

DESCRIPTION OF MAP UNITS

- Qe SAND (Quaternary)—Tan to white well-sorted windblown sand. Includes sand dunes.
- Qal ALLUVIUM (Quaternary)—Unconsolidated poorly bedded gravel, sand, and minor silt. Includes talus, stream, and terrace deposits.
- Qc CONGLOMERATE (Quaternary)—Weakly consolidated to unconsolidated conglomerate and pebble sandstone. Surface of unit is commonly mantled by lag gravel of pebble to cobble size fragments.
- Qu UNDIFFERENTIATED ALLUVIUM (Quaternary)—Unconsolidated to weakly consolidated poorly bedded gravel, sand, and silt. Includes talus, stream, terrace, and playa deposits and sand dunes.
- Q7c CONGLOMERATE (Quaternary and Tertiary)—Weakly consolidated poorly bedded conglomerate and sandstone. Locally includes fanglomerate and lag gravel.
- Tb2 BASALT FLOWS (Miocene)—Dense black aphyritic to weakly porphyritic basalt flows. Flows are locally vesicular and weather dark red brown to tan. Phenocrysts consist of up to 1 percent plagioclase in an aphanitic groundmass. Flow breccia present at base of flow locally. Brown to tan pumice lapilli tuff and gray vitric air-fall ash occur locally at the base of the unit. At the top of the unit red-brown basaltic ash beds are present.
- Ttc TROUT CREEK FORMATION (Miocene)—Formation, first described by Smith (1927), consists of gray to tan tuffaceous sandstone and siltstone and shale interstratified with white to tan diatomite. Pumice lapilli tuff and tuffaceous conglomerate are locally present.
- Thr HORNBLENDE RHYOLITE (Miocene)—Purple gray to brown porphyritic rhyolite flows with 5 percent smoky quartz phenocrysts, 1 to 14 percent sanidine phenocrysts, 2 percent hornblende and minor magnetite and apophane. Glassy groundmass is devitrified and contains abundant spherulites.
- Tr RHYOLITE (Miocene)—Red-gray to white porphyritic rhyolite flows with 1 to 14 percent sanidine and minor magnetite, quartz, and apophane. Glassy groundmass is devitrified but locally black vitrophyre is present at the base of flow. Flow foliation and alignment of vesicles is common. Locally silicified and argillically altered.
- Ti INTRUSIVE DIABASE (Miocene)—Dark-gray porphyritic diabase dikes and plugs. Plagioclase phenocrysts comprise 3 percent of rock and occur in crystalline groundmass of plagioclase, pyroxene, and olivine.
- Ttw TUFF OF WHITEHORSE CREEK (Miocene)—Unwelded to densely welded peraluminous ash-flow tuff composed of several ash flows as well as interstratified air-fall tuffs. Basal ash flow consists of light-gray to white unwelded aphyritic tuff with abundant white to gray pumice in a light-gray ash matrix. Lithic fragments are locally abundant. Above this basal ash flow are beds of air-fall tuff consisting of interstratified lapilli-rich and ash-rich layers. Above air-fall tuff is an ash-flow tuff which is unwelded near base and densely welded at top; locally it is columnar jointed. Ash-flow tuff is light gray, aphyritic, and grades upward into a dark-gray to black pumice rich at base; it grades upward into a dark-gray to black unwelded tuff containing abundant lithic fragments. Upper welded zone is tan to brown and contains as much as 1 percent phenocrysts of sanidine. Lithophyal zones are common near base of welded zone. Tuff locally rests on basalt, which in places is so obscured by talus from tuff that locally it may be included in this unit. K-Ar date on sanidine of 15.0±0.3 m.y. (Rytuba and others, 1981).
- Tpb PORPHYRYTIC BASALTIC ANDESITE (Miocene)—Dark-gray to gray-green basaltic andesite flow with 13 percent plagioclase phenocrysts. Weathers tan to brown.
- Tb1a BASALT AND SEDIMENTS (Miocene)—Black, aphyritic basalt flows, locally amygdaloidal, and associated agglomerate. Uppermost flow in unit has large, up to 3 m long, glassy labradorite phenocrysts. Sediments and tuffs interbedded with the unit. Tb1s consist of light-gray water-laid tuff and brick-red tuffaceous sediments. Locally conglomerate and pebble sandstone, primarily composed of basalt fragments, are present.
- Tttu TUFF OF TROUT CREEK MOUNTAINS UPPER MEMBER (Miocene)—Light-gray to gray-green porphyritic rhyolite ash-flow tuff which is moderately welded. Phenocrysts consist of 4 percent subhedral to euhedral sanidine 0.25 to 2 mm in length, 1 percent subhedral to anhedral aegirine 0.5 to 1.5 mm in length and minor subhedral olivine in a vitric groundmass.
- Ttt TUFF OF TROUT CREEK MOUNTAINS (Miocene)—Unwelded to densely welded vapor-phase recrystallized comenditic ash-flow tuff. Included in the unit is unwelded tan to yellowish air-fall and pumice lapilli tuffs with a total thickness of 1 to 4 m which occur below the base of the tuff. The tuff is a simple cooling unit. Basal part consists of unwelded to partly welded porphyritic gray tuff containing 26 percent anorthoclase phenocrysts, 1 percent feldspar, and 1 percent quartz. Ilmenite occurs as inclusions in clinopyroxene and all phases contain apatite inclusions. Sparse phenocrysts of magnetite and hypersthene also are present. Tuff grades upward into black vitrophyre 1/2 to 1 m thick. Above the vitrophyre tuff is densely welded green, blue-green, to green-gray porphyritic tuff containing vapor-phase cavities developed within partly flattened tan to white pumice up to 5 cm long. Lithic fragments of andesite and basalt up to 4 cm in length are abundant locally. Phenocrysts of anorthoclase vary from about 5 to 25 percent and locally up to 3 percent smoky quartz phenocrysts are present. Tuff is locally columnar jointed. K-Ar date on sanidine of 15.9±0.3 m.y. (Greene, 1976).
- Tto TUFF OF OREGON CANYON (Miocene)—Unwelded to densely welded light-blue-green to white comenditic tuff. Gray to tan air-fall tuffs occur at the base of the unit and are overlain by gray basal vitrophyre 1 to 2 m thick. Above vitrophyre, tuff is blue green to white and vapor-phase recrystallized. Phenocrysts consist of 5.5 percent sanidine, 4 percent quartz, and 1 percent arfvedsonite; they occur in a finely crystalline groundmass of quartz, potassium feldspar, and arfvedsonite. Arfvedsonite gives rock a blue-green color and indicates rhyolite is peraluminous. Flattened pumice fragments are replaced by quartz, potassium feldspar, and arfvedsonite. Lithic fragments of porphyritic andesite are locally abundant. Top 10 m of tuff is red brown and unwelded to partly welded. Dark-gray to brown partly flattened pumice as much as 10 cm long occur in a red-brown ash matrix. Lithic fragments are abundant in this upper zone. Phenocrysts in top 10 m of tuff consist of 4 percent sanidine, 1.3 percent quartz, and 0.2 percent clinopyroxene. Transition zone from blue-green lower part of tuff to upper red-brown part is gradational over approximately 2 m and consists of red-brown pumice in a green matrix. Unit forms cliffs and locally displays columnar jointing. K-Ar date on sanidine of 16.1±0.2 m.y. (E. H. McKee, written comm., 1981).
- Trf RHYOLITE AND BRECCIA (Miocene)—Medium-light-gray to grayish-blue porphyritic rhyolite flow and flow breccia. Phenocrysts comprise 17 percent of rock and consist of 13 percent subhedral to euhedral sanidine and 2 percent magnetite, all in an aphanitic groundmass. Texture generally shows well-developed flow banding with trachytic flow texture.

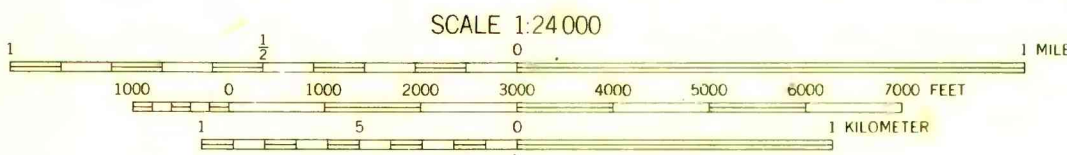
REFERENCES

- Greene, R. C., 1976, Volcanic rocks of the McInerney caldera, Nevada-Oregon: U.S. Geological Survey Open-File Report 76-253, 50 p.
- Rytuba, J. J., Minor, S. A., and McKee, E. H., 1981, Geology of the Whitehorse caldera and caldera-fill deposits, Malheur County, Oregon: U.S. Geological Survey Open-File Report 81-1092, 19 p.
- Smith, W. D., 1927, Contributions to the geology of southeastern Oregon: Journal of Geology, v. 35, p. 421-441.



Based on U.S. Geological Survey 1978

- CONTACT—Dashed where approximately located
- FAULTS—Dotted where concealed and dashed where uncertain. Ball and bar on downthrown side
- STRIKE AND DIP OF BEDS



CONTOUR INTERVAL 20 FEET

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

GEOLOGIC MAP OF THE RED LOOKOUT BUTTE QUADRANGLE, HARNEY COUNTY, OREGON,

By

James J. Rytuba, Scott A. Minor, Robert J. Miller, and Dean B. Vander Meulen