STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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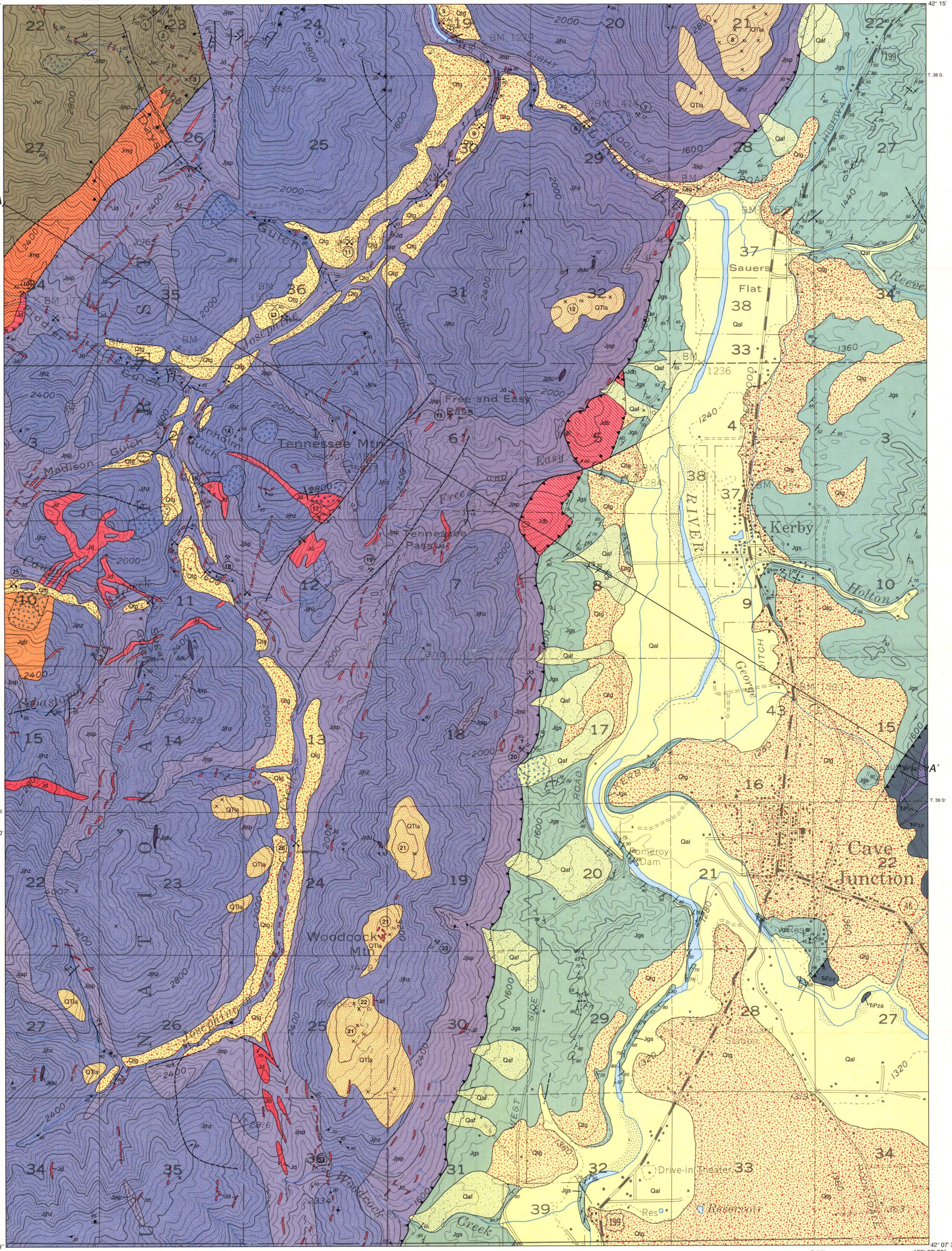
Geologic Map of the Northwest Quarter of the Cave Junction Quadrangle, Josephine County, Oregon

1986

GMS-38
Geologic Map of the Northwest Quarter of the Cave Junction Quadrangle, Josephine County, Oregon
By Len Ramp
Plate 1

Funded in part by the USDA Forest Service



Base map from U.S. Geological Survey - enlarged version of Cave Junction 15' quadrangle (original scale 1:62,500)

Topography from aerial photographs by multiplex methods and from planetable surveys by USBR and by USGS 1954
Aerial photographs taken 1952

Polyconic projection. 1927 North American datum
10,000-foot grid based on Oregon coordinate system, south zone

Dashed land lines indicate approximate locations

TRUE NORTH — MAGNETIC NORTH — 20°
APPROXIMATE MEAN DECLINATION, 1954

SCALE 1:24 000
1 — ½ — 0 — 1 MILE
1000 — 0 — 1000 — 2000 — 3000 — 4000 — 5000 — 6000 — 7000 FEET
1 — .5 — 0 — 1 KILOMETER

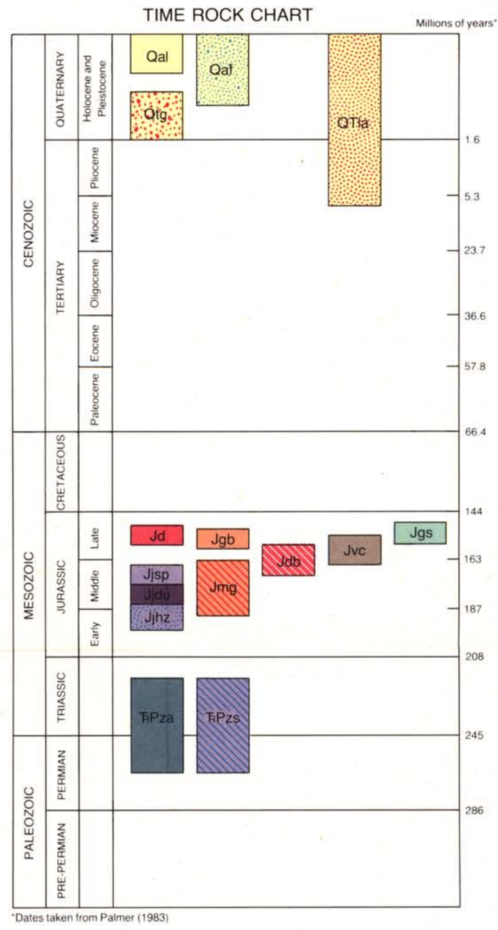
CONTOUR INTERVAL 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

OREGON
QUADRANGLE LOCATION

Geology by Len Ramp

Field work completed in 1985
Map reviewed by Barry Moring, U.S. Geological Survey, Robert G. Coleman, Menlo Park, and Gregory D. Harper, State University of New York
Chemical analysis supervised by Gary L. Baxter
Cartography by Mark E. Neuhaus

TIME ROCK CHART



*Dates taken from Palmer (1983)

GEOLOGY AND MINERAL DEPOSITS

Geologic setting

The map area includes a portion of the Western Jurassic Belt and a small area of the Western Paleozoic and Triassic Belt of the complex Klamath Mountains geomorphic province. These belts, which were named by Irwin (1960), are separated by an east-dipping thrust that is exposed in the vicinity of Cave Junction. Many of the rocks of both belts belong to ancient oceanic crusts. The suite of rocks making up such a crust is referred to as an ophiolite. A normal, complete ophiolite suite includes a base of peridotite from the upper mantle, overlain in sequence by gabbro and sheeted diabasic dikes, ocean-floor basaltic lavas, and pelagic sediments. Harper (1980) describes a complete ophiolite, the Josephine ophiolite, a few miles to the south where it is well exposed along the Smith River in Del Norte County, California.

About 60 percent of the map area is underlain by ultramafic rocks, primarily peridotite and serpentinite, which are part of a northeast-extending arm of the large Josephine ultramafic sheet. The ultramafic rocks are highly deformed, intruded by numerous dikes, and in large part serpentinized.

The relationship of the layered volcaniclastic rocks (**Jvc**) in the northwest corner of the map to the marine metasedimentary rocks (**Jgs**) lying east of the ultramafic rocks is not shown in this area; a few miles to the north, however, these units appear to be in conformable contact, with unit **Jgs** overlying unit **Jvc**.

Structure

The major structural features are the faulted boundaries of principal geologic units in the area. The west-dipping thrust fault bounding the eastern edge of the ultramafic rocks is not well exposed but appears as highly sheared serpentinite gouge overriding the metasedimentary rocks. This fault appears to dip from about 30° to about 60° west. The deeply alluviated Illinois Valley is evidence of possible recent movement along this fault, which may have formed a temporary dam to the Illinois River on possibly more than one occasion. The west edge of the ultramafic arm is marked by a northeast-trending, nearly vertical fault that has been offset by later northwest-trending high-angle faults.

Sedimentary units **Jvc** and **Jgs** appear to be isoclinally folded and steeply dipping. The predominant direction of dip is to the east.

Mineral deposits (see Table 1)

The area has had significant placer gold production since 1850, when gold was discovered in the Illinois River near the mouth of Josephine Creek. Several small seasonal placer operations are still active in the area.

A few lode gold deposits were prospected and mined in a small way, primarily in the early days, and records of production and geologic details are sparse. Much of the placer gold appears to have come from mineralization in the volcaniclastic terrain and is also associated with dikes intruding the ultramafic rocks.

Platinum group metals are found in most of the gold placer concentrates from the area, but chemical analyses of panned concentrates from essentially all the stream sediments failed to show significant concentrations of these metals.

Wells and others (1949, p. 21) report from approximate analyses of platinum group metals in the area that they contain about 30 percent platinum, 32 percent iridium, 25 percent osmium, 13 percent ruthenium, and little or no rhodium or palladium. Since the present analyses are for platinum and palladium only, it is conceivable that interesting amounts of the other platinum group metals may be present (Table 3, Plate 2). The ratio of platinum metals to gold in placer concentrates in Josephine Creek is unreported. Wells and others (1949) reported a ratio of platinum group metals to gold in the Waldo area south of Cave Junction of 1:75, and Shenon (1933) reported a ratio of about 1:50 in the Takilma area.

A few small chromite deposits occur in the Josephine ultramafic rocks. None in this area have had significant production. They are described in a Department publication, Bulletin 52 (Ramp, 1961).

Nickel-bearing lateritic soils developed on the Josephine peridotite, in particular on Eight Dollar Mountain and Woodcock Mountain, are described in an earlier Department publication (Ramp, 1978).

The mineral josephinite has been the subject of considerable geologic interest for a number of years. This native metal alloy of nickel and iron occurs as nuggets in stream gravels along a 3-mi-long north-flowing stretch of upper Josephine Creek and to a lesser extent in Woodcock Creek and Mendenhall Creek. One of the more complete studies of josephinite has been that of Botto and Morrison (1976). Dick (1974) reported the occurrence of grains of josephinite up to 4 mm long in outcrops of sheared serpentinite near the saddle between Woodcock Creek and Mendenhall Creek. An attempt was made during the present study to duplicate that find, and bulk samples of sheared serpentinite were taken in the above described saddle and in the saddle between Woodcock Creek and Josephine Creek (see Table 2, Plate 2, samples 95 and 96). Microscopic examination of a multitude of slabs and crushing, grinding, and subsequent gravity separation of bulk samples of the rock failed to reveal the presence of josephinite. In addition, no platinum group minerals were detected in the rocks or concentrates.

Terrace gravel deposits (**Qtg**) derived from Galice Formation metasedimentary rocks (**Jgs**) in the area northeast of Kerby may contain clay that can be used in the manufacture of brick and tile. Future testing is being planned to evaluate this potential.

Previous geologic mapping

The area has been mapped by Wells and others (1949), Ramer (1967), Dick (1976), Ramp and Peterson (1979), and Smith and others (1982).

Acknowledgments

Some field assistance was provided by Mark Ferns, Paul Staub, and Klaus Neuendorf, Oregon Department of Geology and Mineral Industries. The completed map was reviewed by Barry Moring, U.S. Geological Survey, Menlo Park, California; Robert G. Coleman, Menlo Park; and Gregory D. Harper, State University of New York, Albany, New York. The Bureau of Mines in Reno, Nevada, provided the gold, palladium, and platinum analyses.

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EXPLANATION

Qal — **Alluvium (Holocene)** — Sand, gravel, and silt in stream channels on flood plains and terraces forming a cover over bed rock varying in thickness from a few inches to more than 150 ft in the Sauers Flat area near Kerby, judging from logged depth to bed rock in nearby water wells

Qaf — **Alluvial fan deposits (Holocene-Pleistocene?)** — Soil and rock debris from adjacent steep slopes; derived from gulches with intermittent stream flow and/or landslide debris (**Qls**); composed predominantly of ultramafic material

Qtg — **Terrace gravel (Pleistocene)** — Older, partially cemented alluvium; consists of sand, gravel, silt, and clay deposits on benches and gentle slopes from about 30 ft to 300 ft above present stream channels. Some deposits have been worked extensively for gold, particularly along lower Josephine Creek and its tributaries. Deposits derived from Galice sedimentary rocks have been weathered in part to clay

QTla — **Lateritic soil (Holocene-Miocene?)** — Iron-rich soil developed on peridotite surfaces; predominantly the result of chemical weathering. The unit is usually found on flat ridge tops and old landslide areas and has residual enrichment of nickel, cobalt, and chromite (Ramp, 1978)

Jd — **Dikes (Upper Jurassic)** — Numerous small- to medium-sized dikes dated at 150 million years before the present (m.y. B.P.) (Harper and others, 1986) intruding ultramafic and volcaniclastic rocks. Composition of dikes includes andesite, quartz diorite, dacite, hornblende diorite, hornblende gabbro, diabase, porphyritic andesite, and rodingite (see rock descriptions in Table 2, Plate 2). The dikes are generally tabular in peridotite and lenticular in serpentinite. Some larger dikes are composite or multiple with varying textures and compositions. Gold is associated with a few of the dikes. Thickness of some dikes has been exaggerated on the map to permit graphic representation

Jgs — **Metasedimentary rocks (Upper Jurassic)** — Metamorphosed thin-bedded siltstone and graywacke sandstone with graded bedding, black shale, minor layers of pebble conglomerate, and chert. The unit is tightly folded and steeply dipping and displays some slaty cleavage. These same pelagic sediments overlie the Josephine ophiolite in Del Norte County, California, and contain *Buchia concentrica* (Sowerby) of late Oxfordian to early Kimmeridgian age (Harper, 1980). This unit was correlated with the Galice Formation of Diller (1907) by Wells and others (1949), Wells and Walker (1953), and Cater and Wells (1953)

Jgb — **Gabbro (Upper Jurassic)** — Medium- to coarse-grained hornblende gabbro with poikilitic texture; contains green hornblende, calcic plagioclase, accessory magnetite, epidote, and minor quartz. The body mapped on Canyon Creek contains some diorite and appears to be related to the other dikes (**Jd**)

Jvc — **Volcaniclastic rocks (Upper-Middle? Jurassic)** — Andesitic water-laid tuffs and agglomerate, volcanic wacke with graded bedding, dark siltstone, chert, and altered lavas (greenstone). About 2 mi to the northwest, this unit contains very coarse water-worked volcanic conglomerate and pillow lavas that are overlying and derived from diabasic dikes (Ramp, 1984). These rocks are mapped as volcanic member of Galice Formation by Wells and others (1949) and may be equivalent to the Rogue Formation of Wells and Walker (1953), which has been dated at 157 ± 2 m.y. B.P. (Saleeby, 1984). This formation encloses a stratabound massive sulfide deposit (mine 1, Table 1)

Jdb — **Diabasic dikes and pillow basalt (Upper-Middle? Jurassic)** — Dark-green augite basalt with abundant secondary chlorite; overlies and occurs as screens between medium-coarse to fine-grained diabasic dike rocks that have abundant secondary epidote. These rocks appear to be overthrust on serpentinized Josephine peridotite as has occurred with similar rocks at the Turner-Albright Mine about 14 mi to the south. A few miles farther south in Del Norte County, California, similar rocks are dated at 157 m.y. B.P. and mapped as the upper portion of the Josephine ophiolite (Harper, 1980)

Jmg — **Metagabbro (Middle-Lower? Jurassic)** — Rocks mapped in this unit have considerable variation and include amphibolite, clinopyroxenite with diorite "veins," hornblende diorite, dark-green clinopyroxene-rich gabbro, and hornblende gabbro with secondary quartz, epidote, and minor pyrite. The amphibolite shows well-developed foliation and has abundant epidote on the fractures. The unit appears to be in fault contact with both the serpentinite and volcaniclastic rocks. Its relationship to the other units is unclear, but the unit probably should be considered as part of the mafic-ultramafic Josephine ophiolite sequence

Jjsp, **Jjdu**, **Jjhz** — **Josephine peridotite (Middle-Lower? Jurassic)** — This unit is largely harzburgite tectonite (**Jjhz**) with minor dunite (**Jjdu**). Most of the peridotite has been serpentinized to some degree. Areas of greater than 50 percent serpentinization are mapped separately (**Jjsp**). A few small areas such as on Eight Dollar Mountain and on some of the higher terrain are fresh, unserpentinized harzburgite (olivine and enstatite with accessory magnetite and chromite). Areas of more complete serpentinization are generally situated near fault contacts, along shear zones, and in areas of lower terrain. (Areas of predominant serpentinization were outlined, in part, by photogeologic methods and should be considered approximate.) A few small segregations of chromite have been prospected and mined in this unit. It is also the source of the native nickel iron mineral josephinite, which has been recovered from placer operations on upper Josephine Creek

TRPza — **Applegate Group (Triassic-Paleozoic)** — Metasedimentary and metavolcanic rocks of probable marine depositional environment including "greenstone," argillite, chert, quartzite, marble, and minor intrusives. Metamorphic grade varies from greenschist facies up to amphibolite facies and even higher near plutons. Cherts are recrystallized to quartzites. Epidote-clinozoisite alteration is pervasive, and much of the plagioclase is altered to albite. Smith and others (1982) suggest Triassic- to Paleozoic-age range

TRPzs — **Serpentinite (Triassic-Paleozoic)** — Serpentinized peridotite and dunite occurring with the Applegate Group

Table 1. MINES AND PROSPECTS IN THE NORTHWEST QUARTER OF THE CAVE JUNCTION QUADRANGLE, OREGON*. LOCATIONS ARE SHOWN ON MAP ON PLATE 1.

Map no.	Mine or prospect	Commodity	¼/¼	Sec.	Location T.(S.)	R.(W.)	Elevation (ft)	Geologic formation	Description	Workings	Production	References
1.	Sulfide No. 1 (Twin Tunnel)	Au	NE/SW	23	38	9	2,550	Jvc	Massive granular pyrite layer in volcanic sediments	Two short adits	Nil	7
2.	Gold Ridge (?)	Au	NE/SW	23	38	9	2,970	Jvc	Pyrite in fractured cherty tuffaceous sediments	Shaft and decline on ridge 15 ft deep	Nil	4
3.	Chatty claim	Au	NW/NE	26	38	9	2,730	Jvc, Jjsp	Pocket mineralization on vertical fault contact of serpentinite and metasediments	Shallow open cut and short adit	$8,000 pocket	1,2,4
4.	Black King	Cr	SW/SE	24	38	9	2,650	Jjhz	Small lenticular pods of massive chromite in serpentinized harzburgite	Shallow pit	Small	5
5.	Unnamed placer	Au	NE/SW	19	38	8	1,250	Qtg, Jjsp	Poorly sorted, partially cemented gravel on serpentinite bed rock	Shallow pits	Unknown	3
6.	Consolidated placer	Au	SE/NW	29	38	8	1,300	Qtg, Jjsp	Medium to fine gravel and sand on serpentinite bed rock	Small pit	Unknown	--
7.	Eight Dollar No. 1	Cr	SE/NE	29	38	8	1,830	Jjhz	Disseminated to banded chromite in 6-ft-thick lens of dunite in harzburgite	Shallow cut	1½ tons	5
8.	Eight Dollar Laterite	Ni	--	21	38	8	2,000 to 3,200	QTla, Jjhz	Red lateritic soil and saprolite developed on peridotite	Several pits	Large samples	6
9.	Golden Princess placer	Au	SW/NE	30	38	8	1,270	Qtg, Jjsp	Poorly sorted, partially cemented gravel on serpentinite bed rock	Shallow hydraulic pits (nearly worked out)	Unknown	4
10.	Mood	Au	Center	34	38	9	1,780	Jjsp, Jmg, Jd	Serpentinite metagabbro contact zone with diorite dike, pyrite, quartz	Open cut and over 2,000 ft of caved tunnels	A few hundred ounces	1,2,4
11.	Gold King (Smith)	Au	NW/NE	36	38	9	1,500	Qtg, Jjsp	Semicemented gravels on serpentinite bed rock	Shallow pits, ponds, and trenches	Unreported	7
12.	Free and Easy Laterite	Ni	S½	32	38	8	2,000 to 2,400	QTla, Jjhz	Red lateritic soil and yellow saprolite developed on peridotite	Shallow pits	None	6
13.	Bear placer and Foster asbestos	Au, chrysotile	SW¼	36	38	9	1,400 ±	Qtg, Jjsp	Cemented gravels on serpentinite bed rock with chrysotile veinlets	1,100 ft of drifts on bed rock and several diamond drill holes	Unreported	4,3,7
14.	Low Boy	Cr	SE/NE	2	39	9	2,200	Jjhz	Thin chromite schlieren in harzburgite and disseminated in altered dunite	Two small cuts	None	5
15.	Free and Easy	Au	SE/NW SW/NE	6	39	8	2,080	Jjsp, Jd	Gold occurs in sheared altered dikes in sheared serpentinite; values are spotty	Caved adits and small cuts	Unreported	1,2,4
16.	Alta (Oro Fino)	Au	SW/SE SE/SE	2	39	9	1,680 to 1,900	Jd, Jjsp	Sulfides and gold in diorite dike intruding serpentinite	Caved adits and cuts	Some early-day production; totals not recorded	1,2,4
17.	Roseburg and Fidelity	Au	SW/SE	1	39	9	2,400 to 2,500	Jd	Pyrite and gold in quartz veins in diorite surrounded by serpentinite	Two adits and small cuts	Unrecorded	1,2,4
18.	Tennessee	Cr	SE/NE NE/NE	11	39	9	1,760	Jjsp	Small coarse-grained, high-grade chromite layer in partly serpentinized harzburgite and dunite	Small cuts	21 long tons	5
19.	Tennessee Pass	Cr	SE/NE	12	39	9	2,165	Jjsp	Small lens-shaped bodies of massive chromite in sheared serpentinite	Shallow cuts, short adit, and glory hole	300 tons high grade	5
20.	Lucky Strike	Cr	NE/SE	18	39	8	1,730	Jjsp	Thin chromite zone in sheared serpentinite strikes N. 15° E. and dips 45° W.	Short drifts, shallow shaft, and bulldozer trench	20 long tons	5
21.	Woodcock Mtn. Laterite	Ni	--	19,24, 25,30, 31	39	8-9	2,400 to 3,400	QTla, Jjhz	Shallow rocky lateritic soil and saprolite developed on harzburgite and dunite	Shallow cuts and trenches	None	6
22.	Nettie (Woodcock)	Cr	SE/NE	25	39	9	3,280	QTla	Small boulders of refractory-grade chromite in lateritic soil	Shallow pit beside dozer trench	None	5
23.	Dottie May	Cr	SE/SW	19	39	8	2,700	Jjhz	Narrow north-trending streaks of massive and disseminated refractory-grade chromite in serpentinized dunite	Short adit and shallow cut	None	5
24.	Woodcock Creek	Cr	Center	36	39	9	2,000	Jjsp	Narrow lenses and streaks of chromite in serpentinized harzburgite and dunite	Small cuts	None	--
25.	Canyon Creek placers	Au	SE/NW	10	39	9	1,600 to 1,800	Qtg, Jjsp	Partially cemented gravels and sand on serpentinite bed rock have been extensively worked	Numerous pits and ground-sluiced areas and drifts	Large but no records	1
26.	Josephinite placers	Josephinite	NE/NW	24	39	9	1,760	Qtg, Jjsp	Native nickel iron nuggets derived from serpentinite occur in partly cemented terrace and stream gravels	Small hydraulic pits	Small production for specimen market and as by-product of gold placers	8

* Several other small prospects for both gold and chromite are present in the map area but are not listed here due to lack of pertinent data. Extensive placer mining, mainly hydraulic, has been done along Josephine Creek and most of its tributaries, especially Canyon Creek, Tennessee Gulch below the Roseburg and Fidelity, and Fiddler Gulch below the Mood and Days Gulch. Present-day mining activity is mainly small Venturi-type dredges operating within the stream channels.

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MAP SYMBOLS

Landslide debris — Deposits of mixed soil and rock fragments; depicted by pattern printed over color representing predominant underlying rock unit

Contact — Approximately located; queried where uncertain

Fault — Arrow showing dip; bar and ball on downthrown side; dashed where approximate or inferred; dotted where concealed; queried where uncertain

Thrust fault — Teeth on upper plate; dashed where approximate; dotted where concealed

Zone of intense shearing

Strike and dip of bedding

Strike and dip of overturned bedding

Strike of vertical beds

Strike and dip of foliation in metamorphic rocks or banding in igneous rocks

Vertical foliation

Strike and dip of joint

Vertical joint

Strike and dip of parallel jointing

Anticline axis

Spring

Shaft — **Mine adit**

Gold placer — **Mine or quarry**

Prospect

Numbers correspond to numbers in Table 1

Au Cr Ni — **Principal metal at mine or prospect**

Josephinite Chrysotile Shale — **Mineral occurrence or rock product**

GEOLOGIC CROSS SECTION