

Montana Drought Outlook Report – Summer 2024



Big Belt Mountains near White Sulphur Springs

Photo: Michael Downey



Summary of Antecedent and Recent Conditions

The 2023 water year (October 1, 2022 – September 30, 2023) closed following a summer punctuated by extremes. In October, dry conditions and above normal temperatures persisted in the northwest, but the eastern two-thirds and southwest Montana were generally cooler and wetter than average. Conditions shifted quickly in November and December to a warmer, drier trend, setting the tenor for the remainder of the winter. With much of Montana nearly snow free by the New Year, many of Montana’s high elevation Snow Telemetry (SNOTEL) Network sites set new record lows during this period. The early deficits in snowpack proved too great to overcome despite the arrival of above average precipitation in late January, February and early March. While conditions improved in the north over the winter, conditions degraded significantly in the south, which moved from drought free to severe drought in some locations.

Warmer than average temperatures in late March and April continued to deplete the snowpack at all elevations. April extended the winter’s drying trend with much below average precipitation in eastern Montana and across the island ranges that characterize the western half of the state. This trend shifted dramatically in May with the onset of cooler than average temperatures and much above average precipitation in all but the southwest corner of the state. Many locations in central and southeast Montana received upwards of 4 inches of rain and snow over a week of unsettled weather early in the month. The Bear Paw Mountains, south of Havre, received more than 10 inches of rain and snow resulting in damaging local flooding.

Following the warm and dry winter, May’s cooler temperatures and above average precipitation provided a boon for areas teetering on the edge of extreme to severe drought by late April. Unfortunately, June has been much drier than average. June is typically Montana’s wettest month. Depending upon accumulated precipitation and temperatures over the next 4 to 6 weeks, the net deficits in June could result in the onset of widespread drought. In recent years, July has trended drier than average. Given this year’s dry June, consequences of hot and dry July could be severe.

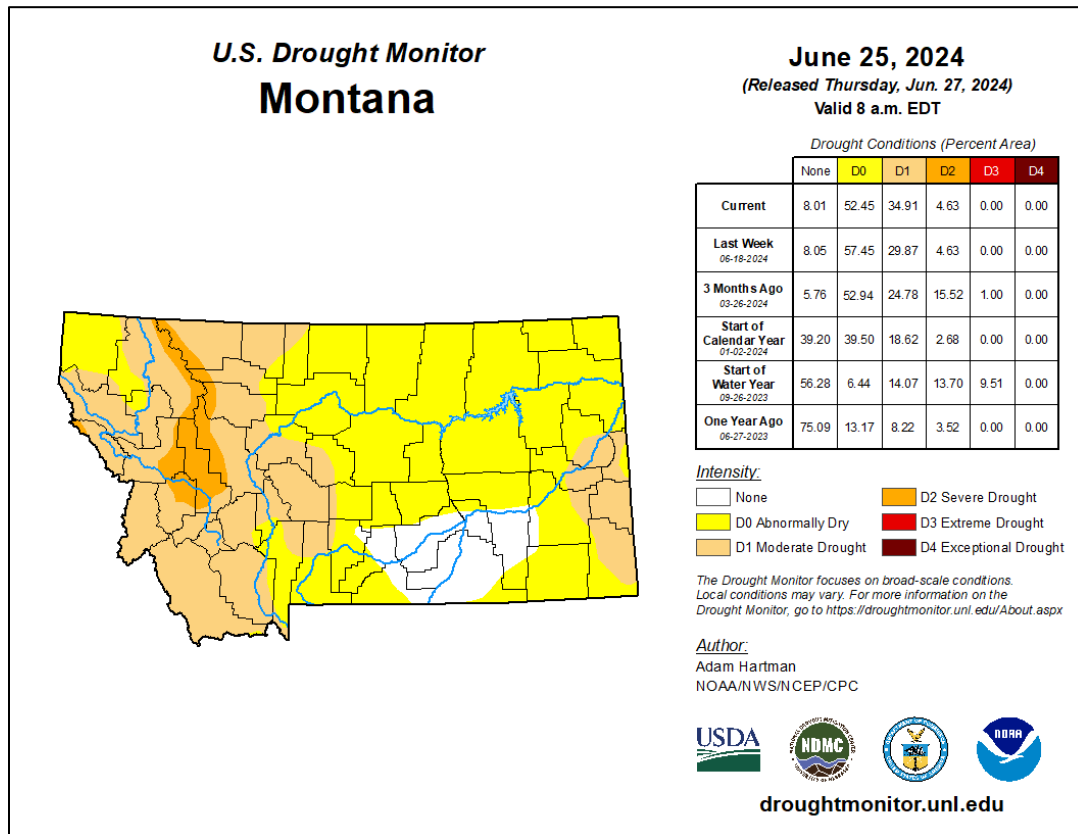


Figure 1 – Drought Categories, June 25, 2024

U.S. Drought Monitor

Seasonal Drought Forecast

Late June to early July typically mark the end of Montana’s high precipitation months with the onset of the hot and dry summer season. As is often the case, some clear winners emerged this spring and early summer as storm tracks both delivered and disappointed across Montana. Cooler temperatures in May preserved the high elevation snowpack and lowered evaporative demand. Some basins in the northwest are still holding snowpack at the end of June despite much below average snowpack accumulations this winter.

Unfortunately, the first three weeks of June have been much drier than average. Parts of south central, southwest and north central Montana have received only 25 to 50 percent of normal precipitation. With a July forecast trending hotter than average with below average precipitation, the probability for improved conditions in the next month is waning by the day. With approximately 40% of the state currently in moderate to severe drought and 52% indicating abnormally dry conditions, there is a high probability of continued development of moderate to severe or extreme drought conditions over the next month. The abundance or absence of summer rainstorms and the prevalence of daytime temperatures exceeding 90 degrees Fahrenheit will play important roles in determining the severity of drought conditions locally this summer.

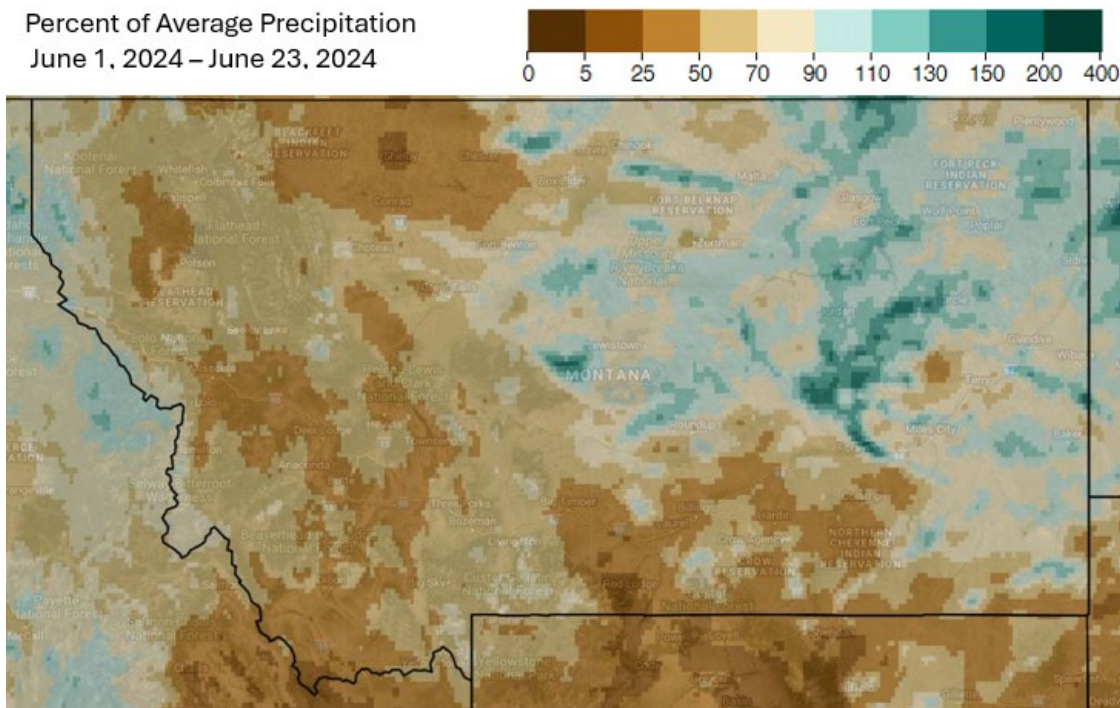


Figure 2 – Percent of Average Precipitation 6/1/24 – 6/23/24

Generated by Climate Engine

While the potential for significant summer precipitation diminishes in the coming weeks, regionally significant summer precipitation can materialize as late as mid-to late July. After that, summer precipitation is mostly limited to thunderstorms which can be locally significant. NOAA’s Climate Prediction Center [one-month weather forecast](#) indicates a 50 to 60 percent chance for above average temperatures and indicates a 40 to 60 percent chance for below normal precipitation. The [three-month outlook](#) also indicates probabilities for above average temperatures and below average precipitation across most of Montana. July and August are typically hot and dry in Montana, but late summer storms are important for sustaining crops, wildlife, stockwater ponds and for suppressing wildfire.

May rains were timely this year, and the Vegetative Health Index (a satellite-based product) shows a positive response statewide. While not as good as last year, the indicator does show substantially better vegetative health on this date than in 2020, 2021, and 2022. Green to blue colors indicate a positive trend and yellow to pink colors indicate more compromised conditions.

Figure 3 - Montana, Vegetative Health Index, week 25 – June 24, 2024 - Center for Satellite Applications and Research, NOAA

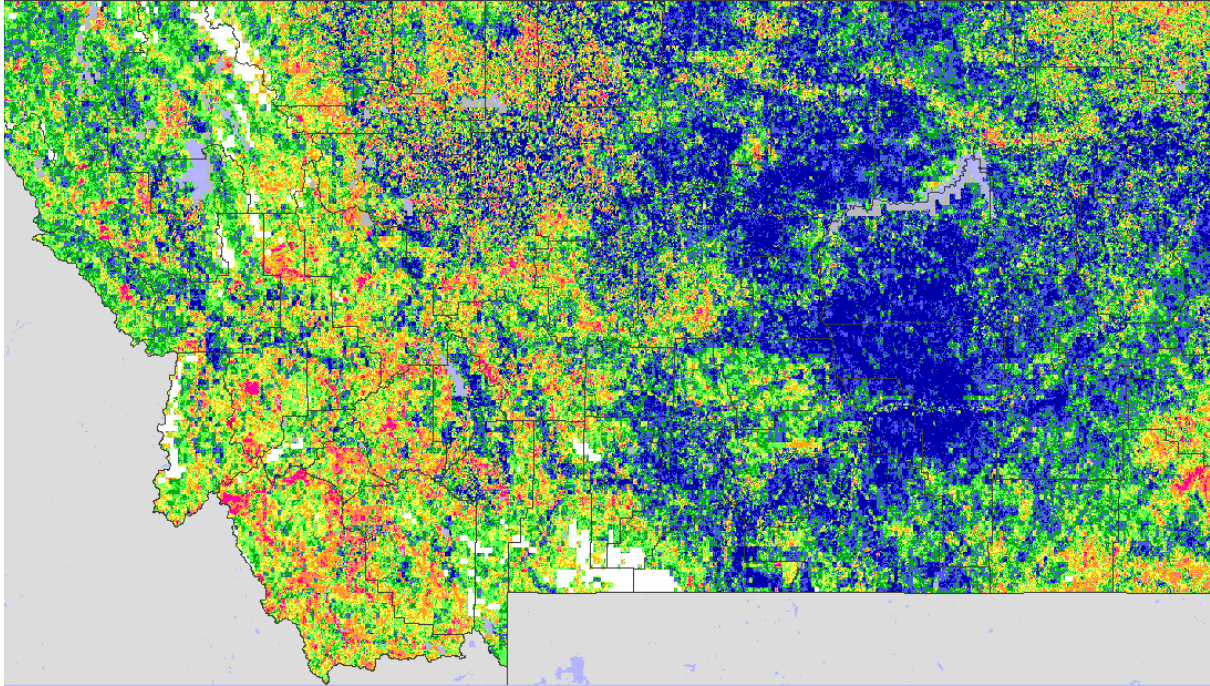
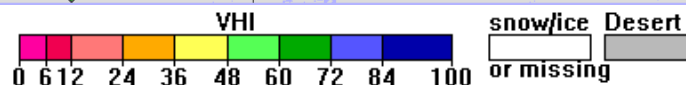
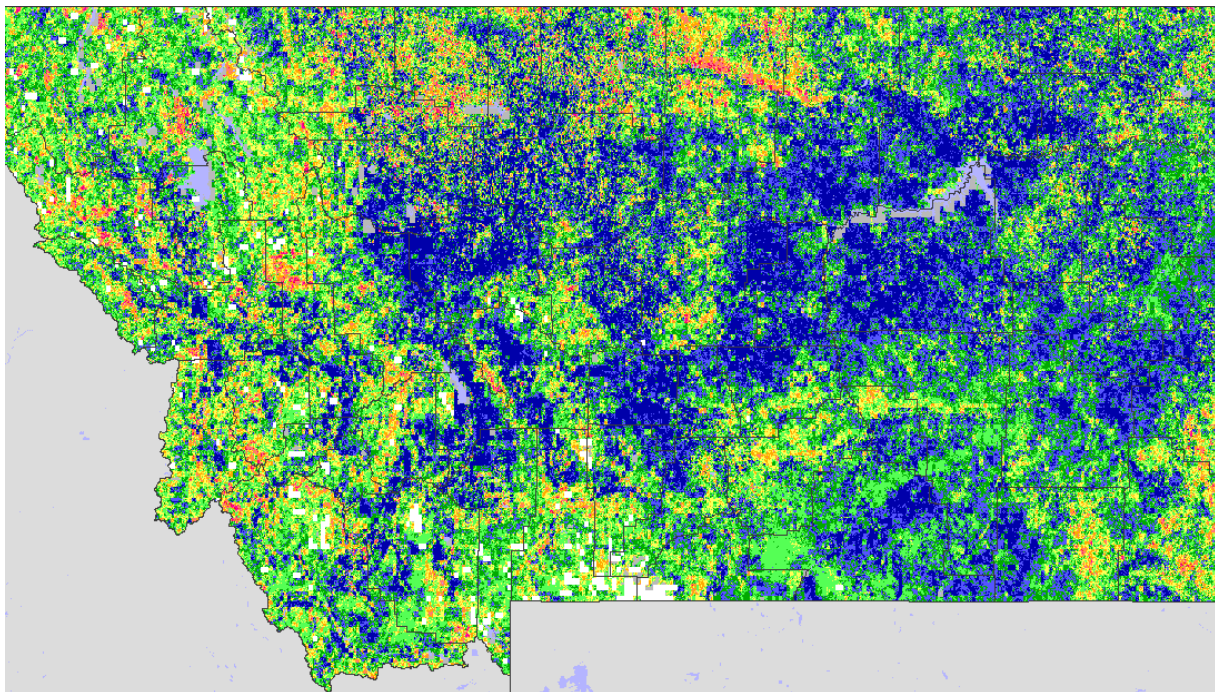


Figure 4 - Montana, Vegetative Health Index, week 25 – June 24, 2023 - Center for Satellite Applications and Research, NOAA



This summer’s seasonal drought outlook has degraded considerably as compared with outlooks issued earlier this year. As shown in the map below, northwest and southwest Montana will likely remain in drought with drought expanding east to include the western half of Montana. The [Seasonal Drought Outlook](#) through the end of September currently indicates a high probability for drought development across all of Montana.

U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

Valid for June 2024
Released May 31, 2024

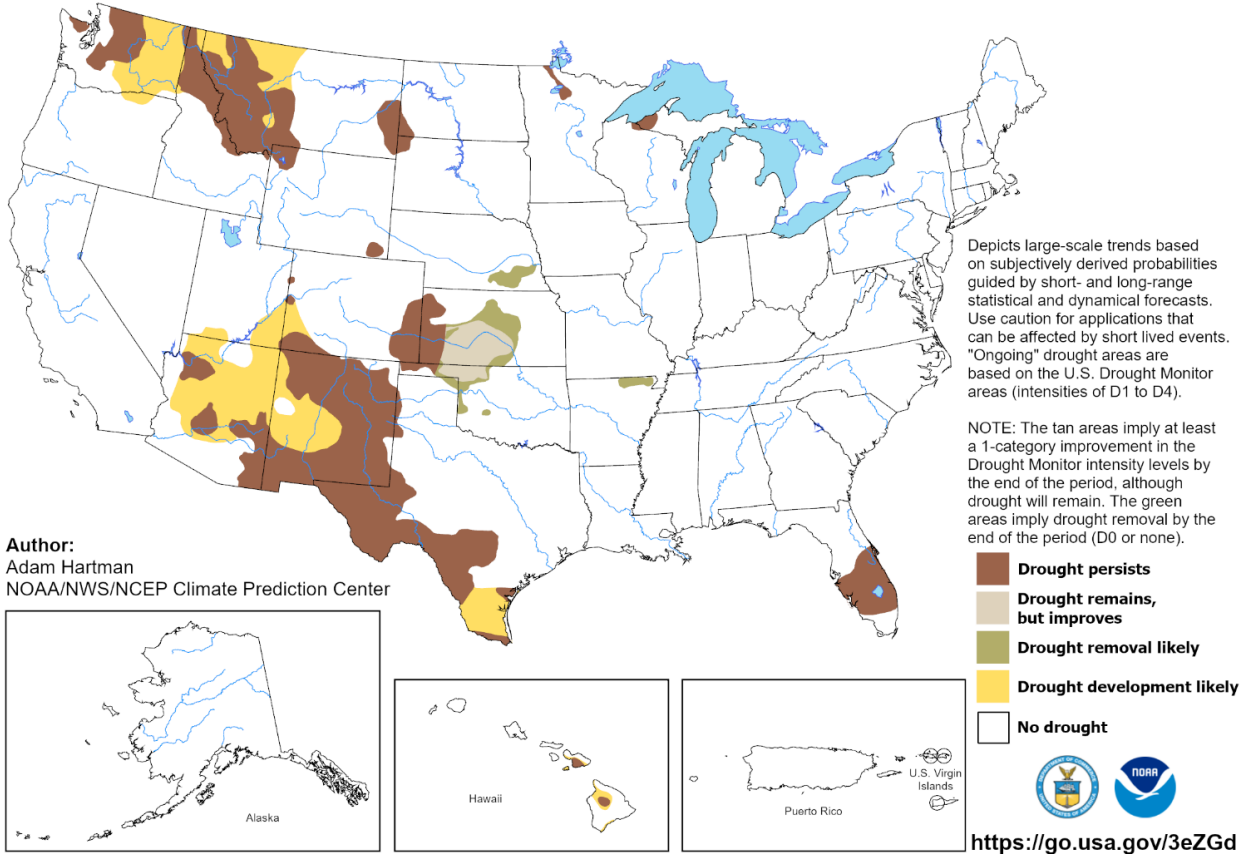


Figure 5 – U.S. Monthly Drought Outlook

Snowpack / Precipitation – Overview:

The [June NRCS Snow Survey Report](#) offers a good summation of the conclusion of the season’s snowpack. Several storms brought significant snow accumulations to the mountains in May, although much of it melted as quickly as it arrived. These late accumulations combined with cool weather was helpful following the winter’s poor snowpack that was 70% of normal or less in many basins. The Upper Missouri Basin near Helena and the Sun/Teton were the lowest on June 1st at 5-15% of normal. By the end of May near normal snowpack could be found at only the highest elevation locations. This development came in stark contrast to the previous year when much above normal temperatures in May caused an unusually early and fast melt-off. While only a few basins achieved peak snowpack this year, cooler temperatures in May and late accumulations helped greatly in sustaining an otherwise diminished snowpack and associated contributions to streamflow. The maps in Figures 6 and 7 show snow water equivalent for that day as compared to the median for that day. Percentages displayed do not represent the snowpack percentage for the season.

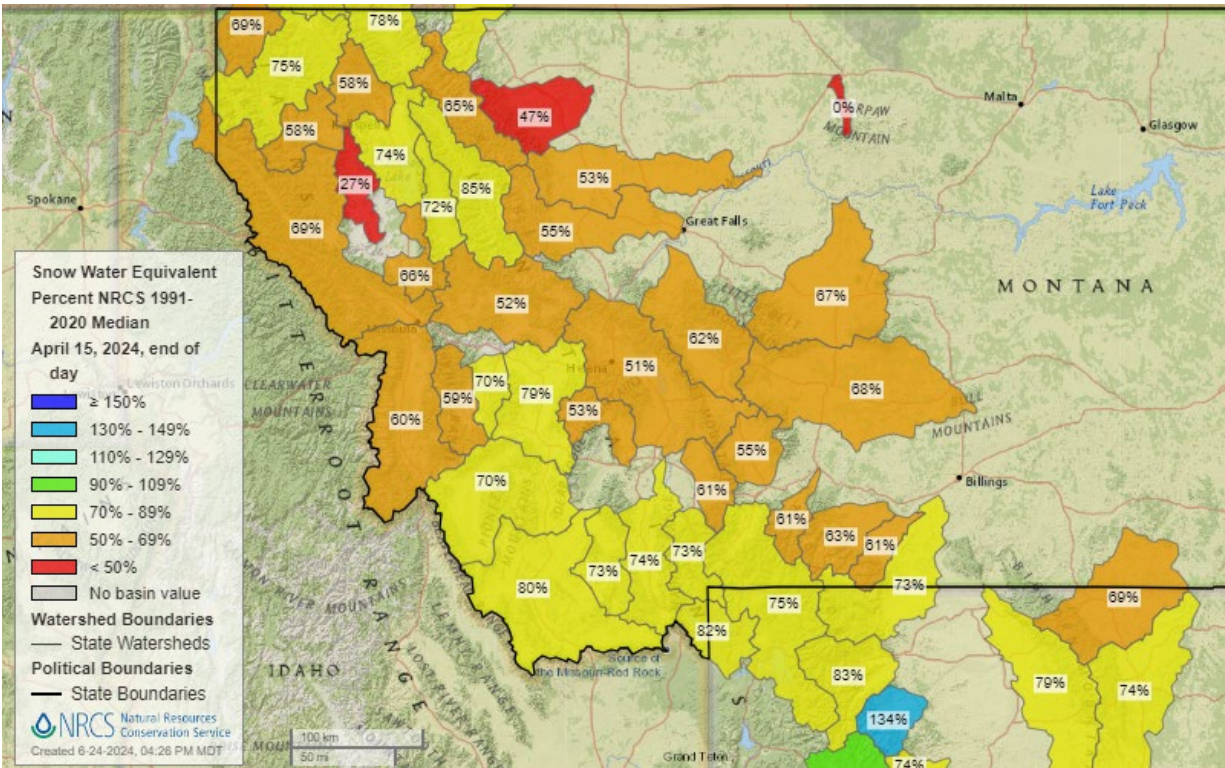


Figure 6 - Snow Water Equivalent as a percentage of median, April 15, 2024

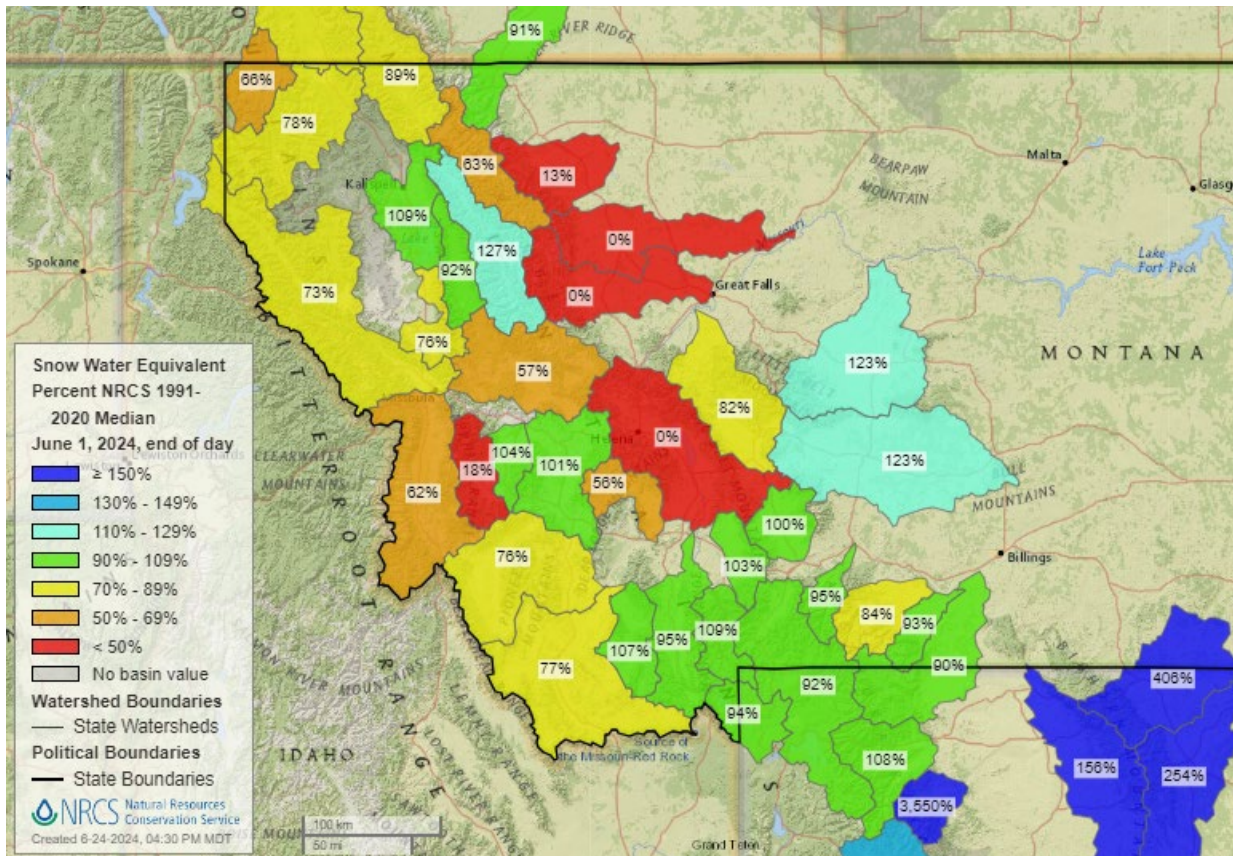
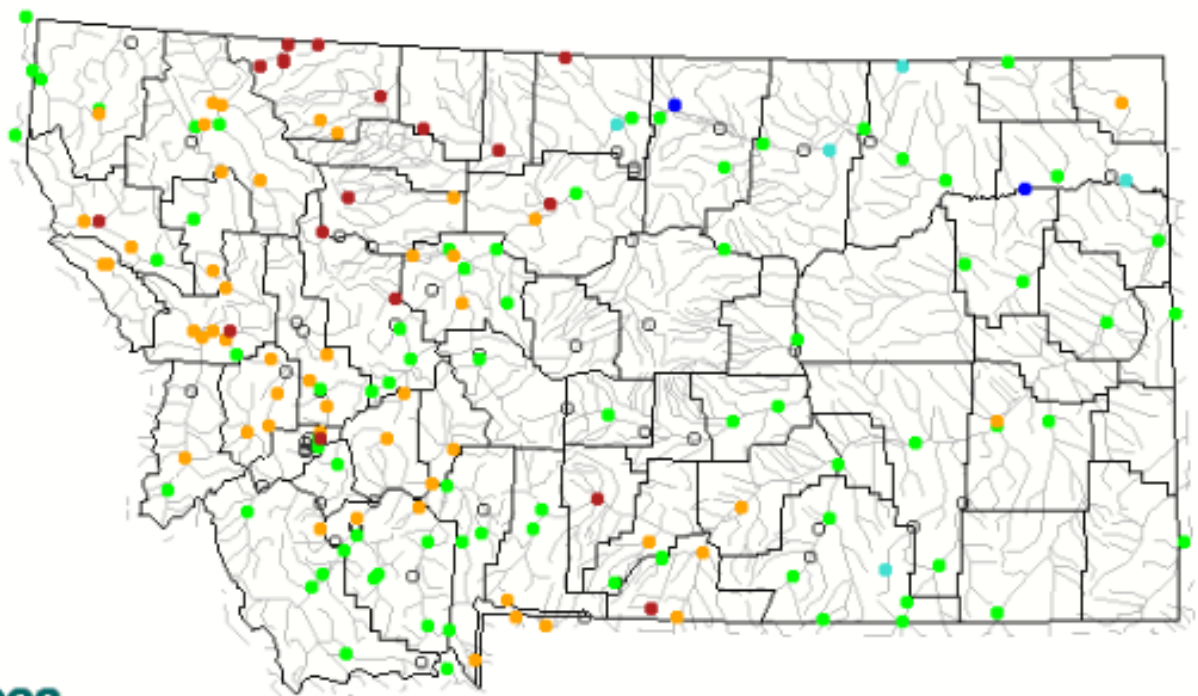


Figure 7 - Snow Water Equivalent as a percentage of median, June 1, 2024

Streamflow: ([DNRC/USGS/MBMG Gaging Stations](#), [USGS Water Watch Dashboard](#), [Missouri Basin Forecast Center](#), [Northwest River Forecast Center](#))

As detailed in the [NRCS Water Supply Outlook Report](#) for June, total streamflow volume in many Montana rivers was well below normal for the entire month of May. Several rivers west of the Continental Divide and along the Rocky Mountain Front experienced near record low (<10 percentile) total streamflow volume last month. That includes the Clark Fork, Bitterroot, Blackfoot, Swan, Middle Fork Flathead, South Fork Flathead, Marias, Cut Bank, Teton, and Sun River. The low flows were due in part to cool weather and delayed snowmelt and in part to the overall lack of water year precipitation in those regions. In contrast, exceptional precipitation during May in north central Montana resulted in well above normal streamflow in the Milk River. Normal peak streamflow dates range from mid-May to early-June in Montana.

Considering the low snowpack this winter and below average precipitation in April and in June, streamflows have held up surprisingly well. Absent average to above average precipitation in the next month, streamflows are likely to drop off quickly. Montana has occasionally experienced very dry conditions in June followed by unusually wet conditions in July, most recently during the summer of 2016. However, with hot and dry conditions in the forecast, that is an unlikely scenario.



Explanation - Percentile classes							
●	●	●	●	●	●	○	
Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High	Not-ranked

Figure 8 – Real-time streamflow as compared to historical streamflow for Monday June 24, 2024

Reservoirs: ([Bureau of Reclamation Reservoirs](#), [State Operated Reservoirs](#))

Water storage across Montana is in better condition than we have experienced since the summer of 2019. Of 17 state water projects all but four (Willow Creek, Yellowstone, Nevada Creek, and East Fork Rock Creek) were more than 100% of average on June 1st (reservoir elevation status for July 1 was unavailable in time for this report). Private dams, stockwater ponds and dugouts mostly filled this spring. Temperatures and associated surface water demands in July and August will have the greatest impact on reservoir elevations later this summer and into next fall.

Soil Moisture:

Soil Moisture data from Montana’s Mesonet Soil Moisture Monitoring Network looks promising and improved over recent years at this point in the season. Both modeled and individual station data show average to much above average soil moisture across much of Montana. Recently, stations have begun to show diminished values in western and eastern Montana. Data from this network corresponds with satellite based modeled products like the one shown in Figure 9. With this network in the early stages of build-out, many stations have less than 5 years of monitoring data. This shorter period of record means those sites are less reliable as indicators of average soil moisture but are useful as near-term indicators of changes in soil moisture due to factors such as recent precipitation and the impacts of evaporation from wind, temperature and plant transpiration.

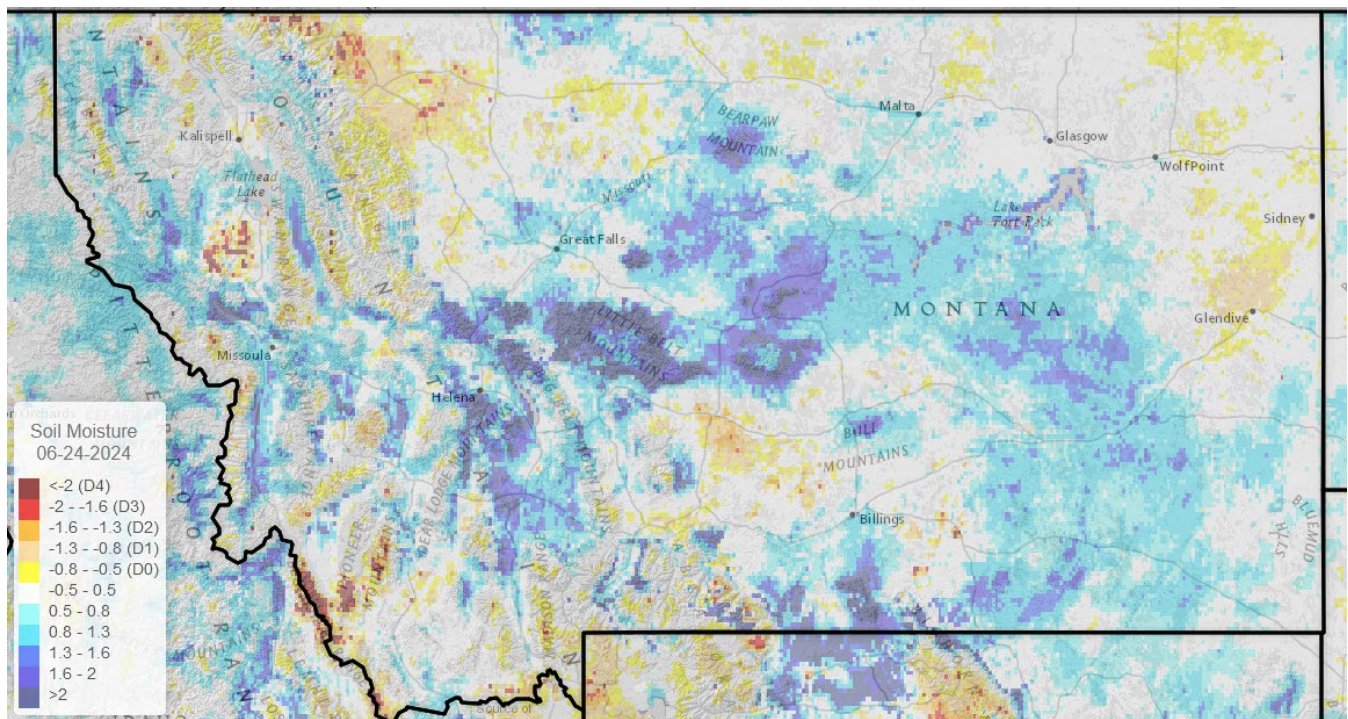


Figure 9 – SPoRT Soil Moisture Model

UMRB Drought Indicators Dashboard - MT Climate Office

Long Term Weather Forecast:

The [Climate Prediction Center’s](#) temperature outlook for July indicates probabilities of an increased chance for above normal temperatures of 33% - 40% in the northwest and 60% - 70% chance in south central and southeast Montana. The precipitation outlook is also negative with probabilities of 50% to 60% chance for below normal precipitation in western and central Montana and 33% to 50% chance of below normal precipitation in eastern Montana. The maps in Figures 10

and 11 show the 1-month forecast for both temperature and precipitation. The 3-month forecast is similar, however, the longer timespan makes this forecast much less reliable. July and August are typically Montana's hottest and driest months.

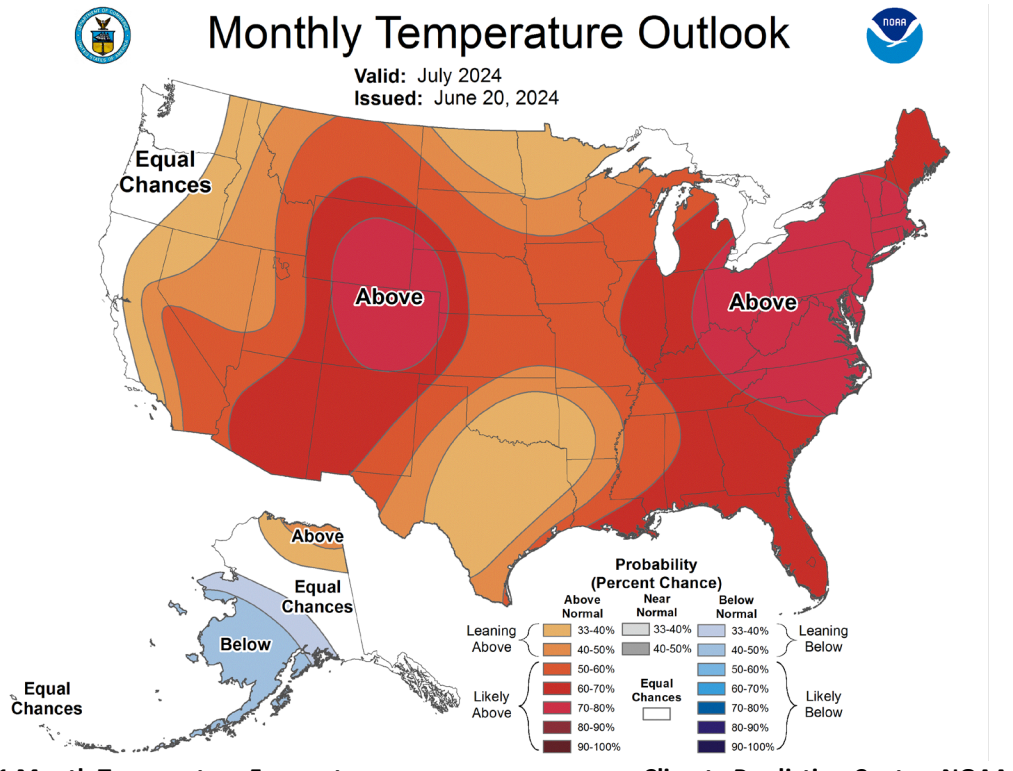


Figure 10 - 1 Month Temperature Forecast:

Climate Prediction Center -NOAA

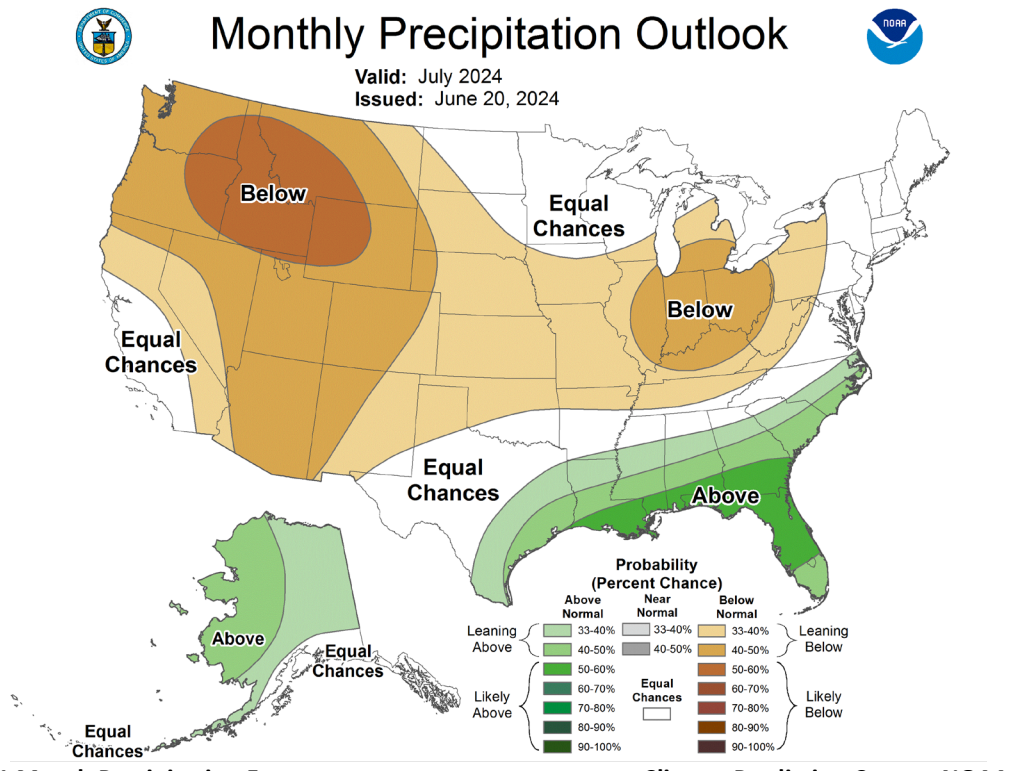


Figure 11 - 1 Month Precipitation Forecast:

Climate Prediction Center -NOAA

Wildfire Outlook:

The outlook for significant wildfire potential is normal across Montana. Moisture that fell in May is expected to delay the start of significant fires around the Northern Rockies, especially east of the Continental Divide, while continuing dryness through the summer and early fall months is expected to extend the end of fire season.

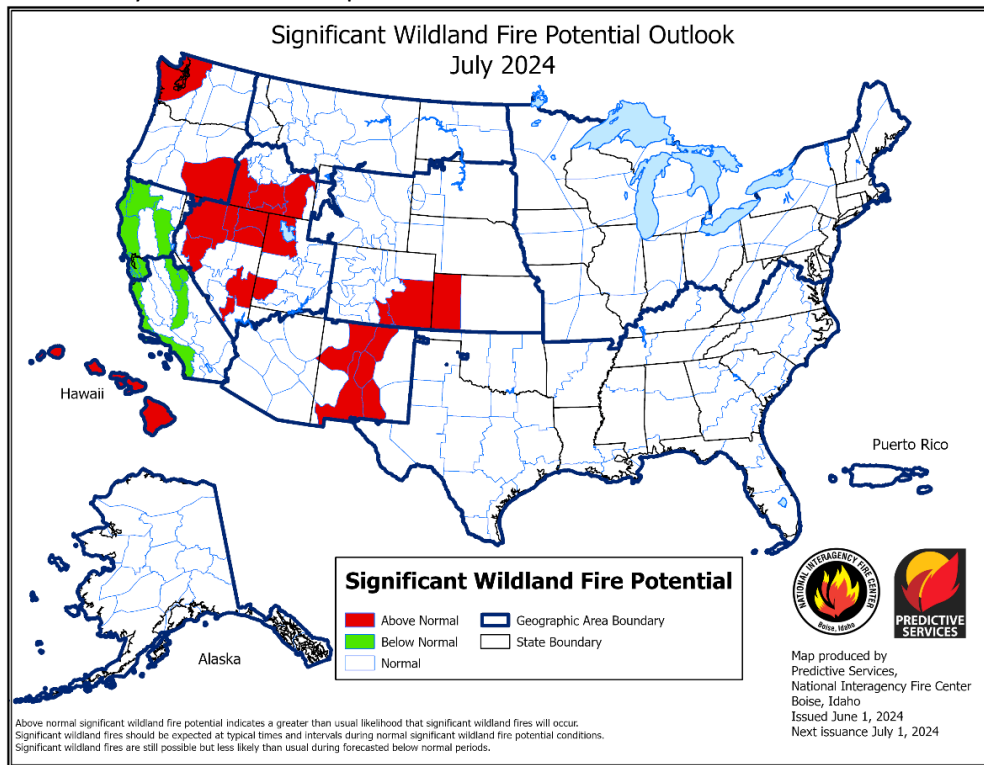


Figure 12 – July Wildfire Forecast

National Interagency Fire Center

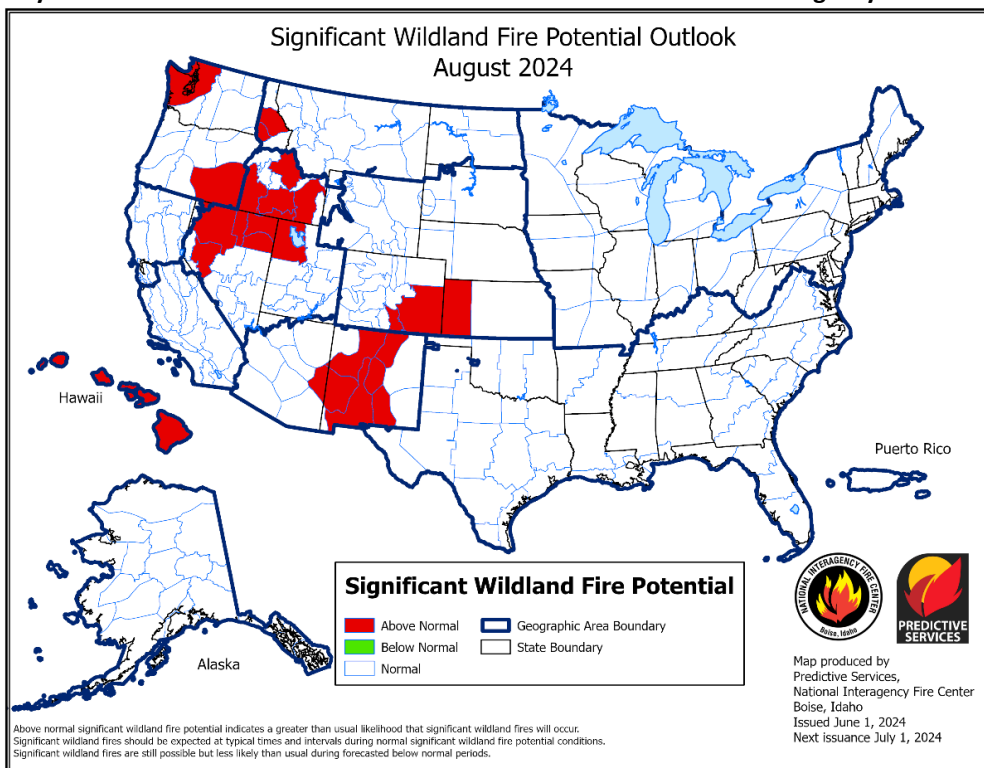


Figure 13 – August Wildfire Forecast

National Interagency Fire Center

USDA Drought Disaster Declarations:

The secretarial natural disaster designation allows the United States Department of Agriculture (USDA) Farm Service Agency (FSA) to extend much-needed emergency assistance to producers recovering from natural disasters through emergency loans and other aid. Assistance can be used to meet various recovery needs including the replacement of essential items such as equipment or livestock, reorganization of a farming operation, or to refinance certain debts. Producers should contact their local FSA representative for more information.

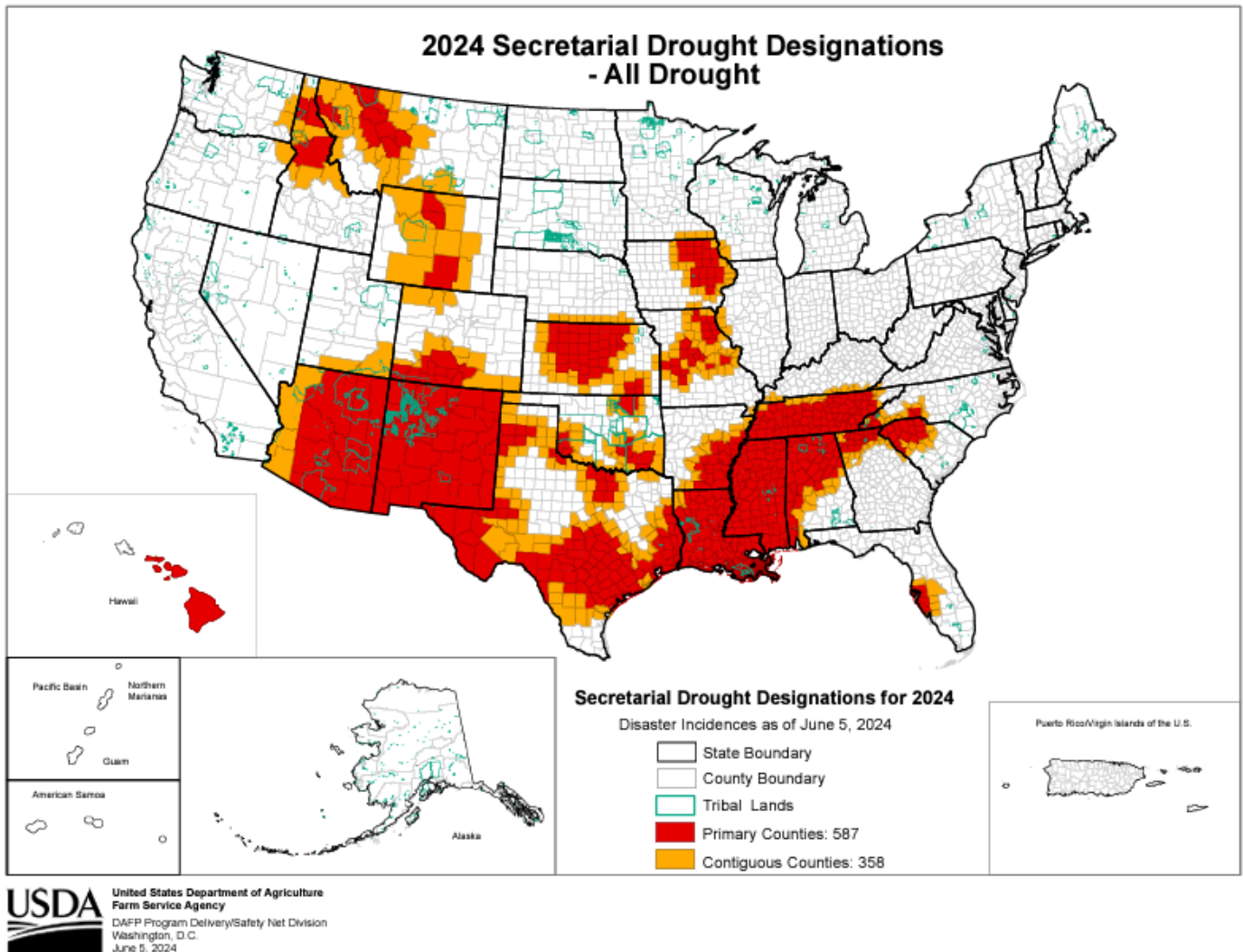


Figure 14 – Drought Disaster Declarations as of June 21, 2024

Farm Services Agency, USDA

Montana counties designated as a drought disaster area for Crop Year 2024 as of June 21, 2024 – Primary: Cascade, Glacier, Judith Basin, Lewis and Clark, Meagher, Pondera, Sanders, Teton.

Secondary: Broadwater, Choteau, Fergus, Flathead, Gallatin, Jefferson, Lake, Liberty, Lincoln, Mineral, Missoula, Park, Powell, Sweet Grass, Toole.

Key Take-Aways:

- Much of the state, particularly the northern half of Montana, is entering its fifth consecutive year of abnormally dry or drought conditions. Despite warmer temperatures this winter and a record low snowpack in some watersheds, wetter than average conditions last fall and in May have sustained soil moisture in advance of this summer.
- Below average temperatures and above average precipitation in May boosted snowpack at high elevations and slowed run-off. However, below average precipitation in April and in June have resulted in the early onset of drought conditions statewide with abnormally dry and moderate to severe drought conditions advancing prior to the onset of the dry season.
- Outside of the northwest, Montana's reservoirs benefitted this year from high carry-over in 2023. Most of Montana's state and federal water projects filled this spring. With inflows diminishing due to low snowpack, reservoir levels could fall quickly this summer.
- Streamflows in western Montana are predominantly below to much below average at the end of June. Streamflows in eastern Montana are mostly average to above average at some locations. The winter's low snowpack is likely to result in greatly diminished streamflows statewide by mid-summer. Local conditions will depend largely on regional temperatures and summer precipitation.
- Surface water storage levels at state reservoirs, are mostly above average. Conditions at private reservoirs and dugouts vary by location. The area east of the Continental Divide along the Rocky Mountain Front is the most compromised and is likely to suffer shortages in stock ponds and smaller reservoirs.
- The outlook for significant wildfire potential is normal across Montana. Moisture that fell in May is expected to delay the start of significant fires around the Northern Rockies, especially east of the Continental Divide. Continuing dryness through the summer and early fall months is expected to extend the end of fire season.
- These combined drought indicators offer a negative drought outlook for the remainder of the summer and early fall. Conditions could worsen quickly in the event of much above average temperatures and below average precipitation in the coming weeks and months.

Drought Evaluation Tools and Resources – The following resources provide useful tools that DNRC and their partners use to evaluate drought and water supply conditions on a weekly basis across Montana.

[Upper Missouri River Drought Indicators Dashboard](#)

Montana Drought Impacts Reporter - Submit a report: <https://nris.mt.gov/droughtsurvey>
View results: <https://nris.mt.gov/droughtimpacts>

[NRCS Interactive Precip Portal](#)

[Climate Prediction Center](#) (Longer term temperature and precipitation outlooks)

[USGS Water Watch Dashboard](#)

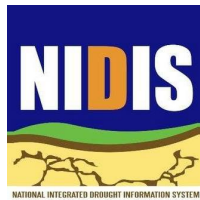
[Weather Prediction Center](#) (Near term weather forecasts)

[Montana Mesonet Data Downloader](#)

DNRC can help answer questions about water resources in your area or provide information about water management tools like stream gages, near you. DNRC also provides planning assistance and technical support for local water supply planning for your community and in your watershed.

In partnership with other state and federal agencies and Tribes, experts in climate science, snowpack, streamflow and weather information collect and evaluate drought and water supply data on a weekly basis throughout the year. This information is distilled into weekly recommendations to the U.S. Drought Monitor, which tracks drought conditions nationally. Much of the information contained in this report comes from the [NRCs Water Supply Outlook Report](#), [U.S. Drought Monitor](#), [Climate Prediction Center](#), [National Integrated Drought Information System](#), [National Interagency Coordination Center](#) and other sources. Please contact [Michael Downey](#), at DNRC (mdowney2@mt.gov) with questions or feedback about the information contained in this report.

Working on behalf of the Drought and Water Supply Advisory Committee, DNRC has compiled this Summer Drought Forecast. This report provides a synopsis of statewide conditions gleaned from multiple sources and offers links to additional resources with more in-depth information. This report would not be possible without the ongoing participation and contributions of our local, university, state, tribal and federal partners, some of which are listed below:



This report was developed by DNRC on behalf of the Montana Drought & Water Supply Advisory Committee pursuant to MCA 2-15-3308(5).