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MINERAL RESOURCE POTENTIAL OF THE NORTH FORK SMITH RIVER ROADLESS AREAS, DEL NORTE COUNTY, CALIFORNIA, CURRY AND JOSEPHINE COUNTIES, OREGON

SUMMARY REPORT

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STUDIES RELATED TO WILDERNESS

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 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 North Fork Smith River Roadless Areas (05707 and 06707), Six Rivers and Siskiyou National Forests, Del Norte County, California, Curry and Josephine Counties, Oregon. The areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The geologic environment of tectonite-harzburgite and basal cumulus section of the Josephine ophiolite of Harper (1980) along with younger silicic intrusives found within the North Fork Smith River Roadless Areas suggests a potential for mineral deposits containing nickel, chromium, cobalt, magnesium, iron, copper, mercury, platinum-group elements, and asbestos. The potential for deposits containing chromium, cobalt, and nickel is high. Weathering of ultramafic rocks has produced lateritic soils enriched in nickel, cobalt, chromium, magnesium, and iron. Total indicated resources and marginal reserves of nickel-cobalt-chromium-magnesium ore in residual deposits within the roadless areas are estimated to be 16 million tons. Gasquet Mountain and 11 other properties immediately adjacent to the area contain an additional estimated 29 million tons. Tectonite and cumulate ultramafic rocks contain resources of chromite with possible associated platinum-group elements. Total indicated chromium resources within and adjacent to the roadless areas may be in excess of 35,000 tons (M. M. Hamilton, A. R. Buehler, and P. N. Gabby, unpub. data, 1983). Hydrothermal activity initiated by Tertiary silicic intrusions has accompanying mercury mineralization as well as copper- and cobalt-bearing magnetite veins deposited in serpentine shear zones and fractures. Magnetite veins within the study area, primarily with copper and cobalt values plus associated trace gold and silver, have a total of 21,000 tons of material averaging 1 percent copper and 0.05 percent cobalt; an additional 29,000 tons occur adjacent to the area (M. M. Hamilton, A. R. Buehler, and P. N. Gabby, unpub. data, 1983). The potential for deposits containing mercury is high to moderate in the study area. Identified resources of mercury at the Webb mine, adjacent to the study area, are 80,000 tons of ore averaging 5.8 lb mercury per ton. Mineral resource potential of the area is low for iron, gold, silver, and asbestos.

INTRODUCTION

Location

The North Fork Smith River Roadless Areas (05707 and 06707) are located in Del Norte County, northwestern California, and Curry and Josephine Counties, southwestern Oregon, respectively (fig. 1). Most of the study area lies just south of the California-Oregon border in the Klamath Mountains geomorphic province. The roadless areas encompass 39,400 acres in Six Rivers National Forest and 950 acres in Siskiyou National Forest, including most of the headwaters of the North Fork Smith River and Diamond Creek. The area is accessible from Smith River, Calif., via U.S. Forest Service Roads 308 and 305 (Wimer Road), and via Gasquet Mountain Road and Gasquet Toll Road-Patrick Creek Road which originate from U.S. Highway 199. The Wimer Road, an old stagecoach route, cuts across the northern part of the area.

Geologic setting

The structural pattern of the Klamath Mountains province tectonically juxtaposes a large mantle-derived slab of partially serpentinized tectonite harzburgite-dunite, ultramafic-mafic cumulate, gabbro, and metavolcanic rocks of the western Jurassic belt against the Dothan Formation, which is exposed in the northwestern part of the area (Harper, 1980; Gray and others, 1983). Jurassic and Cretaceous intermediate-composition intrusions and Tertiary rhyolitic rocks invade the ultramafic slab along major shear zones. Local hydrothermal alteration accompanied much of the Tertiary activity. A protracted period of weathering under subtropical to tropical climatic conditions during Tertiary time produced widespread development of laterite. The complex geologic history suggests a range of mineralization types existing within a fairly limited suite of rock types. The geologic environment includes early magmatic syngenetic deposits, epigenetic epithermal deposits, and lateritization.

GEOLOGY, GEOCHEMISTRY, AND GEOPHYSICS PERTAINING TO MINERAL RESOURCE ASSESSMENT

Geology

Most of the North Fork Smith River Roadless Areas (05707 and 06707) lies south of the California-Oregon border in the Klamath Mountains geologic province. The geologic map by Gray and others (1983) was simplified to show the major rock units of the roadless areas and is used as a base for this report. Most of the igneous rocks belong to an ophiolite sequence called the Josephine ophiolite by Harper (1980). The age of the ophiolite is probably Late Jurassic as indicated by a concordant U-Pb date of 157 m.y. on a plagiogranite within the ophiolite sequence (Harper and Saleeby, 1980) and by the presence of Late Jurassic fossils in a pebble conglomerate bed overlying the ophiolite (D. L. Jones, oral commun., 1979).

All the components of an ophiolite sequence are present in the North Fork Smith River area and are briefly described in order from oldest to youngest. The Josephine Peridotite is the lowermost unit exposed and covers approximately 310 mi^2, an area much larger than that of the roadless areas. The peridotite is composed of harzburgite and dunite tectonite. Above the Josephine Peridotite are cumulus ultramafic and gabbroic rocks exposed near the east edge of the roadless area. A massive serpentinite shear zone marks the contact between these cumulus rocks and the harzburgite-dunite tectonite. Dunite lenses of various sizes containing podiform chromitite occur in both tectonite and cumulus ultramafic rocks. Most of the chromite deposits appear to be located in and adjacent to the contact zone between the peridotite tectonite and the cumulus rocks. Intrusive breccia and local diabase dikes occur in the noncumulus gabbro. Minor amounts of volcanic rocks and associated diabase dikes that crop out in the northeastern part of the roadless area are considered to be the uppermost part of the Josephine ophiolite.

Two younger intrusive events are indicated by small stocks and dikes that cut the Josephine ophiolite. The older of the two consists of rocks of intermediate composition, mainly hornblende diorite and minor quartz diorite, intruded along predominantly north-trending structures. The largest of these intrusion-injected structures, commonly marked by shear zones, lies in the north-central region of the roadless areas running from the Oregon border south across the North Fork of Diamond Creek to the area around High Plateau Creek. Rocks from the younger intrusive event are much more widespread, occurring along northwest-trending shear zones and fractures through the tectonite peridotite mass, and they crosscut the diorite. The rocks of the younger event are silicic porphyries that have low-temperature hydrothermal alteration and metamorphism associated with them.

Nickeliferous laterites overlie relatively fresh peridotite (mainly harzburgite tectonite) and occur on flat or gently sloping erosion surfaces that probably developed during a protracted period of weathering starting in the Eocene or Oligocene and culminating in the Pliocene.

Small stream terraces formed during the Quaternary are found along the Diamond Creek drainage and scattered along the North Fork Smith River.

Geochemistry

A geochemical survey of the North Fork Smith River areas was undertaken by the U.S. Geological Survey in 1979 and 1980. Analytical data for 111 rock, 75 stream-sediment, and 31 chromitite samples collected in and adjacent to the North Fork Smith River Roadless Areas are given in Gray and others (1982) and interpreted by Page and others (1983).

Analysis of the geochemical data has resulted in the recognition of three main groups of elements based on interelement correlation (Page and others, 1983). These groups are related to major geologic events or units within the roadless area. Two of these groups—(1) nickel, magnesium, cobalt, iron, chromium, and platinum and (2) iron, manganese, copper, scandium, vanadium, calcium, titanium, and platinum—are related to ultramafic rocks and gabbro and basaltic to andesitic volcanic rocks, respectively. The third major group—barium, boron, copper, mercury, zirconium, yttrium, strontium, and lead—reflects a low-temperature overprint and characterizes the intrusion of silicic porphyritic rocks and accompanying hydrothermal alteration. Anomalous concentrations of boron, barium, and mercury, in particular, probably are related to the movement of hydrothermal fluids along shear zones and faults. Map A of the accompanying map sheet shows drainage basins containing anomalous amounts of mercury and copper in stream-sediment samples.

Analytical data from chromite mines and prospects within the area indicate an average Cr:Fe ratio of approximately 2.4 for the chromitite samples (Cater and Wells, 1953, p. 121). Nickeliferous laterites have concentrations of nickel, cobalt, chromium, and copper, and representative analyses are shown in table 1 (pamphlet) (Michael Foose, unpub. data, 1982; Gray and others, 1982). See also laterite properties in table 1 (map sheet).

Table 1.— Range of composition of laterite (ppm)
[Samples 232 and 233 represent series of samples taken at one site (varying depth).
NA, not analyzed]

Sample no.	Co	Ni	Cu	Cr
232	480-1,000	3,900-7,900	63-110	NA
233	440-1,300	5,500-16,000	43-98	NA
SR-20	1,000	5,000	100	>5,000
SR-21	1,000	5,000	200	>5,000

Geophysics

An aeromagnetic survey of those parts of the Crescent City and Gasquet quadrangles, California, that are underlain predominantly by ultramafic rocks of the Josephine Peridotite was performed in 1977 and compiled at a scale of 1:62,500 (Griscom, 1983). The purpose of that investigation was to study the relation between local chromite deposits and aeromagnetic data.

In general, magnetic anomalies due to topographic fluctuations obscure magnetic anomalies between adjacent rock units. Areas of known or suspected chromite potential were also inadequately resolved by the aeromagnetic survey. Several of the areas of low-intensity magnetization indicated by the survey, however, correspond to known geologic features and are consistent with magnetic properties, patterns of geologic structures, and rock types exposed at the surface (Griscom, 1983) (see map A). Areas of low magnetic susceptibility overlie large intrusive bodies with intermediate to silicic composition and swarms of shear zones with hydrothermal alteration. For example, the northeasternmost magnetic low directly overlies an intrusion of quartz diorite that has been severely altered by late-stage hydrothermal activity accompanying the deposition of low-grade mercury ore. Zones of magnetic lows, then, correspond closely to magmatic mineralization associated with either silicic rocks possessing a perceptively low-intensity magnetization or rocks containing a magnetite destructive-oxidizing alteration.

MINING AND MINERALIZATION

Mining in Del Norte County dates back to the early 1850's when copper was discovered in the Low Divide district just west of the study area. The district remained active until 1870 with about 2,000 tons of high-grade copper ore shipped from Alta and Union mines (Maxson, 1933, p. 144). In the 1860's, the Rockland mining district was established on the northern side of the area along the divide between the North Fork Smith River and Diamond Creek. The district's principal mine, the Cleopatra (fig. 2, table 2, no. 8), had yielded approximately 200 tons of high-grade copper ore by 1911 (Lowell, 1915). About 1900, a small copper deposit was developed at the Britten prospect (Copper Queen) (table 2, no. 21) in the Diamond Creek drainage; any production was probably limited. Mining interest in these copper districts

never revived after initial production because of the small size of remaining resources.

Mercury was discovered on Diamond Creek at the Sunny Brook Mercury mine (table 2, no. 10) in the 1850's. Placer miners produced a small amount of mercury for amalgamation from this mine and from the Big Boy Mercury mine (table 2, no. 16) to the north. Attempts to mine the large low-grade mercury deposit at the Big Boy in the 1920's and 1960's were unsuccessful. In the 1940's, a mercury deposit on the east side of the study area at the Webb Mercury mine (table 2, no. 40) was developed with production of approximately 250 flasks (a flask contains 76 lbs of mercury) of mercury. In 1983, this property was being explored to determine if any mercury resources remain.

Chromite mining in Del Norte County started in the early 1860's at the Mountain View mine (fig. 2). Between 1918 and 1958, 20 properties within and adjacent to the study area had reported production of about 41,000 tons of chromite; most was shipped to the Metal Reserve Company in Grants Pass, Oreg. The High Plateau mine (fig. 2, no. 63) was the leading producer with 25,000 tons produced between 1918 and 1958. Most production was associated with wartime markets and years of Federal price-support programs. Since the end of government stockpiling in 1958, there has been little chromite mining activity.

Although interest in nickeliferous laterites dates back to 1865, development of the resource started in 1954 when Hanna Nickel Smelting Company began processing ore from Nickel Mountain in Oregon. In 1957, New Jersey Zinc Company and Rare Metals Corporation initiated exploration projects on Gasquet and Pine Flat Mountains. Since that time claim staking and exploration activity has been constant, with approximately 1,200 claims filed by California Nickel Corporation, El Paso Mining and Milling Company, Union Carbide Corporation, Coastal Mining and Milling Company, O'Brien Associates, Meridian Resources, Ltd., Cal Ore Corporation, and numerous individuals. Currently (1983), California Nickel Corporation is developing their property on Gasquet Mountain; approximately 30 percent of their laterite deposits are inside the roadless areas.

Approximately 2,300 claims have been located within or adjacent to the roadless areas from the 1880's to the present. Of these, 1,100 were lode locations and 1,200 were placer. Most of the placer locations involved laterites.

There are four types of mineral occurrences in the study area: nickeliferous laterite, chromite in pods or sheets, cupreous magnetite veins, and mercury in and associated with siliceous dikes. The nickeliferous laterites are residual soils that are formed by the weathering of peridotites rich in the relatively insoluable trace elements nickel, cobalt, chromium, and iron. Thicker laterites are developed on bedrock of unserpentinized harzburgite tectonite. There are three horizons in lateritic soils: an upper hematitic zone, a limonitic zone, and a lower saprolitic zone. Cobalt is often enriched near the top of laterite deposits and nickel at the bottom. Deposit types include landslide-slump blocks, ridge-top sections of the old peneplain, and continuous-slope types that have been transported by soil creep and fluvial erosion. Laterites in the southeastern and eastern parts of the study area are of lower grade than those in the western and northwestern parts.

Chromite is associated with harzburgite and dunite. The chromium is derived from the upper mantle or lower crust and has undergone much tectonic deformation and displacement during emplacement of the ophiolite within the continental margin accretionary prism. Deposits are enveloped by dunite and are most numerous near the sheared contact zone between the cumulate and tectonite layers (Gray and others, 1982). This zone is roughly parallel to layering in the ophiolite that dips gently eastward, and is exposed at higher topographic elevations in the peridotite. Exposures of chromite are concentrated in three regions: the ridge from Gasquet Mountain north to Pine Flat Mountain, High and Low Divides, and Elk Camp Ridge. Chromite deposits are either massive or disseminated; massive deposits occur as pods or as tabular sheets. Most chromite properties are small pod deposits in shear zone of serpentinite or in harzburgite country rock. The only properties with tabular-sheet deposits are the Judy prospect, Toujours Gai and High Plateau mines (table 2, nos. 27, 37, 55, and 63). Small disseminated chromite deposits are exposed on the Lost Lake, Wild Finn, Skyline, and Elk Camp Ridge properties (table 2, nos. 20, 31, 53, and 74).

Copper minerals are associated with magnetite veins emplaced along fault and shear zones in harzburgite. The veins also carry values of gold, silver, and cobalt. They trend generally north to northwest and are distributed near the edges of the ultramafic rocks. The magnetite veins are believed to have been deposited as hydrothermal fluids circulating in the harzburgite tectonite body which was cooled in large serpentinite sheared areas. Tertiary-age silicic magmatic activity is the source of the hydrothermal system. Three parts of the study area contain copper-bearing vein deposits: on the west at the Low Divide No. 1, Copper Hill, Aurora, Little Bitt, and Copper Lake properties (table 2, nos. 43, 44, 47, 48, and 51); on the north at the Cleopatra mine (table 2, no. 8); and on the northeast at the Copper Queen prospect (table 2, no. 21).

Mercury is found as veinlets of cinnabar and native mercury associated with silicic intrusions in harzburgite country rock. These intrusions are believed to be the youngest intrusive event affecting the ultramafic rocks of the Josephine ophiolite and were emplaced along zones of weakness caused by previous intrusions (Gray and others, 1982). At the Sunny Brook Mercury mine (table 2, no. 10), veinlets of cinnabar in quartz veins are adjacent to a hornblende diorite dike. At the Big Boy Mercury mine (table 2, no. 16) fracture fillings of cinnabar are in a diorite intrusion that apparently has been propylitized and mineralized by an unexposed, later intrusion. At the Webb Mercury mine (table 2, no. 40), cinnabar and native mercury are within a siliceous dike that intruded a diorite dike swarm.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

On the basis of joint studies by the U.S. Bureau of Mines and the U.S. Geological Survey, areas outlined on figure 3 within and immediately adjacent to the North Fork Smith River Roadless Areas (05707 and 06707) have potential for the occurrence of mineral deposits. Geologic, geochemical, and geophysical conditions favorable for the occurrence of certain types of deposits are evaluated below. No geologic or geochemical evidence was found to indicate the possibility of deposits of asbestos, gold, manganese, or platinum-group elements and the potential for these is low.

Laterite deposits

Evaluation of characteristics favorable for the occurrence of laterite deposits containing nickel, cobalt, and chromium in the North Fork Smith River Roadless Areas is given below:

Favorable characteristics	Conditions met in the North Fork Smith River Roadless Areas
1. Occurrence of nickel, cobalt and chromium in laterite deposits	yes
2. Presence of nickel-, cobalt- and chromium-enriched parent ultramafic rocks with developed lateritic soils	yes
3. Relatively flat topographical areas developed on ultramafic rocks during a period of lateritic soil formation	yes
4. Tonnages upward of 10 million short tons and nickel grades in excess of 0.65 percent in an individual or closely grouped set of deposits	partially

5. Homogeneous grades without large lateral and vertical changes in the deposit	partially
6. A metallurgical process capable of extracting metals from chemically and mineralogically diverse soils	yes

Podiform chromite deposits

Evaluation of the characteristics favorable for the occurrence of podiform and disseminated chromite deposits and associated platinum-group elements in the North Fork Smith River Roadless Areas is given below:

Favorable characteristics	Conditions met in the North Fork Smith River Roadless Areas
1. Occurrence of podiform and disseminated chromite deposits	yes
2. Presence of ultramafic rocks of an ophiolitic sequence that contains extensive areas of dunite, tectonites, and cumulates	yes
3. A deposit or closely clustered group of deposits having at least 100,000 short tons of ore and grades of 43 percent or greater Cr_2O_3	no
4. Large unfaulted and unsheared blocks of ultramafic rocks	partially
5. Inexpensive mining, milling, and extraction methods available	partially

Copper- and cobalt-bearing magnetite vein deposits

Evaluation of characteristics favorable for the occurrence of copper- and cobalt-bearing magnetite vein deposits in the North Fork Smith River Roadless Areas is given below:

Favorable characteristics	Conditions met in the North Fork Smith River Roadless Areas
1. Ultramafic rocks that could provide a source for iron, cobalt, and copper	yes
2. Extensive serpentinization of the ultramafic rocks to provide the environment for metal remobilization	yes
3. Heat source to initiate hydrothermal activity	yes
4. Identified occurrences of this type of mineralization	yes

Mercury deposits

Evaluation of the characteristics favorable for the occurrence of mercury deposits in the North Fork Smith River Roadless Areas is as follows:

Favorable characteristics	Conditions met in the North Fork Smith River Roadless Areas
1. Occurrence of disseminated mercury deposits	yes
2. Presence of silicic (rhyolitic) intrusives with accompanying hydrothermal alteration	yes
3. Presence of abundant brecciated and sheared zones in country rock	yes
4. Drainage basins containing anomalous amounts of mercury	yes

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Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity
[Underlined names indicate properties with identified resources or moderate or high potential. From M. M. Hamilton, A. R. Buehler, and P. N. Gabby, unpub. data, 1983]

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
1	Climax prospect (nickel, cobalt, chromium, magnesium)	The group contains one ridge-top-type laterite deposit and all or part of five slump-block-type deposits totaling 286 acres (59 acres in roadless area) with an average thickness of 26 ft. Deposits range in elevation from 1,700 to 2,600 ft.	Approximately 90 power-auger holes, drillsites, and bulldozer trenches, and eight hand-auger holes in a disturbed area totaling 410 acres.	Within the study area, the property contains 1 million tons of measured, indicated, and inferred marginal reserves averaging 0.73 percent nickel, 0.06 percent cobalt, 1.6 percent chromium oxide (Cr_2O_3), and 21 percent magnesium oxide (MgO). Analyses of 276 samples from 17 locations ranged from 0.31 to 1.64 percent nickel, 0.011 to 0.194 percent cobalt, 0.50 to 4.80 percent Cr_2O_3, and 1.7 to 40.5 percent MgO. An additional 3.4 million tons of laterite resources on this property is adjacent to the study area.
2	Lost Road No. 2 prospect (copper)	A 0.5- to 1-ft-thick cupreous magnetite vein strikes approximately north in sheared, silicified serpentine and harzburgite. Vein contains chalcocite and malachite; wallrock is hydrothermally altered.	Five small, sloughed prospect pits along strike of vein.	Two grab samples of vein material had 3.15 and 5.00 percent copper. There is a moderate potential for copper resources.
3	Lost Road No. 1 mine (chromium)	A chromite pod in dunite was mined out in the 1940's, leaving remnants of a dunite body with disseminated chromite.	Several small prospect pits, a 150-ft-long bulldozer cut, and a caved shaft. Production in 1942 consisted of 48 tons containing 39.9 percent Cr_2O_3.	Three grab samples of massive chromite dump material averaged 27.3 percent Cr_2O_3. This property has a moderate potential for chromium resources.
4	Baby Elephant mine (chromium)	A 160-ft-long and 30-ft-wide dunite body in harzburgite contains a small chromite pod and patches of disseminated chromite. The long axis of the dunite body is oriented north.	Two east-trending bulldozer cuts; chromite pod removed from 8-ft-diameter pit.	One select sample of massive chromite had 35.5 percent Cr_2O_3. Two grab samples of disseminated chromite showed less than one percent Cr_2O_3. A low potential for resources of chromium exists.
5	Pine flat Chromite mine (chromium)	A 60-ft-long, 4-ft-wide chromite pod in dunite within sheared serpentinite and harzburgite was mined out, leaving only remnants of the pod. The pod strikes N. 20° W.	Pod removed by pits and trenches along strike; subsequently, vicinity explored with bulldozer trenches totaling 500 ft. The property yielded 10 tons of chromite with 42 percent Cr_2O_3 in 1944.	One select sample of massive chromite had 27.8 percent Cr_2O_3, indicating a medium grade for approximately 3 tons of chromite in a stockpile and dump debris. The property has a moderate potential for chromium resources.

Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity--(continued)

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
6	PFM prospect (nickel, cobalt, chromium, magnesium)	One combination ridge-top-type and slump-block-type laterite deposit and all or part of five slump-block-type deposits covering 296 acres (124 acres in roadless area) with an average thickness of 15 ft. Deposit elevations range from 1,300 to 2,600 ft.	Approximately 15 bulldozer trenches and 124 hand-auger holes in disturbed areas totaling 100 acres.	Within the study area the property contains 1.1 million tons of measured, indicated, and inferred marginal reserves averaging 0.76 percent nickel, 0.06 percent cobalt, 1.9 percent Cr_2O_3, and 14 percent MgO. Analyses of 71 samples from 52 locations ranged from 0.29 to 1.48 percent nickel, 0.021 to 0.240 percent cobalt, 0.52 to 3.86 percent Cr_2O_3, and 6.1 to 40.5 percent MgO. An additional 1.8 million tons of laterite resources on this property is adjacent to the study area.
7	Unnamed prospect (chromium)	A shear zone in serpentinite and harzburgite strikes N. 55° W. and dips 70° NE. and contains a 100-ft-long, 4-ft-wide dunite body. The dunite contains minor amounts of disseminated chromite.	One small prospect pit just above river level.	One grab sample of dunite had 0.51 percent Cr_2O_3.
8	Cleopatra mine[1] (copper, cobalt)	A shear zone trending northwest in serpentinite and harzburgite contains scattered, cupreous, magnetite lenses and veins that include limonite, hematite, chalcocite, cuprite, azurite, quartz, and minor bornite, native copper, pentlandite, cobaltite, and linnaeite.	Over 23,000 ft of bullozer cuts and trenches; two flooded and caved shafts; one caved inclined shaft; and two adits, one 13 ft long and one caved; twenty tons of hand-sorted ore containing 15 to 20 percent copper were produced by 1908 (Hershey, 1908, p. 429).	Twenty-five samples: ten select samples of vein material averaged 1.9 percent copper and 0.05 percent cobalt; five chip samples across a 1.9-ft-thick, 170-ft-long cupreous magnetite vein indicate a 2,300-ton occurrence averaging 0.48 percent copper and 0.02 percent cobalt. Two select samples of chromite float averaged 40.8 percent Cr_2O_3. The remaining samples have no significant mineral values. This property has a moderate potential for resources of copper and cobalt.
9	DF prospect (nickel, cobalt, chromium, magnesium)	One slope-type and three slump-block-type laterite deposits cover a total of 227 acres (165 acres in roadless area) with an average thickness of 7 ft. There are two zones of chromite surface float. Deposit elevations range from 1,300 to 2,300 ft.	Six bulldozer sample pits and trenches in a disturbed area of 85 acres.	Within the study area the property contains 1.1 million tons of measured and inferred marginal reserves averaging 0.63 percent nickel, 0.06 percent cobalt, 2.2 percent Cr_2O_3, and 9.7 percent MgO. Analyses of 36 samples from 30 locations ranged from 0.33 to 1.10 percent nickel, 0.017 to 0.180 percent cobalt, 0.61 to 3.80 percent Cr_2O_3, and 6.7 to 20.3 percent MgO. An additional 350,000 tons of laterite resources on this property is adjacent to the study area.

10	Sunny Brook[1] Mercury mine (mercury)	Native mercury and cinnabar were found in one of three, 6- to 10-ft-thick, northerly trending, steeply dipping felsic dikes.	Two caved shafts about 30 ft deep; a 40-ft by 10-ft by 6-ft trench, and a three-pipe retort. Three flasks of mercury were produced in the 1860's and one flask in 1917.	Three chip samples of dike material were taken; one contained 1.2 lb mercury per ton and 0.014 oz gold per ton; two others contained no significant concentration of elements. The property has a moderate potential for mercury resources.
11	October Queen[1] prospect (mercury)	A northerly trending, 8-ft-thick felsic dike contains minor amounts of cinnabar. A northerly trending, 8-ft-thick shear zone in serpentinite contains interstitial calcite with traces of hematite.	Caved adit about 20 ft long.	Two chip samples were taken, one of the felsic dike and one of calcite with an unknown metallic mineral. Neither sample had significant concentrations of elements.
12	Hard Rock[1] prospect (mercury)	Minor amounts of limonite are visible in an 8-ft-thick shear zone striking N. 4° W. in harzburgite.	Three trenches trending N. 45° E. total approximately 330 ft in length and average 6 ft wide and 4 ft deep.	The prospect was originally claimed for mercury but no mineral occurrences were seen. No samples were taken.
13	Discovery No. 1 and No. 2 prospects (chromium)	A highly sheared and fractured serpentinite zone with calcite is approximately 160 ft wide and trends N. 60° W. in harzburgite.	Three northeast-trending trenches total about 530 ft long.	A select sample from a dump contained 46.9 percent Cr_2O_3. One sample across the shear zone contained no significant mineral values. The property has a low potential for resources of chromium.
14	Earl No. 1 prospect (chromium)	Fractured and sheared serpentinite and harzburgite have very minor amounts of limonite.	Caved adit estimated to be 400 ft long.	Only country rock was seen on the adit dump. No samples were taken.
15	Unnamed prospect[1] (chromium?)	A 50-ft-thick felsic dike, striking north and containing approximately 1 percent pyrite, has intruded harzburgite country rock.	Approximately 1,000 ft of bulldozer cuts.	A grab sample of dike material had no significant mineral values.
16	Big Boy Mercury mine (mercury)	A zone of cinnabar veinlets and fracture fillings about 80 ft long and 12 ft wide occur near the center of an altered diorite body. Floyd Gray (oral commun., 1982) believes the mineralization may have been caused by silicic rock (unexposed) intruding the diorite.	Sixty-acre area is bulldozed, trenched, and hydraulicked; several old caved adits; and remnants of a concentrating mill, retort, and ore bins.	Twenty-two grab and chip samples; one 80-ft random chip sample had 0.2 lb mercury per ton, and two other samples had trace mercury. There is a moderate potential for mercury resources, based on past reports.
17	Chrome[1] mine (chromium)	A small chromite pod in serpentinized harzburgite and dunite was removed from a shear zone in serpentinite. Only remnants of the associated dunite body are exposed. The general trend of the body is north.	Pit 240 ft long and 100 ft wide; one caved adit.	One select sample of a 0.5-ton stockpile had 40.1 percent Cr_2O_3. There is a low potential for chromium resources.

Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity--(continued)

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
18	Unnamed prospect (chromium)	A stringer 6 in. thick and 5 to 10 ft long, of chromite in harzburgite.	A caved adit estimated to be 50 ft long.	A small amount of chromite was seen on the dump, but none was found in place. A low potential for chromium resources exists.
19	Richey mine (chromium)	A dunite body within harzburgite reportedly contains a 0.3-ft-thick chromite stringer (Wells and others, 1946, p. 41). The mineralized zone is not exposed.	Two prospect pits and two caved adits. In 1943, 26 tons of chromite containing 41 percent Cr_2O_3 was produced.	Two grab samples of massive chromite dump material had 40.5 and 45.9 percent Cr_2O_3. There is a moderate potential for chromium resources.
20	Lost Lake prospect (chromium)	Small parallel stringers of chromite less than 0.2 ft thick are in serpentinized harzburgite.	Several bulldozer cuts and trenches in an area 450 by 200 ft.	One grab sample of massive chromite had 31.9 percent Cr_2O_3. This property has a low potential for chromium resources.
21	Copper Queen prospect (copper, silver)	A vein with quartz, magnetite, limonite, malachite, and chrysocolla in serpentinite averages 5 ft thick and is exposed for a strike length of 40 ft. The vein strikes north, dips 45° E., and is associated with a diorite dike that intrudes a shear zone.	Two caved adits estimated to be 160 and 120 ft in length; several pits and trenches along strike. A small amount of copper may have been produced.	Six samples: two chip samples across the vein representing 7,800 tons of material contained an average of 0.3 oz silver per ton and 1.6 percent copper. Three select samples had 19.4, 4.4, and 0.21 percent copper; silver ranged to 1.2 oz per ton. The property has a moderate potential for resources of copper and silver.
22	Old Doe[1] mine (chromium)	Several pods of massive chromite are within a 150-ft-thick shear zone that strikes northwest in serpentinite and harzburgite. One pod was mined to a depth of 35 ft. Another pod was reported to measure 12 by 8 by 30 ft but is now inaccessible due to caved workings (H. Funk, mine operator, oral commun., 1981).	An inclined shaft was sunk 35 ft on a chromite pod; three caved adits; most of the hillside in the vicinity of the adit is trenched or cut by bulldozers. Between 1943 and 1958, 11,848 tons of chromite averaging 47.1 percent Cr_2O_3, with a chromium-to-iron ratio of 2.7 to 1 was produced.	The reported pod of high-grade chromite would contain about 400 tons. This pod was drilled and left in place when the mine closed. There is a high potential for chromium resources.
23	Stone Corral prospect (nickel, cobalt, chromium, magnesium)	Part or all of three slump-block-type laterite deposits cover 430 acres (324 acres in roadless area) with an average thickness of 15 ft. Deposit elevations range from 1,300 to 2,300 ft.	Approximately 120 bulldozed trenches and drill sites and 24 hand-auger holes in a disturbed area of 300 acres.	Within the study area the property contains 3.0 million tons of measured, indicated, and inferred marginal reserves averaging 0.65 percent nickel, 0.04 percent cobalt, 1.9 percent Cr_2O_3, and 13 percent MgO. Analyses of 582 samples from 128 locations ranged from 0.04 to 1.79 percent nickel, 0.004 to 0.200 percent cobalt, 0.82 to 2.54 percnt Cr_2O_3, and 6.3 to 51.3 percent MgO. An additional 1.2 million tons of laterite resources on this property are adjacen to the study area.

24	Stone Corral[1] Chromite prospect (chromium)	Small dunite bodies within minor shear zones in harzburgite were visible in workings.	Seven trenches totaling 600 ft in length and averaging 10 ft wide by 4 ft deep; one pit 100 ft long, 75 ft wide, and 20 ft deep.	One select sample from sparse chromite float and stockpile of less than 50 lb contained 33.0 percent Cr_2O_3. There is a low potential for chromium resources.
25	Eagle Pass prospect (chromium)	A 50-ft-long lens of dunite trends eastward and contains massive chromite pods and stringers. Chromite has either been removed or is covered by sloughed workings.	One bulldozer trench 130 ft long.	One grab sampled of massive-chromite dump debris contained 45.6 percent Cr_2O_3. There is a moderate potential for chromium resources.
26	Wishful Thinking prospect (chromium)	A chromite stringer exposed for 7 ft with an average thickness of 5 in. strikes N. 70° E., dips 55° to 70° NW., and is encased in a dunite body surrounded by harzburgite. Stringer thickness increases with depth to the point at which the stringer goes below water level in the inclined shaft.	Inclined shaft, 16 ft to water level; 500 ft of trenches.	One select sample of chromite float had 47.8 percent Cr_2O_3. One 7-in. chip sample across the stringer suggested 6 tons of dunite averaging 32.1 percent Cr_2O_3. There is a moderate potential for resources of chromium.
27	Judy prospect (nickel, cobalt, chromium, magnesium)	One ridge-top-type laterite deposit extends into a slump-block-type deposit and covers 148 acres (13.5 acres in roadless area) with an average thickness of 10 ft. Deposit elevation ranges from 2,200 to 2,800 ft.	Approximately 60 bulldozer and backhoe trenches, and seven hand-auger holes in a disturbed area of 140 acres.	Within the study area the property contains 97,000 tons of measured and inferred subeconomic resources averaging 0.85 percent nickel, 0.11 percent cobalt, 2.1 percent Cr_2O_3, and 9.4 percent MgO. Analyses of 47 samples from nine locations ranged from 0.23 to 1.42 percent nickel, 0.009 to 0.32 percent cobalt, 0.30 to 3.50 percent Cr_2O_3, and 2.0 to 23.0 percent MgO. An additional 980,000 tons of laterite resources on this property is adjacent to the study area.
28	Dubbo prospect[1] (chromium)	Small chromite pods and stringers are within zones of sheared serpentinite and harzburgite. Chromite occurrences, covered by sloughed workings, are suggested by chromite float, debris, and stockpiles.	Three large, sloughed prospect pits and one caved adit estimated 50 ft in length.	Four grab samples of massive chromite from float and stockpiles range from 36.5 to 51.1 percent Cr_2O_3. This property has a moderate potential for chromium resources.
29	Robert's[1] prospect (Bonanza mine) (chromium)	A N. 30° E.-striking lens of disseminated chromite 1 ft thick and 4 ft long is exposed within a highly fractured and sheared serpentinite zone as much as 50 ft thick with dunite bodies as much as 15 ft across.	About 3,200 ft of bulldozed roads and trenches; four pits; one caved shaft reported to be 50 ft deep and stoped on one side (Wells and others, 1946). In 1942 and 1952, 188 tons of chromite averaging 48.1 percent Cr_2O_3 was produced.	Two samples from four stockpiles containing 400 lbs had 51.2 and 52.1 percent Cr_2O_3. One sample of the disseminated chromite stringer indicated a 1-ton occurrence averaging 16.0 percent Cr_2O_3. A high potential for chromium resources is indicatd.

Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity--(continued)

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
30	Saints Airstrip prospect (chromium?)	Several small dunite pods are near a 15-ft-thick sheared serpentinite zone trending N. 20 W. in harzburgite.	About 900 ft of bulldozer trenches averaging 6 ft deep and 15 ft wide.	No mineral occurrences were exposed.
31	Wild Finn prospect[1] (chromium)	Two lenses, 20 and 30 ft long averaging 1 ft thick, of disseminated chromite in dunite associated with serpentinite in shear zones. Host rocks is harzburgite, which is intruded by felsic dikes.	An estimated 100 ft of underground workings; 1,500 ft of trenches and roads; and a pit 400 ft long, 80 ft wide, and 30 ft deep.	A grab sample of massive chromite from the dump had 51.8 percent Cr_2O_3. A grab sample of disseminated chromite had 22.1 percent Cr_2O_3. One sample of dike rock contained 0.4 oz silver per ton. About 270 tons of dunite averages 22.1 percent Cr_2O_3. There is a high potential for chromium resources.
32	Unnamed laterite prospect (nickel, cobalt, chromium, magnesium)	One slump-block-type laterite deposit covers 4 acres with an average thickness of 7 ft. Deposit elevations range from 2,100 to 2,300 ft.	None.	The property contains 27,000 tons of measured and inferred subeconomic resources averaging 0.26 percent nickel, 0.04 percent cobalt, 1.6 percent Cr_2O_3, and 8.9 percent MgO. Analyses of nine auger samples from five locations ranged from 0.09 to 0.57 percent nickel, 0.020 to 0.080 percent cobalt, 0.72 to 3.05 percent Cr_2O_3, and 7.6 to 13.1 percent MgO.
33	Red Lilly prospect (chromium)	Numerous small chromite pods and stringers in a dunite body are as much as 8 in. thick and 2.5 ft long. The dunite body trends north in harzburgite.	Five bulldozer trenches total over 500 ft along strike of dunite body.	Two grab samples from stockpiles totaling 1 ton and containing massive chromite averaged 52.5 percent Cr_2O_3. The property has a moderate potential for chromium resources.
34	Old Blazer prospect (Logan mine) (chromium)	Chromite pods are within a north-striking shear zone of serpentinite and harzburgite. Most of the chromite has been mined. This structure may be a continuation of the one to the south at the Holiday mine.	A 200- by 300-ft bench cut, about 900 ft of bulldozer cuts, one caved adit reported to be 800 ft in length (Thomas Carlson, pers. comun., 1982), and a 30-ft adit. In 1943, ten tons of chromite were produced.	A chip sample across a chromite pod indicated a 2-ton occurrence averaging 28.3 percent Cr_2O_3. One grab sample of disseminated chromite from a dunite body in the main structure had 4.7 percent Cr_2O_3. A grab sample of massive chromite debris had 34.6 percent Cr_2O_3. The property has a moderate potential for chromium resources.
35	Turbo prospect[1] (copper)	In 1982, the prospect was being explored for volcanogenic massive sulfide deposits of copper in metavolcanic rocks east of the harzburgite. Deposits of this type occur at the Monumental mine, 4 mi northeast of the prospect.	None.	A series of geochemical soil samples taken by Baretta Mining Company contained up to 1,700 ppm copper. A geochemical anomaly over 400 ft long suggests a moderate potential for copper resources.

36	Elk Camp mine (chromium)	Numerous dunite bodies with small chromite pods and stringers are exposed on top of a broad ridge. Larger chromite pods have been removed and probably contained only a few tons of chromite each.	Several dozen shallow bulldozer pits and trenches. About 25 tons of chromite was produced between 1952 and 1954, with 44.2 percent Cr_2O_3 and a chromium-to-iron ratio of 2.9 to 1.	Seven select samples had from 28.0 to 45.2 percent Cr_2O_3. There is a moderate potential for chromium resources on this property.
37	Toujours Gai mine[1] (chromium)	A tabular sheet of massive chromite ranging from a few inches to 5 ft thick was mined in the 1940's. Downdip extensions of this sheet, striking N. 40° E. and dipping 15°-25° SE., are exposed in adits north of the main pit. The undulating sheet had fault displacements of a foot or less.	Property covered with bulldozer pits and trenches; two adits total about 360 ft in length; three caved inclined shafts. About 867 tons of chromite averaging 46.9 percent Cr_2O_3 were produced between 1943 and 1948.	Six chip samples across the chromite body exposed in the adits average 45.2 percent Cr_2O_3 and indicated about 400 tons of chromite-bearing rock. There is a high potential for chromium resources.
38	O'Brian Associates[1] prospect (nickel, cobalt, chromium, magnesium)	Seven slump-block-type laterite deposits cover 71 acres (54 acres in roadless area) with an average thickness of 6 ft. Deposit elevations range from 1,600 to 3,100 ft.	One bulldozer trench.	Within the study area the property contains 310,000 tons of measured and inferred subeconomic resources averaging 0.49 percent nickel, 0.05 percent cobalt, 2.5 percent Cr_2O_3, and 8.9 percent MgO. Analyses of 93 samples from 64 locations ranged from 0.22 to 0.95 percent nickel, 0.010 to 0.160 percent cobalt, 0.56 to 6.65 percent Cr_2O_3, and 6.1 to 28.4 percent MgO. An additional 99,000 tons of laterite resources on this property is adjacent to the study area.
39	Chrome X[1] prospect (chromium?)	A small dunite body striking north, with minor amounts of chromite, is exposed on a ridge top.	A 140-ft-long bulldozer cut.	There is no exposed mineral occurrence, and no samples were taken.
40	Webb Mercury[1] mine (mercury)	Multiple intrusions of diabase dikes in harzburgite contain native mercury, cinnabar, and minor amounts of gold and silver.	Approximately 1,000 ft of underground workings with all but about 100 ft caved; 16,000 ft of trenches and bulldozer roads; one pit 300 ft long by 150 ft wide by 40 ft deep; a 4- pipe retort; and 50-ft-long ore chute. Between 1943 and 1962, 252 flasks of mercury were produced from 853 tons of ore averaging 22.4 lb mercury per ton.	Seventy-four chip samples and one grab sample were taken: three contained 231.6, 32.4, and 17.4 lb mercury per ton; 17 others contained from 0.2 to 4 lb mercury per ton; three samples contained 2.2, 0.4, 0.2 oz silver per ton; and one sample contained 0.042 oz gold per ton. There is an estimated 80,000 tons of indicated and inferred marginal reserves averaging 5.8 lb mercury per ton. The property has a high potential for additional mercury resources.

Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity--(continued)

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
41	Martha B. prospect (chromium)	A small chromite-bearing pod in dunite is in a shear zone of serpentinite and harzburgite. The zone strikes N. 20° E. and dips 80° SE. Remnants of the dunite are exposed in the main pit.	A prospect pit on chromite outcrop; a 120-ft by 40-ft bulldozed bench on shear zone.	One select sample of chromite debris assayed 47.4 percent Cr_2O_3. There is a low potential for resources of chromium.
42	Four Cut prospect[1] (chromium)	Dunite pods and stringers as much as 5 ft thick are in a highly sheared serpentinite zone as much as 60 ft thick, which trends N. 85° W. in moderately altered harzburgite. An 80-ft-thick felsic dike parallels the shear zone.	Eight trenches totaling about 2,000 ft in length, averaging 10 ft wide and 3 ft deep; one 6-ft-deep pit.	Three samples of chromite float contained 32.2 to 36.8 percent Cr_2O_3; two chip samples of the felsic dike had no significant values. The property has a low potential for chromium resources.
43	Low Divide No. 1 mine[1] (copper, cobalt, gold, chromium)	A small chromite pod is in a shear zone of serpentinite that strikes north and dips east. Also on the property is a poorly exposed cupreous magnetite vein that has apparent northwest trend and contains cuprite, chalcocite, bornite, native copper, linnaeite, azurite, sphalerite, and cobaltite.	Chromite pod mined from a 50- to 60-ft-deep inclined shaft (now flooded); a 15-ft-long adit behind the shaft; a bulldozer trench 500 ft long, 50 ft wide, and 30 ft deep dug for road material. The cupreous vein is explored by a shaft (caved) and two bulldozer trenches totaling 270 ft in length. Ninety tons of chromite was produced between 1954 and 1957, with 43.5 percent Cr_2O_3 and chromium-to-iron ratio of 2.6 to 1 were produced between 1954 and 1957.	One select sample of massive-chromite dump debris had 38 percent Cr_2O_3. Two select samples of cupreous magnetite vein material had 17.2 and 15.9 percent copper, 0.27 and 0.12 percent cobalt, and 0.015 and 0.018 oz gold per ton. Mineral occurrences are covered by caved, flooded, or sloughed workings. There is a high potential for copper, cobalt, and gold resources, and a moderate potential for chromium resources.
44	Copper Hill prospect[1] (copper, cobalt)	A 40-ft-long cupreous magnetite vein strikes N. 85° W. and dips 22° SW. in a shear zone of serpentinite and harzburgite. The vein averages 4.2 ft thick and consists of magnetite, chalcocite, limonite, malachite, azurite, chrysocolla, and cobaltite. It may continue 100 ft to the northeast where a similar vein crops out.	Two prospect pits on vein outcrop; two bulldozer pits cut the vein.	Two chip samples across the vein in the main pit had 2.07 and 0.68 percent copper; one contained 0.15 percent cobalt. One select sample of vein material from the smaller pit had 1.03 percent copper and 0.10 percent cobalt. About 1,400 tons of the vein averages 1.28 percent copper and 0.07 percent cobalt. The property has a high potential for resources of copper and cobalt.

45	Lady Belle 82 prospect (copper)	Cupreous magnetite veins in serpentinite and harzburgite were reportedly crosscut in now-caved workings (San Francisco Alta newspaper in 1864). These veins may be extensions of veins exposed updip on the Aurora prospect.	One west-trending adit open for 1,200 ft (reported in a San Francisco newspaper article to be 1,600 ft long).	Eight chip samples showed no significant concentrations of mineral values. There is a low potential for copper resources, based on the report of cupreous veins.
46	Sunshine prospect (copper?)	No outcrop. Hydrothermally altered serpentinite and harzburgite are on adit dump.	One caved adit estimated to have 500 ft of workings.	One dump sample contained no significant mineral values.
47	Aurora prospect (copper, cobalt, gold)	Six cupreous magnetite veins in harzburgite and serpentinite are as much as 1.5 ft thick and include limonite, malachite, chalcocite, bornite, chrysocolla, and pentlandite. The veins strike northwest and follow shear zones in the harzburgite.	Two caved adits totaling about 1,000 ft long, one caved shaft, about 50 ft deep; numerous small prospect pits and trenches; bulldozer trenches and cuts; superimposed grids of laterite sample sites.	Eight chip samples across veins had from 0.03 to 2.0 percent copper, 0.03 to 0.23 percent cobalt, and as much as 0.4 oz gold per ton. Ten select samples of vein material on the dumps had as much as 10.4 percent copper, 0.21 percent cobalt, and 0.308 oz gold per ton. Occurrences total 12,000 tons averaging 0.48 percent copper, 0.06 percent cobalt, and 0.09 oz gold per ton. A high potential for resources of copper, cobalt, and gold exists.
48	Little Bitt prospect[1] (copper, cobalt)	A vein of cupreous magnetite averaging 3.3 ft thick is exposed for 75 ft. The vein occupies a shear zone that strikes N. 2° W., dips 30° NE., and includes limonite, clay gouge, and bits of serpentine and malachite.	A 65-ft-long adit, and 200- by 25-ft cut.	Two chip samples across the vein averaged 2.1 percent copper and 0.17 percent cobalt. There is an estimated 2,000 tons of vein material; a high potential for copper and cobalt exists downdip and along strike.
49	Two Bitt prospect (chromium, copper)	Shear zones in harzburgite includes minor amounts of dunite and srpentinite. Some chromite float is on surface. Dump debris contains cupreous magnetite and malachite-stained gossan.	Twelve trenches with a total length of 1,500 ft, an average width of 20 ft, and an average depth of 8 ft.	Two grab samples of chromite had 28.9 and 25.6 percent Cr_2O_3; one select sample of massive magnetite showed 5.80 percent copper, and 0.4 oz silver per ton; and one select gossan sample had 2.65 percent copper and 0.36 percent cobalt. A moderate potential for chromium and copper resources exists at this property.
50	Gooch mine (chromium)	Several small lenses and stringers of chromite in serpentinite and harzburgite were explored along a 125-ft-long zone. The structure is covered by caved workings.	Three bulldozer trenches totaling 130 ft in length and averaging 6 ft deep; one 20-ft-long, 30-ft-wide, and 4-ft-deep pit; two, 1-ton stockpiles of massive chromite. Four tons of chromite with 36.4 percent Cr_2O_3 were produced in the 1940's.	Two grab samples of stockpile material averaged 23.2 percent Cr_2O_3. There is a moderate potential for chromium resources.

Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity--(continued)

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
51	Copper Lake[1] prospect (gold, silver, copper cobalt)	An 11-ft-thick vein strikes N. 13° E. and dips 40° SE. in sheared serpentinite and harzburgite. Vein includes limonite, magnetite, malachite, and chrysocolla, and is exposed for a strike length of about 200 ft.	One caved and flooded 60-ft-deep shaft; a 300-ft-long bulldozer cut along vein.	Two chip samples across the vein assayed 0.21 and 0.5 percent copper and 0.5 and 0.2 oz silver per ton; one had 0.046 oz gold per ton and 0.03 percent cobalt. There is a high potential for resources of copper, cobalt, gold, and silver.
52	Gasquet Mountain[1] prospect (nickel, cobalt, chromium, magnesium)	One slump-block-type and one continuous-slope-type laterite deposit cover 363 acres with an average thickness of 31 ft. The largest part of these deposits is outside the study area. Deposit elevations range from 1,200 to 2,100 ft.	Approximately 90 backhoe pits and bulldozer trenchs in a disturbed area of 180 acres.	Within the study area the property contain 6.7 million tons of measured and inferred marginal reserves averaging 0.68 percent nickel, 0.05 percent cobalt, 1.7 percent Cr_2O_3, and 16.3 percent MgO. Analyses of 967 samples from 106 locations ranged from 0.04 to 1.77 percent nickel, 0.009 to 0.37 percent cobalt, 0.76 to 2.56 percent Cr_2O_3, and 1.1 to 70.7 percent MgO. An additional 18 million tons of laterite resources on this property are adjacent to the study area.
53	Skyline mine (chromium)	Parallel bands of massive chromite, as much as 8 in. thick, and disseminated chromite are in a dunite body 8 ft thick and 100 ft long. Several smaller dunite bodies in harzburgite are near the main dunite body.	One large cut 140 by 60 ft and one bulldozer trench 25 ft long. From 1944, 185 tons containing 44.4 to 50.6 percent Cr_2O_3 (Wells and others, 1946, p. 39).	One grab sample of stockpiled chromite had 47.5 percent Cr_2O_3. Another grab sample of massive chromite assayed 47.5 percent Cr_2O_3. This property has a high potential for resources of chromium.
54	Judy South prosect (nickel, cobalt, chromium, magnesium)	Three slump-block-type laterite deposits cover 200 acres (149 acres in roadless) area) with an average thickness of 12 ft. Deposit elevations range from 1,300 to 2,600 ft.	Fifty-eight hand-auger holes.	Within the study area the property contains 1.1 million tons of measured and inferred, subeconomic resources averaging 0.90 percent nickel, 0.05 percent cobalt, 2.0 percent Cr_2O_3, and 13 percent MgO. Analyses of 67 samples from 62 locations range from 0.29 to 1.44 percent nickel, 0.026 to 0.510 percent cobalt, 1.19 to 4.47 percent Cr_2O_3, and 6.3 to 24.9 percent MgO. An additional 510,000 tons of laterite resources on this property is adjacent to the study area.
55	Judy mine[1] (chromium)	A tabular sheet of chromite averages 0.9 ft thick and occurs in a dunite pod in harzburgite. The chromite strikes northeast, dips northwest, and is exposed for 100 ft.	An inclined shaft with short crosscuts and drifts on two levels totaling 170 ft in length; the vicinity around the shaft is bulldozed. Production from 1942 to 1956 was 1,105 tons of chromite containing 45.0 percent Cr_2O_3 and a chromium-to-iron ratio of 2.5.	Five chip samples across the chromite sheet, representing a 1,300-ton occurrence of dunite, averaged 40.8 percent Cr_2O_3. One grab sample of a 9-ton stockpile had 44.5 percent Cr_2O_3. There is a high potential for resources of chromium.

56	Blue Bird mine (chromium)	A dunite body contains podiform and disseminated chromite. The exposed chromite was mined out in the 1940's.	Two large bulldozer cuts. Production from 1943 to 1956 totaled 144 tons of chromite containing 42.3 percent Cr_2O_3 with chromium-to-iron ratio of 2.5.	Two grab samples of massive chromite debris had 48.3 and 52.9 percent Cr_2O_3. There is a moderate potential for chromium resources.
57	High Plateau No. 2 mine (chromium)	Several chromite stringers as much as 7 in. thick are within a dunite body 90 ft long and 17 ft thick. The body strikes N. 50° W., dips 30° SW., and is within harzburgite. Most of the chromite has been mined.	An open pit about 100 ft long and 20 ft wide along an outcrop of the dunite body.	One chip sample across a chromite stringer assayed 37.9 percent Cr_2O_3. There is about 3 tons of chromite exposed in place and in dump debris. A low potential for chromium resources exists.
58	High Plateau No. 1 prospect (chromium)	Several dunite bodies in harzburgite contain chromite as pods and disseminations. The largest body is over 200 ft long and trends northwest.	Two cuts, 17 and 230 ft long, and one caved adit.	One grab sample of masssive chromite from a 4-ton stock pile assayed 54.8 percent Cr_2O_3. One grab sample of massive and disseminated chromite from a 10-ton stockpile assayed 49.0 percent Cr_2O_3. There is a moderate potential for chromium resources.
59	Unnamed laterite prospect (nickel, cobalt, chromium, magnesium)	One ridge-top-type laterite deposit covers 4.1 acres with an average thickness of 6 ft. Deposit elevations range from 2,600 to 2,800 ft.	None.	The property contains 25,000 tons of measured and inferred subeconomic resources averaging 1.04 percent nickel, 0.08 percent cobalt, 2.6 percent Cr_2O_3, and 8.9 percent MgO. Analyses of eight auger samples from six locations ranged from 0.85 to 1.54 percent nickel, 0.070 to 0.100 percent cobalt, 2.05 to 3.21 percent Cr_2O_3, and 6.8 to 13.4 percent MgO.
60	Unnamed laterite prospect (nickel, cobalt, chromium, magnesium)	One slump-block-type laterite deposit covers 1.6 acres with an average thickness of 4.8 ft. Deposit elevations range from 2,200 to 2,700 ft.	None.	The property contains an occurrence of 8,500 tons of laterite averaging 0.79 percent nickel, 0.06 percent cobalt, 2.2 percent Cr_2O_3, and 8.5 percent MgO. Analyses of 3 auger samples from 3 locations ranged from 0.75 to 0.81 percent nickel, 0.05 to 0.07 percent cobalt, 1.69 to 3.24 percent Cr_2O_3, and 6.7 to 9.7 percent MgO.
61	Low Plateau mine (Azalea no. 1) (chromium)	Chromite-bearing dunite bodies are within harzburgite. The largest body exposed is 100 ft long, trends north, and dips to the east. Chromite occurs as disseminations and massive stringers as much as 4 in. thick.	Two cuts with benches, one 400 by 150 ft, and the other 225 by 75 ft; three prospect pits; and one caved inclined shaft. Production from 1955 to 1957 was 161 tons containing 47.8 percent Cr_2O_3 with a chromium- to-iron ratio of 2.6 to 1.	One grab sample of a 2-ton stockpile contained 40.8 percent Cr_2O_3. One select sample of massive chromite had 48.1 percent Cr_2O_3. There is a high potential for chromium resources.
62	Azalea prospect (chromium)	Several dunite bodies in harzburgite contain chromite disseminations and pods as much as 4 in. thick.	One 50- by 120-ft bench cut, one caved adit, and one prospect pit.	Three grab samples of massive chromite had 37.9 to 49.6 percent Cr_2O_3. There is a moderate potential for chromium resources.

Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity--(continued)

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
63	High Plateau (Browns) mine[1] (chromium)	A tabular body of massive chromite, as much as 16 ft thick, is faulted into several separate parts. The body strikes N. 20° W. and dips gently to the northeast. Much of the deposit has been mined. Massive chromite as much as 9 ft thick is in place over a 140-ft strike length.	One adit with over 1,600 ft of drifts, inclines, crosscuts, and stopes; one caved adit; surface exposures of the body mined by open pit. Production from 1918 to 1958 was 25,514 tons of chromite with 51.3 percent Cr_2O_3 and a chromium-to-iron ratio of 3.0 to 1.	Six chip samples taken across the chromite body show an indicated and inferred marginal reserve of 28,000 tons of chromite containing 52 percent Cr_2O_3. There is a high potential for additional chromium resources.
64	Dipper mine[1] (chromium)	This deposit consists of landslide debris from the chromite body at the High Plateau mine. High-grade chunks of massive chromite are distributed throughout the hillside colluvium.	An area 225 by 500 ft was bulldozed, excavated, and cut; a millsite with stockpile and tailings is below the main workings on High Plateau Creek. Production in 1943 and 1944 was 101 tons of high-grade massive chromite.	Fine-grained mill tailings contain 4,100 tons of indicated subeconomic resources averaging 18 percent Cr_2O_3. Landslide material is estimated to contain 2,500 tons of inferred subeconomic resources which may average 57 percent Cr_2O_3.
65	Lookout prospect (chromium)	Small pods, stringers, and disseminations of chromite are in a dunite body within harzburgite.	An area 225 by 500 ft bulldozed and cut; two bulldozer trenches, 100 and 150 ft long.	Two grab samples of massive chromite had 49.6 and 54.0 percent Cr_2O_3. This property has a moderate potential for chromium resources.
66	DAN prospect (nickel, cobalt, chromium, magnesium)	One ridge-top-type and one slump-block-type laterite deposit cover 17 acres (14 acres in roadless area) averaging 8 ft thick. Deposit elevation ranges from 1,900 to 2,400 ft.	Approximately 20 bulldozer trenches and backhoe pits in a disturbed area of 6 acres.	Within the study area the property contains 91,000 tons of measured and inferred subeconomic resources averaging 0.67 percent nickel, 0.08 percent cobalt, 3.5 percent Cr_2O_3, and 11 percent MgO. Analyses of 78 samples from 21 localities ranged from 0.19 to 1.13 percent nickel, 0.013 to 0.380 percent cobalt, 0.30 to 16.80 percent Cr_2O_3, and 1.7 to 29.8 percent MgO. An additional 29,000 tons of laterite resources on this property are adjacent to the study area.
67	Red Wing prospect (nickel, cobalt, chromium, magnesium)	One slump-block-type laterite deposit covers 23 acres with an average thickness of 5 ft. Deposit elevation ranges from 1,900 to 3,400 ft.	None.	The property contains 120,000 tons of measured and inferred subeconomic resources averaging 0.59 percent nickel, 0.06 percent cobalt, 2.0 percent Cr_2O_3, and 8.2 percent MgO. Analyses of 19 auger samples from 16 localities range from 0.39 to 0.79 percent nickel, 0.03 to 0.08 percent cobalt 0.73 to 2.92 percent Cr_2O_3, and 6.4 to 12.9 percent MgO.

68	Chrome Hill mine (chromium)	Numerous stringers of chromite 3 to 12 in. thick occur in dunite bodies as much as 40 ft long. Most of exposed stringers were mined in the 1940's and 1950's.	About 11 bulldozer trenches; three open pits as much as 300 ft long, 150 ft wide, and 40 ft deep; one 30-ft adit; four loading pads and bins; cabin ruins. Ninety-one tons of chromite were produced between 1943 and 1956 that average 46.7 percent Cr_2O_3 with a chromium to iron ratio of 2.7 to 1.	Two chip samples across chromite stringers had 34.0 and 41.0 percent Cr_2O_3. Four select samples of massive chromite debris and of a 1.5-ton stockpile averaged 47 percent Cr_2O_3. Two select samples of disseminated chromite had 19.5 and 0.83 percent Cr_2O_3. There is a high potential for chromium resources.
69	Flag prospect (chromium)	A 160-ft-long, 20-ft-wide dunite body strikes N. 40° W. and contains small chromite stringers and pods along its long axis. There is little chromite in place.	About 300 ft of hand-dug trenches along dunite outcrop.	A composite grab sample from four stockpiles of less than 1 ton had 57 percent Cr_2O_3. A low potential for chromium resources exists.
70	McCroon No. 2[1] and No. 3 prospects (Stony Creek mine) (chromium)	Several 1- to 4-in.-thick chromite stringers are in small dunite bodies within shear zones of serpentinite and fractured harzburgite. The zones trend northwest. Kammerite and uvarovite are accessory chromium-bearing minerals. Several chromite pods were probably removed.	A 180-ft-long, 60-ft-wide cut at remnants of an adit; at three others sites are numerous pits, trenches, and bulldozed cuts. Production in 1958 was 137 tons of chromite with 56.7 percent Cr_2O_3 and a chromium-to-iron ratio of 2.9 to 1.	Two grab samples from 2 tons of stockpiles averaged 33.9 percent Cr_2O_3. A chip sample across a chromite stringer contained 36.9 percent Cr_2O_3. Exposed stringers contain about 1 ton of medium-grade chromite. There is a moderate potential for chromium resources.
71	Unnamed laterite prospect (nickel, cobalt, chromium, magnesium)	One ridge-top-type laterite deposit covers 11.1 acres (3.8 acres in roadless area) with an average thickness of 7.9 ft. Deposit elevation ranges from 3,100 to 3,200 ft.	None.	The property contains 32,000 tons of measured and inferred, subeconomic resources averaging 0.56 percent nickel, 0.10 percent cobalt, 2.0 percent Cr_2O_3, and 10 percent MgO. Analyses of 30 auger samples from 14 locations ranged from 0.28 to 1.20 percent nickel, 0.040 to 0.170 percent cobalt, 0.74 to 6.85 percent Cr_2O_3, and 7.2 to 22.4 percent MgO. An additional 41,000 tons of laterite resources on this property are adjacent to the study area.
72	McCroon prospect[1] (chromium)	A dunite body in harzburgite contains disseminated and massive chromite. A small chromite pod that was removed is suggested by a stockpile and massive chromite debris.	About 450 by 200 ft of bulldozer cuts and trenches and three other bulldozer trenches 130, 125, and 45 ft long.	Five grab samples of massive chromite had 20.2 to 30.8 percent Cr_2O_3. The property has a low potential for chromium resources.

Table 2.--Mines, prospects, and mineralized areas, North Fork Smith River Roadless Areas and vicinity--(continued)

Map no.	Name (commodity)	Summary	Workings and production	Sample and resource data
73	Wonder mine (chromium)	Several chromite pods and stringers in dunite have been mined from a shear zone striking N. 10° E. and dipping 45° SE.; part of one chromite pod remains. Several other small dunite bodies with chromite in shear zones are scattered throughout the property. At one site asbestos veinlets as much as 1/8 in. thick are in harzburgite.	A caved shaft about 50 ft deep; an inclined shaft 80 ft deep with 20 ft of drift; several acres of bulldozed trenches, pits, and scrapes in the vicinity of the inclined shaft; a number of small pits scattered throughout the property. A total of 28 tons of chromite, averging 58 percent Cr_2O_3, were produced between 1951 and 1954.	Four chip samples across chromite from the inclined shaft averaged 40.6 percent Cr_2O_3 and represent a 325-ton occurrence. Three chip samples of small chromite stringers averaged 32.1 percent Cr_2O_3. Four select samples of massive chromite averaged 41.6 percent Cr_2O_3. There is a high potential for chromium resources.
74	Elk Camp Ridge prospect (nickel, cobalt, chromium, magnesium)	One slump-block-type laterite deposit with an average thickness of 4 ft covers 10 acres. Deposit elevation ranges from 2,600 to 2,800 ft.	None.	The property contains 44,000 tons of measured and inferred subeconomic resources averaging 0.65 percent nickel, 0.07 percent cobalt, 2.6 percent Cr_2O_3, and 7.4 percent MgO. Analyses of nine auger samples from nine locations ranged from 0.43 to 0.81 percent nickel, 0.04 to 0.09 percent cobalt, 1.20 to 7.06 percent Cr_2O_3, and 6.9 to 7.8 percent MgO.
75	Elk Ridge prospect (chromium)	Pods and stringers of chromite in a 200-ft-long, 100-ft-wide dunite body trend northwest. Twenty-five other dunite bodies vary from 5 to 225 ft in diameter. Five of these contain disseminated chromite.	Eight pits and trenches from 5 ft to 300 ft in length; one open pit consisting of 625 ft of bulldozer trenches and cuts as much as 15 ft deep; a caved shaft.	Eleven samples taken: one chip sample across a 37-ton chromite pod had 22.6 percent Cr_2O_3. One select sample from a 1-ton stockpile had 20.1 percent Cr_2O_3. One grab sample of massive chromite debris had 57.5 percent Cr_2O_3. Eight chip and grab samples of disseminated chromite had less than 1 percent Cr_2O_3. The property has a moderate potential for chromium resources.
76	CAM prospect (nickel, cobalt, chromiium, magnesium)	Seven ridge-top-type and 18 slump-block-type laterite deposits cover 535 acres (159 acres in roadless area) with an average thickness of 9 ft.	Twenty-two hand-auger holes.	Within the study area the property contains 990,000 tons of measured and inferred subeconomic resources averaging 0.50 percent nickel, 0.07 percent cobalt, 2.5 percent Cr_2O_3, and 10 percent MgO. Analyses of 118 samples from 49 locations ranged from 0.12 to 0.93 percent nickel, 0.006 to 0.310 percent cobalt, 0.07 to 7.52 percent Cr_2O_3, and 2.0 to 63.0 percent MgO. An additional 2.7 million tons of laterite resources on this property is adjacent to the study area.

77	Old Bill prospect (chromium)	A small dunite body in harzburgite has several stringers of chromite. Part of the dunite contains disseminated chromite.	Five bulldozer trenches ranging from 25 to 100 ft in length and averaging 2 to 3 ft deep.	Four select samples of low-grade chromite in dump debris averaged 11.3 percent Cr_2O_3. The property has a low potential for chromium resources.
78	Blackjack mine[1] (chromium)	A small pod of chromite in dunite within a shear zone of serpentinite and harzburgite was mined in the 1940's; only dump debris of massive chromite remains. Parts of in-place dunite contain disseminated chromite.	Four bulldozer trenches totaling 210 ft in length. About 30 tons of medium-grade chromite was produced in 1942.	One select sample of disseminated chromite had 1.2 percent Cr_2O_3. Two select samples of massive chromite debris showed 36 and 26 percent Cr_2O_3. This property has moderate potential for chromium resources.
79	Wolverine prospect (chromium?)	A shear zone in harzburgite may have contained small amounts of chromite.	One caved adit with estimated length of 50 ft.	No exposed chromite occurrences.
80	Unnamed laterite prospect[1] (nickel, cobalt, chromium, magnesium)	One slump-block-type laterite deposit covers 15 acres with an average thickness of 3 ft. Deposit elevation ranges from 400 to 600 ft.	None.	The property contains an estimated 55,000 tons of inferred subeconomic resources with 0.40 percent nickel, 0.05 percent cobalt, 2.1 percent Cr_2O_3, and 7.1 percent MgO, based on one sample.

[1]Adjacent to roadless area.

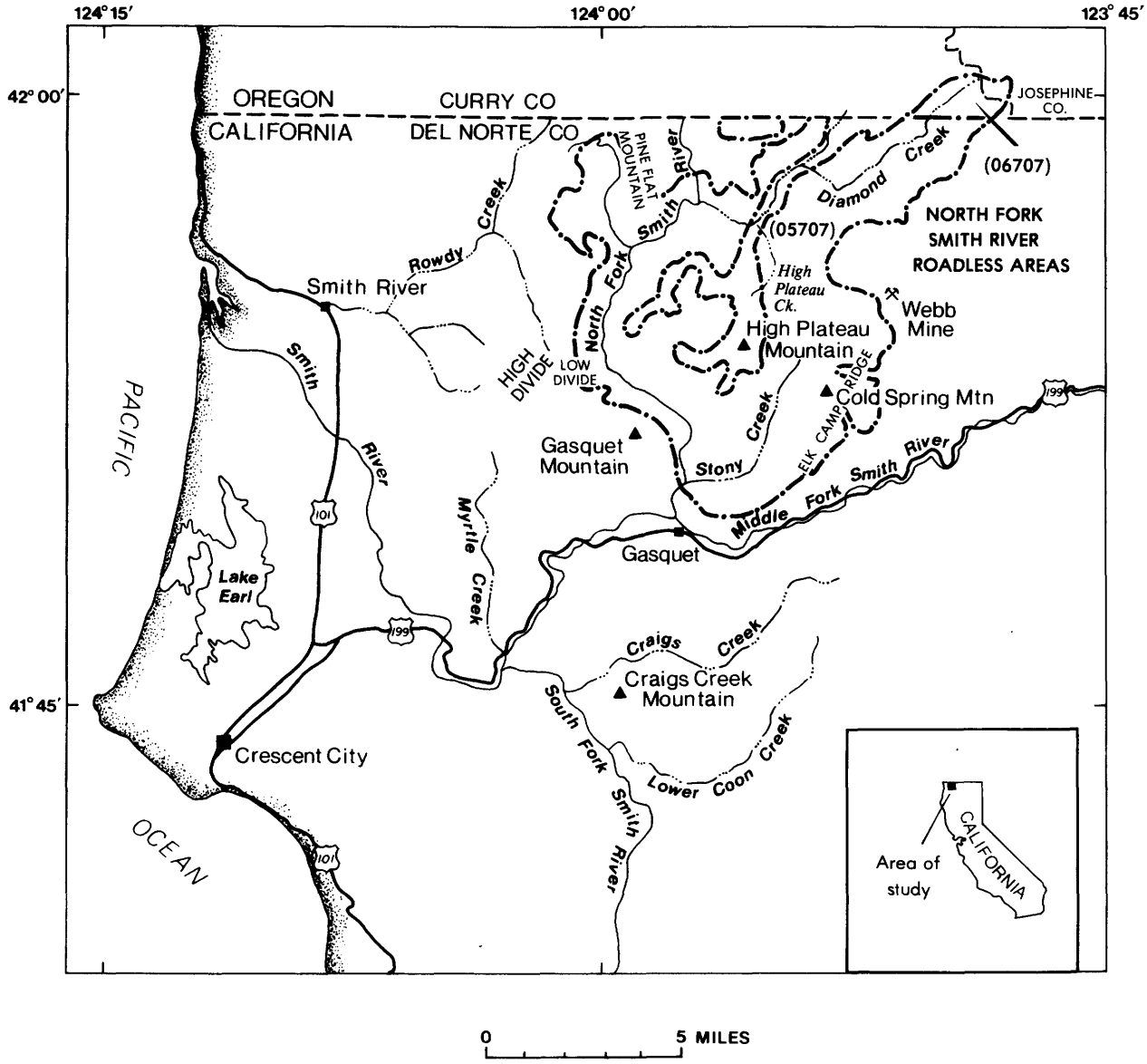
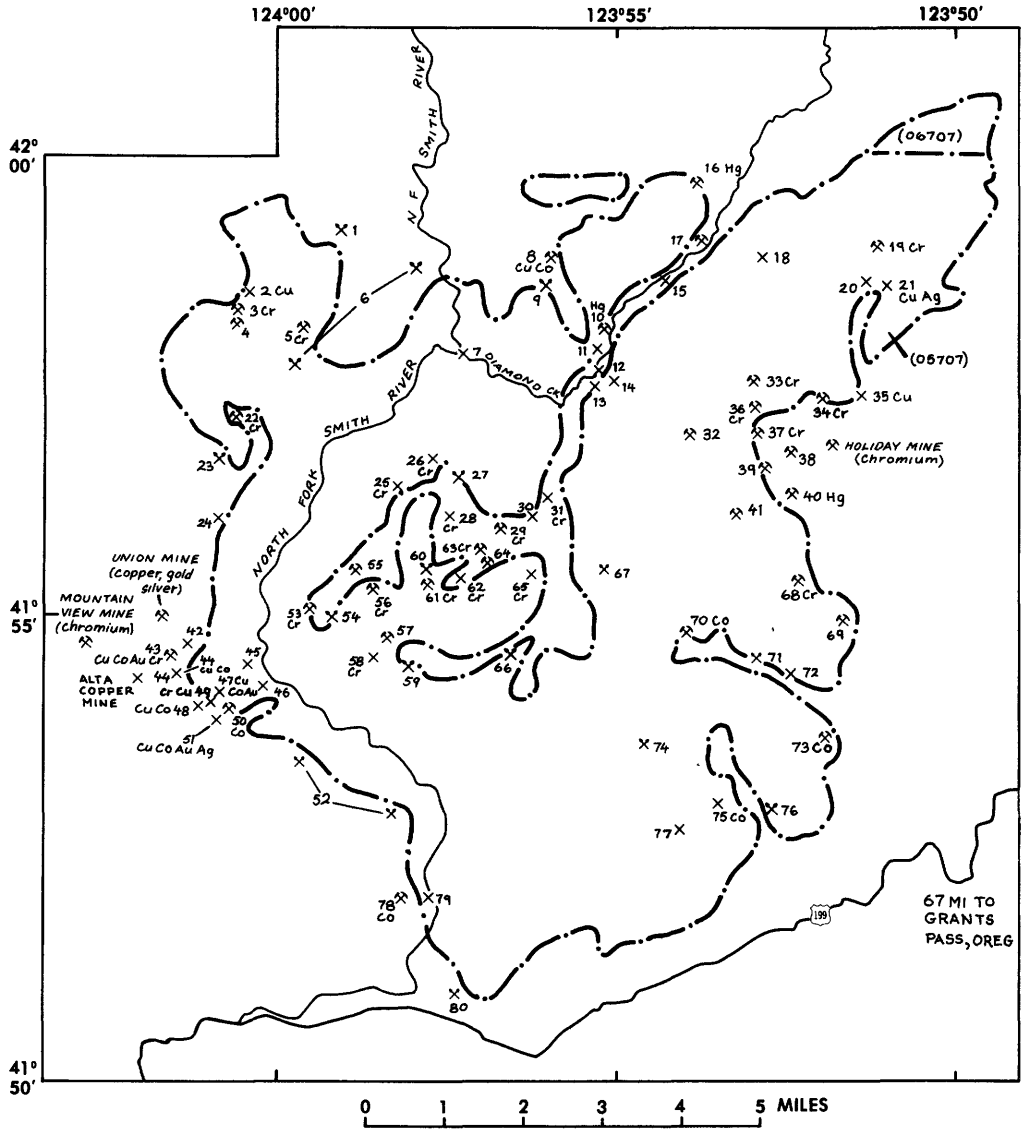


Figure 1.--Index map showing location of North Fork Smith River Roadless Areas.



EXPLANATION

LODE MINE (PAST PRODUCTION) OR PROSPECT--Commodity shown if property has mineral resources or moderate to high potential. Au, gold; Ag, silver; Cr, chromium; Co, cobalt; Cu, copper; Hg, mercury

LATERITE PROSPECT WITH RESOURCES OF NICKEL, COBALT, AND CHROMIUM--Magnesium may be recovered. Symbol is placed in center of prospect

BOUNDARY OF ROADLESS AREA

Figure 2. Mines and prospects in and near the North Fork Smith River Roadless Areas.

LIST OF MINES AND PROSPECTS
(See table 2)

1. Climax prospect
2. Lost Road No. 2 prospect
3. Lost Road No. 1 mine
4. Baby Elephant mine
5. Pine Flat Chromite mine
6. PFM prospect
7. Unnamed prospect
8. Cleopatra mine
9. DF prospect
10. Sunny Brook Mercury mine
11. October Queen prospect
12. Hard Rock prospect
13. Discovery No. 1 and No. 2 prospect
14. Earl No. 1 prospect
15. Unnamed prospect
16. Big Boy Mercury mine
17. Chrome mine
18. Unnamed prospect
19. Richey mine
20. Lost Lake prospect
21. Copper Queen prospect
22. Old Doe mine
23. Stone Corral prospect
24. Stone Corral Chromite prospect
25. Eagle Pass prospect
26. Wishful Thinking prospect
27. Judy prospect
28. Dubbo prospect
29. Robert's prospect (Bonanza mine)
30. Saints Airstrip prospect
31. Wild Finn prospect
32. Unnamed laterite prospect
33. Red Lilly prospect
34. Old Blazer prospect (Logan mine)
35. Turbo prospect
36. Elk Camp mine
37. Toujours Gai mine
38. O'Brian Associates prospect
39. Chrome X prospect
40. Webb Mercury mine
41. Martina U prospect
42. Four Cut prospect
43. Low Divide No. 1 mine
44. Copper Hill prospect
45. Lady Belle 82 prospect
46. Sunshine prospect
47. Aurora prospect
48. Little Bitt prospect
49. Two Bitt prospect
50. Gooch mine
51. Copper Lake prospect
52. Gasquet Mountain prospect
53. Skyline mine
54. Judy South prospect
55. Judy mine
56. Blue Bird mine
57. High Plateau No. 2 mine
58. High Plateau No. 1 mine
59. Unnamed laterite prospect
60. Unnamed laterite prospect
61. Low Plateau mine (Azalea No. 1)
62. Azalea prospect
63. High Plateau mine (Brown mine)
64. Dipper mine
65. Lookout prospect
66. DAN prospect
67. Red Wing prospect
68. Chrome Hill mine
69. Flag prospect
70. McCroon No. 2 and No. 3 prospect (Stony Creek mine)
71. Unnamed laterite prospect
72. McCroon prospect
73. Wonder mine
74. Elk Camp Ridge prospect
75. Elk Ridge prospect
76. CAM prospect
77. Old Bill prospect
78. Blackjack mine
79. Woverine prospect
80. Unnamed laterite prospect

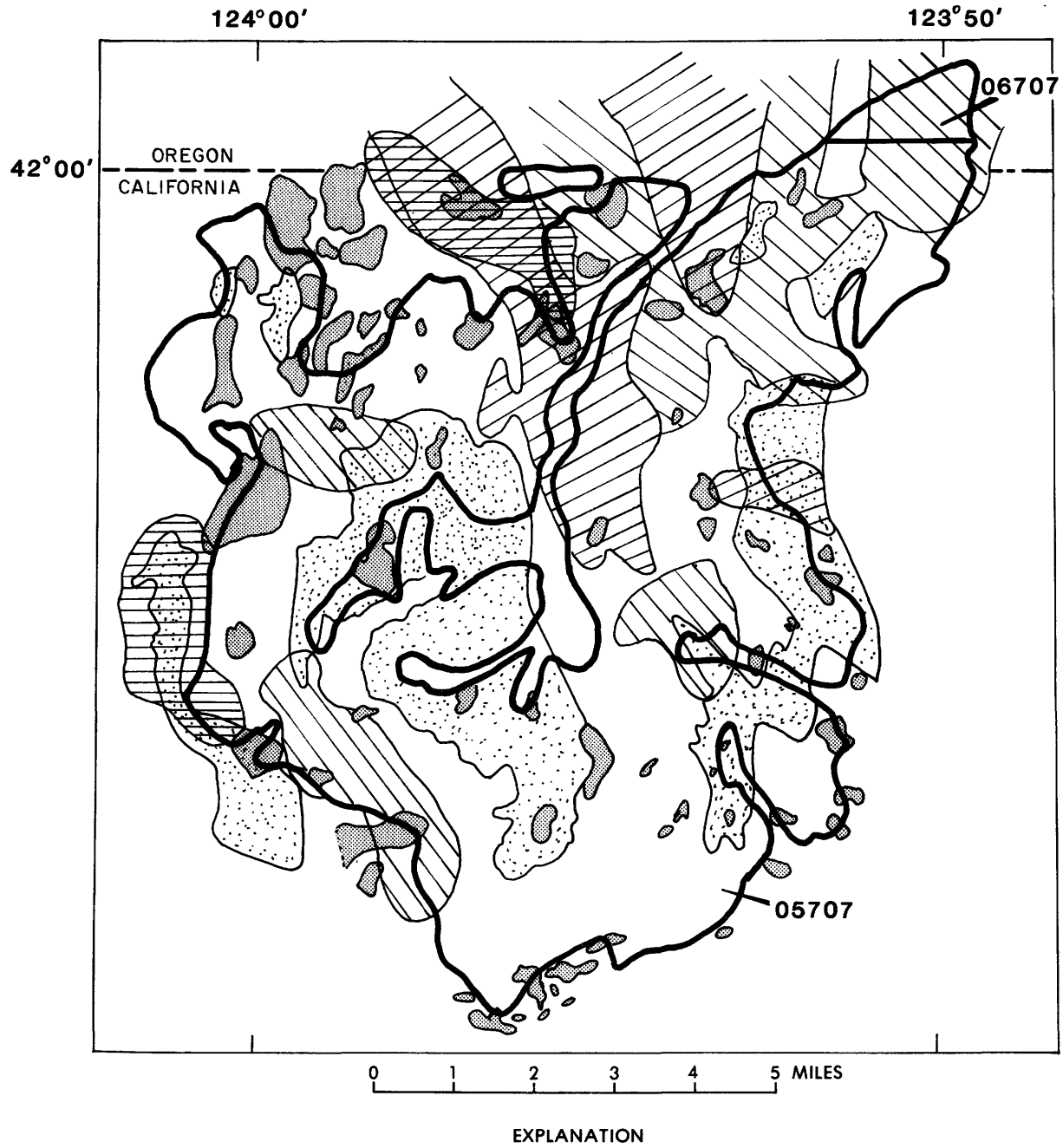


Figure 3. Mineral resource potential of the North Fork Smith River Roadless Areas.