



United States Department of Agriculture

Natural Resources
Conservation Service

Montana

Water Supply Outlook Report

February 1, 2023



Although much of January consisted of sunny days without precipitation, a major winter storm during the last week of the month added to the snowpack while also improving snow conditions for recreationalists. This storm provided some locations in Montana with two to three feet of snow. While this storm was beneficial, most snowpack percentages decreased over the last month. The snowpack currently ranges from below normal in northwestern Montana and the Rocky Mountain Front to above normal in central Montana. With two to three months remaining in the typical snowpack accumulation season, some uncertainty remains in terms of what spring snowmelt will provide for water supply.

For more water supply information, contact:

Eric Larson

Water Supply Specialist

Federal Building

10 East Babcock, Room 443

Bozeman, MT 59715

406-599-9697

eric.larson@usda.gov

<https://www.nrcs.usda.gov/wps/portal/wcc/home/quicklinks/states/montana/>

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C., 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

Operational News

Outreach and Education

Common duties of Montana Data Collection Office (DCO) staff can include repairing SNOTEL stations, measuring Snow Courses, and performing data analysis. We also prioritize school outreach and education. Typically, our staff attends several school events per year, ranging from elementary school presentations to college course field days.

On January 11, 2023, Montana DCO staff member, Eric Larson, joined Park High School students for their annual snow science field day at Mill Creek. Educational topics included survival science, avalanche awareness, snowpack analysis, and careers in snow science. Students participated in snow sampling using a Federal Snow Sampler. They also dug snow pits, tested snowpack weak layers, discussed snow crystals, assessed snowpack stability, and performed avalanche transceiver searches.

Montana DCO staff is always looking for an opportunity to talk about the importance of snow and how it relates to water supply. If you know of a school or organization looking for a snow related presentation please let us know. Whether it's a field trip or a classroom presentation, we would be happy to join.



Eric Larson teaching the basics of snow sampling and discussing NRCS Snow Survey careers



Park High Survival Science Class and Instructors

Precipitation

Following nearly three months of abundant precipitation across much of Montana, weather patterns changed in early January, producing relatively dry conditions for the month. The timing of this change was alarmingly similar to mid-January of 2022, which at that time led to a prolonged period of well below normal precipitation.

Fortunately, this year October through December precipitation was above normal in most locations and provided a buffer to the mostly lacking January precipitation.

The most significant precipitation event of last month arrived on around January 24 and was the result of large low-pressure system located over the Hudson Bay in Canada, which directed arctic air and moisture at Montana from a northwesterly direction. Montana received some of the largest totals in the western United States from that event which occurred from [January 24 through 27](#). The largest totals were in the Rattlesnake and southern Mission Mountains north of Missoula, where over 3 inches of precipitation fell. Storm totals of 2 inches or greater for the rest of the region can be seen in the following table:

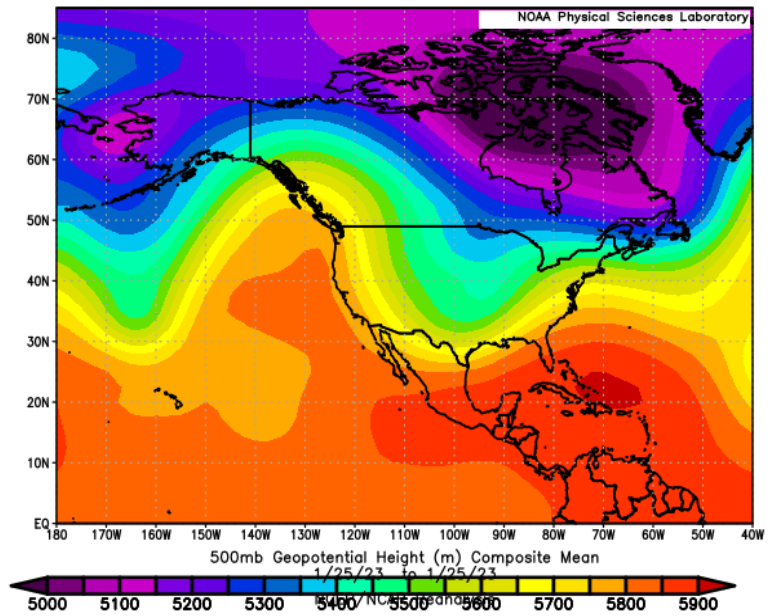


Figure: 500mb atmospheric pressure during late-January storm that provided ample moisture to the region. [Daily Climate Composites: NOAA Physical Sciences Laboratory](#)

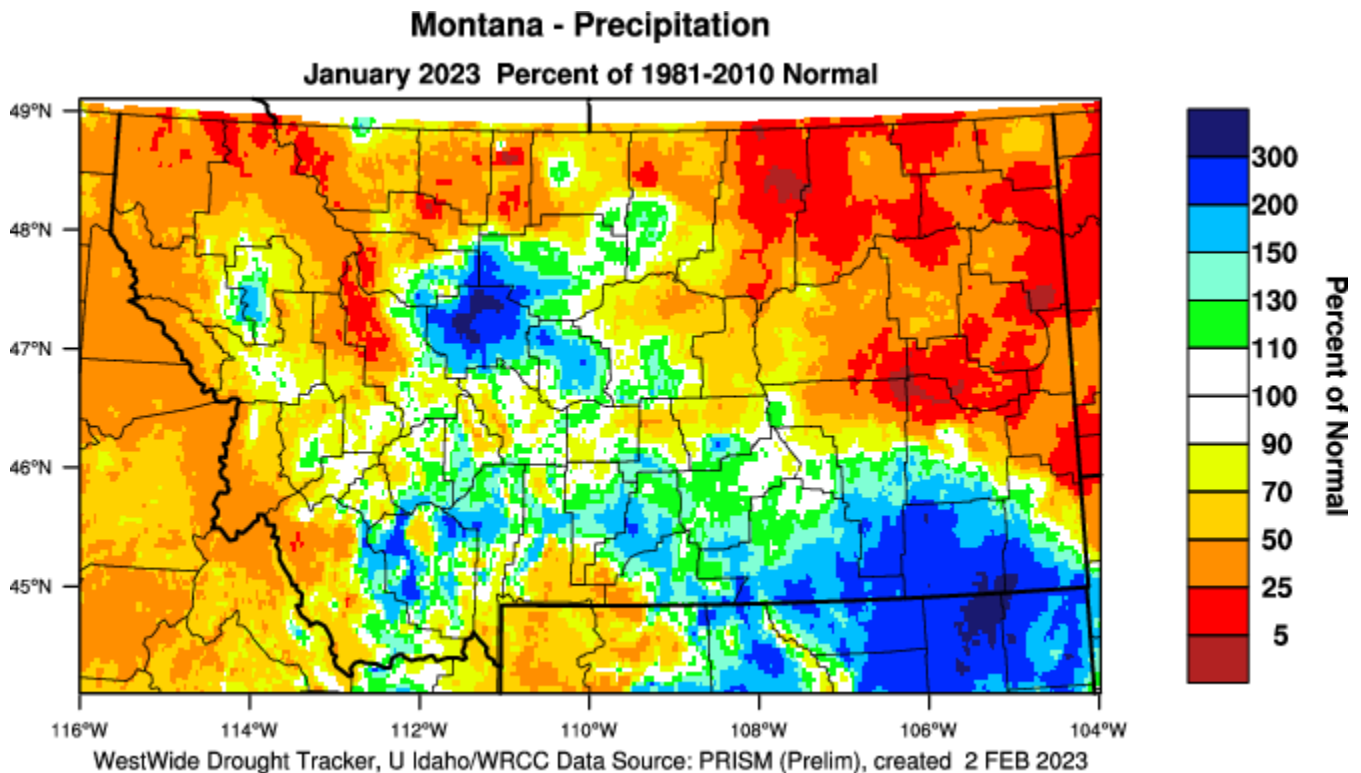
Snow Water Equivalent Accumulation from January 24 through January 27, 2023

SNOTEL	Mountain Range	County	Elevation	Accumulation (Inches)
Stuart Mountain	Rattlesnake	Missoula	7400	3.8
North Fork Jocko	Mission	Missoula	6330	3
Darkhorse Lake	Beaverhead	Beaverhead	8945	2.7
Moss Peak	Mission	Lake	6780	2.6
Twin Lakes	Bitterroot	Ravalli	6400	2.4
Bald Mtn.	Bighorn	Big Horn	9380	2.3
Crystal Lake	Big Snowy	Fergus	6050	2.3
Shower Falls	Gallatin	Gallatin	8100	2.2
Warm Springs	Flint Creek	Granite	7800	2.2
Elk Peak	Castle	Meagher	7600	2.1
Brackett Creek	Bridger	Gallatin	7320	2.7
Sacajawea	Bridger	Gallatin	6550	2.1
Sucker Creek	Bighorn	Sheridan	8880	2

Precipitation was widespread during the late January event and all of Montana’s basins received measurable snow, except the southern Absaroka and Wind River ranges which received less than a couple tenths of precipitation. Fortunately, this region had a couple smaller precipitation events throughout the month in addition to a large storm during the first week of January which provided nearly 2 inches of precipitation.

Overall, January precipitation totals were low in most in basins west of the Continental Divide and several SNOTEL stations along the Idaho border stretching from Sula to Troy reported nearly [record low January precipitation](#). Most river basins west of the divide reported less than 60% of normal [January precipitation](#). The Rocky Mountain Front and Glacier National Park were also relatively dry, receiving less than half of their normal January precipitation. Most of southwest Montana received slightly less than normal January precipitation. Part of central Montana and the Bighorn, Powder, and Tongue River basins received above normal January precipitation.

[Water Year precipitation](#) is near to above normal in all basins east of the Continental Divide, except for the Saint Mary’s River basin which is well below normal primarily due to the conditions in Glacier National Park. Water Year precipitation is also well below normal (about 70-90%) in all basins west of the Continental Divide, which is unfortunate because November through January tend to be the wettest months in that region. Most SNOTEL stations in northwest Montana including the Bitterroot River basin currently have a [water year precipitation deficit](#) of about 3 to 5 inches and will need several large storms or well above normal precipitation over the next 2 to 3 months to recover. Central Montana, the Missouri River headwaters (Jefferson-Madison-Gallatin), and portions of the Bighorn Mountains have had above normal water year precipitation, which will act as a small buffer in the event of inactive weather ahead.

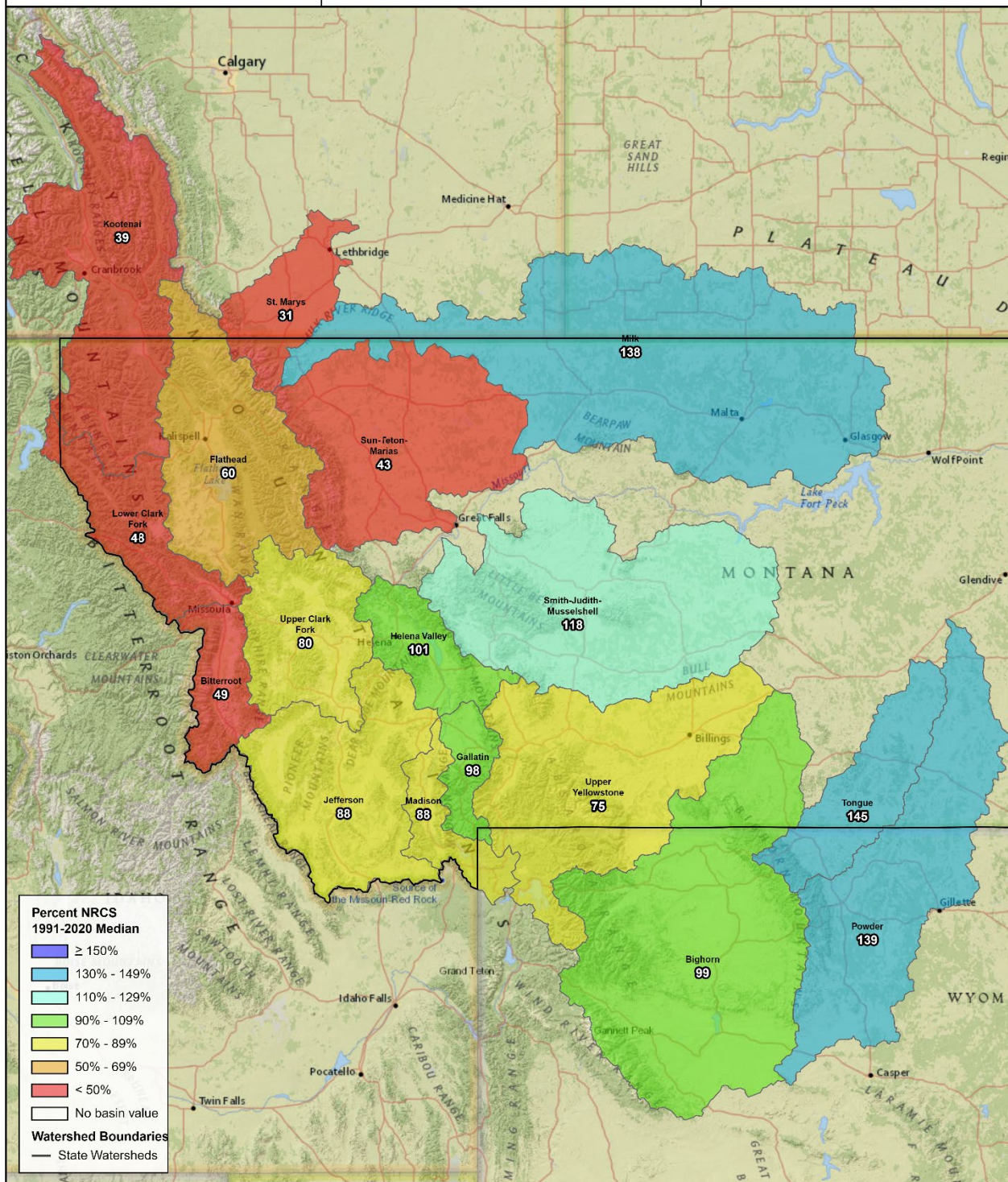


1 month Precipitation

Monthly SNOTEL Precipitation

January 1, 2023 - January 31, 2023

Percent NRCS 1991-2020 Median



Percent NRCS 1991-2020 Median

- ≥ 150%
- 130% - 149%
- 110% - 129%
- 90% - 109%
- 70% - 89%
- 50% - 69%
- < 50%
- No basin value

Watershed Boundaries

- State Watersheds

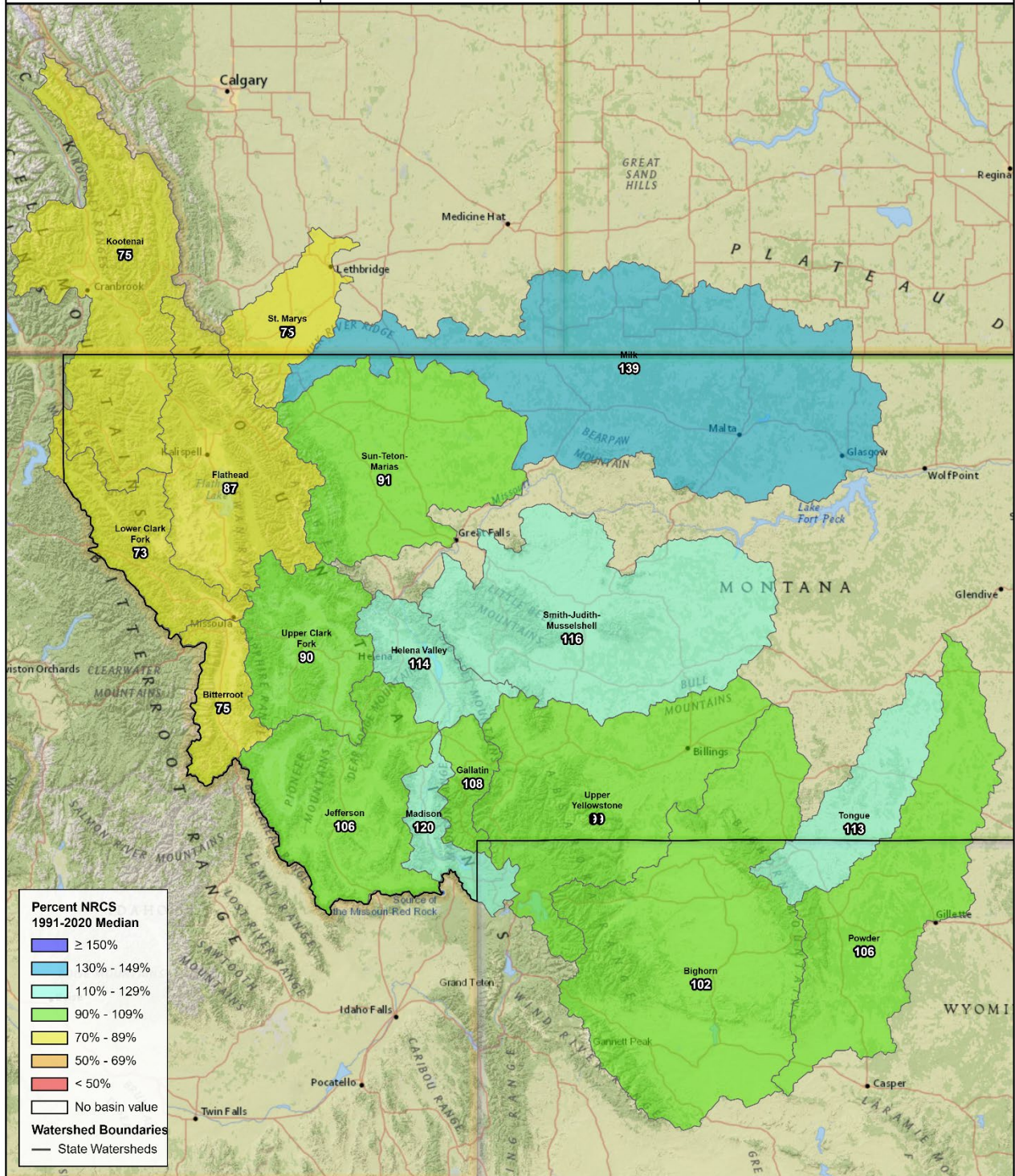


Water Year to Date Precipitation

Water Year SNOTEL Precipitation

October 1, 2022 - January 31, 2023

Percent NRCS 1991-2020 Median



Percent NRCS 1991-2020 Median

- ≥ 150%
- 130% - 149%
- 110% - 129%
- 90% - 109%
- 70% - 89%
- 50% - 69%
- < 50%
- No basin value

Watershed Boundaries

- State Watersheds

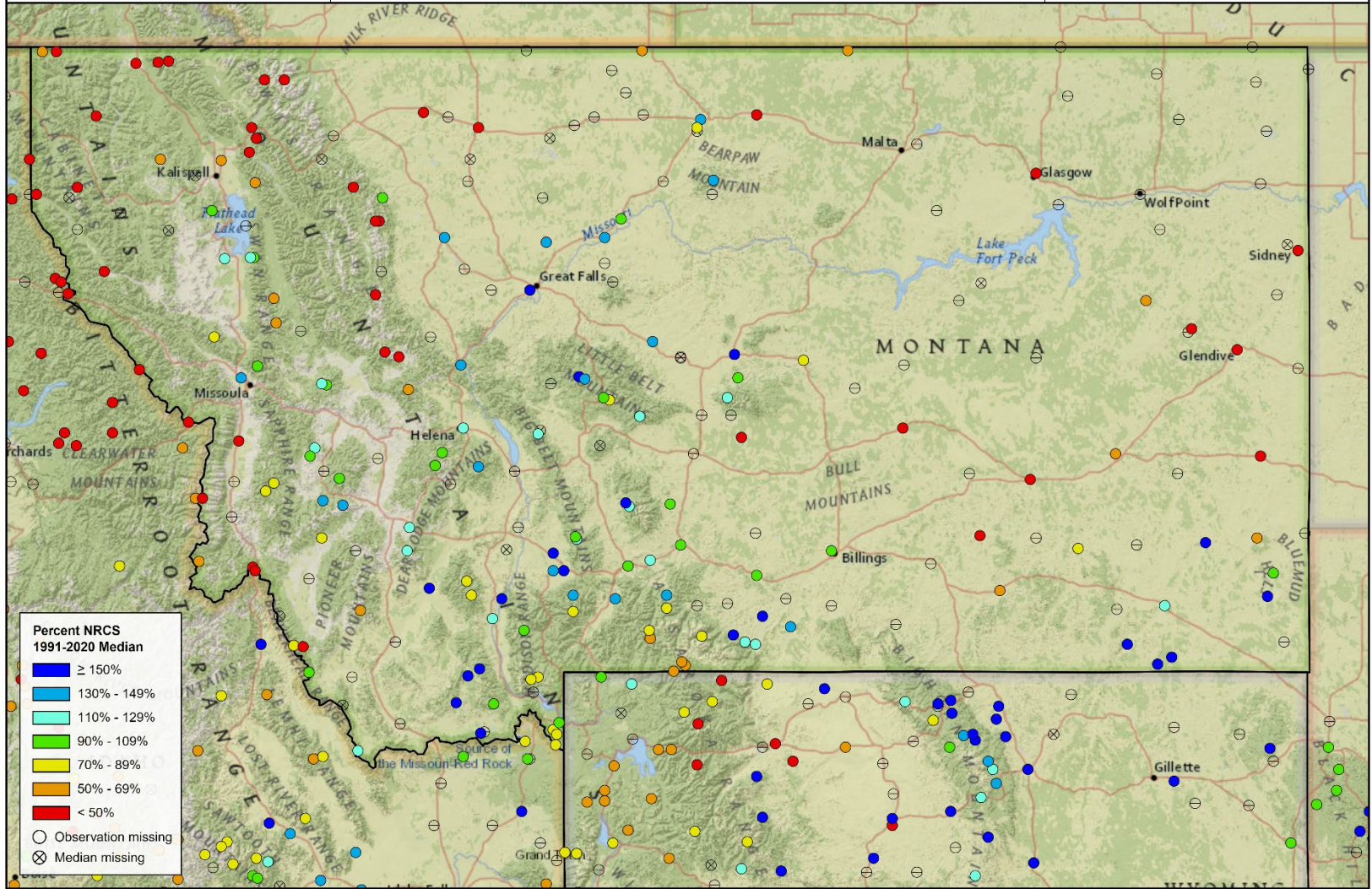


1 month Precipitation

Monthly Precipitation

Percent NRCS 1991-2020 Median

January 1, 2023 - January 31, 2023

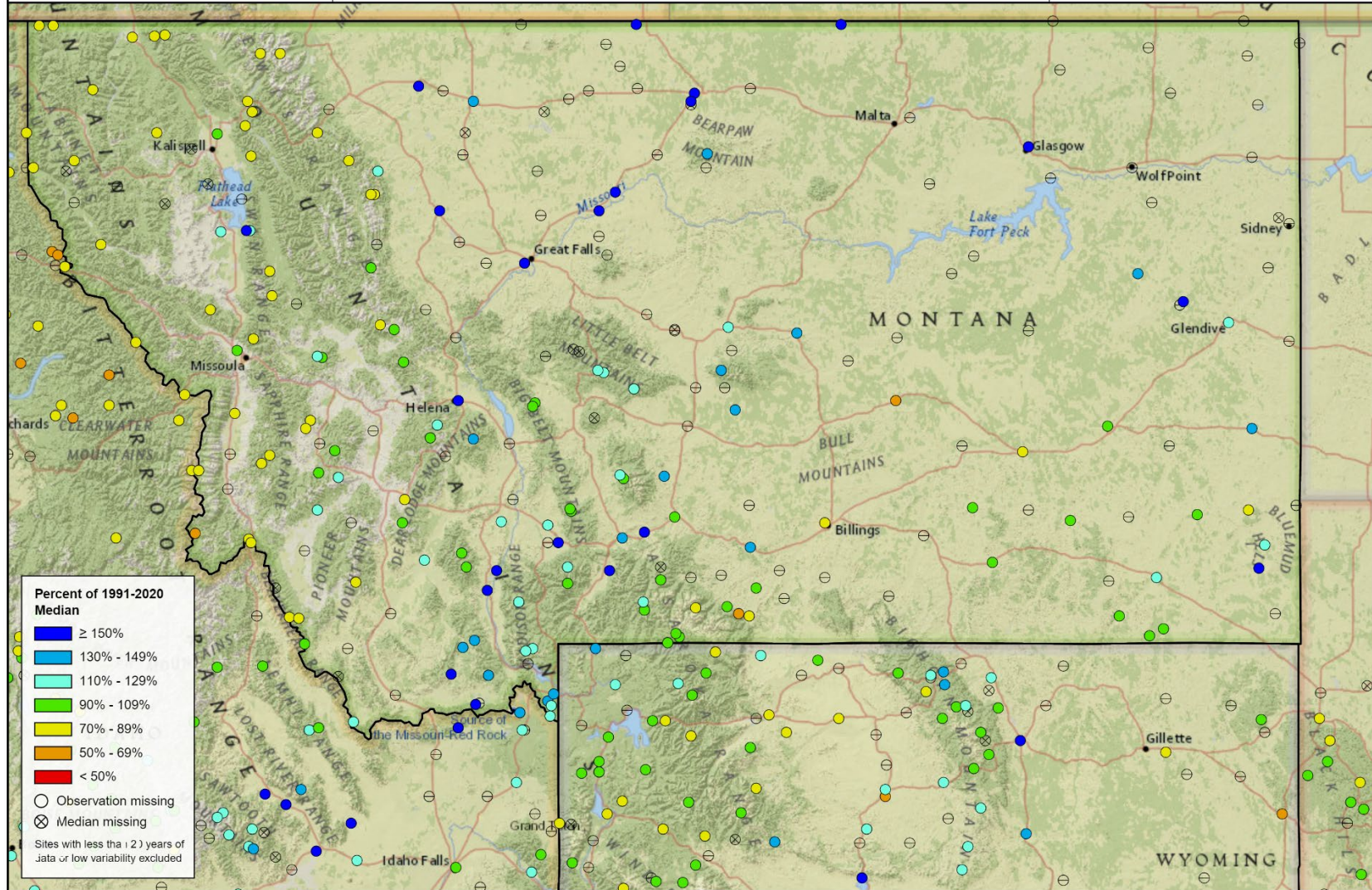


Water Year to Date Precipitation

Water Year Precipitation

October 1, 2022 - January 31, 2023

Percent of 1991-2020 Median



Snowpack

Many of Montana’s river basins experienced below normal precipitation in January and as a result snowpack percentages (snowpack compared to normal) have dropped in those basins since January 1. River basins west of the Continental Divide saw a 20-30% decrease in their snowpack percentages. January is typically a significant snowpack accumulation month in those basins, and they received well below normal precipitation last month. Montana’s only major river basins that didn’t see a decrease in their snowpack percentages include the Bighorn-Powder-Tongue, Smith-Judith-Musselshell, and Milk. All these basins received normal to above normal January precipitation. Regardless of widespread decreases in snowpack percentages, many basins built enough of a buffer in November and December and are still in good condition. [Snowpack percentages](#) are near to above normal east of the Continental Divide, except for the Rocky Mountain Front which is about 80%. West of the divide snowpack percentages are generally worse along the Idaho border at about 80 to 85%. They are slightly better in the Flathead and Upper Clark Fork River basins at about 90-95% of normal.

There is still time remaining to make up for snowpack deficits, but basins that are well below normal will ideally start recovering soon. River basins in northwest Montana have the largest deficit to recover from. High elevation SNOTEL stations in the Flathead, Kootenai, Lower Clark Fork, and Bitterroot River basins are about [5 to 7 inches of snow water equivalent](#) less than normal for February 1. While that could be recovered in a couple large storms there are only two to three months remaining to make that recovery. SNOTEL stations in the southern Madison and Gallatin River basins have a surplus of about 2 to 4 inches of snow water equivalent for February 1. The rest of Montana’s major basins are right on track and within an inch or two of normal snow water equivalent for February 1. The following table shows current basin wide snow water equivalent, compared to last year, last month, and normal peak levels:

Major Basin Snow Water Equivalent (SWE) Percentage and Peak SWE Information

Basin	Last Year SWE % Normal 2/1/2022	Last Month SWE % Normal 1/1/2023	Current SWE % Normal 2/1/2023	Normal Peak Date -	Normal Peak SWE (inches)	Current SWE (inches)	Remaining SWE to Reach Normal Peak (inches)
Bighorn	95%	108%	115%	April 20	13.9	8.6	5.3
Bitterroot	97%	100%	82%	April 6	21.4	11.6	9.8
Flathead	98%	117%	90%	April 14	26.1	15.4	10.7
Gallatin	87%	123%	109%	April 24	21.9	12.4	9.5
Helena Valley	89%	115%	110%	April 16	13.6	8.7	4.9
Jefferson	90%	112%	105%	April 18	14.9	9.5	5.4
Kootenai	112%	106%	81%	April 8	25.6	13.1	12.5
Lower Clark Fork	105%	113%	86%	April 14	31.2	16.6	14.6
Madison	94%	136%	121%	April 22	21.9	14.5	7.4
Milk	91%	159%	172%	March 26	5.4	5.4	0.0
Powder	79%	113%	114%	April 14	10.8	6.2	4.6
Smith-Judith-Musselshell	85%	119%	123%	April 16	15.4	9.6	5.8
St. Marys	105%	111%	78%	April 6	29.2	14.7	14.5
Sun-Teton-Marias	97%	121%	86%	April 16	17.1	8.0	9.1
Tongue	90%	103%	108%	April 29	13.5	7.1	6.4
Upper Clark Fork	91%	103%	95%	April 13	15.9	10.0	5.9
Upper Yellowstone	85%	111%	99%	April 23	19.1	10.5	8.6

Sub-Basin Snow Water Equivalent – Current Compared to Last Month

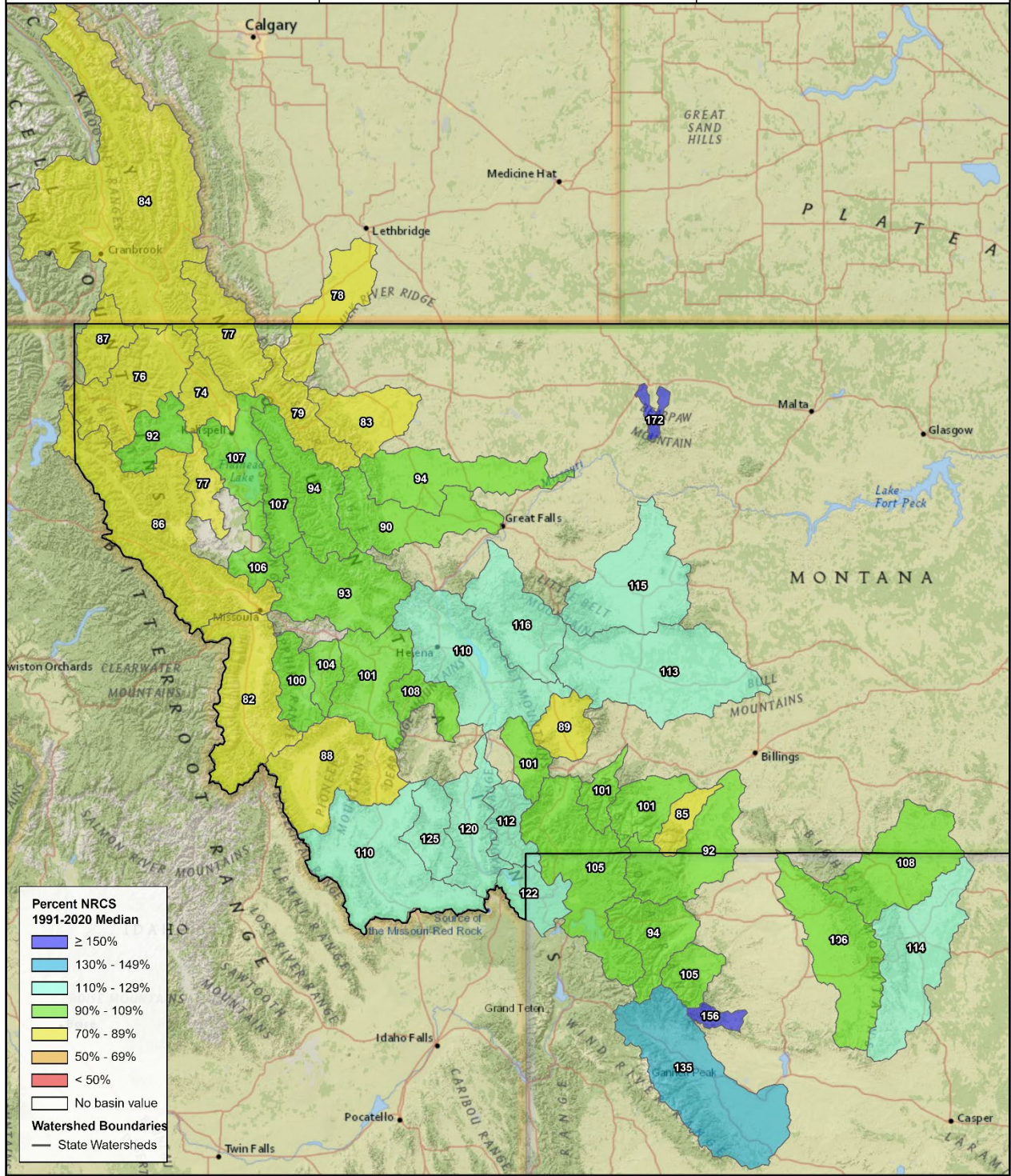
River Basin Name	January 1, 2023 SWE % Normal	February 1, 2023 SWE % Normal	SWE % Difference
Bear Paw	159%	172%	+13%
Beaverhead	118%	110%	-8%
Big Hole	102%	88%	-14%
Big Horn	99%	106%	+7%
Bitterroot	100%	82%	-18%
Blackfoot	106%	93%	-13%
Boulder (Jefferson)	103%	108%	+5%
Boulder (Yellowstone)	115%	101%	-14%
Clarks Fork Yellowstone	109%	92%	-17%
Fisher	128%	92%	-36%
Flathead Lake	133%	107%	-26%
Flint	100%	104%	+4%
Gallatin ab Gateway	131%	112%	-19%
Greybull-Wood	87%	105%	+18%
Helena Valley	115%	110%	-5%
Judith	123%	115%	-8%
Kootenai in Canada	102%	84%	-18%
Kootenai in Montana	109%	76%	-33%
Little Bitterroot	112%	77%	-35%
Lower Clark Fork	113%	86%	-27%
Madison ab Hebgen	144%	122%	-22%
Madison bw Hebgen	127%	120%	-7%
Marias	121%	83%	-38%
Middle Fork Flathead	111%	79%	-32%
Musselshell	121%	113%	-8%
North Fork Flathead	108%	77%	-31%
Northern Gallatin	104%	101%	-3%
Owl	131%	156%	+25%
Powder	113%	114%	+1%
Rock (Clark Fork)	100%	100%	+0%
Rock (Yellowstone)	87%	85%	-2%
Ruby	121%	125%	+4%
Shields	83%	89%	+6%
Shoshone	103%	94%	-9%
Smith	119%	116%	-3%
South Fork Flathead	117%	94%	-23%
Southern Flathead	127%	106%	-21%
St. Marys	111%	78%	-33%
Stillwater (Flathead)	108%	74%	-34%
Stillwater (Yellowstone)	113%	101%	-12%
Sun	120%	90%	-30%
Swan	126%	107%	-19%
Teton	121%	94%	-27%
Tongue	103%	108%	+5%
Upper Clark	99%	101%	+2%
Wind	120%	135%	+15%
Yaak	115%	87%	-28%
Yellowstone ab Livingston	121%	105%	-16%

Snow Water Equivalent

Sub-Basin Snow Water Equivalent

February 1st, 2023

Percent NRCS 1991-2020 Median

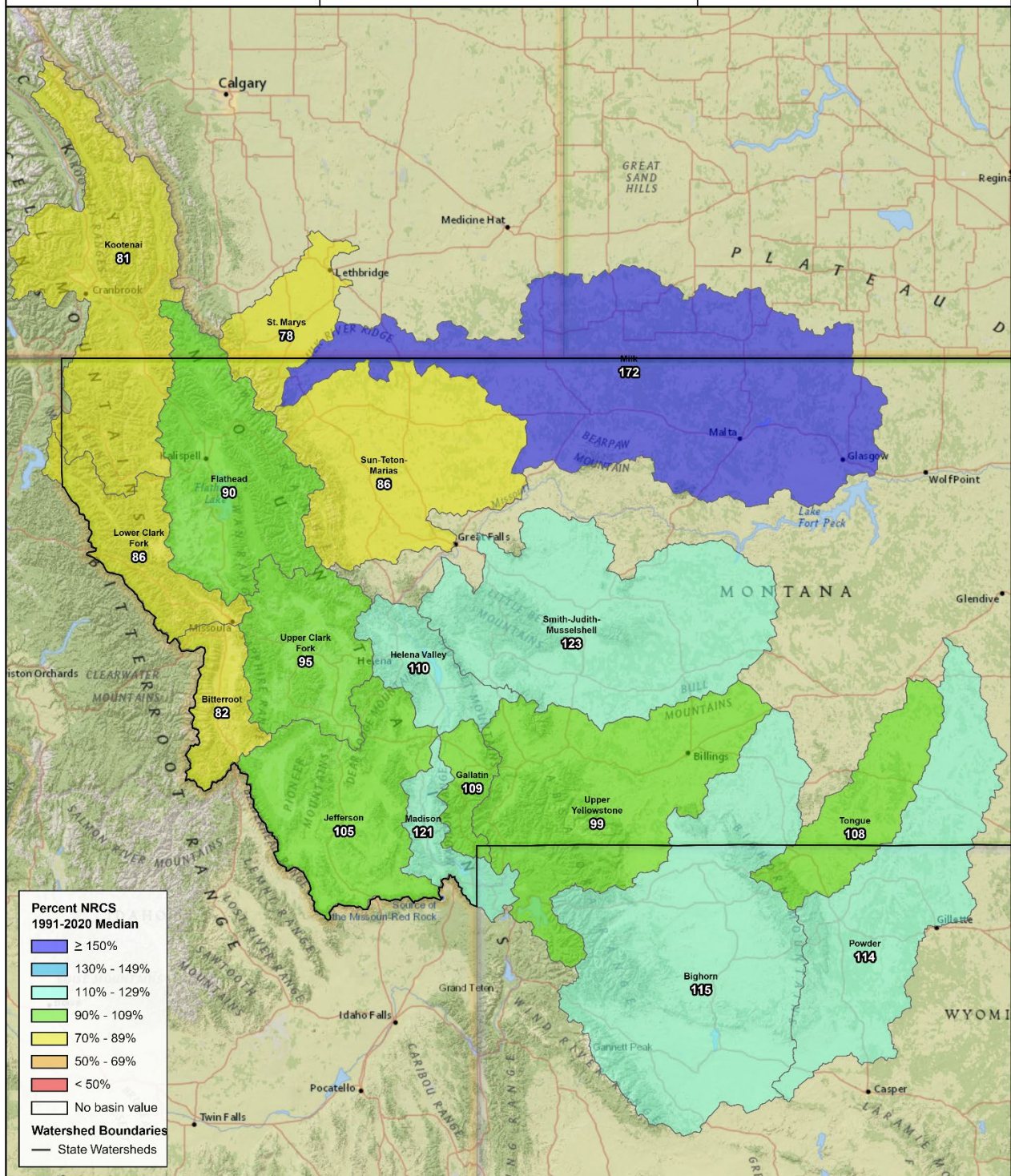


Snow Water Equivalent

Major Basin Snow Water Equivalent

February 1st, 2023

Percent NRCS 1991-2020 Median



Percent NRCS 1991-2020 Median

- ≥ 150%
- 130% - 149%
- 110% - 129%
- 90% - 109%
- 70% - 89%
- 50% - 69%
- < 50%
- No basin value

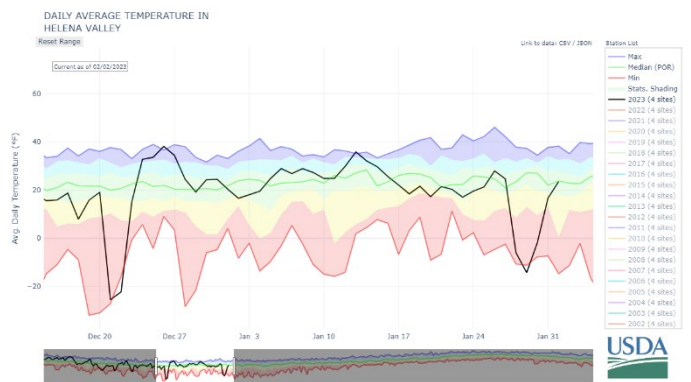
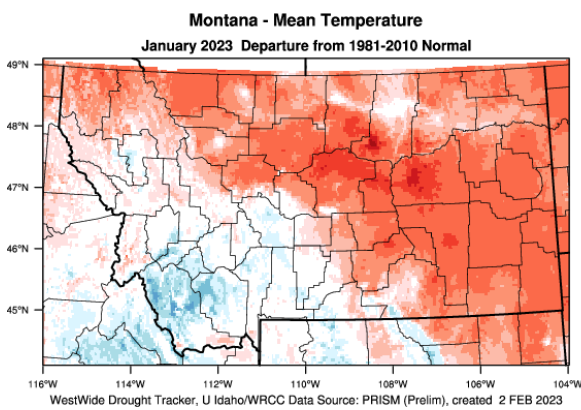
Watershed Boundaries

- State Watersheds

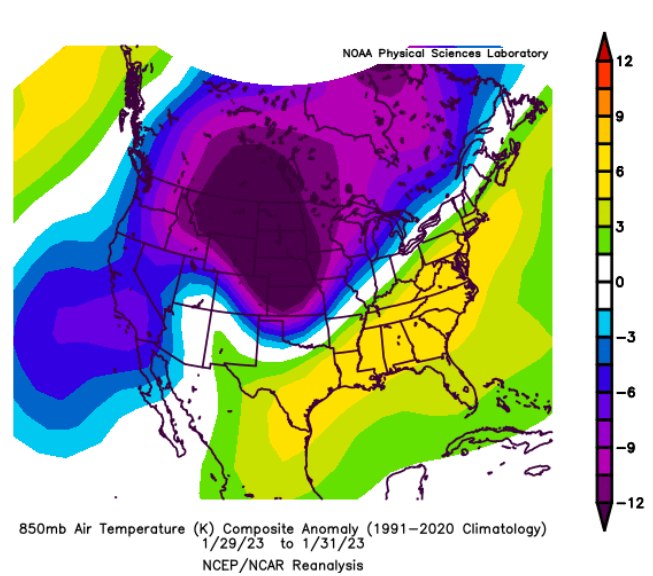
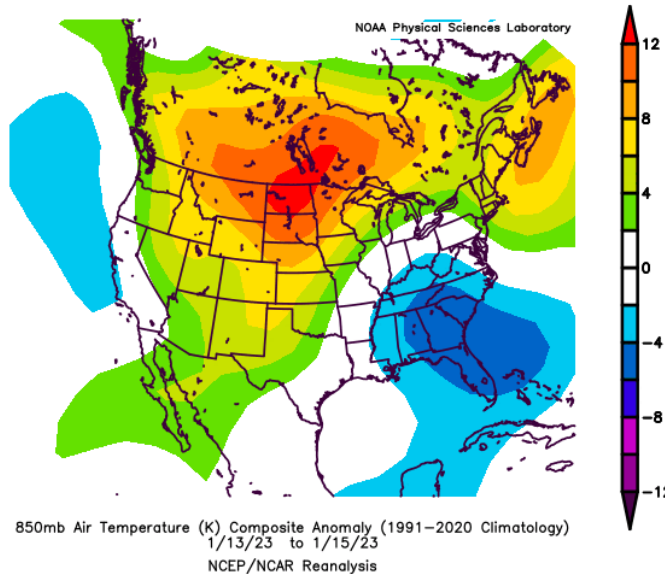


Temperature

The first month of 2023 brought a wild ride of temperature swings. After the deep freeze at the end of December, temperatures rebounded to above average for several days before leveling out to near average for the first half of January. In the middle of the month, a warming trend pushed temperatures back into the above-average range for a few days before hovering around normal until the end of the month. From January 29 to 30, another blast of Arctic air brought below average temperatures across the state, bringing temperatures well into the negatives, though not reaching quite as low as December’s freeze. It took a few days for things to warm up again and now Montana is starting February with near normal temperatures. Overall, the monthly average temperature was slightly above average for most of the state, with the exception of southwest Montana, which saw slightly below average temperatures for the month of January (below, left).



On the above plot to the right are daily average temperatures from the Helena Valley basin, which includes data from four SNOTEL stations. This pattern is very similar to what was seen across the state. Below are temperature anomalies for January 13 to 15 (left) and January 29 to 31 (right), which show the periods of warm and cold temperatures relative to normal. The January 13 to 15 warm period was 6 to 10 degrees C warmer than normal in Montana, and the January 29 to 31 warm period was 10 or more degrees C below normal.



Reservoirs

February 1 reservoir storage levels are similar to last month across Montana. Bair, Gibson, Como, Sherburne, Lima, Nelson, Nilan, and Willow Creek Reservoir are well below normal for this time of year. Helena Valley, Mystic Lake, Painted Rocks, Ruby River, and Tongue River Reservoir are well above normal for this time of year. All other reservoirs are near normal for this time of year.

Reservoir Storage – Current Compared to Last Month and Last Year

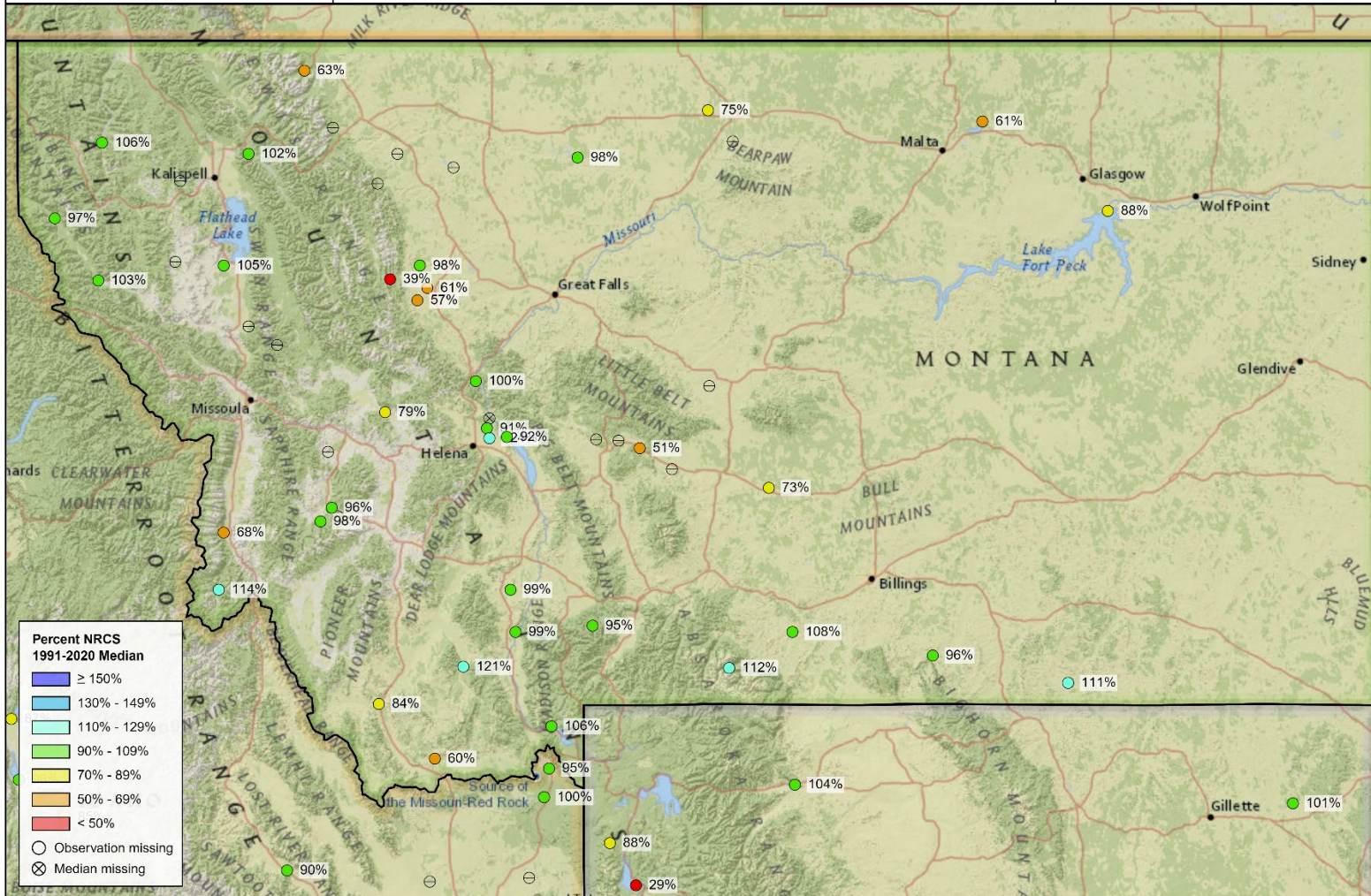
Reservoir	% of Median (1991-2020)		
	February 1, 2023	January 1, 2023	February 1, 2022
Ackley Lake	na	86%	82%
Bair Res	51%	54%	77%
Bighorn Lake	96%	94%	96%
Canyon Ferry Lake	92%	89%	85%
Clark Canyon Res	84%	82%	74%
Cooney Res	108%	108%	112%
Deadman's Basin Res	73%	71%	71%
East Fork Rock Creek Res	98%	97%	100%
Ennis Lake	99%	109%	100%
Flathead Lake	105%	97%	98%
Fort Peck Lake	88%	85%	93%
Fresno Res	75%	76%	64%
Georgetown Lake	96%	94%	94%
Gibson Res	39%	41%	60%
Hebgen Lake	106%	105%	90%
Helena Valley Reservoir	124%	125%	116%
Holter Lake	100%	100%	100%
Hungry Horse Lake	102%	98%	115%
Lake Como	68%	68%	119%
Lake Elwell (Tiber)	98%	98%	101%
Lake Frances	na	69%	111%
Lake Helena	91%	90%	91%
Lake Koocanusa	106%	108%	84%
Lake Sherburne	63%	60%	175%
Lima Reservoir	60%	58%	71%
Middle Creek Res	95%	97%	94%
Mystic Lake	112%	133%	138%
Nelson Res	61%	60%	63%
Nevada Creek Res	79%	79%	85%
Nilan Reservoir	57%	na	76%
Noxon Rapids Reservoir	97%	100%	99%
Painted Rocks Lake	114%	112%	133%
Pishkun Res	98%	98%	97%
Ruby River Reservoir	121%	126%	93%
Smith River Res	na	68%	na
Swift Res	na	89%	70%
Thompson Falls Res	103%	104%	101%
Tongue River Res	111%	104%	103%
Willow Creek Res (Harrison)	99%	108%	87%
Willow Creek Res - Augusta	61%	61%	80%

Reservoir Storage

Reservoir Storage

Percent NRCS 1991-2020 Median

February 1st, 2023



Drought Status

The most recent National Drought Monitor map, released on February 2, 2023, shows that 95% of Montana is under drought designation. Last year on February 1, 92% of the state was under drought designation. While much of the state is still under drought status, the class designation (D0-D4) improvement has been significant. Currently only 11% of the state is designated D3 (0% D4), while last year on February 1, 46% of Montana was classified under D3-D4 (Extreme-Exceptional Drought). Since last month, parts of northwest Montana and southcentral Montana have been downgraded from D0 to D1.

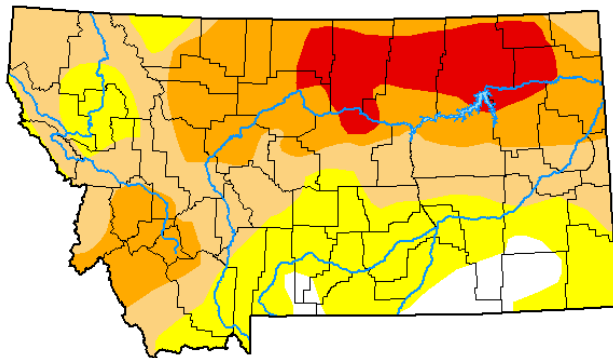
If you want more information about drought conditions or need assistance due to drought, the links below can help you gather information and provide information for contacting appropriate agencies.

Drought Links:

- [U.S. Drought Monitor](#)
- [National Integrated Drought Information System](#)
- [USDA Drought Portal \(News and Resources\)](#)
- [Farm Services Agency Montana News Releases \(Information on Programs and Deadlines\)](#)
- [Farm Services Agency Disaster Assistance Programs](#)
- [Montana Department of Natural Resources and Conservation Drought Management](#)

U.S. Drought Monitor Montana

January 31, 2023
(Released Thursday, Feb. 2, 2023)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	4.81	95.19	67.78	37.00	10.80	0.00
Last Week 01-24-2023	4.81	95.19	59.89	37.00	10.80	0.00
3 Months Ago 11-01-2022	10.43	89.57	74.32	41.97	15.61	0.00
Start of Calendar Year 01-03-2023	8.71	91.29	59.92	36.33	10.80	0.00
Start of Water Year 09-27-2022	5.40	94.60	77.46	45.05	12.35	0.00
One Year Ago 02-01-2022	8.15	91.85	89.22	85.89	45.54	7.64

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate 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>

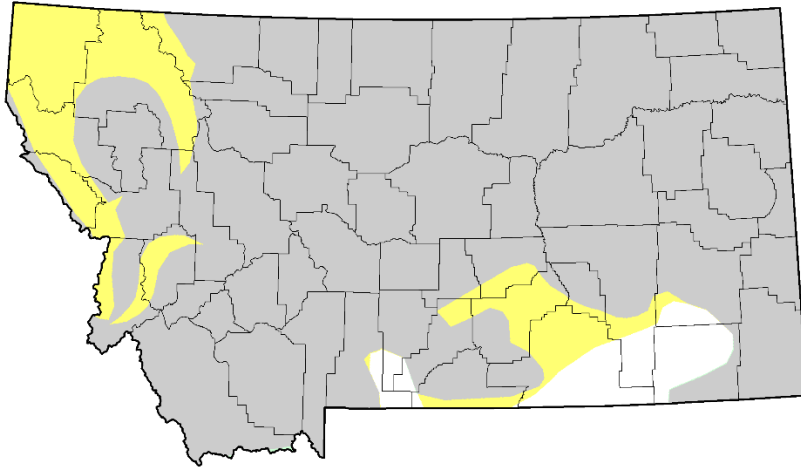
Author:

Rocky Bilotta
NCEI/NOAA



droughtmonitor.unl.edu

U.S. Drought Monitor Class Change - Montana
4 Week

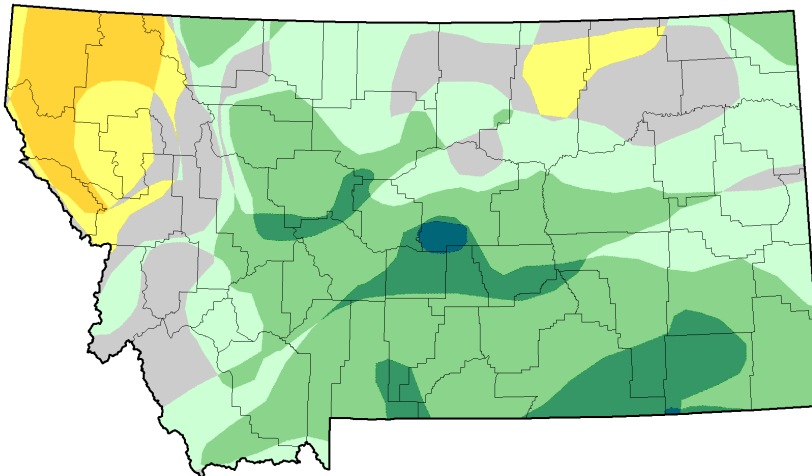


- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

January 31, 2023
compared to
January 3, 2023

droughtmonitor.unl.edu

U.S. Drought Monitor Class Change - Montana
52 Week



- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

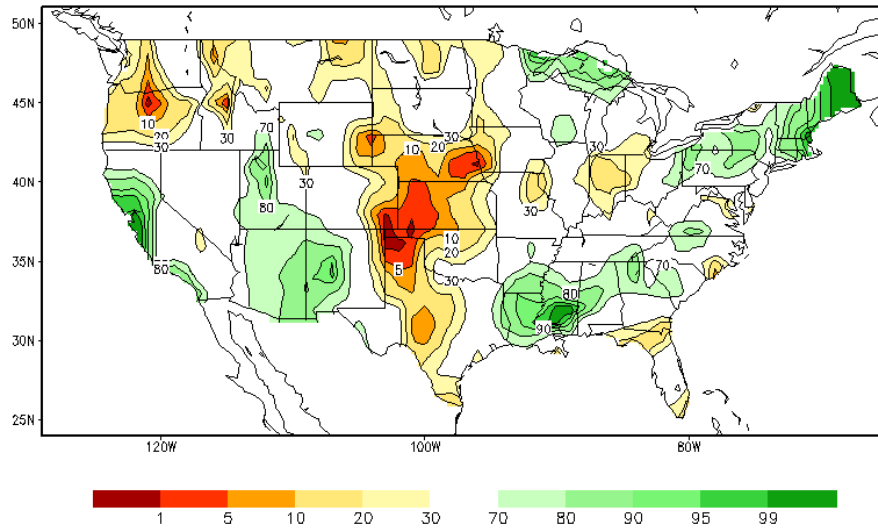
January 31, 2023
compared to
February 1, 2022

droughtmonitor.unl.edu

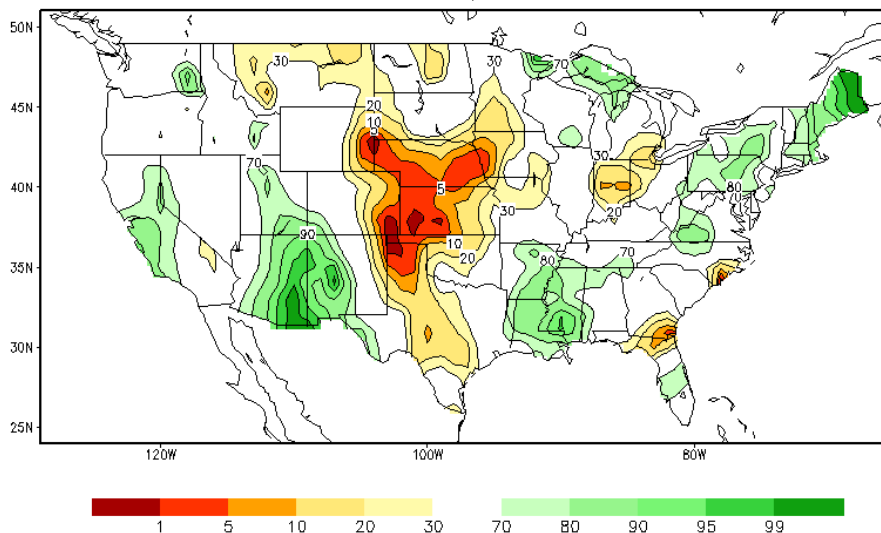
Soil Moisture

Modeled soil moisture for February 2, 2023, in Montana ranges from the 50th percentile (normal) to about the 10th percentile (less than normal). Soil moisture percentiles are lowest in northwest Montana and northeast Montana, while soil moisture percentiles in central Montana and southeast Montana are near normal (50th percentile). Modeled soil moisture has decreased from last month in northwest and northeast Montana, but it has increased slightly in northcentral and southwest Montana.

Calculated Soil Moisture Ranking Percentile
FEB 02, 2023



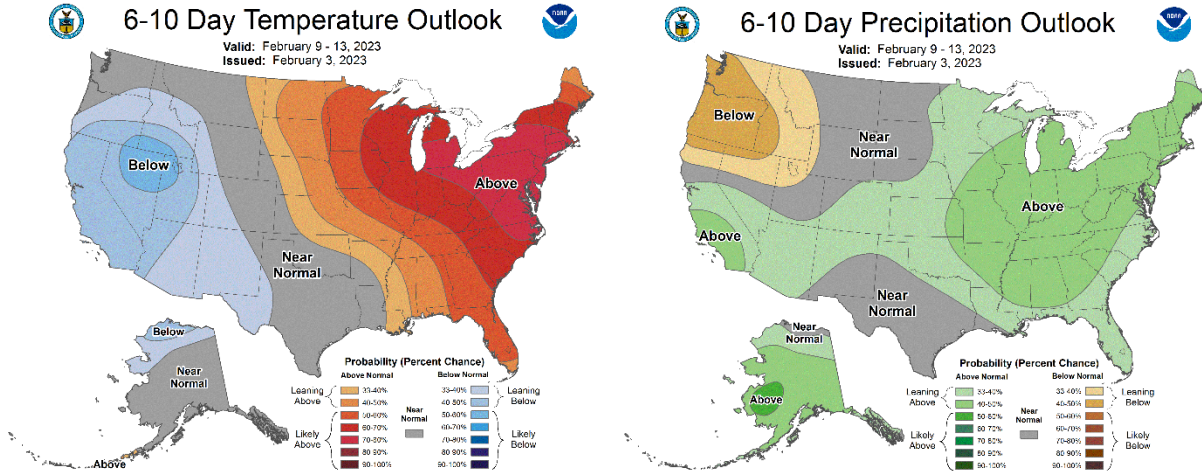
Calculated Soil Moisture Ranking Percentile
JAN 03, 2023



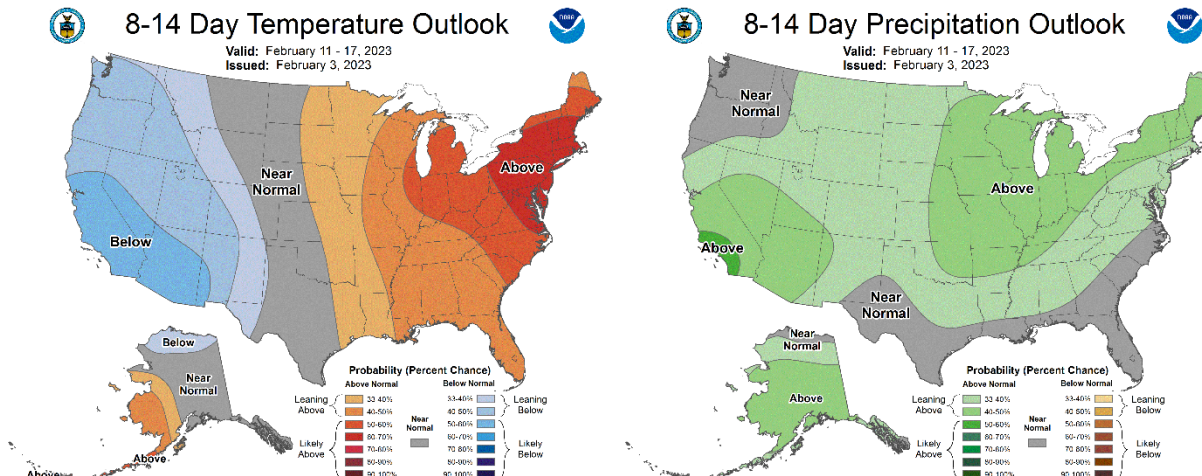
Weather and Climate Outlook

Outlooks from [NOAA's Climate Prediction Center](https://www.noaa.gov/climate-prediction-center) indicate near-to-below normal temperature and near-to-above normal precipitation is likely over the next couple weeks across Montana. The 1-month outlook indicates below normal temperatures are likely in western Montana and above normal precipitation is likely across all of Montana. The 3-month outlook indicates below normal temperatures and above normal precipitation.

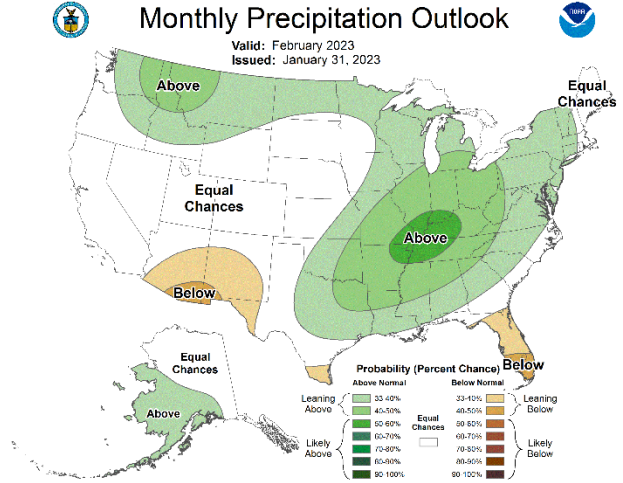
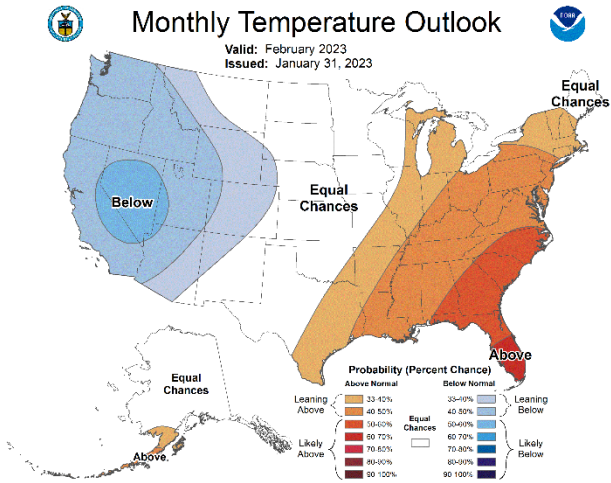
6-10 Day Outlook



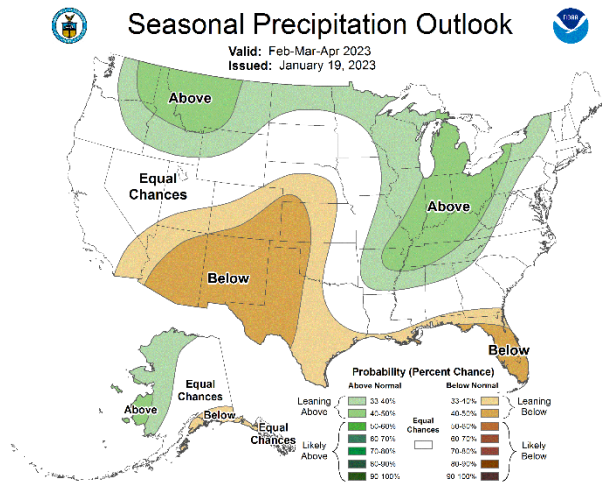
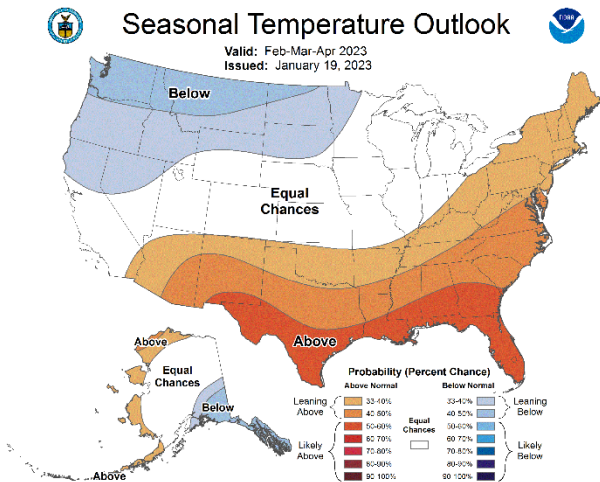
8-14 Day Outlook



1 Month Outlook



3 Month Outlook



Water Supply Outlook Report - Webpage Access

The following links will take you to Snow Survey webpages dedicated to Montana's major river basins and a statewide overview. Various water supply related maps are available using the drop-down menus. Hover over and click on points or basins of interest to view data and charts.

Monthly Data - Interactive Web Pages		
<i>Monthly Data - Statewide Overview</i>		
<u>Monthly Statewide Overview</u>		
<i>Monthly Data - River Basin Summaries</i>		
Columbia River Basin	Missouri River Basin	Yellowstone River Basin
<u>Kootenai</u>	<u>Jefferson</u>	<u>Upper Yellowstone</u>
<u>Flathead</u>	<u>Madison</u>	<u>Bighorn-Powder-Tongue</u>
<u>Upper Clark</u>	<u>Gallatin</u>	
<u>Bitterroot</u>	<u>Helena Valley</u>	
<u>Lower Clark</u>	<u>Smith-Judith-Musselshell</u>	
	<u>Sun-Teton</u>	
	<u>St. Mary</u>	
	<u>Milk</u>	

Links and Resources

The following links will take you to the external (non-NRCS) resources used in this report:

Precipitation

- [PRISM Climate Group – Oregon State University](#)
- [West Wide Drought Tracker](#)
- [Montana Climate Office – University of Montana](#)
 - [Drought Indicator Dashboard](#)

Temperature

- [West Wide Drought Tracker](#)
- [NOAA NWS – Climate Offices](#)

Drought Information

- [Montana | U.S. Drought Monitor \(unl.edu\)](#)
- [Outlooks | U.S. Drought Monitor \(unl.edu\)](#)
- [Montana | Drought.gov](#)

Soil Moisture

- [USDA – National Agricultural Statistics Service – National Crop Progress](#)
- [NOAA NWS Climate Prediction Center - Calculated Soil Moisture Ranking Percentiles](#)

Current Streamflow

- [USGS WaterWatch -- Streamflow conditions](#)

Weather and Climate Predictions

- [Climate Prediction Center \(noaa.gov\)](#)

Issued by:

Terry Cosby

Chief

Natural Resources Conservation Service

U.S. Department of Agriculture

Released by:

Tom Watson

State Conservationist

Natural Resources Conservation Service

Bozeman, Montana

Report Created by:

Montana Snow Survey Staff

10 East Babcock St, Room 443

Bozeman, MT 59715

mt-nrcs-snow@usda.gov



**Montana
Water Supply Outlook
Report**
Natural Resources Conservation Service

