United States Department of Agriculture

NRCS

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

Weekly Report - Snowpack / Drought Monitor Update Date: 16 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 Southwest and with below average conditions over the Intermountain West (Fig. 2). ACIS 7-day average temperature anomalies show that the greatest positive temperature departures occurred over eastern New Mexico and southeast Arizona (>+8F) and the greatest negative departures occurred over southeastern Oregon and north-central Nevada (<-6F) (Fig. 2a).

Precipitation: ACIS 7-day average precipitation amounts for the period ending 15 July shows widely scattered thunderstorm activity across the Northern Tier States with light rain over western Oregon. Typical dry conditions prevailed elsewhere (Fig 3 and 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 over southwestern New Mexico and northwestern Oregon (Fig. 3b).

WESTERN DROUGHT STATUS

The West: Monsoon showers were mostly confined to southern and eastern portions of the Four Corners Region, offering minimal relief from long-term drought. Meanwhile, an upper-air disturbance triggered beneficial showers (up to an inch) across northern portions of the region, although rain was largely hit and miss. A reassessment of the situation in Montana from experts in the field resulted in some modifications to the current drought depiction, with expanding drought noted in western and central portions of the state, while recent heavy rain in northeastern Montana reduced the coverage of D0 and D1. Author: Eric Luebehusen, United States Department of Agriculture

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, 4b, and 4c).

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.

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 [NDV I= (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/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

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

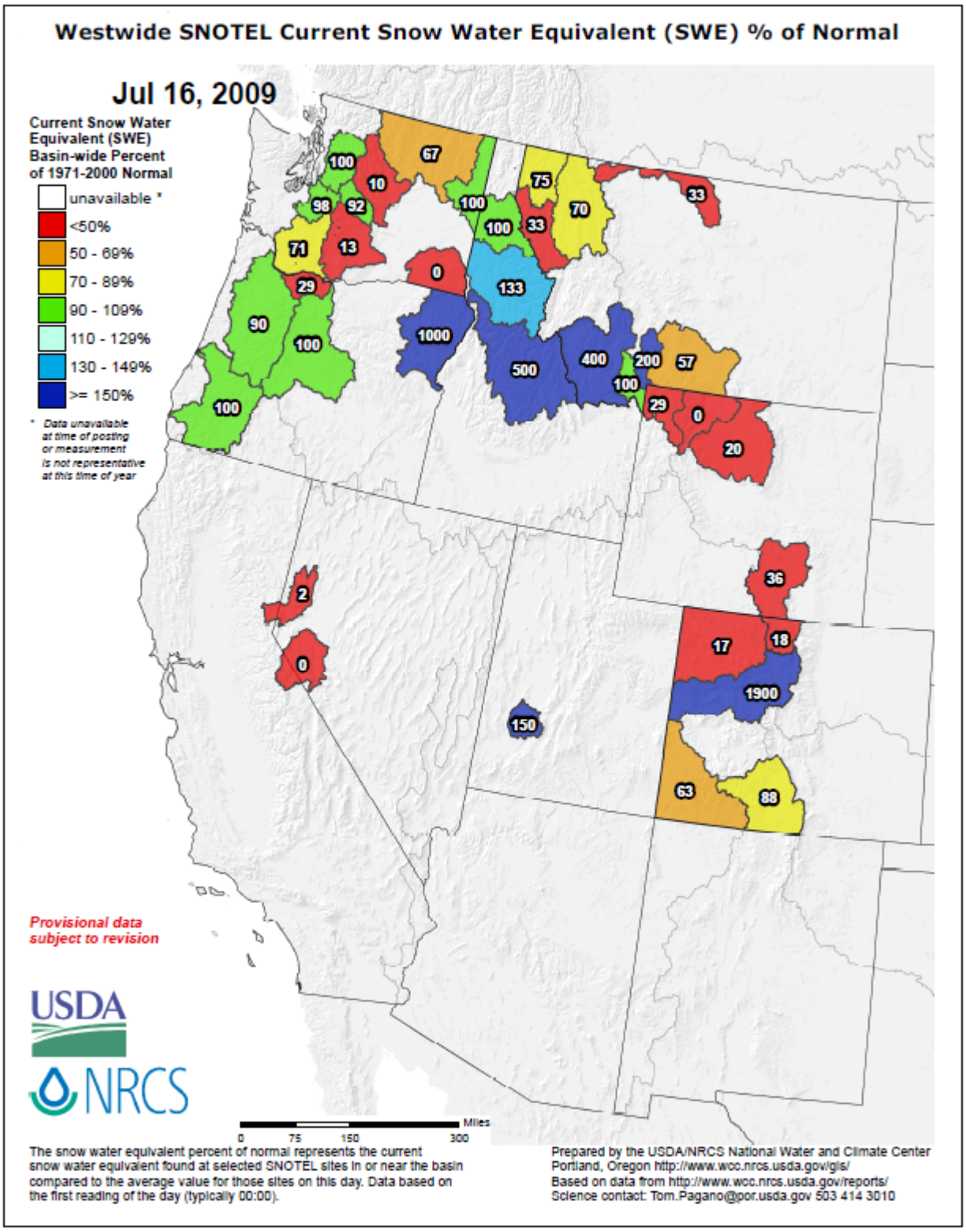


Fig. 1. Snow-water equivalent percent to date shows the last remnants of high altitude snow cover across the West. Snow statistics become less reliable at the end of the Water Year when snow on the ground is rare except at the highest elevations. This will be the last map shown this water year.
Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west_swepctnormal_update.pdf

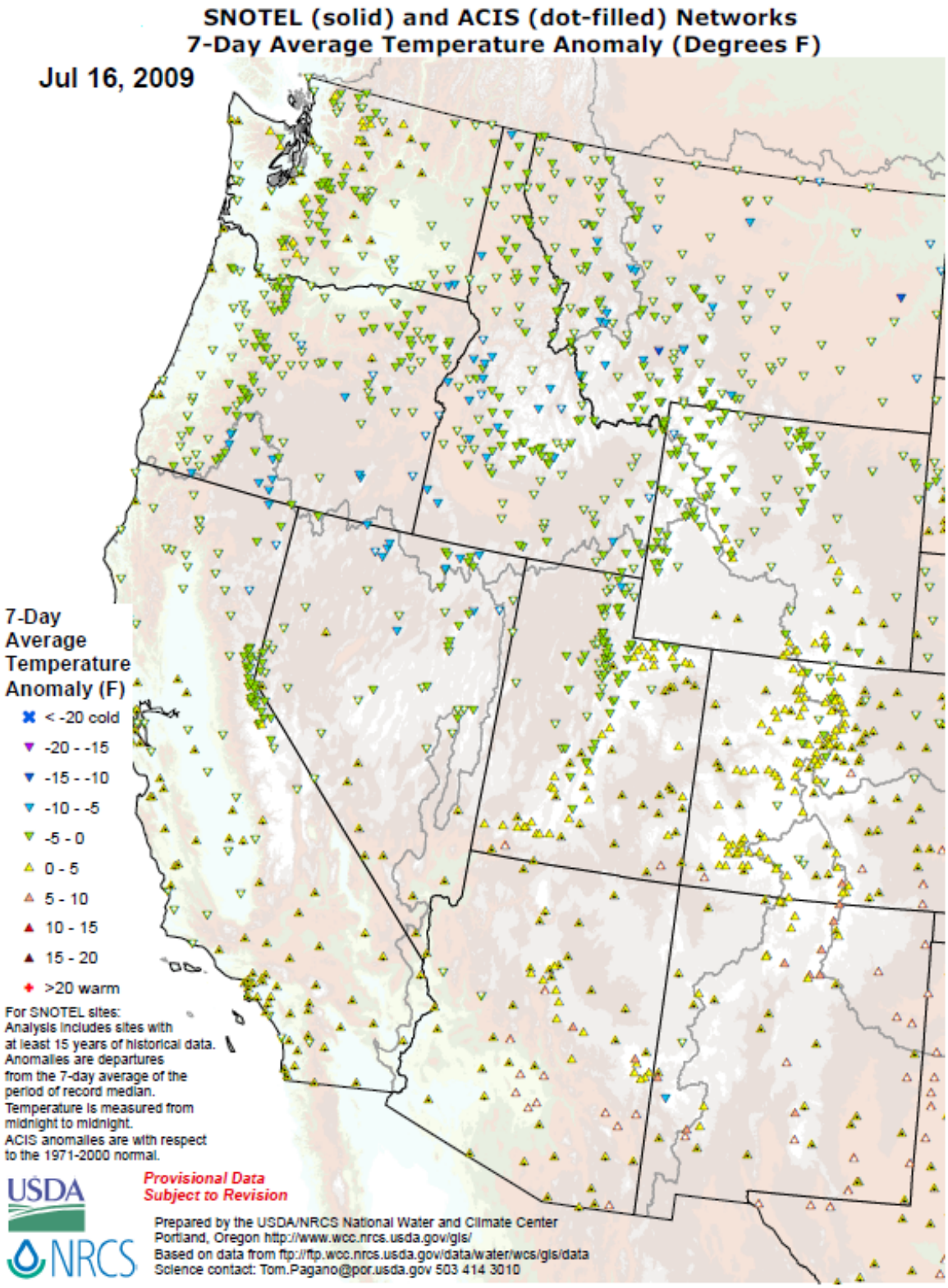


Fig. 2. SNOTEL and ACIS-day station average temperature anomalies were above average over most of the Southwest and with below average conditions over the Intermountain West. Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/WestwideTavg7dAnomalyAcis.pdf

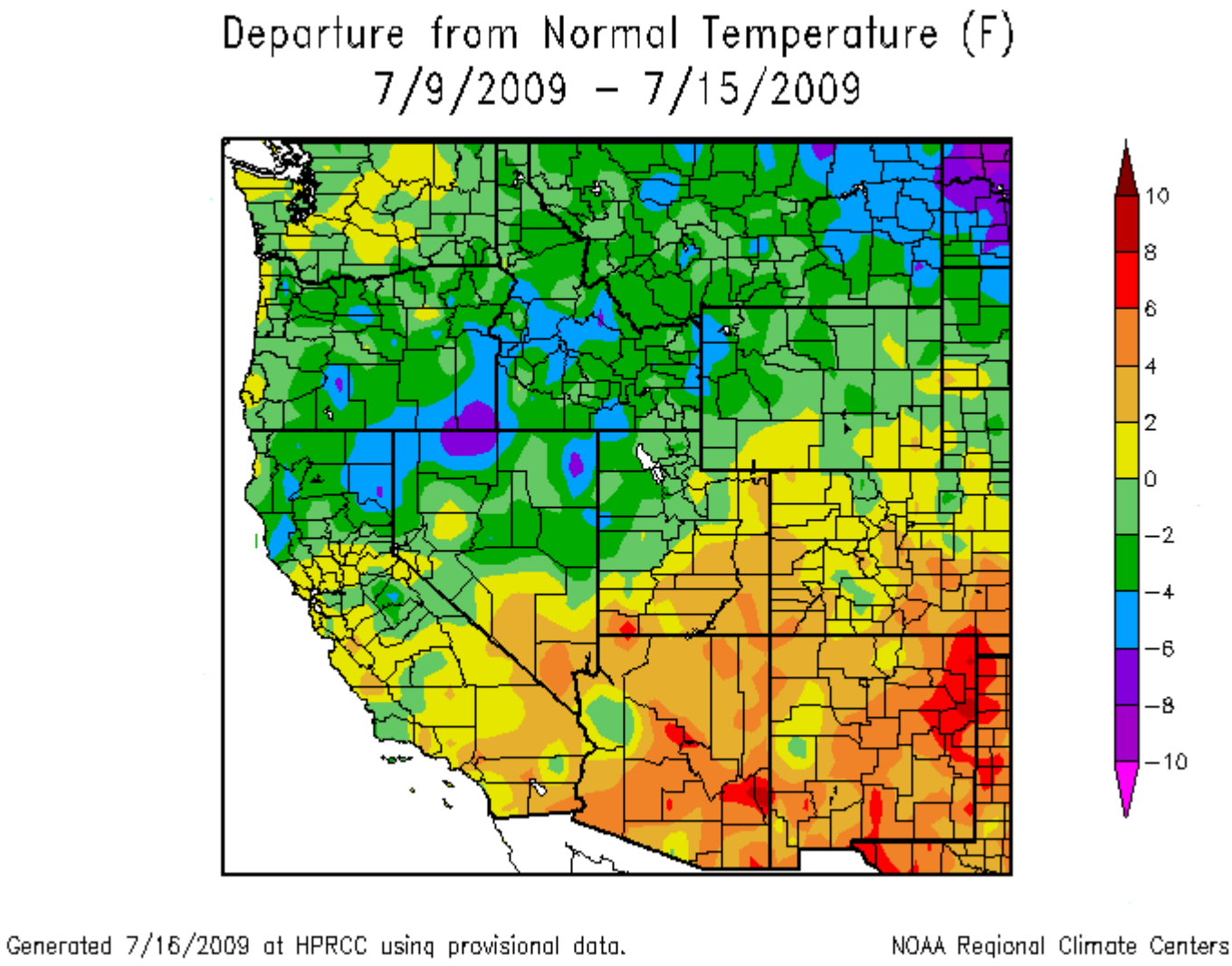
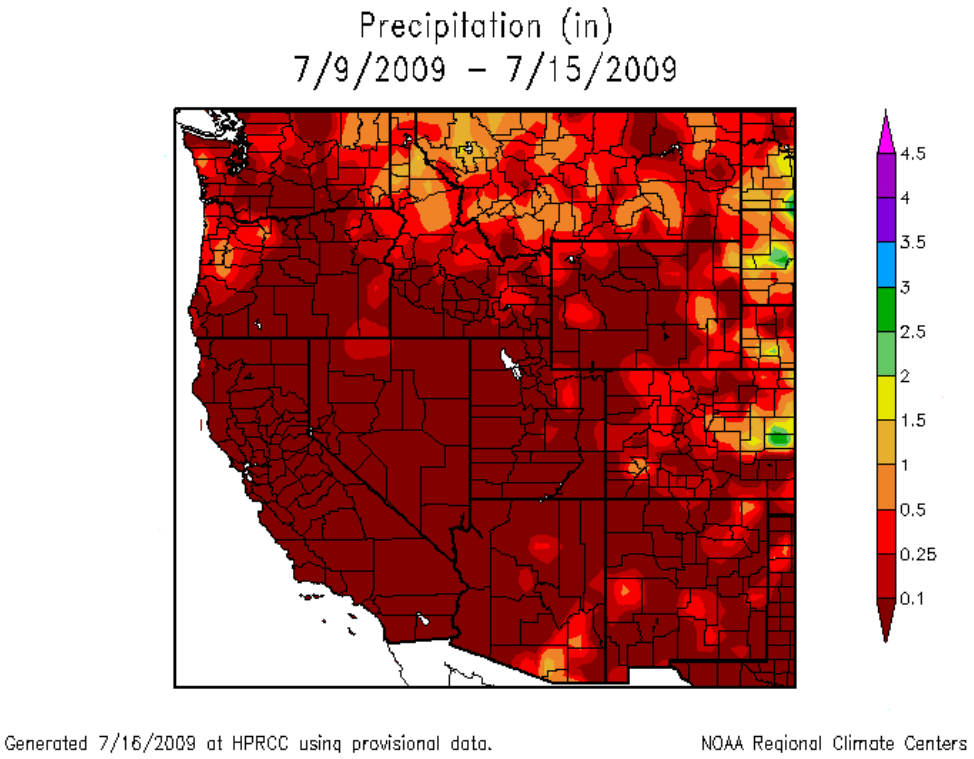


Fig. 2a. ACIS 7-day average temperature anomalies show that the greatest positive temperature departures occurred over eastern New Mexico and southeast Arizona (>+8F) and the greatest negative departures occurred over southeastern Oregon and north-central Nevada (<-6F). Ref: http://www.hprcc.unl.edu/maps/current/index.php?action=update_product&product=TDept



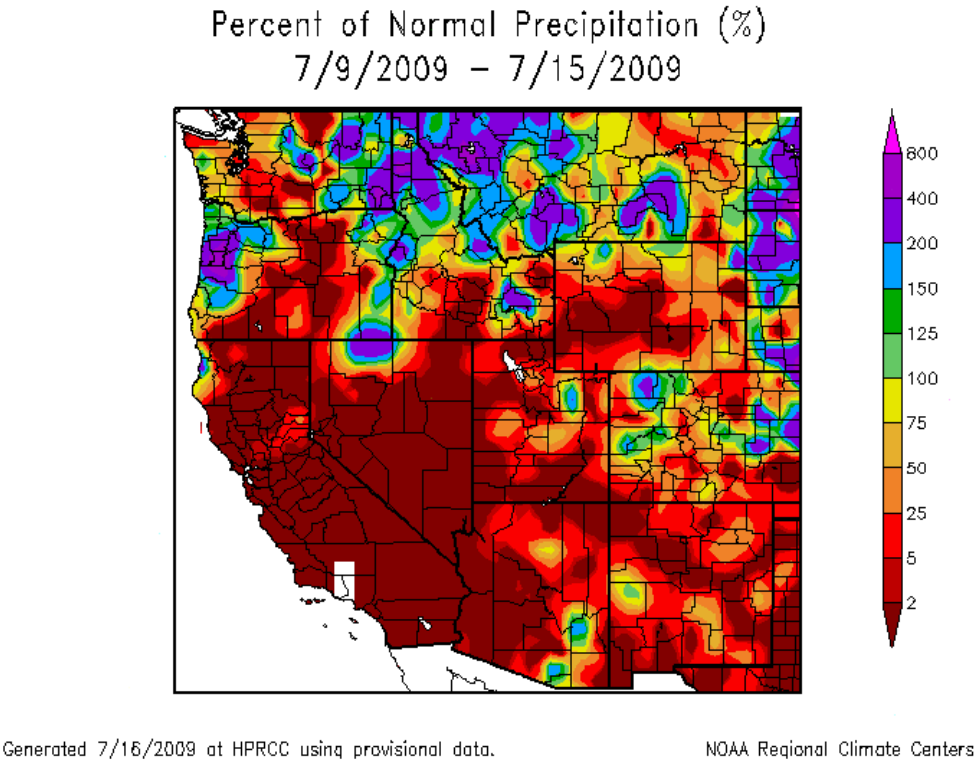


Fig. 3. and 3a. ACIS 7-day average precipitation amounts for the period ending 15 July shows widely scattered thunderstorm activity across the Northern Tier States with light rain over western Oregon. Typical dry conditions prevailed elsewhere.
Ref: http://www.hprcc.unl.edu/maps/index.php?action=update_product&product=PNorm

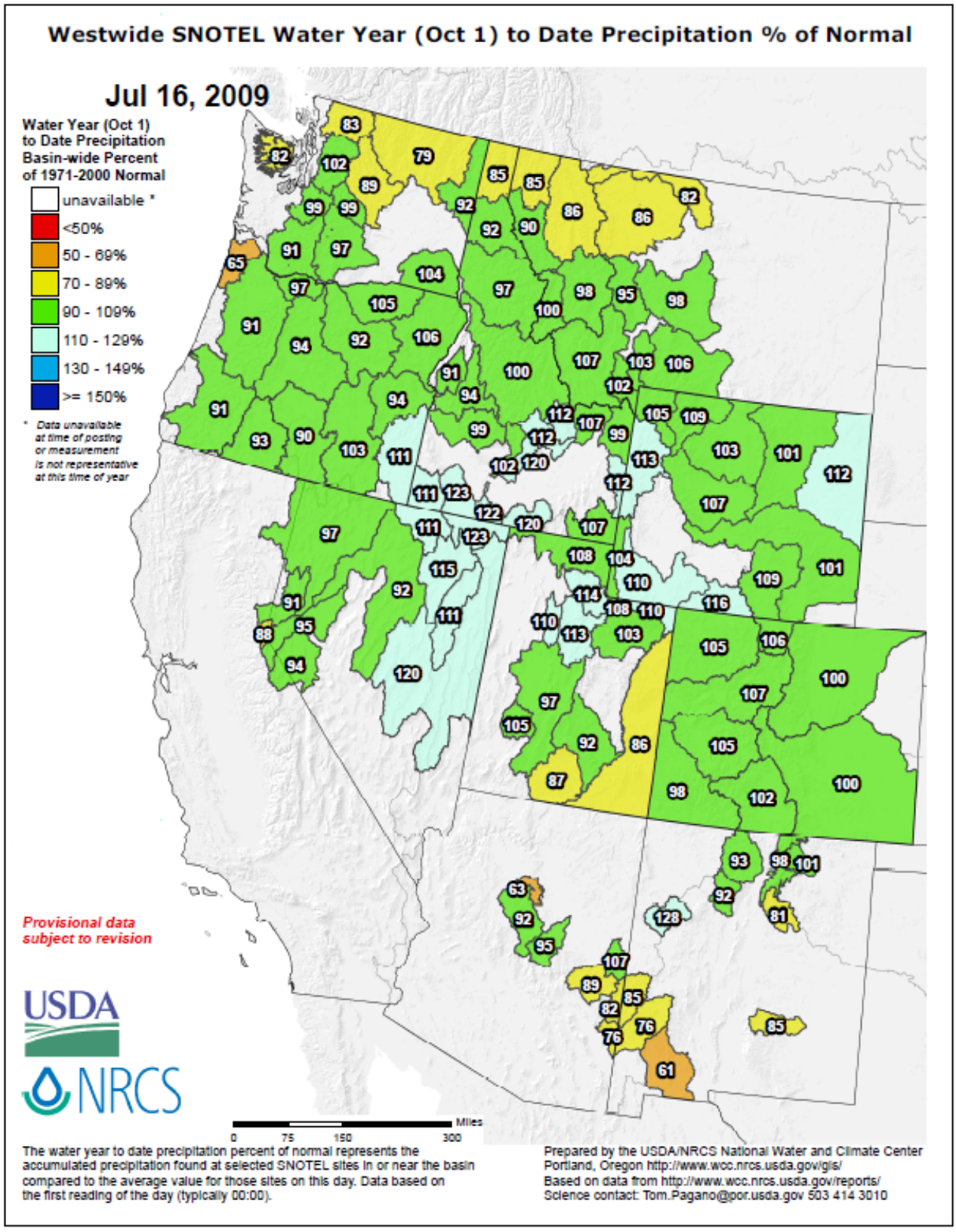


Fig 3b. Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2009 Water Year that began on October 1, 2008 shows surplus values over southern Idaho into Wyoming and eastern Nevada with deficits over the northernmost Tier States and into southwest New Mexico and northwest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

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

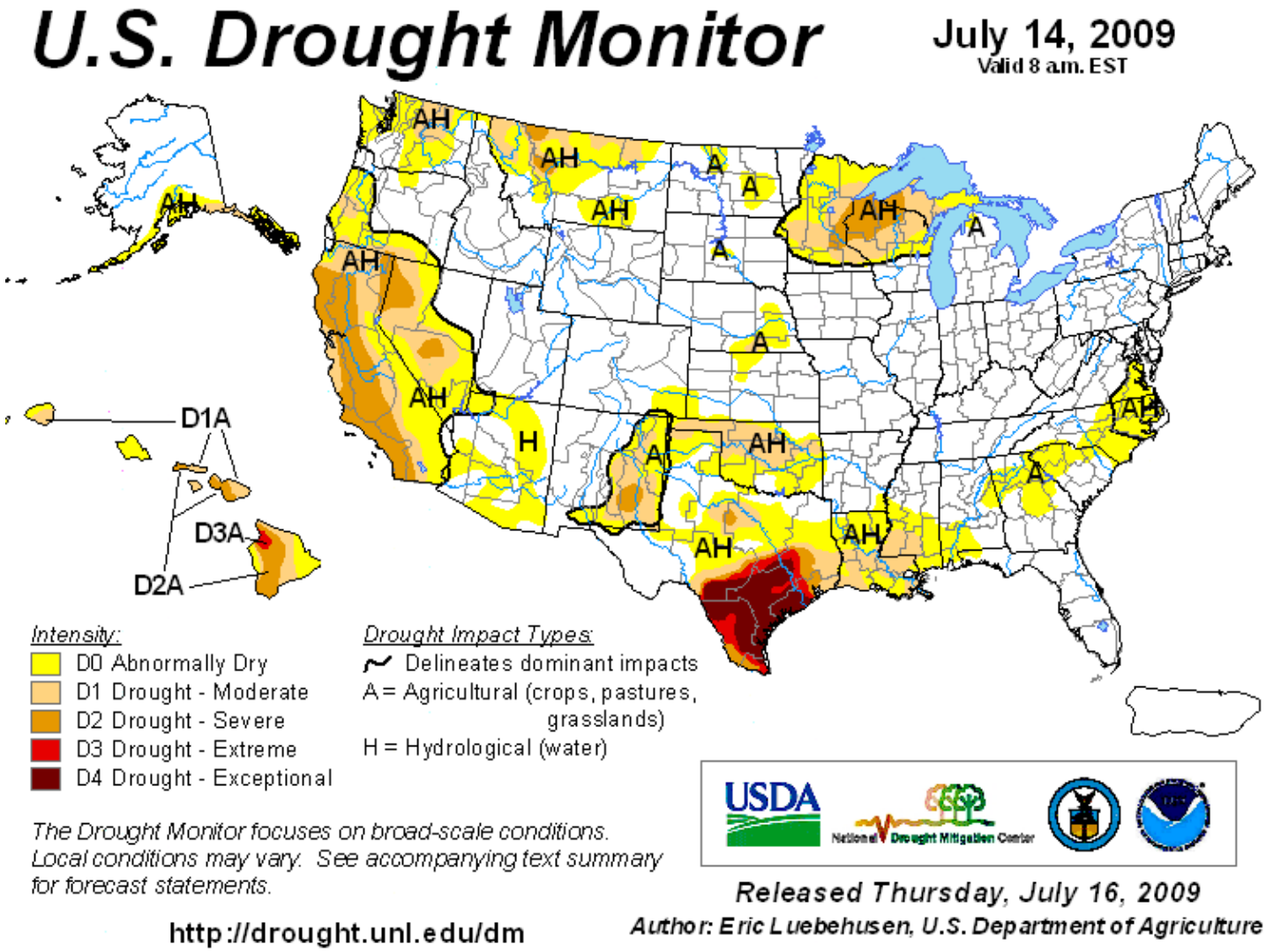


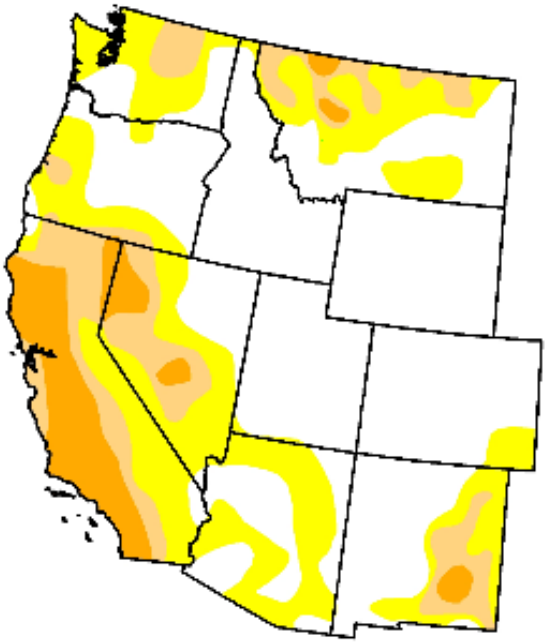
Fig. 4. Current Drought Monitor weekly summary.
Ref: National Drought Mitigation Center (NDMC) - http://www.drought.unl.edu/dm/monitor.html

U.S. Drought Monitor
West

July 14, 2009
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	55.1	44.9	19.0	7.7	0.0	0.0
Last Week (07/07/2009 map)	55.3	44.7	18.4	7.6	0.0	0.0
3 Months Ago (04/21/2009 map)	32.9	67.1	25.8	7.7	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 (07/15/2008 map)	41.1	58.9	33.3	7.3	0.4	0.1



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

USDA National Drought Mitigation Center

Released Thursday, July 16, 2009

Author: Eric Luebehusen, U.S. Department of Agriculture

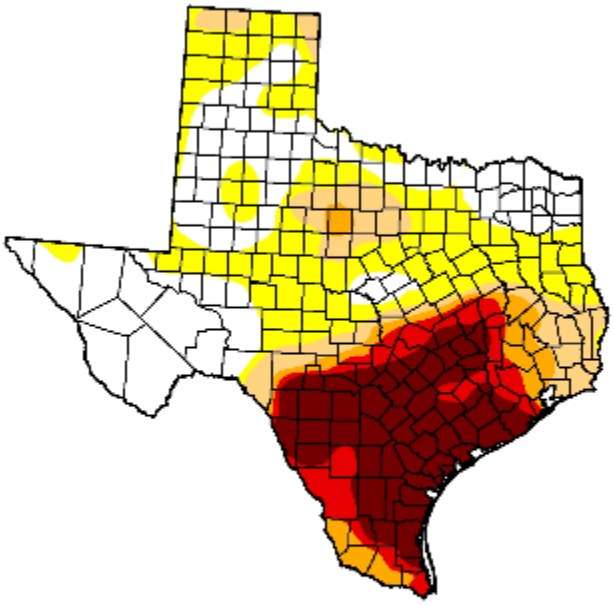
Fig. 4a. Drought Monitor for the Western States with statistics over various time periods. Regionally, conditions have remained essentially unchanged during the past week.
Ref: http://www.drought.unl.edu/dm/DM_west.htm.

U.S. Drought Monitor
Texas

July 14, 2009
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	31.8	68.2	40.4	30.0	24.7	17.9
Last Week (07/07/2009 map)	37.7	62.3	39.4	28.8	22.4	14.1
3 Months Ago (04/21/2009 map)	22.1	77.9	60.5	45.9	22.7	11.2
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 (07/15/2008 map)	12.0	88.0	64.0	39.0	20.8	4.4



Intensity:

- D0 Abnormally Dry
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http://drought.unl.edu/dm

Released Thursday, July 16, 2009
Author: Eric Luebehusen, U.S. Department of Agriculture

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

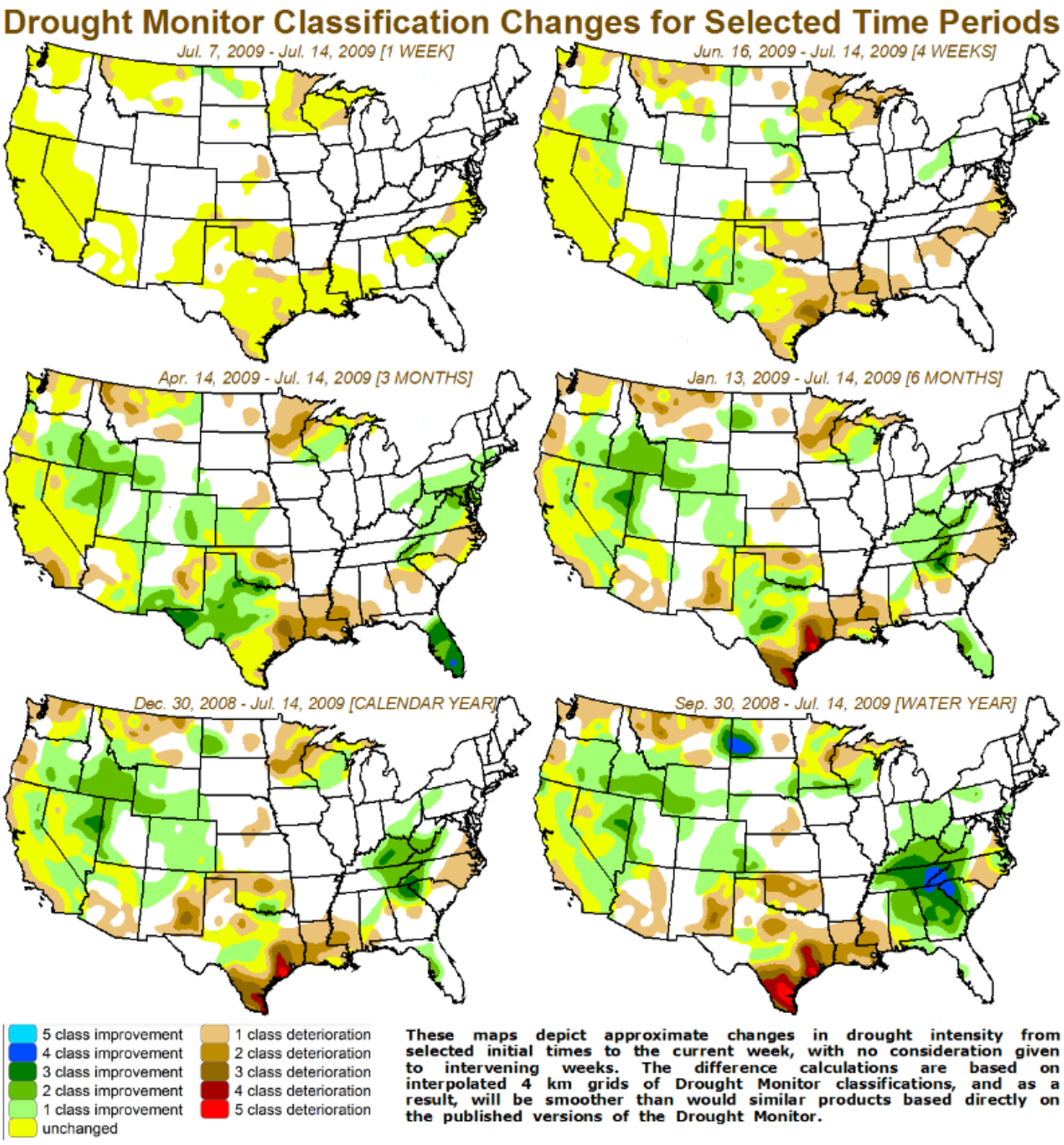
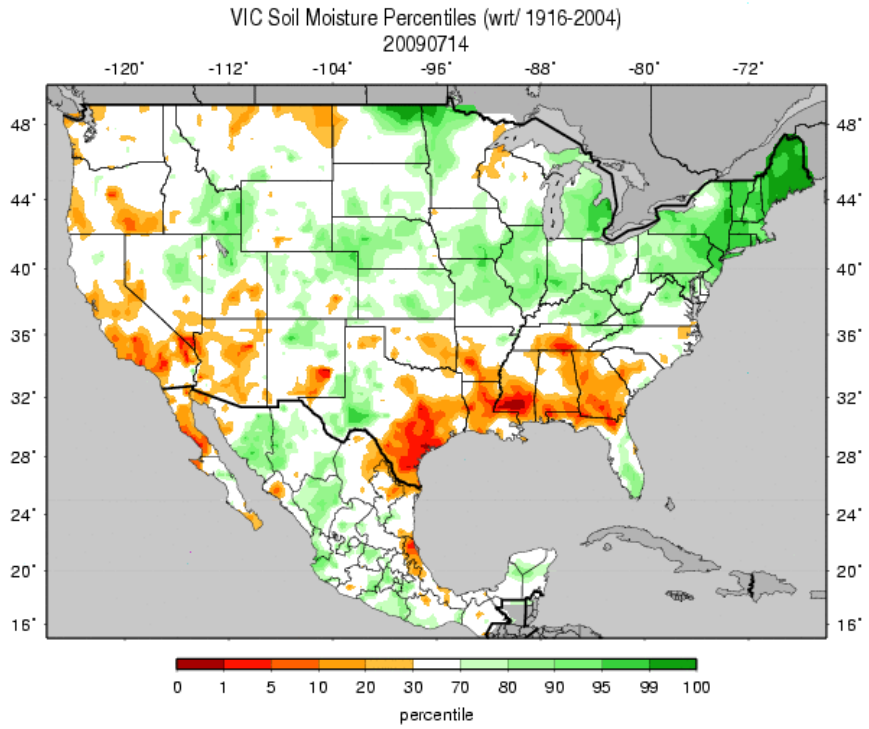
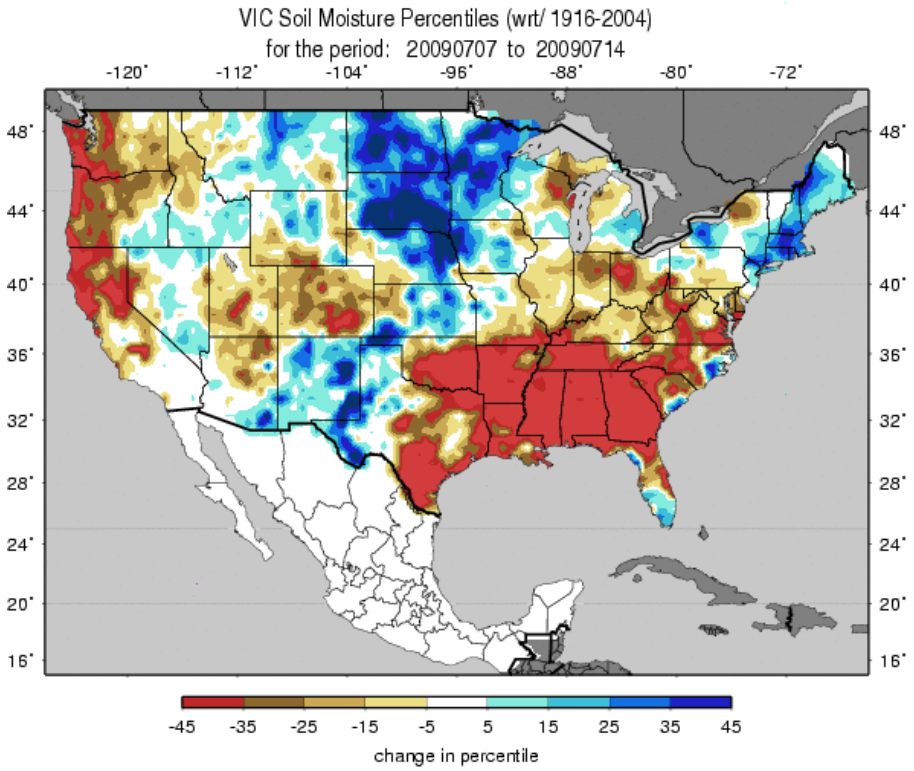


Fig. 4c: Drought Monitor Classification changes over various time periods.

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



Figs. 5a: Soil Moisture ranking in percentile based on 1916-2004 climatology as of 14 July. Near saturation exists over the northeastern region of the country, while excessive dryness is scattered across the Gulf Coast States and parts of the Southwest. 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 a complete reversal in areas with surpluses and deficits from last week. The Gulf Coast States and the Coastal regions of the Pacific Northwest have dried out significantly. The Upper Great Plains shows a marked increase in soil moisture. Ref: http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt.1wk.gif

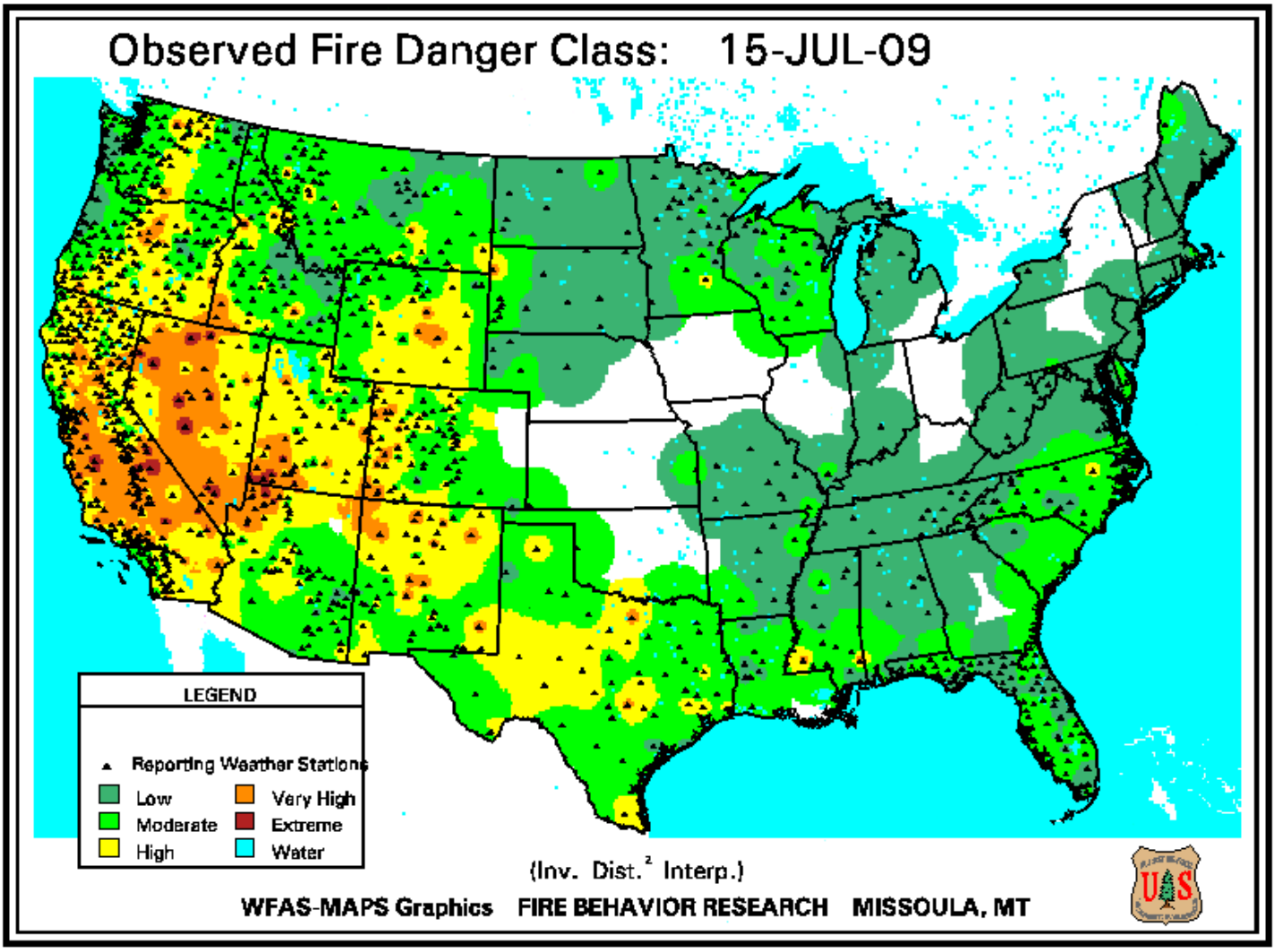


Fig. 6. Observed Fire Danger Class. Conditions over the Great Basin and into California are becoming very high to extreme as high pressure builds over the West. Ref: http://www.wfas.net/images/firedanger/fd_class.gif

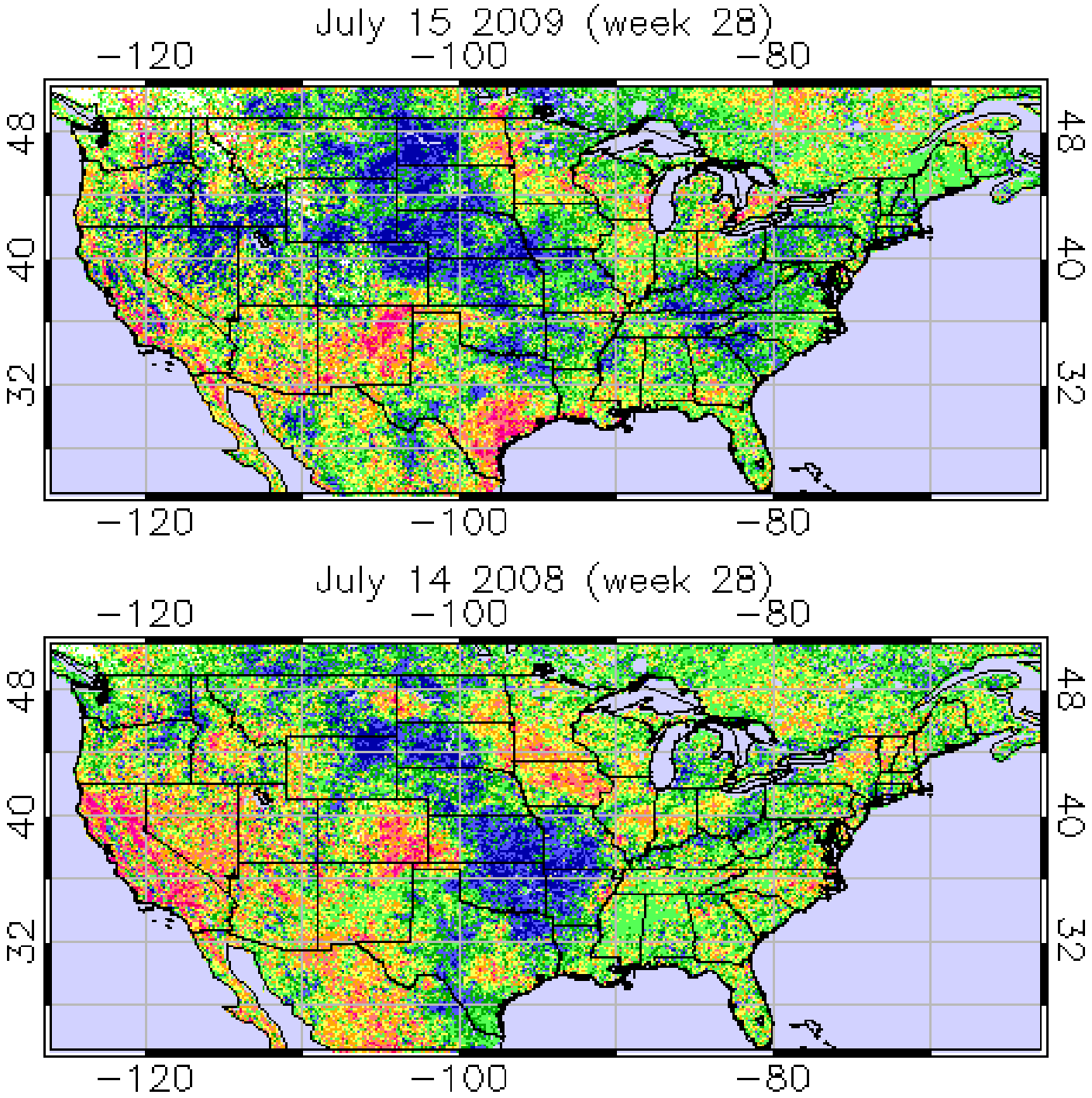


Fig. 7. Vegetation Drought Response Index: Note the comparison to last year. The upper mid-west, New Mexico, and southern Texas are significantly stressed while the Plains and Ohio Valley show favorable conditions this week. (Note these charts are a week old).
Ref: http://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh_currentImage.php

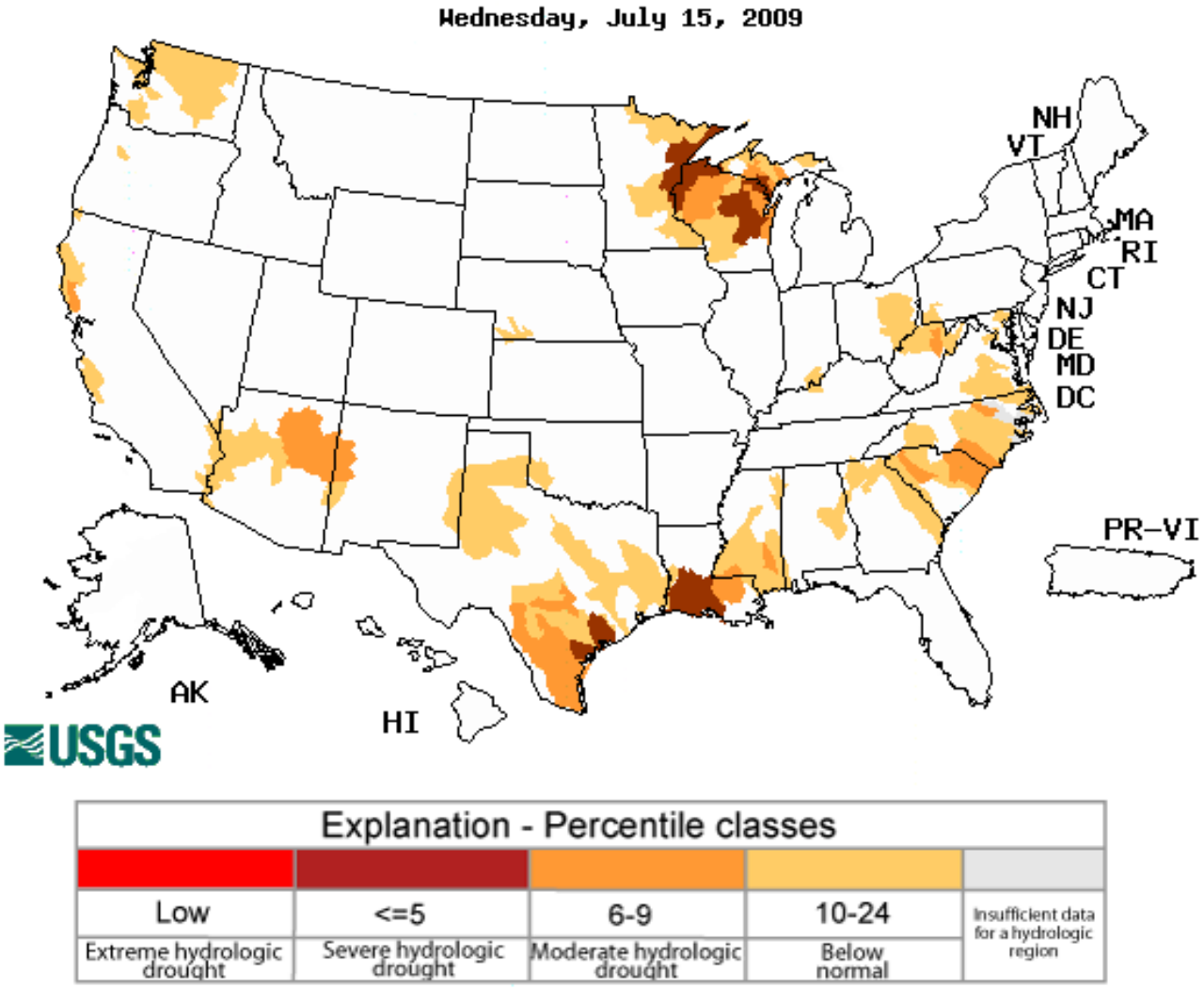


Fig. 8. Map of below normal 7-day average streamflow compared to historical streamflow for the day of year. Conditions over parts of Texas, Louisiana, Minnesota, and Wisconsin show severe flows while conditions in northeast Arizona have deteriorated since last week.
Ref: http://water.usgs.gov/waterwatch/?m=dryw&w=map&r=us

National Drought Summary -- July 14, 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 Northeast and Mid-Atlantic: Below-normal temperatures helped mitigate the impacts of developing short-term dryness in southern portions of the region. However, pockets of persistent dryness in central North Carolina led to an expansion of D0 (Abnormally dry) into central portions of the state. In contrast, another week of beneficial rainfall from eastern Pennsylvania northward into New England kept streamflows at near-record high levels.

Southeast: Showers developed over much of the region, although unfavorably dry weather lingered across interior portions of southern Georgia. Nevertheless, there were no new areas of drought introduced into the Southeast during the past week, with showers tallying more than an inch of rain over most of the region. The most notable change in the Southeast was the removal of D0 from the southern South Carolina-Georgia border, where locally more than three inches of rain fell. 7-Day average streamflows remained in the 30th percentile or lower from Georgia into eastern North Carolina, reflecting the lingering effects of long-term dryness and recent (30-day) rainfall deficits.

The Delta: Light to moderate showers stemmed the expansion of drought in the southern Delta, although streamflows continued to run at lower-than-normal levels. Rain bypassed the northern Delta, where D0 was accordingly expanded northward to account for 30-day departures of 2 to 4 inches.

Upper Midwest: Dry weather prevailed, which led to the expansion of drought coverage in this region. Most notably, portions of northwestern Wisconsin and southeastern Minnesota have received less than 70 percent of normal precipitation over the last 365 days, which has caused streamflows to drop below the 5th percentile over large portions of the area. Abnormal Dryness (D0) was also introduced into northern Michigan, reflecting declining streamflows and pronounced short-term precipitation shortages.

The Plains: Drought expanded under a dry, hot weather regime across the south. In Texas and Oklahoma, record-setting heat (100°F or greater) coupled with gusty winds and little, if any, rainfall resulted in expansion of drought over most areas. In Texas, drought intensity and coverage expanded over most of the state, with Extreme (D3) to Exceptional (D4) drought extending from Del Rio eastward into Centerville, and southward through College Station to Galveston. Drought also expanded in western and northern portions of the state in response to scorching heat and strong winds. The same held true in Oklahoma, where a record-shattering high of 114°F in Buffalo was a telltale marker of rapidly increasing dryness and crop stress. However, more than an inch of rain in eastern portions of the state was enough to keep drought from worsening in these areas, although substantial longer-term deficits still persist. Farther north, an additional one to three inches of rainfall eased Abnormal Dryness (D0) in the Dakotas, although the moisture was mostly a no-show in eastern North Dakota.

The West: Monsoon showers were mostly confined to southern and eastern portions of the Four Corners Region, offering minimal relief from long-term drought. Meanwhile, an upper-air

disturbance triggered beneficial showers (up to an inch) across northern portions of the region, although rain was largely hit and miss. A reassessment of the situation in Montana from experts in the field resulted in some modifications to the current drought depiction, with expanding drought noted in western and central portions of the state, while recent heavy rain in northeastern Montana reduced the coverage of D0 and D1.

Hawaii, Alaska and Puerto Rico: Isolated showers in Hawaii did little to improve drought, with mostly dry weather prevailing over most of the islands. In keeping with the record heat in the southern contiguous U.S., Molokai's maximum temperature of 87°F on July 11 was a daily record. In Puerto Rico, widespread showers (locally more than 2 inches) were reported during the past week, although amounts along the northern coast were generally less than half an inch. Dry weather prevailed in Alaska, offering no relief to the state's southern D0 and D1 areas.

Looking Ahead: Unsettled weather in the east will contrast with mostly dry conditions across the western U.S. For the rest of the week, a pair of cold fronts will generate showers and thunderstorms from the Mississippi Valley eastward to the Atlantic Coast. Some showers are also possible across the southern Plains, although current guidance indicates the rain will not provide widespread drought relief to Texas and Oklahoma. Out west, high pressure will maintain dry, increasingly hot weather, although monsoon showers will linger in eastern portions of the Four Corners region.

The CPC 6-10 day forecast (July 21-25) calls for above-normal temperatures in New England and from the Rockies to the Pacific Coast. In contrast, cooler-than-normal conditions are anticipated from the central Corn Belt south and eastward to the Delta and Southeast. Above-normal rainfall will be confined to Gulf and Atlantic Coast States as well as eastern portions of the Four Corners Region, while below-normal precipitation continues west of the Rockies and from the southern Plains into the western Great Lakes.

Author: Eric Luebehusen, United States Department of Agriculture

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 16, 2009