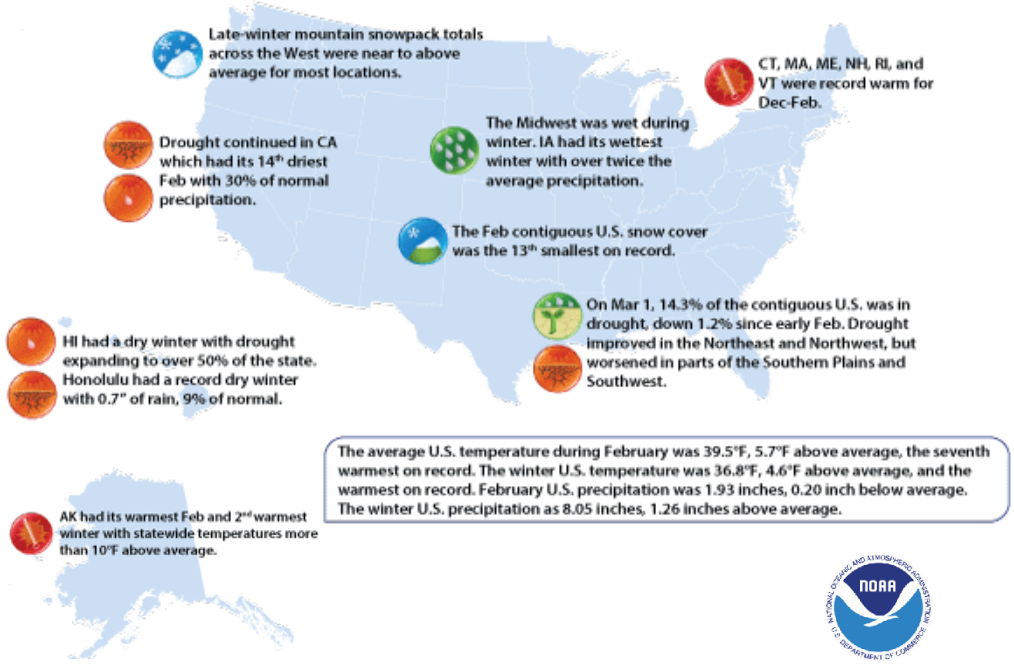
Quarterly Climate Impacts and Outlook

Western Region March 2016

Significant Events for December 2015-February 2016



NCDC // www.ncdc.noaa.gov/sotc/national

Dec-Feb Highlights for the West

Snowpack >75% of normal nearly West-wide, most basins near normal

Sierra snowpack below normal, though much better than last 4 winters

Large areas of drought amelioration in Northwest, Great Basin

Seattle, WA and Portland, OR had wettest Dec-Feb period on record

Dec-Feb 3rd warmest for MT, 9th warmest for WA, CA

Warmest Feb on record for MT, AZ

Extreme to exceptional drought conditions persist in CA, western NV

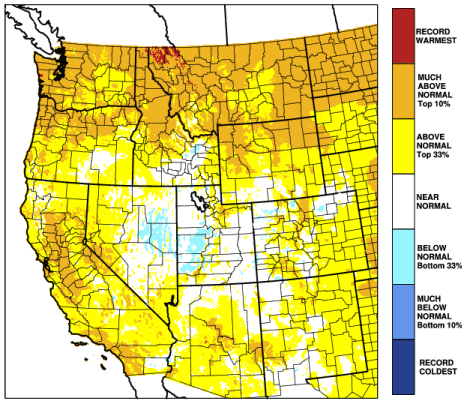
Warm coastal waters referred to as "blobs" continue to have negative impact on marine life

Strong El Niño conditions persist in the tropical Pacific, slowly weakening since peak in Nov/Dec

Regional Overview for December 2015-February 2016

Mean Temperature Percentile

Dec 2015-Feb 2016

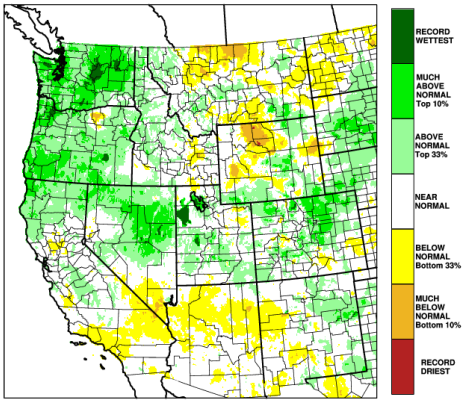


WRCC // www.wrcc.dri.edu/wwdt/

Warmer than normal temperatures were observed over much of the West this winter, owing in part to a very warm February with strong high pressure over the West. The greatest departures were seen along the northern tier of the region, where many Montana locations had a top-10 warmest Dec-Feb on record. CA saw above normal Jan-Feb temperatures; San Diego observed its warmest Feb on record. The Great Basin was slightly cooler than normal due to pooling of cold air in low-lying areas during periods of high pressure.

Precipitation Percentile

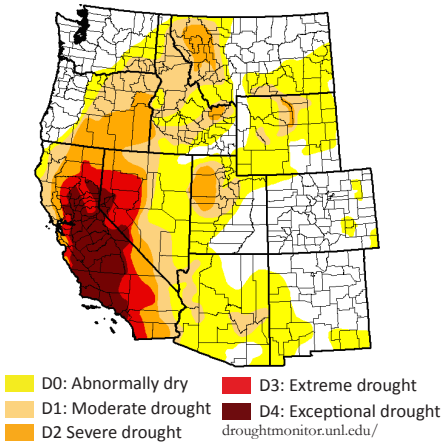
Dec 2015-Feb 2016



Winter precipitation was opposite of the anticipated El Niño pattern (dry Northwest, wet Southwest), with well above normal precipitation in the Pacific Northwest and northern Great Basin and below normal across the Southwest. Following a very active weather pattern Dec-Jan, high pressure set up over the region in Feb, limiting precipitation in the Sierra Nevada, Southwest, and Colorado River Basin. Large gains in snowpack were made during Dec-Jan, though most basins finished the season near normal.

U.S. Drought Monitor

Mar. 1, 2016



At the start of winter, 37% of the West was in severe to exceptional drought. By Mar 1, only 19.7% of the area observed these conditions. Above normal precipitation and a healthy snowpack helped alleviate drought conditions in the Northwest, especially eastern WA and western OR. The northern Great Basin also saw improvement. Drought conditions worsened this winter along the MT-WY border due to below normal precipitation and snowpack. The area along the US-Mexico border has been abnormally dry as well.

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Regional Impacts for December 2015-February 2016

Drought, Flooding and Water Resources

CA reservoirs recovered some storage, though only 1 major reservoir (Folsom) held above average storage as of Feb 29

CA State Water Project deliveries anticipated at 30%; may still vary based on spring precipitation

Forecast Apr-July runoff to L. Powell reduced from 85% to 80% of normal due to warm/dry Feb

High surf, sea levels caused damage to CA coastal structures

Heavy Dec rainfall in western OR/WA produced flooding, road closures, damage to residences and landslides

Warm Feb temperatures caused early snowmelt, flooding along Yakima R. in WA and on rural roads in eastern NV

Fisheries

West Coast pinniped strandings continued this winter due to lack of food, high domoic acid in available food

Low numbers of winter salmon returns on Skagit R., Samish R. in WA (coho) and Sacramento R., CA (Chinook)

Recreation

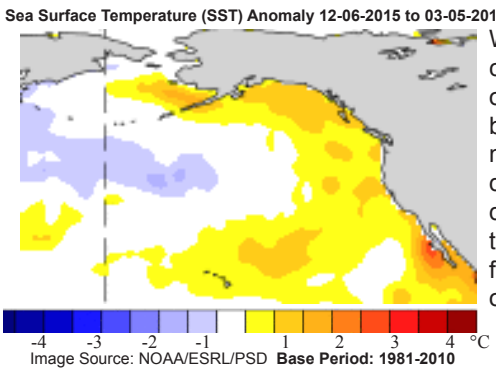
Ski resorts had good winter after poor season in 2014-15

Death Valley, CA, had above normal winter rains, producing best wildflower bloom since 2005

Energy

Lack of cheap hydro power due to drought raised CA power costs $2B over last 4 years

Dungeness Crab Fisheries Impacted by warm water "blobs"

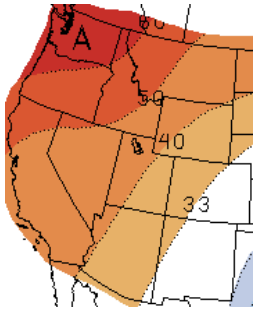


West Coast Dungeness crab fisheries typically open in early December, but were delayed a month in many locations due to high levels of domoic acid found in the crabs. Dungeness fisheries have yet to open in CA north of 38°.

Toxic algal blooms that produce domoic acid often occur when SSTs are warmer than normal, as they were this winter (image above). Warm SSTs lower the nutrient content of the waters and stress diatoms, causing them to produce the toxic acid. Toxic algal blooms occur occasionally in the coastal waters, but are typically not this long-lasting or widespread. In CA, Governor Brown has requested disaster aid for crabbers and related industries; losses for the crabbing season are estimated at $49 million. Poor ocean conditions (warmer than normal waters) are anticipated to continue through summer 2016.


Image source: The Inertia

Regional Outlook for Apr-May-Jun 2016

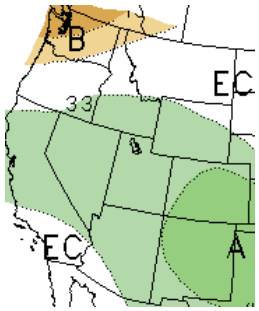


Apr-May-Jun temperature outlook produced by CPC Mar 17 2016

CPC// www.cpc.ncep.noaa.gov /

A indicates above normal
B indicates below normal
N indicates normal
EC means equal chances for A, N or B

Numbers indicate percent chance of temperature in warmest one-third and of precipitation in wettest one-third

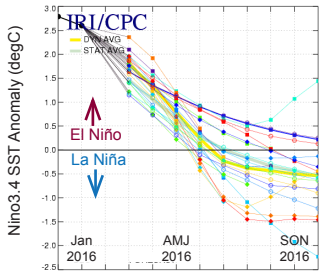


Apr-May-Jun precipitation outlook produced by CPC Mar 17 2016

NOAA CPC Apr-Jun Seasonal Outlook

The greatest likelihood of well above normal temperatures is projected for the Pacific Northwest during the Apr-Jun period. The precipitation outlook displays a weakening El Niño signal, with the greatest chances for above normal precipitation in NM and CO. In WA, odds are tilted towards drier than normal conditions.

Model ENSO Predictions Jan 2016-Dec 2016



IRI// iri.columbia.edu/our-expertise/

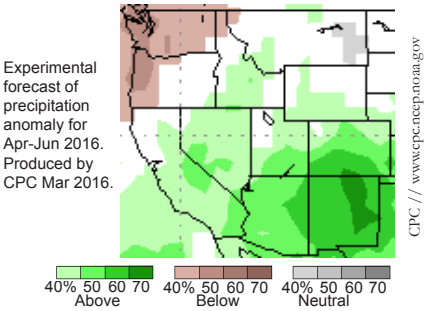
ENSO (El Niño Southern Oscillation) model predictions

Each line represents one model forecast of sea surface temperature (SST) anomaly. Black line represents observed.

Produced by IRI Feb. 18 2016

IRI ENSO Outlook

Model forecasts suggest El Niño conditions will weaken through spring and transition to ENSO-neutral by summer, with a possible transition to La Niña conditions for the fall and winter.



Experimental forecast of precipitation anomaly for Apr-Jun 2016. Produced by CPC Mar 2016.

CPC // www.cpc.ncep.noaa.gov

NMME Precipitation Forecast

The National Multi-Model Ensemble combines 7 different climate research models. The NMME suggests above normal precipitation across the Southwest for Apr-Jun, related to fading El Niño.

Western Region Partners

Western Regional Climate Center
wrcc.dri.edu
National Integrated Drought Information System (NIDIS) - drought.gov
Western Governors' Association
westgov.org
Western States Water Council
westgov.org/wswc
NOAA/ESRL Physical Sciences Division
esrl.noaa.gov/psd
NOAA Climate Prediction Center
www.cpc.ncep.noaa.gov
National Centers for Envir. Info. (NCEI)
www.ncdc.noaa.gov
USDA/NRCS National Water and Climate Center - www.wcc.nrcs.usda.gov
National Interagency Fire Center
www.nifc.gov
NOAA's Western Regional Collaboration Team
www.regions.noaa.gov/western/western_region_team.html
Western Water Assessment
wwa.colorado.edu
Climate Assessment for the Southwest
climas.arizona.edu
California Nevada Applications Program
meteora.ucsd.edu/cnap
Climate Impacts Research Consortium
pnwclimate.org/resources
NWS River Forecast Centers
water.weather.gov/ahps/rfc/rfc.php
NOAA Fisheries Service
www.nmfs.noaa.gov/
NWS Western Region Forecast Offices
www.wrh.noaa.gov/
State Climatologists - stateclimate.org

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