GEOLOGY OF THE BURNS AREA, OREGON

Geology covering the Burns, Calamity Butte, Harney, and West Myrtle Butte, Oregon 15 minute quadrangles.

Description of map units

Qal Alluvium - Recent. Poorly to well-sorted sand, gravel and silt. Confined to larter valley bottoms and the Harney Basin.

Qf Fan Deposits - Recent. Poorly sorted mixtures of gravel and sand. Locally includes talus.

Qls Landslide Deposits - Recent. Landslide block of welded tuff and sediments. Only deposit mapped is in Silvies River Canyon (Sec.s 6-7, T.22S., R.30E.).

Qs Sedimentary Deposits - Mostly unconsolidated silt and clay, generally pale brown. Sand and gravel locally present; coherent where diagenetically altered or cemented by caliche. Mostly lacustrine, in part fluviatile.

QTtg Terrace gravels - Unconsolidated deposits of gravel and sand Predominately consists of rounded pebbles of welded tuff and coarse sand with occasional pebbles of quartzite. Restricted primarily to thin layers (<20 ft) capping some of the low hills north of Burns.

Qts Tuffaceous Sediments - Well-consolidated to unconsolidated tuffaceous sandstones and siltstones with minor lenses of conglomerate. Typically yellowish-brown to reddish, ranging in thickness from a few feet to over 100 ft in some areas bordering the Harney Basin (Sec. 10, T.22S., R.32E.). Predominately composed of weathered Double O Ranch welded tuff with lessor amounts of Prater Ck., and Devine Canyon welded tuff. Includes some of the sedimentary part of the Harney Formation of Piper, Robinson and Park (1939) in the south and southwest corner of the map area (T.24-25 S., R.29-31 E.).

Qtb Basalts - Mostly diktytaxitic, commonly vesicular but locally dense or platy nonporphyritic, fine-grained basalt, typically composed of plagioclase 50 percent, olivine 10 percent, augite 25 percent, magnetite 2 percent, void 10 percent; ophitic texture. In places, consists of several thin flows separated by thin sedimentary layers. Exposed on table west of Sagehen Valley (Secs. 9-11, T.24S., R.29E.). Age, 2.4 m.y. based on potassium-argon dating of one sample from Wrights Point (T.24-25 S., R.31E.) which is near the top of the unit.

QTmv Mafic vent complexes - Basalt and andesite scoria, cinders, agglomerate, and thin flows, commonly reddish; forms lava cones and small shield volcanoes. Exposed in gravel pits along hwy 20, 4 miles south of Burns (Sec. 2-3, T.24S., R.30E.).

Tdo Double "O" Ranch welded tuff - Pumaceous, crystal bearing, welded ash-flow tuff, well exposed across the central and western portions of the mapped area. Reference section is on a southwest facing fault scarp (SW¼ Sec. 23, T.27S., R.28E.) about 5 miles south-southeast of the Double O Ranch. This section is 210 feet thick and consists of a basal vitric zone, medium to dark gray, porous, containing abundant pumice and about 4 ft thick, grading upward into a brownish-gray dense devitrified zone about 8 ft. thick. Above this is a light-brownish-gray devitrified lithophysal zone 190 ft thick which grades upward into a pale brown dense devitrified zone about 8 ft thick which contains abundant pumice. This exposure characterizes the unit in most exposures although the average thickness is 100-150 ft. Tuffs in all zones contain less than 1 percent phenocrysts. Phenocrysts are alkali feldspar, plagioclase, quartz, and augite; devitrified groundmass is alkali feldspar, crystobalite, tridymite, and quartz. A possible vent area for the tuff is located about 35 miles southwest of Burns along Buzzard Creek (T.28S., R.28E.) (Walker, 1969). Age of the unit based on two potassium-argon dates is about 6 m.y. (J.C. VonEssen and J. C. Engels, 1967; and J. C. Engels, 1970).

Ta Andesite - Dark-gray with brownish mottling, aphanitic; less than 1 percent phenocrysts of plagioclase and augite. Several thin flows, total thickness a few tens to 100 ft. Present between Little Emigrant Creek (T.20S., R.27E.) and Burns. Underlies welded tuff of Double O Ranch (Good exposure of contact in gravel pit 5 miles north of Burns (SW¼ Sec. 14, T.22S., R.30E.)). Locally overlies welded tuff of Devine Canyon.

Tst Tuffaceous sedimentary rocks - Typically pale brown to yellowish-gray, well to semi-consolidated tuffaceous sedimentary rocks and tuffs, poorly stratified; commonly consists of poorly sorted mixture of pumice, scoria, other rock fragments, plagioclase grains, and glass shards in clay matrix; locally light gray to white, well stratified, and consisting of fresh pumice and glass shards. Mostly lacustrine, in part fluviatile and air-fall origin. Thickness ranges from a few feet to a few hundred feet, depending on local topography during intervals between eruptions of major tuff units. Poorly fossiliferous. Age, mostly early and middle Pliocene. Correlative, in part with Idaho Group of Malde and Powers, (1962).

Twtp Prater Creek - Pale-reddish-brown welded ash-flow tuff, no phenocrysts, little pumice, nearly all devitrified. Typical section consists of a dense basal zone, very rarely vitric,

a highly inflated lithophysal central zone, and a dense upper zone. The lithophysal zone of this unit is identical to the lithophysal zone of the Double O Ranch tuff in hand specimens. In several locations, primarily those east of Devine Canyon the lithophysal zone is absent and the tuff is light-gray and finely porous. The Prater Creek welded tuff is the least widespread of the three welded tuff units with an areal extent of about 250 square miles. Age 6-9 m.y.

Tr Rhyodacite - Medium to light-gray, pale red or pale brown; commonly streaked, mottled, or flow banded; aphanitic or vitrophyric, locally vesicular. Some flows aphyric, others porphyritic containing as much as 20 percent plagioclase phenocrysts and sparse phenocrysts of augite, pypersthene, and magnetite. Groundmass composed of alkali feldspar, plagioclase, silica minerals, and glass. Forms several prominent hills (Burns Butte, T.23S., R.30E. and an unnamed hill Sec. 13, T.21S., R.31E.). Age, 7.82±0.26 m.y., potassium-argon date by J. C. Engels (1970).

Tdv Devine Canyon welded tuff - Crystal-rich welded ash-flow tuff, extensively exposed over the mapped area, and the most widespread in Oregon, covering approximately 7,200 square miles. The best exposures occur along Poison Creek and Devine Canyon (north central portion of the map) where the unit is 80 ft thick. It is a light-gray to light greenish-gray vitric tuff that is moderately dense and coherent with abundant flattened pumice. In thicker sections a devitrified zone may be present which is medium-light to greenish-gray, generally streaked and mottled; commonly dense but may have large lenticular voids, and weathers to small bits. Lithophysae zones are absent and rock fragments are sparse and mostly of andesite. The tuff ranges thickness from a few feet near its margins to just over 100 ft north of Burns. A possible source area may be a few miles east of Burns buried beneath sedimentary deposits (Robert C. Green, 1973). Potassium-argon dating gives the tuff an age of 9.2±0.6 m.y. (Robert C. Green, 1973). The large areal extent coupled with the relatively thin welded tuff unit suggest a rather featureless topography at the time of extrusion. Phenocrysts of alkali feldspar comprise from 1 to 29 percent of the tuff, increasing from the bottom to the top of the unit. Quartz phenocrysts comprise 1 to 7 percent of the tuff. The groundmass of the devitrified tuff is composed of alkali feldspar, crystobalite, quartz, pyroxene, magnetite, ilmenite, and rarely tridymite. The vitric groundmass is composed of glass shards, alkali feldspar, minor quartz and rare pyroxene, magnetite, and ilmenite.

Tts Tuffaceous sediments - Tuffaceous sedimentary rocks and pumaceous tuffs, white to light shades of yellow, brown, or gray, mostly fine-grained and poorly to moderately well bedded. Contains local beds of pebble conglomerate. Glass fragments, commonly fresh, in some beds, devitrified. Flood-plain or

shallow lake deposits. Includes welded tuff in canyon of Silvies River (T.19-20S., R.30-31E.) and Poison Creek (Sec.13, T.21S., R.30E., and Secs. 7 and 18, T.21S., R.31E.). Underlies welded tuff of Devine Canyon. Correlative in part with Mascall Formation (Merriam, 1901) and Juntura Formation of Shotwell (1963). Includes rocks of late Miocene and early Pliocene age.

Tba Basalt and andesite - Medium to dark-gray, commonly streaked or mottled with lighter grays or browns. Aphanitic to fine-frained, generally nonporous. Mostly aphyric, locally contains a few percent plagioclase phenocrysts or less than 1 percent olivine phenocrysts. Fresh or slightly altered. Tuffaceous sedimentary rocks locally interbedded. Consists of many flows, each a few feet to several tens of feet thick. Maximum total thickness of unit about 2000 ft., in mapped area 1000-1500 ft. Unit interfingers with and/or is equivalent to flows of Columbia River Basalt mapped to the north (Walker and others, 1967; Swanson, 1969; and Brown and Thayer, 1966). In the northeast portion of the map the unit is partly equivalent to the Strawberry Volcanics of Brown and Thayer (1966). Northeast of the map area the unit includes the unnamed igneous complex of Haddock (1967) and of Kittleman, in part, and others (1965, 1967), equivalent to their Owyhee Basalt. Southeast of the mapped area it is continuous with the Steens Basalt of Fuller (1931). Mapped as units Tfb, Tbf, and Taf on Adel quadrangle (Walker and Repenning, 1965) and on Jordan Valley quadrangle (Walker and Repenning, 1966). Potassium-argon dating in various portions of the unit give ages from 12 to nearly 20 m.y.

Js Sedimentary rocks - Exposed only in the northwest corner of the mapped area. Fossiliferous dark-gray siltstones and shales, some sandstones and conglomerate with basalt boulders, and minor amounts of limestone. Ammonites give a Sinemurian (Early Jurassic) age. Mapped as the Donovan Formation by Lupher (1941). Just north of map area (Sec. 29, T.19S., R.31E.) limestone with plycatostylid fragments and siltstone occur (H. J. Buddenhagen, 1971).

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PLATE II

EXPLANATION

PLIOCENE & PLEISTOCENE & HOLOCENE

- Qal Alluvium
- Qf Fan Deposits
- Landslide Deposits
- Qs Sedimentary Deposits
- QTtg Terrace Gravels
- QTs Tuffaceous Sediments
- Qtb Basalts
- QTmv Mafic Vent Complex

Faults — dotted where concealed; downthrown block; dashed where inferred

PLIOCENE

- Tdo Double "O" Ranch Welded Tuff
- Ta Andesite
- Tst Tuffaceous Sediments
- Twtp Prater Creek Welded Tuff
- Tr Rhyodacite
- Tdv Devine Canyon Welded Tuff

MIOCENE

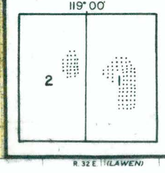
- Tts Tuffaceous Sediments
- Tba Basalt and Andesite

JURASSIC

- Js Sedimentary Rocks

- Vents for mafic rocks
- Vents for silicic rocks
- Altered areas--silicification and/or hydrothermal alteration
- Strike & dip

Map references



1. Robert C. Greene, George W. Walker, and Raymond E. Corcoran (Geologic map of the Burns quadrangle, Oregon) 1972.

2. Robert C. Greene (Preliminary geologic map of the Burns and West Myrtle Butte 15-minute quadrangles, Oregon) 1972. Modified Oct. 1975, J.E. Deymonaz

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BURNS OREGON GEOLOGIC MAP