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PRELIMINARY GEOLOGIC MAPS OF THE CORVALLIS, WREN, AND MARYS PEAK 7.5′ QUADRANGLES, BENTON, LINCOLN, AND LINN COUNTIES, OREGON

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INTRODUCTION

The maps, table, and text in this report are preliminary and have not been reviewed for scientific content.

Preliminary geologic maps of the Corvallis, Wren, and Marys Peak quadrangles (plates 1, 2, and 3, respectively) were prepared by merging new field data with data compiled from existing geologic maps and geologic interpretations of soil maps and water well logs. The maps cover the western edge of the Willamette Valley and the eastern part of the Oregon Coast Range along the Newport-Corvallis Highway (Oregon State Highway 20). Oregon State University, the cities of Corvallis and Philomath, and the smaller communities of Wren and Blodgett lie within the map boundaries. Land use outside of urban and rural residential areas includes timber production on steeper terrain and farming and grazing on the flats. Large tracts of private forest land are interspersed with public forests including the Siuslaw National Forest, Oregon State University's McDonald Forest, Benton County Parks, and the Corvallis Watershed.

The Corvallis quadrangle lies along U.S. Highway 99 West and is only a few miles west of U.S. Interstate Highway 5. Access to the Mary's Peak and Wren quadrangles is from Oregon Highways 20, 34, and 223. Off the main highways, access is from a system of U.S. Forest Service, county, private timberland, and private residential roads. Railroads enter Corvallis from the north, south, and west; the western line follows the winding course of the Marys River connecting Philomath, Wren, and Blodgett.

Rocks in this area reveal an early history of seafloor spreading and volcanism followed by deposition of marine sedimentary rocks, the most common of which is sandstone. The composition of the oldest sedimentary beds reflects a nearby source of sand within the volcanic terrane. Younger sandstone is composed of far-traveled grains that originated in feldspar, mica, and quartz-rich terranes to the south and east. Sandstone deposition was punctuated by tectonic events that folded, tilted, faulted, and rotated the strata. During periods of low sea level there were islands, shoals, or peninsulas that restricted interaction between local waters and the Pacific Ocean. Sills (sheetlike intrusions) of basalt, gabbro, diorite, and granodiorite formed between the sandstone layers when hot magma forced its way upward along zones of weakness. Eventually, the land rose and the sea retreated, hills formed in the west, and a broad river valley formed to the east. The Willamette River system evolved in this valley as volcanoes located farther to the east erupted to form the Cascade Range. Alluvial fans formed at the mouths of major tributaries and were later eroded back to a few terrace remnants by the main stream. During the ice age, extraordinary floods brought on by bursting dams of glacial ice floated boulders and cobbles from Canada and Montana down the Columbia River and into the Willamette Valley, temporarily transforming it into a giant muddy lake. When the lake drained for the last time, a blanket of silt covered almost everything below 400 ft (122 m) elevation. As the river retreated from flood-swollen drainage ways to the lowest channels, it began, once again, to migrate back and forth across the valley floor, reworking the silt-covered floodplains and carrying sand, gravel, and silt to the sea.

Radiometric dates and fossil collections suggest that the oldest rocks in the area are about 50 million years old, marine sandstone beds are as young as about 40 million years old, sills are 30 to 35 million years old, and the youngest flood silt deposits are 10 to 12 thousand years old.

EXPLANATION OF MAP UNITS

Qal **Alluvium, undivided (Holocene and upper Pleistocene)** — sand, gravel, and silt deposited along streams. Generally shown in drainages that lie above the limits of Willamette Silt deposition (400 ft [122 m] elevation) or that may have cut through Willamette Silt. Deposits in drainages dominated by weakly cemented sandstone bedrock contain sediment dominated by micaceous and quartzo-feldspathic sand. Drainages with mixed bedrock contain strikingly bimodal dark gray gravel and light-colored sand. Locally divided to show units Qya and Qaf.

Qya **Young alluvium (Holocene)** — sand, gravel, and silt deposited by modern streams. Deposits in volcanic dominated drainages contain sediment dominated by pebble gravel. Deposits in drainages dominated by weekly cemented sandstone bedrock contain sediment dominated by micaceous and quartzo-feldspathic sand. Drainages with mixed bedrock contain strikingly bimodal dark gray gravel and light-colored sand. Deposits of the Willamette River typically include floodplain sequences of sand and silt underlain by fining-upward sand and gravel facies interpreted as channel deposits.

Qaf **Alluvial fan deposits (Holocene and upper Pleistocene)** — sand, gravel, boulders, and woody debris in fan-shaped accumulations at slope breaks. These generally occur where mouths of small streams and side canyons enter drainages of the larger tributaries.

The risk of debris flows and fast-moving landslides is generally high on areas underlain by young alluvial fan deposits. Site-specific studies should be undertaken to determine actual risk.

Qls **Landslide deposits (Holocene to upper Pleistocene)** — boulders, gravel, sand, mud, and large coherent blocks of adjacent bedrock lithologies that have been transported down slope by gravity sliding. Landslides locations have been compiled from earlier publications with local additions and modifications based on new field work or inferred from topography.

Qws **Willamette Silt (upper Pleistocene, 12.7–15 ka)** — thin- to medium-bedded rhythmites of silt, sandy silt, and silty clay. Deposited by repeated Missoula (Bretz) floods when glacial dams in the upper Columbia River drainage failed catastrophically and generated floodwaters that temporarily filled the Willamette Valley. Individual rhythmites range from 0.1 to 1.0 m thick (O'Connor and others, 2001); each is interpreted as the deposit left by a single flood event. Ice-rafted erratic pebbles and boulders with continental provenance occur at elevations as high as 400 ft (122 m) above sea level. Areas below about 250 to 300 feet (76-91 m) elevation were draped with a thick (3-6 m, 10–20 ft) blanket of silt by repeated floods (Gannett and Caldwell, 1998). Locally absent where removed by hillside erosion, receding floodwaters, or incision by younger channels. May include some gravel deposits where the velocity of receding floodwaters was sufficient to winnow away sand and silt or to move gravel. Locally overlain by younger floodplain deposits of Wisconsin (Tioga?) age according to Allison (1953). O'Conner and others (2001) report an age range of 12.7 to 15 ka. Willamette Silt largely blanketed topography, creating similar, distinctive soils that overlie many different surficial and bedrock units. Nearly identical soils top older alluvial fan units as well as bedrock hills. The following list of related soils have been given different names based on subtle variations in weathering, mixing, and dissection: Amity, Coburg, Conser, Holcomb, Malabon, Willamette, and Woodburn (Langridge, 1987). Beneath the Willamette Silt older, buried, soils and weathered zones are often preserved at the top of the buried unit.

Qoa **Old alluvium (Pleistocene)** — sand, gravel, silt, and clay preserved at elevations above currently active alluvial flats along large streams in the Wren and Marys Peak quadrangles.

QTt **Terrace deposits (lower Pleistocene? to Miocene)** — sand, clay, and gravel that are locally consolidated or cemented to form poorly indurated sandstone, claystone, and conglomerate. Preserved locally along the western edge of the Willamette Valley; locally forms high benches south of Philomath. May include abandoned segments of large, ancient alluvial fans where major tributaries such as the Marys River enter the Willamette Valley. Probably correlative to similar gravel deposits in the Lebanon-Albany area. Outcrops consist of micaceous sandstone and fine- to medium-grained basaltic pebble gravel and pebbly sandstone. In outcrop it is difficult to distinguish sandstone of this unit from weathered sandstone belonging to the Spencer Formation.

Water-well drillers log the bulk of the formation as varieties of clay, suggesting that feldspathic sands like those seen in outcrops are deeply weathered and that the altered sand grains disintegrate during the drilling process. Black, lithic, coarse sand and black gravel are more consistently reported by water well drillers. More than two dozen wells drilled in benches south of Philomath show two black sand and/or gravel intervals; the upper interval is 3–9 feet thick and the lower interval more than 24 feet thick. Well logs indicate that these intervals are overlain by “clay,” underlain by “clay,” and separated by 33–58 feet of “clay.” Although there is locally great variability in the reported depth to bedrock — it may vary by more than 200 ft in adjacent wells — taken overall this group of well logs suggests a general thickening of this section toward the northeast, toward the edge of the bench. Wells along the northeast edge of the bench commonly reveal that bedrock is a few tens of feet deeper than the height of the bench above the valley floor. A new road cut in this section revealed a thick, channelized, fining-upward sequences in which dark basalt-pebble gravel is overlain by tan micaceous arkosic sand. The bimodal relationship between grain size and provenance distinguishes these strata from most of the other units in the basin.

Many water wells drilled into this formation encountered intervals of “blue clay.” Blue clay is similarly reported from water wells that penetrate young sand and gravel sequences beneath nearby valleys. Elsewhere in the Willamette Valley, intervals of “blue clay” have been reported from decomposed fine-grained sandstone, siltstone, and claystone that form the tops of fluvial fining-upward sequences in old alluvium and from drilled intervals known to be weathered Eocene bedrock (Spencer Formation) at the surface. Geologists working near Corvallis examined a thick interval of “blue clay” and interpret it as having been deposited in a lacustrine or low-energy fluvial environment. Near Buena Vista, thick weathered sections of Spencer Formation sandstone are also logged as “clay” by water well drillers, so care must be taken in assigning “clay” sequences reported from water wells to any particular formation.

Probably equivalent to older sand and gravel deposits preserved in benches east of Albany. Age based on stratigraphic position and the relationship between similar strata and young lava flows in the eastern part of the valley (Mark Ferns, personal communication, 2008).

Ts **Spencer Formation (middle Eocene)** — micaceous arkosic and lithic sandstone, siltstone, and lithic arkose in sequences ranging from thin- to thick-bedded or massive. Sandstone ranges from thin interbeds to thick massive (bioturbated) sequences. Interpreted as deposited in shallow to deep(?) marine environments but the facies have not been mapped separately. Thick fine-grained sequences are generally interpreted as deep marine facies that accompanied sea level high stands while sandy facies are interpreted as shallow water facies deposited during episodes of low sea level. Age of the formation is based on ages reported elsewhere in the Coast Range and correlation with the type area near Eugene (see Wiley, 2006). The upper contact in the Eugene area is dated at about 40 Ma where the Spencer Formation is overlain by the Fox Hollow Tuff of that age (Madin and Murray, 2006).

Problematic exposures of fossiliferous, micaceous sandstone, tentatively assigned to the Spencer Formation, crop out northeast and southwest of Blair Creek and along Old Peak Road in the Wren quadrangle. These poorly exposed beds contain a significant percentage of lithic grains and appear to dip beneath igneous rocks (mapped as a sill) to the southeast. If mapped correctly, the throw on the strand of the Corvallis fault that follows Greasy Creek would be limited to the extent of the sill. Alternatively, if the igneous rocks can be shown to be a lava flow, then mica entered the system locally prior to eruption of the uppermost pillow basalt flows, a relationship not seen elsewhere and suggesting that some of the volcanics in this area are considerably younger than other Siletz River Volcanics. In places these fossiliferous, micaceous sands are more like those found in the Spencer Formation, having only small bleached biotite and muscovite grains. Basaltic lavas have been mapped above Spencer Formation sandstone in the Albany quadrangle to the east-northeast.

Tt **Tyee Formation (middle Eocene)**—micaceous sandstone and less common mudstone as turbidites. Sandstone ranges from fine to coarse grained and may contain abundant woody debris. Pebbly sandstone, conglomerate, coal, and mega-fossils are very rare or absent. Bed thickness ranges from thin-bedded to massive or amalgamated. Cross-bedding was not recognized except in convolute laminations of turbidites. Sandstone is notably micaceous, most commonly with both biotite and muscovite, and typically arkosic, which distinguishes it from older lithic sandstone turbidites of the Kings Valley and Siletz River formations. Age of the formation is based on ages reported elsewhere in the Coast Range and on correlations between the formations, global sea level curves, and nearby oil wells.

The contact with the underlying Kings Valley Siltstone is marked by the sudden appearance of abundant mica. However, the contact is gradational in terms of the decreasing abundance of lithic volcanic grains. Other authors have reported an unconformity at the base of the Tyee Formation (Walker and Duncan, 1989) with micaceous sandstone deposited directly on mafic volcanic rocks of the Siletz River Formation. Where outcrops are too small to distinguish turbidite sequences, for example in amalgamated sandstone or thick mudstone sequences, the formation may be difficult to distinguish from the overlying Spencer Formation. In some areas mica content may help distinguish whether sandstone beds belong to Tyee or Spencer formations. The typical Tyee Formation sandstone contains more biotite, particularly more fresh-looking biotite, than Spencer Formation sandstone which typically has a larger percentage of muscovite and bleached biotite. Fossils are much more common in the Spencer Formation.

Tkv **Kings Valley Siltstone (middle and lower Eocene)**—siltstone, mudstone, lithic to tuffaceous sandstone, and rare conglomerate and tuff. Mica is typically absent. Sedimentary structures suggest deposition in a wide variety of environments including submarine fans.

Within the mapped area, this sequence includes about 200 m of clastic sedimentary rocks that overlie volcanic rocks of the Siletz River Volcanics and underlie micaceous arkosic sedimentary rocks of the Tyee Formation. Conglomerate and lithic sandstone contain clasts and grains of mafic to intermediate volcanic lithologies including rock types similar to those found in the underlying Siletz River Volcanics. Near Blodgett these rocks contain marine fossils.

Originally described as the Kings Valley Siltstone member of the Siletz River Volcanics by Vokes and others (1954). About a kilometer thick in the type area to the north where it contains abundant interbedded lava flows and tuff. Fossils reported by Vokes and others (1954) and Baldwin (1955) were, at that time, considered equivalent to faunas from the Umpqua Group in the Roseburg area.

Tsr **Siletz River Volcanics (lower Eocene and Paleocene?)**—basalt and basaltic-andesite lava flows and related rocks. Flows are typically augite-, plagioclase-, and/or olivine-phyric marine pillow lavas. They may be vesicular, amygdaloidal, or brecciated. Chemistry is either quartz or olivine normative. In some exposures, pillowed intervals are sufficiently coherent to infer paleohorizontal and to estimate strike and dip.

Amalgamated basaltic pillow lavas form the lower part of the unit and are interpreted as submarine mid-ocean ridge basalt (MORB) type lavas. Lava flows in the upper part of the unit are locally interbedded with marine sandstone, siltstone, and less commonly with tuffaceous rocks and conglomerate that are too thin, poorly exposed, or discontinuous to map separately. East of Blodgett, the highest and presumably youngest of the lava flows assigned to this unit is composed of basaltic andesite, suggesting a major change in magma type and perhaps in the plate tectonic setting accompanying the extinction of Siletz River Volcanics volcanoes. At several basalt quarries the tops of the headwalls reveal thin-bedded lithic sandstone and siltstone turbidite sequences that are generally not recognized in less perfect exposures. Locally these sandstone beds may contain abundant (30%) foraminifera tests. Where sedimentary rocks are extensive enough to be mapped separately, this unit is divided to show unit Tsrs:

Tsrs **Sedimentary rocks (lower Eocene)** — sandstone, siltstone, and less common tuffaceous sandstone and conglomerate. Sandstone is typically lithic, with grains consisting of well-rounded mafic volcanic rock fragments. Sandstone may contain a large percentage of foraminifera tests.

The soil map of Benton County shows large areas of soil derived from sedimentary rock where only basalt was recognized in the field. Some of these areas undoubtedly contain thin sedimentary interbeds, and some lie downslope from areas underlain by sedimentary rock. However, it also seems likely that in some cases soils derived from deeply weathered volcanic rock are similar to soils derived from sedimentary rock that was itself derived from weathered volcanic rock. Several water well logs show sandstone and siltstone in areas mapped as Siletz River Volcanics, and these rocks are thought to represent sedimentary interbeds similar to those mapped in unit Tsrs.

Ti **Intrusive rocks (early Miocene ? to late Eocene)** — mafic to intermediate, fine- to medium-grained intrusive rocks that range from gabbro to granodiorite and basalt to basaltic andesite. At least three intrusive suites are believed to be present. In the Wren, Corvallis, and Marys Peak quadrangles these include 1) small gabbro, basalt, and basaltic andesite intrusives of early Eocene age (circa 50–55 Ma), that may have served as feeders for lava flows of the Siletz River volcanics, 2) gabbro and related rocks associated with the Mary's Peak Sill (circa 30–33 Ma), and 3) quartz-bearing basaltic andesite, tonalite, and granodiorite dikes and sills that cut sedimentary rocks as young as the Spencer Formation and so are probably younger than about 40 Ma.

Additional intrusions were depicted on an earlier map compiled by Yeats and others (1991). Many of those intrusions were mapped on the basis of magnetic anomalies. In some of these areas the only intrusive rocks seen during this study were thin (circa 20 cm) strongly magnetic mafic dikes that cut across sedimentary country rock in orientations parallel to the long axes of the magnetic anomalies. In the Marys Peak quadrangle, Baldwin (1955) mapped Tertiary intrusives not shown on this map.

Color, grain size, and induration contrasts between intrusive and sedimentary rock are much more pronounced than the contrast between mafic intrusions and basalt flows. The paucity of mapped intrusions in the Siletz River Formation may be due to this lack of contrast. Tertiary intrusive rocks are probably more widespread than is shown on the map. Locally divided to show unit Timp.

Timp **Marys Peak Sill (Oligocene, K/Ar age of 30.5±1.2 Ma [Tatsumoto and Snavely, 1969, corrected]; ^{40}Ar^{39}Ar age of 32.46 ± 0.24 Ma [Oxford, 2006])** — gabbro and related rocks that form a 400-m-thick sill at Marys Peak. Intrudes the sedimentary section at or near the contact between the Kings Valley and Tyee Formations.

GEOLOGIC HISTORY

The geology of the area records an episode of widespread volcanic activity about 50 million years ago, during Paleocene or early Eocene time, that was interspersed with and then followed by deposition of marine sandstone and siltstone. The volcanic rocks are predominantly marine pillow lavas of the Siletz River Volcanics. This suite of volcanic rocks extends from the Roseburg area to the south northward into Washington State. The oldest lavas in the suite are Paleocene, but at this latitude lavas older than Eocene have not been reported. The uppermost lava flow, mapped in the northwest quarter of the Wren quadrangle, is a basaltic andesite that is considerably more silica rich than older basaltic lavas (see Table 1; table data are also available as a spreadsheet in this report). In some places, thin intervals of foraminiferal, tuffaceous, or lithic sandstone and siltstone lie between successive lava flows. The sedimentary interbeds become more common and generally thicker higher in the section. Although nonmarine sandstone facies and subaerial lava flows have been reported from the Siletz River Formation elsewhere in the Coast Range, none were recognized here. Where the lava flows are best exposed, in quarries for example, they contain pillowed intervals.

When volcanic activity ended, sediments similar to those deposited between the lava flows accumulated in a thick sequence of sandstone and mudstone turbidites known locally as the Kings Valley Siltstone (Vokes and others, 1954) and herein considered part of the Umpqua Group (Molenaar, 1985). Conglomerate or block and ash tuff occurs locally. A dramatic change in the type of sandstone occurs above the Kings Valley Formation due an influx of mica, quartz, and feldspar that apparently overwhelmed tuffaceous and lithic-volcaniclastic sediment sources. The mica-rich sandstone that resulted probably had a source in a dissected arc terrane to the south in the Klamath Mountains or eastward on the continent itself.

The oldest of these micaceous rocks form sandstone and mudstone turbidites assigned to the Tyee Formation and are interpreted as submarine fan deposits. Near faults, beds assigned to the Tyee Formation are locally steeply dipping or overturned. At the northern edge of the Wren quadrangle the mapped contact between the Kings Valley Siltstone and the Tyee Formation does not dip as steeply as the bedding. This implies possible angular unconformity or fault repetition. However, where beds near the contact are well exposed, the transition from lithic volcanic sandstone to micaceous arkosic sandstone is gradational. This could indicate either reworking of older lithic volcanic sandstone and conglomerate at an unconformity or a gradational contact. It contrasts with areas to the south, near Roseburg, where the transition from older rocks to Tyee Formation is abrupt.

A thick sequence of lithic sandstone lies above the Tyee Formation in oil wells drilled in the Willamette Valley but is represented by only a few small outcrops in the Corvallis quadrangle (Baker, 1988; Wiley 2006). Moderately deformed micaceous sandstone and siltstone assigned to the Spencer Formation unconformably overlies the Tyee Formation. Younger, little deformed, nonmarine sedimentary rocks are preserved along the lower reaches of the Marys River near Philomath and Corvallis. Ice-age Bretz Flood deposits including Willamette Silt and widely scattered exotic clasts mantle topography below about 400 ft (122 m) with thicker deposits preserved at lower elevations. Postglacial streams migrated laterally across the valleys, reworking older surficial units and depositing sand and gravel along active channels and finer alluvium on broad flood plains and in abandoned channels.

The Marys Peak quadrangle, the westernmost of the three quadrangles, straddles the crest of the Oregon Coast Range. Marys Peak itself dominates the southeastern part of the quadrangle and is the highest peak in this part of the Coast Range. Most of this quadrangle, including areas west of the highest ridges, lies within the Marys River drainage that flows eastward to the Willamette River. In many reaches, this stream displays incised meanders. Such a complex drainage pattern was probably inherited from an earlier time when the crest of the range lay farther to the west, topographic relief was less pronounced, and the river was free to move laterally in a wider valley. It is also possible that a westward shift in the course of the Willamette River, from an earlier location well to the east, significantly shortened the Marys River and caused it to incise, preserving a snapshot of its ancient course. Evidence for a broad valley floor at somewhat higher elevation includes the preservation of a widespread low-relief erosional surface in the Corvallis-Philomath area and the presence of wide flats along and north of the Marys River between Blodgett and Wren. The channels of the

Table 1. Whole-rock XRF (x-ray fluorescence) analyses for Corvallis, Wren, and Marys Peak 7.5′ quadrangles, Benton, Lincoln, and Linn Counties, Oregon.

Map No.	Map Unit	7.5′ Quadrangle	Field and Laboratory No.	UTM Easting (NAD 27)	UTM Northing (NAD 27)	Lithology	Feature
1	Tsr	Lewisburg	108-16-1	478564	4941560	basalt	lava flow
2	Tsr	Corvallis	1107-1-1	471350	4940646	basalt	lava flow
3	Tsr	Wren	1207-18-1	466526	4939795	basalt	lava flow
4	Tsr	Wren	108-17-3	462967	4939712	basalt	lava flow
5	Ti	Corvallis	108-16-2	478139	4939040	basalt	dike
6	Tsr	Corvallis	108-16-4	476992	4938752	basalt	lava flow
7	Tsr	Wren	1107-15-1	462480	4938040	basaltic andesite	lava flow
8	Ti	Corvallis	108-16-3	478202	4937558	basaltic andesite	intrusive
9	Ti	Marys Peak	108-17-2	450954	4936911	basaltic andesite / tonalite	weathered core
10	Tsr	Wren	108-17-1	467746	4936194	basalt	lava flow
11	Tsr	Corvallis	64MWJ07	470372	4935341	basalt	cobble or core
12	Ti	Corvallis	71MWJ07	473596	4934539	gabbro	boulder
13	Tsr	Corvallis	1207-19-1	460796	4932444	basalt	lava flow
14	Ti	Wren	108-17-4	469827	4929800	granodiorite	sill
15	Ts?	Flat Mtn.	1207-18-2	468401	4926947	dacite	waterlaid tuff?

Map	Map	*Oxides (wt. percent)*													
No.	**Unit**	**SiO_2**	**TiO_2**	**Al_2O_3**	**Fe_2O_3**	**FeO**	**MnO**	**MgO**	**CaO**	**Na_2O**	**K_2O**	**P_2O_5**	**LOI**	**Total**	**Fe_2O_3T**
1	Tsr	43.83	1.64	14.53	6.06	5.37	0.18	8.84	11.09	1.89	0.47	0.21	6.11	100.22	12.03
2	Tsr	46.37	1.56	14.58	1.69	9.08	0.18	7.80	12.81	1.85	0.23	0.16	3.30	99.61	11.78
3	Tsr	46.47	2.20	14.06	2.92	10.00	0.21	6.12	11.87	2.32	0.32	0.24	3.09	99.82	14.03
4	Tsr	45.15	2.05	13.38	4.24	8.48	0.18	7.17	11.21	2.11	0.26	0.21	5.31	99.75	13.66
5	Ti	45.56	1.75	15.24	2.55	9.00	0.19	8.91	11.70	2.10	0.53	0.27	1.73	99.53	12.55
6	Tsr	41.80	2.12	14.69	10.19	4.14	0.20	6.67	9.93	2.24	0.55	0.27	7.00	99.80	14.79
7	Tsr	51.85	2.06	12.66	3.94	10.56	0.26	1.96	7.40	2.89	1.24	0.88	4.51	100.21	15.68
8	Ti	54.77	1.92	14.04	2.44	7.58	0.19	3.61	6.03	4.44	0.81	0.35	3.55	99.73	10.86
9	Ti	52.31	1.89	12.74	6.75	8.30	0.27	1.38	6.48	2.62	1.47	0.67	5.46	100.34	15.97
10	Tsr	45.84	1.58	14.35	3.50	7.57	0.20	7.51	13.05	1.93	0.07	0.18	4.04	99.82	11.91
11	Tsr	46.65	1.58	13.71	4.14	7.98	0.18	7.72	12.62	1.88	0.13	0.16	3.00	99.75	13.01
12	Ti	45.69	1.50	15.04	3.99	7.27	0.17	6.80	12.23	1.93	0.14	0.16	4.72	99.64	12.07
13	Tsr	45.49	3.00	13.69	5.89	8.62	0.20	5.23	11.09	2.21	0.38	0.30	3.95	100.05	15.47
14	Ti	61.03	1.30	13.73	1.80	6.29	0.13	1.73	4.43	3.49	2.82	0.24	2.87	99.86	8.79
15	Ts?	65.01	0.18	21.97	1.18	0.59	0.03	0.12	0.11	0.06	0.54	0.07	9.96	99.82	1.84

Map	Map	*Trace elements (parts per million)*																	
No.	**Unit**	**Rb**	**Sr**	**Y**	**Zr**	**V**	**Ni**	**Cr**	**Nb**	**Ga**	**Cu**	**Zn**	**Co**	**Ba**	**La**	**Ce**	**U**	**Th**	**Sc**	**Pb**
1	Tsr	1.2	219	26.5	91	334	110	259	8.7	17.1	148	83	48	25	7	18	<0.5	1.6	38	2
2	Tsr	1.8	483	23.2	95	284	93	88	7.5	18.9	196	71	44	25	10	19	<0.5	<0.5	28	1
3	Tsr	2.3	197	23.1	89	313	110	309	5.6	16.9	139	77	45	40	10	16	<0.5	1.9	35	2
4	Tsr	34.5	248	61.0	271	93	2	11	19.3	23.7	22	152	26	285	23	58	<0.5	6.0	27	4
5	Ti	4.2	238	27.9	141	314	75	125	11.8	21.3	173	97	46	85	11	25	<0.5	2.0	32	2
6	Tsr	22.0	9	23.6	140	19	6	5	16.8	21.0	4	14	<1	258	25	49	2.9	12.0	6	<1
7	Tsr	7.5	229	34.7	196	381	74	101	16.5	21.6	212	108	45	100	12	38	<0.5	1.6	33	3
8	Ti	9.6	338	22.5	97	308	122	265	16.9	12.7	78	80	47	121	11	29	<0.5	<0.5	37	2
9	Ti	12.7	318	26.0	124	308	152	328	24.5	15.6	82	90	53	147	14	31	0.6	2.9	36	2
10	Tsr	20.0	270	36.5	199	256	9	24	13.8	19.3	169	106	26	225	18	44	<0.5	2.2	26	3
11	Tsr	11.1	353	28.4	132	347	54	88	18.9	16.5	90	104	50	120	11	31	<0.5	3.6	33	2
12	Ti	<0.5	183	25.1	92	330	112	313	6.5	16.8	140	85	46	15	9	17	<0.5	1.6	40	2
13	Tsr	48.3	267	56.6	256	136	2	36	22.6	25.9	34	203	21	298	26	46	<0.5	5.3	46	6
14	Ti	8.9	257	25.8	117	329	95	213	11.0	17.4	206	122	47	71	11	22	<0.5	1.2	35	2
15	Ts?	109.0	205	63	421	121	4	20	22.4	23.4	42	114	17	575	30	81	1.3	10.2	14	7

See page 9 for analytical procedures.

Marys and Willamette rivers in the Wren and Corvallis quadrangles were mapped using orthorectified 2005 aerial photography and so are slightly different from the channel positions depicted on the older topographic base.

STRUCTURAL GEOLOGY

When greatly simplified, the structure in this part of the eastern Coast Range is that of a broad, gently northeast-plunging anticline with a core of Eocene pillow basalt overlain by younger Eocene sedimentary rocks that dip gently to the southeast and northwest. This simple structural model is complicated by one major and many smaller faults, one major and many lesser folds, and one major and many smaller intrusions. The folds and faults are largely consistent with shortening along north-south or northwest-southeast axes. More easterly strikes are increasingly common in strata younger than the Tyee Formation. The timing of intrusions suggests a change in the structural regime occurred between about 35 and 30 Ma (Oxford, 2006).

The northeast-trending, steeply northwest-dipping Corvallis fault cuts across the southeastern limb of the anticline in the Philomath-Corvallis-Lewisburg area, generally placing Siletz River Formation over Tyee Formation turbidites. Lesser faults generally parallel the Corvallis fault, but some, like the Kings Valley fault, have the opposite sense of throw. Others, like the Philomath and Bald Hills faults, have east or northeast trends.

The Jefferson anticline extends from Lewisburg to Jefferson and either refolds or is a more easterly-plunging extension of the larger regional anticline described above. Smaller folds are indicated by reversals in dip direction but exposures are generally too poor to accurately map fold axes. (See Yeats and others, 1991, 1996, for a different depiction of fold axes and intrusions.) These folds typically parallel northeasterly trends of larger structures but, locally, bedding strikes parallel to northwest-trending faults or intrusion margins.

Mafic to intermediate rocks of the Marys Peak sill intruded the section near the Tyee Formation-Kings Valley Formation contact on the northwest limb of the anticline, producing a patch of rock that resists erosion and now forms one of the most prominent peaks in the Coast Range. Smaller intrusions range from gabbro to granodiorite. Like the Marys Peak sill, many of these form resistant hills and ridgelines, particularly where the gabbro and granodiorite intrude sedimentary rock. Intrusions were most commonly mapped along the Corvallis fault and along the upper and lower contacts of the Tyee Formation.

The Corvallis fault and associated folds are the most prominent geologic structures in the Corvallis and Wren quadrangles. The traces of the fault and dips of nearby beds suggest that dips on fault planes range from vertical to steeply west-dipping. The apparent throw is down-to-the-east with older Siletz River Volcanics cropping out west of the fault and younger Tyee and Spencer formations cropping out east of the fault, suggesting a thrust or reverse fault. Locally, the dips of overturned beds near the fault are as low as 65 degrees to the west, suggesting a similar dip for the fault. However, some evidence suggests strike-slip movement. Strike-slip offset along the fault is indicated by the presence of subhorizontal slickensides (Alan Niem, personal communication, 2007), by detailed studies in the Corvallis area (Goldfinger, 1990), and by apparent offset of the Siletz River-Tyee-Spencer contacts. Goldfinger's detailed mapping suggests left-lateral offset. The presence of northeast-trending, short-wavelength, en echelon, left-stepping folds along the fault also suggests a left-lateral strain component. Although the apparent offset of Eocene contacts between the Dawson and Arlie areas is right lateral, this relationship might also be explained by the eastward plunge of the Jefferson anticline. The presence of micaceous fossiliferous Spencer Formation sandstone west of Greasy Creek in the Wren quadrangle suggests that much of the deformation and offset along the fault is older. Dips in Spencer Formation on either side of the fault are to the south-southeast and rarely exceed 35°, while older beds of the Tyee Formation have more northerly strikes and are often overturned.

It is not clear whether bedding attitudes in the northwestern part of the Corvallis quadrangle are affected by the south limb of the Jefferson Anticline. Its trend is parallel to that of many of the small folds along the Corvallis fault, suggesting that the two sets of features resulted from a similar strain regime. In the Albany quadrangle, the bedrock high produced by the Jefferson Anticline bisects the Quaternary basin fill along the Willamette River, suggesting that it and the strain regime that formed it are relatively young. Such a strain regime is also consistent with northwest-trending right-lateral offset like that seen where the Corvallis fault is cut by the Philomath fault.

GEOLOGIC HAZARDS

Landslides depicted on the geologic map were compiled from hazard studies by Bela (1979) and Wang and others (2001) and modified where appropriate on the basis of new field work.

Many small alluvial fans were mapped, most on the basis of topography shown on the 7.5′ quadrangle maps. Where these alluvial fans lie at the mouths of steep sided canyons there may be significant risk of fast-moving landslides such as debris flows. In terms of location, the risk is highest at the apex of the fan. In terms of timing, the risk of fast-moving landslides is increased during episodes of intense rainfall that occur after soils have been saturated by fall and early winter rainfall.

The author strongly recommends that landowners intending to build on lots underlain by or adjacent to areas mapped as units Qaf or Qls have a site-specific geologic investigation conducted by a registered geologist or engineer before building pads or foundations are designed.

Earthquake hazards are discussed by Wang and others (2001). Some folding mapped in the Corvallis area parallels the Jefferson anticline and may be of similar age. In the Albany quadrangle the Jefferson anticline bisects the Willamette Valley fill and may be as young as Quaternary (Wiley, 2006).

ROCK NAMES AND ANALYTICAL PROCEDURES

Igneous rock names are based on major element chemistry (Table 1). The ratio between total alkali and silica (International Union of Geological Sciences standard fields) is used to assign rock names to fine-grained igneous rocks and is adapted according to the “ANOR” method of Streckheisen and Le Maitre (1979) to assign names to coarse-grained feldspathoid-free intrusive rocks.

Stanley A. Mertzman (Department of Geosciences, Franklin and Marshall College, Lancaster, PA) provided XRF analyses for samples listed in Table 1. Analyses were completed using the following procedures.

The original rock/mineral powder is crushed, using aluminum oxide milling media, until the entire sample passes through a clean 80 mesh sieve. Then, 3.6 g of lithium tetraborate and 0.4 g of rock powder are mixed in a Spex Mixer Mill. The powder is transferred to a 95% Pt-5% Au crucible and 3 drops of a 2% solution of LiI are added. The mixture is then covered with a 95% Pt-5% Au lid (which will also act as a mold), and heated for 10 minutes. After being stirred and thoroughly convected, the molten contents of the red-hot crucible are poured into the lid to cool. A Philips 2404 X-ray fluorescence vacuum spectrometer equipped with a 102-position sample changer and a 4-KW Rh X-ray tube is used for automated data acquisition and reduction. The major elements are determined via this technique together with chromium and vanadium.

Working curves for each element of interest are determined by analyzing geochemical rock standards, data which have been synthesized by Abbey (1983) and Govindaraju (1994). Between 30 and 50 data points are gathered for each working curve; various elemental interferences are also taken into account, e.g., $SrK_{ß}$ on Zr, $RbK_{ß}$ on Y, etc. The Rh Compton peak is utilized for a mass absorption correction. Slope and intercept values, together with correction factors for the various wavelength interferences, are calculated and then stored on a computer.

The X-ray procedure determines the total iron content as Fe_2O_3T. The amount of ferrous iron is titrated using a modified Reichen and Fahey (1962) method, and loss on ignition is determined by heating an exact aliquot of the sample at 950°C for one hour.

Trace element analysis is accomplished by weighing out 7 g of whole rock powder and adding 1 g of high-purity microcrystalline cellulose, mixing for 10 minutes, and pressing the sample into a briquette. Copolywax powder is substituted for cellulose when the whole rock SiO_2 content is >55 weight percent. Data are reported as parts per million (ppm). The elements measured this way include Rb, Sr, Y, Zr, Nb, Ni, Ga, Cu, Zn, U, Th, Co, Pb, Sc, Cr, and V. La, Ce, and Ba amounts have been calibrated using an L X-ray line and a mass absorption correction.

ROCK AND MINERAL RESOURCES

Basalt from the Siletz River Volcanics is widely mined for road metal, fill, and, riprap, and decorative rock. A large granodiorite intrusion south of Philomath produces rock widely used for landscaping. Small quarries have been developed in many of the smaller intrusions. Round rock is mined in pits developed along old channels of the Willamette River. Beautiful samples of radial acicular zeolite have been collected from basalt flows southeast of Wren. A distinctive black, basalt-pebble gravel has been mined locally along the Marys River.

Energy Resources

Sequences of sedimentary rock in these three quadrangles are generally too thin to generate or trap significant accumulations of oil or gas. No coal beds were encountered during fieldwork or reported on well drillers' logs.

WATER WELLS

An attempt was made to locate water wells and other drill holes that have well logs archived by the Oregon Department of Water Resources (OWRD). Very few wells were actually visited in the field. Instead, approximate locations were estimated using tax lot maps, street addresses, and aerial photographs to plot locations on the map. The accuracy of the locations ranges widely, from errors of one-half mile possible for wells located only by section and plotted at the section centroid to a few tens of feet for wells located by address or tax lot number on a city lot with bearing and distance from a corner. At each mapped location the number of the well log is indicated. This number can be combined with the first four letters of the county name (e.g., BENT 5473), to retrieve an image of the well log from the OWRD web site. The symbol color at each well site indicates key lithologies reported on the log that were used to aid in preparation of the geologic map.

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Because good outcrops may be short-lived, widely separated, or quickly overgrown, older geologic maps cited herein should be consulted for alternative interpretations.

Water well logs archived on the Oregon Department of Water Resources website provided additional data points.

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