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Teleconnections: Remote Weather Conditions Relationships

New snowmelt runoff forecasting techniques using teleconnections improve water management capabilities

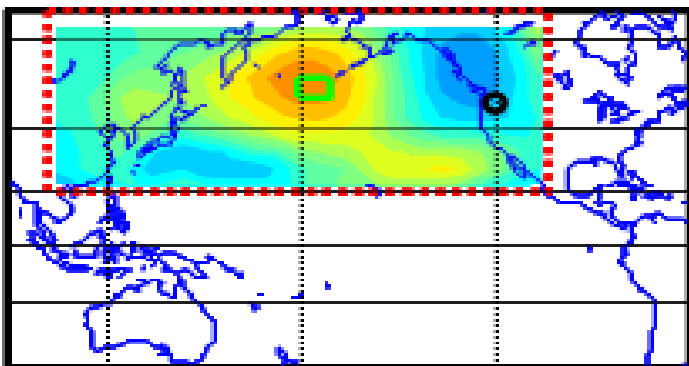
What Is The Problem?

Water managers must annually plan and schedule reservoir operations, hydropower generation, and water transfers as effectively and efficiently as possible. In the western U.S., these planning and scheduling processes rely heavily on predictions of April-July snowmelt volume. The economic benefits of hydropower and reservoir operations depend upon the accuracy of these water supply predictions.

April-July runoff volume forecasts are typically made once a month beginning in January. Gains have been made in forecast accuracy through improvement to the forecast model frameworks (see [Improved Water Supply Predictions Bulletin](#)). However, more improvements are possible.

What Is The Solution?

Reclamation has evaluated how relationships between seasonal western U.S. runoff and prior atmospheric pressure patterns might be used to enhance water supply forecast accuracy. The study considered April-July runoff volumes in 17 Mid-Pacific and Pacific Northwest basins, and how these volumes were correlated with atmospheric pressure conditions over the North Pacific, months earlier. In the example graphic below, Aug-Nov pressure conditions near the Aleutian Islands (green box) show a relatively strong relationship with Yakima basin April-July runoff (black circle); warm colors show in-phase relationships. These relationships that can predict weather months later at distant locations are termed “teleconnections”.



Multiple teleconnections were identified for the 17 western U.S. basins that can be used to improve forecast accuracy. Some of the teleconnections occur as early as the previous summer, which is months ahead of traditional water supply predictive information that currently limits forecasts to being issued no earlier than January of the given water-year.

Forecast improvements were evaluated by comparing teleconnection and traditional predictive variables in the water supply forecasting framework mentioned above. Results suggest significant forecast improvements for most basins and the potential for earlier forecasts. Based on these results, Reclamation developed the *Teleconnections for Snowmelt Volume Forecasting* computer program package, which facilitates teleconnection data retrieval and longer-lead forecasting of April-July snowmelt volumes for the 17 basins included in the case study (i.e. located in Reclamation’s Mid-Pacific and Pacific Northwest regions).



Who Can Benefit?

Several entities provide April-July seasonal runoff forecasts used by Reclamation (i.e. Reclamation’s Pacific Northwest region (PN6200), California Department of Water Resources, USDA/NRCS National Water & Climate Center, and NWS CANNV River Forecast Center). Reclamation stands to benefit from this information if it becomes folded into operational forecast products served by these providers. To that end, the tool mentioned above has been distributed to these entities who are continuing to evaluate it on an experimental basis. For example, PN6200 recently incorporated teleconnections components into runoff forecast models and is evaluating the potential benefits.

More Information

In addition to the computer program package tools discussed above, a user’s manual and other detailed reports on teleconnections for runoff forecasts are available at [Teleconnections](#).

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Collaborators

Reclamation's Science and Technology Program and PN62000
and the NOAA Climate Diagnostics Center www.cdc.noaa.gov/