WRITTEN STATEMENT

Jeanine Jones

Interstate Resources Manager for the California Department of Water Resources

on behalf of the Western States Water Council

Before the

Subcommittee on Environment

Committee on Science, Space, and Technology

United States House of Representatives

Hearing on

"Reauthorizing the Weather Act: Users of Weather Data and Areas for Improvement by Sector"

June 6, 2023

Chairman Miller, Ranking Member Ross, and members of the Environment Subcommittee. Thank you for inviting me to testify before you today on the importance of improving subseasonal to seasonal (S2S) forecasting in the upcoming reauthorization of the *Weather Research and Forecasting Innovation Act of 2017* (Public Law 115-25). I am Jeanine Jones, Interstate Resources Manager for the California Department of Water Resources and a member and former Chair of the Western States Water Council. The Western States Water Council is a government entity composed of representatives from eighteen western states that works to promote effective cooperation among western states on conservation, development, and management of water resources.

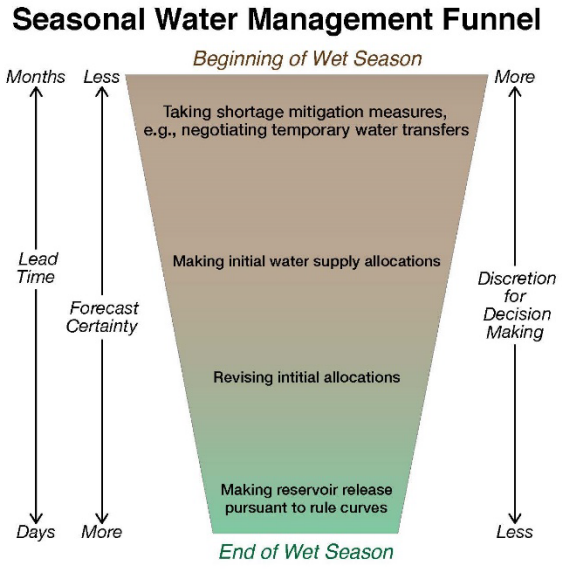
I am a registered civil engineer in California and Nevada and a designee on the Colorado River Board of California. Much of my career has been spent in drought preparedness and management. I have previously served on NOAA's Climate Working Group and on the Water Resources Adaptation to Climate Change Workgroup of the USGS Advisory Committee on Water Information.

Forecasting and Water Management

The western U.S. has high variability in precipitation, both annually and within the water year. As documented by the National Oceanic and Atmospheric Administration's (NOAA's) National Centers for Environmental Information, disasters at both wet and dry extremes (floods and droughts) are responsible for billions of dollars in losses. Being able to predict and plan for extremes and to store water when available benefits local communities, agriculture, energy production, and the environment.

Water management decisions are made at many time scales. Lead time is critical in making water management decisions and few such decisions are made within the time period of a conventional weather forecast (i.e., lead times of up to seven to ten days). These short-lead forecasts can support actions such as near-term reservoir operations, but reservoir operations decisions represent only a small fraction of water management decision-making. Most decisions involve longer timeframes, with the most impactful ones involving resource allocation or hazard mitigation actions made with lead times of months, not days.

Water users, whether they are retail water agencies who contract with a water wholesaler for their supplies or individuals such as agricultural producers, want information about their likely annual water allocations as early as possible to allow them to make operational or business decisions. It is not the forecast of a single storm that influences such decisions, but rather the cumulative results of multiple storms occurring over weeks or months that determines their water supply conditions. For example, about half of the nation's drinking water and most of the drinking water in rural areas comes from groundwater; whether a community or resident needs to drill a new well or deepen an existing one in expectation of potential drought-related shortages is unrelated to the forecast of a single storm but a seasonal forecast would be relevant information.

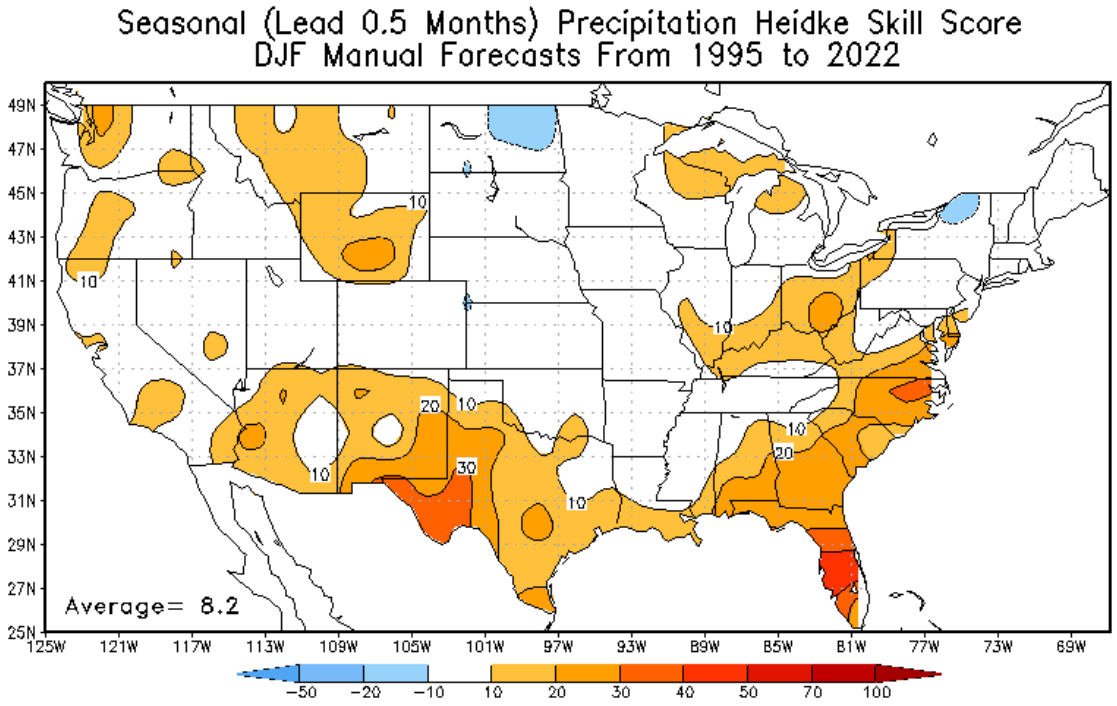


Water agencies' preparation for the extremes of droughts and floods can entail actions such as prepositioning resources, negotiating contracts for water transfers or temporary agricultural land fallowing programs, completing environmental regulatory compliance and permitting, or implementing public outreach campaigns. Such actions do not happen quickly, and they need to be put in place before impacts occur in order to mitigate potential hazards. State water agencies may be able to offer financial or technical assistance to mitigate impacts, but they too need advance warning to secure the resources needed,

including state budget resources. Water agencies have pointed out the importance of skillful seasonal forecasting for drought response, as has NOAA itself.[1]

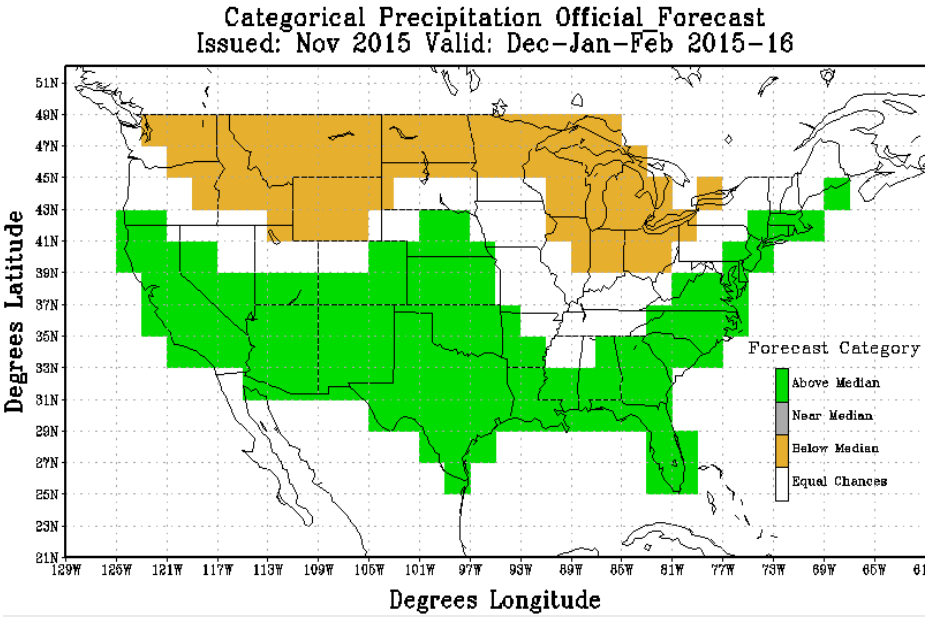
Present S2S Forecast Products Not Adequate

There is significant disparity between water agency needs and applications for S2S precipitation forecasts and the skill of presently available operational products. The National Weather Service's Climate Prediction Center (CPC) has issued S2S precipitation outlooks since the mid-1990s. However, forecast skill for the western U.S. is limited – just slightly better than predicting average weather conditions – and is not adequate to support water management decision-making. The CPC graphic below summarizes the historical skill of its outlooks for the December – February period important for western water supply. The Heidke skill score measures the performance of forecasts. A zero score means no more skill than predicting average historical conditions; a perfect forecast would have a score of one.



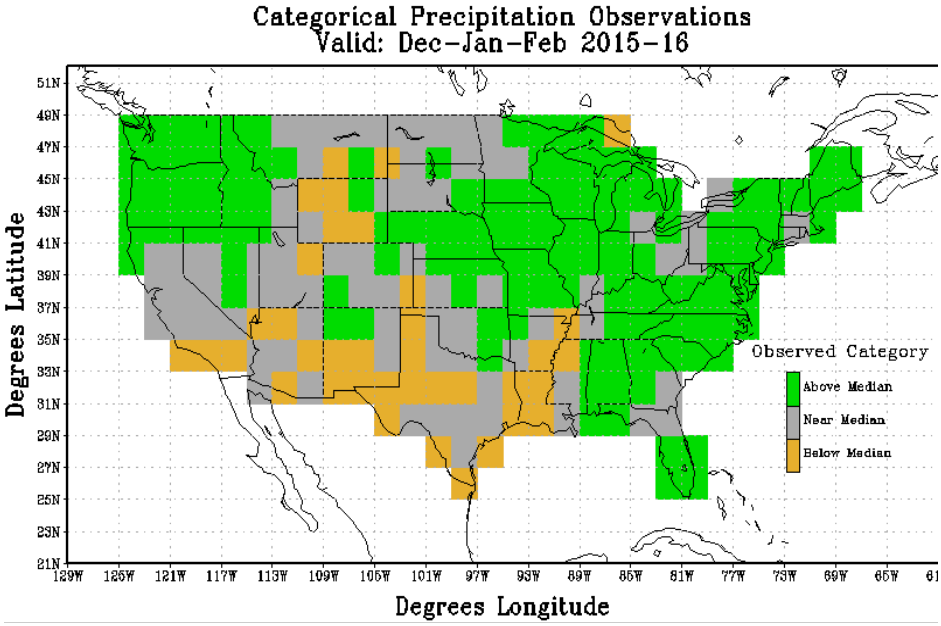
[1] https://www.weather.gov/media/publications/assessments/drought_ca14.pdf

Of particular note for water agencies, NOAA's seasonal outlooks have been dramatically wrong in extreme years when the need for skillful forecasts is the greatest. Shown below is a Water Year 2016 example, when one of the strongest El Niño events of record occurred, comparing NOAA's precipitation outlook with the observed conditions. Water Year 2016 was the fifth year of California's 2012-2016 drought, when urban water agencies were calling for their customers to comply with stringent conservation requirements at the same time as the news media were postulating wide-scale flooding based on the precipitation outlook tied to a strong El Niño event. This example highlights the lack of scientific understanding regarding the actual influence of the El Niño-Southern Oscillation (ENSO) in much of the country. NOAA's precipitation outlooks rely heavily on ENSO conditions as an indicator of precipitation, but research performed by the Western Regional Climate Center[2] and by others[3] shows that ENSO conditions alone are a poor predictor in many western watersheds, including in California and in the Upper Colorado River Basin.

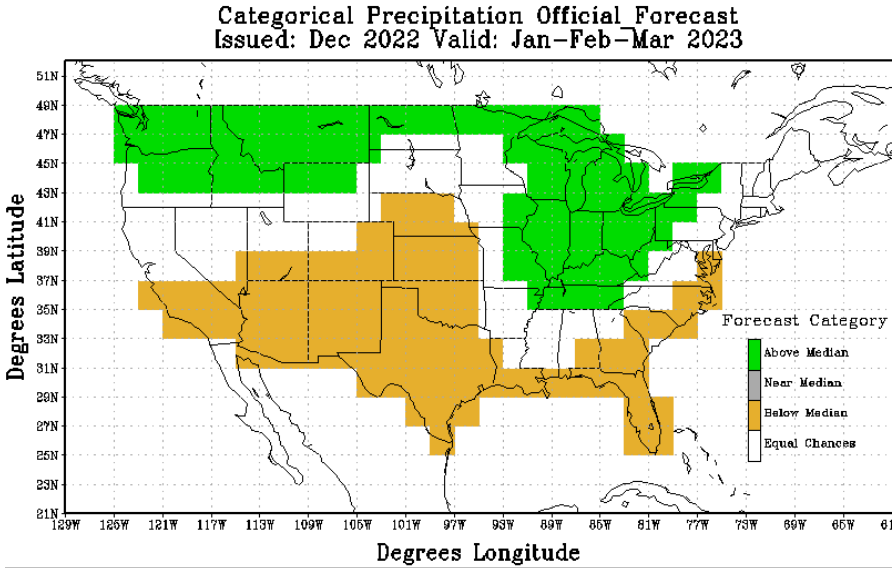


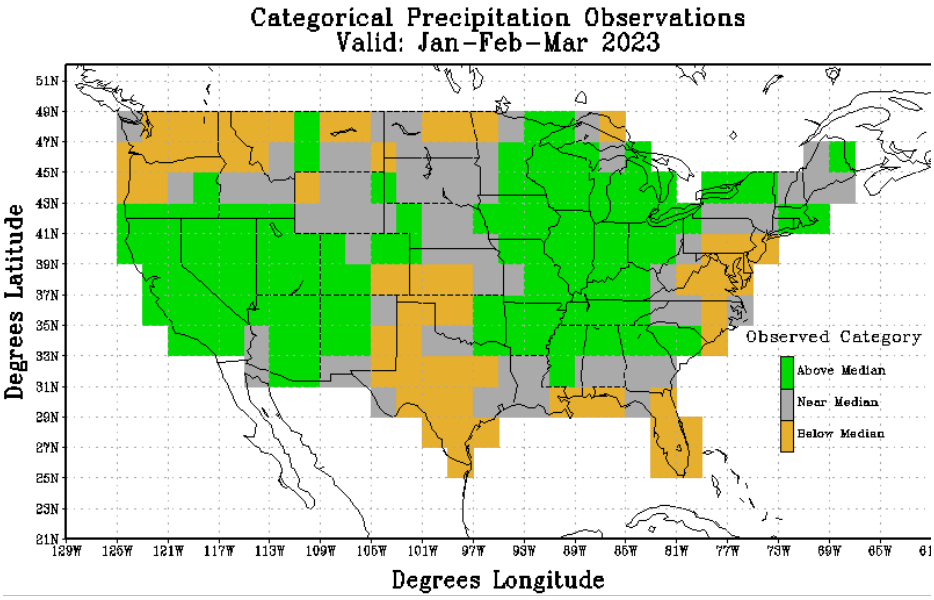
[2] https://wrcc.dri.edu/Climate/soi_precip.php

[3] https://journals.ametsoc.org/view/journals/bams/103/12/BAMS-D-21-0252.1.xml



The present water year, Water Year 2023, is another illustration of a dramatically missed forecast in a critically important water year. Many western watersheds went from severe drought conditions to flooding conditions. California, for example, had just experienced its driest three consecutive years of record and water agencies were preparing for another year of drought emergency response. Instead, one of the wettest years of record occurred, necessitating a rapid shift to flood emergency response and flood fights, and a massive effort to maximize groundwater recharge with temporarily available floodwaters, including issuance of emergency recharge permits and mobilization of rented high-capacity pumps.





Opportunities for Improving Forecasting

The *Weather Research and Forecasting Innovation Act of 2017* directed NOAA to improve its S2S forecasts and to submit a report to Congress with recommendation for doing so. NOAA's 2020 report to Congress[4] pursuant to that requirement recommended four regional pilot projects *chosen based on the existence of major climate phenomena that have huge economic impacts and for which current S2S predictive skill is too low to be effectively used by many stakeholders. They were also chosen because the limited predictive skill of the climate phenomena highlighted for these regions is due to fundamental limitations in our current understanding and models. Therefore, improving predictive skill for these projects would improve skill for other regions as well.*

Two of the pilot projects were for precipitation forecasting, one for winter precipitation in the western U.S. to support water management and the other for spring/summer precipitation in the central U.S. for agriculture. Although recommended in 2020, NOAA has not sought funding for these pilot projects via the President's budget request to Congress. In concept, the pilot projects would be modelled after NOAA's successful Hurricane Forecasting Improvement Program (HFIP), in which specific metrics of performance

[4] https://repository.library.noaa.gov/view/noaa/27408

improvement would be identified for its operational forecasts. Each of the pilot projects would require a level of investment and time commitment similar to that for HFIP.

Western water agencies have demonstrated their support for a winter precipitation pilot project, as evidenced by seed research projects funded by the California Department of Water Resources with NOAA, the National Aeronautics and Space Administration, and the academic community, and by stakeholder support as evidenced by the attached letter for the record.

Reliable S2S forecasts would allow water managers to operate infrastructure more efficiently and allocate resources to mitigate and manage impacts. Improved forecasts would also allow agencies to expand the use of new technologies to maximize efficient use of infrastructure and resources. Forecast-informed reservoir operations (FIRO) and managed aquifer recharge with floodwaters (FloodMAR) are now being successfully piloted at the seven-day weather forecast time scale. Expanding use of forecasts to longer time scales, if reliable S2S forecasts were available, would significantly increase the ability to develop new water supplies at minimal cost to their customers.

Recommendation

The Western States Water Council respectfully recommends that the Weather Act be reauthorized with explicit direction to NOAA to improve S2S precipitation forecasting, including the specific direction to NOAA to implement to two precipitation forecasting pilot projects it recommended in its 2020 report to Congress.

Conclusion

Mr. Chairman, Ranking Member, and Members of the Subcommittee, thank you for the opportunity to testify before you today. I would be pleased to answer any questions you may have.