NOAA AND THE CALIFORNIA WATER ACTION PLAN

Partnering for resilience

Seasonal drought outlook
Drought tendency through May 31, 2015

Drought persists or intensifies

Drought development likely

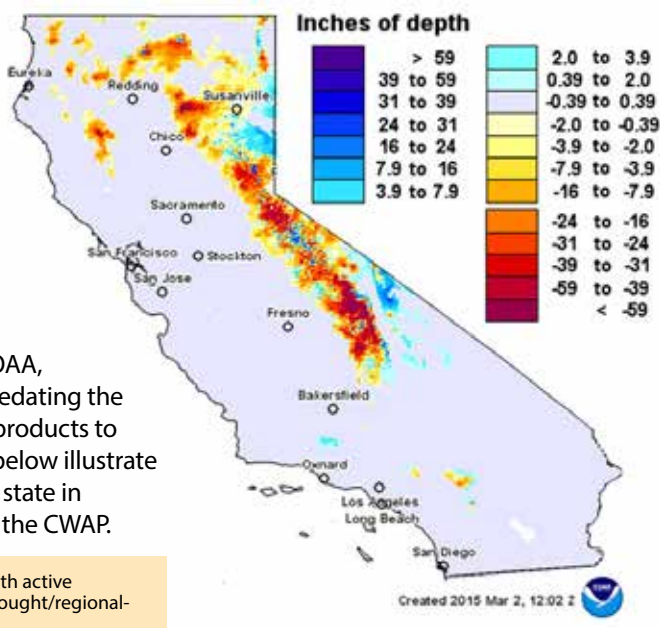
http://www.cpc.ncep.noaa.gov/

In response to the ongoing California drought, Gov. Edmund G. Brown Jr. released the California Water Action Plan (CWAP) in 2014, directing the California Natural Resources Agency, the California Environmental Protection Agency, and the California Department of Food and Agriculture to identify key actions for the next one to five years, to (1) address urgent needs and (2) provide the foundation for the sustainable management of California's water resources.

NOAA and its partners have been providing California with research, analyses, publications, forecasts, communications and stakeholder engagements to support drought preparedness, mitigation and recovery. Collaborations among NOAA, NIDIS and California partners are long-standing, predating the present drought, focused on linking research and products to management. The selected NOAA activities listed below illustrate the agency's ongoing commitment to support the state in addressing specific issues and actions identified in the CWAP.

NOTE REGARDING LINKS: Download a pdf of this document with active hyperlinks to the resources listed at http://www.drought.gov/drought/regional-programs/california/reports-assessments-and-outlooks

Snow depth: departure from normal
Map compares normal depth of snow pack to current levels as of March 2, 2015



http://www.nohrsc.noaa.gov/

UNCERTAIN WATER SUPPLIES

NOAA actions:

■ **Analysis of the effects of climate change and climate variability** on water supplies and resources .

■ **Development and distribution of public briefing documents** about the most up-to-date science regarding influences of droughts, atmospheric rivers, and El Niño on water supply variability and reliability.

■ **Construction of future climate scenarios** to assess potential impacts and trajectories.

RESOURCES AND LINKS

California Climate Data Archive:

Great Basin Weather and Climate Dashboard

Will El Niño Make a Difference?

Our Changing Climate 2012: Vulnerability and Adaptation to the Increasing Risks from Climate Change in California

California Climate Extremes Workshop Report 2011

Southwest Climate Assessment Summary for Decision Makers, 2012

Statistical Downscaling Using Localized Constructed Analogs (LOCA)

WATER SCARCITY/DROUGHT

NOAA actions:

■ **Documentation of the surprisingly strong role of major storms and floods** in ending previous droughts in California, and the role of the occurrence or absence of any major atmospheric river storms in cycles of plenty and drought.

■ **Within-season monthly monitoring of fallowed land** extent in the Central Valley using Landsat imagery. Knowledge of the amount and spatial distribution of fallowing helps agricultural communities and government make informed decisions to reduce the impacts of water shortage and have helped the state locate county food banks.

RESOURCES AND LINKS

Atmospheric rivers as drought busters on the US west coast

Drought and the California Delta—A matter of extremes: San Francisco Estuary and Watershed Science

Flooding on California's Russian River—Role of atmospheric rivers

National Geographic issue on the 2014 California Drought

POOR WATER QUALITY

NOAA actions:

■ **Evaluation of the historic roles of major storms on salinity** in the Delta, and how those impacts have changed with modern water management procedures.

■ **High-resolution mapping of saltwater inundation** from sea level rise.

■ **Quantification of water lost** during the drought through GPS sensors, in coordination with Scripps Institution of Oceanography.

RESOURCES AND LINKS

Climate change projections of sea-level extremes along the California coast

Contemporaneous Subsidence and Levee Overtopping Potential, Sacramento-San Joaquin Delta

Ongoing drought-induced uplift in the western United States

(In press): Promoting atmospheric-river and snowmelt fueled biogeomorphic processes by restoring river-floodplain connectivity in California's Central Valley

DECLINING GROUNDWATER

NOAA actions:

■ **Development of simulation models** that couple climate change projections directly to and through groundwater flow and storage simulations for the Central Valley.

RESOURCES AND LINKS

Integrated simulation of consumptive use and land subsidence in the Central Valley, California, for the past and for a future subject to urbanization and climate change

A method for physically-based model analysis of conjunctive use in response to potential climate changes

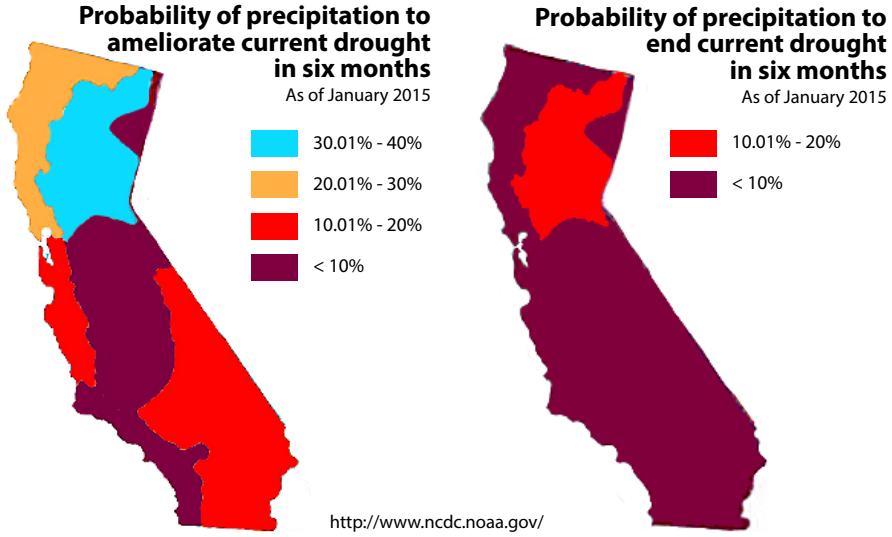
DECLINING NATIVE FISH SPECIES & LOSS OF WILDLIFE

NOAA actions:

■ **Characterizing the historic role of major atmospheric-river storms** in initiating ecologically beneficial inundations (Yolo Bypass of the Sacramento River, floodplains along the unregulated Cosumnes River, as proxies for floodplain habitats in the Central Valley).

■ **Development of indicators** to protect fish populations in the Russian River through work with stakeholders to study hydrologic extremes.

■ **Multiple efforts through NOAA Fisheries** related to the CWAP and meeting the state's co-equal goals of restoring the Bay Delta ecosystem, improving water supply reliability, andproviding key technical assistance on the state's Bay Delta Conservation Plan.



FLOODS

NOAA actions:

■ **Research on atmospheric rivers** to understand and better predict major flood events in California, and help communities to reduce their vulnerability.

■ **Examination of stakeholder perspectives** on vulnerabilities and preparedness for an extreme storm event in the greater Lake Tahoe, Reno, and Carson City region.

■ **Characterization of the historic role of atmospheric-river storms** in causing levee breaks in the Central Valley and Delta, where levees are still the primary defense against salinity intrusions.

RESOURCES AND LINKS

Flooding on California's Russian River—Role of atmospheric rivers

Atmospheric rivers, floods, and the water resources of California

Storms, floods and the science of atmospheric rivers

Historical and national perspectives on extreme west-coast precipitation associated with atmospheric rivers during December 2010

The coming megafloods

LOOKING AHEAD: MANAGING AND PREPARING FOR DRY PERIODS

NOAA actions:

■ **Develop and provide drought early warning information** to decision makers throughout California, including leading drought preparedness activities, involving more than 100 water agencies, organizations, industries, tribes, and other stakeholders. Partners include the California Rural Water Association, California Department of Water Resources, and California-Nevada Applications Program (CNAP).

■ **Address drought issues and water demands in urban areas** of Southern California, where water supplies are primarily imported and water demands are heavily residential. NOAA works with stakeholders develop indicators for drought assessment and forecasting of direct relevance to stakeholders, and to assess drought conditions.

■ **Characterize and understand historic droughts** using stakeholder-informed indicators. For example, NOAA developed a percentile-based indicator system for assessing present drought in the context of the frequency and severity of historic events. Among the findings: the severity of drought conditions developing in early 2014, based on a 12-month precipitation anomaly, would be expected to occur less than once every 10,000 years.

RESOURCES AND LINKS

Improving Drought Prediction; April/May 2013

Drought Impacts Reporting, August 2013

Small Water Systems Workshops, California Rural Water Association, California Water Commission 2013; list of events

California Drought Outlook Forum: What's Ahead and What We Can Do; February, 2014

Making Decisions in Dry Times: Science and Strategies for Dealing with Drought; May, 2014

Causes and Predictability of the 2011-14 California Drought, December 2014

■ **Development of Forecast-Informed Reservoir Operations (FIRO),** a management strategy that uses data from watershed monitoring and weather and water forecasting to help managers selectively retain or release water in a manner that reflects current and forecast conditions.

■ **Develop an integrated water resources monitor and outlook** to represent the current and seasonally forecast state of water resources including precipitation, snow, runoff into reservoirs, soil moisture, and other variables important to water management (proposal under consideration).

■ **Refinement to existing drought amelioration tools** to make them more relevant and useful to California's hydrology.

■ **A NOAA drought-related services assessment** (currently under review) to improve decision support for decision makers in the state.