

The Willamette Valley
Most of Oregon's population, technology and agricultural centers, and important transportation, power, and communications lifelines are located in the Willamette Valley of western Oregon. The lowlands of the Willamette Valley extend about 120 km along the Willamette River and contain the major cities of Portland, Salem, Corvallis, and Eugene. The valley is subject to a variety of earthquake hazards (Madsen, 1990), and its water and geologic resources are under pressure from rapid urbanization (Garnett and Caldwell, 1998).

The valley is part of the Willamette River drainage basin, which covers 31,715 km² between the crest of the Oregon Coast Range to the west and the Cascade Range to the east (Garnett and Caldwell, 1998). The Willamette River is the largest river in the valley and is fed by several major tributaries, including the McKenzie, Clatsop, Santiam, Tualatin, Yamhill and Clackamas Rivers. The valley is the major source of ground and surface water for the population centers.

The valley consists of four sub-basins: the southern and northern Willamette basins, the Tualatin basin, and the Portland basin (see Figure 1). The Willamette River separates the southern Willamette basin from the northern basin, and the Clatsop Mountains separate the northern basin from the Tualatin basin. North of the Tualatin basin, the Tualatin Mountains form the divide with the Portland basin.

The Willamette Valley lies within a fore-basin between the Cascade Willamette Arc and the Coast Range that may have originated in early Tertiary time (Yates and others, 1996). Some of the sub-basins have accumulated several hundred meters of sediment in late Cenozoic time. The northern basin also contains lavas of the Miocene Columbia River Basalt Group (CRBG). Flows of the CRBG entered the valley approximately 16 million years ago through a low in the Cascade Range and spread into the Portland and northern Willamette basins. The Tualatin Mountains, Clatsop Mountains, Willamette Hills, and Santiam Hills are largely composed of CRBG flows that dip inward toward the basin centers (Benson, and others, 1989; Yates and others, 1996). Approximately 10 to 120 Ma, the Boring Lava was erupted from several vents throughout the northern Willamette, Portland, and Tualatin basins (Conroy and others, 1996; Madsen, 1990; Madsen, 1994). Boring Lava capped the Oregon City plateau (Yates and others, 1996) and created many of the prominent small cone-shaped hills and prominent northwest-trending ridges in the Portland basin (Madsen, 1990). Between 15,000 and 12,500 years ago, catastrophic floods from glacial Lake Missoula inundated the majority of the Willamette Valley (Conroy and others, 2001). These floods reached up to 120 meters above sea level covering the valley with up to 15 meters of sediment and depositing ice-cold boulders (designs to the Willamette Valley as far south as Eugene, Oregon (Allison, 1935; Watts, 1980; O'Connor and others, 2001).

Creating the map
This open file report was generated as a resource for earth and environmental scientists interested in the physiography of the Willamette Valley. Several data sets were used to generate this report, including: 1) Topographic data from the U.S. Geological Survey 10-meter digital elevation models (DEM); <http://geopubs.wr.usgs.gov/open-file/01-294/> (with reports); 2) Stream coverages for the Willamette, Columbia River, Santiam River, and the Yamhill River - River coverages from The Northeast Aquatic Information Network or Streamnet - <http://www.streamnet.org>; 3) Transportation Coverage; Standard Data Transfer Files (STDS) from the National Atlas data depot - <http://www.nationalatlas.gov/atlftp.html>. The data were compiled using the Grid module in ARC/INFO, and colors were assigned to elevation ranges to create the color-shaded relief map. Elevation intervals are smaller in the lowlands to emphasize fluvial and flood features. The hillshade and color grids were combined to produce the color-shaded relief map. A detailed description of the techniques used to create these maps is in the README file of this report. Hargrett and Greenberg (1996) developed many of the above techniques and have created a useful guide to working with DEMs, which is available on the web side web at <http://pubs.usgs.gov/of/96-487/haug2.html>.

Users of these data should be aware that the 10-meter DEM is not sufficiently detailed to show cultural features, particularly the cut and fill along the interstate freeways, State Highways, and major gravel pits. In the Tualatin Mountains, state highway 26 produces a prominent northwest-trending lineation in the topography. In addition to elevation across 7.5-minute topographic quadrangle boundaries, most obvious in the northwest-most corner of the Tualatin Basin, 2) use shaded patterns around point sources in areas with gentle slopes, most notable in the northern Willamette Valley near Woodburn, and 3) in areas with steep slopes a step pattern can be noticeable, examples are present in stream channels 10-15 miles west of Salem. We did not remove them because a produced unacceptable smoothing of the topographic detail in the original 10-meter DEM. It should be noted that with less vertical exaggeration the artifacts will be less obvious. This Open-File report, including data set maps, is available on-line at <http://geopubs.wr.usgs.gov/open-file/01-294/>.

We thank Ralph Hargrett for many thoughtful discussions about the techniques used to create color-shaded relief maps. Ian Madsen and Jan O'Connor provided helpful reviews and Ian suggested a basic color scheme for the color-shaded relief map.

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Universal Transverse Mercator Projection, zone 10, 2x vertical exaggeration, compiled from 7.5 minute 10-meter DEMs (available on-line with this report)

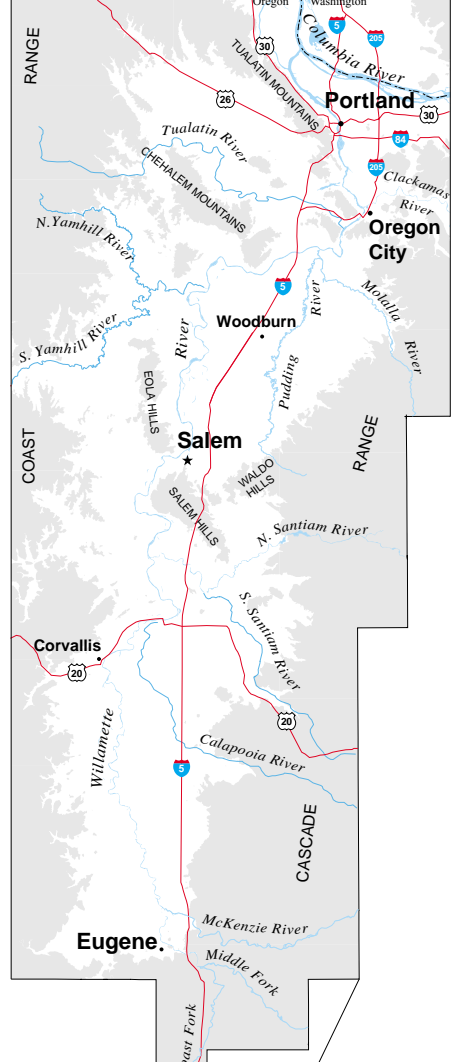
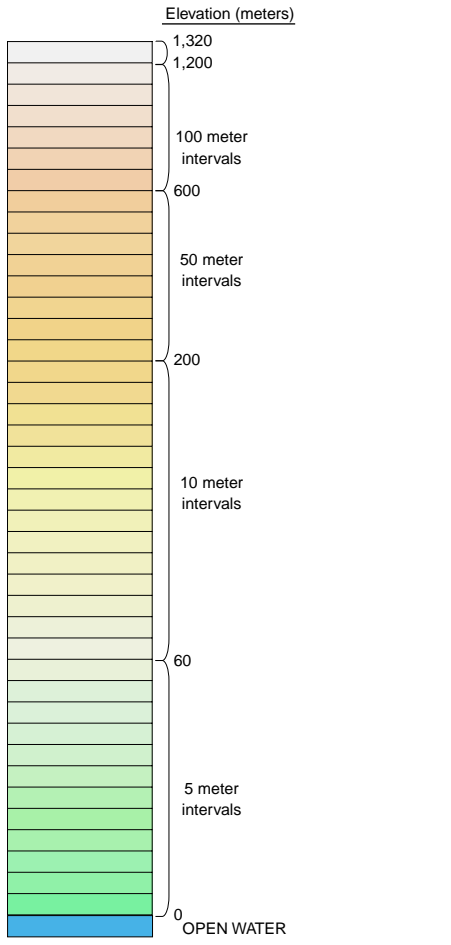


Figure 1. Location Map

COLOR SHADED-RELIEF MAP OF THE WILLAMETTE VALLEY, OREGON BY R. W. GIVLER AND R. E. WELLS 2001

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