RESEARCH

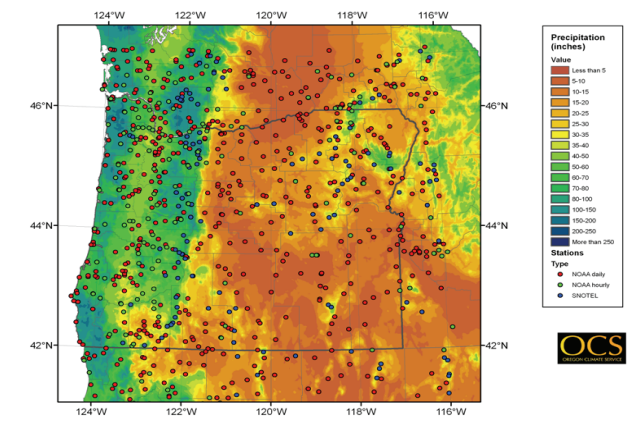
Research Notes

RSN 08-04 December 2007

Rainfall Maps for the 21st Century

A research project regarding regional precipitation-frequency analyses of 24-hour precipitation annual maxima for the State of Oregon has recently been completed by Oregon State University's Oregon Climate Service. Results of the research provide an update of 40-year-old data with 21st Century maps. This project was a cooperative effort between ODOT, Oregon Water Resources Department, and the Central Oregon Intergovernmental Council.

A final report documents the findings of regional precipitation-frequency analyses of 24-hour precipitation annual maxima for the State of Oregon. It also describes the procedures used for spatial mapping of the precipitation-frequency estimates for selected recurrence intervals.



Map showing the study area and the locations of precipitation stations used in the new maps and report. The colors behind the station points depict the spatial variation of mean annual precipitation across the study area.

The report and included maps represent an update of the information contained in the precipitation-frequency atlas, published by the National Weather Service in 1973 (NOAA Atlas 2). Data collection for the National Weather Service (NWS) study ended in 1966. The new study includes the 40-years of precipitation record collected since 1966 as well as additional data from sources not available in 1966. These additional data provide a precipitation database with more than double the record that was available in the original NWS study.

In addition to the much expanded dataset, there have been major advances in the methods for statistical analysis of precipitation annual maxima, and for spatial mapping of precipitation in complex terrain. L-Moment statistical analysis techniques, conducted within a regional framework, have greatly improved the reliability of precipitation magnitude-frequency estimates.

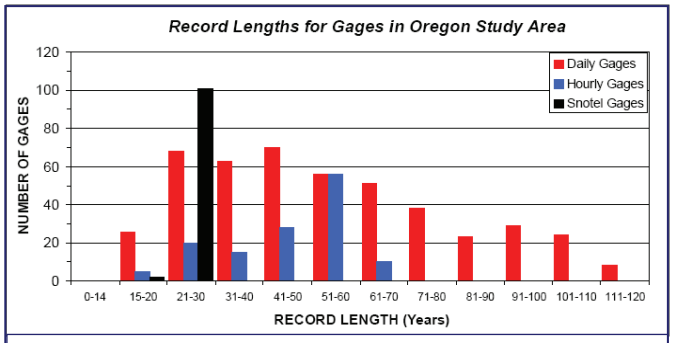
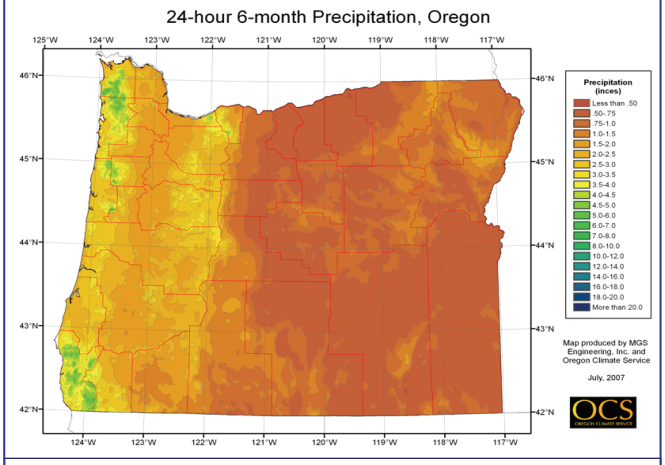


Chart showing number of gages used in the study, grouped by the length of record that each station had accumulated. No stations with less than 15 years of data were used.

Development of the PRISM model, incorporating digital terrain data, has also improved the spatial mapping of precipitation and increased the reliability of estimating precipitation in the broad areas between precipitation measurement stations. These methodologies are particularly important in areas such as Oregon, with high topographic and climatic variability. Both of these methodologies have been utilized in conducting the precipitation-frequency analyses and in developing isopluvial maps for selected recurrence intervals.

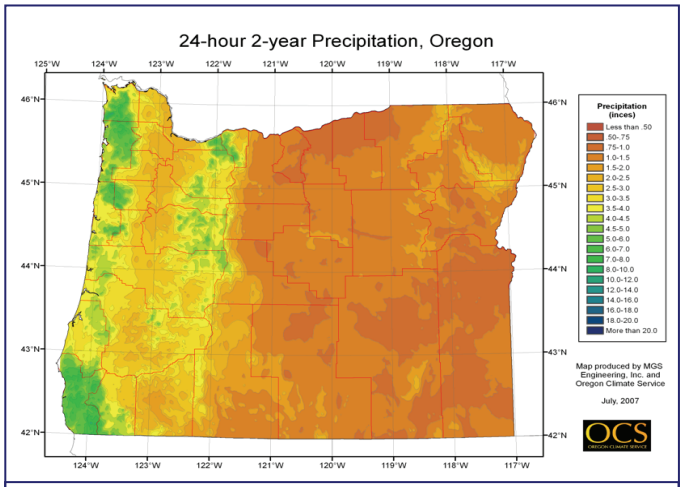
The study area was divided into 17 climate regions and 68 sub-regions, which had similar enough characteristics to apply these modern statistical techniques. Isopluvial maps were then computed for 24-hour precipitation, with

recurrences of 6-months, 2-years, 10-years, 25-years, 50-years, 100-years, 500-years, and 1000-years.



Reproduction map of 24-hour precipitation with a 6-month recurrence interval. Conceptually, one would expect to see at least the depicted amount of rainfall during a 24-hour period at least once in 6 months time.

The complete report also provides guidance regarding the limitations of this work. For example, the maps are based on "point" values at approximately .25 square mile. For watersheds larger than a few square miles, reduction factors would need to be applied.



Reproduction map of 24-hour precipitation with a 2-year recurrence interval. Conceptually, one would expect to see at least the depicted amount of rainfall during a 24-hour period at least once in 2 years time.

Information regarding Probable Maximum Precipitation is also being produced for the Oregon Department of Water Resources.

There is still additional work remaining to be done with this modern data set. For example, there is a need for 2-hour precipitation maps over the same range of recurrence intervals.

For more information, contact Matthew Mabey at 503-986-2847 or via e-mail: *Matthew.Mabey@odot.state.or.us*

Technical oversight for this project was provided by the Technical Advisory Committee members: Phil Chang (Central Oregon Intergovernmental Council), Michele Eraut (FHWA), Oliver Flick (City of Bend), Barry Norris (OWRD), Alvin Shoblom (ODOT GeoEnvironmental), and Matthew Mabey (ODOT Research).

To request a copy of the research report *"Regional Precipitation-Frequency Analysis and Spatial Mapping of 24-Hour Precipitation for Oregon,"* contact the ODOT Research Unit by phone, or view the report on the Research Unit webpage listed below.

Oregon Department of Transportation

Research Unit
200 Hawthorne Ave. SE, Suite B-240
Salem, OR 97301-5192

Telephone: 503-986-2700
FAX: 503-986-2844

For more information on ODOT's Research Program and Projects, check the website at

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