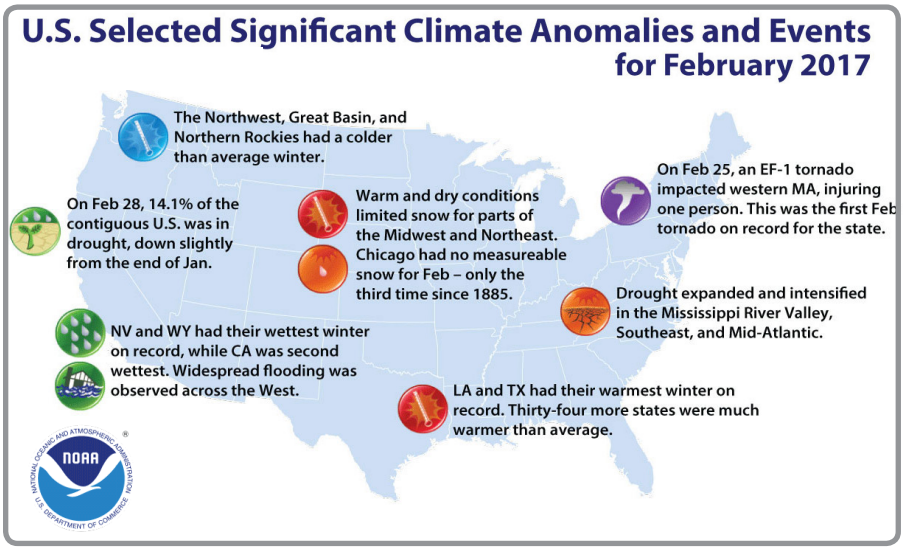
Quarterly Climate Impacts and Outlook

Missouri River Basin

March 2017

National - *Significant Events for December 2016 - February 2017*



The average U.S. temperature during February was 41.2°F, 7.3°F above average, and the second warmest on record. The winter U.S. temperature was 35.9°F, 3.7°F above average, and the sixth highest on record. February U.S. precipitation was 2.21 inches, 0.08 inch above average. The winter precipitation total was 8.22 inches, 1.43 inches above average, and the eighth wettest on record.

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

Highlights for the Basin

It was the sixth warmest winter for the U.S., with the majority of the extreme warmth to the south and east of the Basin. The exception was Missouri, which had its 4th warmest winter on record.

It was also the eighth wettest winter for the U.S. The Basin had extremes on both ends of the spectrum, with Wyoming (wettest), Colorado (5th wettest), and North Dakota (6th wettest) ranking among the wettest winters on record and Missouri ranking 10th driest.

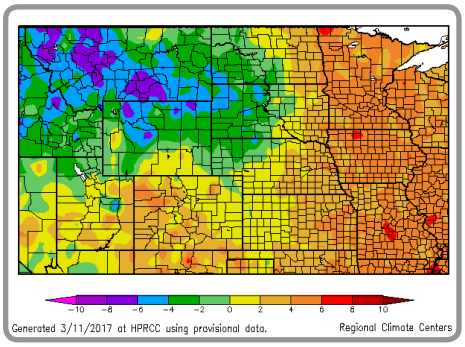
Numerous locations set new temperature records in February - even beating out those set in recent years. A new February record of 87°F in Goodland, KS crushed its old record by 5°F, set just last year. Meanwhile, Denver, CO had its earliest 80°F+ day on record with a high temperature of 80°F on February 10th. This beat the previous record, March 16, 2015, by over a month.

While upper portions of the Basin received heavy snowfall this winter, lower portions experienced a "snow drought." Season-to-date snowfall for Bismarck, ND ranked as the 4th highest on record (62.9 inches), while Lincoln, NE ranked as 2nd lowest (6.9 inches).

Regional - *Climate Overview for December 2016 - February 2017*

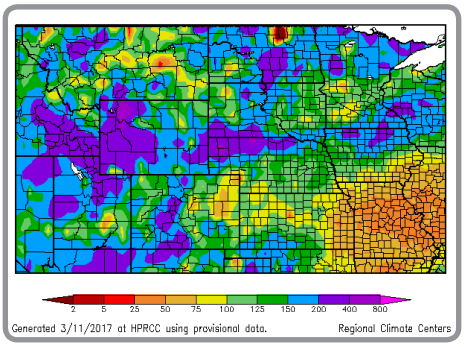
Temperature and Precipitation Anomalies

Departure from Normal Temperature (°F)
December 1, 2016 - February 28, 2017



There was a large contrast in temperatures across the Basin this winter, with departures ranging from 8°F below normal to 8°F above normal. Generally, areas to the north and west were below normal, while areas to the south and east were above normal. This general pattern held during December and January, but much above-normal temperatures were widespread during February. By the end of winter, records were nearly set on both ends of the spectrum, as several locations ranked in either the top 10 warmest or coolest winters on record.

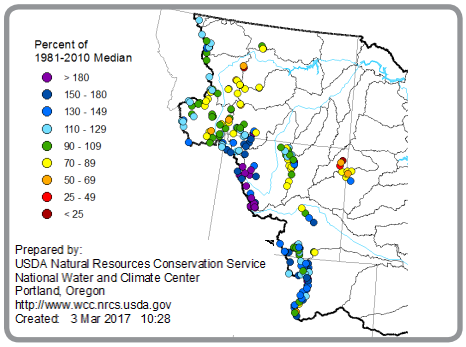
Percent of Normal Precipitation (%)
December 1, 2016 - February 28, 2017



Overall, precipitation was above to much above normal for the majority of the Basin. Most of Wyoming, central Colorado, northern Nebraska/southern South Dakota, and portions of Montana and North Dakota received at least 200 percent of normal precipitation. On the other hand, areas of eastern Colorado and eastern Kansas, along with the majority of Missouri were below normal. This resulted in improvements in drought conditions in wetter areas and the persistence or development of drought conditions in drier areas.

Mountain Snowpack

Missouri Basin Mountain Snowpack
03/01/2017



Rocky Mountain snowpack was off to a slow start this season, but then quickly rebounded. In some areas, snowfall was so heavy at times that ski resorts were forced to shut down. By mid-March, mountain snowpack was above average for the reach above Fort Peck Dam (104%) and for the reach between Fort Peck and Garrison Dams (137%). The U.S. Army Corps of Engineers and the Bureau of Reclamation are releasing water to make room for an above-normal runoff year due to the high snowpack. Plains snowpack has largely melted due to extreme warmth.

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Regional - *Impacts for December 2016 - February 2017*

Christmas Day Storm

A large, potent storm system impacted the region on Christmas Day, with freezing rain, heavy snowfall, and blizzard conditions in the north and severe thunderstorms to the south. The storm severely impacted travel, caused power outages to thousands, and damaged homes and buildings. In places like Minot, North Dakota, over a foot of snow fell with heavy drifting. According to the *Minot Daily News*, the local police issued a rare "no travel" advisory. To the south, a rare December tornado outbreak occurred in Kansas and Nebraska.

Heavy Fuels Increase Fire Risk

A largely snowless winter combined with ample vegetation growth from last year's rains has led to an increased fire risk this spring. Typically, winter snows knock vegetation to the ground, where it becomes packed and can hold moisture. Standing vegetation, however, dries and burns much more quickly, which increases the risk of fire. As of this writing, several fires have already burned hundreds of thousands of acres across portions of Colorado, Kansas, Nebraska, and South Dakota. People, structures, and thousands of cattle have all fallen victim to the fires.

Early Warmth Causes Concerns

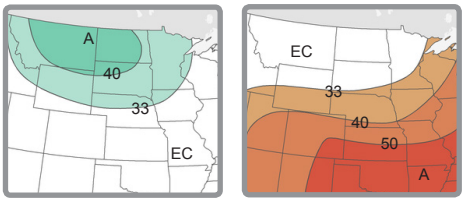
The extreme warmth of February had many impacts including ice jam flooding, early calving, and muddy fields. Pests, such as the alfalfa weevil, were already spotted in some areas as well. Additionally, an early green-up of winter wheat puts the crop at a higher risk for freeze damage. In some areas of early green-up, last spring freezes typically occur in late April and early May. Depending on conditions this spring, the impacts of this early warmth could continue to be realized.

Above: (Top) Heavy snows in Colorado and Wyoming have impacted wildlife, forcing them to roads in search of food, photo courtesy Wyoming Game & Fish Department; (Middle) over 1,000 acres burned in this early spring fire on the Pine Ridge Reservation, photo courtesy David Martin, BIA; and (Bottom) early budding magnolia tree in Kansas, photo courtesy Mary Knapp, K-State Weather Data Library.

Regional - *Outlook for April - June 2017*

3-Month Precipitation and Temperature Outlooks

Valid for April - June 2017



Precipitation Temperature

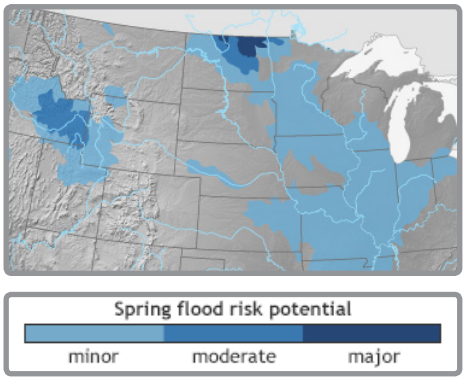
EC: Equal chances of above, near or below normal
A: Above normal, **B:** Below normal

According to the Climate Prediction Center, La Niña conditions ended in February and ENSO-neutral conditions are currently present. These conditions are favored through the late spring or early summer, with an increasing potential for the development of El Niño conditions into the fall.

Over the next three months, above-normal temperatures are favored for much of the Basin including Colorado, Kansas, Missouri, Nebraska, the southern half of Wyoming, and portions of southern South Dakota. Meanwhile, above-normal precipitation is favored for much of the northern tier of the Basin including Montana, the Dakotas, much of Wyoming, and northern Nebraska.

NOAA Spring Flood Outlook

03/16/2017



According to NOAA, an above-normal to much above-normal flood risk exists for northern areas of North Dakota, including the Souris River, Devils Lake, and northern portions of the Red River of the North. Moderate to major flooding is possible for areas of the Souris and Red Rivers, while record runoff for the Devils Lake Basin increases the chances for significant flooding there.

Although concerns were mounting over the potential for significant flooding throughout the Red River Valley, the February warmth melted much of the snowpack and lowered the overall risk.

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

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