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MINERAL RESOURCES OF THE CHARLES SHELDON WILDERNESS STUDY AREA, HUMBOLDT AND WASHOE COUNTIES, NEVADA AND LAKE AND HARNEY COUNTIES, OREGON

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STUDIES RELATED TO WILDERNESS

In accordance with the provision of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, the U.S. Geological Survey and U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Studies and reports of all primitive areas have been completed. Areas officially designated as "wilderness," wild," or "canoe" when the Act was passed were incorporated into the National Wilderness Preservation System, and some of them are currently being studied. The Act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. This report discusses the results of a mineral survey of some of the land in the Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon, that is being considered for wilderness designation.

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STUDIES RELATED TO WILDERNESS--WILDERNESS AREAS

MINERAL RESOURCES OF THE CHARLES SHELDON WILDERNESS STUDY AREA, HUMBOLDT AND WASHOE COUNTIES, NEVADA, AND LAKE AND HARNEY COUNTIES, OREGON

SUMMARY AND INTRODUCTION

By U.S. Geological Survey and

U.S. Bureau of Mines

Summary

A mineral survey of the Charles Sheldon wilderness study area, located in Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon was conducted in 1974 and 1975 (fig. 1A, 1B, 1C). The mineral resource potential was evaluated by geological, geochemical, and geophysical studies by the U.S. Geological Survey, and by the examination of mines, prospects, and other mineralized localities by the U.S. Bureau of Mines. The investigation identified several areas of significant mineral potential within the study area which includes the Charles Sheldon Antelope Range and the Sheldon National Antelope Refuge (fig. 1B). The Virgin Valley area contains reserves of precious opal, small quantities of decorative building stone, and low-grade uranium resources. The investigation indicates that there are several areas of potential for the discovery at depth of mercury and for base and complex precious metal sulfide deposits within the study area. Reservoir temperatures, estimated from the analysis of thermal springs, suggest that the area has low-to-moderate potential for geothermal resources. The potential for oil, gas, or coal is very low.

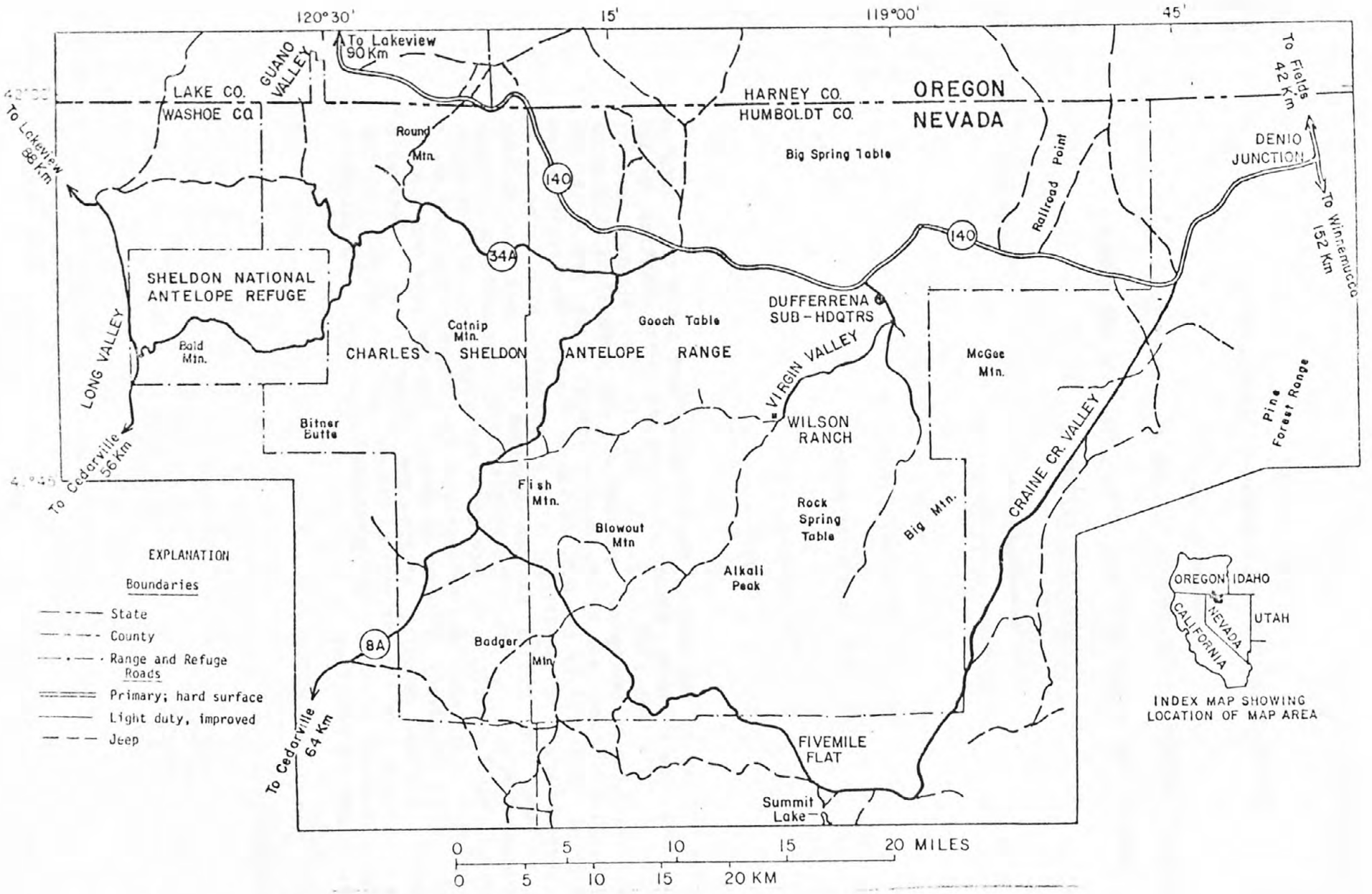


Figure 1A.--Map showing location and geographic features of the Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

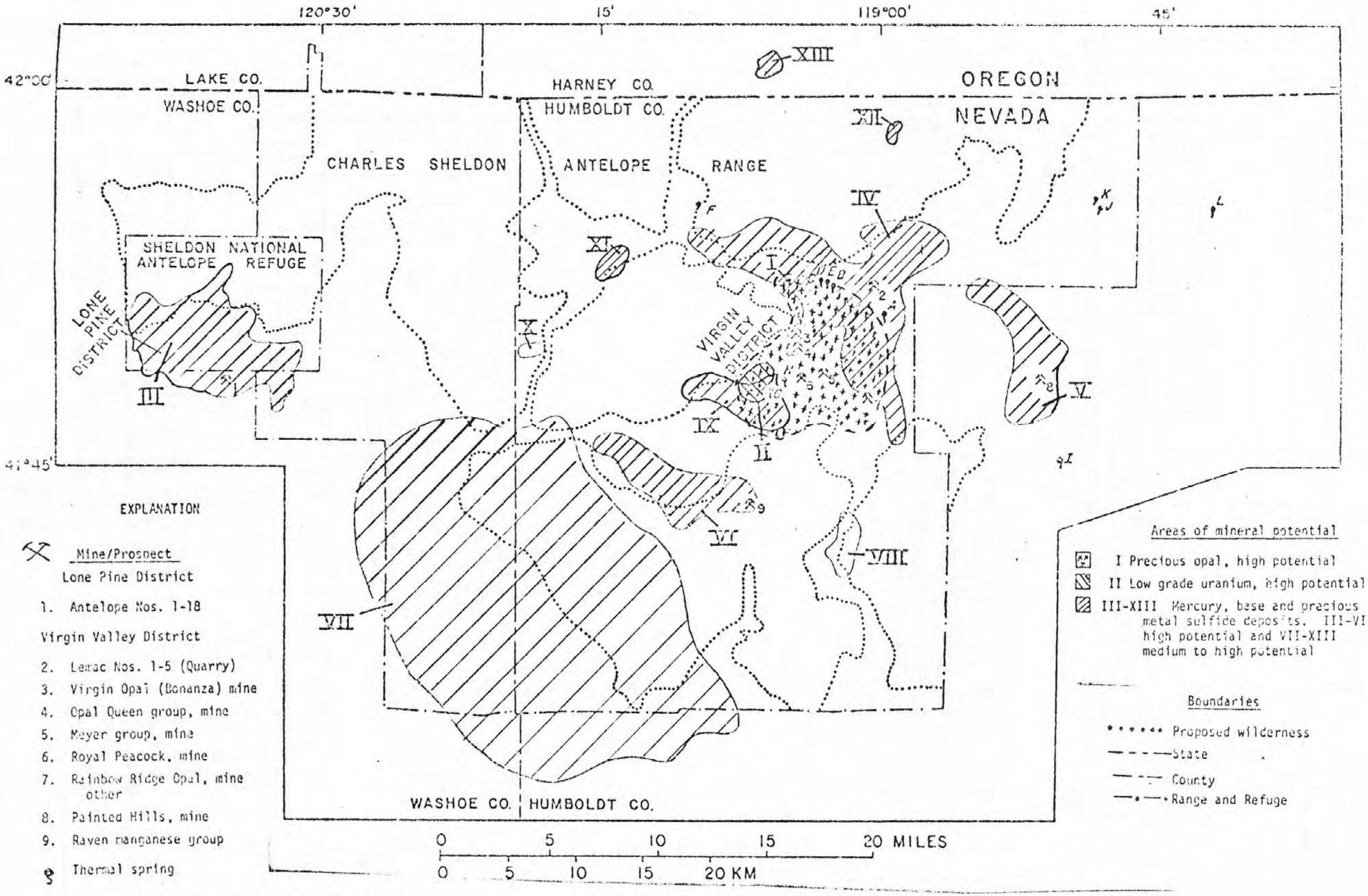


Figure 18.--Map showing areas of potential mineral resources in relation to the proposed wilderness area, Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

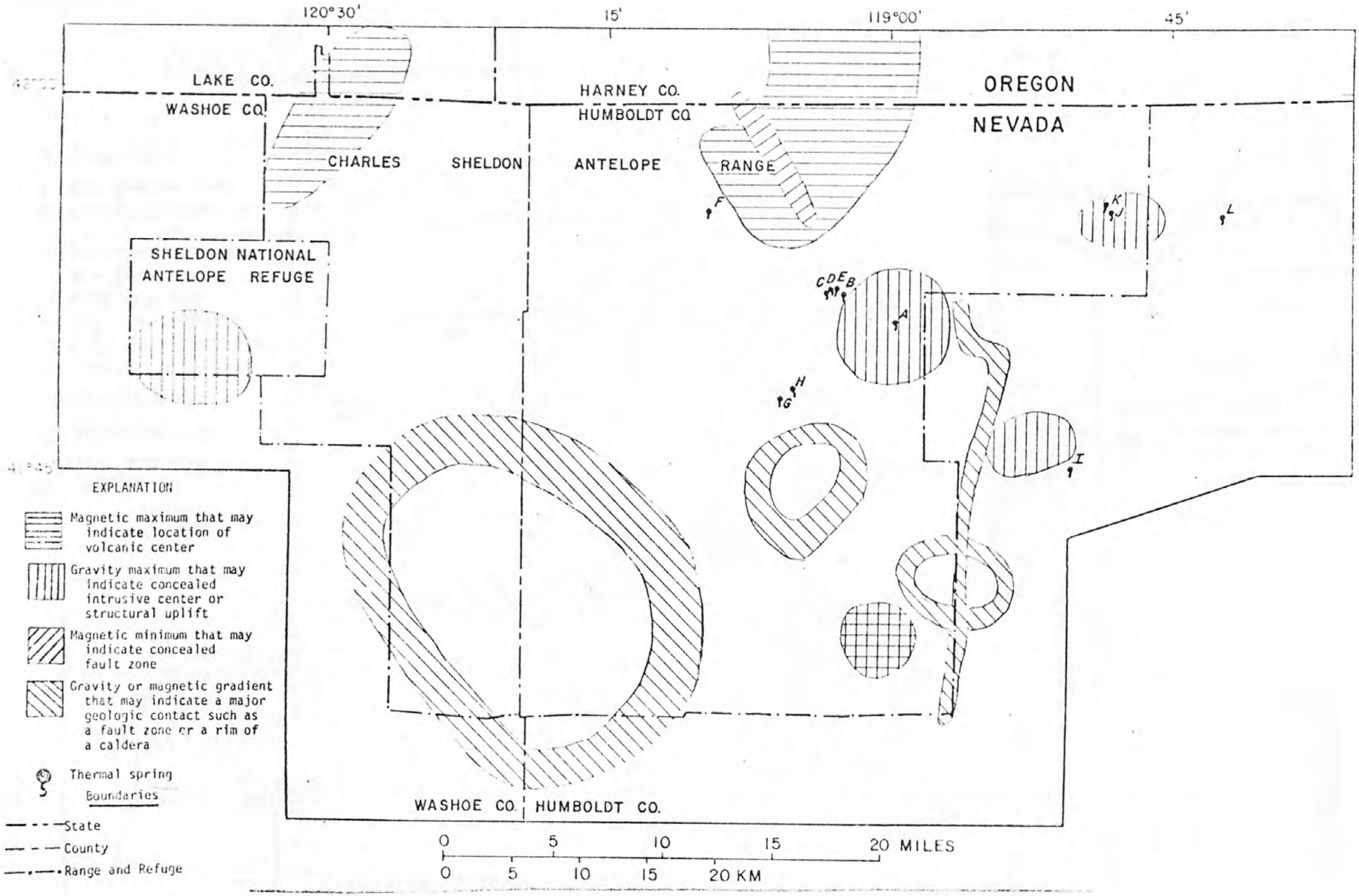


Figure 1C.--Prominent gravity and magnetic anomalies in the Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Outcrops within the study area consist entirely of volcanic and continental sedimentary rocks of Late Tertiary and Quaternary age. These rocks rest on a burial basement that is probably comprised of Permian, Triassic, and Jurassic metavolcanic and sedimentary and Jurassic and Cretaceous granitic rocks. The thickness of the Late Tertiary and Quaternary rocks is variable but on the order of 300 to 600 meters (m). The Cenozoic units are flat-lying or gently dipping and exhibit much interfingering in local basins.

Volcanic rocks are andesite lava flows, rhyolite ash-flow tuffs, and basalt flows. The andesitic rocks are the oldest and are Middle Miocene (about 15-16 m.y. by K-Ar) in age. The ash-flow tuffs are slightly younger and are parts of regionally widespread tuff sheets recognized elsewhere in northwestern Nevada. Basalt flows that cap much of the area are variable in age; some are as old as about 9 m.y., others as young as about 1-2 m.y. Tuffaceous sedimentary strata are lenticular units at many horizons in the section and are especially thick in ancient valleys such as Virgin Valley.

Basin and Range faults in the Antelope Range and Refuge are fewer in number, have less offset and a different trend than in surrounding regions of the Great Basin. The general trend of the faults is northwest in the Range and Refuge, it is northeast in adjacent regions. There are no major mountains of block fault origin in the study area.

Geophysical investigations consisted of gravity and aeromagnetic surveys (fig. 1C). The gravity map shows a decrease of gravity anomaly level of about 15 mgal between the study area and the Pine Forest Range to the east, where pre-Tertiary rocks are exposed. If the observed difference in gravity level is entirely an effect of an estimated 0.2 g/cm^3 density contrast between the Tertiary and pre-Tertiary rocks, the study area is underlain by about 1,800 m of Tertiary and younger rocks. The 15-mgal change of gravity level mostly occurs within a north-trending 4 kilometer (km) zone along the west edge of the Pine Forest Range, indicating a major fault boundary. A fault zone also is indicated by northwest-trending gravity contours centered about 6 km northeast of the Range Subheadquarters. Fault zones or major geologic contacts similarly are indicated by the occurrence of approximately linear magnetic contours near the east and northeast edges of the study area. The rather linear zones of high gravity or magnetic gradients are considered possible sites for future mineral exploration.

The occurrence of four gravity maxima in or along the edge of the study area suggest the presence of concealed intrusive centers or uplifted localities. The westmost gravity anomaly occurs at a structurally uplifted location near the Lone Pine mining district at the west edge of the study area. Two gravity maxima that occur near thermal springs along the east edge of the study area seem too broad to be explained wholly as an effect of local densification of the underlying tuffaceous sedimentary rocks by compaction and filling pre-existing pore space with precipitates from mineral-rich thermal waters. A magnetic maximum nearly coincides with the location of the fourth gravity maximum in the southeast corner of the study area. Two broad magnetic maxima near the northeast and northwest corners of the study area probably reflect concealed extensions of volcanic centers that are exposed to the north

of the study area. The localities of gravity or magnetic maxima are considered possible sites for future possible mineral exploration, if such studies are undertaken.

Three prominent closed gravity minima along the south edge of the study area may reveal underlying calderas, which are masked by younger Tertiary rocks. The largest caldera is 17 by 25 km in size and, if the assumed underlying tuffaceous sedimentary rocks are on the average 0.2 g/cm^3 less dense than the surrounding volcanic rocks, the caldera extends to a depth of about 2.7 km. The areas along the edges of the postulated calderas are considered sites for possible future mineral exploration.

Based on geochemical sampling, anomalous concentrations of gold, mercury, antimony, arsenic, tungsten, molybdenum, manganese, and barium, and anomalous ratios of cadmium to zinc form dispersion patterns which delineate target areas for possible exploration for concealed mineral deposits. The targets of potential metallic resources within the study area are shown on figure 1B, No. III-XIII.

The south part of the Sheldon National Antelope Refuge (area III in fig. 1B) has potential for deposits of mercury and for concealed base and complex precious-metal sulfide deposits. A mercury anomaly covers a large part of the area. In addition, the anomalous concentration of the other elements mentioned above and the anomalous cadmium to zinc ratios form dispersion patterns that are contiguous with normal faults, and some magnetic and/or gravity highs.

Additional areas which may contain mercury and concealed base and complex precious-metal sulfide deposits are the areas encompassing the Subheadquarters (area IV in fig. 1B) and Painted Hills Mine (area V in fig. 1B). The geochemical dispersion patterns and their relationship to geological, geophysical, and thermal springs suggests that the Subheadquarters and Painted Hills mineralized areas may be joined at depth and may extend northwestward beneath younger volcanic rocks.

Area VI in figure 1B has a potential for similar metallic resources. Most of the valley of Hell Creek from its source to its junction with Virgin Creek is fault-controlled. The area near the junction of Hell Creek and Virgin Creek is contiguous to a geophysical anomaly. Anomalous amounts of mercury, arsenic, antimony, molybdenum, barium, gold, and manganese, anomalous ratios of cadmium to zinc, as well as several mercury prospects, seem to be associated with the faults and the western edge of a geophysical anomaly.

In the southwestern part of the Range gravity and magnetic anomalies of substantial size suggest the possible existence of a caldera or buried pluton. The widespread geochemical anomalies in this area are similar in size and magnitude to the mineralized McDermitt Caldera located approximately 132 km to the northwest in the Opalite Mining district. Whether a caldera or buried pluton is present in the area, the geochemical data suggest that area III shown on figure 1B has a possible potential for concealed mercury and complex precious metal sulfide deposits.

Areas VIII through XIII in figure 1B are other localities where anomalous concentrations of some of the elements discussed, anomalous ratios, and detectable gold occur in either stream sediments or rocks.

The study area contains two mining districts: the Virgin Valley near the eastern edge of the Range, and the Lone Pine near the southern part of the Refuge. Production from the study area is estimated to have been several million dollars, with nearly all production coming from the Virgin Valley district. Precious opal accounted for over 75 percent of the total. Significant deposits are at the Rainbow Ridge Opal, Royal Peacock, and Virgin Opal (Bonanza) mines in the Virgin Valley district (fig. 1B, No. I). Over 16,000 tonnes (t) of ornamental dimension stone valued at $66/t and about 14 t of fluorescent opalite have also been produced from the Virgin Valley district. A small amount of mercury reportedly was produced from the Lone Pine district.

One thousand six hundred fifty-six lode and 98 placer claims have been located within the area. Three hundred ninety-three claims are being actively worked.

Precious opal reserves and resources in the Virgin Valley district are estimated to be several million dollars in the following mines: Meyer group, Opal Queen group, Rainbow Ridge Opal, Royal Peacock, and Virgin Opal (Bonanza) (fig. 1B, No. I). Resources of ornamental dimension stone adjacent to the quarry in the Virgin Valley district are estimated to be more than 227,000 t of poor quality stone.

A submarginal uranium resource in tuffaceous sediments (fig. 1B, No. II) in the Virgin Valley district may contain 14 to 18 million t of uranium ore. Uranium may occur in tuffaceous sediments beneath younger volcanics adjacent to the Virgin Valley uranium occurrences (area II in fig. 1B) or in tuffaceous sediments associated with hot springs. Anomalous concentrations of some of the elements discussed, anomalous ratios, and detectable gold are associated with the known uranium occurrences.

Introduction

Location and access

The Charles Sheldon wilderness study area is located in the vicinity of the junction of California, Oregon, and Nevada in Humboldt and Washoe Counties, Nevada, and in Lake and Harney Counties, Oregon (fig. 1B). The study area includes the Charles Sheldon Antelope Range and Sheldon National Antelope Refuge which covers an area of approximately 2,140 km^2. In this report, these units will be referred to as "the Range" and "the Refuge". The Range and Refuge have been under the dual management of the Bureau of Sport Fisheries and Wildlife with headquarters in Lakeview, Oregon, and the Bureau of Land Management, with headquarters in Cedarville, California.

The study area is far from any large town. Virgin Valley, location of the Dufferrena Sub-headquarters and principal focus of activity in the Range, is 192 km from Winnemucca, Nevada (paved road), 153 km from Lakeview, Oregon (paved road), 142 km from Cedarville, California (90 km of gravel), and 82 km from Fields, Oregon (paved road). Denio Junction, with a combined gas station, motel, and restaurant, is 40 km away (paved road). In this report the Dufferrena Sub-headquarters will be referred to as the Sub-headquarters.

Access within the Range and Refuge is provided by a network of gravel and dirt roads, branching off from the paved route 140 (fig. 1A). Routes 8A and 34A are fair to good gravel roads and are also arterial routes. Other good gravel roads lead up Virgin Valley to the Wilson Ranch, between Badger and Blowout Mountains to Fivemile Flat and Summit Lake, and from Thousand Creek up Craine Creek Valley to Summit Lake.

Other roads in the Range and Refuge are rough and require 4-wheel drive. Access to the tops of Big Springs, Gooch, and Rock Springs Tables is poor.

Proposed wilderness

In 1971 certain portions of the Range, Refuge and adjacent areas were first proposed for wilderness status. By 1974, the proposed wilderness was expanded to include 8 units totaling 1,380 km^2 inside the Range and Refuge and 75 km^2 adjacent to it for a total of 1,455 km^2 (fig. 1B).

Wildlife and vegetation

Wildlife in the area is diversified, with antelope the species chiefly associated with the Refuge and Range. About 1,500 antelope are present at the peak period of winter use. Antelope of an interstate herd move in considerable numbers from Oregon to winter on the Refuge and Range. Summer populations are lower and usually total about 800 animals. Deer use the higher mountains extensively in summer and fall but many move off the Refuge and Range to winter on lower elevations farther east. The California bighorn sheep, originally indigenous, was extinct in the area by 1930. Sheep were reintroduced in 1968 and a small herd is becoming established in the Hell Creek drainage. Other native mammals include the coyote, bobcat, mountain lion and a host of smaller mammals characteristic of the region. Free-roaming horses and burros are also present in substantial numbers. Over 145 species of birds have been recorded. Birds vary seasonally in numbers and species but are always most abundant and diverse around springs or other water sources. The ponds, reservoirs and intermittent lakes total about 2750 surface hectacres (h) and are favored by migrating ducks, geese, swans and a variety of other waterbirds. Peak waterfowl populations may range up to 20,000. The native sage grouse and introduced chukar partridge are periodically abundant. Fishery resources are meager but Catnip Reservoir supports the endangered Lahontan cutthroat trout. It is reserved exclusively for restocking purposes. A number of amphibians and reptiles have been recorded, but like small mammals, no extensive inventory has ever been made.

Sagebrush and occasional grasses cover most of the valley areas. The table tops are covered with low sagebrush with occasional stands of big sagebrush and grass. Patches of mountain mahogany clothe some slopes at higher elevations giving way to willow, cottonwood and aspen in some drainages at lower elevations. Springs and seeps are often associated with small meadows.

Archaeological site

Early man's presence in the area dates to at least 10,000 years ago--to the great pluvial lakes of the Pleistocene Epoch. Caves such as the Last Supper Cave in Hell Creek Canyon provide a chronology of occupancy. This cave is the only known archaeological site of major size still intact.

Climate

The Charles Sheldon wilderness study area is classified by Sthraler (1969) as a middle-latitude desert climate, an interior region shut off by mountains from invasions of maritime air masses but dominated by continental tropical air masses in summer and continental polar air masses in winter. This climate has an annual temperature range from below -20°C in winter to over 37°C in the summer. The high altitude produces a daily summer temperature change frequently exceeding 10°C and an abnormally short frost-free period. Precipitation ranges from 13 to 38 cm annually, mostly falling as snow or winter rains. During the summer the relative humidity averages about 20 percent and may fall to 10 percent. The lower elevations may have an average growing season of about 75 days, and higher elevations may have frost in any month of the year.

Topographic and geologic setting

The Range and Refuge are in the northwestern part of the Great Basin section of the Basin and Range province (Fenneman, 1931, p. 326). Topographically, the Range and Refuge are mostly flat plateaus and rounded mountains, locally broken by steep scarps or cut by canyons. High fault scarps adjacent to flat, alluvial valleys, a characteristic feature of the Great Basin, are present both on the east (McGee Mountain-Craine Creek Valley) and west (Round Mountain-Guano Valley and Bald Mountain-Long Valley) sides of the area.

Several peaks (Catnip, Bald, Badger, Fish Creek Mountains) have summit elevations slightly over 2,100 m above sea level; total relief in the area is just over 900 m.

The Range and Refuge are on the southeast flank of a broad basin filled with sedimentary and volcanic rocks of Tertiary and Quaternary age that occupy northwesternmost Nevada, northeastern California, and south-central Oregon. Pre-Tertiary rocks adjacent to this basin to the southeast include Cretaceous granitic rocks and Permian, Triassic, and Jurassic volcanic and sedimentary rocks. These are found in the Pine Forest Range and Pueblo Mountains 10-15 km east from the Range boundary. Paleozoic and Mesozoic metamorphic and Cretaceous granitic rocks of the Sierra Nevada, Klamath and Blue Mountain provinces, all over 150 km, bound the southern, western, and northern sides of the basin.

This basin is dominated by northwest-trending normal faults. The structural break between this area and the northeast-trending fault block ranges to the east occurs at the Pine Forest Range and the Black Rock Desert to the south.

Previous studies

A reconnaissance map by D. A. Noble (1971, unpub.) covered the Humboldt County part of the Range and mapping for a thesis by W. G. Wendell (1970) included the Virgin Valley and McGee Mountain areas. The Washoe County part of the Range and Refuge is included on the county map by Bonham (1969).

Several investigators have reported the occurrence of valuable minerals in or near the Charles Sheldon wilderness study area.

Ross (1941, p. 23) reported on numerous mercury prospects and mines in the vicinity of the junction of California, Oregon, and Nevada. The nearest occurrence of cinnabar to the study area is in the Lone Pine district approximately 6.4 km southwest of the headquarters of the Sheldon National Antelope Refuge (fig. 1B). The main occurrences of mercury are just south of the Refuge, although several small prospects are just within the boundary (Holmes, 1965, p. 269). Sporadic exploration since 1929 has not resulted in production. Bonham (1969, p. 70) reported that trace amounts of gold occur with cinnabar in the Lone Pine district; however, mineable amounts of gold were not found by prospecting.

Wendell (1970, p. 109) indicated that cinnabar was found along a major fault which is adjacent to the Painted Hills mine (fig. 1B). He reported that Recent movement along one of the associated faults is indicated by steam emission; temperatures in a drill hole within the fault zone were 55°C at a depth of 60.9 m (Wendell, 1970, p. 98).

Staatz and Bauer (1951) reported the discovery of uraniferous opal in the Virgin Valley district (fig. 1B). This district has produced some of the best gem opal found in the United States; however, no production of uranium has been reported.

Harold Stager (written commun., 1976) reported visiting the Raven manganese claims (fig. 1B) in June 1959. The deposit consists of beds of cryptomelane interbedded with volcanic ash, silt, fine sand, and diatomite. No production has been reported from these claims.

The U.S. Geological Survey's Mineral and Water Resources of Nevada (1964) mentions fire opal, dimension stone, and uranium occurrences in Virgin Valley.

Present investigations

A new geologic map of the Range, Refuge and vicinity was prepared for the present mineral resource study (pl. 1). It includes all areas mentioned in the various wilderness proposals. In much of the Humboldt County portion, the map is identical with that of Noble (1971, unpub.); elsewhere it differs.

Field mapping was done by R. C. Greene in October 1974, May and June, 1975, and by R. C. Greene assisted by K. L. Stark in July 1975. Uranium deposits were investigated by J. E. Peterson in May 1975.

The country rock is principally andesite and associated tuffs, with most of the latter altered to a bentonitic clay. Gold and silver prospecting began in 1897 and continued through 1909. The district has had not reported gold or silver production; however, studies indicate it has potential. In 1929 mercury was discovered; soon thereafter, the Antelope claims were located south of the refuge boundary. The Antelope mine produced a small amount of mercury, but assays show the ore is low-grade. A total of 353 claims were located in the district, 80 of which are south of the study area boundary.

In 1954 and 1955 a total of 142 uranium claims were located; however, little activity followed, and the district is now idle.

MINERAL COMMODITIES

Opal, building stone, and uranium are the principal commodities in the Charles Sheldon wilderness study area. Except where noted, national and world data and other technical data for the following section are from U.S. Bureau of Mines Commodity Data Summaries, January 1976, 1978, and Minerals Facts and Problems, 1975.

Gemstones (including precious opal)

Annual domestic gemstone production from 1880 to 1970 constituted from 0.2 to 1.3 percent of the world's total output in terms of value (Jahns, 1975). Opal represented approximately 1 percent of the domestic production in 1970 (Jahns, 1975). Opal represents less than 2 percent of the total production (excluding diamonds and pearls) in the world (Jahns, 1975). In 1976 domestic gemstone production was estimated to be $6.8 million, and apparent consumption, including diamonds, was estimated to be $1,098 million. Estimated imports were $1,622 million, while exports and re-exports were $533 million. United States precious opal deposits occur principally in Nevada, and to lesser extents in Idaho, Oregon, and Washington (Schlegel, 1957). Nearly all imported precious opal comes from Australia Zale's Jewelry Co., Spokane, Washington (oral commun., 1978).

Precious opal's greatest utilizations are in the jewelry industry and as collector's items. Common opal and opalized wood are sometimes cut and polished for ornaments.

Precious opal jewelry has become increasingly popular, and the demand is expected to increase. Synthetic opals are of low quality and of little, if any, commercial importance.

Opal prices vary greatly, according to the matrix color, intensity, and color of opalescence. Prices increase as matrix color darkens and intensity of opalescence increases. Prices per carat also increase with larger cabochons. A transparent opal with intense opalescence may be valued from $10 to $35 for a one-carat cahochon and $30 to $90 per carat for a 10-carat cabochon. A very dark opal with intense opalescenace may be valued from $130 to $4,000 for a one-carat cabochon and $400 to $7,200 per carat for a 10-carat cabochon (Jahns, 1975).

Although opal is mined in several places, the Virgin Valley district's most productive mines are the Rainbow Ridge, Royal Peacock, and Virgin Opal (Bonanza).

Building stone

Dimension stone's major uses are: rough blocks, monuments, building stone, curbing, and rubble. Estimated domestic production in 1977, was 1.3 million t valued at $104 million. Of the total, 41 percent was granite, 30 percent limestone, and 19 percent sandstone. U.S. demand for dimension stone is not expected to grow through 1985. The estimated average price in 1977 was $86/t.

During production years, tuffaceous sandstone was quarried from the north end of Virgin Valley and reportedly sold for $66/t at the quarry site (oral commun., Bob Wegman, 1976).

Uranium

In 1977 primary U.S. uranium demand for nuclear fuels was estimated to have been 11,200 t U_3O_8. An additional 270 t, from depleted uranium stocks, were consumed in non-nuclear uses such as ballast, counterweights, radiation shielding, alloys, catalysts, glass colorant, and electrical components. Recoverable mine production was 12,700 t U_3O_8. Imports of uranium concentrates and other compounds for consumption totaled approximately 3,600 t, and came primarily from Canada. United States reserves area estimated to be 620,000 t of U_3O_8 at $66/kg. In 1977, the average price of U_3O_8 was $44/kg. At year end, the spot market price was about $93/kg.

To meet the requirements of commercial power reactors during the next decade, domestic U_3O_8 production is expected to continue its rapid growth. Demand is anticipated to increase at an annual rate of 15 percent through 1985.

The average grade of ore mined by 120 operations in 1975 was 0.18 percent U_3O_8.

Uranium claims are situated sporadically throughout the range and refuge. The main group covers an area about 1.6 km wide and 3.2 km long extending north from the Virgin Valley Ranch.

PREVIOUS STUDIES

Most of the studies in the area were limited in scope. Mirriam (1910) desribed the geology of Virgin Valley and Thousand Creek Formations. Frock (1963) and Wendell (1970) described the stratigraphy and structure of the Virgin Valley-McGee Mountain-Thousand Creek area. Ross (1941), Bailey (1944), and Holmes (1965) discussed mercury potential in the Bald Mountain area, Lone Pine districts. Staatz (1951) conducted a limited reconnaissance of the uranium potential in Virgin Valley, and Stager (1959) discussed a manganese occurrence near Virgin Creek.

PRESENT STUDIES

Methods of evaluation

Courthouse records and mineral reports were used to determine the historical significance of the mining districts, and sites of claims and mineral deposits. Past and present owners of mineral properties were contacted; historical property data and production records were obtained where available. Permission to examine the properties and publish data was sought from owners to active claims. Most of the owners denied permission to examine their properties. The descriptions of properties for which permission was not granted are taken from earlier reports and, therefore, are not supported or augmented by Bureau of Mines field examinations.

All mines, prospects, and claims were sought in the field. Where permitted, the properties were examined, and where warranted, sampled and mapped.

Resources have been classified according to the following definitions adopted by the U.S. Bureau of Mines and U.S. Geological Survey (U.S. Bureau of Mines and U.S. Geological Survey, 1976).

Resource.--A concentration of naturally occurring solid, liquid, or gaseous materials in or on the Earth's crust in such form that economic extraction of a commodity is currently or potentially feasible.

Reserve.--That portion of the identified resource from which a usable mineral and energy commodity can be economically and legally extracted at the time of determination. The term ore is used for reserves of some minerals.

Indicated.--Reserves or resources for which tonnage and grade are computed partly from projection for a reasonable distance on geologic evidence. The sites available for inspection, measurement, and sampling are too widely or otherwise inappropriately spaced to permit the mineral bodies to be outlined completely or the grade established throughout.

Inferred.--Reserves or resources for which quantitative estimates are based largely on broad knowledge of the geologic character of the deposit and for which there are few, if any, samples or measurements. The estimates are based on an assumed continuity or repetition, of which there is geologic evidence; this evidence may include comparison with deposits of similar type. Bodies that are completely concealed may be included if there is specific geologic evidence of their presence. Estimates of inferred reserves or resources should include a statement of the specific limits within which the inferred material may lie.

Paramarginal.--The portion of Subeconomic Resources that (1) borders on being economically producible or (2) is not commercially available solely because of legal or political circumstances.

Submarginal.--The portion of Subeconomic Resources which would require a substantially higher price (more than 1.5 times the price at the time of determination) or a major cost-reducing advance in technology.

Sampling and analytical methods

Four hundred three lode samples ranging from 2.2 to 4.5 kg were collected during field evaluations. Four types were taken: chip, a series of continuous rock chips across or along exposure; random chip, a collection of rock chips from an exposure; grab, an unselected assortment of rock pieces from a rock pile or exposure; and select, hand-picked material of the highest grade rock available. Most of the lode samples were fire assayed to determine their gold and silver content. Samples containing visible metallic minerals were analyzed by atomic absorption, colorimetric, or X-ray fluorescence methods. At least one sample from each mineralized structure on a property was analyzed by semiquantitative spectrographic methods. If anomalous amounts of economic elements were detected in a sample by spectrography, the sample was further analyzed by more accurate means. All were checked for the presence of radioactive and fluorescent minerals.

Claims located for uranium were checked for radioactivity with a hand-held scintillation counter. Readings were recorded in milliroentgens per hour (mR/hr).

ACKNOWLEDGEMENTS

The authors wish to express their appreciation to claim holders, property owners, and local residents for their cooperation. Special acknowledgment is due Harry W. Wilson and Keith Hodson for their historical data on precious opal; and to Henry John, for his historical sketch of the area.

MINES AND PROSPECTS

Described in alphabetical order are the 41 mines, prospects, and claimed areas within or immediately adjacent to the study area that were examined.

Name: Antelope Nos. 1-18 (Lodestar Nos. 1-60)

Index Map No.: Plate 5, No. 1

Location: Secs. 22, 23, and 24, T. 45 N., R. 21 E., a short distance outside the south boundary of refuge

Elevation: 1770 to 1950 m

Access: By jeep road 10 km southwest from refuge headquarters.

History: The Antelope claims located by Curtis Mathews and W. S. Miller in December 1929, marked the first reported discovery of mercury in the Lone Pine mining district. Little exploratory work was done until the Colton Log and Lumber Co. took a bond on the property in 1939 (Bailey and Phoenix, 1944). Reportedly they recovered a small amount of mercury from a 10-pipe retort. During 1955 and 1956, a batch-type furnace plant was installed, and in 1958 development of alluvial material was undertaken (U.S. Bur. Mines, 1965). Little work has since been done on the property.

In 1969 the Lodestar Nos. 1-60 were located by Frank Margrave. The claims reported lie slightly south of the Charles Sheldon Antelope Refuge and probably overlap the Antelope group.

Previous production: Reportedly a small amount of mercury has been produced (Bailey and Phoenix, 1944).

Geology of deposit: The country rock is northerly-striking, easterly-dipping andesite flows, with associated tuffs and agglomerates. The andesite is red to black and fine-grained. The tuffs are light gray and contain a few layers of conglomerate. Andesite in the southern part of the area is overlain by a basalt flow 6 to 15 m thick. Mineralized rock is restricted to a series of steeply-dipping, northwest-trending shear zones, and to a lesser extent, alluvial material (Ross, 1941). Structures reported by Ross (1941) are obscured by colluvium.

Development: One caved, inclined shaft, reported to have been 21 m deep (U.S. Bur. Mines, 1965), 113 pits, and 39 trenches were observed (fig. 26). Nearly all workings are caved. Most excavation was done by bulldozer.

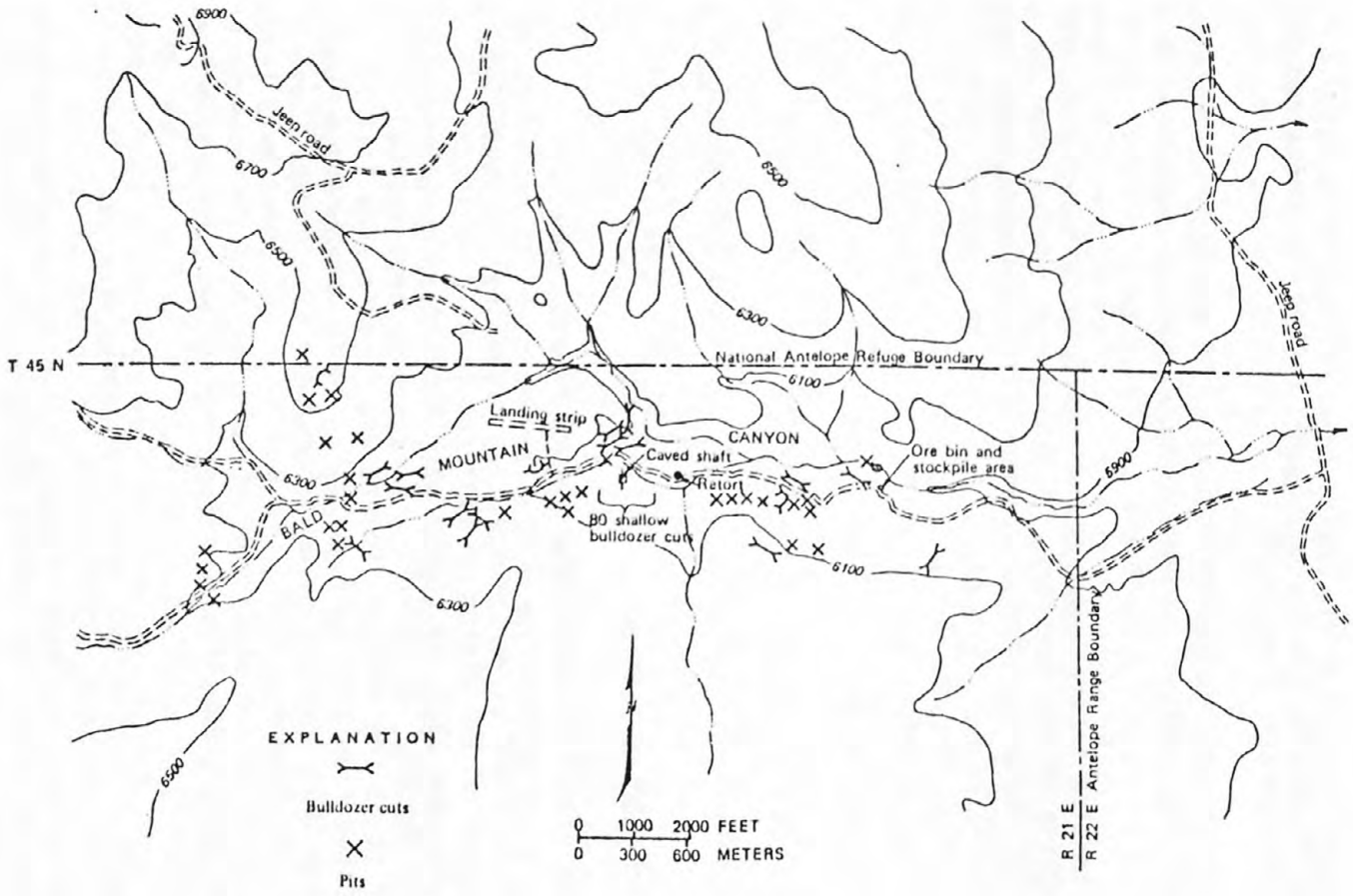


Figure 26.--Workings, Antelope group.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Sampling: In 1940 the U.S. Geological Survey cut four samples across seams 48, 36, 15, and 122, 91, 38, 25 cm thick that assayed 0.29, 0.07, 0.18, and 0.70 percent mercury, respectively (Ross, 1941).

Four samples cut by the Colton Log and Lumber Co. contained 0.35, 0.33, and 0.075 percent mercury (Ross, 1941).

During the present field investigation, 59 samples from rock in place and dumps of workings assayed as much as 0.073 percent mercury with an average of 0.005 percent.

Conclusions: Sampled material was probably diluted by weathering and resultant sloughing of the workings. A random grab sample from the ore bin assayed 0.073 percent mercury. Mercury-bearing structures do not extend into the refuge.

Name: Bald Mountain claims

Index Map No.: Plate 5, No. 2

Location: Secs. 5, 6, 7, 8, 9, 10, 15, 16, 17, and 18, T. 45 N., R. 21 E.

Elevation: From 1830 to 2190 m

Access: By jeep road 3 km south from refuge headquarters.

History: Early gold and silver prospecting, from 1897 through 1909, led to the location of 109 claims on adjacent to Bald Mountain. In the two years 1911 and 1918, 25 claims were located. In December 1929, the discovery of mercury, south of the refuge boundary, sparked exploration for it in the refuge. Courthouse records show that 30 claims were located from 1930 through 1941. During the uranium boom years of 1954 and 1955, 140 claims were located. Five groups (Nevada Guy Nos. 1-43, Lone Pine Nos. 1-29, Jim Bum Nos. 1-22, Amar Nos. 1-20, and Hades Nos. 1-13) on the south side of Bald Mountain comprise most of the claims. Some groups appear to overlap others. No claims have been located since 1955.

Geology of deposit: Country rock is predominantly andesite with associated tuff and ash beds, although rhyolite crops out in the southwest corner of Sec. 8. Most of the gold and silver claims are in an area underlain by tuff. The tuff is mostly vitric. The textures grade from very fine to coarse and sugary; some are welded. Colors are cream, light green, yellow, pink to purple, brown, and red. Much of the tuff has altered to bentonitic clay. Most of the uranium claims are underlain by fine-grained, dark-colored andesite.

Development: Four caved adits, 2 shafts, 5 cuts, 36 pits, and 60 trenches were found in the area (fig. 27). Most of the workings are caved.

Sampling: A total of 86 samples were taken. Of extremely altered volcanic rocks, one grab sample assayed 1.4 g/t, three others assayed 0.3 g/t, and still another 113 g/t.

A chip sample from a 1.3- to 5-cm-thick quartz vein in light purple to brown welded tuff assayed .06 percent mercury. A 1.34-m chip sample taken across a shear zone striking N. 55' W. and dipping 80' S. in a purple welded tuff assayed 0.023 percent mercury and a grab sample of highly altered green and pink silicified ash assayed 0.02 percent mercury.

Conclusions: Assay results of anomalous gold, silver, and mercury suggest low-grade recovery potentials. Geochemical work by the U.S. Geological Survey indicates a high potential for deposits of mercury and for concealed base and complex precious-metal sulfide deposits.

Name: Bighorn group

Index Map No.: Plate 5, No. 13

Location: Sec. 2, T. 44 N., R. 24 E.

Elevation: 1830 m

Access: By jeep road 16 km southwest from Virgin Valley Ranch, then by cross-country travel 1.6 km east

History: The Big Horn, Little Horn, and Mountain Sheep claims were located in 1960 by Vottero.

Geology of deposit: Weathered rhyolite

Development: None

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.02 to 0.03 mR/hr were observed. Four random chip rhyolite samples each had less than 0.001 percent U_3O_8 and a trace silver.

Conclusions: No economic mineral potential.

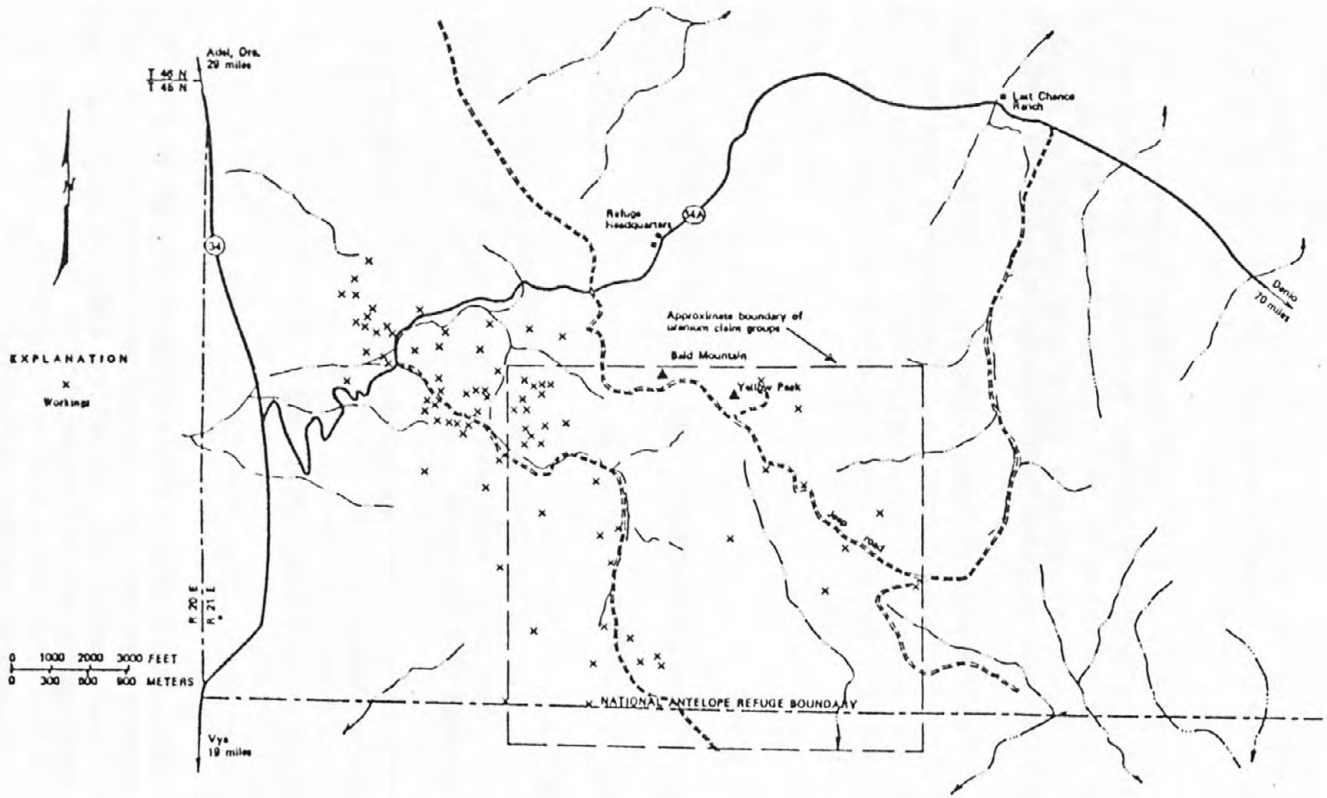


Figure 27.--Workings, Bald Mountain claims.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Name: Blue Dragon Nos. 1-3

Index Map No.: Plate 5, No. 35

Location: Sec. 24, T. 44 N., R. 24-1/2 E.

Elevation: 1710 to 1800 m

Access: By jeep road 26 km southwest from Virgin Valley Ranch

History: The claims were located by Vincent Palmer in 1968 for mercury.

Geology of deposit: The area is underlain by ash beds that have been partially altered to montmorillonite clay. A silicified breccia zone crops out over a 183 m square area. The zone has angular fragments of cream- to pink-colored ash in a matrix of clear to light-pink silica. Mercury minerals are scarce.

Development: One shaft, 13.4 m deep, three bulldozer cuts, one pit, four trenches, and one caved adit or trench.

Sampling: Nine samples from rock in place and from workings dumps assayed a trace of gold, and as much as 10 g/t and 0.006 percent mercury.

Conclusions: Low mineral potential.

Name: Charline Nos. 1 and 2

Index Map No.: Plate 5, No. 5

Location: Secs. 14 and 15, T. 46 N., R. 23 E.

Elevation: 2012 m

Access: By Highway 34A, 10 km west from the junction with Highway 8A, then by cross-country travel 1.6 km north

History: Located by Charline Brown in 1956

Geology of deposit: Gray to reddish-brown banded rhyolite

Development: None

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding the background count of 0.025 to 0.03 mR/hr were observed. Three random chip samples from rhyolite outcrops had no anomalous metallic content.

Conclusions: No economic mineral potential.

Name: Crater group

Index Map No.: Plate 5, No. 36

Location: Secs. 15, 16, and 22, T. 44 N., R. 24 E.

Elevation: 2110 to 2170 m

Access: By jeep road 24 km southwest from Virgin Valley Ranch

History: Thirty-one claims were staked in 1954 by Harry W. Wilson, and others.

Geology of deposit: Iron-oxide-stained, light-gray rhyolite

Development: Twenty discovery pits observed

Sampling: Discovery pits were checked for radioactivity with a scintillation counter. Background readings of 0.04 to 0.045 mR/hr were observed. One small area near the summit of Blowout Mountain had a reading of 0.07 mR/hr. Sixteen samples of rhyolite and residual soil each contained a trace silver and less than 0.001 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Echo group

Index Map No.: Plate 5, No. 6

Location: W1/2 sec. 31, T. 46 N., R. 24 E.

Elevation: 1860 m

Access: By State Highway 8A, 6.4 km from junction with State Highway 140.

History: Twelve mining claims were located in 1955 by S and S Exploration Co.

Geology of deposit: The area is underlain by rhyolite and recent alluvium. No mineralized structures were observed.

Development: Eight shallow bulldozer cuts in alluvium

Sampling: All bulldozer cuts and outcrops were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.03 to 0.035 mR/hr were observed. Four samples from bulldozer cuts and six from rhyolite outcrops assayed a trace silver and less than 0.001 percent U_3O_8 each.

Conclusions: No economic mineral potential.

Name: Eddy group

Onwer: Charles L. Eddy and others

Index Map No.: Plate 5, No. 23

Location: Secs. 5 and 8, T. 45 N., R. 26 E.

Elevation: 1555 m

Access: By Virgin Valley road 8 km south from junction with State Highway 140, then by good dirt road 0.8 km northwest

History: The group consists of 21 claims: West Gem Hill, Mayday, Bluebird, Richard, Patrick, Crazy Indian, Lil Abner, Daisy Mae, No. 2 Opal, Hidden Valley, Lu Lu, Sparkle Plenty, Windfall, Marvelous, Lorrie Lee, East Gem Hill, Nancy's Nightmare, Sun Valley, Evening Star, Opal Valley, and New Moon. One claim was located in 1948, the others 1969 through 1974.

Previous production: Mr. Eddy stated that some precious opal has been produced but did not specify the amount.

Geology of deposit: An opal-bearing horizon is in slump blocks of bedded volcanic tuffs, ash, and tuffaceous sandstone and siltstone. The horizon is bentonitic, greenish in color, and contains wood fragments and pebbles. In places, it is 1.8 m thick. Sediments range in dip from flat-lying to as much as 30 degrees. The opal-bearing horizon is difficult to trace because it is slumped and tilted.

Development: Approximately 70 pits and bulldozer trenches were observed. Some trenches are several hundred feet long (fig. 28).

Sampling: Sampling consisted of digging into exposed beds and observing the presence or absence of indicators of precious opal. Common opal was observed at numerous places.

Conclusions: The likelihood of additional precious opal is high.

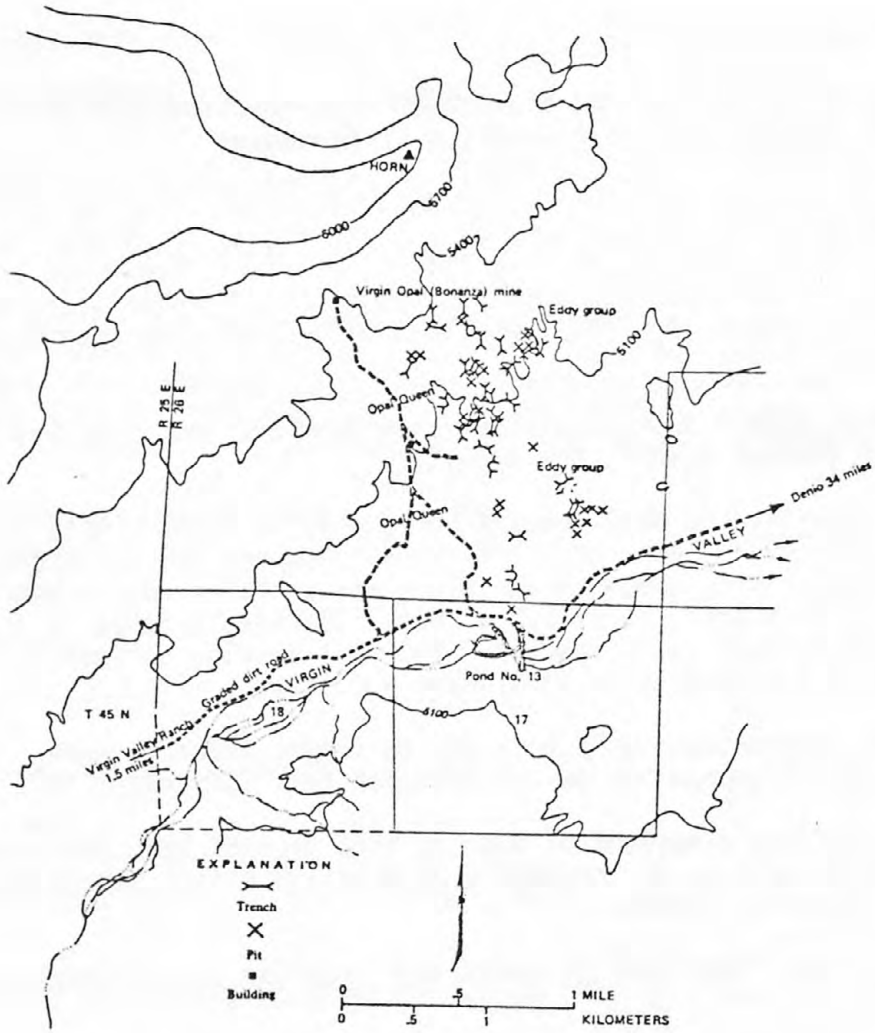


Figure 28.--Workings, Eddy group.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Name: Fortune group, Uranium King, and Lucky Jack

Index Map No.: Plate 5, No. 18

Location: Secs. 29, 31, and 32, T. 46 N., R. 27 E.

Elevation: 1330 to 1420 m

Access: By State Highway 140, 37 km west from Denio

History: The Fortune group, consisting of 20 claims, was located in 1955 by Charles Baker. The Uranium King and Lucky Jack claims were located in 1955 by Jack Neal and Roy Clifton.

Geology of deposits: Alluvium containing abundant rhyolite and basalt cobbles overlies tuffaceous sediments. Rhyolite crops out on the south end of the claim block.

Development: Approximately 45 bulldozer cuts

Sampling: All workings were checked for radioactivity with a scintillation counter. No reading exceeding a background count of 0.015 to 0.03 mR/hr was observed. Twelve samples from bulldozer cuts had no anomalous metallic content.

Conclusions: No economic mineral potential.

Name: Golden Cash, Jackpot, Buried Treasure, and Golden Horde

Index Map No.: Plate 5, No. 39

Location: Sec. 36, T. 44 N., R. 24 E.

Elevation: 1890 m

Access: By jeep road 16 km south from Virgin Valley Ranch.

History: Carl A. Stone and Dorothy J. Alford each located two claims in 1954.

Geology of deposit: Gray to green rhyolite

Development: None

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.025 to 0.035 mR/hr were observed. Four random chip samples of rhyolite each contained a trace gold and silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Goodwill

Index Map No.: Plate 5, No. 20

Location: Sec. 2, T. 45 N., R. 26 E.

Elevation: 1490 m

Access: By dirt road 1.6 km south from Duffurrena Sub-headquarters.

History: The claim was located as a "mercury and hydrothermal lode" in 1974 by Harry W. Wilson.

Geology of deposit: The claim is underlain by beds of ash, ash partially altered to montmorillonite clay, and tuffaceous sandstone striking N. 10' W. and dipping 1' to 5' SW. The ash bed contains numerous geodes.

Development: Five pits

Sampling: One sample was taken from the pits and contained 20 ppm mercury.

Conclusions: The claim has no economic potential for mercury. The geodes may have some economic value. The tuffaceous sandstone is relatively unfractured and its thickness, cleavability, and horizontal dimensions are such that it may be suitable for dimension stone.

Name: Grubstake Nos. 1-4

Index Map No.: Plate 5, No. 29

Location: Secs. 22, 26, and 27, T. 45 N., R. 25 E., south of Mud Spring Canyon, 1.6 to 3.2 km west of Virgin Valley Ranch

Elevation: 1600 to 1720 m

Access: By dirt road 1.6 km west from Virgin Valley Ranch

History: The Grubstake group was located in 1955 by Grace Cummings and Meed Cooley.

Geology of deposit: Colluvium overlying gray to reddish rhyolite bedrock

Development: Sixteen bulldozer cuts in colluvium. Most are shallow, range from 6 to 107 m in length, and are along the north side of the road over a distance of about 2.4 km

Sampling: All workings were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.03 to 0.06 mR/hr were observed. Five grab samples of soil and rock from the bulldozer cuts and one chip sample of rhyolite assayed no anomalous metallic content.

Conclusions: No economic mineral potential.

Name: Hope Group

Index Map No.: Plate 5, No. 30

Location: Sec. 21 T. 45 N., R. 25 E.

Elevation: 1798 m

Access: By jeep road 6 km west from Virgin Valley Ranch

History: Thirty-five claims were located by E. Plaskett in 1956.

Geology of deposit: Gray to reddish-brown banded rhyolite and recent alluvium

Development: Thirteen shallow bulldozer cuts in alluvium along the jeep road

Sampling: Bulldozer cuts and rhyolite outcrops were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.025 to 0.03 mR/hr were observed. Ten samples of alluvium and rhyolite assayed no anomalous metallic content.

Conclusions: No economic mineral potential.

Name: Kim Nos. 1-9

Index Map No.: Plate 5, No. 14

Location: Sec. 23, T. 45 N., R. 24 E.

Elevation: 1830 to 1840 m

Access: By State Highway 8A, 18 km south from junction with State Highway 140, then by dirt road 8 km east

History: The claims were located September 1955 by Kenneth Arnold.

Geology of deposit: Basalt cap rock over rhyolite breccia and tuff

Development: Five shallow bulldozer cuts

Sampling: Bulldozer cuts were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.02 to 0.04 mR/hr were observed. Five samples from bulldozer cuts each contained a trace gold and silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Ladd and Shepardson's group

Index Map No.: Plate 5, No. 26

Location: Secs. 24 and 25, T. 45 N., R. 26 E.

Elevation: 1520 to 1670 m

Access: By dirt road 8 km south from Duffurrena Sub-headquarters.

History: A group of 12 claims was located in 1956 by Ladd and Shepardson.

Geology of deposit: Alluvium overlies rhyolite and light gray, green, and yellow welded tuffs. No mineralized structures were observed.

Development: Three pits, two bulldozer cuts, and three roads or cuts totaling about 3 km in length.

Sampling: Five samples taken from rock in place and from dumps of bulldozer cuts assayed only a trace uranium.

Conclusions: No economic mineral potential.

Name: Lemac Nos. 1-5

Owner: Tom Conner

Index Map No.: Plate 5, No. 19

Location: Sec. 2, T. 45 N., R. 26 E.

Elevation: 1478 m

Access: By Virgin Valley road 3 km south from junction with State Highway 140.

History: Stone was first quarried from the deposit in the early 1870's; it was used in the contruction of homesteads in northwestern Nevada. Prior to 1952, Mr. Turner held the claims (personal commun., Henry John, 1976); in 1952, Bob Wegman and his brothers, William and Theron started production at the site. A cable saw capable of cutting 82 t without being moved, three mud saws for slabbing, and a guillotine crusher were installed. The Wegmans worked the quarry for 15 years before abandoning the claims (oral commun., Bob Wegman, 1976). The claims were relocated in 1970 by Mike Lee, and acquired in 1972 by Tom Connors, the present owner (personal commun., Henry John, 1976).

Previous production: The only recorded production was that of Wegman's. Approximately 50 percent of the stone mined was suitable for shipping. During 15 years of operation, about 16,000 t were shipped to outlets from as far away as Spokane, Washington, and southern Nevada. At the quarry site stone sold for $66/t (oral commun., Bob Wegman, 1976).

Geology of deposit: Permission for the Bureau of Mines to examine the claims was not received. According to Wendell (1969), "One of the flaggy volcanic siltstone units within the Red Member of the Virgin Valley Formation was commercially quarried for ornamental building stone until 1967. The unit is 5 to 6 m thick in the vicinity of the quarry and thins rapidly in all directions."

Outside the claim boundaries, the flaggy siltstone unit ranges from 0.5 to 0.9 m thick, averaging 0.8 m thick and underlies at least 53 h north and northwest of the quarry. The unit is essentially flat lying, but locally dips as much as 8' both northwest and southeast. The siltstone beyong the claim boundaries is too thin and broken for use as quality ornamental stone.

Development: A quarry which appears to be 61 by 122 m

Conclusions: Probably, under favorable economic conditions, production could be resumed.

Name: Lucky Four

Index Map No.: Plate 5, No. 17

Location: Sec. 33, T. 47 N., R. 26 E.

Elevation: 1710 m

Access: By State Highway 140, 43 km west from Denio, then by cross-country travel 6 km northwest.

History: One 32.4-h placer claim was located by Claude Noble in 1951.

Geology of deposit: The claim is underlain by recent alluvium and basalt. No mineralized structures were observed.

Development: None

Sampling: One sample assayed a trace silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Lucky Horshoe group

Index Map No.: Plate 5, No. 38

Location: Sec. 6, T. 43 N., R. 25 E.; Sec. 31, T. 44 N., R. 25 E., and Sec. 36, T. 44 N., R. 24-1/2 E.

Elevation: 1905 to 2045 m

Access: By jeep road 13 km south from Virgin Valley Ranch

History: Fourteen claims were located in 1955 by P. B. Meyers, J. Meyers, W. W. Ware, and G. Kendricks.

Geology of deposit: Gray to green rhyolite

Development: None

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.025 to 0.030 mR/hr were observed. Ten random chip samples of rhyolite each contained a trace gold and silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Lucky Jim Nos. 1-8 and Apex

Index Map No.: Plate 5, No. 11

Location: Sec. 32, T. 45 N., R. 24 E.

Elevation: 1900 m

Access: By State Highway 8A, 19 km south from junction with State Highway 140, then by jeep road 3 km east

History: The Lucky Jim group was located in 1955 by Ralph Peterson, and the Apex in 1955 by Gus Pearson.

Geology of deposit: Colluvium and alluvium over rhyolite bedrock

Development: Four bulldozer pits in alluvium

Sampling: All bulldozer pits were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.015 to 0.03 mR/hr were observed. Four samples of soil from bulldozer pits each contained a trace gold and silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Lucky Strike

Index Map No.: Plate 5, No. 33

Location: Sec. 12, T. 44 N., R. 24-1/2 E.

Elevation: 1920 m

Access: By State Highway 8A, 19 km south from junction with State Highway 140, then by jeep road 14 km east.

History: Located in 1949 by Mary Lamb and Vincent Marconi.

Geology of deposit: The claim is underlain by ash beds. A 4.9-m wide fault zone trending N. 74' W. and intermittently exposed for 97.5 m contains brecciated ash layers in a siliceous matrix.

Development: A trench 7.6 m wide, 33.5 m long, and 3.7 m deep is the principal working. Eight other small trenches and pits are on the zone.

Sampling: Two chip samples across the zone each contained a trace gold and 3.4 g/t of silver.

Conclusions: No economic mineral potential.

Name: McKenney Camp uranium claims

Index Map No.: Plate 5, No. 15

Location: Secs. 15, 21, 22, 23, 27, and 28, T. 46 N., R. 25 E.

Elevation: 1550 to 1680 m

Access: By State Highway 140, 62 km west of Denio

History: The area contains 116 mining claims located from 1955 through 1969 by various persons. Many are relocations.

Geology of deposit: The claims are underlain by recent alluvium and gray to dark purplish rhyolite. No mineralized structures were observed.

Development: Fifteen shallow bulldozer cuts in alluvium

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.02 to 0.04 mR/hr were observed. Thirty-two samples from rock in place and bulldozer cuts contained no more than a trace gold and silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Mesa

Index Map No.: Plate 5, No. 31

Location: Sec. 31, T. 45 N., R. 26 E.

Elevation: 1890 m

Access: By jeep road 3 km southeast from Virgin Valley Ranch

History: Located in 1953 by MacDonald

Geology of deposit: Flay-lying basalt caps volcanic sediments

Development: Shallow bulldozer cuts in residual soil overlying the basalt

Sampling: One bulldozer cut grab sample had no anomalous metallic content.

Conclusions: No economic mineral potential.

Name: Meyer group mine

Onwer: John and Virgie Meyer

Index Map No.: Plate 5, No. 24

Location: Sec. 17, T. 45 N., R. 26 E.

Elevation: 1500 to 1570 m

Access: By Virgin Valley road 4 miles (6 km) south from Duffurrena Sub-headquarters

History: The group consists of five claims. The Becky, Mucket, and White Hills claims were located in the summer of 1954, and the Moon Walk in July 1969. Former owners of the Black Hope quit claimed to Meyer in 1971. Meyer leased the Becky and Mucket claims to Opals Incorporated from about 1969 to 1971.

Production: Owner's income from the Becky and Mucket claims during 1969 to 1971 was approximately $3,500; $1,500 of which was from leasing and $2,000 from opals produced by the lessee. The $2,000 represents 5 percent of the total opal value.

The owners themselves mined $2,000 worth of opal from the Black Hope, White Hills, and Moon Walk claims.

Total opal value produced from the Meyer group is estimated to be $42,000.

Geology of deposit: Nearly horizontally-bedded lacustrine sediments of volcanic tuff, ash, and ashy sandstone and siltstone have occasional layers of gypsum and pieces of wood in various stages of petrification. Tuff layers exposed to weathering are altered to montmorillonite. Petrified wood and small fragments of precious opal were found in the tuff exposed by the largest bulldozer cut on the Moon Walk claim. The opal-bearing tuff horizon is 3 m thick in places. A well-exposed contact between tuff and an overlying bed of ash has an apparent dip of 3' N.

Development: Thirteen bulldozer cuts and one pit was observed (fig. 29). A small wooden storage shed is on the White Hills claim.

Sampling: Sampling consisted of digging into the exposed beds and observing the presence or absence of indicators of precious opal. Small fragments of precious opal were observed.

Conclusions: The Meyer claims have a precious opal potential. About 12 h, underlain by the opal-bearing horizon, are minable. This is based on a strike length of 1,830 m and an economic width limit of 60 m. Beyond 60 m, the stripping ratio would be excessive.

Name: Obsidian group, Columbia and Loise

Index Map No.: Plate 5, No. 9

Location: Secs. 2 and 11, T. 44 N., R. 23 E.

Elevation: 1830 to 1950 m

Access: By State Highway 8A, 22 km south from junction with State Highway 140

History: The Obsidian group consists of eight claims located in 1955 by Carl H. Ripattee and H. E. Alloway. The Columbia and Loise claims were located in 1956 by Carol J. Hicks.

Geology of deposit: Recent alluvium overlies gray rhyolite with feldspar phenocrysts. No mineralized structures were observed.

Development: One shallow bulldozer cut in alluvium

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.02 to 0.03 mR/hr were observed. Ten samples of alluvium and rhyolite had traces of gold and silver, and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

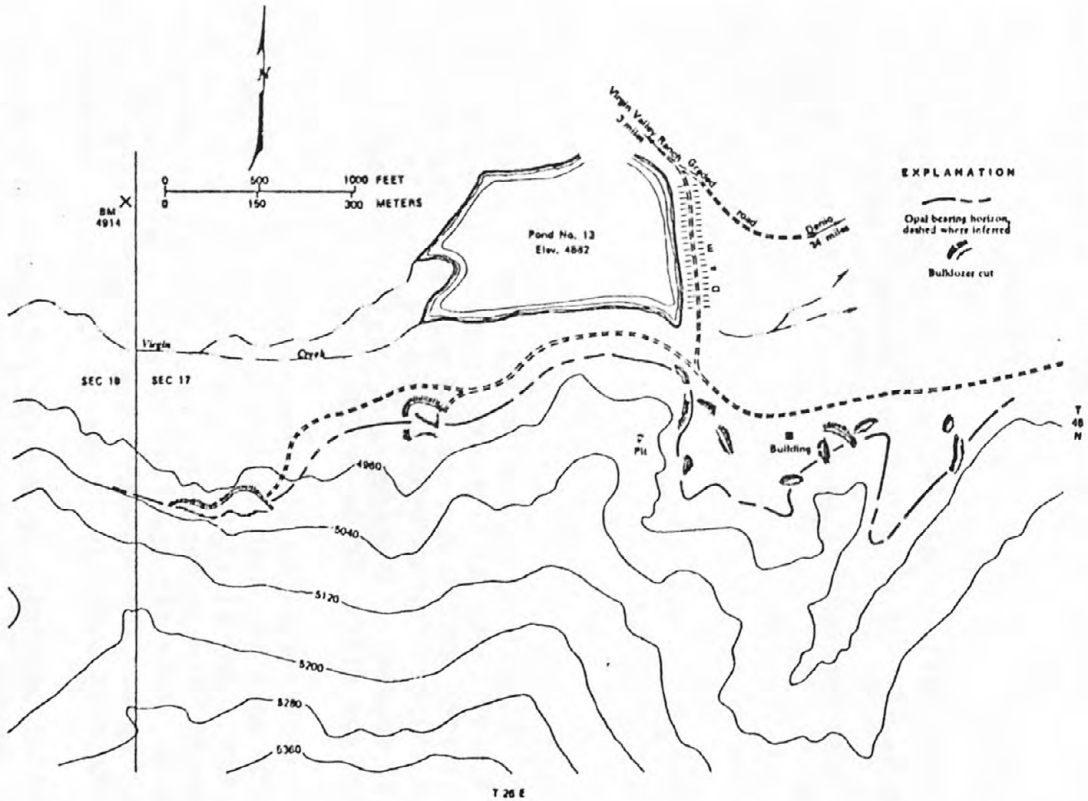


Figure 29.--Meyer group mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Name: Opal Queen group mine

Owner: Ed and Louise Mitchell

Index Map No.: Plate 5, No.22

Location: Secs. 7 and 8, T. 45 N., R. 26 E., on the north side of Virgin Valley

Elevation: 1555 m

Access: By Virgin Valley road 6 km south from Duffurrena Sub-headquarters, then by dirt road 0.8 km north

History: The mine consists of seven claims. The Opal Queen claim, located October 30, 1908, may be the earliest mineral location in Virgin Valley. The Lucky Lou, Miserable Mitch, Bell, Le-Bob, Black Beauty, and Beautiful Opal were located by the Mitchells in 1969 and 1970.

Precious production: Precious opal has been produced from the property for many years. The amount is unknown.

Geology of deposit: An opal-bearing horizon is in slump blocks of bedded, volcanic tuff, ash, and tuffaceous sandstone and siltstone. Some tuff layers exposed to weathering are highly altered to montmorillonite clay. The opal-bearing horizon is bentonitic, greenish in color, and carries wood fragments and pebbles. The horizon is sometimes 1.8 m thick. The sedimentary rocks range in dip from flat lying to 45 degrees. Slumping and rotation of the blocks make the opal-bearing horizon difficult to trace.

Development: Approximately 50 pits and trenches were observed (fig. 30). Most of the work has been done on a slump block which tilts as much as 45 degrees. Actual depth of mining cannot be measured because of caving. However, the opal-bearing horizon has been mined for a distance of 180 m. Many old workings have been obliterated by more recent bulldozer work. The claimants are presently working on an area 76 m south of the main workings in nearly horizontal sediments.

Sampling: Sampling consisted of digging into exposed beds and observing the presence or absence of indicators of precious opal. At the time of examination, the claimants removed several precious opals. One specimen of the black variety measured about 5 cm by 2.5 cm by 3.8 cm and was valued at several hundred dollars.

Conclusions: The likelihood of additional precious opal is high. The area presently being mined and developed covers 0.4 to 0.8 h.

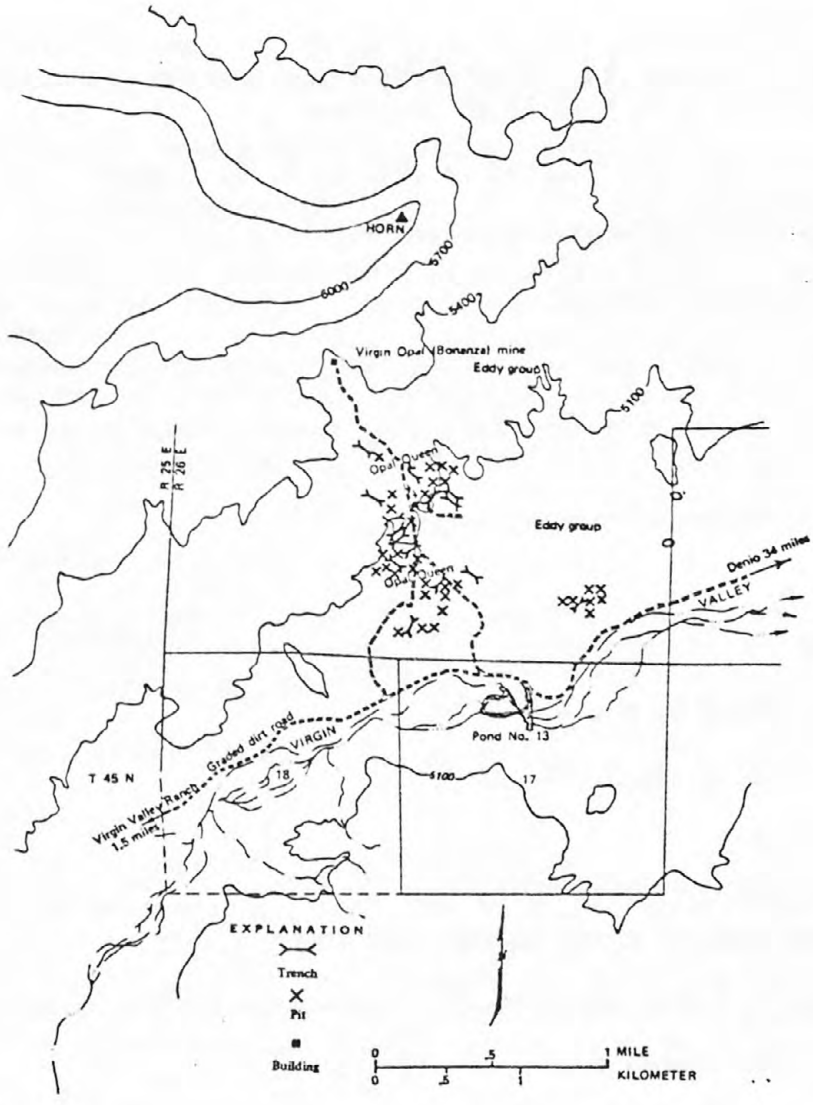


Figure 30.--Workings, Opal Queen group mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Name: Pretty Rock group

Index Map No.: Plate 5, No. 41

Location: Sec. 28, T. 43 N., R. 23 E.

Elevation: 1783 m

Access: By State Highway 8A, 27 km south from junction with State Highway 140, then by dirt road 18 km southeast

History: Four claims were located in 1955 by B. D. Steward

Geology of deposit: Tuffaceous rock and rhyolite

Development: One bulldozer cut

Sampling: The bulldozer cut and outcrops were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.015 ti 0.02 mR/hr were observed. Two random grab samples had traces of gold and silver, and less than 0.001 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Prospect

Index Map No.: Plate 5, No. 4

Location: Sec. 28, T. 46 N., R. 23 E.

Elevation: 2088 m

Access: By State Highway 34A, 8 km west from junction with State Highway 8A, then cross-country travel 3 km south

Geology of deposit: Gray rhyolite with iron-oxide surface coatings

Development: Claim monument

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background of 0.02 to 0.03 mR/hr were observed. One random grab sample had no anomalous metallic content.

Conclusions: No economic mineral potential.

Name: Prospect

Index Map No.: Plate 5, No. 8

Location: Sec. 3, T. 44 N., R. 23 E.

Elevation: 1920 m

Access: By State Highway 8A, 24 km south from junction with State Highway 140, then by cross-country travel 1.6 km west

Geology of deposit: Basalt capping volcanic sediments

Development: 4.6-m-diameter pit

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.025 to 0.03 mR/hr were observed. Two chip samples of basalt contained traces of gold and silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Rainbow Ridge Opal mine

Owner: Keith Hodson

Index Map No.: Plate 5, No. 25

Location: Secs. 22 and 23, T. 45 N., R. 26 E.

Elevation: 1524 m

Access: By dirt road 8 km south from Duffurrena Sub-headquarters

History: The first discovery of precious opal in Virgin Valley reportedly took place in 1905 or 1906 where the Rainbow Ridge Opal mine is presently located (Hodson and Dake, 1950). The original claims were owned by D. Roop, E. McGee, and George T. Hill (U.S. Geol. Survey, 1913).

Opal chips were found on the east side a of small hill in 1908, and a tunnel, about 100 m long, was dug (Hodson and Dake, 1950). A large open cut is at the site of the original portal.

In 1917, the Roebling Opal, weighing 2,665 carats (553 g), was found at the Rainbow Ridge mine. It was purchased by the late Colonel Roebling and is on display in the U.S. National Museum in Washington, D.C. At time of discovery, the opal was valued between $50,000 and $250,000 (U.S. Geol. Survey and Nevada Bur. Mines, 1964).

In 1929, six claims were patented; the Royal Opal, Rincon Belle, Black Opal Nos. 1, 2, and 3, and Pandora.

Little work was done at the Rainbow Ridge Opal Mine from 1920 until 1949 when Keith Hodson purchased the claims, installed electric lights in the underground mine, and started several crosscuts and a drift. He also excavated two large open cuts. In 1952, while working underground, he discovered the Hodson black fire opal weighing 2.95 kg, then valued at $50,000 (U.S. Geol. Survey and Nevada Bur. Mines, 1964).

During the past several years, Mr. Hodson has been working the Virgin Opal claim, which he purchased in 1955, and consequently, little work has been performed at the Rainbow Ridge Opal mine.

Previous production: Two very large, and numerous smaller, precious opals.

Geology of deposit: The Rainbow Ridge Opal mine is underlain by nearly horizontal ash, tuff, and tuffaceous sandstone beds. The opal-bearing horizon averages 1.2 m thick and is predominantly bentonite containing pods of ash, rhyolite pebbles, petrified wood, and opal. The amount of petrified wood increases downward within the opal-bearing horizon, Precious opal at the Rainbow Ridge Opal mine occurs as "conk" and as void fillings left where wood has rooted away. "Conk" is formed when opal fills the voids between growth rings in partially petrified wood.

Development: Two large cuts and eight smaller pits were observed (fig. 31). The largest cut is 97.5 m long, 76.2 m wide, and exposes a 10.4-m vertical section; the smaller is 45.7 m long, 70.1 m wide, and exposes a 6.7-m vertical section. Undergound workings total an estimated 228 m. The Hodsons have a home, trailer house, work shop, and rock display room on the property.

Sampling: Sampling consisted of digging into exposed beds and observing the presence or absence of indicators of precious opal. Fragments of precious opal were observed at numerous places.

Conclusions: The precious opal potential is high. More than 8.1 h are underlain by the precious opal-bearing horizon and projections of the strike and dip suggest substantially more.

The opalescence of the black fire opals found at Rainbow Ridge Opal mine is equal to the best in the world; however, the quality of the opal for cut gems is poor. Cabochons cut from the opal usually check within five years (Hodson and Dake, 1950).

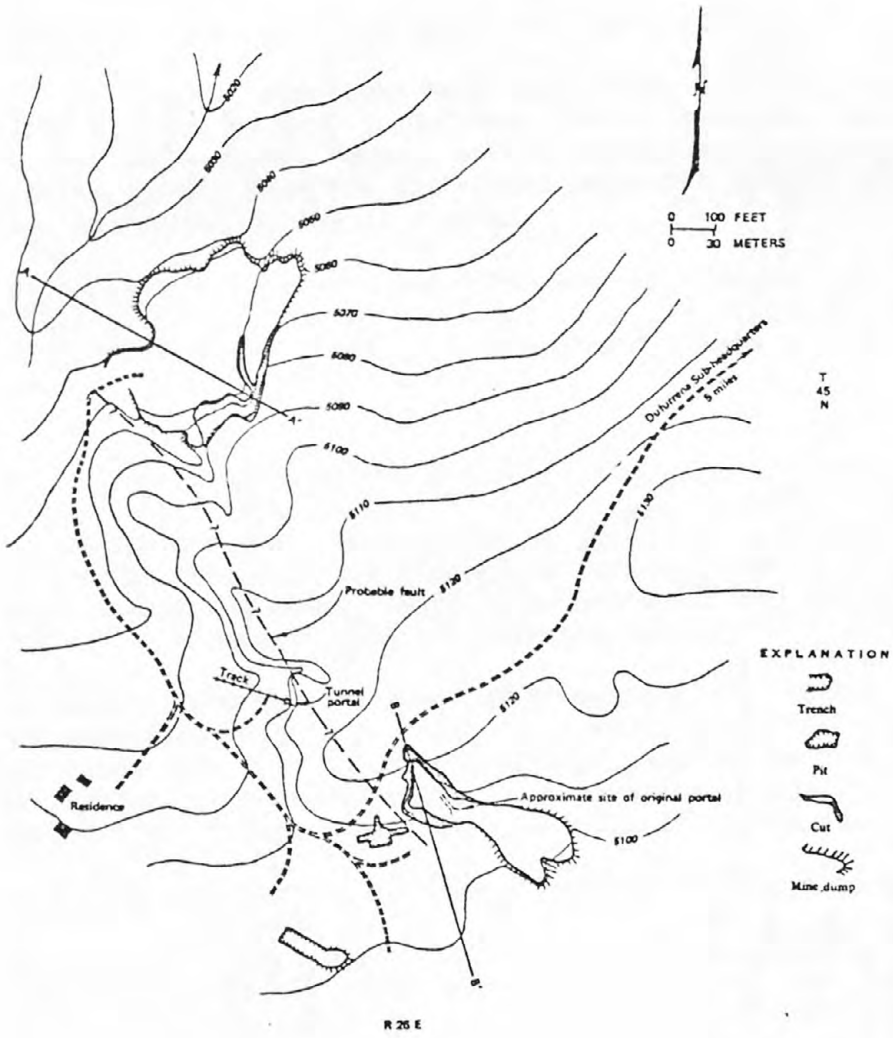
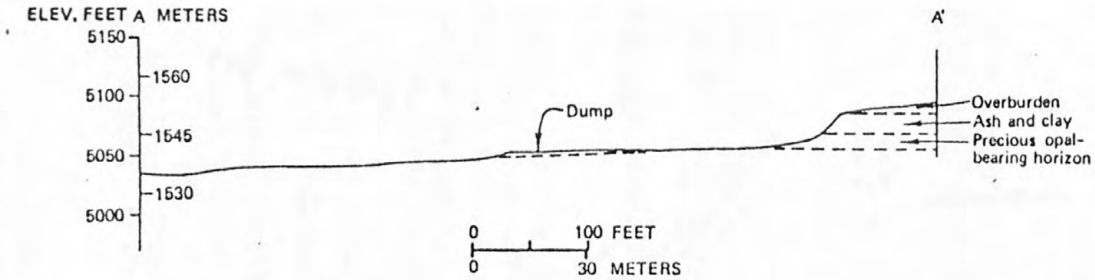


Figure 31.--Rainbow Ridge Opal mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.



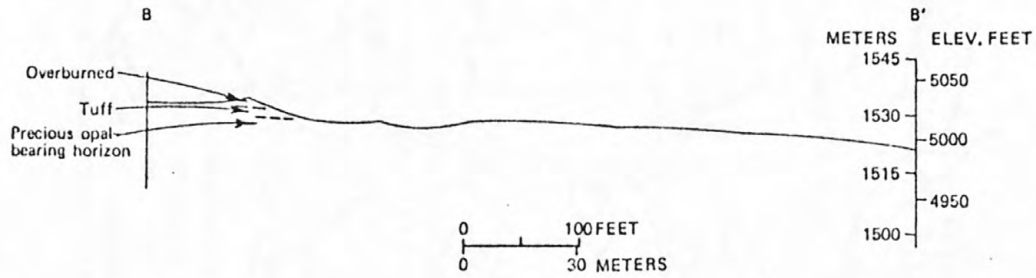


Figure 31a.--Rainbow Ridge Opal mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Name: Raven Manganese group

Index Map No.: Plate 5, No. 34

Location: Sec. 15, T. 44 N., R. 25 E.

Elevation: 1743 to 1768 m

Access: By jeep road 6 km south from Virgin Valley Ranch.

History: Three claims, the Raven Manganese, Black Bird, and Eagle, were located July 8, 1953, by Carl S. DuChemin, D. S. Symington, and A. G. Knab. In June 1959, at the request of the owners, Hal Stager of the U.S. Geological Survey examined the claims under the Defense Minerals Exploration Adminstration (DMEA) program.

Geology of deposit: The claims are in an area of moderate relief underlain by volcanic flows and tuffs. Most of the volcanic rocks are rhyolitic to andesitic in composition and area flatlying or dip a few degrees north.

One sample submitted to the U.S. Geological Survey by Mr. Knab was identified as cryptomelane [$K\ (Mn^{2+}\ ,\ Mn^{4+})_8O_{16}$]. In 1959, 17 beds of cryptomelane-rich material were exposed by shallow trenches and pits. They averaged 15 cm in thickness and cropped out over an area 91 m long and 30 m wide (Stager, written commun., 1959). The exposures are now obscured by the weathering and sloughing of pits and trenches.

The workings expose three beds of brown to black, earthy to slaty, cryptomelane-bearing material. The beds, conformable with the bedding of the volcanics, range from 8 to 13 cm in thickness, and can be traced for 24 m. The upper crytomelane-bearing bed is 3.7 m stratigraphically above the other two. The two lower beds are separated by 0.3 m of glassy ash.

Development: Three sloughed, shallow, hand-dug trenches 4 to 23 m long

Resource estimate: Stager estimated an aggregate thickness of 2.4 m of mineralized rock in about 15 m of sediments. Assuming this aggregate thickness is persistent over the 91 m of strike length and that it extends downdip 31 m, there are about 18,000 t of mineralized rock containing as much as 10 percent manganese in about 113,000 t of material.

Conclusions: Because the mineralized rock is in thin beds throughout nonmineralized material, considerable dilution would occur during mining. This, together with the small tonnage and low grade, makes the resource submarginal at best.

Name: Royal Peacock mine

Owner: Harry W. Wilson

Index Map No.: Plate 5, No. 27

Location: Secs. 17, 18, 19, and 30, T. 45 N., R. 26 E.

Elevation: 1494 to 1676 m

Access: By Virgin Valley road 13 km south from junction with State Highway 140

History: The date of the original location and the name of the locator are unknown. During the 1920's and 1930's, Mr. Rhinehart and Dan Arachevaleta owned a group of claims where the present group is located: Kelly, Skajwm, Royal Peacock Nos. 1 and 2, Northern Light, Peacock Nos. 2-4, Phantom, Little Pebble, Pebble, Angel Nos. 1 and 2, Starfire, Red Ball, Yellow Ball, Star Bright, and Blue Ball. Flora Haines Locheed and Mark Foster relocated the claims in 1937. In 1939, Flora Locheed quit claimed her interest to Mark Foster. H. W. Wilson's father purchased the group in 1942. In 1968, the claim group was leased by William J. Kelley. Mr. Kelley formed Opals Incorporated, and with the help of Allan Carlson, discovered a method of stabilizing Virgin Valley opal. Opals Incorporated last worked the claims in 1973. Harry W. Wilson bought the company in July 1974, and produced a small amount of opal during the remainder of the year. In 1975, Wilson stripped overburden in preparation for production in 1976.

Previous production: There is no record of production prior to 1969, but a small amount of opal was mined and sold locally according to H. W. Wilson.

Opals Incorporated produced 363 kg of opal in 1970, and 354 kg in 1971. Although the total 1972 yield is unknown, it included one rich pocket which sold for more than $90,000 (wholesale price). In 1973, 227 kg were reported. The Royal Peacock opal, weighing 191 carats (38.2 g) was found in 1970, and may be worth $250,000. The higher-quality opals were purchased by Beverly Hills Gems. Production through 1972 was from the Royal Peacock Nos. 1 and 2, and thereafter from the Northern Light. Approximately one percent of the mined opal was classified as precious opal, and it brought from $250 to $500 per carat wholesale. In 1974 Wilson's total production was 18 kg, of which slightly more than 2.7 kg were precious opal. There was little production during 1975, but it is scheduled to be resumed in 1976.

Geology of deposit: The claims are underlain by ash, tuff, and tuffaceous sandstone beds, which strike northwest and dip 2' to 4' NE. The opal-bearing horizon is as much as 2 m thick and is predominantly greenish bentonite containing pods of ash, rhyolite pebbles, petrified wood, and opal. At the Pebble claim, only slight amounts of petrified wood are associated with the opal. Wilson said the water content of mined opal was found to increase westwardly from the Royal Peacock No. 1 to the Northern Light.

Development: Seven large cuts and many smaller pits and trenches were observed (figs. 32 and 33). According to Wilson, when Opals Incorporated began production, seven adits were on the property. They apparently date back to the late teens and early 1920's. The largest cut on the Royal Peacock Nos. 1 and 2 claims is 283 m long, 24 m wide, and exposes a 8.8 m vertical section.

Sampling: Sampling consisted of digging into exposed beds and observing the presence or absence of precious opal indicators. Fragments of precious opal were observed at numerous places.

Conclusions: About 22 h underlain by the opal-bearing horizon are minable. This is based on a strike length of 3,660 m and an economic width limit of 61 m. Beyond 61 m, the stripping ratio would be excessive. The likelihood of additional precious opal is high.

Name: Skyline group

Index Map No.: Plate 5, No. 7

Location: Secs. 17, 21, 28, and 33, T. 46 N., R. 24 E.

Elevation: 1768 m

Access: By State Highway 8A, 3 km southeast from junction with State Highway 140

History: The group consists of nine claims, the Skyline, Nine, Sally, Grace, Dorothy, and Maud J. Nos. 1-4, which were located in 1941 by Mr. Mustard for manganese.

Geology of deposit: The claims are underlain by recent alluvium and rhyolite that contains vugs, some of which are filled by agate.

Development: One pit

Sampling: Six samples from rock in place and from the dump of the pit showed as much as a trace gold and silver and 0.4 percent manganese.

Conclusions: No economic mineral potential.

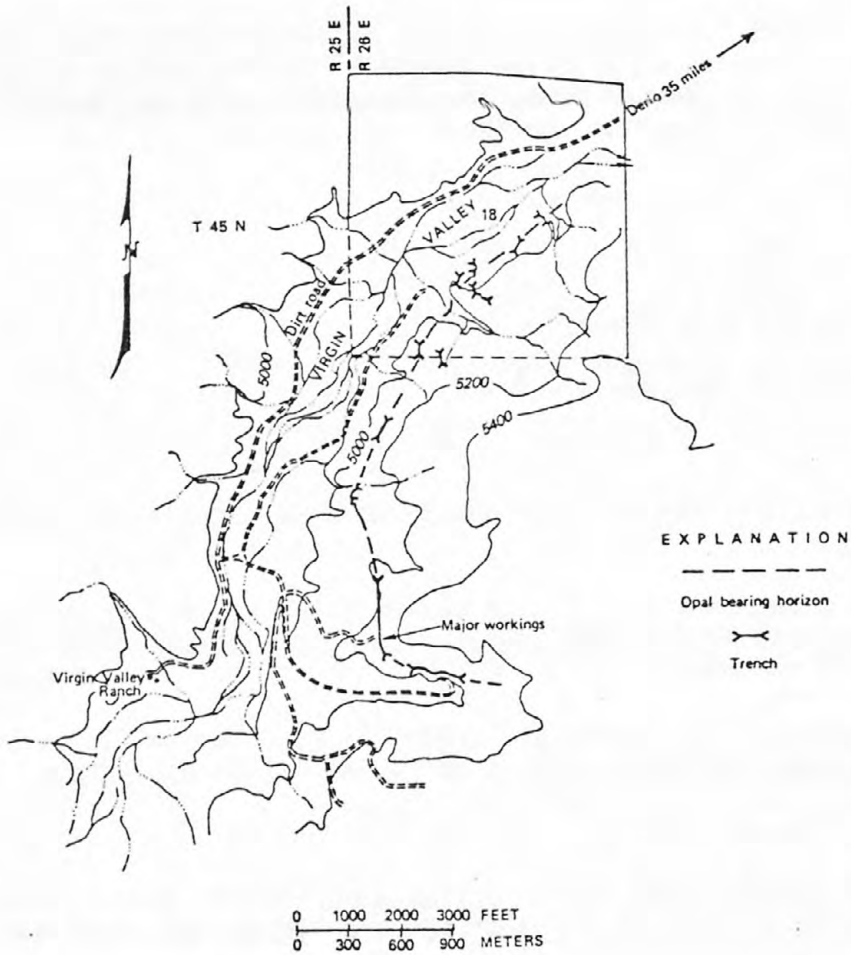


Figure 32.--Royal Peacock mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

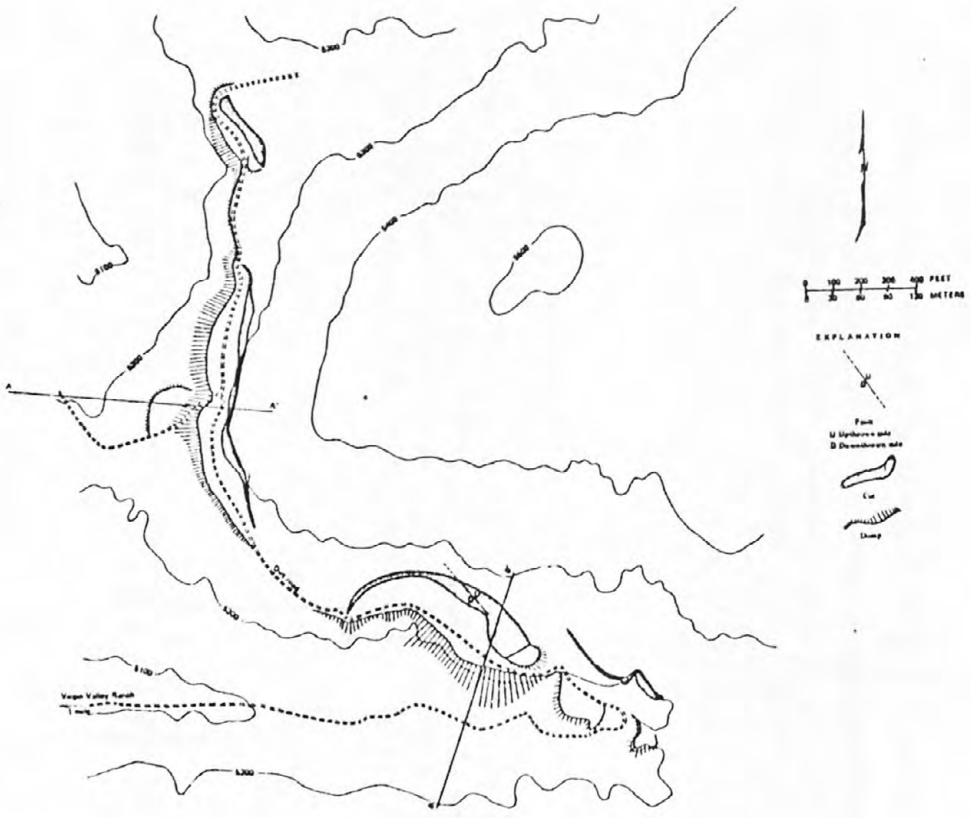


Figure 33.--Major workings, Royal Peacock mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

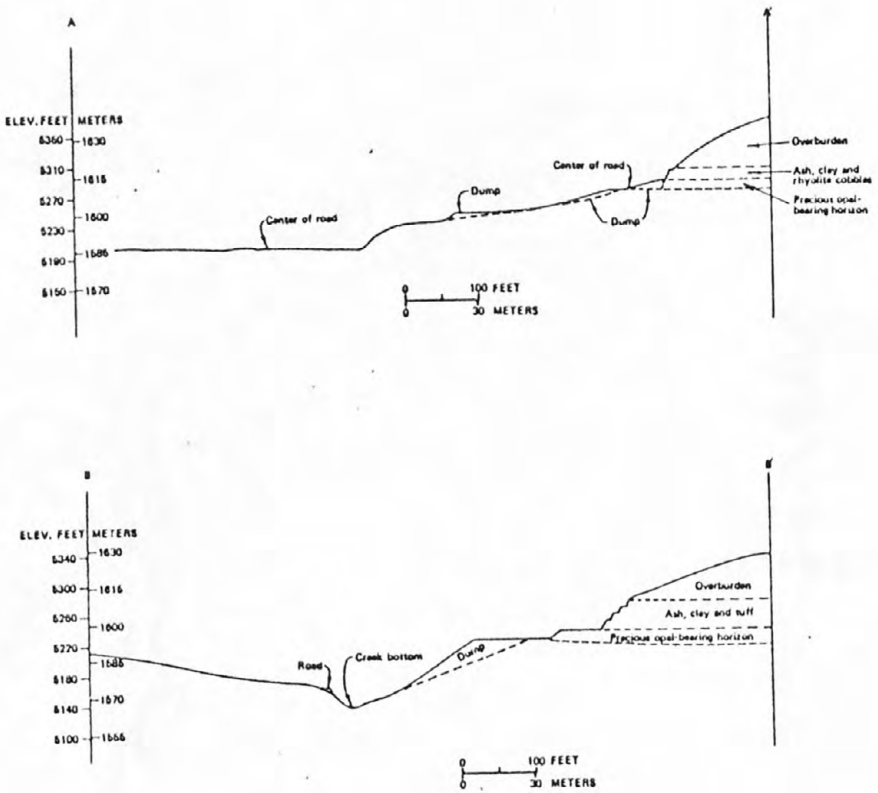


Figure 33a.--Major workings, Royal Peacock mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Name: Steamboat group

Index Map No.: Plate 5, No. 32

Location: Secs. 3 and 10, T. 44 N., R. 25 E.

Elevation: 1646 m

Access: By dirt road 0.8 km from Virgin Valley Ranch, then by cross-country travel 1.6 km south

History: Eleven claims were located by Harry W. Wilson during May and June, 1955.

Geology of deposit: A prominent point consists mostly of coarse-grained, light-gray, bedded tuff capped with a resistant ignimbrite. The tuff and ignimbrite strike northeast and dip 15' SE. At the west end of the point, the tuff is about 18 m thick; however, 244 m to the east, it is completely covered by talus.

Development: None

Sampling: Tuffaceous and ignimbrite outcrops were checked for radioactivity with a scintillation counter. Background readings were 0.025 to 0.03 mR/hr. Two 15-cm-thick lenses of yellow to cream-colored tuff within the light gray tuff had readings of 0.11 to 0.12 mR/hr. Six samples of tuffaceous material were taken. Four had a trace U_3O_8 and two from the yellow to cream-colored lenses assayed 0.032 and 0.037 percent U_3O_8.

Conclusions: Insufficient uranium-bearing material to constitute a mineral resource.

Name: Suni Nos. 1-3

Index Map No.: Plate 6, No. 12

Location: Secs. 32 and 33, T. 45 N., R. 24 E.

Elevation: 1881 to 1887 m

Access: By State Highway 8A, 19 km south from junction with State Highway 140, then by dirt road 5 km east

History: Located in 1955 by Kenneth Arnold

Geology of deposit: Residual soil and colluvium over rhyolite bedrock

Development: Five shallow bulldozer cuts

Sampling: Bulldozer cuts were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.015 to 0.03 mR/hr were observed. Three samples of soil with rhyolite and obsidian float were taken from bulldozer cuts. All had values of less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Sunny Jim

Index Map No.: Plate 5, No. 10

Location: Sec. 32, T. 45 N., R. 24 E.

Elevation: 1905 m

Access: By State Highway 8A, 19 km south from junction with State Highway 140, then by dirt road 3.2 km east

History: Located in 1955 by Bob Wees

Geology of deposit: Colluvium and alluvium over rhyolite bedrock

Development: Shallow bulldozer cuts

Sampling: Bulldozer cuts were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.02 to 0.04 mR/hr were observed. A sample of soil and rhyolite float from a bulldozer cut had less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Viola and Nellie group

Index Map No.: Plate 5, No. 40

Location: Sec. 7, T. 43 N., R. 24 E.

Elevation: 2019 m

Access: By State Highway 8A, 27 km south from junction with State Highway 140, then by dirt road 11 km south

History: The Viola Nos. 1-3 and Nellie Nos. 1-3 claims were located in 1955 by Leo Roessler.

Geology of deposit: Weathered rhyolite

Development: None

Sampling: The area was checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.02 to 0.03 mR/hr were observed. Five random chip samples of rhyolite each contained less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Virgin Duff group, Pronghorn group, and Beverly No. 1

Index Map No.: Plate 5, No. 16

Location: Secs. 30 and 31, T. 46 N., R. 26 E., and Secs. 25 and 36, T. 46 N., R. 25 E.

Elevation: 1524 m

Access: By State Highway 140, 51 km west from Denio

History: The groups consist of 17 claims, located in 1955 and 1956 by Paul Viles, Cliff Poulsen, Harold Gleason, and Dan Thompson.

Geology of deposit: The area is underlain by recent alluvium and gray to dark-purplish rhyolite. No mineralized structures were observed.

Development: Sixteen bulldozer cuts in alluvium

Sampling: All bulldozer cuts and outcrops were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.025 to 0.035 mR/hr were observed. Nine samples from rock in place and from bulldozer cuts assayed no more than a trace silver and less than 0.005 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Virgin Opal (Bonanza) mine

Owner: Keith Hodson

Index Map No.: Plate 5, No. 21

Location: Secs. 6 and 7, T. 45 N., R. 26 E.

Elevation: 1585 to 1707 m

Access: By Virgin Valley road 8 km southwest from Duffurrena Sub-headquarters, then by dirt road 3 km northwest

History: The early history of the claim, locally referred to as the Bonanza, is vague. The original location was probably in 1908 by Ivan Dow, George Mathewson, Alfred Thompson, and others. In 1943, it was relocated as the Virgin Opal claim by Mr. Garaventa. Keith Hodson, the present owner, purchased it in 1955 (U.S. Geol. Survey and Nevada Bur. Mines, 1964).

Previous production: One broken precious opal weighing a total of 3.3 kg was discovered by Mr. Hodson. Many smaller precious opals have been recovered.

Geology of deposit: The claim is underlain by nearly horizontal ash, tuff, and tuffaceous sandstone beds. The opal-bearing horizon averages more than 1.2 m thick and consists primarily of light-colored bentonite containing varying amounts of petrified wood, rhyolite pebbles, ash, and opal. Precious opals are usually found in the upper half of the horizon.

Development: Two large cuts, one small cut, one adit, and one storage building were observed (figs. 34, 35, and 36). The larger cut is 123 m long, 15 m wide, and exposes a 16-m vertical section. The other large cut is 88 m long, 30 m wide, and exposes a 21-m verticle section

Sampling: Sampling consisted of digging into exposed beds and observing the presence or absence of precious opal indicators. Fragments of precious opal were observed at numerous places.

Conclusions: About 1.6 h underlain by the opal-bearing horizon are minable. This is based on a strike length of 550 m and an economic width limit of 30 m. Beyond 30 m, the stripping ratio would be excessive. The potential of additional precious opal is high.

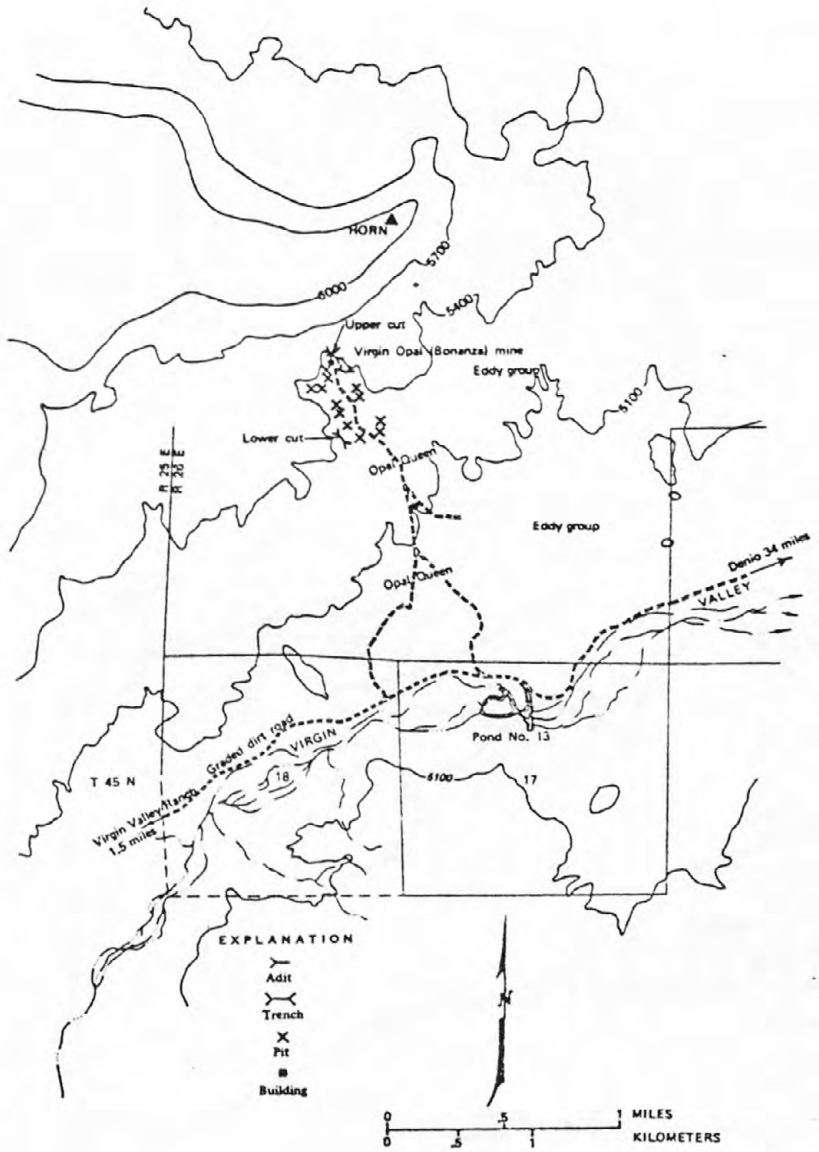


Figure 34.--Workings, Virgin Opal (Bonanza) mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

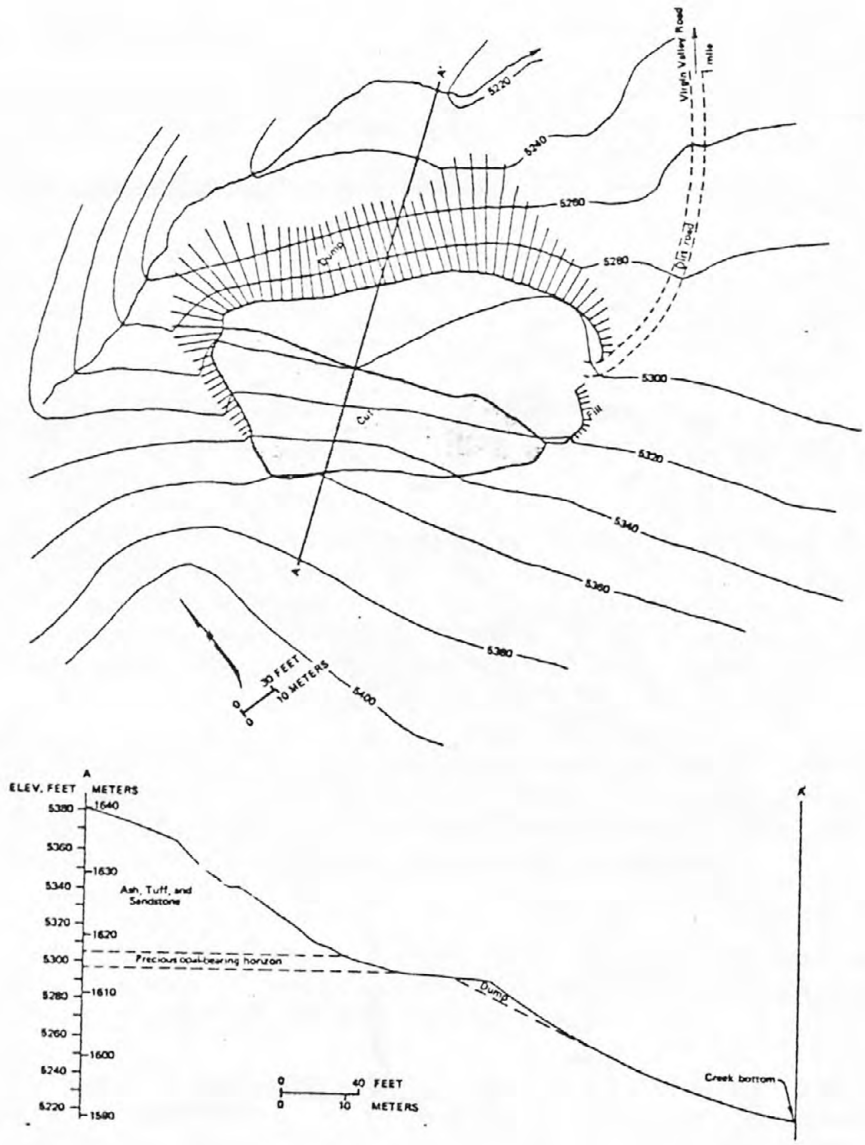


Figure 35.--Lower cut, Virgin Opal (Bonanza) mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

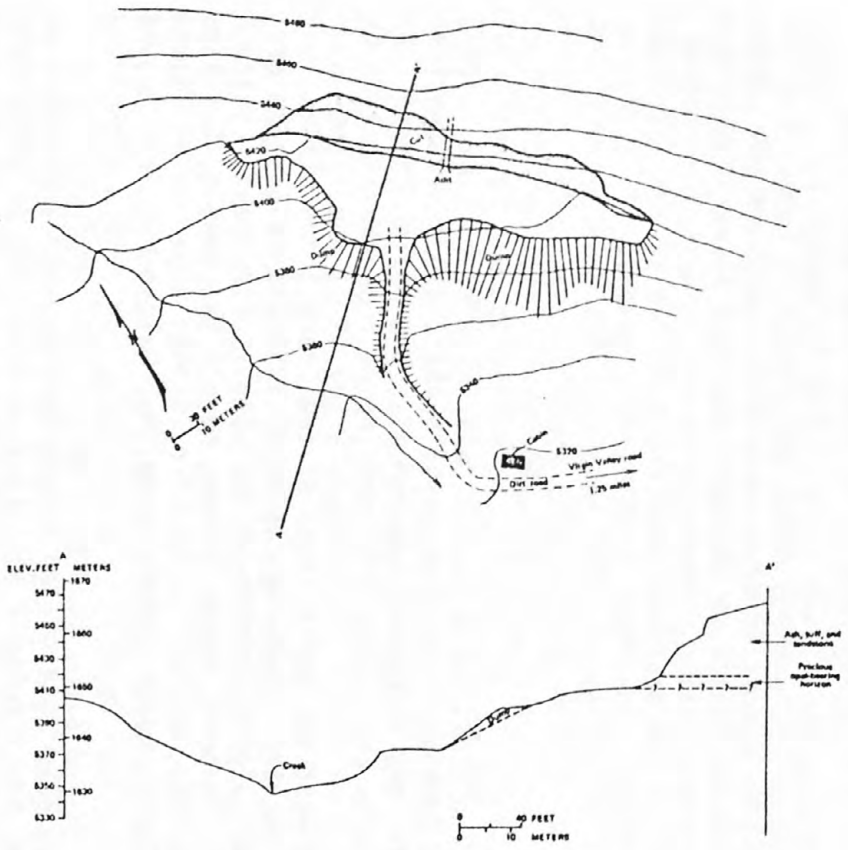


Figure 36.--Upper Cut, Virgin Opal (Bonanza) mine.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Name: Virgin Valley uranium claims

Owners: G. Kreiger, Mitchel, V. Ruedy, J. Crane, and H. Wilson.

Index Map No.: Plate 5, No. 28

Location: Secs. 2, 3, T. 44 N., R. 25 E., Secs. 12, 13, 24, 25, and 36, T. 45 N., R. 25 E., Secs. 30, 31, T. 45 N., R. 26 E.

Elevation: 1524 to 1890 m

Access: By Virgin Valley road 11 km south from Duffurrena Sub-headquarters

History: Having discovered uranium minerals early in the summer 1950, Jack Crane located claims on the east and west sides of Virgin Valley (Staatz and Bauer, 1951). Between 1950 and 1954, Crane located the Fourth of July 1 and 2, April Fool 1 and 2, Wee Wee Marie, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Tony, David B., Afterthought, Dixie 1-5, Suprise, Rosalee, Big Hole, Reno, Buckhorn, Sweetwater, Cameron, Holiday, Lucky Four, Barney, January, February, March, August, September, October, November, December, Fourth of July, Fangle, Little Virgin, Jackknife, Maverick, Ace 1-3, Bing 1 and 2, Pluto, Venus, Saturn, Neptune, and Mars. Of these 52 claims, 13 are shown on the Humboldt County surveyor's plat, all on the west side of Virgin Valley.

On the west and north sides of the Crane group claims, the Lone Star Uranium Co. located 36 mining claims in 1954 and 1955. The claims are the Jackal, Kismet, Todos, Amigos, Alamo, Big Virgin, Jeep, Little Big Horn, Tatie, Jo Jo, Tadpole, Hepto, Bongo, Moon Glow, Sunset, Sunrise, Sunny Jim, Lucky Dog, Sprite, Hillbilly, Pacific, Alpha, Beta, Delta, Gamma, Epsilon, Zeta, Eta, Theta, Kappa, Omega, Iota, Mu, Galdys M., Faun P., Paiute, and Vadore.

About 0.8 km east of the Virgin Valley ranch and on the east side of Virgin Valley are the April Fool 1, 2, and 3. The original locator is unknown. Mark Foster relocated the claims in 1937. In 1942, The Wilson family bought them from Foster. Harry W. Wilson is now the sole owner.

Harry W. Wilson has relocated some of the claims north of Virgin Valley Ranch previously claimed by Jack Crane as the Angie 1, 2, and 3 in 1976. Harry W. Wilson and Gus Kreiger located 11 claims around the Angie group in 1976. The claims are the Barbara, Barbara 1-4, and Hal and Hal 1-7.

Gus Kreiger located a block of 132 claims southeast of Virgin Valley ranch in 1976. They were the Mule, Jackass, Donkey, Charlawne, Charlotte 1-22, Jane 1-13, East Rim 1-11, 13-23, 13-23, 25-35, 37-47, 49-59, South Rim 1-20, Mars, Neptune, Saturn, Venus, and Pluto.

During 1976, Kreiger, Mitchell, Ruedy, Crane, and Wilson made an agreement to promote all their claims as a unit to interested mining companies. To date, several companies have expressed an interest.

Previous production: Greenish-yellow, translucent, fluorescent opalite which occurs at the top of a diatomaceous earth bed on the April Fool group was sold for 77 cents/kg from 1937 to 1942 to rock collectors and the Ultraviolet Corp., in San Gabriel, California. After Wilson purchased the group, he also sold opalite to Raytech, Inc., in Massachusetts. Between 14 and 18 t have been sold since 1942.

Geology of deposit: A sequence of gently dipping tuff and ash beds at least 91 m thick are capped by basalt and terrace gravel. The tuff layers are mostly greenish-gray, friable and porous; traces of fibrous gypsum, iron- and manganese-oxides coat fracture surfaces. The ash beds are generally thinner, lighter colored, and finer grained than the tuff. The beds strike northwesterly and dip 5' to 10' northeasterly. Forty-five discontinuous layers of opalite were observed. Some had anomalous amounts of uranium. The layers of opalite occur parallel to the bedding of the ash and tuff and range in thickness from 0.03 to 1 m. The length of the exposed opalite layers is from 2 m to more than 366 m. Many stages of silicification were observed. Less silicified beds resemble shale while thoroughly silicified beds are massive and translucent. The opalite has a distinctive conchoidal fracture, and is gray, brown, tan, black, white, and pale green. Irregular and lense-like layers of diatomaceous earth, some 2 m thick, are exposed for over 610 m on the April Fool 1, 2, and 3 claims.

Development: One hundred eighty-eight shallow bulldozer cuts and trenches were observed (fig. 37). Three bulldozer cuts on a hillside below the airport have a combined length of over 610 m.

Sampling: All workings and opalite beds were checked for radioactivity with a scintillation counter. Background readings ranged from 0.015 to 0.05 mR/hr. Of the 48 opalite beds checked, 10 have anomalous readings in a few places, the highest being 0.90 mR/hr. Sixty-four samples of opalite and tuff contained from less than 0.02 to 0.08 percent U_3O_8. Seventeen samples had 0.02 percent or more U_3O_8 (Table 6). The highest sample results came from a hillside exposure near the airstrip. Table 6 also gives analytical results for gold and silver. Analyses of the diatomaceous earth indicated good brightness but no potential as a filter aid.

Resource estimate: An area north of Virgin Valley Ranch, which is approximately 1.6 by 0.4 km wide and 15 m deep, may contain 14 to 18 million t of low-grade, uranium-bearing material constituting a submarginal resource.

Conclusions: The uranium mineralization encountered indicates some potential for discovery of additional submarginal resource and possibly discovery of ore grade uranium deposit.

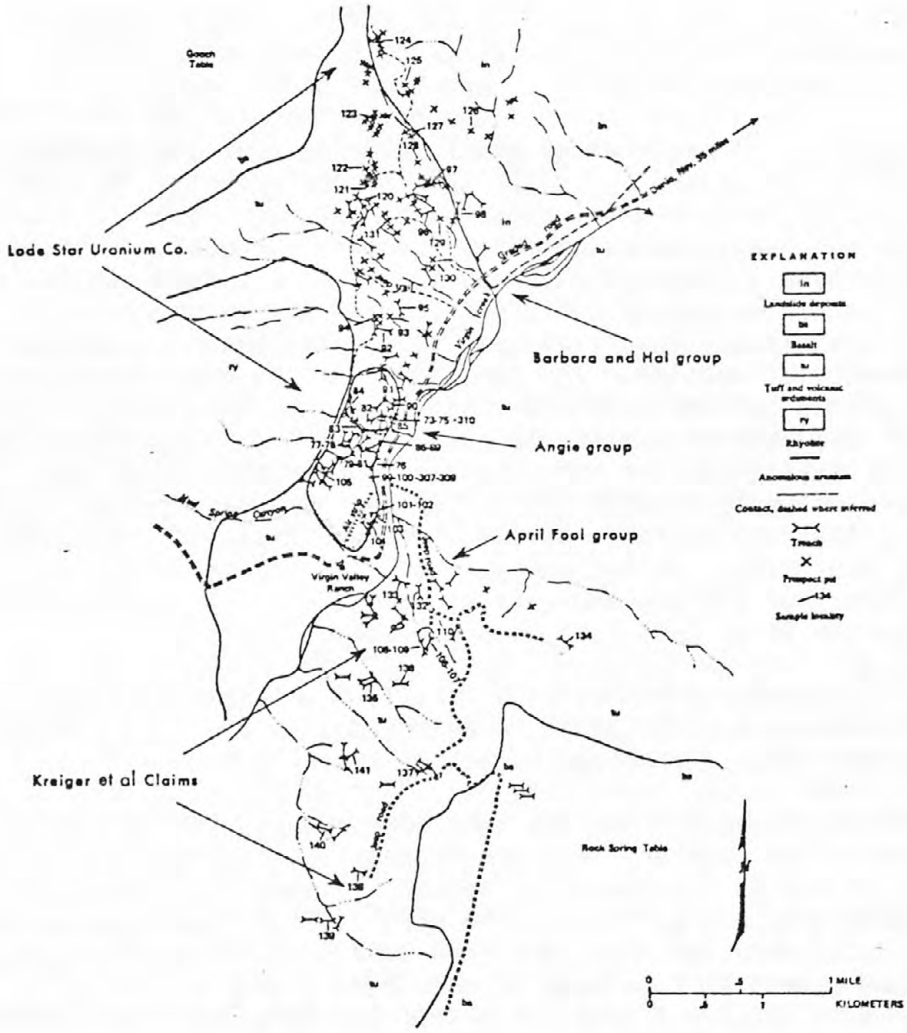


Figure 37.--Workings, Virgin Valley uranium claims.

Charles Sheldon wilderness study area, Humboldt and Washoe Counties, Nevada, and Lake and Harney Counties, Oregon.

Table 6.--Workings, Virgin Valley uranium claims (to accompany fig. 37)

Sample analyses for Virgin Valley uranium claims.

[Tr, trace; N, not detected; --, not analyzed; <, less than shown]

Sample				Gold (grams per metric ton)	Silver (grams per metric ton)	U_3O_8 (percent)
No.	Type	Length (meters)	Description			
73	Chip---	0.12	Brown to dark-gray opalized tuff	N	N	0.033
74	do-----	.18	do----------	N	N	.009
75	do-----	.39	do----------	N	N	.005
76	do-----	.21	do----------	N	N	<.002
77	do-----	.36	Gray opalized tuff with wood fragments----------	N	N	<.002
78	do-----	.30	do----------	N	N	.064
79	do-----	.12	Red to gray opalized tuff-------	N	N	.033
80	do-----	.30	do----------	N	7	.027
81	do-----	.27	White and gray massive opalite--	N	7	.007
82	do-----	.27	Gray tuff with black carbonaceous fragments----------	N	N	.048
83	do-----	.69	do----------	N	N	.021
84	do-----	0.27	Gray ruff with black carbonaceous fragments	Tr	N	0.020
85	do-----	.63	Tan to brown opalized tuffs-----	N	N	.036

Sample				Gold (grams per metric ton)	Silver (grams per metric ton)	U_3O_8 (percent)
No.	Type	Length (meters)	Description			
86	Chip--	.21	Olive-green opalite----------	N	N	.004
87	do----	.39	do----------	N	Tr	<.002
88	do----	.30	Brown opalized tuff----------	N	Tr	.046
89	do----	.39	Brown to gray opalized tuff-----	N	N	<.002
90	do----	.33	Gray partially opalized tuff----	N	N	<.002
91	do----	.54	Green massive opalite and white to cream tuff----------	Tr	N	.017
92	do----	.57	Brown to green opalite----------	Tr	3	.011
93	do----	.27	do----------	N	N	.017
94	do----	.27	do----------	N	N	.012
95	do----	1.20	Brown opalized tuff----------	N	N	.013
96	do----	.21	Gray opalite----------	N	N	<.002
97	do----	.48	Brown, orange, and gray opalized tuff----------	N	N	<.002
98	do----	0.60	Brown, orange, and gray opalized tuff----------	N	N	<0.002
99	do----	.54	Gray opalized tuff and gray tuff	N	N	.030

Sample				Gold (grams per metric ton)	Silver (grams per metric ton)	U_3O_8 (percent)
No.	Type	Length (meters)	Description			
100	Chip--	.27	Gray opalized tuff----------	N	N	.078
101	do----	.60	Brown to gray opalized tuff-----	N	N	.008
102	do----	.81	Gray opalized tuff and white tuff----------	N	N	.030
103	do----	.99	Yellow to brown opalite and white tuff----------	Tr	N	.080
104	do----	.15	Yellow to brown opalized tuff---	N	N	.027
105	do----	.78	Yellow to brown-stained zone in white tuff----------	N	N	.036
106	do----	1.50	Diatomite----------	--	--	--
107	do----	.60	Cream to reddish translucent opalite----------	N	N	.010
108	do----	.75	Diatomite----------	--	--	--
109	do----	.18	Cream, yellow and brown translucent opalite----------	N	N	.017
110	do----	0.30	Orange, brown, greenish opalized tuff----------	N	N	0.007
120	do----	.66	Light-gray bedded tuff----------	N	N	.002
121	Grab--	--	Brownish tuff----------	N	N	<.002
122	do----	--	Light-gray tuff----------	N	N	<.002
123	do----	--	do----------	N	N	<.002
124	do----	--	White to gray tuff----------	N	N	<.002
125	do----	--	do----------	N	N	<.002
126	do----	--	do----------	N	N	<.002
127	Random chip--	--	Light-gray tuff----------	N	N	<.002
128	Grab--	--	White to gray tuff----------	N	N	<.002
129	do----	--	do----------	N	N	<.002

Sample				Gold (grams per metric ton)	Silver (grams per metric ton)	U_3O_8 (percent)
No.	Type	Length (meters)	Description			
130	Grab--	--	White to gray tuff----------	N	N	<.002
131	do----	--	do----------	N	N	<.002
132	do----	--	Orange to brown opalized tuff---	N	N	<.002
133	Chip--	0.69	Gray tuffaceous silstone--------	Tr	N	<0.002
134	Grab--	--	Gray tuff----------	N	N	<.002
135	Chip--	1.20	Thinly bedded white ash---------	N	N	<.002
136	Random chip--	--	Light-brown tuff----------	N	N	<.002
137	Grab--	--	Dark-gray basalt----------	N	N	<.002
138	do----	--	Light-brown tuff and dark-gray basalt----------	N	N	<.002
139	do----	--	do----------	N	N	<.002
140	do----	--	do----------	Tr	N	<.002
141	do----	--	Brown and gray tuff----------	Tr	N	.002
307	Chip--	.45	Yellow to light-brown opalite---	--	--	.035
308	Random chip--	--	Yellow to brown opalized stump--	--	--	.053
309	Chip--	1.20	Gray opalized tuff----------	--	--	.002
310	do----	.30	White tuff----------	--	--	.007

Name: Wild Rose

Index Map No.: Plate 5, No. 3

Location: Sec. 1, T. 45 N., R. 22 E., 2 miles (3.2 km) east of Swan Lake

Elevation: 1798 m

Access: By State Highway 34 A 10 km west from junction with State Highway 8A, then by cross-country travel 1.6 km north

History: Located August 7, 1927 by D. D. McLeod

Geology of deposit: Slightly vesicular basalt

Development: None

Sampling: One grab sample assayed a trace gold and less than 0.001 percent U_3O_8.

Conclusions: No economic mineral potential.

Name: Yellow Rock group

Index Map No.: Plate 5, No. 37

Location: Sec. 21, T. 44 N., R. 37

Elevation: 1887 to 1897 m

Access: By State Highway 8A 27 km south from junction with State Highway 140, then by dirt road 13 km east

History: Ten claims were located in 1955 by Yellow Rock Uranium Co.

Geology of deposit: Rhyolite and whitish volcanic tuff containing cinders

Development: Shallow bulldozer cuts

Sampling: All bulldozer cuts were checked for radioactivity with a scintillation counter. No readings exceeding a background count of 0.02 to 0.025 mR/hr were observed. Six random soil grab samples from bulldozer cuts and two random chip samples of rhyolite assayed a trace gold and silver and less than 0.001 percent U_3O_8.

Conclusions: No economic mineral potential.

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