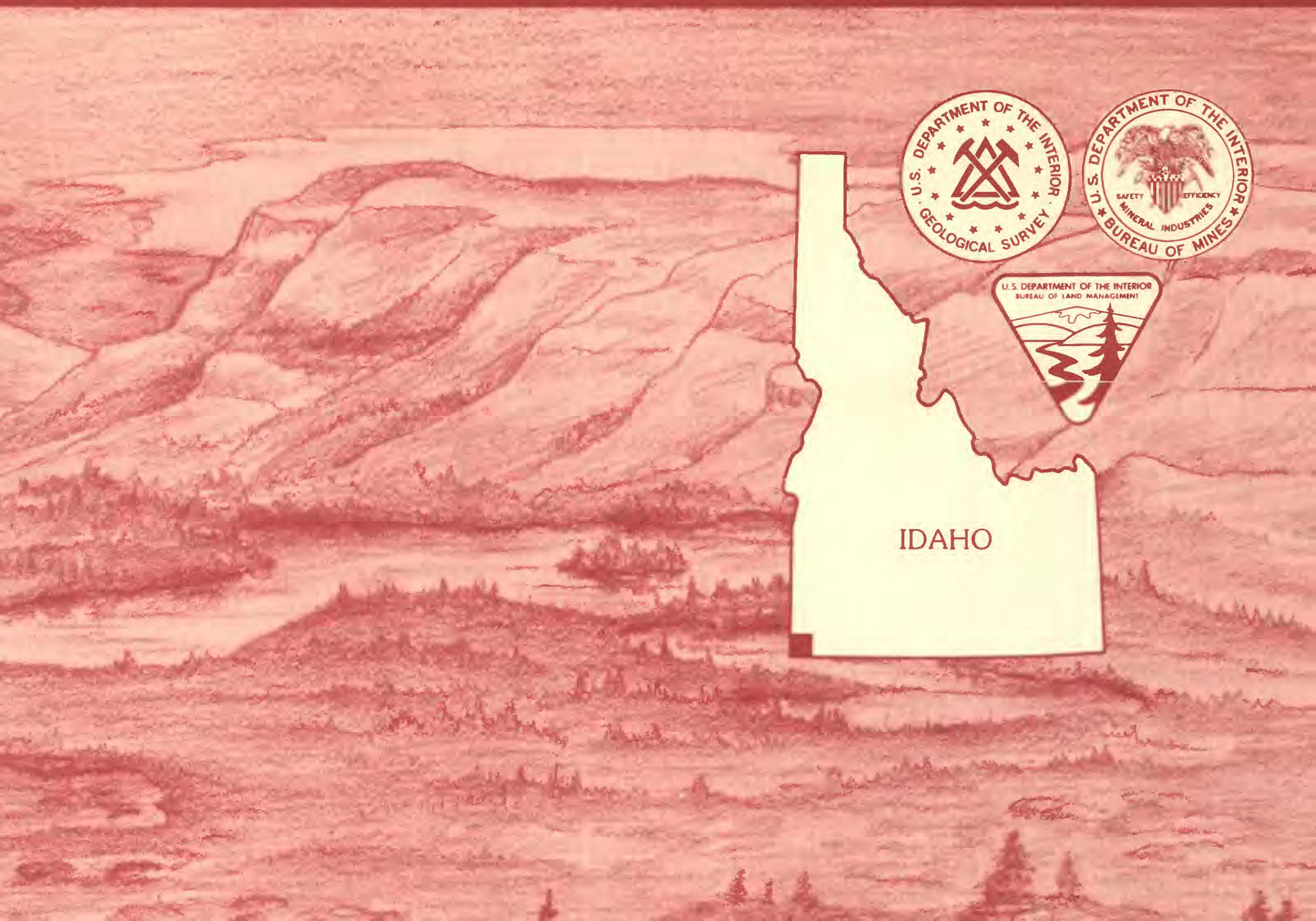
Mineral Resources of the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho

U.S. GEOLOGICAL SURVEY BULLETIN 1719–B



Chapter B

Mineral Resources of the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho

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U.S. GEOLOGICAL SURVEY BULLETIN 1719–B

MINERAL RESOURCES OF WILDERNESS STUDY AREAS:
OWYHEE RIVER REGION, IDAHO AND NEVADA

DEPARTMENT OF THE INTERIOR
DONALD PAUL HODEL, Secretary

U.S. GEOLOGICAL SURVEY
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STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Area

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the 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 mineral survey of the Battle Creek Wilderness Study Area (ID-016-49E), Yatahoney Creek Wilderness Study Area (ID-016-49D), and Juniper Creek Wilderness Study Area (ID-016-52), Owyhee County, Idaho.

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FIGURES

Mineral Resources of the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho

By Carolyn A. Goeldner, Michael G. Sawlan, *and* Harley D. King
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SUMMARY

Abstract

The parts of the three wilderness study areas included in this report and for which mineral surveys were requested, Battle Creek (ID-016-49E), Yatahoney Creek (ID-016-49D), and Juniper Creek (ID-016-52), encompass 31,880 acres, 9,550 acres, and 12,350 acres, respectively, in southwestern Idaho. In this report, the areas studied are referred to as "the wilderness study areas," or simply "the study areas." Field work for this report was carried out by the U.S. Bureau of Mines and U.S. Geological Survey in 1984 and 1985. The three study areas contain no known mines, claims, or prospects. They are covered by natural gas leases or lease applications, but no exploration has occurred. On the basis of geologic studies, geochemical and geophysical evidence, and mineral surveys, these wilderness study areas are defined as having low mineral resource potential for gold, silver, lead, tin, and diatomite. In this report, any references to the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas refer only to those parts of the wilderness study areas for which the Bureau of Land Management requested mineral surveys.

Character and Setting

The Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas lie along the Owyhee River and its tributaries in extreme southwestern Idaho (fig. 1). All three study areas are located in the Owyhee Plateau subprovince of the Columbia Intermontane geologic province, informally known as the Owyhee volcanic field (Pansze, 1975). Elevation ranges from 4,609 ft on the Owyhee River near Wiley Ranch in the Yatahoney Creek Wilderness Study Area to 5,651 ft in the northern part of the Battle Creek Wilderness Study Area. Plateau topography characterizes the intercanyon areas, although, within the study areas, relief is as much as 500 ft along the Owyhee River and Battle Creek.

The stratigraphy of the three areas comprises horizontal, laterally extensive Miocene (about 14 to 10 million years before present, or Ma) rhyolitic rocks locally overlain by Miocene sedimentary rocks and Miocene and (or) Pliocene(5 to 2 Ma) basalt (fig. 2) (see Geologic Time Chart, last page of report). In the Battle Creek Wilderness Study Area, sedimentary rocks and basalt occur mostly southeast of Battle Creek. Northwest-trending en echelon normal faults with vertical displacements of 20-100 ft occur primarily southeast of Battle Creek (fig. 2).

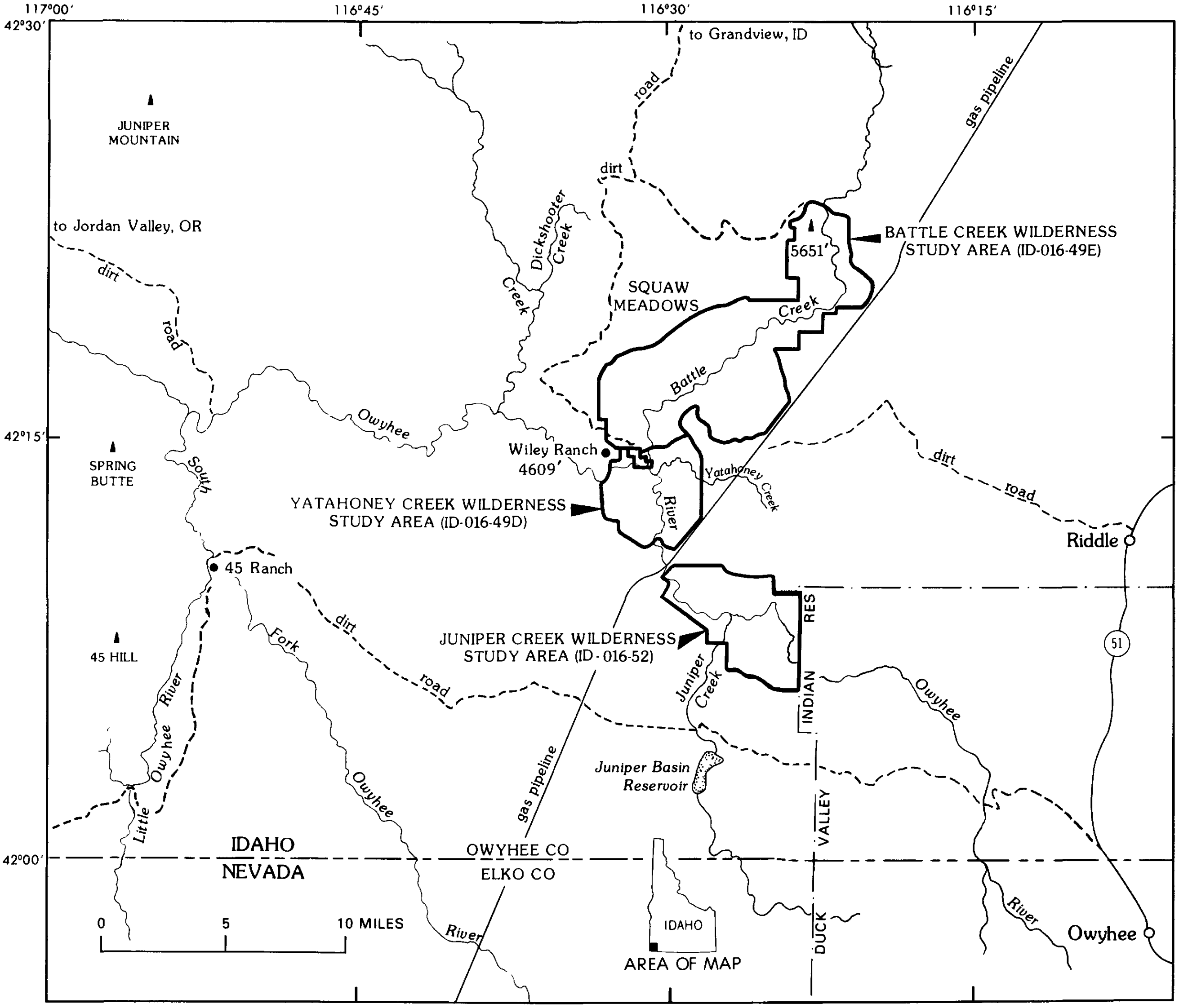

Figure 1. Index map showing the locations of the Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho.

Mineral Resource Potential of the Battle Creek Wilderness Study Area

The Battle Creek Wilderness Study Area has no known mines, claims, or prospects. Placer samples collected by the U.S. Bureau of Mines contained detectable levels of gold, but not in concentrations sufficient to indicate a mineral resource; the source of the gold is thought to be 20 mi north of the study area (Winters, 1985). About 50 percent of the area is covered by oil and gas leases or lease applications, but no exploration has occurred. The area has a low resource potential for gold, silver, and tin and an unknown resource potential for oil and gas.

Mineral Resource Potential of the Yatahoney Creek Wilderness Study Area

The Yatahoney Creek Wilderness Study Area contains no known mines, claims, or prospects. Just south of the study area, near the gas pipeline crossing, there is a small outcrop of diatomaceous earth (Leszcykowski, 1986), but the projected size of the occurrence does not indicate an undiscovered resource. The southern part and the northeast corner of the study area is covered by oil and gas leases or lease applications, but no exploration has occurred. The study area has a low resource potential for lead, tin, and diatomite and an unknown resource potential for oil and gas.

Mineral Resource Potential of the Juniper Creek Wilderness Study Area

The Juniper Creek Wilderness Study Area contains no known mines, claims, or prospects. It is entirely covered by oil and gas leases or lease applications, but no exploration has occurred (Graham, 1985). The study area has a low mineral resource potential for lead, tin, and diatomite and an unknown mineral resource potential for oil and gas.

INTRODUCTION

Area Description

The Battle Creek (ID-016-49E), Yatahoney Creek (ID-016-49D), and Juniper Creek (ID-016-52) Wilderness Study Areas as a whole include 54,180 acres located along the Owyhee River and its tributaries in extreme southwestern Idaho. The Battle Creek and Yatahoney Creek Wilderness Study Areas are contiguous, but a narrow gas-pipeline corridor separates the Juniper Creek and Yatahoney Creek Wilderness Study Areas. The study areas are characterized by flat plateaus, except along the stream courses where the waters have incised nearly vertical canyons as deep as 500 ft.

Access to the Battle Creek Wilderness Study Area is by graded dirt roads and unimproved roads suitable only for four-wheel-drive vehicles. The Yatahoney Creek Wilderness Study Area is contiguous with the southern boundary of the Battle Creek Wilderness Study Area, and a jeep trail marks the common boundary of the two study areas. The Juniper Creek Wilderness Study Area lies about one mile south of the Yatahoney Creek Wilderness Study Area and is bounded on the east by the Duck Valley Indian Reservation and on the south by an unimproved road. Principal access to the Juniper Creek Wilderness Study Area is by gravel roads from Owyhee, Nevada to Juniper Basin Reservoir, and then by jeep trail to the wilderness study area boundary.

Previous and Present Investigations

Previous work related to the wilderness study areas includes mostly large-scale regional studies. Ekren and others (1981) published a 1:250,000-scale geologic map of a portion of Owyhee County. Ekren and others (1982) described the volcanic stratigraphy of western Owyhee County, and Bonnischen and Breckenridge (1982) reported on the general geology of southwestern Idaho. Another study by Ekren and others (1984) dealt with the origin of the rhyolite of the Owyhee plateau.

Mineral resources in the area were evaluated in a report on the geology and energy and mineral resources by Mathews and Blackburn (1983). Reports on the uranium potential of the Owyhee plateau region were prepared for the Department of Energy during their National Uranium Resource Evaluation program, which includes reports by Geodata International Inc. (1980), Bendix Field Engineering Corp. (1982), and Union Carbide Corp. (1982). In 1976, geologists from the U.S. Bureau of Mines studied areas along the Owyhee River for mineral resources (R. W. Morris, 1976, U.S. Bureau of Mines unpub. report, Spokane, Wash.).

In 1985, geologists from the U.S. Bureau of Mines published open-file reports in conjunction with this report on the mineral resources of the Yatahoney Creek (Leszcykowski, 1986), Battle Creek (Winters, 1985), and Juniper Creek Wilderness Study Areas (Graham, 1985). The U.S. Geological Survey conducted field investigations in the three wilderness study areas during 1984 and 1985. The work included field checking of existing geologic maps, new mapping where necessary, and geochemical sampling.

Appraisal of Identified Resources

By Richard A. Winters, Andrew M. Leszcykowski, and Donald E. Graham
U. S.Bureau of Mines

No mining or commercial mineral exploration has occurred in any of the wilderness study areas. In the Battle Creek Wilderness Study Area, 6 of 12 placer samples contained subeconomic but detectable concentrations of gold (Winters, 1985). Each sample had a gold value of less than \$0.02/yd^3 (price of gold calculated at \$400.00/troy ounce), whereas \$0.10-0.15/yd^3 is considered anomalous, and \$8-10/yd^3 is marginally economic. The source of the gold is assumed to be about 20 mi north of the wilderness study area (Winters, 1985), where the headwaters of

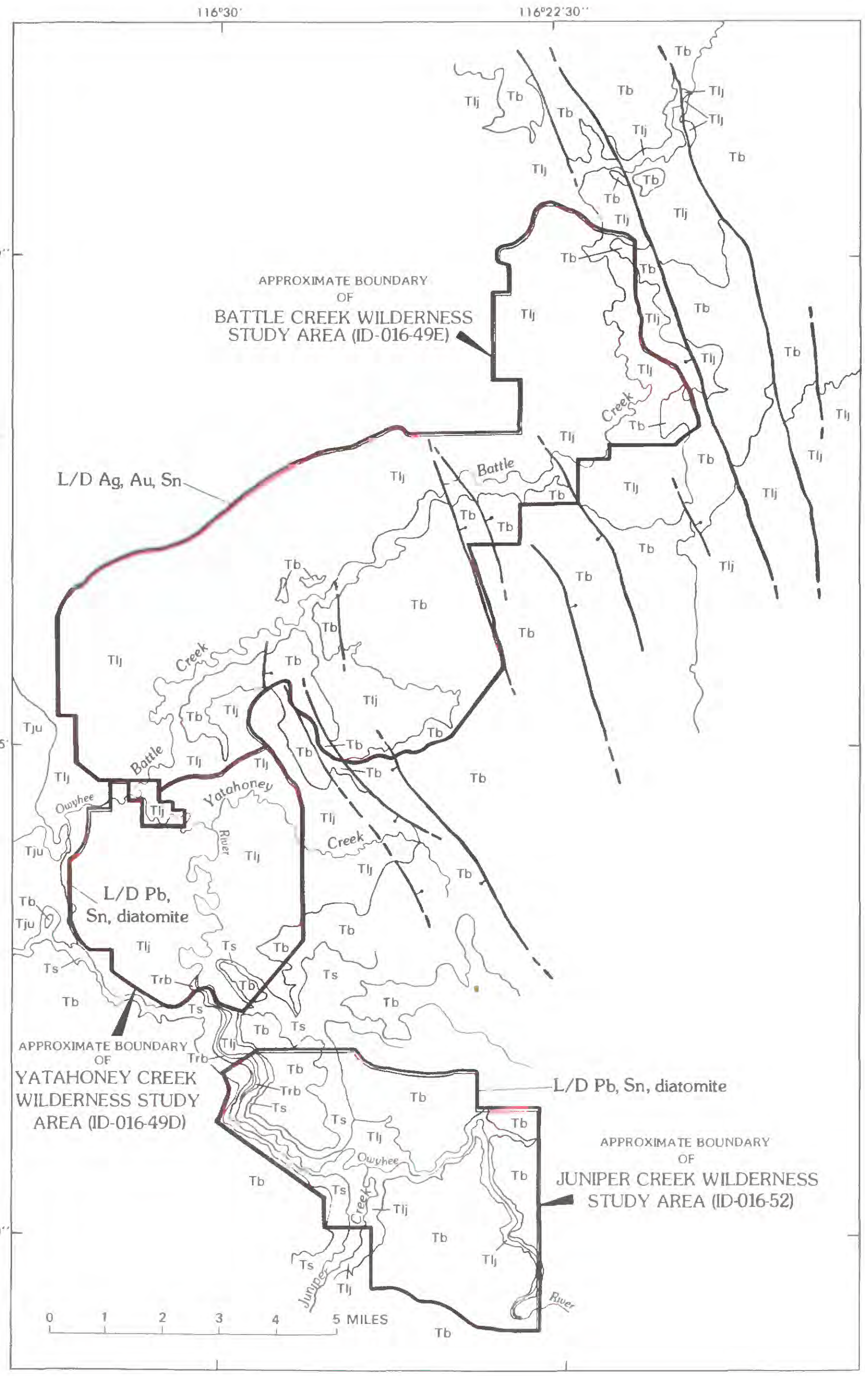

Figure 2. Map showing geology and mineral resource potential of the Battle Creek, Yatahoney Creek and Juniper Creek Wilderness Study Areas, Owyhee County, Idaho.

EXPLANATION

AREA WITH LOW MINERAL RESOURCE POTENTIAL–Au, Ag, Pb, Sn, and diatomite. Applies to entire wilderness study area. See appendix 1 and figure 3 for definition of mineral resource potential and certainty of assessment

COMMODITIES

Au	Gold
Ag	Silver
Pb	Lead
Sn	Tin
Diatomite	

CORRELATION OF MAP UNITS

Tb	Pliocene and (or) Miocene	TERTIARY
Ts	Miocene	
Tlj		
Trb		
Tju		

DESCRIPTION OF MAP UNITS

Tb	BASALT (PLIOCENE AND (OR) MIOCENE)
Ts	SEDIMENTARY ROCKS (MIOCENE)
Tlj	LITTLE JACKS RHYOLITE (MIOCENE)
Trb	RHYOLITE OF THE BADLANDS (MIOCENE)
Tju	RHYOLITE OF UPPER JUNIPER MOUNTAIN (MIOCENE)

MAP SYMBOLS

CONTACT

NORMAL FAULT–Bar and ball on downthrown side; dashed where approximately located

Figure 2. Continued.

Battle Creek drain several old mining areas in Cretaceous granitic rocks, dioritic to rhyolitic dikes, and the Eocene Challis Volcanics (dated at 44.7±0.8 Ma; Armstrong, 1980) at a location about 30 mi north of the wilderness study area. There is a small localized outcrop of diatomaceous earth just south of the Yatahoney Creek Wilderness Study Area. The nearest major diatomite deposit is 14 mi to the north (Powers, 1947).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

By Carolyn A. Goeldner, Michael G. Sawlan,
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U.S. Geological Survey

Geology

The Battle Creek, Yatahoney Creek, and Juniper Creek Wilderness Study Areas are underlain by laterally extensive, flat-lying Miocene rhyolite rheoignimbrites. These are locally overlain by fluviolacustrine sedimentary rocks. Upper Miocene and (or) Pliocene basalts cap the sequence and form the plateaus southeast of Battle Creek.

In the Owyhee Mountains region 25-30 mi north of the study areas, the basement rocks consist of Paleozoic metamorphic rocks, Mesozoic intrusive rocks, and Cenozoic volcanic rocks, particularly the lower Miocene rhyolite of Silver City, which contains vein gold and silver (Ekren and others, 1982). The depth to the pre-Cenozoic basement rocks in the study areas is conjectural. The upper Cenozoic rocks are inferred to be at least 1,000 to 1,500 ft thick and perhaps as much as several thousand feet thick in the vicinity of the study areas (Malde and Powers, 1962).

The rhyolitic rocks in the wilderness study areas are rheoignimbrites; the flows were emplaced as ash flows and continued to flow after collapse of the dense ash cloud. Ekren and others (1984) named these rocks "tuff" on the basis of the inferred emplacement mechanism. However, in most localities, the rhyolite formed flow-banded devitrified lava. Vitroclastic textures are recognizable in parts of some outcrops, most commonly at the tops and bottoms of flow units, but these textures have been largely destroyed by annealing and shear deformation of glass shards during flow. Sigmoidal flow foliations, folds, and diapir structures are common in the lavalike parts of the flows. The amplitudes of these folded, distorted structures ranges from a few inches to more than 300 ft. Thus, these rocks are more properly classified as rhyolite than as tuff. The names of the rhyolitic units used in this report have been modified from those used by Ekren and others (1984).

Three rhyolitic units were distinguished in the wilderness study areas. The oldest unit, the rhyolite of upper Juniper Mountain (=upper lobes of Juniper Mountain of Ekren and others, 1984), has an approximate age of 12-13 Ma (Neill, 1975; Armstrong, 1980) and is present along the western margin of the Yatahoney Creek Wilderness Study Area. This rhyolite is overlain by the rhyolite of The Badlands (=tuff of The Badlands of Ekren and others, 1984), which crops out at one location along the Owyhee River in the northwest corner of the Juniper Creek Wilderness Study Area. This rhyolite is, in turn, overlain by the Little Jacks Rhyolite (=Little Jacks Tuff of Ekren and others, 1984), which is the most laterally extensive rhyolite in the area and is dated at 9-10 Ma (Neill, 1975; Armstrong, 1980). The Little Jacks Rhyolite is a dense flow-foliated rhyolite that forms the steep canyon walls of Battle Creek. It attains a maximum thickness of 500-600 ft within the study areas and more than 1,000 ft at the type locality in Little Jacks Creek Canyon (Ekren and others, 1984), about 30 mi northeast of the Battle Creek Wilderness Study Area. The name "Little Jacks Tuff" is herein changed to "Little Jacks Rhyolite" in order to more accurately reflect its lithologic character.

The rhyolitic units may comprise a single cooling unit (rhyolite of The Badlands) or multiple cooling units (rhyolite of upper Juniper Mountain and Little Jacks Rhyolite). The rhyolite contains 10-25 percent phenocrysts, mainly of plagioclase and (or) sanidine. Quartz phenocrysts are abundant in the rhyolite of upper Juniper Mountain but are absent or rare in the Little Jacks Rhyolite. Ferro-pigeonite is ubiquitous but relatively sparse. Accessory phases consist of zircon and allanite(?).

Upper Miocene sedimentary rocks are exposed along the Owyhee River and Juniper Creek in the Yatahoney Creek and Juniper Creek Wilderness Study Areas (fig. 2). They consist of poorly lithified mudstone, sandstone, and pebble and cobble conglomerate. Rhyolite clasts are the most common, and fine-grained diatomaceous or tuffaceous sedimentary-rock pebbles are locally present. Deposition occurred in a fluviolacustrine environment, most likely within shallow grabens. These Miocene sedimentary rocks are usually overlain by basalt, although sedimentary rocks and basalt are locally intercalated.

Upper Miocene and (or) Pliocene basalt caps the stratigraphic sequence and is present south of Battle Creek and along either side of the Owyhee River (fig. 2). It includes 1 to 4 flows of intergranular to subophitic, sparsely and finely porphyritic olivine-phyric or olivine and plagioclase-phyric lava. Chromian spinel is commonly included in these olivine phenocrysts. Individual flows are thin (10-40 ft), and their composite thickness is typically less than 100 ft; they erupted locally from low-profile shield volcanoes.

In the Battle Creek Wilderness Study Area, north-to-northwest-trending en echelon normal faults exhibit 20-100 ft vertical displacements of the Tertiary strata. Shallow grabens formed among the basalt mesas as a result of offset of the capping basalt.

Geochemical Studies

The reconnaissance geochemical study was based on analysis and evaluation of stream sediments and the nonmagnetic fraction of heavy-mineral concentrates from stream sediments. The stream-sediment and concentrate samples contain material derived from major rock units of the drainage basin. Sampled drainage basins range in area from less than one to about 3 square miles.

All 90 stream-sediment (SS) samples and 47 heavy-mineral-concentrate (HMC) samples were analyzed for 31 elements by a semiquantitative emission-spectrographic method. Stream-sediment samples were analyzed by the method described by Myers and others (1961) and HMC samples by the method of Grimes and Marranzino (1968). Heavy-mineral concentrate samples were also analyzed for selected elements by atomic-absorption spectroscopy and inductively coupled argon plasma-atomic emission spectroscopy. These analyses identify drainages with anomalously high concentrations of metallic and metal-related elements. Anomalous concentrations were determined by inspection of histograms and by noting enrichment relative to crustal abundances of these elements.

In the Battle Creek Wilderness Study Area, 4 of 17 HMC samples had slightly elevated concentrations of tin and lead. Some HMC samples from the Yatahoney Creek Wilderness Study Area (5 of 18 samples) and the Juniper Creek Wilderness Study Area (7 of 19 samples) exhibited weakly anomalous concentrations of tin and lead. These anomalies are not considered to be significant. Small lead anomalies in HMC samples occur in areas near roads and are probably due to culturally introduced material, such as lead shot. Heavy-mineral concentrate samples with anomalous tin concentrations are widely scattered throughout the study areas and the Owyhee Plateau in general (H. D. King, unpub. data). They are often located next to samples with no anomalous concentrations, are not clustered along specific drainage basins, and are not associated with any specific rock unit. Therefore, these weakly anomalous concentrations are regarded as insignificant.

Geophysical Studies

The Bouguer gravity-anomaly map of extreme southwestern Idaho and southeastern Oregon is characterized by a gravity plateau with values between -150 and -175 milligals over a predominantly rhyolitic terrane (Kulik, written commun., 1986). The wilderness study areas lie in the middle of this gravity plateau and possess values between -165 and -170 milligals.

Aeromagnetic data for the wilderness study areas were obtained from the Aeromagnetic Map of Idaho (U.S. Geological Survey, 1978). Flight lines run east-west at 5-mile spacing and 12,500 ft barometric elevation. These data show only a minor magnetic gradient within the wilderness study areas, with values from 1,000 to 1,100 gammas, and provide no significant constraints on mineral resource potential.

CONCLUSIONS

Geologic, geochemical, and geophysical studies indicate that the likelihood of the occurrence of any mineral resources in the wilderness study areas is extremely remote. Therefore, the Battle Creek Wilderness Study Area is assigned a low mineral resource potential for gold, silver, and tin with a certainty level of D. The Yatahoney Creek Wilderness Study Area is assigned a low mineral resource potential for lead, tin, and diatomite with a certainty level of D, and the Juniper Creek Wilderness Study Area is assigned a low mineral resource potential for lead, tin, and diatomite with a certainty level of D. All three wilderness study areas have an unknown mineral resource potential for oil and gas.

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APPENDIX 1. Definition of levels of mineral resource potential and certainty of assessment

Mineral resource potential is defined as the likelihood of the presence of mineral resources in a defined area; it is not a measure of the amount of resources or their profitability.

Mineral resources are concentrations of naturally occurring solid, liquid, or gaseous materials in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible.

Low mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment where the existence of resources is unlikely. This level of potential embraces areas of dispersed mineralized rock as well as areas having few or no indications of mineralization. Assignment of low potential requires specific positive knowledge; it is not used as a catchall for areas where adequate data are lacking.

Moderate mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a reasonable chance for resource accumulation, and where an application of genetic and (or) occurrence models indicates favorable ground.

High mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resources, where interpretations of data indicate a high likelihood for resource accumulation, where data support occurrence and (or) genetic models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential requires positive knowledge that resource-forming processes have been active in at least part of the area; it does not require that occurrences or deposits be identified.

Unknown mineral resource potential is assigned to areas where the level of knowledge is so inadequate that classification of the area as high, moderate, or low would be misleading. The phrase "no mineral resource potential" applies only to a specific resource type in a well-defined area. This phrase is not used if there is the slightest possibility of resource occurrence; it is not appropriate as the summary rating for any area.

Expression of the certainty of the mineral resource assessment incorporates a consideration of (1) the adequacy of the geologic, geochemical, geophysical, and resource data base available at the time of the assessment, (2) the adequacy of the occurrence or the genetic model used as the basis for a specific evaluation, and (3) an evaluation of the likelihood that the expected mineral endowment of the area is, or could be, economically extractable.

Levels of certainty of assessment are denoted by letters, A-D (fig. 3).

A. The available data are not adequate to determine the level of mineral resource potential. Level A is used with an assignment of unknown mineral resource potential.

B. The available data are adequate to suggest the geologic environment and the level of mineral resource potential, but either evidence is insufficient to establish precisely the likelihood of resource occurrence, or occurrence and (or) genetic models are not known well enough for predictive resource assessment.

C. The available data give a good indication of the geologic environment and the level of mineral resource potential, but additional evidence is needed to establish precisely the likelihood of resource occurrence, the activity of resource-forming processes, or available occurrence and (or) genetic models are minimal for predictive applications.

D. The available data clearly define the geologic environment and the level of mineral resource potential, and indicate the activity of resource—forming processes. Key evidence to interpret the presence or absence of specified types of resources is available, and occurrence and (or) genetic models are adequate for predictive resource assessment.

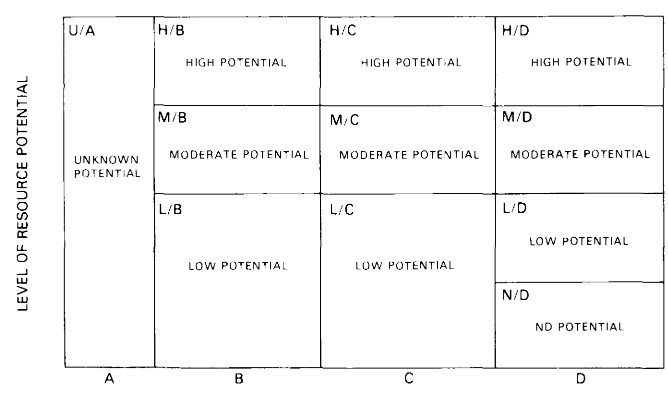

Figure 3. Major elements of mineral resource potential/certainty classification.

GEOLOGIC TIME CHART

Terms and boundary ages used by the U.S. Geological Survey in this report

EON	ERA	PERIOD		EPOCH	AGE ESTIMATES OF BOUNDARIES (in Ma)
Phanerozoic	Cenozoic	Quaternary		Holocene	0.010
				Pleistocene	1.7
		Tertiary	Neogene Subperiod	Pliocene	5
				Miocene	24
			Paleogene Subperiod	Oligocene	38
				Eocene	55
				Paleocene	66
	Mesozoic	Cretaceous		Late	96
				Early	138
		Jurassic		Late Middle Early	205
		Triassic		Late Middle Early	~240
	Paleozoic	Permian		Late Early	290
		Carboniferous Periods	Pennsylvanian	Late Middle Early	~330
			Mississippian	Late Early	360
		Devonian		Late Middle Early	410
		Silurian		Late Middle Early	435
		Ordovician		Late Middle Early	500
		Cambrian		Late Middle Early	~570[1]
Proterozoic	Late Proterozoic				900
	Middle Proterozoic				1600
	Early Proterozoic				2500
Archean	Late Archean				3000
	Middle Archean				3400
	Early Archean				
		(3800 ?)			
pre-Archean[2]					4550

[1]Rocks older than 570 Ma also called Precambrian, a time term without specific rank.

[2]Informal time term without specific rank.

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March 3, 1849