Intermountain West Climate Summary

by The Western Water Assessment Issued April 12, 2005

April 2005 Climate Summary

Hydrological Drought – Drought conditions did not change significantly, but with some improvement in central Utah, northwest Colorado and southern Wyoming.

Temperature – Temperatures were close to average in March, with pockets of above average temperatures in northern Wyoming, Utah and Colorado and below average in Colorado's central mountains.

Precipitation and Snowpack – March 2005 was much wetter than average in much of Utah and a few places in western Colorado, but average or below average in Wyoming and eastern Colorado.

El Niño – El Nino is weakening and expected to be in neutral conditions this summer; ENSO anomalies are not likely to be a significant factor creating precipitation and temperature anomalies over the U.S. into the summer and fall of 2005.

Climate Forecasts – An increased risk of above normal temperatures is predicted across much of the western U.S., reflecting long-term trends. With no ENSO anomaly to work with, there is no skill in precipitation forecasts for the summer; average precipitation across the region is shown on page 4.

The Western States Seasonal Climate and Fire Assessment Workshop

The Western States Seasonal Climate and Fire Assessment Workshop, co-organized by the NOAA funded Climate Assessment for the Southwest (CLIMAS) was held March 28 - April 1, 2005 in Boulder, Colorado. This is the third year that fire managers, wildland fire analysts, climatologists, and predictive service meteorologists from a number of agencies have gotten together in the spring to assess the probabilities for the upcoming fire season. The result is a comprehensive seasonal weather/climate/fuels outlook for the Western and Alaskan Geographic Areas for 2005. The Fire Assessment and Outlook for 2005 will be released on april 26th by the Secretary of Agriculture, and then it will be available on line with updates for the remainder of the 2005 fire season will be available at www.nifc.gov/news/pred_services/Main_page.htm (Go to National Wildland Fire Outlook / Assessments). A longer, more detailed summary of the assessment will be available soon on the web at: http://www.ispe.arizona.edu/climas/conferences/NSAW/west05/index.html.

The workshop was hosted by the NOAA Climate Diagnostics Center and the NOAA-CIRES Western Water Assessment, and several CDC researchers instructed fire weather forecasters in climate related topics to improve their understanding of long-range forecasting methods and techniques. Other workshop co-organizers were the Program for Climate, Ecosystem and Fire Applications, the California Applications Program, and the National Predictive Services Group.

In This Issue

Contact Us - We want to hear your questions and feedback! Please e-mail us at WWAoutlook@sciencepolicy.colorado.edu

The Intermountain West Climate Summary is published monthly by Western Water Assessment in cooperation with CIRES, the Center for Science and Technology Policy Research, and the NOAA Climate Diagnostics

CIRES

Center for Science and Technology Policy Research

NOAA-CIRES Climate Diagnostics Center

Improve Your Climate Vocabulary!

Courtesy of NOAA Climate Diagnostic Center

Forecast 1) A statement predicting how or when an event or condition will occur drawing on a collection of guidance tools or predictions. 2) To estimate or calculate in advance, especially to predict (weather conditions) by analysis of meteorological data.

Outlook A forecast provided with considerable lead time that certain conditions may develop. Often depicted as the likelihood, through probabilities, that the average temperature and total precipitation for the outlook's valid period will be above, below, or near normal (median for precipitation).

Guidance Forecast models and tools (either statistical or numerical) used by forecasters in creating "official" forecast products.

Prediction An objective forecast of the future state of the atmosphere generated by running a climate/weather forecast model or a simpler empirical model based on data analysis.

Experimental Product A product that is tentative or under development; an informal, unrecognized, unvetted model for future prediction. The National Weather Service (NWS) makes experimental products available for testing and evaluation for a specified, limited time period for the explicit purpose of obtaining customer feedback.

Operational Product A product that provides consistent timely delivery of sanctioned data, products or services; produced on a reliable and continuous basis.

Official Product A product issued by an organization as a sanctioned expert opinion of position. For example, real-time current *official* weather observations, forecasts, and warnings are issued by the NWS for use by the national and international community.

Average or Climate normal A number computed as an arithmetic mean of some climate variable (e.g. temperature, precipitation, snowpack level) over a long time period, usually 30 consecutive years. This number may or may not be the expected or most likely occurrence at any given time. This is especially true with precipitation in dry climates, such as the desert in the U.S. Southwest, and temperatures at continental locations which frequently experience large swings from cold to warm temperatures.

Climatology The expected values of temperature, precipitation or other climate variables for a given location and time of year.

Anomaly The deviation of a climate variable (usually temperature or precipitation) in a given region over a specified period from the long-term average value for the same region. The current standard is to calculate anomalies as the departure from a 30-year average.

Tercile A way to divide a climate variable's historic occurrence into three categories: below normal, near normal, and above normal. Terciles divide data into three categories that have the same chance of occurring. For example, in a 30-year climatology of precipitation/temperature the 10 driest/coldest years belong in the below-normal tercile, the 10 wettest/warmest years belong in the above-normal tercile, and the other 10 years belong in the near-normal tercile. These numbers translate into the probability of a randomly chosen year in that set as having a 33.3% chance of being in the below-normal tercile, 33.3% chance of being in the near-normal tercile, and 33.3% chance of being in the above-normal tercile. Seasonal climate outlooks are often given in terms of the chances of being in one of the tercile categories, based on the historic climate data from the past, which is usually the past 30 years.

Climate Variability Fluctuations in time about the average conditions.

Climate Change A sustained departure from the previous climate conditions.

Climate information The data, products and services that can be used for decision support by policy makers and resource managers from all levels of government, all sectors of the economy and society, all levels of major corporations, small businesses, and individual users. Examples of climate information include current conditions, climatology, forecasts, outlooks and guidance.

On the Web

http://www.cpc.ncep.noaa.gov/products/outreach/glossary.shtml
http://www.srh.noaa.gov/oun/severewx/glossary.php
http://k12.ocs.ou.edu/teachers/glossary/
http://iri.columbia.edu/outreach/meeting/MediaWS2001/Glossary.html
http://amsglossary.allenpress.com/glossary
http://www.bom.gov.au/lam/glossary/
http://www.bom.gov.au/climate/glossary/

Temperature through 3/31/05 Source: High Plains Regional Climate Center

The Intermountain West region saw March temperatures that were close to average (Figures 1a-b). In contrast to February, which had greater high and low anomalies, most of the region was 2°F above or below normal for the monthly average. Pockets of up to 4°F above average existed in parts of northern Wyoming, northeastern Utah and north-central Colorado. On the other hand, Colorado's central and south-central mountains had pockets of 4°F below average in March.

Last year, March temperatures were between 2-8°F above average for the Intermountain West Region. That caused the snowpack to start melting early and led to lower snowpack in March. Nevertheless, this year the cooler temperatures helped to maintain the snowpack in the mountains and keep average snow water equivalents closer to average as well. See page 6 for snowpack information.

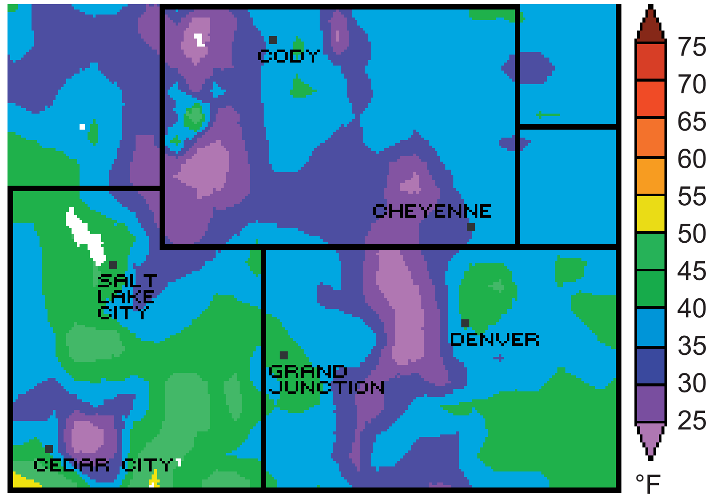


Figure 1a. Average temperature for the previous month in °F (March 2-31, 2005).

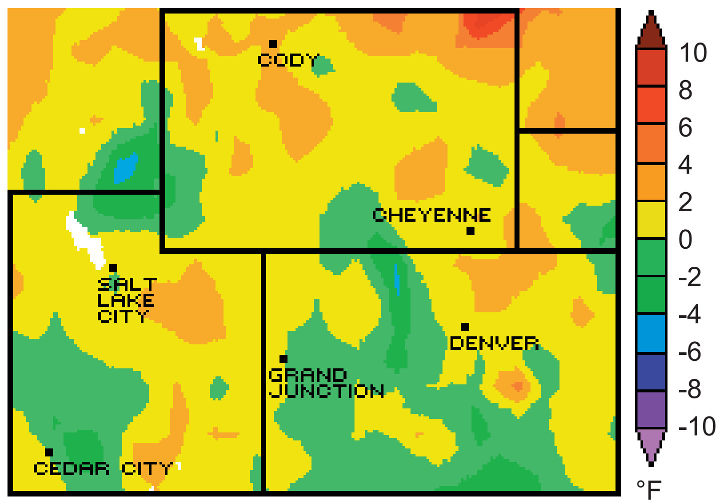


Figure 1b. Departure from average temperature for the previous month in °F (March 2-31, 2005).

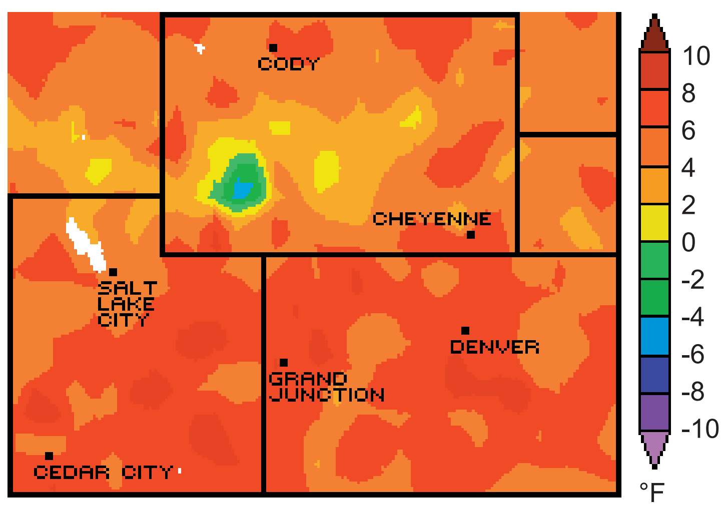


Figure 1c. Last year's departure from average temperature in °F (March 2004).

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 1a-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.

On the Web

For the most recent versions these and maps of other climate variables including individual station data, 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 4/04/05 Sources: NOAA Climate Diagnostic Center, NOAA Climate Prediction Center

Precipitation in the Intermountain West region falls primarily as snow in March, and snowpack and snow water equivalent (SWE) depend on elevation. In the plains, however, some precipitation does fall as rain this time of year. In March, precipitation totals in the Intermountain West region ranged from 1-3 inches. (Figure 2a). Overall, all three states increased their percent of normal precipitation totals for the month of March and since the start of water year 2005 (Figures 2b-c). Much of eastern Colorado and throughout Wyoming improved their percent of average precipitation, going from below 40% in February to 60-80% of average precipitation in March. Like in February, storms late in the month brought anomalously high levels of snow to Utah, with most of the sate seeing 120-200% more snow than normal in March.

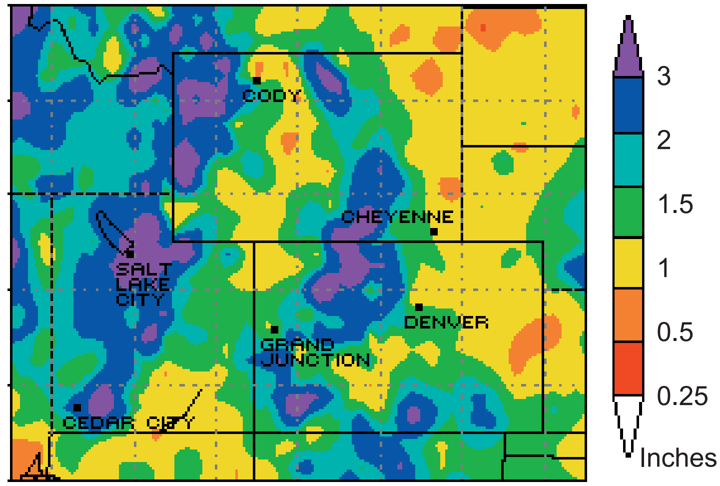


Figure 2a. Average precipitation for the previous month in inches (March 6, 2005 - April 4, 2005).

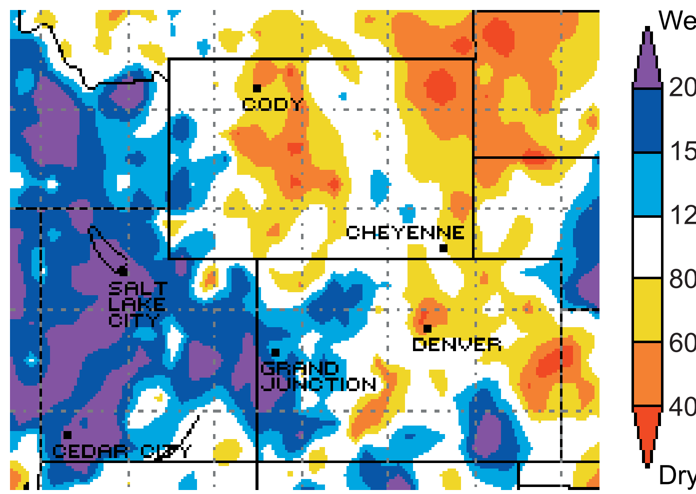


Figure 2b. Percent of normal precipitation for the previous month (March 6, 2005 - April 4, 2005).

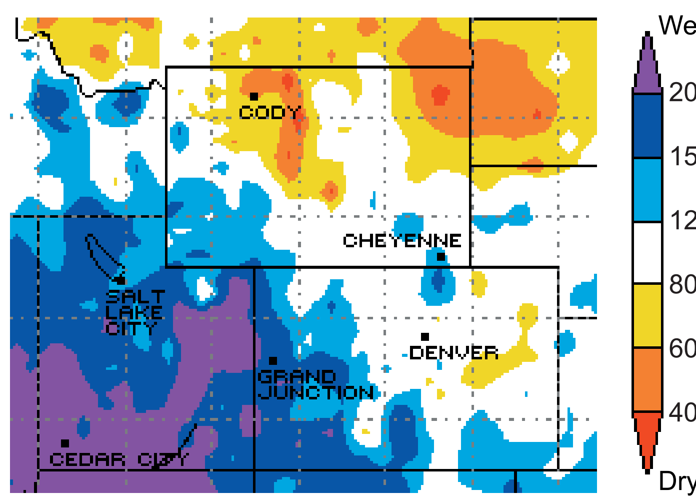


Figure 2c. Percent of average precipitation accumulated since the start of the water year (October 1, 2004 - April 4, 2005).

Notes

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2004 we are in the 2005 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 consistent 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 2a-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

Daily precipitation maps: http://www.cdc.noaa.gov/Drought/.

More precipitation maps: http://www.hprcc.unl.edu/products/current.html, http://www.wrcc.dri.edu/recent_climate.html.

NOAA precipitation/drought 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 released 4/05/05

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

The Drought Monitor did not change very much in the last month. There were improvements in central Utah, and northwest Colorado and a slight improvement in southern Wyoming. Northern Wyoming remains in a D4 and D3 stage drought.

Continued snowfall in the Sevier, Provo and Uintah basins in central **Utah** helped move those areas out of a drought situation. Note that the SWSI for the Provo basin is still below zero (see page 10 for Utah SWSI). In **Colorado**, despite a lower that average snowpack in the northwest, this area improved from a D2- to a D1- stage drought and this area is no longer considered to be in a hydrological drought. Finally, while a small area in southern **Wyoming** saw an improvement from D2 to D1 drought status, most of the state is anomalously dry with the northern half experiencing either a D3- or D4-stage drought.

Notes

The U.S. Drought Monitor 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 Richard Heim and Candace Tankersley, of NOAA's National Environmental Satellite and Informational Data Service (NESDIS) and National Climatic Data Center (NCDC).

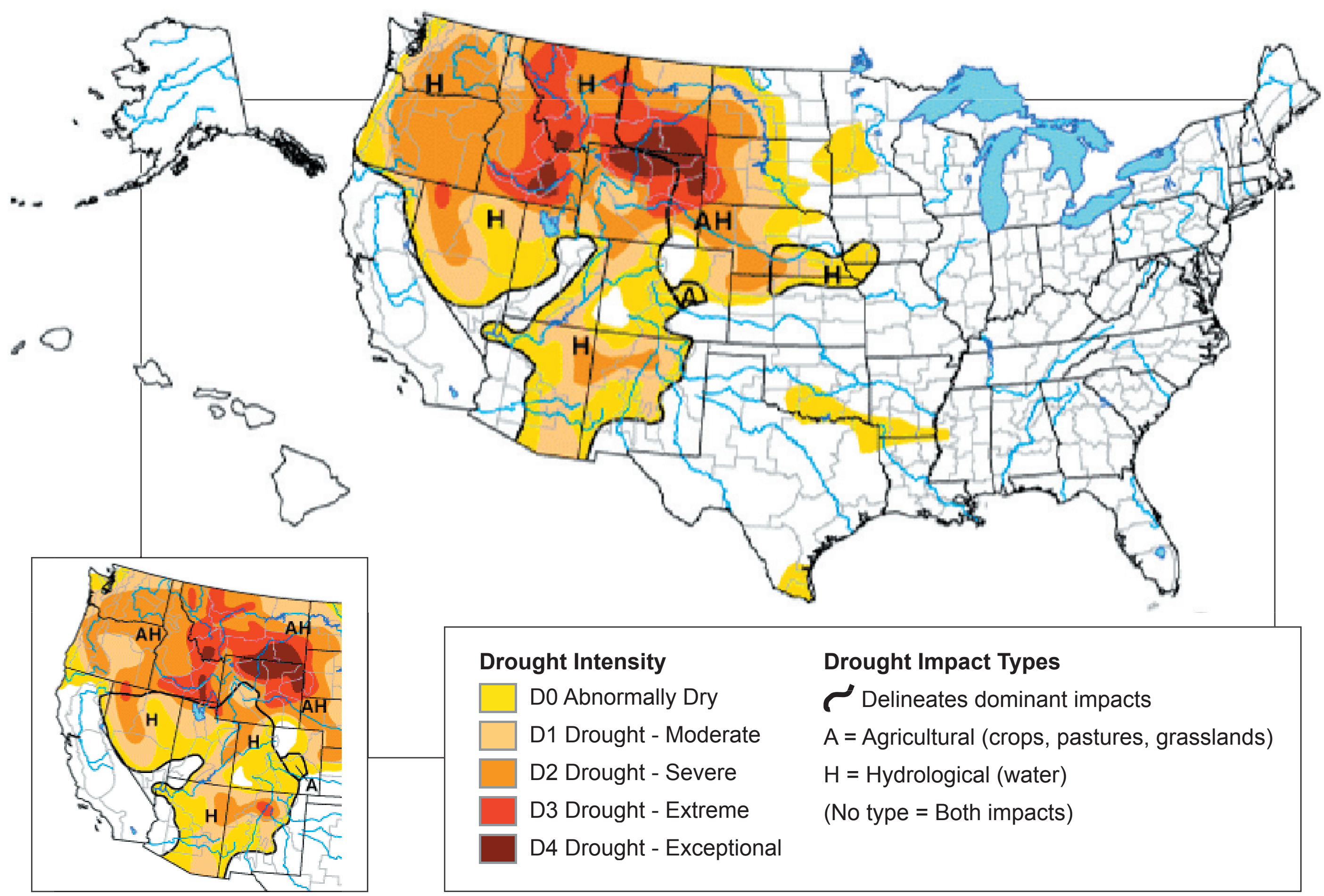


Figure 3. Drought Monitor released April 7, 2005 (full size) and last month March 10, 2005 (inset, lower left) for comparison.

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.

Intermountain West Snowpack released 4/05/05

Source: USDA Natural Resources Conservation Service (NRCS) Water and Climate Center

Colorado snowpack percentages did not change very much from last month, due to a dry first half and a wet second half of March. Basins in the south and southwest remain from 127%-140% above normal, despite some melting due to high temperatures in the beginning of March. Alternatively, while the northern and central mountains remain 84-86% of normal, the South Platte basin did improve 10% from last month. For the first time since 1997, Colorado had a statewide snowpack average above 100% on April 1st.

Despite most of March being dry, a few storms at then end of the month left **Utah** with continued above average snowpack totals, ranging from 102% in the Bear River basin to 234% in southwest Utah. Mild temperatures keep the low elevations snowpacks down, but they are still close to normal. According to the Utah Natural Resources Conservation Service (NRCS), large snowpacks will allow more snow to accumulate for a longer time, delaying the start of spring runoff. In addition, this situation will most likely lead to flooding, especially in southern Utah and the Uintah basin. See page 15 for streamflow outlooks.

In contrast to the high snowpack levels in Colorado and Utah are the below normal snowpack levels in **Wyoming**. According to the Wyoming NRCS, 9 out of 13 river basins improved their snowpack percentages during the month of March, but a large part of the state remains below normal. The Belle Fourche and Cheyenne basins in the northeast are the lowest with snowpacks that are between 25% and 50% below normal. These quantities are contrast to the southwest where the Lower Green and the Upper Bear River Basins are between 110% and 150% of normal.

Notes

Snow water equivalent (SWE) or snow water content (SWC) is determined by measuring the weight of snow on a "pillow" (like a very large bathroom scale) at the SNOTEL site. Knowing the size of the pillow and the density of water, SWE is then calculated from the weight measurement. SWE depends mainly on the density of the snow, and it refers to the depth of water that would result by melting the snowpack at the measurement site. Given two snow samples of the same depth, heavy, wet snow will yield a greater SWE than light, powdery snow. SWE is important in estimating runoff and streamflow. Snowpack telemetry (SNOTEL) sites are automated stations operated by NRCS that measure snowpack. In addition, SWE is measured manually at other locations called snow courses. (See page 15 for water supply forecasts.)

Figure 4 shows the SWE based on SNOTEL and snow course sites in the Intermountain West states, compared to the 1971-2000 average values. The number of SNOTEL or snow course sites varies by basin. Individual sites do not always report data due to lack of snow or instrument error, these basins with incomplete data are designated in white on the map.

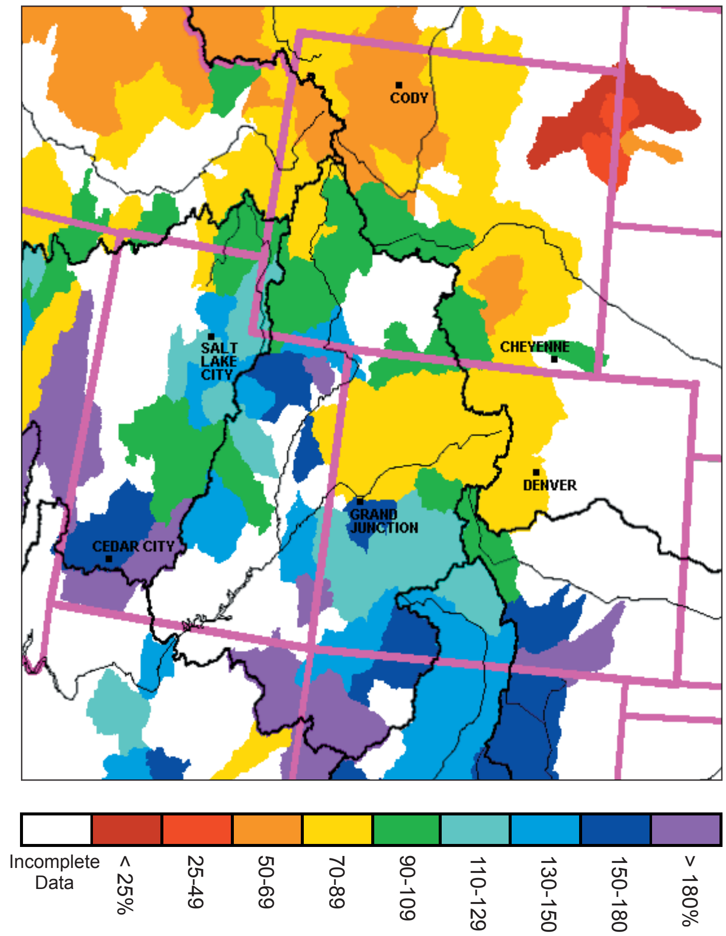


Figure 4. Snow water equivalent (SWE) as a percent of average for available monitoring sites in the Intermountain West as of April 1, 2005.

On the Web

Graphs like this and snowpack graphs of the western U.S.: http://www.wcc.nrcs.usda.gov/snowcourse/snow_map.html.
Snow course and SNOTEL data updated daily, please visit one of the following sites:

River basin data of SWE and precipitation: http://www.wrcc.dri.edu/snotelanom/snotelbasin.

Individual station data of SWE and precipitation for SNOTEL and snow course sites: http://www.wcc.nrcs.usda.gov/snowcourse/snow_rpt.html or http://www.wcc.nrcs.usda.gov/snotel/.

Graphic representations of SWE and precipitation at individual SNOTEL sites: http://www.wcc.nrcs.usda.gov/snow/snoteldata.html.

Regional Water Availability Status released 4/06/2005

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

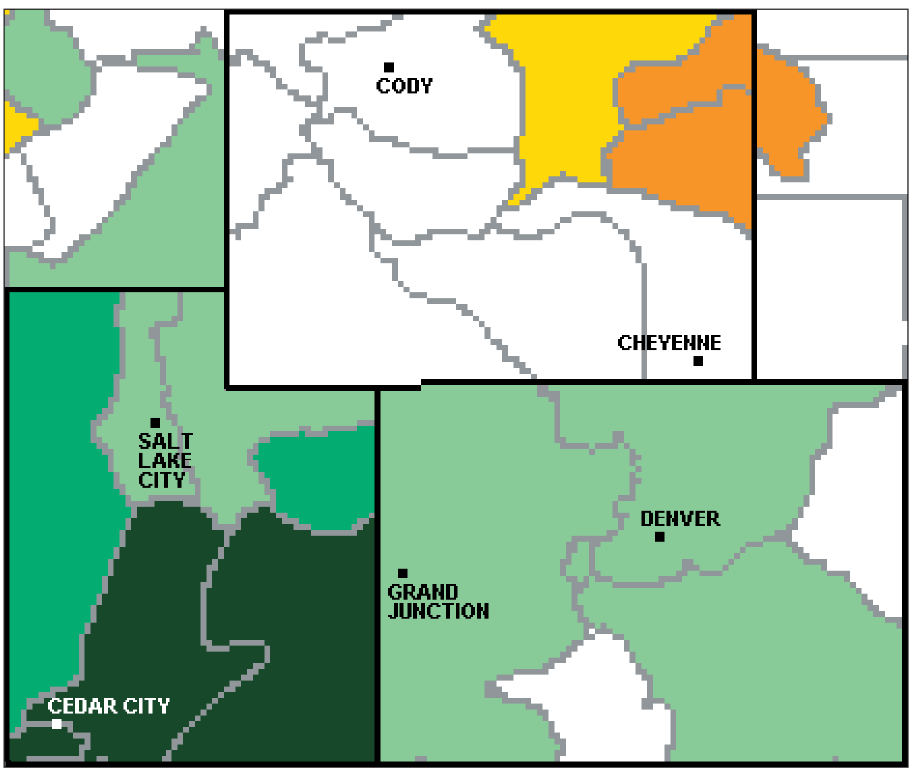
The Standardized Precipitation Index (SPI) can be used to monitor conditions on a variety of time scales. 3- and 6-month SPIs are useful in short-term agricultural applications and longer-term SPIs (12 months and longer) are useful in hydrological applications. The 12- month SPI for the Intermountain West Region (Figure 5a) reflects precipitation patterns over the past 12 months (through the end of March 2005) compared to the precipitation the same 12 consecutive months during all the previous years of available data.

The 12-month SPI for the Intermountain West Region ranges from being very dry in northeast Wyoming, to extremely wet in southern Utah. Most of **Colorado** is moderately wet. However, despite a high snowpack in the Rio Grand basin in south-central Colorado, the basin remains normal due to lower than average precipitation during the summer and early fall. The opposite is true for the north-central mountains, which had a below average snowfall season, but due to a wet summer, the area is still moderately wet. **Wyoming** is mostly normal, with the exception of the northeast being very dry. This is due to the lower than normal snowfall this winter in addition to the low levels of precipitation for that area for the entire past year. Finally, **Utah** has seen record levels of snow this winter, boosting its SPI despite a dry summer in 2004.

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. 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 5a. 12-month Intermountain West regional Standardized Precipitation Index. (released 4/06/05)

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

Source: Colorado Division of Water Resources, State Engineer and USDA Natural Resources Conservation Service.

While the SPI uses precipitation to calculate a drought severity index, the Surface Water Supply Index (SWSI) is another useful measure of water availability related to streamflows, reservoir levels, and even groundwater levels.

Notes

Each state calculates their SWSI a little differently.
The Surface Water Supply Index (SWSI), developed by the Colorado Office of the State Engineer and the USDA Natural Resources Conservation Service, is used as an indicator of mountain-based water supply conditions in the major river basins of the state is based on snowpack, reservoir storage, and precipitation for the winter period (November through April). During the winter period, snowpack is the primary component in all basins except the South Platte Basin where reservoir storage is given the most weight. The SWSI values in Figure 5b were computed for each of the seven major basins in Colorado for April 1, 2005, and reflect conditions during the month of March 2005.

Surface Water Supply Index March 1, 2005

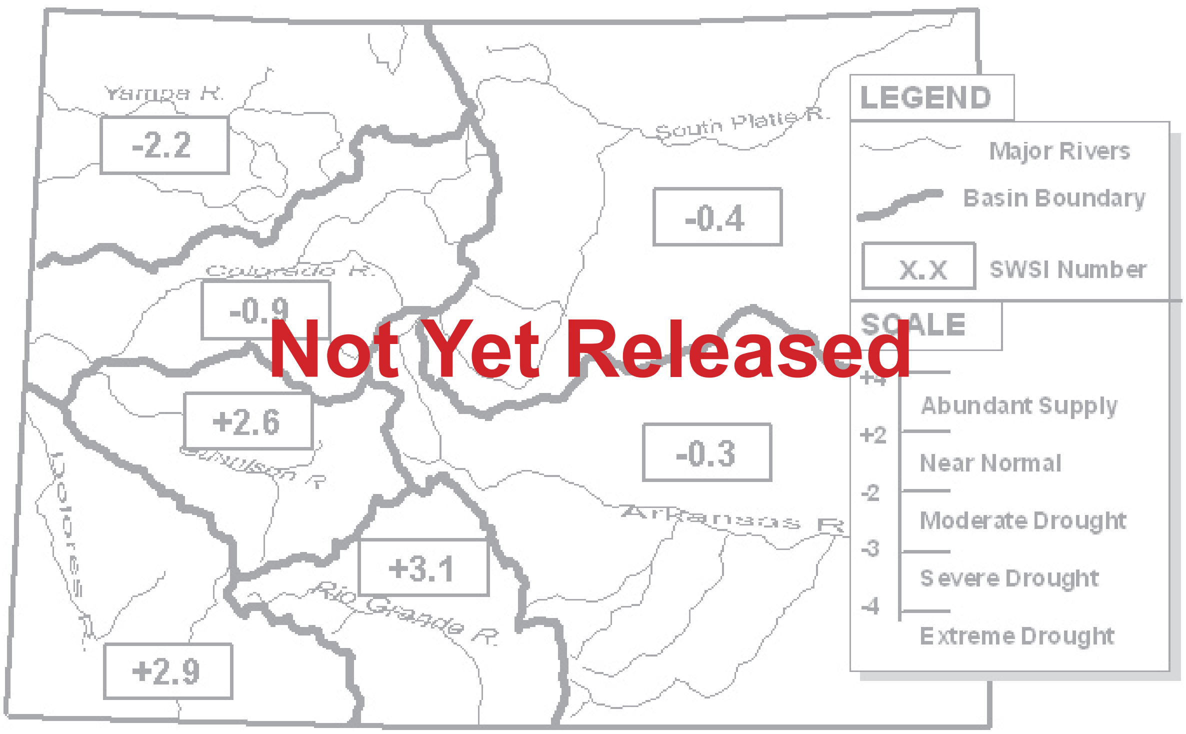


Figure 5b. Surface Water Supply Index. The map shows the projected streamfl ows by basin for spring and summer 2005, based on current conditions as of March 1. (Not yet updated. 3/10/05)

On the Web

For the current SWSI map, visit: http://www.co.nrcs.usda.gov/snow/watersupply/.

The Colorado Water Availability Task Force's next meeting is tentatively scheduled for May 12th at the Colorado Department of Wildlife headquarters in Denver. Agendas and minutes of this and previous meetings are available at: http://www.cwcb.state.co.us/owc/Drought_Planning/Agendas/Agendas.htm.

Wyoming Water Availability **released 4/11/2005**

Source: USDA Natural Resources Conservation Service

Figure 5c shows that most of Wyoming's river basins are facing a dry spring. The basins in the southwest, along with the Shoshone in the north are near normal, but the rest of the state has mild to extreme drought conditions. The Lower North Platte and Laramie basins in the east and the Upper Snake basin in the west are driest due to low snowfall this winter. Streamflows are forecasted to be low across the state. See page 15 for water supply forecasts.

Notes

Each state calculates their SWSI a little differently.
From the WY NRCS site: "The Surface Water Supply Index (SWSI) is computed using only surface water supplies for the drainage. The computation includes reservoir storage, if applicable, plus the forecast runoff. The index is purposely created to resemble the Palmer Drought Index, with normal conditions centered near zero. Adequate and excessive supply has a positive number and deficit water supply has a negative value. Soil moisture and forecast precipitation are not considered as such, but the forecast runoff may consider these values."

April 2005 Surface Water Supply Index Values

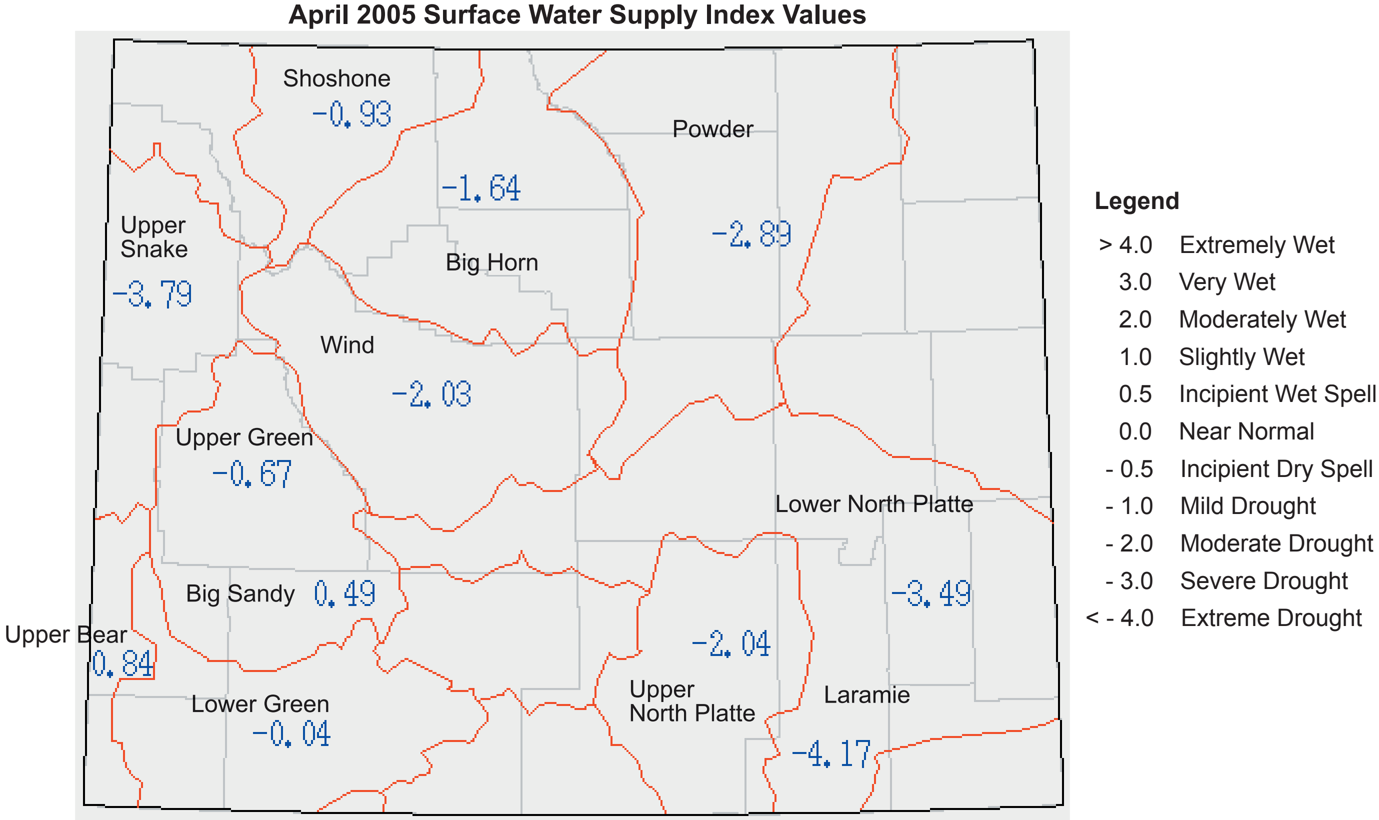


Figure 5c. Wyoming Surface Water Supply Index (released 4/11/05)

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 Palmer Drought Index is found on NOAA's drought page: www.drought.noaa.gov.

Utah Water Availability released 4/05/2005

Source: USDA Natural Resources Conservation Service

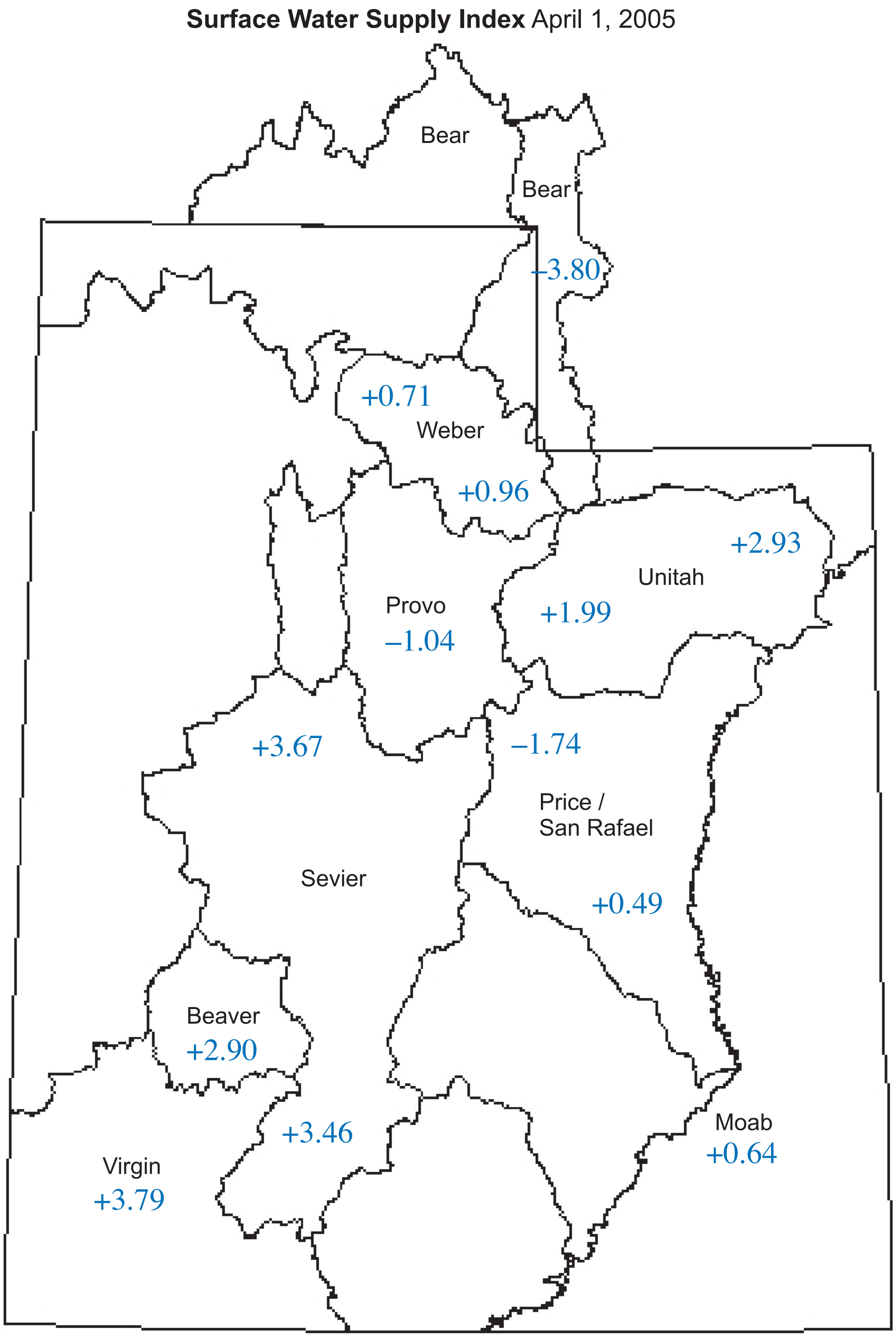


Figure 5d. Utah Surface Water Supply Index (released 4/05/05).

Figure 5d shows three of the river basins in southwest Utah (Upper Sevier, Lower Sevier and Virgin) are approaching 'abundant supply' due to anomalously high snowpacks this winter. The West and East Uintah basins are doing well also, while the Bear River basin is approaching 'extremely dry' conditions. All the other basins have a SWSI above zero, with the exception of the Price and Provo Rivers.

Notes

Each state calculates their SWSI a little differently.

From the UT NRCS: "The Surface Water Supply Index (SWSI) is a predictive indicator of total surface water availability within a watershed for the spring and summer water use seasons. The index is calculated by combining pre-runoff reservoir storage (carryover) with forecasts of spring and summer streamflow, which are based on current snowpack and other hydrologic variables. SWSI values are scaled from +4.1 (abundant supply) to -4.1 (extremely dry) with a value of zero (0) indicating media water supply as compared to historical analysis. SWSI's are calculated in this fashion to be consistent with other hydroclimatic indicators such as the Palmer Drought Index and the [Standardized] Precipitation Index." See page 7 for the SPI.

Legend

+4.1 abundant supply

0 water supply is comparable to historical average

- 4.1 extremely dry

On the Web

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/.

The Palmer Drought Index is found on NOAA's drought page: www.drought.noaa.gov.

Temperature Outlook April - August 2005

Source: NOAA Climate Prediction Center

The long-lead temperature forecasts from the NOAA Climate Predictions Center (CPC) indicates an increased probability of above normal temperatures in most of the southwest, central and southern Utah, and western Colorado for the April-June forecast period and for forecast periods through August 2005 (Figures 6a-d). This forecast is consistent with an observed trend towards higher temperatures across much of the Western U.S., which is a large part of the basis for the seasonal forecast. In general, due to the strong trend the temperature forecast skill is very high and may be the most certain of all the projections for the upcoming year.

Notes

These outlooks 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.

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

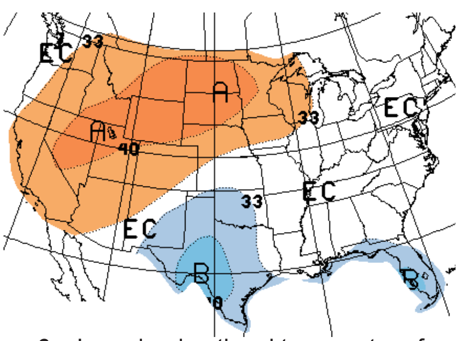


Figure 6a. Long-lead national temperature forecast for April 2005. (released March 31, 2005)

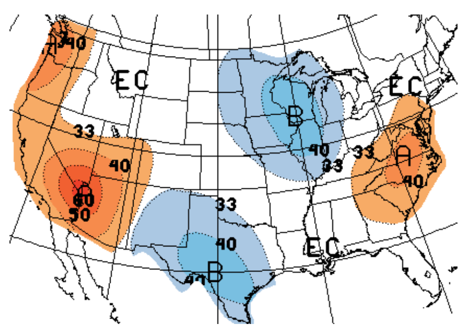


Figure 6b. Long-lead national temperature forecast for April – June 2005. (released March 17, 2005)

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

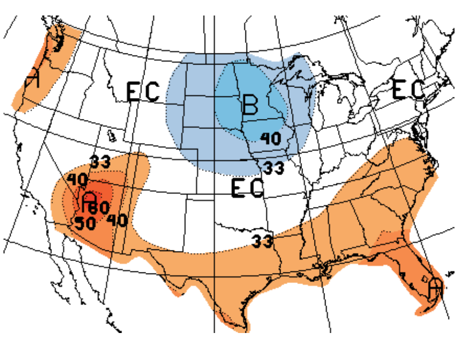


Figure 6c. Long-lead national temperature forecast for May – July 2005. (released March 17, 2005)

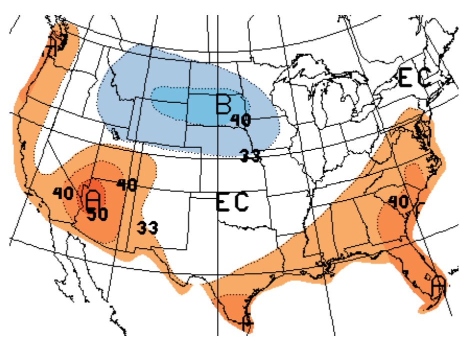


Figure 6d. Long-lead national temperature forecast for June – August 2005. (released March 17, 2005)

On the Web

For more information and the most recent forecast images, visit: http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html. Please note that this website has many graphics and may load slowly on your computer.

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 April - July 2005

Source: NOAA Climate Prediction Center

The precipitation outlook issued by the NOAA Climate Predictions Center (CPC) is for “Equal Chances” (EC), or climatology, for the April-May-June 2005 forecast period and for the following few months (Figure 7a). Forecasts of precipitation in the western U.S. are heavily influenced by the status of the ENSO cycle, and there is generally only skill in the precipitation forecast when a strong ENSO anomaly is present. The positive sea surface temperature (SST) anomalies in the equatorial Pacific have waned (see page 14 for the ENSO status and forecast), so there is little information on which to base a forecast, particularly for the Intermountain West region. The “Equal Chances” reflects the uncertainty in conditions and the lack of known forcing factors for anomalies.

Maps of the average precipitation for the Intermountain West for the upcoming months of April (Figure 7b), May (Figure 7c), and June (Figure 7d) show the mean precipitation or climate normals. May is the wettest month of these three in the Intermountain West region, with some places in Wyoming receiving an average of over 3 inches of precipitation. (Remember that these are measurements of rainfall or rainfall-equivalents.) While April is only slightly drier than May, June is the month when the spring rains taper off in western Colorado and Utah. However, on average wet conditions continue into June for much of Wyoming, which is currently the driest state in the region. If the average conditions occur, Wyoming’s drought status could improve. (See page 5 for drought monitor and page 6 for current snowpack.)

Notes

The seasonal precipitation outlook 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 percent 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.

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.

Average in Figures 7b-d 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 consistent 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 7b-d come from NOAA’s Climate Prediction Center, but the maps were created by NOAA’s Climate Diagnostics Center.

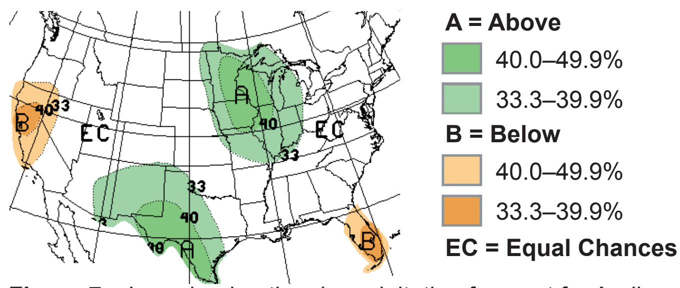


Figure 7a. Long-lead national precipitation forecast for April – June 2005. (released March 17, 2005)

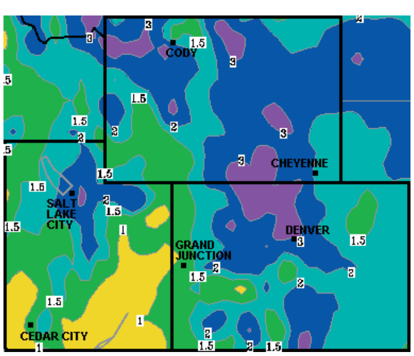


Figure 7b. Average precipitation for April.

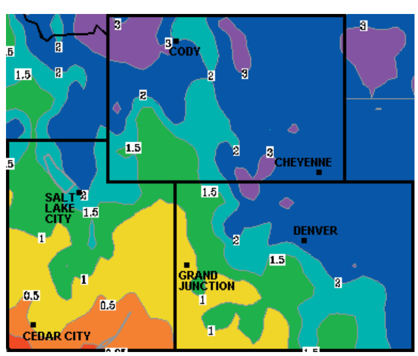


Figure 7c. Average precipitation for May.

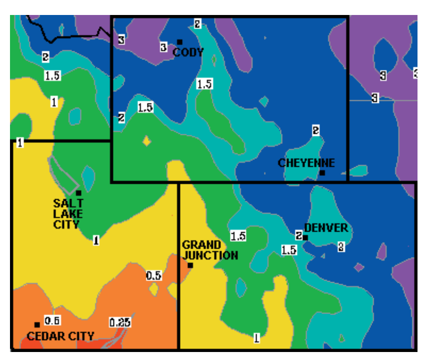
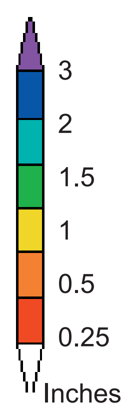


Figure 7d. Average precipitation for June.



On the Web

For more information, visit: http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html. Please note that this website has many graphics and may load slowly on your computer.

For IRI forecasts, visit: http://iri.columbia.edu/climate/forecast/net_asmt/.

More information about precipitation 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.

Seasonal Drought Outlook through May 2005

Source: NOAA Climate Prediction Center

According to the NOAA Climate Prediction Center, continuing storms have eased drought across the Southwest and Great Basin. The latest seasonal drought outlook (Figure 8) calls for additional improvement for lingering drought areas, including **Utah** Melt from the extraordinary mountain snowpack in this region will boost streamflows this spring, improving reservoir supplies. However, one season will not be enough to bring full recovery to the largest reservoirs, such as Mead and Powell on the Colorado River, although even these will benefit from this past winter's prolific snows. In much of **Wyoming** and the northern High Plains, including the upper Missouri River basin, below-normal mountain snowpacks will mean ongoing hydrological drought, although late winter storms and spring rains should offer limited improvement by benefiting soil moisture. Drought in the northwestern US has worsened, including northwest Wyoming, and it is very unlikely that this region will see significant improvement in the hydrological drought picture this late in the wet season, given the difficulty of making up the deficits following four consecutive months of below-normal precipitation.

Notes

The delineated areas in the Seasonal Drought Outlook (Figure 8) 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.

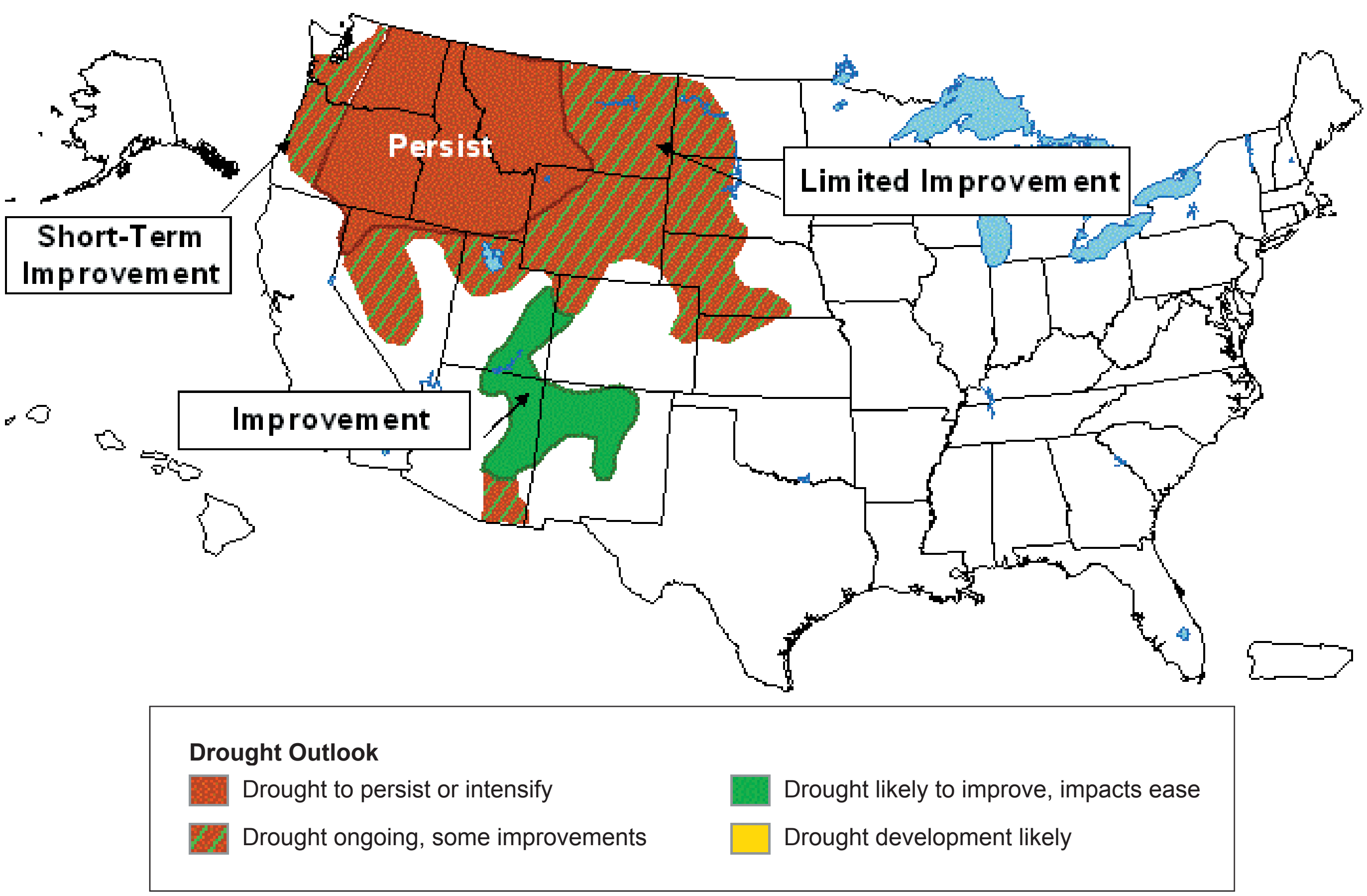


Figure 8. Seasonal Drought Outlook through May 2005 (release date March 17, 2005).

On the Web

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

El Niño Status and Forecast

Sources: International Research Institute for Climate Prediction, NOAA Climate Prediction Center

NOAA defines an El Niño as a phenomenon in the equatorial Pacific Ocean characterized by a positive sea surface temperature (SST) departure from normal (for the 1971-2000 base period), averaged over three months, greater than or equal in magnitude to 0.5°C in a region defined by 120°W-170°W and 5°N-5°S (commonly referred to as Niño 3.4).

According to the NOAA Climate Prediction Center, sea surface temperature (SST) anomalies along the equator in the pacific have decreased since the beginning of the year, and SSTs in the area that defines El Niño (Niño 3.4) have decreased to the smallest values since July 2004 (Figure 9). Only SSTs in the western central Pacific (Niño 4 region) remains more than 0.5 degrees above normal, which is the temperature threshold for NOAA's definition of El Niño. In the last half of March there was some warming in the central equatorial pacific. This warming is not expected to be a resurgence of El Niño, but rather a brief variation. Guidance from other forecast tools suggests ENSO-neutral, or near normal conditions for the rest of the summer, and will not be a factor.

Notes

Figure 9 consists of two graphics showing the observed SST (upper) and the observed SST anomalies (lower) in the Pacific Ocean. NOAA produces these graphics from data from an system of 70 moored buoys spread out over the Pacific Ocean, centered on the equator. This system, called the TOGA/TAO Array, measures temperature, currents and winds in the Pacific equatorial band and it transmits data around the world in real-time. NOAA uses these observations to predict short-term (a few months to one year) climate variations.

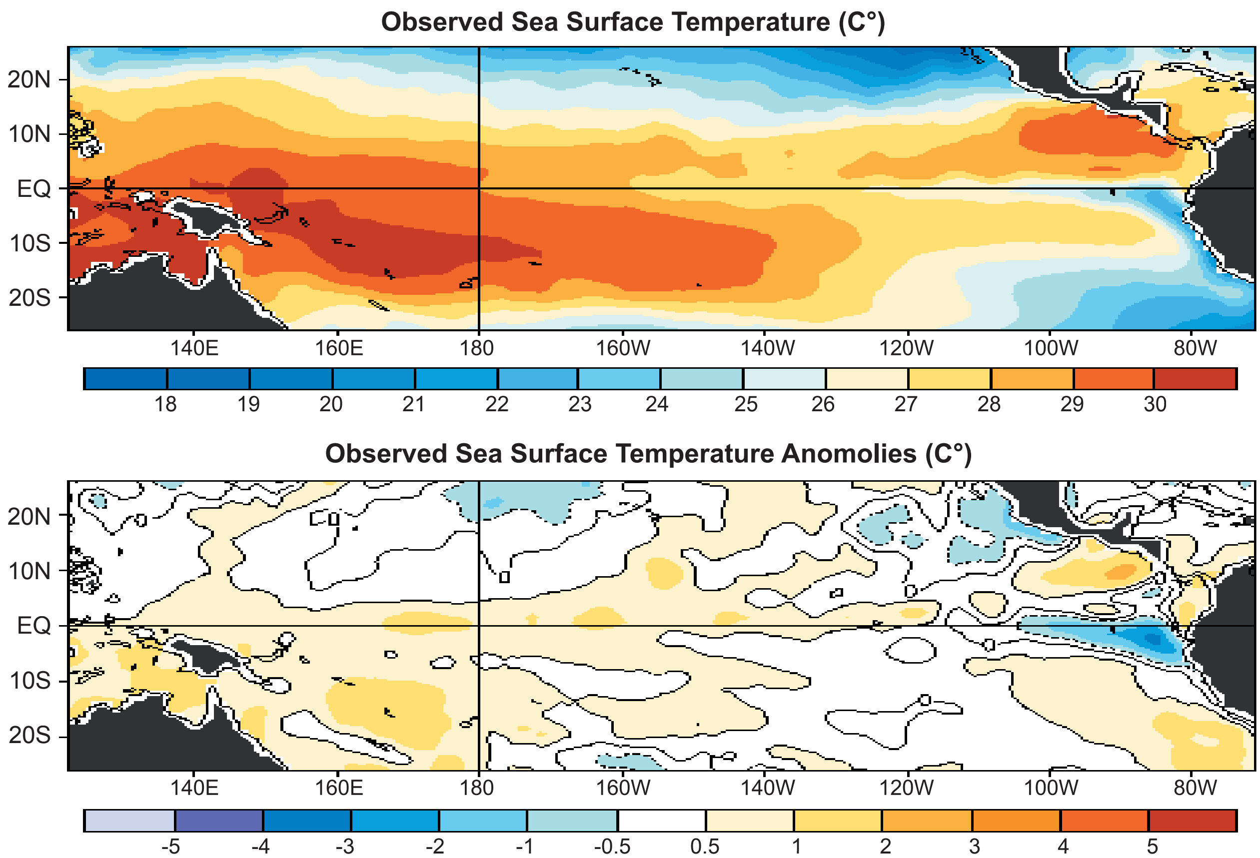


Figure 9. Two graphics showing the observed SST (upper) and the observed SST anomalies (lower) in the Pacific Ocean. The Niño 3.4 region encompasses the area between 120°W-170°W and 5°N-5°S. The graphics represent the 7-day average centered on March 30, 2005.

On the Web

For a technical discussion of current El Niño conditions, visit: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/.

Fore 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/.

Water Supply Forecast for the 2005 runoff season (released 4/05/05)

Source: USDA Natural Resources Conservation Service Water and Climate Center

The water supply forecast for the Intermountain West region is highly varied, due to above average snowpacks in parts of Utah and Colorado and below average snowpacks in Wyoming. According to the NRCS, **Utah** will see both low and high streamflows this year, with flows in the Virgin River expected to be 300+% of average and flow in the Bear River under 60% of average. Likewise, in **Colorado** tributaries to the San Juan, Gunnison and Arkansas Rivers will have streamflows above 150% of average, but the northern rivers like the upper South Platte and North Platte are only expected to see 60-70% of average streamflows. **Wyoming's** water supply forecast is more uniform across the state with 50-70% of average streamflows predicted for most basins, except the Lower North Platte, Lower Snake and Upper Bear rivers, which are forecasted to have close to average flows this year.

Notes

The map on this page does not display the official NOAA streamflow forecast, official forecasts are developed by individual river basin forecast centers. (See 'On the Web' box below for links to the official forecasts.) We present the NRCS water supply forecasts because they show the entire Intermountain West region together.

Figure 10 shows the forecasts of natural runoff, based principally on measurements of precipitation, snow water equivalent, and antecedent runoff (influenced by precipitation in the fall before it started snowing). Forecasts become more accurate as more of the data affecting runoff are measured, i.e. accuracy increases from January to May. In addition, these forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will have an average affect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

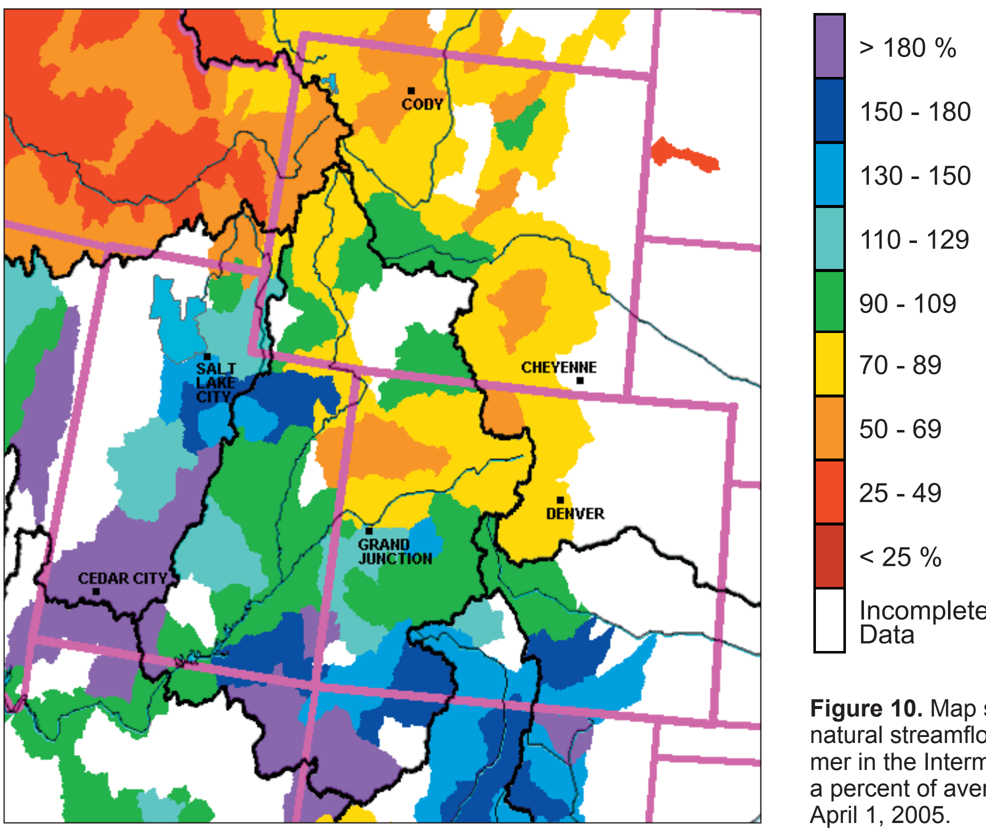


Figure 10. Map showing the expected natural streamflows for spring and summer in the Intermountain West region as a percent of average streamflows as of April 1, 2005.

On the Web

For more information about NRCS water supply forecasts based on snow accumulation and access to the graph on this page, visit: http://www.wcc.nrcs.usda.gov/wsf/.

The official NOAA streamflow forecasts are available through the following websites of individual River Forecast Centers:
- Colorado Basin (includes Great Basin): http://www.cbrfc.noaa.gov/
- Missouri Basin (includes South Platte and North Plate: http://www.crh.noaa.gov/mbrfc/
- West Gulf (includes Rio Grande): http://www.srh.noaa.gov/wgrfc/
- Arkansas Basin: http://www.srh.noaa.gov/abrfc/

Conference Explores the Intersection of Law, Policy and Climate on the Colorado River

By Douglas Kenney, University of Colorado Natural Resources Law Center, Western Water Assessment.

The Colorado River is approaching a crossroads. For the first time in its history, satisfying water demands in one state may require curtailing legally-recognized uses in another. This is not the first instance of water shortages in the region, and conflict among the seven Colorado River states is certainly not new. But the potential shortages on the horizon are larger in scale and magnitude than ever seen before, and the regional insurance policy against this sort of catastrophe, the storage reservoirs of Lake Powell and Mead, are being pushed to their limits.

As shown in Figure 11, water storage has dropped precipitously. The decline of Lake Powell (along the Arizona-Utah border) is particularly alarming; the reservoir has lost more than half its storage in the past four years. Declining water levels have already meant an end to surplus deliveries relied upon by some downstream users, have further stressed environmental resources, and are beginning to impact the ability to generate hydropower. The long-range fear is that further declines could prevent the upper basin states (Colorado, Wyoming, Utah and New Mexico) from honoring the downstream water delivery obligations (to California, Arizona and Nevada) spelled out in the Colorado River Compact, perhaps triggering a compact call.

Many factors explain this quickly emerging problem. First, population growth in this region is the fastest in the nation, and has fueled increasing demands on the river. Second, the body of law that allocates water among the states promises more water than the system can reliably provide, an error understood for many decades but one that has largely been ignored until the current crisis. And third, severe drought has exposed the limits and increasing vulnerability of the system, forcing policy-makers into rushed negotiations about how to allocate shortages. Inflows to the system in 2004 are estimated at approximately 51% of normal, following the trend seen in 2000 (62%), 2001 (59%), 2002 (25%) and 2003 (51%).

The WWA is exploring these issues in several projects. In one effort, the WWA has joined with the Natural Resources Law Center and other collaborators to host a conference entitled “Hard Times on the Colorado River: Drought, Growth and the Future of the Compact,” scheduled for June 8-10 at the CU Law School. Key water decision-makers from throughout the basin will come together to explore a variety of topics pertaining to the Law of the River, the ability of the system to meet water delivery and hydropower obligations, potential impacts of shortages to water users and the environment, and solutions for future management. The event is open to the public, although registration is required. More information is available at: **www.colorado.edu/law/summerconference/**.

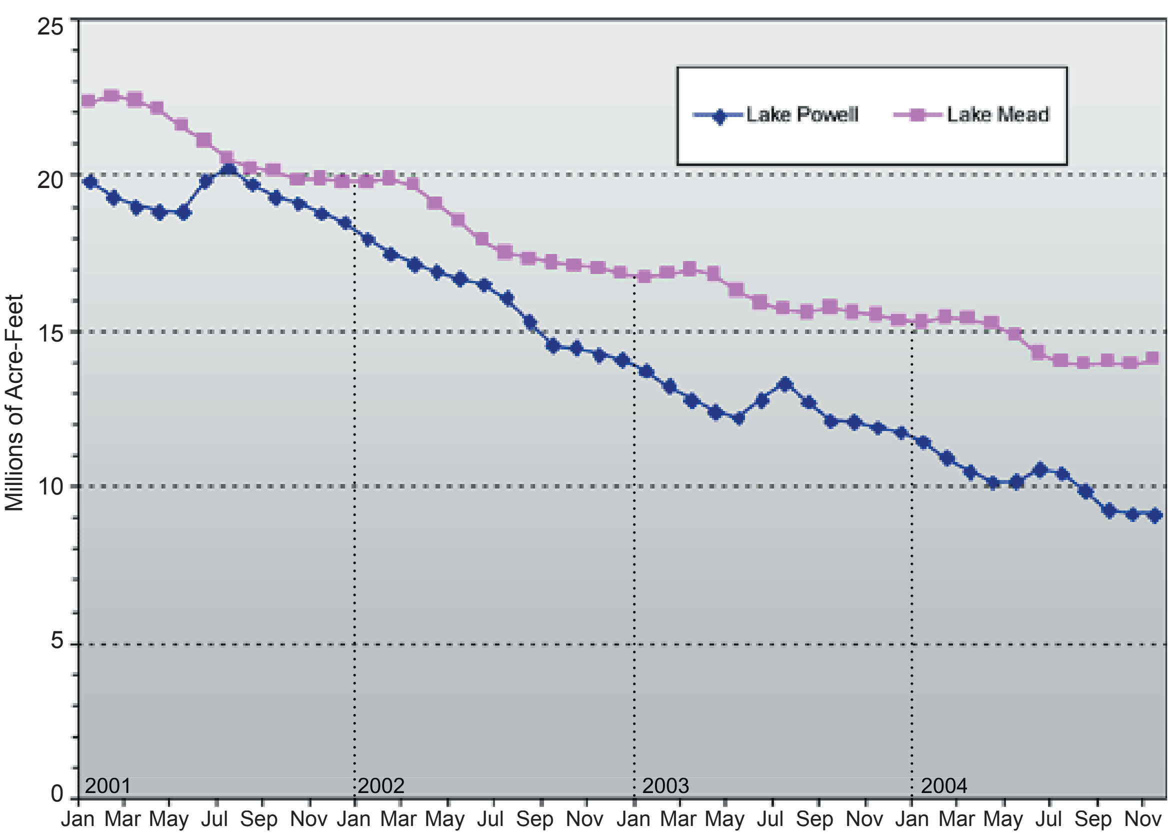


Figure 11. Storage in acre-feet of Lake Mead and Lake Powell from January 2001 – November 2004. Both reservoirs are declining due to the west-wide drought conditions.