NATIONAL HYDROPOWER ASSOCIATION MEETING

December 3, 2008 Birmingham Alabama

Roger McNeil Service Hydrologist NWS Birmingham Alabama





There are three commonly described types of Drought:

•Meteorological drought is usually measured by how far from normal precipitation has been over a period of time.

•Agricultural drought occurs when soil moisture is insufficient to meet crops' needs to produce an average crop. It may occur in times of average precipitation depending on soil types. (Short Term)

 Hydrological drought refers to deficiencies in surface and Subsurface water supplies. (Long Term)

Droughts are normal climate features. They can occur almost anywhere.

Birmingham Historical Droughts

Calendar year since 1900

28.86 inches (2007)
34.32 inches (1904)
36.14 inches (1931)
36.94 inches (1943)
37.84 inches (1908)

Birmingham Historical Droughts

 12 month droughts - Jan 2007 through Dec 2007 (28.86") - Dec 1930 through Nov 1931 (30.29") - Sep 1985 through Aug 1986 (31.84") - Jan 1904 through Dec 1904 (34.32") - Feb 1908 through Jan 1909 (36.54") - Jan 1943 through Dec 1943 (36.94") - Feb 1954 through Jan 1955 (38.98") - Dec 1923 through Nov 1924 (41.43")

Birmingham Historical Droughts

24 month droughts

- December 2006 through November 2008 (77.91")
- December 1929 through November 1931 (78.42")
- January 1942 through December 1942 (81.03")
- May 1924 through April 1926 (82.30")
- February 1954 through January 1956 (82.48")
- November 1985 through October 1987 (85.22")

Some Tools for Monitoring Drought

- Precipitation Totals/Anomalies
- Palmer Drought Severity Index (PDSI)
- Crop Moisture Index (CMI)
- Stream Flows

Standardized Precipitation Index

- The Standardized Precipitation Index (SPI) is a relatively new drought index based only on precipitation.
- The SPI can be used to monitor conditions on a variety of time scales.
- Temporal flexibility allows the SPI to be useful in both short-term agricultural and long-term hydrological applications.

Standardized Precipitation Index

- Longer intervals affect groundwater, stream-flow and reservoir storage.
- Shorter intervals are helpful in estimating soil moisture, which is very important to farmers and responds fairly immediately to rainfall or the lack of it.

Standardized Precipitation Index

http://drought.unl.edu/monitor

Monitoring Drought

What is Drought? Planning for Drought Drought Risk and Impacts Mitigating Drought About the NDMC Contact Information What's New Site Map Search the Site Publications Photo Gallery NDMC Home Page Quick Links NDMC's Drought Impact Reporter U.S. Drought Monitor **Drought for Kids** For Media

Other Drought-related Sites

Because there is no single definition for drought, its onset and termination are difficult to determine. We can, however, identify various indicators of drought, and tracking these indicators provides us with a crucial means of monitoring drought. Determining which indicators to use poses more difficulties for planners: should they rely on data collected for specific parameters (such as streamflow and snowpack), or should they select one or more indices, which incorporate and weigh various types of data in various combinations? Equally important in choosing these indicators is a consideration of the type or types of water shortage facing the planner—an index or parameters well suited to agricultural concerns are of limited use to urban planners.

How to Use this Section

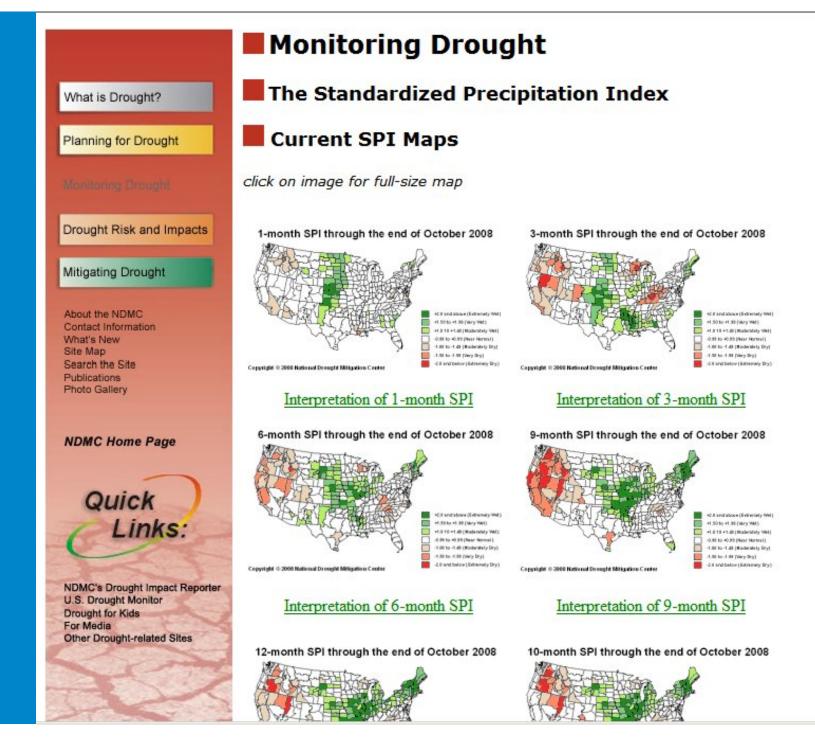
If you are new to the concept of monitoring drought, "<u>Drought Indices</u>", an NDMC white paper, will give you a good overview of the various kinds of drought indices and their uses. Two newer tools, the Standardized Precipitation Index and the Drought Monitor, are highlighted below. Use this section also to explore the many monitoring tools available on the web.

The Standardized Precipitation Index

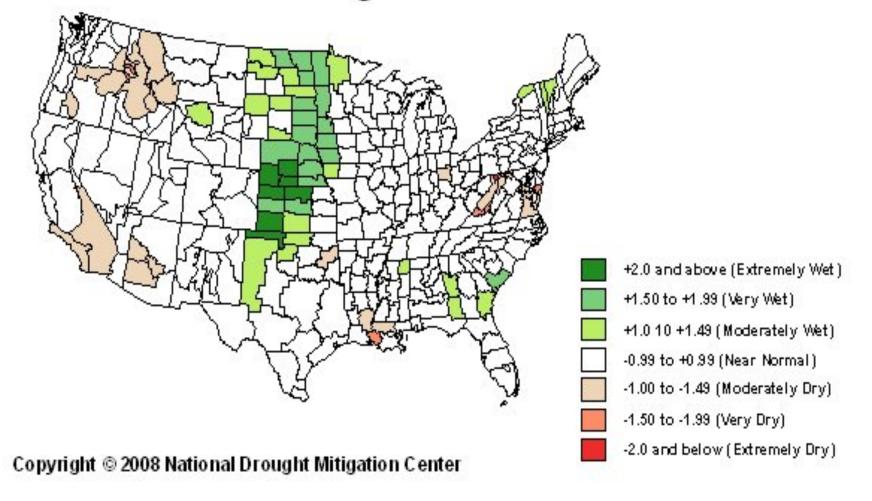
The SPI is an index based on precipitation only. It can be used on a variety of time scales, which allows it to be useful for both short-term agricultural and long-term hydrological applications. You can <u>download the SPI program and sample files here</u>.

The Drought Monitor

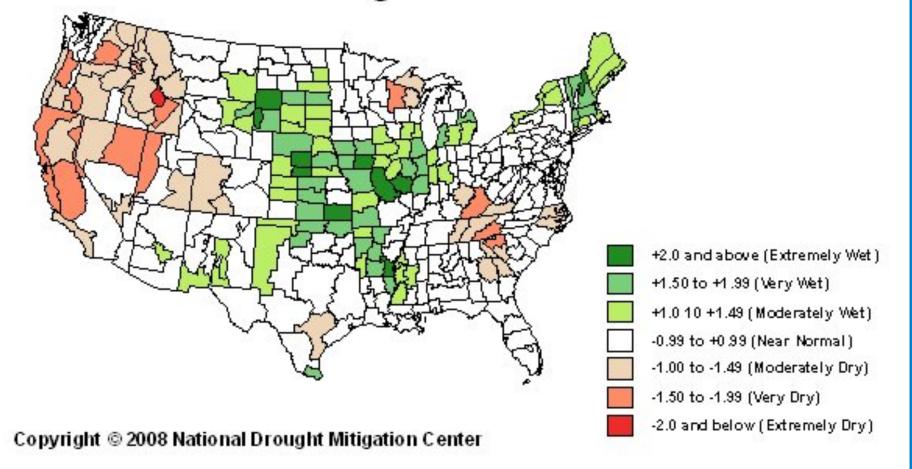
A comprehensive drought monitoring effort between the USDA (JAWF/NRCS), NOAA/CPC (NCEP/NWS), NCDC (DOC/NOAA), and the National Drought Mitigation Center

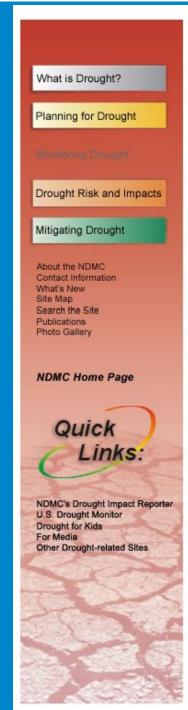


1-month SPI through the end of October 2008



6-month SPI through the end of October 2008





Monitoring Drought

The Standardized Precipitation Index

Interpretation of a 6-month SPI

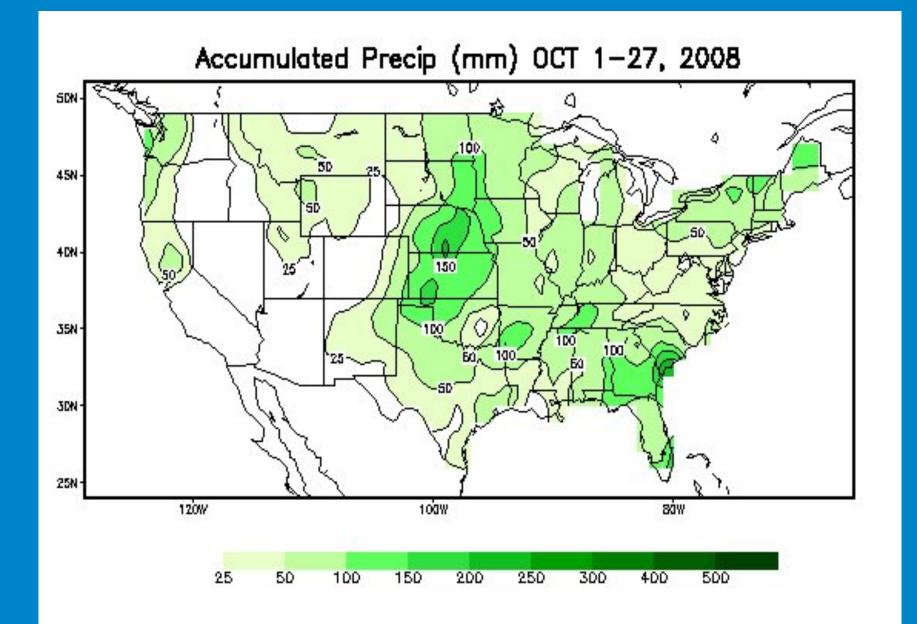
The 6-month SPI compares the precipitation for that period with the same 6-month period over the historical record. For example, a 6-month SPI at the end of September compares the precipitation total for the April–September period with all the past totals for that same period.

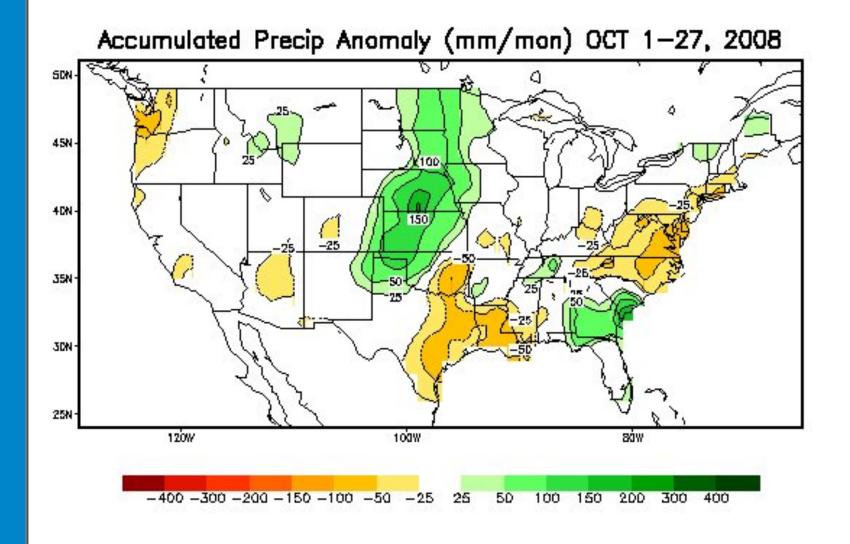
The 6-month SPI indicates medium-term trends in precipitation and is still considered to be more sensitive to conditions at this scale than the Palmer Index. A 6-month SPI can be very effective in showing the precipitation over distinct seasons. For example, a 6-month SPI at the end of March would give a very good indication of the amount of precipitation that has fallen in California during the very important period from October through March (see <u>6-month SPI for the end of March 1996</u>). Information from a 6-month SPI may also begin to be associated with anomalous streamflows and reservoir levels.

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http://www.cpc.ncep.noaa.gov/soilmst/p.shtml

ПОНВ	Nationa Climate F	al Weather Ser Prediction	11 Alexandre		
A DAME	Home	Site Map	News	Organization	Sea
Search the CPC	HOME > Monitoring & Dat	ta > U.S. Soil Moisture Mo	onitoring > Precipitation		
About Us Our Mission Who We Are		Precipi	tation		
Contact Us CPC Information CPC Web Team			most recent 12 months a ths percentiles, climatolog		
USA.gov	Precipitation				
Government Made Easy	<u>Current Mont</u> <u>Most Recent 1</u>				
	Precipitation Anom	aly			
	<u>Current Mont</u> <u>Most Recent 1</u>				
	Precipitation Perce	ntiles			
	Most Recent 1	2 months			
	Monthly Climatolog	Ι¥.			
	Precipitation				
	<u>Outlooks</u>				
	• Soil Moisture				
	• <u>CAS</u> • <u>MRF</u>				
	Notes:				
	Anomaly: Ranking Percentile:		Climatology (unit: mm) is zero in more than one year		
	recentle.	during 1932-200	00, the ranking percentile is ot shown in the map		





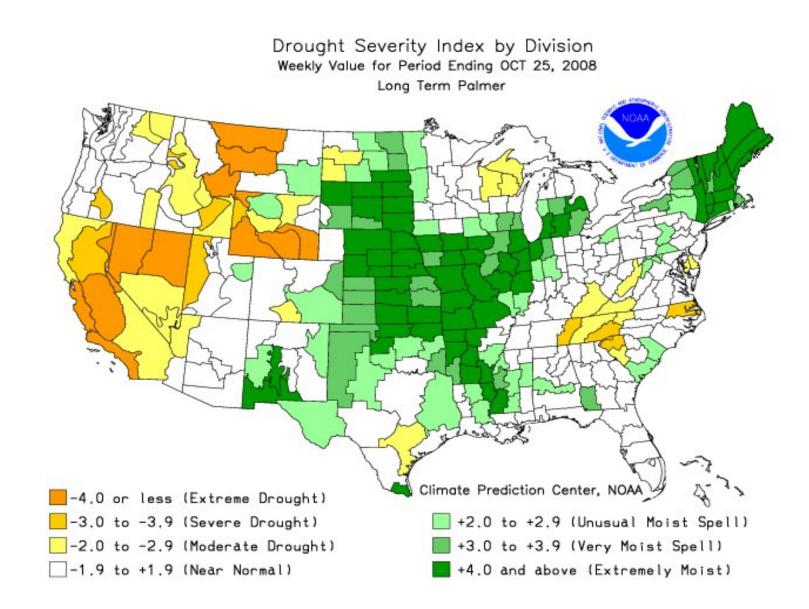
Palmer Drought Severity Index

- Overview: The Palmer is a soil moisture algorithm calibrated for relatively homogeneous regions.
- Who uses it: Many U.S. government agencies and states rely on the Palmer to trigger drought relief programs.
- Pros: The first comprehensive drought index developed in the United States.
- Cons: Palmer values may lag emerging droughts by several months; less well suited for mountainous land or areas of frequent climatic extremes.

Palmer Drought Severity Index

- The PDSI is a meteorological drought index, and it responds to weather conditions that have been abnormally dry or abnormally wet.
- When conditions change from dry to normal or wet, the drought measured by the PDSI ends without taking into account stream flow, lake and reservoir levels, and other longer-term hydrologic impacts.
- The PDSI is calculated based on precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil.

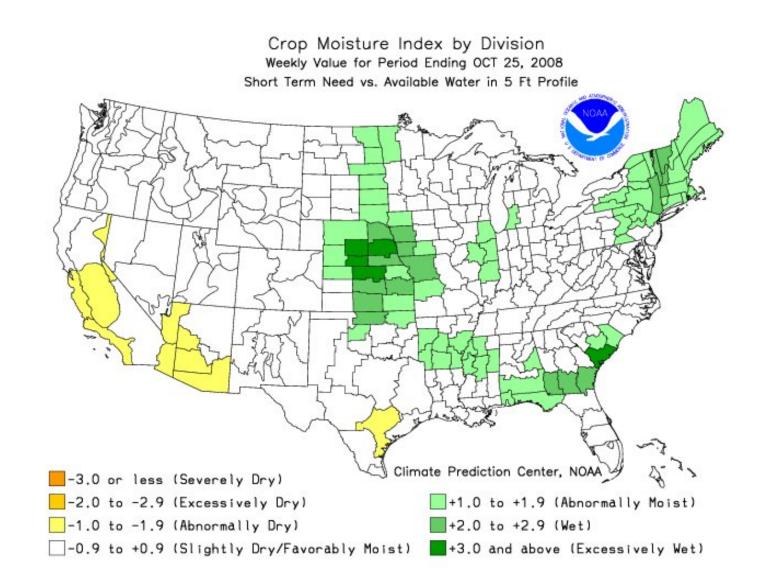
Palmer Classifications			
4.0 or more	extremely wet		
3.0 to 3.99	very wet		
2.0 to 2.99	moderately wet		
1.0 to 1.99	slightly wet		
0.5 to 0.99	incipient wet spell		
0.49 to -0.49	near normal		
-0.5 to -0.99	incipient dry spell		
-1.0 to -1.99	mild drought		
-2.0 to -2.99	moderate drought		
-3.0 to -3.99	severe drought		
-4.0 or less	extreme drought		



Crop Moisture Index (CMI)

http://www.cpc.noaa.gov/products/monitoring_and_data/drought.shtml

- Description: A Palmer derivative, the CMI reflects moisture supply in the short term across major crop-producing regions and is not intended to assess long-term droughts.
- Pros: Identifies potential agricultural droughts.



Stream Flows

http://waterdata.usgs.gov/nwis/rt

Stream flows are sustained by ground water discharge

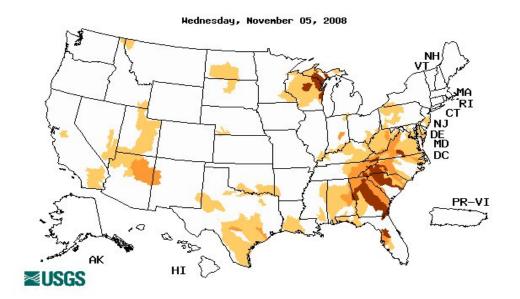
Long term stream flows are better indicators for long term drought than daily stream flows

Rapid return to much below normal stream flows following significant rainfall usually is a good indicator of longer term drought conditions



Drought Watch -- USGS State Information on Drought

Map of below normal 7-day average streamflow compared to historical streamflow for the day of year (United States)

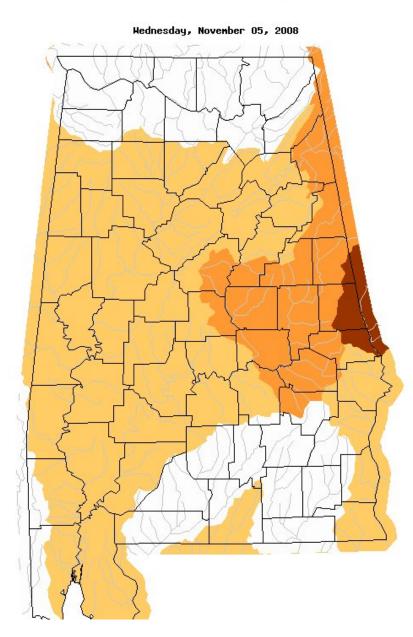


Choose a data retrieval option and select a state on the map O State DroughtWatch, O State map

	Explanation	 Percentile class 	ses	
Low	<=5	6-9	10-24	Insufficient data
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below	for a hydrologic region

Drought Watch -- USGS State Information on Drought

Map of below normal 7-day average streamflow compared to historical streamflow for the day of year (Alabama)



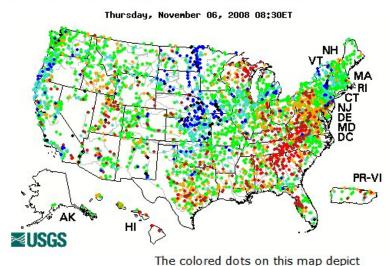


News: Recent changes

USGS Real-Time Water Data for the Nation

Predefined displays		Select sites by number or name
Introduction	no grouping 💌	go

Daily Streamflow Conditions



Explanation

- High
 ≥ 90th percentile
 75th 89th percentile
 25th 74th percentile
 10th 24th percentile
- 🛑 < 10th percentile

streamflow conditions as a <u>percentile</u>, which is computed from the period of record for the current day of the year. Only stations with at least 30 years of record are used.

The **gray circles** indicate other stations that were not ranked in percentiles either because they have fewer than 30 years of record or because they report

Select a state from the map to access real-time data

Real-time data typically are recorded at 15-60 minute intervals, stored onsite, and then transmitted to USGS offices every 1 to 4 hours, depending on the data relay technique used. Recording and transmission times may be more frequent during critical events. Data from real-time sites are relayed to USGS offices via satellite, telephone, and/or radio and are available for viewing within minutes of arrival.

All real-time data are provisional and subject to revision.

Build Table	Build a custom summary table of the most recent data for one or more sites, states, or hydrologic regions.
Build Sequence	Build a custom sequence of graphical or tabular data for one or more sites, states, or hydrologic regions.



National Water Information System: Web Interface

USGS Water Resources

Data Category: Real-time ▼ GO

Geographic Area:

Alabama

News: Recent changes

USGS Real-Time Water Data for Alabama

Predefined displays	Group table by	Select sites by number or name
Introduction	no grouping 💽	go

Daily Streamflow Conditions

Select a site to retrieve data and station information.

Thursday, November 06, 2008 08:30ET



Statewide Streamflow Table

Real-time data typically are recorded at 15-60 minute intervals, stored onsite, and then transmitted to USGS offices every 1 to 4 hours, depending on the data relay technique used. Recording and transmission times may be more frequent during critical events. Data from real-time sites are relayed to USGS offices via satellite, telephone, and/or radio and are available for viewing within minutes of arrival.

All real-time data are provisional and subject to revision.

Build Table	Build a custom summary table for one or more stations.
Build Sequence	Build a custom sequence of graphical or tabular data for one or more stations.



 $\bigcirc \ge 90$ th percentile

75th - 80th nercentile

The colored dots on this map depict streamflow conditions as a <u>percentile</u>, which is computed from the period of record for the current day of the year. Only stations with at least 30 years of record are

	Out-offerent	Design	
Available Parameters	Output format	Days	
🗖 All 3 Available Parameters for this site		7	-
🗹 00060 Discharge	C Graph w/ stats	(1-60)	GO
🗹 00065 Gage height	C Graph w/o stats		
00045 Precipitation	C Table		
	C Tab-separated		

Summary of all available data for this site

Discharge, cubic feet per second

Most recent instantaneous value: 3.3 11-06-2008 07:30



🛆 Median daily statistic (54 years) 🛛 — Discharge

Create presentation-quality graph

Parameter 00060; DD 02

Daily discharge statistics, in cfs, for Nov 6 based on 54 years of

record more

Min (2001)	Most Recent Instantaneous Value		Median	80th percen- tile		Max (2003)
2.5	3.3	14	35	124	134	2840

Gage height, feet

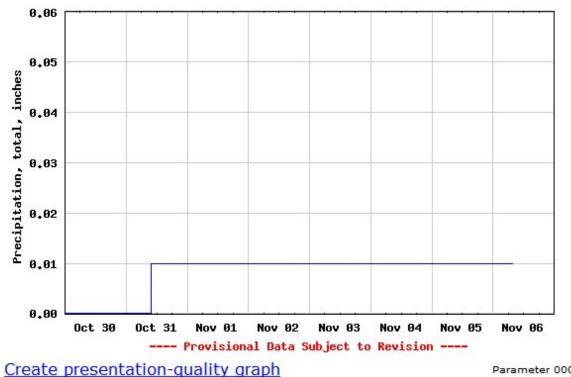
Most recent instantaneous value: 1.58 11-06-2008 07:30



USGS 02464000 NORTH RIVER NEAR SAMANTHA AL

Precipitation, total, inches

Most recent instantaneous value: 0.00 11-06-2008 07:30



USGS 02464000 NORTH RIVER NEAR SAMANTHA AL

Parameter 00045; DD 09

Additional Drought Information Sources

 National Integrated Drought Information System http://www.drought.gov/

 NASS – National Agricultural Statistics Service http://www.nass.usda.gov/

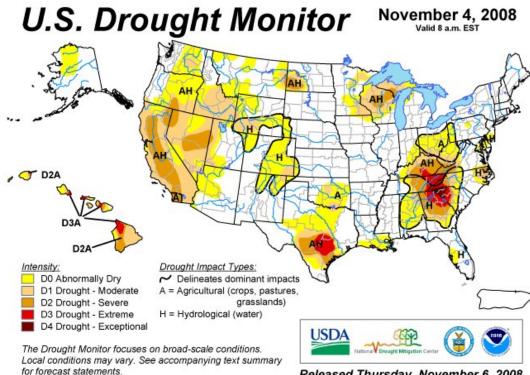


Drought Monitor Forecasts What's New Current Conditions About Us

Visit the <u>NDMC Photo Gallery</u> to see photos of drought conditions in <u>California</u>, <u>Georgia</u>, <u>South Carolina</u>, and other states. If you have photos showing drought conditions, please consider <u>submitting</u> them to the Photo Gallery.

The data cutoff for Drought Monitor maps is Tuesday at 7 a.m. Eastern Standard Time. The maps, which are based on analysis of the data, are released each Thursday at 8:30 a.m. Eastern Time.

NOTE: To view regional drought conditions, click on map below. State maps can be accessed from regional maps.



Released Thursday, November 6, 2008 Author: Mark Svoboda, National Drought Mitigation Center

To compare current drought conditions with last week's map, click <u>here</u>. To view tabular statistics of this week's Drought Monitor, click <u>here</u>. To view tabular statistics for the Drought Monitor archive, click <u>here</u>. To view Drought Monitor Change Maps, click <u>here</u>.

6-week

animation

http://drought.unl.edu/dm

NDMC's Drought	
Impact Reporter	

12-week animation short-term drought indicator blends long-term drought indicator blends



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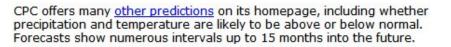
USA.gov

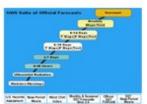
- Planning
- Research

Seasonal Temperature and Precipitation

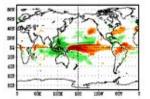


The Climate Prediction Center's (CPC) Seasonal Drought Outlook is issued twice a month. The Outlook predicts whether drought will emerge, stay the same or get better in the next three months.





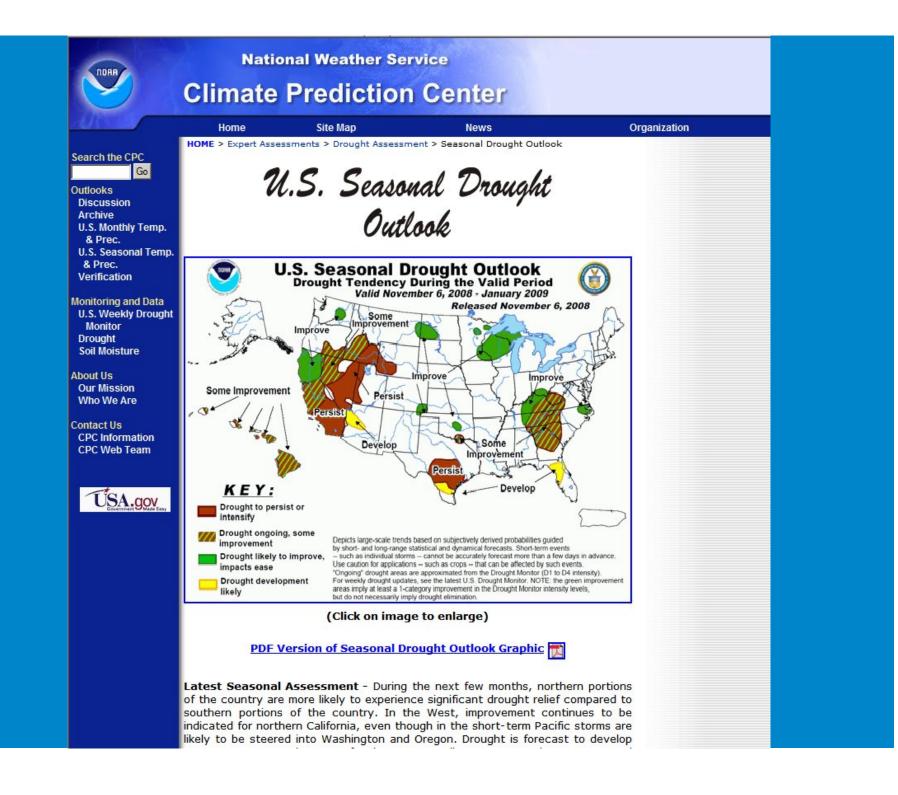
A graphical interface for the CPC temperature and precipitation outlooks is also available.

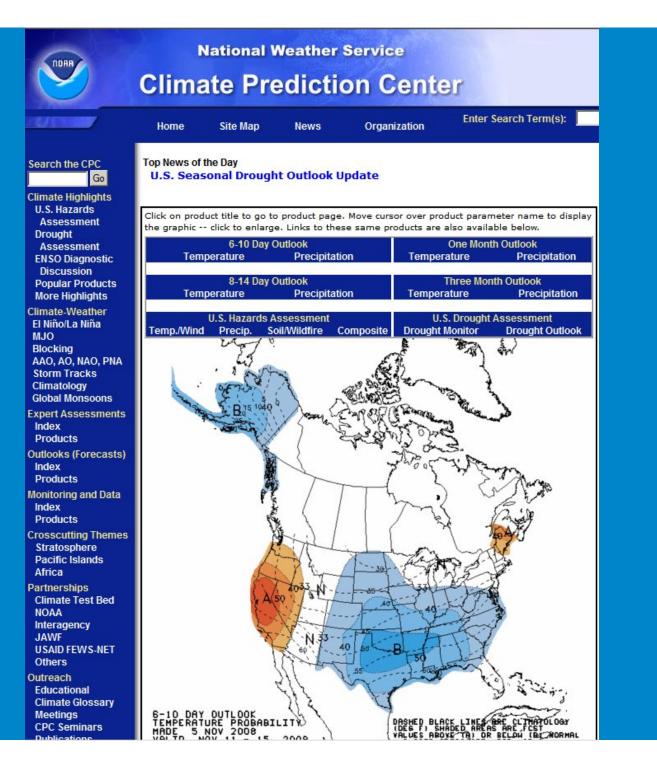


CPC's official seasonal outlooks incorporate a set of dynamic models showing monthly and seasonal outlooks for temperature, precipitation, atmospheric circulation, and sea surface temperatures, including El Niño/La Niña status. Outlooks up to six months are available.



The International Research Institute for Climate and Society at Columbia University offers Seasonal Climate Forecasts for Africa, Asia, Australia, Europe, the Middle East, the Pacific Islands, South America, and the entire globe.







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USA.gov

Soil Moisture



The Climate Prediction Center has an experimental <u>Palmer Drought</u> <u>Severity Index</u> forecast. The one-week outlook is presented as a map. A four-month outlook is available as tabular data for each climate division. The Palmer index assesses total moisture by using temperature and precipitation to compute water supply and demand and soil moisture. It is considered most relevant for non-irrigated cropland and primarily reflects long-term drought.

0



The Palmer drought model features the capability to compute the amount of precipitation that would be required to end a drought or reduce (ameliorate) a drought's severity. Maps of the precipitation needed, and the probability of receiving it based on historical records, are available from the <u>National Climatic Data Center</u>.



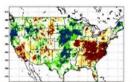
One- and two-week <u>forecasts of soil moisture anomalies</u>, (that is, the difference between seasonal normal and current), based on the Global Forecast System (GFS) model are available. The monthly and seasonal forecasts of soil moisture anomalies produced by the Constructed Analog on Soil Moisture (CAS) model are also available.



The Experimental Surface Water Monitor, from the University of Washington, provides analyses of soil moisture, snow water equivalent and other water-related variables.



Experimental Soil Moisture Forecasts, up to six months, are available at Princeton University's Drought Monitoring and Forecasting project web site. These forecasts are based on a statistical design called the Extended Stream-flow Prediction (ESP) and a dynamic seasonal model called the Climate Forecast System (CFS).



NOAA and NASA are collaborating on the <u>Land Data Assimilation Systems</u> (LDAS) experimental drought monitor to provide soil-moisture maps derived from near real-time estimates.



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What is NIDIS?

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Drought Impact Reporter National Drought Mitigation Center



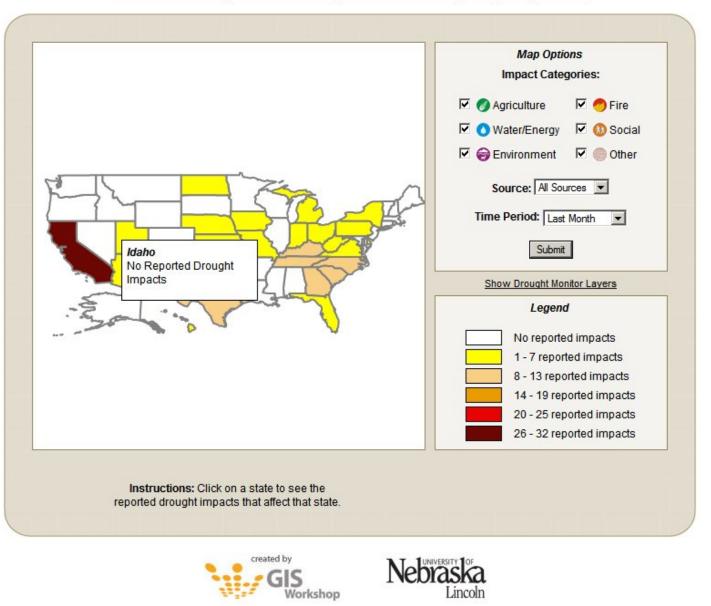
The Drought Impact Reporter maps the effects of drought, based on reports from media, observers and other sources. It is searchable by state and county, by category of impact, and by time period. Clicking on a state produces a pop-up summary of reported impact types. Clicking on a county (and then scrolling down) yields detail about individual impacts, in many cases linked to the original reports. Users who click down to the county level will find a wealth of stories about drought's effects in specific places and times. The <u>Drought Impact Reporter</u> also allows people to enter first-hand reports about drought impacts.

Search:

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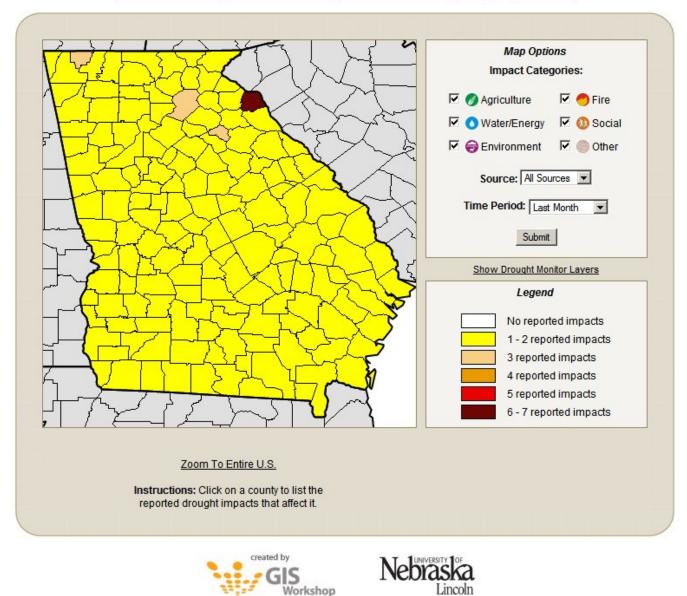
Drought Impact Reporter

View Drought Impacts | Add A Drought Impact | Time-Lapse Animation | About | Help | User Login





View Drought Impacts | Add A Drought Impact | Time-Lapse Animation | About | Help | User Login

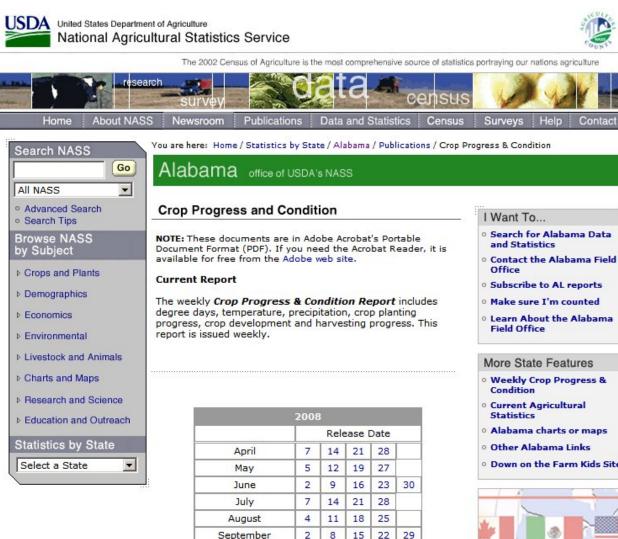


NASS Web Page





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Tripartite site for North American Agricultural Statistics

Also See

Alabama's Precipitation Since January 2008

October

November

	2007	7			
	Release Date				
April	2	9	16	23	30
May	7	14	21	29	

6 14 20 27

3

10

17 24



CROP PROGRESS AND CONDITION

AND ABAMA

Alabama Agriculture Counts!!

BILL WEAVER, DIRECTOR USDA/NASS ALABAMA FIELD OFFICE RON SPARKS, COMMISSIONER ALABAMA DEPT. OF AG. AND INDUSTRIES

 PO Box 240578, Montgomery, AL 36124-0578
 ● 1 (800) 832-4181
 ● RELEASED: November 3, 2008 - 3:00 P.M.

 Visit our website at:
 http://www.nass.usda.gov/al
 ● I (800) 832-4181
 ● RELEASED: November 3, 2008 - 3:00 P.M.

Julie Schmidt, Ag. Statistician

Advantageous Conditions Allow Surge in Harvest Progress

Data tables reflect the week ending: November 2, 2008.

Crop	This Week	Last Week	2007	5-Yr Avg
	rcent			
Cotton Bolls Opening	100	99	100	99
Cotton Harvested	73	57	77	68
Peanuts Dug	91	76	77	87
Peanuts Combined	80	61	65	78
Soybeans Harvested	65	58	70	65
Winter Wheat Planted	12	5	na	na

CROP/LVSTK CONDITION

Crop	Very Poor	Poor	Fair	Good	Exc.	
		Percent				
Cotton	2	10	37	44	7	
Livestock	0	11	41	45	3	
Pasture & Range	4	18	40	33	5	

below normal during the past week. Daytime highs ranged from 67 degrees in Bridgeport to 79 degrees in Livingston and Mobile. Overnight lows varied between a freezing 23 degrees in Hamilton and 34 degrees in Bay Minette. There was no rainfall recorded at any official weather station.

Small Grains: More small grain acreage was seeded across the state during the past week, with large increases to come following the harvest of the remaining row crop acreages. Small grain crops that had already emerged were in good condition as a result of the timely rainfall of the previous two weeks.

Cotton/Peanuts/Soybeans: Crop harvest progressed well. <u>Donald E. Mann</u>, County Executive Director in the Jackson County FSA office, noted that overall, crop yields were varied but better than expected. Optimal weather **Questions or Comments**

Contact me at

205-664-3010

or e-mail at

roger.mcneil@noaa.gov