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TITANIUM PLACER DEPOSITS OF IDAHO

By R. H. Storch and D. C. Holt



UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

1963

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TITANIUM PLACER DEPOSITS OF IDAHO

by

R. H. Storch¹ and D. C. Holt²

ABSTRACT

During reconnaissance investigations of more than 300 stream areas in Idaho to determine the potential value of ilmenite in black-sand placer deposits 46 deposits were explored by churn drilling, trenching, test pitting, or shafting. The component mineral content and total black-sand content were determined for more than 8,690 reconnaissance and exploration samples.

Data compiled during the investigation indicate a good potential for large, low-grade deposits containing ilmenite, monazite, columbite, euxenite, uranothorite, and other radioactive black minerals and accessory black-sand minerals. The data also indicate most deposits will be economic only if several component minerals can be recovered as coproducts.

INTRODUCTION

In the years between 1949 and 1955, a survey of radioactive placer minerals in Idaho was made by the Bureau of Mines. Funds were provided by the Raw Materials Division of the U.S. Atomic Energy Commission, and a series of reports describing the project were published by the Department of Commerce (5, 8, 9, 10, 11, 12, 13, 17, 18, 21).³ Although this investigation was concerned primarily with radioactive minerals, quantitative estimates of the principal titanium minerals were made of all samples taken during the course of the 6-year project. Much of the data gathered on ilmenite during 1949-55 and subsequent field work in 1956 and 1957 are summarized in this report.

The present work was undertaken as part of a program to locate potential sources of supply for the domestic titanium industry.

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²Mining engineer, Spokane Office of Mineral Resources, Bureau of Mines, Spokane, Wash.

³Underlined numbers in parentheses refer to items in the bibliography at the end of this report.

Bucket-line dredges operated intermittently in central Idaho during the period 1950-59. Black-sand concentrate recovered on the dredges near Cascade, Idaho, was processed at a plant in Boise, using a combination of high-tension electrostatic and high-intensity magnetic separation methods. Monazite was the principal product, and ilmenite, garnet, titaniferous magnetite, and zircon were stockpiled as byproducts; the ilmenite was sold later. Black-sand concentrate from the Bear Valley deposit in Valley County was processed at a plant in Lowman, Idaho. Euxenite, columbite, and some monazite were sold; the remaining accessory minerals were stockpiled.

Officials of the companies operating the dredges provided some data for this report. In addition, nearly 300 placer areas were examined and sampled in reconnaissance fashion during the investigation. Of these areas, ranging in size from less than 100 acres to more than 1,000 acres, 46 were selected for exploration by churn drilling, trenching, or test pitting. More than 1,100 reconnaissance samples were taken, and a total of 7,590 exploration samples were processed in the laboratory to recover the black sands for analyses.

The deposits with the most favorable balance between size, grade of titanium minerals, and quantity of desirable coproduct minerals are in or adjacent to Long Valley and in Bear Valley, Valley County, Idaho. The principal coproduct minerals are ilmenite, magnetite, garnet, monazite, columbite, and radioactive black minerals including euxenite and samarskite.

Both stream- and bench-type placers are found in the area. The gravel generally was less than 6 inches in diameter. Drill holes ranged from 5 to 140 feet in depth and many did not reach bedrock.

Alluvial material was essentially derived from the granitic Idaho batholith. It consisted principally of quartz, feldspar, clay, and mica.

Consumer's specifications for ilmenite may vary considerably, and therefore, the economic value of Idaho ilmenite is dependent upon the needs of the individual consumer.

ACKNOWLEDGMENTS

The writers wish to express their appreciation to the many owners and lessees whose names, addresses, and property locations are given in the appendix. Their cooperation contributed much to the exploration program.

Particular thanks are extended to the Raw Materials Division of the U.S. Atomic Energy Commission for granting permission to publish the data acquired by the Bureau of Mines while the investigation was being sponsored by the U.S. AEC.

Thanks are also due the Bureau of Reclamation which furnished funds for part of the investigation on the Gold Fork River deposit.

The following companies explored placer deposits under Defense Minerals Exploration Administration contracts and kindly granted permission to publish information relating to their respective properties:

Deposit

Cosumnes Gold Dredging Co., Inc.....White Hawk Basin, Valley County
465 California Street
San Francisco, Calif.

Cosumnes Gold Dredging Co., Inc.....Paddy Flats, Valley County
465 California Street
San Francisco, Calif.

United States Thorium Corp.....Hull's Big Creek, Valley County
Cascade, Idaho

J. R. Simplot Co.....Dismal Swamp, Elmore County
Continental Bank Building
Boise, Idaho

HISTORY AND PRODUCTION

Ilmenite production in Idaho has been related directly to the production of monazite and radioactive black minerals, principally euxenite and samarskite. Dredging for monazite with standard bucket-line gold dredges commenced in the vicinity of Big Creek in the Long Valley area, Valley County, in 1950. The black-sand concentrates were pumped ashore and shipped to a separation plant in Boise for processing. At the plant, the mineral fractions were recovered by a combination of high-tension electrostatic and high-intensity magnetic techniques. As a byproduct of monazite mining, a few carloads of ilmenite were sold for sandblasting and roofing granules. The remaining coproduct minerals including garnet, titaniferous magnetite, and zircon were stockpiled. In 1955 the dredges in Long Valley were closed down indefinitely because of the unfavorable monazite market. A small market developed in 1956 for the ilmenite, and several thousand tons of stockpiled material were retreated and cleaned to the required specifications before shipment.

Two dredges, with bucket capacities of 4.5 and 6 cubic feet, respectively, were operating in upper Bear Valley, Valley County, until the latter part of 1959, when a Government contract was terminated. Concentrates from these dredges were treated at Lowman, Idaho. The Bear Valley placer deposit has more than 30 years of reserves at a mining rate of about 8,000 cubic yards per day. Euxenite, columbite, and monazite were marketed, and the ilmenite, magnetite, titaniferous magnetite, zircon, and garnet were stockpiled.

GENERAL GEOLOGY AND MINERALOGY

The Idaho batholith is the most important source of ilmenite and associated black-sand minerals in Idaho (fig. 1). None of the placers derived from the peripheral rocks was found to contain significant amounts of titanium minerals.

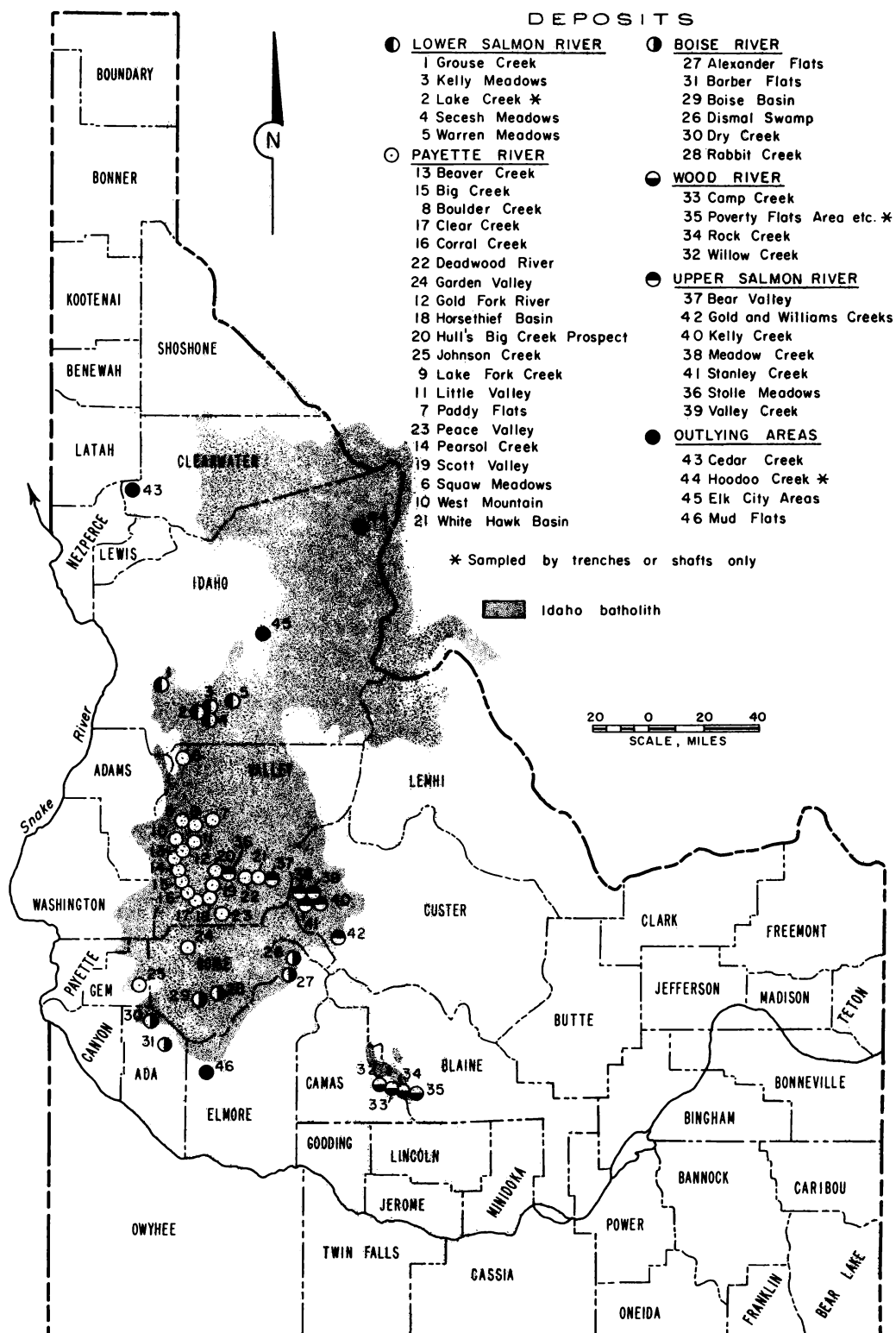


FIGURE 1. - Deposits Sampled by Drill Holes, Trenches, or Shafts.

The batholith covers an area of several thousand square miles in central Idaho, with a small part extending into western Montana. In general, it is bounded on the north and east by Precambrian metamorphics and on the south and west by Challis volcanics and Snake River basalts. The batholith is described as granitic, but quartz monzonite, quartz diorite, granodiorite, and related rocks are found in some areas.

Another granitic intrusion, genetically related to the Idaho batholith, covers an area of 1,200 square miles in the northern part of Idaho. This region, however, was scoured by continental glaciation, which apparently precludes the possibility of finding any important concentration of black sands. Alluvium in this area is composed largely of lakebed sediments, glacial outwash, and unstratified material in glacial moraines.

Black-sand minerals, generally being friable and brittle, are subject to attrition when waterborne. Since the specific gravity of these minerals is only about twice that of quartz, their deposition takes place largely under comparatively quiescent conditions. The majority of the larger or richer black-sand deposits found were close to the host rock from which the minerals were derived. Basalt flows, block faulting, or alpine glacial moraines that obstructed original stream drainage systems often developed favorable conditions for deposition of heavy minerals. As the stream velocity decreased, the black-sand minerals had an opportunity to settle, and a limited amount of classification resulted. Subsequent removal of the obstructions and changes in stream directions and gradients resulted in re-sorting and upgrading the black-sand content of the deposits. In the re-sorting process, some new stream deposits were formed whereas other old deposits were left as high bench placers.

Most of the placers tested were of the stream-bed type. Most of the gravel was less than 6 inches in diameter. Boulders more than 15 inches in diameter were uncommon.

The placers are composed essentially of quartz, clay, and mica; black-sand minerals rarely comprised more than 1 percent of the alluvium tested. Minerals in the concentrate, in addition to ilmenite, usually included magnetite, garnet, sphene, monazite, columbite, and the radioactive black minerals, euxenite, samarskite, and uranothorite. Mineral proportions varied in different placers.

Table 1 gives chemical analyses of ilmenite fractions representing typical samples from 18 placer deposits. The ilmenite fractions were removed from the black-sand concentrates with a Franz isodynamic separator.⁴

⁴Reference to specific makes or models of equipment is made only to facilitate understanding and does not imply endorsement by the Bureau of Mines.

TABLE 1. - Chemical analyses of ilmenite fraction, percent

Placer area	TiO ₂	Total Fe	FeO	Fe ₂ O ₃	CaO	MgO	MnO	Al ₂ O ₃	SiO ₂	Ca ₂ O ₅	V	P	Cr	C	S
Boise County															
Elk Creek.....	47.0	37.9	-	-	<0.10	<0.10	3.81	0.72	1.70	0.30	-	-	-	-	-
Garden Valley.....	35.2	42.3	-	-	<.10	<.10	3.79	1.50	3.64	.40	-	-	-	-	-
Granite Creek.....	46.1	36.8	-	-	<.10	<.10	5.11	.48	2.24	1.40	-	-	-	-	-
Grimes Creek.....	40.3	43.0	-	-	<.10	<.10	2.23	1.12	2.24	.30	-	-	-	-	-
Moore's Creek.....	48.2	35.7	-	-	<.10	<.10	2.87	.64	1.20	.50	-	-	-	-	-
Custer County															
Gold Creek and Williams Creek...	46.3	37.2	-	-	<0.10	<0.10	4.11	0.44	0.58	0.20	-	-	-	-	-
Idaho County															
Hoodoo Creek.....	45.6	35.6	-	-	<0.10	0.18	1.34	1.34	4.09	0.22	-	-	-	-	-
Secesh Meadows.....	49.9	33.4	-	-	<.10	<.10	2.53	1.44	2.64	<.20	-	-	-	-	-
Valley County															
Bear Valley.....	26.6	46.1	-	-	1.21	.38	2.75	2.10	3.34	0.18	-	-	-	-	-
Beaver Creek.....	46.7	36.6	35.8	11.9	<.10	<.10	3.24	.72	1.56	<.20	0.20	0.005	0.003	0.046	0.001
Big Creek.....	45.9	34.2	34.2	10.2	.22	.45	3.77	.80	1.17	.32	.04	.005	.002	.055	.016
Boulder Creek.....	46.2	36.5	-	-	<.10	.81	2.00	.91	2.06	.10	-	-	-	-	-
Clear Creek.....	46.7	36.0	35.0	11.8	<.10	<.10	4.00	.44	1.62	.30	.18	.005	.002	.040	.001
Corral Creek.....	46.09	33.4	31.3	12.6	.20	.33	3.81	.98	1.99	.32	.05	.005	.002	.055	.015
Gold Fork River...	45.3	34.9	35.2	13.9	.15	.10	3.20	.59	3.06	.40	.09	.025	.13	.023	.005
Lake Fork Creek...	45.2	36.9	-	-	<.10	<.10	2.17	2.76	1.48	-	-	-	-	-	-
Pearsol Creek.....	47.5	35.6	33.9	10.8	<.10	<.10	3.91	.68	.96	.20	.09	.005	.003	.055	.006
Scott Valley.....	46.1	36.1	34.1	12.1	<.10	<.10	3.96	.36	1.74	.20	.16	.005	.003	.065	.028

WORK BY THE BUREAU OF MINES

An investigation of the placer deposits in Idaho as a potential source of radioactive minerals was started in 1949 and continued through 1955. The work was done by the Bureau of Mines with funds provided by the Raw Materials Division of the U.S. Atomic Energy Commission. Supplemental data were gathered by the Bureau of Mines in 1956 and 1957. Quantitative estimates of coproduct and byproduct minerals were made during all phases of the investigation.

Preliminary investigations were made by panning gravel from sites that appeared favorable for concentration of black sands. The concentrate was examined in the field, and the more common black-sand minerals were identified (7). If justified by the preliminary investigation, several 50- to 100-pound representative samples were concentrated in the field laboratory, and more accurate estimates were made of the black-sand content. Nearly 300 stream areas in 21 counties were examined in this manner (fig. 2), and laboratory concentration tests were made on more than 1,100 samples. Reconnaissance data are summarized in table 2.

Forty-six of the more promising areas were explored further by churn-drill holes, trenches, shafts, and test pits.

Virtually all churn drilling was performed under contract by privately owned companies using truck-mounted drills (fig. 3) and heavy-duty casing equipped with a 7.5-inch drive shoe. A minor part of the drilling was done with a small Bureau-owned drill with casing equipped with a 6.5-inch drive shoe.

Trenches and pits were excavated either by bulldozers or back-hoe machines (fig. 4). Telescoping caisson was used for shafts that were excavated by hand.

Samples were concentrated by gravity in the field laboratory to recover the black-sand minerals. The concentrate was sized on a 10-mesh screen, and the oversize was examined visually and radiometrically to determine the presence of radioactive black minerals. If plus 10-mesh black sand was present, the coarse material was treated further in a small laboratory jig. The minus 10-mesh material was fed through a hydraulic cone to an intermediate-size Wilfley table. The tailings were rerun to assure the best recovery possible. Black-sand minerals were concentrated further by passing them over a small laboratory Wilfley table twice and by panning the middling product.

Concentrates were examined under a binocular microscope, and quantitative estimates were made of the more abundant heavy minerals. Chemical analyses were made on all black-sand concentrates showing significant radioactivity. Detailed information on the laboratory procedure has been published (7).

Concentrating tests and quantitative mineral estimates were made on 7,590 samples at the Bureau's laboratories. Quantitative chemical analyses were made on selected samples.

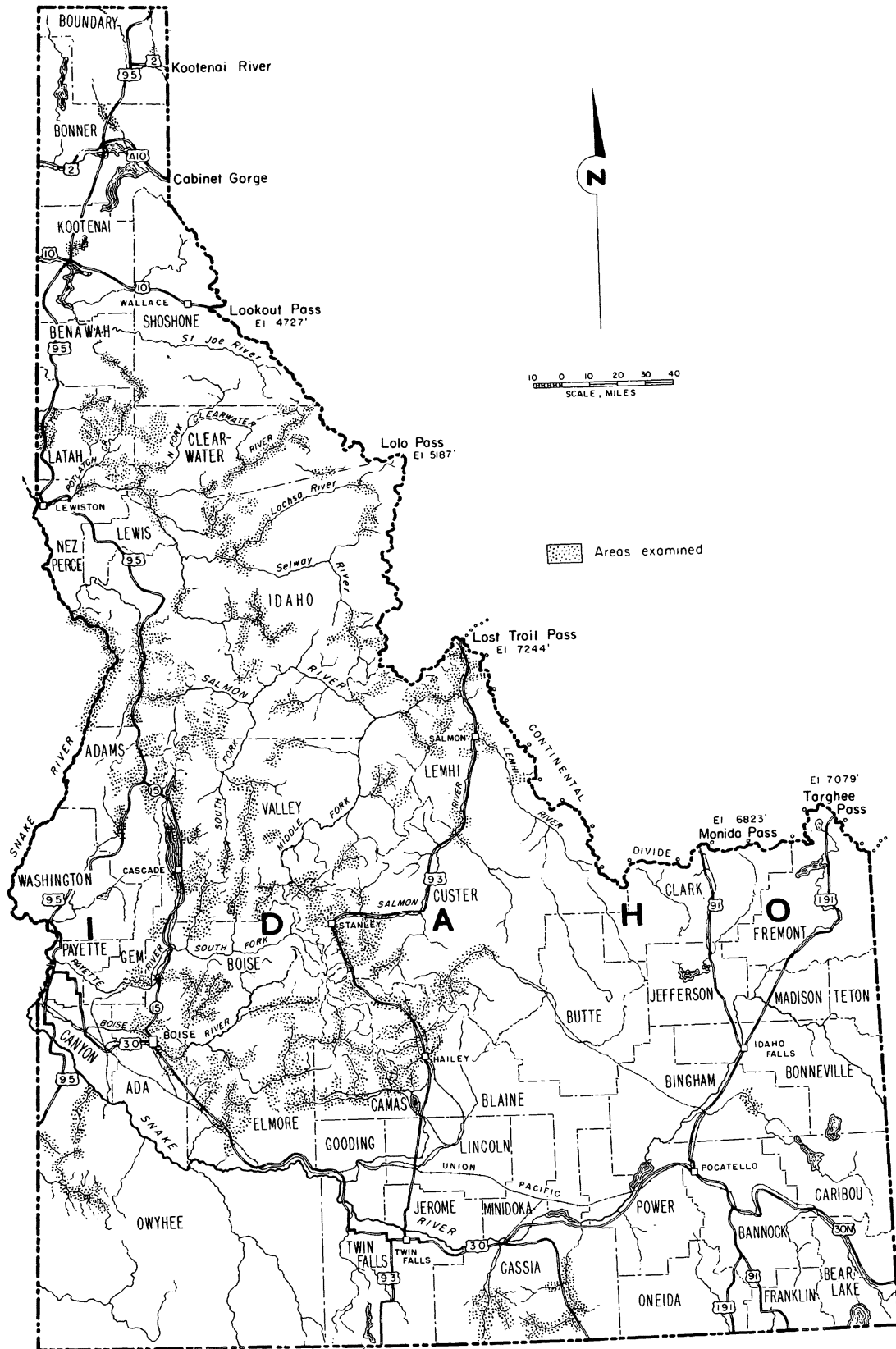


FIGURE 2. - Placer Areas Examined.



FIGURE 3. - Standard Churn Drill, Camp Creek Placer, Blaine County.



FIGURE 4. - Backhoe Used for Trenching, Gold Creek and Williams Creek Placer, Custer County.

TABLE 2. - Summary of reconnaissance sample data

(Tr, trace to 0.5 pound except for monazite, which is less than 0.05 pound;
NE, no estimate made in panned sample; ND, none detected)

Placer area	Location ¹		Sampling method	Number samples	Estimated content in pounds per cubic yard				
	Township	Range			Total black sand	Ilmenite	Monazite	Magnetite	Garnet	Zircon
Ada County									
Boise River:									
Blacks Creek.....	2 N	4 E	Grab..	2	Tr-5	NE	Tr	NE	NE
Boise River Valley.....	3,4 N	1 W, 1,2,3 E	...do...	18	Tr-20	Tr-6	Tr-0.6	Tr-4	Tr-1
Crane Gulch.....	4 N	2 E	...do...	2	1-3	Tr-1	Tr-.1	Tr	Tr
Stuart Gulch.....	4 N	2 E	...do...	4	8-38	4-25	0.6-2.3	Tr-2	Tr
Upper Dry Creek.....	4,5 N	2 E	...do...	10	10-50	5-30	.2-3.2	Tr-2	Tr-3
Willow Creek.....	5 N	1 W	Pan...	2	Tr-5	NE	Tr	NE	NE
Adams County									
Little Salmon River:									
Big Creek.....	18 N	2 E	Pan...	2	Tr-2	NE	Tr	NE	NE
Boulder Creek.....	21 N	1 E	...do...	3	Tr-2	NE	Tr	NE	NE
Goose Creek.....	19 N	2 E	...do...	2	1-5	NE	Tr	NE	NE
Six Mile Creek.....	20 N	1 E	...do...	2	1-5	NE	Tr	NE	NE
Thorn Creek.....	19 N	2 E	Grab..	11	8-80	2-45	0.1-0.8	Tr-5	Tr-2
Weiser River:									
Big Mud Creek.....	19 N	1 E	Pan...	2	1-5	NE	Tr	NE	NE
Little Mud Creek.....	19 N	1 E	...do...	2	1-5	NE	Tr	NE	NE
Lost Lake Creek.....	19 N	1 W	...do...	2	1-5	NE	Tr	NE	NE
Mill Creek.....	17 N	1 W	...do...	2	1-5	NE	Tr	NE	NE
Price Creek.....	19 N	1 W	...do...	2	1-5	NE	Tr	NE	NE
Benewah County									
St. Maries River.....	44 N	1 W	Pan...	4	2-20	Tr-2	Tr	NE	NE
Bingham County									
Blackfoot River.....	2 S	37 E	Grab..	2	10-30	2-6	Tr	1-3	Tr
Blaine County									
Big Wood River:									
Boulder Creek.....	5 N	16 E	Pan...	2	Tr-10	NE	Tr	NE	NE
Croy Creek.....	2 N	17,18 E	...do...	5	Tr-5	NE	Tr	NE	NE
Deer Creek.....	3 N	17,18 E	...do...	4	2-10	NE	Tr	NE	NE
East Fork Big Wood River...	3 N	18 E	...do...	3	Tr-5	NE	Tr	NE	NE
Kelly Creek.....	1,2 N	17 E	...do...	4	2-5	NE	Tr	NE	NE
North Fork Big Wood River..	5,6 N	17 E	...do...	5	2-5	NE	Tr	NE	NE
Quigley Creek.....	2,3 N	18,19 E	...do...	4	Tr-5	NE	Tr	NE	NE
Warm Springs Creek.....	3,4 N	16 E	...do...	6	2-5	NE	Tr	NE	NE
Wood River Valley.....	1,2,3,4 N	17,18 E	...do...	10	5-10	NE	Tr	NE	NE
Little Wood River:									
Baugh Creek.....	2 N	20 E	Pan...	3	Tr-5	NE	Tr	NE	NE
Copper Creek.....	2 N	20 E	...do...	2	2-10	NE	Tr	NE	NE

Salmon River:									
Alturas Creek.....	7 N	14 E	Grab..	3	5-15	NE	Tr-0.3	NE	NE
Beaver Creek.....	7 N	14 E	Pan...	3	3-5	NE	Tr	NE	NE
Frenchman Creek.....	6 N	14 E	...do...	2	1-5	NE	Tr	NE	NE
Pole Creek.....	7 N	14 E	...do...	2	1-2	NE	Tr	NE	NE
Salmon River.....	6 N	15 E	...do...	4	1-2	NE	Tr	NE	NE
Smiley Creek.....	6,7 N	14 E	...do...	4	1-2	NE	Tr	NE	NE
Boise County									
Middle Fork Payette River:									
Easley Creek.....	10 N	4 E	Grab..	4	10-25	5-13	0.2-1.5	2-5	1-3
Lightning Creek.....	10 N	4.5 E	...do...	3	5-25	1-6	.4-3.0	1-3	2-7
Scraper Creek.....	10 N	4 E	...do...	3	5-20	2-9	.2-1.1	1-2	1-5
North Fork Boise River:									
Cottonwood Creek.....	4 N	5 E	...do...	2	5-9	1-2	.1- .3	1-2	Tr
South Fork Payette River:									
Danskin Creek.....	8,9 N	5 E	Pan...	2	4-5	2-3	Tr	Tr	NE
Grayback Creek Flat.....	9 N	6 E	Grab..	2	Tr-1	NE	Tr	NE	NE
Pine Flat Bar.....	9 N	7 E	...do...	3	10-15	NE	Tr	NE	NE
Sweet Creek Bar.....	8 N	5 E	...do...	3	1-3	NE	Tr	NE	NE
Wash Creek.....	8 N	4 E	...do...	3	5-46	NE	Tr- .5	NE	NE
Tributary Streams to Boise Basin:									
Boston Gulch.....	7 N	5 E	...do...	2	10-40	7-30	.5-2.5	1-4	Tr-1
Clay Gulch.....	7 N	5 E	...do...	4	3-10	1-4	.5-3.0	Tr-1	Tr
Frenchman Gulch.....	7 N	4 E	...do...	2	5-20	3-11	.5-1.5	1-3	Tr
Ophir Creek.....	7 N	4 E	...do...	1	19	14	0.8	Tr	Tr
Slaughterhouse Gulch.....	7 N	5 E	...do...	3	3-12	2-7	.4-1.2	Tr	Tr
Summit Flat.....	8 N	6 E	...do...	9	1-11	Tr-3	Tr- .2	Tr-1	Tr
Telephone Line Gulch.....	7 N	5 E	...do...	1	12	7	.8	1	Tr
Wet Gulch.....	8 N	5 E	...do...	2	Tr-1	Tr	Tr- .3	Tr	Tr
Bonner County									
Pack River.....	58,59 N	1 W	Pan...	3	2-5	1-3	ND	NE	NE
Boundary County									
Deep Creek.....	61 N	1 E	Pan...	2	1-2	Tr-1	ND	NE	NE
Moyie River.....	65 N	2 E	...do...	4	Tr-1	NE	ND	NE	NE
Camas County									
Fairfield:									
Beaver Creek.....	1 N	16 E	Grab..	4	10-15	2-3	0.1-0.3	5-8	Tr
Camas Creek.....	1 S	14,15,16 E	Pan...	6	2-10	NE	Tr	NE	NE
Chimney Creek.....	1 S, 1 N	12 E	...do...	3	5-15	NE	Tr	NE	NE
Corral Creek.....	1 N	13 E	...do...	2	3-10	NE	Tr	NE	NE
Elk Creek.....	1 N	15 E	...do...	3	Tr-10	NE	Tr	NE	NE
Soldier Creek.....	1,2 N	14 E	...do...	6	5-15	NE	Tr	NE	Ne
Upper Willow Creek.....	2 N	15 E	Grab..	6	4-20	1-4	Tr- .2	1-10	Tr
South Fork Boise River:									
Bear Creek.....	5 N	13 E	Pan...	4	5-10	Tr-1	Tr	1-5	NE
Big Smoky Creek.....	3 N	13 E	...do...	3	1-5	NE	Tr	NE	NE

Boise meridian.

TABLE 2. - Summary of reconnaissance sample data--Continued

(Tr, trace to 0.5 pound except for monazite, which is less than 0.05 pound;
NE, no estimate made in panned sample; ND, none detected)

Placer area	Location ¹		Sampling method	Number samples	Estimated content in pounds per cubic yard					
	Township	Range			Total black sand					
					Ilmenite	Monazite	Magnetite	Garnet	Zircon	
Camas County--Continued										
South Fork Boise River (Con.):										
Carrie Creek.....	3 N	14 E	Pan	3	2-10	NE	Tr	NE	NE	NE
Emma Creek.....	5 N	13 E	...do...	4	5-10	NE	Tr	NE	NE	NE
Grindstone Creek.....	3 N	14 E	...do...	2	3-5	NE	Tr	NE	NE	NE
Hunter Creek Bar.....	4 N	13 E	...do...	4	5-10	NE	Tr	NE	NE	NE
Johnson Creek.....	5 N	13 E	...do...	2	5-10	NE	Tr	NE	NE	NE
Little Smoky Creek.....	3 N	13,14 E	...do...	3	Tr-5	NE	Tr	NE	NE	NE
South Fork Valley.....	4 N	13 E	Grab..	10	2-10	Tr-1	Tr	Tr-4	Tr	Tr
Cassia County										
Almo Basin:										
Edwards Creek.....	15 S	24 E	Grab..	3	10-20	4-8	Tr	2-4	Tr-1	Tr
Graham Creek.....	15 S	24 E	...do...	3	1-3	1-2	Tr	Tr	Tr	Tr
Waterfall Creek.....	15 S	24 E	...do...	3	5-20	1-2	Tr-0.5	1-4	Tr	Tr
Goose Creek:										
Birch Creek.....	14 S	22,23E	...do...	6	2-10	1-3	Tr	Tr-2	Tr	Tr
Cold Creek.....	15 S	22 E	Pan...	2	Tr-2	NE	ND	NE	NE	NE
Little Pole Creek.....	16 S	22 E	...do...	2	Tr-2	NE	ND	NE	NE	NE
Trapper Creek.....	15 S	20 E	Grab..	4	2-10	Tr-1	Tr	1-3	Tr	Tr
Raft River:										
Cassia Creek.....	13 S	25 E	Pan...	6	Tr-2	Tr	Tr	Tr-1	Tr	Tr
Circle Creek.....	15 S	24 E	Grab..	5	2-23	Tr-6	Tr	1-15	Tr-3	Tr
Dry Wash Creeks.....	16 S	24 E	...do...	9	2-15	1-4	Tr	Tr-2	Tr-2	Tr
Clearwater County										
Elk River:										
Burnt Creek.....	39 N	2 E	Pan...	5	2-10	Tr	Tr	NE	NE	NE
East Fork Potlatch Creek...	41 N	1,2 E	Grab..	4	5-15	Tr-1	Tr	Tr	4-12	Tr
Elk Creek.....	40,41 N	2 E	Pan...	12	2-15	NE	Tr	NE	NE	NE
Moose City:										
Cayuse Creek.....	38 N	13 E	...do...	3	2-5	Tr-2	Tr	1-2	Tr	Tr
Chamberlain Meadows.....	41 N	10 E	...do...	2	Tr-5	Tr-2	Tr	Tr-2	Tr	Tr
Independence Creek.....	40 N	11 E	...do...	4	Tr-3	Tr	Tr	Tr	Tr	Tr
Kelly Creek.....	39 N	11 E	...do...	4	Tr-5	Tr	Tr	Tr-2	Tr	Tr
Lake Creek Bar.....	41 N	11 E	...do...	4	2-5	Tr	Tr	1-3	Tr	Tr
Moose Creek.....	39,40 N	11 E	Grab..	4	9-15	6-10	Tr	Tr	1-2	Tr
Musselshell and Pierce:										
Gold Creek.....	35 N	6 E	Pan...	6	5-15	1-3	Tr-0.5	2-10	Tr	Tr
Jim Brown Creek.....	35 N	5 E	Grab..	5	5-15	2-7	Tr-.2	Tr	Tr	Tr-1
Lolo Creek.....	34 N	6 E	...do...	2	5-20	Tr-2	Tr-.2	2-10	NE	NE

Musselshell Creek.....	35 N	6 E	....do....	6	2-10	1-3	Tr-.5	1-5	Tr	Tr
Upper Lolo Creek.....	36 N	7 E	Pan....	4	5-20	Tr-2	Tr-.5	2-18	Tr	Tr
Shanghai Creek.....	37 N	5,6 E	Grab..	5	10-50	5-30	Tr-.2	Tr	Tr-1	Tr-1
North Fork Clearwater River:										
Dent Bar.....	38 N	2 E	Pan....	4	2-20	Tr-2	Tr	NE	NE	NE
Elk Creek Bar.....	38 N	2 E	....do....	2	2-20	Tr-2	Tr	NE	NE	NE
Dicks Creek Bar.....	38 N	1 E	Grab..	2	30-60	4-9	Tr	Tr	20-40	Tr-1
Orogrande Creek.....	38 N	7 E	....do....	4	5-20	2-5	Tr-.3	Tr	Tr-1	Tr-1
Teaklean Butte:										
Cavendish Summit.....	38 N	1 W	....do....	4	5-40	2-30	0.2-.6	Tr	Tr-1	Tr
Dave Haight Meadows.....	38 N	1 E	....do....	3	10-30	7-20	.2-.5	Tr-1	Tr-1	Tr-1
Gravel Pit.....	38 N	1 W	....do....	2	10-30	8-25	.2-.8	Tr-1	Tr-1	Tr-1
Lucky Six Creek.....	38 N	1 E	....do....	8	15-35	12-30	.2-.9	Tr-1	Tr-1	Tr-1
South Fork Dicks Creek.....	39 N	1 E	....do....	6	8-17	4-12	.2-.5	1-2	Tr	Tr-1
Big Lost River:			Custer County							
Big Lost River Valley.....	8 N	21 E	Pan....	4	Tr-5	NE	Tr	NE	NE	NE
Broad Creek.....	5 N	21 E	....do....	2	Tr	NE	Tr	NE	NE	NE
East Fork Big Lost River...	6 N	22 E	....do....	3	Tr	NE	Tr	NE	NE	NE
Star Hope Creek.....	5 N	21 E	....do....	3	Tr	NE	Tr	NE	NE	NE
Wildhorse Creek.....	6 N	20 E	....do....	2	4-10	NE	Tr	NE	NE	NE
East Fork Salmon River:										
Germania Creek.....	8 N	16 E	....do....	2	Tr	NE	ND	NE	NE	NE
Washington Creek.....	8 N	16 E	....do....	2	2-5	NE	ND	NE	NE	NE
Middle Fork Salmon River:										
Beaver Creek.....	13 N	12 E	....do....	4	2-10	Tr-5	Tr	Tr-5	Tr	Tr
Canyon Creek.....	14 N	13 E	....do....	2	Tr	NE	Tr	NE	NE	NE
Loon Creek.....	14,15 N	13 E	....do....	4	2-5	NE	Tr	NE	NE	NE
Kelly Creek.....	12 N	12 E	....do....	2	Tr	NE	Tr	NE	NE	NE
Knapp Creek.....	12 N	12 E	....do....	2	Tr	NE	Tr	NE	NE	NE
Mayfield Creek.....	14 N	13,14E	....do....	5	Tr-5	NE	Tr	NE	NE	NE
Pioneer Creek.....	14 N	13 E	....do....	2	Tr	NE	Tr	NE	NE	NE
Trail Creek.....	14 N	13 E	....do....	6	2-5	NE	Tr	NE	NE	NE
Upper Salmon River:										
Basin Creek.....	11,12 N	13 E	Grab..	6	2-30	Tr-4	Tr	1-18	Tr	Tr
Boundary Creek.....	10 N	13 E	Pan....	4	5-20	Tr-5	Tr	Tr-10	NE	NE
Cleveland Creek.....	10 N	14 E	....do....	3	5-20	NE	Tr-0.3	NE	NE	NE
Elk Creek.....	11 N	12 E	....do....	2	Tr-5	NE	Tr	NE	NE	NE
Fisher Creek.....	8 N	14 E	Grab..	12	1-10	Tr-4	Tr-.6	Tr-3	Tr	Tr
Fourth of July Creek.....	8 N	14,15 E	Pan....	6	Tr	Tr	Tr	NE	NE	NE
Martin Creek.....	9 N	15 E	Grab..	8	4-37	1-6	Tr-1.0	1-20	Tr	Tr
McGowan Creek.....	11 N	12 E	Pan....	2	Tr-5	Tr	Tr	NE	NE	NE
Nip and Tuck Creek.....	11 N	13 E	....do....	2	5-10	NE	Tr	NE	NE	NE
Pigtail Creek.....	9 N	15 E	Grab..	11	10-85	2-6	Tr-2.0	2-70	Tr	Tr-1
Salmon River Valley.....	8,9,10,11 N	13,14,15 E	Pan....	15	Tr-10	Tr-5	Tr	Tr-5	NE	NE
Stanley Lake Creek.....	11 N	12 E	....do....	2	Tr	Tr	Tr	NE	NE	NE

†Boise meridian.

TABLE 2. - Summary of reconnaissance sample data--Continued

(Tr, trace to 0.5 pound except for monazite, which is less than 0.05 pound;
NE, no estimate made in panned sample; ND, none detected)

Placer area	Location ¹		Sampling method	Number samples	Estimated content in pounds per cubic yard					
	Township	Range			Total black sand	Ilmenite	Monazite	Magnetite	Garnet	Zircon
Custer County--Continued										
Upper Salmon River (Con.):										
Tennell Creek.....	11 N	12, 13 E	Grab..	2	Tr-25	Tr-9	Tr	Tr-2	Tr	
Warm Springs Creek.....	9 N	15 E	...do...	15	1-80	Tr-5	Tr-1.0	Tr-60	Tr	
Yankee Fork.....	12 N	15 E	Pan...	4	Tr-10	Tr	Tr	NE	NE	
Elmore County										
Middle Fork Boise River:										
Black Warrior Creek.....	6 N	10 E	Grab..	4	2-5	Tr-1	0.1-0.2	1-3	Tr	
Buck Creek.....	5 N	9 E	Pan...	6	1-5	Tr	Tr- .2	NE	NE	
Deadman Creek.....	5 N	9 E	...do...	4	2-10	Tr	Tr- .2	NE	NE	
Eagle Creek Bar.....	6 N	10 E	...do...	3	5-40	Tr-7	Tr- .5	3-30	NE	
Main River Bars.....	5, 6 N	10, 11 E	...do...	15	2-20	Tr-4	Tr	1-10	NE	
Queen's River Bar.....	6 N	10 E	...do...	2	3-10	Tr-2	Tr	1-8	NE	
Snake River:										
Black Creek.....	2 N	4 E	Grab..	2	5-8	Tr-5	.1- .2	Tr	2-3	
Canyon Creek.....	3 S	6 E	...do...	2	Tr	Tr	Tr	Tr	Tr	
Ditto Creek.....	1 S	5 E	...do...	2	10-50	Tr-1	.1-2.0	Tr	5-32	
Dry Creek.....	1 S	6 E	...do...	2	4-15	Tr	.2- .3	Tr	2-9	
Squaw Creek.....	2 S	5 E	...do...	2	Tr	Tr	Tr	Tr	Tr	
South Fork Boise River:										
Cat Creek.....	1 S	9 E	Pan...	6	5-10	Tr-2	.1- .3	2-5	NE	
Deer Creek.....	2 N	10 E	...do...	3	5-20	Tr-2	.1- .2	2-10	NE	
Feather River.....	3, 4 N	10 E	Grab..	8	5-20	Tr-1	Tr	3-16	NE	
Schoolhouse Gulch.....	3 N	10 E	Pan...	2	5-20	Tr-2	Tr- .2	2-10	NE	
Smith Creek.....	2 N	7 E	Grab..	2	5-13	Tr	.2- .5	Tr	5-10	
Willow Creek.....	1, 2 N	6 E	...do...	5	1-25	Tr-2	Tr- .7	Tr-7	Tr-11	
Idaho County										
Chamberlain Basin:										
Chamberlain Creek.....	24 N	10, 11 E	Pan...	3	1-20	NE	Tr	NE	NE	
South Fork.....	23, 24 N	10 E	...do...	6	Tr-20	NE	Tr	NE	NE	
West Fork.....	24 N	10 E	...do...	8	5-20	NE	Tr	NE	NE	
Moose Creek.....	23 N	10 E	...do...	2	Tr-5	NE	Tr	NE	NE	
Ranch Creek.....	24 N	10 E	...do...	3	2-20	NE	Tr	NE	NE	
Dixie:										
Crooked Creek.....	26 N	8 E	Grab..	12	2-13	1-6	0.2-1.3	1-3	Tr-2	
Dixie Meadows.....	25 N	8 E	...do...	10	2-4	1-2	Tr- .2	Tr	Tr	
Elk City:										
American River.....	29, 30 N	8 E	...do...	6	5-30	3-15	Tr- .4	Tr-2	Tr-1	
Buffalo Creek.....	29 N	8 E	...do...	5	20-69	10-48	.2- .7	Tr-1	Tr-1	
Crooked River.....	27, 28, 29 N	7 E	...do...	8	5-20	3-10	Tr- .2	1-6	Tr	

TABLE 2. - Summary of reconnaissance sample data--Continued

(Tr, trace to 0.5 pound except for monazite, which is less than 0.05 pound;
NE, no estimate made in panned sample; ND, none detected)

Placer area	Location ¹		Sampling method	Number samples	Estimated content in pounds per cubic yard					
	Township	Range			Total black sand	Ilmenite	Monazite	Magnetite	Garnet	Zircon
Lemhi County										
Leesburg:										
Arnett Creek.....	22 N	19, 20 E	Grab	6	10-50	6-20	Tr-1.0	2-10	Tr-2	Tr
Moose Creek.....	23 N	20 E	...do...	5	2-10	1-5	Tr- .1	Tr-2	Tr	Tr-1
Napias Creek.....	21,22 N	19,30 E	...do...	10	3-50	2-40	Tr-1.0	1-10	Tr-2	Tr-1
Panther Creek.....	22,23 N	18 E	...do...	6	5-40	2-30	Tr	1-10	Tr-1	Tr-3
Phelan Creek.....	21 N	20 E	...do...	4	3-38	2-24	Tr- .6	1-6	Tr-1	Tr-1
North Fork:										
Dahlonga Creek.....	26 N	21,22 E	...do...	8	5-22	4-14	Tr- .4	Tr-3	Tr	Tr
Deep Creek.....	26 N	21 E	Pan...	2	2-3	1-2	Tr	Tr-1	NE	NE
Hammearean Creek.....	26 N	21 E	...do...	2	2-4	1-3	Tr	NE	NE	NE
Horse Creek.....	25 N	16 E	Grab..	8	2-28	1-8	0.1- .9	Tr-12	Tr	Tr-1
Hughes Creek.....	25 N	21 E	...do...	10	1-5	Tr-3	Tr	Tr	Tr	Tr
Hull Creek.....	25 N	21 E	...do...	2	Tr-5	Tr-3	Tr	Tr-3	Tr-1	Tr
North Fork Salmon River....	24,25,26 N	21 E	...do...	12	Tr-30	Tr-17	Tr- .3	Tr-3	NE	NE
Papoose Creek.....	24 N	19 E	Pan...	2	Tr-25	1-6	Tr	1-5	NE	NE
Reynolds Creek.....	25 N	16 E	Grab..	2	2-5	1-3	Tr- .1	Tr	NE	Tr
Sage Creek.....	24 N	20 E	Pan...	2	2-10	NE	Tr	NE	NE	NE
Sheep Creek.....	25 N	21,22 E	...do...	10	Tr-3	Tr	Tr	NE	NE	NE
Spring Creek.....	24 N	19 E	...do...	2	5-15	2-10	Tr	Tr-3	NE	NE
Squaw Creek.....	24 N	19 E	...do...	4	5-25	2-15	Tr	Tr-10	NE	NE
Vine Creek.....	26 N	21 E	...do...	2	Tr	NE	Tr	NE	NE	NE
Volter Creek.....	26 N	21 E	Grab..	3	2-9	1-5	Tr- .1	Tr-1	Tr	Tr
Salmon:										
Agency Creek.....	19 N	24 E	Pan...	3	Tr-5	NE	Tr	NE	NE	NE
Hat Creek.....	17 N	20 E	...do...	3	2-10	NE	Tr	NE	NE	NE
Kirtley Creek.....	21,22 N	22,23 E	...do...	4	2-20	Tr-6	Tr	Tr-10	NE	NE
Lemhi River.....	16,17,18, 19,20,21 N	22,23,24 E	...do...	8	Tr-20	NE	Tr	NE	NE	NE
Pahsimeroi River.....	15 N	21 E	...do...	3	Tr	NE	ND	NE	NE	NE
Second Creek.....	19 N	21 E	...do...	2	2-10	NE	Tr	NE	NE	NE
Wallace Creek.....	22 N	21 E	...do...	4	5-20	1-5	Tr	2-10	NE	NE
Yellowjacket:										
Hoodoo Creek.....	20 N	16 E	Grab..	8	4-10	1-3	Tr	1-4	Tr	Tr
Lower Yellowjacket Creek....	20 N	17 E	...do...	12	1-10	Tr-3	Tr	Tr-2	Tr	Tr
Upper Yellowjacket Creek....	20 N	16,17 E	...do...	20	2-100	Tr-10	Tr	1-80	Tr	Tr
Lewis County										
Clearwater River.....	35 N	2 E	Pan...	3	2-15	Tr-5	Tr	NE	NE	NE
Nez Perce County										
Clearwater River.....	37 N	3 W	Pan...	2	Tr-10	Tr-2	Tr	NE	NE	NE

Owyhee County										
Silver City:	6,7 S	3 W	Grab	3	1-2	Tr-1	Tr-0.1	Tr	Tr-1	Tr
Boulder Creek.....	6 S	4 W	....do....	2	1-3	Tr-1	Tr-.1	Tr	Tr-1	Tr
Deer Creek.....	6,4 S	4 W	....do....	4	2-6	Tr-3	0.1-.2	Tr-1	Tr-1	Tr
Jordan Creek.....	6 S	2 W	....do....	10	4-30	2-17	.1-.6	1-2	Tr-2	Tr
Meadow Creek.....										
Snake River:										
Brown's Creek.....	4 S	1 E	Pan....	2	1-2	NE	Tr	NE	NE	NE
Castle Creek.....	5 S	1 E	....do....	2	1-2	NE	Tr	NE	NE	NE
Cow Creek.....	4 S	6 W	Grab...	2	2-8	Tr-2	Tr-.1	Tr-1	Tr-1	Tr
Rabbit Creek.....	2 S	2 W	....do....	2	2-7	1-5	Tr	Tr-1	Tr	Tr
Sinker Creek.....	4 S	2 W	Pan....	2	1-2	NE	Tr	NE	NE	NE
Shoshone County										
St. Maries River.....	43 N	1 E	Pan....	3	2-20	Tr	Tr	NE	1-10	NE
Valley County										
Bear Valley:										
Bearskin Creek.....	12 N	8 E	Grab..	3	1-4	Tr-1	Tr-0.2	Tr	Tr-1	Tr
Elk Creek.....	13 N	8,9 E	....do....	2	2-9	Tr-2	0.1-.5	Tr	1	Tr
Little Beaver Creek.....	13 N	8 E	....do....	2	2-10	1-4	.1-.4	Tr	Tr	Tr
Nameless Creek.....	13 N	9 E	....do....	2	1-4	Tr	Tr-.1	Tr	Tr	Tr
Deadwood River:										
Bummer Creek.....	12 N	7 E	Pan....	2	5-20	2-10	Tr	1-10	NE	NE
Upper Deadwood River.....	13 N	7 E	Grab..	3	6-18	3-9	.5-1.8	Tr-3	Tr-3	Tr
Wild Buck Creek.....	12 N	7 E	Pan....	3	10-30	5-10	Tr	5-10	NE	NE
Landmark:										
Bobcat Creek Bar.....	15,16 N	8 E	....do....	2	5-20	NE	0.1	NE	NE	NE
Lower Johnson Creek.....	17,18 N	8 E	Grab..	4	5-20	1-5	Tr	1-5	Tr	Tr
Peanut Creek.....	15 N	8 E	Pan....	3	Tr-5	NE	Tr	NE	NE	NE
Pistol Creek.....	16 N	9,10 E	....do....	2	Tr	NE	Tr	NE	NE	NE
Rock Creek (Pen Basin).....	15 N	8 E	....do....	8	Tr-5	NE	Tr	NE	NE	NE
Sand Creek.....	15 N	8 E	....do....	3	Tr-5	NE	Tr	NE	NE	NE
Upper Johnson Creek.....	15 N	8 E	Grab..	4	2-11	Tr-2	Tr-.1	Tr-6	Tr	Tr
Whiskey Creek.....	15 N	8 E	Pan....	3	Tr	NE	Tr	NE	NE	NE
North Fork Payette River:										
Boulder Creek.....	16,17 N	3 E	Grab..	11	7-61	4-15	Tr-.4	Tr-29	Tr-9	Tr-4
Hot Creek.....	15 N	3 E	....do....	4	2-27	1-19	Tr-1.1	Tr-1	Tr	Tr
Lake Fork River.....	17 N	3 E	....do....	5	6-79	3-20	Tr-2.4	Tr-2	1-21	Tr-4
Moore Creek.....	13 N	4 E	....do....	2	27-60	8-18	.3-.6	5-6	11-24	1-9
North Fork Gold Fork River:										
Flat Creek.....	15,16 N	4 E	....do....	2	9-39	2-31	Tr	4-5	Tr	Tr
Kennally Creek.....	17 N	4,5 E	....do....	9	2-156	Tr	.1-3.9	Tr-94	Tr-14	Tr-2
Paddy Creek.....	17 N	4 E	....do....	4	17-138	11-41	.3-1.8	Tr-76	1-13	Tr-1
Powelson Creek.....	17 N	5 E	....do....	2	2-16	Tr	.2-2.8	Tr	Tr-4	Tr
Rapid Creek.....	17 N	4 E	....do....	3	26-70	2-7	.3-1.1	7-55	2-3	1-2
Olson Creek.....	13 N	3 E	....do....	2	28-59	6-9	.8-1.2	Tr-2	17-35	1-3
Round Valley Creek.....	12 N	3,4 E	....do....	2	7-8	3-4	.1	Tr	Tr	Tr-1
Skunk Creek.....	12 N	4 E	....do....	1	6	2	.7	Tr	2	Tr
Upper Big Creek.....	14,15 N	5 E	....do....	13	1-71	1-28	Tr-11.4	Tr-12	Tr-11	Tr-3
Willow Creek.....	16 N	3 E	....do....	8	3-43	1-26	Tr-.3	Tr-1	Tr-6	Tr-1

Boise meridian.

The drilling and sampling done are considered as preliminary. Although an estimate was made of the extent of the titanium-bearing gravel, when possible, none of the deposits were explored enough to determine the exact reserves by volume of gravel or by pounds of recoverable mineral.

The properties explored in the various counties are given in the appendix, together with the location by township and range and the name of the property owner at the time the work was done.

Economic exploitation of Idaho ilmenite resources is dependent upon favorable market conditions for the coproduct minerals--monazite, columbite, magnetite, garnet, zircon, and radioactive black minerals. Transportation costs are quite high in relation to the marketing areas in 1962.

DESCRIPTION OF DEPOSITS

Payette River Drainage

General

The Payette River drainage system includes the North, Middle, and South Forks of the Payette River and their tributaries (fig. 1). These streams drain the southwestern part of the Idaho batholith. A total of 20 placer areas (fig. 2) was sampled by churn drilling--one area in Gem County, one in Boise County, and the rest in Valley County.

Climatic conditions are variable in Idaho because altitudes range from about 3,000 feet at the southernmost deposit to more than 6,000 feet at the northernmost deposit. At higher altitudes, the mining season ordinarily would be limited to about 10 months out of the year.

Enough water for mining is available in the immediate vicinity of all the properties except the Corral and Johnson Creek deposits for which the nearest adequate supply of surface water is about 2 miles away.

High-voltage transmission lines owned by the Idaho Power Co. cross, or are relatively near, all the deposits with the exception of the deposits at Squaw Meadows, Paddy Flats, Peace Valley, and the Deadwood River. All but these four deposits are also within 10 miles of a branch line of the Union Pacific Railroad between Emmett and McCall, Idaho. Access to the placers is provided primarily by Idaho State Highway No. 15, which connects with U.S. Highway No. 30 at Boise and crosses several of the deposits in Long Valley. Other State highways and county roads originating at State Highway No. 15 provide access to the other placer areas.

Long Valley, which has a southerly trend along the North Fork of the Payette River, is near the western extremity of the Idaho batholith. The more important placer deposits are in this valley or in adjacent tributary valleys. The west side of the valley is bounded by a fault scarp at the base of West Mountain, which rises abruptly several thousand feet. A lake was created when the uplift of West Mountain dammed the Payette River and, subsequently,

tributary streams from the granitic mountains on the east deposited deltas of alluvial material in the lake. Rise and fall of the lake level and change in gradient and course of the westward-flowing streams, because of block faulting in the mountains on the east side of the valley, were contributing factors to the location, size, shape, and mineral content of the black-sand deposits.

Essentially, the alluvium is composed of quartz, feldspar, and mica in sizes ranging from clay to fine gravel. It is termed Long Valley wash to differentiate it from the more recent basaltic, gneissic, and granitic materials deposited by the North Fork of the Payette River.

Titanium-bearing placer deposits in the Payette River drainage system are given alphabetically in table 3 with information for each of the deposits.

Squaw Meadows

Squaw Meadows is in a high mountain valley near the headwaters of the North Fork of the Payette River, about 21 miles north of McCall.

The valley, about 2 miles long with an average width of 1,200 feet, is bounded on both sides by granitic rocks. Three holes were drilled in the area to depths from 37 to 55 feet. The 37-foot hole reached bedrock, and the other two bottomed in clay or lake sediments of granitic sand that contained only a small concentration of heavy minerals. The ilmenite content averaged 2 pounds per cubic yard.

Paddy Flats

The Paddy Flat placer, about 10 miles southeast of McCall, Idaho, includes the drainage systems of Paddy Creek, Camp Creek, Rapid Creek, and smaller unnamed streams. A part of the deposit, about 2.5 miles long and 0.6 mile wide, was tested by the Cosumnes Gold Dredging Co., Inc. The company drilled 35 randomly spaced holes from 6 to 84 feet deep; 14 reached bedrock.

The weighted average of black-sand concentrates was 60 pounds per cubic yard, but the amount of concentrates varied widely in areal extent and vertical section as did the ratio of the mineral constituents in the individual samples. The weighted average of the ilmenite and monazite from 14 drill holes was 11.6 and 0.30 pounds per cubic yard, respectively.

Boulder Creek

The Boulder Creek placer is 2.5 miles east and 1 mile north of the town of Lake Fork, Idaho.

The deposit covers an area of about 160 acres in a shallow depression. The material appears to be reconcentrated glacial outwash; gravel in the stream bed is 6 inches or less in diameter.

TABLE 3. - Summary of exploration data for Payette River Drainage

(Tr, trace)

Placer area	Number of drill holes	Depth range, ft	Total footage	Number of samples	Average number of pounds per cubic yard						
					Ilmenite	Monazite	Radio-active blacks ¹	Columbite	Magnetite	Garnet	Zircon
Beaver Creek.....	16	50-100	1,138	244	10.6	0.51	-	-	0.5	0.1	0.1
Big Creek.....	39	30-110	2,355	519	13.4	1.50	Tr	-	.2	1.5	.6
Boulder Creek.....	2	15	30	6	19.2	Tr	-	-	2.8	3.5	3.6
Clear Creek:											
Upper.....	8	10-20	119	37	5.5	1.16	-	-	.5	5.2	.2
Lower.....	27	30-80	1,264	287	4.6	.71	-	-	.3	5.0	.3
Corral Creek.....	61	20-123	3,518	773	3.9	1.80	Tr	-	.2	.1	.1
Deadwood River....	10	6-32	246	52	3.3	.10	Tr	Tr	4.6	.5	.1
Garden Valley:											
Anderson Creek..	6	40-60	230	55	4.1	.32	Tr	-	2.1	.2	.1
Garden Valley...	15	40-120	980	196	1.7	.18	Tr	Tr	.3	2.9	.1
Gold Fork River...	31	16-140	2,050	422	10.3	.38	Tr	-	4.0	2.9	.3
Horsethief Basin..	3	10-59	119	26	3.1	1.57	-	-	.3	.3	.4
Hull's Big Creek prospect.....	6	10-28	120	22	5.0	1.60	Tr	-	.2	1.2	.6
Johnson Creek.....	10	7-40	182	37	7.3	.38	-	-	7.0	1.7	.4
Lake Fork Creek...	1	20	20	4	2.1	Tr	-	-	2.4	3.3	.3
Little Valley.....	5	35-45	198	45	6.8	.45	Tr	-	6.9	5.6	.5
Paddy Flats.....	35	6-84	1,106	220	11.6	.30	Tr	-	18.9	3.4	Tr
Peace Valley.....	6	11-16	82	17	1.6	.29	-	-	2.7	2.2	.3
Pearsol Creek.....	65	30-120	3,898	780	16.0	1.63	-	-	.2	.7	.1
Scott Valley.....	16	5-68	644	145	9.1	.57	Tr	-	.6	1.9	.7
Squaw Meadows.....	3	37-55	145	29	2.0	.16	-	-	1.2	.4	.4
West Mountain.....	19	30-107	976	212	2.6	.06	Tr	-	.4	.2	.1
White Hawk Basin..	10	9-18	129	26	3.0	.70	0.13	0.15	1.0	5.0	-
Totals.....	395	-	19,549	4,154	-	-	-	-	-	-	-

¹ Euxenite, samarskite, etc.

Two holes, each 15 feet deep, were drilled 2,200 feet apart on the east side of the creek. Both holes reached granite-gneiss bedrock--one at 8 feet and the other at 12 feet. Average ilmenite content for the two holes was about 19.2 pounds per cubic yard. The black-sand content decreased with depth in each hole.

Lake Fork Creek

The Lake Fork Creek deposit, several square miles in extent, is about 5 miles south of McCall. County and private roads and open fields provide access.

Although the stream bars contain relatively much black sand, samples taken about 200 feet east of the creek contain much less. The granitic and basaltic sand and gravel, apparently of glacial origin, is highly compacted.

A single hole was drilled to a depth of 20 feet in a roadside gravel pit on the north side of the county road one-fourth mile east of Lakefork. The black sand averaged 11.3 pounds per cubic yard, including 2.1 pounds of ilmenite.

West Mountain

The West Mountain placer deposit covers an area of several hundred acres in the low, timber-covered hills between West Mountain and the Cascade Reservoir. The alluvial material appears to be of the same origin as that in placers on the east side of the valley.

Nineteen holes were drilled, ranging from 30 to 107 feet in depth. One reached bedrock; all encountered virtually barren lake sediments below a superficial layer of monazite-bearing gravel. The lake sediments consisted of clay with bands of fine white, yellow, and brown sands.

Average black-sand content in the deposit was less than 5 pounds per cubic yard, including 2.6 pounds of ilmenite.

Little Valley

The Little Valley placer, about 19 miles by road northeast of Cascade, is near the confluence of the North Fork of the Gold Fork River and Flat Creek.

The deposit is about 2,200 acres in area. Half of the surface is covered with brush and second growth timber; the rest is open land used for grazing and cultivation.

Little Valley is a structural basin formed by a series of block faults. Alluvial gravel, with an average depth of 30 feet, is underlain by fine-grained lacustrine sediments with a low black-sand content. Remnants of a low bench consisting of coarse, iron-stained, gold-bearing gravel are near the mouth of the North Fork of the Gold Fork and downstream on the main Gold Fork River.

Five holes ranging in depth from 35 to 45 feet were drilled in the area; none reached bedrock (fig. 5). Average ilmenite content was 6.8 pounds and monazite 0.45 pound per cubic yard.

Gold Fork River (19)

The Gold Fork River placer is on the east side of Long Valley, 14 miles north of Cascade (fig. 6). Idaho State Highway No. 15 crosses the area and continues north through McCall.

The total length of the deposit is about 6 miles; the width, where tested, ranges from 1,000 to 4,000 feet. In Long Valley, the Gold Fork River meanders through a depression bordered by gravel terraces that range in height from 10 to more than 50 feet. The depression ranges in width from about 1,500 feet in the eastern part to more than 3,000 feet at the mouth of the river on the west.

A dam across the North Fork of the Payette River at Cascade has created a reservoir that inundates about one-half of the Gold Fork River basin during part of each year. Upstream from the flooded area the depression is mostly swamp or is covered with thick brush and scattered clumps of trees. The terraces on either side are cultivated farm lands.

Thirty-one holes, ranging in depth from 16 to 140 feet, were drilled in the deposit. Holes prefixed "G" refer to drilling done by the Special Minerals Section, "GF" refers to Bureau of Mines drilling, and "DH" to drilling done by the Bureau of Reclamation. Mineral content was calculated to a depth of 100 feet. Holes G-1, G-2, G-8, and G-10 reached bedrock. The areal extent of the deposit was not delimited.

Distribution of heavy minerals in the deposit is erratic both in vertical section and areal extent. The average content is 10.3 pounds ilmenite and 0.38 pound monazite per cubic yard. Gravel from several of the drill holes had a significant gold content.

An analysis of the ilmenite fraction of a composite sample of black-sand concentrates showed: 45.3 percent TiO_2 , 34.9 percent Fe, and 0.40 percent Cb_2O_5 (table 1).

Beaver Creek

The Beaver Creek placer, in the northern part of Cascade Valley, begins on the east side of Idaho State Highway No. 15 about 1 mile north of Cascade, Idaho, and extends northward about 4 miles along the drainage of Beaver Creek, a tributary to the North Fork of the Payette River, and other intermittent streams (21) (fig. 7). The width of the valley averages about 1.5 miles. With the exception of brush bordering the creeks, the area is used for agriculture purposes.

Sixteen holes were drilled, ranging from 50 to 100 feet in depth; none reached bedrock. The black-sand content was calculated only to a depth of 85 feet in the deeper holes.

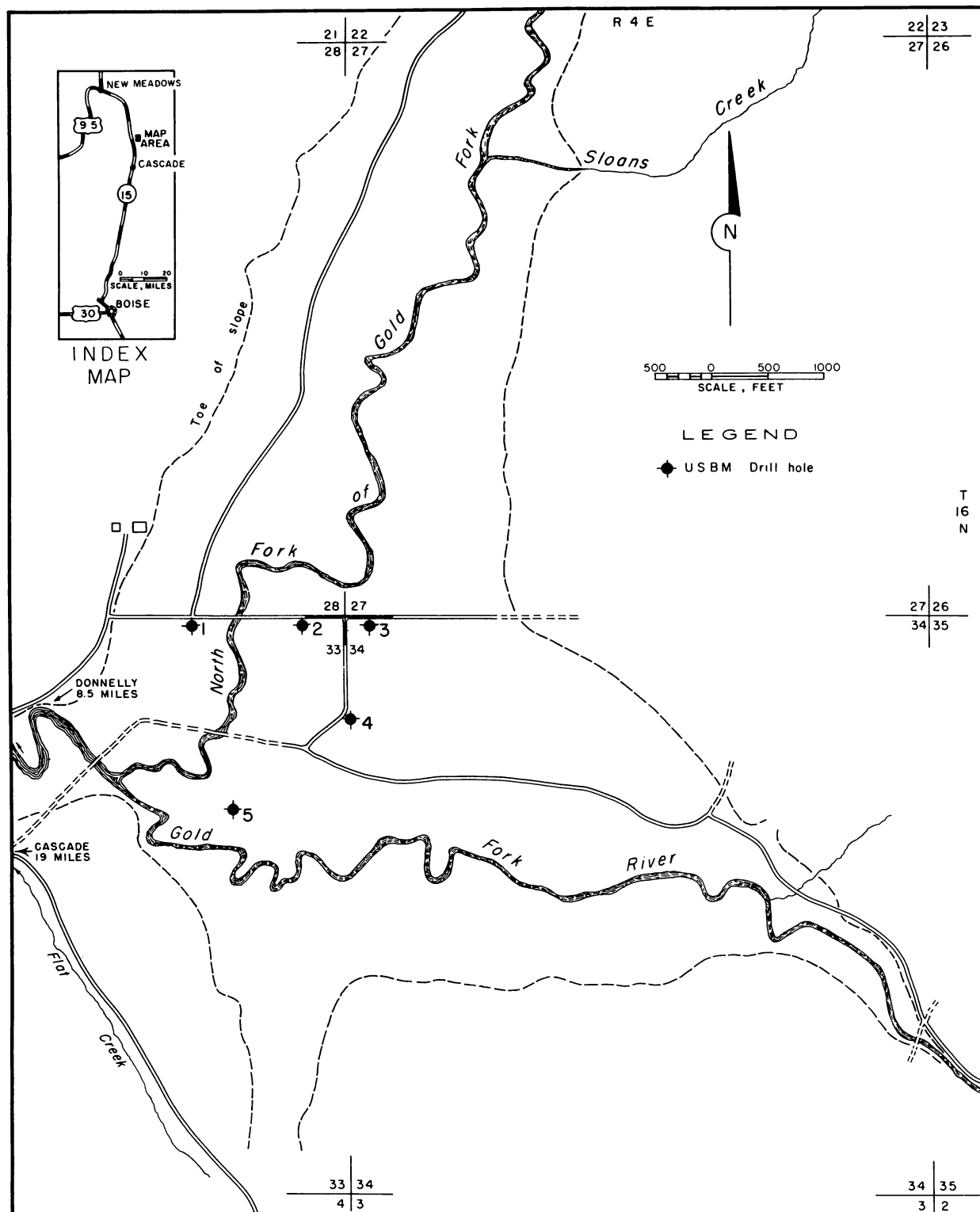


FIGURE 5. - Little Valley Placer Area, Valley County.

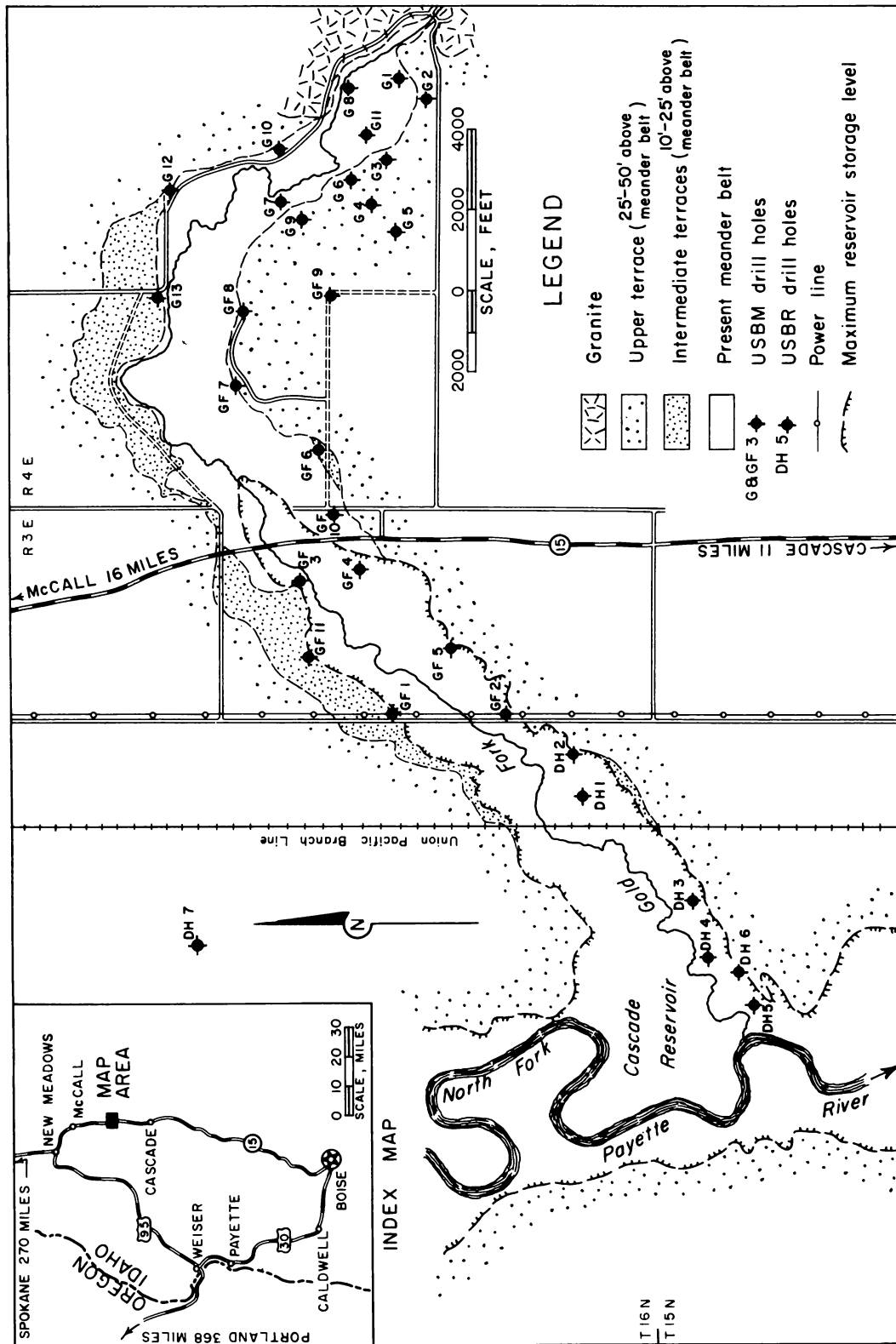


FIGURE 6. - Gold Fork Placer Area, Valley County.

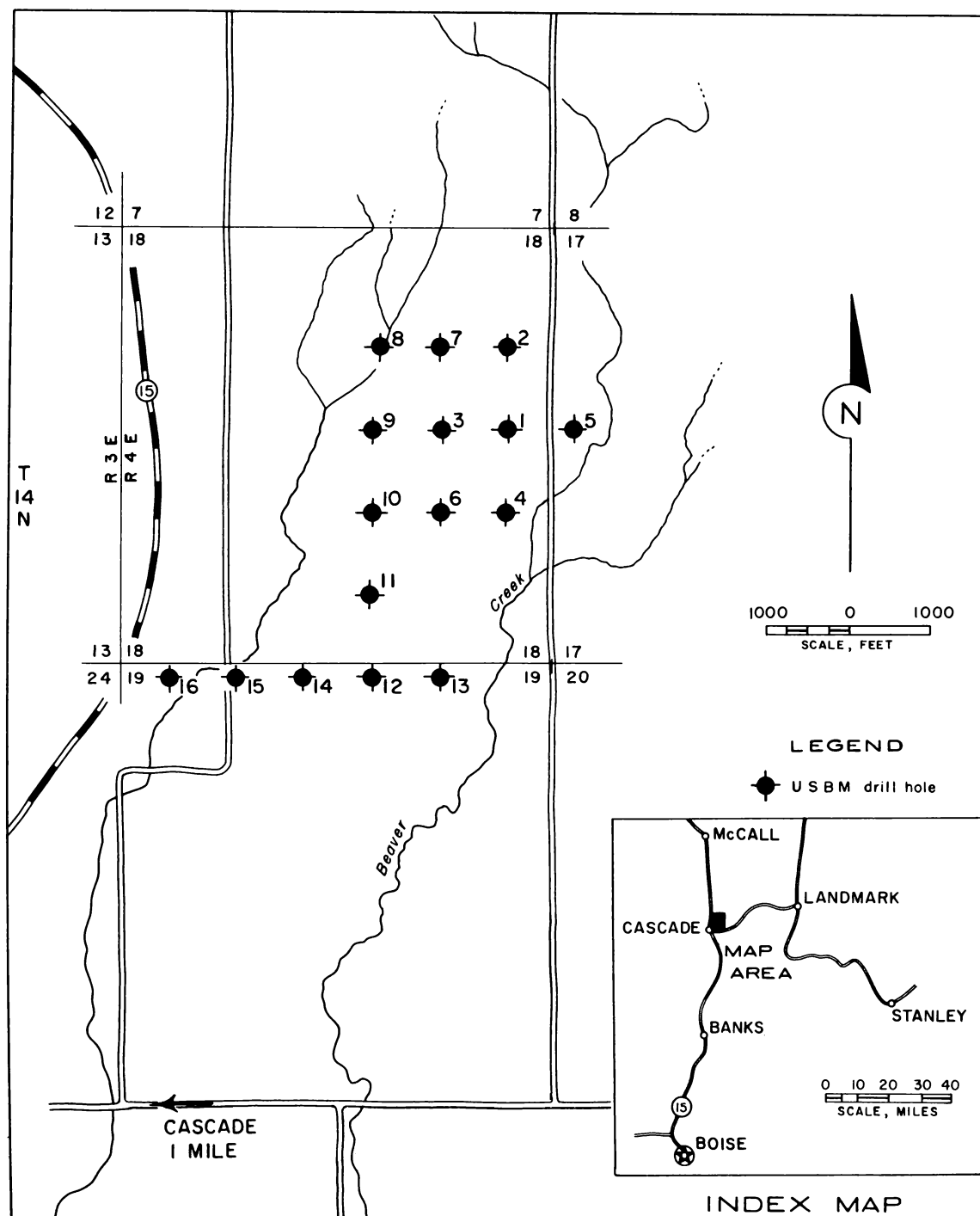


FIGURE 7. - Beaver Creek Placer Area, Valley County.

Ilmenite represented about 70 percent of the black-sand minerals, averaging 10.6 pounds per cubic yard. The average monazite content was 0.51 pound per cubic yard.

An analysis of the ilmenite fraction of a composite sample of black-sand concentrates showed 46.7 percent TiO_2 , 36.6 percent Fe, <0.20 percent Cb_2O_5 (table 1).

Pearsol Creek

The Pearsol Creek placer deposit is on the east side of Long Valley and is contiguous to the Big Creek placer (8) (fig. 8). Idaho State Highway No. 15 is one-fourth mile to the southwest. Cascade is less than 2 miles to the northwest.

Sixty-five holes were drilled in exploring an area of about 3 square miles. The holes ranged in depth from 30 to 120 feet; none reached bedrock. Most of the land surface, which is now used for agricultural purposes, has been cleared.

Mineralogically the black sands are essentially the same as those in other deposits on the east side of Long Valley. The deposit contains an average of 16 pounds of ilmenite and 1.63 pounds of monazite per cubic yard; also trace amounts of very fine gold are present.

The ilmenite fraction of a composite sample of black-sand concentrate contained 47.5 percent TiO_2 , 35.6 percent Fe, and 0.20 percent Cb_2O_5 (table 1).

Big Creek

The Big Creek deposit is in the southern part of Long Valley (11) (fig. 9). Idaho State Highway No. 15 crosses the western edge of the placer area 3 miles south of Cascade.

Big Creek crosses Long Valley from the east and empties into the North Fork of the Payette River. Before dredging operations began in 1950, the original stream channel was confined to a slight depression about 1,250 feet wide bounded by sand and gravel benches as much as 20 feet high on either side. Black-sand minerals were not confined to the limits of the depression or basin area. The alluvium consists of clay beds with a low black-sand content interbedded with several horizons of sand and fine gravel. The coarser gravel seldom exceeded 2 inches in diameter.

Thirty-nine holes were churn-drilled ranging from 30 to 110 feet in depth; none reached bedrock. Holes usually were bottomed in a layer of clay barren of black sand. The black-sand mineral content was calculated to a depth of 100 feet. Drilling did not delimit the deposit in either areal extent or vertical depth.

The black sand included an average of 13.4 pounds of ilmenite and 1.50 pounds of monazite per cubic yard. A small amount of fine gold was noted in a few samples.

The ilmenite fraction of a composite sample of black-sand concentrate assayed 45.9 percent TiO_2 , 34.2 percent Fe, and 0.32 percent Cb_2O_5 (table 1).

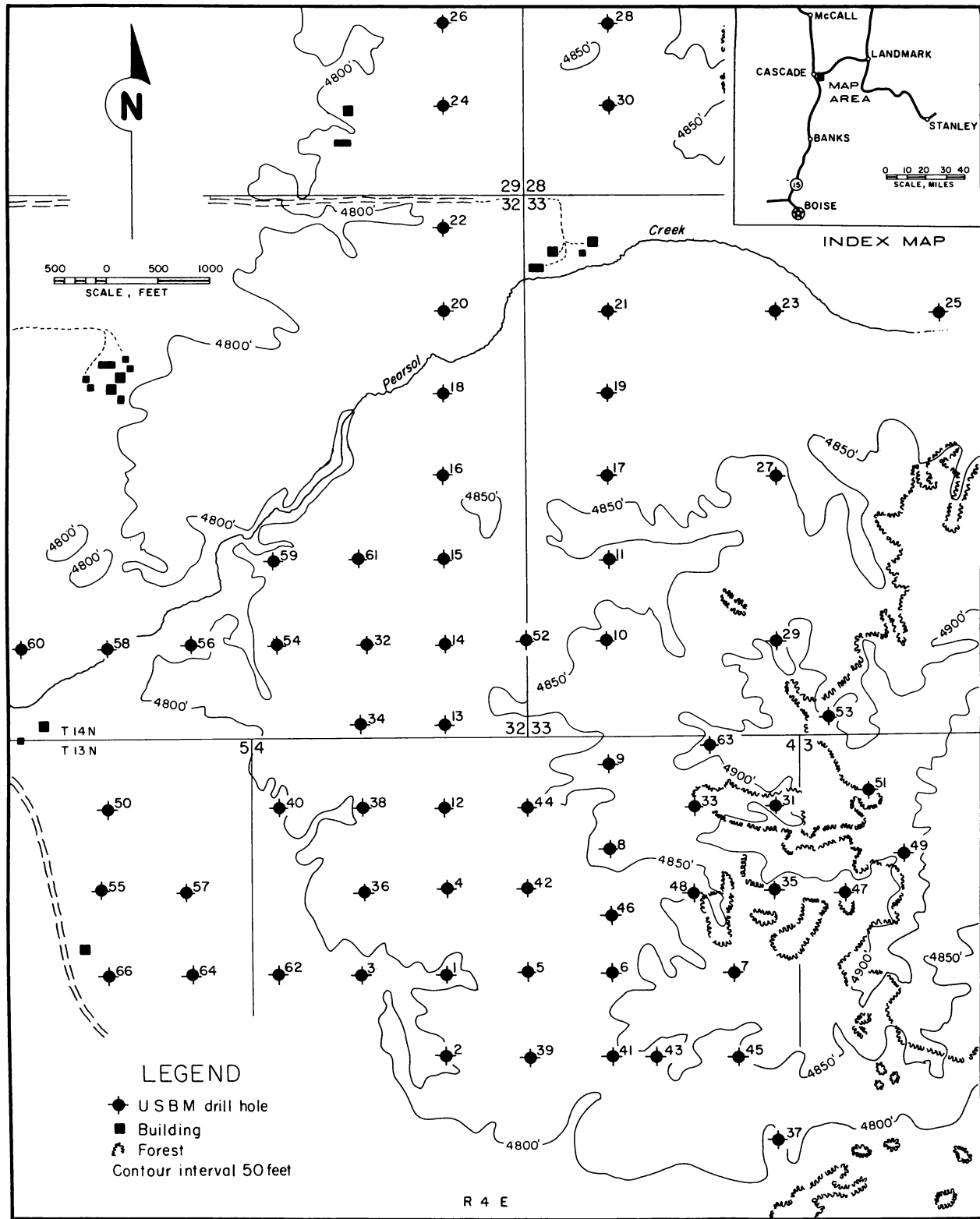


FIGURE 8. - Pearsol Creek Placer Area, Valley County.

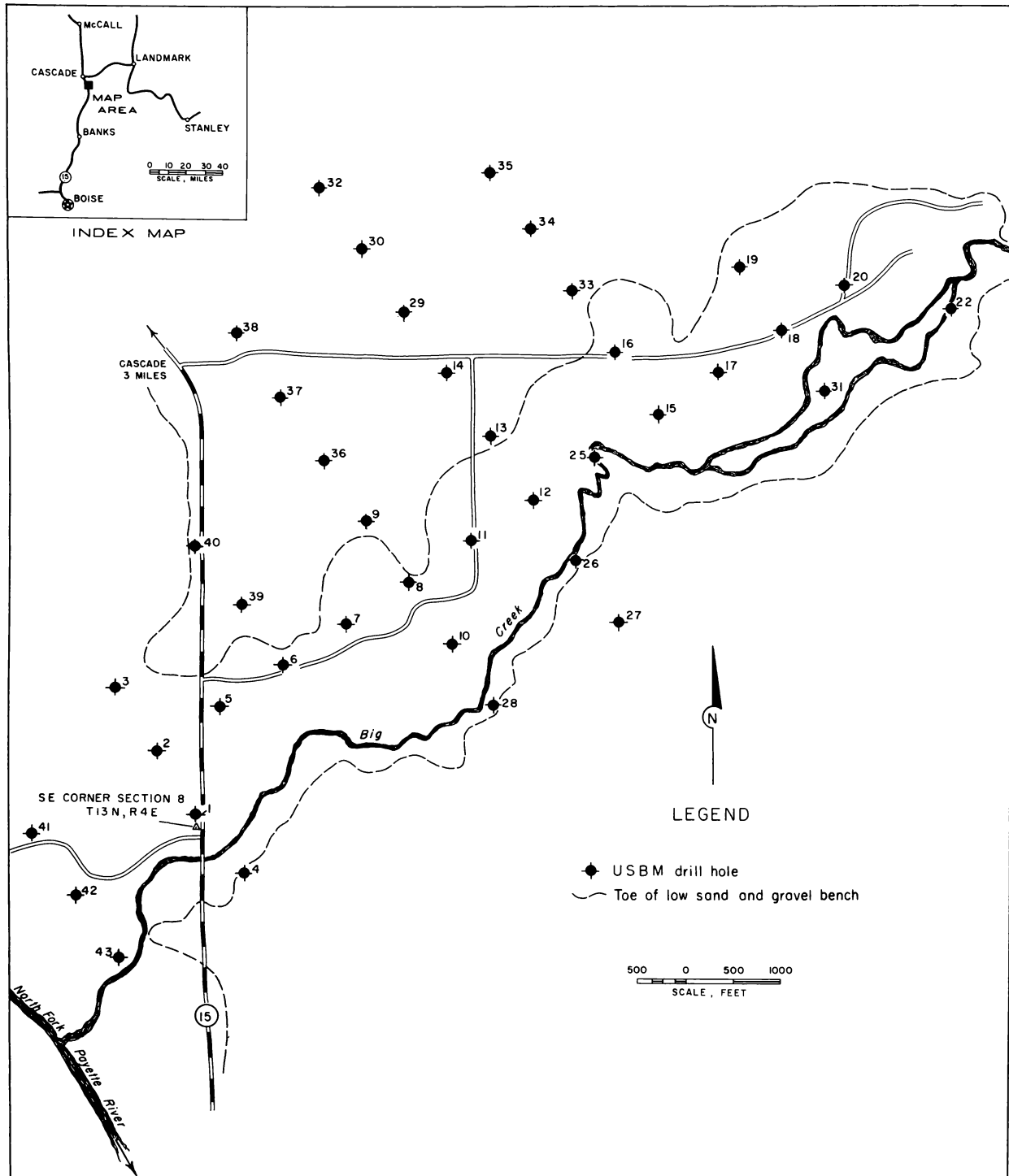


FIGURE 9. - Big Creek Placer Area, Valley County.

Corral Creek

The Corral Creek placer on the east side of Long Valley (fig. 10) (10) is contiguous to the south side of the Big Creek placer. It is about 2 miles long and 1.5 miles wide. The surface is cultivated except for a small acreage used for grazing on the eastern edge.

Sixty-one holes were drilled to depths ranging from 20 to 123 feet. The black-sand content of the gravel was estimated to a maximum depth of 100 feet. Two holes reached bedrock near the mountains bordering the extreme eastern edge of the deposit; a majority of the holes were bottomed in clay.

The black-sand content of the deposit is low, with ilmenite averaging 3.9 pounds and monazite 1.80 pounds per cubic yard. This deposit has the largest average monazite content of any placer deposit tested in Idaho. The ilmenite fraction of a composite sample of black-sand concentrate assayed 46.09 percent TiO_2 , 33.4 percent Fe, and 0.32 percent Cb_2O_5 (table 1).

Clear Creek

The Clear Creek placers were the southernmost deposits in Long Valley drilled by the Bureau. These deposits, designated as Upper and Lower Clear Creek, are separated by a narrow boulder-strewn canyon 2 miles long. Idaho State Highway No. 15 traverses the western edge of the Lower Clear Creek area 7 miles south of Cascade (fig. 11).

The Upper Clear Creek deposit occupies a narrow valley about 300 feet wide and 3 miles long. As indicated by drilling, the depth of the deposit does not exceed 20 feet. Eight random-spaced holes were drilled to bedrock at depths ranging from 10 to 20 feet. Ilmenite averaged 5.5 pounds and monazite 1.16 pounds per cubic yard. The gravel was much coarser than in the Lower Clear Creek area; some boulders were more than 2 feet in diameter.

The Lower Clear Creek deposit covers a larger area than the 1.5 square miles that were tested by drilling. For the most part, it is open agricultural land although part of the surface is covered with brush and scattered groves of timber.

Alluvium in the eastern two-thirds of the deposit is typical of the Long Valley wash; the western one-third is composed of more recent fill from the North Fork of the Payette River.

Twenty-seven holes, 30 to 80 feet deep, were drilled in the Lower Clear Creek area; none reached bedrock.

Analysis of a composite sample from seven drill holes in the Lower Clear Creek area indicated that 83 percent of the black sand was ilmenite and garnet in almost equal amounts. Ilmenite constituted 4.6 pounds and monazite 0.71 pound per cubic yard. The ilmenite fraction of a composite of black-sand concentrate assayed 46.7 percent TiO_2 , 36.0 percent Fe, and 0.30 percent Cb_2O_5 (table 1).

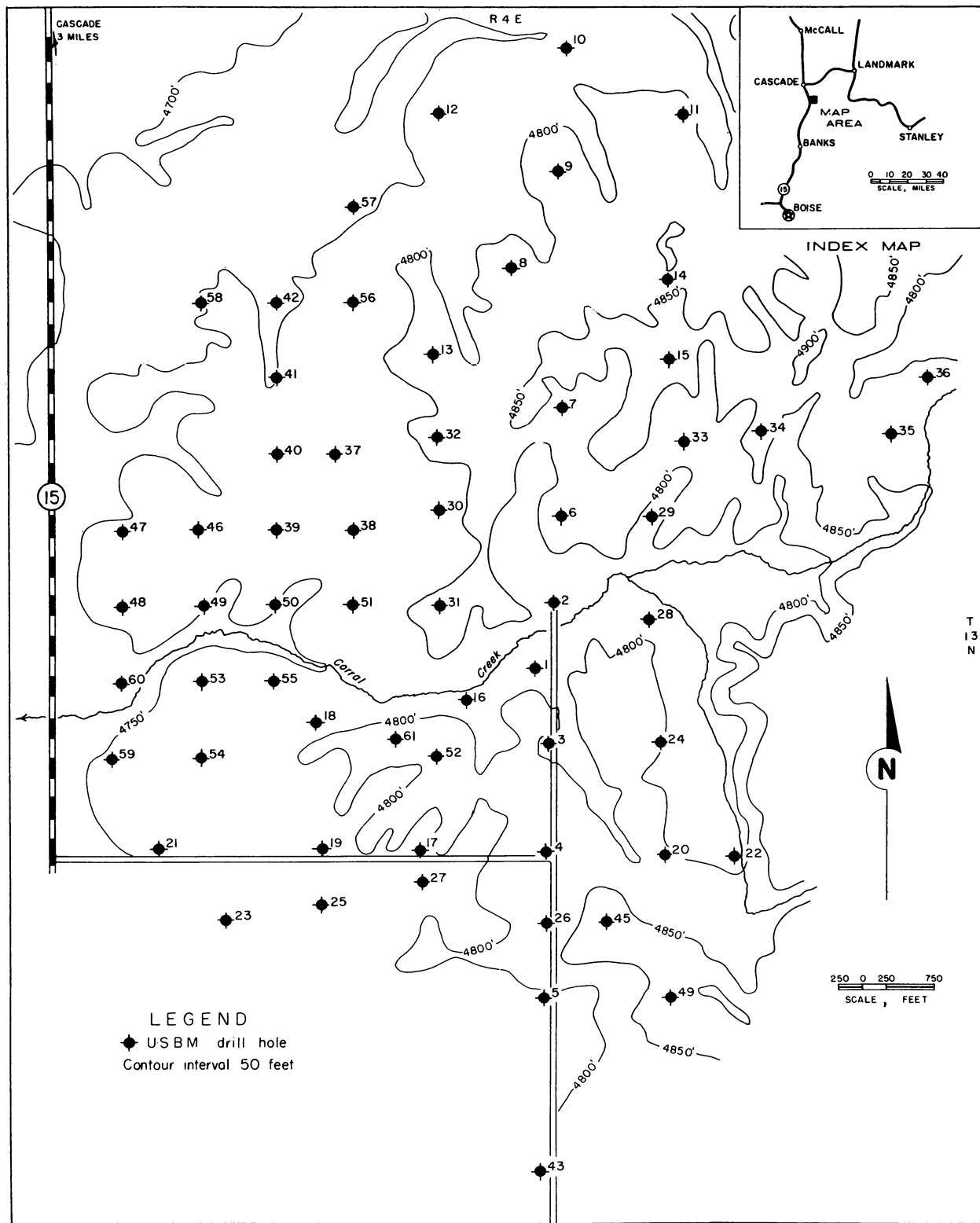


FIGURE 10. - Corral Creek Placer Area, Valley County.

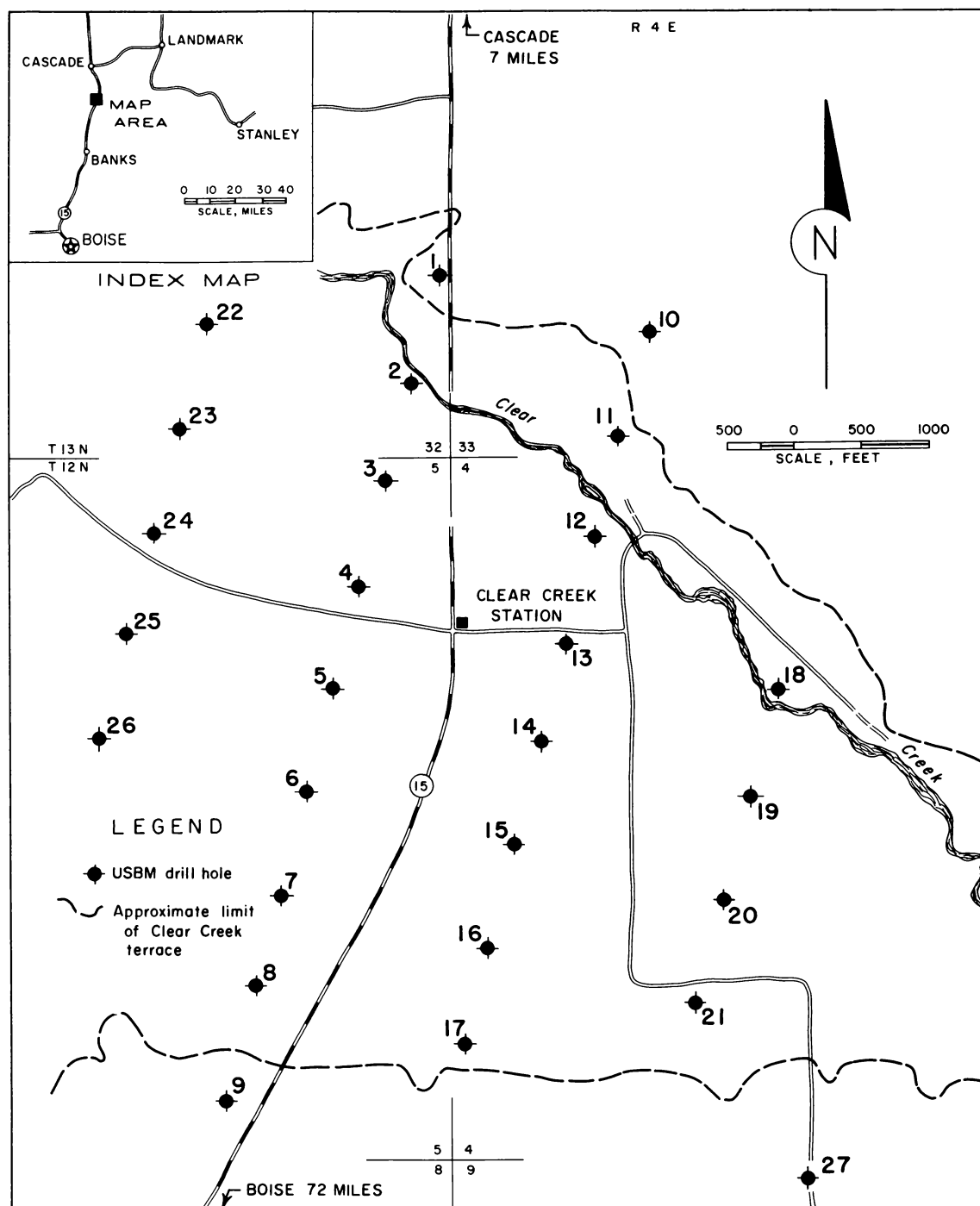


FIGURE 11. - Lower Clear Creek Placer Area, Valley County.

Horsethief Basin

Horsethief Basin (12) is about 7 miles east of Cascade, Idaho, at the southern or downstream end of Scott Valley. The area investigated is about

6,000 feet long and has a maximum width of 2,000 feet. The surface is covered with sage brush, except for 40 or 50 acres of meadow in the lower portion and scattered clumps of trees at the upstream end.

Alluvial material in the deposit is derived from granitic rocks. Coarse gravel does not exceed 6 inches in diameter.

Three holes were drilled near the upper end of the basin (fig. 12) to depths ranging from 10 to 59 feet. Hole No. 1 reached bedrock at 10 feet.

The gravel contains an average of 3.1 pounds ilmenite and 1.57 pounds monazite per cubic yard.

Scott Valley

The lower end of Scott Valley is 7 miles east of Cascade, Idaho, on the Stibnite-Cascade road (12) (fig. 13). The valley, about 5 miles long and 300 to 3,000 feet wide, with narrow canyons at the north and south ends, is drained by Big Creek and its tributaries. The land surface is either swampy or covered with a heavy mantle of brush and second growth timber.

Scott Valley occupies an old north-trending fault. It is bordered on the east by a comparatively soft, coarse-grained granite and on the west by a hard, dense, granitic rock. Alluvial material consists of sand and gravel interbedded with clay. The clay acts as a false bedrock for the concentration of the black-sand minerals. The gravel in the valley proper contains cobbles up to 6 inches in diameter and many large boulders at both the upper and lower ends of the basin.

Sixteen holes were drilled, ranging from 5 to 68 feet in depth. Five holes in the northern or upstream end of the valley encountered bedrock.

The drilling results indicated an average of 9.1 pounds of ilmenite and 0.57 pound of monazite per cubic yard. The ilmenite fraction of the black-sand concentrate assayed 46.1 percent TiO_2 , 36.1 percent Fe, and 0.20 percent Cb_2O_5 (table 1).

Hull's Big Creek Prospect

Hull's Big Creek prospect is at the extreme upstream end of Scott Valley. Access is by the Cascade-Stibnite road that parallels the property 12.5 miles east of Cascade.

The deposit is about 6,000 feet long and averages 400 feet in width. Heavy brush and timber cover the area. Most of the gravel in the deposit is less than 6 inches in diameter, except near the mouth of Johnson Creek, a tributary to Big Creek. The alluvium consists of weathered and eroded products of granite. In general, higher black-sand concentration occurs near the surface and decreases rapidly as bedrock is approached.

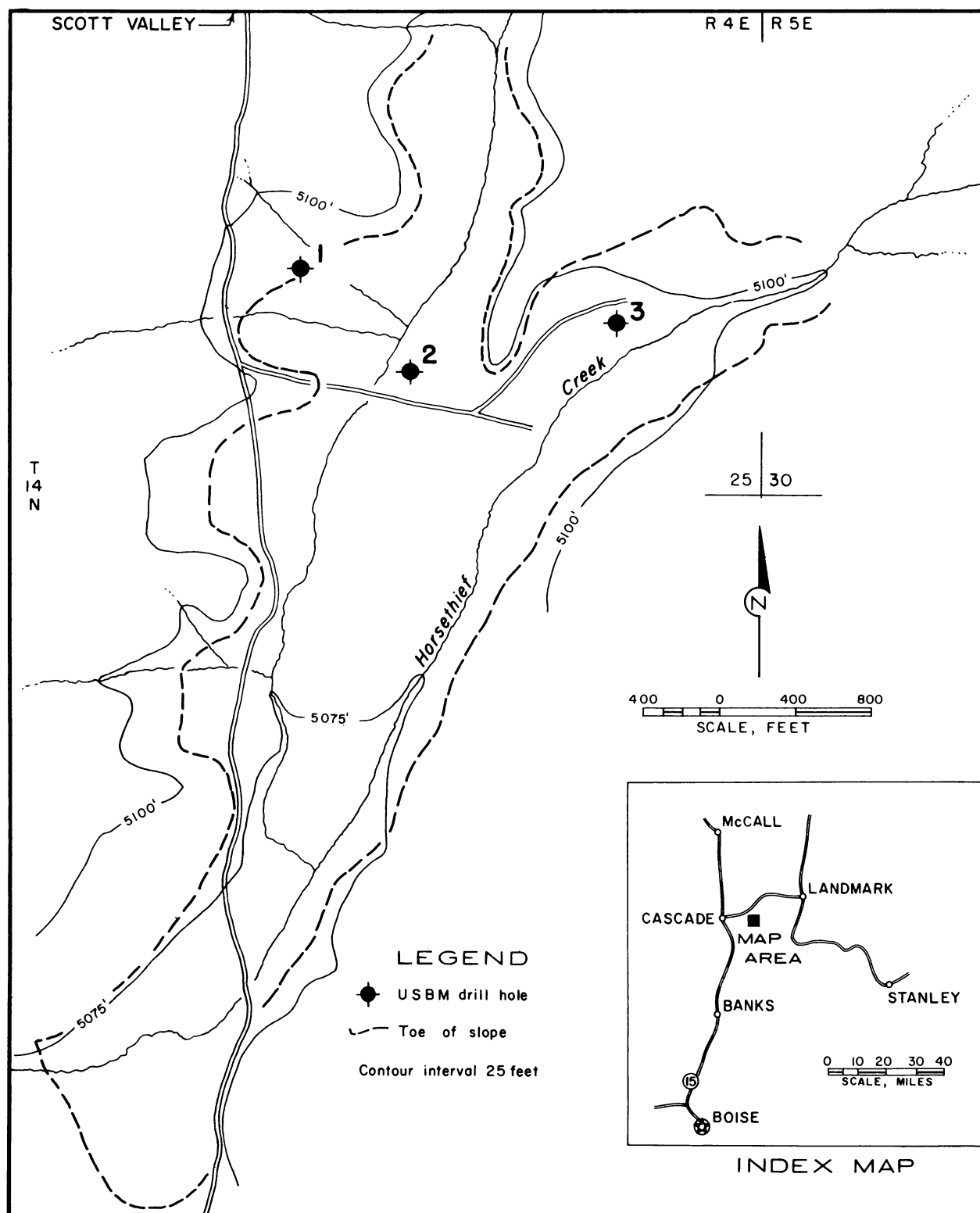


FIGURE 12. - Horsethief Basin Placer Area, Valley County.

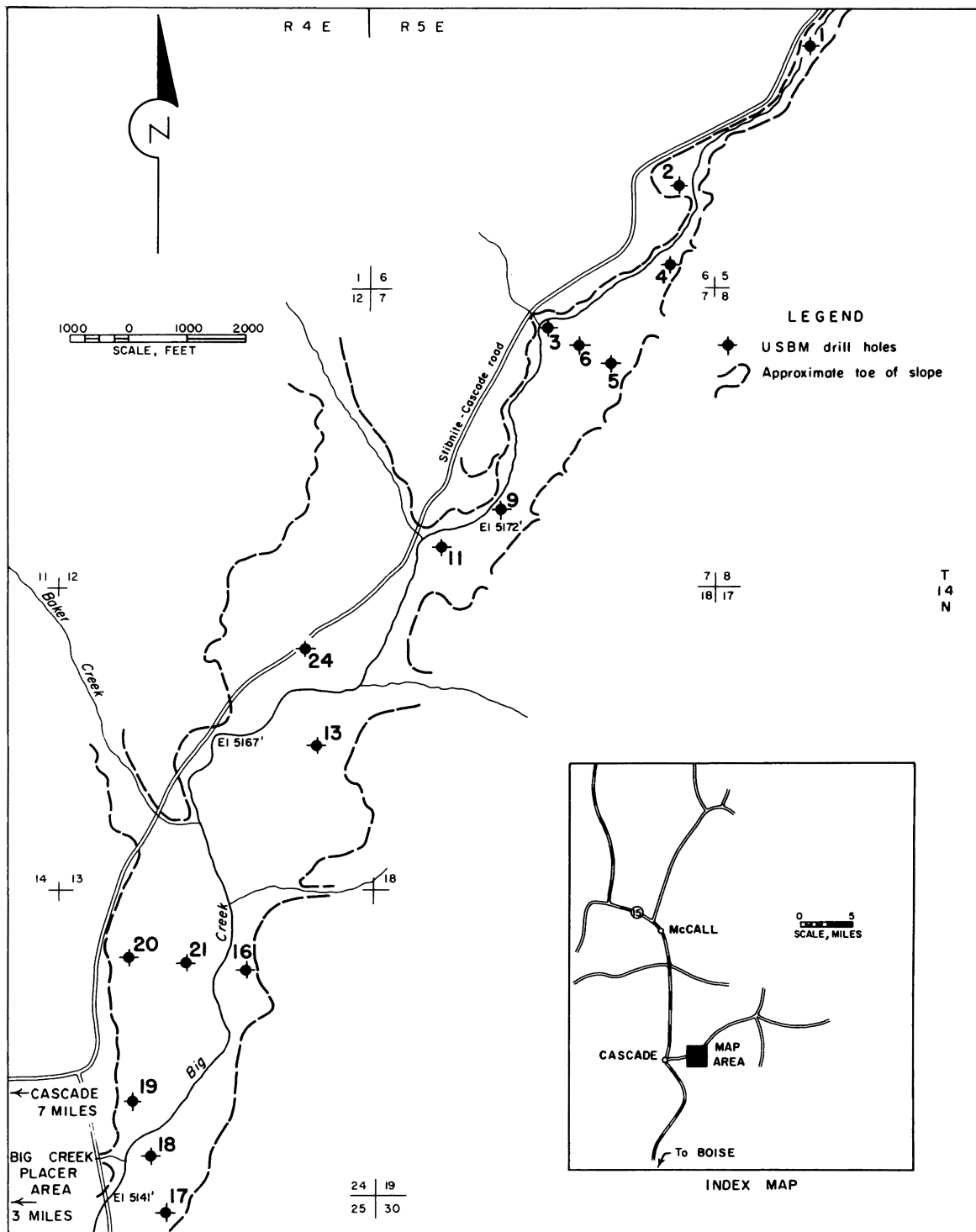


FIGURE 13. - Scott Valley Placer Area, Valley County.

The deposit was explored under a Defense Mineral Exploration Administration contract. Six drill holes randomly spaced were about 500 feet apart. Depth to bedrock ranged from 10 to 28 feet. The average amount of ilmenite and monazite from the holes represented 5.0 pounds and 1.6 pounds per cubic yard, respectively.

Deadwood River

The placer area is accessible by graveled roads from either Stanley (54 miles east) or Cascade. From Cascade, a road extends east 37 miles to Landmark, Idaho, then south 21 miles to the deposit.

The Deadwood River placer is several miles long and, in places, is almost 3,000 feet wide (fig. 14) (20). Included in the overall width is a lateral moraine that forms a bench 200 to 2,000 feet wide paralleling the east side of the valley. The bench is timbered quite heavily whereas the bottom land includes both swampy and forested areas.

The sand and gravel in the deposit are of granitic origin. Alpine glaciation, as evidenced by lateral moraines and erratic boulders, has adversely affected the concentration of the black-sand minerals. Preliminary surface testing indicated a high black-sand content, but the amount decreased rapidly with depth in the drill holes.

Ten holes were drilled in two random groups about 6,000 feet apart ranging from 6 to 32 feet in depth. Many large boulders made drilling very difficult and, as a result, none of the holes reached bedrock.

Ilmenite in the deposit averaged 3.3 pounds and monazite only 0.1 pound per cubic yard.

White Hawk Basin

The White Hawk Basin placer, about 9 miles west of the Big Meadows Ranger Station in Bear Valley, can be reached by a Forest Service road.

The deposit is about 5,000 feet long and averages 2,000 feet in width. It is an open area surrounded by timber-covered mountains. Alluvium in the deposit is sand and medium-size gravel derived from granite.

Exploration was conducted by the Cosummes Gold Dredging Co., Inc., under contract with the Defense Minerals Exploration Administration. Ten randomly spaced holes, 9 to 18 feet deep, were dug to bedrock with a 22-inch-diameter clamshell bucket.

Average content in the deposit is 3.0 pounds ilmenite and 0.7 pound monazite per cubic yard.

Peace Valley

The deposit is near the confluence of Peace Creek and Silver Creek about 24 miles northeast of Crouch, Idaho.

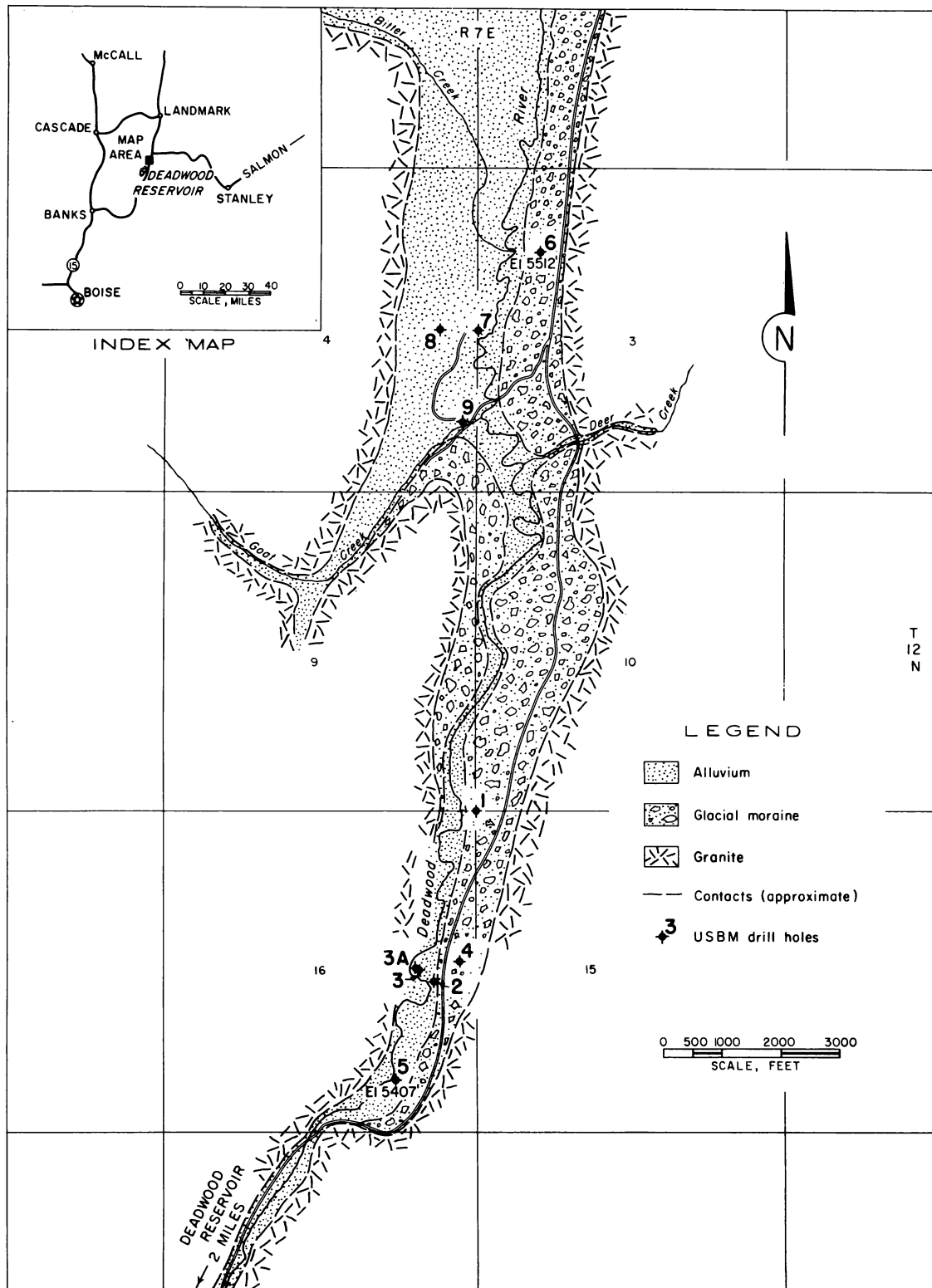


FIGURE 14. - Deadwood River Placer Area, Valley County. (Adapted from Federal Geological Survey Map.)

The area investigated is about 18,000 feet long and averages 1,200 feet in width. The valley fill is glacial outwash containing boulders as much as 2 feet or more in diameter. Five surface grab samples averaged 56.0 pounds of black sand per cubic yard. Six churn-drill holes, ranging in depth from 11 to 15 feet, were drilled to bedrock. Surface concentration was evident because the material from the holes averaged only 1.6 pounds ilmenite and 0.29 pound monazite per cubic yard.

Garden Valley--Anderson Creek

The Garden Valley and Anderson Creek placers are virtually contiguous on their northern end. The area can be reached from Crouch, Idaho, which is 35 miles north of Boise.

Garden Valley, drained by the South Fork of the Payette River, is more than 12,000 feet long and 5,000 to 9,000 feet wide. It includes both river bottom land and a gravel terrace that rises abruptly for about 40 feet on the north side of the river. The alluvium contains both granitic and basaltic gravels; most of the gravel is less than 6 inches in diameter. Exploration consisted of drilling 15 holes in two lines across the valley. The depth of holes ranged from 40 to 120 feet; none reached bedrock. Average content was 1.7 pounds ilmenite and 0.18 pound monazite per cubic yard.

Anderson Creek flows into the Middle Fork of the Payette River about 1.5 miles north of its junction with the South Fork. An east-west gravel ridge more than 200 feet in height separates the Garden Valley placer from the Anderson Creek placer. The placer area is about 6,000 feet long and 1,500 feet wide. The sand and gravel was derived from granite. Six holes were drilled, 40 to 60 feet deep; none reached bedrock. Ilmenite averaged 4.1 pounds and monazite 0.32 pound per cubic yard.

Johnson Creek

Johnson Creek is a small intermittent tributary stream that flows into the south side of the main Payette River about 14 miles west of Horseshoe Bend, Idaho. The placer deposit occupies a narrow valley and two grass-covered terraces about one-half mile apart on the west side of the creek. An area of bottom land about 150 feet wide and 7,000 feet long was explored with 10 drill holes ranging from 7 to 40 feet deep.

The alluvium is composed of sand and gravel derived from both basaltic and granitic rocks. Outcrops in the immediate vicinity of the deposit consist entirely of basalt. Basalt bedrock was also reached in the two northernmost drill holes; the remainder were bottomed in lake sediments low in black-sand content. The quantity of black sand invariably decreased with depth.

Ilmenite averaged 7.3 pounds and monazite 0.38 pound per cubic yard. A trace of gold was recovered from all the drill holes.

Conclusions

The placer deposits in the Payette River drainage are primarily monazite-bearing with ilmenite as a byproduct and represent the largest known source of ilmenite in Idaho. The ilmenite contains an average of more than 45 percent TiO_2 and usually 0.20 to 0.40 percent Cb_2O_5 (table 1).

Other accessory minerals are magnetite, titaniferous magnetite, garnet, and zircon. With the possible exception of the Gold Fork placer, the amount of gold in the deposits is insignificant.

The exploitation of the deposits is dependent primarily upon the market price of monazite and to a lesser extent on the price of the byproduct minerals.

Boise River Drainage

General

The Boise River drainage system includes the Boise River and its tributaries, the North, South, and Middle Fork Rivers (fig. 1). Flowing generally westward, these streams drain the southeast part of the Idaho batholith.

Deposits in this drainage differ widely in physiography, geology, and mineralogy. A summary of exploration data is shown in table 4.

Dismal Swamp

The Dismal Swamp placer (1) is in Elmore County about 45 miles northeast of Mountain Home, Idaho. The nearest settlement, Rocky Bar, is 8 miles southeast.

The irregularly shaped deposit is along small tributaries of Buck Creek, which flows into the Middle Fork of the Boise River. The land is heavily wooded. The area prospected is about 2,000 feet long and 50 to 400 feet wide.

Granitic sand and gravel are interbedded with layers of peat moss, logs, and other vegetable matter.

J. R. Simplot Co., with the aid of a Defense Minerals Exploration Administration loan, explored the Dismal Swamp placer with trenches, churn-drill holes, and shafts. The workings consisted of 16 trenches ranging from 6 to 12 feet in depth; 25 drill holes, 6.5 to 18.5 feet in depth; and 2 shafts, 10.5 and 12.5 feet deep. The shafts were sunk around two drill holes to obtain comparative sampling results.

The ilmenite fraction was less than 1 pound per cubic yard. Columbite and gem-quality topaz are the important minerals.

TABLE 4. - Summary of exploration data for Boise River Drainage

(Tr, trace)

Placer area	Number of drill holes	Depth, ft	Total footage	Number of samples	Average number of pounds per cubic yard						
					Ilmenite	Monazite	Radio-active blacks ¹	Columbite	Magnetite	Garnet	Zircon
Alexander Flats....	10	10-23	158	29	1.1	0.08	Tr	-	2.0	0.8	Tr
Barber Flats.....	1	50	50	10	1.7	.10	-	-	3.1	.7	Tr
Boise Basin:											
Fall Creek.....	5	34-45	215	43	2.4	.63	Tr	-	4.7	.3	0.7
Granite Creek....	27	7-28	113	25	3.0	.96	Tr	-	2.2	.7	1.3
Grassy Flats....	12	27-50	475	97	1.8	.34	Tr	-	1.7	.2	.4
Grimes Creek....	16	7-30	269	58	1.8	.61	Tr	-	1.3	.5	.6
Moore's & Elk Creeks.....	-	-	-	33	.5	.19	Tr	-	.1	1.5	.5
Wolf Creek.....	410	18-58	301	63	3.2	.83	Tr	-	1.2	.6	1.7
Dismal Swamp.....	527	7-19	352	197	.7	Tr	Tr	61.4	-	-	-
Dry Creek.....	1	50	50	10	2.6	.08	-	-	.3	.1	.3
Rabbit Creek.....	20	7-31	327	68	.4	.10	Tr	Tr	.3	2.9	.1
Totals.....	109	-	2,310	603	-	-	-	-	-	-	-

¹Includes euxenite, samarskite, etc.²Includes 6 shafts.³Dredge samples.⁴Includes 10 shafts.⁵Includes 2 shafts.⁶Weakly magnetic fraction averages from 14 to 20 percent (CbTa)₂O₅.

Alexander Flats

Alexander Flats is in Elmore County on the Middle Fork of the Boise River 7 miles above its confluence with the North Fork. The deposit is about 50 miles by road east of Boise.

The placer area consists of two mountain basins separated by a narrow rocky gorge. The total area of both basins does not exceed 250 acres of open, grass-covered grazing land. The alluvial sand is composed principally of quartz and feldspar. There are a few boulders as much as 15 inches in diameter.

Ten holes were drilled to bedrock, with depths ranging from 10 to 23 feet. The material averaged 1.1 pounds ilmenite and 0.08 pound monazite per cubic yard. The deposit contains gold values of a few cents per cubic yard.

Rabbit Creek

The Rabbit Creek placer in Boise County about 11 miles east of Idaho City, Idaho, is on a tributary of the North Fork of the Boise River and occupies a narrow valley 100 to 500 feet wide and about 4 miles long. The upstream and downstream ends of the area narrow to canyons. There is evidence of early day gold placer mining on a low bench at the junction of the North and West Forks of Rabbit Creek and for about 2 miles downstream on the south side of the main creek. The main channel apparently was not disturbed.

Sand and gravel in the deposit are derived from granite with some boulders as much as 3 feet in diameter. Larger boulders occur along the sides of the narrow valley and at the downstream end of the deposit. Most of the area is covered with timber and buck brush.

The depth of 20 holes drilled to bedrock ranged from 7 to 31 feet.

The black sands averaged 0.4 pound of ilmenite and 0.10 pound of monazite per cubic yard. A significant amount of gold was recovered from several drill holes.

Boise Basin

The Boise Basin area includes several placers along streams draining the central part of Boise County. Idaho City, the county seat, is 40 miles north-east of Boise on State Highway No. 21. Secondary gravel roads extend westward from Idaho City to the old mining settlements of Centerville, Placerville, and Quartzburg.

Boise Basin is a structural depression that covers an area of about 200 square miles (3, 6, 9). Principal streams are Moores Creek, Elk Creek, Grimes Creek, and Granite Creek, all with numerous tributaries. The drainage system and placer deposits were affected by block faulting and basaltic lava flows. The basement rock of the region is a granite overlain by lacustrine material and mineral-bearing sand and gravel. Both bench and creek bottom placer

deposits have mainly a granitic composition although some basaltic materials resulted from erosion of the lava cap. The gravel in the deposits seldom exceeds 8 inches in diameter except at the headwaters of a few streams.

An estimated 90 percent of the minable gravel in the area has been dredged or hydraulicked for gold. The major deposits of current interest consist principally of old tailings. The coarser material now overlies the finer sands and gravel. Because of the manner in which a bucketline dredge operates, the finer materials, including the black-sand minerals, are distributed erratically both horizontally and vertically beneath the coarser tailings. As a result, it was extremely difficult to resample the dredge tailings with any degree of accuracy. The placers were tested by churn drilling, shaft sinking, trenching as follows:

Placer	Number of test openings		
	Drill holes	Shafts	Trenches
Grassy Flats.....	12	-	-
Wolf Creek.....	10	-	-
Fall Creek.....	5	-	-
Granite Creek.....	1	3	3
Grimes Creek.....	6	1	9

In addition three dredge samples were taken from the Moores Creek and Elk Creek deposits. Depth of samples ranged from 7 to 58 feet.

Black-sand content was low in the creek deposits. Average ilmenite content, in pounds per cubic yard, for the several placer deposits was: Fall Creek, 2.4; Granite Creek, 3.0; Grassy Flats, 1.8; Grimes Creek, 1.8; Moores and Elk Creek, 0.5; and Wolf Creek, 3.2. Monazite content in the deposits was less than 1 pound per cubic yard.

Analyses of the ilmenite fraction of the black-sand concentrates from the Boise Basin area showed a TiO_2 range of 40.3 to 48.2 percent and an Fe range of 35.7 to 43.0 percent (table 1).

Dry Creek

Dry Creek follows a wide flat valley of rich farm land northwest of Boise in Ada County and drains westward into the Boise River. State Highway No. 15 crosses the valley 7 miles north of Boise.

Material from a single drill hole, 50 feet deep, that bottomed in lake sediments averaged 2.6 pounds of ilmenite and 0.08 pound of monazite per cubic yard. Recent wash of granitic material in the stream bars contained more than 2 pounds of monazite per cubic yard for selected samples.

Barber Flats

This placer deposit comprises part of the Boise River Valley southeast of Boise in Ada County. From the Boise city limits, it is 3.5 miles to the deposit via State Highway No. 21.

The deposit consists of several hundred acres of grazing and farm lands. Sand and gravel in the deposit are composed both of basaltic and granitic material.

One hole, 50 feet in depth, was drilled near the center of the valley on a county road right-of-way. Bedrock, or possibly a large basalt boulder, was encountered at 45 feet.

Black-sand minerals totaled 6.5 pounds per cubic yard with ilmenite representing 1.7 pounds and monazite 0.10 pound. Fifty-one very fine gold colors were recovered with the black-sand concentrates.

Conclusions

The placer deposits in the Boise River drainage basin do not contain sufficient ilmenite for an economically feasible mining operation. None of the deposits tested contains more than 4 pounds of ilmenite per cubic yard, and the amount of coproduct minerals is correspondingly small.

Wood River Drainage

General

Several placers were explored by drilling and trenching in the Wood River drainage area. The stream areas are on the west side of Wood River, a short distance from the Magic Reservoir in south-central Idaho. The creeks have their source in a granitic stock that is probably related to the Idaho batholith (fig. 1).

The altitude of the region is about 5,000 feet. The climate is semi-arid with hot dry summers and frequent subzero temperatures during the winter. Only the Willow Creek deposit has a sufficient supply of water for mining purposes.

A high-voltage powerline of the Idaho Power & Light Co. crosses or is within a short distance of all the deposits. The nearest railhead is a branch line of the Union Pacific Railroad that serves Hailey and Bellevue, less than 20 miles to the east.

The deposits contain a small amount of ilmenite intergrown with hematite. The principal black-sand minerals are uranothorite (uranium-thorium silicate) and a columbium-rare-earth-bearing sphene.

The exploration data are summarized in table 5.

Willow Creek

The Willow Creek area in Camas County is about 18 miles southwest of Hailey, Idaho. It consists of several hundred acres of agricultural land underlain by medium-size wash material with a granitic composition.

TABLE 5. - Summary of exploration data for Wood River Drainage

(Tr, trace)

Placer area	Number of drill holes	Depth range, ft	Total footage	Number of samples	Average number of pounds per cubic yard				
					Ilmenite plus hematite	Sphene	Monazite	Uranothorite	Magnetite Zircon
Camp Creek.....	¹ 61	3-70	1,662	337	4.1	3.2	Tr	0.119	9.4 0.3
Poverty Flats area:									
Dead Sheep Creek	² 18	2-15	137	34	.9	3.6	Tr	.054	5.6 .3
Poverty Flats....	² 5	10-16	67	15	1.7	3.6	Tr	.016	6.5 .3
Reed Creek.....	² 7	10-17	101	22	1.0	1.9	Tr	.022	2.6 .1
Rock Creek:									
Area No. 1.....	³ 24	4-45	579	118	3.3	6.3	Tr	.074	7.4 .5
Area No. 2.....	² 7	2-8	38	10	4.3	7.3	Tr	.312	36.2 .3
Area No. 3.....	⁴ 37	5-47	717	104	3.5	7.3	Tr	.198	15.8 .5
Willow Creek.....	3	30-45	115	23	1.1	Tr	Tr	Tr	1.8 Tr
Totals.....	162	-	3,416	663	-	-	-	-	-

¹ Includes 34 trenches.² Trenches only.³ Includes 6 trenches.⁴ Includes 12 trenches.

Three holes, 800 feet apart, were drilled in a line normal to the Willow Creek drainage on the State highway right-of-way. The holes ranged from 30 to 45 feet in depth; all were bottomed in alluvium. The ilmenite-hematite product was only 1.1 pounds per cubic yard.

Camp Creek

This area includes the Camp Creek drainage in both Blaine and Camas Counties (17) (fig. 15). Idaho State Highway No. 22 crosses the northern part and continues about 17 miles northeast to Hailey.

The deposit has an area of several hundred acres. The southern part is grazing land and cultivated fields; the rest is covered with sagebrush with a few trees and willows bordering the creek. The alluvium consists of basalt together with material from a granitic outlier to the north. The gravel, mostly less than 6 inches in diameter, is intimately compacted with a reddish-brown, sticky, basaltic clay.

The more shallow parts of the deposit were tested by channel-sampling trenches excavated with a diesel-powered back hoe. Of 24 trenches excavated, 16 reached bedrock. Of 37 holes drilled to depths ranging from 25 to 70 feet, 3 reached bedrock. The black-sand content was calculated to a maximum depth of 55 feet.

The black-sand minerals in pounds per cubic yard were: Ilmenite-hematite, 4.1 pounds; sphene, 3.2 pounds; and uranothorite, 0.119 pound. The sphene contained 33 percent TiO_2 , 1.8 percent Cb_2O_5 , 0.6 percent yttrium, and 0.01 percent thulium. The uranothorite averaged 51.9 percent ThO_2 and 5.5 percent U_3O_8 .

Rock Creek

The Rock Creek placers in Blaine County include three separate and non-contiguous deposits designated as Areas 1, 2, and 3 (fig. 16) (18). The nearest town is Bellevue, Idaho, approximately 15 miles northeast of the deposit by Idaho State Highway No. 22 and U.S. Highway No. 93. Area 1, as outlined by drill holes and test pits, consists of about 200 acres of meadow land; Area 2 covers 30 acres of barren open land; Area 3 consists of 90 acres of cultivated meadow with some brush-covered land.

The alluvium here is composed of disintegrated granite and material derived from remnants of a basalt flow. Most of the alluvium is composed of sand together with gravel less than 4 inches in diameter.

Forty-four holes, ranging in depth from 10 to 47 feet, were drilled, and 25 test pits, 3 to 17 feet in depth, were excavated with a back hoe. The black-sand content was calculated to a maximum depth of 35 feet in the drill holes.

The average black-sand content per cubic yard in the three areas was: Area No. 1--ilmenite-hematite, 3.3 pounds; sphene, 6.3 pounds; and

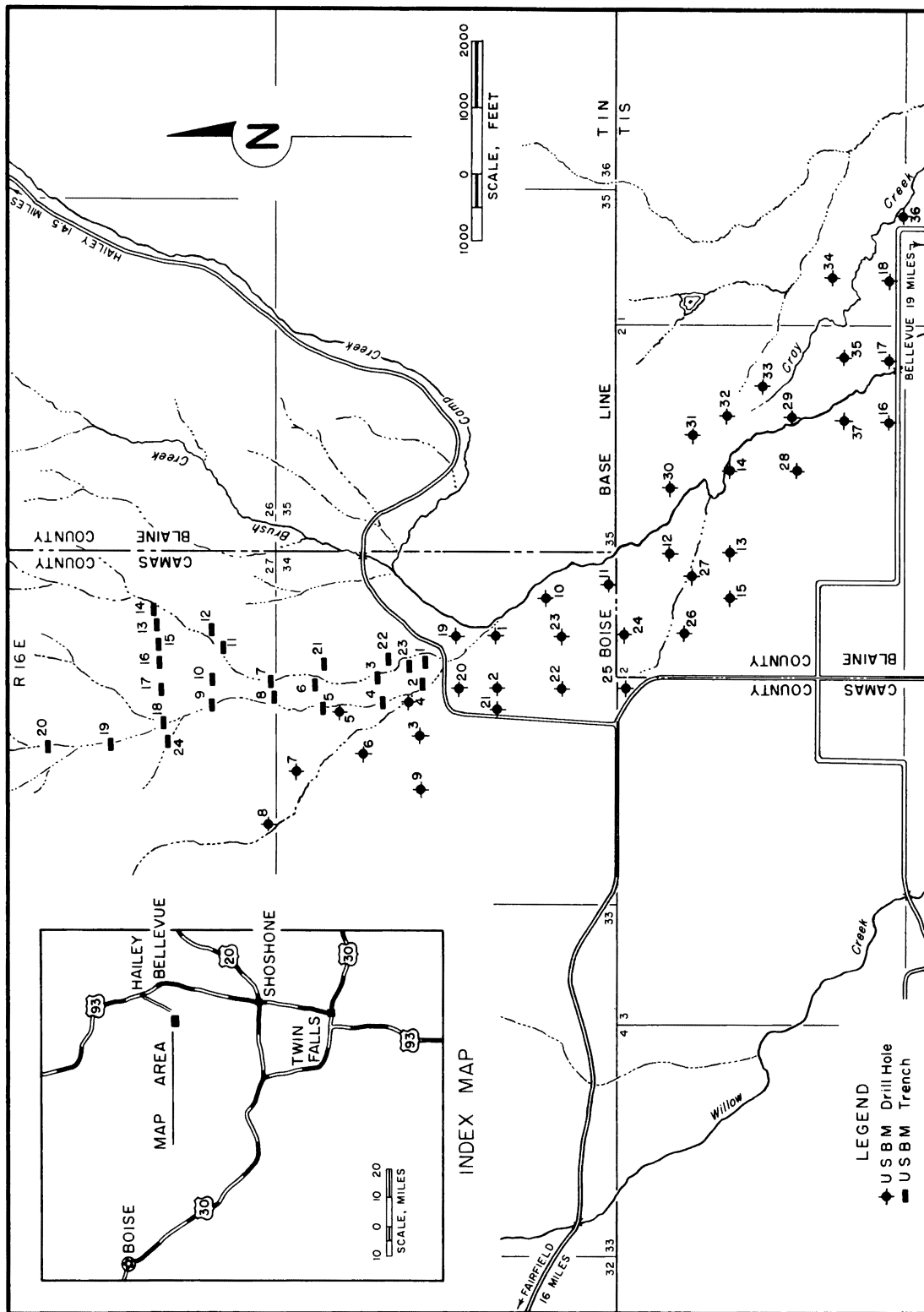


FIGURE 15. - Camp Creek Placer Area, Blaine and Camas Counties.

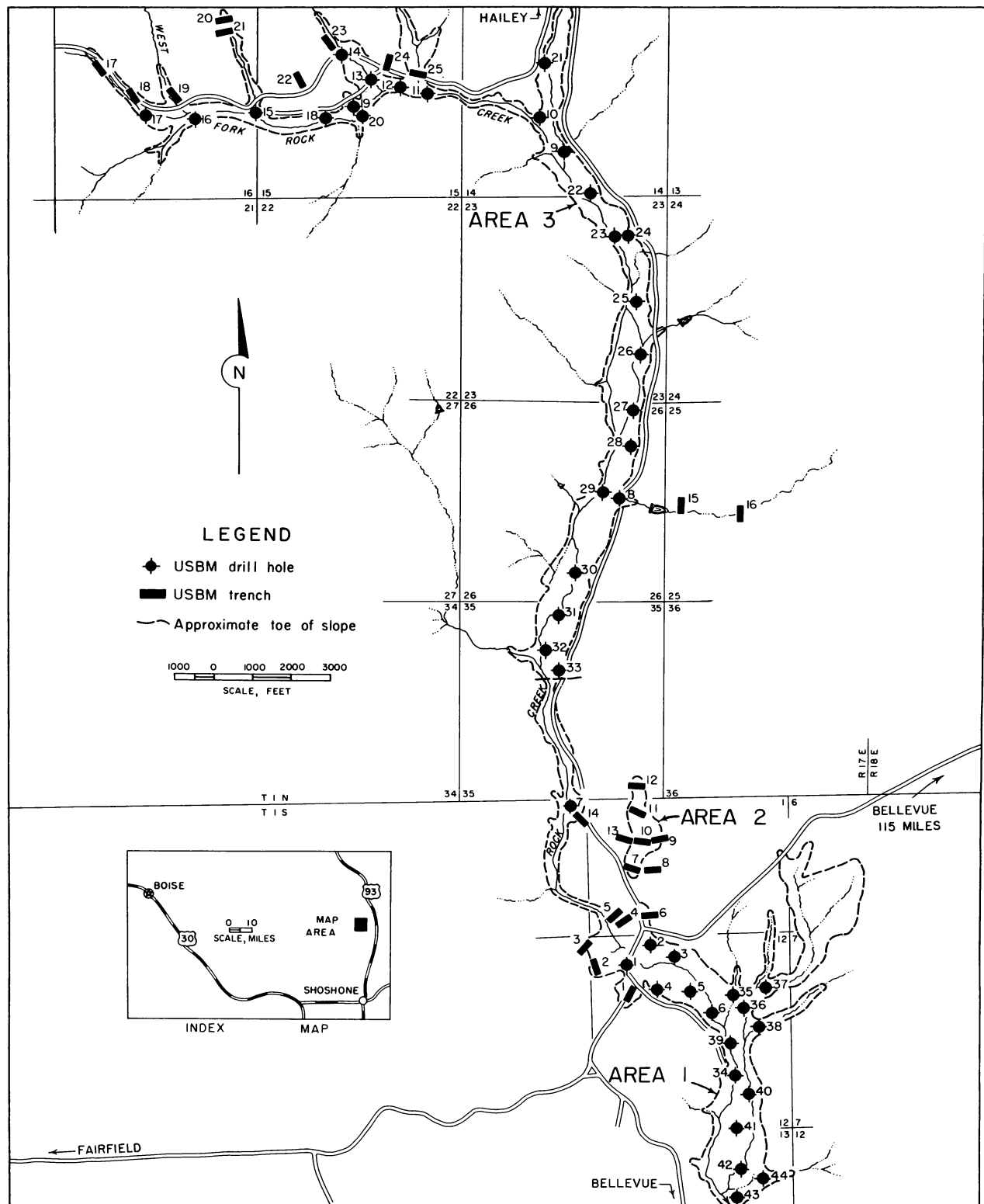


FIGURE 16. - Rock Creek Placer Area, Blaine County.

uranothorite, 0.074 pound. Area No. 2--ilmenite-hematite, 4.3 pounds; sphene, 7.3 pounds; and uranothorite, 0.312 pounds. Area No. 3--ilmenite-hematite, 3.4 pounds; sphene, 6.6 pounds; and uranothorite 0.198 pound. The uranothorite contained an average of 49.5 percent ThO_2 and 6.2 percent U_3O_8 ; the sphene had about 0.5 percent Cb_2O_5 and 0.9 percent yttrium.

Reed Creek, Poverty Flats, and Dead Sheep Creek

The Reed Creek deposit is about 7 miles southwest of Bellevue. Dirt roads provide access to Poverty Flats and Dead Sheep Creek from Reed Creek.

The three noncontiguous placers are gently sloping terraces overlooking Big Wood River Valley. They are drained by small intermittent streams flowing in a general southeasterly direction. The alluvial and residual material, principally quartz and feldspars, has been subjected to a limited amount of local sorting by stream action followed by redeposition and concentration of the black sand.

Eighteen trenches were excavated with a back hoe on Dead Sheep Creek--7 on Reed Creek, and 5 on Poverty Flats. None of these randomly spaced excavations, 2 to 17 feet in depth, reached bedrock. The ilmenite content ranged from 0.9 to 1.7 pounds and sphene from 1.9 to 3.6 pounds per cubic yard.

Conclusions

Placer deposits in the Wood River drainage basin do not contain enough ilmenite for an economically feasible mining venture. Uranothorite and columbium-yttrium-bearing sphene are the most valuable minerals in the black sands but development of a placer mining operation would be difficult because of the insufficient water supply.

Upper Salmon River Drainage

General

Placer deposits in the Upper Salmon River drainage basin (figs. 1 and 2) are: (1) Bear Valley, on a tributary of the Middle Fork of the Salmon River, (2) Stolle Meadows, on the South Fork of the Salmon, and (3) five other placers along tributaries of the main Salmon River.

Altitudes at the deposits range from 5,000 to 7,500 feet so that, at some of the placers, mining seasons usually would not exceed 10 months out of a year. All deposits have enough water for mining purposes. The data on the placer deposits in the Upper Salmon River drainage basin is given alphabetically in table 6.

Upper Bear Valley was dredged from 1955 to 1959 for radioactive black minerals, monazite, and columbite. Byproduct minerals were stockpiled, including ilmenite, magnetite, titaniferous magnetite, garnet, and zircon.

TABLE 6. - Summary of exploration data for Upper Salmon River Drainage

(Tr, trace)

Placer area	Number of drill holes	Depth range, ft	Total footage	Number of samples	Average number of pounds per cubic yard						
					Ilmenite	Monazite	Radio-active blacks ¹	Columbite	Magnetite	Garnet	Zircon
Bear Valley:											
Upper.....	42	9-98	1,897	440	13.8	0.83	0.127	0.112	3.7	7.9	Tr
Central.....	25	10-100	935	221	6.9	.60	.062	.080	3.2	1.1	Tr
Lower.....	16	48-120	1,467	312	3.7	.10	.020	.015	2.1	.7	Tr
Gold and Williams Creeks.....	245	10-88	1,834	373	3.5	.89	.08	-	25.3	Tr	0.2
Kelly Creek.....	15	5-30	211	44	4.9	.13	Tr	-	1.4	Tr	Tr
Meadow Creek.....	2	21-26	47	9	1.3	.06	Tr	-	4.2	.1	.1
Stanley Creek.....	5	14-75	212	43	2.9	.15	Tr	-	4.1	Tr	Tr
Stolle Meadows.....	4	25-39	132	27	2.1	.22	-	-	5.3	1.5	.8
Valley Creek.....	3	25-61	126	25	2.4	.04	Tr	Tr	5.6	Tr	Tr
Totals.....	153	-	6,729	1,467	-	-	-	-	-	-	-

¹ Includes euxenite, samarskite, etc.² Includes 13 test pits.

Stolle Meadows

Stolle Meadows placer is on the South Fork of the Salmon River. Access is by a Forest Service road extending 25 miles northeast from Cascade, then 5 miles south to the upper end of the meadows.

The deposit covers an area exceeding 800 acres; the depth to bedrock was not ascertained by drilling. Black-sand minerals are limited largely to a 10-foot surface layer of weathered granitic material that overlays lake sediments. The depth of the four holes drilled ranged from 25 to 39 feet. The material averaged 2.1 pounds of ilmenite and less than 0.25 pound of monazite per cubic yard.

Bear Valley

Bear Valley placers include three contiguous areas (13) (fig. 17): (1) Upper Bear Valley (Big Meadows), about 3 miles long and 1,000 to 4,000 feet wide, (2) Central Bear Valley, a northward continuation for 11 miles downstream to a point about 1 mile below the mouth of Elk Creek, and (3) Lower Bear Valley, an area of approximately 6 square miles. Graveled roads maintained by the Forest Service provide access to the placers. From the junction of Elk Creek and Bear Valley Creek road, the distances are: Lowman, 42 miles to the south; Cascade, 74 miles to the west; and Stanley, 36 miles to the east. The road from Lowman has been kept open during winter months by Porter Bros. Corp. because of their dredging operations in Upper Bear Valley.

Most of Upper Bear Valley is open meadows. Central Bear Valley and Lower Bear Valley are partially open grass lands, but a large part of each area is covered with fallen timber, brush, and jack pine.

In both Upper and Lower Bear Valley, most of the gravel is less than 6 inches in diameter except at the mouth of tributary streams. Central Bear Valley has been subjected to some glaciation, and remnants of both terminal and lateral moraines have contributed coarser wash. A few glacial erratics bordering the valley exceed 10 feet in diameter.

Exploration work consisted of 42 holes 9 to 98 feet deep in Upper Bear Valley (fig. 18); 25 randomly spaced holes 10 to 100 feet deep in Central Bear Valley; and 16 holes 48 to 120 feet deep in Lower Bear Valley. The only holes that reached bedrock were in the upstream and downstream parts of the Upper Bear Valley deposit. The Geological Survey made a study of the Bear Valley placer deposits drilled by the Bureau of Mines (14).

Distribution of black-sand minerals in pounds per cubic yard in Bear Valley is as follows: Upper Bear Valley--ilmenite 13.8, monazite 0.83, and radioactive blacks 0.127; Central Bear Valley--ilmenite 6.9, monazite 0.60, and radioactive blacks 0.062; Lower Bear Valley--ilmenite 3.7, monazite 0.10, and radioactive black minerals 0.02.

A chemical analysis of a composite sample of the ilmenite fraction in the black-sand concentrate from Upper Bear Valley showed 26.6 percent TiO_2 , 46.1 percent Fe, and 0.18 percent Cb_2O_5 (table 1).

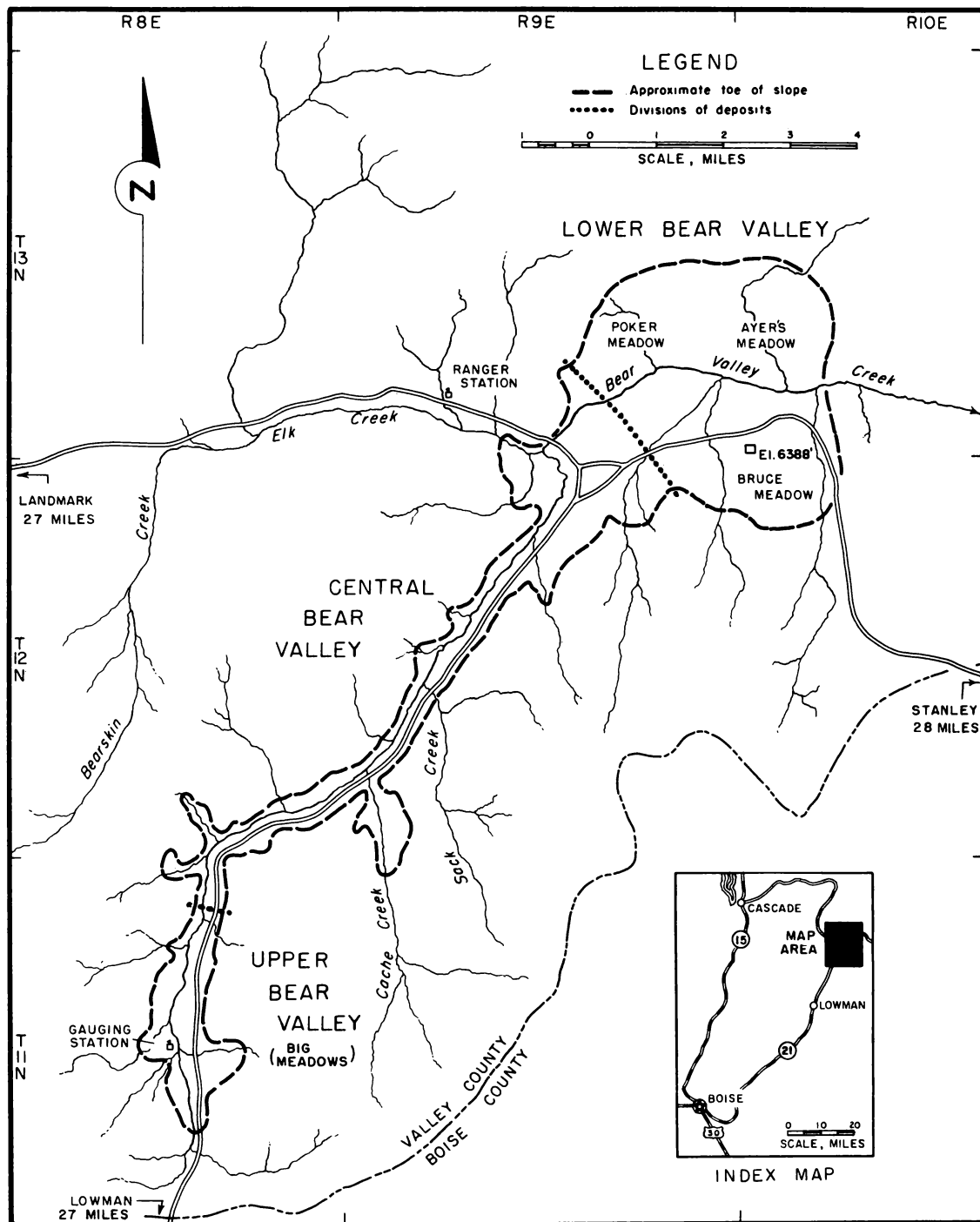


FIGURE 17. - Bear Valley Placer Deposits, Valley County.

Valley Creek

The confluence of Valley Creek and Meadow Creek is about 11 miles northwest of Stanley on the road to Landmark. The placer area borders Valley Creek upstream from the junction.

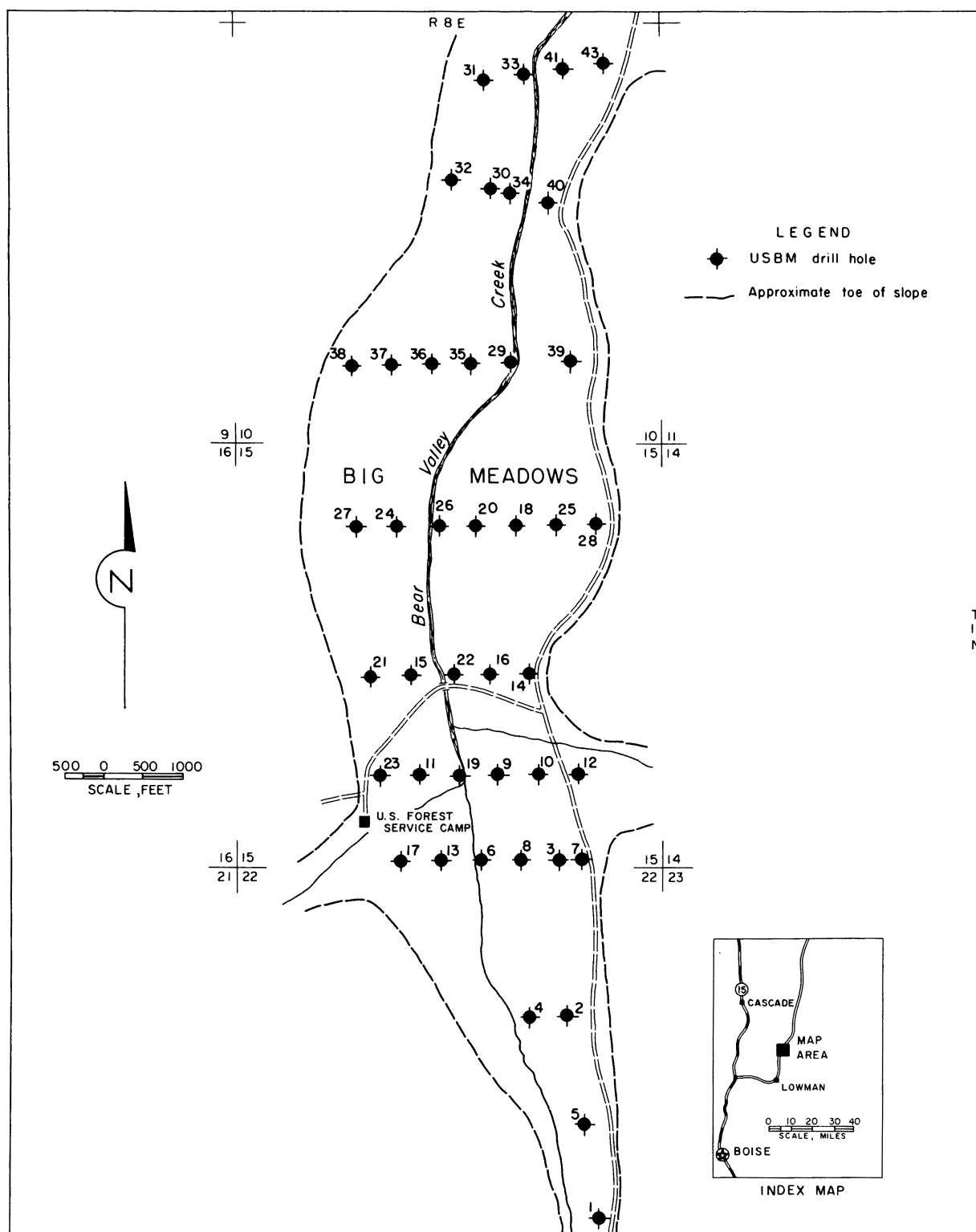


FIGURE 18. - Upper Bear Valley Placer Area, Valley County.

The timber-covered placer area consists of several hundred acres underlain with sand and gravels of granitic origin and unknown depth. Some boulders are larger than 18 inches in diameter.

A line of three holes, ranging from 25 to 61 feet in depth, was drilled normal to the creek a short distance below the point where it emerges from a narrow, rock-rimmed canyon at the head of the main valley.

The weighted average of the ilmenite content was 2.4 pounds and of the monazite, 0.04 pound per cubic yard.

Meadow Creek

The Meadow Creek placer, adjacent to Valley Creek, borders each side of Meadow Creek for several miles.

The area includes several hundred acres in a valley more than 1 mile wide. The alluvium here consists entirely of granitic sand and gravel. All the gravel was less than 6 inches in diameter.

Two shallow holes were drilled to depths of 21 and 26 feet; neither reached bedrock.

The average content of the samples was 1.3 pounds of ilmenite and 0.06 pound of monazite per cubic yard.

Kelly Creek

Kelly Creek placer is accessible from the Stanley-Landmark road by a Forest Service road that passes over a low divide about 5 miles north of Stanley, Idaho. The placer is about 11 miles by road from Stanley.

Kelly Creek flows to the northeast into Basin Creek, which flows into the Salmon River a few miles downstream from Stanley. The placer includes both stream and bench gravels composed principally of granitic material. Jasper cobbles and boulders as much as 2 feet in diameter probably were derived from an ancient alpine glacial moraine.

Small jack pines and brush cover most of the surface. Old gold placer tailings occupy an area about 1,500 feet long, with an average width of about 500 feet near the center of the deposit. Small-scale hydraulic gold placer mining was being done at the same time the drilling was done. The stream bed was tested for black sand for a distance of about 1.5 miles. The width of the creek bottom land varies from 100 to 300 feet, but if the bench ground is included, the width in places exceeds 1,000 feet.

Fifteen holes were drilled to depths from 5 to 30 feet. The depth to bedrock ranged from 2 to 28 feet.

Black sands in the deposit included 4.9 pounds of ilmenite and 0.13 pound of monazite per cubic yard and a trace of gold. The uncommon radioactive mineral brannerite also was identified in the black sands.

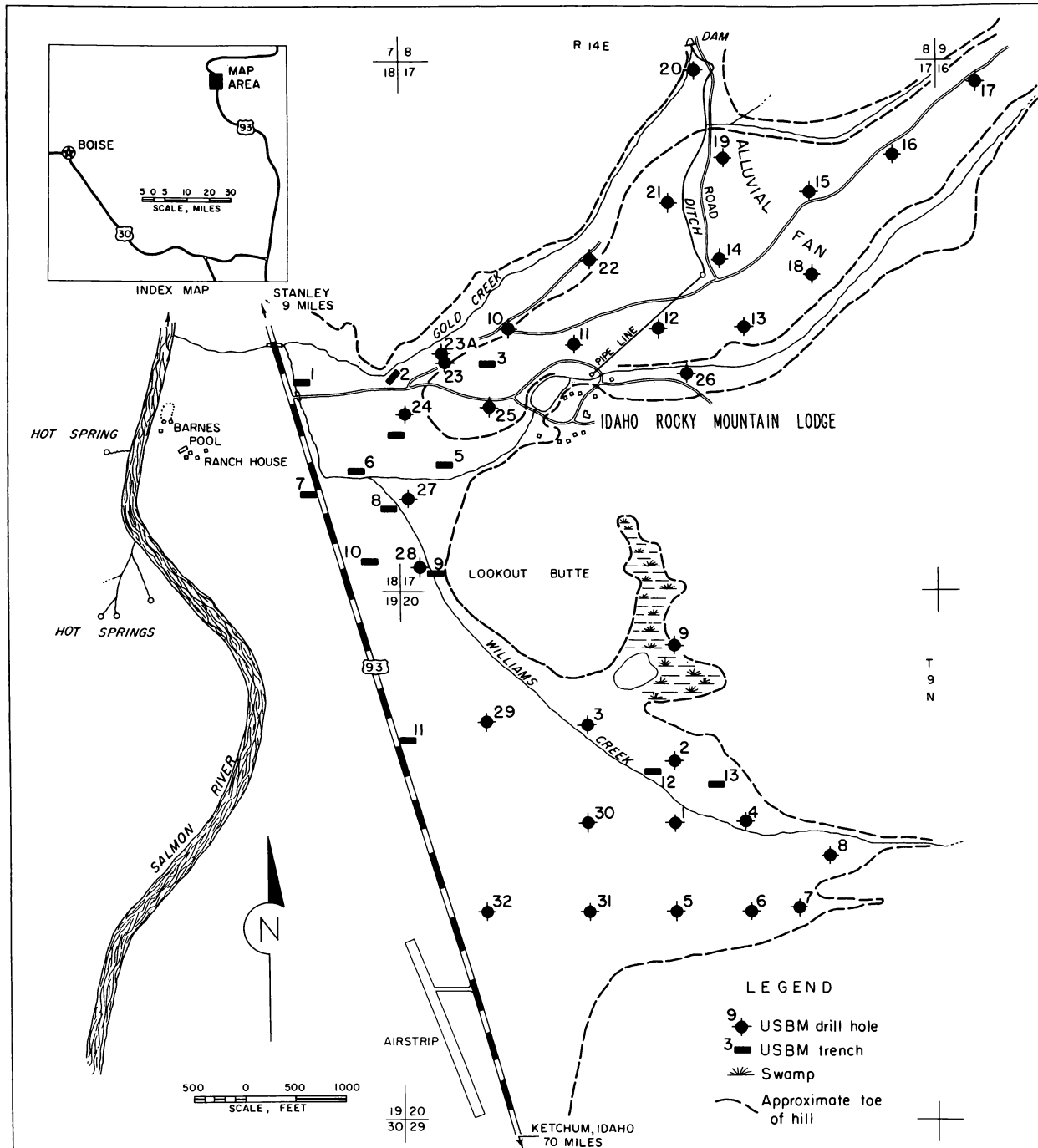


FIGURE 19. - Gold and Williams Creek Placer Area, Custer County.

A chemical analysis of a composite sample of the ilmenite fraction in the black-sand concentrate assayed 46.3 percent TiO_2 ; 37.2 percent Fe; and 0.20 percent Cb_2O_5 (table 1).

Conclusions

Two dredges owned by the Porter Bros. Corp. were used in Upper Bear Valley to recover radioactive black minerals, monazite, and columbite. The accessory minerals ilmenite, magnetite, titaniferous magnetite, garnet, and zircon were stockpiled and, under favorable market conditions, would be economic byproducts.

The Gold Creek and Williams Creek deposits is a small ilmenite resource that could be recovered as a byproduct if the monazite and radioactive black minerals were mined.

Other placers tested in the Upper Salmon River drainage have a low black-sand content.

Lower Salmon River Drainage

General

Five placer areas were explored with shafts and drill holes on the Lower Salmon River drainage basin, which includes the tributaries to the South Fork and the main Salmon River (figs. 1 and 2).

Enough water is available for placer mining. The nearest electrical powerlines are about 30 miles away. The altitude of the deposits averages almost 6,000 feet, so that deep snow and severe winter weather would limit the mining season to 9 or 10 months. With the exception of the Grouse Creek deposit, the most practical access is by the Warren-McCall road. McCall is the railhead for a branch line of the Union Pacific Railroad.

Exploration data are summarized in table 7.

Grouse Creek

Grouse Creek is 3 miles southeast of the deserted gold mining town of Florence (15). It is a small tributary of Meadow Creek, which flows into Wind River 1 mile from the junction of Wind River with the main Salmon River. Florence is about 40 miles northeast of Riggins, Idaho, and the same distance southeast of Freedom on U.S. Highway No. 95. Access is by steep, rough, and poorly maintained roads that are normally open only 4 or 5 months each year.

The shallow deposit is covered by heavy timber except in areas of swamp and peat bogs. Two branch streams at the headwaters of Grouse Creek, which have been hand-mined for gold, and the main stream channel were tested for a distance of about 2 miles and over an average width of 400 feet. Gravel in the deposit was not more than 6 inches in diameter, although there were a few large surface boulders near the edge of the deposit. The alluvium here was

principally weathered products of local igneous rocks with the exception of minor amounts of resistant quartzite pebbles and cobbles.

TABLE 7. - Summary of exploration data for Lower Salmon River Drainage

(Tr, trace)

Placer area	Number of drill holes	Depth range, ft	Total foot-age	Number of samples	Average number of pounds per cubic yard				
					Ilmenite	Monazite	Magnetite	Garnet	Zircon
Grouse Creek...	¹ 24	3-6	110	25	1.2	0.75	Tr	0.1	0.1
Kelly Meadows..	3	40-53	133	27	4.7	.97	0.8	5.7	.1
Lake Creek.....	3	12-15	40	² 9	-	-	-	-	-
Secesh Meadows.	³ 45	5-50	1,092	252	1.6	.30	.8	1.5	.5
Warren Meadows:									
Bench Ground.	8	5-45	171	36	.2	.31	.3	.6	.1
Valley Ground	21	8-50	477	100	.2	.34	.2	.9	.1
Totals....	104	-	2,023	449	-	-	-	-	-

¹ Test pits or shafts only.

² Sample results unavailable.

³ Includes 9 test pits.

Twenty-four randomly spaced bulldozer trenches, 3 to 6 feet deep, were excavated to bedrock and were channel-sampled. The gravel contained 1.2 pounds of ilmenite and 0.75 pound of monazite per cubic yard. In one sample, the monazite represented 56 percent of the black-sand concentrate; the average for 25 samples was 21 percent monazite. A trace of gold was present.

Lake Creek

The Lake Creek placer is 2 miles north of the Burgdorf junction on the McCall-Warren road.

The placer consists of about 250 acres of open meadow with some wooded land situated in an alpine valley. Lake Creek, which heads within a few miles of the main Salmon River, follows a fault depression southward to its confluence with the Secesh River, which in turn empties into the South Fork of the Salmon River.

A sectionalized steel casing was used to sink 3 shafts to bedrock, at depths ranging from 12 to 15 feet. The alluvium, composed of both granitic and metamorphic material, included a few boulders more than 1 foot in diameter. The total black-sand content ranged from 5 to 13 pounds per cubic yard; since

only trace amounts of monazite were present, the percentage of ilmenite was not determined. A trace amount of gold was present.

Warren Meadows

The Warren Meadows placer is about 44 miles north of McCall (16).

The principal placer area, beginning about 1.7 miles south of Warren on Warren Creek, is 300 to 3,500 feet wide and extends upstream for nearly 6 miles. More than 95 percent of the valley floor has been dredged for gold. Several hundred acres of bench ground are in the apex formed by the confluence of Thomas Creek and Steamboat Creek, both tributaries to Warren Creek and the main Salmon River. Other small isolated bench areas are located upstream on either side of Warren Creek, but their small size makes them unimportant. Some hydraulic mining for gold has been done on the benches, but for the most part they have been untouched.

All the holes drilled to investigate the area either encountered quartz monzonite bedrock or were bottomed in comparatively barren lacustrine sediments that underlay the alluvial gravel. Older gravel found on the hill slopes and on the tops of flat ridges was composed almost entirely of quartzitic material, probably deposited by glacial action. More recent gravel on the lower benches and in the meadows has been derived principally from quartz monzonite. Most of the gravel is not more than 6 inches in diameter with a few boulders as much as 12 inches in diameter.

Exploration consisted of 21 drill holes in the dredge tailings on the valley floor and 8 holes in the virgin gravel terraces. Depth to bedrock on the terraces ranged from 5 to 45 feet; the depth of the holes in dredge tailings ranged from 8 to 50 feet.

Black-sand content of Warren Meadow placer gravel is unusually low. The material contains an average of 0.2 pound of ilmenite per cubic yard both in the bench ground and creek bottom and 0.31 pound of monazite per cubic yard on the bench and 0.34 in the bottom land.

Secesh Meadows

Secesh Meadows is 33 miles north of McCall and about 4 miles east of the Burgdorf junction.

The placer area begins on Grouse Creek, one-half mile from the junction of Grouse Creek and the Secesh River, and extends downstream along the Secesh River about 4.5 miles. The average width is 2,000 feet except for a narrow canyon one-half mile in length a short distance below the junction of Grouse Creek and the Secesh River. Both open meadows and timberland cover the area.

Schist, gneiss, and quartzite occur at the headwaters of the two tributary streams, Lake Creek and Grouse Creek. Near the mouth of Grouse Creek, the bedrock consists of soft sandstone, shale, and lignitic coal.

Glaciation has played an important part in the distribution of the gravel on both Grouse Creek and the Secesh River. Remnants of gold-bearing moraines and terrace outwash from ancient glaciers are found on both sides of the two streams and in some instances are found high above their respective valley floors (19).

The alluvium in Secesh Meadows contains boulders that seldom exceed 1 foot in diameter, but upstream on Lake Creek and Grouse Creek, boulders exceeding 2 feet in diameter are common. Bedrock is a soft decomposed granitic rock overlain in places by a thin bed of impure lignitic coal.

All drill holes reached bedrock, with the exception of two holes near the mouth of Grouse Creek. The depths of holes ranged from 16 to 50 feet.

The material contains an average of 1.6 pounds of ilmenite and 0.30 pound of monazite per cubic yard. A small amount of gold was present.

Operators have placer-mined for gold near the mouth of Grouse Creek. Euhedral corundum crystals often are found on or near bedrock in the placer pit and on the dumps of old hydraulic tailings from bench placers on the east side of the creek. Some crystals are more than 2 inches long.

Kelly Meadows

Kelly Meadows, in a high mountain basin across a divide from the headwaters of Grouse Creek, is about 33 miles northeast of McCall.

The Kelly Meadows placer has an area of less than 40 acres. Parts are extremely swampy, and other parts are covered with a heavy growth of timber. On the headwaters of Kelly Creek are coarse gravels with evidence of old placer gold workings. Downstream in the meadow area, drilling indicated a surface concentration of some gold and black sands.

The country rock immediately surrounding the basin is composed largely of granitic rock. At higher altitudes are remnants of the Precambrian Belt series that have contributed some metamorphic rocks to the placer gravels in the deposit.

Three holes, 40 to 53 feet deep, were drilled. They bottomed in lake sediments or glacial till.

The black sand contains an average of 4.7 pounds of ilmenite and 0.97 pound of monazite per cubic yard.

Conclusions

The placer deposits that were tested within the Lower Salmon River drainage basin do not contain significant quantities of ilmenite or monazite.

Outlying Deposits

General

The Cedar Creek, Hoodoo Creek, and Elk City areas and the Mud Flats placers are outside the drainage areas previously described. Three are in north-central Idaho; the Mud Flats deposit is in south-central Idaho. Three have sufficient water for mining purposes; the Mud Flats deposit does not. Accessibility, geology, physical features, and other factors related to the individual deposits vary widely. Exploration data are summarized in table 8.

Cedar Creek

Cedar Creek in Clearwater County is a tributary to the South Fork of Potlatch Creek, which flows into the main Clearwater River.

The property can be reached on State Highway No. 7 from Orofino, Idaho, 20 miles to the southeast, or from Kendrick, Idaho, 10 miles to the northwest. Both Orofino and Kendrick are served by a branch line of the Northern Pacific Railroad.

The Cedar Creek drainage has low relief at an altitude of about 2,700 feet. Vegetation consists of brush, scattered clumps of second-growth timber, and open grassland. The meadow is about 8,000 feet long and 800 feet wide.

Sand and gravel in the deposit are derived from granitic rock, quartzite, schist, and other metamorphics. Placer material is less than 6 inches in diameter except near the headwaters of Cedar Creek and its small tributaries. In the vicinity of the deposit the country rock is schist and quartzite. A tongue of basalt exposed at the lower end of the deposit apparently dammed Cedar Creek at one time. Remnants of an old stream channel are exposed upstream on the south side of the creek at a higher altitude.

Five random holes were drilled to bedrock at depths ranging from 10 to 22 feet. The material contained an average of 4.1 pounds of ilmenite per cubic yard. Sample material from the best drill hole contained an average of 9 pounds of ilmenite and 0.5 pound of rutile per cubic yard with only a trace of monazite. The TiO_2 content of the ilmenite was the highest for any placer deposit in Idaho for which an analysis was made; it averaged 51.8 percent TiO_2 .

Hoodoo Creek

The Hoodoo Creek placer is in Idaho County about 69 miles southwest of Lolo, Mont. Lolo is on a branch line of the Northern Pacific Railroad and is also the nearest source of electric power. Idaho State Highway No. 9 extends from the summit of Lolo Pass to the Powell Ranger station, from which a Forest Service road continues southward 17 miles to the lower Hoodoo deposit (fig. 20). The property normally is accessible for 6 months of the year.

TABLE 8. - Summary of exploration data for outlying deposits

(Tr, trace)

Placer area	Number of drill holes	Depth range, ft	Total footage	Number of samples	Average number of pounds per cubic yard						
					Ilmenite	Monazite	Radio-active blacks ¹	Columbite	Magnetite	Garnet	Zircon
Cedar Creek.....	5	10-22	93	20	4.1	Tr	Tr	-	0.3	0.8	0.3
Hoodoo Creek.....	2 10	2-9	30	10	52.2	Tr	-	-	2.3	.7	1.0
Elk City Areas:											
Upper Red River.	12	15-80	410	82	4.3	0.35	Tr	Tr	3.9	.3	.4
Central Red River.....	9	18-40	283	57	5.1	.41	Tr	Tr	5.2	.4	.7
Big Elk Creek...	4	19-40	117	24	7.0	.32	Tr	Tr	.5	.3	.4
Mud Flat.....	4	25-55	175	35	.8	.24	-	-	1.5	4.4	.1
Totals.....	44	-	1,108	228	-	-	-	-	-	-	-

¹Includes euxenite, samarskite, etc.²Includes test pits only.

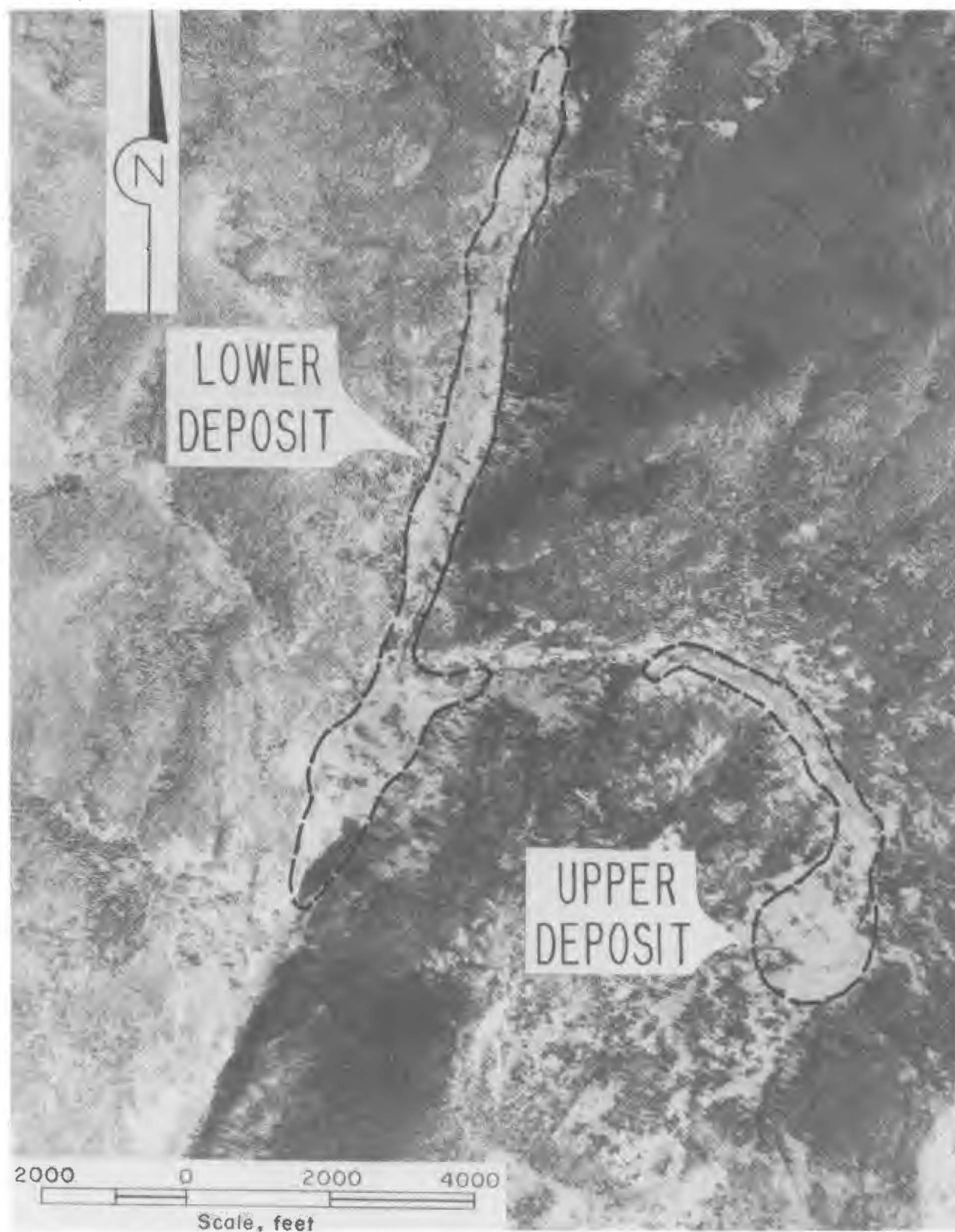


FIGURE 20. - Hoodoo Creek Placer, Idaho County.

The upper deposit, a broad alluvial fan spreading from the base of Hoodoo Mountain, tapers into a narrow strip of alluvium extending downstream along the creek channel a distance of about 6,000 feet; the average width is 500 feet. The lower deposit is in the main valley of Hoodoo Creek beginning at the south end of Hoodoo Lake and extending about 13,000 feet to the north. Its average width is 400 feet. Altitude of both deposits is between 5,600 and 6,000 feet. The hills are well forested, but the valley floor is a grassy meadow with some marshy ground and a few scattered trees.

The region is underlain by quartz monzonite. Alpine glaciation has left remnants of a terminal moraine that separates the two deposits for a distance of one-half mile. Erratics as much as 6 feet in diameter are scattered over the deposits at intervals of a few hundred feet.

Channel samples were taken from 10 test pits in the upper and lower deposits at depths from 2 to 9 feet. The depth to bedrock was not determined.

The average ilmenite content in the upper and lower deposits was 52.2 pounds per cubic yard. Only a trace of monazite was present. The ilmenite assayed 45.6 percent TiO_2 , 35.6 percent Fe, and 0.22 percent Cb_2O_5 (table 1).

Elk City Areas

Three areas in the vicinity of Elk City, Idaho County, were tested by drilling--Upper Red River, Central Red River, and Big Elk Creek (2). Elk City is 59 miles east of Grangeville, which is on U.S. Highway No. 95 and also on a branch line of the Northern Pacific Railroad. The Central Red River deposit is 8 miles south of Elk City, and the Upper Red River area is 12 miles south. The Big Elk Creek deposit is on the outskirts of the town to the west and northwest.

In general, the surface of the three deposits consists of open cultivated fields and grassland at altitudes of about 4,500 feet. Some brush borders the streams. A part of Red River, as well as other stream areas in the vicinity of Elk City, have been dredged previously for gold, and the tailing piles support practically no vegetation.

Most of the alluvium in the deposits is disintegrated granitic rock, but there is some gneiss, schist, and quartzite gravels. Most of the gravel is less than 1 foot in diameter except near the headwaters of the streams.

Twelve holes were drilled in the Upper Red River area to depths ranging from 15 to 80 feet. Seven holes reached bedrock at depths between 11 and 57 feet. The area explored is 1,000 to 5,000 feet wide and about 2 miles long. In Central Red Valley, nine holes were drilled to depths ranging from 18 to 40 feet within an area 2 miles long and 1 mile wide. One hole reached bedrock at a depth of 33 feet. On Big Elk Creek, four randomly spaced holes were drilled to depths ranging from 19 to 40 feet; two of the holes reached bedrock at 17 and 37 feet.

The average ilmenite content per cubic yard in the Upper Red River deposit was 5.1 pounds; in Central Red River, 7.0 pounds; and in Big Elk Creek, 4.3 pounds. In the same order, the amount of monazite was 0.35, 0.41, and 0.32 pound per cubic yard. A trace of gold was found in each of the deposits.

Mud Flats

The deposit is in Elmore County on the southern extremity of the granite intrusive occupying central and south-central Idaho. An unimproved gravel road extends 13 miles northeast from Mountain Home to the deposit. Mountain Home is 44 miles southeast of Boise on U.S. Highway No. 30 and the Union Pacific Railroad.

The area includes several thousand acres of the sagebrush-covered plain that extends northward from Mountain Home to the base of the mountains in central Idaho. The alluvium is composed of Payette Lake sediments and flood plain granitic outwash from small intermittent streams. Occasional basalt boulders are exposed on the surface. Drilling indicated a superficial concentration of black sand. Interbedded clay, sand, and black-sand-bearing gravel overlay older lake sediments.

Four holes were drilled in the deposit to depths ranging from 25 to 55 feet. The hole nearest the base of the mountain reached bedrock at 24 feet.

The placer materials averaged 0.8 pound ilmenite and 0.24 pound monazite per cubic yard.

Conclusions

The outlying placer deposits are either too inaccessible or too low in grade to be presently important as a source of ilmenite.

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APPENDIX. - INDEX OF PROPERTY NAMES, LOCATION, AND OWNERSHIP

Placer deposit	Location	Ownership
Ada County		
Barber Flats.....	T 3 N, Rs 2 and 3 E.....	County road right-of-way.
Dry Creek.....	Tps 4 and 5 N, R 1 E.....	Julius Joker, Rt. 3, Boise, Idaho.
Blaine County		
Sheep Creek.....	Tps 1 S and 1 N, R 18 E..	John Brown, Inc., Bellevue, Idaho;
Poverty Flats.	Tps 1 S and 1 N, R 18 E..	and Joe Telechia, Shoshone, Idaho.
Reed Creek.....	Tps 1 S and 1 N, R 18 E..	
Rock Creek.....	Tps 1 N and 1 S, R 17 E..	C. R. Tews, Shoshone, Idaho; Joe Telechia, Shoshone, Idaho; T. H. Gooding, Gooding, Idaho; and George M. Stewart, Hailey, Idaho.
Blaine and Camas Counties		
Camp Creek.....	Tps 1 N and 1 S, R 16 E..	Mrs. Alfred Johanson, Gooding, Idaho; and Mrs. Maude C. Tham, Hailey, Idaho.
Boise County		
Boise Basin.....	Tps 6, 7, and 8 N, Rs 4, 5, and 6 E.	Golden Age Mines, Inc., Centerville, Idaho; Grimes Payette Mining Co., Centerville, Idaho; Baumhoff-Marshall, Inc., Centerville, Idaho; Idaho-Canadian Dredging Co., Boise, Idaho; Fred Ball, Boise, Idaho; and A. A. Fairchild, address unknown.
Garden Valley...	Tps 8 and 9 N, Rs 4 and 5 E.	Richard H. Harley, Garden Valley, Idaho; Robert Mills, Garden Valley, Idaho; L. A. Canady, Garden Valley, Idaho; William Asp, Garden Valley, Idaho; S. K. Atkinson, Boise, Idaho; Idaho-Canadian Dredging Co., Boise, Idaho; John Clark, Crouch, Idaho; and C. C. Anderson, Crouch, Idaho.
Rabbit Creek....	T 6 N, Rs 6 and 7 E.....	Glen Macy, Baker, Oreg.; and W. W. Blackwell, Baker, Oreg.
Clearwater County		
Cedar Creek.....	T 38 N, R 1 W.....	Lawrence L. Olson, Orofino, Idaho; Donald Cantril, Southwick, Idaho; R. S. Betts, Southwick, Idaho; and Otto F. Silflow, Cameron, Idaho.
Custer County		
Gold Creek and Williams Creek.	T 9 n, R 14 E.....	Edward F. Bogart, Stanley, Idaho.
Kelly Creek.....	T 11 N, R 13 E.....	John Weidman, Stanley, Idaho.

Placer deposit	Location	Ownership
Custer County--Continued		
Meadow Creek....	T 11 N, R 12 E.....	Within boundaries of Challis National Forest.
Stanley Creek...	T 11 N, R 13 E.....	John Weidman, Stanley, Idaho.
Valley Creek....	T 11 N, R 12 E.....	Within boundaries of Challis National Forest.
Elmore County		
Alexander Flats.	T 5 N, R 8 E.....	James B. Taylor, Boise, Idaho.
Dismal Swamp....	T 5 N, R 9 E.....	J. R. Simplot Co., Boise, Idaho.
Mud Flats.....	T 1 S, R 6 E.....	F. W. and R. H. Bennett, Mountain Home, Idaho; and E. C. Johnson, Mountain Home, Idaho.
Gem County		
Johnson Creek...	Tps 6 and 7 N, R 1 E.....	W. F. Clifford, Montour, Idaho.
Idaho County		
Elk City Areas..	{Tps 27 and 28 N, R 9 E T 29 N, R 8 E	{John Arker, Grangeville, Idaho; G. C. Nitz, Elk City, Idaho; J. R. Lightfoot, Elk City, Idaho; and Edgar A. Johnson, Elk City, Idaho.
Grouse Creek....	T 25 N, R 4 E.....	W. A. White, Riggins, Idaho; and R. F. Winters, Riggins, Idaho.
Hoodoo Creek....	Tps 34 and 35 N, Rs 14 and 15 E.	H. C. Parker, Hamilton, Mont.; and Roy Pierson, Hamilton, Mont.
Kelly Meadows...	T 23 N, R 5 E.....	W. R. McDowell, Warren, Idaho; and L. D. Cram, Warren, Idaho.
Lake Creek.....	T 22 N, R 4 E.....	William Harris, Burgdorf, Idaho.
Secesh Meadows..	T 22 N, R 5 E.....	Yuba Consolidated Industries, San Francisco, Calif.; Tom O'Connel, and others, Boise, Idaho; and George Winkler, Council, Idaho.
Warren Meadows..	Tps 22 and 23 N, R 6 E...	Leland Wagner, Warren, Idaho; W. W. Prather, Warren, Idaho; W. R. McDowell, Warren, Idaho; and A. C. Solomon, McCall, Idaho.
Valley County		
Bear Valley.....	Tps 11, 12, and 13 N, Rs 8, 9, and 10 E.	Robert L. Wilson, and others, Cascade, Idaho; A. A. Cassner, and others, Riggins, Idaho; H. A. McDowell, and others, Craigmont, Idaho; Sherwin N. Barton, Boise, Idaho; and Sam Barton, and others, Boise, Idaho.
Beaver Creek....	T 14 N, R 4 E.....	Frank Callender, Cascade, Idaho.
Big Creek.....	T 13 N, R 4 E.....	H. F. Baumhoff, Boise, Idaho; Ben Goslin, Boise, Idaho; Edwin Goslin, Boise, Idaho; D. W. Kennedy, Boise, Idaho; C. A. Olson, Boise, Idaho; and C. W. Parks, Emmett, Idaho.

Placer deposit	Location	Ownership
Valley County--Continued		
Boulder Creek...	T 17 N, R 4 E.....	Orson A. Robinson, Lake Fork, Idaho.
Clear Creek.....	Tps 12 and 13 N, Rs 4 and 5 E.	E. Hasbrouck, Cascade, Idaho; H. Bingman, Boise, Idaho; Boise Payette Lumber Co., Boise, Idaho; Dorsey C. Herrick, Boise, Idaho; L. Dennis, Alpha, Idaho; and W. O. Cunningham, Meridian, Idaho.
Corral Creek....	T 13 N, R 4 E.....	D. W. Kennedy, Boise, Idaho; C. A. Olson, Cascade, Idaho; W. T. Jones, Cascade, Idaho; Clifford Olson, Cascade, Idaho; and Ben R. Goslin, Cascade, Idaho.
Deadwood River..	T 12 N, R 7 E.....	J. F. Van Brocklin, Riggins, Idaho; and George A. Williams, Riggins, Idaho.
Gold Fork River.	Tps 15 and 16 N, Rs 3 and 4 E.	Geo. M. Loomis, Donnelly, Idaho; Floyd Loomis, Donnelly, Idaho; G. E. Davis, Donnelly, Idaho; G. W. Davis, Donnelly, Idaho; and Laurel Hansen, Donnelly, Idaho.
Horsethief Basin	T 14 N, R 4 E.....	Boise Payette Lumber Co., Boise, Idaho.
Hull's Big Creek	T 15 N, R 5 E.....	V. N. Vandevanter, 3832 Clinto Ave., Fresno, Calif.
Lake Fork Creek.	Tps 17 and 18 N, R 3 E...	Valley County barrow pit.
Little Valley...	T 16 N, R 4 E.....	Andrew Robinson, Ontario, Oreg.
Paddy Flats.....	Tps 16 and 17 N, Rs 4 and 5 E.	Cosumnes Gold Dredging Co., Inc., 465 California St., San Francisco, Calif.
Peace Valley....	T 12 N, R 6 E.....	L. S. Heller, Boise, Idaho; and Julius Miller, Garden Valley, Idaho.
Pearsol Creek...	Tps 13 and 14 N, R 4 E...	Forest E. Robb, Cascade, Idaho; T. J. Davis, Cascade, Idaho; Jack Loyd, Cascade, Idaho; D. W. Kennedy, Boise, Idaho; and J. R. Simplot Co., Boise, Idaho.
Scott Valley....	T 14 N, Rs 4 and 5 E.....	David Little, Emmett, Idaho; Earl Huskey, Cascade, Idaho; and Boise Payette Lumber Co., Boise, Idaho.

Placer deposit	Location	Ownership
Valley County--Continued		
Squaw Meadows...	Tps 14 and 15 N, R 6 E...	W. W. Prather, Warren, Idaho; W. G. Keenen, Warren, Idaho; Louise Brooks, Warren, Idaho; Wilburta Taylor, Warren, Idaho; and R. M. Carrey, Warren, Idaho.
White Hawk Basin	T 11 N, R 7 E.....	Cosummes Gold Dredging Co., Inc., 465 California St., San Francisco, Calif.
West Mountain...	Tps 15 and 16 N, R 3 E...	Joseph Slifka and Andrew Little, Jr.

