

Montana Drought Outlook Report – Summer 2022



Signs of renewal in Deep Creek, near Townsend MT, 2022



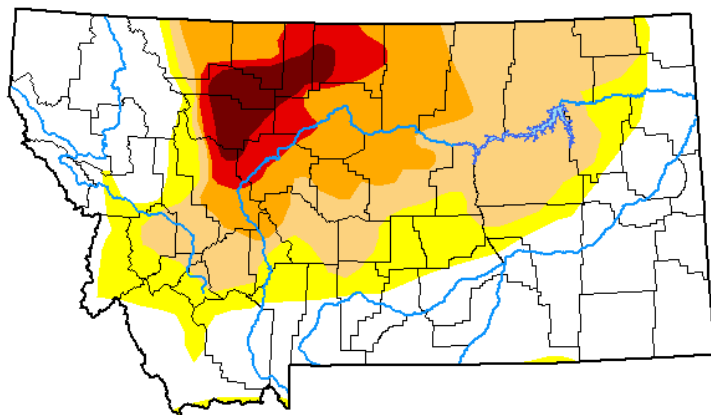
Summary of Antecedent and Current Conditions

The weather pattern in late 2021 followed a similar track to the previous year with an exceptionally dry fall that led to a warm, dry and open winter. The absence of critical fall precipitation in September and October left soil moisture severely depleted after more than 12 months of severe (D2) to exceptional (D4) drought. Isolated precipitation events in early October in southeast and northwest Montana improved conditions locally, but state averages trended drier and warmer throughout the fall of 2021. Apart from some marginal improvements in the northwest, drought conditions across Montana continued to deteriorate through early December 2021. This date is the latest point in the year that drought conditions have continued to worsen since the start of the US Drought Monitor in January of 2000. The pattern of weather extremes that characterized the fall of 2020 and all of 2021 persisted through the first six months of 2022.

Since the last drought report in mid-April, a cooler and wetter weather pattern has emerged. Minimum temperatures in April were the third coldest on record. This trend continued in May with average temperatures falling two degrees below normal for the month. In early April, mountain snowpack across western Montana trended from average to much below average with many SNOTEL sites registering 25 to 30 percent below the normal peak snow accumulation which typically occurs in mid to late April. Storms in mid and late April boosted snowpack at most locations across western Montana and marked the beginning of a trend that spread across the state through the first three weeks in June. As statewide precipitation events brought significant amounts of rain and snow over Memorial Day weekend, accumulations have continued through June, effectively reversing the dry, warming trend that gripped the state through much of the winter. Drought conditions improved statewide in April, May and the first three weeks of June except for north central Montana that picked up only marginal moisture and remained mostly dry during what is typically one of the wettest times of the year in that area. Drought conditions in Glacier, Toole, Pondera, Teton, Liberty and Hill counties worsened through the spring with conditions degrading to D4 (exceptional) drought by early June.

U.S. Drought Monitor Montana

June 28, 2022
(Released Thursday, Jun. 30, 2022)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	44.72	55.28	40.19	19.56	7.42	3.01
Last Week 06-21-2022	24.56	75.44	43.93	19.96	9.17	3.01
3 Months Ago 03-29-2022	12.65	87.35	85.32	82.52	52.44	0.00
Start of Calendar Year 01-04-2022	7.36	92.64	89.33	86.35	53.93	13.87
Start of Water Year 09-28-2021	0.00	100.00	100.00	100.00	65.68	21.91
One Year Ago 06-29-2021	7.49	92.51	78.41	60.96	19.94	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

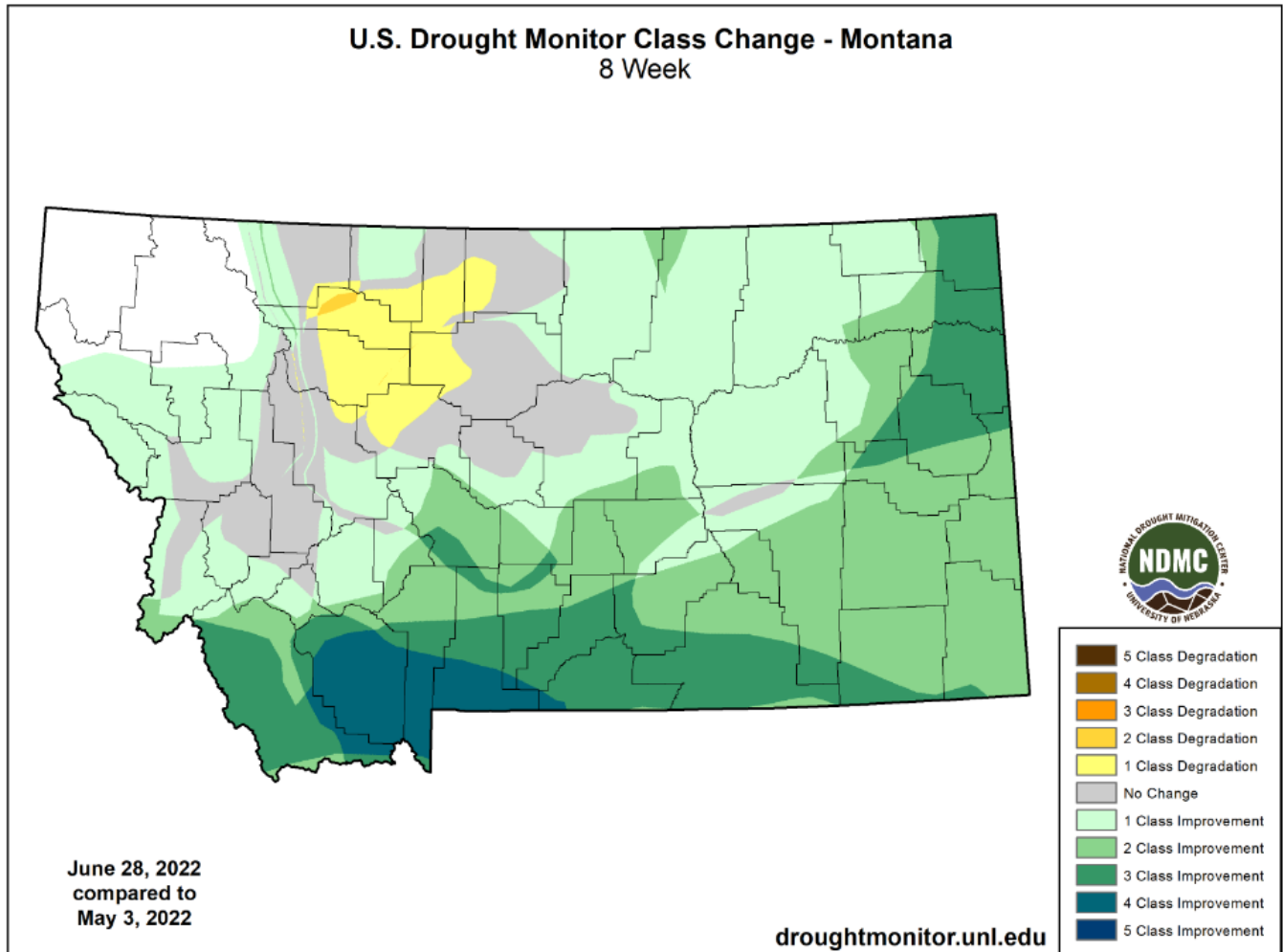
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

Curtis Riganti
National Drought Mitigation Center

Seasonal Drought Forecast

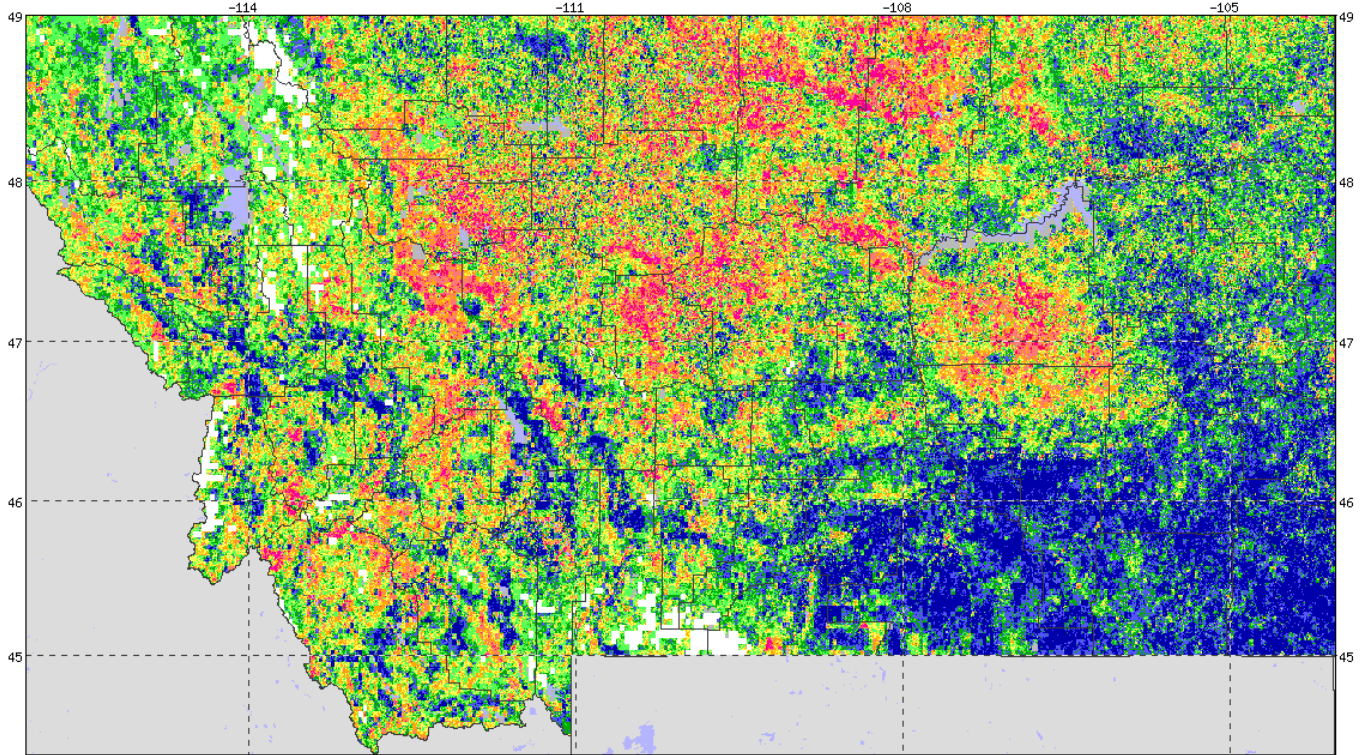
Late June and early July marks the end of Montana’s high precipitation months and the onset of the typically hot and dry summer season. In late March 2022, the seasonal outlook for April, May and June indicated warmer and drier than normal conditions across the state for the spring and early summer. The forecast appeared reminiscent of June 2021 – the second warmest and the driest on record since 1895. However, by early April the forecast shifted, and April and May were colder and wetter than normal. June weather followed that trend with precipitation amounts reaching average and above average in some locales. A cooler and wetter than normal spring has greatly improved drought conditions and the drought outlook across the state. The map below illustrates improvements in drought conditions in most of Montana over the last eight weeks.



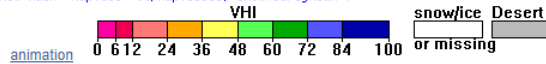
The potential for significant summer precipitation in the coming weeks is waning quickly, although regional summer precipitation can materialize as late as mid-July. After that, summer precipitation is mostly limited to thunderstorms which can be significant locally. NOAA’s Climate Prediction Center [one-month weather forecast](#) offers no clear indication for above or below normal temperatures or precipitation. However, the [three-month outlook](#) indicates a 30% – 40% chance for above normal temperatures and below normal precipitation. July and August are typically hot and dry and despite the forecast for dry and hot weather ahead, the cooler and wetter April, May and June across much of the state has greatly improved conditions over last year. This fact is borne out by maps showing the vegetative health index (a satellite-based product) this year as compared with the same date last year.

United States, 27: Montana, Vegetation Health Index (VHI): Current Week and One Year Ago
VHI of current year

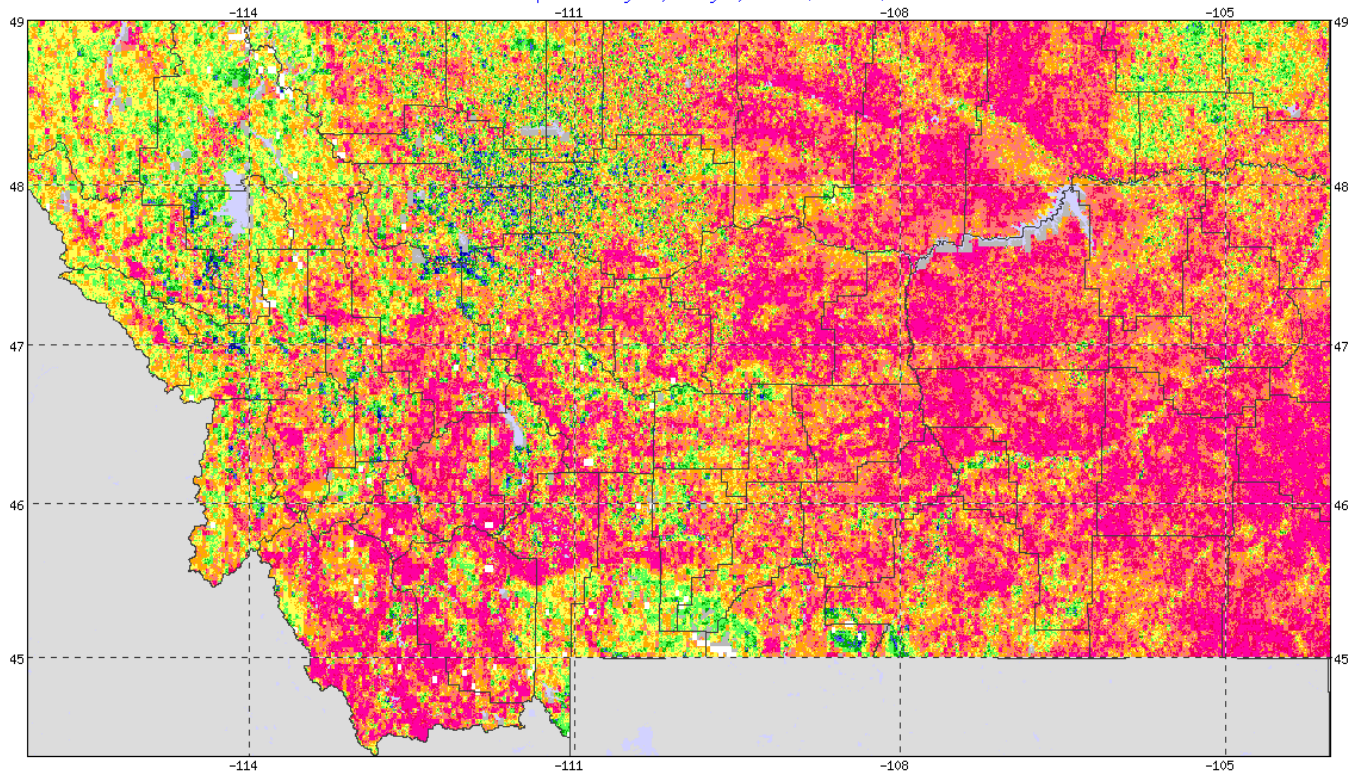
VHI of current year, July 1, 2022 (week 26)



VIIRS-NPP, Zoom Level=7 (1.2 km), tiles=24,missing snow mask MapTile = ../mapTilesG, showYearlyMean=0



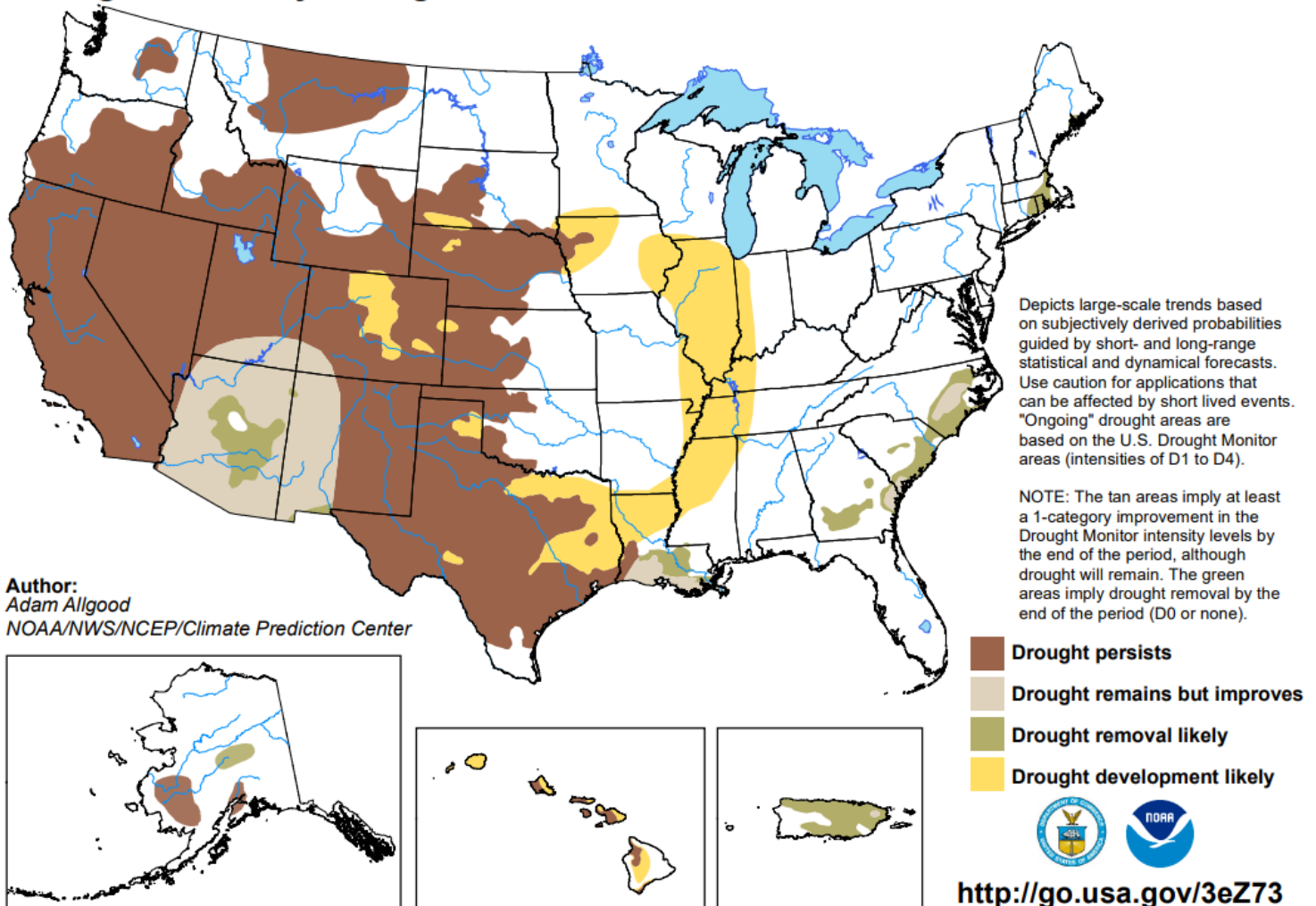
VHI of previous year, July 1, 2021 (week 26)



This summer's seasonal drought outlook has improved considerably as compared with outlooks issued earlier this year. As shown in the map below, North Central Montana will likely remain in drought through the summer and into the fall with drought conditions easing across the rest of the state.

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

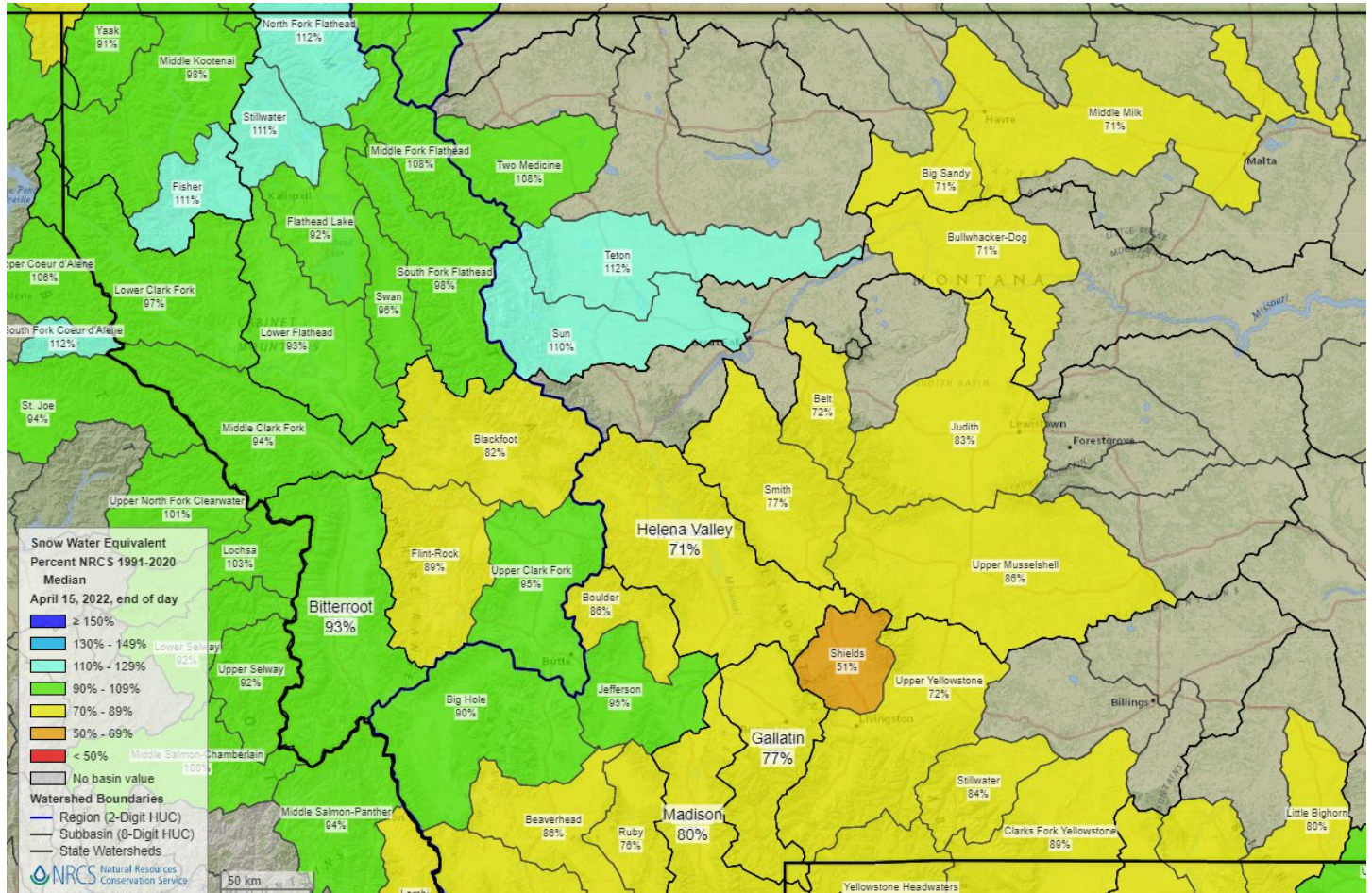
Valid for June 16 - September 30, 2022
Released June 16



Snowpack / Precipitation – Overview:

The warm and dry winter followed by the cold and wet spring has complicated attempts to characterize Montana's current water supply. The cold weather in April and May significantly delayed the snowmelt and effectively retained snowpack at least two and up to three weeks longer at high elevations across Montana. Most locations above 6,000 ft. elevation gained snowpack through the end of May. This delay in snowmelt has greatly extended the run-off as compared to last year. However, total accumulated snowpack (total winter accumulation) for the season was still below average for much of western Montana as illustrated by the maps below.

Snow Water Equivalent as a percentage of median April 15, 2022

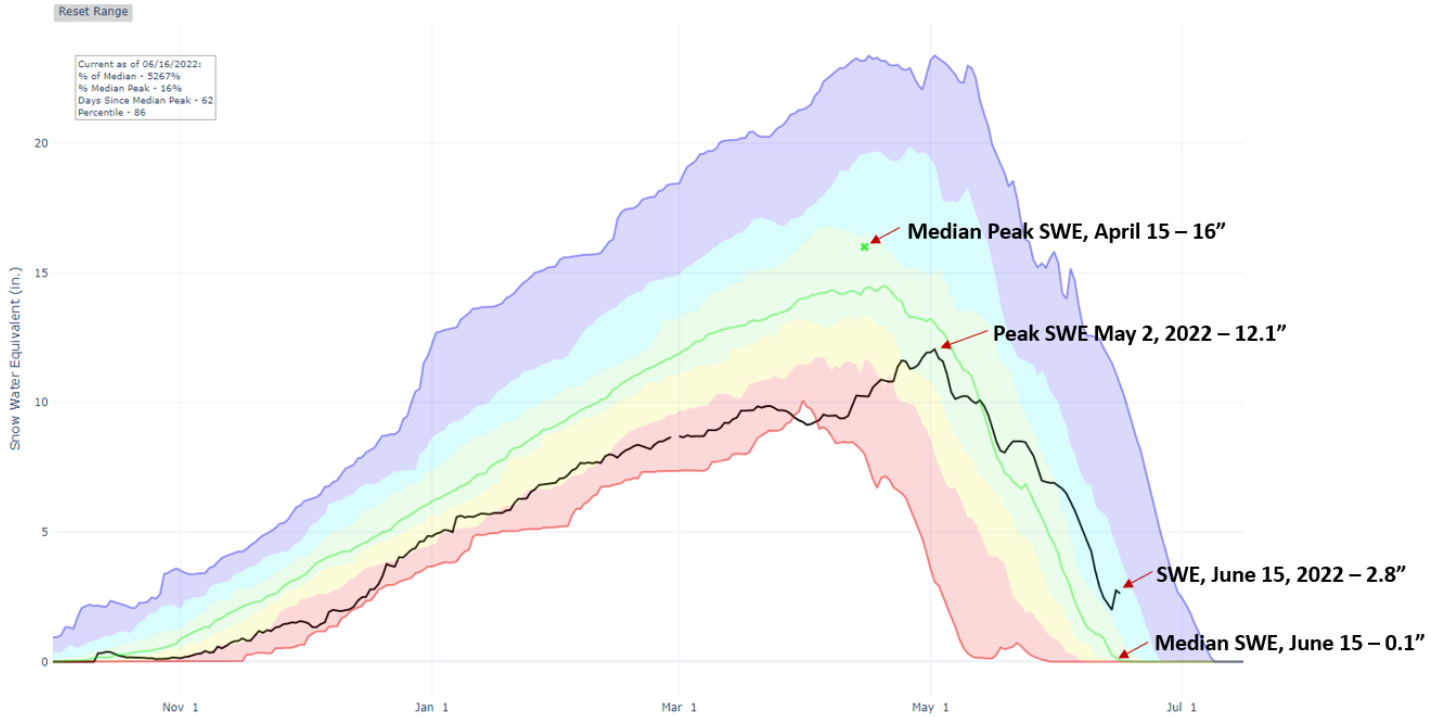


This year's below-normal snowpack was driven by warm temperatures in January, February and March, which greatly diminished the mid and low elevation snowpack that is typically present in a more "normal" winter. This fact may come as a surprise, considering the flood activity in northwest Montana and unprecedented flooding across the Yellowstone River Basin in early June. The flooding in the Yellowstone Basin was driven by an unusual late season snow event that recorded high elevation accumulations of up to 30 inches of snow, followed shortly by a rain on snow event exceeding 3 inches in some areas. However, absent the late season storms, the volume of snow water equivalent (SWE) in the basin was below normal for the season. The Yellowstone Basin above Livingston reached its peak snowpack on May 15 this year. On that day, SWE in the Yellowstone Basin above Livingston was three inches below the normal peak of 24.1 inches of SWE.

The graph below of SWE in the Smith River basin offers another good illustration of the difference between seasonal versus daily snowpack as well as the influence the cold temperatures in April and May had on the timing of the snowmelt. In a typical year, there is approximately 0.1" of SWE left in the high elevations of the Smith River Basin on June 15. This year, 2.8" of SWE remained on June 15th despite a total snowpack of 4" below normal for the season. The shortage in total snowpack volume this year across many of Montana's watersheds has led to the much below normal streamflow this spring in many rivers and streams in the central and north central areas of the state.

SNOW WATER EQUIVALENT IN SMITH

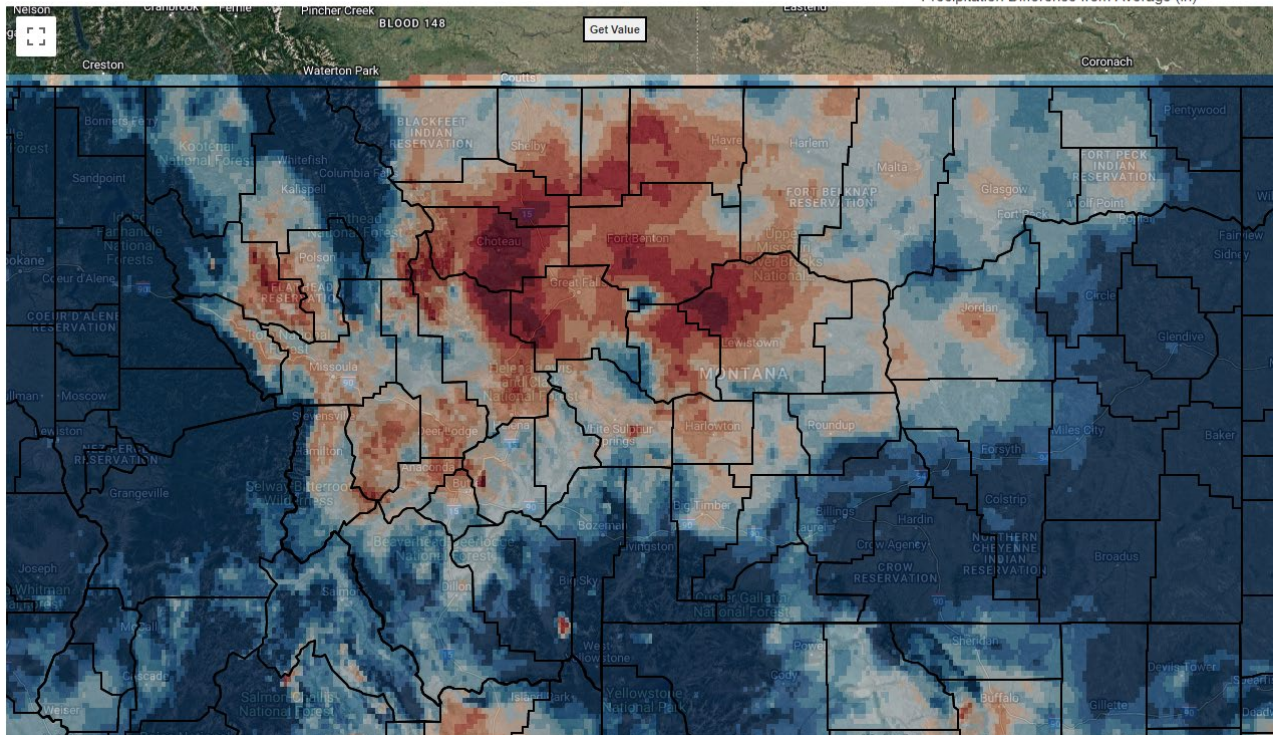
Snow Water Equivalent in the Smith River Basin June 15, 2022



Precipitation this spring has followed the trend of extremes across the state with some areas experiencing much above normal while other areas accumulated far below normal as indicated on the map below. This map of precipitation difference from average conditions for the period from April 1 to June 24 correlates closely with the map of drought classifications on page 1.

Precipitation Difference from Average (gridMET)

2022-04-01 to 2022-06-24, Total, vs. 1981 - 2010

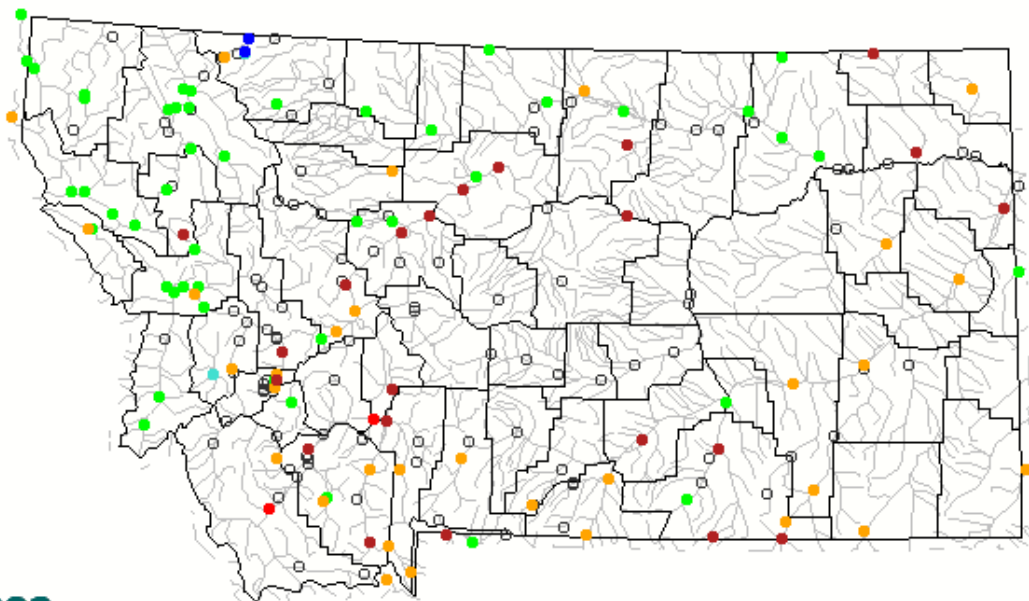


Eastern Montana and the southern belt are showing accumulations of 3 or more inches of precipitation above normal while Glacier, Pondera, Teton, Toole, and Liberty counties fall below normal.

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

Streamflow in rivers across the state has recently improved compared to earlier this spring when extreme weather events caused record lows followed by record highs. Despite the ongoing flooding in the third week of June, early spring streamflow fell to well below normal, setting record lows on the Smith and Ruby Rivers and other rivers and streams across the state. The explanation for some of the exceptionally low flows in early spring is multi-faceted. Cold weather in April and May delayed snowmelt and diminished the early season runoff. This year’s low flows are also the by-product of two years of severe drought and the associated depletions in groundwater that contribute directly to stream baseflows. Despite the delayed run-off across Montana, late season streamflow may fall below normal across the state as the conditions recover following two years of extreme drought. Complete recovery in the shallow aquifers that feed Montana’s surface waters will require a continued period of normal to above average accumulations in precipitation.

Friday, April 15, 2022 09:30ET



Search USGS streamgage

Choose a data retrieval option and select a location on the map

- List of all stations Single station Nearest stations Peak flow

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

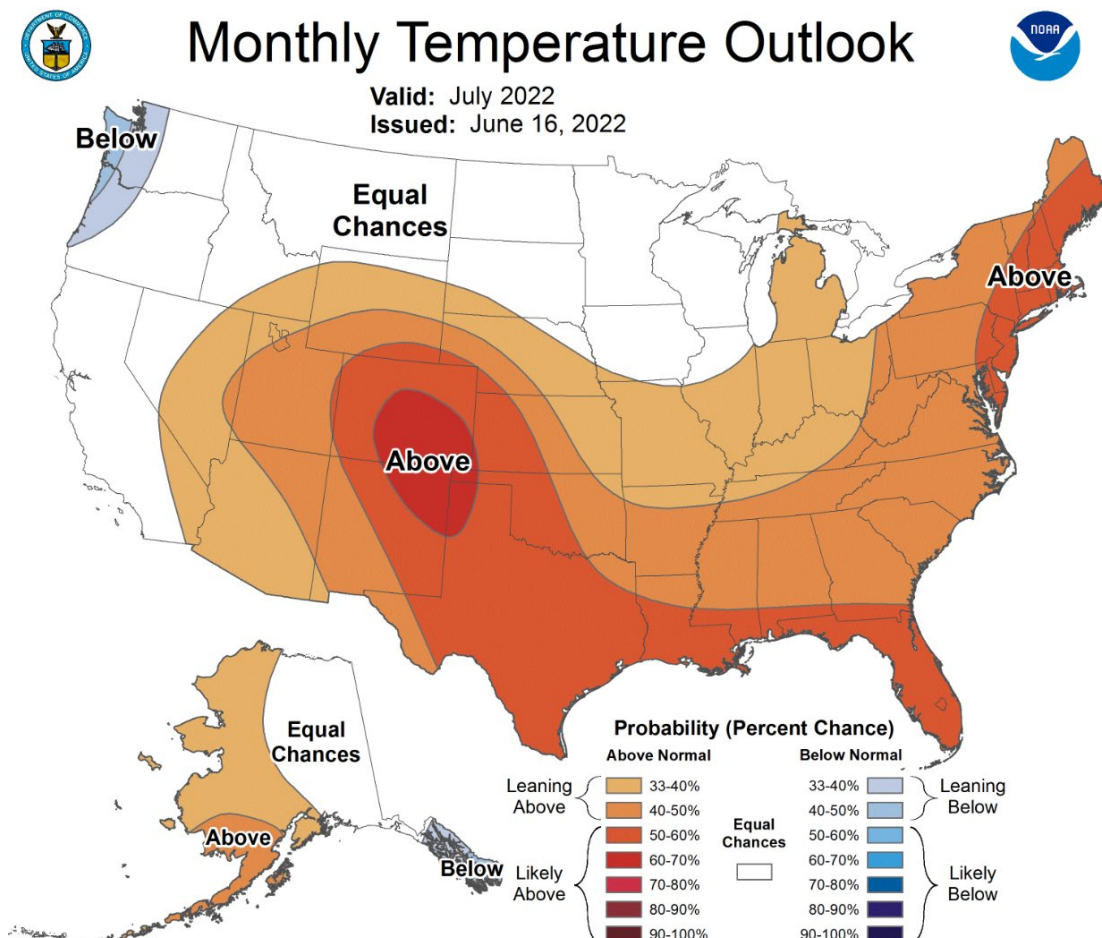
Reservoirs: ([Bureau of Reclamation Reservoirs](#), [State Reservoirs](#))

Water elevations at state-owned reservoirs across Montana were mostly below normal as of June 1. Reservoir elevation status for July 1 was unavailable in time for this report. It is unclear if the deficits in storage levels resulted from the delay in spring run-off, reduced availability, or low carry-over due to drought conditions in 2021. A combination of all three is likely, depending on the facility. Some facilities that would have fallen short but for the recent extreme events in late May and early June will likely fill. Conditions in north central Montana are likely to remain dire through the summer and early fall. Conditions at the smaller irrigator-controlled reservoirs across the state are mixed and many small reservoirs will not fill despite the recent precipitation. Many agricultural producers across the state will likely find it challenging to provide adequate stock water through the summer.

Long Term Weather Forecast:

The [Climate Prediction Center's](#) current temperature outlook for July calls does not indicate a clear signal for above or below normal temperatures. The precipitation outlook is similar with no clear signal for precipitations amounts that are either above or below normal in July. The maps below show the 1-month forecast for both temperature and precipitation. The 3-month forecast does indicate both warmer and drier conditions in the months ahead, however the longer timespan makes this forecast much reliable. July and August are typically Montana's hottest and driest months so the forecast for a hot and dry July and August is not as concerning as it would be earlier in the spring.

1 Month Temperature Forecast:



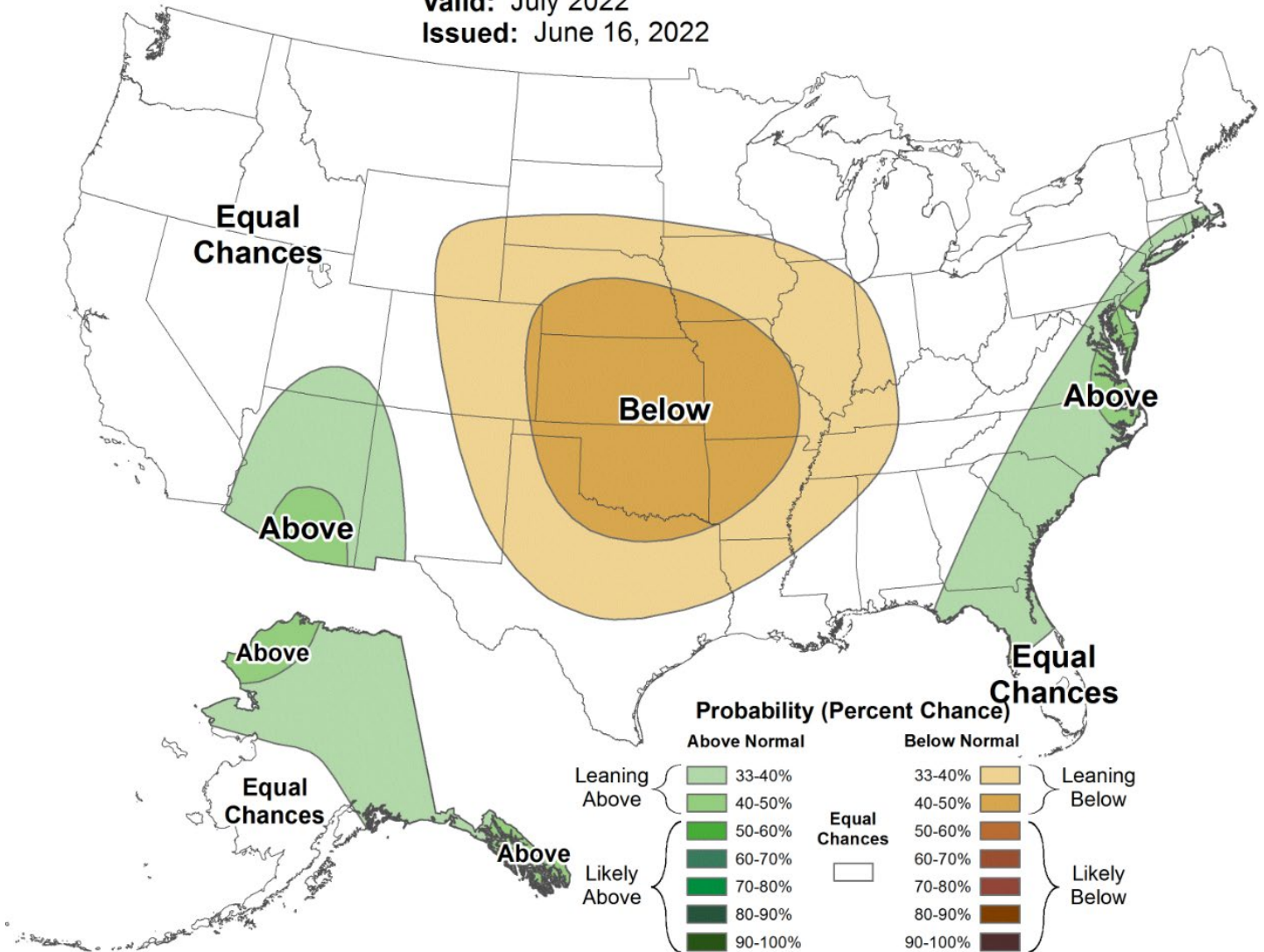
Month Precipitation Forecast:



Monthly Precipitation Outlook

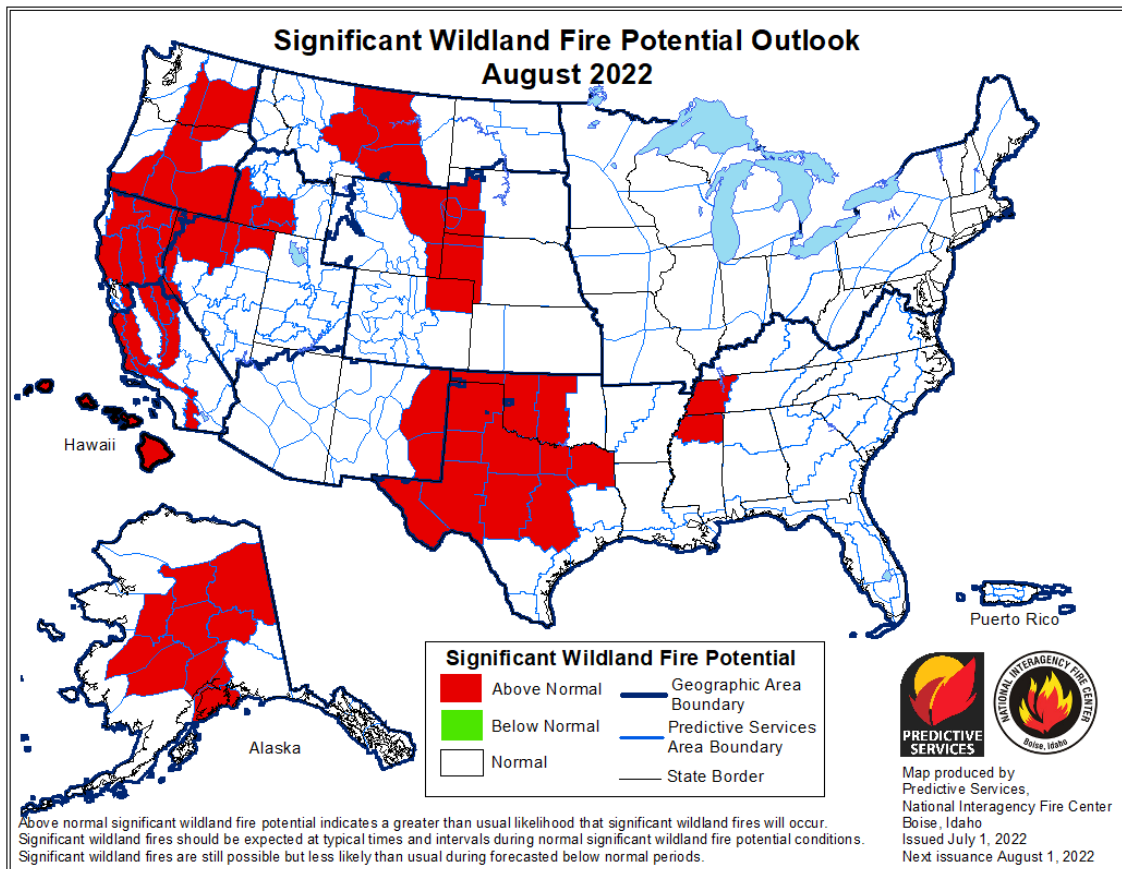
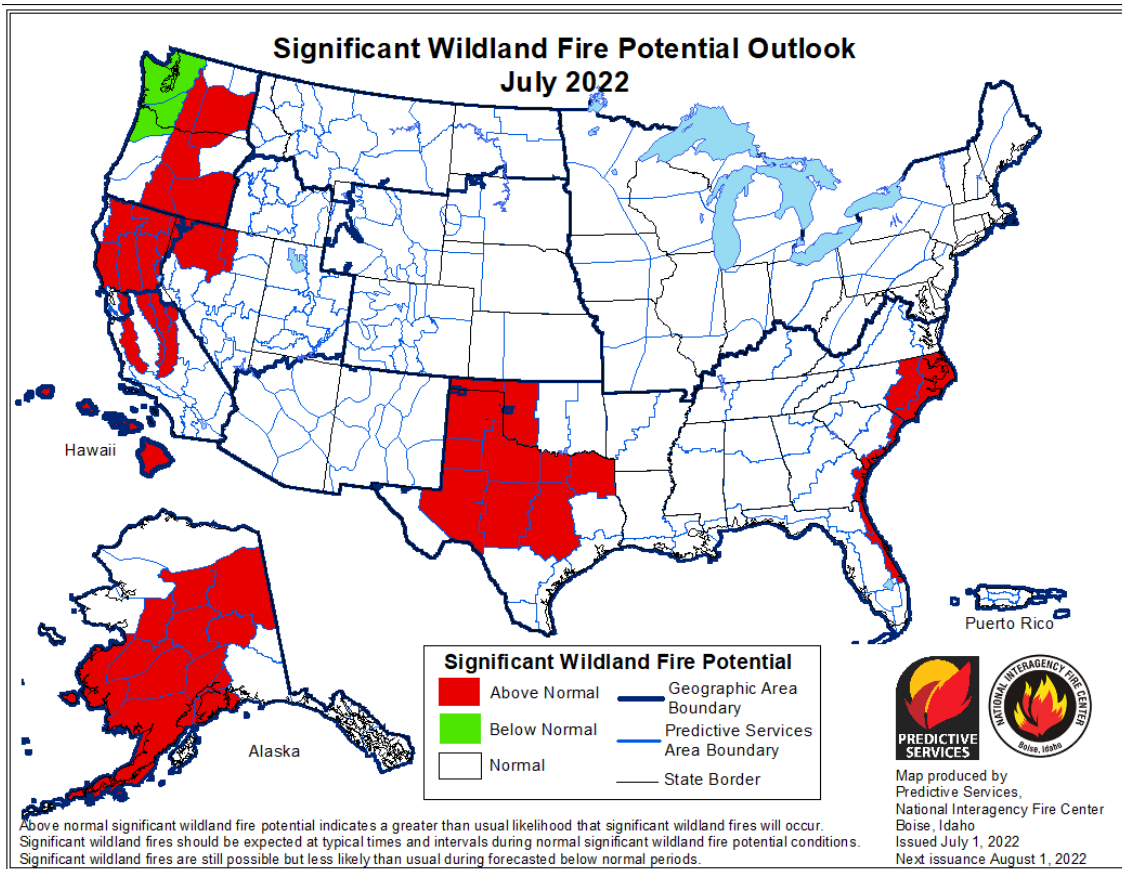


Valid: July 2022
 Issued: June 16, 2022



Wildfire Outlook Summary ([excerpt from the North American Seasonal Fire Assessment 7/1/22](#)):

The late start of green-up this spring, and the absence of severe or greater drought over the bulk of the geographic area, except over portions of north-central Montana, accompanies an absence of sustained periods of extreme heat in the current short-term forecast modeling. This combined with the July monthly climate outlook of near-average temperatures and precipitation, leads to a forecast of normal significant fire potential for all the geographic area during July. Drought conditions are expected to intensify some during the summer, but likely not as dramatically compared to the previous two years due to less potential for extended periods of hot weather.



Report Summary

- Conditions in the fall of 2021 and winter of 2022 closely followed a similar pattern to the fall of 2020 and winter of 2021, dominated by warmer and drier conditions which diminished low and mid-elevation snowpack and depleted soil moisture.
- Drought conditions worsened through the fall and into December of 2021.
- Despite the cool and wet spring of 2022, some areas of the state missed the precipitation and drought in north central Montana worsened in June.
- While drought has eased considerably across much of Montana, it is likely to persist in the north central area of the state through the summer and into the fall.
- Streamflow has rebounded with the onset of summer but may diminish more quickly than normal following two years of severe drought and the forecast for hotter and drier than normal conditions in July and August.
- Inadequate stock water is likely to continue to present challenges to many producers though the summer.
- The outlook for significant wildfire potential has moderated to normal levels in July across Montana with the outlook remaining above normal in central Montana in August.

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>

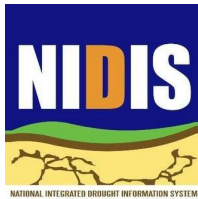
[NRCS Interactive Precip Portal](#)

[USGS Water Watch Dashboard](#)

[Montana Mesonet Data Downloader](#)

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 Governor's 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 Governor's Drought & Water Supply Advisory Committee pursuant to MCA 2-15-3308(5).