Reconnaissance Geologic Map of the Dixonville 7.5' Quadrangle, Oregon

(geology pamphlet)

By
Angela S. Jayko[1] and Ray E. Wells[1]

Digital Database
By
R.W. Givler[1], J.S. Fenton[1], and M. Sinor[1]

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[1]U.S. Geological Survey, 345 Middlefield Rd. MS-975, Menlo Park, CA 94025

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A. S. Jayko and R.E. Wells
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Introduction

The Dixonville 7.5 minute quadrangle is situated near the edge of two major geologic and tectonic provinces the northernmost Klamath Mountains and 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 Upper Jurassic and Lower 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

(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 a 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 late 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 slightly disrupted by NE trending faults with apparent normal separation.

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 that resulted 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 the 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.

Objectives

This study was undertaken as part of a contribution to 1:100,000 mapping of the Roseburg 30' x 60' quadrangle (Wells, et al., 2000). The purpose of this mapping was to assess the oil and gas potential of the Tertiary Tyee basin (see Ryu, et al., 1996). 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.

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

Stratigraphy

The rocks of the area can be separated into three major sequences that are characteristic of the tectonic provinces they represent. From oldest to youngest, as described above are the Late Jurassic Rogue arc complex including a younger plutonic complex of the Klamath Mountains; the melange, broken formation and semi-schists of the Late Mesozoic accretion complex represented by the Dothan Formation; and the Paleocene and early Eocene forearc basin deposits of the Oregon Coast Ranges.

The Rogue arc complex consists of 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 gabbroic to intermediate country rock is locally preserved.

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, Late Cretaceous Whitsett Limestone (Diller 1898).

Rocks of the Oregon Coast Ranges are represented by Umpqua Group including the Eocene White Tail Ridge and Tenmile Formations, the Bushnell Rock unit, and Siletz River basalts (Ryu, et al., 1992). The White Tail Ridge Formation consists of shallow marine, cross-bedded and massive planar bedded, fossiliferous sandstone and mudstone. It is underlain by submarine fan sequence and associated basaltic rocks. The rocks are part of a regionally extensive regressive sequence of submarine fan to nonmarine fluvial deposits that ranges from Paleocene to middle Eocene age (Ramp, 1972, Baldwin, 1974, Ryberg, 1984, Niem and Niem, 1990, Ryu, et al., 1992). The base of the section is considered to have been deposited in a transtensive forearc basin setting while the upper part of the section was emergent and likely syntectonic with transpressive deformation.

Structure

The structural grain of the Mesozoic rocks in the region, as well as this quadrangle, is strongly dominated by north 30° to 40° east trending faults and lithologic belts. The major faults separating Mesozoic units represent upper- and middle-crustal brittle structures including high-angle reverse faults and associated overturned folds, and deeper-seated north-west verging brittle and ductile shear zones within the plutonic complex.

The structures associated with Tertiary rocks are northerly striking and include imbricate thrusts and folds that are principally late Eocene age. The Tertiary and Dothan rocks are separated by the Dixonville thrust, the Dothan and Klamath rocks are separated by the Dodson Butte thrust. 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.

The contact between rocks of the Jurassic Rogue arc complex and the underlying siliceous plutonic rocks is typically characterized by a broad zone of cataclastic deformation, the hanging wall and foot-wall rocks are commonly strongly foliated as well. Mineralization associated with this deformation is typically of the lower greenschist facies with abundant secondary epidote, albite and pumpellyite. These faults and breccias zones are not invaded by magmatic fluids, suggesting they are not syntectonic with the plutonism but were subsequent. The structural pendants of Rogue arc are locally strongly hydrothermally altered. Leaching of the mafic phases is common, particularly adjacent to the high-angle normal faults.

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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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.

Tdi **Tertiary intrusive rocks (Oligocene?)--** Dominantly glomero-porphyritic clinopyroxene porphyritic intrusive with diabasic texture, + plagioclase phyric dikes that cut Mesozoic basement and basal Tertiary section; may be feeder dikes to Ta unit on adjacent Lane Mountain Quadrangle to east (Jayko, 1996); contact aureoles in Mesozoic rocks developed around largest of dikes.

Umpqua Group

Twt **White Tail Ridge Formation (Lower Eocene)--** Thick-bedded, medium- to coarse-grained, mica-bearing lithic-feldspathic sandstone with minor interbedded mudstone; abundant diverse fauna locally, mollusk, gastropod, and echinoid bearing; some coarse and carbonaceous siltstones. Some beds display large-scale trough cross-bedding, some planar bedded. Conglomerate, pebble conglomerate sandstone and shale; bedded, large-scale low angle trough crossbeds; conglomerate is generally matrix supported. Clasts rounded to well rounded, very poorly sorted, poorly to moderately-well graded beds; locally, large continuous burrows in olived-colored siltstone interbeds, very dark lithic, friable, blue-gray coarse sandstone to grit. Generally pale buff to orange weathering. Mainly shallow marine upper fan to delta complex. Unit is locally unconformable on the Tenmile Formation (unit Tm). Planktonic foraminifera are assigned to zone CP10 and coccoliths assigned to the CP-11 coccolith stages (see Ryu and others, 1992 for details).

Tm **Tenmile Formation (Lower Eocene)--** Well-bedded and indurated dark gray, rhythmically thin-bedded, medium-grained, deep marine lithic turbidites and mudstone. Locally concretionary and foram-bearing. Tenmile Formation conformably overlies Bushnell Rock Formation northeast of Dixonville. Foraminiferal and coccolith assemblages indicate formation is early Eocene (Penutian foraminiferal stage and CP10-11 coccolith stages; see Ryu and others, 1992).

Tbr **Bushnell Rock Formation (Lower Eocene)--** Indurated medium gray pebble to boulder conglomerate containing rounded to subrounded quartz, volcanic, and metamorphic clasts in thick- to very thick-bedded framework-supported, graded and reverse graded beds. Locally basaltic conglomerate at base, derived from underlying Siletz River Volcanics; grades upsection into pebbly, coarse-grained lithic sandstone with minor bathyal foraminifer-bearing, dark gray, laminated mudstone interbeds containing coccoliths referred to CP 10 zone (D. Bukry, written communication, 1993). Facies represents deep-marine submarine channels or canyon fills and upper submarine fan valley sequences (Ryu and others, 1992).

Bushnell Rock formation locally divided into:

Tsc **Slater Creek Member (Lower Eocene)--** Shallow-marine, fine-grained, thick-bedded to massive gray-green to pinkish-buff, bioturbated lithic feldspathic sandstone with minor dark gray mudstone partings, polymict conglomerate lenses, and massive hackly sandy mudstone. Contains locally abundant broken fossil mollusks, worm tubes, scattered pebbles, mudstone rip-ups, and carbonized wood. Unit conformably overlies the conglomerate facies of the Bushnell Rock Formation in Singleton Valley and is inferred to be early Eocene in age based on stratigraphic position and molluscan assemblage (L. Marincovich, written comm., 1992).

Tbrm **Debris flow deposit (Lower Eocene)--** Boulders (up to 4m in diameter) and cobbles of greenstone (gs), tectonized greywacke, basalt, and chert derived from Dothan complex and Siletz River Volcanics in matrix of muddy sandstone. Interfingers with conglomerate, basaltic mudflow breccia, and medium-bedded lithic turbidite sandstone and siltstone to form lenticular channel deposit near the base of the Bushnell Rock Formation.

Tsr **Siletz River Volcanics (Lower Eocene and upper Paleocene)--** Dark gray to brownish black, amygdaloidal (dominantly smectite, zeolite, calcite, and quartz), tholeiitic submarine basalt pillow and sheet flows. Locally includes diabase, pillow breccia, mudflow breccia, and dark brown, locally fossiliferous basaltic tuffaceous siltstone and sandstone interbeds near the top of the section. A steeply dipping flow sequence at least 4 km thick is exposed in the Roseburg anticlinorium west of Dixonville. Sparse laminated mudstone interbeds 10 km to west along Umpqua River Highway contain coccoliths referred to the late Paleocene (D. Bukry, written communication, 1993). Eight km to west of quadrangle, flows interfinger upsection with overlying lower Eocene Bushnell Rock Formation.

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.

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.

Accretion Complex

KJd **Dothan Formation (Lower Cretaceous and Upper Jurassic)—** Slate, fine and medium grained metagreywacke, moderately to strongly foliated, zeolite to pumpellyite facies(?) metamorphism. Also includes argillaceous mudstone, and minor pebble and cobble conglomerate. Graywackes are micaceous quartzofeldspathic to lithic composition. Regionally the unit contains blocks of accreted oceanic crust that includes greenstone (gs), pillow basalt, and radiolarian chert (ch), and shallow marine algal limestone, pelagic foraminiferal limestone (ls) (Whitsett Limestone of Diller 1898) and blocks of metamorphic rocks including blueschist, metatuff, metachert and amphibolite. The Dothan is interpreted to be a highly folded trench and trench-slope basin deposit that post-dates the Nevadan orogeny and was metamorphosed during the Cretaceous.

KJd2 **Semischistose Dothan Formation (Lower Cretaceous and Upper 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 lesser biotite, rare detrital quartzo-feldspathic clasts containing fine-grained euhedral brown hornblende; locally orange-red weathering. Includes blocks of greenstone (gs) and serpentinite (sp).

Western Klamath terrane

Jurassic continental arc complex

Jrv **Rogue Formation? (Upper Jurassic)--** Extrusive and hypabyssal intrusive rocks of mafic and intermediate composition, commonly very fine grained aphyric or plagioclase-pyroxene porphyry, extrusive rocks commonly amygdaloidal, 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.

Jrvs **Schistose Rogue Formation (Upper 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, containing epidote, chlorite, sphene-bearing assemblages.

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

Jris **Schistose mafic intrusive unit (Upper Jurassic?)--** Intrusive rocks, intermediate to mafic in composition (gabbro and diorite, minor quartz diorite), generally medium to coarse grained, metamorphosed to pumpellyite facies and/or lower greenschist facies, epidote, chlorite, sphene-bearing assemblages; penetrative cataclastic and or schistose fabric. 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.

sp **Serpentinite –** Occurs locally in fault zones.