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UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

MINERAL INVESTIGATION OF PALISADE MESA AND THE WALL WILDERNESS STUDY AREAS, NYE COUNTY, NEVADA

By
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This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. Work on this study was conducted by personnel from the Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

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 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 mineral survey of Palisade Mesa (NV-060-142/162) and The Wall (NV-060-163) Wilderness Study Areas, Nye County, Nevada.

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By Richard F. Kness, Bureau of Mines

SUMMARY

Palisade Mesa and The Wall are contiguous Bureau of Land Management Wilderness Study Areas in south-central Nevada. Palisade Mesa contains about 66,110 acres and The Wall contains about 30,320 acres.

There has been no mining activity in or within 2 mi of the wilderness study areas. No mining claims are present. No metallic mineral resources were identified, however, antimony, copper, gold, lead, silver, and zinc were mined within 15 mi of the study areas but from different geologic environments.

Oligocene and Miocene ash-flow tuffs and lavas are the oldest rocks exposed in the wilderness study areas. The Pancake Range/Williams Ridge-Hot Creek Valley caldera is within and the Lunar Lake caldera is adjacent to the boundaries. Faults, possibly caused by caldera collapse, are not mineralized where exposed. Exposed rhyolites are barren of metallic mineral occurrences.

No drilling or oil and gas exploration is known to have occurred in either wilderness study area. Oil and gas resources are unlikely. Thick sequences of extrusive igneous rocks are not conducive for hydrocarbon accumulation.

Geothermal resources exist along major Basin and Range faults in Railroad Valley, but are not known to occur within the wilderness study areas.

Most rocks in the wilderness study areas are suitable for construction purposes and some for decorative use, but similar resources exist closer to market areas.

INTRODUCTION

In May 1984, the Bureau of Mines (Bureau), in conjunction with the U.S. Geological Survey (USGS), studied the mineral resources of Palisade Mesa and The Wall Wilderness Study Areas (WSA's), Nye County, Nevada. The land is administered by the U.S. Bureau of Land Management (BLM) Bureau personnel investigate mines, prospects, and mineralized areas to appraise quantity and quality of reserves and subeconomic resources. The USGS assesses the probability of undiscovered mineral resources based on their regional geological, geochemical, and geophysical studies. This report presents the results of the study conducted by the Bureau. The USGS will publish results of its study separately, and a joint Bureau-USGS report will integrate and summarize all the results.

Geographic setting

Palisade Mesa and The Wall are contiguous WSA's in south-central Nevada, about 65 mi northeast of Tonopah and about 15 mi east of Warm Springs (fig. 1). Palisade Mesa contains about 66,110 acres and The Wall contains about 30,320 acres.

The WSA's are in the Basin and Range physiographic province, which is characterized by subparallel mountain ranges separated by broad alluvium-filled valleys. In the southern part of the Pancake Range, the WSA's are bounded on the east by Railroad Valley and on the west by Hot Creek Valley.

Elevations within the WSA's range from approximately 5,200 to over 7,500 ft. Citadel Mountain (7,503 ft), near the western boundary, is the highest peak within Palisade Mesa. An unnamed peak (6,873 ft) in the Pancake Range is the highest point in The Wall (fig. 1).

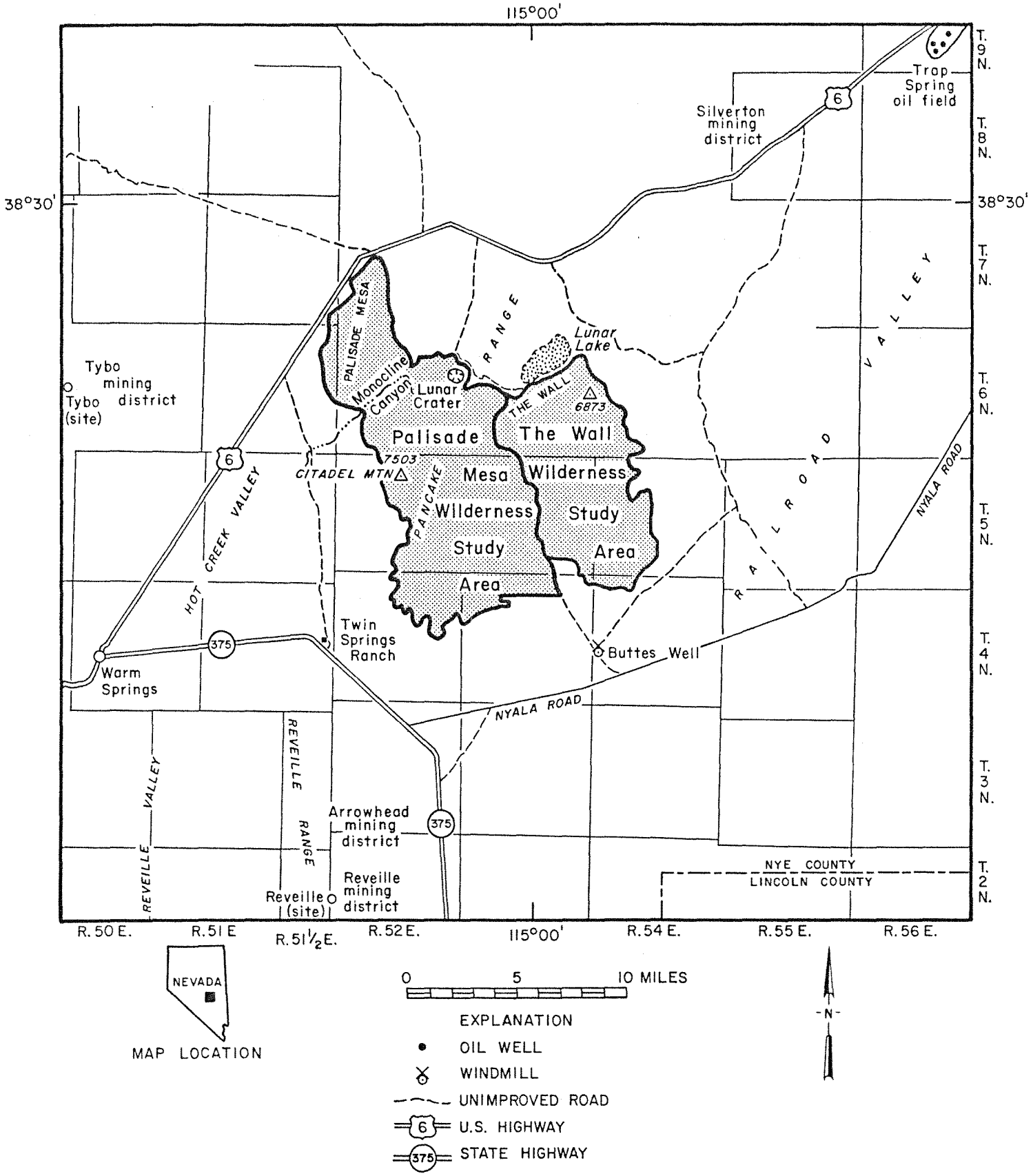


Figure 1.--Index map of Palisade Mesa and The Wall Wilderness Study Areas.

A series of northeast-trending dissected mesas and plateaus known as The Wall (fig. 2) form the northern border of The Wall WSA. The Wall ranges in elevation from 6,450 to 6,750 ft and continues in an arcuate trend northeast of the WSA for about 7 mi.

Lunar Crater, inside the northeast Palisade Mesa WSA boundary, is a registered National Natural Landmark. Lunar Crater is a low, circular, inactive volcanic cone in the Lunar Crater volcanic field.

Rainfall in the region averages about 7 in. per year (Scott, 1969, p. 5); streams and drainages flow intermittently. Lunar Lake, north of The Wall WSA, is a mudflat or playa lake that is dry for much of the year.

Unimproved roads off U.S. Highway 6, State Highway 375, and the Nyala Road provide access to the boundaries and interior of the WSA's (fig. 1). An unimproved road off Highway 6 runs south to Lunar Crater, continues generally southward to Buttes Well, forming the boundary between the WSA's.

Previous investigations

The mineral resources of Nye County, Nevada were compiled by Kral (1951). A preliminary geologic map of northern Nye County was published by Kleinhampl and Ziony (1967), and the geology of the southern Pancake Range and the Lunar Crater volcanic field was the subject of a Ph.D. dissertation by Scott (1969). The Lunar Crater volcanic field was studied for the National Aeronautics and Space Administration (Scott and Trask, 1971).

The principal published references covering parts of the WSA's are 1:48,000 scale geologic maps; geologic map of The Wall Quadrangle (Ekren and others, 1972), geologic and Bouguer gravity map of the Reveille Quadrangle (Ekren and others, 1973), and geologic map of the Lunar Crater Quadrangle (Snyder and others, 1972).

Figure 2.--The Wall, T.6N., R.54., Nye County, Nevada. View is toward the northwest. (Photo by Richard Kness)

Method of Investigation

County records in Tonopah, Nevada, and records on file with the BLM in Reno, Nevada, were examined for the location of patented and unpatented mining claims; BLM records were also examined for geothermal and oil and gas leases. Oral information on claims and leases was obtained from the BLM office in Tonopah, Nevada.

Prior to field investigation, a detailed literature search was made for geologic and mining information pertinent to the WSA's. National Uranium Resource Evaluation (NURE) reports, published by the U.S. Department of Energy, were checked for uranium occurrences and radiometric anomalies.

V.J. Barndt, prospector, and J. Fallini, rancher, provided information on mining and prospecting in the region.

Field studies included ground reconnaissance, surface traverses, and a 2 hr helicopter overflight of the WSA's. Eighteen man-days of field work were done in the areas.

A total of 57 samples was collected. Twenty-six chip and grab, 6 panned concentrate, and 13 stream sediment samples were collected from in and near Palisade Mesa WSA; 4 panned concentrate and 8 stream sediment samples were taken in and near The Wall WSA.

Chip samples were taken across suspected mineralized structures. Rhyolites were sampled on behalf of an ongoing research program at the Bureau of Mines Reno Research Center to identify possible unconventional tin resources as part of the Strategic Mineral Provenance Project. If black sands were observed, panned concentrate samples were taken. Stream sediment samples were taken in larger drainages as a check for tin or mineralization related to mapped faults. Sampled localities are shown on plate 1.

Analyses for gold, silver, and tin were by fire assay and atomic absorption methods for all samples. Semi-quantitative spectrographic analysis for 40 elements was conducted on all samples (see appendix for list of elements and detection limits). Results of analyses are available for public inspection at the Bureau of Mines, Intermountain Field Operations Center, Denver, Colo. 80225.

Mining activity and mining districts

No mining has occurred in, or within 2 mi of either WSA, but antimony, copper, gold, lead, silver, and zinc have been mined and prospected for within 15 mi.

No mineralized areas were identified and no evidence of past or recent mining activity or prospecting was found in, or within 2 mi of Palisade Mesa and The Wall WSA's during field reconnaissance in May 1984. According to V.J. Barndt and J. Fallini, there has been no recent prospecting in either WSA (oral commun., 1984). The mine and spring symbol shown on the 1:62,500 scale Lunar Crater topographic map, inside the northeastern Palisade Mesa WSA boundary, is a hand-dug well.

No patented or unpatented mining claims are within the WSA's. The nearest mining claims are 2 1/2 mi southwest of Palisade Mesa and 2 1/2 mi northeast of The Wall (pl. 1).

Arrowhead, Reveille, Silverton, and Tybo (fig. 1) are mining districts 10 to 15 mi from the WSA's boundaries (Schilling, 1976). Mining began in 1865 when gold and silver were discovered near Tybo. In 1867, lead and silver were discovered near the site of Reveille. Mineralization in the Arrowhead district was discovered in 1919. Information on these nearby mining districts is summarized from Kral (1951).

The geology of the Arrowhead and Reveille districts south of the WSA's is similar. Silver ore minerals, argentite and pyrargyrite, were mined from veins within faults in Tertiary volcanic rocks. From 1920 to 1939 recorded production was 225 tons valued at $4,755 (Kral, 1951, p. 13). Mineral occurrences are in faults and replacement bodies near the contact of Paleozoic sedimentary rocks and Tertiary volcanics. Ore minerals are argentiferous galena (lead), cerargyrite (silver), cerussite (lead), and stibnite (antimony). Production records are incomplete, but from 1866 to 1946 recorded production was 8,261 tons valued at approximately $613,000 (Kral, 1951, p. 142-143).

In the Silverton district northeast of the WSA's, silver occurs in replacement deposits in Paleozoic limestones near the contact with Tertiary rhyolitic dikes and sills. Small shipments of ore carrying 10-30 oz silver per ton were made during the 1930's (Kral, 1951, p. 49).

In the Tybo district west of the WSA's, mineralized veins have replaced Tertiary quartz latite porphyry dikes which followed pre-existing faults in Paleozoic sedimentary rocks. Veins contain argentiferous galena, calcite, chalcopyrite, pyrite, quartz, and sphalerite. From 1874 to 1944 total recorded production was 596,040 tons valued at $9,789, 281 (Kral, 1951, p. 191).

Borrow and gravel pits in alluvium and basalt cinders are along U.S. Highway 6 and State Highway 375 (pl. 1) outside the WSA's. Alluvium and basalt cinders are sources of road metal for highway and road maintance. No borrow or gravel pits were noted in the WSA's during the field investigation.

GEOLOGY

Geologic mapping by Ekren and others (1972), Ekren and others (1973), and Snyder and others (1972) show Oligocene and Miocene ash-flow tuffs and lavas

as the oldest rocks exposed in Palisade Mesa and The Wall WSA's. The ash-flow tuff units vary in composition from rhyolite to quartz latite and lavas are composed of quartz latite or andesite. Individual ash-flow tuffs and lava flows vary in thickness and lateral extent and have a cumulative thickness of 8,000 ft (Scott and Trask, 1971, p. I2).

The geologic map of the Wall Quadrangle (Ekren and others, 1972) indicates that The Wall WSA is inside the inferred boundary of the Pancake Range caldera. Ekren and others (1976, pl. 1) show a buried caldera (Williams Ridge-Hot Creek Valley caldera complex) boundary outside and enclosing both WSA's. The location of caldera boundaries in relation to the WSA's are shown on Plate 1.

Scott (1969, p. 91-92) identified the Lunar Lake caldera (pl. 1) adjacent to the northern WSA's boundaries. A part of the Lunar Lake caldera is outlined by an arcuate escarpment termed The Wall. The Wall, composed of ash-flow tuffs, forms a series of dissected mesas and plateaus along the southeastern and eastern margins of the Lunar Crater volcanic field. In the Lunar Crater volcanic field, Quaternary basalt flows and pyroclastic rocks were extruded and ejected from cratered cones, maars, mounds, and fissures formed along N. 30°E.-trending lineaments (Scott and Trask, 1971, p. I2).

A genetic relationship exists between ash-flow tuffs and volcanic calderas. During or after eruption of ash-flow tuffs, collapse calderas can be formed by collapse of the magma chamber roof due to withdrawal of magmatic support at depth.

Many epithermal (low-temperature near-surface) gold and silver deposits are associated elsewhere with calderas. Fractures and faults formed by caldera

collapse may become the site of later base and precious metal mineralization. Mineralization may be a late phase of the caldera forming activity or an entirely unrelated younger event (McKee, 1979, p. 208).

ENERGY RESOURCES

No drilling or other oil and gas exploration is known to have occurred ineither WSA, but a dry oil and gas hole (pl. 1) was drilled to a depth of 1,711 ft. approximately 9 mi northeast of The Wall boundary in Railroad Valley. As of Dec. 1984, 5,500 acres in Palisade Mesa and 8,000 acres in The Wall were leased for oil and gas and additional leases were outside, generally surrounding both WSA's (pl. 1).

Sandberg (1983) evaluated the petroleum resources of wilderness lands in Nevada using the following four major parameters that govern oil and gas accumulation: the presence of source rocks, maturation history, reservoir rocks, and traps. Both WSA's are rated as having no petroleum potential because thick sequences of extrusive igneous rock are present and high geothermal temperatures preclude the presence of hydrocarbons in source or reservoir rocks (See Sandberg, 1983, p. H1, H3, H5-H6).

Railroad Valley is the major oil producing area in Nevada, and the Trap Spring field is the nearest oil field, about 22 mi northeast of the Wall WSA (fig 1). Production occurs from a combination structural and stratigraphic trap in a Tertiary ash-flow tuff (Pritchards Station Formation). Structure is controlled by the down-thrown side of the Railroad Valley-bounding fault (See Duey, 1979, p. 469, 472).

The Railroad Valley geothermal area (pl. 1) is 1/4 mi outside the eastern boundary of The Wall but no geothermal leases or lease applications are within

either WSA. Thermal springs and wells in Railroad Valley occur mainly along the margins of the valley, either coincident with, or basinward, from major Basin and Range faults. Abel, Chimney Springs, Coyote Hole, and Storm (pl. 1) are thermal springs outside The Wall WSA along the trend of a northeast-striking fault. The temperatures of the thermal springs range from 84-160°F (Garside and Schilling, 1979, p. 50-52, 115-116). No thermal springs or travertine deposits were observed during the field study in the WSA's.

RESULTS OF FIELD INVESTIGATION

Epithermal gold-silver veins in faults related to calderas and tin-bearing rhyolites are the deposit types likely to occur in the geologic environment of the WSA's.

Geologic maps (Ekren and others, 1972; Ekren and others, 1973; and Snyder and others, 1972) show a complex system of generally northerly and northeasterly-trending normal faults, which may have been caused by caldera collapse. Faulting is prevalent in Monocline Canyon in Palisade Mesa WSA. The N. 50°E.-striking Monocline Canyon Fault and a N. 10°E.-striking fault can be traced on the surface for approximately 1 1/4 and 3/4 mi, respectively (pl. 1).

Surface indicators of epithermal mineralization may include: silicified fault zones, stockwork quartz veins, silicified and pyritized vent breccia, and propylitic alteration (chlorite, calcite, and pyrite). None of these indicators, however, were observed along the trace of either fault, and except for small patches of silica crust just outside Palisade Mesa WSA (pl. 1, table 1, sample no. 9), none were noted in either WSA.

Analytical data (table 1, sample nos. 25, 29-32) show no pathfinder (mobile) elements or precious metal values. Pathfinders may be closely associated with, and may assist in finding, mineral occurrences or deposits.

Pathfinder elements for epithermal gold-silver veins are: antimony, arsenic, bismuth, and silver (See Levinson, 1980, p. 53, 872, 882). Other ore elements associated with epithermal gold-silver veins are copper, gold, lead, mercury, tellurium, thallium, uranium, and zinc (Berger, 1982, p. 119).

Ten panned concentrate samples of stream gravels and 21 stream sediment samples were taken in drainages in and near the WSA's to determine if pathfinder elements are related to possibly mineralized faults. Analytical data (tables 1 and 2) showed no such elements.

Antimony, bismuth, copper, gold, lead, and silver values were below detection limits. Although tellurium (table 1) and arsenic and zinc (tables 1 and 2) are present, the amount and distribution of these elements are not indicative of the presence of outcropping or near-surface mineral resources.

A map showing Tertiary volcanic centers in Nevada (Albers and Kleinhampl, 1970, p. C1) indicates that the Pancake Range caldera is not mineralized. Our field investigation corroborates that conclusion.

Some rocks of granitic composition contain disseminated tin. Granite contains an average abundance of 3 ppm tin; values of 20 ppm may indicate tin mineralized granites (Levinson, 1980, p. 44, 319-320). Ash-flow tuffs exposed in the WSA's are rhyolitic to quartz latite (fine-grained equivalents of granites) in composition.

Eighteen rock samples (tables 1 and 2) contained between 5 and 14 ppm tin. Tin values were below detection limits in the other rock samples. The highest value is 36 ppm tin (table 1, sample no. 14). This one value above 20 ppm does not show the exposed ash-flow tuffs to be tin-bearing in Palisade Mesa and The Wall WSA's.

Basalt and cinders in the Lunar Crater volcanic field are sources of aggregate and crushed stone. Construction materials have a high bulk-low unit value that generally restricts the use or market area. Transporation costs generally limit utilization of such deposits to under 30 mi.

Basalt cinders can be used as decorative stone. According to the BLM, no demand exists for decorative rock near the WSA's because of the remote location from population centers (D.L. Eddy, oral commun., 1984).

CONCLUSIONS

Exposed Tertiary ash-flow tuffs and lavas within Palisade Mesa and The Wall WSA's are barren of metallic mineral occurrences. Some faults are traceable on the surface but are not mineralized where exposed in and outside the WSA's. Analytical data do not show base metal, precious metal, or pathfinder element values that may indicate gold, silver, tin, or other metallic resources at or near the surface.

Because of the geologic setting, oil and gas resources within the WSA's are unlikely. Thick sequences of extrusive igneous rocks indicate high geothermal temperatures which may have precluded the presence of hydrocarbons. Railroad Valley oil production is from combination traps found along major Basin and Range faults that are outside the boundaries. The only known drilling for hydrocarbons is a dry oil and gas hole drilled 9 mi northeast of The Wall WSA.

Geothermal resources exist outside The Wall WSA in Railroad Valley. Thermal springs and wells are along or basinward from major Basin and Range faults that are outside the boundaries. Geothermal resources are not likely at depth within the WSA's.

Most rocks in the WSA's are without special or unique properties and are suitable for construction purposes. Large resources of similar rock types are present elsewhere. Basalt cinders and scoria, present in the Lunar Crater volcanic field, can be used as decorative stone. No markets have been identified and large resources are present elsewhere.

REFERENCES

Albers, J.P., and Kleinhampl, F.J., 1970, Spatial relation of mineral deposits to Tertiary volcanic centers in Nevada: U.S. Geological Survey Professional Paper 700-C, p. C1-C10.

Berger, B.R., 1982, The geological attributes of Au-Ag-base metal epithermal deposits in Erickson, R.L., ed., Characteristics of mineral deposit occurrences: U.S. Geological Survey Open-File Report 82-795, p. 119-126.

Duey, H.D., 1979, Trap Spring oil field, Nye County, Nevada, in Newman, G.W., and Goode, H.D., eds., Basin and Range symposium and Great Basin field conference: Rocky Mountain Association Geologists and Utah Geological Association, p. 469-476.

Ekren, E.B., Hinricks, E.N., and Dixon, G.L., 1972, Geologic map of The Wall Quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-719, scale 1:48,000.

Ekren, E.B., Rogers, C.L., and Dixon, G.L., 1973, Geologic and Bouguer gravity map of the Reveille Quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-806, scale 1:48,000.

Ekren, E.B., Bucknam, R.C., Carr, W.J., Dixon, G.L., and Quinlivian, W.D., 1976, East-trending structural lineaments in central Nevada: U.S. Geological Survey Professional Paper 986, 16 p.

Garside, L.J., and Schilling, J.H., 1979, Thermal waters of Nevada: Nevada Bureau of Mines and Geology, Bulletin 91, Mackay School of Mines and University of Nevada, Reno, 163 p.

Kleinhampl, F.J., and Ziony, J.I., 1967, Preliminary geologic map of northern Nye County, Nevada: U.S. Geological Survey Open-File Report 67-129, scale 1:200,000, 2 sheets.

Kral, V.E., 1951, Mineral resources of Nye County, Nevada: University Nevada Bulletin 45, no. 3, Nevada State Bureau of Mines and Mackay School of Mines, 223 p.

Levinson, A.A., 1980, Introduction to exploration geochemistry: Applied Publishing, Wilmette, 924 p.

McKee, E.H., 1979, Ash-flow sheets and calderas: their genetic relationship to ore deposits in Nevada, in Chapin, C.E., and Elston, W.E., eds., Ash-flow tuffs: Geological Society America Special Paper 180, p. 205-211.

Sandberg, C.A., 1983, Petroleum potential of wilderness lands in Nevada: U.S. Geological Survey Circular 902-H, p. H1-H11.

Schilling, J.H., 1976, Metal mining districts of Nevada, Nevada Bureau of Mines and Geology, Map 37, scale 1:1,000,000, 3rd edition.

REFERENCES--Continued

Scott, D.H., 1969, Geology of the southern Pancake Range and Lunar Crater volcanic field, Nye County, Nevada: Unpublished Ph. D. thesis, University California-Los Angeles, 128 p.

Scott, D.H., and Trask, N.J., 1971, Geology of the Lunar Crater volcanic field, Nye County, Nevada: U.S. Geological Survey Professional Paper 599-I, 22 p.

Snyder, R.P., Ekren, E.B., and Dixon, G.L, 1972, Geologic map of the Lunar Crater Quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Geologic Investigation Map I-700, scale 1:48,000.

Table 1.-- Analytical data and description of samples 1-45 from in and near Palisade Mesa Wilderness Study, Nye County, Nevada

[Antimony, bismuth, copper, gold, lead, and silver were below detection limits in all samples. As, arsenic; Sn, tin; Te, tellurium; Zn, zinc; ---, below detection limit; <, less than; panned conc., panned concentrate]

Sample No.	Type	Assay data As (percent)	Sn (percent)	Zn (percent)	Remarks
			TWIN SPRINGS RANCH AREA		
1	Grab	---	<0.0005	0.007	Bald Mountain Tuff, rhyolitic, welded, and reddish-brown.
2	Do.	---	< .0005	.006	Bald Mountain tuff, black vitrophyre; 0.06% Te.
3	Stream sediment	0.03	< .0005	.01	Monotony Tuff and Shingle Pass Tuff-unit C; northerly-striking fault-controlled drainage.
4	Chip, random	---	< .0005	.004	Flow-layered rhyolite.
5	Chip, 42 in.	---	< .0005	.005	Shingle Pass Tuff, welded, minor iron oxide stained, and reddish; N. 58°E.-striking fault.
6	Stream sediment	.05	.0009	.04	Shingle Pass Tuff-unit C, Buckwheat Rim Tuff, and Black Beauty Mesa Tuff; northeast-striking fault-controlled drainage.
7	Panned conc.	---	.0014	.04	Shingle Pass Tuff-unit C, Buckwheat Rim Tuff, and Black Beauty Mesa Tuff; northeast-striking fault-controlled drainage; magnetite with biotite, feldspar, hornblende, quartz, and tourmaline.
8	Stream sediment	.05	< .0005	.01	Shingle Pass Tuff; northeast-striking fault-controlled drainage.
9	Chip, random	---	.0009	.006	Shingle Pass Tuff, silica crust, welded, and reddish.
10	Stream sediment	.03	< .0005	.07	Buckwheat Rim Tuff and Granite-Weathering Tuff; east-striking fault-controlled drainage.

Table 1.-- Analytical data and description of samples 1-45 from in and near Palisade Mesa Wilderness Study, Nye County, Nevada--Continued

[Antimony, bismuth, copper, gold, lead, and silver were below detection limits in all samples. As, arsenic; Sn, tin; Te, tellurium; Zn, zinc; ---, below detection limit; <, less than; panned conc., panned concentrate]

Sample No.	Sample Type	Assay data As (percent)	Assay data Sn (percent)	Assay data Zn (percent)	Remarks
11	Panned conc.	---	<0.0005	0.03	Buckwheat Rim Tuff and Granite-Weathering Tuff; east-striking fault-controlled drainage; magnetite with biotite, feldspar, quartz, and hornblende.
12	Stream sediment	0.04	< .0005	.02	Buckwheat Rim Tuff and Granite-Weathering Tuff; north-striking fault-controlled drainage.
13	Panned conc.	---	.0006	.03	Buckwheat Rim Tuff; north-striking fault-controlled drainage; magnetite with biotite, feldspar, hornblende, quartz, and tourmaline.
14	Stream sediment	.04	.0036	.03	Lunar Cuesta Tuff, Buckwheat Rim Tuff, and Granite-Weathering Tuff; northeast-striking fault-controlled drainage.
15	Panned conc.	---	< .0005	.03	Lunar Cuesta Tuff, Buckwheat Rim Tuff, and Granite-Weathering Tuff; northeast-striking fault-controlled drainage; magnetite with feldspar, hornblende, quartz, and tourmaline.
			BIG FAULT AREA		
16	Stream sediment	.05	< .0005	.01	Lunar Cuesta Tuff and Buckwheat Rim Tuff; fault-controlled drainage along Big Fault Ridge.
17	Chip, random	---	.0006	.02	Buckwheat Rim Tuff, pebble and cobble size lithic fragments.
18	Do.	---	.0005	.02	Buckwheat Rim Tuff, quartz latite, welded.
			BLACK BEAUTY MESA AREA		
19	Do.	---	< .0005	.006	Granite-Weathering Tuff, rhyolitic, welded.

Table 1.-- Analytical data and description of samples 1-45 from in and near Palisade Mesa Wilderness Study, Nye County, Nevada--Continued

[Antimony, bismuth, copper, gold, lead, and silver were below detection limits in all samples. As, arsenic; Sn, tin; Te, tellurium; Zn, zinc; ---, below detection limit; <, less than; panned conc., panned concentrate]

Sample No.	Type	Assay data: As (percent)	Sn (percent)	Zn (percent)	Remarks
20	Stream sediment	0.04	<0.0005	0.02	Andesite lava flows, Buckwheat Rim Tuff, Black Beauty Mesa Tuff, and Granite-Weathering Tuff; northeast-striking fault-controlled drainage.
21	Chip, random	---	< .0005	.008	Black Beauty Mesa Tuff, quartz latite, welded, and reddish.
22	Stream sediment	.05	< .0005	.01	Andesite lava flows and Black Beauty Mesa Tuff.
			MONOCLINE CANYON AREA		
23	Do.	.05	< .0005	.01	Lunar Cuesta Tuff, Buckskin Point Tuff, andesite lava flows, and Buckwheat Rim Tuff.
24	Panned conc.	---	.0006	.04	Lunar Cuesta Tuff, Buckskin Point Tuff, andesite lava flows, and Buckwheat Rim Tuff; magnetite with biotite, feldspar, hornblende, quartz, and tourmaline.
25	Chip, random	---	.0005	.007	Buckskin Point Tuff; 10-ft-wide (?) N. 50°E.-striking Monocline Canyon Fault.
26	Stream sediment	.06	< .0005	.01	Lunar Cuesta Tuff, Buckskin Point Tuff, and Buckwheat Rim Tuff.
27	Panned conc.	---	< .0005	.03	Lunar Cuesta Tuff, Buckskin Point Tuff, and Buckwheat Rim Tuff; magnetite with feldspar, hornblende, quartz, and tourmaline.
28	Chip, random	---	< .0005	.007	Lunar Cuesta Tuff, quartz latite, welded, and gray-brown.
29	Do.	---	< .0005	.009	Buckskin Point Tuff; 10-ft-wide (?) N. 50°E.-striking Monocline Canyon Fault.
30	Do.	---	< .0005	.04	Lunar Cuesta Tuff; 10-ft-wide(?) N. 50°E.-striking Monocline Canyon Fault.

Table 1.-- Analytical data and description of samples 1-45 from in and near Palisade Mesa Wilderness Study, Nye County, Nevada--Continued

[Antimony, bismuth, copper, gold, lead, and silver were below detection limits in all samples. As, arsenic; Sn, tin; Te, tellurium; Zn, zinc; ---, below detection limit; <, less than; panned conc., panned concentrate]

Sample No.	Type	Assay data: As (percent)	Sn (percent)	Zn (percent)	Remarks
31	Do.	---	0.0006	0.006	Lunar Cuesta Tuff; N. 10°E.-striking fault.
32	Chip, random	---	< .0005	.01	Lunar Cuesta Tuff; N. 10°E.-striking fault.
33	Stream sediment	0.03	< .0005	.01	Lunar Cuesta Tuff, Buckskin Point Tuff, andesite lava flows, and Buckwheat Rim Tuff.
34	Chip, random	---	< .0005	.02	Andesite lava flow, aphanitic, fractured, and black.
35	Do.	---	< .0005	.01	Lava flow, quartz latite, and light-gray.
35	Do.	---	.006	.009	Buckskin Point Tuff, quartz latite, welded and gray.
			PALISADE MESA AREA		
37	Do.	---	.0006	.006	Monotony Tuff, quartz latite, welded, and light-brown.
38	Do.	---	.0007	.006	Monotony Tuff, 20-ft-thick vitrophyre.
39	Do.	---	.0006	.003	Palisade Mesa Tuff, rhyolitic, welded and light-gray
40	Stream sediment	.03	< .0005	.009	Monotony Tuff and Lunar Cuesta Tuff
41	Grab	---	.0006	.004	Sand and cobble size rhyolitic alluvium.
42	Chip random	---	< .0005	.004	Shingle Pass Tuff, rhyolitic, welded and reddish.
43	Grab	---	< .0005	.006	Sand and cobble size rhyolitic alluvium.
44	Chip, random	---	< .0005	.003	Shingle Pass Tuff, welded, and reddish.
45	Do.	---	< .0005	.005	Lunar Cuesta Tuff, quartz latite, welded and gray-brown.

Table 2.--Analytical data and description of samples 46-57 from in and near The Wall Wilderness Study Area, Nye County, Nevada

[Antimony, bismuth, copper, gold, lead, silver, and tellurium were below detection limits in all samples. As, arsenic; Sn, tin; Zn, zinc; ---, below detection limit; <, less than; panned conc., panned concentrate]

Sample No.	Type	Assay data (percent) As	Sn	Zn	Remarks
46	Stream sediment	0.04	<0.0005	0.01	Shingle Pass Tuff, Lunar Cuesta Tuff, and Big Sand Spring Valley Rhyolite.
47	Panned conc.	---	.0014	.07	Shingle Pass Tuff, Lunar Cuesta Tuff, and Big Sand Spring Valley Rhyolite; magnetite with biotite, feldspar, hornblende, quartz, and tourmaline.
48	Stream sediment	.03	< .0005	.008	Shingle Pass tuff and Lunar Cuesta Tuff.
49	Do.	.04	< .0005	.007	Lunar Cuesta Tuff, Buckwheat Rim Tuff Clinkstone-Weathering Tuff, and Granite-Weathering Tuff.
50	Do.	.04	.0005	.01	Lunar Cuesta Tuff, Buckwheat Rim Tuff, and Granite-Weathering Tuff; northeast-striking fault-controlled drainage.
51	Panned conc.	---	< .0005	.06	Shingle Pass Tuff and Lunar Cuesta Tuff; magnetite with biotite, feldspar, hornblende, quartz, and tourmaline.
52	Stream sediment	---	< .0005	.007	Shingle Pass Tuff and Lunar Cuesta Tuff.
53	Panned conc.	---	.0008	.06	Shingle Pass Tuff and Lunar Cuesta Tuff; northwest-striking fault-controlled drainage; magnetite with biotite hornblende, quartz, and tourmaline.
54	Stream sediment	.04	< .0005	.01	Shingle Pass Tuff and Lunar Cuesta Tuff; northwest-striking fault-controlled drainage.
55	Panned conc.	---	.0007	.07	Shingle Pass Tuff, Lunar Cuesta Tuff, and Granite-Weathering Tuff; northeast-striking fault-controlled drainage; magnetite with biotite, feldspar, hornblende, and tourmaline.

Table 2.--Analytical data and description of samples 46-57 from in and near The Wall Wilderness Study Area, Nye County, Nevada--Continued

[Anitimony, bismuth, copper, gold, lead, silver, and tellurim were below detection limits in all samples. As, arsenic; Sn, tin; Zn, zinc; ---, below detection limit; <, less than; panned conc., panned concentrate]

Sample No.	Type	Assay data As (percent)	Sn (percent)	Zn (percent)	Remarks
56	Stream sediment	0.05	<0.0005	0.009	Shingle Pass Tuff, Lunar Cuesta Tuff, and Granite-Weathering Tuff; northeast-striking fault-controlled drainage.
57	Do.	.04	< .0005	.003	Shingle Pass Tuff, Lunar Cuesta Tuff, and Granite-Weathering Tuff.

APPENDIX--Semiquantitative optical emission spectrographic analysis detection limits, U.S. Bureau of Mines, Reno Research Center

Element	Detection limit (percent)	Element	Detection limit (percent)
Ag	0.002	Mo	0.0001
Al	.001	Na	.3
As	.01	Nb	.007
Au	.002	Ni	.0005
B	.003	P	.7
Ba	.002	Pb	.001
Be	.0001	Pt	.0001
Bi	.01	Re	.0006
Ca	.05	Sb	.06
Cd	.0005	Sc	.0004
Co	.001	Si	.0006
Cr	.0003	Sn	.001
Cu	.0006	Sr	.0001
Fe	.0006	Ta	.02
Ga	.0002	Te	.04
K	2.0	Ti	.03
La	.01	V	.005
Li	.002	Zn	.0001
Mg	.0001	Zr	.003
Mn	.001	Y	.0009

These detection limits represent an ideal situation. In actual analyses, the detection limits vary with the composition of the material analysed. These numbers are to be used only as a guide.

Area Name, Number, Classification, Size

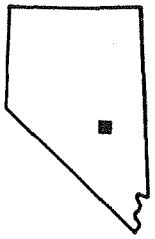
Palisade Mesa
NV-060-142/162
Wilderness Study Area (WSA)
66,110 acres

State

Nevada

BLM District

Battle Mountain



Estimated Commodity Potential
Development Potential

Low-base and precious metals
Low-oil and gas
Low-geothermal
Low-construction and decorative rock

Recorded Production

None

Mining Districts, Mines, and Claims

Four mining districts are within a 15 mi radius of the WSA boundaries. Antimony, copper, gold, lead, silver, and zinc were mined. No mining activity has occurred and no patented or unpatented mining claims are within the WSA.

No drilling or other oil and gas exploration is known to have occurred in the WSA. As of Dec. 1984, 5,500 acres were leased for oil and gas.

Geothermal resources are not known to occur.

Most rocks in the WSA are suitable for construction purposes and some for decorative use.

Recent Company Activity

None

Mineral Setting

Oligocene and Miocene ash-flow tuffs and lavas are the oldest rocks exposed. Quaternary basalt flows and cinder cones are exposed in and adjacent to the northeastern WSA boundary.

A volcanic caldera is within and another is adjacent to the boundaries. Faults, possibly caused by caldera collapse, are not mineralized where exposed. Exposed ash-flow tuffs are barren of metallic mineral occurrences.

Recommendations

None

References

Albers, J.P., and Kleinhampl, F.J., 1970, Spatial relation of mineral deposits to Tertiary volcanic centers in Nevada: U.S. Geological Survey Professional Paper 700-C, p. C1-C10.

Ekren, E.B., Rogers, C.L., and Dixon, G.L., 1973, Geologic and Bouguer gravity map of the Reveille Quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-806, scale 1:48,000.

Scott, D.H., and Trask, N.J., 1971, Geology of the Lunar Crater volcanic field, Nye County, Nevada: U.S. Geological Survey Professional Paper 599-I, 22 p.

Snyder, R.P., Ekren, E.B., and Dixon, G.L., 1972, Geologic map of the Lunar Crater Quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-700, Scale 1:48,000.

Area Name, Number, Classification, Size

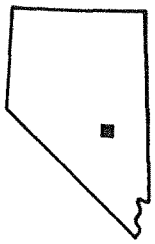
The Wall
NV-060-142/163
Wilderness Study Area (WSA)
30,320 acres

State

Nevada

BLM District

Battle Mountain



Estimated Commodity Potential
Development Potential

Low-base and precious metals
Low-oil and gas
Low-geothermal
Low-construction and decorative rock

Recorded Production

None

Mining Districts, Mines, and Claims

Four mining districts are within a 15 mi radius of the WSA boundaries. Antimony, copper, gold, lead, silver, and zinc were mined. No mining activity has occurred and no patented or unpatented mining claims are within the WSA.

No drilling or other oil and gas exploration is known to have occurred in the WSA. As of Dec. 1984, 8,000 acres were leased for oil and gas.

The Railroad Valley geothermal area is 1/4 mi outside the eastern boundary but no geothermal leases or lease applications are within the WSA.

Most rocks in the WSA are suitable for construction purposes and some for decorative use.

Recent Company Activity

None

Mineral Setting

Oligocene and Miocene ash-flow tuffs and lavas are the oldest rocks exposed. Quaternary basalt flows and cinder cones are exposed in and adjacent to the northwestern WSA boundary.

A volcanic caldera is within and another is adjacent to the boundaries. Faults, possibly caused by caldera collapse, are not mineralized where exposed. Exposed ash-flow tuffs are barren of metallic mineral occurrences.

Recommendations

None

References

Albers, J.P., and Kleinhampl, F.J., 1970, Spatial relation of mineral deposits to Tertiary volcanic centers in Nevada: U.S. Geological Survey Professional Paper 700-C, p. C1-C10.

Ekren, E.B., Rogers, C.L., and Dixon, G.L., 1973, Geologic and Bouguer gravity map of the Reveille Quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-806, scale 1:48,000.

Scott, D.H., and Trask, N.J., 1971, Geology of the Lunar Crater volcanic field, Nye County, Nevada: U.S. Geological Survey Professional Paper 599-I, 22 p.

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

OPEN FILE REPORT
MLA 26-85
PLATE 1

PALISADE MESA

THE WALL

WILDERNESS

STUDY AREA

Railroad Valley Geothermal Area

Inferred boundary of the Lunar Lake Caldera

Inferred boundary of the Pancake Range/Williams Ridge-Hot Creek Valley calderas

Monocline Canyon Fault

Big Fault

Twin Springs Ranch

Chimney Springs
140–160° F

1,711
Shell Oil Co.
Coyote Unit No.1
140° F

84–98° F

111–113° F

113–115° F

Geology modified from Ekren, E. B., Hinricks, E. N., and Dixon, G. L., 1972; Ekren, E. B., Rogers, C. L., and Dixon, G. L., 1973; Ekren, E. B., Bucknam, R. C., Carr, W. J., Dixon, G. L., and Quinlivian, W. D., 1976; Garside, L. J., and Schilling, J. H., 1979; Snyder, R. P., Ekren, E. B., and Dixon, G. L., 1972.

Geothermal information from Garside, L. J., and Schilling, J. H., 1979.

EXPLANATION

- APPROXIMATE BOUNDARIES OF THE PALISADE MESA AND THE WALL WILDERNESS STUDY AREAS
- UNPATENTED MINING CLAIMS
- OIL AND GAS LEASES
- APPROXIMATE BOUNDARY OF GEOTHERMAL AREA
- APPROXIMATE BOUNDARY OF CALDERAS
- FAULT--Bar and ball on downthrown side
- FAULT--Dashed where approximate; dotted where concealed
- 09 LOCALITY OF SAMPLED OUTCROP--Showing sample number
- ●51 LOCALITY OF PANNED CONCENTRATE SAMPLE--Showing sample number
- ▲33 LOCALITY OF STREAM SEDIMENT SAMPLE--Showing sample number
- 140–160° F THERMAL SPRING--Showing temperature in degrees Fahrenheit
- SURFACE OPENINGS
  - Borrow or gravel pit
  - 1,711 Dry hole, showing depth in feet

Base from the U.S. Geological Survey, 1:62,500
Lunar Crater, 1967; Reveille, 1968; The Wall, 1967.

MN

SCALE 1:62,500
½ 0 1 2 3 4 MILES
CONTOUR INTERVAL 40 FEET

NEVADA
MAP LOCATION

Field work completed in 1984 by Richard F. Kness; assisted by John T. Neubert and Robert A. Welsh.

SAMPLE LOCALITY MAP OF THE PALISADE MESA AND THE WALL WILDERNESS STUDY AREAS, NYE COUNTY, NEVADA

BY

RICHARD F. KNESS, U.S. BUREAU OF MINES

1985