DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1343-B

Base from U.S. Geological Survey,
1:24 000, Big Springs, 1972, Red Ledges, 1973;
1:62 500, Wheeler Peak, 1948, Garrison, 1949,
Sacramento Pass, 1959; 1:250 000, Ely, 1956 (rev. 1971)

Geology from Whitebread (1982)

15°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1983

SCALE 1:62500
CONTOUR INTERVAL 40, 80, AND 100 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MINERAL RESOURCE POTENTIAL MAP OF THE WHEELER PEAK AND HIGHLAND RIDGE FURTHER PLANNING AREAS, WHITE PINE COUNTY, NEVADA

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MINERAL RESOURCE POTENTIAL SYMBOLS

A — AREA OF MINERAL POTENTIAL--Boundary approximate. Letters refer to discussion in text

SITE OF STREAM-SEDIMENT SAMPLES--Analyses of panned concentrates

- ○ ≥100 ppm tungsten
- △ ≥100 ppm beryllium
- □ ≥300 ppm lead
- ◇ ≥200 ppm zinc
- • ≥3 ppm silver
- ▭ ≥200 ppm thorium
- ○ ≥200 ppm barium

CORRELATION OF MAP UNITS

Qs, Ql	Holocene and Pleistocene	QUATERNARY
Qg	Pleistocene	
Unconformity		
Tcy		TERTIARY
Unconformity		
Tn	Oligocene	
Unconformity		
Tco	Eocene(?)	
Unconformity		
TKJi		TERTIARY, CRETACEOUS, AND JURASSIC
PPMe		PERMIAN, PENNSYLVANIAN, AND MISSISSIPPIAN
MDu		MISSISSIPPIAN AND DEVONIAN
Dg	Upper and Middle Devonian	DEVONIAN
DSOu		DEVONIAN, SILURIAN, AND ORDOVICIAN
OCu	Middle Ordovician to Upper Cambrian	ORDOVICIAN AND CAMBRIAN
€n	Upper Cambrian	CAMBRIAN
€u	Upper and Middle Cambrian	
€pc	Middle Cambrian	
€p	Middle and Lower Cambrian	
€pm	Lower Cambrian	
Zm		PROTEROZOIC Z

DESCRIPTION OF MAP UNITS

Qs — UNCONSOLIDATED SEDIMENTARY DEPOSITS (Holocene and Pleistocene)--Silt, sand, and gravel. Includes alluvium, colluvium, and pediment gravels

Ql — LANDSLIDE DEBRIS (Holocene and Pleistocene)--Rubble composed of small to very large blocks and fragments derived from locally exposed rock units

Qg — GLACIAL DEPOSITS (Pleistocene)--Morainal ridges and glaciofluvial debris

Tcy — YOUNGER CONGLOMERATE (Tertiary)--Crudely stratified conglomerate containing pebbles, cobbles, and boulders in a matrix of coarse sand. Contains large glide blocks of brecciated Paleozoic rocks

Tn — NEEDLES RANGE FORMATION (Oligocene)--Light-gray to pale-red ash-flow tuff characterized by abundant crystals of plagioclase, hornblende, biotite, and quartz

Tco — OLDER CONGLOMERATE (Eocene?)--Conglomerate with interbedded sandstone and light-gray tuff

TKJi — GRANITIC ROCKS (Tertiary, Cretaceous, and Jurassic)--Granodiorite, quartz monzonite, and porphyritic quartz monzonite composed mainly of quartz, plagioclase, potassium feldspar, biotite, and muscovite. Porphyritic varieties contain phenocrysts of potassium feldspar as much as 1.5 in. (4 cm) long. Includes aplite dikes

PPMe — ELY LIMESTONE (Permian, Pennsylvanian, and Mississippian)--Medium- to coarse-grained detrital limestone with interbeds of less resistant silty limestone. Partial thickness about 1,500 ft (450 m); top not exposed

MDu — CHAINMAN SHALE, JOANA LIMESTONE, AND PILOT SHALE, UNDIVIDED (Mississippian and Devonian)--The Chainman (Mississippian) is dark-gray shale and siltstone with minor limestone, but locally contains sandstone in upper part. The Joana (Mississippian) is resistant medium-gray detrital limestone about 300 ft (90 m) thick. The Pilot (Mississippian and Devonian) is mainly calcareous siltstone that weathers yellowish gray to grayish orange. Sequence is about 2,800 ft (850 m) thick

Dg — GUILMETTE FORMATION (Upper and Middle Devonian)--Very thick bedded limestone with zones of thin-bedded limestone and some dolomite. Locally contains sandstone in upper part. About 2,500 ft (750 m) thick

DSOu — SIMONSON, SEVY, LAKETOWN, AND FISH HAVEN DOLOMITES, UNDIVIDED (Devonian, Silurian, and Ordovician)--The Simonson (Devonian) is brownish-gray to light-yellowish-gray fine- to coarse-grained dolomite with some interbedded dense dolomite that weathers light gray. The Sevy (Devonian) is even-bedded light-gray dense dolomite. The Laketown (Silurian) and Fish Haven (Ordovician) are light- to dark-gray medium-grained dolomite. Sequence about 2,900 ft (900 m) thick

OCu — EUREKA QUARTZITE AND POGONIP GROUP, UNDIVIDED (Ordovician and Cambrian)--The Eureka (Middle Ordovician) is very light gray fine- to medium-grained quartzite and sandstone, about 450 ft (135 m) thick. The Pogonip Group (Middle Ordovician to Upper Cambrian) is thick- to thin-bedded limestone and thin-bedded shaly limestone with a unit of olive gray shale and limestone about 500 ft (150 m) below the top. The Pogonip Group is about 3,600 ft (1,100 m) thick

€n — NOTCH PEAK LIMESTONE (Upper Cambrian)--Medium-gray massive limestone, locally dolomitized. Thin-bedded limestone in basal 200 ft (60 m). About 1,700 ft (500 m) thick

€u — CORSET SPRING SHALE, JOHNS WASH LIMESTONE, AND LINCOLN PEAK FORMATION, UNDIVIDED (Upper and Middle Cambrian)--The Corset Spring (Upper Cambrian) is light-olive-gray shale about 70 ft (20 m) thick. The Johns Wash (Upper Cambrian) is thin-bedded to massive limestone about 250 ft (75 m) thick. The Lincoln Peak (Upper and Middle Cambrian) is very thin bedded limestone, shaly limestone, and shale; together about 4,000 ft (1,200 m) thick

€pc — POLE CANYON LIMESTONE (Middle Cambrian)--Alternating units of light-gray massive limestone and dark-gray thin-bedded to massive limestone. About 1,800 ft (550 m) thick

€p — PIOCHE SHALE (Middle and Lower Cambrian)--Lower part is siltstone, shale, and minor limestone; upper part is calcareous quartzite, siltstone, and sandy limestone. About 350 ft (110 m) thick

€pm — PROSPECT MOUNTAIN QUARTZITE (Lower Cambrian)--Medium- to thick-bedded fine- to coarse-grained quartzite. About 5,000 ft (1,500 m) thick

Zm — MCCOY CREEK GROUP OF MISCH AND HAZZARD (1962) (Proterozoic Z)--Quartzite and minor conglomerate alternating with argillite, phyllite, and schist. Partial thickness about 3,000 ft (900 m); base not exposed

- CONTACT
- FAULT--Dotted where concealed. Ball and bar on downthrown side
- LOW-ANGLE FAULT--Dotted where concealed. Sawteeth on upper plate
- 35 STRIKE AND DIP OF INCLINED BEDS
- ⊕ HORIZONTAL BEDS
- SHAFT
- ADIT
- TRENCH
- X PROSPECT PIT
- BOUNDARY OF HUMBOLDT NATIONAL FOREST
- APPROXIMATE BOUNDARY OF FURTHER PLANNING AREA

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 resource potential. 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 resource survey of the Wheeler Peak (4359) and Highland Ridge (4391) Further Planning Areas in the Humboldt National Forest, White Pine County, Nevada. These areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The Wheeler Peak Further Planning Area contains areas with a low to moderate potential for tungsten, beryllium, lead, zinc, gold and possibly thorium and rare earth elements. Several mines within the area have produced tungsten, and mines in a similar geologic setting outside the study area have yielded tungsten, beryllium, gold, silver, and lead. Alluvial deposits at the north end of the study area have yielded a small amount of placer gold and have moderate potential for additional small production. Panned concentrates of stream sediments locally have high values of tungsten, beryllium, lead, zinc, and thorium.

The Highland Ridge Further Planning Area has one area of moderate to high potential for tungsten and several areas of low to moderate potential for tungsten, silver, lead, and zinc. Tungsten mines of the Shoshone district (pamphlet, fig. 2) are just west of the area, and the Bonanzy and Hope mines are outside the east border. Analyses of panned concentrates of stream sediments in parts of the area show high values of tungsten, lead, zinc, silver, beryllium, and barium. Most of the study area has a low potential for these elements because of its structural setting, but favorable host rocks concealed beneath the Snake Range decollement possibly have low to moderate potential for tungsten, beryllium, silver, and lead.

The study areas contain large resources of limestone, and scattered sites contain rocks suitable for building stone or flagstone. These materials have a low potential because of their inaccessibility and distance from markets. The potential for sand and gravel is low because these materials are readily available at more accessible sites. The potential for oil and gas is considered to be low, although several areas along the east and west borders of the Wheeler Peak and Highland Ridge areas have been leased for oil and gas exploration.

INTRODUCTION

The Wheeler Peak and Highland Ridge Further Planning Areas include a major part of the southern Snake Range in eastern White Pine County, Nevada. The Wheeler Peak area encompasses 61,919 acres (25,059 ha), and the Highland Ridge area covers 76,017 acres (30,764 ha). The Snake Range is bounded on the west by Spring Valley and on the east by Snake Valley. The altitude within the study areas ranges from 6,040 ft to 13,063 ft (1841 m to 3982 m). The Utah state boundary is about 4 mi (6.5 km) east of the study areas. Baker, Nev. and Garrison, Utah, are the only permanent communities in the immediate area; Ely, Nevada, 35 mi (56 km) to the northwest, and Delta, Utah, about 85 mi (137 km) to the northeast, are the nearest main population centers. U.S. Highway 50 crosses the Snake Range about 4 mi (6.5 km) north of the Wheeler Peak study area, U.S. Highway 93 is about 8 mi (13 km) west of it, and Nevada Highway 487 and Utah Highway 21 are about 5 mi (8 km) to the east.

GEOLOGY

The Wheeler Peak and Highland Ridge Further Planning Areas are underlain mainly by clastic rocks of Proterozoic Z age and clastic and carbonate rocks of Cambrian to Permian age that were deposited in the Cordilleran miogeosyncline (Whitebread, 1982). Granitic rocks that intrude Cambrian and older rocks yield radiometric ages (Lee and others, 1970) that suggest intrusive episodes in Jurassic, Cretaceous, and Oligocene time. Tertiary conglomerate and ash-flow tuff locally overlie the Paleozoic rocks. Quaternary deposits consist of alluvial and glacial deposits and landslides.

The range is separated into two distinct structural elements by the Snake Range decollement, a low-angle fault that juxtaposed Middle Cambrian to Permian rocks over Middle Cambrian and older rocks. Field relations indicate that movement on the decollement occurred after emplacement of at least some of the granitic rocks, but prior to deposition of the Tertiary conglomerate and ash-flow tuff.

The principal mineral resources in the study areas occur as vein deposits in relatively undeformed, weakly metamorphosed sedimentary rocks and granitic rocks in the lower plate of the decollement. The complexly faulted rocks of the upper plate are unmineralized.

GEOCHEMISTRY

Stream sediments were sampled at 138 sites within and adjacent to the Wheeler Peak and Highland Ridge Further Planning Areas. At each site a bulk sample was collected and a comparable sample was panned to concentrate the heavy minerals. Some of the panned concentrates contained anomalously high values of tungsten, beryllium, lead, zinc, silver, thorium, and barium. In samples from drainages in the Wheeler Peak area, the panned concentrates contained as much as 5,000 ppm tungsten, >1,000 ppm beryllium, 2,000 ppm lead, 5,000 ppm zinc, >2,000 ppm thorium, and 700 ppm barium. In some samples from drainages in the Highland Ridge area, the panned concentrates contained as much as 5,000 ppm tungsten, 150 ppm beryllium, 10,000 ppm lead, 5,000 ppm zinc, 100 ppm silver, 500 ppm thorium, and >5,000 ppm barium. Many of the samples from mines and prospects in the study areas contain anomalous values of tungsten, lead, silver, or zinc.

GEOPHYSICS

The aeromagnetic and gravity data show a correlation with the geology in the region, but no anomalies can be directly related to known ore deposits. Many of the magnetic anomalies are associated with granitic rocks, but the lack of magnetic highs in some of the granitic rocks indicates local variations in susceptibility within the pluton. A broad magnetic high east of the Wheeler Peak area indicates that the pluton extends beneath the alluvium into Snake Valley. A basin-and-range fault along the west side of the Snake Range is suggested by the linear outline of the range front, but the gravity data do not indicate a great thickness of alluvial deposits immediately west of there.

ASSESSMENT OF POTENTIAL

The appraisal of the mineral resource potential of the Wheeler Peak and Highland Ridge Further Planning Areas is based on observed mineral occurrences in mines and prospects, proximity to known mineral occurrences, the stratigraphic and structural setting, and geochemical data from rock and stream-sediment samples. A classification of high, moderate, or low potential was used in the evaluation. A high mineral resource potential indicates high probability of the presence of mineral deposits. A moderate mineral resource potential indicates a reasonable chance for the occurrence of mineral deposits. A low mineral resource potential indicates there is little or no evidence to suggest the presence of mineral resources.

Within the Wheeler Peak Further Planning Area, tungsten has been mined from quartz veins in the "Wheeler limestone" unit (of local usage) in the lower part of the Pioche Shale and in quartz monzonite of presumable Jurassic age. Small amounts of tungsten, lead, and zinc minerals are found in prospects in the area. Quartz veins in the Prospect Mountain Quartzite and the Pioche Shale are probably the source of placer gold in gravels at the north end of the area. The workings of a tungsten mine extend into the western edge of the Highland Ridge area and several prospects in the Pole Canyon Limestone contain anomalous amounts of tungsten or silver, lead, zinc, and copper. Outside of the areas, gold has been produced from veins in the Prospect Mountain Quartzite and Pioche Shale and from placers; tungsten has been mined from veins in the Pioche Shale, Pole Canyon Limestone, Lincoln Peak Formation, and in granitic rocks; beryllium is found in veins in the Pioche Shale; and lead and silver have been mined from veins in the Pole Canyon Limestone.

The Wheeler Peak Further Planning Area includes areas of low to moderate potential for tungsten, beryllium, lead, zinc, gold, and possibly thorium and rare earth elements. Several mines in the area have produced tungsten, and the geologic setting of known and potentially mineralized areas is similar to that of mines adjacent to the study area that have produced tungsten, beryllium, gold, silver, and lead. Placers at the north end of the study area have produced a small amount of gold, and the alluvial deposits there have a moderate potential for placer gold. High values of tungsten, beryllium, lead, zinc, and thorium in panned concentrates of stream sediments define several favorable areas that have little evidence of earlier prospecting activity.

The Highland Ridge Roadless Area contains one area of high potential for tungsten and several areas of low to moderate potential for tungsten, lead, zinc, and silver in rocks in the lower plate of the Snake Range decollement. The potential is low in parts of the area where upper-plate rocks are exposed, but favorable host rocks concealed beneath the decollement may have low to moderate potential for tungsten, beryllium, silver, and lead. High values of barium were noted in panned concentrates of stream sediments, but the potential for barium resources is considered to be low, although additional studies are needed to determine their potential.

Paleozoic carbonate units in both the Wheeler Peak and Highland Ridge Further Planning Areas are a large resource of limestone, but the potential is low because of the distance from markets. Rock from several formations has been used locally for building stone or flagstone, but the potential for these localities also is restricted by their inaccessibility. Sand and gravel have low potential because of their availability at more accessible sites. Several tracts of land along the east and west borders of the study areas have been leased for oil and gas exploration, but the potential for oil and gas within the areas is low.

Those areas considered to have favorable mineral potential are shown on the map, and the criteria upon which they were chosen are listed below.

Areas of Mineral Potential and Criteria for Classification

Area A, moderate potential for placer gold.

1. Contains placer workings that have yielded a small amount of gold

Area B, low to moderate potential for tungsten and beryllium.

1. Panned concentrates of stream-sediment samples contain 100-1000 ppm tungsten and <100->1,000 ppm beryllium
2. Tungsten deposits occur in granitic rocks in adjacent areas

Area C, low to moderate potential for tungsten and beryllium.

1. Johnson scheelite mine lies within area; veins from Hub mine and adjacent properties, which yielded heubnerite, extend into area
2. Heubnerite, scheelite, galena, sphalerite, and fluorite occur in veins explored by prospect pits
3. Panned concentrates of stream sediment-samples contain 100-2,000 ppm tungsten and 100-500 ppm beryllium

Area D, low to moderate potential for tungsten.

1. Panned concentrates of stream-sediment samples contain <100-500 ppm tungsten
2. The Pioche Shale and Pole Canyon Limestone exposed in area are favorable host rocks for tungsten deposits in adjacent areas
3. Prospect pits in skarn contain anomalously high amounts of tungsten, beryllium, lead, and zinc

Area E, low to moderate potential for tungsten, beryllium, and lead.

1. Panned concentrates of stream-sediment samples contain <300-2,000 ppm lead
2. The Pioche Shale and Pole Canyon Limestone are favorable host rocks
3. Bonita scheelite mine, in the Pioche Shale, is about 1/2 mi southeast of area
4. Beryllian idocrase occurs within area

Area F, low to moderate potential for tungsten, beryllium, lead, and zinc.

1. Panned concentrates of stream-sediment samples contain 700-5,000 ppm tungsten, <300-500 ppm lead, and <200-5,000 ppm zinc
2. Chapman-Taylor (Big Wash) scheelite mine is on south border of area
3. Galena and sphalerite were noted in quartz veins explored in prospect pits
4. Tungsten, beryllium, and lead-silver mines are in similar host rocks less than 2 mi to the southwest

Area G, low to moderate potential for tungsten.

1. Bonita scheelite mine, which also contains minor galena and pyrite, lies along north border of area
2. Panned concentrates of stream-sediment samples contain 100-2,000 ppm tungsten
3. The Pioche Shale and Pole Canyon Limestone are favorable host rocks

Area H, low to moderate potential for tungsten, lead, zinc, and silver.

1. Panned concentrates of stream-sediment samples contain 2,000-5,000 ppm tungsten, <300-10,000 ppm lead, <200-2,000 ppm zinc, and <3->100 ppm silver
2. The Chapman-Taylor (Big Wash) tungsten mine is about 1/4 mi north of the area, and the St. Lawrence lead-silver mine is about 1 mi west
3. The Pole Canyon Limestone is a favorable host rock

Area I, low to moderate potential for tungsten, lead, and silver

1. Panned concentrates of stream-sediment samples contain 700-2,000 ppm tungsten
2. The fault that localizes the lead-zinc-silver ore of the St. Lawrence mine projects into this area
3. The Pole Canyon Limestone is a favorable host rock

Area J, low to moderate potential for tungsten.

1. Hope mine is near border, and scheelite-bearing veins may extend into area
2. Scheelite was observed with quartz in prospect pit
3. Panned concentrates of stream-sediment samples contain 2,000-5,000 ppm tungsten and 100-150 ppm beryllium, but the source area for the samples includes the Bonanzy and Hope mines

Area K, low to moderate potential for tungsten, lead, and silver

1. Panned concentrate of stream-sediment sample contains 300 ppm tungsten, 1,000 ppm lead, and 3 ppm silver
2. Samples from adit and prospects along quartz vein in the Pole Canyon Limestone contain 1,500 ppm lead, 50 ppm silver, 1,000 ppm zinc, and 1,000 ppm copper

Area L, moderate to high potential for tungsten.

1. Scheelite mines of the Shoshone district are immediately west of area
2. The easternmost workings of the Silver Bell mine extend into the area, and more than 1,000 units of WO_3 are inferred to be present on the basis of exposures in the mine workings (Brown, 1983)
3. The vein of the Canary Yellow mine crops out in area L, and other east-trending veins may extend into the area

REFERENCES

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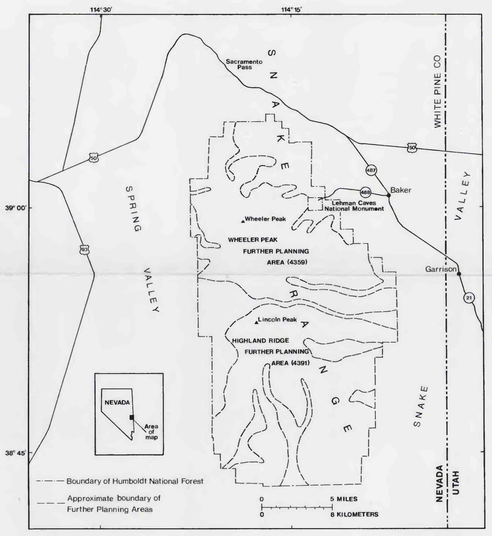
Lee, D. E., Marvin, R. R., Stern, T. W., and Peterman, Z. E., 1970, Modification of potassium-argon ages by Tertiary thrusting in the Snake Range, White Pine County, Nevada, in Geological Survey Research 1970: U.S. Geological Survey Professional Paper 700-D, p. D92-D102.

Misch, Peter, and Hazzard, J. C., 1962, Stratigraphy and metamorphism of late Precambrian rocks in central northeastern Nevada and adjacent Utah: American Association of Petroleum Geologists Bulletin, v. 46, no. 3, p. 289-343.

Whitebread, D. H., 1982, Geologic map of the Wheeler Peak and Highland Ridge Further Planning Areas, White Pine County, Nevada: U.S. Geological Survey Miscellaneous Field Investigations Map MF-1343-A, scale 1:62,500.



Index map showing location of the Wheeler Peak and Highland Ridge Further Planning Areas, Nevada.

Explanatory pamphlet accompanies map

Interior—Geological Survey, Reston, Va.—1983

For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225