



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

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**Weekly Report - Snowpack / Drought Monitor Update Date: 24 December 2009**

**SNOTEL SNOWPACK AND PRECIPITATION SUMMARY**

The weather pattern during this U.S. Drought Monitor (USDM) week (last Tuesday through this Tuesday morning) was a continuation of storm systems embedded in the westerly flow which has characterized much of the month. The week began with beneficial precipitation falling over the drought areas of the Pacific Northwest and Deep South Texas. Another Pacific system moved into the West by the end of the USDM week.

**Snow:** SNOTEL Snow-Water Equivalent (SWE) percent of normal values for 23 December 2009 shows amounts haven't changed appreciably during the past week (Fig. 1). Arizona, New Mexico, and southern Utah have the highest SWE values in the West despite below normal precipitation since the start of the Water-Year.

**Temperature:** SNOTEL and ACIS-day station average weekly temperature experienced abnormally warmer conditions over the Northern Tier States (Fig.2). ACIS 7-day average temperature anomalies show that the greatest positive temperature departure was scattered across regions of the Northern Rockies (>+12F) and the greatest negative departure occurred over the Uinta Mountains of Utah (<-12F) (Fig. 2a).

**Precipitation:** ACIS 7-day average precipitation amounts for the period ending 23 December shows the bulk of the heaviest precipitation fell over western Washington (Fig. 3). In terms of percent of normal, a large area from eastern Nevada to eastern Colorado and over the Northern Tier States experienced high weekly percentages. Most of California, southern Arizona, New Mexico and Wyoming experienced much lower percentages (Fig. 3a). Seasonal precipitation (rain & SWE) as a percent of normal for the 2010 Water Year that began on October 1, 2009 shows most of the West at or below normal values this week despite above normal snow water equivalent over much of the Southwest (Fig. 3b).

**WESTERN DROUGHT STATUS**

**The West:** Widespread areas of 2+ inches of precipitation fell over the Pacific Northwest coast this week, but mostly west of the drought areas. Above-normal precipitation was reported over parts of the northern California drought areas, and over northern Idaho and northwest Montana D0 areas, but the amounts were not significant enough to erase the deficits for the last 30 days and longer so no change was made to the USDM depiction.

Below-normal precipitation since the beginning of the water year (which started October 1) was widespread across the interior basin from Nevada and Utah to Idaho. Below-normal mountain snowpack was observed at high elevation SNOTEL stations across this area and into western Wyoming and southern Oregon. Stream base flow levels remained low across northern California to parts of Oregon and Washington.

Snowpack over Arizona was above-normal, but in the Flagstaff area it was melting at a very fast rate. Precipitation across Arizona was well-below normal for the water year-to-date as

## Weekly Snowpack and Drought Monitor Update Report

well as for the calendar year-to-date, and modeled soil moisture was also dry. No change was made to the depiction over Arizona this week. Author: Richard Heim, National Climatic Data Center, NOAA

***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 and 4a).

### **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](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/cgibin/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>.

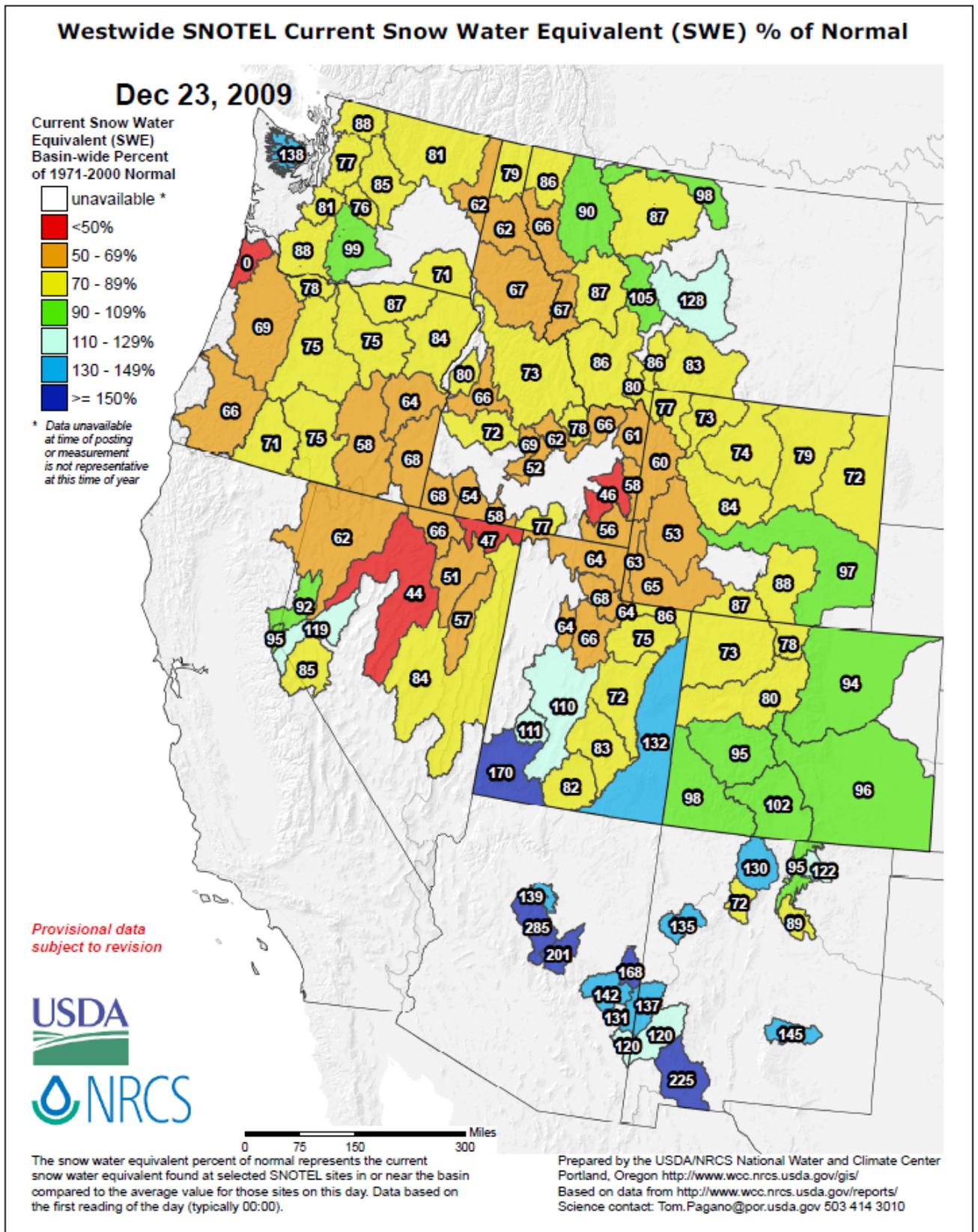
### **FOR MORE INFORMATION**

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>

## **Weekly Snowpack and Drought Monitor Update Report**

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



**Fig 1. SNOTEL Snow-Water Equivalent percent of normal values for 23 December 2009 shows amounts haven't changed appreciably during the past week.**

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

# Weekly Snowpack and Drought Monitor Update Report

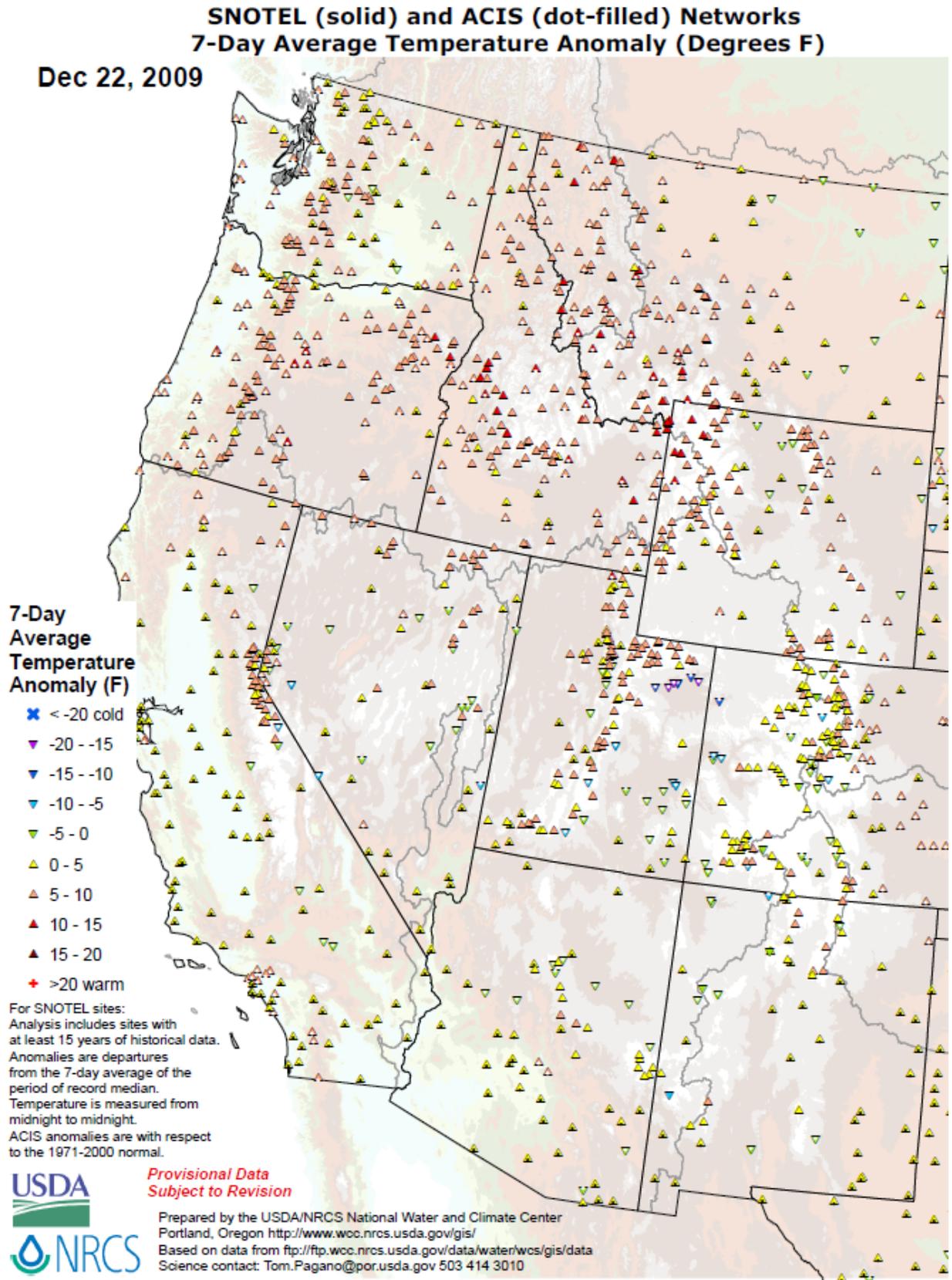
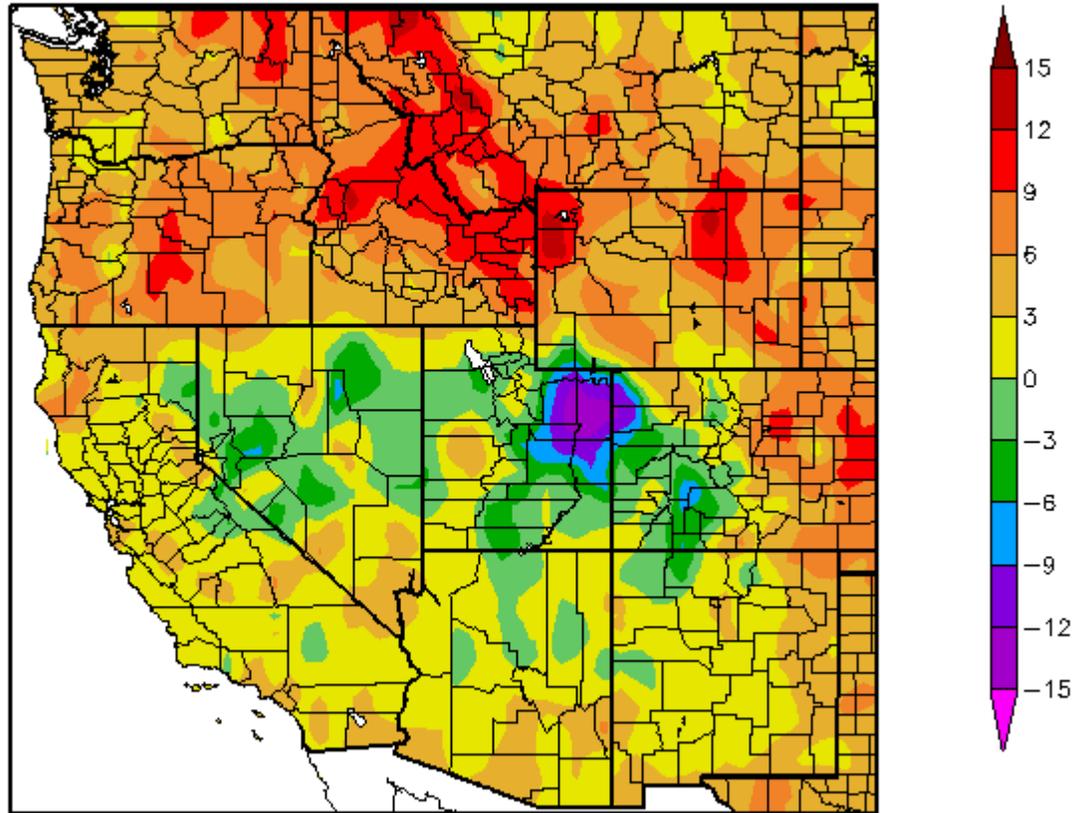


Fig. 2. SNOTEL and ACIS-day station average weekly temperature (ending 22 December) experienced abnormally warmer conditions over the Northern Tier States. Ref: <ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/WestwideTavg7dAnomalyAcis.pdf>

Departure from Normal Temperature (F)  
12/17/2009 – 12/23/2009



Generated 12/24/2009 at HPRCC using provisional data.

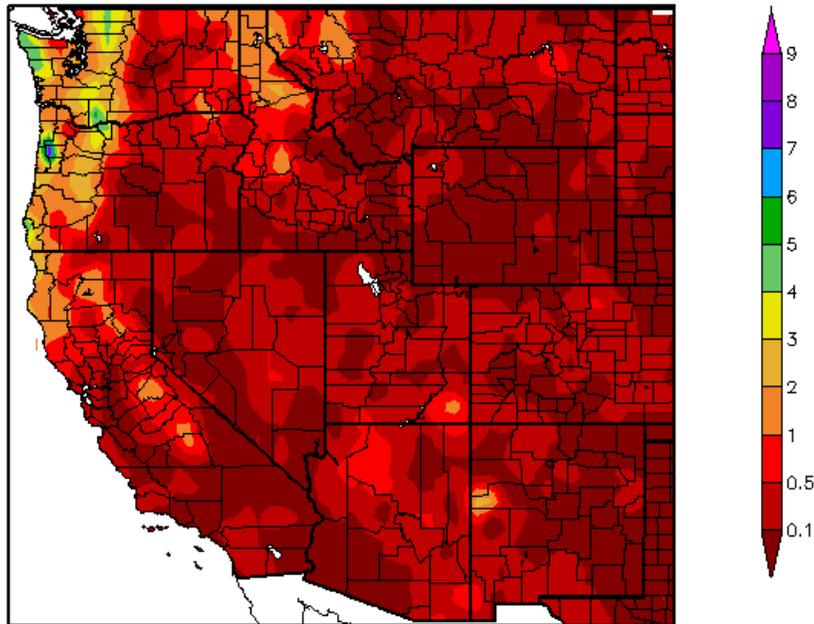
NOAA Regional Climate Centers

**Fig. 2a. ACIS 7-day average temperature anomalies show that the greatest positive temperature departure was scattered across regions of the Northern Rockies (>+12F) and the greatest negative departure occurred over the Uinta Mountains of Utah (<-12F).**

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

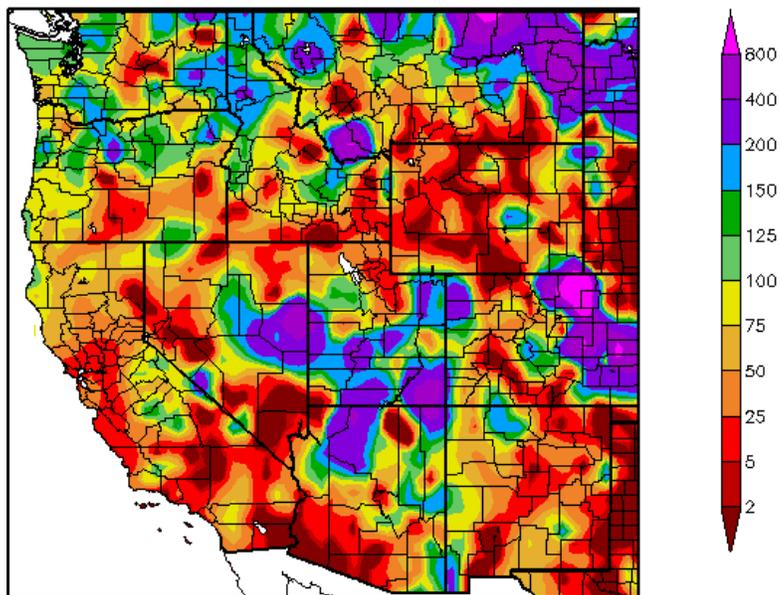
Precipitation (in)  
12/17/2009 - 12/23/2009



Generated 12/24/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

Percent of Normal Precipitation (%)  
12/17/2009 - 12/23/2009



Generated 12/24/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

**Fig. 3. and 3a.** ACIS 7-day average precipitation amounts for the period ending 23 December shows the bulk of the heaviest precipitation fell over western Washington. In terms of percent of normal, a large area from eastern Nevada to eastern Colorado and over the Northern Tier States experienced high weekly percentages. Most of California, southern Arizona, New Mexico and Wyoming experienced much lower percentages. Ref: <http://www.hprcc.unl.edu/maps/current/>.

Weekly Snowpack and Drought Monitor Update Report

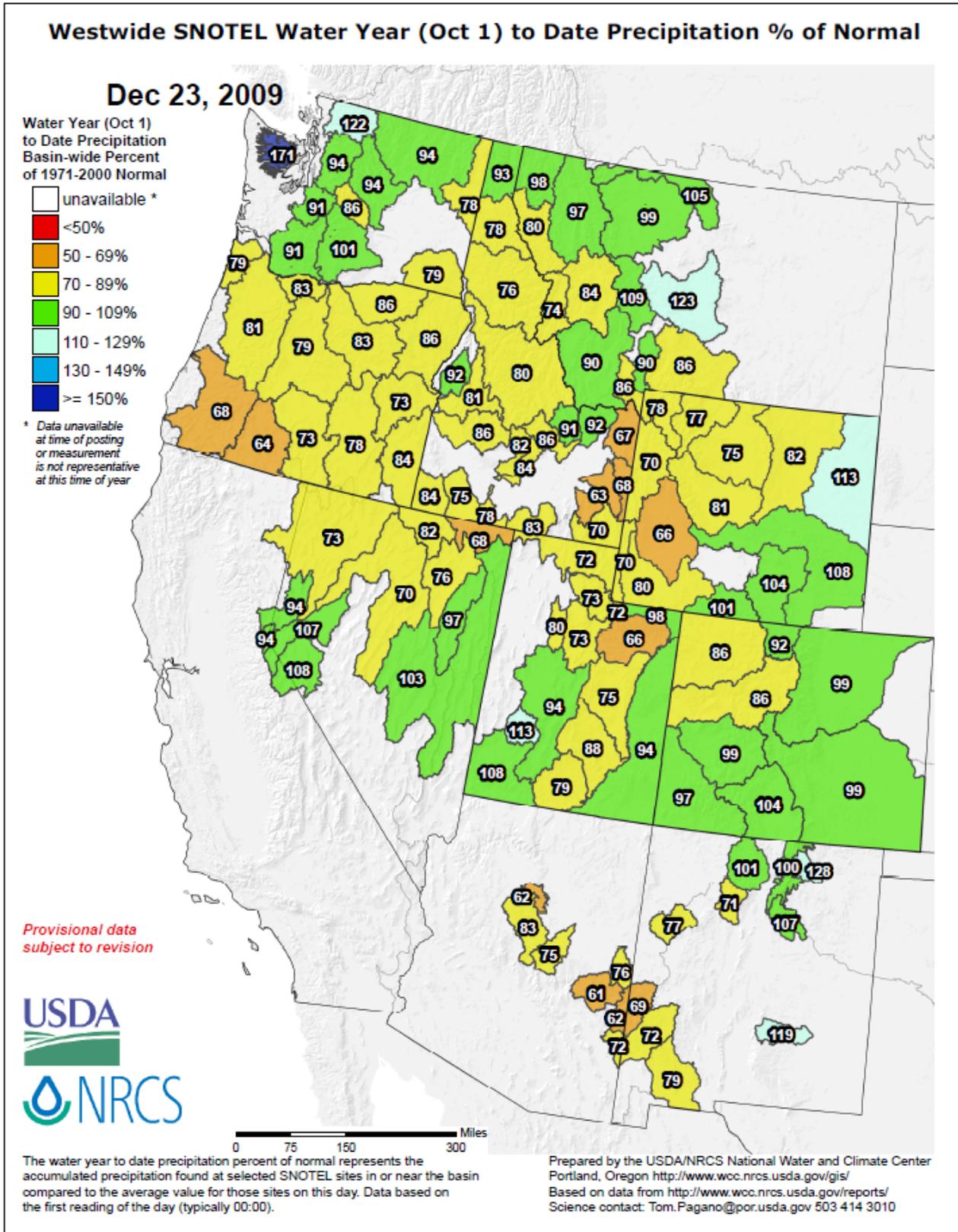
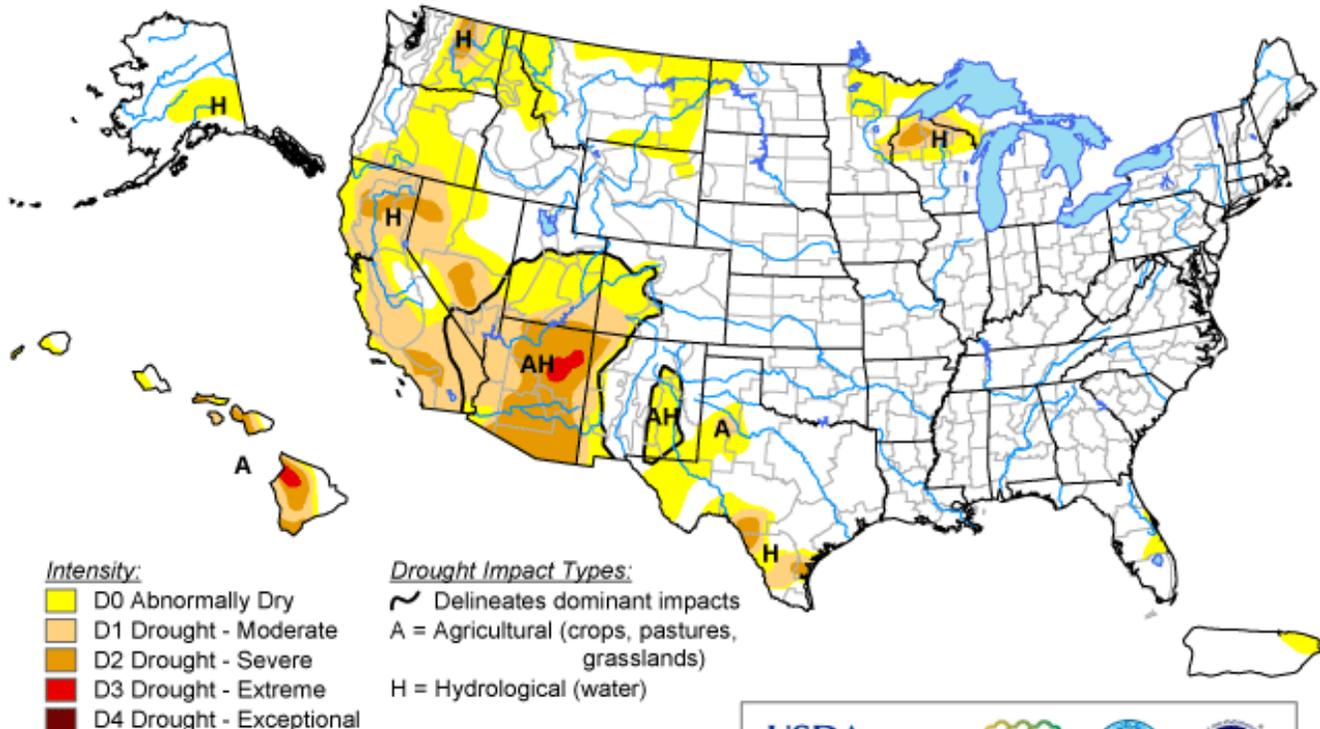


Fig 3b. Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2010 Water Year that began on October 1, 2009 shows most of the West at or below normal values during the week despite above normal snow water equivalent over much of the Southwest.

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

# U.S. Drought Monitor

December 22, 2009  
Valid 7 a.m. EST



Intensity:

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

Drought Impact Types:

- Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

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



Released Thursday, December 24, 2009

Author: Richard Heim/Liz Love-Brotak, NOAA/NESDIS/NCDC

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

Fig. 4. Current Drought Monitor weekly summary.

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

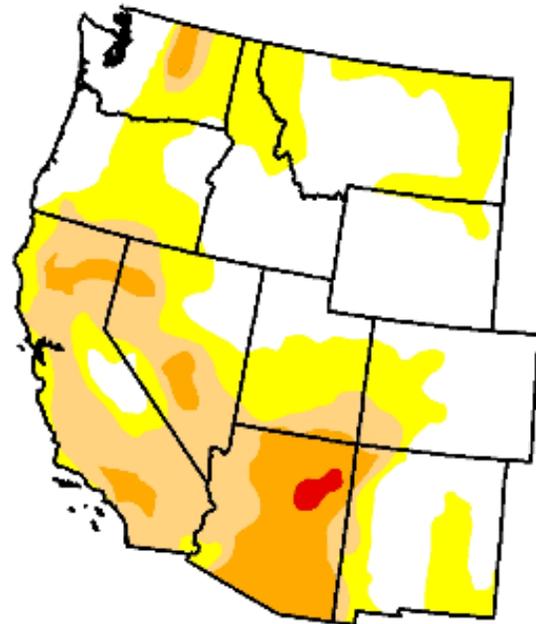
# U.S. Drought Monitor

## West

December 22, 2009  
Valid 7 a.m. EST

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	43.0	57.0	28.4	9.9	0.5	0.0
Last Week (12/15/2009 map)	43.0	57.0	28.4	9.9	0.5	0.0
3 Months Ago (09/29/2009 map)	40.7	59.3	22.8	7.5	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 (12/23/2008 map)	31.5	68.5	30.1	9.0	0.4	0.0



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
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- D4 Drought - Exceptional

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



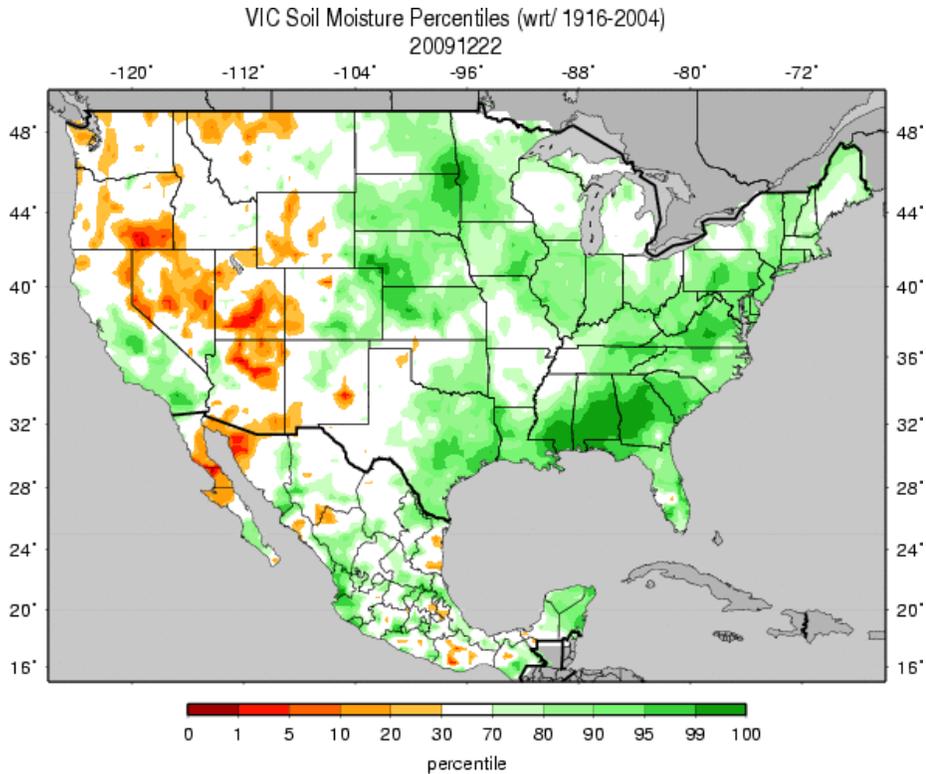
**Released Thursday, December 24, 2009**  
Author: Richard Heim, NOAA/NESDIS/NCDC

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

**Fig. 4a. Drought Monitor for the Western States with statistics over various time periods. Regionally there was no change since last week.**

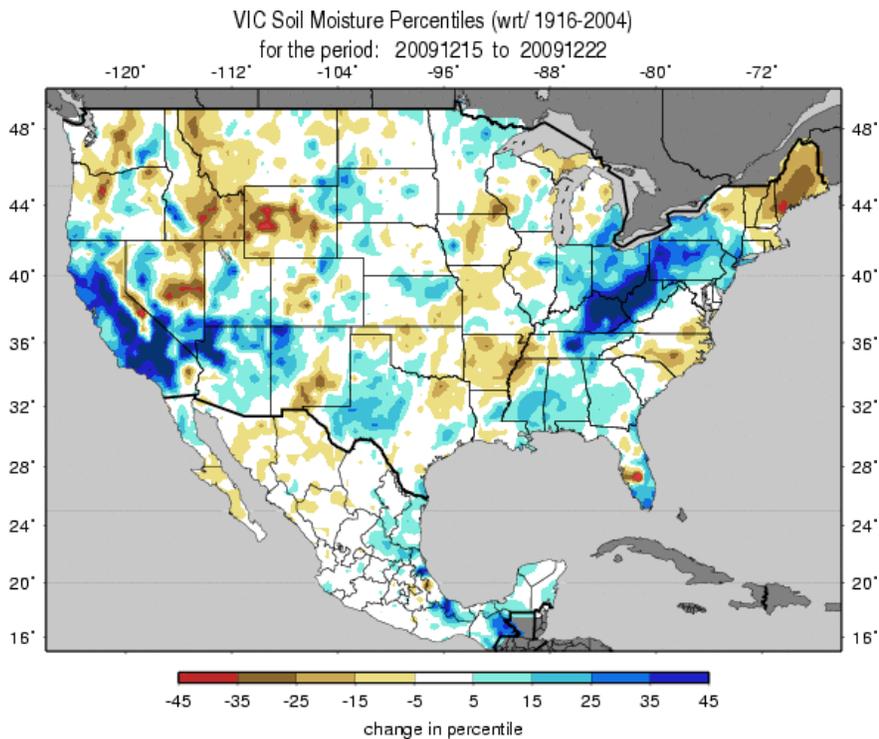
Ref: [http://www.drought.unl.edu/dm/DM\\_west.htm](http://www.drought.unl.edu/dm/DM_west.htm)

# Weekly Snowpack and Drought Monitor Update Report



**Figs. 5a: Soil Moisture ranking in percentile based on 1916-2004 climatology as of 22 December.**

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

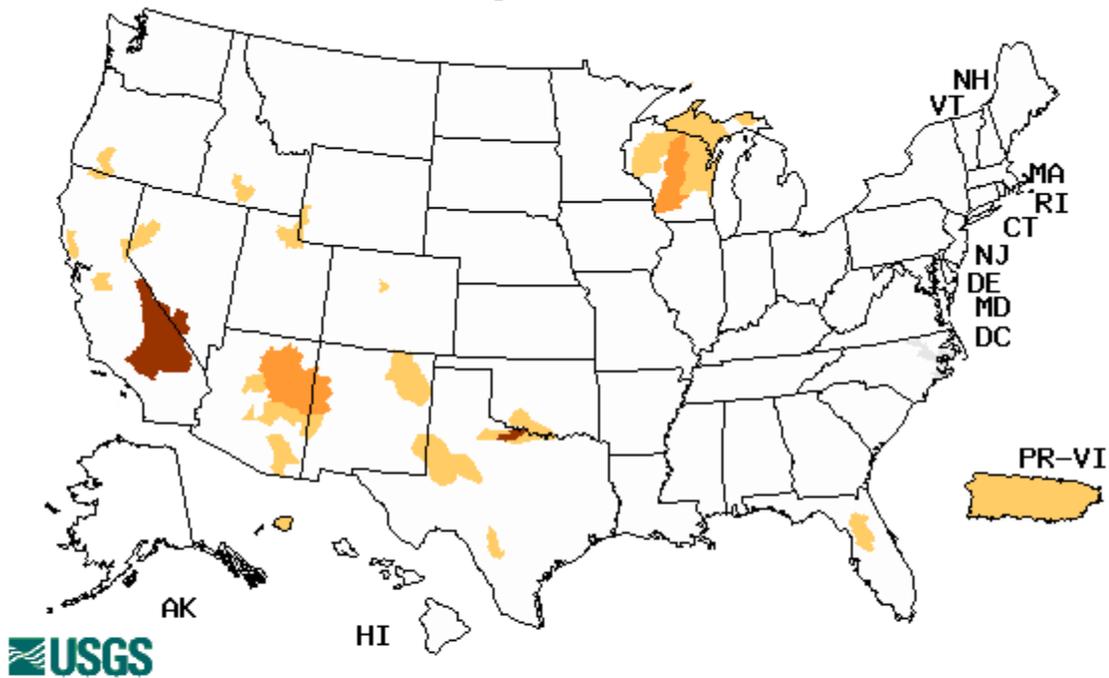


**Figs. 5b: Soil Moisture change in percentile based on 1916-2004 climatology for the week ending 22 December.**

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

# Weekly Snowpack and Drought Monitor Update Report

Hednesday, December 23, 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. 6.** Map of below normal 7-day average streamflow compared to historical streamflow for the day of year. Conditions have worsened over southern California, Note, many streams are frozen and thus the flows become more unreliable during the winter.

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

## Weekly Snowpack and Drought Monitor Update Report

### National Drought Summary -- December 22, 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 weather pattern during this U.S. Drought Monitor (USDM) week (last Tuesday through this Tuesday morning) was a continuation of storm systems embedded in the westerly flow which has characterized much of the month. The week began with beneficial precipitation falling over the drought areas of the Pacific Northwest and Deep South Texas. A strong Gulf of Mexico low pressure system brought heavy rain to the Southeast, including the Florida drought areas, and heavy snow in the colder air along the Appalachians to the mid-Atlantic coast. Another Pacific system moved into the West by the end of the USDM week.

**The Southeast:** Widespread rains of 2 inches or more fell across Indian River and St. Lucie counties in Florida, with some isolated reports of 10" or more. The rain was beneficial in the short-term, but long-term deficits remained over some parts of the Florida drought area. Moderate drought (D1) was eliminated and the area of abnormal dryness (D0) was reduced. The remaining D0 was a reflection of longer-term hydrological impacts.

**The Great Lakes Region:** The drought-affected areas of the region saw no precipitation this week, with continued low streamflows. Persistent long-term deficits resulted in unchanged drought classification in this region.

**The Plains:** In Deep South Texas, widespread 2-inch-plus rains resulted in the contraction of the severe drought (D2) area to Jim Wells, Nueces, and Kleberg counties and contraction of the D1 and D0 to the south. Beneficial rains have given this area a precipitation surplus for recent months and soil moisture has recovered. However, moisture deficits at 9 months to 24 months were significant, with the greatest deficits over the contracted D2 region.

The last several weeks have been very dry across parts of the southern and northern Plains, especially from the northern Texas panhandle, across northern Oklahoma, to southeastern Kansas. The dryness has not caused any notable impacts so far in this winter dry season, so no change was made here to this week's USDM depiction. But this area will be monitored closely as the winter progresses.

**The West:** Widespread areas of 2+ inches of precipitation fell over the Pacific Northwest coast this week, but mostly west of the drought areas. Above-normal precipitation was reported over parts of the northern California drought areas, and over northern Idaho and northwest Montana D0 areas, but the amounts were not significant enough to erase the deficits for the last 30 days and longer so no change was made to the USDM depiction.

Below-normal precipitation since the beginning of the water year (which started October 1) was widespread across the interior basin from Nevada and Utah to Idaho. Below-normal mountain snowpack was observed at high elevation SNOTEL stations across this area and into western Wyoming and southern Oregon. Stream base flow levels remained low across northern California to parts of Oregon and Washington.

## Weekly Snowpack and Drought Monitor Update Report

Snowpack over Arizona was above-normal, but in the Flagstaff area it was melting at a very fast rate. Precipitation across Arizona was well-below normal for the water year-to-date as well as for the calendar year-to-date, and modeled soil moisture was also dry. No change was made to the depiction over Arizona this week.

**Hawaii, Alaska and Puerto Rico:** Eastern Puerto Rico had an inch of rainfall in the last 7 days, but this was still below normal for the week. The eastern half of the island had a below-normal rainfall pattern with 8+ inch deficits in some areas for the last 60 days and 16 inch deficits in places at 180 days. Streams in the northeast were low (both current streamflows and those averaged over the last 28 days reflecting base flow conditions). An area of abnormal dryness (D0) was added to northeast Puerto Rico over the area having the greatest rainfall deficits and lowest streamflows.

The impacts designator was changed from AH to H over the Alaska D0 area, to reflect continuing long-term precipitation deficits and below-normal snowpack. Drought conditions remained unchanged across the Hawaiian Islands. Recent rains in windward locations elevated streamflow but were not significant enough to change the drought depiction.

**Looking Ahead:** Weather systems moving in the westerly flow will bring areas of rain and snow to the country during the next 2 weeks. Above-normal precipitation is expected along the southern tier states from California to the Mid-Atlantic Coast December 29, 2009-January 2, 2010, with below-normal precipitation forecast for the Ohio Valley to northern Rockies. The weather systems will drag cooler-than-normal air behind them as they cross the country, while above-normal temperatures are expected over western Alaska.

For the first week of 2010 (January 1-6), above-normal precipitation is forecast for the Gulf Coast to Mid-Atlantic Coast and much of Montana, with below-normal precipitation on tap for the rest of the West, the central Plains to Ohio Valley, and New England. An upper-air trough with colder-than-normal air is expected to dominate much of the country, while warmer-than-normal air hugs the Pacific Coast.

Below-normal precipitation is forecast for Alaska throughout the period.

**Author:** [Richard Heim, National Climatic Data Center, 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 December 23, 2009