



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

Weekly Report - Snowpack / Drought Monitor Update **Date: 23 July 2009**

SNOTEL SNOWPACK AND PRECIPITATION SUMMARY

Temperature: SNOTEL and ACIS-day station average temperature anomalies were above average over most of the Southwest, Northern Cascades and California and below average over the much of the northern half of the West (higher altitude SNOTEL sites appeared cooler than average for this period) (Fig.1). ACIS 7-day average temperature anomalies show that the greatest positive temperature departures occurred over southern California (>+9F) and the greatest negative departures occurred over northwestern High Plains (<-3F) (Fig. 1a).

Precipitation: ACIS 7-day average precipitation amounts for the period ending 22 July shows a mostly dry West with the exception of heavier amounts scattered across the Western Great Basin and the Southwest (especially eastern New Mexico) (Fig 2 and 2a). 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 (Fig. 2b).

WESTERN DROUGHT STATUS

The West: Monsoon remained mostly confined to southern and eastern portions of the Four Corners Region, although heavy rain fell in eastern New Mexico shortly after the cutoff date for this week's Drought Monitor. Meanwhile, additional 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. The remainder of the West was unchanged from last week. 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. 3, 3a, 3b, and 3c).

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-

Weekly Snowpack and Drought Monitor Update Report

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

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 [$NDVI = (NIR - VIS) / (NIR + VIS)$] 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. 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

Weekly Snowpack and Drought Monitor Update Report

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.

PASTURE AND RANGELAND CONDITIONS (Figure 8)

This product is produced and compiled by the NOAA's Climate Prediction Center:

<http://www.cpc.ncep.noaa.gov/products/predictions/experimental/edb/pasture-range-statewide-conditions.pdf>.

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

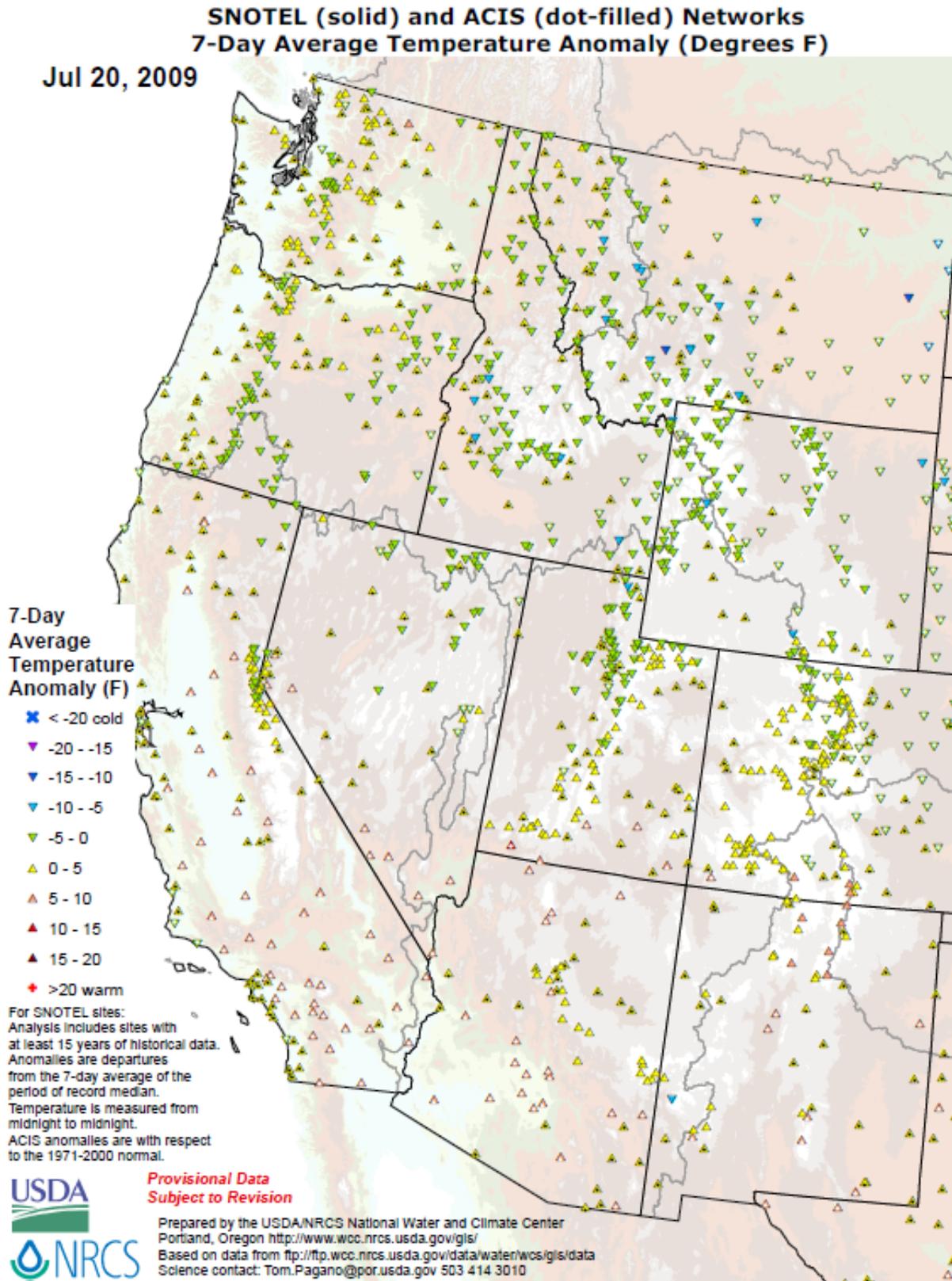
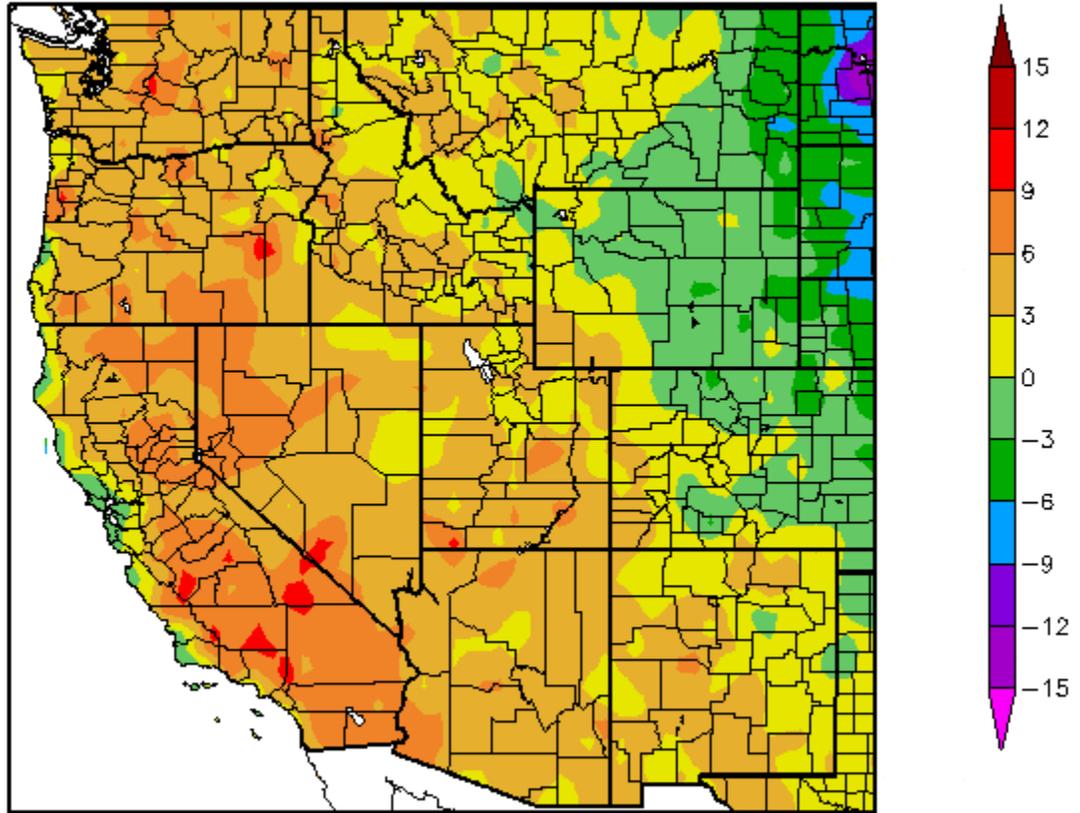


Fig. 1. SNOTEL and ACIS-day station average temperature anomalies were above average over most of the Southwest, Northern Cascades and California and below average over the much of the northern half of the West (higher altitude SNOTEL sites appeared cooler than average for this period). Ref: <ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/WestwideTavg7dAnomalyAcis.pdf>

Departure from Normal Temperature (F)
7/16/2009 – 7/22/2009



Generated 7/23/2009 at HPRCC using provisional data.

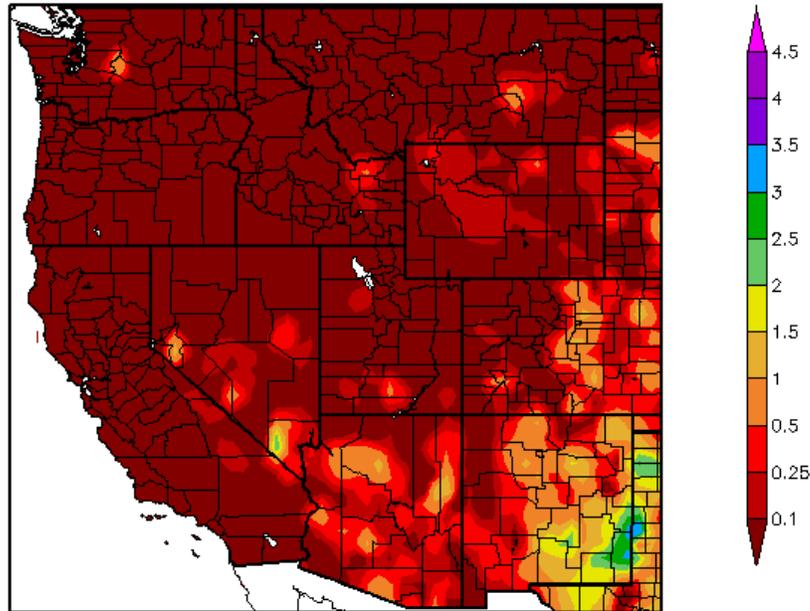
NOAA Regional Climate Centers

Fig. 1a. ACIS 7-day average temperature anomalies show that the greatest positive temperature departures occurred over southern California (>+9F) and the greatest negative departures occurred over northwestern High Plains (<-3F).

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

Weekly Snowpack and Drought Monitor Update Report

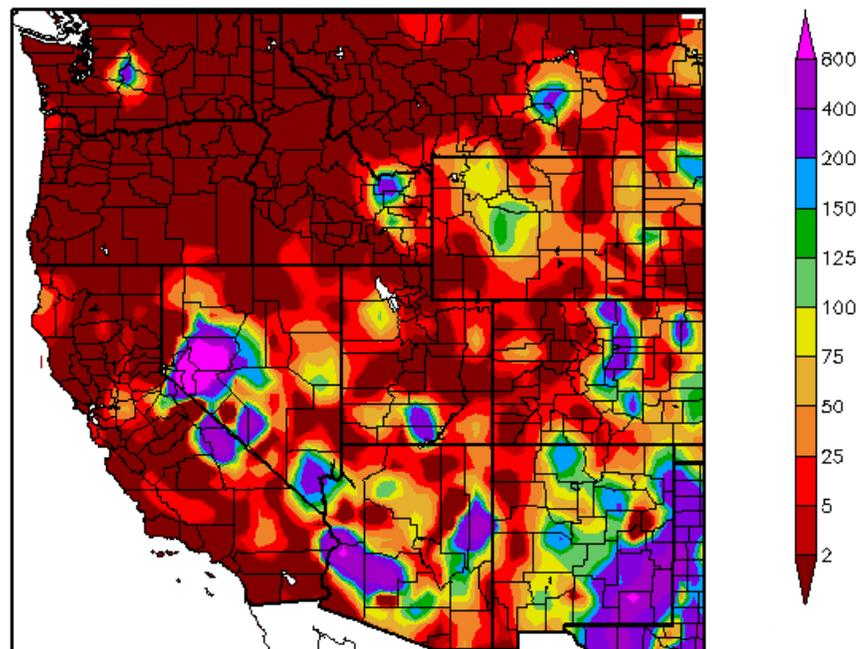
Precipitation (in)
7/16/2009 – 7/22/2009



Generated 7/23/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

Percent of Normal Precipitation (%)
7/16/2009 – 7/22/2009



Generated 7/23/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

Fig. 2. and 2a. ACIS 7-day average precipitation amounts for the period ending 22 July shows a mostly dry West with the exception of heavier amounts scattered across the Western Great Basin and the Southwest (especially eastern New Mexico).

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

Weekly Snowpack and Drought Monitor Update Report

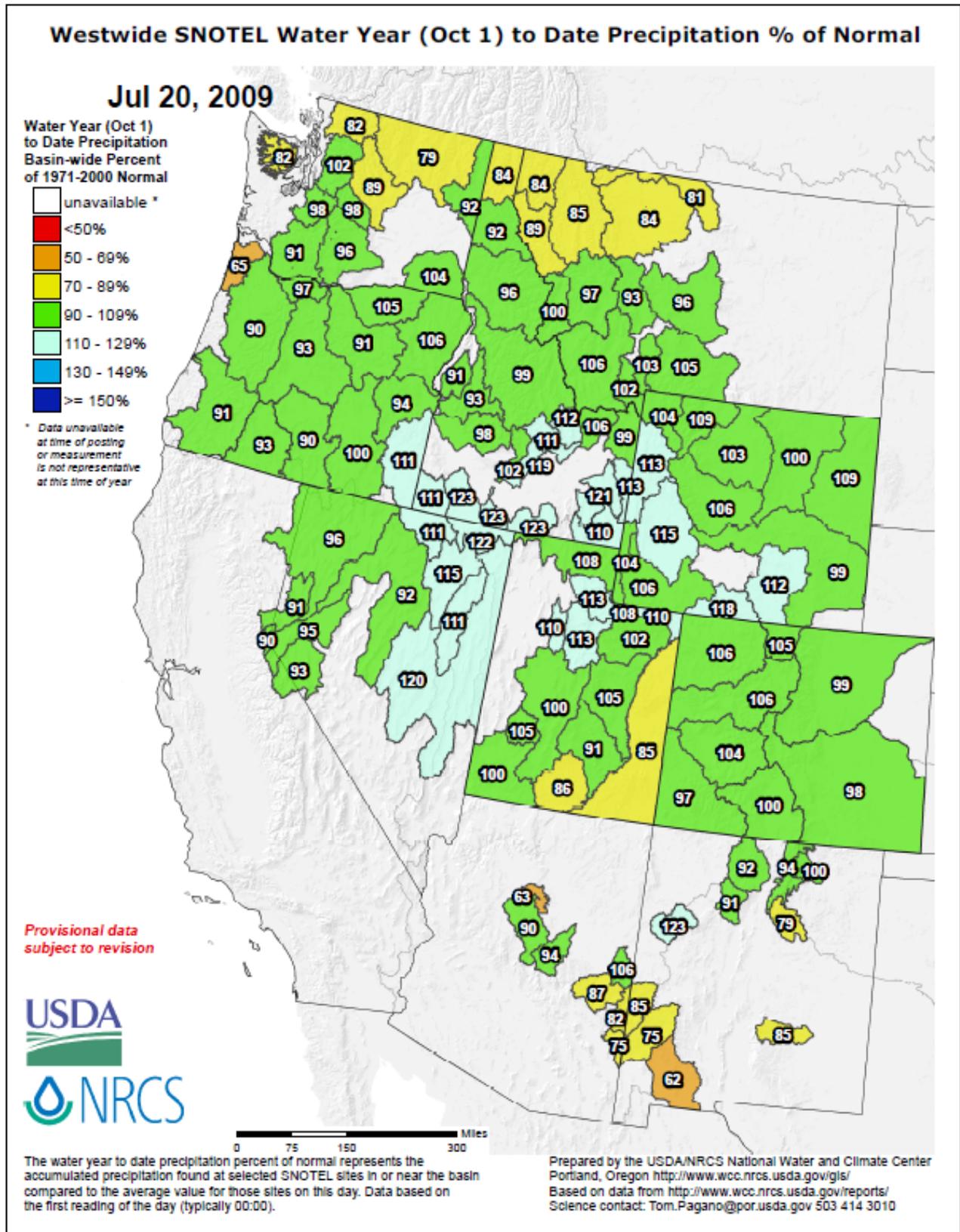


Fig 2b. Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2009 Water Year that began on October 1, 2008 shows surplus values over southern Idaho into Wyoming and eastern Nevada with deficits over the northernmost Tier States and into southwest New Mexico and northwest Oregon.

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

U.S. Drought Monitor

July 21, 2009
Valid 8 am. EST

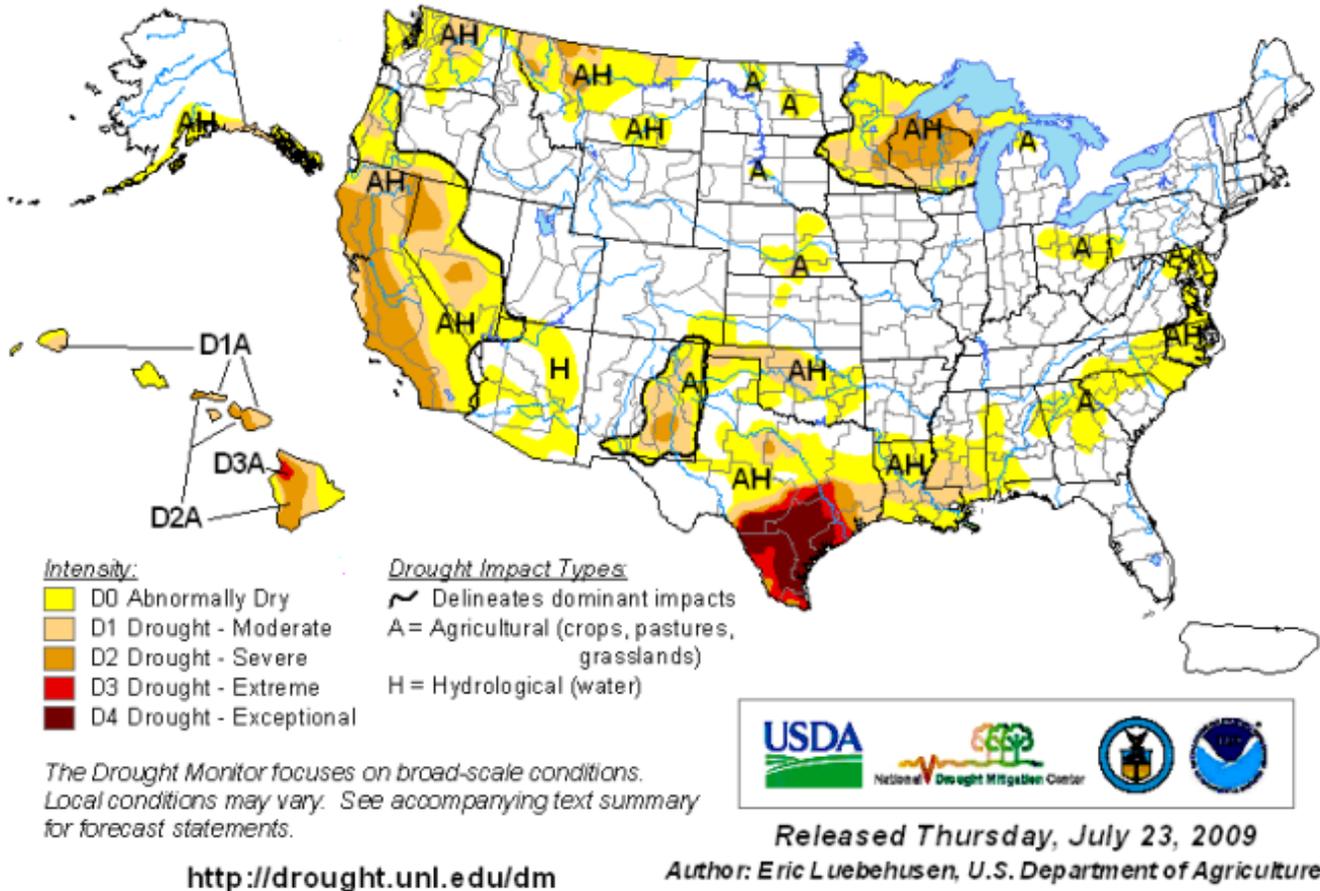


Fig. 3. Current Drought Monitor weekly summary.

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

U.S. Drought Monitor

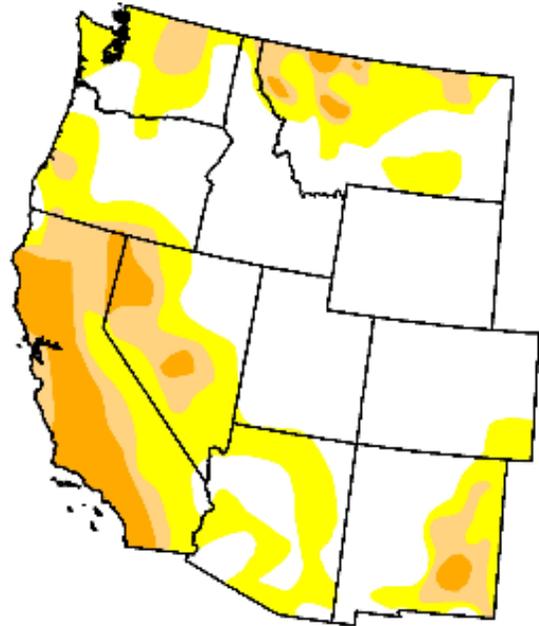
West

July 21, 2009

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	54.9	45.1	18.9	7.8	0.0	0.0
Last Week (07/14/2009 map)	55.1	44.9	19.0	7.7	0.0	0.0
3 Months Ago (04/28/2009 map)	33.6	66.4	25.2	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 (07/22/2008 map)	34.0	66.0	30.2	6.0	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>



Released Thursday, July 23, 2009

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

Fig. 3a. 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.

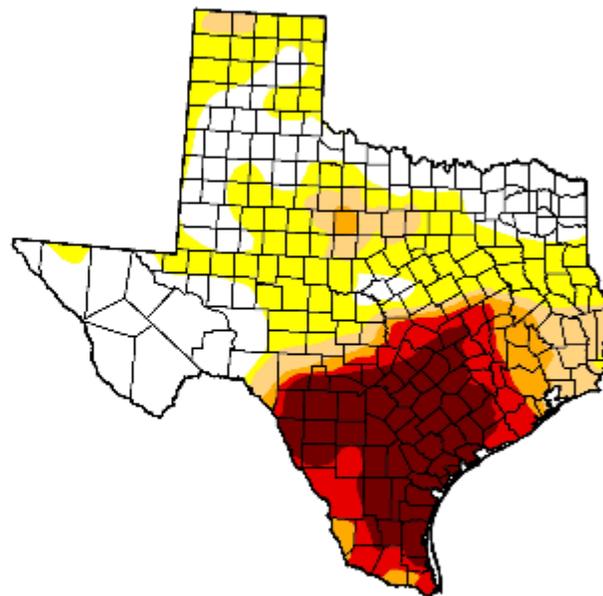
U.S. Drought Monitor

Texas

July 21, 2009
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	32.3	67.7	38.7	29.6	24.7	16.5
Last Week (07/14/2009 map)	31.8	68.2	40.4	30.0	24.7	17.9
3 Months Ago (04/28/2009 map)	24.6	75.4	56.3	41.6	21.4	9.7
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 (07/22/2008 map)	13.4	86.6	65.6	39.1	22.3	6.1



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



Released Thursday, July 23, 2009

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

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

Fig. 3b: Texas is the only state with D4 drought condition in the US. Note conditions have remained essentially unchanged since last week.

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

Drought Monitor Classification Changes for Selected Time Periods

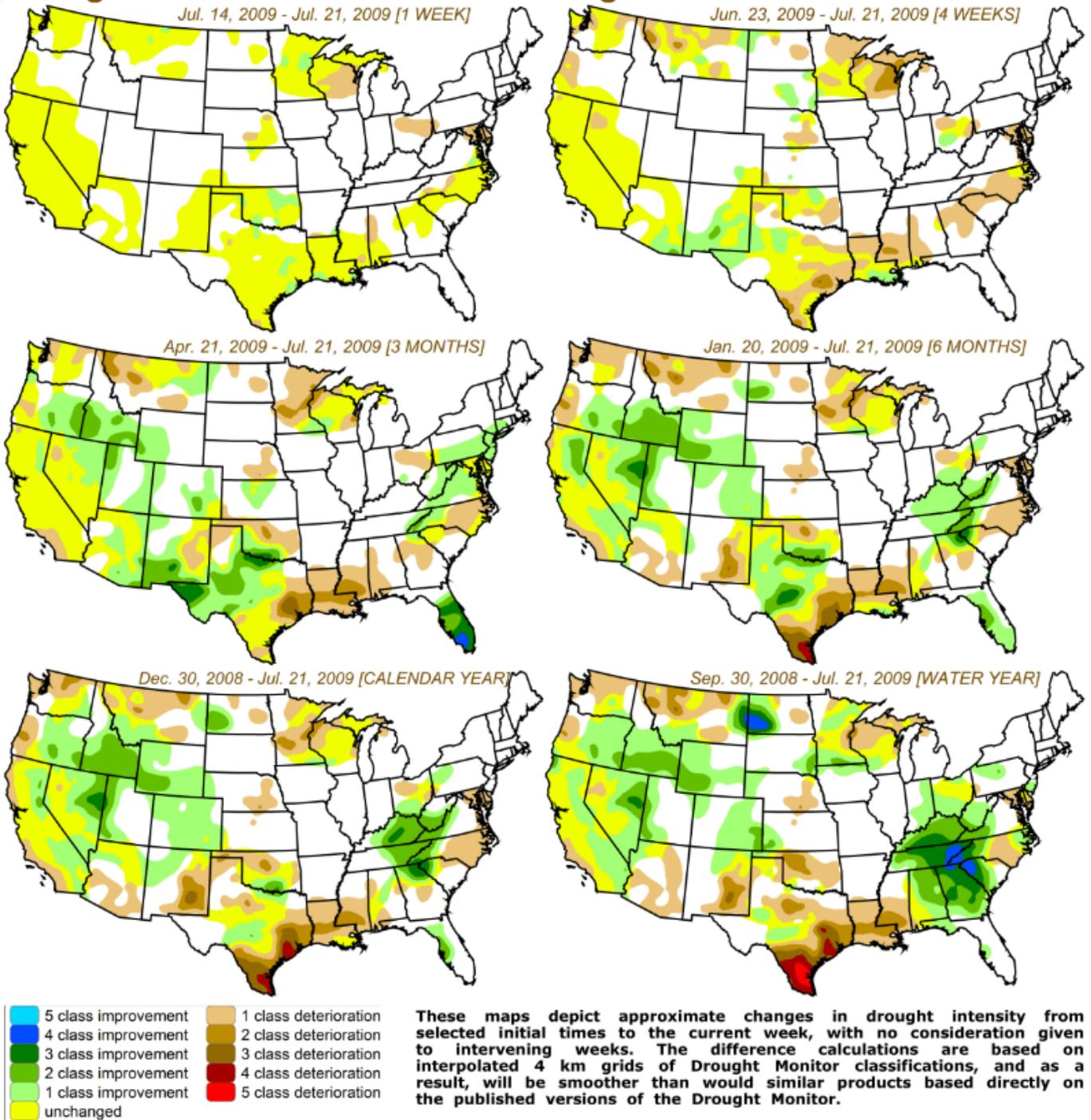
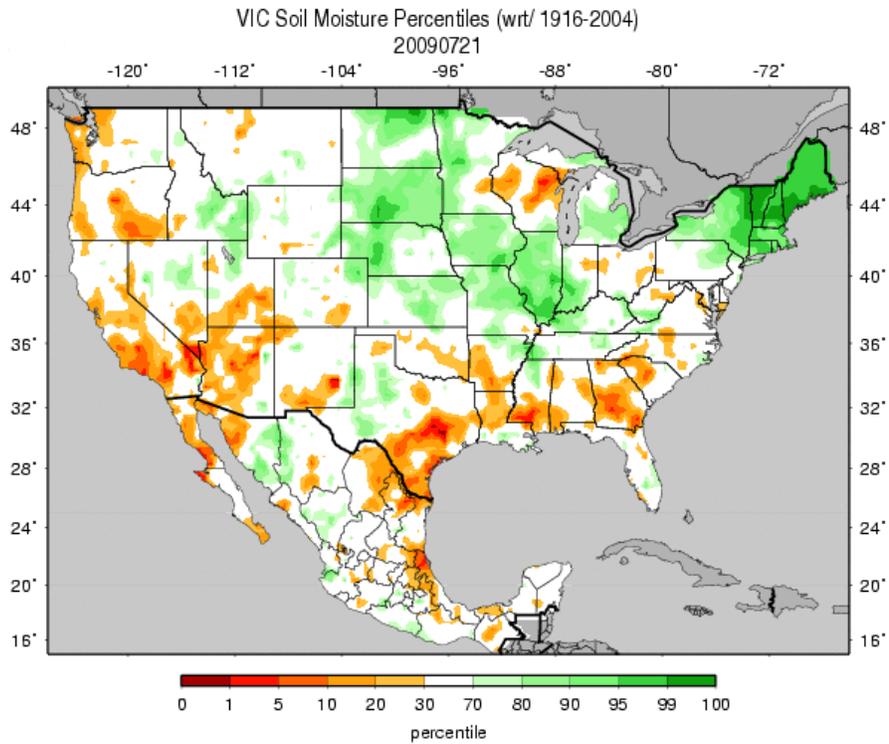


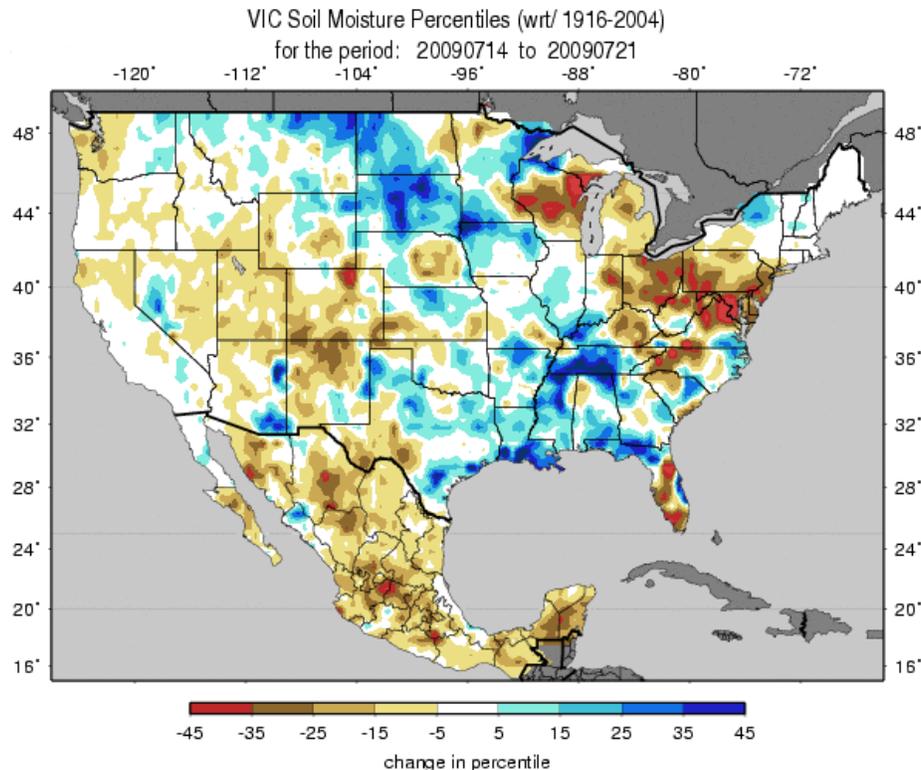
Fig. 3c: Drought Monitor Classification changes over various time periods.

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

Weekly Snowpack and Drought Monitor Update Report

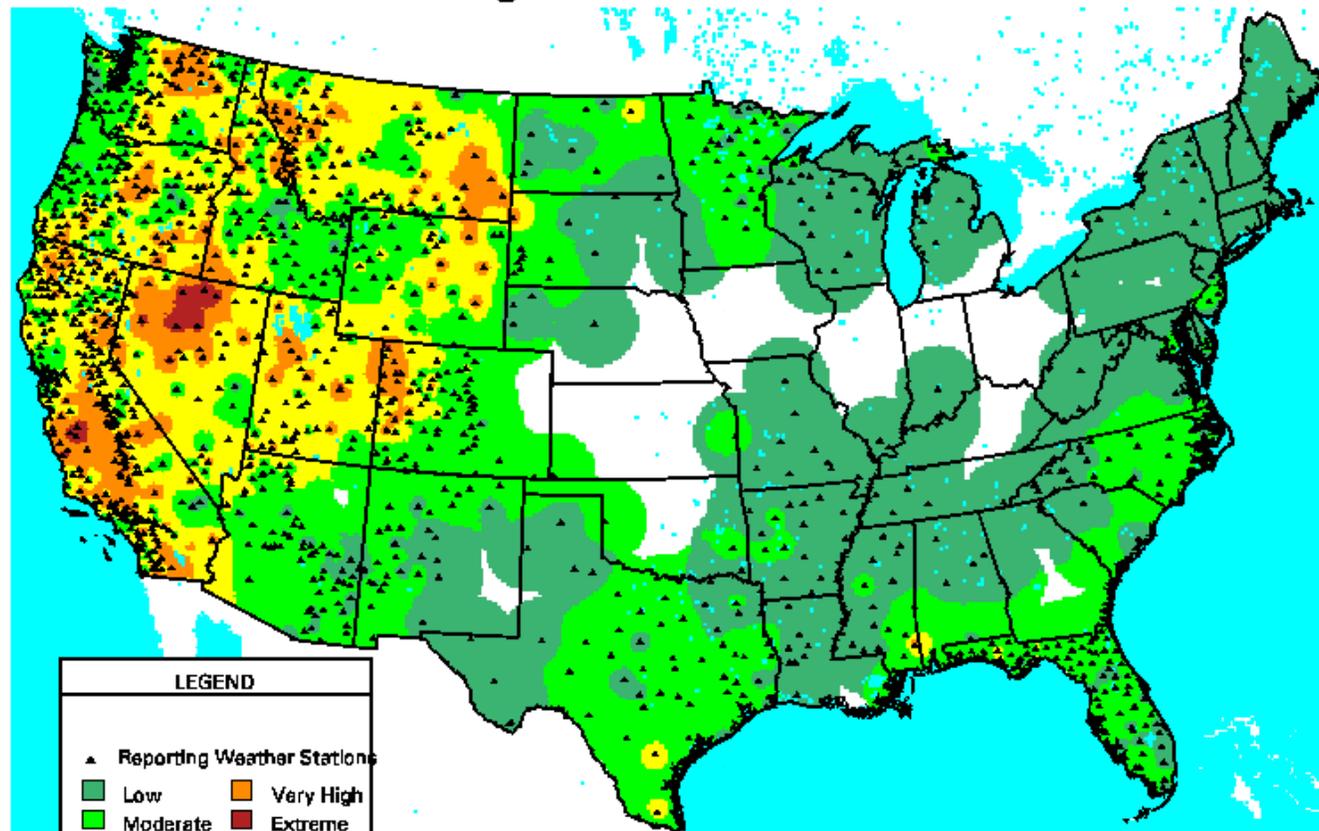


Figs. 4a: Soil Moisture ranking in percentile based on 1916-2004 climatology as of 21 July. Near saturation exists over the northeastern region of the country, while excessive dryness is scattered across the Gulf Coast States and parts of the Southwest. Ref: http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_gnt.gif



Figs. 4b: Soil Moisture change in percentile based on 1916-2004 climatology for this past week. Excessive dryness is found over Florida, the Ohio Valley, and Wisconsin. Excessive moisture is found over the Lower Mississippi River Valley and the Northern High Plains. Ref: http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_gnt.1wk.gif

Observed Fire Danger Class: 22-JUL-09



(Inv. Dist. ² Interp.)

WFAS-MAPS Graphics FIRE BEHAVIOR RESEARCH MISSOULA, MT



Fig. 5. Observed Fire Danger Class. Conditions over the Great Basin and into California are very high to extreme as high pressure builds over the West. The threat of parts of the Northern Tier States is also becoming increasingly higher.

Ref: http://www.wfas.net/images/firedanger/fd_class.gif

Weekly Snowpack and Drought Monitor Update Report

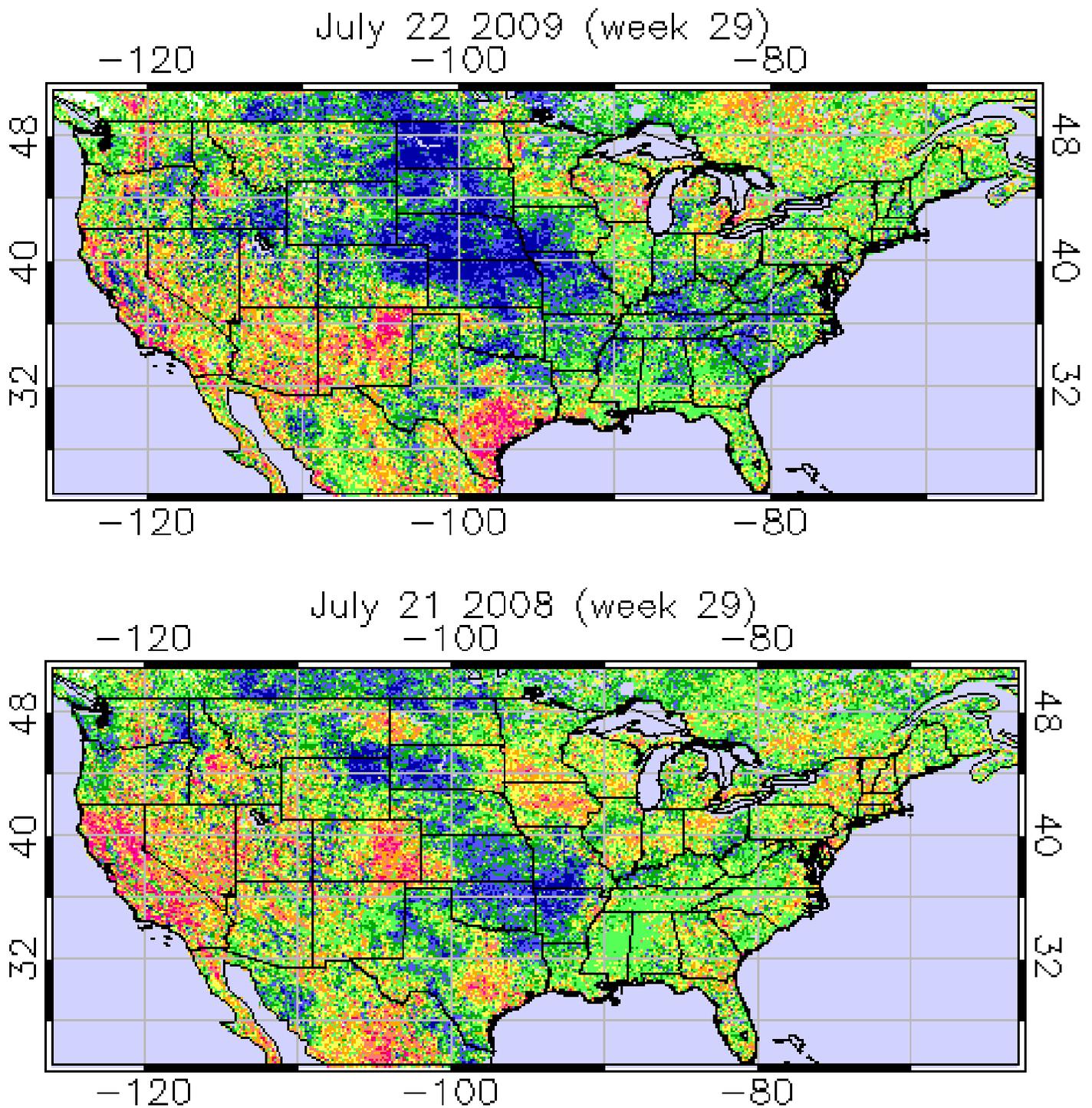
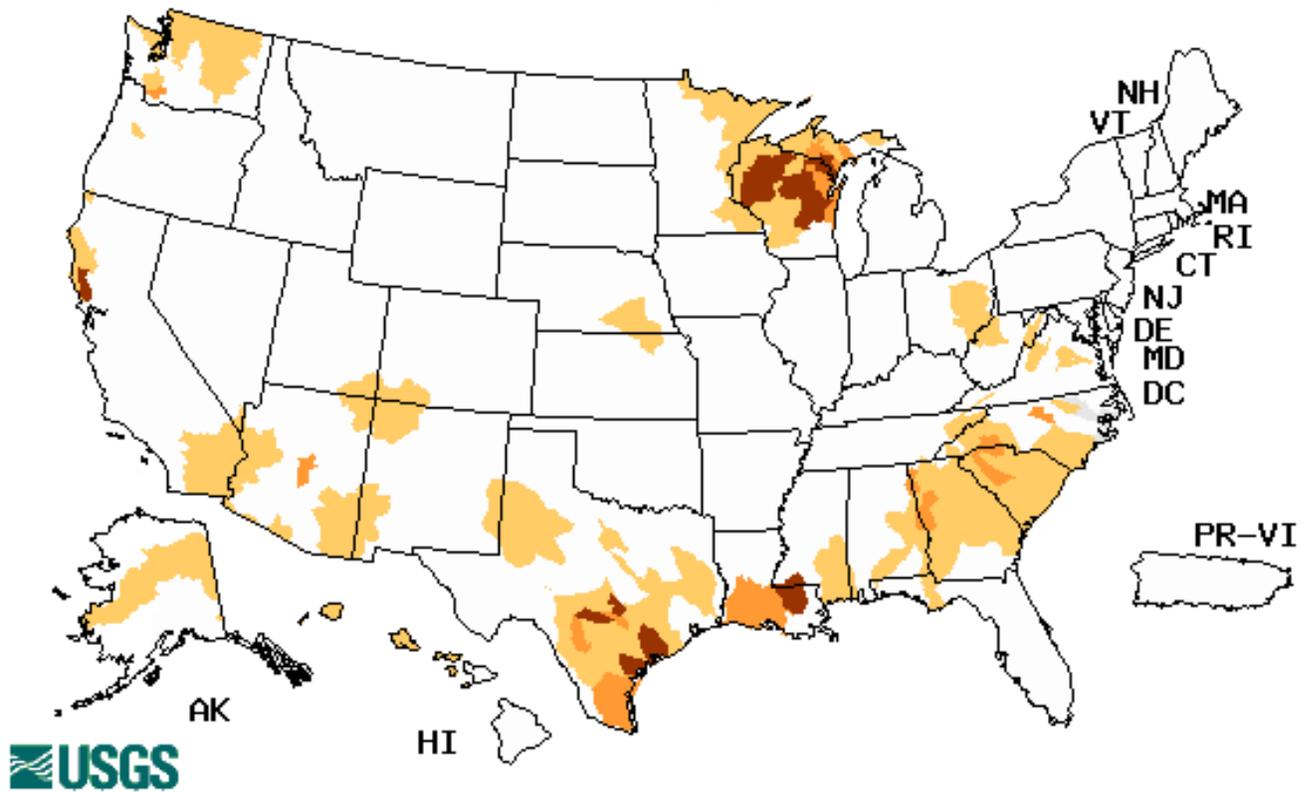


Fig. 6. Vegetation Drought Response Index: Note the comparison to last year. The Central and Northern Great Plains are very favorable while Texas and northeast New Mexico show very stressed conditions this week. Last year, California and Colorado were the most stressed states.

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

Weekly Snowpack and Drought Monitor Update Report

Wednesday, July 22, 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 over parts of Texas, Louisiana, and Wisconsin show severe flows.

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

Weekly Snowpack and Drought Monitor Update Report

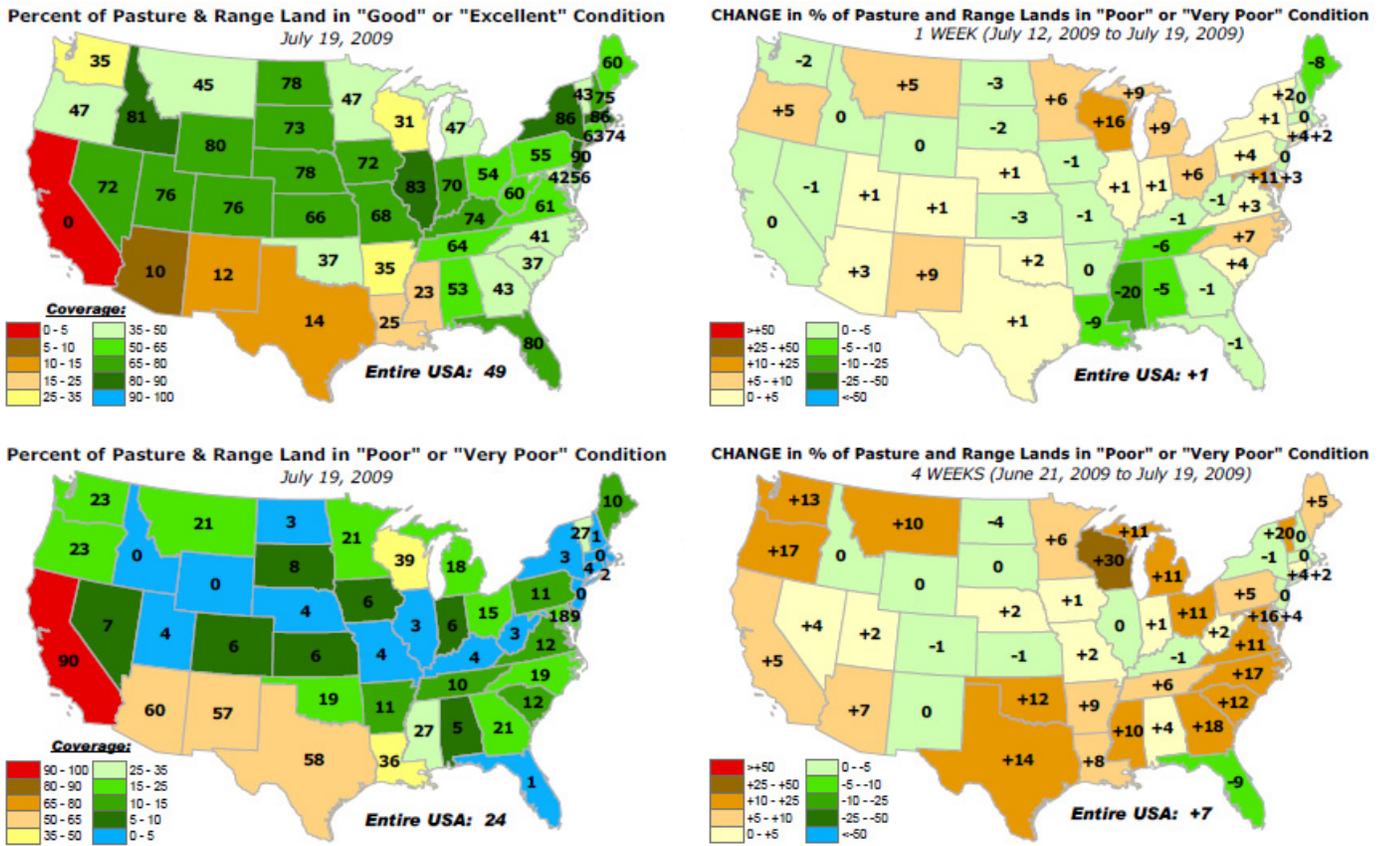


Fig. 8. Current Pasture and Range Land conditions and changes over the last week and last month.

Ref: <http://www.cpc.ncep.noaa.gov/products/predictions/experimental/edb/pasture-range-statewide-conditions.pdf>

Weekly Snowpack and Drought Monitor Update Report

National Drought Summary -- July 21, 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: Drier-than-normal conditions persisted across much of Maryland, Delaware, and northern Virginia, where D0 was introduced in response to declining streamflows and developing topsoil moisture shortages. Minor expansion of Abnormally Dry (D0) was also noted in central North Carolina, while locally heavy showers in eastern North Carolina resulted in some modest improvement in the D0 areas immediately adjacent to Albemarle and Pamlico Sounds. Farther north, cool, wet conditions prevailed in New England

Southeast: Showers persisted in Florida and along the Atlantic Coast, while dry conditions prevailed across interior portions of Georgia and South Carolina. In southern Georgia, D0 was expanded slightly southward due to declining streamflows and 30-day precipitation departures of 2 inches or more. Abnormally dry conditions (D0) also expanded northward along the Alabama-Mississippi border. Elsewhere, there were no new areas of drought introduced into the Southeast during the past week.

The Delta: Moderate to heavy showers (1-3 inches, locally more) along the Gulf Coast eased short-term deficits and improved streamflow levels. Consequently, D1 (Moderate Drought) was removed from southern-most portions of Louisiana. Likewise in the northern Delta, more than 2 inches of rain eased Abnormally Dry conditions. Rain bypassed southeastern Mississippi, where Moderate Drought expanded eastward just inland from the coast. Abnormally dry conditions also expanded into southwestern Arkansas, where rainfall over the past 30 days has been well short of the 4-inch normal. Nevertheless, much of the southern Delta remains under the grips of longer-term drought, with significant precipitation departures noted over the past 90, 180, and 365 days.

The Plains: Beneficial rain was observed from Nebraska southward into central and eastern Texas, most notably reducing drought in eastern and southern Oklahoma as well as northern and eastern Texas. Despite the widespread shower activity, pockets of dryness prevailed in west-central Texas, western Oklahoma, and south-central Nebraska, with minimal - if any - improvement in drought designation. Scattered showers did little to ease Severe to Exceptional Drought (D2-D4) in southern Texas, where another week of record heat (100°F or greater) compounded the impacts of ongoing dryness. The latest satellite-derived Vegetation Health Index depicted conditions much worse than the same time last year over southern Texas, indicative of severely stressed crops and pastures. Farther north, up to an inch of rainfall eased Abnormal Dryness in North Dakotas, although the moisture generally bypassed the Dakotas' D0 areas.

Upper Midwest: Heavy rain provided drought relief to central and northern Minnesota, with many areas reporting more than 3 inches of rain during the past week. In contrast, dry weather maintained a firm grip on D0-D2 areas of central and southern Wisconsin, with drought coverage expanded over much of the state in response to near-record low streamflows and large precipitation deficits over both the short and long term. Abnormal Dryness (D0) also expanded slightly in northern Michigan, a reflection of declining streamflows and pronounced short-term precipitation shortages.

Weekly Snowpack and Drought Monitor Update Report

The West: Monsoon remained mostly confined to southern and eastern portions of the Four Corners Region, although heavy rain fell in eastern New Mexico shortly after the cutoff date for this week's Drought Monitor. Meanwhile, additional 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. The remainder of the West was unchanged from last week.

Hawaii, Alaska and Puerto Rico: Reports from Hawaii indicated that trade wind rainfall along the east-facing slopes maintained the current status of drought over most of the islands. Light showers were observed in Alaska, although rain was not heavy enough to offer significant relief to the state's southern D0 and D1 areas. Central and eastern portions of Alaska are being monitored for low streamflows as well as increased wildfire activity. In Puerto Rico, 1 to 3 inches of rain over the eastern and western third of the island maintained near- to above-normal streamflows, while pockets of dry weather were noted in central Puerto Rico.

Looking Ahead: A nearly-stationary upper-air low north of the Great Lakes will usher a series of weak cold fronts across the central and eastern U.S. over the next 7 days. Consequently, showers and thunderstorms will provide hit-and-miss relief to most drought areas east of the Rockies, with the best chance for heavy rain from the Delta northeastward into the Ohio River Valley and Northeast. Rain is expected to more or less bypass the Extreme to Exceptional Drought areas of southern Texas, however. Out west, high pressure will maintain dry, hot weather, although monsoon showers will prevail in eastern portions of the Four Corners region.

The CPC 6-10 day forecast (July 28 – August 1) calls for near- to below-normal temperatures over most of the contiguous U.S. east of the Rockies, with abnormally warm weather confined to the Pacific Coast States and southern Florida. Above-normal rainfall is expected in New England and from the central Plains eastward into the Southeast. Meanwhile, below-normal precipitation will continue west of the Rockies and from northern Montana into the Upper Midwest.

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 23, 2009