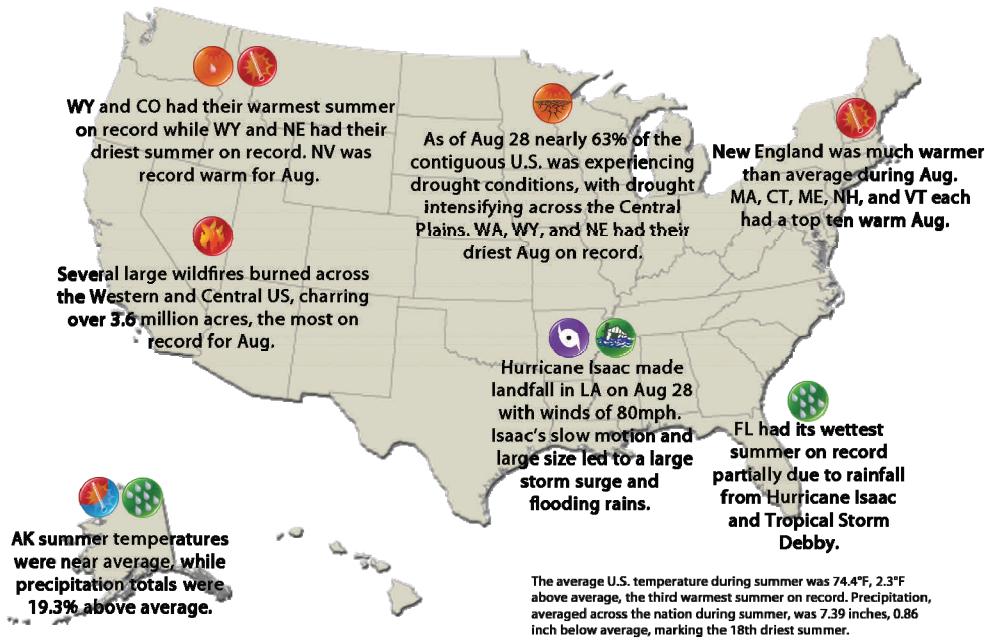


National Outlook — Significant Events for Summer 2012

Extreme Drought Persists Across the Western States



Central US:

- Summer 2012 ranks as the **warmest on record** for Wyoming and Colorado.

Southern Great Plains:

- 91% of Oklahoma** was in extreme drought as of Sept. 1, up from 3% on June 1.

Western US

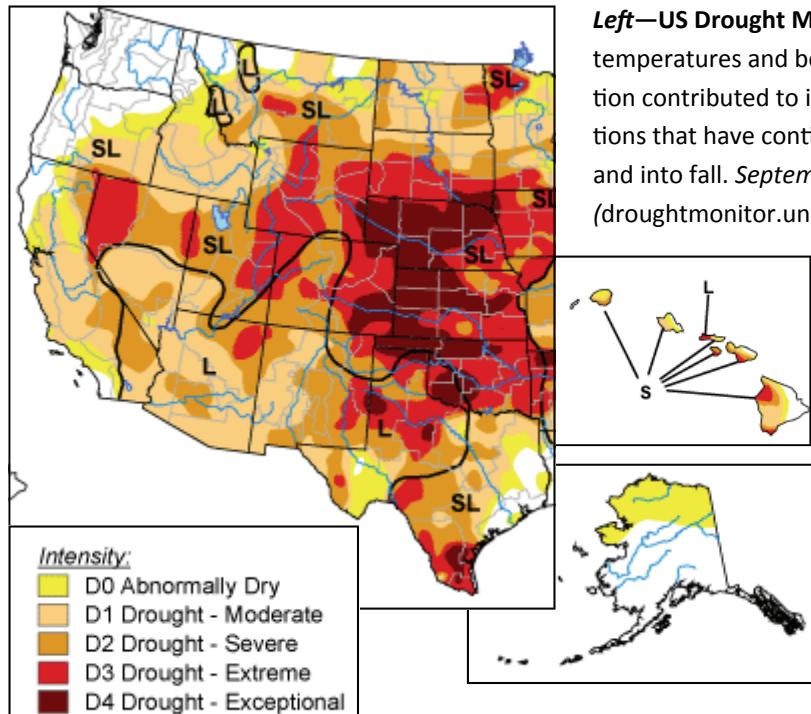
- Though drought conditions endured, the southwest **monsoon brought some rain and relief** to Arizona as well as parts of southern California, Nevada, Utah and Colorado.

Pacific Islands:

- Drought persisted through the rainy season, with **extreme drought** on leeward areas of Maui, Lanai, Molokai and the Big Island.

Regional Outlook — Climate Overview for Summer 2012

Drought in the West

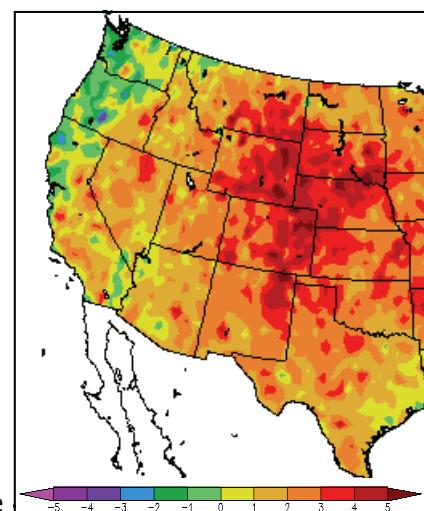


Left—US Drought Monitor: Above-average temperatures and below-average precipitation contributed to intense drought conditions that have continued late into summer and into fall. *September 25, 2012.*
(droughtmonitor.unl.edu)

Right — Departure from Normal Temperature: Average daily temperatures were as much as 5 degrees above average in the West. The very warm June-July period was tempered by near-normal August conditions in much of the Rockies. (hprcc.unl.edu)

Departure from Normal Temp. (F)

June — August 2012



Regional Impacts

Wildfire

Wildfire activity was high in the southern interior west for the first part of the summer and became more active further west and north over the second half of the summer.

Animal Husbandry

Farming and ranching continues to suffer in Hawaii due to persistence of drought conditions. On Kauai, Oahu, Maui, and the Big Island, degraded pastures have required ranchers to reduce their herd size.

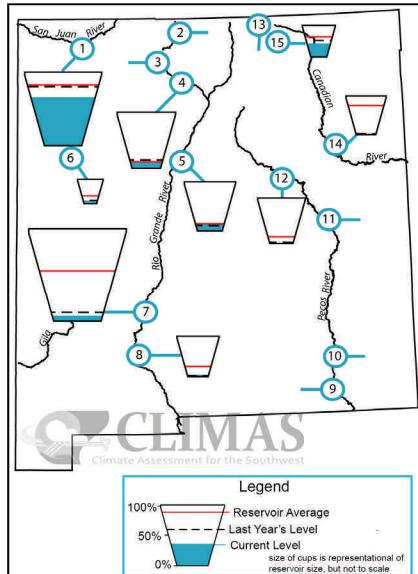
Corn and Soy

The USDA projects national corn production at 10.8 billion bushels, down 13% from 2011 and the lowest production since 2006. Soybean production is expected to be down 12% from 2011.

Reservoir Storage

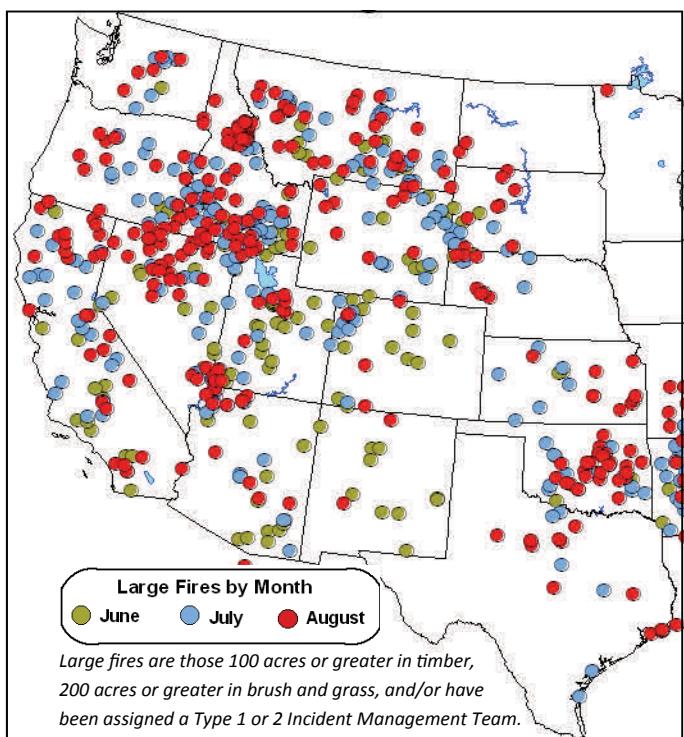
Water supplies in many of the seventeen contiguous WGA states continued to decline and the upcoming fall and winter season rainfall will be critical. As evidence of this, reservoir storage in New Mexico was well below average in several of the state's reservoirs (see figure to the right).

New Mexico Reservoir Storage Aug 2012



Large Wildfires in the Western US

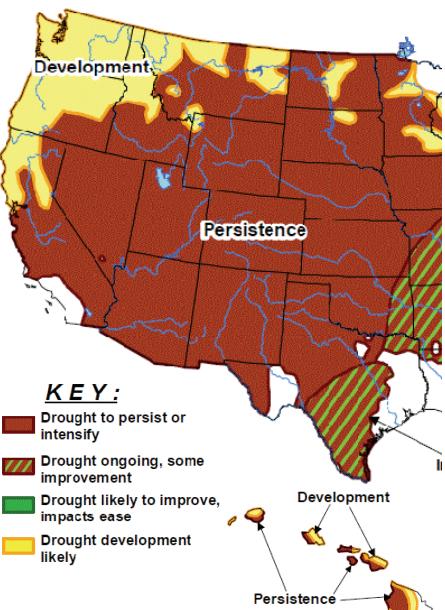
June—Aug 2012



Above: Large Wildfires in the Western US, June-August 2012. Map from Predictive Services, National Interagency Coordination Center. (nifc.gov)

Left: Reservoir storage in New Mexico was significantly below average in much of the state. Conditions on August 31. (climas.arizona.edu)

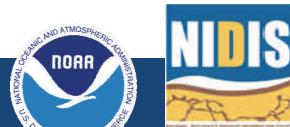
Regional Outlook



Outlook Indicates Continuing Dry Conditions

Fall will likely bring **below-average precipitation to the Pacific Northwest**, making drought development likely. Drought will persist across most of the West and Great Plains, but signs of **above-normal precipitation in Texas** could bring some improvement.

Left: US Seasonal Drought Outlook; valid September—December 2012. (cpc.ncep.noaa.gov)



El Niño Outlook

Weak El Niño conditions are likely to develop in the fall and persist through at least December, possibly into early spring.

An El Niño year typically means above-average precipitation in the southwestern US, but predictions for borderline El Niño conditions indicate that **rainfall likely will not match previous wet years during an El Niño**.

An increased likelihood of **below-median precipitation is expected in the northwest US through spring of 2013**.

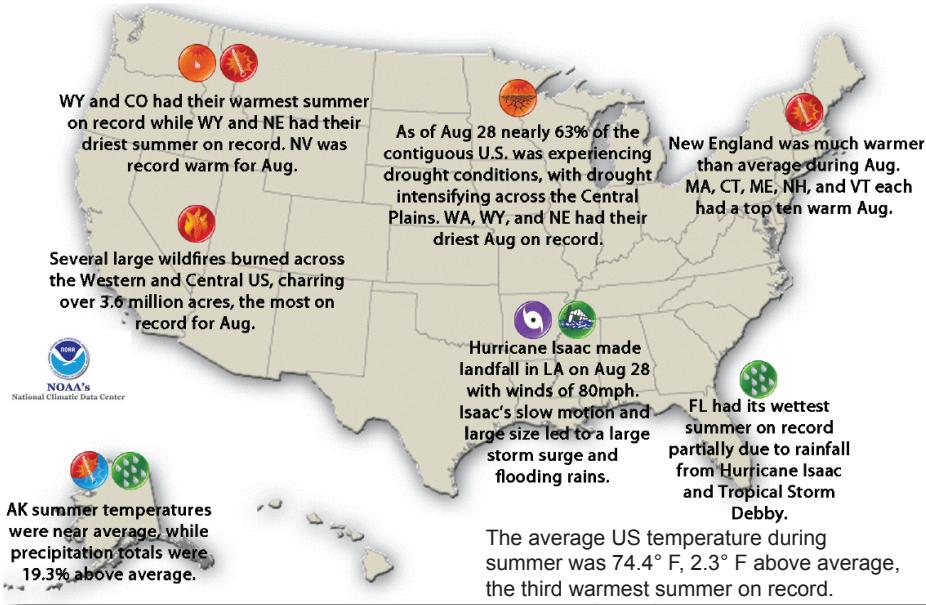


Western Governors' Association — Outlook Contact:
Carlee Brown (cbrown@westgov.org)

Quarterly Climate Impacts and Outlook

Western Region
September 2012

National - Significant Events for June - August 2012



Highlights for the West

Critical fire conditions (low relative humidity, high wind, drought conditions) persisted across much of the West, allowing wildfires to develop and spread rapidly.

The **Southwest monsoon** brought rain to Arizona as well as parts of southern California, Nevada, Utah and Colorado.

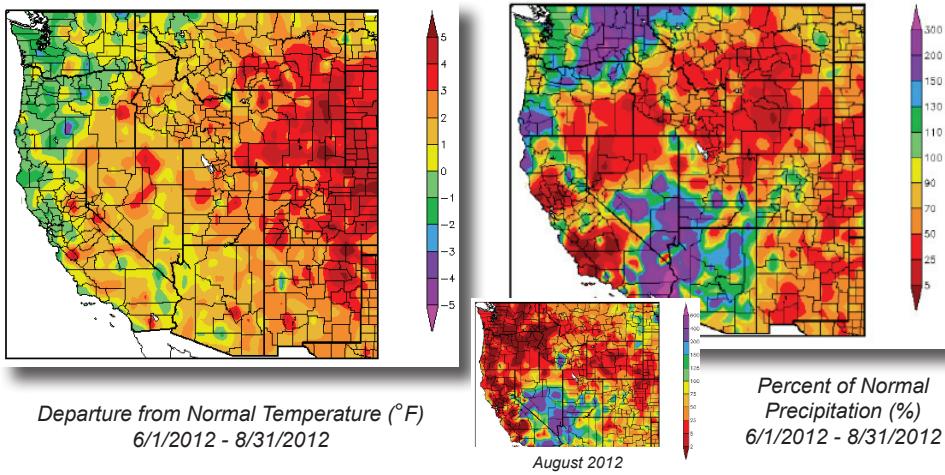
Severe thunderstorms stretched from California to Oregon and Washington at the end of July.

Coastal upwelling was a bit below normal off the Pacific Northwest, water temperatures were cooler than average, and food abundance was among the highest in 14 years.

Recent equatorial sea surface **temperatures** are more than 0.5°C above average in the eastern Pacific Ocean; however ENSO-neutral conditions continued during August.

Regional - Climate Overview for June - August 2012

Temperature and Precipitation Anomalies

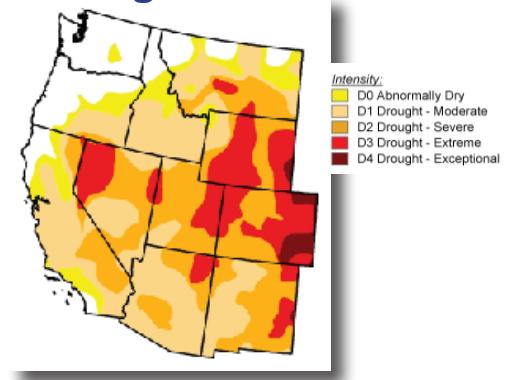


The temperature anomalies shown in the left panel indicate that most of the interior West had above-normal temperatures (warm colors), with slightly cooler-than-normal temperatures in the Northwest and along the Pacific Coast.

The Pacific Northwest (Washington, western Oregon, northern California) and the Southwest Monsoon region (southern California, southern Nevada, southwest Utah and Arizona) had above-normal seasonal precipitation, while the remainder of the West received much less precipitation than normal. August precipitation in the Northwest was well below normal (see inset), and August was the driest on record in Washington. (Provisional temperature and precipitation data courtesy of the High Plains Regional Climate Center, www.hpcc.unl.edu.)

The US Drought Monitor shows abnormally dry to extreme drought conditions in much of the West. (The Drought Monitor is a collaborative product from the USDA, NOAA and National Drought Mitigation Center www.droughtmonitor.unl.edu/monitor.html.)

Drought in the West



Regional Impacts - for June - August 2012

Climate and Weather

High evapotranspiration rates in response to high temperatures reduced the benefits of precipitation when it occurred.

Drought and Water Resources Impacts

Reservoir volumes throughout much of the region continued to decline and the upcoming fall and winter season rainfall will be critical for water supply: Lake Powell is at 58% of capacity, Lake Mead 51% and Elephant Butte Lake 8%. Collectively, California reservoirs are below the median capacity for the first time in five years.

Natural Resources

Over 14,000 wildfires burned over 6.5 million acres.

Freshwater streams had warmer water and low-flows, resulting in both voluntary and non-voluntary fishing curtailments as well as supplemental reservoir water releases.

Large wild animals entered neighborhoods in pursuit of food.

Juvenile salmon survival is favorable due to cooler than average ocean temperatures and high food abundance. Returns of adult Coho salmon in 2013 and Chinook in 2014 are likely to be higher than average.

Agriculture

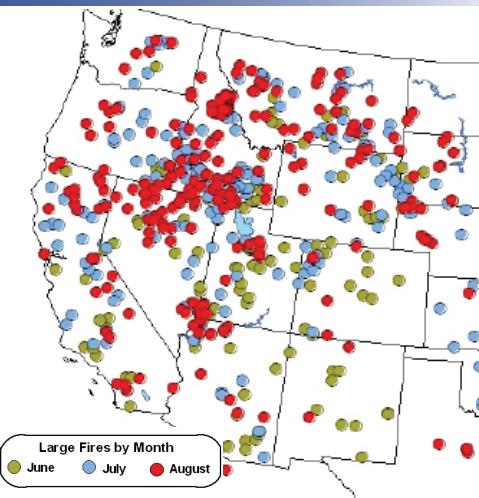
Agricultural productivity (such as the apple harvest in WA) was reduced due to hail damage.

Grazing quota allotments on public lands were reduced due to poor rangeland conditions while supplemental hay is in short supply and expensive.

Health

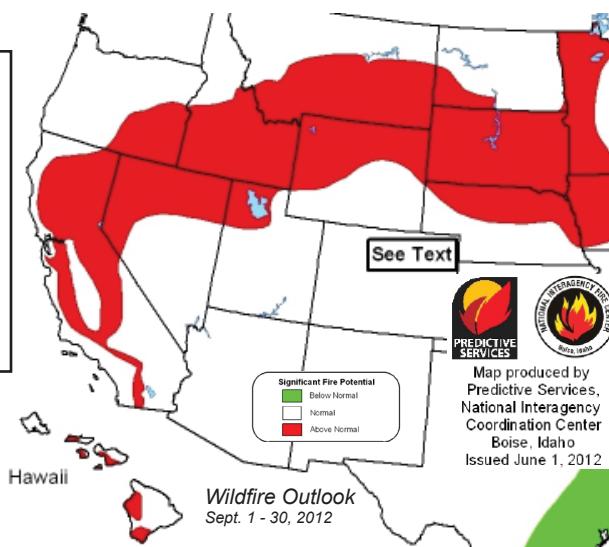
West Nile virus outbreaks increased due to favorable conditions of hot and dry weather with episodic rainfall.

Air quality and visibility were degraded by wildfire smoke.



Large wildfires* in the western US in June, July and August. Wildfire activity was high in the southern interior west for the first part of the summer and became more active further west and north over the second half of the summer. (Map produced by Predictive Services, National Interagency Coordination Center, Boise, Idaho. www.predictiveservices.nifc.gov) *100 acres or greater in timber, 300 acres or greater in brush and grass, and/or have been assigned a Type 1 or 2 Incident Management Team.

Regional Outlook - for Fall 2012



NIFC Monthly and Seasonal Fire Potential

The West experienced rainfall deficits resulting in below normal live and dead fuel moistures in a band stretching from central and northern California, through the northern Great Basin and into the Northern Rockies and Northern Plains (red shading). Across many of these areas, a heavier and more continuous than normal fuel bed is creating conditions where fires are able to spread more rapidly and into areas not normally prone to fire at this time of year. The seasonal forecast (see inset) indicates fire potential in the west decreases, except for some areas of Southern California.

NOAA Seasonal Climate Outlook

Weak El Niño conditions are likely to develop during the fall, and persist into winter and early spring. An increased likelihood of below median precipitation is expected in the northwest US through spring of 2013. Should El Niño conditions become established, there will be an enhanced chance for above median precipitation across the southwestern US through the end of the upcoming winter and early spring. (Climate Prediction Center, www.cpc.ncep.noaa.gov).

Western Region Partners

Western Regional Climate Center
wrcc.dri.edu

National Integrated Drought Information System (NIDIS) - drought.gov

Western Governors' Association
westgov.org

Western States Water Council
westgov.org/wswc

National Interagency Fire Center
www.nifc.gov

USDA/NRCS National Water and Climate Center - www.wcc.nrcs.usda.gov

DOI WaterSMART
www.usbr.gov/WaterSMART

NOAA/ESRL Physical Sciences Division
esrl.noaa.gov/psd

NOAA's Western Regional Collaboration Team
www.regions.noaa.gov/western/western_region_team.html

Western Water Assessment
colorado.edu

Climate Assessment for the Southwest
climas.arizona.edu

California Nevada Applications Program
meteora.ucsd.edu/cap

Climate Impacts Research Consortium
pnwclimate.org/resources

Colorado Basin River Forecast Center
www.cbrfc.noaa.gov

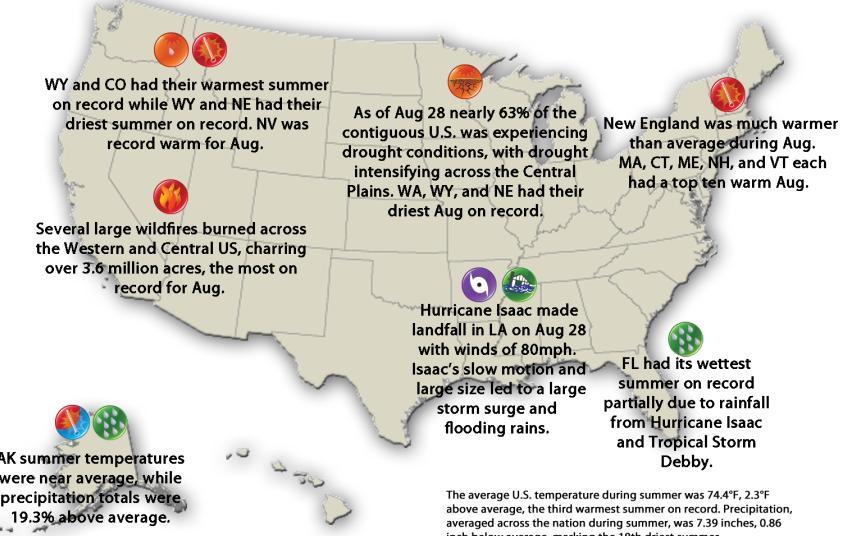
California Nevada River Forecast Center
www.cnrfc.noaa.gov

NOAA Fisheries Service - [www.nmfs.noaa.gov/nws.noaa.gov/om/csd/index.php?section=programs#western](http://www.nmfs.noaa.gov/nws/noaa.gov/om/csd/index.php?section=programs#western)

State Climatologists - stateclimate.org

National - Significant Events for June - August 2012

Significant Events for August and Summer 2012



Extreme Drought Reemerges in the Southern Plains

Oklahoma

- 91% of the state in **extreme drought** on September 1st, up from 3% on June 1st
- 150,000+ acres burned by wildfires in 2012

Texas

- 21% of the state in **extreme drought** on September 1st, up from 10% on June 1st
- Many reservoirs in West Texas below last year's levels – some **at or near 0% capacity**

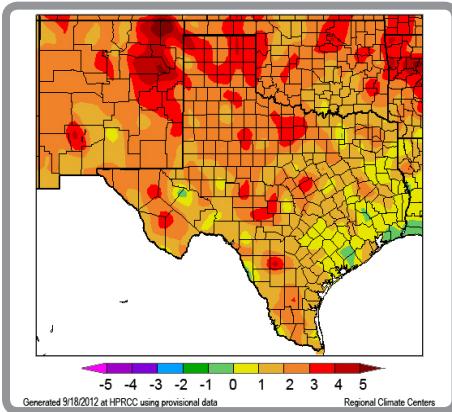
New Mexico

- State's major reservoir, Elephant Butte, at **less than 10% capacity** on Sep 1st
- 370,000+ acres burned by wildfires in 2012

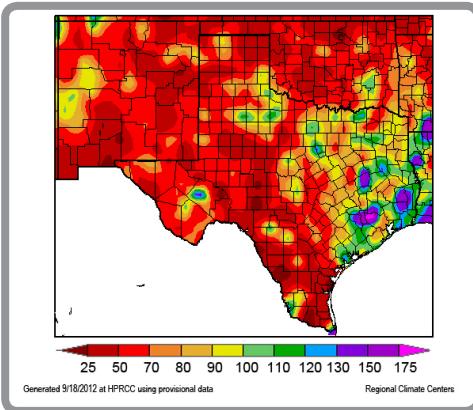
Regional - Climate Overview for June - August 2012

Temperature and Precipitation Anomalies

Departure from Normal Temperature (°F)
6/1/2012 - 8/31/2012

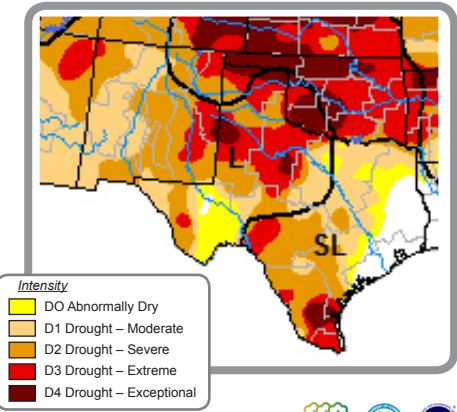


Percent of Normal Precipitation (%)
6/1/2012 - 8/31/2012



Drought

US Drought Monitor
9/13/2012



USDA National Drought Mitigation Center NOAA

Provisional data courtesy of High Plains Regional Climate Center, (www.hprcc.unl.edu) and the U.S. Drought Portal, (www.drought.gov)

Above-average temperatures (above, left) and below-average precipitation (above, middle) both contributed to intense summer drought conditions in the Southern Great Plains (above, right).

2011 and 2012 have been two of the warmest years on record in the Southern Plains (left). Records date back to 1895.

Temperature and Precipitation Rankings

	Jun 1st-Aug 31st	Jan 1st-Aug 31st	Sep 2010-Aug 2012
Oklahoma	12th warmest	HOTTEST	HOTTEST
Texas	10th warmest	3rd warmest	HOTTEST
New Mexico	3rd warmest	2nd warmest	HOTTEST
Oklahoma	17th driest	35th driest	9th driest
Texas	39th driest	67th driest	5th driest
New Mexico	8th driest	5th driest	DRIEST



Regional Highlight - The Historic 2010 – 2012 Drought Continues

Climate Extremes

Since October 1st 2010 – the approximate beginning of the current historic drought – nearly all locations in Texas, Oklahoma, and New Mexico have received substantially below-average precipitation (right). Conditions have been further exacerbated by exceptional heat across much of the region.

Oklahoma and Texas

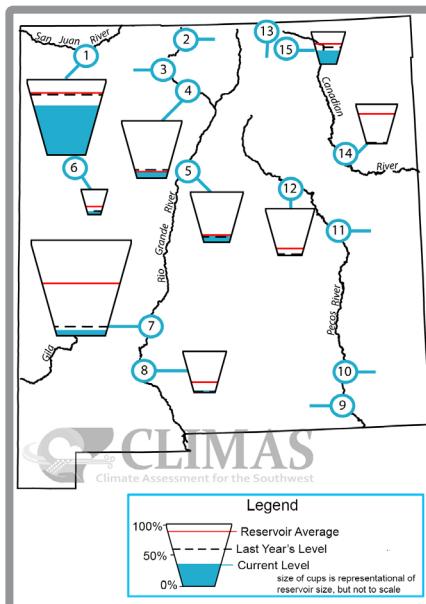
- Both states had driest 24-month period since 1956 (ending Aug 31st)
- Oklahoma on pace for its **warmest year on record** (since 1895)

New Mexico

- 24-month period ending Aug 31st was both **driest and warmest on record** (since 1895)

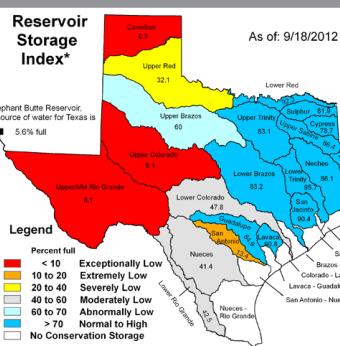
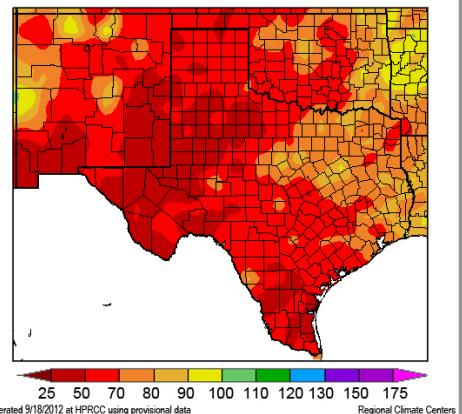
Water Resources

Among the most significant impacts of the combination of historic dryness and heat has been the reduction in reservoir capacity in New Mexico and Texas.

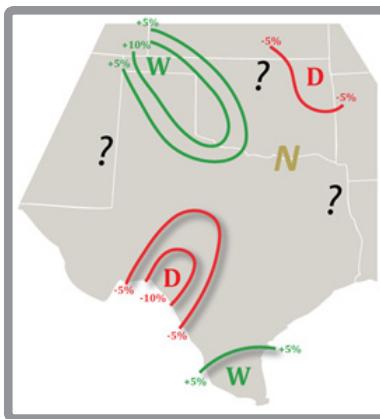
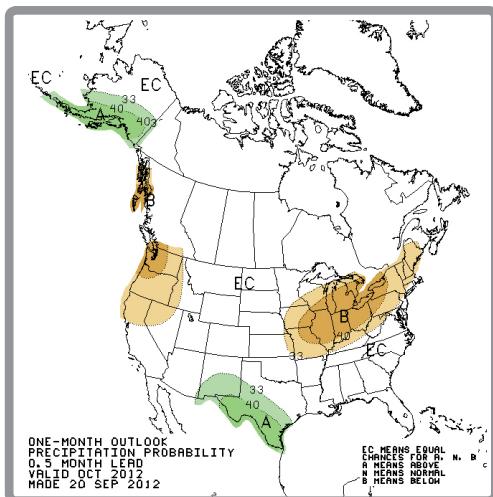


Above: www.climas.arizona.edu; conditions on August 31st
 Top right: www.hprcc.unl.edu; Sep 2010 thru August 2012
 Bottom right: www.twdb.state.tx.us; conditions on September 18th

Percent of Normal Precipitation (%)
10/1/2010 – 8/31/2012



Regional Outlook - for Fall Season



Left: www.cpc.noaa.gov, October 2012 national precipitation outlook
 Above: www.esrl.noaa.gov/psd, Fall 2012 (October-December) Southern Plains precipitation outlook

Southern Plains Partners

Cooperative Institute for Research in Environmental Sciences
cires.colorado.edu

Climate Assessment for the Southwest
climas.arizona.edu

DOI South Central Climate Science Center
doi.gov/csc/southcentral

National Drought Mitigation Center
drought.unl.edu

National Integrated Drought Information System
drought.gov

NOAA/NESDIS National Climatic Data Center
ncdc.noaa.gov

NOAA/NWS Southern Region
srh.noaa.gov

NOAA/NWS Climate Prediction Center
cpc.noaa.gov

NOAA/OAR Physical Sciences Division
esrl.noaa.gov/psd

NOAA Regional Collaboration Teams
regions.noaa.gov

Southern Climate Impacts Planning Program
southernclimate.org

Southern Regional Climate Center
srcc.lsu.edu

State Climatologists
stateclimate.org

Texas Water Development Board
twdb.state.tx.us

Western Governors Association
westgov.org

Western Regional Climate Center
wrcc.dri.edu

Official NOAA October Precipitation Outlook

- For October, there is an **increased probability** of above-normal precipitation in portions of **south and east Texas**
- There are **equal chances** of either above- or below-normal precipitation in **Oklahoma and New Mexico**

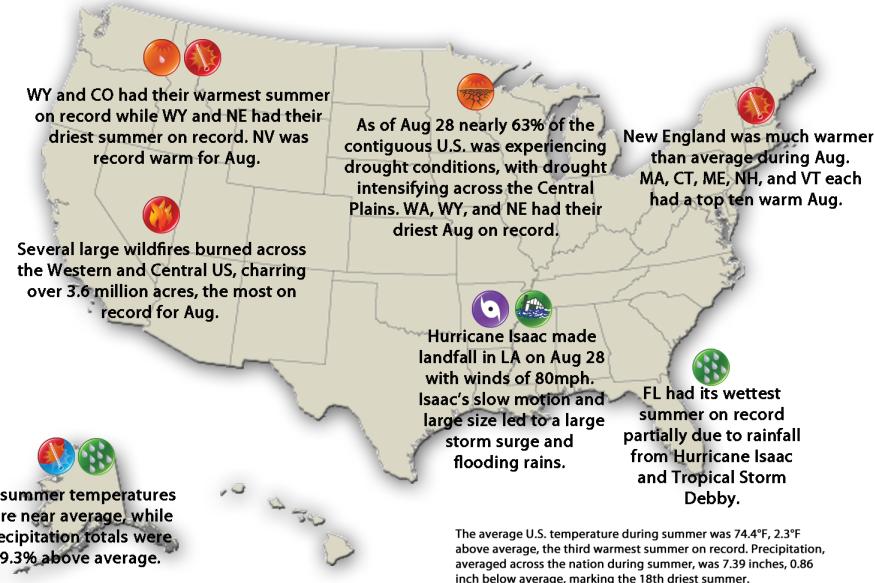
Looking Forward: Regional Fall Forecast

- Borderline El Niño-like conditions are likely to persist through at least December
- There are **increased chances** of wet conditions in the **Texas and Oklahoma panhandles**
- There are **decreased chances** of wet conditions in **southwest Texas and eastern Oklahoma**



National - Significant Events for June - August 2012

Significant Events for August and Summer 2012



Highlights for the Central Region

Summer 2012 ranks as the warmest on record for Wyoming and Colorado, and in the top ten warmest for nine other states in the region. 1,828 maximum temperature and high minimum temperature records were set during the course of the summer in the region at stations with 80 or more years of record.

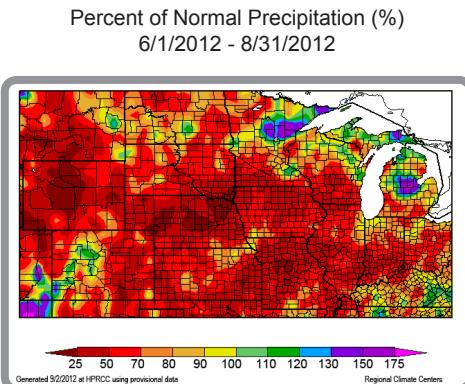
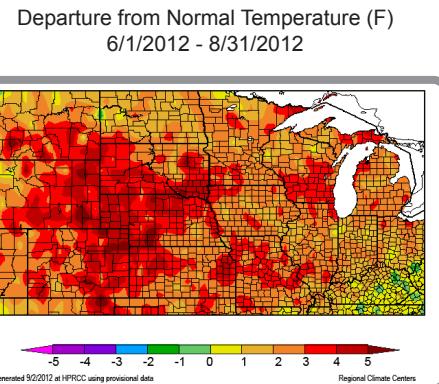
Drought expanded and intensified through August. At the peak around August 21st, 77 percent of the Central Region was experiencing moderate to exceptional drought.

Hot, dry weather resulted in an active wildfire season throughout the region. At end of August there were 15 wildfires still active in Wyoming, Colorado, and North Dakota.

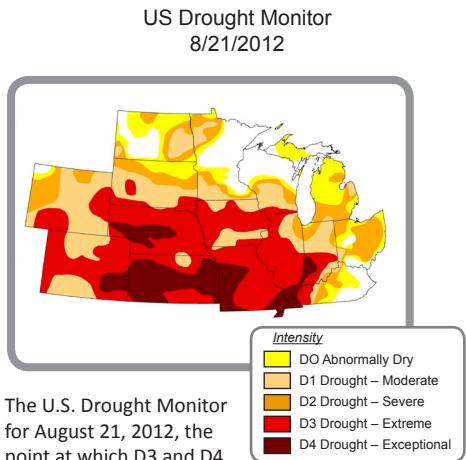
Six to ten inches of rain on June 19-20 caused catastrophic flooding in Duluth, MN. Damages to the city infrastructure alone are estimated at \$50 to \$80 million.

Regional - Climate Overview for June - August 2012

Temperature and Precipitation Anomalies



Drought



Average daily temperatures ranged from 1°F to 3°F above normal in the eastern half of the region to 3°F to 5°F above normal in the western half. The very warm June-July period was tempered by near normal August temperatures across the region east of the Rockies.

Precipitation during the summer period ranged from less than 10 percent of normal in central Wyoming to 125 percent or normal from northeastern Minnesota across northern Lower Michigan. August rainfall was well above normal in the eastern Midwest, but summer rainfall in the region was only about 50 percent of normal.

Although August rainfall in the eastern half of the region brought improvement to drought conditions, it was generally too little, too late for agriculture.

Regional - for June - August 2012

Agriculture

The drought and high heat severely impacted all sectors of agriculture throughout the region. USDA projects national corn production at 10.8 billion bushels, down 13% from 2011 and the lowest production since 2006. Soybean production is expected to be down 12 percent from 2011.

Water Resources

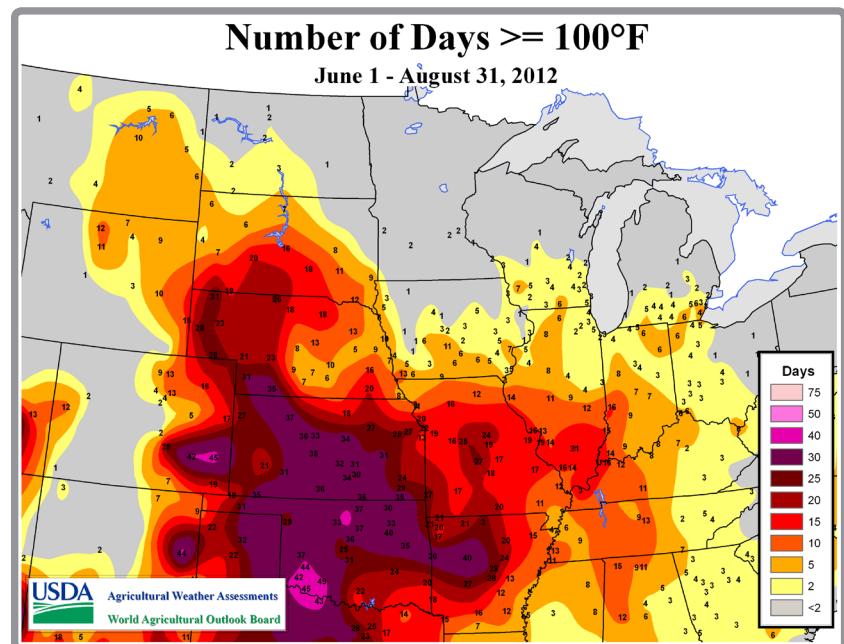
Low water levels in residential wells and dry farm ponds were common throughout the region. It was reported that 10 to 12 percent of the wells intended for fracking were on hold in Kansas due to lack of water. Surface water use for irrigation was stopped in Nebraska due to low river levels.

Wildfire

The Waldo Canyon fire near Colorado Springs destroyed 346 homes with insurance claims totaling \$352.6 million. It is the most destructive fire in Colorado history, eclipsing the High Park fire near Fort Collins in June. As of August 31 the Waldo Canyon fire was still active but fully contained.

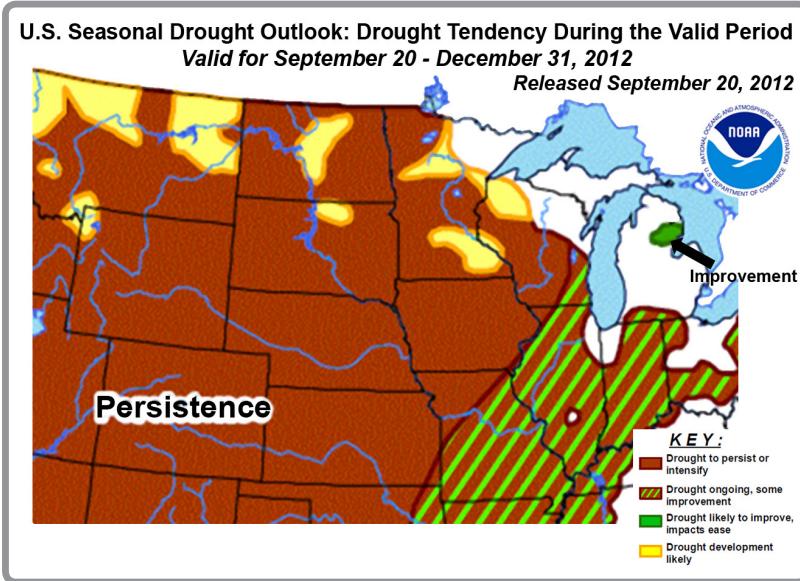
Transportation

Low water levels on middle and lower Mississippi River resulted in a backup of barge traffic up and down the river. There were dozens of reports of roads buckling across a number of states during the peak of the heat in July, posing a danger to drivers and adding to road maintenance costs.



This map shows the number of days at or above 100°F in the Central Region this summer.
Source: USDA

Regional Outlook - for Fall 2012



Drought Expected to Persist in Western Third of Region

Drought is expected to persist in the Central Plains throughout the fall, while improvement is expected east of the Mississippi River and in the Northern Plains. While a dry fall will be favorable for harvest, a dry fall followed by a drier than normal winter will mean that there will be little recharge of soil moisture prior to the next growing season. Persistent dry weather in the Plains will also threaten the upcoming winter wheat crop.

NOAA Three Month Outlook

The temperature outlook for September through November indicates an increased probability of warmer than normal temperatures throughout the region, with the greatest chances across Minnesota and the Great Lakes. There is an equal chance for above, normal, or below normal precipitation for the entire region.

Central Region Partners

- Midwestern Regional Climate Center
mrcc.isws.illinois.edu
- High Plains regional Climate Center
www.hprcc.unl.edu
- National Drought Mitigation Center
drought.unl.edu
- National Integrated Drought Information System (NIDIS)
www.drought.gov
- State Climatologists
www.stateclimate.org
- National Weather Service Central Region
www.crh.noaa.gov/crh
- North Central River Forecast Center
www.crh.noaa.gov/ncrfc
- Missouri Basin River Forecast Center
www.crh.noaa.gov/mbrfc
- National Climatic Data Center
www.ncdc.noaa.gov
- NWS Climate Prediction Center
www.cpc.ncep.noaa.gov
- Climate Science Program, Iowa State University
climate.engineering.iastate.edu
- WaterSMART Clearinghouse, U.S. Dept. of Interior
www.doi.gov/watersmart/html/index.php
- Western Governors' Association
westgov.org