UNITED STATES DEPARTMENT OF THE INTERIOR

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Analytical results and sample locality map for stream-sediment and panned-concentrate samples from the Mallard and Upper Bargamin Additions to the Frank Church-River of No Return Wilderness, Idaho County, Idaho

By

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

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STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral values if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Mallard and Upper Bargamin Additions to the Frank Church-River of No Return Wilderness in the Nezperce National Forest, Idaho County, Idaho. The area was established as a wilderness by Public Law 96-312, July 23, 1980.

INTRODUCTION

In the summer of 1983 the U.S. Geological Survey conducted a reconnaissance geochemical survey of the Upper Bargamin and Mallard Additions to the Frank Church-River of No Return Wilderness, Idaho County, Idaho.

The Upper Bargamin Addition comprises about 20 mi^2 (52 km^2) in the southern part of Idaho County, Idaho, and lies about 16 mi (28 km) southeast of Elk City, Idaho. The Mallard Addition, also in Idaho County, comprises 1.5 mi^2 (4 km^2) and lies 11 mi (18 km) southwest of the Upper Bargamin Addition. Access to the two areas is by secondary roads from Elk City, which is on Idaho Route 14 (fig. 1).

The Upper Bargamin Addition is characterized by moderately steep topography resulting from dissection of uplands by Bargamin Creek and its many tributaries. Elevation ranges from about 8,000 ft (2,440 m) on the ridge line at the eastern boundary to about 4,400 ft (1,340 m) at Bargamin Creek on the southern boundary. The area is heavily forested with conifer trees. A moderately heavy undergrowth of shrubs is commonly present.

The Mallard Addition is a steep, rugged gorge formed by Big Mallard Creek in its flow from rolling upland terrain to the bottom of the Salmon River canyon. The elevation ranges from about 5,200 ft (1,580 m) on the northern boundary to about 3,200 ft (1,200 m) at Big Mallard Creek on the southern boundary.

Most of the Upper Bargamin Addition is underlain by Eocene granitic rocks; the northwestern end and southeastern tip of the area are underlain by Precambrian gneiss. The Mallard Addition is underlain by Eocene granitic rocks (Karen Lund, written communication, 1985). No mineral deposits have been reported in either area. Geology and mineral resources of adjoining areas of the Frank Church-River of No Return Wilderness are outlined by Weis and others (1972) and Cater and others (1973).

Samples were collected by G. A. Nowlan, S. C. Rose, and G. P. Pudlik. Analyses were by R. T. Hopkins, Jr., T. A. Roemer, D. L. Kelley, and M. Walter.

METHODS OF STUDY

Sample Media

Analyses of the stream-sediment samples represent the chemistry of the rock material eroded from the drainage basin upstream from each sample locality. Such information is useful in identifying those basins which contain concentrations of elements that may be related to mineral deposits. Panned-concentrate samples provide information about the chemistry of a limited number of minerals in rock material eroded from the drainage basin

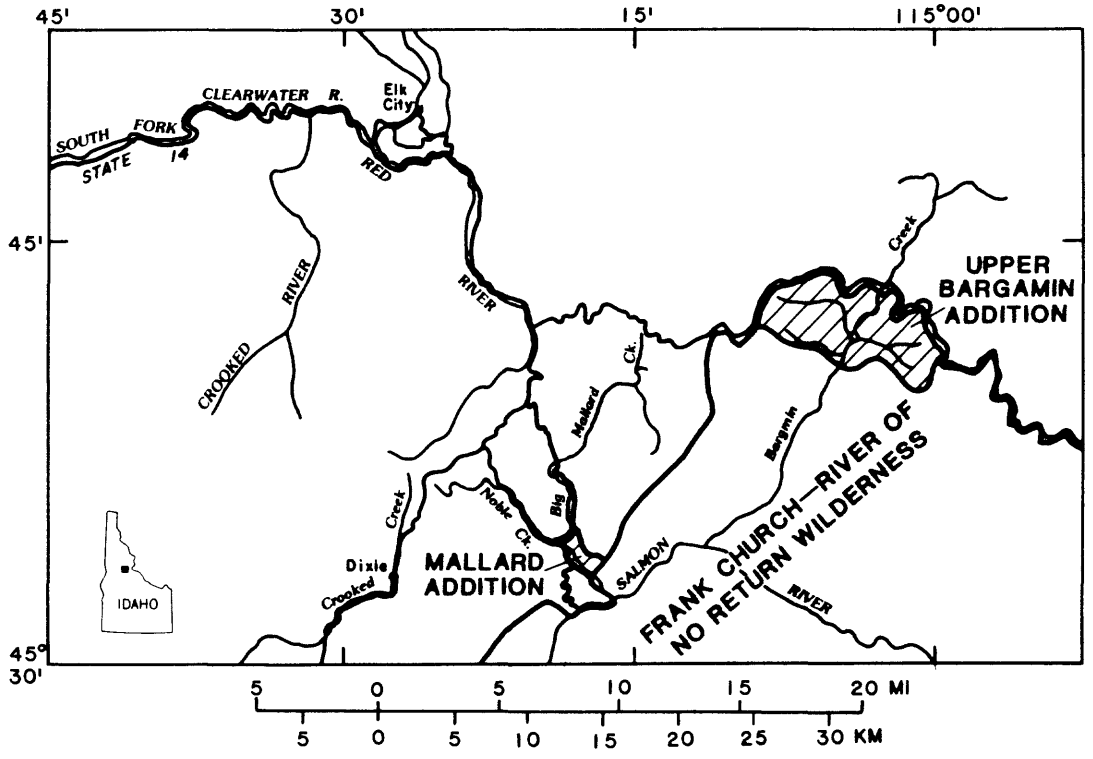

Figure 1. Index map, Mallard and Upper Bargamin Additions to the Frank Church-River of No Return Wilderness, Idaho County, Idaho.

upstream from each sample locality. The selective concentration of minerals, many of which are ore-related, permits determination of some elements that are not easily detected in stream-sediment samples.

Sample Collection

Samples were collected at 64 localities (plate 1). At all of the localities, a stream-sediment sample was collected; at most of the localities two panned-concentrate samples were collected. The two panned-concentrate samples will be referred to as the heavy-mineral-concentrate sample and the raw panned-concentrate sample. Sampling density was about two sample localities per square mile.

Stream-sediment samples

The stream-sediment samples consisted of grab samples of active alluvium collected primarily from first-order (unbranched) and second-order (below the junction of two first-order) streams as shown on USGS topographic maps (scale = 1:24,000).

Heavy-mineral-concentrate samples

Heavy-mineral-concentrate samples were collected from the same active alluvium as the stream-sediment samples. Each bulk sample was screened with a 2.0-mm (10-mesh) screen to remove the coarse material. The less than 2.0-mm fraction was panned until most of the quartz, feldspar, organic material, and clay-sized material were removed.

Raw panned-concentrate samples

A heaping 16-inch pan of unscreened alluvium (approximately 20 lbs or 9 kg) was panned until between 1 g and 22 g remained.

Sample Preparation

The stream-sediment samples were oven dried at less than 60°C, then sieved using 80-mesh (0.17-mm) stainless-steel sieves. The portion of the sediment passing through the sieve was saved for analysis.

After oven drying at less than 60°C, bromoform (specific gravity 2.8) was used to remove the remaining quartz and feldspar from the heavy-mineral-concentrate samples that had been panned in the field. The resultant heavy-mineral sample was separated into three fractions using a large electromagnet (in this case a modified Frantz Isodynamic Separator). The most magnetic material, primarily magnetite, was not analyzed. The second fraction, largely ferromagnesian silicates and iron oxides, was saved for analysis/archival storage. The third fraction (the least magnetic material including the nonmagnetic ore minerals, zircon, sphene, etc.) was split using a Jones splitter. One split was hand-ground for spectrographic analysis; the other split was saved for mineralogical analysis. These magnetic separates are the same separates that would be produced by using a Frantz Isodynamic Separator set at a slope of 15° and a tilt of 10° with a current of 0.1 ampere to remove the magnetite and ilmenite, and a current of 1.0 ampere to split the remainder of the sample into paramagnetic and nonmagnetic fractions.

The raw panned-concentrate samples were dried at less than 60°C and then were analyzed for gold without further preparation.

Sample Analysis

Spectrographic method

The stream-sediment and heavy-mineral-concentrate samples were analyzed for 31 elements using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their lower limits of determination are listed in table 1. Spectrographic results were obtained by visual comparison of spectra derived from the sample against spectra obtained from standards made from pure oxides and carbonates. Standard concentrations are geometrically spaced over any given order of magnitude of concentration as follows: 100, 50, 20, 10, and so forth. Samples whose concentrations are estimated to fall between those values are assigned values of 70, 30, 15, and so forth. The precision of the analytical method is approximately plus or minus one reporting interval at the 83 percent confidence level and plus or minus two reporting intervals at the 96 percent confidence level (Motooka and Grimes, 1976). Values determined for the major elements (Ca, Fe, Mg, and Ti) are given in weight percent; all others are given in parts per million (micrograms/gram).

Other Methods

Other methods of analysis used on samples from the Mallard and Upper Bargamin Additions are summarized in table 2.

Analytical results are listed in tables 3, 4, and 5.

ROCK ANALYSIS STORAGE SYSTEM

Upon completion of all analytical work, the analytical results were entered into a computer-based file called Rock Analysis Storage System (RASS). This data base contains both descriptive geological information and analytical data. Any or all of this information may be retrieved and converted to a binary form (STATPAC) for computerized statistical analysis or publication (VanTrump and Miesch, 1976).

DESCRIPTION OF DATA TABLES

Tables 3-5 list the analyses for samples of stream sediment, heavy-mineral concentrate, and raw panned concentrate, respectively. For the three tables, the data are arranged so that column 1 contains the USGS-assigned sample identifications. The numeric portions of the identifications correspond to the numbers shown on the locality map (plate 1). Stream-sediment samples were analyzed for As, Cd, Sb, and Zn by both emission spectrography and atomic absorption. The results in table 3 for Cd and Zn are atomic-absorption results. A letter "N" in tables 3 and 4 indicates that a given element was looked for but not detected at the lower limit of determination shown for that element in tables 1 and 2. If an element was observed but was below the lowest reporting value, a "less than" symbol (<) was entered in the tables in front of the lower limit of determination. If an element was observed but was above the highest reporting value, a "greater than" symbol (>) was entered in the tables in front of the upper limit of

determination. Because of the formatting used in the computer program that produced tables 3 and 4, some of the elements listed in these tables (Ca, Fe, Mg, Ti, Ag, Be, and U) carry one or more nonsignificant digits to the right of the significant digits. The analysts did not determine these elements to the accuracy suggested by the extra zeros. The elements shown in the following table were not detected at the lower limits of determination shown in tables 1 and 2; consequently the columns for these elements have been omitted from tables 3 and 4:

	Method	
Sample type	Emission spectrography	Atomic absorption
Stream sediment	As, Au, Bi, Cd, Mo, Sb, Th, W, Zn	As, Sb
Heavy-mineral concentrate	Ag, As, Au, Cd, Mo, Sb, Zn	

Results for Zr in heavy-mineral-concentrate samples were all greater than the upper limit of determination, 2,000 ppm, and were omitted from table 4.

The lower limit of determination for Au by atomic absorption is 0.05 ppm, based on a 10-g sample (table 2). Because the sample weight for raw panned concentrates is variable, the lower limit of determination is variable when reported in terms of ppm (table 5). However, the Au method used for this study will detect 0.5 μg of Au, as reflected in table 5 by the last column (Au per pan, μg).

Latitudes and longitudes listed in tables 3-5 are based on 1:24,000-scale U.S. Geological Survey topographic maps of the Boston Mountain, Spread Creek Point, and Whitewater Ranch quadrangles. The listed coordinates may not conform precisely to the plotted locations in plate 1.

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TABLE 1.--Limits of determination for the spectrographic analysis of stream sediments, based on a 10-mg sample

[The spectrographic limits of determination for heavy-mineral-concentrate samples are based on a 5-mg sample, and are therefore two reporting intervals higher than the limits given for rocks and stream sediments]

Elements	Lower determination limit	Upper determination limit
	Percent	
Iron (Fe)	0.05	20
Magnesium (Mg)	.02	10
Calcium (Ca)	.05	20
Titanium (Ti)	.002	1
	Parts per million	
Manganese (Mn)	10	5,000
Silver (Ag)	0.5	5,000
Arsenic (As)	200	10,000
Gold (Au)	10	500
Boron (B)	10	2,000
Barium (Ba)	20	5,000
Beryllium (Be)	1	1,000
Bismuth (Bi)	10	1,000
Cadmium (Cd)	20	500
Cobalt (Co)	5	2,000
Chromium (Cr)	10	5,000
Copper (Cu)	5	20,000
Lanthanum (La)	20	1,000
Molybdenum (Mo)	5	2,000
Niobium (Nb)	20	2,000
Nickel (Ni)	5	5,000
Lead (Pb)	10	20,000
Antimony (Sb)	100	10,000
Scandium (Sc)	5	100
Tin (Sn)	10	1,000
Strontium (Sr)	100	5,000
Vanadium (V)	10	10,000
Tungsten (W)	50	10,000
Yttrium (Y)	10	2,000
Zinc (Zn)	200	10,000
Zirconium (Zr)	10	1,000
Thorium (Th)	100	2,000

Table 2.--Lower limits of determination for methods other than the spectrographic method

[AA = atomic absorption; SI = specific ion; and F = fluorometry]

Element or constituent determined	Sample Type	Method	Determination limit (ppm)	Reference
Gold (Au)	Raw panned-concentrate	AA	0.05*	Thompson and others, 1968.
Arsenic (As)	Stream sediment	AA	10	Modification of Viets, 1978.
Antimony (Sb)	" "	AA	2	
Zinc (Zn)	" "	AA	5	
Cadmium (Cd)	" "	AA	0.1	
Fluorine (F)	" "	SI	100	Hopkins, 1977.
Uranium (U)	" "	F	0.05	Modification of Centanni and others, 1956.

*Based on a 10-g sample

Table 3.--Analyses of stream-sediment samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown]

Sample	Latitude	Longitude	Ca	Fe	Mg	Ti	Ag	B	Ba	Be	Cd	Co	Cr	Cu	F	La	Mn	Nb	Ni	Pb
Mallard samples																				
IA2001	45 31 49	115 18 20	1.5	3.0	.7	.7	N	20	500	2.0	N	10	100	30	<100	150	700	<20	30	30
IA3030	45 34 46	115 18 30	1.5	3.0	1.0	.5	N	15	700	3.0	.1	7	100	10	300	30	700	<20	15	30
IA3031	45 34 26	115 18 48	1.5	3.0	.7	.7	N	15	700	2.0	.1	7	100	15	200	300	700	<20	10	30
IA3032	45 34 16	115 19 28	1.0	3.0	1.0	.7	N	30	500	3.0	.2	10	100	20	300	300	1,000	<20	20	70
IA3033	45 34 4	115 19 12	1.5	5.0	1.0	.7	N	20	700	2.0	.2	10	150	30	200	50	700	<20	30	30
IA3034	45 33 46	115 18 5	1.5	3.0	.7	.5	N	20	700	3.0	.2	10	70	20	200	200	1,000	<20	20	30
IA3035	45 33 45	115 18 3	1.5	3.0	1.0	.7	N	15	700	3.0	.1	10	100	10	200	30	700	<20	15	30
IA3036	45 33 59	115 16 23	1.0	3.0	.7	.5	1.5	20	700	3.0	.2	7	100	15	200	100	500	<20	10	30
IA3037	45 34 0	115 16 42	1.5	3.0	.7	.5	N	30	1,000	5.0	.3	10	150	20	300	50	1,000	<20	20	30
IA3038	45 34 30	115 17 27	1.5	2.0	.7	.5	N	20	700	5.0	.2	10	70	20	200	50	700	<20	15	30
IA3039	45 34 45	115 17 37	1.5	3.0	.7	.5	N	20	1,000	3.0	.3	10	70	20	200	50	1,000	<20	20	30
IA3040	45 34 54	115 18 1	2.0	5.0	1.5	.7	N	20	1,000	3.0	.1	15	150	20	200	50	1,000	<20	30	30
IA3098	45 32 16	115 16 12	1.0	2.0	.7	.3	N	N	500	<1.0	.1	5	70	5	200	20	500	N	15	30
Upper Bargamin samples																				
IA2002	45 43 31	115 2 8	1.0	2.0	.5	.5	N	N	300	5.0	.1	5	30	7	200	300	700	20	<5	30
IA2003	45 43 30	115 2 9	1.0	2.0	.5	.7	N	N	300	5.0	.1	N	30	5	200	500	700	30	<5	30
IA2004	45 43 31	115 1 49	1.5	5.0	1.0	1.0	N	10	500	3.0	.1	10	50	7	200	300	1,000	50	<5	70
IA2005	45 43 19	115 1 46	1.5	3.0	1.0	1.0	N	N	500	3.0	.1	7	70	7	200	200	1,000	30	<5	30
IA2018	45 43 18	115 3 52	.7	1.5	.3	.5	N	30	300	15.0	.4	N	20	10	200	30	700	30	<5	30
IA2019	45 42 16	115 2 42	2.0	5.0	1.0	>1.0	N	10	700	2.0	.1	7	70	10	200	200	1,000	70	<5	30
IA2020	45 42 23	115 2 39	1.5	7.0	.7	>1.0	N	N	700	2.0	.1	7	50	7	200	300	1,000	100	<5	30
IA2021	45 43 5	115 2 28	1.0	3.0	.7	.7	N	<10	300	5.0	.1	5	30	7	200	300	700	50	<5	50
IA2022	45 41 23	115 3 58	1.5	5.0	.7	>1.0	N	N	500	3.0	.2	10	100	10	200	500	1,000	20	<5	30
IA2023	45 41 21	115 3 40	2.0	5.0	1.0	1.0	N	N	1,000	2.0	.1	10	70	10	200	200	1,000	30	5	30
IA2024	45 41 27	115 3 35	3.0	10.0	2.0	>1.0	N	N	1,000	1.5	.1	10	70	15	200	200	1,500	50	5	30
IA2025	45 41 29	115 3 40	1.5	7.0	.7	>1.0	N	N	300	3.0	.1	7	70	7	200	500	1,000	50	<5	20
IA2053	45 44 1	115 1 34	1.5	3.0	.7	.7	N	20	700	7.0	.4	10	50	10	200	200	700	30	5	30
IA2054	45 43 48	115 1 14	2.0	5.0	1.0	>1.0	N	N	1,000	2.0	.1	10	100	7	300	200	700	30	20	30
IA2055	45 43 46	115 1 15	3.0	5.0	2.0	>1.0	N	N	700	1.5	.1	10	200	15	300	100	1,000	20	50	30
IA2056	45 42 8	115 1 26	2.0	5.0	1.5	1.0	N	10	1,000	1.5	.1	10	100	10	300	50	1,000	20	5	30
IA2057	45 42 11	115 1 26	2.0	5.0	1.5	1.0	N	N	700	2.0	.1	10	100	10	300	70	1,000	20	7	30
IA2070	45 42 54	115 7 18	1.5	5.0	.7	.7	N	N	1,000	3.0	.2	7	100	10	300	70	700	<20	7	30
IA2071	45 42 53	115 7 19	1.5	3.0	.7	.7	N	10	1,000	3.0	.2	7	70	7	300	100	700	20	10	30
IA2072	45 42 44	115 7 7	3.0	5.0	1.5	1.0	N	10	700	2.0	.2	10	100	10	200	70	1,000	<20	30	20
IA2073	45 42 45	115 5 53	1.5	.3	.7	.7	N	10	500	3.0	.1	7	100	10	200	50	500	<20	20	30
IA2074	45 42 43	115 5 55	2.0	.5	1.0	1.0	N	15	500	3.0	.3	10	100	20	200	50	1,000	20	15	30
IA2075	45 42 47	115 5 19	1.5	.3	.7	.5	N	<10	700	5.0	.2	7	50	10	200	70	700	<20	10	30
IA2076	45 42 58	115 4 52	1.5	.2	.3	.5	N	15	500	7.0	.2	5	30	7	200	30	700	20	<5	30
IA2077	45 39 58	115 1 55	2.0	.5	2.0	1.0	N	15	500	3.0	.2	15	200	20	300	150	1,000	30	50	30
IA2078	45 40 47	115 1 50	2.0	.3	2.0	.7	N	10	700	3.0	.2	15	200	15	200	100	1,000	20	50	30
IA2079	45 41 10	115 1 42	1.5	.5	1.0	1.0	N	N	700	2.0	.1	10	100	7	200	30	1,000	20	10	30
IA2080	45 41 11	115 1 42	2.0	.5	1.0	1.0	N	10	700	2.0	.1	10	70	10	300	50	1,000	20	7	30
IA2081	45 43 51	115 3 48	1.5	.3	.7	.7	N	20	500	7.0	.3	7	50	10	200	50	1,000	20	10	30
IA2082	45 43 57	115 3 38	1.0	.3	.7	.7	N	10	700	7.0	.2	7	50	7	300	50	700	50	10	30
IA3099	45 42 44	115 9 35	2.0	.5	1.0	1.0	<.5	<10	700	5.0	.3	10	100	20	300	30	1,000	<20	20	30
IA3100	45 42 43	115 9 33	1.5	.3	.7	.7	<.5	20	700	5.0	.1	10	150	20	300	50	300	20	20	50
IA3101	45 43 33	115 9 58	3.0	.5	1.0	1.0	N	10	1,000	2.0	.2	10	150	20	200	100	700	<20	15	30
IA3102	45 43 34	115 10 0	1.0	.5	.7	1.0	N	N	1,000	2.0	.1	7	100	20	300	100	700	20	10	30
IA3103	45 44 59	115 7 25	2.0	.5	1.0	.7	N	<10	1,000	3.0	.2	10	70	20	300	70	1,000	30	15	30
IA3104	45 44 22	115 8 26	2.0	.3	.7	.5	N	20	1,000	5.0	.3	7	70	20	200	30	700	20	10	30
IA3105	45 44 23	115 8 37	1.5	.3	.7	.7	N	N	700	3.0	.1	7	70	20	300	50	700	20	10	30

Table 3.--Analyses of stream-sediment samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho--Continued

Sample	Sc	Sn	Sr	U	V	Y	Zn	Zr
								Mallard samples--Continued
IA2001	10	N	300	7.2	70	100	35	500
IA3030	7	N	300	4.5	70	50	35	500
IA3031	7	N	300	1.9	70	150	20	1,000
IA3032	7	15	300	2.5	100	150	55	700
IA3033	10	N	300	2.5	100	100	35	700
IA3034	7	N	300	3.0	100	100	30	500
IA3035	10	N	300	3.0	100	70	30	700
IA3036	7	N	300	2.8	70	70	25	700
IA3037	10	N	200	3.4	100	70	35	300
IA3038	7	N	300	4.7	100	100	20	200
IA3039	7	N	300	2.5	100	50	20	500
IA3040	15	N	300	1.8	100	50	35	500
IA3098	5	N	300	2.4	50	30	30	150
								Upper Bargamin samples--Continued
IA2002	7	10	150	2.0	50	70	45	700
IA2003	5	30	100	6.2	20	200	45	1,000
IA2004	10	15	200	3.3	50	100	35	>1,000
IA2005	10	N	300	4.3	70	70	40	>1,000
IA2018	<5	N	150	4.0	20	70	40	500
IA2019	10	<10	200	5.3	50	70	50	>1,000
IA2020	10	N	200	2.8	30	100	55	>1,000
IA2021	<5	20	100	2.5	30	100	40	1,000
IA2022	7	100	200	7.6	70	200	35	1,000
IA2023	7	N	300	5.3	50	50	40	1,000
IA2024	7	N	300	2.8	70	100	50	>1,000
IA2025	7	<10	<100	5.8	50	100	40	>1,000
IA2053	7	10	150	3.6	70	70	50	1,000
IA2054	7	N	300	4.4	70	70	40	>1,000
IA2055	10	N	300	13.0	100	70	35	>1,000
IA2056	10	N	300	3.8	70	50	40	>1,000
IA2057	10	N	300	1.9	100	70	45	>1,000
IA2070	7	N	300	2.1	100	200	30	1,000
IA2071	7	N	300	4.5	70	150	20	1,000
IA2072	10	<10	200	9.4	150	200	25	1,000
IA2073	7	N	500	2.6	100	70	20	500
IA2074	7	N	200	19.0	150	150	40	>1,000
IA2075	7	N	300	4.4	70	70	25	500
IA2076	5	N	200	6.6	70	50	35	1,000
IA2077	10	N	300	5.6	100	70	45	500
IA2078	10	N	300	3.8	100	70	25	700
IA2079	10	N	300	2.6	70	30	35	1,000
IA2080	10	N	500	1.9	100	30	40	>1,000
IA2081	7	N	300	4.6	70	150	30	500
IA2082	5	10	200	3.6	70	50	45	300
IA3099	10	N	300	9.7	150	100	35	1,000
IA3100	7	N	300	13.0	70	70	30	300
IA3101	7	<10	300	4.9	100	150	25	>1,000
IA3102	7	<10	300	2.0	100	200	30	1,000
IA3103	7	N	1,000	2.6	150	70	40	500
IA3104	7	N	500	7.3	100	70	45	700
IA3105	7	N	500	2.3	100	70	30	700

Table 3.--Analyses of stream-sediment samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho--Continued

Sample	Latitude	Longitude	Ca	Fe	Mg	Ti	Ag	B	Ba	Be	Cd	Co	Cr	Cu	F	La	Mn	Nb	Ni	Pb
Upper Bargamin samples--Continued																				
IA3106	45 40 28	115 4 27	2.0	.5	1.0	.7	N	10	1,000	2.0	.2	10	150	20	400	50	1,000	<20	20	30
IA3107	45 40 26	115 4 37	2.0	.5	1.0	.7	N	10	700	3.0	.1	10	100	20	300	200	1,000	20	20	30
IA3108	45 41 29	115 5 45	1.5	.3	.5	.7	N	30	500	7.0	.4	5	50	15	200	150	700	50	5	30
IA3109	45 41 26	115 5 46	1.0	1.0	.2	.7	N	N	300	10.0	.3	N	10	5	300	30	700	20	<5	20
IA3110	45 41 1	115 5 12	1.5	1.0	.2	.5	N	<10	300	10.0	.2	N	15	5	300	50	500	20	N	20
IA3111	45 41 1	115 4 45	1.5	3.0	.5	1.0	N	N	500	7.0	.2	5	10	7	300	1,000	1,000	50	<5	30
IA3112	45 40 59	115 4 43	1.0	3.0	.3	.7	N	N	500	10.0	.2	5	<10	5	400	150	1,000	30	<5	30
IA3113	45 40 25	115 4 59	1.5	5.0	.7	1.0	N	N	500	10.0	.2	5	<10	5	400	700	1,000	30	5	30
IA3114	45 40 6	115 5 20	1.5	5.0	.7	1.0	N	<10	500	7.0	.2	5	<10	7	300	700	1,000	50	<5	30
IA3115	45 39 55	115 5 44	1.5	3.0	.7	1.0	N	<10	500	7.0	.2	5	20	7	300	300	700	30	<5	30
IA3116	45 41 55	115 4 22	1.0	2.0	.3	.7	N	10	500	15.0	.3	N	15	15	300	200	1,000	50	<5	50
IA3117	45 41 54	115 4 19	2.0	5.0	1.5	>1.0	N	N	700	5.0	.1	10	30	10	300	50	1,000	30	15	30
IA3126	45 42 26	115 2 44	1.5	7.0	1.0	>1.0	N	N	700	3.0	.1	7	20	7	200	700	1,000	50	5	30
IA3127	45 40 50	115 4 13	2.0	7.0	1.5	>1.0	N	N	1,000	3.0	.1	7	<10	7	300	70	1,500	30	15	15

Table 3.--Analyses of stream-sediment samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho--Continued

Sample	Sc	Sn	Sr	U	V	Y	Zn	Zr
								Upper Bargamin samples--Continued
IA3106	7	N	300	7.0	100	30	60	700
IA3107	10	<10	300	3.3	100	50	60	700
IA3108	5	20	150	3.2	70	70	55	1,000
IA3109	N	N	N	7.9	20	30	45	700
IA3110	N	N	N	2.7	20	30	35	>1,000
IA3111	N	10	N	3.2	30	200	55	>1,000
IA3112	<5	<10	<100	4.7	30	70	55	1,000
IA3113	<5	15	<100	4.5	30	150	70	>1,000
IA3114	<5	<10	<100	2.2	30	100	55	>1,000
IA3115	N	<10	<100	7.8	30	70	45	>1,000
IA3116	N	<10	N	5.3	30	100	60	700
IA3117	7	<10	150	5.2	150	100	40	1,000
IA3126	<5	<10	150	2.0	70	100	45	>1,000
IA3127	7	N	200	13.0	100	70	60	>1,000

Table 4.--Analyses of heavy-mineral-concentrate samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho

[N, not detected; <, detected but below the limit of determination shown; >, determined to be greater than the value shown]

Sample	Latitude	Longitude	Ca	Fe	Mg	Ti	B	Ba	Be	Bi	Co	Cr	Cu	La	Mn	Nb	Ni	Pb
Mallard samples																		
IH2001	45 31 49	115 18 20	15.0	.70	.10	>2	<20	<50	N	N	N	100	70	70	300	100	N	20
IH3030	45 34 46	115 18 30	1.5	<.10	<.05	>2	N	100	N	<20	N	100	N	50	50	50	N	70
IH3031	45 34 26	115 18 48	1.5	.10	<.05	>2	N	100	N	N	N	30	N	50	70	<50	N	50
IH3032	45 34 16	115 19 28	5.0	<.10	<.05	>2	<20	<50	N	N	N	100	N	70	200	50	N	70
IH3033	45 34 4	115 19 12	5.0	.10	.15	>2	N	50	N	N	<10	150	N	100	200	150	N	30
IH3034	45 33 46	115 18 5	15.0	.30	.05	>2	N	<50	N	N	N	100	<10	70	300	50	N	50
IH3035	45 33 45	115 18 3	7.0	.10	<.05	>2	N	N	N	N	N	100	N	70	300	N	N	70
IH3036	45 33 59	115 16 23	.7	<.10	.05	>2	N	200	N	N	N	50	N	50	50	50	N	20
IH3038	45 34 30	115 17 27	1.0	<.10	.05	>2	<20	50	300	N	N	70	N	50	50	70	N	50
IH3039	45 34 45	115 17 37	2.0	N	.05	>2	<20	700	N	N	N	50	N	50	70	70	N	70
IH3098	45 32 16	115 16 12	10.0	<.10	<.05	>2	N	<50	N	50	N	100	N	70	200	<50	N	70
Upper Bargamin samples																		
IH2002	45 43 31	115 2 8	1.0	.15	<.05	>2	N	N	50	N	N	100	10	70	150	200	N	70
IH2003	45 43 30	115 2 9	.3	.50	.05	>2	N	<50	<2	N	20	150	30	1,000	150	70	N	200
IH2004	45 43 31	115 1 49	1.0	.30	.05	>2	N	<50	N	N	N	100	<10	100	150	150	N	30
IH2005	45 43 19	115 1 46	3.0	.30	<.05	>2	N	<50	N	N	N	70	N	150	200	<50	N	<20
IH2018	45 43 18	115 3 52	.3	.50	.05	>2	N	N	<2	N	N	20	15	100	70	<50	<10	70
IH2019	45 42 16	115 2 42	1.0	.50	.05	>2	N	<50	N	300	N	20	<10	70	100	<50	N	<20
IH2020	45 42 23	115 2 39	1.5	.70	.05	>2	N	50	N	N	N	30	15	70	150	N	<10	30
IH2021	45 43 5	115 2 28	.5	1.00	.05	2	30	<50	7	N	N	<20	20	100	200	100	N	100
IH2022	45 41 23	115 3 58	7.0	.50	.10	>2	N	300	N	N	N	200	N	500	200	150	<10	150
IH2023	45 41 21	115 3 40	1.5	.50	.05	>2	N	<50	N	N	N	20	N	300	150	N	N	30
IH2024	45 41 27	115 3 35	2.0	.50	.05	>2	N	<50	N	N	N	20	N	70	100	N	N	<20
IH2025	45 41 29	115 3 40	1.0	.50	<.05	>2	N	N	N	N	N	30	20	70	100	<50	N	<20
IH2053	45 44 1	115 1 34	3.0	.30	.05	>2	N	N	N	N	N	100	N	500	200	<50	10	<20
IH2054	45 43 48	115 1 14	1.5	.30	.05	>2	N	N	N	N	N	100	<10	300	150	500	N	70
IH2055	45 43 46	115 1 15	3.0	.30	.07	>2	N	N	N	30	N	70	N	300	150	<50	<10	<20
IH2056	45 42 8	115 1 26	3.0	.50	.07	>2	N	200	N	150	N	70	N	100	200	<50	N	50
IH2057	45 42 11	115 1 26	3.0	.50	<.05	>2	N	N	N	N	N	70	<10	150	200	100	N	<20
IH2070	45 42 54	115 7 18	10.0	.20	<.05	>2	N	N	N	150	N	200	N	50	200	150	N	100
IH2071	45 42 53	115 7 19	15.0	.10	<.05	>2	N	N	N	N	N	300	N	100	200	100	N	70
IH2072	45 42 44	115 7 7	10.0	.20	.05	>2	N	50	N	N	<10	70	N	70	200	50	N	100
IH2073	45 42 45	115 5 53	2.0	<.10	<.05	>2	N	N	N	N	<10	1,500	N	50	150	200	N	70
IH2074	45 42 43	115 5 55	5.0	.30	.10	>2	N	<50	N	N	N	100	N	1,000	200	50	N	100
IH2075	45 42 47	115 5 19	3.0	.30	.05	>2	N	<50	N	N	N	200	<10	200	300	150	N	150
IH2076	45 42 58	115 4 52	.3	<.10	<.05	>2	N	N	N	N	<10	300	N	70	100	150	N	70
IH2077	45 39 58	115 1 55	15.0	.20	.07	>2	N	N	N	N	N	N	N	1,000	500	100	N	<20
IH2078	45 40 47	115 1 50	10.0	.30	.10	>2	<20	N	N	N	N	<20	N	500	300	70	N	70
IH2079	45 41 10	115 1 42	1.0	1.00	.15	>2	N	<50	N	N	N	N	<10	200	300	50	N	30
IH2080	45 41 11	115 1 42	1.0	.30	<.05	>2	N	<50	N	N	N	20	10	150	150	50	N	20
IH2081	45 43 51	115 3 48	1.0	.30	.07	>2	N	<50	N	2,000	30	300	30	300	200	100	N	150
IH2082	45 43 57	115 3 38	2.0	.50	.05	>2	<20	<50	<2	N	50	N	50	>2,000	300	70	N	150
IH3099	45 42 44	115 9 35	15.0	.20	.07	>2	N	N	N	N	N	150	N	70	300	100	N	50
IH3101	45 43 33	115 9 58	10.0	<.10	.05	>2	N	N	N	30	N	500	N	70	300	150	N	70
IH3102	45 43 34	115 10 0	3.0	1.50	.05	>2	N	300	N	N	N	300	N	150	300	200	<10	20
IH3103	45 44 59	115 7 25	15.0	.50	<.05	>2	N	N	N	N	N	150	N	700	700	500	N	20
IH3104	45 44 22	115 8 26	20.0	.50	.05	>2	N	<50	N	500	N	50	N	700	1,000	1,000	N	30
IH3105	45 44 23	115 8 37	10.0	.50	.05	>2	N	N	N	N	N	500	N	500	700	300	N	20
IH3106	45 40 28	115 4 27	30.0	.50	.30	>2	N	N	N	N	N	70	N	1,000	700	70	10	20
IH3107	45 40 26	115 4 37	15.0	.70	.20	>2	N	200	N	N	N	100	N	700	700	150	N	50
IH3108	45 41 29	115 5 45	.5	1.00	.05	>2	20	<50	7	N	N	30	20	2,000	500	50	N	100

Table 4.--Analyses of heavy-mineral-concentrate samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho--Continued

Sample	Sc	Sn	Sr	Th	V	W	Y
					Mallard samples--Continued		
IH2001	50	1,000	N	N	300	300	700
IH3030	<10	>2,000	N	N	100	N	1,500
IH3031	70	500	N	N	70	100	1,000
IH3032	70	>2,000	N	N	150	1,000	1,500
IH3033	150	300	N	N	150	N	700
IH3034	50	>2,000	N	N	100	150	1,000
IH3035	50	50	N	N	150	N	1,000
IH3036	100	100	N	N	70	N	700
IH3038	70	70	N	N	100	<100	700
IH3039	70	100	N	N	100	N	700
IH3098	50	700	N	N	150	700	1,500
					Upper Bargamin samples--Continued		
IH2002	<10	>2,000	N	3,000	150	N	1,500
IH2003	70	>2,000	N	>5,000	70	N	3,000
IH2004	30	2,000	N	1,500	150	N	1,500
IH2005	50	200	N	200	150	N	1,000
IH2018	150	>2,000	N	3,000	30	N	2,000
IH2019	70	70	N	300	70	N	1,000
IH2020	50	1,500	N	1,500	100	N	1,000
IH2021	50	>2,000	N	>5,000	50	N	>5,000
IH2022	50	>2,000	N	5,000	200	N	1,500
IH2023	50	30	N	1,000	70	N	1,000
IH2024	50	20	N	200	70	N	1,000
IH2025	50	>2,000	N	1,000	70	N	2,000
IH2053	50	70	N	300	150	N	1,000
IH2054	50	>2,000	N	5,000	100	N	2,000
IH2055	30	200	N	N	100	N	1,000
IH2056	50	100	N	500	70	N	700
IH2057	30	150	N	N	100	N	1,000
IH2070	50	300	N	N	150	N	1,500
IH2071	70	70	N	N	200	N	1,500
IH2072	50	50	N	3,000	150	N	2,000
IH2073	70	150	N	300	500	N	1,500
IH2074	50	100	N	1,000	200	N	2,000
IH2075	50	2,000	N	3,000	300	100	2,000
IH2076	70	2,000	N	3,000	200	N	2,000
IH2077	<10	70	N	N	200	200	1,000
IH2078	30	70	N	N	150	N	1,500
IH2079	50	70	N	2,000	100	N	1,000
IH2080	50	50	N	700	70	N	1,500
IH2081	150	>2,000	N	>5,000	150	100	5,000
IH2082	100	>2,000	N	>5,000	70	N	>5,000
IH3099	70	100	N	300	200	<100	3,000
IH3101	30	150	N	300	300	100	2,000
IH3102	20	70	N	N	300	150	1,000
IH3103	10	2,000	N	N	300	N	2,000
IH3104	20	300	N	N	200	100	3,000
IH3105	50	1,500	N	N	300	200	2,000
IH3106	20	70	200	N	150	100	2,000
IH3107	20	500	N	1,500	200	N	1,000
IH3108	70	>2,000	N	>5,000	50	N	5,000

Table 4.--Analyses of heavy-mineral-concentrate samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho--Continued

Sample	Latitude	Longitude	Ca	Fe	Mg	Ti	B	Ba	Be	Bi	Co	Cr	Cu	La	Mn	Nb	Ni	Pb
								Upper Bargamin samples--Continued										
IH3109	45 41 26	115 5 46	1.5	.70	.10	>2	<20	N	5	N	N	200	10	>2,000	500	200	N	150
IH3111	45 41 1	115 4 45	.2	.70	<.05	2	N	<50	<2	N	N	50	20	700	200	50	N	70
IH3112	45 40 59	115 4 43	.7	1.00	<.05	>2	N	<50	<2	N	N	20	15	2,000	300	100	N	100
IH3113	45 40 25	115 4 59	1.0	3.00	.30	2	N	<50	<2	N	N	50	20	>2,000	500	100	N	150
IH3115	45 39 55	115 5 44	2.0	.70	.30	>2	<20	<50	3	N	N	150	15	2,000	300	150	N	150
IH3116	45 41 55	115 4 22	.5	1.00	.30	>2	20	<50	5	N	N	<20	20	>2,000	300	150	N	70
IH3117	45 41 54	115 4 19	5.0	.30	<.05	>2	N	50	N	100	<10	300	N	100	200	150	N	100
IH3126	45 42 26	115 2 44	1.5	.30	.07	>2	N	<50	N	N	N	50	15	2,000	150	150	N	50
IH3127	45 40 50	115 4 13	5.0	.50	.30	>2	N	N	N	N	N	100	N	700	300	50	10	N

Table 4.--Analyses of heavy-mineral-concentrate samples, Mallard and Upper Bargamin Additions, River of No Return Wilderness, Idaho--Continued

Sample	Sc	Sn	Sr	Th	V	W	Y
					Upper Bargamin samples--Continued		
IH3109	150	300	N	5,000	150	N	5,000
IH3111	50	>2,000	N	5,000	N	N	5,000
IH3112	100	100	N	>5,000	30	N	5,000
IH3113	50	>2,000	N	>5,000	50	N	5,000
IH3115	150	1,500	N	>5,000	50	N	5,000
IH3116	100	>2,000	N	>5,000	20	N	>5,000
IH3117	30	1,500	N	3,000	200	N	1,500
IH3126	30	2,000	N	3,000	150	N	2,000
IH3127	20	50	N	200	200	N	700

TABLE 5. Gold in raw panned-concentrate samples, Mallard and Upper Bargamin Additions, Frank Church-River of No Return Wilderness, Idaho

[N, not detected at the limit of determination shown; <, detected but below the limit of determination shown]

Sample	Latitude	Longitude	Weight of concentrate (g)	Au in concentrate (ppm)	Au per pan (μg)
		Mallard samples			
IG2001	45 31 49	115 18 20	6.68	<.07	<.5
IG3030	45 34 46	115 18 30	7.90	.55	4.3
IG3031	45 34 26	115 18 48	20.75	N(.02)	N(.5)
IG3032	45 34 16	115 19 28	8.11	N(.06)	N(.5)
IG3033	45 34 4	115 19 12	4.88	N(.10)	N(.5)
IG3034	45 33 46	115 18 5	9.31	3.8	35
IG3035	45 33 45	115 18 3	11.37	N(.04)	N(.5)
IG3036	45 33 59	115 16 23	5.39	N(.09)	N(.5)
IG3038	45 34 30	115 17 27	6.48	N(.08)	N(.5)
IG3039	45 34 45	115 17 37	6.02	.60	3.6
IG3098	45 32 16	115 16 12	10.29	N(.05)	N(.5)
		Upper Bargamin samples			
IG2002	45 43 31	115 2 8	6.80	N(.07)	N(.5)
IG2003	45 43 30	115 2 9	9.22	.65	6.0
IG2004	45 43 31	115 1 49	15.84	N(.03)	N(.5)
IG2005	45 43 19	115 1 46	9.43	N(.05)	N(.5)
IG2018	45 43 18	115 3 52	5.52	N(.09)	N(.5)
IG2019	45 42 16	115 2 42	10.39	N(.05)	N(.5)
IG2020	45 42 23	115 2 39	11.17	N(.04)	N(.5)
IG2021	45 43 5	115 2 28	5.85	N(.09)	N(.5)
IG2022	45 41 23	115 3 58	12.49	N(.04)	N(.5)
IG2023	45 41 21	115 3 40	5.36	N(.09)	N(.5)
IG2024	45 41 27	115 3 35	11.11	N(.05)	N(.5)
IG2025	45 41 29	115 3 40	7.00	3.3	23
IG2053	45 44 1	115 1 34	6.67	<.08	<.5
IG2054	45 43 48	115 1 14	6.99	N(.07)	N(.5)
IG2055	45 43 46	115 1 15	5.00	N(.10)	N(.5)
IG2056	45 42 8	115 1 26	13.94	N(.04)	N(.5)
IG2057	45 42 11	115 1 26	6.87	N(.07)	N(.5)
IG2070	45 42 54	115 7 18	6.03	N(.08)	N(.5)
IG2071	45 42 53	115 7 19	7.10	N(.07)	N(.5)
IG2072	45 42 44	115 7 7	8.44	N(.06)	N(.5)
IG2073	45 42 45	115 5 53	5.01	N(.10)	N(.5)
IG2074	45 42 43	115 5 55	8.61	N(.06)	N(.5)
IG2075	45 42 47	115 5 19	5.49	5.0	27
IG2076	45 42 58	115 4 52	4.31	<.12	<.5

TABLE 5. Gold in raw panned-concentrate samples, Mallard and Upper Bargamin Additions, Frank Church-River of No Return Wilderness, Idaho--Continued

Sample	Latitude	Longitude	Weight of concentrate (g)	Au in concentrate (ppm)	Au per pan (µg)
IG2077	45 39 58	115 1 55	6.30	N(.08)	N(.5)
IG2078	45 40 47	115 1 50	6.94	N(.07)	N(.5)
IG2079	45 41 10	115 1 42	6.63	N(.08)	N(.5)
IG2080	45 41 11	115 1 42	7.26	N(.07)	N(.5)
IG2081	45 43 51	115 3 48	4.05	3.2	13
IG2082	45 43 57	115 3 38	5.23	N(.10)	N(.5)
IG3099	45 42 44	115 9 35	13.15	N(.04)	N(.5)
IG3100	45 42 43	115 9 33	4.77	N(.10)	N(.5)
IG3101	45 43 33	115 9 58	4.60	N(.11)	N(.5)
IG3102	45 43 34	115 10 0	15.78	N(.03)	N(.5)
IG3103	45 44 59	115 7 25	13.29	N(.04)	N(.5)
IG3104	45 44 22	115 8 26	15.04	N(.03)	N(.5)
IG3105	45 44 23	115 8 37	14.15	2.6	37
IG3106	45 40 28	115 4 27	2.79	N(.18)	N(.5)
IG3107	45 40 26	115 4 37	4.22	N(.12)	N(.5)
IG3108	45 41 29	115 5 45	8.02	N(.06)	N(.5)
IG3109	45 41 26	115 5 46	4.24	N(.12)	N(.5)
IG3111	45 41 1	115 4 45	1.75	N(.29)	N(.5)
IG3112	45 40 59	115 4 43	7.57	N(.07)	N(.5)
IG3113	45 40 25	115 4 59	5.36	N(.09)	N(.5)
IG3115	45 39 55	115 5 44	10.50	N(.05)	N(.5)
IG3116	45 41 55	115 4 22	3.18	N(.15)	N(.5)
IG3117	45 41 54	115 4 19	18.93	N(.03)	N(.5)
IG3126	45 42 26	115 2 44	15.94	N(.03)	N(.5)
IG3127	45 40 50	115 4 13	21.18	N(.02)	N(.5)