STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

GEOLOGIC MAP OF THE CAMAS VALLEY QUADRANGLE, DOUGLAS AND COOS COUNTIES, OREGON

1993

Base map by U. S. Geological Survey
CONTROL BY . . . . . USGS, NOS/NOAA
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN 1984
FIELD CHECKED . . . . . 1988 MAP EDITED 1990
PROJECTION . . . . . LAMBERT CONFORMAL CONIC
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR . . . . . ZONE 10
10,000-FOOT STATE GRID TICKS . . . . . OREGON, SOUTH ZONE
UTM GRID DECLINATION . . . . . 0°28' WEST
1990 MAGNETIC NORTH DECLINATION . . . . . 18° EAST
VERTICAL DATUM . . . . . NATIONAL GEODETIC VERTICAL DATUM OF 1929
HORIZONTAL DATUM . . . . . 1927 NORTH AMERICAN DATUM
To place on the predicted North American Datum of 1983, move the projection lines as shown by dashed corner ticks (21 meters north and 97 meters east)
There may be private inholdings within the boundaries of any Federal and State Reservations shown on this map
No distinction made between houses, barns, and other buildings

NORTH

OREGON
QUADRANGLE LOCATION

SCALE 1:24 000
KILOMETERS · METERS · MILES · FEET

CONTOUR INTERVAL 40 FEET
SUPPLEMENTARY CONTOUR INTERVAL 20 FEET
To convert feet to meters multiply by .3048
To convert meters to feet multiply by 3.2808

Geology by Gerald L. Black and George R. Priest,
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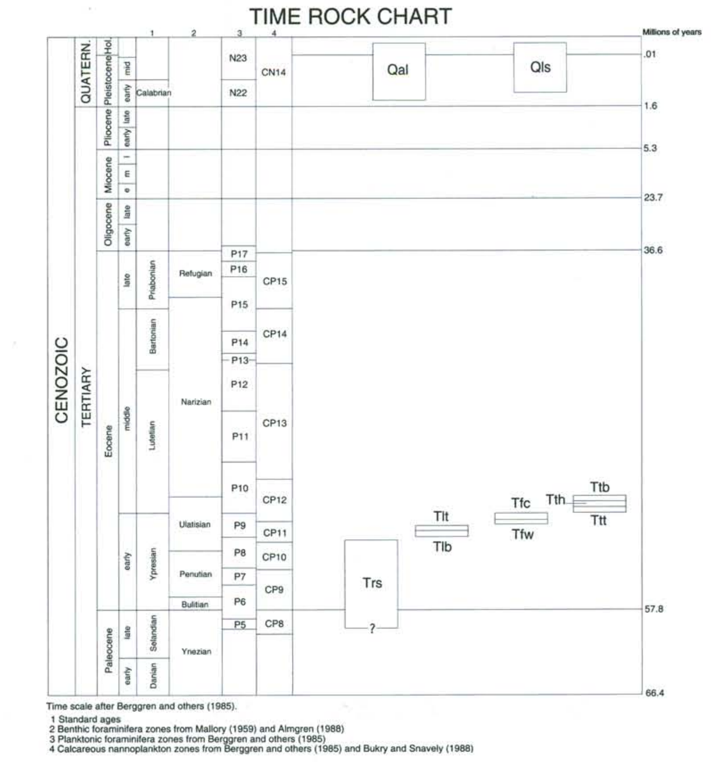
Field work conducted July-November, 1990

Reviewed by E.M. Baldwin, University of Oregon; Peter Hales, Weyerhaeuser Corporation; Alan R. Niem and Wendy A. Niem, Oregon State University; and C.M. Molenaar, U.S. Geological Survey

Cartography by Paul E. Staub

TIME ROCK CHART



Time scale after Berggren and others (1985).
1 Standard ages
2 Benthic foraminifera zones from Mallory (1959) and Almgren (1988)
3 Planktonic foraminifera zones from Berggren and others (1985)
4 Calcareous nannoplankton zones from Berggren and others (1985) and Bukry and Snavely (1988)

EXPLANATION

Qal

Quaternary alluvium (Holocene and Pleistocene)—Unconsolidated clay, silt, sand, and gravel deposited in channels and on the flood plains of modern streams. Attitudes depicted in alluvium are from exposures of underlying bedrock units that are too small to be shown at the map scale

Qls

Landslide deposits (Holocene and Pleistocene)—Clay, silt, sand, and gravel chaotically mixed with angular blocks of weathered bedrock

ANGULAR UNCONFORMITY

Tyee Formation (middle Eocene; Ulatisian)

Ttb

Baughman Member of Baldwin (1974) (middle Eocene; Ulatisian)—Sandstone interbedded with lesser amounts of siltstone and mudstone. Sandstone is bluish-gray, micaceous, lithic-arkosic wacke that is medium to coarse grained, locally pebbly, moderately sorted, and well indurated. Mottled color due to zeolitization is common. Porosity is low, owing to the degree of induration and amount of clay and zeolite matrix cement (typically 20-40 percent). Amalgamated sandstone beds are very thick to massive and channelized to lens shaped. Typically parallel bedded with minor basal scour. Large-scale trough and planar cross-beds are common. Carbonized wood and plant debris is abundant along bedding planes. Sandstone units are cliff formers. Thin-bedded sequences consist of fine-grained sandstone, siltstone, and mudstone. Maximum thickness of the Baughman Member in the map area (top eroded) is approximately 500 m (1,650 ft). Total thickness of the member is approximately 760 m (2,500 ft) at the type section 17 km (10.6 mi) to the north. Interpreted as a sand-rich prograding deltaic system by Chan and Dott (1983, 1986), Heller and Dickinson (1985), and Molenaar (1985)

LOCAL DISCONFORMITY

Tth

Hubbard Creek Member of Baldwin (1974) (middle Eocene; Ulatisian)—Dark- to medium-gray mudstone interbedded with micaceous siltstone and lesser amounts of very fine-grained thin-bedded micaceous sandstone. Beds range in thickness from 0.5 mm to 8-9 cm (0.02-3.5 in.). Horizontal lamination is the dominant sedimentary structure, but ripples and small-scale cross-laminations are common in sandstone and siltstone beds. Sandstone beds are composed of base-missing Bouma turbidite sequences (T_{bcde}). Small pelecypod molds and casts occur in the mudstone, but the strata are generally not bioturbated. Carbonized-plant debris and mica are abundant along bedding planes. The Hubbard Creek Member at the type section 17 km (10.6 mi) to the north is approximately 120 m (400 ft) thick (Baldwin, 1974). The unit maintains a relatively consistent 120-m thickness throughout the study area. Unit **Tth** consists mostly of Mutti-Ricci Lucchi turbidite Facies G (Mutti-Ricci Lucchi, 1972; 1975), with lesser amounts of Facies F and minor amounts of Facies D. Unit **Tth** is interpreted as a slope facies (Molenaar, 1985)
Ttt

Ttt

Tyee Mountain Member of Baldwin (1974) (middle Eocene; Ulatisian)—Light-gray to bluish-gray, brown-weathered, micaceous, lithic-arkosic wacke in amalgamated sandstone beds up to 20 m (66 ft) thick. Sandstone is fine to medium grained, poorly sorted, and well indurated with ubiquitous coarse sand-sized flakes of biotite and muscovite. Porosity is low owing to the degree of induration and amount of clay matrix (typically 20-40 percent). Beds are locally graded. Flute, groove, and load casts are present, and mudstone ripup clasts are abundant in the upper parts of sandstone beds. Carbonized wood and plant debris is common. The Tyee Mountain Member is 365 m (1,200 ft) thick in the northern part of the map area at Bennett Rock, where it forms near-vertical cliffs. It thins rapidly to the south, and, where present in the southern part of the map area, it is less than 100 ft (30 m) thick. Locally, it may pinch out entirely. At the type section 35 km (21.75 mi) to the north, the Tyee Mountain Member is 760 m (2,500 ft) thick (Baldwin and Perttu, 1989). In the map area, the contact with the underlying Camas Valley Member of the Flournoy Formation appears to be gradational. Baldwin (1974) and Baldwin and Perttu (1989) suggested that an unconformity separates the Tyee Mountain and Camas Valley Members, while Molenaar (1985) interpreted the relationship as conformable. Unit **Ttt** consists of Mutti-Ricci Lucchi Facies B. At the type section, the Tyee Mountain Member is interpreted by Chan and Dott (1983) as an inner sandy submarine-fan facies. They noted, however, that there appeared to be a line source for the deposits rather than a single large submarine canyon. Heller and Dickinson (1985) called this facies a submarine ramp turbidite complex

Flournoy Formation (upper lower Eocene; Ulatisian)

Tfc
Tfcs

Camas Valley Member of Baldwin (1974) (upper lower Eocene; Ulatisian)—Largely slope- and low hill-forming, unit **Tfc** consists of massive dark-gray to gray-green mudstone with minor siltstone and very fine-grained sandstone. Increasing amounts of thin-bedded, fine-grained, micaceous, arkosic sandstone occur toward the top of the member. These sandstone beds represent the lower parts of incomplete (base-missing) Bouma sequences (i.e., T_{bcd}, T_{cde}). Horizontal lamination is the dominant sedimentary structure. Mudstone is commonly massive, with a tendency to spheroidal weathering. Small calcareous concretions are abundant. Locally bioturbated and slump folded. Contains sparse molluscan fossils. Total thickness is approximately 500 m (1,650 ft).

Unit **Tfcs** is a lenticular body of interbedded pebbly sandstone, sandstone, and siltstone. Sandstone is nonmicaceous, medium-grained to granular lithic arkosic wacke and arenite. Bed thicknesses range from a few centimeters to 1.5 m (4.9 ft). Parallel bedding dominates, but hummocky cross-stratification is relatively common. Coarser beds are burrowed. Siltstones have undergone extensive disruptive bioturbation. Carbonized-plant debris is abundant. The transition to overlying mudstone is abrupt. The entire sequence is less than 30 m (100 ft) thick and thickens and coarsens upward.

The contact of the Camas Valley Member with the overlying Tyee Formation appears to be gradational, as explained in the section on the Tyee Mountain Member (unit **Ttt**). The contact with the underlying White Tail Ridge Member of the Flournoy Formation appears conformable throughout most of the area, but there seems to be a local unconformity between the two members in the vicinity of the Reston fault (Black, 1990).

Most of the Camas Valley Member consists of Mutti-Ricci Lucchi Facies G with minor Facies F. Unit **Tfcs** was deposited in storm-dominated, relatively shallow water and is interpreted as transition to lower-shoreface facies. The encasing mudstones are interpreted as outer-shelf to upper-slope deposits. The upper part of the member, where base-missing Bouma sequences are more common, is interpreted as an upper-slope facies

Tfw
Tfwf

White Tail Ridge Member of Baldwin (1974) (upper lower Eocene; Ulatisian)—Exposures of the White Tail Ridge Member in the Camas Valley quadrangle consist of approximately 70 percent medium-grained lithic arkosic arenite and lithic arkosic wacke, 20 percent siltstone and mudstone, and 10 percent conglomerate. Thin coal beds are also present. The thick sandstone that dominates the member forms Camas Mountain, a gently westward-dipping homoclinal ridge.

Several subfacies occur in unit **Tfw**. The most common rocks are medium blue-gray, brown-weathering, fine-grained lithic arkosic arenite with lesser lithic arkosic wacke. Clay matrix varies from 5 to 15 percent. Lithic rock fragments comprise about 15 percent, and the remaining fragments are quartz and feldspar. Muscovite comprises less than 1 percent of the rock and is present in the form of tiny flakes less than 0.5 mm (0.02 in.) in diameter. The sandstone is moderately well sorted and generally moderately strong though locally friable. Framework grains are angular to subangular, and the porosity is moderate to low. Beds are tabular to slightly lenticular, range from 0.25 to 1 m (0.8-3.3 ft) in thickness, and are commonly amalgamated. Discontinuous mudstone interbeds are generally less than 1 mm (0.04 in.) thick. Vertical burrows, local thin, discontinuous, broken molluscan shell-hash layers, and hummocky cross-bedding are common. Interpreted as a shallow-marine transition to lower-shoreface facies.

Lithologically similar, medium- to coarse-grained sandstone beds containing moderate to abundant vertical to subvertical burrows and abundant trough cross-beds cap much of the dip slope of Camas Mountain south of Camas Mountain State Park. They form massive beds up to 5 m (16.4 ft) in thickness. These rocks are interpreted as an upper-shoreface facies. They are particularly well exposed in a quarry in SW¼ sec. 21, T. 29 S., R. 8 W., and in road cuts along Highway 42 at the south end of the quadrangle.

Marine siltstone sequences 10-20 m (32.8-65.6 ft) thick are mottled dark greenish gray and usually interbedded with lesser amounts of fine-grained lithic arkosic wacke. Beds are locally parallel laminated and ripple cross-laminated with bedding thicknesses from 1 to 4 mm (0.04-0.16 in.). Flaser, wavy, and lenticular beds are all abundant, though sedimentary structures are generally destroyed by bioturbation. Calcareous concretions are present. Carbonized-wood debris and small molluscan fossils are common. Interpreted as interdistributary bay facies. Excellent exposures occur in road cuts along Highway 42 at the southwest end of the quadrangle.

Unit **Tfwf** consists of pebble conglomerate interbedded with pebbly sandstone, granular to medium-grained sandstone, siltstone, and mudstone. Sandstone and conglomerate are dark gray to greenish gray when fresh but weather to brown. Massive mudstone is dark gray when fresh to light gray green when weathered. Most of the coarser rocks are lithic arkosic wackes, but arenites are common. Sorting varies from poor to moderate. Framework grains are angular to subangular, and the porosity is moderate. Clasts in the conglomerate typically range from 2 mm to 2 cm (0.08-0.8 in.) in diameter, are rounded to well rounded, and commonly have a reddish-brown oxidized coating. The clasts consist of approximately 65 percent chert and quartzite, 25 percent metamorphic rock fragments, and 10 percent graywacke. Mudstone ripup clasts are common. Bed thicknesses range from 2 to 3 cm to 7 m (1 in. to 23 ft). The thickest beds (conglomerate) tend to be massive, but normal grading and clast imbrication are common. Bases of sandstone and conglomerate beds are often deeply scoured. Both trough and tabular cross-beds are common. Lateral accretion surfaces are present. Beds form thinning- and fining-upward sequences. Siltstone and mudstone intervals are typically poorly exposed slope formers. They are poorly bedded to massive and range in thickness from a few centimeters to 3 m (9.8 ft). Thicker intervals contain thin (to 10 cm [4 in.]), wedge-shaped, fine-grained sandstone beds. The poorly developed bedding in the fine-grained deposits may be due to bioturbation by plant roots. Carbonized-plant debris is common, and small rootlets in growth positions occur. Conglomerate and sandstone are interpreted as fluvial channel facies. Massive interbedded siltstone and mudstone are interpreted as overbank deposits. The best exposures of these facies occur along a logging road in NW¼ sec. 34 and SW¼ sec. 27, T. 29 S., R. 8 W.

Thinly laminated, carbonaceous mudstone units and lignitic coal beds ranging in thickness from 0.25 to 1.25 m (0.8-4.1 ft) are interpreted as a swamp/marsh facies. Excellent exposures occur at the south end of the quadrangle in road cuts along Highway 42 (sec. 36, T. 29 S., R. 9 W.). There, the coals contain fragments of Teredo-bored wood and are overlain by shoreface sandstone. Good exposures also occur in the bed of Berry Creek in NE¼ sec. 22, T. 29 S., R. 8 W., along the eastern margin of the quadrangle.

The White Tail Ridge Member of the Flournoy Formation has a thickness of approximately 365 m (1,200 ft) at the type section 11 km (6.8 mi) northeast of the study area (Black, 1990). Within the Camas Valley quadrangle the thickness is highly variable. In the extreme northern part of the area in sec. 21, T. 28 S., R. 8 W., where the member overlies the Reston fault, it is only 10-20 m (33-66 ft) thick. The unit thickens slightly to the south but is still only 90-120 m (300-400 ft) thick over the Camas Mountain anticline. It thickens rapidly south of the Camas Mountain anticline. In the extreme southeast part of the map (sec. 34, T. 29 S., R. 8 W.) it is 886 m (2,900 ft) thick. Whether these variations in thickness represent true unit thicknesses or are in part due to erosion is uncertain. Upper-shoreface sandstone caps the member throughout the study area, but several such facies are present within the member. Also, the conglomerate and pebbly sandstone fluvial facies appears to lens out rapidly northward and to onlap the Camas Mountain anticline. If erosion is not responsible for the thickness variations, then topographic highs existed during deposition of the White Tail Ridge Member.

Baldwin (1974) and Baldwin and Perttu (1989) map the extreme southeast portion of the map (from Berry Creek eastward) as the Olalla Creek Member of the Lookingglass Formation. A detailed examination of these rocks and of rocks mapped as Olalla Creek Member immediately east of the quadrangle shows that (1) they are lithologically identical to the rocks of the White Tail Ridge Member; (2) the same depositional facies are present in both units (i.e., both units contain abundant shallow-marine and nonmarine fluvial facies); and (3) apparent differences in attitude between the two units (i.e., ~10°-14° westward dips in the White Rail Ridge Member on Camas Mountain and much steeper [up to 54° west] dips measured on a ridge 1.1 km [0.7 mi] east of the quadrangle boundary) are the result of drag folding on the Wildlife Safari fault. The Wildlife Safari fault is a major northeast-trending right-lateral strike-slip fault. The surface trace of the fault is 2.1 km (1.3 mi) east of the quadrangle boundary. As there is no reliable means of differentiating between the two members, all rocks previously mapped as the Olalla Creek Member were included in the White Tail Ridge Member. This interpretation is identical to that of Molenaar (1985). Harms (1957) mapped these rocks as a single unit (his Barret Ranch Member of the Umpqua Formation) and in his cross sections interpreted the variations in attitude as the result of drag folding on the Tenmile fault (his name for what is now known as the Wildlife Safari fault).

The White Tail Ridge Member appears to be conformable with the overlying Camas Valley Member, though there is a local angular unconformity between the two members at Reston, about 1.6 km (1 mi) northeast of the study area (Black, 1990). This same local unconformity occurs in the study area along an unnamed northeast-trending ridge in the NE¼ sec. 21, T. 28 S., R. 8 W. The relationship between the White Tail Ridge Member and the Tenmile Member of the Lookingglass Formation is discussed below

DISCONFORMITY(?)

MAP SYMBOLS

Contact—Approximately located

Strike and dip of bedding

Strike and dip of overturned bedding

Normal fault—arrow showing dip; bar and ball on downthrown side; dashed where approximate; dotted where concealed

Thrust fault—teeth on upper plate; dashed where approximate; dotted where concealed

Anticline axis—dashed where approximate; dotted where concealed

Syncline axis—dashed where approximate; dotted where concealed

Overturned syncline—dashed where approximate; dotted where concealed

Dry hydrocarbon exploration hole—Total depth shown in feet

Geochemical sample location—Number corresponds to that used in Niem and Niem (1990), Plate 2 and Table 1a

Discussion of geology and hydrocarbon potential in accompanying text

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Geologic Map of the Camas Valley Quadrangle, Douglas and Coos Counties, Oregon

By G.L. Black and G.R. Priest

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Lookingglass Formation (lower Eocene; Penutian to lower Ulatisian)

Tlt

Tenmile Member of Baldwin (1974) (lower Eocene; Penutian to lower Ulatisian)—Rhythmically interbedded, dark-gray lithic sandstone and mudstone forming incomplete (base-missing) Bouma sequences (T_{bcde}). The upper part of the member consists of massive, spheroidally weathering, gray-green mudstone. Sandstone is thin bedded, fine grained, moderately sorted, and moderately strong to strong. Bed thicknesses range from <1 to 7 cm (0.4-3 in.). The beds have sharp bases and gradational tops. Thicker beds tend to be graded. The Tenmile Member is 730-975 m (2,400-3,200 ft) thick in the type section east of the map area (Baldwin, 1974; Molenaar, 1985). Within the map area, the maximum thickness is about 730 m (2,400 ft).

The lower part of the Tenmile Member consists mostly of Mutti-Ricci Lucchi Facies D. The uppermost part of the member, which is apparently not present everywhere, consists of Facies G. The mudstone-dominated upper part of the unit is best exposed east of the quadrangle along Highway 42. The turbidite-dominated part of the member is interpreted as a slope facies, and the mudstone-dominated upper part is interpreted as an outer-shelf facies.

The relationship of the Tenmile Member to the overlying White Tail Ridge Member depends on which facies of the Tenmile Member is present at the contact. There is a disconformity (locally an angular unconformity?) between the two members where the White Tail Ridge Member overlies the turbidite facies. A good example occurs east of Berry Creek along a ridge 1.1 km (0.7 mi) east of the quadrangle boundary, where shallow-marine shoreface facies sandstone and siltstone of the White Tail Ridge Member overlies a deep-water turbidite channel facies in the Tenmile Member. The White Tail Ridge Member is conformable with, and perhaps interfingers with, the mudstone-dominated upper part of the Tenmile Member (see cross section B-B′). The contact with the underlying Bushnell Rock Member of the Lookingglass Formation is conformable.

The Tenmile Member was interpreted by Ryberg (1984) and Heller and Ryberg (1983) as lower-slope deposits and as an outer shelf to upper-slope facies by Molenaar (1985)

Tlb

Bushnell Rock Member of Baldwin (1974) (lower Eocene; Penutian to lower Ulatisian)—Very thick- to thick-bedded pebble and cobble conglomerate with minor interbedded coarse-grained lithic sandstone, pebbly sandstone, and siltstone. Bedding thicknesses range from 0.5 to 6 m (1.6-19.7 ft). Conglomerate is poorly sorted, clast supported, and moderately strong. Porosity is generally poor. Clasts tend to be discoidal and subrounded to rounded. Compositions are dominantly graywacke (~50 percent), metamorphic (~25 percent), and basaltic (~10 percent) with minor quartz and green, red, and gray chert. Matrix is greenish-gray, fine- to coarse-grained clayey lithic sandstone. Most beds are disorganized, but normal, reverse, and reverse to normal graded beds are present. Cross-bedding occurs in the lower part of the sequence, but turbidites consisting of pebbly to massive lithic sandstone with flute and groove casts occur in the upper part of the unit. Unit **Tlb** is mapped only along the extreme northeast margin of the map area. The Bushnell Rock Member is approximately 250 m (800 ft) thick at the type section at Bushnell Rock (Baldwin, 1974), a short distance east-northeast of the study area. The Bushnell Rock Member has been interpreted as a fan delta (Kugler, 1979) and as a braided stream deposit (Ryberg, 1984) but is a deep-sea canyon-fill or channelized facies in the upper part of the unit (Alan Niem and In-Chang Ryu, Oregon State University, personal communication, 1991). The Bushnell Rock Member is conformable with the overlying Tenmile Member and unconformably overlies Roseburg Formation sedimentary rocks, pillow basalt, and pre-Tertiary rocks at the type section

ANGULAR UNCONFORMITY

Trs

Roseburg Formation of Baldwin (1974) (Paleocene to lower Eocene)—Interbedded turbidite sandstone and mudstone that crop out in the northeast part of the map area.

Unit **Trs** consists of highly deformed, well-indurated, dark-gray lithic wacke, pebbly sandstone, siltstone, and mudstone. Both base-missing (T_{bcde}) and complete (T_{abcde}) Bouma turbidite sequences are common. The Roseburg Formation just northeast of the study area (e.g., at Bushnell Rock) also includes pillow basalt and breccia interbedded with the sedimentary rocks. The Roseburg sedimentary rocks consist of Mutti-Ricci Lucchi Facies C and D. Ryberg (1984) interpreted the Roseburg Formation sedimentary rocks as a submarine fan formed in a subduction zone or trench

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LITHOLOGIC SYMBOLS

(Used in cross sections)

Conglomerate

Massive amalgamated sandstone with discontinuous shale partings

Cross-bedded sandstone

Bedded sandstone

Interbedded sandstone, siltstone, and shale (turbidite sequences)

Siltstone

Mudstone

Unconformity

Gradational contact

GEOLOGIC CROSS SECTIONS

Quaternary units not shown