



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

Weekly Report - Snowpack / Drought Monitor Update Date: 9 July 2009

SNOTEL SNOWPACK AND PRECIPITATION SUMMARY

Snow: Snow-water equivalent percent to date shows the last remnants of high altitude snow cover across the West. Snow statistics become less reliable at the end of the Water Year when snow on the ground is rare except at the highest elevations (Fig 1).

Temperature: SNOTEL and ACIS-day station average temperature anomalies were above average over most of the Pacific Northwest and with below average conditions over the Central and Southern Rockies and Coastal California (Fig. 2). ACIS 7-day average temperature anomalies (thru 7 July) show that the greatest positive temperature departures occurred over areas of Oregon and Washington (**>+6F**) and the greatest negative departures occurred over northeast Colorado and the Central Coast of California (**<-4F**) (Fig. 2a).

Precipitation: ACIS 7-day average precipitation anomaly for the period ending 7 July shows and active precipitation pattern across all but the West Coast States (Fig 3). However, note that during this period, rainfall was generally light except in isolated thunderstorms (southern Arizona, eastern New Mexico, and central Wyoming) (Fig. 3a). Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2009 Water Year that began on October 1, 2008 shows surplus values over southern Idaho into Wyoming and eastern Nevada with deficits over the northernmost Tier States and in southwest New Mexico (Fig. 3b).

WESTERN DROUGHT STATUS

The West: Heavy rainfall, with several locations reporting 1 to 4 inches, improved D0 to D1 conditions in Arizona as well as northeastern Montana, with severe drought eliminated in the latter region. Farther west, a detailed re-assessment of central and western Montana led to some expansion of D0 and D1 conditions, with severe drought introduced in part of west-central Montana west of Great Falls, MT. Since early April, only half of normal precipitation fell on the D1 to D2 areas extending from this region northward to the Canadian border.

Most other parts of the West remained seasonably dry. However, in western Washington and northwestern Oregon, where normal rainfall is somewhat higher than in many other parts of the West during the summer, moisture deficits have slowly increased since spring. These areas reported 1.5 to locally 5.0 inches less precipitation than normal since early April, and D0 coverage was expanded as a result. On the other side of the Cascades, much of interior eastern Washington reported less than an inch of precipitation during the last couple of months (less than 50 percent of normal in most locations), inducing a slight expansion D0 and D1 conditions. Farther south, as the seasonably dry summer continued, reports of impacts related to water supplies and potential fire danger later in the season led to an expansion of D1 and D2 conditions in northwestern Nevada, and limited D0 and D1 expansion in parts of northwestern California and southwestern Oregon.

Author: Rich Tinker, CPC/NCEP/NWS/NOAA.

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve maintain and improve our natural resources and environment

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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/>.

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. 6).

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

(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.

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Background of the Tool

Monitoring vegetation health (condition), including drought detection and watch, is based on radiance measurements in the visible (VIS), near infrared (NIR), and 10.3-11.3 micrometers thermal (T) bands (channels) of the Advanced Very High Resolution Radiometer (AVHRR). These measurements are processed to reduce long-term noise. The VIS and NIR values were converted to the Normalized Difference Vegetation Index [$NDVI = (NIR - VIS) / (NIR + VIS)$] and the T to brightness temperature (BT) using a look-up table. The NDVI and BT were filtered in order to eliminate high frequency noise. They were also adjusted for a non-uniformity of the land surface due to climate and ecosystem differences using multi-year NDVI and BT data. The NDVI and BT were converted to the Vegetation Condition Index (VCI), Temperature Condition Index (TCI), and their combination (VT).

U.S. HISTORICAL STREAMFLOW

This map, (Fig. 8) 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.

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/cgi-bin/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

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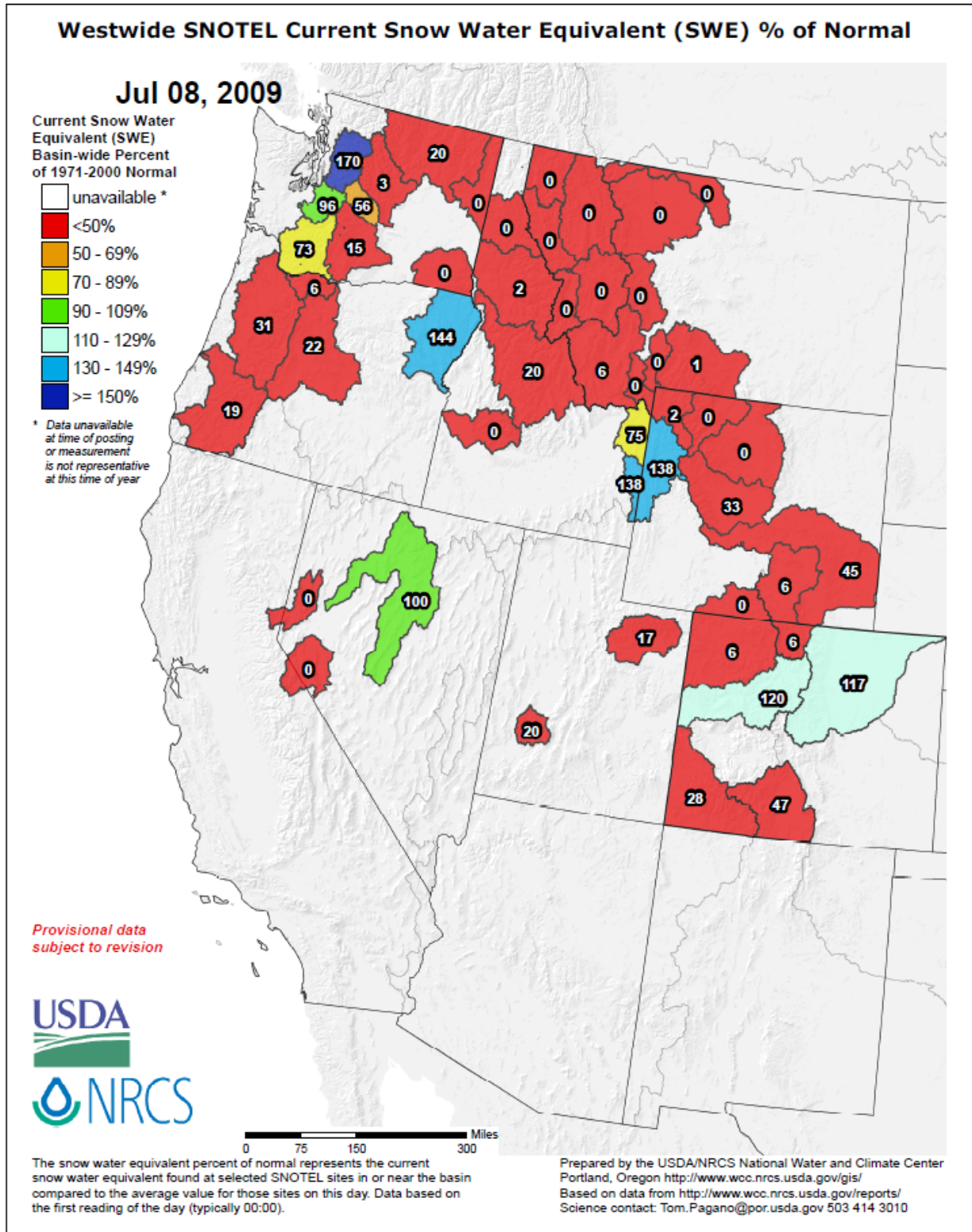


Fig. 1. Snow-water equivalent percent to date shows the last remnants of high altitude snow cover across the West. Snow statistics become less reliable at the end of the Water Year when snow on the ground is rare except at the highest elevations.

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

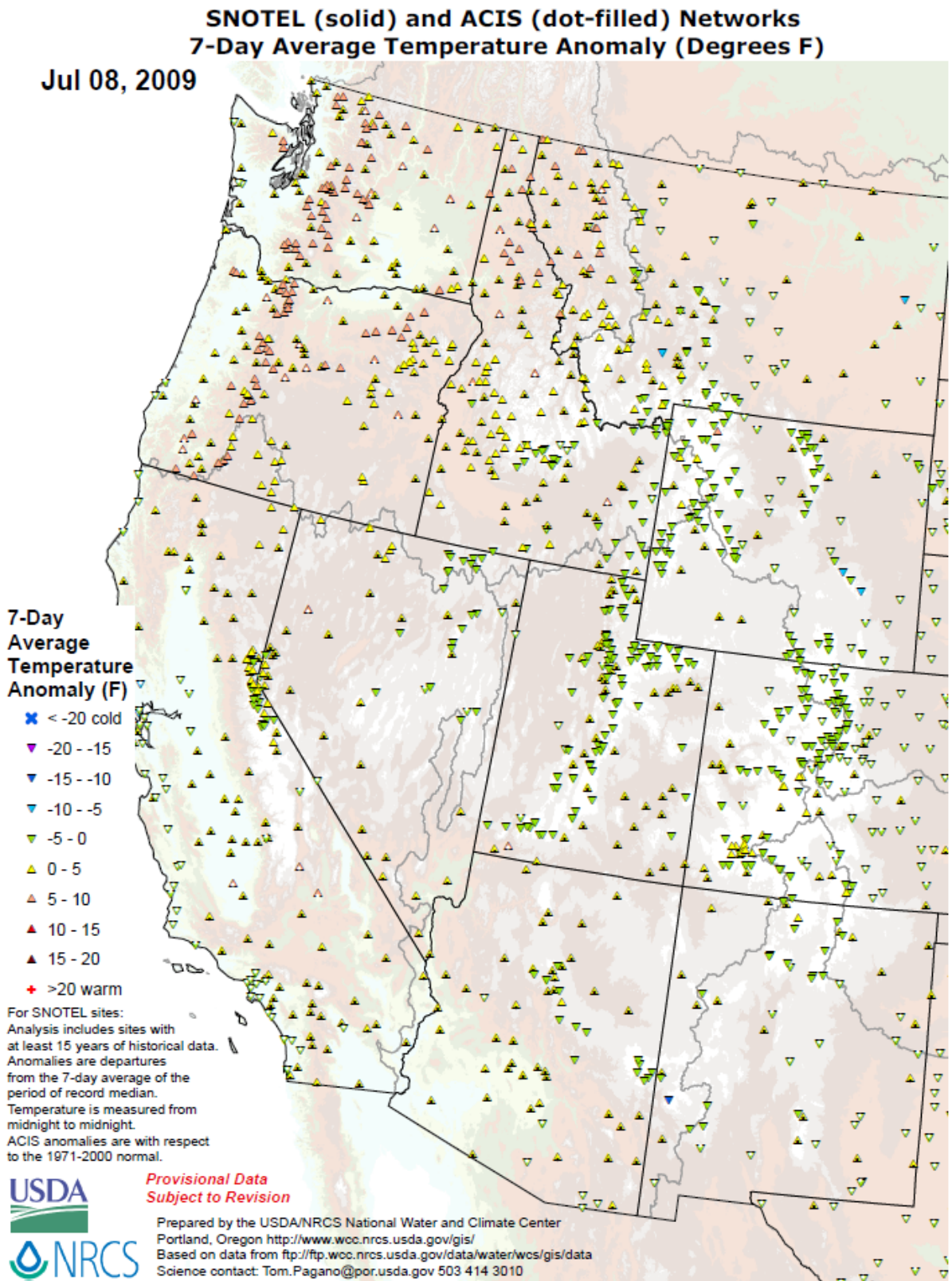
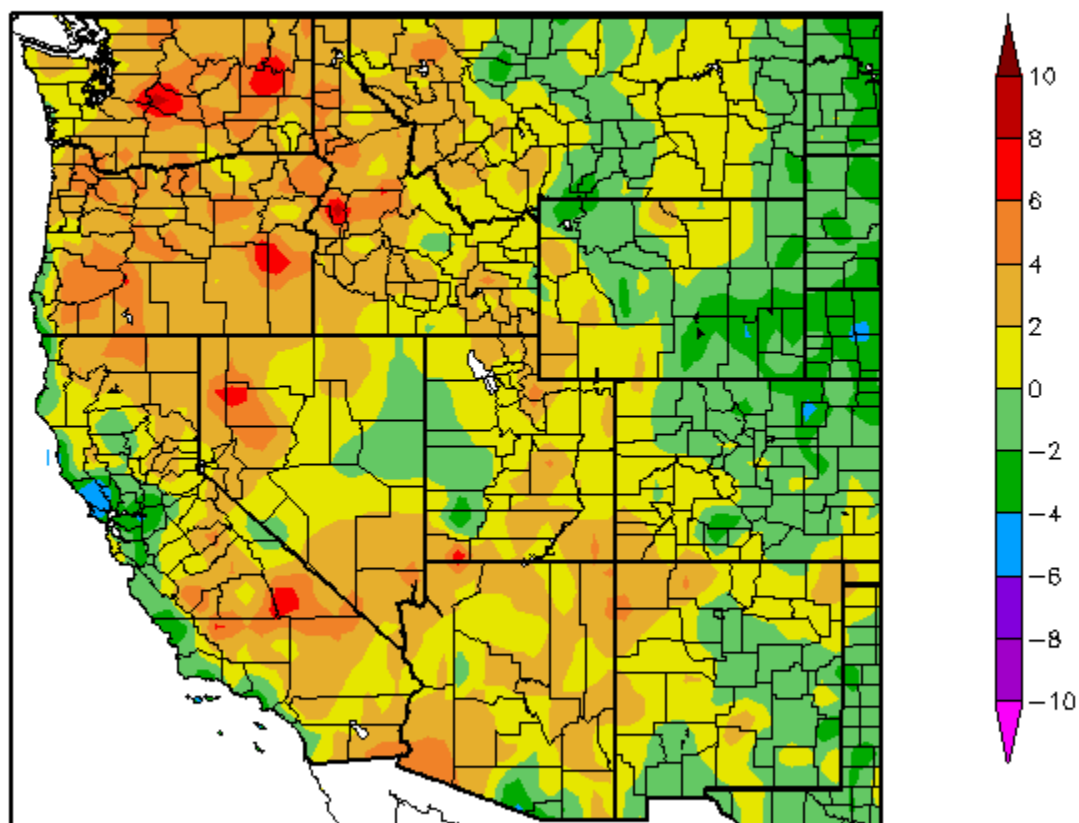


Fig. 2. SNOTEL and ACIS-day station average temperature anomalies were above average over most of the Pacific Northwest and with below average conditions over the Central and Southern Rockies and Coastal California.

Ref: <ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/WestwideTavg7dAnomalyAcis.pdf>

Departure from Normal Temperature (F)
7/1/2009 – 7/7/2009



Generated 7/8/2009 at HPRCC using provisional data.

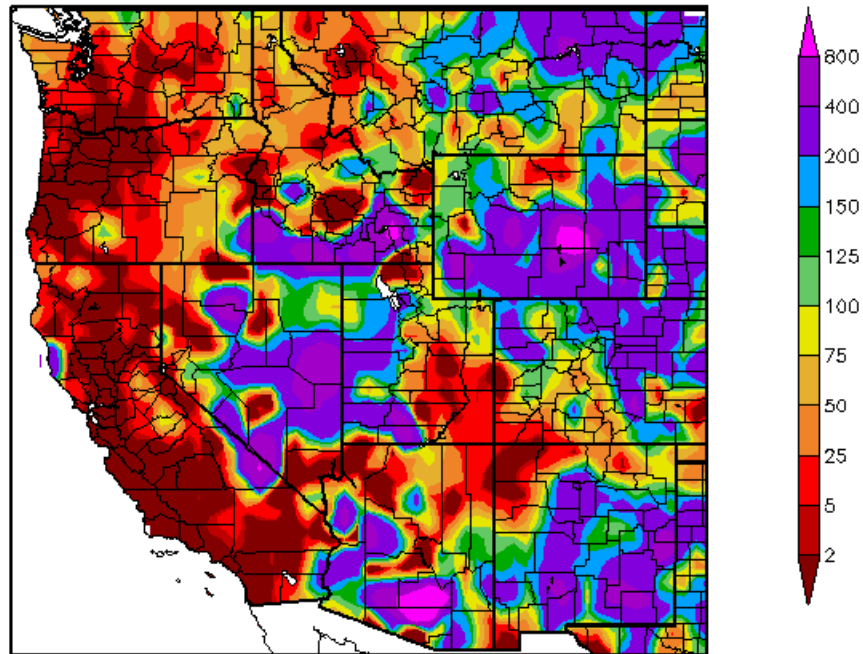
NOAA Regional Climate Centers

Fig. 2a. ACIS 7-day average temperature anomalies (thru 7 July) show that the greatest positive temperature departures occurred over areas of Oregon and Washington (>+6F) and the greatest negative departures occurred over northeast Colorado and the Central Coast of California (<-4F).

Ref: http://www.hprcc.unl.edu/maps/current/index.php?action=update_product&product=TDept

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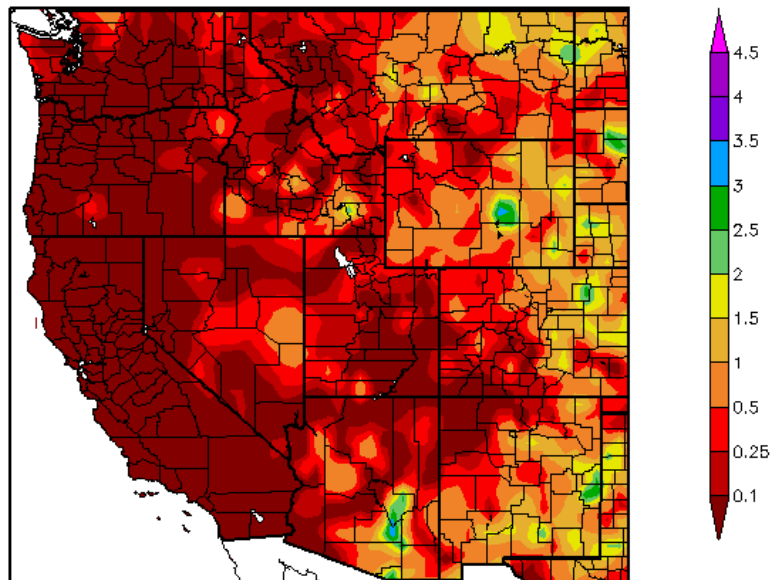
Percent of Normal Precipitation (%)
7/1/2009 – 7/7/2009



Generated 7/8/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

Precipitation (in)
7/1/2009 – 7/7/2009



Generated 7/8/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

Fig. 3. and 3a. ACIS 7-day average precipitation anomaly for the period ending 7 July shows and active precipitation pattern across all but the West Coast States. However, note that during this period, rainfall was generally light except in isolated thunderstorms (southern Arizona, eastern New Mexico, and central Wyoming).

Ref: http://www.hprcc.unl.edu/maps/index.php?action=update_product&product=PNorm

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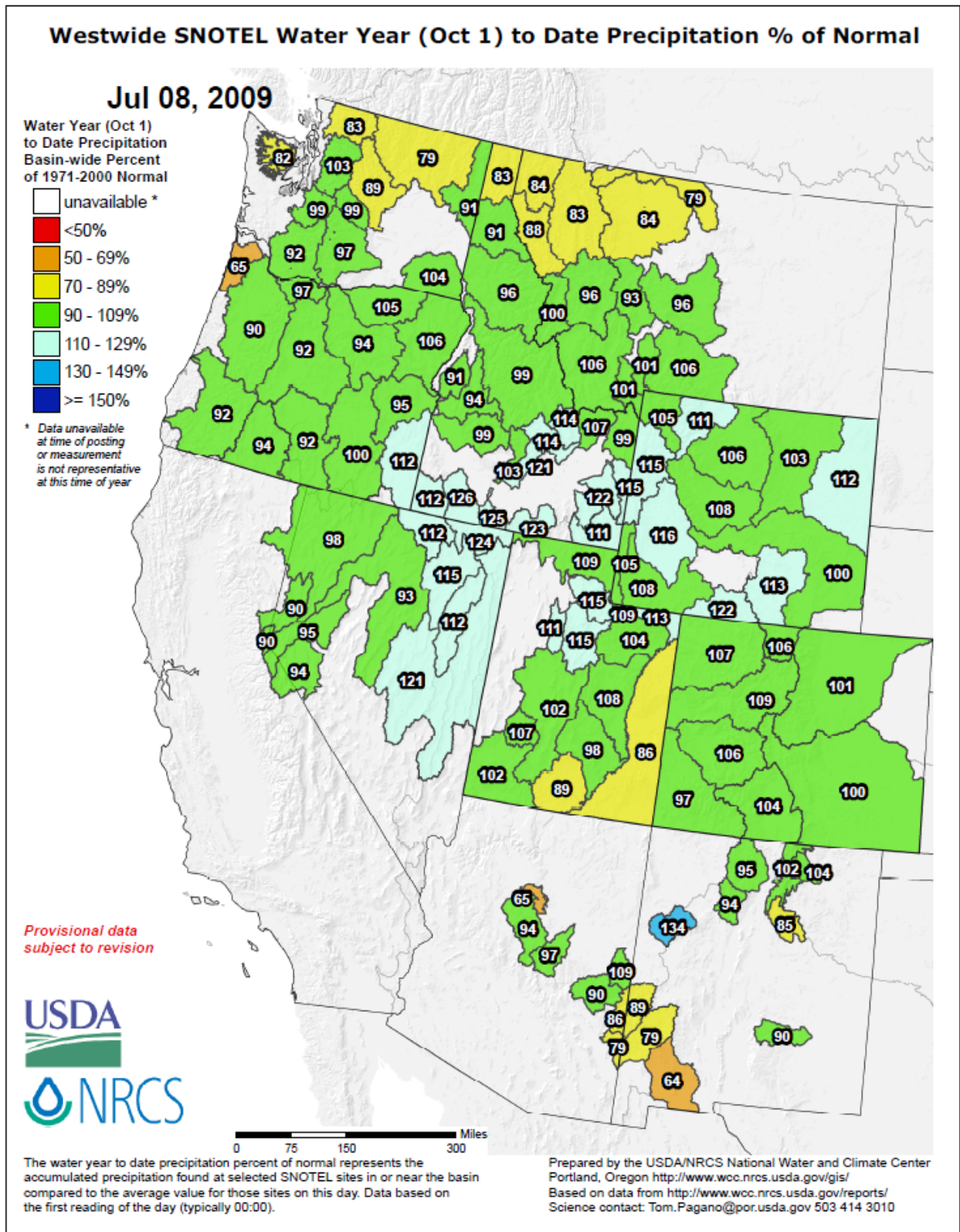


Fig 3b. Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2009 Water Year that began on October 1, 2008 shows surplus values over southern Idaho into Wyoming and eastern Nevada with deficits over the northernmost Tier States and ino southwest New Mexico.

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

U.S. Drought Monitor

July 7, 2009
Valid 8 a.m. EDT

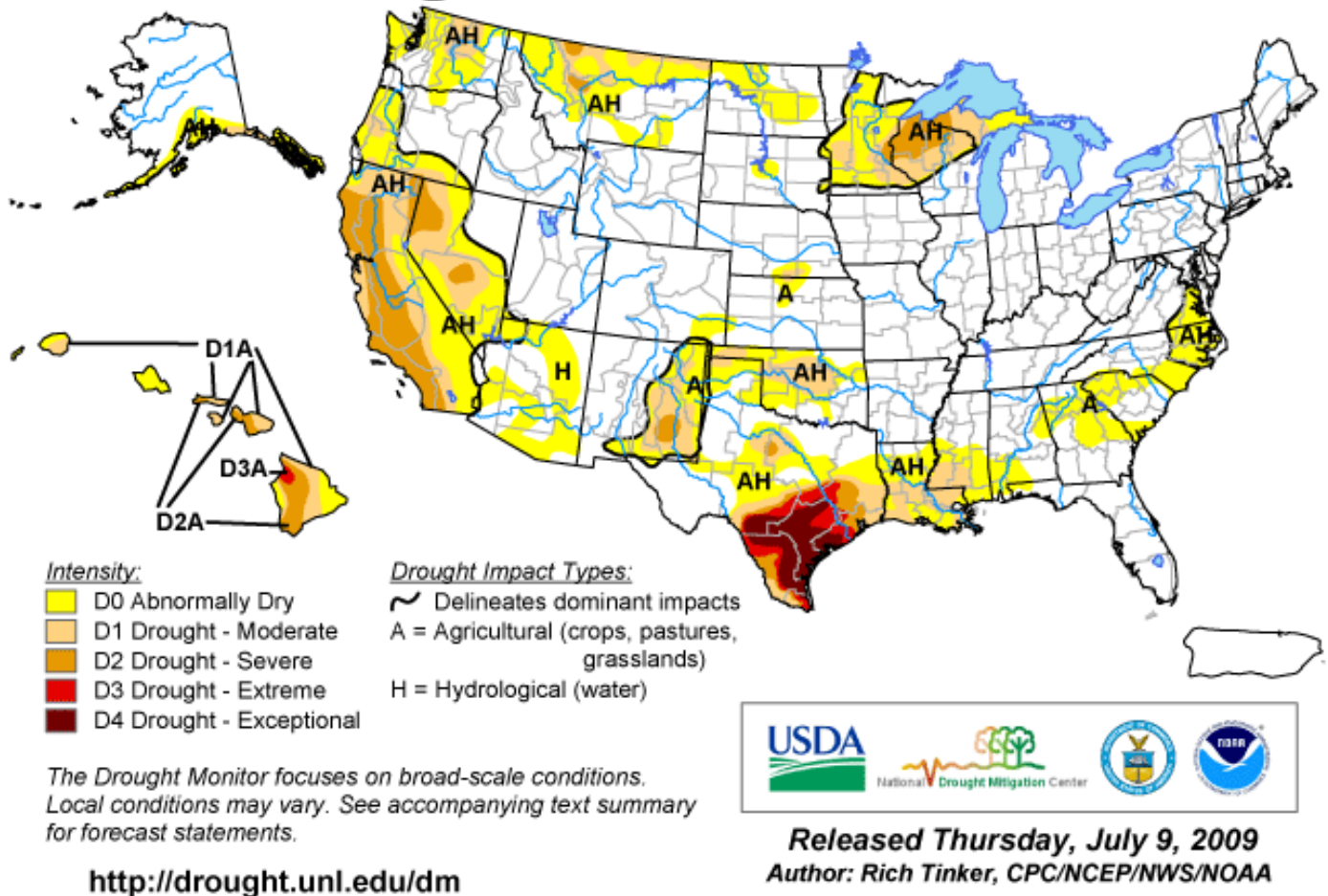


Fig. 4. Current Drought Monitor weekly summary.

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

U.S. Drought Monitor

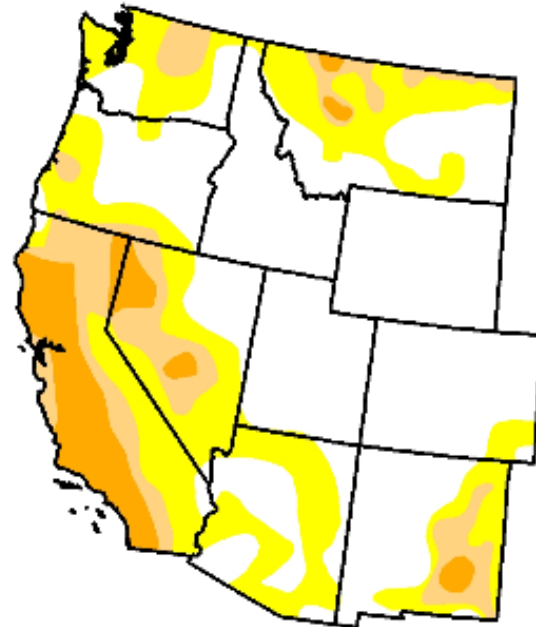
West

July 7, 2009
Valid 7 a.m. EST

Drought Conditions (Percent Area)						
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	55.3	44.7	18.4	7.6	0.0	0.0
Last Week (06/30/2009 map)	55.1	44.9	17.9	7.1	0.0	0.0
3 Months Ago (04/14/2009 map)	34.7	65.3	25.6	7.1	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 (10/07/2008 map)	41.3	58.7	28.6	10.4	0.1	0.0
One Year Ago (07/08/2008 map)	39.9	60.1	34.5	9.0	1.7	0.1

Intensity:

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



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, July 9, 2009

Author: R. Tinker, CPC/NOAA

Fig. 4a. Drought Monitor for the Western States with statistics over various time periods. Regionally, conditions have remained unchanged during the past week.

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

U.S. Drought Monitor

Texas

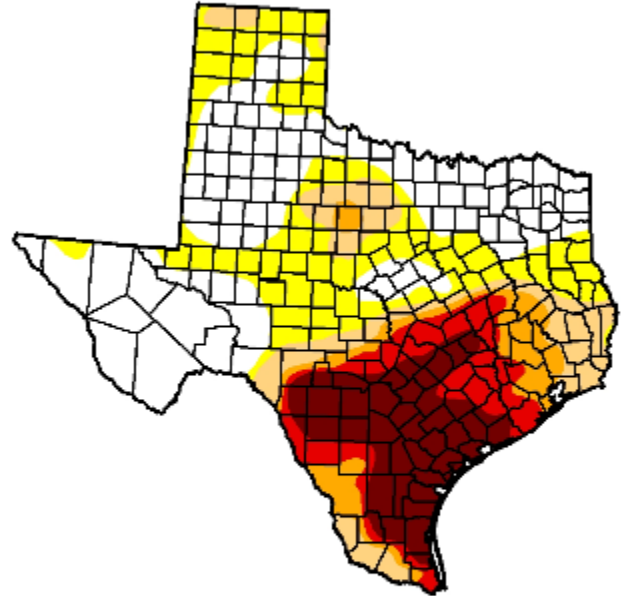
July 7, 2009

Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	37.7	62.3	39.4	28.8	22.4	14.1
Last Week (06/30/2009 map)	28.2	71.8	38.4	27.9	20.0	11.1
3 Months Ago (04/14/2009 map)	14.9	85.1	68.2	50.6	25.1	11.5
Start of Calendar Year (01/06/2009 map)	41.7	58.3	24.5	15.0	9.1	4.2
Start of Water Year (10/07/2008 map)	67.2	32.8	20.5	11.0	3.6	0.0
One Year Ago (07/08/2008 map)	12.4	87.6	64.0	44.9	22.6	4.6

Intensity:

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



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

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



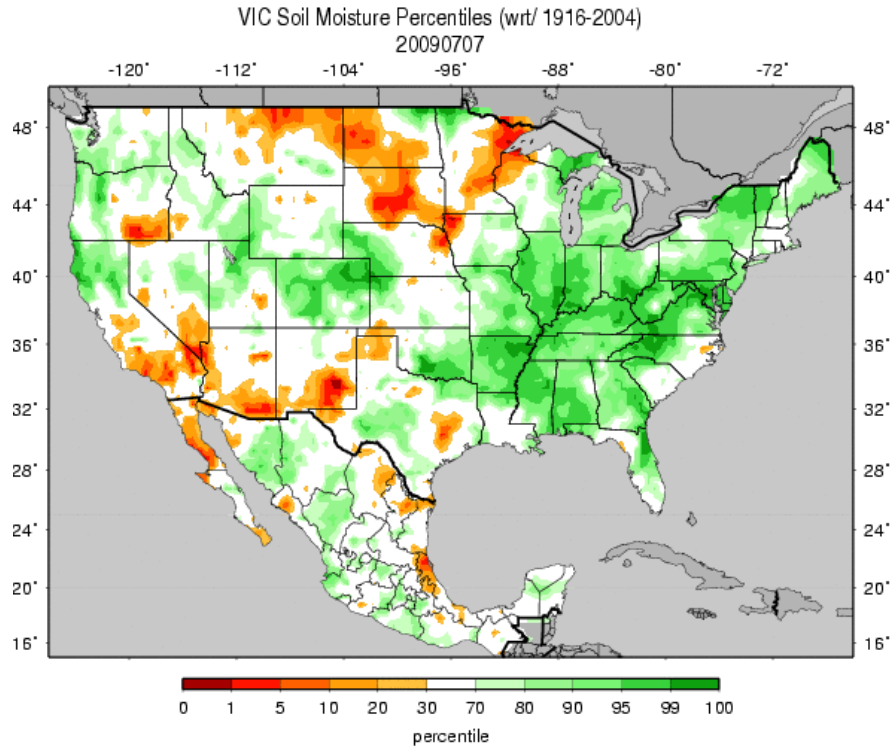
Released Thursday, July 9, 2009

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Fig. 4b: Texas is the only state with D4 drought condition in the US. Note conditions have deteriorated slightly in the D3-D4 categories since last week.

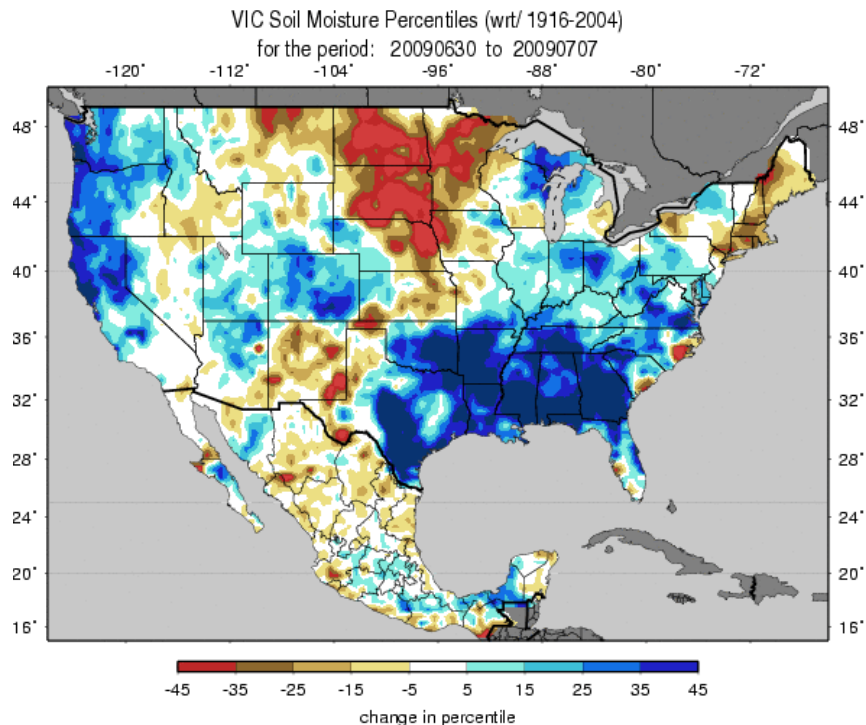
Ref: http://www.drought.unl.edu/dm/DM_state.htm?TX,S

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Figs. 5a: Soil Moisture ranking in percentile based on 1916-2004 climatology as of 7 July. Near saturation exists over the eastern third of the Nation, while excessive dryness is scattered across the Southwest and Northern Plains. 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 this past week. There was significant moistening over the Southeast into Texas and over the Pacific Northwest Coast. Excessive drying is noted over the Northern Great Plains. Ref:

http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt_1wk.gif

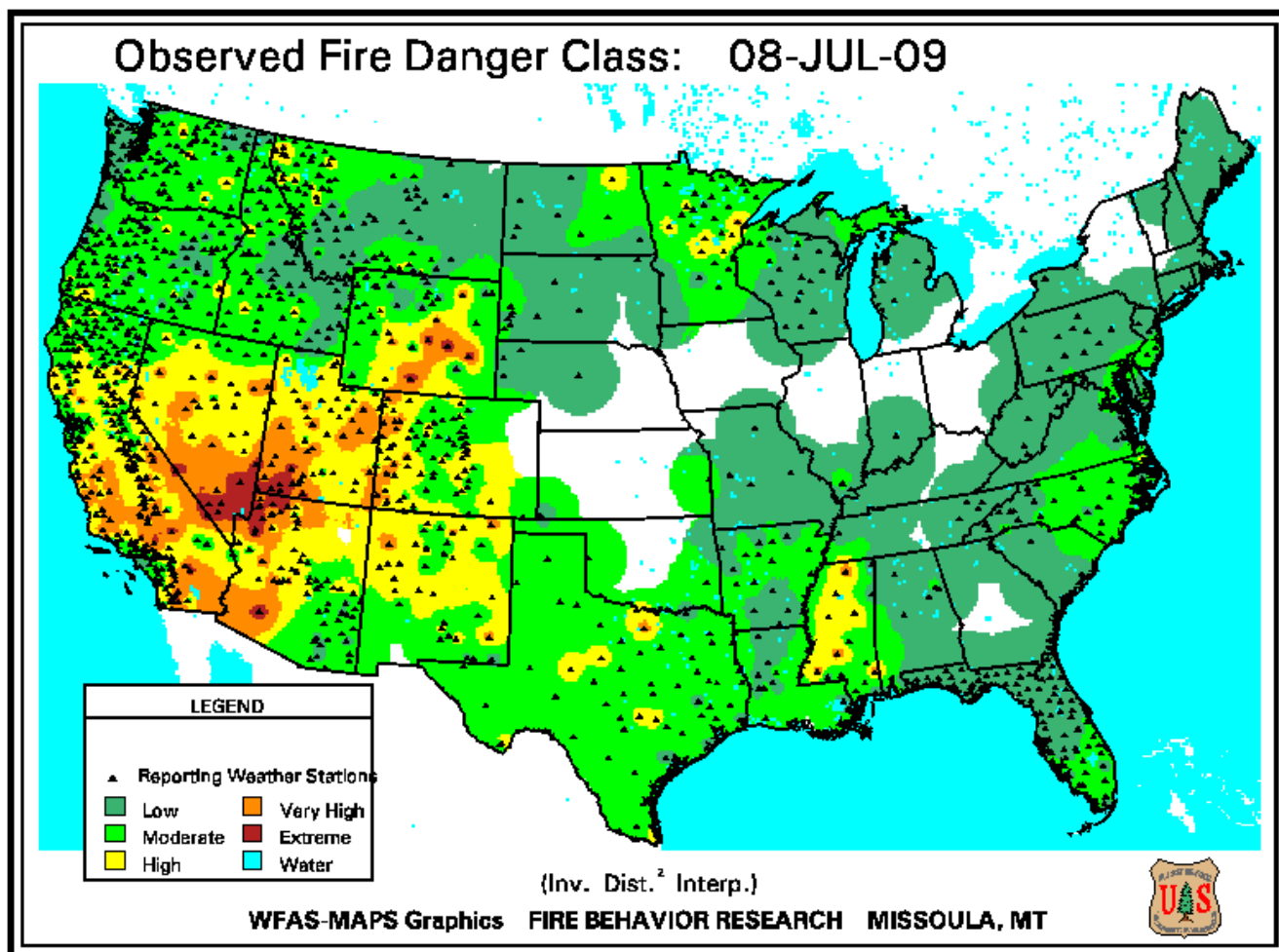


Fig. 6. Observed Fire Danger Class. Conditions have deteriorated once again over the Southern Great Basin, southern California, and into Wyoming. Alabama continues to show elevated fire risk. Ref: http://www.wfas.net/images/firedanger/fd_class.gif

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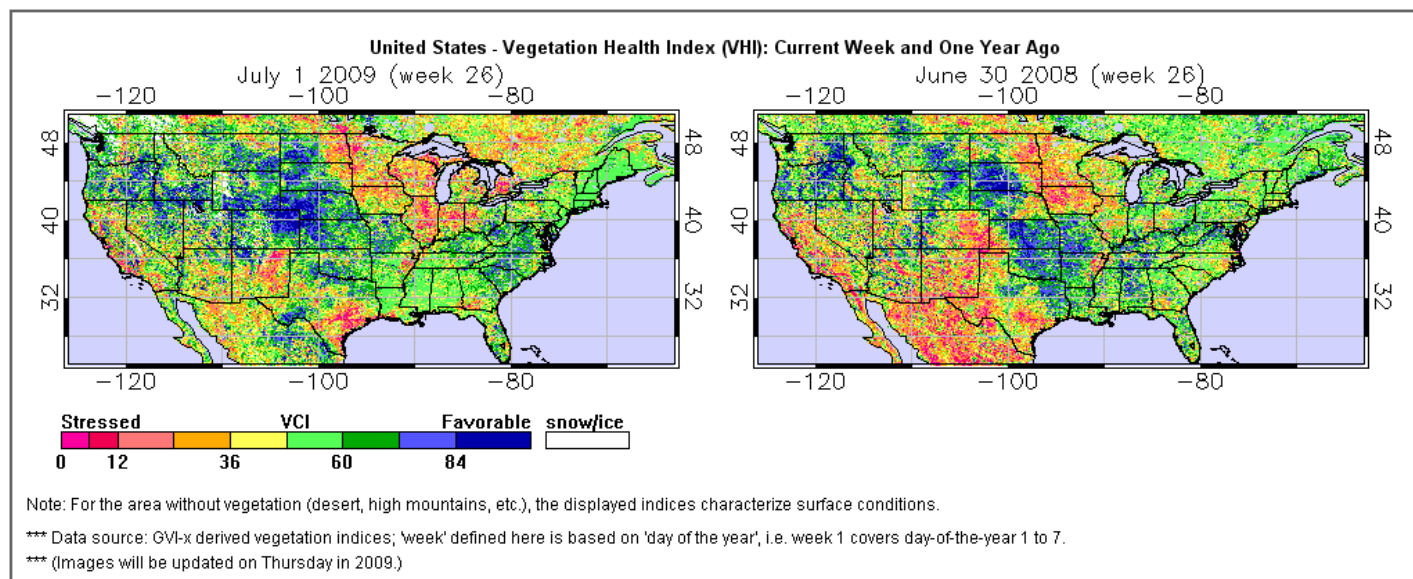
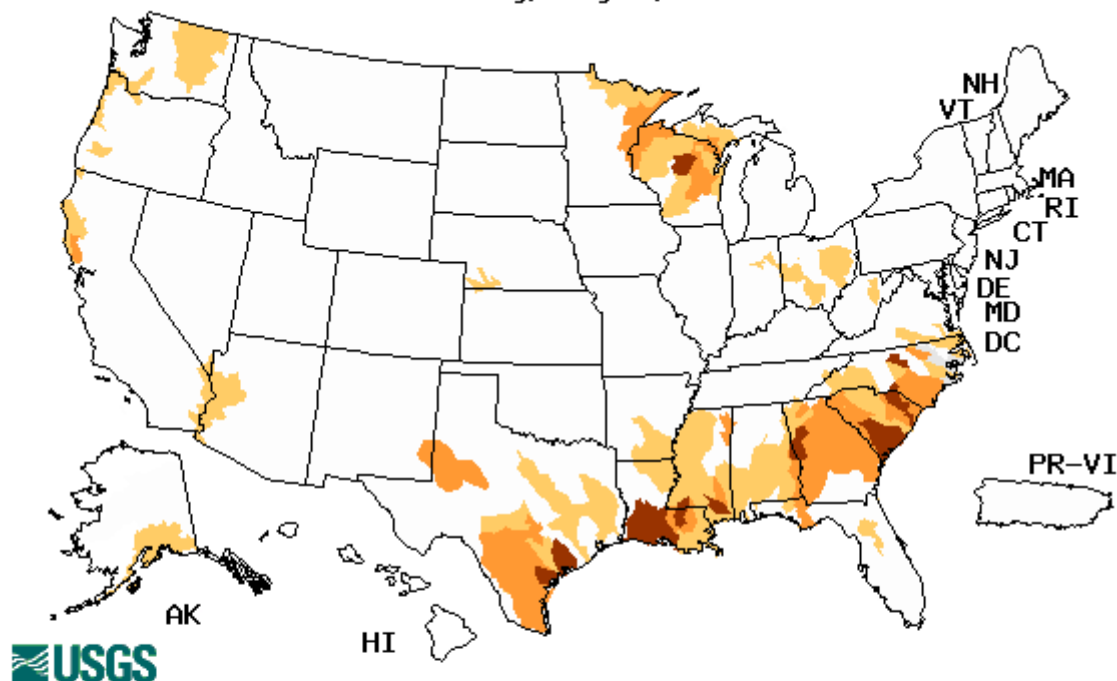


Fig. 7. Vegetation Drought Response Index: Note the comparison to last year. The upper mid-west, New Mexico, and southern Texas are significantly stressed while the Western Plains show favorable conditions this week. (Note these charts are a week old).

Ref: http://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh_currentImage.php

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Tuesday, July 07, 2009



Choose a data retrieval option and select a state on the map

☐ State DroughtWatch, ☒ State map

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. 8. Map of below normal 7-day average streamflow compared to historical streamflow for the day of year. Conditions over parts of Texas and eastward into South Carolina are considered severe. Northern Wisconsin is also showing severe streamflow levels.

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

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National Drought Summary -- July 7, 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/>.

Significant rainfall evaded most areas of severe to exceptional drought this past week, although quite a few locations experiencing D0 to D1 conditions recorded at least moderate totals. Rainfall was lacking once again across significant portions of the Southeast, prompting expansion of abnormally dry conditions into several areas from Alabama through the Carolinas, primarily for agricultural impacts and surface moisture shortages. Farther north and west, spotty relief was observed through the dry areas in the Plains and Rockies, but seasonably dry weather along the West Coast and continued low precipitation totals through Hawaii and southern Alaska allowed dryness to persist or intensify in those areas.

The Southeast: Although moderate to locally heavy rains fell on several areas from Mississippi through the Carolinas, amounts sufficient to improve conditions in existing dry areas were limited to southern Tennessee and adjacent Alabama, and parts of southern Louisiana. The spotty moderate amounts that fell on other areas of dryness and drought provided enough moisture to hold off any deterioration, but not enough for any substantial improvement.

Some areas near the central Gulf Coast and a large area covering east-central Alabama, much of central and northern Georgia, most of southern and upstate South Carolina, and adjacent North Carolina received only light rainfall for at least the third consecutive week. This dryness is short-lived but has been quite intense, quickly depleting surface moisture. Most of these areas reported less than 0.5 inch of rain during the last 2 weeks, and less than 2 inches of rain since early June. Declining near-surface soil moisture and low streamflows have been observed throughout these regions, thus DOA was introduced in this developing area of short-term dryness.

Upper Midwest: Dry weather was again observed over most of this region, although 1 to locally 3 inches of rain fell on a few sites in southwestern Minnesota and adjacent South Dakota. Fortunately, cooler than normal conditions accompanied the dryness, bringing at least temporary declines in water demand and evaporation rates. The continued lack of precipitation, however, led to a northward expansion of D2 through northern Wisconsin and adjacent Michigan, some D1 expansion in western Minnesota and the central Upper Peninsula of Michigan, and an extension of abnormal dryness through north-central Minnesota and the eastern Upper Peninsula. Most of these areas received less than 70 percent of normal precipitation since the beginning of the year, and deficits of 8 to nearly 16 inches have accumulated over the last 12 months across northern Wisconsin and east-central Minnesota.

The Plains: Stark heat and dryness again dominated the areas most seriously impacted by drought, specifically central and southern Texas. Although substantial rainfall (1 to 4 inches with isolated totals topping 6 inches) fell on numerous locations in other parts of Texas, eastern New Mexico, southern Oklahoma, and Louisiana, little rainfall reached areas from San Antonio, TX to Houston, TX and points south. As a result, D2 to D4 conditions expanded again this week, with severe drought reaching into the Houston, TX and Galveston, TX metropolitan areas, and exceptional drought spreading from central Texas into a broad area along the Gulf

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Coast from north of Brownsville, TX through Corpus Christi, TX and Victoria, TX. Precipitation totals for the central and northern reaches of the D2 to D4 areas ranged from 8 to locally more than 20 inches below normal over the past 12 months, and significantly below-normal precipitation dates back almost 2 years through a large portion of central and upper southern Texas.

In other parts of the Plains, the aforementioned areas of moderate to locally heavy rainfall allowed for some reduction in D0 to D2 conditions from the southern High Plains eastward through parts of Oklahoma, the northern half of Texas, and Louisiana, although most areas remained unchanged from last week. Farther north, scattered moderate rainfall prompted limited contraction of D0 and D1 conditions in north-central Kansas, adjacent Nebraska, and South Dakota while drier weather led to an expansion of D0 in a swath from southeastern through northwestern North Dakota.

The West: Heavy rainfall, with several locations reporting 1 to 4 inches, improved D0 to D1 conditions in Arizona as well as northeastern Montana, with severe drought eliminated in the latter region. Farther west, a detailed re-assessment of central and western Montana led to some expansion of D0 and D1 conditions, with severe drought introduced in part of west-central Montana west of Great Falls, MT. Since early April, only half of normal precipitation fell on the D1 to D2 areas extending from this region northward to the Canadian border.

Most other parts of the West remained seasonably dry. However, in western Washington and northwestern Oregon, where normal rainfall is somewhat higher than in many other parts of the West during the summer, moisture deficits have slowly increased since spring. These areas reported 1.5 to locally 5.0 inches less precipitation than normal since early April, and D0 coverage was expanded as a result. On the other side of the Cascades, much of interior eastern Washington reported less than an inch of precipitation during the last couple of months (less than 50 percent of normal in most locations), inducing a slight expansion D0 and D1 conditions. Farther south, as the seasonably dry summer continued, reports of impacts related to water supplies and potential fire danger later in the season led to an expansion of D1 and D2 conditions in northwestern Nevada, and limited D0 and D1 expansion in parts of northwestern California and southwestern Oregon.

Alaska and Hawaii: Another week of generally subnormal rainfall increased concerns and impacts related to surface moisture and agriculture in central parts of the state as severe drought expanded into central and southern Maui and the western half of Molokai. Extreme drought was introduced in a small part of northwestern Hawaii Island, but for eastern sections of the Island, June rainfall was enough to ease moderate drought.

Little or no rain last week kept abnormal dryness and moderate drought intact across the southern tier of Alaska. Yakutat, AK reported 9.51 inches of precipitation during April – June 2009, their second driest such period in 60 years of records (7.27 inches, 1954). In a broad area extending from Kodiak Island and south-central Alaska southeastward through the Panhandle, only 35 to 75 percent of normal precipitation was reported since early April.

Looking Ahead: The next 5 days (July 9 – 13, 2009) could bring heavy rain (1 to 3 inches) to southern South Carolina and east-central Georgia. Moderate to heavy amounts (0.5 to 2.0 inches) are forecast for the drought-plagued sections of the Great Lakes region and upper Mississippi Valley. Lesser totals (0.25 to locally over 1.00 inch) are expected through the central and northern Plains, the Mississippi Delta, south-central Alabama, central and northeastern Georgia, and upstate South Carolina. Other areas experiencing abnormal dryness or drought across the contiguous 48 states are only expected to receive a few tenths of an inch of rain at best, and unfortunately no measurable rain is forecast for the parched sections of Texas. For the ensuing 5 days (July 14 – 18, 2009), below-normal precipitation is again

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expected across Texas, in addition to much of the Southeast, the lower Mississippi Valley, the southern Plains, the climatologically dry areas from west-central Oregon southeastward through western Arizona, and southeastern Alaska. Meanwhile, the odds favor above-normal precipitation in most of the Rockies, areas from the central and northern Plains northeastward through western Minnesota and southern Wisconsin, and southwestern Alaska.

Author: [Rich 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 July 8, 2009