

NOAA's Water Capabilities and California Drought Service Assessment

Kevin Werner

Western Region RCSD and Team Lead

July 2015

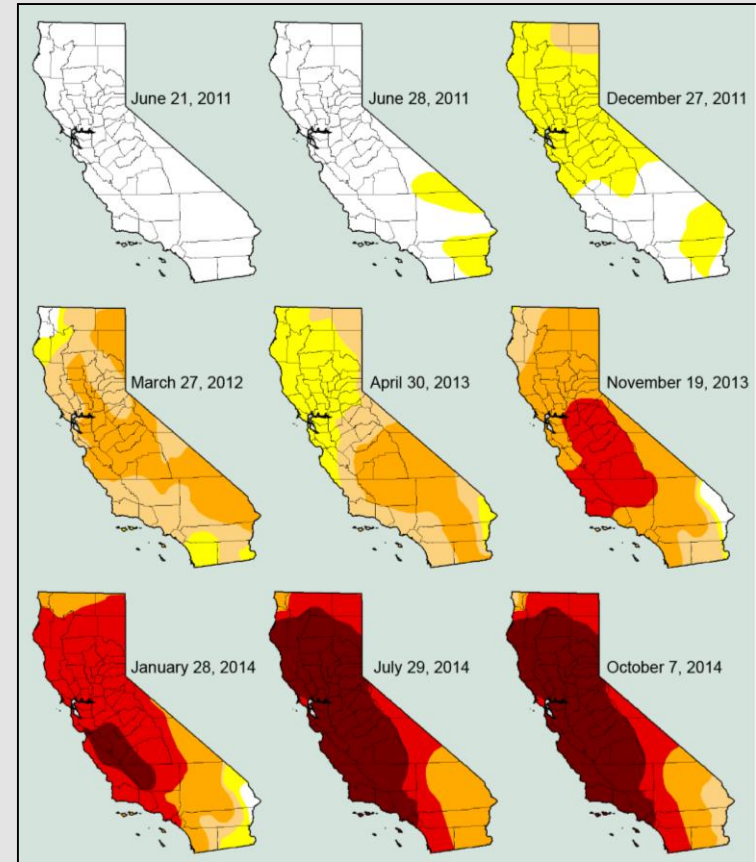


- Western Drought Status and Outlook
 - Monitoring
 - Forecasting weather, climate and weather
 - Climate change
- NOAA organization
- NOAA's California Service Assessment
- Questions/Discussion



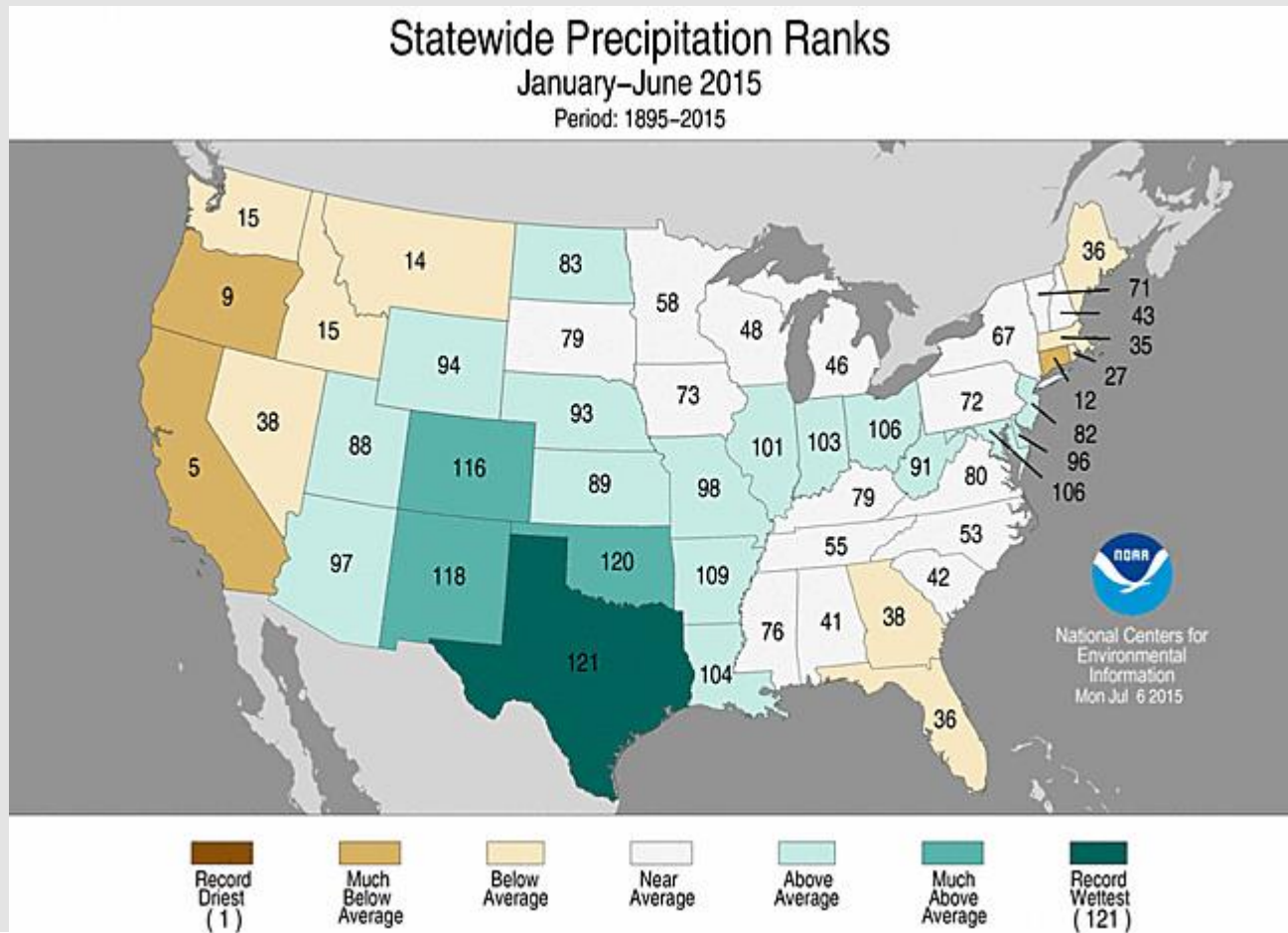
California Drought

- 2012-2014 driest 3 year period on record for much of state
- Key 2014 statistics:
 - Precipitation: Less than 2 years worth of average precipitation over last 3 years
 - Mountain snow: 2014 snow pack was about 1/3 average
 - Rivers: 2014 Runoff volumes 10-50% average
 - Reservoirs: Aug 2014 statewide reservoir storage 57% average and 36% capacity
- California now exceptionally vulnerable to water shortages – will take much above average snow/precip to re-charge reservoirs and groundwater

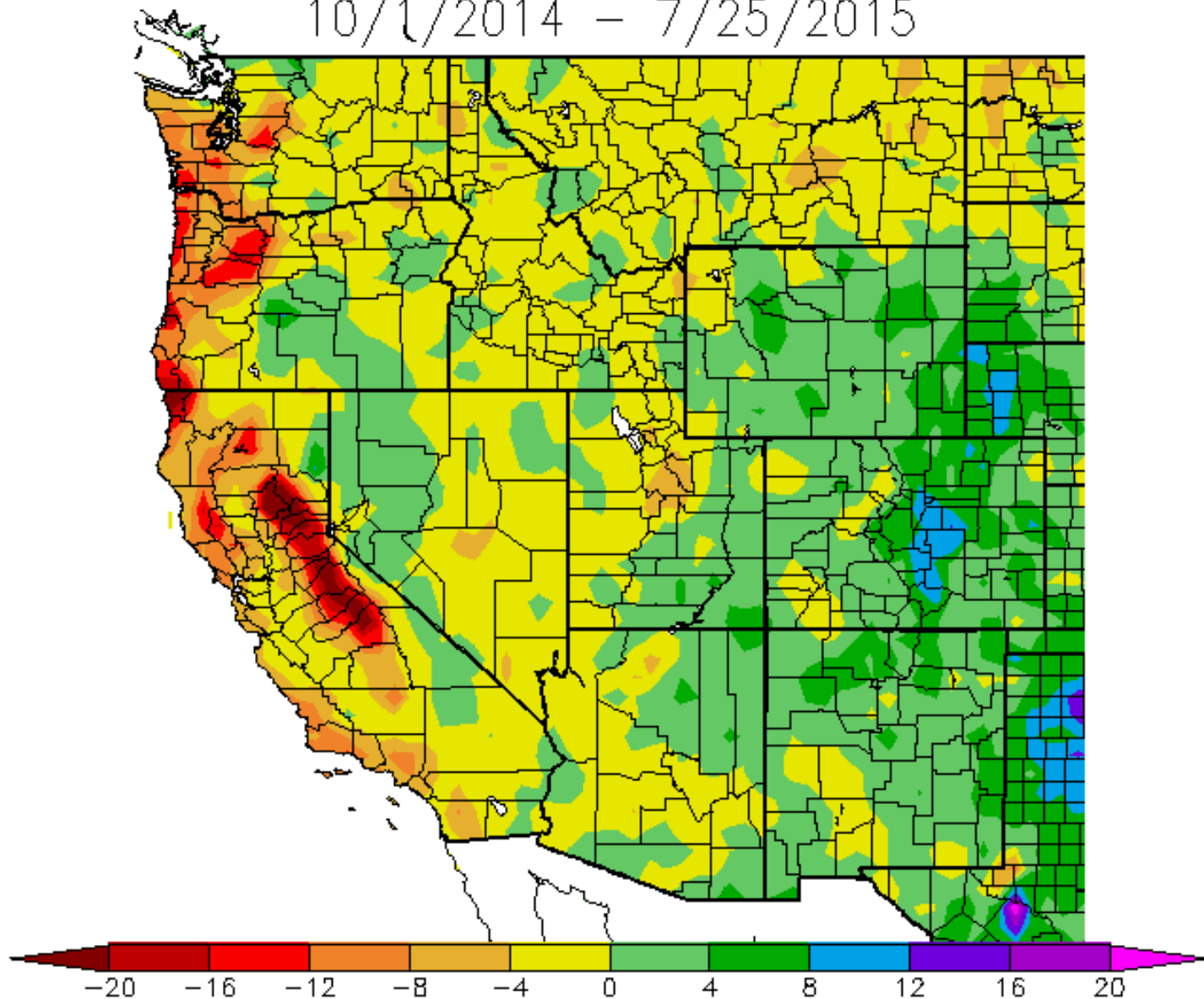


Continuing in 2015...

- Extreme drought conditions have persisted into 2015.

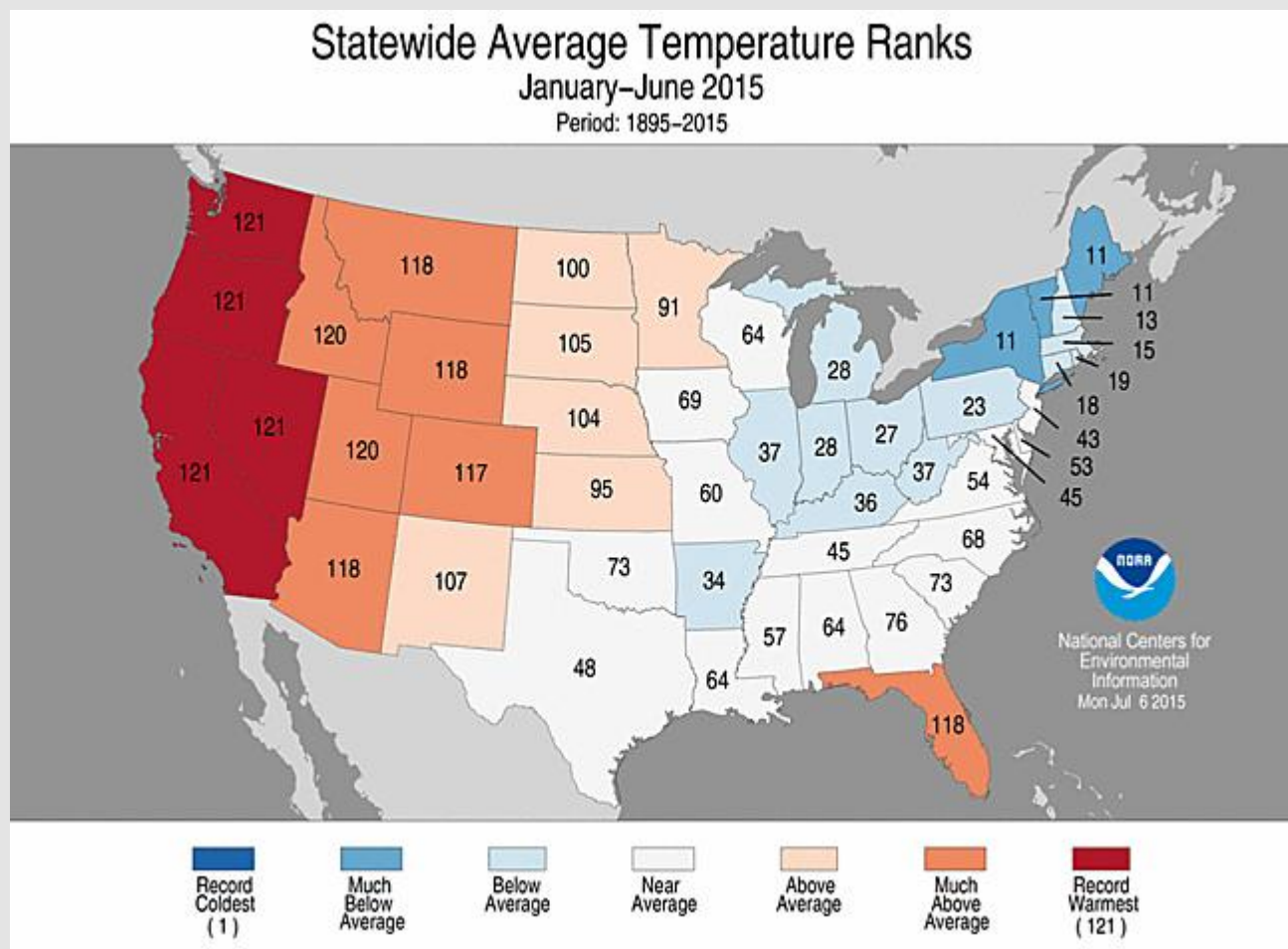


Precipitation Departure from Average (in.)
10/1/2014 – 7/25/2015

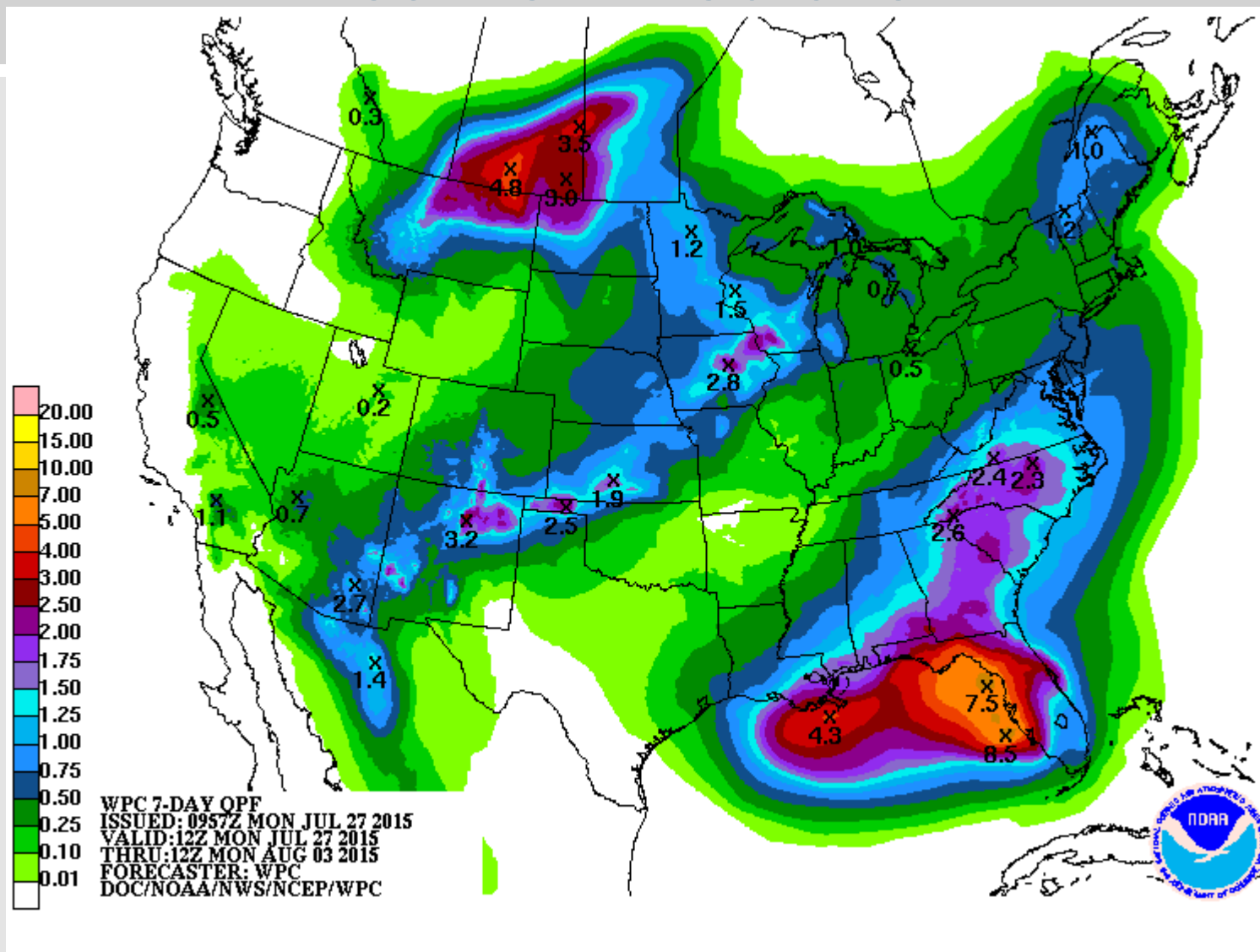


Generated 7/26/2015 at WRCC using provisional data.
NOAA Regional Climate Centers

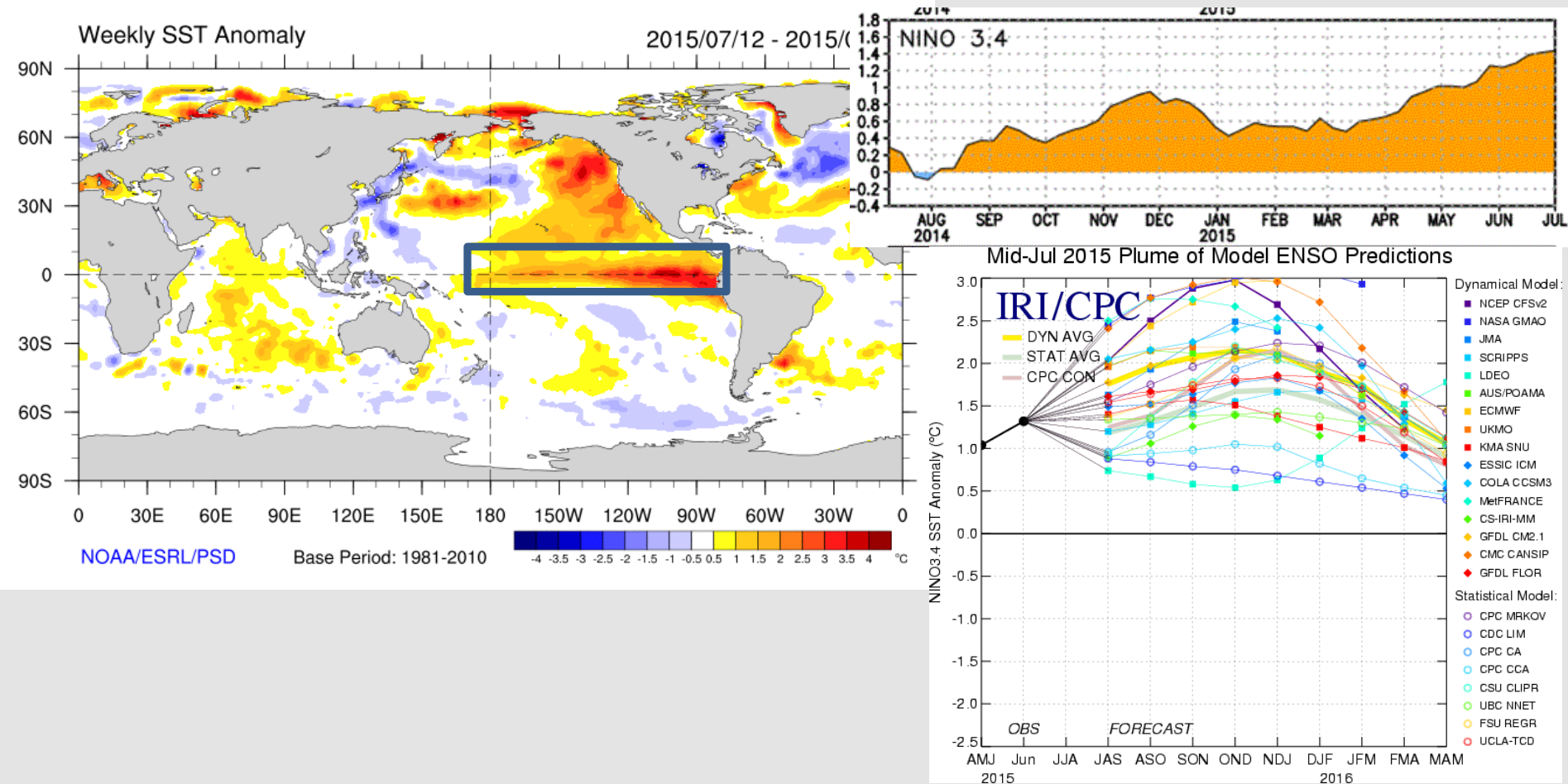
2015 Temperatures



Weather Prediction

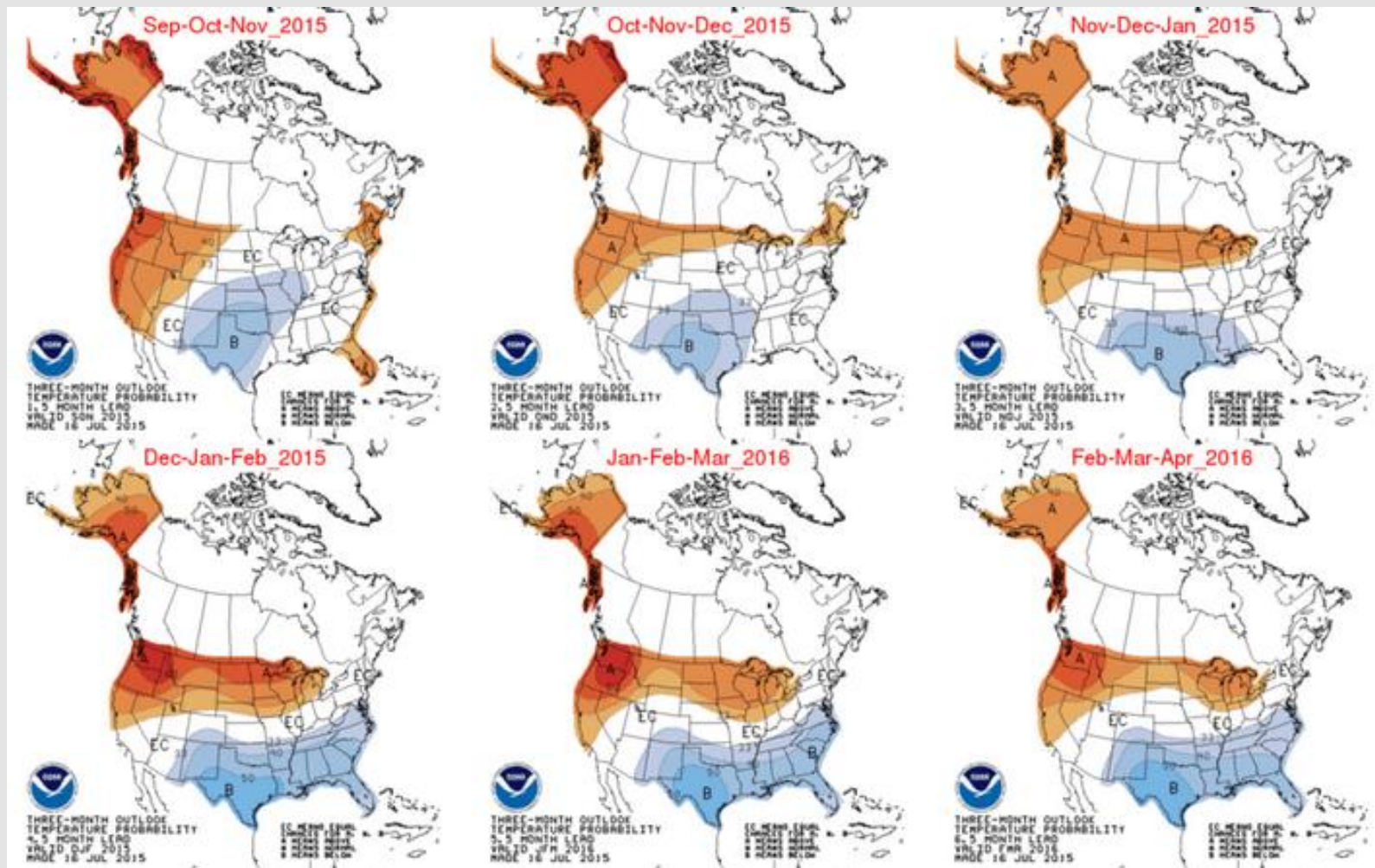


Climate Status

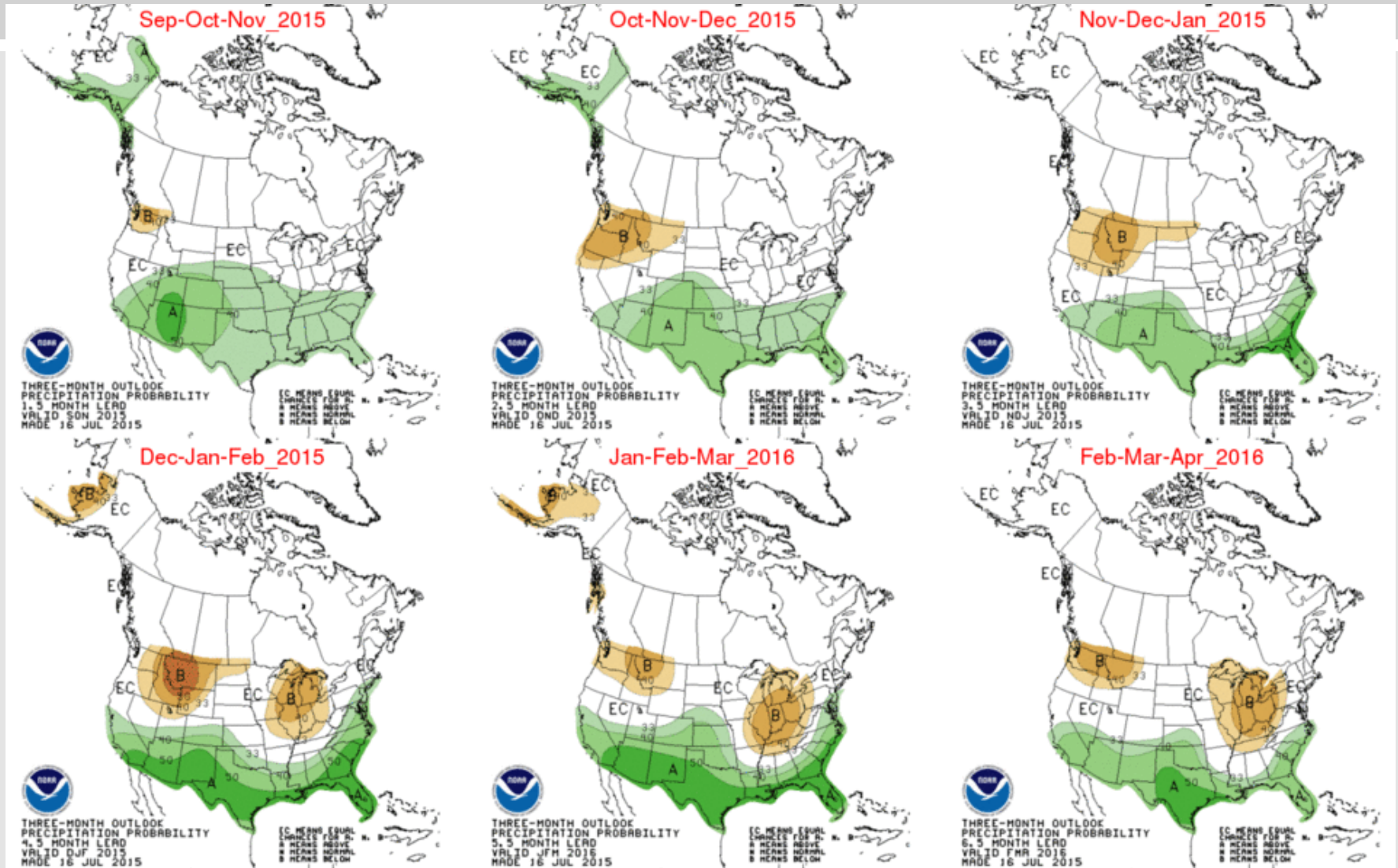


Source: NOAA/CPC

Climate Prediction



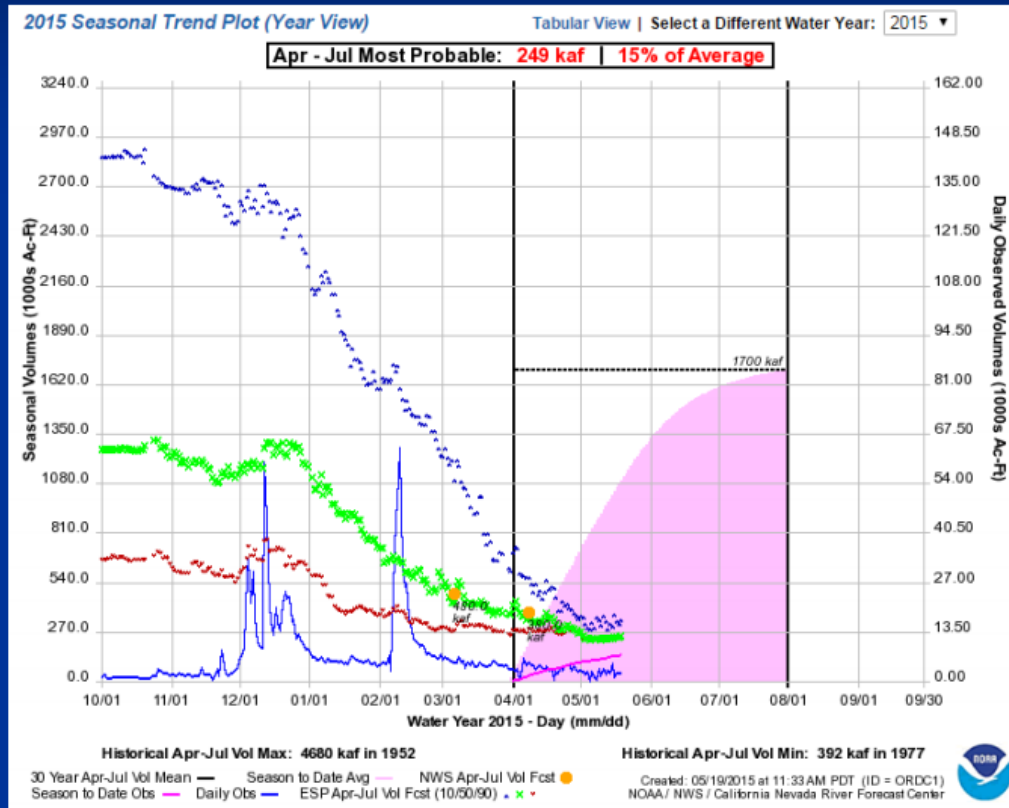
Climate Prediction



Water Prediction



2015 Seasonal (April-July) Forecast Feather River inflow to Oroville Reservoir

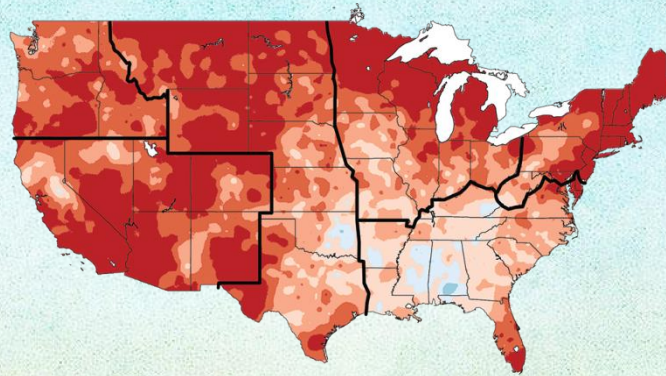


Third National Climate Assessment

Climate Change Impacts in the United States



U.S. Global Change Research Program
**National Climate
Assessment**



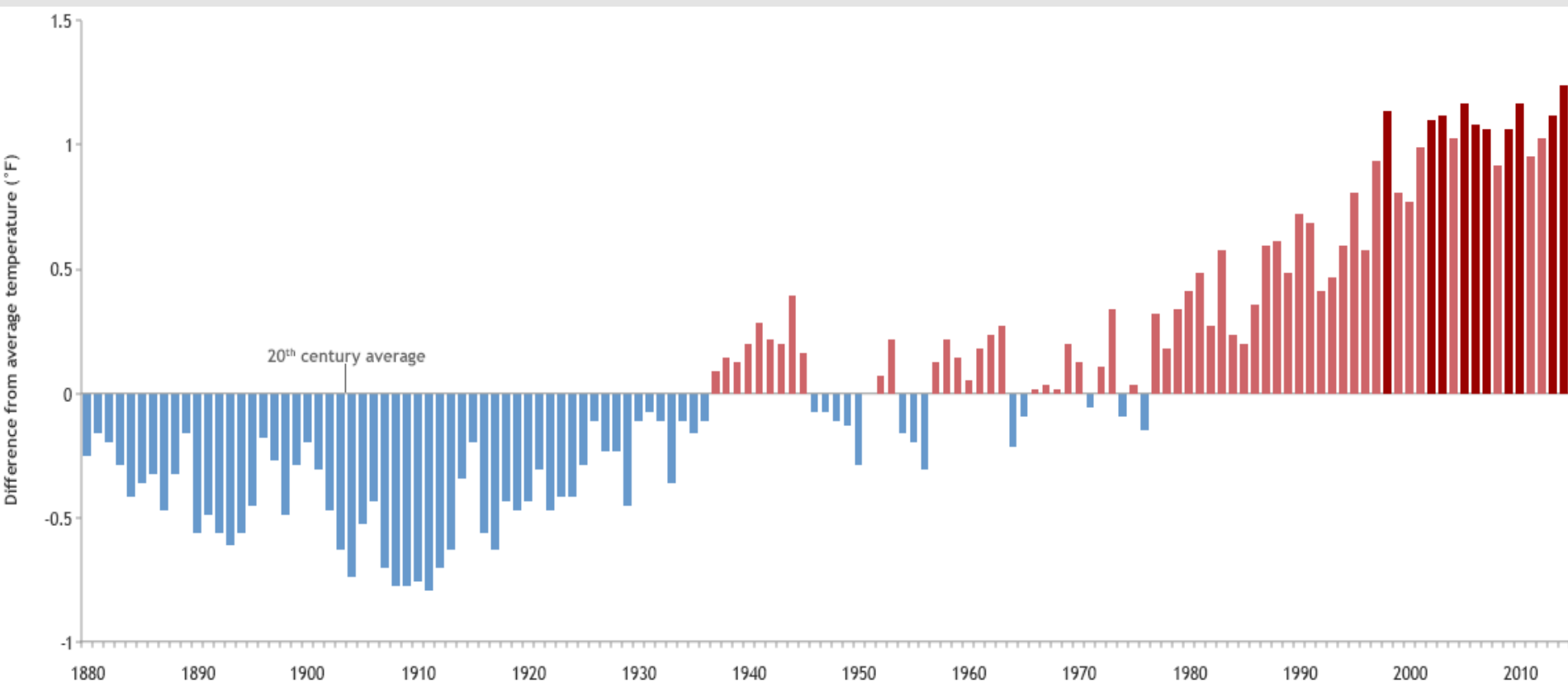
Main Messages

- Largest & most comprehensive **for the U.S.**
- Climate change is happening **now**
- America is **feeling the effects**
- Important **opportunities** to manage & prepare



U.S. Global Change Research Program
**National Climate
Assessment**

2014 Warmest Year on Record





Global Temperatures

RANK 1 = WARMEST PERIOD OF RECORD: 1880–2014	YEAR	ANOMALY °C	ANOMALY °F
1	2014	0.69	1.24
2 (tie)	2010	0.65	1.17
2 (tie)	2005	0.65	1.17
4	1998	0.63	1.13
5 (tie)	2013	0.62	1.12
5 (tie)	2003	0.62	1.12
7	2002	0.61	1.10
8	2006	0.60	1.08
9 (tie)	2009	0.59	1.06
9 (tie)	2007	0.59	1.06

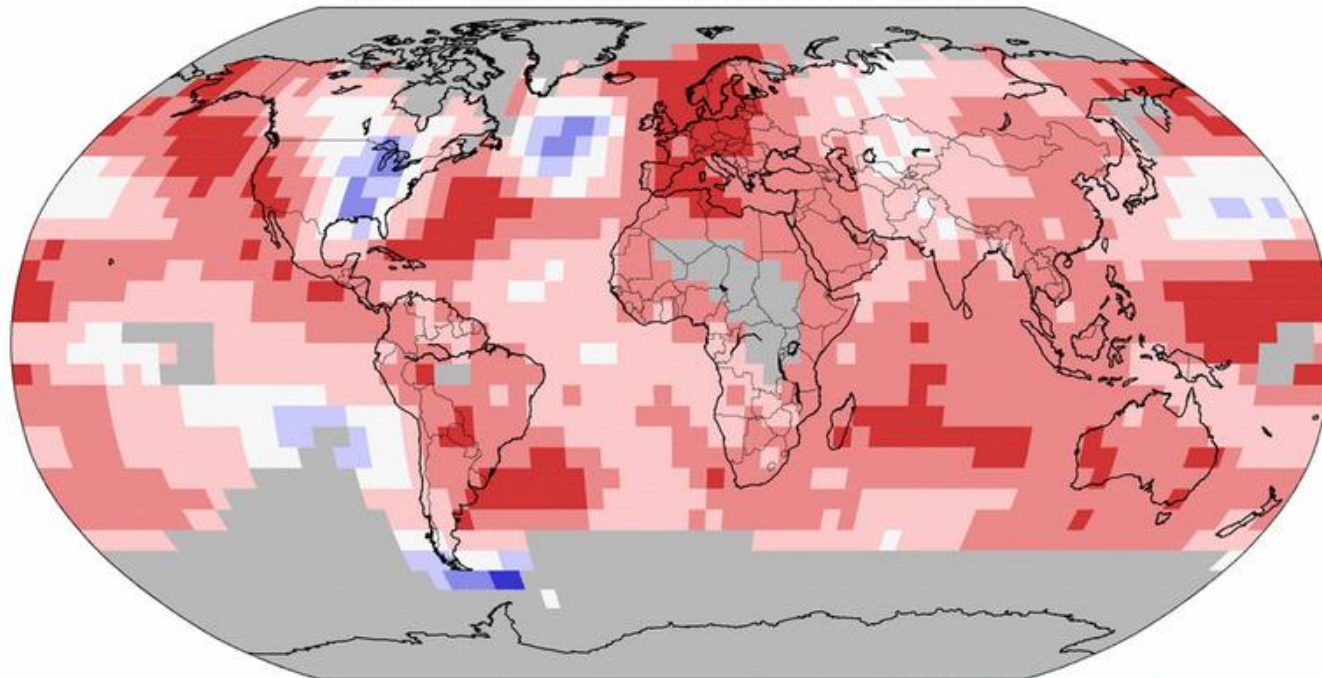
Source: <http://www.ncdc.noaa.gov/sotc/global/>

2014 Global Temperature

Land & Ocean Temperature Percentiles Jan–Dec 2014

NOAA's National Climatic Data Center

Data Source: GHCN–M version 3.2.2 & ERSST version 3b



Record
Coldest

Much
Cooler than
Average

Cooler than
Average

Near
Average

Warmer than
Average

Much
Warmer than
Average

Record
Warmest



Mon Jan 12 19:34:46 EST 2015

Source: <http://www.ncdc.noaa.gov/soft/global/>

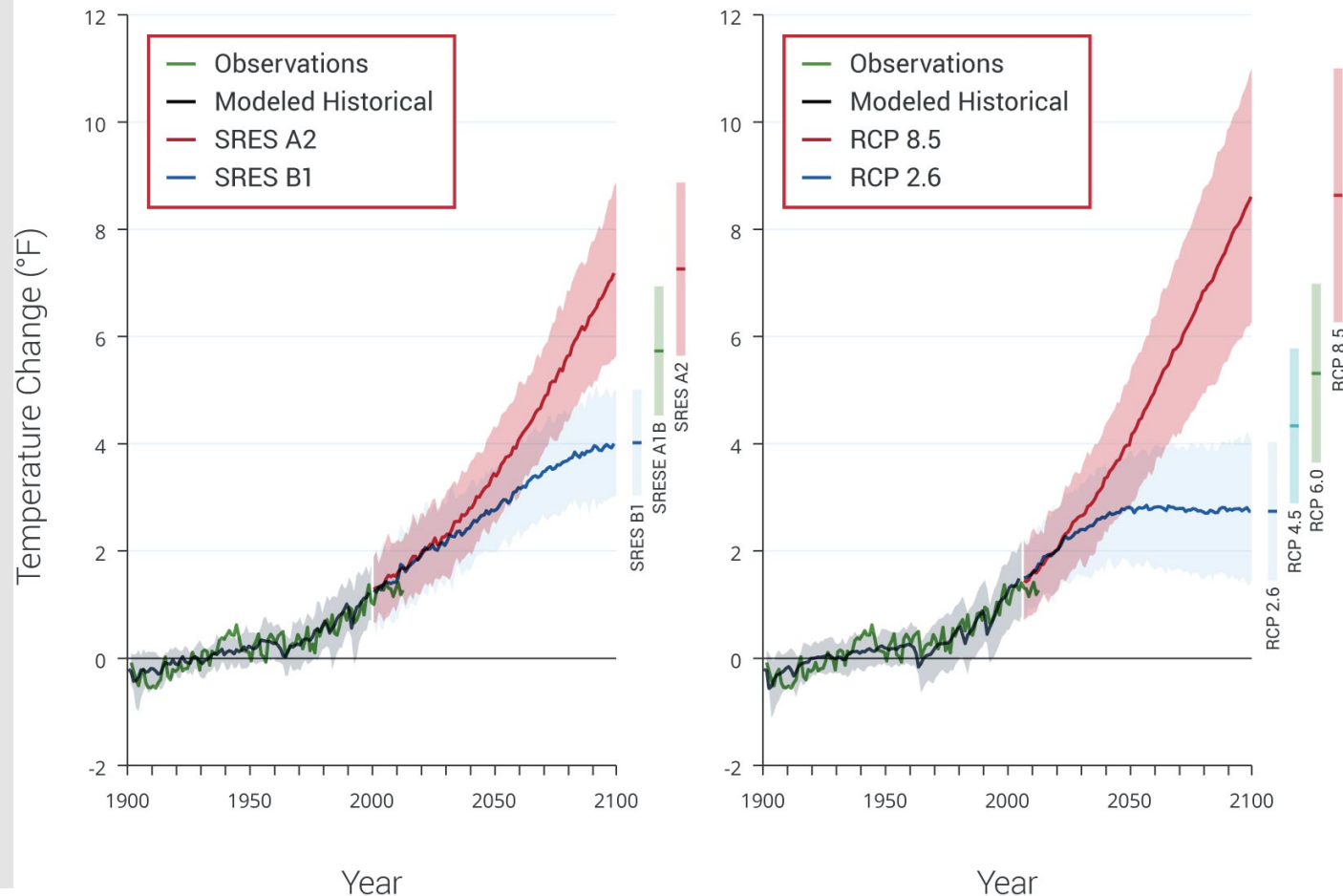
Projected Temperature Change



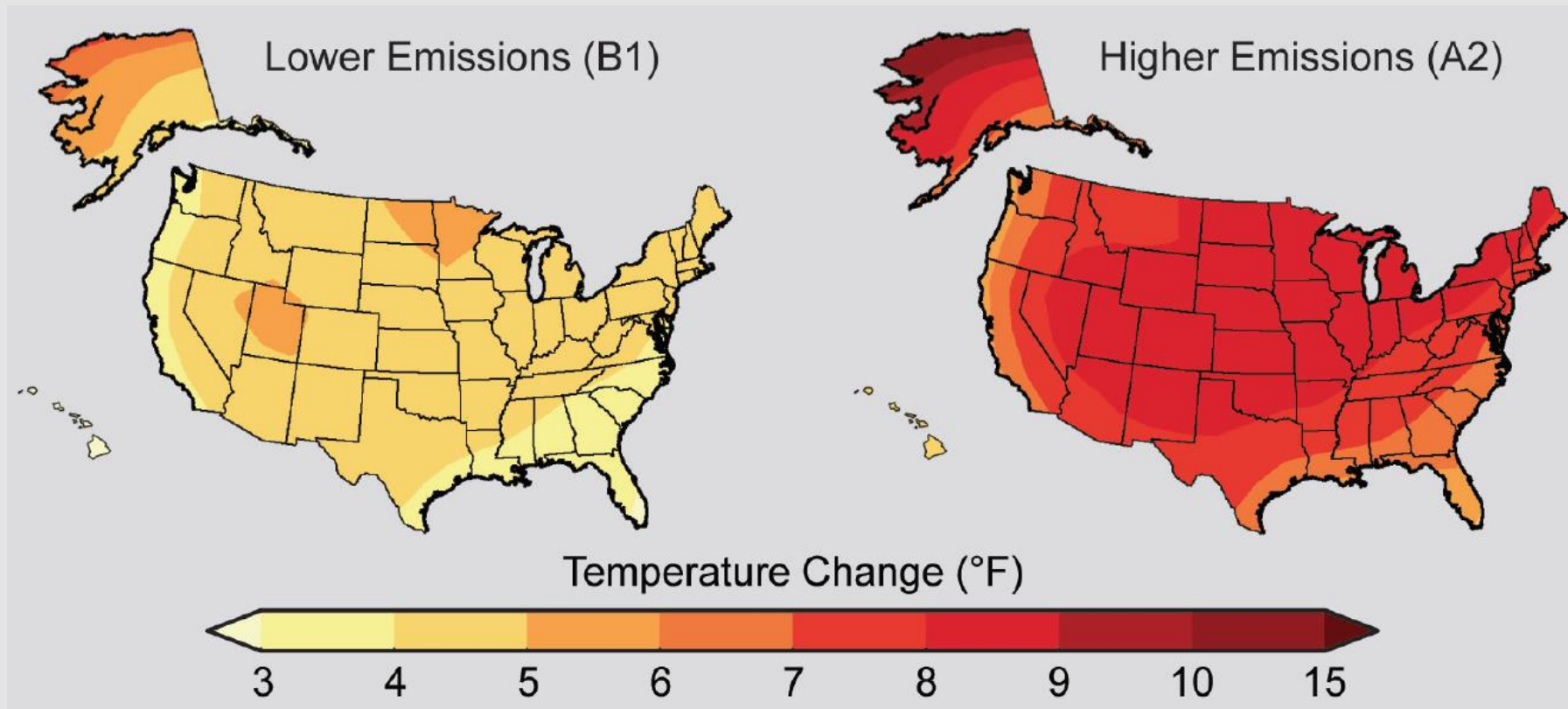
U.S. Global Change Research Program

National Climate
Assessment

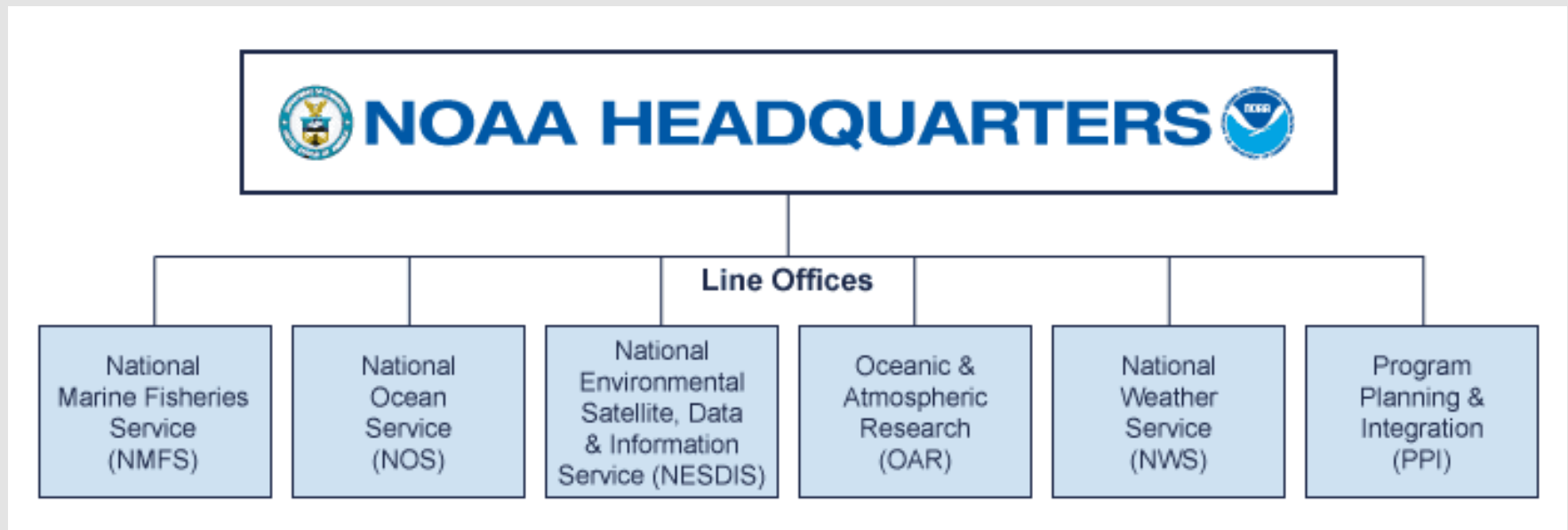
Emissions Levels Determine Temperature Rises



Projected Temperature Change

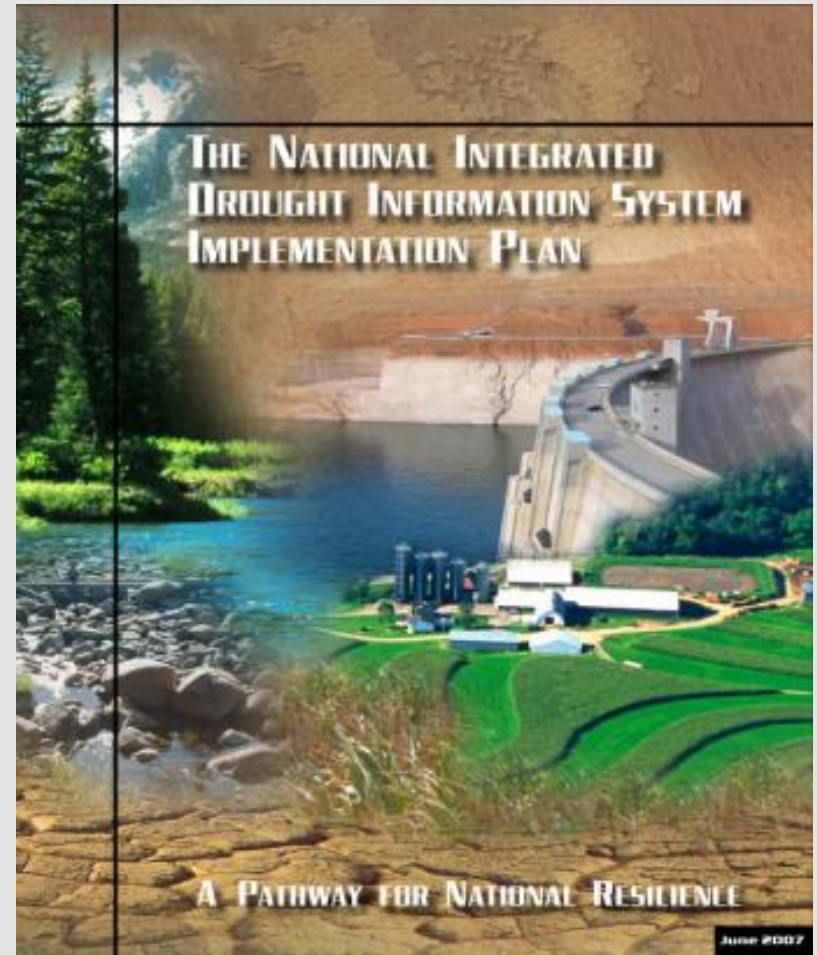


NOAA Organization



NIDIS

- Congressionally authorized program to develop drought early warning systems



National Water Center

Initial Operating Capacity: May 26, 2015

A catalyst to transform NOAA's water prediction program



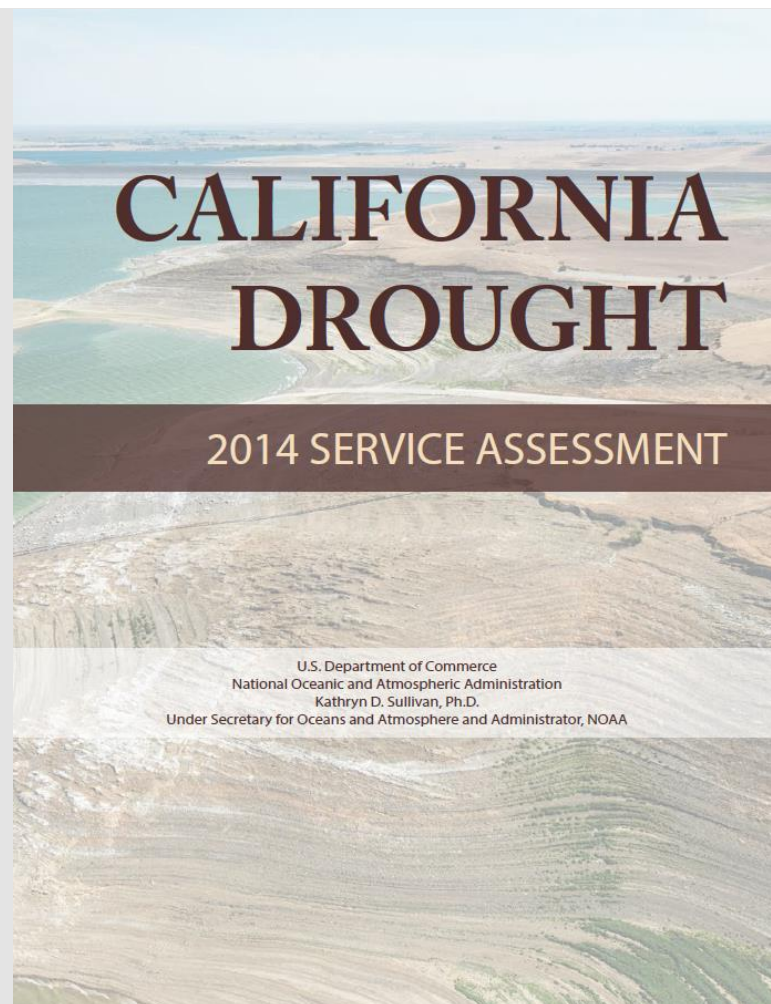
VISION: Scientific excellence and innovation driving water prediction to support decisions for a water resilient nation.

BENEFITS:

- State-of-the science model for global to street level prediction
- Operations Center to establish common operating picture within NOAA and among water agencies; decision support for floods to drought
- Proving ground to accelerate research to operations
- Data integration and service backup for entire water program

NOAA's California Drought Assessment

- **Understand drought impacted decisions** – Understand and describe the decisions impacted by the drought in the following sectors: water resources, agriculture, fisheries, and municipal government
- **Assess NOAA effectiveness** – Assess the effectiveness of NOAA data, forecasts, and services provided by NOAA to decision makers in the key sectors impacted by the drought during water year 2014.



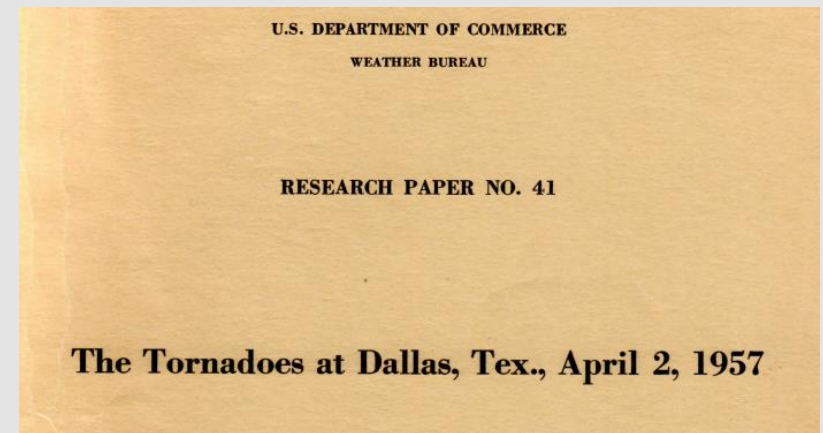


Assessment Scope

- Focus on NOAA data, forecasts, and science provided to decision makers in key sectors
- Identify improvements implementable within six months of report
- Will not assess NOAA/NMFS regulatory or management actions

Background: Service Assessments

- NOAA/NWS history of service assessments dates to 1957
- Focus on services provided for short duration weather events including tornadoes, floods, hurricanes, and storms
- Identify recommendations for NOAA/NWS to improve services for future events
- Recommendations tracked
- No assessment to date on drought
- Sandy assessment was a NOAA wide assessment



Service Assessment

The Missouri/Souris River Floods of May – August 2011



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service



Drought Impacts

- Water Resources
 - Surface water supply reduced by about one third
 - Major loss of groundwater
- Agriculture
 - About 17k jobs lost
 - About \$2B in economic losses
- Fisheries
 - Reduced streamflows and warmer temperatures have created challenges for fish



Field Work Overview

- Team divided into sector focused sub-teams: **Water Resources**, **Agriculture**, and **Fisheries**
- Each sub-team prioritized and organized stakeholder interviews for diversity of perspective and experience
- Over 100 stakeholders interviewed for this report include:
 - **Internal NOAA**
 - **Federal Government**
 - **State/Local Government**
 - **Academia**
 - **NGO/Industry Associations**
 - **Media**

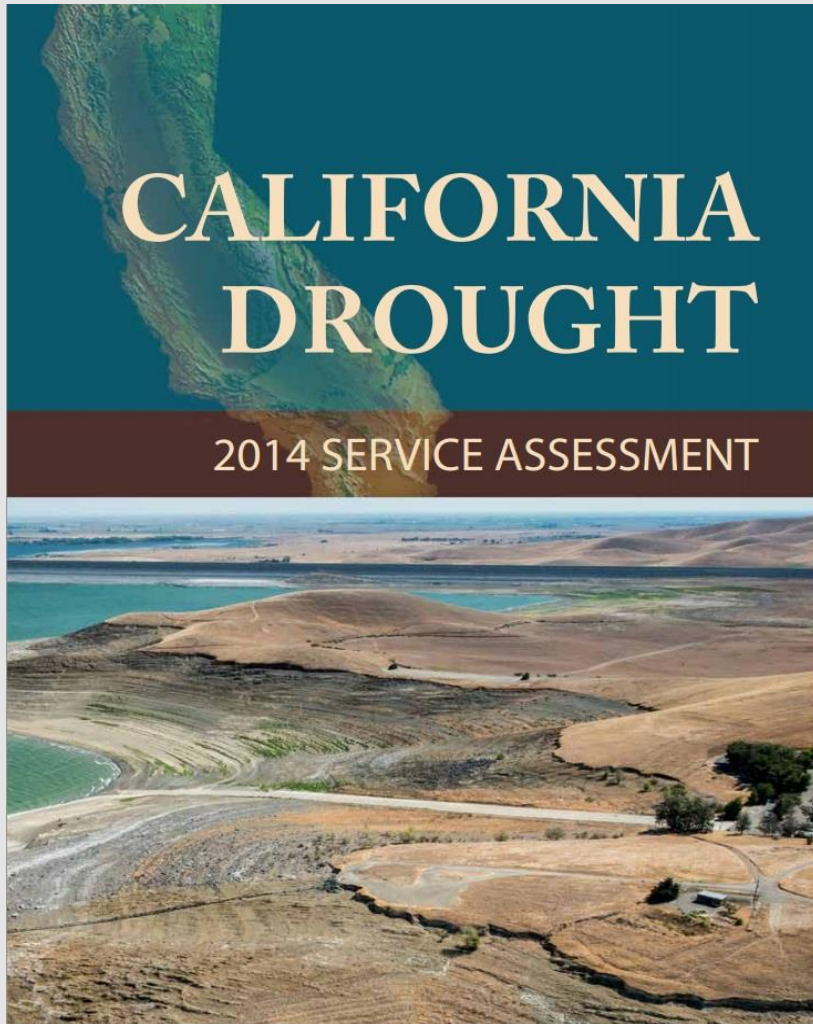


Team Members

- Lead: Kevin Werner (NESDIS)
- Vice Lead: Roger Pierce (NWS)
- Vice Lead: Chad McNutt (OAR)
- Ryan Wulff (NMFS)
- Jawed Hameedi (NOS)
- John Ewald (NOAA HQ Communications)
- Chris Smallcomb (NWS)
- Karin Gleason (NESDIS/NCDC)
- Mike Anderson (CA DWR and CA state climatologist)
- Chris Stachelski (NWS and NRAP Detailee)

Executive Sponsor: NOAA DUS-O VADM Devany

By the Numbers



- 10 team members
- 43 recommendations
- 100+ interviews
- 40+ reviewers
- 400+ comments
- 62 pages
- 10 months
- 3 focus sectors
- 1 really bad drought

Assessment Report





Findings

- Agriculture (chapter 3)
- Fisheries and Coastal Ecosystems (chapter 4)
- Water Resources (chapter 5)
- Major and Cross Cutting Themes (chapter 6):
 - Matching NOAA investments in science, data, and forecasts to stakeholder needs
 - Improved Seasonal prediction for water resources
 - Improving NOAA collaboration with partner agencies and organizations
 - Develop full natural flow modeling and forecasting
 - Improving NOAA internal coordination



Agriculture (chapter 3)

- Agriculture sector desires more NOAA collaboration
 - Explore enhanced ag weather services
- Mixed reactions and perceptions on El Nino and seasonal prediction
- Agriculture generally not relying on NOAA seasonal predictions
- NOAA's drought information not always accessible or relevant
- Role for NOAA research



Fish and Coasts (Chapter 4)

- Opportunities for improved water modeling and forecasting targeted at key decision makers:
 - Full natural flow of surface water
 - Water quality for surface and Bay Delta water
 - Water temperature forecasting
- Improving localized NOAA information and application
- NOAA's Habitat Blueprint viewed as best practice by stakeholders



Water Resources (chapter 5)

- Opportunities exist to improve application of water resource forecasts particularly in reservoir operations
- Improved cool season precipitation forecasts for mountains is a major opportunity
- Forecast improvements desired by stakeholders:
 - Importance of weather and climate reforecasts for water resources forecasting
 - Online forecast verification capabilities
 - Greater usage of NCDC's data expertise

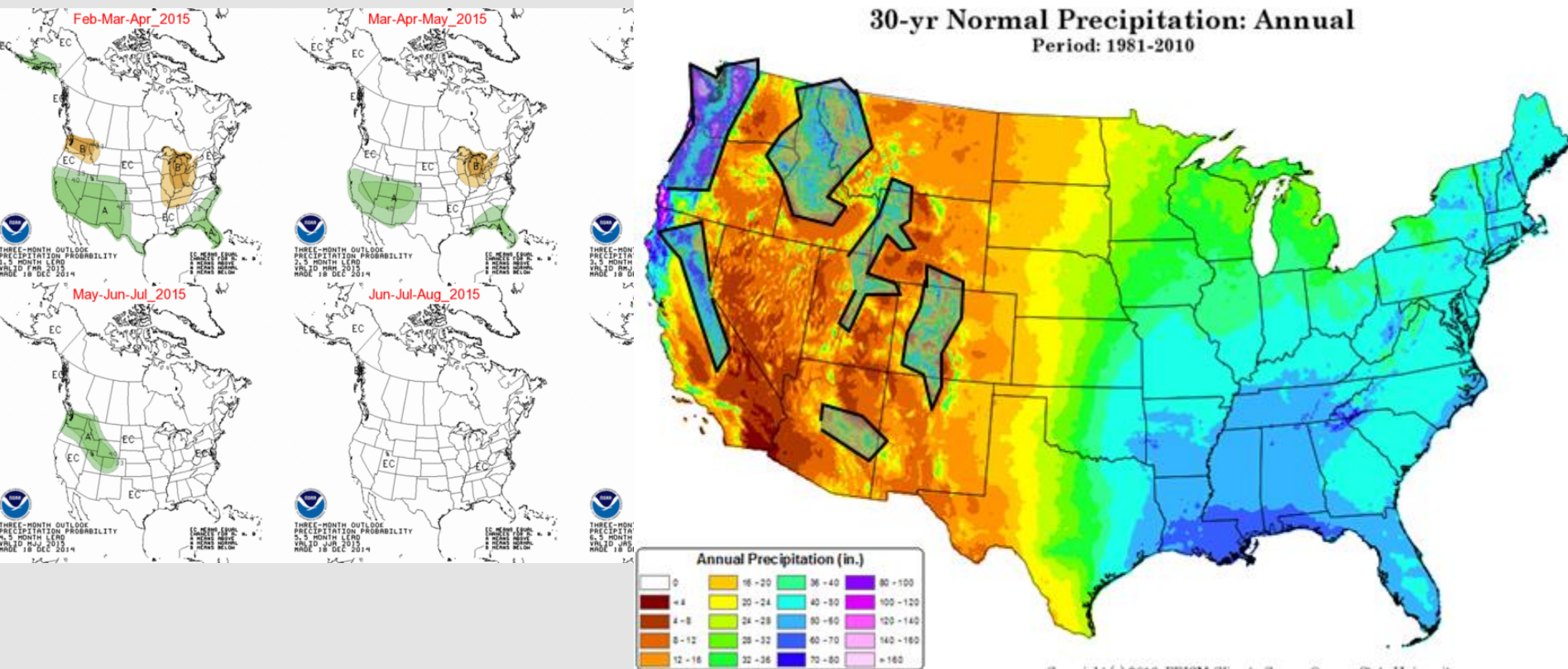


Improved Seasonal Prediction for Water Resources

- Matching NOAA investments in science, data, and forecasts to stakeholder needs
 - Improve cool season precipitation forecasts and their application
- Improving NOAA collaboration with partner agencies and organizations
 - Best practices: Russian River Habitat Blueprint and Hydromet Testbed
 - Partner with other agencies to develop capabilities for full natural flow modeling and forecasting

Improved Seasonal Prediction for Water Resources

- #1 Stakeholder request: What is the forecast for the upcoming winter's precipitation?





Full Natural Flow Modeling and Forecasting

- **Finding:** Many water decision makers—water boards, fisheries managers, coastal ecosystem planners, and recreational water users in particular—require a "whole" view of water system environments (physical and biological elements).
- **Recommendation:** NOAA should initiate (or expand through existing Integrated Water Resources Services and Science MOU) a partnership among other federal and state agencies (particularly USGS and DWR) and other stakeholders for scoping modeling and monitoring activities needed to estimate and forecast full natural flows (FNFs) in streams and rivers in California.

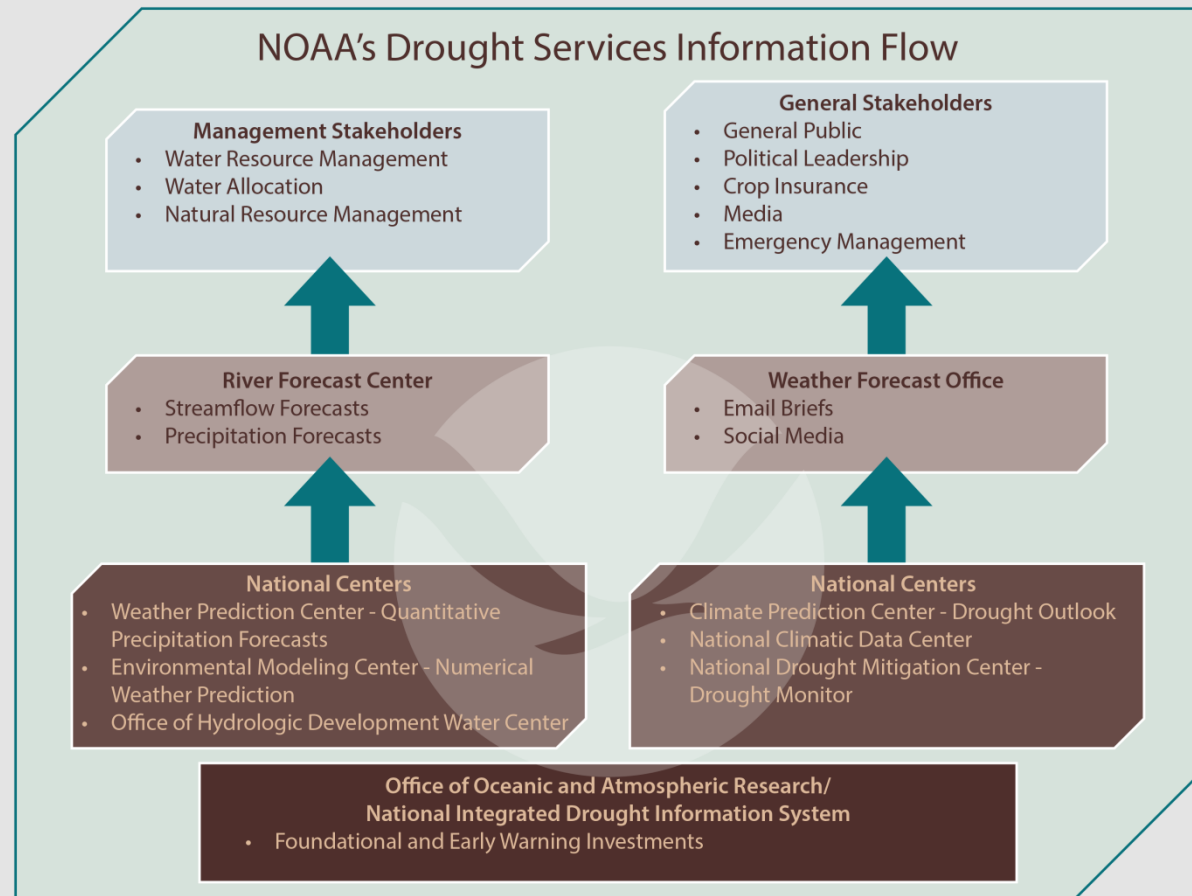
Improved NOAA Coordination

- NOAA expertise on drought and water resources dispersed through agency and geography
- NWS WFOs and RFCs are the de facto “front line” for most services
- National centers contain significant expertise
- Challenge: Effectively leverage strengths of agency’s components for stakeholders



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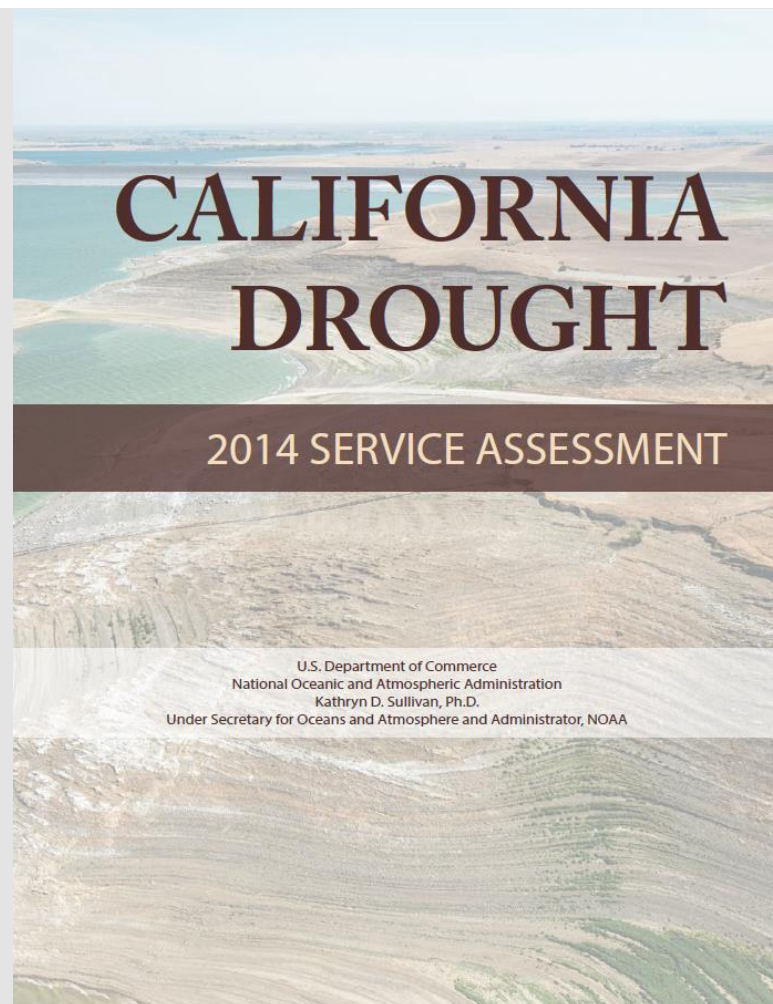


Next Steps

- Final report approved (April 2015)
- Report release (May 2015)
- NOAA's Executive Panel (NEP) will receive report and identify implementation activities

Report URL:

<http://www.nws.noaa.gov/om/assessments/index.shtml>



Questions?

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