Intermountain West Climate Summary

by The Western Water Assessment

Issued October 12, 2005

October 2005 Climate Summary

Hydrological Conditions – Overall, hydrologic conditions have improved considerably over the past water year, and there is potential for improvement in areas of Wyoming still in lingering drought.

Temperature – September temperatures were close to average this year, with the eastern half of the region slightly above average and the western half slightly below.

Precipitation – Precipitation amounts were mostly below average in September, and each state had some areas that got only 40% of average precipitation. For water year 2005, Utah was the only state to have above average precipitation throughout the state.

ENSO – Conditions in the tropical pacific are near-average, or "ENSO-neutral," and are not a factor in the climate predictions for the upcoming winter.

Climate Forecasts – Above average temperatures across the west are consistent with long term trends. Models indicate increased chances of below average precipitation in the Southwest.

The Bottom Line – The regional standardized precipitation index is near-normal to wet for the past year for most of the Intermountain West, with a few areas in dry categories. Most major reservoirs recovered to near-normal levels this year, although Lake Powell still remains at 3/4 of average capacity for this time of year.

Note that the next outlook will be issued December 9, 2005..

Western Water Assessment to host regional Climate Workshops for Water Resource Decision makers in the Intermountain West

Western Water Assessment is planning a series of workshops on climate forecasts for water managers. The first two will be in December in Golden, Colorado and Cheyenne, Wyoming. These workshops will be a great opportunity to learn more about NOAA climate products and how water managers use them in their annual operations and long-term planning decisions. The goal of the workshops is to lay the groundwork to expand the use of NOAA climate products in water resource planning and decision-making, and to provide feedback on the products. Two similar workshops in Golden and Cheyenne will provide an in depth introduction to four climate products, tailored to address interests in each state.

The Colorado workshop is scheduled for 9am-4pm on Thursday, December 1st in Golden, Colorado. The Wyoming workshop is tentatively scheduled for Monday, December 12th in Cheyenne, WY. Details and registration forms for both workshops will be available at: http://wwa.colorado.edu/links/colorado_climate_workshop.html.

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On the Web: http://wwa.colorado.edu

Contact Us - Send questions or feedback, or to sign up for our summary e-mail announcement, please e-mail us at: WWASummary@wwa.colorado.edu.

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The Intermountain West Climate Summary is published monthly by Western Water Assessment, a joint project of the University of Colorado and the NOAA Climate Diagnostics Center, researching water, climate and societal interactions.

CIRES

Introduction to the Drought Impact Reporter

By Keah Schuenemann, Graduate student at the University of Colorado.

The National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln was established to help people and institutions reduce their vulnerability to drought through preparedness and risk management. A risk management approach, which strongly emphasizes improved monitoring and preparedness, requires more timely information on the severity and spatial extent of drought and its associated impacts. Toward that end, the NDMC recently unveiled the Drought Impact Reporter (http://drought.unl.edu/), a database to archive the impacts of drought throughout the United States.

What is the purpose of the Drought Impact Reporter? The Drought Impact Reporter was created to fulfill the need for a national database of drought impacts. "With NIDIS (National Integrated Drought Information System) and potential Congressional legislation calling for better drought impact assessment, we believe this tool will help meet that need," said Mark Svoboda of the NDMC. It is the first step in creating a comprehensive database and archive for impacts on local, regional, and national levels. Evidence shows that drought impacts are generally increasing in magnitude and complexity. The Drought Impact Reporter is intended to help policy and decision makers better understand and respond to those impacts.

What are the sources of the listed drought impacts? A wide variety of drought impacts are being collected, analyzed, and organized by the NDMC staff. The sources include stories from more than 5,000 online sources; scientific publications; old news clippings and reports; and members of the public or government agencies, such as the National Oceanic and Atmospheric Administration and the U.S. Department of Agriculture. NDMC staff are populating the database, beginning with the most recent impacts

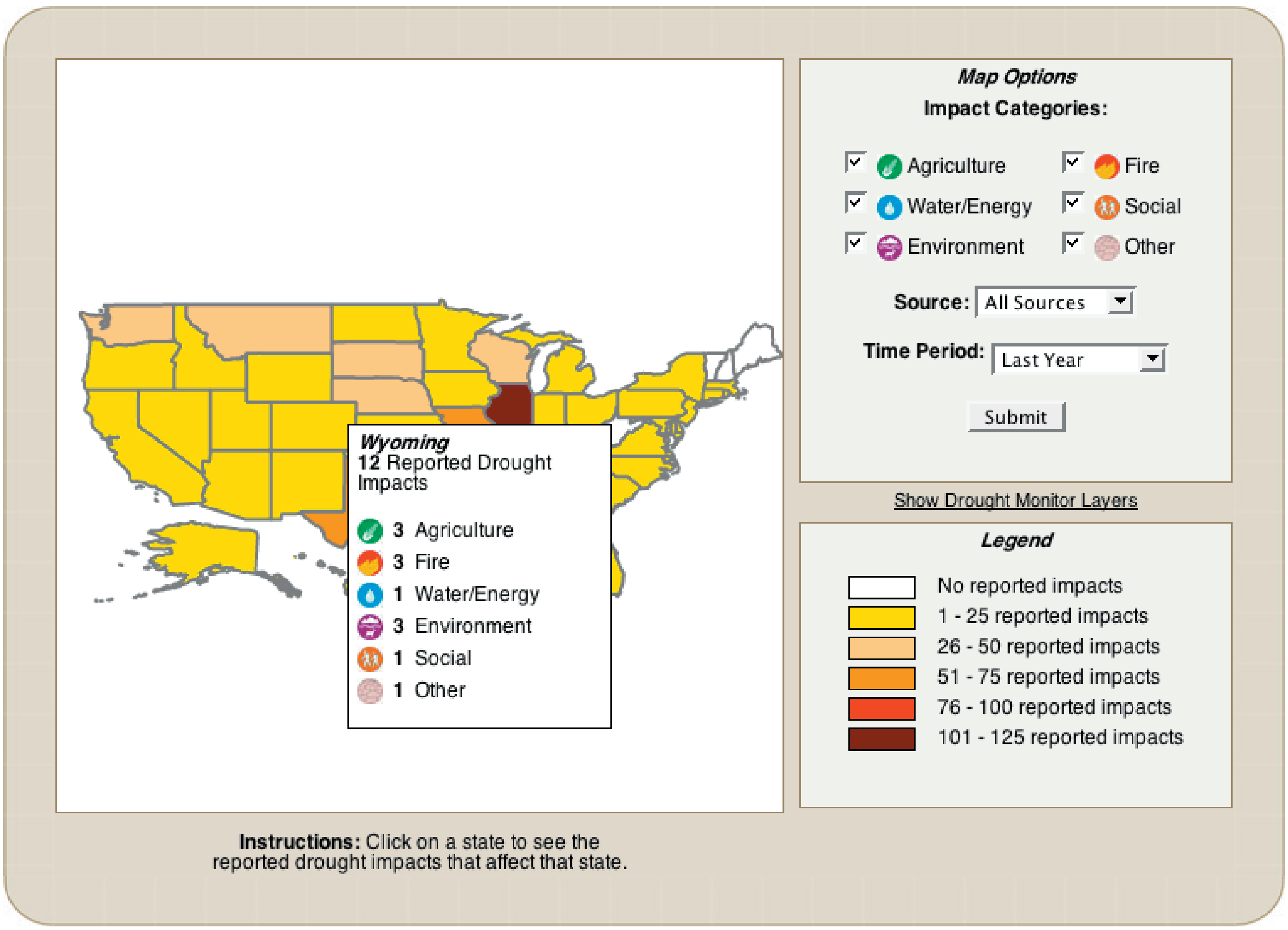


Figure 1a. Homepage of the Drought Impacts Reporter website, highlighting the number and types of drought impacts for the past year in Wyoming. A user can see the types of drought impacts for each state by scrolling over the map on the homepage.

and working back.

How are the impacts categorized?

The impacts are put into one or more of six impact categories: agriculture, energy and water, environment, fire, social, or other impacts. The definitions and examples of the categories are as follows:

- **Agricultural** impacts are associated with farming and ranching. One example of an agricultural impact for late July 2005 notes that more than 117,000 Illinois farmers have reported production losses, with 74,000 estimating losses of 30% or more; 16 farmers have lost all their crops because of drought. This example was one of 20 agricultural impacts for the state of Illinois during that month.
- **Energy and water** impacts are associated with surface or subsurface water supplies, stream levels or streamflow, hydropower generation, or navigation. For example, in mid-July 2005 more than 100 people in Suamico, WI, reported dry wells. Also in the Midwest, the navigation seasons on the Missouri and Mississippi rivers were cut short because of low water levels.
- **Environmental** impacts are associated with wildlife, fisheries, forests, and other fauna. An example of an environmental impact was in southwestern Montana, where the water temperature of a popular fishing river reached 73 degrees on three consecutive days. In late July 2005, the state fish and wildlife department decided to prohibit fishing from noon until midnight until further notice to reduce stress on the fishery. Fish caught and released when warm water temperatures decrease oxygen to critical levels are unlikely to survive after release.
- **Fire** impacts are associated with forest and range fires that occur during drought events. For example, at the end of September 2005 the Texas Forest Service categorized North Texas at the highest potential risk for grassfires because of maximum drought conditions. Outdoor burning bans are in place in 103 Texas counties.
- **Social** impacts are associated with the public or the recreation and tourism sector. An example of a social impact was in July 2005, when the county commissioner for Clark County, Nevada introduced a new ordinance that would bar new golf courses from being built unless they use reclaimed water.
- **Other** impacts are impacts that do not easily fit into any of the other categories and usually include general statements of drought emergencies being declared. Other impacts also include various widespread economic impacts, such as the 34,000 layoffs in the green or landscaping industry in Colorado since 2002.

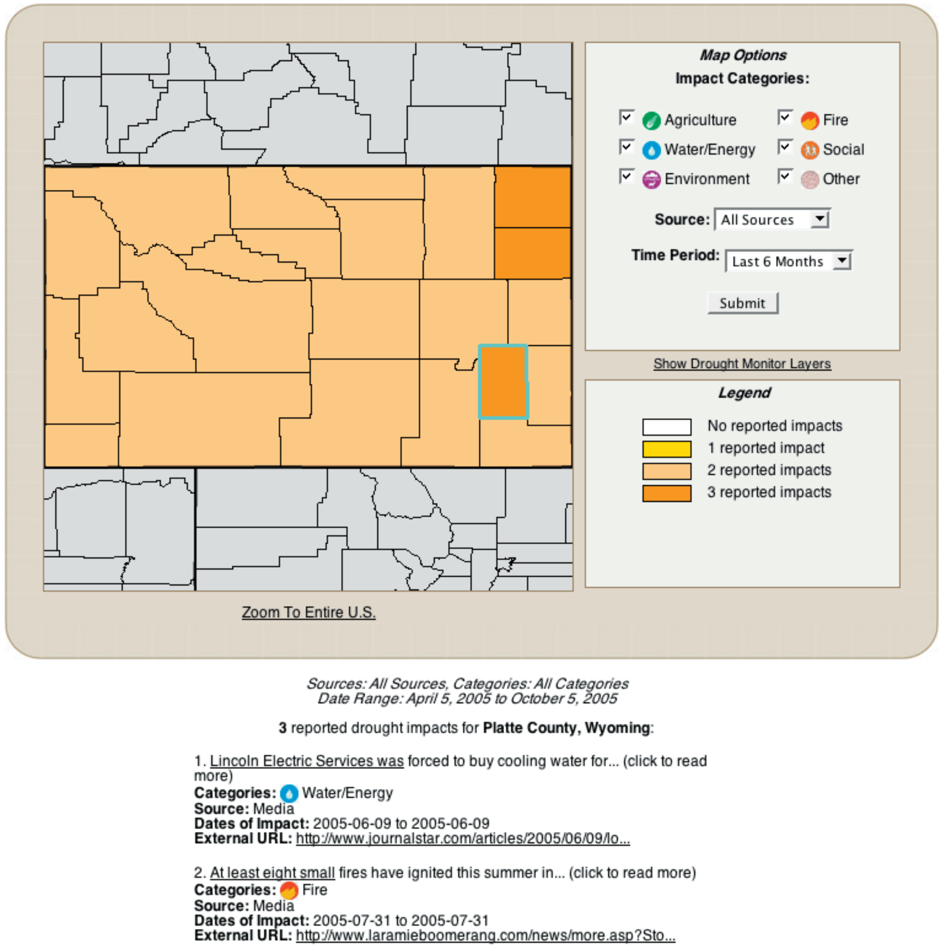


Figure 1b. Example from the Drought Impact Reporter website of the drought impacts reported in Wyoming for the past six months. A user can see the number of drought impacts by county in each state by clicking on a state from the homepage. The three impacts reported in Platte County are highlighted and summarized below the map by clicking on that county from the state map.

How does the online tool work?

The online Drought Impact Reporter has many useful options for displaying the impacts. The initial screen allows the user to pick any combination of impact categories, the preferred source of the impacts, and the time-period over which

(Continued on p.19)

On the Web

- Drought Impacts Reporter: http://droughtreporter.unl.edu/
- U.S. Drought Monitor: http://www.drought.unl.edu/dm/monitor.html
- NIDIS: http://www.nws.noaa.gov/ost/climate/NIDIS/

Temperature through 9/30/05

Source: High Plains Regional Climate Center

The average temperatures for the month of September in the Intermountain West region ranged from 45-55°F in the mountains of western **Wyoming** and central **Colorado** to 70-80°F in southeast **Colorado** and near Lake Powell in south-central **Utah** (Figure 2a).

Throughout most of the region, the temperatures were within 2°F of average, with the exception of small parts of **Utah** mountains which were up to 4°F below normal and parts of the plains of northeastern **Wyoming** and southeastern **Colorado** that were up to 6°F above average (Figure 2b).

September 2004 temperatures were similar to this year, with the exception that it was cooler in **Colorado** last year (Figure 2c). In addition, the plains of eastern **Wyoming** and **Colorado** were closer to average last year than they were this year.

Notes

Average refers to the arithmetic mean of annual data from 1971-2000. Departure from average temperature is calculated by subtracting current data from the average. The result can be positive or negative.

These continuous color maps are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. Interpolation procedures can cause aberrant values in data-sparse regions. For maps with individual station data, please see web sites listed below.

Figures 2a-c are experimental products from the High Plains Regional Climate Center. This data is considered experimental because it utilizes the newest data available, which is not always quality controlled.

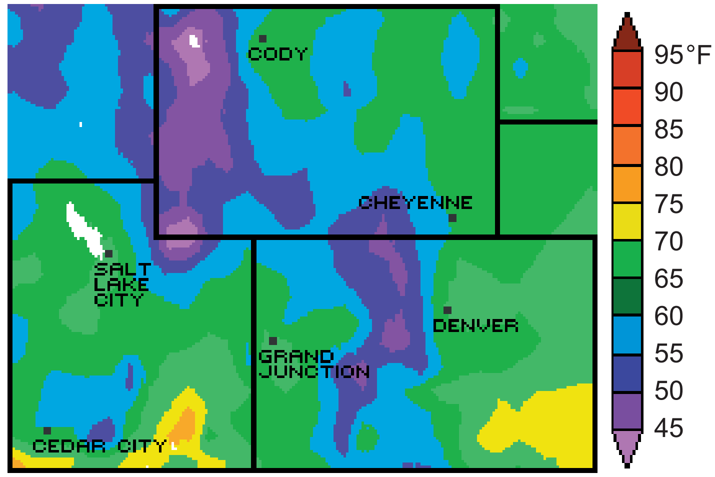


Figure 2a. Average temperature for the month of September 2005 in °F.

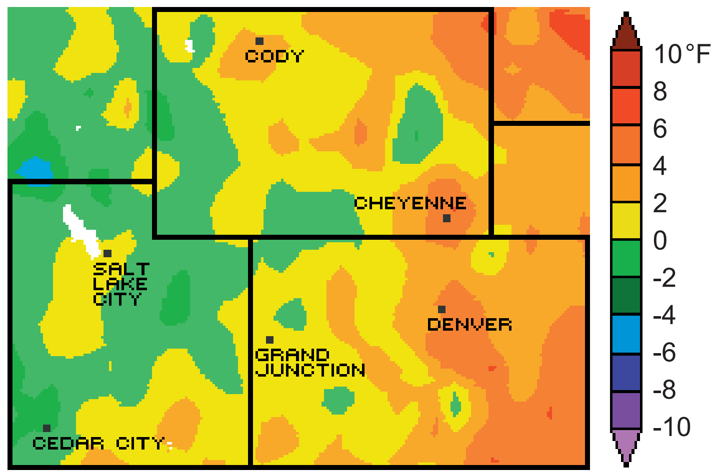


Figure 2b. Departure from average temperature for the month of September 2005 in °F.

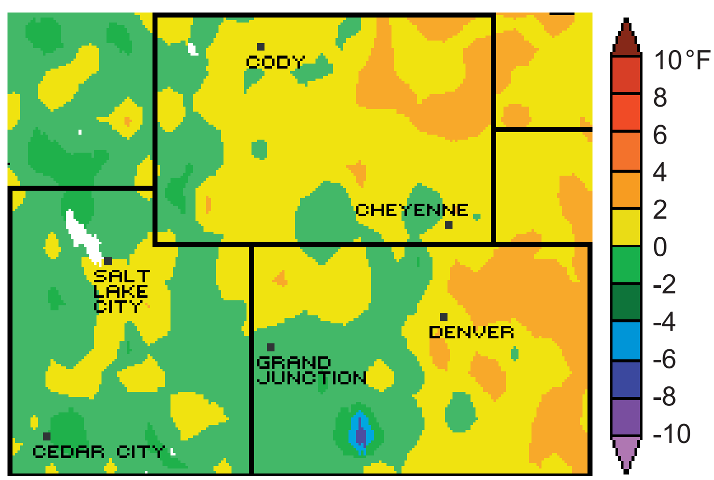


Figure 2c. Departure from average temperature in °F for last year, September 2004.

On the Web

- For most recent versions of these and other climate maps, visit: http://www.hprcc.unl.edu/products/current.html.
- For information on temperature and precipitation trends, visit: http://www.cpc.ncep.noaa.gov/trndtext.htm.
- For a list of weather stations in Colorado, Utah, and Wyoming, visit: http://www.wrcc.dri.edu/summary.

Precipitation through 9/30/05

Source: NOAA Climate Diagnostics Center, NOAA Climate Prediction Center

Precipitation in the Intermountain West region falls primarily as rain in September, but it can snow in the mountains, depending on temperature.

During the month of September 2005, most of the precipitation in the Intermountain West region fell in the mountains of northwestern and south-central **Wyoming**, western **Colorado** and eastern **Utah** (Figure 3a). Some of these areas received up to 3 inches of precipitation, while western **Utah** and eastern **Colorado** only received 0.5 inches. **Utah** mountains had an early fall snow in mid-September and **Colorado** mountains saw snow at the end of the month. These precipitation totals were mostly below average for the Intermountain West region, up to 40% below normal in eastern **Wyoming**, eastern **Colorado** and western **Utah** (Figure 3b).

Overall the 2005 water year was above 120% of normal in Utah and near normal throughout **Wyoming** and **Colorado** (Figure 3c). However, parts of central **Wyoming** and eastern **Colorado** only had 50% of normal precipitation in the 2005 water year. Despite the normal or below normal precipitation levels for **Wyoming**, it was enough to contribute to pushing the state largely out of a severe drought. (See Wyoming water availability page 10 for more information.)

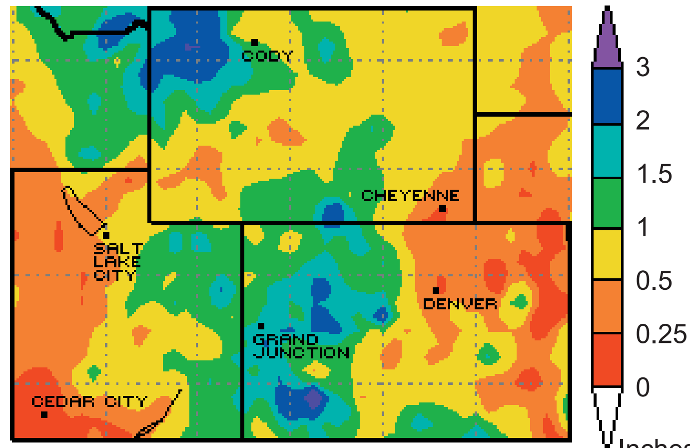


Figure 3a. Total precipitation in inches for the month of September 2005.

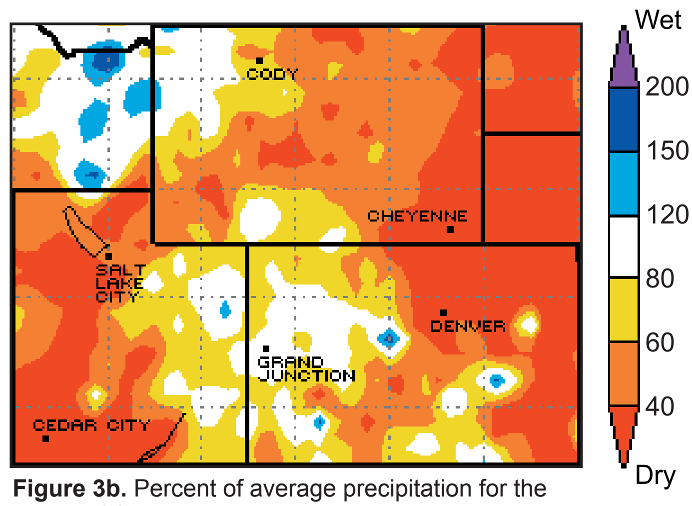


Figure 3b. Percent of average precipitation for the month of September 2005.

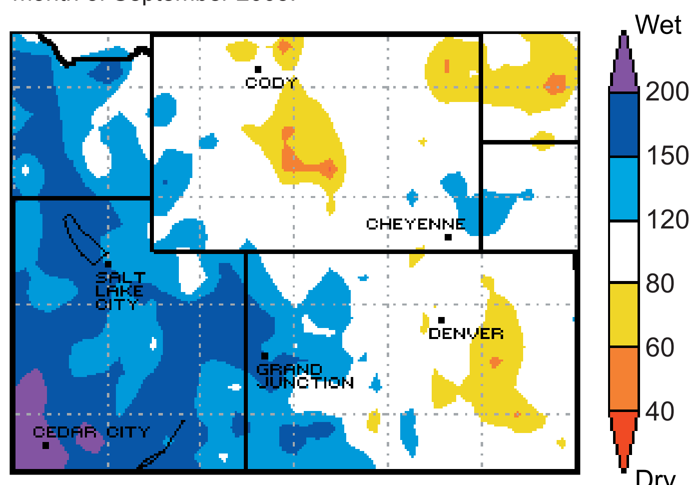


Figure 3c. Percent of average precipitation accumulated during the 2004 water year (Oct. 1, 2004- Sept. 30, 2005).

Notes

The water year begins on October 1 and ends on September 30 of the following year. The 2004 water year just ended on September 30, 2005. As of October 1, 2005 we are in the 2006 water year. The water year is a more hydrologically sound measure of climate and hydrological activity than is the standard calendar year. It reflects the natural cycle accumulation of snow in the winter and runoff and use of water in the spring and summer.

Average refers to the arithmetic mean of annual data from 1996-2004. This period of record is only nine years long because it includes SNOTEL data, which has a continuous record beginning in 1996. Percent of average precipitation is calculated by taking the ratio of current to average precipitation and multiplying by 100.

The data in Figures 3a-c come from NOAA's Climate Prediction Center, but the maps were created by NOAA's Climate Diagnostics Center, and they are updated daily (see website below). These continuous color maps are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. Interpolation procedures can cause aberrant values in data-sparse regions.

On the Web

- For the most recent versions these and maps of other climate variables: http://www.hprcc.unl.edu/products/current.html.
- For precipitation maps like those in the previous summaries, which are updated daily: http://www.cdc.noaa.gov/Drought/.
- For National Climatic Data Center precipitation reports: http://lwf.ncdc.noaa.gov/oa/climate/research/2002/perspectives.html.
- For a list of weather stations in Colorado, Utah, and Wyoming, visit: http://www.wrcc.dri.edu/summary.

U.S. Drought Monitor conditions as of 10/04/05

Source: U.S. Department of Agriculture, National Drought Mitigation Center, National Oceanic and Atmospheric Administration

According to the U.S. Drought Monitor (Figure 4), late spring and early summer rains, along with snowmelt runoff helped ease the drought in the Intermountain West. Most of **Wyoming** is currently facing a moderate (D1) to severe (D2) hydrological drought. Most of **Utah** is not facing drought conditions, except along the Green and Colorado Rivers, which are abnormally dry (D0). Western **Colorado** is normal, while eastern **Colorado** is abnormally dry (D0). These conditions are relatively unchanged since last month (see inset) and back to late July. These conditions are much wetter than six months ago (not shown), when most of **Utah** and **Colorado** were in D0 – D1 stages of drought and north and northwestern **Wyoming** faced extreme (D3) to exceptional drought (D4).

Notes

The U.S. Drought Monitor (Figure 4) is released weekly (every Thursday) and represents data collected through the previous Tuesday. The inset (lower left) shows the western United States from the previous month's map.

The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of the several agencies; the author of this monitor is Rich Tinker NOAA Climate Prediction Center.

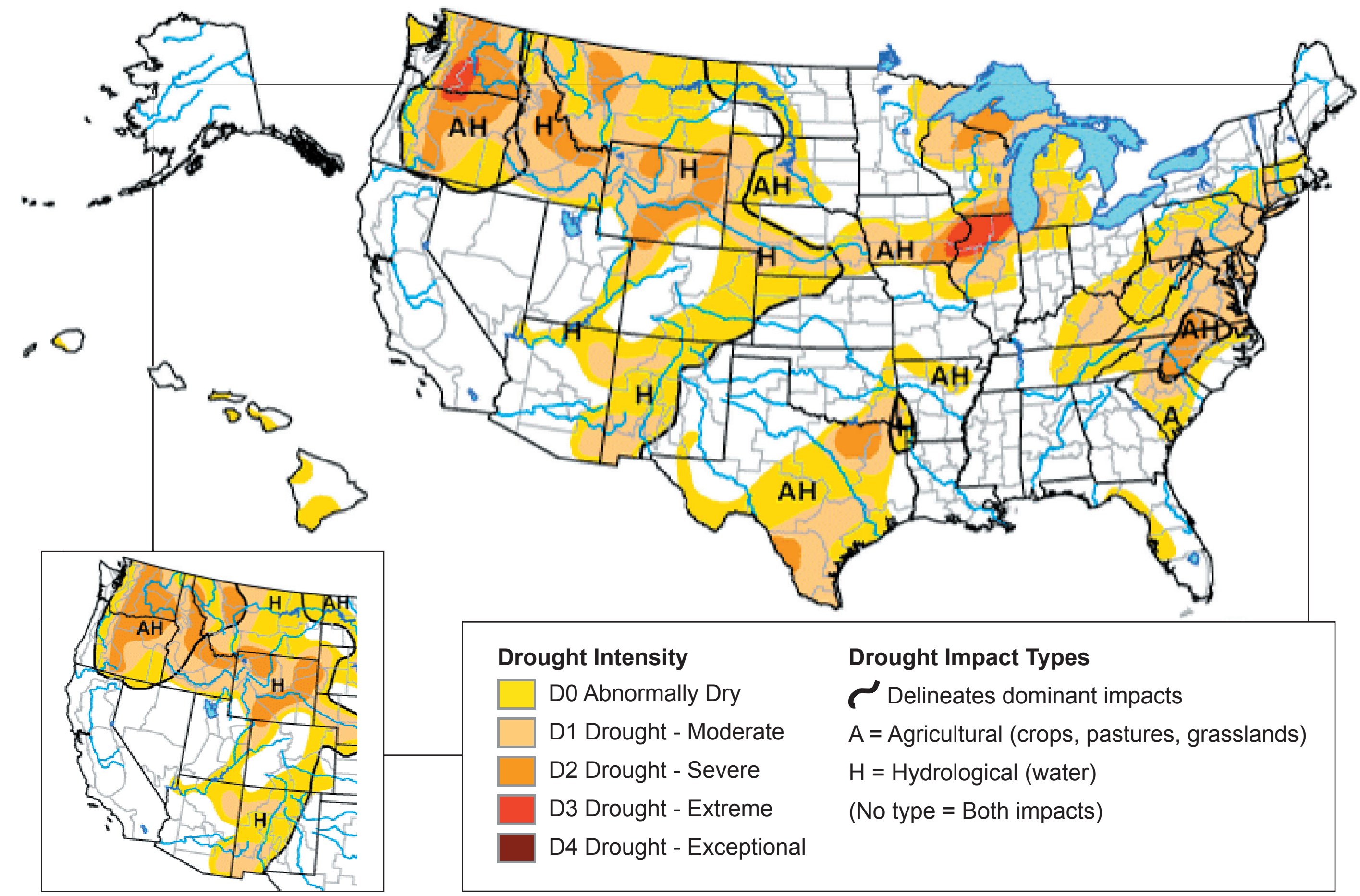


Figure 4. Drought Monitor released October 6, 2005 (full size) and last month September 8, 2005 (inset, lower left) for comparison.

On the Web

For the most recent Drought Monitor, visit: http://www.drought.unl.edu/dm/monitor.html. This site also includes archives of past drought monitors.

Reservoir Status

Source: Denver Water, U. S. Bureau of Reclamation, Northern Colorado Water Conservancy District, Natural Resources Conservation Service, and Central Utah Water Conservancy District

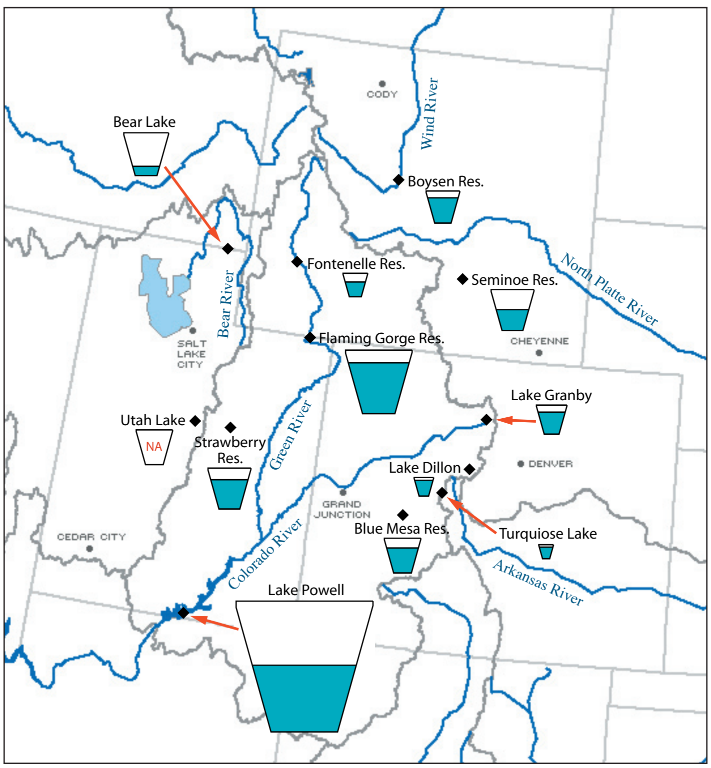
The majority of inflow to most western reservoirs is from snowmelt in April-July. All of the reservoir levels in Figure 5 have increased since the beginning of May. Reservoir "% Full" in September reflects a combination of the April-July inflows, which are the majority of the supply for the water year, minus the reservoir releases of the summer/early fall months. Seven out of the eleven reservoirs that are reporting current storage have over 100% of average storage contents for this time of year. According to a reservoir operations update on September 15, 2005, the USBR expects fall reservoir inflows at Fontenelle and Flaming Gorge reservoirs to be 93% and 81% of average, respectively. The Bureau plans that reservoirs will maintain constant releases through fall and winter 2006. Reservoir levels will slowly decline until spring inflows begin. The report also states that April – July unregulated inflows to Lake Powell were 111% of average (http://www.wapa.gov/crsp/operatns.htm).

The NOAA Colorado Basin River Forecast Center is expected to issue the first outlook for Lake Powell in December 2005, followed by water supply outlooks for other reservoirs in early January 2006. See http://www.cbrfc.noaa.gov/.

Notes

The size of each "tea-cup" in Figure 6 is proportional to the size of the reservoir, as is the amount the tea-cup is filled. The first percentage shown in the table is the current contents divided by the total capacity. The second percentage shown is the percent of average water in the reservoir for this time of year. Reservoir statuses are updated at different times, so for the most recent information, see the websites listed in the "On the Web" box.

The percent of average is the current storage divided by the average storage for that day, going back to when the specific reservoir started filling. Averages with (*) were hand calculated by using raw data from the USBR, whereas the other averages were calculated by the organization that keeps the data for those reservoirs.



Reservoir	Current Water (KAF)	Total Capacity (KAF)	% Full	% of Average
Colorado				
Blue Mesa Res.	585.6	829.5	71%	94%
Lake Dillon	241.0	254.0	95%	103%
Lake Granby	426.1	539.8	79%	108%
Turquiose Lake	117.3	129.4	91%	103%
Utah				
Bear Lake	233.5	1,302.0	18%	33%
Lake Powell	11,949.6	24,322.0	49%	73%
Strawberry Res.	841.2	1,106.5	76%	126%
Utah Lake	Not Available this Month			
Wyoming				
Boysen Res.	631.9	741.6	85%	113%
Flaming Gorge Res.	3,173.9	3,749.0	85%	107%
Fontenelle Res.	242.8	344.8	70%	101%
Seminoe Res.	438.6	1,017.3	43%	71%

KAF = Thousands of Acre Feet

Figure 5. Tea-cup diagram of several large reservoirs in the Intermountain West Region. All reservoir content data is from between September 30 and October 4, 2005.

On the Web

- Lake Dillon ["check res. levels" pdf]: http://www.water.denver.co.gov/indexmain.html
- Turquoise Lake, Lake Granby, Boysen Reservoir, and Seminoe Reservoir: http://www.usbr.gov/gp/hydromet/teacup_form.cfm
- Blue Mesa Res., Lake Powell, Flaming Gorge Res., and Fontenelle Res. : http://www.usbr.gov/uc/wcao/water/basin/tc_cr.html
- Strawberry Res.: http://www.cuwcd.com/operations/currentdata.htm
- Utah Lake and Bear Lake: http://www.wcc.nrcs.usda.gov/cgibin/resv_rpt.pl?state=utah

Regional Standardized Precipitation Index data through 9/30/2005

Source: Western Regional Climate Center, using data from NOAA Climate Prediction Center and NOAA National Climatic Data Center

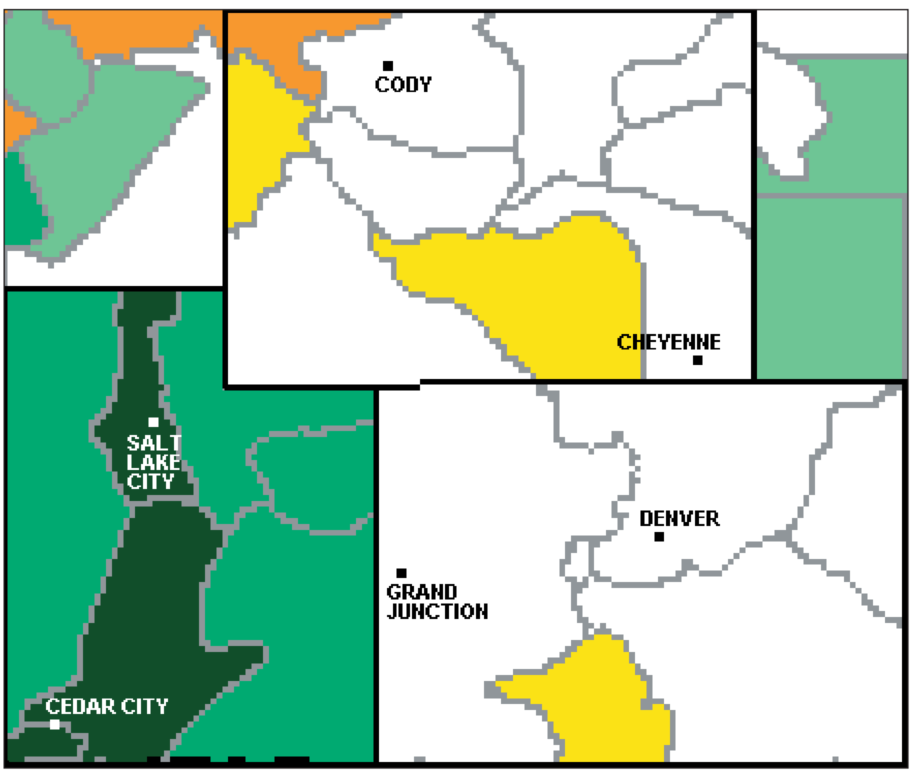
The Standardized Precipitation Index (SPI) can be used to monitor conditions on a variety of time scales. 3- and 6-month SPIs are useful in short-term agricultural applications and longer-term SPIs (12 months and longer) are useful in hydrological applications. The 12- month SPI for the Intermountain West region (Figure 6) reflects precipitation patterns over the past 12 months (through the end of September 2005) compared to the average precipitation of the same 12 consecutive months during all the previous years of available data.

This month, the 12-month SPI shows that **Colorado** and **Wyoming** are in the near normal or moderately dry categories, while **Utah** is very to extremely wet. **Colorado** is closest to normal, with all the climate divisions in the normal range, except the moderately dry Rio Grande basin in the south. Most of **Wyoming** is also in the near normal range, except the Upper Platte division in the south and the Upper Snake division in the northwest, which are both moderately dry. The driest part of **Wyoming** is in the northwest, where along with the dry Upper Snake division, the Yellowstone division is very dry. On the other hand, the 12-month SPI for **Utah** is still high despite below normal precipitation in September for much of the state. (See page 5 for recent precipitation amounts.)

Notes

The Standardized Precipitation Index (SPI) is a simple statistic generated from accumulated precipitation totals for consecutive months compared to the historical data for that station. Near normal SPI means that the total precipitation for the past 12 months is near the long-term average for one year. An index value of -1 indicates moderate drought severity and means that only 15 out of 100 years would be expected to be drier. An index value of -2 means severe drought with only one year in 40 expected to be drier. (courtesy of the Colorado Climate Center)

The SPI calculation for any location is based on the long-term precipitation record for a desired period. This long-term record is fitted to a probability distribution, which is then transformed into a normal distribution so that the mean SPI for the location and desired period is zero. Positive SPI values indicate greater than median precipitation, and negative values indicate less than median precipitation. Because the SPI is normalized, wetter and drier climates can be represented in the same way, and wet periods can also be monitored using the SPI.



+3.00 and above Exceptionally Wet
+2.00 to +2.99 Extremely Wet
+1.25 to +1.99 Very Wet
+0.75 to +1.24 Moderately Wet
- 0.74 to +0.74 Near Normal
- 1.24 to - 0.75 Moderately Dry
- 1.99 to - 1.25 Very Dry
- 2.99 to - 2.00 Extremely Dry
- 3.00 and below Exceptionally Dry

Figure 6. 12-month Intermountain West regional Standardized Precipitation Index. (data through 9/30/05)

On the Web

- For information on the SPI, how it is calculated, and other similar products for the entire country, visit http://www.wrcc.dri.edu/spi/spi.html.
- For information on past precipitation trends, visit: http://www.hprcc.unl.edu/products/current.html.

Colorado Water Availability October 2005

Source: Colorado Division of Water Resources, State Engineer, USDA Natural Resources Conservation Service, U.S. Geological Survey

For the most part, Colorado's rivers are flowing at normal or slightly wet levels, according to the USGS stream gauges (Figure 7). The highest streamflows are in the southwestern part of the state, in the Dolores and Gunnison River Basins. On the other hand, parts of the Yampa, Colorado and Arkansas River Basins are flowing slightly lower than normal. Low flows in the Eagle River in the last week of September prompted the Colorado Water Conservation Board (CWCB)to place a call on the river in order to support fish populations, according to a Summit Daily News article from September 23, 2005 (http://www.summitdaily.com/article/20050923/NEWS/109230038). A CWCB spokesperson said it is not common for them to place a call on the Eagle River, but low flow conditions that make such a call necessary tend to occur this time of year.

Notes

Each state calculates their SWSI a little differently.

The "7-day average streamflow" map (Figure 7) shows the average streamflow conditions for the past 7 days compared to the same period in past years. By averaging over the past 7 days, the values on the map are more indicative of longer-term streamflow conditions than either the "Real-time streamflow" or the "Daily streamflow" maps. If a station is categorized in "near normal" or 25th – 75th percentile class, it means that the streamflows are in the same range as 25-75% of past years. Note that this "normal" category represents a wide range of flows. Only stations having at least 30 years of record are used. Areas containing no dots indicate locations where flow data for the current day are temporarily unavailable. The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.

7-Day Average Streamflows

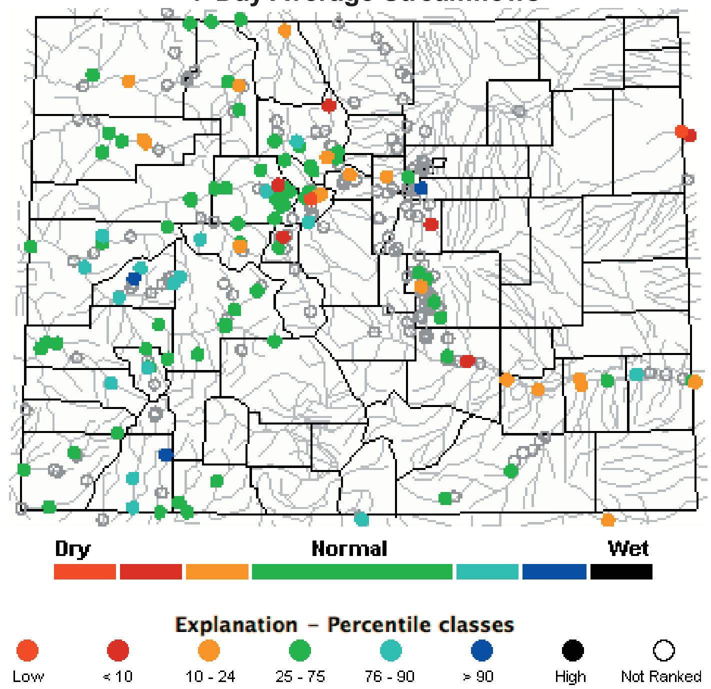


Figure 7. Seven-day average streamflow conditions for points in Colorado, as of October 4, 2005 computed at USGS gauging stations. The colors represent 7-day average streamflow compared to percentiles of 7-day average streamflow for October 4th.

On the Web

- For the current SWSI map, and for the latest "Colorado Water Supply Conditions" Report from the State Engineer, go to: http://water.state.co.us/pubs/swsi.asp.
- For current streamflow information from USGS, visit: http://water.usgs.gov/waterwatch/.

Wyoming Water Availability October 2005

Source: Wyoming Resources Data System and the U.S. Geological Survey

Wyoming's drought status improved over the summer months, so about half the state is considered in normal drought status, according to the Wyoming State Climatologist (Figure 8a). The central and western part of the state is in a drought watch, but this is still an improvement over the spring and summer climatologist assessments (not shown, see previous three climate summaries).

Wyoming's western rivers are mostly flowing in the normal to slightly wet range, while the rivers in the southeast are in drier categories (Figure 8b). The State Climatologist, in his September drought report noted that, "while a number of [stream] gauges (regionally less that half the state) are reporting below normal flows, conditions are only somewhat drier than normal for this time of year."

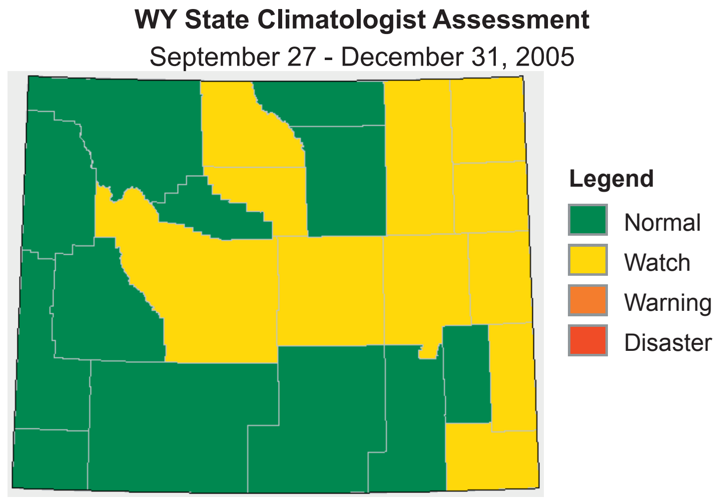


Figure 8a. Wyoming drought status. This map shows the Wyoming State Climatologist's assessment of the status of the drought throughout the state.

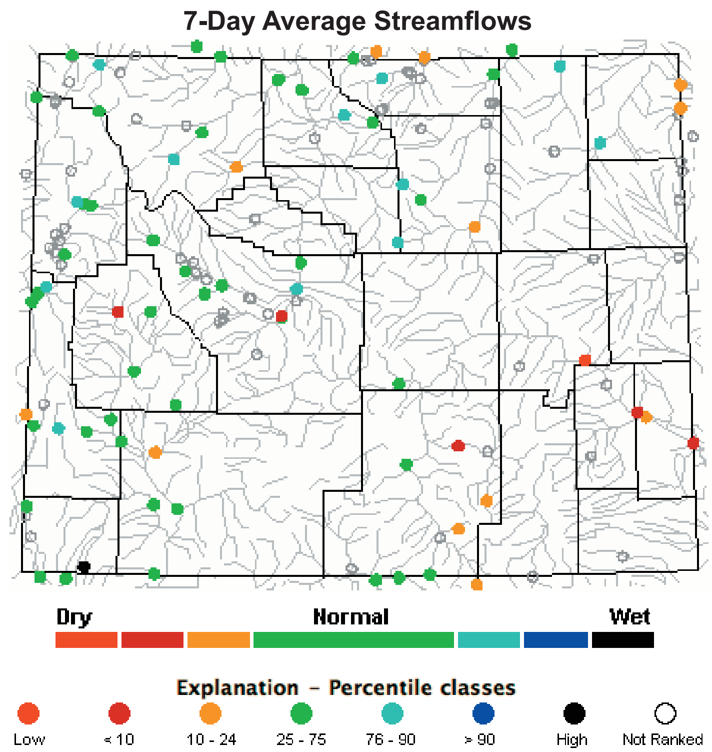


Figure 8b. Seven-day average streamflow conditions for points in Wyoming, as of October 4, 2005 computed at USGS gauging stations. The colors represent 7-day average streamflow compared to percentiles of 7-day average streamflow for October 4th.

Notes

Each state calculates their SWSI a little differently.

The Drought Status (Figure 8a) is calculated by the Wyoming state climatologist, based on snow water equivalent and other data.

The "7-day average streamflow" map (Figure 8b) shows the average streamflow conditions for the past 7 days compared to the same period in past years. By averaging over the past 7 days, the values on the map are more indicative of longer-term streamflow conditions than either the "Real-time streamflow" or the "Daily streamflow" maps. If a station is categorized in "near normal" or 25th – 75th percentile class, it means that the streamflows are in the same range as 25-75% of past years. Note that this "normal" category represents a wide range of flows. Only stations having at least 30 years of record are used. Areas containing no dots indicate locations where flow data for the current day are temporarily unavailable. The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.

On the Web

- The Wyoming SWSI, along with more data about current water supply status for the state, can be found at: http://www.wrds.uwyo.edu/wrds/nrcs/nrcs.html.
- The Wyoming Drought Status is found at: http://www.wrds.uwyo.edu/wrds/wsc/dtf/drought.html.
- The Palmer Drought Index is found on NOAA's drought page: www.drought.noaa.gov.
- For current streamflow information from USGS, visit: http://water.usgs.gov/waterwatch/

Utah Water Availability October 2005

Source: USDA Natural Resources Conservation Service

While most of Utah had normal or below average precipitation in September, the high winter snowpack left lingering effects on Utah's watersheds. About half the streamflow gauges are in the normal category and the other half are 76% or more than normal. There are four sites that are exceptions, reporting below normal streamflows.

In a September 6, 2005 Deseret News article, Randy Julander of the Natural Resource Conservation Service stated that the above average precipitation totals that Utah experienced in the 2005 water year have brought the state out of the drought that began in 1999. However, he cautions that the long-term drought crisis is not over unless the next few years turn out to be as wet as 2005. The article can be found at: http://deseretnews.com/dn/view/0,1249,615155524,00.html.

Notes

Each state calculates their SWSI a little differently.

The "7-day average streamflow" map (Figure 9) shows the average streamflow conditions for the past 7 days compared to the same period in past years. By averaging over the past 7 days, the values on the map are more indicative of longer-term streamflow conditions than either the "Real-time streamflow" or the "Daily streamflow" maps. If a station is categorized in "near normal" or 25^{th} – 75^{th} percentile class, it means that the streamflows are in the same range as 25-75% of past years. Note that this "normal" category represents a wide range of flows. Only stations having at least 30 years of record are used. Areas containing no dots indicate locations where flow data for the current day are temporarily unavailable. The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.

7-Day Average Streamflows

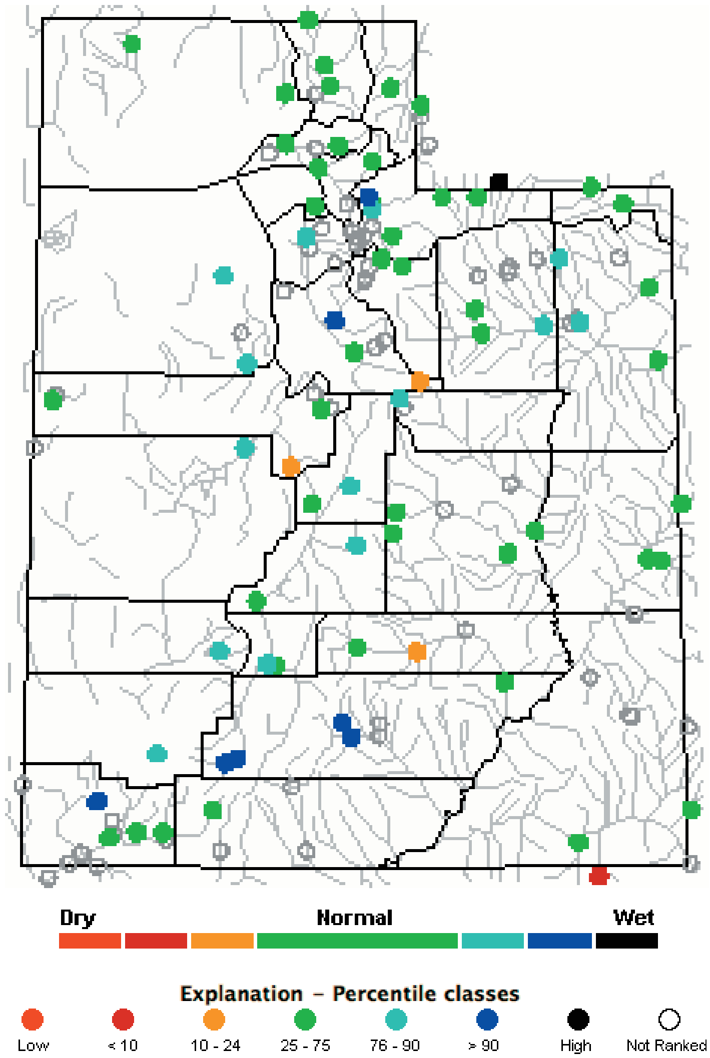


Figure 9. Seven-day average streamflow conditions for points in Utah, as of October 4, 2005 computed at USGS gauging stations. The colors represent 7-day average streamflow compared to percentiles of 7-day average streamflow for October 4th.

On the Web

- For current streamflow information from USGS, visit: http://water.usgs.gov/waterwatch/
- The Utah SWSI, along with more data about current water supply status for the state, can be found at: http://www.ut.nrcs.usda.gov/snow/watersupply/

Temperature Outlook October 2005 – February 2006

Source: NOAA Climate Prediction Center

According to the NOAA Climate Prediction Center (CPC), a large area of the U.S., including much of the Intermountain West, has an increased risk of above average temperatures in October 2005 (Figure 10a), forecast periods through February (Figures 10b-d), and the spring of 2006 (not shown). The region of above average temperatures for October, November, and December (OND) throughout the West is expanded over that in the OND forecast last month. El Niño Southern Oscillation (ENSO) is not a significant factor in temperature or precipitation forecasts during the upcoming few months, however, abnormally warm SSTs in the subtropical Atlantic are a factor in many models which predict warm temperatures over an expanded spatial area in the West (see ENSO Status, page 16).

In August 2005, CPC began using a new forecast tool that they developed. The tool combines several statistical models and a 15-member ensemble mean from dynamic models using the known skill of the various tools to form a weighted average. This new tool, called CON, helps to reduce the uncertainty that forecasters confront when they try to subjectively combine various forecast tools. Verification of the tool over forecasts from the 1995-2005 period indicates that the tool should significantly improve temperature forecasts over the continental U.S., including the Intermountain West region.

Notes

The seasonal temperature outlooks in Figures 10a-d predict the likelihood (chance) of *above-average*, *near-average*, and *below-average* temperature, but not the magnitude of such variation. The numbers on the maps refer to the percent chance that temperatures will be in one of these three categories, they do not refer to degrees of temperature.

The NOAA-CPC outlooks are a 3-category forecast based largely on the status of El Niño and recent trends. As a starting point, the 1971-2000 climate record for each particular 1 or 3 month period is divided into 3 categories or terciles, each with a 33.3 percent chance of occurring. The middle tercile is considered the *near-average* (or normal) temperature range. The forecast indicates the likelihood of the temperature being in one of the warmer or cooler terciles--*above-average* (A) or *below-average* (B)--with a corresponding adjustment to the opposite category; the near-average category is preserved at 33.3 likelihood, unless the anomaly forecast probability is very high. For a detailed description of how this works, see notes on the following page.

Equal Chances (EC) indicates areas for which the models cannot predict the temperature with any confidence. EC is used as a "default option" representing equal chances or a 33.3% probability for each tercile indicating areas where the reliability (i.e., 'skill') of the forecast is poor.

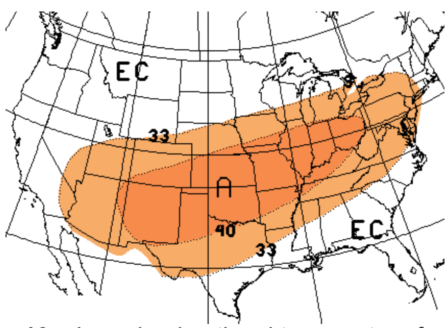


Figure 10a. Long-lead national temperature forecast for Oct. 2005. (released Sept. 30, 2005)

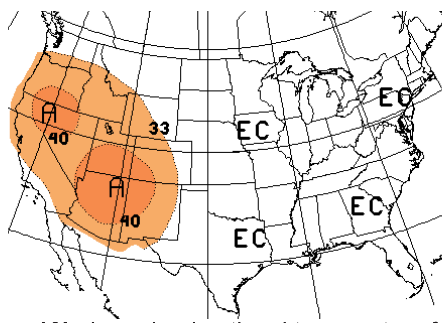


Figure 10b. Long-lead national temperature forecast for Oct. – Dec. 2005. (released Sept. 15, 2005)

A = Above
- 60.0–69.9%
- 50.0–59.9%
- 40.0–49.9%
- 33.3–39.9%

B = Below
- 40.0–49.9%
- 33.3–39.9%

EC = Equal Chances

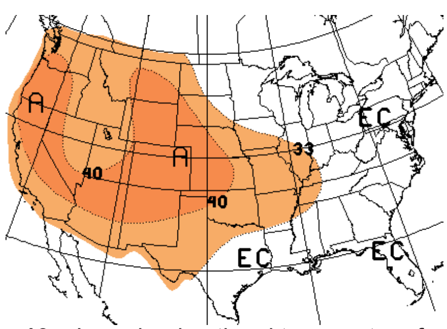


Figure 10c. Long-lead national temperature forecast for Nov. 2005 – Jan. 2006. (released Sept. 15, 2005)

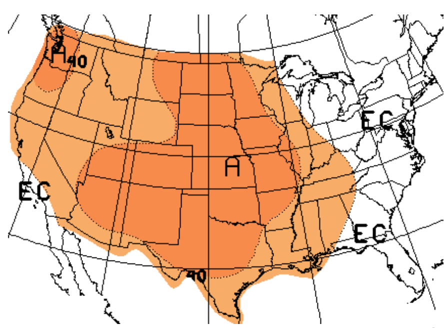


Figure 10d. Long-lead national temperature forecast for Dec. 2005 – Feb. 2006. (released Sept. 15, 2005)

On the Web

- For more: http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html.
- The CPC "discussion for non-technical users" is at: http://www.cpc.noaa.gov/products/predictions/90day/fxus05.html
- For IRI forecasts, visit: http://iri.columbia.edu/climate/forecast/net_asmt/.
- More information about temperature distributions at specific stations in Colorado, Utah, Wyoming, and across the West can be found at the Western Regional Climate Center, http://www.wrcc.dri.edu/CLIMATEDATA.html.

Precipitation Outlook October – December 2005

Source: NOAA Climate Prediction Center, NOAA Climate Diagnostics Center

According to the precipitation outlooks issued September 15th by the NOAA Climate Prediction Center, an extensive area of the Southwest has a higher risk of below average precipitation in October 2005 and the October-December (OND) 2005 forecast period (Figures 11a-b). Several forecast models all indicated below average precipitation in the southwest, including western **Colorado** and much of **Utah**. The forecast for below average precipitation continues through December 2005-February 2006 (DJF), in Arizona and New Mexico (not shown).

In September, CPC began using the new "CON" forecast tool for precipitation that they developed first for temperature. This tool is combines several statistical models and a 15-member ensemble mean from dynamic models - using the known skill of the various tools to form a weighted average. This new tool helps to reduce the uncertainty, which forecasters confront when they try to subjectively combine various forecast tools. Verification of the tool for temperature forecasts from the 1995-2005 period indicate that the tool should significantly improve temperature forecasts over the continental U.S; however, the precipitation forecasts from the CON have not yet been verified and the new method was used much more conservatively for the precipitation outlooks issued this month than for temperature.

Notes

The seasonal precipitation outlook in Figures 11a-b predicts the likelihood (chance) of above-average, near-average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps refer to the percent chance that precipitation will be in one of these three categories, they do not refer to inches of precipitation.

The NOAA-CPC outlooks are a 3-category forecast based largely on the status of El Niño and recent trends. As a starting point, the 1971-2000 climate record for each particular 1 or 3 month period is divided into 3 categories or terciles, each with a 33.3% chance of occurring. The middle tercile is considered the near-average (or normal) precipitation range. The forecast indicates the likelihood of the precipitation being in one of the wetter or cooler terciles--above-average (A) or below-average (B)--with a corresponding adjustment to the opposite category; the near-average category is preserved at 33.3% likelihood, unless the anomaly forecast probability is very high.

Thus, using the NOAA-CPC temperature outlook, areas with light brown shading display a 33.3-39.9% chance of above-average, a 33.3% chance of near-average, and a 26.7-33.3% chance of below-average temperature. A shade darker brown indicates a 40.0-50.0% chance of above-average, a 33.3% chance of near-average, and a 16.7-26.6% chance of below-average temperature, and so on.

Equal Chances (EC) indicates areas for which the models cannot predict the temperature with any confidence. EC is used as a "default option" representing equal chances or a 33.3% probability for each tercile indicating areas where the reliability (i.e., 'skill') of the forecast is poor.

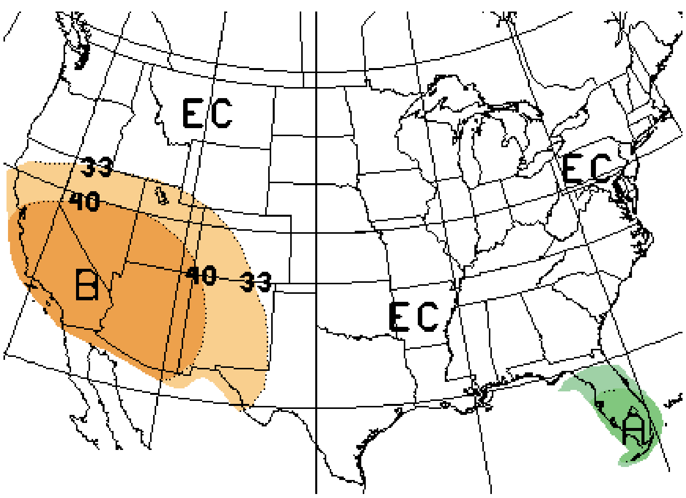


Figure 11a. Long-lead national precipitation forecast for October 2005. (released September 30, 2005)

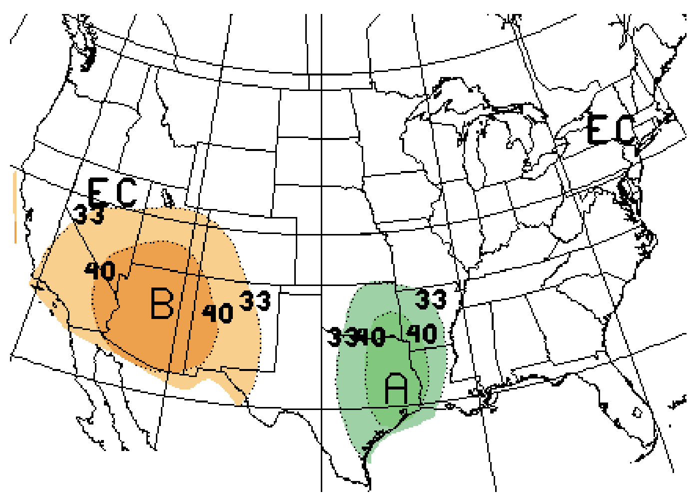


Figure 11b. Long-lead national precipitation forecast for October - December 2005. (released September 15, 2005)

A = Above
40.0–49.9%
33.3–39.9%

B = Below
40.0–49.9%
33.3–39.9%

EC = Equal Chances

Precipitation Outlook continued

The experimental Southwest climate forecast issued September 12th for Oct.-Nov.-Dec. (Figure 11c), indicates an increased risk of wet conditions for eastern **Colorado** (whereas the CPC forecast is for equal chances, "EC," or no shift in risk for the same region). The question marks over **Utah** and western **Colorado** denote a greater likelihood that those regions will have either wetter OR drier precipitation, and a lesser likelihood of near-normal precipitation. To see the Southwest Climate Forecast for January-March, see the webpage at the address below.

Notes

The experimental guidance for seasonal future precipitation in Figure 11c shows most recent forecast of shifts in tercile probabilities for July - September 2005. In order to be shown on this map, a forecast tilt in the odds has to reach at least 3% either towards wet (above-average), dry (below-average), or near-normal (average). Shifts towards the wettest (driest) tercile are indicated in green (red), and are contoured in 5% increments, while near-normal tilts of at least 3% are indicated by the letter "N". Shifts over 10% considered significant. Positive (negative) shifts between three and five percent are indicated by a green (red) plus (minus) sign, while minor shifts of one or two percent are left blank in this display.

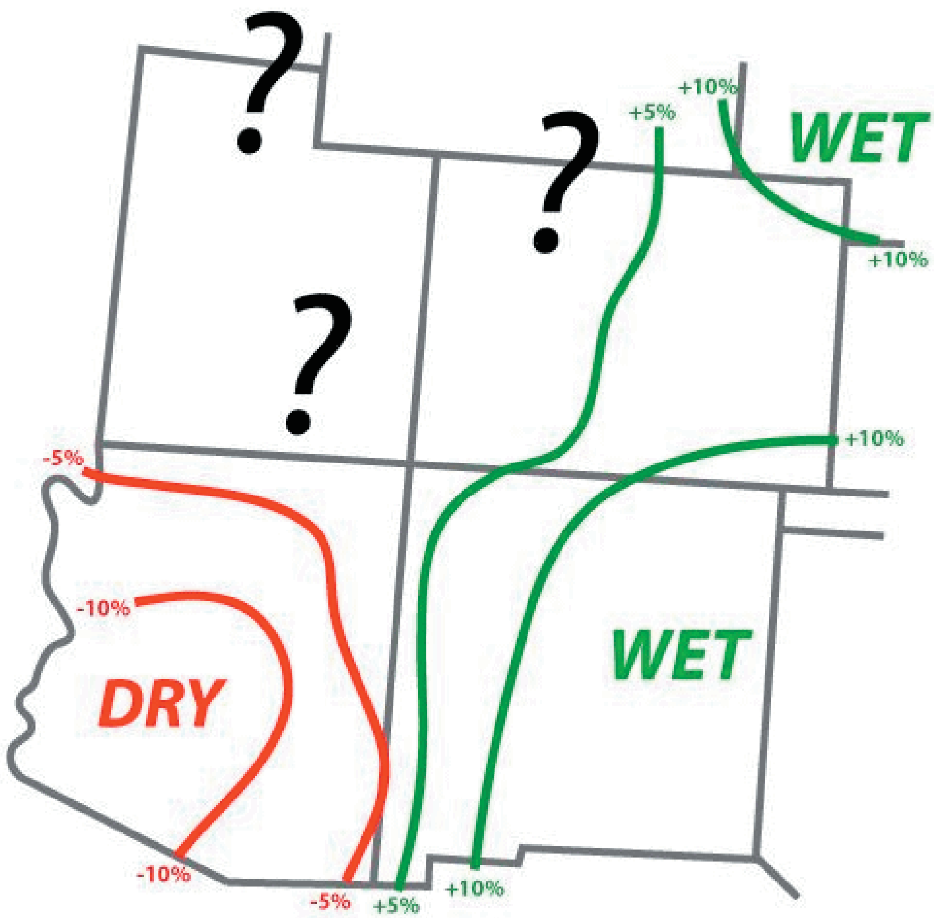


Figure 11c. Experimental guidance for seasonal precipitation in the southwest for October – December 2005. (issued September 12, 2005)

On the Web

- For more: http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html.
- The CPC "discussion for non-technical users" is at: http://www.cpc.noaa.gov/products/predictions/90day/fxus05.html
- For IRI forecasts, visit: http://iri.columbia.edu/climate/forecast/net_asmt/.
- More information about temperature distributions at specific stations in Colorado, Utah, Wyoming, and across the West can be found at the Western Regional Climate Center, http://www.wrcc.dri.edu/CLIMATEDATA.html.
- The CDC experimental guidance product, including a discussion and executive summary, is available on the web at: http://www.cdc.noaa.gov/people/klaus.wolter/SWcasts/index.html

Seasonal Drought Outlook through December 2005

Source: NOAA Climate Prediction Center

The Seasonal Drought Outlook shows lingering hydrologic drought across most of **Wyoming**, and northwestern **Colorado**, with possible improvement in northeastern **Wyoming** and parts of **Nebraska**. There are no indications of emerging drought conditions elsewhere in the Intermountain West. Northeastern **Wyoming** received significant precipitation in late September and early October, but according to the Drought Monitor, this was not enough to produce significant drought improvement due to the exceptionally long-term nature of the dryness affecting the region.

Notes

The delineated areas in the Seasonal Drought Outlook (Figure 12) are defined subjectively and are based on expert assessment of numerous indicators, including outputs of short- and long-term forecasting models. "Ongoing" drought areas are schematically approximated from the Drought Monitor (D1 to D4). For weekly drought updates, see the latest Drought Monitor text on the website: http://www.drought.unl.edu/dm/monitor.html. NOTE: The green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

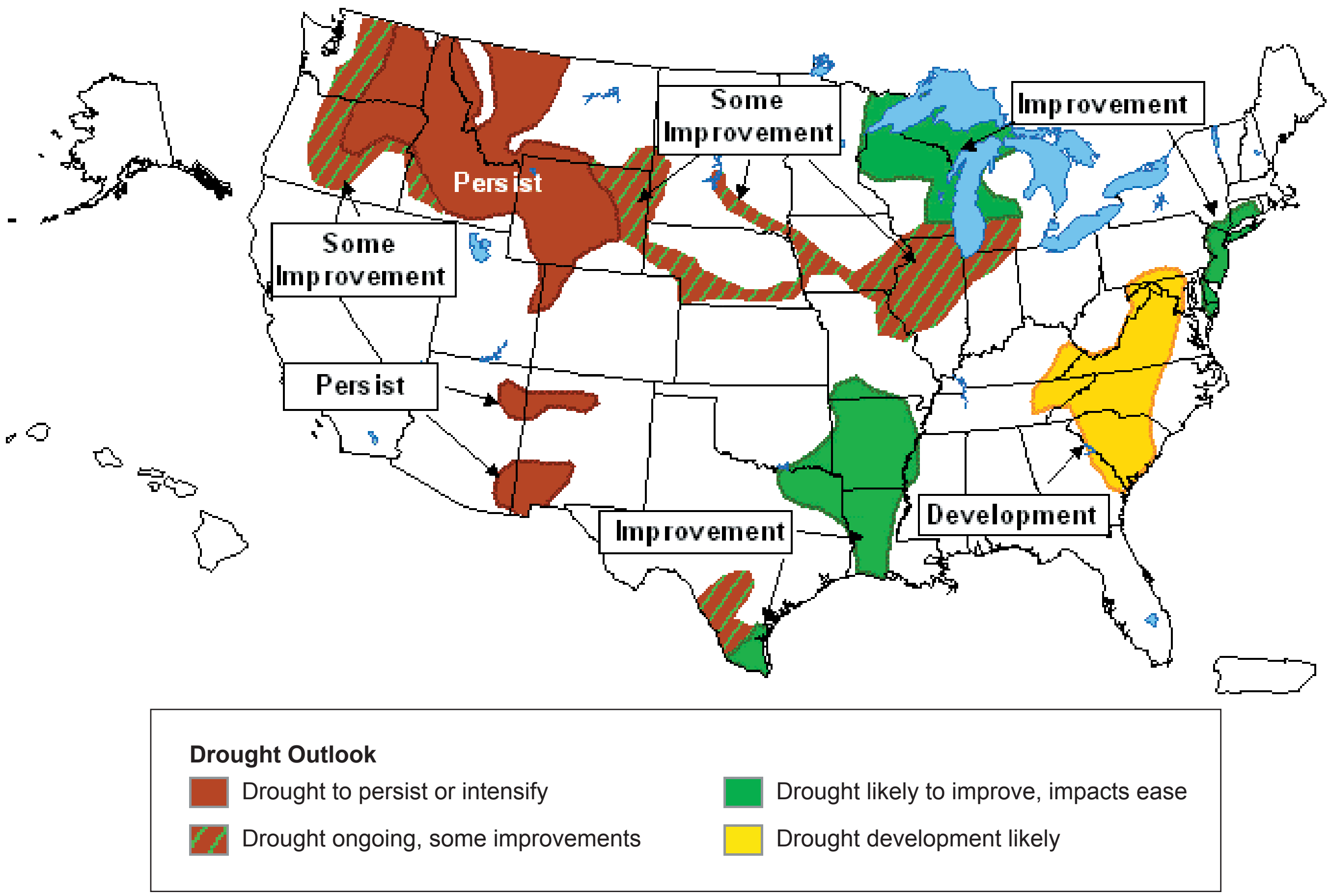


Figure 12. Seasonal Drought Outlook through December 2005 (release date September 15, 2005).

On the Web

For more information, visit: http://www.drought.noaa.gov/.

El Niño Status and Forecast

Source: NOAA Climate Prediction Center

According to the NOAA Climate Prediction Center, sea surface temperatures (SSTs) and subsurface ocean temperatures remain close to average (within ±0.5° C) across the entire equatorial Pacific (Figure 13a). Atmospheric conditions, including low-level winds, convection (rain) and sea level pressure also remained near average over most of the tropical Pacific Ocean. Throughout the tropical North Atlantic Ocean and extending into the Caribbean Sea, SSTs continue to be well above average (not shown). These abnormally warm SSTs have contributed to a very active Atlantic hurricane season.

Notes

Two graphics in Figure 13a produced by NOAA show the observed SST (upper) and the observed SST anomalies (lower) in the Pacific Ocean. This data is from the TOGA/TAO Array of 70 moored buoys spread out over the Pacific Ocean, centered on the equator. These buoys measure temperature, currents and winds in the Pacific equatorial band and transmits data around the world in real-time. NOAA uses these observations to predict short-term (a few months to one year) climate variations.

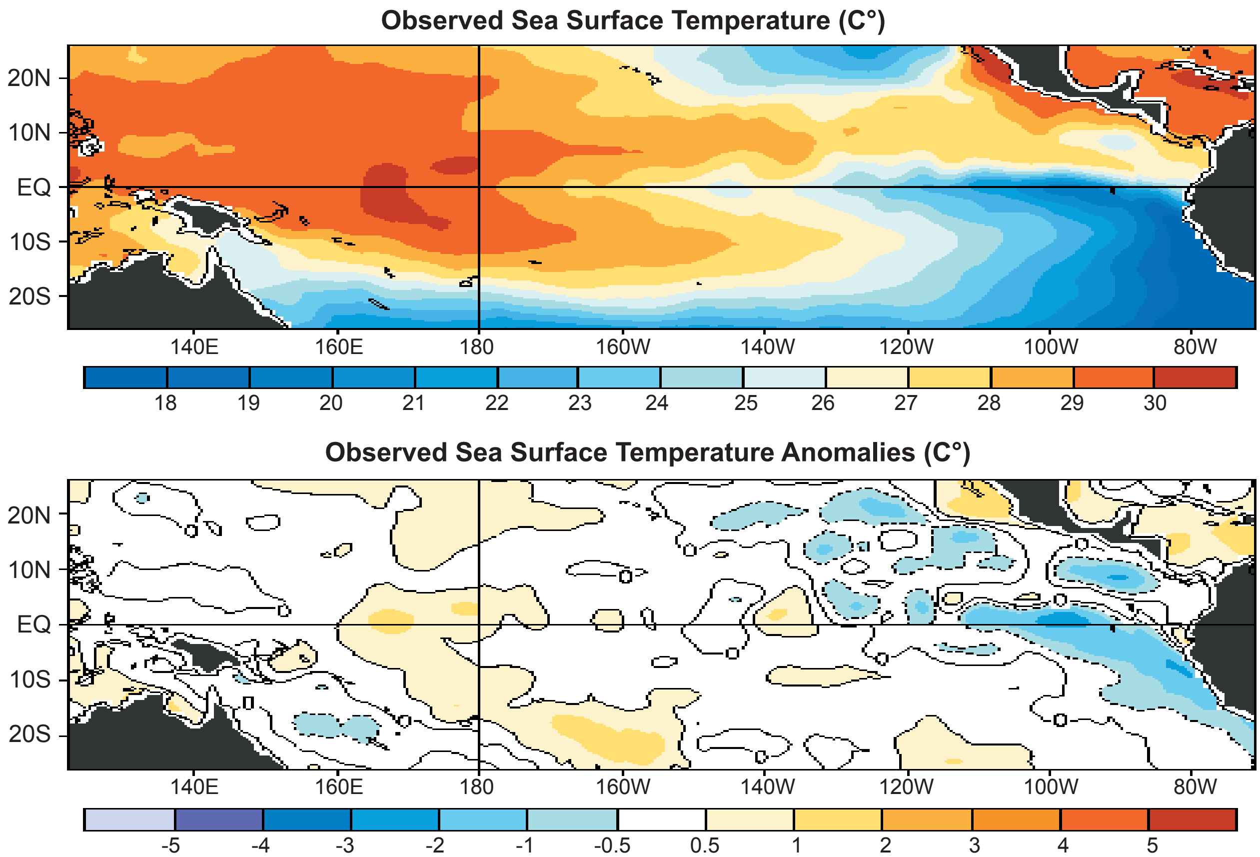


Figure 13a. Two graphics showing the observed SST (upper) and the observed SST anomalies (lower) in the Pacific Ocean. The Niño 3.4 region encompasses the area between 120°W-170°W and 5°N-5°S. The graphics represent the 7-day average centered on September 28, 2005.

El Niño Status and Forecast continued

The most recent statistical and coupled model forecasts range widely from projecting a weak La Niña to a weak El Niño (Figure 13b). This large spread indicates considerable uncertainty. However, current conditions and recent observed trends support a continuation of ENSO-neutral conditions for the next 3-6 months.

Notes

Figure 13b shows multiple forecasts for SST in the Niño 3.4 region for nine overlapping 3-month periods from September 2005 to July 2006. " Niño 3.4" refers to the region of the equatorial Pacific from 120°W to 170°W and 5°N to 5°S, which is the basis for defining ENSO sea surface temperature anomalies. Initials at the bottom of the graph represent groups of three months (e.g. SON = Sept-Nov). The expected skills of the models, based on historical performance, are not equal to one another. The skills also generally decrease as the lead-time increases. Thirdly, forecasts made at some times of the year generally have higher skill than forecasts made at other times of the year--namely, they are better when made between June and December than when they are made between February and May. Differences among the forecasts of the models reflect both differences in model design and actual uncertainty in the forecast of the possible future SST scenario.

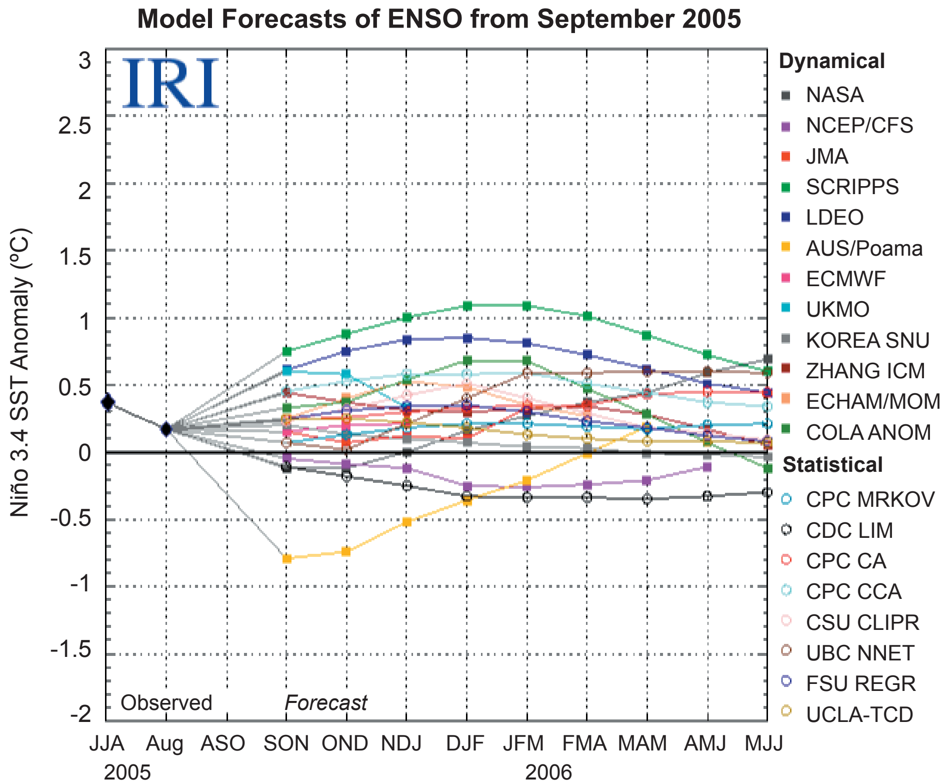


Figure 13b. Forecasts made by dynamical and statistical models for sea surface temperatures (SST) in the Niño 3.4 region for nine overlapping 3-month periods from September 2005 to July 2006 (released October 6, 2005). Forecasts are courtesy of the International Research Institute (IRI) for Climate Prediction.

On the Web

- For a technical discussion of current El Niño conditions, visit: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/.
- For updated graphics of SST and SST anomalies, visit this site and click on "Weekly SST Anomalies": http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml#current.
- For more information about El Niño, including the most recent forecasts, visit: http://iri.columbia.edu/climate/ENSO/.

High Plains Regional Climate Center

By Keah Schuenemann and Jessica Lowrey, using adapted text from the HPRCC website.

Climate problems tend to be regional in scale. That is, climate anomalies such as droughts, heat waves, and blizzards typically affect an area larger than one state but not the entire country at one time. The NOAA National Climatic Data Center's Regional Climate Centers Program was developed to meet local and regional needs for climate data, research-based information, and expertise.

A nationwide network of six regional centers provides convenient and timely access to accurate and reliable climate information. These centers also monitor and report current climate conditions in the regions they serve. The expertise and data resources of the Regional Climate Centers are available to assist in interpreting present conditions, quantifying climate variability, and assessing the likelihood of extreme weather events that often produce major social, economic and environmental impacts in a region.

The High Plains Regional Climate Center (HPRCC) is located at the University of Nebraska in Lincoln, and it is responsible for coordinating all applied climate activities for North and South Dakota, Nebraska, Kansas, Wyoming, and Colorado. The HPRCC is known for its expertise in the use of automated weather stations to ingest near real-time climate data. The Automated Weather Data Network (AWDN) takes hourly air temperature, humidity, soil temperature, wind speed, wind direction, solar radiation, and precipitation measurements. The data is available (for a fee) online or through contacting the climate office itself and includes other relevant data from the NWS surface weather networks. One can access free maps of current and historical climate information based on data from the AWDN and other weather networks at the HPRCC site. The HPRCC trains scientists from around the world to set up automated weather stations and manage the near real-time data.

Research projects at the HPRCC involve expanding their climate service activities. They developed soil water monitoring capabilities that help to quantitatively monitor the weather and climate impacts in the region. They study drought, developing better ways to monitor drought, and forecasting the impact of weather and climate change on the agriculture in the region. Users whose work touches soil and water conservation, sustainable agriculture systems, agricultural competitiveness and profitability, and natural resources and environmental management often request this type of information from the HPRCC.

HPRCC also serves the public by offering telephone consultation, web-based services, and a monthly climate impacts newsletter. The level of service has now

(Continued on p.19)

Day of the Year of the First Fall Freeze (36°F)

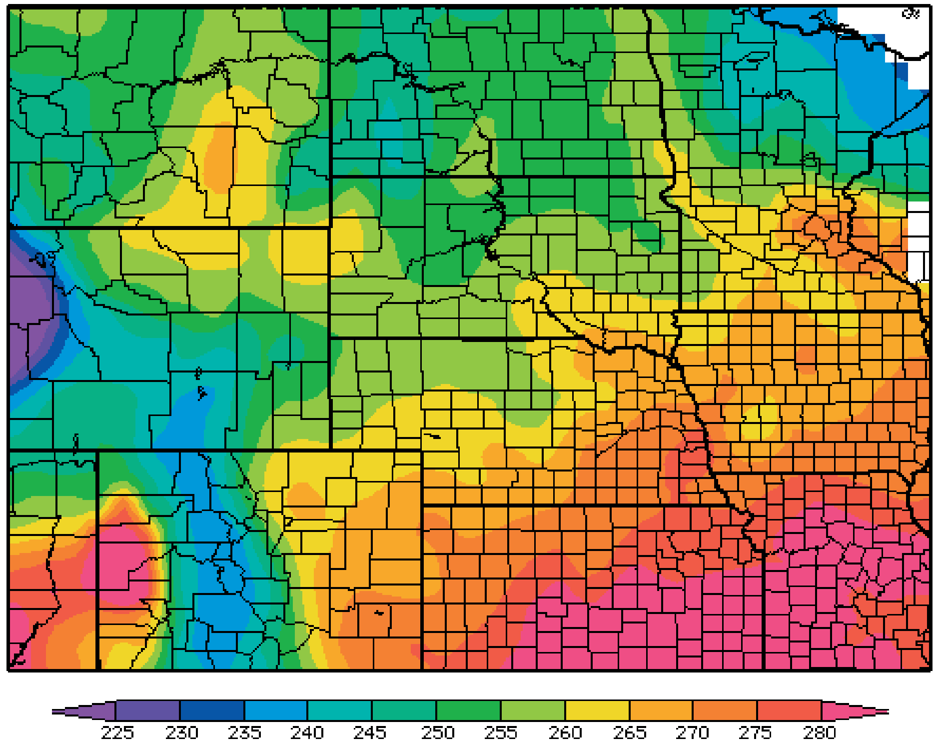


Figure 14a. An example of a map from the Climate Atlas found on the HPRCC website under "Climate Products." This map shows the average day of the year (1-365) for the first fall freeze in the High Plains region. Freeze dates shown range from around day 225 (August 13) to after day 280 (October 7).

On the Web

- High Plains Regional Climate Center: http://www.hprcc.unl.edu/,
- NOAA's Regional Climate Center page: http://www.ncdc.noaa.gov/oa/climate/regionalclimatecenters.html

(Continued from Focus p.18)

reached 16 million hits annually on the web. In addition to the weather observations the products available through the webpage include current climate summary maps, Automatic Weather Data Network maps, 30-year normals, climate atlas, historical data summaries, and links to other federal agencies' data. Within this information is not only weather data, but crop water use and crop performance for major crops, pest development, livestock conditions, soil water, and heat indices. One example of climate summary maps available from the HPRCC, is the recent temperature maps found in every edition of the Intermountain West Climate Summary (See page 4). Figures 14a-b show some other examples of climate summary maps users can create on the HPRCC website.

September Maximum Temperature (°F)

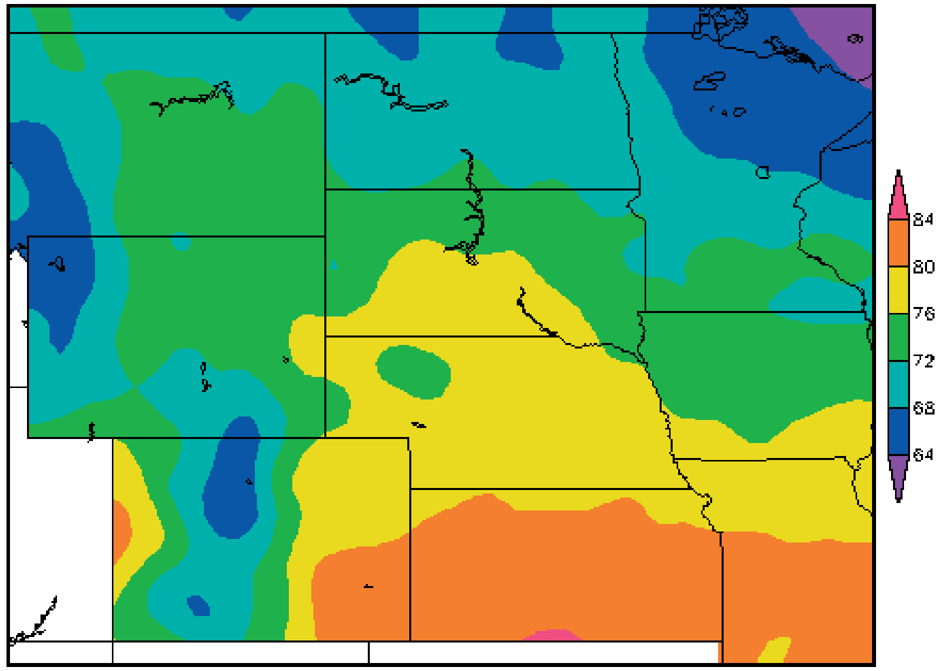


Figure 14b. An example of a map '30-year Normals' found on the HPRCC website under "Climate Products." This map shows the average maximum daily temperature in September.

(Continued from Feature Article p.3)

the impacts occurred. On the map display, the user can move the mouse over any state to see the number and types of drought impacts that were reported in each state (see Figure 1a, on page 2). The user can then click on a state to zoom in and see the location of the impacts by county. To find more information on the impacts for each county, the user clicks on that county to see a list at the bottom of the page with details surrounding the impact, including a link to the source (see Figure 1b, on page 3). Figure 1c is an example of a detailed description of a drought impact. The user can also see an animation of drought impacts through time. While looking at any view of the map, the user can select "show drought monitor layers," which will plot contours showing the severity and locations of drought as determined by the current U.S. Drought Monitor over the drought impacts.

The website also has a section ("Add a Drought Impact") for the public to provide information on drought impacts, which the NDMC team enters into the database. You can assist the NDMC by passing on the Drought Impact Reporter URL to other users and by submitting drought impact reports and suggestions through the website to help improve this work-in-progress.

Drought Impact Event

The state of Wyoming is dealing with an outbreak of pine beetles killing thousands of acres of pine trees statewide. Officials are quite concerned that the mounting dead timber will increase fire potential. According to officials, portions of the Shoshone National Forest east of Yellowstone National Park have experienced a 70-percent mortality rate due to the infestation. According to the Medicine Bow forest spokeswoman, beetle epidemics are a natural occurrence, however the current outbreak has exacerbated by the drought. Most of the state of Wyoming has been in drought for the last five years. The pine beetles target weak or stressed trees. When in drought, pine trees become stressed and do not have the energy to produce resin to fend off the beetles.

Categories: Environment
Source: Media
Dates of Impact: 2005-10-04 to 2005-10-04
External URL:
http://www.casperstartribune.net/articles/2005/10...

(See Affected Areas)

Wyoming: Entire State

Figure 1c. A detailed description of a drought impact affecting the entire state of Wyoming since the beginning of October 2005. A user could get to this kind of description at the Drought Impact Reporter website by clicking in one of the drought impacts listed by county for each state map, like in Figure 1b.