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Reconnaissance Geologic Map of the Dodson Butte 7.5' Quadrangle, Oregon

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Introduction

The Dodson Butte 7.5 minute quadrangle lies almost entirely within the northernmost Klamath Mountains province although a small corner includes Mesozoic accretionary complex of the southeastern part of the Oregon Coast Ranges (Figure 1). Rocks of the Klamath Mountains province that lie within the study area include ultramafic, mafic, intermediate and siliceous igneous types (Diller, 1898, Ramp, 1972, Ryberg, 1984). Similar rock associations that lie to the southwest yield Late Jurassic and earliest Cretaceous radiometric ages (Dott, 1965, Saleeby, et al., 1982, Hotz, 1971, Harper and Wright, 1984). These rocks, which are part of the Western Klamath terrane (Western Jurassic belt of (Irwin, 1964), are considered to have formed within an extensive volcanic arc and rifted arc complex (Harper and Wright, 1984) that lay along western North America during the Late Jurassic (Garcia, 1979, Garcia, 1982, Saleeby, et al., 1982, Ryberg, 1984). Imbricate thrust faulting and collapse of the arc during the Nevadan orogeny, which ranged in age between about 150 to 145 Ma in the Klamath region (Coleman, 1972, Saleeby, et al., 1982, Harper and Wright, 1984) was syntectonic with, or closely followed by deposition of the volcano-lithic clastic rocks of the Myrtle Group. The Myrtle Group consists of Late Jurassic and Early to middle Cretaceous turbidity and mass flow deposits considered to be either arc basin and/or post-orogenic flysh basins that were syntectonic with the waning phases of arc collapse (Imlay et al., 1959, Ryberg, 1984, Garcia, 1982, Roure and Blanchet, 1983). The intermediate and mafic igneous rocks of the Rogue arc and the pre-Nevadan sedimentary cover (the Galice Formation, (Garcia, 1979)) are intruded by siliceous and intermediate plutonic rocks principally of quartz diorite and granodiorite composition (Dott, 1965, Saleeby, et al., 1982, Garcia, 1982, Harper and Wright, 1984). The plutonic rocks are locally tectonized into amphibolite, gneiss, banded gneiss and augen gneiss. Similar metamorphic rocks have yielded metamorphic ages of 165 to 150 Ma (Coleman, 1972, Hotz, 1971, Saleeby, et al., 1982, Coleman and Lanphere, 1991)

The Jurassic arc rocks and sedimentary cover occur as a tectonic outlier in this region (Figure 2) as they are bound to the northwest and southeast by melange, broken formation and semi-schists of the Dothan Formation and Dothan Formation(?) that are considered part of a Late Mesozoic accretion complex (Ramp, 1972, Blake, et al., 1985) The plutonism that accompanied arc formation and tectonic collapse of the arc does not intrude the structurally underlying Dothan Formation, indicating major fault displacements since the Early Cretaceous. Semischistose and schistose rocks of the accretion complex have yielded metamorphic ages of around 125-140 Ma where they have been studied to the southwest (Coleman and Lanphere, 1971, Dott, 1965,

Coleman, 1972). These rocks were unroofed and unconformably overlain by marine deposits by late early Eocene time (Baldwin, 1974).

The early Tertiary history of this region is controversial. The most recent interpretation is that during the Paleocene and early Eocene the convergent margin was undergoing transtension or forearc extension as suggested by the voluminous extrusion of pillow basalt and related dike complexes to the northwest (Wells, et al., 1984, Snavely, 1987). This episode was followed shortly by thrust and strike-slip faulting in the late early Eocene (Ryberg, 1984).

During the Eocene, the Mesozoic convergent margin association of arc, clastic basin, and accretion complex was partly unroofed and faulted against early Cenozoic rocks of the Oregon Coast Ranges (Ramp, 1972, Baldwin, 1974, Champ, 1969, Ryberg, 1984). Faults that are typical of this period of deformation include high-angle reverse faults with a very strong component of strike-slip displacement characterized by the low-angle rake of striae. Thrust and oblique-slip faults are ubiquitous in early Tertiary rocks to the northwest (Ryberg, 1984, Niem and Niem, 1990).

The Mesozoic and early Cenozoic arc and forearc rocks are unconformably overlain to the east by the late Eocene and younger, mainly continental fluvial deposits and pyroclastic flows of the Cascade arc (Peck, et al., 1964, Baldwin, 1974, Walker and MacLeod, 1991). Minor fossiliferous shallow marine sandstone is locally present. The volcanic sequence consists of a homoclinal section of about 1 to 2 kilometers of andesitic to rhyolitic flows and ash flow tuff. The section is gently east-tilted and is only slightly disrupted by NE trending faults with apparent normal separation, thus putting a cap on the timing of much of the faulting seen in this area.

Previous Work

The first major geologic study of the Roseburg and adjacent areas was carried out by Diller (1898) and Wells and Peck (1961) who mapped the basic geologic framework of the region. More detailed mapping relevant to this map area was carried out through a concerted effort at University of Oregon, Eugene under the direction of E.M. Baldwin. Thisresulted in the completion of three Masters theses (Hixson, 1965, Champ, 1969, Seeley, 1974) which helped refine major unit boundaries (See index to geologic mapping). The map area included in a regional compilation of Douglas County by Ramp and Beaulieu (Ramp, 1972) was primarily generalized from Diller (1898). Ryberg (1984) and Niem and Niem (1990) provided major regional tectonic syntheses concerning the evolution of early Tertiary sedimentary rocks of the region.

This present study was undertaken as part of a contribution to 1:100,000 mapping of the Roseburg 30' x 60' quadrangle. Field studies were made during the middle summer months of 1992, 1993 and 1994. The mapping was greatly facilitated by the numerous logging roads that lace the national forests lands,

otherwise heavy vegetation and deep weathering of the region limit access to rock exposure.

Several important modifications to the regional mapping (Walker and MacLeod, 1991) have resulted from this investigation. The nature of the contact relations between the major units within Klamath lithologies has been investigated in greater detail.. Many of the boundaries were found to be dominantly major fault zones. Overtuning of the arc complex occurred near the Klamath basement-Dothan contact. The sense of displacement on the major bounding structures was also given careful attention. The contacts between Rogue volcanic and hypabyssal rocks with the underlying plutonic rocks are characterized by semi-ductile to cataclastic fabrics of low greenschist facies that are generally devoid of silicification, siliceous veins or aplitic dikes suggesting the contacts are faults and the faults are post-plutonic. The major structural boundary between the Rogue arc complex and underlying Dothan rocks includes a variety of ductile high strain rocks, schists and semi-schists that occur within a kilometer or two wide zone that is low-angle, east-dipping and west-verging.

Stratigraphy

The rocks of the area can be separated into three major sequences: 1.) the Late Jurassic Rogue arc complex including a younger plutonic complex of the Klamath Mountains, 2.) a Late Jurassic? and Early Cretaceous sedimetary cover; and 3.) the melange, broken formation and semi-schists of the Late Mesozoic accretion complex represented by the Dothan Formation.

The Rogue arc complex is an igneous complex that includes predominantly hornblende gabbro, hornblende diorite, and diabase rocks that are commonly slightly to strongly foliated. The extrusive part of the complex is characterized by quartz keratophyre, keratophyre, plagioclase porphyry flows, pillows, hypabyssal dikes and flows, flow breccia, and minor tuffaceous sedimentary rock. These rocks are commonly tectonically brecciated and have undergone low to moderate greenschist facies metamorphism. They are locally intruded by quartz diorite, granodiorite and similar siliceous plutonic rocks that are generally unfoliated or weakly foliated near the margins. Metamorphosed country rock that was gabbroic to intermediate in composition is preserved; however, along many contacts the primary intrusive contact between the 'older arc' and younger siliceous plutonic rock is obscured by faults that are interpreted as low-angle normal faults.

The Rogue arc complex is unconformably overlain by unmetamorphosed clastic rocks of the Myrtle Group which includes the Riddle and Days Creek Formations that in this area span the Early Cretaceous (Berriasian to late Albian). The basal part of the section includes tuffaceous sedimentary rocks and volcanic breccia suggesting that deposition was in part coeval with arc volcanism. Conglomerates in the lower part of the section are rich in mafic to intermediate volcanic clasts and dark chert or

cherty tuff, and lack any significant component of plutonic rock.

The Dothan Formation is considered to be part of a subduction-accretion complex that formed during latest Jurassic and Cretaceous time (Ryberg, 1984, Blake, et al., 1985). It consists of very low grade, sub-pumpellyite faces and pumpellyite bearing, graywacke and semischitose graywacke with very minor scattered blocks of greenstone, chert and limestone, including blocks of shallow water, Upper Cretaceous Whitsett Limestone (Diller 1898).

Structure

The structural grain of the region, as well as this quadrangle, is strongly dominated by north 30° to 40° east trending faults and lithic belts. Structures include high-angle reverse faults and associated overturned folds, deeper-seated north-west verging brittle faults and ductile shear zones within the plutonic complex. In addition, high-angle faults with apparent normal separation down-drop unmetamorphosed rock of the Mesozoic forearc basin.

Many of the low-angle contacts between the Rogue arc complex and underlying plutonic rocks are interpreted as low-angle normal faults. Mineralization associated with this extensional faulting is typically of the lower greenschist facies with abundant secondary epidote, albite and pumpellyite. The normal faults and breccias zones are not invaded by magmatic fluids suggesting they are not syntectonic with plutonism but were postplutionic Structural pendants of Rogue arc are locally strongly hydrothermally altered. Leaching of the mafic phases is common, particularly adjacent to high-angle normal fault zones.

The high-angle normal faults are locally characterized by broad breccia zones and more rarely by intrusion of Tertiary andesitic and basaltic dike rocks. Siliceous quartz diorite dikes are found locally within the extrusive and intrusive parts of the Rogue complex. Such dike rocks have not been observed in the overlying Mesozoic sedimentary rocks.

The Dothan and Klamath rocks are separated by the Dodson Butte thurst. The Dodson Butte thrust is a major northeast trending zone of imbricate faults that emplaces the Rogue arc complex and associated rocks over the Dothan complex. The igneous complex is locally overturned and in the adjacent quadrangle to the west is pentratively deformed into strongly banded and foliated gneiss, augen gneiss and mylonitic rock along major northwest verging thrust faults to the northeast in the Dixonville quadrangle.

Metamorphism

Regional, contact, and hydrothermal metamorphic rocks are present within the study area. Regional metamorphic rocks include low to moderate-grade greenschist facies rocks of the arc complex that are inferred to have formed during the Nevadan orogeny of Late Jurassic age. Metamorphic rocks that formed during this event, which represents imbrication of the Late Jurassic arc, include gneiss, banded

gneiss, augen gneiss and mylonitic rocks that are inferred to have originated at middle crustal levels (Champ, 1969, Hotz, 1971, Garcia, 1982, Coleman and Lanphere, 1991). These rocks are typically upper greenschist and lower amphibolite facies.

Retrograde assemblages with epidote-pumpellyite and lower greenschist facies assemblages are commonly associated with cataclastic fabrics particularly near the major fault contacts which bound the arc complex units. This post plutonic semi-brittle deformation may be post-Nevadan and Cretaceous in age. The cataclastic fabrics are inferred to have formed during extension associated with uplift and unroofing of the plutonic rocks.

In addition, low-grade schists and semi-schists of prehnite-pumpellyite facies are characteristic of the higher-grade accretion complex rocks of the Dothan Formation in this area. These rocks generally structurally underlie major thrust faults that have the Rogue arc complex in the hanging wall. Schists of the Dothan Formation are generally partially reconstituted meta-sedimentary rocks with a moderately developed pressure solution fabric and incipient development of chlorite, white mica, ± pumpellyite. Detrital tourmaline, epidote, biotite, muscovite, hornblende and pyroxene are common constituents of these rocks, but are not indicative of the metamorphic grade.

Hornfelsic hornblende gabbro rocks are locally present near the margins of large quartz diorite and granodiorite plutons. Hydrothermal alteration is widespread near high-angle faults that cut the Rogue volcanic rocks.

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Dodson Butte 1:24,000 Quadrangle

DESCRIPTION OF MAP UNITS

Qfl **Fluvial deposits (Holocene and Pleistocene?)**--Fluvial deposits consistsing of poorly sorted, well rounded to subrounded; boulders cobbles pebbles grit, sand, and silt; unconsolidated material

Qls **Landslide deposits (Holocene and Pleistocene?)**--chaotic mixture of clay, silt, sand, gravel and boulders of weathered and fresh bedrock composition

Qal **Alluvial deposits (Holocene and Pleistocene?)**--Alluvial deposits consisting of unconsolidated or poorly consolidated; angular and sub angular cobbly, pebble, gravel, and sand sized clasts, commonly reddish or yellow orange weathering

Qcl **Colluvium (Holocene and Pleistocene?)**--unconsolidated or poorly consolidated; angular and sub angular cobbly, pebble, gravel, and sand sized clasts, commonly reddish or yellow orange weathering

Accretion Complex

KJd **Dothan Formation (Early Cretaceous and Late Jurassic)**--slate fine and medium grained metagreywacke, argillaceous mudstone, and minor pebble and cobble conglomerate. Graywackes are micaceous quartzofeldspathic to lithic composition. Unit is moderately to strongly foliatedwith zeolite to pumpellyite facies metamorphism. Regionally the unit contains blocks of accreted oceanic crust that includes greenstone, pillow basalt, radiolarian chert, and shallow marine algal limestone, pelagic foraminiferal limestone (Whitsett Limestone of Diller 1898) and block of metamorphic rocks including blueschist, metatuff, metachert and amphibolite. The Dothan is probably a post Nevadan highly folded trench and trench-slope basin deposit that is post Nevadan and metamorphosed during the Cretaceous

KJd2 **Dothan Formation Semischistose (Early Cretaceous and Late Jurassic)**--Slate, phyllitic siltstone, fine and medium grained metagreywacke, weakly to moderately foliated where thick-bedded, semi-schistose where thin-bedded, pumpellyite facies metamorphism?, argillaceous mudstone with minor pebble and cobble conglomerate. Graywackes are micaceous feldspathic to lithic in composition, locally contains abundant detrital epidote, white mica, chlorite and lessar biotite, rare detrital quartzo-feldspathic clasts containing fine-grained euhedral brown hornblende; locally very orange-red weathering

Western Klamath terrane
Jurassic continental arc complex and sedimentary cover

Myrtle Group (middle Cretaceous to Late Jurassic)--Mudstone, sandstone and conglomerate of the Days Creek and Riddle Formations. These units represent forearc or foreland mass flow and channel deposits that were deposited during the waning stages of the Nevadan orogeny or just following. The Riddle Formation unconformably overlies Rogue Volcanics

KJr **Riddle Formation (Early Cretaceous and Late Jurassic?)**-Well bedded pebble to cobble conglomerate, volcanic sandstone and shale turbidites and mass flow deposits; locally interbedded tuffacous sedimentary rock and volcanic breccia near the base; conglomerate (JKrc) dominated by volcanic and dark chert rich clast types; unit is unmetamorphosed and moderately indurated; locally silicified with quartz viens near major faults, thin-bedded siltstone and shale slightly concretionary, locally very fossiliferous and bioturbated. Conglomerate clasts are very well-rounded, poorly sorted and consist predominantly of mafic and felsic volcanic rock, dark to gray chert, diabase and volcanic sandstone; dark green-brown weathering. Contains abundant *Buchia uncitoides* of Lower Cretaceous, (Berriasian age) and possible *Buchia elderensis* or *piochii* of Upper Jurassic, Tithonian age (William Elder, Per. comm.)

Jrv **Rogue Volcanics? (Late Jurassic)**--Extrusive and hypabyssal intrusive rocks of mafic and intermediate composition, commonly very fine grained aphyric or plagioclase-pyroxene porphyry, extrusive rocks commonly amygduloidal, extremly rare thin bedded intermediate and siliceous, thin-bedded, crystal-lithic, plagioclase phyric tuffs locally. Dense, dark green where fresh, weathers rusty, locally contains pillow and pillow breccia texture. Locally hydrothermally altered and leached of mafic constituents

Jri **Mafic intrusive unit (Late Jurassic?)**--Intrusive rocks, intermediate to mafic in composition (gabbro and diorite) here considered to be part the intrusive equivalent rocks to the Rogue volcanics, generally medium to coarse grained, metamorphosed to pumpellyite facies and lower greenschist facies. Unit tends to weather dark rusty red

Jrs **Serpentinized ultramafic rock (Jurassic?)**--commonly foliated dark to pale green serpentinized peridotite and serpentinite, where fresh weathers rusty, locally occurs in fault zones

Jrvs **Schistose Rogue Volcanics? (Late Jurassic)**--Extrusive and hypabyssal intrusive rocks of mafic and intermediate composition with penetrative cataclastic and/or schistose fabric, commonly very fine grained aphyric or plagioclase-pyroxene porphyry, extremly rare thin bedded intermediate and siliceous, thin-bedded, crystal-lithic, plagioclase phyric tuffs locally. Dense, dark green where fresh, weathers rusty, locally contains pillow and pillow breccia texture; metamorphosed to pumpellyite facies and/or lower greenschist facies, epidote, chlorite, sphene-bearing assemblages

Intrusive Complex

KJi **Intrusive rocks (Cretaceous and/or Jurassic)**--Granodiorite, quartz diorite, diorite and hornblende diorite, generally massive, unfoliated or only very weakly foliated, white weathering, very deeply weathered; commonly friable; commonly uralized or weakly metamorphosed to lower greenschist facies; quartz diorite includes accessory apatite, sphene, trace white mica, green chlorite, and epidote. Green hornblende and biotite are the principal mafic phases. Quartz ranges from a few percent to about 30 percent

Metamorphic rocks

KJag **Augen gneiss (Cretaceous? and/or Jurassic)**--Strongly foliated, banded medium-crystalline rock consisting predominantly of hornblende-rich and plagioclase ± quartz rich layers. This rock appears to be tectonized hornblende diorite that has undergone cataclasis and sub-mylonitic deformation.

mm **Metamorphic complex, (Jurassic or older)**--includes mafic foliated rocks that were country rock to Late Jurassic and/or Cretaceous intrusives (JKi); locally includes rock with tectonite fabrics that range from weakly foliated to augen gneiss, commonly lineated, nubbly whitish weathering, commonly deeply weathered and dissaggrated; locally cut by abundant siliceous and keratophyric dikes

Fossil Localities in the Dodson Butte quadrangle

Map No.	Fossil Name	Age
93 DB-3	*Buchia* cf. *uncitoides*	Berriasian
93 DB-4	*Buchia uncitoides*	Berriasian
93 DB-5	*Buchia uncitoides*	Berriasian
3-92 DB	*Buchia* c.f. *uncitoides*	Berriasian
7-92 DB	*Buchia* c.f. *uncitoides*	Berriasian
8-92 DB	*Buchia uncitoides*	Berriasian

***Fossils identified by Will Elder**

Map Symbols
Attitudes

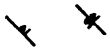
Bedding: Inclined, vertical, horizontal

Bedding: Top direction known

Bedding: Overturned

Crumpled or disrupted bedding

Foliation: Inclined, vertical, horizontal

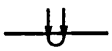


Foliation and Bedding: Inclined and vertical

Brittle or cataclastic foliation

Dike orientation: Inclined and vertical

Lineation

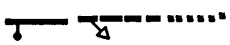


Overturned syncline, dashed where approximately located

Overturned anticline, dashed where approximately located

Contacts

Depositional contact: dashed where approximately located, dotted where concealed, queried where inferred



Fault, ball on down-thrown block, open arrow indicates dip where known, lineation symbol indicates rake of striae, dashed where approximately located, dotted where concealed, queried where inferred

Thrust fault, teeth on hanging-wall, dashed where approximately located, dotted where concealed, queried where inferred

Low-angle normal fault, dashed where approximately located, dotted where concealed, queried where inferred

Small faults with known dip

Strike-slip fault, paired arrows indicate relative displacement