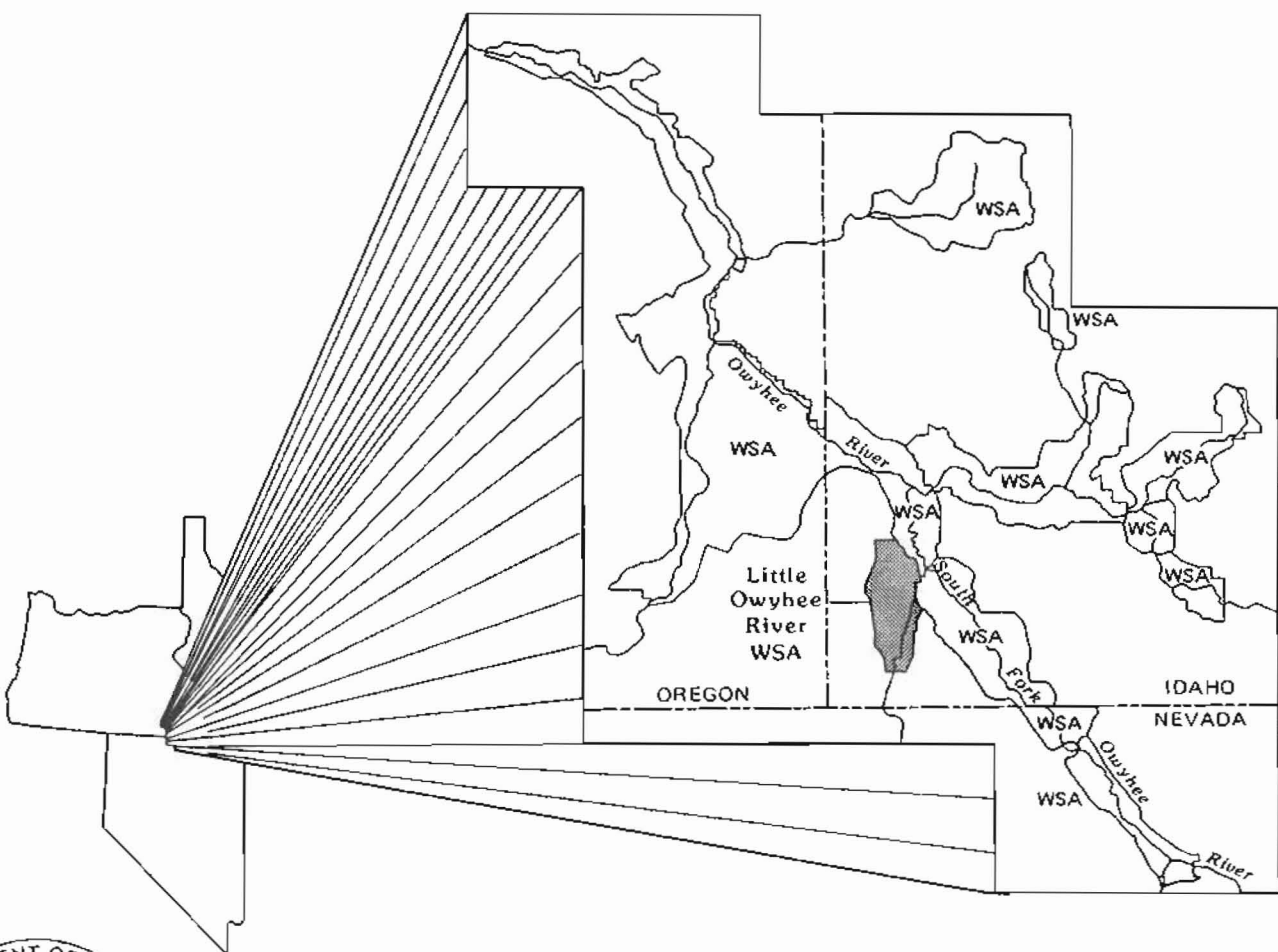


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Bureau of Mines Mineral Land Assessment/1985
Open File Report

**Mineral Resources of the Little Owyhee River
Wilderness Study Area, Owyhee County, Idaho**



**BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR**

MINERAL RESOURCES OF THE LITTLE OWYHEE RIVER
WILDERNESS STUDY AREA, OWYHEE COUNTY, IDAHO

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PREFACE

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and U.S. Bureau of Mines to conduct mineral surveys on U.S. Bureau of Land Management administered land designated as Wilderness Study 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 Bureau of Mines mineral survey of the Little Owyhee River Wilderness Study Area (ID-16-48C), Owyhee County, ID.

This open-file report will be summarized in a joint report published by the U.S. Geological Survey. The data were gathered and interpreted by Bureau of Mines personnel from Western Field Operations Center, East 360 Third Avenue, Spokane, WA 99202. The report has been edited by members of the Branch of Mineral Land Assessment at the field center and reviewed at the Division of Mineral Land Assessment, Washington, DC.

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SUMMARY

A mineral survey of the 24,600-acre Little Owyhee River Wilderness Study Area (WSA) in southwestern Idaho was conducted by the U.S. Bureau of Mines in 1984. No mining claims have been located inside the WSA, and no mineral resources were identified.

Surface geology of the WSA is dominated by Banbury Basalt which overlies Swisher Mountain Tuff. Lacustrine (lake) sediments filling what are apparently ancient river canyons, occur at two localities. Within the WSA these sediments contain occurrences of diatomaceous beds and zeolites in altered volcanic ash layers. The ash is interbedded with lacustrine clay, quartzose sand, and gravel. Exploitation of these minerals is severely limited by thick volcanic overburden or sediments. Silicified tuff locally contains jasper, chalcedony, and common opal that may be of interest to hobbyists.

Sand and gravel deposits suitable for construction use occur in the WSA, but larger deposits closer to markets are numerous in the region. Samples from these deposits contained minor placer gold typical of the Owyhee River area, but no other significant heavy minerals were noted.

Oil and gas leases or lease applications cover the eastern and western thirds of the WSA; however, no resources of either energy source have been found.

INTRODUCTION

A mineral survey of the Little Owyhee River Wilderness Study Area (WSA) ^{1/} was conducted by the U.S. Bureau of Mines (USBM) and the U.S. Geological Survey (USGS) at the request of the U.S. Bureau of Land Management (BLM). The USBM researched the mining and mineral exploration history and evaluated mines, prospects, and mineralized areas within or adjacent to the WSA. The USGS evaluated the mineral potential of the WSA by regional geochemical and geophysical surveys and geological mapping. Results of the investigations will be used to help determine the suitability of the WSA for inclusion into the National Wilderness Preservation System. Although the immediate goal of this and other USBM mineral surveys is to provide data for the President, Congress, government agencies, and the public for land-use decisions, the long-term objective is to ensure the Nation has an adequate and dependable supply of minerals at a reasonable cost.

Setting

The 24,600-acre Little Owyhee River WSA is in Owyhee County in the extreme southwestern corner of Idaho (fig. 1). Access to the study area

^{1/} A WSA is a roadless area or island that has been inventoried by the U.S. Bureau of Land Management and found to have wilderness characteristics as described in Section 603 of the Federal Land Policy and Management Act and Section 2(c) of the Wilderness Act of 1964 (78 Stat. 891).

is via a system of paved, graded gravel, and dirt roads. The WSA is about 60 miles south of Jordan Valley, OR. Access from Owyhee, NV, is westerly 40 miles by dirt road to the 45 Ranch at the northeastern boundary of the WSA (fig. 2). From there, unimproved dirt roads outline the eastern and northern border. Access to the southern portion is by dirt road easterly 50 miles from McDermitt, NV, to the Star Valley Ranch. The WSA is separated by jeep roads on the northeast from the Owyhee River Canyon WSA (ID-16-48B) and the South Fork Owyhee River WSA (ID-16-53 and NV-010-103A), which were studied concurrently (Gabby, 1985; Mayerle, 1985).

Basalt tablelands of the Owyhee Uplands geologic subprovince, incised by stream action, dominate the WSA. Except for the spectacular canyons, the terrain is flat to gently rolling, with an average elevation of about 5,200 ft. Elevations range from 4,365 ft at river level in the north end of the WSA to 5,487 ft at the top of 45 Hill near the center of the area. The Little Owyhee River, its tributaries, and Spring Creek, a tributary of the Owyhee River, have cut deep canyons into the basalt tablelands and the underlying sediments and tuffs. The narrow, steep canyons range from 400 to 800 ft deep along the river. Vegetation consists primarily of sagebrush and desert grasses, with a few juniper trees growing in Spring Creek Basin at the north end of the study area. Most of the average annual precipitation of 10 in. per year falls as rain or snow between October and April. Summer months are hot, with temperatures exceeding 100°F, and there are frequent but isolated thunderstorms.

Previous Studies

There have been few geologic studies done in the vicinity of the WSA; most were broad, regional studies or site specific for distant mineral-producing areas. Geologic studies of the region included those by Hope and Coats (1976), Ekren and others (1981, 1984), and Bonnichsen and Breckenridge (1982). Previous studies of the geology, energy, and minerals (GEM) resources were by Mathews and Blackburn (1983a, 1983b). Several reports on uranium potential were prepared for the Department of Energy during their National Uranium Resource Evaluation (NURE) program, by Geodata International, Inc. (1980), Bendix Field Engineering, Corp. (1982), and Union Carbide Corp. (1982). Morris (1976) studied mineral resources in a portion of the Owyhee River.

Present Study

Work by the USBM entailed pre-field, field, and report preparation phases in 1984 and 1985. Pre-field studies included library research and perusal of Owyhee County and BLM mining and mineral lease records. Bureau of Mines and other production records were searched and pertinent data compiled. The field study involved sampling zeolitic and diatomaceous Tertiary sediments, sand and gravel along the Little Owyhee River at approximately 1/2-mile intervals, and sampling of altered zones in the Swisher Mountain Tuff. Mines and prospects outside, but near, the study area were examined to establish guides to mineral deposits in the region.

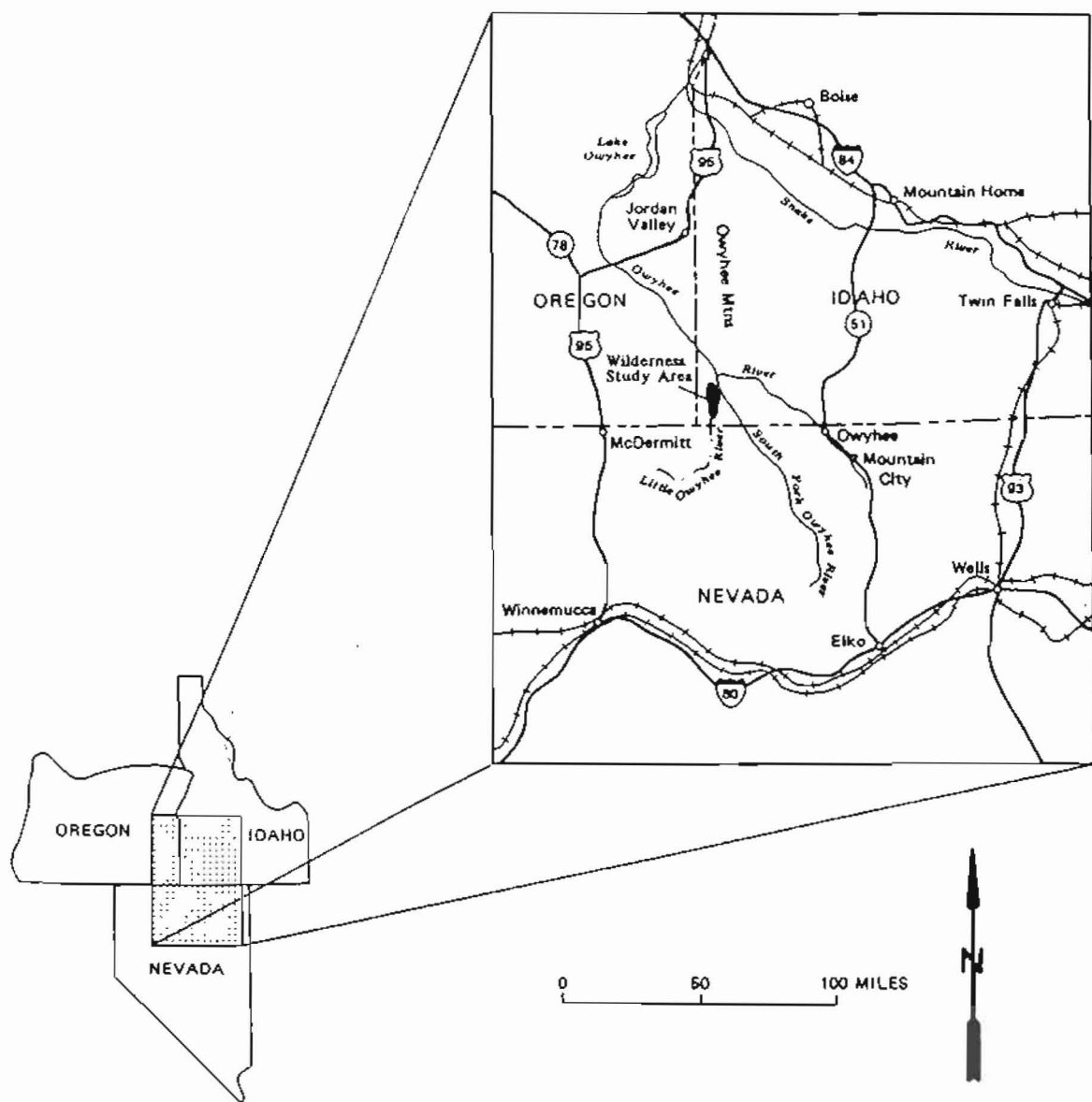


FIGURE 1. — Location map of the Little Owyhee River Wilderness Study Area, (ID-16-48C), Owyhee County, ID

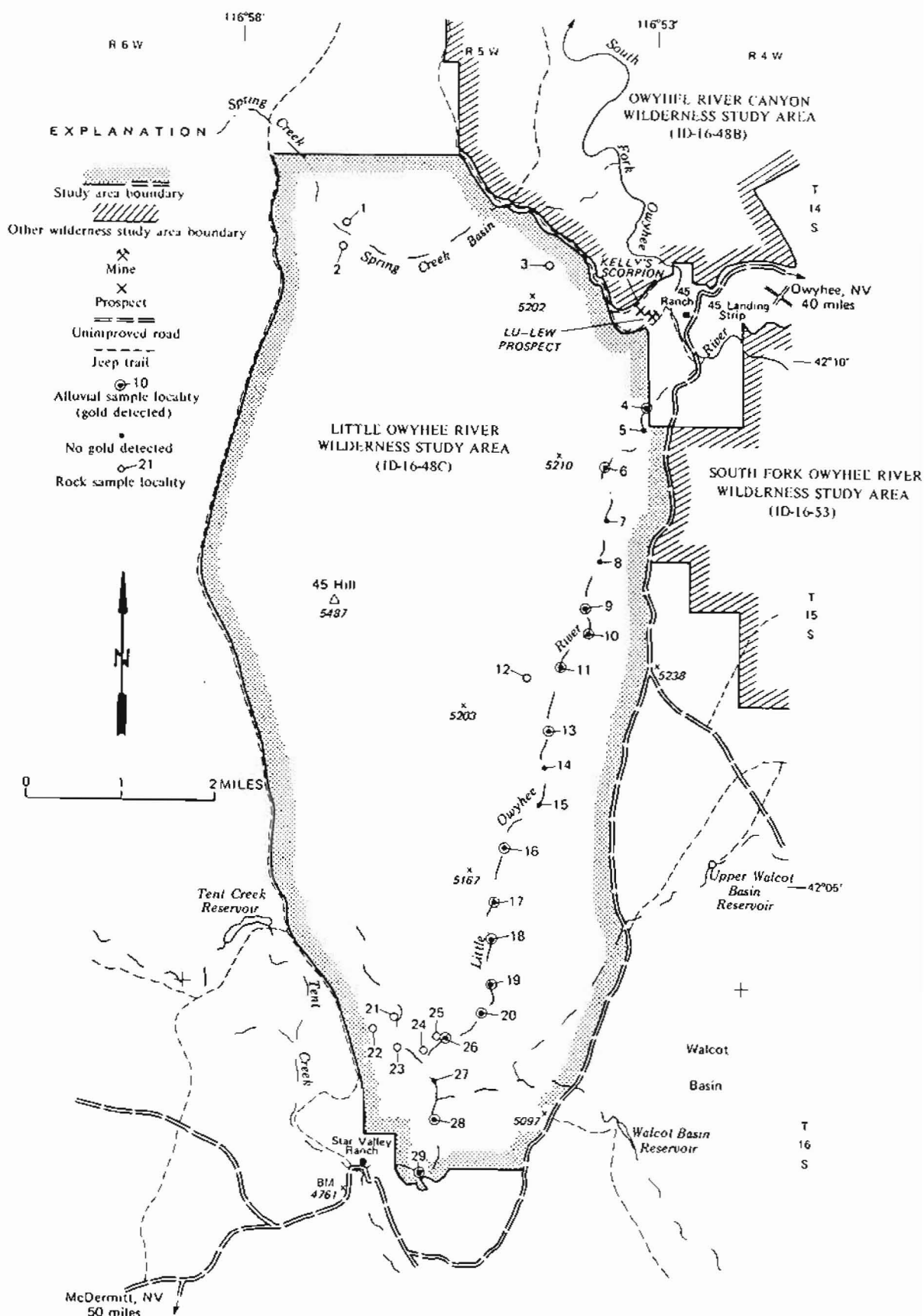


FIGURE 2. - Sample localities in the Little Owyhee River Wilderness Study Area (ID-16-48C), Owyhee County, ID

Samples collected at prospects and other sites consisted of 139 rock (including diatomite and zeolite samples) and 20 alluvial (placer) samples. Rock samples were of four types: 1) chip - a regular series of rock chips taken in a continuous line across a mineralized zone or other exposure; 2) random chip - an unsystematic series of chips taken from an exposure of apparently homogeneous rock; and 3) select - pieces of rock chosen from the apparently most mineralized parts of an exposure, of any particular fraction (e.g. quartz, host rock), or the best pieces of float. Alluvial samples were: reconnaissance - samples of surficial sand and gravel, generally one level 14-in. panful partially concentrated on site to check for presence of gold or other heavy minerals in placers.

Rock samples, other than diatomite and zeolite samples, were analyzed for gold and silver by fire-assay, for arsenic and antimony by atomic absorption, and for mercury by one of several special methods. At least one sample from each locality was analyzed for 40 elements 2/ by semi-quantitative methods to detect unsuspected elements of possible significance.

Sedimentary material suspected of being diatomaceous was sampled and examined microscopically. If diatoms were present, bulk samples of 10 to 15 lb were shipped to the Western Field Operations Center for further examination. Of the 39 diatomite samples taken, 35 were sent to the Manville Service Corporation, Research and Development Center, Denver, CO, for further studies, including additional microscopic examination and ignition testing.

Hand specimens of sediment suspected of containing zeolites were tested for ion exchange capability (Helfferich, 1964). After determining zeolites were present in some of the sediments, a total of 86 chip samples were taken of material with physical characteristics similar to the tested materials. These samples were analyzed by x-ray diffraction to determine the presence and abundance of zeolites and contaminants.

Field concentrates of alluvial samples were further concentrated on a laboratory-size Wilfley table. The resulting heavy mineral fractions were scanned with a binocular microscope to determine their content; all gold detected, was of very fine size and was recovered by amalgamation. The concentrates were also checked for radioactivity and fluorescence. Complete sample analyses are on file at Western Field Operations Center, Spokane, WA.

2/ Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, gallium, gold, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, niobium, palladium, phosphorus, platinum, potassium, scandium, silicon, silver, sodium, strontium, tantalum, tellurium, tin, titanium, vanadium, yttrium, zinc, and zirconium.

ACKNOWLEDGEMENTS

The authors are grateful to Ben Glanville, owner of the 45 Ranch, and to caretakers Sonny and Judy Smith for providing historical and access information, and for their many courtesies. Tom Seiner, BLM geologist, provided aerial photographs and much useful information. Dr. Friedrich Helfferich answered many technical questions which made it possible to adjust his zeolite reaction test from a simple field test to a semi-quantitative test of cation exchange capabilities. We would also like to thank Karl Fair of Ore, Inc. for his estimation of the present value of a select sample of banded chalcedony.

GEOLOGIC SETTING

Geology of the WSA region is dominated by the Tertiary Swisher Mountain Tuffs and the Banbury Basalt flows (Ekren and others, 1981). Between the tuff and overlying basalt flows are consolidated and unconsolidated lacustrine (lake) sediments as much as 400 ft thick, exposed in the canyon walls.

The Miocene Swisher Mountain Tuffs are a layered sequence with little remaining evidence of pumice or glass shards (Ekren and others, 1981). These tuffs, in freshly fractured hand specimens, are primarily medium gray to reddish gray, and weathered outcrops are usually reddish brown. In the WSA, the tuffs are seen only in the Little Owyhee River canyon; elsewhere they are overlain by lacustrine sediments and Banbury Basalt.

The Miocene Banbury Basalt is a layered sequence of fine-grained, vesicular, olivine basalt flows (Ekren and others, 1981). Some flows may have been locally derived from 45 Hill, one of several apparent shield volcanoes in the region. Upper basalt flows are thin-bedded and interfingered, and form the upland that surrounds the Little Owyhee River.

Minor amounts of consolidated sediments between the basalt and the tuff are seen in canyon walls of the river; larger accumulations of unconsolidated sediments fill what appear to be relict stream or river channels at the north and south ends of the WSA (fig. 2, nos. 1-3 and 21-24). The consolidated sediments are comprised mainly of tuffaceous sand, zeolitic/vitric silicic ash, and basalt fragments. The unconsolidated sediments are mainly tuffaceous sand, vitric silicic ash with minor zeolitic alteration, lacustrine diatomite, and minor amounts of pebble gravel.

A 150-ft-wide fault zone of brecciated and silicified tuff occurs at the southern end of the WSA (fig. 2, no. 25).

A minor amount of placer gold was found in samples along the Little Owyhee River; the source of the gold could not be determined. It probably came from gold-bearing areas at the headwaters of the Little Owyhee River in northern Nevada.

MINES, PROSPECTS, AND MINERALIZED AREAS

There are no mining districts in or near the WSA. The study area and adjacent region have no history of mining other than minor, non-recorded production of jasper, chalcedony, and common opal suitable for lapidary purposes or as specimens ^{3/}. The only known production near the WSA came from the Lu-Lew Prospect (Gabby, 1985), 1/4 mile west of the 45 Ranch (fig. 2). Several hundred pounds of jasper and thunder eggs ^{4/} were probably produced during the last several years from a zone of silicified Swisher Mountain Tuff near the contact between the tuff and overlying lacustrine sediments.

Localities in or near the WSA, which were examined during this survey are summarized in Table 1. These include lacustrine sediments containing zeolitic and diatomaceous horizons at the northern and southern ends of the area, a silicified fault zone near the southern end of the area, and sand and gravel occurrences containing placer gold along the Little Owyhee River.

Approximately the eastern and western thirds of the WSA are covered by oil and gas leases or lease applications, but no known exploration has been done.

APPRAISAL OF MINERAL RESOURCES

In the WSA, some of the jasper, chalcedony, and common opal that occurs in silicified outcrops or as float is suitable for lapidary purposes or as mineral specimens. This material, although available at a number of sites in the region, is not of exceptional quality, has a limited market, and requires much labor to recover; hence, the material is of low unit-value and can be recovered only on a recreational basis by hobbyists. Sample analyses and geological evidence indicate that the silica at sites near the WSA was deposited by cold, meteoric ground

^{3/} Jasper and chalcedony are hard minerals that may be stained by iron, manganese, or other elements producing colors and patterns. Good quality material is commonly sold to rockshops or lapidary supply companies, generally for use as settings in belt buckles, bolo-ties, bookends, carvings, mineral specimens, or most commonly, for resale to lapidary hobbyists. The value of the material is based on ease of cutting and polishing; amount of discarded material; brightness, intensity, translucency, and uniqueness of the colors and patterns; form, size, and finish of the completed jewelry or mineral specimens; and fashion and demand. Common opal is by itself soft and brittle and not unique. However, when this opal forms bands and fillings in vugs and fractures within the jasper and chalcedony, pleasing patterns and colors may result, thus giving value to these combined minerals.

^{4/} Fist-size, hollow, spherical, aggregations of chalcedony.

TABLE 1.--Mines, prospects, and mineralized areas in and adjacent to the Little
Owyhee River Wilderness Study Area (ID-16-48C), Owyhee County, ID

Map no. (fig. 2)	Name or location	Summary	Sample and resource data
1	SE1/4 sec. 20 T. 14 S., R. 5 W. 16	Lacustrine sediments containing diatomite and volcanic ash beds.	Twenty-four chip samples representing 113.5 vertical ft of sediment from hand-dug trenches. Twenty-three contained diatomite; of these 20 were of unsuitable quality due to high non-diatom contamination, high crystalline content, poor diatom structure, or dark color. One sample had desirable properties, and two others were slightly poorer. One sample contained no zeolites.
2	SE1/4 sec. 20, T. 14 S., R. 5 W. 140	Lacustrine sediments containing volcanic ash beds, sections of which appeared zeolitic.	Eight chip samples representing 34.5 vertical ft of sediment were analyzed for zeolites; none were detected.
3	NE1/4 sec. 27, T. 14 S., R. 5 W. 159	Lacustrine sediments containing diatomaceous and volcanic ash beds.	Six chip samples were taken which represent 107 vertical ft of sediment. Three diatomite samples were of unsuitable quality, and three contained no zeolites.

TABLE 1.--Mines, prospects, and mineralized areas in and adjacent to the Little Owyhee River Wilderness Study Area (ID-16-48C), Owyhee County, ID--Continued

Map no. (fig. 2)	Name or location	Summary	Sample and resource data
4-11, 13-20, 26-29	Alluvial samples. <i>hoo</i>	Samples were taken at approximately 1/2-mile intervals along the Little Owyhee River. Heavy minerals from all major rock types in the study area were represented.	Twenty alluvial samples: 14 contained gold averaging \$0.016/yd ³ with no more than \$0.03/yd ³ in any sample. Gold values calculated at \$400.00/oz.
12 <i>hoo</i>	SE1/4 sec. 15, T. 15 S., R. 5 W.	Six-ft-thick layer of sediment lies between Banbury Basalt and Swisher Mountain Tuff.	Two chip samples of sediment analyzed for gold, silver, mercury, arsenic, and antimony showed no anomalous amounts present.
21 <i>hoo</i>	NW1/4 sec. 4, T. 16 S., R. 5 W.	Lacustrine sediments containing diatomite and volcanic ash beds, sections of which appeared zeolitic.	Fifteen samples representing 75 vertical ft of sediment were analyzed for zeolite content; none was detected. Ten samples contained diatomite of poor quality.
22 <i>hoo</i>	SW1/4 sec. 4, T. 16 S., R. 5 W.	Lacustrine sediments containing volcanic ash beds, sections of which appeared zeolitic.	Thirty-five chip samples representing 97 vertical ft of sediment contained no zeolites.

TABLE 1.--Mines, prospects, and mineralized areas in and adjacent to the Little
Owyhee River Wilderness Study Area (ID-16-48C), Owyhee County, ID--Continued

Map no. (fig. 2)	Name or location	Summary	Sample and resource data
23	SW1/4 sec. 4, T. 16 S., R. 5 W. 161	Lacustrine sediments containing diatomite and zeolitic ash beds.	Fourteen chip samples representing 59 vertical ft of sediment were checked for diatomite quality or zeolite content. The three samples checked for diatomite were of poor quality; five of the 11 samples checked for zeolite contained 2% clinoptilolite.
24	SE1/4 sec. 4, T. 16 S., R. 5 W. 149	One hundred ft of zeolitic ash beds and pebble conglomerate are overlain by 200-300 ft of lacustrine sediments and basalt.	Ten samples analyzed for zeolite contained from 33% to 48% clinoptilolite and averaged 42%. All samples were analyzed for gold, silver, arsenic, antimony, and mercury, but no anomalous amounts of these elements were detected. Development of the zeolite would be nearly impossible due to the thick overburden.
25	SE1/4 sec. 4, T. 16 W., R. 5 W. 110	A 150-ft-wide outcrop of fault breccia altered by either hydrothermal action or fault-controlled ground water. Prominent banded chalcedony associated with very minor amounts of silicified tuff.	Nine samples analyzed for gold, silver, arsenic, antimony, and mercury showed no anomalous concentrations of the elements.

waters (Mayerle, 1985); no evidence of genesis by epithermal systems, which would have the possibility of associated precious metal deposits, was noted.

Lacustrine deposits within the WSA consist mainly of quartz pebbles, unaltered volcanic ash, diatomaceous earth, and clay. The volcanic ash is locally altered to zeolite; 10 of 78 samples showed zeolite content ranging from 33 to 48%. Preliminary tests by Manville Service Corporation indicate that only one of the 36 diatomite samples exhibits desirable properties (many whole diatoms, minor amounts of contaminants, a low ignition loss, and light color). Cost of removing the overburden and the long distance to market would make both the zeolite and diatomite prohibitively expensive to produce.

No significant gold or other heavy minerals were found in any of the small gravel deposits. Sand and gravel deposits cannot compete for construction uses with numerous, larger deposits closer to markets. No gas or oil resources are known in or near the WSA.

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