STUDIES RELATED TO WILDERNESS

PRIMITIVE AREAS

CLEAR CREEK-UPPER BIG DEER CREEK AREA, IDAHO

GEOLOGICAL SURVEY BULLETIN 1391-C

Mineral Resources of the Clear Creek–Upper Big Deer Creek Study Area, Contiguous to the Idaho Primitive Area, Lemhi County, Idaho

By FRED W. CATER *and* DARRELL M. PINCKNEY, U.S. GEOLOGICAL SURVEY, *and* RONALD B. STOTELMEYER, U.S. BUREAU OF MINES

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An evaluation of the mineral potential of the area

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1975

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

V. E. McKelvey, *Director*

Library of Congress Cataloging in Publication Data
Cater, Frederick William, 1912-
Mineral resources of the Clear Creek-Upper Big Deer Creek study area, contiguous to the Idaho Primitive Area, Lemhi County, Idaho.
(Studies related to wilderness—primitive areas)
(Geological Survey Bulletin 1391-C)
Supt. of Docs. no.: I 19.3:1391-C
1. Mines and mineral resources—Idaho—Lemhi Co.
I. Pinckney, Darrell M., joint author. II. Stotelmeyer, Ronald B., joint author. III. Title: Mineral resources of the Clear Creek-Upper Big Deer Creek study area. IV. Series. V. Series: United States Geological Survey Bulletin 1391-C.
QE75.B9 no. 1391-C [TN24.I2] 557.3'08s [553'.09796'78] 75-619066

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402
Stock Number 024-001-02702-0

STUDIES RELATED TO WILDERNESS

PRIMITIVE AREAS

In accordance with the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Conference Report on Senate bill 4, 88th Congress, the U.S. Geological Survey and the Bureau of Mines are making mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System. Areas classed as "primitive" were not included in the Wilderness System, but the act provides that each primitive area be studied for its suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. This report describes the results of a mineral survey in the Clear Creek-Upper Big Deer Creek study area, contiguous to the Idaho Primitive Area, Idaho.

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MINERAL RESOURCES OF THE CLEAR CREEK-UPPER BIG DEER CREEK STUDY AREA, CONTIGUOUS TO THE IDAHO PRIMITIVE AREA, LEMHI COUNTY, IDAHO

By FRED W. CATER and DARRELL M. PINCKNEY, U.S. Geological Survey, and RONALD B. STOTELMEYER, U.S. Bureau of Mines

SUMMARY

The mineral survey of the Clear Creek-Upper Big Deer Creek area contiguous to the Idaho Primitive Area, Idaho, was made by the U.S. Geological Survey and the U.S. Bureau of Mines in 1972. The area, studied at the request of the U.S. Forest Service, consists of about 85 square miles (220 square kilometres) in the central part of the highlands of central Idaho adjacent to the northeast corner of the Idaho Primitive Area. Although the study area is near or adjacent to mining districts that have produced considerable mineral wealth in past years and that have a potential for future production, no evidence was found that indicates the presence of lode deposits of valuable metals. The area does contain several deposits of placer gold along the Salmon River and Panther Creek but all are economically submarginal.

The study area is underlain by rocks ranging in age from Precambrian to Tertiary. The oldest rocks are gneiss, schist, and quartzite that crop out through the central part of the area from Salmon River south to Big Deer Creek. Relatively low-grade metasedimentary rocks of the Precambrian Yellowjacket Formation underlie a few square miles in the southern part of the area. They are intruded by granitic rocks of the Cretaceous Idaho batholith and the Tertiary Crags pluton. Alluvial deposits occupy the valleys of the major streams.

Appraisal of the mineral resources of the study area involved reconnaissance geologic mapping and sampling of rocks, stream sediments, and placers. No rocks containing anomalous quantities of valuable metals were found. The results of the stream-sediment sampling program were generally negative except for anomalous tin values in the Upper Big Deer Creek drainage. The area has no potential for oil, gas, or coal, and contains no evidence of sources of geothermal energy.

Since discovery of gold in the Salmon River drainage in 1866, the gravel deposits in the study area have been intermittently prospected or worked for gold by small-scale methods. The investigation indicates a potential for the development of some gold placer resources along the Salmon River. An estimated 12.3 million cubic yards (9.4 million cubic metres) of gravel is on the south side of the Salmon River and west side of Panther Creek. Average near-surface gold values of gravel deposits are estimated to range from \$0.08 to \$0.61/yd^3 at a price of \$100/troy oz (0.032 to 0.247 g/m^3). Samples indicate values near bedrock range from about \$0.46 to \$2.60/yd^3 (0.186 to 1.053 g/m^3). Most deposits are partly covered with barren overburden. Undoubtedly, there are similar amounts of auriferous gravels on the north side of the Salmon River.

INTRODUCTION

The Clear Creek–Upper Big Deer Creek study area comprises about 85 mi^2 (220 km^2) of mountainous country along the northeast border of the Idaho Primitive Area in central Idaho (figs. 1 and 2). This report describes the geology and contains an evaluation of the mineral resources of the area.

Much of the area, particularly in the western part and along Salmon River, is rugged and has a local relief of more than 4,000 feet (1,200 m). Altitudes in the area range from about 3,000 feet (915 m) on the Salmon River at the northwest corner of the area to nearly 9,500 feet (2,900 m) on an unnamed peak west of Upper Big Deer Creek. Most of the area is accessible by a system of trails which are fairly well maintained and which start from roads bordering the area along the Salmon River, Panther Creek, and the head of Big Deer Creek. Some privately owned land is held along the Salmon River and the lower reaches of other major streams.

PREVIOUS INVESTIGATIONS

No geologic reports dealing specifically with the Clear Creek–Upper Big Deer Creek area have been published, but a number of reports cover adjacent or nearby areas. Vhay (1948) and Canney, Hawkes, Richmond, and Vhay (1953) have studied the Blackbird mining district. The Idaho Primitive Area was studied by Cater and others (1973), and the Salmon River Breaks Primitive Area by Weis, Schmitt, Tuchet, and Davis (1972). Other nearby areas have been described by Ross (1934), Anderson (1953, 1959), Larsen and Schmidt (1958), and Shockey (1957). Ross (1941) described briefly the ore deposits in the Blackbird and other nearby mining districts.

The U.S. Bureau of Mines made a field survey of the placer mining districts of Lemhi County in 1938. This report by S. H. Lorain and O. H. Metzger (1939) included descriptions of gold placer deposits in the study area. The gravel bars and placer workings on the north side of the river below the confluence of the Middle Fork were recently studied by E. T. Tuchek (Weis and others, 1972).

PRESENT INVESTIGATIONS

Fieldwork by the U.S. Geological Survey was done by F. W. Cater and D. M. Pinckney in August 1972. This work consisted of reconnaissance geologic mapping by foot traverses and geochemical sampling. The sampling program included collection and analyses of stream sediments and of both unaltered and altered rocks that might possibly be associated with metallization.

The U.S. Bureau of Mines conducted studies of placer deposits along the Salmon River and Panther Creek during the summer and fall of 1972. Field examinations were made by R. B. Stotelmeyer, accompanied by Ar-

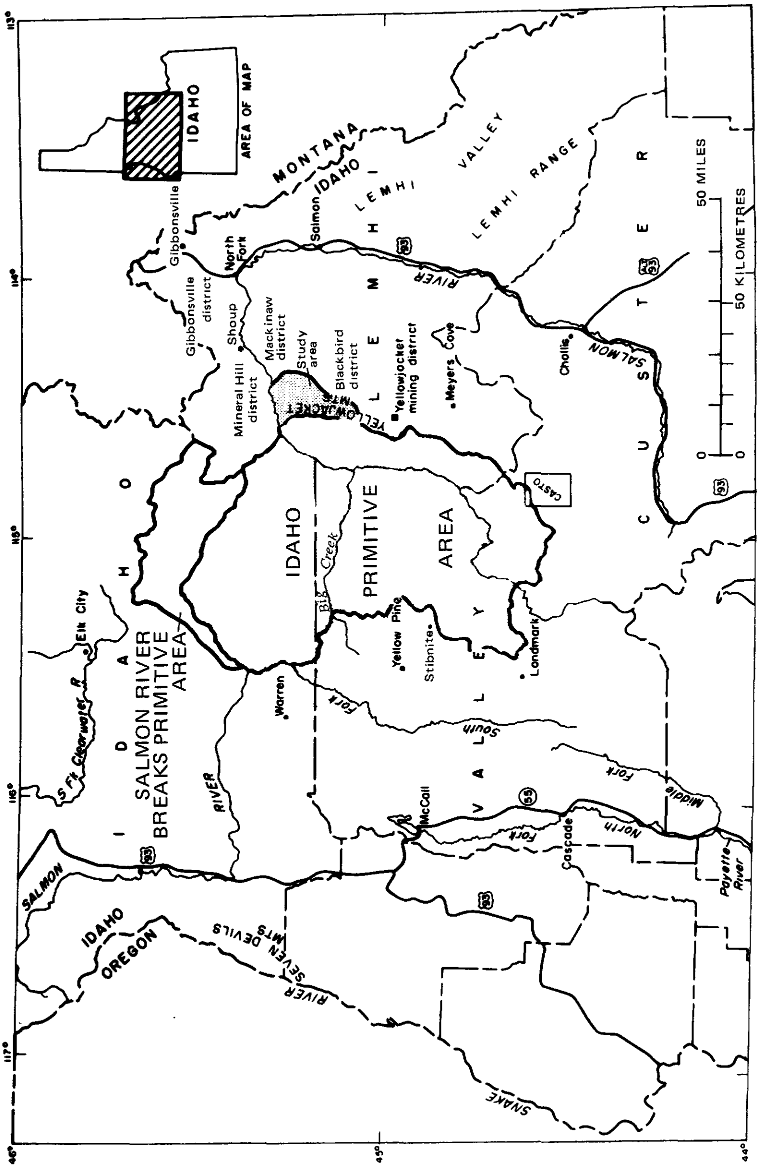


FIGURE 1.—Location of Clear Creek-Upper Big Dear Creek study area (patterned).

nold Mroz. They were assisted at various times by R. D. Weldin and 10 other individuals from the U.S. Bureau of Mines. Seismic studies of the gravel bars were done by Eldon C. Pattee and Steven Schmauch. Placer concentrates were processed by Dean C. Holt.

ACKNOWLEDGMENTS

The help and cooperation of local residents who aided in the studies, particularly Eller and Verla Watson at Ramshead Lodge, are appreciated.

GEOLOGY

GEOLOGIC SETTING

The Clear Creek–Upper Big Deer Creek study area is underlain chiefly by gneiss, schist, and quartzite (fig. 2), which may be parts of the same rock units that underlie much of the vast mountainous mass of central Idaho. Coarsely crystalline gneiss and schist and subordinate quartzite underlie the largest part of the area. These coarsely crystalline rocks may be overlain in the southern part of the area by fine-grained metasedimentary rocks of the Precambrian Yellowjacket Formation. All of the metamorphic rocks are intruded by granodiorite and quartz monzonite, partly of the Idaho batholith (Cretaceous), and partly of the Crags pluton (Tertiary). The youngest rocks are scattered dikes of Tertiary age.

PRECAMBRIAN ROCKS

GNEISS, SCHIST, AND QUARTZITE

A complex of gneiss, schist, and quartzite, thought to be at least in part of early Precambrian age, crops out along the Salmon River and extends as far south as Big Deer Creek. No attempt was made to map individual units within this complex. The gneiss is strongly differentiated into light and dark laminae and consists mostly of quartz, plagioclase, microcline, and biotite, but hornblende, garnet, and muscovite are abundant locally. Schist is mostly coarsely crystalline, particularly to the north, and consists largely of biotite, muscovite, plagioclase, and quartz. Some of the gneiss and schist contains a considerable amount of granitic and pegmatitic material, mostly as thin concordant masses. Quartzite occurs as thick, massive, vitreous layers and as thin, micaceous lenses. Thick, massive layers, which dip gently northward, form prominent ledges along the middle and lower reaches of Garden Creek.

The complex of ancient rocks is strongly folded. Axial planes of more tightly compressed folds are marked by zones of extreme distortion, and rodding in such zones is pervasive. Superposed on the major folds in many places are small-scale crossfolds ranging from a fraction of an inch to several feet across. The axes of these crossfolds are parallel to and trend down the dip of foliation.

The complex of highly folded rocks has not been dated directly. The contact with the Yellowjacket Formation in the upper part of the Big Deer Creek drainage is poorly exposed if, indeed, it is exposed at all. Possibly the Yellowjacket Formation is younger than the complex of gneiss and schist. All original sedimentary features in the complex, except gross compositional layering, have been destroyed by recrystallization and metamorphic segregation, whereas such features are abundant in the presumably younger Yellowjacket Formation. Rocks somewhat similar to the gneiss-and-schist complex form the basement in nearby areas in southwestern Montana, and some of these rocks are as much as 3.1 billion years old (Giletti, 1966).

YELLOWJACKET FORMATION

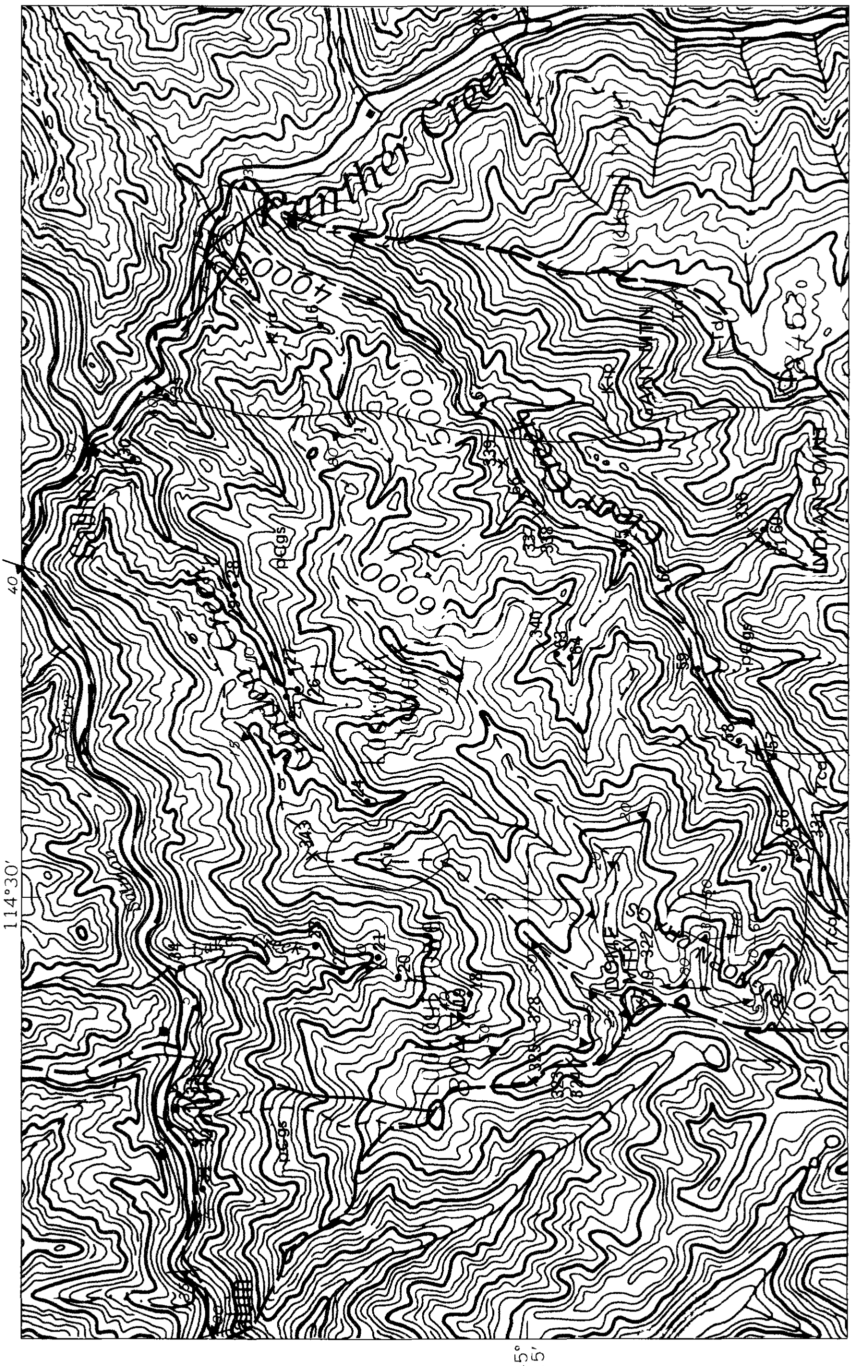
Within the study area the Yellowjacket Formation crops out only in a small area east of the headwaters of Big Deer Creek where it is well exposed along the road to Blackbird Mountain; the formation is well exposed also throughout large areas in the Idaho Primitive Area (Cater and others, 1973). Within the study area only dark-colored argillite, siltite, and impure quartzite crop out, but elsewhere the formation includes calcareous and metavolcanic rocks. Most of the rocks in the study area are thin bedded and fine grained, and have a distinct cleavage. Despite thorough recrystallization, sedimentary features such as crossbedding and graded bedding are preserved in many outcrops. Argillite and siltite are dark in color and consist of fine-grained aggregates of quartz, biotite, and muscovite; quartzite is light colored and contains more quartz than the argillite and siltite.

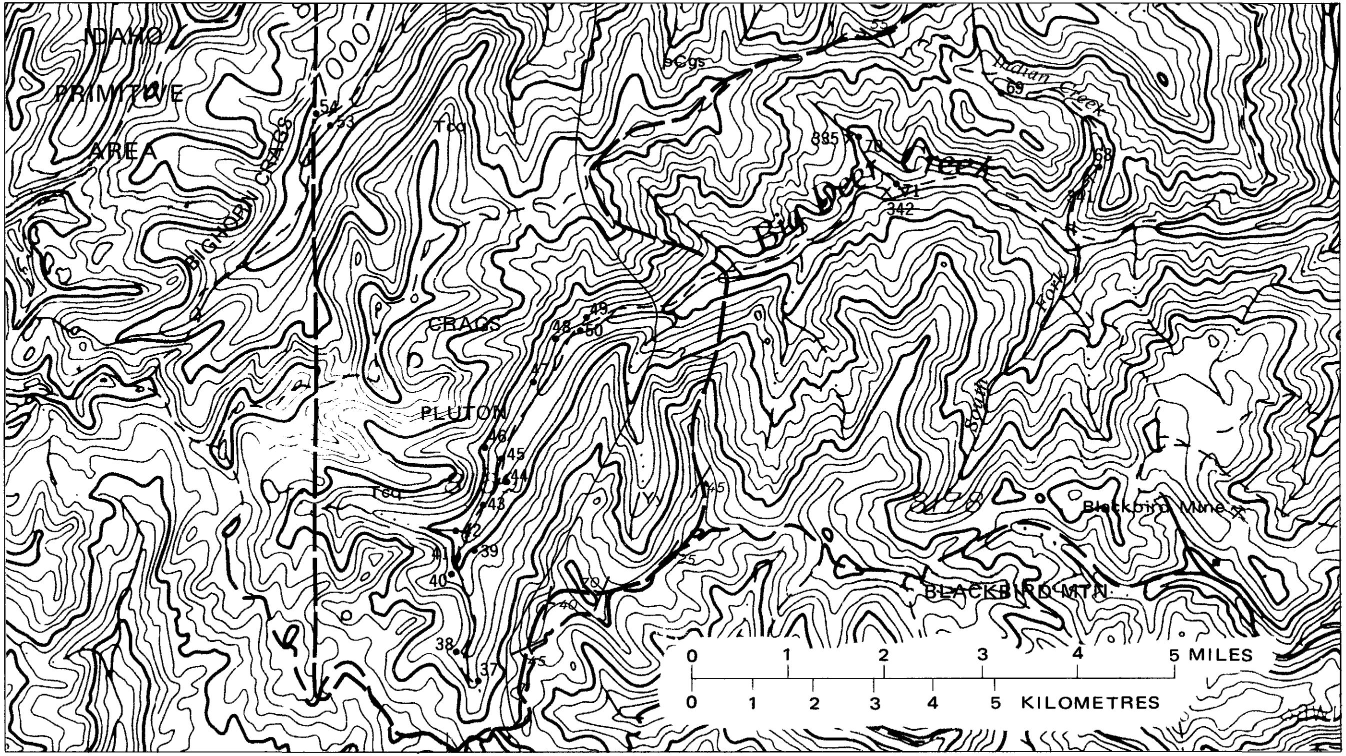
The thickness of the Yellowjacket is not known, but in nearby areas the exposed thickness must approach 10,000 feet (3,000 m) and the base is not exposed. Where exposed in the study area, the Yellowjacket is folded and crumpled, but not as much as in the Blackbird mine area a few miles to the east.

The Yellowjacket has long been and is still assumed to be equivalent to some part of the Belt Supergroup (as in Ross, 1934), a sequence of rock that is widespread in northern Idaho and western Montana. According to Ruppel (1974) the Yellowjacket is similar to and probably correlates with the lower part of a very thick sequence of Precambrian sedimentary rocks, which is extensively exposed in the northern part of the Lemhi Range and which Ruppel correlates with the Belt. Obradovich and Peterman (1968) found that the Belt Supergroup in western Montana spans the age interval from about 900 to 1,300 m.y. (million years), so the correlative Yellowjacket is of Precambrian Y age.

CRETACEOUS ROCKS

Granitoid rocks of the Idaho batholith, of Cretaceous age (Larsen and others, 1958), underlie much of central and northern Idaho; two masses of


Panther Creek
INDIAN POINT
114°30′
45°
15′
40



Base from U.S. Geological Survey Elk City, 1:250,000, 1956

114°30′

Geology by F. W. Cater and D. M. Pinckney, 1972

FIGURE 2.—Generalized geologic map of the Clear Creek–Upper Big Deer Creek study area. Explanation on following page.

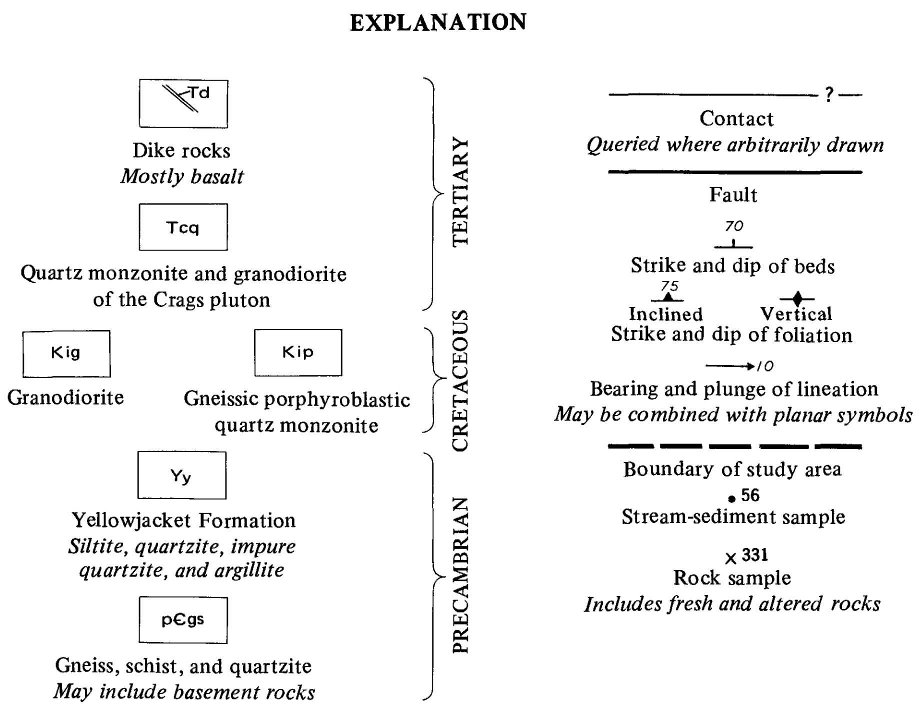


FIGURE 2.—Continued.

rock believed to be related to the batholith are exposed in the study area. Both masses are somewhat gneissic and recrystallized, and differ in these characteristics from most of the batholithic rocks elsewhere. Consequently, it is conceivable that both masses are prebatholith in age. Larsen and Schmidt (1958, p. 11-13) consider the larger mass in the eastern part of the study area to be a part of the batholith. The western mass, which crops out on the ridge west of the upper part of Garden Creek, is much smaller and probably does not exceed a square mile in outcrop area.

GNEISSIC PORPHYROBLASTIC QUARTZ MONZONITE

The body of igneous rock along the eastern side of the area is a gneissic porphyroblastic quartz monzonite of unusual appearance. Contacts with the enclosing gneiss and schist are fairly sharp, and locally, apophyses of quartz monzonite project into the gneiss and schist. The rock is gray and somewhat gneissic. It contains large porphyroblasts of perthitic orthoclase, many of which exceed 4 inches (10 cm) in diameter. In much of the rock, porphyroblasts constitute about half the volume of the rock. The much finer grained matrix tends to form folia that wrap around the porphyroblasts. Some of the porphyroblasts are fairly well formed crystals, but others are almost spherical. The gneissic groundmass is anhedral and crystalloblastic. It consists of biotite, quartz, oligoclase, and perthite, with accessory zircon, titanite, allanite, and opaque minerals.

GRANODIORITE

The small mass of igneous rock cropping out on the ridge west of upper Garden Creek is gray, medium-grained biotite granodiorite with a distinct foliation. Its contact with gneiss and schist is sharp where observed. The rock consists of somewhat perthitic orthoclase and microcline, oligoclase, quartz, and biotite. Scattered grains of hornblende occur sparingly; accessory minerals are magnetite, titanite, zircon, and allanite. The texture is anhedral and crystalloblastic. Inasmuch as this rock is not in contact with the porphyroblastic quartz monzonite, their relative ages are unknown.

TERTIARY ROCKS

Tertiary rocks include the Crags pluton, of Eocene age, and various dikes, some of which may be related to the Eocene Challis Volcanics which underlie large areas in the Idaho Primitive Area and to the south. Some dikes may be considerably younger than Eocene, perhaps as young as Miocene.

QUARTZ MONZONITE AND DIORITE OF THE CRAGS PLUTON

The Crags pluton crops out along the southwestern edge of the study area and forms most of the Bighorn Crags in and adjacent to the study area. The contact with older rocks is sharp. The pluton consists of medium-grained to coarsely porphyritic biotite quartz monzonite that locally grades into granodiorite. Border rocks of the pluton in places have porphyritic and aphanitic textures, which can be ascribed to chilling. The rock is light gray to cream colored where fresh and is massive, widely jointed, and resistant to erosion. The rocks consist of oligoclase, perthitic orthoclase, quartz, biotite, and minor hornblende. Opaque minerals, titanite, allanite, and zircon are accessory. Textures are hypidiomorphic. To the west in the primitive area the pluton cuts the Idaho batholith. Radiometric ages, determined by the potassium-argon method, of micas of three samples from the primitive area are 44.2 to 47.5 m.y. (R. L. Armstrong, written commun., 1971).

DIKES

Dikes are far less common in the study area than to the southwest in the primitive area, but scattered silicic and basalt dikes crop out, few of which were mapped because of their poor exposures. Most dikes strike north. The more silicic dikes range in composition from andesite to rhyolite, but rhyodacites are probably most common. These dikes are mostly buff, pink, or gray porphyries containing phenocrysts of feldspar and biotite. Few dikes exceed 10 feet (3 m) in thickness. Basalt dikes, some of them more than 100 feet (30 m) thick, crop out on the ridgetop between Gant Mountain and Indian Point. The basalt is dark and moderately fine grained. These dikes resemble Tertiary dikes that crop out southwest of the study area; hence, their age is probably Tertiary, also. The dikes to the southwest have already been described (Cater and others, 1973).

QUATERNARY ALLUVIAL DEPOSITS

Alluvial deposits, consisting of locally derived boulders and gravel, are present in areas too small to be shown on the geologic map (fig. 2). Above about 5,500 feet (1,680 m) elevation, the valleys of Clear Creek and Big Deer Creek were glaciated; they contain no alluvium or glacial deposits, and the streams flow on bedrock. Narrow strips of alluvium occur along Salmon River, along the lower mile of Clear Creek, and along Big Deer Creek near the mouths of the South Fork and Indian Creek. Elsewhere, alluvial deposits consist almost entirely of small fans at the mouths of tributary streams. Most of the material in the fans consists of coarse poorly sorted gravel and talus that have been transported only a short distance.

STRUCTURE

Foliation and compositional layering are parallel where observed in the presumably pre-Belt metamorphic rocks, which are complexly folded and crumpled. The axial planes of the larger folds are probably inclined and are marked by zones of extreme deformation and rodding. Small crossfolds, a fraction of an inch to several feet across, are conspicuous in most outcrops of these old rocks, and ptygmatic veins of granitic material are common. Because of time limitations, no attempt was made to map even the largest folds, but a large synform was noted trending northward through Dome Mountain.

The Yellowjacket Formation within the study area is structurally less complex than the gneisses and schists, and the beds generally dip southeast at moderate angles. However, to the east, outside the study area in the Blackbird mine area, the beds show extreme crumpling and folding. Both bedding and cleavage are visible in most outcrops; where seen together they tend to be parallel.

A few large faults marked by zones of highly sheared material are present near the mouth of Clear Creek and about 9 miles (14.5 km) up Clear Creek. A thick shear zone on the ridge west of upper Garden Creek is iron stained. Faults with small offsets may be present but were not recognized because of a lack of distinctive rock units and good exposures.

GEOCHEMICAL STUDIES

The study area is in a region that has yielded considerable mineral wealth and therefore may have a potential for future yield; however, no rocks potentially productive of fossil fuels (coal, oil, and gas) exist in the area, and no surface evidence of potential sources of geothermal energy is present. The mineral potential of the area is evaluated with the aid of geochemical studies whereby trace amounts of certain elements that constitute halos of, or erosional products from, a mineral deposit are detected and serve as a guide to obscure mineral concentrations. Numerous prospectors, who have combed the area for more than 100 years, could not have overlooked any large visible ore bodies, yet none have been found, even though rock types and geologic structures like those in which ore deposits have been found elsewhere occur throughout the area. Evidence of metallization, such as altered rocks, leached rocks that may have contained ore, or geochemical halos, is scarce in the study area.

Testing and appraising the area involved a search for altered or leached rocks and sampling to determine the presence of geochemical halos. Because of the virtual absence of altered and leached rocks, heaviest reliance in evaluating the mineral potential of the area was placed on stream-sediment sampling. This method provided maximum information consistent with rapid coverage, because such samples contain not only erosional detritus from upstream rock masses but also the metallic ions from stream waters adsorbed on silt and clay particles.

All the larger streams and their side drainages were sampled and analyzed, and, in addition, samples were collected from tributaries of Big Deer Creek outside the study area, most importantly from the tributary draining the area at the north end of the Blackbird district. This was done so that analytical results from the edge of a known mineralized area could be compared with results from areas not known to be mineralized.

ANALYTICAL TECHNIQUES AND RESULTS

All samples were analyzed by semiquantitative spectrographic methods for 30 elements. In addition, the stream-sediment samples were analyzed chemically for copper, arsenic, cobalt, and citrate-soluble heavy metals. Spectrographic analyses generally corroborated the results of chemical analyses, but differences in results are marked for some stream-sediment samples. (See table 1.) These differences occur because the spectrographic analyses measure the total content of the element in question, whereas the chemical methods measure the amount of the surface-adsorbed element. Stream-sediment samples containing unusually large amounts of metal, determined spectrographically, indicate that mineralized rock outcrops in the drainage basin, whereas high-metal values determined by the citrate-soluble method may indicate metal concentrations at depth beneath the drainage basin inasmuch as some of the surface water once circulated as ground water.

The analytical results from samples in this study area are not strictly comparable with those taken in previous years from the Idaho Primitive Area (Cater and others, 1973). The analytic techniques have been refined, and detection limits for some elements have changed. The bias introduced by these techniques and detection limits, however, is not thought to be sufficient to preclude comparisons, although the background levels for citrate-soluble heavy metals and for copper by chemical test are higher for samples from this area than for samples from the Idaho Primitive Area.

A few samples of stream sediments, numbers 20, 21, 35, 46, 47, and 68, contain higher than background amounts of some metals. Samples 20 and 21 contain some lead and citrate-soluble heavy metal, probably from the altered rock at the head of Lake Creek and the iron-stained shear zone on the ridge west of Garden Creek. Samples 46 and 47 contain some lead and citrate-soluble heavy metals, probably from altered parts of the Crags pluton that were noted by J. S. Vhay (written commun., 1972). The small amount of cobalt in sample 35 probably is related to the contact of the large body of porphyroblastic quartz monzonite, which is slightly altered in many places. Several samples from upper Big Deer Creek contain as much as 700 ppm (parts per million) tin; these samples may represent concentrates of heavy tin-bearing minerals from the granitic rocks, which locally contain small amounts of tin.

Sample 68 is from Indian Creek, outside the area, at the extreme northern edge of the Blackbird mining district. Water from a small prospect drains into the creek several hundred feet above the sample site. The entire area has been very thoroughly prospected by extensive trenches and cuts. The only sign of mineralization found by us was a single oxidized and leached vein, only a few inches wide. In spite of the sparsity of mineralization, sample 68 contained 500 ppm copper, 200 ppm cobalt, and 200 ppm arsenic—much more than any other stream-sediment sample.

Spectrographic analyses of fresh rocks, altered rocks, and miscellaneous materials are shown in table 1. The analyses of the fresh and altered rocks are fairly uniform among the samples; the slight variations are consistent with variations expected in rocks of the types sampled. The two samples of altered rocks do not differ appreciably from the fresh rocks.

Samples 340, 341, and 342 (table 1) include a sample of oxidized material from the vein in the Blackbird district mentioned above, a secondary coating of malachite, and a sample from a spring deposit. The vein material is high in copper, cobalt, and arsenic, which is expectable from a vein at the edge of the Blackbird mining district. The chief ore minerals in the district are chalcopyrite ($CuFeS_2$) and cobaltite ($CoAsS$). The coating of malachite is rich in copper only, and represents a very small amount of metal deposited by ground water. The spring deposit is mostly covered by a mantle of soil; it is highly calcareous and appears to be tufa, such as is deposited by hot springs. The tufa sample is not enriched in any valuable metal.

Our investigations lead us to conclude that although sizable metallic deposits are known adjacent to the study area, the surficial mineral resources potential within the area is low.

ECONOMIC APPRAISAL

By Ronald B. Stotelmeyer, U.S. Bureau of Mines

SETTING

The Clear Creek-Upper Big Deer Creek study area in Lemhi County is bounded on three sides by productive mining districts: the Mineral Hill district to the north, the Mackinaw (Leesburg) district to the east, and the Blackbird district to the south (fig. 1). Lemhi County has produced 515,000 troy oz (16,000,000 g) of gold (Staley, 1946, p. 22) and cobalt, nickel, copper, molybdenum, silver, and lead. A major portion of this production was from the northwestern part of the county within 20 miles (32 km) of the study area.

The Mineral Hill district contains inactive gold lode and placer mines in the Owl Creek drainage. Owl Creek empties into the Salmon River near the upstream end of a series of auriferous gravel deposits in the study area (fig. 3). Gold from this drainage and other drainages upstream are the probable source of the placer values in the deposits examined. Lode mines at Shoup, which is on the Salmon River several miles upstream from the study area, are considered to be some of the most promising gold lode mines in Lemhi County.

Other sources of gold include numerous lode and placer deposits in the Gibbonsville district on the North Fork of the Salmon River, the Mackinaw (Leesburg) district, which borders the study area on the east, and the Blackbird district to the south. The Mackinaw district includes

TABLE 1.—*Analyses of samples from the Clear Creek–*

[ppm, parts per million; CxHM, citrate-soluble heavy metals; CxCu, cold-extractable copper; number in parentheses indicates sensitivity limit of method used; L, indicates detected, but below limit of determination; N, indicates that the element was looked for but not found; ---, not determined. Also looked for and not found or present in amounts

	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										
16	0.7	N	1,000	100	300	100	30	20	30	10	150
17	1.0	N	1,500	70	1,000	150	10	20	10	L	100
18	.3	N	300	70	200	30	20	20	N	20	20
19	.3	N	150	50	200	N	10	15	15	15	30
20	.3	N	200	70	200	20	20	15	150	50	30
21	.2	N	150	70	200	30	15	15	50	20	30
22	.5	N	300	70	300	30	15	20	15	N	50
23	.2	N	200	70	200	30	20	20	15	70	30
24	.3	N	200	70	300	70	15	20	N	30	50
25	.3	N	150	70	300	70	15	15	10	20	70
26	1.0	N	1,500	150	1,000	100	10	20	15	L	70
27	1.0	N	1,500	100	300	70	15	15	10	L	70
28	.7	N	1,000	100	200	50	10	20	10	10	70
29	.3	N	200	70	200	50	7	15	10	10	30
30	.5	N	200	70	300	30	7	10	10	10	30
31	.3	N	300	70	150	70	10	15	15	20	30
32	.2	N	300	70	150	20	15	70	10	20	20
33	.2	N	200	70	200	30	15	30	15	30	50
34	.5	N	500	100	300	30	20	50	15	30	70
35	.3	N	300	70	150	L	30	100	15	20	30
36	.7	N	700	100	200	150	20	15	15	10	150
37	.05	N	300	L	200	20	5	20	50	N	70
38	.2	N	700	20	300	70	7	10	10	N	100
39	.05	N	200	10	200	30	5	15	50	N	20
40	.2	N	500	30	300	50	5	15	70	N	300
41	.2	N	1,000	30	300	30	7	20	30	N	100
42	.2	N	500	30	200	100	5	10	70	N	100
43	.3	N	700	30	300	200	5	7	70	N	150
44	.07	N	150	L	100	N	5	15	20	N	30
45	.1	N	200	L	200	20	L	5	20	N	20
46	.15	N	700	20	100	30	5	15	50	N	100
47	.2	N	700	30	300	50	L	15	100	N	100
48	.2	N	600	30	200	100	5	15	50	N	70
49	.15	N	700	20	300	50	L	7	30	N	100
50	.1	N	150	10	150	20	L	5	15	N	70
53	.2	N	200	20	100	50	5	10	30	N	20
54	.3	N	500	30	500	300	L	5	15	N	70
55	.15	N	150	10	500	70	L	15	15	N	30
56	.3	N	500	70	300	20	15	20	20	N	20
57	.2	N	200	20	200	70	5	15	15	N	20
58	.2	N	200	70	200	20	15	7	10	10	20
59	.3	N	300	70	100	20	30	50	20	15	15
60	.3	N	150	70	300	30	30	50	N	N	50
61	.5	N	200	70	300	30	20	30	10	30	20
62	.2	N	150	70	300	50	15	15	10	N	30
63	.3	N	200	70	500	50	20	70	10	N	50
64	.15	N	150	50	200	30	15	15	10	20	30
65	.3	N	150	70	300	50	30	20	10	30	30
66	.3	N	300	70	200	70	10	15	10	N	30
67	.5	N	300	70	300	70	20	15	10	N	70
68	.2	N	150	30	300	30	15	500	N	50	30
69	.2	N	200	50	300	30	10	15	10	20	30
70	.3	N	150	50	300	20	15	20	N	N	10
71	.2	N	300	100	70	20	20	15	15	20	100

Upper Big Deer Creek study area, Lemhi County, Idaho

normal for type of material sampled were, Ca (.05), Mg (.02), Fe (.05), in percent, and Mn (10), Au (10), Bi (10), Cd (20), Nb (10), Sb (100), Sc (5), and W (50), in parts per million. Analysts: R. N. Babcock, B. Crim, C. A. Curtis, J. A. Domenico, R. T. Hopkins, R. W. Leinz, R. C. Miller, and D. F. Siems]

	Semiquantitative spectrographic analyses--Continued (ppm)									Chemical analyses (ppm)		
Sample	Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	As (10)	CxHM (.5)	CxCu (.5)	As (10)
Stream-sediment samples--Continued												
16	N	N	15	1.5	70	500	N	N	---	4	3	N
17	N	N	10	1.0	30	150	100	N	---	3	4	N
18	N	N	10	1.5	50	200	L	.5	---	1	4	L
19	N	N	N	1.5	30	300	100	N	---	L	4	N
20	N	N	5	2.0	70	150	100	.5	---	20	3	N
21	N	N	5	1.5	30	200	150	.5	---	17	5	N
22	N	N	15	1.5	30	300	100	N	---	4	3	N
23	N	N	15	1.5	50	200	100	L	---	3	5	N
24	N	N	15	1.5	30	200	100	N	---	7	4	L
25	N	N	15	1.0	50	150	100	N	---	4	1	L
26	N	N	15	1.0	20	150	200	N	---	5	2	N
27	N	N	15	1.0	50	150	300	N	---	7	5	N
28	N	N	15	1.0	30	200	200	N	---	5	1	N
29	N	N	10	1.5	30	150	150	N	---	3	3	L
30	N	N	15	1.5	30	300	150	N	---	3	3	L
31	N	N	15	1.5	50	300	150	N	---	7	10	10
32	N	N	15	2.0	70	200	150	N	---	2	4	N
33	N	N	15	2.0	50	150	150	N	---	3	4	N
34	N	N	15	1.5	70	150	100	N	---	1	4	N
35	N	N	150	2.0	50	150	150	N	---	4	15	L
36	N	N	15	2.0	70	150	100	N	---	9	N	N
37	N	30	N	20.0	N	L	N	N	---	1	2	N
38	N	700	N	10.0	10	30	N	L	---	5	5	N
39	5	15	N	15.0	N	20	N	N	---	5	3	N
40	10	20	N	30.0	10	50	N	N	---	3	1	N
41	L	20	7	20.0	15	70	N	N	---	---	---	N
42	5	20	N	15.0	L	70	N	N	---	5	3	N
43	N	300	N	7.0	10	50	N	N	---	4	3	N
44	7	10	N	7.0	N	30	N	L	---	4	2	N
45	10	10	N	7.0	N	20	N	N	---	7	3	N
46	5	30	N	15.0	L	30	N	N	---	14	2	N
47	L	20	N	20.0	10	70	N	N	---	17	3	N
48	N	20	N	10.0	10	70	N	N	---	5	2	N
49	N	10	N	10.0	10	70	N	N	---	2	L	N
50	N	15	N	7.0	N	30	N	N	---	1	3	N
53	N	N	N	2.0	L	150	100	N	---	2	1	N
54	N	10	N	3.0	L	100	100	N	---	3	1	N
55	N	L	N	3.0	10	100	L	N	---	1	N	N
56	N	N	5	2.0	50	150	150	N	---	4	4	N
57	N	L	N	3.0	15	100	100	N	---	3	4	---
58	N	N	10	2.0	30	150	100	N	---	2	N	N
59	N	N	10	3.0	50	150	100	L	---	4	4	N
60	N	N	10	3.0	50	150	150	N	---	4	3	N
61	N	N	10	1.0	50	150	100	N	---	1	2	N
62	N	N	7	1.5	30	200	100	N	---	9	3	N
63	N	N	7	2.0	50	300	150	N	---	4	L	N
64	N	N	15	1.0	30	300	150	N	---	1	5	N
65	N	N	20	1.5	70	200	100	N	---	4	7	N
66	N	N	10	2.0	30	150	150	N	---	7	4	N
67	N	N	10	3.0	50	150	150	N	---	4	3	N
68	N	N	200	1.5	30	150	L	N	---	17	90	20
69	N	N	5	1.5	30	200	100	N	---	9	7	N
70	N	N	10	L	20	150	L	N	---	1	4	N
71	N	10	15	1.0	30	150	1,500	.5	---	2	5	N

TABLE 1—*Analyses of samples from the Clear*

Semiquantitative spectrographic analyses--Continued

Sample	(percent) Ti (.002)	Zn (200)	(ppm) Mn (10)	V (10)	Zr (10)	La (20)	Ni (5)	Cu (5)	Pb (10)	B (10)	Y (5)
					ROCK SAMPLES						
					Unaltered rocks						
319	0.2	N	50	10	70	N	5	15	20	10	10
320	.3	N	500	50	100	30	N	5	L	L	30
321	.3	N	70	50	100	20	20	50	N	10	10
322	.05	N	L	L	30	N	5	L	N	L	L
324	.15	N	100	10	100	20	7	L	L	L	15
325	.3	N	150	70	100	20	20	L	L	L	20
326	.2	N	200	50	100	50	20	L	10	20	20
327	.07	N	20	L	50	20	5	L	10	15	L
328	.1	N	20	L	70	20	L	L	L	10	L
331	.2	N	200	20	100	30	10	L	L	L	20
335	.1	N	300	L	30	20	L	L	15	L	20
336	.015	N	200	L	70	20	L	L	20	L	70
337	.03	N	200	L	70	20	L	L	30	L	70
338	.07	N	20	L	30	20	L	L	10	L	L
339	.07	N	200	L	300	50	L	L	L	L	70
344	.2	N	100	20	50	30	5	10	L	L	20
					Altered rocks						
323	0.3	N	70	50	150	20	5	L	N	15	15
343	.07	N	50	15	70	20	5	20	N	10	10
					Miscellaneous rocks						
340	0.07	N	20	10	200	N	5	2,000	L	10	L
341	.02	N	20	L	N	N	20	5,000	10	L	10
342	.1	N	150	20	70	N	7	100	N	L	15

the rich placer deposits on Napias and Beaver Creeks, tributaries of Panther Creek, which forms the northeast boundary of the study area.

The Blackbird district, which includes the Clear Creek–Upper Big Deer Creek study area, is the site of the most important cobalt deposit in the United States. Production from this district, mostly between 1951 and 1968, included copper, cobalt, gold, silver, and nickel valued at more than $36 million. Mining claims in this district overlook Clear Creek, and mining operations are visible from the proposed wilderness. Claims in the Big Deer Creek drainage are within a mile of the study-area boundary.

METHODS OF STUDY

Lode-mining-claim data pertaining to the Clear Creek–Upper Big Deer Creek study area were abstracted from Lemhi County records. Following a brief field reconnaissance to examine the few lode claim locations, the Bureau's work in the study area was directed to evaluation of gold placer deposits along the Salmon River and lower Panther Creek. Reconnais-

Creek–Upper Big Deer Creek study area—Continued

Sample	Semiquantitative spectrographic analyses--Continued (ppm) Mo (5)	Sn (10)	Co (5)	Be (1)	Cr (5)	Ba (10)	Sr (100)	Ag (.5)	As (10)	Rock type
ROCK SAMPLES--Continued										
Unaltered rocks--Continued										
319	N	N	N	1.0	15	500	100	N	N	Quartz.
320	N	N	10	1.0	50	300	100	N	N	Schist.
321	N	N	10	L	50	150	L	N	N	Do.
322	N	N	N	L	L	100	N	N	N	Quartz.
324	N	N	N	1.5	20	300	150	N	N	Do.
325	N	L	7	1.0	50	300	100	N	N	Gneiss.
326	N	L	7	1.5	50	300	150	N	N	Do.
327	N	N	N	1.0	L	1,000	150	N	N	Do.
328	N	N	N	1.0	10	150	N	N	N	Do.
331	N	N	5	2.0	30	300	150	N	N	Do.
335	N	L	L	2.0	N	100	L	N	N	Crags pluton.
336	N	20	N	5.0	N	L	N	N	N	Alaskite float.
337	N	10	N	3.0	N	20	N	N	N	Do.
338	N	N	N	1.0	N	500	200	N	N	Gneiss.
339	N	N	N	1.0	N	L	N	N	N	Do.
344	N	N	7	L	10	100	N	N	N	Idaho batholith.
Altered rocks--Continued										
323	N	N	7	1.0	30	50	100	N	N	
343	N	N	5	1.0	10	500	L	N	N	
Miscellaneous rocks--Continued										
340	N	N	15	1.0	L	150	N	N	N	Malachite.
341	N	N	500	N	10	L	N	N	1,000	Vein.
342	N	N	7	N	30	200	1,000	N	N	Tufa.

sance pan samples were taken, and test pits and trenches were dug into the larger deposits. Bulk samples from the pits and trenches were concentrated by using a vibrating mechanical sluice box and further concentrated by processing on a Wilfley table. Concentrates were amalgamated to determine gold content and some were examined petrographically.

The gold content of the placer gravels is expressed, in this report, in terms of dollars per cubic yard and(or) grams per cubic metre. In calculating the gold content in terms of dollars, a price of $100 per troy ounce was used.

LODE CLAIMS

The only known lode claims locations in the study area were a group called the White Rock, located in 1954 somewhere along Clear Creek. Vague descriptions indicate other claims are 1 mile south of Clear Creek, and overlooking Golden Trout Lake in the Bighorn Crags. These areas were examined, but no indication of prospecting or mining activities was seen.

PLACER DEPOSITS

The only mineral commodity of significance in the study area is gold. A variety of factors has caused the price of gold to be in a rising trend that began at $35 troy oz and has been higher than $200 troy oz since 1968. If a high price for gold is sustained, some of the gravel deposits along the Salmon River in the study area may be economically minable. Additional exploration would be required to determine the average grade and verify the economic feasibility of mining. Gold in gravel deposits along the river upstream from Middle Fork and on Panther Creek has resulted from erosion of gold-bearing rocks along the upper Salmon River and its tributaries (fig. 3). Downcutting of the Salmon and its tributaries has resulted in the perching of parts of ancient gold-bearing river bars in terraces or benches several hundred feet above the present river level. These bench gravels have contributed gold to lower benches through a reworking process.

The size and grade of the principal placer deposits are shown in table 2.

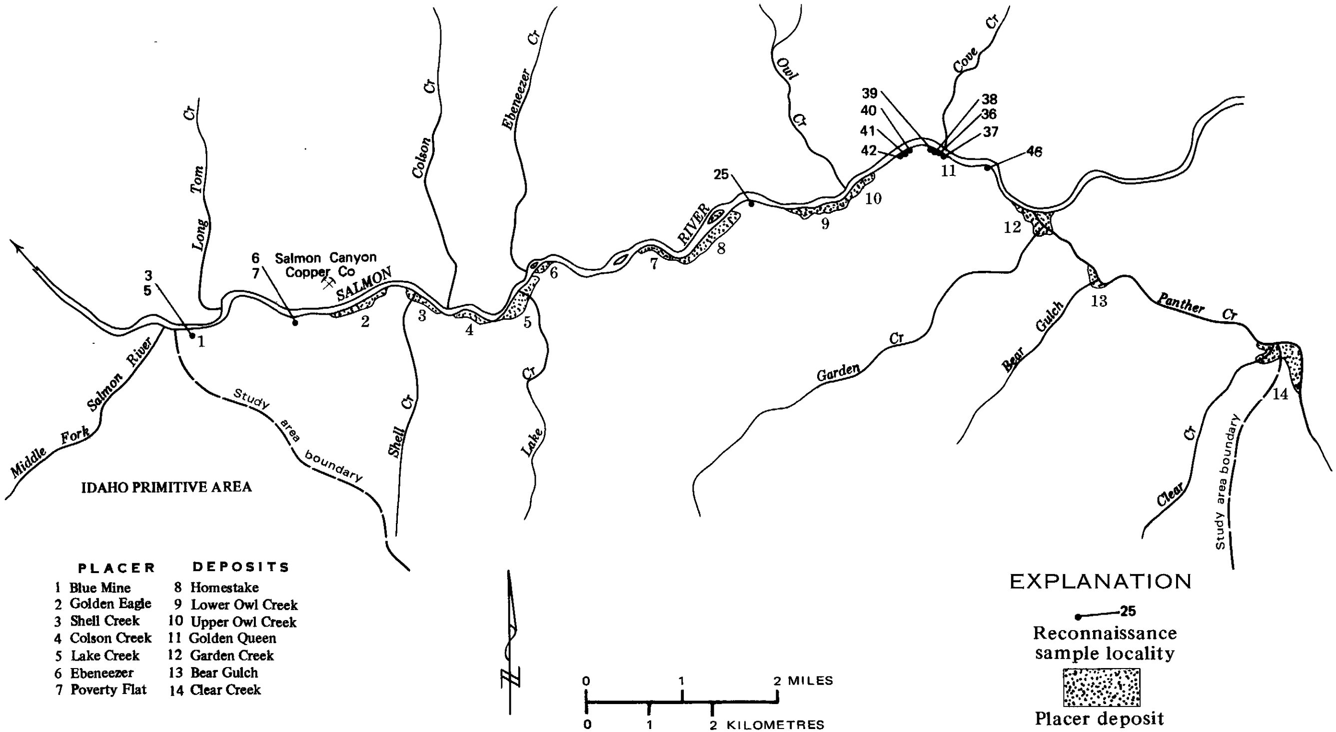
Fourteen major deposits (fig. 3) were sampled (12 by test pitting and trenching). A total of 12,246,000 yd^3 (9,368,000 m^3) of gravel is estimated to occur in these deposits. Two of these deposits extend outside the study area. In addition, 50,000–80,000 yd^3 (38,000–61,000 m^3) of auriferous gravel is estimated to occur in other small river bars and deposits.

Bench gravels, consisting of rounded and well-sorted igneous and metamorphic clasts as much as 2 feet (0.6 m) in diameter, contain most of the gold. Larger boulders possibly occur at depth in the thicker gravel. Bedrock schist and gneiss beneath the gravels have been scoured smooth, though not level, in the few places where they were observed. Interiors of the high benches were not examined or sampled. Freshly eroded exposures show that the composition of the high benches is about the same as that of the low benches.

Data for reconnaissance samples shown in figure 3

Sample No.	Gold content		Remarks
	Cents per cubic yard[1]	Grams per cubic metre	
3	8	0.032	Undisturbed gravel between old placer workings.
4	112	.454	Do.
5	15	.061	Do.
6	15	.061	Do.
7	8	.032	Do.
25	< 2	< .008	Beach gravel.
36	11	.045	Do.
37	12	.049	Do.
38	23	.093	Sand near bedrock.
39	29	.117	Beach gravel.
40	5	.020	Do.
41	8	.032	Do.
42	47	.190	Do.
46	234	.947	Sandy clay on bedrock.

[1] Calculated using a gold price of $100.00 per troy ounce.



PLACER DEPOSITS

1 Blue Mine	8 Homestake
2 Golden Eagle	9 Lower Owl Creek
3 Shell Creek	10 Upper Owl Creek
4 Colson Creek	11 Golden Queen
5 Lake Creek	12 Garden Creek
6 Ebeneezer	13 Bear Gulch
7 Poverty Flat	14 Clear Creek

FIGURE 3.—Placer deposits in the Clear Creek–Upper Big Deer Creek study area.

TABLE 2.—*Principal gold placer deposits in the study area*

	Extent of deposit (hectares)	Overburden (cubic metres)	Gravel (cubic metres)	Range of sample values of gold in gravel: grams per cubic metre	Range of sample values of gold in gravel: cents per cubic yard at $100 per ounce
Bear Gulch	5.0	299,000	298,000	(1)	(1)
Blue Mine	.01	0	765	[2]0.032–0.454	8–112
Clear Creek (low bench)[3]	5.2	0	285,000	.008	< 2
(high bench)[3]	4.4	0	672,000	< .008–1.057	< 2–261
Colson Creek	3.2	0	288,000	.008– .024	< 2– 6
Ebeneezer	1.6	0	52,000	< .008– .202	< 2– 50
Garden Creek[3]	4.7	138,000	334,000	< .008	< 2
Golden Eagle	2.9	59,500	222,000	.044– .563	11–139
Golden Queen	(4)	(4)	(4)	[2].044– .093	11– 23
Homestake (low bench)	13.0	592,000	1,469,000	(5)	(5)
(high bench)	8.6	0	275,000	.061– .656	15–162
Lake Creek (high benches)	10.3	0	2,680,000	< .008– .024	< 2– 6
Lower Owl Creek (low bench)	11.9	283,000	820,000	(1)	(1)
(high bench)	4.7	0	458,000	(1)	(1)
Poverty Flat	6.5	161,000	398,000	< .008– .178	< 2– 44
Shell Creek	4.5	48,600	455,000	.020– .575	5–142
Upper Owl Creek Placer (low bench)	4.3	118,500	386,000	.062– .308	15– 76
(high bench)	1.7	0	265,000	(6)	(6)

[1]Test pits and trenches did not penetrate through overburden.
[2]Reconnaissance samples.
[3]Includes only that part in the Clear Creek–Upper Big Deer Creek study area.
[4]Not estimated.
[5]Overburden has values as much as 0.019 grams per cubic metre; gravel was not sampled on the low bench. Values in top 6 feet of island were < 0.006 grams per cubic metre.
[6]Not sampled.

Alluvial fans that are nearly barren of gold cover most of the low benches and form a thin cover on the high benches. This alluvial material is poorly sorted, consisting of mostly silt and a few rounded cobbles and boulders as much as 10 feet (3 m) in diameter. The majority of the rock fragments are angular, with sharp edges which indicate that the fan material was derived from nearby canyon walls and tributary canyons.

PLACER MINING

Every placer deposit in the study area along the Salmon River contains some evidence of past mining activities, such as old workings, pieces of equipment and machinery, and claim corners. Although no records were found of gold production in the Clear Creek–Upper Big Deer Creek study area, evidence indicates that several thousand cubic yards of placer gravels have been processed. On the south side of the Salmon River, small mining operations have been conducted on Homestake, Ebeneezer, and Golden Eagle placers (fig. 3). The largest operations were on the north bank in the Cove Creek area, on the placer opposite Owl Creek, and in the Poverty Flat area. Easily accessible gravels between the large deposits were worked by small-scale methods to mine the high-grade gravel. The deposits at the mouth of Panther Creek and at Poverty Flat are covered by patented placer claims.

Development of the Salmon River placer deposits has been limited by the large amount of overburden covering the river gravels. The overburden has resulted from rockfalls near steep canyon walls and from the accumulation of large volumes of barren rock from tributary canyons. Placering on the south side of the river has been limited by lack of access across the river as well.

Mining activities were by small-scale methods, probably employing no more than four men. Gold recovery was by means of sluice boxes, rockers, and gold pans. There is some evidence that hydraulicking methods were used on a few deposits.

The relatively small size of the placer deposits and seasonal variations in the river level limit feasible mining methods to hydraulicking, dragline dredges, or open-pit operations. The most efficient method of processing the gravel above river level would probably be by hydraulicking. This method, however, would require costly safeguards against pollution of the river by muddy water or large volumes of washed gravel. Protection could be accomplished by construction of settling ponds and coffer dams around the deposit. However, a relatively small floating plant with dragline would be more feasible and muddy water could be confined to the pond.

The bedrock would have to be excavated a foot or more deep to recover any very high grade gold pockets in bedrock traps. There is no apparent problem with clay and no unusually large amounts of buried organic material.

SAMPLING

Prior to the beginning of trenching and pit digging into large deposits, a reconnaissance was made of the south bank of the Salmon River between Panther Creek and Middle Fork, and pan samples were taken. The locations of those samples taken between large deposits are shown in figure 3, and some of the analyses are shown in the accompanying table; other samples taken near the major gravel deposits are included in sections of this report describing the individual placers. Reconnaissance samples from along the Salmon River were usually taken from shallow holes dug 6–12 inches (15.3–30.6 cm) below the gravel surface, commonly near the high-water mark. Six of them were taken from bedrock. The reconnaissance samples were concentrated by panning; each sample consisted of one full 14- or 16-inch gold pan.

The larger placers were evaluated by means of 48 test pits and trenches. Pits were as much as 9 feet (2.8 m) deep and trenches down the faces of benches were as much as 48 feet (15 m) long. No attempt was made to excavate below the water table. Of the 48 test holes, 7 were dug to the water table, 4 bottomed on boulders, and 7 reached bedrock. Many pits and trenches did not penetrate through alluvial fans or detritus to the underlying gravel. The thickness of the overburden where it was sampled is shown in the tables accompanying the illustrations, and an estimate of the amount of overburden on each deposit is given in table 2.

At most test pits and trenches, 1 ft^3 (0.028 m^3) of sample was taken per foot (0.3 m) of pit depth. The swell factor averages about 30 percent. A total of 186 samples was taken at the 12 largest deposits. Samples were washed and concentrated by using a vibrating mechanical sluice box and were further concentrated by processing on a Wilfley table.

The gold values for concentrates containing only a few colors were estimated visually; all other concentrates were amalgamated and the gold was weighed. Final values per cubic yard were calculated using a gold price of $100 per troy ounce. The gold has an average fineness of 859 (859 parts pure gold per thousand).

GOLD AND BLACK SANDS DISTRIBUTION

Gold was found in all but 13 of 186 samples taken at the 48 pits and trenches. Values were as much as \$2.61/yd^3 (1.06 g/m^3) in these large sample volumes and as much as \$2.33/yd^3 (0.945 g/m^3) in reconnaissance pan samples. All samples from undisturbed, well-rounded and well-sorted bench gravel contained gold.

Most of the samples from the overburden of alluvial-fan material contained some gold, which was probably derived from erosion of the high benches or from occasional flooding of the Salmon River. Gold values in the overburden were as much as \$0.05/yd^3 (0.020 g/m^3) but nearly all overburden samples contained less than \$0.02/yd^3 (0.008 g/m^3). The contact zone between alluvial fans and bench gravel is commonly marked by a sand layer in which there is a noticeable increase in the number of gold particles, compared with the values in poorly sorted detritus of the overburden.

In low-bench gravels, gold values increase with depth. The gold is not distributed evenly in the gravel, and the maximum values in benches are almost invariably on the underlying bedrock surface.

The gold values in the interiors of the high benches were not determined. Good values, however, were found near the contact of high and low benches.

In the gravel the black sand content varied from less than 1 lb/yd^3 (0.06 kg/m^3) to 23 lb/yd^3 (13.6 kg/m^3); the average was 5 lb/yd^3 (3.0 kg/m^3) in the gravels along the Salmon River and 10 lb/yd^3 (5.9 kg/m^3) in the gravels along Panther Creek. Some layers, generally less than 1 foot (0.3 m) thick, are composed almost entirely of black sands. Tests of these accumulations on river bars showed no appreciable gold values.

Concentrates of black sand from all samples contained an average of 25 percent magnetic minerals, primarily magnetite; low-bench gravel contained 32 percent. Concentrates were scanned for fluorescence and radioactivity. Many had slightly anomalous radioactivity, which was probably from thorium in the mineral monazite or from uranium atoms in zircon crystal lattices. Measured radioactivity was as much as 10 percent monazite-equivalent in concentrates from Poverty Flat. Only two concentrates contained as much as 20 percent by weight of zircon. The average zircon content is less than 0.2 lb/yd^3 (120 g/m^3) of gravel. Neither the radioactive minerals nor the zircon constitutes a potential resource.

DESCRIPTION OF PLACER DEPOSITS

GARDEN CREEK PLACER

The Garden Creek placer, at the confluence of Garden Creek, Panther Creek, and the Salmon River (fig. 3, no. 12), is covered by the Bear patented placer claim (Mineral Survey 2471).

The patented claim consists of 26.9 acres (10.9 ha), but only about 12 acres (4.9 ha) of the deposit are in the Clear Creek–Upper Big Deer Creek study area west of Panther Creek and south of the Salmon River (fig. 4).

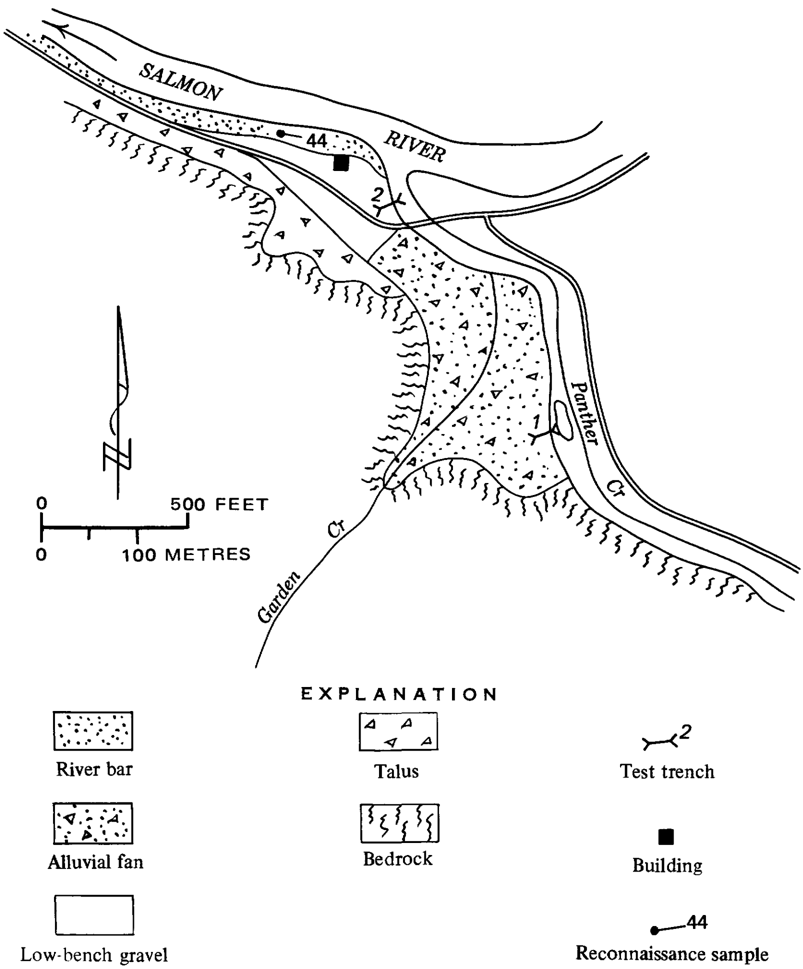


FIGURE 4.—Garden Creek placer.

The bench gravel in the study area has been leveled and there is no indication of current activities.

A seismic spread near the center of the area of bench gravel indicates a depth to bedrock of about 35 feet (11 m); one-fourth of the distance is overburden of the Garden Creek alluvial fan (table 2). Trenches were dug at sites 1 and 2 to sample vertical sections of 33 feet (10 m) and 18 feet (5.5 m) respectively, and samples representing depth intervals of 2-4 feet (0.6–1.2 m) were analyzed. Trench 1 was entirely in the alluvial fan and trench 2 was entirely in poorly sorted gravel. All trench samples contained values of less than \$0.02/yd^3 (0.008 g/m^3). A reconnaissance pan sample contained less than \$0.06/yd^3 (0.024 g/m^3).

GOLDEN QUEEN PLACER

The Golden Queen placer (fig. 1, No. 11) was operated in 1938–39 (Lorain and Metzger, 1939, p. 79). Most of the gravel and the main placering area are on the north side of the river. Samples taken near bedrock on that side reportedly yielded gold values of \$2.14–\$2.85/yd^3 (0.87–1.15 g/m^3). Past operations on the south bank are reported by local residents to have handled gravel worth up to \$14.00/yd^3 (5.8 g/m^3). Floods and revegetation have erased all traces of this former mining activity on the south bank. Samples 36–38 (fig. 3) taken during this current fieldwork gave values of \$0.11–\$0.23/yd^3 (0.44–0.093 g/m^3). Several thousand cubic yards of gravel remain (table 2).

UPPER OWL CREEK PLACER

The Upper Owl Creek placer (fig. 3, No. 10), opposite the mouth of Owl Creek (fig. 5), consists of 10.5 acres (4.25 ha) of bench gravel covered by alluvial fans. The deposit has a rolling surface 20–30 feet (6–9 m) above

Data for sample sites shown in figure 5

Site No.	Depth interval		Gold content		Remarks
	Feet	Metres	Cents per cubic yard[1]	Grams per cubic metre	
1	0 - 1.0	0 -0.3	6	0.024	Sandy topsoil.
	1.0- 4.0	.3-1.2	20	.081	Silty sand.
	4.0- 4.5	1.2-1.4	52	.211	Gravel.
2	0 - 7.3	0 -2.3	< 2	< .008	Alluvium.
3	0 -12.1	0 -3.7	< 2	< .008	Do.
	12.1-14.1	3.7-4.3	< 2	< .008	Gravel.
	14.1-16.1	4.3-5.0	15	.061	Do.
	16.1-18.1	5.0-5.3	67	.271	Do.
	18.1-21.1	5.3-6.2	76	.308	Do.
4	0 -10.0	0 -3.1	< 2	< .008	Alluvium.
5	0 -17.0	0 -5.1	< 2	< .008	Do.
	17.0-19.0	5.1-5.8	37	.150	Sand.
	19.0-21.5	5.8-6.3	37	.150	Sand and pea gravel.
	21.5-24.5	6.3-7.5	60	.243	Gravel.
	24.5-27.5	7.5-8.2	21	.085	Do.
43	....	.....	8	.032	Reconnaissance pan sample.
19	....	.....	3	.012	Do.
20	....	.....	6	.024	Do.

[1]Calculated using a gold price of \$100.00 per troy ounce.

the river. This terrain is a result of alluvial fans having been deposited by outwash from steep tributary canyons. Evidence of mining activities includes several prospect pits at the upper end of the low bench and one old claim corner.

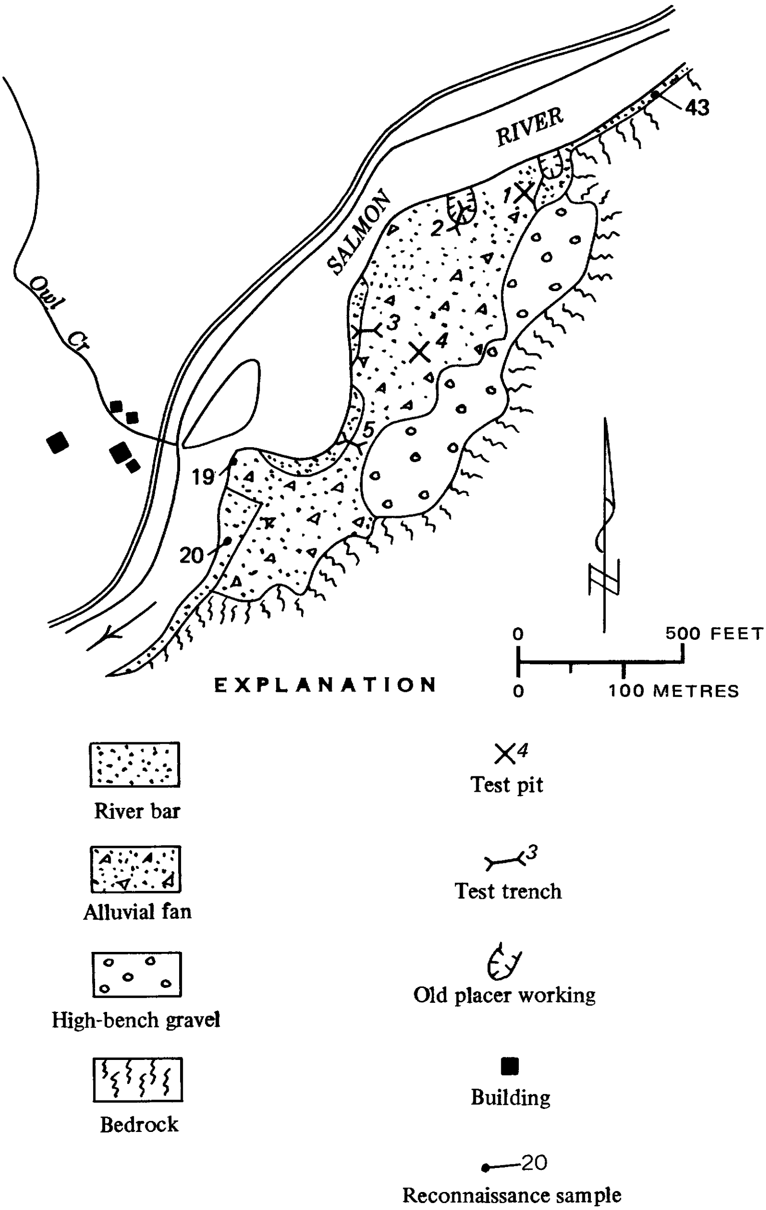


FIGURE 5.—Upper Owl Creek placer.

A seismic spread on the low bench indicates that bedrock ranges from 30 to 75 feet (9 to 23 m) below the surface. The volume of low-bench gravel is about 505,000 yd^3 (390,000 m^3) and is covered by about 155,000 yd^3 (120,000 m^3) of overburden. Gold values of samples of the low-bench gravel averaged \$0.38/yd^3 (0.154 g/m^3).

A total of 347,000 yd^3 (268,000 m^3) of gravel is estimated to be in a high bench whose top is about 100 feet (30 m) above the present river level. The high bench is estimated to have an average thickness of 50 feet (15 m) and was not sampled.

LOWER OWL CREEK PLACER

Lower Owl Creek placer (fig. 3, No. 9) includes about 29 acres (12 ha) of low-bench gravel as much as 25 feet (8 m) above river level, which is covered by a thick—greater than 11 feet (3.5 m)—layer of alluvial-fan detritus (fig. 6).

Seismic spreads in the low areas between the two principal fans indicate a depth to bedrock of 35–40 feet (10–12 m). About one-third the thickness is probably nearly barren overburden. The volume of the low-bench deposit is about 1,400,000 yd^3 (1,100,000 m^3) of which approximately 1,000,000 yd^3 (770,000 m^3) is gravel (table 2). Test pits could not be excavated deep enough to sample the gravel beneath the alluvial-fan material. Only minor gold was recovered from the samples, including reconnaissance pan samples taken from shallow holes dug in the beach. The gravel, however, probably contains values similar to the Upper Owl Creek deposit. Gravel of apparently higher grade was mined directly across the river.

A remnant of gravel in a high bench is 100 feet (30 m) or more above the present river level. The high bench covers about 11.7 acres (4.7 ha) and is estimated to contain nearly 600,000 yd^3 (460,000 m^3) of gravel. Only one test pit was put down into the high-bench gravel. It did not extend through the alluvial-fan material into gravel. Samples contained values of less than \$0.01/yd^3 (0.004 g/m^3).

Data for sample sites shown in figure 6

Site No.	Depth interval		Gold content		Remarks
	Feet	Metres	Cents per cubic yard[1]	Grams per cubic metre	
1	0 - 6.5	0 -2.0	< 2	<0.008	Alluvium.
2	0 - 8.9	0 -2.7	< 2	< .008	Do.
3	0 - 2.0	0 - .6	< 2	< .008	Topsoil.
	2.0- 5.0	.6-1.6	< 2	< .008	Alluvial-fan detritus.
	5.0- 8.0	1.6-2.4	< 2	< .008	Coarse black sand.
	8.0-11.0	2.4-3.4	< 2	< .008	Fine silt.
4	0 - 5.0	0 -1.5	< 2	< .008	Alluvium.
5	0 - 2.0	0 - .6	< 2	< .008	Do.
	2.0-11.0	.6-3.4	< 2	< .008	Do.
21	....	.....	< 2	< .008	Reconnaissance pan sample.
22	....	.....	< 2	< .008	Do.
23	....	.....	< 3	< .012	Do.
24	....	.....	< 3	< .012	Do.

[1]Calculated using a gold price of \$100.00 per troy ounce.

HOMESTAKE PLACER

The Homestake placer (fig. 3, No. 8) is on the south bank of the Salmon River.

The volume of low-bench gravel, including the island at the northeast end, is estimated to be 1,900,000 yd^3 (1,450,000 m^3) (table 2). The low bench is covered by 774,000 yd^3 (592,000 m^3) of nearly barren alluvial fan and detritus. The tops of the fans are as much as 30 feet (9 m) above the river. Seismic tests indicate an average fan thickness of 15–20 feet (4.5–6 m) and depths to bedrock of 50 feet (15 m) or more over much of the deposit. About 360,000 yd^3 (277,000 m^3) of high-bench gravel occurs high on the valley wall.

A series of trenches (2–6, fig. 7) were dug and sampled in the face of an old placer-working at the contact of the high and low gravels (fig. 8). This was the site of the Homestake claim located and operated by G. W. Morris in the early 1940's. Mining probably consisted of hydraulicking of the

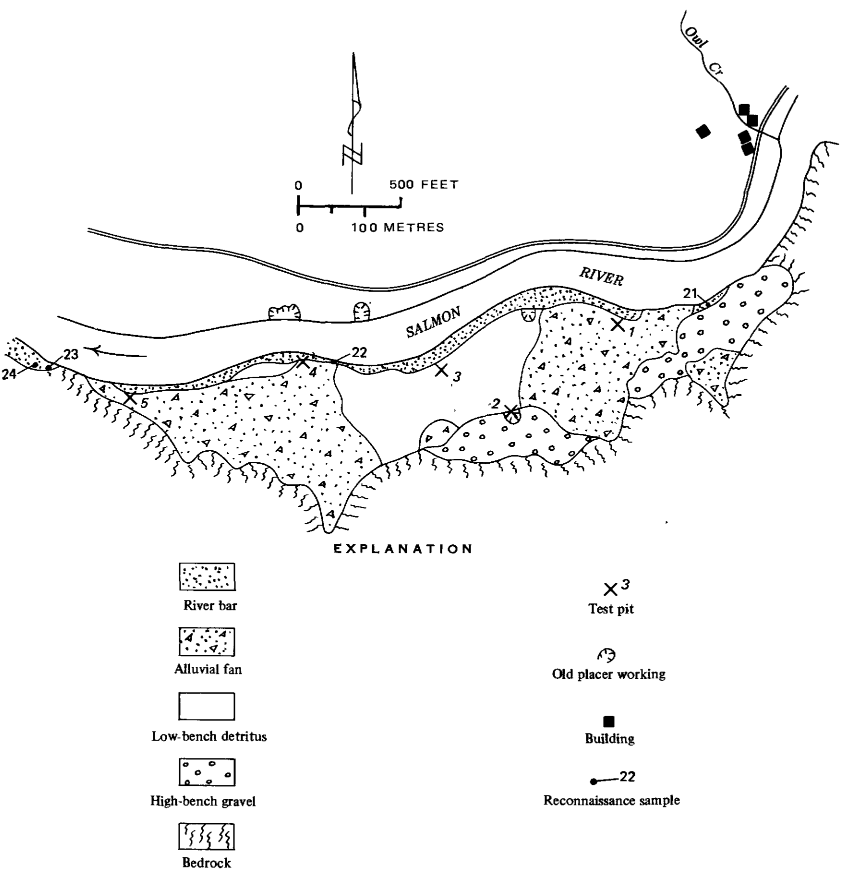


FIGURE 6.—Lower Owl Creek placer.

bench gravel into a long sluice box. The pits represent a vertical section of about 30 feet (9 m). The high-bench gravel consists of a mixture of angular, subangular, and rounded gravels that form a relatively thin veneer over schist bedrock. Gravel in the gully below, in which the sluice box was placed, is well rounded. Gold values in the high-bench gravels averaged \$0.44/yd^3 (0.178 g/m^3). The gold value of samples from the upper section of the low-bench gravel averaged \$0.31/yd^3 (0.126 g/m^3).

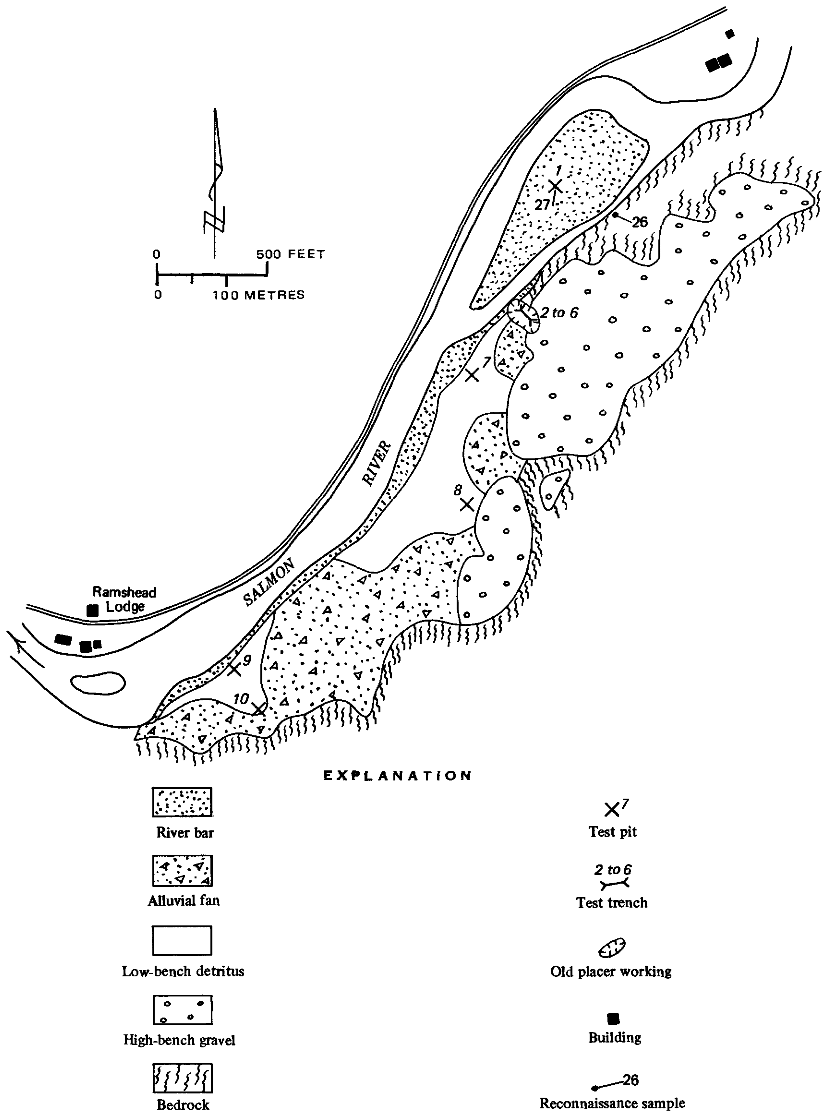


FIGURE 7.—Homestake placer.

Data for sample sites shown in figure 7

Site No.	Depth interval Feet	Metres	Gold content Cents per cubic yard[1]	Grams per Cubic metre	Remarks
1..........	0 - 1.25	0 -1.1	< 2	< 0.008	Island bar sand.
	1.25- 4.25	1.1-1.3	< 2	< .008	Island bar gravel.
	4.25- 5.92	1.3-1.8	< 2	< .008	Do.
2..........	0 - 2.0	0 - .6	15	.061	Topsoil.
	2.0- 6.5	.6-2.0	28	.113	High-bench gravel.
3..........	0 - 2.0	0 - .6	11	.044	Topsoil.
	2.0- 3.0	.6- .9	14	.057	High-bench gravel.
	3.0- 4.0	.9-1.2	115	.466	High-bench gravel on bedrock.
4..........	0 - 1.0	0 - .5	69	.279	Topsoil.
	1.0- 4.0	.5-1.2	44	.180	High-bench gravel.
	4.0- 5.5	1.2-1.7	162	656	High-bench gravel on bedrock.
5..........	0 - 1.0	0 - .5	17	.069	Topsoil.
	1.0- 5.0	.5-1.5	63	.255	High-bench gravel.
	5.0- 9.0	1.5-2.8	41	.166	Do.
6..........	0 - 2.0	0 - .6	6	.024	Topsoil.
	2.0- 6.0	.6-1.8	14	.057	Low-bench boulders and sand.
	6.0- 8.0	1.8-2.4	46	.186	Gravel.
	8.0-11.0	2.4-3.4	18	.073	Do.
7..........	0 - 1.0	0 - .5	< 2	< .008	Topsoil.
	1.0- 5.0	.5-1.5	< 2	< .008	Detritus.
	5.0- 7.0	1.5-2.1	5	.020	Do.
8..........	0 - 7.5	0 -2.2	< 2	< .008	Alluvium.
9..........	0 - 7.5	0 -2.2	< 2	< .008	Do.
10..........	0 - 8.0	0 -2.5	< 2	< .008	Do.
26..........	......	.....	< 2	< .008	Reconnaissance pan sample (bedrock).
27..........	......	.....	3	.012	Reconnaissance pan sample.

[1]Calculated using a gold price of $100.00 per troy ounce.

Four pits (7–10, fig. 7) were dug in the downstream part of the lower bench, but even though they were in the low area between fans, the bottom of the alluvial-fan material was not reached. Gold values were low.

A reconnaissance pan sample (not listed), taken at the small bench remnant about 100 feet (30 m) east of pit 8 (fig. 7) and about 200 feet (60 m) above the present river level, was found to contain several small flakes of gold.

POVERTY FLAT PLACER

Poverty Flat placer deposit (fig. 3 No. 7; fig. 9) is on both sides of the Salmon River. The north side is covered by the Daisy patented claim (Mineral Survey 2794).

On the south side of the river, the desposit consists of about 16 acres (6.5 ha) of national forest land. Most of the low-bench placer on the south side is covered by poorly sorted alluvium derived from small tributary canyons. Only small remnants of high-bench gravels were found on the lower end. A seismic spread on the low bench between the two large alluvial fans indicated a depth to gravel of 4 feet (1.2 m) and a total depth to bedrock of 30 feet (9 m). The fans, however, have an additional thickness of as much as 20 feet (6 m) above the bench. Total volume of the deposit is estimated to be about 730,000 yd^3 (540,000 m^3), including 520,000 yd^3 (385,000 m^3) of gravel (table 2). The gold value of samples averages $0.18/$yd^3$ (0.073 g/m^3).

The face of the upstream high-bench remnant, which is composed of loose, subangular gravel, was sampled by means of two offset trenches (2 and 4, fig. 9), and a pit (3, fig. 9). In the trench sections, gold values were as much as \$0.30/yd^3 (0.12 g/m^3).

A reconnaissance pan sample (28, fig. 9) taken from the base of the downstream high bench, about 10 feet (3 m) above the river, contained a gold value of \$1.80/yd^3 (0.729 g/m^3).

The bedrock slopes to near river level at test site 5 (fig. 9) where old placer workings had excavated into the base of the bench gravel. Gold values were as much as \$0.44/yd^3 (0.180 g/m^3).

EBENEEZER PLACER

The area examined (fig. 4, No. 6) is upstream from Ebeneezer Creek (fig. 10) and contains about 68,000 yd^3 (52,000 m^3) of gravel. The placer has an area of 4 acres (1.6 ha) and a maximum elevation of 10 feet (3 m) above river level; depth to bedrock averages about 14 feet (4.3 m), based on a seismic spread. A caved shaft and several pieces of equipment are evidence of old placer activity.

Gold values were \$0.02–\$0.11/yd^3 (0.008–0.045 g/m^3), except for a layer of pebbly sand which had a value of \$.0.50/yd^3 (0.203 g/m^3).

FIGURE 8.—Homestake placer workings in high-bench gravel.

LAKE CREEK PLACER

The Lake Creek placer is on private land (Homestead Entry Survey 426) belonging to Herman Nelson (fig. 3, No. 5). High-bench gravel underlies a terrace, which is about 100 feet (31 m) above the river, and covers about

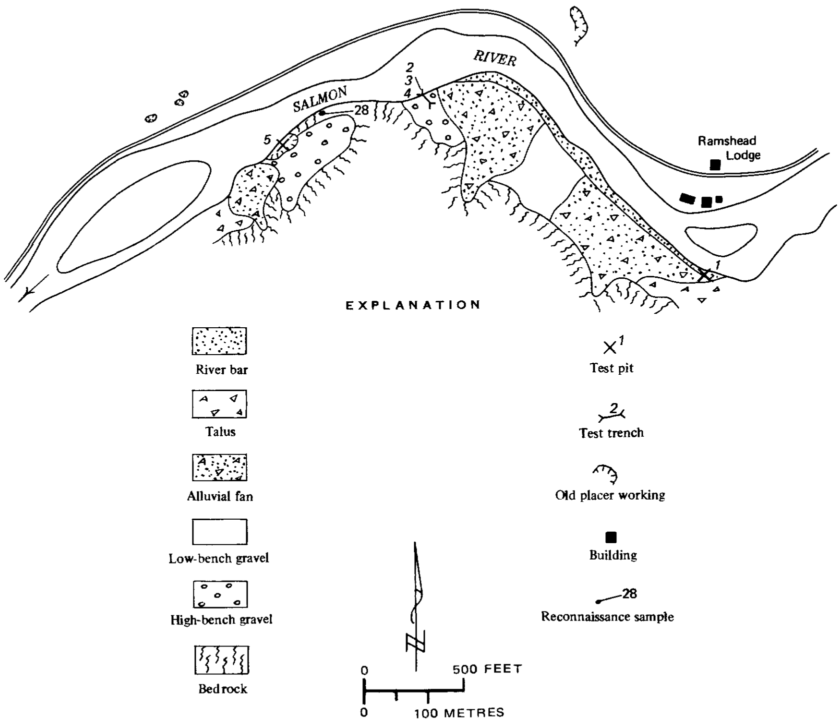


FIGURE 9.—Poverty Flat placer.

Data for sample sites shown in figure 9

Site No.	Depth interval: Feet	Depth interval: Metres	Gold: Cents per cubic yard[1]	Gold: Grams per cubic metre	Remarks
1..........	0 -11.40	0 -3.5	<2	< 0.008	Alluvium.
2..........	0 - 2.92	0 - .9	<2	< .008	Angular high-bench gravel.
	2.92- 5.50	.9 -1.7	<2	< .008	Do.
	5.50- 7.17	1.7 -2.15	3	.012	Sand.
	7.17- 9.84	2.15-2.95	< 2	< .008	Angular high-bench gravel.
	9.84-10.84	2.95-3.3	< 2	< .008	Do.
	10.84-14.84	3.3 -4.5	< 2	< .008	Do.
3..........	0 - 2.80	0 - .85	14	.057	Alluvial-fan detritus.
	2.8 - 5.50	.85-1.7	12	.049	Gravel.
4..........	0 - 2.00	0 - .62	<2	< .008	Pebbly sand.
	2.0 - 4.25	.62-1.3	<2	< .008	Sand.
	4.25- 4.83	1.3 -1.45	<2	< .008	Clayey sand.
5..........	0 - 2.33	0 - .75	< 2	< .008	Gravel.
	2.33- 6.25	.75-2.0	< 2	< .008	Do.
	6.25- 7.67	2.0 -2.3	20	.081	Do.
	7.67- 8.67	2.3 -2.8	44	.178	Gravel on bedrock.
28	....	.....	180	.729	Reconnaissance pan sample

[1]Calculated using a gold price of $100.00 per troy ounce.

25 acres (10 ha) (fig. 11). The deposit is bisected by the canyon of Lake Creek. Some gravel was mined on the north side of the river, opposite the deposit. Sample localities were at each end of the deposit and were out-

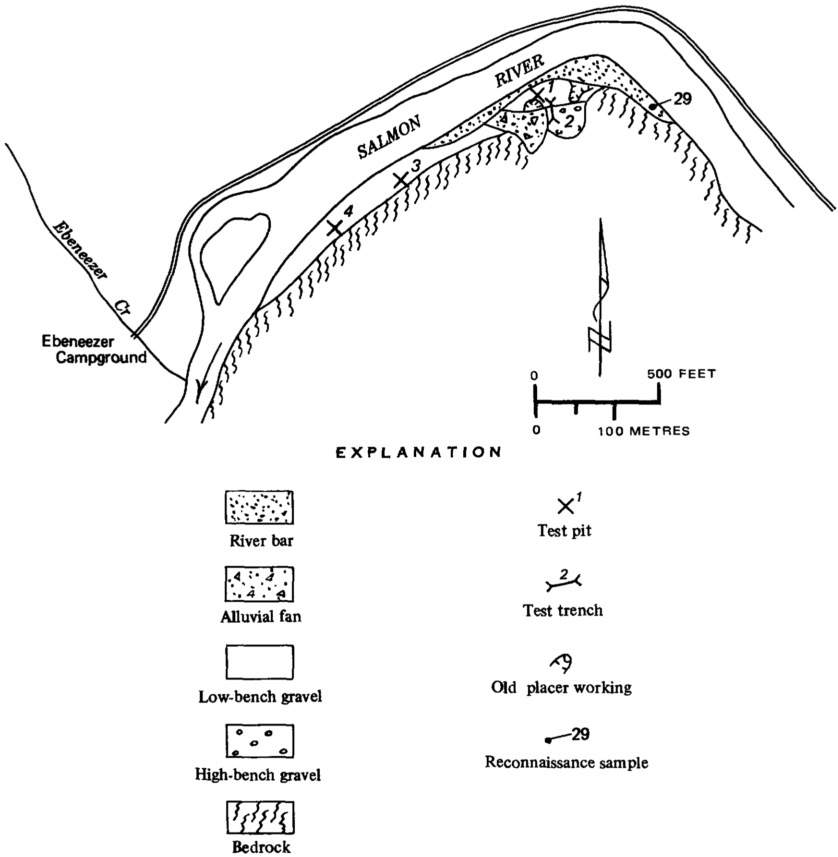


FIGURE 10.—Ebeneezer placer.

Data for sample sites shown in figure 10

Site No.	Depth interval: Feet	Depth interval: Metres	Gold content: Cents per cubic yard[1]	Gold content: Grams per cubic metre	Remarks
1..........	0 -1.25	0 -0.4	<2	< 0.008	Sand.
	1.25-3.0	.4 -9.2	56	.227	Pebbly sand.
	3.0 -5.0	9.2 -1.55	6	.024	Rounded gravel.
	5.0 -8.0	1.55-2.45	11	.045	Do.
2..........	0 -2.5	0 - .78	9	.036	Rounded high-bench gravel.
	2.5 -5.5	.78-1.65	6	.024	Do.
3..........	0 -2.5	0 - .65	< 2	<.008	Rounded gravel.
	2.0 -4.0	.65-1.25	< 2	<.008	Do.
	4.0 -6.0	1.25-1.85	< 2	<.008	Do.
	6.0 -8.0	1.85-2.5	5	.020	Do.
4..........	0 -4.2	0 -1.25	< 2	<.008	Silty sand.
	4.2 -8.2	1.25-2.5	< 2	<.008	Clayey sand.
29..........	....	.....	5	.020	Reconnaissance pan sample.

[1]Calculated using a gold price of $100.00 per troy ounce.

side private property.

The volume of material of the whole deposit is estimated to be about 3,500,000 yd³ (2,700,000 m³) (table 2). Insufficient data were obtained to estimate amounts of gold present in the Lake Creek high bench because

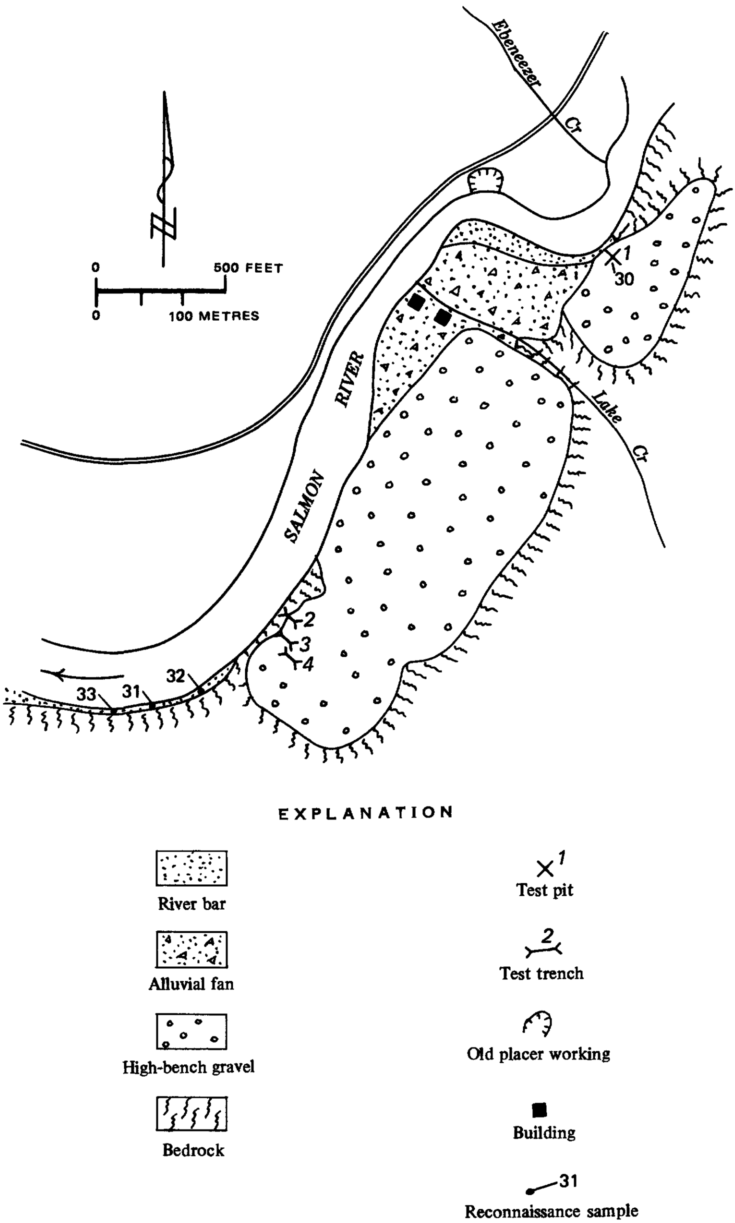


FIGURE 11.—Lake Creek placer.

Data for sample sites shown in figure 11

Site No.	Depth interval: Feet	Depth interval: Metres	Gold content: Cents per cubic yard[1]	Gold content: Grams per cubic metre	Remarks
1..........	0 - 4.0	0 -1.25	6	0.025	Rounded high-bench gravel on bedrock.
2..........	0 - 4.0	0 - .65	< 2	< .008	Rounded bench gravel.
	2.0-10.0	.65-3.1	< 2	< .008	Do.
3..........	0 - 2.0	0 - .65	< 2	< .008	Topsoil.
	2.0- 6.0	.65-1.85	< 2	< .008	Sand and boulder.
	6.0- 7.5	1.85-2.15	< 2	< .008	Angular high-bench gravel.
	7.5- 9.5	2.15-2.9	< 2	< .008	Black sand and pea gravel.
4..........	0 - 2.5	0 - .78	< 2	< .008	Angular high-bench gravel.
	2.5- 5.2	.78-1.55	< 2	< .008	Do.
	5.2- 7.2	1.55-2.1	< 2	< .008	Sand.
	7.2- 9.9	2.1 -3.0	< 2	< .008	Angular high-bench gravel.
30..........	....	.....	46	.186	Reconnaissance pan sample on bedrock.
31..........	....	.....	49	.198	Reconnaissance pan sample.
32..........	....	.....	6	.024	Do.
33..........	....	.....	5	.020	Reconnaissance pan sample on bedrock.

[1]Calculated using a gold price of $100.00 per troy ounce.

depth to bedrock is probably in excess of 100 feet (31 m) and drilling or shaft sinking would be required for evaluation. Most samples were surficial and reflect the leaner gravels higher in the section. However, some reconnaissance samples showed values of \$0.05–\$0.46/yd^3 (0.020–0.186 g/m^3).

COLSON CREEK PLACER

The Colson Creek placer (fig. 3, No. 4) is a river bar extending about 0.3 mile (0.5 km) along the south side of the Salmon River near Colson Creek. The bar covers 8 acres (3.2 ha), and seismic spread indicates that the depth to bedrock is a minimum of 30 feet (9 m) in the middle of the deposit. The volume, therefore, is in excess of 387,000 yd^3 (296,000 m^3) (table 2).

Three test holes were dug in the deposit: 8 feet (2.5 m) in the upstream end, 6.6 feet (2.0 m) deep to the water table near the center, and 8 feet (2.5 m) in the downstream end. Because of accidental gold loss in processing, the actual values for these samples are unknown. Values of \$0.06/yd^3 (0.024 g/m^3) were recorded, but field estimates were several times higher.

Data for sample sites shown in fugure 12

Site No.	Depth interval: Feet	Depth interval: Metres	Gold content: Cents per cubic yard[1]	Gold content: Grams per Cubic metre	Remarks
1..........	0 - 4.0	0 -1.25	12	0.049	Sand and pea gravel.
	4.0- 5.0	1.25-1.55	21	.085	Sand and pea gravel on large boulder.
2..........	0 - 6.0	0 -2.8	5	.020	Sand.
	6.0- 9.0	2.8 -2.75	8	.032	Gravel at water table.
3..........	0 -14.4	0 -4.35	< 2	< .008	Alluvium.
8..........	....	....	112	.454	Reconnaissance pan sample.
9..........	....	....	8	.032	Do.
10..........	....	....	86	.348	Do.
11..........	....	....	46	.186	Do.
12..........	....	....	142	.575	Do.
34..........	....	....	21	.085	Do.
35..........	....	....	6	.024	Do.

[1]Calculated using a gold price of $100.00 per troy ounce.

SHELL CREEK PLACER

The Shell Creek placer (fig. 3, No. 3) is on private land (Homestead Entry Survey 624) owned by Fred Colson. The area of the gravel is about 11 acres (4.5 ha), the thickness computed from seismic spread near the cen-

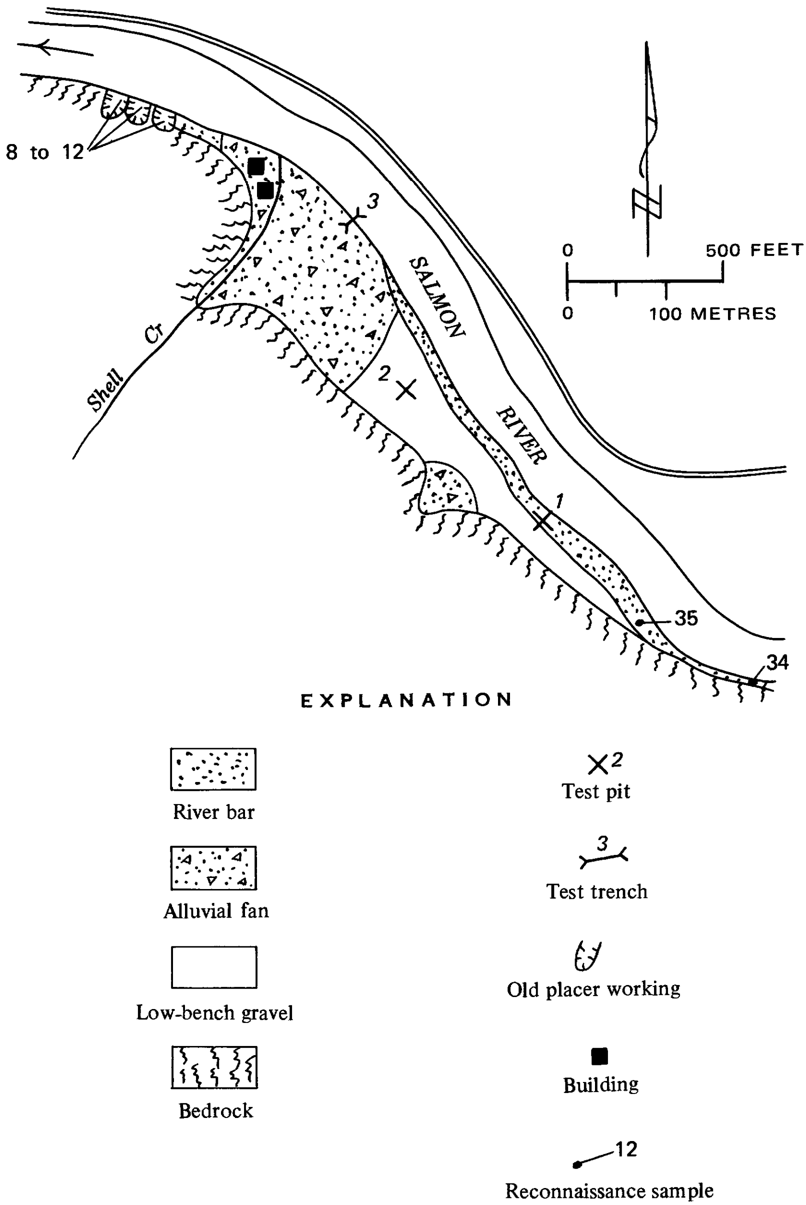


FIGURE 12.—Shell Creek placer.

ter of the deposit is about 37 feet (11 m). The volume of gravel is 590,000 yd^3 (455,000 m^3) and the volume of overburden is 62,000 yd^3 (48,000 m^3).

Samples from test pits contained an average gold value of \$0.11/yd^3 (0.045 g/m^3). Values in reconnaissance pan samples, however, taken near old placer workings, were as much as \$1.42/yd^3 (0.575 g/m^3) (fig. 12).

GOLDEN EAGLE PLACER

The Golden Eagle placer (fig. 3, No. 2) is on the south bank of the Salmon River 2 miles (3.2 m) upstream from the mouth of Middle Fork. It is a narrow deposit of high-bench gravel (fig. 13). The rounded gravel on the upstream end has a thickness of about 25 feet, and the overlying allu-

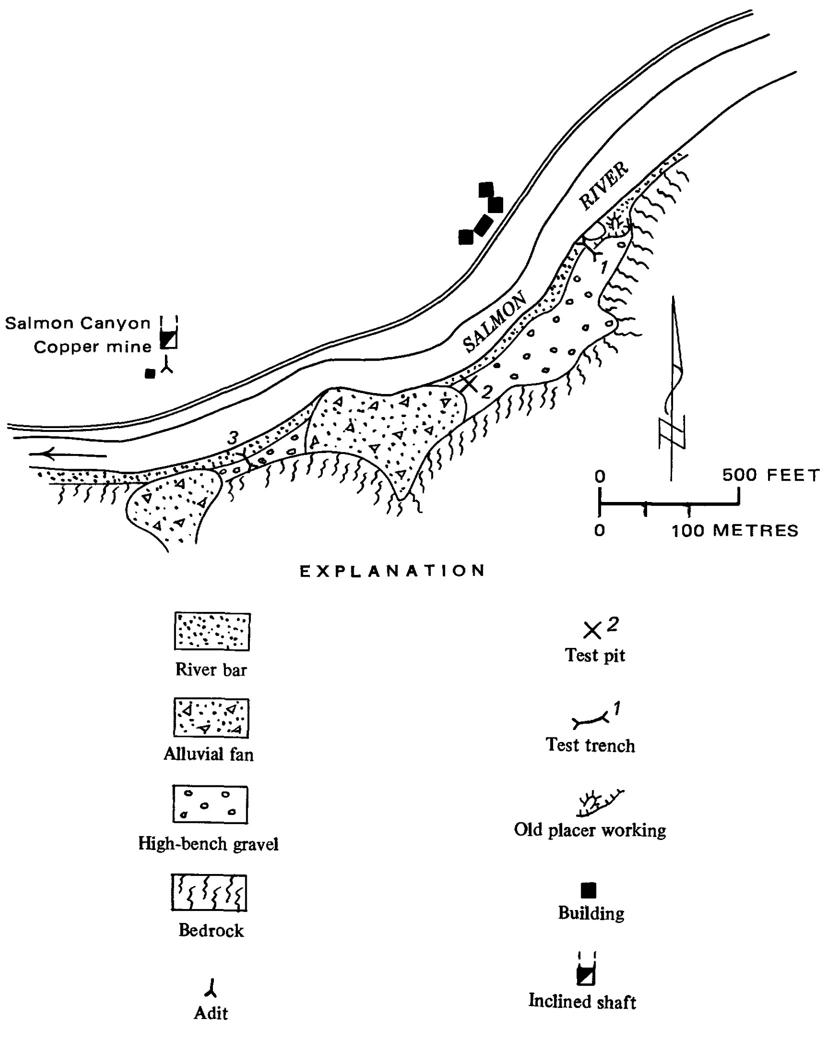


FIGURE 13.—Golden Eagle placer.

vial-fan area at the center of the deposit has a maximum thickness of about 50 feet. The area of the high bench and fan is 7.2 acres (2.8 ha) and the volume of gravel is about 290,000 yd^3 (220,000 m^3) (table 2).

Placering has been done at the upper end of the deposit. Gold values of samples from the old workings ranged from \$0.11–\$1.39/yd^3 (0.045–0.562 g/m^3), the highest value being on bedrock (fig. 13). The average gold value of placer gravel from the deposit, however, was \$0.67/yd^3 (0.271 g/m^3).

BLUE MINE

The placer at Blue Mine (fig. 3, No. 1) is on the south bank of the Salmon River, a short distance upstream from the mouth of Middle Fork. The claim was located in 1939 by Harry E. Jones. Mining operations were conducted along parts of a narrow stretch of beach about 100 feet (30 m) long and 10–20 feet (3–6 m) wide. Most of the beach is covered by coarse talus. The shallow depth to water probably prevented mining of all but the top few feet of gravel. Reconnaissance pan samples (3–5, fig. 3) from the top few inches of the beach material contained gold values ranging from \$0.08 to \$1.12/yd^3 (0.032 to 0.454 g/m^3) (table 3). About 1,000 yd^3 (765 m^3) of auriferous gravel probably remain at the site (table 2).

BEAR GULCH FAN

The Bear Gulch alluvial fan (fig. 3, No. 13) covering 12.4 acres (5 ha) (table 2) is on the west side of Panther Creek 1 mile (1.6 km) from its confluence with the Salmon River. A test pit and trench were excavated in the alluvial-fan material to determine if gold was derived from the Bear Gulch drainage basin. Only traces of gold were detected. The pit and trench did not penetrate through the alluvial fan.

CLEAR CREEK DEPOSIT

The Clear Creek deposit (fig. 3, No. 14) contains high-bench gravel that is about 50 feet (15 m) thick with a volume of more than a million cubic

Data for sample sites shown in figure 13

Site No.	Depth interval		Gold content		Remarks
	Feet	Metres	Cents per cubic yard[1]	Grams per cubic metre	
1	0 - 1.5	0 -0.5	11	0.045	Poorly sorted alluvium.
	1.5-10.5	.5-3.25	107	.433	High-bench gravel.
	10.5-11.5	3.25-5.0	24	.097	Do.
	11.5-18.5	5.0 -5.6	11	.045	Do.
	18.5-20.5	5.6 -6.25	139	.563	High-bench gravel on bedrock.
2	0 - 4.2	0 -1.24	55	.223	High-bench gravel.
	4.2- 6.8	1.24-2.2	14	.057	High-bench gravel on bedrock.
3	0 - 1.3	0 - .4	< 2	<.008	Topsoil.
	1.3- 5.3	.4 -1.65	< 2	<.008	Talus and sand.
	5.3- 7.3	1.65-2.18	< 2	<.008	Do.
	7.3- 9.6	2.18-2.6	< 2	<.008	Silty sand.
	9.6-12.0	2.6 -3.54	< 2	<.008	Sand.
	12.0-17.0	3.54-5.2	< 2	<.008	Alluvial-fan detritus.
	17.0-19.75	5.2 -6.0	< 2	<.008	Sand.

[1]Calculated using a gold price of \$100.00 per troy ounce.

yards. Additional high-bench gravel occurs south of Clear Creek but only that part of the bench north of the creek was sampled. The valley also contains several million cubic yards of low-bench gravel along the creeks.

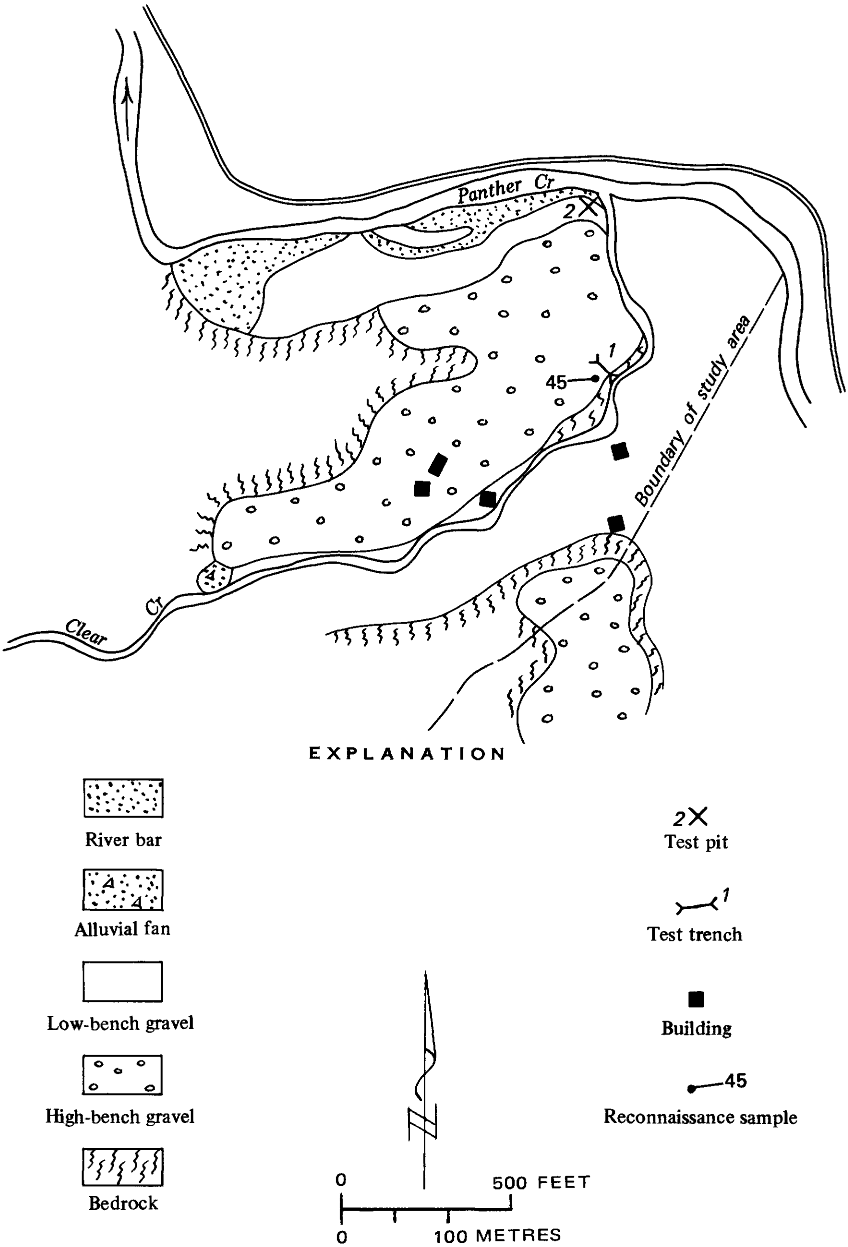


FIGURE 14.—Clear Creek deposit.

The deposits in the study area are on privately owned land (Homestead Entry Survey 371).

In trench 1 (fig. 14), most of the gravel exposed has a gold content value of less than \$0.01/yd^3 (0.004 g/m^3); the bottom 2.25 feet (0.8 m) has a value of \$2.61/yd^3 (1.06 g/m^3). Reconnaissance sample 45, showing a value of \$0.29/yd^3 (0.117 g/m^3), was taken near the middle of the section. Data are inconclusive regarding the gold content of the large low bench, as the pit (fig. 14, No. 2) did not penetrate through the sand into gravel.

Clear Creek No. 1 claim—The Clear Creek No. 1 placer claim was reportedly located 1.5 miles (2.4 km) up Clear Creek in 1961. The location, however, was probably farther upstream, near the mouth of Rancherio Creek (sec. 12, T. 22 N., R. 17 E.), where a piece of sluice box was found in the ruins of an old shed. The coca-mat liner in the bottom contained two very fine gold colors. Reconnaissance panning in the vicinity did not reveal a gold placer potential.

MISCELLANEOUS PLACERS AND RECONNAISSANCE SAMPLES

None of the miscellaneous placers that are found between the relatively large Salmon River deposits contain enough gravel to be developed by drag-line dredges or large-scale hydraulicking. Small operations utilizing portable placer machines or small-scale hydraulicking could possibly be successful where higher values are found and little "dead work" is required for development. Approximately 80,000 yd^3 (60,000 m^3) of these miscellaneous gravels are above the water table between Panther Creek and Middle Fork. Reconnaissance pan samples were taken and test pits and trenches were dug in the larger deposits (table 3).

CONCLUSIONS

On the basis of this study we conclude that there is little evidence of moderately large near-surface lode deposits of valuable metals in the study

Data for sample sites shown in figure 14

Site No.	Depth interval		Gold content		Remarks
	Feet	Metres	Cents per cubic yard[1]	Grams per cubic metre	
1	0 - 3.75	0 - 1.3	< 2	< 0.008	Angular and rounded bench gravel.
	3.75- 7.75	1.3- 2.3	< 2	< .008	Subangular and rounded bench gravel.
	7.75-12.2	2.3- 3.7	< 2	< .008	Do.
	12.2 -15.9	3.7- 4.9	5	.020	Do.
	15.9 -19.3	4.9- 6.0	< 2	< .008	Do.
	19.3 -23.5	6.0- 7.1	< 2	< .008	Rounded bench gravel.
	23.5 -24.25	7.1- 7.2	< 2	< .008	Sand and gravel.
	24.25-26.5	7.2- 8.2	2	.008	Well-sorted sand and gravel.
	26.5 -31.75	8.2- 9.8	2	.008	Sand and gravel.
	31.75-36.5	9.8-11.5	< 2	< .008	Do.
	36.5 -39.5	11.5-12.0	2	.008	Do.
	39.5 -45.75	12.0-14.0	2	.008	Coarse sand.
	45.75-48.0	14.0-14.5	261	1.06	Bench gravel on bedrock.
2..........	0 - 2.4	0 - .73	< 2	< .008	Sandy gravel.
	2.4 - 4.75	.73- 1.45	< 2	< .008	Sand and pea gravel at water table.
45.........	......	......	29	.117	Reconnaissance pan sample.

[1]Calculated using a gold price of \$100.00 per troy ounce.

area except for a tin potential in the Upper Big Deer Creek drainage. While the surface lode potential of this area is low, there is somewhat greater potential for gold in bench placers along the Salmon River.

Most of the placer sampling consisted of near-surface samples, and data are lacking regarding the gold distribution in the interior of the benches and below the water table. There is some evidence that gold values may increase with depth as a bedrock surface is approached, and that significantly higher than average values should be found in selected channels in the bench gravels.

More than 12,000,000 yd^3 (9,000,000 m^3) of auriferous gravel is indicated in the bench deposits on the south side of the river. Some of these deposits are potential gold resources. A large unknown volume of gold-bearing gravel may be in the present river channel as a result of reworking of the bench deposits.

Average surficial values of the bench gravels are estimated to range from \$0.08 to \$0.61/yd^3 (0.032 to 0.247 g/m^3). Insufficient sample data from near bedrock indicate the gold values of these portions range from \$0.30 to \$2.60/yd^3 (0.122 to 1.05 g/m^3). Most bench gravels are partly covered with as much as several tens of feet of virtually barren alluvial fan material. Additional exploration is necessary to delineate the average gold content and the economic feasibility of mining. Large deposits of bench gravels occur on the north side of the Salmon River, and potentially they could be developed with the gravel in the present stream channel and the bench gravel on the south side of the river in the study area.

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