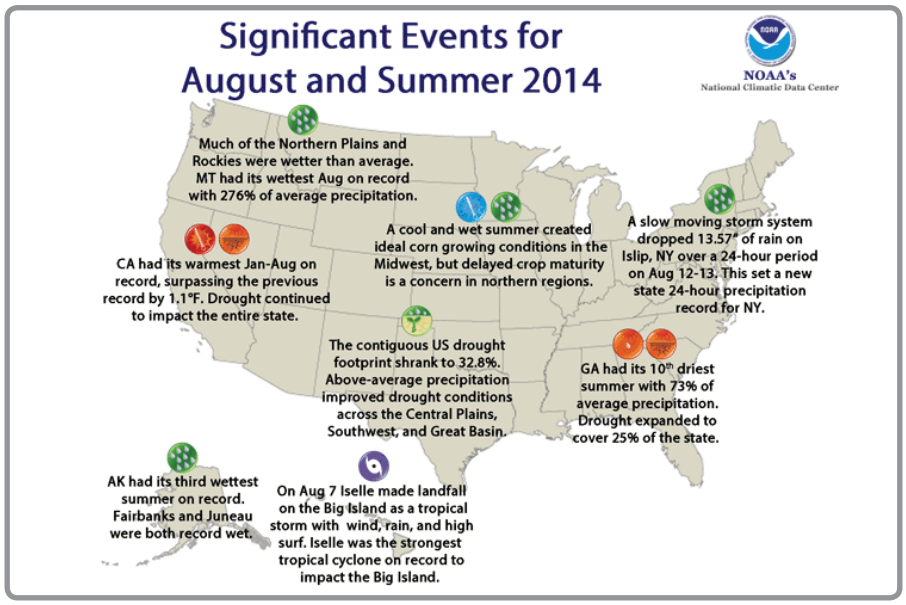
Quarterly Climate Impacts and Outlook

Missouri River Basin

September 2014

National - *Significant Events for June - August 2014*



The average US temperature during August was 72.2°F, 0.1°F above average. The summer US temperature was 71.7°F, 0.3°F above average. August US precipitation was 3.10 inches, 0.48 inch above average. The summer precipitation total was 9.39 inches, 1.07 inches above average and the ninth wettest summer on record.

Highlights for the Basin

Overall it was a cool, wet summer for the Missouri River Basin. Many states ranked in the top 10 wettest summers on record including Iowa (4), South Dakota (7), Nebraska (8), and North Dakota (9). Both June and August were wet, while July was dry. The extremes in precipitation are illustrated well in South Dakota's rankings which went from 4th wettest in June, 6th driest in July, and 2nd wettest in August.

Canton, South Dakota, located just south of Sioux Falls on the Big Sioux River, set a new state-wide record for the highest precipitation in any one month with a June total of 19.75 inches.

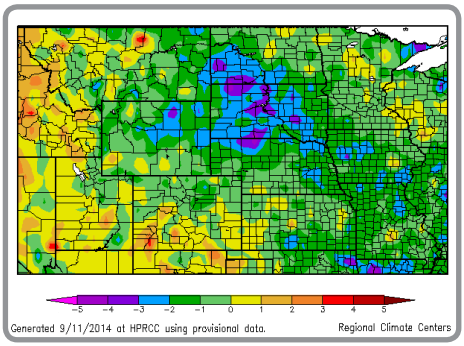
The Big Sioux River set a new peak of record streamflow of 108,000 cfs on June 18th following record-breaking rainfall from thunderstorms the previous week and a dam break in Minnesota. Measurements on the Big Sioux began in 1929.

Montana had its wettest August on record after receiving extreme precipitation at the end of the month. In just a few short days some locations received half of their average annual rainfall. This resulted in flooding along the Milk and Musselshell Rivers.

Regional - *Climate Overview for June - August 2014*

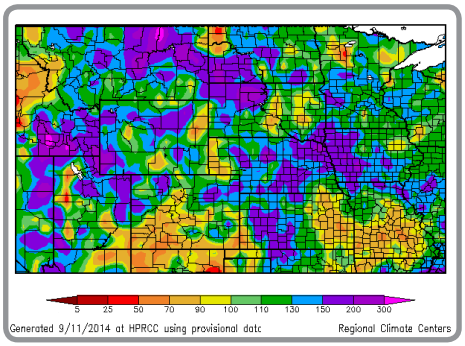
Temperature and Precipitation Anomalies

Departure from Normal Temperature (°F)
June 1 - August 31, 2014



Overall, it was a cool summer across the Missouri River Basin states. June and August temperatures were within a couple degrees of normal, with the cool areas confined to the north, while July temperatures were below normal across most of the Basin, especially in Iowa and Missouri. Ultimately, the largest departures for the entire summer were located in South Dakota, southwestern North Dakota, northern Nebraska, and north-central Wyoming where temperature departures of 2°F-5°F below normal occurred.

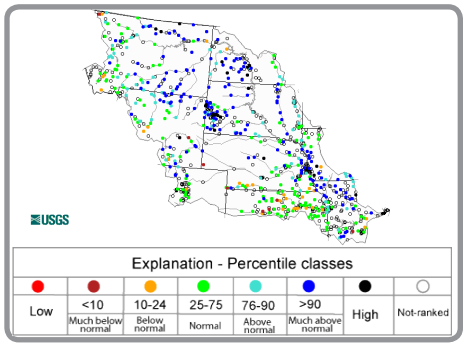
Percent of Normal Precipitation (%)
June 1 - August 31, 2014



Precipitation went from one extreme to the other this summer as June was fairly wet, July was dry, and August was wet again. Even with the dry conditions in July, summer precipitation was above normal overall, with large areas of eastern Montana into the western Dakotas, central and eastern Nebraska into western Iowa, and western Kansas receiving over 150% of normal precipitation. Only areas of southern Colorado, eastern Kansas, central South Dakota, the Nebraska panhandle, and southern Missouri were dry.

Streamflow

Missouri Basin Streamflow
09/18/2014



Streamflow measurements at mid-September showed that most of the Basin was experiencing much above normal to high streamflows. The high streamflows in Montana, North Dakota, Nebraska, and Iowa were due to above normal precipitation, however high flows in the Black Hills have been present since the October 2013 blizzard. Lower flows were present in Nebraska along the Republican River and in Kansas along the Kansas River where drought impacts have lingered.

Contact: Natalie Umphlett (numphlett2@unl.edu)

Regional - *Impacts for June - August 2014*

Long-term Impacts of Drought

The nation's cattle industry is still being impacted by the ongoing drought in the central and southern Plains. The drought has shifted much of the country's cattle herd to the north, to places like Nebraska and Iowa. Earlier this year, Nebraska even surpassed Texas as the top cattle feeding state, according to the USDA National Agricultural Statistics Service.

Cool, Wet Summer Benefits

There were many benefits from this cool, wet summer. Although development was behind, the nation's corn and soybean crops are in such good condition that record yields are expected for both crops. Other crops benefitted from the cooler weather, especially small grains and cool season pasturelands. Additionally, the Basin enjoyed a slow fire season and lower cooling bills.

Above: (Left) Volunteers laying sandbags along the Big Sioux River in June in Akron, Iowa, courtesy Tim Hynds, Sioux City Journal, (Center) Pasturelands near Lusk, Wyoming, courtesy Pam Freeman, (Right) Flooding in central Montana in August, courtesy Scott Irvin, Montana DNRC, Lewistown Regional Water Resources Office.

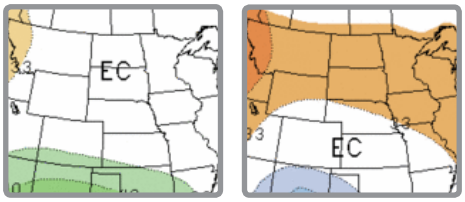
Heavy Precipitation Impacts the Missouri River and its Tributaries

Record-setting precipitation impacted parts of the Basin in June, which led to flooding along the Big Sioux River, and in August with flooding along the Milk and Musselshell Rivers. Typically, streamflows are low in the fall, however high mid-September streamflows reflected the heavy precipitation that occurred over the summer. The US Army Corps of Engineers has increased releases on the Missouri River in order to evacuate flood control storage and lessen future flood risk. Consequently, this will extend the navigation season by 10 days. The heavy precipitation also impacted agriculture. In August, approximately 90% of Montana's wheat crop had not been harvested at the time of the heavy rains and producers were concerned about the crop's quality. In South Dakota, wheat harvest was behind due to high moisture levels in the crop.

Regional - *Outlook for October - December 2014*

3-Month Precipitation and Temperature Outlooks

Valid for October - December 2014



Precipitation Temperature

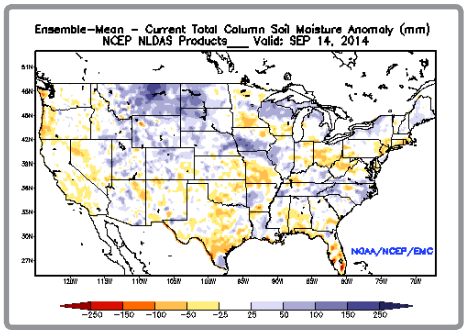
EC: Equal chances of above, near or below normal
A: Above normal, **B:** Below normal

ENSO (El Niño/Southern Oscillation) neutral conditions continued this summer. The 3-month outlooks indicate increased chances for above normal temperatures across northern and eastern portions of the Basin. The precipitation outlook shows equal chances for above, below, or near normal precipitation.

While El Niño conditions are likely to develop later this year, the impacts of this potential development are unclear at this time. Because of a cool summer and late planting there is a higher risk of frost/freeze damage in the northern part of the Corn Belt. At the time of this writing patchy freezes have occurred with some regional impacts. Overall, the impact has not been serious.

Soil Moisture Conditions

09/14/2014



A combination of factors has led to increased soil moisture conditions throughout the Basin, especially in northern areas. Heavy precipitation and reduced crop water usage due to cooler weather played a role in the current conditions. There is still time for soil moisture levels to change before the soils freeze, however these conditions should be monitored as soil moisture at the end of fall is unlikely to change over the winter. This will help give indications whether soil moisture will impact the spring flood season or the start of the next growing season. This map shows the total column soil moisture anomaly in millimeters, from a NOAA model called NLDAS.

MO River Basin Partners

High Plains Regional Climate Center
www.hprcc.unl.edu
Kansas State, Department of Agronomy
www.agronomy.k-state.edu
National Oceanic and Atmospheric Administration
www.noaa.gov
- **National Weather Service - Central Region**
  www.crh.noaa.gov/crh
- **National Climatic Data Center**
  www.ncdc.noaa.gov
- **Missouri River Basin Forecast Center**
  www.crh.noaa.gov/mbrfc
- **Climate Prediction Center**
  www.cpc.ncep.noaa.gov
- **National Operational Hydrologic Remote Sensing Center**
  www.nohrsc.noaa.gov

National Drought Mitigation Center
www.drought.unl.edu
National Integrated Drought Information System (NIDIS)
www.drought.gov
State Climatologists
www.stateclimate.org
South Dakota State University Extension
http://igrow.org
U.S. Army Corps of Engineers - Missouri River Basin Water Management Division
www.usace.army.mil
U.S. Department of Agriculture
www.usda.gov
- **NRCS National Water & Climate Center**
  www.wcc.nrcs.usda.gov
- **Regional Climate Hubs**
  www.usda.gov/oce/climate_change/regional_hubs.htm

U.S. Geological Survey, Water Mission Area
www.usgs.gov/water
Western Governors' Association
www.westgov.org

Contact: Natalie Umphlett (numphlett2@unl.edu)