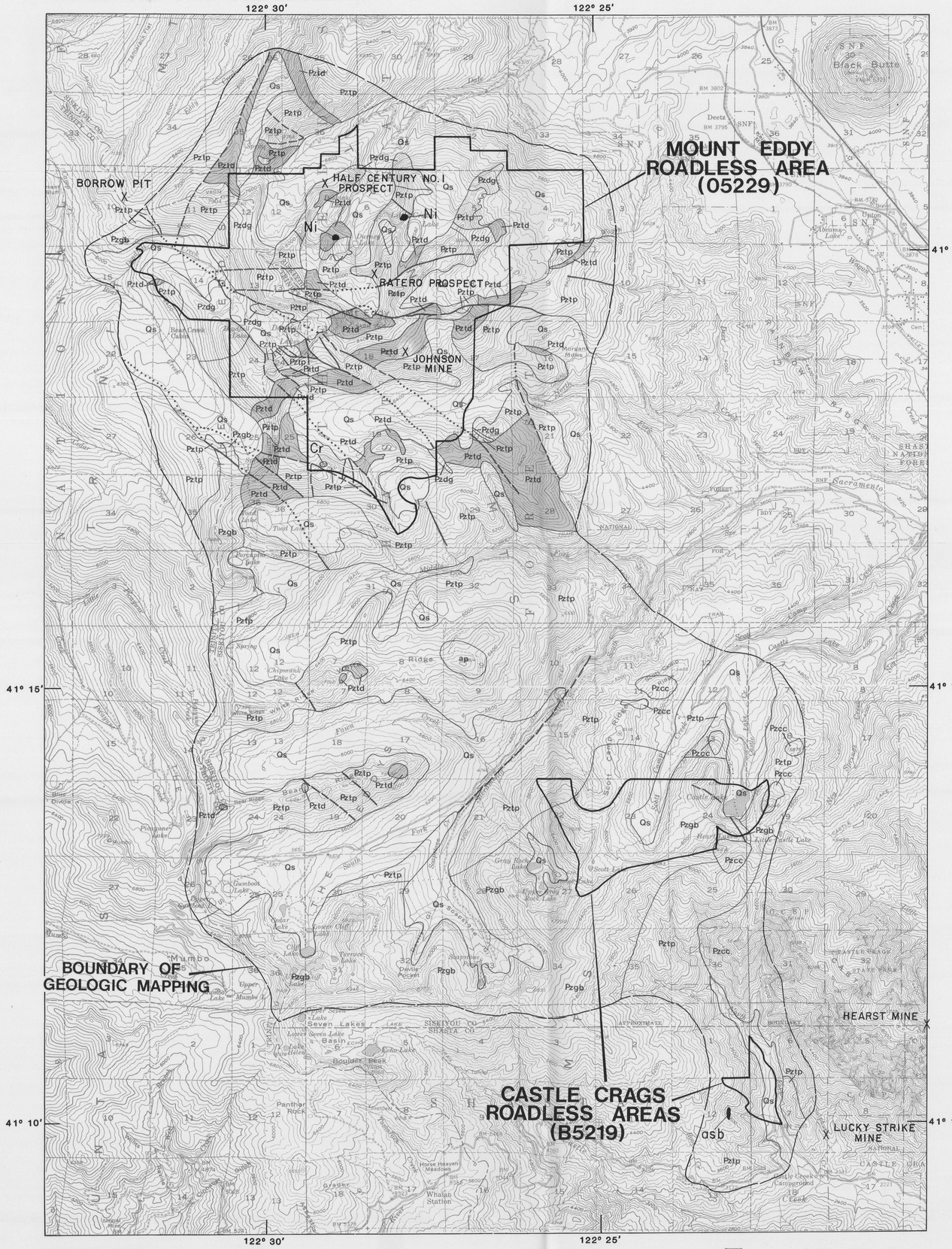
UNITED STATES GEOLOGICAL SURVEY
DEPARTMENT OF THE INTERIOR

MISCELLANEOUS FIELD STUDIES
MAP MF 1529-B



Base from U.S. Geological Survey
Dunsmuir, Weed, 1954;
Bonanza King, China Mtn. 1955

SCALE 1:62500

CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1983

AREA OF MAP

Geology by Quick, 1981;
Throckmorton, 1978;
Peterson, and others, in prep.

MINERAL RESOURCE POTENTIAL MAP OF THE MOUNT EDDY AND CASTLE CRAGS ROADLESS AREAS, SHASTA, SISKIYOU, AND TRINITY COUNTIES, CALIFORNIA

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EXPLANATION

- AREA OF CHROMITE OCCURRENCE AND LOW POTENTIAL FOR CHROMITE
- Ni — AREA OF POSSIBLE LOW-GRADE NICKEL MINERALIZATION
- asb — AREA OF ASBESTOS VEINS
- X — MINES AND PROSPECT PITS

CORRELATION OF MAP UNITS

Qs	QUATERNARY
ap	PALEOZOIC OR YOUNGER
Pzcc, Pzdg, Pzgb	PALEOZOIC
Pztp, Pztd	PALEOZOIC

DESCRIPTION OF MAP UNITS

Qs — SURFICIAL DEPOSITS (QUATERNARY)--Alluvium, talus, and glacial till

ap — APLITIC ROCKS (PALEOZOIC OR YOUNGER)--Granodiorite

Pzcc — CASTLE CRAGS PLUTON (PALEOZOIC)--Sodic granodiorite and alkalic trondhjemite plus adjacent granodioritic hypabyssal dikes and plugs

Pzdg — HORNBLENDE DIORITE AND GRANODIORITE (PALEOZOIC)

Pzgb — GABBRO (PALEOZOIC)

TRINITY ULTRAMAFIC SHEET (PALEOZOIC)--As mapped, consists of:

Pztd — Dunite

Pztp — Peridotite

CONTACT--Approximately located, dotted where concealed

FAULT--Dashed where inferred, dotted where concealed

APPROXIMATE BOUNDARY OF ROADLESS AREA

STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral resource potential survey of the Mount Eddy (05229) and Castle Crags (B5219) Roadless Areas in the Shasta-Trinity National Forest, Shasta, Siskiyou, and Trinity Counties, California. The Mount Eddy and Castle Crags Roadless 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

Significant occurrences of mineral commodities may occur within the Mount Eddy and Castle Crags Roadless Areas. Although platinum-group metals were not detected in stream-sediment concentrates, it is possible that they are present in the roadless areas but were not sufficiently concentrated in a panned concentrate to be detected. Nickel and cobalt did not occur in anomalous amounts in samples analyzed spectrographically, but slightly higher than average nickel values in small dunite bodies in the northern part of the Mount Eddy Roadless Area may indicate low-grade mineralization within the peridotite, providing nickel occurs in sulfide phases. Analyses do show nickel oxide in olivine (Quick, 1981b), and sulfide minerals were not detected in hand specimens from these areas. The region has been examined on the surface in the past for chromite and asbestos. Although both minerals are ubiquitous there is probably only a low potential for asbestos resources on the basis of vein size at the surface. A few prospects and other small areas of chromite were noted, however, without subsurface data, any dunite body must be considered to have potential for chromite. In the Mount Eddy Roadless Area the Ratero prospect is estimated to contain 260 tons of inferred low-grade chromite and the Johnson mine probably also contains some additional chromite. The geochemical data for boron, barium, and mercury plus abundant quartz veining in gabbro and hornblende diorite provide evidence for a pervasive hydrothermal alteration, which could have formed mercury, gold, or vein deposits. The Half Century No. 1 prospect in the Mount Eddy area contains trace amounts of copper sulfide and oxide minerals and a quartz sample nearby contained 0.271 oz/ton gold. This deposit is not considered significant.

Sand and gravel deposits occur in the Castle Crags Roadless Area, but they cannot compete with superior deposits closer to market. At a borrow pit northwest of the Mount Eddy Roadless Area, sheared serpenitnite is quarried for road metal; similar rock occurs in the roadless area; however, better material is more readily available elsewhere.

INTRODUCTION

The Mount Eddy and Castle Crags Roadless Areas occupy 9,600 acres and 3,300 acres, respectively, in Shasta, Siskiyou, and Trinity Counties, Calif., approximately 8 mi west of the towns of Mount Shasta City and Dunsmuir (fig. 1). The Castle Crags Roadless Area is divided into two sections: the northern section 6 mi west of Dunsmuir and the southern section 4 mi west of Castella. Access to the areas is provided by trails and secondary roads from Interstate 5. The areas are located in a rugged terrain of glacially scoured, north-trending ridges and peaks in the easternmost part of the Klamath Mountains where altitudes range from about 2,500 ft along the north fork of Castle Creek to 9,025 ft on Mount Eddy. At lower elevations manzanita and other brush are prevalent whereas at higher elevations vegetation is absent except for occasional gnarled conifers and ground level plants. At middle elevations conifers and deciduous trees dominate.

Four weeks were spent in the field by U.S. Geological Survey personnel during the summer of 1982. During this time geologic maps from theses were field checked (Quick, 1981a; Throckmorton, 1978; Vennum, 1971), geology between the two areas was mapped in reconnaissance, and rock samples were collected for geochemical analysis. One week during the summer of 1981 was spent in collecting stream-sediment samples. The U.S. Bureau of Mines conducted a mineral resource assessment of the Castle Crags Roadless Area during 1981 and of the Mount Eddy Roadless Area during 1982. County claim records, U.S. Bureau of Land Management records, U.S. Forest Service files and records, and published literature were searched, and localities with possible mineral resources were examined.

GEOLOGY

Mount Eddy and Castle Crags Roadless Areas are underlain by part of the Trinity ultramafic sheet, one of the largest such bodies in the United States. The ultramafic rocks have been intruded by large gabbro bodies, hornblende diorite stocks, and younger granitic plutons, all of which are Paleozoic in age (Throckmorton, 1978; Vennum, 1980; Quick, 1981b).

The Trinity ultramafic sheet, which dips to the east and is several miles thick, contains harzburgite, dunite, and plagioclase lherzolite with minor amounts of other ultramafic rocks, frequently emplaced as dikes (Quick, 1981b). The degree of serpentinization of the ultramafic rock varies considerably and in general increases southward. In the Mount Eddy area the different ultramafic rocks are usually easily distinguishable in the field, whereas to the south serpentinization obscures the original petrography. Dunite (which hosts chromite deposits) forms small bodies inches to feet in size and large thick tabular bodies more than 0.6 mi long. Where rock types are distinguishable, dunite is estimated to comprise 15 to 20 percent of the peridotite. The peridotite is considered to be part of the upper mantle emplaced onto the continent and the dunite bodies are thought to be genetically related to this mantle section (Quick, 1981c).

A large gabbro body emplaced into the Trinity peridotite underlies most of the northern Castle Crags area (Throckmorton, 1978). The body is composed of cumulus gabbro grading upward into massive coarse-grained non-cumulus gabbro and downward into cumulus peridotite. Dikes from this gabbro and other gabbro bodies west of Mount Eddy intrude joint and shear zones within the Trinity peridotite.

Hornblende diorite consisting of plagioclase, hornblende, and occasionally significant amounts of quartz, occurs as small stocks in the northern part of the Mount Eddy area. Inclusions of peridotite and gabbro in the diorite demonstrate that the diorite is younger (Quick, 1981b).

Numerous quartz veins throughout the gabbro and hornblende diorite may have been formed by hydrothermal fluids or by residual fluids from the Castle Crags pluton. The veins are usually about an inch wide and traceable for about 3 ft.

Granitic rocks of the Castle Crags pluton crop out east of the Castle Crags areas. Most of the pluton is a sodic granodiorite but the core is alkalic trondhjemite and the rim is granodiorite (Vennum, 1980). The pluton and adjacent areas, including the northern Castle Crags Roadless Area, are intruded by a variety of dikes and small plugs related to the pluton. A 3 to 5 ft wide metamorphic aureole surrounds the pluton. In it the peridotite becomes more serpentinized and in places tremolite has developed. Gabbro adjacent to the pluton has been converted to albite-epidote hornfels facies assemblages.

Much of the area is covered by Quaternary deposits, including talus, alluvium, and glacial debris that obscure the bedrock geology.

GEOCHEMISTRY

Spectrographic, atomic-absorption, and fire-assay analyses of rock, stream-sediment, and stream-sediment-concentrate samples from within and near the Mount Eddy and Castle Crags Roadless Areas (Peterson and others, 1983) indicate a pervasive hydrothermal imprint on the ultramafic and mafic rocks: boron, barium, and mercury in all stream-sediment samples are present in higher concentrations than expected for ultramafic and mafic terranes. Rock samples show a similar but less pronounced pattern for boron and barium. Of particular note are the high barium values (150 to 2,000 parts per million (ppm)) in the hornblende diorite rock samples, which may be related to extensive quartz veining in the unit. Quartz veins within the gabbro and hornblende diorite may contain small amounts of copper and gold. One quartz sample at the Half Century No. 1 prospect contained 700 ppm copper. Small amounts of gold were detected in the quartz veins and a small amount (0.2 and 0.01 ppm) was also measured in two of the stream-sediment concentrates in the northwestern part of the Mount Eddy Roadless Area The source of the gold in the stream-sediment concentrates is probably the quartz veins. Small amounts of placer gold may be present in stream deposits. Dunite samples in the northern part of Mount Eddy area contain higher nickel values than other rocks analyzed, which may indicate low-grade mineralization, however, no evidence of sulfides was observed in hand specimens. A small dunite pod in the southern part of the Mount Eddy Roadless Area southwest of the inactive Johnson mine contains anomalous amounts of chromium, which is in accord with abundant disseminated chromite visible in the outcrop.

One sample of lateritic soil near the Castle Crags Roadless Area contained 0.3 percent nickel, 0.09 percent chromium, 0.02 percent cobalt, and no gold or silver. One gravel sample has trace amounts of gold.

GEOPHYSICS

An unpublished aeromagnetic map produced by the University of Oregon covers the Mount Eddy and Castle Crags Roadless Areas at a scale of 1:250,000. The character of the magnetic anomalies reflects the rock types exposed at the surface. Areas underlain by hornblende diorite and granodiorite show magnetic lows relative to areas underlain by peridotite and gabbro. The magnetic low associated with the Castle Crags pluton is less prominent than might be expected because of its high topographic relief. Variations within the magnetically high areas reflect topography, with ridge crests corresponding to magnetic highs. The small scale of the map precludes any aeromagnetic interpretation of ore potential.

MINING ACTIVITY

No mining claims are located in the Castle Crags Roadless Area. Four chromite claim groups located east and south of the area were active from 1906 to 1917, and briefly in the 1940's. There is no evidence of current mining activity on these claims, or in the roadless area.

Chromite has been the principal metallic mineral mined in the region. The Little Castle Creek mine, 3 mi east of the study area yielded 16,625 tons of chromite ore between 1906 and 1953. It was abandoned after World War I, briefly operated during World War II, and closed in 1954 (Lydon and O'Brien, 1974; Wells and Hawkes, 1965). Just west of this mine is the Hearst mine (outside of the map area) which yielded 60 tons of chromite ore prior to 1918 (Wells and Hawkes, 1965). A total of 3,938 tons of chromite ore was reported produced at the Coggins mine (east-northeast of the southern Castle Crags area) between 1916 and 1943 (Wells and Hawkes, 1965). Closer to the study area the Lucky Strike mine produced 31 tons of hand-sorted chromite ore in 1943 (Wells and Hawkes, 1965).

The Montrose mill about two miles east of the southern Castle Crags area was built in 1942 to custom mill low-grade chromium ore which was then sold to the government stockpile. Mines as far as 150 mi away supplied ore while the mill operated intermittently between 1942 and 1955. About 1958, the millsite was included in the Castle Crags State Park; subsequently, the mill equipment was removed and the site cleared and planted (Lydon and O'Brien, 1974).

Interest in chromite and asbestos occurrences on Mount Eddy began in 1916, continued through World Wars I and II, and subsided in 1956. Since 1916, 36 mining claims have been located in the Mount Eddy Roadless Area. Three lode claims were active in 1982. The Mount Eddy Roadless Area encompasses six mineral properties, but only one mine and two prospects have mineral resource potential. A borrow pit northwest of the area is quarried for road metal. The Johnson mine southeast of the Mount Eddy summit produced an unrecorded amount of chromium ore during World War II (Wells and Cater, 1950). Production came from a 35 ft decline in podiform chromite in dunite located in a shear zone of serpentinized peridotite which trends N. 15° W. and dips 60° SE. A grab sample from the remaining stockpile assayed 39.8 percent Cr_2O_3. On the Ratero prosepct, northeast of Mount Eddy a pod of chromite is 16 in. wide, exposed for 40 ft. It strikes east-west and dips at 45° N. in serpentinized peridotite. A sample at the prospect assayed 38.1 percent Cr_2O_3. On the Half Century No. 1 prospect northwest of Dobkins Lake discontinuous irregular vuggy iron-stained quartz lenses average 5 in. wide. They occur in hornblende diorite and strike N. 70° E. and dip 50° NW. The quartz contains small amounts of chalcopyrite, bornite, and malachite. A grab sample from quartz found down slope from the pits assayed 0.271 oz/ton gold.

MINERAL RESOURCE EVALUATION

There is evidence for several types of mineralization within the Mount Eddy and Castle Crags Roadless Areas. The region has been prospected on the surface for asbestos and chromium. Although both of these minerals are ubiquitous, they do not occur in large concentrations anywhere within the region. Small amounts of low-grade chromite are inferred to be present at the Ratero prospect and Johnson mine. The chromite-bearing dunite pod in the southern corner of the Mount Eddy Roadless Area has a surface area of only about 300 ft^2, which is not sufficiently large to form a viable deposit unless it expands greatly and becomes more massive at depth. Without subsurface information, the extent of chromite mineralization cannot be determined at this time. Because dunite bodies are permissive hosts for chromite deposits, they must be considered to have potential for chromite. A 3-in.-wide asbestos vein of slip-fiber chrysotile was found in a stream drainage about 0.3 mi west of the southern Castle Crags area, but it could be traced along strike for only about 10 ft. The asbestos fibers were about 0.25 in. long and quite brittle. No other such veins were found during this study. Low-grade nickel mineralization may occur in the northern part of the Mount Eddy area, but further work is needed to determine whether sulfide phases are present. Little lateritic soil has developed in either of the roadless areas. The Mount Eddy area has little or no soil on ridge crests and hillsides and valleys are covered with talus and alluvial material. The parts of the Castle Crags area underlain by ultramafic rocks typically have a thick cover of manzanita or abundant trees which are not usually found in lateritic soil. Mineralization in the quartz veins appears to be restricted to small quantities of copper and possibly gold. The Half Century No. 1 prospect northwest of Dobkins Lake in the Mount Eddy Roadless Area (where the gold and high copper values occurred) contains traces of chalcopyrite, bornite, and malachite, and the quartz is highly stained by limonite.

Sand and gravel deposits occur in the Castle Crags Roadless Area, but they are too far from major markets. At a borrow pit northwest of the Mount Eddy Roadless Area, sheared serpentinite is quarried for road metal; similar rock occurs in the roadless area; however, better material is readily available elsewhere.

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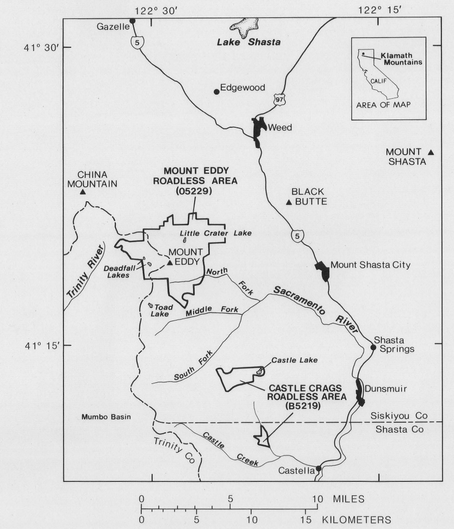

Figure 1. Index map showing location of Mount Eddy (05229) and Castle Crags (B5219) Roadless Areas, California.

Interior—Geological Survey, Reston, Va.—1983

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