

**UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY**

**Mineral Resource Potential of the
Indian Heaven Roadless Area,
Skamania County, Washington**

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STUDIES RELATED TO WILDERNESS

Under the provisions 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 the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. 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 presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Indian Heaven Roadless Area (U.S. Forest Service Number 06076), Gifford Pinchot National Forest, Skamania County, Wash. Indian Heaven Roadless Area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The results of geological, geochemical, geophysical, and mining activity surveys in the Indian Heaven Roadless Area indicate no recognized potential for metallic resources within the roadless area. No active mining claims exist in the Indian Heaven Roadless Area. However, a small gold claim 5 mi west of the roadless area, within an altered zone in the older volcanic rocks is active.

Basalt has been quarried from Indian View Point and volcanic cinder and gravel from small quarries located within 0.5 mi of the roadless area. Stone, cinder, and gravel may be considered a low-potential resource, but an ample supply closer to local markets exists outside the roadless area.

Because the roadless area is in a young volcanic field, the geothermal resource potential has been examined (Schuster and others, 1978). Results of this drilling program are inconclusive. Studies of water geochemistry of the St. Martins (Carson) hot springs approximately 9 mi south of the roadless area, indicate aquifer temperatures less than 212°F (100°C); the extent of the aquifer is unknown. In 1982, a geothermal lease application was filed on about 15,000 acres of the Indian Heaven Roadless Area.

Oil and gas leases covering about 25,000 acres of the roadless area have been awarded following an oil show in a well drilled 24 mi southwest of the roadless area. Potential structural traps may exist in the Eagle Creek Formation underlying the roadless area. The potential for oil and gas reserves within the roadless area cannot be further evaluated without subsurface exploration.

INTRODUCTION

The Indian Heaven Roadless Area is in a late Cenozoic basaltic field in Skamania County, Wash. It is between Mount St. Helens on the west and Mount Adams on the east, and covers 27,590 acres. It is 14 mi north of the Columbia River and 40 mi east of Vancouver, Wash. Access to the area is by county road, along the Wind River, north from Washington State Highway 14, from the town of Carson, Wash. The area is heavily wooded, and the surrounding area has been clearcut for timber. Camping facilities and existing trails are heavily used, especially during the late summer and fall. Elevations range from 3,640 ft to 5,925 ft, the maximum elevation is at the summit of Lemei Rock. A location map is shown in figure 1.

Earlier geologic mapping of the region was conducted by Wise (1970), Hammond and others (1976), and Hammond (1980). Geologic mapping for this study was done by P. E. Hammond (unpub. mapping, 1982). A simplified geologic map is shown in figure 2. Analytical results from stream-sediment samples, panned-concentrate samples from stream sediments, and rock and water samples are given in Church and others (1982). The U.S. Bureau of Mines searched county records and other data available concerning mineral deposits and mining activity, claims, leases, and mining production, to ascertain the status of mining activity in the roadless area. Recently, there has been limited gold production from an altered zone within the older volcanic rocks, 5 mi west of the Indian Heaven Roadless Area.

GEOLOGY

The geology of the area consists of a series of young volcanic rocks (less than 6.1 m.y. old, E. H. McKee, unpub. data, 1982). The area consists chiefly of a chain of young, north-south trending, coalescing shield volcanos 3.7-5 mi in diameter and 1,650 to 2,210 ft high. They are composed of high-alumina olivine basalts (J. E. Taggart, written commun., 1982), basaltic andesites and andesites. Each volcano is constructed of a broad, gently inclined flank of mostly pahoehoe lava flows that surround a core of weakly altered to unaltered breccia, tephra, and bifurcating dikes, and is capped by a central tephra cone 500-1,000 ft high. Glaciation has greatly modified the shape of the volcanos. The flanking lava flows are interstratified with deposits of glacial origin 35-100 ft thick from three or more periods of glaciation. The volcanic chain overlies a nearly parallel-trending broad syncline composed of older volcanic strata of the Western Cascade group (Hammond, 1980). As much as 1,000 ft of the Eagle Creek Formation, a unit of the Western Cascade group, is exposed in an erosional window east of Bird Mountain, and in the west-facing cirque between Berry Mountain and Gifford Peak. Volcanic vents are along a north-south fissure system between Sawtooth Mountain and Reds Mountain. A simplified geologic map is shown in figure 2. The earliest eruptions appear to be centered in the area of East Crater (EC). Volcanic activity continued at local vent centers during the late Pleistocene and Holocene. Age relationships of some of the volcanic centers are shown in the "CORRELATION OF MAP UNITS" and the "LIST OF MAP UNITS" that accompanies figure 2. Lemel Rock (LR) is the youngest of the shield volcanos. The most recent volcanic eruptions in the area occurred about 12,000 years ago at Lone Butte (LB), just west of the northern end of the roadless area and about 8,200 years ago (on the basis of carbon-14 dating, P. E. Hammond, unpub. data, 1982) at Big Lava Bed, southeast of the roadless area.

GEOCHEMISTRY

Reconnaissance geochemistry of the area was done using stream-sediment samples and water samples from drainage basins each covering approximately 3.2 mi². Panned concentrates from stream sediments were collected from larger, second- or third-order drainages, to evaluate the nonmagnetic, heavy-mineral content. A representative suite of rock samples was collected from mapped flow units, and tephra was collected from the volcanic vents for analysis. In all, 36 stream-sediment samples, 25 water samples, 40 rock samples and 12 panned-concentrate samples from stream sediments and three sulfide concentrates from ores were analyzed. The analytical results obtained and the methods used are given in Church and others (1983). In addition, the mineralogy of the nonmagnetic heavy-mineral fraction of the panned concentrates from stream sediments was also determined and is reported (Church and others, 1983).

Analytical results from the water analyses, indicate a small amount of copper, zinc, and sulfate present in several of the streams, but do not indicate values sufficiently high to warrant further investigation. These values are in the range of expected values from waters draining a basaltic terrane, and can readily be explained by the geochemistry of the basalts. Values obtained from the stream sediments agree very well with the range of values measured in the volcanic rocks (see Church and others, 1983, tables 7 and 8). Pyrite was the only sulfide observed in the mineralogical examination of the nonmagnetic heavy-mineral fraction of the panned concentrates from stream

EXPLANATION FOR FIGURE 2

--- APPROXIMATE BOUNDARY OF THE INDIAN HEAVEN ROADLESS AREA (06076)

— CONTACT-- queried where uncertain

▲ VOLCANIC CENTER

- BM--Bird Mountain
- BYM--Berry Mountain
- GP--Gifford Peak
- LB--Lone Butte
- LR--Lemei Rock
- RM--Red Mountain
- SM--Sawtooth Mountain
- EC--East Crater

CORRELATION OF MAP UNITS

Surficial deposits

- Q1s Landslides
- Q1g Glacier deposits

Lava flows of Indian Heaven volcanic field

- Qb1 Basalt of Big Lava Bed
- Q1c Basalt of Comcomly Lakes
- Q1e Basalt of Ice Cave
- Q1c Basalt of East Crater
- Q1c Basalt of Outlaw Creek
- Q1c Basalt of Black Creek
- Q1f Andesite of Forlorn Lakes
- Q1p Basalt of Indian Viewpoint
- Q1s Basalt of Surprise Lakes
- Q1g Basalt of Gifford Peak
- Q1c Basalt of Rush Creek
- Q1c Undifferentiated basalt, basaltic andesite and andesite

Western Cascade Group

- Tb Undifferentiated bedrock of the Western Cascades Group

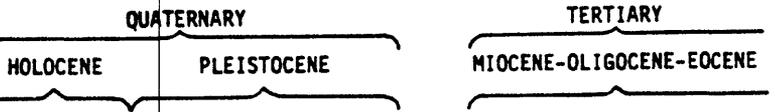
LIST OF MAP UNITS

Q1s LANDSLIDES (HOLOCENE)

Q1g GLACIAL DEPOSITS (QUATERNARY) (10-30 m thick)

Lava flows of Indian Heaven volcanic field

- Qb1 BASALT OF BIG LAVA BED (QUATERNARY)--Phyric olivine basalt
- Q1c BASALT OF COMCOMLY LAKES (QUATERNARY)--Phyric olivine basalt erupted from vent near Lemei Rock (LR)
- Q1e BASALT OF ICE CAVE (QUATERNARY)--Coarsely phyric olivine-plagioclase basalt erupted from vent near Lemei Rock (LR)
- Q1c BASALT OF BLACK CREEK (QUATERNARY)--Phyric olivine basalt erupted from vents on Sawtooth Mountain (SM)
- Q1p BASALT OF GIFFORD PEAK (QUATERNARY)--Phyric olivine basalt erupted from vents at Gifford Peak (GP) and Berry Mountain (BYM)
- Q1c BASALT OF RUSH CREEK (QUATERNARY)--Coarsely phyric olivine-plagioclase basalt erupted from East Crater
- Q1b UNDIFFERENTIATED BASALT, BASALTIC ANDESITE AND ANDESITE (PLEISTOCENE-PLIOGENE)
- Tb UNDIFFERENTIATED BEDROCK OF THE WESTERN CASCADES GROUP (TERTIARY)--Includes the Eagle Creek Formation, lava flows of Council Bluff, Stevens Ridge Formation and Ohanapecosch Formation (Hammond, 1980)



sediments, and no anomalous values were reported for any of those samples, with the possible exception of IH1901C (Church and others, 1983). This sample contained 200 parts per million (ppm) copper and 100 ppm lead; it was collected from a small tributary of Black Creek draining the southwest corner of the roadless area, and represents some sulfide phases, possibly from the basalt of Black Creek. This mineralized rock is derived from a broad, northwest-trending zone of altered volcanic rocks of the Western Cascades, southwest of the roadless area. No special significance is attached to this isolated observation.

GEOPHYSICS

Gravity (Stricklin, 1975) and aeromagnetic (U.S. Geological Survey, 1975) surveys of the Indian Heaven Roadless Area indicate a smooth regional structure and define the locations of fissure systems that have acted as conduits for the basaltic volcanism seen in the area. These data do not indicate any feature that might be associated with a buried pluton or a hydrothermal system.

MINING ACTIVITY AND MINERALIZED ROCK

No producing mines, active mining claims, or mineral patents exist in the roadless area. No evidence of metallic mineralized rock was observed in the rocks of the Indian Heaven Roadless Area or in float in the streams draining the area. Incipient hydrothermally altered coarse breccia was observed in the dissected core of Lemei Rock volcano. The alteration consisted of silicification and hematization. Recently, there has been small-scale production of gold from the Wind River mine in an altered zone within the older volcanic rocks, 5 mi west of the Indian Heaven Roadless Area (see fig. 1). Analytical results from sulfide concentrate made from a hand specimen taken from the altered zone and the ore zone of the Wind River mine are given in Table 1.

Table 1.—Analytical results from sulfide concentrates from the Wind River mine

[E. L. Mosier, analyst; all results given in parts per million. The ore zone concentrate consisted of 90% chalcopyrite and pyrite, 9% secondary copper minerals, and a trace amount of sphalerite; mineralogy by J. G. Frisken. Altered zone results are from two averaged samples; sulfide minerals identified in the concentrates were 1–2% pyrite and chalcopyrite, trace of covellite and many iron-stained grains; mineralogy by J. G. Frisken.]

Element	Ore Zone	Altered Zone
Ag	200	3
As	2,000	<500
Au	70	20
Bi	100	10
Co	15	10
Cu	>20,000	1,000
Mo	15	<10
Pb	10,000	30
Sb	300	<200
Sn	30	<20
Zn	1,500	700

The only mineral production within the roadless area has been about 200,000 tons of basalt quarried near Indian View Point. The deposit was last worked in 1962; the material, a gray, blocky olivine basalt was used locally for road construction. The deposit is estimated to cover an area of about 150 acres in the roadless area. If the thickness averages 180 ft, this deposit contains about 100 million tons of stone.

Cinders within the area are associated with small cinder cone remnants on the flanks of some volcanic centers, such as Bird Mountain, Red Mountain, and Sawtooth Mountain. A cinder pit about 0.1 mi outside the roadless area near Racetrack Camp measures about 215 ft long, 30 ft deep, and 60 ft wide. An estimated 1,400 yd³ of material have been removed. This deposit is part of the largest cinder cone in the vicinity, it measures approximately 270 ft high, has a 1,100 ft radius, and contains an estimated 13 million yd³ of inferred cinder resources, about 10 percent of which lies in the roadless area.

A gravel pit approximately 0.5 mi outside the roadless area near Smokey Creek Camp was last worked for road material in 1962 (R. Squires, U.S. Forest Service, oral commun., 1982). This deposit, estimated to contain about 100,000 yd³ of gravel, does not extend into the roadless area. Several small sand and gravel deposits occur along streams in the roadless area.

Geothermal lease applications have been filed on about 15,000 acres within the roadless area, and on 3,000 acres just outside the boundary. These lease applications probably resulted from a heat flow study of the area (Schuster and others, 1978).

Oil and gas leases have been awarded on about 25,000 acres inside and 47,000 acres contiguous with the roadless area. The nearest oil exploration well was drilled 24 mi southwest of the roadless area (McFarland, 1979, p. 66-67) near an oil seep; a show of oil occurred at a depth of 250 ft.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Examination of the Indian Heaven Roadless Area and sample analyses failed to show any potential for metallic resources in the roadless area. A low potential exists for the production of volcanic cinder for local markets; however, there is an ample supply of equally suitable cinder outside the roadless area. The basalt quarry near Indian View Point is considered to have a low potential for local use. Equal or better quality basalt is available closer to markets.

Preliminary investigation of the geothermal potential of the area has been made (Schuster and others, 1978). The results are inconclusive; however, data from a hot spring that is 9 mi south of the roadless area, indicate an aquifer of unknown extent at a temperature less than 212°F (Schuster and others, 1978; table 3, p. 20-21). Bureau of Land Management records show that geothermal lease applications have been filed on about 15,000 acres within the roadless area.

Recent interest in oil and gas exploration in the roadless area has resulted in oil and gas leases covering about 25,000 acres of the roadless area. Structural traps in the Eagle Creek Formation could contain oil and gas resources within the Indian Heaven Roadless Area. The potential for oil and gas reserves in the roadless area cannot be evaluated further without subsurface exploration.

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