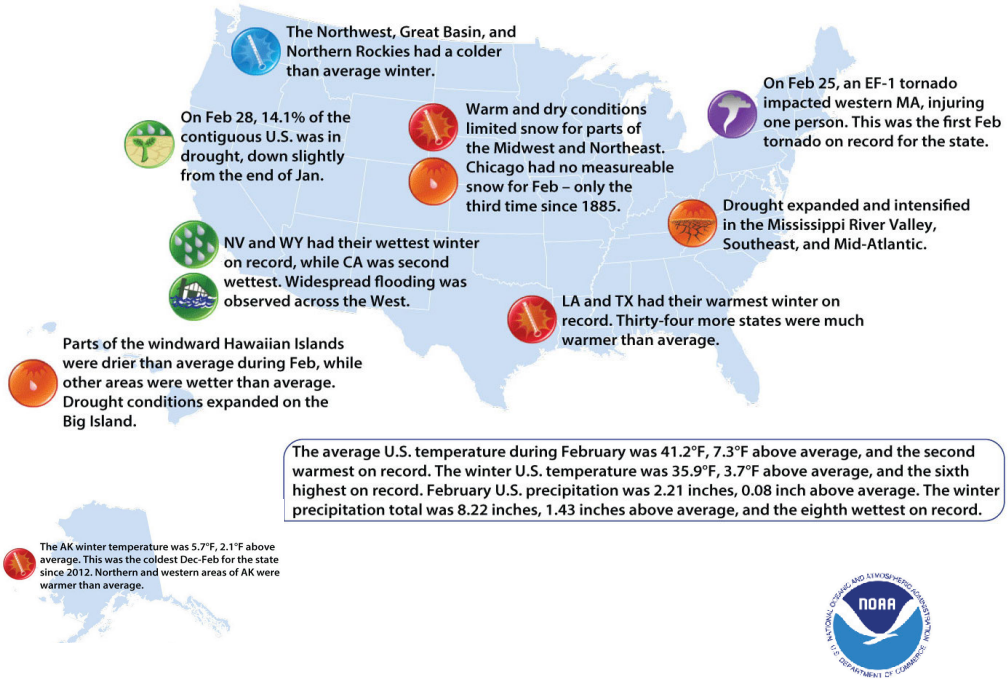
Quarterly Climate Impacts and Outlook

Western Region March 2017

Significant Events for December 2016 - February 2017



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

The average U.S. temperature during February was 41.2°F, 7.3°F above average, and the second warmest on record. The winter U.S. temperature was 35.9°F, 3.7°F above average, and the sixth highest on record. February U.S. precipitation was 2.21 inches, 0.08 inch above average. The winter precipitation total was 8.22 inches, 1.43 inches above average, and the eighth wettest on record.

Dec-Feb Highlights for the West

Wettest winter (Dec-Feb) on record for NV, WY; 2nd wettest for CA

Well above normal snowpack in Sierra Nevada, southern Cascades, central and southern Rockies

Major flooding, travel impacts across West due to abundant precipitation

Cooler than normal temperatures across northern tier of West, above normal in Four Corners area

Second warmest winter on record for NM; 6th warmest for AZ

Significant reduction in drought conditions across West

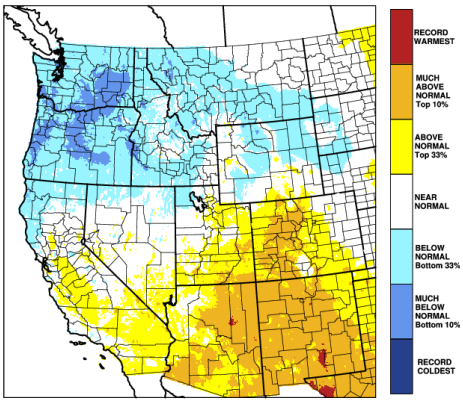
Sea surface temperatures near normal along West Coast; large area of northeast Pacific cooler than normal

ENSO-neutral conditions favored through spring, some models favor El Niño development by summer

Regional Overview for December 2016 - February 2017

Mean Temperature Percentile

Dec 2016-Feb 2017

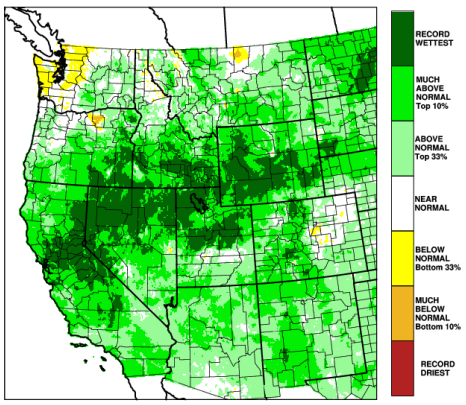


WRCC // www.wrcc.dri.edu/wwdt/

High pressure was anchored over the southeastern US for much of the winter, producing well above normal temperatures that reached westward into the Four Corners states. February was the most severe month of the season with average temperature anomalies in the Southwest exceeding 6 F. In contrast, persistent low pressure over the Pacific Northwest allowed for cold, polar air to move into this region. This kept temperatures well below normal, and many southeastern WA/northern OR locatons saw one of their bottom-10 coldest winters on record. Near normal temperatures dominated in between.

Precipitation Percentile

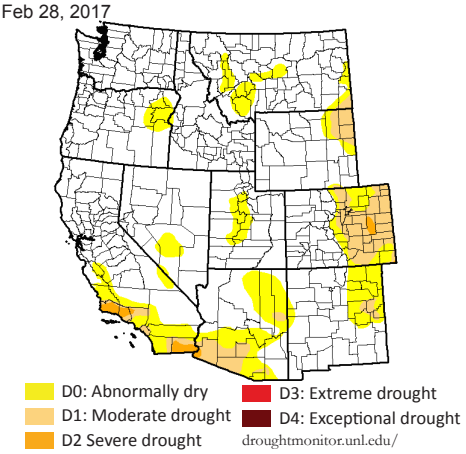
Dec 2016-Feb 2017



A steady parade of atmospheric river (AR) storms impacted the West this winter. These storms transport large amounts of water vapor and often produce extreme precipitation. The area of "record wettest" shown above reflects ARs passing through a favored terrain gap from the San Francisco Bay across the relatively low elevations of the northern Sierra. Several AR events also impacted southern CA and AZ as well, bringing both drought relief and flooding. The storm track favored the southern part of the region; the northern tier saw closer to normal precipitation totals, with some areas slightly below normal.

U.S. Drought Monitor

Feb 28, 2017



Only 7% of the West remained in drought at the end of February, down from 26% at the start of the winter season. The development of an above normal Sierra Nevada snowpack (180-200+% of normal) promises ample spring runoff and helped alleviate water resource concerns for both CA and NV. Some areas of southern CA still have reservoir and groundwater shortages and will be slower to come out of drought. Above normal precipitation in eastern OR helped to alleviate drought in that area. Drought conditions persisted in northeastern NM, eastern CO, and southern AZ during the winter season.

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Regional Impacts for December 2016 - February 2017

Weather

Several ice storms, low elevation snow impacted Pacific Northwest cities, causing major travel impacts

February windstorm with gusts up to 90 mph snapped steel power lines near Jackson Hole, WY

Drought, Flooding and Water Resources

CA Central Valley Project allocations 100% for many service areas; in 2016 allocations for South of Delta 5%, M&I 55%

CA State Water Project allocations anticipated at 60% in Jan, full allocations last received in 2006

Large water supply forecast for Colorado R. Basin: L. Powell inflow 145% of average; Flaming Gorge 231% of average

Heavy snows caused many roof collapses across Pacific Northwest, impacting businesses and human safety

Ice jams caused minor flooding in inland West; such flooding reported on Weiser, Bear, Green rivers

Streams in AZ that haven't flowed in many years observing flows this year

Reservoir releases in Colorado Basin to prepare for spring runoff have generated high streamflows for late winter season

Coastal and Fisheries

Millions of fish in hatchery below Oroville dam relocated due to health concerns associated with muddy water

Record wave height of 34 ft. measured in central CA in Jan; high surf damaged coastal structures in Monterey Bay area

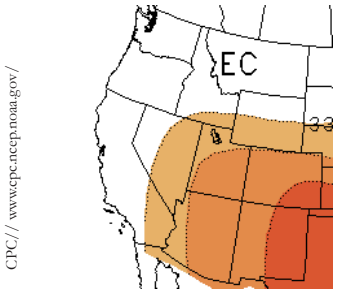
Widespread Storm Damage in California/Northern Nevada

This season's moisture-laden storms produced abundant precipitation in CA and NV. Persistent rainfall allowed for soils to become saturated, such that by late Jan/early Feb, flooding and landslides were widespread in the region. These events weaked havoc on transportation corridors.

Damaged Oroville spillway, Feb 27 2017

Interstate 80 over the Sierra was closed for long durations many times over the course of the season, interrupting ski tourist travel and interstate commerce. In Big Sur, landslides caused a bridge collapse and closure of Highway 1 with no estimated re-open date. Early estimates for road damage in CA exceed $500M. In Nevada, mountain roads suffered snow and debris avalanche closures and many rural roads became impassable due to flooding. Several warm storms had very high runoff due to rain on snow and damaging floods occurred on the Truckee R. and Humboldt R. in northern NV and the Feather R. in northeastern CA, to name a few. A creek in San Jose, CA, flooded resulting in evacuation of 14,000 people and $100M in damage. The spillway to Oroville Dam was compromised during a period where flood control releases were needed, resulting in the temporary evacuation of 180,000 people below the dam in February.

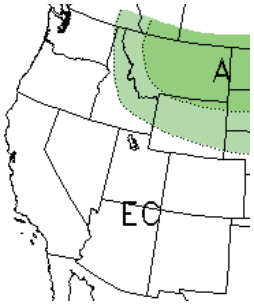
Regional Outlook for Apr-May-Jun 2017



Apr-May-Jun temperature outlook produced by CPC Mar 16 2017

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

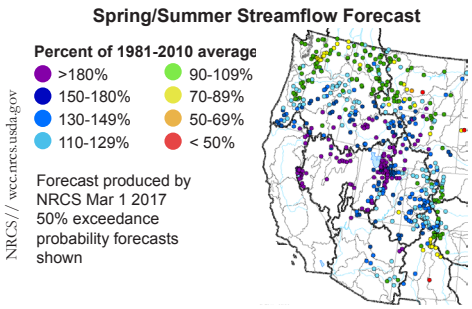
Numbers indicate percent chance of temperature in warmest/coolest one-third and of precipitation in wettest/driest one-third



Apr-May-Jun precipitation outlook produced by CPC Mar 16 2017

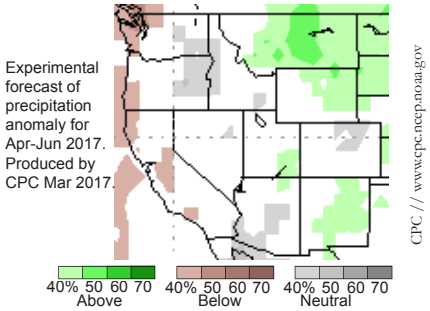
NOAA CPC April-June Seasonal Outlook

CPC indicates a 33-40% chance of above normal precipitation across MT, eastern ID, and northern WY. Equal chances of above or below normal precipitation are indicated elsewhere. A 33-40% chance of above normal temperatures is projected for the eastern Great Basin and Four Corners states, and up to a 50% chance in eastern NM.



NRCS Streamflow Outlook

Above normal snowpack in the Great Basin, southern Cascades, and Colorado Basins raises concerns for snowmelt flooding in spring and summer. Increased streamflow will raise reservoirs to levels not seen in years in CA and NV.



NMME Precipitation Forecast

The National Multi-Model Ensemble combines 7 climate research models. The NMME suggests a chance of above normal precipitation in MT and NM and a chance of below normal precipitation in some areas of CA. Generally equal chances elsewhere.

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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