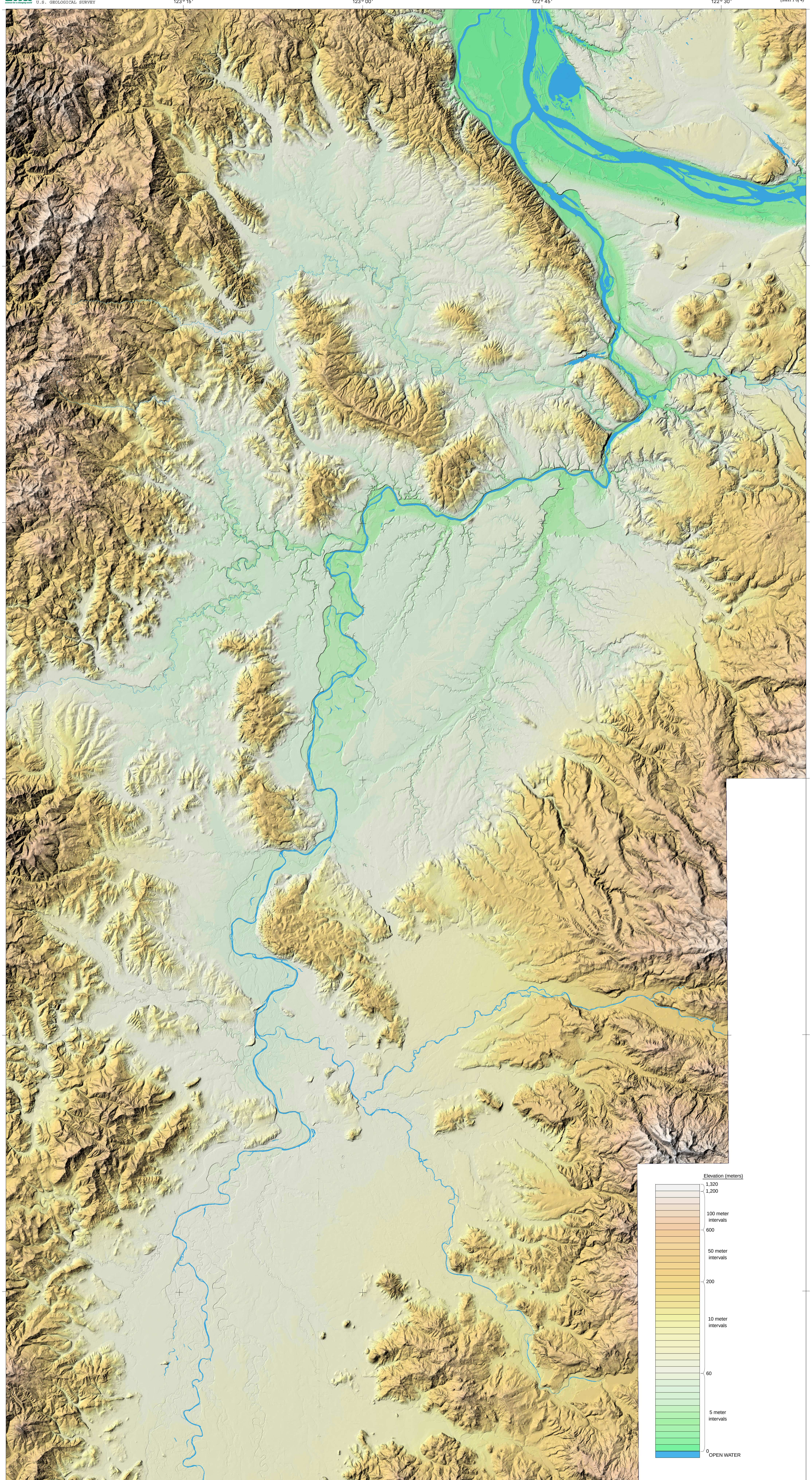
OPEN-FILE REPORT 01-294
(sheet 1 of 4)



Universal Transverse Mercator Projection, zone 10, 3x vertical exaggeration compiled from 7.5 minute10-meter DEMs (available on-line with this report)

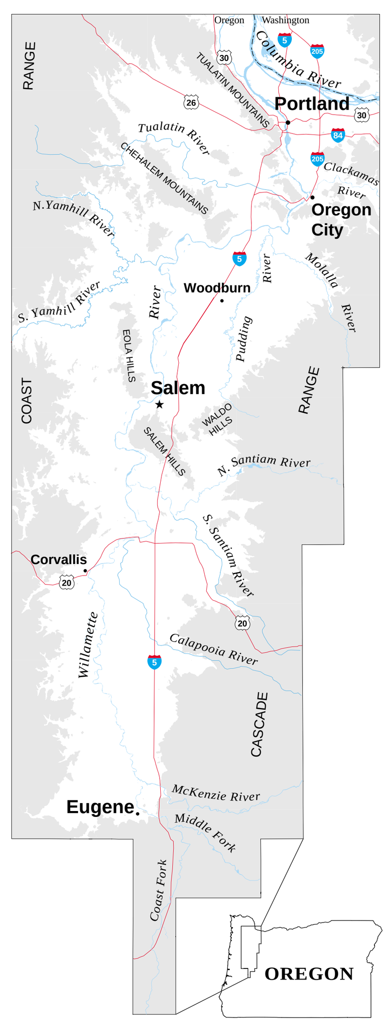


Figure 1. Location Map

SCALE 1:125,000

KILOMETERS 1 0 5 10

MILES 1 0 5 10

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 (Madin, 1990), and its water and geologic resources are under pressure from rapid urbanization (Gannett 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 on the west and the Cascade Range to the east (Gannett and Caldwell, 1998). The Willamette River is the largest river in the valley and is fed by several major tributaries, including the McKenzie, Calapooia, 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 Waldo Hills separate the southern Willamette basin from the northern basin, and the Chehalem Mountains separate the northern basin from the Tualatin Basin. Northeast of the Tualatin basin, the Tualatin Mountains form the divide with the Portland Basin.

The Willamette Valley lies within a fore-arc basin between the Cascade Volcanic Arc and the Coast Ranges that may have originated in early Tertiary time (Yeats and others, 1996). Some of the sub-basins have accumulated several hundred meters of sediment in late Cenozoic time. The northern basins also contain 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, Chehalem Mountains, Waldo Hills, and Salem Hills are largely composed of CRBG flows that dip inward toward the basin centers (Beeson, and others, 1989, Yeats, and others, 1996). Approximately 3.0 to 0.26 Ma, the Boring Lavas were erupted from several vents throughout the northern Willamette, Portland, and Tualatin basins (Conrey and others, 1996, Madin, 1994). Boring Lavas capped the Oregon City plateau (Yeats, and others, 1996) and created many of the prominent small cone-shaped hills and mountains southeast of downtown Portland (Madin, 1990). Between 15,000 and 12,700 years ago catastrophic floods from glacial Lake Missoula inundated the majority of the Willamette Valley (O'Connor and others, 2001). These floods reached up to 120 meters above sea level covering the valley with up to 35 meters of sediment and depositing ice-rafted boulders foreign to the Willamette Valley as far south as Eugene, Oregon (Allison, 1935, Waitt, 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) Topography – U.S. Geological Survey 10-meter digital elevation models (DEMs) - http://geopubs.wr.usgs.gov/open-file/of01-294/ (with report), 2) Streams coverages for the Willamette, Columbia River, Santiam River, and the Yamhill River - River coverages from The Northwest 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/atlasftp.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. Haugerud and Greenberg (1998) developed many of the above techniques and have created a useful guide to working with DEMs, which is available on the world wide web at http://pubs.usgs.gov/openfile/of98-487/haug2.html.

Users of these data should be aware that the 10-meter DEM is 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 the cultural features, there are three kinds of errors to the data that are visible at publication scale: 1) mis-matches in elevation across 7.5-minute topographic quadrangle boundaries, most obvious in the northwestern most corner of the Tualatin Basin; 2) star-shaped 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 it produced unacceptable smoothing of the topographic detail in the original 10-meter DEM. It should be noted that 3x vertical exaggeration the artifacts will be less obvious. This Open-File report, including data and maps, is available on-line at http://geopubs.wr.usgs.gov/open-file/of01-294/

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

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COLOR SHADED-RELIEF MAP OF THE WILLAMETTE VALLEY, OREGON

BY
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2001

For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225

Available on World Wide Web at *http://geopubs.wr.usgs.gov/open-file/of01-294/*