



Research Notes

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ODOT and USGS join forces to ask: How Low Can You Flow?

Growing populations in all western United States are putting increasing stresses on both water supply and water quality. Using flow statistics derived from stream gage data, scientists can characterize the water flow of a certain magnitude at a location of interest on a stream. These statistics can be used to efficiently determine low flows for fish passage, temporary water management, and stormwater quality facility designs.

What is Low-Flow?

In the case of this study, low-flow refers to the period of time when streams or waterways experience relatively low levels of flowing water, in other words, the opposite of flood-flow. The study produced low-flow statistics for all streams and waterways in Oregon, as well as in adjoining portions of Washington, Idaho, Nevada and California

In Oregon, hundreds of river reaches (stream segments) have been designated as impaired (exceeding water quality and/or biological criteria) by Total Maximum Daily Load (TMDL) assessments. Reliable estimates of expected stream flow are needed at specific periods of the year when determining the maximum allowable amount of a pollutant.

Likewise in Oregon, hundreds of river reaches are home to endangered or threatened aquatic species. Water handling structures, such as culverts, need to be designed to accommodate aquatic life over most of the range of flows they experience.

Temporary water handling during construction or maintenance activities is also an important application of low-flow projections.

For the purposes of this study ODOT tapped the expertise of the United States Geological Survey (USGS) Water Resources Division. This Division was asked to develop regression equations for predicting flow-duration quantiles for the 5th, 10th, 25th, 50th, and 95th percent exceedances and for 7-day, 10-year (7Q10); and 7-day, 2-year (7Q2) low flows.

The study area encompassed all of Oregon and adjoining areas of Washington, Idaho, Nevada, and California. Included in this area were entire sections or portions of nine U.S. Environmental Protection Agency (EPA) Level III eco-regions: Coast Range, Klamath Mountains, Willamette Valley, Cascades, Eastern Cascades Slopes and Foothills, Columbia Plateau, Blue Mountains, Snake River Plain, and Northern Basin and Range.

One of the most difficult aspects of this work was properly accounting for consumptive uses of water above the stream gages that provide the data on which this work is based.

In the end, the study produced 910 regression equations. The USGS is adding these equations to their web-based tool, StreamStats. StreamStats will provide users with a set of both annual and monthly flow-duration and low-flow frequency estimates for any ungaged site within Oregon. Prediction intervals at the 90-percent confidence level are also automatically computed. Prediction intervals quantify the uncertainty in using a regression equation at an ungaged site. A 90-percent confidence level means that there is 90-percent assurance that the true value of a flow statistic at an ungaged site will be within a plus or minus interval around the predicted flow statistic.



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