BULLETIN 88

Geology and Mineral Resources of the Upper Chetco Drainage Area, Oregon

INCLUDING THE KALMIOPSIS WILDERNESS AND BIG CRAGGIES BOTANICAL AREAS

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
R. E. CORCORAN, STATE GEOLOGIST

1975

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FOREWORD

Mining and agriculture are the primary sources of all new wealth, and minerals are the lifeblood of any industrialized civilization. Annually the economy of the United States now requires more than four billion tons of new mineral supplies. Two decades ago that tonnage was only half as large, whereas by the year 2000 it could nearly triple present requirements. Development of domestic mineral resources is not keeping pace with domestic demand. Ever-increasing mineral imports are producing a continuing unfavorable U.S. balance of trade, and expropriations of mines by foreign governments have modified the flow of these materials to this country or made them more costly.

The area designated as the Kalmiopsis Wilderness has had a history of sporadic mining activity dating back more than 100 years. Gold mining, both lode and placer, and chromite mining have been carried on in relatively recent times. Known deposits of iron, copper, and nickel are now attracting the interest of prospectors and mining companies.

The approximately 80,000 acres of land included in the Kalmiopsis Wilderness will be closed to mineral entry on December 31, 1983. The purpose of this report, therefore, is to provide basic geologic information on this large mineralized region so that there will be an available record of the mineral potential for future use. If the United States is to maintain a reasonable self-sufficiency in its mineral requirements, the mining industry will need to accelerate its domestic mineral exploration programs during the coming years. It is hoped that this bulletin will help to expedite the efforts by the private sector to find and develop some of the known mineral deposits in this part of southwestern Oregon before they are locked up.

R. E. Corcoran
State Geologist

September 1975

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GEOLOGY AND MINERAL RESOURCES OF THE UPPER CHETCO DRAINAGE AREA, OREGON

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INTRODUCTION

Location of Area

The Upper Chetco River drainage area lies in the Klamath Mountains geomorphic province of southwestern Oregon. The map area is situated mainly in Curry County, but its eastern and northern margins extend into adjacent Josephine County (Figure 1). Within the map area, and occupying most of it, is the Kalmiopsis Wilderness Area; to the northwest is a portion of the Big Craggies Botanical Area.

The Kalmiopsis Wilderness Area (formerly designated a Wild Area) was established by Congress as part of the National Wilderness System in 1964. It includes approximately 76,900 acres and is subject to the regulations defined in Public Law 88-577 of Sept. 3, 1964. Prospecting is allowed and mining claims may be located on valid mineral discoveries in the area up to, but not after, December 31, 1983. On January 1, 1984 mineral resources, subject to valid existing rights, are withdrawn from all forms of appropriation under the mining laws within wilderness areas designated by this Act.

The Kalmiopsis Wilderness Area is roughly oval in shape. The eastern and southern boundaries are established approximately along the drainage divide between the Chetco and Illinois Rivers and the Chetco and North Fork Smith Rivers. The southwestern and western boundaries are at Red Mountain, Vulcan Peak, Moores Ridge, Quail Prairie Mountain, and at the mouth of Boulder Creek on the Chetco River. The boundary then follows along the Chetco River and up Tincup Creek to Pearsoll Peak on the north. A few adjustments of the margins have been made and other enlargements proposed for the area since it was established. The area is named for *Kalmiopsis leachiana*, a small flowering-shrub member of the heath family.

The Big Craggies Botanical Area includes approximately 3,800 acres of the upper portion of the main Big Craggies and Green Craggie which lie between Collier Creek and the Chetco River about 2 miles northwest of the Kalmiopsis Wilderness Area.

The Botanical Area was proposed by the U. S. Forest Service for withdrawal from mineral entry on March 21, 1967. If and when the withdrawal becomes final, any mining claims located after that date are null and void.

Purpose and Scope of Study

Knowledge about the geology and mineral resources in this region has been very limited, and, because much of the area was designated as part of the Wilderness System, the need for information prompted the Department to engage in a program of field study.

This rugged mountainous region has had a significant history of mining activity, including gold mining, both lode and placer, and chromite mining. In the early years, copper prospects were found during the search for gold, and small amounts of platinum were produced from placers. In recent years, low-grade deposits of iron, copper, and nickel have been of interest to prospectors and mining companies.

The goals of this study have been to prepare a fairly detailed geologic map, to attempt to interpret the complex origin and structure of the formations, and to gather as much information as possible on the mineral-resource potential.

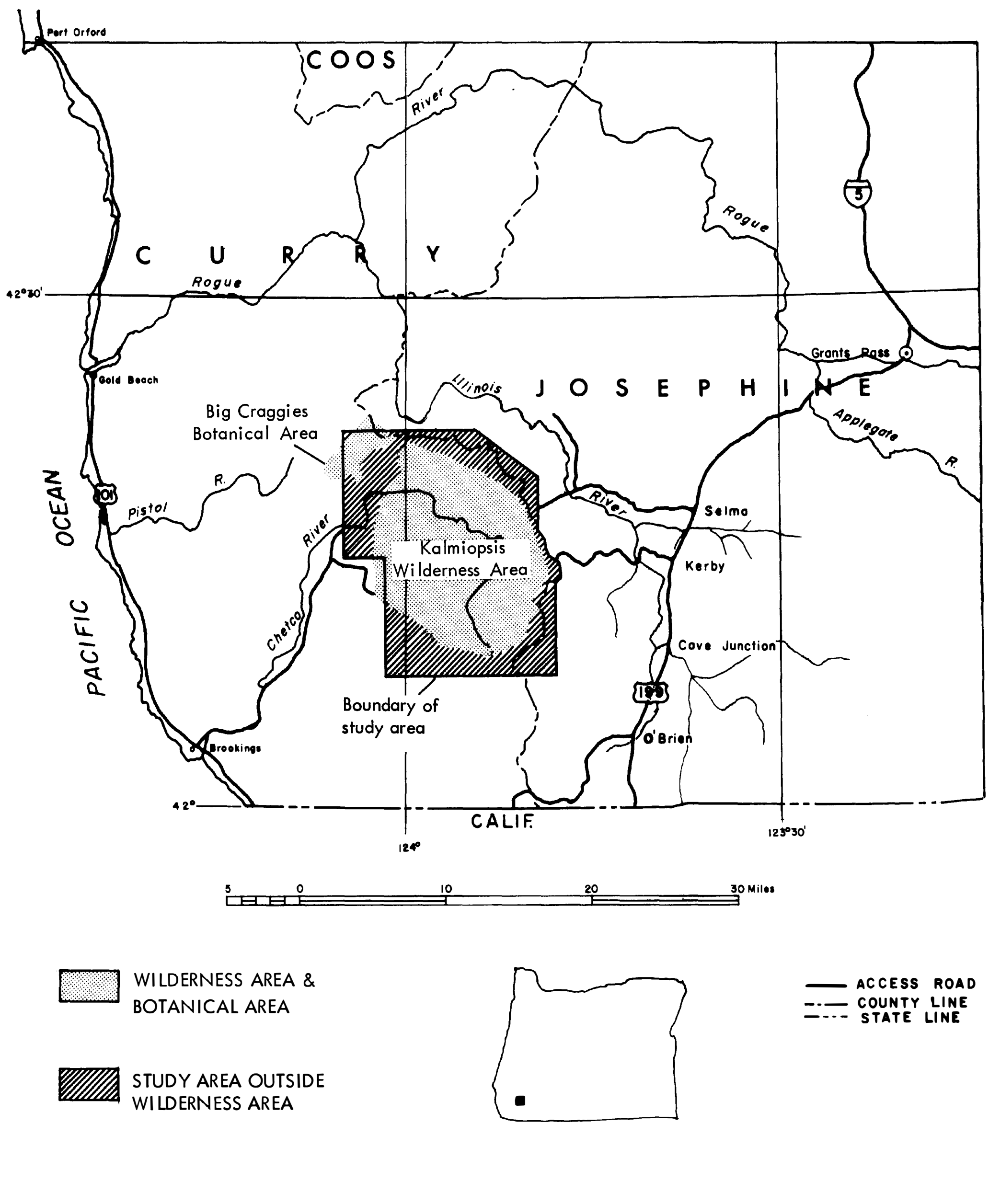


Figure 1. Map of southwest Oregon showing extent of study area and access routes.

Field Methods

Field work for this report began in the summer of 1965 and was completed in 1971. The early work involved following the major streams and collecting stream sediment samples for geochemical analysis (see Appendix A). During the course of mapping, rock samples were collected for thin-section study (Appendix B).

Mapping was accomplished by traversing all streams, trails, roads, and ridges on foot. In areas of critical geology, contacts were followed or intersected at close intervals. Loop traverses were taken from various base camps set up by backpacking in the needed supplies. Several backpacking traverses were made in the area with a new camp being set up each night. Two winter trips were made into the Little Chetco area on cross-country skis. Nearly all of the mapping was done on foot because regulations prohibit the use of motorized equipment within the boundaries of the Wilderness Area, except by special-use permit.

Aerial photos taken in 1964, having a scale of approximately 1:12,000 and topographic maps with a scale of 1:31,680 were used in field mapping.

Previous Work

A reconnaissance geologic map was prepared by Butler and Mitchell (1916) to accompany their report on the geology and mineral resources of Curry County. Most of the area mapped for the present report is covered by the Preliminary Geologic Map of the Kerby Quadrangle accompanying Department Bulletin 40 (Wells and others, 1949). Mapping and structure of the Dothan Formation in sections 22, 23, 24, 25, 26, and 27, T. 37 S., R. 11 W., and a portion of T. 37½ S., R. 11 W., on the Chetco River southwest of Heather Mountain, and sections 2, 3, 9, 10, 11, 12, 15, 16 and 23, T. 38 S., R. 11 W., are taken from their map (Wells and others, 1949). Some mapping was done in the area in 1954 by the present writer during a study of chromite deposits in southwestern Oregon (Ramp, 1961). A portion of the northeastern section of the map area was studied by J. P. Wise (1969) for a master's thesis project at Idaho State University. Coleman (1972), in his work on the Colebrooke Schist of southwestern Oregon, extended his mapping into the Big Craggies area. Geologic studies in the area around Vulcan Peak are reported by Himmelberg and Loney (1973), and an elongate area overlapping the southern part of the area was mapped by Henry Dick in 1971 and 1972 for his doctoral dissertation at Yale University (in preparation). Much of the map area is covered by the aeromagnetic map by Balsley and others (1960).

Access to Area

The map area may be reached by four routes: two from the east, one from the south, and one from the west (Figure 1). The northernmost of the eastern routes leaves U. S. Highway 199 at Selma, follows the Illinois River road west for about 12 miles, then branches to the southwest, crosses a low-water bridge over the Illinois River, and proceeds along West Fork Rancherie Creek to Chetco Pass. The last 5 miles of this route from the Illinois River road to Chetco Pass is low-standard and should not be attempted with low-slung cars.

The second eastern route leaves U. S. Highway 199 about 4 miles south of Selma and proceeds west on Eight Dollar road, crosses the Illinois River just downstream from the mouth of Josephine Creek, winds in a westerly direction up the Mikes Gulch drainage, then around the south flank of Fiddler Mountain, and on to Onion Camp, a distance of about 17 miles. This route is generally well graded with a good crushed-rock surface and passible to highway cars when free of snow.

The southern route leaves U. S. 199 at O'Brien and follows the Wimer road to the south and west for about 13 miles, then branches to the north on the Chetco Divide road and trail, past Frantz Meadow, Buckskin Peak, Mud Spring, and Rough and Ready Lake to Doe Gap. The last 6 miles from Frantz Meadow to Doe Gap has been passable only to narrow rigs with high clearance or trail bikes. Walking is recommended beyond Rough and Ready Lake. The first 5-mile stretch of road north from Wimer road has been improved recently and further improvements may be made on this southern route in the future.

The western route begins at Brookings on the Coast Highway (U.S. 101). It follows up the Chetco River for about 19 miles, then up the South Fork Chetco River, Quail Prairie Creek, and around Pollywog Butte to the Vulcan Peak area, a distance of about 31 miles from Brookings. To reach points farther north, one may continue on up the Chetco road to Mineral Hill, Tolman Ranch, or Quail Prairie Mountain Lookout via a network of logging roads in the area. The western route is passable to most highway cars.

At the boundaries of the Wilderness Area, signs and locked gates exclude motorized vehicles from further travel, except by special permit for mining purposes and Forest Service maintenance.

Maps that show topography, streams, trails and other features are the Collier Butte, Pearsall Peak, Mt. Emily, and Chetco Peak 15-minute quadrangle maps, published by the U.S. Geological Survey, and the Kalmiopsis Wilderness Area map published by the U.S. Forest Service.

Acknowledgments

The writer is grateful to those who assisted him in the field at various times: Jim Blanchard, Joe LaFleur, Dick Bowen, Vern Newton, Norm Peterson, John Beaulieu, Greg Ramp, and Terrel Vance. He wishes to thank Perry and Ruth Davis, who live at Emlly* Cabin (Figure 2) on the Little Chetco River in the southern part of the map area, for hospitality and kind assistance.

Gratitude is also extended to members of the Department staff who prepared the maps and text for final publication: Margaret Steere and Carol Brookhyser for editing, Ruth Pavlat for copy preparation, and Steve Renoud for cartography.

Figure 2. Emlly Cabin, home of Perry and Ruth Davis, is on historic site near the Little Chetco River, SE¼ sec. 10, T. 39 S., R. 10 W.

* According to Perry Davis, Emlly Cabin derived its curious spelling from its original owner, an Englishman named Mr. Emlly. Emlly built the cabin about 1880, mined gold along the Little Chetco River, and returned to England about 1890.

TOPOGRAPHY, CLIMATE, AND VEGETATION

The area is one of rugged terrain with maximum relief of about 4,700 feet (Figure 3). The lowest point, slightly less than 400 feet, is on the Chetco River in the west edge of the area, and the highest point, 5,098 feet, is at Pearsoll Peak (Figure 4). The highest point in the Big Craggies is 4,621 feet. Other high points in the map area include Canyon Peak - 4,903; Chetco Peak - 4,660; Vulcan Peak - 4,655; Tincup Peak - 4,494; and Whetstone Butte - 4,464.

The area is drained chiefly by the Upper Chetco River and its tributaries, but the South Fork of the Chetco, the North Fork of Smith River, and the Illinois River also reach into the area.

The slopes are generally steep and most of the ridges and canyons are sharp and narrow. The topography is that of a rejuvenated area where recent uplift has caused rapid erosion (down-cutting of streams). This has given rise to over-steepened slopes, and landsliding is therefore commonplace. A large portion of the upper surface of the area lies just above 4,000 feet elevation. A few remnant broad flat areas, such as Gold Basin, were interpreted as evidence of a large erosional plane called the "Klamath peneplane" by Diller (1902).

Features of alpine-type glaciation are present in a few areas at about 4,000 feet and higher and include glacial cirque lakes or tarns, such as Babyfoot and Vulcan Lakes (Figures 5 and 6); a number of other partially developed cirques can be seen on the north and east flanks of the higher ridges, such as Big Craggies. Glacial moraine deposits occur in the headwaters of Box Canyon Creek and residual lateral moraines on Fresno Creek. Smaller glacial deposits are present in other areas. Valen Lake at the head of Boulder Creek was formed by a rock slide from the north flank of Dry Butte.

The climate is moist and temperate. The winter months from October to April are cool and wet. Annual precipitation varies from about 60 to 100 inches. Above 4,000 feet a 10-foot snow pack is not uncommon. The months of June, July, August and September are generally very dry and occasionally temperatures range up to the mid 90's.

The adequate to high rainfall supports rapid growth of forests and in places dense to nearly impenetrable brush cover where trees have been removed by historic fires. Areas of ultramafic and mafic rock have a relatively sparce vegetative cover and are much easier to traverse on foot.

The U. S. Forest Service reports a very interesting botanical assemblage in the area. Information printed on the reverse side of the Wilderness Area Map (Rev. 1972, G. P. O. 796-033) describes many of the rare and interesting species, including *Kalmiopsis leachiana*, Brewer spruce, *Lencothoe divisial*, Sadler oak, Labrador tea, Jeffry pine, and *Darlingtonia*. They report that "...over 12 species of coniferous trees, 9 species of hardwood trees, 31 species of shrubs, and many species of herbaceous plants are found within its boundaries."

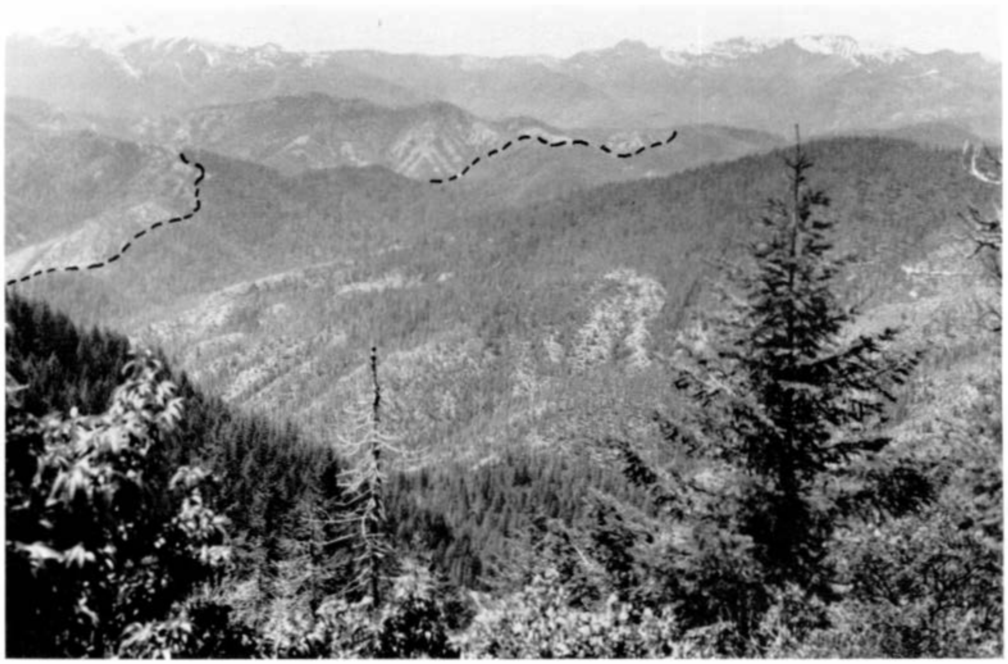


Figure 3. View west across southern part of Kalmiopsis Wilderness Area. Snow-covered mountain on skyline at left is Chetco Peak; one on right is Vulcan Peak. Approximate trace of Madstone Cabin Thrust Fault is marked on photo.

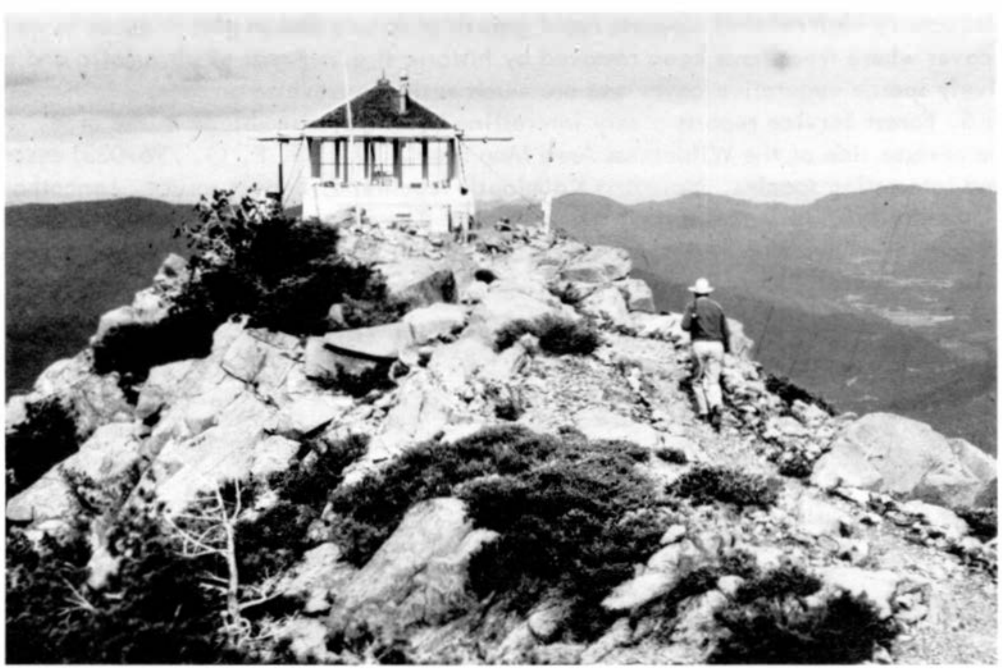


Figure 4. Pearsoll Peak lookout station. The peak (5,098 feet) is highest point in study area. Underlying rocks are peridotite.

Figure 5. Vulcan Lake, the larger and higher of two glacial cirque lakes at head of Box Canyon Creek, is in peridotite. View is from ridge west of lake.

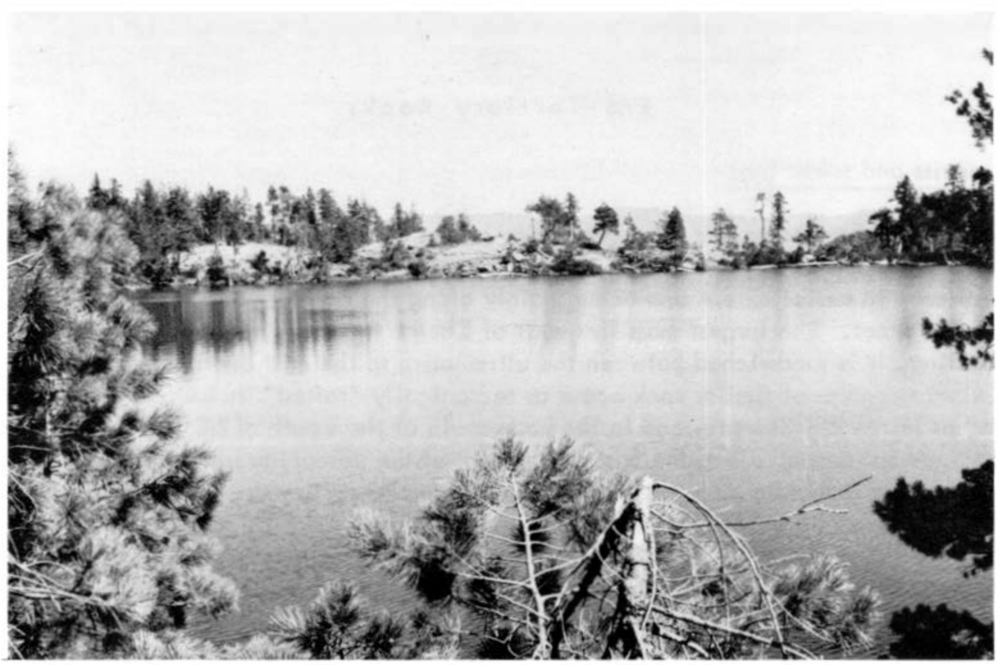


Figure 6. View across Vulcan Lake from east shore.

GEOLOGY

General Discussion

The area has a complex and interesting geologic history (Sheet 1). Most of the rock formations conform to the concept of ophiolite as described in current geologic literature. These rocks are believed to have their origin in an environment which includes a section of the upper mantle, oceanic crust, and ocean floor. The suite may also include volcanics derived from an ancient island arc. Thrust faulting, especially the Valen Lake Thrust may represent crustal collision and resulting subduction or under thrusting of the western plate.

Geologically the area can be divided into four main parts: 1) The southern part, the Josephine ultramafic sheet, consists mainly of harzburgite with lesser amounts of dunite and pyroxenite. The entire mass has been more or less serpentinized, but shear zones within the mass and along its contacts are highly serpentinized. 2) The northeastern portion of the map area lying north of the Josephine ultramafic sheet, is a geologically complex area that includes isoclinally folded sediments and layered volcanics of the Rogue Formation. These rocks have been intruded by serpentinite, gabbro, and dikes of dioritic composition. 3) The central and north-central part of the map area is a large, mafic, igneous complex of plutons including gabbro, diorite, and metagabbro with a few inclusions of peridotite and pyroxenite. This igneous mass has been referred to as the Illinois-Chetco gabbro-diorite complex (Brooks and Ramp, 1968) and as the Chetco River complex (Hotz, 1971). 4) The fourth general subdivision is the Dothan Formation, which underlies the bulk of the western portion of the map area and has been thrust under both the Josephine ultramafic sheet and the mafic complex. The gneissic metagabbros of the Big Craggies represent an overthrust klippe from the larger mafic complex to the east and its entire mass is also underlain by Dothan Formation.

Pre-Tertiary Rocks

Amphibole gneiss and schist (ag)

Amphibolites of unknown age are believed to be the oldest rocks in the area. These rocks include quartz-rich hornblende gneiss, lesser amounts of amphibole schist, and interbeds of impure metaquartzite. They are restricted in aerial extent and occur mainly along the northern and western margins of the Josephine ultramafic sheet. The largest mass lies west of Chetco Peak and south of Red Mountain where, as a result of thrusting, it is sandwiched between the ultramafics to the east and the underlying Dothan Formation. A few small bodies of similar rock occur as tectonically "rafted" inclusions within serpentinites in thrust faults, as in the Big Craggies and in the body south of the mouth of Miller Creek. Some bodies of the amphibole gneiss mapped along the northern margins of the Josephine ultramafic sheet grade imperceptibly into gneissic metagabbros derived from the mafic complex. They are probably a tectonically deformed, highly altered phase of the gabbro. Other rocks including mica-bearing schists, impure metaquartzites, and dark, fine-grained amphibolites are apparently high-grade metasediments or metavolcanics.

Mineralogically the amphibolites contain varying amounts of green hornblende, plagioclase, saussurite (epidote, quartz, calcite, zoisite, chlorite, garnet), magnetite, and sphene. The principal minerals are green hornblende and plagioclase. Some of the amphibolites are devoid of quartz while others grade into quartzite. In some, feldspars appear to have been fairly calcic, and the more calcic varieties have been thoroughly saussuritized. Some fresh albite is also usually present.

Narrow, white bands of fibrous zoisite or prehnite (?) display intricate flowage folding in the gneiss west of Chetco Lake. A thin section of this rock shows the feldspar to be mainly andesine; quartz is absent, and green hornblende makes up about 70 percent of the rock. Accessory minerals include small round inclusions of apatite, minor sphene, and magnetite. The mineral grains have an average median diameter "stretched mosaic" texture.

A similar rock on the Chetco River downstream from the Madstone Cabin site, has a ragged crushed-appearing seriate texture. The feldspars are completely saussuritized and some of the hornblende is altered to chlorite along narrow shears. The rock contains epidote, some garnet, and finely disseminated pyrite.

The large body of gneissic rocks extending from Carter Creek through Bailey Mountain, Little Chetco, and across the main Chetco was mapped by Wells and others (1949) as "amphibole gneiss." In re-mapping these rocks, an attempt has been made to separate gneissic metagabbros and metapyroxenites from amphibole gneiss and schist derived from older volcanic and sedimentary rocks. Therefore, the gneissic metagabbros and some of the very coarse-grained hornblendic rocks included in the "amphibole gneiss" of Wells and others (1949) are mapped as distinct units in this study. Mineralogy, degree of deformation, and structural position aid in distinguishing these rock units. The metagabbros generally have some residual pyroxenes, calcic plagioclase, and hornblende that is pseudomorphic after pyroxene, some of which may display poikilitic texture enclosing plagioclase.

Age of the amphibole gneiss and schist is uncertain. The gneiss near Chetco Lake, which includes some quartzite with a small deposit of rhodonite, appears to be very similar to rocks belonging to the Applegate Group of Upper Triassic age. It is also very much like the quartzite-bearing gneiss that occurs in the upper Briggs Creek area and extends north to the Galice area. The latter has been mapped by Wells and Walker (1953) as amphibole gneiss and interpreted as metamorphosed Rogue Formation of Upper Jurassic age. This problem remains unsolved, and, although the writer prefers to place these rocks in the older category, no conclusive evidence has been obtained in this study area.

Rogue Formation (Jr; mv, ms, ph)

Altered volcanic rocks including basaltic to andesitic lavas, tuffs, tuff breccias, volcanic wackes, and interbedded fine-grained tuffaceous sedimentary rocks occur in the eastern portion of the map area. The volcanic rocks appear to be mainly of submarine origin as evidenced by pillow basalts and intermediate to siliceous tuff breccias seen in the vicinity of Babyfoot Lake and Canyon Peak. Much of this group of rocks is tightly folded and in places overturned (Figures 7 and 8). The rocks are intruded by narrow sill-like bodies of serpentinite and a few small dikes of diabase, gabbro, and diorite. Where warped, dragged, and squeezed into the broad zone of the fault contact along the northern edge of the Josephine peridotite body, these rocks are altered to phyllonites (phyllites formed by mylonitization) which resemble rocks mapped as Colebrooke Schist several miles northwest of the area (Coleman, 1972).

This group of metavolcanic rocks was originally mapped as part of the Galice Formation by Wells and others (1949). In a later report covering the Galice quadrangle to the northeast, Wells and Walker (1953) mapped an extension of these volcanic rocks and renamed the major portion of them the Rogue Formation. The Rogue Formation underlies the Galice and is assigned an Upper Jurassic age.

A few areas of Rogue volcanic rocks have been intruded by a multitude of diabase, gabbro, and diorite dikes so as to make the formation difficult to distinguish from an intrusive mass. Examples are found at Eagle Mountain (sec. 13, T. 38 S., R. 10 W.) and the body capping serpentinite west of Ditch Creek in secs. 2, 3, 10, and 11, T. 39 S., R. 10 W. These areas may represent a sheeted dike sequence like those described in ophiolites.

In a few places, the Rogue Formation is mineralized with fairly abundant sulfides and associated gold, silver, and copper, which occur within the formation and along its contacts with serpentinite. The formation probably represents the main potential for mineral resources in the map area.

Ultramafic rocks (pd, sp, d)

Ultramafic rocks are distributed throughout the eastern and southern portion of the map area. The largest mass is the Josephine peridotite body to the south, which has been referred to as a sheet by Wells and others (1949). Narrow sill-like stringers of serpentinite intrude the Rogue Formation and extend northward from the main sheet. A fairly large body of peridotite, including areas of very coarse-grained dunite, underlies Pearsoll Peak and extends north out of the map area.

Figure 7. Overturned tuffaceous sedimentary rocks and interbedded volcanics of Rogue Formation exposed at Whetstone Butte.

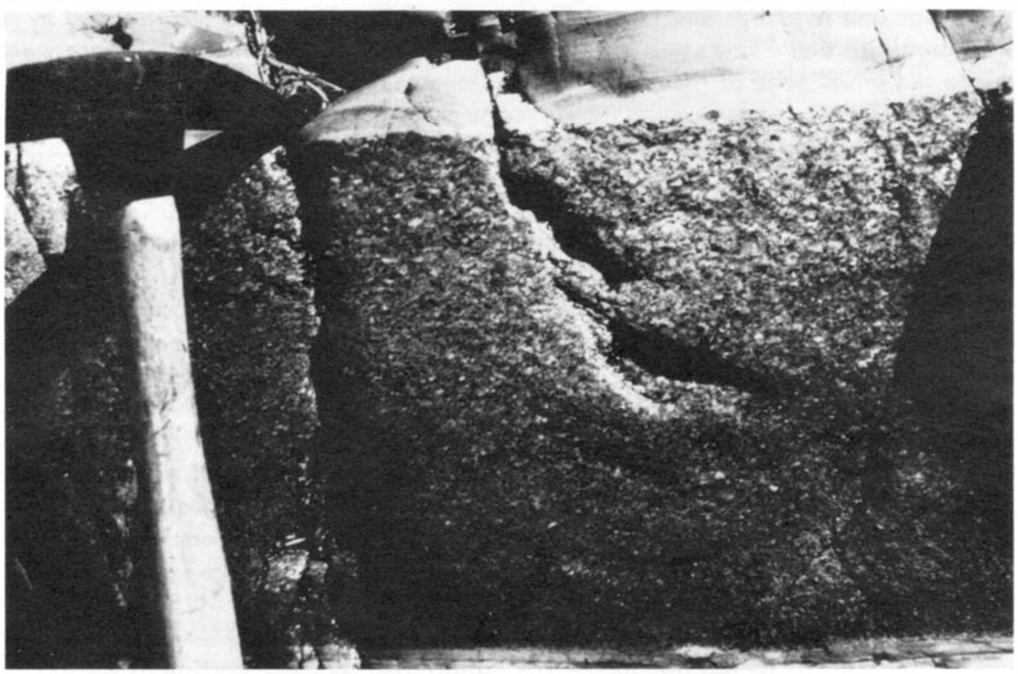


Figure 8. Gritty sandstone layer in Rogue Formation exposed on Babyfoot Creek shows overturned graded bedding.

The ultramafic rocks mapped in the area include varieties of peridotite, such as harzburgite, dunite pyroxenite, and lherzolite, and serpentinites derived from each. Most of the peridotites are more or less serpentinized, although fair-sized areas in the major Josephine ultramafic body remain relatively serpentine free. No attempt has been made in this study to map separately the bodies largely altered to serpentinite from those that are relatively unaltered peridotite, but appropriate map symbols are used to imply the principal rock type present.

In a detailed study of ultramafic rocks in the Vulcan Peak area, Himmelberg and Loney (1973) describe the rocks as largely harzburgite composed mostly of olivine, 15 to 30 percent orthopyroxene and accessory amounts, generally less than 2 percent, of clinopyroxene and chromium spinel.

Pyroxenite (py) and coarse-grained hornblendic rocks (hm, hbc)

Ultramafic rocks lying north of the west-trending Madstone Cabin Thrust Fault, which forms the contact between the main Josephine peridotite sheet and the area of gabbroic rocks, appear to be extensively altered to clinopyroxenite where they come in contact with the gabbros. The pyroxenites appear to be reaction rims of alteration around included peridotite and dunite bodies affected by the surrounding gabbros. Most of these pyroxenites are strongly banded and have the appearance of medium- to coarse-grained pyroxene gneiss. Some are relatively pure pyroxene while others have thin feldspathic bands.

Further alteration of the pyroxenites by injection of multiple veinlets and dikes of probable dioritic composition appears to have formed the very coarse-grained hornblendic rocks (Figure 9) (hornblendic metapyroxenite) in which the hornblende crystals average 3 inches in length, but attain a length of as much as 2 feet (Figure 10) in some places.

These rocks vary in composition from pure hornblendites, as on the Little Chetco River about 1½ miles upstream from the mouth, to fairly light-colored, coarse-grained hornblende gabbros that are about 50 percent plagioclase. The plagioclase is generally in the range of labradorite, or more calcic, and is more or less saussuritized in some of the rocks. Some of the coarse-grained hornblendic rocks display comb texture, i. e., have broad banding developed with the growth of hornblende crystals across the banding (Figure 11).

The interrelationships of the ultramafic and the coarsely crystalline basic plutonic rocks, best observed along the Little Chetco River, present an interesting problem of origin worthy of more study. The concept of partial melting in an environment of high temperatures and lowering pressures during emplacement from the upper mantle into the crust may best explain the origin of these unusual coarse-grained "hybrid" rock types (Dickey, 1970; Wilshire and Jackson, 1975; Wilshire and Trask, 1971).

Wells and others (1949) mapped the very coarse-grained hornblendic rocks as "pegmatitic hornblende diorites." A few geologists have suggested that these rocks formed by metasomatic alteration and prefer to call them metasomatites. Evidence that they are derived from extensive alteration of ultramafic rocks through an intermediate pyroxinite stage is strongly convincing, but a more detailed study will need to be made before the mode of origin can be fully understood.

Gabbro and gabbro-diorite (gb, hb, gb-di), and metagabbro (mg)

A large body of gabbro, gabbro-diorite, and metagabbro extends in a northerly direction from under the Josephine peridotite sheet through the central portion of the map area and continues northward into the Illinois River area. This complex mafic pluton, called the Chetco River complex by Hotz (1971), is 4 to 5 miles wide and about 25 miles long. Rocks in this body that are exposed in the map area vary in composition from coarse-grained hornblende gabbro to quartz diorite and include gneissic metagabbro, two-pyroxene gabbro, and hornblende diorite (epidiorite). The relatively unaltered gabbro contains 50 to 60 percent calcic plagioclase of labradorite to bytownite composition, 20 to 30 percent pyroxenes, 10 to 40 percent hornblende, and 2 to 5 percent magnetite. The plagioclase is commonly zoned and more or less sausuritized. The clinopyroxenes (augite) generally occur in greater quantity than orthopyroxenes (hypersthene). They are nearly always altered in part to hornblende. Most of the gabbro is medium grained, and has a granitic texture. Pyroxenes and replacing hornblende often display poikilitic texture with inclusions of plagioclase. The epidiorite and gneissic metagabbro are more altered and have very little residual pyroxene. The banded varieties generally display cataclastic texture and have some secondary quartz, epidote, chlorite, and albite.

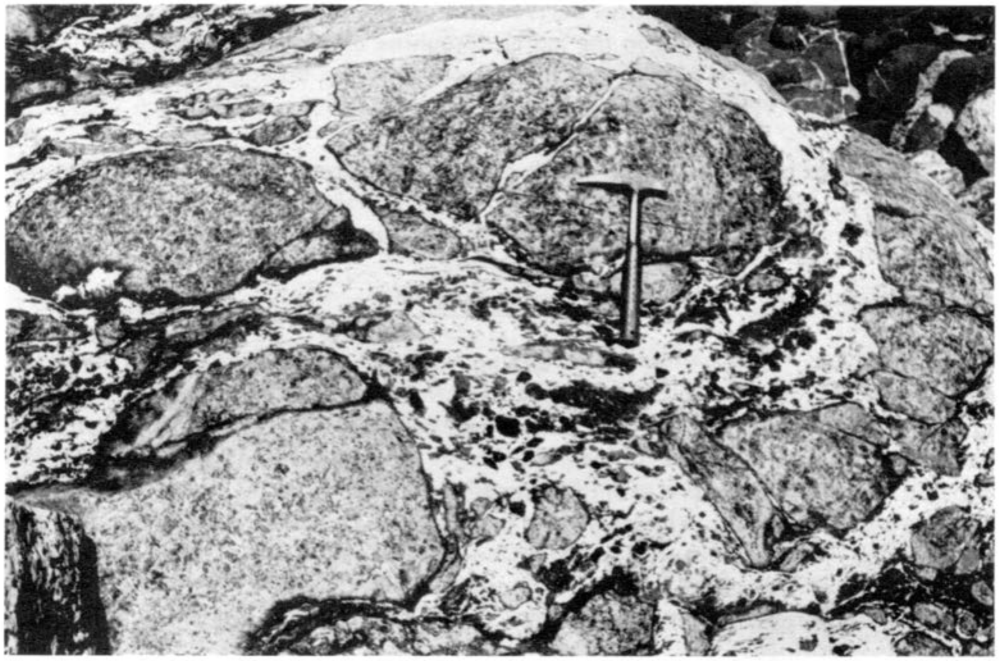


Figure 9. A step in the formation of coarse-grained hornblendic metapyroxenite; "undigested" pyroxenite masses have been partly altered to a hornblende-plagioclase rock by reaction with hot, aqueous solutions.

Figure 10. Coarse-grained hornblendic metapyroxenite exposed on ridge in NW$\frac{1}{4}$ sec. 1, T. 39 S., R. 11 W. Some of the hornblende crystals are as much as 2 feet long.

Hotz (1971) sampled, chemically analyzed, and age-dated rocks from the Chetco River complex north of the mapped area. The potassium-argon age determined on hornblende from hornblende gabbros in this body is 150 million years. This agrees with age determinations obtained by Dick (1973) on a number of gabbro and diabase dikes intruding the volcanics and the Josephine peridotite in the southern portion of the map area and to the east.

Gneissic metagabbros of the Big Craggies include a variety of textures and grain sizes similar to rocks in the main Chetco River complex, but show somewhat more intense deformation. The Big Craggies gneiss includes some medium-grained hornblende gabbro similar to that at Dry Butte. Some of the rocks are strongly banded, have cataclastic texture, and display drag folding and ptygmatic folds (Figure 12). Banding ranges from thin to broad. Coarse clots or inclusions of pyroxene can be found in the gneiss. One such inclusion is a rounded crystal of clinopyroxene (diopside) 2 inches in diameter with a secondary hornblende halo (Figure 13). Coarse-grained hornblende gabbro or hornblendic metapyroxenite also makes up a significant portion of the Big Craggies complex and crops out on the eastern ridge.

Diabasic and related dikes (dd)

A few generally small, fine- to medium-grained, dark-colored dikes intrude ultramafic rocks in the area. Wells and others (1949, p. 11-12) call them "dolerite and related dikes," describe them as having either a diabasic or an intersertal texture, and further state:

> "They consist of about equal amounts of subhedral interlocking crystals of plagioclase that surround irregular but squarish crystals of pyroxene - either dark-green augite or pigeonite - together with 5 to 10 percent of titaniferous magnetite, or ilmenite or both. Now, however, the feldspars are more or less altered to saussurite, the pyroxenes to a fibrous uralitic variety of hornblende and the ilmenite to leucoxene. Some of the diabase contains a bladed brown variety of hornblende that seems to be primary, but no evidence of olivine could be found."

A few samples of these dike rocks examined in thin section show a variation in composition from basalt or microgabbro to andesite. These dikes are possibly related to the gabbros.

Diorite dikes and related rocks (di, hd, qd) and pegmatites (peg)

More siliceous dikes, probably only slightly younger than the gabbros and possibly representing differentiates of them, intrude all formations except the Dothan. These dikes vary in size from the large diorite dike west of Sourdough Flat, which is about 500 feet wide and 6,000 feet long, to very small pegmatite bodies intruding the mafic and ultramafic rocks, the size of which must be exaggerated in order for them to be shown on the map.

Wherever cross-cutting relationships have been seen, the gabbros are younger than the ultramafic rocks and the diorites younger than the gabbros (Figure 14).

The dikes vary somewhat in composition, but the most common are hornblende diorites. One variety contains fairly abundant quartz, altered (saussuritized) zoned labradorite to andesine plagioclase with some secondary albite, green hornblende, minor biotite, and magnetite. Quartz, visible with the hand lens, is intergranular and possibly of secondary origin. This variety of hornblende diorite appears to be altered from a more mafic intrusive. It has been observed at various places along the thrust contact between ultramafics and the gabbros, such as at Granite Saddle north of Pearsoll Peak, near Slide Creek, and at the west end of the Little Craggie Ridge.

The large diorite dike southwest of Sourdough Flat is medium grained and light gray with visible garnet, chlorite after biotite, abundant quartz, andesine feldspar, minor hornblende and magnetite, and rare apatite. Portions of the dike have cataclastic texture. The plagioclase is zoned and shows some saussuritization, especially in the more calcic cores.

Pegmatites are light colored, contain potash and soda feldspar (mainly microcline and albite), quartz, and muscovite. The feldspars generally have cloudy alteration. No unusual minerals were seen in thin section. These rocks are rare and probably represent late-stage aqueous differentiates of the diorites.

Figure 11. Coarse-grained hornblende gabbro in Little Chetco River illustrates peculiar comb texture with hornblende crystals oriented at right angles to banding.

Figure 12. Augen gneiss (gneissic metagabbro) of the Big Craggies illustrates ptygmatic folding and a variety of textures.

The gabbros, diorites, and related intrusions of Late Jurassic age, which postdate the Rogue Formation and predate the Dothan Formation, were intruded during the Nevadan Orogeny. It is probable that the bulk of gold, copper, and related sulfide ore minerals were deposited during this episode.

Dothan Formation (Jd, Jds, Jdb, Jdc)

The Dothan Formation extends from the coast of northern California and southern Oregon northeasterly in a wide, continuous band across the Klamath Mountains into southern Douglas County, Oregon. The Formation underlies much of the western part of the map area west of the Valen Lake Thrust Fault along which it has been thrust under most of the older formations.

The Dothan Formation consists of graywacke sandstone (about 40 percent), with interbedded siltstone and shale (30 percent), pillow lavas and volcanic breccia (15 percent), chert (10 percent), and conglomerate (5 percent). Its total thickness in the map area is unknown, but, from exposures along the Rogue River to the northeast, Wells and Walker (1953) estimate the thickness at 10,000 to 18,000 feet.

Diller (1907) named the Formation after exposures along Cow Creek near Dothan Station (West Fork) in Douglas County. Fossils found on the Chetco River about 1,000 feet upstream from the mouth of Boulder Creek in the map area and identified as *Buchia piochii* (Gabb) establish the age of this portion of the Dothan as latest Jurassic (Tithonian) (Ramp, 1969).

The Formation varies considerably in degree of deformation from fairly flat lying to overturned. A few small drag folds have developed adjacent to intraformational fault zones, and small-scale, tight folding appears to be a fairly common feature. In the map area, structures are best exposed along the Chetco River, Tincup Creek, and Boulder Creek (see Figure 15). Drag folding and shearing are prevalent in the less competent shaly interbeds.

Lenticular bodies of chert, usually less than 300 feet thick and 1/4 mile long, occur intermittently through the Formation in the map area. Some of the chert is well banded and multicolored, but more commonly it is light gray, massive, and fractured, with fractures filled by thin quartz veinlets or coated with manganese and iron oxides.

Conglomerate is uncommon in the map area, although one horizon containing distinctive tan limestone boulders can be seen along the small unnamed stream in the southeast corner sec. 12, T. 38 S., R. 12 W. Other boulders and cobbles in the conglomerate consist mainly of graywacke, chert, and siltstone.

Wells and Walker (1953) recognize and describe four distinctive stratigraphic zones across the strike of the Dothan in the Galice quadrangle. Dott (1971) finds Dothan on the southern Oregon Coast to be in part comparable to zones of Wells and Walker in the Galice quadrangle. Although no attempt has been made in the present study to map the Dothan Formation in detail, its stratigraphic sequence appears to be similar to that of other areas described in the literature.

The Dothan Formation has been considered the possible equivalent of both the Otter Point Formation (Coleman, 1972) and the Franciscan Formation of California (Dott, 1971; Irwin, 1964).

Tertiary and Quaternary Rocks

Dacitic dikes (da, dp)

Small light-colored, commonly porphyritic, dikes of dacitic composition have been mapped intruding both the ultramafic rocks and the metavolcanics of the Rogue Formation. Dacite and dacite porphyry dikes similar to these have been described throughout southwestern Oregon by Diller (1903), Diller and Kay (1924), Wells and others (1949), Dott (1971), and other writers. Dott (1971) reported a K-Ar whole-rock determination on a sample of dacite near Brookings which yielded a date of 30$\pm$1 million years. These dacitic dike rocks contain a large percentage of plagioclase along with fairly abundant orthoclase and quartz with accessory minerals including apatite, hornblende, biotite, magnetite, secondary kaolin, epidote, and zoisite. The plagioclase in some of the dikes appears to be sodic andesine that is in part saussuritized.

Figure 13. Clinopyroxene crystal inclusion in Big Craggies gneissic metagabbro. Note hornblende alteration around inclusion.

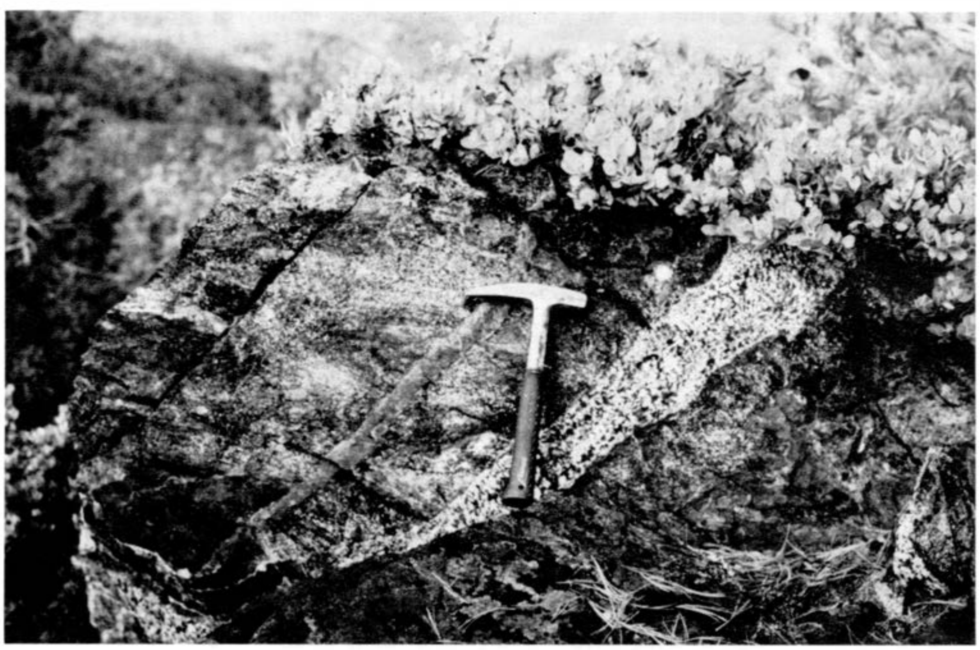


Figure 14. Diorite dikes penetrating gabbro are exposed on ridge in SW cor. sec. 29, T. 38 S., R. 10 W.

Old stream gravels (Tg)

A relatively thin cover of Tertiary stream gravels, occupying about 250 acres, remains at between 3,700 and 4,000 feet elevation at Gold Basin 2 miles west of Pearsoll Peak. These gravels lie on an ancient erosional surface on gabbro bedrock. This surface has been referred to by Diller (1902) as the Klamath peneplane. Although Diller assigned the erosion surface a Miocene age, Wells and others (1949, p. 16) question the validity of Diller's dating but offer no new evidence other than to assign a Miocene or Pliocene age to the gravel on their map.

The gravel is reported by Diller (1914, p. 96) to be as much as 110 feet thick where best exposed at its southern edge, but it thins rapidly to the east and west. The gravel is well cemented beneath the zone of weathering. Pebbles, cobbles, and boulders are mainly gabbro with numerous other rock types including metavolcanics, peridotite, quartzite, amphibolite, graywacke, and chert.

Wells and others (1949, p. 16) describe the structure of the Gold Basin gravels as follows:

> "Stratification is hard to see but is sufficiently well developed to show that the beds strike N. 35° E. and dip 35° SE. The deposit is cut by widely spaced vertical joints. Obviously the beds have been tilted toward the southeast, and the whole surface of low relief on which they rest may have been tilted a few degrees in this direction. The formation was laid down by a stream which, according to Diller (1914), flowed northward."

Glacial moraine (Qgm)

Pleistocene glacial moraine deposits have been mapped in the drainages of upper Box Canyon and Fresno Creeks. Less extensive deposits, although not mapped, occur in the U-shaped canyons of upper Madstone and Broken Cot Creeks and in the unnamed creek between them; moraines can also be found in the Babyfoot Lake area.

The large moraine in the headwaters of Box Canyon Creek below Vulcan Lakes is composed entirely of ultramafic debris ranging from peridotite boulders as large as 2 feet in diameter to fine serpentine rock flour. Most of the deposit lies above 2,800 feet elevation and appears to include both moraine and glacial outwash material. Discontinuous deposits of possible lateral moraines occur at about 2,400 feet elevation in the canyon of Fresno Creek and extend nearly to the mouth of the Creek. Whether glacier ice reached this far or the deposits represent remnants of glacial outwash is uncertain.

Wells and others (1949, p. 17), describe the moraines and report as follows:

> "The forms of the cirques and of the moraines show no modification by weathering or stream erosion, so it is assumed that they were formed during the last glacial stage (Wisconsin) when glaciers of alpine type extended down to this altitude."

Bench gravels (Qbg)

Deposits of stream gravels occur on benches from 10 to 75 feet or more above the present stream channels and generally above present stream flood stage. Bench gravels are common along the Chetco and Little Chetco Rivers and along some of the creeks such as Tincup, Box Canyon, and Boulder. A few of these deposits are shown on the geologic map (Plate 1). Composition and size-range of the gravel is similar to deposits in the presently active bars. Thickness of the bench gravel deposits examined ranges from a few inches to about 15 feet (Figure 16). The bench gravels characteristically merge with talus from the slopes above them. A number of these bench deposits have been worked in a small way by placer miners. Deposits remaining along the Chetco near Babyfoot Creek and along the upper Little Chetco show significant gold values.

Landslide debris (Qls)

Landslides are numerous in all types of rocks in the map area. Some of the recent slides are shown on the map, as are a few older ones which obscure contacts and make mapping difficult.

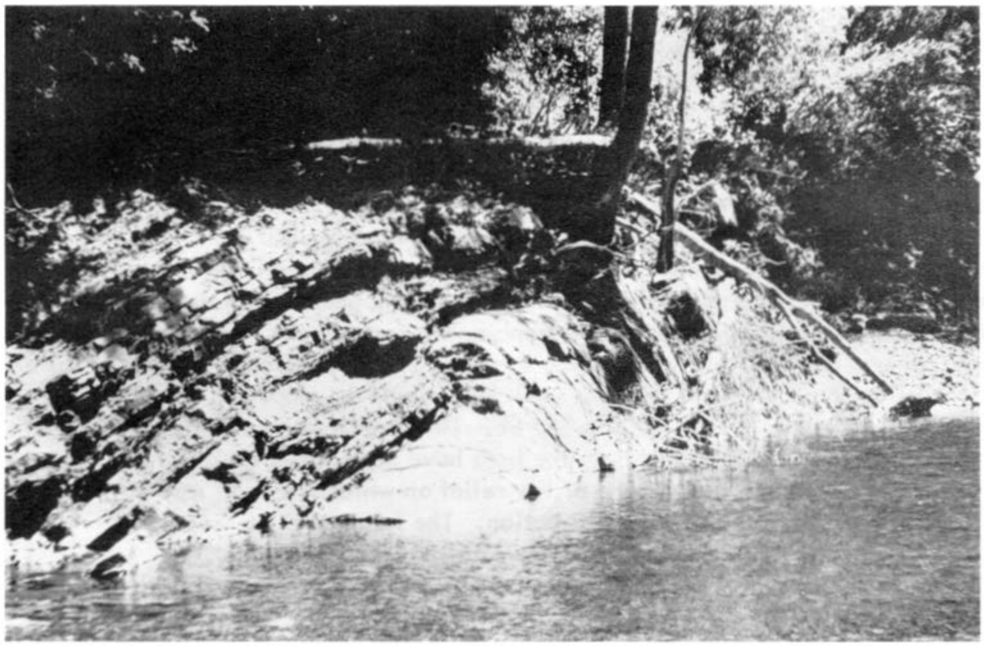


Figure 15. Crest of plunging asymmetric fold in Dothan Formation exposed on Chetco River just west of Chetco Bar. Axis trends N. 10° W., and limbs dip 40° E. and 70° W.

Figure 16. Bench gravel on upper Chetco River near Madstone Cabin site. Bedrock is serpentinite.

Several large areas of older slides along the Chetco River and major tributaries were reactivated during periods of high water in the winter of 1964-65. One massive slide in partly serpentinized peridotite about a mile upriver from Madstone Cabin site temporarily dammed the river and caused a large buildup of gravel behind it.

In the Dothan Formation, the over-steepened slopes and sheared incompetent shale and siltstone have given rise to many landslide areas, especially in the steep-walled canyon of Tincup Creek where undercutting of the stream bank by high water in 1964-65 generated slides that stripped all soil and vegetation, including large trees, down to bare rock. In some places, the heads of the slides extended to the ridge tops. Slide debris, which probably dammed Tincup Creek temporarily, was quickly sluiced out by flood waters and carried into the lower reaches of the canyon where it formed gravel bars 10 or more feet thick and several acres in extent.

A steep narrow rock slide that occurred on the north side of Dry Butte dammed a small tributary of Boulder Creek and formed Valen Lake. Judging from the size of trees growing on the dam, the slide must have occurred about 300 years ago. The limited drainage area and intermittent nature of the stream above this point has enabled the dam and small lake to remain intact (Figure 17).

Much of the area of Sourdough Flat north of Slide Creek appears to be an ancient, massive slump block of ultramafic rocks. Large exposures of peridotite-serpentinite slide breccia can be seen in the steep slopes west of the Little Arctic Chrome mine in the SW$\frac{1}{4}$ of sec. 11, T. 38 S., R. 10 W (Figure 18). The principal rock involved in this slide is a very coarse-grained dunite, deep weathering of the slide debris has formed a deposit of nickel-bearing lateritic soil and saprolite.

Structure

The area has had a complex and interesting tectonic history. There are two prominent structural features: thrust faults and north to northeast-trending folds. A few northwest-trending, high-angle transverse faults are mapped in the area, but none of these appear to have significant displacement along them.

Thrust faults

The north-trending major thrust forming the eastern margin of the Dothan Formation, called the Valen Lake Thrust Fault in this report, represents a major tectonic event which took place sometime after deposition of the Dothan, probably during Late Cretaceous time (Irwin, 1964 and Hotz, 1969). Movement along this fault involves underthrusting of the Dothan Formation from west to east and overthrusting of the Josephine ultramafics and Chetco River complex from east to west. The Valen Lake Thrust Fault is a segment of a major unnamed structure which extends northward into Douglas County and southward into northern California. It can be traced for about 250 miles. Irwin (1964) interprets this thrust fault as marking the western boundary of the Klamath Mountains. Hotz (1969) describes a segment of the thrust which forms the contact between the Dothan and Rogue Formations in an area about 25 miles north of the upper Chetco area. The Valen Lake Thrust Fault is not an appropriate name for the entire structural feature but is used for convenience in this report.

An earlier, generally east-trending thrust fault, called the Madstone Cabin Thrust Fault in this report, has moved the Josephine ultramafic sheet up over the Chetco River complex and also over the Rogue Formation. The direction of relative movement of the overlying ultramafics has been northwesterly.

The contact of the western margins of the Rogue Formation and the Pearsoll Peak ultramafic body with the Chetco River mafic complex is also a reverse or thrust fault. This north-trending fault branches from the Madstone Cabin Thrust Fault at a point near the crest of the ridge between the Little and main Chetco Rivers.

Detailed mapping in proximity with these fault zones is difficult owing to a complex intermixing of rock types. Rocks generally present in and adjacent to the fault zones include highly sheared serpentinite, phylonite, and gneiss with well-developed banding and cataclastic texture. The complex map pattern along the Little Chetco near Emlly Cabin and the surrounding area is suggestive of imbricate or multiple thrusting and a more thorough study is needed to work out the details of this structural problem.

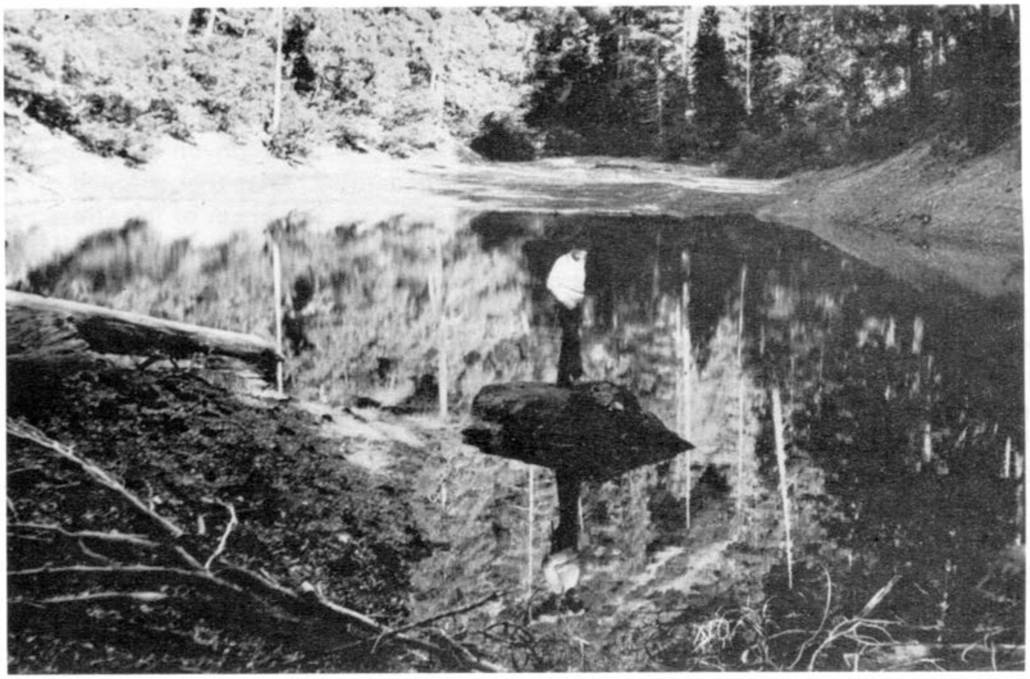


Figure 17. Valen Lake was formed by a rock slide off a steep north face of Dry Butte which dammed a tributary of Boulder Creek.

Figure 18. Ultramafic landslide breccia exposed above southwest part of Sourdough Flat, SW¼ sec. 11, T. 38 S., R. 10 W.

The Big Craggies are a klippe-like feature riding on a cushion of sheared serpentinite overlying the Dothan Formation. Gneissic metagabbros of the Big Craggies are in part similar to rocks in the vicinity of Dry Butte and Bailey Mountain. Coarse-grained hornblendic metapyroxenites like those in the Chetco River complex are also present in the Craggie complex. Coleman (1972) mapped a large area to the north and west, including the Big Craggies, and discusses some of these thrust features.

Folds

The pattern of folding in the Rogue Formation is isoclinal, and overturned sections are common (Figure 7). Strikes are generally north to N. 40° E., with a very few northwesterly and easterly trends in areas of more complex deformation. The dips are predominantly eastward and vary from 15° to near vertical. Relatively narrow sill-like serpentinite bodies intruding the Rogue Formation appear to have been involved in at least the later stages of deformation.

The mafic igneous complex and included ultramafics generally conform to the northerly strike and easterly dip of the older rocks. They also display a westerly warp in the area north of the Madstone Cabin Thrust Fault, mainly along the Little Chetco River. This westerly warp structure is also an important feature in the Rogue Formation and associated serpentinite bands.

Folding in the Dothan, aside from a few small drag folds, is generally somewhat more open and gentle than that seen in the Rogue Formation. The fold axes trend northerly and the beds are generally right side up. Folding of the Dothan Formation must have taken place at least in part during the period it was being thrust to the east under the older mafic and ultramafic rocks (Figure 15).

Figure 19. Old placer workings ("China Diggins," no. 53) in bench gravel of Little Chetco River, SW$\frac{1}{4}$ sec. 10, T. 39 S., R. 10 W.

HISTORY OF MINING ACTIVITY

Production of Gold

Mining activity in the Upper Chetco area, like that of the rest of southwest Oregon began with gold seekers in the early 1850's. Placer mining probably spread from the extensive operations on Canyon Creek westward over the divide into the headwaters of the Little Chetco, and from Rancherie Creek over the divide to the Slide Creek area (Sheet 2).

The Ditch Creek placer ditch to the mine near Emlly Cabin on the Little Chetco was completed in 1878 by Chinese labor. Mr. Emlly, an Englishman, reportedly took out $25,000 in gold in the 1880's. This included production from a lode deposit (Emlly mine, No. 58) on the hillside about 150 yards northwest of Emlly Cabin. Emlly Cabin was built about 1880 (Figure 2). Bert Adams occupied and worked the placer claims from Ditch Creek to Copper Creek from about 1890 to 1930. Placer activity extended for 3 miles along the Little Chetco from about a mile above Hawk Creek to a point between Copper and Henry Creeks (Figure 19). Some early placer mining was probably also done at a few spots along the main Chetco and tributaries, including Carter, Babyfoot, Slide, and Miller Creeks.

The old gravels of Gold Basin were explored in the middle to late 1800's, and a patent to 160 acres, mostly in sec. 33, T. 37 S., R. 10 W., was issued to the Mabelle Mining Company in 1897.

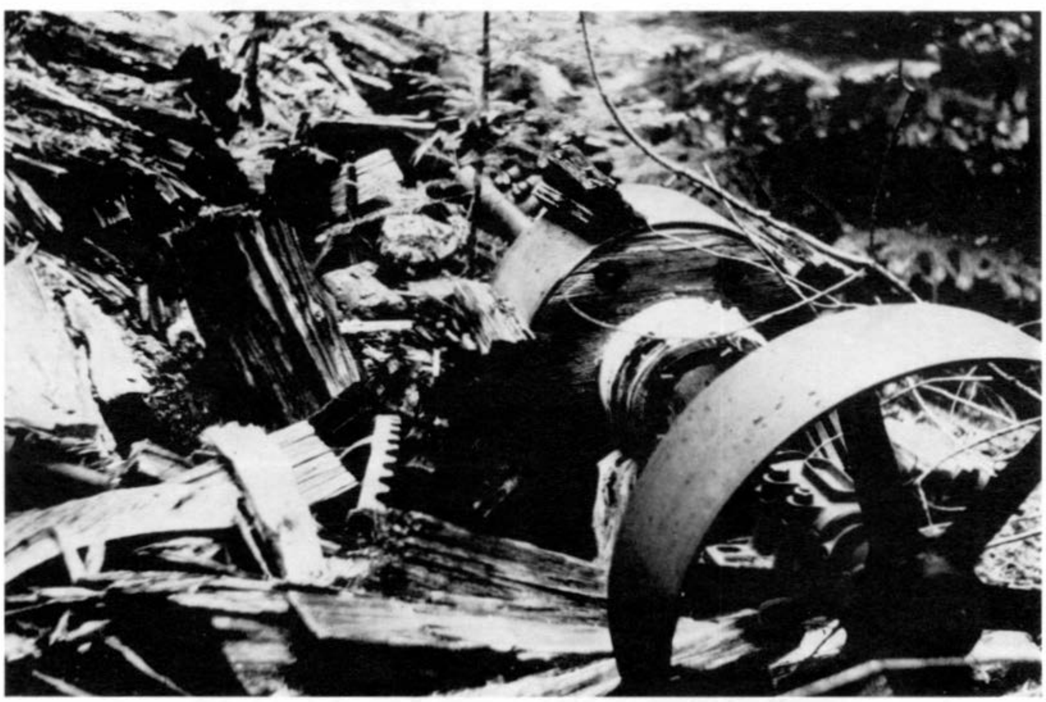


Figure 20. Ruins of mill at Hustis mine (no. 16), sec. 14, T. 38 S., R. 10 W.

During the late 1800's considerable mining and prospecting was done in the "China Diggings" district, which included the drainage areas of Slide, Miller, Babyfoot, and Carter Creeks and the Little Chetco River. Early activity at gold mines and prospects, such as the Higgins (Golden Dream), Hustis, Miller (Robert E), and Bacon (Peck), are reported by Diller (1914) and Butler and Mitchell (1916). During the depression years of the 1930's, gold-mining activity was revived in the same area. At that time there were about 10 dwellings in the area (Figure 20).

No published estimations of total production of gold from these placers have been made. Judging from the limited areal extent of the old placers that are still in evidence, the figures must have been modest, probably in the range of $50,000 gross value (2,500 ounces).

The total value of lode production, including some ground-sluiced areas of reported rich eluvial deposits, may have been close to $200,000. The greatest lode production of record was from the Peck (No. 21) mine near the center of sec. 23, T. 38 S., R. 10 W. The mine was taken up by I. F. Peck in 1919, and a total of about $80,000 was produced during 1928 and 1929. Total production to 1952 is estimated at about $120,000. The later mining at the Peck was done by W. D. Bowser.

Production of Chromite

The main period of chromite production was between 1952 and 1958. Eighteen chromite occurrences in the area have been credited with some production; the activity is documented by Ramp (1961).

Gross production of metallurgical-grade chromite in the map area has been about 2,400 long tons. The largest portion of this was 1,200 tons of mill concentrates from McCaleb's Sourdough No. 2 mine (No. 11) on Sourdough Flat near the $\frac{1}{4}$-corner secs. 11 and 12, T. 38 S., R. 10 W. The largest production of high-grade lump ore from a single occurrence was about 200 long tons from the Gardner mine (No. 50), secs. 3 and 10, T. 39 S., R. 11 W. (Figure 21).

Production of Other Minerals

A small but unrecorded amount of platinum has been produced from placers along the main Chetco. The most recent exploration and sampling activity for platinum was by Lawrence Stevens and associates in 1969 and 1970 along the main Chetco about 2 miles above the mouth of the Little Chetco. Samples of black sand concentrates contained a few visible grains of platinum metals.

A small shipment of manganese oxide ore was reportedly made during World War II from the Long Ridge deposit (No. 49) in sec. 13, T. 38 S., R. 12 W. There was also an early report of a small shipment of copper ore from the area near Emlly Cabin (No. 56) by the Chetco Copper Company (Diller, 1914, p. 84).

METALLIC MINERAL RESOURCES

In the map area, gold, chromite, copper, iron, and nickel are believed to have some potential for future development and production. Cobalt, manganese, mercury, and platinum are also known to be present and may warrant further investigation. The metallic mineral resources are discussed below in alphabetical sequence.

Chromite

A total of 32 chrome mines and prospects are known in the map area, and, in addition, there are a few sites where float chromite was gathered and assayed (Table 1). Most of these occurrences are described in the Department's Bulletin 52 by Ramp (1961), and will not be treated in detail here.

Chromite occurs exclusively in the ultramafic rocks and predominantly in the olivine-rich varieties (harzbergite and dunite) and serpentinites derived from them. No chromite occurrences are known in the banded clinopyroxenites which are enclosed in the Chetco River gabbro complex. Chromite is found at widely scattered occurrences in the main Josephine peridotite sheet with an apparent preference for the western and northern margin areas of the sheet. Chromite is also scattered along the sill-like apophyses of serpentinite extending northward from the Josephine sheet and penetrating the Rogue Formation.

The area of greatest chromite production, Sourdough Flat, is a large landslide mass in the southern portion of the Pearsoll Peak ultramafic body. This area also probably represents the greatest potential for future production in the area. The largest deposit mined was at McCaleb's Sourdough No. 2 pit (No. 11) from a zone of low-grade, banded-disseminated chromite 5 to 12 feet thick which assayed about 30 percent Cr_2O_3. This zone was mined for about 200 feet along the strike and to a depth of 50 feet.

None of the known chromite occurrences in the area appear to have significant potential reserves of metallurgical-grade ore. It appears logical, however, that detailed prospecting of the Josephine peridotite body which extends southward into California may reveal as yet undiscovered reserves of chromite. It should be pointed out that further exploration at mines such as the Gardner (No. 50), where development has extended only a short distance below the surface, should expose additional ore (Figure 21).

Cobalt

A single occurrence (No. 72) is located about 2 miles N. 35° E. from Doe Gap at about 3,750 feet elevation, near the head of a tributary of the Chetco River, near a projected section line between sections 26 and 27, T. 39 S., R. 10 W. (unsurveyed).

This unnamed prospect which was worked many years ago has three small shallow caved cuts. Maximum dimensions of the mineralized zone appear to be about 3 feet thick by 125 feet long. The strike is northwest and the dip nearly vertical. Mineralization occurs in an altered magnetite-bearing pyroxenite with pyrrhotite, minor chalcopyrite, malachite, and erythrite. The rock weathers to a dark-brown gossan with minor copper stain and rare cobalt bloom.

A sample collected by the writer in September 1969 assayed nil gold and silver, trace cobalt, 0.2 percent copper, 0.1 percent nickel, and nil platinum. The surrounding rocks are partly serpentinized harzburgite. Minor amounts of cobalt are associated with nickel in laterite deposits, such as on Sourdough Flat (see Figure 24).

Some limited exploration and sampling to determine whether there may be any potential for developing ore appears to be justified.

Table 1. Chromite occurrences in the Upper Chetco River area

Map No.	Name	Location Qtr.	Sec.	T.S.	R.W.	Production (long tons)	Type of ore	% Cr_2O_3 approximate	Cr:Fe
29	Babyfoot mine	W½	30	38	9	100	Massive	48	3:1
42	Bailey prospect	SE	3	39	10	½	Massive	--	---
20	Bowser mine	NE	22	38	10	"small"	Milled-	43	2:2:1 *
		NW	23	38	10		low grade		
61	Buck Chromite	SW	11	39	10	small	Massive	--	---
40	Burned Cabin	SE	2	39	10	40	Massive	45	2:9:1
39	Carter Creek divide	N½	2	39	10	30	Massive	46	2:7:1
64	Chetco Lake	?	23	39	11	small	Mill ore	42	2:7:1 *
44	Chromite float (a)	NW	3	39	10	---	Massive	44	2:9:1
52	Chromite float (b)	?	8	39	10	---	Massive	42	2:0:1
68	Chromite float (c)	?	20	39	10	---	Massive	49	2:4:1
14	Eagle Mountain	N½	13	38	10	---	Small quantity mixed	--	---
4	Eagles Nest	NE	11	38	10	Small	Mill ore	35	2:3:1
59	Emlly Chrome	SE	10	39	10	6 (?)	Massive	40	2:7:1
50	Gardner mine	N½	10	39	11	200	Massive	50	2:9:1
55	Hawks Rest View	NW	10	39	11	40	Massive	46	3:0:1
41	Little Boy	W½	2	39	10	15	Massive	46	2:4:1
6	Little Siberia	SW	11	38	10	195 (mill ore)	Disseminated and banded; massive	55	2:8:1 *
15	Lost is Found	SE	11	38	10	? small (mill ore)	Narrow stringer	31	1:7:1
30	Lucky Day	Cent.	30	38	9	None	Dissem. and massive	47	3:0:1 *
	McCaleb's Sourdough:								
10	#1	NW	12	38	10	None	Dissem. and massive	15	---
11	#2		11-12	38	10	1,200 (milled concentrates)	Disseminated	50	2:5:1 *
57	Morning Sun	S½	10	39	10	10	Massive	--	---
74	Nancy Hank	SW	10	39	11	None	Disseminated	37	2:2:1
71	No Name prospect (a)	NW	26	39	10	None	Massive	49	2:4:1
73	No Name prospect (b)	SW	26	39	10	None	Massive	42	2:1:1
34	No Name prospect (c)	NW	36	38	10	None	Massive	44	2:7:1
3	Pearsoll mine	N½	2	38	10	250 (mill ore)	Disseminated	52	2:7:1 *
3(a)	Pearsoll group	SE	2	38	10	None	Banded disseminated	--	---
5	Prospectors Dream	W.edge	11	38	10	Small	Granular schlieren	42	---
51	Rosie	NE	11	39	11	30	Massive pod	45	2:5:1
70	Square Lake prospect	NE	24	39	10	None	Mixed	--	---
28	Sugarloaf	NW	25	38	10	1	Massive pod	54	3:5:1
8	Uncle Sam	NE	11	38	10	"less than 100"	Granular	35	---
7	Wonder		11-14	38	10	250 + ?	Granular	42	2:2:1

* Assay of concentrates or selected high grade

Figure 21. Open pit at Gardner chrome mine (no. 50) sec. 10, T. 39 S., R. 11 W.

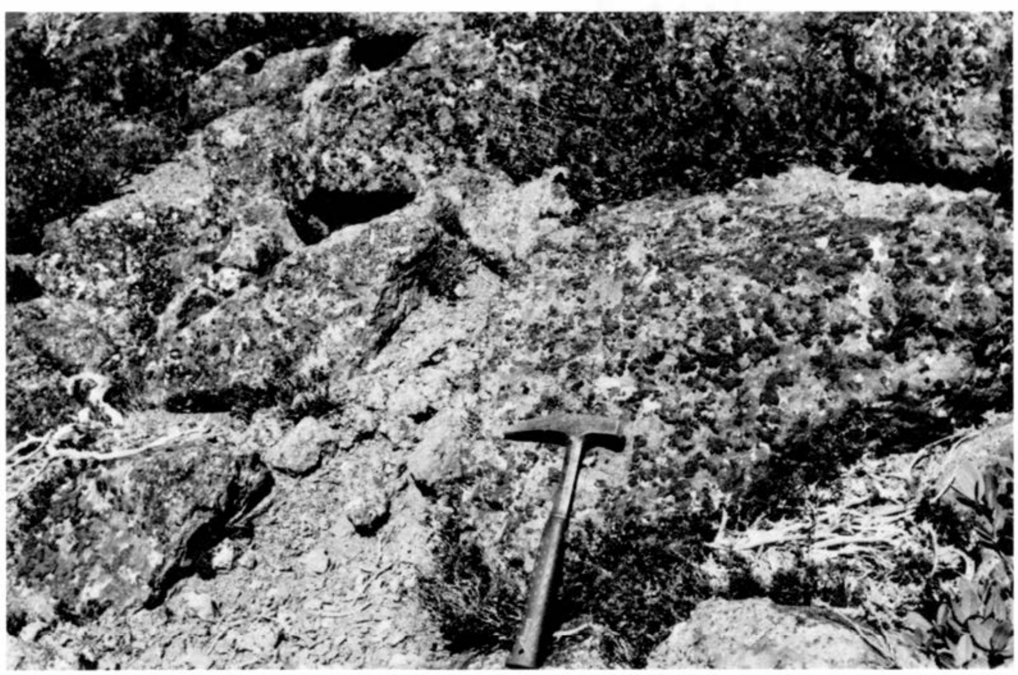


Figure 22. Magnetite clots in altered pyroxenite (no. 45), SE$\frac{1}{4}$ sec. 31, T. 38 S., R. 10 W.

Copper

Small occurrences of copper are known in the area (Table 2). They are associated with gold in the relatively narrow north-trending zone of metavolcanics and metasediments of the Rogue Formation between the Little Chetco River near Copper Creek and the Eagle Mountain area. Several of the copper occurrences are within or along the margins of narrow, sheared bodies of serpentinite. Most of the occurrences have been worked very little and only one shipment of copper ore is recorded from the area. Diller (1914, p.84) reports on the Chetco Copper Co. mine as follows:

> "The same serpentine belt with which the copper deposits are associated on Fall and Rancherie Creeks extends southwest by the head of Canyon Creek to Chetco River, where a number of similar deposits occur and have been prospected, by the Chetco Copper Co. and others, by tunnels aggregating more than 250 feet. The ore appears to be mainly chalcopyrite, but Dixon's prospect has furnished some native copper and some remarkably beautiful specimens of the bright red oxide of copper, cuprite, in minute cubic crystals. A small amount of ore is said to have been shipped from this locality."

The precise location of this mine is not known, but it appears likely from Diller's map that he was referring to the adits in the W½ of sec. 10, T. 39 S., R. 10 W. (No. 56). The southwestern of this group of three short adits, called the Sunset Tunnel by Perry Davis, present owner of the claims, has some ore on the dump that could be of shipping grade if carefully hand cobbed.

Geochemical studies of stream sediment samples from the area (Appendix A) show only a few weakly anomalous sample sites for copper. The strongest copper test was obtained from the small unnamed gulch flowing into the Little Chetco River from the north in the W½ sec. 10, below the Sunset Tunnel.

Some limited exploration in the form of detailed mapping and soil sampling, possibly followed by some geophysical testing and, ultimately, drilling, may be warranted in two of the areas of copper occurrences. These are the area just north of Eagle Creek, where the Eagle Creek copper group (No. 18) is situated and the Copper Creek area west of Emily Cabin. The Eagle Creek area may be the more likely to justify further exploration.

The Eagle Creek copper group prospects are located in the NW¼ sec. 24, T. 38 S., R. 10 W., between 2,700 and 3,000 feet elevation. Old workings can be found between Eagle Creek and the road leading to the Peck mine. They lie within and along the contact of a body of serpentinite and metavolcanics, both of which have been intruded by dikes and small masses of diorite and gabbroic rocks. The gossan area and disseminated pyrite near the west edge of the SW¼ sec. 13 on Miller Creek (No. 17) may be a northern extension of this area (see section on gold).

Development at the Eagle Creek group consists of 6 or 8 shallow cuts and a caved adit which may have been 200 feet long, judging from the size of the dump. The adit is located on the nose of a small ridge at about 2,900 feet elevation a short distance south of the road junction leading to the Peck mine. Its trend was apparently northwesterly following a narrow mineralized shear in metagabbro. Some copper-bearing sulfide gossan and minor quartz can be found on the dump.

Mineralization at the Eagle Creek group prospects varies somewhat depending on the host rocks. Pits in sheared serpentinite contain lenses and streaks of limonite gossan with some residual chalcopyrite and secondary malachite. Mineralization in the layered metavolcanic and tuffaceous metasedimentary rocks underlying the serpentinite on the bluffs above Eagle Creek contains disseminated pyrite and chalcopyrite in gray quartz and siliceous to cherty metasedimentary rock with manganese-oxide staining and fine-grained disseminated sulfides. A few tons of low- to medium-grade copper-bearing ore are stacked by the cuts, but there has been no known production from this group. Reconnaissance sampling shows copper values from 0.60 to 13.30 percent. Gold and silver values are low.

Geology of the Copper Creek area is similar to that of the Eagle Creek area. Some copper mineralization is found in the three adits in somewhat foliated tuffaceous metasediments or metavolcanics underlying serpentinite in the W½ sec. 10, T. 38 S., R. 10 W. The upper adit, called the "melanterite tunnel"

Table 2. Copper prospects and occurrences, Upper Chetco River area

Map No.	Name	Location ¼ sec.	TS	RW	Copper minerals reported	Development	Comments & assays
12	Stone prospect	NE/SW 12	38	10	Chalcopyrite, pyrrhotite	Small cut	5 ft. thick gossan strikes N. 45° E., dips steep E. on serp.-metased. contact 2.5% Cu
16	Hustis mine	14	38	10	Malachite, chalcopyrite	Open cuts and adit	Sheared serp. gossan on contact. 4.1% Cu
22	Mouth Morrison Gulch	SW 23	38	10	Malachite, chalcopyrite, pyrite, pyrrhotite	None	4-foot wide copper-stained shear zone. Strike N. near vertical. Sample 0.3 oz/ton Au; 0.9% Cu
17	Miller Creek Gossan	W/SW 13	38	10	Chalcopyrite with pyrite in gossan	Shallow cuts	Large gossan area. 0.06 Au, 0.40 Ag, 0.20% Cu
18	Eagle Creek group	NW 24	38	10	Limonite, malachite, chalcopyrite	Shallow cuts & caved adit	Spotty mineralization over small area
43	Bailey Cabin, Carter Creek	(?)35, 2,3	38-39	10	Verbal report, not visited	Shallow cuts	Somewhere between Bailey Cabin and Carter Creek in Rogue Fm.
54 and 56	Copper Creek group	W½ 10	39	10	Chalcopyrite, copper sulfates, some sphalerite	3 short adits Shallow cuts	This is probably the Chetco Copper Company mine reported by Diller, 1914

(No. 54) is about 25 feet in length. It is situated in the NW$\frac{1}{4}$ sec. 10 at about 2,800 feet elevation, just around the hillside southwest of the Hawks Rest View chromite mine. The adit enters in a northeast direction.

Mineralization encountered in the tunnel is thickly disseminated to massive granular pyrite in a siliceous phyllite. There is some limonite after pyrite and minor iron sulfate. A 23-foot channel sample cut at waist height along the northwest wall of the adit assayed 0.02 ounces/ton gold, nil silver, and 0.10 percent copper. The layered rocks strike about N. 8° W. and dip 40° to 60° E. under the serpentinite.

The two lower adits are situated about 1,000 feet south. The eastern one is about 50 feet long in a N. 53° E. direction. It penetrates mineralization similar to that in the melanterite tunnel and foliation of the rocks at this point strikes N. 15° W. and dips 35° E. The western lower adit, called the Sunset Tunnel, is about 90 feet long with a 15-foot crosscut to the right. The main portion of the tunnel trends N. 20° W. parallel to the strike of foliation in the rocks and the dip is 35° E.

A selected sample of the ore from a narrow enriched zone in the adit containing quartz, abundant pyrite, chalcopyrite, and minor sphalerite assayed 8.53 percent copper and 1.30 percent zinc. This is probably the source of the small amount of production reported by Diller (1914).

Recent mapping in the area by the writer revealed a few other indications of copper mineralization. A small amount of disseminated pyrite with minor copper stain was noted in metavolcanic rocks exposed in Copper Creek; some malachite and chalcopyrite were seen in a narrow mineralized shear zone exposed at the portal of the Emlly Gold mine caved adit (No. 58) about 150 yards northwest of Emlly Cabin; and small amounts of malachite (apparently deposited from copper-rich seepage water) which has replaced decaying vegetation at the surface were found a short distance south and west of the Peck mine. This malachite is probably derived from mineralization similar to that found near the mouth of Morrison Gulch just across Babyfoot Creek.

It should be pointed out that the character of the Rogue Formation host rocks and the copper mineralization in them appears to fit the pattern of volcanogenic deposits described in current literature. Further exploration with this in mind may be justified.

Gold

The total gold production for the area has been estimated at about $250,000. Most of the gold mining activity took place during the late 1800's with significant renewed activity during the depression years of the 1930's. Probably the largest production came at a time when the price of gold was $20.67 per ounce.

It is entirely possible that production estimations for placer operations, which centered mainly on the Little Chetco River, are too conservative. Since no detailed survey has been made of the placer areas and there has been insufficient sampling done to properly evaluate them, we have no adequate means of determining past production or future potential. Values reported by small placer operators and limited sampling show good gold values in gravels of the upper Little Chetco. Values at Emlly Cabin are reported to be in excess of $1.00 per cubic yard (with gold at $35 per ounce). The values at the mouth of Hawk Creek are reported to be slightly higher, and at Tuckers (Petersons) claims (No. 63) about half a mile above Hawk Creek, the values were reported by Forest Service mineral examiners in 1963 to be about $5.00 per cubic yard (also at $35 per ounce). With the 1973-1974 price of gold rising well above $100 per ounce, it appears a few small operations could be profitable even though the workable yardage is limited.

The bench gravels and active bar gravels along the Chetco River in the vicinity of Babyfoot and Slide Creeks and on downstream at Taggerts Bar and Chetco Bar represent larger deposits with slightly lower values. Preliminary samplings of these deposits by Forest Service mineral examiners in 1961 indicated average values of about $1.00 per cubic yard (at $35 per ounce).

The Tertiary gravels at Gold Basin were tested in 1875 and 1876 and, according to Diller (1914, p. 96), were found to contain very little gold. Some gold had apparently become concentrated as fine material at the surface, and the little mining that was done was in the headwaters of Tincup Creek (No. 2), where erosion of tributary streams headward had reworked some of the old gravels. The Mabelle Mining Company obtained patent to a 160-acre association placer claim on Gold Basin in 1897, but no further mining has been done. The property has recently been re-obtained by the Forest Service in trade for other land, but the mineral rights were reportedly retained by the former owners.

Gold mineralization occurs mainly in altered volcanic and sedimentary rocks of the Rogue Formation. Most of the mines and prospects are concentrated along or near sheared contacts of these rocks with serpentinites. A few are on or close to contacts with diorite or gabbro dikes. Quartz is normally, but not always, an associated gangue mineral. Talcy shear zones with disseminated pyrite also carry gold values. Scattered small quartz veinlets weathering out at the surface have enriched the soil with gold at the MC claims (No. 37) about a mile north of Canyon Peak. This type of mineralization may be the source of placer values in upper reaches of the Little Chetco River.

Brief summary descriptions of the lode gold mines and prospects in the area are summarized below.

BECCA AND MORNING (CASEY), No. 13

Location:	SE$\frac{1}{4}$ sec. 7, T. 38 S., R. 9 W., 3,300 feet elevation near the head of West Fork Rancherie Creek.
Development:	Three tunnels total more than 300 feet.
Geology:	Narrow northeast-trending gossan on serpentine-greenstone contact is a leached pyrite-bearing fault gouge zone which pans free gold at the surface. The sheared serpentinite shows some copper stains.
Production:	Discovered about 1910. A small home-made two-stamp mill was used during the 1930's. There was a small production each year for several years but records were not obtained.
References:	Diller, 1914, p. 64; Parks and Swartley, 1916, p. 52; Oregon Department of Geology and Mineral Industries, 1942, p. 123-124.

EMLLY MINE, No. 58

Location:	S$\frac{1}{2}$ sec. 10, T. 39 S., R. 10 W., about 2,350 feet elevation about 150 yards northwest of Emlly Cabin.
Development:	Open cut or glory hole about 60 feet long, 20 feet wide, and 10 feet deep; a short, caved adit lies about 150 feet southeast of the cut. The tunnel was connected to the cut by a raise.
Geology:	Workings are in a greenstone inclusion surrounded by serpentinite. The adit follows a northwest-trending vertical shear zone along the serpentinite contact. A limonite gossan is formed at the surface. Minerals recognized in the serpentinite shear include magnetite, chalcopyrite, some malachite with limonite and minor chalcocite. A 2-foot chip sample across this zone at the portal assayed 0.11 oz/ton gold, 0.10 oz/ton silver, and 0.3 percent copper.
Production:	The mine reportedly produced about $1,000 worth of gold by hand methods from high-grade oxidized ore during the 1880's.
Reference:	Perry Davis, oral communication, 1965.

FRAZIER MINE, No. 23

Location: E. edge, NW$\frac{1}{4}$ sec. 26, T. 38 S., R. 10 W., at about 2,800 feet elevation on the hillside east of Morrison Gulch.

Development: An 80-foot tunnel and seven cuts expose the vein for about 400 feet along the strike.

Geology: A 1- to 6-foot thick vein of fractured iron-stained quartz lies along the north-trending sheared contact of a narrow serpentinite zone in metavolcanics. The main ore mineral is arsenopyrite with some pyrite and free gold. A sample from the ore pile taken in 1969 assayed 0.36 oz/ton gold and 0.20 oz/ton silver.

Production: A $12,000 to $14,000 pocket was reportedly mined in 1935, and an additional $650 production is reported up to 1938.

Reference: Department mine file report, 1938.

GOLDEN DREAM (HIGGINS) MINE, No. 9

Location: NE$\frac{1}{4}$ sec. 14, SE$\frac{1}{4}$ sec. 11, and W$\frac{1}{2}$ sec. 12, T. 38 S., R. 10 W., near the head of Slide Creek, from 2,100 to 3,350 feet elevation.

Development: L-shaped, ground-sluiced open cut with 150- and 200-foot legs and three or four short adits at about 3,350 feet elevation. Other hydraulicked pits and a caved 100-foot tunnel which lie to the south in sections 11 and 14 were in the old Higgins group.

Geology: Sheared metasedimentary and metavolcanic rocks along serpentinite contacts contain numerous small quartz veinlets, some sulfide mineralization, and free gold in sheared talcose rock. Some diorite and gabbro dikes are nearby.

Production: Higgins set up a three-stamp mill on Slide Creek about 2,100 feet elevation. Rich eluvial material was reported sluiced at several sites in early 1900's, but production figures are not reported.

References: Diller, 1914, p. 65; Parks and Swartley, 1916, p. 120; Oregon Department of Geology and Mineral Industries, 1940, p. 59; Brooks & Ramp, 1968, p. 197.

GOLDEN EAGLE MINE, No. 24

Location: SW$\frac{1}{4}$ NE$\frac{1}{4}$ sec. 24, T. 38 S., R. 10 W., at about 3,100 feet elevation.

Development: One open cut 250 feet long, 50 feet wide, and 40 feet deep.

Geology: Gold occurs in a blanket mixture of crushed iron-stained vein quartz with clay and other rock fragments, 6 inches to 2$\frac{1}{2}$ feet thick, lying parallel to the hill slope, 6 to 30 feet deep, in landslide debris. Slide material is mixed sediments and volcanics of the Rogue Formation. The underlying bedrock is serpentinite and argillite.

Production: Located in 1935. Mined in a small way intermittently as a hydraulic placer operation, concentrating gold in a sluice box, and as an open-pit hand operation which recovered gold on an amalgam plate below a small scrubber. Total production to 1963 is probably about $1,000.

References: Department mine file report, 1963; Oregon Department of Geology and Mineral Industries, 1940,p. 59-60; Brooks and Ramp, 1968, p. 197.

HILLTOP GROUP (HAMAKER PROSPECTS) Nos. 35 and 38

Location: SW¼ sec. 31, T. 38 S., R. 9 W., and east edge sec. 36, T. 38 S., R. 10 W., from about 4,000 to 4,600 feet elevation.

Development: One small cut and inclined adit about 22 feet long at the base of a cliff in the E½ sec. 36, a shallow vertical shaft about 150 feet south of the ¼ corner of secs. 31 and 36, and one adit about 60 feet long and several shallow cuts in the SW¼ sec. 31.

Geology: The workings in sec. 36 lie along the contact of the serpentinite and metavolcanics with a thin zone of metasedimentary rock sandwiched between. A small cut above the inclined adit at the contact exposed small quartz veinlets in metasedimentary rock. Veins strike about N. 55° E. and dip 60° SE. A selected sample of this vein material (P-32132 taken in 1967) assayed 0.44 oz/ton gold and trace silver. Other openings in SW¼ sec. 31 expose mostly highly fractured greenstone (metabasalt) with small discontinuous quartz veinlets. Values are quite erratic. Gold can be panned from the soil at a number of spots in the area. Some rhodonite and manganese oxides occur in cuts above the 60-foot adit.

Production: There is no record or evidence of production.

References: Department mine file report, 1938; Appling, 1958, p. 25-27.

HUSTIS MINE (HUSTIS AND ANDERSON CLAIMS), No. 16

Location: Near the center of sec. 14, T. 38 S., R. 10 W., from about 2,400 to 2,600 feet elevation on the ridge between Slide and Miller Creeks.

Development: Workings include shallow placered pits on both sides of the ridge and at least two caved adits entering from the Miller Creek side of the saddle. Diller (1914) reports a 100-foot tunnel to the east in greenstone which reaches a serpentine contact. Placer ditches reach the ridge from both Slide and Miller Creeks.

Geology: Mineralization occurs in a north-striking, near-vertical shear zone injected by highly sheared talcy serpentinite exposed between fractured volcanic wacke to the west and a partly decomposed diorite dike intruding metavolcanics to the east. A few narrow malachite-stained gossan lenses indicate the presence of sulfides. Values were recovered as free gold in sluice boxes. A sample (P-31195) cut across a 1-foot by 8-foot lens of gossan in the main pit on the north side of the saddle assayed 0.42 oz/ton gold, 0.20 oz/ton silver and 0.50 percent copper.

History and production: Diller (1914) reports an old arrastre in ruins as evidence of mining activity several years earlier; probably in the late 1800's (see Figure 17). Production statistics are not available.

References: Diller, 1914, p. 65; Brooks and Ramp, 1968, p. 198.

MC PROSPECT, No. 37

Location: Near center sec. 1, T. 39 S., R. 10 W., between about 4,100 and 4,300 feet elevation on the southwest side of the ridge between the headwaters of Ditch Creek and Carter Creek.

Development: A few shallow cuts and trenches and a short adit.

Geology: A few narrow quartz veins and numerous small discontinuous veinlets occur in a belt of fractured and deformed metavolcanic and metasedimentary rocks including tuffs, tuffaceous sandstone, chert and argillite underlain by a sill-like body of serpentinite to the west. Some gold was recovered from near-surface debris and soil by panning. A 20-inch chip sample across the sheared serpentinite contact exposed in the short adit (XG-216) assayed 0.40 oz/ton gold.

History and gold production: Claims were located in 1958. Bulk sampling and mill testing have been done by two different companies in search of low grade ore bodies. Values appear to be spotty and sampling results were discouraging. Total production has probably been about 20 ounces to date.

References: Department mine file report, 1973; Lloyd Frizzell, oral communication, February 5, 1974.

MELANTERITE TUNNEL, No. 54 (see section on copper for description of Copper Creek area)

MILLER CREEK GOSSAN, No. 17

Location: W½ SW¼ sec. 13, T. 38 S., R. 10 W., from about 2,800 to 3,000 feet elevation.

Development: Shallow cuts on both sides of the creek. A placer ditch at one time diverted water from Miller Creek to the south from this point.

Geology: The country rocks are altered volcanics including tuffs and flows with lesser amounts of interbedded tuffaceous sediments. In the mineralized area, which from preliminary examination appears to be about 100 feet wide and 300 feet long, the rocks are somewhat brecciated, silicified and impregnated with pyrite. Mineralization varies in intensity from sparcely disseminated to compact granular masses of pyrite. A small body of serpentinite lies about 500 feet west of the old cuts. Surface samples indicate low gold, silver, and copper values (see Table 2). The apparent size of the area and extent of mineralization should justify further exploration and sampling with the hope of discovering an ore-body at depth or nearby.

Production: There has been no production.

Reference: Department mine file report, 1967.

PECK MINE (BACON), No. 21

Location: Near center sec. 23, T. 38 S., R. 10 W., at about 2,100 feet elevation and $\frac{1}{4}$ mile north of Babyfoot Creek.

Development: Shenon (1933, p. 52) mapped and described the workings in detail. A total of about 2,000 feet in 4 levels along with raises and stopes are mostly caved and inaccessible at present.

Geology: Ore occurs in an east-northeast-striking, steep south-dipping quartz fissure vein in greenstone. Average width of the vein structure where mined was about 30 inches. Veins in the greenstone are cut off at the sheared serpentinite contact. Ore minerals include arsenopyrite, pyrite, chalcopyrite, pyrrhotite, and gold. Veins are also offset by a north-striking high-angle fault exposed in the workings. Some of the ore mined was exceptionally rich.

History and production: The mine was located by I. F. Peck in 1919. A total of $79,140.10 was produced from a small, rich ore shoot in 1928 and 1929. Some early production by ground sluicing was undoubtedly accomplished after completion of the ditch from Miller Creek by Bacon prior to Peck's development of the vein (Diller, 1914, p. 65-66). The mine was worked intermittently to 1952 by W. D. Bowser who produced about $40,000. Total production to 1952 is estimated to be in excess of $120,000 worth of gold. Very little mining has been done since that time.

References: Diller, 1914, p. 65-66; Shenon, 1933, p. 51-55; and Department mine files.

ROBERT E. (MILLER) MINE, No. 19

Location: About $\frac{1}{2}$ mile directly north of the Peck mine at the north edge sec. 23 and south edge sec. 14, T. 38 S., R. 10 W., on the south side of Miller Creek at about 2,300 feet elevation.

Development: There is about 250 feet of tunnel in one adit,and an old ground-sluiced pit about 100 by 200 feet is situated up the hillside from the adit.

Geology: The workings are on the faulted contact of serpentinite with altered chloritic metavolcanic rocks. At this point the contact strikes about N. 60° W. and dips near vertical. Values occur in the sheared contact zone and in small quartz veins containing some calcite with disseminated sulfides including arsenopyrite, pyrrhotite, and chalcopyrite. Assays in excess of 1 oz/ton gold are not uncommon.

Production: Some of the ore from this mine may have been milled at and credited to the Peck mine. Records of placer production and production from the adit are not available and very little information has been obtained on the history of this mine.

Reference: Diller, 1914, p. 65; visited by the writer in July 1966.

STUMBLE PROSPECT, No. 36

Location: N. edge sec. 2, T. 39 S., R. 10 W., at about 3,200 feet elevation, about $\frac{1}{2}$ mile south of Carter Creek. The claim extends into section 35.

Development: Two short adits: one 40 feet long with stope, the other, now caved, may have been 15 or 20 feet long; several shallow cuts.

Geology:	Thin, coarse-crystalline to vuggy and tapering multiple quartz veinlets in a zone 2½ to 4½ feet thick strike N. 43° W. and dip 60° SW. Veinlets penetrate fine-grained to medium, coarse-grained, thin-bedded, indurated tuffaceous sediments. Ore minerals include gold, chalcopyrite, pyrite, and arsenopyrite. Gold assays range from about half an ounce to nearly 8 ounces per ton.
Production:	A small amount of high grade has been mined, but no production records or history are available.
References:	Wells and others (1949, No. 109); Department mine file report, 1962; unpublished U. S. Forest Service mineral examination report, 1964; Brooks and Ramp, 1968, p. 199.

YOUNG MINE, No. 33

Location:	Near ¼ corner N. edge sec. 35, T. 38 S., R. 10 W., about 4,200 feet elevation.
Development:	Open cut in steep, rocky face is about 20 by 30 by 15 feet in size.
Geology:	Country rocks are layered silicified tuffaceous sandstone and shale which strike north and dip 50° E. Several quartz veinlets occur in the metasediments. A 6-inch fissure, with breccia and crystalline quartz, which strikes west and dips 65° S. is exposed in the face of the cut. Values were reported to occur in a pocket. No details given.
Production:	A $1,000 pocket was reportedly recovered by R. D. Young in 1937.
References:	Oregon Department of Geology & Mineral Inudstries, 1940, p. 62; Brooks and Ramp, 1968, p. 199.

Iron

Magnetite is a common mineral in the gabbros, pyroxenites, and the coarse-grained hornblendic metapyroxenites. In a few areas, magnetite is sufficiently abundant to attract the interest of prospectors.

A group of claims called the Tincup Iron Group (No. 1) was located in the area between Tincup Peak and Gold Basin about 1957. Coarse-grained and granular aggregates of magnetite up to 3/4 inch in diameter are disseminated in pyroxenite and in part of the gabbro. Preliminary sampling and mapping indicated a large low-grade deposit in this area containing from about 15 to 25 percent magnetite by weight, which when concentrated magnetically assays about 60 percent Fe, 1.4 percent TiO_2, trace Ni, and 0.18 percent Cr_2O_3.

Outcroppings of similar magnetite-rich rock occur on the ridge (No. 45) in sec. 31, T. 38 S., R.10 W. (Figure 22); on the east slope of Mount Billingslea; as float in the west tributary of Box Canyon Creek in sec. 35, T. 38 S., R. 11 W.; and in bench gravels along the Chetco for a short distance upstream from the mouth of the Little Chetco. Some of the gabbros of Granite Butte in the northern part of the area also appear to have interesting amounts of disseminated magnetite. Further investigation of the iron potential in the area may be justified.

Manganese

Small deposits of manganese occur in cherts of the Dothan Formation and the Rogue Formation, where the oxides have been enriched by surface weathering. There is also a small deposit of rhodonite near Chetco Lake (No. 65) in the amphibole gneiss and schist. Only two manganese occurrences in the area have been previously reported. These are the Long Ridge prospect (No. 49) and the Hamaker prospect (No. 38). The more important of the two is the Long Ridge prospect located about $1\frac{1}{2}$ miles north-northeast of the former Long Ridge lookout station at the west edge of the map area. During the mapping work, three other occurrences were noted (Nos. 48, 65, and 69).

LONG RIDGE PROSPECT, No. 49

Location: SE$\frac{1}{4}$ NW$\frac{1}{4}$ sec. 13, T. 38 S., R. 12 W., at about 1,400 feet elevation.

Development: A $1\frac{1}{2}$-mile unimproved road leads to the deposit from the Quail Prairie lookout road. There is about 1,000 feet of trenching in the area of surface float.

Geology: Manganese oxides occur on fracture surfaces and as pods in chert lenses in graywacke sandstone of the Dothan Formation. Manganese oxide pods weighing from a few pounds to 6 tons are erratically distributed through the chert lenses. A sample taken from a 30-ton stockpile by Appling (1958, p. 11) assayed 52.5 percent manganese and 1.3 percent iron.

Production: The property was being developed in 1941 and about 50 tons of ore were reportedly shipped during World War II.

References: Department mine file report, 1941; Appling, 1958, p. 11-12.

HAMAKER PROSPECT (same as Hilltop group, gold) No. 38

Location: SW$\frac{1}{4}$ sec. 31, T. 38 S., R. 9 W., just above (south) of the Little Chetco access road at about 4,600 feet elevation.

Development: One adit about 60 feet long (used for water) and a few shallow surface cuts.

Geology: Small lenses of chert and rhodonite occur in fine-grained siliceous sediments interbedded with volcanic rocks of the Rogue Formation. Appling (1958, p. 25-26) states:

> "Rhodonite and intermixed quartz, with disseminated pyrite occur in the metasediments as five small, irregular pods, the largest of which was estimated to weigh approximately three-fourths of a ton. Most of the pods are fractured and oxides of manganese coat the fracture surfaces. A grab sample from one of the pits assayed 23 percent Mn."

Production: None

Reference: Appling, 1958, p. 25-27

CHETCO LAKE RHODONITE, No. 65

Location: About $\frac{1}{4}$ mile south of Chetco Lake and 100 yards northwest of the saddle at about 4,080 feet elevation in what may be W$\frac{1}{2}$ sec. 25, T. 39 S., R. 11 W. (unsurveyed)

Development: Small discovery pit only.

Geology: A 30-inch lens of rhodonite and rhodochrosite with some associated manganese oxides occurs in quartzite within amphibole gneiss. Banding in the quartzite and gneiss at the pit strikes about N. 35° E. and dips 35° W. About 100 feet southeast of this point, banding strikes N. 30° E. and dips 25° SE.(variable).

Production: A number of specimens have been removed for ornamental and lapidary rock.

OTHER MANGANESE OCCURRENCES, Nos. 48 and 69

An occurrence of manganese was noted in the form of large float boulders of dark-brown to black manganese oxide-stained ferruginous chert in the west fork of the Mislatnah Creek just above the junction of Craggie Creek in the N. $\frac{1}{2}$ sec. 2, T. 38 S., R. 12 W. No analyses were made of this rock but it is believed to be similar in origin to the Long Ridge deposit.

A small prospect pit was noted on the ridge east of Hawks Rest, near the north edge of the NE$\frac{1}{4}$ sec. 22, T. 39 S., R. 10 W., at about 3,680 feet elevation. Pieces of magnetite with manganese oxide apparently came from a small lens about 1 foot thick in banded metavolcanics which strike about N. 75° W. and dip nearly vertically. No assays were obtained.

Mercury

There are no known quicksilver deposits in the area, but cinnabar can be panned from stream sediments in a few places and has shown up in the geochemical stream-sediment sampling. During mapping, cinnabar was panned from Miller, Slide, Carter, and Babyfoot Creeks. A high mercury anomaly was obtained in a stream-sediment sample (No. 54, Appendix A) from the tributary of Babyfoot Creek near the north edge of the NE$\frac{1}{4}$ sec. 31, T. 38 S., R. 9 W. A minor amount of cinnabar can also be panned at various places on the Little Chetco River.

Nickel

Nickel normally occurs in ultramafic rocks (peridotite and serpentinite) in the range from 0.1 to 0.3 percent. Weathering processes tend to concentrate nickel as a residual oxide and secondary silicate in lateritic soils and saprolites developed over peridotites. These laterites often contain about 1 percent of nickel. Areas of gentle topography such as flat-topped ridges and benches, including landslide areas, are considered favorable sites to prospect for nickel.

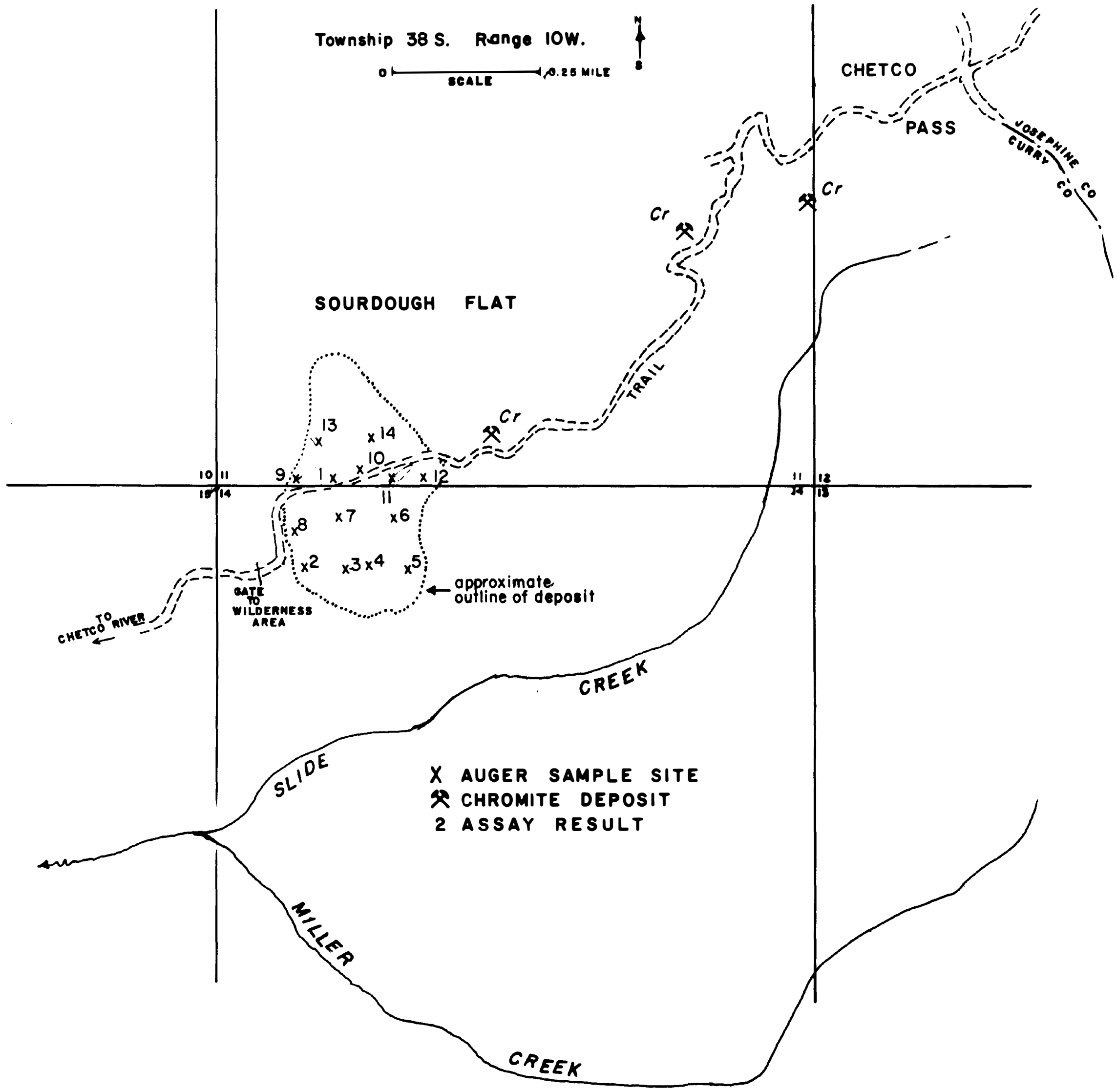
Red lateritic soils have been noted in four areas: a landslide area in the southwestern part of Sourdough Flat, small patches on the ridge between Little Chetco and the main Chetco Rivers, to the southeast in the vicinity of Doe Gap, and small areas in sections 24 and 25, T. 39 S., R. 10 W., just south of Square Lake. A few other areas in the large peridotite mass southwest of the Chetco River also appear to have some soil cover and may be worthy of further investigation.

Exploration work done during the course of this study by the writer and assistants has consisted of shallow hand auger sampling that in a few spots reached a maximum depth of 10 feet (Figure 23). Augering of the red soil areas (No. 67) on the hillside and ridge northeast of the Chetco River from about 1 mile to 2 miles north of the mouth of Broken Cot Creek produced samples from a depth of 2 to 4 feet which assayed from 0.30 to 0.73 percent nickel. Shallow samples taken on the slopes about 3,000 feet N. 55° E. of Doe Gap assayed from 0.50 to 0.99 percent nickel.

The landslide area in the southwestern portion of Sourdough Flat, in sections 11 and 14, T. 38 S., R. 10 W. (see sketch map, Figure 24) apparently contains a higher nickel concentration than the other areas. Auger samples taken at 14 sites over the slide area are listed on the map (Figure 24). The area, which is about 1,200 feet wide and 2,000 feet long, occupies about 40 acres. Depth of the soil and saprolite development has not been accurately determined, but for most of the area it appears to be quite shallow and rocky. Only two of the sample sites augered reached to 10 feet without encountering rocks. An estimated maximum depth of 100 feet and an average depth of 10 feet of soil and saprolite development may be a reasonable potential for this deposit. The parent rock involved in the slide is mostly a peculiar coarse-grained dunite having olivine crystals, some as large as 2 inches in diameter and possibly averaging 1 inch in diameter. The olivine is characteristically highly fractured and also displays good cleavage. Two analyses of the unweathered coarse-grained dunite show a nickel content of 0.22 and 0.313 percent.

The geochemical stream-sediment sampling project (Appendix A) indicated six sites in the area with anomalous nickel content in the range of 3,000 to 5,000 parts per million. These sites include Madstone Creek (No. 96); two sites on the branch of Box Canyon Creek which drains the Vulcan Lake moraine area (Nos. 64 and 65); a site near the head of the main Chetco (No. 99) in the NE¼ sec. 28, T. 39 S., R. 10 W.; Broken Cot Creek (No. 98); and the stream between Broken Cot and Madstone Creek (No. 97). The anomalous samples from Box Canyon Creek may be evidence of nickel concentration in the extensive glacial moraine deposited northeast of Vulcan Lake. Preliminary investigation of anomalous nickel in similar stream-sediment samples from Josephine Creek by the U. S. Bureau of Mines (ORE BIN, 1970) failed to isolate concentratable nickel minerals but showed that further investigation may be justified.

Figure 23. Auger sampling nickel-bearing lateritic soil on ridge northwest of Hawks Rest (no. 67).



ASSAY RESULTS

No.	Depth	%Ni	%Co
1.	0-3'	1.14	0.19
2.	0-5'	0.88	--
3a.	0-5'	0.83	--
3b.	5-10'	1.18	0.14
4.	0-44"	1.15	--
5.	0-40"	1.27	--
6.	0-2'	1.30	--
7.	0-18"	0.96	--
8.	0-32"	1.16	--
9.	0-3'	1.14	--
10.	0-3'	1.05	--
11.	0-18"	1.05	--
12.	0-18"	0.89	--
13a.	0-5'	0.78	--
13b.	5-10'	0.86	0.26
14.	0-4'	0.48	--

Figure 24. Map of landslide area on Sourdough Flat showing distribution of auger sampling and assay results of tests for nickel.

Platinum

Platinum-group metals occur in minor amounts with gold in the placers of the Upper Chetco drainage. Reports do not indicate the percentage ratio, but it is most certainly very small. Some private prospecting and testing of gravels on the Chetco and Little Chetco Rivers during recent years have shown the presence of platinum metals, but no thorough sampling program has been conducted.

Assays of panned concentrates from small placer operation on the Chetco River about half a mile upstream from the mouth of the Little Chetco showed 1.8 ± 0.2 ppm platinum and less than 0.001 ppm palladium. The combined platinum-palladium assay of this sample showed 0.05 oz/ton. A magnetic concentrate from the panned sluice box concentrate assayed 0.28 ppm platinum and 0.001 ppm palladium; it assayed 0.006 oz/ton combined platinum-palladium.

It is probable that other platinum-group metals occur in the area. Wells and others (1949, p. 21) state:

> "Precise analytical data for these metals in the 'platinum' from southeastern Oregon are scanty but apparently it runs about 30 percent platinum, 32 percent iridium, 25 percent osmium, 13 percent ruthenium, and little or no rhodium or palladium."

Further investigation of the occurrence of platinum in the area appears to be justified.

INDUSTRIAL MINERALS

There are minor occurrences of chrysotile asbestos in serpentinites in the area, but none have been seen that are of sufficient quality or quantity to constitute a valuable prospect.

Potentially large reserves of fresh olivine suitable for the manufacture of refractory brick, foundry sand, and other possible uses (Wagner and Ramp, 1969, p. 192) are present in the vicinity of Pearsoll Peak and Sourdough Flat. The olivine occurs in very coarse-grained, fresh dunite. Although not mapped in detail, the dunite exposures are on the southwest flanks of Pearsoll Peak in sections 2 and 3, near Prospectors Dream chromite occurrence at the west edge of sec. 11, and on Sourdough Flat in the SW$\frac{1}{4}$ sec. 11 and NW$\frac{1}{4}$ sec. 14, T. 38 S., R. 10 W.

Optics and X-ray diffraction analyses of the dunite indicate a forsterite content greater than 80 percent (R.A. Loney, U. S. G. S., written communication, 1971).

No other industrial mineral resources are known in the map area.

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APPENDIX A

GEOCHEMICAL RESULTS OF STREAM-SEDIMENT SAMPLES[1]

Map No.	Lab No.	Mn	Ba	Co	Cu	Ni	Pb	Hg*	Sr	V	Zn**	Zr
1.	AIF -718	1,000	500	20	100	100	30	0.1	100	300	50	200
2.	AIF -719	1,500	700	20	150	100	30	0.1	150	300	T	150
3.	AIF -720	700	500	20	50	100	20	0.1	100	300	50	150
4.	AIG-827	700	300	15	70	70	10	0.1	200	150	80	100
5.	AIG-828	1,000	50	50	70	100	N	0.1	200	500	75	15
6.	AIG-829	1,000	20	30	70	70	N	0.1	150	300	80	L
7.	AIG-830	1,000	L	30	70	300	N	N	100	200	80	N
8.	AIG-831	1,000	30	20	100	20	N	N	300	300	80	20
9.	AIG-832	1,500	70	30	70	20	N	N	200	500	80	15
10.	AIG-833	1,500	50	30	100	100	N	N	200	500	90	15
11.	AIF -728	700	500	30	70	150	30	0.1	100	300	50	200
12.	AIF -727	700	500	20	100	100	30	0.15	150	300	50	200
13.	AIF -726	700	500	20	70	100	20	0.1	100	300	50	150
14.	AIF -725	700	700	20	150	70	50	0.15	100	300	50	200
15.	AIF -724	700	700	20	70	100	20	0.1	100	300	100	150
16.	AIF -717	700	1,000	20	100	100	30	0.2	150	300	90	200
17.	AIF -716	700	700	20	50	100	30	0.3	100	300	95	200
18.	AIF -723	700	700	15	70	70	30	0.15	100	300	100	150
19.	AIF -722	1,000	500	15	50	100	20	T	100	200	50	300
20.	AIF -721	1,000	700	50	100	300	20	T	150	300	50	150
21.	AIG-824	1,000	700	10	70	70	30	0.1	200	200	100	200
22.	AIG-823	700	500	7	50	50	L	0.1	150	150	N	200
23.	AIG-822	700	500	7	50	50	20	T	150	150	N	150
24.	AIG-821	700	300	20	70	50	10	T	200	200	50	100
25.	AIG-820	700	500	15	50	70	20	T	100	200	50	200
26.	AIG-819	700	500	10	50	70	20	T	150	200	50	200
27.	AIG-818	700	70	50	70	200	N	N	100	500	N	70
28.	AIG-837	1,000	300	20	50	70	10	0.1	200	300	80	70
29.	AIG-838	1,000	N	50	70	300	N	0.1	100	500	80	70
30.	AIG-817	1,500	50	50	150	100	N	0.1	200	500	N	15

APPENDIX A, continued

GEOCHEMICAL RESULTS OF STREAM-SEDIMENT SAMPLES[1]

Map No.	Lab No.	Mn	Ba	Co	Cu	Ni	Pb	Hg*	Sr	V	Zn**	Zr
31.	AIG-840	1,000	20	30	70	100	N	0.1	150	300	N	10
32.	AIG-816	1,000	50	20	100	70	N	T	200	300	N	30
33.	AIG-835	1,500	50	30	100	100	N	0.1	200	500	70	20
34.	AIG-834	700	20	70	30	1,000	N	0.1	N	200	70	N
35.	AIG-836	1,500	N	30	70	150	N	0.1	N	300	80	N
36.	AIG-815	700	50	30	50	700	N	T	L	300	N	L
37.	AIG-814	700	50	30	50	700	N	T	N	200	N	L
38.	AIG-825	700	70	50	50	700	N	0.1	N	150	85	20
39.	AIG-826	700	70	50	50	700	N	0.2	L	150	80	15
40.	AIG-813	700	150	15	70	300	L	0.15	L	200	N	30
41.	AIF -646	1,500	150	50	150	300	N	0.1	100	500	50	100
42.	AIF -645	1,500	150	50	150	100	N	0.1	200	1,000	T	100
43.	AIF -707	1,000	70	100	30	1,500	50	0.1	L	200	60	20
44.	AIF -643	1,000	100	100	100	1,000	N	0.15	L	500	50	30
45.	AIF -644	1,000	150	150	70	1,000	N	0.2	100	700	50	100
46.	AIF -667	1,000	200	50	100	300	10	N	300	300	90	50
47.	AIF -668	1,000	200	50	100	500	10	0.1	300	300	80	50
48.	AIF -669	1,500	300	30	200	70	10	0.5	300	500	85	70
49.	AIF -670	1,000	70	100	30	1,500	N	0.5	L	300	80	20
50.	AIF -672	1,000	150	100	100	700	N	1.0	150	300	90	100
51.	AIF -671	1,000	70	150	30	1,500	N	0.1	L	300	85	30
52.	AIF -623	1,500	100	50	150	300	N	1.25	150	500	50	100
53.	AIF -622	2,000	70	20	150	50	10	4.5	L	300	50	50
54.	AIF -621	1,500	150	100	150	300	N	20.+	200	500	100	150
55.	AIG-566	700	500	10	70	50	20	N	L	200	80	150
56.	AIG-622	1,000	700	20	70	70	30	T	100	200	70	150
57.	AIG-621	700	700	10	50	30	20	T	200	150	20	150
58.	AIG-620	1,000	700	15	70	50	15	0.1	L	200	20	150
59.	AIG-619	1,000	700	30	70	100	15	T	100	500	40	100
60.	AIG-618	1,000	700	30	100	70	15	T	200	300	35	100
61.	AIG-616	1,000	500	20	70	100	20	T	100	200	70	150

APPENDIX A, continued

GEOCHEMICAL RESULTS OF STREAM-SEDIMENT SAMPLES[1]

Map No.	Lab No.	Mn	Ba	Co	Cu	Ni	Pb	Hg*	Sr	V	Zn**	Zr
62.	AIG-617	1,000	500	20	70	50	20	0.6	L	200	150	150
63.	AIG-615	700	500	7	70	30	20	T	L	150	150	100
64.	AIF-699	1,000	N	150	20	5,000	N	N	N	150	N	N
65.	AIF-700	1,000	30	150	30	3,000	N	N	N	200	35	10
66.	AIF-701	1,000	50	100	30	500	N	N	100	300	N	200
67.	AIF-702	1,500	50	100	150	200	N	N	200	700	60	20
68.	AIF-703	1,500	100	50	150	300	N	N	200	500	60	150
69.	AIF-704	1,000	20	100	100	300	N	N	100	500	70	20
70.	AIF-705	1,500	50	150	100	300	N	N	100	500	60	20
71.	AIF-706	1,000	20	100	30	300	N	N	L	500	70	10
72.	AIF-692	1,500	200	70	150	500	N	N	30	500	30	50
73.	AIF-693	1,500	70	100	100	300	N	N	50	500	35	50
74.	AIF-694	1,500	200	100	100	700	N	0.1	30	300	75	70
75.	AIF-695	1,000	150	100	100	700	N	N	30	300	30	50
76.	AIF-698	1,000	200	100	70	1,000	N	N	200	300	70	70
77.	AIF-697	1,000	70	150	30	1,500	N	N	100	300	60	200
78.	AIF-642	1,500	150	100	700	1,500	20	0.3	L	300	200	20
79.	AIF-624	1,000	100	100	30	1,000	N	0.75	100	300	50	30
80.	AIF-641	1,500	100	50	100	700	10	0.2	100	200	100	30
81.	AIF-628	1,000	70	100	30	1,500	N	T	L	300	50	30
82.	AIF-626	1,000	70	150	30	1,500	N	T	100	200	50	30
83.	AIF-627	1,000	20	150	30	2,000	N	0.1	N	150	50	10
84.	AIF-640	1,500	100	100	150	1,500	N	0.15	100	300	50	30
85.	AIF-629	1,000	70	150	30	2,000	N	0.15	N	300	100	30
86.	AIF-630	1,500	150	70	50	700	L	0.15	150	300	50	70
87.	AIF-631	1,500	150	100	100	700	N	T	150	500	50	100
88.	AIF-632	1,000	100	150	50	1,000	N	0.1	100	500	50	70
89.	AIF-633	1,500	200	100	70	700	N	0.1	200	300	50	100
90.	AIF-634	1,500	200	100	150	500	N	0.1	200	700	50	100
91.	AIF-635	1,500	300	100	150	300	N	T	300	500	50	150
92.	AIF-639	1,000	100	100	50	1,500	N	T	100	200	50	30

APPENDIX A, continued

GEOCHEMICAL RESULTS OF STREAM-SEDIMENT SAMPLES[1]

Map No.	Lab No.	Mn	Ba	Co	Cu	Ni	Pb	Hg*	Sr	V	Zn**	Zr
93.	AIF -636	1,000	150	100	70	700	N	T	100	300	50	70
94.	AIF -638	1,000	150	100	50	1,500	N	0.1	150	300	50	70
95.	AIF -637	1,500	100	150	70	2,000	N	0.1	150	500	50	50
96.	AIF -691	700	N	150	15	3,000	N	N	N	200	70	N
97.	AIF -650	1,000	N	150	20	3,000	N	0.1	N	300	N	N
98.	AIF -649	700	20	150	30	3,000	N	T	N	200	T	10
99.	AIF -648	700	20	150	50	3,000	N	0.15	N	300	50	10
100.	AIF -647	1,000	50	150	20	2,000	N	T	L	200	50	10

[1] Results from semi-quantitative spectrographic analyses by U.S. Geological Survey, 1969, except for Hg and Zn values
* LeMaire Mercury Detector, R. G. Bowen, analyst
** Rapid semi-quantitative wet chemical, R. G. Bowen, analyst
L Detected, but below limit of determination or below value shown
N Not detected at limit of detection, or at value shown
T Trace

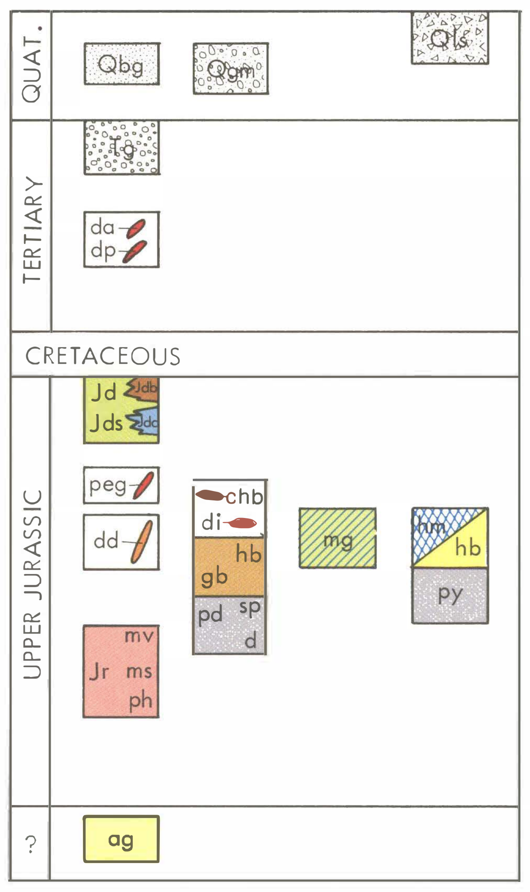
APPENDIX B. THIN SECTIONS OF ROCKS FROM THE UPPER CHETCO AREA

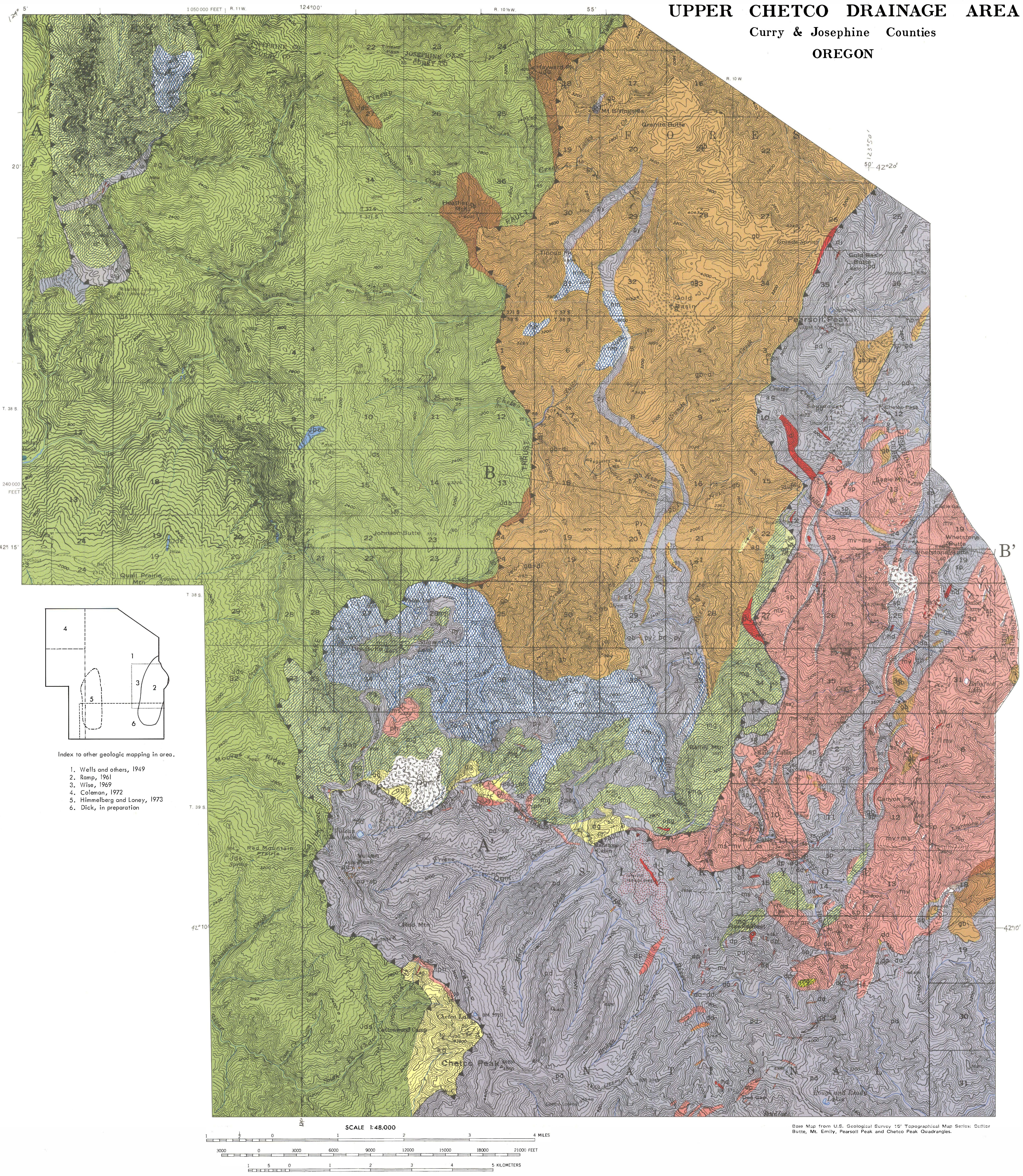
Map No.	Location sec.	T.(S)	R.(W)	Rock type
1.	22	38	10	Amphibole gneiss (possibly metagabbro)
2.	22	38	10	Metagabbro (epidiorite)
3.	22	38	10	Metagabbro (epidiorite)
4.	15-22	38	10	Gabbro
5.	18	38	10	Hornblende gabbro
6.	15-16	38	10	Gabbro
7.	16	38	10	Clinopyroxenite
8.	16	38	10	Clinopyroxenite
9.	15	38	10	Gabbro
10.	17	38	10	Two pyroxene gabbro
11.	2	38	10	Gneissic granodiorite dike "granulite"?
12.	27	37	10	Gabbro
13.	8	39	10	Clinopyroxenite gneissic
14.	34	38	11	Gabbro
15.	26	37	10	Quartz diorite (altered from gabbro?)
16.	17	37	10	Gabbro
17.	21	37	10	Two pyroxene, gabbro
18.	3	38	10	Gabbro - diorite
19.	33	38	10	Basalt or micro-gabbro dike
20.	1	39	11	Gneissic metagabbro
21.	1	39	11	Gneissic metagabbro
22.	27	38	10	Cataclastic quartz diorite (metagabbro?)
23.	27	38	10	Cataclastic quartz diorite (metagabbro?)
24.	9	38	11	Gneiss (cataclastic)
25.	3	38	11	Gabbro (altered)
26.	7	38	10	Gneiss (saussuritized)
27.	32	38	10	Coarse hornblendic metagabbro or metapyroxenite
28.	22	38	10	Gneissic diorite
29.	22	38	10	Diorite (altered)
30.	32	37	10	Gabbro at Gold Basin
31.	12	38	10	Andesite
32.	1	38	10	Phyllonite
33.	12	39	11	Phyllonite
34.	16-21	38	10	Pyroxenite
35.	14	38	10	Coarse dunite
36.	27	38	11	Gabbro - Dry Butte
37.	14	39	10	Andesite (dolerite) dike
38.	33	38	10	Gneiss (metagabbro)
39.	33	38	10	Meta-olivine gabbro
40.	33	38	10	Hornblende gabbro
41.	30	38	10	Anorthosite dike in gabbro
42.	26(?)	39	11	Gneissic amphibolite
43.	5	39	10	Pegmatitic hornblende gabbro dike
44.	14	38	10	Diorite
45.	23(?)	39	11	Pegmatite dike
46.	23	39	10	Dacite dike
47.	1	39	10	Gabbro dike

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
R. E. CORCORAN, STATE GEOLOGIST

GEOLOGIC MAP of the UPPER CHETCO DRAINAGE AREA
Curry & Josephine Counties OREGON

Stratigraphic Time Chart





Base Map from U.S. Geological Survey 15' Topographical Map Series: Collier Butte, Mt. Emily, Pearsoll Peak and Chetco Peak Quadrangles.

Index to other geologic mapping in area.

1. Wells and others, 1949
2. Ramp, 1961
3. Wise, 1969
4. Coleman, 1972
5. Himmelberg and Loney, 1973
6. Dick, in preparation

EXPLANATION

Qls — *Landslide debris.*

Qbg — *Bench gravels. Poorly sorted gravel and sand on benches as much as 80 feet above the present streams.*

Qgm — *Glacial moraine. Mostly peridotite debris partially cemented with serpentinite matrix.*

Tg — *Old stream gravel and sand deposits of Gold Basin. Although partly decomposed, the gravels are firmly cemented.*

da- dp- — *Dacitic dikes (da) including dacite porphyry (dp). Light-colored, fine-grained rock, frequently with feldspar phenocrysts.*

Jdb Jd Jdc Jds — *Dothan Formation (Jd). Graywacke sandstone, dark siltstone, shale, and minor conglomerate (Jds); pillow basalt (Jdb); and chert (Jdc).*

peg — *Pegmatite. Small dikes and lenticular bodies of light-colored rock containing quartz, plagioclase, orthoclase, and muscovite.*

hd di — *Diorite (di) including hornblende diorite (hd) and quartz diorite (qd) occuring as dikes and more siliceous zones in the Chetco River gabbro complex.*

dd — *Diabase and related dikes. Dark-colored, fine- to medium-grained rocks, some with diabasic texture, forming small dikes in and near ultramafic rocks.*

gb-di gb hb — *Gabbro and related rocks including two-pyroxene gabbro (gb), hornblende gabbro grading into hornblendite (hb), and gabbro-diorite (gb-di).*

mg — *Metagabbro. Generally gneissic, medium-grained rock with hornblende replacing pyroxenes; often with cataclastic texture and saussuritized feldspar. Grades into relatively unaltered gabbro.*

chb hb hm — *Coarse- to very coarse-grained hornblendic meta-pyroxenite apparently formed by metasomatic alteration of pyroxenite by injection of diorite or gabbro dike swarms (hm). Includes some relatively pure, very coarse-grained hornblende rock (chb).*

py — *Pyroxenite. Medium- to coarse-grained rock composed mostly of clinopyroxenes, often displaying gneissic banding, usually in contact with gabbro, and apparently altered from periodotite.*

pd sp d — *Ultraafic rocks including mostly serpentinite (sp), harzburgite with minor lherzolite (pd), and dunite (d).*

Jr mv ms ph — *Rogue Formation (Jr) includes fine-grained tuffs, tuff breccias, agglomerates, and flows (mv); tuffaceous siltstones and sandstones with occasional layers of grit showing graded bedding (ms); and phylonites in zones of more intense tectonism (ph).*

ag — *Amphibole gneiss and schist including amphibolite, quartz-rich hornblende gneiss, amphibole schist and a few thin zones of impure mataquartzite; derived from sedimentary rocks, volcanics, and gabbros; age uncertain.*

GEOLOGIC SYMBOLS

Faults

Fault, showing dip (dashed where approximately located, dotted where concealed)

Thrust fault, barbs on side of upper plate (dashed where approximately located, dotted where concealed)

Contacts

Contact (dashed where approximately located, dotted where concealed)

Folds

Anticline (dashed where approximately located)

Syncline (dashed where approximately located)

Bedding

Strike and dip of beds

Strike and dip of overturned beds

Strike of vertical beds

Horizontal beds

Foliation

Strike and dip of foliation

Strike of vertical foliation

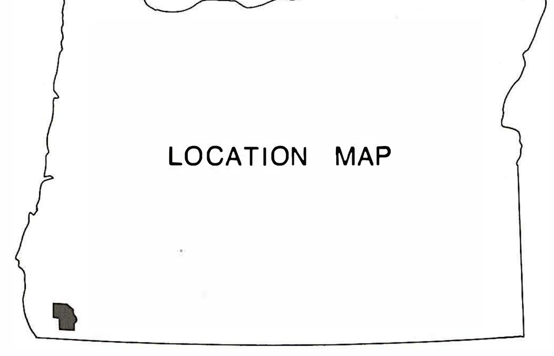
Horizontal foliation

Joints

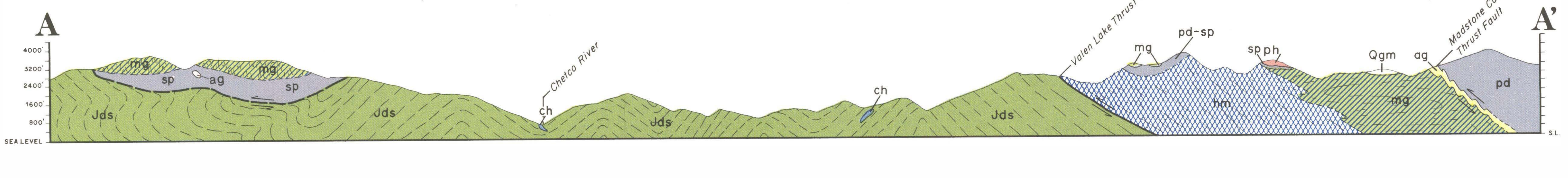
Strike and dip of parallel joints

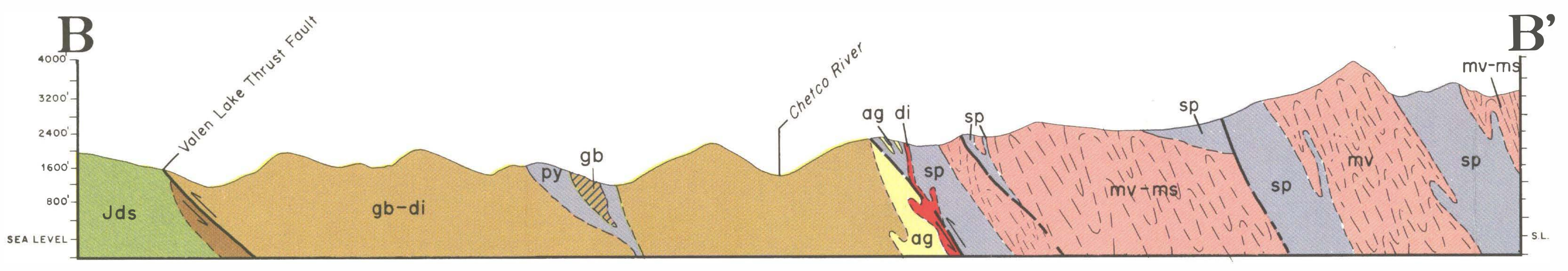
Mine and Mineral Symbols

(See Mineral Deposits Map)



Geologic Cross Sections

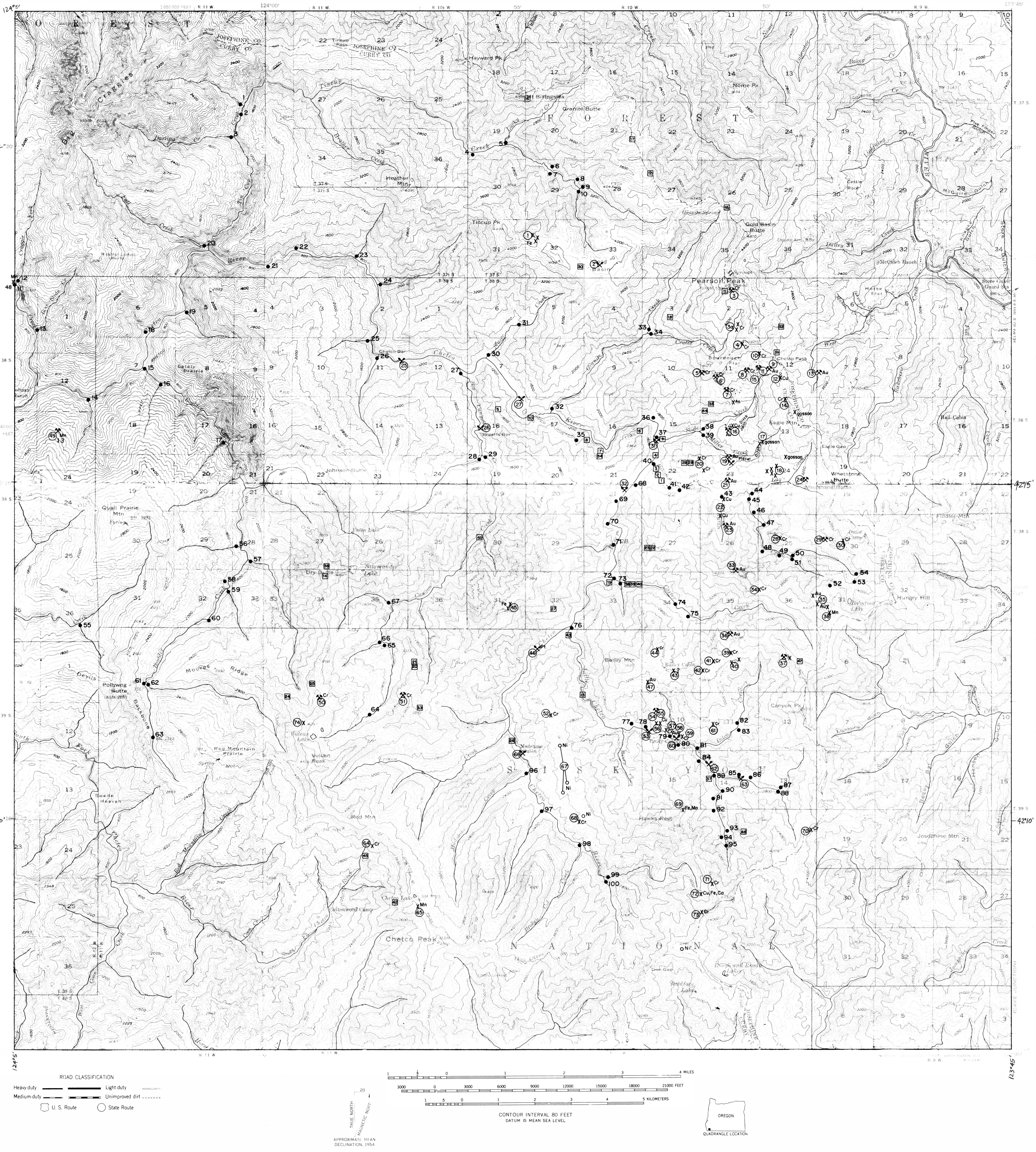




Geology by Len Ramp

Cartography by S. R. Renoud 1974

Mineral Deposits Map of the Upper Chetco Drainage Area Curry & Josephine Counties, Oregon



LEGEND

Map No.	Mine or Prospect Name	Metals or Minerals	Location ¼	Sec.	T(S)	R(W)
1.	Tincup group	Fe		32	37	10
2.	Gold Basin placers	Au		33	37	10
3.	Pearsoll mine	Cr		2	38	10
4.	Eagles Nest	Cr	NE	11	38	10
5.	Prospectors Dream	Cr	W	11	38	10
6.	Little Siberia	Cr	SW	11	38	10
7.	Wonder Group	Cr	S	11	38	10
8.	Uncle Sam	Cr	E½	11	38	10
9.	Golden Dream (Higgins) (Empire)	Au	W½	12	38	10
10.	Sourdough No. 1	Cr		11-12	38	10
11.	Sourdough No. 2 (McCaleb mine)	Cr	E	11	38	10
12.	Stone prospect	Cu	SW	12	38	10
13.	Becca and Morning (Casey)	Au	W	7	38	9
14.	Eagle Mountain prospect	Cr	N	13	38	10
15.	Lost is Found	Cr	SE	11	38	10
16.	Hustis mine	Au-Cu		14	38	10
17.	Miller Creek Gossan	Au-Cu	W/SW	13	38	10
18.	Eagle Creek group	Cu	NW	24	38	10
19.	Robert E.	Au	N	23	38	10
20.	Bowser	Cr	N	22-23	38	10
21.	Peck mine	Au		23	38	10
22.	Morrison Gulch prospects	Cu		23-26	38	10
23.	Frazier mine	Au	NW	26	38	10
24.	Golden Eagle	Au	NE	24	38	10
25.	Red Ore (Chetco Bar) placer	Au	NE	11	38	11
26.	Box Canyon placer	Au	W½	18	38	10
27.	Taggarts Bar placer	Au		7-17-18	38	10
28.	Sugarloaf prospect	Cr	NW	25	38	10
29	Babyfoot mine	Cr	W½	30	38	9
30.	Lucky Day prospect	Cr		30	38	9
31.	Slide Creek (Brown) placer	Au	SW	15	38	10
32.	No Name placer	Au		21	38	10
33.	Young mine	Au		26-35	38	10
34.	No Name prospect (c)	Cr	NW	36	38	10
35.	Hilltop group (Hamaker)	Au		31-36	38	9-10
36.	Stumble mine	Au	N	2	39	10
37.	MC mine	Au		1	39	10
38.	Hilltop (Hamaker) prospect	Au-Mn	SW	31	38	9
39.	Carter Creek Divide	Cr	N½	2	39	10
40.	Burned Cabin	Cr		2	39	10
41.	Little Boy claim	Cr	W½	2	39	10
42.	Bailey Chromite prospect	Cr	SW	2	39	10
43.	Bailey Cabin prospect	?	S½	3	39	10
44.	Chromite float (a)	Cr	NW	3	39	10
45.	No Name occurrence (f)	Fe	SE	31	38	10
46.	Stevens placer	Pt	NW	5	39	10
47.	No Name prospects (e)	Au	SW	3	39	10
48.	Mislatnah Chert float	Mn	N½	2	38	12
49.	Long Ridge mine	Mn		13	38	12
50.	Gardner mine	Cr		10	39	11
51.	Rosie mine	Cr	NE	11	39	11
52.	Chromite float (b)	Cr		8	39	10
53.	China Diggings placer	Au	SW	10	39	10
54.	Melanterite Tunnel	Au-Cu	NW	10	39	10
55.	Hawks Rest View	Cr	NW	10	39	10
56.	Copper Creek group	Cu,Zn,Au	W½	10	39	10
57.	Morning Sun	Cr	S½	10	39	10
58.	Emlly mine	Au,Cu	SE	10	39	10
59.	Emlly Chrome	Cr	SE	10	39	10
60.	Emlly placer	Au	SE	10	39	10
61.	Buck Chromite	Cr	SW	11	39	10
62.	Davis placer	Au	NW	14	39	10
63.	Peterson placer	Au	E½	14	39	10
64.	Chetco Lake Chromite	Cr		23	39	11
65.	Chetco Lake Rhodonite	Rhodonite		25	39	11
66.	Madstone placer	Au,Pt	NEcor	18	39	10
67.	No Name Laterite	Ni		8,17,20	39	10
68.	Chrome float (c)	Cr		20	39	10
69.	No Name prospect (d)	Mn,Fe		15-22	39	10
70.	Square Lake prospect	Cr	NE	24	39	10
71.	No Name prospect (a)	Cr	NW	26	39	10
72.	Cobalt prospect	Cu,Fe,Co		26-27	39	10
73.	No Name prospect (b)	Cr	SW	26	39	10
74.	Nancy Hank prospect	Cr	SW	10	39	11
75.	Sourdough Flat prospect	Ni		11-14	38	10

MINES PROSPECTS & SAMPLE SITES

99 ● STREAM SEDIMENT SAMPLE SITE (SEE APPENDIX A)

▣ ROCK SAMPLE SITE (thin sections) (SEE APPENDIX B)

⚒ MINE

X PLACER

⚒ PROSPECT

O SOIL SAMPLE SITE

(22) ref. to MAP NO. & NAME above