



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

Weekly Report - Snowpack / Drought Monitor Update Date: 18 March 2010

SNOTEL SNOWPACK AND PRECIPITATION SUMMARY

Snow: SNOTEL Snow-Water Equivalent percent of normal values for 18 March 2010 shows surpluses over the Southwest and deficits over the Northern Tier States (Fig. 1). SNOTEL 7 day snow depth change reveals increases across most of the Washington Cascades. Significant snowfall over New Mexico earlier this week has rapidly melted by today (Fig. 1a).



Monday morning greeted the author with 7.5" of snow but within 24 hours it was completely gone (Santa Fe, NM). Photo by Jan Curtis

Temperature: ACIS 7-day average temperature anomalies show that the greatest positive temperature departures were over parts of Montana Rockies ($>+10^{\circ}\text{F}$) and the greatest negative departure occurred over parts of the Colorado Rockies ($<-10^{\circ}\text{F}$) (Fig. 2).

Precipitation: ACIS 7-day average precipitation amounts for the period ending 17 March shows the bulk of the heaviest precipitation fell along the Pacific Northwest Coast. Areas with significant deficits occurred over the Northern and Central Rockies and the Lower Colorado River Basin (Fig. 3). In terms of percent of normal, well above normal amounts were scattered across the Northern Cascades, 4-Corners Region, and eastern New Mexico (Fig 3a). For the 2010 Water-Year that began on 1 October 2009, Arizona and New Mexico have the largest surpluses while the northern interior Western States have the greatest deficits. Any weekly changes during this time of year are usually small as was the case this week (Fig. 3b).

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WESTERN DROUGHT STATUS

The West: Precipitation across the west was scattered in coverage at best, with the highest amounts along the coasts of Oregon and Washington (1.0 to greater than 5.0 inches) and in the Sierra Nevada (0.5-2.0 inches). Most of the precipitation fell outside of the moderate and severe drought areas, so most of the changes to the drought monitor were small in scale. In northeast Washington, some abnormal dryness was alleviated due to 1.0-2.2 inches of rainfall.

Across the northern Rockies in Idaho and Montana, local inputs combined with available national level data to drive some modest improvements. The area of extreme drought in western Montana was trimmed back due to reports of 0.5 – 1.0 inch of precipitation just east of Montana-Idaho border. In western Wyoming, severe drought coverage was expanded based on continued below-average snow water equivalence measurements (many sites in the lowest 5 percent according to the Natural Resources Conservation Service). Besides the low water content, precipitation continued to be below normal in the already dry areas, so that prompted an intensification of the most severe drought, rather than an overall expansion.

Surface Water Supply Index (SWSI) and SPI3 and SPI6 values indicated severe drought across northwestern Colorado, but local information suggested that conditions were not as dry as those two measurements indicated. Soil moisture values CPC indicate near normal conditions and reservoirs are in good shape, so the snowpack and low demand seem to be mitigating the lack of precipitation. Moderate drought was introduced from Grand to Moffat counties in northern Colorado to reflect the worsening conditions, but holding short of relying completely on modeled data in favor of observations.

Across the southern Rockies, improvements were made across southern Utah, based on above-average snowpack (110-150 percent of normal) at SNOTEL sites and local inputs. Additionally, SWSI values for the Moab and Virgin River Basins in southern Utah indicate above-normal water supplies, with SWSI values of 1.74 and 2.78 respectively. Consistent with improved conditions in southern Utah, some improvements were made in southern Nevada as well. SPI6 and SPI12 both indicate severe drought, but SPI values at other timescales less than 1 year support only moderate drought (D1). Modeled soil moisture values show near-normal or even wetter than normal conditions with monthly precipitation being near normal. Minor improvements were made across central Arizona in response to the wet winter.

In northern California, moderate drought conditions were removed from most of Tehama County, reflecting positive SPI values (measured at three month intervals out to 1 year), soil moisture values from multiple models, and a lack of reported impacts. Precipitation deficits at 30 and 90 days do still exist, so the area of D1 was not removed completely. Along the eastern border of California, the area of extreme drought (D2) was extended southward to Plumas County, supported by Climate Prediction Center (CPC) soil moisture values and reservoir levels at Oroville Reservoir. With storage at 57% of their historical average for March 16, Oroville Reservoir is the least full, when compared to its historical average, of all the major reservoirs according to the California Department of Water Resources.

Finally, precipitation and snowpack have been below average for a while across Idaho, Montana, and western Wyoming, and have declined to seriously low levels recently. As a result, D1 and D2 conditions expanded significantly across these regions and adjacent eastern Washington and Oregon. In the western half of Wyoming, snowpack water content was generally below 70 percent of average for the date, and surface water supply indices (SWSI's) were among the lowest 5 to 20 percent of expected values for this time of year. In areas of western Wyoming and adjacent Utah where snowpack water

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content was below 55 percent of normal for the date, D2 was introduced. Farther north, significant D1 and D2 expansion took place across central and northern Idaho and, to a lesser extent, western Wyoming as seasonal precipitation totals and snowpack water content continued to decline relative to average conditions for early March. During the last 60 days, less than half of normal precipitation fell on northwestern Montana and essentially the northern half of Idaho.

Author: Matthew Rosencrans, NOAA/NWS/NCEP/Climate Prediction Center

A comprehensive narrative describing drought conditions for the nation can be found at the end of this document.

DROUGHT IMPACTS DEFINITIONS (<http://drought.unl.edu/dm/classify.htm>)

The possible impacts associated with **D4 (H, A)** drought include widespread crop/pasture losses and shortages of water in reservoirs, streams, and wells creating water emergencies. The possible impacts associated with **D3 (H, A)** drought include major crop/pasture losses and widespread water shortages or restrictions. Possible impacts from **D2 (H, A)** drought are focused on water shortages common and water restrictions imposed and crop or pasture losses likely. The possible impacts associated with **D1 (H, A)** drought are focused on water shortages developing in streams, reservoirs, or wells, and some damage to crops and pastures (Figs. 4, 4a, and 4b).

SOIL MOISTURE

Soil moisture (Figs. 5a and 5b), is simulated by the [VIC macroscale hydrologic model](#). The detailed, physically-based VIC model is driven by observed daily precipitation and temperature maxima and minima from approximately 2130 stations, selected for reporting reliably in real-time and for having records of longer than 45 years (and various other criteria). Another good resource can be found at: <http://www.emc.ncep.noaa.gov/mmb/nldas/drought/>.

U.S. HISTORICAL STREAMFLOW

http://water.usgs.gov/cgi-bin/waterwatch?state=us&map_type=dryw&web_type=map.

This map, (Fig. 6) shows the 7-day average streamflow conditions in hydrologic units of the United States and Puerto Rico for the day of year. The colors represent 7-day average streamflow percentiles based on historical streamflow for the day of the year. Thus, the map shows conditions adjusted for this time of the year. Only stations having at least 30 years of record are used. Sub-regions shaded gray indicate that insufficient data were available to compute a reliable 7-day average streamflow value. During winter months, this situation frequently arises due to ice effects. The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.

STATE ACTIVITIES

State government drought activities can be tracked at the following URL:

<http://drought.unl.edu/mitigate/mitigate.htm>. NRCS SS/WSF State Office personnel are participating in state drought committee meetings and providing the committees and media with appropriate SS/WSF information - <http://www.wcc.nrcs.usda.gov/cqibin/bor.pl>. Additional information describing the products available from the Drought Monitor can be found at the following URL: <http://drought.unl.edu/dm/> and <http://drought.gov>.

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FOR MORE INFORMATION

The National Water and Climate Center Homepage provide the latest available snowpack and water supply information. Please visit us at <http://www.wcc.nrcs.usda.gov>. This document is available from the following location on the NWCC homepage - <http://www.wcc.nrcs.usda.gov/water/drought/wdr.pl>

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

/s/ NOLLER HERBERT
Director, Conservation Engineering Division

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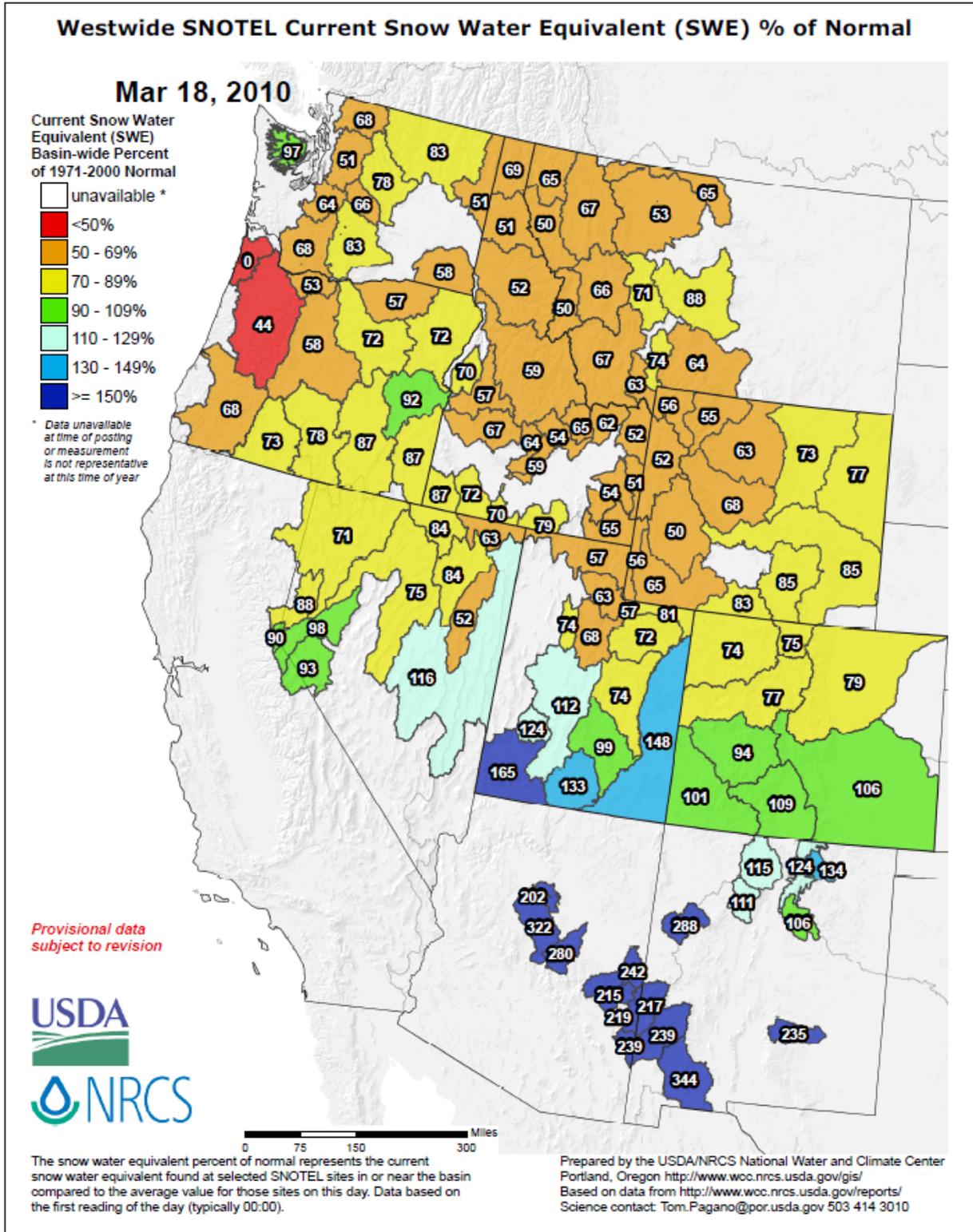


Fig. 1: SNOTEL Snow-Water Equivalent percent of normal values for 18 March 2010 shows surpluses over the Southwest and deficits over the Northern Tier States.

Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west_swepctnormal_update.pdf

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SNOTEL 7-Day Snow Depth Change (Inches)

Mar 18, 2010

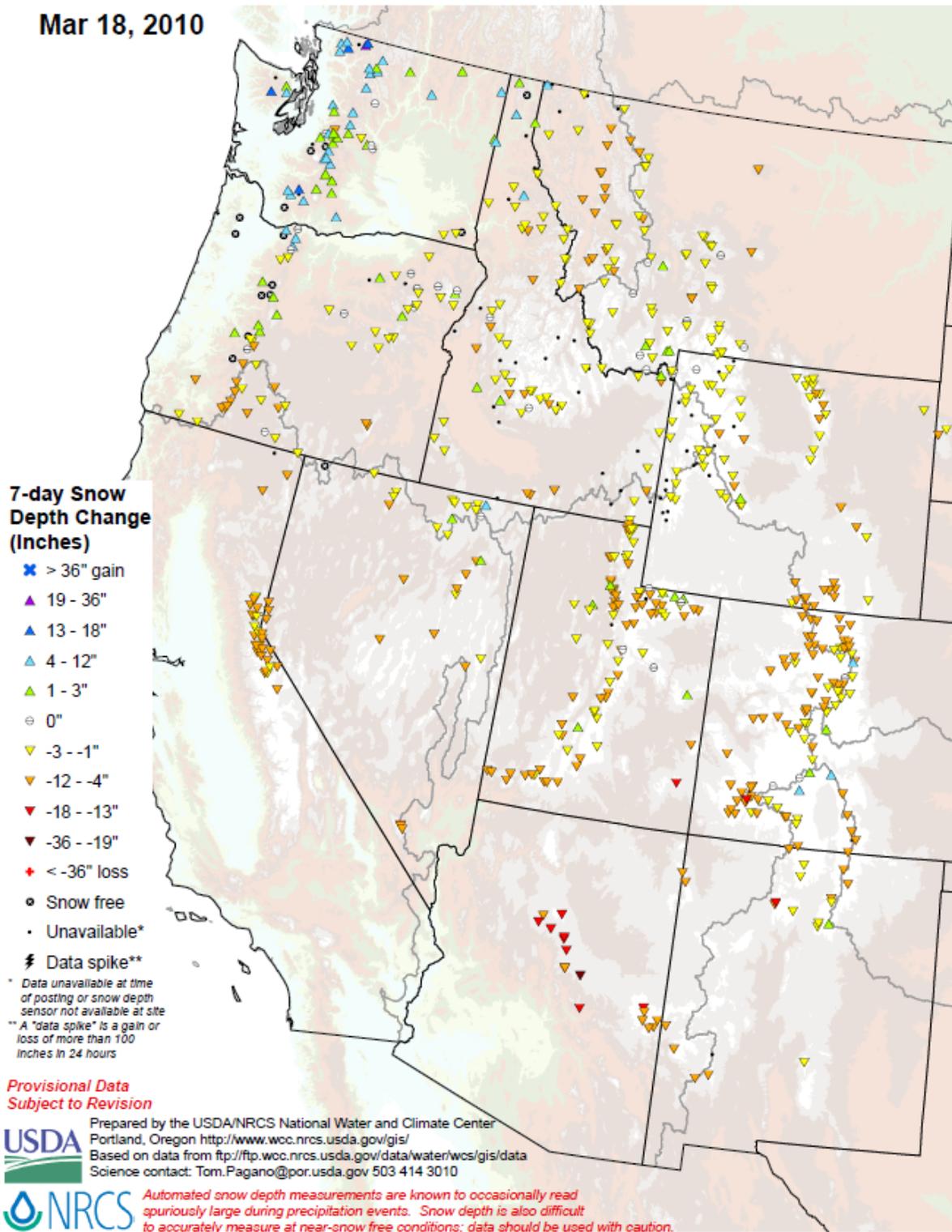
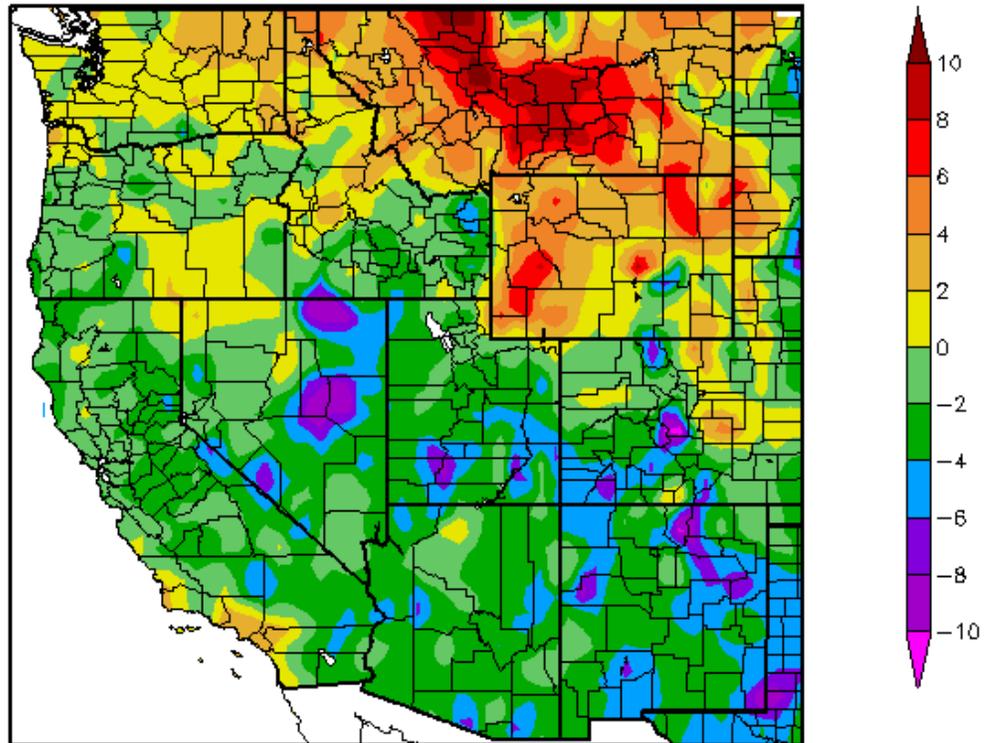


Fig. 1a: SNOTEL 7 day snow depth change reveals increases across most of the Washington Cascades. Significant snowfall over New Mexico earlier this week has rapidly melted by today.

Ref: http://www.wcc.nrcs.usda.gov/ftpref/data/water/wcs/gis/maps/west_snowdepth_7ddelta.pdf

Departure from Normal Temperature (F)
3/11/2010 – 3/17/2010



Generated 3/18/2010 at HPRCC using provisional data.

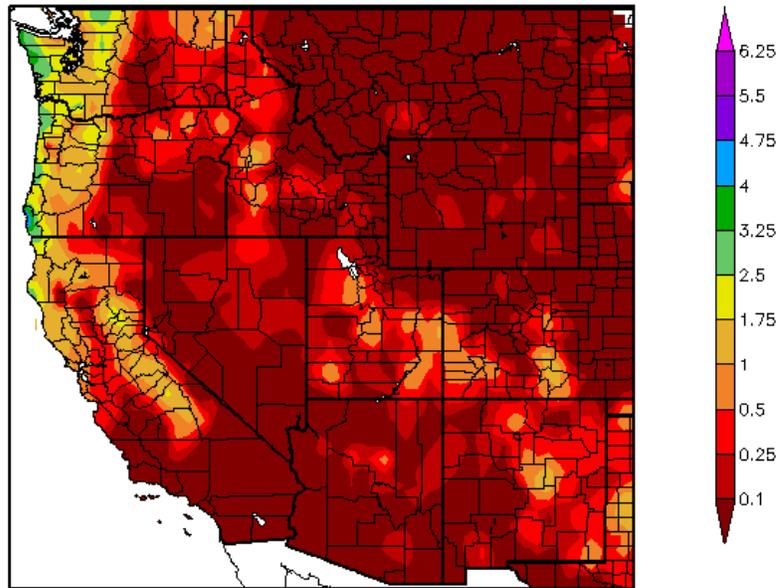
NOAA Regional Climate Centers

Fig. 2: ACIS 7-day average temperature anomalies show that the greatest positive temperature departures were over parts of Montana Rockies (>+10°F) and the greatest negative departure occurred over parts of the Colorado Rockies (<-10°F).

Ref: http://www.hprcc.unl.edu/maps/current/index.php?action=update_daterange&daterange=7d

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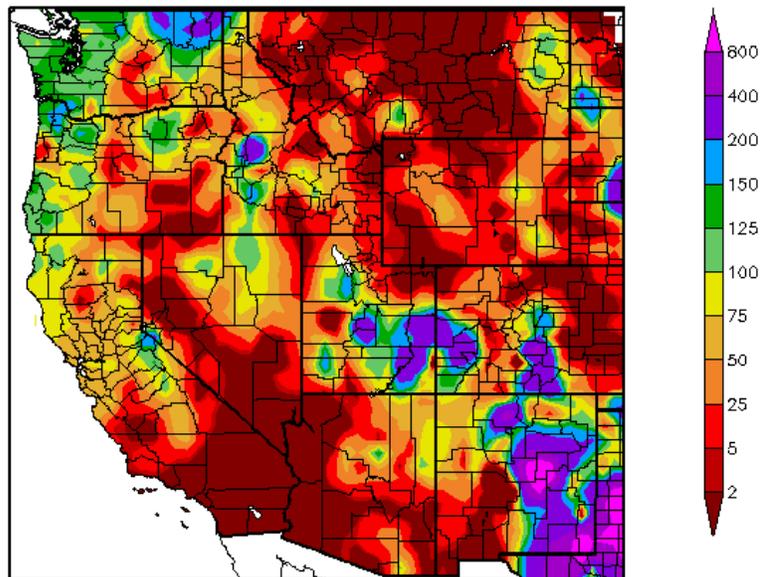
Precipitation (in)
3/11/2010 – 3/17/2010



Generated 3/18/2010 at HPRCC using provisional data.

NOAA Regional Climate Centers

Percent of Normal Precipitation (%)
3/11/2010 – 3/17/2010



Generated 3/18/2010 at HPRCC using provisional data.

NOAA Regional Climate Centers

Fig. 3. and 3a: ACIS 7-day average precipitation amounts for the period ending 17 March shows the bulk of the heaviest precipitation fell along the Pacific Northwest Coast. Areas with significant deficits occurred over the Northern and Central Rockies and the Lower Colorado River Basin. In terms of percent of normal, well above normal amounts were scattered across the Northern Cascades, 4-Corners Region, and eastern New Mexico. Ref: <http://www.hprcc.unl.edu/maps/current/>

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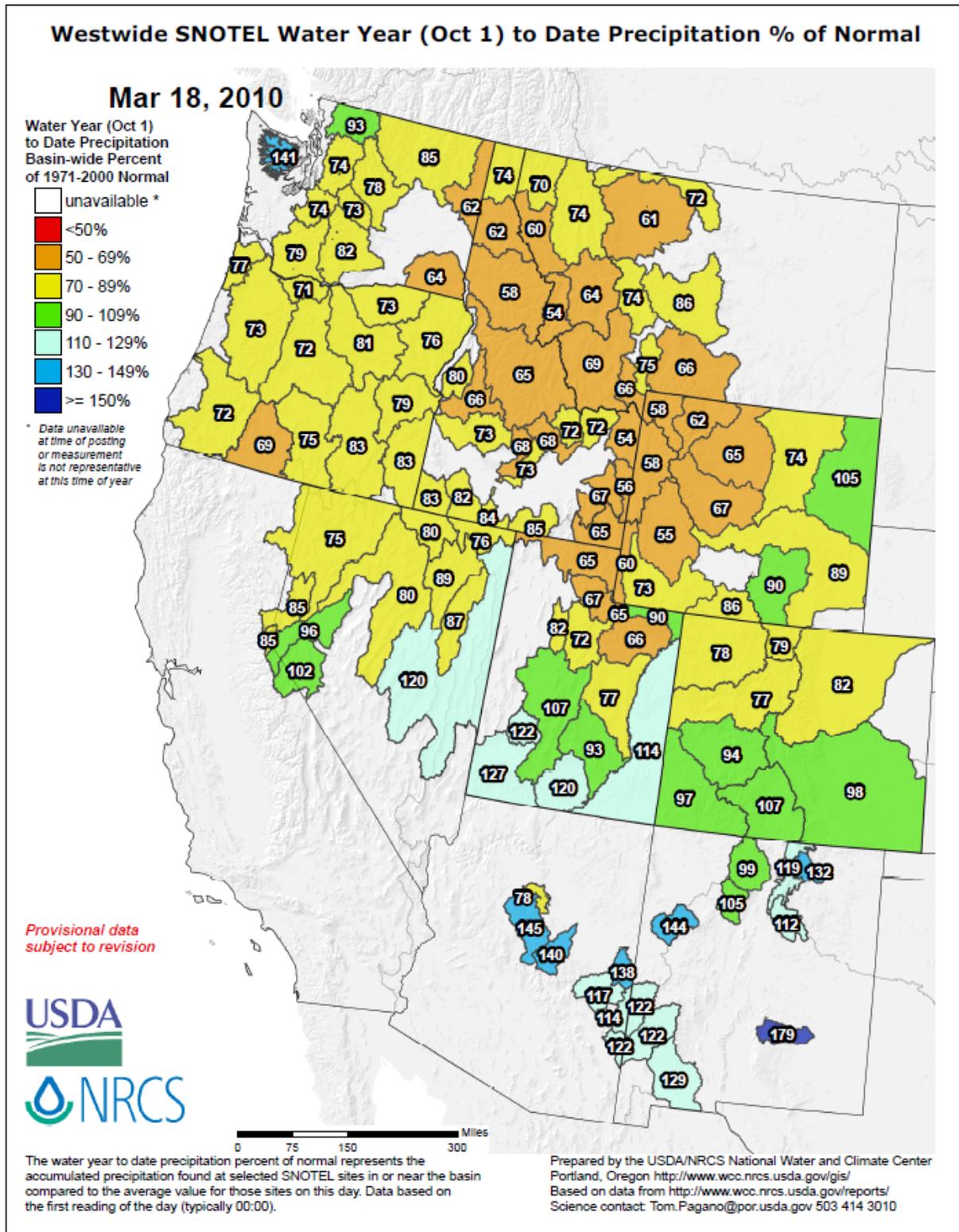


Fig 3b. For the 2010 Water-Year that began on 1 October 2009, Arizona and New Mexico have the largest surpluses while the northern interior Western States have the greatest deficits. Any weekly changes during this time of year are usually small as was the case this week.

Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west_wytdprecpcnormal_update.pdf

U.S. Drought Monitor

March 16, 2010

Valid 7 a.m. EST

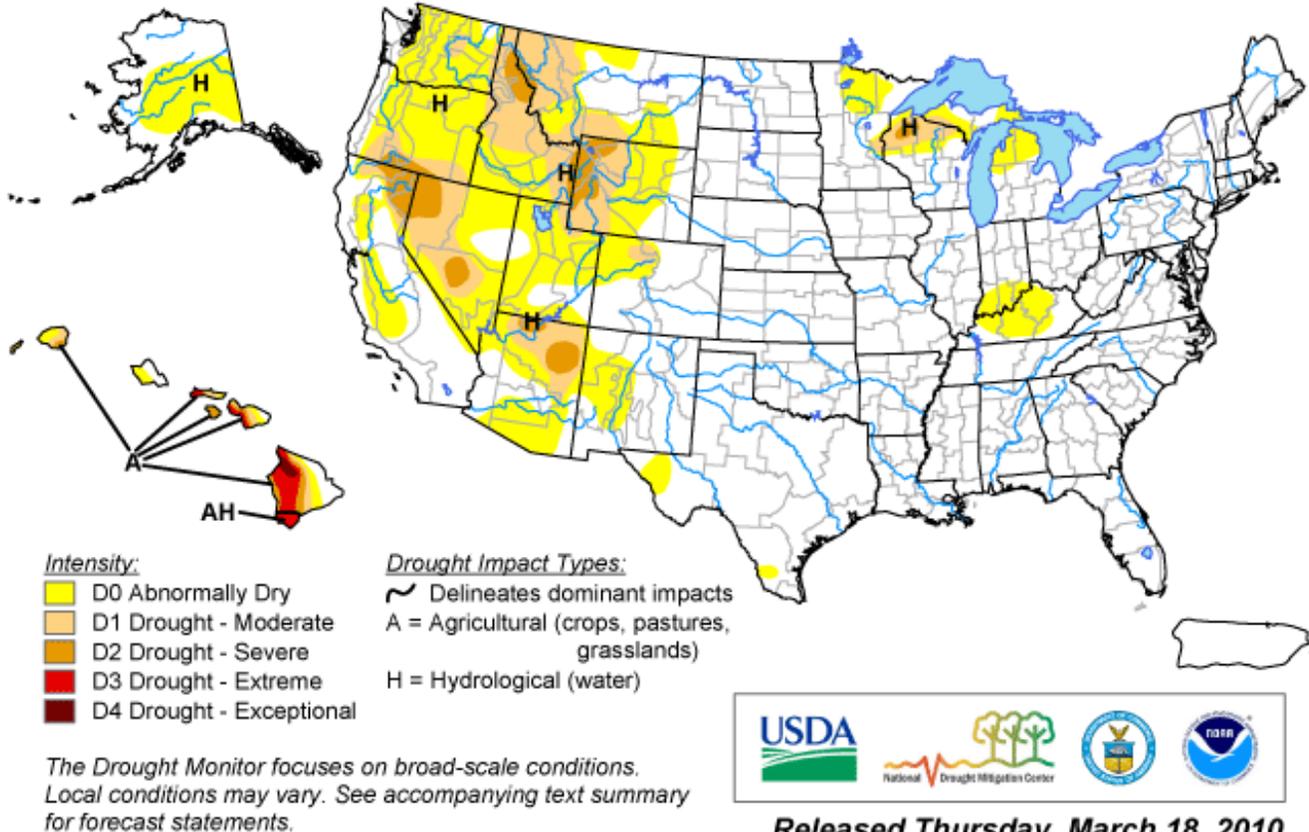


Fig. 4. Current Drought Monitor weekly summary. Note Hawaii is the only state that is in D4 Drought. Ref: National Drought Mitigation Center (NDMC) - <http://www.drought.unl.edu/dm/monitor.html>

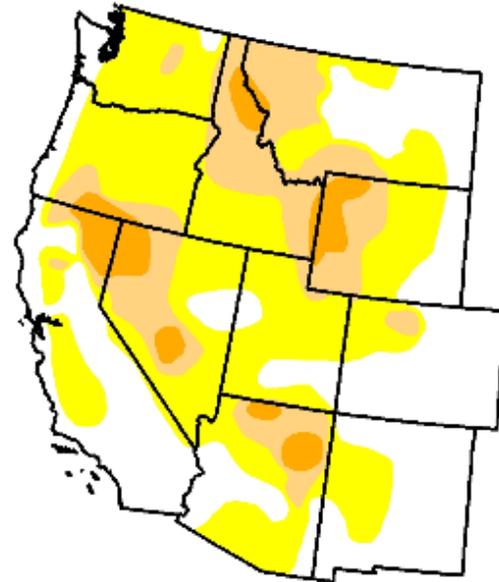
U.S. Drought Monitor

West

March 16, 2010
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	38.1	61.9	22.3	5.6	0.0	0.0
Last Week (03/09/2010 map)	36.0	64.0	23.0	5.7	0.0	0.0
3 Months Ago (12/22/2009 map)	43.0	57.0	28.4	9.9	0.5	0.0
Start of Calendar Year (01/05/2010 map)	40.1	59.9	30.6	9.9	0.5	0.0
Start of Water Year (10/06/2009 map)	42.1	57.9	25.4	8.5	0.0	0.0
One Year Ago (03/17/2009 map)	33.4	66.6	25.8	4.2	0.0	0.0



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements

<http://drought.unl.edu/dm>



Released Thursday, March 18, 2010
Author: M. Rosenkrans, CPC/NOAA

Fig. 4a: Drought Monitor for the Western States with statistics over various time periods. Regionally there were no significant changes since last week.

Ref: http://www.drought.unl.edu/dm/DM_west.htm

Drought Monitor Classification Changes for Selected Time Periods

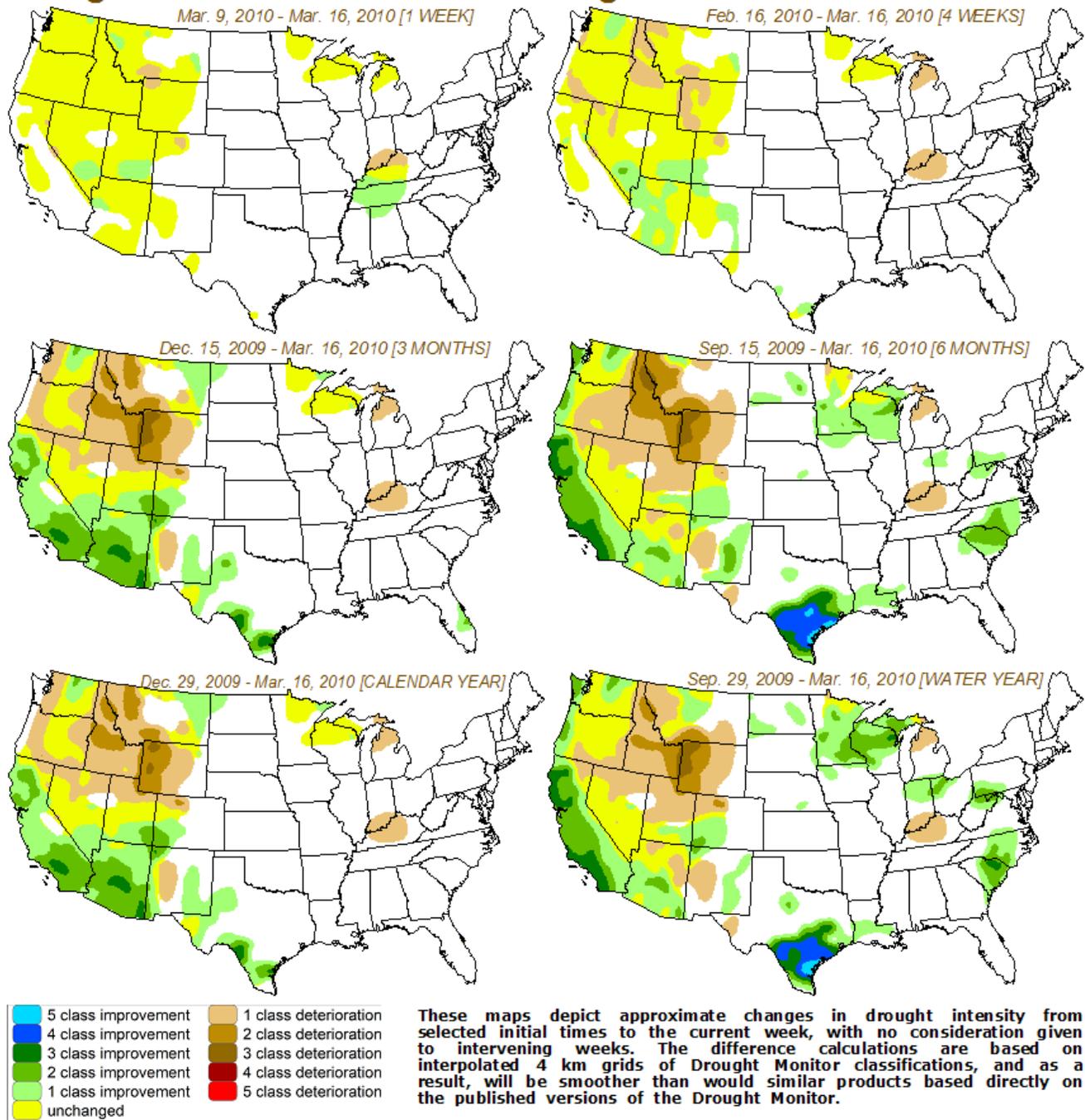
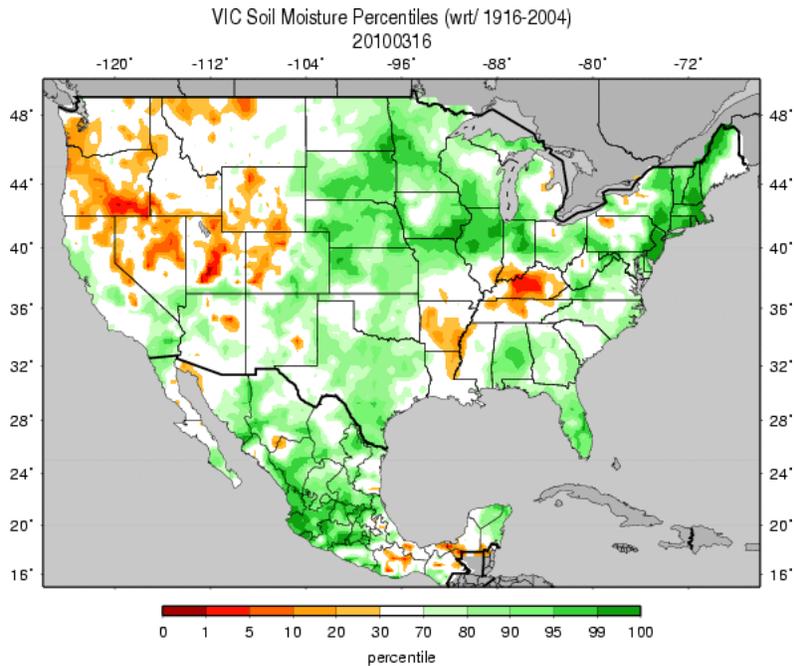


Fig. 4b: Drought Monitor Classification Changes for Selected Time periods. Note mostly status quo for this week (top left map). A drying trend is noted over the Northern Rockies this winter.

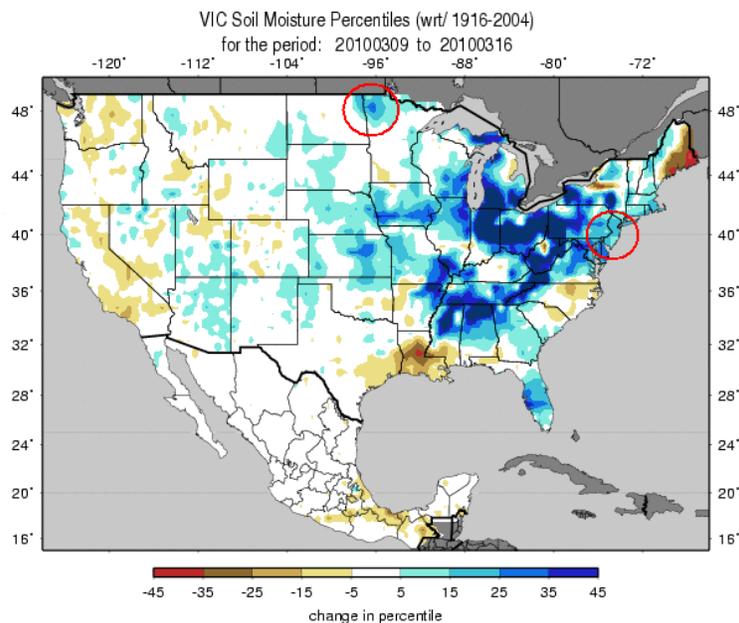
Ref: <http://www.cpc.ncep.noaa.gov/products/predictions/experimental/edb/dm-change-4maps.png>

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Figs. 5a: Soil Moisture ranking in percentile based on 1916-2004 climatology as of 16 March. The same regional patterns of dry and wet persist since last week.

Ref: http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt.gif

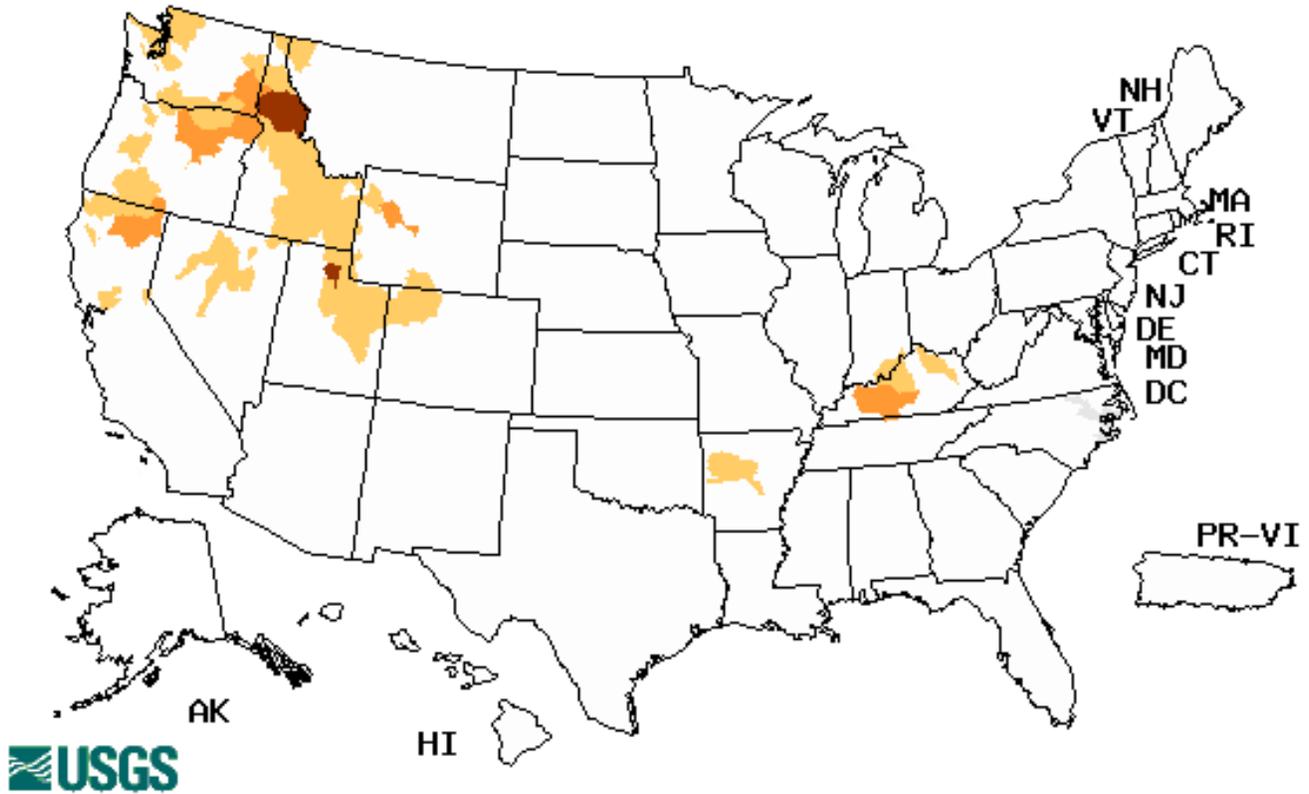


Figs. 5b: Soil Moisture change in percentile based on 1916-2004 climatology for the week shows a much moister conditions over the Upper Mid-West and drier conditions over southern Louisiana. The Red circles indicate the Red River Valley in ND/MN (flooding) and significant flooding in New Jersey. Ref:

http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt.1wk.gif

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Wednesday, March 17, 2010



Explanation - Percentile classes				
Low	<=5	6-9	10-24	Insufficient data for a hydrologic region
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below normal	

Fig. 6. Map of below normal 7-day average streamflow compared to historical streamflow for the day of year. The impact of El Niño over the Pacific Northwest is starting to be seen with some areas in a severe (impaired) stream flow classification.

Ref: <http://water.usgs.gov/waterwatch/?m=dryw&w=map&r=us>

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National Drought Summary -- March 16, 2010

The discussion in the Looking Ahead section is simply a description of what the official national guidance from the National Weather Service (NWS) National Centers for Environmental Prediction is depicting for current areas of dryness and drought. The NWS forecast products utilized include the HPC 5-day QPF and 5-day Mean Temperature progs, the 6-10 Day Outlooks of Temperature and Precipitation Probability, and the 8-14 Day Outlooks of Temperature and Precipitation Probability, valid as of late Wednesday afternoon of the USDM release week. The NWS forecast web page used for this section is: <http://www.cpc.ncep.noaa.gov/products/forecasts/>.

During the past 7 days, dryness generally decreased east of the Mississippi River in association with multiple low-pressure systems that moved across the region from March 10-14. Heavy rains linked to flooding were observed from the Ohio River Valley to New England. Out west, the pattern of continued dry conditions across the Northern Rockies continued. Most of the precipitation from the lone storm system that impacted the northwest fell west of the Cascades. Light rains precluded any expansion of dryness in Texas but did not amount to enough to completely alleviate longer term dryness.

East of the Mississippi River: Many areas east of the Mississippi River Valley received some precipitation over the past week, with some areas recording devastating flooding. Notable areas receiving little to no precipitation were the already present drought areas in the Upper Midwest and over the southern Indiana to central Kentucky. The abnormally dry (D0) and moderate drought (D1) areas in northern Wisconsin were reshaped to reflect the isolated reports of greater than 1.0 inch of rain across Forest, Marinette, Langlade and Oconto Counties. A small adjustment was made in the vicinity of Oceana and Mason counties in Michigan to reflect recent precipitation and better align with 3- and 6-month Standardized Precipitation Index (SPI) values.

Precipitation over the past week bypassed most of western Kentucky and southern Indiana but rains across western and central Tennessee ranged from 0.5-2.5 inches. Soil moisture values from the University of Washington models show the driest soils (below the tenth percentile) over western and central Kentucky, responding well to the rains across Tennessee.

Texas: The areas of abnormal dryness in southern and western Texas persisted, with little precipitation reported in these regions during the past 7 days.

The West: Precipitation across the west was scattered in coverage at best, with the highest amounts along the coasts of Oregon and Washington (1.0 to greater than 5.0 inches) and in the Sierra Nevada (0.5-2.0 inches). Most of the precipitation fell outside of the moderate and severe drought areas, so most of the changes to the drought monitor were small in scale. In northeast Washington, some abnormal dryness was alleviated due to 1.0-2.2 inches of rainfall.

Across the northern Rockies in Idaho and Montana, local inputs combined with available national level data to drive some modest improvements. The area of extreme drought in western Montana was trimmed back due to reports of 0.5 – 1.0 inch of precipitation just east of Montana-Idaho border. In western Wyoming, severe drought coverage was expanded based on continued below-average snow water equivalence measurements (many sites in the lowest 5 percent according to the Natural Resources Conservation Service). Besides the low water content, precipitation continued to be below normal in the already dry areas, so that prompted an intensification of the most severe drought, rather than an overall expansion.

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Finally, precipitation and snowpack have been below average for a while across Idaho, Montana, and western Wyoming, and have declined to seriously low levels recently. As a result, D1 and D2 conditions expanded significantly across these regions and adjacent eastern Washington and Oregon. In the western half of Wyoming, snowpack water content was generally below 70 percent of average for the date, and surface water supply indices (SWSI's) were among the lowest 5 to 20 percent of expected values for this time of year. In areas of western Wyoming and adjacent Utah where snowpack water content was below 55 percent of normal for the date, D2 was introduced. Farther north, significant D1 and D2 expansion took place across central and northern Idaho and, to a lesser extent, western Wyoming as seasonal precipitation totals and snowpack water content continued to decline relative to average conditions for early March. During the last 60 days, less than half of normal precipitation fell on northwestern Montana and essentially the northern half of Idaho.

Hawaii and Alaska: The windward (northeast) facing slopes of Hawaii saw minor improvements due to frequent trade wind shower activity. Abnormal dryness was removed from the east and northeast slopes of the Big Island and the northeast slopes of Oahu. Severe drought (D2) was shifted from northeast Kauai to the southeast portion of the island. Rainfall elsewhere was welcome, but did little to impact the drought conditions.

In Alaska, the west side of the Susitna basin has received approximately 80 percent of average snowfall, the Tok snow course received 90 percent of average, and the 40 mile snow courses and Porcupine basin snow courses were 88 and 87 percent of average, respectively. Dryness did continue for portions of the state, with the Red Dog Mine precipitation gauge catching only 39 percent of average since Oct. 1. The Gulf coast and Southeast were dry in February, but have received significant precipitation the first 2 weeks of March. They have received average or more for the month. Additional,

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Bettles and Homer reported above-normal precipitation, so the area of abnormal dryness was trimmed on the north and south, while expanding westward.

Looking Ahead: Moderate to isolated pockets of heavy precipitation are anticipated from March 17-22, 2010 across portions of the Northern and Central Rockies, Great Plains, Upper Midwest, Great Lakes, and Southeast. Light precipitation is forecast for most of the country east of the Rockies, with most of the precipitation forecast to fall outside of the currently depicted drought areas. For the ensuing 5 days (March 23-27, 2010), the odds favor drier than normal conditions across much of the contiguous 48 states. Wetter than normal conditions are favored along the gulf coast, eastern seaboard and Lower Great Lakes. Southern Alaska should continue to be wet, at odds with the interior and northern portions of the largest state, which should be drier than average.

Author: [Matthew Rosencrans, NOAA/NWS/NCEP/Climate Prediction Center](#)

Dryness Categories

D0 ... Abnormally Dry ... used for areas showing dryness but not yet in drought, or for areas recovering from drought.

Drought Intensity Categories

D1 ... Moderate Drought

D2 ... Severe Drought

D3 ... Extreme Drought

D4 ... Exceptional Drought

Drought or Dryness Types

A ... Agricultural

H ... Hydrological

Updated March 17, 2010