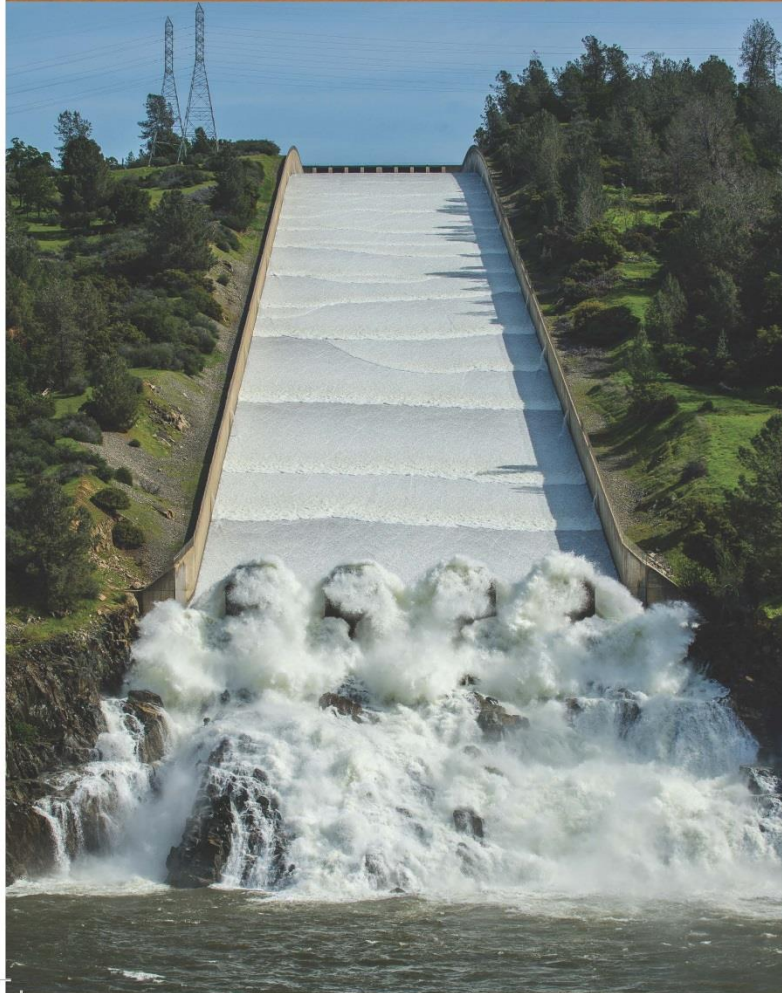


Improving  
Sub-Seasonal to Seasonal  
Precipitation Forecasting for  
Water Management



WESTERN  
STATES  
WATER  
COUNCIL

# Sub-Seasonal to Seasonal (S2S) Precipitation Forecasting

- Operational weather models – typically 2 weeks out (higher skill in first week)
- Sub-seasonal – 2 weeks to about 60 days
- Seasonal – up to 12 months



# Why This Effort?

## WSWC Perspective

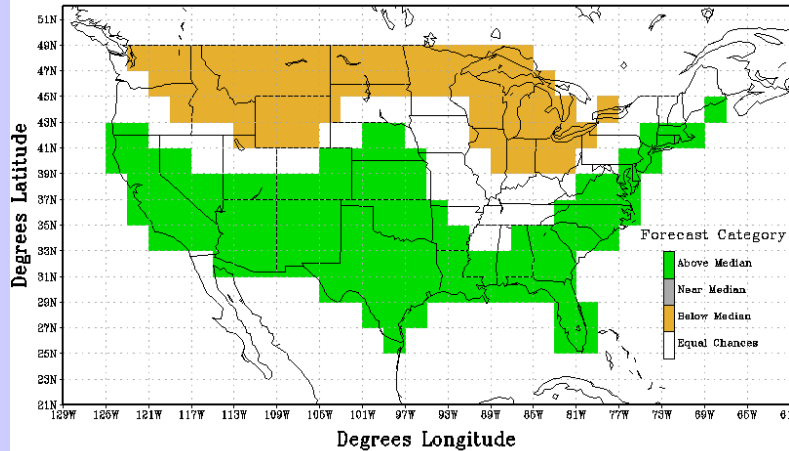
- Importance of skillful sub-seasonal to seasonal precipitation forecasting for Western water management
- Lack of resources being directed to improving S2S precipitation forecasting
- Lack of resources being directed to Western precipitation prediction needs
- Time is ripe for action

# **WSWC/NOAA/CDWR Workshops on S2S Precipitation Forecasting**

- San Diego, May 2015
- Salt Lake City at NWS Western Region HQ, October 2015
- Las Vegas at Colorado River Water Users Association, December 2015
- College Park, April 2016
- San Diego, 2016

# Present Forecasting Skill Not Usable for Water Management

Categorical Precipitation Official Forecast  
Issued: Nov 2015 Valid: Dec-Jan-Feb 2015-16



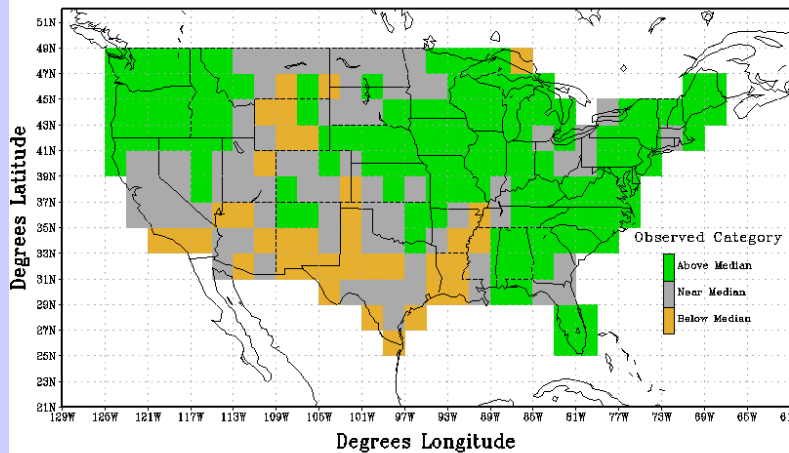
**Precipitation Forecast Heidke Skill Scores :**

Non-Equal Chance(non EC) forecasts: -7.87

All forecasts: -6.03

% coverage not Equal Chance forecasts : 76.72

Categorical Precipitation Observations  
Valid: Dec-Jan-Feb 2015-16



# CALIFORNIA DROUGHT



2014 SERVICE ASSESSMENT



# Lead Time Very Important for Water Management

- Public health & safety decisions
- Balancing risk/cost trade-offs
- Increasing water management efficiency
- Operating within legal & regulatory frameworks
- Reducing impacts of extreme events
- Responding to increased competition for resources

# Will the Rest of This Winter be Wet or Dry?

## Example Sub-Seasonal Decisions

- How much water will we be able to provide to our water users? When can we make the announcement?
- Will we hit hydrologic shortage triggers that require extraordinary conservation measures, or the need to negotiate contracts or adopt regulations?
- Is an elevated flood risk likely this spring? Should we pre-position resources?
- If the rest of this winter looks dry, can we use reservoir flood control space to store water for allocation to users (e.g., forecast-informed reservoir operations)?
- Will we have to curtail diversions on intensively used rivers? How early in the season?



# Will This Winter be Wet or Dry?

## Example Seasonal Decisions

- Should we begin negotiating contracts for one-time sale of surplus wet-weather water? Can we set up a temporary groundwater banking program to take advantage of wet conditions?
- Do we need to seek additional drought response funding or raise water rates? Do we need to budget for enhanced water conservation activities?
- Should we make plans and adopt regulations for adopting a drought water bank?
- Should we intensify flood preparedness activities in vulnerable areas?

# NEXT GENERATION EARTH SYSTEM PREDICTION

## STRATEGIES FOR SUBSEASONAL TO SEASONAL FORECASTS

Committee on Developing a U.S. Research Agenda to Advance Subseasonal to  
Seasonal Forecasting

Board on Atmospheric Sciences and Climate  
Ocean Studies Board

Division on Earth and Life Studies

*This prepublication version of Next Generation Earth System Prediction: Strategies for Subseasonal to Seasonal Forecasts has been provided to the public to facilitate timely access to the report. Although the substance of the report is final, editorial changes may be made throughout the text and citations will be checked prior to publication. The final report will be available through the National Academies Press in spring 2016.*

*The National Academies of*  
SCIENCES • ENGINEERING • MEDICINE

THE NATIONAL ACADEMIES PRESS

Washington, DC

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# One Hundred Fifteenth Congress of the United States of America

## AT THE FIRST SESSION

*Begun and held at the City of Washington on Tuesday,  
the third day of January, two thousand and seventeen*

### An Act

To improve the National Oceanic and Atmospheric Administration's weather research through a focused program of investment on affordable and attainable advances in observational, computing, and modeling capabilities to support substantial improvement in weather forecasting and prediction of high impact weather events, to expand commercial opportunities for the provision of weather data, and for other purposes.

*Be it enacted by the Senate and House of Representatives of  
the United States of America in Congress assembled,*

#### SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the “Weather Research and Forecasting Innovation Act of 2017”.

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

Sec. 1. Short title; table of contents.  
Sec. 2. Definitions.

#### TITLE I—UNITED STATES WEATHER RESEARCH AND FORECASTING IMPROVEMENT

Sec. 101. Public safety priority.  
Sec. 102. Weather research and forecasting innovation.  
Sec. 103. Tornado warning improvement and extension program.  
Sec. 104. Hurricane forecast improvement program.  
Sec. 105. Weather research and development planning.  
Sec. 106. Observing system planning.  
Sec. 107. Observing system simulation experiments.  
Sec. 108. Annual report on computing resources prioritization.  
Sec. 109. United States Weather Research program.  
Sec. 110. Authorization of appropriations.

#### TITLE II—SUBSEASONAL AND SEASONAL FORECASTING INNOVATION

Sec. 201. Improving subseasonal and seasonal forecasts.

#### TITLE III—WEATHER SATELLITE AND DATA INNOVATION

Sec. 301. National Oceanic and Atmospheric Administration satellite and data management.  
Sec. 302. Commercial weather data.  
Sec. 303. Unnecessary duplication.

#### TITLE IV—FEDERAL WEATHER COORDINATION

Sec. 401. Environmental Information Services Working Group.  
Sec. 402. Interagency weather research and forecast innovation coordination.  
Sec. 403. Office of Oceanic and Atmospheric Research and National Weather Service exchange program.  
Sec. 404. Visiting fellows at National Weather Service.  
Sec. 405. Warning coordination meteorologists at weather forecast offices of National Weather Service.  
Sec. 406. Improving National Oceanic and Atmospheric Administration communication of hazardous weather and water events.  
Sec. 407. National Oceanic and Atmospheric Administration Weather Ready All Hazards Award Program.

