STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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GEOLOGY AND GOLD DEPOSITS MAP OF THE GREENHORN QUADRANGLE, BAKER AND GRANT COUNTIES, OREGON

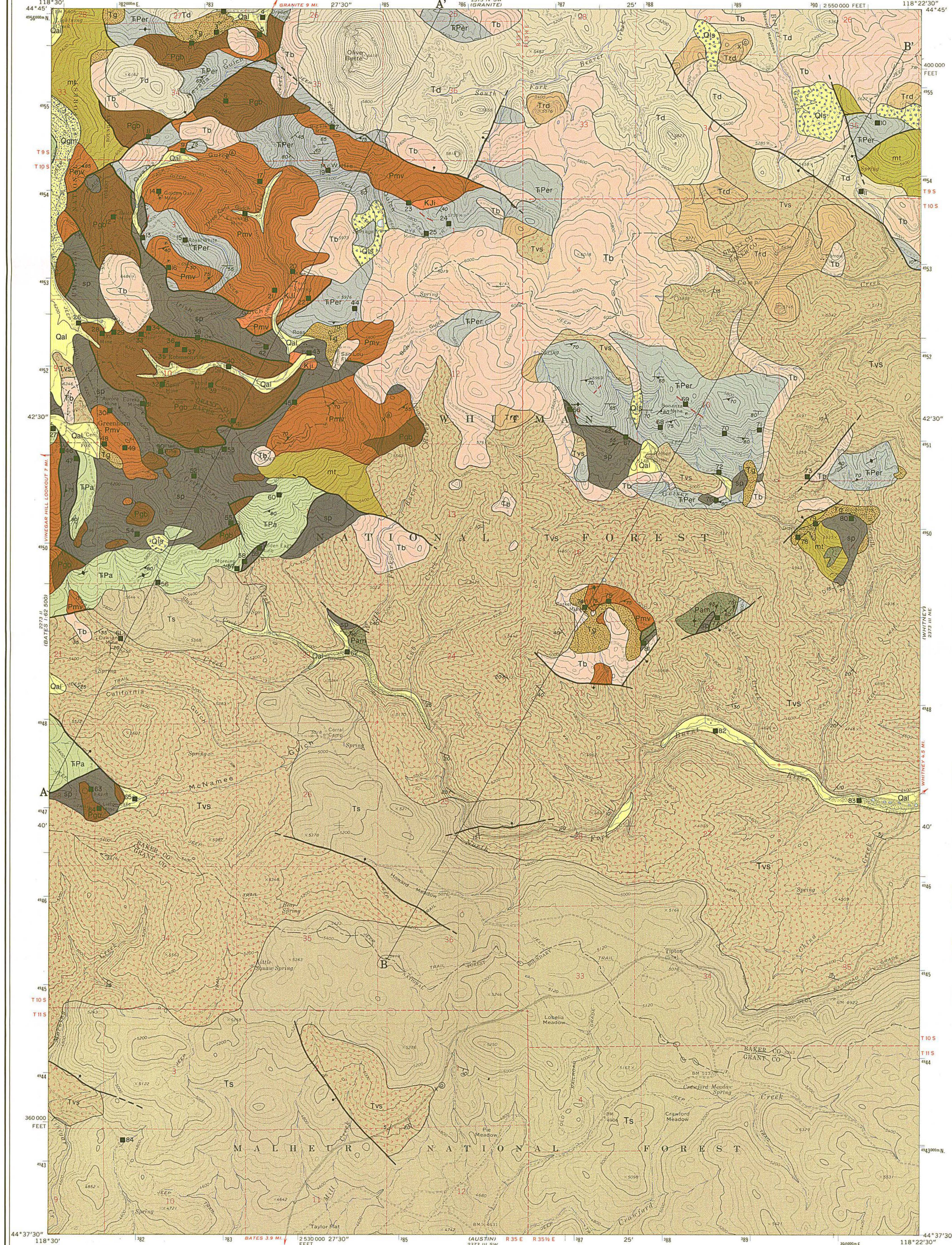
1983

GMS-28

Geology and Gold Deposits Map of the Greenhorn Quadrangle, Baker and Grant Counties, Oregon

M.L. Ferns and others

Funded in part by United States Department of Agriculture — U.S. Forest Service



Base map by U.S. Geological Survey
Control by USGS and NOS/NOAA
Topography by photogrammetric methods from aerial photographs taken 1971. Field checked 1972
Projection and 10,000-foot grid ticks: Oregon coordinate system, north zone (Lambert conformal conic)
1000-metre Universal Transverse Mercator grid ticks, zone 11, shown in blue. 1927 North American datum
Fine red dashed lines indicate selected fence lines
Where omitted, land lines have not been established

UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

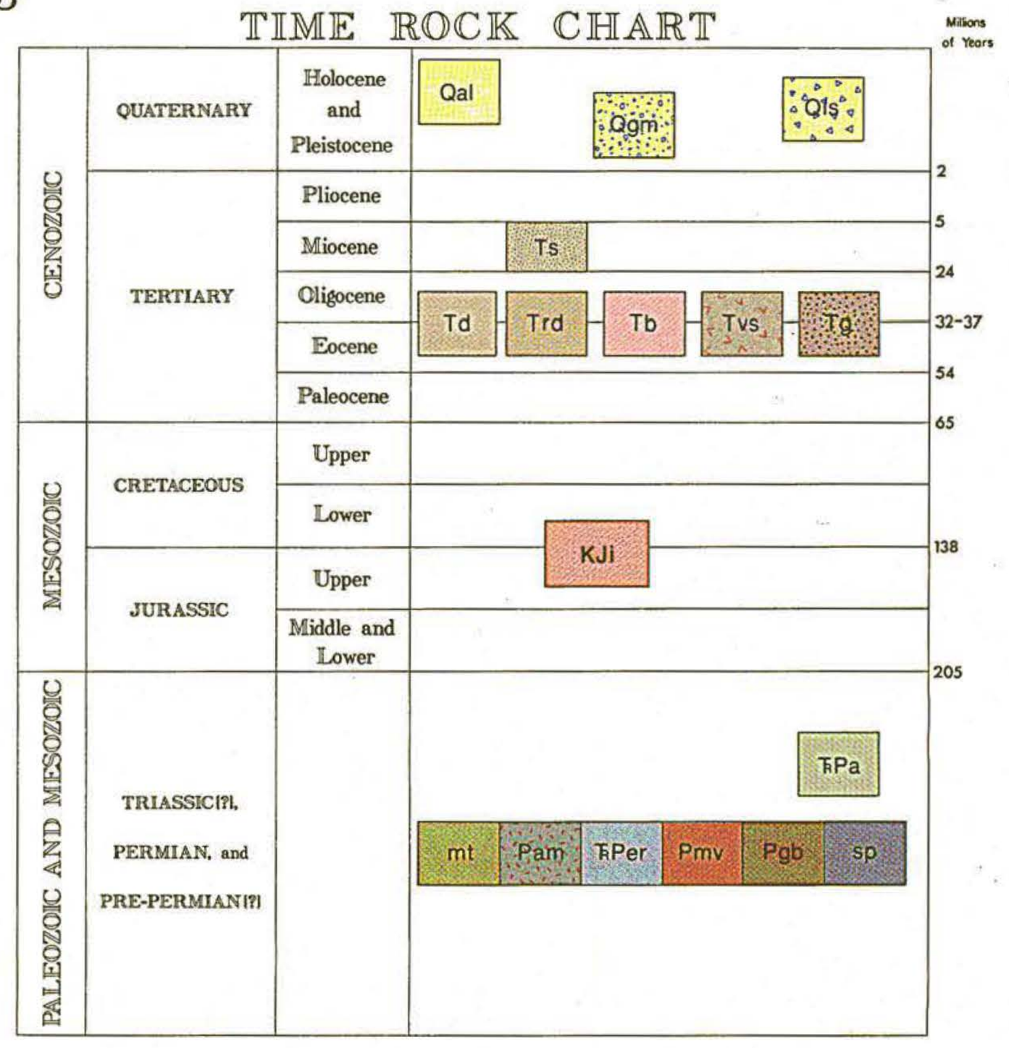
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

Geology by M.L. Ferns, H.C. Brooks, and D.G. Avery
Field work completed in 1982

Map prepared by STATE OF OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Cartography by Paul E. Staub

TIME ROCK CHART



EXPLANATION

Qal — **Alluvium (Holocene and Pleistocene):** *Unconsolidated, poorly sorted fluviatile deposits consisting of gravel, sand, and silt in channels and flood plains of the present drainage system*

Qls — **Landslide debris (Holocene and Pleistocene):** *Unstratified, heterogeneous mixtures of soil and angular rock fragments resulting from bedrock failure on oversteepened slopes; typified by hummocky topography*

Qgm — **Glacial deposits (Holocene and Pleistocene):** *Unconsolidated, unsorted accumulations of boulders, cobbles, sand, and silt in Lightning Creek*

Ts — **Volcanic and sedimentary rocks (Miocene):** *Predominantly gray to black, locally vesicular aphanitic basalt, basaltic andesite, and andesite flows with minor amounts of interbedded tuffaceous and diatomaceous sediments and welded vitric tuff. The flows are predominantly pilotaxitic to hyalopilitic augite-bearing basaltic andesites and andesites of the Strawberry Volcanics. Wheeler (1982) reports a whole-rock K-Ar age of 9.96 m.y. from similar basalt in the Bates quadrangle to the west. Sedimentary rocks in the unit include poorly consolidated deposits of diatomite and tuff and are believed to be correlative with the Mascall Formation (Wheeler, 1982)*

Td — **Porphyritic dacite and andesite (upper Eocene and Oligocene):** *Flows, domes, and shallow intrusives of porphyritic hornblende dacite and silicic andesite. Predominantly light- and medium-gray dacites with large spongy phenocrysts of plagioclase, smaller euhedral hornblende phenocrysts, and resorbed quartz phenocrysts in an aphanitic groundmass. Biotite and orthopyroxene also occur as phenocrysts. At Olive Butte, columnar-jointed flows also include medium-grained plutonic xenoliths*

Trd — **Silicic volcanic rocks (upper Eocene and Oligocene):** *Flows and tuffs of generally aphanitic hornblende dacite and silicic andesite. Typically pink and light-gray and locally flow-banded*

Tb — **Basalt and basaltic andesite (upper Eocene and Oligocene):** *Predominantly black to dark-gray, fine-grained porphyritic holocrystalline olivine basalt flows. The unit includes flows which underlie, interfinger with, and overlie volcaniclastic rocks of unit* **Tvs**

Tvs — **Volcaniclastic rocks (upper Eocene and Oligocene):** *Predominantly volcanic mudflow breccia deposits (lahars) with irregularly intercalated tuffaceous boulder conglomerates, bedded tuffs, and tuffaceous sandstones and siltstones. Also includes local lava flows of aphanitic and porphyritic platy andesites. The volcaniclastic deposits typically are poorly consolidated and consist of poorly sorted, subrounded to subangular volcanic rock fragments in a matrix of felsic volcanic ash, sand, and silt. Clasts are predominantly porphyritic, dark-gray, light-gray, and brownish-red pyroxene and hornblende andesites. Smaller amounts of dacite, rhyodacite, and basalt also occur as clasts*

Tg — **Gravels (upper Eocene and Oligocene):** *Stratified deposits of consolidated and loosely cemented gravel, sand, and clay. The detritus is composed of pre-Tertiary rock fragments at Parkerville and Winterville and includes Tertiary volcanic rocks at the Oro Fino Placer (3). The deposits probably represent several episodes of deposition prior to and contemporaneous with early Tertiary volcanism. Locally extensively worked for placer gold*

KJi — **Quartz diorite and granodiorite (Cretaceous and Upper Jurassic):** *Small intrusive masses. Includes equigranular hornblende quartz diorite at Tone Springs, equigranular muscovite-bearing granodiorite at the head of Olive Creek, and strongly sericitized porphyritic biotite granodiorite north of the Pyx Mine (25). The intrusives are presumed to be equivalent to the Bald Mountain Batholith in age but may include some lower Tertiary rocks*

ŦPa — **Clastic sedimentary rocks (Triassic and Permian?):** *Predominantly argillite and sandstone with small amounts of conglomerate, chert, and limestone. Coarse-grained sedimentary rocks include chert-pebble conglomerates and coarse polymictic sedimentary breccias which contain clasts of metamorphosed gabbro, diorite, chert, greenstone, and serpentine. Finer grained conglomerates include poorly sorted lithic wackes composed of chert, argillite, and sandstone clasts in an argillaceous matrix. The conglomerates also contain minor amounts of volcanic rock fragments, serpentine and limestone clasts, and quartz and feldspar crystals. The sedimentary rocks contain fragments of gabbro, greenstone, and serpentine derived from the underlying serpentine-matrix mélange and are in depositional contact with gabbro (***Pgb***) and serpentine (***sp***) east of the Golden Eagle Mine (55), indicating that the initial mélange formation must pre-date the deposition of unit* **ŦPa**. *Fragments of similar sedimentary rocks are also encased within the mélange. Mullen (1978) reports Early Permian (Leonardian) conodonts and Early Permian (Wolfcampian) fusulinids from a limestone pod in similar rocks in the Bates quadrangle to the west. However, the Early Permian date conflicts with earlier correlations, based on lithologic and stratigraphic similarities, between unit* **ŦPa** *and rocks of Late Triassic and Jurassic age to the south (Brown and Thayer, 1966). The Early Permian fossils may be exotic to unit* **ŦPa** *and derived by sedimentary reworking of older limestones which had been previously incorporated into the underlying mélange. If this is the case, the sedimentary rocks could be as young as Late Triassic, and mélange formation may have occurred in the Early or Middle Triassic*

Ophiolite and associated rocks: *Rock units below unit* **ŦPa** *in the Time Rock Chart are lithologic subdivisions of a structurally chaotic terrane consisting of an ophiolite assemblage of serpentine, gabbro, and pillow basalt and including sedimentary rocks consisting of banded chert, chert, and argillite. The rocks have been so fragmented and displaced by tectonic processes that their original stratigraphic succession is largely indeterminable. Theoretically, development of the ophiolite assemblage involved contemporaneous plutonic, volcanic, and sedimentary processes which extended over a long time period. Available fossil and radiometric age data indicate that most of the rocks are of Permian age, but older Paleozoic and younger Mesozoic rocks may be included*

mt — **Mixed-rock terrane (Triassic and Permian?):** *A structurally chaotic, predominantly ophiolitic assemblage of tectonically juxtaposed rocks of different compositions and ages. Mostly gabbro and greenstone with smaller amounts of diorite, quartz diorite, serpentine, serpentine-matrix mélange, argillite, chert, limestone, and epidote amphibolite. Individual blocks typically range from a few feet to a few hundred feet in the longest dimension. The terrane may be correlative with similar zones mapped in the Bourne and Mt. Ireland quadrangles to the northeast (Brooks and others, 1982; Ferns and others, 1982)*

Pam — **Epidote amphibolites (Permian?):** *Predominantly strongly foliated epidote amphibolites with minor amounts of white-mica quartz schists and blue-amphibole-bearing amphibolites. Metamorphic minerals include green amphibole, epidote, albite, and quartz. Parent rocks were gabbros and mafic volcanic rocks. The unit is characterized by a well-developed foliation and tightly crenulated folds*

ŦPer — **Elkhorn Ridge Argillite (Triassic, Permian, and Pennsylvanian):** *Predominantly chert, siliceous argillite, and argillite with minor amounts of chert-pebble conglomerate, limestone, and tuffaceous argillite. Locally intercalated with pillow lavas and volcaniclastic rocks of unit* **Pmv**. *Contorted ribbon cherts exposed along Olive Creek reportedly contain conodonts of Middle Permian age (Dickinson and Thayer, 1978). Fossils of Pennsylvanian, Permian, and Triassic age have been found in limestone pods in Elkhorn Ridge Argillite outside of the Greenhorn quadrangle. The diverse ages and structural complexity indicate that the Elkhorn Ridge Argillite is not a simple stratigraphic unit*

Pmv — **Greenstone (Permian):** *Predominantly pillow basalts, felsite, felsic tuffs, volcanic conglomerates, and breccias with minor amounts of interbedded tuffaceous argillite, limestone, and chert. The dark-gray amygdaloidal pillow basalts retain relict titanaugite phenocrysts in a generally felty groundmass of chlorite, albite, and epidote. Interbedded volcanic breccias locally contain small limestone pods. Middle Permian conodonts were reported from one such pod near Bennett Creek (Mullen, 1978, p. 120). The felsites are generally light-greenish-gray, flinty-textured aphanitic rocks which are locally interbedded with light-green chert and grayish-green, fine-grained quartz-albite (quartz keratophyre) tuffs. Small metamorphosed quartz-diorite dikes locally intrude the volcanic rocks*

Pgb — **Metamorphosed intrusive rocks (Triassic? and Permian):** *Predominantly metamorphosed gabbro and diorite with subordinate amounts of pyroxenite, quartz diorite, diabase, and albite granite. The map unit may include intrusive rocks of several different ages and origins. The oldest rocks constitute part of an ophiolite assemblage and include gabbro, tectonite gabbro, and pyroxenite. Layered gabbros in the assemblage crop out adjacent to foliated peridotite north of the Owl Mine (38). Younger(?) diorite and quartz-diorite dikes locally intrude metavolcanic rocks. A Pb-U age of 243 m.y. has been obtained from zircons in a similar-appearing quartz diorite in the Granite quadrangle to the north (Brooks and others, 1983)*

sp — **Serpentine and serpentine-matrix mélange (Triassic and Permian?):** *Predominantly green or black serpentinite and serpentine-matrix mélange in which small blocks and discontinuous bands of greenstone, gabbro, chert, argillite, and epidote amphibolite are arrayed in a matrix of sheared serpentine. Small exposures of foliated peridotite and pyroxenite are included locally, e.g. north of the Owl Mine (38) and immediately to the west of the Black Hawk Mine (16). Many small blocks of argillite, gabbro, and greenstone are included within the serpentine-matrix mélange near the town of Greenhorn. Blocks of serpentine-matrix conglomerates derived from the mélange and encased within it are found about 300 ft to the east of the Don Juan Mine (51). Unit is unconformably overlain by sedimentary rocks of unit* **ŦPa** *east of the Golden Eagle Mine (55). The serpentinized rocks probably represent part of a Permian or older ophiolite complex. Part of the serpentinite has been tectonically mobilized into juxtaposition with younger rocks (diapirically juxtaposed). A similar mélange in the Aldrich Mountains to the southwest is unconformably overlain by Upper Triassic sedimentary rocks (Brown and Thayer, 1966; Dickinson and Thayer, 1978)*

GEOLOGIC SYMBOLS

Contact--approximately located

Fault--ball and bar on downthrown side. Dashed where inferred or concealed

Quartz veins and mineralized fault zones — dashed where approximately located

■84 Mine and prospect locations--numbers correspond to map numbers in Table 1

Ⓓ Source of rock sample for which chemical data are presented in Table 2

Strike and dip of beds or lava flows

Strike of vertical bed

Strike and dip of foliation

Strike of vertical foliation

MINERAL DEPOSITS

Gold and silver have been the major mineral products of the quadrangle, which covers the eastern half of the Greenhorn district. Total gold production, using historical values of gold and silver at the time of mining, is estimated at $3.8 million, with a lode production of about $2.2 million and a placer production of about $1.6 million. Chromite and cinnabar are also found in the quadrangle. About 18 tons of chromite ore was produced from the Winterville deposit (79) during World War II. No mercury production has been recorded.

The bulk of the lode production was from the Bonanza Mine, which is on a northwest-striking quartz vein in argillite. An additional small amount of gold was produced from generally discontinuous stringers and pockets in chert and in serpentine and gabbro. The more persistent northwest-striking veins are in argillite and chert and tend to parallel major structures in the pre-Tertiary rocks. The north- and northeast-striking veins in the Greenhorn area are generally in gabbro and serpentine and are of limited lateral extent, although the Belcher vein is in greenstone and is reportedly traceable for 1,400 ft (Pardee and Hewett, 1914).

Known mines and prospects are located on the map by numbers that correspond to the list of names and locations in Table 1. A check of patent plats and other maps indicated that some mines and prospects are misnamed on the topographic base map. These errors have been corrected wherever possible. Some of the names of lesser known mines and prospects were found in the literature and on old property maps. Because of time constraints, some map traverses were as much as half a mile apart, and it is likely that many small veins and prospect excavations were not observed.

The major producer in the quadrangle was the Bonanza Mine, which produced about $1.75 million, mostly during the period of 1892-1904. The production came from a composite quartz vein in argillite which strikes N. 55° W. and dips steeply to the southwest. The major ore shoot attained a maximum horizontal length of 800 ft and was mined to a depth of 1,000 ft below the outcrop. According to Lindgren (1901, p. 701): "The ore body as a whole forms a mass of clay slate traversed by quartz veins and seams of all sizes . . . . Though the pay streak averages only 5 to 6 feet, it swelled in places up to 40 feet by the appearance of a vast number of quartz stringers."

The area immediately adjoining the old town site of Robinsonville yielded about $200,000 in gold from near-surface veins. Here many rich pockets of free gold, some with galena, chalcopyrite, and dolomite, occurred in quartz veins in metagabbro and serpentine. Although several of these veins were heavily developed, the deposits apparently failed to persist to depth. Pardee and Hewett (1914, p. 25) suggest that these deposits were formed in part due to secondary enrichment during a period of erosion prior to deposition of the overlying Tertiary basalts.

Placer deposits in the quadrangle include the rich residual and gulch placers in the immediate vicinity of Greenhorn, consolidated Tertiary gravels such as those at Parkerville, and channel and bench gravels along the modern stream channels.

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Table 1. MINES AND PROSPECTS IN THE GREENHORN QUADRANGLE

Map no.	Mine or prospect name	Quarter section	Section	Township (South)	Range (East)	Elevation (ft)	Geologic formation	Geologic description	Surface and/or underground workings	Past production	References
1.	Oro Fino	SE	27	9	35	5,160	Td	Disseminated pyrite in tuff breccia and dacite porphyry	Several hundred feet in old adits, open cut	Small	12 (7-20-01, 9-10-04)
2.	Name unknown	NE	34	9	35	5,360	Pgb	2-ft-wide limonitic gouge zone with disseminated pyrite in quartz and calcite stringers	Small trench	None	—
3.	Oro Fino Placer	NE SE	34 27	9 9	35 35	5,200 —	Tg, Qal	Reworked Tertiary gravels	Several acres placered	Small	—
4.	Porter Brothers Dredge	SW	26	9	35	5,040	Qal	Placer, Olive Creek stream channel	Several hundred acres worked on Granite, Clear, and Olive Creeks	Small within map area	9
5.	Paymaster Group	NW	35	9	35	5,080	Pgb	Quartz and calcite stringers in chloritic metagabbro	300-ft adit	None	12 (7-20-01)
6.	Sixteen-To-One	SE	34	9	35	5,540	Pgb	Quartz vein	400-ft adit	Unknown	11, 12 (12-05-03)
7.	Big Elk, Olive Butte	SE	35	9	35	5,640	ŦPer	Limonitic quartz breccia in silicified argillite	About 400 ft of workings in two adits and shallow shafts	Small	7
8.	Altona	SW	34	9	35	5,540	Pgb ŦPer	Limonitic breccia zone with quartz and calcite stringers in metagabbro	Shallow shaft and short adit	None	10
9.	Kelly Group, Double Eagle	SE	34	9	35	5,680	Pmv ŦPer	Granitic dikes in greenstone and tuffaceous argillite	About 400 ft of workings	None	1, 7, 12 (12-5-03)
10.	Name unknown	NE	35	9	35½	5,520	sp, ŦPer	Quartz and carbonate stringers in argillite and talcose ultramafic rocks	Trenches	None	—
11.	White Wonder	SE	35	9	35½	5,160	Td	Limonitized gouge with cinnabar in tuffaceous volcanic rocks	Trenches	None	8
12.	Little Blue Bucket	NW	3	10	35	6,240	Pgb	Gouge zone with quartz, calcite, and pyrite. Strikes N. 30° E.	Shallow inclined shaft with about 300 ft of workings	Small	10
13.	Golden Gate	SW	3	10	35	6,200	Pmv, sp, Pgb, ŦPer	Quartz vein up to 40 ft wide in metagabbro and serpentine. Strikes NE., dips 60° E.	About 600 ft of workings	Small	1, 2, 3, 4, 5, 7, 9
14.	Belcher	NW	3	10	35	6,160	Pmv	Shear zone up to 3½ ft wide with quartz dolomite, marcasite, and manganese oxides. Strikes N. 30° E.; dips 65° SE.	Over 3,000 ft of workings	Small	1, 2, 3, 4, 5, 7
15.	Royal White	SE	3	10	35	6,200	ŦPer	Vein 1 to 3 ft wide of chert breccia cemented by chalcedony. Strikes N. 40° E. Dips steeply west. Iron and manganese oxides common	About 300 ft of workings	Small About $7,500	2, 3, 4, 5, 7, 9
16.	Black Hawk, Myers	SW	3	10	35	6,280	Pmv	Limonitic quartz vein in greenstone. Strikes N.	About 600 ft of workings on three levels	Small	11, 12 (7-18-03, 1-2-04)
17.	American Group	NW	2	10	35	5,400	ŦPer	Limonitic shear zone in argillite. Strikes NE.	Short adit	None	10
18.	Eureka Placer, Olive Creek Placers	NW	2	10	35	5,400	Qal	Channel gravels	About 1 acre mined	Small	12 (5-2-03)
19.	Name unknown	NE	2	10	35	5,360	ŦPer	Limonitic quartz vein in silicified chert and argillite. Strikes N. 45° W., dips 85° W.	Trenches and pits	None	—
20.	Tone Spring, Olive Group	SW	2	10	35	5,500	Pmv, KJi	Quartz vein with pyrite in hornfelsed metavolcanics and quartz-diorite dikes. Strikes N. 30° E.	About 500 ft of workings in two adits	Unknown	10
21.	Black Bart, Olive Creek Group	SW	2	10	35	5,600	Pmv, KJi	Limonitic quartz vein in hornfelsed metavolcanics and chert along contact with quartz diorite	About 500 ft of workings in two adits	Unknown	10, 12 (10-07-99, 10-24-03)
22.	Name unknown	S½ SW	2	10	35	5,800	Pmv	Quartz veins in greenstone	About 200 ft in short adits	None	—
23.	Name unknown	NW	1	10	35	5,840	Pmv, ŦPer, KJi	Massive quartz veins and altered quartz-diorite dikes along contact between silicified argillite and greenstone	About 400 ft of workings	Unknown	—
24.	Name unknown	Center NW	1	10	35	5,880	ŦPer	Narrow quartz veins and limonitic shear zones in silicified argillite	Trenches and pits	None	—
25.	Pyx	SW	1	10	35	5,760	ŦPer	Limonitic shear zones in silicified argillite. Strike N. 65°-70° W.	Over 1,200 ft of workings on three levels	Unknown, unverified reports of $300,000 early production	5, 7, 9, 10
26.	Placer	NE	9	10	35	6,200	Qal	Reworked Tertiary gravel in channel of Lightning Creek	Several acres mined	Small	—
27.	West Side	SE	9	10	35	6,320	ŦPa, sp, Pmv	Quartz vein in argillite contains dolomite, calcite, galena, and pyrite. Strikes N.	100-ft shaft and 400-ft adit	Small	3, 4, 5, 7, 9
28.	Hidden Treasure	NW	10	10	35	6,280	Pgb	Quartz vein in metagabbro. Strikes N. 15° E., dips NW.	100-ft shaft	Small	4, 5, 10, 12 (5-16-03)
29.	IXL	NW	10	10	35	6,280	Pgb	Quartz vein in metagabbro. Strikes N. 35° E. Nearly vertical dip	280-ft shaft with about 1,000 ft of drifts	Estimated $20,000	4, 5, 9, 10, 12 (7-18-03, 5-16-03, 10-22-04)
30.	Aurora	SW	10	10	35	6,320	Pmv, sp	Along contact between serpentine and greenstone	Short adit and shallow shaft	Unknown	—
31.	Eureka, Junebug?	SW	10	10	35	6,200	Pgb, ŦPa	Quartz vein in serpentine and argillite	Two short adits and shallow shafts	Small	1
32.	Ophir, Spero?	Center SW	10	10	35	6,200	Pgb	Quartz vein up to 4 ft wide in metadiorite. Strikes N. 30° E.	Shaft with 300 ft of workings	Unknown	1, 12 (9-21-01, 2-8-08)
33.	Forty-nine Jimmy	NW	10	10	35	6,280	Pgb	Quartz vein in metagabbro. Strikes NE.	200-ft shaft	Small	12 (6-4-04, 7-30-04)
34.	Humboldt	NW	10	10	35	6,280	Pgb	Quartz vein in metagabbro. Strikes NE.	Shaft with about 300 ft of workings	Unknown	10, 12 (7-18-03, 7-30-04, 6-18-04, 6-17-05)
35.	Nashville?	NW	10	10	35	6,240	Pgb	Quartz veins in metagabbro. Strike NE.	About 300 ft of workings	Small	12 (12-5-03)
36.	Virginia	NE	10	10	35	6,280	Pgb	Limonitic quartz vein in metagabbro. Strikes NE.	200-ft shaft	Estimated $20,000	1, 3, 4, 9, 12 (12-05-03)
37.	Red Bird	NE	10	10	35	6,280	Pgb	Limonitic quartz veins in sheared gabbro and diorite	515 ft of workings including an 80-ft shaft	Estimated $12,000	4, 7, 9, 10
38.	Owl	NE	10	10	35	6,080	Pgb, sp	Two limonitic quartz veins in sheared metagabbro near serpentine contact. Strike N. 30°-45° W., dip 75° S.	60-ft shaft with 300 ft of workings	Estimated $13,896	7, 9, 10
39.	Rabbit	SE	10	10	35	6,040	Pgb	Quartz vein in metadiorite. Strikes N. 10° E., dips 70° E.	About 1,000 ft of workings	Estimated $40,000	7, 9, 10
40.	Placer	NE	10	10	35	5,960	Pgb	Channel gravels	About 1 acre placered	Small	—
41.	Name unknown	SE	10	10	35	6,000	Pgb	In metagabbro	Two short adits	Unknown	—
42.	Name unknown	NW	11	10	35	5,760	Pgb	Zone of chalcedonic quartz veinlets in serpentine. Strikes N. 80° W.	Shallow pit	None	—
43.	Name unknown	NW	11	10	35	5,760	KJi	Limonitic quartz vein in quartz diorite	About 200 ft of workings	Unknown	—
44.	Ross Gulch	NE	11	10	35	5,800	ŦPer	Limonitic gouge in silicified chert and argillite	About 500 ft of workings in two adits and a shaft	Small	12 (1-10-03, 1-2-04)
45.	Bluebird	SW	11	10	35	5,960	Pgb, sp	Free gold in serpentine and gabbro	Shallow shaft	Small	—
46.	Repete	NE	16	10	35	6,280	Pmv, sp	Quartz veins in greenstone and serpentine	Numerous pits and trenches	Unknown	—
47.	Baird	NE	16	10	35	6,240	sp	Chalcedony stringers in serpentine. Strike NW.	Shallow pits	Small	13
48.	Name unknown	NW	15	10	35	6,240	Pmv, Pgb	In metagabbro and greenstone	Shallow shaft	None	—
49.	Name unknown	NW	15	10	35	6,320	Pmv	In greenstone	Short adit and shallow pits and trenches	None	—
50.	Phoenix	NW	15	10	35	6,040	sp, Pgb	Quartz vein with free gold and chalcopyrite in serpentine	About 1,500 ft of workings in three adits	Small	1, 3, 4, 5, 6, 9
51.	Don Juan	NE	15	10	35	5,800	sp, Pgb	Quartz vein with dolomite, free gold, chalcopyrite, and galena in serpentine and gabbro	About 1,000 ft of workings	Small, prior to 1916	1, 3, 4, 5, 6, 9
52.	Greenhorn No. 3	NE	15	10	35	5,680	sp	In serpentine	Adit about 100 ft long	None	—
53.	Name unknown	NE	15	10	35	5,920	sp	In serpentine	Short adit	None	—
54.	Name unknown	SW	15	10	35	6,040	sp	Limonitic zone with quartz veinlets in serpentine	Short adit and trenches	None	—
55.	Golden Eagle	SE	15	10	35	5,400	sp, ŦPa, Pgb	Quartz veins with dolomite, free gold, chalcopyrite, and galena in serpentine. Strikes NW., dips 50°-70° NE.	Three adits totaling about 2,700 ft	Estimated $75,000 prior to 1916	2, 3, 4, 5, 6, 9
56.	Placer	SW	15	10	35	5,520	Qal	Channel gravel	Small area mined	Small	—
57.	Morning Glory?	SE	15	10	35	5,280	sp, ŦPa	Quartz veins in serpentine along contact with argillite and graywacke	Reportedly 1,200 ft of workings	Small	6
58.	Name unknown	SW	14	10	35	5,280	sp, ŦPa	Quartz veins in serpentine along contact with argillite and graywacke	Two short adits	Unknown	—
59.	Gold Coin?	SW	14	10	35	5,320	sp, ŦPa	Quartz veins in serpentine along contact with argillite and graywacke	About 1,000 ft of workings	Unknown	6, 12 (10-29-04)
60.	Name unknown	NW	14	10	35	5,880	sp, ŦPa	Limonitic quartz vein with talc and carbonate in serpentine	50-ft adit and shallow shaft	None	—
61.	Dawson Placer	NW	22	10	35	5,360	Qal	Channel gravels	Small area mined	Small	—
62.	Triangle Dredge Placer	— SW	23 24	10 10	35 35	5,000 —	Qal	Channel gravels of Slab Creek and Burnt River	About 1½ mi of channel worked by dragline dredge	Small	10
63.	Gold Bullion	NE	28	10	35	5,400	sp, Pgb	Silicified metagabbro	50-ft shaft	None	1, 5
64.	Listen Lake, Pine Tree Group	SW	27	10	35	5,280	sp, Pgb	Pyrite and chalcopyrite in silicified metagabbro	Shaft with about 300 ft of workings	Unknown	1, 2, 4, 5, 6, 9
65.	McNamee Gulch placers	SW	27	10	35	5,120	Qal	Channel gravels	About 1 acre mined	Small	1
66.	Blackbird?	NW	9	10	35½	5,400	ŦPer, sp	Quartz vein in argillite along contact with serpentine. Strikes N. 50° W.	Adit about 400 ft long	Unknown	12 (6-21-02, 1-12-04)
67.	White Elephant	SE	9	10	35½	5,360	ŦPer, sp	Composite quartz vein up to 4 ft wide in argillite along contact with serpentine	Short adit	Unknown	12 (6-21-02, 1-12-04)
68.	Richmond	SW	10	10	35½	5,400	ŦPer	Narrow quartz veins and limonitic shear zones in silicified chert and argillite. Strike N. 15°-20° W.	Three short adits and a 300-ft shaft	Unknown	1, 12 (6-21-02)
69.	Bonanza	SW	10	10	35½	5,600	ŦPer, sp	Composite quartz vein up to 40 ft wide in carbonaceous argillite. Strikes N. 55° W., dips steeply SW.	About 18,000 ft of workings extending to a depth of 1,200 ft below the outcrop	Est. $1,750,000 mainly during 1892-1904	1, 2, 3, 4, 5, 6, 9
70.	Keystone Belle	SE	10	10	35½	5,400	ŦPer	Quartz stringers in carbonaceous argillite	Adit totaling about 200 ft	None	1, 12 (6-21-02)
71.	Sarah	SE	10	10	35½	5,400	ŦPer	In chert and argillite	Short adit	None	—
72.	Crown Point	SE	10	10	35½	5,000	ŦPer	In chert and argillite	Short adit	None	—
73.	Name unknown	SW	11	10	35½	5,120	Tvs	Opaline quartz in a shear zone about 2 ft wide in Tertiary volcaniclastic sediments. Strikes N. 40° E.	Shallow pits	None	—
74.	Parkerville	SE	16	10	35½	5,000	Tg	Buried Tertiary channel gravels	About 5 acres placered	Est. $150,000	1, 2, 4
75.	Lucky Boy	SE	16	10	35½	4,960	Pmv	In metavolcanics	Shallow shaft	Unknown	10
76.	Name unknown	NE	15	10	35½	4,880	ŦPer, sp	Composite quartz vein in argillite parallels serpentine contact. Strikes N. 70° E.	Shallow pits and trenches	None	—
77.	Brandy	SE	15	10	35½	4,800	Pam	Quartz vein in epidote amphibolite	Short adit	Unknown	—
78.	Diamond Jack, Winterville Placers	NW	14	10	35½	4,760	Tg	Tertiary channel gravels	Several acres placered	Est. $55,000 prior to 1900	1, 2, 4, 12 (12-28-01)
79.	Winterville Chrome	NW	14	10	35½	4,800	sp	Chromite lens in serpentine	Small pit	About 18 tons of chromite	10
80.	Golden Boy, Winterville Placers	NE	14	10	35½	4,840	Tg	Tertiary channel gravels	About 1 acre placered	Production included under No. 78	1, 2, 4
81.	Chrome prospect	NW	22	10	35½	4,960	sp	Chromite lens in serpentine	Small trench	None	—
82.	Tobias Placer	SE	22	10	35½	4,480	Qal	Quaternary bench gravel	Small area placered	Small production in 1982	—
83.	Sunshine Dredge Placer	NE	26	10	35½	4,360	Qal	Quaternary channel gravels along North Fork of Burnt River and extending into the adjacent Whitney quadrangle	About 4 mi of stream channel worked by bucketline dredge	4,457 oz Au and 902 oz Ag during 1941-42 and 1945-46	9, 10
84.	Name unknown	NW	10	11	35	4,720	Ts	Small area of chalcedonic and opaline quartz in andesite	Small prospect pits	None	—

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Table 2. CHEMICAL ANALYSES OF ROCK SAMPLES*

Sample	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	¼	Sec.	T.(S.)	R. (E.)	Sample description	Map unit
A.	46.84	16.52	1.83	5.03	5.76	0.12	11.79	4.93	1.28	5.27	0.64	SE	34	9	35	Pillow basalt	Pmv
B.	43.80	16.49	1.48	7.60	8.71	0.29	11.20	7.67	0.26	2.35	0.14	SW	12	10	35	Mafic greenstone	Pmv
C.	67.12	17.49	0.62	1.45	1.66	0.04	4.52	0.77	1.95	4.21	0.17	SE	27	9	35½	Aphanitic dacite	Trd
D.	52.89	16.57	1.58	4.37	5.00	0.15	8.03	6.16	1.23	3.49	0.54	SW	1	11	35	Basalt (basal Strawberry)	Ts

* All analyses by X-ray fluorescence performed at Washington State University, Pullman, Washington, under the direction of Dr. Peter Hooper. Analyses are normalized on a volatile-free basis, and total Fe is expressed as Fe_2O_3/FeO at an arbitrarily fixed ratio.
All analyses are in weight percent.

Geologic Cross Sections

The subsurface representation of the ophiolite and associated rock units in the cross sections is largely schematic.