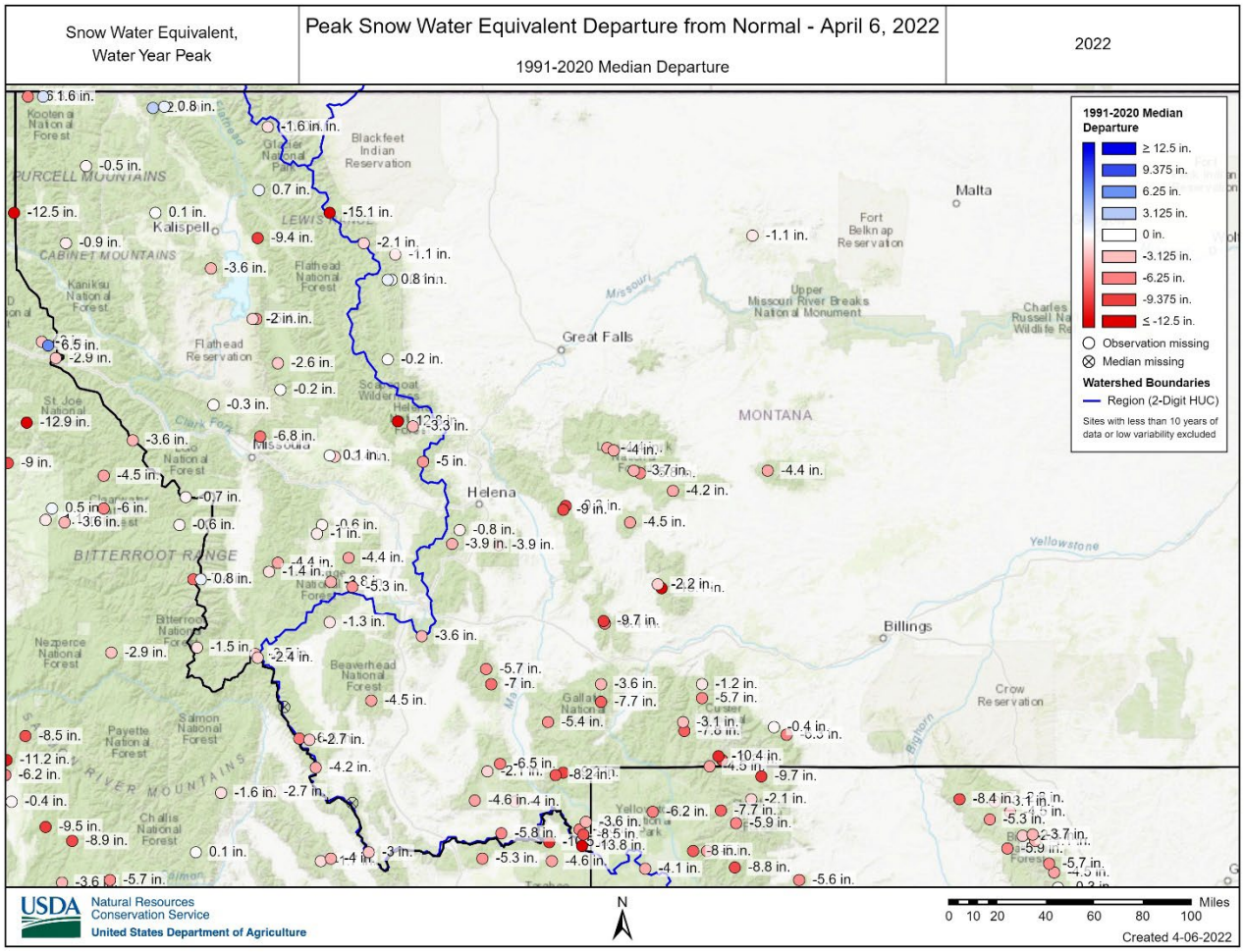
USDA
United States Department of Agriculture

Natural Resources
Conservation Service

Montana
Water Supply Outlook Report
April 1, 2022



March did not bring a much-needed shift to active weather patterns and the resulting benefit to our mountain snowpack. Snowpack percentages have decreased from last month and basin-wide percentages are currently below normal in every major basin in the state. The map above shows how many inches of snow water equivalent (SWE) are needed at each SNOTEL site to reach normal peak SWE totals. The snowpack for most locations in Montana peaks in mid to late April. There are still a couple of weeks left for the mountains to recover these deficits but adding 10 inches of SWE to the snowpack in that amount of time is unlikely.

For more water supply information, contact:

USDA-NRCS Montana Snow Survey Staff
10 East Babcock, Room 443
Bozeman, MT 59715
MT-nrcs-snow@usda.gov
https://www.nrcs.usda.gov/wps/portal/nrcs/mt/snow/

Operational News

Lack of Snow Creates Access Challenges for April 1 Manual Snow Surveys

There are 123 USDA-NRCS cooperative snow courses scheduled to be measured during April 1 surveys in the region covered by the Montana Data Collection Office. Some of these snow courses are only measured on April 1 because it is near the timing of when the snowpack typically peaks. Surveying snow in the spring can bring challenges. Some years are more difficult than others. Frequently the challenges are related to lack of snow left on May 1 or June 1 but this year those challenges presented themselves during many of the April 1 surveys.

Riding dirt while accessing Foolhen Snow Course during April 1 surveys

Many snow courses are located far from where you can get a truck and therefore accessed using snowmobiles. This year April 1 snowmobile access was exceptionally difficult in many locations. One example was Foolhen Snow Course located in the Pioneer Mountains near Wise River. Ideally the snowmobiles are unloaded at the main highway, and the road/trail is snow covered all the way to the snow course. Due to lack of snow this year there was an extra-long snow free section of road past a long section of snow-covered road that the truck couldn't be driven down. As a result, the snowmobiles had to be driven across dirt for several hundred yards to reach more snow. Although not ideal, that was a short enough distance of dirt that the snowmobiles did not overheat and data from the Foolhen snow course was successfully collected. That was not the case for several other snow courses. Surveyors attempting to access Nez Perce Creek snow course located in the Boulder Mountains northeast of Butte were not so lucky. A snow drift with vehicle already stuck in it blocked the access and a stretch of dirt too long to ride a snowmobile across resulted in a missed survey.

When a snow course cannot be accessed the data can potentially be estimated, however estimating can be tricky especially for snow courses that are only measured once a year. Generally, snow course estimates are avoided unless requested by a water user or if it is a critical input to a particular streamflow forecast. In either case, the estimate will not always be included in the long-term dataset. No snow course estimates were made for April 1 this year, however the table to the right lists the snow courses that were not surveyed this year due to lack of snow on the trail or road.

Snow Course	Mountain Range	Number of Successful April 1 Surveys	Number of Unsuccessful April 1 Surveys
Eagle Creek	Crazy	58	3
Forest Lake	Crazy	59	2
Haymaker	Little Belt	54	7
Nez Perce Creek	Boulder	55	6

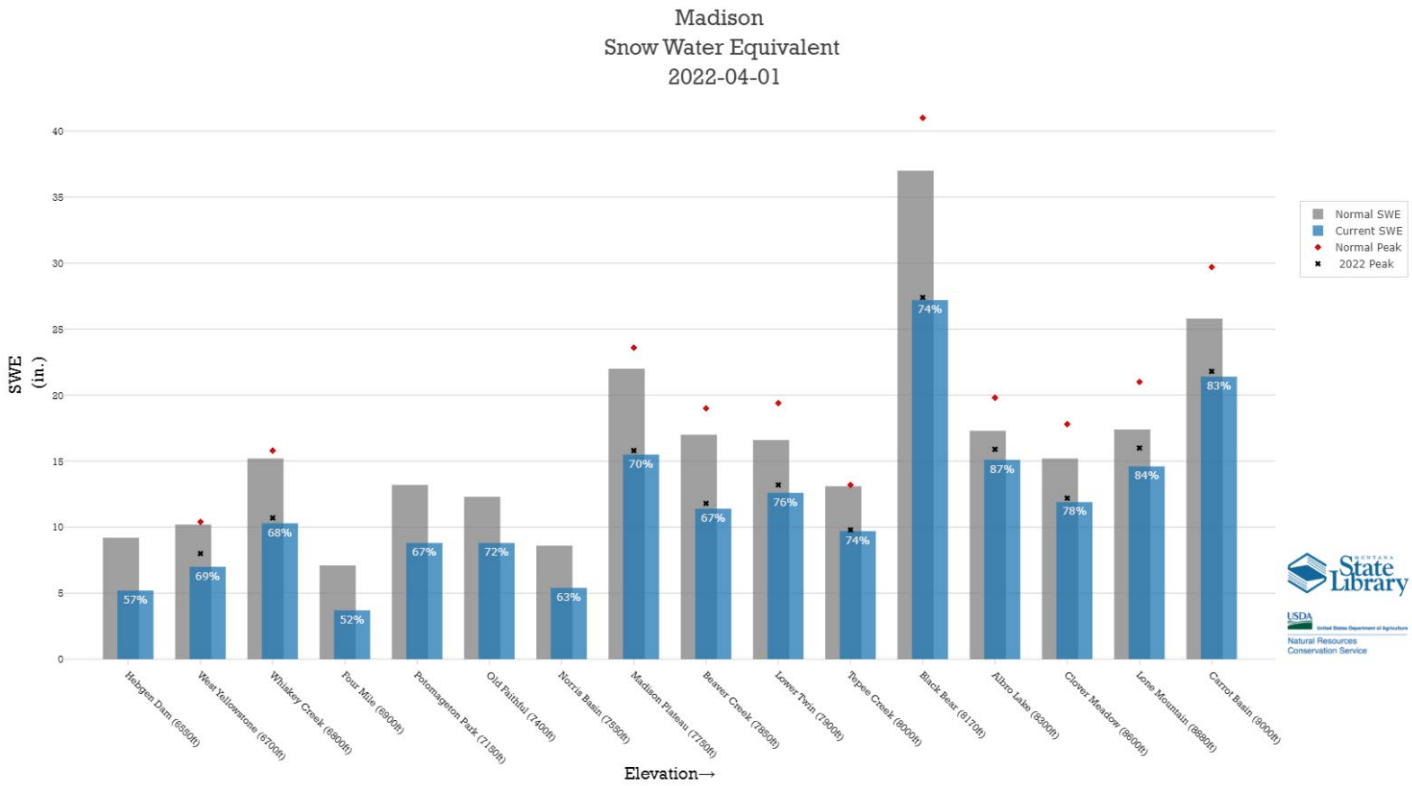
Unsuccessful April 1, 2022, Snow Course Surveys

Snow Survey Product Highlight

Viewing Snowpack (Snow Water Equivalent) Data by Elevation

A basin wide percentage often doesn't provide the full picture of what is happening with the snowpack in a river basin or region. This season is a great example of the need for more in-depth information. While the percentages have decreased over the last month, they don't fully reflect the conditions that anyone who has visited the mountains recently has observed. Across the state the snowpack at low and mid elevations is severely depleted. The Snow Water Equivalent (SWE) Elevation Plots developed through a collaboration between NRCS Montana Snow Survey Program and the Montana State Library are a simple yet effective way to view snowpack information by elevation.

The SWE Elevation Plots, as shown below for the Madison river basin, are available on a monthly and daily basis for all major river basins in Montana and northern Wyoming. The monthly plots include snow course data while the daily plots only include SNOTEL data.



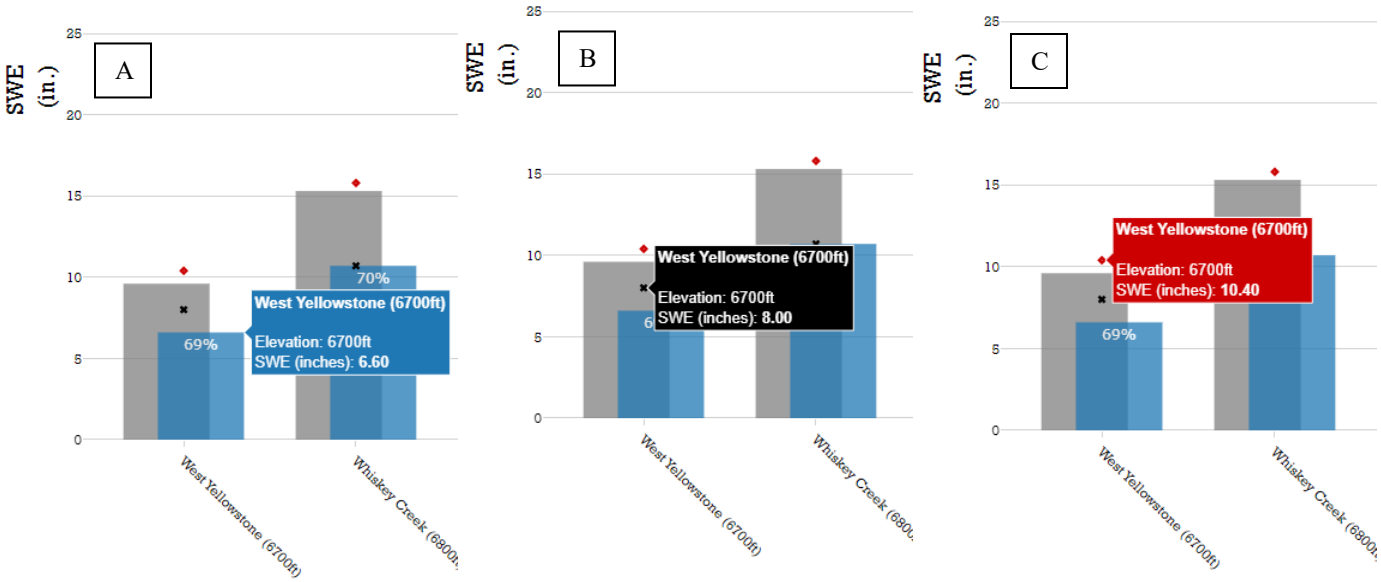
In the above plot (click on it to view a larger image in your web browser) current SWE data in inches (blue bars) for each snow course and SNOTEL site in the basin are compared to normal SWE (gray bars) for the specific date. The current percent of normal for each station is also displayed on the blue bars. The stations are arranged by elevation, lowest on the left to highest on the right. The elevations of the specific sites are also listed in the labels on the x-axis.

From this plot it's easy to see that the snowpack is below normal across the entire basin and that the upper elevations are closer to normal, in the 75-85% range while the lower elevations are much below normal in the

50-70% range. One benefit of looking at the monthly plots instead of the daily is the addition of snow courses which generally adds data points at the lower and mid elevations.

These plots also provide information on how current SWE totals stack up to the peak SWE for the season as well as the normal peak SWE for a station. The images below show the plot zoomed in on the Carrot Basin SNOTEL site located in the Taylor Fork of the Gallatin River. If you hover over the blue bar, the site name, elevation, and SWE (inches) is displayed (A). The black dot on the plots indicates the current peak SWE value for each station; if you hover over it the value in inches is displayed (B). The red dot is the normal peak SWE value for each station or the maximum SWE that each station records in a "typical" year. If you hover over the dot the value for the normal peak SWE is displayed (C).

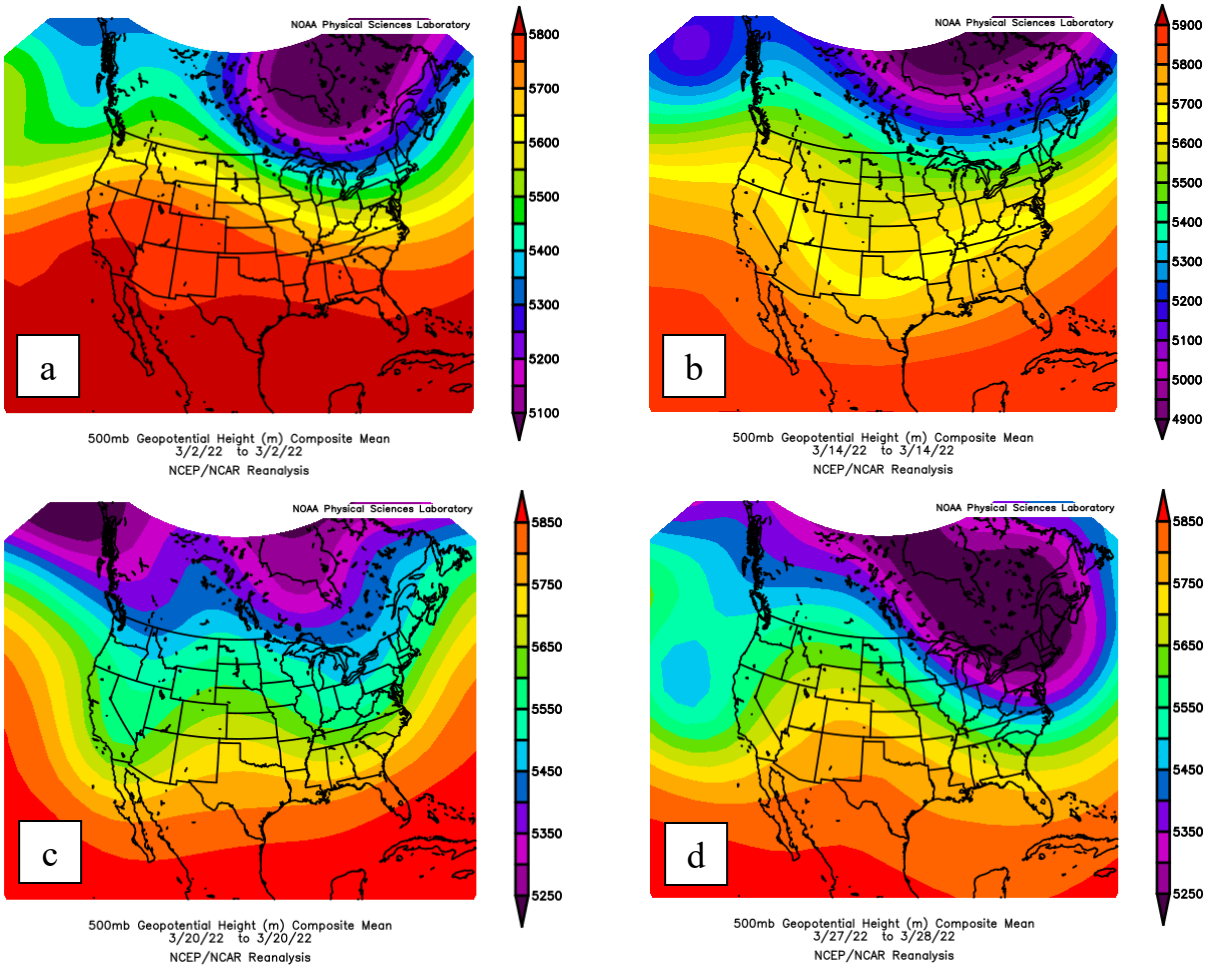
For Carrot Basin SNOTEL, as of April 6, current SWE and peak SWE for this season are the same, which suggests that snow is still accumulating at the site, and it has not reached its seasonal peak. For lower elevation sites this may not be the case. The images below show the same information for the West Yellowstone SNOTEL site located near the west entrance to Yellowstone National Park at 6700 feet of elevation. On April 6, the current SWE value was 6.6 inches (A) but the peak SWE for the 2022 season is 8.0 inches (B). This site has most likely already hit its peak snowpack for the season. If you compare it to the normal peak of 10.4 inches (C) you can see that it only reached 77% of the typical maximum value for the season!



Weather and Climate

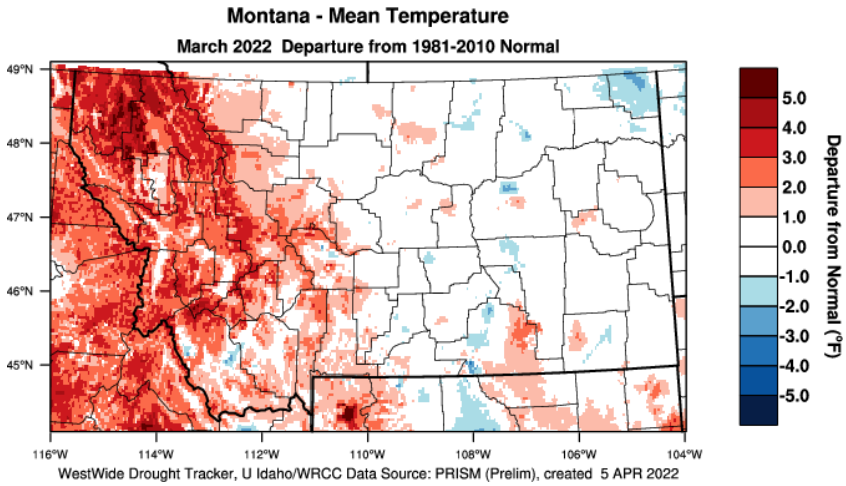
Circulation Patterns

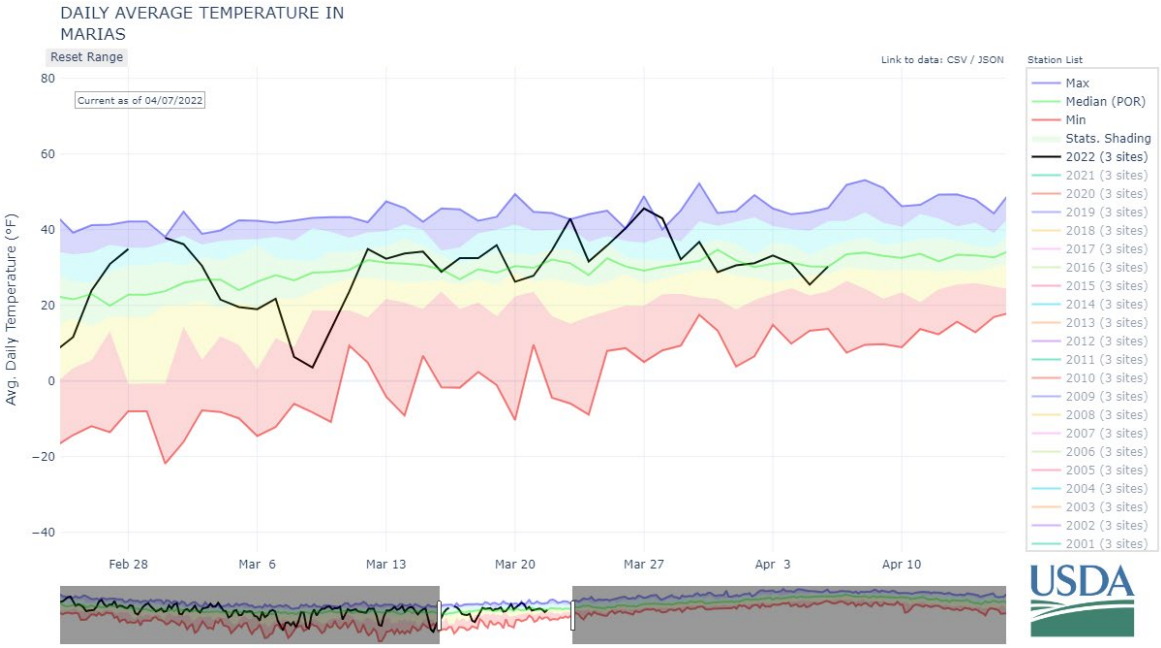
March brought a variety of spring weather patterns that resulted in incremental increases in snow and precipitation throughout the month. The timing of snow and precipitation across Montana often varies by region because of the way topography interacts with circulation patterns that carry moisture and thermal air masses, and that was certainly true in March. The three circulation maps below correspond to increases in snow and precipitation in different regions: (a) the Rocky Mountain Front, which received up to an inch or more of precipitation – much of it falling as rain – on March 2 when west/northwest flow delivered moisture, (b) the far corner of northwest Montana received 0.5”-1” of SWE and up to 6” of snow depth on March 14 due to westerly flow bringing moisture from the Pacific, and (c) southwest Montana and Wyoming mountain ranges received an influx of snow on March 20, benefitting from a southerly-dipping low pressure center that brought cool temperature from the north and moisture from the Gulf. The fourth circulation map (d) shows upper-level circulation patterns for March 27 and 28, which brought unseasonably warm temperatures to the region with strong southwesterly flow.



Temperature

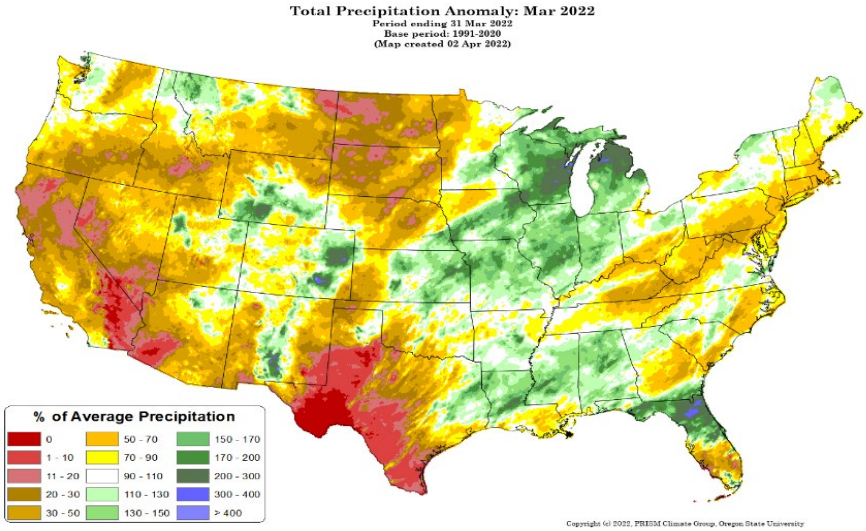
Overall, average March temperatures were above normal for mountainous western Montana, in some cases significantly so (map to right). East of the Rocky Mountain Front, monthly average temperatures were close to normal in March and were some of the most consistently "normal" temperature ranges all season. There was only one notable cold snap on March 8-9, and maximum temperatures were only slightly higher than normal toward the end of the month (below, daily average temperatures in Marias Basin).





Precipitation

March precipitation was well below normal across most of Montana. Exceptions were northwest Montana and the northern Rocky Mountain Front, which received near to above normal precipitation. Most of that region's precipitation occurred during the first week of March, and unfortunately minimum daily temperature were above freezing, and it rained at all but the highest elevations. For example, Emery Creek SNOTEL (4350 ft), near West Glacier, received 2.4 inches of rain during the first week. Higher elevations in Glacier National Park, such as Flattop Mountain SNOTEL (6300 ft), received 4.4 inches of mixed precipitation (rain/snow) during that storm.



March 2022 Total Precipitation Anomaly. CONUS. Courtesy Prism Climate Group, Oregon State University

Basins east of the Continental Divide, excluding the northern Rocky Mountain Front, received well below normal precipitation in March. Central to south central Montana only received slightly more than half of normal monthly accumulation and a handful of stations in that region recorded record low March precipitation.

Precipitation totals from mid-January to current are below normal for all basins in Montana. Southwest Montana and the Bighorn River basin fared

the worst. Many stations in that region recorded record low precipitation for that 86 day period. Water year to date precipitation (since October 1) is not as grim, which is primarily a result of the significant precipitation received in December and rain received in October-November. More precipitation is needed across Montana right now and over the next 3 months, particularly before the drier summer months arrive.

Snowpack

March didn't bring the significant increase to the snowpack that was needed. Statewide, most snowpack percentages decreased for the third consecutive month. Snow water equivalent (SWE) did increase since last month at most snow courses and SNOTEL sites, however the accumulation was less than normal in most regions. Northwest Montana received a significant storm early in March, however much of it was rain. Deeper snowpacks had enough cold content to withstand the rain and saw increases, while the shallower low elevation snowpack started to melt and SWE decreased. The current statewide snowpack is below normal. In northwest Montana and the northern Rocky Mountain Front, it is below but near normal, while the rest of the state is well below normal.

Normal snowpack peak dates range from early to late April in the mountains of northwest Montana and from mid-April to early May in southwest and central Montana. This year factors such as warmer than normal temperatures, sunny days, and rain on snow have driven much of the mid to low elevation snowpack into early and rapid melt. It is still likely that high elevation snow will continue to accumulate, but unless a major weather pattern change occurs, low and mid elevations have likely already peaked. If that's the case then many of these peaks occurred 2-3 weeks early at well below normal levels.

When comparing the current statewide snowpack percentages to recent years it somewhat resembles 2015, 2010, 2007, 2005, 2001. There are some exceptions. For example, northwest Montana currently has higher snowpack percentages than any of those years. Also worth noting is that while the April 1 snowpack is a good indicator of future water supply, many other antecedent conditions and future weather are a large component too. There is a small amount of time remaining to make up for current snowpack deficits, but near record snowfall in April will be required in many locations. Table 1 shows the current snowpack and how it compares to normal peak values at various SNOTEL sites. Recent years with record setting April snow accumulation were 2011 and 2017. If miraculously April does provide record snowfall, it is still unlikely the snowpack outside of northwest Montana and the northern Rocky Mountain front will make a full recovery.

SNOTEL Site	Mountain Range	Elevation (ft)	April 1, 2022 SWE*	Median Peak SWE*	SWE* Needed to Reach Median Peak	Median Peak SWE* Date	Record April SWE Increase*	Year of Record
Savage Pass	Bitterroot	6190	24.6	27	2.4	17-Apr	5.3	2011
Flattop Mtn.	Lewis	6300	44.1	47.2	3.1	30-Apr	11.2	2011
Onion Park	Little Belt	7410	11.0	15.6	4.6	25-Apr	6.6	2011
Crystal Lake	Big Snowy	6050	9.7	14.7	5	18-Apr	8.6	1991, 2011
Warm Springs	Flint Creek	7800	19.4	24.4	5	4-May	8	2011
Deer Park	Wind River	9700	10.6	16.6	6	24-Apr	9.3	1999
Cloud Peak Res.	Bighorn	9860	11.8	18	6.2	4-May	8.4	1999
Clover Meadow	Gravelly	8600	11.9	18.7	6.8	2-May	6.7	2017
Hawkins Lake	Purcell	6450	22.5	29.5	7	22-Apr	8.9	2011
Darkhorse Lake	Beavehead	8945	25.1	32.2	7.1	6-May	8	2011
Togwotee Pass	Absaroka	9580	17.7	26.6	8.9	2-May	8.3	2011
Noisy Basin	Swan	6040	36.9	47.2	10.3	24-Apr	14.5	2017
Brackett Creek	Bridger	7320	14.0	24.6	10.6	24-Apr	6.1	2011
Fisher Creek	Beartooth	9100	25.4	37	11.6	4-May	8.5	2011

*Snow Water Equivalent. Median based off 1991-2020 data

April 1 snow water equivalent data for select SNOTEL sites.

Basin-wide Snow Water Equivalent – March 1, 2022 vs. April 1, 2022

River Basin Name	March 1 SWE % Normal	April 1 SWE % Normal	SWE % Change
Bear Paw	79%	22%	-57%
Beaverhead	82%	71%	-11%
Big Hole	87%	79%	-8%
Big Horn	85%	81%	-4%
Bitterroot	95%	83%	-12%
Blackfoot	87%	73%	-14%
Boulder (Jefferson)	89%	80%	-9%
Boulder (Yellowstone)	86%	74%	-12%
Clarks Fork Yellowstone	84%	81%	-3%
Fisher	99%	93%	-6%
Flathead Lake	92%	87%	-5%
Flint	90%	82%	-8%
Gallatin ab Gateway	84%	80%	-4%
Greybull-Wood	85%	76%	-9%
Helena Valley	85%	74%	-11%
Judith	79%	67%	-12%
Kootenai in Canada	114%	108%	-6%
Kootenai in Montana	101%	101%	+0%
Little Bitterroot	80%	70%	-10%
Lower Clark Fork	100%	91%	-9%
Madison ab Hebgen	79%	69%	-10%
Madison bw Hebgen	81%	75%	-6%
Marias	99%	97%	-2%
Middle Fork Flathead	103%	98%	-5%
Musselshell	77%	69%	-8%
North Fork Flathead	99%	100%	+1%
Northern Gallatin	74%	67%	-7%
Owl	107%	98%	-9%
Powder	83%	80%	-3%
Rock (Clark Fork)	91%	82%	-9%
Rock (Yellowstone)	74%	72%	-2%
Ruby	72%	72%	+0%
Shields	62%	49%	-13%
Shoshone	83%	74%	-9%
Smith	81%	72%	-9%
South Fork Flathead	89%	86%	-3%
Southern Flathead	99%	95%	-4%
St. Marys	105%	96%	-9%
Stillwater (Flathead)	90%	96%	+6%
Stillwater (Yellowstone)	86%	78%	-8%
Sun	103%	96%	-7%
Swan	91%	92%	+1%
Teton	105%	98%	-7%
Tongue	93%	88%	-5%
Upper Clark	86%	80%	-6%
Wind	92%	84%	-8%
Yaak	95%	91%	-4%
Yellowstone ab Livingston	82%	75%	-7%

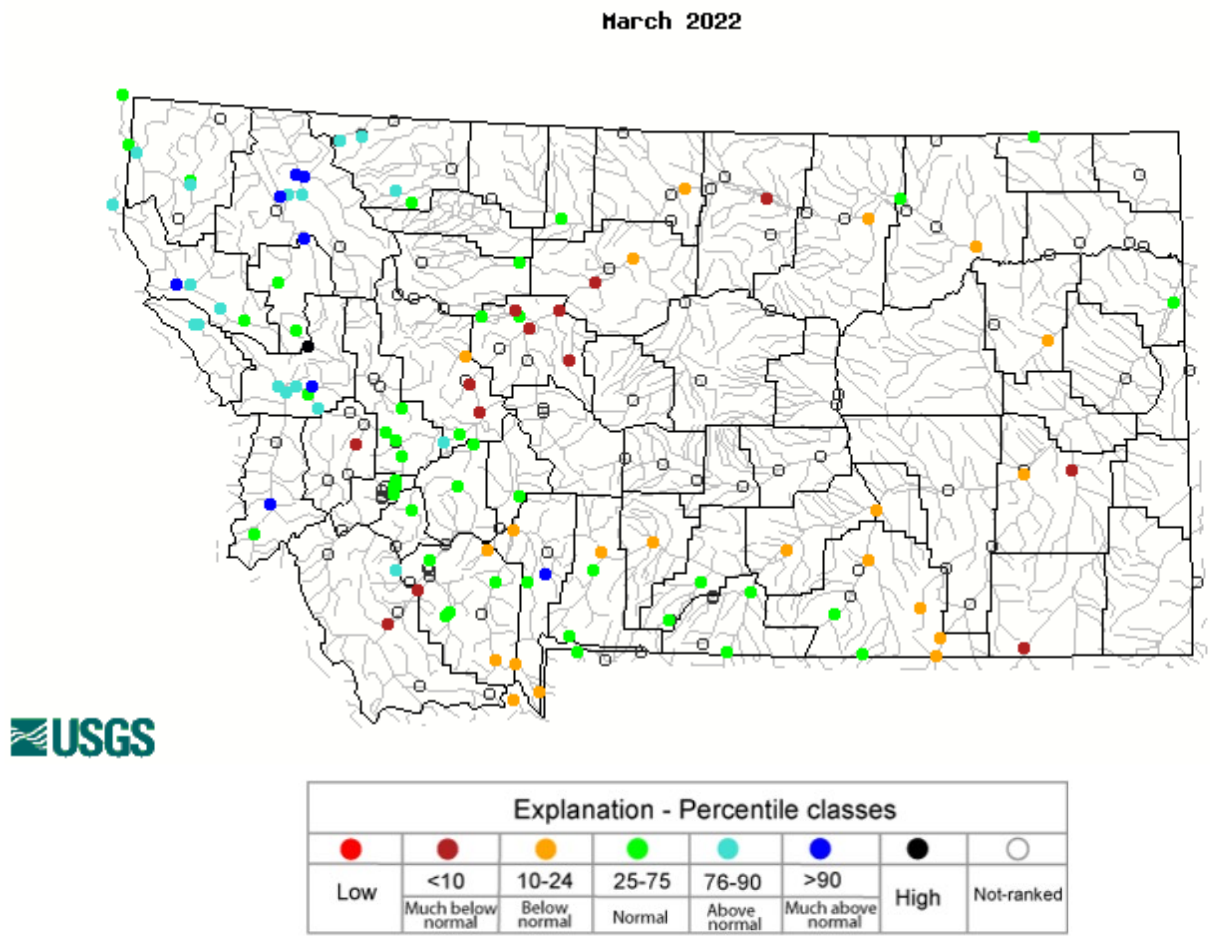
Reservoirs

End of March reservoir storage levels range from well below normal to well above normal. Gibson, Nilan, Bair, Lima, Fresno, and Nelson reservoirs are at the lower end of that range (60-70%). Flathead, Como, Hungry Horse, Helena Valley, Lake Sherburne, and Cooney are all above normal (110-140%). Mystic Lake is well above normal at 231%. In general, reservoir levels are higher than last month and lower than last year at this time.

Current Streamflows

For many gages on the mainstem of the Missouri River, streamflow in March was well below normal. This area received well below normal precipitation throughout the month and snowpack at the upper elevations has not started to contribute to flows downstream yet. Snowpack at higher elevations is below normal, however, and forecasts for the runoff season reflect that.

In the northwest region of the state, streamflow for March was well above normal due to a combination of above normal precipitation for the month as well as above normal temperatures causing the snowpack at the mid and low elevations to begin melting. Thankfully in these basins the snowpack remains near to above normal at the higher elevations and streamflow forecasts for the remainder of the season are still slightly above normal.



Drought Information

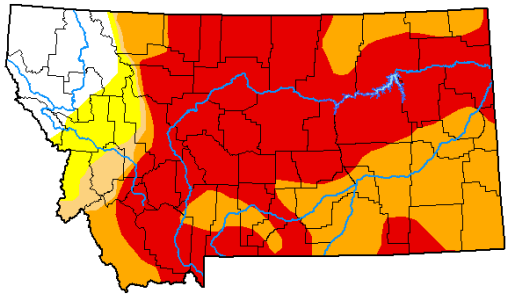
The most recent National Drought Monitor map, released on April 7, 2022, shows 85% of the state of Montana in some category of drought designation.

Conditions have improved slightly over the winter. Since early January (see the map from January 4, 2022) the area in northwest Montana not in a drought classification has expanded thanks to above normal precipitation during that time period. There are also no longer any counties in the state categorized as exceptional or D4 drought at this time.

Despite these modest improvements, over half (52%) of the state is experiencing extreme drought conditions. If the trend of above normal temperatures and below normal precipitation continues into this spring season for the region east of the continental divide we can expect these drought designations to deteriorate.

U.S. Drought Monitor

Montana



April 5, 2022

(Released Thursday, Apr. 7, 2022)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	9.38	90.62	85.32	82.52	52.44	0.00
Last Week *03-29-2022*	12.65	87.35	85.32	82.52	52.44	0.00
3 Months Ago *01-04-2022*	7.36	92.64	89.33	86.35	53.93	13.87
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 *04-06-2021*	16.52	83.48	43.51	18.06	5.60	0.00

Intensity:

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

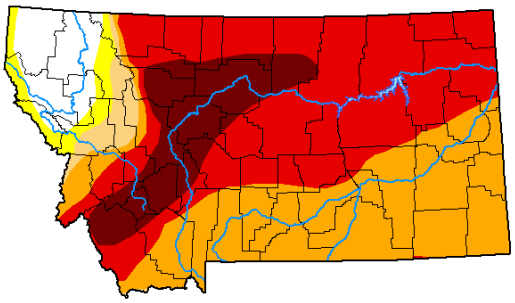
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Deborah Bathke
National Drought Mitigation Center

droughtmonitor.unl.edu

U.S. Drought Monitor

Montana



January 4, 2022

(Released Thursday, Jan. 6, 2022)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	7.36	92.64	89.33	86.35	53.93	13.87
Last Week *12-28-2021*	7.38	92.62	89.37	86.35	59.77	20.15
3 Months Ago *10-05-2021*	0.00	100.00	100.00	100.00	69.27	21.91
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 *01-05-2021*	36.35	63.65	34.49	8.27	0.36	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:
Richard Tinker
CPC/NOAA/NWS/NCEP

droughtmonitor.unl.edu

If you would like more information about current drought conditions or require assistance due to drought, the links below can help you gather information and assist you in getting in touch with the appropriate agencies.

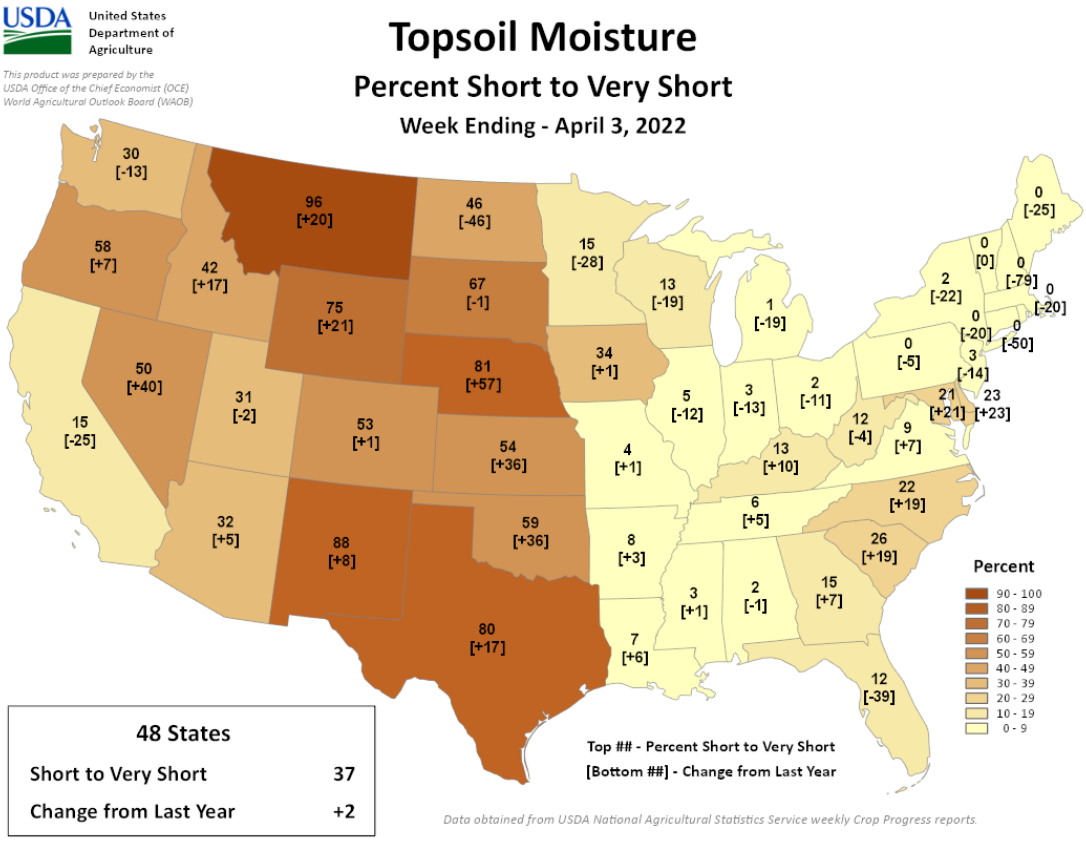
Drought Links:

- 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

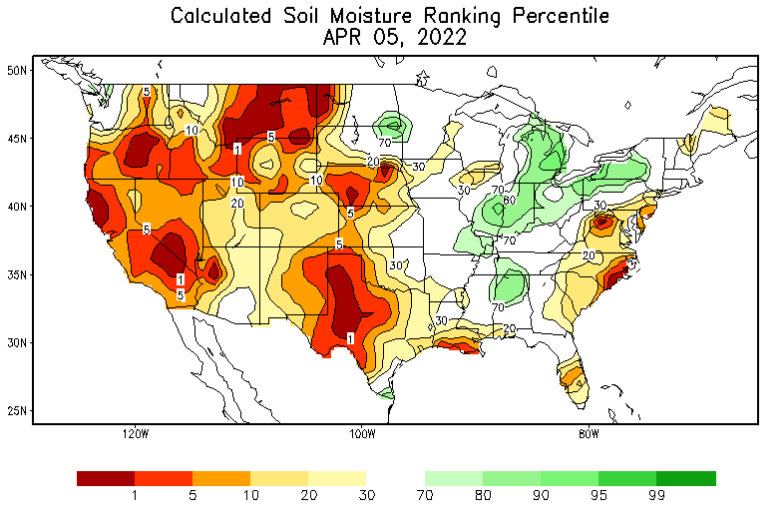
Soil Moisture

As we head into the growing season the most recent topsoil moisture data shows that 96% of the topsoil in Montana is categorized as short to very short. This is a 20% increase compared to last year.

Topsoil is the top 6 inches of soil and being in the short to very short classification means the soil ranges from dry (short) to moisture supplies that are significantly less than what is required for plant development (very short).



Modeled soil moisture, shown below, for April 5, 2022, indicates that soils are at or below the 5th percentile for moisture content across most of the state. The exception is northwest Montana which is faring much better. The largest deficits extend from southwest Montana up to the Canadian border in eastern Montana.

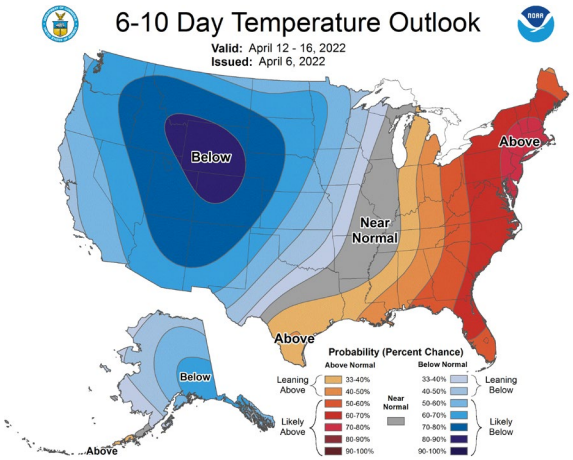


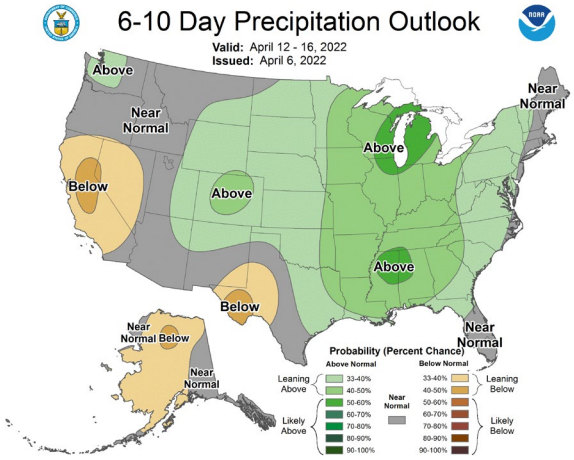
Soil moisture deficits can have significant impacts on surface water runoff come spring and summer as any accumulated snowpack will first be used to infiltrate and recharge dry soils.

Weather and Climate Predictions

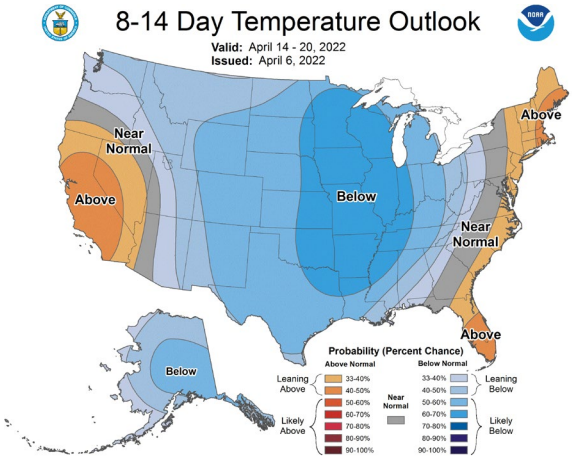
According to NOAA's Climate Prediction Center, the immediate future looks to be cooler than normal, with near-normal precipitation for the next week or two. Both the 6-10 day outlook and the 8-14 day outlook show increased chances of below normal temperatures. The models are in less agreement about precipitation, with the 6-10 day outlook showing near to above normal precipitation and the 8-14 day outlook showing near to below normal precipitation.

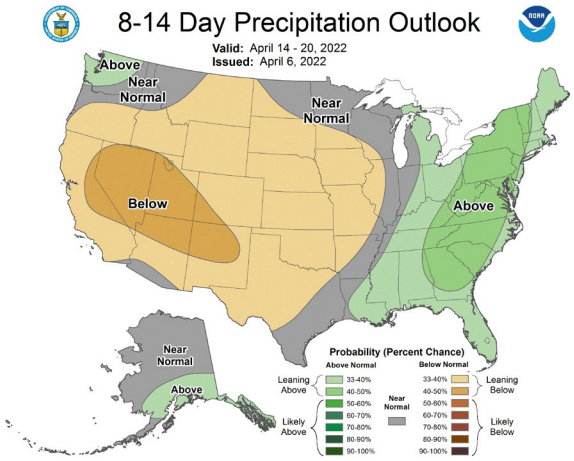
6-10 Day Outlook





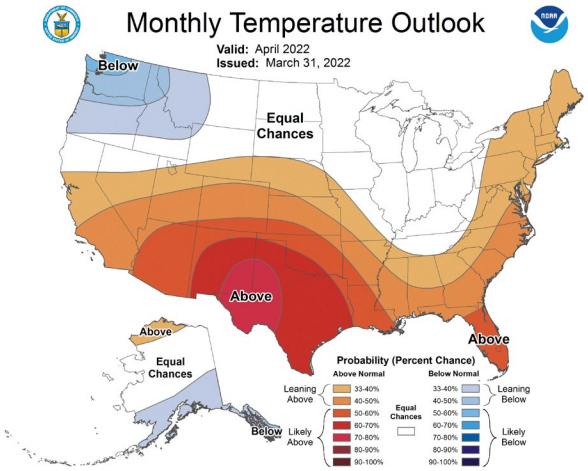
8-14 Day Outlook

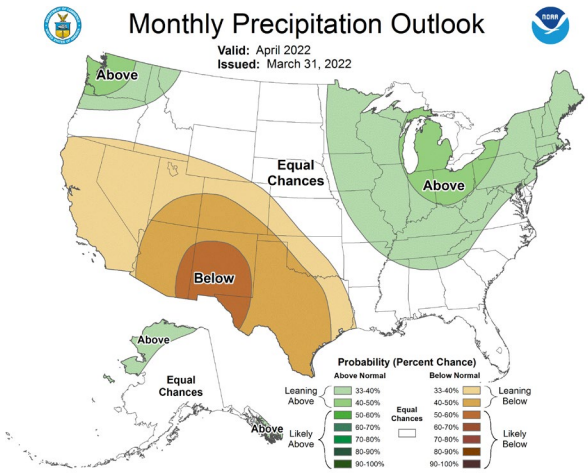




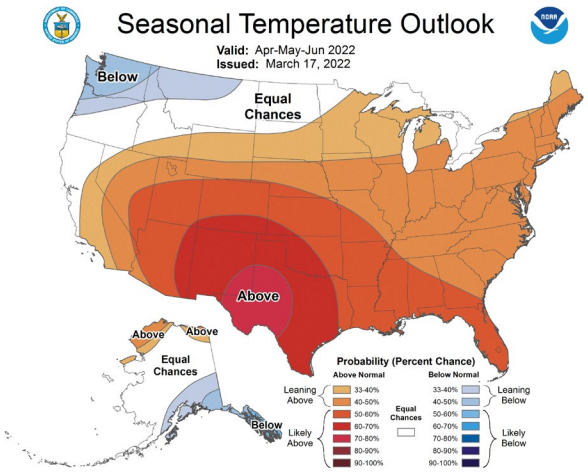
Long term outlooks for April, May, and June do not show a strong probability in either direction for temperature or precipitation; most of Montana is in the “equal chances” category where conditions could go either way. There does appear to be a slightly increased chance of cooler than normal temperatures in western Montana, and a slightly increased chance of below normal precipitation across the southern part of the state. Conditions over the next few months will be the final factor in streamflow for spring and summer.

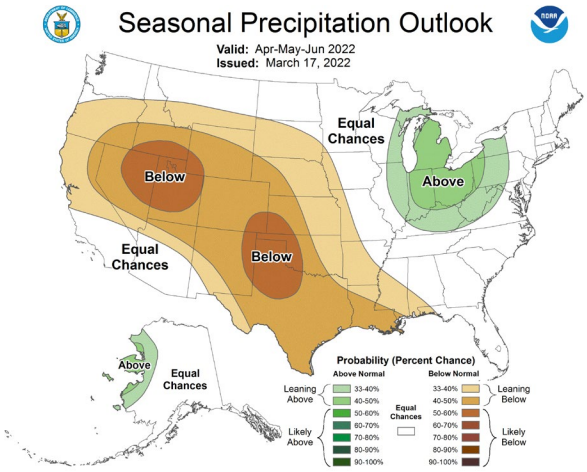
One Month Outlook





Three Month Outlook





Official Streamflow Forecasts

How Forecasts Are Made

Most of the annual streamflow in the Western United States originates as snowfall that has accumulated high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are combined with snowpack data to prepare runoff forecasts.

Snowpack measurements are obtained by using a combination of manual and automated SNOTEL measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. At automated stations, snow depth and snow water equivalent as well as precipitation and temperature are monitored daily. Both monthly and daily data are used to project snowmelt runoff.

Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed the most probable forecast 50% of the time. Similarly, the actual streamflow volume can be expected to exceed the 90% forecast volume 90% of the time. The same is true for the 70%, 30%, and 10% forecasts. Generally, the 90% and 70% forecasts reflect drier than normal hydrologic and climatic conditions in the coming months; the 30% and 10% forecasts reflect wetter than normal conditions. As the forecast season progresses, a greater portion of the future hydrologic and climatic uncertainty will become known, and the additional forecasts will move closer to the most probable forecasts.

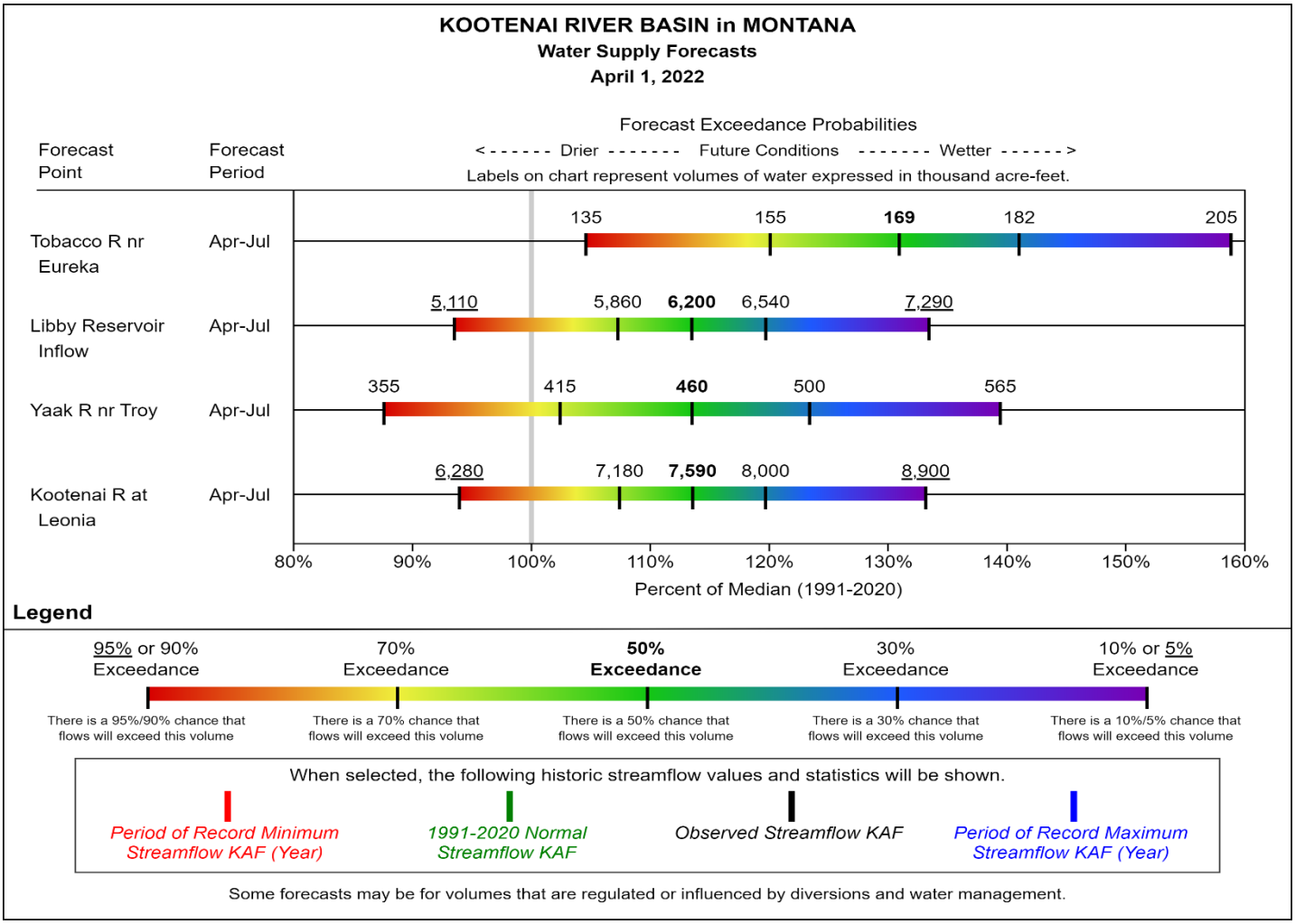
Summary

With the opportunity to add to our mountain reservoirs diminishing, the outlook for spring and summer runoff in some areas of the state is somewhat grim. The current forecasts for southwest Montana and the mainstem of the Missouri are all well below normal. Of particular concern, the forecasts for the Beaverhead River and downstream on the Jefferson are calling for less than 50% of normal flows for April to July. This region experienced very low streamflows last season and it appears to be setting up for a repeat of those conditions this year. It's a similar story for the Smith and Musselshell rivers, with flows last season being well below normal and current forecasts at around 50% of normal for this season.

The picture is a bit rosier for streams along the Rocky Mountain Front and in the river basins west of the Continental Divide. These areas have near normal snowpacks and have received beneficial precipitation over the last few months. As a result, streamflow forecasts are near to above normal in most of these river basins. The exceptions are the forecasts for the Upper Clark Fork and its Flint Creek and Rock Creek tributaries. Forecasts for those gages are in the 70-85% of normal range. This area missed out on the above normal precipitation the other basins benefitted from.

At this point in the season the best bet for improved streamflows will be continued cool weather to hold onto high elevation snowpack and above average spring precipitation. Please see the individual river basin charts below for individual forecast point ranges.

Forecast Charts

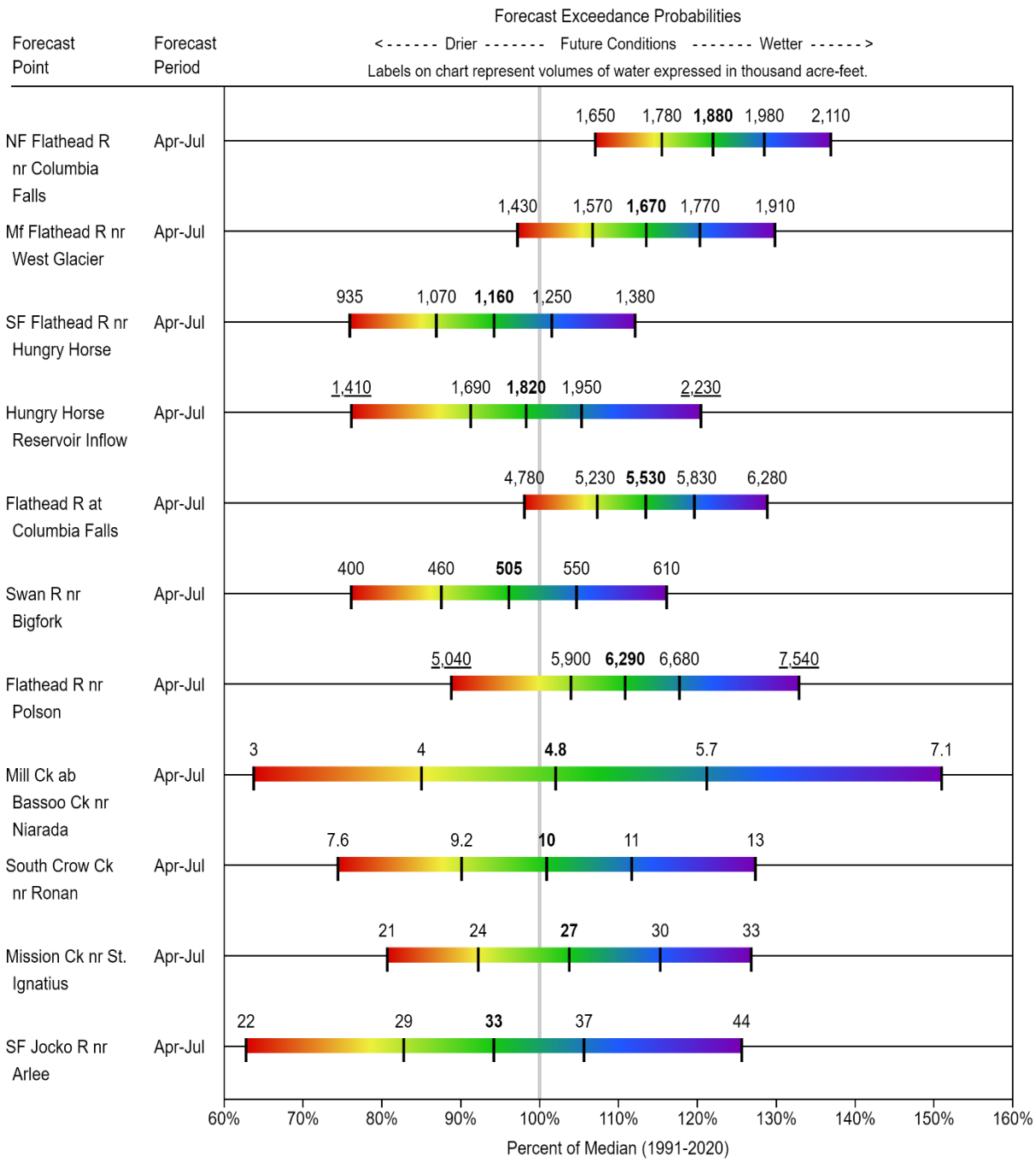


Legend

FLATHEAD RIVER BASIN

Water Supply Forecasts

April 1, 2022



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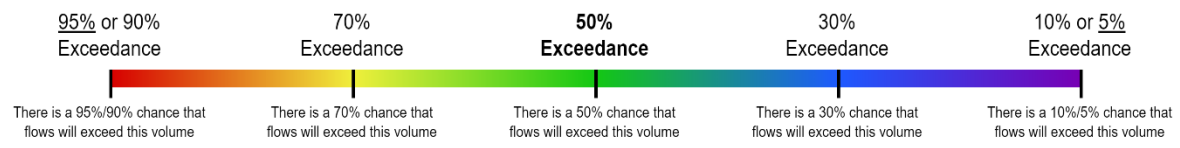


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

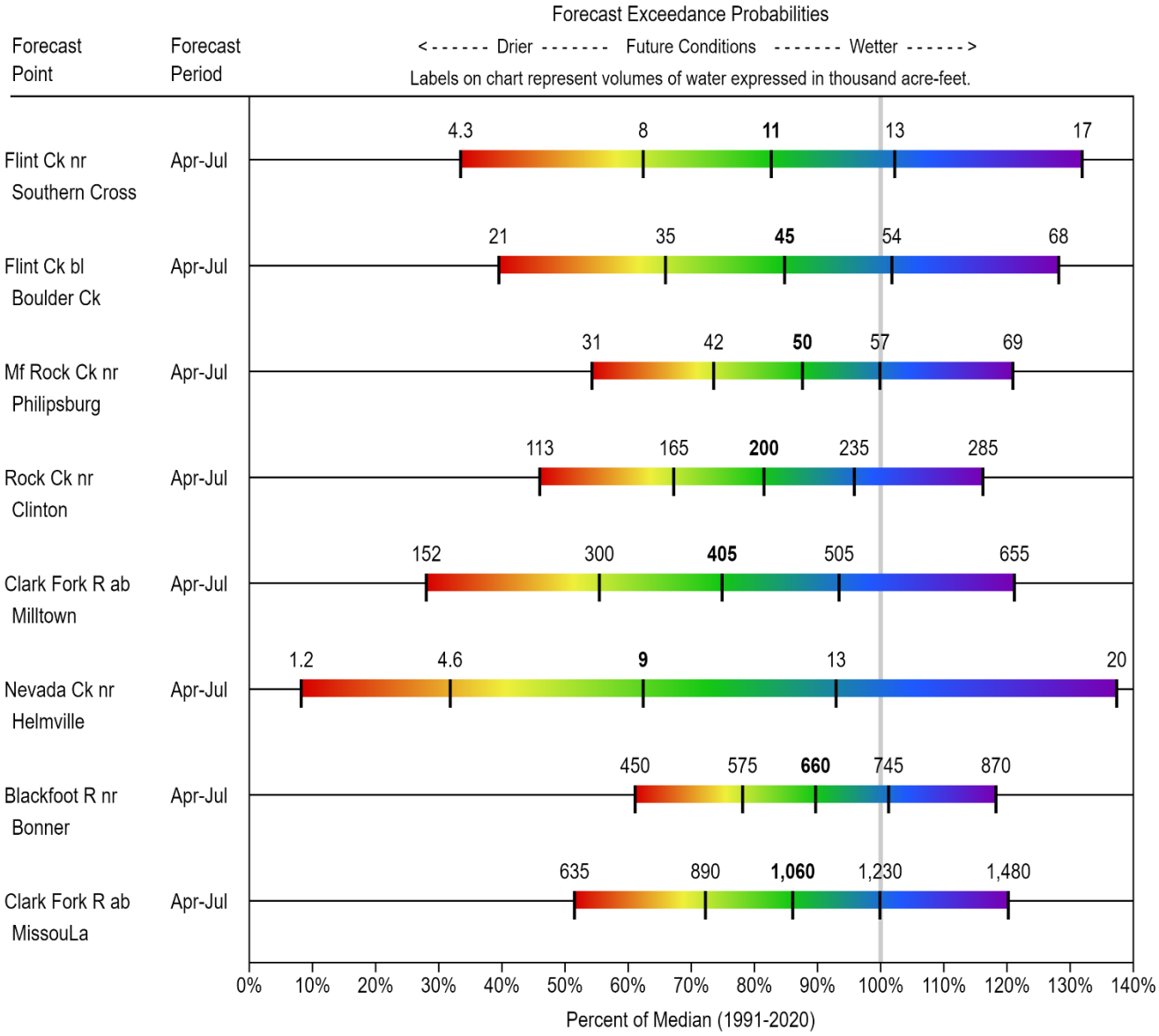
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

UPPER CLARK FORK RIVER BASIN

Water Supply Forecasts

April 1, 2022



Legend

95% or 90% Exceedance	70% Exceedance	**50% Exceedance**	30% Exceedance	10% or 5% Exceedance
There is a 95%/90% chance that flows will exceed this volume	There is a 70% chance that flows will exceed this volume	There is a 50% chance that flows will exceed this volume	There is a 30% chance that flows will exceed this volume	There is a 10%/5% chance that flows will exceed this volume

When selected, the following historic streamflow values and statistics will be shown.

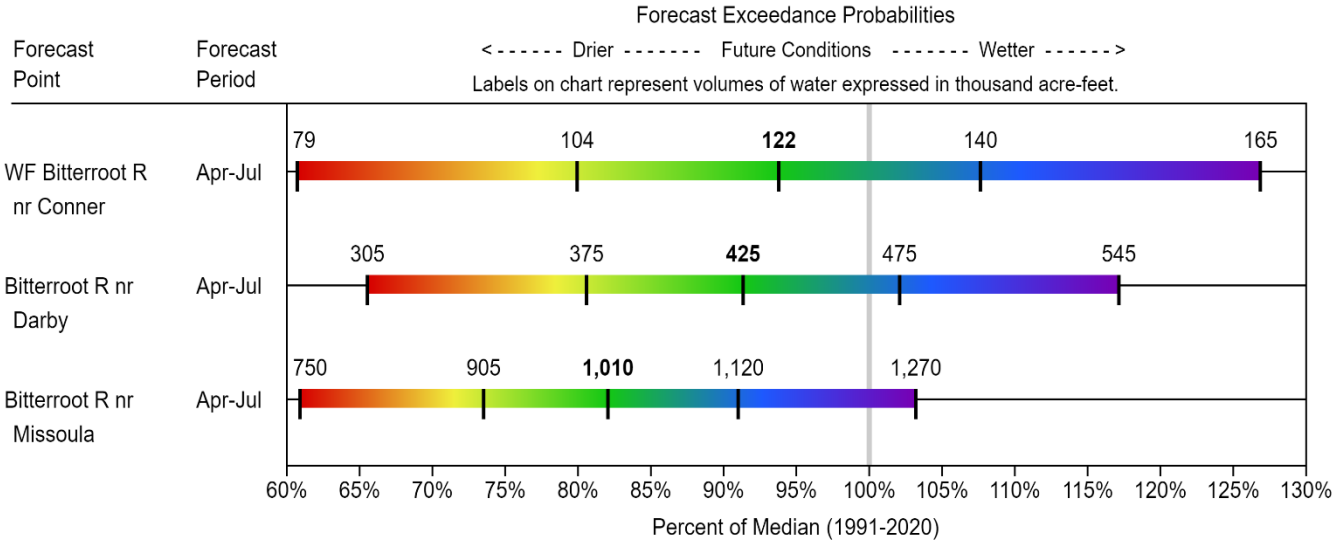
Period of Record Minimum Streamflow KAF (Year)	*1991-2020 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

BITTERROOT RIVER BASIN

Water Supply Forecasts

April 1, 2022



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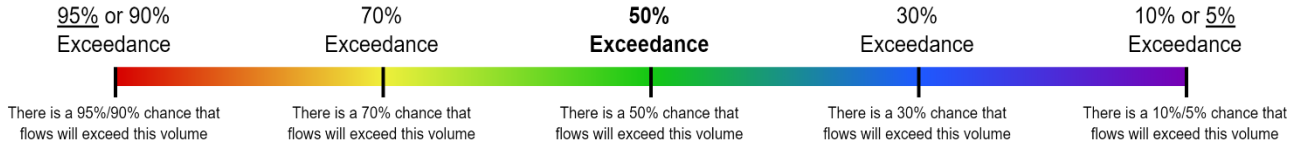


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

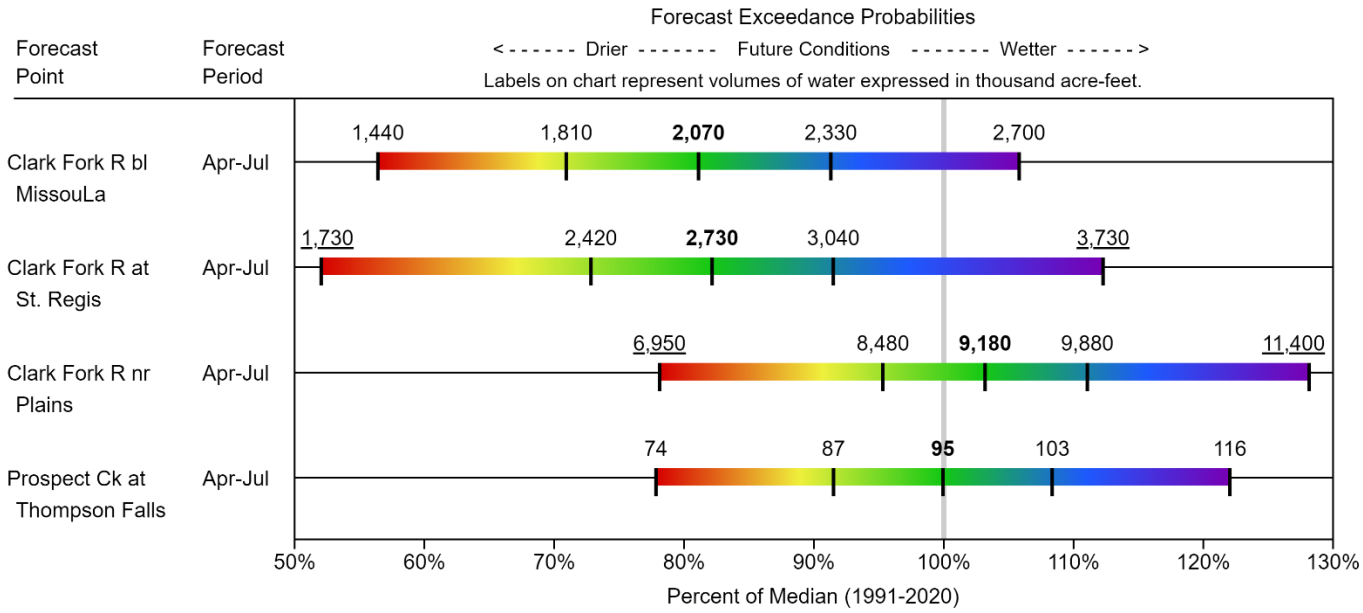
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

LOWER CLARK FORK RIVER BASIN

Water Supply Forecasts

April 1, 2022



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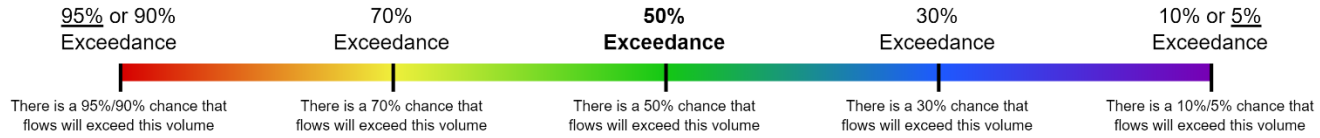


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

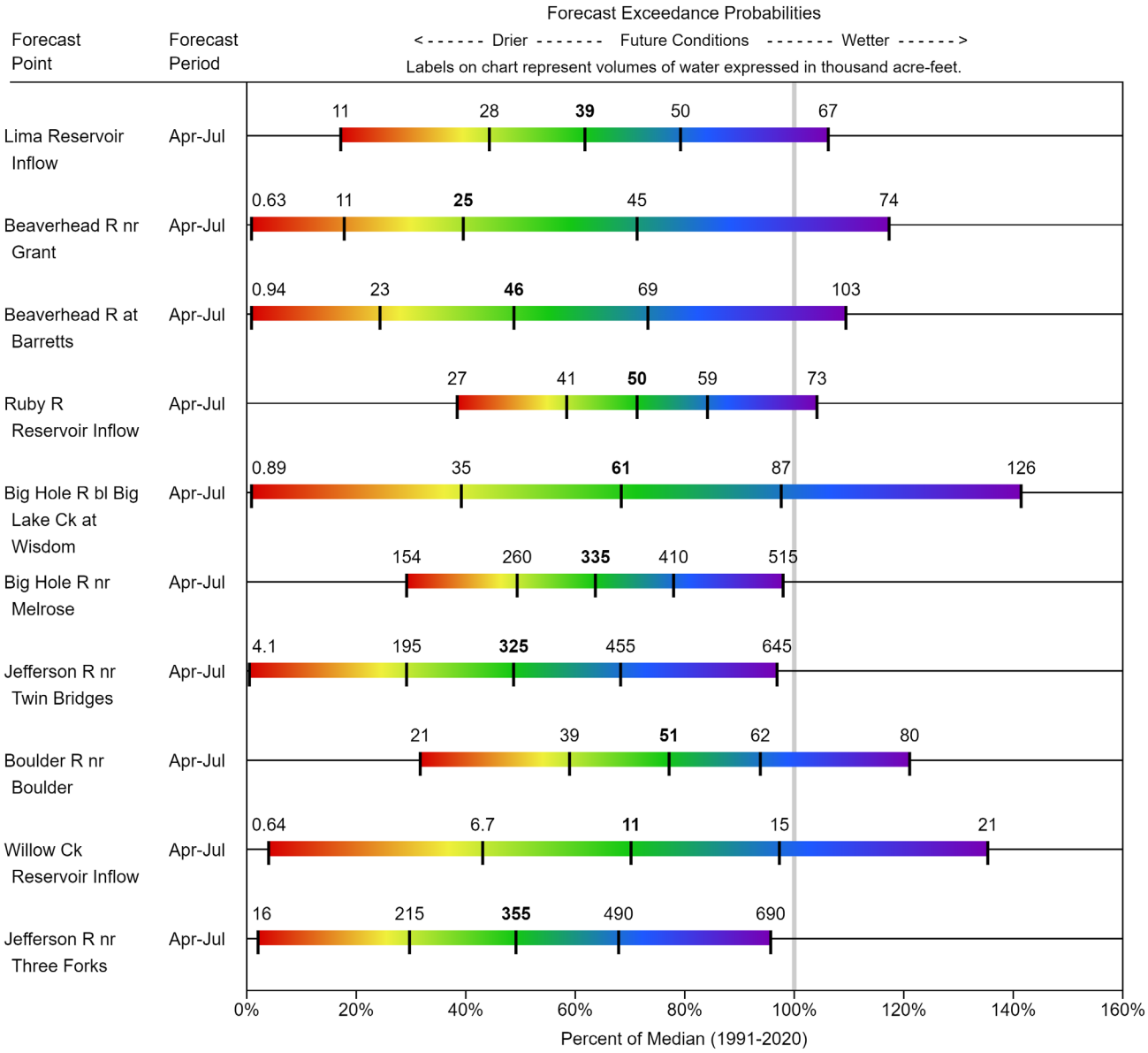
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

JEFFERSON RIVER BASIN

Water Supply Forecasts

April 1, 2022



Legend

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When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)	*1991-2020 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

MADISON RIVER BASIN

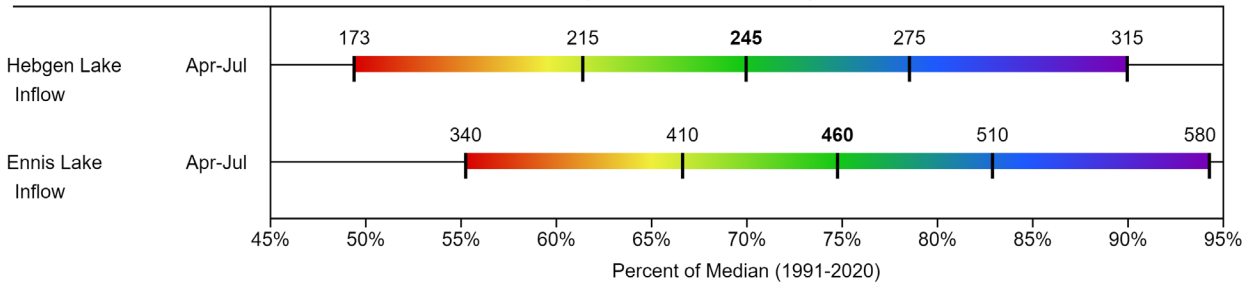
Water Supply Forecasts

April 1, 2022

Forecast Exceedance Probabilities

< - - - - - - Drier - - - - - - - Future Conditions - - - - - - - Wetter - - - - - - >

Labels on chart represent volumes of water expressed in thousand acre-feet.



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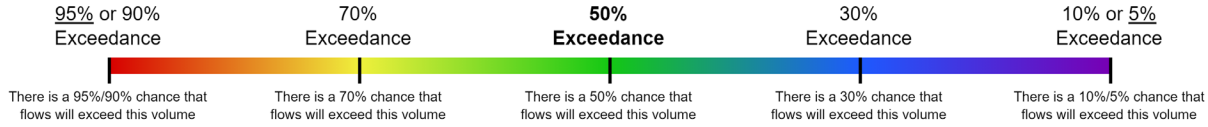


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

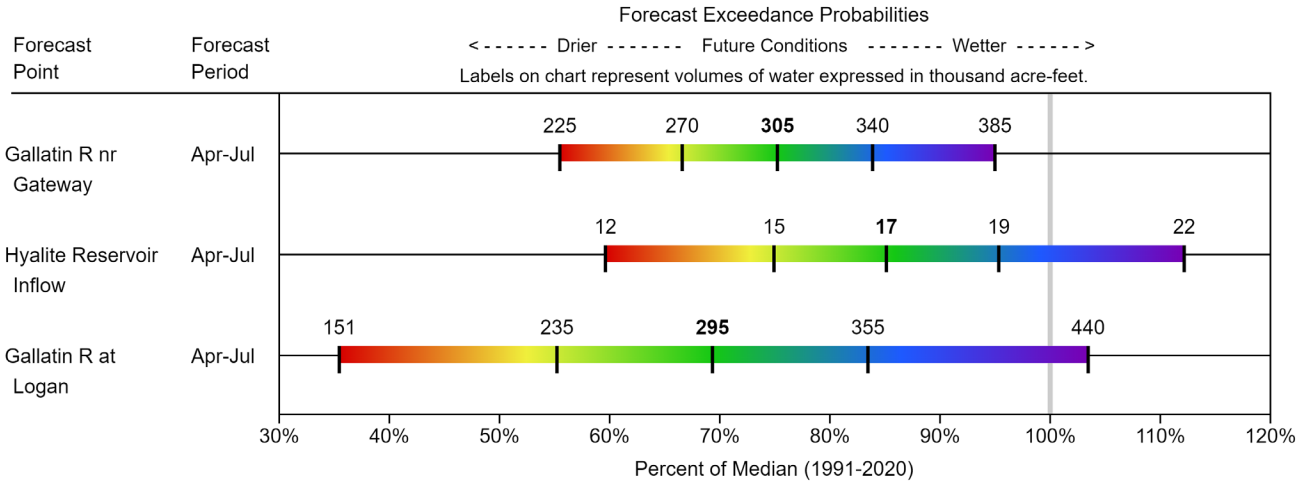
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

GALLATIN RIVER BASIN

Water Supply Forecasts

April 1, 2022



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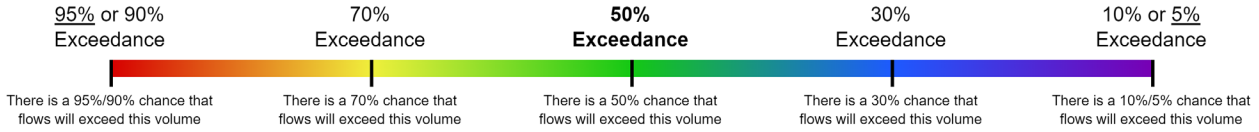


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

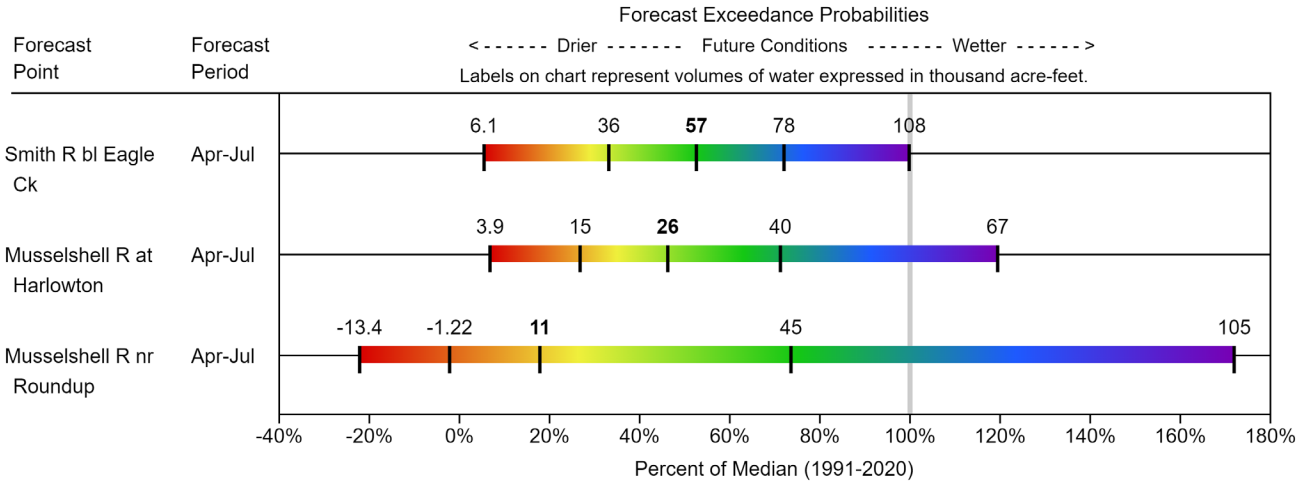
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

SMITH-JUDITH-MUSSELSHELL

Water Supply Forecasts

April 1, 2022



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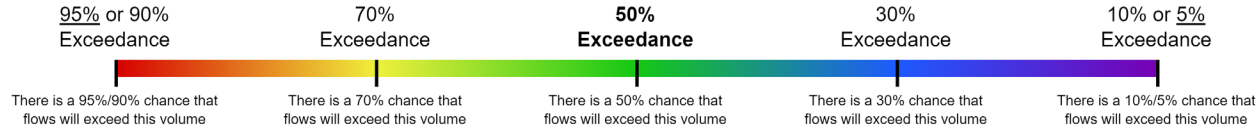


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

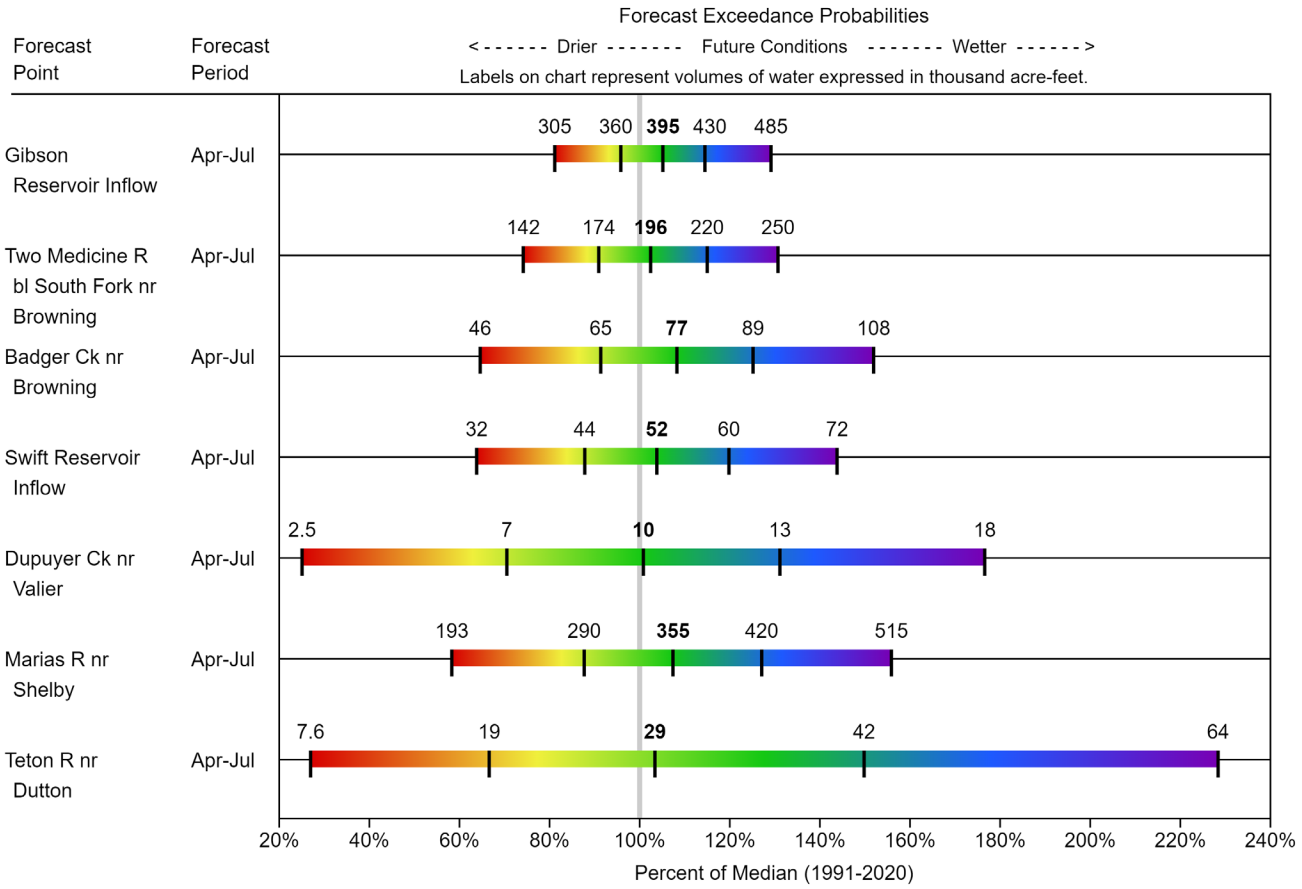
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

SUN-TETON-MARIAS

Water Supply Forecasts

April 1, 2022



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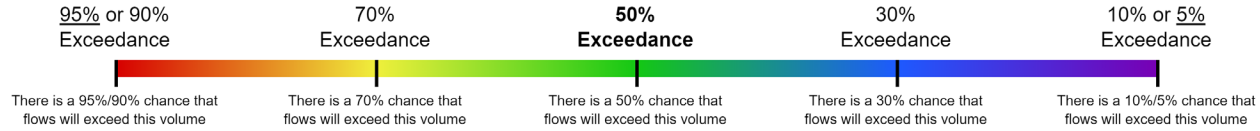


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

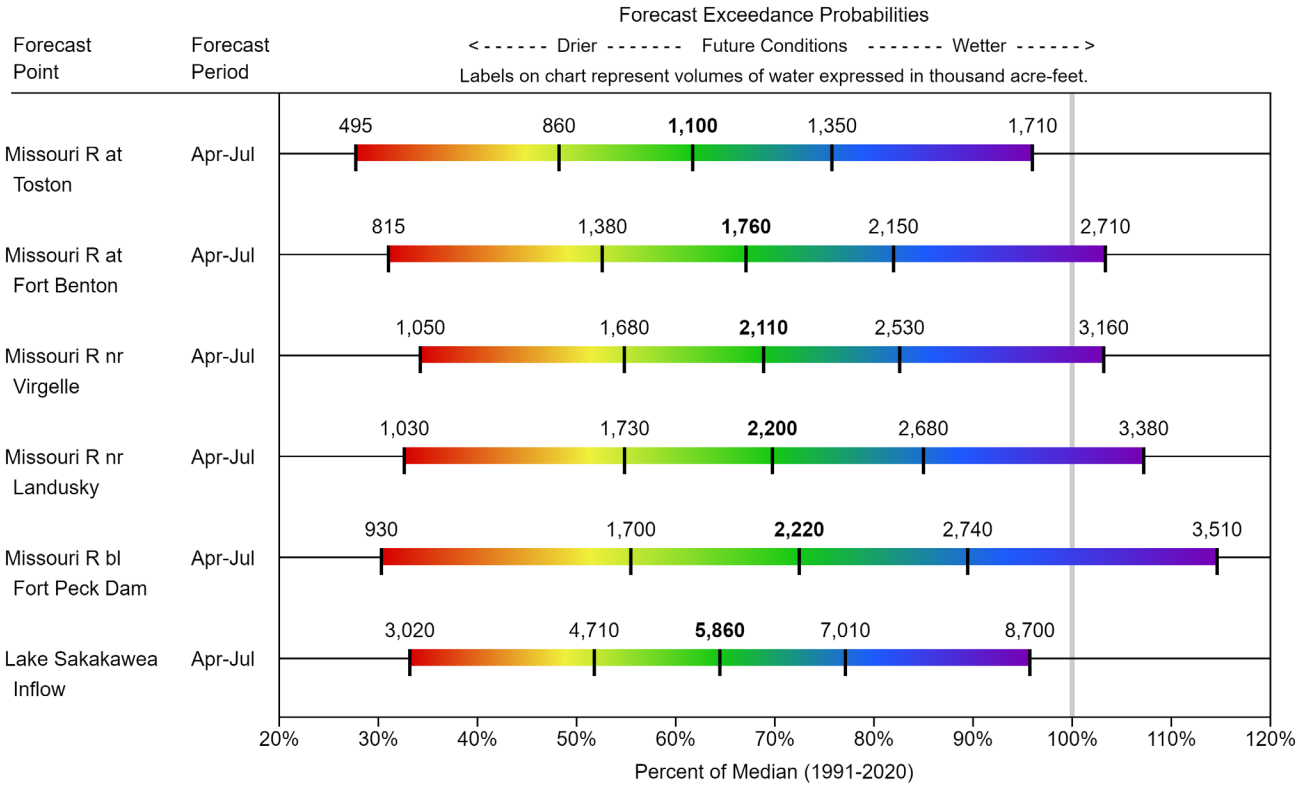
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

MISSOURI MAINSTEM BASIN

Water Supply Forecasts

April 1, 2022



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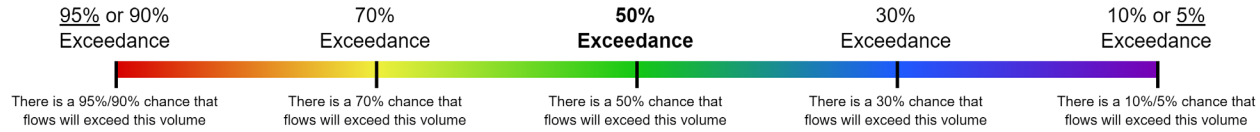


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

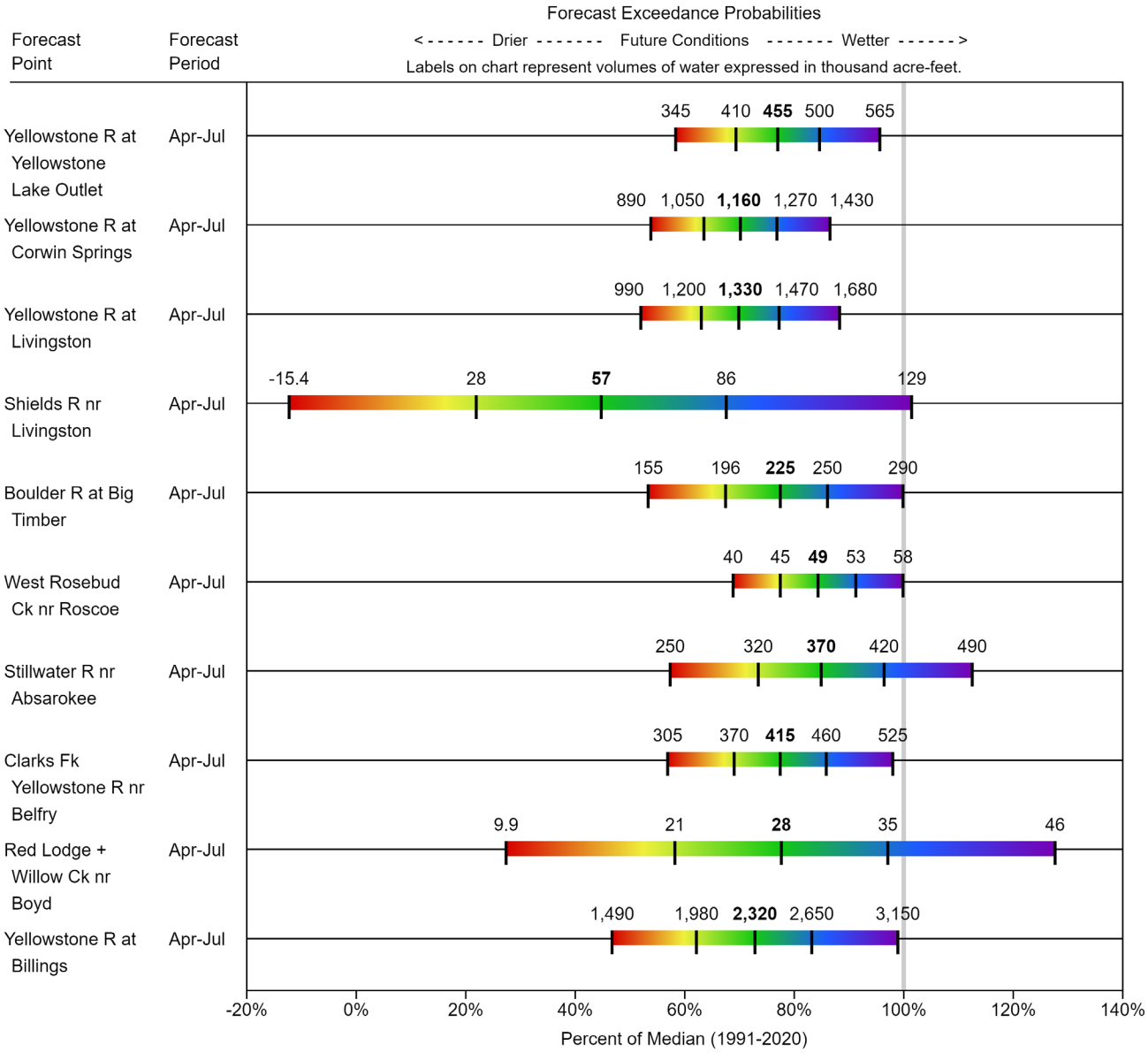
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

UPPER YELLOWSTONE RIVER BASIN

Water Supply Forecasts

April 1, 2022



Legend

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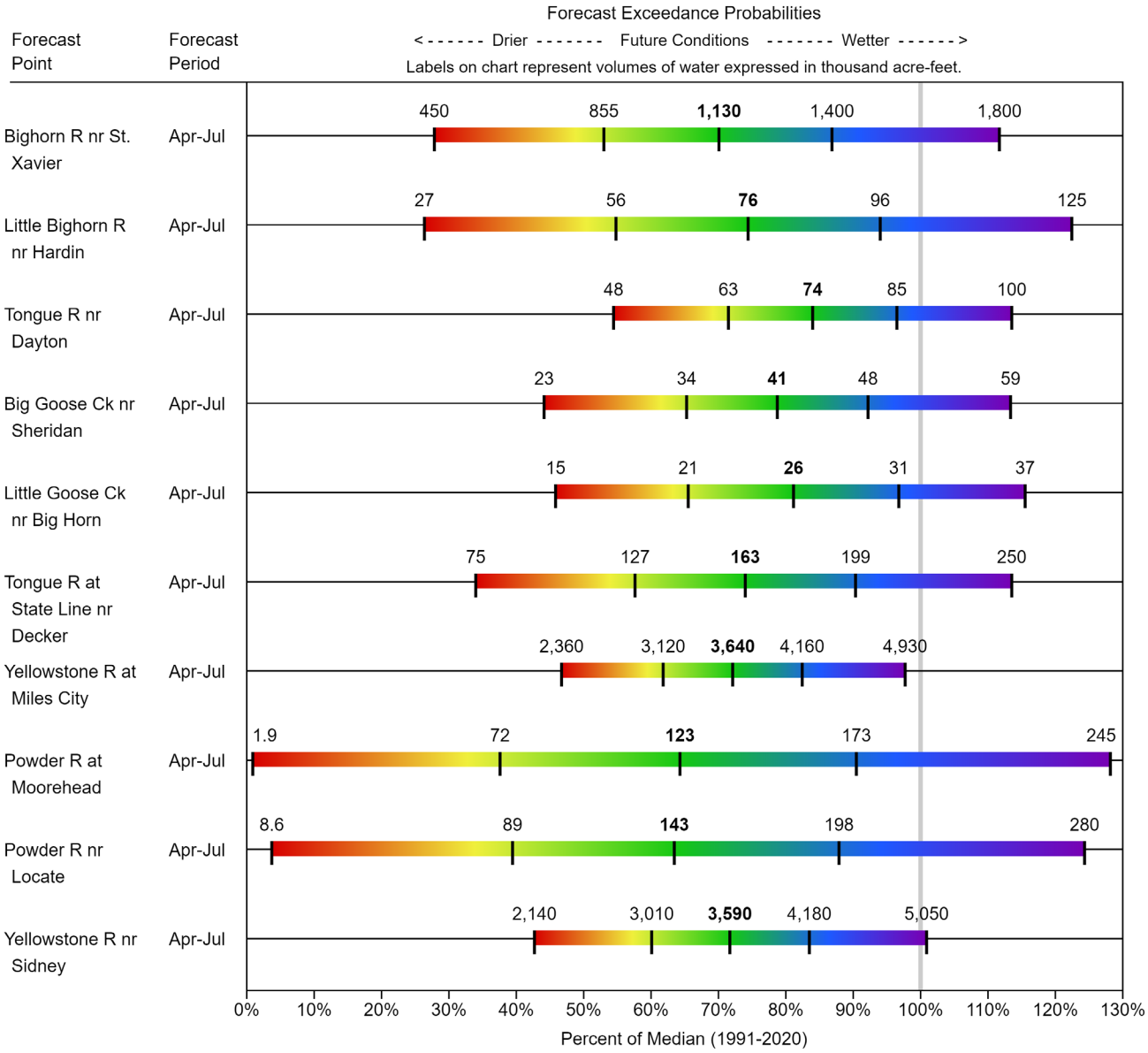
Period of Record Minimum Streamflow KAF (Year)	*1991-2020 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

LOWER YELLOWSTONE RIVER BASIN (Wyoming)

Water Supply Forecasts

April 1, 2022



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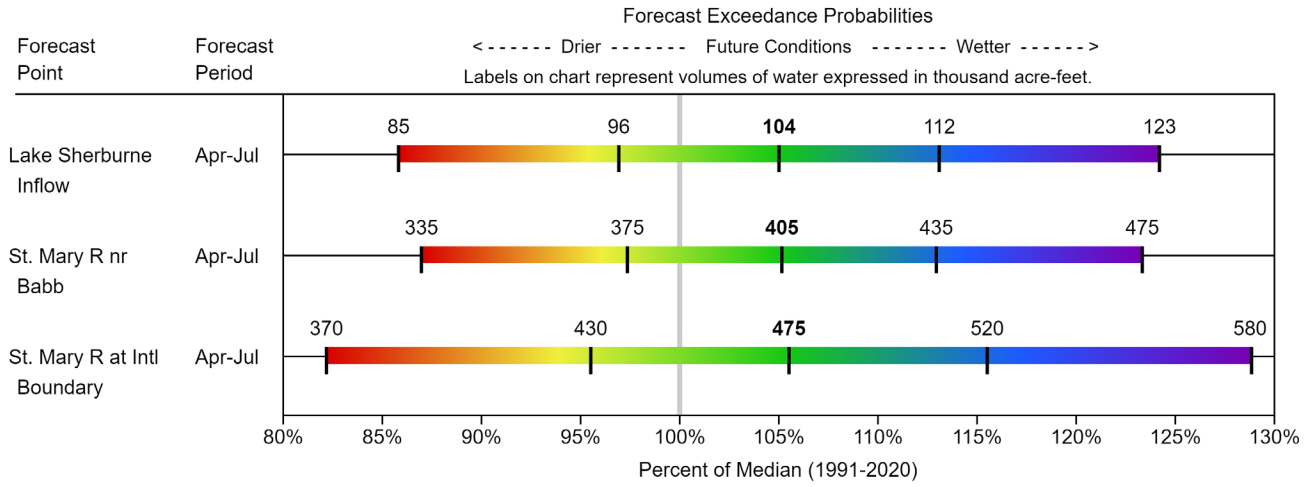
Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

ST. MARY & MILK BASINS

Water Supply Forecasts

April 1, 2022



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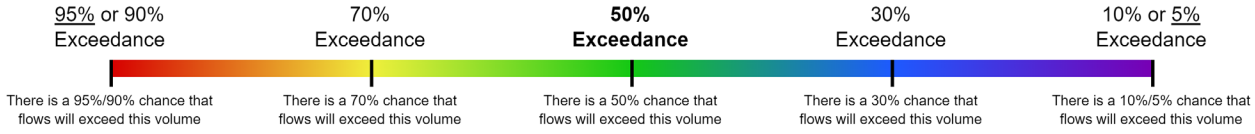

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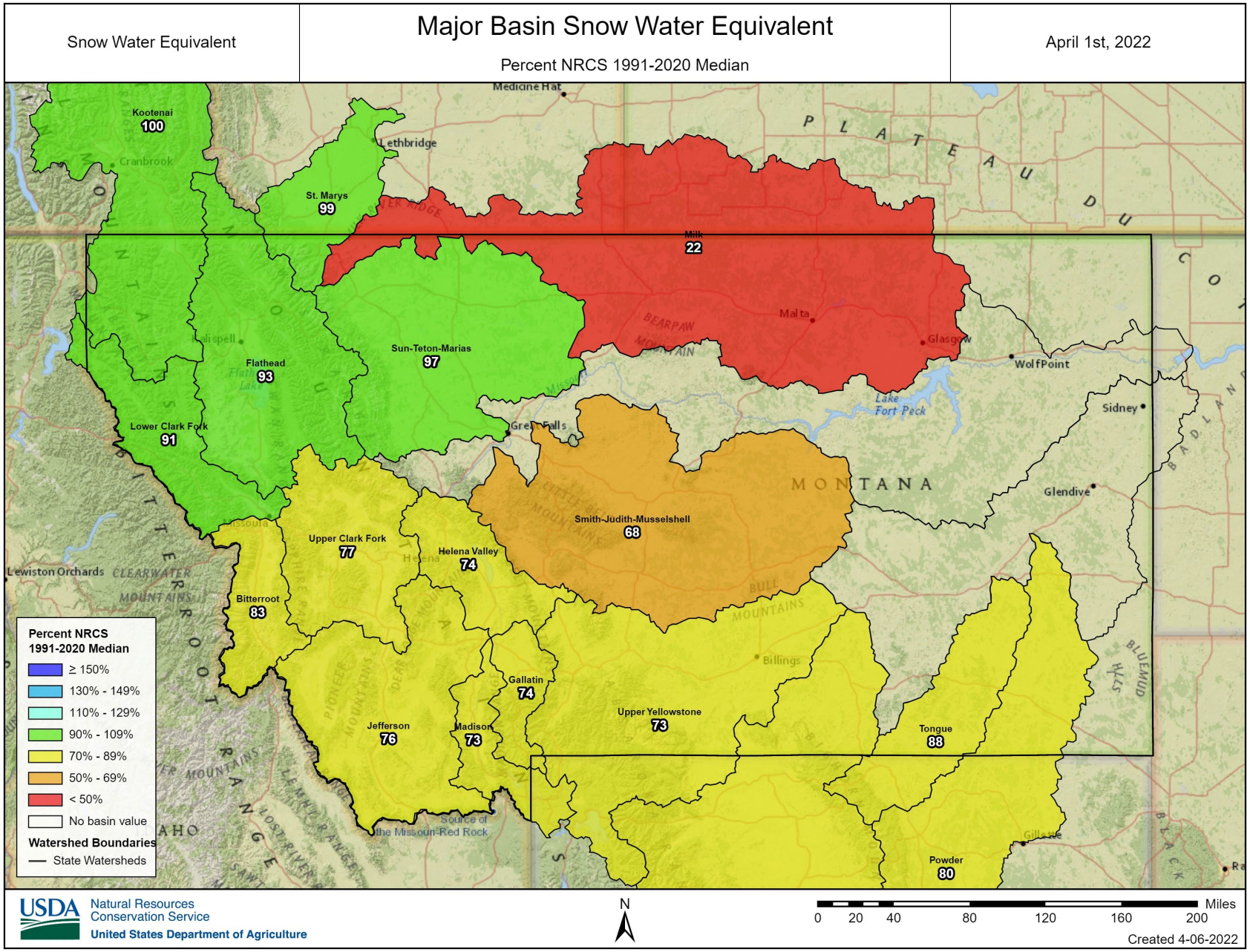
1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

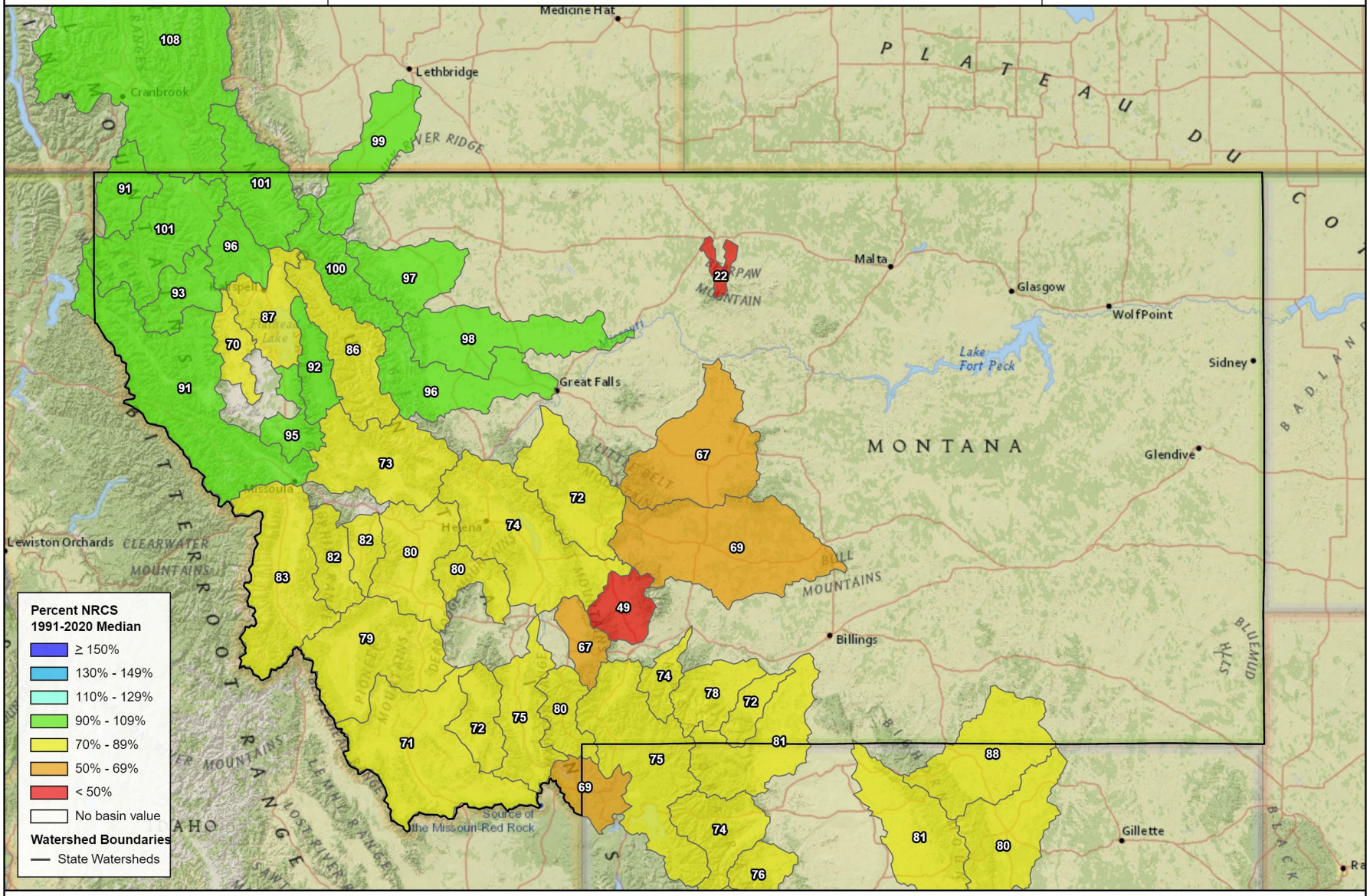
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

Maps


Snow Water Equivalent
Major Basin Snow Water Equivalent
Percent NRCS 1991-2020 Median
April 1st, 2022
Kootenai 100
St. Marys 99
Milk 22
Flathead 93
Sun-Teton-Marias 97
Lower Clark Fork 91
Upper Clark Fork 77
Helena Valley 74
Smith-Judith-Musselshell 68
Bitterroot 83
Gallatin 74
Jefferson 76
Madison 73
Upper Yellowstone 73
Tongue 88
Powder 80
Percent NRCS 1991-2020 Median
≥ 150%
130% - 149%
110% - 129%
90% - 109%
70% - 89%
50% - 69%
< 50%
No basin value
Watershed Boundaries
State Watersheds
USDA Natural Resources Conservation Service
United States Department of Agriculture
N
0 20 40 80 120 160 200 Miles
Created 4-06-2022

Snow Water Equivalent	Sub-Basin Snow Water Equivalent Percent NRCS 1991-2020 Median	April 1st, 2022



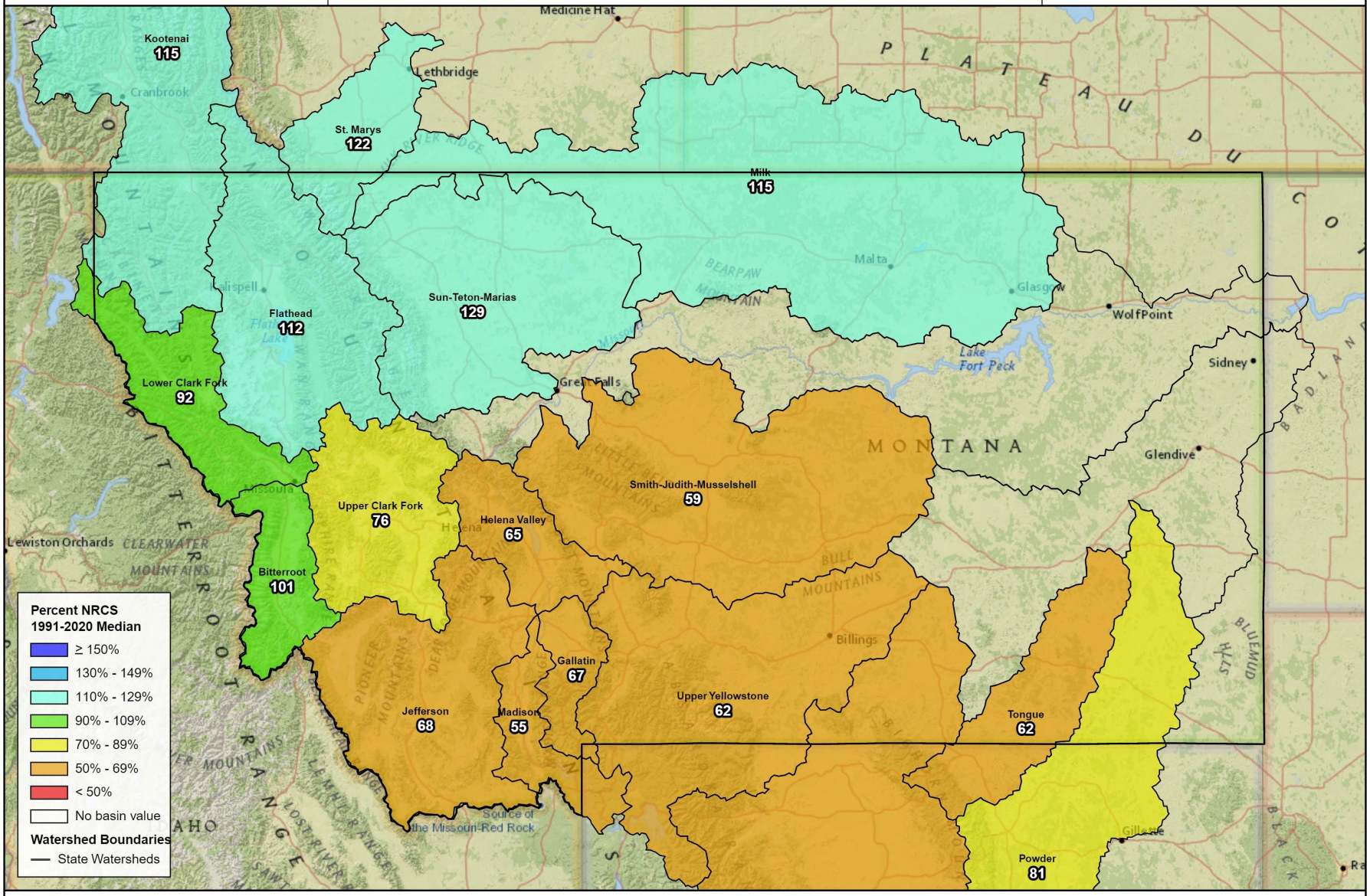
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 4-06-2022

1 month Precipitation	Monthly Precipitation Percent NRCS 1991-2020 Median	March 1, 2022 - March 31, 2022



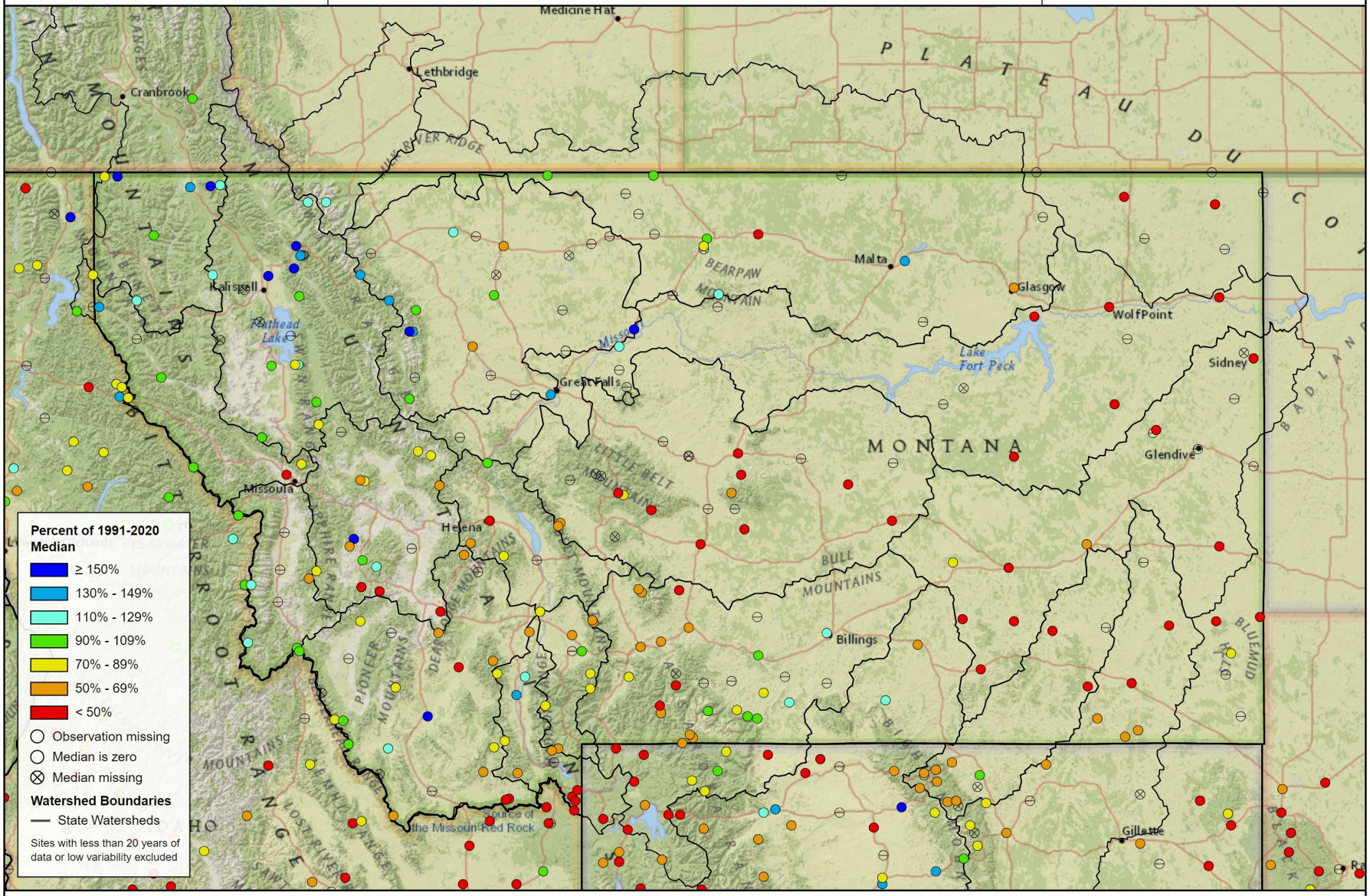
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 4-06-2022

1 month Precipitation	Monthly Precipitation Percent of 1991-2020 Median	March 1, 2022 - March 31, 2022



USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

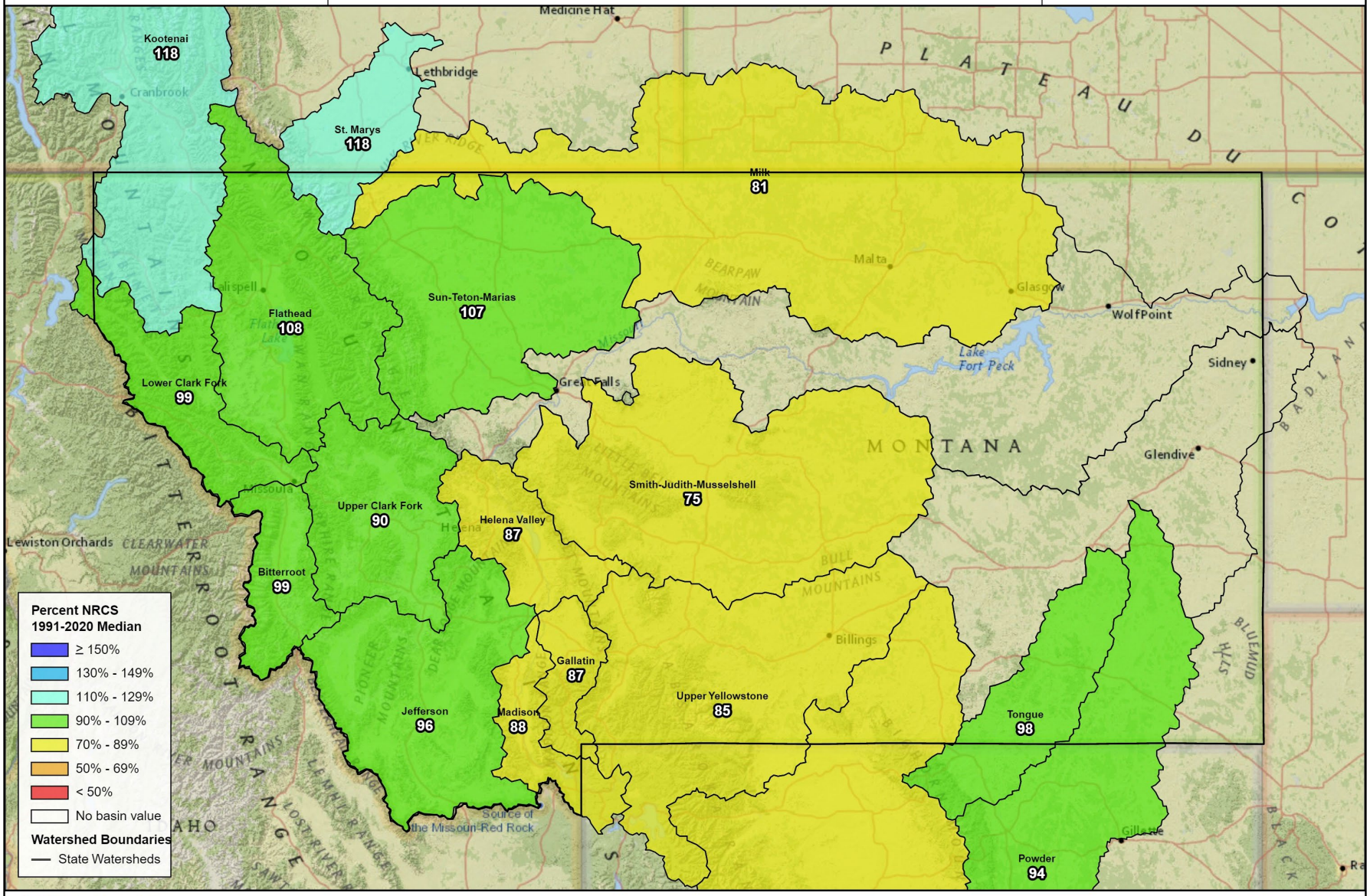
Created 4-06-2022

Water Year to Date Precipitation

Water Year Precipitation

Percent NRCS 1991-2020 Median

October 1, 2021 - March 31, 2022



USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

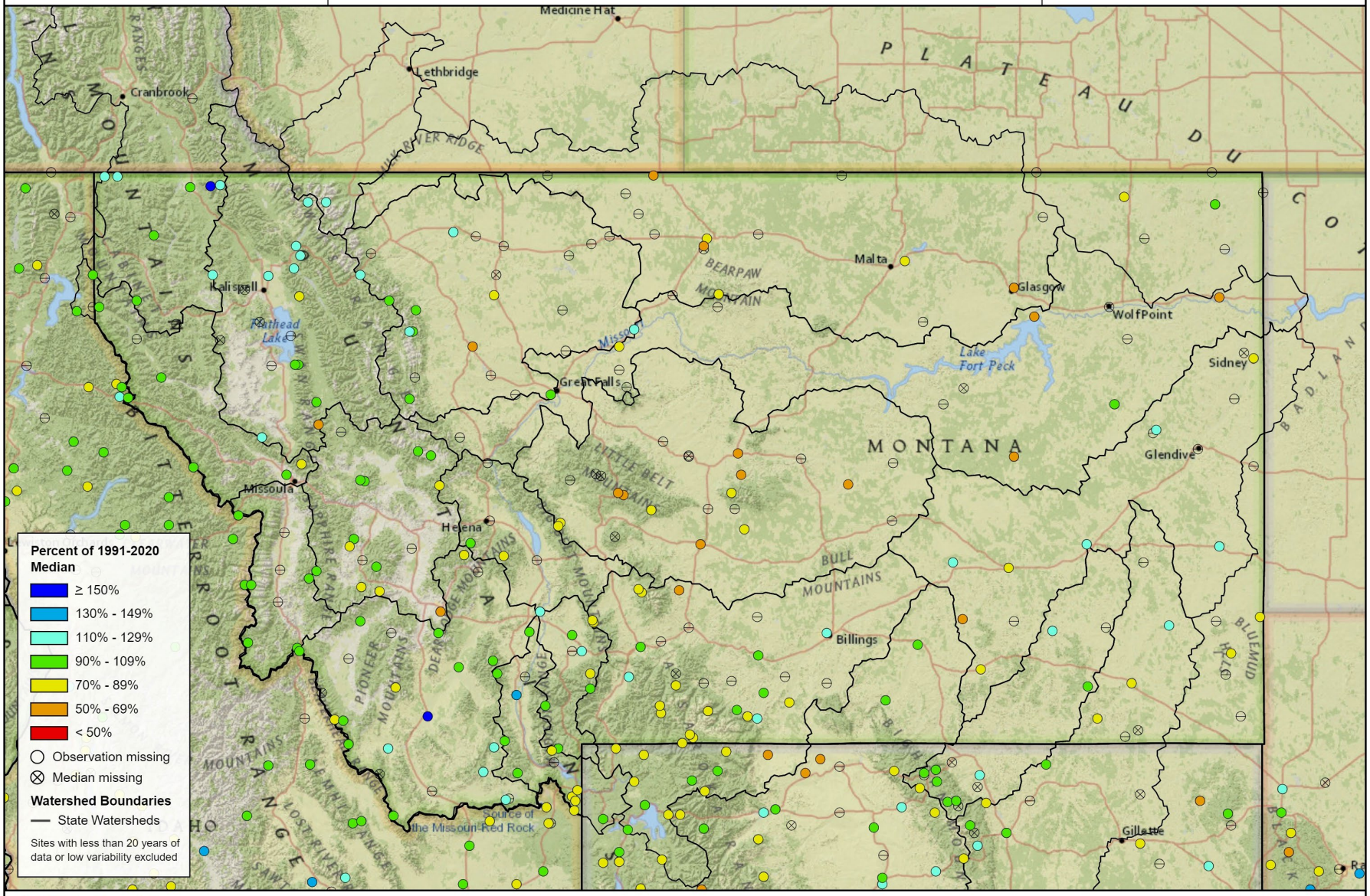
Created 4-06-2022

Water Year to Date Precipitation

Water Year Precipitation

Percent of 1991-2020 Median

October 1, 2021 - March 31, 2022



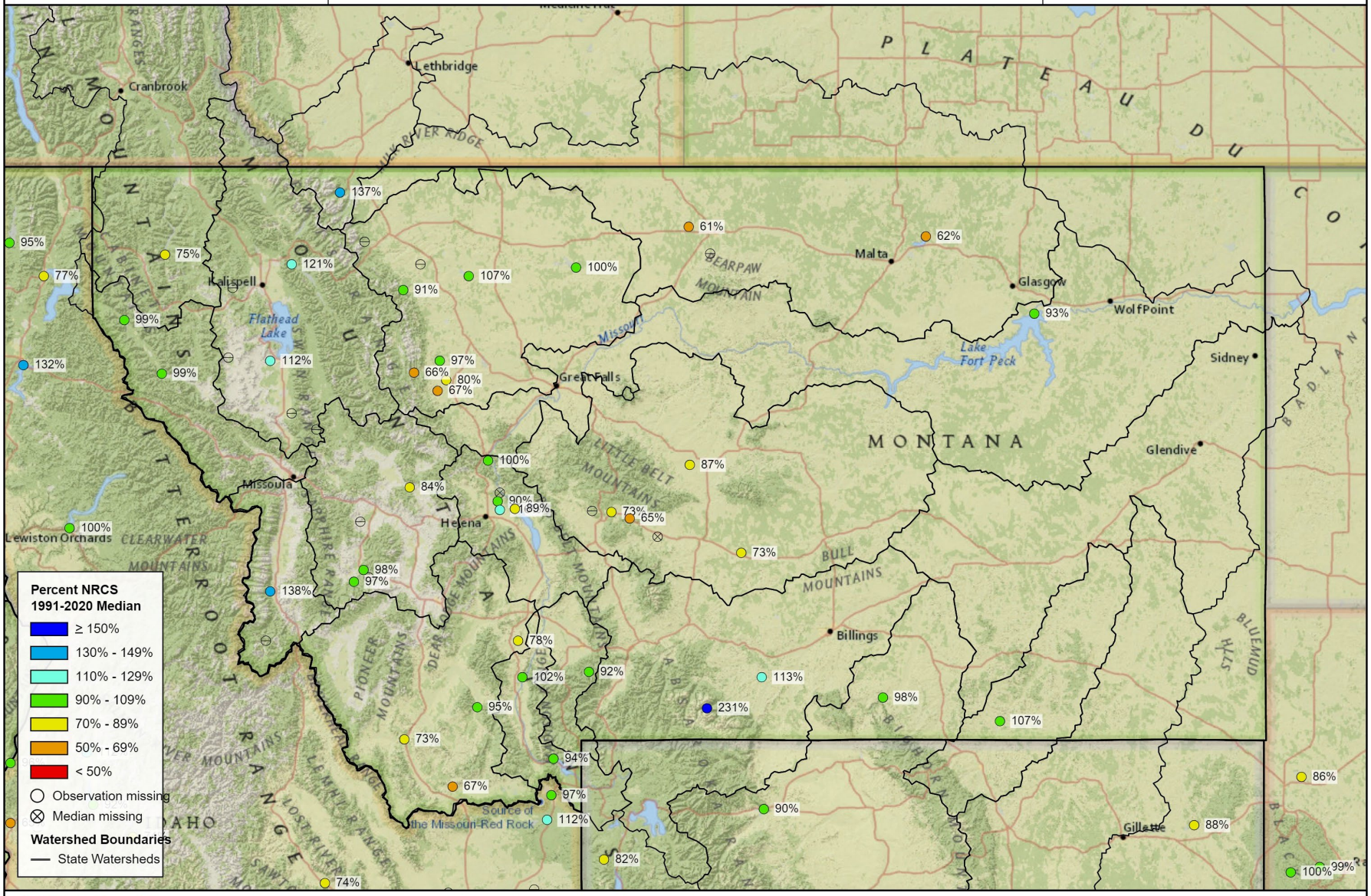
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 4-06-2022

Reservoir Storage	Reservoir Storage Percent NRCS 1991-2020 Median	April 1st, 2022



USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

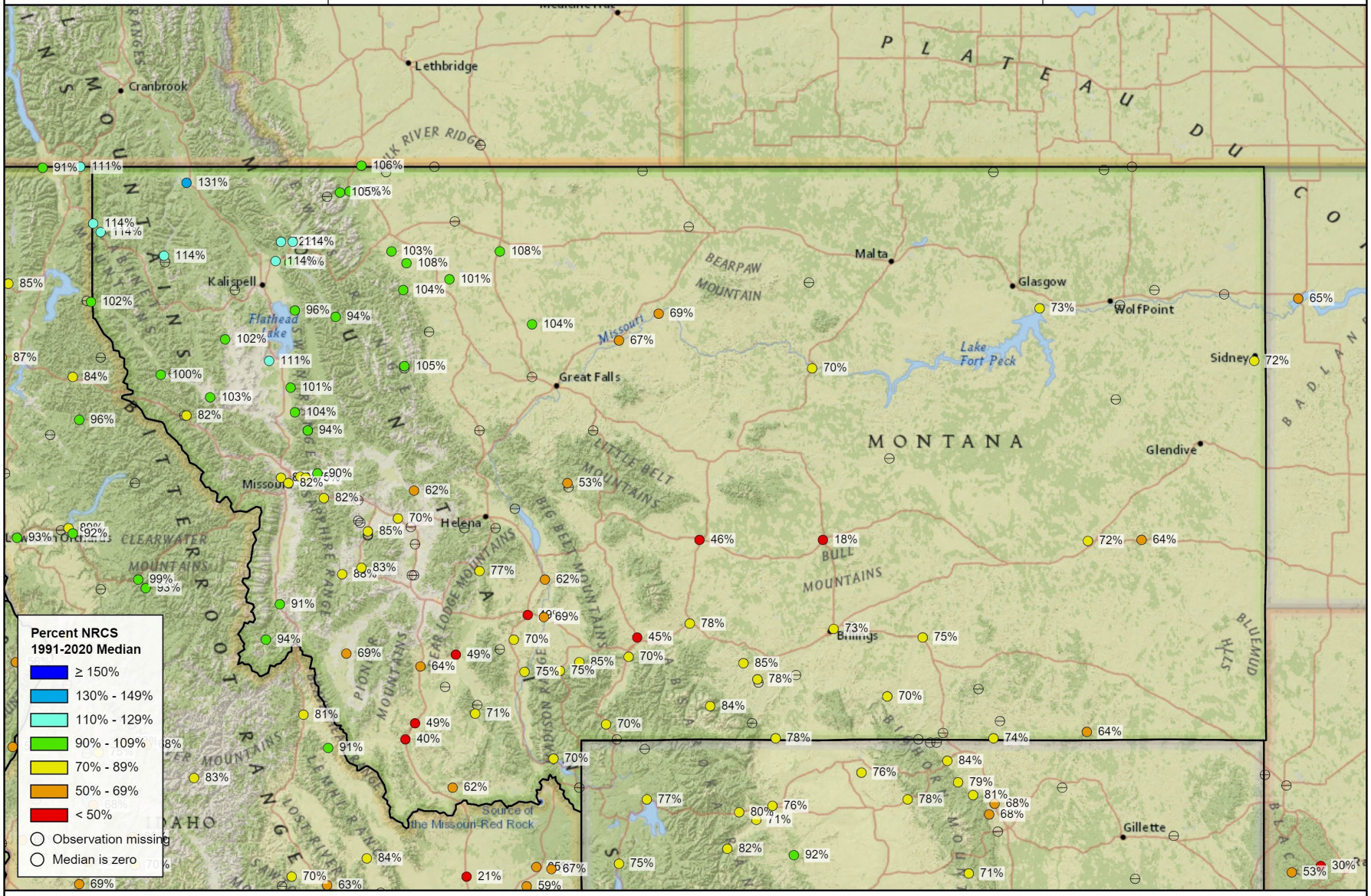
Created 4-07-2022

Forecast Volume,
50% Exceedance Probability

Streamflow Forecasts: April 1st - July 31st, 2022

Percent NRCS 1991-2020 Median

Primary Period, April 1, 2022



USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 4-07-2022

WSOR Web Page Access

The links below will take you to web pages dedicated to the individual river basins and statewide overview for presenting the monthly data. Users are encouraged to interact with the maps presented, select different maps using the drop-down menu, and hover over or click on points or basins of interest to view data and plots.

Monthly Data - Interactive Web Pages		
Monthly Data - Statewide Overview		
Monthly Statewide Overview		
Monthly Data - River Basin Summaries		
Columbia River Basin	**Missouri River Basin**	**Yellowstone River Basin**
Kootenai	**Jefferson**	**U. Yellowstone**
Flathead	**Madison**	**Wyoming**
Upper Clark	**Gallatin**	
Bitterroot	**Helena Valley**	
Lower Clark	**Smith-Judith**	
	Sun-Teton	
	St. Mary	
	Milk	

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
Email: mt-nrcs-snow@usda.gov

Montana Water Supply Outlook Report

Natural Resources Conservation Service