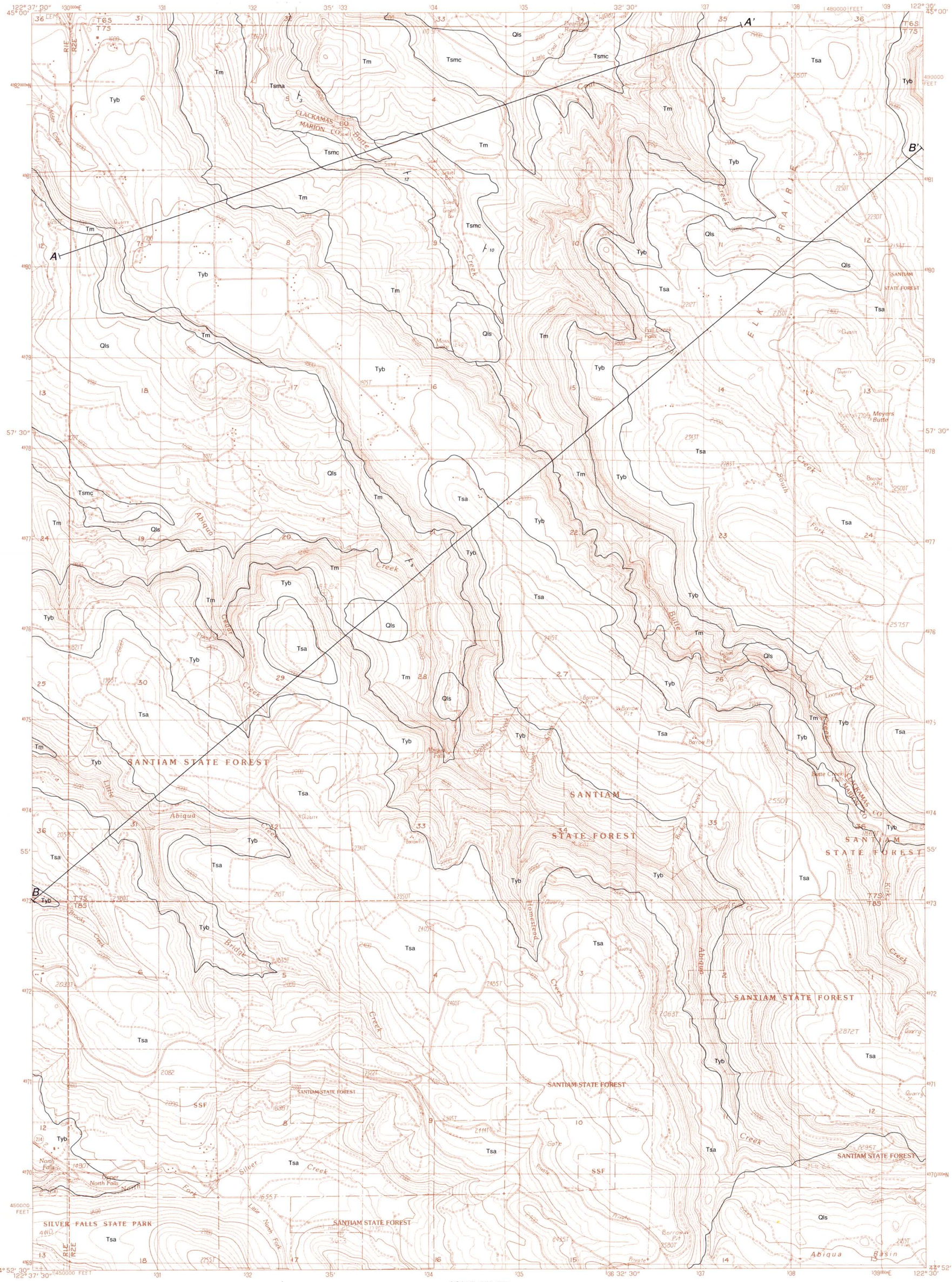
STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

# GEOLOGIC MAP OF THE ELK PRAIRIE QUADRANGLE, MARION AND CLACKAMAS COUNTIES, OREGON

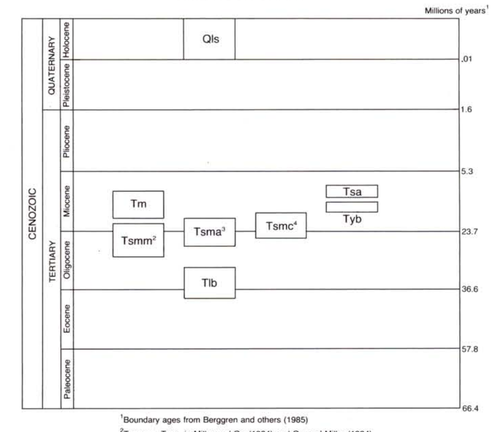
1986

**GMS-51**

Geologic Map of the Elk Prairie Quadrangle, Marion and Clackamas Counties, Oregon
By William N. Orr and Paul R. Miller




## TIME ROCK CHART




[1]Boundary ages from Berggren and others (1985)
[2]Tsmm = $Tom_1$ in Miller and Orr (1984) and Orr and Miller (1984)
[3]Tsma = $Tom_2$ in Miller and Orr (1984) and Orr and Miller (1984)
[4]Tsmc = $Tom_3$ in Miller and Orr (1984) and Orr and Miller (1984)

## EXPLANATION

### SURFICIAL GEOLOGIC UNITS (Quaternary)

Qls — **Landslide deposits (Holocene)** — Poorly consolidated materials derived from indurated, older tuffaceous deposits. Well developed between older, indurated rocks of the Scotts Mills Formation and younger overlying rocks of the Molalla Formation. Unit is up to 50 m thick

### BEDROCK GEOLOGIC UNITS

Tsa — **Sardine Formation (Miocene)** — Hypersthene andesite, andesite, and basaltic-andesite flows, with smaller amounts of volcanic agglomerates, pumice, and aquagene tuffs. Flow rocks are typically platy jointed and medium to dark gray in color. Tuffs are drab green and brown to white or olive gray and of dacitic composition. Unit has been subdivided and mapped in detail by Hampton (1972). Regional distribution of unit in Cascades is treated by Priest in Priest and Vogt (1983)

Tyb — **Yakima Basalt Subgroup of the Columbia River Basalt Group (Miocene)** (following the classification of Swanson and others, 1979; Beeson and Moran, 1979) — Gray to dark-gray, very fine-grained, dense basalt and basaltic andesite. Flows are columnar and, to a lesser degree, hackly jointed. Intrachannel flows fill older Tertiary stream valleys cut into the Scotts Mills anticline and form flat-topped interfluves between the steeply incised stream canyons dissecting the marine sedimentary section. Unit is 0-300 m thick

Tm — **Molalla Formation (lower Miocene)** — Tuffaceous paleosols, volcanic conglomerates and agglomerates, and aquagene tuffs. Tan- and buff-colored with lateral accretion foresets as much as 2 m in diameter. Gravel-rich sequences grade laterally and vertically to thick, rhythmically bedded sequences of cross-bedded sands and blocky or prismatic, fractured light-green claystones. White to light-gray, oxidized, trough cross-bedded tuffs and weakly developed paleosols are common. Localized occurrences of marine tuffs appear at the base of the unit along its most westerly margins. Glassy detritus is largely devitrified and of andesitic or dacitic/rhyodacitic composition. Carbonized leaves and silicified logs are common throughout. The unit is more than 350 m thick and thins to the west. Fossil leaves dated by Wolfe (in Peck and others, 1964) as early Miocene. Unit has been mapped locally in part as the upper part of the Little Butte Volcanic Series by Peck and others (1964)

**Scotts Mills Formation**

Tsmc — **Crooked Finger Member (Oligocene and Miocene)** — In excess of 200 m of weakly indurated, bluish-gray to brown or drab-green coaliferous volcanic conglomerate and mudstone dominantly of nonmarine origin. Typical exposures along Coal Creek in southern Clackamas County. Conglomerates bear altered, rounded clasts of basalt, basaltic andesite, and tuffs and are associated with extensive carbonized root systems and intraformational breccias. The unit is cut by widespread muddy channel-fill deposits grading into microlaminated, organic-rich deposits, dark fissile claystones, or coals. Thick, cumulative sequences contain coal beds up to 40 cm in thickness. The associated underclays are cut by small, finely branching root systems. Localized occurrences of silicified wood are scattered throughout the section. The unit is lens shaped and of limited extent. Mapped in part locally as "Butte Creek beds" by Harper (1946). Unit **Tsmc** is same as unit **$Tom_3$** of Miller and Orr (1984) and Orr and Miller (1984)

Tsma — **Abiqua Member (Oligocene and Miocene)** — More than 250 m of well-indurated reddish light-buff to tan or gray, tuffaceous volcanic arkose of marine and nonmarine origin. Typical exposures along Abiqua Creek in northern Marion County. The prism-shaped unit is characterized by widespread stream-incised disconformities associated with cumulative, horizontally bedded concretionary carbonate horizons (calcretes). Sandstones are massive to parallel laminated and epsilon or swash cross stratified. High-angle cross-beds are present but rare. Pebbly conglomerate layers are thin, discontinuous, and lens shaped. Concentrated fossiliferous marine sequences are common near base of unit, and muddy channel fills are common near unit top. Sediments consist of micaceous, tuffaceous quartzo-feldspathic and volcanic detritus including material of extrabasinal provenance. Replacement of feldspar grains by carbonate is common in association with the calcrete horizons. Glassy pyroclastic detritus is largely devitrified. Carbonate and opaline silica cements are common and well developed with local overgrowths in association with more mature sediments. Marine molluscan fossils near the base of the unit have been dated by Durham and others (1942) as correlative with the "Vaqueros Stage" of upper Oligocene-lower Miocene in California. Echinoderms at the same level assigned by Linder and Orr (1983) to the upper Oligocene. Mapped locally in part as the "Butte Creek beds" by Harper (1946). Unit **Tsma** is same as unit **$Tom_2$** of Miller and Orr (1984) and Orr and Miller (1984)

Tsmm — **Marquam Member (Oligocene and Miocene)** (shown only on cross section) — More than 300 m of medium bluish-greenish-gray to olive, immature to mature volcanic litharenite conglomerates, sandstones, and tuffaceous or zeolitic claystones. Typical exposures less than 1 km east and south of Marquam, Oregon, in Clackamas County. Conglomeratic deposits are associated with abundant barnacle plate fragments of debris-flow deposits. Carbonate-rich deposits occur in association with isolated exposures of older basalts. Locally, these bioclastic limestones are up to 75 percent $CaCO_3$. Conglomerates with megaripple-bedded cosets develop in association with extensive exposures of the underlying basalt. Thick annealed sequences of parallel and, to a lesser extent, hummocky cross-stratified sands bear lensoid accumulations of molluscs near the base of the sequence. At the top of the unit, sharp erosive contacts are common. Fine-grained sediments occur as small ripple-bedded units, with local parallel laminations. Thin, rhythmically bedded sandstone/claystone couplets are common. Locally tuffaceous claystones bear an abundance of bioturbation structures and some plant remains. The unit, predominantly marine, is wedge shaped and onlaps the older basalt surface to the north and east. Molluscan assemblages from near the base of the unit assigned by Orr and Miller (1982, 1983a) to the Juanian West Coast provincial molluscan stage (upper Oligocene). Vertebrate fossils (Cetacea) from near the base of the unit have been assigned by Orr and Faulhaber (1975) and Orr and Miller (1983a) to the upper Oligocene. Mapped in part as the "Butte Creek beds" by Harper (1946). Unit **Tsmm** is same as unit **$Tom_1$** of Miller and Orr (1984) and Orr and Miller (1984)

Tlb — **Little Butte volcanic rocks-older basalts (upper Eocene? and Oligocene)** (shown only on cross section) — Mapped locally as Little Butte Volcanic Series by Peck and others (1964). Medium-dark-gray, fine-grained to aphanatic olivine-basalt, basaltic andesite, and andesitic basalt, with sporadic accumulations of porphyritic andesite. Basalts are typically vesicular or amygdaloidal. Zoned plagioclase feldspars and pyroxene are common and occur in an intergranular to subophitic groundmass

## REFERENCES


Beeson, M.H., and Moran, M.R., 1979, Stratigraphy and structure of the Columbia River Basalt Group in the Cascade Range, Oregon, *in* Hull, D.A., principal investigator, and Riccio, J.F., ed., Geothermal resource assessment of Mount Hood, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report O-79-8, p. 5-77.

Berggren, W.A., Kent, D.V., Flynn, J.J., and Van Couvering, J.A., 1985, Cenozoic geochronology: Geological Society of America Bulletin, v. 96, no. 11, p. 1407-1418.

Durham, J.W., Harper, H., and Wilder, B., Jr., 1942, Lower Miocene in the Willamette Valley, Oregon [abs.]: Geological Society of America Bulletin, v. 53, no. 12, pt. 2, p. 1817.

Hampton, E.R., 1972, Geology and ground water of the Molalla-Salem slope area, northern Willamette Valley, Oregon: U.S. Geological Survey Water-Supply Paper 1997, 83 p.

Harper, H.E., 1946, Preliminary report on the geology of the Molalla quadrangle, Oregon: Corvallis, Oreg., Oregon State College master's thesis, 29 p.

Linder, R., and Orr, W.N., 1983, Mid-Tertiary echinoids from the Oregon Western Cascades [abs.]: Oregon Academy of Science Proceedings, v. 19, p. 53.

Miller, P.R., and Orr, W.N., 1984, Geologic map of the Scotts Mills quadrangle, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-33.

------1986, The Scotts Mills Formation: Mid-Tertiary geologic history and paleography of the central Western Cascade Range, Oregon: Oregon Department of Geology and Mineral Industries, Oregon Geology, v. 48, no. 12, p. 139-148.

Orr, W.N., and Faulhaber, J., 1975, A middle-Tertiary cetacean from Oregon: Northwest Science, v. 49, no. 3, p. 174-181.

Orr, W.N., and Miller, P.R., 1982, Mid-Tertiary stratigraphy of the Oregon Western Cascades [abs.]: Geological Society of America Abstracts with Programs, v. 14, no. 4, p. 222.

------1983a, Fossil Cetacea (whales) in the Oregon Western Cascades: Oregon Department of Geology and Mineral Industries, Oregon Geology, v. 45, no. 9, p. 95-98.

------1983b, Mid-Tertiary basaltic shoal complexes in the Oregon Western Cascades [abs.]: Pacific Section, AAPG/SEPM/SEG, annual joint convention, Sacramento, Calif., Abstracts with Programs, p. 122.

------1984, Geologic map of the Stayton NE quadrangle, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-34.

Peck, D.L., Griggs, A.B., Schlicker, H.G., Wells, F.G., and Dole, H.M., 1964, Geology of the central and northern parts of the Western Cascade Range in Oregon: U.S. Geological Survey Professional Paper 449, 56 p.

Priest, G.R., and Vogt, B.F., eds., 1983, Geology and geothermal resources of the central Oregon Cascade Range: Oregon Department of Geology and Mineral Industries Special Paper 15, 123 p.

Swanson, D.A., Wright, T.L., Hooper, P.R., and Bentley, R.D., 1979, Revisions in stratigraphic nomenclature of the Columbia River Basalt Group: U.S. Geological Survey Bulletin 1457-G, 59 p.


CONTROL BY ..... USGS, NOS/NOAA
COMPILED FROM AERIAL PHOTOGRAPHS TAKEN ..... 1982
FIELD CHECKED ..... 1983. MAP EDITED ..... 1985
PROJECTION ..... LAMBERT CONFORMAL CONIC
GRID: 1000-METER UNIVERSAL TRANSVERSE MERCATOR .... ZONE 10
10,000-FOOT STATE GRID TICKS ..... OREGON, NORTH ZONE
UTM GRID DECLINATION ..... 0°19' EAST
1980 MAGNETIC NORTH DECLINATION ..... 19°30' 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 ( 22 meters north / 94 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


QUADRANGLE LOCATION

SCALE 1:24 000

1 .5 0 KILOMETERS 1 2
1000 0 METERS 1000 2000
1 .5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10 000
FEET

CONTOUR INTERVAL 40 FEET

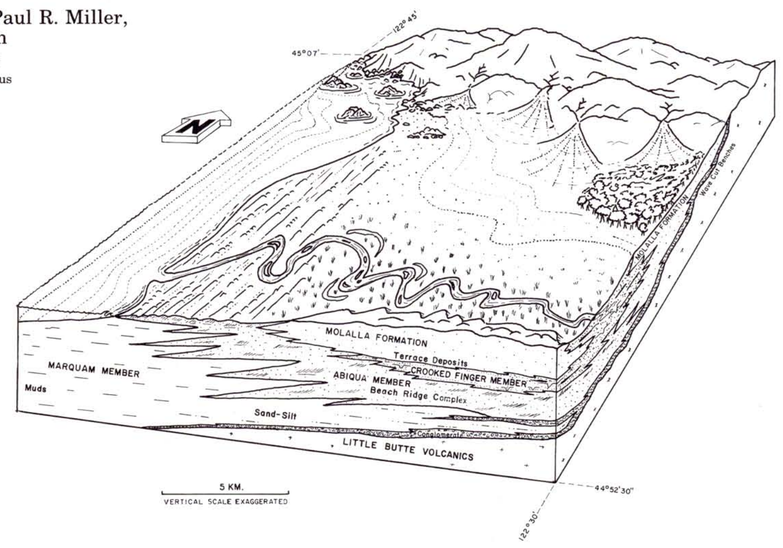
NORTH

## MAP SYMBOLS

Strike and dip

Contact

Geology by William N. Orr and Paul R. Miller,
University of Oregon
Field work completed in 1985
Cartography by Mark E. Neuhaus




SCOTTS MILLS AND MOLALLA FORMATION DEPOSITIONAL ENVIRONMENTS

## GEOLOGIC CROSS SECTIONS