2019 SPRING UPDATE

Welcome to the April 2019 Montana Drought & Climate newsletter. We hope that Montana farmers and ranchers find the information here useful. Please send us your feedback!

The online version of this newsletter has maps that allow you to zoom in on your local area. Check it out at climate.umt.edu/mtdrought/latest/.

Here's what you'll find in this newsletter:

Early Spring 2019 Update — Understanding current and past conditions aids in predicting future conditions. This section provides an overview of how this spring is progressing.

Late Spring 2019 Forecast — The seasonal forecast discusses predictions for temperature, precipitation, and drought, as well as the global air circulation patterns that impact growing conditions and water availability in Montana.

Reference — A helpful glossary of terms found in this newsletter.

On the cover: Glasgow, MT, March 30, 2019. Rapid snowmelt and spring storms are causing flooding of the Milk River in eastern Montana. PHOTO: © SEAN R. HEAVEY

In Brief

- Historically cold temperatures during February and early March have warmed as we moved into spring.

- Statewide snowpack was near normal at the end of February, but has decreased in northwestern Montana while increasing in the south-central part of the state.

- Soil moisture is high across Montana, as is typical in early spring. The timing and temperature of spring storms will in large part determine the speed and intensity of snowmelt.

- The NOAA seasonal forecast for April–June is for warmer than normal conditions in western Montana and cooler than normal conditions in eastern Montana. Conditions in southern Montana are somewhat likely to be wetter than normal during late spring and early summer.
IN A WORD…
Weather and climate forecasters use words and information in very particular ways that may be different from what we are accustomed to. Here is a list of terms we use in this newsletter:

Weather and Climate — The difference between weather and climate is timescale. Weather is the day-to-day interaction of factors like temperature, humidity, precipitation, cloudiness, visibility, and wind. To understand climate at a given place requires looking at weather trends over relatively long periods of time—months, years, and decades. In addition to studying weather, scientists examine climate trends or cycles of variability to understand the bigger picture of long-term changes.

Temperature and Precipitation — Throughout this newsletter, we report past temperature and precipitation data derived directly from the GridMET daily 4-km-gridded meteorological dataset from the University of Idaho. Temperature data are reported as seasonal averages; precipitation data are reported as seasonal total precipitation. Our three-month temperature and precipitation forecasts come from NOAA’s Climate Prediction Center.

Normal(s) — Climatologists use the term “normal” to compare current conditions or forecasts, such as temperature or precipitation, to the past. Here, the normal value is the statistical mean (the average) for a given measurement in a specific place during a specific period of time. Climatologists use the most recent 30-year period, rounded to the nearest decade, to define normal in North America: 1981–2010. The goal is to look far enough back in time to capture variation in weather patterns, but not so far as to be irrelevant to recent conditions. In 2021, we will start using the 1991–2020 period.

La Niña/El Niño — El Niño and La Niña are the warm and cool phases of a recurring climate pattern across the tropical Pacific, the El Niño Southern Oscillation (ENSO). When ENSO is between warm and cool phases, conditions are called ENSO Neutral. ENSO is one of several global climate phenomena that affect Montana’s weather patterns, and ENSO conditions often guide seasonal climate projections for Montana. Current ENSO conditions and up-to-date projections are available on NOAA’s ENSO website.

Snow Water Equivalent (SWE) — SWE is the amount of water contained within the snowpack. It can be thought of as the depth of water that would theoretically result if you melted the entire snowpack. SWE is measured across the West by the USDA Natural Resources Conservation Service’s SNOTEL network of snow monitoring stations. The SWE percent of normal represents the current snow water equivalent found at selected SNOTEL sites in the basin compared to the normal value for those sites from 1981–2010.

Root Zone Soil Wetness — Root Zone Soil Wetness is a measure of how much water has saturated the soil. More specifically, it’s the relative saturation between completely dry (indicated by a 0) and completely saturated (indicated by a 1) between 0 and 100 cm depth. In the maps in this newsletter, soil saturation comes from NASA’s Soil Moisture Active Passive (SMAP) satellite program “SPL4SMGP” data product. Soil moisture is mapped using a combination of radar and radiometer measurements from space and surface observations at an approximately 9-km spatial resolution.
Early Spring 2019 Review

Temperature

Brrrr! February and early March brought near-record lows across Montana, with some areas more than 30°F below normal temperatures. These extreme cold temperatures bring benefits beyond good ski conditions—Montana’s snowpack was able to rebound from a slow start in early winter, and the deep freezes likely killed mountain pine beetle populations that have been attacking Montana forests since the late 1990s. Cold temperatures in February made for a hard start to the calving season. Producers were forced thaw water supplies and supplement cows and calves with additional feed. Many put up wind breaks and plenty of straw to keep cows and calves as warm and dry as possible. Temperatures have warmed since mid-March, however, and are now normal or slightly warmer than normal across the state.

The graph to the right compares historical daily temperatures (shaded bands and dashed lines) to current daily temperatures so far in 2019 (solid-jagged lines) across Montana. The shaded bands represent the range of recorded temperatures during the 1981–2010 period on any given day. The red bands and lines represent the high temperatures and the blues bands and lines represent the lows. The dashed red and blue lines represent the average high and average low temperatures during the 1981–2010 period.

Precipitation

Although February brought several large winter storms to Montana, March has been drier than normal, leading to overall drier conditions during late winter. The exception is north-eastern Montana, portions of which have experienced over 300% of normal precipitation for February through Early April.
The graph to the right compares historical daily precipitation (shaded band and dashed line) to current daily precipitation so far in 2019 (vertical bars) across Montana. The shaded band represents the range of recorded precipitation during the 1981–2010 period on any given day. The dashed line represents the average precipitation during the 1981–2010 period.

**Snowpack**

Snowpack across western Montana continues to diverge along a line from roughly Lolo to Great Falls, with increasingly lower than average Snow Water Equivalent (SWE) in northwest Montana (80%–100%), and higher than average SWE for southern and central Montana (100%–120%). The timing and extent of storms in April—and whether they bring predominately snow or rain—will largely determine how long the snowpack is retained into the late spring. Continue to pay attention to spring temperatures, since they impact the timing of snowmelt and flooding.

**Soil Moisture**

As Montana thaws after a long winter, soil moisture measurements from weather stations and satellite data become more accurate. Soil moisture is factored into drought and flood forecasts as an indicator of wet or dry basin conditions. We are seeing typical soil moisture conditions for early spring across Montana. The majority of Montana currently has very saturated soil (the blue areas in the map at right). Soils in southwestern Montana are drier than the rest of the state; the extreme dry spots in northeastern Montana are noise in the data that will become more accurate as conditions warm. As we move into spring, daytime temperatures and the intensity of spring storms will greatly determine how soil moisture conditions change across the state.
El Niño Update
The El Niño Southern Oscillation (ENSO) is a natural seasonal fluctuation in the sea surface temperature of the Pacific ocean near the equator. El Niño events have a strong influence on winter weather across Montana, and less of an influence during the rest of the year. We are still experiencing a weak El Niño, but conditions through this winter have been very different (much colder!) than a typical El Niño. Historically, April–June precipitation and temperature during an El Niño year are practically identical to those of a normal or La Niña year, meaning that climate forecasting is more difficult and must depend on other data to make seasonal predictions.

These maps show what an average El Niño April–June looks like relative to normal. Keep an eye on the NOAA ENSO outlook (https://www.climate.gov/enso) for the latest ENSO conditions and predictions as we head into late spring.

Early spring during an El Niño event is on average warmer than normal across Montana, especially as you move towards northwestern Montana.

Ballantine rancher Dean Becker moves a cold calf to the barn to be with its mother in early February. PHOTO: CASEY PAGE, BILLINGS GAZETTE
The two graphs to the right show how Montana as a whole is affected by the ENSO climate patterns. The solid lines represent the average conditions in each of El Niño, La Niña, and ENSO Neutral conditions (see the Reference section for an explanation of these conditions). The dashed lines represent the range of recorded conditions during the 1981–2010 period on any given day.

For temperature, ENSO conditions only have a strong influence on Montana climate in the winter months; the solid green line (El Niño) is above the other lines during the winter, indicating warmer winter conditions on average in El Niño years.

For precipitation, however, it is very difficult to distinguish the three solid lines. El Niño conditions lead to slightly drier winters, while La Niña conditions are indistinguishable from ENSO Neutral conditions with regard to winter precipitation across Montana.

**Temperature**

NOAA's Climate Prediction Center (CPC) is projecting that temperatures will likely be warmer than normal across western Montana this spring, and potentially cooler than normal across eastern Montana. Warmer temperatures may accelerate spring snowmelt and prompt an earlier start to the growing season.

**Precipitation**

The CPC has increased its seasonal precipitation forecast across southern Montana to “somewhat likely wetter” conditions. The rest of the state continues to be in the “Equal Chances” category, meaning that precipitation may be higher, lower, or near normal depending upon particular storm tracks. The timing of these storms will matter too; precipitation in the spring may still fall as snow in the mountains, but as we move into late spring rain-dominant storms could accelerate snowmelt.
About Montana Drought & Climate and the Montana Climate Office

Montana Drought & Climate is a USDA-funded project of the Montana Climate Office (MCO) at the W.A. Franke College of Forestry & Conservation at the University of Montana, in collaboration with the Montana State University Extension Service. The MCO is an independent state-designated body that provides Montanans with high-quality, timely, relevant, and scientifically-based climate information and services. We strive to be a credible and expert source of information for decision makers that rely on the most current information on climate to make important decisions. It is also the role of the MCO to assist stakeholders in interpreting climate information or adapting climate products to their needs.

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MARK YOUR CALENDARS!
MT DROUGHT & CLIMATE NEWSLETTER TIMING

We traveled the state in summer 2018, meeting with farmers and ranchers in St. Ignatius, Chester, Harlowton, Fairfield, and Choteau. We wanted to learn more about your operations, what kind of climate information would be helpful to you, and when you would like to see it. Based on your feedback, we will provide this newsletter on March 1st, April 15th, June 1st, and October 15th.

WE WANT YOUR FEEDBACK!
Do you have questions, stories about climate impacts on your operations, or suggestions regarding how we can make this newsletter better? Please contact mtndrought@umontana.edu with questions and comments, or to be removed from our mailing list.

PHOTO:
KELSEY JENCSO