

Introduction

The Willamette River Basin (WRB), by definition, contains all lands that drain into the Willamette River, i.e., the Willamette River watershed. Thirteen of the thirty-six Oregon counties lie within or intersect this natural boundary (Fig. 1 and Table 1).

Figure 1. *Willamette River Basin and Oregon counties.*

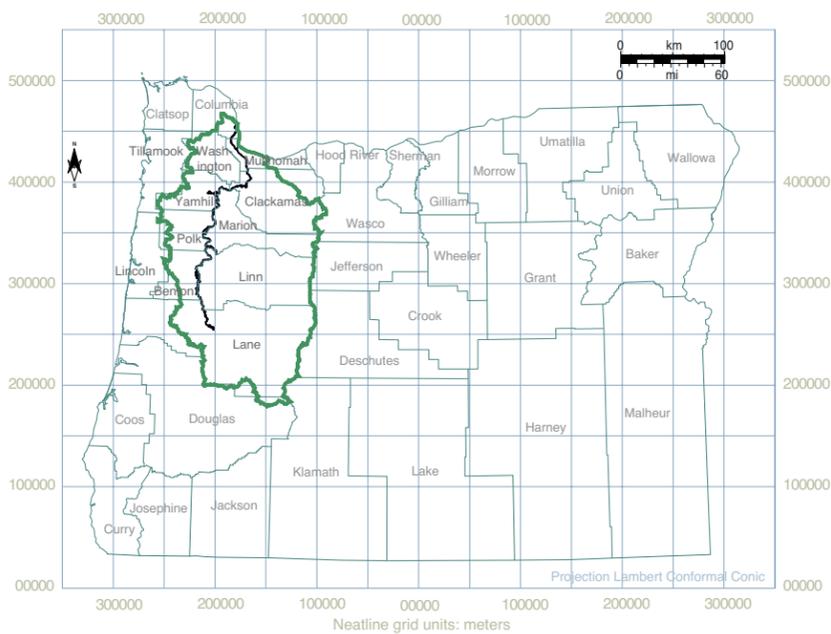


Table 1. *Area and percentage of Oregon counties in Willamette River Basin.*

County	Co. Area (ac)	Area in WRB (ac)	%Co. in WRB	%WRB in Co.
Benton	434,201	328,097	75.6	4.5
Clackamas	1,201,728	943,429	78.5	12.8
Columbia	423,101	83,774	19.8	1.1
Douglas	3,236,500	65,112	2.0	0.9
Lane	2,950,997	2,255,820	76.4	30.7
Lincoln	627,843	9,331	1.5	0.1
Linn	1,476,732	1,468,204	99.4	20.0
Marion	764,295	760,714	99.5	10.4
Multnomah	281,735	140,633	49.9	1.9
Polk	475,890	422,518	88.8	5.8
Tillamook	704,982	6,146	0.9	0.1
Washington	469,001	413,944	88.3	5.6
Yamhill	459,391	422,481	92.0	5.8

Note: Multiply acreages by 0.4046856 to obtain equivalent in hectares.

The WRB is about 180 miles long and 100 miles wide (290 by 161 kilometers), and encompasses 11,478 square miles (29,728 km²), or 12% of the State of Oregon (Fig. 2). The basin is centered at approximately 45°N, 123°W in the northwest section of the state, and is oriented north-south between the crests of the Cascade Mountains on the east side and the Coast Range on the west side (Fig. 3). Elevations range from approximately 10 ft (3 m) above sea level at the confluence with the Columbia River to around 450 ft (137 m) at the south end of the valley floor; elevations on the west side reach 4097 ft (1249 m) at Marys Peak, the highest point in the Coast Range, and on the east side in the Cascade Range reach 10,495 ft (3199 m) at Mt. Jefferson. Mt. Hood at 11,245 ft (3427 m) is the highest point in the Cascade Mountains and in Oregon and lies outside the WRB to the east bordering the Sandy River watershed.

Landforms

The turbulent geologic history of the Pacific Northwest is clearly evident in the landforms of the WRB, where the imprints of recent volcanic eruptions, lava floods, and mudflows are found alongside glacial outwash, river alluvium, and marine sediments. The WRB lies within the Cascadia geologic province, which extends from British Columbia to northern California: the province’s western boundary lies 50-70 miles (81-113 km) off the Pacific coast where the Juan de Fuca tectonic plate meets and slides beneath the North America plate. The eastern boundary of the province is defined as the crest of the Cascade Range, a part of the “ring of fire” that encircles the Pacific Ocean. Over one thousand volcanoes lie between Mt. Rainier and Lassen Peak, and notable peaks within the eastern boundary of the WRB include Mt. Jefferson and the Three Sisters.^{1,2,3}



Figure 2. *Location of the Willamette River Basin within the continental United States.*

The Coast Range is a physiographically mature mountain range that extends from northern Washington to southern Oregon. It was formed primarily from uplifted crust and continental margin marine sediments. Erosion has worn down the range, particularly on the western side, and has exposed basalt flows and igneous intrusions, notably Marys Peak.⁴

The northern two-thirds of the Willamette Valley is underlain by the Columbia River Basalt Group, which spread out in basalt floods over substantial portions of southern Washington and northern Oregon around 15 million years ago.⁵

Climate

The climate in the Pacific Northwest is broadly divided into two regions by the barrier effects of the Cascade Range (Fig. 3). West of these mountains, the maritime influence of the Pacific Ocean dominates, while to the east, continental influences control the climate. In winter, warm, moist air moves over the Pacific Ocean from the southwest, tending to collide with the cold, dry continental air mass over the eastern part of the Pacific Northwest. This produces widespread and frequent rain west of the Cascade Range in December through February. East of the Cascades, winter temperatures are colder and precipitation is less. Heavy snowfall occurs in the Cascades, and in the highest regions permanent snowfields and glaciers persist. In the Coast Range, rain is heavy, but snowfall is generally light and transitory, although snow does accumulate on the highest peaks. In summer, high pressure in the mid-latitudes of the northern Pacific Ocean brings air from the northwest that is relatively cool and dry.

The WRB’s climate of cool, wet winters and warm, dry summers is mitigated by the effects of the two bordering mountain ranges. The relatively low Coast Range moderates the marine climate and creates a rain shadow in the western part of the WRB. On its eastern boundary, the topographic effects of the Cascades produce sharp temperature and precipitation gradients in the foothills and mountains. While the Oregon coast experiences frequent summer fog, the WRB tends to be relatively hot and sunny from July through September, with summer rainfall comprising 5% of the annual average total.^{6,7}

Water

Significant water resources exist west of the Cascade Range due to the heavy precipitation and moderate evapotranspiration rates. This is in striking contrast to the east side of the Cascades where low rainfall and higher temperatures result in comparatively arid conditions.

The Willamette River is the 13th largest river in the conterminous U.S. in terms of stream flow and produces more runoff per unit of land area than any of the larger rivers.⁸ Annual average discharge at the river’s mouth is 22.73 million acre-ft (2.8 million ha-m), accounting for 15% of the total flow in the Columbia River.⁹ Between 1941 and 1969, the U.S. Army Corps of Engineers built 11 major water storage reservoirs on tributaries to the Willamette River to provide irrigation water and inexpensive power and,

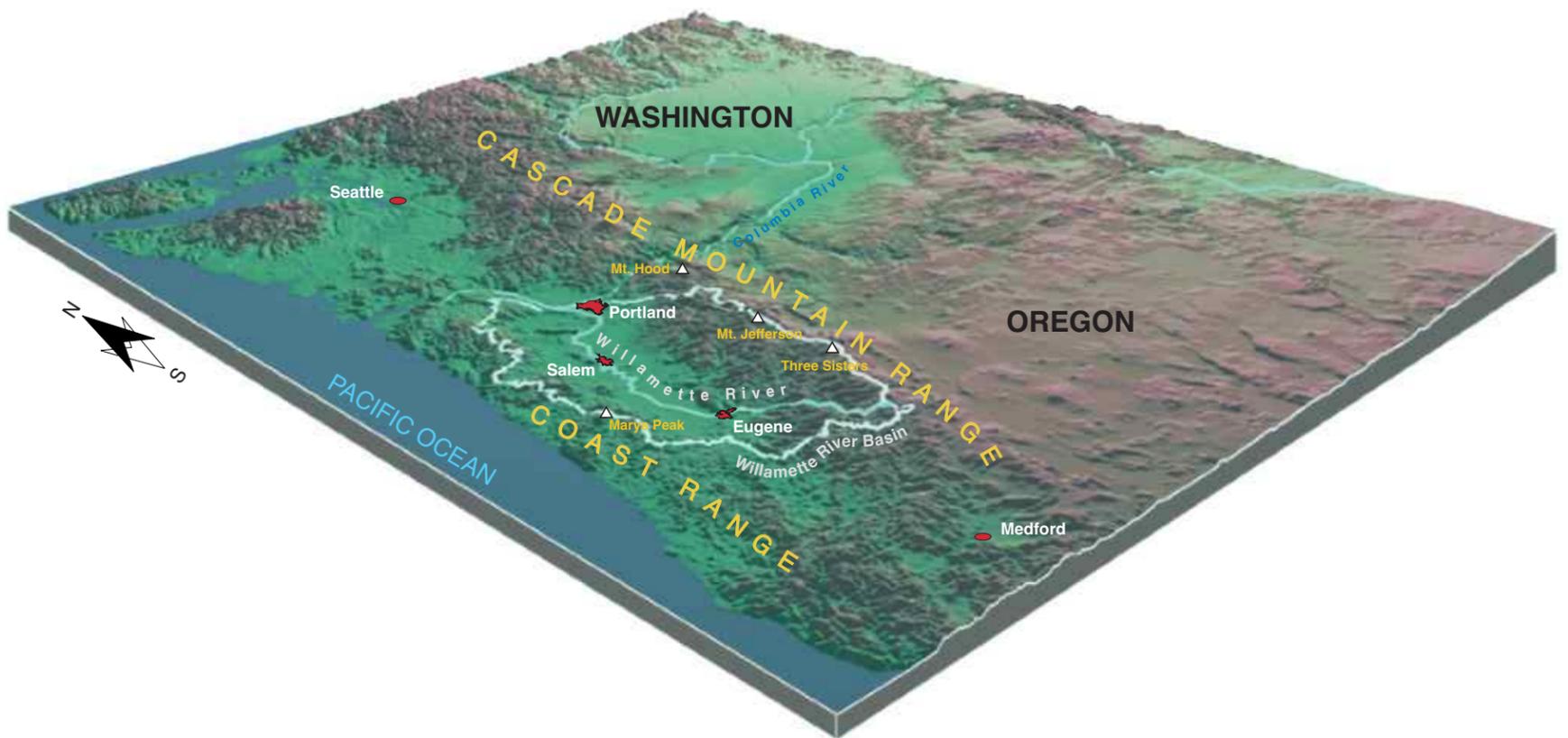


Figure 3. View of the Willamette River Basin within the Cascade and Coast Ranges of the Pacific Northwest, showing location of major cities.

most importantly, minimize the Willamette's damaging floods. Operation of the dams has lowered peak flows in the river during winter, and increased summer low flows, significantly altering the natural hydrological dynamics of the river.

The dams and other human modifications of the river network have contributed, however, to the decline of native fish populations — particularly salmon. The Willamette River is a vital migratory route for spring Chinook and steelhead that move through the WRB to tributaries such as the Clackamas, Santiam, and McKenzie Rivers. In addition, the WRB contains the richest native fish fauna in the state.¹⁰ Of the 31 native fish species that occur in the basin, seven are listed by the federal or state government as endangered, threatened, or sensitive.

Land

The Pacific Northwest cool, wet winters favor the growth of evergreen conifer forests. These abundant forests support a valuable commercial forestry industry. Thirteen National Forests administered by the U.S. Department of Agriculture Forest Service lie within Oregon. The Willamette, Mt. Hood, and Umpqua Forests of the WRB form part of a forested corridor that runs from southern Oregon to British Columbia along the Cascade Range. Forestland in the foothills of the Cascades and the Coast Range of the WRB also produce timber under management by the Bureau of Land Management (O&C Lands). Approximately 75% of the WRB is forested compared with 45% of the State of Oregon.^{7,11,12} In 1995, 4.3 billion board feet of timber were harvested in Oregon, approximately 31% of which originated in the WRB.¹³

While timberland is found in the foothills and at higher elevations, the valley floor of the WRB is one of the most important agricultural areas in Oregon due to the fertile soils and long growing season. About 45% of the total \$2.29 billion market value of Oregon agricultural products in 1992 was produced in the WRB.¹⁴ Horticultural plants, vegetables and fruit, grass seed, wine grapes, Christmas trees, grain, and hay are some of the products grown in the valley.

Innovative land use laws enacted in 1973 by the State of Oregon¹⁵ have enabled agricultural and timber lands to coexist alongside population centers, with the result that, today, the WRB is a mix of contrasting land uses.

People

Humans have lived in the Willamette River Basin for about 10,000 years, clustered for the most part around the river. Most of the Native American inhabitants were part of the Kalapuyan family, including the Calapooia, Luckiamute, and Yamhill tribes. The Clackamas tribe, part of the Chinook family, lived along the lower Willamette River below Willamette Falls. The name Willamette derives from the Kalapuyan word Wal-lamt, although the meaning of the word is uncertain. Some observers claim it referred to a particular location near present-day Oregon City, while others assert Wallamet referred to the river above Oregon Falls. According to a letter by G. H. Hines in the records of the Marion County Historical Society, Wal-lamt meant “green river,” an accurate description of the river's color at various times of the year. The present spelling is a product of both French and English interpretations of the indigenous people's unwritten language.^{16,17} Calapooia, Luckiamute, Yamhill, and Clackamas are now all names of major tributaries to the Willamette River. The Kalapuya managed the Willamette landscape for at least 200 years prior to EuroAmerican settlement. They burned the valley annually to maintain the open grasslands and savanna that favored game species, such as deer, and native plants, such as camas, that were staples of the Kalapuyan diet.

The relatively mild climate, the abundance of natural resources, and homestead opportunities drew large numbers of EuroAmerican settlers to the Pacific Northwest starting in the early 1800s. With the Coast Range and the Cascades forming barriers that constrained east-west movement, major north-south transportation corridors developed in the Willamette River Valley. Population centers developed along these accessways, and cities expanded onto the floodplains as dams dampened river flooding. By 1990, about 2 million people lived in the WRB, representing 68% of the total population of Oregon. The three largest population centers — Portland, Salem, and Eugene-Springfield — are situated along the banks of the Willamette River and the Interstate 5 transportation corridor.⁷