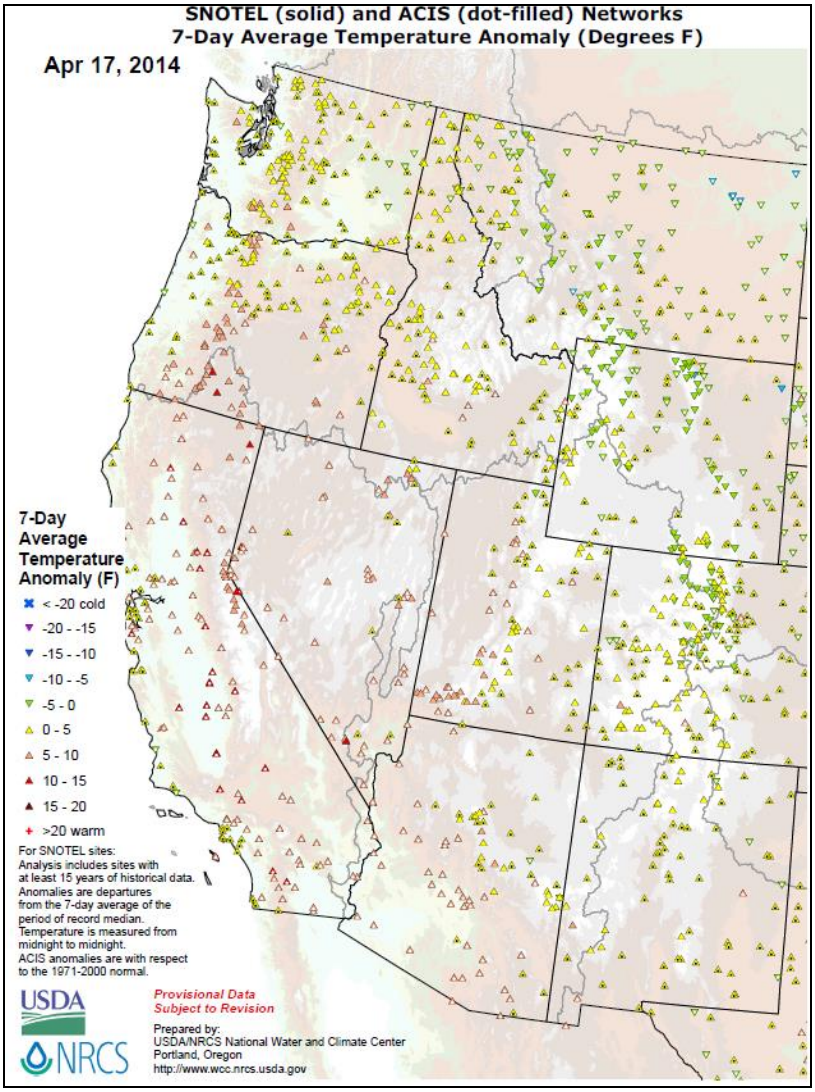
United States Department of Agriculture

Natural Resources Conservation Service
P.O. Box 2890
Washington, D.C. 20013

Weekly Snowpack / Drought Monitor Update

April 17, 2014

Temperature



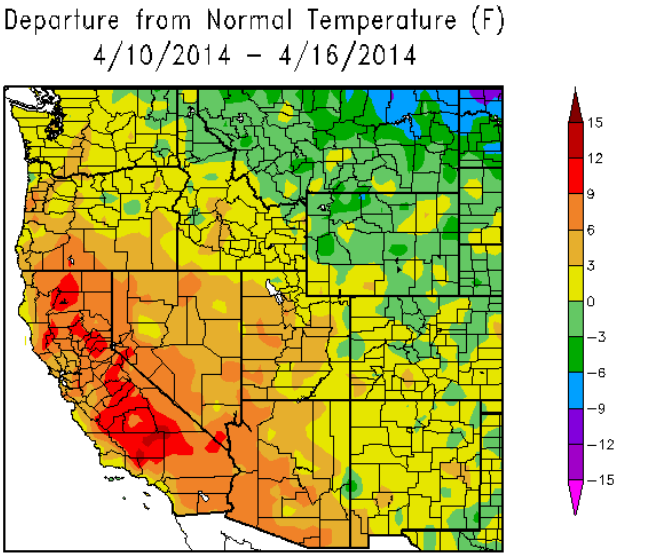
SNOTEL and ACIS 7-day temperature anomaly shows temperatures well above normal over California, Nevada and adjacent areas. Below normal temperatures dominate east of the Continental Divide.

Click on most maps in this report to enlarge and see latest available update.

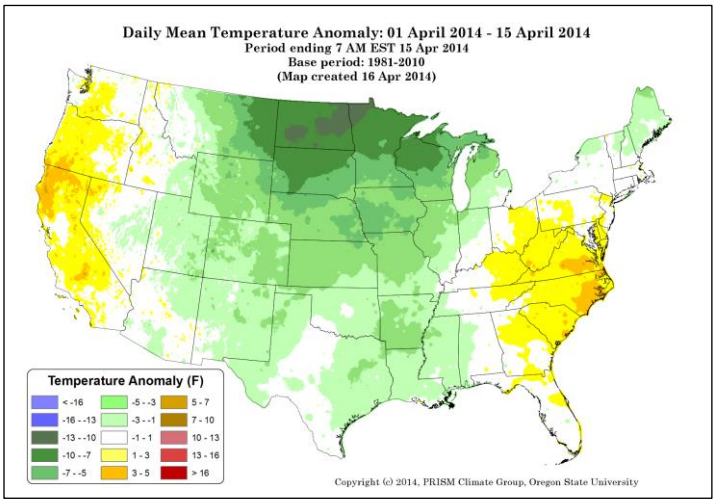
ACIS 7-day average temperature anomalies, ending April 16, show the greatest negative temperature departures over northwest North Dakota (<-9°F). The greatest positive temperature departures occurred in interior California (>+9°F).

- Wyoming Record Cold

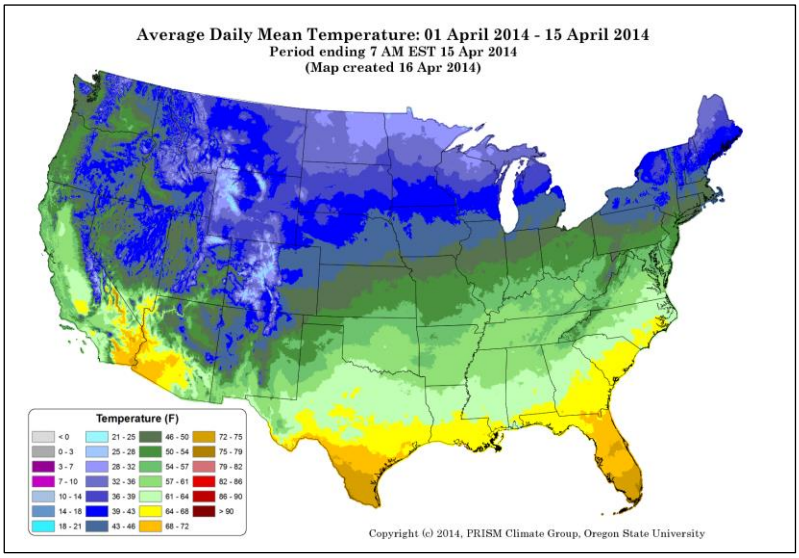
✓ Also, see Dashboard and the Westwide Drought Tracker.



This preliminary PRISM temperature map contains all available network data, including SNOTEL data, and will be updated periodically as additional data become available and are quality controlled.



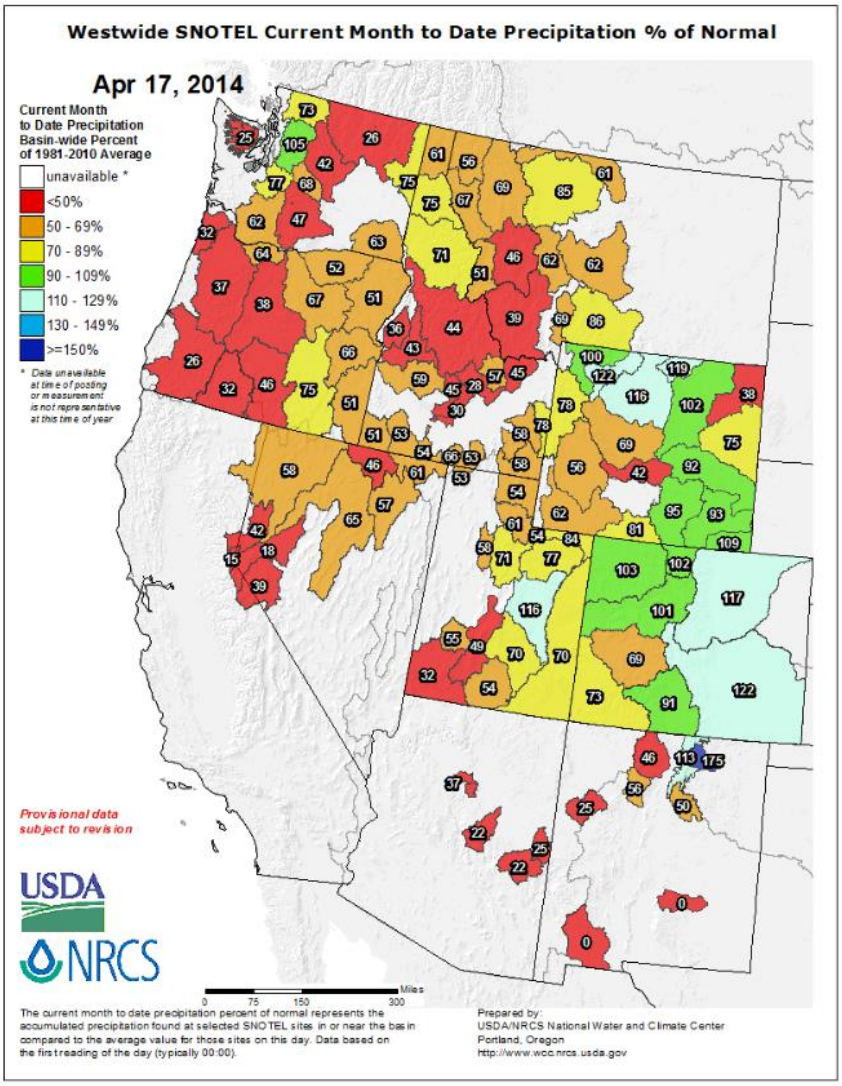
← The April 2014 temperature departures map shows a fairly cold pattern over the central region of the country; especially over the northern Great Plains. Above normal temperatures dominate the Pacific Coast states and Mid-Atlantic states.

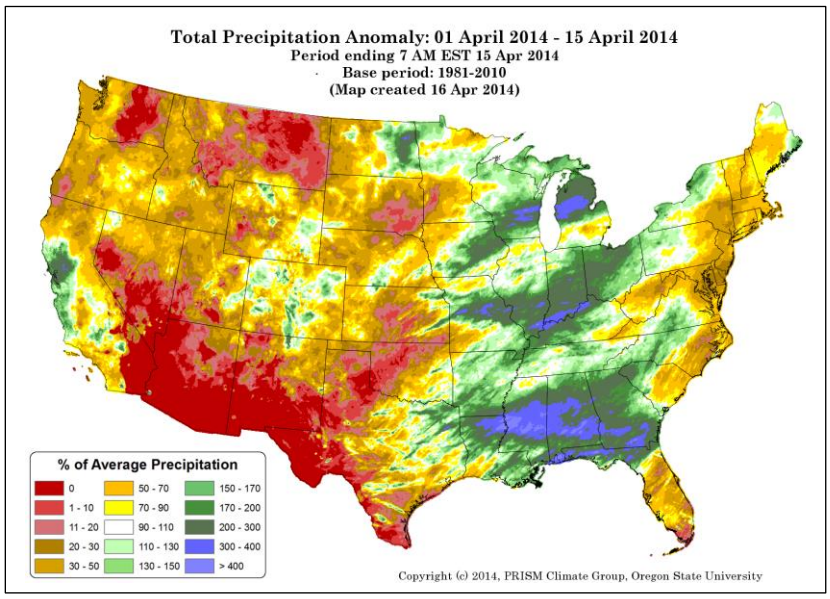


Forecasting the start of the spring snowmelt and subsequent runoff depends, in part, on when average temperatures warm to above freezing. Monitoring this type of climate map is a useful way to gauge when this onset is likely to occur.

Precipitation

The April SNOTEL precipitation percent of normal map shows predominately deficit conditions over much of the West. Basins east of the Continental Divide in Wyoming and Colorado are faring better with normal or surplus total amounts.



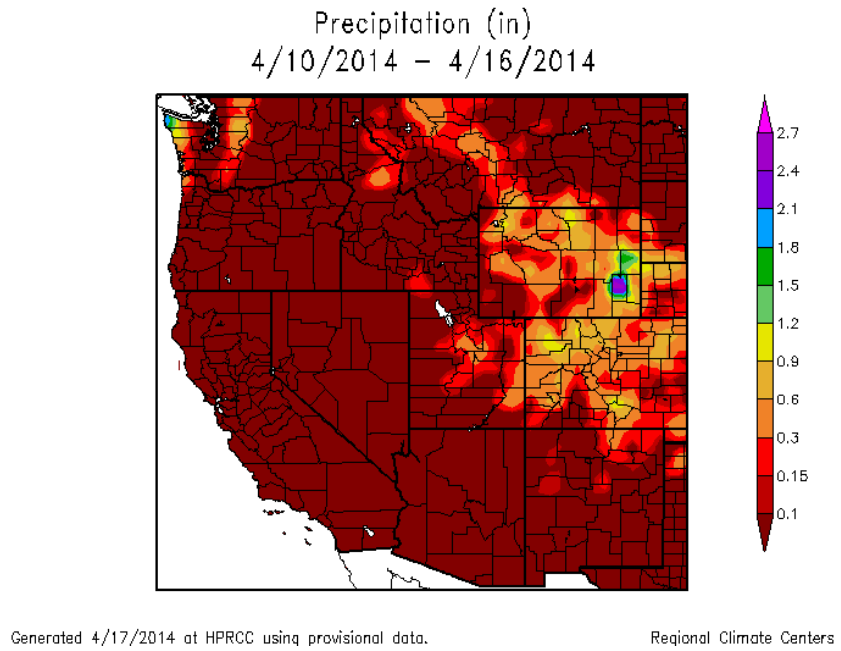


← The April **precipitation anomaly** pattern reveals surplus moisture over the Midwest and Gulf Coast states, including the central California coast. The Southwest, Northwest, Northern Rockies, and much of the Great Plains are falling behind in moisture.

This preliminary daily PRISM precipitation map contains all available network data, including SNOTEL data, and is updated periodically as additional data become available and are quality controlled.

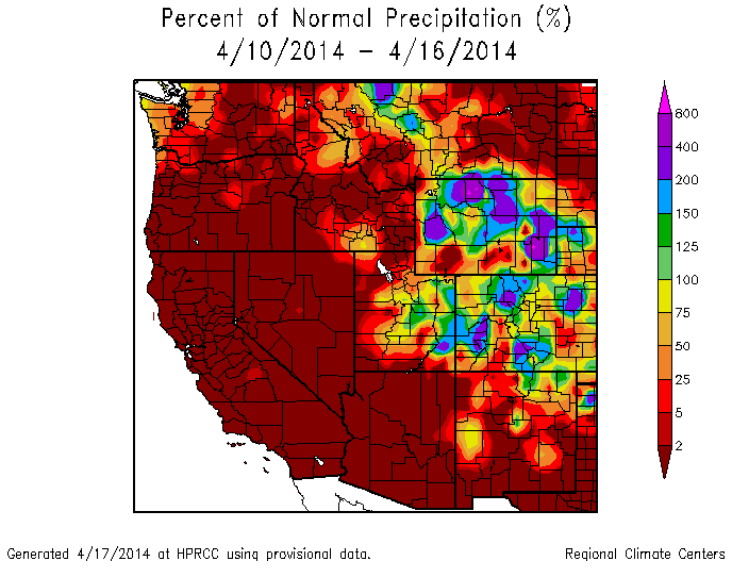
The ACIS 7-day total precipitation map shows continued moisture falling over Olympic Mountains in Washington and thorough the Central Rockies. Lesser amounts fell across the Northern Rockies and Northern Cascades.

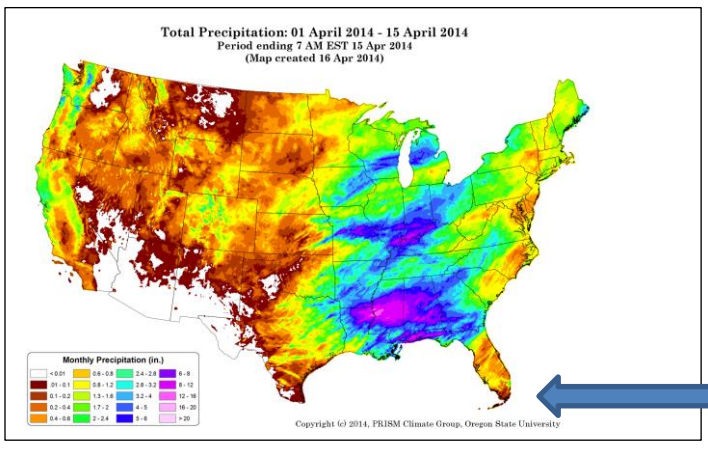
Elsewhere, little if any precipitation occurred.



As would be expected based on the map above, this map reflects a similar pattern of precipitation that fell across the West during the week. →

It does not take much moisture to up the percentages this time of year (e.g., less than one inch results in 300% of normal over northwest Wyoming).





← The April 2014 **total precipitation** indicates large regions across the country with significant moisture and dryness.

Areas that have been in drought for some time are not being helped if this pattern persists.

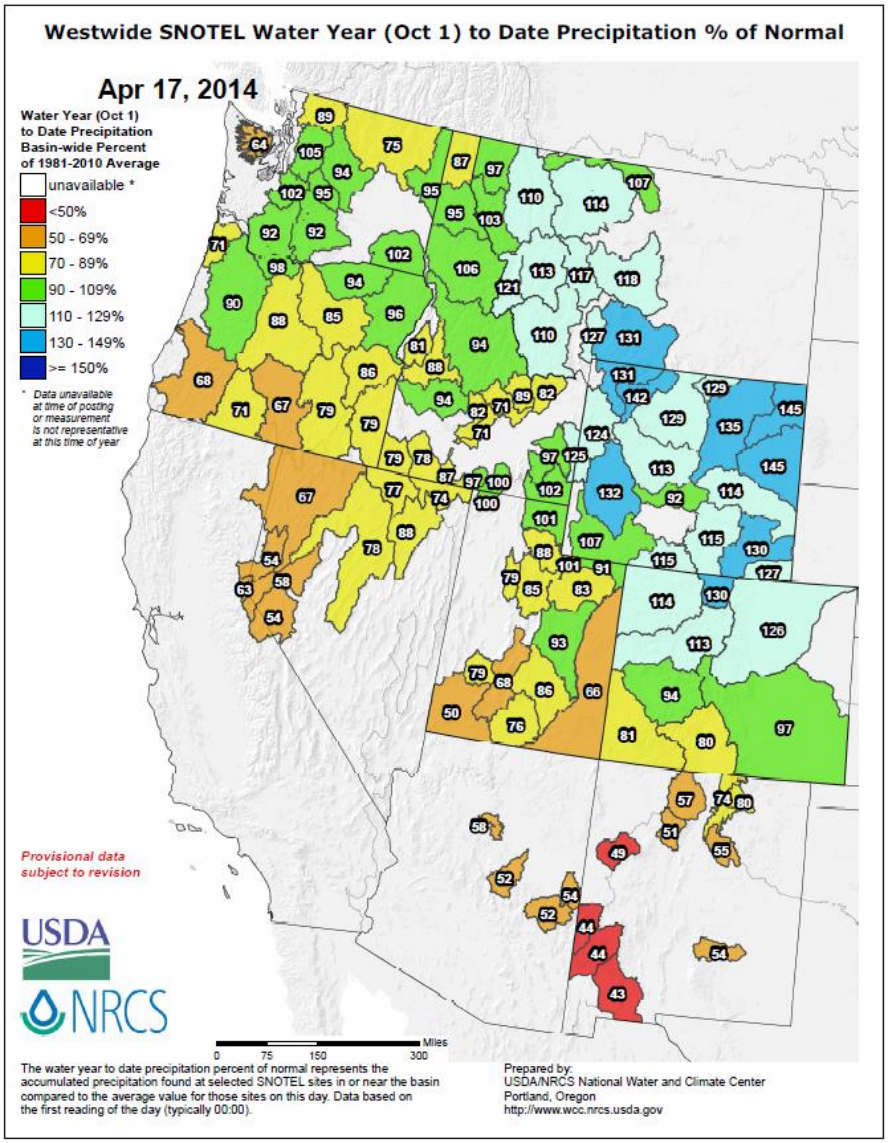
See Go Hydrology for current and forecast conditions over southern Florida.

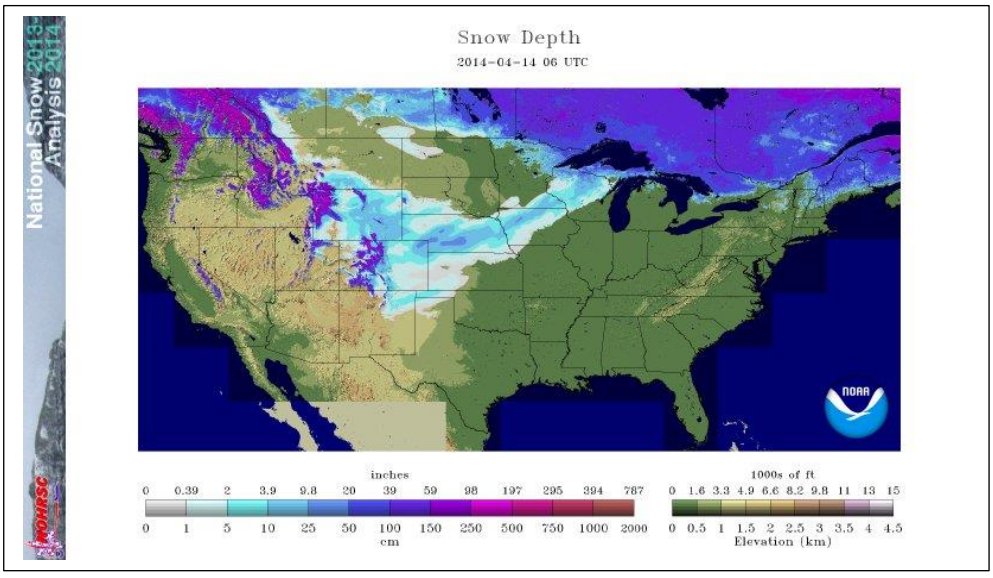
For the 2014 Water Year that began on October 1, 2013, only central Montana, all of Wyoming, and northern Colorado are experiencing surpluses.

The largest deficits are centered over southern Oregon, western Nevada, southern and eastern Utah, Arizona, and New Mexico.

As the Water Year advances, it becomes more difficult for river basins to change bin categories.

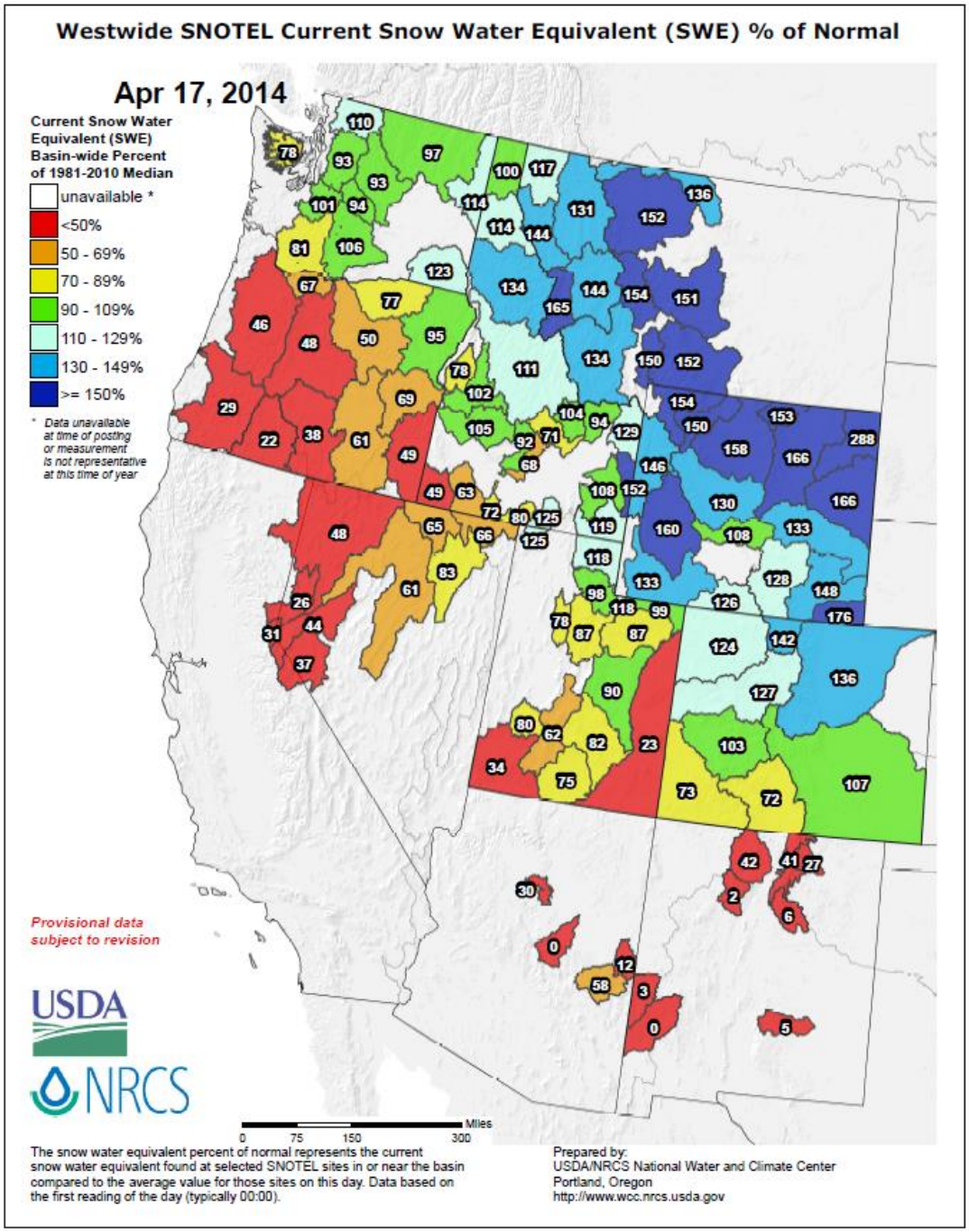
However, there are indications that the Southwest will experience a moderate summer monsoon. **Click** for latest NOAA CPC Seasonal Outlook.





← Snow depth as of April 14. Cold may be a potential factor for damage to winter wheat over the central and southern Great Plains due to Arctic-like outbreaks this week.

Snow



Snow Water Equivalent (SWE) values are generally higher east of the Continental Divide, with the exception of New Mexico. During this time of year, the percent of normal can increase without additional moisture if the melt of the snowpack is delayed by colder than normal conditions. Values over the Southwest can also ramp up quickly with any precipitation event, because this is usually a dry time of year.

The water supply forecasts issued by the National Water and Climate Center for the spring and summer months are now available.

See the latest:

- National Snow Analysis
- West-Wide Water Supply Forecast Tables
- Wyoming Record Snows This Week

Weather and Drought Summary

National Drought Summary – April 15, 2014

The following **Weather and Drought Summary** is provided by this week's NDMC Drought Author: Brian Fuchs, NDMC

USDM Map Services: (contains archived maps)

For the contiguous 48 states, the U.S. Drought Monitor showed 37.88 percent of the area in moderate drought or worse, compared with 37.98 percent a week earlier. D4 increased to 2.83% this past week.

For all 50 U.S. states and Puerto Rico, the U.S. Drought Monitor showed 31.65 percent of the area in moderate drought or worse, compared with 31.73 percent a week earlier.

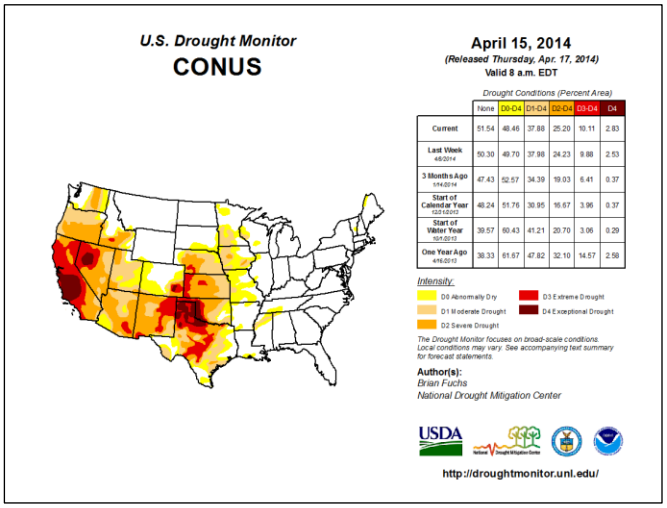
Current Drought Monitor weekly summary. The exceptional D4 levels of drought are scattered across CA, NV, CO, TX, and OK.

The latest drought indicator blend and component percentiles spreadsheet is a great resource for climate division drought statistics. This link is for the latest Drought Outlook (forecast). See climatological rankings.

For more drought news, see Drought Impact Reporter.

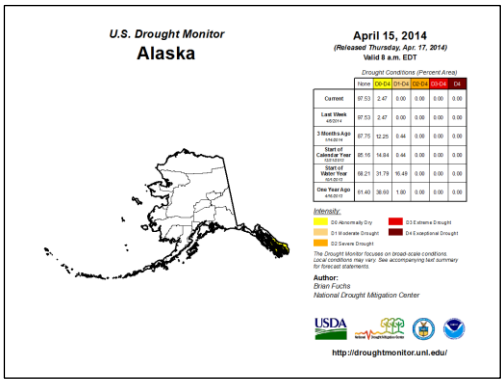
Drought Management Resources (√):

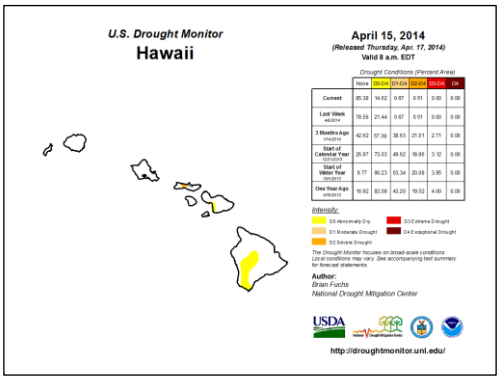
- ✓ Watch AgDay TV
- ✓ Drought Impacts Webinar Series
- ✓ Quarterly Climate Summary and Outlooks for the Great Lakes, Midwest and Missouri Basin States



See: Latest Drought Impacts during the past week.

- Beef herd expansion threatened in the coming weeks - April 7
- Droughts Worldwide May Have an Effect on American Dinner Plates - April 7
- Beef prices hit all-time high in U.S. - April 8
- U.S.D.A. Crop Progress shows declines from fall - April 9
- UC Geographers Develop a System to Track the Dynamics of Drought - April 10
- Hold the lime? Price of limes rises following drought - April 11





The 49th and 50th States show relatively benign drought conditions. No changes noted for Alaska and Hawaii has experienced significant improvements.

A comprehensive narrative describing drought conditions across other parts of the nation can be found toward the end of this document. For drought impacts definitions for the figures that follow, click here.

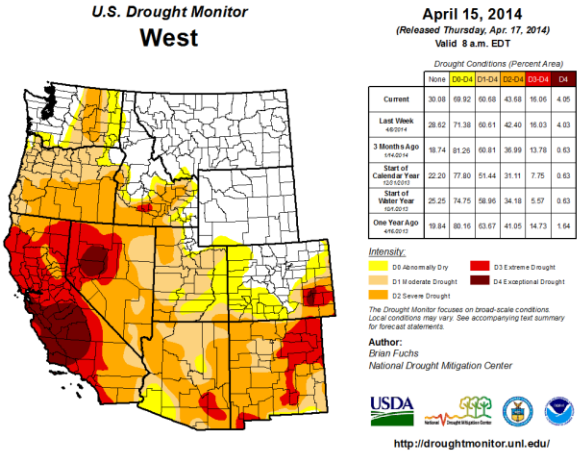
Risk Management Web Resources

- ✓ Drought Monitor for the Western States
- ✓ Drought Impact Reporter for New Mexico
- ✓ California Data Exchange Center & Flood Management
- ✓ Intermountain West Climate Dashboard
- ✓ Great Basin Dashboard
- ✓ CLIMAS January 2014 Climate Summary

U.S. Impacts during the past week

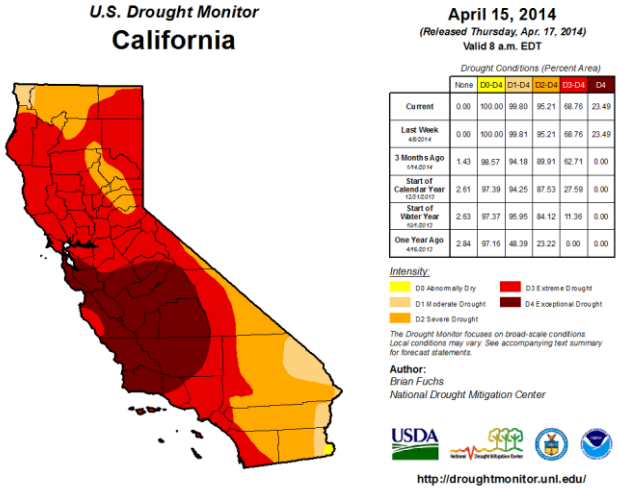
- Klamath irrigation project facing another short year - April 9, **Oregon**
- NID Declares Stage II Drought, Asks Customers to - Conserve Water
  April 10, **Nevada**

Click to enlarge maps



Slight deterioration in D2 occurred this week.

State with D-4 Exceptional Drought



No significant changes occurred this week.

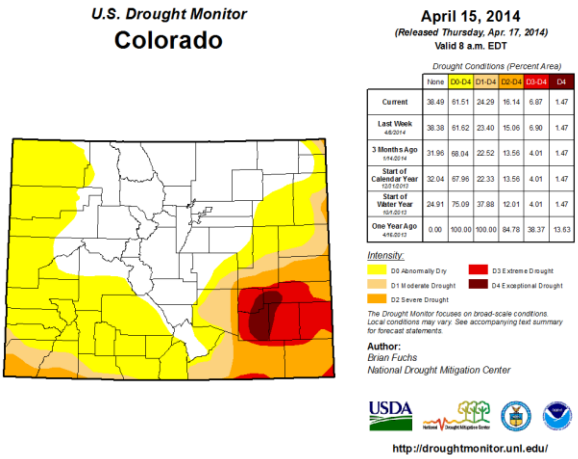
CA Drought Information Resources

Drought News from California

- Cold, Then Dry: Dealing California Citrus Farmers a Double Punch - April 8
- California Senate approves drought relief for homeowners April 7
- Water deliveries remain at 0 pending further study - April 9
- California water plan unveils hardships to come as drought persists - April 9
- Drought Forces Silicon Valley Triathlon Move To Half Moon Bay - April 10
- Withered California Fruit Seen Raising Food Costs - April 9
- Marijuana Grow Ops Are Drying Out California's Water Supply – April 16

See the end of this report for additional California Sierra Nevada-related snow pack (remotely sensed data).

State with D-4 Exceptional Drought



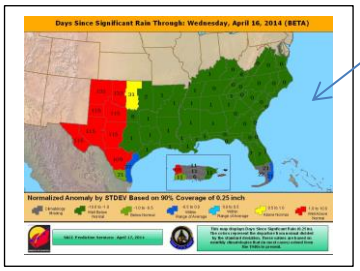
No significant changes occurred this week.

- 'Pray for rain' - April 5
- Colorado tumbleweeds overrun drought areas - April 9

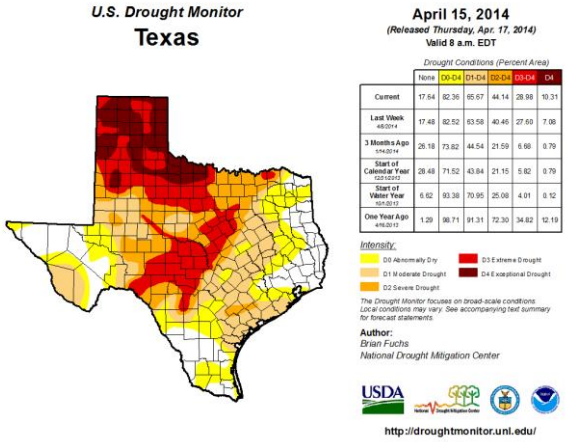
State with D-4 Exceptional Drought

- ✓ Texas Drought Website.
- ✓ Texas Reservoirs.
- ✓ **Texas Drought Monitor Coordination Conference Call: on Monday's 2:00 PM - 3:00 PM CST**

- Drought threatens Texas rice farmers' futures - April 6
- Drought forces another cut in pumping from Edwards Aquifer - April 10
- Digging Up Old Drilling Logs to Strike Not Oil, but Water – April 10
- Wildflowers coming into bloom - April 7



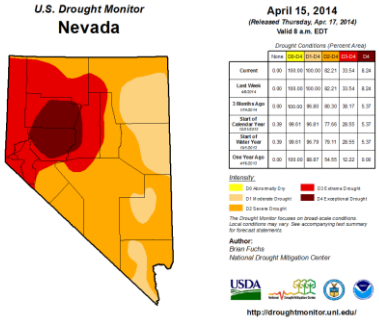
Days Since Rain Summary



Deterioration in D4 by +3% occurred during the past week.

See the end of this report for additional Texas-related drought data (historical perspective).

State with D-4 Exceptional Drought



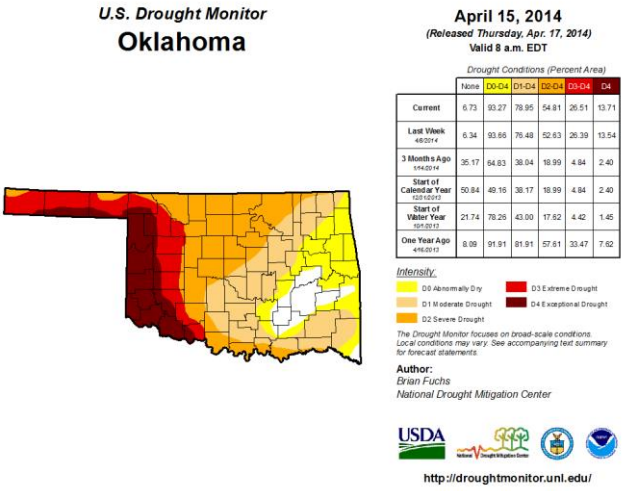
No changes have occurred during the past week.

State with D-4 Exceptional Drought

Deterioration has occurred in D2 by 2% this week.

Related news:

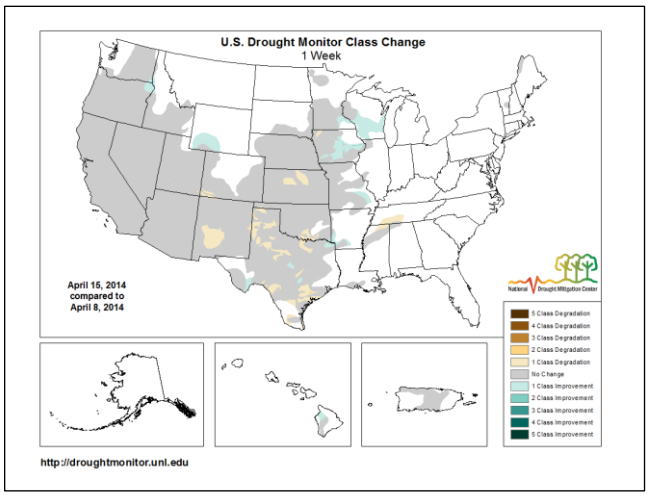
- ✓ 2014 Kansas Drought Report and Summary
- ✓ **Special Edition: Freeze injury on wheat**

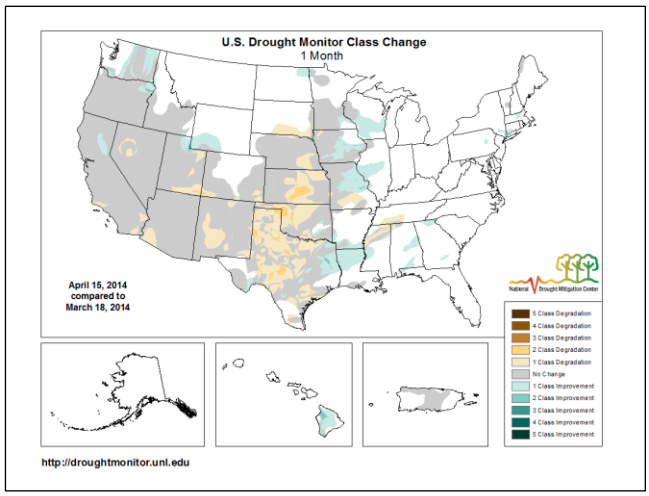


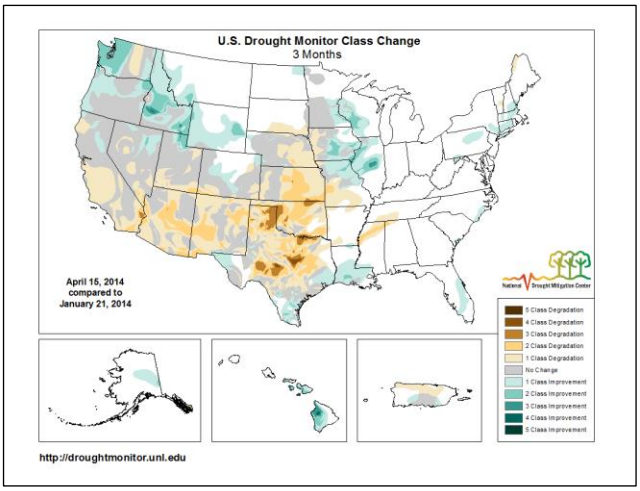
- ***Past 30 days precipitation totals***
- ***Past 30 days precipitation percent of normal***
- ***Calendar Year precipitation totals***
- ***Calendar Year precip percent of normal***

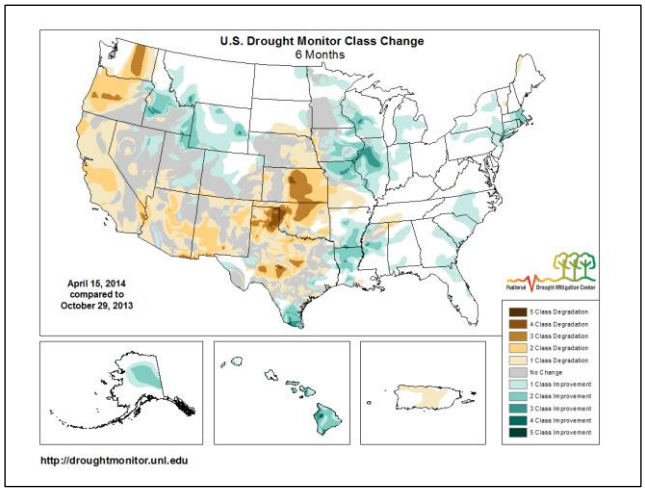
- ✓ ***Winter Wheat Status (update)***

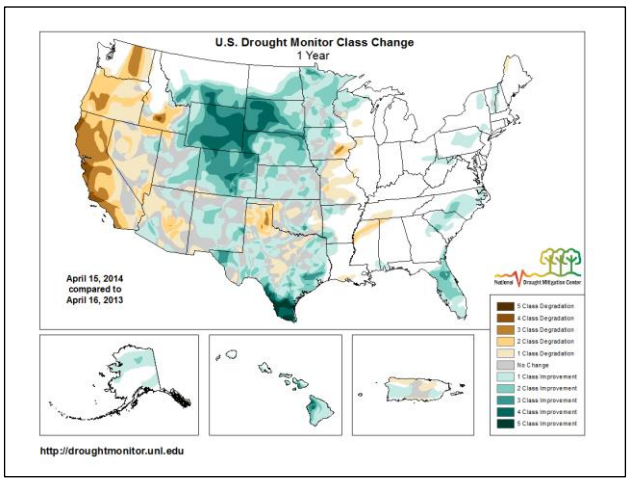
Changes in Drought Monitor Categories **(over various time periods)**

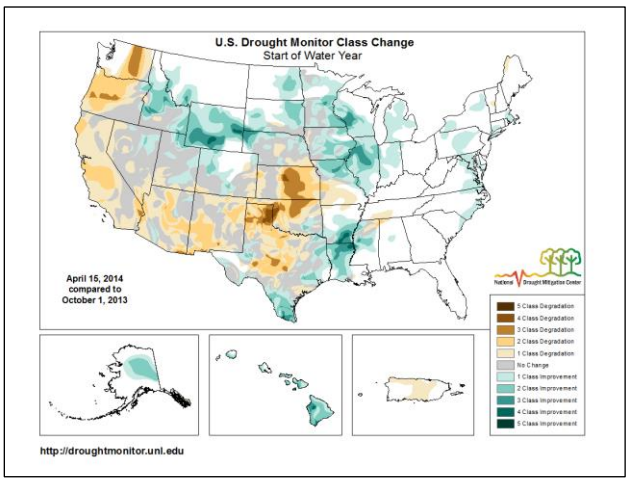






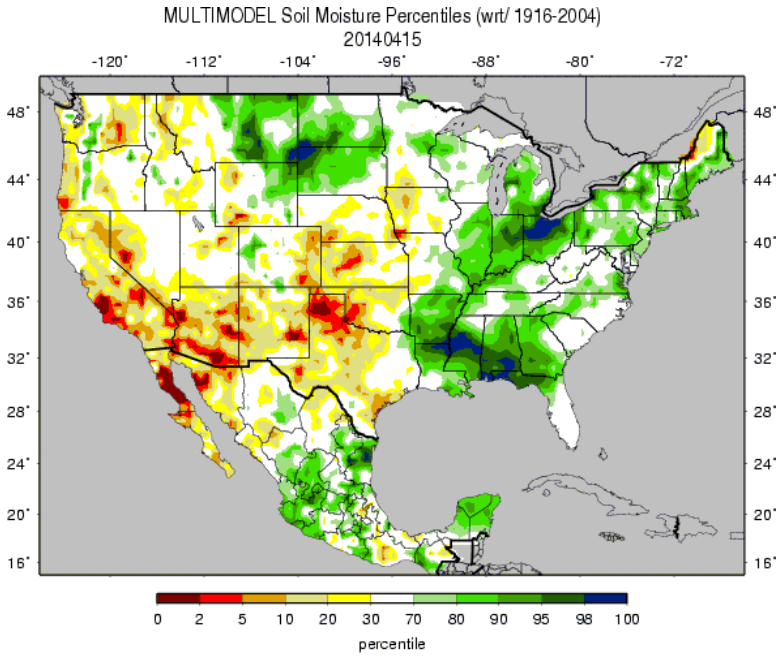






Changes to the drought monitor usually start to accelerate in the spring. Since the start of the 2014 Water Year (lower right map), the western drought conditions have worsened over the Pacific Northwest and improved over Wyoming and Idaho. Conditions have also improved over the Mississippi River Valley, but have worsened from Kansas to northern Texas.

Soil Moisture



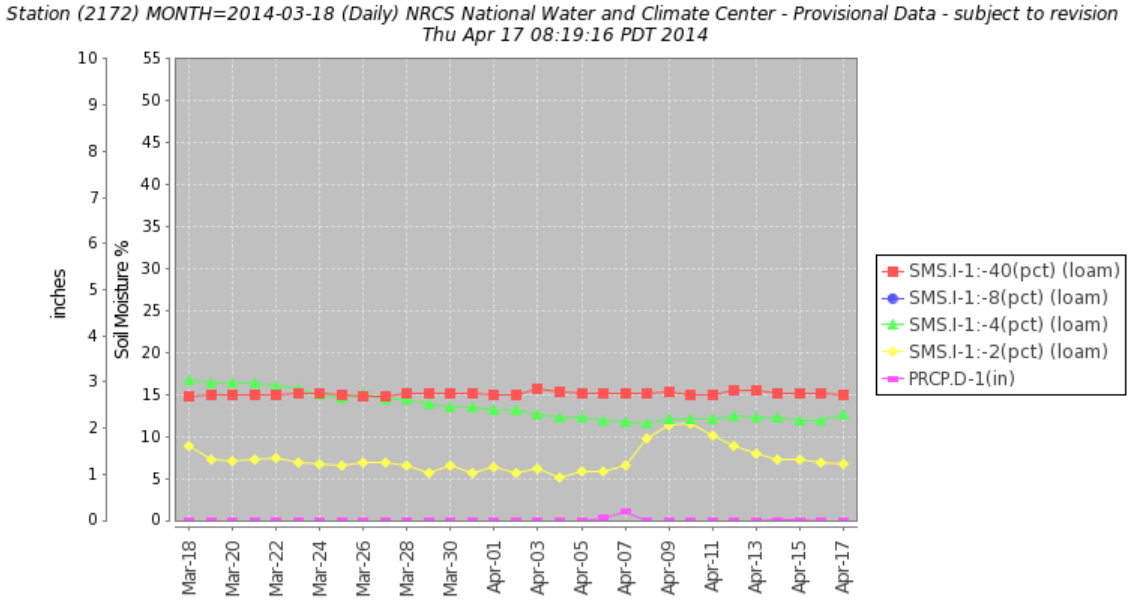
Soil moisture ranking in percentile as of April 15 shows dryness over central California, southern Arizona, eastern New Mexico, and the southwestern Great Plains (i.e., northern Texas). Moist soils dominate the northern Great Plains, the Ohio River Valley, and the Gulf Coast states. With abundant snowpack in Montana, concern exists about potential Missouri River flooding in the coming weeks *(see the next page for more data)*.

Useful Hydrological Links: *Crop Moisture Index; Palmer Drought Severity Index; Standardized Precipitation Index; Surface Water Supply Index; Weekly supplemental maps, Minnesota Climate Working Group; Experimental High Resolution Drought Trigger Tool;* NLDAS Drought Monitor; Soil Moisture.

Soil Health-unlock your farm's potential

Note: Northernmost states with continued frozen ground will not have the most accurate and reliable soil moisture measurements until late April.

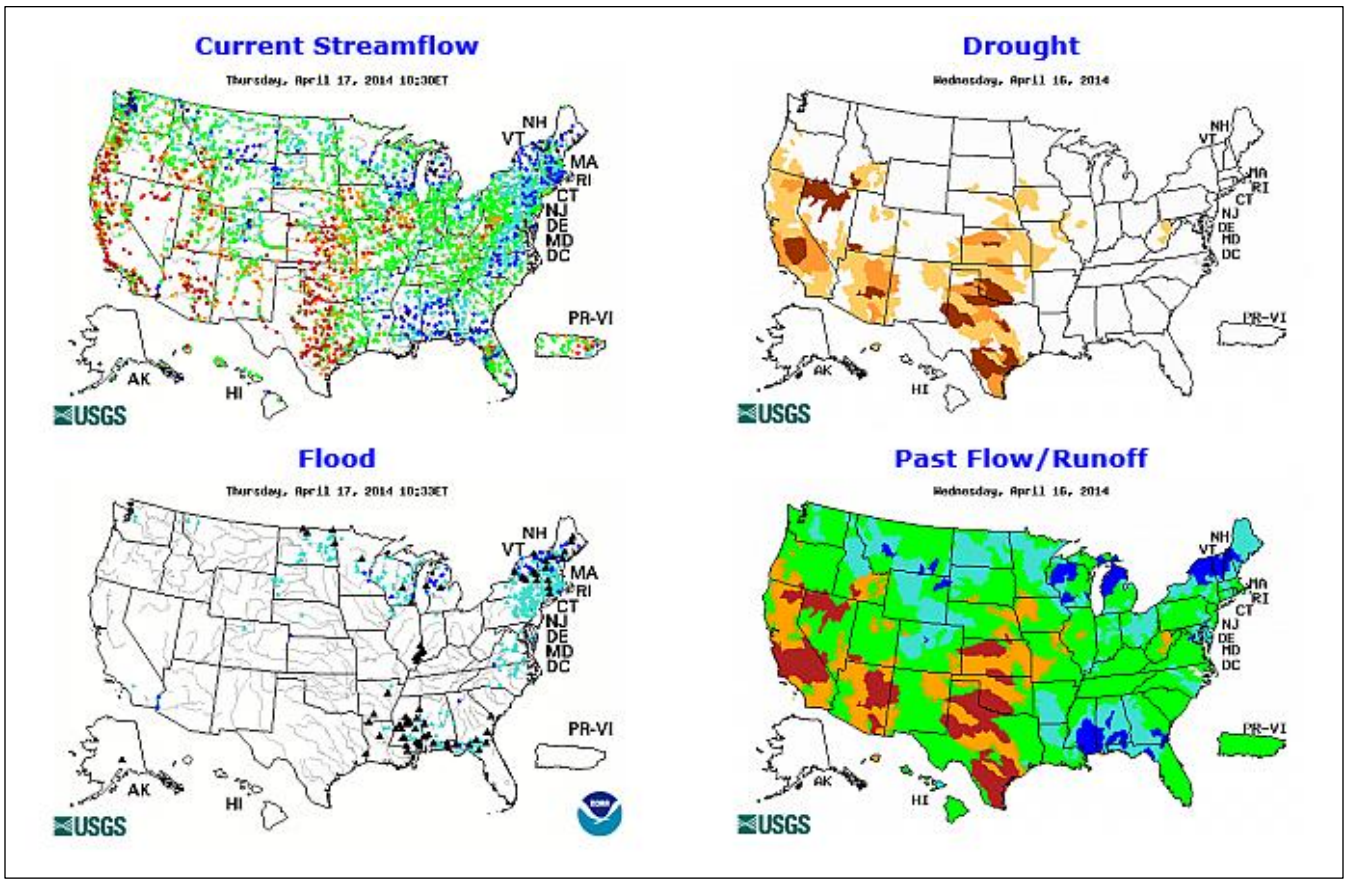
Soil Climate Analysis Network (SCAN)



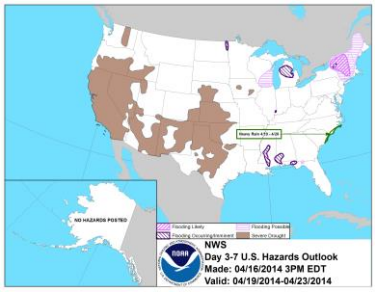
This NRCS resource shows soil moisture data at a SCAN site located in northern New Mexico. Note how light rain on April 7 caused a temporary increase in near-surface soil moisture.

Useful Agriculture Links: *Vegetation Drought Response Index; Evaporative Stress Index; Vegetation Health Index; NDVI Greenness Map; GRACE-Based Surface Soil Moisture; North American Soil Moisture Network. Monthly Wild Fire Forecast Report.*

Streamflow

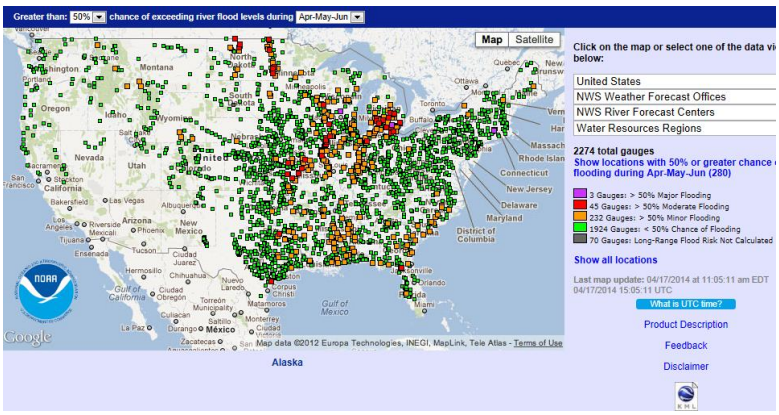


Click maps to enlarge and update



Flooding is imminent across the Gulf Coast States, the Red River Valley in North Dakota, and Michigan. Likely or possible flooding is expected over New England and Wisconsin.

National Long Range Outlook



During the next three months, flooding is possible over the Red River Valley in North Dakota, the upper Midwest, and the middle Mississippi River Valley. Currently, **3** gauges have a greater than 50% chance to experience major flooding; **45** gauges for moderate flooding; **232** gauges for minor flooding.

National Drought Summary for April 15, 2014

Prepared by: Drought Monitor Author: Brian Fuchs, National Drought Mitigation Center

Hawaii, Alaska and Puerto Rico

“Continued rains on the Big Island of Hawaii allowed for continued improvements to the D0 conditions there. Only Molokai has any lingering drought issues, and that is in response to continued water restrictions. No changes were made in Alaska or Puerto Rico this week.

Midwest

A significant rain and snow event in the Midwest brought 2-4 inches of precipitation from Iowa into Wisconsin and Michigan. A full category improvement to the drought depiction was made from eastern Iowa into Wisconsin. For northwest Iowa, the dry pattern continued and D1 conditions were pushed farther to the west. Most of the region was above normal for the week, even with the wild swing in temperatures. The upper Midwest was 2-4 degrees Fahrenheit below normal for the week.

South

Warm temperatures and dry conditions were experienced over much of the south this week. Areas of central Arkansas did record up to 3 inches of rain this week and an inch of rain was recorded over portions of northeast Texas. Even as the week averaged out above normal, cold air at the end of the current U.S. Drought Monitor period pushed into the region with overnight lows well below freezing and snow in the Texas and Oklahoma panhandles. The dryness in the Texas panhandle allowed for D4 expansion this week. In central Texas, D2 was also expanded while an area of D3 was improved slightly. Dryness in southern Texas also warranted the expansion and intensification of drought, with D1 and D2 expanding. Another round of precipitation in the Big Bend of Texas allowed for D0 to improve while the extreme areas of northeast Texas also had D0 improve. Southern Oklahoma also had degradation of drought conditions, with D1 and D2 conditions expanding.

Southeast

Another round of showers and thunderstorms in the region brought heavy rain to portions of Alabama and Mississippi, with up to 4 inches recorded in central Mississippi. Some areas of north Georgia into Tennessee and western North Carolina have been dry on several time scales and will need to be monitored for deterioration. In an area of northern Mississippi and southern Tennessee, which the heavy rains recently missed, D0 was expanded this week.

The Northeast

A rare warmer-than-normal week brought temperatures that were 4-8 degrees Fahrenheit above normal for the region. Scattered showers in the region generally brought precipitation amounts of less than 1 inch. Even with the above-normal temperatures, there were not any changes to the drought status of the region this week because water demand is still lagging as vegetation is slow to come out of dormancy.

The Plains

As with the Midwest and south, the temperatures this week were quite variable as very warm temperatures were followed by very cold temperatures at the end of the week. Most of the region was 2-4 degrees Fahrenheit above normal for the week outside of the northern High Plains. Portions of

Nebraska and eastern Kansas saw a mix of thunderstorms, rain, and wet snow, but this was not enough to show improvements. The drought intensity increased to D3 over central Kansas while D2 was expanded into more of eastern Kansas.

The West

Another dry week over much of the western United States. Areas of the Pacific Northwest did record up to an inch of precipitation while the central Rocky Mountains continued receiving precipitation as rain and snow was recorded in Wyoming and Colorado. The warm temperatures continued over the west with almost all areas above normal for the week, and in California, temperatures were 9-12 degrees above normal. This was detrimental to the low snowpack as some areas of California lost half of the snow water equivalence (SWE) in a single week and there was little response to inflows into reservoirs. Drought conditions worsened as D2 was expanded in eastern New Mexico and southwestern Colorado. In southwestern Colorado, D1 was also expanded. A reanalysis of conditions was done in southwest Wyoming and northeast Oregon this week, which allowed for the improvement to D0 conditions there.

Looking Ahead

Over the next 5-7 days, there is a good chance of precipitation from the plains to the upper Midwest, with more than an inch anticipated from northern Wisconsin into eastern Nebraska and south into Oklahoma and Arkansas. A storm system will move into the Pacific Northwest, potentially bringing up to 4 inches of rain into portions of Washington. In the southeast from Florida up the Carolinas coast, there is a good opportunity for heavy rain as well. A warming pattern looks to bring above-normal temperatures over much of the United States from the Great Basin into the northeast, and high temperatures will be up to 10-12 degrees Fahrenheit above normal in the central plains.

The 6-10 day outlook continues to show higher-than-normal chances for above-normal precipitation over most of the southern plains, Midwest, and Pacific Northwest. The best chances for above-normal temperatures are in the middle and eastern sections of the United States, from the Rocky Mountains and to the east. Chances for cooler-than-normal temperatures are greatest along the west coast."

****

State Activities

State government drought activities can be tracked through their drought plans. NRCS Snow Survey and Water Supply Forecasting (SSWSF) Program State Office personnel are participating in state drought committee meetings and providing the committees and media with appropriate SSWSF information. Additional information describing the tools available from the Drought Monitor can also be found at the U.S. Drought Portal.

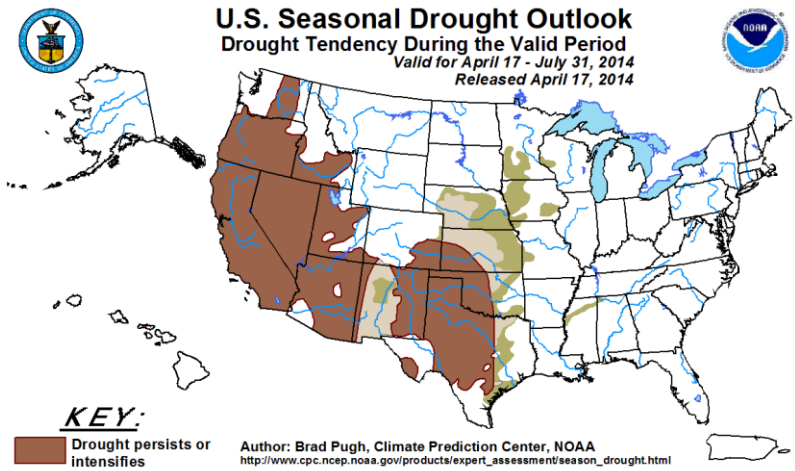
More Information

The National Water and Climate Center (NWCC) Homepage provides the latest available snowpack and water supply information. This document is available weekly. CONUS Snowpack and Drought Reports from 2007 are available online. Reports from 2001-2006 are available on request.

This report uses data and products provided by the Interagency Drought Monitor Consortium members and the National Interagency Fire Center.

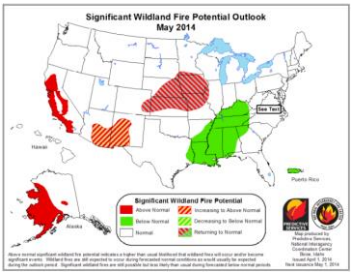
/s/
David W. Smith
Acting Deputy Chief, Soil Science and Resource Assessment

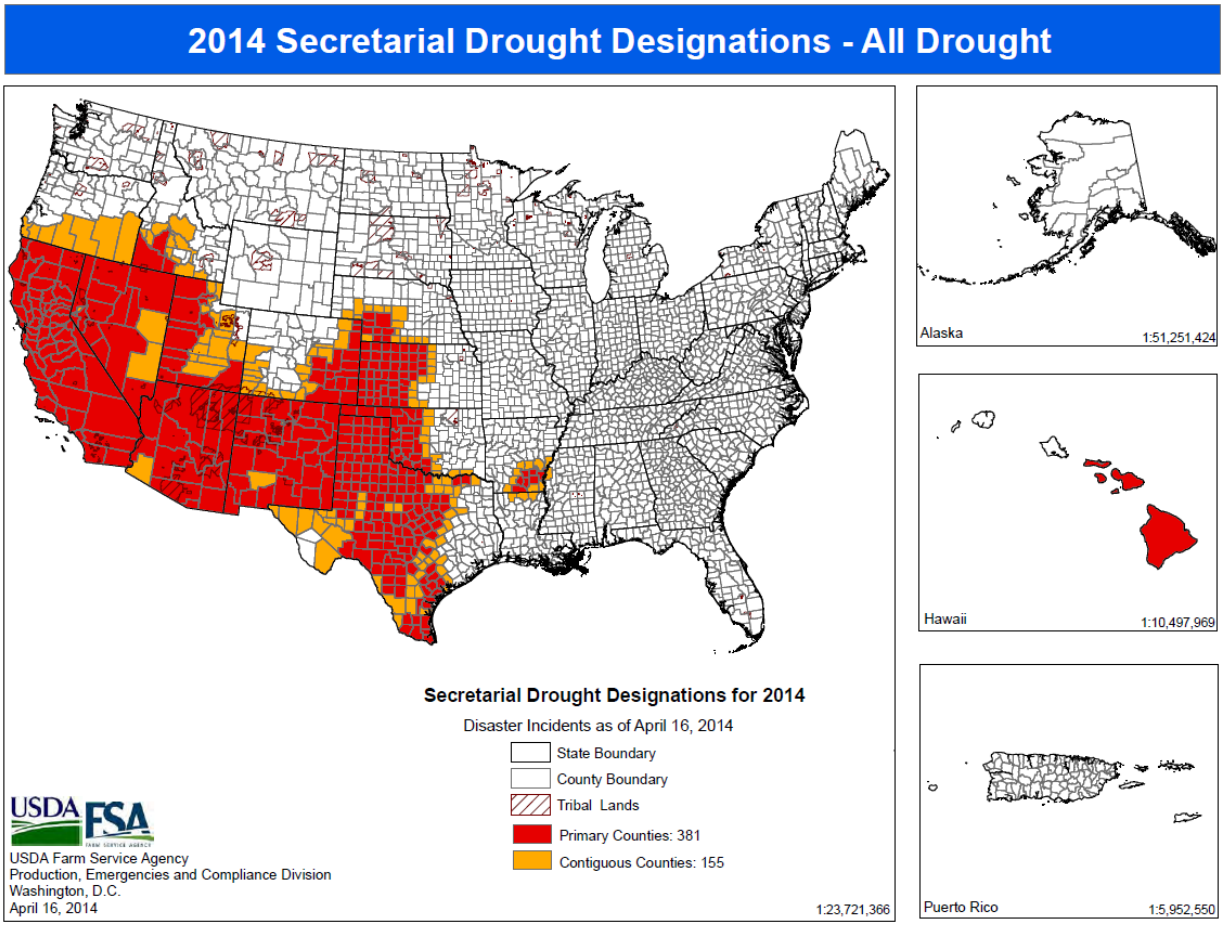
Drought Outlook For April 17 to July 31, 2014



- Drought is expected to persist over much of the West. However, western New Mexico is expected to benefit from the summer monsoon. The area from the Central Great Plains to the northern Midwest is also expected to improve.

✓ Also see: National Significant Wildland Fire Potential Outlook (updated on the first of each month) contains a content summary of the previous month's conditions.





Refer to the USDA Drought Assistance website and National Sustainable Agriculture Information Service. Read about the new USDA Regional Climate Hubs.

Supplemental Drought-Agriculture News

Provided by Brad Rippey, USDA Meteorologist

Download archived "U.S. Crops in Drought" files

Winter Wheat Highlights and Summary

"As a follow-up to Monday's discussion, Day #2 of the southern Plains' wheat freeze has occurred. Without any snow left on the ground, the wheat crop was at the mercy of the unusually low temperatures.

In case anyone wants to refresh their memories on where winter wheat is grown, follow this link:
http://www.usda.gov/oce/weather/pubs/Other/MWCACP/Graphs/USA/US_WheatWinter.pdf

As for this morning (Tuesday), freezes occurred just about everywhere north and west of a line from Junction, Texas, to Little Rock, Arkansas, to Cincinnati, Ohio.

Temperatures fell to 25°F or below – a key threshold for damage to jointing winter wheat – at most locations northwest of a Lubbock, Texas, to Oklahoma City, Oklahoma, to Quincy, Illinois, line.

Speaking of jointing wheat, here are the April 13 numbers:

Oklahoma: 80% jointing (52% last week; 5-year average = 86%)
Kansas: 31% jointing (14% last week; 5-year average = 47%)
Colorado: 6% jointing (4% last week; 5-year average = 16%)

Just eyeballing the data, I'd say that perhaps 5% of Colorado's crop was at risk of freeze injury, along with about 25% of the Kansas crop and at least 50% of the Oklahoma crop. Texas is a little tougher to get a handle on, due to varying stages of development (statewide, 16% of the crop was heading, versus 9% a week ago and the 5-year average of 28%), but there is certainly risk for the Northern Panhandle wheat, as well as any heading wheat farther south and east.

We're not done yet, as Tuesday's night focus shifts farther east. Freeze warnings have already been issued for much of Mississippi, Alabama, northern Georgia, and points north. Concerns include winter wheat (e.g. 16% headed in Alabama, 5% headed in South Carolina), blooming and beyond fruit crops (e.g. peaches in Georgia and South Carolina survived an earlier freeze on March 26-27, but now it's three weeks later), and emerged summer crops (e.g. corn is 28% emerged in Mississippi, along with 25% in South Carolina and 17% in Alabama).

At this point, it doesn't look like we've reached the magnitude of the April 2007 cold blast, in part because March was so warm in 2007 and so cold (east of the Rockies) in 2014."

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This following a collection of drought-related news stories from the past seven days or so. Impact information from these articles is entered into the Drought Impact Reporter. A number of these articles will also be posted on the Drought Headlines page at the NDMC website. The list is compiled by Denise D. Gutzmer, Drought Impact Specialist, and National Drought Mitigation Center.

Beef prices
The retail price for "all fresh" USDA choice-grade beef hit a record $5.28 per pound in February, compared to $4.91 one year ago. Consumers paid $3.97 for the same grade of beef in 2008. Years of drought are to blame for the rising beef prices.

Winter wheat
The USDA rated the wheat crop to be 35 percent good to excellent, 36 percent fair and 29 percent poor to very poor on April 6, which is considerably below last fall's ratings of 62 percent good to excellent, 30 percent fair and 8 percent poor to very poor as the crop entered dormancy. Drought in Kansas, Oklahoma, Texas, Oregon and Washington took a toll on the crop.

California
The California Department of Water Resources and U.S. Bureau of Reclamation revealed their Drought Operations Plan on April 9. Changes in water management include easing water quality rules in the Sacramento-San Joaquin Delta, which would entail keeping river flows low and conserving water in reservoirs, particularly Shasta Lake. Temporary dams may be installed in the Delta channels to keep salt water from encroaching up the river. The plan also calls for more hatchery breeding of endangered winter-run Chinook salmon.

Water allocations of zero percent have not changed, but recent storms could change that forecast.

Push to capture more storm water
Democratic Sen. Dianne Feinstein joined Central Valley House Republicans in urging Cabinet secretaries to back the move to collect as much water as possible from recent California storms. State and federal water officials had

eased environmental rules by April 2 to divert storm water into reservoirs, keeping less water from flowing into rivers where endangered species would benefit. The change in environmental rules will remain in effect through June. While lawmakers say more water can be captured without harming protected species, more than 40 environmental groups vehemently disagree, claiming that the lower flows could result in the extinction of some fish species.

Short water supplies in Tulare County
The Terra Bella Irrigation District (TBIG) notified its 600 farmers that they will receive no irrigation water this year for the first time in the district's history because the district will not likely get any water from the federally-operated Friant-Kern canal. The main crops in this area are citrus and pistachio trees—crops that cannot be left unwatered without substantial loss.

The district provides water to a $100 million citrus crop, and farmers, desperate to get water, have brought checks totaling $4 million to the district office to purchase water on their behalf. The manager has not been able to find any water to purchase so far.

The town of Terra Bella expects to receive half of the usual water supply from the Friant-Kern canal.

Texas
Mapping Texas groundwater
Researchers at the University of Texas at Austin are sifting through numerous oil and gas drilling logs in the Bureau of Economic Geology building to map out the locations of brackish groundwater throughout the state for the purpose of siting desalination plants. They are also consulting well water data and other information to better understand the underground rock formations and determine the quality of the water in them.

Wildflowers
More wildflowers are blooming in Texas this year as past years of drought have killed some grass, allowing wildflowers to proliferate and dominate those areas.

Colorado
Clearing tumbleweed from roads and bridges has cost Crowley County $108,000 since November, which is more than a third of the county's annual budget.
El Paso County and Colorado Springs have spent $209,000 dealing with the pesky tumbleweeds.
El Paso, Crowley and Pueblo counties are contemplating local states of emergency to permit them to seek financial help from the state.

California has the most impacts listed for the last 30 days in the Drought Impact Reporter, with most of those being related to the water supply. Texas is the runner up with 26 impacts, and many of those detail agricultural damage and concerns about dwindling water supplies.

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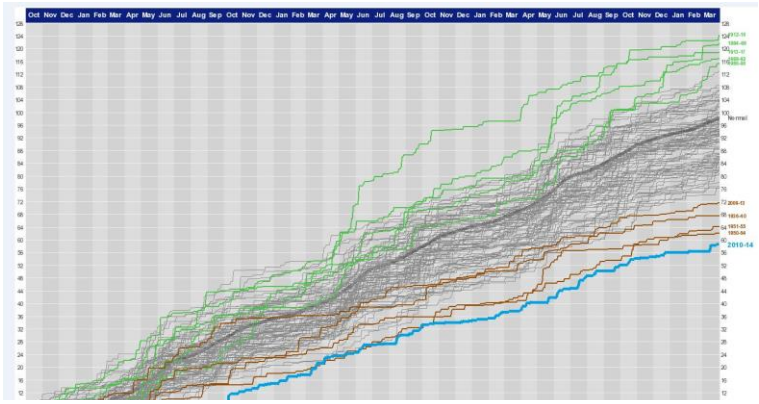
Tea Cup reservoir depictions:

- http://www.usbr.gov/uc/water/basin/ ← Upper Colorado
- http://www.usbr.gov/uc/wcao/water/basin/tc_gr.html; ← Upper Snake
- http://www.usbr.gov/pn/hydromet/burtea.html ← Upper Colorado
- http://www.usbr.gov/uc/water/basin/tc_cr.html ← Upper Colorado
- http://www.usbr.gov/pn/hydromet/select.html ← Pacific Northwest
- http://www.sevierriver.org/reservoirs/teacup-diagram-of-reservoirs/ ← Sevier River Water (UT)

NWCC's Surface Water Supply Index (SWSI) maps are located here.

Supplemental Data



← "*For Wichita Falls, precip over the past 42 months ending 3/31/2014 has been a mere 58.51 inches. This is the driest consecutive 42 month period on record at Wichita Falls. Previous record was 62.03 inches ending on 3/31/1954. This current period is about 5% drier than what was previously considered to be the 'Drought of Record' for this portion of TX*." Victor Murphy, NWS Southern Region

The following information is provided by Noah Molotch and Leanne Lestak, University of Colorado and JPL/NASA

"The near-real time SWE report for April 14, 2014 is included on the next page. On April 14th, percent of average SWE values for this date have decreased from the last report (4/7/14). The Northern watersheds are at 10%, the Central watersheds are at 26%, and the Southern watersheds are at 18% of average for this date. SWE depths have decreased across the region and snow extent has decreased relative to the last report.

The report (in PDF format) and both tables (in Excel format) have been posted on our anonymous FTP site.

Real Time (RT) Snow Water Equivalent (SWE) Simulation
April 14, 2014
Sierra Nevada Mountains, California

Abstract

On April 14th, percent of average SWE values for this date have decreased to 10% for the Northern watersheds, 26% for the Central, and 18% for the Southern watersheds (see map above). 82 snow sensors in the Sierra network were recording snow out of a total of 99 sensors. The locations of sensors that aren't recording snow (shown in yellow in Figure 3, left map) are lower elevation and a few that are offline in other strategic locations.

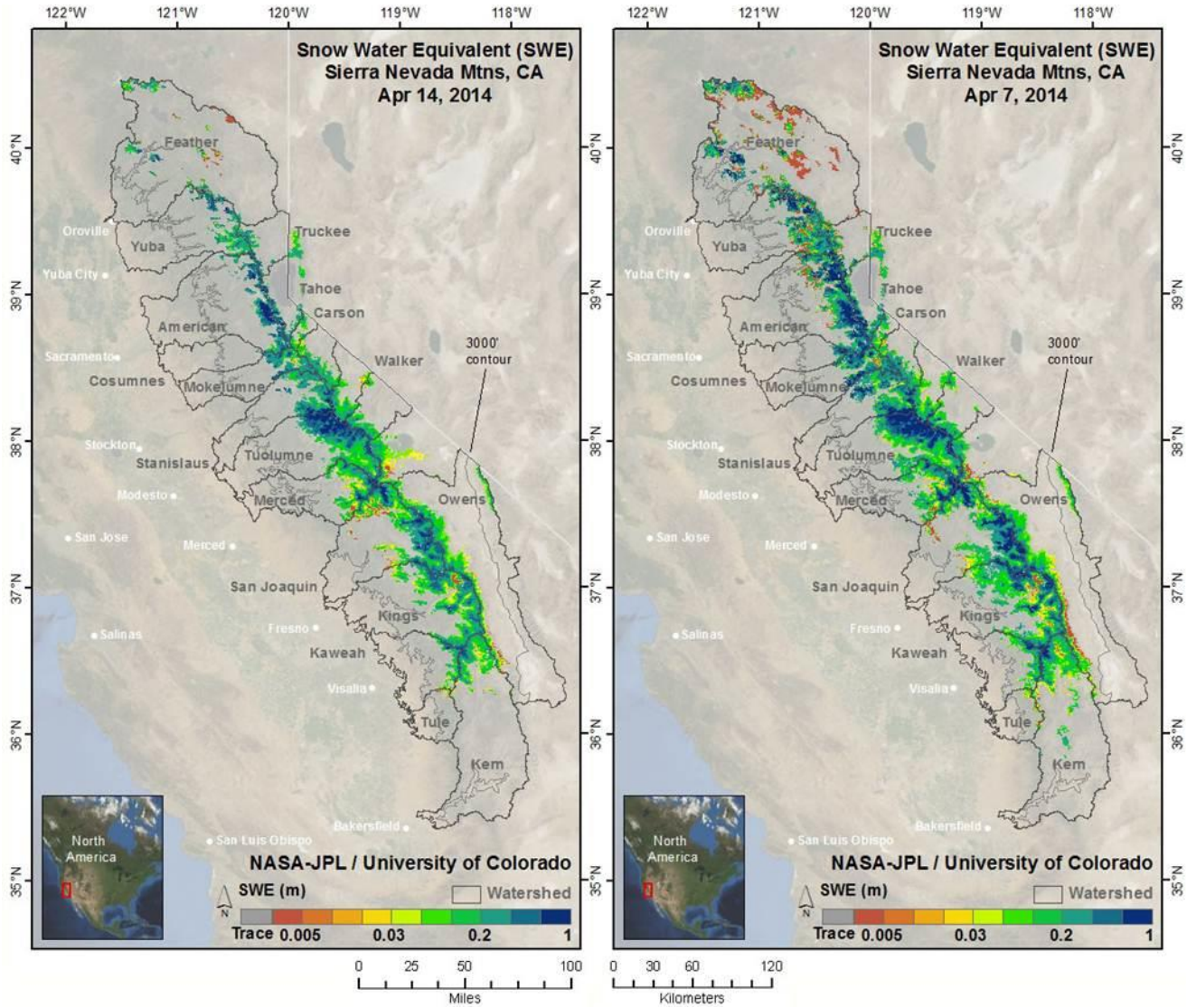


Figure 1. RT simulated SWE amounts for Apr 14, 2014 is shown on the left and for Apr 7, 2014 are shown on the right. SWE depths have decreased at all elevations and snow extent has decreased since the last report.

Introduction

We have developed a real-time SWE estimation scheme based on historical SWE reconstructions between 2000-2012, a real time MODIS/MODSCAG image (Painter et al, 2009), and daily in situ SWE measurements for the Sierra Nevada in California (Molotch, 2009; Molotch and Margulies, 2008; Molotch and Bales, 2006; Molotch and Bales, 2005, Molotch, et. al., 2004 and Guan). Real-time SWE will be released on a weekly basis during the maximum snow accumulation/ablation period.

Discussion

The most recent cloud-free MODIS/MODSCAG image available is for April 14, 2014. The percent of average values regional map (shown at the beginning of the report) was derived from the data shown in table 1. **Figure 1** shows SWE amounts for April 14, 2014 and for Apr 7, 2014. On April 14, 2014, snow depths have decreased from the last report, 88 snow sensors in the Sierra network were operational and 82 were recording snow out of a total of 99 sensors. For comparison in 2012, a very dry year, 76 were operational and 75 recorded snow out of 99 total on April 14th, and in 2009, a normal year, 81 were operational and 78 recorded snow out of 99 total on April 14th. Note the locations of sensors that aren't recording snow (shown in yellow in Figure 3, left map) are lower elevation sensors and a few that are offline in other strategic locations, so calculations from sensors alone do not accurately calculate SWE for each watershed. **Figure 2** shows the percent of average SWE for April 14, 2014 for the snow-covered area on left and on the right is the mean percent of average for April 14, 2014 shown by watershed for all

model pixels above 3000' (shown as gray elevation contour line on left map). Note that watershed averages are much lower than those calculated using snow sensors alone. Snow sensors produce a point value whereas the spatial SWE allows for areal calculations. Every square foot above 3000' in the watershed can be used to calculate the mean, therefore the mean value will be different than those calculated by snow sensor point data. **Figure 3** shows the 13 year modeled average SWE for April 14th on the left with snow sensors shown in yellow that recorded no snow and in red for sensors that recorded snow on April 14, 2014; and a banded elevation map on the right. **Table 1** shows mean SWE and mean % of average SWE for 4/14/2014, mean SWE for 4/7/2014, change in SWE between 4/7/2014 and 4/14/2014 for each watershed, summarized for each watershed above 3000'.

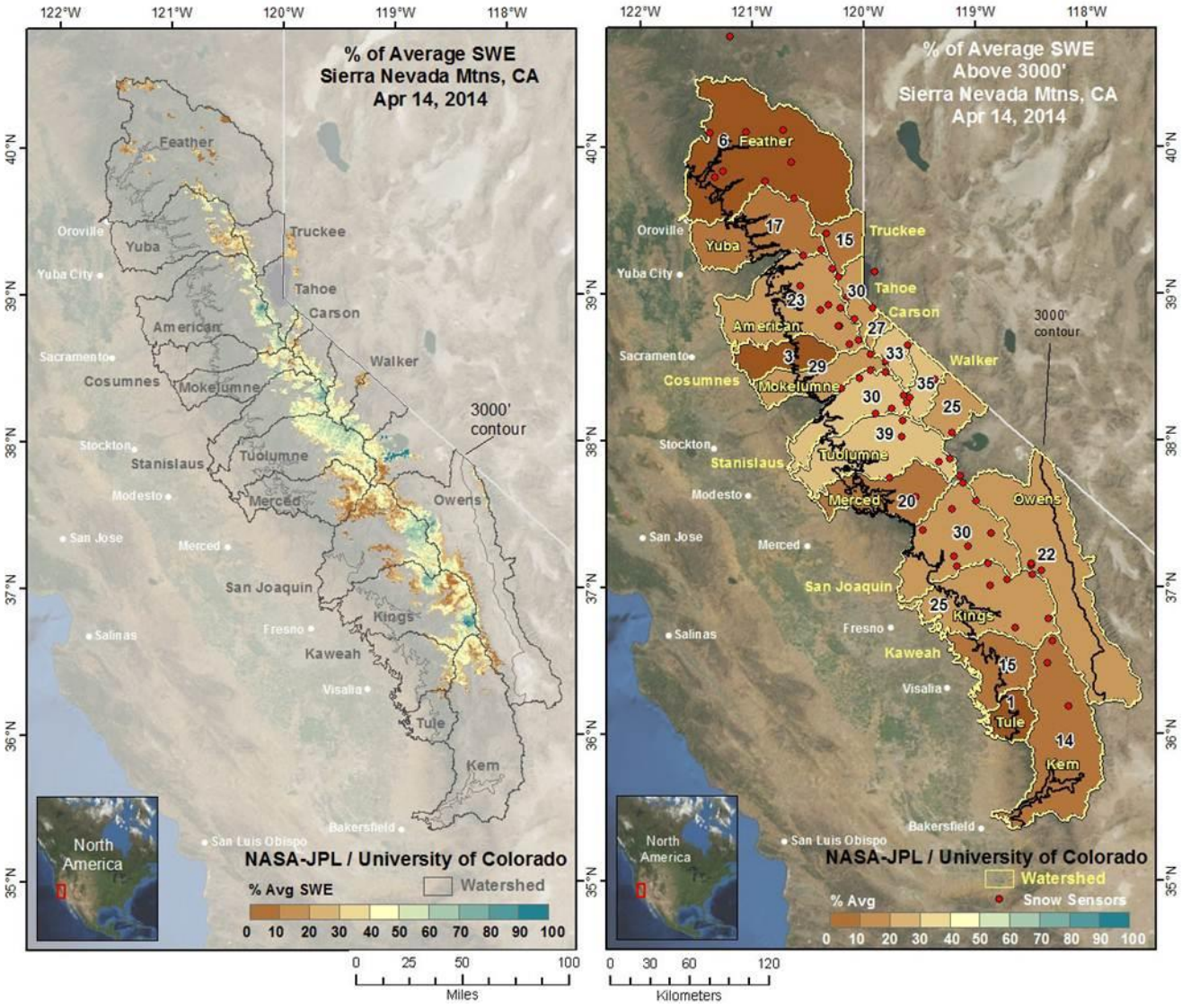


Figure 2. Percent of average RT simulated SWE for April 14, 2014 for the entire Sierra (on left) and by watershed (on right). Watershed percentages are calculated for all model pixels above 3000' (shown as gray line on left map). SWE snow sensors that had snow on April 14, 2014 have been added to the map on the right.

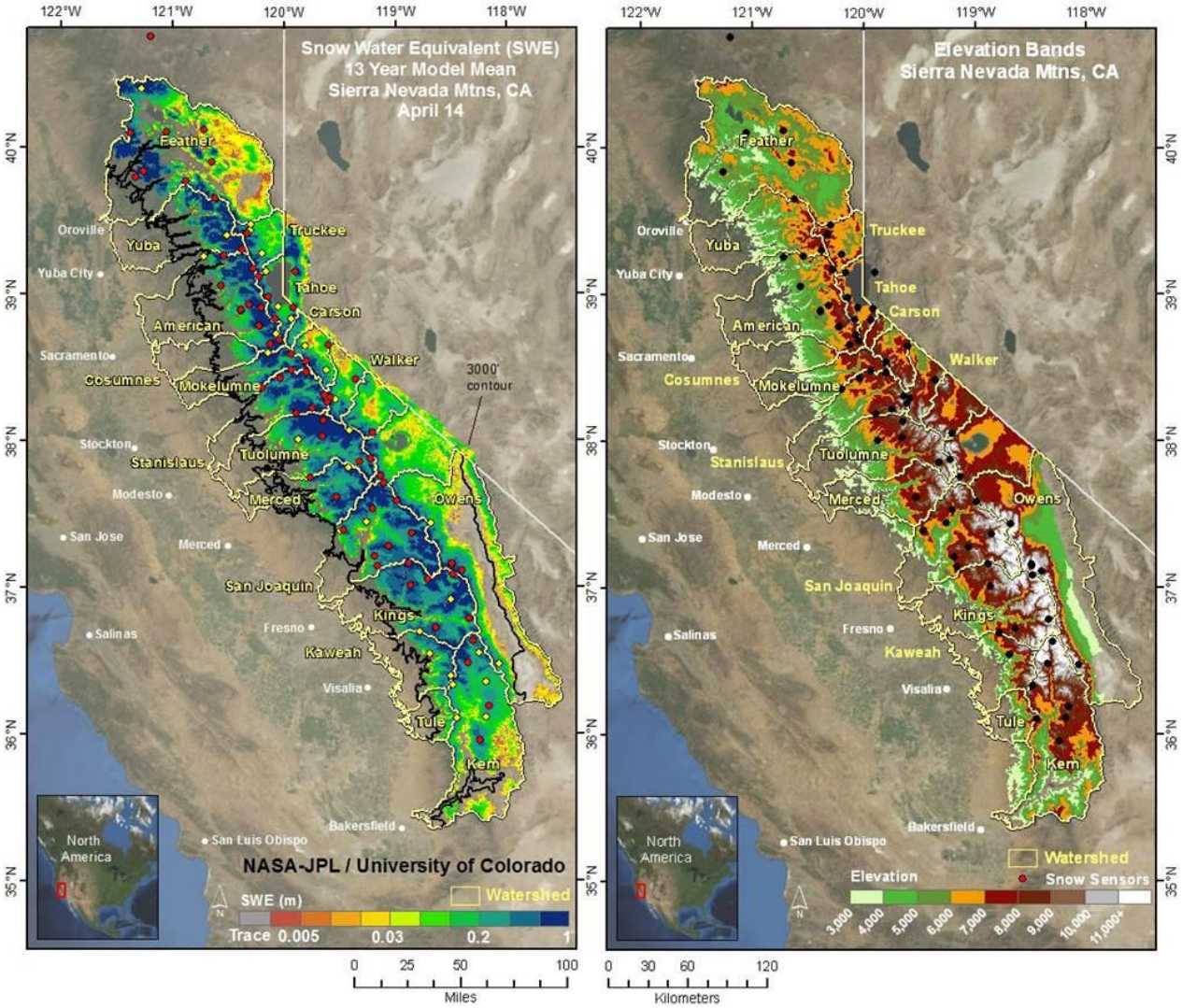


Figure 3. 13 year modeled average SWE for April 14th on the left with snow sensors shown in yellow that recorded no snow (see discussion above for an explanation) and in red for sensors that recorded snow on April 14, 2014; and a banded elevation map on the right.

Table 1. All calculations are for elevations above 3000'. Shown are mean SWE and mean % of Average SWE for 4/14/2014, mean SWE for 4/7/2014, and change in SWE between 4/7/2014 and 4/14/2014 for each watershed."

Watershed	4/14/14 % Avg to Date	4/14/14 SWE (in)	4/7/14 SWE (in)	4/7 thru 4/14 Change in SWE (in)
AMERICAN	23.37	2.62	5.43	-2.81
FEATHER	6.02	0.61	1.83	-1.22
KAWEAH	14.97	1.11	1.86	-0.76
KERN	13.88	1.03	1.70	-0.67
KINGS	24.68	3.97	5.55	-1.58
TAHOE	29.52	6.72	11.28	-4.56
MERCED	19.94	2.42	3.61	-1.19
OWENS	22.42	1.27	1.68	-0.41
SAN JOAQUIN	29.55	5.18	6.82	-1.64
STANISLAUS	30.49	4.49	7.08	-2.59
TRUCKEE	14.65	2.25	4.18	-1.92
TUOLUMNE	39.44	6.09	8.04	-1.95
YUBA	17.34	1.96	4.10	-2.14
COSUMNES	2.84	0.08	0.84	-0.77
MOKELUMNE	28.53	3.04	5.40	-2.36
TULE	1.49	0.06	0.20	-0.13
WEST WALKER RIVER	35.44	4.22	5.06	-0.83
EAST WALKER RIVER	24.85	2.50	3.39	-0.89
WEST FORK CARSON RIVER	26.94	4.34	6.54	-2.20
EAST FORK CARSON RIVER	32.70	3.94	5.18	-1.24