

Montana Weather/Precipitation Summary

June 2011 by NOAA's National Weather Service Great Falls Montana

The cool and wet conditions of this spring continued into June. Regular and heavy rainfall, along with snowmelt, produced some of the highest river stages and lake levels in eastern Montana on record. Flooding occurred on most rivers and streams in the state at some point in June.

The Climate Prediction Center stated that the atmospheric circulations of June still reflected aspects of La Nina, but continued to weaken. A trough of low-pressure dominated the Pacific Northwest (Fig. 2) producing cooler temperatures (Fig. 3) and a flow of moisture into the area. During June, temperatures averaged from near normal around Anaconda, to 5 degrees below normal across portions of northern and northwest Montana. Precipitation totals varied widely, with highest amounts in the central and east. Over much of western Montana, precipitation essentially ended by mid-June. This caused a rapid drying of soil conditions by the end of the month across the western half of the state. At Cut Bank, the last half of June was the second driest of record, as they received only 0.05 inches of rain.

Temperatures across the state (Fig. 1) averaged 57.4F; three degrees below normal. This was the 20th coolest June, and was the coolest June since 1998. Temperatures averaged coolest across north-central and eastern Montana (Fig. 4). This was the fifth consecutive month of below normal temperatures. The statewide average temperature for the past 12 months is about 1F below normal. Some of the largest cool departures from normal in the northern hemisphere occurred in Montana (Fig. 3).

Precipitation averaged above normal in June (Fig. 1). Pockets of below average rainfall were scattered across the state. The statewide average of 3.21 inches is a 0.70-inch surplus or 127 percent of average for the month, and the eighth consecutive month of above normal precipitation. The precipitation excess over the average in the past 12 months is 5.97 inches. Positive precipitation anomalies were greatest over the central, north-central and northeastern portions of the state (Fig. 5). Over the Rockies, deep snowpack remained at some locations. Snow-on-ground totals were near 100-inches at a few higher locations in the Mission and Swan Ranges.

Wind speeds were slightly below the monthly normal in June. Besides the normally windy areas near the Rockies, the windiest region was along the North Dakota border and northeast Montana. June's average of 8.4 mph was 0.6 mph below the normal for June; or the 9th calmest June of record.

Soil moisture conditions continued above average in June. The composite of 18 stations across the state show the wettest average June conditions since 2005.

June 1-6

While heavy rain fell across western Montana, with snow in the higher elevations, eastern portions warmed into the 70s during the first couple of days of June. Nearly two inches of rain fell in portions of Powell

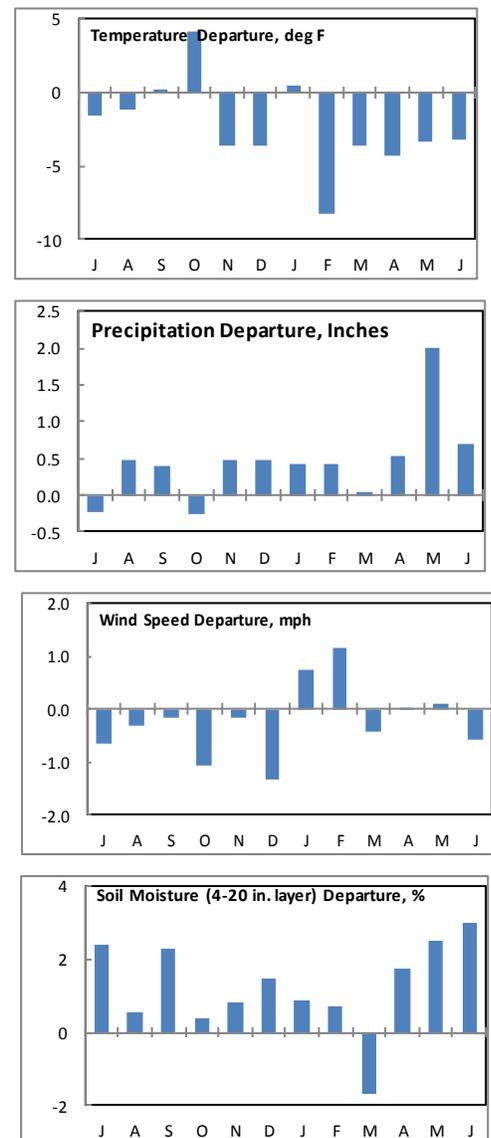


Figure 1. Statewide departures from normal for 18 locations.

County in western Montana. Windy conditions along a cold front produced winds to 63 mph at Norris Hill on the second. Thunderstorms across portions of eastern Montana yielded hail to 1.75 inches near Terry (Prairie). Wind gusts reached 68 mph near Livingston and 58 mph at Glasgow. Much cooler air spread into the state with high temperatures in the 40s over central Montana on the third. Nearly 1.5 feet of snow fell at higher elevations in Missoula County on the third, with over three inches of rain at lower elevations west of the divide. Over the central island ranges, nearly 1.5 feet of snow fell in the Little Belts, again with over three inches of rain in the Bear Paws. After the storminess of the first few days, high pressure moved into the state. Cooler air dropped the temperature to 19F at West Yellowstone on the fourth, for the month's lowest. This also tied the statewide lowest temperature for the date also set at West Yellowstone in 1920. A rapid warm-up brought the temperature to near 90F over much of eastern Montana on the sixth. Broadus reached 91F on the sixth, tying the month's warmest reading. Along with the warmer air was a round of thunderstorms. Severe thunderstorms brought hail up to 2.75 inches in diameter at Columbus (Stillwater), with 1.5-2-inch hail reported over portions of Sweet Grass, Rosebud and Stillwater Counties. Two tornados were spotted in Yellowstone County, one near Molt and the other near Shepherd. Some buildings and power lines were damaged with each. A hail-storm accompanied with five inches of rain occurred near Ryegate (Golden Valley). This storm spooked a herd of cattle, which ran over a 200-foot cliff, causing 180 head to die.

June 7-21

A very wet and unsettled period dominated mid-June. Regular storms with heavy precipitation visited most of the state. Heavy rain fell over northeast Montana on the seventh, producing flash flooding in the Glasgow area. Heavy rains also fell over central Montana, with 2.5 inches in the Elkhorn Mountains, 3-inches at Shonkin (Chouteau) and 2-inches near Browning (Glacier). On the 11th, thunderstorms again produced heavy rain with some large hail in eastern Montana. Hail to 1.5 inches in size fell at Ridge (Carter), and flooding again occurred near Nashua (Valley) after 2-3 inches of rain fell. Another round of thunderstorms across eastern Montana on the 12th dumped hail to 4.25 inches in size near Biddle (Powder River). A weak tornado occurred near Albion (Carter), which damaged grain bins and power lines. Some one-inch hail also fell in the Bozeman and Flat Willow areas. Again on the 15th, hail with strong winds occurred in south central Montana, with one-inch hail at Worden (Yellowstone), and 65 mph gusts at Sweeney Creek. Flooding occurred after thunderstorms dumped over three inches of rain in the Dagmar area (Sheridan). A break in the weather with warmer conditions returned on the 20th and 21st.

June 22-30

Much drier air prevailed statewide during the last week of the month. Scattered thunderstorms accompanied a cold front on the 23rd. Hail to 1.75 inches in diameter fell at Fort Shaw (Cascade), with 1.25 inch hail falling at Seeley Lake (Missoula). Gusty winds to 60 mph also accompanied some of the storms over eastern Montana. As the front continued into southeast Montana, a gust to 61 mph was recorded at Fort Howes (Powder River) on the 24th. After cooler air settled across the state, setting new record low temperatures on the 26th and 27th, a rapid warm-up occurred on the 28th. Temperatures soared to 97F at Bridger on the 28th. Scattered thunderstorms across central Montana produced winds to 68 mph near Cascade and 70 mph near Chinook. On the 29th, the temperature rose to 102F at Fort Peck, for the month's warmest. Along a cold front, severe thunderstorms broke out across central and northeast Montana. Hail to two inches fell in Valley County, with funnel clouds spotted near Glasgow. Cooler and windy conditions on the 30th produced gusts to 97 mph at Logan Pass, the highest gust of the month.

New Temperature Records for the current month

| Station | Record Type | New Record | Date | Previous Record | Year of Previous Record |
|------------------|---|------------|------|-----------------|-------------------------|
| West Yellowstone | Low Daily Min Tied daily statewide low | 19 | 4 | 19 | 1920 |
| Great Falls | Low Daily Max | 49 | 9 | 49 | 2002 |
| Lewistown | Low Daily Max | 47 | 9 | 47 | 1995 |
| Great Falls | Low Daily Min | 36 | 26 | 36 | 1999 |

| | | | | | |
|------------|-----------------|--------|----|--------|------|
| Livingston | Low Daily Min | 35 | 27 | 35 | 1985 |
| Cut Bank | Latest first 80 | Jun 22 | | Jun 10 | 1965 |
| Havre | Latest first 80 | Jun 22 | | Jun 9 | 1898 |
| Lewistown | Latest first 80 | Jun 23 | | Jun 10 | 1991 |

Precipitation/convection

Severe convective weather occurred on twelve days in June (the average is 11 days). Three tornados were spotted during the month – one near Molt, a second near Shepherd, and a third near Albion.

New Precipitation Records for the current month

| Station | Record Type | New Record | Date | Previous Record | Year of Previous Record |
|------------|-------------------|------------|------|-----------------|-------------------------|
| Bozeman | High Daily Precip | 1.22 | 7 | 0.54 | 1967 |
| Glasgow | High Daily Precip | 1.73 | 7 | 1.19 | 1994 |
| Helena | High Daily Precip | 1.14 | 7 | 0.87 | 1934 |
| Livingston | High Daily Precip | 0.83 | 7 | 0.72 | 1934 |
| Dillon | High Daily Precip | 0.84 | 8 | 0.65 | 1947 |

Several USDA SNOTEL stations recorded late season records for the highest snow-water-equivalent (SWE) so-late-in-the season. Some other records were set for the latest snow-melt dates of record. These records are listed in the following tables.

| Station | June 30 SWE | Previous Record | Year of Previous Record | Records Began |
|-----------------------------|-------------|-----------------|-------------------------|---------------|
| Badger Pass (Rockies) | 27.4 inches | 25.7 in | 2008 | 1950 |
| Barker Lakes (Anaconda) | 12.9 | 3.7 | 1995 | 1980 |
| Black Bear (Rockies) | 26.7 | 18.1 | 1995 | 1972 |
| Clover Meadow (Snowcrest) | 6.7 | 1.8 | 2008 | 1979 |
| Darkhorse Lake (Beaverhead) | 31.0 | 22.5 | 1995 | 1981 |
| Flattop Mtn (Lewis) | 44.5 | 36.1 | 1991 | 1970 |
| Hoodoo Basin (Bitterroot) | 35.2 | 24.5 | 1997 | 1967 |
| Noisy Basin (Swan) | 45.6 | 17.9 | 1997 | 1971 |
| Stahl Peak (Whitefish) | 39.7 | 34.6 | 1991 | 1971 |
| Warm Spgs (Anaconda) | 18.5 | 8.1 | 1978 | 1978 |

Latest Snow-melt records

| Station | New record date | Old record date | Year | Records began |
|-----------------------------|-----------------|-----------------|-----------|---------------|
| Boulder Mtn (Big Belt) | Jun 30 | Jun 30 | 1982 | 1979 |
| Dupuyer Creek (Rockies) | Jun 8 | Jun 8 | 1991 | 1984 |
| Lakeview Ridge (Centennial) | Jun 6 | Jun 3 | 1998 | 1979 |
| Lick Creek (Gallatin) | Jun 11 | Jun 10 | 1975 | 1964 |
| Mt Lockhart (Rockies) | Jun 30 | Jun 6 | 2002 | 1969 |
| Poorman Ck (Cabinet) | Jun 25 | Jun 25 | 1974/2002 | 1969 |
| Waldron (Rockies) | Jun 7 | Jun 4 | 1975 | 1969 |

June summary information:

| | | | |
|--|---|---|--|
| High Temperature | 102°F at Fort Peck (29 th) | Greatest Precip | 7.24" at Shenango RAWS (Gallatin) |
| Low Temperature | 19°F at West Yellowstone (4 th) | | 11.70" at Noisy Basin (Flathead) |
| Warmest Ave Temp | 64.6°F at Sidney (Richland) | Peak Wind Gust | 70 mph near Chinook (28 th) (Blaine) 97 mph at Logan Pass (30 th) |
| Coollest Ave Temp | 44.9°F at Mullan Pass | | |
| Range of Temp departures | -0.4°F at Anaconda to -5.9°F near Polson | Highest Ave Wind | 17.6 mph at Deep Creek and 12.2 mph at Hillside (Garfield) |
| 18 city mean monthly Temperature/Normal | 57.4/60.4; 20 th coolest of record (since 1880) | 18 city mean monthly wind speed/Normal | 8.4 mph/9.0 mph; 9 th calmest of record (since 1936) |
| 18 city mean monthly precipitation/Normal | 3.21/2.51" – 127% normal; 31 st wettest of record (since 1880) | 19 city mean monthly snow/Normal | 0/0 |

Other info

Several daily wind gust records were set during the month.

| Station | Record Type | New Record | Date | Previous Record | Year of Previous Record |
|------------|-----------------|------------|------|-----------------|-------------------------|
| Lewistown | High daily gust | 54 | 2 | 44 | 2008 |
| Livingston | High daily gust | 59 | 2 | 47 | 2008 |
| Baker | High daily gust | 53 | 7 | 48 | 2007 |
| Havre | High daily gust | 59 | 23 | 49 | 1993 |

Summary of water year and other precipitation and lake level information...

To this point in the water-year, this is the 10th coolest of record, with a statewide average temperature of 33.8F. This is the coolest October through June period since 1978 (which is the coolest). The water-year composite total precipitation is 16.06 inches, or the wettest of record. The previously wettest water-year through June was in 1880-81; when 14.65 inches fell through June 30 (only two stations were included in the 1880-81 average). The average composite annual (Oct-Sep) precipitation is 15.45 inches, which has been exceeded with June's precipitation. In the climatological record, this has never been done before by June.

For the period from April through June, Miles City and Glendive have had their wettest of record. Miles City has received 14.0 inches, with the old record 13.10 inches set in 1993. Glendive recorded 14.20 inches, with an old record of 12.8 inches in 1896. For May and June combined, Miles City and Glendive have also recorded their wettest of record. At Miles City, 12.0 inches fell, with the old record 11.30 inches in 1944. At Glendive, 11.30 inches of rain fell, with the old record 11.20 inches in 1896.

Deep snow cover at some higher locations has also established a new record for late opening of the Going-to-the-Sun Road in Glacier Park. This year there were still several miles yet to plow before the road could be opened. Since the road first opened in 1933, because of snow conditions, this will be the latest opening yet. In 1933, the grand opening of the road was on July 15. In 1943, the road opened on July 10 due to reduced staffing due to World War II.

With the large amounts of rainfall in the past two months, and the addition of snowmelt, flooding occurred at many locations across the state. Several lakes reached new record high levels as the rain and snowmelt rushed into the drainages. The following table lists the highest levels reached in June, along with some information as to when the last peak was reached. The table also lists the old record high or highest level of record. With so many years of low water flows in memory, the most recent lowest elevation is also listed.

| Lake | Highest elevation in June | | Old High | Most Recent low | Records began |
|--------------|---------------------------|------------------------------------|--------------------------|------------------------|---------------|
| Canyon Ferry | 3799.25-ft | Highest since June 1998 | 3800-ft | 3776.27-ft in Apr 2006 | 1953 |
| Clark Canyon | 5554.17-ft | Highest since July and August 1984 | 5561-ft | 5490.01-ft in 2003 | 1964 |
| Fort Peck | 2251.4-ft | Highest since July 1975 | 2251.6-ft | 2197-ft in Feb 2007 | 1940 |
| Fresno | 2577.91-ft | Old high in Mar 1994 and Mar 1978 | 2577.38-ft 2577.25-ft | 2536.04-ft in Apr 2002 | 1947 |
| Tiber Res | 3008.70-ft | Highest since Jul 1965 | 3005.59-ft | 2973.92-ft in Apr 2008 | 1956 |

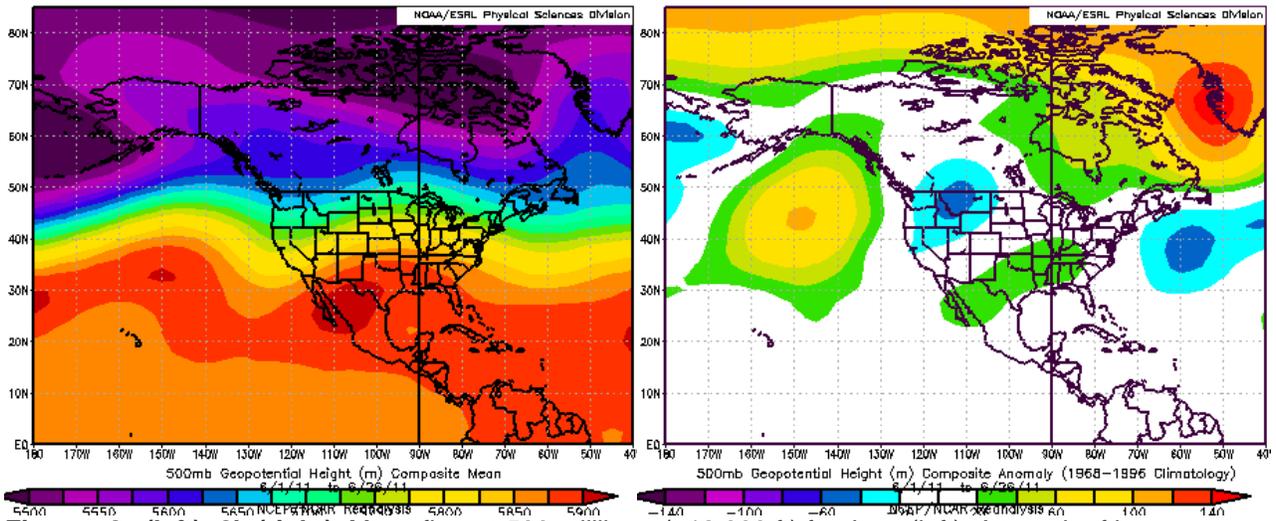
**Historical Rank of Precipitation (inches)
for the Current Month and Water Year to Date**

| Location | Jun | % of Norm | Rank | Pcntl | Oct 1 – Jun 30 | % of norm | Rank | Pcntl | Years |
|-------------|------|-----------|------|-------|----------------|-----------|------|-------|-------|
| Baker | 2.32 | 91% | | | 13.84 | 171% | | | 13 |
| Billings | 1.46 | 77% | 45 | 43 | 17.93 | 159% | 101 | 99 | 102 |
| Belgrade | 3.21 | 133% | 58 | 77 | 10.39 | 95% | 35 | 47 | 74 |
| Butte | 3.93 | 190% | 103 | 87 | 10.53 | 119% | 75 | 64 | 117 |
| Cut Bank | 2.40 | 97% | 51 | 49 | 7.80 | 97% | 61 | 59 | 103 |
| Dillon | 2.38 | 134% | 53 | 73 | 8.27 | 123% | 53 | 74 | 71 |
| Glasgow | 5.20 | 236% | 108 | 95 | 17.75 | 246% | 111 | 100 | 111 |
| Great Falls | 2.58 | 115% | 58 | 48 | 15.94 | 151% | 113 | 95 | 119 |
| Havre | 2.95 | 155% | 84 | 63 | 12.05 | 156% | 124 | 95 | 131 |
| Helena | 4.05 | 223% | 120 | 90 | 11.74 | 154% | 115 | 86 | 133 |
| Jordan | 1.84 | 72% | | | 14.17 | 189% | | | 13 |
| Kalispell | 3.16 | 137% | 91 | 77 | 16.80 | 126% | 113 | 97 | 117 |
| Lewistown | 4.22 | 144% | 81 | 70 | 19.89 | 159% | 113 | 98 | 115 |
| Livingston | 3.32 | 148% | 93 | 85 | 12.19 | 106% | 74 | 70 | 106 |
| Miles City | 3.13 | 129% | 92 | 68 | 16.07 | 169% | 131 | 98 | 134 |
| Missoula | 2.82 | 163% | 103 | 77 | 13.61 | 130% | 109 | 84 | 129 |
| Mullan Pass | 2.84 | 104% | 48 | 65 | 52.02 | 171% | 69 | 99 | 70 |
| Wolf Point | 6.03 | 221% | | | 14.19 | 193% | | | 13 |
| Glendive | 3.25 | 126% | 61 | 52 | 18.70 | 203% | 107 | 99 | 108 |
| Sidney | 1.43 | 51% | 11 | 14 | 16.34 | 175% | 70 | 100 | 70 |
| BZN-MSU | 3.44 | 121% | 91 | 68 | 17.40 | 119% | 115 | 88 | 131 |

Rankings and Percentiles are 1=driest, higher numbers=wetter.

For an automated version of this chart, updated daily, go to

<http://www.wrh.noaa.gov/tfx/dx.php?wfo=tfx&type=&loc=products&fx=PCPNTOTALS>



Figures 2a (left); 2b (right). Mean flow at 500 millibars (~18,000 ft) for June (left). A trough of low-pressure was along the North American west coast, with a ridge of high pressure over the western Great Lakes (left). This created lower than usual heights across Montana (right). Climatologically, a weak trough dominates more along the west coast, with a weak ridge over eastern Montana.

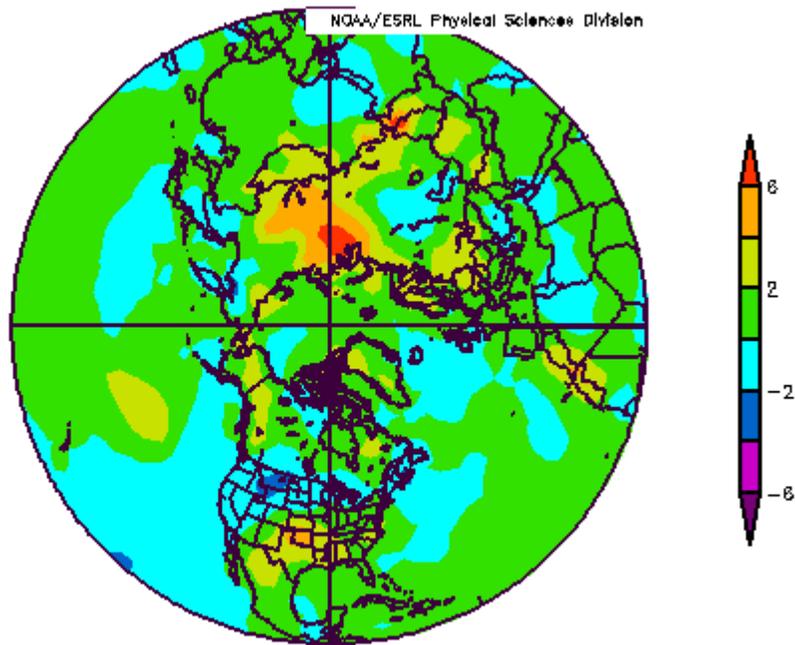


Figure 3. Surface Air Temperature (C) Composite Anomaly (1968–1996 Climatology). Note the negative departure from normal across Montana.

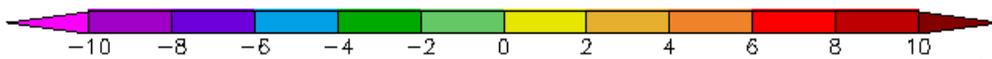
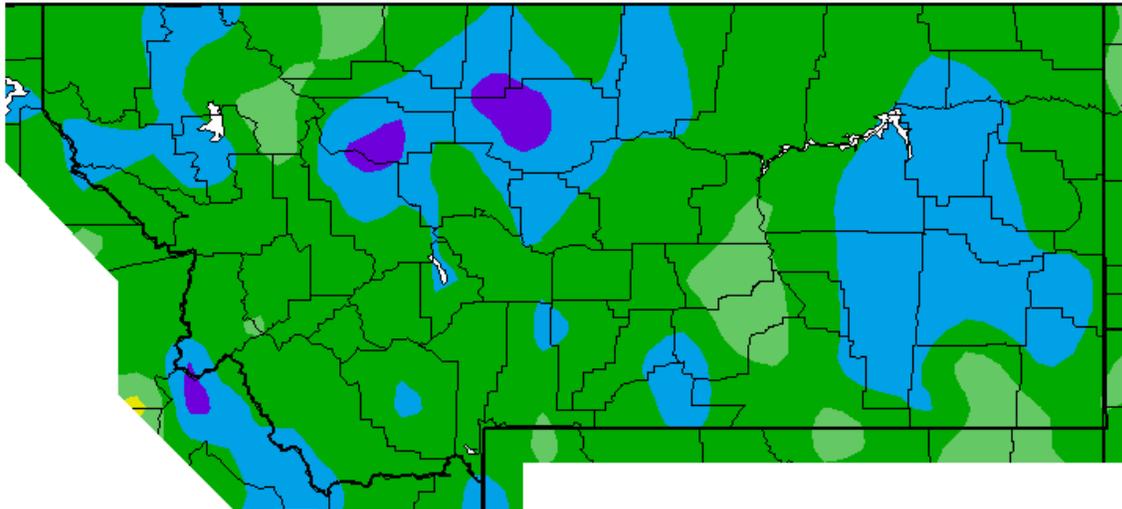
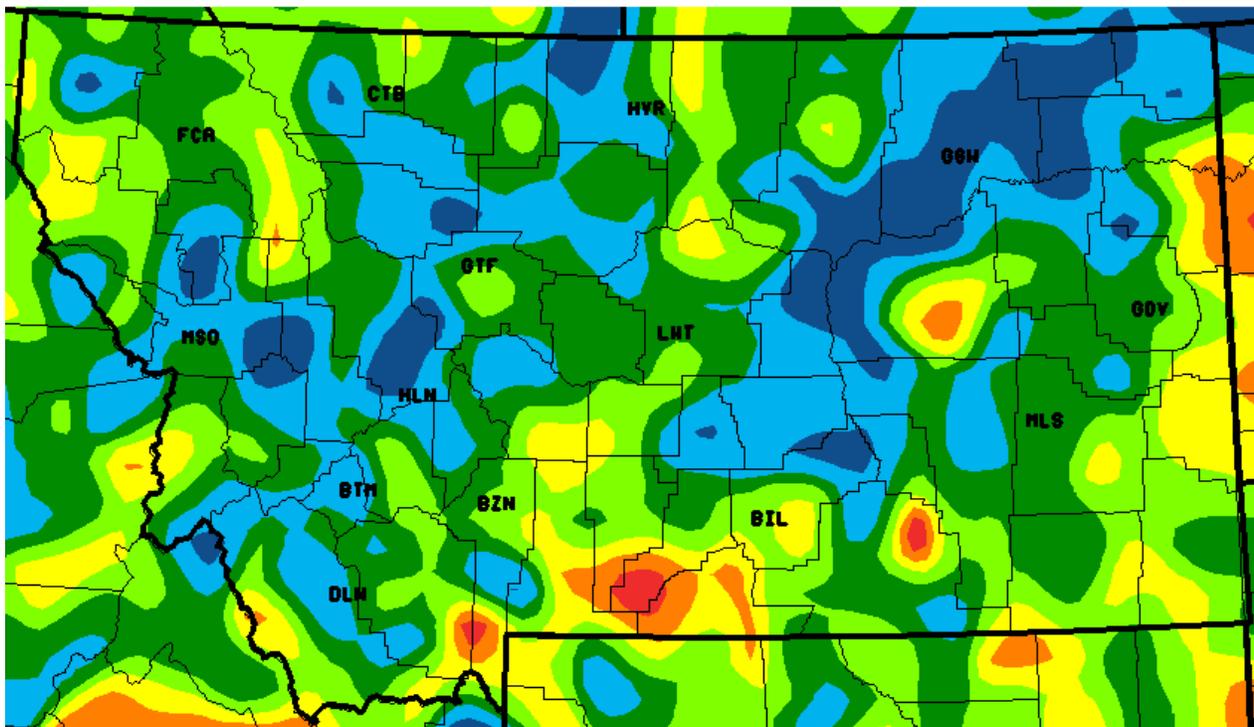


Figure 4. Temperature anomaly for June. Temperatures were below normal across the state (Western Region Climate Center).



June 2011 Percent of Normal Precipitation
Period of Normal: 1971-2000



Figure 5. Precipitation anomaly (% of normal) for June.

For a state map of % of normal water year precipitation (updated around the 7th of each month), go to:
http://www.wrh.noaa.gov/tfx/image.php?wfo=txf&type=data&loc=hydro&fx=watyr_pcntnorm.png

For the latest information on mountain snow pack from the NRCS, go to:
<http://www.mt.nrcs.usda.gov/snow/index.html>

For the latest U.S. Drought Monitor, issued weekly by the Climate Prediction Center (CPC), go to:
<http://www.drought.unl.edu/dm/monitor.html>

These data are preliminary and have not undergone final QC by NCDC. Therefore, these data are subject to revision. Final and certified climate data can be access at the National Climatic Data Center (NCDC) <http://www.ncdc.noaa.gov>. Many more links are on the Drought Information Page of the NWS Great Falls web site at <http://www.wrh.noaa.gov/tfx/main/drought.php?wfo=tx>. The climatological record for normals is 1971-2000. The ranking period for temperature, precipitation and snowfall is since 1880. The ranking period for wind speeds is since 1936. The ranking period for soil moisture is since 1995.