

National - Significant Events for September - November 2016

Highlights for the Basin

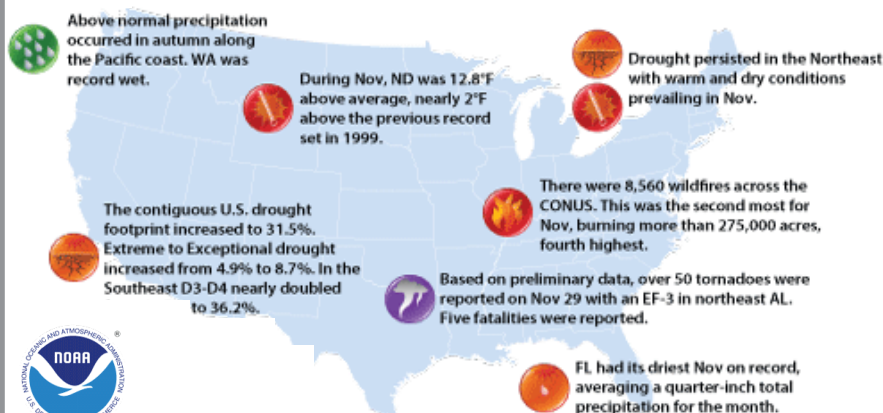
It was one of the warmest falls on record for the Missouri River Basin with each state in the region ranking in the top 5 warmest falls, including Colorado and Kansas (warmest); Missouri, Nebraska, North Dakota, South Dakota, and Wyoming (2nd); and Montana (4th).

Many interesting temperature records were set this fall. Dodge City, KS had its latest 100°F+ day on record with a high temperature of 101°F on October 17th. This was also the highest October temperature on record for that location. Meanwhile, Boulder, Colorado Springs, and Denver all set/tied their highest November temperature on record on the 16th. On that day, Lincoln, NE also had its latest 80°F day on record.

Three tornadoes were confirmed on November 27th in south-central Nebraska, which was the first time that more than one tornado occurred in the month of November in the state.

Some locations had their latest first freeze on record. For example, temperatures finally hit freezing on November 12th in Manhattan, KS. This freeze was nearly a month later than average, and the latest on record.

U.S. Selected Significant Climate Anomalies and Events November and Autumn 2016



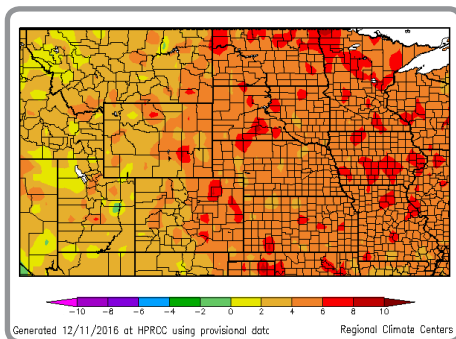
The average U.S. temperature during November was 48.0°F, 6.3°F above average and the second warmest on record. The autumn U.S. temperature was 57.6°F, 4.1°F above average and the warmest on record. The November precipitation total was 1.73 inches, 0.50 inch below the average. The autumn precipitation total was 6.88 inches, which is average for the period.

Please Note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <http://www.ncdc.noaa.gov/sotc>

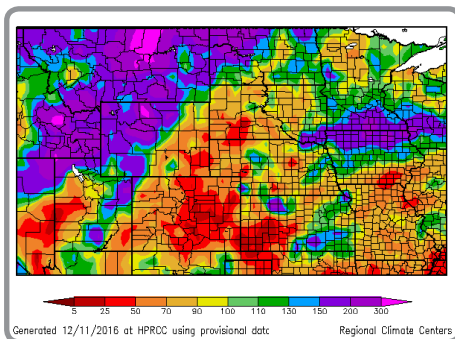
Regional - Climate Overview for September - November 2016

Temperature and Precipitation Anomalies

Departure from Normal Temperature (°F)
September 1 - November 30, 2016

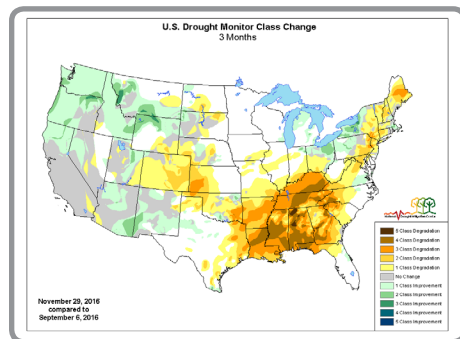


Percent of Normal Precipitation (%)
September 1 - November 30, 2016



Drought Conditions

U.S. Drought Monitor Class Change
3 Months



This fall was unusually warm across the Missouri River Basin with most locations ending the season in the 4-6°F above-normal range. Temperatures each month of the season were above normal, with high minimum temperatures driving much of the warmth. In terms of departures, November was the most extreme with temperatures ranging from 4°F above normal in the south to 16°F above normal in the north. Interestingly, this fall was the warmest on record for the U.S., beating out the record that was set only last year.

Fall precipitation across the region was characterized by extremes in both wetness and dryness. A large area encompassing Montana, northwestern Wyoming, and western North Dakota received at least 150% of normal precipitation, while portions of eastern Colorado, western Kansas, southeastern Wyoming, and southwestern South Dakota received less than 50% of normal precipitation. Snowpack accumulations in the Rockies were off to a slow start, but conditions could change significantly as the snow season progresses.

Extreme warmth coupled with low precipitation drove drought development across portions of the Basin this fall. Rapid development of drought is atypical during this season across the Plains; however, abnormally warm weather caused soils to dry more than usual. Meanwhile, heavy rains early in the season helped improve drought conditions across portions of Montana, northern Wyoming, and western South Dakota. Current drought conditions in the region are largely expected to persist through the winter.

Regional - Impacts for September - November 2016

Large Fires Impact Region

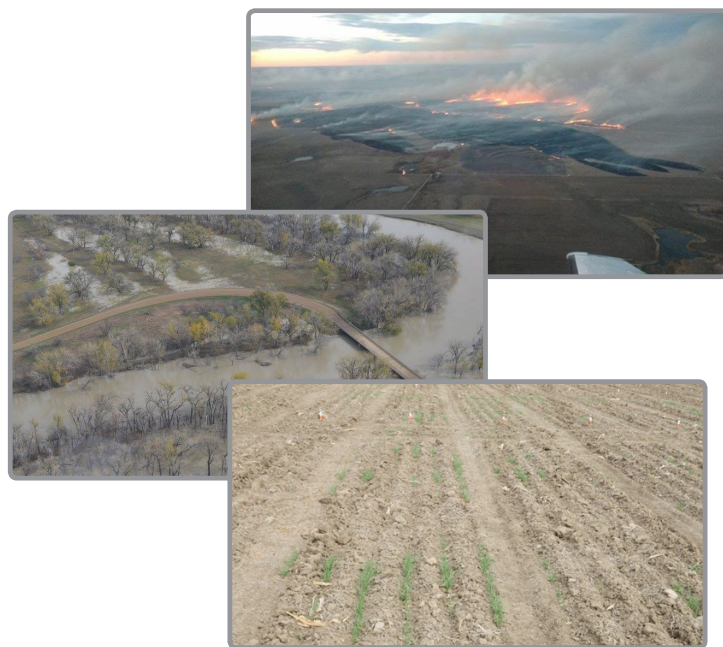
Although fires during the fall season are not uncommon, there were noteworthy fires that impacted the region this fall. The Cottonwood Fire in western South Dakota burned 41,360 acres in what was the largest October wildfire in the state's history. The fire burned private, state, and national grassland property, and also destroyed hay and cattle. It is worth noting that this was the 5th largest wildfire on record for the state.

Heavy Rains Bring Flooding to Montana

Heavy rains in early October caused flooding in northern Montana along the Milk River, a tributary of the Missouri River. Although impacts were generally limited to road closures and flooded fields, the timing was unusual. According to the National Weather Service in Glasgow, MT, similar flooding events in the area had not occurred in the fall for at least 30 years. Ultimately, this October was the wettest on record for the state of Montana and numerous individual locations received over 400% of normal precipitation. By the end of the fall, many individual locations already ranked in the top 10 wettest years on record.

Isolated Impacts to Agriculture

Overall, it was an outstanding year for row crops in the U.S., with record yields projected for corn, soybeans, and sugar beets in many of the states in the region. Early in the season, high dew points led to foggy mornings that slowed soybean harvest, but warm and dry conditions later on helped with harvest activities. These conditions were not welcome by dryland winter wheat producers as the crop has struggled in some areas.

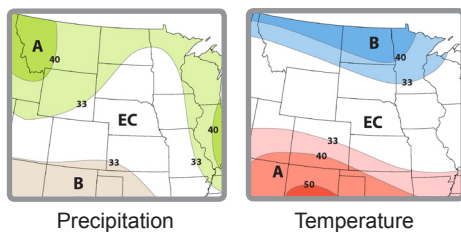


Above: (Top) Cottonwood Fire on October 17th, photo courtesy South Dakota Division of Wildland Fire; (Middle) aerial view of flooding along Milk River in northern Montana, photo courtesy Steve Stanley; and (Bottom) poorly emerged winter wheat at K-State research plots in November, photo courtesy A.J. Foster, K-State Research and Extension, Extension Agronomy eUpdate.

Regional - Outlook for January - March 2017

3-Month Precipitation and Temperature Outlooks

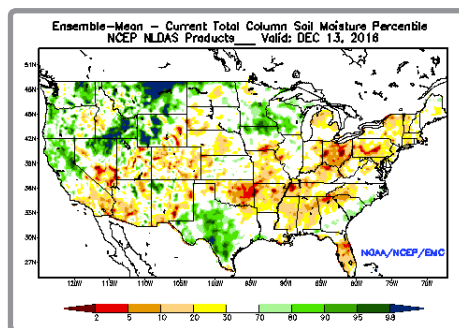
Valid for January - March 2017



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

Soil Moisture Conditions

12/13/2016



According to the Climate Prediction Center, La Niña conditions are present and a transition to ENSO-neutral conditions is expected over the next few months.

Through March, above-normal precipitation is favored for areas of the northern Rockies, Wyoming, and portions of the Dakotas. Meanwhile, increased chances for below-normal precipitation exist for southern areas of Colorado and Kansas. For temperatures, below-normal conditions are favored to the north, while above-normal conditions could occur across portions of Colorado and Kansas. For more information on La Niña in the Basin, see: <http://www.hprcc.unl.edu/pdf/LaNina-MOBasin-2016-Final.pdf>

Modeled soil moisture conditions at the start of the winter indicated wet soils across central Montana, western Wyoming, and northern portions of North Dakota. Drier soils were evident for several other areas of the Basin, including large areas of Colorado and Missouri. Soil moisture at this time of the year can be indicative of conditions at the start of the spring - given that the soils have already frozen. The northern tier of the region should be monitored for potential flooding in the spring with the combination of wet soils and an outlook for above-normal precipitation this winter. This map shows the percent of average soil moisture conditions from a NOAA model called NLDAS.

MO River Basin Partners

High Plains Regional Climate Center
www.hprcc.unl.edu

National Drought Mitigation Center
www.drought.unl.edu

National Integrated Drought Information System
www.drought.gov

National Oceanic and Atmospheric Administration
National Weather Service - Central Region
www.crh.noaa.gov/crh
National Centers for Environmental Information
www.ncdc.noaa.gov
Missouri River Basin Forecast Center
www.crh.noaa.gov/mbrfc
Climate Prediction Center
www.cpc.ncep.noaa.gov

North Central Climate Science Center
<http://nccsc.colostate.edu>

South Dakota State University Extension
<http://igrow.org>

American Association of State Climatologists
www.stateclimate.org

U.S. Army Corps of Engineers - Missouri River Basin
Water Management Division
www.usace.army.mil

U.S. Department of Agriculture
Regional Climate Hubs
www.usda.gov/oce/climate_change/regional_hubs.htm

U.S. Bureau of Reclamation
www.usbr.gov

U.S. Geological Survey, Water Mission Area
www.usgs.gov/water

Western Governors' Association
www.westgov.org