MINERAL RESOURCE POTENTIAL OF THE NORTH FORK JOHN DAY RIVER ROADLESS AREA, GRANT COUNTY, OREGON

SUMMARY REPORT

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SUMMARY

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964), and related acts, 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 in 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 North Fork John Day River Roadless Area (B62553), Umatilla and Wallowa-Whitman National Forests, Grant County, Oregon. The 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.

INTRODUCTION

The North Fork John Day River Roadless Area comprises 21,210 acres in the Umatilla and Wallowa-Whitman National Forests, Grant County, Oregon, about 30 mi northwest of Baker, Oregon.

Gold occurs in placer deposits along the North Fork John Day River. Indicated and inferred marginal reserves, estimated at 840,000 yd³, have a weighted average value of $1.78/yd³ at $500 per troy ounce and constitute about 30 percent of the total gold resources. Indicated and inferred resources, including reserves, total 2.8 million yd³ and have a weighted average value of $1.60/yd³ in gold.

Twenty-one drainages tributary to the North Fork John Day River have resource potential for gold. On the basis of concentrations of gold in samples, these drainages are ranked as having high (more than 50 parts per million (ppm)), medium (between 10 and 50 ppm) or low (between 0.5 and 10 ppm) potential for the occurrence of gold resources. Drainages that have high gold resource potential are along the southeast border of the study area. Silver may be recoverable with gold.

Fractured basalt and chert for road metal are in the roadless area, along with sand and gravel deposits.

GEOLGY

Most of the roadless area is underlain by rocks that are known or inferred to be of Paleozoic or Triassic age. The oldest rock in the area may be metamorphosed hornblende diorite in the northeastern part. These rocks are faulted against Elkhorn Ridge Argillite (see below), so that their relation to other rocks of the roadless area is not known. The hornblende diorite could be part of the basement upon which Elkhorn Ridge Argillite was deposited. Age of the hornblende diorite would then be Pennsylvanian or older, although an age as young as Triassic is possible. The unit is tentatively assigned a Paleozoic or Triassic age.

Elkhorn Ridge Argillite, which underlies most of the roadless area, consists mostly of a monotonous assemblage of argillite and chert, which originally must have been several thousand feet thick. East of the roadless area the formation has yielded Pennsylvanian and Permian fusulinids and Early to Middle Triassic pentactinoids, hydrozoans and hexacorals (Bostwick and D. A. Koch, 1962; Bostwick, in Brooks and others, 1976, p. 4), which establish the age of the formation as late Paleozoic and Triassic.

Associated and retrogressively metamorphosed diorite in the southern and western parts of the roadless area underlie an assemblage of pyroclastic and volcanic rocks. One of the diorite bodies, in the northeastern corner of the Granite quadrangle, was dated as Permian (Brooks and others, 1982).

The pyroclastic and volcanic rock assemblage was deposited on the diorite. The assemblage, consisting chiefly of tuff, lapillistone and andesite is about 2,000 ft thick in the northwest corner of the Granite quadrangle. Based on the age of the underlying diorite, the assemblage is Permian or younger and probably no older than Middle Triassic.

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The Elkhorn Ridge Argillite and the pyroclastic and volcanic rock assemblage were juxtaposed by faulting and underwent regional metamorphism in greenschist facies sometime in the Triassic. Ave Lallemant and others (1986) concluded that metamorphism in the region occurred at the end of the Triassic.

Post-tectonic dikes intruding the argillite and the assemblage (diorite and latite in the argillite; hornblende pyroxenite in the assemblage) were partly retrogressively metamorphosed and must have been emplaced prior to the nearly unaltered Jurassic diorite.

Fresh diorite comprises three stocks in the roadless area and the Crane Creek stock (Taubeneck, 1957, p. 185) just east of the roadless area. The stocks may be apophyses of the Bald Mountain batholith exposed still farther to the east. The batholith was dated by Armstrong and others (1977, p. 400) at 147 ± 17 m.y. Although this date covers the range Middle Jurassic to Early Cretaceous, they postulate that the batholith was emplaced during Jurassic time, but remained hot or was reheated in the Early Cretaceous. For this reason, the diorite stocks are assigned a Jurassic age in this report.

Contact metamorphic aureoles around the two western diorite stocks and the Crane Creek stock are approximately 1 mile wide. Mineral assemblages in the country rock up to a few thousand feet from the intrusive contact are characteristic of hornblende hornfels facies.

Leucocratic quartz monzonite is present in the southwestern part of the roadless area. It is probably younger than the Jurassic diorite intrusions because quartz monzonite dikes intrude the diorite and the broad contact-metamorphic aureole around the diorite intrusions in the northwestern part of the roadless area. The quartz monzonite is, therefore, Jurassic or Cretaceous in age.

Tertiary volcanics, pyroclastic and sedimentary rocks overlie the Mesozoic and Paleozoic rocks above an angular unconformity. Lithologies in and near the roadless area include black basalt and andesite, dark to light-grey ignimbrite, arkosic sandstone, and lake bed deposits. Age of the assemblage is Eocene and Oligocene (Brooks and others, 1982).

Alluvium and reworked tephra occur along the canyon bottoms; glacial deposits, undifferentiated regolith and tephra cover parts of the ridges that flank the North Fork John Day River and its tributaries.

**GEOCHEMISTRY**

Several types of samples were chemically analyzed to provide the basis for determining the mineral resource potential of the roadless area. Stream-sediment samples from 60 sites include silt (60 samples) and pan concentrates (57 samples). Alluvial samples (444) were taken at 285 sites from 60 sites include silt (60 samples) and pan concentrates (57 samples). Alluvial samples (444) were taken at 285 sites from 60 sites. Rock samples (60) included quartz and hematite veins, hematite veins, hematite-cemented euhedral brecia, and greisen. The silt, pan-concentrate and rock samples were analyzed for 31 elements by emission spectrographic methods and for gold by atomic absorption. The alluvial samples were processed in the laboratory to recover placer gold.

Gold occurs in numerous placer deposits along the North Fork John Day River in the roadless area. Some stream-sediment samples from tributaries of the North Fork also contain detectable amounts of gold (lower limit of detection 0.05 ppm). Only one rock sample taken in this study contained detectable amounts of gold.

Gold in the stream-sediment samples occurs in association with silver, tin, tungsten, and zinc in several combinations (Evans, 1984b). The geographic distribution of the gold and associated elements suggests at least three sources for the gold: (1) reworked glacial or fluvioglacial deposits in and near the eastern part of the roadless area; (2) reworked Tertiary placers located mostly outside the area; and (3) mineralized zones in fractured argillite and chert.

**MINING DISTRICTS AND MINERALIZATION**

The roadless area is in the eastern part of the North Fork John Day River mining district and the western part of the Granite district (Conyne, 1983). The region that includes the roadless area has a history of mining that dates from the autumn 1861 discovery of placer gold in Granite Creek, a tributary of the North Fork John Day River, near the present town of Granite (fig. 1; Pardee and Hewett, 1914, p. 9), and from initial mining of placer deposits near McCarty Gulch in 1845 in the North Fork district (Oregon Metal Mines Handbook, 1941, p. 97). Granite Creek and its tributaries have yielded large amounts of placer gold from just outside the roadless area (fig. 2). During the periods 1938-42 and 1946-51, a bucketline dredge was operated on these creeks (Brooks and Ramp, 1968, p. 57).

Other placer mines, worked mainly with hydraulic equipment, were the Klopp mine, just south of the North Fork John Day campground and outside the roadless area, and the Thornburg mine on the North Fork about 5 miles west-southwest of the Klopp mine (fig. 2). By 1901 the Klopp mine had been worked for many years, with an annual production of $3,000 to $6,000 (Lindgren, 1901, p. 687). The volume of gravel worked from placers to 1916 was estimated at 6.5 million yd$^3$ yielding $342,000$ in gold (Parks and Swartley, 1916, p. 165).

The Thornburg mine (fig. 2), also called the Steuben placers, was worked in the late 1800s. By 1901 the placers had been worked steadily for many years with an annual production of several thousand dollars (Lindgren, 1901, p. 686). The April 26, 1986, edition of the Sumpter, Oregon, Blue Mountain Weekly newspaper reported the Thornburg placer gold value at 8 to 20 cents/yd$^3$ of gravel.

Several thousand ounces of gold were produced from the Davis and Calhoun placers on the North Fork John Day River just west of the roadless area (fig. 2) by washing plant and dredge during 1940-42 and 1947-50 (Brooks and Ramp, 1968, p. 57).

Thirty-five areas have been identified that contain significant tailing and boulder piles from placer mining activities. Some of these areas are as large as 10 acres. Remains of at least 10 ditches and flumes, some more than 1,000 ft long, are present. Most mining done in the roadless area entailed working bars and bench deposits down to or near bedrock.

The production of placer gold for the Granite district and North Fork drainage basin was estimated to be $2,000,000$ by 1914 (Pardee and Hewett, 1914, p. 10), and, by 1968, was estimated at more than $5,000,000$ (Brooks and Ramp, 1968, p. 64). The production of placer gold for the Granite district and North Fork drainage basin was estimated to be $2,000,000$ by 1914 (Pardee and Hewett, 1914, p. 10), and, by 1968, was estimated at more than $5,000,000$.

Approximately 1 million yd$^3$ of placer gravel has been mined from four or five principal deposits within the roadless area. Total production is unknown, and an estimate of production is not possible due to lack of records. Most output, however, was probably from the Thornburg mine.

Most of the area along the North Fork John Day River in the roadless area is not covered by mineral claims. A few placer claims are also present along creeks tributary to the North Fork John Day River. Claims in the roadless area numbered over 200 in 1980; the exact number is difficult to determine because of new claims being located and existing claims being renewed, abandoned, or relocated. There are no patented claims or mineral leases within the roadless area, and no large producing or developing mines. Claimants now work on a small scale, many using portable gasoline-powered...
suction dredges. Most of the gold obtained is very fine
grained.

Of the hundreds of claims located over the years in the
roadless area, only a few have been lode claims; no lode
mining is known at the present time. Lode mining in
surrounding areas began in the 1870's with discovery of the
Monumental mine in 1874 and the La Bellevue mine in 1877
(Lindgren, 1901, p. 685), both located east of the map area.
The Buffalo mine, the largest mine of the Granite district, is
2.5 mi southeast of the roadless area (fig. 2). It began
operation in the mid-1880's and has been active almost
continuously to the present. Exploration has been carried on
recently at the Cougar-Independence and La Bellevue mines
(Brooks and Ramp, 1968, p. 64).

**ASSessment of Mineral Resource Potential**

Placer gold resources exist along the North Fork John
Day River (Conyac, 1983). The roadless area contains 1.4
million yd$^3$ of indicated resources and about 1.4 million yd$^3$
of inferred resources having a weighted average of 0.002
carat/yard$^3$. Comparing only deposits containing gold values over $1.00/yd^3$, the study area contains indicated marginal reserves of 10,000 yd$^3$ and inferred marginal reserves of 330,000 yd$^3$ with a weighted average gold value of $1.78/yd^3$. These marginal reserves are about 30 percent of the total placer resources.

Of the total volume of deposits composing the marginal reserve base, 670,000 yd$^3$ averaging $1.60/yd^3$ are at and above the mouth of Granite Creek; 170,000 yd$^3$ averaging $2.48/yd^3$ are below the mouth of Granite Creek.

The amount of gold actually recoverable during placer
mining may differ from the estimates of gold content given
above, because some of the extremely fine-grained gold that
may have been included in the laboratory analysis of samples
from the deposits would probably not be recovered during
drilling. Gold recovery can also exceed estimated gold
cost, as suggested by results of 23 alluvial samples taken
from just above bedrock in the roadless area, which imply
that the deposits may tend to be enriched in gold downward.

An estimate of the economic feasibility of mining the
placer gravels, other than by suction dredging, indicates that
the deposits in the roadless area are too small to support
large placer mines. A hypothetical mining operation for
placers along the river would require minimal preparation.
Using a minimum grade of $1.00/yd^3$, the $840,000 yd^3$ of
marginal reserves would take about 6.4 years to mine, assuming a production rate of 500 yd$^3$ per day and a work
schedule of one shift (8 man-hours) per day for 260 days per
year using front end loaders and portable gravel washing
equipment. In order to realize a 20 percent return on
investment, either a value of $2.75 per yd$^3$, or a 56-percent increase in the gold price to about $780 per troy ounce is
required.

The potential for occurrence of gold resources was
determined for 21 drainages tributary to the North Fork John
Day River (fig. 2). The atomic absorption analyses upon
which the potential is based represent total gold content of the
samples, and their use in describing gold potential in the
roadless area requires explanation. Although much of the
gold in the sample is probably free gold, some of it may be
incorporated into minerals such as pyrite, which would not be
sought in a placer mining operation. In addition, some of the
free gold is probably extremely fine grained and would not be
recoverable by mining with ordinary separation methods;
therefore, the gold values obtained by atomic absorption
analysis may be higher than concentrations of gold that can be
practically recovered by washing placer gravels.

Listed are the streams that are tributary to the map area.

for definition of terms.
4 Dollar value based on gold price of $500 per troy ounce.

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Figure 1.—Index map showing location of North Fork John Day River Roadless Area (B6253), Grant County, Oregon.
Figure 2.—Map of the North Fork John Day River Roadless Area. Numbered areas have potential for gold lode and placer resources: I, high; II, moderate; and III, low. See text for explanation.