



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

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**Weekly Report - Snowpack / Drought Monitor Update**      **Date: 15 October 2009**

## **SNOTEL SNOWPACK AND PRECIPITATION SUMMARY**

**Temperature:** SNOTEL and ACIS-day station average weekly temperature anomalies continued to be quite cool across the West again this week (Fig.1). ACIS 7-day average temperature anomalies show that the greatest positive temperature departures occurred over the western New Mexico (>+5F) and the greatest negative departures occurred over the Montana Rockies and Wyoming Big Horn Mountains (<-25F) (Fig. 1a).

**Precipitation:** ACIS 7-day average precipitation amounts for the period ending 14 October shows a mostly dry West with the exception of some heavier scattered rain and snow over the higher elevation of the Sierra Range in California and Central Rockies (Fig 2 and 2a). Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2010 Water Year that began on October 1, 2009 shows rather exaggerated values since the Water Year is only 15 days old (Fig. 2b).

## **WESTERN DROUGHT STATUS**

**The Four Corners States:** In the wake of monsoonal rainfall that was at best disappointing, reports of drought-related impacts have been on the rise recently across Arizona and areas near the Four Corners site, including depressed streamflows, lowering reservoir levels, and surface moisture depletion. For the state of Arizona as a whole, 35.9 percent of streamflow reports for the 75-day stretch ending October 12, 2009 were below the 10 percentile threshold for the observation date. This was the largest amount for any 75-day period since the U. S. Geological Survey began summarizing such statewide statistics on a daily basis in 1999. Only on several occasions during the last half of May 2002 did the amount of similarly low reports top 35 percent for a 75-day period, topping out at 35.1 percent. In many areas, the lack of moisture left behind by the disappointing monsoon season is exacerbated by substantial precipitation deficits dating back 1 to 2 years of 4 to locally almost 12 inches. Given a detailed look at the variety of impacts being reported and the serious implications of the abnormally dry monsoon season, severe drought (D2) was expanded to cover a large part of central and eastern Arizona and adjacent sections of the other Four Corners states, including the Hopi and Navajo Nations. Elsewhere, less dramatic D0 and D1 expansion was implemented in other parts of eastern and northwestern Arizona and adjoining sections of neighboring states.

**The Rest of the West:** Little or no precipitation fell on most other dry areas in the West, keeping D0 to D2 conditions intact. Late in the period, an unseasonably strong storm approaching the northern half of California and western Nevada spread precipitation totals ranging from a few tenths of an inch to locally over an inch into areas from the northern Sierra Nevada westward to the coast as the bulk of the system was offshore but approaching the region. Author: Richard Tinker, CPC/NCEP/NWS/NOAA

## Weekly Snowpack and Drought Monitor Update Report

***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. 3, 3a, and 3b).

### **SOIL MOISTURE**

Soil moisture (Figs. 4a and 4b), 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/>.

### **OBSERVED FIRE DANGER CLASS**

The [adjective class rating](#) is a method of normalizing rating classes across different fuel models, indexes, and station locations. It is based on the primary fuel model cataloged for the station, the fire danger index selected to reflect staffing levels, and climatological class breakpoints. This information is provided by local station managers. About 90% use the Burning Index (BI); others use Energy Release Component (ERC). Staffing class breakpoints are set by local managers from historical fire weather climatology (Figs. 5).

Only reporting station locations are indicated with a marker on the maps. Values between stations are estimated with an inverse distance-squared technique on a 10-km grid. This works pretty well in areas of relatively high station density, but has obvious shortcomings in other areas.

### **VEGETATION STRESS (Figure 6)**

([http://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh\\_currentImage.php](http://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh_currentImage.php))

#### **Image Interpretation**

The images are color-coded maps of vegetation condition (health) estimated by the Vegetation and Temperature Condition Index (VT). The VT is a numerical index, which changes from 0 to 100 characterizing change in vegetation conditions from extremely poor (0) to excellent (100). Fair conditions are coded by green color (50), which changes to brown and red when conditions deteriorate and to blue when they improve. The VT reflects indirectly a combination of chlorophyll and moisture content in the vegetation and also changes in thermal conditions at the surface. This new approach combines the visible, near infrared and thermal radiances in a numerical index characterizing vegetation health. This approach is extremely useful in detecting and monitoring such complex and difficult-to-identify phenomenon as drought. The VT values below 35 are used for identifying vegetation stress which is an indirect drought indicator. The VT is very useful for early drought detection, assessing drought area coverage, duration, and intensity, and for monitoring drought impacts on vegetation and agricultural crops.

## Weekly Snowpack and Drought Monitor Update Report

### U.S. HISTORICAL STREAMFLOW

This map, (Fig. 7) 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.

[http://water.usgs.gov/cgi-bin/waterwatch?state=us&map\\_type=dryw&web\\_type=map](http://water.usgs.gov/cgi-bin/waterwatch?state=us&map_type=dryw&web_type=map).

### 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>.

### 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

# Weekly Snowpack and Drought Monitor Update Report

## SNOTEL (solid) and ACIS (dot-filled) Networks 7-Day Average Temperature Anomaly (Degrees F)

Oct 15, 2009

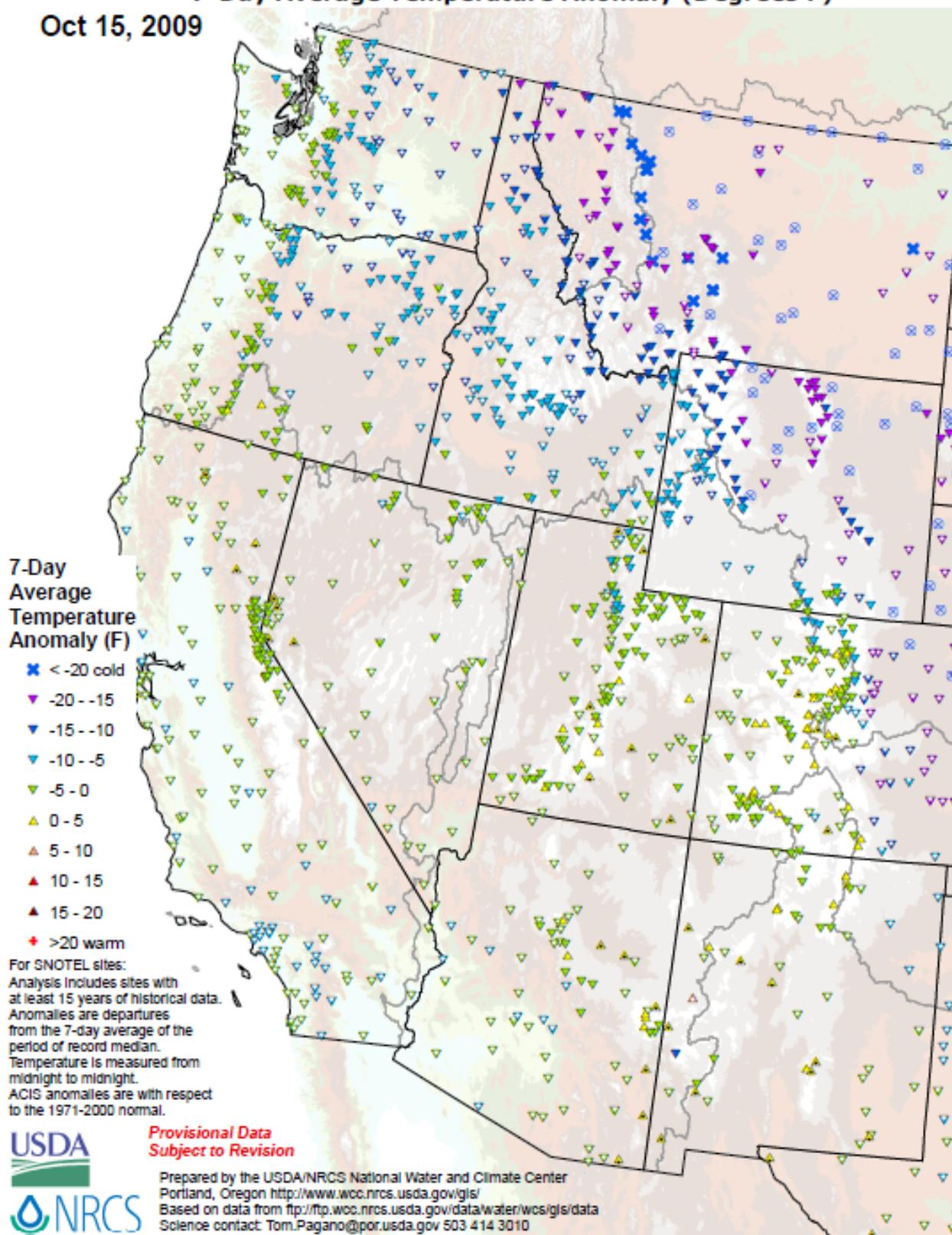
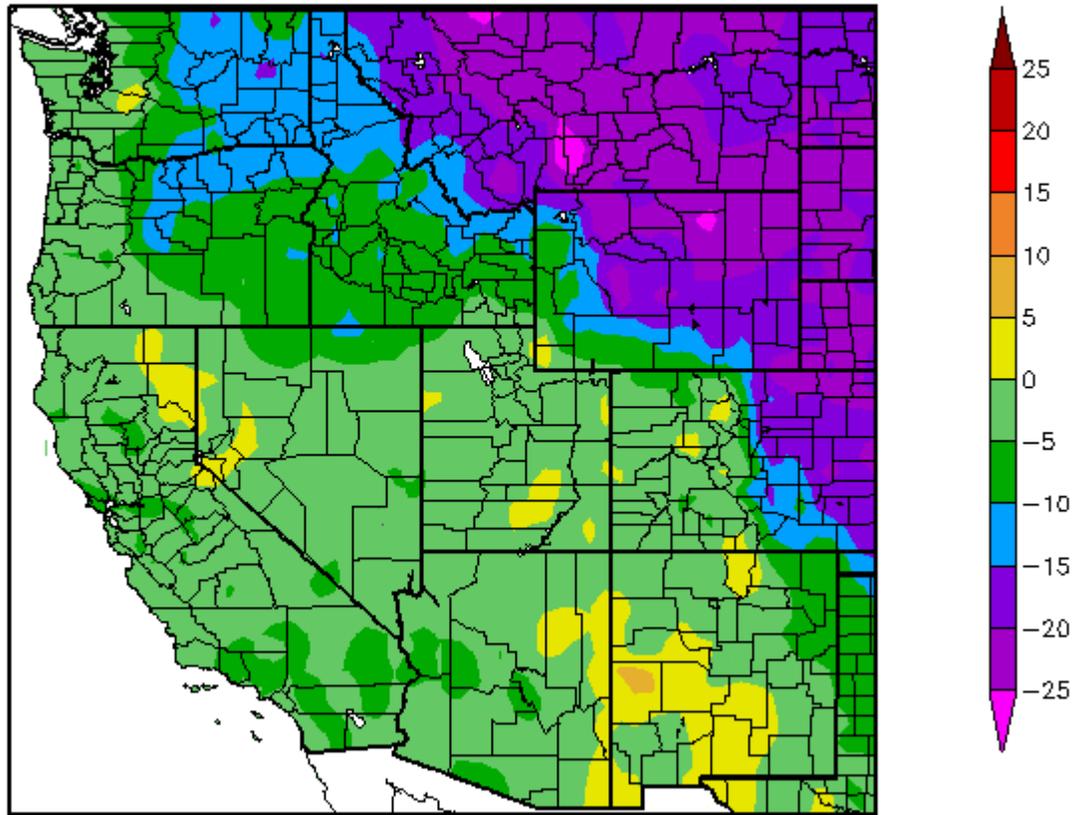


Fig. 1. SNOTEL and ACIS-day station average weekly temperature anomalies continued to be quite cool across the West again this week. Ref: <ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/WestwideTavg7dAnomalyAcis.pdf>

Departure from Normal Temperature (F)  
10/8/2009 – 10/14/2009



Generated 10/15/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

**Fig. 1a. ACIS 7-day average temperature anomalies show that the greatest positive temperature departures occurred over the western New Mexico (>+5F) and the greatest negative departures occurred over the Montana Rockies and Wyoming Big Horn Mountains (<-25F).**

Ref: [http://www.hprcc.unl.edu/maps/current/index.php?action=update\\_product&product=TDdept](http://www.hprcc.unl.edu/maps/current/index.php?action=update_product&product=TDdept)

# Weekly Snowpack and Drought Monitor Update Report

Precipitation (in)  
10/8/2009 - 10/14/2009

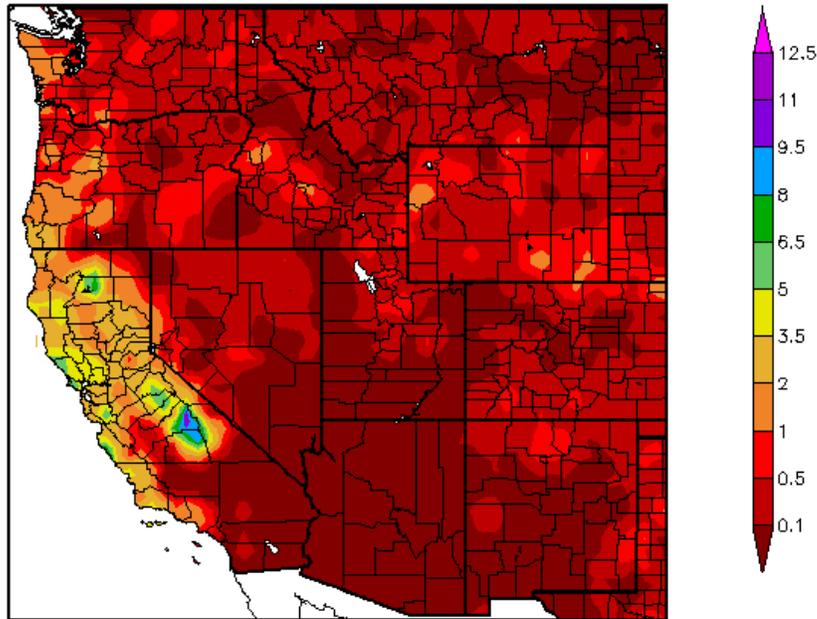
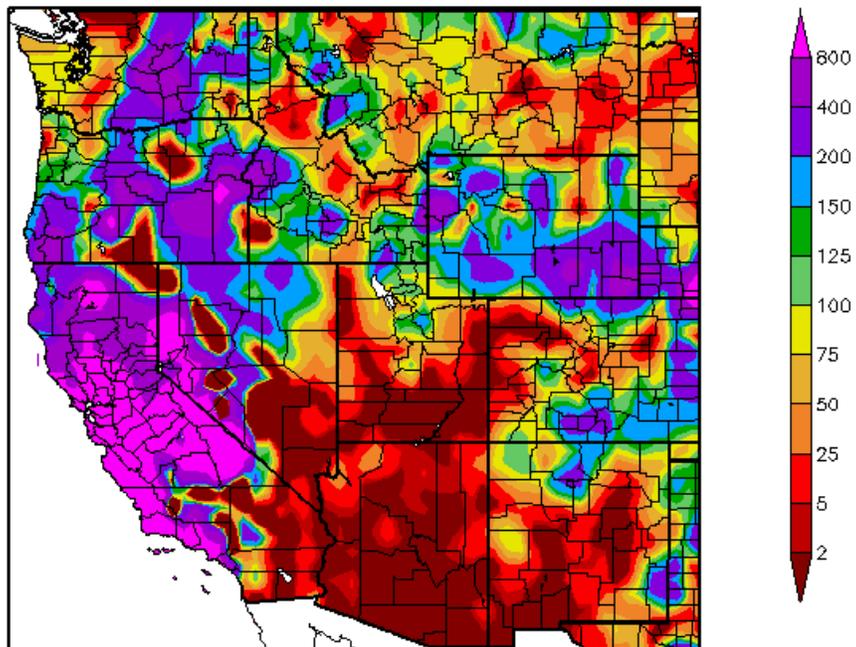


Fig. 2. and 2a. ACIS 7-day average precipitation amounts for the period ending 14 October shows a mostly dry West with the exception of some heavier scattered rain and snow over the higher elevation of the Sierra Range in California and Central Rockies. Ref: <http://www.hprcc.unl.edu/maps/current/>.

Percent of Normal Precipitation (%)  
10/8/2009 - 10/14/2009



Weekly Snowpack and Drought Monitor Update Report

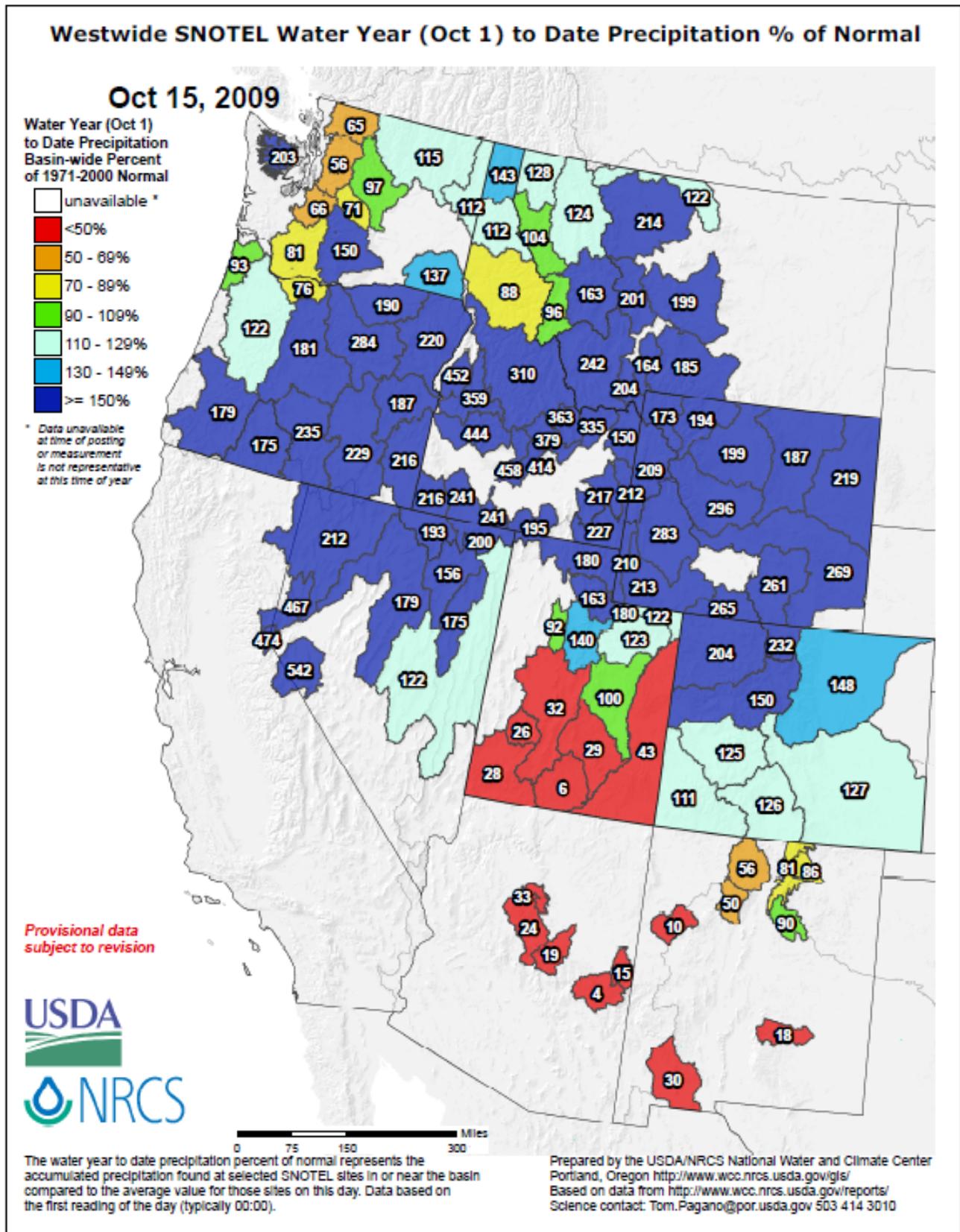
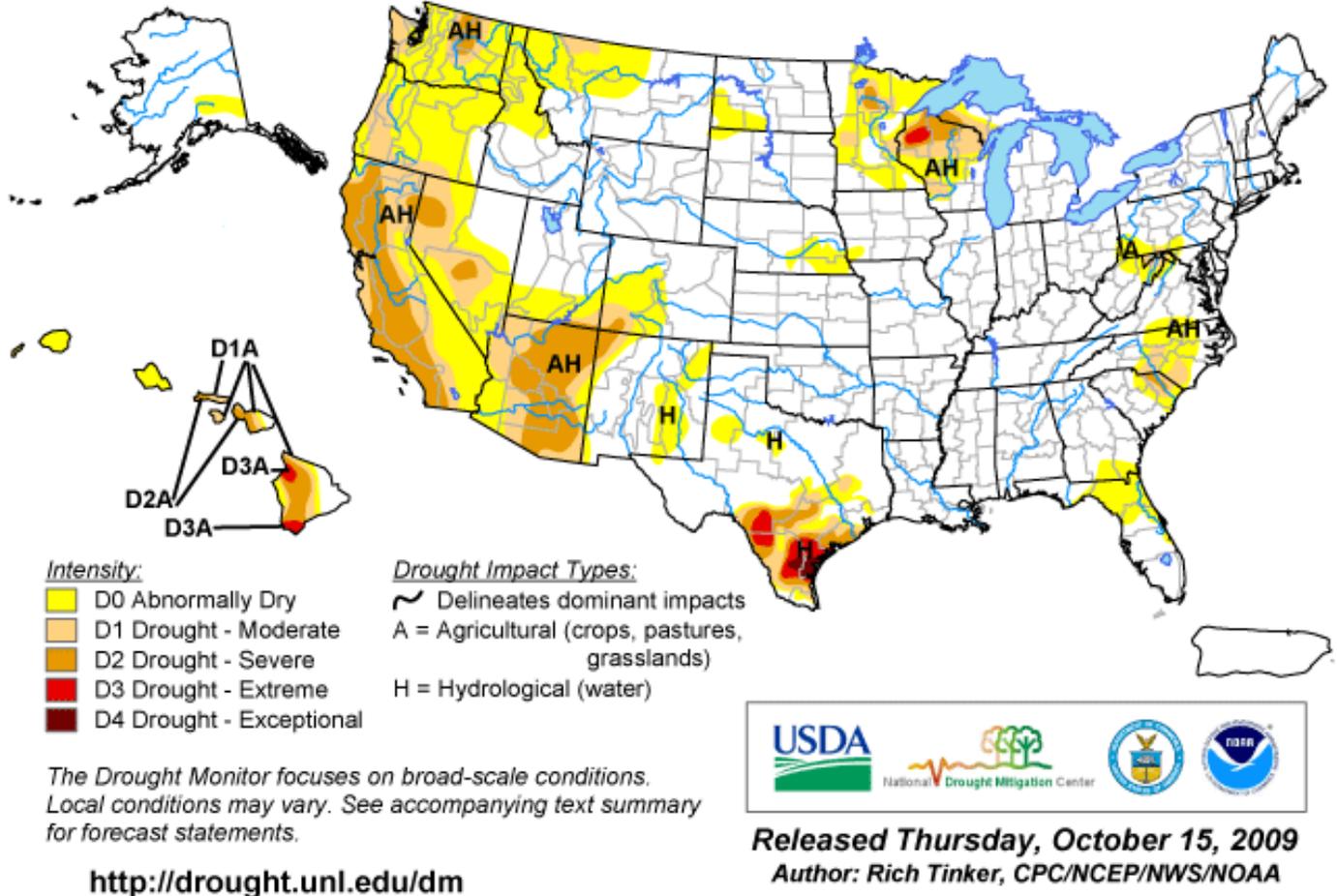


Fig 2b. Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2010 Water Year that began on October 1, 2009 shows rather exaggerated values since the Water Year is only 15 days old.

Ref: [ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west\\_wytdprecptnormal\\_update.pdf](ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west_wytdprecptnormal_update.pdf).

# U.S. Drought Monitor

October 13, 2009  
Valid 8 a.m. EDT



**Fig. 3. Current Drought Monitor weekly summary.**

Ref: National Drought Mitigation Center (NDMC) - <http://www.drought.unl.edu/dm/monitor.html>

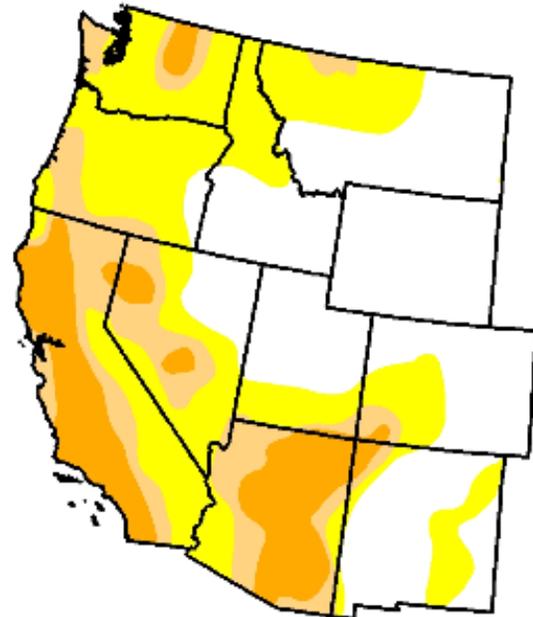
# U.S. Drought Monitor

## West

October 13, 2009  
Valid 7 a.m. EST

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	41.8	58.2	26.5	13.1	0.0	0.0
Last Week (10/06/2009 map)	42.1	57.9	25.4	8.5	0.0	0.0
3 Months Ago (07/21/2009 map)	54.9	45.1	18.9	7.8	0.0	0.0
Start of Calendar Year (01/06/2009 map)	37.4	62.6	28.9	8.8	0.4	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 (10/14/2008 map)	44.1	55.9	27.5	9.8	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, October 15, 2009  
Author: R. Tinker, CPC/NOAA

Fig. 3a. Drought Monitor for the Western States with statistics over various time periods. Regionally, there was some deterioration in D2-D4 during the past week.

Ref: [http://www.drought.unl.edu/dm/DM\\_west.htm](http://www.drought.unl.edu/dm/DM_west.htm).

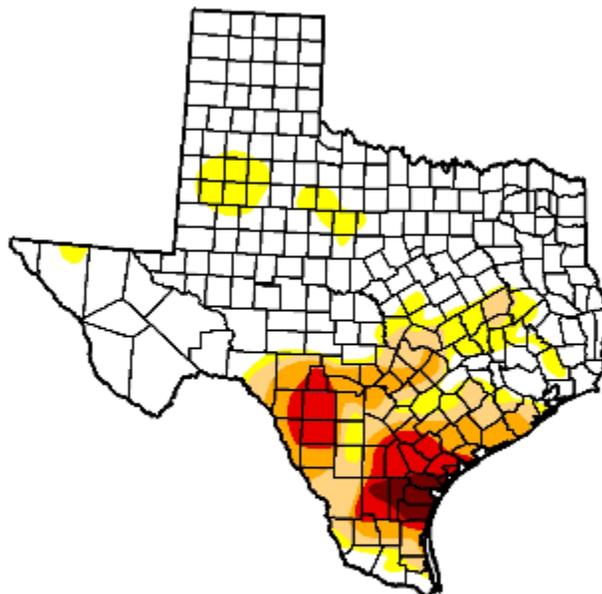
# U.S. Drought Monitor

## Texas

October 13, 2009  
Valid 7 a.m. EST

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	68.9	31.1	20.8	13.3	6.2	1.5
Last Week (10/06/2009 map)	66.1	33.9	22.4	14.5	6.8	1.5
3 Months Ago (07/21/2009 map)	32.3	67.7	38.7	29.6	24.7	16.5
Start of Calendar Year (01/06/2009 map)	41.7	58.3	24.5	15.0	9.1	4.2
Start of Water Year (10/06/2009 map)	66.1	33.9	22.4	14.5	6.8	1.5
One Year Ago (10/14/2008 map)	70.1	29.9	17.7	11.1	4.5	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>

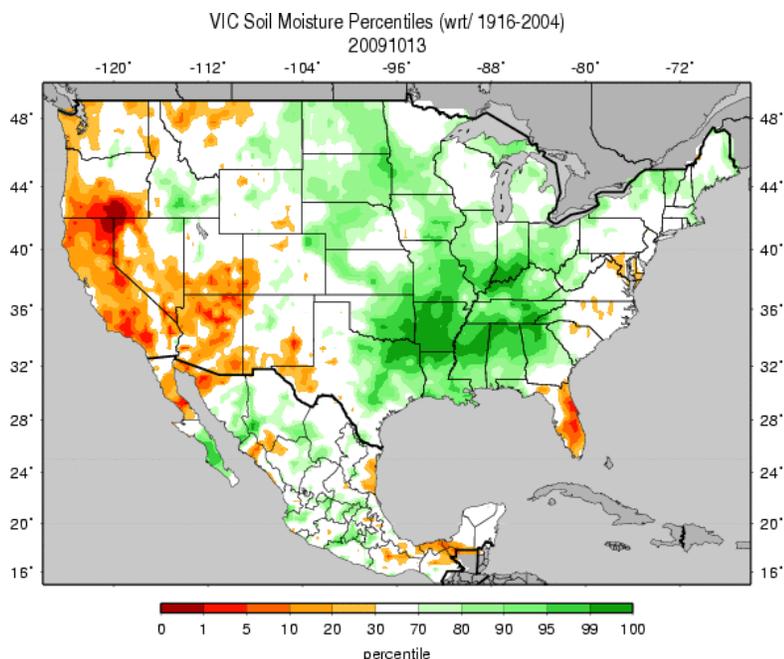


Released Thursday, October 15, 2009  
Author: R. Tinker, CPC/NOAA

**Fig. 3b:** Texas is the only state with D4 drought condition in the US. No significant category changes this week.

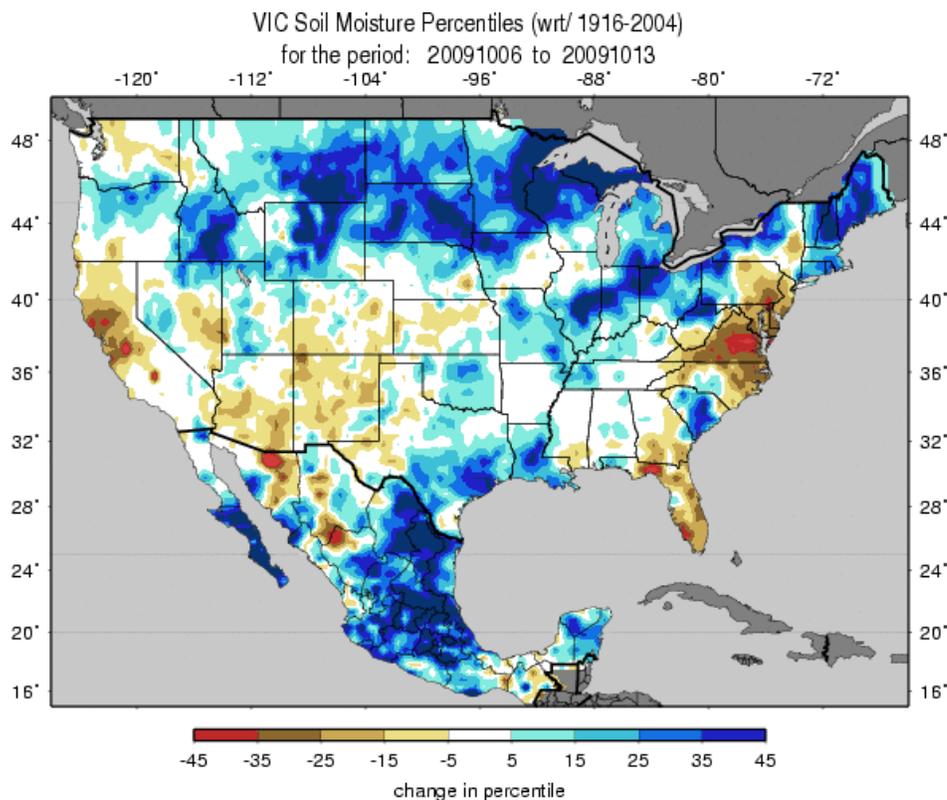
Ref: [http://www.drought.unl.edu/dm/DM\\_state.htm?TX,S](http://www.drought.unl.edu/dm/DM_state.htm?TX,S)

## Weekly Snowpack and Drought Monitor Update Report



**Figs. 4a:** Soil Moisture ranking in percentile based on 1916-2004 climatology as of 13 October. Note that the Southern States are the wettest areas while the driest areas dominate over the Oregon, California, Arizona and now Florida.

Ref: [http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm\\_qnt.gif](http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt.gif)



**Figs. 4b:** Soil Moisture change in percentile based on 1916-2004 climatology for this past week. Excessive drying is found over California and the Mid-Atlantic States. Excessive moistening is found over much of Northern Plains, the Northwest Gulf Coast, and New England.

Ref:

[http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm\\_qnt.1wk.gif](http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt.1wk.gif)

Weekly Snowpack and Drought Monitor Update Report

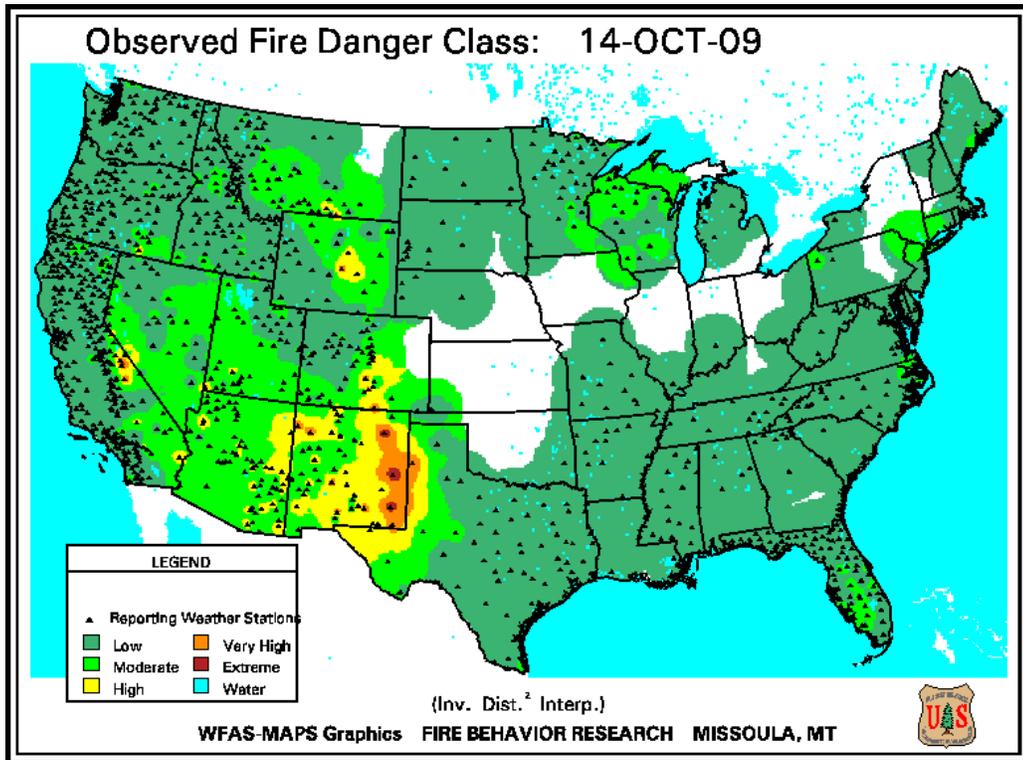


Fig. 5a. Observed Fire Danger Class.

Ref: [http://www.wfas.net/images/firedanger/fd\\_class.gif](http://www.wfas.net/images/firedanger/fd_class.gif)

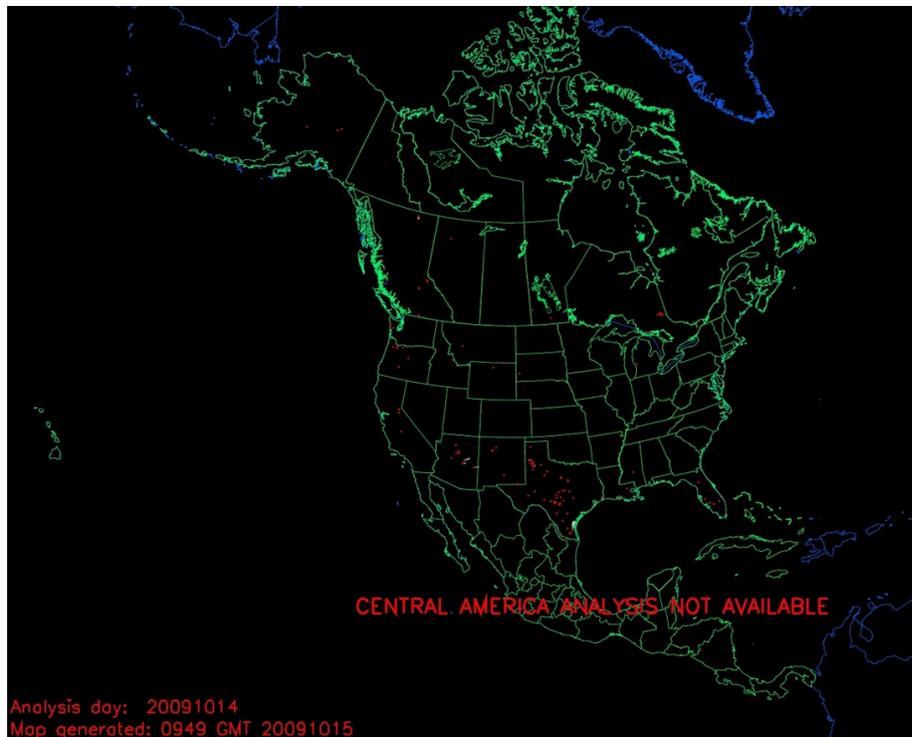


Fig. 5b. Hazard Mapping System Fire and Smoke. Analysis is for 10/09/2009 with fires shown as red dots (mostly in Texas). Smoke, when detected by the analyst, is in gray.

Ref: <http://www.osdpd.noaa.gov/ml/land/hms.html>.

Weekly Snowpack and Drought Monitor Update Report

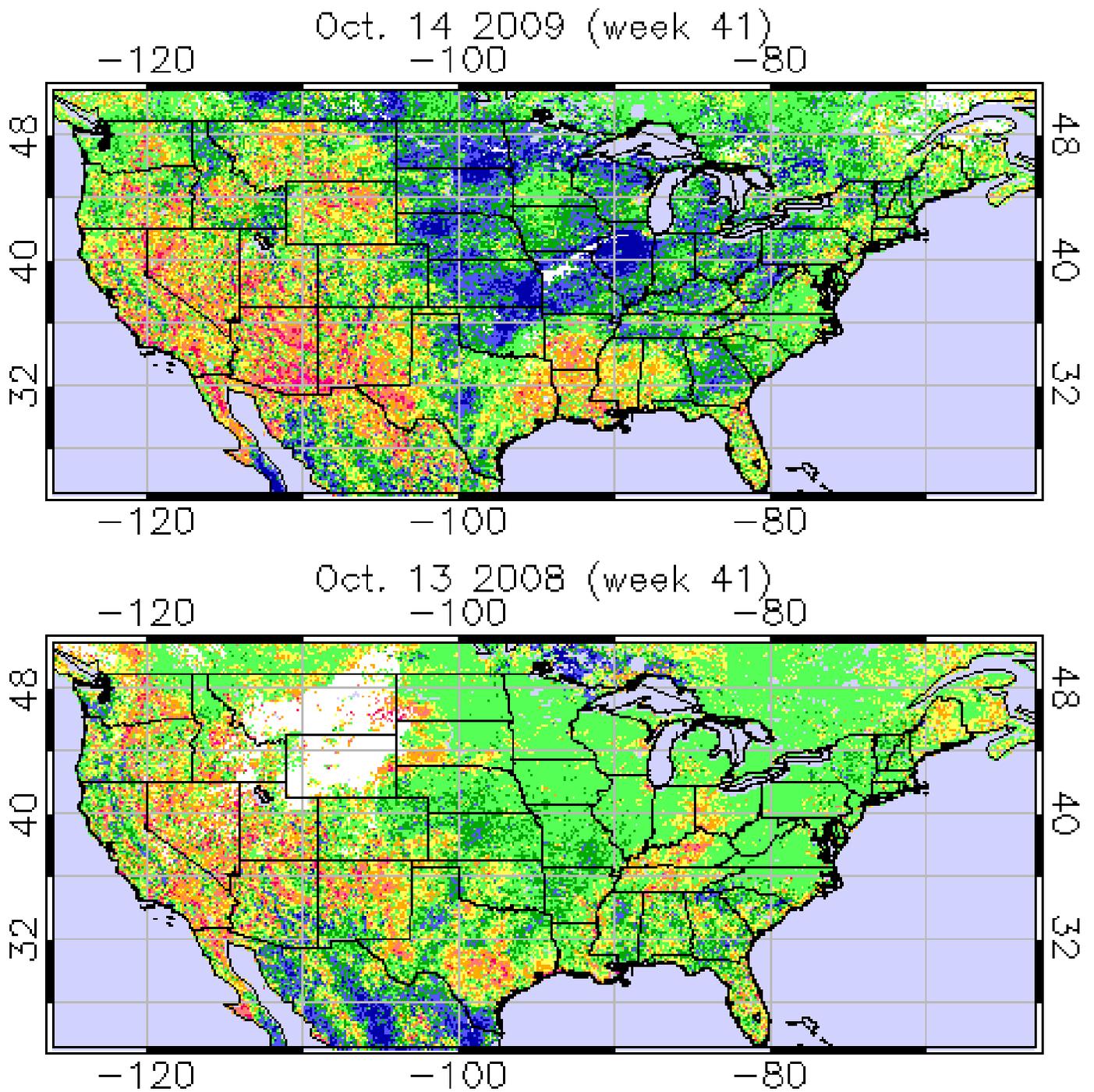
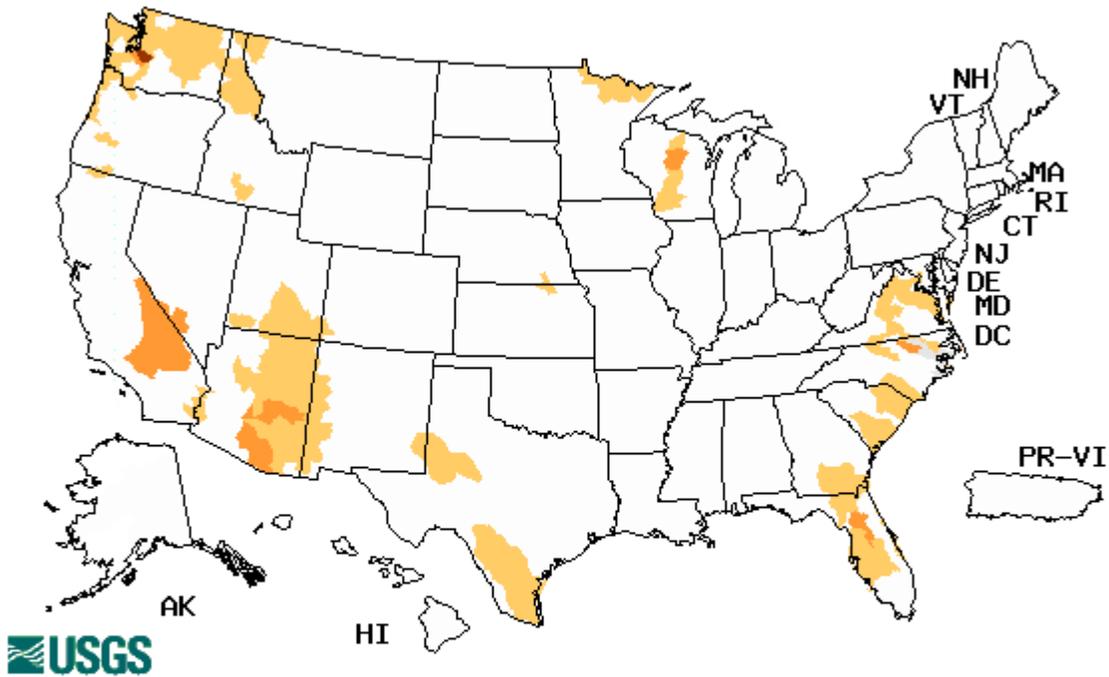


Fig. 6. Vegetation Drought Response Index: Note the comparison to last year. The Central Plains show very favorable conditions while Arizona shows stressed condition this week. Last year, stress conditions were scattered across the Western States.

Ref: [http://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh\\_currentImage.php](http://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh_currentImage.php)

# Weekly Snowpack and Drought Monitor Update Report

Wednesday, October 14, 2009



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. 7. Map of below normal 7-day average streamflow compared to historical streamflow for the day of year. Conditions are moderate over southern California and severe over the Southern Puget Sound area of Washington.

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

## Weekly Snowpack and Drought Monitor Update Report

### National Drought Summary -- October 13, 2009

*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/>.*

**The Central Appalachians and Western Mid-Atlantic:** Generally 1 to 2 inches of precipitation fell on the dry areas to the north and west of the Maryland Panhandle, eliminating moderate drought in these areas and reducing the extent of abnormal dryness somewhat. From the Maryland and West Virginia Panhandles through eastern parts of the region, only a few tenths of an inch of precipitation was recorded, and D0 to D1 conditions remained unchanged there.

**The Carolinas and Adjacent Virginia:** Moderate to heavy rains exceeding an inch fell across the dry areas in South Carolina, with lesser amounts restricted to areas near the Atlantic Coast and near the North Carolina border. Between 2 and 5 inches doused central parts of the state. As a result, the western extent of the D0 to D2 areas retreated to the east. Farther north and near the Atlantic Coast, rains generally totaled less than an inch and D0 to D1 conditions remained unchanged.

**Southeast Georgia and Northern Florida:** Only scattered light rains were reported last week, continuing a pattern of generally below-normal precipitation that dates back at least 3 months. Most locations are at least 2 inches below normal for this period, with many sites reporting deficits of 4 to locally over 8 inches, especially near the east-central and northwestern peninsular Florida coasts, and in part of north-central Florida and adjacent south-central Georgia. Earlier heavy rains have left many areas with near- or above-normal 6-month totals, although large shortfalls of 4 inches to near 1 foot exist along the east-central Florida coast and to a lesser extent in many areas near the border between Florida and Georgia. In consideration of all these factors, an area of abnormal dryness was introduced in southeastern Georgia and much of northern peninsular Florida, and along the east-central Florida coast.

**Ohio and Indiana:** Between 1 and 3 inches of precipitation fell throughout the dry areas in Indiana while 0.5 to 1.0 inch moistened northwestern Ohio. Considering the relatively short duration and shallowness of the dryness in this region, this precipitation seemed sufficient to eliminate all abnormal dryness formerly analyzed in the region.

**The Great Lakes Region and Upper Midwest:** Widespread, beneficial moderate to heavy precipitation (1 to 3 inches) fell on many of the most severely affected drought areas extending from east-central Minnesota eastward across the northern half of Wisconsin and the Upper Peninsula of Michigan, though large amounts were more spotty in northwestern Wisconsin, including the area experiencing extreme drought. This led to a contraction of the D0 to D3 areas covering the region, to a substantial extent in some areas. Across the rest of Minnesota, the southern half of Wisconsin, and northwestern Iowa, generally light rain fell, with totals approaching an inch in a few spots. Enough precipitation fell to eliminate D0 in northwestern and north-central Iowa, but in contrast, a modest increase in rainfall anomalies since spring led to a slight westward and northward expansion of abnormal dryness in the northern half of Minnesota.

## Weekly Snowpack and Drought Monitor Update Report

**The Central and Northern Great Plains:** Moderate precipitation eliminated D0 conditions in western Nebraska and in northwestern Oklahoma while little or no precipitation across southwestern Iowa, southeastern Nebraska, and the western Dakotas kept abnormal dryness unchanged in those areas.

**The Southern Plains:** A dry week kept D0 conditions intact in eastern New Mexico while increasing precipitation deficits prompted the introduction of abnormal dryness in part of west-central Texas near Lubbock. The last 90 days brought less than half of normal precipitation to much of the region, and the developing dryness in the short-term has allowed longer-term precipitation shortages to resurface, with parts of the area recording less than 70 percent of normal precipitation during the last 12 months. In contrast, 1 to 3 inches of rain fell on the D0 and D1 areas in north-central Texas, eradicating moderate drought for the time being and cutting the area of abnormal dryness approximately in half. Meanwhile, a few inches of rain brought an end to D0 conditions in west-central Louisiana and adjacent Texas.

In the large, protracted, but recently improving area of dryness and drought covering most of central and southern Texas, another week of widespread moderate to heavy rains brought additional improvements to north-central and northeastern parts of the region while substantial totals generally declined and became more scattered in areas farther south and west. Just over 8 inches of rain fell on San Antonio, TX during the first 12 days of October 2009, already establishing the month as the 9th wettest October in over a century of records, even if no additional precipitation were to fall until November. On the Drought Monitor, areas of additional improvement were noted in some of the D0 to D3 areas receiving heavier rains, but because of the deep and protracted nature of the drought before the recent rains set in, improvement continues to be analyzed slowly and incrementally in deference to the fact that large hydrologic shortages, 2 years in the making in some areas, continue to seriously impact the region. The combined water volume stored in Lake Buchanan and Lake Travis on October 12, 2009 was above the lowest amount observed in the last few months, but remained at a level (49 percent of average since the 1940's) which was lower only during the droughts of the early 1950's and most recently in 1964.

**The Four Corners States:** In the wake of monsoonal rainfall that was at best disappointing, reports of drought-related impacts have been on the rise recently across Arizona and areas near the Four Corners site, including depressed streamflows, lowering reservoir levels, and surface moisture depletion. For the state of Arizona as a whole, 35.9 percent of streamflow reports for the 75-day stretch ending October 12, 2009 were below the 10 percentile threshold for the observation date. This was the largest amount for any 75-day period since the U. S. Geological Survey began summarizing such statewide statistics on a daily basis in 1999. Only on several occasions during the last half of May 2002 did the amount of similarly low reports top 35 percent for a 75-day period, topping out at 35.1 percent. In many areas, the lack of moisture left behind by the disappointing monsoon season is exacerbated by substantial precipitation deficits dating back 1 to 2 years of 4 to locally almost 12 inches. Given a detailed look at the variety of impacts being reported and the serious implications of the abnormally dry monsoon season, severe drought (D2) was expanded to cover a large part of central and eastern Arizona and adjacent sections of the other Four Corners states, including the Hopi and Navajo Nations. Elsewhere, less dramatic D0 and D1 expansion was implemented in other parts of eastern and northwestern Arizona and adjoining sections of neighboring states.

**The Rest of the West:** Little or no precipitation fell on most other dry areas in the West, keeping D0 to D2 conditions intact. Late in the period, an unseasonably strong storm approaching the northern half of California and western Nevada spread precipitation totals ranging from a few tenths of an inch to locally over an inch into areas from the northern

## Weekly Snowpack and Drought Monitor Update Report

Sierra Nevada westward to the coast as the bulk of the system was offshore but approaching the region.

**Hawaii:** Scattered light rain was once again observed in the wake of the storm that brought heavy but essentially transient rains the prior week, prompting no change in the D0 to D3 areas affecting the state.

**Alaska:** Moderate precipitation reduced the extent of D0 conditions yet again last week from the south and west. Drier weather allowed a small area of D0 to persist in central and northeastern sections of the area analyzed last week.

**Looking Ahead:** For October 14 – 19, 2009, at least moderate precipitation (more than 0.5 inch) is forecast for the areas of dryness and drought east of the Mississippi River and south of the Great Lakes. The largest totals (1.5 to 3.0 inches) are anticipated in the mid-Atlantic Piedmont and parts of southeastern Georgia. Well to the west, similar moderate to heavy amounts are expected in Washington west of the Cascades, and in western Oregon. Meanwhile, light to locally moderate precipitation is forecast for the western Great Lakes, Minnesota, the dry areas in the central and northern Great Plains, the northern Intermountain West, and southwestern California. Little if any precipitation is expected elsewhere.

The ensuing 5 days (October 20 – 24, 2009) as a whole features enhanced probabilities for surplus precipitation from the Great Lakes Region, the East Coast Piedmont, and the northeastern Gulf Coast westward through the High Plains, and for the northwestern quarter of the contiguous 48 states. No tilt of the odds toward wet or dry conditions could be determined elsewhere. None of the existing dry areas appear to have enhanced chances for subnormal precipitation during this period.

**Author:** [Richard Tinker, CPC/NCEP/NWS/NOAA](#)

### 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: 15 October 2009