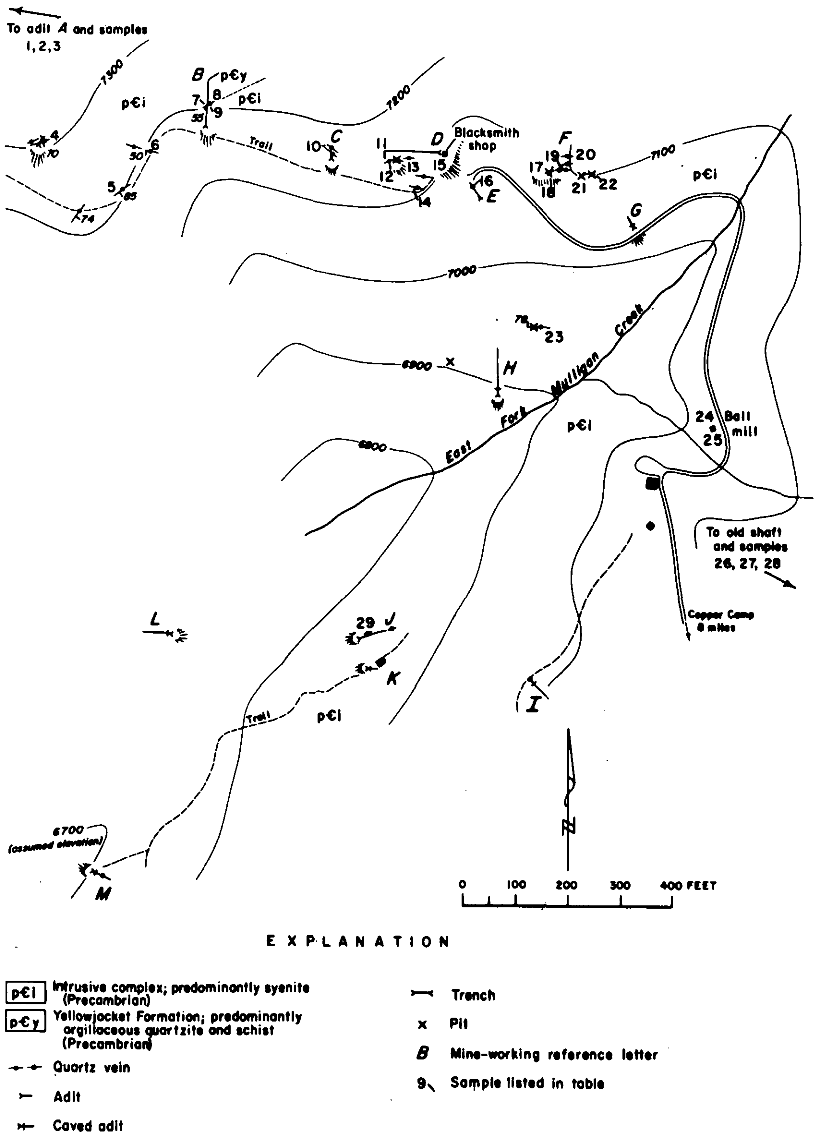


FIGURE 34. — Orofino mine.

talus covers the slopes. Considerable quartz-vein material was observed in talus and landslide rubble. Most of the mine workings are high on the slopes, where overburden is relatively thin and a few outcrops occur.

A system of two or more nearly parallel fracture-filling quartz veins can be inferred for nearly 2,000 feet on the northwest side of the East Fork of Mulligan Creek. The veins follow an east-trending fracture pattern; they

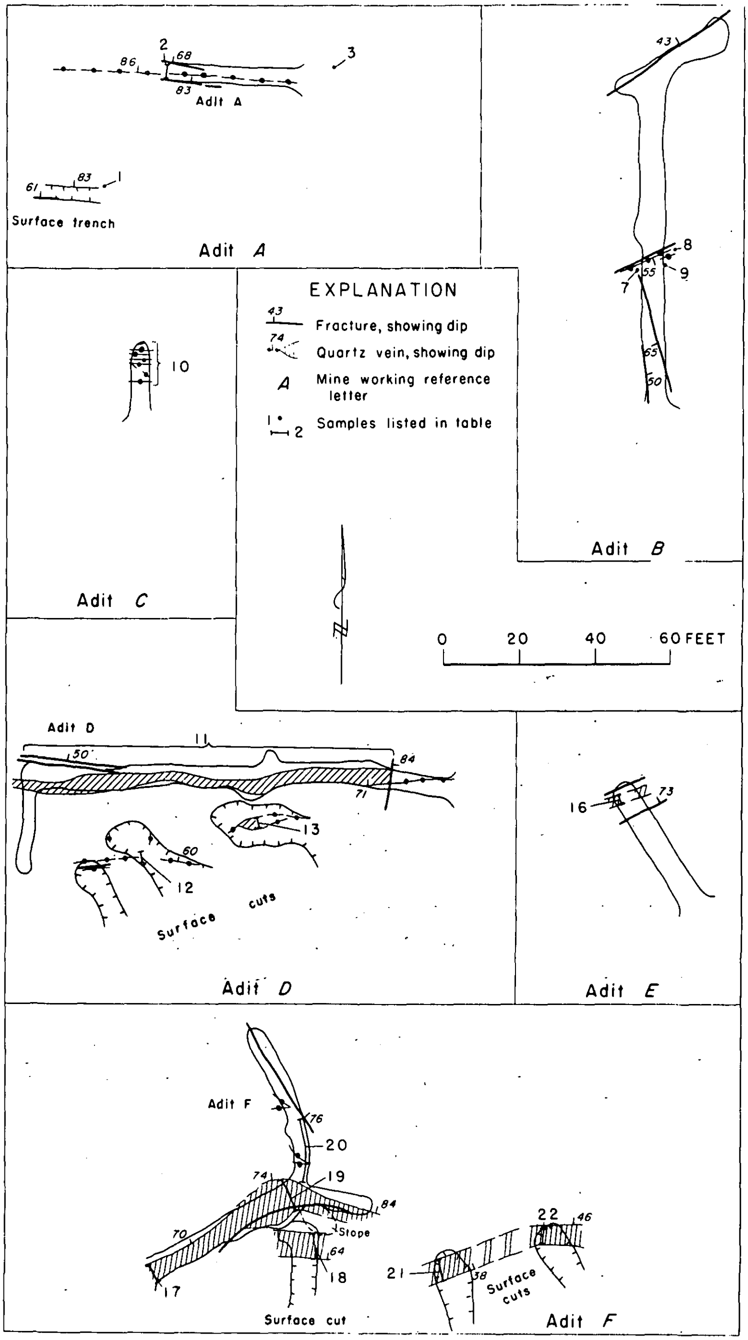


FIGURE 35. — Selected underground workings and surface trenches, Orofino mine. Sample analyses shown in table accompanying figure 34.

Data for samples shown in figures 34 and 35

[Tr, trace; N.d., not determined; N, not detected. Samples 2, 7-13, and 16-22 from underground working or surface cut]

Sample No.	Sample Type	Locality or vein width (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	Grab	Dump	Tr	Tr	N
2	Chip	0.4	0.06	Tr	0.01
3	Grab	Stockpile	Tr	0.15	N
4	Chip	5.0	Tr	.03	N
5	do	4.5	Tr	Tr	.03
6	do	2.5	Tr	Tr	.03
7	do	.5	Tr	Tr	.02
8	do	Dike	Tr	Tr	N
9	do	1.0	Tr	Tr	N
10	do	10.0	Tr	.1	.64
11	Random chip	2.0-4.0	.02	Tr	.05
12	Chip	.6	.34	.7	.23
13	do	3.5	.04	.3	.03
14	do	5.0	.03	Tr	N.d.
15	Grab	Stockpile	.70	.5	.06
16	Chip	2.5	Tr	Tr	.03
17	do	6.0	Tr	.3	N
18	do	6.0	.52	.2	.17
19	do	8.0	.38	.1	.17
20	do	1.0	Tr	.1	.11
21	do	6.0	.02	Tr	.02
22	do	4.7	Tr	Tr	.05
23	do	1.3	.01	Tr	N.d.
24	Grab	Ore bin	.27	Tr	.10
25	do	Concentrate	4.27	1.1	N.d.
26	Chip	.5	Tr	Tr	N.d.
27	do	2.3	.02	.2	N.d.
28	do	4.5	.02	Tr	N.d.
29	do	.5	Tr	Tr	N

pinch and swell varying in thickness from a few inches to more than 8 feet and averaging about 3 feet. The strike is about N. 85° E.; dips are steep. Strikes may vary 20°-30°, and some dips are as gentle as 40°. Veins are not persistently exposed for more than 100 feet along their strikes. They appear to be faulted segments that have been slightly offset by movement along north-trending faults. The principal vein segment is best exposed by adits *D* and *F* (figs. 34 and 35).

The segment of vein exposed by these workings has an inferred length of 500 feet and ranges in width from 1 to at least 8 feet. Samples taken across the exposed parts assayed from a trace to 0.52 ounce gold per ton.

TABLE 11. — *Semiquantitative spectrographic*

[*Sample sites shown in fig. 34. Tr, trace; >, greater than; <, less than; asterisk, *, chemical*

Site	Percent					Parts per million (except as noted)				
	Ca	Fe	Mg	Mn	Ti	Sr	Co	Cr	Mo	Ni
4	0.15	7.0	0.7	0.5	0.5	<50	30	5	15	20
5	.07	1.5	.07	.1	.07	<50	<5	7	<2	7
8	10.00	15.0	1.5	*.5	1.0	150	7	500	7	50
9	.1	2.0	.07	.15	.01	<50	<5	7	<2	3
10	.1	5.0	.1	.03	.03	<50	<5	15	15	2
11	<.05	20.0	.15	.15	.3	<50	5	50	15	30
12	.1	10.0	.7	.1	.5	<50	<5	100	15	20
13	<.05	7.0	.2	.7	.3	<50	5	20	0	7
14	.5	1.5	.03	.02	.02	<50	<5	5	<2	2
15	<.5	2.0	.1	.02	.15	<50	<5	30	10	5
16	3.0	7.0	.7	.5	1.0	50	7	150	<2	15
17	.05	2.0	.15	.07	.07	<50	<5	5	<2	5
18	.05	7.0	.15	.1	.1	<50	30	7	0	20
19	3.0	7.0	.03	>.5	.002	150	50	7	<2	20
20	3.0	5.0	1.5	.3	.3	500	15	5	3	10
21	<.05	2.0	.2	.05	.15	<50	<5	20	7	5
22	1.0	15.0	.7	>.5	1.0	100	30	1000	0	200
24	<.05	1.5	.07	.007	.15	<50	<5	15	<2	3
29	.5	7.0	.1	.3	.3	50	<5	5	10	<2

A similar system of quartz veins can be inferred on the southeast side of the creek, where a few east-trending veins are exposed along an apparent strike length of more than 2,000 feet. An old exploration shaft east of the mapped area (fig. 34) exposes a quartz vein 0.5-4.5 feet wide. Two other veins exposed on the southeast side of the creek are only 0.5 foot wide. Overall grade is estimated at about 0.06 ounce gold per ton, 0.11 ounce silver per ton, and 0.15 percent copper. Anomalous amounts of bismuth (0.05-0.14 percent), tungsten (0.02 and 0.11 percent), and other metals were detected in a few samples taken from quartz veins exposed near adits *D, E,* and *F* (table 11).

Past exploration and development was done mainly by hand methods. Ore in the stockpiles and ore bin is much higher grade than the indicated overall grade for the quartz veins and was probably hand sorted or selectively mined. The ore is not evenly distributed throughout the veins, so a profitable mining operation would depend upon the size of the high-grade zones.

MOHAWK GROUP

The Mohawk property (fig. 30, No. 10) is an enlargement of the Mohawk group of claims mentioned by Shenon and Ross (1936). The original property, plus some additional ground, was restaked as the Gold Pan group in 1931 by E. A. Williams and has been held since 1960 by assessment work of Lew Morgan.

Workings consist of several short caved adits and more than 20 old prospect pits and trenches (fig. 36). Most are in rocks of the syenite-gabbro complex near its contact with Hoodoo Quartzite. Tertiary dikes cut both rock types. Workings below the cabin are along a northeast-trending quartz fissure vein. Most of the other workings are near northwest-trending Tertiary dikes and near the contact between the two major rock types.

analyses of selected samples, Orofino mine

analysis, in percent. Not detected by spectrographic analysis: Pb, Zn, Sb, Sn, As]

Parts per million (except as noted) — Continued										
B	Ba	Be	Bi	Zr	V	La	W	Y	Sc	Ga
10	500	7	30	500	50	30	<100	30	15	30
10	20	2	<10	10	<10	30	<100	5	<5	<10
15	300	15	<10	300	150	50	*Tr	30	70	30
10	15	1	<10	<10	10	20	<100	7	50	<10
10	10	1	50	<10	10	20	<100	5	<5	<10
30	150	5	.05	150	100	20	*.11	30	7	30
20	300	7	<10	300	100	30	*.02	10	10	30
15	150	7	*.13	200	100	20	0	10	5	20
10	20	2	15	50	10	20	<100	5	<5	<10
20	30	5	*.14	15	20	20	<100	<5	<5	<10
30	200	10	*.05	200	100	20	0	10	15	15
20	70	1	100	150	15	20	<100	5	<5	<10
30	70	3	*.14	150	20	20	<100	10	<5	10
15	<10	300	<10	<10	<10	20	<100	30	<5	<10
10	200	10	<10	1000	30	300	<100	200	10	30
10	50	5	10	10	50	<20	<100	5	<5	40
30	*.06	7	<10	700	150	20	<100	50	70	50
20	20	1	100	15	10	20	<100	10	<5	<10
30	700	7	<10	500	30	50	<100	15	7	50

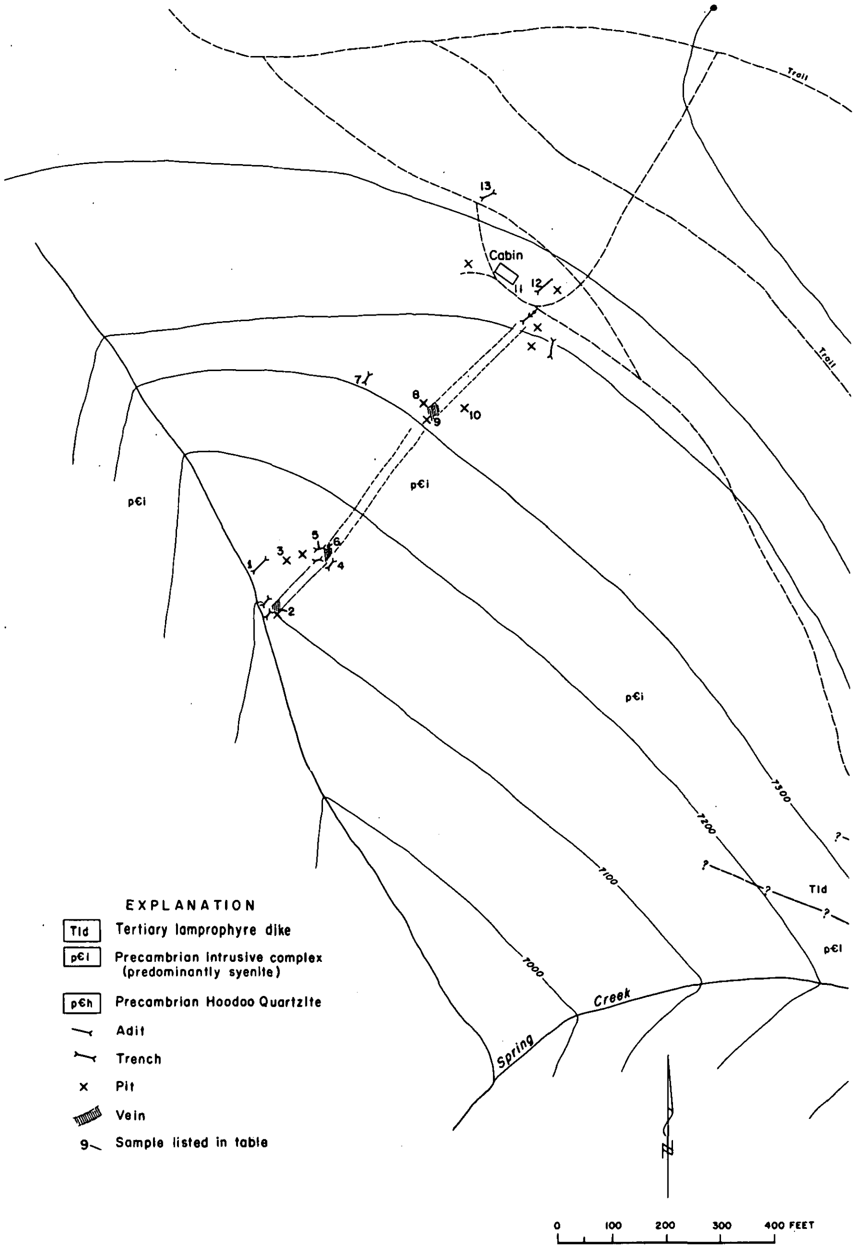


FIGURE 36. — Mohawk group.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36
Tld
37
38
32
p€i
39
40
41
43
42
p€h
p€i
p€h
7700
7800 (assumed)
7600
7500
7400
Trail
p€i
p€h
85
85
Tld
44
p€h
p€h
p€i
46
47
45
48

Data for samples shown in figure 36

[Tr, trace; N, not detected]

Sample No.	Sample Type	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	Grab (altered syenite)	N	N	Tr
2	Chip (quartz vein)	0.05	N	Tr
3	Grab (quartz)	.06	N	Tr
4	Chip (quartz vein)	.02	0.05	Tr
5	Chip (wallrock)	Tr	N	N
6	Grab (dump)	Tr	N	Tr
7	do	Tr	N	Tr
8	Chip (syenite)	Tr	N	0.02
9	Chip (quartz vein)	.01	.05	.02
10	Grab (syenite)	N	N	Tr
11	Grab (high-grade)	3.35	1.77	1.59
12	Chip (wallrock)	N	N	N
13	Grab (dump)	Tr	N	Tr
14	Chip (dike)	N	N	Tr
15	Grab (dump)	N	N	Tr
16	do	Tr	N	Tr
17	do	Tr	N	Tr
18	do	N	N	N
19	Grab (syenite)	Tr	N	Tr
20	Grab (dump)	.02	N	Tr
21	do	N	N	N
22	Chip (dike)	N	N	N
23	Grab (dump)	Tr	Tr	.05
24	Chip (contact zone)	N	N	N
25	Grab (dump)	.04	N	Tr
26	do	.06	N	Tr
27	do	.13	.80	.18
28	do	N	Tr	Tr
29	do	N	Tr	Tr
30	do	N	N	Tr
31	do	.05	.15	.17
32	do	N	N	Tr
33	do	Tr	N	Tr
34	do	.06	.20	N
35	Chip (dike)	Tr	N	Tr
36	Grab (dump)	.07	N	N
37	do	.30	.40	.71
38	do	.62	.15	Tr
39	Chip (dike)	.02	N	.07
40	Grab (argillite)	Tr	N	.05
41	Grab (dump)	1.11	.40	.26
42	do	.27	.05	.16
43	Grab (syenite)	.17	N	.07
44	Grab (dump)	Tr	N	Tr
45	Grab (syenite)	Tr	N	Tr
46	Chip (quartz vein)	N	N	Tr
47	do	Tr	N	Tr
48	Grab (syenite)	Tr	N	Tr

Most of the old mine workings are completely caved and expose little mineralized material or rock in place. A few samples were taken from quartz veins outcropping southwest of the cabin, but most were taken from the dumps of old workings. Sample 11, from an old explosives box containing pulverized ore reportedly taken from the caved adit nearest the cabin, assayed 3.35 ounces gold per ton, 1.77 ounces silver per ton, and 1.59 percent copper. This box of "high-grade" powder probably indicates the existence of high-grade ore pockets. The quartz outcrops are as much as 25 feet wide, have an inferred length of more than 800 feet, and average 0.04 ounce gold per ton.

Several samples taken from the dumps of caved workings in the northeast part of the mapped area contain gold values (fig. 36). No mineralized rock

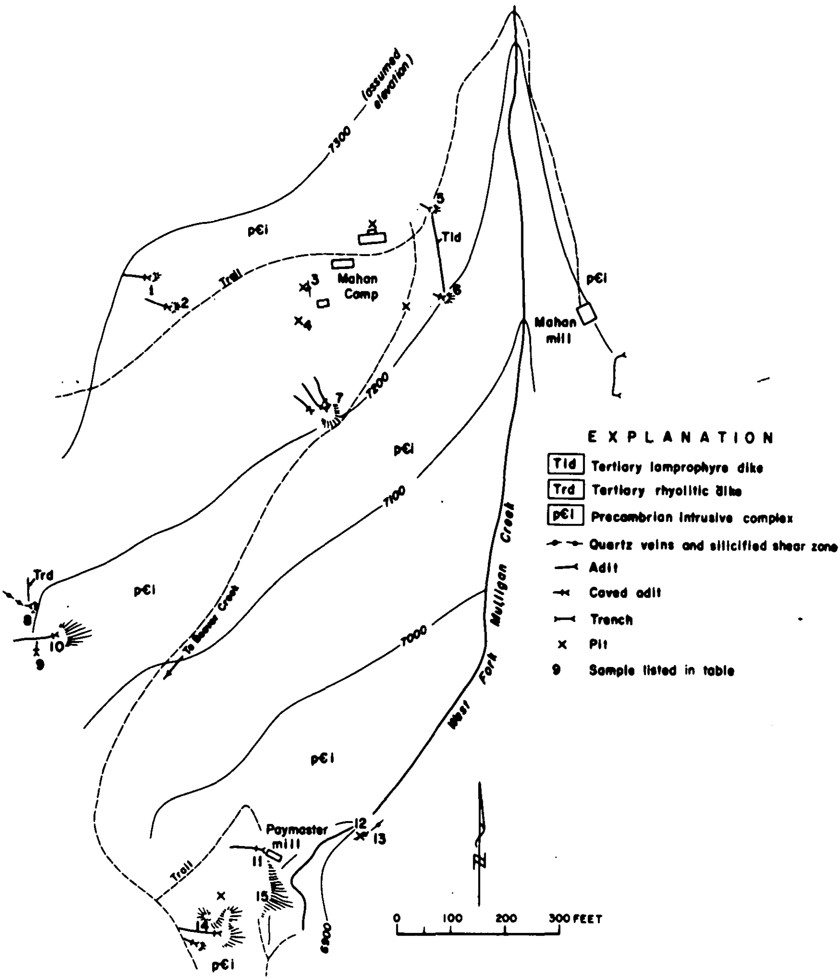


FIGURE 37. — Mahan group.

Data for samples shown in figure 37

[Tr, trace; N, not detected]

Sample No.	Sample Type	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	Grab (quartz, dump)	Tr	0.3	0.04
2	do	Tr	.2	.02
3	Chip (1-ft vein)	Tr	.3	.03
4	Grab (dump)	Tr	.3	Tr
5	Chip (dike)	Tr	.2	N
6	Grab (dump)	Tr	.3	Tr
7	do	Tr	.3	Tr
8	Chip (1.2-ft shear zone)	Tr	.3	N
9	Grab (dump)	Tr	.4	Tr
10	do	Tr	.2	Tr
11	Grab (ore bin)	0.16	.4	.15
12	Grab (stockpile)	.49	8.2	2.11
13	Chip (3-ft shear zone)	.14	1.0	.18
14	Grab (stockpile)	.34	.3	.46
15	Grab (dump)	Tr	.3	.03

is exposed, but the workings are confined to a belt about 1,000 feet long and 200 feet wide that roughly parallels the syenite-quartzite contact and at least one Tertiary dike. All samples taken along this belt were random dump samples composed of altered iron-stained syenite, some gossan material, lamprophyre dike rock, and very little quartz vein material. Samples taken at the east end of the belt were relatively high in gold; the average content from the dumps of six exploration pits and a test shaft was 0.33 ounce gold per ton, 0.13 ounce silver per ton, and 0.17 percent copper. A few samples contained a trace molybdenum.

Old prospects in the southeast part of the mapped area are also near the syenite-quartzite contact. Samples of dumps there contained no silver and only trace amounts of gold and copper.

Total estimated potential resources are large, but grade, as determined from the few quartz vein exposures, is submarginal. Gold values obtained from samples taken from dumps in the northeast part of the prospect area are relatively high for random dump samples. The quartz exposures extending southwest from the cabin indicate a persistent vein. The Mohawk group is believed to have a potential for discovery of minable but probably small ore shoots.

Mahan Group

The Mahan group (fig. 30, No. 23) of gold prospects is along the upper half of the West Fork of Mulligan Creek in secs. 29, 30, 31, and 32, T. 22 N., R. 10 E. The main workings (fig. 37) are west of the creek at elevations ranging from 6,900 to 7,300 feet. Probably all the workings along the West Fork of Mulligan Creek were once considered to be part of the Mahan group. County records show that from 1907 to 1940 Charles Mahan and his son located more than 12 groups of mining claims on the West Fork of Mulligan Creek. In 1936, the Mahan property consisted of an old 5-stamp mill in disrepair, a new handmade 1-stamp mill (the Paymaster), and a few scattered short tunnels, according to Shenon and Ross (1936). The old 5-stamp mill was reportedly operated on float ore from the talus slopes east of the mill. No production has been recorded, and apparently it was small. The latest Mahan group of three claims was staked in 1961 by Messrs. Cahill, Leatherman, and Earl.

Outcrops are few, and all the old mine workings are caved; therefore, geology is inferred from rocks from mine dumps, stockpiles, and talus slopes. Predominant country rock is apparently syenite of the Precambrian intrusive complex that is common to the Ramey Ridge vicinity. North-trending Tertiary lamprophyre and rhyolitic dikes cut the country rock, and quartz fissure veins and silicified shear zones apparently follow both northwest and northeast fractures.

Width of quartz veins and silicified shear zones apparently ranges from a few inches to 3 feet. Two veins, thought to be in place, strike N. 16° W. and N. 56° E. and dip nearly vertically. Veins are composed of 90-95 percent quartz, as much as 5 percent each magnetite and other iron oxides, a trace to 2 percent pyrite, manganese oxide stain, and scattered traces chalcopyrite and malachite. Silicified shear zones contain 40-60 percent quartz; the remainder is highly altered, iron- and manganese-stained country rock. Fifteen samples were analyzed (fig. 37).

Workings near the Paymaster mill (fig. 37) have the best potential for mineral resources. Sample 13, from a 3-foot-wide sheared and altered silicified zone exposed above a caved portal east of the Paymaster mill, assayed 0.14 ounce gold per ton, 1.0 ounce silver per ton, and 0.18 percent copper. That zone is probably a continuation of the vein exposed on the west side of the creek. Stockpile and ore-bin samples carry good metal values (fig. 37).

Average grade and amount of resources are difficult to calculate, owing to lack of exposures. Potential resources, however, of the mapped area are estimated to be more than 100,000 tons. Prospects along the east side of the West Fork of Mulligan Creek (fig. 30, Nos. 18-21 and 24) and Beaver Ridge prospect (fig. 30, No. 22) are all near the Mahan group and can be considered as a unit in estimating future potential. Average grade would probably be less than 0.03 ounce gold and silver per ton and 0.2 percent copper. Some individual veins, such as those in the Paymaster mill area, are higher grade.

BEAVER RIDGE (ANITI, MOTHER LODE) PROSPECTS

Numerous old workings are on Beaver Ridge, between Beaver Creek and the West Fork of Mulligan Creek (fig. 30, No. 22). They are about 1,000 feet west of the Mahan group at altitudes of about 7,400-8,000 feet.

The only location notices found in the area were listed as part of the Mother Lode group staked by J. I. Zorton and others in 1940 and the Aniti group staked by Scott Williams in 1948. Other old location posts were found, but the claim notices were gone.

All the old workings (fig. 38) are caved or badly sloughed, and little mineralized material is exposed. Quartz float is common in the overburden, but outcrops are few.

Country rock is syenite porphyry of the Precambrian intrusive complex. The rock is highly fractured, with considerable iron and some manganese stain along fractures. Fractures trend in several directions, but the most prominent ones strike N. 45°-85° W. and dip 60°-70° SW. Much of the rock contains 5-10 percent disseminated magnetite and more than 10 percent biotite that occurs as clusters of minute flakes.

Soil and rock mantle is 2-4 feet deep over nearly all the prospect area. Quartz veins and silicified sheared zones are rarely observed in place but are evidently widespread, as indicated by the abundant quartz float in the overburden. Most veins apparently follow the predominant northwest fracture pattern in the syenite.

Quartz veins shown in figure 38 are inferred from a few exposures and

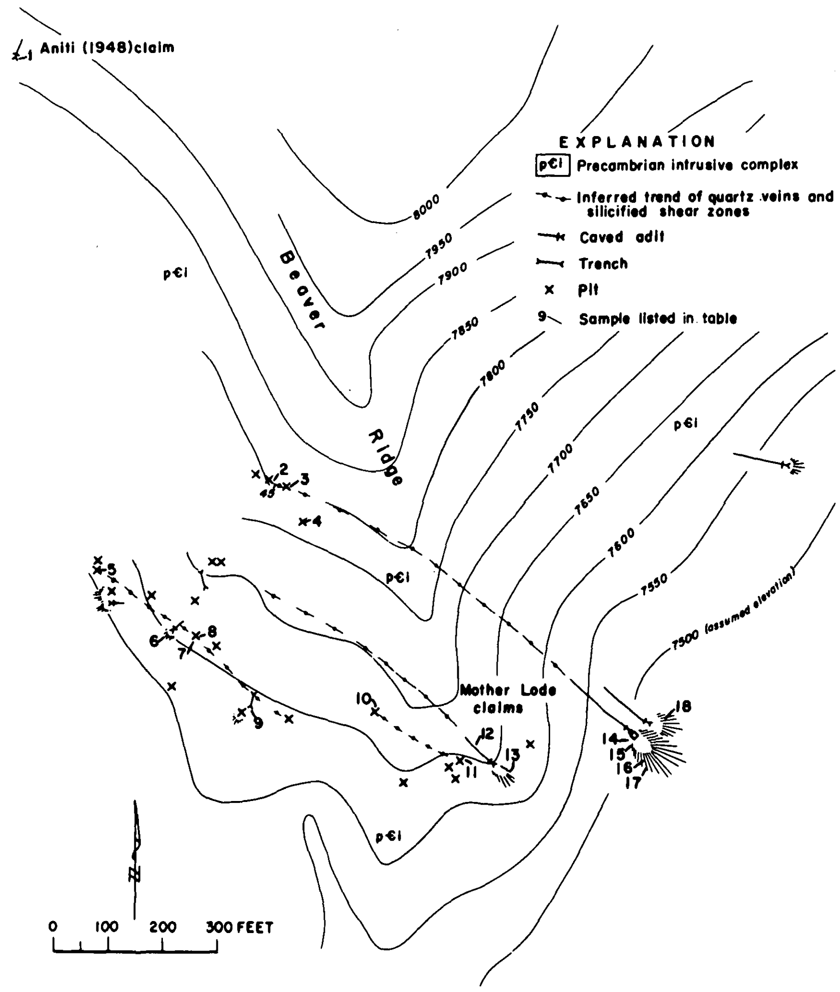


FIGURE 38. — Beaver Ridge prospect.

from the orientation of old caved workings. Mineral composition of veins and silicified shear zones varies considerably. Most samples (fig. 38) are from small quartz stockpiles and dumps. The quartz vein material normally contains some magnetite, 1-5 percent iron oxides, and a little manganese stain. Malachite stain occurs but is rare. Most of the material is oxidized, but sparse pyrite and chalcopyrite were observed.

Indicated width of the veins ranges from a few inches to 2 feet. Some veins have inferred lengths of 400-800 feet. Tenor determined from the available oxidized vein material is very low and probably averages about 0.01-0.02 ounce gold per ton, 0.3 ounce silver per ton, and 0.02 percent copper. A 2- to 4-foot-wide silicified shear zone (sample 2, fig. 38), exposed near the central part of the mapped area, has the best potential.

Data for samples shown in figure 38

[Tr, trace]

Sample		Gold	Silver	Copper
No.	Type	(oz per ton)	(oz per ton)	(percent)
1	Grab (quartz, dump)	Tr	0.2	0.01
2	Chip (3-ft zone)	0.14	.1	.01
3	Grab (quartz, dump)	Tr	.2	.01
4	Grab (quartz, stockpile)	Tr	.1	.01
5	do	Tr	.3	Tr
6	Channel (dump)	Tr	.2	.07
7	do	Tr	.3	.03
8	Grab (quartz, dump)	Tr	Tr	.02
9	Grab (dump)	Tr	.1	.01
10	Grab (quartz, stockpile)	Tr	.1	.02
11	do	Tr	.6	.02
12	Chip (1.7-ft zone)	.02	.4	.02
13	Grab (quartz, dump)	Tr	.7	.02
14	Grab (stockpile)	Tr	.7	.15
15	do	Tr	.3	Tr
16	Channel (dump)	Tr	.4	Tr
17	Grab (dump, dike rock)	Tr	.2	Tr
18	Channel (dump)	Tr	.1	Tr

Little Gem No. 7 Claim

The Little Gem No. 7 claim (fig. 30, No. 24) is about 1,200 feet east, up a steep talus slope, from the old Mahan mill. Charles Mahan staked the Little Gem group of seven claims in 1914. The other six claims continued northward from No. 7 to include claims that have been relocated as the Mother Lode (No. 21), Gold Reef group (No. 20), Pharmacist (No. 19), and Gold Slide (No. 18). These claims, described separately, appear to be located along the north-trending Little Gem shear zone. Most workings at these five properties were dug less than 200 feet downslope (west) from the inferred shear zone and are oriented at near right angles to it. The Little Gem shear zone has been inferred by float and a few intermittent exposures for a strike length of three-fourths mile; maximum width of the exposed segments is 4 feet. The zone is composed of quartz, schistose material with abundant biotite, syenite breccia, and fault gouge. Samples taken from the few exposures rarely assayed more than a trace gold, silver, or copper, but related veins contained higher values.

Development work at the Little Gem No. 7 consists of two east-trending adits. The upper adit, now caved, apparently was about 50 feet long. A sample of quartz vein material sorted from its dump contained a trace gold. The lower adit (fig. 39) is 87 feet long and exposes small but high-grade quartz veins. The quartz veins average 3-4 inches in width and contain pyrite and a little chalcopyrite. Average grade of the veins is estimated to be 1.9 ounces gold per ton, 4.3 ounces silver per ton, 0.37 percent copper, and less than 0.02 percent lead, zinc, and molybdenum. The Little Gem shear zone is exposed in the adit at a point 26 feet from the portal; it strikes N. 7° E. and dips 65° W. The zone is a maximum 3 feet wide and is composed of syenite breccia, abundant micaceous material, and fault gouge but contains only a trace gold.

Reportedly, quartz vein material from this property was treated at the

Mahan 5-stamp mill. Although no production figures are available, the extent of the workings and size of the quartz vein exposures indicate total production as probably less than 300 tons.

The visible veins are narrow, and additional work would have to be done to determine their potential.

OTHER LODE PROSPECTS

Mother Lode prospect. — The Mother Lode prospect (fig. 30, No. 21) was probably first located by Charles Mahan in 1914 as part of the Little Gem group and was apparently restaked in 1940 by J. I. Zorton and Mahan as the Mother Lode. The prospect is on the east side of the West Fork at Mulligan Creek, between the Little Gem No. 7 and Gold Reef group.

Prospect workings consist of a 33-foot-long adit, a 30-foot-long trench, and three pits. The adit is caved, and walls of the trench and pits are badly sloughed. All workings are alined approximately N. 80° E. Country rock is syenite, although biotite schist occurs near a 6-foot-wide mass of quartz exposed at the caved face of the adit. The quartz mass appears to trend in the same direction as the adit but may be part of the inferred north-trending Little Gem shear zone. The quartz contains about 5 percent weathered pyrite and less than 0.5 percent chalcopyrite, manganese stain, and malachite. A sample taken across the quartz mass assayed 0.09 ounce gold per ton, 0.08 ounce silver per ton, and a trace copper.

Gold Reef group. — The Gold Reef group (fig. 30, No. 20) was staked by J. J. Flynn in 1916 and restaked by I. Dolbow in 1919. Workings consist of two caved adits, alined in an east-west direction, and a small pit 100 feet northeast of the upper adit. The upper adit is about 35 feet long and is about 50 feet east of and 20 feet higher in elevation than the lower adit. The lower adit is estimated to be 65 feet long. Predominant country rock is syenite, but the small pit exposes iron-stained biotite schist that contains no economic minerals. The caved upper adit partly exposes a 3- to 4-foot-wide north-trending silicified shear zone, a sample of which assayed 0.01 ounce gold per ton and a trace silver and copper. A sample of iron- and manganese-stained quartz with a trace of malachite, sorted from the dump of the lower caved adit, contained no gold and a trace silver and copper.

The material sampled is too low grade to be of economic interest. The

Data for samples shown in figure 39

[All samples were random chip. Tr, trace; N, not detected; <, less than]

Sample No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	7	1.20	1.3	0.77
2	5	Tr	N	< .01
3	4	Tr	N	< .01
4	6	5.70	14.38	.39
5	4	.11	N	.05

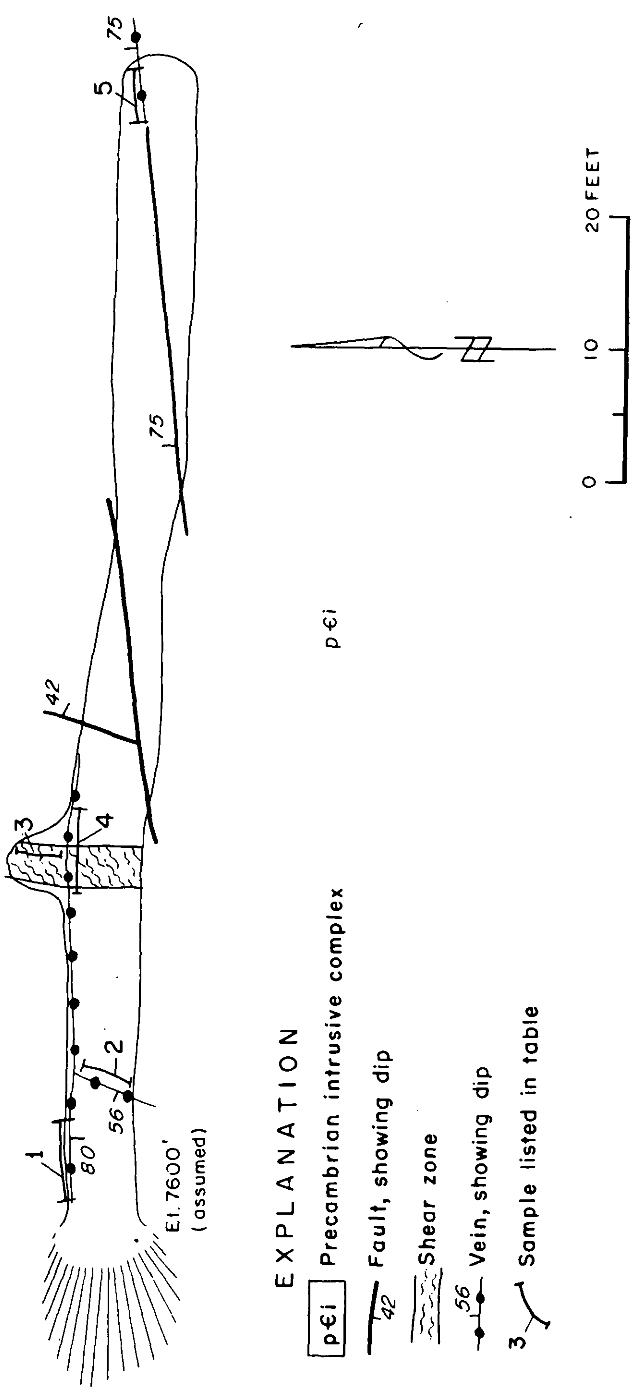


FIGURE 39. — Underground workings, Little Gem No. 7 claim.

shear zone is assumed to be an extension of the Little Gem shear zone that appears to continue northward to the Pharmacist and Gold Slide prospects.

Pharmacist claim. — The Pharmacist claim (fig. 30, No. 19) was recorded by J. I. Zorton in 1926. A caved adit, estimated to be about 250 feet long, and a small trench, 12 feet long, are about 70 feet apart and trend S. 35° E. The country rock — highly fractured iron-stained syenite — is not exposed in the workings. Quartz vein material sorted from the dumps contains about 2 percent combined iron oxides and altered pyrite and a trace gold.

Gold Slide group. — The Gold Slide group of three claims (fig. 30, No. 18) is on a steep talus slope at an altitude of approximately 7,800 feet. The claims were first recorded by R. B. MacGregor in 1905. Workings consist of six small pits and trenches that are about equally spaced in a north-south direction spanning 180 feet. The workings no longer expose bedrock but apparently followed a quartz vein or silicified shear zone in syenite country rock. Broken quartz sorted from the dumps contains a few percent altered pyrite and iron oxides and indicates a vein (or veins) only a few inches wide. Most samples of quartz contained only trace amounts of gold and silver, but quartz sorted from the dump of the northernmost pit contained 0.05 ounce gold per ton. No economic minerals were detected in samples of altered wallrock. The concealed quartz vein is probably the northernmost extension of the Little Gem shear zone.

Colorado claim. — The Colorado claim (fig. 30, No. 6) was originally located in 1908, by T. G. Thomas. Workings consist of one small sloughed trench, 10 feet long, 3 feet wide, and 1-2 feet deep. No bedrock is exposed, but rock on the dump is light-colored brittle quartzite with small quartz veinlets that contain traces sulfides. No gold, silver, or other economic mineral commodities were detected in samples from the dump.

Gold Dollar group (Trade Dollar, Little Annie). — The Gold Dollar group of lode claims (fig. 30, No. 9) was staked originally by J. M. Hand in 1902. Six old sloughed prospect pits and trenches partly exposed four small quartz veins that pinch and swell. The veins, 1-8 inches thick, occur as fissure fillings in the intrusive complex. They apparently strike N. 18° E. and dip 78° NW. Most of the vein material is slightly iron stained, containing some boxwork indicative of leached sulfide minerals. Sorted quartz from the dump of one trench contained 0.05 ounce gold per ton, but seven other samples contained only traces gold and copper and no silver.

Luzon claim. — This claim (fig. 30, No. 11) was originally located in 1906 by W. W. Burr but may have been relocated in the Mahan group.

Seven old sloughed pits and trenches, the largest 17 feet in diameter, are alined in a N. 20°-30° E. direction. Bedrock is not exposed by the workings, and 1-2 feet of overburden covers the surrounding area. Country rock, as indicated by dump material, is coarse-grained syenite. Quartz from the dumps is slightly iron and manganese stained, and some dumps contain pegmatitic material. Five samples of quartz, sorted from the dumps, contained traces gold and copper but no silver.

Valley View claim. — The Valley View claim (fig. 30, No. 12) is about one-fourth mile northwest of the Luzon claim; it was located originally by T. J. Lynch in 1904.

Prospect workings consist of two old caved trenches; the larger is 17 feet long, 9 feet wide, and 2 feet deep. Overburden is 2-3 feet thick in the prospect area, and bedrock is no longer exposed in either trench. Rock on the dumps is coarse-grained syenite and minor quartz. The trenches are oriented N. 30°-50° E., probably indicating the trend of a vein. Quartz from the dumps contained a little iron stain and a trace gold and copper.

Lewiston Fraction claim. — The Lewiston Fraction claim (fig. 30, No. 14) was staked originally by Charles Mahan in 1907. It is about 1,500 feet southeast of the Luzon claim.

Prospect workings consist of one pit 16 feet long, 11 feet wide, and 3 feet deep and several small trenches less than 5 feet long. The largest working probably follows a quartz vein trending about N. 55° E., but no bedrock is exposed. Rock on the dump is syenite and minor slightly iron-stained quartz. A sample of the quartz material, sorted from the dump, contained 0.05 ounce silver per ton and traces gold and copper. Like many other prospects in this vicinity, this claim gives no indication as to extent of mineralization; available quartz vein material is too low grade to be of economic interest.

Gold Bug Cabin prospect. — The Gold Bug Cabin prospect workings (fig. 30, No. 13) are near the junction of West Fork Mulligan Creek (Mahan) and Ramey Ridge trails. The cabin is at an altitude of about 8,000 feet, near a small spring at the head of the West Fork of Mulligan Creek. The cabin is referred to locally as the Gold Bug Cabin but none of the mining claims listed in courthouse records appear to fit this location.

Workings consist of a caved adit about 50 feet long, a 60-foot-long trench, and six small pits, all within a few hundred feet of the cabin. Four other small pits are located a few hundred feet down drainage from the cabin. All the workings are caved or sloughed, and no mineralized material was visible. Orientation of the workings indicates a probable quartz vein that trends about N. 20° W. Broken rock on the prospect dumps is predominantly syenite, partly decomposed. Small amounts of quartz vein material, sorted from the dumps, contained less than 2 percent weathered pyrite and a little specular hematite. Three of four samples taken of quartz vein material contained no economic minerals; the fourth contained only a trace gold and silver.

Gold Bug prospect. — The Gold Bug prospect workings (fig. 30, No. 16) are principally on the east side of the West Fork of Mulligan Creek about 800 feet south of the Gold Bug Cabin.

Workings consist of two 5-foot-diameter pits and a 15-foot-long trench trending N. 70° E. The workings are badly sloughed and no longer expose bedrock. Rock on the dump is syenite and some fault breccia and minor quartz. Samples taken of all three rock types contained no gold, silver, or other economic mineral commodities.

Badger claim. — The Badger claim (fig. 30, No. 15) was staked by Charles Mahan in 1926. It is on the west side of the West Fork of Mulligan Creek, midway between the Valley View prospect (No. 12) and the Happy Jack claim (No. 17)

Bedrock is not exposed in a small sloughed trench and a shallow caved shaft at the prospect, but broken rock on the dumps is predominantly fractured and iron-stained syenite. Quartz on the dumps indicates a vein less than 6 inches wide, containing less than 2 percent iron oxides and a little specular hematite. The two prospect workings possibly indicate a vein trending N. 85° W. Samples of the quartz contained a trace gold.

Happy Jack prospect. — County records indicate that the Happy Jack prospect (fig. 30, No. 17) was located by Craig Short in 1933. The prospect is on the west side of the West Fork of Mulligan Creek, about 600 feet south of the Gold Bug Cabin. A 268-foot-long adit was driven N. 80° W. under the main West Fork Mulligan Creek trail. The adit is partly timbered and partly caved near the portal and near the face. Wallrock is syenite of the intrusive complex. The adit follows and crosscuts several small fault and fracture zones. The predominant fault-gouge zone strikes N. 80° W., parallel to the adit, and dips 86° NE. Most samples taken along the iron- and manganese-stained fracture zones assayed only traces gold and no other economic metals. One sample taken across the back of the adit, 40 feet from the portal, assayed 0.01 ounce gold per ton and 0.2 percent barium. That sample cut a zone of highly fractured wallrock containing a ½-inch-wide quartz stringer.

Portland prospect. — The Portland prospect (fig. 30, No. 25) is midway between the headwaters of the East and West Forks of Mulligan Creek but on the east side of Ramey Ridge. It was located by Mr. Hollester in 1902 and is accessible by the main Ramey Ridge trail.

A sloughed pit does not expose bedrock. The predominant float is quartzite. Quartz from the dump contains minor pyrite and assayed only a trace gold and no silver.

Avenger prospect. — The Avenger prospect (fig. 30, No. 26) was staked by Hazel and Jack Griffen in 1939. It is atop Ramey Ridge near the junction of the Ramey Ridge and Orofino mine trails.

A sloughed discovery pit, 15 feet in diameter and 4 feet deep, is the only working. Rock on the dump is predominantly syenite and small pieces of quartz containing small amounts of weathered pyrite. A sample of the quartz contained no gold, silver, or other metals.

North Mildred claim. — The North Mildred claim (fig. 30, No. 27) was staked by Walter Estep in 1929, probably as part of the original Arrastre

(Orofino mine) group. It may also be on a partial overstake of the Florence "A" group. It is on top of Ramey Ridge at the head of the East Fork of Mulligan Creek.

Two shallow trenches, 95 and 30 feet in length, and two small pits are badly sloughed and do not expose bedrock. Float and rock on the dumps indicate that the prospect is located along the syenite-quartzite contact. Samples of iron-stained quartz from the dumps and trenches contained traces gold and copper but no silver or other metals.

Protection claim. — The Protection claim (fig. 30, No. 28) was staked by W. A. Estep and Frank Lobear in 1929. It is on the west side of the East Fork of Mulligan Creek near its head and is accessible by either the Ramey Ridge or the Orofino mine trail.

The only working — a sloughed exploration trench 20 feet long, 4 feet wide, and 3 feet deep — does not expose bedrock. Predominant rock on the dump is syenite. Small amounts of quartz sorted from the dump contained a few percent weathered pyrite but no gold or silver. The trench apparently was dug in an attempt to explore for an extension of the mineralized structures at the Orofino.

Florence "A" group. — The Florence "A" group of five or more lode claims (fig. 30, No. 30) was originally staked by M. B. Merritt and others in 1904 and probably included some of the adjoining prospect areas to the east that are described under other claim names. The old prospect workings are near the top of Ramey Ridge, northwest of the headwaters of the East Fork of Mulligan Creek, about 200 yards south of the East Fork trail and Ramey Ridge trail junction.

Prospect workings consist of 24 randomly oriented pits and trenches. The two largest trenches, 65 and 115 feet long, are oriented N. 80° E. and N. 10° W., respectively. Bedrock is no longer exposed in any of the workings, but rock on the dumps is predominantly syenite. Small amounts of quartz were found on the dumps of the two large trenches. A random grab sample of quartz, containing minor iron and manganese stain and minor pyrite, assayed 0.03 ounce gold and 0.74 ounce silver per ton. The scattered prospect workings were probably dug to test for extensions of the vein system of the Orofino mine; apparently no veins of consequence were found.

Ajax group. — The Ajax group of lode claims (fig. 30, No. 32) was staked by William F. Yeates in 1915 and may be a relocation of the Golden Age group recorded by T. J. Lynch in 1906. It is at the head of the East Fork of Mulligan Creek, about 800 feet northeast of the principal Orofino workings.

Prospect workings consist of two 10-foot-long trenches apparently dug to test for possible northward extensions of the Orofino vein system; they apparently did not expose a quartz vein. Altered and iron-stained syenite from the dumps contained no minerals of value.

B. J. prospect. — The B. J. prospect (fig. 30, No. 31), first located about

1904 by H. W. Burton and others, is on the summit of Ramey Ridge, at the head of the East Fork of Mulligan Creek.

A 30-foot-long trench and four prospect pits are sloughed and filled with overburden to a depth of about 3 feet. The workings are alined in a N. 10° E. direction along a distance of 110 feet, indicating the strike of a structure. Dump material, syenite and small amounts of quartz, contained less than 2 percent pyrite. A random grab sample of the quartz contained only a trace gold and no detectable silver or other economic minerals.

Paymaster prospect. — W. S. Boyles and others staked the Paymaster No. 1 and No. 2 lode claims in 1911. The claims (fig. 30, No. 33) are at the head of the East Fork of Mulligan Creek and north of the Orofino group (No. 36).

Two small prospect pits are badly sloughed and do not expose bedrock. Rock on the dumps is syenite and quartz. A sample of the quartz contained no detectable economic minerals.

Submarine claim. — The Submarine claim (fig. 30, No. 34) adjoins the Paymaster on the southeast and the Orofino group on the northeast. It was originally located in 1906 by L. C. Stephenson.

One old test shaft, 10 by 8 feet at the collar and caved to a depth of 4 feet, is the only working on the prospect. No mineralized structure is exposed, and no vein material was found on the dump. The prospect is covered by 2-3 feet of overburden. Except for some altered rock on the dump, the host rock is syenite porphyry. A random grab sample from the dump contained only a trace gold. The shaft apparently was sunk to explore for an extension of the Orofino lode.

Goldfield group. — The Goldfield group of lode claims (fig. 30, No. 29) was originally located by B. B. Scott in 1907. The prospect workings are about 200 feet west of the top of Ramey Ridge.

Two prospect pits no longer expose bedrock, but nearby are outcrops of highly fractured rocks of the intrusive complex, in which prominent fractures trend east and dip 71° N. Most of the prospect area is covered by 3-4 feet of overburden. Although no mineralized rock is visible, there is considerable quartz float. The float contains 5-10 percent mica, mainly altered biotite, and less than 2 percent altered sulfides, mostly pyrite. A random sample of the quartz contained only a trace gold.

Gold Crown group. — The Gold Cown group of claims (fig. 30, No. 35) is about midway between the Ramey Ridge trail and the bulldozer road to the Orofino property. Between 1935 and 1939, the claims were recorded by Burt B. Spilman, administrator of the Estep estate.

Country rock is highly jointed syenite; predominant fractures trend nearly east and dip 71° N. Two caved adits, each about 60 feet long and trending N. 70° E., apparently followed a 1.5- to 2-foot-wide quartz vein. Vein material sorted from the adit dumps contained 5-10 percent sulfides, predominantly pyrite, and assayed 0.15-0.21 ounce gold and 0-1.07 ounces silver per ton. A 50-foot-long trench and four small pits were also dug on the property. A few thousand tons of mineral resources potentially occur at this property.

Schley No. 3 group. — The Schley group of three claims (fig. 30, No. 37) was located in 1904 and 1905 by R. D. Amond. The discovery work for the Schley No. 3 is on top of Ramey Ridge about 100 feet northeast of the main Ramey Ridge trail. The other claims apparently extend northwestward to include ground later staked as the Gold Crown group.

Bedrock is not exposed on the prospect, but rock on the dump of a 70-foot-long trench is syenite. Quartz sorted from the dump contained less than 5 percent weathered pyrite, a trace gold, and 0.01 percent copper.

Lucky Strike claim. — The Lucky Strike claim (fig. 30, No. 44) was staked by Frank Lobear in 1932. It is on top of Ramey Ridge and is accessible by the Copper Camp-Orofino four-wheel-drive vehicle trail that passes through the prospect.

Bedrock is covered by extensive overburden except where it is partly exposed by four pits in a line bearing N. 80° W. The pits appear to have been dug along the contact between syenite on the north and argillaceous quartzite on the south. Small amounts of iron stain and trace amounts of specular hematite occur along the contact, but nothing of value was found.

Gold Bug No. 5. — The Gold Bug claims Nos. 1 through 4 (fig. 30, No. 40) were located apparently along the crest of Eightyeight Ridge. They include several small prospect pits that no longer penetrate the overburden. The claims were located in 1945 by Frank Lobear. Samples of slightly iron stained quartz sorted from the dumps of these caved pits contained no mineral values.

The Gold Bug No. 5 claim (fig. 30, No. 41), at the extreme east end of Eightyeight Ridge and 1,200 feet east of the old Lobear cabin, has been prospected by a 49-foot-long sloughed trench and a 33-foot-long adit. The adit was driven along a nearly vertical 3- to 17-inch-wide quartz fissure vein that strikes N. 80° W. The trench is at right angles to the adit and crosscuts the vein. The vein and accompanying wallrock alteration zone is 41 inches wide in the trench and 29 inches wide at the face of the adit. It is intermittently exposed for 37 feet. A sample across the structure exposed in the trench assayed 0.01 ounce gold per ton, 0.075 ounce silver per ton, and a trace copper. A sample across the 29-inch-wide structure in the adit assayed only a trace gold and no silver or copper.

Betty Jane claim. — The Betty Jane claim (fig. 30, No. 39) was staked by Messrs. Thomson and McLaughlin in 1925. It is atop Eightyeight Ridge and about 1½ miles east of Ramey Ridge.

An 11-inch-wide quartz fissure vein in syenite porphyry is exposed to a depth of 3 feet in a small prospect pit. The vein strikes N. 73° E. and dips 60° NW. It is exposed for only 4 feet along the surface before it is covered by overburden. A sample taken across the quartz vein contained about 2 percent weathered pyrite and only a trace silver. No gold or other metal values were found.

Virginia group. — The Virginia group of claims (fig. 30, No. 38) is located on top and along the south side of Eightyeight Ridge, 300-1,000 feet east of the ridge's junction with Ramey Ridge. The claims were staked in 1928 by Craig Short. The only prospect working near the top of the ridge is a 27-foot-long trench that trends N. 80° E. The trench is sloughed and does not expose any bedrock. Dump samples of weathered quartz containing slight iron stain assayed a trace copper. About 1,000 feet farther east along the southeast side of the ridge is a 20-foot-long caved adit and a 23-foot-long trench. The caved adit partly exposes a quartz vein striking N. 20° E. and dipping 60° SE. and a nearly parallel lamprophyric dike, both in altered syenite. The vein exposed is 4.5-6 feet wide and is primarily quartz and silicified and hydrothermally altered country rock. The vein contains up to 15 percent altered pyrite in small veinlets and masses, but samples from across the vein contained no detectable metal values.

MOUNTAIN MEADOW PLACERS

Four mountain meadows (Crane, Hand, Upper Ramey, and Lower Ramey) located along the northern edge of the Ramey Ridge district (fig. 30, Nos. 1, 2, 3, and 4) were examined for economic placer minerals. All the meadows were once staked as placer claims, but no evidence remains of previous mining or prospecting activity.

The meadows are at altitudes ranging from 7,200 to 7,800 feet at the headwaters of Boulder, Hand, and Ramey Creeks. They are long, narrow, sometimes marshy, flats that are surrounded by dense lodgepole pine forests. The flats are alluvium-filled basins, characterized by a small meandering stream and high mountain grasses. Ridges and rounded mountaintops, ranging in altitude from 8,000 to 8,500 feet, surround the meadows.

The meadows contain between 1,695,000 and 6,970,000 cubic yards of alluvium (table 12). They were sampled with a power auger.

The 18 auger sites are shown in figure 40. Concentrates, obtained on a laboratory-size Wilfley table, were tested for gold and other heavy minerals. Most samples contained no visible gold, and the best contained only 0.3 cent gold per cubic yard (table 13).

TABLE 12. — *Summary data, mountain meadow placers, Ramey Ridge district*

[Tr, trace; N, not detected]

Meadow	Size (acres)	Estimated volume (cu yd)	Range of gold values	Estimated black sands[1] (lb per cu yd)
Crane	76	1,840,000	N to Tr	2.0
Hand	216	6,970,000	N to Tr	3.0
Upper Ramey	128	3,098,000	N to Tr	7.0
Lower Ramey	70	1,695,000	N	13.0

[1]Composed predominantly of heavy detrital minerals (magnetite, allanite, ilmenite, zircon, etc.) but as much as 10 percent quartz, feldspar, and other light detrital minerals may be present.

TABLE 13. — *Sample data for mountain meadow placers, Ramey Ridge district*

[Samples sites shown in fig. **40**. Tr, trace; N, not detected]

Site	Depth interval (ft)	Sample volume (cu ft)	Gold content		Black sands (lb per cu yd)
			Colors[1]	Value (cents per cu yd)[2]	
Crane Meadows					
1 -----	0 - 2.5	0.49	N	N	1.2
	2.5- 6.0	.69	N	N	2.2
	6.0- 9.4	.67	N	N	1.9
	9.4-13.0	.71	N	N	N
2 -----	0 - 2.5	.49	N	N	.4
	2.5- 7.5	.98	2v.f.	Tr	.8
3 -----	0 - 4.0	.78	4v.f.	Tr	3.2
	4.0- 9.0	.98	3v.f.	Tr	.9
	9.0-10.0	.24	11v.f.	Tr	3.4
Hand Meadows					
4 -----	0 - 1.5	1.5	N	N	N
	1.5- 3.6	.41	N	N	0.8
	3.6- 5.8	.43	N	N	1.1
	5.8- 7.6	.36	N	N	.2
5 -----	0 - 3.3	.64	N	N	N
	3.3-10.0	1.32	N	N	N
	10.0-15.0	.98	N	N	.4
6 -----	0 - 1.5	.29	N	N	2.5
	1.5- 3.8	.44	N	N	2.7
	3.8-11.5	1.52	2f.	Tr	1.9
7 -----	0 - 3.0	1.07	2v.f.	Tr	1.7
	3.0- 9.5	1.28	2v.f.	Tr	2.3
	9.5-14.0	.88	N	N	2.2
8 -----	0 - 2.5	.88	N	N	.5
	2.5- 5.2	.52	N	N	10.5
	5.2-10.0	.90	1m.	0.3	1.5
9 -----	0 - 2.0	.70	N	N	.5
	2.0- 3.6	.31	N	N	4.2
	3.6-11.5	1.54	4v.f.	Tr	1.8
10 -----	0 - 2.8	1.2	N	N	-------
	2.8- 3.6	.16	N	N	6.2
	3.6- 6.3	.52	N	N	4.9
	6.3- 8.4	.42	N	N	4.2
11 -----	0 - 2.0	.70	N	N	.2
	2.0- 5.3	.65	N	N	10.8
	5.3- 5.6	.06	N	N	2.1
12 -----	0 - 1.9	.39	N	N	3.5
13 -----	0 - 6.4	1.25	14v.f.	Tr	4.9
Upper Ramey Meadows					
14 -----	0 - 1.7	0.33	N	N	8.0
	1.7- 2.3	.13	N	N	29.1
15 -----	0 - 2.0	.39	2v.f.	Tr	7.0
	2.0- 4.5	.49	N	N	4.2
16 -----	0 - 2.3	.46	N	N	.2
	2.3- 3.3	.20	N	N	8.0
	3.3- 5.8	.49	1v.f.	Tr	7.4
17 -----	0 - 1.6	.31	N	N	.5
	1.6- 2.6	.20	1v.f.	Tr	8.1
	2.6- 5.0	.47	3v.f.	Tr	13.5

TABLE 13. — *Sample data for mountain meadow placers, Ramey Ridge district* — Continued

Site	Depth interval (ft)	Sample volume (cu ft)	Gold content		Black sands (lb per cu yd)
			Colors[1]	Value (cents per cu yd)[2]	
Lower Ramey Meadows					
18 -----	0 - 1.8	0.64	N	N	3.3
	1.8- 3.1	.24	N	N	25.8

[1]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300 to 1,000 colors to equal 1 cent; m. (medium) requires 10 to 300 colors to equal 1 cent.
[2]Gold values based on $47.85 per troy ounce.

Source rock for the alluvium is apparently quartz monzonite and granodiorite of the Idaho batholith, although outcrops in the vicinity of the meadows are few. Alluvial material that underlies the meadows is sand, clay, and pea-sized gravel. The material, in descending stratigraphic sequence, is generally as follows:

Range in depth (feet)	*Description*
0- 3	Soil, dark-brown to pale-gray; mixed with varying amounts of fine sandy clay and humus.
1- 6	Clay, reddish-brown, sandy, iron-stained; fine to very coarse sand mixed with clay.
3-11	Clay, blue-gray, sandy; fine to very coarse subangular sand and pea-sized gravel; mixed with blue-gray to blue-green clay.
6-15	Coarse sand and small gravel; very coarse sand and pea-sized gravel mixed with varying amounts of clay, sometimes iron-stained; grades to angular rock fragments and decomposed granitic rock near bedrock.

The upper stratigraphic units were thin or missing at a few of the holes, and in some holes the auger would not penetrate the lowest unit. The amount of gold seen increased slightly with depth. Zircon, not a major constituent, averaged only about 0.5 pound per cubic yard. As might be expected, the highest concentrations of zircon (less than 2 lb per cu yd) are in the lowest unit. Total estimated zircon contained in all four meadow deposits is only 3,400 tons. Gold, zircon, and other minerals are of no economic significance.

BIG CREEK AREA

The Big Creek area includes lode properties less than a mile north of Big Creek and placer sites along both sides of the 8-mile-long section of Big Creek included in the Ramey Ridge district. No property is more than a mile by trail from the road that parallels the creek. Elevations range from 4,600 feet at Monumental Bar to about 6,200 feet at the highest lode working. Placer sites along Big Creek are covered with brush and trees, but the north slope, where lode prospects are located, is relatively open.

The area is underlain by the Precambrian Yellowjacket Formation, Hoodoo Quartzite, and the Ramey Ridge Complex. The principal lode deposit, Copper Camp, consists of quartz-magnetite veins in argillaceous quartzite of the Yellowjacket Formation. Small but relatively high-grade gold-quartz veins occur in the intrusive complex at the Sunlight and Golden Bear properties (fig. 30, Nos. 58 and 59). Although placer sites along this section of Big Creek represent a potential source of ilmenite (titanium), they are too low grade and inaccessible to be mined.

Rocket Mines, Ltd., Vancouver, British Columbia, Canada, is currently conducting a diamond-drilling program at Copper Camp. Other mining activity is limited to annual assessment work. No mineral production has been recorded from the Big Creek area but there is potential for some future production.

COPPER CAMP MINE

The property, known for many years as Copper Camp, is roughly bounded on the east by Camp Creek, on the west by Copper Creek, and on the south by Big Creek (fig. 30, No. 51). It is 8.5 miles northeast from the Big Creek Ranger Station by way of a rough single-track road that parallels Big Creek. A mine access road connects the camp at a 4,800-foot elevation with the uppermost mine workings at 6,200 feet. The area is densely forested with ponderosa and lodgepole pine.

The mine was first located in 1888 (Shenon and Ross, 1936, p. 33-35) and was organized as the Copper Camp Mining Co. in 1903. The 29 lode and 5 placer claims making up the present property were relocated in 1953 by the present owner, Copper Camp Consolidated Mines, Inc., Boise, Idaho. The property was leased subsequently by Highland Surprise Consolidated Mining Co. of Wallace, Idaho, who made the first systematic geologic evaluation of the property. Their engineers surveyed and mapped the general area, sampled vein exposures in the old surface and underground workings, and built access roads. On the basis of the near-surface showings, they recommended diamond drilling and underground exploration and development work. Inability to raise the necessary capital for this venture resulted in curtailment of operations by 1957. The property remained essentially inactive until April 1969, when Rocket Mines, Ltd., Vancouver, British Columbia, acquired a lease and option-to-purchase agreement from Copper Camp Consolidated. During the summer of 1969, engineers for Rocket Mines, Ltd., conducted a preliminary surface mapping program and recommended diamond drilling and underground work similar to the program laid out in 1956 by Highland Surprise. One diamond drill hole (No. 6) was completed in the fall of 1969, a reconnaissance electromagnetic survey was made the following spring, and four more diamond drill holes were completed that summer and fall. Diamond drilling was resumed in the summer of 1971.

Shenon and Ross (1936) classified the rocks at Copper Camp and vicinity as dark-colored quartzite and argillite of the upper part of the Yellowjacket Formation. Dark-colored lamprophyre and quartz latite porphyry dikes oc-

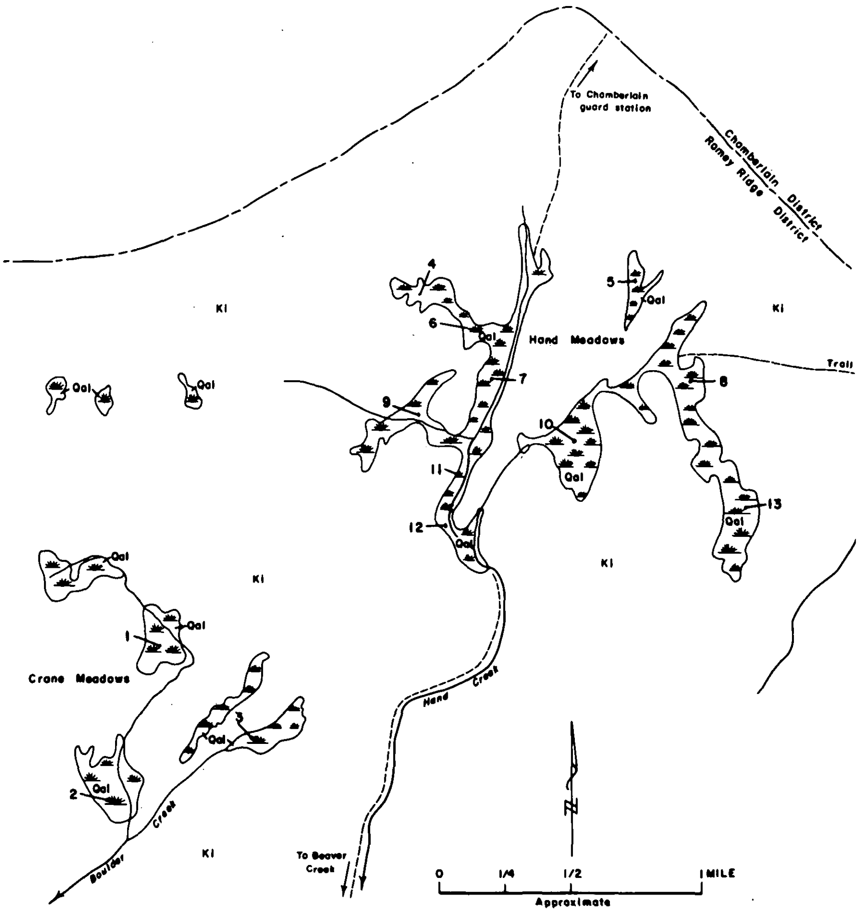
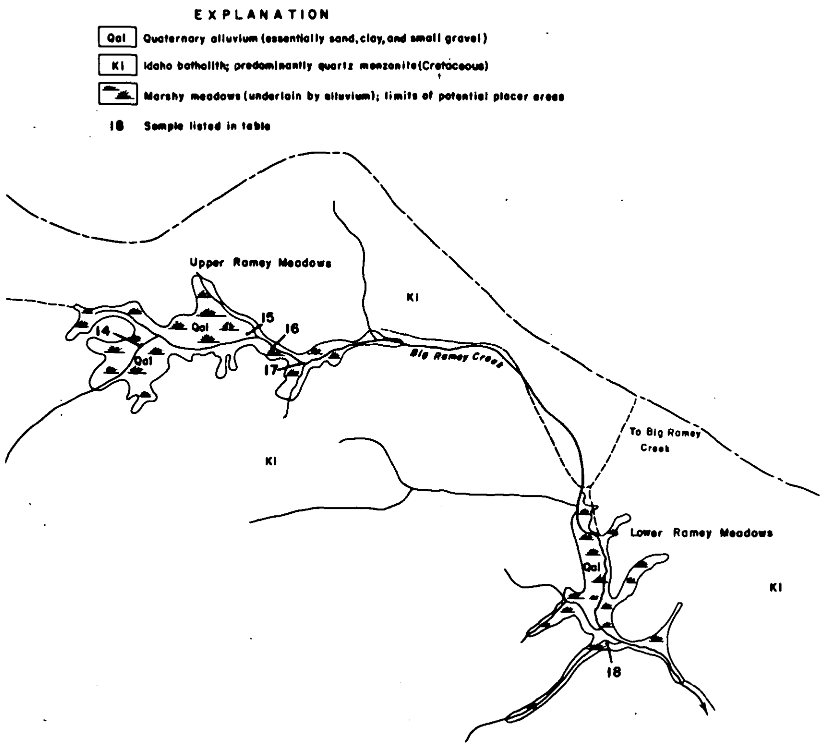


FIGURE 40. — Mountain meadow placers in the alluvium indicate limits



Ramey Ridge district. Deposits of Quaternary
of potential placer areas.

cur near Copper Camp. John Lamb (written commun., 1969), consulting engineer, described the local structural framework as a broad anticlinal fold, with a steep west-dipping limb in the Spring Creek draw and an undulating, gently east-dipping limb in the Camp Creek draw. The crest of the fold is just east of the Salt Lick (vein) outcrop and apparently trends northwestward; the direction of plunge was not determined.

Numerous pits, trenches, and short adits expose at least nine, and possibly 17, approximately parallel vein segments in an area less than 1 mile long and 2,000 feet wide (fig. 41). No single vein exposure has been traced along its strike with certainty for more than a few hundred feet. The problem of delineating the veins is complicated by extensive soil overburden, vegetation cover, a series of approximately parallel northwest-trending faults, and several small landslides.

The veins vary from a few inches to at least 10 feet wide. Reliable trend measurements could not be made with a compass, owing to excessive magnetite, but generally the veins trend east to northeast and dip 50°-60° NW.

On the surface the mineralized veins and shear zones are composed of quartz, magnetite, and ferromagnesium silicates, containing lesser amounts of hematite, limonite, malachite and biotite, minor sericite, muscovite, and gypsum, and even less pyrolusite, chalcopyrite, and garnet. Malachite occurs interstitially along schistosity, as fracture fillings, and as coatings on other mineral grains. Many of the wider shear zones (along Spring Creek and Black Bear veins) are in fine-grained altered schist and contain one or more quartz-magnetite veins. Samples of the veins assayed from a trace to 0.12 ounce gold per ton, trace to 0.8 ounce silver per ton, 0.03 to 17.0 percent copper, and 2.9 to more than 60 percent iron. Titanium content of the magnetite ranged from 0.02 to 0.28 percent and averaged about 0.11 percent. Spectrographic analyses of selected samples detected no other valuable elements.

Three parallel veins exposed on the steep east slope above Spring Creek are referred to as the Upper, Middle and Lower Tibor veins (fig. 41). All three strike east and dip 60°-70° N. Average thicknesses and weighted assays of intermittent surface outcrops are:

Vein	Thickness (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Iron (percent)
Upper ---	3.5	0.01	0.30	1.77	52
Middle ---	2.3	.01	.15	2.17	20
Lower ---	4.8	Trace	Trace	3.4	20

Previous investigators have inferred the extension of these three veins 2,500 feet eastward to connect with the Black Bear vein, another exposed 300 feet north of the Black Bear vein, and the Green vein, near Camp Creek. About midway between the two sets of exposures is the outcrop of a

Data for samples shown in figures 41 and 42

[Tr, trace; N.d., not determined. All samples are chip unless otherwise noted. Samples 14-19 and 28-32 taken from underground workings. Iron analyses are total iron]

Vein	Sample		Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Iron (percent)
	No.	Locality or length (feet)				
Upper Tibor	1	3.0	0.01	0.30	1.21	51.9
	2	4.0	N.d.	N.d.	2.2	N.d.
Middle Tibor	3	Grab	N.d.	N.d.	.3	N.d.
	4	3.0	Tr	.10	.44	10.4
	5	2.0	N.d.	N.d.	5.1	N.d.
	6	2.0	.02	.20	1.71	31.6
Lower Tibor	7	5.3	N.d.	N.d.	3.9	N.d.
	8	5.3	N.d.	N.d.	2.0	N.d.
	9	3.0	Tr	Tr	3.85	20.2
	10	5.0	N.d.	N.d.	3.25	N.d.
	11	5.0	N.d.	N.d.	4.3	N.d.
Tibor Extension	12	3.0	Tr	.10	1.55	38.7
Upper Black Bear	13	2.1	N.d.	N.d.	.34	N.d.
Black Bear	14	4.0	.02	.10	1.62	33.2
	15	13.0	N.d.	N.d.	1.09	N.d.
	16	11.0	Tr	.20	1.25	20.4
	17	8.0	N.d.	N.d.	1.97	N.d.
	18	8.0	Tr	.20	.94	N.d.
	19	7.0	N.d.	N.d.	2.11	N.d.
Green	20	4.0	.01	Tr	1.00	8.7
	21	8.0	N.d.	N.d.	7.2	N.d.
	22	8.0	N.d.	N.d.	17.0	N.d.
	23	8.0	N.d.	N.d.	5.6	N.d.
Green Extension	24	Grab	.05	.20	.40	42.9
	25	Stockpile	.01	.10	.76	30.6
Camp Creek	26	7.0	Tr	.4	1.93	7.2
Spring Creek	27	3.3	.04	.30	1.08	46.4
	28	4.5	.01	.10	.94	20.2
	29	4.5	.04	Tr	1.20	28.1
	30	1.0	Tr	.10	.78	59.9
	31	1.0	.12	.70	.88	34.4
	32	6.0	Tr	Tr	.40	18.7
Salt Lick	33	2.5	.11	.8	2.48	32.7
	34	4.0	N.d.	N.d.	.65	N.d.
	35	1.5	Tr	Tr	1.38	39.1
	36	5.0	N.d.	N.d.	.44	N.d.
	37	5.0	N.d.	N.d.	.70	N.d.
Salt Lick Extension	38	4.5	.02	Tr	3.20	42.5
Upper Copper Creek	39	2.0	Tr	.25	2.02	57.1
Old Ladies	40	3.0	Tr	3.0	.12	52.2
	41	Stockpile	.02	.20	2.12	40.8
	42	3.5	.06	.20	2.91	51.7
	43	3.0	.07	.10	4.12	60.0
	44	1.8	.02	Tr	1.96	55.5
Old Ladies Extension	45	3.0	Tr	.30	2.46	12.5
	46	Grab	Tr	.40	.49	24.9
	47	4.0	Tr	.20	.56	2.9
Porphyry	48	Grab	.01	.40	1.89	33.3
Lower Copper Creek	49	Stockpile	Tr	.10	1.71	61.4
	50	3.5	Tr	.20	.46	47.8
Millsite	51	----------	.02	.1	1.00	7.3

3-foot-wide magnetite vein called the Tibor Extension. If the three Tibor veins are continuous with the three veins exposed near Camp Creek, a potential resource on the order of 2.5 million tons of mineralized material can be inferred. These projections, however, are highly questionable.

Attempts by Rocket Mines, Ltd., to diamond drill the Tibor veins during the summer of 1970 were unsatisfactory because of difficult coring conditions. No holes have been drilled to test the possible eastward extension of the Tibor veins.

The Black Bear vein has been developed by an adit that follows the shear zone for about 130 feet (fig. 42). A caved adit known as the Black Bear crosscut (fig. 41) was reportedly driven 545 feet northwesterly to intersect

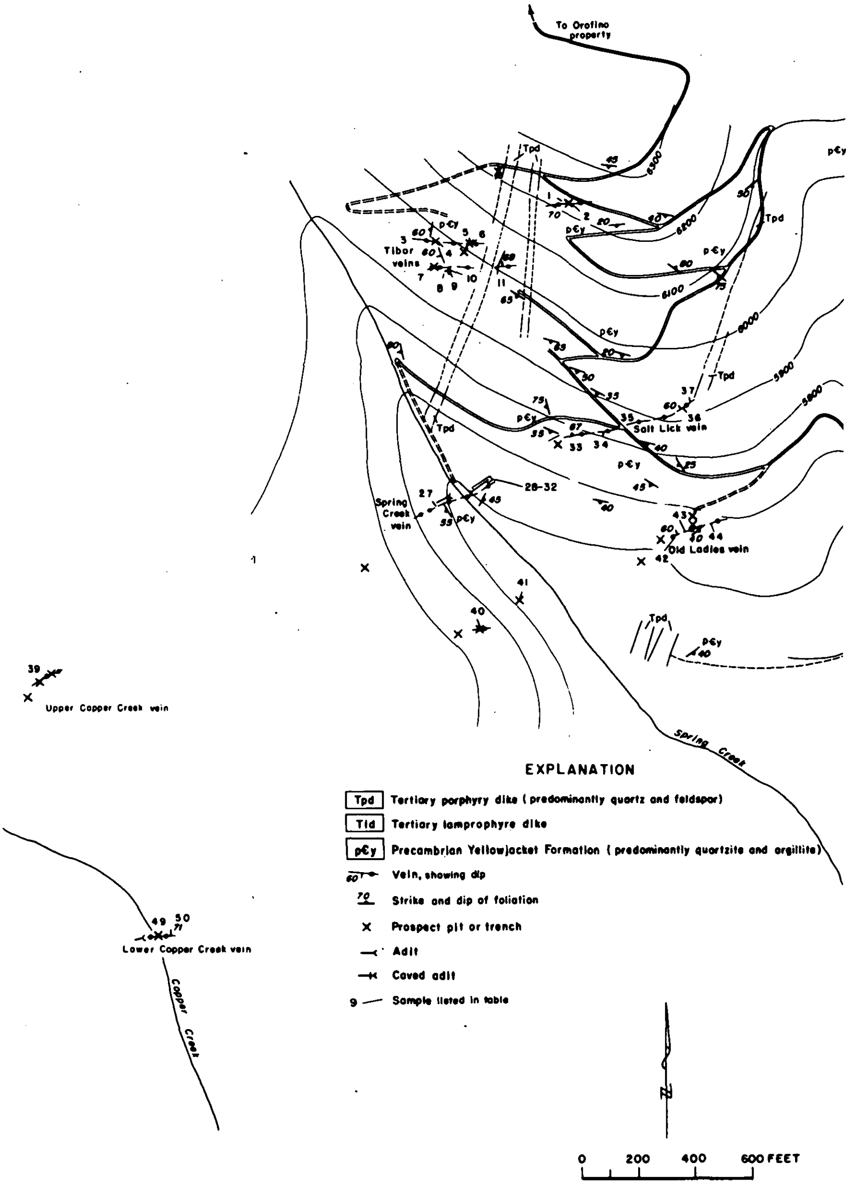
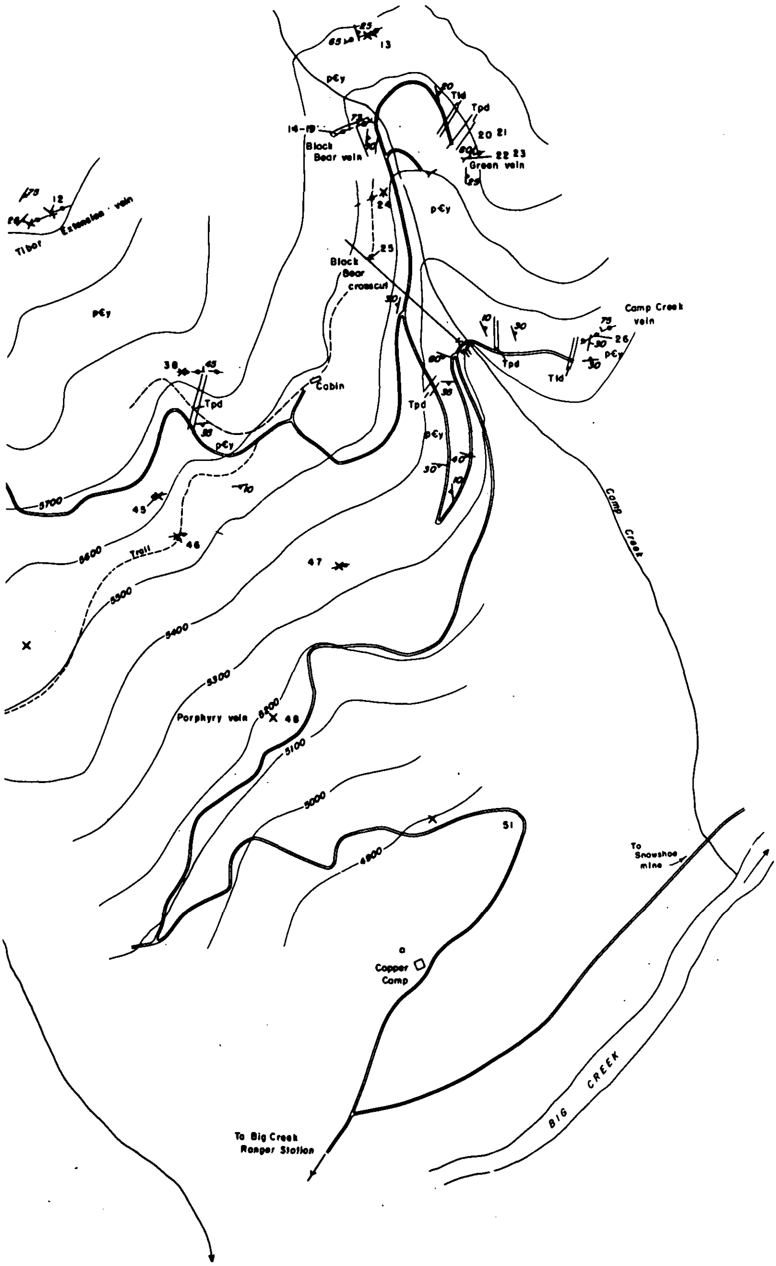


FIGURE 41. — Copper Camp mine. Modified
L. Mill,



from DMEA file report map, 1956, and George
1971.

the Black Bear vein at depth but was apparently discontinued more than 400 feet short of the vein. The Black Bear vein strikes N. 70°-80°E. and dips 35°-70° NW.; it is from 4 to 13 feet wide. Vein samples averaged about 1.5

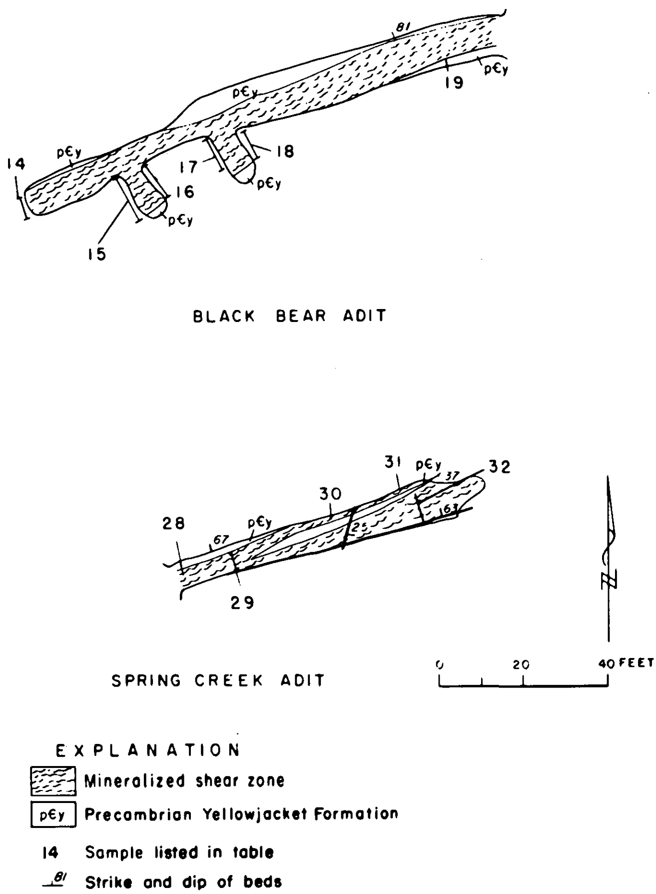


FIGURE 42. — Underground workings, Copper Camp mine. Sample analyses shown in table accompanying figure 41.

percent copper, 0.01 ounce gold per ton, 0.18 ounce silver per ton, and 24 percent iron. Iron occurs principally as magnetite. Calculated from the single showing in the Black Bear drift, resources are 10,000 tons containing 1.5 percent copper.

Previous investigators reportedly sampled an 8-foot-wide mineralized zone in the now-caved Green adit that assayed from 5.6 to 17.0 percent copper. The caved adit supposedly derived its name from the green copper carbonate (malachite) coating on the adit walls; it is likely that the samples were from an area of secondary copper enrichment and do not represent the average grade of the vein. A 21-foot-long adit, just above the caved Green adit, exposes a vein, 2 feet wide at the portal, that pinches to 2 inches wide at the face. The vein strikes N. 80° E., dips 80° N., and can be inferred 400 feet westward to an outcrop on the west side of Camp Creek. Near-surface oxidized vein exposures and ore piles average less than 1 percent copper and indicate weaker mineralization than assigned for the Green adit.

The Spring Creek vein crops out on both sides of Spring Creek and is exposed intermittently for a strike length of 250 feet by two short adits and a trench (fig. 41). Outcrops range in width from 3 to 4.5 feet, strike N. 70° E., and dip 60°-70° NW. Exposed in the 80-foot-long adit (fig. 42) are a 12-foot-wide shear zone, mainly schist, and two 1-foot-wide quartz-magnetite veins. Six samples from the Spring Creek veins averaged 0.03 ounce gold per ton, 0.14 ounce silver per ton, 0.9 percent copper, and 28 percent iron. Two inclined diamond drill holes, put down by Rocket Mines, Ltd., and collared on the east bank of Spring Creek, intersected the vein at 217.5 and 224 feet. The two intersections are separated by an indicated strike length of 170 feet. The drill core reportedly indicates true vein-width intersections of 6.5 feet assaying 3.90 percent copper and 4.6 feet assaying 3.59 percent copper (G. L. Mill, consulting engineer, written commun., 1971). Diamond drill core samples obtained at depth contained about four times the copper content of samples from leached surface exposures.

The vein referred to as the Salt Lick is exposed by shallow prospect workings about 400 feet east of Spring Creek and again 400-500 feet farther eastward along its strike. It strikes N. 70°-80° E., dips 50°-70° N., and is 2-5 feet wide. Samples taken across the exposures have a weighted average of 0.07 ounce gold and silver per ton, 0.92 percent copper, and 35.5 percent iron.

The Salt Lick and Spring Creek veins are probably the same vein, displaced 100-150 feet by faulting. During the summer of 1971, Rocket Mines, Ltd., drilled a vertical hole (diamond drill hole 9) about midway between the two principal outcrops of the Spring Creek and Salt Lick veins. The following core intersections and copper assays were reported by company officials.

Core footage	Core length (feet)	Estimated true width (feet)	Copper content (percent)
155-160	5.0	2.1	2.5
160-165	5.0	2.1	.67
165-169	4.0	1.7	2.60
174-176	2.0	.8	.36

Rocket Mines, Ltd., diamond drill hole 10 was reportedly positioned 850 feet east of Spring Creek to test for the downdip extension of the Salt Lick vein. The following intersections with the Salt Lick vein and the copper content were reported by G. L. Mill (written commun., 1971).

Core footage	Core length (feet)	Estimated true width (feet)	Copper content (percent)
162.5-168	5.5	3.9	2.43
176 -178	2.0	1.4	2.26
179 -186.5	7.5	5.3	1.22
188 -191	3.0	2.1	.63

These intersections may represent a series of closely spaced parallel veins or branches of the same vein. The uppermost intersection (162.5-168 ft) corresponds to the downdip projection of the Salt Lick vein exposed on the surface. A resource of 20,000 tons with an average grade of 3.35 percent copper for the Spring Creek-Salt Lick vein was estimated by G. L. Mill. The significant difference in copper content between surface samples and those obtained at depth probably reflects leaching at the surface.

The Old Ladies vein is best exposed by a short caved adit and a few shallow prospect pits 500 to 700 feet east of Spring Creek (fig. 41). The vein strikes N. 80° E., dips 60° N., and averages 2.8 feet wide along 200 feet of intermittent outcrops. The vein is composed mainly of quartz and magnetite. Four samples taken across exposures averaged 0.04 ounce gold per ton, 0.12 ounce silver per ton, 2.26 percent copper, and 55 percent iron. Rocket Mines, Ltd., diamond drill hole 11 was positioned about 70 feet north of the Old Ladies vein outcrop. The hole was drilled almost vertically, and the following mineralized vein intersections and copper content were reported by company officials.

Core footage	Core length (feet)	Approximate true width (feet)	Copper content (percent)
195-205	10.0	5.0	3.55
205-211.6	6.6	3.3	2.70
218-225	7.0	3.5	1.05

Nearest possible extensions of the Old Ladies vein are exposed about 700 feet westward and more than 1,000 feet eastward; these projections are highly questionable. The possible western extension, on the opposite side of Spring Creek and referred to as the Lower Spring Creek vein, consists of a single, poorly exposed, 3-foot-wide quartz-magnetite vein.

More than 1,000 feet eastward along the apparent strike of the Old Ladies vein are two vein outcrops referred to as the Old Ladies Extension. The two outcrops each average 3.5 feet in thickness, and samples taken across them averaged a trace gold, 0.24 ounce silver per ton, 1.38 percent copper, and 19 percent iron. Seven hundred feet farther east another pit exposes an apparent 4-foot-wide vein. If this is another extension of the Old Ladies vein, it has been offset considerably by faulting.

Two veins referred to as the Upper and Lower Copper Creek veins are the westernmost exposures of the Copper Camp vein system (fig. 41). They strike N. 65° E. to nearly due east, dip 70°-80° N., and are 2-4 feet wide.

Samples average 0.18 ounce silver per ton, 1.39 percent copper, 55.4 percent iron, and a trace gold.

The Camp Creek vein, the easternmost exposure of the Copper Camp veins, strikes about N. 60° E., dips 75° NW., and varies from 2.5 feet wide at the top of the exposure to 6.5 feet wide at the base. A sample taken across the vein assayed 0.4 ounce silver per ton, 1.93 percent copper, 7.2 percent iron, and a trace gold.

Old property-claim maps show a "porphyry vein" about 1,000 feet northwest of the mine-camp buildings. A small pile of oxidized quartz-magnetite vein material, near a sloughed trench, is the only evidence that a vein exists in this area.

Diamond drilling has indicated higher grade copper resources and a more extensive vein system than is indicated by surface outcrops. Drill holes intersecting some veins at depth indicated thicker shear zones than those exposed on the surface. Some veins intersected at vertical depths of 150-250 feet contain up to four times more copper than their leached outcrops.

A resource of 310,000 tons averaging 0.016 ounce gold per ton, 0.18 ounce silver per ton, 1.93 percent copper, and 33 percent iron is indicated by reasonable projections of the veins and near-surface samples.

If some displacement is assumed, due to faulting and near-surface slumping, and the various vein segments are projected between outcrops, five continuous veins can be inferred. The five inferred veins — Upper Tibor, Middle Tibor, Lower Tibor, Spring Creek-Salt Lick, and Old Ladies — range in width from 2.5 to 4.3 feet and in length from 2,500 to 5,200 feet. Estimated potential resources for the proposed five veins to a depth of 1,000 feet are about 5.5 million tons. Projection of the veins to such lengths and depths, however, is questionable. The average grade would probably be higher than indicated by surface samples. The iron occurs as magnetite, averaging about 40 to 45 percent of the vein material. Potential resources are estimated to be as much as 2.4 million tons of magnetite (1.75 million tons of iron), available as a possible byproduct.

The tonnages indicated (310,000 tons) are not of sufficient size and grade to be minable under present economic conditions. The narrow widths and unknown lengths of the veins make it hazardous to infer quantities of potential resources, which might range from less than 1 million tons to 5 million tons. If the veins extend as inferred and grade increases with depth as indicated by diamond drilling, the property would be economically minable.

SUNLIGHT GROUP

The Sunlight Nos. 1 and 2 lode claims (fig. 30, No. 58) were staked by L. E. Curtise in 1947 and 1960, respectively. The claims are one-fourth to one-half mile northeast of the mouth of Little Ramey Creek, where Mr. Curtise maintains a cabin on ground located as a millsite for the Sunlight claims.

Two or more northwest-trending quartz fissure veins in the intrusive-complex rocks are exposed by shallow surface workings. The veins are 1 to 14 inches wide, strike N. 69°-70° W., and dip 65°-85° NE. The exposed vein material is mainly quartz with some altered feldspar, mica, malachite and iron-oxide stain, and scattered small amounts of pyrite and chalcopyrite.

A 180-foot-long northeast-trending adit was apparently driven to crosscut at least two of the veins at projected depths of about 110 and 160 feet. A 2- to 4-foot-wide fault zone, with 1- to 4-inch-wide quartz stringers, was intersected at the face of the adit. It probably represents the downward extension of the nearest vein. A sample taken across the fault zone assayed only traces gold, silver, and copper. The vein is exposed near the surface by an adit for a length of 40 feet and to a depth of 22 feet where the adit is stoped to the surface. Samples taken across the 8- to 14-inch-wide vein contained a trace to 0.14 ounce gold per ton and traces silver and copper.

About 110 feet north of the stoped adit a second, parallel quartz vein is exposed in two segments, which strike N. 65°-70° W. and dip 70° NE. The longer segment has been exposed by a trench for 30 feet but averages only 2 inches in width. A sample taken over the full length of the exposure assayed 0.96 ounce gold per ton, 0.7 ounce silver per ton, and 5 percent copper. About 35 feet southeast, an extension of the second vein is exposed by a small prospect pit. This exposure is 10 feet long and 3-4 inches in average width; a sample contained 0.04 ounce gold per ton and traces silver and copper.

Approximately 50 feet N. 80° E. of the extension of the second vein is another small quartz vein that strikes N. 75° W. and dips 70° NE. It may be another segment of the second vein that has been displaced 30 feet northward. This vein is 8 to 10 inches wide and 15 feet long in a small prospect pit. A representative sample contained a trace gold, 0.2 ounce silver per ton, and 1.8 percent copper.

Approximately 300 feet N. 80° E. from the stoped adit, a copper-carbonate-stained lamprophyre dike is poorly exposed by a 10-foot-long trench. The dike strikes N. 60° W., dips 82° NE., is 4 feet wide, and is exposed for 15 feet. A sample taken across the dike, including some vein quartz along the hanging wall, contained 0.14 ounce gold per ton, a trace silver, and 5.72 percent copper.

Golden Bear Group

The Golden Bear Nos. 1 and 2 claims (fig. 30, No. 59) were staked by Wilbur Wiles and Ray Thrall in 1961. The claims are one-half mile north of Big Creek and about midway between Little Ramey Creek and Crooked Creek, on the west side of Carpenters Gulch. Nearly all development work has been on the Golden Bear No. 1 claim.

At the Golden Bear No. 1, a small pinch-and-swell quartz vein has been exposed intermittently for 320 feet by prospect pits and trenches. The vein strikes N. 65°-85° W. and dips 50°-80° NE. At least two segments of the vein have been displaced 5-15 feet northward by north-trending faults. Width of the vein varies from 4 inches to 5 feet and averages about 1.25 feet. Vein material consists of altered, iron-oxide-stained quartz, containing small pockets of limonite-hematite and small amounts of malachite, chalcopyrite, and pyrite. Boxwork structures of silica and iron-oxide indicate leaching of iron-bearing minerals, probably pyrite. Six samples taken across vein exposures contained from a trace to 1.18 ounce gold per ton, trace to 0.3 ounce silver per ton, and 0.11 to 0.97 percent copper. The average metal content is estimated to be 0.6 ounce gold per ton, 0.13 ounce silver per ton, and 0.68 percent copper. The wider parts of the vein contain the highest metal values.

The Golden Bear No. 1 vein is estimated to contain 5,000 tons of submarginal resources. The westward extension of the vein was not observed on the Little Ramey Creek side of the ridge, probably because of extensive overburden and dense vegetation. On the east side of the west fork of Carpenters Gulch, however, about 400 to 500 feet east of the main vein exposure, a small exposure may represent the eastern continuation of the vein. If the vein extends between showings, a potential resource exceeding 30,000 tons is estimated.

A quartz outcrop on the Golden Bear No. 2 claim, about 600 feet south of the Golden Bear No. 1, is 20 feet long and 6 feet high. The outcrop averages 3 feet wide, strikes N. 70° E., and dips 85° NW. A sample across the southwest end of this iron-stained exposure contained no copper and only traces gold and silver. At the northeast end of the vein exposure is a 4-foot-diameter zone of boxwork structures formed by the alteration and leaching of pyrite. A sample across this zone contained 0.03 percent cobalt and 0.5 percent manganese, only traces gold and silver, and no copper.

Approximately 100 yards northwest of the Golden Bear No. 2 outcrop is a 1- to 8-inch-wide quartz vein that can be traced for 75 feet along the surface before it is covered by overburden. The vein may be on the adjacent Sunlight claim (fig. 30, No. 58). It averages 4 to 5 inches wide, strikes N. 70°-80° W., and dips 60°-80° NE. Composition is quartz with some iron-oxide minerals and small amounts of malachite and altered chalcopyrite. A composite sample taken across the vein at several places assayed 0.80 ounce gold per ton, and 0.5 ounce silver per ton.

The veins are too narrow to be economically minable, but the property has a potential for discovery of minable deposits.

OTHER LODE PROSPECTS

Big Sunflower No. 1 claim.— The Big Sunflower No. 1 claim (fig. 30, No. 54), was staked by G. W. Winters in 1936. The discovery pit is 130 feet north from the junction of Big Ramey Creek with Big Creek and about 15 feet west of the Big Creek road.

Prospect workings consist of two small pits, averaging 5 feet in diameter and 3 feet in depth. One pit exposes a quartz fissure vein in schistose rocks of the Yellowjacket Formation. The vein strikes N. 8° E., dips 78° E., and can be traced for 23 feet along the surface. Quartz float can be traced at least 30 feet northward to Big Ramey Creek. The vein averages less than 1.5 feet wide and is exposed to a maximum depth of 10 feet. Vein material consists of massive white quartz with malachite and iron-oxide stain. Samples contained only a trace gold, 0.05 ounce silver per ton, and a trace copper.

TABLE 14. — *Summary data, placers along Big Creek*

[Tr, trace]

Deposit	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands[2] (lb per cu yd)
Beaver Creek placer	5.1	165,000	0.3 to 4.0	1.3
Crossing Bar placer	12.8	415,000	Tr to 1.5	5.7
Copper Creek placer	11.3	365,000	Tr	14.4
Copper Camp Flat	20.0	780,000	Tr to 4.1	16.7
Fall Creek placer	35.0	680,000	Tr to 2.1	9.3
Big Ramey placer	34.0	650,000	Tr to .1	3.5
Little Ramey placer	10.0	320,000	Tr	35.0
Carpenters Gulch	2.0	50,000	Tr	20.0
Monumental Bar	4.0	120,000	Tr to 41.0	14.3

[1]Gold values are based on a price of $47.85 per troy ounce.
[2]Mainly ilmenite and magnetite, with small amounts of zircon, pyrite, limonite, garnet, and ferromagnesian silicates.

Black and White claim. — The Black and White claim (fig. 30, No. 55) was staked in 1912 by J. J. Flynn as the Gold Dollar and was restaked in 1950 by J. O. Vines as the Black and White. The prospect is about 800 feet east of a cabin at the mouth of Big Ramey Creek. Workings consist of a short adit, three small prospect pits, and a 15-foot-long trench. The adit and trench, 200 feet apart, each expose quartz fissure veins that follow the bedding planes of interbedded schist and quartzite. A poorly exposed contact between the Yellowjacket Formation and the intrusive complex (predominantly syenite) is 60 to 80 feet north of the exposures.

A 2.7-foot-wide quartz-calcite vein, exposed by the adit, strikes N. 40° W. and dips 38° NE. It is exposed for 9 feet along its strike and to a depth of 10 feet. Fifty feet farther west, the same vein crops out for an exposed length of 3 feet and is 1.0-1.5 feet wide. Vein material contains 10-15 percent iron oxides but no sulfide minerals; it assayed 0.07 ounce gold per ton, 1.79 ounce silver per ton, and a trace copper.

A 0.5- to 1.5-foot-wide quartz vein, at the trench, strikes N. 87° W. and dips 44° N. It is exposed for a length of 44 feet and to a depth of 17 feet. Small quartz stringers extend approximately 4 feet from the vein into the schist footwall and 1 foot into the quartzite hanging wall. The vein material is quartz with less than 5 percent limonite and assayed only a trace gold. A sample of altered wallrock on each side of the vein contained only a trace gold.

Gold King group. — The Gold King group (fig. 30, No. 48) of four lode claims was staked by Sortero Bolenzello in 1932. The claims are about 2,000 feet north of Big Creek and opposite the mouth of Gold Creek.

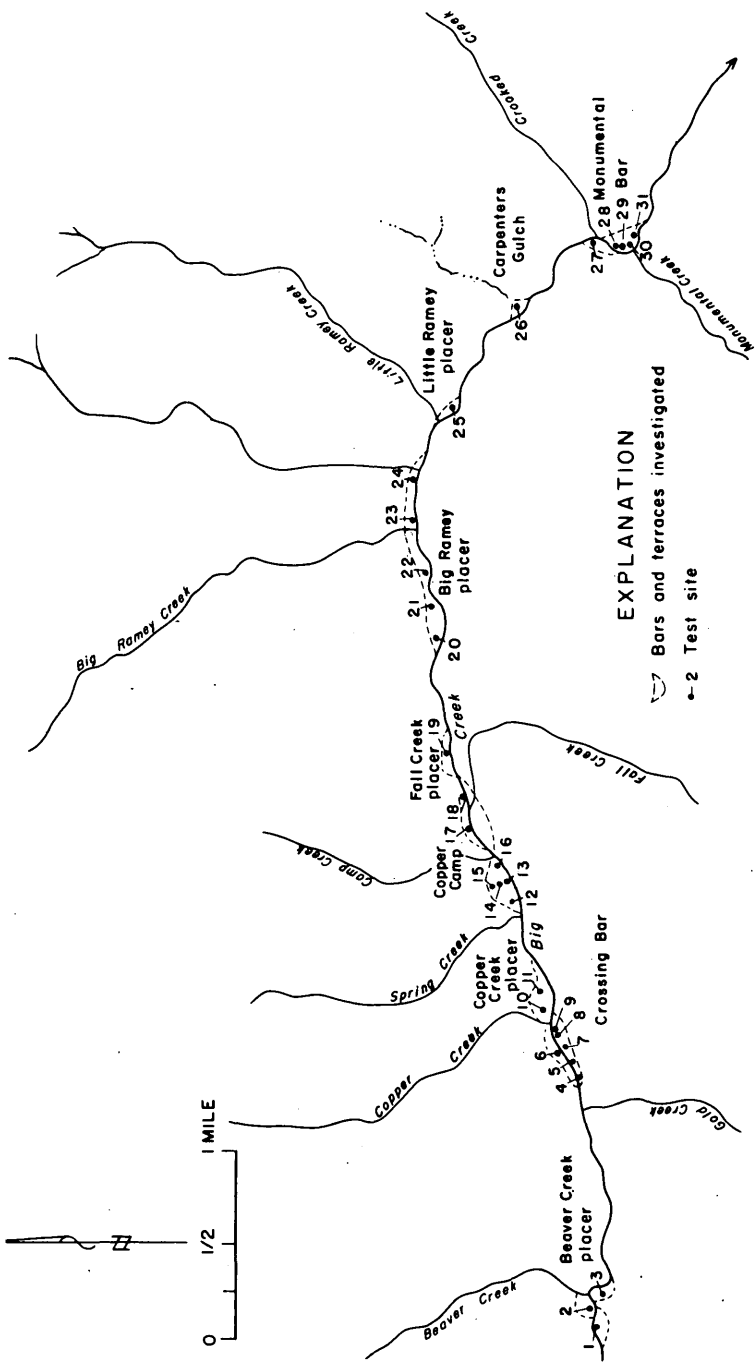


FIGURE 43. — Big Creek placer area.

Placers Along Big Creek

The part of Big Creek included in the Ramey Ridge district extends from the mouth of Beaver Creek to Monumental Bar (fig. 43), a distance of about 8 miles. A rough single-track road parallels Big Creek. Elevations along the creek range from about 5,000 feet at the mouth of Beaver Creek to less than 4,600 feet at Monumental Bar. The average fall of the creek is 50 to 60 feet per mile, but in places the stream gradient is much less, and narrow flood plains form. The creek is underlain by argillaceous quartzite from the mouth of Beaver Creek to Copper Camp, Hoodoo Quartzite near Copper Camp, and basic rocks of the intrusive complex from near Copper Camp to beyond Monumental Bar.

All the alluvial deposits were originally located as placer claims; a few have been recently relocated. The lack of placer workings indicates no significant production. The deposits are alluvial terraces above the creek bed, alluvial fans at the mouth of tributaries, or low-lying gravel along the creek. They contain 50,000 to 780,000 cubic yards of gravel (table 14). Most have a thick cover of brush, and many are forested with conifers as much as 4 feet in diameter.

The composition of alluvium averages slightly more than 50 percent quartzite, about 30 percent granitic rocks, about 10 percent other metamorphic rocks, less than 10 percent lamprophyre, and about 1 percent rhyolite. Slightly more than 5 percent of the alluvial material exceeds 1 foot in diameter, and less than 0.5 percent exceeds 2 feet. More than 80 percent of the material is less than 1 inch in diameter.

A backhoe was used to sample deposits along this section of the creek. Eighty-three samples were taken from 31 backhoe pits (fig. 43). The pits ranged in depth from 3.5 to 13.0 feet and averaged 8.6 feet. Small amounts of gold were seen from top to bottom at nearly every sample test site (table 15). There is no indication that gold values increase with depth. Best gold values were found at Monumental Bar, where values ranged from a trace to more than 40 cents per cubic yard. Samples from the other sites rarely contained gold values of more than 1 cent per cubic yard.

Copper Camp Flat, Copper Creek, and Monumental Bar contain relatively large amounts of ilmenite. Gravel from these sites is estimated to total 1,265,000 cubic yards containing 5,200 tons of ilmenite (7 to 9 lb per cu yd). More than twice this yardage is estimated if all nine sites are included. The deposits, however, are too low grade and inacessible to be mined for ilmenite.

Many samples taken along this section of Big Creek, particularly those taken below Copper Creek, contain more than normal concentrations of black sands. The black-sand concentrates from samples ranged from less than 1 to 41.8 pounds per cubic yard and averaged 13.4 pounds per cubic yard. The average magnetite content of all black-sand concentrates was 30 percent. The composition of black-sand concentrates from four represen-

TABLE 15. — *Sample data for Big Creek placers*

[Sites shown in fig. 43. Tr, trace; N, not detected]

Site	Depth interval[1] (feet)	Gold content		Black sands (lb per cu yd)
		Colors[2]	Value (cents per cu yd)[3]	
Beaver Creek placer				
1 ----------	0 - 3	4f., lm., lc.	1.9	1.5
	3 - 6	8v.f., 7f.	1.0	1.4
2 ----------	0 - 3	5f.	1.1	.6
	3 - 6	11f., lm., lc.	4.0	1.4
	6 - 9	11f., 2m.	1.8	1.2
3 ----------	0 - 3	1f.	.4	1.3
	3 - 6	12f., 9m.	2.1	1.4
	6 - 9	8v.f.	.3	1.0
	9 - 11	7v.f., 2m.	.8	2.0
Crossing Bar placer				
4 ----------	0 - 3	1f., 1m.	Tr	3.1
	3 - 6	3f., 1m.	0.3	2.4
	6 - 8.5	1f.	Tr	1.1
5 ----------	0 - 3	3v.f.	Tr	5.6
	3 - 6	16f., 5m.	1.5	12.0
	6 - 9	11v.f.	.7	10.5
	9 - 12	24v.f., 3m.	1.2	11.5
6 ----------	0 - 3	3f.	Tr	2.7
	3 - 6	4f.	Tr	5.0
	6 - 9	6f.	Tr	6.0
	9 - 12	7f., 3m.	.7	4.1
7 ----------	0 - 3	3v.f.	Tr	6.3
	3 - 6	4v.f.	Tr	6.3
	6 - 9	2v.f.	Tr	5.6
	9 - 12	6v.f., 5f.	Tr	3.6
	12 - 12.5	1m.	Tr	2.6
8 ----------	0 - 3	5v.f.	Tr	7.5
	3 - 6	5v.f.	Tr	6.6
	6 - 9	5f., 1m.	.4	5.6
	9 - 12	11f., 2m.	.7	6.8
9 ----------	0 - 3	4v.f., 1m.	.4	5.7
	3 - 6	2f.	Tr	6.2
	6 - 9	3f.	Tr	4.8
	9 - 12	8v.f.	Tr	4.6
Copper Creek placer				
10 ----------	0 - 3	5v.f.	Tr	19.1
	3 - 6	2v.f.	Tr	19.5
	6 - 9	3v.f.	Tr	11.2
11 ----------	0 - 3	N	N	7.1
	3 - 6	2v.f.	Tr	15.3
Copper Camp Flat				
12 ----------	0 - 3	10v.f., 1m.	1.4	31.5
	3 - 6	5v.f., 1m.	1.4	38.1
	6 - 9	Tr(?)	Tr	32.2
	9 - 11	2f.	Tr	20.2
13 ----------	0 - 3	Tr(?)	Tr	7.7
	3 - 6	4v.f.	Tr	12.3
	6 - 9	3v.f.	Tr	9.6
	9 - 12	N	N	11.7
	12 - 13	N	N	9.9
14 ----------	0 - 3	1f.	Tr	12.9
	3 - 6	9f.	.7	14.9
	6 - 9	7f.	.7	10.0
	9 - 11	8f.	.7	11.8
15 ----------	0 - 3	4f.	.7	13.0
	3 - 6	5f.	.7	13.4
	6 - 9	26v.f., 15m.	4.1	19.9
16 ----------	0 - 3	3v.f.	.3	23.6
	3 - 6	5v.f.	.7	25.0
	6 - 9	2v.f.	Tr	12.6
	9 - 10.5	6f., 1m.	.3	4.5

TABLE 15. — *Sample data for Big Creek placers* — Continued

Site	Depth interval[1] (feet)	Gold content: Colors[2]	Gold content: Value (cents per cu yd)[3]	Black sands (lb per cu yd)
		Fall Creek placer		
17	0 - 3	18f.	0.7	16.4
	3 - 6	4f.	Tr	13.4
	6 - 9.5 (3.5 cu ft)	12f., 4m.	2.1	8.6
18	0 - 9 (9 cu ft[3])	6f., 4m.	Tr	4.0
19	0 - 3	3f.	Tr	13.4
	3 - 6	26v.f., 2m.	1.4	14.3
	6 - 9	5f., 1m.	.7	3.2
		Big Ramey placer		
20	0 - 9 (9 cu ft)	17v.f., 2m.	0.1	2.9
21	0 - 3.8 (3.8 cu ft)	2f.	Tr	2.8
22	0 - 1.2 (1.2 cu ft)	2f.	Tr	3.4
	1.2- 3.7 (2.5 cu ft)	2f.	Tr	1.7
23	0 - 5 (5 cu ft)	11f.	Tr	4.1
24	0 - 5.2 (5.2 cu ft)	4v.f.	Tr	6.1
		Little Ramey placer		
25	0 - 6 (6 cu ft)	N	N	35.7
	6 -10 (4 cu ft)	N	N	34.3
		Carpenters Gulch		
26	0 - 6 (6 cu ft)	2f.	Tr	21.3
		Monumental Bar		
27	0 - 4.7 (4.7 cu ft)	10f., 35m.	13.7	6.5
28	0 - 1.5 (1.5 cu ft)	4v.f.	Tr	14.9
	1.5- 6.5 (5 cu ft)	4v.f., 1m.	Tr	10.1
29	0 - 1.7 (1.7 cu ft)	5f., 5m.	6.8	4.9
	1.7-10.2 (8.5 cu ft)	4f., 2m.	.7	2.3
30	0 - 4 (4 cu ft)	31v.f., 16f. 8m.	13.7	17.5
	4 - 7.5 (3.5 cu ft)	20v.f., 10f. 3m.	6.8	12.0
	7.5-10.5 (3 cu ft)	8f., 4m.	.1	18.9
31	0 - 3.5 (3.5 cu ft)	600f., 150m. 3c.	41.0	41.8

[1]All samples are 3 cubic feet in volume, except where shown in parentheses.
[2]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300 to 1,000 colors to equal 1 cent; m. (medium) requires 10 to 300 colors to equal 1 cent; c. (coarse) requires less than 10 colors to equal 1 cent worth of gold.
[3]Gold values are based on a price of $47.85 per troy ounce.

tative samples at Copper Camp Flat averaged 23 percent magnetite, 52 percent ilmenite, 13 percent ferromagnesian silicates, 4 percent staurolite, 3 percent apatite, 2 percent zircon, 0.8 percent epidote, 0.6 percent altered pyrite, 0.5 percent garnet, and less than 0.5 percent each rutile, scheelite, sphene, and tourmaline. Samples from the Little Ramey and Carpenters Gulch alluvial-fan deposits contained 20 to 35 percent black sands. Concentrates from these samples were composed of 60-80 percent magnetite. The alluvial fans are small and rarely contain free gold or significant concentrations of economic detrital minerals.

Ilmenite fractions were separated electromagnetically from selected concentrates. The ilmenite fractions were principally mixtures of ilmenite, altered magnetite, and hematite with small amounts of ferromagnesian silicate minerals as intergrowths and attached fragments. Similar magnetic susceptibility precluded further separation. The fractions averaged 25 to 26 percent TiO_2 and 25 to 27 percent iron.

CROOKED CREEK AREA

Principal mineral properties in this area are within 1 mile of the road that parallels Crooked Creek.

Elevations range from 4,628 feet at the mouth of Crooked Creek to 7,750 feet at Acorn Butte. South- and east-facing slopes are relatively open and support sparse clumps of grass, sagebrush, and other vegetation. North- and west-facing slopes are heavily forested with undergrowth of bushes, shrubs, and grasses.

The area is underlain primarily by faulted and fractured rocks of the Precambrian intrusive, the Ramey Ridge Complex. Remnants of resistant white Hoodoo Quartzite overlie the intrusive complex. Lode deposits consist of lenticular sulfide-bearing quartz veins that cut both rock types. Some, if not most, of the quartz veins occur along fault zones. Vein walls have slickensides in many places, and the vein has inclusions of country rock. Principal veins in the Crooked Creek area are the Snowshoe, Idaho-Rainbow, and Yellow Jacket (fig. 30, Nos. 64, 63, and 62). These three have many characteristics in common, but only the Snowshoe has recorded metal production.

SNOWSHOE MINE

Based on past metal production, the Snowshoe mine (fig. 30, No. 64) is the most important mineral property in the Ramey Ridge district. It is in Snowshoe Gulch, on the north side of Crooked Creek, about 19 miles by rough single-lane road from Big Creek, Idaho.

The Snowshoe group consists of 16 lode and two placer claims. Principal mine workings are on the steep talus-covered east slope of Snowshoe Gulch at elevations ranging from 5,400 to 5,700 feet (fig. 44). Snowshoe Gulch is dry except for mine water seeping from the lowest (No. 3) portal.

The property was first located during the Thunder Mountain boom in 1904 by Jacob and Eric Jensen. They worked the claims intermittently for 25 years and then leased the property to Big Creek Gold Mines, Inc., of New York. The lease expired in 1934, and the mine was sold by the Jensens to Pierce Metals Development Co. Extensive development followed until

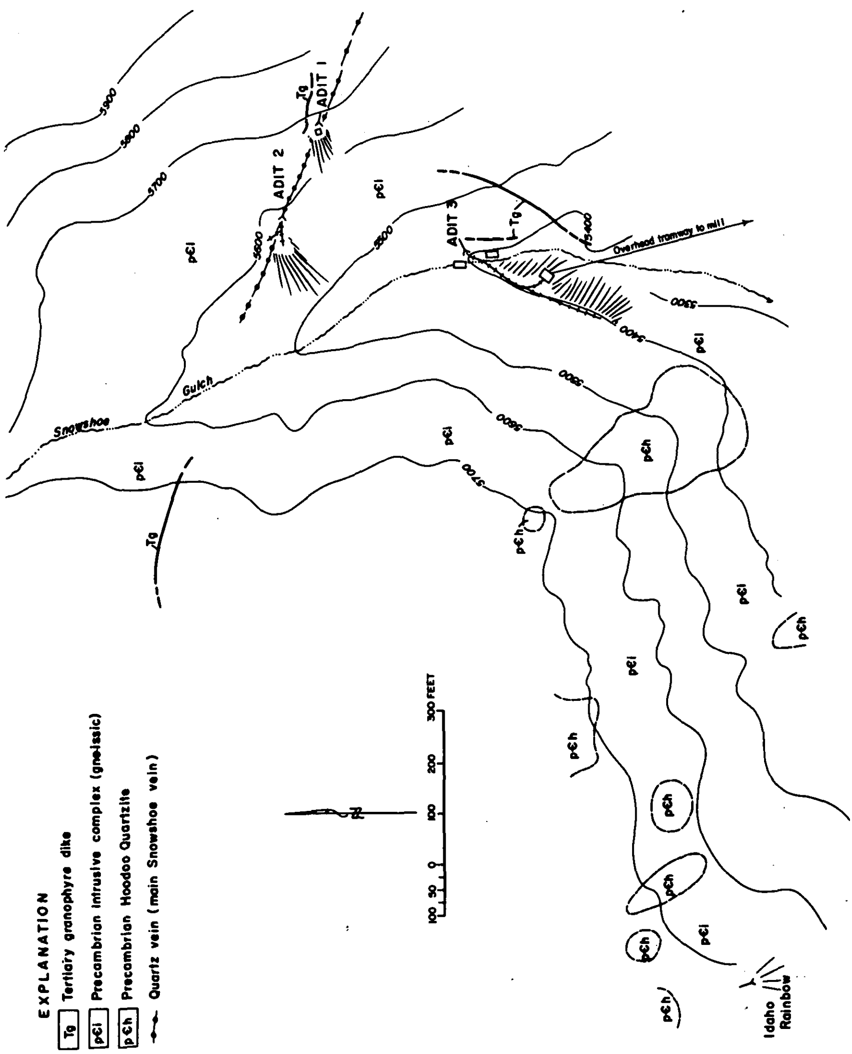


FIGURE 44. — Snowshoe mine.

World War II. The camp reportedly housed more than 60 people at one time. Seven bunkhouses were constructed at the mouth of Snowshoe Gulch, and a schoolhouse was built 300 yards farther up Crooked Creek. A blacksmith shop, an assay shop, a 25-ton-per-day flotation and amalgamation mill, and a cookhouse were built at the mine site. Mining activity continued until the War Production Board Order L-208 forced closure of gold mines in October 1942. Some production and development work was, however, reported in 1943. Assessment work was carried on by Thomas Nevitt until his death in 1964. Dale Creech, president of Far West Mining Co., Boise, Idaho, acquired the rights to buildings and equipment, and the mining company currently holds the unpatented claims. All the old buildings are in a state of disrepair, and the underground mine workings are mostly inaccessible.

Recorded metal production for 1916-43 is listed in table 8. Recorded production prior to 1937 is not complete, but 1937 mine maps show a mined-out area equal to about 210,000 cubic feet, 17,500 tons, of ore. Even at an average value of $3 per ton, metal production prior to 1938 would have exceeded $50,000. Therefore, total metal production from the Snowshoe mine is estimated at more than $300,000, mostly in gold, mainly during 1934-43.

Wallrock in the Snowshoe mine is predominantly a gneissic basic rock of the Precambrian intrusive complex with inclusions of quartzite and some schist. Tertiary dikes, mainly granophyre, are common. The Snowshoe lode is in an irregular shear zone, varying from 0.5 to 8 feet in width, with numerous folds and splits. It is cut by minor cross faults with maximum observed offsets of 6 feet. The shear zone normally strikes N. 50°-40° W. and dips 50°-60° NE. It is relatively continuous and can be traced for at least 2,000 feet along the strike. Lenses of banded coarse-grained semitranslucent quartz containing pyrite, chalcopyrite, pyrrhotite, and minor amounts of disseminated galena occur at intervals along the shear zone. According to old unpublished reports, the near-surface oxidized ore zone and zone of supergene copper enrichment contained much higher metal values than the lower zone now exposed by underground workings. Shenon and Ross (1936, p. 32-33) visited the mine in 1929 and wrote: "Most of the ore is reported to carry $20 to $50 to the ton in gold and silver, but ore of much higher-grade has been found in small lenses and kidneys at intervals along the hanging wall." Bell (1929, p. 8) reported that average assays of this high-grade ore ran 25 to 40 ounces gold to the ton, with 15 to 20 ounces silver. The upper workings are now inaccessible and may be mined out. An old (1934) mine map by Pierce Metals Development Co. (fig. 45) shows near-surface gold values from the now-caved upper (No. 1) level.

Underground workings (fig. 46) at the Snowshoe mine consist of three entry levels. The upper, No. 1 entry level is inaccessible but is 314 feet long, according to old company maps. It follows the principal Snowshoe lode,

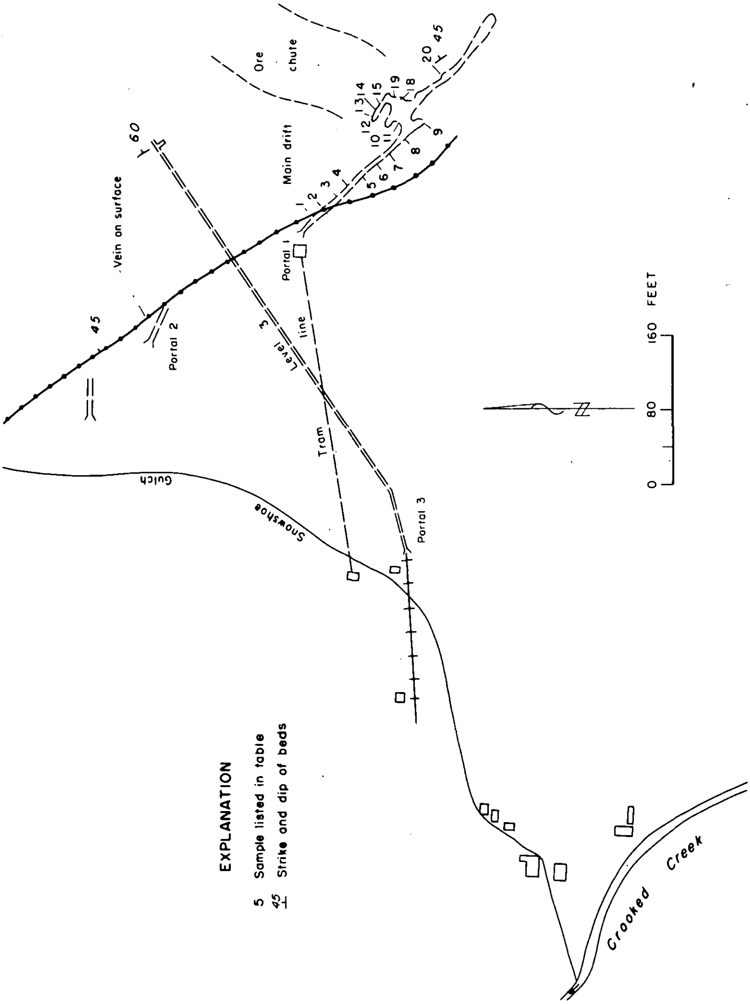


FIGURE 45. — Surface and underground workings in 1934, Snowshoe mine. Map and sample data by A. J. Wahl, mining engineer, September 1, 1934.

Data for samples shown in figure 45

[Tr, trace]

Sample No.	Sample Width (feet)	Gold content (oz per ton)	Sample No.	Sample Width (feet)	Gold content (oz per ton)
1	2.5	0.80	11	4.0	0.86
2	2.2	.13	12	2.5	4.30
3	2.5	Tr	13	2.5	1.23
4	4.2	.10	14	2.5	.58
5	3.2	.35	15	4.5	2.30
6	3.0	.11	16	3.5	.02
7	2.2	.78	17	2.5	1.67
8	.5	2.05	18	3.5	.44
9	2.0	1.14	19	2.0	1.02
10	2.5	4.12	20	4.0	4.32

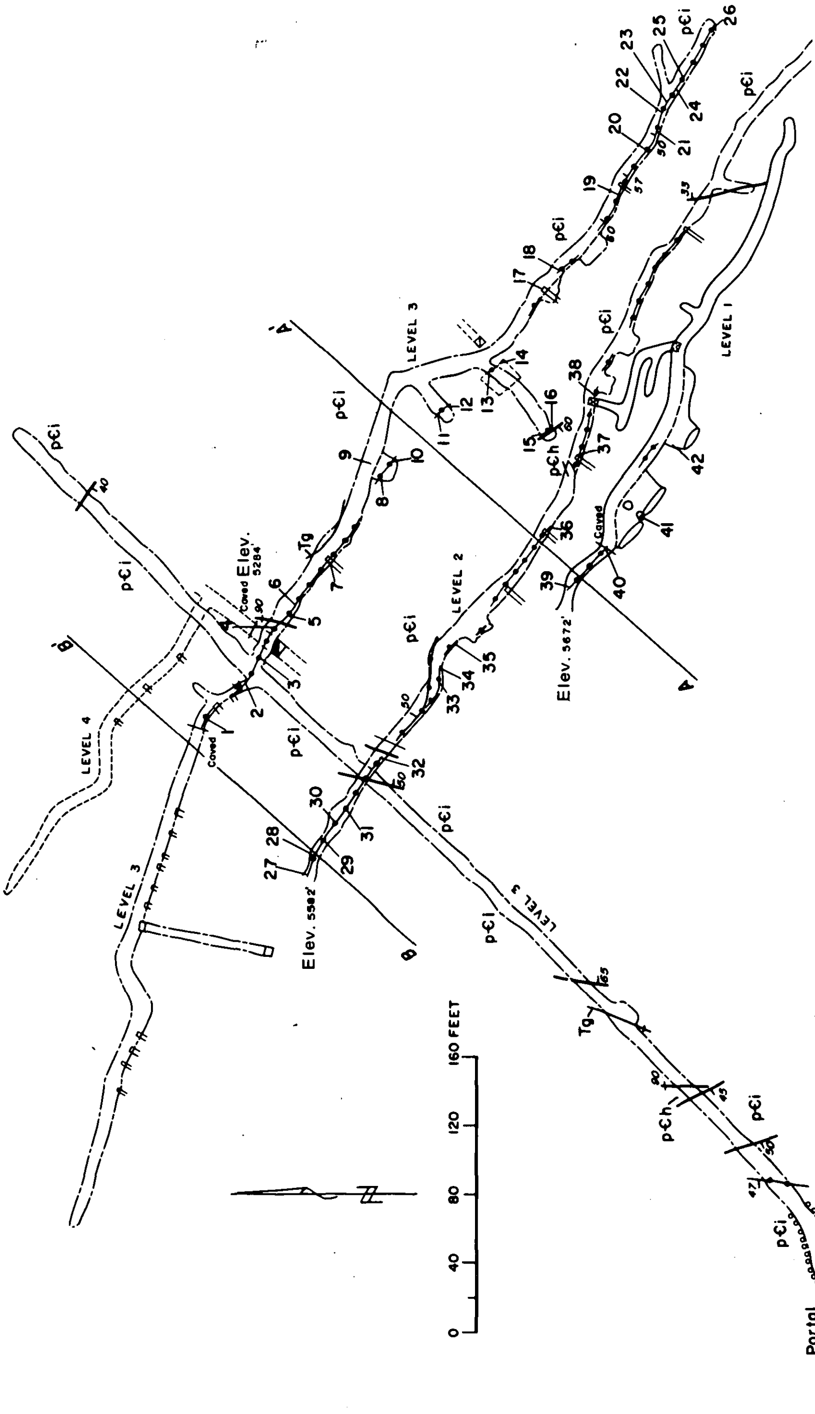
and ore zones have been stoped to the surface. The middle, No. 2 entry level was driven 596 feet along the vein. The lower, No. 3 entry level is a crosscut with drifts to the southeast and to the northwest. Only 25 feet of the drift to the northwest is accessible; old stopes and ore chutes have caved and blocked off the remainder of the drift. A fourth level is connected with the No. 3 level by a winze but is inaccessible. Old mine maps also show two 30- to 50-foot-long sublevels that are interconnected by a raise from the No. 2 level to the No. 1 level, but these, too, are inaccessible.

Veins are only accessible for sampling in the No. 2 level and part of the No. 3 level. The areas of most intensive mining are presumably those that contained the highest grade ore, and these are now inaccessible; therefore, samples taken during the current investigation probably contain below-average metal values.

An undetermined amount of vein material has been mined between the No. 2 and No. 3 levels, but an estimated 15,000 to 20,000 tons of unmined material, averaging 0.09 to 0.12 ounce gold per ton, probably remains. The vein continues another 127 feet downdip to the fourth level, resutling in another 15,000 tons that reportedly carries higher values than the second and third levels. The Snowshoe vein has not been developed along its full length, and its maximum depth is still undetermined.

YELLOW JACKET GROUP

The Yellow Jacket group (fig. 30, No. 62) of eight mining claims was staked by Jacob Jensen in 1906. The claims were later purchased by the present owner, M. C. Scott, of Olympia, Wash. Scott's cabin and storage sheds are three-fourths mile west of the Snowshoe mine, 4 miles up Crooked Creek from Big Creek. The Snowshoe mine road parallels Crooked Creek and passes through the center of the property. Steep foot trails provide access to lode claims on each side of the creek. Elevations range from about 5,100 feet at Scott's cabin to about 6,000 feet at the prospect workings. Lode claims on the southeast side of Crooked Creek are forested, but those on the northwest side of the creek are covered by sagebrush and small



LEVEL 1
LEVEL 2
LEVEL 3
LEVEL 4
Caved
Elev. 5284'
Elev. 5582'
Elev. 5672'
Portal
Elev. 5404'
pЄi
pЄh
Tg
A
A'
B
B'
0
40
80
120
160 FEET

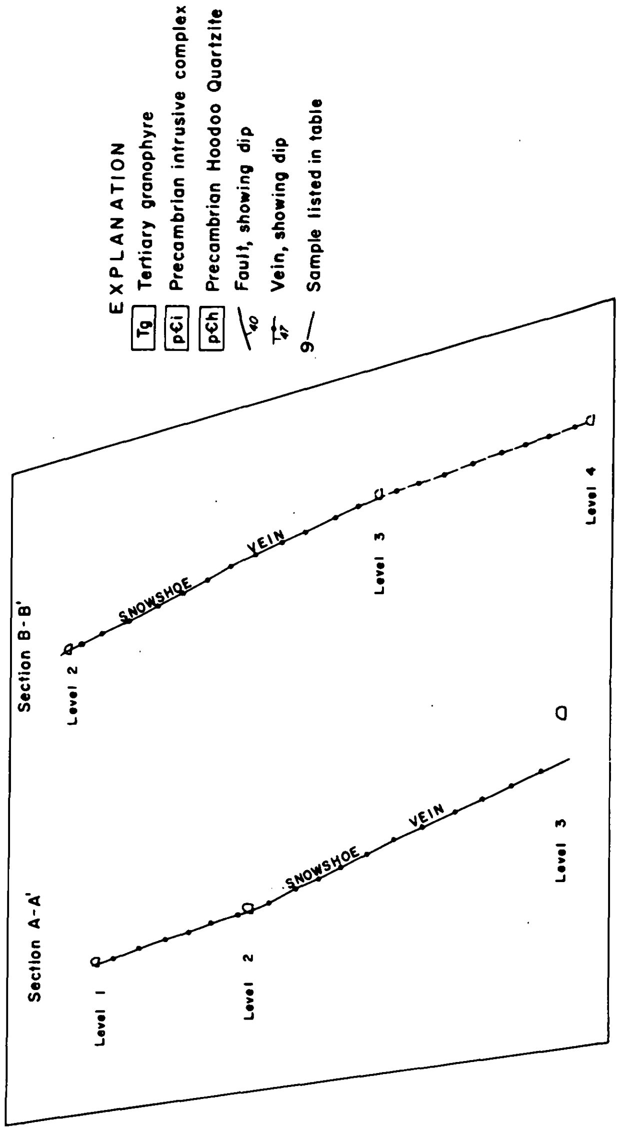


FIGURE 46. — Underground workings, Snowshoe mine.

Data for samples shown in figure 46

[Tr, trace; N, not detected]

Sample No.	Sample Type	Vein width (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
		No. 3 level			
1	Chip	1.6	Tr	Tr	Tr
2	do	1.8	0.35	1.30	0.26
3	do	5.0	.09	N	.02
4	do	.84	N	N	Tr
5	do	.66	.14	.20	Tr
6	do	5.0	.07	N	Tr
7	Grab	-------	.04	N	.05
8	Chip	4.0	.13	Tr	Tr
9	Grab	-------	.04	.05	Tr
10	Chip	4.0	.11	N	.02
11	Grab	-------	.08	N	Tr
12	Chip	3.0	.20	.05	Tr
13	do	2.5	.12	N	Tr
14	Grab	-------	.80	N	Tr
15	Chip	4.6	Tr	Tr	Tr
16	do	.9	N	N	Tr
17	Grab	-------	.03	.10	.02
18	Chip	.5	.21	.30	Tr
19	Grab	-------	.06	N	.06
20	Chip	.5	.04	N	.03
21	do	1.0	.10	N	Tr
22	do	1.4	.03	.15	Tr
23	do	1.1	.08	.20	.02
24	do	1.0	.04	Tr	Tr
25	do	.5	.03	.10	Tr
26	do	1.2	N	N	Tr
		No. 2 level			
27	Chip	1.2	0.05	N	Tr
28	do	1.1	.05	Tr	Tr
29	do	1.2	.05	Tr	Tr
30	do	2.5	.01	N	Tr
31	do	1.6	.02	N	Tr
32	do	.8	.02	N	Tr
33	do	2.0	Tr	N	Tr
34	do	3.3	.06	0.10	Tr
35	do	3.5	.08	Tr	Tr
36	Grab	-------	.05	N	Tr
37	Chip	2.5	.23	Tr	Tr
38	do	2.6	.31	.10	0.69
		No. 1 level			
39	Chip	4.0	Tr	N	Tr
40	do	1.5	N	N	Tr
41	do	1.0	0.10	Tr	Tr
42	do	4.0	Tr	Tr	Tr

patches of conifers. Overburden is 1 to 3 feet deep over most of the prospect area.

The principal lode claims extend along the same vein for 3,000 to 4,000 feet on each side of the creek, and others were staked along Crooked Creek, apparently as placer claims and a millsite (fig. 47).

Workings consist of four adits varying in length from 10 to 750 feet and five sloughed prospect pits. The alined workings are apparently on the same vein. On the northwest side of Crooked Creek the vein is in massive white quartzite, but on the southeast side of the creek, exposures are in dark-colored gneissic rocks of the intrusive complex. Although the Crooked Creek fault, a northwesterly trending strike-slip fault, is inferred along this section of Crooked Creek, there is no noticeable displacement of the Yellow Jacket vein.

The vein is best exposed by a 750-foot-long adit at the south end of the Yellow Jacket No. 4 claim (fig. 48). This adit is along the northwest-trending vein structure for about 600 feet, then turns westward into massive quartzite. The vein width in the adit ranges from 0.5 to 4 feet and averages 2.4 feet. At the opposite end of the same claim, but on the Bismarck Creek side of the ridge, a 30-foot-long adit follows a 4-foot-wide shear zone that is the westernmost exposure of the Yellow Jacket vein. The vein strikes N. 55°-75° W. and dips 65°-85° NE. Estimated composition is about 90 percent quartz, 6 percent fault gouge, 3 percent pyrite and chalcopyrite, and 1 percent malachite and iron- and manganese-oxide minerals. Mr. Scott reported that gold values are confined primarily to the two sulfide minerals and about equally distributed. Samples taken across the vein structure varied from 0 to 0.40 ounce gold per ton, 0 to 0.50 ounce silver per ton, trace to 1.85 percent copper, trace to 0.04 percent lead, and trace to 0.10 percent zinc. Values of samples weighted by width of vein averaged 0.08 ounce gold per ton, 0.10 ounce silver per ton, and 0.30 percent copper.

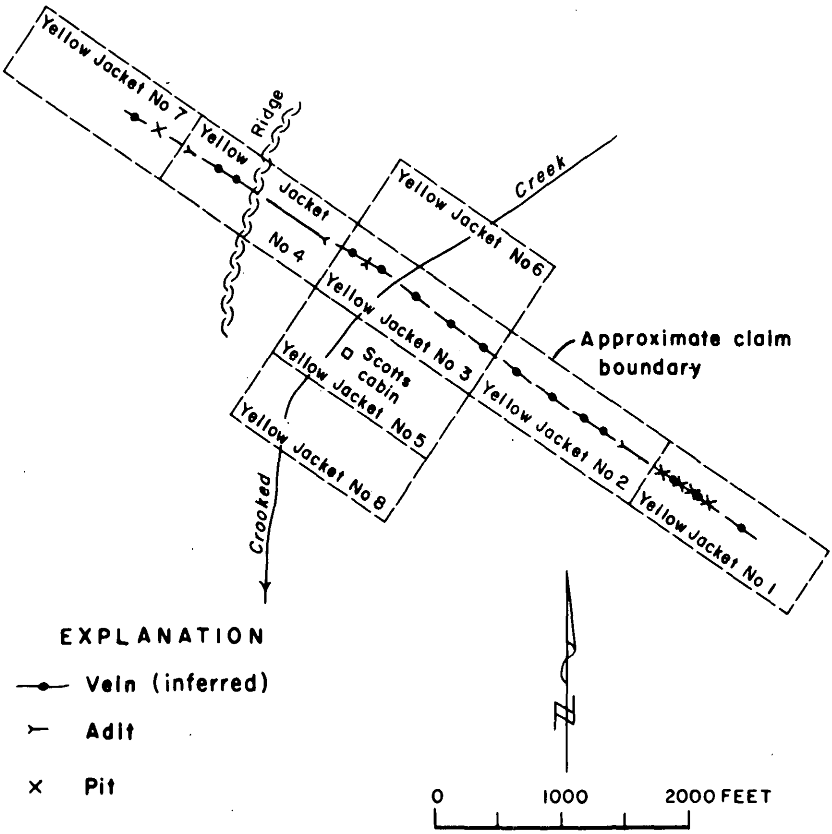


FIGURE 47. — Yellow Jacket group.

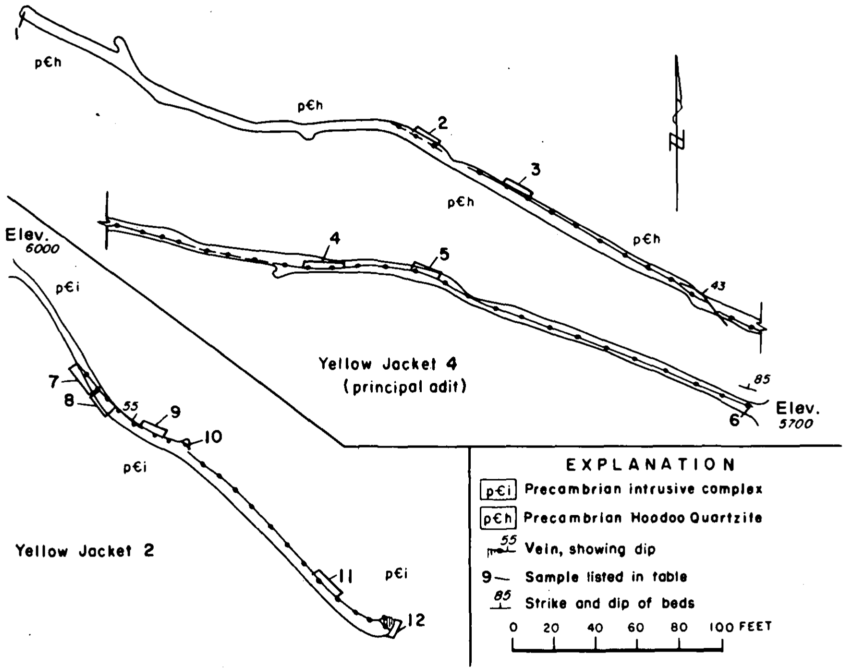


FIGURE 48. — Principal underground workings, Yellow Jacket group.

Exposures of the Yellow Jacket vein on the southeast side of Crooked Creek are limited to a 260-foot-long adit on the Yellow Jacket No. 2 claim. Four sloughed pits on the adjoining Yellow Jacket No. 1 claim are along the trend of the vein but no longer expose rock in place. The first 60 feet of the adit is partly caved and does not expose the vein. The remaining 200 feet of the adit follows the Yellow Jacket vein. The strike is generally N. 60° W., and the dip is 55° NE. Width of the vein ranges from 0.5 to 10 feet and averages slightly less than 4 feet. The first 40 feet of the vein, 0.5 to 2 feet wide, is composed mainly of fault gouge with small pods of quartz vein material. The remaining 160 feet is predominantly quartz, varying greatly

Data for samples shown in figure 48

[Tr, trace; N, not detected. All samples are chip]

Sample	Vein width (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	4.0	Tr	N	Tr
2	.8	0.40	0.30	Tr
3	2.0	N	N	Tr
4	2.5	.02	.50	1.85
5	4.0	Tr	N	Tr
6	.5-3.0	.28	.05	.08
7	.5-2.0	.02	.86	.67
8	2.0	Tr	.29	.91
9	2.0	.03	N	1.11
10	5.0	.02	N	.21
11	3.0-4.0	.02	N	Tr
12	10.0	.07	N	.03

in thickness and reaching a maximum width of 10 feet at the face of the adit. The mineral composition is approximately the same as on the northeast side of the creek. Samples from the fault gouge contained from a trace to 0.02 ounce gold per ton, 0.29 to 0.86 ounce silver per ton, and 0.67 to 0.91 percent copper. Samples from that portion which is predominantly quartz contained 0.2 to 0.7 ounce gold per ton, no silver, and a trace to 1.11 percent copper. The highest gold value was obtained from a sample taken across the face of the adit. Weighted average metal values for all vein samples taken from the Yellow Jacket No. 2 adit were 0.04 ounce gold per ton, 0.07 ounce silver per ton, and 0.26 percent copper.

The four prospect pits on the Yellow Jacket No. 1 claim apparently are along the same vein segment exposed in the adit on the Yellow Jacket No. 2 claim. However, the pits, about 30 feet apart, are sloughed and no longer expose the vein. Iron- and malachite-stained gossan and small amounts of quartz containing weathered pyrite and chalcopyrite were observed on the dumps of all four pits. A random sample of this oxidized material assayed 0.44 ounce gold per ton, 1.0 ounce silver per ton, and 0.07 percent copper.

The Yellow Jacket vein appears to be continuous between the various exposures. Inferring a depth of 400 feet below the adit levels, potential resources for the Yellow Jacket vein are estimated to be 200,000 tons, averaging 0.05 ounce gold per ton, 0.08 ounce silver per ton, and 0.30 percent copper. Average grade of the vein material is too low to support mining.

IDAHO-RAINBOW GROUP

The Idaho-Rainbow group (fig. 30, No. 63) of seven contiguous lode claims adjoins the west side of the Snowshoe group. The principal mine working (fig. 49) is about 500 feet north of Crooked Creek.

The property was originally known as the Buckhorn claim and was probably first located by J. T. Bell and others in 1902. The property was later acquired by Noel and John Routson, who leased the property with option to purchase to H. T. Maib and associates in 1937. Maib and associates formed Idaho Rainbow Mines, Inc., in 1938, and by 1946 they had completed nearly all the development that has been done on the property.

A 638-foot-long adit and several sloughed surface cuts are on the property. Reportedly, these surface workings exposed 10- to 40-foot-long segments of quartz vein averaging 1 foot wide for an intermittent strike length of at least 1,000 feet

The Idaho-Rainbow vein resembles the Snowshoe vein in most respects. It is nearly parallel with the Snowshoe vein and may be the same structure offset to the south by a concealed fault along Snowshoe Gulch. The vein is exposed intermittently along a northwest-trending fault zone for nearly 400 feet in the adit. The strike is N. 40°-55° W., and the dip is 45°-60° NE. The width ranges from 1 to 15 inches and averages about 9 inches. The quartz contains as much as 10 percent each disseminated pyrite and chalcopyrite, 1 percent malachite stain, trace amounts of galena, and 1-2 percent iron and manganese stain. A maximum of 2 inches of fault gouge was observed on either side of the vein. No sulfide minerals were observed in the wallrock. Average metal content for a 194-foot-long section of the quartz vein is estimated at 0.06 ounce gold per ton, 0.6 ounce silver per ton, and 0.5 percent copper. A trace to 0.1 percent lead and up to 0.02 percent arsenic and 1 percent titanium were detected in a few samples. Inferring a depth of 500 feet, the Idaho-Rainbow vein is estimated to contain about 30,000 tons of material with the metal values just stated. The vein is too narrow and too low grade to be mined at a profit.

GALENA PROSPECT

The Galena prospect (fig. 30, No. 66) is about one-half mile south of the Snowshoe mine and three-fourths mile north of Acorn Butte Lookout. Old

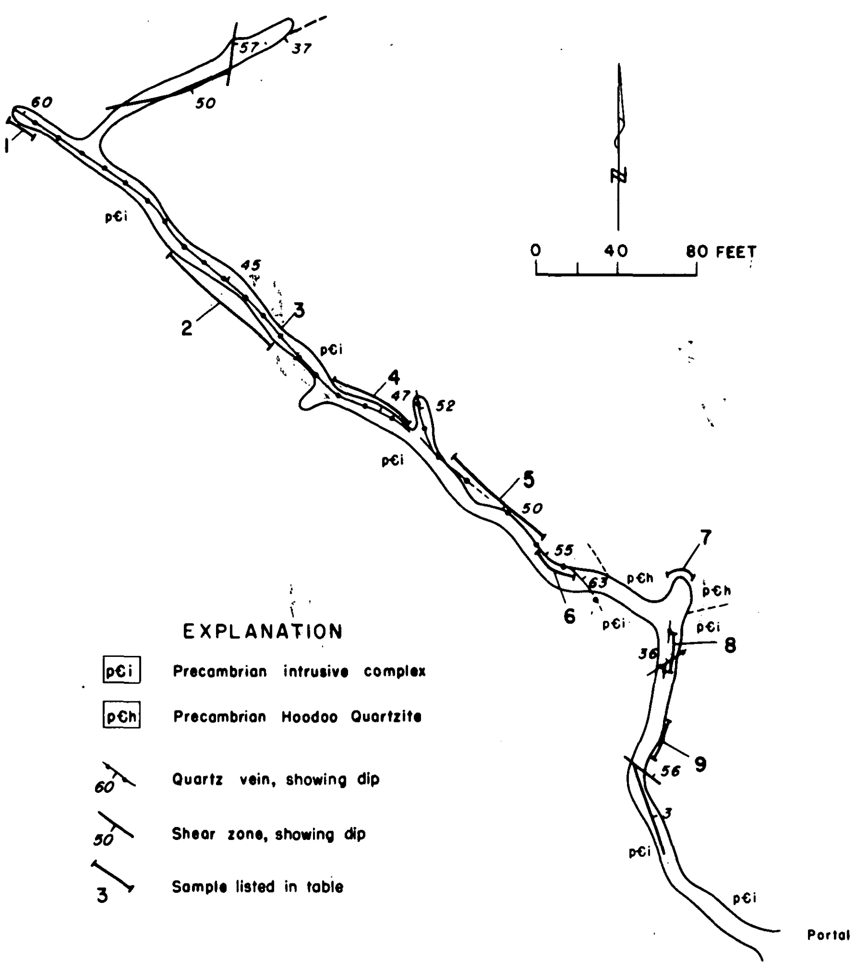


FIGURE 49. — Underground workings, Idaho-Rainbow group.

mining-claim descriptions are vague but indicate that the prospect was located at least as early as 1935; it is commonly referred to as the Galena or Galena Lead.

Prospect workings consist of an adit with a 35-foot-long opencut and a shallow pit. The larger working exposes a quartz fissure vein for 15 feet along its strike, to a depth of 10 feet. The exposed part of the quartz vein is 4-16 inches wide along a primary fracture in the intrusive complex. The fracture strikes N. 70° W. and dips 65° N. The vein is 6 inches wide in the small pit, 20 feet east of the adit. Six 1- to 4-inch-wide aplite dikes occur along a secondary fracture pattern that strikes N. 40°-45° E. and dips steeply to the southeast.

A 2-ton stockpile of vein material contains about 5 percent galena, 1 percent chalcopyrite and pyrite, iron-oxide minerals, and trace amounts of malachite, azurite, and bornite. A representative sample of the stockpile assayed 0.24 ounce gold per ton, 0.96 ounce silver per ton, 0.41 percent copper, 3.07 percent lead, and no zinc or molybdenum. A sample taken 16 inches across the exposure at the face of the adit contained minor sulfide minerals and assayed only 0.07 percent lead, 0.22 ounce silver per ton, and traces gold, copper, and zinc. A 5- to 6-inch-wide gouge zone on either side of the vein contains 0.06 percent lead, 0.01 percent copper, 0.26 ounce silver per ton, and traces gold and zinc. A sample taken across the exposure in the small prospect pit contained only 0.01 percent lead, 0.24 ounce silver per ton, traces gold and copper, and no detectable zinc or molybdenum. The six fine-grained aplite dikes exposed in the north wall of the adit contain less than 1 percent of an unidentified finely disseminated black mineral. A composite sample of the dikes assayed 0.01 percent lead, 0.22 ounce silver per ton, and traces gold, copper, and zinc. The apparently unaltered country rock also contains specks of the unidentified black mineral. A 10-foot-long chip sample taken from an outcrop 10 feet west of the adit assayed 0.22 ounce silver per ton and traces gold and copper.

Most sulfide minerals occur as pods or segregations throughout the quartz vein. Sulfide-rich quartz in the stockpile probably represents less than one-third of the total vein material removed from the prospect workings, indicating considerable hand sorting. The overall grade of the quartz vein exposure is too low to be mined at a profit.

Data for samples shown in figure 49

[Tr, trace; N, not detected. Sample 7 chip; all others random chip]

Sample	Length (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	15	Tr	0.07	0.01
2	58	0.022	.54	.44
3	10	.17	1.40	2.22
4	45	.024	.38	.26
5	60	.026	.62	.58
6	21	.292	.72	.28
7	10	Tr	.15	.01
8	20	Tr	.13	N
9	20	Tr	.19	N

OTHER LODE PROSPECTS

Acorn Butte No. 1 prospect. — About 800-1,000 feet west of the Acorn Butte No. 2 prospect is a 300-foot-wide, 1,000-foot-long outcrop of quartzite (fig. 30, No. 67). The massive northwest-trending outcrop contains minor iron-oxide stain along fracture surfaces but no sulfides or economic minerals. A 100-foot-long chip sample taken across the width of the outcrop contained a trace gold and 0.22 ounce silver per ton.

Brown Bear prospect. — At the bottom of a small canyon about 1 mile S. 55° W. of Acorn Butte is an old exploration pit 8 feet long, 6 feet wide, and 4 feet deep (fig. 30, No. 72). The pit is the only remaining evidence of the Brown Bear claim staked by J. T. Bell and others in 1902. Overburden and rock talus is several feet deep in the area, and the pit no longer exposes bedrock. A sample of slightly iron-stained gabbro sorted from the dump contained only 0.12 ounce silver per ton and a trace gold and copper.

Acorn Butte No. 4 prospect. — A 4-foot-wide, 10-foot-long quartz vein exposure (fig. 30, No. 71) was observed about 1 mile S. 75° W. of Acorn Butte Lookout. A sample from the vein, typical of the Acorn Butte area, contained a trace gold and copper, 0.18 ounce silver per ton, and 3.0 percent titanium.

Acorn Butte No. 2 prospect. — A discovery pit and trench (fig. 30, No. 68) were observed on a ridge crest one-half mile north of Acorn Butte. Overburden is nearly 3 feet deep over most of the prospect area, and bedrock is not exposed in the prospect workings. Small amounts of iron-stained quartz vein material with altered gabbro sorted from the dump of the pit contained about 2 percent calcite and 1 percent disseminated magnetite. A sample of the vein material assayed a trace gold and 0.5 ounce silver per ton. A trench is 100 feet east of the pit. No vein material, sulfide minerals, or alteration evidence was observed in the dump material.

Acorn Butte No. 3 prospect. — The prospect (fig. 30, No. 70) is one-half mile S. 80° W. of Acorn Butte Lookout. A 1-foot-wide quartz vein is exposed for 16 feet along its strike in a 5-foot-deep trench. The vein strikes N. 5° E., dips 60° W., and is composed principally of quartz. More than 10 percent calcite and less than 5 percent iron-oxide minerals are present. A random chip sample contained traces gold and copper but no silver or other economic metals. About 500 feet lower and northwestward from the trench is a short caved adit. Iron-stained quartz sorted from the dump contained traces gold and copper and 0.12 ounce silver per ton.

Silver Dome claim. — About 300-400 feet south of the caved adit is the Silver Dome claim (fig. 30, No. 69), located in 1956 by Clifford Shepard and Roland Clark. Prospect workings consist of a caved adit that trends N. 35° E. and two prospect pits, all apparently on the same vein. Several feet of overburden cover most of the claim area, but the predominant country rock, as indicated by the dumps, is medium-grained gabbro of the Precambrian intrusive complex. A sample of quartz-calcite vein material, sorted from the dump of the adit, assayed a trace gold and 0.20 ounce silver per ton. About 200 feet northeast of the caved adit and nearly 100 feet higher in elevation, a 4-foot-wide, 30-foot-long vein segment is exposed by two small prospect pits. The segment contains less than 5 percent iron-oxide minerals and about 1 percent altered pyrite. Samples taken across the vein contained a trace gold and copper and a trace to 0.14 ounce silver per ton. One sample contained 0.008 percent WO_3; tungsten was reported to occur at several prospects in the Acorn Butte area, but that sample was the only one that contained detectable amounts.

CROOKED CREEK PLACERS

Crooked Creek is a major tributary of Big Creek. Potential placer sites are mostly confined to a 1-mile section of the creek extending from the Snowshoe mine to slightly below the mouth of Bismarck Creek (fig. 30, No. 65). Most of this section of the creek is covered by claims of the Snowshoe, Rainbow, and Yellow Jacket groups. Elsewhere, the canyon is steep and narrow, providing few places for significant alluvial deposits to form. No placer production has been reported from Crooked Creek, and there is no evidence of recent placer activity.

The deposits are estimated to contain approximately 400,000 cubic yards of alluvium. Two test pits were hand dug to depths of 4.0 and 3.7 feet; water and caving of the pit walls prevented deeper penetration. Site 1 was dug one-fourth mile below Scott's cabin, and site 2 was dug 300 feet below Bismarck Creek (table 16). The amount of gold contained in the three samples is insignificant. Black-sand content of the samples averaged 18.8 pounds per cubic yard. Estimated average mineral composition of the black-sand concentrates was 51 percent ilmenite, 27 percent magnetite, 18 percent ferromagnesian silicates, 1.5 percent apatite, 1 percent zircon, 0.5 percent sphene, and trace amounts of anatase, rutile, garnet, allanite, and scheelite. Estimated average ilmenite content was high, about 9.6 pounds per cubic yard, but the alluvial deposits are too small to support mining.

TABLE 16. — *Reconnaissance placer samples from Crooked Creek*

[Tr, trace]

Site	Depth interval (ft)	Sample volume (cu ft)	Gold content		Black sands (lb per cu yd)
			Colors[1]	Value (cents per cu yd)[2]	
1	0 -4	4	8v.f.	0.3	19.4
2	0 -1.5	1.5	3v.f.	Tr	10.3
	1.5-3.7	2.2	2v.f.	Tr	23.4

[1]Number of particles of gold observed in the sample; v.f. (very fine) requires 1,000 or more colors to equal 1 cent.
[2]Gold values based on a price of $47.85 per troy ounce.

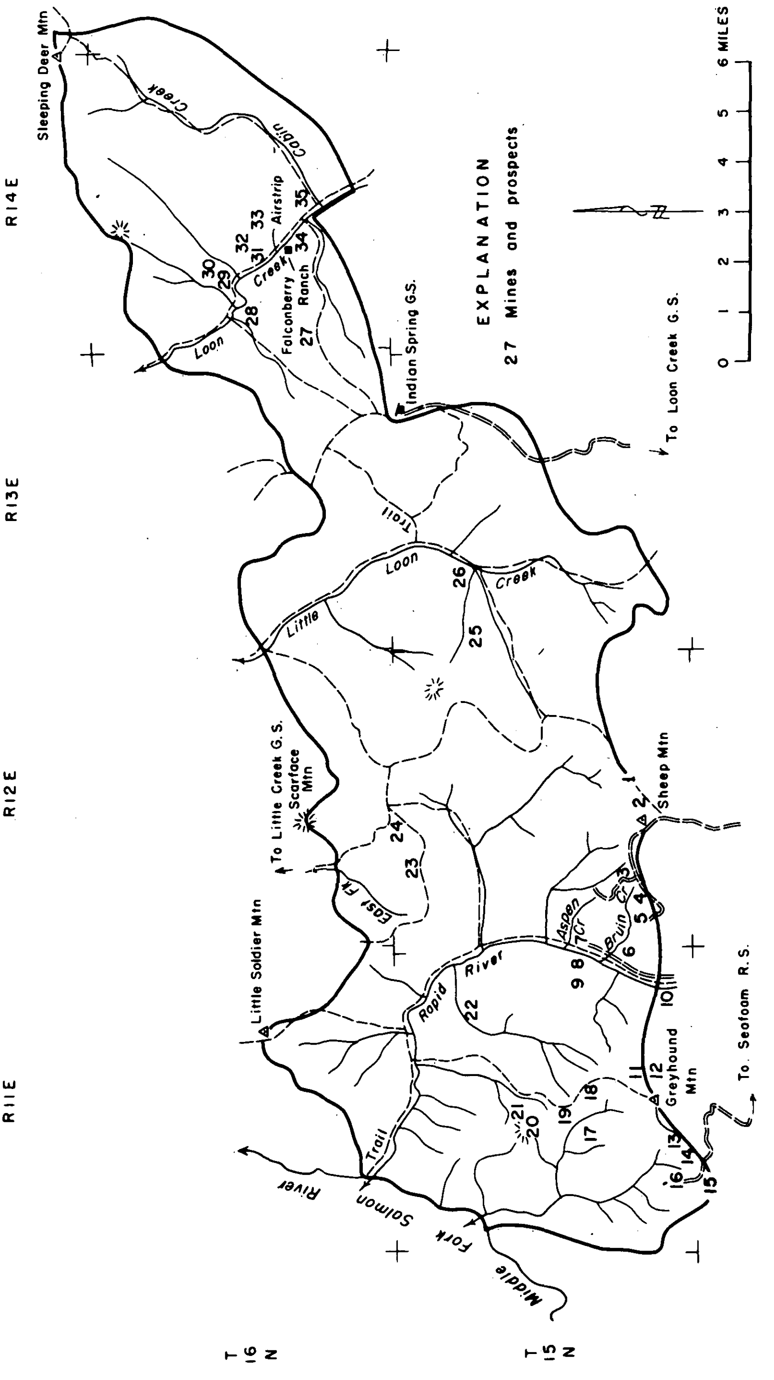


FIGURE 50. — Mines and prospects, Greyhound Ridge addition.

GREYHOUND RIDGE ADDITION

The Greyhound Ridge addition is an area of about 140 square miles at the south end of the Idaho Primitive Area (fig. 50). It includes parts of the Seafoam, Sheep Mountain, and Loon Creek mining districts of Lemhi and Custer Counties. Deposits of silver, lead, zinc, and copper are within the addition, along the west end of the south boundary.

Prospecting in the region began about 1867 when placers were discovered on Loon Creek just south of the addition. Placers on Loon Creek and the upper reaches of Rapid River were soon abandoned in favor of nearby lode deposits. The Greyhound, Seafoam, and Lost Packer mines south of the addition and the Mountain King and Hardscrabble mines (fig. 50, Nos. 3 and 21) within the addition were the early producers. Most of the production was during 1867-1910. Smelters at the Greyhound and Lost Packer mines processed most of the ore.

Lode production totaling $1,083,734 is recorded from the Sheep Mountain, Seafoam, and Loon Creek districts. Production from the Mountain King mine is reported to be $323,100, and about $706,900 was produced from the Lost Packer mine, 0.5 mile outside the study area. The Greyhound mine produced $19,276 ($871 from within the study area) from 1910 to the present. Other properties such as the Lead-Metals and Blackjack (fig. 50, Nos. 5 and 8) had minor production. Gold was the principal commodity produced in the region; other commodities, in the order of decreasing importance, were silver, lead, zinc, and copper. Occurrences of molybdenum and tungsten have been reported, but no production is known.

Two major types of lode deposits, both presumed to be Tertiary (Ross, 1934), occur in the Greyhound Ridge addition: (1) mineralized shear zones in the Yellowjacket Formation and (2) partial replacement deposits in metamorphic rocks. Type 1 deposits are mineralized shear zones that parallel a regional system of Tertiary faults which trend N. 45° W. and cut not only metamorphic rocks of the Precambrian Yellowjacket Formation but also granite of the Cretaceous Idaho batholith and flows of the Tertiary Challis Volcanics. The mineral deposits, partly replacement and partly fissure filling are lenses and veins containing gold or copper. Most deposits of type 1 are around Loon Creek and Greyhound Mountain. Deposits of

Mines and prospects shown in figure 50

1. Old Timer prospect
2. Badger Lode prospect
3. Mountain King mine
4. Lemp group
5. Lead-Metals group
6. Bacon group
7. Idaho prospect
8. Blackjack group
9. Snowstorm group
10. Opal Creek placer
11. Brown Bear prospect
12. Moonshine prospect
13. Dowling Quartz prospect
14. Porphyry Peak claim
15. Capitol State claim
16. Republican group
17. West Side claim
18. Columbus claim
19. Ramshorn prospect
20. Outlook claim
21. Hardscrabble group
22. Bell Creek placers
23. Thomas Creek No. 2 claim
24. Thomas Creek No. 3 claim
25. Dirty Dutchman prospect
26. Triple B prospect
27. Jack Creek prospect
28. Biggs Ranch placer
29. Good Enough group
30. White Quartz claim
31. Black Nugget claim
32. Burn Creek prospect
33. Can't Savie prospect
34. Falconberry Ranch placer
35. Valentine group

type 2 are partial replacement deposits associated with fractures in metamorphic-rock roof pendants in the Idaho batholith. The pendant blocks are Precambrian schist or dolomite, with intercalated shale and quartzite. Most of these deposits are around Sheep Mountain.

There are no significant placers within the addition despite the production from those nearby. Placer localities sampled in the addition are along Loon Creek and on tributaries of Rapid River.

SHEEP MOUNTAIN AREA

The Sheep Mountain area, at the south boundary of the addition, is an area of high relief; the highest point is 9,192 feet at the summit of Sheep Mountain. Access is by way of 8.5 miles of road from the Seafoam Ranger Station. Three properties — Mountain King, Lead-Metals group, and Lemp group (fig. 50, Nos. 3, 5, and 4) — have had some production.

The Sheep Mountain area is underlain by roof pendants of Precambrian rock in quartz monzonite of the Idaho batholith. The deposits are in the roof pendants and were formed by replacement along shear zones. They are 1.5-8 feet wide and are exposed intermittently along their strikes for as much as 1,600 feet. Samples contained as much as 0.47 ounce gold per ton, 52.9 ounces silver per ton, 64.0 percent lead, 12.7 percent zinc and 4.6 percent copper, but most contained much less.

MOUNTAIN KING MINE

The Mountain King mine (fig. 50, No. 3), about 1½ miles west of Sheep Mountain, is on the north side of the ridge and is accessible by 12 miles of road from Seafoam Ranger Station. This property was claimed in the 1880's, but only a small amount of work was done until the property was leased by Hecla Mining Co. in 1927. Records of the Ketchum smelter show that in 1884 two shipments of high-grade or cobbed ore amounted to 5.75 dry tons and contained 1,067.28 ounces of silver and 5,049 pounds of lead (Ross, 1930, p. 6). Shipments in 1890 and 1892 amounted to 71.85 dry tons and contained 6,579.12 ounces of silver and 79,601 pounds of lead. Estimates of value of production before 1927 range from $80,000 to $500,000 (Ross, 1930, p. 6). No production was recorded from 1927 until 1935, but production during 1935-65 totaled 3,186 tons containing 0.05 ounce gold per ton, 16.6 ounces silver per ton, 11.9 percent zinc, 10.1 percent lead, and 0.2 percent copper. Total recorded production was $323,100. Lee Hopkins and others purchased the property in 1967 and restaked the old Mountain King claims, which, combined with the old Silver Streak and Happy Day properties (fig. 51), became part of the 86 claims of the Mountain King group.

The deposit is in one of the larger roof pendants. Some mineralization occurred along the sedimentary-intrusive contact. All ore, except for several morainal boulders in Aspen Creek (Silver Streak prospects), came from the limestone, but sampling shows that sparsely disseminated sulfides also occur in the quartzite and in the granitic rocks.

The Mountain King workings total 1,650 feet in length. There are three levels on about 50-foot intervals; one is internal (fig. 52). Only the 200 level was sampled because the 100 level is caved and the 150 level is unsafe. Ore has been stoped from all levels. No mining or milling equipment is on the property.

The principal structure is a siliceous replacement vein 2-8 feet thick. It strikes N. 76° W. and dips 48° S., approximately parallel to bedding in marble. The vein is well defined and is continuous for 110 feet to where it is cut by a granitic dike. The structure probably continues beyond the dike, but has not been adequately explored. Mineralized rock was intersected along the pendant-granitic rock contact during a drilling project in 1968. Three holes were put down, but because of poor positioning, they did not intersect the main vein. Caved workings to the southeast on the Happy Day claim reportedly show a similar vein which might be a continuation of this structure.

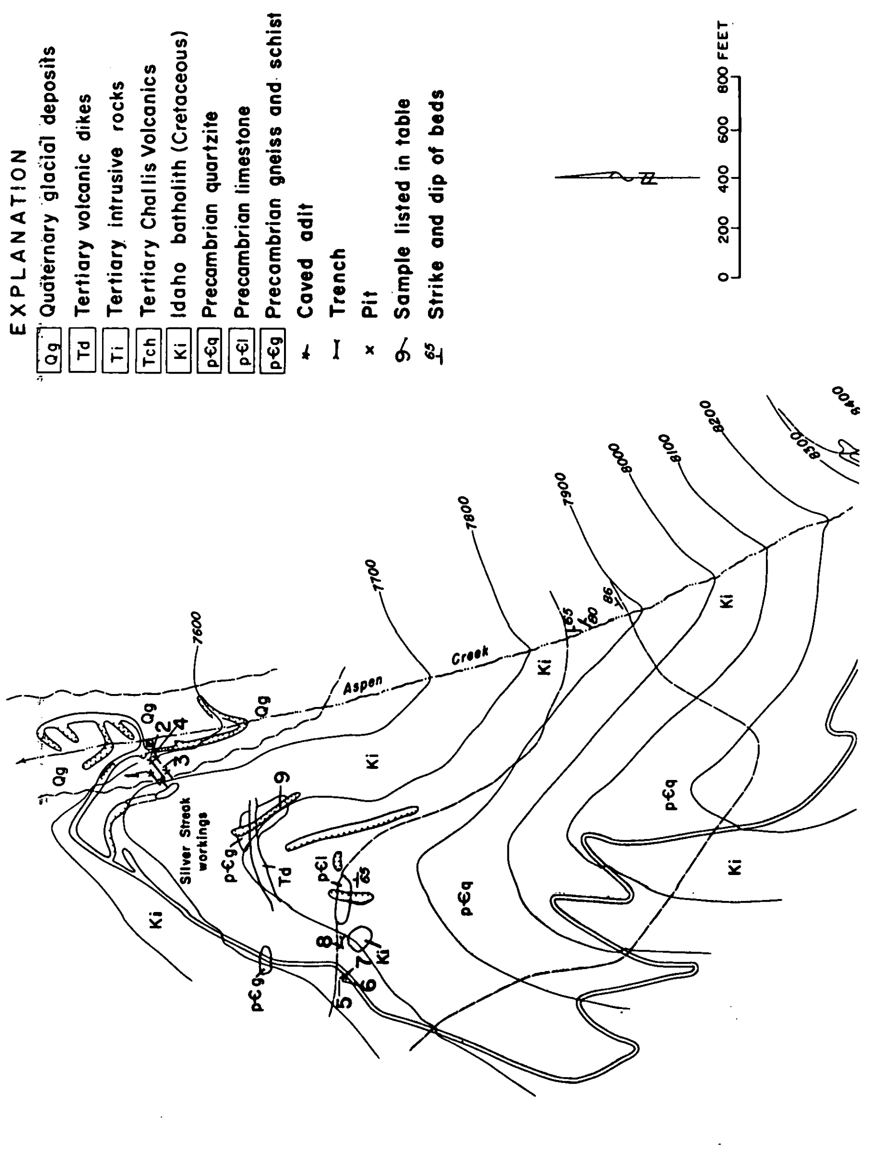
The main vein consists of argentiferous galena, pyrite, sphalerite, and chalcopyrite in a siliceous gangue. Assays showed that the metal content is 0.15-28.0 ounces of silver per ton, a trace to 0.2 ounce gold per ton, a trace to 0.52 percent copper, a trace to 50.2 percent lead, and a trace to 12.7 percent zinc. Cadmium, checked in one sample, amounted to 0.07 percent compared to 11.0 percent associated zinc.

A potential resource of 10,000 tons is estimated to exist below the 200 level, at a grade of 0.07 ounce gold per ton, 2.3 ounces silver per ton, 1.5 percent lead, 4.0 percent zinc, and 0.15 percent copper. Another 15,000 tons

Data for samples shown in figures 51 and 52

[Tr, trace; N.d., not determined; N, not detected. Samples 11-21 collected from underground workings]

Sample No.	Sample Type	Locality or length (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)	Zinc (percent)
1	Grab	Dump	Tr	2.7	N.d.	3.8	5.6
2	do	do	0.01	.5	Tr	.3	N
3	do	do	Tr	.3	N.d.	.1	.1
4	do	do	.01	.1	N	N	N
5	do	do	Tr	.2	0.1	.1	.1
6	do	do	Tr	N	N	Tr	N
7	Chip	----------	Tr	.05	.04	N	N
8	Grab	Trench	Tr	.2	Tr	Tr	N
9	do	do	Tr	.1	.4	N	N
10	do	Dump	Tr	.4	.1	.1	.01
11	Chip (vein)	2.0	.20	23.10	.40	22.0	12.7
12	do	4.0	.10	28.00	.52	50.2	12.0
13	do	2.6	.09	21.20	.43	9.5	11.2
14	Chip (footwall).	52.0	Tr	.40	Tr	Tr	1.2
15	do	40.0	.04	.80	Tr	.8	2.3
16	do	28.0	.006	1.20	Tr	.3	1.5
17	Chip (hanging wall).	59.0	Tr	.15	Tr	Tr	Tr
18	do	7.0	Tr	.50	Tr	2.1	2.4
19	do	8.0	.05	.80	.05	1.3	2.1
20	do	7.5	.10	1.5	.03	.9	3.2
21	Chip (vein)	3.5	.20	2.5	.12	1.6	11.0
22	Chip	10.0	.02	15.6	Tr	9.0	5.7
23	do	10.0	Tr	Tr	N	N	N


EXPLANATION
Qg Quaternary glacial deposits
Td Tertiary volcanic dikes
Ti Tertiary intrusive rocks
Tch Tertiary Challis Volcanics
Ki Idaho batholith (Cretaceous)
p€q Precambrian quartzite
p€l Precambrian limestone
p€g Precambrian gneiss and schist
Caved adit
Trench
Pit
Sample listed in table
Strike and dip of beds
0 200 400 600 800 FEET
Aspen Creek
Silver Streak workings
7600
7700
7800
7900
8000
8100
8200
8300
8400

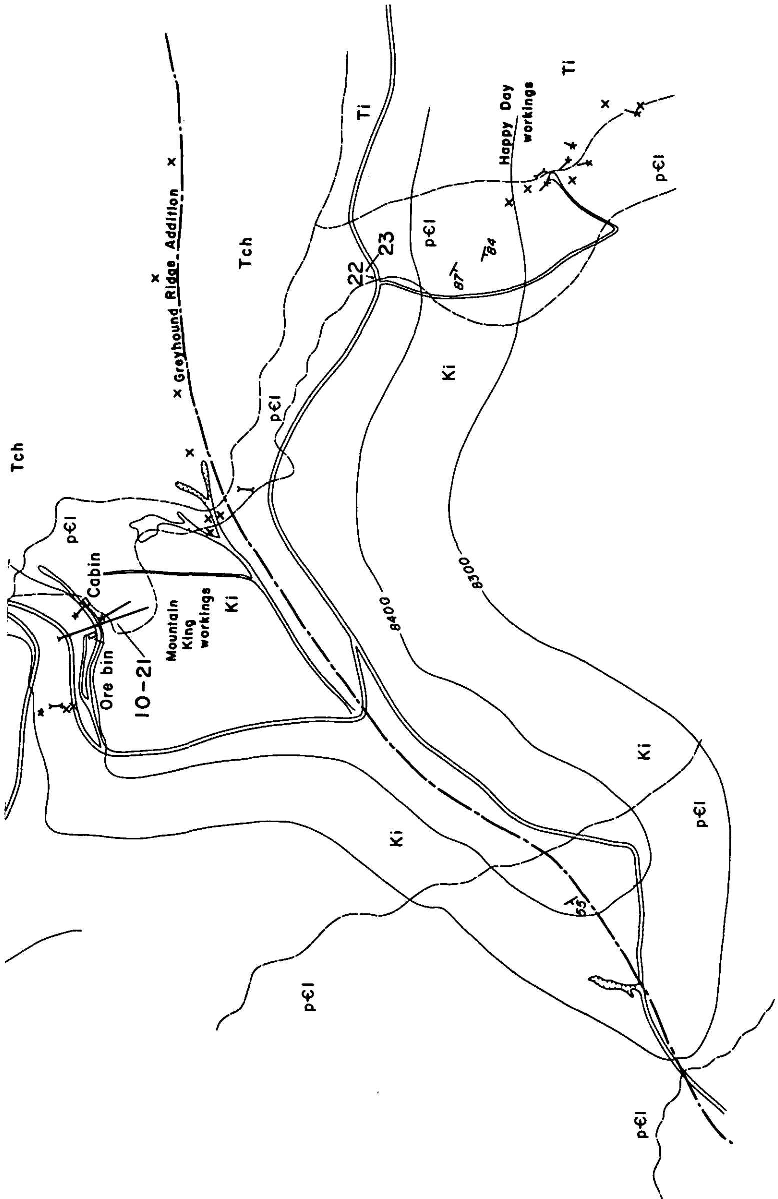


FIGURE 51. — Mountain King mine.

of potential resources in the footwall are estimated to contain a trace gold, 0.9 ounce silver per ton, 0.9 percent lead, 1.2 percent zinc, and a trace copper. On the south side of the dike, an estimated 35,000 tons of potential

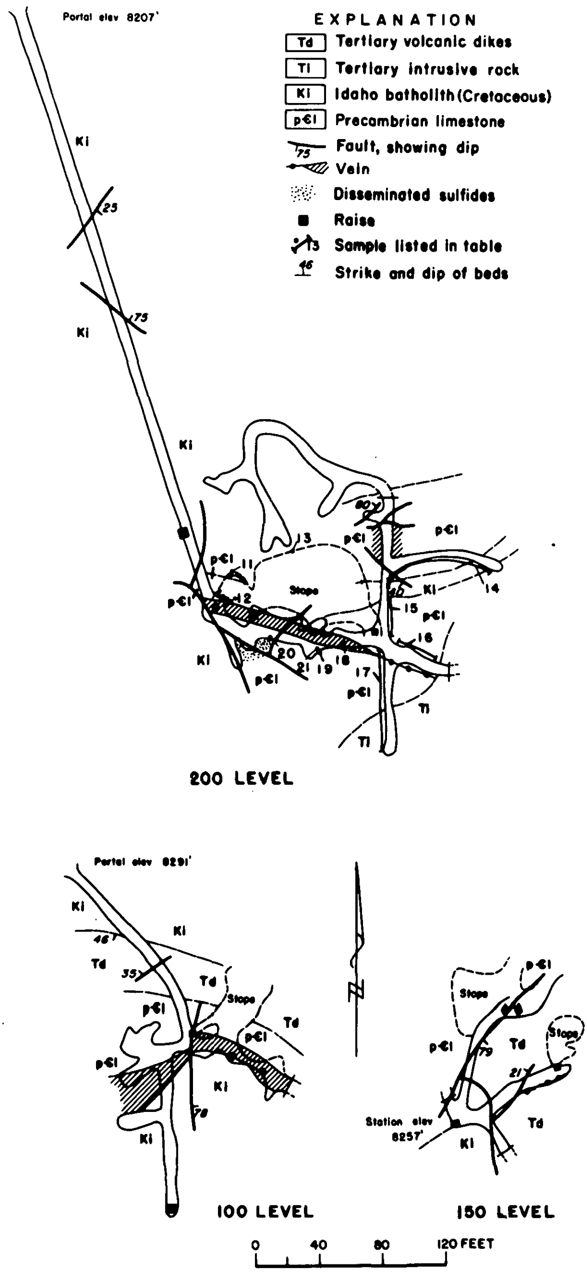


FIGURE 52. — Underground workings, Mountain King mine. Sample data shown in table preceding figure 51.

resources contain a trace gold, 2.5 ounces silver per ton, 1.5 percent lead, 2.0 percent zinc, and a trace copper.

Outcrops indicate that the pendant extends several hundred feet to the east of the Mountain King and to the south into the valley of Lime Creek. The property probably will continue to be explored.

The Silver Streak workings are about 3,600 feet north of the Mountain King and about 800 feet lower (fig. 51). Workings consist of several caved adits, pits, and trenches. These were excavated to search for structures inferred by high-grade lead-zinc-silver float in Aspen Creek nearby. The float probably originated higher on the ridge at or near the Mountain King workings. Samples of rock in dumps and soil contained a maximum of 0.01 ounce gold per ton, 2.7 ounces silver per ton, 0.4 percent copper, 3.8 percent lead, and 5.6 percent zinc.

The southernmost workings of the Mountain King group are those on the Happy Day claim. These are south of the study area boundary but may be on the southern extension of the Mountain King vein. Most of the workings are caved and could not be examined. One 10-foot sample of two taken along a roadcut (fig. 51) contained 0.02 ounce gold per ton, 15.6 ounces silver per ton, 9.0 percent lead, and 7.6 percent zinc. The material sampled was decomposed marble near a contact with granitic rock. The second sample contained only a trace gold and silver.

LEAD-METALS GROUP

The Lead-Metals group (fig. 50, No. 5) is at an altitude of 7,000-7,800 feet on a steep mountain slope at the head of Bruin Creek and is at the end of the Sheep Mountain road, 1.7 miles west of Sheep Mountain. A 12-mile dirt road to the property from Seafoam Ranger Station is maintained by the owners. Bedrock is generally concealed by soil and vegetation in the prospect area.

The original property, comprising eight lode claims, was staked in 1946. In 1969, Empire Exploration, Inc., made a shipment of sorted dump material (John Ivey, oral commun., 1970).

The property has been developed by four adits, a shaft, and a few surface cuts (fig. 53). Two adits are caved, and the others are partially flooded. No mining or milling equipment is on the property.

The area is underlain by a sequence of dolomitized marble and quartzite, encircled by medium-grained granitic rock of the Idaho batholith. Most of the rock is gray when weathered, and bedding is rarely visible in outcrops. Contact between the granitic and metasedimentary rocks is well defined.

Mineralization is mainly in a shear zone which trends N. 37° W., parallel to the predominant fractures in the country rock and to a diorite porphyry dike. The main shear zone dips 20°-50° SE., ranges in thickness from 1.5 to 4 feet, and is exposed intermittently for at least 1,350 feet. Several smaller shear zones, ranging in thickness from 0.1 to 2 feet, are closely associated with the main structure. Mineralization is present in ¼- to 2-inch-thick

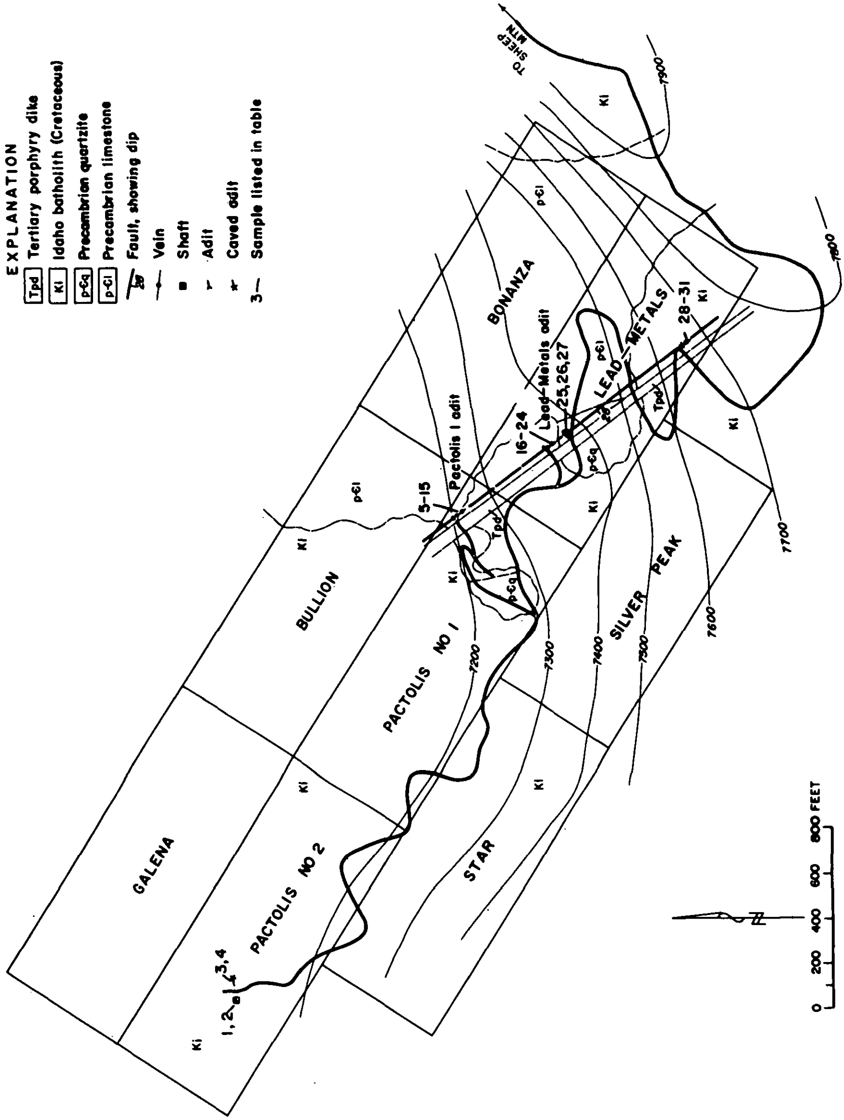


FIGURE 53. — Lead-Metals group. Claim boundaries are approximately located.

sulfide-rich stringers and veinlets within brecciated parts of the shear zones. The stringers and veinlets are composed of white quartz with up to 20 percent each of galena and pyrite, less than 1 percent sphalerite, and minor amounts of chalcopyrite and bornite. Small amounts of sulfides are disseminated in the adjacent wallrock. Despite differences in structure and host rock, the mineral assemblage in the veinlets is consistent throughout the property.

Samples taken across the thickness of the shear zone averaged a trace gold, 2.56 ounces silver per ton, 0.06 percent copper, 2.0 percent lead, and 0.24 percent zinc. The shear zone has an average thickness of 2.7 feet and is exposed intermittently for a length of 1,350 feet.

Exceptionally high assay values were obtained from samples of the sulfide-rich veinlets and stringers within the main shear zone. One sample from a 4-inch-thick veinlet exposed in the Pactolis adit (fig. 54) contained 0.04 ounce gold per ton, 52.90 ounces silver per ton, 4.6 percent copper, 64.0

Data for samples shown in figures 53 and 54

[Tr, trace; N.d., not determined; N, not detected]

Sample		Locality or length (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)	Zinc (percent)
No.	Type						
1	Grab	Dump	0.11	0.3	N.d.	0.01	0.03
2	do	do	.05	.3	N.d.	.31	.15
3	do	do	.18	3.4	N.d.	.14	.04
4	do	do	.09	9.4	N.d.	8.20	5.60
5	Chip (shear zone).	1.5	Tr	.1	N	3	.2
6	Chip (quartz vein).	1.1	.03	8.41	0.24	4.2	.5
7	do	.4	.01	11.11	.32	8.5	Tr
8	Chip (shear zone).	1.5	Tr	.10	N	.1	Tr
9	do	1.2	Tr	N	N	N	N
10	Chip (quartz vein).	1.4	N	N	N	N	N
11	Chip (shear zone).	2.8	Tr	.12	N	.5	N
12	do	1.8	N	.56	N	.6	N
13	Select, grab (quartz vein).	-----	.04	52.90	4.60	64	4
14	Chip (shear zone).	3.4	Tr	.37	Tr	Tr	.2
15	Chip (quartz vein).	1.6	.19	Tr	Tr	2	Tr
16	Random chip (dike).	-----	Tr	.02	N.d.	N.d.	N.d.
17	Chip (shear zone).	1	.02	6.7	N.d.	8	N.d.
18	do	1.7	Tr	.40	N.d.	N.d.	N.d.
19	Chip (quartz vein).	.2	.14	23.80	1.1	15	N.d.
20	Chip (shear zone).	1.7	Tr	Tr	N.d.	.1	N.d.
21	do	2	Tr	1.5	N.d.	N.d.	N.d.
22	Random chip (wallrock).	-----	Tr	.4	N.d.	.1	N.d.
23	Chip (quartz vein).	2	Tr	16.7	N.d.	N.d.	N.d.
24	do	.5	.04	.4	N.d.	.7	N.d.
25	Grab	Stockpile(?)	N	N	.1	.5	1.3
26	Chip (wallrock).	-----	N	N	N	.2	N
27	Grab	Stockpile	Tr	2.4	.3	22.8	2.3
28	Random chip (dike).	-----	N	N	N	N	N
29	Chip (shear zone).	-----	Tr	Tr	N.d.	N.d.	N.d.
30	Random chip (wallrock).	-----	Tr	Tr	N	N	N
31	Grab	Dump	N	N	N	N	N

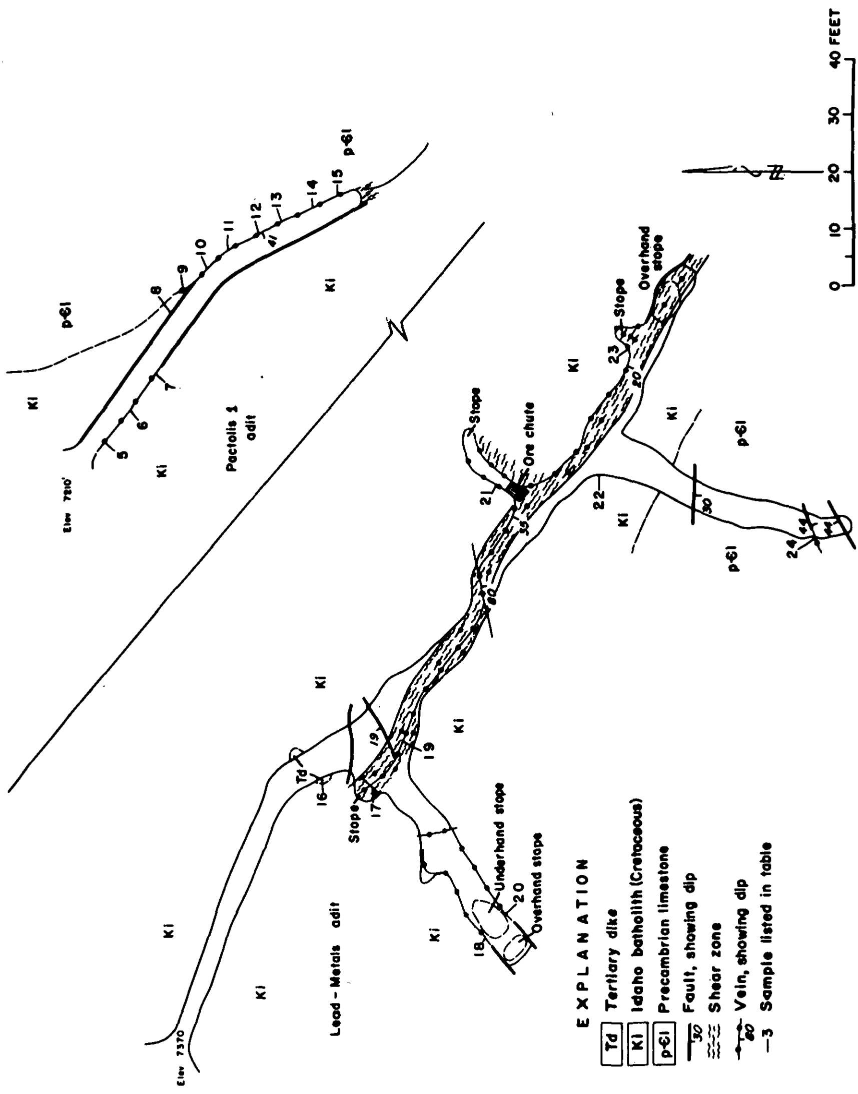


FIGURE 54. — Underground workings, Lead-Metals group. Sample data shown in table following figure 53.

percent lead, and 4.0 percent zinc. A similar 4-inch-thick veinlet in the Lead-Metals adit contained 0.14 ounce gold per ton, 23.8 ounces silver per ton, 1.1 percent copper, and 15.0 percent lead. Production apparently has been limited to selective mining of these high-grade stringers or cobbing high-grade ore from the dumps.

BACON GROUP

The Bacon 1 and 2 claims (fig. 50, No. 6) are at an altitude of 6,600 feet on a forested slope one-half mile from the Rapid River road, across and down the ridge one-half mile from the end of the Sheep Mountain road.

The claims were staked in 1946 and restaked in 1970 by Mr. Bacon. Three adits and three large trenches are on the claims. One adit is caved, and only one trench exposes bedrock.

Mineralized shear zones occur throughout a marble roof pendant, and deposits were formed by fissure filling and replacement. Average thickness of quartz veins within shear zones is about 6 inches. The contact of the pendant is not well exposed, but the few outcrops indicate the pendant to be 750 feet wide and 1,000 feet long. Other mineralized shears probably occur within the limestone.

A 1-inch-thick mineralized shear exposed in adit 1 (fig. 55) strikes N. 45° E. and dips 11° N. The shear zone contains (in order of decreasing abundance) pyrite, sphalerite, marcasite, limonite, and chalcopyrite. The metallic minerals are in a thin layer enclosed by white quartz. Adit 2 is caved and shows no bedrock. Mineralized rock on the dump contains large amounts of both pyrite and galena but small amounts of quartz. Adit 3 exposes part of an 8-foot-thick horizontal shear zone, which is also exposed in a pit above. The shear zone is mineralized to a point 20 feet from the portal. Galena, pyrite, and values of gold and silver occur in quartz veins up to 6 inches thick within the shear zone. Stockpiled material contained layers of galena and quartz in limestone. Cuts 1 and 2 (fig. 55), are sloughed, but galena and pyrite are disseminated in limestone in small stockpiles.

Average tenor of high-grade material from a stockpile and selected from dumps is 0.26 ounce gold per ton, 9.6 ounces silver per ton, 0.42 percent copper, 6.61 percent lead, and 14.49 percent zinc. The average thickness of the veins within the shear zones is about 6 inches. Two 8-foot samples cut across the total shear thickness contained 0.29 and 0.47 ounce gold per ton, 2.1 and 1.3 ounces silver per ton, 0.01 and 0.46 percent copper, 0.17 and 0.85 percent lead, and 0.04 and 1.02 percent zinc.

Assuming that the shear zone is continuous through the limestone block, a resource of 38,000 tons is estimated.

OTHER LODE PROSPECTS

Lemp group. — The Lemp group (fig. 50, No. 4) is 1½ miles west of Sheep Mountain, on the Sheep Mountain road and east of the Lead-Metals group. The claims were patented in the 1890's. There was probably some production, although none was recorded. A shaft and adit (both caved),

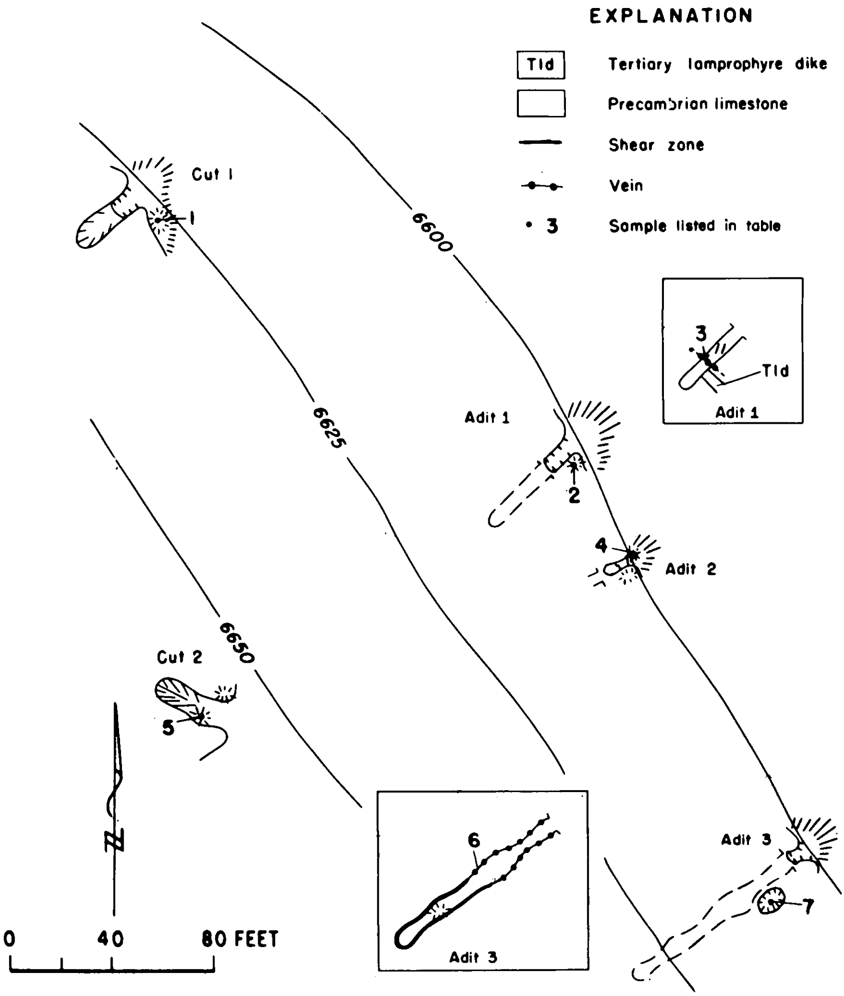


FIGURE 55. — Bacon group.

trench, and a surface cut opened on a shear zone trending N. 60° W. in quartz monzonite. Because of poor exposures and sparse outcrops, the zone could not be traced. A diorite porphyry dike, possibly related to the structure, parallels the shear zone. A select sample taken of iron-stained material on the stockpile contained galena, chalcopyrite, and pyrite in a gangue of quartz and sheared rock fragments. It assayed a trace gold, 0.2 ounce silver per ton, 0.01 percent lead, and 0.01 percent copper.

Badger Lode prospect. — The Badger lode (fig. 50, No. 2) was located in 1946. It is just east of the summit of Sheep Mountain and is reached by a cross-country route from the Sheep Mountain road. A partially sloughed pit was dug in andesite porphyry. No mineralized rock is exposed in the pit, but a grab sample of a nearby gossan contained traces of bornite and

Data for samples shown in figure 55

[Samples 1, 2, 4, 5 were grab; samples 3, 6, 7, were chip]

Sample	Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)	Zinc (percent)
1	Stockpile	0.02	15.5	0.66	10.80	18.20
2	Dump	.66	1.7	.43	.14	.94
3	2	.47	1.3	.46	.17	.04
4	Stockpile	.35	11.5	.12	2.30	18.20
5	do	.02	9.8	.46	13.20	20.60
6	8	.29	2.1	.01	.85	1.02
7	8	.40	13.0	.48	4.40	.97

chalcopyrite in quartz. The sample contained a trace gold, 0.2 ounce silver per ton, 0.01 percent lead, and 0.01 percent copper.

Old Timer prospect. — The Old Timer prospect (fig. 50, No. 1) is at an altitude of 8,500 feet and is accessible by a trail from the Sheep Mountain road. The property is 1 mile east of Sheep Mountain. Three pits and a trench have been dug on the property. Tertiary dacite and a few schist xenoliths contain stockworks of numerous ¼- to 1-inch-thick veinlets of pink rhodochrosite. The amount of rhodochrosite is small. No lead or silver was detected.

GREYHOUND MOUNTAIN AREA

The Greyhound Mountain area is at the southwest edge of the Greyhound Ridge district and can be reached from Seafoam Ranger Station by 11 miles of dirt road. The area has high relief; the highest point is Greyhound Mountain, at an altitude of 8,995 feet. Most of the ridges and valleys are forested, and some summits are open grassy areas.

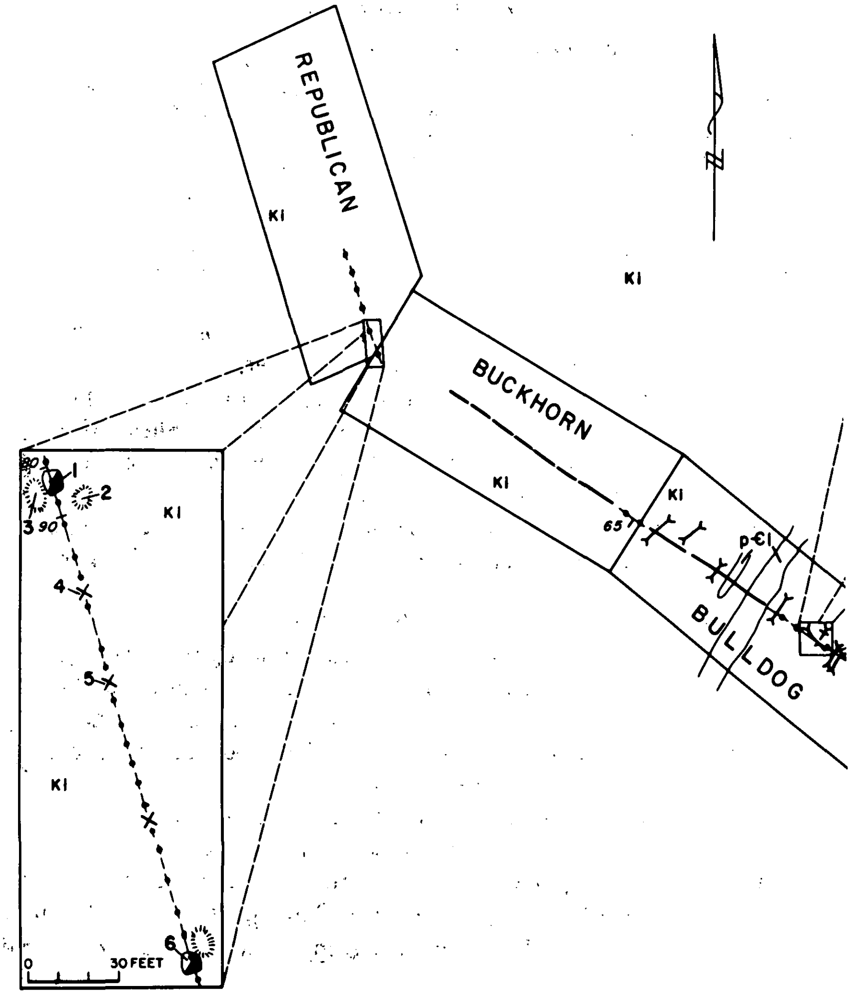
The area is underlain by granitic rocks of the Idaho batholith. Mineral production has been recorded from mines in the district near Greyhound Mountain. The most important has been from the Greyhound mine located just outside the study boundary (pl. 1). The Republican and Hardscrabble groups (fig. 50, Nos. 16, 21) within the study area have recorded small production.

The deposits are predominantly mineralized shear zones 0.1-35 feet thick. They can be traced as much as 1,400 feet along the surface. Samples contained as much as 0.23 ounce gold per ton, 59.8 ounces silver per ton, 5.6 percent lead, 1.4 percent zinc, and 0.3 percent copper.

REPUBLICAN GROUP

The Republican group includes the Republican, Buckhorn, Bulldog, and Idaho patented claims (fig. 50, No. 16). The group is adjoined by the Logan, Doe, and Stag claims. The Republican property was first located in the early 1900's and restaked several times. The Stag and Doe groups were located in 1956, but no workings were observed on the claims. The Logan claim is part of the Greyhound mine group, most of which is outside the Idaho study area.

Access to the group is by way of the Greyhound Ridge road, which leads



REPUBLICAN
BUCKHORN
BULLDOG
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pЄl
65
80
1
2
3
90
4
5
6
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30 FEET
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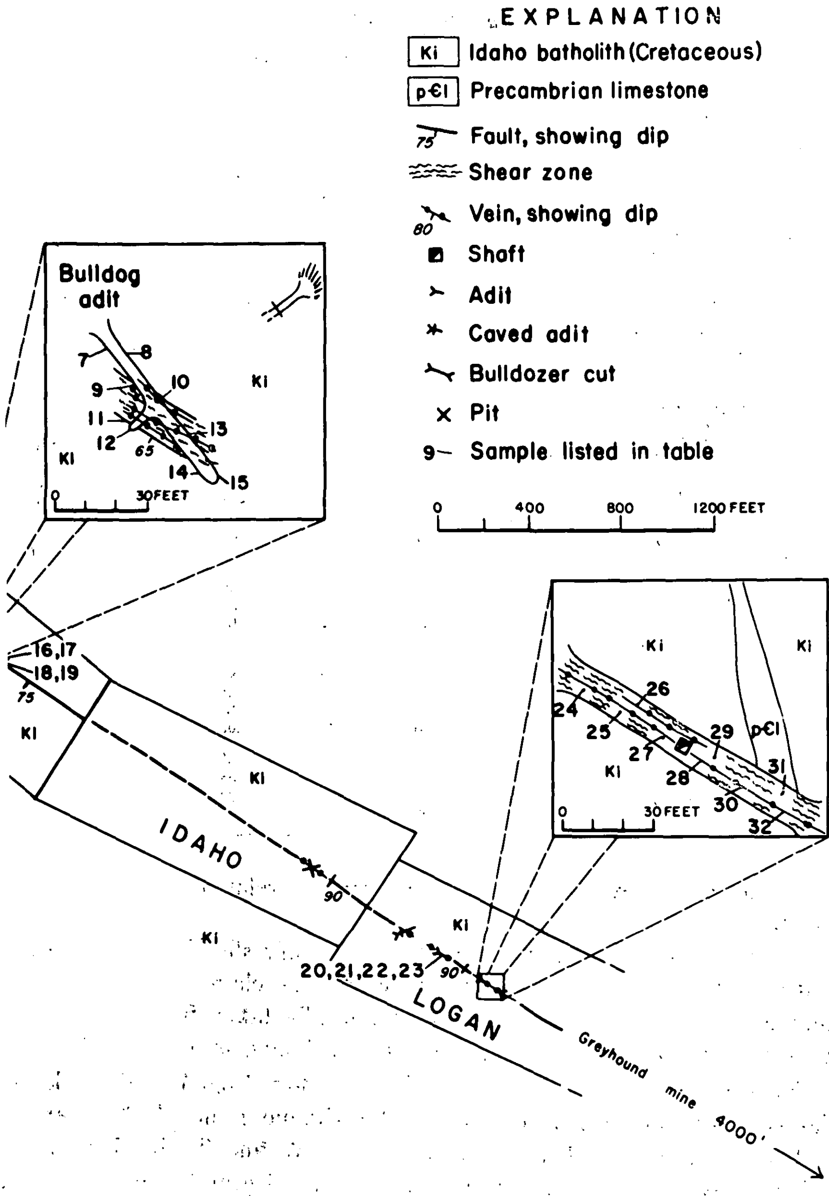
FIGURE 56.—



Republican group.

Data for samples shown in figure 56

[Tr, trace; N.d., not determined; N, not detected]

Sample No.	Sample Type	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)	Zinc (percent)
1	Chip (quartz vein)	1.0	0.01	0.2	Tr	N	N
2	Grab (stockpile)	----	.01	5.9	N	N	0.5
3	do	----	.10	4.1	Tr	3.0	N
4	Chip (quartz vein)	1.0	Tr	.3	Tr	2.0	Tr
5	do	2.0	Tr	.1	Tr	.3	N
6	do	5.0	.01	.8	Tr	4.5	N
7	Chip (wallrock)	6.0	Tr	.5	0.02	.2	N.d.
8	do	4.0	Tr	7.7	.03	1.1	N.d.
9	Chip (shear zone)	5.5	Tr	6.2	Tr	4.7	.8
10	Chip (quartz vein)	.5	Tr	30.5	.18	4.6	N.d.
11	do	.5	.02	21.8	.06	2.3	N.d.
12	Chip (wallrock)	4.0	Tr	.4	N	N	N.d.
13	Chip (shear zone)	3.1	Tr	.2	.01	.1	N.d.
14	Chip (wallrock)	4.5	Tr	.1	N	.5	N.d.
15	Chip (contact zone)	3.5	Tr	.4	.02	.1	N.d.
16	Chip (wallrock)	12.0	.01	.2	Tr	2.0	N
17	do	10.0	Tr	.7	N.d.	N.d.	N.d.
18	do	22.0	Tr	N	N	N	N.d.
19	do	15.0	Tr	.9	.02	Tr	N.d.
20	Grab (dump)	----	.03	9.6	.01	N	N.d.
21	Chip (shear zone)	2.0	.02	2.6	N	N	N.d.
22	do	----	.01	.3	.01	.10	N.d.
23	do	3.0	Tr	N	.01	.01	N.d.
24	Chip (quartz vein)	5.0	N	N	N	4.7	N.d.
25	do	5.0	N	N	N	N	N.d.
26	do	5.0	.01	2.1	.01	.2	N.d.
27	do	4.0	Tr	2.0	N	1.0	N.d.
28	do	4.0	.01	2.1	.02	.1	N.d.
29	Chip (shear zone)	5.0	Tr	.7	.01	.1	N.d.
30	Chip (quartz vein)	5.0	.01	2.7	.02	N.d.	N.d.
31	Chip (shear zone)	5.0	Tr	.1	.02	N.d.	N.d.
32	Chip (quartz vein)	5.0	Tr	.3	N	.1	N.d.

to the head of Greyhound Creek. The terrain is relatively flat, but a cliff trends through the Logan claim.

Workings on the property consist of discovery shafts, pits, and small adits; the largest is a 61-foot adit on the Bulldog claim (fig. 56). A small amount of ore from the claims was reportedly taken from the Bulldog workings and sent to the smelter at the Greyhound mine in about 1905.

The vein (shear zone) on the Idaho, Bulldog, Logan, and Buckhorn claims is similar to the vein on the Greyhound mine property and is probably its extension. The zone strikes N. 55° W. and dips from vertical to 65° S. It is composed of crushed and sericitized granite cemented by a bluish quartz containing finely disseminated sulfides. Identified minerals are, in order of decreasing abundance: galena, sphalerite, pyrrhotite, arsenopyrite, chalcopyrite, and pyrite. The vein ranges in thickness from 18 inches in the Idaho discovery pit to 12 feet in the Bulldog adit, but it averages 2.5 feet. Assays showed values as high as 4.7 percent lead, 30.5 ounces silver per ton, 0.8 percent zinc, and 0.10 ounce gold per ton, but the values averaged much less. Average grade of the shear zone is estimated to be 0.006 ounce gold per ton, 1.3 ounces silver per ton, 0.01 percent copper, and 0.9 percent lead. Samples taken from quartz veins in the shear zone contained slightly higher metal values — 2.0 ounces silver per ton, 1.3 percent lead, 0.01 percent copper, and a trace gold.

The vein on the Republican claim differs structurally and mineralogically from the vein on the other claims. The vein is confined to granite, strikes N. 18° W., and dips 80°-87° S. It does not exceed 3 feet in thickness and contains galena, pyrite, chalcopyrite, and bornite. It can be traced 250 feet along its strike. Two discovery pits, a maximum of 18 feet deep, have been dug on the vein. Approximately 8 tons of ore is stockpiled beside the north pit (fig. 56). A grab sample of the stockpile contained 4.1 ounces silver per ton, 3.0 percent lead, and no zinc. Samples taken across the vein averaged about 0.008 ounce gold per ton, 0.5 ounce silver per ton, 2.7 percent lead, and a trace copper.

Dowling Quartz Prospect

The Dowling Quartz claims (fig. 50, No. 13) are 0.7 mile southwest from the Greyhound Mountain Lookout and 200 feet southeast of the Greyhound Ridge trail.

Workings on the claims consist of two adits (fig. 57) and three pits. The north adit is caved, but a prominent shear zone can be traced from the adit to a pit 50 feet upslope. The zone is also exposed in the lower adit. The vertical zone strikes N. 55° W. It is offset by a small fault which trends N. 35° E. and has an apparent 10-foot displacement. The shear zone is composed of pyrite, argentiferous galena, chalcopyrite, and quartz in a matrix of sheared granitic rock. By altered material at the surface and exposures of the zone in the workings, the structure was traced for 300 feet. The thickness ranges from 0.5 to 3.5 feet. One select chip sample contained 7.67 ounces silver per ton; a select grab from the dump contained 59.8 ounces silver per ton.

Samples indicate that the property should have a potential for discovery of minable deposits.

Ramshorn Prospect

The Ramshorn Nos. 1 and 2 claims (fig. 50, No. 19) are 2 miles north of Greyhound Mountain and are adjacent to the Hardscrabble trail. The claims were worked in 1970.

Outcrops are sparse, owing to overburden as much as 10 feet thick. Workings consist of a caved adit, a shaft, two trenches, and five pits, all dug to expose and selectively mine the mineralized material. Mineralization followed a network of fractures (fig. 58) and formed replacement and fissure-filling veins. The veins appear to be of different ages. The veins, 2-6 inches thick, can be traced 240 feet along the surface. The veins contain chalcopyrite, pyrite, and argentiferous galena in white quartz.

A small quantity of ore is reported (Frank Smith, oral commun., 1968) to have been packed out. Some mineralized material remains in place, on the dump, and in the ore bin; three samples contained an average of 0.23 ounce gold per ton, 7.2 ounces silver per ton, and 0.32 percent copper.

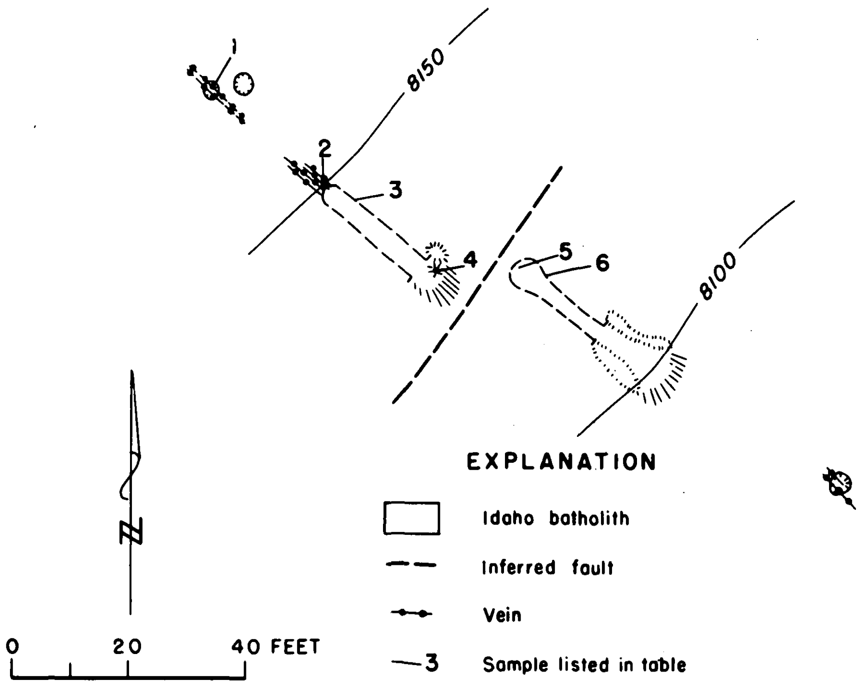


FIGURE 57. — Dowling Quartz prospect. Claim boundaries are approximately located.

Data for samples shown in figure 57

[Tr, trace. Asterisk (*), sample from underground workings. Sample 4 was select grab, all others were chip]

Sample	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Lead (percent)	Zinc (percent)
1	2	Tr	0.20	2.0	0.2
2	2	0.01	7.67	5.6	1.4
3*	4	Tr	.17	.01	.04
4	Dump	.02	59.80	2.85	.35
5*	3	Tr	.12	3.0	.50
6*	4	.02	1.96	.01	.01

Additional work would have to be done to determine the potential of the property.

OTHER LODE PROSPECTS

Porphyry Peak claim. — The Porphyry Peak claim (fig. 50, No. 14) was located in 1956 and adjoins the west edge of the Dowling Quartz property (No. 13). A trench exposes a 2-foot-thick vertical lamprophyre dike that cuts the granitic country rock at N. 30° W. No economic minerals were observed, and assays showed no mineral values.

Capitol State claim. — The Capitol State claim (fig. 50, No. 15) is

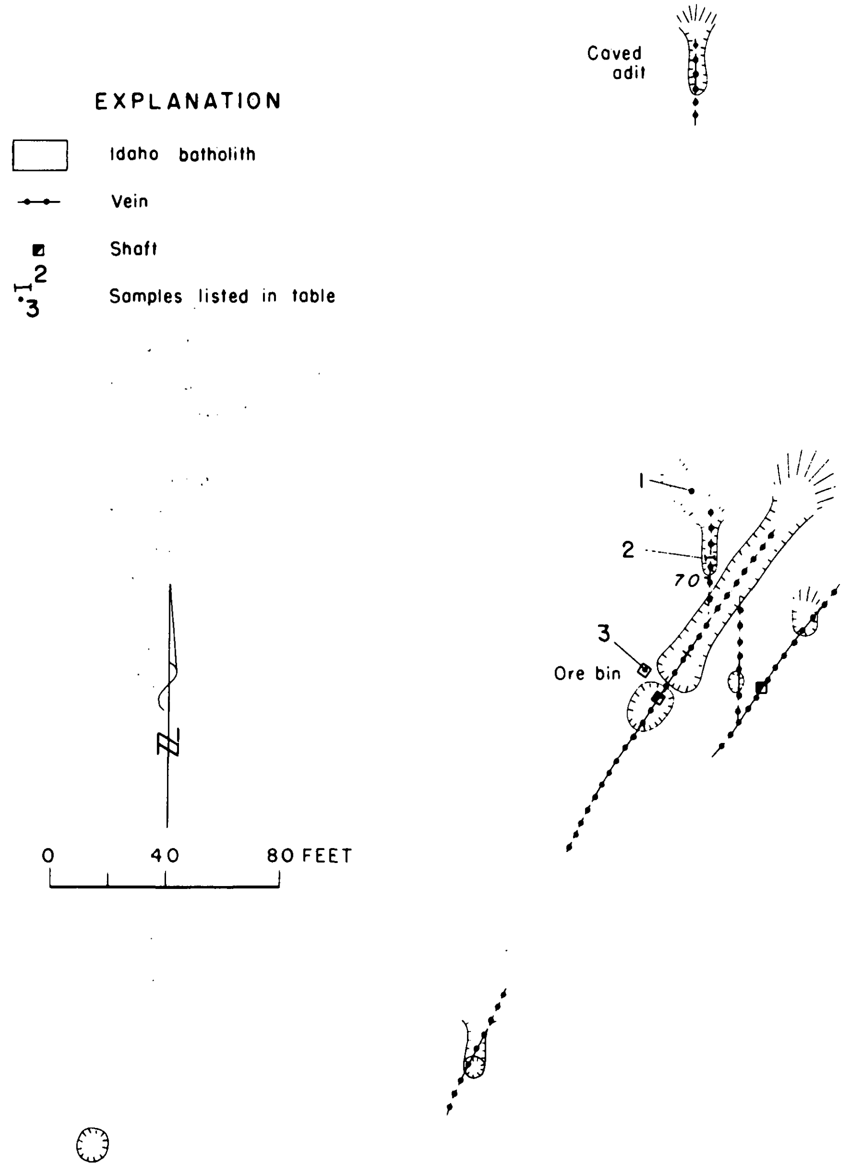


FIGURE 58. — Ramshorn prospect.

Data for samples shown in figure 58

Sample No.	Sample Type	Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	Grab	Dump	0.24	4.3	0.24
2	Chip	0.3	.23	7.1	.30
3	Grab	Ore bin	.22	10.1	.42

reached by one-half mile of trail leading west along Greyhound Ridge from the Greyhound Ridge road. It is west of the Republican-Greyhound shear zone, on either a parallel or subsidiary structure. Two pits are dug in iron-stained rock and soil but do not expose bedrock. A random dump sample contained a trace gold and 0.3 ounce silver per ton.

Brown Bear prospect. — The Brown Bear 1 and 2 claims (fig. 50, No. 11) are at the ridge crest and 1 mile east of Greyhound Mountain. A trail leads from the Greyhound Mountain Lookout to the claims. The claims were staked in 1960. Workings consist of four pits which expose an iron-oxide-rich shear in granitic rock. The vertical shear strikes north. It is 4 inches thick and can be traced for 30 feet along the strike. Material in the shear consists of disseminated sulfides in quartz and sheared granitic rock. A sample contained 0.03 ounce gold per ton and 6.5 ounces silver per ton.

Moonshine prospect. — The Moonshine 1 and 2 claims (fig. 50, No. 12) were located south of, and adjacent to, the Brown Bear claims. A trench on the property is sloughed and exposes no mineralized structures or bedrock. It might represent an attempt to crosscut the extension of the Brown Bear shear zone. Rock on the dump contains galena in iron-stained quartz. Samples contained 1.3 percent lead but no detectable gold and silver.

Hardscrabble group. — The Hardscrabble group of six claims (fig. 50, No. 21) is at the end of the Hardscrabble Ridge trail, 3 miles north of Greyhound Mountain. The Hardscrabble No. 6 claim is often called the Ben Hur. The Hardscrabble group, staked in July 1898, is one of the district's older properties. In the earlier days, ore was packed to the Greyhound smelter over a 6 mile trail that still constitutes the only access (Frank Smith, oral commun., 1968). Although continually claimed and worked, production has been small. Most of the work was done on the Hardscrabble No. 1 claim, where there are four caved adits, a cabin, and one prospect pit. Portals of the 50- to 100-foot-long adits are closed because of slumping of the overburden, which is 2-10 feet thick. The Ben Hur has an open 15-foot timbered adit and two pits.

Quartz monzonite of the Idaho batholith is cut by a complex network of shears and fractures on the property. Some serve as watercourses and can be traced by springs and seeps. The main structure, trending N. 5° E., is a variably dipping shear zone with many subsidiary fractures. Other fractures served as structural control for basalt dikes. The main structure is about 2 feet thick and can be traced intermittently for 1,400 feet on the surface; most of the works are in this zone. Other workings are on lesser structures and do not expose mineralized material. Economic minerals found in the main zone, in order of decreasing abundance, are sphalerite, galena, and chalcopyrite; the remainder of the shear zones is granitic rock and quartz. Random samples of all the workings and the few exposures of the shear zone contained an average of a trace gold, 0.9 ounce silver per ton, 0.1 percent copper, 0.9 percent lead, and 0.7 percent zinc.

The structures exposed are possibly the northern extensions of those explored on the Ramshorn claims one-half mile to the south (fig. 50, No. 19).

Outlook claim. — The Outlook claim (fig. 50, No. 20), located in 1905, is 3 miles north of Greyhound Mountain. Three pits expose a 6-inch-thick quartz vein which cuts granitic rock of the Idaho batholith. The vertical vein strikes due north and is traceable for 65 feet. Several similar veins occur nearby. No metallic minerals were seen in any of the veins, and samples contained no economic metal values.

West Side claim. — The West Side claim (fig. 50, No. 17), located in 1929, is on a ridge crest. A pit is on each of two altered zones associated with fractures. Both fractures strike N. 25° W. and dip steeply; they are filled with iron-stained quartz. Similarly oriented fractures are common in granitic rock but none are mineralized. A select sample from the 1- to 2-inch-thick veins contained a trace gold and 8.3 ounces silver per ton.

Columbus claim. — The Columbus claim (fig. 50, No. 18), located in 1902, is next to the Hardscrabble trail, 1 mile north of Greyhound Mountain. Three pits have been dug on a 6-inch-thick quartz vein which cuts the granitic country rock. Overburden conceals the vein beyond the pits. Samples of iron-oxide-rich material and of the quartz vein in the pits contained no economic metal values.

RAPID RIVER AREA

Rapid River flows through the west end of the Greyhound Ridge addition. The river cuts through the Idaho batholith and roof pendants of Yellowjacket Formation, marble, shale, and quartzite. Lode prospects in the Rapid River area are located along the river and are about 3 miles northwest of Sheep Mountain; placers have been worked on Bell Creek and on Rapid River just south of the study boundary. Access to the area is by way of 7 miles of road from the Seafoam Ranger Station. The road terminates at the Blackjack claims (fig. 50, No. 8). Access beyond the Blackjack claims is by a trail which follows the river through the study area.

The Blackjack claim has potential for discovery of a minable deposit.

Placer deposits are small and are estimated to average less than 8 cents per cubic yard.

Blackjack Group

The Blackjack group (fig. 50, No. 8) consists of eight lode claims on the west bank of Rapid River near the mouth of Bruin Creek. A 7-mile dirt road, serviceable only for four-wheel-drive vehicles, has been constructed from Seafoam Ranger Station down Rapid River and terminates at the workings. Slopes at the property are steep and moderately forested. Soil and talus cover bedrock.

The deposit was discovered in the early 1900's but no significant work was done until 1938, when three adits were driven (fig. 59).The upper adit exposes a vein from which a shipment of 2,610 tons was made. The ore assayed 0.06 ounce gold per ton, 41.3 ounces silver per ton, 34.1 percent

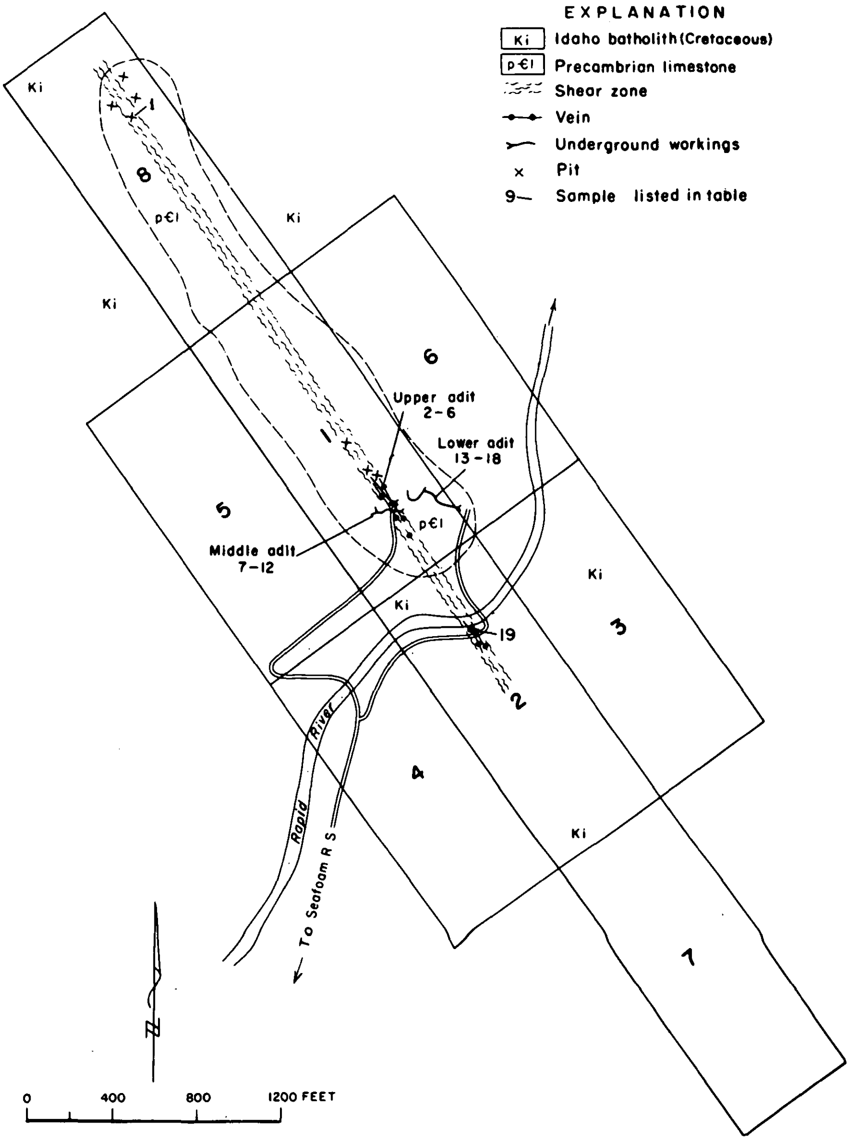


FIGURE 59. — Blackjack group. Claim boundaries are approximately located.

lead, and 5.8 percent zinc and had a total value of $114,000. The middle adit intersected the same vein, but no material was mined. The lower adit was driven to intersect the vein but east of its downward projection. Several pits and cuts are also on the property.

The mineralized shear zone is about 5 feet thick and cuts a roof pendant of interbedded marble and shale. It strikes N. 38° W. and dips 75° N., as do other mineralized zones in the district. The shear zone is exposed for 100 feet vertically between the two upper adits (fig. 60) and is intermittently

Data for samples shown in figures 59 and 60

[Nos. 1 and 19 shown in figure 59 only. Tr, trace; N.d., not determined; N, not detected. Molybdenum was determined only for sample 19, which contained 0.5 percent]

Sample No.	Sample Type	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)	Zinc (percent)
1	Grab	Dump	Tr	0.30	Tr	Tr	0.03
2	Chip (shear zone)	3.5	N	N	Tr	3.3	6.2
3	Chip (quartz vein)	2.0	N	N	N	.3	2.7
4	do	2.5	0.22	31.3	0.3	7.1	5.6
5	do	1.1	.02	10.8	Tr	13.2	4.6
6	Chip (shear zone)	4.0	N	N	Tr	.3	2.7
7	Chip (quartz vein)	.8	Tr	.1	Tr	Tr	.4
8	Chip (shear zone)	3.0	N	N	Tr	1.1	.4
9	Chip (quartz vein)	.7	.03	.20	Tr	Tr	.8
10	do	1.5	N	N	Tr	2.2	5.5
11	do	1.2	.22	N	Tr	Tr	.8
12	Chip (shear zone)	5.0	N	N	Tr	.4	3.8
13	Chip (fault zone)	2.6	Tr	.10	N	N	N
14	do	1.0	Tr	.15	N.d.	N.d.	N.d.
15	do	1.0	Tr	Tr	N	N	N
16	do	.2	N	N	N	N	N
17	Chip (altered zone)	5.0	N	N	N	N	N
18	do	5.0	N	N	N	N	N
19	Grab	Dump	Tr	.3	.04	Tr	.04

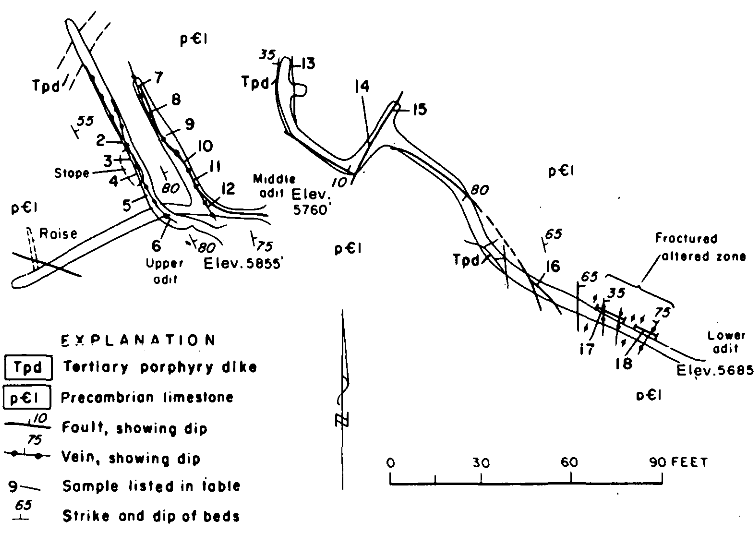


FIGURE 60. — Underground workings, Blackjack group.

traceable for 2,200 feet horizontally on the surface. Several smaller narrow, unmineralized shears, having a variety of attitudes and thicknesses ranging from 0.1 to 1 foot, occur on the property.

The values lie in pods and lenses of quartz and calcite which are ¼ inch to 2.5 feet thick. The thickest part of the zone exposed in the upper adit was stoped for 12 feet horizontally. The metallic minerals are oxidized silver and lead sulfides.

Samples of high-grade material in the upper adit contained as much as

31.3 ounces silver per ton, 13.2 percent lead, and 6.2 percent zinc. Values in the other two adits were considerably less. A grab sample from a dump on the Blackjack No. 2 claim contained 0.5 percent molybdenum; other occurrences have been reportedly found but none were observed.

Shear-zone material between the upper and middle levels is estimated at about 2,000 tons. Samples across the shear zone average 3.4 percent zinc and 1.17 percent lead. Most metal values are confined to the quartz veins within the shear zone. Available quartz vein material between the two levels is estimated at 700 tons, averaging 0.087 ounce gold per ton, 9.21 ounces silver per ton, 0.08 percent copper, 3.7 percent lead, and 3.5 percent zinc.

Similar deposits probably occur in the remainder of the Blackjack shear zone.

Other Prospects

Snowstorm group. — The Snowstorm group (fig. 50, No. 9) consists of 13 claims and is 1 mile west of the end of the Rapid River road and upslope from the Blackjack group. The claims were staked in 1910 on a northwestern projection of the Blackjack shear zone. Several pits were dug but failed to expose bedrock. Pit samples did not contain mineral values.

Idaho prospect. — The Idaho 1 and 2 claims (fig. 50, No. 7) are along Rapid River at its junction with Aspen Creek. The claims were located in 1910, and five small pits, all in gossan, were dug on claim 2. The pits do not expose bedrock but are apparently on a zone of cross-fracturing associated with lamprophyre dikes in granite. The only dike outcrop strikes N. 30° W., dips vertically, and contains minute veinlets of pyrite. No economic minerals were visible in the pits; random samples of the gossan contained only traces gold, silver, and lead.

Bell Creek placers. — The Bell Creek placers (fig. 50, No. 22) include the Red Star, Union Jack, and American Flag claims and are along the lower reaches of Bell Creek, a tributary of Rapid River. The area contains relatively small amounts of placer material. Several nuggets were reportedly found in the past, but panning revealed only a few minute colors. No workings were seen.

Opal Creek placer. — Although not actually within the Greyhound Ridge addition, the Opal Creek placer claim (fig. 50, No. 10) was examined because it was most recently worked and is one of the largest placer bars along Rapid River. It is on the west side of Rapid River, just south of Opal Creek.

Placer work was done on a flat-topped terrace, which is about 40 feet above the riverbed. Two large pits were dug and material was moved to the river level in a 55-foot chute. Material in the bar ranges from sand to 2-foot boulders. Channel samples taken down the pit walls contained an average of 8 cents of gold per cubic yard.

LOON CREEK AREA

The Loon Creek area is at the east end of the Greyhound Ridge addition and may be reached by 7 miles of trail from the end of the Indian Springs Guard Station road or by 9 miles of road from the end of the Loon Creek Guard Station road. A trail runs the length of Loon Creek. A private landing field suitable only for small aircraft is at Falconberry Ranch. Steep, sparsely forested slopes are underlain by Tertiary intrusive and extrusive rocks. Lode prospects in this part of the study area have been located on narrow quartz veins containing small amounts of sulfides. Placer deposits along the upper reaches of Loon Creek have been historically important, but no large producers are within the study area.

Valentine Group

The Valentine group (fig. 50, No. 35), consisting of six claims, is on the east side of Loon Creek, just north of Cabin Creek. The locality is underlain by Precambrian schist and Tertiary Challis Volcanics. The claims were first located in 1907 and were prospected until 1910; apparently, no other work has been done.

Workings on the property consist of a 114-foot-long adit, a 17-foot-deep shaft (caved), and numerous shallow cuts. The adit was driven along a quartz vein in black schist. The vein is irregular, trends N. 87° E. and dips 45°-57° N. Thickness ranges from 0.1 to 1.2 feet but averages 0.3 foot, with a general narrowing to the east. The vein contains pyrite and chalcopyrite, minor azurite, and bornite. Iron oxide and malachite stains are prevalent along the walls of the drift. Several shears are exposed, but none are mineralized. The shaft was driven on the schist-volcanics contact and reportedly exposed a vein. A sample taken across the contact in the shaft assayed a trace gold, 0.05 ounce silver per ton, and 0.02 percent copper. Neither the veins nor the contact is traceable on the surface.

Chip samples were taken across the vein in the adit (fig. 61); although only one sample contained more than a trace gold, the samples contained 0.16-17.70 ounces silver per ton and 0.03-5.95 percent copper. A 4-foot chip sample across the face of the small cut just south of the main portal contained a trace gold, 1.70 ounces silver per ton, and 0.56 percent copper.

Burn Creek Prospect

The Burn Creek claims (fig. 50, No. 32) are about 1 mile north of Falconberry Ranch, about 2,000 feet northeast of the mouth of a side creek.

Workings consist of a group of three adits and three prospect pits and another pit across the valley. The uppermost adit (the only one open) is 20 feet long; it was driven along a 2-foot-wide vein which occupies one of the many shears in the granitic rock. The vein strikes N. 20° E. and dips 10° NW. Vein material is white sheared quartz with disseminated pyrite. Samples across the vein averaged 0.3 ounce silver per ton, 0.01 percent copper, and a trace gold. Two upper pits are apparently on the same vein, and lower workings are probably on parallel veins. None of the veins crop out.

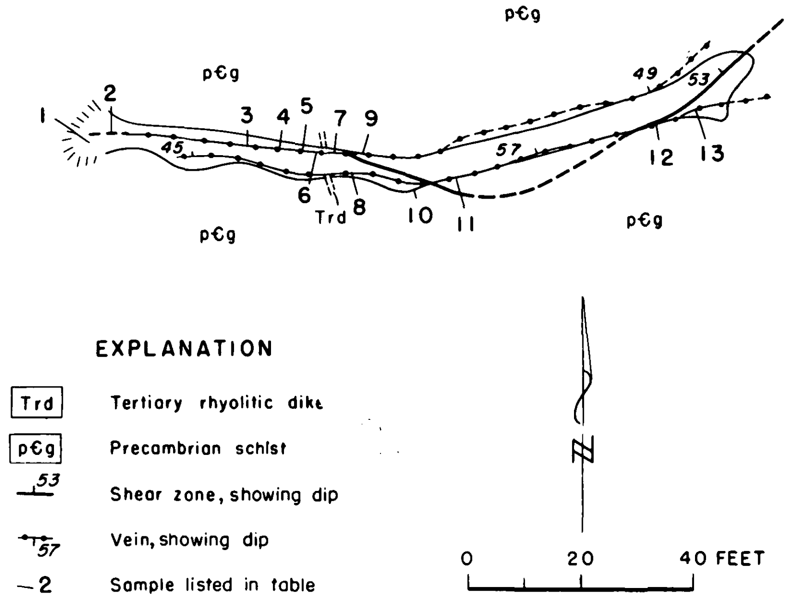


FIGURE 61. — Underground workings, Valentine group.

OTHER PROSPECTS

Black Nugget claim. — The Black Nugget claim (fig. 50, No. 31) was located in 1929; it is on a ridge 100 feet northeast of the Loon Creek trail. Workings consist of a 45-foot-long adit and a test pit. The adit was driven along a mineralized vertical shear zone in granitic rock. The shear is 2 inches thick at the portal but only one-fourth of an inch at the face. Several other shears, none of them mineralized, parallel the vein. The vein contains chalcopyrite and malachite in calcite and quartz. A continuous chip sample taken along 28 feet of the vein contained a trace gold, 0.1 ounce silver per ton, and 0.02 percent copper.

Good Enough group. — The Good Enough group (fig. 50, No. 29) was located in 1939. Workings consist of one 15-foot-long adit and some cuts in overburden ½-2 feet thick. At some sites the work has exposed narrow, iron-oxide-rich shears in quartz diorite or diorite. Pegmatite and quartz veins occur throughout the locality. The adit on the No. 3 claim was driven on a 3-inch-thick shear which strikes N. 80° E. and dips 75° N. A sample from the adit portal contained a trace gold and 0.2 ounce silver per ton.

White Quartz claim. — The White Quartz claim (fig. 50, No. 30) is on a ridge crest. A pit exposes a white quartz vein which strikes N. 45° W. in pink granite. The vein is 2-3 feet thick and at least 110 feet long. No ore minerals are evident, and samples of the vein material contained no values.

Can't Savie prospect. — The Can't Savie prospect (fig. 50, No. 33) is east of Loon Creek. A pit exposes iron-stained andesite of the Challis Volcanics.

Data for samples shown in figure 61

[Samples 1 and 7 were select grab; all others were chip. Tr, trace]

Sample	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	Dump ------	Tr	15.28	6.25
2	0.8	Tr	.43	.03
3	.2	Tr	.20	.07
4	.01	Tr	1.40	1.32
5	.2	Tr	7.84	4.85
6	.2	Tr	11.69	5.95
7	Vein -------	Tr	1.30	9.60
8	.2	Tr	4.71	3.53
9	1.2	Tr	.47	.25
10	.1	Tr	.16	.11
11	.2	Tr	1.30	1.14
12	.4	Tr	2.36	3.63
13	.2	0.02	17.70	5.45

No structures or mineralized material was found. Samples contained no values.

Jack Creek prospect. — The Jack Creek prospect (fig. 50, No. 27) is near the Jack Creek trail and is 2.5 miles west of Loon Creek. The prospect covers a highly iron-stained pink granite. No workings were found. The granite is cut by a network of quartz veins ¼-6 inches wide and as much as 10 feet long. A random chip sample of the veins contained a trace gold and 0.2 ounce silver per ton.

Biggs Ranch placer. — The deposit (fig. 50, No. 28) is part of the privately owned Biggs Ranch. The present owner is Dr. J. Hatch, who also owns the Falconberry Ranch 2.7 miles upstream. The deposit covers 27 acres and is estimated to contain 780,000 cubic yards of alluvium. The alluvial material ranges in size from sand to 2-foot boulders. Samples taken from three test pits contained a trace gold and a maximum of 1.1 pounds black sand per cubic yard. The pits were 4.5-9 feet deep and did not reach bedrock.

Falconberry Ranch placer. — The Falconberry Ranch placer (fig. 50, No. 34) is along the west side of Loon Creek. The deposit has two benches and is formed of material ranging in size from sand to 2-foot boulders. It covers 44 acres and is estimated to contain 860,000 cubic yards of alluvium. Eight test pits 3.5-6 feet deep were dug on the bar; the water table was intersected, and bedrock was not reached. Pit samples contained a maximum of 1.0 cent gold per cubic yard and 1.8 pounds of black sand per cubic yard.

MISCELLANEOUS PROSPECTS

There are four other, isolated claims in the Greyhound Ridge addition (fig. 50, Nos. 23-26). All may be reached by trail.

The deposits are mostly iron-stained dike rocks. Samples of the rock contained a trace gold and as much as 1.3 ounces silver per ton. One lode deposit, however, contains sulfide minerals of better values.

Dirty Dutchman Prospect

The Dirty Dutchman prospect (fig. 50, No. 25), located in 1957, is about 1.7 miles up a side creek from Little Loon Creek.

The Tertiary dacite porphyry country rock is fractured, and the intersection of three major joints served as the locus for mineralization, as exposed in a trench. Gossan covers an area 30 by 25 feet at the junction of the fractures, which range in strike from N. 20° W. to due west and range in dip from vertical to 15° S. The gossan contains thin veins of chalcopyrite, argentiferous galena, and pyrite. A select sample of the veins contained 5.0 percent lead, 2.0 percent copper, 1.0 ounce silver per ton, and a trace gold. Average grade of the entire zone is 2.0 percent lead, 1.0 percent copper, 0.5 ounce silver per ton, and a trace gold.

Other Lode Prospects

Thomas Creek No. 2 claim. — The Thomas Creek No. 2 claim (fig. 50, No. 23) is along the trail at the head of the East Fork Thomas Creek and 2.5 miles southwest of Scarface Mountain. A shallow pit was dug on a vertical andesite dike, striking N. 25° E., which cuts shaly limestone. The dike can be traced for 115 feet and is about 15 feet thick. It is jointed and stained. No metallic minerals were visible. Random samples of the dike and of the limestone contained a trace gold and 0.3 ounce silver per ton.

Thomas Creek No. 3 claim. — The Thomas Creek No. 3 claim (fig. 50, No. 24) is about 2 miles south of Scarface Mountain. An andesite porphyry dike trending N. 60° W. is in granitic rock. The dike is highly fractured, 1,000 feet long and 200 feet wide. A 50-foot trench has been dug on the dike. Neither dike nor country rock is mineralized; samples contained only a trace gold and 0.2 ounce silver per ton.

Triple B prospect. — The Triple B claim (fig. 50, No. 26) is 1,000 feet west of Little Loon Creek. The main working is a caved adit driven along a shear, trending N. 85° E., in the Tertiary dacite porphyry. Most of the claim is covered by 1-5 feet of overburden. The dump of the adit is iron stained and contained no visible metallic minerals. A random chip sample contained a trace gold and 1.3 ounces silver per ton.

In addition to the lode claim, a placer claim covers the alluvium below the prospect on Little Loon Creek. The volume of alluvium is relatively small, and no gold values were found by reconnaissance panning.

PISTOL CREEK DISTRICT

Past production of gold, silver, copper, lead, and tungsten and the potential for the discovery of additional resources make the Pistol Creek district an important mineralized district within the Idaho Primitive Area. The district includes 134 square miles drained by Pistol Creek, a tributary of the Middle Fork Salmon River (fig. 62).

Approximately 175 mining claims, none of them patented, were located in the district. About two-thirds are lode claims and one-third, placer claims. The only privately owned land is the Middle Fork Ranch, a patented homestead, approximately 1 mile down the Middle Fork Salmon River from the confluence of Pistol Creek.

The earliest mining claim was located in 1902. Early locations were on placer ground along the Middle Fork. Local residents report that minor amounts of placer gold were produced from these claims but none is recorded. The production was small "flood gold" deposits — thin, small deposits emplaced during times of high water.

Lode mines in two widely separated areas of the Pistol Creek district have yielded significant quantities of gold, silver, copper, lead, and tungsten and resources remain in both areas. The total combined production from the Lucky Lad (Lucky Boy) and Cougar mines (fig. 62, Nos. 23, 19) on Pistol Creek Ridge amounts to 1,491 ounces gold, 24,586 ounces silver, 2,678 pounds copper, and 315,358 pounds lead concentrated from about 1,220 tons of ore mined between 1935 and 1941. The Springfield Scheelite mine (No. 1) near the head of the West Fork Springfield Creek is reported to have yielded about 5,940 short ton units of WO_3 (tungsten trioxide) concentrated from 39,000 tons of talus and newly mined ores during a 3-year period in the early 1950's. This mine is the only significant tungsten deposit known within the Idaho Primitive Area.

WEST FORK SPRINGFIELD CREEK AREA

The West Fork Springfield Creek area is near the headwaters of the West Fork Springfield Creek, approximately 10 miles by trail or abandoned mine road from the Johnson Creek road. Scheelite was produced from the Springfield Scheelite mine (fig. 62, No. 1) from 1953 until 1955.

The West Fork Springfield Creek is in a U-shaped glaciated valley, covered by overburden and dense forest. Prospecting is difficult.

The ore occurs in a tactite roof pendant in granitic rocks of the Idaho batholith. The original limestone has been replaced, mostly by pyrrhotite and silicate minerals.

Massive pyrrhotite bodies containing scheelite occur at two properties in the West Fork Springfield Creek area. Pyrrhotite in place occurs at the Springfield Scheelite mine and massive pyrrhotite glacial erratics are exposed at the Old Faithful group (fig. 62, No. 2).

The massive pyrrhotite, averaging 0.35 percent WO_3, was concentrated by gravity methods at the Springfield Scheelite mine. A potential resource

Mines and prospects shown in figure 62

1. Springfield Scheelite mine
2. Old Faithful group
3. Virginia Beth prospect
4. Wild Dream prospect
5. Greenrock prospect
6. Iowa-Virginia placer
7. Cross Forks placer
8. Molly Mine group
9. Speckled Trout placer
10. Twenty-five Creek placer
11. Thirty-two Creek placer
12. Buckhorn placer
13. Horse Pistol placer
14. Lower's placer
15. Cap Creek prospect
16. Primitive group placer
17. Indiana placer
18. RDG prospect
19. Cougar mine
20. KW prospect
21. Franklin D. mine
22. Coleman prospect
23. Lucky Lad mine

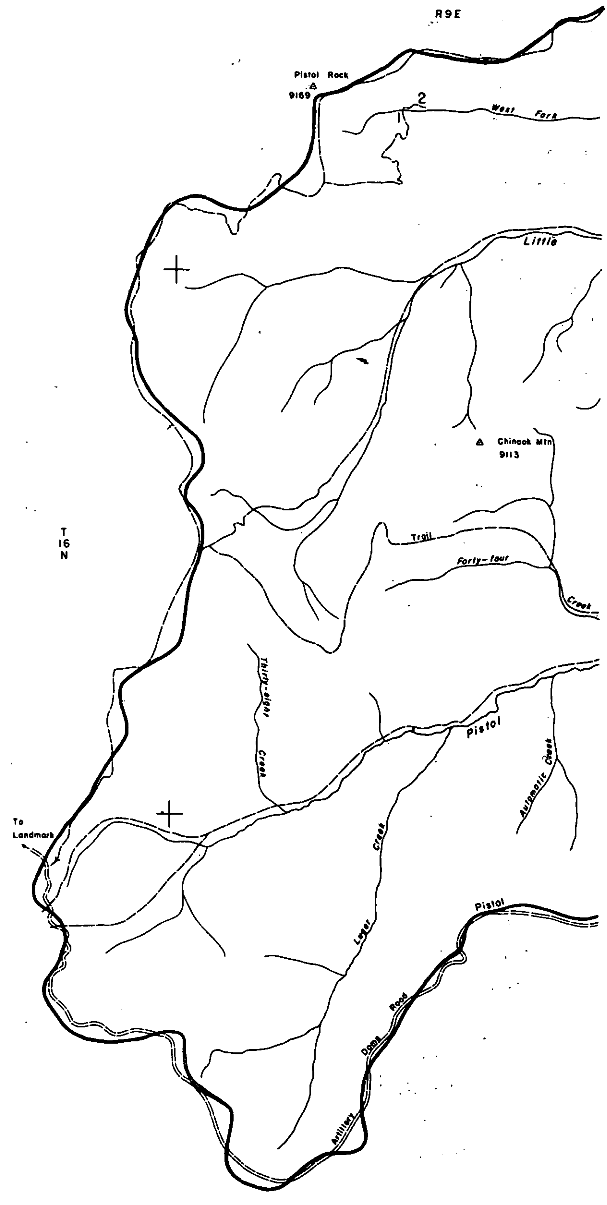
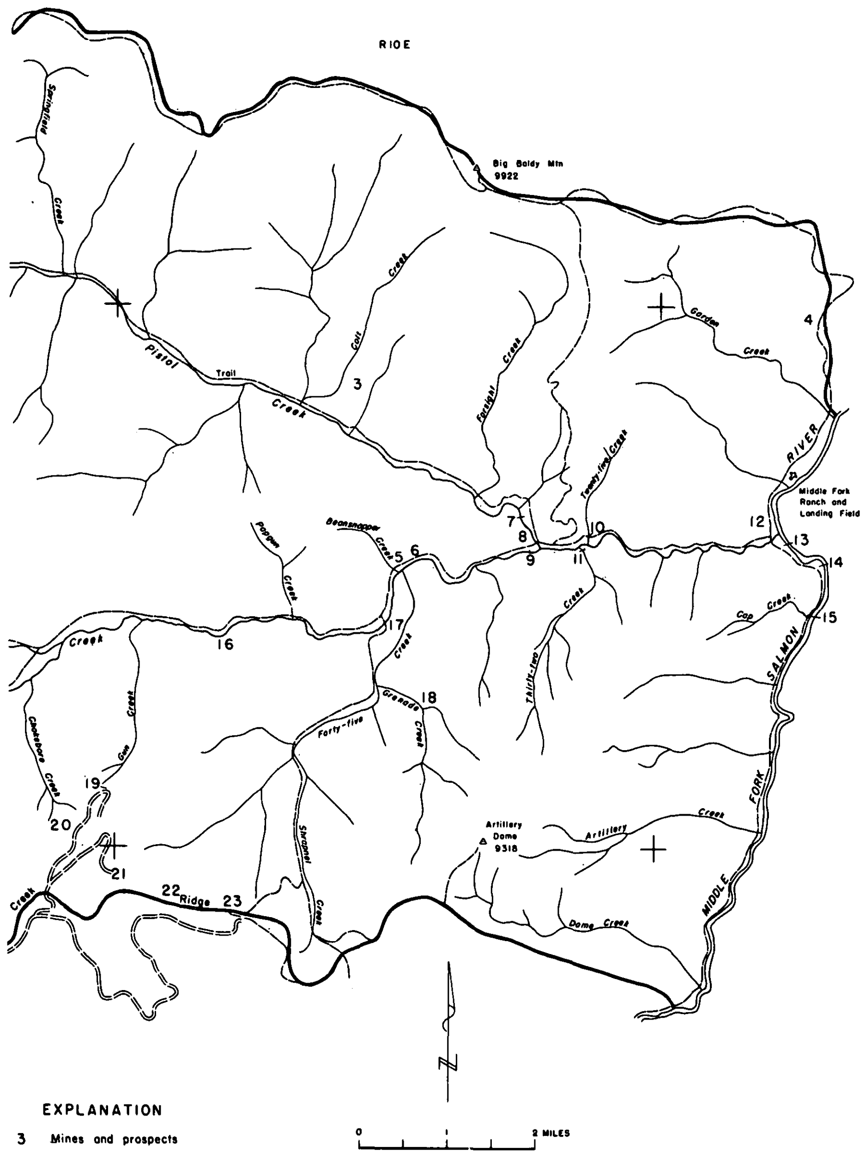


FIGURE 62. — Mines and prospects,



Pistol Creek district.

of 178,000 tons of material containing an average of 0.27 percent WO_3 (48,000 units of WO_3) is estimated to remain on the property. A potential resource of less than 500 tons averaging 0.30 percent WO_3 is estimated to be at the Old Faithful group.

Springfield Scheelite Mine

The Springfield Scheelite mine (fig. 62, No. 1) consists of 10 unpatented mining claims, constituting the White Mare group. It is at an altitude of 7,800 feet near the head of the West Fork Springfield Creek. The best access is by an abandoned mine road from Johnson Creek, west of the area.

The claims covering the tungsten deposit were located in 1945 by Lafe Cox. In 1947 Cox leased the property to Bradley Mining Co.; they completed 1,900 linear feet of exploratory diamond drilling. In 1953 a government subsidy for tungsten ores stimulated the lessee to concentrate the scheelite-rich talus at the Springfield mine. Through the summer and fall of 1953, the talus material was processed at a rate of 60-75 tons per day, producing a rough concentrate containing 15-20 percent WO_3 which was trucked to the Bradley mill at Stibnite, Idaho, for further upgrading. Exploratory drilling under a Defense Minerals Exploration Administration contract in August 1953 delimited an irregularly shaped tactite body (fig. 63). A 75-ton-per-day-capacity gravity mill was constructed in 1954 to

Data for samples shown in figure 63

[Tr, trace; N, not detected]

Sample No.	Sample Type	Length (ft)	WO_3 (percent)
1	Auger hole (tailings)	4.0	0.13
2	do	2.0	.15
3	do	.9	.12
4	do	3.3	.27
5	do	5.9	.49
6	do	5.3	.32
7	do	3.0	.30
8	do	1.3	.25
9	Grab (dump)	-------	Tr
10	Auger hole (tailings)	1.7	.17
11	do	4.0	.14
12	Channel (stockpile)	1.0	.70
13	do	1.0	.20
14	Grab (stockpile)	-------	.74
15	Random chip (talus)	21.0	.04
16	do	33.0	.33
17	do	90.0	.08
18	do	17.0	.30
19	do	25.0	.17
20	do	30.0	.31
21	do	14.0	.47
22	do	20.0	.46
23	do	30.0	.51
24	do	20.0	.47
25	Random chip (talus)	26.0	0.27
26	do	22.0	.45
27	do	27.0	.59
28	do	22.0	.36
29	do	40.0	.51
30	Grab (dump)	-------	.38
31	Random chip (talus)	68.0	.80
32	Channel (dump)	52.0	.20
33	Chip (tactite)	30.0	.13
34	do	17.0	N
35	do	53.0	N
36	do	43.0	.08
37	do	133.0	.35
38	Chip (wallrock)	25.0	N
39	do	20.0	Tr
40	Chip (tactite)	50.0	.23
41	do	60.0	.24
42	do	56.0	.53
43	do	23.0	.80
44	do	22.0	.80
45	Select grab (dump)	76.0	.60
46	do	-------	.20
47	do	100.0	.70
48	Random grab (dump)	-------	Tr

process the remaining talus and ore from the tactite body; the ore from both sources averaged 0.35 percent WO_3. The mill was dismantled and removed in 1955. The Springfield Scheelite mine (fig. 64) has produced more than 39,000 tons of ore from which over 5,940 short ton units WO_3 were extracted. (A short ton unit equals 20 pounds WO_3 and contains 15.862 pounds of tungsten.) The original locator currently holds the claims.

The country rock in the mined area is mostly quartz monzonite, and the deposit is in an irregularly shaped remnant of a tactite body derived from

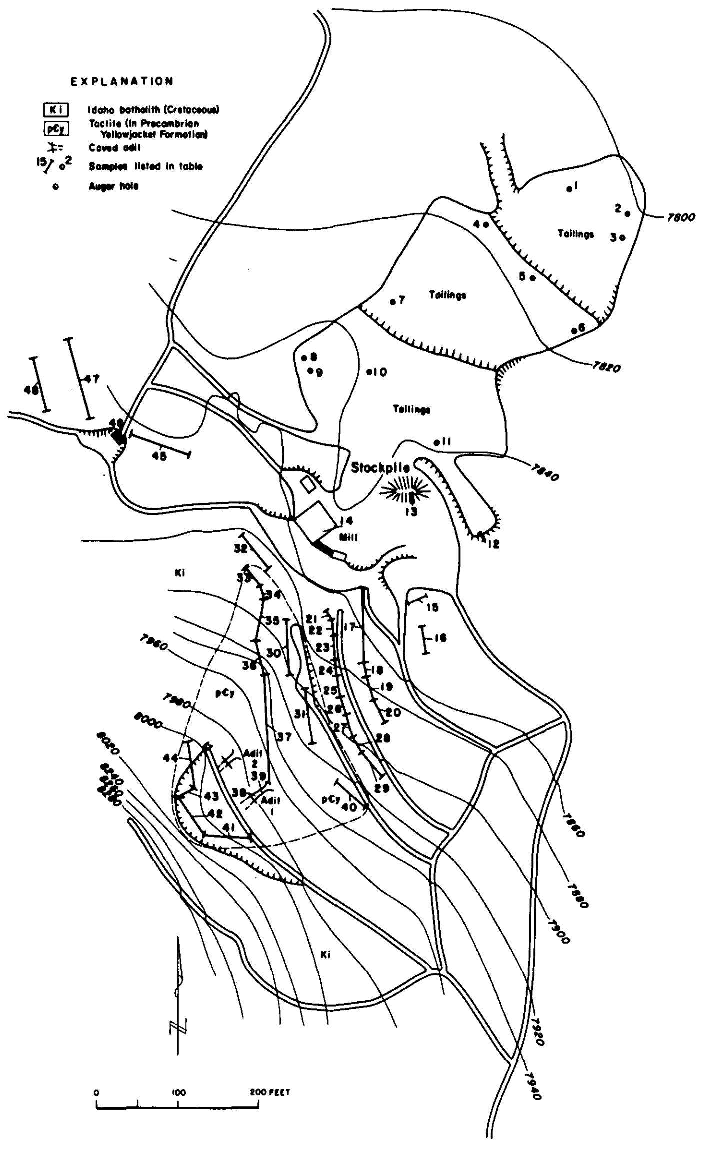


FIGURE 63. — Springfield Scheelite mine.

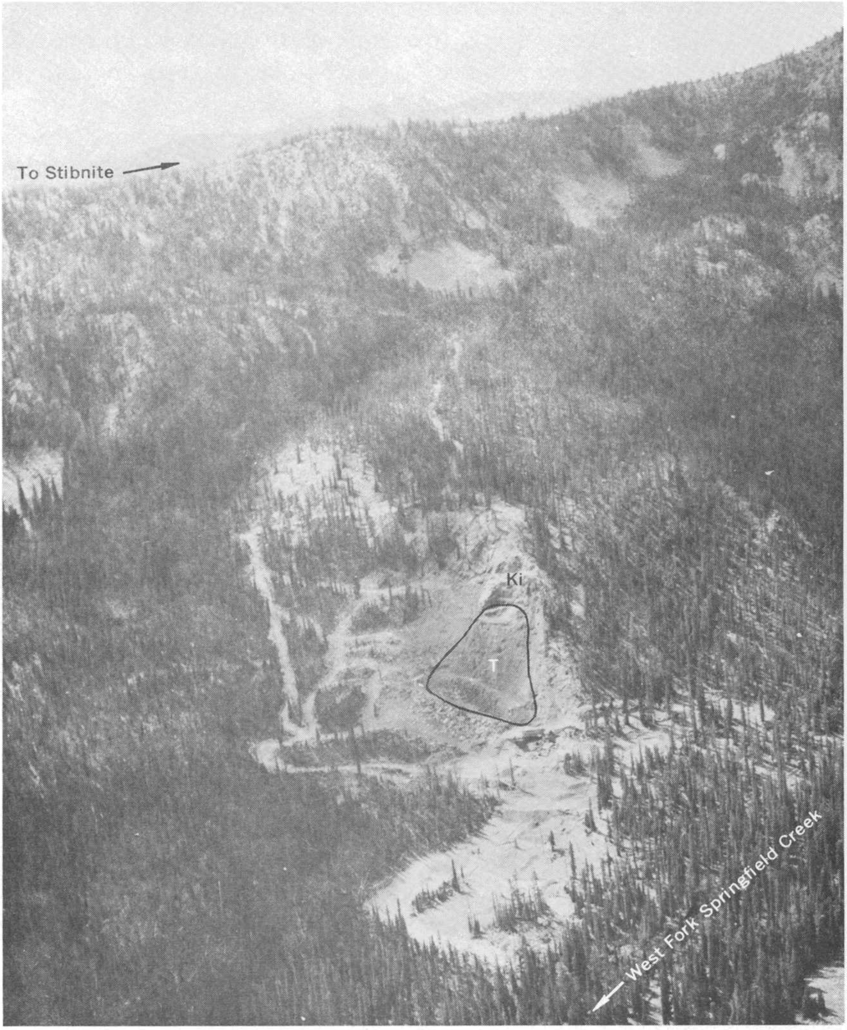


FIGURE 64. — Springfield Scheelite mine; view to the west.- K i, Cretaceous Idaho batholith; T, tactite.

sedimentary rocks that were intensely metamorphosed and shattered during emplacement of the Idaho batholith. The tactite is composed of approximately 20 percent carbonate rocks, 25 percent quartz and silicate minerals, 50 percent pyrrhotite, and less than 1 percent chalcopyrite and scheelite. Drilling indicates that the tactite body is a thin lenticular mass less than 400 feet long, about 225 feet wide, and a maximum of 50 feet thick, lying roughly parallel to the slope of the present surface.

Approximately 151,000 tons of scheelite-bearing rock containing an average of 0.30 percent WO_3 (45,300 units WO_3) is estimated to remain.

The estimate includes the remaining blocky tactite talus and small remnant of the original unmined tactite body. The mill tailings constitute about 27,000 tons of crushed material containing an estimated 0.10 percent WO_3 (2,700 units WO_3). In summary, 178,000 tons containing an average of 0.27 percent WO_3 (48,000 units WO_3) of all types of tungsten-bearing material is estimated to remain on the property.

OLD FAITHFUL GROUP

The Old Faithful group (fig. 62, No. 2) of unpatented mining claims lies 2,000 feet N. 64° E. from the Springfield Scheelite mine, contiguous to the White Mare group. The claims were located by Clinton Biggers and Clark Cox in 1946 and 1954.

Two small exploration pits expose boulders of massive pyrrhotite similar to that found at the Springfield Scheelite mine. The boulders are glacial erratics probably derived from the Springfield Scheelite deposit. Samples averaged 0.30 percent WO_3 but the boulders represent less than 500 tons of potential resource.

PISTOL CREEK RIDGE AREA

The Pistol Creek Ridge area is at the headwaters of Forty-five, Gun, and Chokebore Creeks. It is approximately 28 miles from Landmark, Idaho, by way of the Artillery Dome road. Two properties — Lucky Lad (Lucky Boy) mine and Cougar mine (fig. 62, Nos. 23, 19) — produced gold, silver, copper, and lead ores from 1935 until 1941; three other properties — Franklin D. mine, Coleman prospect, and KW prospect (fig. 62, Nos. 21, 22, 20) — have extensive development. The ore from the Lucky Lad and Cougar mines, which averaged 0.92 ounce gold, 48.4 ounces silver per ton, and 38.1 percent lead, 0.2 percent copper, and 1.1 percent zinc, was transported by pack animal to the nearest road. Mineralized rock containing values totaling less than $40 per ton was not mined because of prohibitive transportation costs (R. E. Sorenson, unpub. data, 1935-36).

Pistol Creek Ridge is relatively flat topped but glaciated on northern slopes. The area of mine development has been moderately glaciated, but outcrops are not abundant. The overburden and forest cover on ridgetop and southern flanks make prospecting difficult.

Ore occurs in pods and highly irregular veins within faults that dip steeply and strike N. 40°-80° W. These faults cut both the quartz monzonite of the Cretaceous Idaho batholith and roof pendants of Precambrian quartzite; they are displaced by postmineralization cross faulting and intrusion of Tertiary andesitic dikes. Partially to highly oxidized ore minerals occur primarily in vuggy quartz veins and in finely ground to blocky iron-stained breccia. Anglesite is present in many places and the sulfides in the vein material are mostly pyrite, galena, and tetrahedrite. Only oxidized ore was mined and none came from more than 60 feet below the surface. Sulfide minerals are exposed in the lower workings of the Lucky Lad and Franklin D. mines.

The properties on Pistol Creek Ridge are estimated to contain approximately 87,550 tons of marginal oxide and sulfide ores. Samples contain 0 to 2.18 ounces gold, 0 to 20.49 ounces silver per ton, and 0.08 to 8 percent lead within the explored area. Additional tonnages of similar grade probably exist in covered, unexplored extensions of structures between properties, a distance of about 2 miles.

Pistol Creek Ridge has good potential for the discovery of additional resources of gold, silver, and lead.

Franklin D. Mine

The Franklin D. mine (fig. 62, No. 21) lies at the head of Forty-five Creek at an altitude of 8,100 feet. The claim was originally located by Art Kimball in 1938 and relocated by him in 1964 as part of the 4th of July group.

A northwest-trending mineralized fault zone of irregular width cuts quartz monzonite of the Idaho batholith (fig. 65). The monzonite is cut by

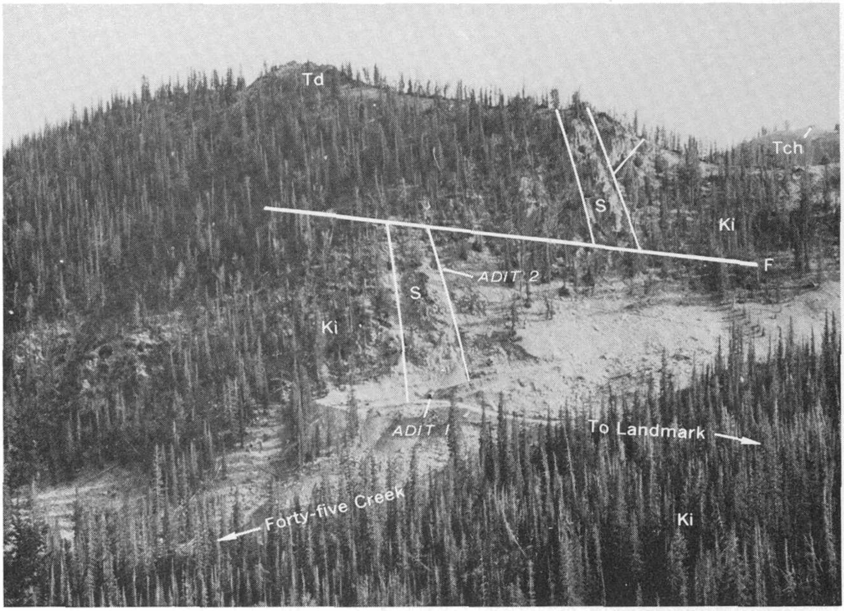


FIGURE 65. — Franklin D. mine; view southward. Tch, Tertiary Challis Volcanics; Td, Tertiary dike; Ki, Cretaceous Idaho batholith; F, fault; S, mineralized fault zone.

northwest-striking Tertiary dikes. The fault zone strikes N. 49°-62° W. and dips from 80° NE. to vertical. Three adits and several test pits have been dug along it. The fault zone can be traced through a length of more than 1,200 feet (fig. 66), is exposed in workings through a vertical distance of nearly 250 feet, and has an average width of 3.5 feet.

The zone is 2-7 feet wide and is composed of finely divided to blocky iron-stained breccia and in places contains an irregular quartz vein. Some of the

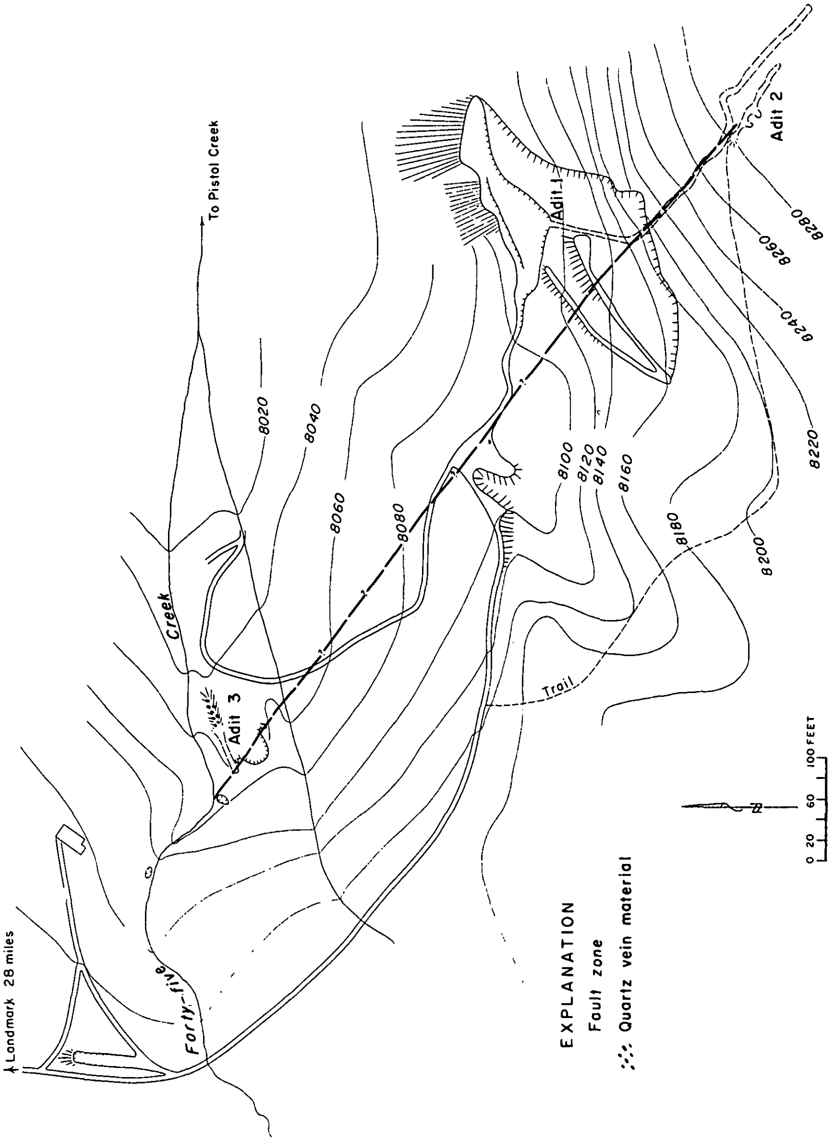


FIGURE 66.—Franklin D. mine.

breccia contains up to 5 percent anglesite. The vein material is composed of at least 75 percent quartz and 5-25 percent pyrite, galena, anglesite, and limonite, combined.

The fault zone (fig. 67) is offset nearly 30 feet by a vertical fault striking N. 45° E., 230 feet from the portal of adit 1. In the section of the drift northwest of the cross fault, the highly iron-stained zone is up to 7 feet wide including breccia and an irregular quartz vein. The vein comprises about 35 percent of the total zone width. An additional 5 percent of the material in the fault is sulfide minerals and their oxidized counterparts. Samples from this section of the zone contained a trace gold and less than 0.40 ounce silver per ton.

The offset section of the mineralized fault in the drift south of the cross fault is predominantly breccia as much as 7 feet wide with a highly irregular

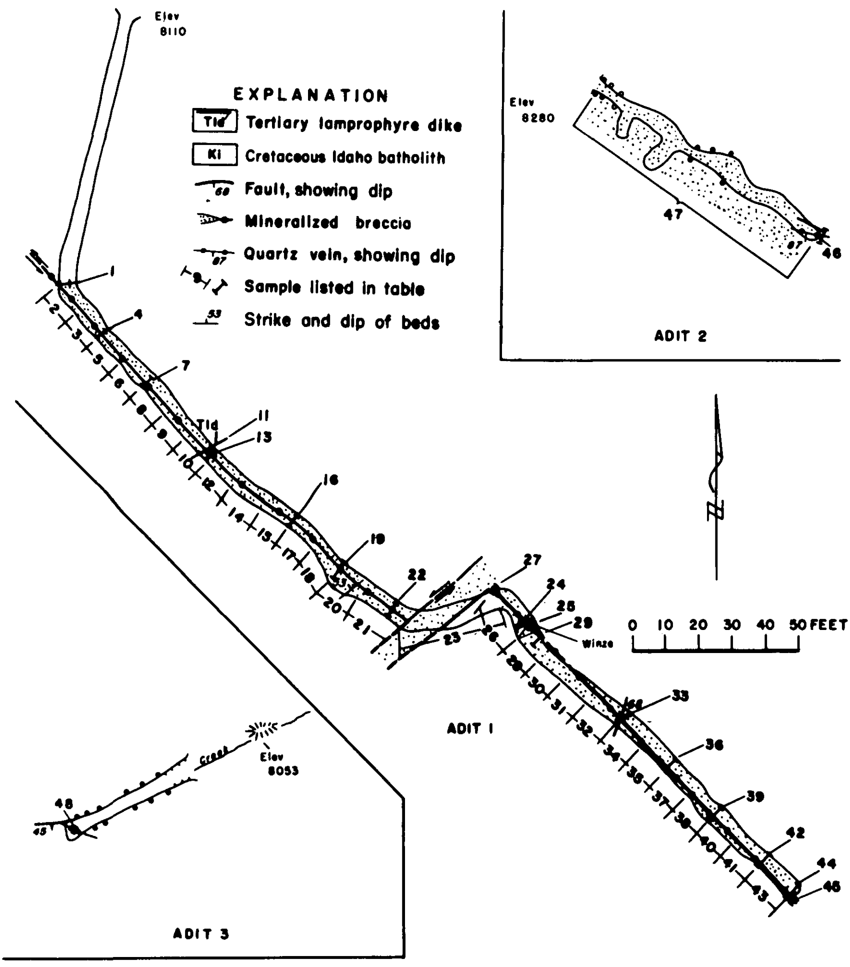


FIGURE 67. — Underground workings, Franklin D. mine.

quartz vein 0.5-2 feet wide. The vein contains 10-20 percent combined pyrite, galena, and anglesite. The pyrite content decreases toward the face as galena correspondingly increases. A winze was sunk on a massive 2-foot-wide section of the quartz vein in a 6-foot-wide section of the fault near the cross fault. Sample 24 from the quartz vein in the winze contained 1.62 ounces gold and 11.80 ounces silver per ton. Sample 25 taken from the entire width of the fault zone in the winze contains 0.52 ounce gold and 2.36 ounces silver per ton and 0.1 percent lead. Samples taken along the quartz vein from the winze to the face, averaging approximately 10 feet in length, contained an average of 0.88 ounce gold, 4.62 ounces silver per ton, and less than 1 percent lead. Samples taken at 10-foot intervals across the fault zone, exposed in the back of the drift, averaged 0.46 ounce gold and 2.2 ounces silver per ton and less than 1 percent lead.

The values of gold and silver are greater south of the cross fault and decrease toward the face. Lead values are minor and erratic.

Adit 2 was driven along iron-stained brecciated quartz monzonite (fig. 67). Some anglesite is visible in the breccia. Small quartz stringers are exposed in the face, where a vertical fault trending N. 60° W. was intersected. Sample 46, taken across the face of the working, contained 0.56 ounce gold

Data for samples shown in figure 67

[Samples 1-47 were random chip; sample 48 was chip. Tr, trace; N, not detected]

Sample No.	Sample Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Sample No.	Sample Length (ft)	Gold (oz per ton)	Silver (oz per ton)
1	4	Tr	0.12	25	7	0.52	2.36
2	10	Tr	.08	26	10	.03	.35
3	10	Tr	.28	27	2	.06	.38
4	5	Tr	.12	28	8	1.43	10.44
5	10	Tr	.19	29	5	.70	3.16
6	10	Tr	Tr	30	10	.86	4.20
7	4	Tr	.08	31	10	.36	1.76
8	10	N	N	32	8	.19	2.11
9	10	Tr	.14	33	5	.03	.80
10	10	0.01	.14	34	10	1.27	5.56
11	7	Tr	.23	35	10	1.01	2.79
12	10	Tr	.10	36	6	.60	1.95
13	4	.35	.38	37	10	1.20	6.06
14	10	Tr	.15	38	10	2.19	9.50
15	10	Tr	.21	39	7	.83	2.82
16	5	.01	.16	40	10	.04	.53
17	10	Tr	.09	41	10	.14	.96
18	10	.02	N	42	5	.26	.77
19	4	.01	.06	43	14	Tr	.24
20	10	Tr	.12	44	5	.07	.20
21	10	Tr	.12	45	2	.27	.80
22	4	Tr	.16	46	5	.56	.98
23	30	Tr	.05	47	80	.28	.70
24	3	1.62	11.80	48	2	1.05	3.21

and 0.98 ounce silver per ton, but no lead. Sample 47, taken along the wall through the length of the adit, contained 0.28 ounce gold and 0.70 ounce silver per ton.

Adit 3 (fig. 67) is near Forty-five Creek. The adit, driven through fractured granite, crosscuts a wide fault striking N. 60° W. and dipping 80° SE. A 2.2-foot-wide quartz vein occurs in the fault. The vein resembles the ex-

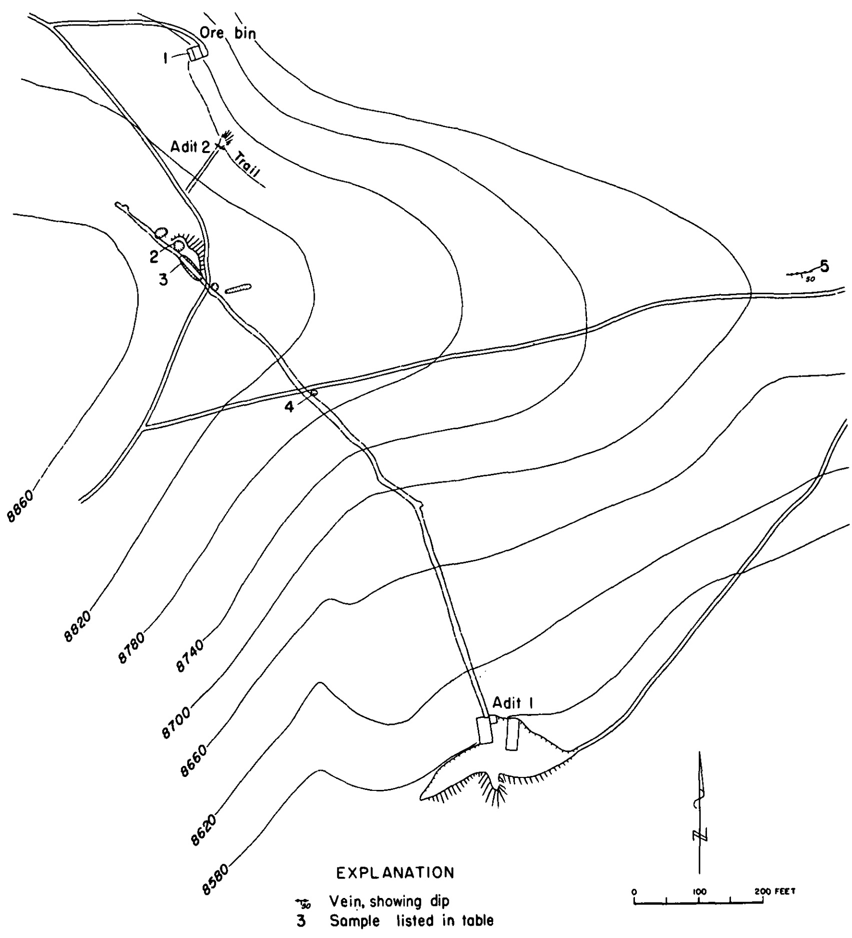


FIGURE 68. — Cougar mine.

posure in the last 130 feet of adit 1 and is composed of 60-80 percent quartz and 20-40 percent combined pyrite and galena. The vein is cut by a low-angle strike-slip fault at the face and is displaced eastward an undetermined distance. The offsetting fault strikes N. 87° E. and dips 30°-45° S. A sample taken across the vein contained 1.05 ounces gold, 3.21 ounces silver per ton, and a trace lead.

The mineralized fault probably extends continuously between adit 1 and adit 3 with minor displacement by cross faulting; it appears to persist through a vertical distance of at least 300 feet. Sample results define discontinuous marginal ore shoots within the fault. A potential resource is estimated to total nearly 81,000 tons of submarginal mineralized material, containing an average of 0.59 ounce gold and 4.48 ounces silver per ton. An

Data for samples shown in figure 68

[Samples 1-3 select grab; samples 4, 5 chip. Tr, trace]

Sample	Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)
1	Dump	0.30	1.16
2	do	.52	1.25
3	do	.66	2.38
4	1.3	.02	.10
5	14.0	Tr	.09

ore shoot of approximately 750 tons containing 1.48 ounces gold and 1.80 ounces silver per ton is estimated to occur within the marginal material. The potential is good for the discovery of additional gold and silver resources of a grade comparable to those known.

Cougar Mine

The workings on the Cougar group of claims (fig. 62, No. 19) are near the head of Gun Creek at the northwest end of the Pistol Creek Ridge area. The group was located by Bob Johnson, Dick Leahy, and Earl Kimball in 1936. Minor amounts of gold and silver were recovered from a small tonnage of oxide ore from surface pits and cuts (fig. 68) between 1936 and 1938.

The country rock is quartzite and quartz monzonite. The gradational contact and the deep overburden preclude accurate mapping between quartz monzonite and quartzite on the surface.

Adit 1 (fig. 69) was driven through quartz monzonite and quartzite to a strong fault zone striking N. 55° W. and dipping 65° NE., and was continued along the fault for approximately 50 feet. The breccia along the fault is 2.5-5 feet wide and averages about 3.8 feet wide. It is iron stained and cut by a few white quartz stringers.

Samples from the breccia to adit 1 contain only a trace gold and very minor silver values to a point corresponding with the beginning of the quartz stringers. Gold assay results increase to an average of 0.18 ounce per ton from this point to the face.

Adit 2 is caved but it probably was driven to crosscut the downward extension of the mineralized zone mined in the surface cuts. The quartz vein material found on the dump and in the nearby ore bin is composed of at least 70 percent quartz and up to 30 percent combined pyrite, arsenopyrite, galena, azurite, and limonite.

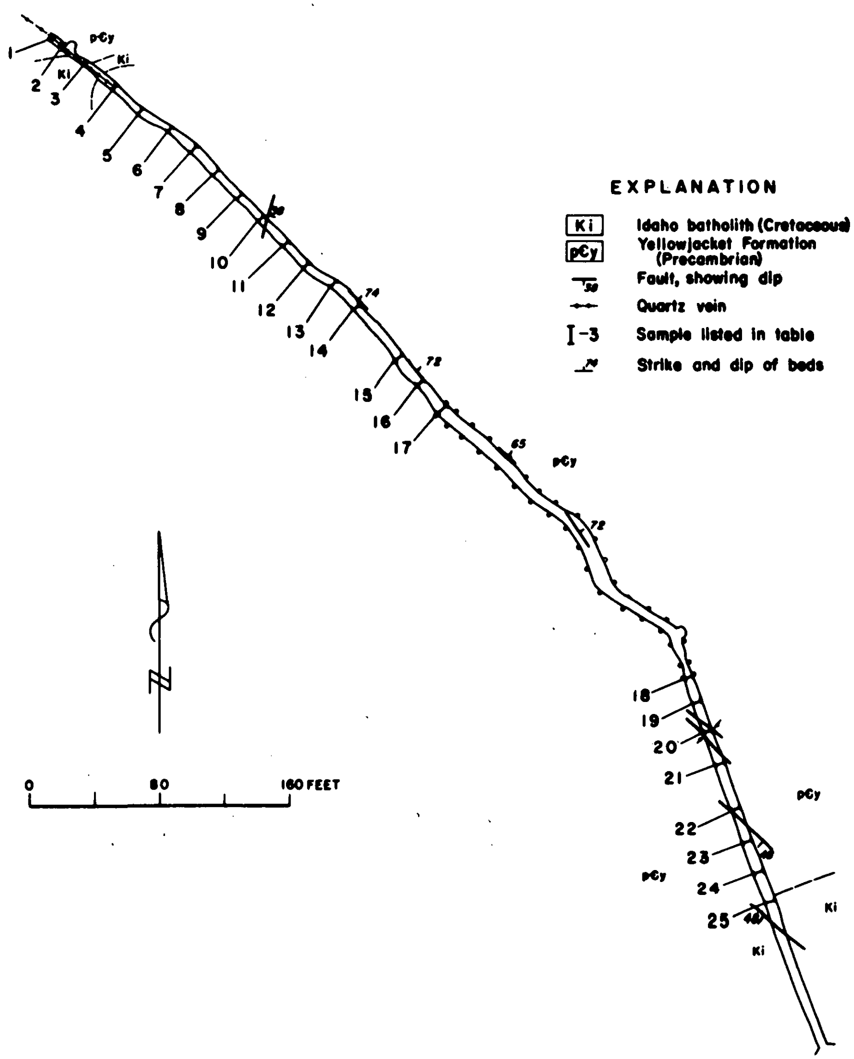


FIGURE 69. — Adit 1, Cougar mine.

Mineralized material in the surface cuts has been covered by caving of the deep overburden. Vein material on the dumps resembles that on the adit 2 dump and in the ore bin. A 1.3-foot-wide iron-stained quartz vein with no sulfide minerals is exposed in a pit southwest from the main surface excavations (fig. 68). The vein strikes N. 35°-45° W. Samples from surface dumps contained 0.30-0.66 ounce gold and 1.16-2.38 ounces silver per ton.

The mineralized zone near the surface cannot be followed, owing to the thick overburden. The similarity of mineralization in adit 1 and in the surface pits indicates that they are probably on the same zone. Potential

Data for samples shown in figure 69

[All samples were chip samples. Tr, trace; N, not detected]

Sample No.	Sample Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Sample No.	Sample Length (ft)	Gold (oz per ton)	Silver (oz per ton)
1	5.0	0.39	0.76	14	3.0	Tr	0.29
2	5.0	.12	.32	15	2.5	Tr	.11
3	4.0	.10	.79	16	5.0	Tr	.28
4	5.0	.10	.38	17	4.5	Tr	.06
5	5.0	Tr	.50	18	3.0	Tr	.08
6	5.0	.04	.71	19	4.0	Tr	.16
7	5.0	Tr	.29	20	3.0	Tr	.12
8	5.0	.02	.11	21	3.5	Tr	.16
9	5.0	Tr	.07	22	3.0	Tr	.10
10	4.5	Tr	.16	23	2.5	Tr	.16
11	4.5	Tr	.20	24	4.0	N	Tr
12	4.0	Tr	.32	25	5.0	Tr	.12
13	4.0	Tr	.11				

resources are estimated to total about 5,000 tons of material containing approximately 0.30 ounce gold and 1.10 ounces silver per ton, and a trace lead. The property has good potential for discovery of additional resources of similar grade.

LUCKY LAD (LUCKY BOY) MINE

This mine (fig. 62, No. 23) is at the headwaters of Forty-five Creek, at an altitude of 7,900 feet, on a ridgetop. Most development work was outside the study area, but the workings from which ore was produced lie within the area.

The property was originally located by Lafe Johnson, Art Kimball, and Dick Leahy of Cascade, Idaho, in 1935. The property was renamed the Lucky Boy, and some production was made during 1935-40. The Lucky Lad was relocated in 1957 as part of the Eagle group by Bennie S. Smith, who sold the property to E. Y. Pruitt of Cascade, Idaho, in 1969.

Country rock in the mine area is quartz monzonite of the Idaho batholith which is cut by numerous dikes and northwest-trending faults. Scattered small remnants of metasedimentary rock occur in the mine area. The fault zone containing the ore dips steeply and strikes N. 70° W.; it consists of finely fractured to blocky iron-stained country rock. Parts of the zone are filled with irregular vuggy quartz veins that are less than 0.5 to 4 feet wide, as much as 60 feet long, and more than 60 feet in vertical extent. The only exposure of the fault zone is in the unmined back of adit 2 (fig. 70). At this point, the fault strikes N. 70° W. and dips 61° SW.; the zone is 4 feet wide and includes coarse to fine-grained iron-stained quartz veins. In this exposure, the fine-grained quartz is more intensely iron stained than the coarse-grained quartz which contains less than 5 percent limonite.

Ore minerals comprise as much as 20 percent of the vein and include galena, anglesite, pyrite, chalcopyrite, and limonitic boxwork. The wallrock contains less than 5 percent anglesite. The northernmost adit (adit 1, fig.

70), from which the recorded production came, was driven along a vein 3.5 feet in maximum thickness containing 0.92 ounce gold, 48.4 ounces silver per ton, 38.1 percent lead, and 0.2 percent copper. Adit 4, driven to explore the fault zone at depth, cut narrow quartz stringers containing sulfide minerals. The ore in this caved adit was valued by R. E. Sorenson (unpub. data, 1935-36) at about $40 per ton.

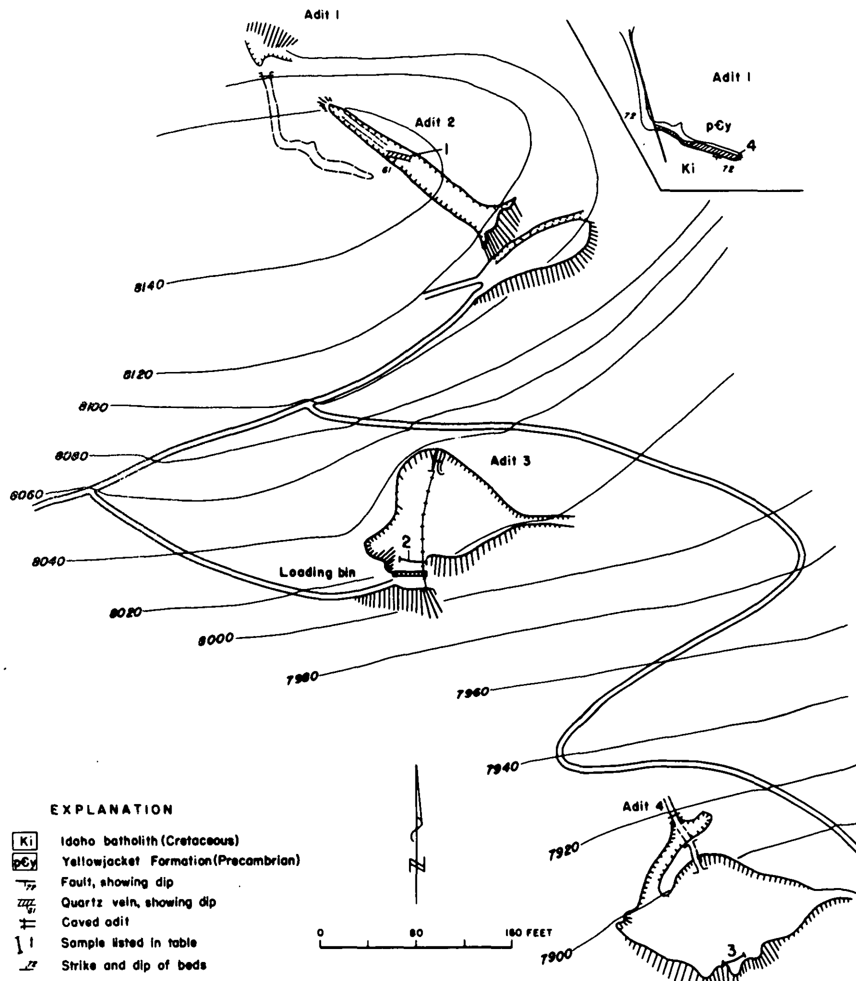


FIGURE 70. — Lucky Lad (Lucky Boy) mine.

Several hundred tons of ore containing 1 ounce gold, 7.6 ounces silver per ton, and 8 percent lead is indicated between adit 1 and the ore exposed above adit 2. The ore shoot is estimated to be 3.5 feet wide, 45 feet long, and 40 feet in vertical extent. Additional resources of gold, silver, and lead may exist in oxidized and enriched zones along extensions of the mineralized structures, but no significant deposits were found by former operators during exploration work.

COLEMAN PROSPECT

The Coleman prospect (fig. 62, No. 22) is at the head of Forty-five Creek, between the Lucky Lad and the Franklin D. mines; it was located by Ray Coleman in 1938 as part of the Monday group of lode claims. It was relocated and is currently held as part of the 4th of July group by Art Kimball of Mountain Home, Idaho.

An adit and cut expose a fault zone, 2 feet wide and partially filled with quartz-sulfide, that strikes N. 30° E. and dips vertically in granitic rocks. The fault zone is intermittently exposed for a horizontal distance of 120 feet and may extend to an outcrop 1,000 feet southwest, along the strike. The zone has been exposed to a depth of 60 feet.

The northeast end of the zone is exposed in the adit, which is caved 60 feet from the portal. Size of the dump indicates that the adit is about 100 feet long. The fault zone, predominantly iron- and manganese-stained breccia, is

Data for samples shown in figure 70

[Samples 1, 4, chip; samples 2, 3, grab. N, not detected]

Sample					
No.	Length (feet)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)
1	4.0	0.392	4.36	0.04	3.4
2	-----	.276	3.34	.05	1.5
3	-----	.196	.53	N	.1
[1]4	3.5	1.62	11.0	N	12.7

[1]From R. E. Sorenson (unpub. data, 1936).

exposed along the back of the adit. Texturally, the breccia ranges from large blocks of granitic rock to sand size. It contains irregular fracture fillings of white, sugary quartz which constitutes less than 20 percent of the fault zone. Wallrock is fractured, silicified, profusely iron-stained granite. No sulfide minerals are visible in the adit but are present in stockpiled quartz near the portal. This material contains up to 5 percent iron-oxide-coated casts, some as large as one-fourth inch across, remaining from weathering of pyrite and galena.

A large cut is 120 feet southwest along the projected strike of the fault. There, the fault is covered by sloughed overburden that contains vein material and highly altered granitic rock. Quartz similar to that in the stockpile near the portal was found on the dump of the cut. The fault zone probably extends southwestward beyond the cut.

Samples from the overburden, stockpiles, and fault zone contained a trace to 0.36 ounce gold and 0.6-1.0 ounce silver per ton, and a maximum of 0.52 percent lead. Resources are minor.

KW Prospect

The KW prospect is at the head of Chokebore Creek in the western part of the Pistol Creek Ridge area (fig. 62, No. 20). The ridge in the vicinity of the prospect is pine forested, and the soil is deep. The KW claim was located in 1937, but no production is recorded.

Exploration work consists of two caved adits and one small pit along a northwest-trending fault zone. A vertical fault cuts quartz monzonite which contains remnants of metasedimentary rocks. The fault strikes N. 72° W. and is exposed in the floor of the upper adit. The lower adit was probably driven along the fault, as the quartz on its dump is similar to that exposed in the upper adit. A grab sample from this material contained a trace gold and 0.11 ounce silver per ton. Quartz was also found on the dump of the pit between the upper and lower adits.

The fault zone in the upper adit is 4 feet wide, predominantly iron-stained breccia and vuggy white quartz containing up to 5 percent galena and pyrite. Most sulfides have been oxidized. A 4-foot chip sample across the fault zone in the upper adit contained 0.11 ounce gold per ton, 20.49 ounces silver per ton, and 2.9 percent lead.

The fault is truncated a few feet southeast of the upper adit. The crosscutting fault strikes N. 26° E. and dips steeply northwest. The direction of movement could not be determined, but the continuation of the mineralized structure is unlikely. The zone developed by the KW workings is mined out.

MISCELLANEOUS LODE PROSPECTS

The Pistol Creek district has six scattered prospects which cannot be included in descriptions of other areas. The six — Virginia Beth, Wild Dream, Cap Creek, Molly Mine group, Greenrock, and RDG — differ geologically from others in the district, but none appears to be a potential resource of economic minerals.

Virginia Beth Prospect

The Virginia Beth group (fig. 62, No. 3) lies on a brush-covered sparsely forested hillside south of Colt Creek. Claims were located in 1939 by Ev Cooper and Lafe Johnson of Nampa, Idaho. Access is by 8 miles of trail from the Middle Fork Ranch.

Workings consist of four shallow exploration pits. The northernmost pit exposes a poorly mineralized shear zone striking N. 75° E. and dipping 75° NW. The zone can be traced northeastward on the surface for about 300 feet. A quartz-filled, iron-stained shear zone exposed in the southernmost pit contains as much as 0.5 percent molybdenite and as much as 10 percent pyrite, hematite, limonite, and chalcopyrite combined.

There has been no production. Samples taken from exposures of the shear zone and excavation dumps contained only a trace gold, 0-0.10 ounce silver per ton, trace to 0.07 percent copper, and 0.02-0.52 percent molybdenum.

OTHER LODE PROSPECTS

Wild Dream prospect. — The seven small exploration pits on the Wild Dream prospect (fig. 62, No. 4) are on Big Baldy Ridge approximately 1 mile north of the confluence of Garden Creek and the Middle Fork Salmon River. The claim was located in 1965 by Edward J. Monaghan and Carl E. Shively of Orofino, Idaho. The pits expose an irregular body of jasper 60 feet wide, 100 feet deep, and 600 feet long on the contact of quartz monzonite with overlying Challis Volcanics.

Samples of the yellow to bright-red jasper and the adjacent country rocks contain no concentrations of metallic minerals. The jasper might be a source of lapidary material.

Cap Creek prospect. — The Cap Creek prospect (fig. 62, No. 15) is near the mouth of Cap Creek on the Middle Fork Salmon River. One small exploration pit is on the southeast end of an iron-stained massive vertical white quartz vein that strikes N. 5° W. The vein is 5-10 feet wide and is traceable for more than 100 feet. Samples contained trace amounts of copper and lead. No other anomalous amounts of metals were detected by spectrographic analyses.

Molly Mine group. — The Molly Mine group (fig. 62, No. 8) is on the divide between Pistol Creek and Little Pistol Creek, 100 yards from their fork.

Two small exploration pits are in a metamorphosed quartzite roof pendant in quartz monzonite of the Idaho batholith. The metamorphosed rocks are cut by aplite and pegmatite dikes. The adjacent intrusive rocks are altered, iron stained, and cut by andesite dikes. The altered quartz monzonite, quartzite, and dikes were sampled. The best values were in a sample of pegmatite dike and adjacent altered quartz monzonite, which contained 0.10 ounce gold and 3.7 ounces silver per ton; other samples contained only a trace gold and silver. Molybdenite is reported to occur on the property, but none was observed or detected by analyses.

Greenrock prospect. — One pit and caved adit are the only workings on the Greenrock property (fig. 62, No. 5). The workings are on the south side of Beansnapper Creek, near Pistol Creek. The prospect was located by Bennie S. Smith of Cascade, Idaho, in 1952.

The quartz monzonite country rock is cut by a 24-foot-wide andesite dike, containing about 1 percent pyrite, and a similarly mineralized 5-foot-wide rhyolite dike. The country rock and the dikes are cut by iron-stained fractures. The fractures contain as much as 10 percent pyrite and iron oxides combined. Samples of the country rock and fracture fillings assayed no gold, silver, or copper. No unusual amounts of metals were detected spectrographically.

RDG prospect. — The RDG prospect (fig. 62, No. 18) is on the north slope of Grenade Creek approximately one-half mile from its confluence with Forty-five Creek. The property consists of several lode claims, first

TABLE 17. — *Summary data, Pistol Creek placers*

[Tr, trace]

Deposit	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands[2] (lb per cu yd)
Cross Forks	4.1	40,000	Tr to 0.5	0.6
Speckled Trout	1.7	40,000	Tr	1.2
Twenty-five Creek	1.4	35,000	Tr	Tr
Thirty-two Creek	1.7	40,000	Tr	Tr
Iowa-Virginia	4.5	50,000	Tr	1.6
Indiana	18.5	30,000	Tr	1.3
Primitive Group	5.1	75,000	Tr	1.6

[1]Gold values are based on a price of $47.85 per troy ounce.
[2]Mainly ilmenite and magnetite, with small amounts of zircon, pyrite, limonite, garnet, and ferromagnesian silicates.

located by Bennie S. Smith but later relocated by Ross Geiling, who currently holds the claims.

Several small exploration pits expose andesite dikes in quartz monzonite. The dikes, parallel to fractures, strike N. 25°-40° E. and dip 50°-80° SE.; some narrow, flat-lying dikes also were observed. Very finely divided widely scattered disseminations of pyrite, molybdenite, and chalcopyrite occur in the dikes and altered wallrock. Samples contained trace amounts of gold, silver, molybdenum, and copper.

PISTOL CREEK PLACERS

The placer deposits in Pistol Creek drainage are confined to the lower 8 miles of the main creek and 1 mile of Little Pistol Creek above the confluence of the main stream (fig. 71). The stream gradient of both forks is

TABLE 18. — *Sample data for Pistol Creek placers*

[Sample sites shown in fig. 71. Tr, trace]

Site name and No.	Depth interval (ft)	Sample volume (cu ft)	Gold content[1] (cents per cu yd)	Black sands concentrate (lb per cu yd)
Twenty-five Creek:				
1	0.0-14.0	14.0	Tr	Tr
	14.0-28.0	14.0	Tr	Tr
Thirty-two Creek:				
2	.0-12.0	12.0	Tr	Tr
Cross Forks:				
3	.0- 4.0	4.0	0.5	0.6
	4.0- 6.0	4.0	Tr	.6
Speckled Trout:				
4	.0- 6.0	6.0	Tr	1.7
	6.0-14.0	8.0	Tr	1.1
5	.0- 4.5	4.5	Tr	.9
Iowa-Virginia:				
6	.0- 2.0	.5	Tr	1.6
Indiana:				
7	.0- 2.0	.4	Tr	2.5
8	.0- 2.0	.4	Tr	Tr
Primitive Group:				
9	.0- 2.0	.5	Tr	1.6
10	.0- 2.0	.2	Tr	1.6

[1]Gold values are based on a price of $47.85 per troy ounce.

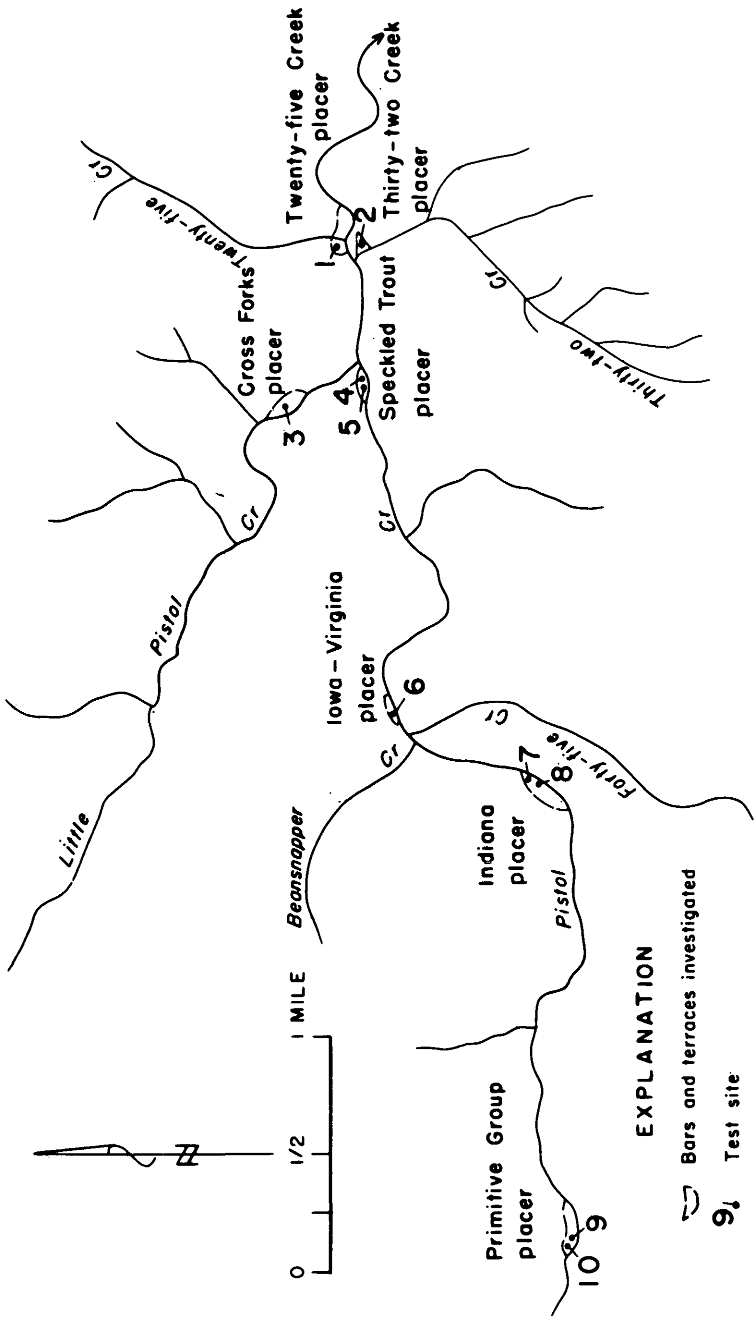


FIGURE 71. — Pistol Creek placer area.

TABLE 19. — *Summary data, Middle Fork Salmon River placers*

Deposit	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands[2] (lb per cu yd)
Buckhorn	24	3,485,000	0.7- 1.4	1.5
Horse Pistol	14	2,033,000	.7- 2.7	.5
Lower's	14	901,000	1.4-57.8	.7

[1]Gold values are based on a price of $47.85 per troy ounce.
[2]Mainly ilmenite and magnetite, with small amounts of zircon, pyrite, limonite, garnet, and ferromagnesium silicates.

about 100 feet per mile. The stream below the forks flows in a narrow, youthful canyon to the junction with the Middle Fork Salmon River.

The upper parts of the drainage are glaciated; the resulting detrital material is mainly poorly sorted quartz monzonite and quartzite. Along the part of the streams where placer claims have been located, the detrital material is reworked into gravel terraces and stream bars. The lower part of the drainage has small terraces and stream bars on quartz monzonite bedrock, showing a fracture pattern predominantly normal to the streamflow.

Samples were taken from all potential placer deposits along Pistol Creek (table 17). Only one sample contained more than a trace of gold (table 18). Black sand content of samples ranged from a trace to 1.6 pounds per cubic yard. The deposits are not a potential resource.

TABLE 20. — *Sample data for Middle Fork Salmon River placers*

[Sample sites shown in fig. 72]

Site No.	Depth interval (ft)	Sample volume (cu ft)	Gold values[1] (cents per cu yd)	Black sands (lb per cu yd)
		Buckhorn		
1	0.0- 4.0	8.0	0.7	2.0
	4.0- 8.0	8.0	1.4	2.4
	8.0-12.0	8.0	.7	1.7
2	.0-18.0	18.0	.7	.5
	18.0-36.0	18.0	.7	.4
	36.0-54.0	18.0	.7	.5
		Horse Pistol		
3	0.0- 2.0	2.0	0.7	0.3
4	.0- 2.0	2.0	2.7	.3
5	.0- 2.0	2.0	.7	.8
		Lower's		
6	0.0-19.0	19.0	1.4	0.6
	19.0-28.0	9.0	13.7	.6
7	.0- 7.0	7.0	16.4	.7
	7.0-15.0	8.0	13.7	1.0
8	.0- 3.0	6.0	4.1	1.3
	3.0- 5.0	12.0	2.1	.4
	5.0- 7.0	12.0	57.8	.5
	7.0- 7.5	3.0	57.4	.7

[1]Gold values are based on a price of $47.85 per troy ounce.

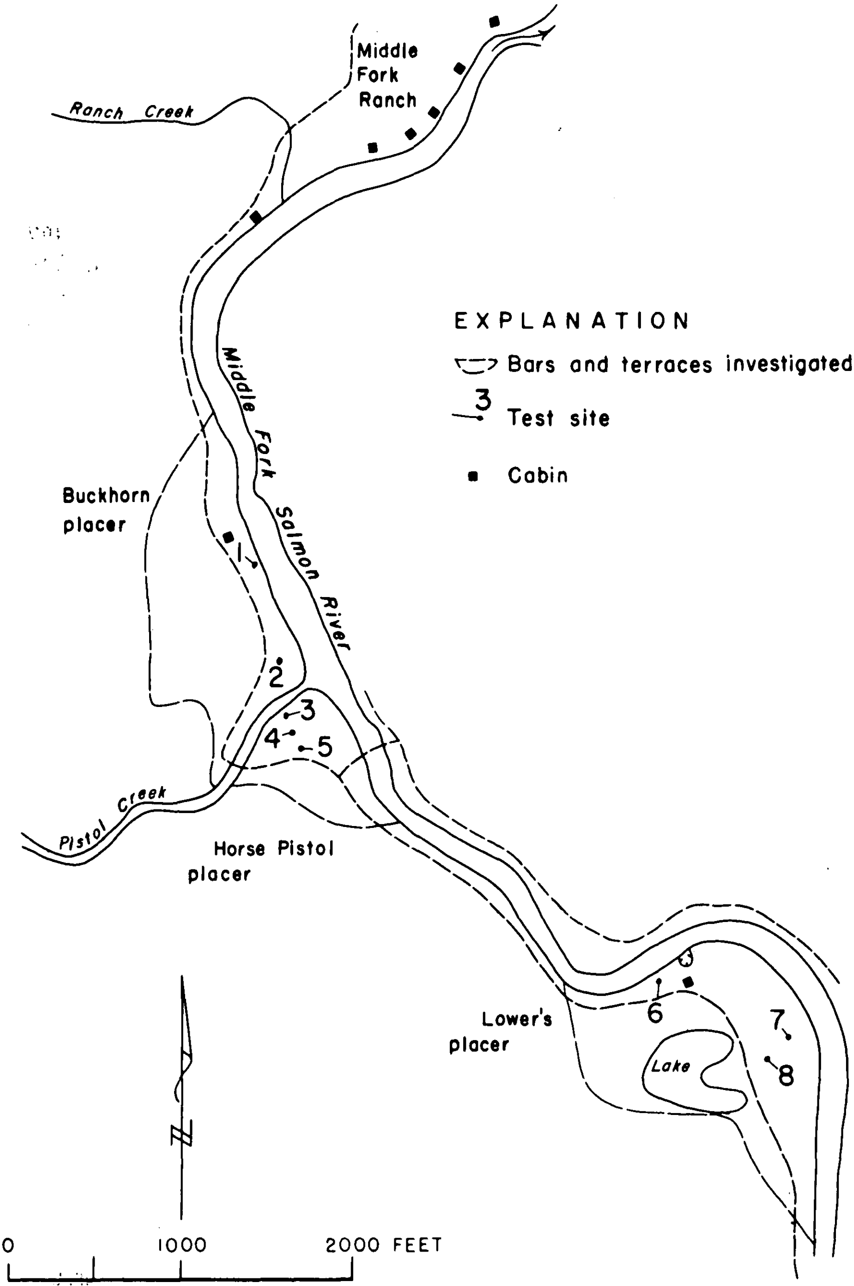


FIGURE 72. — Middle Fork Salmon River placer area.

River Placers

The Buckhorn, Horse Pistol, and Lower's claim (fig. 72) are near the confluence of Pistol Creek and the Middle Fork Salmon River. Access is by trail from the landing strip at Middle Fork Ranch.

All placers are pine-forested benches (table 19). Bedrock is quartz monzonite cut by north-trending granodiorite dikes.

The alluvium is composed predominantly of quartz monzonite and volcanic rock. Sample pits and trenches were 2-54 feet deep (table 20). Samples contained 0.7-57.8 cents gold per cubic yard and 0.3-2.4 pounds of black sand per cubic yard. The gold content of the Buckhorn and Horse Pistol deposits is estimated to be from 0.7 to 2.7 cents per cubic yard. The north end of Lower's placer, however, is estimated to contain 100,000 cubic yards of gravel which contains 20-40 cents per cubic yard. Although the deposit cannot be economically mined in entirety, some concentrations are probably present which may be economically minable.

EDWARDSBURG DISTRICT

The Edwardsburg district has a record of gold and silver production and a potential for development of additional resources. The district covers about 35 square miles (fig. 73). It includes the northern part of the much larger Edwardsburg mining district (fig. 15). described by Ross (1941).

Few prospects in the district are more than a mile from an old mine access road. Most slopes are steep and densely forested. Brush is thick near the creeks. Altitudes range from 8,868 feet near Placer Lake to about 5,000 feet at the confluence of Beaver and Big Creeks. Except on ridge crests, bedrock is generally concealed by at least 1 foot of overburden.

Little mining or prospecting activity was done prior to 1900, but most mining claims were located prior to 1910. Total recorded lode production is about $44,000 in gold and silver, produced from the Golden Hand mine (fig. 73, No. 4) in 1932-41. Only a few ounces of placer gold production has been recorded, but an estimated 3,500 ounces valued at $70,000 to $100,000 has probably been recovered from the Smith Creek-Big Creek placers (No. 32). Considerable underground exploration work has been done at the Werdenhoff mine (No. 23), but there is no record of production.

Early gold prospecting was concentrated near the Golden Hand and Werdenhoff mines. Recent prospecting in the area south of Smith Creek has attempted to find tungsten deposits, similar to that at the Snowbird mine just west of the study boundary.

Most lode deposits in the district are low-grade gold-silver quartz fissure veins in the Yellowjacket Formation or Idaho batholith. Gold placer deposits, along lower Smith Creek and for about 1 mile below its junction with Big Creek, have been worked on a small scale for many years. Attempts at large-scale systematic placer mining during the 1930's were thwarted by abundant large boulders.

For convenience of description, the district has been divided into five areas on the basis of similar geology and access: (1) Golden Hand mine area, (2) Werdenhoff mine area, (3) area south of Smith Creek, (4) McFadden Point area, and (5) Smith Creek-Big Creek placer area.

GOLDEN HAND MINE AREA

Numerous lode prospects are in the Golden Hand mine area, roughly bounded by Pueblo Ridge and the drainages of Cache, Beaver, and Clark Creeks.

Country rock is predominantly granodiorite of the Idaho batholith and argillaceous quartzite of the Yellowjacket Formation. Both rocks are cut by light- and dark-colored Tertiary dikes and quartz veins. Veins and dikes exposed by development work in the area are 0.5-15 feet thick. Extensive development work at the Golden Hand mine was mostly confined to the quartzite-granodiorite contact. Small prospects in the area have explored narrow quartz veins and veinlets in the quartzite. Only the Vee prospect (fig. 73, No. 11) and the Golden Hand mine (No. 4) have potential for discovery of minable resources.

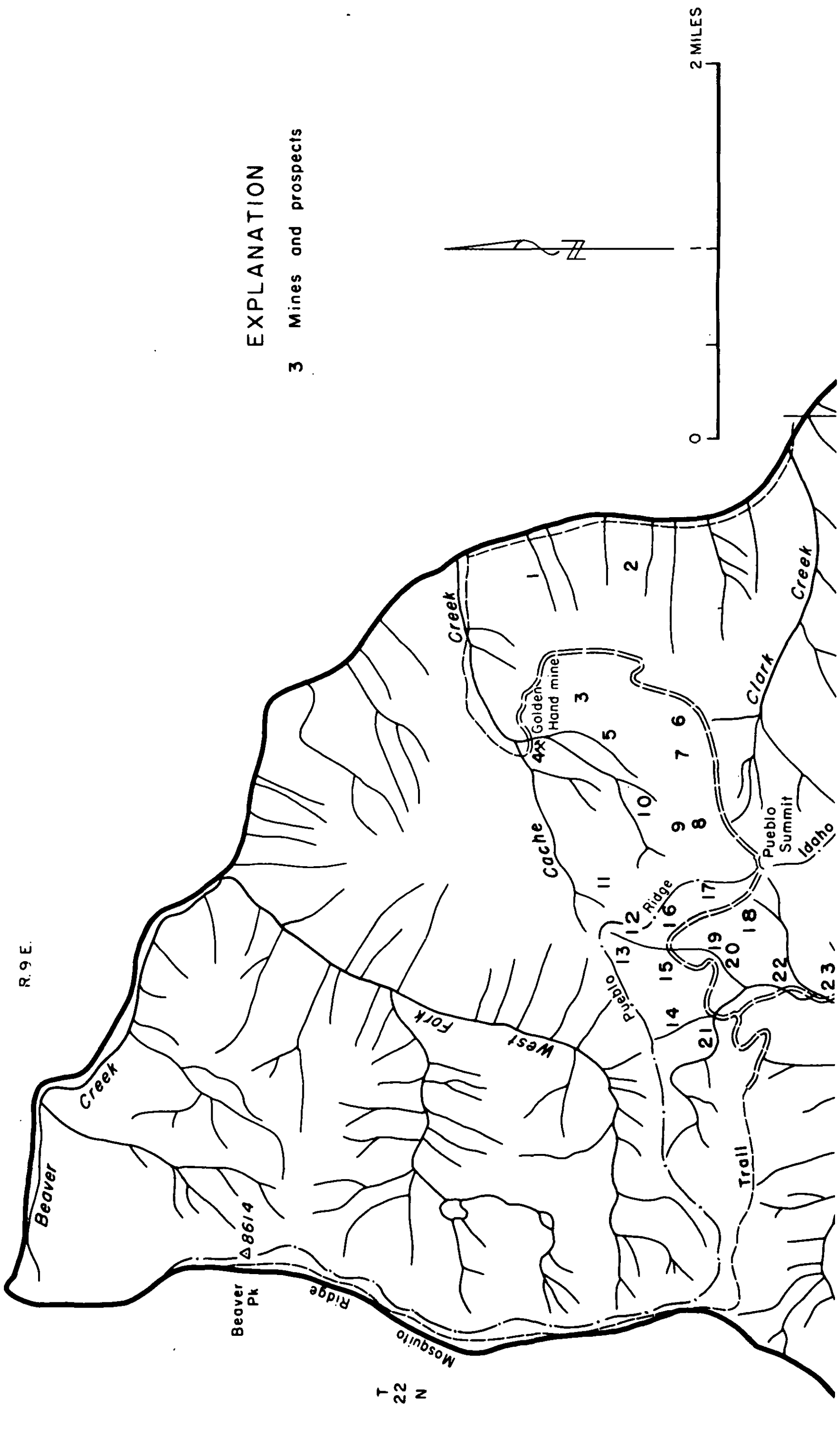
Golden Hand Mine

The Golden Hand mine (fig. 73, No. 4) is near the head of Cache Creek, about 12 miles by unmaintained dirt roads from Big Creek, Idaho. Altitude at the mine is about 7,000 feet.

The deposit was discovered originally by J. M. Hand in about 1889. He located placer claims on Beaver Creek near the mouth of Cache Creek and later discovered two small gold quartz veins on the north side of Cache Creek. The veins were developed by two short adits named the Arrastra and Hand (fig. 74). Ore was treated in an arrastra and the Hand brothers reportedly recovered $1,200 in gold (Shenon and Ross, 1936, p. 30). Shortly after the Thunder Mountain boom, the Penn-Idaho Co. acquired the property and drove two adits on the Neversweat No. 1 claim on the south side of Cache Creek (fig. 74). In 1933 (Shenon and Ross, 1936, p. 30) the property consisted of 26 unpatented mining claims (22 lode and 4 placer) owned by Golden Hand, Inc. The company mined from an opencut on the Neversweat No. 2 claim (fig. 74) and processed the ore in a 6-ton-per-day Straub mill. Claude Elliot relocated the claims in 1963.

Bureau of Mines production records show that 1,368 ounces of gold and 301 ounces of silver were produced from 1,648 tons of high-grade oxidized ore during 1932-34. An additional 200 ounces of gold and 50 ounces of silver were recovered from about 485 tons of ore in 1938. Minor production was reported in 1940 and 1941. Total recorded gold and silver production is valued at $44,212. No production or development has been reported since 1941.

Total development work includes 18 adits, numerous pits and trenches, a small mill, a two-story cookhouse-bunkhouse, and several cabins (fig. 75).


EXPLANATION
3 Mines and prospects
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Mosquito
Ridge
West
Fork
Cache
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Golden Hand mine
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Pueblo
Summit
Idaho
Pueblo
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Trail
1
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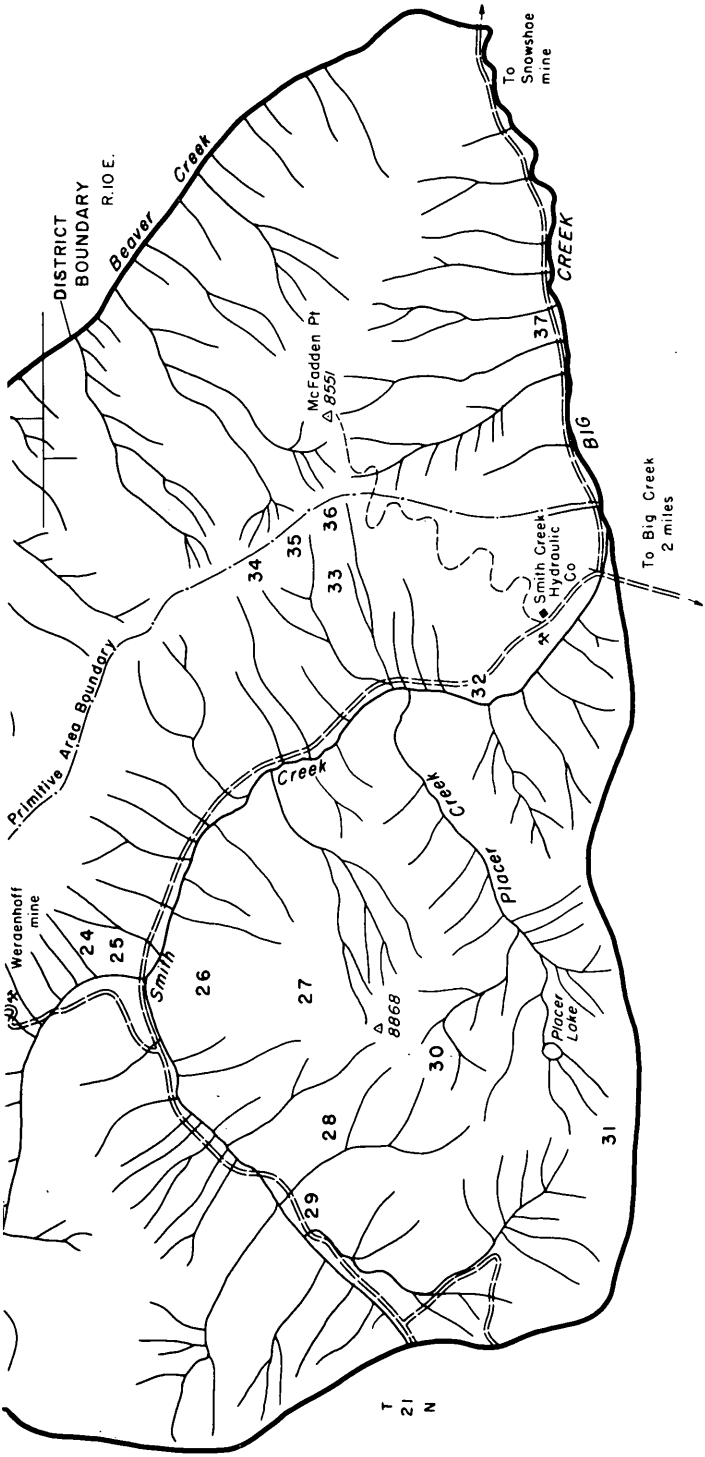


FIGURE 73. — Mines and prospects, Edwardsburg district.

Mines and prospects shown in figure 73

1.	Snowslide prospect	14.	Hilltop prospect	27.	D. D. prospect
2.	Wolf prospect	15.	Snow Drift prospect	28.	Rocket (White Bluff) prospect
3.	Triple A. prospect	16.	July Blizzard prospect	29.	Gold Hill group
4.	Golden Hand mine	17.	T. T. claim	30.	Placer Lake prospect
5.	Nelly More prospect	18.	Pueblo group	31.	Lakeside prospect
6.	Big 4 prospect	19.	Wabash prospect	32.	Smith Creek-Big Creek placers
7.	Bell prospect	20.	Lucky Boy prospect	33.	Hillside prospect
8.	Powder prospect	21.	West Extension prospect	34.	Dagnapan prospect
9.	Dynamite prospect	22.	Crest prospect	35.	Trio group
10.	Hercules prospect	23.	Werdenhoff mine	36.	Hollister prospect
11.	Vee prospect	24.	Black Swan prospect	37.	Tenderfoot prospect
12.	Queen prospect	25.	Blue Stone prospect		
13.	Lost Packer prospect	26.	Summertrail prospect		

Principal mine workings are along the irregular and gradational contact between the Yellowjacket Formation (chiefly schist, quartzite, and argillite) and granodiorite of the Idaho batholith. The contact zone is a complex mixture of highly fractured and silicified rocks.

No significant ore deposits were found during the recent Bureau of Mines investigation. Shenon and Ross (1936, p. 30) described the ore zones exposed in 1933 as follows:

The ore thus far developed lay chiefly along joints and shear planes in granodiorite and schistose rocks of Yellowjacket Formation, although a little disseminated pyrite and tetrahedrite occur in a quartz latite porphyry dike in the lower Neversweat tunnel. The ore minerals include pyrite, galena, sphalerite, tetrahedrite, chalcopyrite, and gold. In the ore the granodiorite and schist have been greatly fractured, and quartz, calcite, sericite, and epidote fill the fractures and form irregular bodies near them. Sulfides and gold occur in fractures in quartz and calcite and along cleavage planes in calcite.

In 1933 total development work at the Neversweat No. 2 claim consisted of two short adits, 70 and 130 feet long, and two opencuts, less than 50 feet long and 25 feet wide. Most past production apparently came from these near-surface workings. R. N. Bell (unpub. consultant's report, 1934) described a pit probably 40 feet square and 15 feet deep, that yielded 1,800 tons of ore from which $32,000 in gold was recovered by plate amalgamation. Much of the later exploration work on the Neversweat No. 2 claim (fig. 76) was apparently unsuccessful in finding other high-grade ore bodies. No ore was observed in any of the accessible Neversweat No. 2 workings, and few samples of potential ore zones assayed more than a trace gold and silver.

Accessible underground workings on the Neversweat No. 1 claim total about 1,150 feet (fig. 77). The best sample, taken from a 2-foot-thick quartz zone exposed by the longer adits, assayed 0.14 ounce gold and 25.5 ounces silver per ton, 0.22 percent copper, and a trace lead. Other small quartz veins and pods containing disseminated pyrite and scattered malachite-azurite stain average about 0.2 ounce silver per ton and a trace gold and copper. Locally, trace amounts of lead, zinc, and barium were detected.

None of the workings dug by the Hand brothers on the north side of Cache Creek are accessible. Host rock is slaty schist containing small

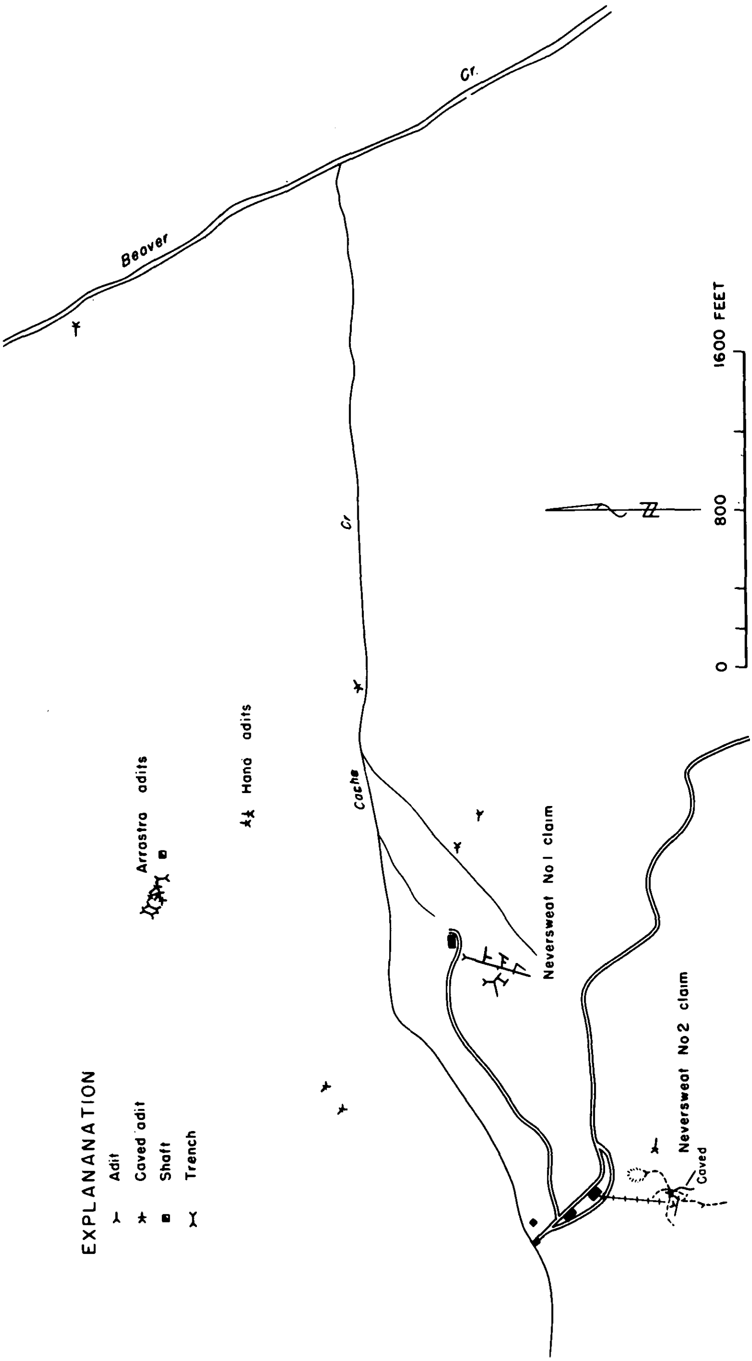


FIGURE 74. — Golden Hand mine.

FIGURE 75. — Golden Hand mine; view to the south.

quartz stringers and pods. Although gold has been produced from the Arrastra and Hand adits, none of the analyzed quartz found in place or sorted from the dumps of old workings contained more than a trace gold or more than 0.2 ounce silver per ton.

Samples sorted from the dumps of other caved workings on the property and taken from a few iron-stained quartz outcrops contained only a trace gold and silver. Reconnaissance pan samples taken from small alluvial deposits along Cache Creek contained gold values averaging about 3 cents per cubic yard near the mouth of the creek and about 7 cents per cubic yard just below the mine workings.

Apparently, the ore occurred in small near-surface pods and zones and was relatively high grade, averaging 0.4-0.8 ounce gold per ton. Ore zones exposed by later underground development work have been smaller than minable size and rarely of minable grade.

Other ore shoots, however, probably exist like those mined near the turn of the century and during the 1930's.

OTHER LODE PROSPECTS

Vee prospect. — The Vee prospect (fig. 73, No. 11) is about three-fourths mile southwest of the Golden Hand mine, near the head of Cache Creek. A prospect pit in quartzite exposes three parallel, nearly vertical, quartz veins that strike N. 34° E. None of the veins are more than 1 foot wide; they are exposed only to a depth of 3 feet and for 15 feet along their strike before being covered by overburden. Vein material is composed of more than 90 percent quartz and less than 10 percent iron oxides. A sample across the veins assayed 0.19 ounce gold per ton. Another prospect pit about 100 feet northeast of the vein exposure is in iron-stained and jointed rhyolite. A sample taken 10 feet across the rhyolite in the pit assayed 0.02 ounce gold per ton. No other economic minerals were detected. More work would have to be done on this prospect to prove a resource.

Snowslide prospect. — The Snowslide claim (fig. 73, No. 1) is about 1 mile east of the Golden Hand mine and one-fourth mile west of Beaver Creek. A 10-foot-diameter pit is completely sloughed. Quartzite cropping out nearby strikes N. 80° W. and dips 25° S. A sample of an iron-stained quartzite outcrop near the pit contained a trace gold.

Wolf prospect. — The Wolf prospect (fig. 73, No. 2) is one-fourth mile west of Beaver Creek and about 1¼ miles southeast of the Golden Hand mine. Two small prospect pits are sloughed and no longer expose bedrock. Rock on the dumps is heavily iron stained quartzite that assayed a trace gold.

Triple A. prospect. — The Triple A. prospect (fig. 73, No. 3) is about one-third mile southeast from the Golden Hand mine. Prospect workings consist of an old caved adit, trending N. 10° W. for about 50 feet. No bedrock is exposed and dump material (iron-stained granitic rock) contains no detectable metal values.

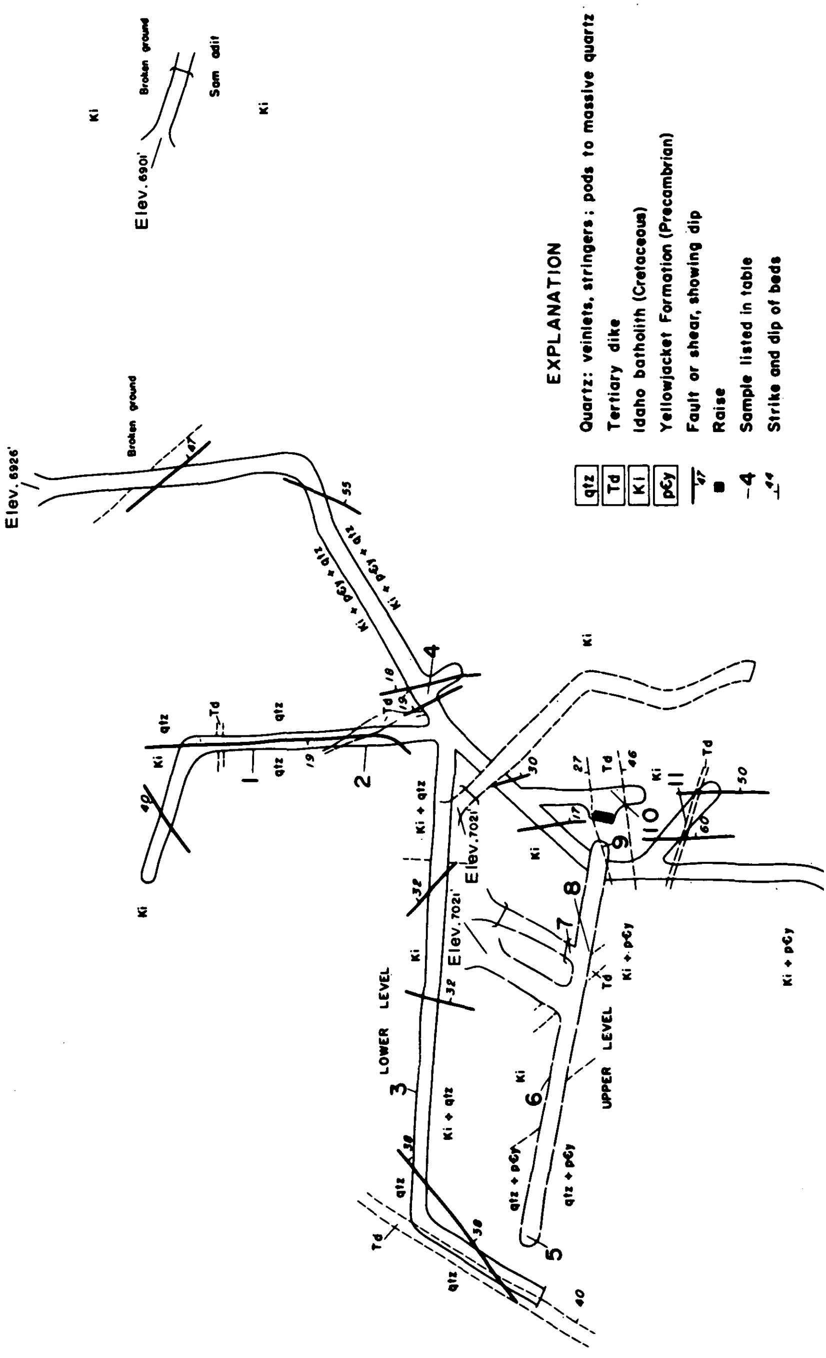
Nelly More prospect. — The Nelly More prospect (fig. 73, No. 5) is 1 mile northeast of Pueblo Summit and less than one-half mile southeast of the Golden Hand mine. A caved trench does not expose bedrock but probably explored a quartz vein in quartzite country rock. A sample of quartz, heavily stained with iron oxide, was sorted from the dump; it assayed a trace gold and 0.07 ounce silver per ton.

Big 4 prospect. — The Big 4 prospect (fig. 73, No. 6) is along the Golden Hand access road, less than 1 mile northeast of Pueblo Summit. Two prospect pits, nearly 1,500 feet apart, are sloughed and do not expose the

Data for samples shown in figure 76

[Sample 10 was grab; all others were chip. Tr, trace]

Sample				Sample			
No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)
1	36	0.02	0.3	7	---	Tr	Tr
2	36	Tr	.3	8	4	.01	.2
3	14	Tr	Tr	9	5	Tr	Tr
4	8	Tr	.1	10	---	Tr	Tr
5	6	Tr	Tr	11	2	Tr	Tr
6	33	.02	Tr	12	2	Tr	Tr


EXPLANATION
qtz Quartz: veinlets, stringers; pods to massive quartz
Td Tertiary dike
Ki Idaho batholith (Cretaceous)
pЄy Yellowjacket Formation (Precambrian)
Fault or shear, showing dip
Raise
Sample listed in table
Strike and dip of beds
Elev. 6926'
Elev. 6901'
Elev. 7021'
Broken ground
Sam adit
LOWER LEVEL
UPPER LEVEL

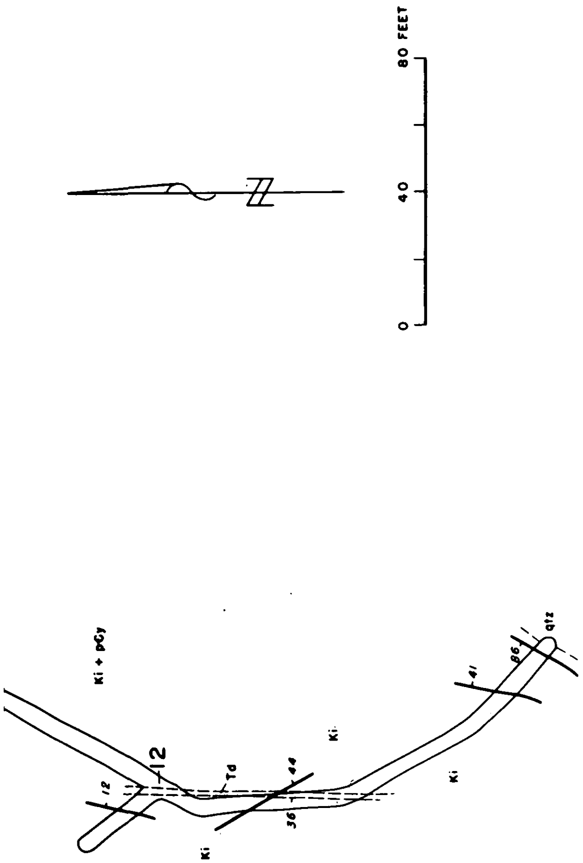


FIGURE 76. — Underground workings, Neversweat No. 2 claim, Golden Hand mine. Modified from undated company map.

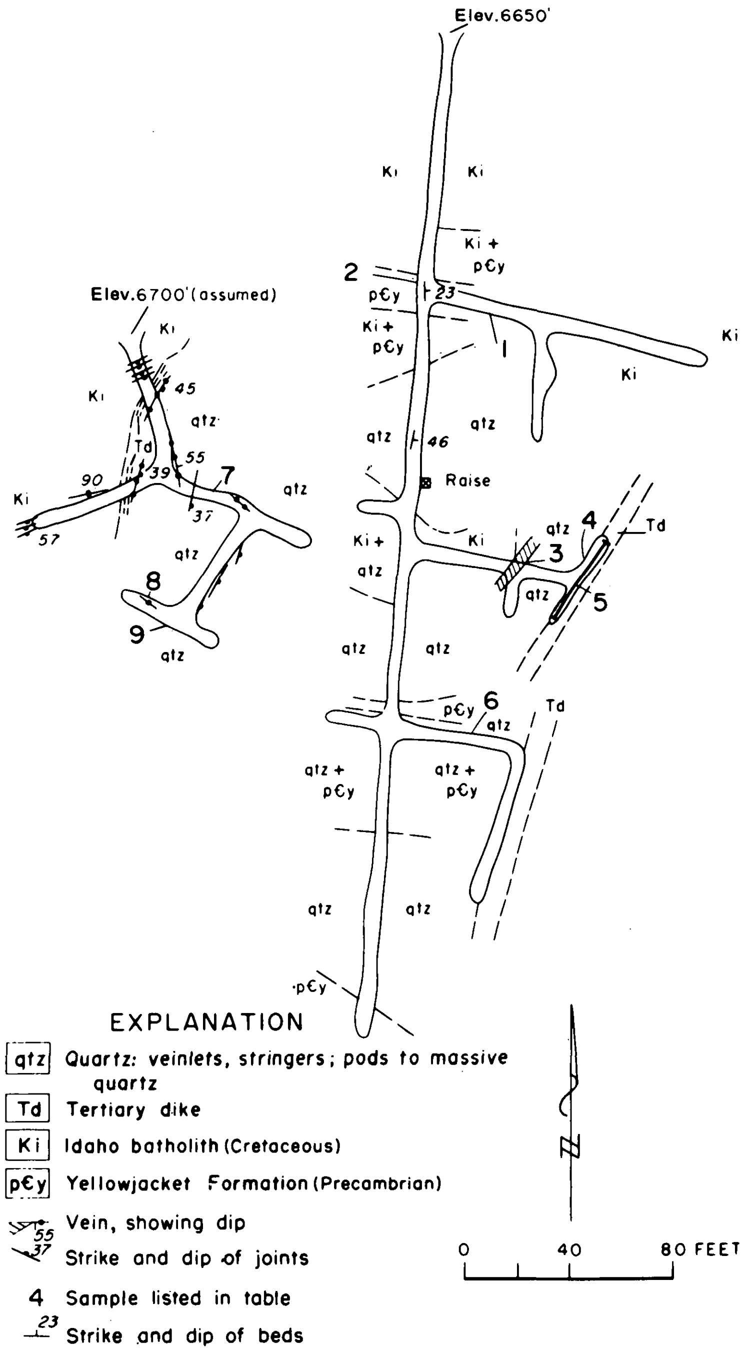


FIGURE 77. — Underground workings, Neversweat No. 1 claim, Golden Hand mine.

Data for samples shown in figure 77

[Sample 2 was grab; all others were chip. Tr, trace; N.d., not determined; N, not detected]

Sample					Sample				
No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	41	Tr	0.1	N	6	---	Tr	0.3	N
2	---	N.d.	N.d.	N.d.	7	70	Tr	.2	Tr
3	2	0.14	25.5	0.22	8	---	Tr	.5	Tr
4	40	Tr	.1	N	9	45	Tr	.2	Tr
5	40	Tr	.1	.02					

quartzite country rock. Dump rock (heavily iron stained quartz) contains an average of 0.02 ounce gold and 0.49 ounce silver per ton.

Bell prospect. — The Bell prospect (fig. 73, No. 7) is about three-fourths mile northeast of Pueblo Summit, near the Golden Hand access road. The only remaining evidence of a claim, staked in 1904, is a small sloughed prospect pit. Iron-stained quartz sorted from the dump contained no detectable gold, silver, or other economic minerals.

Powder prospect. — The Powder prospect (fig. 73, No. 8) is about one-fourth mile northeast of Pueblo Summit. An 8-foot-diameter pit apparently explored a quartz vein in quartzite. Iron-stained quartz vein material sorted from the dump assayed a trace gold.

Dynamite prospect. — The Dynamite prospect (fig. 73, No. 9) is about 1,000 feet north of the Powder prospect. A sloughed trench does not expose bedrock. Dump material consists of vein quartz, quartzite, and granitic rock. The vein material assayed 0.01 ounce gold per ton.

Hercules prospect. — The Hercules prospect (fig. 73, No. 10) is about 0.6 mile southwest of the Golden Hand mine. Country rock is quartzite, which strikes N. 15° W. and dips 24° E. A sloughed trench in a zone of quartz veinlets trends N. 4° W. A sample of profusely iron stained quartzite containing one-half-inch-wide quartz veinlets assayed 0.01 ounce gold per ton.

WERDENHOFF MINE AREA

The Werdenhoff mine and numerous small lode prospects are near North Fork Smith Creek, between Pueblo Ridge and main Smith Creek (fig. 73). None of the prospects are more than one-fourth mile from the Werdenhoff-Golden Hand mine access road. Altitudes range from 6,237 feet at the road junction on Smith Creek to 8,581 feet at the crest of Pueblo Ridge, a distance of about 2 miles.

Predominant rock types are argillaceous quartzite and mica schist of the Yellowjacket Formation and granodiorite and quartz monzonite of the Idaho batholith. Most prospecting and development work has been done on quartz veins in the quartzite near the contact with the batholith. Quartz veins average 1-2 feet thick and generally contain a trace to 0.7 ounce gold and silver per ton.

The Werdenhoff mine and Pueblo group (fig. 73, Nos. 23, 18) are explored more extensively than other properties. Both properties probably had some minor gold production during the early 1900's, but none has been reported. Additional work might discover minable gold.

The Blue Stone prospect (fig. 73, No. 25) is an undeveloped property with widespread low-grade values of silver, lead, and copper. Further exploration at the Blue stone may reveal a minable ore body.

Werdenhoff Mine

The Werdenhoff mine (fig. 73, No. 23) is on the east side of the North Fork of Smith Creek about 1 mile by road from Smith Creek. The original property comprised 21 unpatented claims that included part of the Pueblo group (fig. 73, No. 18).

The property was located originally by Prindle Smith and was relocated by Mr. Werdenhoff during the Thunder Mountain boom (1902-05). Most development work was done by Keystone Gold Mines, Inc., in 1927-34. The Werdenhoff Mining Co. of Tacoma, Wash., was incorporated in 1952. They filed a report with the Idaho Inspector of Mines in 1958 listing 33 unpatented claims for the property. Jack Walker of Vale, Oreg., purchased the milling equipment and located several claims in 1967.

Several buildings, including a 25-ton-per-day mill, are on the property. Mill equipment includes a jaw crusher, 5-stamp mill, rod mill, two concentrating tables, jig, diesel engine, assorted pumps, screens, and miscellaneous equipment. Lack of wear on the crushing equipment, together with the small amount of mill tailing, indicates that little ore was processed. A 1,250-foot-long tramway that was constructed between the mill and adits in 1932 has since been removed.

Exploratory work consists of seven adits aggregating more than 3,400 feet, all driven before 1933. Only the lower adit was inaccessible. Shenon and Ross (1936, p. 28-30) mapped and described the adits in 1933; their work was used freely in the following description.

The area of underground workings (fig. 78) is at the poorly defined and irregular contact zone between the Yellowjacket Formation and granodiorite of the Idaho batholith. The Yellowjacket Formation is light-colored quartzite, with some argillite and schist. Quartz latite porphyry and lamprophyre dikes, containing scattered pyrite, cut the quartzite and granodiorite. Quartz veins containing calcite and sericite, and minor amounts of pyrite, chalcopyrite, sphalerite, galena, tetrahedrite, and gold occur along faults and major joints. Two major quartz veins and a large irregular silicified body, called the Keystone outcrop, have been partly explored by the Werdenhoff workings.

Adit 2 (fig. 79) follows a quartz vein striking approximately N. 35° E. and dipping from 50° SE. to nearly vertical. The vein averages 1.6 feet thick for 100 feet from the portal where it continues as two veins. The east vein is exposed for 200 feet along the adit and again by a crosscut 120 feet farther

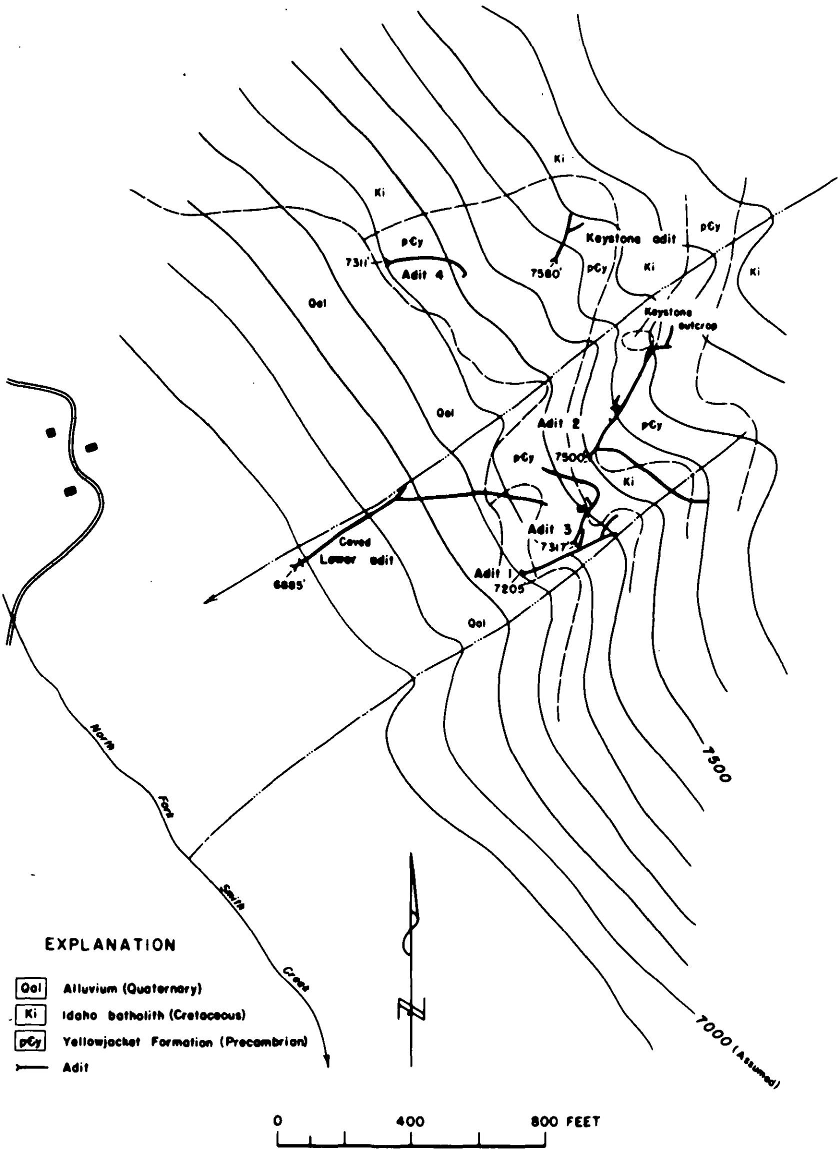


FIGURE 78. — Werdenhoff mine area. Modified from an updated map by Gordon Smith and M. W. Cox

along its strike. In places the west vein is exposed by crosscuts and the adit for more than 300 feet. Thicknesses of the two veins vary considerably but probably average 1.5 feet. The quartz veins are fractured and bounded by fault gouge. Average gold and silver values are about 0.06 and 0.25 ounce per ton. A few samples contained a trace copper.

The Keystone outcrop (fig. 78) is a large silicified zone that crops out about 400 feet north of the portal of adit 2. The outcrop appears to trend

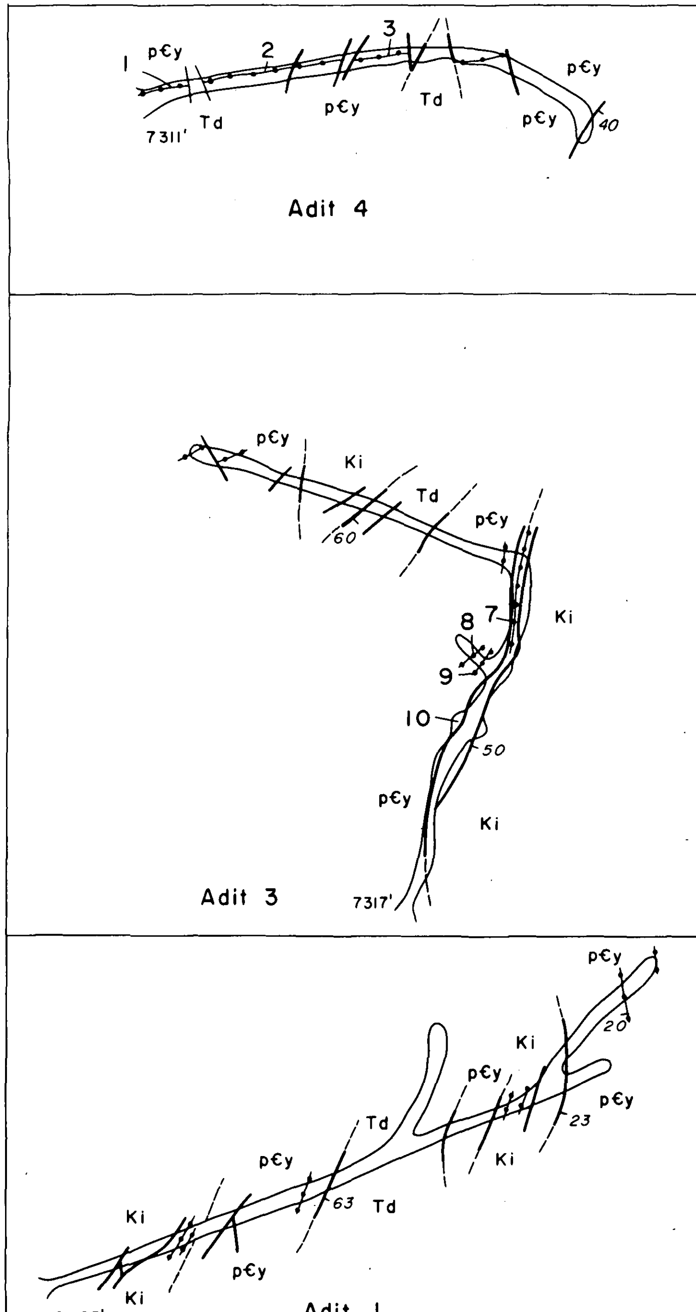
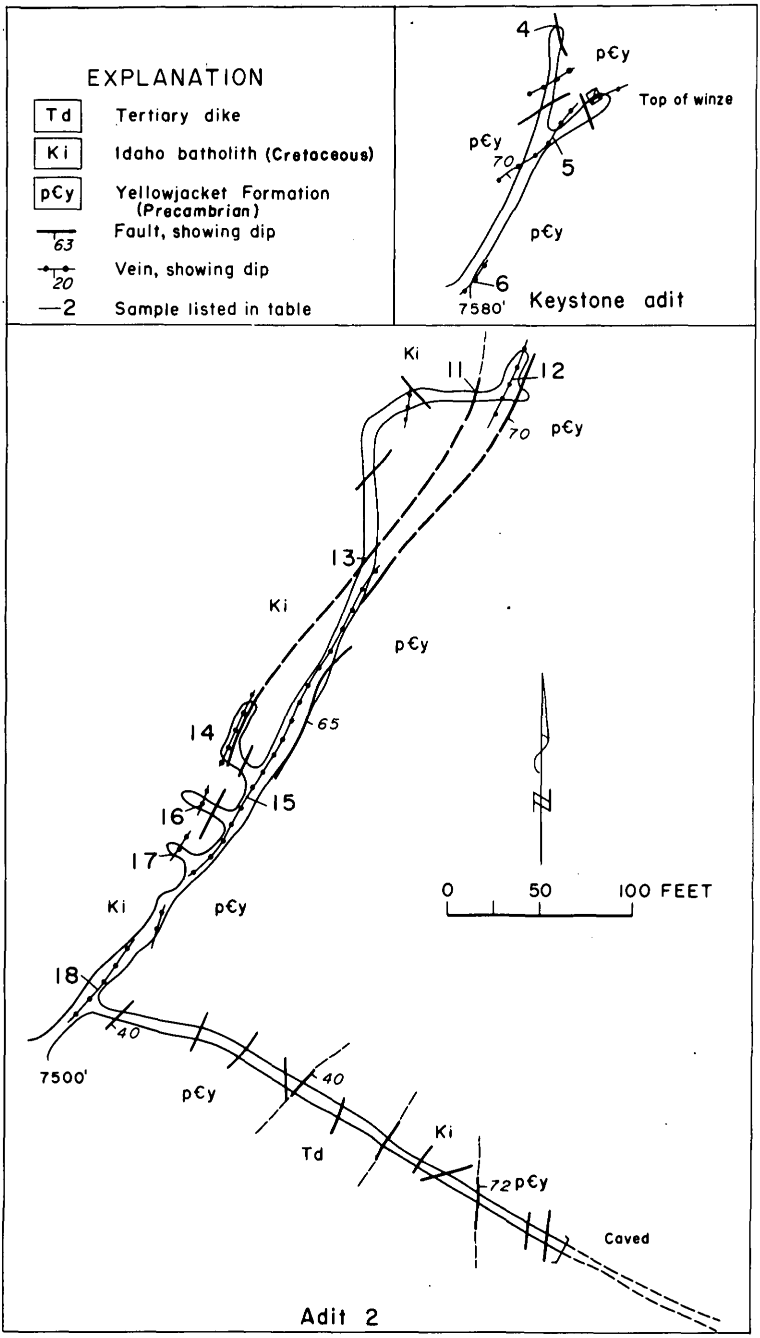


FIGURE 79. — Underground workings, Werdenhoff mine.



Modified from P. J. Shenon and C. P. Ross, 1936.

Data for samples shown in figure 79

[Sample 15 was grab; all others were chip. Tr, trace; N, not detected]

Sample No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Sample No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	4.0	0.13	0.4	N	10	3.0	.47	.6	Tr
2	1.7	Tr	.1	N	11	1.7	.04	.5	Tr
3	3.7	Tr	.2	N	12	.8	Tr	Tr	N
4	3.3	Tr	Tr	N	13	.6	Tr	Tr	N
5	3.0	Tr	Tr	N	14	2.0	Tr	Tr	N
6	2.0	Tr	.5	N	15	---	.01	Tr	N
7	1.5	.02	.1	Tr	16	3.0	Tr	Tr	N
8	2.0	Tr	Tr	N	17	.7	Tr	Tr	N
9	2.0	Tr	.2	N	18	.8	.21	Tr	N

east. Individual quartz-filled fractures in the structure, however, strike N. 25°-84° E. and dip 65°-85° SE. Samples across the outcrop averaged 0.03 ounce gold and 0.5 ounce silver per ton.

Adit 3 apparently was driven along the same vein as adit 2 but 183 feet lower in elevation. The vein strikes N. 25° E. and dips 23°-50° SE. It averages about 1.7 feet thick and is exposed for 190 feet by the adit. The vein contains more gouge and less quartz than in adit 2 and contains only a trace gold and silver. A 30-foot inclined shaft was dug on the outcrop of the vein. Samples across the gouge zone in the shaft also averaged a trace gold and silver.

Adit 1 is 112 feet lower in elevation than adit 3. The adit apparently was driven in an unsuccessful attempt to intersect the vein exposed in adits 2 and 3. Several narrow gouge zones, however, were intersected; some contained thin stringers of quartz but no gold or silver. The vein exposed in adits 2 and 3 tends to decrease in dip with increasing depth; therefore, adit 1 was probably driven below the vein.

Adit 4, about 800 feet northwest of adit 2, was driven for 150 feet along another vein composed of quartz and gouge. The vein strikes N. 80° E., dips 70°-80° E., and ranges in thickness from 1 to 5 feet, averaging about 2.5 feet. Three samples cut across the vein averaged 0.04 ounce gold and 0.2 ounce silver per ton.

The Keystone adit is 350 feet northwest of and 269 feet above adit 4. A quartz vein exposed at the portal strikes N. 35° E. and dips 72° SE. It is exposed along the surface for 40 feet and is 0.5-1 foot thick. The vein is discontinuous and is offset by faults. Samples of the vein exposed inside the adit contained only trace amounts of gold and silver.

The lower adit (fig. 78) is caved. Accessible underground workings at the Werdenhoff mine do not expose mineralized zones of minable size and grade. The vein explored by adits 1, 2, and 3 and the one explored by adit 4 and the Keystone adit are estimated to contain 200,000 tons of rock averaging 0.04 ounce gold and 0.2 ounce silver per ton, assuming continuity with the lower adit. Another 30,000-40,000 tons averaging 0.03 ounce gold and 0.5 ounce silver per ton is estimated for the Keystone outcrop.

Pueblo Group

The Pueblo group (fig. 73, No. 18) of claims is about one-half mile west of Pueblo Summit. Exploratory work consists of three distinct sets of workings. Several log cabins have been built. Mining claim records date from 1902. The deteriorated condition of the mine camp and the caved workings indicate that little has been done since the early 1900's.

One scattered group of workings consists of two vertical shafts and eight pits and trenches. Rocks on the dumps are quartzite and granodiorite and small amounts of quartz vein material. One shaft is caved 70 feet below the collar and the other, at 10 feet. The dump of the deeper shaft indicates greater depth or extensive drifting. Vein material sorted from that dump assayed 0.03 ounce gold per ton.

A group of five small pits and a short trench are 500 feet north of the shafts. No bedrock is exposed in the area, but dump material is predominantly quartzite. Four pits apparently are alined along a quartz vein striking N. 60° W. The trench and remaining pit apparently exposed another vein striking N. 25° W. A sample taken from a small stockpile of heavily iron oxide coated quartz vein material assayed 0.77 ounce gold and 0.10 ounce silver per ton.

About 500 feet farther north are two shafts and two pits. A 12-foot-long drift was driven N. 18° W. from the bottom of one 12-foot-deep shaft, but only granitic country rock is now exposed. A sorted dump sample of heavily iron stained quartz containing 10 percent pyrite assayed 0.02 ounce gold per ton. The other shaft is caved and has similar material on the dump. Vein material was not seen on the dumps of the two caved pits.

The low average grade of quartz vein material sorted from dumps on the Pueblo property indicates a minor potential for discovery of a small low-grade gold resource.

Blue Stone Prospect

The Blue Stone prospect, formerly part of the Werdenhoff mine group, was relocated by Wilbur Wiles in 1969 (fig. 73, No. 25). It is about one-fourth mile northeast from the mouth of the North Fork of Smith Creek.

A caved adit and four small pits are in discontinuous zones of iron-stained micaceous argillite and quartzite. The zones contain small discordant quartz veinlets and pods. Minor amounts of pyrite, galena, tetrahedrite, malachite, and azurite were seen in selected specimens. Iron oxide stains the bedding planes of the host rock, which strikes N. 36° W. and dips 14° SW. Soil and rock talus mask the occurrence; however, the principal area of iron-stained float and poorly exposed outcrops is 200 feet long and 50 feet wide. Samples of float and of outcrops in the area averaged 0.63 ounce silver per ton and traces gold, copper, and lead. Four samples taken from the best rock exposures in prospect workings contained 0.40-1.83 ounces silver per ton, 0.01-1.12 percent lead, trace to 0.46 percent copper, and a trace gold. Additional work is necessary to better evaluate the occurrence.

Other Lode Prospects

Lost Packer prospect. — The Lost Packer prospect (fig. 73, No. 13) is about three-fourths mile northwest of Pueblo Summit. About 50 prospect pits and trenches are on the property. All the workings are caved, and bedrock is not exposed. Rocks around the workings are granodiorite, quartzite, mica schist, and some quartz vein material. Quartz from a small stockpile assayed 0.06 ounce gold per ton, and a sample of quartzite contained a trace gold.

July Blizzard prospect. — Exploration work on the July Blizzard prospect (fig. 73, No. 16) consists of four caved pits located about one-half mile northwest of Pueblo Summit. Dump rock is mainly quartzite, with some granite and quartz vein material. Overburden covers most bedrock, but an 8-inch-thick quartz vein is poorly exposed by one pit. Vein material is heavily iron stained quartz with less than 10 percent feldspar and muscovite. Samples assayed 0.04 ounce gold per ton.

Queen prospect. — The Queen prospect (fig. 73, No. 12) is on Pueblo Ridge midway between the Lost Packer and July Blizzard prospects. Workings consist of two parallel caved adits trending N. 30° E. and a small pit. The dump at the larger adit indicates 400-500 feet of workings. The dump is composed of lightly iron stained granite and a small amount of quartz. The smaller adit was probably 50 feet long. Dump material from the smaller adit and pit is similar to that at the larger adit. Available quartz vein material contained no detectable gold, silver, or other metals.

Black Swan prospect. — The Black Swan prospect (fig. 73, No. 24) is one-half mile S. 30° E. from the Werdenhoff mine. It was part of the original Werdenhoff mine group staked by C. Werdenhoff in 1902. A pit and caved adit, probably 50-75 feet long, apparently were driven along quartz veins in the granitic country rock. Material on the dumps is predominantly iron-stained granodiorite and some quartz. Quartz sorted from the dump contained a few percent pyrite and assayed 0.02 ounce gold and 0.58 ounce silver per ton.

Hilltop prospect. — The Hilltop group of claims (fig. 73, No. 14) is about 1 mile northwest of the Werdenhoff mine. Two groups of workings, 10 and 11 pits each, are about 200 feet apart. None of the pits appear to have reached bedrock. Float in the area, in order of decreasing abundance, is granite, quartzite, mica schist, and quartz vein material. Quartz float contains more than 10 percent iron oxides and about 5 percent biotite and muscovite. Samples of float assayed a trace gold.

Snow Drift prospect. — The Snow Drift prospect (fig. 73, No. 15) is 1 mile north of the Werdenhoff mine. Workings consist of two caved adits and two sloughed pits. An old cabin stands on the property. A 10-inch-thick iron-stained quartz vein in quartzite is poorly exposed near one adit. A sample taken across the vein exposure contained no detectable metal values.

T. T. claim. — The T. T. claim (fig. 73, No. 17) is on the crest of Pueblo Ridge about one-fourth mile northwest of Pueblo Summit. No bedrock is exposed, but pieces of quartzite containing small quartz veinlets are on the dump of a 10-foot-diameter discovery pit. A sample of dump material contained no gold or other mineral values.

Wabash prospect. — The Wabash 1 and 2 claims (fig. 73, No. 19) are about three-fourths mile north of the Werdenhoff mine. Two old cabins and two caved adits are on the property. The adits were about 50 feet long, and rock on the dumps is granodiorite and lesser amounts of quartzite and mica schist. No bedrock is exposed. Dump samples assayed a trace gold.

Lucky Boy prospect. — The Lucky Boy claim (fig. 73, No. 20) is about one-fourth mile southwest of the Wabash prospect. A 12-foot-long trench, trending N. 40° E., is in granitic rock. The trench is badly sloughed, but, judging from the material on the dump, it probably was dug along a quartz vein. The vein material contains a trace gold.

West Extension prospect. — The West Extension prospect (fig. 73, No. 21) is about three-fourths mile northwest of the Werdenhoff mine. Development at the property consists of five caved adits and a trench. The adits trend N. 10°-45° W. and were probably 30 to 60 feet long. All were driven in quartzite that strikes north and dips 72° W. The quartzite is cut by numerous small granitic dikes and quartz veins. Samples taken from the quartzite outcrops contained no important metal values.

Crest prospect. — The Crest prospect (fig. 73, No. 22) is about one-fourth mile north of the Werdenhoff mine. A 34-foot adit driven N. 75° E. crosscuts the contact zone between argillaceous quartzite and granodiorite. Shears and iron-oxide stain occur along the contact, but samples contained no more than 0.01 ounce gold per ton.

AREA SOUTH OF SMITH CREEK

Six lode prospects were examined in the rugged area bounded by Smith Creek on the north and the ridge crest that forms the district boundary on the south (fig. 73). Principal access to the area is the road along Smith Creek. Outside the district, a four-wheel-drive vehicle road extends northward from the Big Creek-Warren road to the ridge crest forming the south boundary of the area. There are no trails in the area and access to most prospects is difficult. Relief is extreme, more than 2,000 feet in less than 1 mile.

The area is underlain primarily by quartzite, argillite, and schist of the Yellowjacket Formation. Five of the six prospects were probably staked for gold, but samples taken from quartz outcrops, stockpiles, and dumps assayed no more than 0.05 ounce gold per ton and contained no silver or other metals. The Rocket (White Bluff) claims (fig. 73, No. 28) cover an area of widely scattered scheelite that occurs mostly in float. Recent prospecting has been done to search for tungsten deposits.

Rocket (White Bluff) Prospect

Several minor scheelite ($CaWO_3$) occurrences are found on the Rocket (White Bluff) claims (fig. 73, No. 28) about 1 mile southwest from the junction of the Smith Creek and Werdenhoff mine roads.

The original group of six lode claims was located as the White Bluff group in 1953 by Wilbur Wiles of Big Creek, Idaho, and later sold to the Werdenhoff Mining Co. Mr. Wiles relocated part of the claims as the Rocket group in 1971.

The country rock is schist, gneiss, slate, quartzite, argillite, and metamorphosed limestone of the Yellowjacket Formation. Scheelite occurs in narrow discontinuous calcareous bands in tactite and as crystals in calcareous tremolite-actinolite boulders. Most of the prospect area is covered with soil and talus, and scheelite occurs mainly in float.

At the Rocket No. 1 claim, a cliff-face exposure of amphibolite tactite, 90 feet long and 70 feet high, strikes N. 30°-50° W. and dips 60°-75° NE. One sample taken from a 6-foot-wide, 5-foot-high zone at the southeast end of the outcrop assayed 0.08 percent WO_3. Finely disseminated scheelite is in narrow discontinuous calcareous bands that are generally less than one-tenth inch thick. Removal of overburden at the southeast end of the outcrop would probably expose more of the scheelite zone. A chip sample taken at random over the remaining tactite outcrop contained less than 0.02 percent WO_3. The northwest end of the tactite exposure grades into calcareous tremolite-actinolite schist and gneiss that overlie the steeply dipping tactite.

About a hundred yards below the Rocket No. 1 tactite exposure, in a small creek basin, are boulders containing scattered crystals of scheelite, as much as one-half inch across. The boulders are amphibolite tactite, containing mostly tremolite-actinolite, calcite, muscovite, some pyrite or pyrrhotite, and a small amount of garnet (Cook, 1956, p. 26). Several pits and trenches have been dug in the unconsolidated material, but none expose bedrock. As much as 25 percent of the boulder rubble exposed in some of the workings contains an estimated 0.5 percent scheelite.

Intrusive rocks of the Idaho batholith are exposed about one-fourth mile downslope from the Rocket No. 1 prospect. The concealed contact between the intrusive rocks of the batholith and the overlying metasedimentary rocks should be favorable for the discovery of a tungsten deposit.

D. D. Prospect

The D. D. prospect (fig. 72, No. 27) is less than 1 mile south of the mouth of the North Fork Smith Creek. Claims covering the prospect area were staked by D. T. Davis in 1906.

Several large quartz veins containing 10-20 percent iron oxides and a few percent altered pyrite occur in quartzite. Iron-oxide minerals occur as ture and vug fillings, and as pseudomorphs after pyrite as much as one-eighth inch across. Soil and rock talus cover most of the prospect area; bedrock exposures are restricted to steep ridge crests and headwalls of cirques.

At the south end of the prospect, numerous quartz veins, from a few inches to 25 feet thick, are exposed in the west headwall of a cirque. The best exposed vein strikes N. 65° W. and dips 45° NE. The exposure is 60 feet long, 25 feet thick, and 20 feet deep. A sample assayed 0.02 ounce gold per ton and no silver or other metals. The other veins contain similar gold values.

A few hundred yards down the ridge crest north of the cirque, a 50-foot-thick vein is poorly exposed for 100 feet along the strike and to a depth of 40 feet. The vein strikes N. 7° W. and dips 75° E.; a sample contained 0.01 ounce gold per ton.

A few hundred yards farther down the ridge, a trench exposes a 0.7-foot-thick quartz vein that strikes N. 50° E. and dips 50° SE. A sample across the vein assayed 0.03 ounce gold per ton. A few hundred feet farther north, a small prospect pit exposes a 1.5-foot-thick quartz vein heavily stained with iron oxide. The vein strikes N. 50° E. and dips 50° SE. A sample taken across the exposure assayed 0.03 ounce gold per ton.

Estimated potential resources for the D. D. group of claims exceeds 1 million tons of quartz vein material averaging only 0.02 ounce gold per ton. The average grade is too low to be mined in the foreseeable future, and the potential for discovery of minable grade ore is poor.

Other Lode Prospects

Lakeside prospect. — The Lakeside prospect (fig. 73, No. 31), which lies at an altitude of 8,550 feet, is at the head of a cirque about one-half mile southwest of Placer Lake. It was staked recently by Wilbur Wiles of Big Creek, Idaho.

A trench was dug on a highly fractured, iron-stained quartz vein. The vein occurs along the contact of hornblende biotite gneiss with argillite-argillaceous quartzite. The 32-foot-thick vein is nearly vertical and strikes N. 45° W. It is exposed 35 feet along the strike and to a depth of 50 feet. Vein material is about 70 percent quartz, 25 percent argillite-argillaceous quartzite, and 5 percent iron oxides. A sample contained 0.01 ounce gold per ton.

About 500 feet west of the vein exposure are two trenches that no longer expose bedrock but were dug in slaty argillite. A 1-ton stockpile near one trench contains profusely iron stained vuggy siliceous rock that assayed 0.05 ounce gold per ton. On the west side of the cirque, N. 45° W. from the 32-foot-thick vein exposure is a poorly defined silicified zone. A 1.7-foot-thick quartz vein in the zone is exposed in a small pit; it strikes N. 28° W. and dips 50° NE. A sample across the vein assayed 0.01 ounce gold per ton.

Placer Lake prospect. — The Placer Lake prospect (fig. 73, No. 30) is on the ridge crest one-half mile north of Placer Lake. Several quartz veins, pods, and stringers, striking N. 60° E. and dipping 60° SE., cut the quartzite country rock. The largest vein is 4 feet wide, 100 feet long, and 50 feet deep. Its exposures, though vuggy and profusely iron stained, contain no more than a trace gold.

Summertrail prospect. — The Summertrail prospect (fig. 73, No. 26) is one-fourth mile south from the mouth of the North Fork of Smith Creek. A trench partly exposes a zone of small quartz veins, pods, and stringers in quartzite. The nearly vertical zone is 20 feet thick and is exposed for 100 feet along its N. 40° E. strike. No gold or other valuable metals were detected in a sample taken across the zone. Samples of four nearby quartz veins 1-12 feet thick contained no metal values.

Gold Hill group. — Prospect workings on the claims (fig. 73, No. 29) are along the south side of the Smith Creek road about 1 mile from the Werdenhoff mine road junction. Two cuts and several pits, scattered for about three-fourths mile along Smith Creek, were dug in unconsolidated material and do not expose bedrock. The unconsolidated material is predominantly quartzite and some granitic rocks and minor quartz vein material. Samples from the trench walls contained a trace to 0.01 ounce gold per ton.

Although the claims were located as lodes, the development work indicates that the claimholder was searching for placer gold. Placer samples from the area contain no more than a few cents in gold per cubic yard.

McFADDEN POINT AREA

Five lode prospects are known in the McFadden Point area. Four of them are grouped together less than 1 mile west of McFadden Point at altitudes ranging from 7,500 to 8,000 feet. The fifth prospect is on the north side of Big Creek, 1½ miles southeast of the other prospects, at an altitude of about 5,000 feet. Access to prospects in the area is provided by a steep unmaintained trail from roads on Smith and Big Creeks.

The prospects are located along quartz veins and shear zones in quartzite and argillaceous quartzite of the Yellowjacket Formation. Samples from mineral occurrences, dumps, and stockpiles contained no more than 0.06 ounce gold per ton, 0.3 ounce silver per ton, 0.02 percent copper, and a trace lead. All exposed mineralized rock is low grade.

HOLLISTER PROSPECT

The Hollister prospect (fig. 73, No. 36), locally known as the Hollister mine, is 1,000 feet west of McFadden Point. It is the best-explored prospect in the McFadden Point area. On the property there are three adits, one trench, and a cabin. Two of the adits are caved, and the trench does not expose bedrock.

The open adit is 250 feet long, trends northeast, and exposes several small shear zones in quartzite. The last 100 feet of the adit follows a 1-foot-wide shear zone that strikes N. 50° E. and dips 45° SE. A sample averaged 0.06 ounce gold per ton. Another shear zone exposed near the portal is a few inches wide, vertical, and strikes N. 50° W. A sample across it assayed 0.02 ounce gold per ton, 0.02 percent copper, and a trace lead. The shear zones are filled with gouge and stringers and pods of quartz.

The portal of one caved adit just north of the open adit exposes a 35-foot-thick, iron-stained quartzite zone. The quartzite zone strikes N. 25° W. and dips 34° NE., but the caved adit appears to trend N. 80° E. A sample taken across the quartzite exposure contained a few percent pyrite and assayed a trace gold and copper.

The third adit is 180 feet S. 30° E. from the open adit and trends N. 36° E. It is caved 20 feet from the portal. The size of the dump indicates a total length of less than 75 feet. The open part of the adit cuts two 3-foot-wide gouge-filled shear zones. The zones, 8 and 12 feet from the portal, strike N. 25° W. and dip about 30° NE. Samples across them contained no more than 0.02 ounce gold per ton.

Other Lode Prospects

Dagnapan prospect. — The Dagnapan prospect (fig. 73, No. 34) is three-fourths mile northwest of McFadden Point.

Two east-trending trenches, situated end to end, explore an iron-stained shear zone in quartzite. The shear zone is 50 feet wide, contains several quartz veinlets, strikes nearly due north, dips 25° E., and is exposed 10 feet along its strike to a depth of 5 feet. A sample across it assayed a trace gold and silver.

Hillside prospect. — The Hillside prospect (fig. 73, No. 33) is 1 mile west of McFadden Point.

A 30-foot-long trench exposes quartzite country rock and a 40-foot-thick dacite dike. The dike strikes N. 30° W., dips 16° NE., and contains no detectable metal values. A sample of iron-stained quartz sorted from the dump assayed a trace gold.

Trio group. — The Trio group of five lode claims (fig. 73, No. 35) is three-fourths mile northwest from McFadden Point.

One pit exposes a 4-foot-wide zone in quartzite, consisting of narrow quartz veins, veinlets, and pods, that contains 10-15 percent iron oxides. The zone strikes N. 25° E., dips 36° SE., and is exposed 20 feet along its strike to a depth of 8 feet. A sample across the zone contained no gold or silver.

Tenderfoot prospect. — The Tenderfoot prospect (fig. 73, No. 37) is on the north side of Big Creek, approximately 1 mile, by road, east of the Smith Creek bridge.

A 32-foot-long adit follows an irregular shear zone containing a pinch-and-swell quartz-magnetite vein. The vertical vein strikes N. 70° W. and is 0.5-5 feet thick. Samples taken across it averaged a trace gold, 0.3 ounce silver per ton, and 16 percent iron. The vein resembles those at Copper Camp (Ramey Ridge district), except that no copper was detected.

SMITH CREEK-BIG CREEK PLACERS

Placer gold occurs along Smith Creek from the mouth westward to the study area boundary, a distance of 7 miles. Included with Smith Creek placers are low terraces along Big Creek extending less than 2 miles below the Smith Creek junction (fig. 80). Altitudes at creek level range from 6,800 feet near the study area boundary to 5,200 feet approximately 1 mile below the mouth of Smith Creek. The placers are accessible by way of a rough road which is normally open from June 15 through November 15.

The first placer claim was recorded as the Pebble claim by Guy and Ernest Heath on May 27, 1901, at the mouth of the North Fork Smith Creek. In 1902 about 20 placer claims were recorded, and through 1951 another 60 claims and relocations were recorded. Many of the claims overlap. Now most of the claims are held by Smith Creek Hydraulic Co. of Boise, Idaho. It is estimated that 3,500 ounces of gold have been produced from Smith Creek. Production values ranged from 15 cents to more than $2 per cubic yard when gold was $20 per ounce.

Remnants of placer mining, done about 1921 and 1922, are visible near Scott's cabin about 1½ miles upstream on Smith Creek from Big Creek. Approximately 15,000 cubic yards of material were moved in this operation. Several high-grade concentrations of gold reportedly were found in this area. Sample sites 11, 12, and 13 (table 21) represent a stratigraphic sequence from a depth of 30 feet to the surface northwest of the claim. The reported gold concentrations were probably just upstream from the extensive Placer Creek alluvial fan.

The placer consists of high, intermediate, and low (stream) terraces of material accumulated mostly by local or intermountain glacial action coupled with stream action. The resultant placer deposits vary lithologically, both laterally and vertically. The deposits grade from unconsolidated to cemented material and from clay to boulders more than 10 feet in diameter. Glacial flour was observed in most of the samples. The gradient of Smith Creek ranges from 150 to 350 feet per mile. The abundant large boulders impede downcutting of the alluvium in the valley of Smith Creek. Bedrock is granite of the Idaho batholith and quartzite of the Yellowjacket Formation; the quartzite is more favorable to gold entrapment.

Depth of the deposits was not determined, but test shafts showed that depths generally exceed 25 feet. In the area surrounding sites 15, 16, 17, 18, and 20 (fig. 80), a stratigraphic section representing more than 50 vertical feet was sampled. In view of the several periods of intermountain glaciation, depths conceivably could be greater than 50 feet.

Economic gold placers generally are formed by cycles of erosion and subsequent reworking of gold-bearing material. The largest and most economic

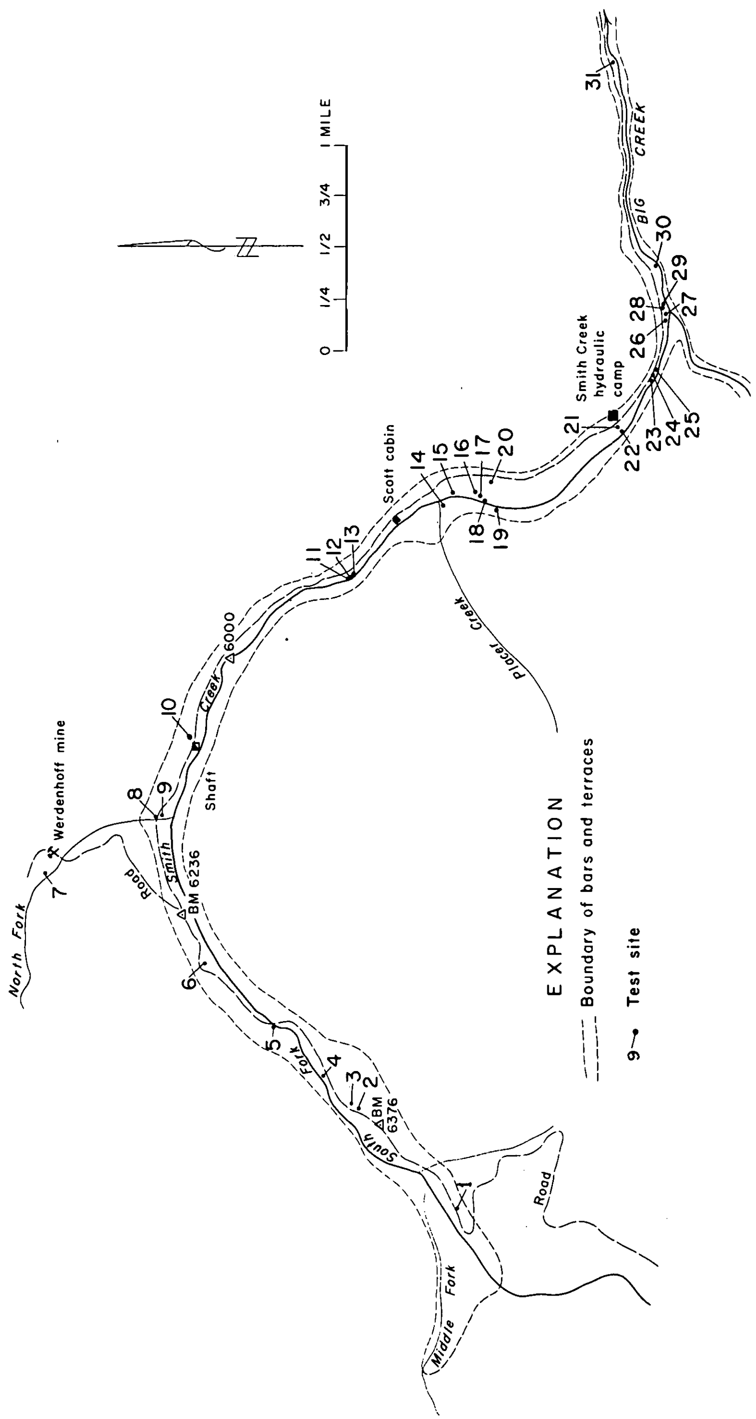


FIGURE 80. — Smith Creek placer area.

placers are formed from low-grade disseminated deposits and not from high-grade stringers. Smith Creek is surrounded by numerous large low-grade disseminated gold, silver, and tungsten deposits. Reworking, however, has not been extensive.

The deposits were sampled by pits dug by hand or with a backhoe; depths at individual sites were as much as 20.3 feet. Eighty-five samples (table 21) were taken at 31 sites (fig. 80). The only pits put down to bedrock were Nos. 26, 27, 28, and 29.

Average gold values generally increase downstream; however, they are not evenly distributed but occur in higher grade pockets, lenses, and stringers. The material along Smith Creek, above Placer Creek, shows little evidence of reworking and subsequent concentration of gold in economic quantities. Resources in the area above Placer Creek are estimated at about 14 million cubic yards containing 1.0-6.3 cents gold per cubic yard in recoverable gold and averaging about 2.6 cents gold per cubic yard, based on 850 fine gold. The glaciofluvial material between Placer Creek and the bridge near the mouth has values ranging from 1.6 to 181.8 cents gold per cubic yard. A resource of 1,971,000 cubic yards of material is estimated for this section, with an average of 16.9 cents gold per cubic yard. The fluvial material at the mouth of Smith Creek and extending 1½ miles down Big Creek contains the best values. The resources there are estimated to be about 1 million cubic yards with values from 19.6 to 446.2 cents gold per cubic yard and an average of 64.3 cents.

Black sand concentrates (table 21) averaged 2.2 pounds per cubic yard. The concentrate from sites 15 and 29 contained 20-30 percent each magnetite and ferromagnesian silicates, 25-30 percent staurolite, 9-16 percent ilmenite, 2-5 percent each altered pyrite-hematite and garnet, 1-2 per-

TABLE 21. — *Sample data for Smith Creek-Big Creek placers*

[Sample sites shown in fig. 80]

Site	Depth interval (feet)	Sample volume (cu ft)	Gold values[1] (cents per cu yd)	Black sands (lb per cu yd)
1	0 - 3	3.0	1.9	3.2
2	1 - 8	6.0	2.1	2.9
3	0 - 2.5	2.5	6.3	5.2
4	0 - 2	3.0	1.4	4.4
5	0 - 8	19.5	5.2	2.6
	8 -11.5	3.0	2.7	2.3
6	0 - 8	18.0	1.1	.2
7	0 - 3	2.0	1.6	1.0
8	0 - 5	6.0	1.9	1.3
9	0 - 8	13.5	2.1	.9
10	0 -10	18.0	1.1	.8
11	1.3- 6.3	15.0	1.6	1.5
	6.3- 8.0	25.0	4.2	2.6
12	2 - 6	13.5	2.1	.6
	6 - 8	13.5	2.7	1.4

TABLE 21. — *Sample data for Smith Creek-Big Creek placers* —Continued

Site	Depth interval (feet)	Sample volume (cu ft)	Gold values[1] (cents per cu yd)	Black sands (lb per cu yd)
13	0 - 2	2.0	1.0	.7
	2 - 5	3.0	2.5	1.7
	5 - 7	12.0	3.8	1.9
	7 - 9	18.0	1.9	.8
	9 -12	20.0	2.1	.5
	12 -14	6.0	6.3	2.2
14	0 - 1	.45	2.6	.8
15	0 - 6	13.5	30.5	.7
	6 - 9	13.5	61.4	2.4
	9 -11	6.75	181.8	1.4
	11 -14	6.75	129.5	1.2
16	0 - 6	3.0	3.3	1.4
17	0 - 4	5.0	12.7	.9
	4 - 5	6.0	20.4	2.5
	5 - 6.5	6.0	14.6	1.4
	6.5- 8	.5	20.8	1.4
	8 -10	9.0	31.2	.5
	10 -12	6.0	25.6	1.5
18	0 - 3	6.0	2.6	1.2
	3 - 6	6.0	5.9	1.4
	6 - 9	6.0	2.3	1.2
	9 -11.5	12.0	13.0	1.3
19	0 - 3	.5	3.6	1.1
20	0 - 5	5.0	1.9	1.3
	5 - 9	4.0	1.6	1.1
21	0 - 5	5.0	4.4	3.6
22	0 - 9	6.75	1.6	.8
23	0 - 3	.75	49.8	8.7
	3 -11	8.0	29.1	3.7
	11 -13	27.0	22.2	1.8
	13 -19	54.0	66.4	2.2
	19 -20.3	4.0	60.8	2.4
24	0 - 7	6.75	15.3	1.7
25	0 - 6	6.0	16.7	.9
	6 -13	7.0	29.4	.8
	13 -15.5	25.0	12.4	1.4
	15.5-17.5	24.0	19.0	1.1
	17.5-18.5	9.0	19.3	.9
	18.5-20	8.0	12.2	1.8
26	0 - 3	1.5	56.3	4.4
27	0 -14	6.0	71.2	2.7
	14 -16.5	5.0	19.6	2.9
28	0 - 8	13.0	36.5	1.6
	8 -11	3.0	60.8	3.7
	11 -13	2.0	30.2	3.1
	13 -15	3.0	61.8	4.9
29	4 - 7	3.0	71.0	7.4
	7 - 9	3.5	217.2	5.5
	9 -11	5.5	446.2	4.7
30	4 - 6	6.0	62.8	3.7
	6 - 7	3.0	22.3	5.2
31	2 - 7	4.0	41.3	1.8
	7 - 9	2.0	57.6	6.9
	9 -11	3.0	54.3	3.5

[1]Gold values based on a price of $47.85 per troy ounce and the average of 850 fineness found in four samples.

cent zircon, 0.5-1 percent scheelite, trace to 0.5 percent each rutile (plus anatase) and sphene, and a trace each epidote, kyanite, tourmaline, and cinnabar. A sample from the 11- to 14-foot interval at site 15 contained a piece of quartz about one-fourth inch in diameter that weighed 149 milligrams and contained 138 milligrams of 838 fine gold. The quartz had rough edges and the gold feathered into the quartz.

Mining of deposits of the size and character found in the Smith Creek-Big Creek area would require hydraulic, dragline-dredge, or similar methods in which mining costs are generally greater than 30 cents per cubic yard. The large boulders in the deposits increase this cost and have so far prohibited mining.

The placer gold resources in the Smith Creek-Big Creek area are estimated to be about 17 million cubic yards of gravel containing an average of about 10 cents in gold per cubic yard. Less than 80 percent of this value is recoverable by conventional placer mining methods. Gravel of this value is not minable but is a potential low-grade resource.

MIDDLE FORK DISTRICT

The Middle Fork district is along the Middle Fork Salmon River and covers about 510 square miles (fig. 81). The district includes the Wilson Creek and part of the Big Creek mining districts described by Ross (1941).

Lode prospects are scattered throughout the Middle Fork district, but most are in the Kimmel Creek-Wilson Creek, Thomas Creek, and Stoddard Lake areas. Mineral commodities are gold, silver, copper, lead, tungsten, uranium, and fluorspar.

The Middle Fork district is in an isolated part of Idaho. The nearest roads are at Yellowjacket, Middle Fork Peak, Sleeping Deer Mountain, and Meyers Cove east of the district; at Falconberry, Indian Springs, and Greyhound Ridge south of the district; and at Pistol Creek Ridge west of the district.

The Middle Fork district is served by a good pack trail which follows the river downstream to Big Creek. Various trails follow tributaries extending east and west from the Middle Fork Salmon River. The main trail does not continue downstream along the Middle Fork from Big Creek; but trails do follow the ridges to the east and west. Travel along the river below the mouth of Big Creek is by boat or helicopter.

Eight grass landing fields are located in or adjacent to the district and are connected by trails. Landing fields are located along the Middle Fork Salmon River at Bernard Creek, the Flying B Ranch, the Simplot Ranch, Mahoney Bar, Thomas Creek, Indian Creek, and Pistol Creek (fig. 81). The Middle Fork district is approximately 1 hour's flying time from McCall, Idaho, to the west and from Challis and Salmon, Idaho, to the east.

Relief in the district is considerable, and slopes are very steep. In some localities altitude differences are more than 5,000 feet in a horizontal distance of less than 4 miles. Above Bernard Creek, the canyon bottom is as much as one-half mile wide. These wide areas are sites of placer deposition. The canyon below Bernard Creek is a narrow rocky near-vertical canyon, and placer deposition occurs only at the mouths of some tributaries.

Lode deposits are mainly fissure filling veins; they occur in all rock types in the district, but most are in the Precambrian Yellowjacket Formation and Tertiary intrusives. Some are in the Precambrian Hoodoo Quartzite and Cretaceous intrusive rocks.

Mining claims were first located in the Middle Fork district in the 1890's. Early activity was stimulated by discoveries in the surrounding districts. About 250 mining claims have been located — 150 placer claims and 100 lode claims. Some of the ground claimed as placer subsequently was located and patented as homesteads.

The Middle Fork district has a recorded production of only $186 of lode gold and 4 troy ounces of placer gold.

Minor potential resources of the Middle Fork district are estimated to be about 40,000 tons of mineralized material scattered among several prospects; the grade varies widely.

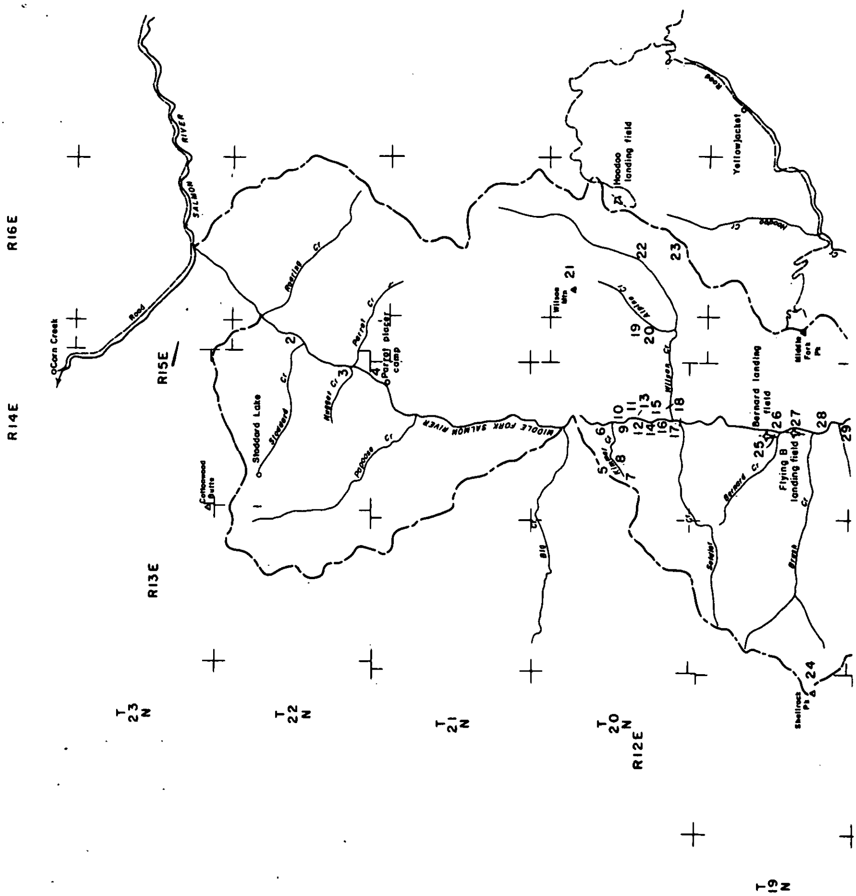
Total placer resources of the Middle Fork district are about 63 million cubic yards of alluvial material averaging 1 cent gold per cubic yard and 1-8 pounds black sand per cubic yard. A few deposits were mined during the 1930's, but most are too small, too inaccessible, and too low grade to be minable. Dredge mining on the Middle Fork Salmon River is prohibited by amendment (Section 47-1323) of Chapter 13, title 47 of the Idaho Code.

KIMMEL CREEK-WILSON CREEK AREA

The Kimmel Creek-Wilson Creek area is the most highly mineralized and explored area in the Middle Fork district. It includes the Kimmel Creek, Sammys Gulch, lower Soldier Creek, and Wilson Creek drainages. The principal access to the area is a trail along the east side of the Middle Fork Salmon River. All the prospects on Wilson Creek can be reached by trail or cross-country travel.

Country rock is argillaceous quartzite of the Yellowjacket Formation. The quartzite was intruded by the Idaho batholith and cut by numerous dikes, shear zones, and faults. Exploration has been restricted to mineralized zones along the northwest-trending shear zones and faults. The veins and fault zones of the area range in width from 0.5 to 4 feet and average less than 2 feet wide. All are intermittently exposed. The mineralized rock generally consists of quartz and calcite, containing as much as 20 percent metallic minerals (pyrite, chalcopyrite, limonite, hematite, and malachite). The metallic minerals generally occur in scattered pods. The area also has iron-stained fault zones containing gold, silver, and copper values.

Eight prospects or groups of mining claims were examined in the Kimmel Creek-Wilson Creek area. A cabin and arrastra are located in Sammys Gulch and another cabin and stamp mill are located on Alpine Creek. Two


SALMON RIVER
Road
Corn Creek
R16E
R15E
R14E
R13E
R12E
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
Stoddard Lake
Parrot placer camp
MIDDLE FORK SALMON RIVER
Wilson Mtn
Hoodoo landing field
Yellowjacket
Bernard landing field
Flying B landing field
Middle Fork Pk
Shellrock Pk
Cottonwood Butte

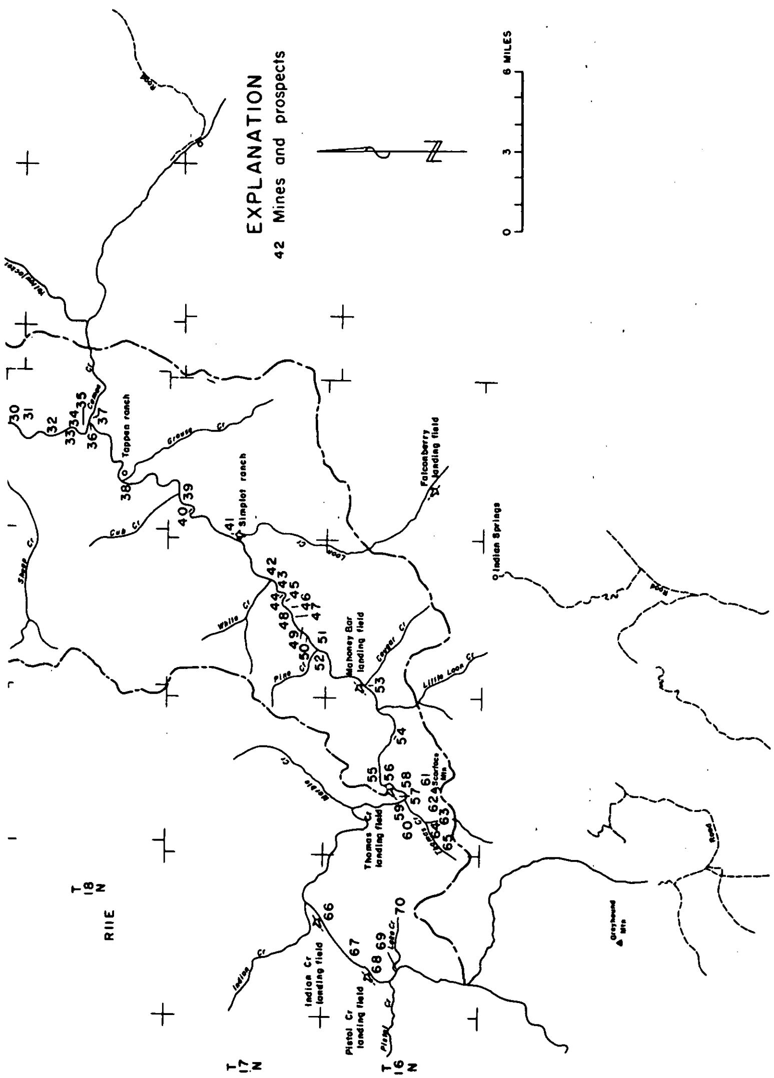


FIGURE 81. — Mines and prospects, Middle Fork district.

Mines and prospects shown in figure 81

1. Ted's group
2. Stoddard Creek placer
3. Nugget Creek placer
4. Parrot Camp placer
5. Kimmel Creek prospect
6. Lower Kimmel Creek prospect
7. Upper Kimmel Creek prospect
8. Tuckaway prospect
9. Lower Survey Creek prospect
10. Woolard Creek placer
11. Rattlesnake Ridge prospect
12. Survey Creek placer
13. Survey Creek Bar placer
14. Big Horn prospect
15. Rattlesnake Camp prospect
16. Grassy Flat placer
17. Deckie prospect
18. Wilson Creek placer
19. Old Johnson Lode prospect
20. Johnson Lode prospect
21. Twin Cove Lake-Ramshorn Lake occurrence
22. Langley Bar placer
23. Lucky Hunter group
24. Shellrock Peak occurrence
25. Bernard Landing Field placer
26. Pole Creek placer
27. Reservoir Creek placer
28. Mormon Ranch placer
29. Sheep Creek Ranch placer
30. Aparejo Point placer
31. Aparejo Creek Fluorite prospect
32. Broken Oar placer
33. Bear Creek placer
34. Pool placer
35. Heatherington placer
36. Camas Creek placer
37. Camas Creek Point placer
38. Tappen Ranch placer
39. Sullivan Uranium prospect
40. Hospital Bar placer
41. Simplot Ranch placer
42. White Creek placer
43. Shep Creek placer
44. Rock Island placer
45. Cox Hotspring placer
46. Culver Creek placer
47. Lower Bacon Creek placer
48. Bacon Creek placer
49. Lower Red Bluff placer
50. Pine Creek placer
51. Crystal Uranium prospect
52. Upper Red Bluff placer
53. Cougar Ranch placer
54. Jackass Flat placer
55. Sunflower Flat placer
56. Little Creek placer
57. Thomas Creek placer
58. Lower Thomas Creek placer
59. Middle Fork Lodge placer
60. Robinhood prospect
61. Chickadee Quartz prospect
62. Little Johnny prospect
63. Hogback Quartz prospect
64. Lovell-Jones prospect
65. Iowa Boy prospect
66. Huntington placer
67. Mule Creek placer
68. Indian Joe placer
69. Lake Creek placer
70. Teapot prospect

tons of ore containing $186 worth of gold was produced from properties on Alpine Creek in 1902 and 1912 (U.S. Geological Survey, 1902, 1912).

JOHNSON LODE PROSPECT

The Johnson Lode prospect (fig. 81, No. 20) is along Alpine Creek, approximately 1 mile upstream from Wilson Creek. It is in a very precipitous, sparsely vegetated, isolated canyon. There is evidence of an attempt to mine and mill material from the property, but no production is on record. Most exploratory work probably was done in the 1930's or before. The property was relocated in 1947 by Fred and Roy Langley. Workings consist of a caved adit, 150 feet long, at the east end of a quartz vein. Equipment includes a 1-stamp mill, buckets, and a gasoline engine.

Country rock is iron-stained argillaceous quartzite of the Yellowjacket Formation, cut by rhyolite dikes. A quartz fissure vein, trending N. 87° E. and dipping 65°-79° N., cuts the quartzite (fig. 82). Thickness ranges from 0.6 to 2.5 feet and averages 1.2 feet. The vein is exposed through a 200-foot vertical range and 300-foot length. It is composed of massive white quartz containing abundant pyrite and chalcopyrite and is profusely iron stained and slightly malachite stained. The malachite stain extends into the wallrock. The vein terminates against a dike to the west and is covered by overburden to the east.

Potential resources at the Johnson Lode prospect are estimated to be 12,000 tons averaging 0.55 ounce gold per ton, 1.08 ounce silver per ton, and 0.08 percent copper. The deposit has potential for discovery of minable ore shoots.

OLD JOHNSON LODE PROSPECT

The Old Johnson Lode prospect (fig. 81, No. 19) is near Alpine Creek approximately one-half mile from Wilson Creek. The claims were recorded in 1947 by Fred and Roy Langley.

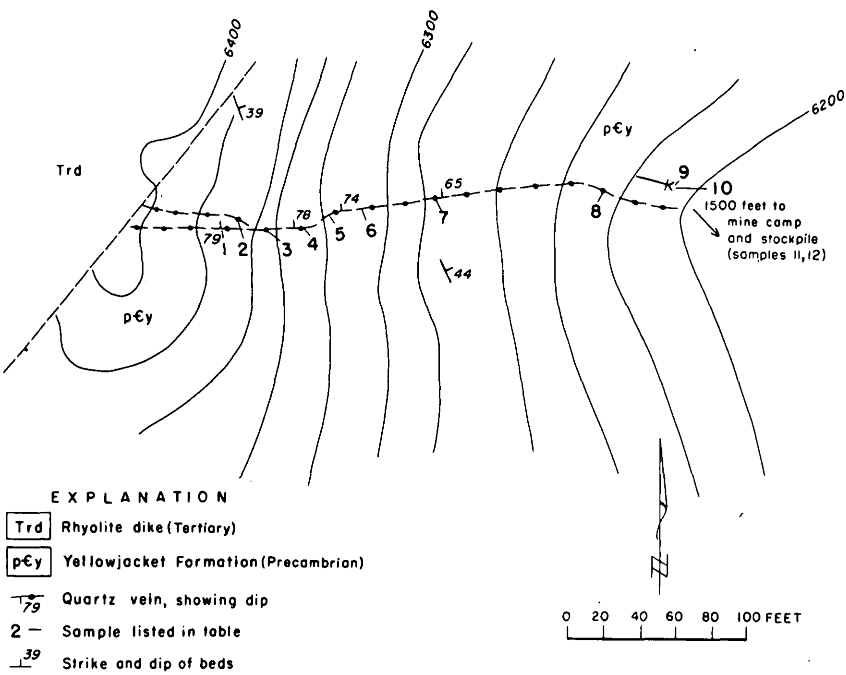


FIGURE 82. — Johnson Lode prospect.

Data for samples shown in figure 82

[Samples 1-8 were chip; samples 9-12 were select grab. Tr, trace; N.d., not determined; N, not detected]

Sample		Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)
No.	Locality or length (ft)				
1	0.67	0.37	3.17	0.31	0.4
2	.33	.23	.11	N.d.	N.d.
3	2.50	2.40	1.05	N	N
4	.60	.14	.21	N.d.	N.d.
5	1.00	.59	.91	.01	N.d.
6	1.00	.10	1.11	.02	N
7	1.50	.02	.05	N.d.	N.d.
8	1.00	.52	.49	N.d.	N.d.
9	Dump ----	1.49	.70	.02	N
10	---do---	2.00	.54	.03	N.d.
11	Stockpile --	.33	.56	2.37	N
12	---do---	.80	Tr	.08	N

The country rock is Yellowjacket Formation — phyllite and argillaceous quartzite and some dolomite — cut by felsitic dikes.

A shear zone containing quartz cuts the country rock. The zone trends N. 17° W. and dips 50° NE. (fig. 83). An outcrop of the zone is 130 feet long, 5 feet wide, and 30 feet high. The fissure filling is composed of about 95 percent iron-stained quartz, 1 percent malachite stain, 1 percent specular hematite, and 1-5 percent pyrite. The metallic minerals occur in irregular pods. The best exposure of sulfides on the property is in the discovery pit (fig. 83); sulfides are sparse elsewhere.

The portal of a caved adit is 547 feet southeastward from the discovery pit. The amount of material on the adit dump indicates it to be about 50 feet long. The quartz on the dump indicates a vein, 1-3 feet thick, composed of about 90 percent iron-stained quartz, 1-5 percent pyrite, 1 percent specular hematite, 1 percent malachite stain, and 1 percent limonite. A random grab sample taken across the adit dump assayed a trace gold, 0.25 ounce silver per ton, and no copper, lead, zinc, or molybdenum. A select grab sample of the quartz assayed 0.78 ounce gold per ton, 1.38 ounce silver per ton, and 0.73 percent copper.

The vein is only 1-3 feet wide and is not economically minable, but a small low-grade resource of about 24,000 tons is estimated to occur on the property.

Data for samples shown in figure 83

[All chip samples. Tr, trace; N.d., not determined; N, not detected]

Sample					
No.	Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)
1	50	Tr	0.08	0.05	Tr
2	1	0.69	.50	Tr	N
3	30	Tr	.11	N.d.	N

Big Horn Prospect

The Big Horn prospect (fig. 81, No. 14) is in the precipitous canyon of Sammys Gulch, a tributary of the Middle Fork Salmon River. The workings extend parallel with the Middle Fork to a point one-half mile to the south. The Big Horn prospect was located first in 1903. Considerable work has been done, but there is no recorded production.

Schistose metasedimentary rocks of the Yellowjacket Formation overlie massive metasedimentary rocks of the Yellowjacket; both are intruded by pink Tertiary granite. In Sammys Gulch, the contact of the two facies of metasediments trends northwest and dips northeast. The quartz veins on the property do not extend above this contact (fig. 84).

The veins on the Big Horn prospect are in fault and shear zones containing fault gouge and less than 10 percent quartz-calcite-sulfide fissure filling. The fissure filling, mainly quartz, contains 10-20 percent calcite and

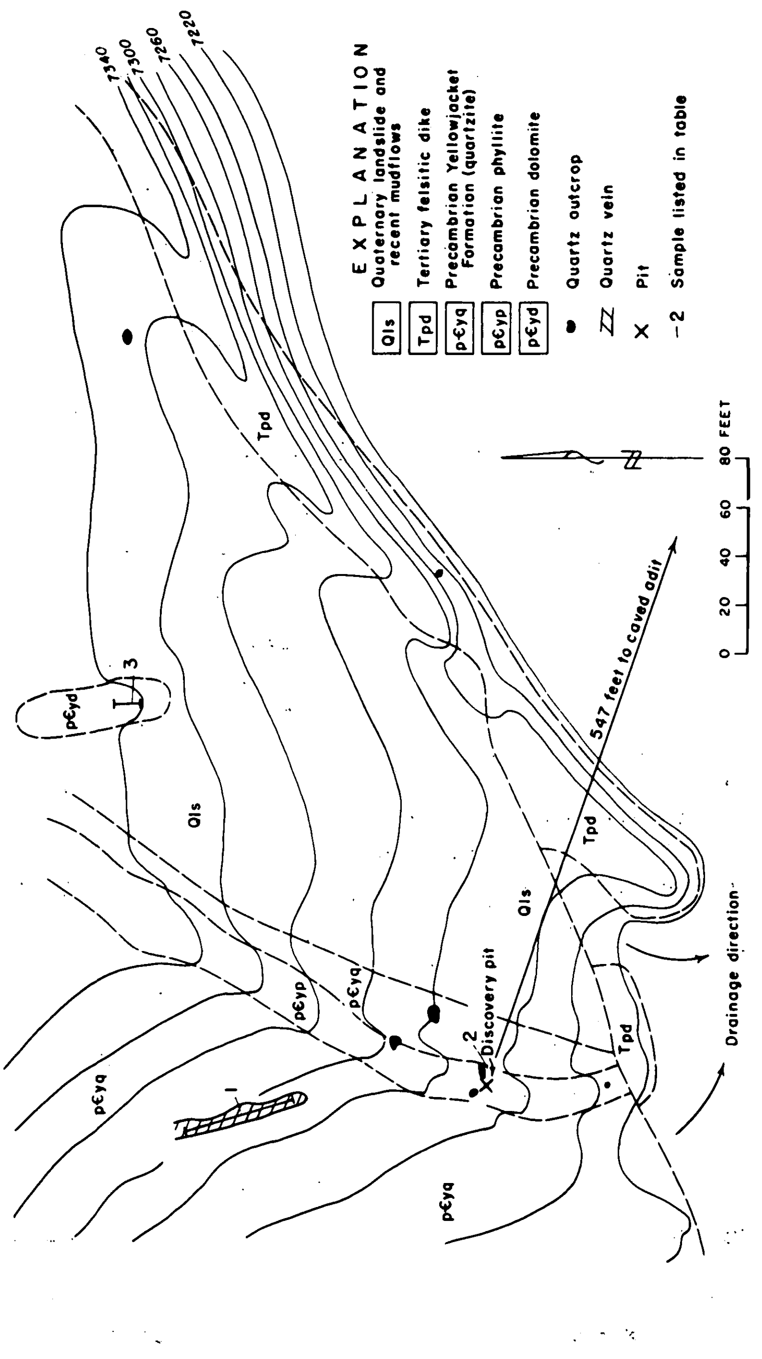


FIGURE 83. — Old Johnson Lode prospect.

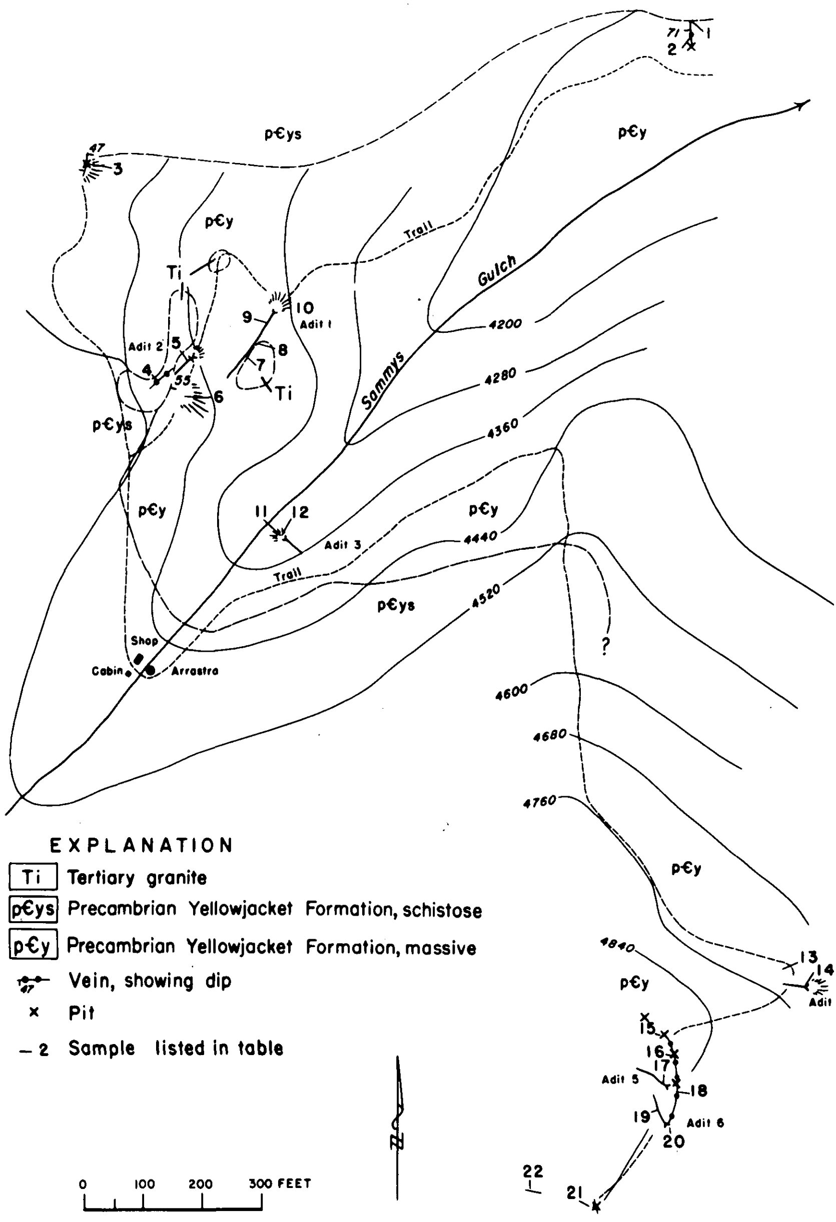


FIGURE 84. — Big Horn prospect.

5 percent pyrite. Limonite-hematite boxwork in parts of the zones is stained in places by malachite.

The Big Horn prospect has two groups of workings connected by good trail. One group along the rocky canyon wall of Sammys Gulch consists of

Data for samples shown in figure 84

[Tr, trace; N.d., not determined; N, not detected. Samples 7-9, 17, 19 collected from underground workings]

Sample No.	Sample Type	Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
1	Chip	0.5	Tr	N	0.04
2	do	10.0	0.11	0.04	N.d.
3	Grab	Dump	Tr	Tr	N.d.
4	Chip	5.0	Tr	N	N.d.
5	do	35.0	Tr	N	N.d.
6	Select grab	Dump	Tr	N	N.d.
7	Chip	4.0	Tr	.12	N.d.
8	do	159.0	Tr	N	N.d.
9	do	4.0	Tr	.50	N.d.
10	Grab	Dump	Tr	.05	N.d.
11	Select grab	do	N	.06	.18
12	do	do	Tr	Tr	N
13	Chip	20.0	Tr	N	N
14	Select grab	Dump	.025	N	N.d.
15	do	do	N	N	N.d.
16	do	do	.80	.50	N
17	Chip	3.0	Tr	N	.10
18	Grab	Dump	Tr	N	N.d.
19	Chip	40.0	.54	.09	.18
20	do	6.0	Tr	N	N.d.
21	Select grab	Dump	.10	.22	.10
22	Chip	20.0	Tr	N	N

one 150-foot-long adit, two caved adits, and two cuts. A cabin, arrastra, and shop are nearby in the brushy gulch bottom. The second group of workings consists of one open adit, two caved adits, and four small pits or trenches. These workings are on a grass- and sagebrush-covered slope with up to 2 feet of overburden and only a few outcrops.

Quartz veins are exposed in several workings. The pit at the northeast corner of the prospect exposes a quartz fissure vein in massive argillaceous quartzite. The vein, 0.4-0.5 feet wide, is exposed for a length of 25 feet to a depth of 10 feet. It trends N. 8° W., dips 71° SW., and is composed of about 96 percent massive white quartz, 4 percent pyrite, with minor malachite stain. A quartz stringer exposed just east of the pit is 15 feet long, 10 feet deep, and 0.33 foot wide. It trends N. 38° W., dips 79° SW., and is composed of 99 percent massive white quartz and about 1 percent iron stain. Both the quartz vein and the adjacent stringer are truncated at the contact between the massive and schistose metasediments. north of the pit.

Three small veins of quartz and calcite as much as 4 inches wide are exposed in adit 1. Samples of the vein material assayed only a trace gold and 0.12-0.50 ounce silver per ton.

Adit 2 is caved, but a quartz fissure vein is exposed in a sloughed area along the trend of the workings, and quartz vein material was found on the dump. The vein trends N. 60° E., dips 85° SE., and is composed of 99 percent massive quartz and 1 percent iron stain. Samples contained only a trace gold and no silver.

A quartz fissure vein is exposed at the northwest corner of the property. The vein strikes N. 22° E., dips 47° SE., and is 1 foot thick. A dump sample contained only a trace gold and silver.

A quartz- and gouge-filled fault zone trending northwest and dipping southwest in massive metasediments is exposed in adit 5. The zone is 2 feet thick and is exposed for a length of 25 feet to a depth of 8 feet. It is composed of about 50 percent fault gouge, 40 percent iron-stained quartz, and 10 percent pyrite. A sample (17) contained a trace gold and no silver. The same vein, exposed in adit 6, trends N. 30° W. and dips 55° SW. The exposure is 50 feet long, 3 feet wide, and 10 feet deep. Composition is 60 percent iron-stained fault gouge, 30 percent iron-stained quartz, and 10 percent pyrite; there is some malachite stain. A sample (19) contained 0.54 ounce gold per ton, 0.09 ounce silver per ton, and 0.18 percent copper.

Twin Cove Lake-Ramshorn Lake Occurrence

The Twin Cove Lake-Ramshorn Lake occurrence (fig. 81, No. 21) is at the headwaters of the western tributaries of Wilson Creek (fig. 85). No mining claims are known to have been located there. The Twin Cove Lake-Ramshorn Lake area was investigated because anomalous amounts of metals were detected in sediment samples taken from streams draining the area.

The country rock, Hoodoo Quartzite and Yellowjacket Formation, is metamorphosed, folded, fractured, cut by both basic and acidic dikes, and intruded locally by granite of the Idaho batholith. The Twin Cove Lake-Ramshorn Lake occurrence consists of iron-stained quartzite of the Yellowjacket Formation which contains about 1 percent magnetite and pyrite. Iron-stained quartzite beds crop out from a point southeast of Ramshorn Lake to a point north of Twin Cove Lake, a distance of approximately 3 miles along the contact between the metasedimentary rocks and the Idaho batholith. There may be extensions north and south of the ex-

Data for samples shown in figure 85

[All samples were chip. Analyses, in parts per million, by atomic absorption]

Sample No.	Sample Length (ft)	Copper	Lead	Zinc	Sample No.	Sample Length (ft)	Copper	Lead	Zinc
1	12	35	15	90	9	10	5	10	60
2	15	40	45	65	10	6	25	10	55
3	100	25	10	45	11	12	20	5	10
4	15	10	15	35	12	50	20	15	65
5	7	35	100	100	13	60	15	15	75
6	6	25	40	30	14	60	10	15	80
7	12	20	10	75	15	20	10	20	75
8	12	20	25	70	16	40	25	15	50

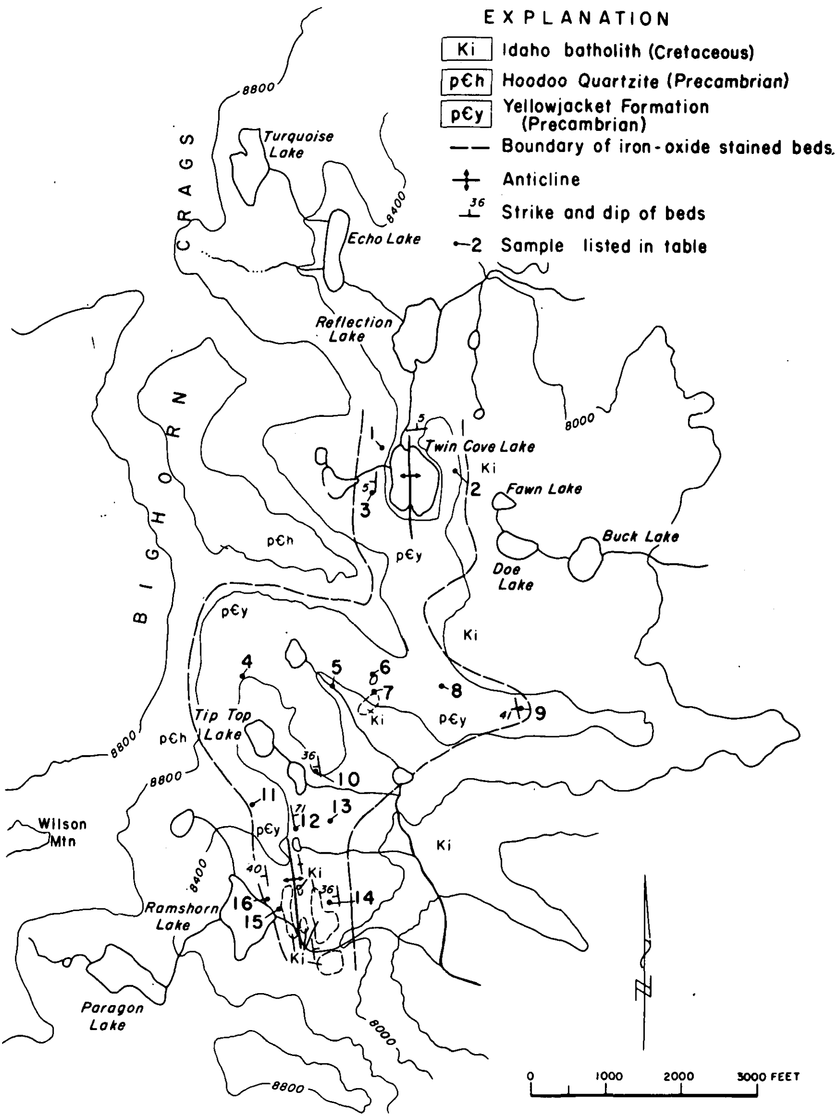


FIGURE 85. — Twin Cove Lake-Ramshorn Lake occurrence.

amined outcrops. The beds are easily located, owing to their reddish-brown iron-oxide color and the linear nature of outcrop. They occur in plunging synclinal and anticlinal structures, which trend northward and plunge slightly west of north.

At least three persistent iron-stained quartzite beds were examined. The beds are less resistant to erosion than the overlying white, massive quartzite and underlying granite. The exposures are in low glaciated areas. The iron-stained beds range in width from less than 1 foot to 40 feet and, at a few places, merge to form zones more than 100 feet wide. Usually the beds are separated by 10-40 feet of slightly stained quartzite or massive white quartzite. The iron-stained beds comprise only 5-10 percent of the total quartzite outcrops, but the slight staining is much more widespread. The iron staining reflects the weathering of pyrite and is not the surface expression of an underlying mineral deposit.

Sixteen samples (fig. 85) were analyzed by the atomic absorption method. Samples contained less than 0.02 ppm gold, less than 0.2 ppm silver, 5-40 ppm copper, 5-100 ppm lead, and 10-100 ppm zinc.

Other Lode Prospects

Kimmel Creek prospect. — The Kimmel Creek prospect (fig. 81, No. 5) is on the divide between Kimmel Creek and Breeching Creek.

The prospect consists of several small exploration pits which expose more than 10 quartz veins and silicified zones through a distance of more than 1 mile along the top of the ridge. The veins and silicified zones generally trend northwest and dip steeply. They cut faulted and folded quartzite of the Yellowjacket Formation, which is intruded by granite of the Idaho batholith. Individual veins and silicified zones, 4 to 6 feet thick, commonly are exposed for more than 100 feet in length and for more than 20 feet in depth. The veins and zones range in composition from 90 to 99 percent quartz and 1 to 10 percent iron oxides. Samples of the quartz veins and silicified zones contained a trace gold, a trace to 1 ounce silver per ton, and a trace copper.

Lower Survey Creek prospect. — The Lower Survey Creek prospect (fig. 81, No. 9) is just north of the confluence of Survey Creek and the Middle Fork Salmon River.

The prospect consists of two small exploration pits exposing two parallel quartz veins trending N. 64° W. and dipping 83° SW. The veins are in fractures in the Yellowjacket Formation. The veins are 2 to 4 feet wide and are exposed for about 50 feet in length and 25 feet in depth. Composition is approximately 99 percent quartz and feldspar and 1 percent malachite. A sample of vein material assayed a trace gold and silver and 0.67 percent copper.

Lower Kimmel Creek prospect. — The Lower Kimmel Creek prospect (fig. 81, No. 6) is just northwest from the confluence of Kimmel Creek and the Middle Fork Salmon River.

A northeast-trending 4- to 8-inch-wide quartz vein occurs along a fracture in the Yellowjacket Formation. The vein is exposed for a length of 45 feet and may extend farther. It is composed of about 90 percent quartz and 10 percent hematite, chalcopyrite, and malachite, combined. One sample of vein material assayed a trace gold, 0.36 ounce silver per ton, and 0.06 percent copper.

Upper Kimmel Creek prospect. — The Upper Kimmel Creek prospect (fig. 81, No. 7) is near the head of Kimmel Creek, on the divide between Kimmel and Survey Creeks.

Numerous small quartz-sulfide stringers are along fractures in metasediments. The fracture fillings are predominantly quartz containing less than 1 percent chalcopyrite, bornite, azurite, and malachite. Four samples of fracture-filling material assayed a trace gold and silver, and from a trace to 0.45 percent copper. Four samples of altered wallrock contained no gold, silver, or copper.

Tuckaway prospect. — The Tuckaway prospect (fig. 81, No. 8) is approximately 2½ miles up Kimmel Creek from the Middle Fork Salmon River.

A 100-foot-long adit and one small exploration trench expose small quartz- and calcite-filled fractures and breccia along a northwest-trending fault in argillaceous quartzite of the Yellowjacket Formation. The fissure fillings are 0.5-1 foot wide. Neither the veins nor the wallrock contain visible sulfides.

Rattlesnake Ridge prospect. — The Rattlesnake Ridge prospect (fig. 81, No. 11) is northeast of the confluence of Rattlesnake Creek with the Middle Fork Salmon River.

Two adits, now caved, were driven along quartz veins trending northwest along bedding planes in the Yellowjacket Formation. The veins range in width from 2 to 4 feet, composed of 95 percent quartz and less than 5 percent pyrite, malachite, and iron-oxide stain. A sample assayed a trace gold, 0.16 ounce silver per ton, and a trace copper.

Rattlesnake Camp prospect. — The Rattlesnake Camp prospect (fig. 81, No. 15) is approximately one-half mile south of the confluence of Rattlesnake Creek with the Middle Fork Salmon River.

Two small exploration pits expose quartz veins along northwest-trending joints in quartz monzonite of the Idaho batholith. The discontinuous veins are less than 1 foot wide and are about 95 percent quartz and 5 percent limonite. No sulfides were observed. A sample of vein material contained no gold or silver.

Deckie prospect. — The Deckie prospect (fig. 81, No. 17) is one-fourth mile northwest of the confluence of Soldier Creek and the Middle Fork Salmon River.

Three small exploration pits expose a series of northwest-trending quartz veins along fractures in quartzite of the Yellowjacket Formation. The veins are less than 4 inches wide and are exposed for less than 20 feet along their strikes. The veins are composed of about 95 percent quartz and less than 5 percent pyrite. A sample of the vein material assayed a trace gold and copper and 0.10 ounce silver per ton.

Lucky Hunter group. — The Lucky Hunter group (fig. 81, No. 23) is on the ridge between Wilson and Hoodoo Creeks. The Lucky Hunter was relocated in 1965 by John O'Conner and Fred S. Bidwell.

Workings consist of a caved adit, a sloughed shaft, and four small exploration trenches or pits. The property has had no recorded production. The workings are confined to gossan above iron-stained quartzite beds of the Hoodoo Quartzite or Yellowjacket Formation. These quartzite beds trend N. 56° W. and dip 41° NE. They are 115 feet thick and are overlain and underlain by white quartzite. The iron-stained quartzite locally contains from 0.5- to 1-inch-wide quartz veinlets along bedding and fractures. The gossan consists of a yellow-brown mixture of iron oxides and quartz. It exhibits boxwork and scattered slickensides.

A select sample of gossan and vein material from a trench contained 0.02 percent copper, 0.03 percent lead, and a trace gold, silver, and zinc. A select sample of gossan and vein material from the adit assayed 1.14 ounces gold per ton, 0.09 percent copper, 0.07 percent lead, and a trace silver and zinc. A chip sample of iron-stained quartzite assayed 0.02 percent copper and a trace gold, silver, lead, and zinc. The metals values are in small irregular veinlets in the gossan, which has a potential resource of several thousand tons.

THOMAS CREEK AREA

The Thomas Creek area includes all the Thomas Creek drainage in the southwestern part of the Middle Fork district. Part of the drainage above the junction of the East Fork Thomas Creek is in the Greyhound Ridge addition.

Altitudes in the area range from 4,400 feet at the mouth of Thomas Creek to 8,400 feet on Scarface Mountain. The canyon walls of Thomas Creek are generally covered by overburden. Most of the northwest-facing slopes are forested.

The Thomas Creek landing field near the mouth of Thomas Creek is the chief means of access to the Middle Fork Lodge and to the Thomas Creek area. The only other route of access is via 10-20 miles of trail from the roads on Greyhound Ridge to the south.

Lode claims were located in the Thomas Creek area as early as 1899, largely prompted by mining in the Loon Creek, Sheep Mountain, and Seafoam mining districts to the south.

Most exploration and development work has been done on Scarface (Iowa) Mountain, on the ridge between Thomas Creek and its East Fork, and just west of the confluence of Thomas Creek. There is much evidence of past activity but no record of production.

Country rock in the Thomas Creek area is predominantly Idaho batholith. Scattered throughout the area are volcanic rocks and roof pendants of limestone, dolomitic marble, and schistose metasedimentary rocks. All are faulted, fractured, and intruded by basic dikes.

The mineralized structures are quartz veins and pegmatite dikes that generally occur along faults or shear zones and to a lesser degree along contacts of the roof pendants.

Quartz veins are frequently explored by prospect workings. The veins are generally less than 3 feet wide and discontinuous. Most can be traced for only a few feet because of overburden. Composition is usually white quartz containing such scattered sulfide minerals.as argentiferous galena, pyrite, and chalcopyrite. Much of the quartz is stained with malachite and iron and manganese oxides.

Robinhood Prospect

The Robinhood prospect (fig. 81, No. 60) is less than 1 mile southwest from the confluence of Thomas Creek and the Middle Fork Salmon River. It is on an open slope covered with grass, sagebrush, and mountain mahogany. The prospect extends from near Thomas Creek to the top of the ridge. Outcrops are scare.

The claims were originally located in 1899 by V. J. McNerney and J. Valler. Most recent locations were made in 1934 by Milton Hood and Earl Kimball. There is no recorded production.

The largest occurrence of mineralized rock on the property is exposed in a small pit next to a prominent outcrop; the pit is at the intersection of two shear zones. The first shear zone strikes S. 83° W. and dips 79° N. It is 26 to 37 inches thick. A quartz vein in the shear zone is 3-22 inches thick. The shear zone and vein cannot be traced along the strike. The zone is composed of 90-95 percent limonite and hematite, 5 percent galena, and malachite stain. Small masses of galena were seen. A sample taken across the zone assayed 0.28 ounce gold per ton, 22.9 ounces silver per ton, 0.48 percent copper, and 5.41 percent lead.

The second shear zone trends N. 76° W. and dips 17° N. It is composed of 97 percent gouge and 2 percent vein material. The zone is 2 feet thick and is exposed only to a depth of 2 feet. It is covered along its strike to the northwest and southeast. A chip sample taken across the zone assayed a trace gold and 0.20 ounce silver per ton. A 6-inch-thick quartz vein, trending north and dipping 39° E., is exposed along the north side of the shear zone. A chip sample across the vein assayed a trace gold, 0.2 ounce silver per ton, a trace copper, and 0.08 percent zinc.

About 200 feet south of the pit, a pegmatite dike is exposed in a second pit. The dike trends N. 24° E. and dips 68° NW. in the Idaho batholith. It is 2.5-5 inches thick. A sample taken across the pegmatite assayed 0.06 ounce gold per ton, 1.7 ounces silver per ton, 0.6 percent copper, and 0.4 percent lead.

Above the pegmatite and in a small forested gully, 100 feet from the top of the ridge, are two trenches, exposing iron-stained granite. A sample taken from the dumps contained no gold or silver.

Atop the ridge and S. 83° W. from the mouth of Thomas Creek is a small pit on a quartz vein outcrop. The vertical vein strikes N. 60° W. along the contact of the Idaho batholith with mica schist. The outcrop is 30 feet long, 20 feet high, and 2 to 10 feet thick. A sample taken across the outcrop assayed a trace gold and 0.60 ounce silver per ton.

Up the ridge from the quartz outcrop is an exploration cut on an andesite dike at the head of the first large gully trending northwest from Thomas

Creek. The andesite dike trends N. 50°-70° W. and dips northeast in Challis Volcanics. The dike is altered and iron stained; a sample assayed a trace gold, 0.20 ounce silver per ton, and 0.05 percent lead.

Only the shear zone on the open slope near the mouth of Thomas Creek indicates a potential for discovery. The irregular nature of the zone, however, indicates its extent to be rather small.

Other Lode Prospects

Chickadee Quartz prospect. — The Chickadee Quartz prospect (fig. 81, No. 61) is northeast from the peak of Scarface Mountain. Several small northwesterly trending quartz-filled shear zones occur in a mafic dike. The dike trends southeast through metasedimentary rocks. Two small exploration pits have been dug. The quartz contains a maximum of 5 percent pyrite, galena, and iron oxides, combined; a sample assayed 0.21 ounce gold per ton.

Little Johnny prospect. — The Little Johnny prospect (fig. 81, No. 62) is on the west slope of Scarface Mountain approximately one-half mile from the top. One caved adit and two small sloughed pits explored a quartz vein trending N. 50° E. and dipping 24° NW. The vein cuts quartz monzonite of the Idaho batholith. No sulfides were observed. A sample assayed 3.39 ounces silver per ton, 0.4 percent lead, and no gold.

Hogback Quartz prospect. — The Hogback Quartz prospect (fig. 81, No. 63) is approximately 1 mile southeast from the confluence of the West Fork Thomas Creek and Thomas Creek.

One small exploration pit exposes an east-trending quartz fissure vein in schistose quartzite of the Yellowjacket Formation. The dimensions of the vein could not be determined, owing to deep overburden and poor exposure. Vein material on the dump of the pit is 95 percent quartz and 5 percent pyrite, malachite, and iron and manganese oxides, combined. This material assayed 0.05 percent copper and no gold or silver.

Lovell-Jones prospect. — The Lovell-Jones prospect (fig. 81, No. 64) is on a ridge one-half mile southwest of the confluence of Thomas Creek and its West Fork.

One caved adit and three small pits explore a quartz vein along the contact between quartz monzonite of the Idaho batholith and overlying rhyolite of the Challis Volcanics. The vein trends S. 54° E., dips flatly northeast, and averages 2 feet thick. The exposure is 75 feet long. No sulfides were seen. A sample of vein material assayed 0.16 ounce gold per ton and 0.39 ounce silver per ton.

Iowa Boy prospect. — The Iowa Boy prospect (fig. 81, No. 65) is approximately 1½ miles southwest of the confluence of Thomas Creek and its West Fork.

One large cut and several small pits have been dug along a quartz vein or veins cutting quartz monzonite of the Idaho batholith. No outcrops were found. Quartz on the dumps indicates a vein or veins less than 6 inches wide, composed of 95 percent quartz and 5 percent combined pyrite, chalcopyrite, and malachite. Quartz is on dumps of all the workings, which extend southeastward for more than 100 feet. Seven samples of the vein material on the dumps assayed from a trace to 0.17 ounce gold per ton, from 0.03 to 6.0 ounces silver per ton, and averaged 0.66 percent copper. The veins are probably too narrow to be considered a potential resource.

Teapot prospect. — The Teapot prospect (fig. 81, No. 70) is at the head of Lake Creek. A claim notice was found posted on a zone of alteration near the contact of a southeast-trending mafic dike cutting quartz monzonite of the Idaho batholith. The zone is composed of profusely iron stained quartz monzonite, containing a small amount of specular hematite. A sample of altered quartz monzonite assayed a trace gold, 0.07 ounce silver per ton, and a trace copper.

MISCELLANEOUS LODE PROSPECTS

Scattered along the Middle Fork between Wilson and Thomas Creeks, in the Stoddard Lake area, and in the Shellrock Peak area, are several small, poorly explored prospects. They are isolated, accessible only by trail or by cross-country travel, and have no recorded mineral production.

Several claims have been recorded for the Stoddard Lake area and local packers and prospectors have reported occurrences of galena and molybdenite in float, but none was found. Ted's group (fig. 81, No. 1) is the most recent group of claims located in the area. Most mineralized occurrences are quartz veins containing a trace gold, small amounts of silver, and sporadic small amounts of tungsten.

Scattered prospects along the Middle Fork Salmon River were staked on occurrences of uranium, fluorite, lead, and silver. The deposits are not economically minable.

The Shellrock Peak occurrences were investigated because anomalous amounts of metals in stream sediments were detected by the U.S. Geological Survey. Swarms of mineralized dikes occur in the area; however, samples contained only small amounts of silver, copper and lead.

TED'S GROUP

The Ted's group (fig. 81, No. 1) is at the head of Papoose Creek, approximately 2½ miles due south, by trail, from Cottonwood Butte and 1¼ miles due west of Stoddard Lake. Ted's group consists of 14 mining claims located by T. C. Landt and others in 1963. Claim notices and corner posts were observed, but no prospect workings were found.

Three quartz veins cut both gneissic intrusives of the Idaho batholith and tactite zones on the claims. One vein trends N. 48° E. and dips 60° NW. in a tactite zone. The vein is at least 50 feet and possibly 500 feet or more long and 200 feet or more deep. Exposures of this vein are 8 to 30 inches wide and are composed of 95 percent massive quartz and 5 percent hematite, limonite, and pyrite, combined. A sample taken across an 8-inch-wide part of the vein contained 0.04 percent WO_3, a trace gold, and 0.03 ounce silver per ton. A grab sample of the tactite contained no unusual amounts of metals.

A second quartz vein also cuts tactite and intrusive rocks. The vertical vein trends N. 78° E., is 12 to 18 inches wide, where exposed, and is more than 90 feet long and 50 feet deep. It is composed of 95 percent fractured, massive, white, iron- and manganese-stained quartz and less than 5 percent hematite and limonite pseudomorphs after pyrite. A sample taken across this vein assayed a trace gold, 0.4 ounce silver per ton, and 0.11 percent lead.

A third quartz vein, similar to the other two, is in quartz monzonite. It trends N. 85° E., is vertical, and is 12 to 24 inches wide, more than 60 feet long, and more than 60 feet deep. A sample taken across the vein assayed a trace gold, 0.3 ounce silver per ton, and 0.02 percent WO_3.

SULLIVAN URANIUM PROSPECT

The Sullivan Uranium prospect (fig. 81, No. 29) is on the south side of the Middle Fork Salmon River about one-fourth mile upstream from the

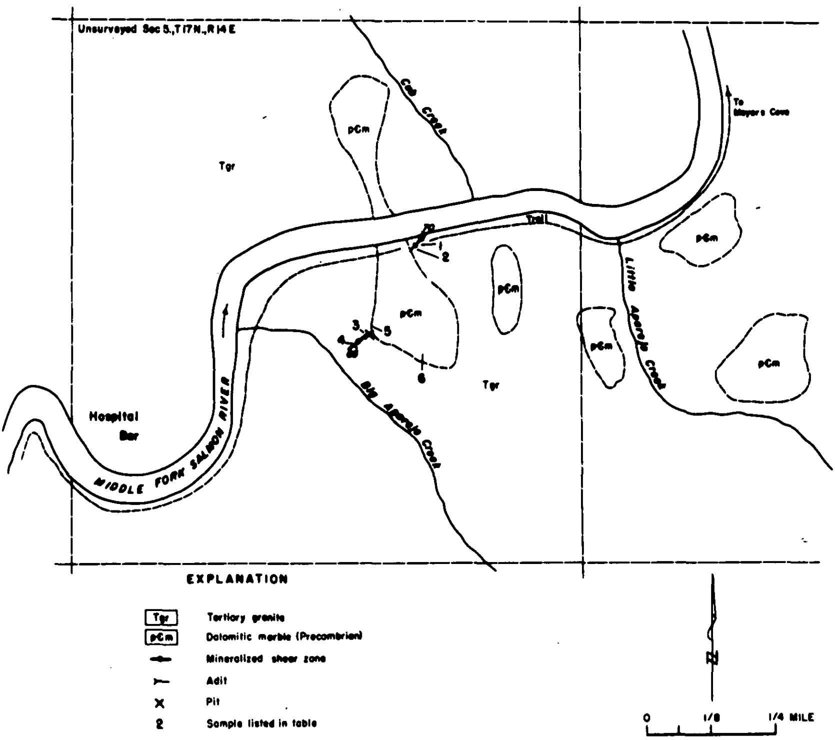


FIGURE 86. — Sullivan Uranium prospect.

mouth of Cub Creek. The workings (fig. 86) are on the ridge between Big and Little Aparejo Creeks.

The Sullivan Uranium prospect was located in 1956 by Bill Sullivan and associates. The property consists of eight lode mining claims, four of them on the northwest side of the Middle Fork Salmon River and four on the southeast side. The only diggings are on the southeast side.

Tertiary intrusives with remnants of dolomitic marble occur in the area. The Sullivan mining claims are on and adjacent to the largest marble pendant which crops out extensively on both sides of the Middle Fork Salmon River; these beds form the vertical cliffs on the northwest side of the river. Uranium minerals occur in shear zones in pink Tertiary granite. The zones do not extend into the marble. The principal shear zone is exposed in a 5-foot-long adit at the east side of the largest marble pendant southeast of the river. A second shear zone is exposed in two pits above the adit on the ridge between Big and Little Aparejo Creeks.

The shear zone exposed in the adit strikes N. 43° E. and dips 70° NW. The wallrock is fractured iron-stained granite. The shear zone is brecciated and radioactive and contains gray sugary quartz, pyrite, fluorite, arsenopyrite or pyrrhotite, and thorite(?). The principal mineralized exposure in the adit is 18 inches wide, 8 feet long and 5 feet deep but probably extends farther. Alteration and iron staining extend as much as 20 feet in the granite on each side. There are no outcrops of the zone above the adit because of brush and talus cover, but by use of a scintillometer the zone was traced uphill for 600 feet.

Data for samples shown in figure 86

[Sample 3 was grab; all others were chip. Tr, trace; N.d., not determined; N, not detected]

Sample							
No.	Location or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)	Zinc (percent)	U_3O_8 (percent)
1	1.5	Tr	0.10	0.02	0.10	0.20	0.004
2	40.0	Tr	Tr	Tr	N.d.	N.d.	.024
3	Stockpile	Tr	1.82	Tr	.40	N	.014
4	3.0	Tr	.27	Tr	.15	N	.016
5	20.0	N	N	.03	N	.34	.007
6	20.0	0.04	Tr	Tr	.70	N	N

The two pits above and southeast from the adit expose another shear zone in pink Tertiary granite. The zone trends N. 50° E. and dips 60°-80° SE. The pits are near the contact between pink granite and the overlying marble. The fracture system cannot be traced into the marble but extends 47 feet between the two pits. It is 1 to 4 feet wide and is exposed to a depth of 5 feet. Quartz stringers are separated by altered granite and breccia through the zone. The stringers contain less than 5 percent combined chalcopyrite, azurite, and malachite.

Low-grade uranium-thorium material exposed in the fracture systems and inferred along both dip and strike total an estimated 23,000 tons, averaging about 0.004 percent U_3O_8, 0.1 ounce silver per ton, 0.1 percent lead, and 0.2 percent zinc. An estimated 800 tons of mineralized granite averaging 0.024 percent U_3O_8 occurs near the adit and can be inferred beneath the marble for 600 feet, as indicated by scintillometer readings.

Aparejo Creek Fluorite Prospect

The Aparejo Creek Fluorite prospect (fig. 81, No. 31) is approximately one-fourth mile south-southeast from the confluence of Sheep Creek with the Middle Fork Salmon River.

One small exploration pit exposes a fissure vein of quartz, calcite, and blue-green fluorite trending N. 50° E. and dipping 70° to 90° SE. in pink Tertiary granite. The vein is exposed intermittently for a distance of 500 feet through a vertical range of 50 feet; it has an average width of 1 foot. It is composed of about 33 percent massive fluorite; other major constituents are calcite, sugary quartz, and mica. No unusual amounts of metals were detected in the material by assay or spectrographic analysis.

Crystal Uranium Prospect

The Crystal Uranium prospect (fig. 81, No. 51) is at the confluence of Pine Creek and the Middle Fork Salmon River.

A claim notice locates an area of pink Tertiary granite. The area was traversed with a scintillometer and has 2 to 3 times higher radioactivity than its surroundings. Radioactivity 2 to 3 times background is not sufficient to indicate a mineral deposit and no radioactive minerals were observed.

Shellrock Peak Occurrence

Shellrock Peak (fig. 81, No. 24) is on the western boundary of the Middle Fork district at the heads of Brush and Sheep Creeks. The area is also drained by Trail Creek and South Fork Rush Creek, which flow westward, away from the Middle Fork district. The ridgetops are relatively flat, but slopes are steep. The ridgetops and canyon bottoms are forested, but generally the slopes are too steep to allow the accumulation of soil and vegetation.

The Shellrock Peak area was investigated because stream-sediment sampling by the U.S. Geological Survey disclosed anomalous metal content; no claims have been located in the area. The country rock is Challis Volcanics, predominantly rhyolite but ranging from rhyolite to andesite. The volcanics, which are of both flow and pyroclastic origin, are cut by a swarm of dikes that altered and mineralized them.

Five dikes, andesitic to rhyolitic in composition, were examined and sampled. They strike N. 60°-75° E., dip 70° SE. to vertical, and are iron stained. Pyrite is disseminated throughout the dikes and sporadically along the fractures. The dikes range in width from 3 to 30 feet and are exposed for as much as 500 feet along their strikes. Alteration extends as much as 15 feet into the country rock.

Seven samples were taken of both the dikes and the country rock. They assayed a trace gold, 0 to 0.01 percent copper, and 0 to 0.01 percent lead and averaged 0.30 ounce silver per ton. The assays and spectrographic analyses indicate that the altered country rock and dike rock are similar in metal content and that both contain anomalous amounts of gold, silver, copper, and lead.

MIDDLE FORK PLACERS

The Middle Fork Salmon River flows 72 miles northward through the Middle Fork district to the main Salmon River. Altitude of the Middle Fork at the south end of the district is approximately 4,850 feet and at the confluence with the main Salmon River is 3,000 feet. Most of the placer deposits along the Middle Fork are reached by a trail that follows the river from Lake Creek downstream to Big Creek. Placer deposits on the side of the river opposite the trail and all placer deposits downstream from Big Creek are accessible only by boat and at times of favorable water conditions.

Dredge mining on the Middle Fork Salmon River is prohibited by amendment (Section 47-1323) of Chapter 13, title 47 of the Idaho code.

The first of about 150 placer claims in the district was located in the 1890's, and the most recent, in the 1960's. The section of the Middle Fork between Indian and Lake Creeks had the greatest amount of placer mining activity; some placer mining was done downstream at Lower Red Bluff (Ross, 1934, p. 103) and Aparejo Point (fig. 81, Nos. 49, 30). The placer deposits between Lake and Indian Creeks were developed by numerous placer cuts, pits, and ditches. Approximately 1,200 cubic yards of material were placered from the Lake Creek bar in the 1930's, but no production was recorded. Reported placer gold production for the Middle Fork district as recorded by the Bureau of Mines Minerals Yearbooks for 1936, 1939, and 1940 is only 4 troy ounces. Production is not reported according to individual property. Most of the gold recovered from the Middle Fork district was not reported, but total production was probably small.

Most of the placer deposits are alluvial terraces as much as 100 feet higher than stream level or low-lying gravel along the riverbed (figs. 87-93). The deposits cover more than 1,000 acres along the Middle Fork Salmon River and contain about 63 million cubic yards of alluvial material (table 22). Most of the 1,000 acres is supervised by the U.S. Forest Service, a minor amount is supervised by the Idaho State Fish and Game Department, and some is held by private individuals or corporations. Ten deposits were originally settled as homesteads: Flying B Ranch, Mormon Ranch (fig. 81, No. 28), Sheep Creek Ranch (No. 43), Tappen Ranch (No. 38), Simplot Ranch (No. 41), Red Bluff (Nos. 49, 52), Cougar Ranch (No. 53), Sunflower Flat (No. 55), Little Creek Ranch (No. 56), and Middle Fork Lodge (No. 59). Only the Flying B Ranch, 7 acres of the Simplot Ranch, and the Middle Fork Lodge are now privately owned.

Values of samples from deposits along the Middle Fork did not increase with depth, thereby indicating absence of gold concentration near bedrock. Fine gold, however, has been concentrated near surface during floods. Areas along the river that are favorable for the deposition of fine flood gold are of very limited acreage, below the high-water mark, and have been

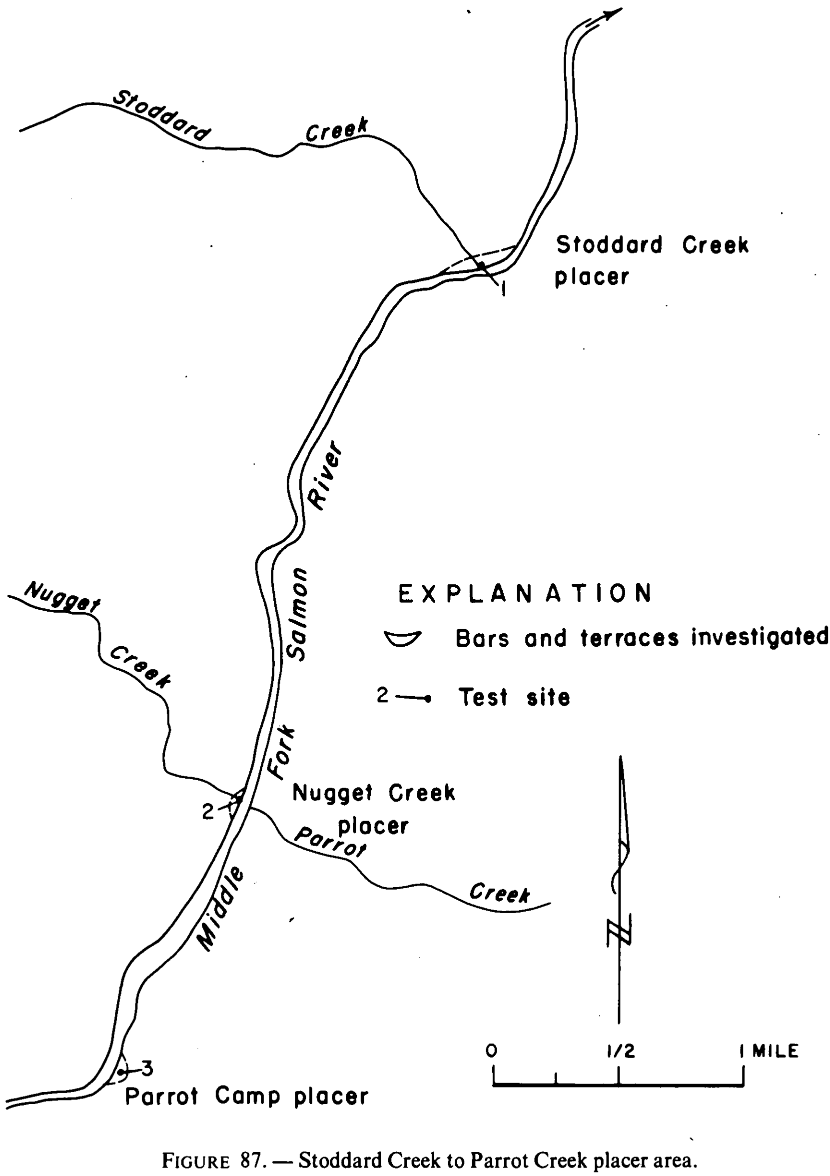


FIGURE 87. — Stoddard Creek to Parrot Creek placer area.

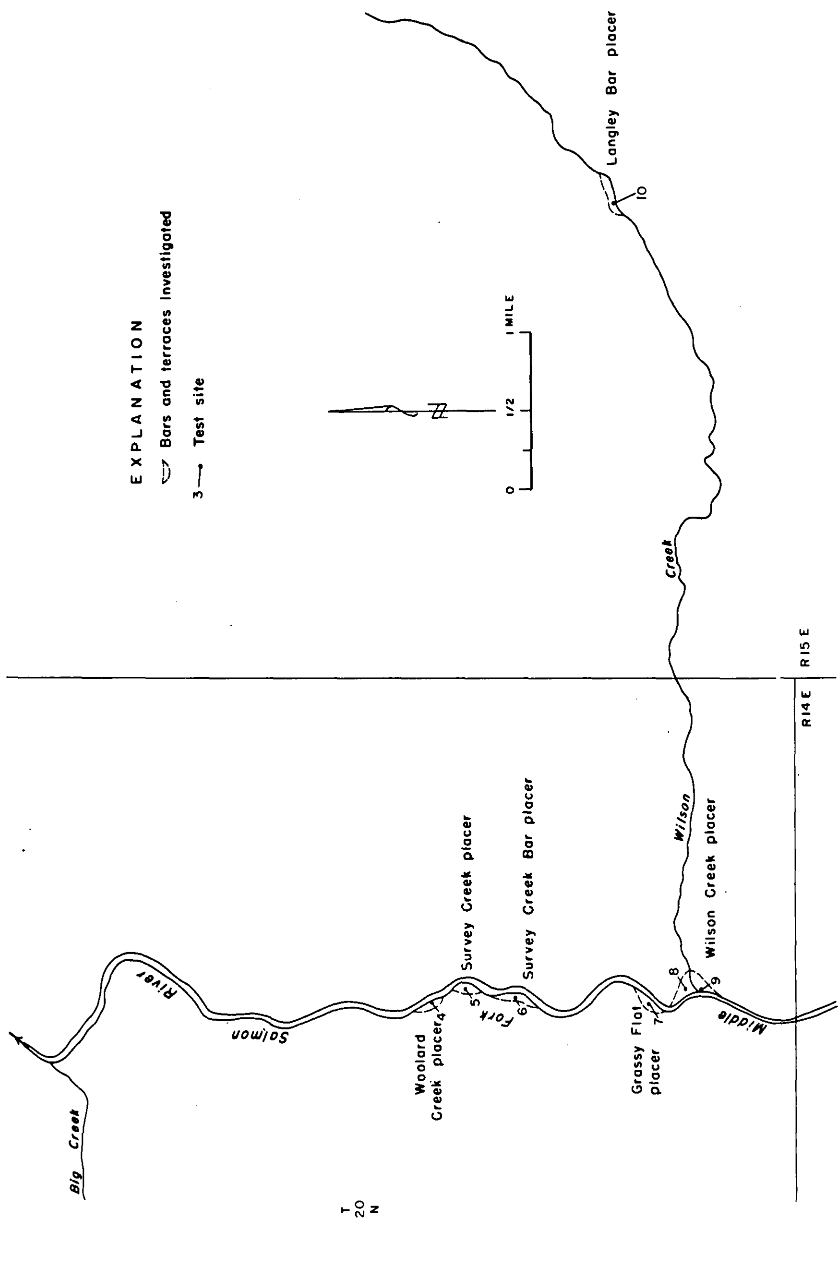


FIGURE 88. — Big Creek to Wilson Creek placer area.

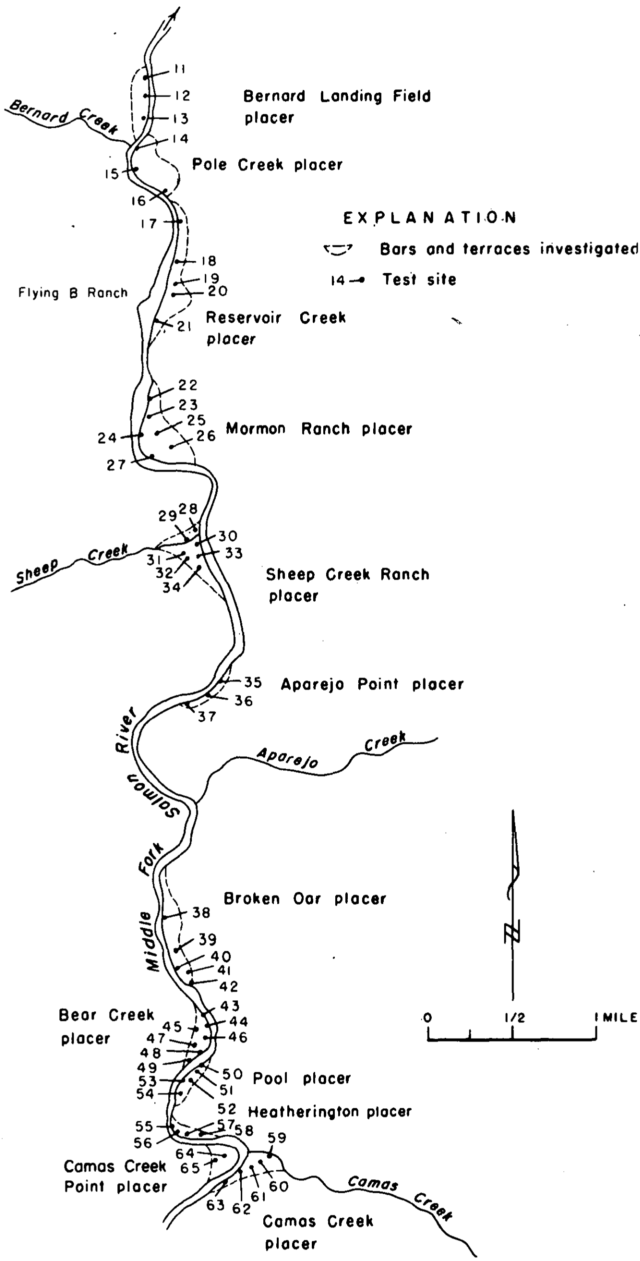


FIGURE 89. — Bernard Creek to Camas Creek placer area.

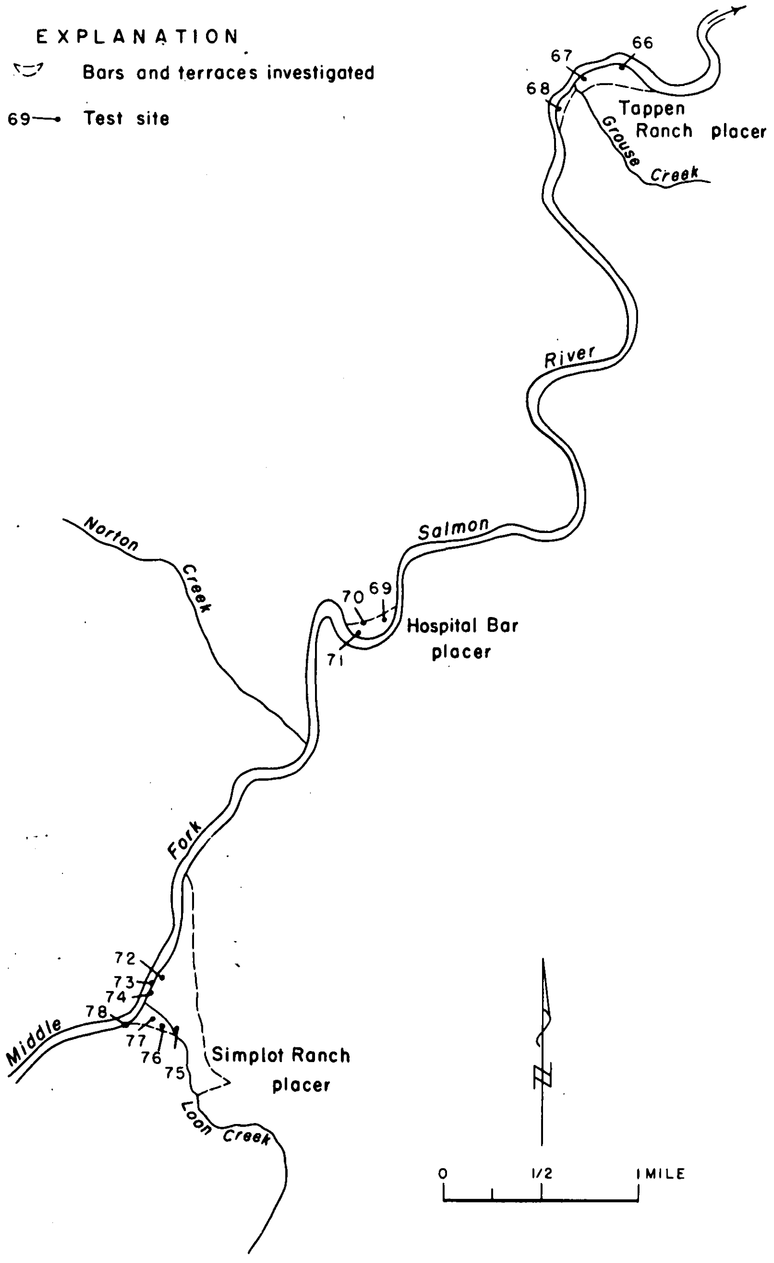


FIGURE 90. — Grouse Creek to Loon Creek placer area.

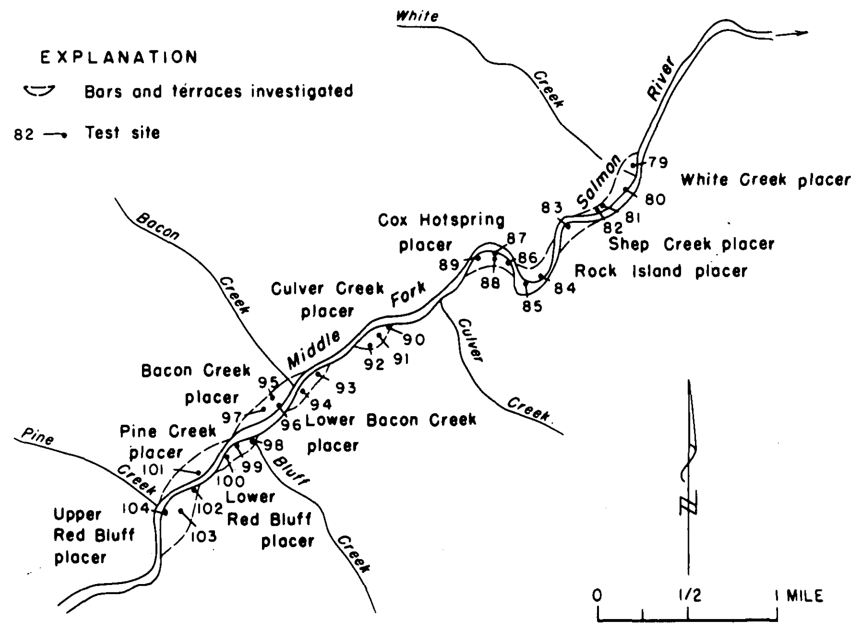


FIGURE 91. — White Creek to Pine Creek placer area.

mined during periods of economic depression. During the 1930's, deposits were mined by local miners who were willing to work material which yielded less than $1 per day. Aparejo Point placer (fig. 89) is probably the best flood gold deposit. It covers about 2 acres and contains about 48,000 cubic yards of bouldery sand. The placer is below the high-water mark. Gold values range from a trace to $1.71 per cubic yard and average $0.41 gold per cubic yard. This appears to be the richest placer deposit in the Middle Fork district.

Samples from the Middle Fork placer deposits contained from less than 0.5 cent to $1.71 gold per cubic yard but averaged less than 1 cent gold per cubic yard (table 23). The black sand concentrates ranged from less than 1 to 8 pounds per cubic yard and averaged 1.5 pounds per cubic yard. The black sands are composed of 26 to 63 percent magnetite, 8.5 to 34.5 percent ilmenite, 2 to 31 percent ferromagnesian silicates, trace to 6 percent garnet, 1 to 7 percent zircon, trace to 4 percent apatite, trace to 7 percent sphene, trace to 1.5 percent allanite, trace to 7.5 percent altered pyrite, 0.5 to 2.5 percent epidote, 0 to 2 percent monazite, and trace amounts of rutile, tourmaline, thorite, scheelite, staurolite, xenotime, and corundum. Small grains of corundum ranging from colorless to bluish to reddish hues were present in some concentrates.

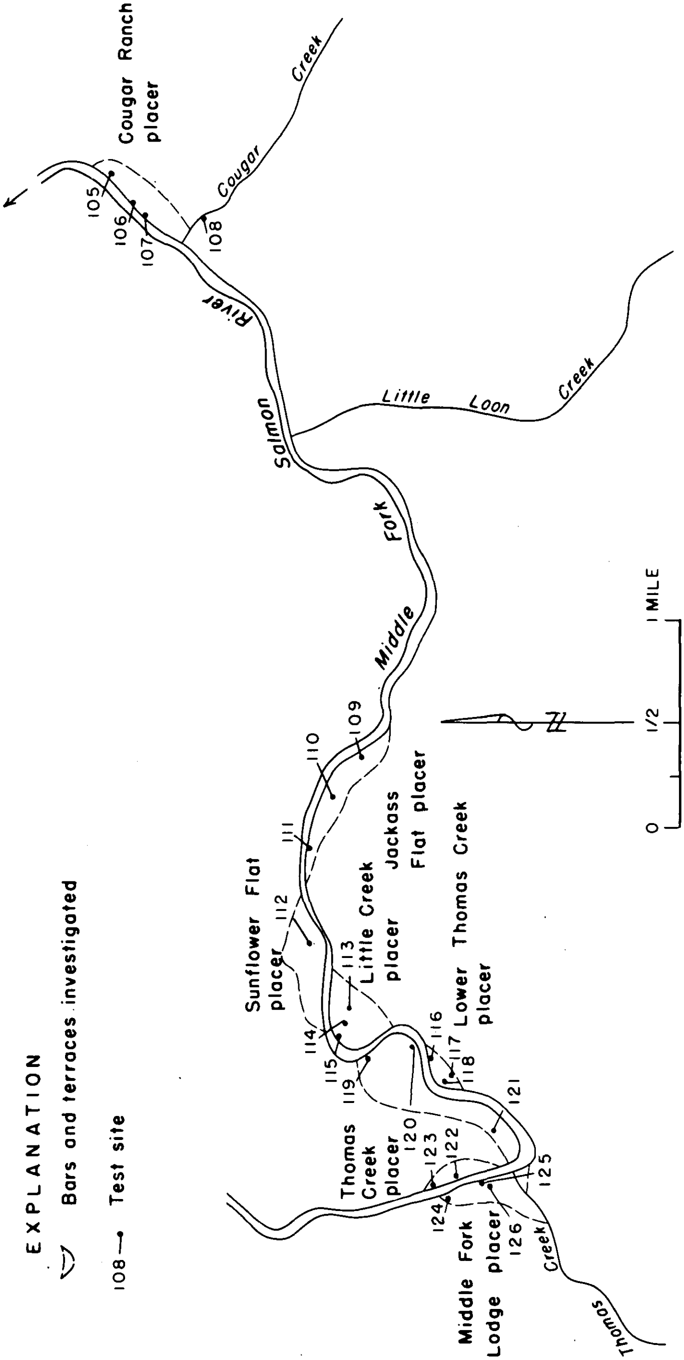


FIGURE 92.—Cougar Creek to Thomas Creek placer area.

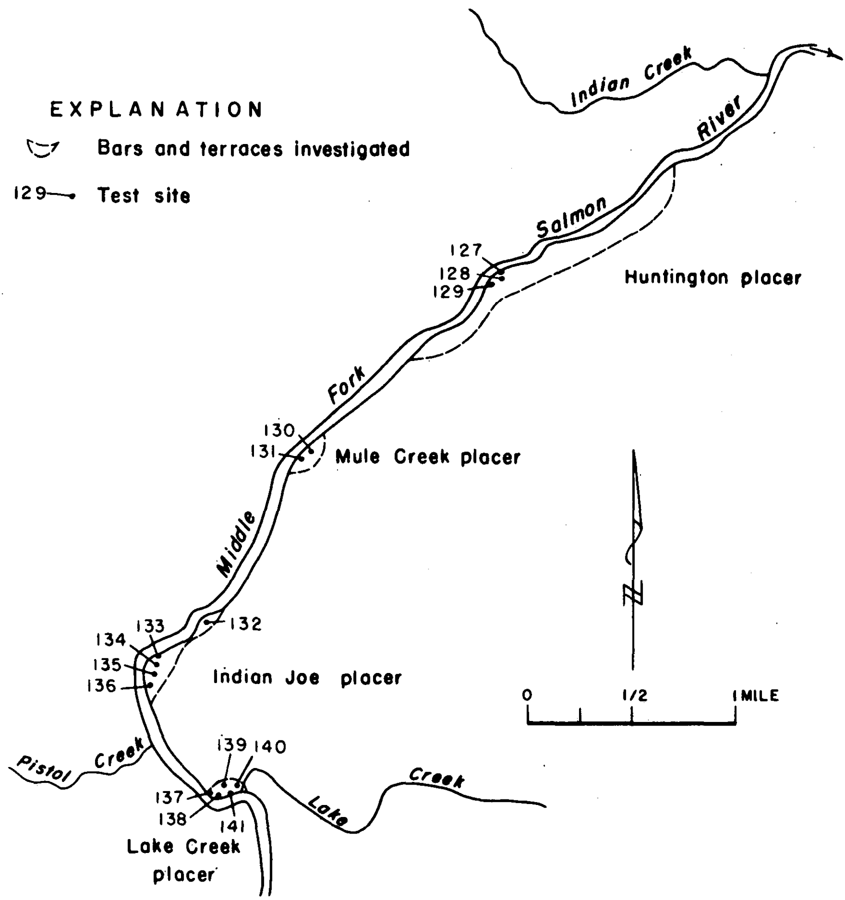


FIGURE 93. — Indian Creek to Lake Creek placer area.

MONUMENTAL CREEK DISTRICT

Mineral resources of the Monumental Creek district consist of scattered gold, copper, and opal deposits. Gem-quality opal is the only mineral commodity produced now, although a little placer gold is reportedly recovered periodically from high-grade pockets on Monumental Creek. The district (fig. 94) comprises the lower two-thirds of the Monumental Creek drainage, the Little Marble Creek drainage, and the small drainages between the two. All are tributaries of Big Creek.

A road along Big Creek traverses the north end of the district; another, to Thunder Mountain, comes to within 3 miles of the district's southern boundary. Other access is by trails which follow Monumental Creek and some of its tributaries. There is a private airstrip near the mouth of Copper Creek and another near the mouth of Talc Creek. The airstrips are about 45 minutes' flying time from McCall, Idaho.

TABLE 22. — *Summary data, Middle Fork district placers*

[Tr, trace]

Placer	Location (text fig.)	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands (lb per cu yd)
Stoddard Creek	87	2	65,000	Tr	1.0
Nugget Creek	87	2	16,000	Tr to 0.7	1.2
Parrot Camp	87	1	8,000	Tr to 2.7	2.1
Woolard Creek	88	5	160,000	Tr to 1.4	2.1
Survey Creek	88	7	101,000	Tr to 1.4	2.5
Survey Creek Bar	88	3	44,000	Tr	1.8
Grassy Flat	88	5	80,000	Tr	1.7
Wilson Creek	88	5	162,000	Tr	1.3
Langley Bar	88	3	50,000	Tr to 0.7	1.3
Bernard Landing Field	89	16	309,000	Tr to 2.1	2.5
Pole Creek	89	17	550,000	Tr	1.0
Reservoir Creek	89	69	2,250,000	Tr to 2.7	1.1
Mormon Ranch placer	89	36	1,184,000	Tr to 6.8	1.4
Sheep Creek Ranch	89	60	1,946,000	Tr to 1.4	.6
Aparejo Point	89	2	48,000	Tr to 170.9	2.4
Broken Oar	89	36	1,170,000	Tr to 2.7	1.3
Bear Creek	89	15	486,000	Tr to 2.1	1.1
Pool	89	11	1,225,000	Tr to 6.8	1.3
Heatherington	89	12	755,000	Tr to 16.4	2.5
Camas Creek	89	14	450,000	Tr to 1.4	1.6
Camas Creek point	89	11	1,225,000	Tr	.8
Tappen Ranch	90	33	2,076,000	Tr to 1.4	1.2
Hospital Bar	90	13	503,000	Tr to 3.4	1.5
Simplot Ranch	90	75	4,360,000	Tr to 19.1	1.0
White Creek	91	13	629,000	Tr to 3.4	.7
Shep Creek	91	7	227,000	Tr to 2.1	.5
Rock Island	91	13	818,000	Tr to 1.4	1.4
Cox Hotspring	91	8	194,000	Tr to 2.7	1.2
Culver Creek	91	15	1,210,000	Tr to 34.2	2.2
Lower Bacon Creek	91	9	292,000	Tr to 2.1	1.9
Bacon Creek	91	21	1,016,000	Tr to 13.0	1.1
Lower Red Bluff	91	6	380,000	Tr to 5.5	2.2
Pine Creek	91	25	1,580,000	Tr to 27.3	1.4
Upper Red Bluff	91	25	1,580,000	Tr to 4.1	1.4
Cougar Ranch	92	25	1,600,000	Tr to 17.8	1.5
Jackass Flat	92	40	1,296,000	Tr to 4.8	1.0
Sunflower Flat	92	13	314,000	Tr	1.2
Little Creek	92	73	9,430,000	Tr to 1.4	0.6
Thomas Creek placer	92	122	10,212,000	Tr to 41.0	1.1
Lower Thomas Creek	92	16	774,000	Tr to 2.7	.8
Middle Fork Lodge	92	37	3,000,000	Tr to 17.8	.9
Huntington	93	120	7,550,000	1.4 to 6.8	.7
Mule Creek	93	8	465,000	Tr to 4.1	1.0
Indian Joe	93	17	990,000	Tr to 16.4	1.0
Lake Creek	93	2	30,000	Tr to 4.1	.4

[1]Gold values are based on a price of $47.85 per troy ounce.

Altitudes range from about 4,600 feet near the mouth of Monumental Creek to more than 9,000 feet at some mountain peaks. The effects of alpine glaciation are well displayed near the headwaters of the West Fork Monumental Creek and Little Marble Creek. Outcrops are not plentiful, owing to soil, brush, and forest cover; accordingly, prospecting is difficult.

Historically, the Monumental Creek district is closely associated with the Thunder Mountain district to the south. As described by Ross (1941), it includes parts of the Thunder Mountain and Big Creek mining districts. The first of an estimated 480 claims staked in the Monumental Creek district was located in 1898. Most placer ground and many lode mining claims were located by 1910. There was much prospecting prior to World War I, but no mineral production was recorded. Mining was inactive from World War I to the 1930's although small placer operations intermittently produced a few ounces of gold (U.S. Geological Survey, Mineral Resources of the United States, 1918). Additional placer and lode mining claims were

TABLE 23. — *Sample data for Middle Fork district placers*

[Placer locations and site numbers are shown in figs. 87-93. See table 22 for specific listings. Tr, trace, N.d., not determined]

Site	Depth interval (feet)	Gold content		Black sands (lb per cu yd)
		Colors[1]	Value[2] (cents per cu yd)	
		Stoddard Creek placer		
1	0.0-3.3	Tr	Tr	1.0
	3.3-10.0	Tr	Tr	1.0
		Nugget Creek placer		
2	Surface	Tr	0.7	1.2
		Parrot Camp placer		
3	0.0- 1.0	6 to 12f.	2.7	2.1
		Woolard Creek placer		
4	0.0- 7.0	30f., 2m.	1.4	2.1
		Survey Creek placer		
5	0.0- 1.2	11f.	1.4	3.4
	1.2- 4.0	7f.	1.4	2.7
		Survey Creek Bar placer		
6	0.0- 1.2	2f.	Tr	1.8
		Grassy Flat placer		
7	0.0- 1.2	3v.f.	Tr	3.5
	1.2- 3.2	1f., 18v.f.	Tr	2.0
	3.2- 7.2	4v.f.	Tr	1.4
		Wilson Creek placer		
8	0.0- 4.0	Tr	Tr	1.1
9	0.0- 2.0	7f.	Tr	2.3
	2.0- 2.5	Tr	Tr	1.6
		Langley Bar placer		
10	0.0- 6.0	4f., 1m.	0.7	1.3
		Bernard Landing Field placer		
11	0.0- 7.1	+60f., 10m.	2.1	1.9
12	0.0- 1.2	1f.	Tr	.3
	1.2- 8.2	18f., 3m.	.7	1.1
13	0.0- 1.5	Tr	Tr	3.8
	1.5- 3.5	2f.	Tr	1.9
		Pole Creek placer		
14	0.0- 2.2	Tr	Tr	1.3
	2.2- 5.3	14f.	Tr	1.8
15	0.0-14.2	4f.	Tr	.6
16	0.0-14.5	1f.	Tr	.9
		Reservoir Creek placer		
17	0.0- 3.0	10f., 5m.	1.4	1.8
	3.0- 6.0	20f., 9m.	2.7	2.7
18	0.0- 2.4	Tr	Tr	2.0
	2.4- 7.5	10f., 5m.	1.4	1.9
19	0.0- 1.8	2f.	Tr	1.4
	1.8- 7.2	18f., 5m.	2.7	1.5
	7.2-14.7	9f., 3m.	1.4	.9
20	0.0- 5.9	Tr	Tr	.6
	5.9- 9.0	2f., 2m.	1.4	.6
21	0.0-1.7	Tr	Tr	1.9
	1.7- 5.7	+60f., 17m.	2.7	5.3

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content		Black sands (lb per cu yd)
		Colors[1]	Value[2] (cents per cu yd)	
		Mormon Ranch placer		
22	0.0- 3.7	2f.	Tr	1.0
	3.7- 8.0	1f.	Tr	.7
	8.0-12.3	1f., 2m.	0.7	.8
	12.3-16.0	3f.	Tr	1.0
	16.0-20.0	3f., 1m.	.7	.5
23	0.0- 3.5	4f.	Tr	1.0
	3.5- 7.0	3f., 1m.	1.4	.4
	7.0-11.3	3f.	Tr	.7
	11.3-13.8	2f.	Tr	.8
24	0.0- 1.7	6f., 3m.	2.7	4.6
	1.7- 4.2	+100f.,+20m.	6.8	2.6
25	0.0- 4.0	4v.f.	Tr	.5
	4.0- 7.5	1m.	.7	.5
26	0.0- 4.5	5f.	Tr	1.0
27	0.0- 0.7	1f.	Tr	2.8
	0.7- 3.2	4f.	Tr	1.0
		Sheep Creek Ranch placer		
28	0.0- 1.3	Tr	Tr	6.9
	1.3- 4.3	Tr	Tr	2.5
	4.3- 6.2	Tr	Tr	1.3
29	0.0- 3.0	1f.	Tr	.4
	3.0- 6.0	Tr	Tr	.5
	6.0- 7.0	Tr	Tr	.3
30	0.0- 1.5	Tr	Tr	.9
	1.5- 7.0	Tr	Tr	.2
31	0.0-10.0	11f.	Tr	.6
	10.0-15.8	1f.	Tr	.9
	15.8-17.3	2f.	Tr	.9
32	0.0- 0.8	2f.	Tr	.2
	0.8-14.0	Tr	Tr	.7
	14.0-15.7	Tr	Tr	1.9
33	0.0- 9.0	22f.	Tr	.6
34	0.0- 2.0	2f., 1m.	1.4	.8
	2.0- 9.0	+150f.	1.4	2.9
		Aparejo Point placer		
35	0.0- 1.5	8f., 2m.	2.7	2.0
	1.5- 3.2	14f., 4m.	13.7	2.9
36	0.0- 4.0	Tr	Tr	1.0
	4.0- 6.0	+ 60f., 30m.	27.3	6.0
37	0.0- 2.3	10f., 2m.	10.9	1.6
	2.3- 5.0	+200f.,+80m.	170.9	5.1
		Broken Oar placer		
38	0.0- 1.8	Tr	Tr	1.3
	1.8-20.2	4m.	.7	.9
39	0.0- 1.0	6f., 2m.	2.7	2.4
	1.0- 5.7	7f.	Tr	1.1
40	0.0- 4.5	+100f.	1.4	2.6
	4.5- 8.7	Tr	Tr	1.0
	8.7- 9.7	Tr	Tr	.8
41	0.0- 1.0	20f., 2m.	2.7	5.1
	1.0- 6.8	5f.	Tr	1.0
42	0.0- 1.4	12f.	Tr	6.5
	1.4- 3.1	50f., 2m.	2.7	7.0
	3.1- 6.3	10f., 5m.	2.7	.9
		Bear Creek placer		
43	0.0- 3.0	3f., 2m.	1.4	1.0
	3.0- 6.5	4f., 1m.	.7	1.4
44	0.0- 1.4	3f.	Tr	2.5
	1.4-16.8	20f., 4m.	.7	.4
45	0.0- 6.5	2f.	Tr	.5
46	0.0- 1.3	Tr	Tr	2.3
	1.3- 6.3	2f., 2m.	1.4	1.6
47	0.0- 3.4	1f., 1m.	.7	1.2
	3.4- 5.4	Tr	Tr	1.2
48	0.0- 2.5	24f., 1m.	2.1	3.9
49	0.0- 1.5	4f.	Tr	2.5
	1.5- 3.2	8f.	Tr	3.3

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content		Black sands (lb per cu yd)
		Colors[1]	Value[2] (cents per cu yd)	
Pool placer				
50	0.0-11.0	+180f., 3m.	3.4	1.7
	11.0-12.0	8f.	Tr	4.3
	12.0-17.2	18f.	Tr	1.1
	17.2-18.7	23f., 3m.	1.4	2.2
51	0.0- 1.0	5f., 2m.	1.4	.2
	1.0- 2.2	+100f., 11m.	2.7	1.9
52	0.0- 1.2	5f.	Tr	4.1
	1.2- 4.6	50f., 25m.	6.8	6.5
53	0.0-14.2	90f., 9m.	1.4	.7
54	0.0- 1.2	5f., 1m.	1.4	2.2
	1.2- 4.9	20f., 17m.	1.4	2.5
Heatherington placer				
55	0.0- 1.0	+40f., 11m.	16.4	0.9
56	0.0- 1.0	20f.	1.4	4.0
	1.0- 5.8	45f., 1m.	.7	1.9
57	0.0- 1.0	30f., 5m.	6.8	6.5
	1.0- 5.0	50f., 3m.	2.7	1.7
58	0.0- 1.0	25f., 3m.	1.4	3.5
	1.0- 4.0	25f.	.7	2.1
Camas Creek placer				
59	0.0- 1.2	--------	0.7	2.2
	1.2- 8.0	6f., 1m.	.7	2.0
	8.0-11.2	7f.	.7	3.2
	11.2-14.7	2f.	Tr	2.2
60	0.0- 5.0	25f., 2m.	.7	2.2
	5.0- 9.5	6f.	Tr	.8
61	0.0- 3.0	25f.	1.4	3.3
	3.0- 6.0	5f., 1m.	.7	.6
62	0.0- 1.3	9f.	Tr	3.8
	1.3- 5.4	10f., 2m.	Tr	1.2
	5.4-13.5	5f.	Tr	.4
63	0.0- 4.2	18f., 6m.	1.4	1.9
	4.2- 9.3	6f.	Tr	.7
Camas Creek Point placer				
64	0.0- 4.8	4f.	Tr	0.7
	4.8- 8.7	5f.	Tr	.7
	8.7-13.8	2f.	Tr	.6
	13.8-20.2	3f.	Tr	.6
	20.2-27.0	4f., 2m.	Tr	.8
65	0.0- 4.3	3f.	Tr	.9
	4.3-10.7	7f.	Tr	.7
	10.7-16.4	3f.	Tr	1.5
	16.4-19.8	4f.	Tr	.9
	19.8-23.3	3f.	Tr	1.2
Tappen Ranch placer				
66	0.0- 3.3	2f.	Tr	0.8
	3.3- 7.2	5f.	Tr	1.2
	7.2-11.2	5f., 3m.	0.7	1.4
	11.2-17.2	8f., 6m.	.7	.9
	17.2-21.9	2f., 2m.	.7	1.4
	21.9-25.9	15f., 2m.	Tr	2.1
	25.9-34.2	3f.	Tr	2.2
	34.2-39.0	2f.	Tr	2.2
67	0.0- 0.8	2f., 2m.	1.4	5.1
	0.8- 6.8	2f.	Tr	1.9
68	0.0- 0.6	2f.	Tr	4.9
	0.6- 5.1	7f., 3m.	Tr	1.3
Hospital Bar placer				
69	0.0- 1.3	5f.	Tr	1.0
	1.3- 5.6	15f., 2m.	Tr	1.3
	5.6- 6.5	3f.	Tr	2.2
70	0.0- 3.0	5f., 10m.	3.4	1.4
71	0.0- 2.9	5f.	Tr	1.0
	2.9- 5.3	21f., 3m.	.7	1.8
	5.3- 8.0	11f.	.7	.9
	8.0-10.0	1f., 1m.	.7	.7

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content: Colors[1]	Gold content: Value[2] (cents per cu yd)	Black sands (lb per cu yd)
		Simplot Ranch placer		
72	0.0- 1.3	1f.	Tr	0.8
	1.3- 5.7	Tr	Tr	.4
	5.7-12.6	5f., 2m.	Tr	.4
	12.6-17.3	Tr	Tr	.3
73	0.0- 1.3	35f., 7m.	4.1	4.0
	1.3- 4.3	12f.	Tr	1.0
	4.3-10.0	35f., 4m.	.7	.8
	10.1-16.1	15f., 2m.	.7	.6
	16.1-21.1	2f.	Tr	.2
74	0.0- 1.2	2f.	Tr	1.3
	1.2- 4.9	2f., 2m.	Tr	1.8
	4.9-10.1	7f.	Tr	1.4
	10.1-13.4	2f., 3m.	Tr	.6
75	0.0- 8.6	40f., 4m.	2.7	.6
	8.6-17.0	4f., 4m.	.7	.3
	17.0-23.2	3f.	Tr	.2
76	0.0- 0.7	4f.	Tr	1.9
	0.7- 2.7	8f.	Tr	2.3
	2.7- 4.8	9f.	Tr	3.0
	4.8- 6.1	3f., 3m.	5.5	1.8
77	0.0- 0.3	1f.	Tr	3.6
	0.3- 3.5	2f., 1m.	Tr	.7
	3.5- 7.1	3f., 1m.	.7	.7
	7.1-10.4	2f.	Tr	1.0
	10.4-14.5	1f.	Tr	.8
	14.5-17.9	2f., 1m.	Tr	.8
78	0.0- 1.8	2f., 2m.	.7	4.5
	1.8- 3.6	40f., 4m.	1.4	5.6
	3.6- 6.1	+100f., +10m.	19.1	2.1
		White Creek placer		
79	0.0- 5.2	2f.	Tr	0.5
	5.2-11.2	3f.	Tr	.6
	11.2-15.7	5f.	Tr	.7
	15.7-20.7	3f.	Tr	.5
	20.7-26.0	1f., 1c.	6.2	.3
	26.0-31.3	8f., 3m.	.7	.6
	31.3-35.3	2f.	Tr	.4
	35.3-40.6	3f., 2m.	Tr	.5
	40.6-42.9	3f.	Tr	.7
	42.9-47.4	7f., 1m.	Tr	.5
	47.4-52.5	14f., 4m.	1.4	.6
	52.5-55.9	12f., 7m.	1.4	.7
80	0.0- 2.6	1m.	Tr	.8
	2.6- 5.4	5f.	Tr	1.3
	5.4- 9.7	3f.	Tr	.7
	9.7-13.7	5f.	Tr	.6
	13.7-16.7	2f.	Tr	.6
	16.7-19.7	2f.	Tr	.6
	19.7-23.4	9f., 3m., 1c.	6.2	.6
	23.4-26.4	14f., 3m.	.7	.9
	26.4-29.7	8f., 5m.	1.4	.6
	29.7-31.7	1f.	Tr	.7
	31.7-34.4	6f., 1m.	Tr	.5
	34.4-37.1	1f.	Tr	.7
	37.1-40.9	12f., 3m.	.7	.6
81	0.0- 3.7	20f., 5m.	2.1	1.0
	3.7- 7.0	15f., 1m.	.7	1.0
	7.0-11.0	3f., 1m.	.7	.5
	11.0-15.6	7f.	Tr	.3
	15.6-20.6	38f., 8m.	.7	1.2
	20.6-24.3	5f.	Tr	.9
82	0.0- 1.7	15f.	1.4	2.8
	1.7- 4.7	12f., 3m.	Tr	1.9
	4.7- 8.5	12f., 9m. 1c.	3.4	.8
	8.5-10.9	5f., 4m.	2.1	.8
		Shep Creek placer		
83	0.0- 3.4	8f., 8m.	2.1	0.7
	3.4- 6.7	2f., 2m.	Tr	.8
	6.7-10.7	2f.	Tr	.5
	10.7-13.2	4f.	Tr	.3
	13.2-17.1	3f.	Tr	.8
	17.1-20.6	6f., 5m.	.7	.7
	20.6-24.2	9f., 5m.	2.1	.8
	24.2-29.3	16f., 8m.	1.4	.7

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content		Black sands (lb per cu yd)
		Colors[1]	Value[2] (cents per cu yd)	
		Rock Island placer		
84	0.0- 4.0	12f.	Tr	0.9
	4.0- 8.0	20f., 3m.	Tr	1.4
	8.0-11.6	+25f., 1m.	0.7	1.8
	11.6-16.6	7f., 1m.	Tr	.6
	16.6-19.3	2f.	Tr	.5
	19.3-22.3	3f.	Tr	.6
	22.3-25.4	2f.	Tr	.1
	25.4-29.6	5f.	Tr	.5
	29.6-34.4	5f.	Tr	.1
85	0.0- 4.0	20f.	Tr	1.7
	4.0- 9.0	3f., 2m.	1.4	.6
	9.0-11.8	2f.	Tr	.9
	11.8-16.5	15f., 6m.	.7	1.5
	16.5-19.9	7f., 2m.	1.4	1.0
		Cox Hotspring placer		
86	0.0- 1.3	2f., 1m.	2.1	3.1
	1.3- 4.0	5f.	Tr	4.4
87	0.0- 0.8	2f.	Tr	5.8
	0.8- 4.0	23f., 3m.	1.4	1.7
	4.0- 8.5	1f.	Tr	.4
88	0.0- 0.7	3f., 2m.	2.7	4.7
	0.7- 3.8	4f., 1m.	Tr	1.0
	3.8- 7.6	4f.	Tr	.8
89	0.0- 1.2	3f., 1m.	.7	4.4
	1.2- 5.6	3f.	Tr	1.3
	5.6-10.0	9f., 2m.	2.1	1.1
		Culver Creek placer		
90	0.0- 2.8	+50f., 20m.	10.9	5.0
	2.8- 9.2	+400f., 40m.	15.0	4.0
	9.2-11.3	9f., 1m.	.7	.9
	11.3-14.4	3f., 1m.	.7	1.3
	14.4-18.0	15f., 1m.	.7	1.3
	18.0-22.3	6f., 1m.	.7	.9
	22.3-23.5	+30f.,+35m.	34.2	4.5
	23.5-29.8	50f., 16m.	4.1	1.0
91	0.0- 1.3	4f.	Tr	2.5
	1.3- 5.3	3f.	Tr	1.1
92	0.0- 1.0	2f.	Tr	1.9
	1.0- 5.6	+50f., 2m.	.7	1.9
		Lower Bacon Creek placer		
93	0.0- 1.5	14f.	0.7	3.2
	1.5- 5.2	55f., 14m.	2.1	2.3
94	0.0- 1.0	4f., 2m.	2.1	2.7
	1.0- 5.6	15f., 1m.	.7	.8
		Bacon Creek placer		
95	0.0- 3.2	10f.	Tr	0.9
	3.2- 6.3	+55f., 4m.	2.7	3.6
96	0.0- 2.3	60f., 15m.	2.7	3.0
	2.3- 9.0	62f., 20m., 2c.	4.8	.4
97	0.0- 0.8	6f., 3m.	13.0	4.6
	0.8- 6.8	20f., 12m.	1.4	1.2
		Lower Red Bluff placer		
98	0.0- 1.8	24f., 2m.	4.1	4.6
	1.8-11.8	+400f.,+10m.	5.5	2.1
	11.8-22.3	+35f., 6m.	1.4	.4
	22.3-31.5	7f.	Tr	.4
99	0.0- 1.6	9f.	.7	5.6
	1.6- 4.2	3f.	Tr	2.7
	4.2- 7.1	2f.	Tr	1.5
	7.1- 9.3	2f., 1m.	Tr	1.4
100	0.0- 4.7	2f., 1m.	.7	1.5
	8.8-12.5	5f., 1m.	.7	1.7
	25.8-33.7	7f.	.7	.5
	33.7-38.2	2f., 1m.	.7	.7
	38.2-45.3	16f., 3m.	.7	1.7

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content		Black sands (lb per cu yd)
		Colors[1]	Value[2] (cents per cu yd)	
		Pine Creek placer		
101	0.0- 4.7	+60f., 10m.	4.8	2.2
	4.7- 9.0	18f., 7m.	1.4	1.4
	9.0-15.7	8f., 2m.	.7	.9
	15.7-20.7	25f., 7m.	1.4	1.3
	20.7-26.0	+100f., 11m.	27.3	2.1
		Upper Red Bluff placer		
102	0.0-26.0	+500f.,+80m.	4.1	0.7
	26.0-34.2	9f., 3m.	.7	.7
103	0.0- 1.8	7f.	1.4	.9
	1.8- 5.5	9f., 5m.	1.4	1.2
	5.5- 6.6	3f.	.7	3.4
	6.6- 9.3	5f., 3m.	.7	1.1
104	0.0- 6.7	18f., 5m.	1.4	1.0
	6.7-13.6	26f., 8m.	.7	.7
	13.6-19.2	38f.	.7	7.7
	19.2-24.9	7f., 1m.	.7	1.0
	24.9-30.5	8f., 1m.	1.4	.8
	30.5-36.5	18f., 1c.	2.7	1.4
	36.5-42.5	16f., 6m.	1.4	1.0
		Cougar Ranch placer		
105	0.0- 2.4	Tr	Tr	1.1
	2.4- 9.0	12f., 4m.	3.4	.7
	9.0-12.0	6f.	Tr	.9
	12.0-16.0	5f.	Tr	.9
	16.0-22.8	25f., 8m.	2.1	1.0
	22.8-27.3	12f., 2m.	2.7	.7
106	0.0- 2.6	60f., 10m.	1.4	3.2
	2.6- 4.4	2f., 2m.	1.4	.9
	4.4- 6.6	14f., 2m.	1.4	2.1
	6.6- 8.5	+40f., 8m.	2.1	2.0
	8.5-11.3	40f., 14m.	10.9	3.1
	11.3-15.3	9f., 1m.	Tr	.7
	15.3-17.7	16f., 7m.	1.4	1.8
	17.7-20.2	+35f., 9m.	1.4	2.1
	20.2-24.8	30f., 11m.	1.4	.8
	24.8-28.4	12f.	Tr	1.1
107	0.0- 1.7	90f., 12m.	4.8	3.2
	1.7- 4.5	+50f., 18m., 2c.	17.8	2.5
108	0.0- 3.0	Tr	Tr	------------
		Jackass Flat placer		
109	0.0- 2.0	4f., 1m.	Tr	1.4
	2.0- 5.7	8f.	Tr	.8
	5.7- 9.3	4f.	Tr	.6
	9.3-14.4	6f.	Tr	.5
	14.4-17.9	2f.	Tr	.1
	17.9-21.8	1f.	Tr	.4
110	0.0- 1.6	8f.	0.7	4.3
	1.6- 3.6	17f., 1m.	1.4	4.3
	3.6- 5.8	2f.	Tr	3.4
111	0.0- 2.3	3f.	Tr	.5
	2.3- 7.0	40f., 8m.	4.8	.5
	7.0-11.0	10f., 3m.	2.7	.2
	11.0-15.3	7f., 1m.	Tr	.4
	15.3-18.9	6f.	Tr	.4
	18.9-25.9	12f., 4m., 1c.	1.4	1.4
	25.9-30.3	3f., 1m.	Tr	.8
		Sunflower Flat placer		
112	0.0- 3.0	1f.	Tr	1.0
	3.0- 4.3	1f.	Tr	3.1
	4.3- 7.6	Tr	Tr	1.2
	7.6-12.0	Tr	Tr	.8
		Little Creek placer		
113	0.0- 1.0	3f.	Tr	1.4
	1.0-11.4	15f., 11m.	0.7	.6
114	0.0- 0.9	7f.	.7	1.5
	0.9-14.9	+30f., 13m.	.7	.2

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content: Colors[1]	Gold content: Value[2] (cents per cu yd)	Black sands (lb per cu yd)
		Little Creek placer — Continued		
	14.9-16.4	8f.	Tr	1.4
115	0.0- 6.7	9f., 7m.	1.4	.8
		Lower Thomas Creek placer		
116	0.0- 3.0	3f.	Tr	2.4
	3.0- 5.5	15f., 1m.	1.4	1.1
	5.5- 9.5	4f., 5m.	.7	.3
	9.5-15.5	2f., 8m.	2.1	.4
117	0.0- 4.0	12f., 6m.	1.4	.5
	4.0-11.0	11f., 4m., 1c.	2.7	.5
118	0.0- 3.0	25f., 6m.	2.1	1.3
	3.0- 7.0	8f., 1m.	.7	.5
		Thomas Creek placer		
119	0.0- 1.5	6f.	0.7	2.3
	1.5- 3.0	10f.	.7	2.2
	3.0- 5.3	11f., 1m.	.7	2.0
	5.3-10.3	10f., 1c.	1.4	.5
	10.3-13.1	5f.	.7	.8
	13.1-15.8	2f., 1m.	.7	.8
	15.8-18.8	2f., 1m.	.7	1.0
	18.8-22.8	5f.	Tr	2.3
	22.8-25.1	7f., 1m.	.7	1.9
	25.1-27.1	7f.,4m.	.7	2.1
	27.1-30.3	4f.	Tr	1.2
	30.3-33.5	8f., 3m.	Tr	1.2
	33.5-35.7	8f., 2m.	Tr	1.2
	35.7-40.2	8f.	Tr	2.3
120	0.0- 2.8	27f., 6m.	1.4	.6
	2.8- 4.9	8f., 16m., 2c.	13.7	.5
	4.9- 6.8	11f., 3m., 1c.	4.1	.8
	6.8-11.6	23f., 6m.	1.4	.1
	11.6-13.1	+250f.,+150m.	41.0	3.1
	13.1-17.9	30f., 27m.	6.8	.9
	17.9-19.9	10f., 3m.	1.4	.8
121	0.0- 4.0	4f.	Tr	.7
	4.0- 8.0	4f., 1m.	.7	1.0
	8.0-12.1	5f.	Tr	.8
	12.1-15.9	10f.	.7	.9
	15.9-18.2	18f., 1m.	2.1	2.0
	18.2-21.2	3f.	Tr	1.2
	21.2-24.9	2f., 2m.	Tr	.9
	24.9-26.8	Tr	Tr	1.1
	26.8-29.8	12f.	Tr	1.4
	29.8-33.0	6f., 1m.	Tr	1.8
	33.0-36.6	2f.	1.4	1.1
	36.6-39.6	3f.	4.1	.8
	39.6-42.5	2f.	27.3	.5
	42.5-45.2	28f.	2.1	2.4
	45.2-47.9	18f.	1.4	2.1
	47.9-50.4	2f.	Tr	.8
	50.4-53.4	1f.	Tr	1.2
	53.4-56.1	4f., 2m.	.7	.8
	56.1-58.7	15f.	.7	1.3
	58.7-60.5	3f.	Tr	1.5
	60.5-63.4	12f.	.7	1.1
	63.4-66.3	5f.	1.4	.6
	66.3-68.5	3f., 1m.	.7	.8
	68.5-71.0	2f.	Tr	.9
	71.0-73.0	3f.	Tr	.7
	73.0-75.5	10f., 3m., 1c.	5.5	.7
	75.5-79.5	Tr	Tr	1.6
	79.5-81.5	2f.	Tr	1.6
		Middle Fork Lodge placer		
122	0.0- 1.9	2f.	Tr	0.6
	1.9- 4.0	3f.	Tr	1.2
	4.0- 6.0	2f.	Tr	1.6
	6.0- 9.1	3f.	0.7	1.3
	9.1-11.1	9f., 1m.	1.4	1.1
	11.1-13.1	1f.	Tr	.7
	13.1-15.1	3f., 1m.	1.4	.7
	15.1-17.1	2f.	Tr	.9

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content: Colors[1]	Gold content: Value[2] (cents per cu yd)	Black sands (lb per cu yd)
Middle Fork Lodge placer — Continued				
123	0.0- 2.7	3f.	Tr	1.2
	2.7- 4.4	4f.	Tr	1.9
	4.4- 6.3	3f.	Tr	1.0
	6.3- 8.3	6f., 1m.	0.7	2.3
	8.3-10.5	3f.	Tr	1.0
124	0.0- 2.5	1f.	Tr	.5
	2.5- 3.8	2f.	Tr	.8
	3.8- 5.6	50f., 1m.	10.3	1.6
125	0.0- 3.3	5m.	17.8	2.1
	3.3- 5.4	25f.	2.7	.6
	5.4- 9.7	10f.	Tr	.4
	9.7-13.7	4v.f.	Tr	.5
	13.7-16.7	2v.f., 1m.	.7	.5
	16.7-20.6	8f., 2m.	2.7	.4
	20.6-22.5	90f., 35m.	6.8	.6
126	0.0- 3.0	4f.	Tr	1.8
	3.0- 5.2	Tr	Tr	.6
	5.2- 7.8	2f.	Tr	1.1
	7.8-10.1	3f.	Tr	1.2
	10.1-12.6	2f.	Tr	1.0
	12.6-15.7	2f.	Tr	.8
	15.7-18.6	12f.	.7	1.8
	18.6-21.5	6f.	Tr	1.0
	21.5-24.8	9f.	.7	.8
Huntington placer				
127	0.0- 3.0	N.d.	6.8	0.7
	3.0- 6.0	N.d.	2.7	.7
	6.0- 9.0	N.d.	1.4	.7
128	0.0- 8.0	N.d.	1.4	1.0
	8.0-16.0	N.d.	1.4	1.0
129	0.0- 7.0	N.d.	4.1	.4
	7.0-14.0	N.d.	2.7	.4
Mule Creek placer				
130	0.0- 1.5	4f.	0.7	1.3
	1.5- 3.7	4f., 1m.	.7	1.1
	3.7- 6.0	5f.	.7	.7
	6.0- 8.2	3f., 1c.	4.1	.7
	8.2- 8.6	3f.	1.4	2.7
131	0.0- 1.4	21f.	2.7	3.1
	1.4- 3.9	2f.	Tr	.8
	3.9- 5.4	2f.	Tr	.7
	5.4- 7.2	1f., 1m.	1.4	.8
	7.2- 9.2	3f., 1m.	4.1	.5
	9.2-11.6	11f., 1m.	1.4	1.0
	11.6-13.9	3f., 1m.	.7	1.1
	13.9-15.8	20f., 1m.	1.4	2.3
	15.8-18.1	11f.	Tr	1.1
	18.1-20.9	11f.	Tr	1.2
	20.9-23.8	6f.	.7	1.9
	23.8-30.8	11f., 6m.	.7	.6
	30.8-32.8	5f., 1m.	.7	.8
	32.8-34.8	3f., 1m.	.7	.9
	34.8-36.8	6f., 2m.	2.1	1.1
Indian Joe placer				
132	0.0- 6.0	N.d.	16.4	3.5
133	0.0-10.0	N.d.	2.7	.5
134	0.0- 6.0	N.d.	8.2	1.6
135	0.0-10.0	N.d.	.7	.2
	10.0-20.0	N.d.	Tr	.3
136	0.0- 3.0	N.d.	2.7	1.5
	3.0- 7.0	N.d.	1.4	.6
	7.0- 8.5	N.d.	1.4	.3
Lake Creek placer				
137	0.0- 2.0	N.d.	1.4	0.8
138	0.0- 4.0	N.d.	2.1	.2
	4.0- 8.0	N.d.	2.1	.4
	8.0-10.0	N.d.	1.4	.1

TABLE 23. — *Sample data for Middle Fork district placers* — Continued

Site	Depth interval (feet)	Gold content		Black sands (lb per cu yd)
		Colors[1]	Value[2] (cents per cu yd)	
Lake Creek placer — Continued				
	10.0-12.0	N.d.	4.1	0.3
	12.0-14.0	N.d.	.7	.4
	14.0-16.0	N.d.	.7	.6
139	0.0-11.0	N.d.	.7	.6
	11.0-22.0	N.d.	.7	.4
140	0.0- 6.0	N.d.	3.4	.4
	6.0-10.0	N.d.	1.4	.3
141	0.0-10.0	N.d.	.7	.4

[1]Colors are the number of gold particles observed in the sample. Relative size of particles are as follows: f. (fine) 300 to over 1000 to value one cent; m. (medium) 10 to 300 to value one cent; c. (coarse) less than 10 to value one cent.
[2]Gold value is based on a price of $47.85 per troy ounce.

located during the depression of the 1930's. Jesse R. Butler and associates incorporated the Idaho Central mine in the Copper Mountain area, did considerable development work, and constructed a 5-stamp mill (Idaho Inspector of Mines (Stewart Campbell), 1928). Recently there has been renewed interest in the district, but only the Redridge mine is now active (fig. 94, No. 18).

Lode deposits in the district are mostly tabular fissure veins or silicified shear zones. A total of 200,000 to 300,000 tons containing about 0.6 percent copper is estimated to occur in the Copper Mountain area. A trace to 0.07 ounce gold and 0.6 ounce silver per ton occur in these copper deposits.

Gem-quality opal is produced at the Redridge mine. An indicated reserve of 9,600 pounds and an inferred reserve of 800,000 pounds of opal in rhyolite is estimated at the property. The gem-quality opal is valued at $12 to $24 per pound. Most gravel deposits average less than 1 cent gold per cubic yard. Some deposits as large as 500,000 cubic yards may average more than 10 cents per cubic yard.

COPPER MOUNTAIN (IDAHO CENTRAL) AREA

The Copper Mountain area represents (fig. 94) the most extensively prospected and probably the most highly mineralized area in the Monumental Creek district. Prospects are along a zone which extends about 2 miles northwestward from the head of Copper Creek. The area is made up of separate prospects which historically have been under the same management. Old reports and records refer to the properties as Copper Mountain, Monumental Copper Camp, Idaho Central Mines, or the Iron Clad group of claims. The camp and millsite can be reached by about 8 miles of trail from a road at the mouth of Monumental Creek.

The area has been prospected since about 1898. In 1928 it was controlled by the Idaho Central Mines Co. and managed by Jesse R. Butler. The main mine camp consisted of three cabins and a water-powered 5-stamp mill (fig. 94). Idaho Central Mines Co. remained active until about 1932. Their holdings consisted of 22 unpatented mining claims developed by six short adits totaling about 350 feet in length (N. C. Sheridan, written commun., 1929). According to Idaho Inspector of Mines reports, the property has been idle since 1932. It is now held by Monumental Gold Mining Corp. of Boise, Idaho (Idaho Inspector of Mines (O. T. Hansen), 1968, p. 137).

Copper, silver, and gold minerals occur in quartz veins and silicified shear zones in the Precambrian Yellowjacket Formation. The largest quartz veins probably average 2½ feet in width and are exposed intermittently over 1,200 feet of their strike lengths. Copper content might average 0.4 percent, but silver and gold content is negligible.

IRON CLAD GROUP

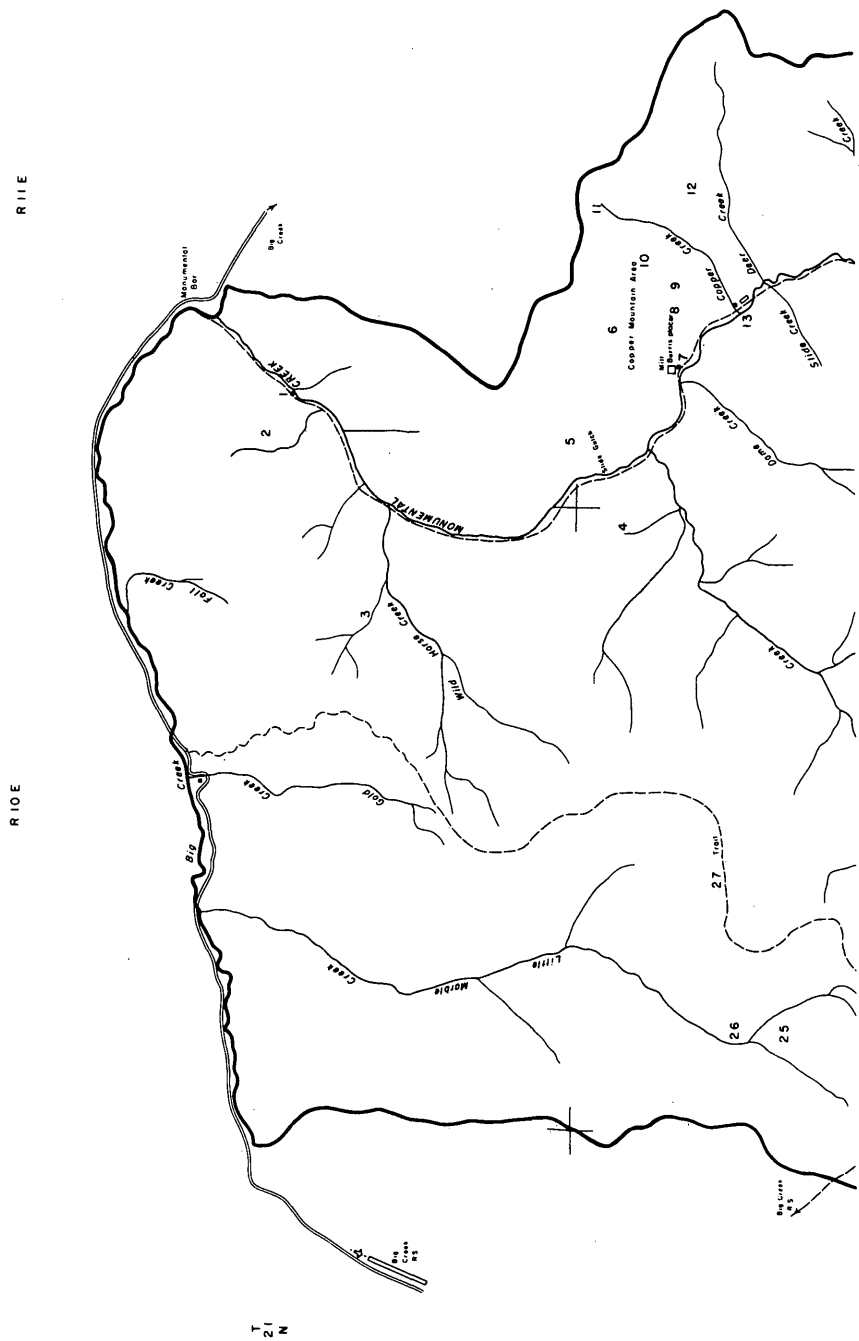
The Iron Clad workings (fig. 94, Nos. 10, 11) consist of two distinct groups of prospects referred to as the upper and lower workings. The upper Iron Clad workings are near the head of Copper Creek at altitudes ranging from about 7,500 to 7,800 feet. The lower workings are about 1 mile north of the mouth of Copper Creek at an altitude of about 6,500 feet. Workings are 1-2 miles northeast from the 5-stamp mill on Monumental Creek.

Country rock is bedded argillaceous quartzite of the Yellowjacket Formation; bedding strikes N. 5°-75° E. and dips 45°-65° NW. Less than 100 feet west of the lower workings, a north-trending Tertiary andesite body intrudes the quartzite. Iron and copper minerals with some gold are in quartz fissure veins and in quartz-rich brecciated zones. Mineralized zones generally trend N. 30°-55° W. and N. 10°-30° E. and dip 35°-90° in various directions. Veins and shear zones are less than 6 inches to 10 feet wide; none are exposed along their strike for more than a few feet. Veins contain quartz and traces of sulfide minerals and are stained with hematite, limonite, and copper minerals.

Exploration and development work at the upper Iron Clad claims (fig. 95) consist of numerous shallow exploration pits and caved adits exposing mineralized zones. The underground workings were driven to crosscut mineralized structures at depth. The caved adit shown in figure 95 apparently intersects mineralized ground because a quartz stockpile is near the portal. Another caved adit, 600 feet west of the mapped area, was driven eastward a few hundred feet but apparently did not intersect a mineralized zone. A small exploration pit, 300 feet south of the mapped area, exposes a 4-foot-wide breccia zone which strikes about N. 15° E. About one-half mile east of the principal upper Iron Clad workings are two short caved adits and a small caved exploration pit on the east side of Copper Creek. A 10-foot-wide shear zone containing three 2-foot-wide parallel quartz veins is

Mines and prospects shown in figure 94

1. Nat Lodė prospect
2. Diamond Creek prospect
3. Wild Horse Copper prospect
4. Snowslide Silver prospect
5. Goat Haven group
6. Copper Clad group
7. Burris placer
8. Green Jacket prospect
9. Barite prospect
10. Lower Iron Clad claims
11. Upper Iron Clad claims
12. Deer Creek prospect
13. Simmons placer
14. Dovel placer
15. Talc Creek prospect
16. Monument prospect
17. Milk Lake prospect
18. Redridge group
19. Monumental Creek Ranch placer
20. West Fork of Monumental Creek placer
21. West Fork Adit prospect
22. West Fork Shaft prospect
23. North Fork of West Fork prospect
24. Catherine Lake prospect
25. Marble Creek prospect
26. Little Marble Creek placer
27. Snowslide Mountain prospect


R 11 E
R 10 E
T 21 N
Monumental Bar
Big Creek
MONUMENTAL CREEK
Copper Mountain Area
Mill
Slide Gulch
Copper Creek
Deer Creek
Slide Creek
Dome Creek
Fall Creek
Horse Creek
Wild
Gold Creek
Big Creek
Marble Creek
Little
Trail
Big Creek R S

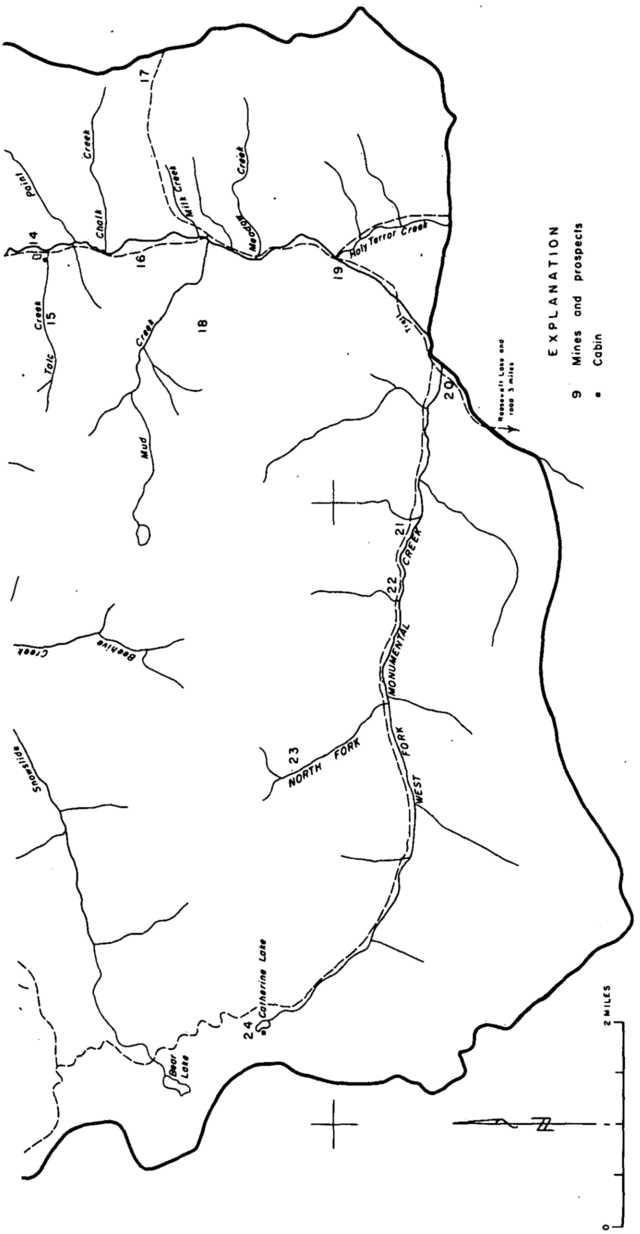


FIGURE 94. — Mines and prospects, Monumental Creek district.

exposed at the portal of one caved adit. The small pit exposes an 18-inch-wide quartz vein.

The nine workings at the lower Iron Clad claims are caved (fig. 95). Some excavations are caved adits, but most are shallow exploration pits. Vein structures are either poorly exposed or completely covered by overburden.

Samples from Iron Clad prospects contained small amounts of gold and silver. Copper values were as high as 1.37 percent but averaged 0.44 percent.

Exposures of quartz veins are scattered intermittently through an area about 1,200 feet long parallel to the strikes on the lower Iron Clad and about 400 feet long on the upper Iron Clad. The veins average about 2½ feet in width and may persist to a depth of 500 feet. Vein material to this depth is estimated to contain about 150,000 tons containing about 0.4 percent copper.

Copper Clad Group

The Copper Clad prospect (fig. 94, No. 6) is about 1 mile north from the mouth of Camp Creek. An obscure foot trail extends from the main Monumental Creek trail to the prospect.

Country rock is argillaceous quartzite of the Yellowjacket Formation (fig. 96). Bedding strikes N. 5° E. and dips 45° W. Ten silicified shear zones are exposed at the property. Most zones strike N. 10°-30° E.; some trend N. 40°-60° W. Dips are from vertical to 60° in various directions. The zones average 2 feet wide and are composed of quartz, hematite, limonite, magnetite, chalcopyrite, malachite, chrysocolla, altered ferromagnesian silicates, and chlorite.

Workings have been dug on four separate shear zones, none of which has been explored for more than a few hundred feet along the strike. Average widths of these zones are estimated to be 2½ feet. Total resources, estimated to a depth of 200 feet, are 40,00 tons. Average copper content may be as much as 1 percent.

Goat Haven Group

The Goat Haven prospect (fig. 94, No. 5) is at an altitude of about 7,500 feet on both sides of Slide Gulch. Access from Monumental Creek is by way of 1½ miles of a poorly defined trail northward from near the mouth of Dame Creek.

The country rock — argillaceous quartzite of the Yellowjacket Formation (fig. 97) — is better exposed on this property than elsewhere in the Copper Mountain area. Quartz introduced along shear planes has filled fissures and replaced some quartzite. The structures mostly strike east and dip 59°-82° N. The veins consist of iron-stained sugary quartz with sericite, malachite, and traces chalcopyrite and pyrite. Samples contained traces gold and silver and a trace to 1.36 percent copper.

There are two groups of workings (fig. 97). The lower group consists of a short inclined shaft and four shallow prospect pits on the north side of Slide Gulch. The inclined shaft exposes a silicified shear zone which strikes N. 85° W. and dips 65° N. and which can be traced for about 100 feet west by intermittent outcrops. The zone, 10 feet wide at the shaft, averages a trace gold, less than 0.1 ounce silver per ton, and 0.6 percent copper. About 100 feet farther west, it is about 7 feet wide and contains an average of 0.13 percent copper and a trace gold and silver. About 40 feet northwest of the shaft, a 2.2-foot-wide vein in the east wall of a small exploration pit strikes east and dips 75° N. A sample across that vein contained a trace gold, 0.1 ounce silver per ton, and 0.41 percent copper. Quartz from the stockpile of a pit 350 feet northeast of the inclined shaft contained traces gold and silver and 1.20 percent copper. Other veins nearby, 1-2 feet wide, contain less in mineral values.

Upper workings are two caved adits and four pits (fig. 97). The two pits farthest east were dug along a silicified fracture zone about 15 feet wide which dips about 80° N. and is exposed intermittently for about 150 feet. A random chip sample along its length contained a trace gold and silver and 1.2 percent copper. This zone is covered and cannot be traced to the east or west. A 2-foot-wide quartz vein is 280 feet to the west. A sample from the outcrop contained a trace gold and silver, and 0.08 percent copper. A stockpile at the portal of adit 1 (caved) contained 0.87 percent copper. Adits 1 and 2 probably were driven to intersect the copper-bearing shear zone.

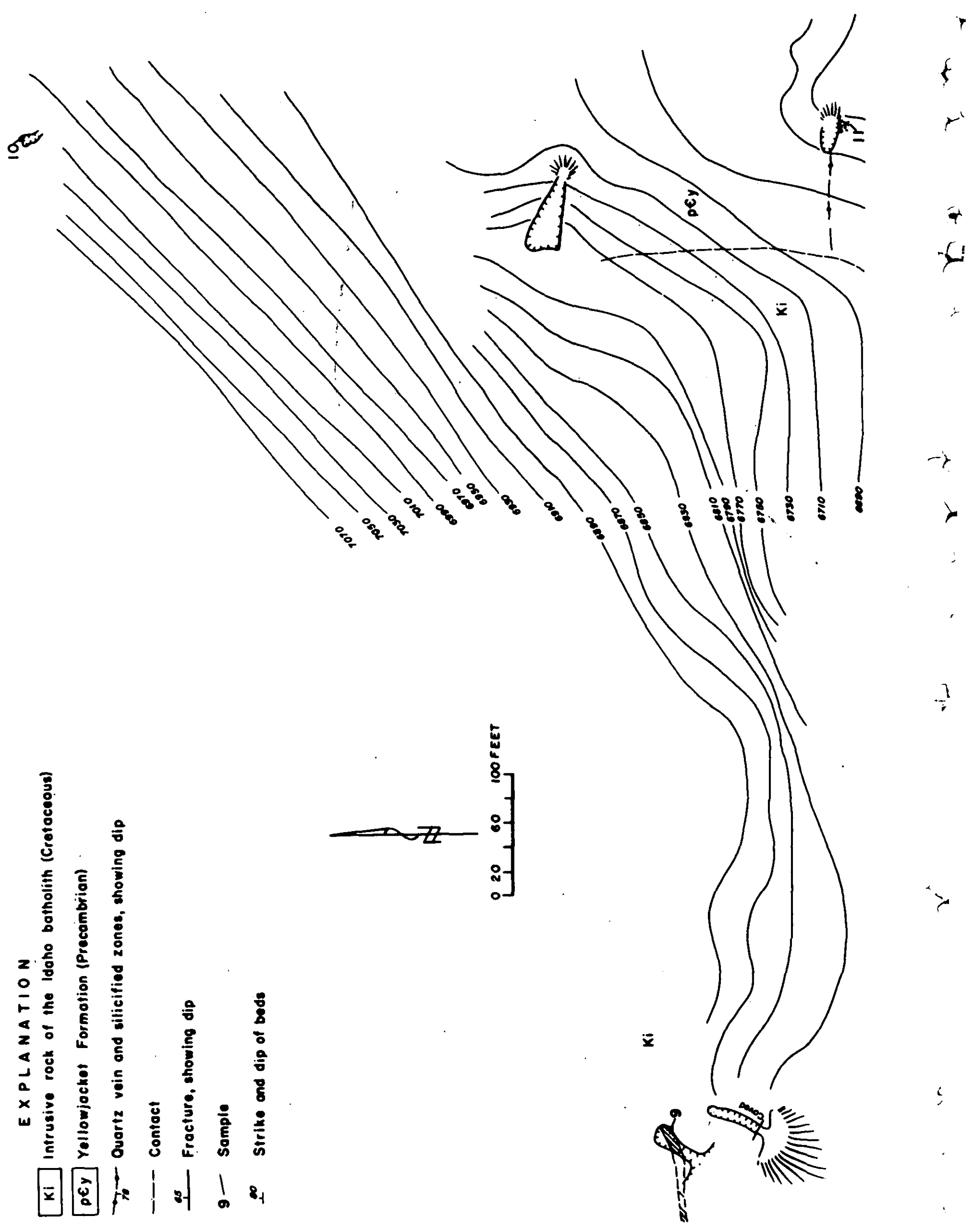
Copper-bearing rock at the Goat Haven group is estimated to be 4,500 tons of about 0.4 percent copper near the lower workings and 15,000-30,000 tons of about 0.8 percent copper near the upper workings. Additional copper-bearing zones probably occur, particularly to the east. Goat Haven structures trend toward those on the Copper Clad group.

Data for samples shown in figure 95

[Tr, trace; N.d., not determined]

Sample No.	Sample Type	Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Iron (percent)
1	Chip	3.5	Tr	Tr	N.d.	N.d.
2	do	3.0	Tr	Tr	N.d.	N.d.
3	do	5.0	Tr	Tr	N.d.	N.d.
4	Grab	Stockpile	Tr	Tr	0.02	24.4
5	do	do	0.07	0.25	N.d.	18.0
6	([1])	?	.02	.6	3.3	N.d.
7	([1])	?	.01	.4	4.1	N.d.
8	Chip	1.0	Tr	.01	N.d.	N.d.
9	do	2.5	.02	Tr	1.37	5.9
10	Select grab		Tr	Tr	.32	4.0
11	Grab	Stockpile	Tr	Tr	N.d.	N.d.
12	Chip	.7	Tr	Tr	.40	35.86
13	do	1.0	Tr	Tr	1.16	25.1
14	Grab	Stockpile	Tr	Tr	.70	40.5
15	do	do	Tr	Tr	.34	18.8
16	Chip	3.0	Tr	Tr	.34	5.6
([2])	Pit face	4.0	Tr	Tr	.32	4.0
([3])	Dump	Select	Tr	Tr	Tr	N.d.
([4])	Vein	1.5	.01	.1	.14	N.d.
([5])	do	2.0	Tr	Tr	.20	11.0

[1]Sample of face; data from old unpublished mine records.
[2]Sample of iron-stained quartzite breccia in pit about 300 feet south of mapped area.
[3]Iron-stained specimens collected north of mapped area.
[4]Sample from pit one-half mile east of mapped area.
[5]Sample from caved adit one-half mile east of mapped area.


EXPLANATION
Ki Intrusive rock of the Idaho batholith (Cretaceous)
pЄy Yellowjacket Formation (Precambrian)
Quartz vein and silicified zones, showing dip
Contact
Fracture, showing dip
Sample
Strike and dip of beds
0 20 60 100 FEET
Ki
pЄy
Ki

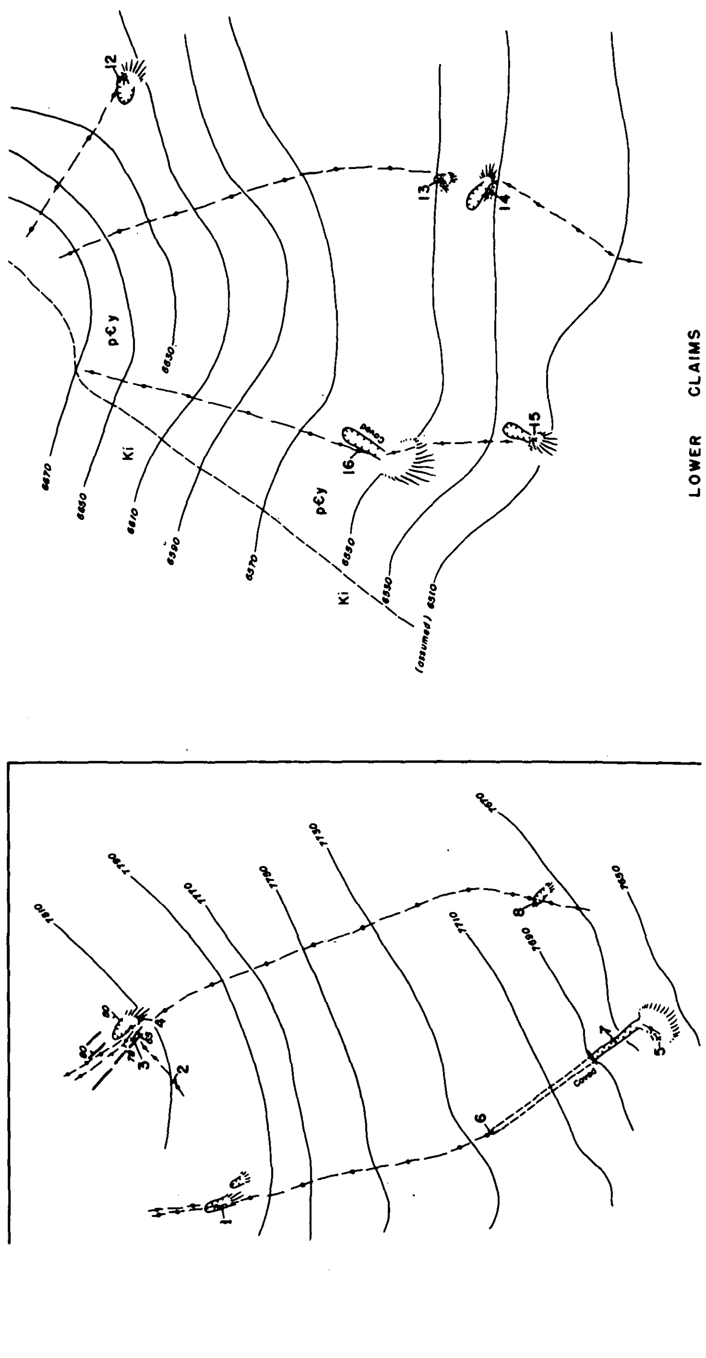


FIGURE 95. — Principal workings, Iron Clad prospect.

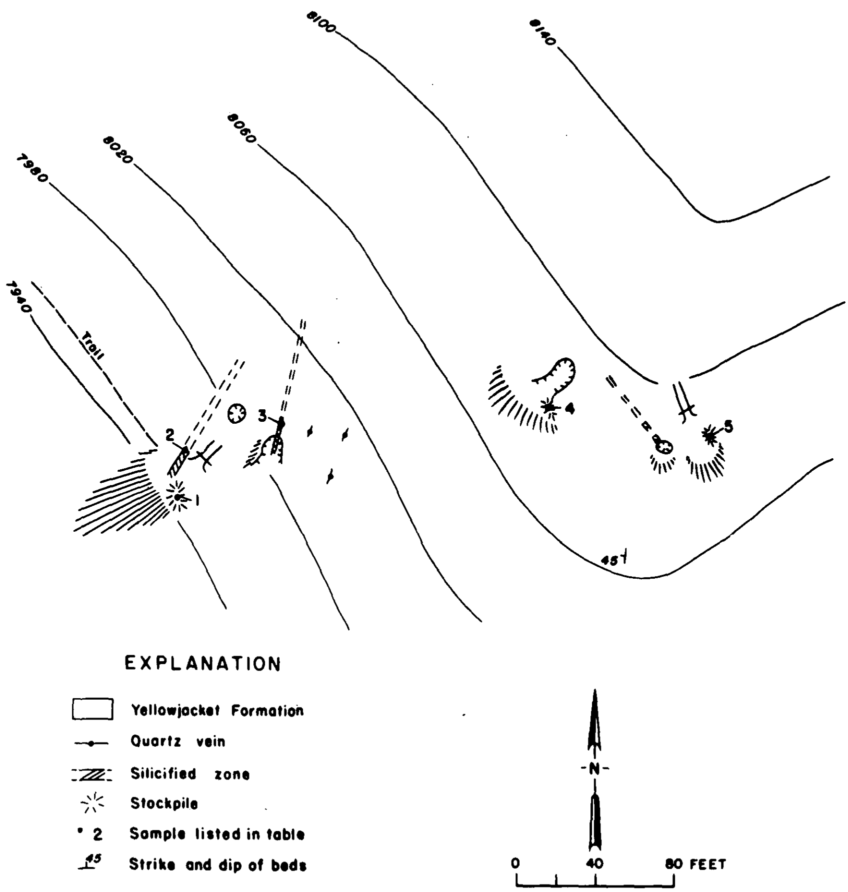


FIGURE 96. — Copper Clad group.

GREEN JACKET PROSPECT

The Green Jacket prospect (fig. 94, No. 8) is at an altitude of about 7,000 feet on a sparsely forested hillside about one-half mile north of Monumental Creek.

Two partly caved north-trending adits, about 100 feet apart, expose iron- and copper-stained silicified shear zones in the quartzite of the Yellowjacket Formation. A silicified zone, 9 feet thick, occurs at the portal of the west adit; it strikes N. 50° E. and dips about 60° NW. A sample from this zone contained a trace gold and silver and 0.94 percent copper. The east adit is badly caved, and only one narrow stringer of mineralized quartz is visible at the portal. A sample of vein material on the dump and in a stockpile contained a trace gold and silver and 1.08 percent copper. A semiquantitative spectrographic analysis of a sample from this property indicated about 70 ppm (0.007 percent) cobalt.

Data for samples shown in figure 96

[Samples 1, 4, 5 are grab; samples 2, 3 are chip. Tr, trace]

Sample		Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
No.	Locality or length (ft)			
1	Stockpile ------	Tr	0.1	2.8
2	3.5	Tr	.1	2.6
3	2.0	Tr	Tr	3.86
4	Stockpile ------	Tr	Tr	1.04
5	----- do -----	0.06	Tr	1.17

Vein material is mostly quartz with some hematite, limonite, malachite, and chalcopyrite. Chalcopyrite is partly altered to hematite and limonite.

Judging from the exposures, about 5,000 tons of resources containing about 1 percent copper is estimated. The property has potential for additional tonnage.

BARITE PROSPECT

The Barite prospect (fig. 94, No. 9) is one-half mile northeast of Monumental Creek and one-half mile north of Copper Creek. The workings on the property consist of one caved adit that trends N. 70° E. Bedrock, not exposed in the vicinity, probably is quartzite of the Yellowjacket Formation. A sample of vein material, composed of barite with some magnetite, limonite, and a trace chalcopyrite and malachite, was selected from the dump. It contained 33 percent barium (equivalent to 56 percent barite) and a trace gold and silver.

MISCELLANEOUS LODE PROSPECTS

Other lode deposits occur scattered mostly within 1 mile of Monumental Creek and the West Fork Monumental Creek or near the head of Little Marble Creek.

REDRIDGE GROUP

The Redridge opal mine (fig. **94**, No. 18) is one-half mile south of Mud Creek and 1 mile west from Monumental Creek. The property is at an

Data for samples shown in figure 97

[Tr, trace]

Sample		Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)
No.	Type				
1	Chip -------	7.5	Tr	Tr	0.13
2	---- do ---	2.0	Tr	0.1	.41
3	---- do ---	7.5	Tr	Tr	Tr
4	---- do ---	10.0	Tr	.1	.64
5	Grab -------	Stockpile -----	Tr	Tr	1.20
6	---- do ---	---- do ----	Tr	Tr	.87
7	Chip -------	2.0	Tr	Tr	.08
8	Random chip --	150.0	Tr	Tr	1.20
(1)	Chip -------	Adit face ------	Tr	.2	1.0
(1)	---- do ---	Shaft --------	0.01	.2	.9

1From old unpublished mine records.

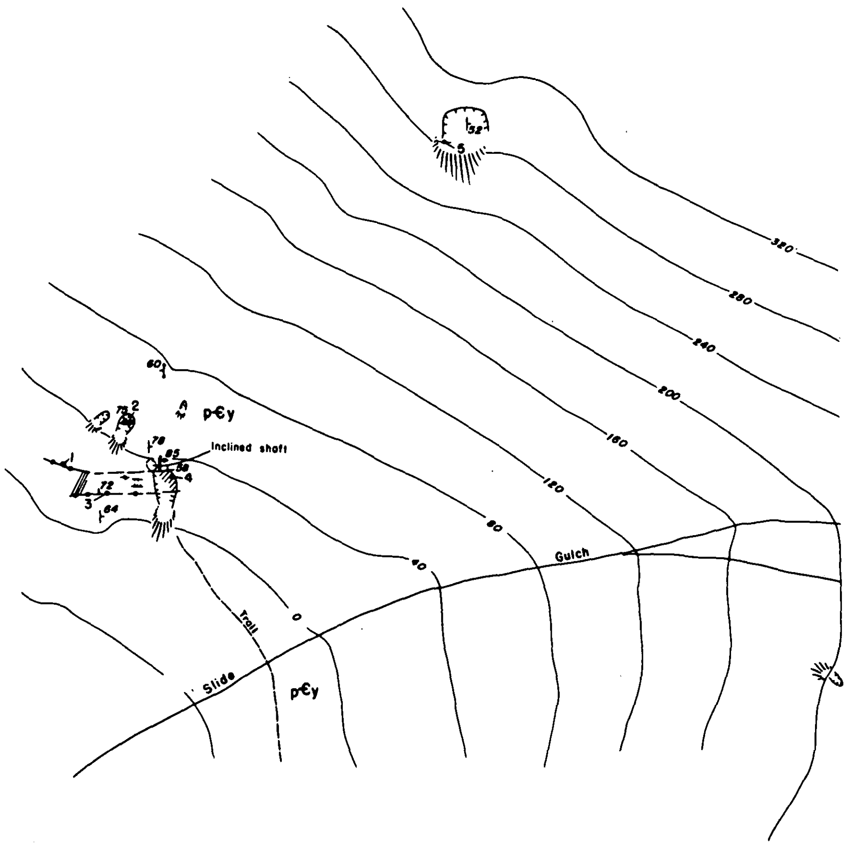
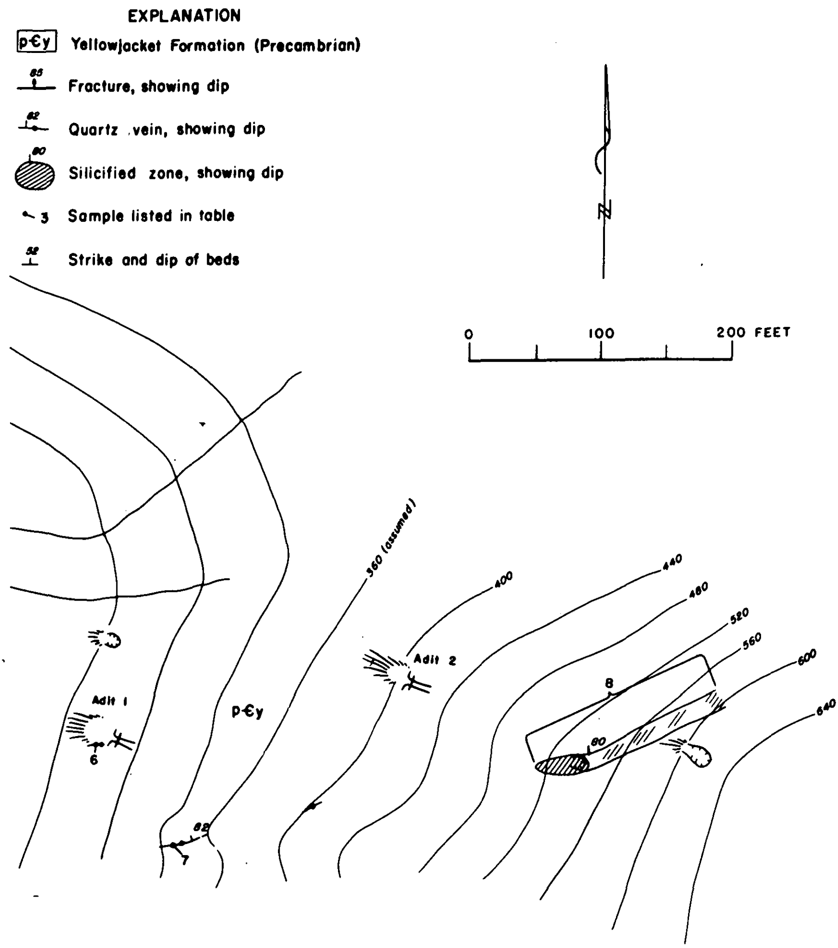


FIGURE 97.—

altitude of 7,300 feet and can be reached by traveling 15 miles of trail from the mouth of Monumental Creek.

The opal occurrence was discovered and staked by Wilbur Wiles in 1963. In 1968 he relocated the property as the Redridge group of claims. Total production has been about 300 tons of rock from which 200 pounds of yellow opal was recovered. About 100 pounds of this opal was sold for $1,000. The present price for opal ranges from $12 to $24 per pound.

The opal occurs as irregular masses a maximum of a few inches across and an inch or more thick in northeast- to northwest-trending fractures in rhyolite (fig. 98). The rhyolite is in an upper unit of the Challis Volcanics easily distinguishable from other rhyolite flows by its black color. The color is due to black rounded obsidian blebs that make up about 50 percent of the rock. The blebs, as much as one-sixteenth of an inch in diameter, weather to



Goat Haven group.

form patches of black obsidian sand that can be used as a surface marker for underlying opal zones.

The opal is transparent, yellow, free of fractures, and of good quality. A small amount, less than 1 percent, is orange to red or contains manganese dendrites (moss opal).

Opal has been mined with handtools from five pits and trenches scattered over a 25,000-square-foot area. The workings are 10-45 feet across and 1-20 feet deep along fracture zones (fig. 99). Opal loss has been high because of breakage during mining.

The Redridge mine has an indicated reserve of 9,600 pounds of yellow opal. Fractures with opal may continue into an area of weathered obsidian and extend one-half mile eastward down Mud Creek and 1 mile southward from the prospect. If the fractures do continue, a resource of as much as

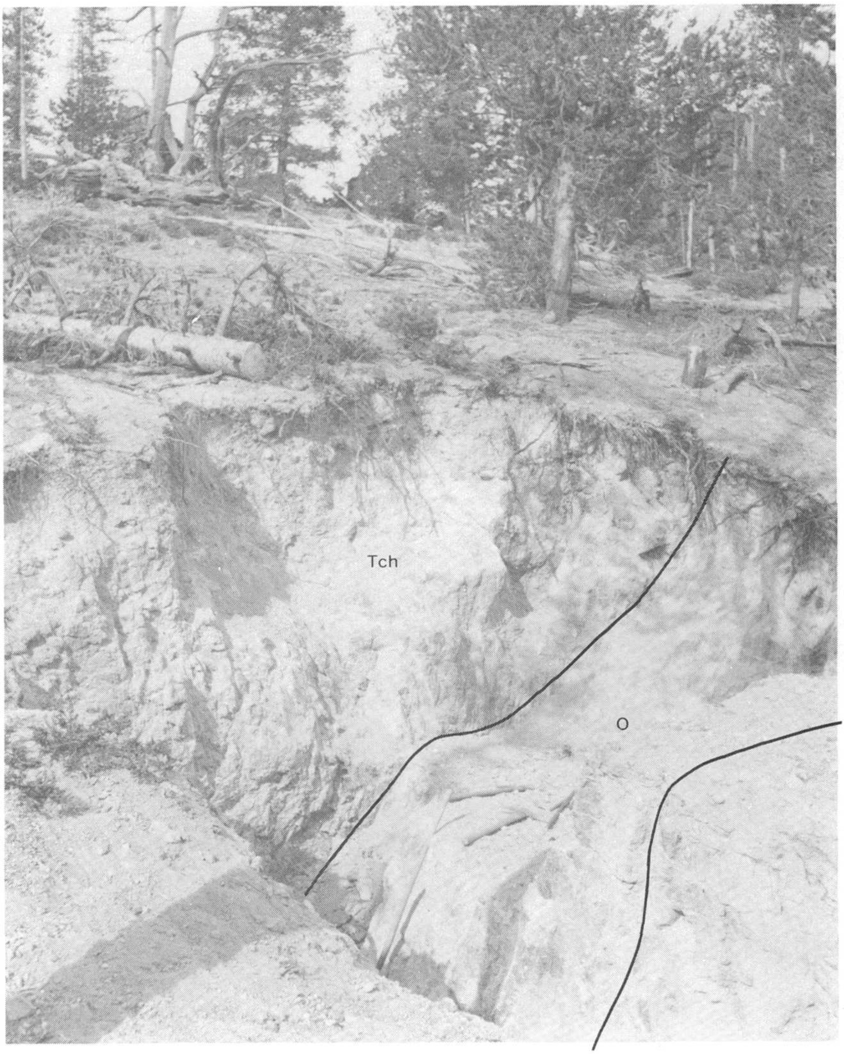


FIGURE 98. — Redridge prospect pit, showing fracture zone containing opal (O). Tch, Tertiary Challis Volcanics.

800,000 pounds of opal can be inferred. Additional opal resources may occur in rhyolite that crops out across Monumental Creek at the head of Milk Creek.

Five chip samples of the opalized zones and country rock contained a trace gold.

OTHER LODE PROSPECTS

Nat Lode prospect. — The Nat Lode prospect (fig. 94, No. 1), currently held by Wilbur Wiles, is about 1 mile by trail southwest of Monumental

Bar. The workings and claim notice are 600 feet due north of the trail and Wiles cabin.

A quartz fissure vein was emplaced along a nearly vertical fault trending N. 67°-75° W. in the Precambrian intrusive complex. An 80-foot-long westerly trending adit and three pits have been dug along veins paralleling the fault. The vein is discontinuous in the adit; segments are as much as 18 inches wide and 50 feet long. Pyrite, chalcopyrite, and tetrahedrite pods are in the quartz. A parallel, 35-foot-long, 1-foot-wide quartz vein crops out 20 feet north of the adit.

Four samples from the main vein consisted of two chip samples totaling 70 feet in length along the adit — one across the adit face and one from a pit 50 feet northwest of the portal. A representative sample, 35 feet long, was taken from a quartz vein paralleling the fault, and a sample of country rock was taken 20 feet south of the portal. The sample from the pit contained 0.03 ounce gold per ton. Three samples contained a trace gold; the other two contained no detectable gold. One vein sample contained a trace silver.

Diamond Creek prospect. — The Diamond Creek prospect (fig. 94, No. 2) is on the ridge approximately three-fourths mile northwest of Monumental Creek. Pods of specular hematite in argillaceous quartzite of the Precambrian Yellowjacket Formation are exposed in 12 small pits. Outcrops are scarce. Assays and spectrographic analyses indicate that the hematite pods contain a trace gold.

Wild Horse Copper prospect. — The Wild Horse Copper prospect (fig. 94, No. 3) is one-fourth mile above the mouth of the north fork of Wild Horse Creek. The claim was located by Wilbur Wiles in 1961. A pit and several cuts have been dug along a calc-schist zone that is 4-6 inches wide and 60 feet long. The zone trends N. 10° W. and dips 40° NE. through greenschist of the Yellowjacket Formation near intrusive rock. The calc-schist contains chalcopyrite and is stained with iron oxides and a minor amount of malachite. Assays and spectrographic analyses indicate only a trace copper and no gold or silver.

Snowslide Mountain prospect. — The Snowslide Mountain prospect (fig. 94, No. 27) is near the summit of Snowslide Mountain. One exploration pit exposes a pod of hematite and magnetite in quartzite. The pod, about 1 ton, contains about 60 percent iron oxides. No other metals were detected.

Marble Creek prospect. — The Marble Creek prospect (fig. 94, No. 25) is near the head of Little Marble Creek. Several pits expose quartz veins in argillaceous quartzite of the Precambrian Yellowjacket Formation. The veins, stained with iron oxides, are less than 6 inches wide. The quartz contains a trace gold and silver, and spectrographic analyses indicated 0.015 percent nickel and 0.01 percent lead.

Catherine Lake prospect. — The Catherine Lake prospect (fig. 94, No. 24) consists of one caved adit and 12 exploration pits near Catherine Lake. Bedrock is andesitic to rhyolitic Challis Volcanics. Overburden is extensive,

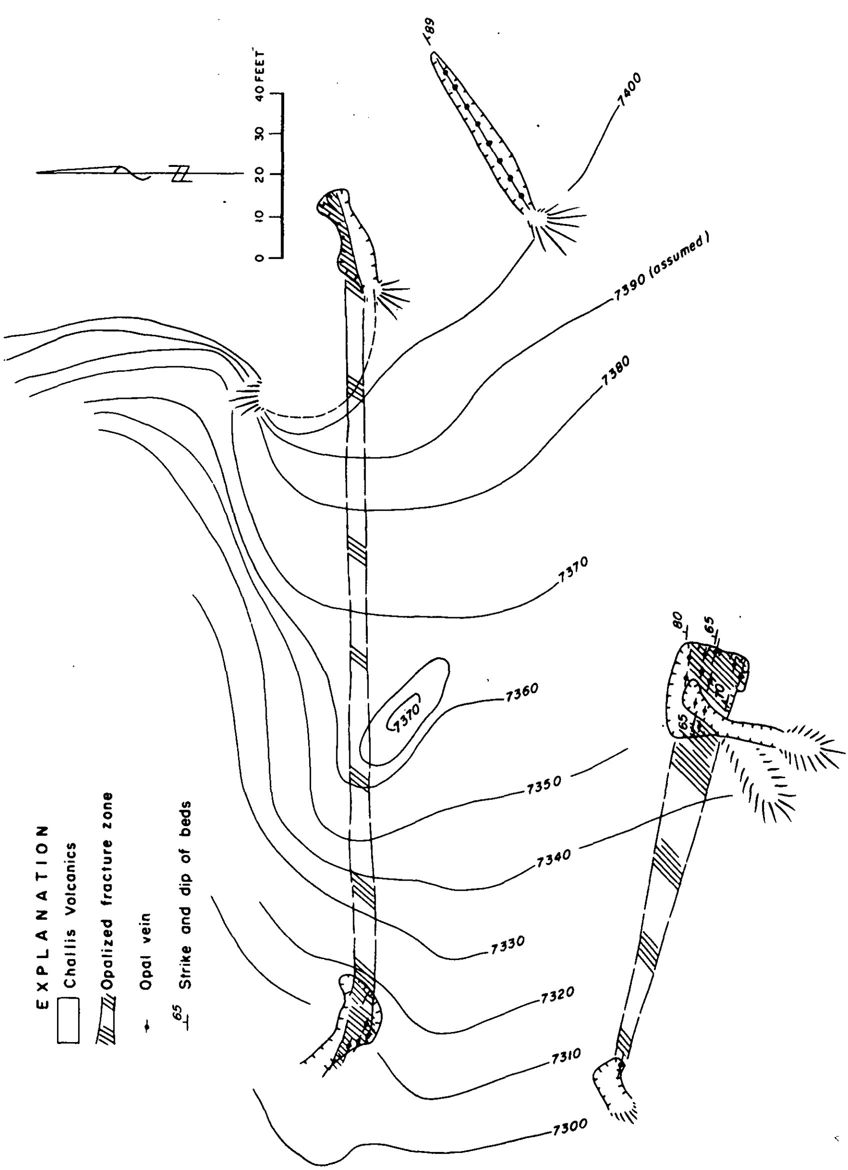


FIGURE 99. — Redridge group.

and few excavations reached bedrock. Samples from these workings contained no more than a trace gold and silver. Samples were taken to test for placer gold, but none was found.

North Fork of West Fork prospect. — Prospectors dug several exploration pits along the North Fork West Fork Monumental Creek (fig. 94, No. 23). Most of these pits are in thick talus below cliffs of iron-stained andesite and did not reach bedrock. Samples from the pits contained no more than a trace gold and 0.10 ounce silver per ton.

Monument prospect. — The Monument prospect (fig. 94, No. 16) is about one-fourth mile south of the mouth of Talc Creek. Country rock is Cretaceous granite of the Idaho batholith, overlain in places by rhyolite and andesite of the Challis Volcanics. Some fractures in the granite contain opal. Several exploration pits and the dump of a caved adit contain fractured granite with opal veins and coatings. Both the granite and volcanics contain only a trace gold.

Talc Creek prospect. — The Talc Creek prospect (fig. 94, No. 15) is about 1 mile upstream from the mouth of Talc Creek. One caved adit exposes iron-stained andesite of the Challis Volcanics. A sample of it showed a trace gold.

Deer Creek prospect. — The Deer Creek prospect (fig. 94, No. 12) is 1½ miles northeast from the mouth of Deer Creek. One exploration pit exposes iron-stained serpentine in a shear zone. The zone is in purple schistose quartzite of the Yellowjacket Formation. The zone is 12-14 feet wide, trends N. 23° W., dips 32° NE., and is parallel to bedding in the quartzite. The serpentine contains a trace copper.

Snowslide Silver prospect. — The Snowslide Silver prospect (fig. 94, No. 4) is about 1 mile northwest of the mouth of Snowslide Creek. Two exploration pits are in iron-stained quartz veins in quartzite of the Yellowjacket Formation. The largest vein exposure is 2 feet thick and less than 100 feet long. Samples of vein quartz and quartzite wallrock contained nothing of value.

West Fork Shaft prospect. — A caved shaft in talus near West Fork Monumental Creek (fig. 94, No. 22) is about 6 miles downstream from Catherine Lake. The dump consists of iron-stained rhyolite and andesite with some pyrite along fractures. A dump sample contained no gold or other metals.

West Fork Adit prospect. — An adit and a pit were dug along a vertical rhyolite dike, striking N. 10° W., one-half mile downstream from the shaft (fig. 94, No. 21). The outcrop is about 100 feet wide, 160 feet long, and 50 feet high. The rhyolite contains disseminated pyrite. Only a trace copper was found.

Milk Lake prospect. — The Milk Lake prospect (fig. 94, No. 17) is at the head of Milk Creek. The claims were located in 1963 by Wilbur Wiles to mine petrified wood. Several exploration pits expose volcanic tuff and ash of the Tertiary Challis Volcanics. Petrified wood and a trace gold and silver were found in the volcanic material. The petrified wood is not of lapidary quality.

PLACER DEPOSITS

Nearly all flat creek-bottom land in the district, about 900 acres, has been located by placer mining claims in the past; some deposits are currently held by location. The better placer ground consists of stream terraces, some of which are 50 feet or more above the present stream. Part of the gravel was deposited as outwash from retreating Pleistocene glaciers. Higher terraces are probably remnants of earlier flood plains.

The district's most extensive placers are along Monumental Creek (table 24). These are the Dovel, Simmons, Monumental Creek Ranch, and Burris placers (fig. 94, Nos. 14, 13, 19, 7), which aggregate about 400 acres. All are privately held, except for the Monumental Creek Ranch, which is owned by the U.S. Forest Service. Gold is reported to have been produced from each property, but no records are available. About 25 million cubic yards of terrace gravel are estimated to occur on these properties. Average gold content, inferred from limited sampling, is less than 1 cent per cubic yard. Black sand concentrates consist chiefly of ferromagnesian silicate minerals and magnetite, with less than 7 percent ilmenite, less than 1 percent zircon and rutile, and a trace apatite, sphene, epidote, tourmaline, and altered pyrite.

Typical placer gravel in the Monumental Creek district is principally rhyolite and quartzite. From 5 to 20 percent of the constituents are clay and silt size, 25-40 percent are sands and pebbles less than 1 inch across, 20-50 percent are pebbles and cobbles 1-6 inches across, and 20-25 percent are cobbles and boulders larger than 6 inches across. Gold concentrations commonly occur in upper and lower gravel layers; clay-rich zones served to localize gold deposition.

The Challis Volcanics are probably the source of the placer gold. Volcanic rocks of the area commonly contain from a trace to a few hundredths of an ounce gold per ton.

SALMON RIVER DISTRICT

The Salmon River district (fig. 100) covers about 330 square miles along the north end of the Idaho Primitive Area. It is a strip of land 3-12 miles wide by about 50 miles long, along the north side of the area, by the Salmon River.

The district is accessible by boat during favorable water conditions and by small aircraft, which use landing fields at Campbells Ferry and Cold Meadows. There are no roads within the district, but a network of trails extends across the area. Pack bridges at Mackay Bar and near the mouth of the Middle Fork Salmon River provide access to the trails and can be reached by roads on the north side of the Salmon River.

Topographic relief is extreme. Steeply inclined canyon walls rise more than 5,000 feet from river level to altitudes of more than 8,500 feet in less

TABLE 24. — *Summary data, Monumental Creek placers*

[Locations are shown in fig. 94. Data on Dovel placer (No. 14) withheld at request of owner. Tr, trace]

Mine or prospect	Deposit	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands (lb per cu yd)
7	Burris	25	645,000	Tr to 19.1	2.6
13	Simmons	55	1,230,000	Tr to 15.0	2.1
19	Monumental Creek Ranch	300	21,780,000	Tr to 6.8	1.2
20	West Fork Monumental Creek	400	30,000,000	Tr to 1.4	.5
26	Little Marble Creek	85	2,057,000	Tr	1.0

[1]Gold values are based on a price of $47.85 per troy ounce.

than 4 horizontal miles. Dense stands of conifers are found along the Salmon River and some tributaries. The higher altitudes are grassy with scattered brush or are barren of vegetation.

The Salmon River district has a history of small-scale placer and lode mining dating to the 1860's. Production, probably small, was recorded with that of surrounding mining districts. Mineral occurrences in the district include gold, silver, lead, zinc, and fluorspar. Approximately 92 placer and 23 lode claims have been located. Many of these were relocations of earlier claims. The placer claims are confined to bars and terraces along the Salmon River.

The Idaho batholith comprises 90 percent of the country rock. Lode deposits, most of them quartz veins, are in the Idaho batholith and Yellowjacket Formation.

Gold, silver, and lead minerals occur in prospects (fig. 100, Nos. 3, 5) in the Sheepeater Mountain-Fivemile Creek area. Considerable development work was done at the Painter mine (fig. 100, No. 2), but there is no recorded production. A low-grade fluorspar deposit occurs near the Salmon River between Big Bear and Arctic Creeks (fig. 100, No. 18). Galena and molybdenite are reported to occur in talus slopes of the Cottonwood Butte area, but none was found (fig. 100, No. 21).

Nearly all alluvial deposits along the Salmon River and some high mountain meadows have been located as placers. Some of these lands have been patented, others are actively held, but most have been allowed to lapse. There is no record of placer gold production. Production was probably small, as indicated by a few scattered workings. All potential placer sites containing substantial yardage were sampled for gold and other heavy metals. Average gold values in placer samples was 1 cent per cubic yard and black sand concentrates averaged 1.5 pounds per cubic yard.

LODE DEPOSITS

SHEEPEATER PROSPECT

The Sheepeater prospect (fig. 100, No. 5) is 12 miles west by trail from the Chamberlain Guard Station landing field and 15 miles north by trail from the road at the Werdenhoff mine. The properties lie on a flat, gently

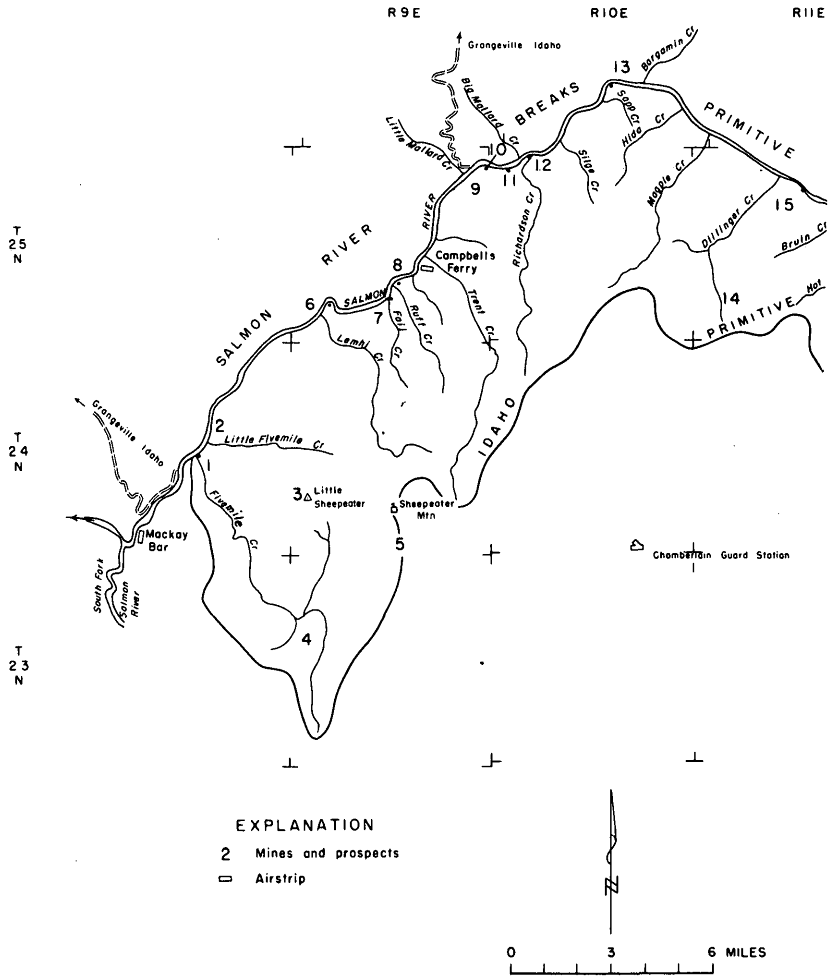
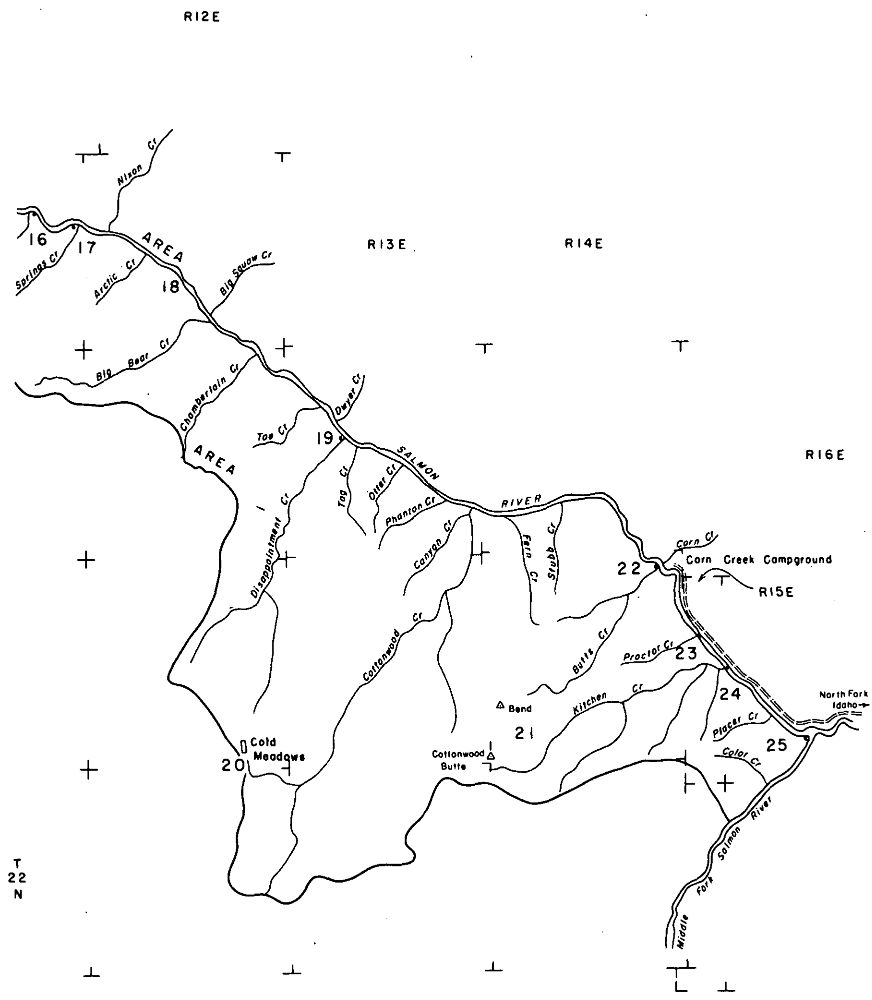


FIGURE 100. — Mines and prospects,

Mines and prospects shown in figure 100

1. Excelsior Bar placer
2. Painter mine
3. Little Sheepeater prospect
4. Hen Creek prospect
5. Sheepeater prospect
6. Lemhi Bar placer
7. Fall Creek Bar placer
8. Widow Bar placer
9. Hermit Hanks prospect
10. Hermit Hanks Bar placer
11. Julie Creek Bar placer
12. Richardson Creek Bar placer
13. Meyers Creek placer
14. Dillinger Meadows placer
15. Bear Creek Bar placer
16. Bruin Creek Bar placer
17. Barth Hot Springs Bar placer
18. Smothers Fluorspar prospect
19. Disappointment Bar placer
20. Cold Meadows placer
21. Cottonwood Butte prospects
22. Cunningham Bar placer
23. Proctor Bar placer
24. Kitchen Creek Bar placer
25. Middle Fork placer



Salmon River district.

sloping, hummocky ridgetop. Overburden as much as 10 feet thick covers the ridgetop, which is moderately forested and grassy. The only outcrops in the area are on the glaciated eastern flank of the ridge.

The prospects, first located by James Hand in 1932, were relocated in 1949 by H. G. Weber. Cecil Woodward, Salt Lake City, Utah, the present owner, located the properties as Ann Nos. 1 and 2 in 1969.

The Ann No. 2 workings consist of one collapsed adit and several small exploration pits and trenches dug by James and M. J. Hand who prospected

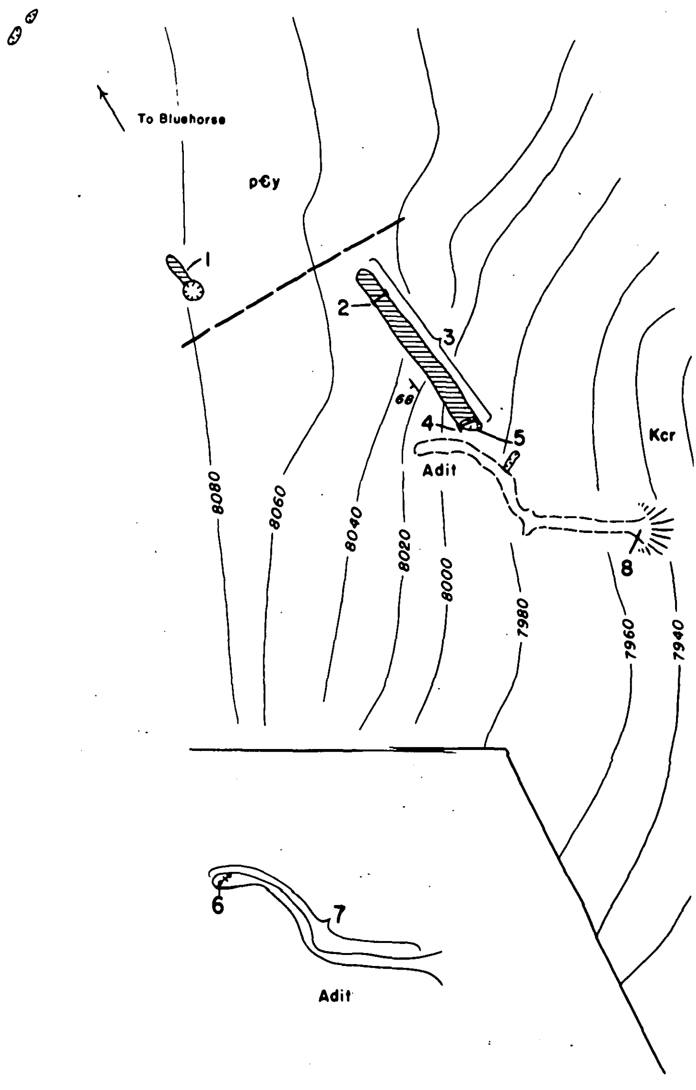
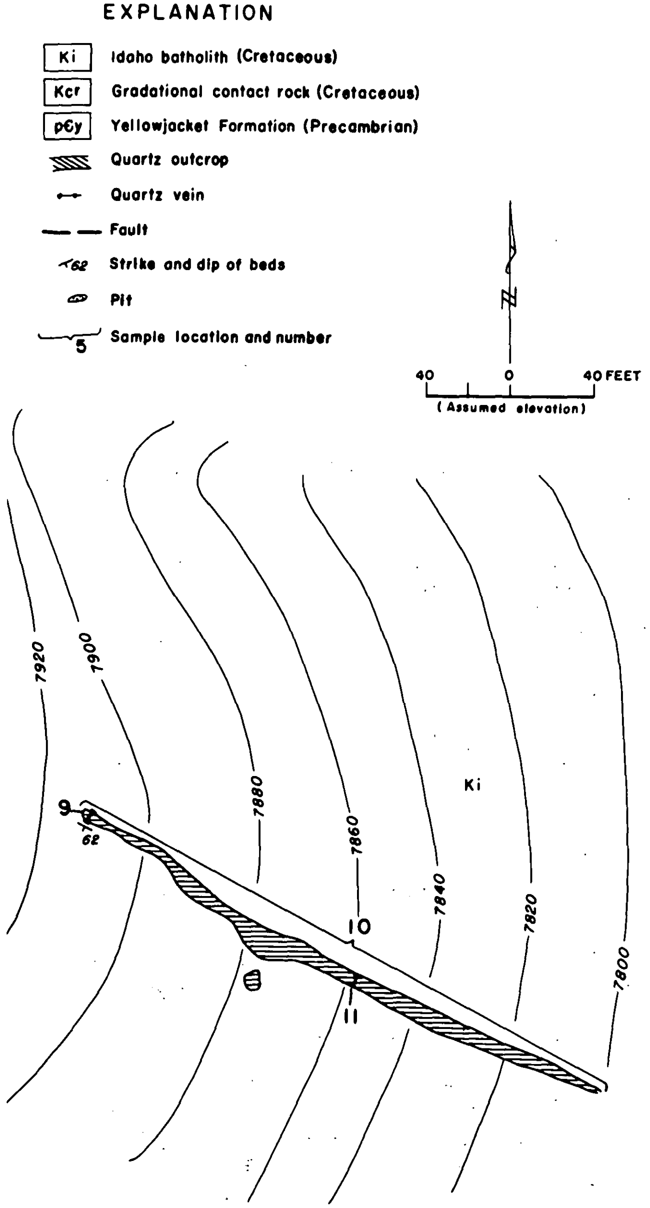


FIGURE 101. — Ann No. 1 workings,

for the gold that was reported to be widespread in the soil in this area. Apparently, no ore was found. The area is covered by deep overburden, and no country rock or mineralized rock crop out. The dumps contain less than 1 percent massive vuggy fractured iron-stained quartz. Vugs are lined with



Sheepeater prospect.

limonite and manganese oxide. No sulfides were seen. Five samples were taken from the overburden exposed by the workings, and two were taken from select pieces of quartz found on the dumps. Three auger holes, 3-4.5 feet deep, were drilled. One sample from overburden in the discovery pit

Data for samples shown in figure 101

[Tr, trace; N.d., not determined; N, not detected]

Sample No.	Sample Type	Location or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Lead (percent)	Zinc (percent)
1	Random chip	25.0	Tr	0.76	N.d.	N
2	Chip	7.0	Tr	Tr	0.09	0.10
3	Random chip	90.0	Tr	4.82	1.2	N
4	Chip	11.0	Tr	5.0	1.0	.10
5	Select grab	Dump	N	37.0	4.0	.06
6	Chip	2.0	0.01	6.2	1.1	1.0
7	Random chip	42.0	Tr	.46	N.d.	N
8	Select grab	Dump	Tr	16.54	N.d.	5.1
9	Chip	12.0	Tr	Tr	Tr	Tr
10	Random chip	280.0	N	.42	N.d.	Tr
11	Chip	12.0	N	Tr	Tr	Tr

contained 0.52 ounce gold per ton and 0.17 ounce silver per ton. The nine other samples taken at the Ann No. 2 workings contained a trace gold and as much as 0.70 ounce silver per ton.

The Ann No. 1 workings are on a glaciated slope 1½ miles south of the lookout on Sheepeater Mountain. The workings are on or near the contact between argillaceous quartzites of the Yellowjacket Formation and granite of the Idaho batholith (fig. 101). The quartzites are irregular masses cut by aplitic and granitic dikes.

A short adit and three pits explore segments of a quartz vein (fig. 101). The vein strikes N. 35°-65° W., dips 60°-70° SW., and cuts both Yellowjacket and granitic rocks. The vein ranges in width from 2 to 15 feet, is intermittently exposed for a length of 680 feet, and is apparently offset by faulting. Composition is 90-95 percent iron-stained quartz and 5-10 percent granitic rock and quartzite inclusions. Lenses in the vein contain as much as 5 percent galena and sphalerite. The massive quartz contains as much as 1 percent disseminated sulfides.

Based on samples from the middle segment, there is about 10,000 tons averaging 8 ounces silver per ton, 1 percent lead, and 1 percent zinc.

Little Sheepeater Prospect

The Little Sheepeater prospect (fig. 100, No. 3) is on the rugged ridge crest of Little Sheepeater Point and is accessible only by trail and cross-country hiking. The property was located in 1949 by H. G. Weber.

Exploration work (fig. 102) consists of two short adits and six small pits, which expose two quartz veins — one trending east to southeast and the other trending northeast. Country rock near the prospect is argillaceous quartzite of the Yellowjacket Formation, which has been intruded by granitic rocks.

The easterly to southeasterly trending vein, exposed by two short adits and five pits, is 4 feet wide and is locally exposed for 375 feet. It is composed of glassy white quartz containing less than 0.5 percent disseminated pyrite and galena. The vein strikes S. 65° E. on the west end and due east on the

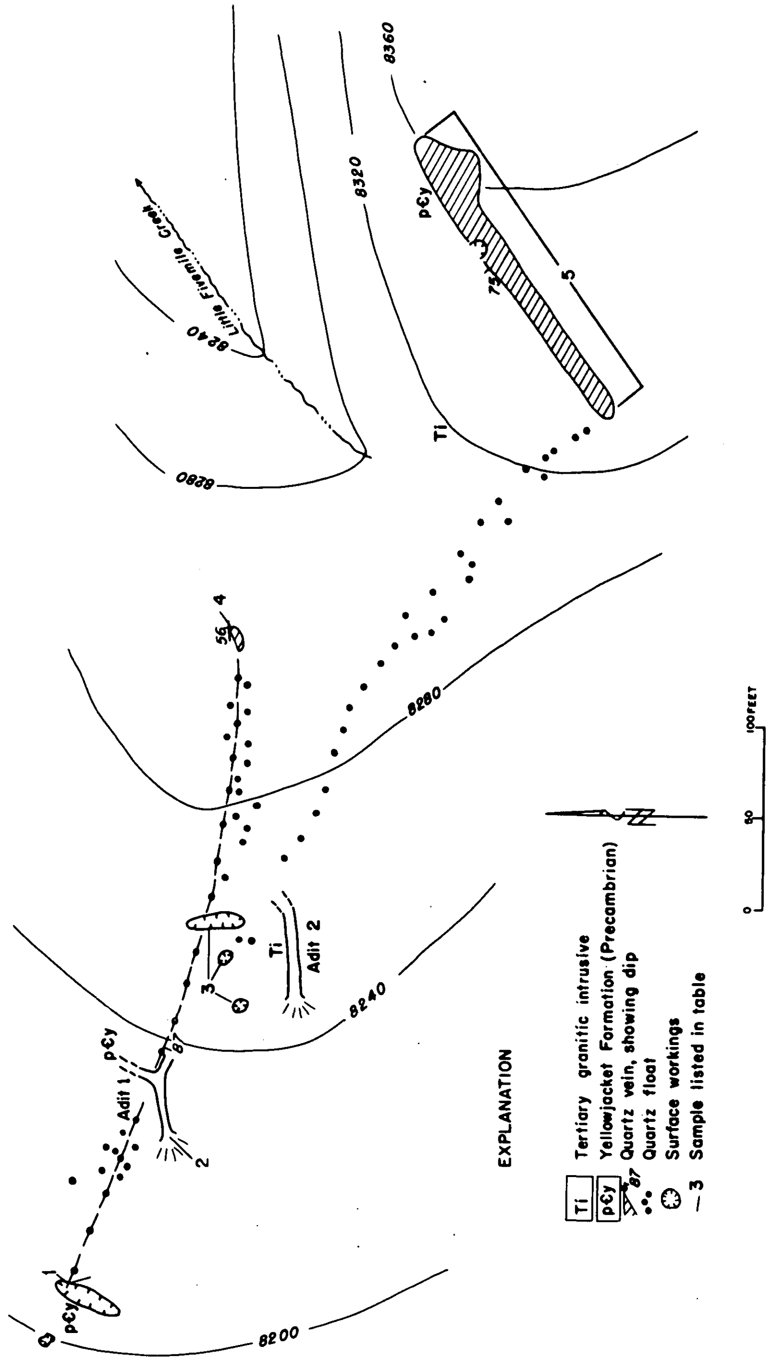


FIGURE 102. — Little Sheepeater prospect.

Data for samples shown in figure 102

[Tr, trace]

Sample No.	Sample Type	Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)	Copper (percent)	Lead (percent)
1	Select grab	Dump	Tr	1.28	Tr	0.16
2	do	do	Tr	1.21	Tr	.41
3	do	do	Tr	1.48	Tr	.24
4	Chip	4.0	Tr	.65	0.01	.65
5	Random chip	190.0	Tr	1.18	Tr	.06

east end; it dips 85° S. Material on the dumps indicate that sulfide minerals are in pods and lenses in quartz; none were seen in outcrop.

The second quartz vein, 450 feet to the southeast, strikes N. 25° E. and dips 75° NW. Its outcrop is 15 feet wide and 190 feet long. The composition is white quartz containing less than 5 percent disseminated pyrite and galena. A small pod of sulfides was seen in a small pit but not in outcrop.

The two veins are estimated to contain 86,000 tons of low-grade material averaging 1.24 ounces silver per ton and 0.18 percent lead.

Painter Mine

The Painter mine (fig. 100, No. 2) is near the confluence of Little Fivemile Creek and the Salmon River and lies on both sides of the Salmon River. Access to the mine is by way of a four-wheel-drive road. The property, consisting of four patented lode claims and an adjoining homestead, was first located in 1935 by Clyde D. Painter. During 1937 and 1938 the property was developed by the Idaho Newsome Mining and Milling Co. (Idaho Inspector of Mines (Arthur Campbell), 1937, p. 171). Ore was mined and milled, but there is no recorded production. Robert V. Hansberger of Boise, Idaho, currently owns the property.

Improvements on the west side of the river consist principally of a burned mill building with attendant buildings and an adit (fig. 103). These improvements are discussed in detail in a report on the Salmon River Breaks Primitive Area (E. T. Tuchek, in Weis, Schmitt, and Tuchek, 1972, p. C59-C62).

An aerial tramway connects the mill to an ore bin on the east side of the river. Improvements on the east side (Idaho Primitive Area) include a shaft, headframe, hoist house, two shops, five adits, two trenches, and one pit. The main production is rumored to have come from the shaft, which is flooded to the collar.

The country rock is intensely fractured silicified quartz monzonite and granodiorite of the Idaho batholith. It is cut by numerous andesite dikes that trend north-northeastward, dip southeastward, vary in width from less than 1 foot to 100 feet, and are traceable for more than 100 feet. The workings explore irregular quartz-filled shear zones as much as 4 feet wide in the country rock and along contacts between the country rock and andesite dikes.

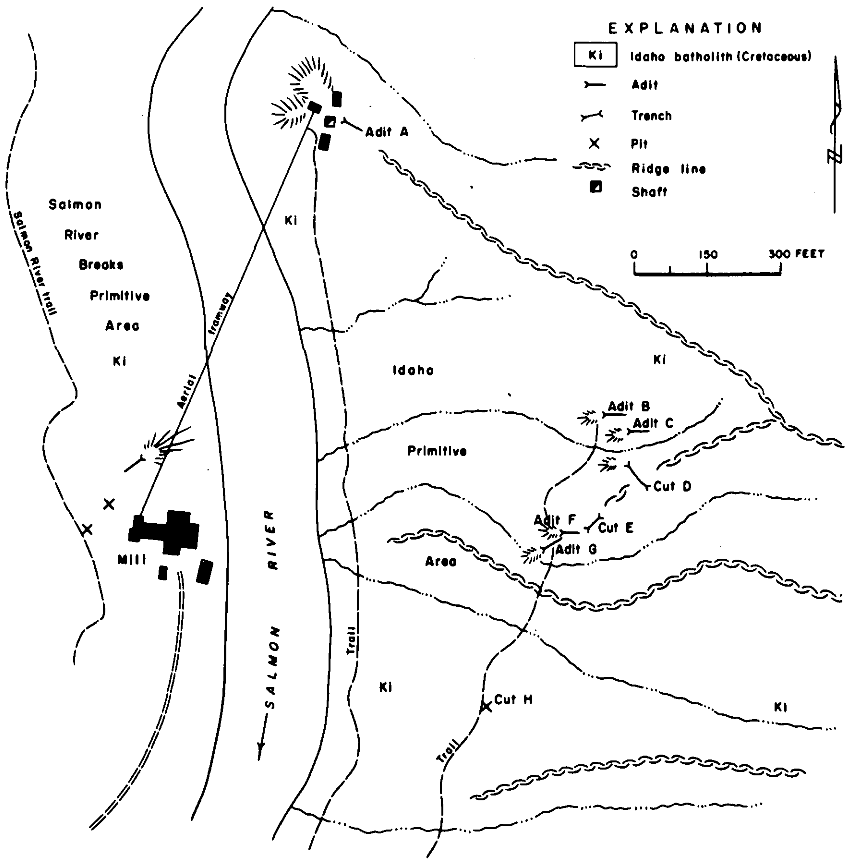


FIGURE 103. — Painter mine.

The quartz is clear to milky white and occurs as discontinuous lenses and stringers. Sulfide minerals are absent in the shear zones; however, minor amounts of pyrite and iron-oxide blebs and stains occur in the country rock. Shears explored by each of the five adits are weak and pinch out within 50 feet (figs. 104, 105). Samples were collected from contact zones, shear zones, quartz lenses, and dikes exposed by the five adits and three cuts. Only two samples contain significant values — sample 5, 4 feet wide, from adit A, contained 1.18 ounces gold and 0.63 ounce silver per ton, and sample 1, 0.2-foot wide, from a narrow quartz veinlet in cut D, assayed 3.95 ounçes gold per ton (fig. 106).

Sample localities for adit A are shown in figure 104, for adits B, C, F, and G in figure 105, and for the surface cuts D, E, and H in figure 106.

The high but erratic gold content of the samples indicates that the property has a limited potential for discovery of economically minable deposits. Some production was apparently made in the 1930's, but there are no records.

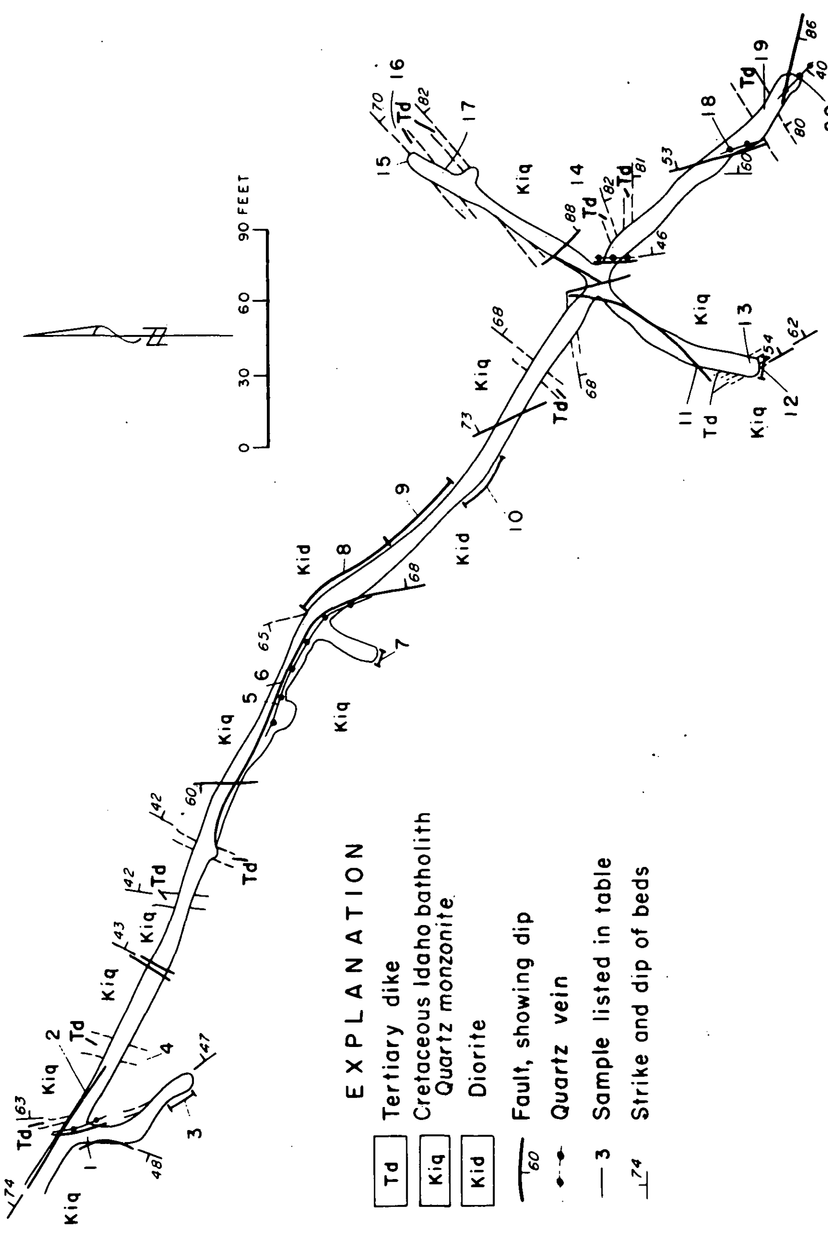


FIGURE 104. — Underground workings, adit A, Painter mine.

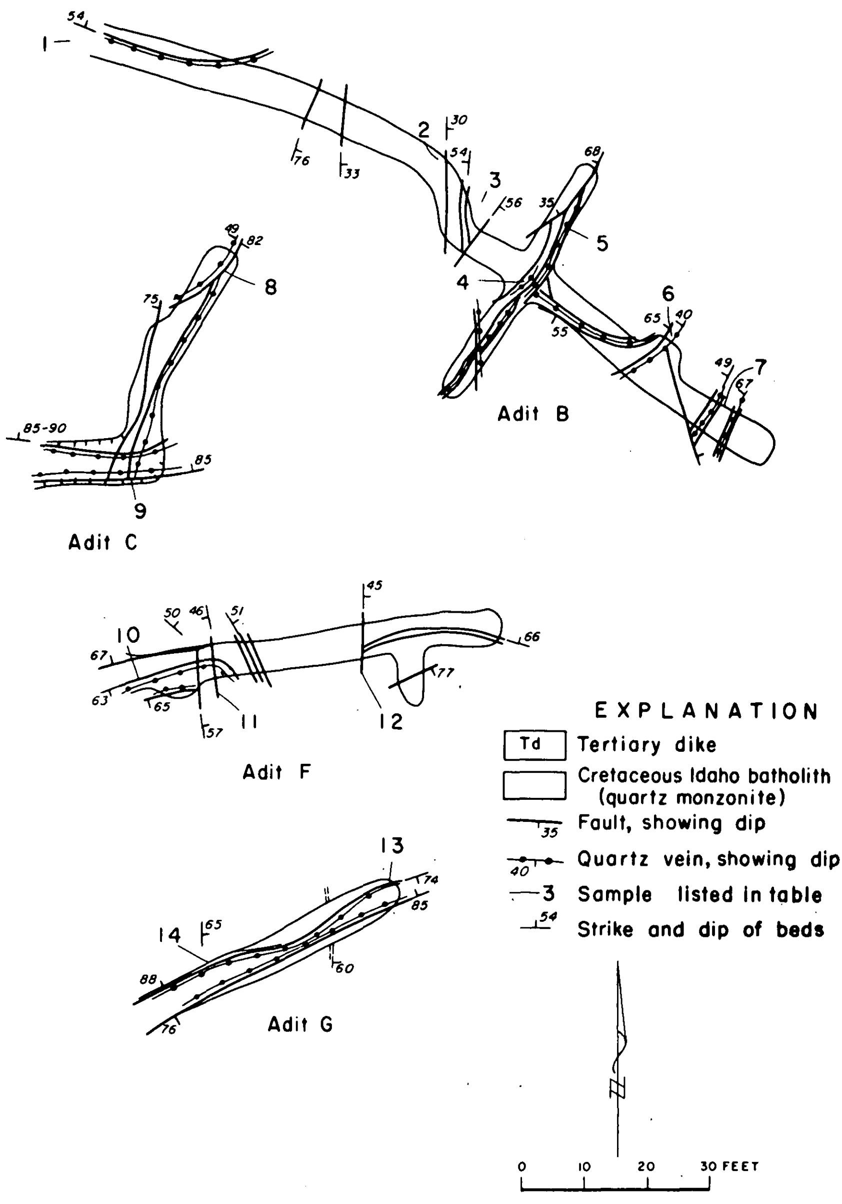


FIGURE 105. — Underground workings, adits B, C, F, and G, Painter mine.

SMOTHERS FLUORSPAR PROSPECT

The Smothers Fluorspar prospect (fig. 100, No. 18) is in the bottom of the rugged Salmon River Canyon and approximately 18 miles downriver by boat from Corn Creek. The canyon walls vary from steep grass- and brush-covered slopes to vertical rocky cliffs. Overburden is as much as 2 feet deep.

Data for samples shown in figure 104

[Tr, trace; N, not detected]

Sample No.	Sample Type	Length (ft)	Gold (oz per ton)	Silver (oz per ton)
1	Chip	1.5	Tr	N
2	do	.5	0.005	N
3	Random chip	10.0	N	N
4	do	10.0	N	N
5	Chip	4.0	1.18	0.63
6	do	2.5	Tr	N
7	Random chip	6.0	N	N
8	do	40.0	N	N
9	do	40.0	N	N
10	do	20.0	N	N
11	Chip	1.5	N	N
12	Random chip	10.0	N	N
13	Chip	5.5	N	N
14	do	1.5	N	N
15	do	5.0	N	N
16	do	4.0	N	N
17	do	.5	N	N
18	do	.12	N	N
19	Random chip	12.0	N	N
20	Chip	2.5	N	N

Data for samples shown in figure 105

[Sample 1 was grab; all others were chip. Tr, trace; N, not detected]

Sample No.	Sample Length (ft)	Gold (oz per ton)	Silver (oz per ton)	Sample No.	Sample Length (ft)	Gold (oz per ton)	Silver (oz per ton)
1	Dump	N	N	8	2.5	.01	.10
2	1.0	Tr	0.10	9	1.5	.10	.13
3	4.0	N	N	10	1.2	.06	.05
4	3.0	0.05	.12	11	.5	Tr	.05
5	1.5	Tr	.05	12	1.5	Tr	.13
6	1.5	Tr	N	13	1.5	N	.11
7	2.0	Tr	N	14	1.4	N	.05

Data for samples shown in figure 106

[Tr, trace; N, not detected]

Sample No.	Sample Type	Locality or length (ft)	Gold (oz per ton)	Silver (oz per ton)
1	Chip	0.2	3.95	1.52
2	do	3.0	.09	.16
3	do	1.8	Tr	.10
4	do	.3	.32	.20
5	Random chip		N	N
6	Grab		N	N
7	do	Dump	.005	.05

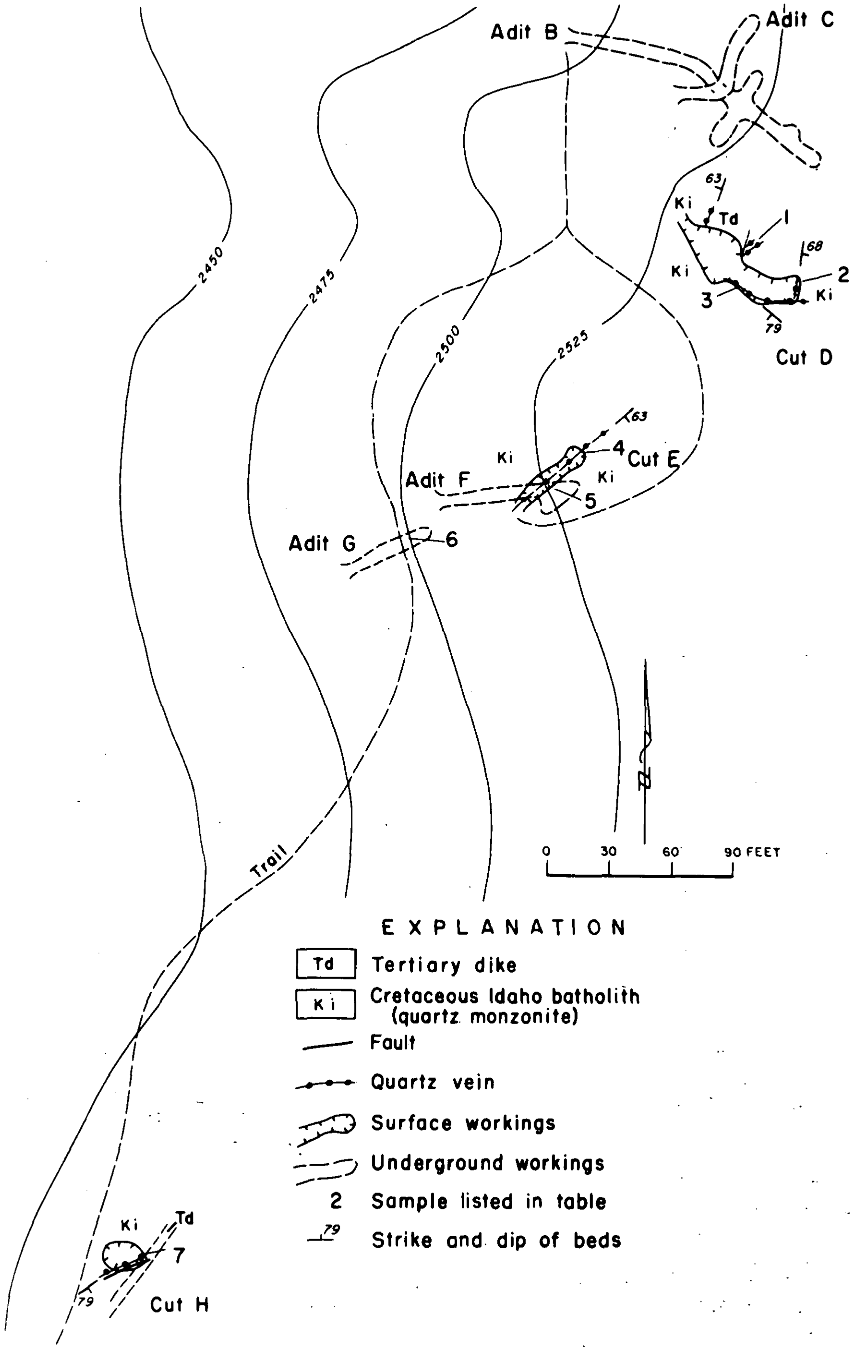


FIGURE 106. — Surface cuts D, E, and H, Painter mine.

The major fluorspar deposit lies on the northeast side of the river (Weis, Schmitt, and Tuchek, 1972, p. C30-C34).

In 1954 the fracture zone and quartz-fluorite veins were found to extend southwest across the river into the Idaho Primitive Area. Three claims — the Brown Cub 1 and 2 and the Green Spar — were subsequently located.

The fracture zone on the west side of the river has been offset approximately 1½ miles by a fault. The zone crops out south of the confluence of Cub Creek and the Salmon River, and is intermittently exposed in a S. 10° E. direction for 1 mile (fig. 107). Quartz veins are numerous in the fracture zone; they range in width from 6 inches to 5 feet, but most are less than 2 feet wide. The veins trend from N. 10° E. to N. 30° W. and dip from 80° NE. to 78° NW. The vein fillings are banded, sugary to coarse-grained quartz. The zone grades into biotite gneiss country rock. The few short stringers of fluorite in the quartz veins generally constitute less than 3 percent of the rock.

No minable fluorite was observed, but much of the area is covered by overburden, and other deposits may occur.

Other Lode Prospects

Hen Creek prospect. — The Hen Creek prospect (fig. 100, No. 4) is on the ridge between Hen and Fivemile Creeks. Two small exploration pits have been dug on a quartz fissure vein trending N. 70° W. and dipping 70° NE. in granitic rocks of the Idaho batholith. The vein, 3 feet wide, crops out for a length of 150 feet and a depth of 30 feet. It is composed of banded white quartz that contains less than 1 percent disseminated pyrite and is bound on both sides by 2 feet of iron-stained granitic fault breccia. Assays showed 0.07 ounce silver per ton.

Hermit Hanks prospect. — The Hermit Hanks prospect (fig. 100, No. 9) is on a terrace adjacent to the Salmon River, across from the Whitewater Ranch. The property was located by Hermit Hank, who lived on his claim until his death in 1956. The property consisted of an unpatented placer claim and an unpatented lode claim. The lode claim was explored by a shaft, now caved, in gneissic diorite. The diorite is intensely altered and contains chlorite and a trace iron oxides. No mineralized structures are exposed in the shaft, and no mineralized rock was seen on the dump. Dump samples contained a trace copper, lead, zinc, and antimony.

Cottonwood Butte prospect. — Local residents, packers, and prospectors have reported occurrences of galena and molybdenum on talus slopes in the vicinity of Cottonwood Butte. Claims have been recorded in this area (fig. 100, No. 21); however, no economic minerals or evidence of claims was seen. Numerous quartz veins cutting gneissic granite country rock in the area were sampled. The veins generally trend northwest and dip northeast and southwest. They range in width from 4 inches to 5 feet and are composed predominantly of white quartz containing less than 1 percent pyrite

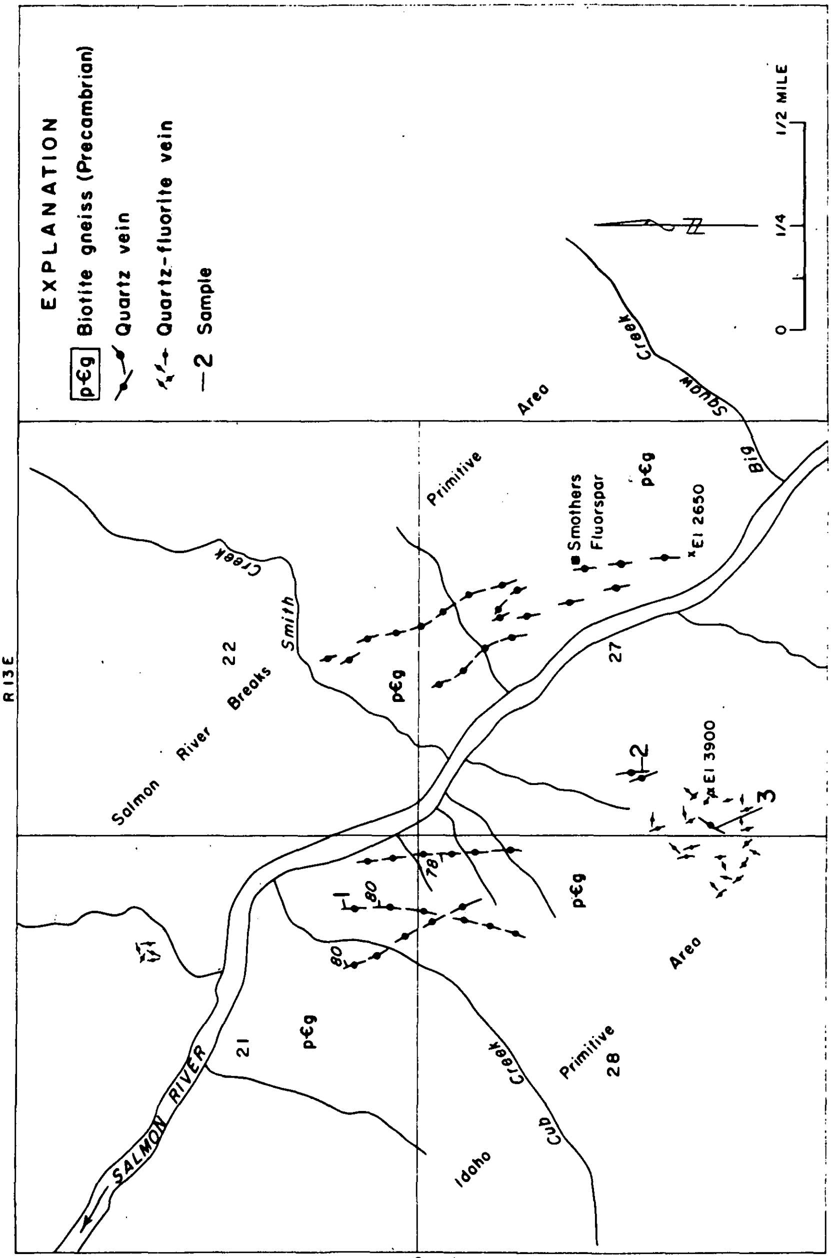


FIGURE 107. — Major veins and sample localities, Smothers Fluorspar prospect.

and iron stain. Samples of vein and wallrock material contained a maximum of 0.4 ounce silver per ton. Spectrographic analyses did not disclose unusual amounts of any other metals.

SALMON RIVER PLACERS

The Salmon River forms the northern boundary of the Salmon River district from the mouth of the Middle Fork to Fivemile Creek, a distance of about 60 miles. Roads terminate on the opposite side of the river at Corn Creek, Whitewater Ranch, and the Painter mine (fig. 100). Access to points along the river from the three roads is by trail or boat. Altitudes along the Salmon River range from about 2,200 feet at Fivemile Creek to 2,850 feet at the mouth of the Middle Fork, an average gradient of 11 feet per mile.

Virtually every potential placer site along the Salmon River has been claimed in the past; some have been relocated in recent years. Present land status is varied and complex. Some alluvial terraces (bars) have been patented as homesteads, some are held as mining claims, and others have been withdrawn from mineral entry by the U.S. Forest Service as administrative sites.

Nineteen bars, remnants of three depositional base levels, occur along the south side of the Salmon River. Sixteen bars were tested for gold and other heavy minerals (table 25). They cover about 230 acres and contain approximately 9.7 million cubic yards of alluvium. The bars are from 10 to 90 feet above the river level. They are mostly granitic and gneissic boulders, cobbles, gravel, and sand.

There were 219 samples taken from 60 sample sites (pits and trenches dug by hand or by backhoe; figs. 108-112). Sample depths ranged from 3.0 to 87.3 feet and averaged 12.3 feet. Small amounts of gold were observed from

TABLE 25. — *Summary data, Salmon River placers*

[Tr, trace]

Placer	Location (text fig.)	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands (lb per cu yd)
Excelsior Bar	108	7	340,000	Tr to 1.4	3.8
Lemhi Bar	108	18	1,830,000	Tr to 2.7	1.6
Fall Creek Bar	108	15	220,000	Tr	.5
Widow Bar	108	34	820,000	Tr to 1.4	.9
Hermit Hanks Bar	109	12	190,000	Tr to 23.2	1.4
Julie Creek Bar	109	2	30,000	Tr to 2.7	2.5
Richardson Creek Bar	109	15	300,000	Tr to 1.4	.8
Meyers Creek	109	12	580,000	Tr to 7.5	.7
Bear Creek Bar	110	10	150,000	Tr to 4.1	1.8
Bruin Creek Bar	110	7	500,000	Tr to 2.1	1.1
Barth Hot Springs Bar	110	55	2,700,000	Tr to 13.7	1.2
Disappointment Bar	111	5	160,000	Tr to 10.3	1.8
Cunningham Bar	112	25	1,210,000	Tr to 4.1	2.5
Proctor Bar	112	4	145,000	Tr to 1.4	2.0
Kitchen Creek Bar	112	2	25,000	Tr	.9
Middle Fork	112	6	500,000	Tr to 68.4	1.5

[1]Gold values based on a price of $47.85 per troy ounce.

top to bottom at nearly every test site, and samples contained a trace to 68.4 cents in gold per cubic yard (table 26). Average gold value is about 1 cent per cubic yard. There is no indication that gold values increase with depth.

The gold occurs principally as very fine "flood gold," transported and deposited during periods of high water. Between 10 and 1,000 particles of gold are needed to equal 1 cent. Flood gold deposits are concentrated in point bars, behind rocks, and in bedrock potholes. Bedrock is either granitic or gneissic metamorphics, the latter forming the more favorable traps because of its uneven blocky habit. During the depression years of the 1930's, local residents supplemented their incomes by mining these small, relatively rich flood gold deposits.

Black sand content of the samples ranged from 0.7 to 3.8 pounds per cubic yard. Petrographic analyses of selected concentrates indicated the components to be predominantly magnetite, ilmenite, sphene, and ferromagnesian silicate minerals. Some concentrates contained a trace allanite, monazite, thorite, scheelite, and cinnabar.

The alluvial terraces along the Salmon River, within the Salmon River district, are too low grade to be economically minable. The only potential resources are the small flood gold deposits.

TABLE 26. — *Sample data for Salmon River placers*

[Placer locations and site numbers are shown in figs. 108-112. See table 25 for specific listings. Tr, trace; N.d., not determined]

Site	Depth interval (feet)[1]	Gold content		Black sands (lb per cu yd)
		Colors[2]	Value[3] (cents per cu yd)	
Excelsior Bar placer				
1	0.0- 5.0	N.d.	Tr	6.0
2	0.0 5.5	N.d.	1.4	1.0
3	0.0- 5.0	N.d.	Tr	4.5
Lemhi Bar placer				
4	0.0- 5.2	N.d.	2.7	2.0
	5.2-10.6	N.d.	Tr	2.0
	10.6-16.0	N.d.	Tr	.5
	16.0-21.0	N.d.	Tr	2.5
	21.0-24.8	N.d.	Tr	1.0
	24.8-29.8	N.d.	Tr	.5
	29.8-34.8	N.d.	Tr	.5
5	0.0-11.0	N.d.	1.4	1.0
6	0.0- 5.0	N.d.	1.4	2.5
	5.0- 9.0	N.d.	Tr	2.5
7	0.0- 5.0	N.d.	Tr	.5
Fall Creek Bar placer				
8	0.0- 6.0	N.d.	Tr	0.5
Widow Bar placer				
9	0.0- 7.0	N.d.	Tr	0.5
10	0.0- 6.0	N.d.	1.4	1.0
11	0.0-10.0	N.d.	Tr	1.0
12	0.0- 8.5	N.d.	Tr	1.0

TABLE 26. — *Sample data for Salmon River placers* — Continued

Site	Depth interval (feet)[1]	Gold content		Black sands (lb per cu yd)
		Colors[2]	Value[3] (cents per cu yd)	
Hermit Hanks Bar placer				
13	0.0- 3.6	4f.	0.7	0.5
	3.6-10.0	100f., 10m.	2.7	2.0
	10.0-16.1	27f., 7m.	2.1	1.5
	16.1-21.8	60f., 7m.	1.4	1.5
	21.8-28.0	50f., 40m.	8.2	1.0
14	0.0- 3.0	8f., 3m.	1.4	1.0
	3.0- 6.1	4f.	.7	1.0
15	0.0- 3.6	57f., 16m.	2.7	2.0
	3.6- 8.1	29f., 10m.	2.1	1.0
	8.1-11.1	63f., 14m.	3.4	1.0
	11.1-15.1	100f.,>20m.	5.5	2.0
	15.1-20.8	150f.,>50m.	23.2	3.0
	20.8-25.9	500f.,>50m.	23.2	3.0
	25.9-30.4	300f.,>85m.	10.3	4.0
16	0.0- 5.4	30f., 16m.	.7	2.5
	5.4-10.4	22f., 16m., 2c.	2.7	1.0
	10.4-18.9	19f., 5m.	1.4	.5
	18.9-25.0	40f., 10m.	.7	.5
Julie Creek Bar placer				
17	0.0- 3.5	60f., 9m.	2.7	5.0
	3.5- 5.5	25f., 4m.	1.4	5.5
	5.5- 9.5	17f., 2m.	.7	1.5
	9.5-13.5	9f., 4m.	2.7	1.5
	13.5-17.5	15f., 3m.	.7	2.0
	17.5-21.5	2f., 1m.	.7	1.5
Richardson Creek Bar placer				
18	0.0- 3.0	8f.	0.7	0.5
	3.0- 4.7	4f.	.7	1.0
	4.7- 8.7	4f.	.7	1.0
19	0.0- 2.0	3f.	.7	1.0
	2.0- 5.8	2f.	.7	1.0
	5.8- 6.7	Tr	.7	1.5
	6.7- 8.7	2f.	.7	1.0
20	0.0- 2.5	5f.	.7	.5
	2.5- 5.3	5f., 1m.	.7	1.0
	5.3- 6.6	7f.	.7	2.0
	6.6-11.6	7f.	.7	1.0
21	0.0- 4.8	65f., 11m.	.7	1.0
	4.8- 7.6	26f., 6m.	1.4	1.5
	7.6-11.9	14f., 5m.	.7	.5
	11.9-15.8	5f.	.7	.5
	15.8-22.4	3f.	.7	.5
	22.4-26.4	2f.	.7	.5
	26.4-30.0	3f.	.7	.5
Meyers Creek placer				
22	0.0- 6.9	100f., 50m.	7.5	1.0
	6.9-13.0	50f., 50m.	4.1	1.0
23	0.0- 2.5	8f.	Tr	1.0
	2.5- 5.5	3f., 1m.	Tr	.5
	5.5- 8.0	4f., 1m.	Tr	.5
	8.0-10.0	3f., 2m.	Tr	.5
	10.0-14.5	5f., 3m.	Tr	.5
	14.5-18.0	17f., 3m.	Tr	.5
	18.0-23.0	4f.	Tr	1.0
	23.0-26.0	12f., 5m.	Tr	1.0
	26.0-28.5	4f.	Tr	1.0
	28.5-30.6	3f., 2m.	.7	1.0
	30.6-32.7	11f., 3m.	1.4	1.0
	32.7-36.0	3f., 2m.	.7	1.0
	36.0-45.4	9f., 14m.	2.7	1.0
	45.4-51.0	6f.	<.5	1.0
	51.0-53.8	24f., 7m.	1.4	1.0
	53.8-57.9	12f.	<.5	1.0
	57.9-63.3	4f., 3m.	<.5	1.0
	63.3-67.4	4f., 1m., 1c.	2.7	1.0
	67.4-71.9	14f., 6m.	1.4	1.0
	71.9-76.4	30f., 9m.	2.7	1.0

TABLE 26. — *Sample data for Salmon River placers* — Continued

Site	Depth interval (feet)[1]	Gold content: Colors[2]	Gold content: Value[3] (cents per cu yd)	Black sands (lb per cu yd)
		Meyers Creek placer — Continued		
	76.4-81.7	15f., 3m., 1c.	.7	1.0
	81.7-87.3	17f., 15m., 1c.	.7	1.0
24	0.0- 2.6	4f.	Tr	1.0
	2.6- 6.3	3f., 2m.	Tr	.5
		Bear Creek Bar placer		
25	0.0- 4.0	17f., 10m.	4.1	2.5
26	0.0- 1.7	4f.	Tr	2.0
	1.7- 4.7	35f., 5m.	2.1	2.0
27	0.0- 1.3	5f., 1m.	Tr	3.0
	1.3- 4.1	25f., 3m.	1.4	3.5
		Bruin Creek Bar placer		
28	0.0 2.1	2f., 2m.	0.7	1.0
	2.1- 4.9	11f., 6m.	2.1	1.0
	4.9- 6.9	6f.	Tr	.5
	6.9- 9.4	6f., 2m.	.7	.5
	9.4-13.0	2f.	Tr	.5
29	0.0- 7.7	16f., 8m.	2.1	1.0
30	0.0- 2.0	7f.	Tr	1.5
	2.0- 6.3	5f., 1m.	Tr	1.5
	6.3- 8.6	5f.	Tr	1.5
31	0.0- 1.0	10f.	Tr	3.0
	1.0- 4.0	8f.	Tr	3.0
	4.0- 8.8	10f.	Tr	3.0
32	0.0- 3.0	7f., 3m.	Tr	.5
	3.0- 7.2	20f.	Tr	.5
33	0.0- 3.0	2f., 2m.	.7	.5
	3.0-10.0	4f., 1m.	Tr	.5
		Barth Hot Springs Bar placer		
34	0.0- 2.7	16f., 6m.	2.7	1.0
	2.7- 6.2	38f., 6m.	2.1	2.0
35	0.0- 3.5	16f., 8m.	2.7	1.0
	3.5- 7.7	21f., 5m.	1.4	2.0
	7.7-11.0	29f., 4m.	1.4	1.5
	11.0-15.3	35f., 2m.	1.4	1.0
	15.3-18.3	18f., 6m.	2.1	2.0
	18.3-22.3	15f., 5m.	1.4	1.0
	22.3-26.8	21f., 3m.	.7	1.0
	26.8-30.4	6f., 2m.	2.1	1.0
	30.4-34.1	16f., 2m.	.7	1.0
	34.1-38.3	15f.	Tr	.5
	38.3-41.8	4f., 1m.	.7	1.0
	41.8-47.1	3f.	Tr	.5
36	0.0- 3.4	16f., 4m.	1.4	.5
	3.4- 6.4	25f., 3m.	1.4	1.5
	6.4-10.9	25f., 8m.	4.1	1.0
	10.9-14.9	30f., 9m.	2.7	1.0
37	0.0- 4.0	40f., 9m., 2c.	8.2	3.0
	4.0- 7.2	95f., 27m., 5c.	13.7	3.5
	7.2-11.7	80f., 34m., 2c.	6.8	3.0
38	0.0- 2.6	20f., 3m.	2.1	.5
	2.6- 5.1	9f., 2m.	.7	1.0
	5.1- 7.6	2f.	Tr	.5
	7.6-10.1	10f.	Tr	.5
39	0.0- 3.0	15f.	Tr	1.0
	3.0- 6.0	4f., 1m.	Tr	.5
	6.0- 8.5	9f., 2m.	1.4	1.0
40	0.0- 4.0	25f., 1m.	.7	.8
	4.0- 6.8	35f., 5m.	2.1	.8
	6.8- 9.5	32f.	Tr	.8
	9.5-12.7	12f., 1m.	.7	.8
	12.7-15.2	8f.	Tr	.8
	15.2-18.1	3f.	Tr	.8
	18.1-22.7	30f., 4m.	1.4	.8
	22.7-25.9	5f.	Tr	.8
	25.9-26.8	Tr	Tr	.8
	26.8-29.1	5f.	Tr	.8
	29.1-33.2	8f.	Tr	.8
41	0.0- 2.2	>50f., 3m.	2.7	2.0

TABLE 26. — *Sample data for Salmon River placers* — Continued

Site	Depth interval (feet)[1]	Gold content: Colors[2]	Gold content: Value[3] (cents per cu yd)	Black sands (lb per cu yd)
Barth Hot Springs Bar placer — Continued				
	2.2- 3.5	15f., 2m.	2.7	4.0
	3.5- 6.4	>70f., 12m.	4.1	2.0
	6.4- 9.4	>70f., 11m., 1c.	6.2	3.0
Disappointment Bar placer				
42	0.0 2.2	40f., 10m.	5.5	2.0
	2.2- 5.8	40f.	1.4	1.5
	5.8- 7.9	18f., 2m.	1.4	2.0
	7.9-10.4	100f., 5m.	5.5	2.0
	10.4-12.9	14f.	Tr	3.0
	12.9-15.9	50f., 6m.	2.7	2.0
	15.9-18.8	100f., 17m.	3.4	2.5
	18.8-21.3	200f.	10.3	2.0
43	0.0- 2.0	2f.	Tr	2.5
	2.0- 5.9	4f., 1m.	Tr	1.5
	5.9- 8.8	5f.	Tr	1.5
	8.8-12.3	3f.	Tr	1.5
	12.3-14.4	Tr	Tr	1.5
	14.4-18.7	3f.	Tr	1.5
	18.7-22.3	4f.	Tr	1.5
	22.3-26.9	10f.	Tr	1.5
Cunningham Bar placer				
44	0.0- 3.5	N.d.	Tr	3.0
	3.5- 8.1	N.d.	Tr	2.0
	8.1-10.7	N.d.	Tr	4.5
	10.7-13.0	N.d.	Tr	.5
	13.0-15.0	N.d.	Tr	3.0
45	0.0- 4.0	N.d.	4.1	1.0
46	0.0- 5.0	N.d.	2.7	2.0
	5.0- 7.0	N.d.	2.7	1.5
47	0.0- 4.6	N.d.	Tr	2.0
	4.6- 6.5	N.d.	Tr	2.5
	6.5- 8.0	N.d.	Tr	6.0
48	0.0- 4.6	N.d.	Tr	2.5
	4.6- 5.5	N.d.	Tr	6.0
	5.5- 8.0	N.d.	Tr	2.0
49	0.0- 3.0	N.d.	Tr	2.0
Proctor Bar placer				
50	0.0- 2.0	N.d.	1.4	4.0
	2.0- 4.0	N.d.	Tr	5.0
	4.0- 6.0	N.d.	Tr	3.0
	6.0- 8.0	N.d.	Tr	4.0
	8.0-10.2	N.d.	Tr	2.5
51	0.0- 3.0	N.d.	Tr	1.5
	3.0- 6.8	N.d.	Tr	2.0
52	0.0- 2.8	N.d.	Tr	1.0
	2.8- 5.3	N.d.	Tr	.5
	5.3- 8.6	N.d.	Tr	.5
	8.6-10.6	N.d.	Tr	.5
	10.6-12.3	N.d.	Tr	1.0
Kitchen Creek Bar placer				
53	0.0- 4.6	N.d.	Tr	0.5
	4.6- 9.0	N.d.	Tr	1.0
	9.0-13.8	N.d.	Tr	1.0
54	0.0- 4.0	N.d.	Tr	1.0
	4.0- 8.2	N.d.	Tr	1.0
55	0.0- 4.2	N.d.	Tr	.5
	4.2- 8.5	N.d.	1.4	.5
56	0.0- 5.2	N.d.	1.4	.5
	5.2-10.0	N.d.	Tr	1.0
	10.0-14.0	N.d.	Tr	1.0
	14.0-18.5	N.d.	Tr	1.0
	18.5-20.7	N.d.	Tr	1.0

TABLE 26. — *Sample data for Salmon River placers* — Continued

Site	Depth interval (feet)[1]	Gold content		Black sands (lb per cu yd)
		Colors[2]	Value[3] (cents per cu yd)	
Middle Fork placer				
57	0.0- 4.3	N.d.	9.6	1.0
	4.3- 7.4	N.d.	68.4	2.5
	7.4-11.5	N.d.	10.9	1.0
58	0.0- 2.5	N.d.	Tr	.5
	2.5- 4.0	N.d.	Tr	.5
	4.0- 6.0	N.d.	Tr	2.0
	6.0- 8.8	N.d.	Tr	1.0
59	0.0- 2.0	N.d.	2.7	1.5
	2.0- 3.9	N.d.	Tr	2.0
	3.9- 6.4	N.d.	6.8	1.5
60	0.0- 6.0	N.d.	1.4	2.5

[1]All samples are 1 cubic foot per foot of depth.
[2]Colors are the number of gold particles observed in the sample. Relative size of particles are as follows: f. (fine) 300 to over 1000 to value one cent; m. (medium) 10 to 300 to value one cent; c. (coarse) less than 10 to value one cent.
[3]Gold values are based on a price of $47.85 per troy ounce.

HIGH MEADOWS PLACERS

Several high mountain meadows are along the southern boundary of the Salmon River district. Two of these — Dillinger Meadows and Cold Meadows (fig. 100, Nos. 14, 20) — were apparently located by placer claims in the past. They were sampled with a power auger.

The meadows are alluvium-filled basins surrounded by dense lodgepole pine forests. Good trails lead to the meadows. Easiest access, however, is by aircraft to airstrips at Cold Meadows or Chamberlain basin. Dillinger Meadows is about 8 miles by trail from the Chamberlain airstrip.

The source rock for the alluvium is quartz monzonite and granodiorite of the Idaho batholith. The composition of alluvium in Cold Meadows is essentially sand, clay, and pea-size gravel. The composition at Dillinger Meadows is similar, but the gravel is much coarser. Sample data are shown in tables 27 and 28. The deposits are not a potential resource of gold or other minerals.

TABLE 27. — *Summary data, High Meadows placers*

[Tr, trace]

Deposit (fig. 100)	Size (acres)	Estimated volume (cu yd)	Gold values	Estimated black sands (lb per cu yd)
Dillinger Meadows	50	160,000	Tr	3.2
Cold Meadows	200	6,390,000	Tr	8.2

BIG CREEK DISTRICT

The Big Creek district, in the central part of the Idaho Primitive Area, is one of the largest districts, but mines and prospects are relatively few (fig. 113).

Much of the district is not easily accessible because of rugged terrain and remoteness. The central section is accessible from the end of a dirt road

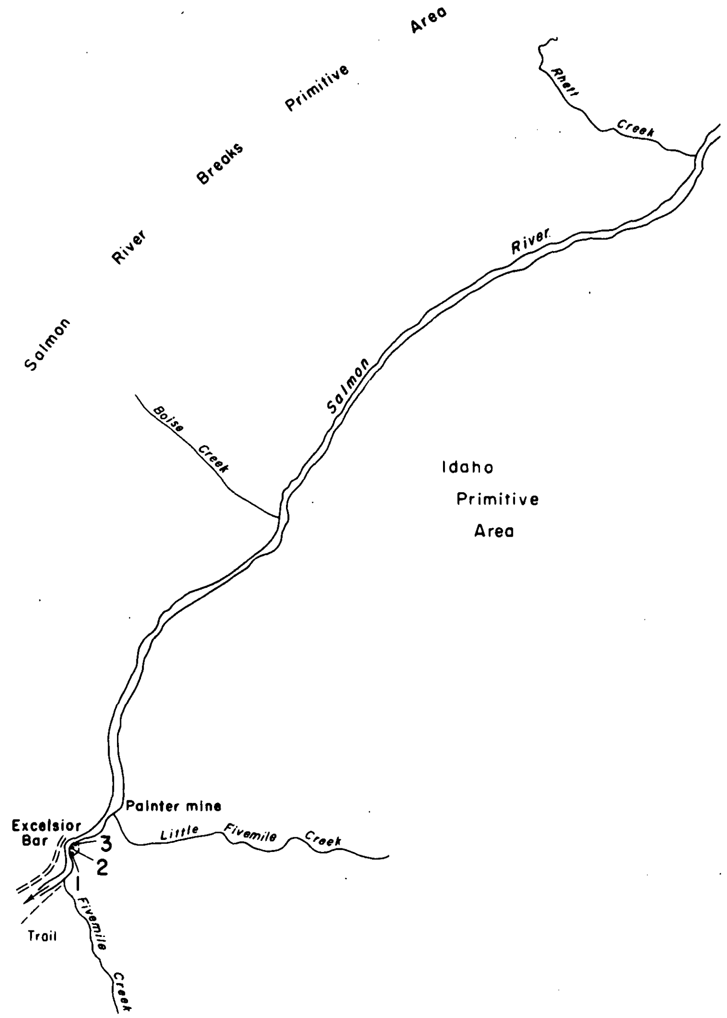
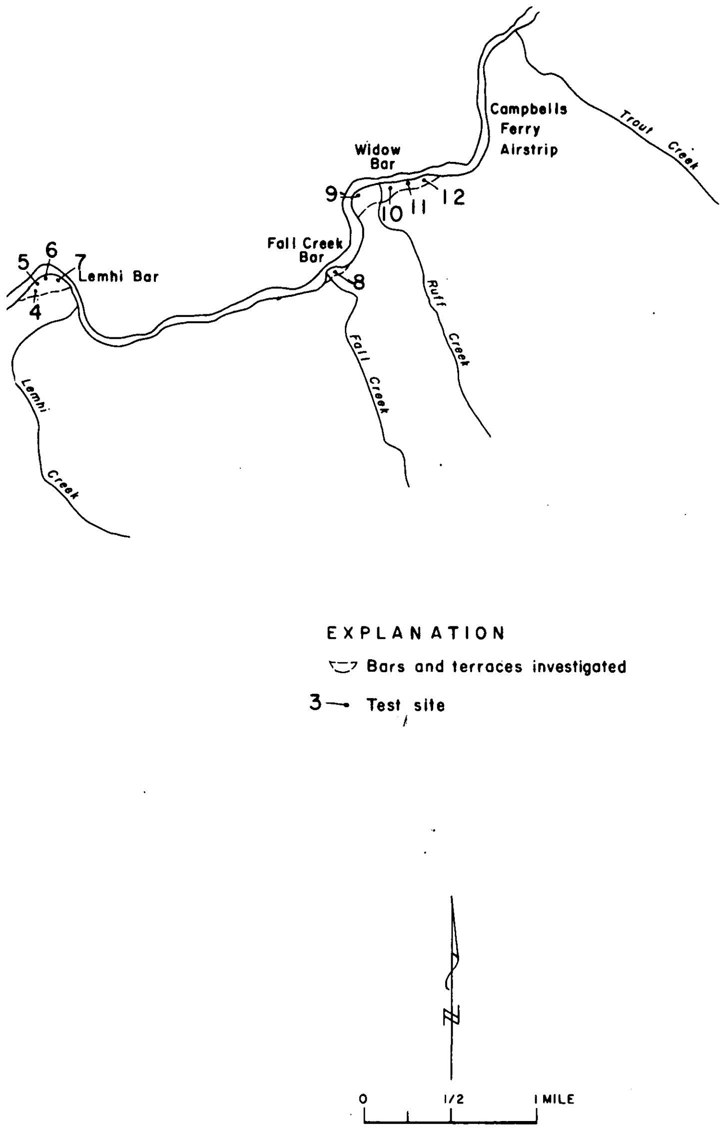


FIGURE 108. — Fivemile Creek



to Trout Creek placer area.

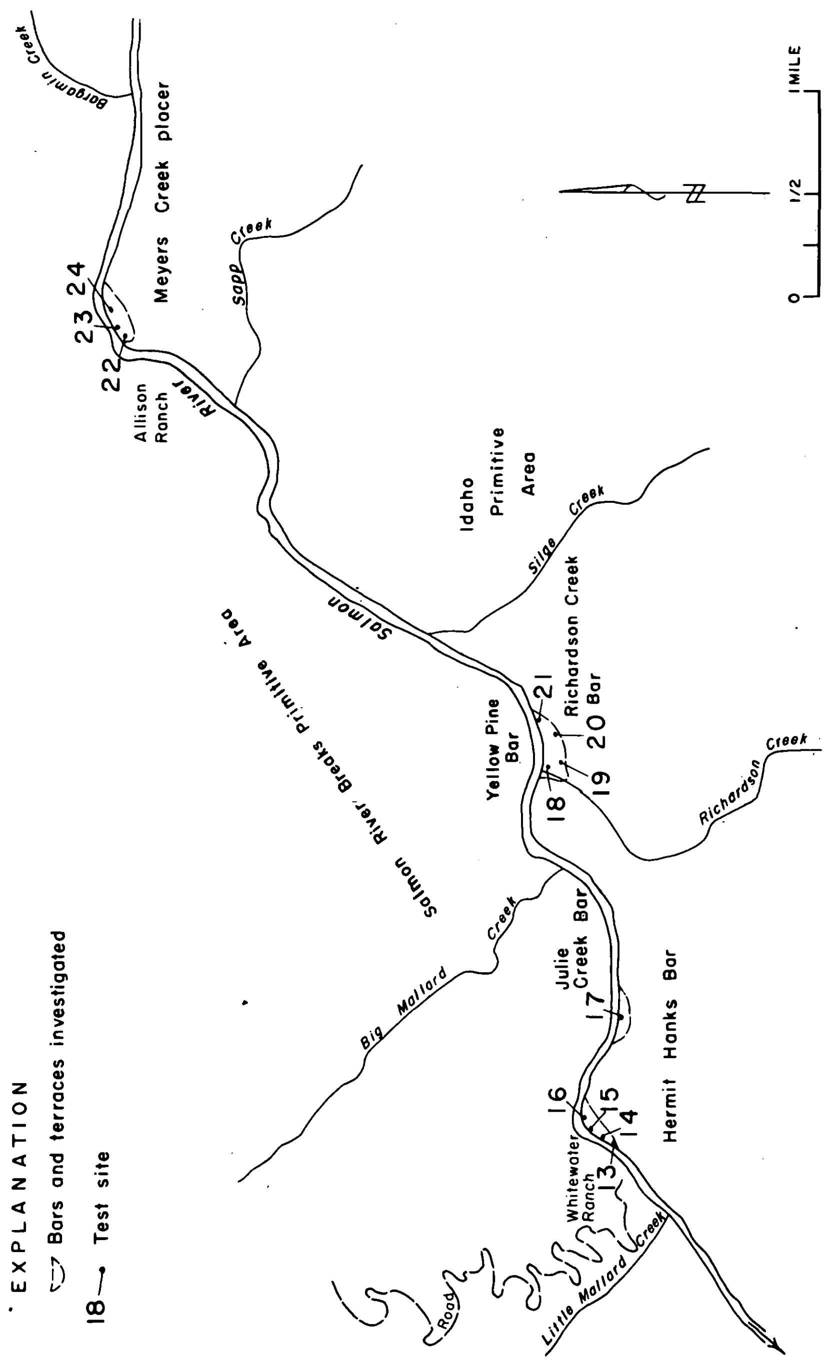


FIGURE 109. — Little Mallard Creek to Bargamin Creek placer area.

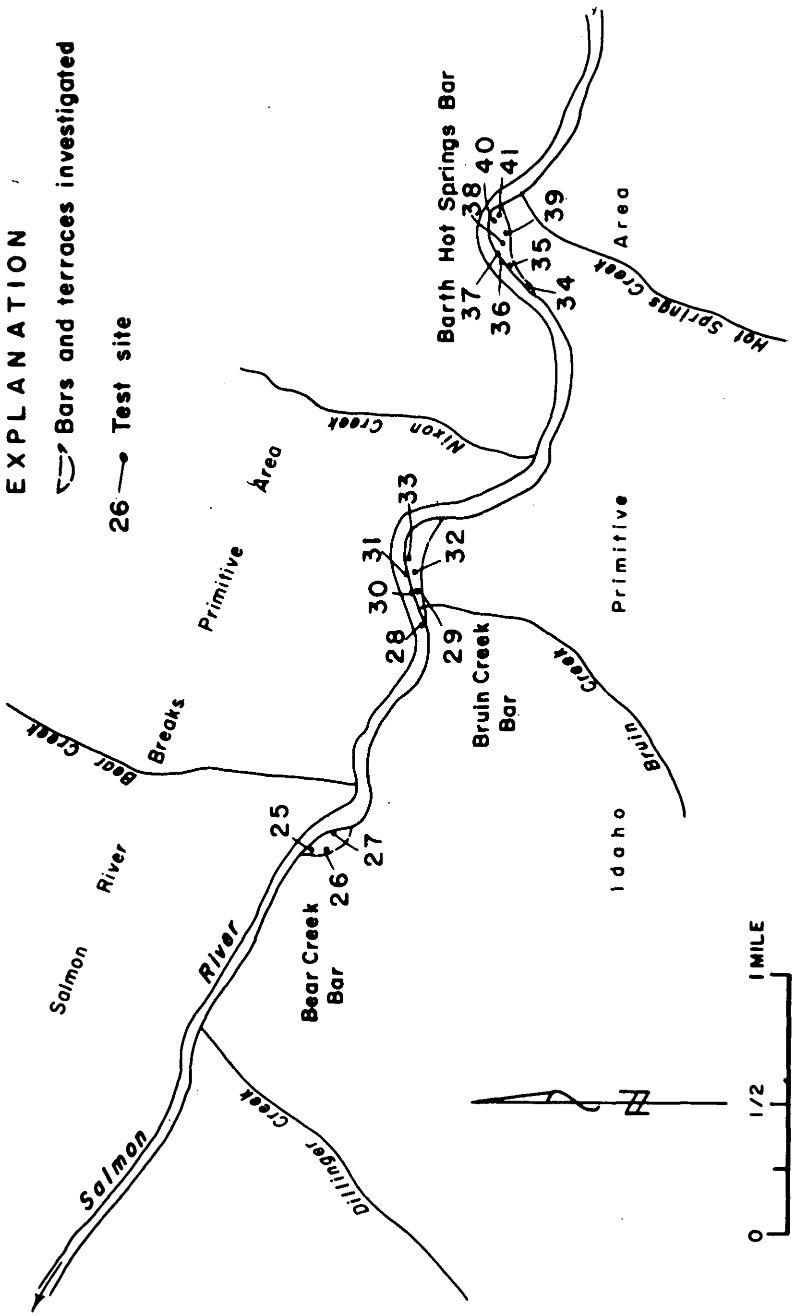


FIGURE 110.—Dillinger Creek to Hot Springs Creek placer area.

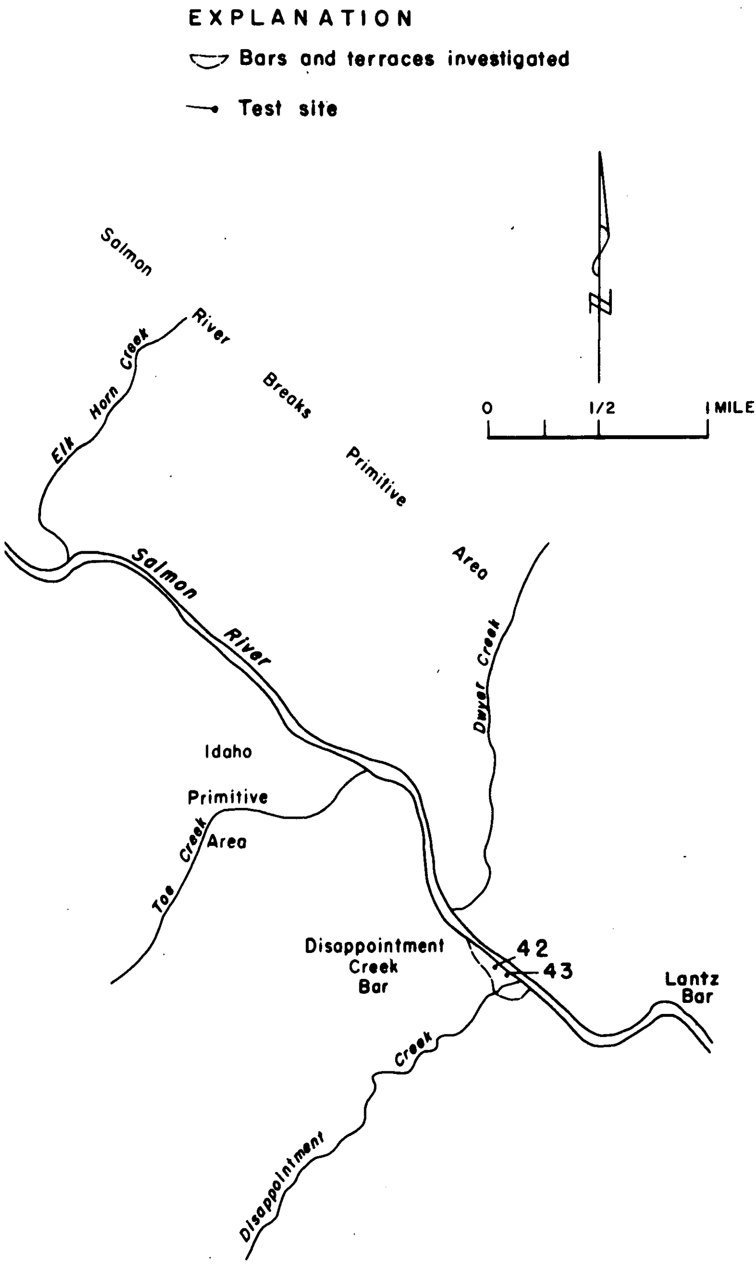


FIGURE 111. — Disappointment Creek Bar placer area.

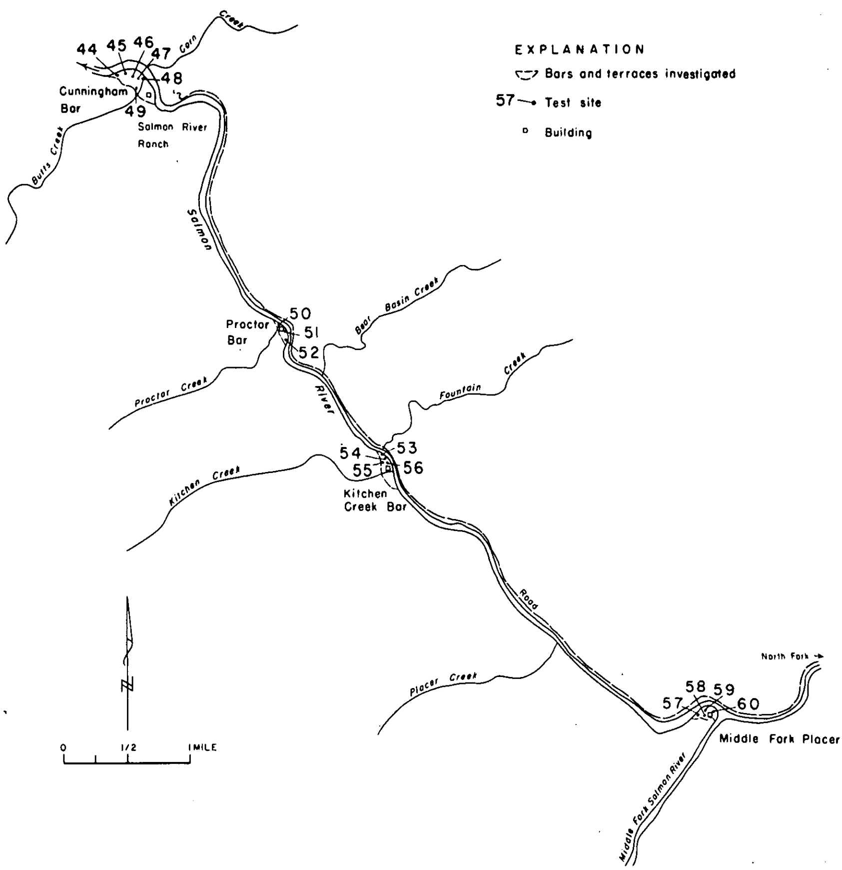


FIGURE 112. — Butts Creek to Middle Fork Salmon River placer area.

which extends 14 miles eastward from the settlement of Big Creek to Monumental Bar on the western boundary of the district. A good trail extends eastward along Big Creek through the central part of the district. Small landing strips are also along Big Creek at Vine Ranch (fig. 113, No. 16), Cabin Creek Ranch, Taylor Ranch, and Soldier Bar. The southwestern part of the district is accessible from a road at Thunder Mountain, and a trail extends northward along ridge crests to the Corner Creek and Big Creek Ridge areas.

Big Creek has deeply incised the mountainous terrain leaving a maximum relief of more than 6,000 feet. Mormon Mountain, at an altitude of 9,545 feet, is the highest point, and the junction of Big Creek and Middle Fork Salmon River, at an altitude of 3,400 feet, is the lowest. The only level tracts are large alluvial terraces along Big Creek. The upland area is characterized by U-shaped glacial valleys.

Prospecting started in the district in the late 1800's following discovery of gold along the Clearwater River many miles to the north and in the Thunder Mountain mining district to the south. Most claims were located in 1902. There has been no recorded production from the district.

Lode deposits that have been discovered are mostly quartz veins that fill fractures. Minor replacement and alteration of the wallrock commonly accompanied emplacement of the veins. Most of them are less than 9 feet wide and less than 350 feet long. The fractures are in the Precambrian Yellowjacket Formation, Hoodoo Quartzite, and intrusive complex and in the Tertiary Challis Volcanics. The deposits are not economically minable, but some have a potential for discovery of ore.

Except for two opal occurrences the lodes are generally assemblages of quartz with pyrite and gold, although galena, chalcopyrite, tetrahedrite, bornite, and magnetite occur in some deposits. Free gold was not seen. The sulfides are mostly altered to secondary minerals near the surface. Some claims were located on fractured country rock containing abnormal amounts of iron oxides.

Alluvial deposits along Big Creek and near the mouths of tributaries were claimed in the late 1800's; a few were relocated in the 1950's. Placer claims were located along West Fork Rush Creek in the early 1900's. Evidence of placering is restricted to a few shallow pits, and no production has been recorded. Gold values in placer samples averaged 0.6 cent per cubic yard. Black sand concentrates from samples taken along Big Creek averaged 15.5 pounds per cubic yard; also, ilmenite was present in the concentrates.

The alluvial deposits along Big Creek are estimated to total nearly 7 million cubic yards and to contain ilmenite averaging 2.7 pounds, worth 2.5 cents, per cubic yard. The grade of the deposits is too low to be considered a potential source of ilmenite.

TABLE 28. — *Sample data for High Meadows placers*

[Tr, trace]

Deposit	Depth interval (feet)	Sample volume (cu ft)	Gold content		Black sands (lb per cu yd)
			Color	Value	
Dillinger Meadows	0 - 4.0	0.3	Tr	Tr	3.2
Cold Meadows	0 - 2.0	.1	Tr	Tr	10.4
	2.0-10.1	.4	Tr	Tr	7.6

ACORN BUTTE AREA

The prospects in the Acorn Butte area are on the slopes and ridges on the south side of Acorn Butte. They are less than 3.5 miles from the boundary of the district, but access by trail from the end of the road at Monumental Bar may be much farther.

The deposits are quartz veins mostly in the Precambrian intrusive complex and quartzite. The largest vein is 20 feet wide and can be traced 120 feet along its strike. Most are 1-3 feet wide and can be traced less than 350 feet along their strikes. Select samples contained as much as 21.4 percent copper and 0.66 ounce gold per ton, but the average grade is too low to be of economic interest. Some prospects, with additional work, may have a potential for discovery of economically minable deposits.

S and B Group

The S and B group of three claims (fig. 113, No. 5) is on the west slope of Acorn Creek valley. The group was located by R. Scott and P. Beal in 1937.

Small workings expose several veins. The largest trench reveals a white vuggy quartz vein that trends N. 80° E. and dips 25° N. It is 2 feet wide and is bounded on the footwall by phyllite and on the hanging wall by argillaceous quartzite. A sample taken across the vein contained a trace gold, silver, copper, and lead.

The vein appears to extend 150 feet northward to a smaller pit. The wallrock in the pit is mica schist. The exposure is estimated to contain 1 percent malachite and 3 percent chalcopyrite. A sample across it assayed 0.17 ounce silver per ton and 3.2 percent copper. A resource of a few thousand tons may be available if the vein extends between the pits.

A small pit to the south of the trench was dug at the intersection of two 2-foot-wide quartz veins in amphibolite. One vein strikes N. 40° E. and is traceable for 47 feet, and the other trends N. 20° W. and is exposed for 39 feet. A sample from the iron-stained parts of the vein contained a trace gold and 0.07 ounce silver per ton.

Acorn Group

The Acorn group of four claims (fig. 113, No. 1), 2 miles southwest of Acorn Butte, was located in April 1937 by P. Beal and R. Scott.

Numerous quartz veins cut Precambrian intrusive rock. Only the larger veins have been worked. A 26-foot adit and a pit were dug on a 40-foot-wide, 180-foot-long, 50-foot-high exposure of highly sheared quartz which strikes northward and dips 75° E. Three adit chip samples, averaging 8 feet in length, and one 12-foot-long outcrop sample contained a trace gold and an average of 0.09 ounce silver per ton.

A pit was dug along a 2- to 3-foot-wide quartz vein in quartzite, approximately 1,000 feet northeast of the adit. The vein trends N. 55° E. and can be traced for 350 feet along the strike. A select sample contained 0.66 ounce gold and 0.13 ounce silver per ton.

Box Springs Claim

The Box Springs claim (fig. 113, No. 4) is 1 mile northwest of the Moore Ranch.

A caved 26-foot-long adit and a 5-foot-deep shaft expose an altered zone along a quartzite-diorite contact. Quartz veins, the largest 1 foot wide, are enclosed in the 10-foot-wide altered zone which strikes N. 80° W. and dips 45°-78° NE. The zone is exposed intermittently for 90 feet along the strike but probably continues farther. The massive white quartz veins contain up to 2 percent pyrite, 5 percent chalcopyrite, and 1 percent bornite. Random chip samples from the altered zone and a quartz stringer at the adit assayed a trace gold and silver. At the shaft, a chip sample of altered material contained a trace gold and silver, but a composite sample selected from the veins contained 0.04 ounce gold per ton, 1.2 ounces silver per ton, and 21.4 percent copper.

The values are contained only in the veins, and only 10 percent of the vein material appears to contain economic minerals. Additional work might prove a potential for copper.

Other Lode Prospects

Dewey Moore group. — The Dewey Moore group (fig. 113, No. 3) originally included claims located by W. Edwards in May 1912, which were later relocated by Dewey Moore. The workings on a south-trending ridge, less than one-half mile from the Moore Ranch, are in several quartz veins.

The largest quartz vein strikes N. 80° W. in amphibolite, near the crest of the ridge. The known length is 340 feet, and the width ranges from 5 to 6 feet. Less than 1 percent pyrite and chalcopyrite occur in the quartz. The sulfides are altered to secondary minerals near the surface. A random chip sample from a pit in the vein contained a trace gold, 0.16 ounce silver per ton, and 0.02 percent copper.

On the nose of the ridge near Big Creek, a 20-foot adit was driven along a quartz vein in granite. The vein, striking N. 79° W. and dipping 35° SW, is 9 feet wide and probably extends 44 feet beyond the adit to a small outcrop. A sample contained a trace gold and 0.11 ounce silver per ton.

Other veins to the east and west trend N. 80° W. in gneiss. Widths are from 1.5 to 2 feet. No sulfides are visible, but assays showed traces of copper.

No Name claim. — The No Name claim (fig. 113, No. 6) is one-half mile east of Acorn Creek and 1 mile N. 40° E. of the Moore Ranch. It was located in 1902 by McCibbie and Neff, but it was not explored.

The claim was located on vuggy iron-stained hornblendite; no vein was seen. The rock is approximately 70 percent hornblende, 20 percent feldspar, 5 percent magnetite, and 5 percent specular hematite.

A random chip sample, 260 feet long, across a section of the rock contained a trace gold, 0.08 ounce silver per ton, and 3.8 percent titanium. The property has no apparent possibilities for development.

Two Friends claim — The Two Friends claim (fig. 113, No. 8) was staked in 1902 by Mrs. T. Wayland and others on the nose of the ridge between Acorn Creek and Lime Creek.

The only mineralized rock found was an iron- and malachite-stained quartz pod in a small pit. It is 1 foot wide, 2 feet high, and 6 feet long. Chalcopyrite was the only visible metallic mineral.

A chip sample taken across the pod assayed 0.19 ounce gold per ton, 0.38 ounce silver per ton, and 4.49 percent copper. A grab sample from the dump contained 0.19 ounce gold per ton, 0.24 ounce silver per ton, and 3.95 percent copper.

Despite the relatively good values, the deposit is probably too small to be of value.

Lime Creek prospect. — The Lime Creek prospect (fig. 113, No. 7) is near the head of Lime Creek. Access is by way of the Acorn Butte trail. No workings exist on the prospect.

The prospect is on two parallel quartz veins in fractures trending N. 70° W. in the coarse-grained quartzite. The quartzite is a small roof pendant in Precambrian intrusive rock. One vein is 1 foot thick and is exposed for 25 feet along its strike; the other is 0.5 foot thick and is exposed 17 feet along its strike. No minerals other than quartz were seen in them. Sample analysis showed a trace gold and 0.08 ounce silver per ton.

GARDEN CREEK AREA

Two lode claims are in the Garden Creek area (fig. 113, Nos. 17, 15). They are less than one-half mile north of Big Creek and about 8 miles by trail from the end of the road at Monumental Bar.

Both claims were staked on fractured or sheared Tertiary rhyolite that is heavily stained by iron oxides along fractures. Samples of the stained rock contained a trace gold, copper, lead, and zinc and up to 0.15 ounce silver per ton. The occurrence is not a potential resource.

Lode Prospects

Valentine claim. — The Valentine claim (fig. 113, No. 17) was staked in 1910 by T. and B. Stump. It is one-fourth mile east of the Garden Creek trail and one-half mile north of Big Creek.

The claim covers an area of highly iron stained Tertiary rhyolite. The material is intensely fractured. The outcrop is about 300 feet long, 125 feet wide, and 50-75 feet high. A random chip sample contained a trace gold and 0.15 ounce silver per ton.

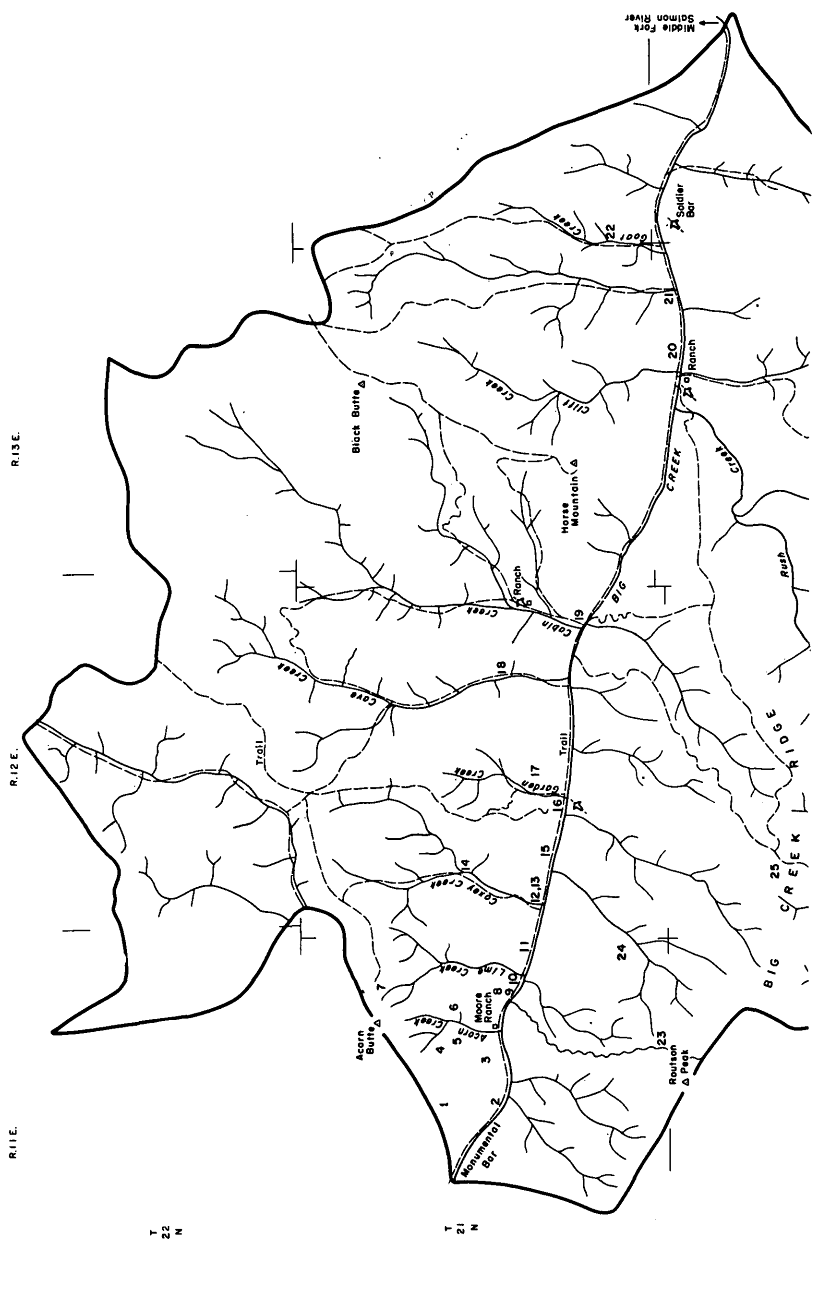
Gold Lodge claim. — The Gold Lodge claim (fig. 113, No. 15) was located by MacDonald and others in 1902 along the Big Creek trail.

Tertiary white rhyolite porphyry on the property is cut by four large parallel shears and several small fractures. The shears strike N. 3° E. and dip 56° W. The host rock is brecciated for 1 foot on each side of the shears. No ore minerals were seen. The sheared outcrop is 90 feet thick, 180 feet long, and 65 feet high. The structures probably extend under talus.

Samples taken from the host rock contained a trace gold and 0.15 ounce silver per ton. Average values for the four gouge zones were less than 0.01 ounce gold per ton, less than 0.25 ounce silver per ton, and a trace zinc and lead.

BIG CREEK RIDGE AREA

Big Creek Ridge lies along the south side of Big Creek valley. The prospects near Routson Peak at the west end of the ridge can be reached by a Forest Service trail leading southward from the Moore Ranch on Big Creek. The prospects near the center of the ridge and along West Fork Rush Creek are not readily accessible. The shortest route is by 10 miles of trail from the end of the road at Thunder Mountain to the south.


Middle Fork Salmon River
Soldier Bar
Goat Creek
Ranch
Cliff Creek
Black Butte
Horse Mountain
BIG CREEK
Rush
Cabin Creek
Cave Creek
Trail
Garden Creek
Coxey Creek
Lime Creek
Acorn Creek
Moore Ranch
Acorn Butte
Routson Peak
Monumental Bar
BIG CREEK RIDGE
R.13 E.
R.12 E.
R.11 E.
T 22 N
T 21 N

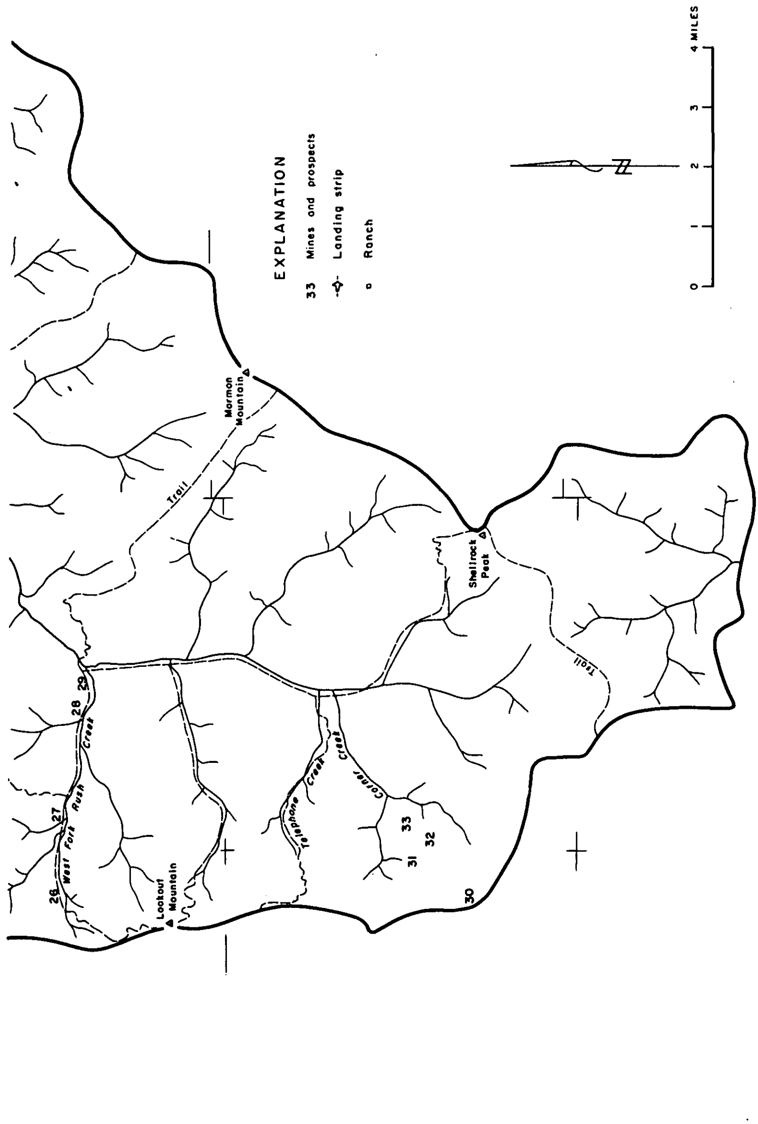


FIGURE 113.—Mines and prospects, Big Creek district.

Mines and prospects shown in figure 113

1. Acorn group	12. Coxey Creek Bar	23. Lost Fawn claim
2. Mile Flat placer	13. No Name placer	24. Copper Mountain group
3. Dewey Moore group	14. Coxey Creek placer	25. Bear Trap prospect
4. Box Springs claim	15. Gold Lodge claim	26. Gilt Edge group
5 S and B group	16. John Vine Bar	27. West Fork Rush Creek placers
6. No Name claim	17. Valentine claim	28. Rush Creek placer group
7. Lime Creek prospect	18. Cave Creek placer	29. Skookum claim
8. Two Friends claim	19. Cabin Creek Bar	30. Highland claim
9. Hard Boil Bar	20. Point placer	31. L. S. No. 1 claim
10. Over Easy Bar	21. Cougar Creek placer	32. Ketchum claim
11. Soft Boil Bar	22. Goat Creek placer	33. W. K. No. 1 claim

Iron-stained dikes and zones occur in Precambrian Hoodoo Quartzite and Yellowjacket Formation. Samples of the stained rock contained a trace to 0.04 ounce gold and 0.18-1.84 ounce silver per ton.

Opal, not of gem quality, is in prospect pits in rhyolite of the Challis Volcanics near the center of the ridge.

Lode Prospects

Copper Mountain group. — The Copper Mountain group (fig. 113, No. 24), was located by Sawyer and Lytle in 1959 about 2.5 miles northeast of Routson Peak. Seven pits were dug in Hoodoo Quartzite. Some are along an easterly striking vertical fault; others are on an irregularly tabular volcanic breccia trending N. 45° W. The fault zone is 110 feet long and 3 feet wide. The breccia is 60 feet long and 8 feet wide. Both structures are exposed to a depth of 15 feet. Parts of the fault consist of 45 percent iron-oxides and 55 percent crushed rock. No metallic minerals were visible in the breccia. Three samples from the fault zone averaged 0.02 ounce gold per ton, 1.01 ounces silver per ton, and a trace copper. A breccia sample contained a trace gold, 0.29 ounce silver per ton, and a trace copper and lead.

Lost Fawn claim. — The Lost Fawn claim (fig. 113, No. 23) is 1 mile northeast of Routson Peak. A pit and two trenches are in heavily stained rhyolite. The stain is mostly iron and manganese oxides. Two samples of the stained rock contained a trace gold and 0.18 and 0.23 ounce silver per ton.

Gilt Edge group. — The Gilt Edge group (fig. 113, No. 26), located in 1902 by M. Kurtz, is along the West Fork Rush Creek trail. Two prospect pits reach the rhyolite bedrock through 1 foot of overburden, but neither shows ore minerals. Samples from each had only a trace gold and silver.

Skookum claim. — The Skookum claim (fig. 113, No. 29), without workings, is near the mouth of the West Fork of Rush Creek; it was located in 1902 by D. Cameron. A 225-foot-wide and 300-foot-long outcrop of micaceous phyllite is in rhyolite porphyry. A grab sample assayed a trace gold and 0.12 ounce silver per ton.

Bear Trap prospect. — Several pits are along the crest of Big Creek Ridge in secs. 7 and 8, T. 20 N., R. 12 E. (fig. 113, No. 25). The pits are in rhyolite of Challis Volcanics. Opal, not of gem quality, is in vugs and fissures in the rhyolite.

PLACER PROSPECTS

West Fork Rush Creek placers. — Numerous placer claims were located on West Fork Rush Creek and its tributaries in the early 1900's, but only two claims were found during the study, and both were recorded in 1902.

The Wickeup placer claim (fig. 113, No. 27), located by D. Cotter, is a low bar having an area of 4.0 acres. The bar is estimated to contain 64,500 cubic yards of alluvium. The only prospect is a 7-foot shaft on the south edge of the bar; a cabin is a few hundred feet northeast of it. Pan samples from the placer pit did not contain gold.

Rush Creek placer group. — The 1¼-mile stretch of valley bottom along West Fork Rush Creek extending upstream from its mouth was claimed as the Rush Creek placer group by L. Caswell (fig. 113, No. 28). Gold was not found in reconnaissance samples.

CORNER CREEK AREA

The Corner Creek area covers the headwaters of Corner Creek (fig. 113). Access is by way of 6 miles of trail from the end of the Thunder Mountain road. Courthouse records indicate widespread location of claims in the early 1900's, but only four lode claims were found. The workings are in iron-stained Challis Volcanics. A sample from the W. K. prospect contained 0.34 ounce gold per ton, but others contained only a trace. Silver content ranged from 0 to 0.3 ounce per ton.

LODE PROSPECTS

L. S. No. 1 claim. — The L. S. No. 1 prospect (fig. 113, No. 31) is near the north fork of Corner Creek. Challis Volcanics underlying the prospect are jointed and have an unusual amount of iron- and manganese-oxide stain. In places, the stain comprises up to 5 percent of the rock.

A 10-foot-long adit, a 400-foot-long trench, and a 5-foot-deep pit do not expose mineralized rock. The adit trends S. 80° W., and the trench trends N. 60° W. A random sample from the adit dump contained a trace gold and 0.3 ounce silver per ton.

Highland claim. — The Highland claim (fig. 113, No. 30) was located in 1902 by W. and C. Gamble on pink Challis Volcanics. The volcanics are fractured and display iron staining along the fractures. Narrow opal veinlets occur along some fractures. A 5-foot-deep pit in the volcanics does not reveal structures or ore minerals. A sample from the pit assayed a trace gold and 0.2 ounce silver per ton.

Ketchum claim. — The Ketchum claim (fig. 113, No. 32) was recorded by Swanson and Lewis in 1902. A small pit explores one of several faults that dip N. 20° W. and strike 60° SW. in porphyritic rhyolite of the Challis Volcanics. Fault filling is 96 percent rock fragments, 2 percent iron oxides, 1 percent opal, and 1 percent chlorite. No economic minerals were seen, and gold and silver were not reported in assays.

W. K. No. 1 claim. — The W. K. No. 1 claim (fig. 113, No. 33) covers numerous fissures filled with iron-stained opal. The largest fissure trends N. 10° E. and dips west. It is bounded on the east by white tuffaceous breccia and on the west by pink porphyritic rhyolite. The opal fill is 1 foot wide by 110 feet long and is exposed to a depth of 20 feet. A sample across the opal contained 0.34 ounce gold per ton and 0.2 ounce silver per ton. The gold content is too low, and the size is too small for mining.

BIG CREEK PLACER AREA

Thirteen alluvial deposits are scattered along Big Creek and tributaries in the center of the district (fig. 114). The deposits are in alluvial terraces above the creek bed, alluvial fans, or low-lying deposits (table 29). All but two contain 21,000 to 280,000 cubic yards; the two largest terraces contain about 1.7 and 4 million cubic yards. Most are almost barren of vegetation; a few are covered with brush and small conifers. Placer claims were recorded for almost all of the terraces in the late 1800's; a few were relocated in the 1950's. No production has been recorded.

Altitudes range from 4,600 feet at Monumental Bar to 3,400 feet at the mouth of Big Creek. Average fall of the creek is 60 feet per mile; the fall is greater in narrow stretches of the canyon.

Depositional features of the deposits indicate that the material is reworked glacial debris. Material size ranges from fine sand to large boulders. More than 70 percent is less than 1 inch across, and more than 85 percent is less than 6 inches across. Less than 10 percent are boulders larger than 1 foot across.

Depending on nearby source rock, the composition of the deposits varies from 5 to 75 percent quartzite, 20 to 30 percent other metamorphic rocks, 10 to 90 percent granitic rocks, and 20 to 70 percent volcanic rocks.

The deposits were sampled from test pits and by channels cut into creek banks. One cubic foot of sample was taken per foot of depth. Gold values did not increase with depth, but gold was observed from top to bottom at most sites (table 30). The best values were at Mile Flat, where values were

TABLE 29. — *Summary data, Big Creek placers*

[Tr, trace]

Deposit	Site (fig. 113)	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands (lb per cu yd)
Mile Flat placer	2	5.9	143,000	Tr to 21.7	9.5
Hard Boil Bar	9	0.6	21,000	0 to 1.2	6.9
Over Easy Bar	10	1.1	71,000	0 to 1.4	11.0
Soft Boil Bar	11	2.3	45,000	0.3 to 0.6	5.8
Coxey Creek Bar	12	5.7	185,000	0 to Tr	10.4
No Name placer	13	4.5	72,000	0 to 0.3	4.8
Coxey Creek placer	14	4.0	77,000	0 to Tr	.8
John Vine Bar	16	109.3	4,056,000	0 to 3.7	7.0
Cave Creek placer	18	45.0	280,000	0 to 4.2	.3
Cabin Creek Bar	19	105.5	1,702,000	0 to 4.2	7.5
Point placer	20	5.0	64,500	Tr	13.6
Cougar Creek placer	21	3.7	30,000	Tr to 1.6	12.3
Goat Creek placer	22	13.1	180,000	0 to Tr	2.7

[1]Gold values are based on a price of $47.85 per troy ounce.

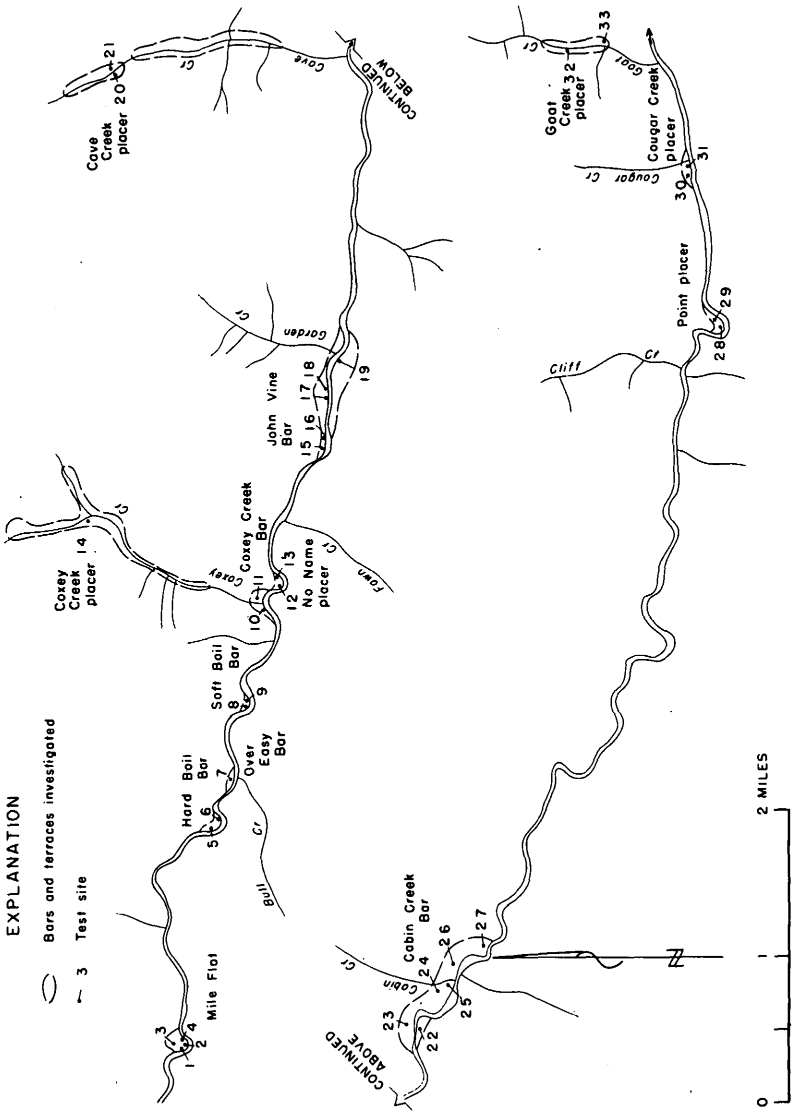


FIGURE 114. — Big Creek placer area.

TABLE 30. — *Sample data for Big Creek district placers*

[Placer locations and site numbers are shown in fig. 114. Tr, trace; N.d., not detected]

Site	Depth interval[1] (feet)	Gold content: Colors[2]	Gold content: Value[3] (cents per cu yd)	Black sands (lb per cu yd)
		Mile Flat placer		
1	0.0 - 5.34	5f.	0.1	8.2
	5.34- 5.60	11v.f.	1.4	152.3
	5.60- 5.75	2m.	4.9	146.5
2	0.0 - 4.75	2v.f.	Tr	4.1
3	0.0 -6.00	4f.	.3	2.0
4	0.0 - 4.16	2f.	.1	3.0
	4.16- 4.50	20f., 12m.	21.7	83.8
	4.50- 5.91	5f., 2m.	.8	9.3
	5.91- 6.25	3m., 11f.	5.6	71.3
		Hard Boil Bar		
5	0.0 - 7.25	2v.f., 1m.	0.1	4.2
	7.25-14.20	N	N	3.8
	14.20-18.4	28v.f., 3m.	.8	6.4
6	0.0 - 3.50	11v.f.	1.0	19.8
	3.50-10.40	19v.f.	.6	3.6
	10.40-15.90	9f.	.6	10.6
		Over Easy Bar		
7	0.0 - 5.80	1f., 4m.	0.1	13.5
	5.80-11.40	29f., 11m.	1.4	8.6
	11.40-17.10	27f., 5m.	1.0	8.5
	17.10-22.50	21f., 4m.	1.0	15.0
	22.50-28.60	3f.	Tr	8.9
	28.60-29.10	5f.	.6	18.0
		Soft Boil Bar		
8	0.0 - 2.00	6v.f.	0.4	7.6
	2.00- 5.30	12v.f.	.3	8.1
9	0.0 - 7.80	26v.f., 2m.	.6	4.3
		Coxey Creek Bar		
10	0.0 - 2.30	N	N	2.0
	2.30- 6.30	N	N	1.8
11	0.0 - 2.30	2v.f.	Tr	9.9
	2.30- 5.80	2v.f.	Tr	11.2
	5.80-10.80	3v.f.	Tr	17.9
	10.80-15.90	3v.f.	Tr	13.2
		No Name placer		
12	0.0 - 5.60	11f., 3m.	0.1	4.1
	5.60- 9.10	6v.f., 2m.	.1	6.1
	9.10-13.10	3f.	.1	3.5
	13.10-18.00	1f.	Tr	2.8
	18.00-21.00	3v.f.	.1	9.5
	21.00-25.30	7v.f., 1m.	.3	1.7
13	0.0 - 2.70	3v.f., 8f.	.3	10.3
		Coxey Creek placer		
14	0.0 - 1.08	N	N	1.0
	1.08- 4.30	2f.	Tr	.7
		John Vine Bar		
15	0.0 - 4.00	16f., 2m.	0.8	5.1
	4.00- 8.50	31f., 7m.	2.5	9.2
	8.50-12.50	12f., 1m.	.8	5.0
16	0.0 - 2.50	4f., 1m.	1.2	4.7
17	0.0 - 2.50	6f., 1m.	2.2	8.2
	2.50- 8.00	10f., 8m.	1.0	1.1
18	0.0 - 2.30	3v.f.	Tr	4.5
	2.30- 3.80	26f., 8m.	3.7	29.0
19	0.0 - 4.50	6f., 3m.	.4	10.6

TABLE 30. — *Sample data for Big Creek district placers* — Continued

Site	Depth interval[1] (feet)	Gold content: Colors[2]	Gold content: Value[3] (cents per cu yd)	Black sands (lb per cu yd)
Cave Creek placer				
20	0.0 - 8.00	6v.f.	Tr	0.3
	8.00-12.00	N	N	.4
21	0.0 - 6.00	N	N	.3
Cabin Creek Bar				
22	0.0 - 5.30	42f., 6m., 3c.	4.2	9.0
	5.30- 9.30	20f., 3m.	1.4	7.1
23	0.0 - 2.50	14f., 1m.	.7	15.0
24	0.0 - 3.30	N	N	.6
25	0.0 - 3.20	7v.f.	.4	18.5
26	0.0 - 1.30	5f., 1m.	.6	8.3
27	0.0 - 2.30	N	N	.8
	2.30- 3.80	N	N	4.1
Point placer				
28	0.0 - 2.50	4v.f.	Tr	8.7
	2.50- 4.80	5v.f.	Tr	14.6
29	0.0 - 2.00	3v.f.	Tr	22.2
	2.00- 9.00	17v.f.	Tr	12.5
Cougar Creek placer				
30	0.0 - 2.00	3f.	0.7	23.6
	2.00- 8.60	66f., 30m.	1.6	13.0
31	0.0 - 2.20	3f.	Tr	7.1
	2.20- 4.50	2f.	Tr	6.8
	4.50- 9.10	5f.	Tr	11.8
Goat Creek placer				
32	9.5	2v.f.	0.7	5.4
	0.5	1f.	Tr	.6
33	0.0 - 3.0	N	N	.1
	3.0 - 6.0	N	N	.1
	6.0 - 9.0	N	N	.1

[1]All samples are 1 cubic foot in volume per foot of depth.
[2]Colors are the number of particles of gold observed in the sample. Relative size of particles are as follows: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300 to 1,000 colors to equal 1 cent; m. (medium) requires 10 to 300 colors to equal 1 cent; c. (coarse) takes less than 10 colors to equal 1 cent worth of gold.
[3]Gold values are based on a price of $47.85 per troy ounce.

as much as 21.7 cents gold per cubic yard. A few samples from other prospects contained more than 1 cent gold per cubic yard.

Black sand (ilmenite and magnetite) concentrates from deposits along Big Creek averaged 7.4 pounds per cubic yard; those from along tributaries averaged less. The average ilmenite content of deposits along Big Creek was estimated to be 2.7 pounds, worth 2.5 cents, per cubic yard. The magnetite content is estimated to average 3.6 pounds per cubic yard. Traces of scheelite were seen in concentrates submitted for petrographic examinations.

The deposits along Big Creek are estimated to total almost 7 million cubic yards but are too low in grade to be considered a potential source of ilmenite or gold.

INDIAN CREEK DISTRICT

No major mines or mine workings are in Indian Creek district. The

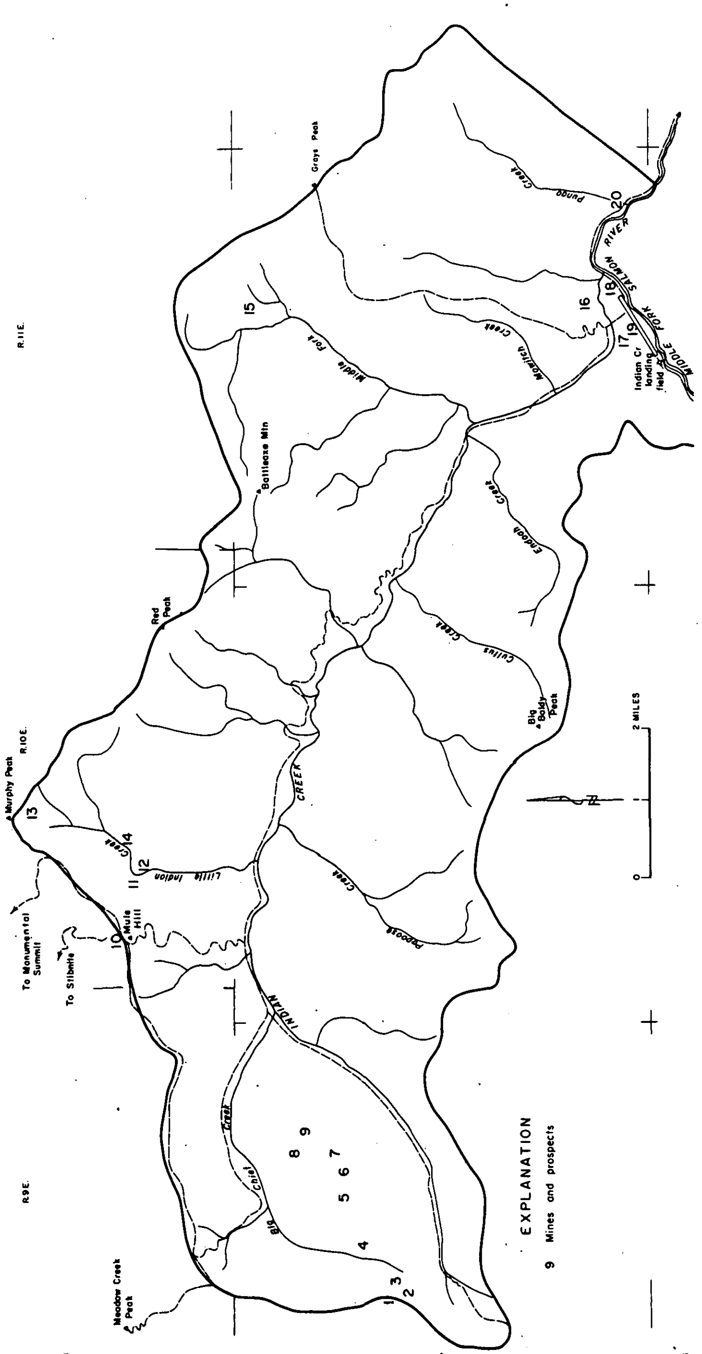


FIGURE 115. — Mines and prospects, Indian Creek district.

Mines and prospects shown in figure 115

1. Several Pits prospect
2. Minnie Wilson No. 1 claim
3. Snow Storm No. 1 claim
4. Rock Rabbit Nos. 1-10 claims
5. S. J. prospect
6. Duches N. claim
7. Slide prospect
8. Copper Mountain (Mary Kate) prospect
9. Big Chief claims
10. Mule Train claims
11. Vesper claim
12. Jerico claim
13. Unknown prospect
14. Lucky Boy placer
15. Chief Executive group
16. Come Back prospect
17. Gold Flat prospect
18. Indian Creek Quartz deposit
19. Indian Creek Landing Field placer
20. Pungo Creek Fluorspar prospect

Pungo Creek Fluorspar prospect (fig. 115, No. 20) at the mouth of Pungo Creek, contains marginal fluorspar resources. A tungsten deposit at Copper Mountain is a small resource (fig. 115, No. 9).

The district, about 93 square miles, is in the southwestern part of the Idaho Primitive Area and in the drainages of Indian and Pungo Creeks. The U.S. Forest Service maintains a 5,000-foot-long runway and guard station at the mouth of Indian Creek. Topography is rough and mountainous; altitudes range from 4,650 feet at Indian Creek landing field to 9,722 feet at the summit of Big Baldy Peak.

Courthouse records list about 200 mining-claim locations within the district since the 1890's. Ninety percent of these locations were for gold in about 1900 during the Thunder Mountain boom. There is no record of production from the district.

Tertiary Challis Volcanics cover about 70 percent of the district, but most deposits are in quartz monzonite and granodiorite of the Cretaceous Idaho batholith at the west end of the district. The Idaho batholith is also exposed in places along the southern boundary of the district.

A roof pendant of limestone in granitic rocks is exposed in the west end of the district; it contains some tungsten and molybdenum minerals.

LODES

Eighteen prospects were identified and sampled. Workings at these sites vary in size and number, but most are small. Outcrop samples indicated traces gold, silver, lead, and copper in some places but not in significant amounts.

A description of the prospects follows, and each property is identified by number in figure 115.

Pungo Creek Fluorspar Prospect

The Pungo Creek Fluorspar prospect is at the mouth of Pungo Creek, a tributary of the Middle Fork Salmon River, approximately 1½ miles downriver from the Indian Creek landing field (fig. 115, No. 20).

The Pungo Creek prospect was first located in the early 1900's erroneously as a quartz vein and was prospected for gold and silver. Fluorite was recognized in 1945, and the prospect was relocated by Edward Budell as the Pungo Creek Nos. 1-6 claims. During the early 1950's, the Fluorspar Corp. of Reno, Nev., held an option on the property and received a Defense Minerals Exploration Administration (DMEA) loan. The exploration pro-

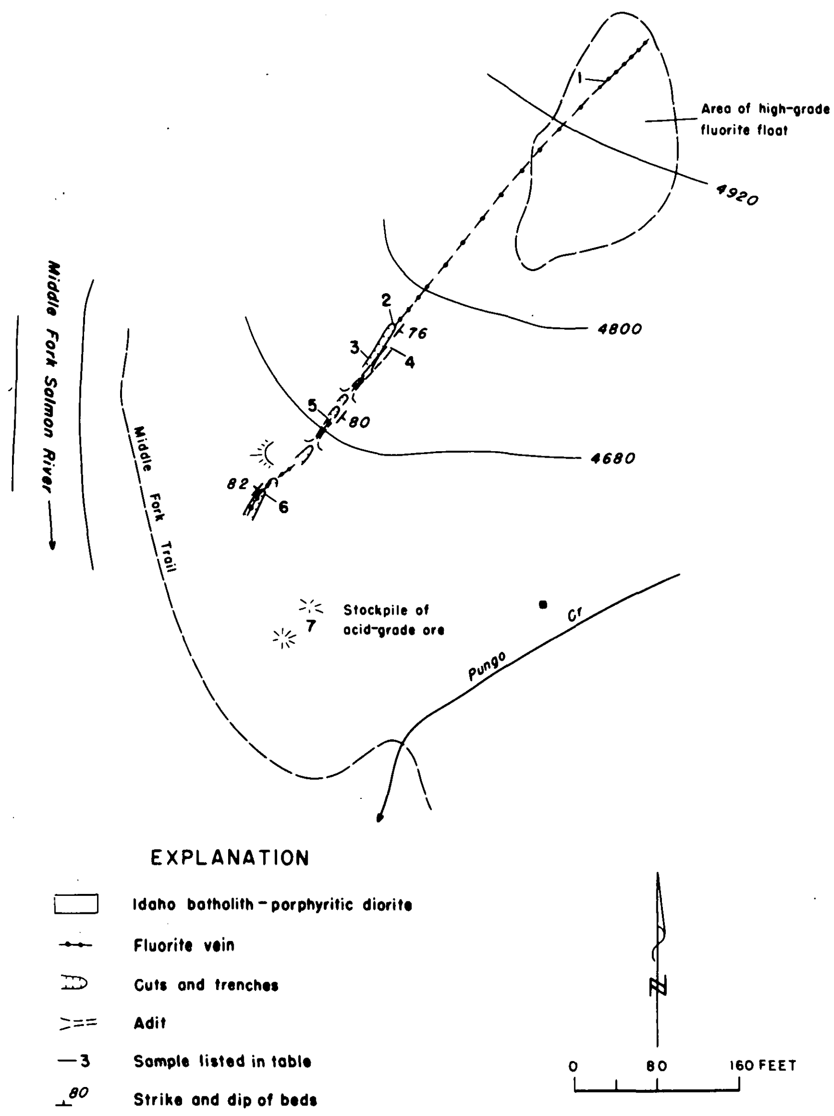


FIGURE 116. — Pungo Creek Fluorspar prospect. Modified from DMEA file report.

ject, however, was not started. The claims were allowed to lapse, and the U.S. Forest Service withdrew the land from mineral entry for administrative-site purposes.

The fluorite occurs in a vein, in small veinlets, and as disseminations in a siliceous brecciated 5-foot-wide fault zone which transects porphyritic diorite (fig. 116).

The fault zone strikes N. 40°-45° E. and dips steeply southeast and northwest. Vein width averages 1.5 feet, ranging from 0.6 to 3 feet; the vein is well exposed for 260 feet up the ridge from the base of the hill. Beyond this point on the ridge, high-grade float and an exposure of low-grade fluorite breccia indicate a total length of about 700 feet. The vein fluorite is massive, is white, green, and blue, and contains minor amounts of quartz.

Data for samples shown in figure 116

[Sample 7 was grab; all others were chip]

Sample			Sample		
No.	Length (ft)	CaF_2 (percent)	No.	Length (ft)	CaF_2 (percent)
1	2.0	3.8	5	[1]4.0	67.0
2	3.0	73.5	6	2.5	53.2
3	2.0	93.5	7	--------	96.9
4	[1]1.3	96.8			

[1]At adit face.

A well exposed fluorite vein is in two short drifts, three opencuts, and a trench. A partly exposed low-grade breccia ore is present in the walls. A cabin and a 75-ton stockpile of acid-grade fluorite, cobbed from about 135 tons of vein material, are on the terrace below the workings.

A resource of 6,800 to 13,000 tons of acid-grade fluorspar is estimated. An equal amount of low-grade material is probably available, making a total-resource estimate on the order of 26,000 tons. The cost of mill construction and processing would prohibit mining the entire deposit. Mining and cobbing the high-grade material might make a marginal operation. The cost of building a road to the property would probably be the determining economic factor.

Copper Mountain (Mary Kate) Prospect

The property was located by Leon Haugh and Ralph M. Taylor in 1960 as the Mary Kate; it was relocated by Leon Haugh and Harry Jernberg in 1964 as the Copper Mountain prospect (fig. 115, No. 8).

Workings consist of a small discovery pit, a caved adit, and a small pit above the adit. The discovery pit, in granodiorite, exposes an amphibolite dike and a block of massive limestone. The dike, which is 4 feet wide, contains finely disseminated pyrite and strikes S. 35° E. Some granodiorite dump material from the pit is stained with copper minerals. Four samples — two from the dump, one from the dike, and one from the limestone block — contained up to 0.20 ounce silver per ton and a trace gold, copper, and tungsten.

The caved adit and small pit are 300 feet east of the discovery pit. They were excavated to explore a granodiorite-limestone contact which trends about S. 35° E. Rock exposed at the caved portal is granodiorite, but the presence of massive limestone on the dump indicates that the contact was intersected. Dump material consists of iron-stained granodiorite and gray massive limestone. Six samples were taken from that area: three samples from the adit dump, one from granodiorite exposed above the adit, one from granodiorite and limestone from the small pit above the adit, and one from limestone from an outcrop 100 feet northeast from the adit. These six samples contained up to 0.26 ounce silver per ton and a trace gold, copper, and tungsten. One sample from the adit dump contained 0.14 percent WO_3 and 0.36 percent copper.

Other Lode Prospects

Indian Creek Quartz deposit. — The Indian Creek Quartz deposit (fig. 115, No. 18) is about 500 feet beyond the northeast end of the Indian Creek landing field. It is a massive quartz body averaging 100 feet long, 100 feet wide, and 50 feet high. It stands in sharp relief to the surrounding, less resistant biotite gneiss and quartzite. The quartz grades into quartzite on the north side.

The milky-white quartz contains less than 1 percent disseminated mica. Iron and manganese stains coat joint surfaces. Analysis of one sample indicates that this deposit is not high-purity silica.

Come Back prospect. — The Come Back property (fig. 115, No. 16) was located by F. S. Allison, W. C. Dewey, C. S. Dixon, and William Grace in 1936 on a slope above the Middle Fork Salmon River. A silicified shear zone up to 5 feet wide in rhyolite is in a small discovery pit. A caved adit, about 200 feet downslope, was probably driven to explore the shear zone at depth, but no mineralized rock was found on the dump or in an outcrop above the adit.

The shear zone in the pit strikes N. 87° E. and dips 49° N. It contains iron-stained milky-white quartz lenses 6 inches to 2 feet wide along shear planes. Galena, sphalerite, chalcopyrite, and bornite occur as knifeblade-thin coatings and fillings along shear planes and are sparsely disseminated through the quartz. About 3 percent of the mineralized zone is sulfides. The zone is exposed to a depth of 8 feet in the pit but could not be traced beyond the pit walls. Analyses of two samples cut across the shear zone indicate values of 0.05 ounce gold and 0.67 ounce silver per ton, 0.12 percent copper, and 0.04 percent lead.

Gold Flat prospect. — A group of several small sloughed prospect pits on the ridge between the Indian Creek landing field and Indian Creek are probably on the Gold Flat claim (fig. 115, No. 17) located by F. S. Allison and G. Dickie in 1905. The pits were dug in iron-stained granitic rocks which, at places, contain narrow quartz stringers. Two samples from the pits contained a trace gold, silver, and copper.

Minnie Wilson No. 1 claim. — The Minnie Wilson No. 1 claim (fig. 115, No. 2) was located by James W. Hood and others in 1904 on the ridge crest west of Big Chief Creek. A small stockpile, adjacent to a sloughed pit in granodiorite, contains pieces of iron-stained vuggy quartz with a trace bornite, malachite, and marcasite. Vein material was not found in place; the vein is probably less than 1 foot wide. Analyses of mineralized quartz collected from the stockpile along with adjacent granodiorite float showed no gold, 0.05 ounce silver per ton, and a trace copper.

Several Pits prospect. — Several small sloughed pits (fig. 115, No. 1) in iron-stained granitic talus are on the ridge crest near the head of Indian Creek. A grab sample of granitic material on the dumps contained 0.01 ounce gold per ton, no silver, and a trace copper, lead, and molybdenum.

Snow Storm No. 1 claim. — The Snow Storm No. 1 claim (fig. 115, No. 3) was located by George McBride in 1904 near the head of Big Chief Creek. The only working is one sloughed pit in granitic talus. Bedrock is not exposed. Pieces of vuggy iron-stained quartz with a trace bornite are concentrated on one side of the dump.

The size of the pieces of quartz indicates that the vein was probably less than 1 foot thick. Analyses of vein material and granitic rocks selected from the dump averaged 0.05 ounce silver per ton, 0.16 percent lead, and a trace copper, molybdenum, and gold.

Rock Rabbit Nos. 1-10 claims. — Mr. Kontes and others located the Rock Rabbit group of claims (fig. 115, No. 4) in 1955 about one-fourth mile east from Big Chief Creek.

Eight small prospect pits and one trench, in granodiorite, are in an area 350 feet long and 200 feet wide. Short randomly oriented quartz veinlets 1 to 6 inches wide are exposed in the main trench. Hematite and limonite occur as vug fillings, fracture coatings, and stains. No ore minerals were seen. Two composite grab samples from the walls and dumps of the pits and trench contained 0.05 ounce silver per ton and no gold, copper, or other important metals.

S. J. prospect. — The S. J. prospect (fig. 115, No. 5) was located on the ridge between Indian and Big Chief Creeks by S. J. McDill in 1905. The only working is a sloughed trench in iron-stained granitic talus. No economic minerals were observed. A grab sample from the trench contained no silver and a trace gold and copper.

Duches N. claim. — The Duches N. claim (fig. 115, No. 6) was located by S. J. McDill and H. H. Cole in 1905. A prospect pit is in iron-stained granitic talus — rock is not exposed. A sample of granitic rock from the dump contained a trace gold and silver.

Slide prospect. — The trench identified as the "Slide prospect" (fig. 115, No. 7) cannot be correlated with recorded mining claims. The 10-foot-long trench is in iron-stained aplite-textured granodiorite. Economic minerals were not seen. Dump samples contained traces copper and no gold or silver.

Big Chief claims. — The Big Chief property (fig. 115, No. 9) was located by Arthur W. and Earl A. Kimball in 1947. Workings consist of four small sloughed pits in iron-stained granodiorite. The pits are on the southeast side of the ridge between Big Chief and Indian Creeks, spaced over a distance of about 1,800 feet. Granodiorite is not exposed by the pits. Analyses of samples, one from each dump, indicated a trace to 0.10 ounce silver per ton and a trace gold, copper, and lead.

Mule Train claims. — Mule Train 6 and 7 claims (fig. 115, No. 10) were staked by Messrs. Meacham, Curdie, and Corbett adjacent to the Old Thunder Mountain road.

The prospect consists of one trench and two small pits and another small pit 800 feet to the west. All are sloughed, but dump material indicates that they were dug in the iron-stained quartz-rich granodiorite. A composite sample from the dumps of the three closest workings contained 0.02 ounce gold per ton and a trace copper, lead, and tungsten. A sample from the pit to the west assayed 0.02 ounce gold and 0.05 ounce silver per ton and a trace copper, lead, and tungsten.

Vesper claim. — H. R. Morse located the Vesper claim (fig. 115, No. 11) in 1935. Three small pits and two trenches are in iron-stained granodiorite. Quartz veinlets, less than 4 inches wide, are exposed in the trenches. Analyses of two samples of quartz-rich material from the dump showed 0.14 ounce silver per ton and a trace copper and gold. Several pieces of granodiorite float with disseminated flecks of molybdenum were found near the workings, but the source was not detected.

Jerico claim. — The Jerico claim (fig. 115, No. 12) was located by H. R. Morse in 1935 near Little Indian Creek. The abundance of quartz in the dumps of a small sloughed pit and trench in granodiorite indicates that numerous small quartz veinlets intersected. Quartz material from the dumps contained a trace gold and copper. Several pieces of granodiorite float containing disseminated flecks of molybdenum were found near the workings, but the source was not located.

Unknown prospect. — A small prospect pit is in a talus slope composed of cobble-sized fragments of weathered rhyolite porphyry near Murphy Peak (fig. 115, No. 13). Analyses of dump samples showed traces gold and silver.

Chief Executive group. — The Chief Executive group of claims (fig. 115, No. 15) was staked by Messrs. Moody and Dougherty in 1902. The only working is a small sloughed trench in talus composed of weathered rhyolite tuff. A sample of dump material contained 0.01 ounce gold per ton and a trace silver and copper.

PLACERS

Placer samples were taken from the Lucky Boy and the Indian Creek Landing Field placers, the only recorded placer claims in the district (fig. 115, Nos. 19, 14). Only the samples from the Indian Creek Landing Field contained more than a trace gold.

LUCKY BOY PLACER

The Lucky Boy property (fig. 115, No. 14) is on the northwest bank of Little Indian Creek approximately 2½ miles upstream from the mouth of Little Indian Creek. The claim was staked by A. D. Parks, D. H. Casey, and C. J. Cromin in 1902.

Three small trenches are in the streambank south of the remains of a small log cabin. Alluvium in the trenches consists of clayey iron-stained soil containing disseminated flakes of mica, grains of quartz, and fragments of rhyolite porphyry. Panned concentrates from material exposed by the workings assayed a trace gold and silver.

Indian Creek Landing Field Placer

The Indian Creek Landing Field placer (fig. 115, No. 19) is along the northwest side of the Middle Fork Salmon River ½ mile upstream from the mouth of Indian Creek and on a relatively flat river terrace 30 feet above river level. The field, maintained by the U.S. Forest Service, was withdrawn from mineral entry for administrative purposes. The terrace deposit covers 165 acres and contains roughly 8 million cubic yards of gravel. The area is densely forested with conifers with trunks as much as 3 feet in diameter.

The southwestern part of the terrace is underlain by pink granitic rock; the northeastern part, by quartzite containing numerous quartz stringers. The deposit is composed of about equal parts rhyolite porphyry and granite. About 10 percent of the alluvium is boulders of more than 1 foot across, and about 50 percent is less than 1 inch across.

Four pits and one trench were dug and channel sampled (fig. 117). The samples were concentrated by a vibrating sluice box and then further concentrated by a laboratory-size Wilfley table. Gold values ranged from a trace to 4.1 cents per cubic yard, giving no indication that values increase with depth (table 31). Black sand concentrates from the samples ranged from less than 1 pound to 2 pounds per cubic yard. The average magnetite content of the black sand concentrates is about 30 percent. No significant concentrations of economic minerals were found in the black sand concentrates.

SOUTH FORK ADDITION

Mineral potential of the South Fork addition is minor. Only a small amount of placer gold production has been recorded. The district (fig. 118) comprises approximately 60 square miles of land contiguous to the east edge of the Warren mining district, which was noted for placer gold production and for some lode gold production.

Both the South Fork Salmon River and the Salmon River are in deeply incised canyons with numerous alluvial terraces along both streams. Maximum relief in the addition is 6,000 feet, and forest, brush, and grass mantle the surface except along canyon slopes. This mantle has been the principal obstacle to prospecting for lodes.

The first mining claims were located in the addition in the 1890's, and a total of 62 (6 lode and 56 placers) locations have been recorded. No evidence of lode mining activity was found, but many old ditches and cuts on the terraces are evidence of past interest in the placer potential of the terraces. One placer mine is known to have operated. In 1937 the Salmon River Placer Mining Co., Boise, Idaho, is said to have produced $870.50 worth of gold.

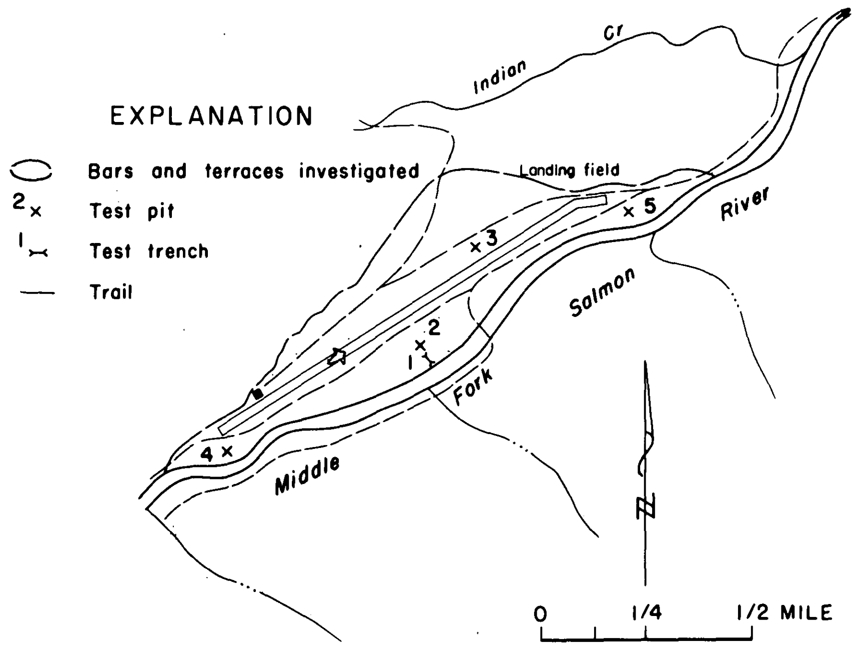


FIGURE 117. — Indian Creek Landing Field placer.

Lode deposits of the South Fork addition are fissure veins, silicified zones, and iron-stained country rock. Along the eastern boundary, granite surrounds roof pendants which consist mostly of argillaceous quartzites intersected by dikes and massive white quartz-hematite veins and pegmatite dikes. Metallic minerals are in the granite, which is faulted and cut by massive white quartz veins. The granite grades downward into biotite gneiss.

Of the six lode mining claims located in the South Fork addition, only two were found. These claims, on the south edge of the addition, are a part of the Wolf Fang group (fig. 118, No. 7). No workings were found, but three additional mineral occurrences were found and examined during the search for mining claims.

Gravel accumulations which were sampled in the district are limited to stream bars and terrace deposits along the South Fork Salmon River from the mouth to a point 3 miles upstream. In total, there are about 84 acres of terrace deposits that contain an estimated 3.7 million cubic yards of gravel. The terrace deposits range from 7 acres containing 135,000 cubic yards of gravel to 32 acres containing more than 1 million cubic yards. The alluvium

Mines and prospects shown in figure 118

1. Salmon placer north
2. Salmon placer south
3. Dodge placer north
4. Dodge placer south
5. Huddleson placer
6. Mountain Sheep placer
7. Wolf Fang group
8. Wolf Fang Peak prospect 1
9. Wolf Fang prospect 2

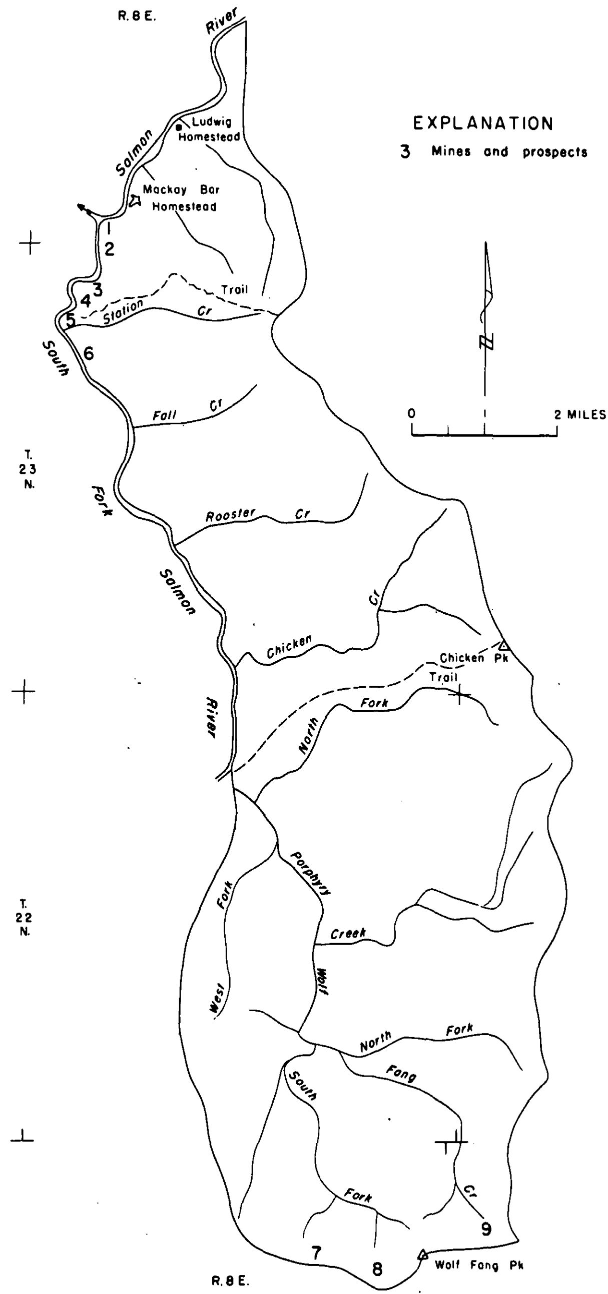


FIGURE 118. — Mines and prospects, South Fork addition.

in general cannot be economically mined at present prices. However, high-grade zones may exist which could be mined.

WOLF FANG PEAK AREA

The Wolf Fang Peak area is in the south end of the addition. Mining claims and the structures sampled in this area are accessible by trail from the Elk Summit road. Quartz veins occur in granitic rocks and along a contact between volcanic and granitic rocks which underlie the area. Veins up to 8 feet wide, silicified zones up to 130 feet wide, and iron-stained granitic rock were sampled at the prospects. The samples contained up to 0.8 ounce silver per ton but only a trace gold.

LODE PROSPECTS

Wolf Fang group. — A claim notice, dated July 1955, was posted on the Wolf Fang group property (fig. 118, No. 7), but there was no evidence of discovery work. The country rock is stained by iron oxides and contains barren quartz stringers 0.25-0.50 inch thick. A random sample of stringers and iron-stained rock contained a trace gold and 0.8 ounce silver per ton.

Wolf Fang Peak prospect 1. — The Wolf Fang Peak prospect 1 (fig. 118, No. 8) is on the ridge at the head of South Fork Wolf Fang Creek. The McRae tungsten property lies directly across the creek. The prospect consists of a quartz vein and silicified zone along a chill zone between the granitic rocks and the overlying volcanic rocks. The structures trend N. 20° E. and dip 65° W. The exposed part of the vein is 8 feet thick, 39 feet long, and 12 feet deep and is composed of massive vuggy iron-stained quartz. The exposed silicified zone is 130 feet thick, 100 feet long, and 100 feet high. A sample of the vein contained a trace gold and 0.30 ounce silver per ton. A sample of the silicified zone contained a trace gold and 0.10 ounce silver per ton.

Wolf Fang prospect 2. — Wolf Fang prospect 2 (fig. 118, No. 9) is at the head of Wolf Fang Creek. It consists of an ultramafic iron-stained dike that cuts the granitic and volcanic rocks. The exposed part of the dike is 8 inches thick, 115 feet long, and 80 feet deep. A sample across the dike contained a trace gold and 0.30 ounce silver per ton.

SOUTH FORK SALMON RIVER PLACERS

The placers examined in the South Fork addition lie along the South Fork Salmon River from the mouth to a point 3 miles upstream (fig. 119). Private lands along the Salmon River at Mackey Bar and Ludwig homesteads were not sampled (fig. 118). Evidence of past placer mining is on most of the terraces, which are held by the Mackay Bar Corp. A total of about 3.7 million cubic yards of gravel is estimated for the placers sampled (table 32). This is about one-fifth of the total gravel near the confluence of the rivers; the remainder is outside the study boundary or underlies the private homestead land. About 120 acres around the mouth of Station Creek was withdrawn as a U.S. Forest Service administrative site.

The only extensive placer mining was done on the southeast side of the mouth of the South Fork Salmon River. The Salmon River Placer Mining Co. of Boise, Idaho, operated a dragline and washing plant on an 80-foot-high section of gravel. In 1937, the last year of operation, the company is reported to have mined 1,766 cubic yards of material from which $870.50 worth of gold was recovered; the material averaged $0.49 per cubic yard.

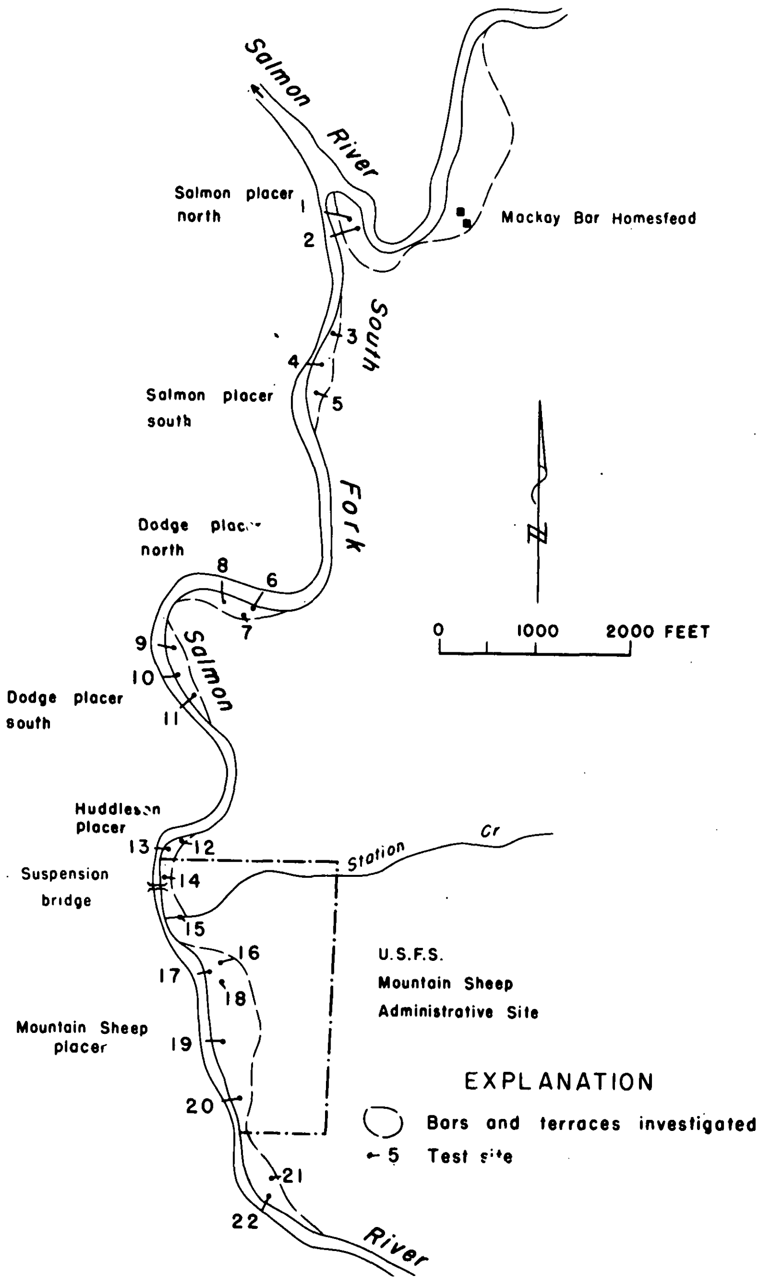


FIGURE 119. — South Fork Salmon River placer area.

TABLE 31. — *Sample data for Indian Creek Landing Field placers*

[Sample sites shown in fig. 117. Tr, trace]

Site	Depth interval[1] (feet)	Gold content		Black sands (lb per cu yd)
		Colors[2]	Value (cents per cu yd)[3]	
1	0 - 5.7	17v.f., 1f.	0.7	1.0
	5.7-10.5	5f., 1m.	1.4	.7
	10.5-16.5	9f.	Tr	1.2
	16.5-19.9	1f., 1m.	.7	.5
	19.9-21.7	2v.f.	Tr	1.1
	21.7-24.6	16f., 5m.	4.1	1.0
2	0 - 2.3	4v.f.	Tr	2.0
	2.3- 6.1	26v.f., 5f.	2.7	1.0
	6.1-10.1	1v.f., 1f.	Tr	1.0
3	0 - 1.7	3v.f.	Tr	1.1
	1.7- 3.1	1v.f.	Tr	1.2
	3.1- 5.9	3v.f.	Tr	1.9
	5.9-10.4	3v.f., 2f.	Tr	.8
4	0 - 2.7	4v.f., 2f.	Tr	1.2
	2.7- 6.0	6v.f., 4f., 8m.	2.7	1.2
5	0 - 2.8	50v.f., 3f.	1.4	1.2
	2.8- 5.5	15v.f., 5f., 1m.	4.1	1.3
	5.5- 9.0	3f.	Tr	.7

[1]All samples are 1 cubic foot per foot of depth.
[2]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires between 300 and 1,000 colors to equal 1 cent; m. (medium) requires 10 to 300 colors to equal 1 cent.
[3]Gold values based on a price of $47.85 per troy ounce.

TABLE 32. — *Summary data, South Fork Salmon River placers*

[Tr, trace]

Deposit	Site (fig. 118)	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands (lb per cu yd)
Salmon placer north	1	3	800,000	Tr to 2.6	1.0
Salmon placer south	2	20	645,000	Tr to 5.1	3.7
Dodger placer north	3	7	169,000	Tr to 10.3	3.1
Dodger placer south	4	7	135,000	Tr to 3.6	2.4
Huddleson placer	5	15	900,000	Tr to 51.0	.9
Mountain Sheep placer	6	32	1,032,500	Tr to 9.2	1.2

[1]Gold values based on a price of $47.85 per troy ounce.

Terrace deposits range from almost stream level to 80 feet above stream level and, with one exception, they are old accretion bars (fig. 120). The terrace gravels are unconsolidated and are composed principally of granitic and volcanic rocks of angular to subrounded sand to boulder size. Clay content and the number and size of boulders would not unduly affect mining.

The area is underlain by granitic rocks and gneiss. Rapid downcutting by stream action has produced a fairly smooth, hard bedrock surface which is not conducive to concentrations of gold in the bedrock.

The deposits were sampled from pits and trenches (table 33). A total of 101 samples was taken at 22 sites. The vertical sections sampled had a maximum depth of 35 feet and averaged 11 feet deep. Many of the minute gold particles are coated with oxides of iron and manganese. Gold values in individual samples ranged from a trace to 51 cents per cubic yard. The highest average amount of gold found in any vertical section was 12 cents per cubic yard. Small amounts of gold, found from top to bottom at every site, do not indicate that gold values increase with depth.

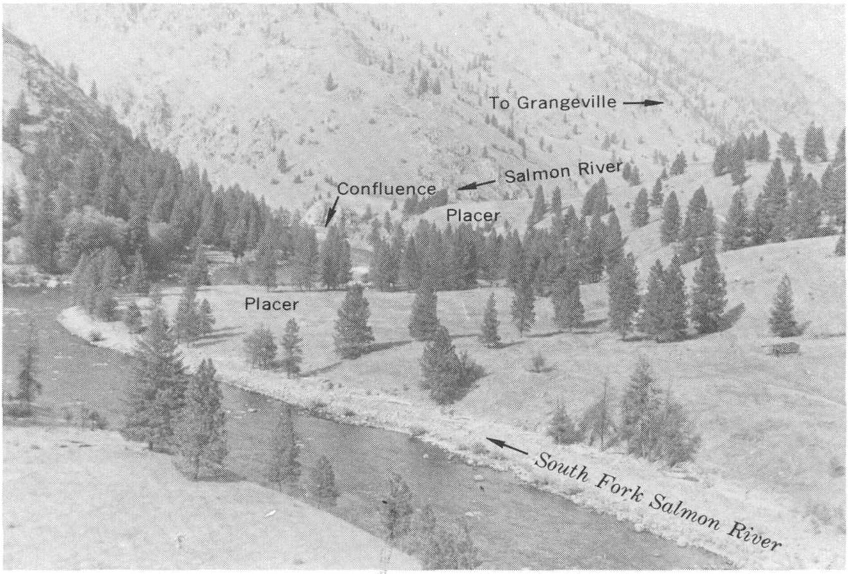


FIGURE 120. — Typical placer near the confluence of the South Fork Salmon River with the Salmon River.

TABLE 33. — *Sample data for South Fork Salmon River placers*

[Sample sites shown in fig. 119. Tr, trace]

Site	Depth interval[1] (feet)	Gold content		Black sands (lb per cu yd)
		Colors[2]	Value[3] (cents per cu yd)	
		Salmon placer north		
1	0.0- 2.0	9f., 1 fair	0.3	1.0
	2.0- 4.4	7f., 2 fair	.7	.6
	4.4- 6.6	9f., 1 fair	2.1	1.0
	6.6- 8.7	2f., 1 fair, 1m.	2.1	.5
	8.7-10.7	7f.	2.6	.9
	10.7-12.9	36f., 2 fair	1.2	2.4
	12.9-15.3	11v.f.	.7	.7
	15.3-18.5	4v.f., 1 fair	.7	.6
	18.5-21.8	6v.f.	Tr	.7
	21.8-24.0	3v.f.	.7	.7
	24.0-28.0	3v.f.	Tr	1.0
	28.0-31.5	15v.f.	.7	.9
	31.5-35.3	6f., 2 fair	1.6	.7
2	0.0- 4.0	8f.	.7	.6
	4.0- 6.5	12v.f., 1 fair	.7	2.4
	6.5- 9.0	20v.f.	.8	2.0
	9.0-11.6	5v.f.	Tr	.7
	11.6-13.4	9v.f., 2 fair	.4	2.2
	13.4-15.2	10f., 2 fair	1.4	2.4
	15.2-17.2	2f., 2fair	.7	.8
	17.2-19.7	35v.f., 4 fair	2.1	2.1
	19.7-21.9	15f., 1 fair	1.6	.9
	21.9-23.9	1f.	Tr	.2
	23.9-25.8	6f.	.7	1.0
	25.8-27.9	9f.	.7	1.7
	27.9-30.1	22f.	.6	2.2
		Salmon placer south		
3	0.0- 2.3	5f.	0.7	0.6
	2.3- 4.6	10f.	.7	.8
	4.6-10.6	7f.	.8	.4
	10.6-12.8	5f., 1 fair	.7	.8

TABLE 33. — *Sample data for South Fork Salmon River placers* — Continued

Site	Depth interval[1] (feet)	Gold content: Colors[2]	Gold content: Value[3] (cents per cu yd)	Black sands (lb per cu yd)
		Salmon placer south — Continued		
4	0.0- 2.8	3v.f.	Tr	.8
	2.8- 4.8	4v.f.	Tr	.8
	4.8- 8.2	2v.f.	Tr	1.0
	8.2-11.8	14f., 3 fair, 1m.	1.1	1.1
5	0.0- 1.6	3f.	Tr	.8
	1.6- 4.0	12v.f., 3 fair	.7	.9
	4.0- 6.0	3v.f.	Tr	.9
	6.0- 9.0	11f., 4 fair, 2m.	5.1	1.3
		Dodge placer north		
6	0.0- 3.0	6v.f.	Tr	0.5
	3.0- 7.0	4v.f.	Tr	.8
	7.0- 8.7	9v.f.	Tr	.4
	8.7-10.3	12v.f.	0.3	1.0
	10.3-12.5	44f., 3 fair	8.5	1.2
	12.5-14.5	48f.	3.8	6.1
7	0.0- 1.9	4f.	Tr	1.5
	1.9- 5.0	8f., 2 fair	5.5	1.4
	5.0- 6.7	51v.f., 8 fair	6.0	2.5
	6.7- 8.5	88f., 11 fair	9.6	3.0
	8.5- 9.6	26f., 2 fair	6.4	2.8
8	0.0- 1.5	11f., 2 fair, 1m.	1.9	7.3
	1.5- 3.7	35f., 4 fair	10.3	3.6
	3.7- 6.0	8f., 1m.	10.0	.9
		Dodge placer south		
9	0.0- 4.0	19v.f., 3 fair	2.3	1.2
10	0.0- 3.1	38v.f., 3 fair	3.6	2.9
	3.1- 6.7	27v.f., 2 fair	2.1	3.6
11	0.0- 1.9	3f.	.8	1.5
	1.9- 3.0	7v.f.	Tr	6.1
		Huddleson placer		
12	0.0- 1.0	11f.	4.1	5.0
	1.0- 2.0	19v.f., 3 fair, 2m.	10.9	5.6
	2.0- 5.0	75f., 10 fair	16.5	3.9
	5.0- 9.0	14f.	1.0	1.0
13	0.0- 3.0	5f., 2m., 1 fair	3.0	1.3
	3.0- 8.0	15v.f., 2 fair, 2m.	.6	.6
14	0.0- 1.0	24f., 2 fair	12.6	7.8
	1.0- 2.0	80f., 30m.	51.0	11.7
	2.0- 4.0	24f., 8 fair	3.4	2.8
	4.0- 8.2	32f., 8 fair	7.4	.7
15	0.0- 1.0	2f.	Tr	.4
		Mountain Sheep placer		
16	0.0- 3.0	24v.f.	3.6	1.0
	3.0- 7.0	4f.	.7	.3
17	0.0- 1.2	7v.f., 1 fair	1.5	2.9
	1.2- 4.7	12f., 2 fair	2.5	.7
18	0.0- 3.0	4f., 1 fair	.6	.4
	3.0- 6.4	9v.f.	.7	.4
19	0.0- 2.5	3f.	Tr	.4
	2.5- 4.7	2v.f.	Tr	.6
	4.7- 6.2	7v.f.	Tr	.9
	6.2- 7.4	8v.f., 1 fair	1.5	1.9
	7.4- 9.9	25f., 10m.	8.9	1.6
	9.9-15.4	20v.f., 4 fair, 1m.	2.1	.6
	15.4-16.0	7v.f., 1m.	.7	.9
20	0.0- 1.6	1f.	Tr	.9
	1.6- 3.3	8v.f.	.7	1.0
	3.3- 5.3	8v.f.	.3	.9
	5.3- 7.3	4f.	Tr	.4
	7.3-10.3	4f., 4 fair	1.8	1.0
	10.3-13.3	10f., 10 fair, 2m.	2.1	1.0
	13.3-17.3	12v.f., 2 fair	.6	.7
	17.3-20.3	10f.	.7	.8
	20.3-22.3	5f.	Tr	.7
	22.3-24.8	5f., 2m.	3.8	.8
	24.8-26.3	4f., 1 fair, 1m.	1.9	.7
	26.3-29.8	2f., 1 fair	.7	.3
	29.8-31.8	8f.	.7	.4
	31.8-33.8	3v.f.	Tr	.3

TABLE 33. — *Sample data for South Fork Salmon River placers* — Continued

Site	Depth interval[1] (feet)	Gold content		Black sands (lb per cu yd)
		Colors[2]	Value[3] (cents per cu yd)	
Mountain Sheep placer — Continued				
21	0.0- 1.5	4f.	Tr	.6
	1.5- 2.8	3f.	Tr	1.8
	2.8- 4.5	24v.f., 4 fair	2.6	1.7
	4.5- 6.0	33v.f., 2 fair	4.2	1.6
	6.0- 7.9	5f.	.7	2.2
22	0.0- 5.0	18f.	9.2	1.6

[1]All samples are 1 cubic foot in volume per foot of depth.
[2]Number of particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300 to 1,000 colors to equal 1 cent; m, (medium) requires 10 to 300 colors to equal 1 cent.
[3]Gold values are based on a price of $47.85 per troy ounce.

Seven samples of black sand concentrates, studied petrographically, are mostly magnetite and ilmenite, minor amounts of monazite, allanite, xenotime, and common minerals and a trace scheelite.

The samples did not contain economic minerals in sufficient quantity to be minable. Small concentrations of gold, which could be mined at a profit, might exist within and adjacent to the area.

MARBLE CREEK DISTRICT

Samples of lode prospects, claims, and favorable areas within the Marble Creek district contain only very minor amounts of valuable minerals. Placer deposits examined contained far less than minable grade gold, silver, or other heavy minerals. The 109-square-mile district has little importance as a potential source of commercial minerals.

Access to the district is by trails from a road near the north boundary and by trail from a landing strip at Thomas Creek on the Middle Fork Salmon River at the extreme south end of the district (fig. 121). Altitudes in the district range from 9,415 feet at Red Peak to approximately 4,300 feet at the Middle Fork Salmon River on the southern boundary. The district is densely forested by coniferous trees except for Red Ridge. Brush and windfalls, especially in the creek bottoms, make travel off main trails difficult.

Mining in the Thunder Mountain area, 4 miles north of the Marble Creek district, stimulated prospecting and claim location in the late 1890's, mainly in the north section of the district in areas of altered rock. There has been no recorded production from the district.

Vein deposits in the Marble Creek district cut Eocene granite and the overlying Challis Volcanics and disseminated minerals in altered areas of the volcanic rocks. The vein deposits are more evident, but the disseminated deposits are widespread and, because of their similarity to the Thunder Mountain deposits, they have received greater attention. Three-fourths of the localities examined were disseminated deposits.

The vein deposits are as much as 3,000 feet long and 100 feet thick. Most are in the pink granite. The only deposit of potential, the Grays Peak Opal

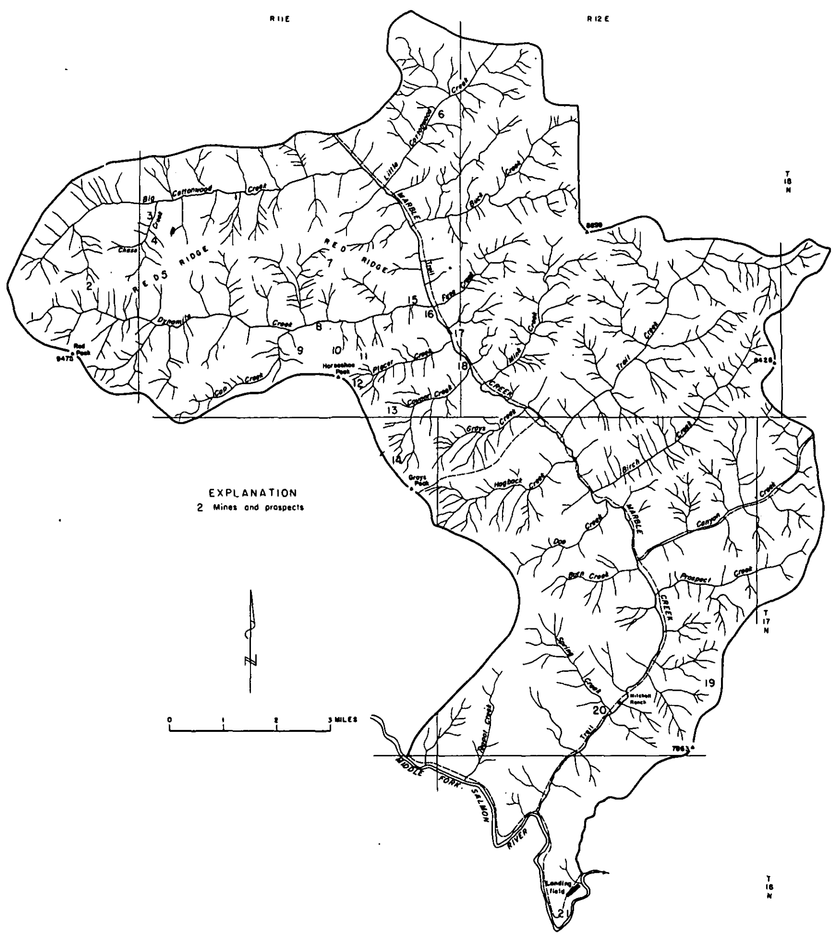


FIGURE 121. — Mines and prospects, Marble Creek district.

Mines and prospects shown in figure 121

1. Giant Legge group	8. Dynamite group	15. Daylight and Darkness group
2. Gem group	9. Hope claim	16. Bonanza group
3. Ibex claim	10. Jerome group	17. Mountain View group
4. Thunderation group	11. McKnight group	18. Golden Rule group
5. Brooklin claim	12. Gold Cord group	19. Marble Creek Fluorspar occurrence
6. Little Cottonwood Creek prospect	13. Allegheny group	20. Spring Creek claim
7. Hercules group	14. Grays Peak Opal deposit	21. Thomas Creek placer

(fig. 121, No. 14), is a vein. The relationship of the veins to the disseminated deposits is unknown.

The disseminated deposits, in the Challis Volcanics, are in bleached, altered zones. The disseminated ore mined in the Thunder Mountain area averaged 0.38 ounce gold per ton (Shenon and Ross, 1936, p. 36), but the samples of altered volcanic rocks in the Marble Creek district averaged only 0.02 ounce gold per ton.

Placer deposits of reworked glacial debris contain traces of gold in the flood plains of Marble Creek and Dynamite Creek.

RED RIDGE AREA

Red Ridge is at the northwest end of the Marble Creek district (fig. 121). The ridge is glaciated at higher altitudes and covered with sparse vegetation. The volcanic rocks making up the ridge are various shades of brown and red.

Claims were located on iron-stained volcanic rocks or along contacts of volcanic units. Samples contained as much as 0.01 ounce gold and 0.56 ounce silver per ton.

Lode Prospects

Giant Legge group. — The two Giant Legge claims (fig. 121, No. 1) are at the head of Dynamite Creek. Two pits have been dug in a heavily iron-stained zone in red rhyolite. The zone is exposed for about 3,600 feet along Dynamite Creek and is 200 feet thick. A sample across the altered zone assayed only 0.02 ounce gold per ton and 0.25 ounce silver per ton.

Gem group. — The Gem group (fig. 121, No. 2) is on the crest of Red Ridge, about 1.2 miles north of Red Peak. No workings are on the six claims of the group, although several blazed trees were seen. The rocks exposed consist of red rhyolite porphyry, about 400 feet thick, overlying gray rhyolite porphyry, 100 feet thick. The flows trend northeast and dip 5°-15° NW. Samples contained no gold or silver.

Ibex claim. — The Ibex claim (fig. 121, No. 3) is on the west side of Chase Creek. A small pit is entirely in iron- and manganese-stained float. A random grab sample from the pit dump assayed only 0.01 ounce gold and 0.56 ounce silver per ton.

Thunderation group. — The Thunderation group (fig. 121, No. 4) was staked near upper Chase Creek in 1902. The only prospecting is a pit in highly iron-oxide stained float. Above the pit are four rhyolite units aggregating about 715 feet thick, overlain by 1,000 feet of basalt. Beginning at the lowest unit, the rhyolite consists of 350 feet of gray quartz-rich porphyry, 250 feet of gray porphyry, 75 feet of dark-brown porphyry, and 40 feet pale white porphyry. Samples from each rhyolite unit and the basalt contained a trace gold and as much as 0.1 ounce silver per ton. Assay results of random grab samples from the pit dump showed similar values.

Brooklin claim. — The Brooklin claim (fig. 121, No. 5) is on the crest of Red Ridge, near the head of Chase Creek. The creek flows along a contact between red rhyolite on the east and gray andesite on the west. A small pit is on the contact. Samples from the pit and from both rock units contained no gold or other valuable minerals.

Hercules group. — The Hercules group of four claims (fig. 121, No. 7) is on the north side of Dynamite Creek near the top of Red Ridge. The claims are on the contact between red altered rhyolite and a yellow to gray rhyolite. The contact strikes N. 26° W. and dips vertically. No sulfides are in the contact zone, which can be observed through a length of about 3,600 feet. No workings were found. Samples across sections of the rock units and along the contact averaged 0.02 ounce gold and 0.25 ounce silver per ton.

HORSESHOE PEAK AREA

Horsehoe Peak area is near the western boundary of the Marble Creek district. The best access is by way of the Marble Creek trail. The country rocks exposed are entirely Challis Volcanics.

Claims have been located on the volcanics, but no mineralized structures were found. Samples contained no more than a trace gold and silver.

LODE PROSPECTS

Hope claim. — The Hope claim (fig. 121, No. 9) is on a tributary of Cap Creek, about 1 mile northwest of Horsehoe Peak. The single working, a small pit, does not reach bedrock. The country rock is iron-stained rhyolite porphyry. The overburden is 4-6 feet thick near the pit. A random grab sample of the dump assayed a trace gold and silver and 0.04 percent copper.

Jerome group. — The Jerome group (fig. 121, No. 10) is about one-half mile north of Horseshoe Peak. Two small prospect pits were dug 2-3 feet into overburden derived from red rhyolite porphyry. Samples from both pits contained only a trace gold and silver.

McKnight group. — The McKnight group (fig. 121, No. 11) of four claims, located in 1902, lies between Dynamite Creek and Placer Creek about 0.6 mile northeast of Horsehoe Peak. Workings consist of five pits in iron-stained rhyolite porphyry float which covers an area approximately 1,300 feet long and 500 feet wide. Samples of the dumps contained no gold or silver.

Gold Cord group. — The Gold Cord group (fig. 121, No. 12) was located in 1902 at the head of Placer Creek approximately 0.4 mile southeast of Horsehoe Peak. Altered red rhyolite crops out over an area 1,200 feet long and 600 feet wide and is exposed through a thickness of 200 feet. A small pit and a caved adit, estimated to be 25-50 feet long, were dug in the rhyolite. There are no apparent structures. Samples from the dumps contained only a trace gold and silver.

Allegheny group. — The Allegheny group (fig. 121, No. 13) is on the ridge between Placer Creek and Cougar Creek, 1.1 miles southeast of Horseshoe Peak. The workings, in red to brown rhyolite porphyry, consist of a caved adit estimated to be 150 feet long and 2 pits, 1,500 and 2,500 feet north of the adit. No mineralization of value was seen. Samples of the dumps and country rock contained no gold or silver or unusual amounts of other metals.

MISCELLANEOUS PROSPECTS

Isolated mining claims and mineral occurrences occur within the Marble Creek district. These include deposits of fluorite and opal. Some claims were staked on barren altered volcanics or low-grade quartz veins.

Lode Deposits

Little Cottonwood Creek prospect. — Ten altered and bleached zones in volcanic rock, ranging in area from 100 by 600 feet to 400 by 2,500 feet, were located in the Little Cottonwood Creek drainage (fig. 121, No. 6). The altered volcanics are white to gray rhyolite porphyry. Samples assayed as much as 0.05 ounce gold per ton and 0.28 ounce silver per ton, but most contained only a trace.

Grays Peak Opal deposit. — A deposit of opal in small veins, pods, and stringers is in a light-gray, highly altered, and silicified rhyolite porphyry on the ridge at the head of Cougar Creek (fig. 121, No. 14). Opal and associated limonite constitute about 1 percent of the rock and lie just below a marker bed of rhyolite containing black obsidian. The zone known to contain opal is about 1 mile long and 50-100 feet thick. The opal on the surface is of poor gem quality, but the deposit resembles the Redridge prospect in the Monumental Creek district (fig. 94, No. 18).

Spring Creek claim. — The Spring Creek claim (fig. 121, No. 20) is about 300 feet southwest of the mouth of Spring Creek and extends northwest from the Marble Creek trail. A quartz fissure vein strikes N. 20° W. and dips 74° SW. in pink granite. The exposure is about 100 feet long. The vein contains limonite pseudormorphs after pyrite, and float contains pyrite. Float on the north side of Spring Creek is 600 feet north along the projected strike. Samples contained a maximum of 0.02 ounce gold per ton, 0.28 ounce silver per ton, and 0.1 percent lead.

Marble Creek Fluorspar occurrence. — The Marble Creek Fluorspar occurrence (fig. 121, No. 19) is on the ridge forming the eastern boundary of the Marble Creek district; it was noted by Ross (1934, p. 131). Fissure veins of quartz, calcite, and fluorspar occur in granitic rock. A 1.2-foot-wide vein, striking N. 54° E. and dipping 50° SE., exhibits definite zoning in which fluorspar pods are enclosed by quartz. The vein is exposed through a 20-foot length. A composite sample taken at 5-foot intervals along the vein contained 20.5 percent CaF_2. The small size of the deposit precludes consideration as a potential resource.

Marble Creek Placers

Marble Creek and Dynamite Creek have reworked alluvial deposits derived mainly from volcanic and glacial debris. Some deposits have been located as placer claims. Two groups — the Dynamite and the Daylight and Darkness (fig. 121, Nos. 8, 15) — are on Dynamite Creek. Three groups — the Bonanza, the Mountain View, and the Golden Rule (fig. 121, Nos. 16-18) — are on upper Marble Creek. The Thomas Creek placer (fig. 121, No. 21) is described with placers in the Middle Fork district. Samples from the deposits indicate that none are minable (table 34).

TABLE 34. — *Summary data, Marble Creek placers*

[Tr, trace]

Deposit	Site (fig. 121)	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands[2] (lb per cu yd)
Dynamite group	8	11.5	185,000	Tr to 0.1	1.0
Daylight and Darkness group	15	16.5	400,000	Tr to .1	1.1
Bonanza group	16	11.1	890,000	Tr to .3	1.9
Mountain View group	17	5.0	440,000	Tr to .3	1.1
Golden Rule group	18	2.3	180,000	Tr to .3	2.7
Mitchell Ranch	------	40.0	640,000	Tr	.38

[1]Gold values are based on a price of $47.85 per troy ounce.
[2]Concentrates are maily ilmenite and magnetite with small amounts of zircon, pyrite, limonite, garnet, and ferromagnesian silicates.

CHAMBERLAIN DISTRICT

The Chamberlain district (fig. 122) is one of the less mineralized districts in the Idaho Primitive Area. Small amounts of magnetite, zircon, allanite, gold, and cinnabar occur in placers, but no mineral production has been recorded.

The Chamberlain district, as designated in this report, contains about 233 square miles and generally coincides with the Chamberlain mining district (fig. 15) designated by Ross (1941).

The Chamberlain district is in a large drainage basin. Altitudes range from 5,700 feet on the basin floor to at least 8,000 feet on encircling rims. The north and south rims are flat glaciated areas with numerous meadows. The east and west rims are rugged and deeply incised. U-shaped valleys and immature drainages characterize the topography between the rims and the basin floor. Granitic rocks of the Idaho batholith and metasedimentary rocks underlie the area. Alluvium and glacial debris cover the basin floor. Most of the district is mantled by dense forest and underbrush, a major impediment to prospecting.

Four lode claims and 18 placer claims have been located and recorded since the 1890's. None has a record of production, and only the Imperial prospect has been explored underground. Lode claims were located on fissure veins and pegmatite dikes in granite and quartzite. The veins are as much as 10 feet thick and 460 feet long. Samples contained a trace gold and as much as 3.03 ounces silver per ton. The dikes are as much as 10 feet wide and contain a trace gold, 0.05-1.04 ounces silver per ton, and as much as 0.4 percent copper. The veins and dikes do not represent resource potential.

Alluvium in high meadow placers totals over 17 million cubic yards. Gold values were less than 1 cent per cubic yard, and black sand concentrates ranged from 1.8 to 7.7 pounds per cubic yard.

Mines and prospects shown in figure 122

1. Silver Bell prospect
2. Eagle prospect
3. Chamberlain Meadow placer
4. Hamilton-Hillsman claim
5. Imperial prospect
6. Lodgepole Meadow placer
7. Haypress Meadow placer
8. Moose Meadow placer
9. Root Ranch placer

IMPERIAL PROSPECT

The Imperial prospect (fig. 122, No. 5), located in 1910 by J. M. Hand, is on the west side of Lodgepole Creek about halfway between the source and the mouth. There is no recorded production and no evidence of recent work. Evidence of past prospecting consists of a caved adit, two caved stopes, and several small exploration pits. The size of the dump indicates a maximum of 500 feet of underground workings.

The area is underlain by quartz monzonite of the Idaho batholith. A 10-foot-wide white quartz vein, trending N. 50° E. and dipping about 75° SE., crops out for 460 feet along its strike (fig. 123). The vein contains magnetite, tetrahedrite, and oxides of iron. Sulfide minerals are spotty except near the mine workings. The total mineral content of the best sample was not sufficient to warrant mining.

OTHER LODE PROSPECTS

Silver Bell prospect. — The Silver Bell prospect (fig. 122, No. 1), located in 1970 by Cecil Woodard, is near the southwest corner of the district at the head of Rim Creek, one-fourth mile northeast of Chicken Peak Lookout. The most direct access is by way of 8 miles of trail from the Werdenhoff mine.

Country rock is a roof pendant of argillaceous quartzite in granite of the Idaho batholith. The quartzite is iron stained, massive, fractured, and faulted. Fissure veins of quartz and hematite occur in the quartzite. These veins comprise about 5 percent of the quartzite and terminate at the granite. Although fractures are randomly oriented, the veins containing relatively large amounts of specular hematite trend northwest. The veins are 0.5-2 feet wide and 80-100 feet long. They contain specular hematite (as much as 80 percent), hematite, and limonite. One shear zone and the included quartz vein is 6 feet thick and is exposed for 70 feet along the strike. A sample across the shear zone assayed a trace gold and 0.04 ounce silver per ton. Samples from other veins and shear zones assayed a trace to 0.03 ounce gold per ton and 0.13-0.23 ounce silver per ton.

Eagle prospect. — The Eagle prospect (fig. 122, No. 2) is on the ridge between the headwaters of No Name and Little Lodgepole Creeks. The prospect was located in 1906 by H. B. Noble. Two small exploration pits expose a quartz pegmatite dike in granite of the Idaho batholith. More than 2 feet of soil mantles the surrounding surface. The dike rock contains 1 percent magnetite and is coated with iron and manganese oxides. Samples contained no gold and 0.05 ounce silver per ton.

Hamilton-Hillsman claim. — The Hamilton-Hillsman claim (fig. 122,

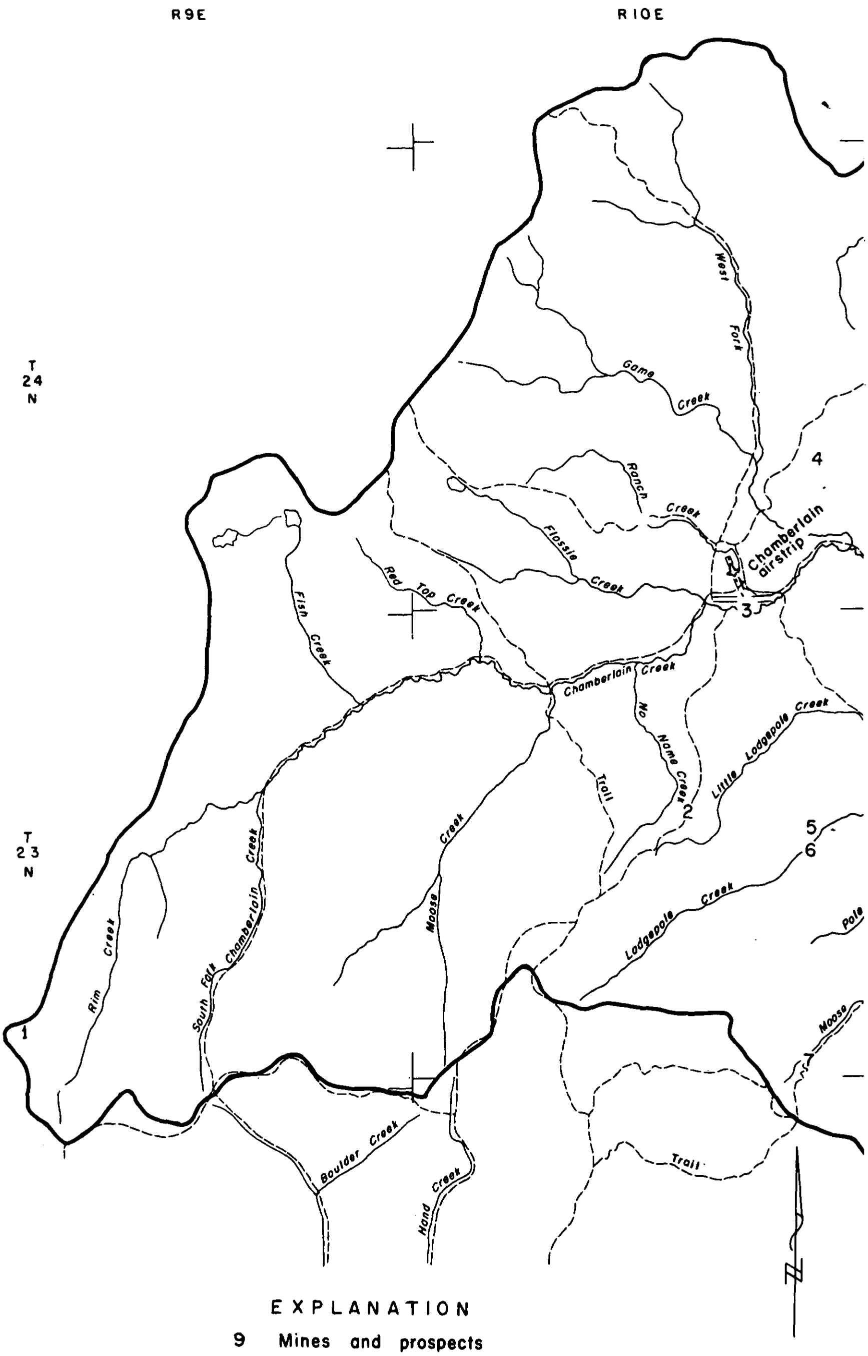
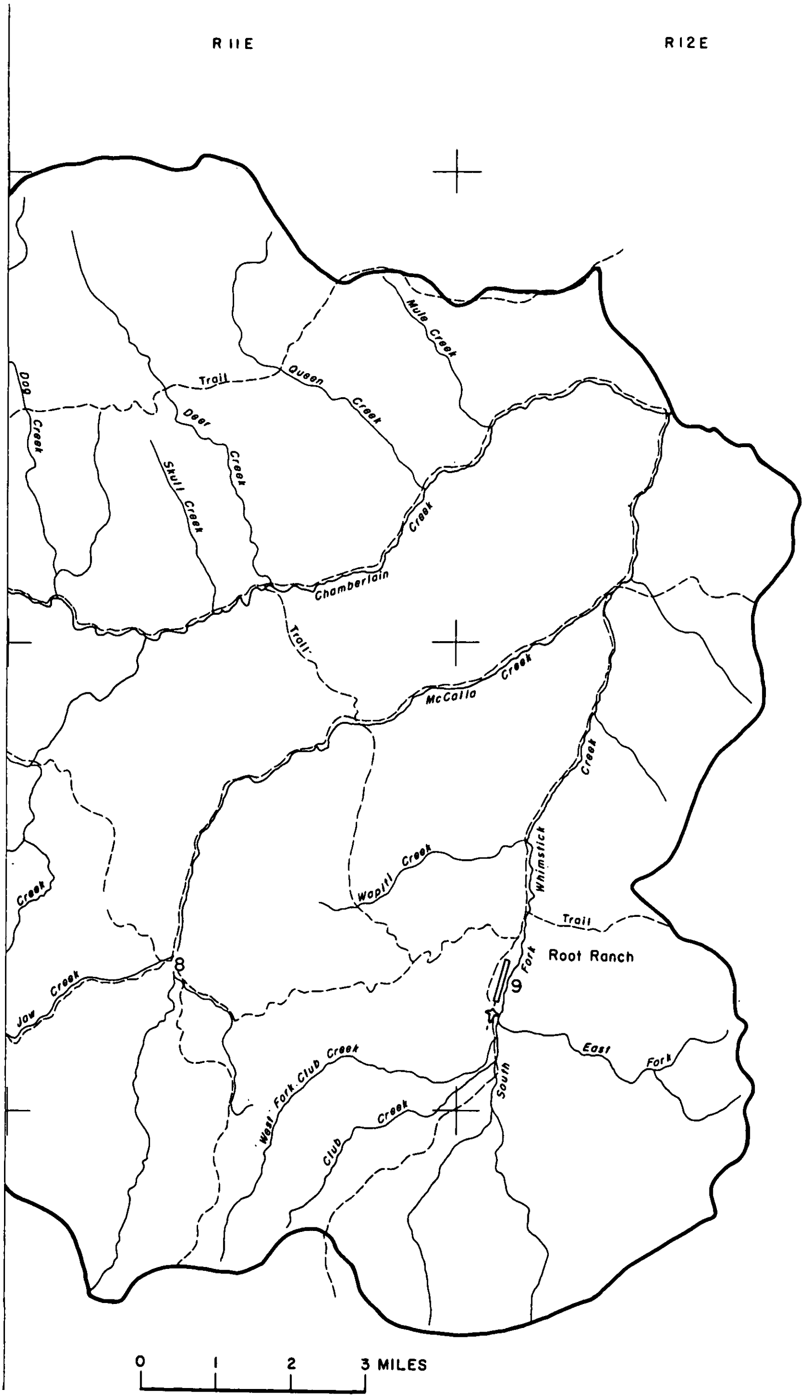


FIGURE 122. — Mines and prospects,



Chamberlain district.

No. 4) is on the ridge between Game Creek and Dog Creek, about 2 miles northeast of the Chamberlain airstrip. Nat Hillsman located the claim in 1956 to cover a malachite-stained pegmatite dike.

The dike trends northwest in granitic country rock. It is 5-12 feet thick and is exposed intermittently for 140 feet. The country rock is altered and stained with malachite adjacent to the dike. The dike is exposed in a small pit and a trench. A second pit, on a projected trace of the dike, exposes altered white granite but no dike. A chip sample taken across copper-stained outcrops of the pegmatite dike contained a trace gold, 0.05 ounce silver per ton, 0.10 percent copper, and a trace lead. A grab sample of altered granite adjacent to the dike contained a trace gold, 1.04 ounce silver per ton, and 0.40 percent copper. A grab sample from the second pit contained a trace gold, 0.28 ounce silver per ton, and 0.11 percent copper.

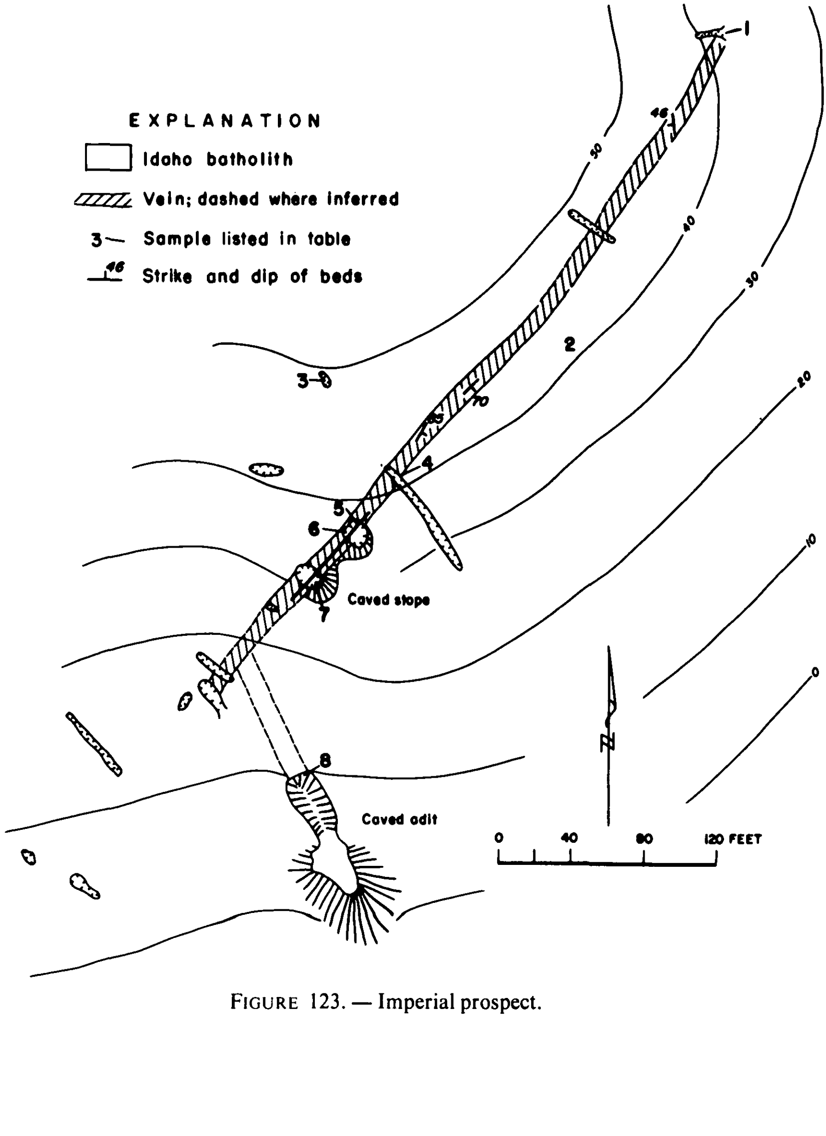


FIGURE 123. — Imperial prospect.

HIGH MEADOW PLACERS

Six meadows in the Chamberlain district have substantial amounts of alluvium (table 35; fig. 124). They were apparently claimed in the past, but no evidence of prospecting was seen. The meadows are long narrow grassy areas surrounded by low forested ridges. Easiest access is by aircraft to the Chamberlain airstrip, but good horse trails lead to the meadows from the end of the road at the Golden Hand mine.

The near-surface parts of the alluvial deposits are mostly clay and sand derived from decomposed granitic rock. The lower sections are sand and gravel.

The meadows were sampled with a power auger, except for areas containing coarse gravel. Test pits were dug by hand in the areas containing coarse gravel; 35 samples were taken at 14 sample sites (table 36). Depth

Data for samples shown in figure 123

[Tr, trace; N.d., not determined; N, not detected]

Sample No.	Sample Type	Material or length (feet)	Gold (oz per ton)	Silver (oz per ton)	Lead (percent)	Zinc (percent)
1	Chip	3	Tr	N	1.2	N
2	Random chip	146	Tr	0.7	N.d.	Tr
3	Grab	Select	Tr	3.03	N	N
4	do	Vein	Tr	.17	N.d.	5.1
5	Chip	5	Tr	.24	N.d.	N
6	do	2	Tr	.18	N.d.	N
7	do	4	Tr	.30	N	N.d.
8	do	4	Tr	Tr	N	N

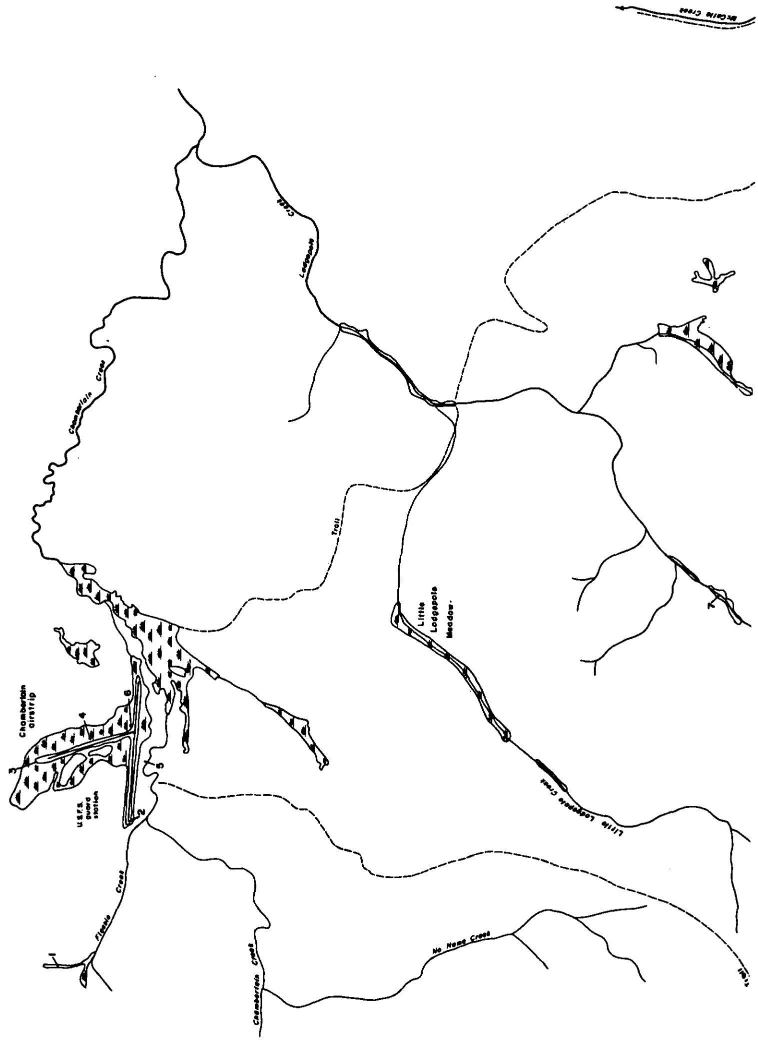
averaged 7.6 feet. Gold values ranged from 0 to 0.3 cent per cubic yard. Black sand content of individual samples ranged from 0.7 to 13.5 pounds per cubic yard. Average black sand content of deposits, however, ranged from 1.8 to 7.7 pounds per cubic yard.

Petrographic analyses of selected black sand concentrates indicated unusual amounts of zircon, allanite, and cinnabar. Zircon comprised an average of 13 percent of the concentrate — 6.4 pounds per cubic yard of sampled material (about 1 cent per cubic yard). Allanite averaged 11 percent of the concentrate, 0.39 pound per cubic yard of sampled material. Allanite commonly contains thorium, cerium, and lanthanum but is not marketable. Only one sample contained more than a trace cinnabar; about 0.015 pound of mercury per cubic yard was recovered from a sample near the Chamberlain airstrip.

CAMAS CREEK ADDITION

The Camas Creek addition has no record of mineral production. It comprises about 35 square miles; a small corner overlaps the southwest corner of the Yellowjacket mining district.

Trails provide the only access to the district. From Highway 93 north of Challis, Idaho, three dirt roads extend to trails that lead into the district: the Middle Fork Peak road to the north, the Meyers Cove road to the east, and


Chamberlain Creek
Lodgepole Creek
Trail
Little Lodgepole Meadow
Little Lodgepole Creek
Chamberlain airstrip
U.S.F.S. guard station
Flossie Creek
Chamberlain Creek
No Name Creek
Trail
1
2
3
4
5
6
7

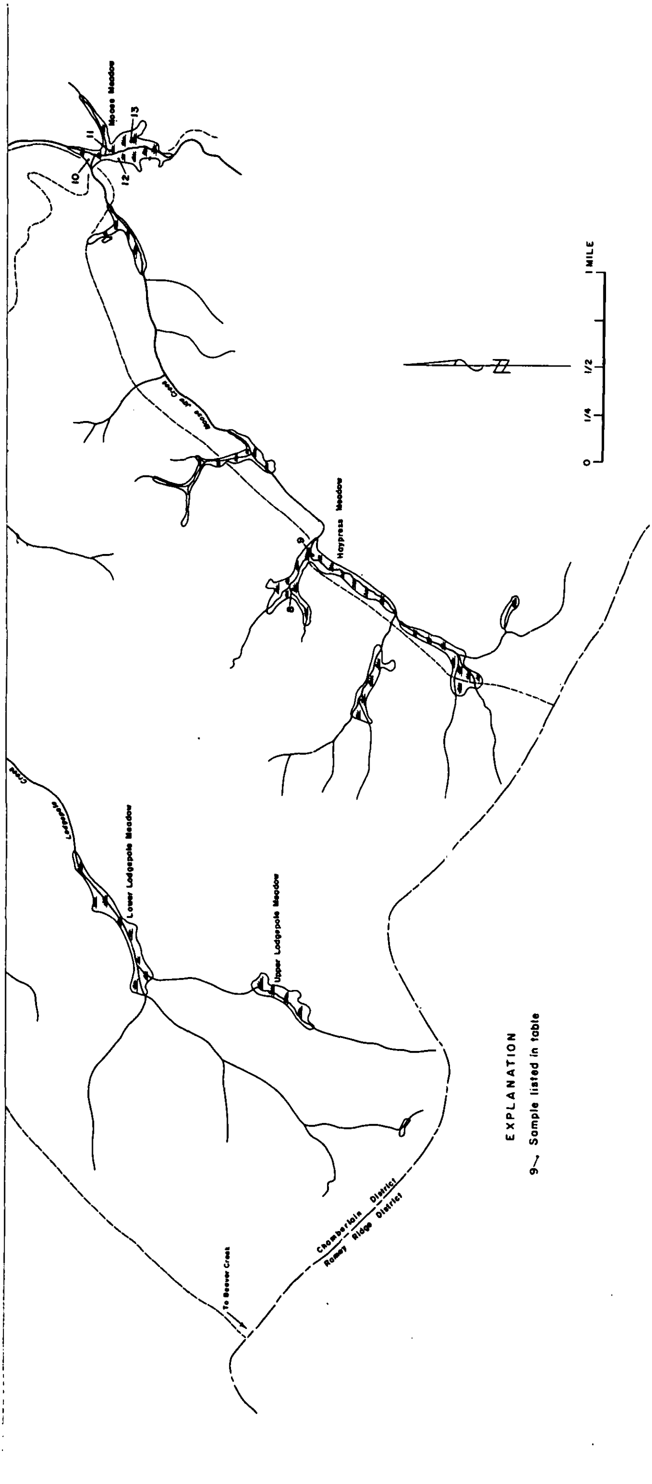


FIGURE 124. — High Meadow placers.

TABLE 35. — *Summary data, Chamberlain district-Mountain Meadows*

[Tr, trace; N, not detected]

Deposit	Site (fig. 122)	Size (acres)	Estimated volume (cu yd)	Range of gold values[1] (cents per cu yd)	Estimated black sands (lb per cu yd)	Estimated average zircon (lb per cu yd)
Chamberlain Meadow	3	340	9,875,000	N to 0.3	4.0	0.68
Flossie Creek	------	10	220,000	N	4.4	N
Haypress Meadow	7	84	1,626,000	N to Tr	2.5	.13
Lodgepole Meadow	6	52	830,000	N	4.0	.4
Moose Meadow	8	40	640,000	N	1.8	.26
Root Ranch	9	120	3,843,000	N	7.7	.50

[1]Gold values based on a price of $47.85 per troy ounce.

the Sleeping Deer Mountain road to the south. None of these roads is suitable for passenger cars.

The Camas Creek addition is in one of the more rugged parts of the Salmon River Mountains. The relief is 5,330 feet and is accentuated by youthful, deeply entrenched streams. Several low-lying alluvial terraces along Camas Creek are the only level tracts of land. A forest fire recently burned most of the area, leaving it cluttered with charred deadfalls. Unburned areas are covered with lodgepole pine.

Mining activity was started in the region during the 1860's, but major production occurred near the turn of the century. Several gold mines near the addition have records of production. Although there have been several producing mines near the addition, activity within the addition has been limited to prospecting. Surrounding mines are idle except for fluorite mines at Meyers Cove, 6 miles east. A major incentive to prospecting has been the legendary presence of a black telluride deposit called the "Lost Cleveland."

Lode claims and prospecting are centered at two geologic features near Woodtick Summit (pl. 1): (1) a black schist roof pendant in granite and (2) iron-stained volcanic rocks. Both contain quartz veins, dikes, and iron-stained fractures and shears. The earliest recorded lode location was the Hale group (1909), and the latest was the Mammoth group (1942). The claims are referred to collectively as the "Woodtick group" because there are numerous pits and trenches but no means of identifying specific mining claims.

The only significant deposits are the terrace deposits along Camas Creek that cap bedrock benches. The alluvium was derived from glacial detritus composed principally of Challis Volcanics. Extensive placer mining has been done on Yellowjacket Creek north of the addition and on Loon Creek to the south, but little has been done within the addition.

WOODTICK GROUP

The Woodtick group (sec. 15, T. 17 N., R. 15 E.) covers the ridge crest on both sides of the trail over Woodtick Summit.

TABLE 36. — *Sample data for mountain meadow placers, Chamberlain district*

[Sample sites shown in fig. 124. Tr, trace; N, not detected]

Site	Depth interval (feet)	Sample volume (cu ft)	Gold content: Colors[1]	Gold content: Value (cents per cu yd)[2]	Black sands (lb per cu yd)
			Flossie Creek		
1	0 - 2.3	0.20	N	N	2.8
	2.3- 4.8	.23	N	N	4.0
	4.8-14.1	.80	N	N	4.9
			Chamberlain Meadow		
2	0 - 6.5	6.5	1f.	Tr	2.0
3	0 - 4.0	4.0	2v.f.	0.1	6.2
	4.0- 7.0	3.0	N	N	3.3
4	0 - 2.0	2.0	N	N	5.7
	2.0- 5.7	3.7	N	N	2.0
	5.7- 8.0	2.34	2v.f., 2f.	.1	1.6
5	0 - 6.5	6.5	8v.f.	.3	2.4
	6.5-11.1	4.58	Tr	Tr	4.5
	11.1-17.8	6.75	5f.	.3	2.7
6	0 - 2.0	2.0	N	N	13.5
	2.0- 4.3	1.33	N	N	6.2
	4.3- 7.7	3.34	N	N	4.6
			Lodgepole Meadow		
7	0 - 2.3	0.79	N	N	2.7
	2.3- 6.0	.32	N	N	7.2
			Haypress Meadow		
8	0 - 1.0	0.20	N	N	2.4
	1 - 2.7	.41	N	N	.7
	2.7- 5.0	.81	5v.f.	Tr	1.9
	5.0- 9.5	1.58	2v.f.	Tr	3.4
	9.5-11.7	.70	----------	----------	1.6
9	0 - 6.1	1.19	1v.f.	Tr	2.7
			Moose Meadow		
10	0 - 4.4	1.0	N	N	1.0
11	0 - 3.0	3.0	N	N	.9
	3.0- 5.0	2.0	N	N	1.0
	5.0- 5.5	.5	N	N	4.3
12	0 - 1.0	.35	N	N	1.4
	1.0- 3.0	.70	N	N	4.1
	3.0- 4.3	.44	N	N	1.2
13	0 - 4.0	4.0	N	N	1.7
			Root Ranch[3]		
14	0 - 3.3	0.65	5v.f.	Tr	6.7
	3.3- 4.5	.06	N	N	6.8
	4.5- 9.0	.27	N	N	12.0
	9.0-12.3	.16	N	N	7.2

[1]Estimated particles of gold observed in the sample and relative size of particles: v.f. (very fine) requires 1,000 or more colors to equal 1 cent; f. (fine) requires 300 to 1,000 colors to equal 1 cent.
[2]Gold values based on $47.85 per troy ounce.
[3]Not shown in figure 124; No. 9 in figure 122.

The principal exploration target has been a Precambrian schist roof pendant in Eocene granite. The pendant covers about 2 square miles. Along the contact, the schist has been baked, and quartz veinlets transect both schist and granite. Foliation of the schist trends about N. 20° W. and dips 65° SW. The schist contains limestone, and quartz lenses and veins. The lenses, parallel to the foliation, are 0.5-5 feet thick and as much as 200 feet long. Veins intersecting the foliation are 1-3 inches wide and 1-10 feet long.

Samples from two pits in the iron-stained baked border zone contained

0.01 ounce gold per ton and 0.2 ounce silver per ton. A sample from some of the intersecting border veinlets assayed a trace gold and 0.4 ounce silver per ton. Samples from a quartz lens contained a trace gold and 0.3 ounce silver per ton, and a sample from a limestone lens contained a trace gold and 0.2 ounce silver per ton.

The Challis Volcanics are southeast of the roof pendant. They contain many fractures, veins, and dikes which strike north or N. 45° W. and dip steeply. The structures are 1-27 feet thick and 75-2,000 feet long. The only working found was one pit. The pit and all the structures seen were sampled. None of the samples contained values of interest; they averaged a trace gold and 0.3 ounce silver per ton.

YELLOWJACKET PLACER GROUP

The Yellowjacket placer group of claims (sec. 17, T. 18 N., R. 16 E.) were located by J. McDonnell in 1892. McDonnell claimed four alluvial deposits in the addition and several along Camas Creek east of the addition. The terraces are heavily forested and are composed of sandy gravel derived mainly from volcanics. None of the material exceeds 1 foot in diameter. Volume of alluvium in the terraces ranges from 2,200 cubic yards to 9,250 cubic yards. Gold is distributed erratically in the gravel. Five channel samples, each consisting of one gold pan of alluvium, were collected down the streambanks on the terraces. They contained a maximum of 68 cents gold per cubic yard and averaged 1.3 cents. The black sand concentrate of samples ranged from 4.6 to 10.2 pounds per cubic yard. The sample with the high value indicates that small concentrations of gold are probably in the placers. The average black sand content, however, is low.

CRAGS ADDITION

The lack of known ore deposits or strongly mineralized areas makes the 12-square-mile Crags addition of little importance as a source of minerals.

The district is accessible only by a trail originating at a Forest Service road near the south end and by trails entering from Clear Creek and the Middle Fork Salmon River drainages (pl. 2).

All but about 2 square miles of the area lies in the Clear Creek drainage. Alpine glaciation at higher elevations has produced cirques, matterhorns, alpine lakes, and typical steep-sided, U-shaped glacial valleys. Elevations range from 9,400 feet to about 6,800 feet where Clear Creek leaves at the east boundary. Vegetation is sparse, mainly coniferous trees and little underbrush.

The country rock is white to pink coarse-grained granite porphyry containing abundant dikes and veins trending mainly N. 50° E. and N. 50° W. The dikes vary from mafic to aplitic.

There has been no mineral production from the district and only a slight amount of prospecting. The Yellowjacket mining district lies 8 to 10 miles south of the Crags addition, but the geologic environment is not comparable. Only a group of three lode claims is within the district, and the potential for discovery of ore deposits appears small.

EXPLORER GROUP

The Explorer group prospect is at an elevation of 8,900 feet at the extreme south end of the district (sec. 36, T. 21 N., R. 16 E.). Access is by an abandoned road, 1 mile northwestward from the Crags campground. The three claims of the group were located in 1961 by W. L. Bishop and others of Blackfoot, Idaho.

The area explored is underlain by granite porphyry. Weathered, iron-stained float is sparsely scattered over an area about 200 feet wide and 400 feet long near the intersection of mafic and aplitic dikes. The mafic dike strikes N. 50° E., and the aplitic dike strikes N. 50° W. Dips could not be measured, because of overburden. The float contains about 20 percent quartz, 5 percent hematite, 5 percent limonite, 2 percent manganese oxides, 1 percent pyrite, and minor chloritic minerals. A single trench outside the area of float does not expose similar float nor bedrock.

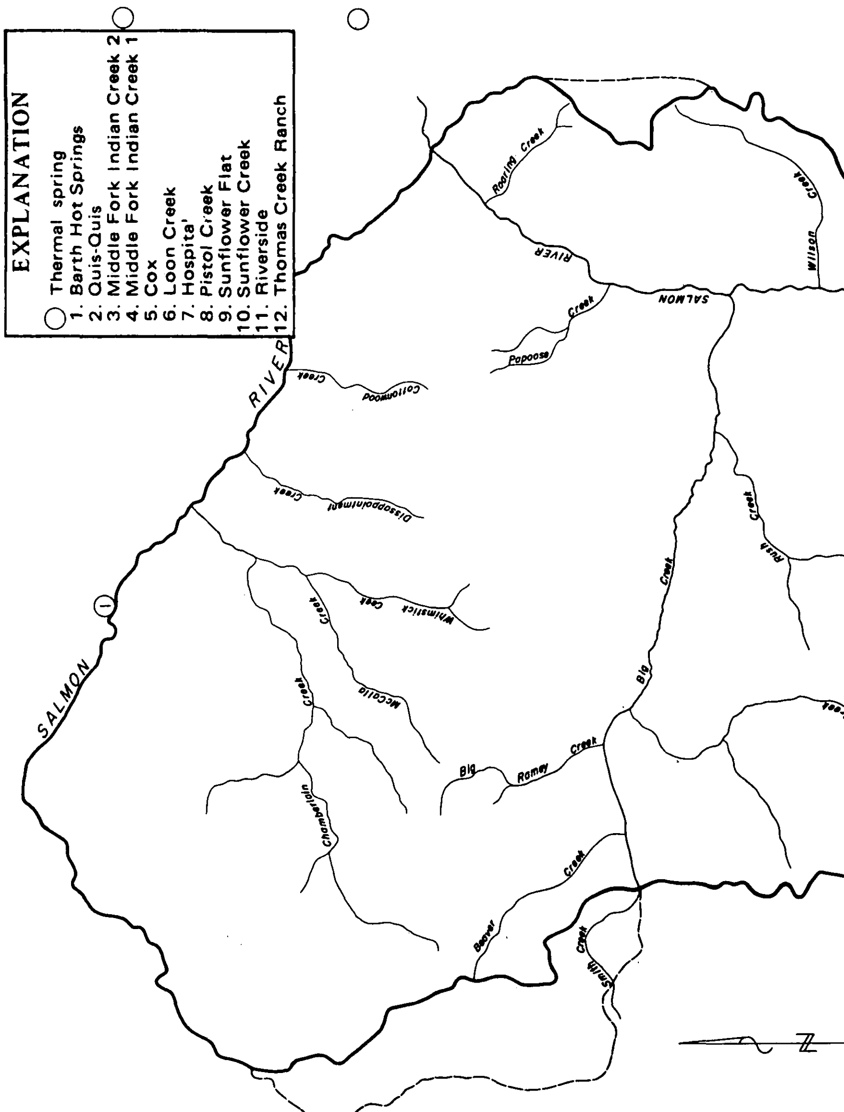
A random sample of the iron-stained float contains 0.17 ounce silver per ton, 0.01 percent copper, 0.05 percent lead, 0.30 percent zinc, but no gold.

Other areas of concentration of dikes and veins exist in the district, but samples from these areas contained only a few parts per million metallic minerals. The district appears to have little potential for discovery of ore deposits.

THERMAL SPRINGS

Twelve areas of thermal springs are known in the Idaho Primitive Area (fig. 125). Eleven are clustered within a 300-square-mile area covering lower Pistol Creek, Indian Creek, and a 20-mile-long segment of the Middle Fork Salmon River. Barth Hot Springs, on the main Salmon River, is widely separated from the other springs and differs in other respects, such as chemical ratios and its much lower mineral content. Some of the springs have been utilized as a source of hot water and space heating (Thomas Creek Ranch), but little is known about their other resource potential. Thermal springs may be the surface expression of a deep-seated steam reservoir that can be tapped to produce electric power. Surficial data were collected from all known hot-spring localities in the primitive area to help determine the geothermal power potential. The following geologic requirements are considered necessary for a geothermal reservoir to have appreciable potential for exploitation: (1) Location within an area of relatively recent igneous activity, (2) sufficient rock permeability and favorable structural conditions, (3) sufficient fluids, (4) a large reservoir, (5) a depth shallow enough to permit drilling (less than 10,000 ft), and (6) relatively high base temperatures.

Thermal springs in the Idaho Primitive Area are in an area of Cenozoic volcanics and tectonic activity. Host rocks are Cretaceous Idaho batholith, Eocene Challis Volcanics, and Eocene granite. Rock types do not appear to


EXPLANATION
○ Thermal spring
1. Barth Hot Springs
2. Quis-Quis
3. Middle Fork Indian Creek 2
4. Middle Fork Indian Creek 1
5. Cox
6. Loon Creek
7. Hospital
8. Pistol Creek
9. Sunflower Flat
10. Sunflower Creek
11. Riverside
12. Thomas Creek Ranch
SALMON
RIVER
Roaring Creek
Wilson Creek
Papoose Creek
Cottonwood Creek
Disappointment Creek
Whimstick Creek
McCalla Creek
Rush Creek
Big Creek
Big Ramey Creek
Chamberlain Creek
Beaver Creek
Smith Creek
N

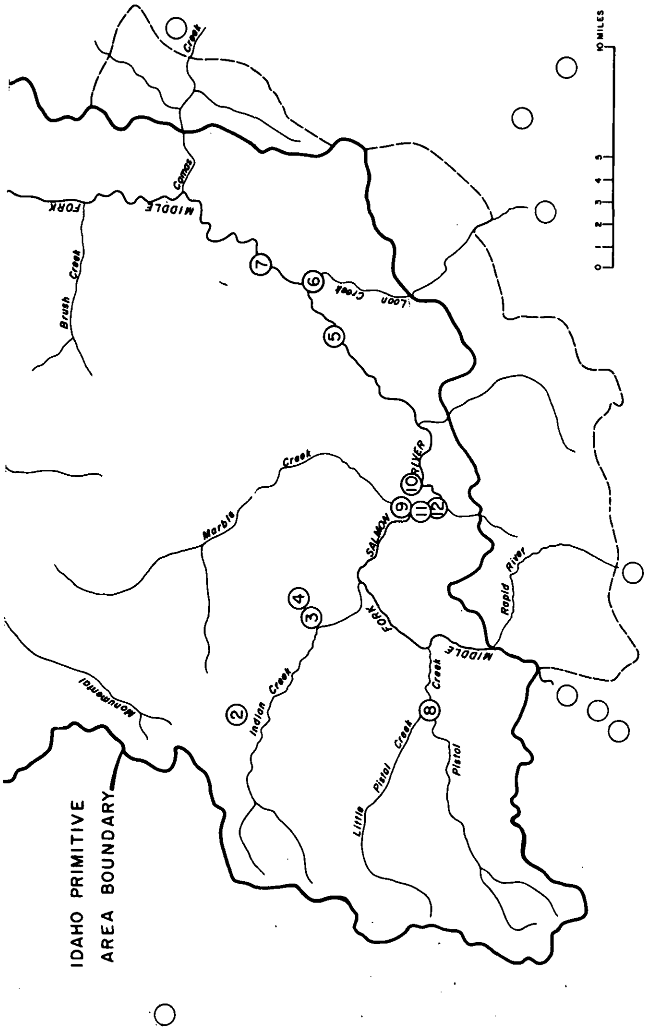


FIGURE 125. — Location of thermal springs, Idaho Primitive Area and vicinity.

influence the distribution of the springs. Tertiary mafic dikes near the thermal springs indicate a possible mutual relationship to a deep-seated heat source.

The igneous rocks are not porous, but the numerous surface fractures and faults are apparently extensive, providing the channelways for convective systems that permit surface waters to reach deep-seated heat sources and return to the surface at greatly elevated temperatures. All springs are on numerous small faults and fractures within a few feet of major streams along probable faults (fig. 126). Most faults and fractures strike N. 45° W; dips are normally greater than 45°.

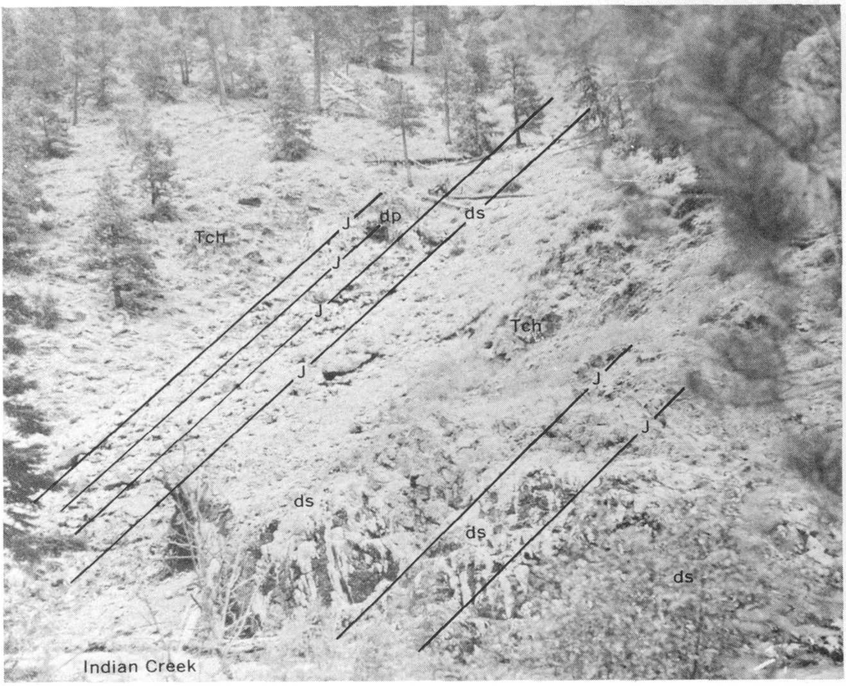


FIGURE 126.— Quis-Quis thermal spring. Tch, Tertiary Challis Volcanics; J, joint; dp, primary discharge point; ds, secondary discharge point.

Total measured hot-water discharge for the 12 localities is relatively small, averaging 32.9 gallons per minute (table 37). These moderately low values indicate that although permeability does exist, it is not of great magnitude. In general, when spring outlets are at or near the level of ground or surface waters, most of the hot water of the system is discharged from the springs (White, 1961). Most hot springs in the primitive area are at or near the surface levels of major streams, and an undetermined amount of discharge takes place underwater.

The porosity and permeability of a potential resource can be established

TABLE 37. — *Physical data for thermal springs, Idaho Primitive Area*

Spring	Discharge (gallons per min)	Temperature (°F)	Surface expression of reservoir (acres)	Host rock	Location (Sec. T.N.R.E.)		
Barth Hot Springs	196.0	141	80	Idaho batholith	18	25	12
Quis-Quis	15.0	157	3	Challis Volcanics	34	18	10
Middle Fork Indian Creek 1	1.5	162	1	do	16	17	11
Middle Fork Indian Creek 2	40.0	191	1	Dike in Idaho batholith	21	17	11
Pistol Creek	3.8	116	50	Idaho batholith	14	16	10
Sunflower Flat	3.5	116	1	Eocene granite	8	16	12
Riverside	4.3	110	1	do	17	16	12
Thomas Creek Ranch	67.5	138	12	do	17	16	12
Sunflower Creek	36.0	149	5	Idaho batholith	16	16	12
Cox	17.5	130	180	Eocene granite	26-27	17	13
Loon Creek	8.0	121	3	do	19	17	14
Hospital	2.0	115	1	do	5	17	14

only by drilling and testing. Magnetic intensity of the underlying rocks, extent of fracture porosity, and the surface area influenced by past and present hot-water discharge were used to estimate the areas of surface expression of the reservoirs. Surface expressions of the reservoirs beneath the 12 hot-spring localities are not extensive (table 37).

Localities with possibly large reservoirs and greater potential are those where groups of thermal springs occur. The 1-square-mile area including the two Middle Fork Indian Creek localities, because of their high temperatures, represents some potential. The 2-square-mile area including Sunflower Flat, Riverside, Thomas Creek, and Sunflower Creek thermal spring localities has less potential. Reservoirs having greater magnitude than those shown in table 37 probably exist in the area.

Depth to the reservoirs is thought to be far less than 10,000 feet and is, therefore, shallow enough to permit drilling. Ross (1934, p. 105-106) calculated a maximum source depth of 6,400 feet for a few hot-spring localities in the primitive area, using a normal temperature gradient of 1° F for 60 feet of depth and a mean annual temperature of 40° F. This figure for source depth is highly questionable.

Ellis (1961) showed that, in an area of several centers of hot-spring activity, the locality with the lowest Na/K ratio is generally nearest its heat source. In the Idaho Primitive Area the two Middle Fork Indian Creek thermal spring localities (fig. 125) have the lowest Na/K ratio (table 38) and the highest water temperatures (table 37).

Determination of water temperatures at depth, using surface data, was somewhat contradictive and inconclusive. Dry steam areas are characterized by a relatively low Cl/SO_4 ratio (Wilson, 1961), a characteristic found in the waters at all 12 thermal-spring localities (table 38). Low Na/K ratios (from 8 to 20) would indicate a notable temperature increase with depth (White, 1961), but high ratios are present at the 12 localities. Silica content is proportional to temperature, and silica does not readily precipitate on cooling. The low silica content of the Idaho Primitive Area springs indicates that water temperature does not increase appreciably

TABLE 38. — *Chemical data for thermal springs, Idaho Primitive Area*

[Analyses in milligrams per liter, by U.S. Geological Survey laboratory, Salt Lake City, Utah]

Spring	SiO_2	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Mn	Cl	Na/K	Cl/SO_4	pH	F	Cl/F
Barth Hot Springs	70	1.6	0.0	50	0.5	51	29	5.3	0	3.6	100	0.7	9.0	5.7	0.6
Quis-Quis	77	2.3	.0	110	2.0	87	22	73.0	0	19.0	55	.3	8.7	17.0	1.1
Middle Fork Indian Creek 1	110	2.1	.0	120	3.7	116	25	64.0	10	14.0	32	.2	8.7	17.0	.8
Middle Fork Indian Creek 2	110	2.0	.0	110	3.6	131	14	62.0	0	14.0	31	.2	8.6	18.0	.8
Pistol Creek: (a)	71	3.7	.2	89	1.4	108	0	66.0	0	13.0	64	.2	6.3	12.0	1.1
(b)	67	5.0	.2	83	1.4	98	0	67.0	3	12.0	59	.2	6.3	10.0	1.2
Sunflower Flat	59	4.5	.0	91	1.6	79	0	100.0	10	13.0	57	.1	7.4	12.0	1.1
Riverside	75	3.2	.0	79	1.8	62	19	56.0	10	8.9	44	.2	8.8	9.9	.9
Thomas Creek Ranch	87	2.1	.0	82	1.8	54	28	63.0	10	10.0	46	.1	9.0	12.0	.8
Sunflower Creek	82	3.0	.1	77	1.6	51	30	41.0	0	9.0	48	.2	8.8	10.0	.9
Loon Creek	72	2.9	.0	93	1.3	114	18	51.0	0	12.0	72	.2	8.7	12.0	1.0
Hospital	55	3.4	.0	87	1.3	149	0	43.0	0	14.0	67	.3	8.3	13.0	1.1
Cox: (a)	69	1.9	.0	84	1.0	83	20	42.0	0	9.9	84	.2	8.8	15.0	.7
(b)	81	1.8	.0	100	1.4	150	7	49.0	0	12.0	71	.2	8.4	15.0	.8
(c)	67	2.4	.0	93	1.1	138	0	47.0	0	11.0	85	.2	7.5	16.0	.7

with depth. Considering, however, the proximity of tremendous quanities of surface water to all the thermal-spring localities, some dilution and cooling of the emanating thermal water appear likely.

Carbonate deposition is always a concern in economic development because of the continual need to unplug wells. The moderate concentrations of CO_3 and HCO_3 in the 12 springs pose no problems. The content of silver, lead, copper, cobalt, iron, and nickel in the waters of Barth, Quis-Quis, and Thomas Creek Ranch hot springs was determined to ascertain the

TABLE 39. — *Metal content of thermal spring water from selected localities, Idaho Primitive Area*

Thermal spring locality	Accessory cation load (lb per yr)					
	Silver	Lead	Copper	Nickel	Iron	Cobalt
Barth Hot Springs	0.0	0.0	0.0	1.8	0.0	0.5
Quis-Quis	.0	.0	.0	.1	.3	.1
Thomas Creek Ranch	.0	.0	.2	.3	.0	.3

presence or absence of valuable mineral byproducts. The analytical results (table 39) reveal the annual production of dissolved accessory metals to be insignificant.

Thermal-spring localities in the Idaho Primitive Area do not meet all the requirements for an appreciable potential for geothermal energy. The mineral product potential is economically insignificant. The springs have less potential for exploitation than many other thermal-spring localities in the Western United States.

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TABLE 1

TABLE 1. — *Analyses of samples from*

[ppm, parts per million; CxHM, citrate-soluble heavy metals; CxCu, cold-extractable detected, but below limit of determination; N, indicates that the element was looked and not found or present in amounts normal for the type of material sampled were A. Bradley, Nancy Conklin, E. F. Cooley, K. J. Curry, G. Dounay, A. Farley, J. L. Hopkins, Claude Huffman, B. W. Lanthorn, J. Matooka, S. K. McDanal, A. L. Smith, Z. Stephenson, A. J. Toevs, L. A. Vinnola, J. S. Wahlberg, and C. L.

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
					STREAM-SEDIMENT SAMPLES						
					Salmon River District						
Q86	0.5	N	1,500	15	700	200	<2	20	20	10	30
Q289	.5	N	1,000	70	300	30	15	15	10	<10	30
Q572	.03	N	200	20	30	30	N	15	10	---	15
Q956	.7	N	500	70	300	50	15	7	20	---	30
Q998	.3	N	700	50	150	30	50	20	20	---	15
R469	.7	N	700	70	700	20	15	70	20	30	70
R470	.3	N	700	70	70	20	70	30	L	10	20
R472	.3	N	700	50	100	30	30	30	10	L	50
R474	.3	N	700	70	300	20	50	30	10	10	30
R478	.3	N	1,000	70	200	50	70	30	15	10	20
R489	---	---	---	---	---	---	---	---	---	---	---
R494	---	---	---	---	---	---	---	---	---	---	---
R495	.3	N	700	70	150	30	30	30	10	10	15
R501	.3	N	700	70	50	L	70	15	10	10	15
R516	---	---	---	---	---	---	---	---	---	---	---
R519	.5	N	700	70	300	200	30	150	15	10	70
R530	.3	N	700	70	200	70	30	20	15	10	30
R540	.3	N	500	50	300	30	10	15	10	10	15
R542	.3	N	1,000	100	1,000	L	15	15	10	15	30
R544	.3	N	500	70	150	30	20	10	10	10	20
R545	.3	N	500	70	200	20	20	30	10	10	50
R546	.3	N	700	70	300	100	15	10	10	10	50
R548	---	---	---	---	---	---	---	---	---	---	---
R550	.3	N	500	70	200	20	10	150	10	15	15
R553	.3	N	300	50	200	30	10	10	15	15	30
R554	.7	N	700	70	300	100	10	150	15	15	30
R555	.5	N	1,000	100	500	30	10	10	70	10	100
R556	.2	N	1,500	70	70	20	30	20	10	10	50
S718	.5	N	1,500	70	500	300	20	30	30	10	100
S737	1	N	1,500	200	700	100	50	7	30	10	7
X947	.3	N	700	70	300	L	20	7	20	L	15
X951	.03	N	>5,000	15	70	N	N	L	L	N	N
X957	.03	N	1,500	L	20	N	N	L	L	70	N
X959	.15	N	1,500	15	70	30	L	20	20	15	30
					Edwardsburg District						
Q2	0.7	N	700	70	300	20	7	15	10	20	15
Q12	1	N	700	150	300	20	20	70	20	20	15
Q49	.7	N	100	200	500	30	15	50	30	30	30
Q281	---	---	---	---	---	---	---	---	---	---	---
Q282	.3	N	700	50	150	30	15	30	70	---	15
Q301	1	N	1,000	50	700	50	20	70	100	50	30
Q302	1	N	1,000	30	500	70	30	70	100	30	20
Q314	.7	N	1,500	50	200	100	15	50	30	30	20
Q318	1	N	1,000	100	500	150	50	70	70	30	30
Q319	1	N	1,000	100	500	70	50	50	50	30	20
Q323	.7	N	500	150	200	70	30	50	20	---	50
Q324	.7	N	700	150	200	50	30	50	50	---	30
Q325	.5	N	700	150	150	70	30	50	50	---	50
					South Fork Salmon River Addition						
S2	0.3	N	3,000	70	200	100	20	7	50	20	50
S10	.2	N	700	70	70	50	20	20	20	20	100
S11	.15	N	1,500	50	70	50	15	L	20	10	15
S12	.15	N	700	30	50	50	15	L	20	10	30
S33	.3	N	700	50	200	100	20	15	20	15	30

the Idaho Primitive Area, Idaho

copper; number in parentheses indicates sensitivity limit of method used; L, indicates for but not found; ---, not looked for; <, less than; >, greater than. Also looked for Au(10), Bi(10), Cd(20), Nb(10), Sb(100), Sc(5), and W(50). Analysts: L. W. Bailey, L. Finley, C. L. Forn, J. G. Frisken, David Grimes, J. C. Hamilton, R. Hansen, R. T. Meier, E. L. Mosier, Harriet G. Neiman, S. Noble, M. S. Rickard, G. Sears, C. Whittington]

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
					STREAM-SEDIMENT SAMPLES						
					Salmon River District						
Q86	N	N	<5	3.0	20	700	300	N	7.0	1.0	<10
Q289	N	N	20	1	500	700	500	N	3	.5	60
Q572	N	N	N	N	10	100	30	N	.5	<.5	40
Q956	N	N	10	1	70	700	300	N	2	.5	40
Q998	N	N	10	N	200	700	200	N	5	.5	10
R469	N	N	70	1	70	200	200	N	4	12	30
R470	N	N	15	1	200	150	150	N	2	4	<10
R472	N	N	10	1	100	150	150	N	4	6	<10
R474	N	N	15	1	150	100	300	N	1	6	<10
R478	N	N	15	1	150	200	300	N	2	4	<10
R489	---	---	---	---	---	---	---	---	2	3	<10
R494	---	---	---	---	---	---	---	---	.5	4	<10
R495	N	N	10	1.5	150	150	200	N	1	4	<10
R501	N	N	15	1	150	200	300	N	2	3	<10
R516	---	---	---	---	---	---	---	---	2	12	<10
R519	N	N	70	1	150	300	300	N	4	4	10
R530	N	N	15	1	70	200	300	N	4	4	<10
R540	N	N	15	1	70	300	300	N	2	3	<10
R542	N	N	20	1	50	150	150	N	2	3	<10
R544	N	N	10	1.5	100	200	300	N	2	1	<10
R545	N	N	70	1	70	200	200	N	2	4	<10
R546	N	N	10	1	70	200	200	N	.5	3	<10
R548	---	---	---	---	---	---	---	---	5	15	<10
R550	N	N	15	1.5	50	200	300	N	2	1.5	<10
R553	N	N	15	1	30	200	150	N	2	6	10
R554	N	N	20	1	50	200	200	N	5	15	<10
R555	N	N	7	1.5	150	150	300	N	.5	.5	<10
R556	N	N	10	1.5	150	150	200	N	2	6	<10
S718	10	N	7	3	70	1,000	300	N	2	3	<10
S737	N	L	10	2	200	1,000	700	N	2	3	<10
X947	N	N	15	1.5	100	700	300	N	5	L	N
X951	15	N	10	L	10	500	100	N	<15	L	L
X957	N	N	7	1.5	30	70	100	N	5	L	N
X959	N	N	L	1.5	30	300	150	N	14	L	N
					Edwardsburg District						
Q2	N	N	>5	1.0	30	700	300	N	5.0	<0.5	<10
Q12	N	N	15	<1	150	1,500	500	N	3	2	20
Q49	N	N	20	<1	150	700	500	N	7	2	10
Q281	---	---	---	---	---	---	---	N	7	N	20
Q282	N	N	7	3	30	500	100	N	9	3	60
Q301	5	N	10	3	150	700	300	N	7	6	60
Q302	7	N	15	2	150	700	500	N	5	7	120
Q314	<2	N	10	2	70	1,000	500	N	5	<.5	<10
Q318	3	N	20	2	300	2,000	1,500	N	7	1.5	20
Q319	2	N	20	1	200	1,000	700	N	7	2	10
Q323	3	N	15	3	150	1,000	300	N	4	<.5	30
Q324	N	N	10	3	100	1,500	300	N	7	1.5	40
Q325	N	N	15	2	100	1,500	200	N	7	2	10
					South Fork Salmon River Addition						
S2	12	N	7	5.0	30	700	300	N	7.0	<0.5	<10
S10	L	N	5	7	50	500	500	N	5	.5	10
S11	N	N	5	2	70	700	500	N	7	<.5	20
S12	N	N	L	2	30	700	300	N	5	<.5	30
S33	N	N	5	1.5	30	700	500	N	7	6	<10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
				STREAM-SEDIMENT SAMPLES--Continued							
				South Fork Salmon River Addition--Continued							
S37	0.1	N	500	30	70	50	10	10	20	20	100
S109	.3	N	1,000	50	150	100	10	10	50	10	50
S200	.2	N	500	30	100	50	15	5	20	10	20
S201	.15	N	700	30	150	100	10	5	30	15	30
S202	1	N	1,000	100	100	50	15	10	15	10	30
S203	.2	N	500	30	70	300	15	10	10	10	50
S204	.2	N	300	30	50	50	15	70	15	15	10
S205	.2	N	700	50	50	150	15	50	10	10	20
S206	.3	N	700	50	100	100	15	50	10	15	20
S208	.2	N	500	50	100	50	15	10	10	10	20
S209	.1	N	500	20	30	50	10	5	10	10	20
S202	.15	N	700	20	70	30	10	5	15	15	15
S219	.3	N	700	70	100	50	15	15	15	15	50
S220	.5	N	1,000	100	200	50	20	20	10	15	3C
S221	.3	N	700	70	150	50	15	10	15	10	30
S222	.5	N	500	70	300	200	15	10	10	10	50
S308	>1	N	1,500	150	200	70	30	50	50	20	50
S309	>1	N	1,500	100	150	70	30	30	50	30	100
B801	---	---	---	---	---	---	---	---	---	---	---
B803	.2	N	1,000	30	200	200	10	50	30	10	70
B804	.2	N	1,000	30	100	50	15	70	30	10	50
B805	.3	N	1,000	50	500	150	7	20	15	10	70
				Chamberlain District							
Q120	0.3	N	1,000	50	1,000	500	<2	10	10	10	50
Q128	.7	N	1,000	100	1,000	100	50	50	20	15	70
Q129	.7	N	1,000	70	1,000	100	15	20	20	<10	70
Q132	.3	N	700	70	1,500	150	7	7	30	---	50
Q185	.5	N	1,500	50	500	30	<2	15	10	10	20
Q231	.2	N	3,000	70	300	100	7	7	30	---	20
Q297	.3	N	3,000	30	150	100	3	20	70	<10	20
Q298	.7	N	<5,000	50	1,000	200	5	30	50	10	30
Q480	.7	N	700	70	700	100	5	70	30	15	50
Q483	1	N	700	70	700	100	10	50	50	10	70
Q753	.3	N	500	70	500	50	7	20	30	---	30
Q754	.2	N	2,000	50	1,000	150	10	30	20	---	50
Q755	.2	N	300	30	300	70	5	30	50	---	50
Q756	.2	N	500	30	200	100	5	15	50	---	70
Q757	.2	N	500	30	500	100	3	15	30	---	50
Q758	.15	N	500	30	100	50	5	20	50	---	30
Q759	.2	N	500	30	200	70	5	20	50	---	50
R371	.7	>200	2,000	30	>1,000	100	5	30	70	20	70
X952	.15	---	700	15	150	70	N	5	15	L	20
X954	.15	---	200	L	N	N	N	5	10	L	N
X960	.03	---	2,000	10	20	30	N	20	10	50	L
				Big Creek District							
B830	0.07	N	1,500	30	30	300	5	15	10	10	100
Q141	.5	N	500	70	200	50	15	20	10	<10	30
Q261	.3	N	300	70	300	70	2	10	20	15	30
Q267	.3	N	500	70	300	30	2	10	10	15	20
Q268	.3	N	700	70	150	30	5	20	15	---	15
Q270	.3	N	500	50	300	100	2	15	30	<10	20
Q355	.5	N	700	50	200	200	20	30	30	20	20
Q356	<1	N	1,500	100	>1,000	150	<2	30	15	30	30
Q357	<1	N	1,500	70	1,000	200	3	50	15	30	20
Q450	---	---	---	---	---	---	---	---	---	---	---

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
STREAM-SEDIMENT SAMPLES--Continued											
South Fork Salmon River Addition--Continued											
S37	N	N	L	5.0	30	500	500	N	2.0	4.0	<10
S109	L	N	L	1.5	20	700	500	N	5	<.5	<10
S200	L	N	L	5	15	500	200	N	9	<.5	<10
S201	L	N	5	5	15	500	200	N	7	<.5	<10
S202	10	N	10	1	70	700	500	N	5	<.5	<10
S203	L	N	L	3	20	500	500	N	1	3	20
S204	15	N	5	2	20	700	500	N	3	8	10
S205	20	N	5	2	50	700	500	N	5	8	10
S206	10	N	5	2	30	700	500	N	3	6	10
S208	5	N	7	2	20	700	500	N	3	3	10
S209	N	N	N	2	50	300	700	N	7	2	10
S212	L	N	5	1.5	20	700	300	N	27	<.5	<10
S219	L	N	5	5	50	500	500	N	5	3	<10
S220	L	N	10	2	50	500	500	N	5	3	<10
S221	5	N	7	1.5	50	700	500	N	5	4	<10
S222	L	N	5	2	50	500	500	N	3	4	<10
S308	L	N	10	3	70	700	700	N	5	2	10
S309	L	N	10	2	70	1,000	700	N	4	3	30
B801	---	---	---	---	---	---	---	---	1	1	<10
B803	N	N	7	2	L	150	200	1.5	9	5	<10
B804	N	N	5	5	15	300	300	2	9	20	<10
B805	N	N	5	5	15	200	300	N	5	1	<10
Chamberlain District											
Q120	3	N	5	2.0	20	700	500	N	2.0	<0.5	60
Q128	2	N	30	1	150	1,000	700	N	3	4	<10
Q129	<2	N	15	1	100	700	700	N	5	1	20
Q132	N	N	7	1.5	20	700	300	N	5	.5	<10
Q185	N	N	5	2	20	700	500	N	3	<.5	60
Q231	3	N	10	3	30	700	300	N	7	<.5	<10
Q297	<2	N	7	2	30	700	300	N	7	.5	<10
Q298	2	N	15	2	100	1,000	1,000	N	9	.5	<10
Q480	<2	N	7	1	70	700	700	N	3	1.5	<10
Q483	<2	N	7	3	70	700	700	N	3	7	<10
Q753	N	N	7	1.5	30	500	150	N	3	4	10
Q754	N	N	10	1.5	20	700	300	N	7	<.5	10
Q755	N	N	5	2	20	500	200	N	4	6	10
Q756	N	N	5	2	15	700	200	N	2	4	<10
Q757	N	N	5	2	15	700	200	N	3	4	<10
Q758	N	N	5	2	15	700	200	N	3	6	10
Q759	N	N	5	2	15	500	200	N	3	4	10
R371	N	N	5	10	5	300	200	N	4	6	10
X952	N	N	10	1.5	30	300	150	N	7	L	<10
X954	N	N	N	L	L	30	L	N	35	L	<10
X960	N	N	N	1	L	150	100	N	30	L	<10
Big Creek District											
B830	N	N	L	5.0	L	50	L	---	1.0	5.0	20
Q141	<2	N	15	<1	100	500	100	---	1	6	60
Q261	N	N	<5	3	100	700	700	N	.5	2	40
Q267	N	N	5	1	100	700	500	N	2	.5	60
Q268	N	N	7	N	70	500	300	N	3	3	<10
Q270	N	N	5	1	100	1,000	1,500	N	3	4	60
Q355	N	N	15	1	200	700	700	N	2	<.5	60
Q356	N	N	20	5	70	700	700	N	2	1	10
Q357	<2	N	20	3	70	1,000	1,000	N	.5	2	<10
Q450	---	---	---	---	---	---	---	---	.5	1	40

TABLE 1. — *Analyses of samples from the*

	Semiquantitative spectrographic analyses										
	(percent)	(ppm)									
Sample	Ti (.002)	Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
					STREAM-SEDIMENT SAMPLES--Continued						
					Big Creek District--Continued						
Q451	0.5	N	500	30	1,000	200	<2	10	30	20	100
Q455	.2	N	200	30	100	50	5	30	<10	10	100
Q464	.7	N	700	50	700	1,000	<2	20	30	20	30
Q467	.5	N	700	30	1,000	200	2	20	20	10	70
Q473	.5	N	700	50	150	50	20	50	10	20	30
Q621	.5	N	700	70	200	30	20	20	20	30	30
Q622	.5	N	700	100	200	30	15	30	10	50	30
Q635	.7	N	1,000	70	500	30	2	15	10	15	30
Q649	.2	N	700	30	100	50	<2	30	15	<10	15
Q657	.2	N	150	20	700	300	N	2	20	---	30
Q661	.15	N	150	20	150	50	N	2	20	---	30
Q662	.2	N	150	30	500	70	5	5	20	---	30
Q729	.1	N	300	20	150	150	3	10	20	---	70
R259	<1	N	3,000	500	500	50	10	50	20	50	50
R260	<1	N	2,000	150	500	50	10	30	50	50	30
R261	<1	N	2,000	300	500	20	20	50	70	50	30
R262	<1	N	3,000	300	500	30	20	100	10	20	50
S561	.7	N	2,000	70	300	50	15	7	30	10	30
S784	.7	L	2,000	100	700	150	7	20	50	15	70
S786	.7	300	3,000	100	500	300	5	30	100	15	150
S787	.15	L	300	30	150	150	L	5	30	20	70
X963	.15	N	700	15	150	150	L	7	15	30	50
					Ramey Ridge District						
Q31	>1	N	2,000	300	>1,000	150	15	500	<10	20	20
Q32	.7	N	700	200	500	50	10	70	10	30	15
Q34	1	N	1,000	300	700	20	3	30	<10	15	15
Q96	1	N	1,500	100	1,000	200	10	50	<10	10	50
Q114	.3	N	1,000	70	150	150	7	15	70	---	30
Q144	<1	N	1,000	100	500	20	15	300	100	15	30
Q145	1	N	1,000	70	500	100	5	30	15	<10	20
Q146	1.5	N	1,000	200	70	30	7	70	N	---	30
Q326	.7	N	1,000	70	500	30	<2	15	<10	10	15
Q952	1.5	N	1,000	150	200	150	7	30	20	---	70
					Middle Fork Salmon River District						
B795	0.05	N	100	10	L	30	7	70	100	10	30
B796	.3	N	1,000	70	150	50	15	70	30	<10	20
Q245	1	N	1,000	70	500	100	5	30	15	<10	20
Q492	>1	N	1,000	100	1,000	300	15	20	50	<10	100
R276	1	N	1,000	150	300	50	15	20	100	50	30
R278	.7	N	1,500	150	200	100	15	50	100	50	30
R279	1	200	2,000	200	300	100	20	50	70	50	30
R321	1	N	1,500	150	300	200	10	30	70	30	30
R322	.7	N	1,000	100	1,000	70	10	200	70	30	50
R324	<1	N	1,500	300	1,000	100	20	50	70	30	20
R326	1	N	1,000	200	1,000	100	15	30	70	50	20
R327	<1	N	1,500	300	700	150	20	20	70	50	30
R330	.7	N	1,000	100	700	150	15	20	70	50	20
R355	1	N	1,000	100	300	50	15	30	70	50	30
R357	1	N	1,000	200	700	100	15	50	70	50	50
R358	.7	N	700	150	200	100	10	30	100		100
R400	.02	N	50	10	10	L	L	20	15	70	50
R401	.07	N	200	15	30	70	L	15	15	20	50
R406	.2	N	150	30	150	70	5	15	30	30	70
R407	.7	N	300	15	100	150	L	10	15	15	150
R415	.3	N	700	30	100	150	5	15	10	20	50
R417	.7	N	1,000	100	500	200	7	15	10	10	150
R420	---	---	---	---	----	---	---	---	---	---	----
R421	.15	N	300	20	150	N	5	15	L	10	L
R422	.3	N	1,000	70	500	200	10	15	15	10	70

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	Chemical analyses (ppm) CxHM (.5)	CxCu (.5)	As (10)
STREAM-SEDIMENT SAMPLES--Continued Big Creek District--Continued											
Q451	<2	N	5	2.0	20	1,500	1,500	N	0.5	<0.5	60
Q455	<2	N	<5	5	50	100	50	N	7	<.5	<10
Q464	<2	N	7	1	100	1,500	1,500	N	<.5	4	10
Q467	<2	N	5	10	30	500	500	N	5	<.5	<10
Q473	<2	N	10	1	150	500	300	N	2	6	<10
Q621	<2	N	7	3	100	300	150	N	.5	.5	40
Q622	<2	N	10	2	100	300	150	N	3	<.5	40
Q635	<2	N	5	3	30	500	50	N	2	2	<10
Q649	<2	N	<5	2	30	150	100	N	2	3	<10
Q657	N	N	N	2	10	1,000	200	N	.5	<.5	10
Q661	N	N	N	2	10	1,000	300	N	.5	1	40
Q662	N	N	3	3	15	1,000	200	N	.5	1.5	40
Q729	N	N	N	1.5	15	700	100	N	3	<.5	40
R259	<5	N	50	1	70	500	500	N	3	3	10
R260	<5	N	5	1	20	500	200	N	9	1	<10
R261	<5	N	50	1	150	1,000	700	N	1	2	<10
R262	<5	N	50	1	100	200	700	N	1	4	<10
S561	5	N	7	2	70	700	300	N	5	<.5	10
S784	L	N	7	3	30	1,500	300	N	5	<.5	---
S786	7	L	5	7	15	1,000	150	N	22	2	---
S787	N	N	L	5	10	700	100	N	5	<.5	---
X963	N	N	N	1.5	L	300	150	N	---	---	---
Ramey Ridge District											
Q31	<2	N	20	<1.0	100	500	700	N	11.0	150.0	<10
Q32	<2	N	7	1	100	500	150	N	3	11	<10
Q34	<2	N	15	<1	10	300	200	N	7	<.5	<10
Q96	<2	N	20	2	70	700	500	N	5	4	10
Q114	N	N	7	1	30	500	200	N	2	<.5	---
Q144	<2	N	20	1.5	70	500	700	N	32	180	<10
Q145	<2	N	15	1	7	700	1,000	N	2	3	<10
Q146	N	N	30	N	30	300	300	N	1	<.5	<10
Q326	<2	N	<5	<1	30	150	200	N	3	<.5	120
Q952	N	N	15	1	30	700	500	N	5	2	10
Middle Fork Salmon River District											
B795	N	N	N	3.0	N	200	N	0.5	18.0	10.0	L
B796	N	N	10	2	100	50	300	N	8	2	N
Q245	<2	<10	15	1	70	100	1,000	N	2	3	<10
Q492	7	N	15	3	150	1,000	1,500	N	3	<.5	<10
R276	<5	N	5	3	50	1,000	700	N	1	1.5	<10
R278	<5	N	7	3	70	700	300	N	4	4	<10
R270	<5	N	10	3	100	1,000	500	7	9	1.5	<10
R321	<5	N	5	2	70	700	500	N	1	.5	10
R322	<5	N	<5	3	100	500	300	N	.5	2	<10
R325	<5	N	5	2	100	2,000	500	N	2	1.5	<10
R326	<5	N	5	3	50	700	200	N	L	1	10
R327	<5	N	10	2	100	1,000	500	N	3	1	<10
R330	<5	N	5	3	50	700	500	N	2	.5	<10
R355	5	N	5	5	50	700	500	N	1	1	10
R357	<5	N	5	5	50	500	500	N	1	2	10
R358	<5	N	<5	10	30	300	200	N	1	<.5	<10
R400	N	N	5	3	L	30	L	.5	14	<.5	<10
R401	N	N	N	2	L	50	100	N	5	<.5	<10
R406	N	N	L	2	15	300	100	.7	2	<.5	<10
R407	N	N	N	5	L	100	200	.5	2	.5	<10
R415	N	N	5	1.5	20	150	300	N	5	<.5	<10
R417	N	N	15	1	50	150	200	N	5	<.5	<10
R420	---	---	---	---	---	---	---	---	1	6	<10
R421	N	N	N	1	L	70	100	N	5	<.5	<10
R422	N	10	10	2	100	200	200	7	1	<.5	<10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
STREAM-SEDIMENT SAMPLES--Continued											
Middle Fork Salmon River District--Continued											
R423	0.3	N	1,500	50	200	500	10	5	30	10	70
R426	.7	N	300	70	150	30	20	70	L	20	70
R429	.15	N	300	70	100	30	15	20	10	20	30
R431	.3	N	500	50	100	30	5	5	100	10	30
R446	.3	N	700	70	150	50	20	20	10	L	50
R449	.2	N	500	70	100	20	20	30	10	10	30
R457	---	---	---	---	---	---	---	---	---	---	---
R463	---	---	---	---	---	---	---	---	---	---	---
R561	.03	N	500	10	20	50	5	20	15	50	70
R562	.2	N	700	30	150	30	5	15	15	10	30
S67	.2	N	300	30	200	100	10	10	20	10	50
S73	.15	N	2,000	30	200	200	L	5	50	10	>200
S75	.15	N	500	50	200	300	20	20	30	20	>200
S78	.2	N	500	70	300	500	L	15	50	L	70
S81	.5	N	500	100	200	100	50	15	100	100	70
S82	.15	N	500	50	300	300	L	5	100	10	70
S92	.3	N	700	50	300	300	N	5	30	L	150
S97	.15	N	5,000	50	150	200	10	10	100	15	>200
S336	.2	N	300	70	300	70	L	10	30	L	30
S337	.3	N	300	70	150	150	5	30	15	L	70
S438	.05	N	300	20	20	300	L	5	10	20	>200
S519	.1	L	1,000	70	50	50	5	7	30	10	30
S524	.5	N	5,000	100	100	70	20	30	30	20	15
S527	.5	L	1,000	50	200	150	5	20	70	10	70
S537	.07	L	1,500	30	30	---	10	30	50	10	30
S578	.7	N	700	100	200	70	70	50	30	100	50
S580	.5	N	700	70	200	70	15	7	20	15	50
S589	.5	L	1,000	50	300	150	7	30	50	10	100
S590	.3	L	700	50	>1,000	200	L	30	50	L	>200
S616	.5	N	5,000	100	70	50	20	30	200	30	30
S617	.07	N	300	30	30	30	5	7	30	30	15
S620	.3	N	300	70	150	50	15	30	70	L	30
S627	.1	---	1,500	30	150	50	N	7	50	L	30
S640	.03	L	150	15	50	50	L	7	15	30	30
S685	.07	N	500	20	50	50	L	7	20	30	30
S704	.15	N	700	30	300	100	5	7	30	10	100
S705	.2	300	2,000	50	500	150	7	50	70	15	>200
S706	.3	200	1,000	30	500	100	5	15	50	15	70
S707	.3	L	700	50	700	150	10	30	70	10	100
S709	.7	L	1,500	70	200	300	7	20	30	10	50
S727	.7	N	1,500	70	300	200	30	30	30	70	100
S732	1	N	1,500	100	500	100	70	70	30	30	70
S742	.15	N	700	30	70	70	5	7	30	L	70
S749	.7	N	1,500	150	300	200	70	150	30	70	150
S750	.5	N	2,000	70	700	300	5	30	150	20	100
S751	1	N	1,000	70	1,000	300	5	30	50	10	150
S766	.7	N	1,000	150	500	70	50	70	30	10	30
S805	.2	N	1,000	50	500	70	10	20	30	10	50
S813	.3	N	300	50	500	300	15	10	50	10	70
S818	.2	N	1,000	30	500	200	5	7	30	20	70
S832	.2	N	1,500	15	100	100	L	5	20	L	20
S851	.3	L	300	70	>1,000	1,000	L	N	70	L	>200
S855	.2	N	500	20	500	300	L	15	30	L	150
S857	.3	200	2,000	70	500	150	10	15	70	20	70
S866	.1	N	100	N	70	70	L	L	10	L	50
S870	.3	L	300	70	>1,000	500	5	7	20	L	150
S942	.15	N	700	L	300	500	L	L	15	10	70

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	Chemical analyses (ppm) CxHM (.5)	CxCu (.5)	As (10)
				STREAM-SEDIMENT SAMPLES--Continued Middle Fork Salmon River District--Continued							
R423	N	15	7	2.0	50	150	150	N	2.0	0.5	<10
R426	N	N	15	1.5	100	70	150	N	4	15	<10
R429	N	N	7	1	100	100	200	N	2	3	<10
R431	N	N	5	1.5	30	500	300	N	.5	.5	<10
R446	N	N	7	1.5	50	200	300	N	2	4	<10
R449	N	N	7	1	70	150	150	N	4	4	<10
R451	---	---	---	---	---	---	---	N	3	23	<10
R463	---	---	---	---	---	---	---	---	2	8	<10
R561	N	N	5	3	L	30	L	N	7	<.5	<10
R562	N	N	5	2	L	150	100	N	5	3	<10
S67	L	N	L	5	30	700	300	N	3	4	<10
S73	L	N	L	20	10	300	500	N	2	<.5	<10
S75	L	N	L	15	50	200	500	N	2	3	<10
S78	L	N	5	10	15	700	500	N	2	3	40
S81	L	N	L	L	70	700	200	N	2	<.5	<10
S82	5	N	L	7	15	300	200	N	2	<.5	<10
S92	L	N	L	3	50	500	200	N	7	1	10
S97	L	N	5	20	10	300	500	N	1	<.5	<10
S336	N	N	L	3	30	700	300	N	5	<.5	10
S337	N	N	L	1.5	30	300	300	N	5	2	10
S438	L	N	L	15	L	200	300	N	5	<.5	---
S519	N	N	10	5	30	150	150	N	7	<.5	<10
S524	L	N	L	1	50	700	300	N	20	<.5	<10
S527	N	10	7	5	20	700	300	N	3	<.5	10
S537	N	N	7	2	30	L	L	N	7	<.5	20
S578	L	N	15	2	300	300	300	N	1	6	10
S580	L	N	5	3	70	700	300	N	5	<.5	10
S589	5	L	L	5	30	700	200	N	5	<.5	10
S590	L	L	N	15	30	300	100	N	1	4	10
S616	5	N	15	3	30	300	150	N	9	<.5	10
S617	N	N	10	3	15	150	100	---	5	<.5	<10
S620	N	N	7	3	70	300	200	---	7	<.5	<10
S627	N	N	7	3	7	300	100	N	5	<.5	10
S640	N	N	N	2	10	L	100	N	5	<.5	<10
S685	N	N	N	5	10	150	150	N	5	<.5	<10
S704	L	N	N	10	30	200	150	N	5	<.5	<10
S705	5	L	5	15	30	300	150	N	20	1	<10
S706	L	L	L	10	15	300	150	N	7	<.5	<10
S707	5	10	L	15	30	700	200	N	5	<.5	<10
S709	L	L	10	3	30	700	300	N	5	<.5	<10
S727	N	N	10	3	30	1,000	300	N	1	3	<10
S732	5	N	15	3	150	1,000	300	N	1	<.5	<10
S742	N	N	N	15	15	150	100	N	5	<.5	10
S749	L	N	10	5	100	500	150	N	2	15	10
S750	5	30	7	10	20	300	150	N	14	<.5	10
S751	10	20	5	10	20	300	150	N	.5	<.5	<10
S766	L	N	7	3	70	1,000	300	N	5	.5	<10
S805	N	N	7	2	30	500	300	N	5	<.5	<10
S813	N	10	7	5	30	500	150	N	5	<.5	<10
S818	N	L	5	7	10	300	100	N	5	<.5	<10
S832	N	N	5	5	L	200	100	N	5	<.5	<10
S851	5	30	5	5	15	150	N	N	5	<.5	10
S855	N	15	L	10	5	150	N	N	5	<.5	<10
S857	15	10	7	3	15	300	100	N	9	.5	<10
S866	N	N	N	2	L	70	L	N	7	<.5	10
S870	N	10	5	3	10	200	L	N	9	<.5	10
S942	N	N	N	7	5	300	N	N	7	.5	<10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
STREAM-SEDIMENT SAMPLES--Continued											
Monumental Creek District											
Q105	0.3	N	500	50	500	300	<2	30	15	<10	100
Q336	1	N	1,500	150	500	70	20	50	15	100	30
Q374	.7	N	700	70	>1,000	300	5	15	30	10	50
Q378	.7	N	1,000	50	500	100	7	50	50	20	50
Q380	.5	N	500	70	150	50	15	50	15	---	20
Q394	.7	N	1,500	70	200	70	5	15	15	15	20
Q427	.2	N	500	20	300	150	3	15	20	---	30
Q443	.15	N	200	30	150	70	<2	20	10	10	70
Q447	.3	N	500	20	>1,000	200	2	20	50	20	30
Q486	1	N	1,000	100	200	70	15	30	10	100	30
Q487	.3	N	500	70	100	50	10	70	10	---	20
Q489	>1	N	700	70	200	50	15	20	<10	70	30
Q509	1	N	1,000	70	300	100	10	15	30	<10	30
Q512	.3	N	500	50	200	100	7	15	20	---	30
Q517	.7	N	500	70	500	50	7	20	<10	70	20
Q519	1	N	700	100	700	50	10	70	10	30	30
Q520	1	N	500	150	1,000	30	3	50	10	15	20
Q521	1	N	700	150	700	20	5	50	10	15	15
Q565	1	N	500	50	300	30	15	30	15	30	30
Q566	.3	N	300	50	200	<20	3	10	20	10	10
Q632	.3	N	700	20	300	100	3	15	50	15	30
Q633	.3	N	1,500	20	1,000	150	5	10	70	10	30
Q900	.3	N	700	50	N	100	7	10	50	---	30
R142	.2	N	300	30	150	100	<2	15	15	15	15
R143	.3	N	700	50	150	100	<2	15	15	15	15
R144	.1	N	200	50	100	100	<2	2	10	<10	20
R145	.5	N	300	30	300	70	<2	10	10	10	15
R146	.2	N	200	20	100	50	2	5	<10	<10	10
R189	.5	N	700	50	700	150	<2	15	30	10	50
R190	.2	N	500	50	200	200	<2	15	20	15	100
Marble Creek District											
Q555	0.5	N	700.	20	1,000	100	<2	7	20	<10	50
Q561	.15	N	200	30	100	50	<2	20	10	<10	30
Q563	.3	N	300	50	300	100	5	20	20	20	20
Q564	.7	N	300	70	300	100	30	30	15	20	50
Q768	.15	N	1,000	15	200	70	N	2	50	---	30
Q772	.15	N	700	15	200	150	N	2	30	---	50
Q780	.07	N	200	20	150	300	3	10	50	---	100
R270	.5	N	1,000	15	700	150	<5	10	70	20	100
S488	.5	N	1,000	70	200	100	30	7	20	10	50
S489	.15	N	1,000	10	200	100	N	L	15	L	20
Crags Addition											
S97	0.15	N	5,000	50	150	200	10	10	100	15	>200
S366	.1	N	300	30	30	70	N	5	20	L	70
S372	.7	N	3,000	70	500	70	10	15	50	15	50
S373	.1	N	300	15	70	50	N	7	30	L	20
Camas Creek Addition											
S645	0.3	N	1,000	50	300	70	20	10	20	100	20
S714	.5	N	1,500	70	700	200	20	20	50	20	70
S756	>1	N	2,000	150	>1,000	700	50	500	70	30	>200
S757	>1	N	1,500	150	>1,000	700	30	150	70	30	200
S759	>1	N	1,500	150	>1,000	700	50	150	70	70	150
S761	>1	N	1,500	200	>1,000	500	50	300	100	50	>200
S908	.15	N	700	70	300	200	L	5	10	15	70
S909	.2	N	3,000	70	300	70	L	5	L	20	70

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	Chemical analyses (ppm) CxHM (.5)	CxCu (.5)	As (10)
				STREAM-SEDIMENT SAMPLES--Continued							
				Monumental Creek District							
Q105	2	N	<5	5.0	20	700	200	N	7.0	0.5	<10
Q336	<2	N	15	1	70	500	150	N	2	3	10
Q374	3	N	70	5	70	700	300	N	5	0.5	20
Q378	5	N	10	1	50	700	700	N	9	1	<10
Q380	N	N	7	1	30	700	100	N	4	3	<10
Q394	7	N	5	1	50	700	500	N	1	<.5	80
Q427	N	N	N	2	7	1,000	200	N	.5	.5	40
Q443	<2	N	<5	5	20	150	100	N	4	<.5	10
Q447	10	N	<5	1	15	700	500	N	5	.5	40
Q486	<2	N	10	<1	70	500	150	N	2	1	40
Q487	N	N	7	1	30	500	100	N	1	1.5	<10
Q489	<2	N	10	1	50	500	70	N	1	<.5	40
Q509	10	N	10	1	70	1,500	700	N	1	<.5	60
Q512	N	N	5	2	30	1,500	300	N	1	.5	40
Q517	<2	N	15	<1	70	500	70	N	3	1	40
Q519	<2	N	10	1	50	700	150	N	3	4	<10
Q520	<2	N	10	1	70	500	200	N	1	3	10
Q521	2	N	10	<1	70	700	150	N	5	3	60
Q565	5	N	20	<1	100	700	200	N	1	4	10
Q566	<2	N	5	<1	30	1,000	700	N	1	4	10
Q632	<2	N	>5	5	15	700	300	N	5	1	<10
Q633	5	N	5	1.5	10	1,000	300	N	17	.5	40
Q900	5	N	7	1	30	1,000	200	N	2	<.5	60
R142	<2	N	>5	1.5	20	200	100	N	.5	<.5	60
R143	<2	N	>5	2	20	300	70	N	2	<.5	40
R144	<2	N	>5	1	10	200	70	N	1	<.5	80
R145	<2	N	>5	2	20	1,000	150	N	.5	<.5	60
R146	<2	N	<5	<1	15	300	150	N	.5	<.5	80
R189	<2	N	<5	2	30	1,000	150	N	5	1	60
R190	<2	N	<5	7	15	500	150	N	3	<.5	120
					Marble Creek District						
Q555	3	N	<5	3.0	10	700	300	N	7.0	<0.5	<10
Q561	<2	N	<5	2	15	300	150	N	2	.5	60
Q563	<2	N	<5	1	50	700	300	N	.5	.5	40
Q564	3	N	10	2	150	700	500	N	1	.5	60
Q768	N	N	N	1.5	7	500	70	N	5	<.5	<10
Q772	N	N	N	2	5	700	100	N	5	<.5	<10
Q780	N	N	N	2	15	200	70	N	7	<.5	10
R270	5	N	<5	10	<5	300	<100	N	2	.5	<10
S488	L	N	10	2	50	1,000	200	N	5	<.5	---
S489	L	N	N	1.5	5	500	50	N	7	<.5	---
					Crags Addition						
S97	L	N	5	20.0	10	300	500	N	1.0	<0.5	<10
S366	N	N	N	5	10	50	L	N	5	<.5	10
S372	L	15	5	3	30	500	200	N	7	<.5	10
S373	N	L	N	5	10	150	100	N	3	<.5	<10
					Camas Creek Addition						
S645	L	N	10	2.0	50	700	500	N	3.0	3.0	160
S714	L	L	10	3	30	1,500	300	N	2	3	<10
S756	L	L	30	2	100	700	300	N	7	30	10
S757	L	N	15	2	100	700	300	N	3	12	<10
S759	L	N	20	3	150	700	300	N	3	15	10
S761	5	N	10	2	150	700	300	N	5	23	10
S908	N	N	L	7	15	300	150	N	5	<.5	<10
S909	N	N	L	30	7	700	300	N	7	<.5	<10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
STREAM-SEDIMENT SAMPLES--Continued											
Thunder Mountain District											
Q409	1.0	N	700	70	1,000	150	2	20	50	<10	20
Q415	.3	N	700	10	700	150	N	15	100	15	70
Q533	.15	N	300	15	300	100	N	150	15	---	20
Q543	.5	N	500	30	500	100	N	20	20	10	70
Q634	.3	N	3,000	50	1,000	100	5	15	50	10	30
Q643	.3	N	3,000	10	1,000	200	5	10	70	10	30
Q644	.2	N	1,500	15	500	100	N	3	15	<10	30
Q646	.3	N	1,500	20	700	200	N	7	50	10	50
Q647	.3	N	1,500	10	500	100	N	2	30	10	20
Q652	.3	N	700	10	300	150	N	10	50	10	50
Q726	.2	N	300	20	50	150	N	5	30	---	50
Q951	.15	200	1,000	30	150	150	7	20	30	N	30
R179	.3	N	500	30	500	200	N	5	20	<10	100
R180	.3	N	300	30	300	100	N	2	20	15	50
R181	.5	N	500	50	>1,000	150	N	15	20	20	50
R182	.5	N	500	50	500	500	N	15	20	20	100
R186	.3	N	500	30	300	200	N	2	50	10	200
R307	1	N	1,000	100	700	70	10	10	30	50	30
R309	.5	N	700	10	500	100	5	7	70	30	30
R310	.7	N	1,500	15	700	70	5	7	70	30	50
R311	.3	N	500	10	700	100	N	15	70	30	30
R313	.3	N	1,000	20	300	200	5	15	100	20	100
R369	.5	N	1,500	20.	200	200	10	20	70	30	50
R370	.5	200	2,000	30	700	200	10	15	50	30	50
S47	.15	N	2,000	20	150	300	5	7	100	20	>200
S51	.15	N	1,500	30	200	100	L	L	50	L	30
S53	.15	N	300	20	300	150	L	5	30	10	30
S56	.15	N	1,000	20	300	200	L	5	50	10	30
S58	.1	N	500	10	200	200	L	5	50	20	50
S60	.1	N	1,000	15	100	1,000	30	7	20	20	>200
S110	.15	N	500	30	100	200	5	5	50	10	100
S111	.15	N	300	20	300	150	L	L	10	10	50
S113	.3	N	2,000	50	200	70	20	10	10	20	20
S239	.15	N	500	20	200	50	L	5	20	10	30
S424	.2	N	2,000	20	500	100	L	15	50	10	50
S425	.2	N	2,000	10	500	100	L	20	50	15	50
S426	.2	N	2,000	20	300	100	L	10	30	15	50
S428	.15	N	1,500	20	300	100	L	5	30	10	70
S431	.2	N	1,500	10	150	70	L	5	30	10	30
Indian Creek District											
Q681	.7	N	500	150	300	200	7	5	15	---	50
Q685	.5	N	500	70	100	50	7	15	10	---	30
Q688	1	N	700	150	700	300	7	50	15	---	70
Q695	.15	N	300	30	200	70	3	7	20	---	30
Q706	.3	N	300	70	150	50	7	10	15	---	20
Q854	.2	N	200	30	150	100	5	70	20	---	30
Q884	.3	N	500	70	200	150	7	50	20	---	50
R263	.7	N	1,000	20	1,000	200	<5	15	100	20	100
R265	.7	N	1,500	10	700	300	5	7	70	20	50
R266	1	N	2,000	15	>1,000	100	<5	15	70	20	50
R268	.7	200	2,000	15	>1,000	200	5	15	50	30	70
R280	.5	200	1,500	20	500	100	5	15	100	20	50
R294	1	N	1,000	150	700	70	20	20	70	30	30
R295	1	N	1,000	150	500	50	15	20	70	20	20
R296	.7	N	1,000	50	700	70	10	15	70	50	30
R297	.5	N	1,000	20	500	100	10	10	70	20	20
R349	1	N	2,000	200	300	50	15	30	70	30	20
R354	1	N	1,000	100	1,000	200	5	20	100	20	20
R706	.15	L	500	20	300	100	L	7	15	10	30

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
	STREAM-SEDIMENT SAMPLES--Continued										
	Thunder Mountain District										
Q409	N	N	7	2.0	70	1,500	500	N	5.0	0.5	30
Q415	10	N	N	2	20	1,500	1,000	N	3	4	30
Q533	N	N	N	1.5	3	1,000	150	N	.5	.5	10
Q543	N	N	N	5	5	700	200	N	5	.5	20
Q634	2	N	7	2	30	700	300	N	35	1	40
Q643	3	N	N	5	10	1,000	200	N	5	.5	<10
Q644	N	N	N	5	7	500	50	N	9	<.5	20
Q646	2	N	N	7	10	700	200	N	14	.5	<10
Q647	3	N	N	2	15	1,000	300	N	5	2	<10
Q652	N	N	N	5	10	500	150	N	9	.5	10
Q726	30	N	3	2	5	1,000	150	N	3	<.5	80
Q951	N	N	5	1.5	30	500	50	N	40	.5	<320
R179	N	N	N	3	30	300	100	N	9	1	80
R180	N	N	N	2	20	1,000	200	N	2	.5	40
R181	N	N	N	2	70	500	150	N	7	2	40
R182	N	N	N	3	20	500	150	N	5	.5	20
R186	N	N	N	5	10	1,000	150	N	5	.5	30
R307	N	N	5	2	20	700	200	N	3	.5	60
R309	5	N	N	5	N	1,000	<100	N	2	.5	60
R310	N	N	N	5	7	700	100	N	3	.5	15
R311	10	N	N	3	N	700	100	N	1	.5	120
R313	7	N	N	7	10	300	100	N	4	1.5	20
R369	N	N	N	5	N	700	100	N	1	.5	15
R370	N	N	5	5	5	500	<100	N	22	1	40
S47	5	N	L	20	10	500	300	N	7	<.5	<10
S51	5	N	5	5	20	1,000	300	N	14	<.5	10
S53	L	N	L	3	10	700	200	N	11	<.5	<10
S56	L	N	L	3	L	700	300	N	9	<.5	<10
S58	N	N	L	3	L	300	200	N	5	<.5	80
S60	5	N	L	10	L	300	300	N	11	<.5	10
S110	L	N	L	7	10	700	200	N	7	<.5	<10
S111	5	N	L	2	15	1,000	200	N	7	<.5	<10
S113	L	N	10	1	20	500	300	N	5	<.5	20
S239	L	N	L	1.5	10	500	70	N	5	1	<10
S424	5	N	L	2	10	700	200	N	7	<.5	----
S425	5	N	L	2	10	700	150	N	7	<.5	---
S426	5	N	L	3	10	700	200	N	7	<.5	---
S428	5	N	L	2	10	700	200	N	5	<.5	---
S431	5	N	L	1.5	10	700	200	N	5	<.5	---
	Indian Creek District										
Q681	N	N	7	2.0	30	700	300	N	1.0	<0.5	60
Q685	N	N	7	1.5	150	700	200	N	2	<.5	120
Q688	30	N	2	3	50	700	300	N	1	<.5	10
Q695	N	N	N	1.5	15	1,000	200	N	.5	<.5	40
Q706	N	N	7	1.5	50	700	200	N	.5	<.5	60
Q854	N	N	5	1	30	700	200	N	3	11	80
Q884	N	N	3	2	20	1,000	300	N	.5	<.5	40
R263	5	N	N	5	5	300	<100	N	9	.5	<10
R265	<5	N	N	3	5	500	<100	N	11	1	<10
R266	<5	N	N	5	5	1,000	300	N	7	.5	<10
R268	7	N	N	3	7	500	<100	N	32	.5	10
R280	5	N	N	5	10	500	<100	N	22	.5	<10
R294	N	N	10	2	100	500	200	N	1	2	10
R295	N	N	10	2	100	700	500	N	.5	1	<10
R296	5	N	5	5	10	700	200	N	1	1	<10
R297	N	N	N	5	5	500	100	N	2	.5	10
R349	N	N	10	3	100	1,000	200	N	2	1	20
R354	N	N	N	2	50	700	200	N	1	.5	<10
R706	N	N	L	3	7	500	100	N	5	<.5	---

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
STREAM-SEDIMENT SAMPLES--Continued Pistol Creek District											
Q796	0.3	N	1,000	30	200	70	3	1	20	---	20
Q839	.2	N	500	70	100	30	15	20	20	700	30
Q844	.2	N	500	30	150	150	5	20	30	---	50
Q870	.3	N	500	70	150	150	7	30	70	---	50
Q891	.3	N	500	50	300	70	7	7	20	---	30
Q892	.3	N	500	50	200	70	15	10	20	---	20
Q894	.2	N	500	50	100	30	10	15	20	---	20
R125	.3	N	150	20	150	20	N	7	30	10	10
R126	.2	N	1,000	20	150	30	15	15	20	10	15
R127	.3	N	700	20	150	200	N	2	15	10	30
R132	.3	N	300	15	150	70	N	3	N	10	10
R133	.3	N	500	20	200	100	N	30	30	10	20
R134	.3	N	300	30	200	70	N	20	N	20	15
R138	.3	N	500	30	150	100	N	30	20	15	20
R178	.3	N	500	100	200	150	N	5	30	70	70
R196	.3	N	500	20	500	100	N	5	15	15	15
R199	.7	N	500	70	700	200	N	10	15	20	30
R204	1	N	1,000	200	500	50	20	15	70	70	20
R205	.5	N	2,000	100	700	70	5	15	100	50	30
R209	1	200	5,000	100	300	200	20	150	50	50	50
R210	1	N	1,000	150	500	100	15	10	100	100	50
R211	.7	N	3,000	100	200	300	20	20	20	100	50
R213	>1	N	1,500	200	500	200	20	20	100	50	50
R214	1	N	1,500	150	300	150	20	15	20	70	50
R224	.5	N	1,500	150	300	100	20	15	20	70	30
R225	.3	N	1,500	100	500	100	20	15	100	50	50
R226	.5	N	1,000	100	500	100	20	15	50	70	50
R227	.3	N	1,000	150	200	100	20	15	100	50	30
R228	.5	N	1,000	150	300	100	30	15	150	100	30
R229	.5	N	1,000	100	500	150	5	10	100	70	30
R230	.5	N	1,500	200	300	500	50	15	100	70	50
R231	.7	N	1,000	150	1,000	300	20	15	100	70	50
R232	.5	N	1,500	100	500	>1,000	15	15	150	70	100
R233	.2	N	1,500	70	200	50	10	15	100	50	20
R234	.7	N	1.500	150	700	500	20	15	70	70	100
R235	1	N	1,000	150	1,000	1,000	30	15	100	70	100
R237	1	N	1,500	150	1,000	200	10	10	100	50	70
R238	1	N	1,500	200	700	100	20	15	100	20	50
R241	1	N	1,000	150	500	150	15	10	50	50	15
R243	1	N	1,500	150	500	500	15	10	50	70	70
R244	>1	N	1,500	150	1,000	300	20	10	100	100	100
R250	.3	N	1,500	70	300	50	10	15	50	50	30
R251	1	N	1,000	100	700	100	15	20	70	50	30
R255	.7	N	500	50	150	150	5	7	30	50	N
R256	>1	N	1,000	200	>1,000	50	10	10	30	50	30
R258	>1	N	1,500	200	500	150	10	20	70	50	50
R273	1	N	700	200	500	200	10	20	20	50	50
R286	.5	N	1,000	50	150	20	10	30	70	50	15
R287	1	N	1,000	100	200	150	20	20	70	50	30
R288	1	N	1,000	100	700	200	20	20	70	50	50
R289	1	N	1,000	100	200	100	20	15	70	100	20
R292	1	N	1,000	100	200	500	50	20	70	20	30
R314	.7	200	1,000	200	300	50	20	30	100	30	30
R315	.7	N	1,000	150	200	50	30	30	100	30	20
R316	.7	N	1,500	200	200	100	30	50	100	50	50
R318	1	200	1,500	200	300	100	30	70	150	50	50
R319	1	200	1,000	200	200	100	20	50	100	50	50
R339	.7	N	1,000	200	500	70	10	15	70	50	30
R340	1	N	1,000	200	300	100	10	20	70	50	50
R341	1	N	1,000	200	300	100	10	30	100	30	50

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
				STREAM-SEDIMENT SAMPLES--Continued Pistol Creek District							
Q796	N	N	5	1.0	15	1,500	500	N	0.5	<0.5	60
Q839	N	N	7	1	30	1,000	300	N	5	<.5	20
Q844	N	N	5	1.5	30	700	300	N	3	<.5	80
Q870	N	N	5	1	30	700	300	N	3	11	10
Q891	N	N	5	N	50	700	200	N	.5	<.5	40
Q892	N	N	5	1	30	1,000	300	N	.5	<.5	60
Q894	N	N	5	1	70	700	200	N	.5	<.5	80
R125	N	N	N	1	10	500	700	N	.5	<.5	80
R126	15	N	5	2	30	300	150	N	3	<.5	40
R127	N	N	N	1.5	20	300	150	N	2	<.5	40
R132	N	N	N	3	20	500	150	N	2	<.5	60
R133	N	N	N	5	20	700	150	N	3	.5	40
R134	N	N	N	2	20	500	150	N	1	1.5	60
R138	N	N	N	1.5	20	700	300	N	2	3	<10
R178	N	N	N	3	30	700	300	N	3	<.5	40
R196	N	N	N	2	20	1,000	500	N	3	<.5	40
R199	N	N	N	1	50	700	300	N	2	<.5	40
R204	N	N	10	2	70	1,500	1,000	N	.5	<.5	10
R205	N	N	N	5	50	1,000	700	N	4	<.5	20
R209	5	N	20	10	30	1,500	700	N	9	6	80
R210	N	N	10	3	70	1,500	700	N	.5	<.5	60
R211	5	N	15	5	50	1,500	700	N	5	4	80
R213	N	N	20	1.5	150	1,500	500	N	.5	.5	40
R214	N	N	10	2	70	2,000	500	N	2	.5	60
R224	N	N	N	3	50	1,500	500	N	7	<.5	160
R225	N	N	N	3	50	1,500	500	N	4	1	120
R226	N	N	5	3	70	2,000	700	N	1	.5	40
R227	N	N	N	3	30	1,000	500	N	2	<.5	160
R228	N	N	5	3	70	2,000	500	N	1	.5	40
R229	N	N	N	3	10	1,500	700	N	2	<.5	20
R230	N	N	5	2	100	2,000	1,000	N	1	.5	10
R231	N	N	5	2	50	2,000	1,000	N	2	.5	60
R232	N	N	5	3	50	2,000	1,000	N	1	.5	20
R233	N	N	N	3	20	1,500	700	N	2	<.5	20
R234	N	N	5	3	70	2,000	1,000	N	1	.5	30
R235	N	N	5	1.5	100	2,000	1,000	N	.5	.5	40
R237	N	N	5	2	70	2,000	700	N	1	<.5	10
R238	N	N	5	2	50	2,000	700	N	1	<.5	10
R241	N	N	N	2	30	2,000	1,000	N	.5	<.5	40
R243	N	N	5	3	30	1,500	1,000	N	1	.5	40
R244	N	N	5	2	50	2,000	1,000	N	.5	.5	20
R250	N	N	5	1	10	700	500	N	7	<.5	15
R251	N	N	5	1	20	700	700	N	5	.5	10
R255	N	N	N	2	15	200	500	N	14	<.5	30
R256	N	N	5	1	50	700	500	N	1	.5	60
R258	N	N	5	1.5	20	700	500	N	2	<.5	80
R273	N	N	7	2	50	1,000	500	N	1	1	120
R286	N	N	N	3	50	1,000	200	N	1	1	<10
R287	N	N	5	2	100	1,000	500	N	2	1	10
R288	N	N	5	2	70	1,000	700	N	1	.5	10
R289	N	N	10	2	100	1,000	500	N	2	.5	20
R292	N	N	10	2	150	500	500	N	2	3	<10
R314	N	N	10	2	700	700	500	N	2	.5	15
R315	N	N	10	3	150	500	500	N	1	.5	10
R316	N	N	10	5	150	700	500	N	2	4	60
R318	N	N	10	5	100	1,000	500	N	1	.5	15
R319	N	N	10	2	100	700	300	N	2	6	20
R339	5	N	5	5	10	500	500	N	3	<.5	<10
R340	N	N	5	5	15	700	500	N	2	.5	20
R341	N	N	N	5	15	500	500	N	5	3	30

TABLE 1. — *Analyses of samples from the*

	Semiquantitative spectrographic analyses										
	(percent)	(ppm)									
Sample	Ti (.002)	Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
					STREAM-SEDIMENT SAMPLES--Continued						
					Pistol Creek District--Continued						
R343	1.0	N	1,000	300	1,000	100	10	20	70	50	50
R346	.7	N	500	100	500	150	10	15	70	30	50
R347	1	N	1,000	200	500	50	15	20	70	50	30
					Greyhound Ridge Addition						
R629	0.3	500	1,000	70	200	20	10	30	30	15	20
R643	.3	500	500	70	300	70	L	20	15	20	20
R654	.2	200	700	50	100	70	5	20	20	70	70
R656	.3	500	700	70	200	100	20	30	30	50	50
R657	.3	L	700	50	150	20	L	20	20	70	15
R660	.3	700	700	30	300	300	L	15	20	30	15
S329	.7	N	1,000	150	700	100	70	30	50	70	50
S346	.07	N	300	30	30	70	30	70	20	30	70
S349	.7	700	1,000	150	300	70	50	50	500	30	50
S350	.7	N	500	100	200	70	10	300	50	10	70
S352	.7	L	1,500	150	200	70	15	50	150	15	50
S463	.5	N	700	100	300	100	10	10	20	10	30
S471	.15	N	700	50	200	>1,000	10	10	50	20	>200
S480	.3	N	700	100	100	150	30	10	30	20	30
S483	.2	1,000	700	100	200	100	30	15	500	50	20
S484	.3	500	1,000	150	300	100	30	15	300	30	20
S485	.2	L	700	70	100	150	20	50	200	20	100
S935	.15	N	300	10	200	70	L	L	15	15	30
S963	.15	N	300	15	150	N	L	L	15	15	10
					SOIL SAMPLES						
B797	0.07	N	50	20	20	20	5	15	20	10	10
B799	.1	L	500	15	70	20	L	70	20	N	15
B800	.2	L	500	30	150	30	10	70	20	10	15
B802	.2	L	700	30	150	30	10	15	15	10	15
B806	.3	N	1,500	70	200	30	50	15	20	10	15
B807	.3	N	1,500	70	150	30	15	15	20	10	10
B808	.5	N	1,500	70	300	20	15	20	15	20	15
B809	.3	N	3,000	70	150	30	10	15	20	15	10
B810	.3	N	2,000	50	70	20	10	10	15	10	L
B813	.3	N	1,000	50	200	30	15	10	10	L	15
B814	.3	N	1,500	70	300	20	10	10	10	L	30
B815	.3	N	1,500	70	300	100	L	10	L	10	70
B818	.3	N	1,000	100	300	70	30	20	10	10	30
B820	.3	N	1,500	70	200	30	10	10	15	10	15
B821	.2	N	1,500	20	300	50	5	10	30	L	50
B822	.2	N	1,000	15	300	50	L	5	30	L	50
B824	.3	N	1,500	30	300	50	5	10	15	L	20
B825	.3	N	2,000	50	300	70	5	10	20	10	20
B826	.5	N	2,000	70	300	150	10	15	30	15	70
B827	.2	N	1,000	50	150	100	5	5	15	15	30
B828	.03	N	150	L	70	N	N	10	L	10	10
B829	.2	N	1,500	20	30	300	5	15	10	15	100
R382	---	---	---	---	---	---	---	---	---	---	---
R383	.3	N	700	30	150	30	10	15	20	15	30
R386	---	---	---	---	---	---	---	---	---	---	---
R388	.15	N	1,000	20	200	20	L	7	10	15	30
R389	.2	N	1,000	30	150	20	10	15	10	15	15
R391	---	---	---	---	---	---	---	---	---	---	---
R402	.1	N	700	20	100	30	5	20	10	15	50
R409	.15	N	700	30	150	30	L	5	15	10	20
R412	.15	N	700	30	150	100	L	10	20	15	70
R424	---	---	---	---	---	---	---	---	---	---	---
R425	.3	N	500	70	200	30	30	10	L	50	30
R436	.3	N	1,000	50	100	20	15	20	20	10	15
R438	.3	N	700	50	150	30	15	15	20	10	15

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
STREAM-SEDIMENT SAMPLES--Continued											
Pistol Creek District--Continued											
R343	N	N	5	2.0	50	1,000	700	N	2.0	0.5	15
R346	N	N	N	5	50	500	700	N	1	<.5	<10
R347	N	N	5	5	70	1,000	700	N	1	1	10
Greyhound Ridge Addition											
R629	N	N	10	3.0	50	700	300	N	4.0	<0.5	<10
R643	N	N	5	2	10	1,000	500	N	2	<.5	<10
R654	N	N	L	7	20	700	500	N	2	<.5	<10
R656	N	N	5	5	30	700	300	N	3	2	<10
R657	N	N	N	2	30	700	500	N	2	<.5	<10
R660	N	N	L	2	10	1,500	500	N	3	<.5	<10
S329	L	N	5	2	70	1,000	100	N	11	3	40
S346	N	N	N	3	15	150	150	N	45	15	15
S349	L	N	10	1.5	70	1,000	500	N	50	4	40
S350	L	N	5	3	70	700	500	N	17	60	10
S352	L	L	10	2	70	1,500	700	N	3	4	20
S463	L	N	5	1.5	20	700	300	N	5	<.5	---
S471	L	N	L	20	10	300	300	N	5	<.5	---
S480	5	N	10	1	100	1,000	500	N	2	3	---
S483	L	N	10	1	50	700	200	N	110	8	---
S484	L	N	10	1	70	700	300	N	70	4	---
S485	L	N	10	5	50	500	300	N	20	12	---
S935	N	N	L	3	L	700	200	N	5	.5	<10
S963	N	N	N	1.5	5	300	200	N	9	<.5	10
SOIL SAMPLES											
B797	N	N	N	2.0	L	50	N	N	1.0	3.0	<10
B799	N	20	N	1.5	N	200	150	N	5	3	<10
B800	N	N	N	2	L	200	150	1.5	2	1	10
B802	N	N	7	2	L	200	150	1	2	8	<10
B806	N	N	10	2	100	200	200	N	2	9	<10
B807	N	N	10	1.5	50	200	200	N	2	9	<10
B808	N	N	15	1	70	200	200	N	1	1	<10
B809	N	N	10	1	20	200	300	N	1	1	<10
B810	N	N	7	1	50	150	150	N	1	3	<10
B813	N	N	5	1.5	100	200	200	N	1	3	<10
B814	N	N	10	1.5	20	200	300	N	1	1	<10
B815	N	N	15	1.5	15	300	300	N	1	1	<10
B818	N	N	15	1	150	200	300	N	1	1	<10
B820	N	N	7	1	20	500	300	N	1	3	<10
B821	N	N	5	2	L	150	100	N	1	3	<10
B822	N	N	5	3	L	150	100	N	1	1	<10
B824	N	N	7	1.5	15	200	150	N	1	1	<10
B825	N	N	10	1.5	20	300	300	N	1	1	<10
B826	N	N	10	2	30	300	300	N	2	3	<10
B827	N	N	5	2	15	300	200	N	1	1	<10
B828	N	N	N	2	N	20	N	N	1	1	<10
B829	N	N	L	5	L	200	L	N	1	1	<10
R382	---	---	---	---	---	---	---	-----	4	<.5	<10
R383	N	N	5	1.5	30	300	150	N	9	<.5	<10
R386	---	---	---	---	---	---	---	---	11	<.5	<10
R388	N	N	L	1.5	10	300	150	N	4	<.5	<10
R389	N	N	N	1	10	300	150	N	2	<.5	<10
R391	---	---	---	---	---	---	---	-----	25	<.5	<10
R402	N	N	5	3	50	100	100	N	2	<.5	<10
R409	N	N	L	1.5	L	150	150	N	7	<.5	<10
R412	N	N	L	3	L	150	200	N	7	<.5	<10
R424	---	---	---	---	---	---	---	---	3	12	<10
R425	N	N	15	1.5	70	70	100	N	2	<.5	<10
R436	N	N	10	1.5	100	300	300	N	7	<.5	<10
R438	N	N	15	1.5	100	200	300	N	4	<.5	<10

TABLE 1. — *Analyses of samples from the*

	Semiquantitative spectrographic analyses										
	(percent)	(ppm)									
Sample	Ti (.002)	Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
SOIL SAMPLES--Continued											
R450	0.007	N	100	L	N	N	N	7	L	30	N
R452	---	---	---	---	---	---	---	---	---	---	---
R488	---	---	---	---	---	---	---	---	---	---	---
R655	.5	500	700	200	500	70	50	70	15	30	30
R702	L	L	700	150	300	70	100	30	15	10	30
R703	L	L	700	150	300	70	150	30	15	10	30
S114	.2	N	700	20	200	100	L	L	30	10	20
S218	.7	N	700	100	70	50	50	15	10	20	30
S226	.1	N	500	20	10	100	10	10	30	30	10
S229	.2	N	2,000	20	300	150	2	5	20	10	50
S235	.1	N	3,000	15	100	300	3	5	10	30	200
S241	.15	N	700	30	150	50	10	5	20	50	30
S263	.15	N	100	20	200	50	L	5	20	10	30
S327	.7	N	700	150	300	70	30	15	30	30	30
S328	.15	N	700	100	70	50	50	5	L	30	30
S340	1	N	2,000	100	300	70	70	30	15	15	30
S342	.3	N	500	100	200	70	15	30	30	30	70
S371	.7	N	3,000	70	500	70	10	15	50	15	50
S378	.7	N	1,500	100	300	50	L	7	20	30	20
S380	.7	N	1,000	70	300	150	L	10	20	15	30
S381	.7	N	700	70	300	150	L	5	20	15	30
S387	.15	N	1,500	100	30	30	30	10	L	L	10
S388	.7	N	500	1,000	150	70	70	30	L	300	30
S435	.3	N	1,500	30	300	70	5	7	50	10	30
S456	.3	N	2,000	50	300	300	L	10	20	15	50
S462	1	N	1,000	150	200	100	70	20	20	20	50
S477	.15	N	500	50	150	500	15	15	30	15	200
S478	.15	N	1,000	30	200	150	10	10	30	15	50
S479	.2	700	700	150	100	70	50	15	200	50	20
S486	.15	N	2,000	100	70	50	50	70	20	10	30
S502	.5	N	5,000	70	200	50	20	20	30	20	20
S503	.7	N	3,000	100	200	50	30	30	30	30	15
S505	1	L	2,000	150	300	50	30	20	20	30	30
S506	.7	L	1,500	100	300	70	70	150	20	30	70
S507	.7	L	5,000	100	300	150	20	30	30	15	50
S508	.7	L	5,000	100	300	70	30	30	30	30	50
S509	.7	L	1,000	100	300	70	30	30	70	30	70
S510	.7	N	700	100	300	50	10	15	20	10	30
S511	1	N	3,000	100	300	70	100	70	20	150	70
S512	1	L	5,000	150	300	70	50	70	30	70	50
S513	.7	N	5,000	100	300	70	30	30	20	20	30
S514	.7	L	3,000	100	300	150	50	30	30	20	50
S515	1	N	2,000	70	300	70	30	70	20	50	30
S516	1	L	2,000	300	300	70	70	150	20	30	70
S517	.7	N	1,500	100	500	70	70	70	30	70	50
S518	.7	N	3,000	100	200	50	20	15	30	20	15
S520	.7	L	3,000	150	500	50	30	30	50	20	30
S528	.7	N	3,000	100	300	70	30	20	30	20	30
S529	.7	N	1,500	150	300	70	50	30	15	200	30
S530	1	L	3,000	200	1,000	70	150	3,000	50	30	30
S551	.7	N	2,000	70	200	50	30	30	30	30	30
S562	.7	N	1,500	70	300	50	30	15	30	15	20
S563	.7	N	1,000	70	500	50	30	50	30	L	30
S571	.03	N	30	15	30	50	10	5	L	L	10
S579	1	N	700	150	30	70	70	10	30	70	70
S581	.7	N	1,500	70	200	70	15	30	20	30	50
S582	1	L	700	100	500	70	30	70	30	70	30
S586	.7	N	3,000	70	200	70	15	30	70	20	100
S587	1	N	1,500	150	300	100	30	30	30	30	50
S588	.5	N	3,000	50	700	70	20	30	70	10	70

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
					SOIL SAMPLES--Continued						
R450	N	N	N	N	N	30	100	N	9.0	<0.5	<10
R452	---	---	---	---	---	---	---	---	3	1	<10
R488	---	---	---	---	---	---	---	---	14	<.5	<10
R655	15	N	15	1	30	1,000	300	N	3	<.5	---
R702	N	N	30	5	300	1,000	200	N	2	3	---
R703	N	N	30	2	300	1,000	300	N	1	6	---
S114	L	N	L	1.5	10	1,500	300	N	2	<.5	<10
S218	L	N	10	2	70	500	500	N	3	<.5	10
S226	L	N	L	1	10	700	200	N	2	<.5	<10
S229	5	N	L	1.5	15	700	50	N	2	<.5	<10
S235	L	N	5	5	5	300	100	N	5	<.5	<10
S241	L	N	5	7	10	500	100	N	2	<.5	<10
S263	7	N	L	2	5	300	50	N	---	---	40
S327	L	N	7	1.5	70	1,500	500	N	2	<.5	30
S328	N	N	L	2	70	700	200	N	.5	.5	20
S340	L	N	15	1.5	300	1,500	500	N	3	1	10
S342	L	N	L	3.0	150	1,000	300	0.5	2.0	2.0	40
S371	L	15	5	3	30	500	200	N	7	<.5	10
S378	L	N	5	1	30	1,000	300	N	1	2	---
S380	L	N	15	1.5	30	1,000	500	L	<1	2	---
S381	N	N	L	1	30	1,000	700	N	<1	2	---
S387	N	N	N	L	70	70	100	N	<1	2	---
S388	5	N	15	1.5	300	1,500	300	N	<1	2	---
S435	10	N	5	2	15	700	200	N	11	<.1	---
S456	L	N	L	5	10	700	200	N	40	<.5	---
S462	L	N	20	1.5	150	700	300	N	1	<.5	---
S477	L	N	L	7	10	500	300	1	5	<.5	---
S478	L	N	L	2	15	700	200	N	9	<.5	---
S479	L	N	5	1	70	700	200	2	65	8	---
S486	5	N	20	2	50	300	200	N	2	8	---
S502	L	L	7	L	70	500	200	N	5	<.5	10
S503	L	N	7	1	70	500	200	N	1	<.5	10
S505	5 5	N	10	1	100	700	500	N	2	<.5	10
S506	L	15	70	1.5	150	700	300	N	3	1	15
S507	L	L	7	2	50	700	300	N	.5	<.5	10
S508	L	N	10	1.5	100	700	200	N	7	<.5	<10
S509	L	N	10	1.5	150	700	300	N	1	<.5	10
S510	L	N	7	1	30	700	300	N	1	<.5	10
S511	L	N	30	1.5	300	700	200	N	2	<.5	<10
S512	7	N	30	L	70	1,500	700	N	11	<.5	<10
S513	L	N	10	1	70	700	300	N	5	<.5	10
S514	5	N	10	1	100	1,500	300	N	3	<.5	10
S515	L	N	10	1	70	1,500	300	N	2	<.5	<10
S516	7	N	30	L	100	700	300	N	7	<.5	<10
S517	L	N	30	1	150	700	300	N	3	<.5	<10
S518	L	N	7	1.5	70	1,500	300	N	20	<.5	10
S520	L	N	10	1.5	100	700	300	N	5	<.5	10
S528	L	N	10	2	70	700	300	N	2	<.5	10
S529	5	N	30	1.5	150	500	100	N	2	<.5	10
S530	7	N	150	1	300	700	150	20	160	480	10
S551	N	N	7	1.5	70	700	300	N	2	<.5	10
S562	5	N	10	1.5	70	700	300	N	2	<.5	15
S563	L	N	5	2	70	700	300	N	1	<.5	10
S571	N	N	N	1	10	L	100	N	1	<.5	<10
S579	L	L	15	2	150	1,500	200	N	1	<.5	10
S581	L	N	7	2	70	700	300	N	3	<.5	10
S582	5	L	15	2	300	1,500	200	N	1	.5	10
S586	L	N	5	3	20	700	100	N	4	<.5	15
S587	7	N	10	5	70	500	200	N	3	<.5	10
S588	L	L	L	5	20	700	150	N	2	<.5	10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
SOIL SAMPLES--Continued											
S594	0.7	N	1,500	70	300	50	30	50	3	20	30
S596	.7	N	2,000	70	300	70	30	30	30	20	30
S601	.15	N	1,500	50	70	30	10	15	20	15	15
S603	.07	N	500	30	50	70	N	7	15	15	30
S605	.007	N	30	10	L	L	L	7	10	15	L
S606	.5	N	200	70	300	70	20	20	30	30	30
S608	.3	L	3,000	70	1,500	30	7	15	15	30	15
S613	1	N	1,500	200	200	70	70	70	30	30	50
S631	.5	N	2,000	50	500	70	10	10	30	15	50
S632	.3	N	700	30	300	50	L	15	20	20	30
S633	.3	L	1,500	70	300	70	15	20	30	15	30
S634	.5	L	1,500	70	70	150	20	30	30	L	30
S636	.5	N	1,500	70	300	70	15	15	30	L	70
S637	.5	L	1,500	70	300	70	10	20	30	15	50
S639	.2	L	1,500	15	300	70	L	30	30	20	50
S642	.5	N	1,500	50	300	70	5	20	30	20	50
S653	.7	N	1,000	100	300	70	30	30	30	L	30
S664	.7	N	1,500	70	300	50	10	10	30	L	30
S665	.7	N	2,000	100	500	200	15	30	30	L	30
S671	.7	N	1,000	100	300	70	20	10	30	10	30
S672	.7	N	1,500	100	500	150	15	10	30	10	30
S696	.7	N	2,000	100	300	70	30	20	30	20	30
S699	1	N	700	70	100	100	30	15	20	10	30
S743	1	N	1,500	150	500	70	50	30	30	50	70
S744	1	N	3,000	200	700	150	70	50	30	30	100
S745	1	N	5,000	150	1,000	200	30	30	50	50	70
S769	1	300	2,000	100	1,000	150	10	30	30	20	200
S809	.5	N	1,500	100	500	200	10	15	50	L	50
S810	.2	N	1,000	70	200	70	10	20	30	15	30
S815	.2	L	1,000	50	500	100	10	15	30	10	70
S820	.3	N	2,000	70	700	100	20	30	70	30	100
S821	1	N	3,000	300	500	200	30	50	N	L	70
S823	1	N	2,000	300	200	100	50	30	N	L	7
S827	.15	N	700	20	200	30	5	20	100	L	70
S828	.3	N	1,500	100	150	20	30	30	70	30	50
S829	.3	N	700	100	500	50	15	15	50	20	30
S830	.3	N	2,000	150	300	50	20	20	50	20	30
S831	.3	N	2,000	100	500	100	20	20	30	20	50
S839	.5	L	2,000	70	300	100	15	20	L	10	50
S840	.5	N	1,000	100	300	200	20	15	N	L	50
S842	.5	L	2,000	20	300	200	50	15	N	L	70
S843	.5	L	1,000	70	300	300	50	300	70	10	100
S848	.2	N	300	70	300	70	---	15	50	L	150
S864	.3	N	300	70	700	300	---	7	50	L	150
S865	.2	200	1,500	15	150	150	---	L	20	10	20
S888	.2	N	700	70	15	20	10	10	10	10	10
S911	.7	N	1,000	100	200	150	1	5	L	15	30
S912	.3	L	700	70	1,000	150	L	5	20	15	70
S914	.3	L	700	70	200	70	7	5	30	30	30
S915	.3	N	1,500	50	300	150	5	5	10	30	50
S916	.3	N	700	70	300	100	5	5	20	30	70
S917	.15	N	700	30	300	150	L	1	20	15	70
S918	.2	N	1,000	50	200	70	L	10	15	50	30
S927	.3	N	500	30	300	70	L	7	15	15	30
S928	.15	N	1,500	20	300	100	L	L	15	15	50
S929	.3	N	500	30	300	100	5	15	30	20	70
S930	.15	N	700	20	150	70	L	L	20	10	70
S931	.3	L	500	30	200	50	5	30	20	15	50
S949	.7	L	1,000	70	700	200	L	10	15	10	70
S950	.3	N	1,000	70	200	70	L	5	30	L	30

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
					SOIL SAMPLES--Continued						
S594	L	N	7	2.0	70	1,000	200	N	1.0	<0.5	10
S596	L	N	10	3	70	1,500	500	N	7	<.5	10
S601	N	N	7	1	30	700	300	N	25	<.5	<10
S603	N	N	N	2	20	50	200	N	7	<.5	<10
S605	N	N	N	N	N	N	L	N	2	<.5	<10
S606	L	L	10	1.5	70	1,000	500	N	11	<.5	<10
S608	N	N	5	1	30	1,000	300	N	40	<.5	<10
S613	5	L	30	1	300	700	700	N	.5	<.5	<10
S631	L	L	L	2	20	700	200	N	11	<.5	<10
S632	L	N	N	2	15	700	150	N	9	<.5	<10
S633	L	L	7	2	30	1,500	300	N	9	<.5	<10
S634	L	N	10	3	20	1,000	300	N	22	<.5	<10
S636	L	N	7	1.5	30	700	300	N	14	<.5	<10
S637	L	L	L	2	30	700	300	N	5	<.5	<10
S639	L	N	L	2	7	1,000	150	N	5	<.5	<10
S642	5	L	L	2	20	700	200	N	7	<.5	<10
S653	L	N	10	2	100	700	300	N	4	<.5	<10
S664	L	N	10	1.5	50	1,000	300	N	11	<.5	<10
S665	L	N	15	1.5	70	1,000	700	N	9	<.5	10
S671	L	N	15	2	70	1,500	500	N	.5	<.5	<10
S672	L	N	15	2	70	1,500	500	N	1	<.5	<10
S696	5	L	7	2	50	700	300	N	.5	<.5	10
S699	L	L	15	1	30	700	300	N	2	<.5	10
S743	5	N	10	2	70	1,000	300	N	1	<.5	10
S744	L	N	20	2	150	1,000	300	N	.5	<.5	10
S745	L	N	10	3	70	700	200	N	3	<.5	10
S769	7	10	7	3	50	1,500	300	N	4	.5	10
S809	N	L	10	3	15	700	200	N	1	<.5	<10
S810	N	N	7	2	20	700	200	N	5	<.5	<10
S815	N	L	7	3	15	700	L	N	3	<.5	<10
S820	N	10	10	10	30	500	L	N	.5	<.5	<10
S821	N	N	30	1	30	1,000	700	N	2	<.5	<10
S823	N	N	30	L	150	700	200	N	4	<.5	<10
S827	N	20	5	5	7	100	N	N	1	<.5	10
S828	N	10	15	3	30	300	100	.5	.5	.5	10
S829	N	L	10	2	30	500	150	L	.5	<.5	10
S830	N	L	15	2	30	500	50	1	2	<.5	10
S831	N	N	10	2	20	500	100	.5	2	<.5	10
S839	N	N	10	1	50	700	150	N	4	1.5	10
S840	N	N	10	1	50	300	L	N	2	.5	10
S842	N	N	5	3	10	700	100	N	3	<.5	10
S843	N	N	20	3	30	300	L	3	22	60	10
S848	N	20	10	10	20	300	100	N	.5	<.5	10
S864	N	10	10	5	20	500	200	N	1	1	10
S865	N	N	L	3	5	300	150	N	160	<.5	<10
S888	N	N	7	L	20	500	150	N	5	<.5	10
S911	N	N	10	1.5	15	1,000	300	N	7	<.5	<10
S912	N	L	5	7	20	300	N	N	.5	<.5	<10
S914	N	N	5	3	30	700	150	L	.5	<.5	<10
S915	N	N	5	3	20	500	150	N	.5	<.5	<10
S916	N	N	5	3	30	500	150	N	1	<.5	<10
S917	N	L	L	7	10	300	N	N	1	<.5	<10
S918	N	N	L	3	30	700	150	L	3	<.5	<10
S927	N	N	L	2	30	300	N	N	.5	<.5	10
S928	N	N	L	7	15	300	N	N	5	<.5	10
S929	N	N	5	3	30	700	200	L	1	<.5	10
S930	N	N	7	7	7	300	N	N	3	<.5	10
S931	N	L	5	3	30	300	N	L	.5	<.5	15
S949	N	N	5	3	20	700	200	N	2	<.5	<10
S950	N	N	L	7	10	300	100	N	2	<.5	10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses											
	(percent)	(ppm)									
Sample	Ti (.002)	Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
SOIL SAMPLES--Continued											
S955	0.3	N	300	70	300	70	15	L	15	30	20
S985	.15	L	1,500	70	300	70	5	15	30	15	70
S986	.3	N	700	70	300	100	5	20	20	10	100
S987	.15	N	700	70	300	70	L	20	20	10	70
S999	.7	L	1,500	70	300	200	5	20	15	20	70
DIKES											
B840	0.3	N	1,000	L	300	30	L	7	15	N	30
B883	.15	N	300	20	100	30	L	L	10	N	20
B884	.3	L	700	100	50	20	30	15	L	L	20
B885	.3	N	700	70	70	30	30	20	L	L	20
B886	.2	N	1,500	150	20	N	20	30	N	L	20
B888	.3	N	1,000	100	70	30	30	20	10	L	20
B890	.5	N	700	70	150	30	L	5	L	N	20
B891	.15	N	300	20	30	30	L	L	15	N	L
B892	.3	N	700	70	50	20	15	7	L	N	10
B961	.2	N	1,000	70	150	20	L	10	L	L	15
B965	.3	N	700	70	70	20	L	L	L	L	15
D121	1.5	N	2,000	500	100	50	70	50	N	N	30
E226	.1	N	300	L	300	20	L	30	10	N	15
E227	1	N	1,000	150	300	30	L	20	L	L	15
E228	1	N	700	150	500	50	L	30	10	L	30
E229	.03	N	300	L	50	N	L	30	15	N	20
E230	.07	N	300	L	150	30	5	30	15	N	15
E231	.1	N	300	L	150	30	5	20	10	N	15
E232	.15	N	300	L	200	30	5	20	15	L	15
E233	.15	N	200	L	150	30	5	30	10	N	20
E234	.07	N	300	L	100	30	5	30	10	L	30
E236	.07	N	150	L	200	N	2	30	N	L	N
E241	.02	N	150	L	20	N	5	30	50	N	L
E248	.7	N	1,000	150	150	30	70	20	L	L	20
E249	.15	N	300	L	300	50	L	20	10	L	15
E250	.15	N	300	L	150	30	N	10	L	L	20
E251	.15	N	300	L	100	50	L	10	10	L	15
E255	.15	N	300	L	150	30	5	7	15	L	20
E261	.2	N	500	30	100	30	15	15	15	N	10
E265	.5	N	1,000	70	300	50	7	30	15	L	30
E299	.2	N	300	15	200	100	L	20	500	N	30
E301	.07	N	300	L	100	N	5	30	50	N	15
Q576	.5	N	700	50	300	70	10	150	30	N	50
Q817	.2	N	700	15	700	50	2	15	50	N	30
Q832	.7	N	1,000	100	300	70	70	20	70	15	30
Q905	.15	N	100	15	200	30	N	5	N	---	20
S551	.7	N	2,000	70	200	50	30	30	30	30	30
UNDIVIDED TERTIARY INTRUSIVE ROCKS											
B841	0.3	N	700	50	20	20	L	L	10	L	10
B842	.3	N	300	20	70	30	L	L	15	L	10
B843	.3	N	300	30	70	30	10	15	10	L	15
B882	.03	N	300	L	20	20	L	L	15	N	15
B898	.5	N	700	70	100	30	10	5	15	L	10
D92	.5	N	1,500	20	500	500	N	3	20	N	70
D96	.15	N	300	20	150	100	N	1	50	N	30
D119	.05	N	300	N	N	30	N	2	30	N	30
D120	.07	N	150	N	N	N	N	7	50	N	50
D426	.15	N	300	7	200	30	L	5	30	L	30
E239	.07	N	300	L	100	30	5	30	15	N	20
E240	.5	N	300	150	300	30	30	70	15	30	20
E302	.3	N	700	50	150	70	7	30	50	N	20
E303	.2	N	300	30	100	30	7	15	30	N	15
Q673	.5	N	700	50	200	150	5	7	50	1	20

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
SOIL SAMPLES--Continued											
S955	N	N	L	10.0	5	300	500	N	2.0	<0.5	<10
S985	N	L	10	3	15	500	N	N	.5	<.5	15
S986	L	L	10	3	30	300	100	N	.5	<.5	10
S987	N	15	L	3	15	300	N	N	1	<.5	15
S999	N	N	15	1.5	30	1,000	200	N	5	1	---
DIKES											
B840	N	N	5	1.0	L	700	300	N	---	---	---
B883	N	N	N	L	N	500	300	N	---	---	---
B884	N	N	50	L	300	300	300	N	---	---	---
B885	N	N	15	L	70	700	700	N	---	---	---
B886	N	N	70	L	700	100	150	N	---	---	---
B888	N	N	20	L	150	300	300	N	---	---	---
B890	N	N	10	1	N	700	300	N	---	---	---
B891	N	N	5	1	N	700	300	N	---	---	---
B892	N	N	15	1	100	300	300	N	---	---	---
B961	N	N	15	L	100	200	300	N	----	---	---
B965	N	N	15	L	30	200	300	N	---	---	---
D121	N	N	30	N	100	500	1,000	N	---	---	---
E226	N	L	N	1.5	L	300	100	0.5	---	---	---
E227	L	N	20	1.5	L	500	500	N	---	---	---
E228	L	N	15	1.5	L	700	300	N	---	---	---
E229	N	L	N	3	L	30	L	N	---	---	---
E230	N	N	N	1.5	L	70	L	N	---	---	---
E231	N	N	N	2	L	70	L	N	---	---	---
E232	N	N	N	2	L	200	L	L	---	---	---
E233	N	N	N	2	L	150	L	N	---	---	---
E234	N	L	N	3	L	100	L	N	---	---	---
E236	N	N	N	L	L	700	L	N	---	---	---
E241	N	N	N	L	10	30	N	N	---	---	---
E248	L	N	50	L	300	700	500	N	---	---	---
E249	L	N	N	1	L	2,000	100	N	---	---	---
E250	N	N	N	L	L	1,500	100	N	---	---	---
E251	N	L	N	2	L	150	L	N	---	---	---
E255	N	N	N	1.5	L	150	L	N	---	---	---
E261	N	N	7	1.5	70	1,000	300	N	---	---	---
E265	L	N	10	1.5	20	1,000	500	N	---	---	---
E299	L	N	5	1.5	L	700	150	L	---	---	---
E301	N	N	L	1.5	L	500	150	L	---	---	---
Q576	N	N	15	1	100	5,000	2,000	N	3	<.5	<10
Q817	N	N	N	2	5	700	300	N	.5	<.5	<10
Q832	N	N	20	1	150	2,000	1,500	N	2	<.5	<10
Q905	N	N	N	1	15	300	15	N	.5	<.5	<10
S551	N	N	7	1.5	70	700	300	N	2	<.5	10
UNDIVIDED TERTIARY INTRUSIVE ROCKS											
B841	N	N	7	L	50	300	300	N	---	---	---
B842	N	N	5	1.0	15	500	300	N	---	---	---
B843	N	N	7	1.5	30	500	300	N	---	---	---
B882	N	N	N	1	N	20	N	N	---	---	---
B898	N	N	10	1	70	500	300	N	---	---	---
D92	N	N	3	1.5	<5	1,500	300	N	---	---	---
D96	N	N	N	3	<5	500	200	N	---	---	---
D119	N	N	N	3	<5	100	30	N	---	---	---
D120	N	N	N	3	<5	50	10	N	---	---	---
D426	N	N	3	3	<5	300	100	N	---	---	---
E239	N	N	N	1.5	L	50	N	N	---	---	---
E240	L	N	30	2	70	700	L	N	---	---	---
E302	N	N	7	1.5	30	1,500	500	N	---	---	---
E303	N	N	7	1.5	50	700	500	N	---	---	---
Q673	N	N	5	1	30	15	1,000	N	3	1	<10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
				UNDIVIDED TERTIARY INTRUSIVE ROCKS--Continued							
S72	0.2	N	1,000	20	200	100	L	L	20	10	20
S550	.7	N	3,000	70	200	70	30	20	30	15	50
				UNALTERED CHALLIS VOLCANICS							
B878	0.3	N	700	30	200	50	L	L	15	L	20
B879	.3	N	700	30	70	30	10	L	15	L	10
B896	.1	N	700	15	50	N	L	5	L	L	10
B897	.5	N	700	100	100	20	15	10	10	L	20
B901	.2	N	200	50	100	30	15	7	N	20	30
B902	.03	N	200	L	30	20	N	5	20	N	10
B903	.05	N	15	L	150	30	L	L	10	N	15
B904	.1	N	70	15	150	L	L	L	10	N	10
B905	.07	N	200	10	50	20	L	L	10	N	10
B906	.2	N	300	50	70	30	L	L	L	N	10
B907	.1	N	700	20	70	20	L	L	10	N	10
B908	.3	N	700	70	100	30	10	5	L	N	15
B909	.07	N	150	L	70	20	L	15	30	N	15
B913	.15	N	500	15	70	30	L	L	20	N	15
B916	.07	N	100	L	300	30	L	L	15	N	15
B917	.1	N	700	15	100	30	L	5	20	N	10
B918	.07	N	500	15	300	30	L	5	20	N	30
B920	.3	N	1,000	70	200	20	5	5	10	10	20
B921	.3	N	500	50	150	30	10	10	20	L	10
B922	.05	N	300	L	150	30	N	L	15	N	50
B923	.1	N	30	L	300	50	N	L	15	N	20
B924	.1	N	1,500	15	150	100	N	5	20	N	30
B962	.15	N	1,000	10	100	70	L	L	10	L	15
B963	.2	N	700	30	200	30	L	5	10	L	15
B968	.15	N	300	20	30	30	5	L	15	L	L
B971	.2	N	30	30	100	20	L	L	L	N	N
D87	.15	N	500	30	200	100	L	7	30	N	30
D88	.05	N	150	20	150	70	N	2	30	N	20
D89	.3	N	300	70	150	100	10	7	30	L	30
D90	.1	N	150	15	150	30	L	7	30	20	20
D91	.3	N	300	50	150	70	10	7	30	L	20
D93	.15	N	700	50	150	100	5	3	70	N	30
D94	.3	N	700	100	200	150	15	3	30	L	30
D95	.3	N	700	150	150	70	15	15	50	N	30
D97	.15	N	150	30	150	70	L	3	50	20	30
D98	.5	N	500	150	150	70	15	7	20	N	30
D100	.5	N	70	150	150	30	N	5	15	N	10
D102	.3	N	300	150	150	50	N	7	20	N	30
D104	.1	N	300	15	150	30	7	150	70	N	50
D105	1	N	1,500	200	200	150	100	20	15	N	70
D107	.3	N	300	70	200	70	5	7	300	N	20
D108	.5	N	1,000	150	200	50	30	30	10	N	30
D109	.7	N	700	30	200	70	N	2	15	N	30
D110	.3	N	700	70	200	70	7	5	15	N	30
D111	.3	N	200	30	150	70	N	2	10	N	30
D114	.3	N	700	70	200	70	15	7	20	N	30
D122	.1	N	70	10	150	30	N	3	15	N	15
E257	.3	N	500	50	150	30	15	30	15	L	10
Q664	.15	N	300	15	500	100	2	7	30	10	20
Q665	.7	N	1,500	15	1,000	100	N	10	30	10	30
D666	.5	N	700	50	500	30	N	10	20	N	15
Q749	.07	N	500	7	100	30	3	5	30	---	15
Q751	.3	N	500	30	200	70	3	2	20	---	30
Q830	.3	N	700	20	300	100	5	3	100	10	20
Q907	.2	N	500	N	300	150	5	2	20	---	30

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses (ppm) Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	Chemical analyses (ppm) CxHM (.5)	CxCu (.5)	As (10)
				UNDIVIDED TERTIARY INTRUSIVE ROCKS--Continued							
S72	L	N	L	1.5	L	1,000	200	N	---	---	10
S550	L	N	7	1.5	100	1,000	300	N	2.0	<0.5	10
				UNALTERED CHALLIS VOLCANICS							
B878	N	N	5	1.0	15	500	300	N	---	---	---
B879	N	N	10	1	50	70	700	1.0	---	---	---
B896	N	N	N	L	N	300	150	N	---	---	---
B897	N	N	15	L	150	500	300	N	---	---	---
B901	N	N	7	1.5	30	200	100	N	---	----	---
B902	N	N	N	1.5	L	30	100	N	---	---	---
B903	N	N	N	1	L	500	100	N	---	---	---
B904	N	10	N	1	L	500	150	N	---	---	---
B905	N	N	N	1	L	150	150	N	---	---	---
B906	N	N	7	1	30	300	300	N	---	---	---
B907	N	N	5	1	L	300	200	N	---	---	---
B908	N	N	10	1	70	700	500	N	---	---	---
B909	N	N	L	1.5	L	150	100	1.5	---	---	---
B913	N	N	L	1	L	1,000	200	N	---	---	---
B916	N	N	N	1.5	L	3,000	N	N	---	---	---
B917	N	N	L	1.5	N	500	150	N	---	---	---
B918	5	N	L	1.5	N	500	100	N	---	---	---
B920	N	N	10	1	30	200	300	N	---	---	---
B921	N	N	5	1	30	500	300	N	---	---	---
B922	5	N	L	5	N	500	100	N	---	---	---
B923	N	N	L	1.5	N	70	N	N	---	---	---
B924	L	N	L	1.5	N	300	100	N	---	---	---
B962	N	N	L	1	N	300	200	N	---	---	---
B963	N	N	5	1	20	700	300	N	---	---	---
B968	N	N	L	1	10	200	200	N	---	---	---
B971	N	N	5	L	30	500	150	N	---	---	---
D87	N	N	<5	2	7	1,500	300	N	---	---	---
D88	N	N	N	1	<5	300	150	N	---	---	---
D89	N	N	7	2	50	1,500	500	N	---	---	---
D90	N	N	<5	3	10	700	150	N	---	---	---
D91	N	N	7	3	30	1,500	700	N	---	---	---
D93	N	N	5	3	20	700	300	N	---	---	---
D94	N	N	15	3	70	1,500	700	N	---	---	---
D95	N	N	15	3	70	1,500	700	N	---	---	---
D97	N	N	<5	3	7	700	300	N	---	---	---
D98	N	N	15	3	70	1,500	700	N	---	---	---
D100	N	N	N	N	100	3,000	300	N	---	---	---
D102	N	N	5	1	70	1,500	700	N	---	---	---
D104	N	N	N	3	<5	200	150	N	---	---	---
D105	N	N	30	1	300	1,000	1,500	N	---	---	---
D107	N	N	7	2	20	1,500	700	N	---	---	---
D108	N	N	20	1.5	300	700	700	N	---	---	---
D109	N	N	15	1.5	700	1,500	1,000	N	---	---	---
D110	N	N	7	3	10	1,500	700	N	---	---	---
D111	N	N	<5	3	7	700	500	N	---	---	---
D114	N	N	15	2	70	1,500	700	N	---	---	---
D122	N	N	N	1	<5	300	70	N	---	---	---
E257	N	N	10	1.5	50	700	500	N	---	---	---
Q664	N	N	N	15	10	300	70	N	2.0	0.5	<10
Q665	N	N	7	5	5	1,500	500	N	1	.5	10
Q666	N	N	5	3	15	2,000	700	N	1	1	<10
Q749	N	N	N	1.5	7	700	70	N	.5	<.5	<10
Q751	N	N	7	1	20	1,000	300	N	3	<.5	<10
Q830	N	N	N	1.5	10	1,500	500	N	2	<.5	<10
Q907	N	N	<5	1	<5	700	70	N	3	<.5	<10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
UNALTERED CHALLIS VOLCANICS--Continued											
Q909	0.15	N	1,000	20	150	300	3	3	500	---	30
Q910	.1	N	1,000	10	150	500	N	1	20	---	20
Q919	.15	N	100	10	200	70	N	10	30	---	15
Q920	.03	N	200	N	70	30	N	10	30	---	20
S269	.2	N	300	30	200	100	L	5	20	10	20
S271	1	200	2,000	L	300	100	20	50	20	10	50
S272	.15	L	500	L	300	150	30	7	30	L	50
S273	.5	L	300	L	500	150	20	5	30	10	70
S274	.1	L	30	L	300	70	30	10	30	L	70
S275	.07	L	30	L	150	100	30	7	30	L	50
T999	.2	N	500	N	300	150	N	10	20	N	50
QUARTZ MONZONITE AND GRANODIORITE OF CRAGS PLUTON											
B863	1.0	N	2	L	30	50	N	L	20	N	50
E235	.2	N	300	L	200	20	5	30	10	L	70
E247	.15	N	300	L	100	50	L	15	10	N	20
E262	.05	N	200	70	70	70	5	15	L	N	20
E300	.3	N	700	L	150	L	5	30	30	N	30
IDAHO BATHOLITH (QUARTZ MONZONITE, GRANODIORITE, AND QUARTZ DIORITE)											
B832	0.05	N	70	L	30	L	L	L	30	N	N
B833	.02	N	30	10	50	20	10	L	L	N	L
B834	.3	N	1,500	50	200	L	N	7	10	L	20
B844	.3	N	1,000	70	50	20	L	7	L	L	15
B845	.1	N	300	15	50	20	L	L	15	N	10
B846	.15	N	300	20	50	70	L	L	20	N	15
B847	.3	N	500	50	100	20	10	L	15	L	10
B848	.3	N	700	30	50	20	10	L	15	L	10
B849	.3	N	300	70	100	50	L	L	15	N	10
B850	.2	N	500	50	100	20	L	L	10	L	L
B852	.15	N	700	20	30	20	L	L	15	N	10
B853	.3	N	700	30	70	20	L	L	15	N	10
B855	.3	N	500	30	70	20	L	10	30	L	10
B857	.3	N	700	50	70	30	10	L	15	L	L
B859	.07	N	200	10	30	20	L	L	20	N	L
B860	.7	N	700	100	70	20	30	50	L	10	15
B861	.1	N	100	10	100	50	L	L	10	N	L
B862	.3	N	300	50	100	20	10	L	15	L	15
B864	.3	N	300	30	70	50	L	5	20	L	10
B865	.3	N	700	50	50	30	L	L	15	L	10
B867	.7	N	700	70	30	30	L	15	L	10	15
B869	.5	N	1,500	100	30	20	10	10	L	10	15
B873	.2	N	300	20	30	30	L	L	10	N	L
B874	.3	N	1,000	70	50	20	N	5	L	L	15
B881	.2	N	200	20	150	50	N	L	20	N	20
B943	.03	N	70	L	30	20	L	L	15	N	10
B960	.3	N	700	70	150	30	L	L	20	N	15
D84	.3	N	500	70	150	70	10	2	30	L	30
D85	.15	N	500	20	150	70	N	7	30	L	50
D106	.3	N	500	100	200	70	15	5	15	N	30
D113	.3	N	500	70	130	50	7	3	20	N	30
D115	.3	N	700	15	150	N	15	5	15	N	20
D116	.3	N	500	50	150	30	7	3	30	N	20
E246	.3	N	700	70	150	20	7	15	15	L	10
E252	.3	N	300	50	150	20	7	15	15	L	10
E266	.007	N	70	20	L	N	5	5	10	N	10
E273	.2	N	300	30	150	70	7	30	15	L	L
E276	.3	N	500	30	150	50	7	30	15	L	15
E277	.3	N	700	20	200	70	5	7	10	L	15
P320	.2	N	300	20	100	N	5	10	20	N	20
Q938	.15	N	300	3	150	30	N	5	N	---	10

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
UNALTERED CHALLIS VOLCANICS--Continued											
Q909	N	N	<5	1.0	5	1,000	200	N	9.0	<0.5	240
Q910	N	N	<5	1	7	1,500	300	N	1	<.5	<10
Q910	10	N	N	1	5	700	70	N	1	3	160
Q920	N	N	N	1.5	3	30	15	N	3	3	<10
S269	L	N	L	1	5	700	100	N	---	---	<10
S271	L	N	20	1	100	2,000	1,000	N	---	---	---
S272	N	N	L	2	L	700	150	N	---	---	---
S273	N	L	N	2	L	700	100	N	---	---	---
S274	L	L	N	2	L	200	100	N	---	---	---
T999	3	N	N	3	<5	700	50	N	---	---	---
QUARTZ MONZONITE AND GRANODIORITE OF CRAGS PLUTON											
B863	N	N	L	2.0	L	50	N	N	---	---	---
E235	N	N	N	1.5	L	300	L	N	----	---	---
E247	N	N	N	2	L	300	150	N	---	---	---
E262	L	N	N	1.5	L	150	L	N	---	---	---
E300	N	N	L	1.5	10	150	L	N	---	---	---
IDAHO BATHOLITH (QUARTZ MONZONITE, GRANODIORITE, AND QUARTZ DIORITE)											
B832	N	N	L	L	N	L	N	50.0	---	---	---
B833	N	N	L	L	N	150	N	1.5	---	---	---
B834	N	N	10	L	L	1,000	700	N	---	---	---
B844	N	N	15	L	30	300	500	N	---	---	---
B845	N	N	L	1.0	L	300	200	N	---	---	---
B846	N	N	L	1	L	700	300	N	-----	---	---
B847	N	N	10	L	30	500	500	N	---	---	---
B848	N	N	5	L	30	1,000	500	N	---	---	---
B849	N	N	L	1	15	700	500	N	---	---	---
B850	N	N	5	L	15	700	700	N	---	---	---
B852	N	N	L	L	L	700	300	N	---	---	---
B853	N	N	5	1	20	1,000	700	N	---	---	---
B855	N	N	10	1	15	700	700	N	---	---	---
B857	N	N	15	1	30	300	500	N	---	---	---
B859	N	N	L	1	L	300	150	N	---	---	---
B860	N	N	20	L	150	50	200	N	---	---	---
B861	N	N	L	L	L	1,500	700	N	---	---	---
B862	N	N	5	1	50	300	300	N	---	---	---
B864	N	N	5	1	30	1,000	700	N	---	---	---
B865	N	N	7	1	30	1,000	700	N	---	---	---
B867	N	N	15	L	N	500	500	N	---	---	---
B869	N	N	30	L	100	200	500	N	---	---	---
B873	N	N	N	1	N	1,000	500	N	---	---	---
B874	N	N	15	L	N	500	300	N	---	---	---
B881	N	N	5	1.5	N	300	300	N	---	---	---
B943	N	N	N	1.5	N	20	N	N	---	---	---
B960	N	N	L	1.5	50	700	300	N	---	---	---
D84	N	N	10	2	30	700	700	N	---	---	---
D85	N	N	5	3	5	700	300	N	---	---	---
D106	N	N	15	1.5	70	2,000	1,500	N	---	---	---
D113	N	N	7	2	30	1,500	700	N	---	---	---
D115	N	N	15	2	70	1,500	1,000	N	---	---	---
D116	N	N	10	2	30	1,500	700	N	---	---	---
E246	N	N	7	1	70	1,000	700	N	---	---	---
E252	N	N	7	1	30	700	500	N	---	---	---
E266	N	N	N	3	L	200	150	N	---	---	---
E273	N	N	7	2	20	700	500	N	---	---	---
E276	L	N	7	1	10	1,000	700	N	---	---	---
E277	N	N	5	1	10	1,500	500	N	---	---	---
P320	N	N	N	1	N	100	N	N	---	---	---
Q938	N	N	<5	1	5	1,000	500	N	4.0	1.5	20

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
IDAHO BATHOLITH (GNEISSIC QUARTZ MONZONITE ALASKITE)											
B837	0.3	N	1,500	70	30	30	L	10	L	L	10
B838	.15	N	300	30	30	L	10	L	10	N	10
B851	.2	N	1,500	100	50	20	50	30	10	50	15
B856	.03	N	300	L	30	20	L	L	15	N	10
B858	.5	N	1,500	70	70	20	L	10	10	L	15
B866	.03	N	20	L	20	20	N	L	10	N	15
B870	.05	N	200	L	20	20	L	L	10	N	L
B871	.03	N	300	L	20	L	L	L	10	N	15
B872	.03	N	700	L	15	20	L	L	10	N	10
B875	.03	N	300	L	20	20	N	L	30	N	10
B876	.03	N	300	L	L	L	N	L	30	N	70
B877	.02	N	700	L	10	L	N	7	15	N	15
B887	.3	N	1,000	150	20	L	30	30	L	10	15
D86	.5	N	1,000	100	N	30	L	7	15	L	30
D112	.3	N	200	30	150	50	7	3	50	N	N
E263	.03	N	300	L	50	N	5	30	10	L	L
E264	.05	N	150	70	300	50	7	30	15	N	30
E267	.7	N	70	L	150	20	7	20	L	L	L
E268	.1	N	200	20	200	L	7	30	N	N	10
E271	.03	N	500	L	50	N	L	15	10	L	15
E272	.03	N	300	L	30	L	L	30	10	L	L
E278	.2	N	300	70	150	30	15	30	10	L	10
E279	.03	N	700	L	50	L	L	30	10	15	10
E308	1	N	700	150	70	30	7	15	10	10	15
PRECAMBRIAN INTRUSIVE COMPLEX--SYENITE											
B941	0.3	N	700	100	70	20	L	5	10	L	15
E205	1	N	1,500	300	150	N	70	70	N	10	20
E237	.5	N	1,000	30	150	70	5	10	N	L	20
E238	.3	N	1,000	L	150	70	5	70	N	L	15
E243	.1	N	150	L	100	30	5	20	L	15	L
E253	.15	N	700	L	150	150	5	15	N	L	15
E305	.2	N	700	L	150	50	7	10	15	N	20
E306	.5	N	700	20	70	50	7	20	15	L	30
E307	1	N	1,000	30	70	50	L	20	L	L	20
Q819	>1	N	3,000	10	500	50	<5	30	50	N	30
S548	.7	L	>5,000	70	300	---	15	20	30	20	30
PRECAMBRIAN INTRUSIVE COMPLEX--GABBRO AND HORNBLENDITE											
B839	0.7	L	1,500	150	N	N	20	15	N	10	L
B867	.7	L	1,500	150	N	N	20	15	N	10	L
B868	.5	N	1,500	150	150	20	L	10	L	10	15
B889	.3	N	1,000	150	10	L	15	30	L	L	20
E254	.5	N	1,500	L	150	50	5	30	L	N	30
Q604	>1	N	3,000	300	10	20	<5	70	<10	15	50
Q823	>1	N	3,000	150	30	30	<5	30	100	<10	30
Q824	>1	N	2,000	300	20	<20	150	70	100	10	30
Q825	>1	N	3,000	300	300	30	20	70	10	10	30
Q826	>1	N	3,000	200	500	300	10	50	15	<10	50
Q827	>1	N	3,000	300	70	200	10	70	20	<10	50
Q828	>1	N	2,000	150	300	200	7	50	10	< 0	50
Q833	>1	N	1,500	300	100	<20	15	50	10	<10	20
S549	.1	N	5,000	150	>1,000	---	70	50	30	30	50
S824	>1	N	1,500	1,000	N	N	30	30	N	L	15
HOODOO QUARTZITE											
B938	0.05	N	30	10	30	L	L	L	L	N	N
B942	.15	N	1,500	20	30	20	L	L	N	10	10
E269	.15	N	300	20	200	L	7	30	N	L	10
P317	200	N	20	<10	30	<20	5	50	10	<10	10
Q605	.15	N	30	30	200	N	N	15	30	10	15
R658	.01	N	30	L	L	30	5	5	70	N	L

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
IDAHO BATHOLITH (GNEISSIC QUARTZ MONZONITE ALASKITE)											
B837	N	N	15	L	15	300	700	N	---	---	----
B838	N	N	7	L	20	300	300	N	---	---	---
B851	N	N	15	1.0	150	300	200	N	---	---	---
B856	N	N	N	1	L	300	300	N	---	---	---
B858	N	N	15	L	15	1,000	700	N	---	---	---
B866	N	N	N	L	N	200	150	N	---	---	---
B870	N	N	N	1	N	700	500	N	---	---	---
B871	N	N	N	1.5	N	300	500	N	---	---	---
B872	N	N	N	1.5	N	200	150	N	---	---	---
B875	N	N	N	1.5	N	150	100	N	---	---	---
B876	N	N	N	2	N	L	N	N	---	---	---
B877	N	N	N	1.5	N	150	100	N	---	---	---
B887	N	N	70	L	700	150	200	N	---	---	---
D86	N	N	15	1.5	30	700	N	N	---	---	---
D112	N	N	3	1	3	1,500	1,000	N	---	---	---
E263	N	N	N	1.5	L	700	500	N	---	---	---
E264	N	N	100	1.5	20	700	500	N	---	---	---
E267	N	N	N	1.5	15	700	300	N	---	---	---
E268	N	N	N	1.5	30	1,500	100	N	---	---	---
E271	N	N	N	3	L	500	200	N	---	---	---
E272	N	N	N	1.5	L	700	300	N	---	---	---
E278	N	N	5	1.5	30	300	300	N	---	---	---
E279	N	10	N	1.5	L	70	100	N	---	---	---
E308	L	N	15	L	10	500	1,000	N	---	---	---
PRECAMBRIAN INTRUSIVE COMPLEX--SYENITE											
B941	N	N	10	L	30	200	700	N	---	---	---
E205	N	N	30	N	70	300	300	N	---	---	---
E237	5	N	7	1.5	L	500	700	N	---	---	---
E238	N	N	N	1	L	700	L	N	---	---	---
E243	N	N	N	1.5	L	1,000	700	N	---	---	---
E253	L	N	N	1	15	300	N	N	---	---	---
E305	L	N	L	1.5	L	700	200	N	---	---	---
E306	L	N	7	L	L	700	700	N	---	---	---
E307	L	N	7	L	10	700	1,500	N	---	---	---
Q819	N	N	N	N	N	>5,000	200	N	25.0	22.0	<10
S548	5	N	5	1.5	70	700	200	N	20	<5	10
PRECAMBRIAN INTRUSIVE COMPLEX--GABBRO AND HORNBLENDITE											
B839	N	N	70	N	L	20	300	N	---	---	---
B867	N	N	70	N	L	20	300	N	---	---	---
B868	N	N	30	L	L	1,000	1,000	N	---	---	---
B889	N	N	50	L	700	70	200	N	---	---	---
E254	L	N	5	1.5	10	300	300	N	---	---	---
Q604	3	N	70	<1	<5	200	700	N	1.0	2.0	40
Q823	N	N	30	N	N	300	5,000	0.15	5	<.5	80
Q824	L	N	70	N	700	150	2,000	1	5	30	40
Q825	N	N	150	N	30	500	3,000	N	3	2	40
Q826	N	N	50	N	N	1,500	3,000	N	5	<.5	20
Q827	N	N	100	N	700	150	3,000	N	4	2	120
Q828	N	N	50	N	N	1,500	1,500	N	.5	<.5	80
Q833	N	N	50	N	10	200	3,000	N	3	1	10
S549	L	N	10	3	100	1,000	150	N	2	<.5	10
S824	N	N	100	N	5	70	300	N	---	---	10
HOODOO QUARTZITE											
B938	N	N	N	L	N	200	100	N	---	---	---
B942	N	N	L	L	L	300	150	N	---	---	---
E269	N	N	N	1.5	30	500	100	N	---	---	---
P317	<5	N	<5	1	50	1,500	300	N	---	---	---
Q605	5	N	N	N	50	70	N	N	0.5	6.0	320
R658	N	N	N	N	10	L	N	3	---	---	---

TABLE 1. — *Analyses of samples from the*

	Semiquantitative spectrographic analyses										
	(percent)	(ppm)									
Sample	Ti (.002)	Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
	YELLOWJACKET FORMATION										
B854	0.15	N	700	30	70	30	L	L	20	N	15
B880	.1	N	1,500	150	70	50	10	10	L	15	20
B939	.2	N	70	30	150	20	L	L	10	10	15
B969	.2	N	150	30	100	20	15	20	N	20	20
	GNEISS AND SCHIST										
B893	0.2	N	100	50	70	30	15	L	L	N	50
B894	.2	N	700	50	150	20	20	L	N	10	20
B895	.2	N	500	50	100	20	15	L	L	N	15
B966	.3	N	300	50	100	20	10	L	10	N	15
E256	.3	N	200	50	150	L	15	30	N	L	15
E258	.03	N	200	L	70	N	5	5	10	L	50
E270	.3	N	700	100	150	30	10	15	10	L	15
Q820	.5	N	1,500	70	300	50	30	15	15	N	50
	ALTERED DIKES										
B932	0.1	N	200	L	150	30	L	L	15	N	20
B940	.15	N	50	50	70	N	20	L	N	15	10
E274	.1	N	300	L	150	30	L	30	15	L	20
P312	5,000	<200	500	100	200	70	5	10	10	30	<10
Q601	.2	N	200	10	700	70	N	15	50	50	50
S158	1	200	1,500	150	500	100	15	30	30	L	---
	ALTERED CHALLIS VOLCANICS										
B911	0.1	N	50	10	100	30	L	L	10	N	10
B912	.07	N	100	L	50	30	L	L	10	N	15
B914	.15	N	300	10	70	30	L	L	10	N	15
B915	.1	N	300	L	150	30	L	5	15	N	20
B919	.07	N	50	L	150	20	L	5	20	N	15
B925	.7	N	1,500	100	150	50	N	15	10	L	30
B926	.05	N	200	10	100	20	N	L	15	N	15
B927	.05	N	50	L	100	200	L	50	15	N	70
B928	.07	N	150	L	150	20	N	L	10	N	15
B929	.07	N	70	L	300	50	N	5	10	N	70
B930	.05	N	10	L	100	30	N	L	L	N	10
B931	.3	N	700	70	70	20	20	10	10	L	15
B933	.07	N	200	L	150	30	N	L	15	N	15
B934	.1	N	500	30	70	20	L	70	10	N	L
B935	.3	N	1,000	70	150	30	5	15	10	L	15
E207	1.5	N	300	15	150	30	7	20	10	N	10
E208	.3	N	500	L	300	70	L	30	10	L	20
E209	.1	N	700	L	150	30	5	7	L	N	15
E210	.3	N	700	50	300	30	7	30	L	L	15
E211	1.5	N	500	L	300	150	5	20	L	L	30
E212	.1	N	150	L	200	N	L	10	15	N	15
E214	.15	N	150	L	300	70	5	30	15	15	30
E222	.03	N	300	15	20	L	L	30	L	10	30
E223	.3	N	300	10	300	30	5	30	15	L	15
E224	.2	N	300	10	150	30	L	20	15	10	15
E225	.2	N	200	L	200	30	L	30	15	15	10
E260	.07	N	150	L	150	N	5	30	15	10	10
E280	.03	N	150	L	70	N	5	10	15	15	20
E304	.15	N	300	10	70	N	7	30	300	N	N
P303	5,000	N	300	100	150	50	15	30	10	10	10
P305	1,500	N	200	<10	300	50	5	10	20	<10	20
Q493	.15	N	300	N	200	30	N	15	30	N	30
Q494	.3	N	30	10	200	70	3	50	15	10	50
Q495	.2	N	20	N	200	100	2	30	50	N	70
Q496	.3	N	300	N	200	150	7	20	10	10	30

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
					YELLOWJACKET FORMATION						
B854	N	N	5	1.0	15	700	300	N	---	---	---
B880	N	N	50	N	N	70	300	N	---	---	---
B939	N	N	N	L	30	300	150	N	---	---	---
B969	N	N	10	L	20	100	N	N	---	---	---
					GNEISS AND SCHIST						
B893	N	N	5	L	70	1,000	200	N	---	---	---
B894	N	N	7	1.0	50	150	100	N	---	---	---
B895	N	N	10	1	50	300	200	N	---	---	---
B966	N	N	10	1	70	200	300	N	---	---	---
E256	N	N	10	1.5	50	500	150	N	---	---	---
E258	N	N	N	1	L	500	200	N	---	---	---
E270	N	N	15	1.5	150	700	500	N	---	---	---
Q820	N	N	20	5	150	200	500	N	3.0	<0.5	<10
					ALTERED DIKES						
B932	N	N	N	1.5	N	500	150	N	---	---	---
B940	N	N	5	1	20	150	100	N	---	---	---
E274	N	N	N	1.5	10	1,000	300	N	---	---	---
P312	<5	<10	<5	2	<10	500	300	N	---	---	---
Q601	3	N	N	7	5	500	N	N	2.0	<0.5	10
S158	L	N	20	1	150	2,000	1,000	N	---	---	---
					ALTFRED CHALLIS VOLCANICS						
B911	N	N	N	1.5	L	150	100	N	---	---	---
B912	N	N	N	1	L	150	100	N	---	---	---
B914	N	N	L	L	L	500	200	N	---	---	---
B915	N	N	N	1	L	1,000	100	N	---	---	---
B919	L	N	L	1	L	50	N	N	---	---	---
B925	N	N	15	1	N	300	300	N	---	---	---
B926	N	N	N	1	N	200	100	N	---	---	---
B927	N	N	N	3	N	50	100	N	---	---	---
B928	N	N	N	1	N	500	N	N	---	---	---
B929	N	N	N	1.5	N	700	100	N	---	---	---
B930	N	N	N	1	N	200	N	N	---	---	---
B931	N	N	20	L	150	300	300	N	---	---	---
B933	N	N	N	1	N	500	50	N	---	---	---
B934	N	N	N	1	N	150	N	N	---	---	---
B935	N	N	5	1	30	700	30	N	---	---	---
E207	N	N	N	1.5	L	700	150	N	---	---	---
E208	N	N	N	1.5	L	1,000	150	N	---	---	---
E209	N	N	N	1.5	10	700	150	N	---	---	---
E210	N	N	10	1.5	20	700	300	N	---	---	---
E211	N	N	N	1.5	10	150	L	N	---	---	---
E212	L	L	N	1.5	L	150	L	N	---	---	---
E214	N	N	N	1.5	L	500	L	N	---	---	---
E222	7	N	N	3	L	70	L	N	---	---	---
E223	N	N	L	1	L	1,500	300	10.0	---	---	---
E224	N	N	N	1.5	L	1,000	150	.5	---	---	---
E225	N	N	N	1.5	L	700	200	.5	---	---	---
E260	N	N	L	1.5	L	500	L	N	---	---	---
E280	N	L	N	1.5	L	150	L	N	---	---	---
E304	N	N	L	L	10	30	100	1	---	---	---
P303	N	N	10	N	50	1,500	300	N	---	---	---
P305	N	N	<5	1.5	<10	300	<100	N	---	---	---
Q493	10	N	N	2	100	50	200	10	5.0	3.0	20
Q494	15	N	N	2	150	30	300	10	14	11	10
Q495	N	N	N	1	100	50	200	10	5	4	40
Q496	10	N	5	2	150	50	200	10	2	<.5	20

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
ALTERED CHALLIS VOLCANICS--Continued											
Q497	N	N	150	N	N	N	7	20	N	N	7
Q498	0.7	N	70	30	300	300	5	15	10	N	50
Q499	.3	N	300	N	200	150	7	15	N	N	10
Q500	.3	N	30	N	200	150	N	2	N	N	15
Q501	.3	N	150	N	300	150	N	5	20	15	30
Q502	.3	N	100	N	200	100	3	30	20	N	20
Q503	.3	N	700	20	300	300	3	20	20	N	20
Q504	.3	N	300	N	300	300	2	20	20	N	50
Q505	.3	N	300	N	700	300	N	20	15	N	30
Q574	.1	N	5,000	N	150	20	70	150	500	10	5
Q585	.3	N	700	50	300	300	3	30	20	N	70
Q586	.03	N	50	N	300	150	2	30	30	N	20
Q587	.2	N	500	N	300	30	N	30	30	N	30
Q588	.5	N	300	20	150	50	7	30	50	N	10
Q589	.7	N	500	50	300	100	3	20	30	N	20
Q590	.1	N	200	N	150	70	N	20	30	N	15
Q591	.3	N	300	15	200	100	2	30	50	10	30
Q592	.3	N	150	30	300	70	N	30	20	N	30
Q593	.3	N	300	30	700	30	N	30	50	N	20
Q597	.2	N	700	10	500	70	N	20	50	10	50
Q598	.3	N	200	10	500	50	N	20	50	N	30
Q599	.15	N	300	10	300	20	5	15	50	N	30
Q600	.3	N	300	10	500	150	2	20	50	15	50
Q602	.2	N	300	10	150	50	N	15	50	N	20
Q603	.7	N	500	100	300	30	10	10	N	50	70
Q606	.3	N	500	20	300	150	N	20	30	10	70
Q607	.3	N	500	15	200	100	N	15	50	20	50
Q608	.3	N	700	N	100	20	N	10	15	30	30
Q609	.07	N	500	N	150	30	N	10	30	15	30
Q610	.15	N	200	15	300	70	N	15	50	15	20
Q611	.3	N	700	20	300	70	15	20	50	N	15
Q612	.3	N	500	10	700	100	5	2	30	N	30
Q613	.3	N	300	50	200	70	7	15	30	N	15
Q615	.3	N	700	15	700	20	N	5	30	N	20
Q616	.3	N	100	10	700	100	N	5	15	N	30
Q617	.3	N	200	10	1,000	30	N	10	50	N	20
Q668	.7	N	700	100	300	100	15	20	30	N	20
Q674	.15	N	150	10	300	50	N	3	15	N	50
Q743	.2	N	500	30	300	70	5	5	30	---	30
Q744	.15	N	500	30	200	70	5	7	30	---	30
Q745	.1	N	150	15	200	30	N	N	30	---	20
Q747	.07	N	150	15	150	30	N	3	30	---	15
Q748	.07	N	500	7	100	30	3	5	50	---	15
Q835	.2	N	50	10	300	70	N	N	15	10	30
Q908	.2	N	500	30	150	30	3	5	30	---	20
Q911	.1	N	500	30	150	30	7	10	20	---	20
Q912	.1	N	200	15	150	150	2	20	300	---	30
Q913	.15	N	500	15	200	70	3	3	20	---	20
Q914	.03	N	100	N	150	30	N	5	30	---	20
Q915	.05	N	50	N	200	50	N	7	50	---	30
Q923	.2	N	70	15	150	70	N	5	20	---	15
Q924	.15	300	2,000	N	300	150	5	3	20	---	70
Q925	.2	N	50	N	300	30	3	3	30	---	30
Q926	.15	N	1,000	7	300	150	7	7	20	---	30
Q931	.1	N	150	30	70	30	3	5	10	---	N
Q933	.15	N	300	15	150	50	3	2	70	---	15
Q935	.15	N	100	N	200	N	N	30	100	N	15
Q937	.07	N	70	N	150	70	N	7	100	N	30
R150	.02	N	200	10	150	N	N	N	N	10	20
S46	.1	N	500	L	200	50	L	5	30	L	20

Idaho Primitive Area, Idaho — Continued

	Semiquantitative spectrographic analyses (ppm)								Chemical analyses (ppm)		
Sample	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
					ALTERED CHALLIS VOLCANICS--Continued						
Q497	N	N	N	1.0	10	50	300	30.0	5.0	4.0	10
Q498	N	N	N	2	200	100	300	2	2	<.5	60
Q499	N	N	N	N	100	100	70	3	3	<.5	80
Q500	N	N	N	N	30	70	50	2	1	<.5	240
Q501	N	N	N	N	50	70	N	1	3	<.5	240
Q502	5	N	N	N	50	100	70	5	3	<.5	120
Q503	N	N	5	3	70	700	150	.05	7	<.5	10
Q504	70	N	N	2	30	500	50	5	2	<.5	120
Q505	50	N	N	1	20	200	N	15	3	<.5	320
Q574	100	N	5	2	300	1,500	700	N	1	1	30
Q585	N	N	7	N	70	1,500	1,000	N	5	3	<10
Q586	7	N	N	N	5	1,500	500	N	3	4	10
Q587	N	N	N	1	N	50	N	N	4	2	<10
Q588	N	N	N	N	150	2,000	700	N	3	3	10
Q589	N	N	7	N	30	2,000	700	N	.5	.15	10
Q590	N	N	N	1	5	1,500	150	N	.5	2	10
Q591	N	N	N	N	20	1,500	700	N	3	1.5	<10
Q592	20	N	N	2	10	1,500	150	N	.5	2	20
Q593	70	N	N	1.5	10	2,000	300	N	1	.5	10
Q597	2	N	N	2	7	1,000	100	N	9	1	<10
Q598	N	N	N	2	5	700	100	N	.5	.5	<10
Q599	10	N	N	2	15	300	150	N	.5	.5	<10
Q600	N	N	N	1	10	3,000	500	N	.5	.5	<10
Q602	N	N	N	2	N	1,500	200	N	1	1	<10
Q603	N	N	7	3	70	1,000	N	N	.5	<.5	40
Q606	2	N	N	2	10	2,000	1,000	N	.5	.5	60
Q607	2	N	5	1	7	1,000	500	N	3	6	<10
Q608	3	N	N	N	5	150	100	N	1	1	10
Q609	N	N	N	N	N	300	150	N	1	<.5	10
Q610	N	N	N	5	5	700	100	N	.5	<.5	10
Q611	N	N	N	3	30	1,000	300	N	2	<.5	<10
Q612	2	N	N	2	7	200	1,000	N	.5	1	<10
Q613	N	N	N	3	30	700	300	N	9	1	10
Q615	N	N	N	5	5	500	50	N	3	1	<10
Q616	N	N	N	3	10	300	50	N	4	<.5	10
Q617	N	N	N	3	7	300	N	N	3	.5	<10
Q668	N	N	5	N	100	3,000	300	N	1	<.5	<10
Q674	N	N	N	7	7	150	N	N	3	<.5	<10
Q743	3	N	5	3	15	2,000	300	N	2	<.5	<10
Q744	N	N	5	3	15	1,500	200	N	2	<.5	<10
Q745	N	N	N	2	15	1,000	150	N	.5	23	<10
Q747	N	N	N	2	5	700	70	N	2	<.5	10
Q748	N	N	3	2	5	700	100	N	4	<.5	<10
Q835	N	N	N	N	N	150	N	N	2	<.5	<10
Q908	N	N	5	1	10	1,000	200	N	1	<.5	<10
Q911	7	N	5	1	15	150	30	N	3	<.5	<10
Q912	2,000	N	N	1	7	700	70	N	5	1.5	40
Q913	100	N	3	1	7	1,500	100	N	5	.5	30
Q914	15	N	N	1	2	150	70	N	.5	.5	60
Q915	7	N	N	1	2	200	50	N	1	.5	20
Q923	5	N	N	1	5	1,000	70	N	1	4	60
Q924	N	N	N	1.5	1	300	30	N	32	<.5	10
Q925	5	N	N	1	1	2,000	70	N	1	<.5	<10
Q926	N	N	N	1.5	2	500	30	N	4	.5	<10
Q931	N	N	N	1	7	300	70	N	3	.5	40
Q933	N	N	3	1.5	7	300	150	N	1	.5	10
Q935	5	N	N	1	2	1,500	70	N	2	<.5	80
Q937	N	N	N	1.5	2	200	70	N	.5	.5	<10
R150	N	N	N	3	N	70	N	N	.5	<.5	<10
S46	L	N	N	3	L	50	150	N	---	---	<10

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent)	(ppm)									
	Ti (.002)	Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
ALTERED CHALLIS VOLCANICS--Continued											
S49	0.1	N	30	L	200	20	L	L	10	L	10
S50	.1	N	50	L	300	50	L	L	20	L	10
S52	.1	N	30	L	300	70	L	L	20	L	10
S71	.15	N	50	L	300	100	L	L	20	10	30
S124	.15	N	30	10	500	100	N	5	30	10	50
S125	.15	N	100	L	500	100	N	7	50	L	50
S156	.1	700	5,000	70	300	100	20	30	50	50	50
S157	.15	L	150	20	200	150	15	30	50	N	70
S159	.7	L	500	150	300	150	20	20	15	L	150
S160	.5	300	500	100	300	100	30	10	20	20	100
S161	1	L	500	300	300	70	15	100	L	20	30
S167	.3	N	1,500	30	300	70	L	15	20	15	30
S227	.1	N	300	10	150	70	2	5	20	L	20
S228	.15	N	300	30	200	70	5	5	20	L	20
S237	.07	N	200	L	150	50	L	L	15	L	20
S238	.05	N	70	L	150	50	L	L	15	L	20
S240	.1	N	300	10	200	50	L	L	20	10	30
S257	.15	N	100	10	150	20	L	5	20	10	20
S258	.15	N	300	15	100	30	L	5	20	10	15
S259	.15	N	100	15	300	70	L	5	20	10	30
S264	.15	L	150	L	500	150	20	7	30	L	50
S265	.2	N	100	20	200	100	L	5	20	20	20
S266	.1	N	30	10	300	50	L	5	10	10	30
S267	.15	N	700	30	200	100	L	5	20	10	30
S268	.15	N	70	10	300	100	L	5	30	10	30
S315	.15	N	300	10	300	150	L	7	50	10	30
S316	.15	200	700	15	200	100	N	N	30	30	50
S317	.1	N	150	10	200	100	L	10	30	L	30
S318	.07	N	300	10	200	70	L	10	50	L	70
S319	.3	N	300	15	300	100	N	5	30	L	30
S879	.15	N	70	10	200	L	L	7	70	10	30
U1	.15	N	15,000	7	300	150	N	10	50	N	30
ALTERED ROCKS OF THE IDAHO BATHOLITH											
B835	0.5	N	1,500	70	10	30	L	L	10	10	30
B836	.3	N	1,500	70	15	L	10	10	30	L	10
B944	.03	N	150	L	30	20	L	15	20	N	20
B967	.015	N	70	L	30	N	L	L	L	N	10
B970	.1	N	700	70	20	L	30	L	L	N	L
D117	.15	N	1,500	15	70	30	L	1	30	N	15
D118	.3	N	300	50	150	50	7	1	30	N	20
E195	.3	N	500	15	150	30	5	5	10	L	15
E196	.15	N	300	15	150	70	5	20	L	L	15
E197	.2	N	300	15	70	30	L	20	15	L	15
E198	.3	N	700	15	100	L	L	30	20	L	15
E275	.3	N	500	30	150	70	5	30	15	L	15
P310	.5	N	700	150	100	50	20	20	20	30	15
P313	.7	N	1,000	100	200	50	10	10	10	30	10
P314	.7	N	20	<10	300	<20	5	5	<10	<10	<10
Q582	.15	N	100	10	150	N	5	300	15	N	15
R641	.07	700	50	L	70	30	L	30	>20,000	30	L
R659	.7	N	700	300	500	30	10	150	70	20	30
S225	15	N	300	30	100	50	10	5	20	10	30
ALTERED ROCKS OF PRECAMBRIAN INTRUSIVE COMPLEXES											
E200	0.3	N	1,000	150	150	L	150	50	N	L	20
E201	.3	N	300	150	100	N	10	7	L	15	L
E202	.3	N	200	50	200	N	15	30	30	15	10
E203	.3	N	300	30	300	N	15	30	15	10	L
E204	.3	N	700	70	150	20	70	7	10	50	70

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
					ALTERED CHALLIS VOLCANICS--Continued						
S49	L	N	N	1.0	L	1,000	200	N	---	---	<10
S50	5	N	N	1.5	L	1,500	200	N	---	---	<10
S52	L	N	N	1.5	L	1,000	200	N	---	---	<10
S71	L	N	L	1	10	1,500	200	N	---	---	<10
S124	N	L	N	2	L	700	L	N	---	---	40
S125	N	L	N	2	5	700	L	N	---	---	60
S156	20	N	N	5	7	1,000	L	L	---	---	---
S157	N	L	L	2	10	700	N	N	---	---	---
S159	L	N	10	1.5	70	700	500	N	---	---	---
S160	5	N	10	3	50	300	300	N	---	---	---
S161	5	N	20	1	70	200	200	N	---	---	---
S167	N	N	L	1.5	15	1,000	300	N	---	---	---
S227	L	N	L	1.5	7	500	50	N	---	---	<10
S228	L	N	L	1.5	10	700	50	N	---	---	<10
S237	L	N	L	.5	L	700	70	N	---	---	<10
S238	L	N	L	.5	L	700	50	N	---	---	<10
S240	L	N	L	1	L	1,000	70	N	---	---	<10
S257	L	N	L	1.5	L	500	50	N	---	---	<10
S258	N	N	L	1	L	700	100	N	---	---	<20
S259	30	N	L	2	5	500	100	N	---	---	120
S264	L	N	N	3	10	700	L	N	---	---	---
S265	L	N	L	1	5	700	70	N	---	---	60
S266	10	N	L	1	5	100	100	N	---	---	40
S267	L	N	5	1.5	5	700	100	N	---	---	10
S268	L	N	L	1	5	500	50	N	---	---	30
S315	N	N	N	3	7	2,000	150	N	2.0	<0.5	30
S316	L	L	N	7	L	300	L	N	14	---	<10
S317	N	N	N	1.5	N	1,500	150	N	---	---	<10
S318	N	L	N	3	L	500	100	N	---	---	<10
S319	N	L	N	1.5	5	1,500	300	N	---	---	<10
S879	L	N	N	3	L	1,000	150	L	---	---	---
U1	5	N	10	5	2	700	30	N	---	---	---
					ALTERED ROCKS OF THE IDAHO BATHOLITH						
B835	N	N	20	1.0	L	200	700	N	---	---	---
B836	N	N	20	L	70	300	300	N	---	---	---
B944	N	N	N	2	N	70	100	N	---	---	---
B967	N	N	5	1.5	N	70	N	N	---	---	---
B970	N	10	15	L	300	70	300	N	---	---	---
D117	N	N	N	2	15	700	3,000	N	---	---	---
D118	N	N	7	1	30	1,500	700	N	---	---	---
D195	N	N	5	1.5	L	700	300	N	---	---	---
E196	N	N	L	1.5	L	700	200	N	---	---	---
E197	N	N	N	1.5	1.5	700	200	N	---	---	---
E198	N	N	N	1.5	L	700	300	N	---	---	---
E275	N	N	7	1.5	10	1,500	700	N	---	---	---
P310	N	N	5	2	30	1,000	700	1.5	---	---	---
P313	N	N	10	1	50	300	200	N	---	---	---
P314	N	N	<5	N	N	100	<100	N	---	---	---
Q582	N	N	N	N	15	150	150	N	17	45	<10
R641	N	N	N	1.5	L	700	200	1,500	---	---	---
R659	5	N	N	L	150	700	1,000	1	---	---	---
S225	L	N	5	1	20	700	500	N	1	<.5	10
					ALTERED ROCKS OF PRECAMBRIAN INTRUSIVE COMPLEXES						
E200	L	N	70	1	1,000	700	300	N	---	---	---
E201	N	N	N	1.5	70	70	L	N	---	---	---
E202	N	N	N	L	70	L	L	L	---	---	---
E203	N	N	N	L	70	L	L	L	---	---	---
E204	N	N	15	1	50	70	L	N	---	---	---

TABLE 1. — *Analyses of samples from the*

Sample	Semiquantitative spectrographic analyses (percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
ALTERED ROCKS OF PRECAMBRIAN INTRUSIVE COMPLEXES--Continued											
E206	1.0	N	700	300	150	30	70	15	N	20	15
E244	.15	N	300	70	100	30	5	30	L	70	N
Q831	.1	N	1,500	300	150	20	7	70	10	N	30
Q834	>1	N	700	300	N	N	10	20	N	15	5
S822	.7	N	700	150	500	150	15	20	N	L	70
ALTERED HOODOO QUARTZITE											
B899	0.2	N	70	15	N	30	L	L	10	L	15
B900	.2	N	300	50	150	30	L	5	L	L	10
B946	.7	N	1,000	70	100	30	5	7	10	L	15
B947	.07	N	100	L	150	30	N	L	10	N	10
E259	.15	N	70	50	200	20	15	30	10	L	10
E298	.07	N	200	L	300	N	L	70	70	N	70
Q906	.1	N	300	10	100	30	5	7	50	---	15
U4	.02	N	1	N	100	N	N	20	---	N	N
ALTERED YELLOWJACKET FORMATION											
B937	0.3	N	1,500	100	150	30	30	15	L	L	30
B959	.3	N	300	70	200	30	10	30	20	20	30
R148	.03	N	1,000	N	50	N	7	5	N	N	N
R149	.15	N	500	10	100	30	15	10	N	N	N
S793	.2	N	50	70	200	70	30	150	15	15	15
S794	.5	L	500	100	300	30	L	70	70	70	15
S795	.15	N	300	10	300	70	N	30	30	N	100
VEINS AND MINERALIZED MATERIAL											
B936	0.05	N	70	L	200	L	L	10	L	N	30
B945	.3	N	300	N	70	20	5	15	N	10	10
B948	.03	N	150	L	100	30	N	L	15	10	10
B949	.2	N	500	15	150	20	7	5	10	N	15
B950	.1	N	150	L	100	L	L	L	15	N	15
B953	.15	N	300	20	70	30	L	L	15	N	10
B954	.3	N	1,000	100	50	30	L	L	L	L	15
B955	.1	N	700	20	70	20	L	L	10	L	L
B956	.1	N	50	30	50	L	L	7	L	N	N
B957 1/	.015	N	30	L	10	N	L	L	150	20	L
B958	.5	N	1,500	70	50	20	L	15	L	L	15
D99	.007	N	500	30	150	N	L	7	N	30	10
D101	.007	N	150	30	150	N	N	<5	N	---	N
D103	.3	700	1,500	70	200	300	N	10,000	300	---	100
E213	1.5	N	100	L	200	N	L	50	10	N	10
E215	.1	N	300	L	300	50	L	20	70	N	20
E216	.07	N	150	L	100	20	N	20	L	N	10
E217	.15	N	300	10	150	L	5	30	30	N	L
E218	.2	N	300	10	200	30	5	5	20	L	15
E219	.03	N	150	L	70	N	L	20	N	N	N
E220	.07	N	200	L	150	N	L	30	30	N	L
E221	.07	N	150	10	150	30	L	15	N	L	L
E282	L	>10,000	150	30	L	L	7	7,000	>2,000	L	N
E283	.003	300	30	L	L	N	7	30	100	L	N
E284	.3	700	>5,000	L	30	L	N	1,500	>20,000	15	L
E285 2/	.02	>10,000	>5,000	L	L	N	100	>20,000	>20,000	N	L
E286 3/	L	3,000	500	L	N	N	70	>20,000	>20,000	N	L
E287	L	700	L	L	L	N	L	300	>20,000	N	N
E288	N	N	150	150	50	L	L	70	3,000	15	10
E289	.07	N	50	70	100	L	L	70	3,000	15	10

1/ Contains 30 ppm Au

2/ Contains 10 ppm Au

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
ALTERED ROCKS OF PRECAMBRIAN INTRUSIVE COMPLEXES--Continued											
E206	5	N	30	N	70	100	150	N	---	---	---
E244	N	L	N	1.5	20	300	N	N	---	---	---
Q831	N	N	50	N	7	500	3,000	N	2.0	2.0	10
Q834	N	N	100	N	N	150	500	N	2	<.5	<10
S822	N	N	20	L	10	300	100	N	>45	<.5	<10
ALTERED HOODOO QUARTZITE											
B899	N	N	5	1.0	N	1,000	150	N	---	---	---
B900	N	N	5	1	70	700	300	N	---	---	---
B946	N	N	10	1	50	300	500	N	---	---	---
B947	N	N	N	1	N	1,000	100	N	---	---	---
E259	L	N	7	1	30	L	200	L	---	---	---
E298	10	N	N	1	10	70	L	0.5	---	---	---
Q906	N	N	N	1	10	700	100	N	1.0	<0.5	<10
U4	N	N	N	N	2	100	10	N	---	---	---
ALTERED YELLOWJACKET FORMATION											
B937	N	N	20	L	150	L	150	N	---	---	---
B959	N	N	5	1.5	70	150	100	N	---	---	---
R148	N	N	N	N	7	30	70	N	2.0	<0.5	80
R149	N	N	N	5	N	15	N	N	1	<.5	160
S793	L	N	70	L	30	2,000	150	1.5	---	---	---
S794	L	N	5	1.5	150	700	100	.7	---	---	---
S795	10	L	N	1	L	100	N	L	---	---	---
VEINS AND MINERALIZED MATERIAL											
B936	N	N	N	1.5	N	50	100	N	---	---	---
B945	N	N	L	1.5	70	150	N	N	---	---	---
B948	N	N	N	1.5	N	20	N	N	---	---	---
B949	N	N	L	1	20	150	L	N	---	---	---
B950	N	N	N	1	N	500	100	N	---	---	---
B953	N	N	L	1	L	300	300	N	---	---	---
B954	N	N	15	1.5	50	300	500	N	---	---	---
B955	N	N	10	1	20	300	300	N	---	---	---
B956	N	N	L	1	N	100	L	N	---	---	---
B957	N	N	N	2	N	30	N	30.0	---	---	---
B958	N	N	20	L	N	200	300	N	---	---	---
D99	N	N	3	2	2	150	10	---	---	---	---
D101	7	N	N	1	2	150	10	N	---	---	---
D103	N	70	15	1	7	1,000	300	15	---	---	---
E213	N	N	N	1.5	L	500	L	L	---	---	---
E215	N	N	N	1.5	L	300	L	N	---	---	---
E216	15	N	N	1.5	L	700	L	L	---	---	---
E217	N	N	N	1.5	L	700	L	N	---	---	---
E218	N	N	N	1.5	10	1,500	150	N	---	---	---
E219	30	N	N	1.5	10	150	L	L	---	---	---
E220	20	N	N	1.5	L	700	L	L	---	---	---
E221	20	N	N	1.5	L	700	L	L	---	---	---
E282	N	N	L	N	L	70	L	300	---	---	---
E283	L	N	N	N	L	30	L	7	---	---	---
E284	5	N	N	1	15	70	150	700	---	---	---
E285	7	N	15	N	15	20	L	700	---	---	--
E286	7	N	7	N	10	20	L	500	---	---	---
E287	7	N	N	N	L	L	L	1,500	---	---	---
E288	N	N	L	1.5	10	100	L	30	---	---	---
E289	L	N	20	L	20	700	L	20	---	---	---

3/ Contains 20 ppm Au.

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
VEINS AND MINERALIZED MATERIALS--Continued											
E290	L	>10,000	300	L	L	L	7	15,000	>20,000	N	N
E291	0.005	>10,000	500	L	L	N	100	2,000	>20,000	N	N
E295	.07	N	300	300	50	L	10	100	150	50	30
P307	.15	10,000	5,000	20	150	50	<5	100	5,000	50	30
P308	.05	<200	1,000	<10	50	<20	5	70	300	70	<10
P309	.05	200	>5,000	<10	20	<20	5	2,000	2,000	30	<10
P315	.002	<200	100	<10	<10	<20	15	100	10,000	<10	<10
P316	.3	<200	5,000	150	200	70	15	300	15,000	20	20
Q506	.3	N	300	N	500	200	N	15	70	N	30
Q507	.15	N	70	N	300	200	N	3	50	N	30
Q508	.2	N	70	20	150	50	N	30	10	10	20
Q524	.02	N	300	70	N	N	15	>5,000	N	30	30
Q525	.01	N	1,500	10	30	N	15	2,000	N	200	50
Q526	.003	N	2,000	N	70	N	15	>5,000	N	150	70
Q527	.07	N	1,500	N	10	50	N	>5,000	N	70	70
Q528	.003	500	300	10	10	N	20	>5,000	N	70	>200
Q529	.005	N	1,500	N	30	N	15	2,000	N	70	70
Q530	N	N	5,000	7	N	N	20	15,000	N	---	15
Q575	.005	200	700	20	10	N	15	5,000	N	100	150
Q577	.02	N	1,500	15	20	N	15	>5,000	N	30	>200
Q578	.02	N	500	30	15	N	15	700	20	20	>200
Q579	.002	N	1,500	10	10	N	7	>5,000	N	N	100
Q580	.007	N	1,000	N	10	N	7	>5,000	N	10	10
Q581	.05	N	300	10	N	N	15	>5,000	N	N	7
Q583	.7	N	500	20	700	70	2	100	15	15	30
Q584	.3	3,000	>5,000	50	700	>1,000	30	70	N	10	>200
Q594	.3	N	1,000	70	N	N	5	20	15	N	5
Q595	.003	N	100	N	15	N	2	10	N	N	7
Q596	.07	N	300	15	100	N	7	70	N	200	150
Q614	.7	N	500	100	500	100	30	30	N	20	30
Q667	N	N	70	20	N	N	2	15	N	N	5
Q669	.5	N	300	100	300	30	3	20	N	N	20
Q670	.15	N	300	30	700	150	2	20	N	10	50
Q671	.07	N	200	20	50	70	2	20	N	N	>200
Q672	.003	N	20	20	N	30	N	N	N	N	70
Q746	.1	N	200	20	300	70	N	1	50	---	30
Q818	>1	N	3,000	100	500	70	2	30	10	N	50
Q821	.005	5,000	100	10	N	N	3	150	>20,000	N	7
Q822	.003	N	2,000	30	N	N	5	15	700	N	15
Q829	1	N	3,000	100	150	20	30	500	300	20	10
Q903	.01	N	300	5	N	N	10	30	N	---	10
Q904	.015	N	100	5	15	N	15	150	N	---	20
Q916	.2	N	300	30	70	30	7	15,000	30	---	10
Q917	.03	N	300	7	N	30	50	200	100	---	N
Q918	.1	N	150	N	300	70	N	20	10	---	30
Q922	.02	N	50	N	300	30	3	5	N	---	20
Q927	.1	N	30	7	150	N	N	5	N	---	N
Q928	.02	N	70	7	100	N	3	7	N	---	N
Q929	.02	N	30	N	70	N	5	7	N	---	N
Q930	.015	N	30	N	100	30	N	5	N	---	10
Q934	.7	N	1,000	30	70	30	10	700	N	---	30
Q936	.02	N	70	7	50	N	20	30	N	N	10
R151	.15	N	150	50	20	N	N	5	N	N	5
R152	.2	N	200	50	100	30	N	200	N	20	20
R156	.5	N	200	70	150	70	N	100	70	50	15
S48	.1	N	30	L	300	20	L	L	10	L	L
S248	.3	N	50	30	300	100	L	7	15	10	20
S249	.1	N	70	10	300	20	L	10	20	10	20
S250	.07	N	30	10	150	20	2	5	10	10	10
S251	.03	N	30	20	100	50	5	7	L	50	L

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
VEINS AND MINERALIZED MATERIALS--Continued											
E290	L	N	5	N	10	L	L	1,500.0	---	---	---
E291	5	N	30	L	10	L	L	500	---	---	---
E295	L	N	L	L	30	30	L	L	---	---	---
P307	N	N	<5	<1.0	<10	1,000	100	3	---	---	---
P308	N	N	<5	1	<10	50	<100	20	---	---	---
P309	N	N	<5	2	<10	20	<100	150	---	---	---
P315	N	N	100	<1	<10	1,000	<100	500	---	---	---
P316	20	N	<5	5	50	<20	300	300	---	---	---
Q506	15	N	N	1	15	150	100	.7	2.0	<0.5	20
Q507	N	N	N	1	7	100	150	N	2	<.5	60
Q508	5	N	N	1	10	1,000	200	3	3	<.5	40
Q524	70	N	50	N	15	20	N	15	>45	>30	20
Q525	5	N	70	N	N	7	N	N	>45	>30	<10
Q526	3	N	30	N	N	7	N	.5	>45	>30	<10
Q527	N	N	5	N	5	150	50	7	>45	>30	<10
Q528	70	N	30	2	5	5	N	15	>45	>30	10
Q529	10	N	30	N	N	N	N	1	>45	>30	10
Q530	N	N	20	N	N	30	N	.5	>45	>30	<10
Q575	7	N	30	N	5	5	N	.7	>45	>150	30
Q577	30	N	20	1	30	3	N	.15	>45	>150	10
Q578	15	N	10	N	100	70	N	15	14	90	>320
Q579	20	N	10	N	7	30	N	5	>45	>150	320
Q580	15	N	30	N	7	150	N	7	>45	>150	320
Q581	30	N	30	N	15	200	N	30	>45	>150	320
Q583	70	N	N	1	20	1,500	300	N	.5	6	160
Q584	N	N	30	30	200	700	70	N	>45	1	>320
Q594	N	N	5	N	7	500	N	N	3	1.5	20
Q595	N	N	N	N	7	10	N	N	1	.5	<10
Q596	N	N	N	N	15	100	N	N	.5	6	<10
Q614	N	N	30	3	70	700	300	N	.5	3	20
Q667	N	N	N	N	5	20	N	N	.5	1.5	<10
Q669	3	N	N	2	50	200	N	N	.5	<.5	10
Q670	20	N	N	5	20	500	70	N	2	<.5	10
Q671	N	N	30	1	10	30	N	N	.5	<.5	30
Q672	N	N	N	3	N	>5,000	1,000	N	.5	<.5	<10
Q746	15	N	N	2	3	3,000	300	N	.5	<.5	10
Q818	N	N	30	5	5	1,000	500	N	.5	<.5	<10
Q821	7	N	N	N	N	30	N	2,000	>45	<.5	120
Q822	N	N	N	N	5	50	N	15	>45	<.5	<10
Q829	3	N	20	1	100	100	300	5	27	<.5	<10
Q903	N	N	5	N	5	30	N	N	.5	<.5	<10
Q904	N	N	5	N	5	30	5	N	3	15	<10
Q916	N	N	15	N	3	70	7	7	>45	>300	40
Q917	N	N	150	N	2	15	15	10	5	<.5	10
Q918	N	N	N	1.5	5	200	30	N	2	6	40
Q922	N	N	N	N	7	15	N	N	2	1.5	<10
Q927	N	N	N	N	5	70	5	N	.5	.5	<10
Q928	10	N	N	N	5	100	15	N	2	1	20
Q929	N	N	N	N	5	30	10	N	3	.5	<10
Q930	N	N	N	N	5	30	5	N	.5	1	<10
Q934	N	N	15	N	2	300	100	N	>45	>300	240
Q936	3	N	7	N	5	70	15	N	.5	<.5	240
R151	5	N	N	2	N	50	N	N	.5	<.5	<10
R152	10	N	N	5	15	70	N	N	2	11	10
R156	N	N	N	20	N	150	50	20	3	<.5	60
SS48	L	N	L	1	L	1,500	200	N	---	---	---
S248	5	N	L	.5	5	1,000	100	N	---	---	80
S249	L	N	L	.15	L	500	50	N	---	---	40
S250	L	N	L	2	5	300	100	7	---	---	30
S251	5	N	L	.15	10	150	100	N	---	---	2,400

TABLE 1. — *Analyses of samples from the*

Semiquantitative spectrographic analyses

Sample	(percent) Ti (.002)	(ppm) Zn (200)	Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
VEINS AND MINERALIZED MATERIALS--Continued											
S252	0.03	N	70	15	300	20	2	5	L	20	L
S261	.15	L	300	15	300	100	15	7	100	L	30
S270	.15	L	500	100	300	150	30	30	30	L	70
S343	.15	3,000	2,000	100	100	70	20	30	300	50	20
S344	.2	5,000	3,000	200	150	70	70	200	3,000	30	30
S846	.5	N	200	200	700	N	30	100	15	L	20
U2	.15	N	100	N	300	N	N	10	15	N	50
U3	.15	N	100	15	200	70	N	10	20	N	30
ISSAN											
E192	0.2	N	500	30	150	30	7	30	L	L	15
E193	.2	N	70	15	150	L	5	7	N	L	L
E194	.7	N	700	100	200	30	70	30	15	L	15
E292[4]	.007	700	150	100	L	N	70	300	1,500	L	200
E293[5]	.005	N	30	300	L	N	L	70	200	L	100
E294	L	L	>5,000	30	L	150	70	15,000	150	N	200
E296	.1	L	1,500	70	30	500	10	70	70	L	20
E297	L	200	1,500	L	L	N	50	15,000	100	N	L
R649	.03	>10,000	30	L	30	30	N	1,500	>20,000	30	L
R714	.02	L	1,000	200	N	20	30	300	10	70	30
S345	.15	N	3,000	300	30	30	100	1,500	15	20	30
S346	.07	N	300	30	30	70	30	70	20	30	70
S377	.15	N	300	30	500	70	L	L	20	L	20
S382	.15	N	500	50	300	300	L	5	100	10	70
S386	.2	N	500	50	200	300	15	7	30	15	150
MISCELLANEOUS											
B964	0.07	300	300	700	50	30	N	10	L	N	20
E199	.007	N	1,500	L	L	30	7	L	N	N	>200
E242	.15	200	2,000	100	30	N	30	30	N	L	10
Q522	.002	300	1,000	N	20	N	10	>5,000	N	70	150
Q523	.1	N	2,000	70	N	N	3	150	N	30	30
R153	.2	N	200	30	700	N	N	5	N	20	N
R154	.3	N	300	150	50	50	30	5	N	10	15
R155	.7	N	200	150	500	100	100	5	N	70	30
U5	.003	N	300	N	N	N	N	3	---	N	N

4/ Contains 70 ppm Au.

Idaho Primitive Area, Idaho — Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm)								Chemical analyses (ppm)		
	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	CxHM (.5)	CxCu (.5)	As (10)
VEINS AND MINERALIZED MATERIALS--Continued											
S252	L	N	L	1.0	5	150	150	N	---	---	<10
S261	7	N	L	3	7	700	200	1.5	---	---	---
S270	L	N	N	3	5	700	100	L	---	---	---
S343	5	N	N	3	7	300	L	1	---	---	40
S344	30	N	10	3	70	300	150	50	---	---	80
S846	N	N	15	1	150	100	N	5	5.0	23.0	<10
U2	N	N	N	3	1.5	500	50	N	---	---	---
U3	5	N	N	3	10	200	10	N	---	---	----
GOSSAN											
E192	N	N	5	1.5	10	150	L	N	---	---	---
E193	N	N	N	1.5	L	150	L	N	---	---	---
E194	5	N	30	1.5	70	150	L	N	---	---	---
E292	L	N	15	L	10	50	L	10.0	---	---	---
E293	N	N	N	L	15	50	L	2	---	---	---
E294	L	N	5	L	10	200	L	7	---	---	---
E296	L	N	15	1.5	30	150	100	.5	---	---	---
E297	50	N	30	N	10	L	L	7	---	---	---
R649	5	N	N	L	10	L	N	1,500	---	---	---
R714	50	N	5	L	10	70	100	N	---	---	---
S345	70	N	70	3	70	100	L	L	---	---	<10
S346	N	N	N	3	15	150	150	L	45.0	15.0	15
S377	L	N	10	3	10	700	500	N	---	---	---
S382	5	N	L	7	15	300	200	N	---	---	---
S386	L	N	L	10	20	500	500	N	---	---	---
MISCELLANEOUS											
B964	N	N	N	L	50	200	200	N	---	---	---
E199	N	N	N	N	L	L	300	N	---	---	---
E242	L	N	5	1.5	70	1,500	500	N	---	---	---
Q522	N	N	N	N	N	5	N	2.0	>45.0	>30.0	40
Q523	N	N	30	N	15	70	70	N	20	>30	<10
R153	N	N	N	2	10	150	N	N	.5	.5	20
R154	N	N	N	N	150	2,000	1,000	N	1	.5	10
R155	N	N	5	1	200	500	100	N	.5	<.5	20
U5	N	N	N	N	2	15	20	N	---	---	---

5/ Contains 30 ppm Au.

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