USDA United States Department of Agriculture

Natural Resources Conservation Service

# Montana Water Supply Outlook Report

March 1, 2025

Mudd Lake in the Anaconda Range near the Mudd Lake Snow Course. The snow course on the far end of the lake had an average snow depth of 52” equaling 14.4” of snow water equivalent (SWE), 93% of median for March 1. After a slower start to the snow accumulation season, above normal February precipitation helped bring the Mudd Lake Snow Course to near normal values. The Mudd Lake Snow Course has been measured 41 times on March 1 since it was installed in 1969. Southwest Montana received well above normal precipitation in February, reaching normal to near normal snowpack. While northwest Montana had near normal February precipitation it was not enough to make up for the dry conditions experienced during January. (Photo: Eric Larson 02/27/2025)

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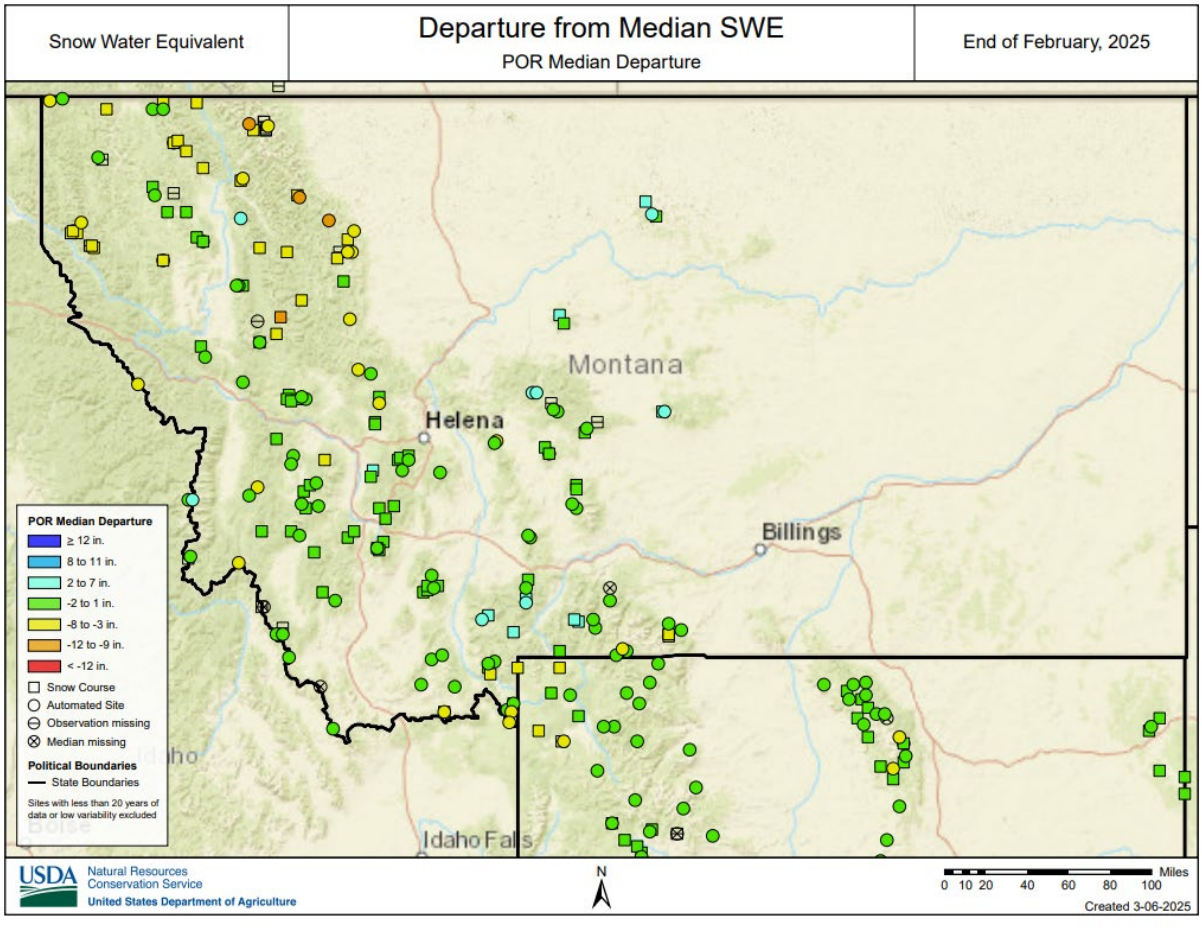
# Statewide Overview

## Summary

February was a month of steady snow accumulation in Montana. Most basins have near to below normal snow water equivalent (SWE). Colder temperatures for most of the month ushered in winter weather. The warm and sunny conditions near the end of the month slowed snow accumulation in most areas. Most snow courses and SNOTELs had SWE values in the range of 2” below to 1” above normal at the end of February. The map below shows snow measuring station departure from median SWE at the end of February. Some snow monitoring stations in the northwest Montana and the Rocky Mountain Front have larger SWE deficits. Dry January conditions and a slow start to water year precipitation accumulation allowed enough time for SWE deficits to increase. However, with snow accumulations in February the deficits decreased, and SWE values got closer to normal. Deficits also exist in soil moisture across the state. Most of the state remains in drought conditions, despite the steady snow accumulations.

The date of the median peak SWE across all SNOTELs in Montana is April 15. Snow accumulations over the next two months will determine water supply heading into the spring and summer. Increased precipitation will be needed to continue the trend of steady snow accumulations. Below or near normal temperatures will also be needed to continue snow accumulations and delay runoff. Soil moisture deficits will require increased precipitation as we approach spring.

Starting with this March 1 Water Supply Outlook Report, Water Supply Forecasts are published with each report through June 1. Streamflows in Montana are forecasted to be slightly below to near normal for April to July, yet a significant portion of the snow accumulation season remains.



# Statewide Overview

## Precipitation

February brought consistent precipitation across most of the state. SNOTELs across the state reported 1-3" of precipitation and a 10-20" increase in settled snow depth the first week of February. The storm was strongest in the Bighorn basin dropping 2-4" of precipitation and a 15-30" increase in settled snow depth. The second week of February precipitation continued in more modest amounts ranging from a few tenths of an inch to an inch of accumulation. Stronger storms returned the third week of February dropping about 0.5-2.5" of precipitation across most Montana SNOTELs. The last week of February was characterized by sunshine and precipitation, with storms falling as a mix of rain and snow depending on region and elevation. SNOTELS across the state received up to an inch of precipitation, with the northwest favored, receiving 1-4" of precipitation at most SNOTELs.

Monthly precipitation statewide was normal to above normal. Southwest Montana had well above normal monthly precipitation, with basins receiving 140-180% of normal February precipitation. Northwest Montana received about 105-130% of normal monthly precipitation. In central Montana, the Smith-Judith-Mussell received near normal precipitation, while the Bear Paw basin received well below normal precipitation for the month of February. The Bighorn mountains had below normal monthly precipitation, resulting in around 90% of normal February precipitation in the Tongue River basin and around 50% of normal precipitation in the Powder River basin.

Normal to above normal precipitation in February improved water year to date precipitation since last month, but early season deficits persist across most of the state. Western Montana, the Tongue, and Powder River basins have received around 70-90% of normal water year to date precipitation since October 1. The south central and central regions of the state that received higher February precipitation have recovered more significantly reaching near normal water year to date precipitation. Despite a dry February, significant early winter precipitation has the Bear Paw basin at well above normal water year to date precipitation. March, April, and May can be a very active time of the year for winter weather in Montana, and summer streamflow will depend on continued precipitation.

**February - Highest Total Accumulated Precipitation - SNOTEL/SNOLITE**

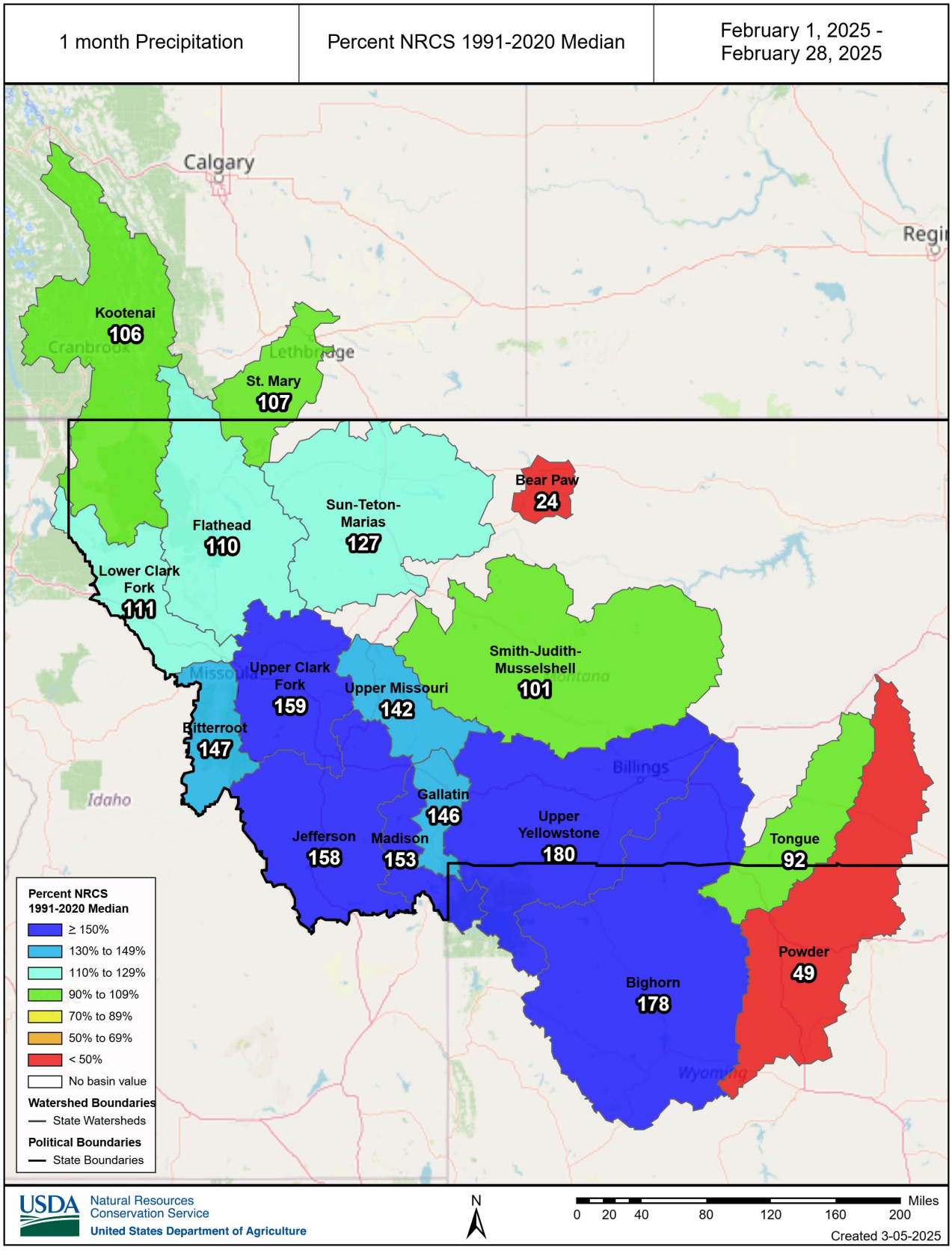
| Station | Precipitation (Inches) | Median (Inches) | Elevation | Basin |
|---|---|---|---|---|
| **Twin Lakes** | 10.0 | 6.6 | 6390 | Bitterroot |
| **Bear Mountain** | 9.7 | 9.0 | 5460 | Kootenai, Lower Clark Fork |
| **North Fork Jocko** | 9.0 | 7.1 | 6110 | Flathead, Upper Clark Fork |
| **Black Bear** | 8.5 | 5.0 | 8160 | Madison |
| **Evening Star** | 8.2 | 4.3 | 9040 | Upper Yellowstone, Bighorn |

**February - Lowest Total Accumulated Precipitation- SNOTEL/SNOLITE**

| Station | Precipitation (Inches) | Median (Inches) | Elevation | Basin |
|---|---|---|---|---|
| **Bear Trap Meadow** | 0.1 | 1.0 | 8200 | Powder, Bighorn |
| **Middle Powder** | 0.1 | 1.2 | 7760 | Powder, Bighorn |
| **Grave Springs** | 0.4 | 1.4 | 8560 | Powder, Bighorn |
| **Rocky Boy** | 0.4 | 1.7 | 4730 | Bear Paw |
| **Timber Creek** | 0.7 | 0.8 | 7910 | Bighorn |

# Statewide Overview

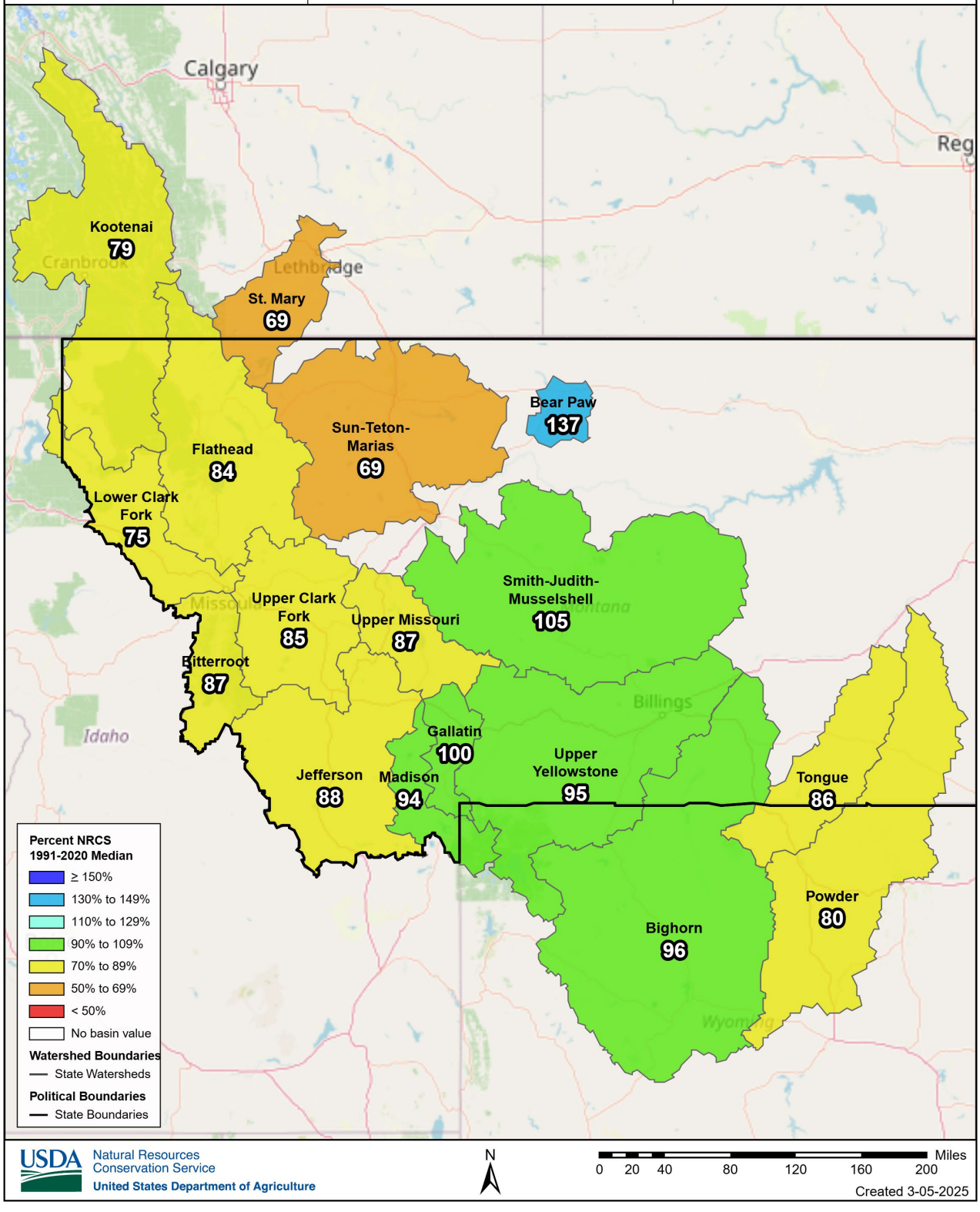
## Precipitation (Continued)



# Statewide Overview

## Precipitation (Continued)

| Water Year to Date Precipitation | Percent NRCS 1991-2020 Median | October 1, 2024 - February 28, 2025 |
|---|---|---|



# Statewide Overview

## Snowpack

The normal to above normal February precipitation improved snowpack conditions across most of the state. Winter storms favored southwest Montana, increasing snowpack from 75-95% of normal on February 1 to 95-110% of normal on March 1. Maximum snow depths in southwest Montana range from 50-85". Conditions improved less substantially in northwest Montana, where the snowpack increased from 55-80% of normal on February 1 to 70-85% of normal on March 1. Maximum snow depths in the northwest range from 65-100". The Powder and Tongue River basins maintained a similar snowpack to last month of 75-95% of normal. Central Montana saw a decrease in snowpack surplus, but thanks to early season storms the snowpack remains well above normal at 120% of median in the Smith-Judith-Musselshell basins and around 160% of median in the Bear Paw basin.

In southwest Montana, March 1 SWE values range from around 3" below to 3" above normal, similar to water years 2021, 2015, and 2003. In the northwest, SWE deficits are more widespread and snow measuring stations are reporting around 1" above to 6" below normal SWE, comparable to conditions in 2019, 2016, and 2009. The snowpack density in the northwest is increasing, indicating a snowpack ripening for runoff. Central Montana snow monitoring stations are reporting 0 to 3" of SWE above normal for March 1 similar to 2023 or 2019. The Bighorn, Powder, and Tongue River basins have SWE values ranging from 2" below to 2" above normal, comparable to 2006, 2005, or 2003.

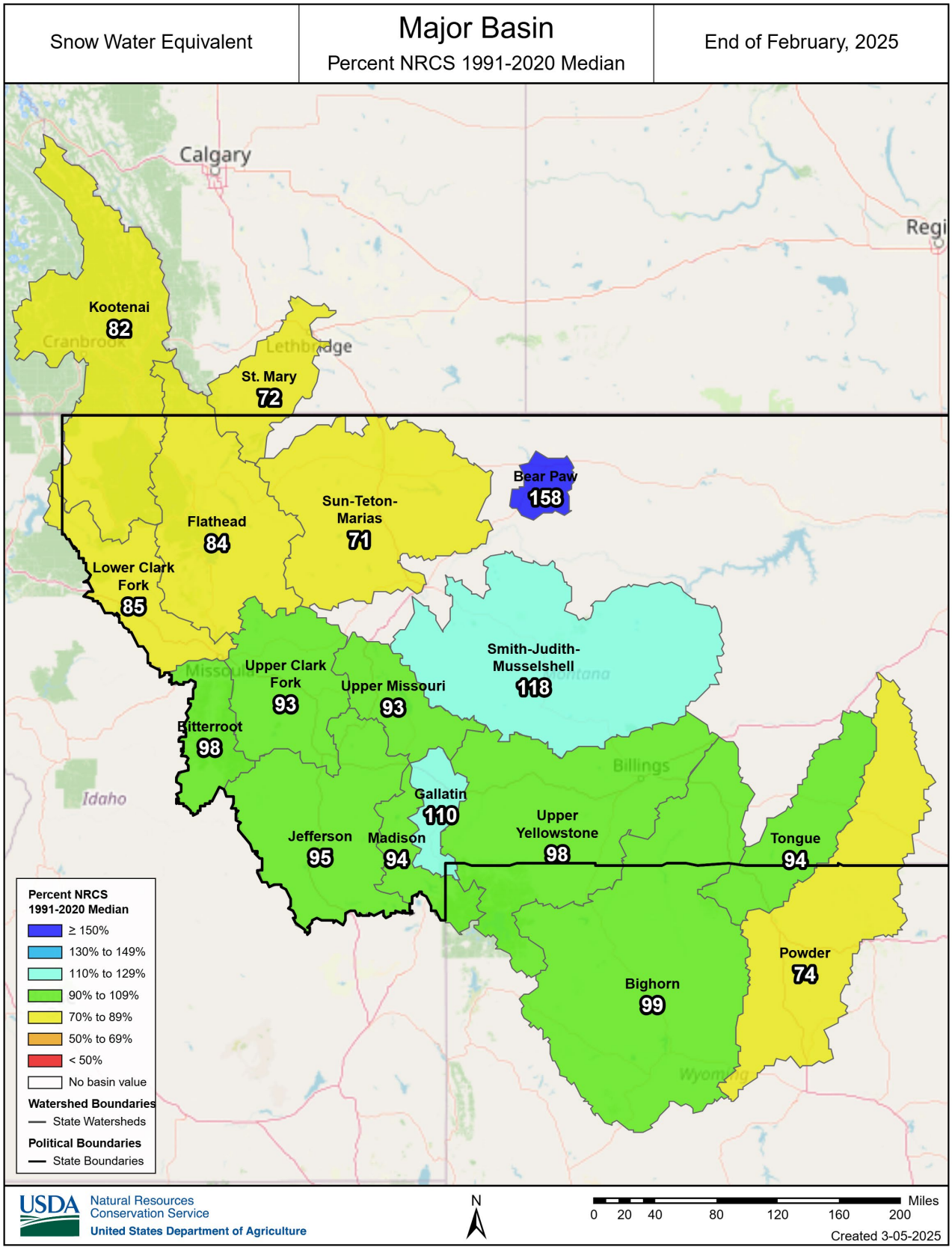
One to two months remain in the typical snowpack accumulation season. Upper elevations across Montana typically don't reach peak SWE until early May. While many stations have near or above normal snowpack for March 1, basin wide snowpack is around 3-10" of SWE below peak values. The Bear Paw basin is the exception, exceeding median peak SWE in early January. Reaching peak SWE will influence spring and summer runoff more that the snapshot of March 1 snowpack. Continued winter storms will be needed to reach peak SWE and maintain or improve upon current snowpack.

**Water Year 2025 - Major Basin - Snowpack Percent of Normal ('91-'20)**

| Basin | Nov 1 | Dec 1 | Jan 1 | Feb 1 | Mar 1 | Apr 1 | May 1 | Jun 1 |
|---|---|---|---|---|---|---|---|---|
| Kootenai | 56 | 127 | 117 | 80 | 82 | - | - | - |
| Flathead | 51 | 124 | 105 | 79 | 84 | - | - | - |
| Upper Clark Fork | 38 | 83 | 72 | 78 | 93 | - | - | - |
| Bitterroot | 74 | 99 | 91 | 80 | 97 | - | - | - |
| Lower Clark Fork | 55 | 134 | 112 | 80 | 85 | - | - | - |
| Jefferson | 44 | 82 | 75 | 82 | 95 | - | - | - |
| Madison | 55 | 88 | 84 | 81 | 94 | - | - | - |
| Gallatin | 53 | 85 | 93 | 92 | 110 | - | - | - |
| Upper Missouri | - | 67 | 67 | 77 | 93 | - | - | - |
| Smith-Judith-Musselshell | 2 | 86 | 91 | 131 | 118 | - | - | - |
| Sun-Teton-Marias | 25 | 81 | 70 | 56 | 71 | - | - | - |
| St. Mary | 50 | 106 | 94 | 67 | 72 | - | - | - |
| Upper Yellowstone | 41 | 62 | 72 | 78 | 98 | - | - | - |
| Bighorn | 54 | 65 | 69 | 81 | 99 | - | - | - |
| Powder | 54 | 65 | 60 | 81 | 74 | - | - | - |
| Tongue | 80 | 81 | 65 | 95 | 94 | - | - | - |
| Bear Paw | - | 222 | 136 | 228 | 158 | - | - | - |

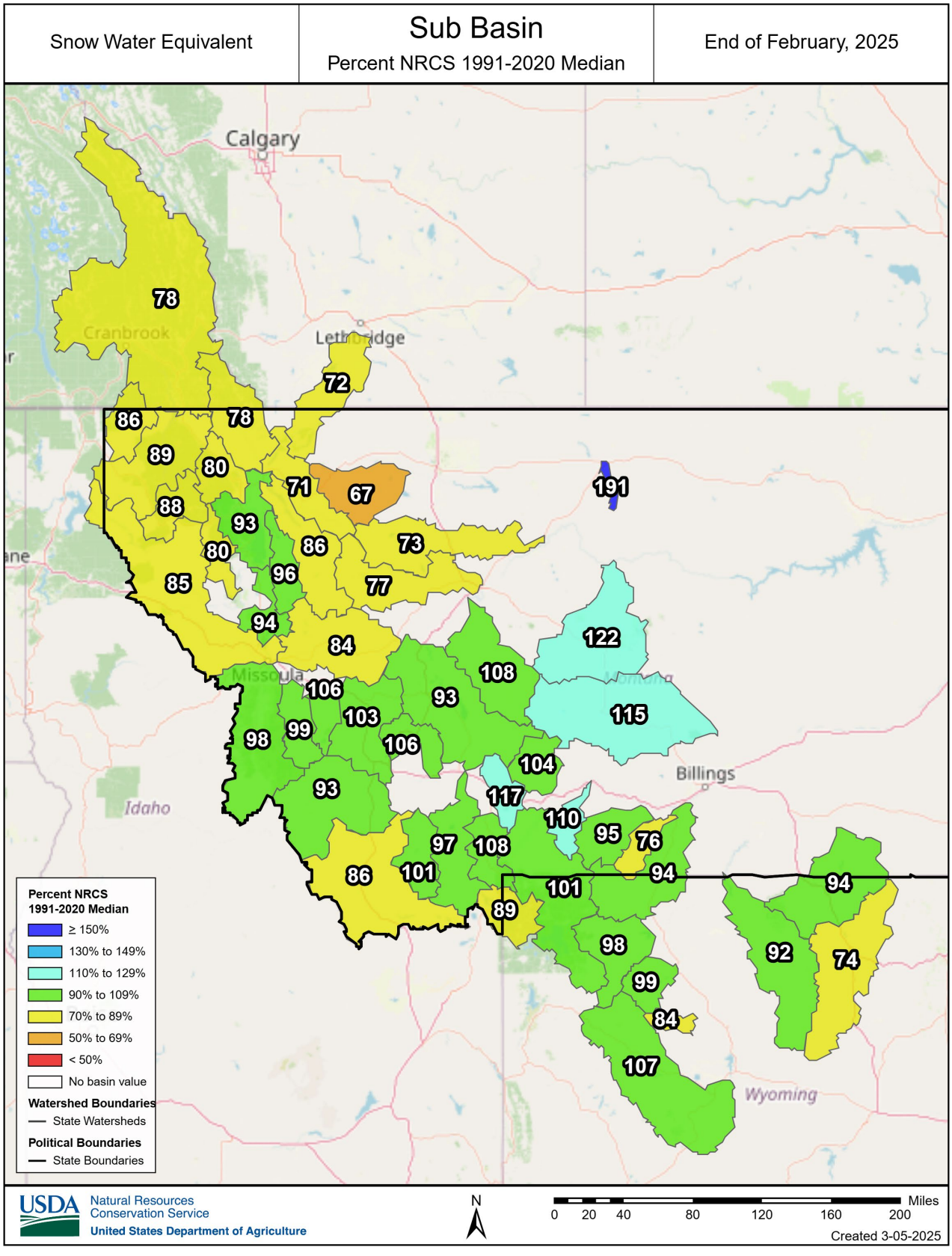
# Statewide Overview

## Snowpack (Continued)



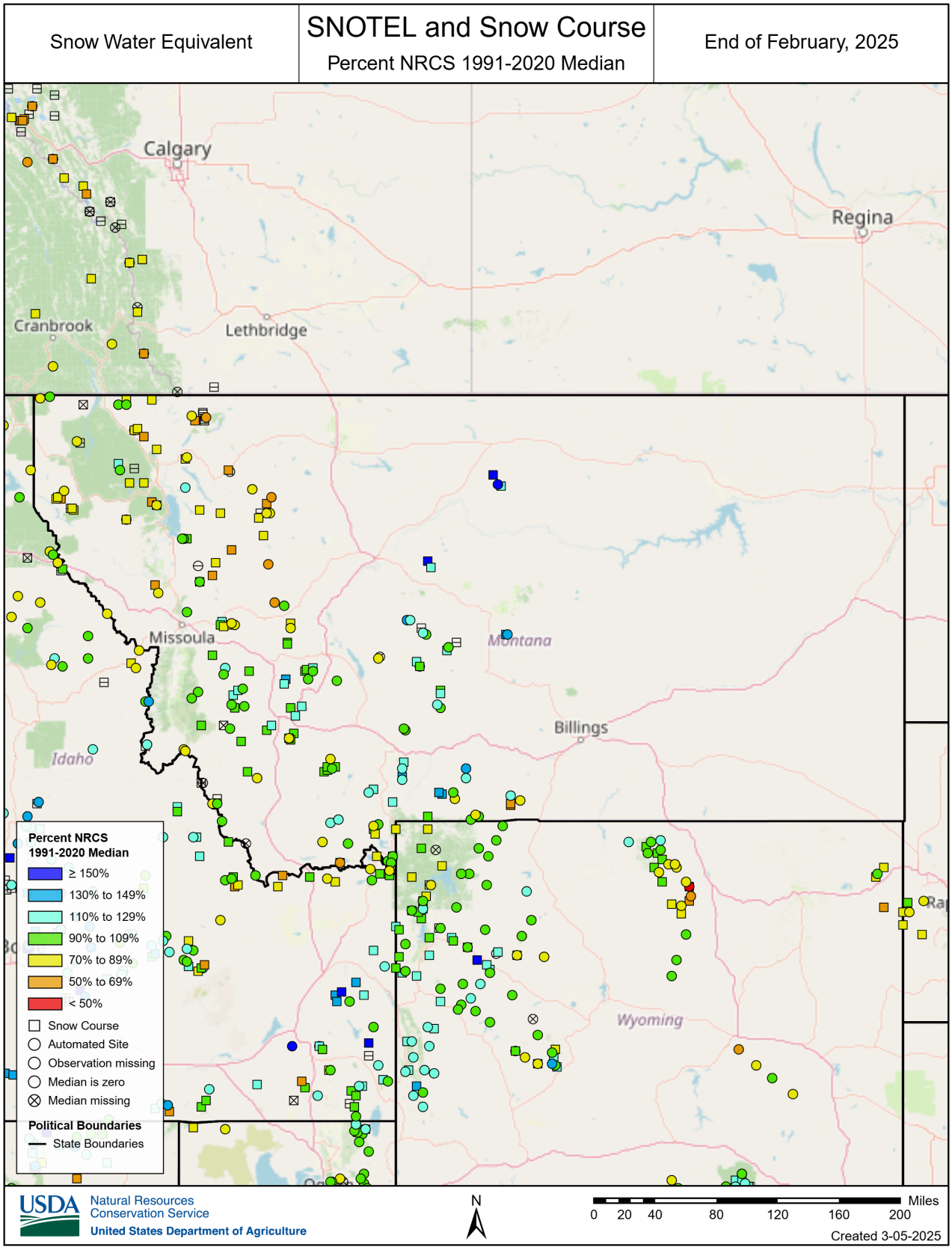
# Statewide Overview

## Snowpack (Continued)



# Statewide Overview

## Snowpack (Continued)



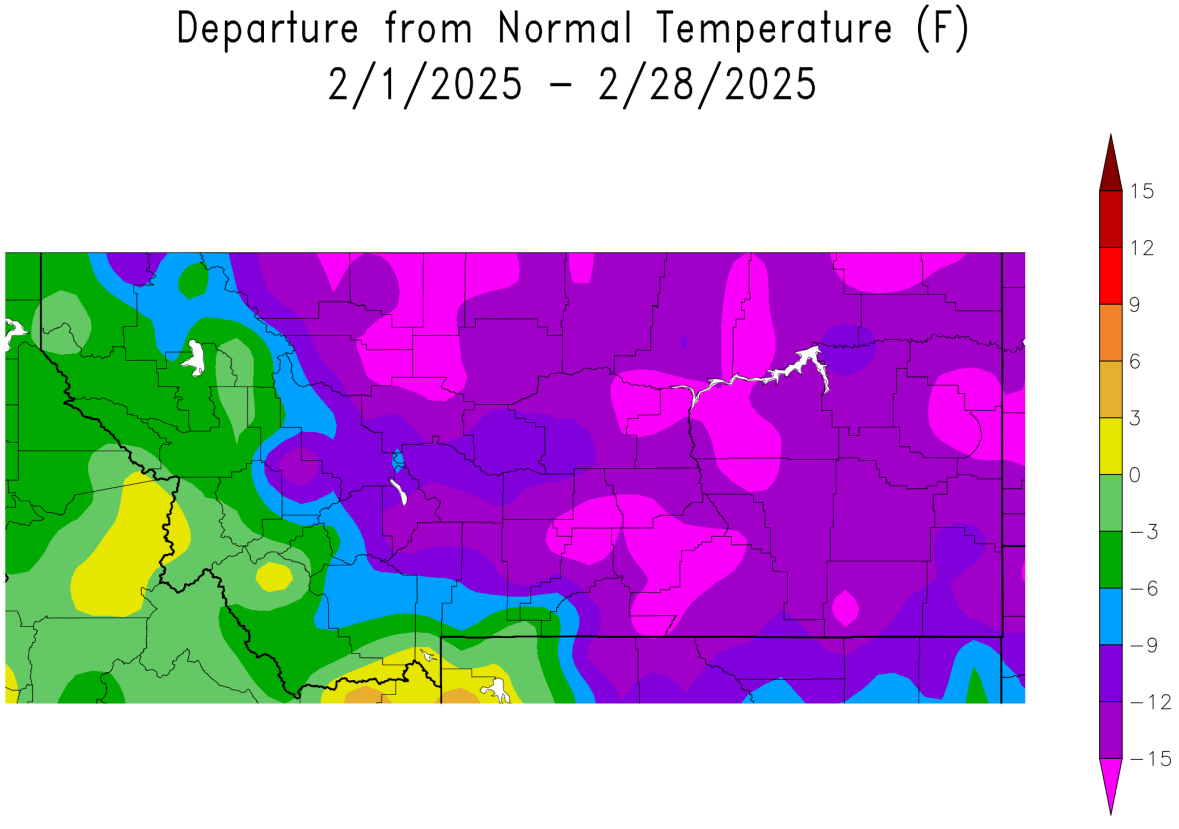
# Statewide Overview

## Temperature

February temperatures were mostly below normal in Montana. Most of the state had temperatures well below normal. The central and eastern portions of the state had temperatures less than 6 °F below normal, with some locations having temperatures up to 15 °F below normal. Western Montana had nearest to normal temperatures. Most of this region had temperatures 3-6 °F below normal. Some areas had temperatures within 3 °F of normal.

SNOTELs located in Montana show the trends of daily average temperatures in February. Although monthly temperatures were mostly below average, the daily average temperatures show how this trend changed near the end of the month. From February 2 to February 20, the average SNOTEL daily temperatures remained below normal. With the coldest stretch being from February 9 to February 13. During this stretch the daily average temperatures dipped down to near -5 °F. From February 20 to February 21, temperatures hovered near normal. From February 21 to the end of the month, the temperatures shifted and remained above normal. These daily average temperatures ranged from 5 to 15 °F above normal near the end of the month.

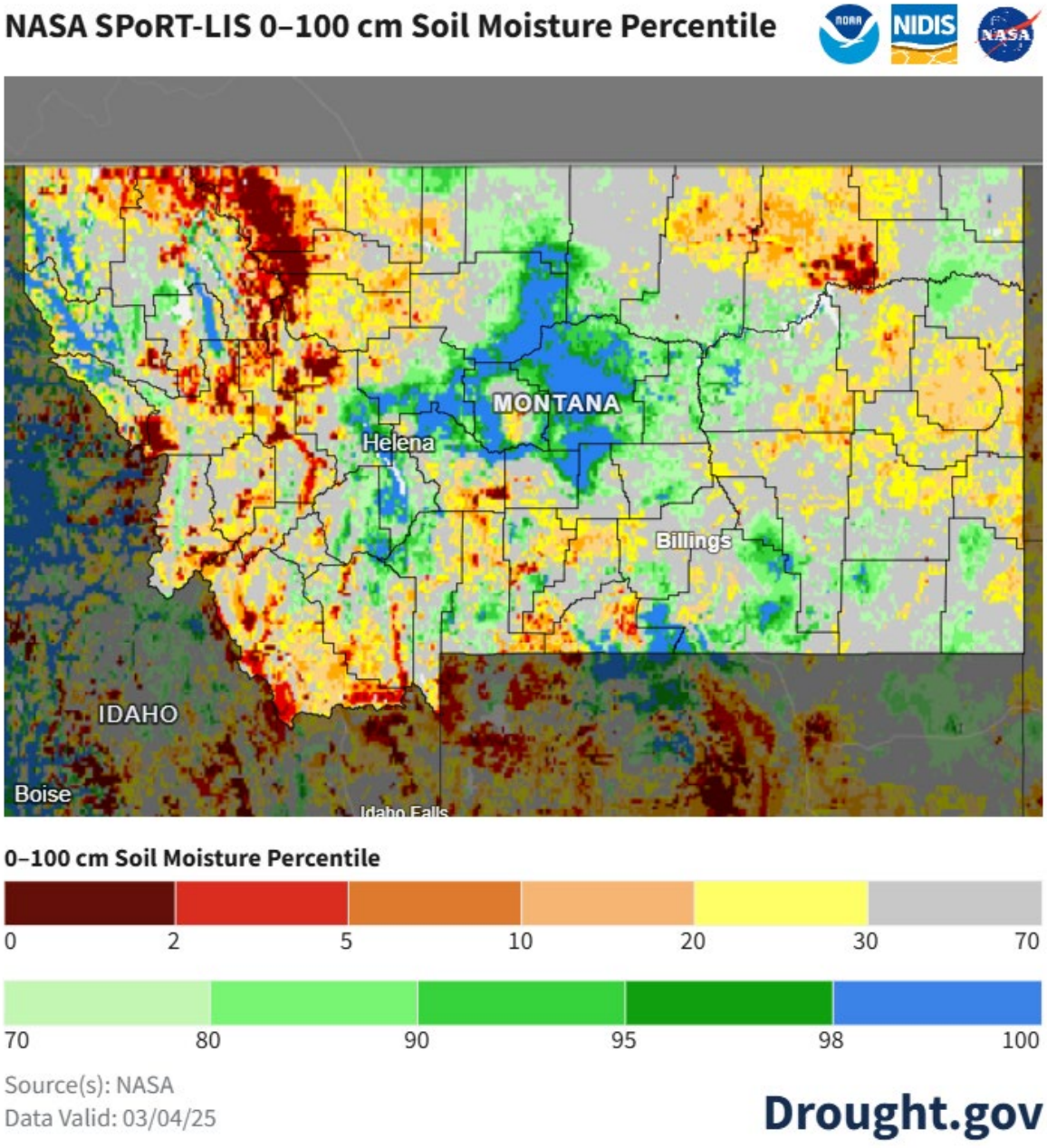
Although February monthly temperatures were mostly below normal, a significant portion of the month had daily temperatures that were above normal. The shift to warmer temperatures impacted lower elevation snowpacks and has started to influence the higher elevation areas.



# Statewide Overview

## Soil Moisture

Soil moisture in the top 100 cm is similar to last month. Most of the state still has soil moistures in the 30-70 percentile or less. However, most areas have seen slight improvements and have increased a percentile ranking. In the central portion of the state, soil moisture is now in the 98-100 percentile. Fewer areas of the state are in the 0-2 percentile this month, but many areas are still below normal soil moisture. Despite some improvements, continued snow accumulation and precipitation will be crucial for continuing the trend of soil moisture increases.



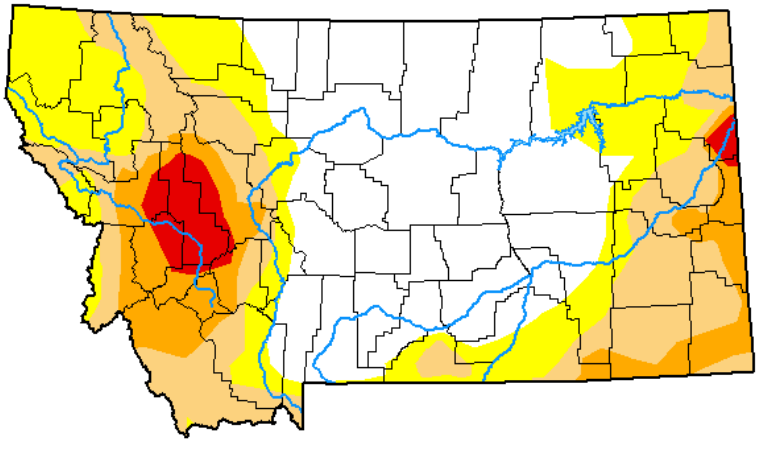
# Statewide Overview

## Drought Monitor

Since last month, drought conditions in the state of Montana have improved. There is a larger area in the no drought conditions category. The areas with no drought conditions increased from about 4 to 40% since last month. This percent area increase and drought condition improvement occurred mostly around the central portion of the state. Drought conditions persist in the western and eastern portions of the state and about 60% of the state has drought conditions. Of those areas: around 24% is abnormally dry, 22% is in moderate drought, 10% in severe drought, 3% in extreme drought, and 0.0% in exceptional drought. Drought conditions remained relatively unchanged in the western part of the state compared to last month. A large portion of the Upper Clark Fork basin remains in extreme drought conditions. Surrounding areas have severe and moderate drought conditions. Future snow accumulation and precipitation will determine if the trend of drought condition improvements will continue.

***U.S. Drought Monitor***

**Montana**



**March 4, 2025**

***(Released Thursday, Mar. 6, 2025)***

**Valid 7 a.m. EST**

*Drought Conditions (Percent Area)*

| | None | D0 | D1 | D2 | D3 | D4 |
|---|---|---|---|---|---|---|
| **Current** | 40.90 | 24.12 | 21.55 | 9.95 | 3.48 | 0.00 |
| **Last Week** 02-25-2025 | 40.90 | 24.09 | 20.87 | 9.99 | 4.15 | 0.00 |
| **3 Months Ago** 12-03-2024 | 5.49 | 37.24 | 26.79 | 13.47 | 16.20 | 0.81 |
| **Start of Calendar Year** 01-07-2025 | 6.70 | 39.08 | 26.98 | 13.46 | 13.79 | 0.00 |
| **Start of Water Year** 10-01-2024 | 15.18 | 42.58 | 21.19 | 11.61 | 8.54 | 0.90 |
| **One Year Ago** 03-05-2024 | 5.42 | 45.98 | 26.62 | 19.61 | 2.36 | 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:*

Curtis Riganti

National Drought Mitigation Center

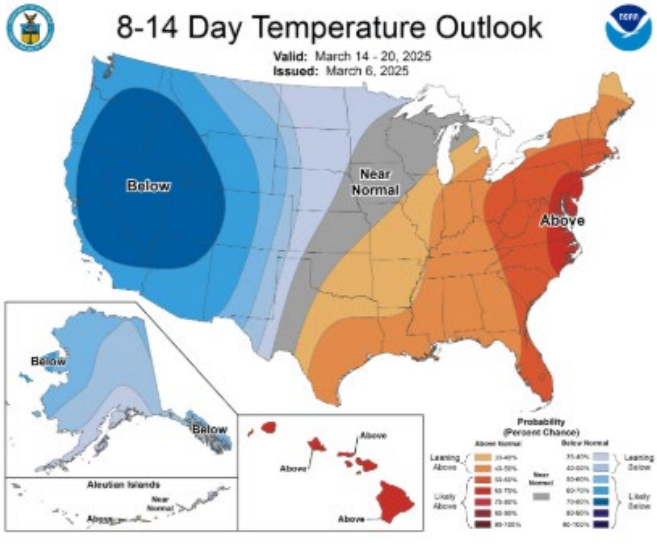
**droughtmonitor.unl.edu**

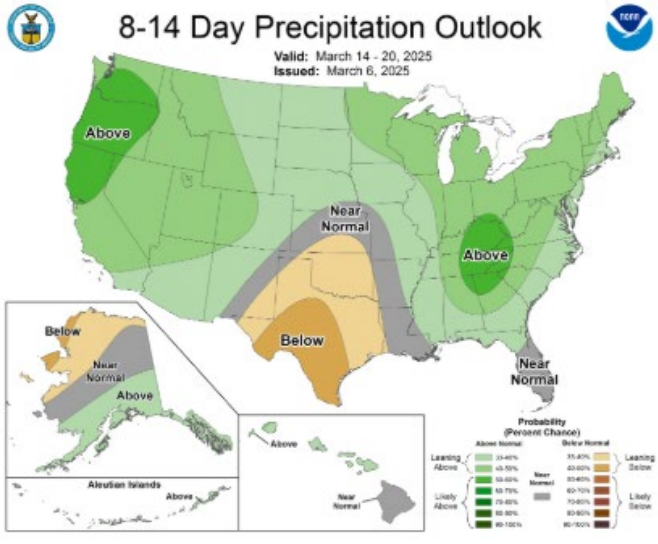
# Statewide Overview

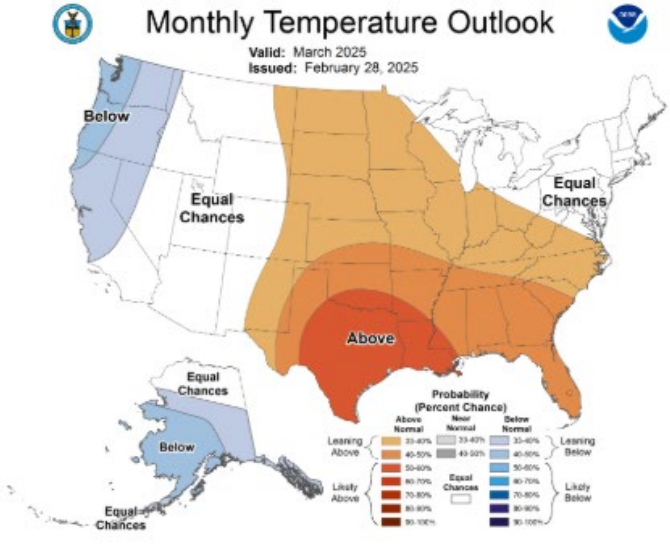
## Weather Outlook

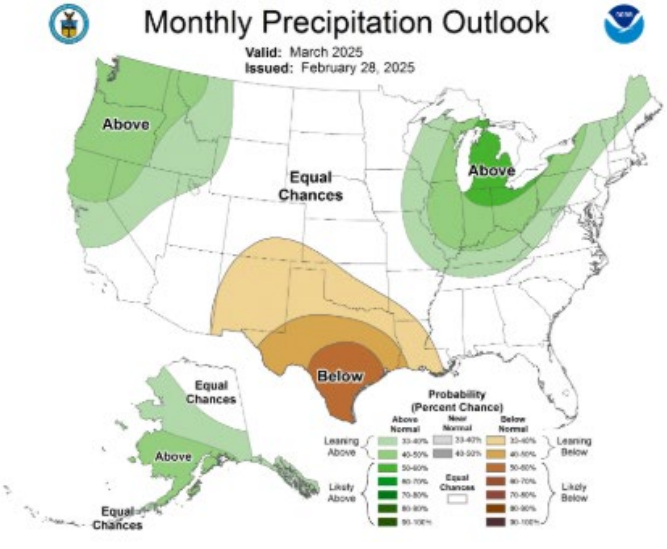
According to the NOAA Climate Prediction Center, temperatures in Montana will likely be below normal in the next 8-14 days. The western and southwestern portions of the state have the highest probabilities of below normal temperatures. Precipitation outlook is leaning towards above normal in the next 8-14 days. The western part of the state has a 40-50% probability of above normal precipitation and the eastern portion of the state has slightly less of a probability.

Montana has equal chances of above or below normal temperatures over the next month. The far eastern portion of the state leans slightly towards above normal temperatures. The western portion of the state is leaning towards above normal precipitation over the next month. The probability of above normal monthly precipitation is higher in the northwest corner of the state. The eastern portion of the state has equal chances of above or below normal temperatures.



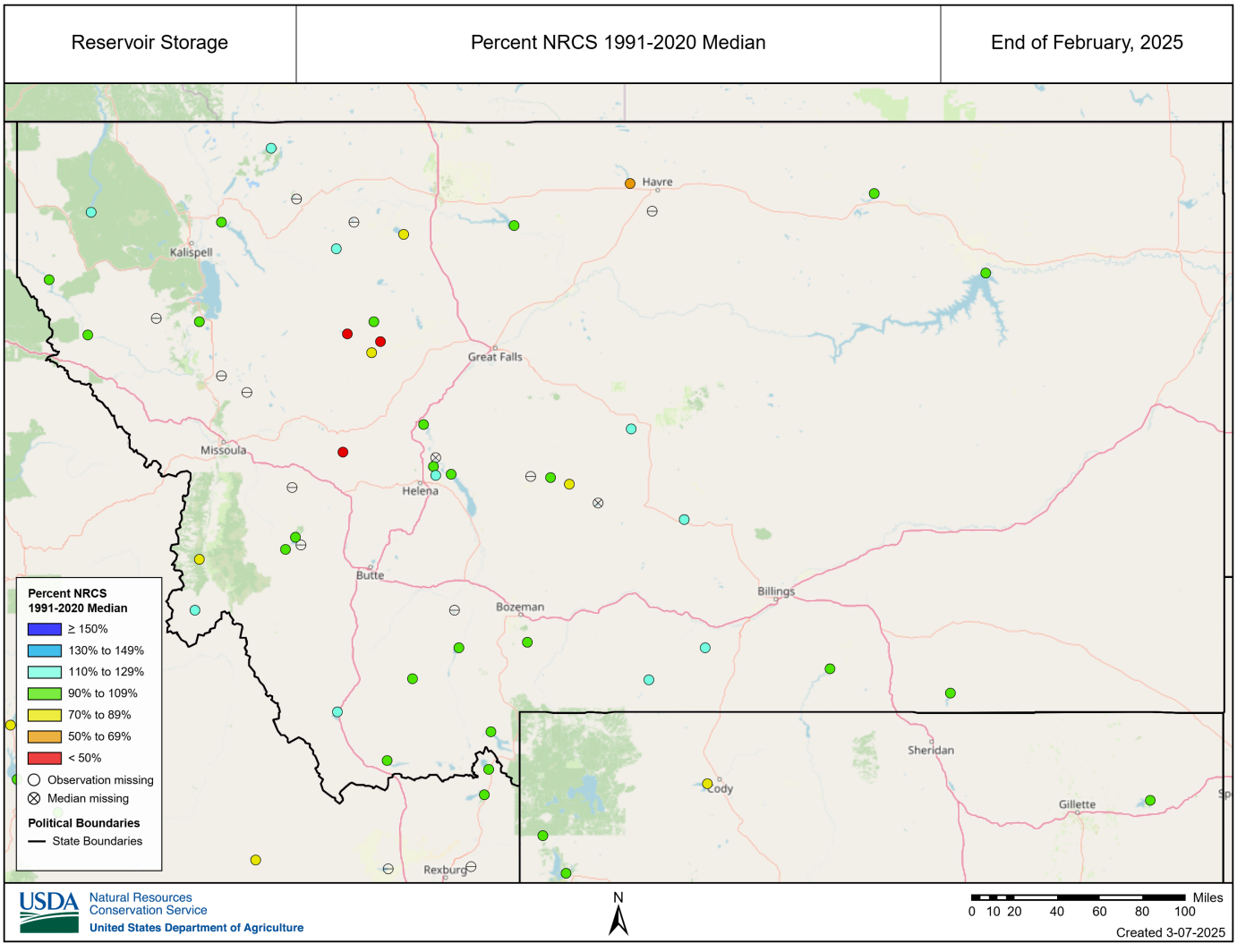



# Statewide Overview

## Reservoirs

Most Montana reservoirs reported near normal end of February storage levels, with some reservoirs reporting above or below normal values. Lake Sherburne, Lake Koocanusa, Swift Reservoir, Helena Valley Reservoir, Painted Rocks Lake, Clark Canyon Reservoir, Ackley Lake, Deadman's Basin Reservoir, Cooney Reservoir, and Mystic Lake Reservoir all had above normal reservoir levels of 110-130% of normal for this time of year. Lake Frances, Nilan Reservoir, Lake Como, and Bair Reservoir reported below normal reservoir levels of 70-90% of normal. Gibson Reservoir, Willow Creek Reservoir, Nevada Creek Reservoir, and Fresno Reservoir all reported well below normal reservoir levels. The remaining reservoir storage facilities across the state reported near normal reservoir storage.



# Statewide Overview

## Reservoirs (Continued)

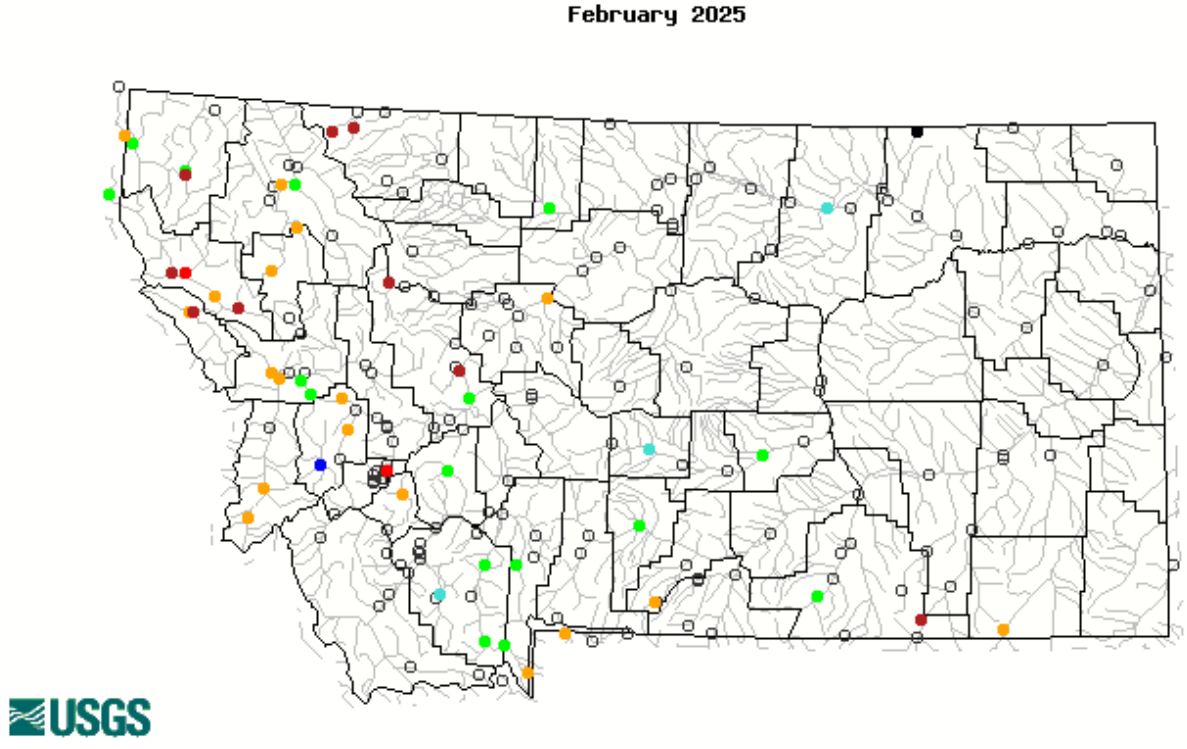
### End of February - Reservoir Storage Percent of Capacity

| Reservoir | Basin | Current % Capacity | Last Year % Capacity | Median % Capacity |
|---|---|---|---|---|
| **Smith River Res** | Smith-Judith-Musselshell | 58 | 80 | 59 |
| **Deadman's Basin Res** | Smith-Judith-Musselshell | 84 | 89 | 71 |
| **Bair Res** | Smith-Judith-Musselshell | 37 | 62 | 50 |
| **Swift Res** | Sun-Teton-Marias | 61 | 44 | 52 |
| **Lake Frances** | Sun-Teton-Marias | 37 | 45 | 44 |
| **Lake Elwell (Tiber)** | Sun-Teton-Marias | 49 | 51 | 54 |
| **Gibson Res** | Sun-Teton-Marias | 5 | 10 | 29 |
| **Mystic Lake** | Upper Yellowstone | 22 | 19 | 17 |
| **Cooney Res** | Upper Yellowstone | 83 | 90 | 69 |
| **Ruby River Reservoir** | Jefferson | 73 | 84 | 73 |
| **Lima Reservoir** | Jefferson | 47 | 68 | 47 |
| **Clark Canyon Res** | Jefferson | 54 | 64 | 47 |
| **Painted Rocks Lake** | Bitterroot | 26 | 29 | 21 |
| **Lake Como** | Bitterroot | 28 | 36 | 38 |
| **Bull Lake** | Bighorn | 23 | 47 | 53 |
| **Buffalo Bill** | Bighorn | 58 | 74 | 68 |
| **Boysen** | Bighorn | 62 | 77 | 72 |
| **Bighorn Lake** | Bighorn | 58 | 61 | 60 |
| **Lake Helena** | Upper Missouri | 78 | 78 | 86 |
| **Holter Lake** | Upper Missouri | 99 | 99 | 99 |
| **Helena Valley Reservoir** | Upper Missouri | 62 | 72 | 54 |
| **Canyon Ferry Lake** | Upper Missouri | 69 | 75 | 72 |
| **Lake Koocanusa** | Kootenai | 63 | 69 | 55 |
| **Hungry Horse Lake** | Flathead | 70 | 83 | 72 |
| **Flathead Lake** | Flathead | 48 | 53 | 44 |
| **Nelson Res** | Milk | 54 | 61 | 56 |
| **Fresno Res** | Milk | 23 | 17 | 38 |
| **Noxon Rapids Reservoir** | Lower Clark Fork | 90 | 95 | 95 |
| **Fort Peck Lake** | Lower Missouri | 71 | 75 | 72 |
| **Nevada Creek Res** | Upper Clark Fork | 24 | 43 | 50 |
| **Georgetown Lake** | Upper Clark Fork | 93 | 96 | 92 |
| **Tongue River Res** | Tongue | 60 | 63 | 55 |
| **Lake Sherburne** | St. Mary | 55 | 64 | 47 |
| **Hebgen Lake** | Madison | 80 | 85 | 75 |
| **Ennis Lake** | Madison | 75 | 75 | 71 |
| **Middle Creek Res** | Gallatin | 53 | 54 | 56 |

# Statewide Overview

## Streamflow

February monthly streamflow varied across the state. Most stations had near or below normal streamflow. Some outliers had high or low streamflow. Last year's low snow and persistent drought conditions could contribute to the below normal baseflows seen at this time. During the recent warming trend, some snowmelt occurred in the valleys and lower elevations. This increased streamflows in some areas. However, the snowmelt that did occur didn't produce enough runoff to increase monthly streamflow to above normal in most locations. The higher elevation snowpack hasn't had widespread melting yet. Future snow accumulations and temperatures will influence streamflow as we approach spring.



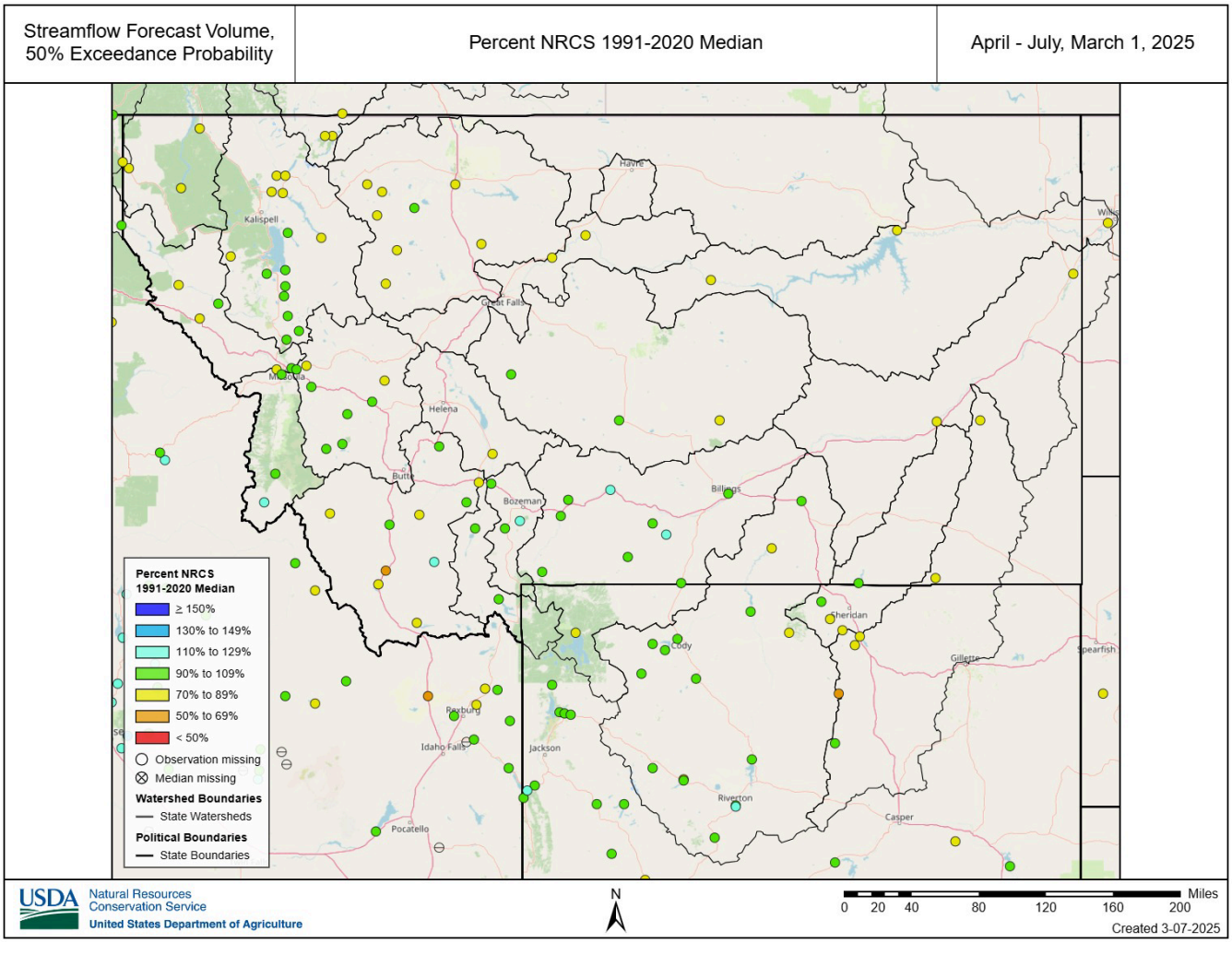

| Explanation - Percentile classes | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Low | <10 | 10-24 | 25-75 | 76-90 | >90 | High | Not-ranked |
| | Much below normal | Below normal | Normal | Above normal | Much above normal | | |

# Statewide Overview

## Water Supply Forecasts

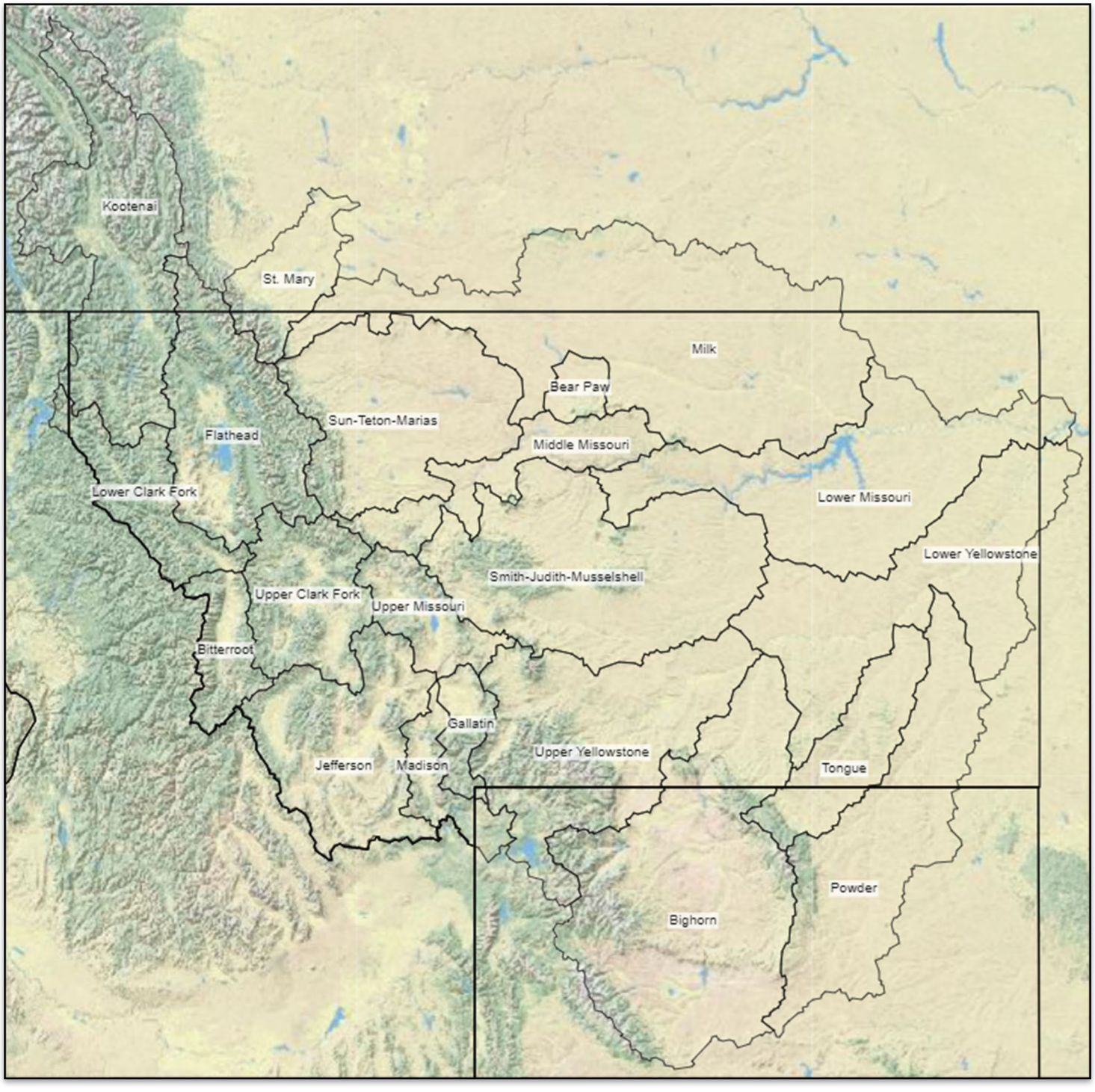
Streamflow forecasts are published in the March 1 – June 1 Water Supply Outlook Reports. March forecasts provide an initial look at what spring and summer snowmelt and runoff may entail this year. Much of the uncertainty in the forecast comes from what the weather will do the rest of the winter and spring. Looking at the full suite of forecast predictions, not just the 50% exceedance, will provide a better picture of the range of streamflows to expect. Forecasts published in later months generally provide a better indication of what the upcoming season will bring.

Across the state February precipitation has improved the water supply outlook, however year to date precipitation is still below to near normal. As a result, most April – July streamflows are forecasted to be about 70-110% of normal. Basins favored by February snowfall such as the Gallatin, Madison, Upper Yellowstone, and Bighorn are predicating near to above normal streamflow. Basins with a larger water year precipitation deficit such as the Powder, Tongue, Jefferson, St. Mary, Sun-Teton-Marias, Kootenai, Upper Flathead, and Lower Clark Fork basins are predicting below normal streamflow. Spring and summer streamflows will be dependent on future weather; continued precipitation over the rest of the winter and spring will be influential in maintaining normal streamflow outlooks and catching up the deficit at locations where below normal streamflow is predicted.



# Basin Overview

## Montana River Basin Definitions

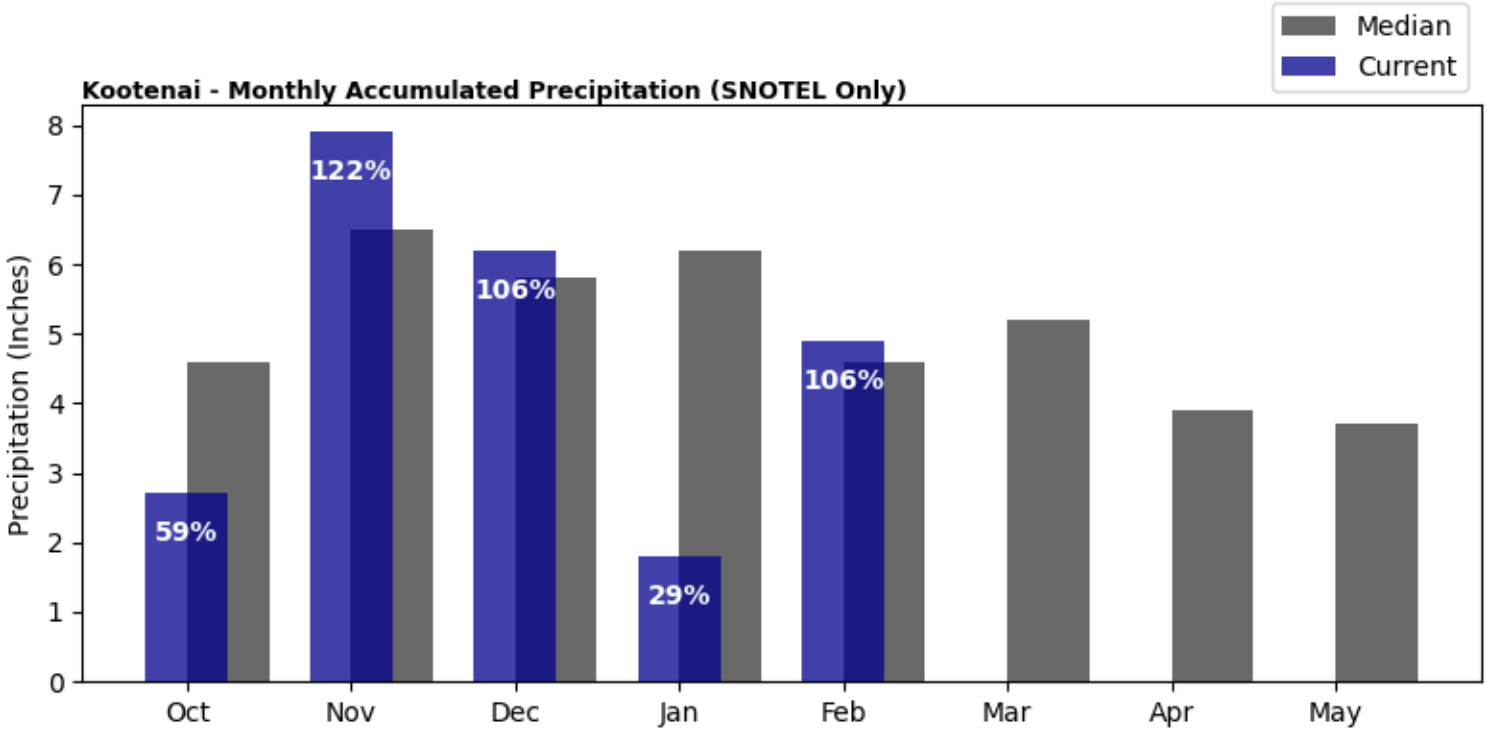


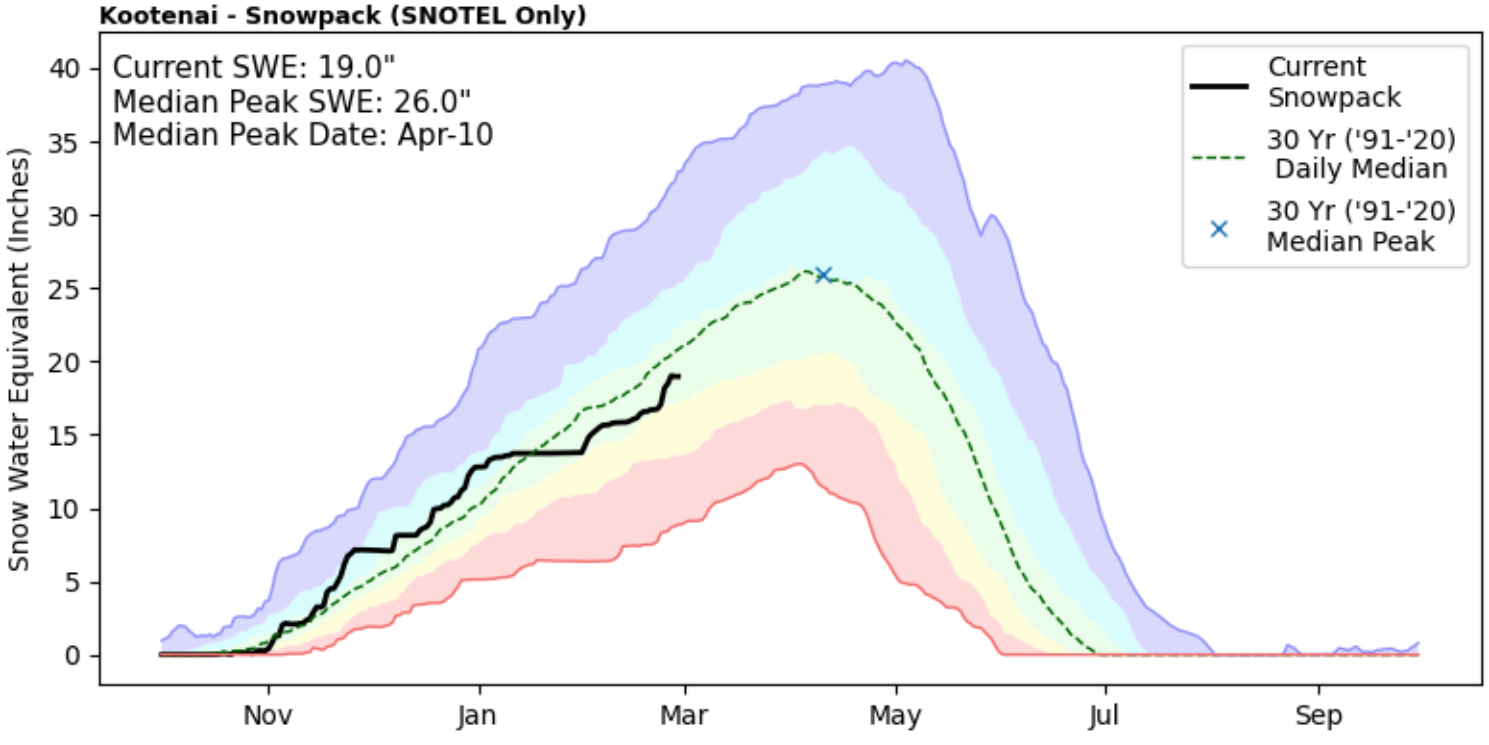

The following basin overview sections only include basins that have SNOTEL sites. For example, there is no basin overview for the Lower Yellowstone, because there are no SNOTEL sites associated with that basin. Water supply information for basins not included in the following sections can be found at https://nwcc-apps.sc.egov.usda.gov/

# Basin Overview

## Kootenai

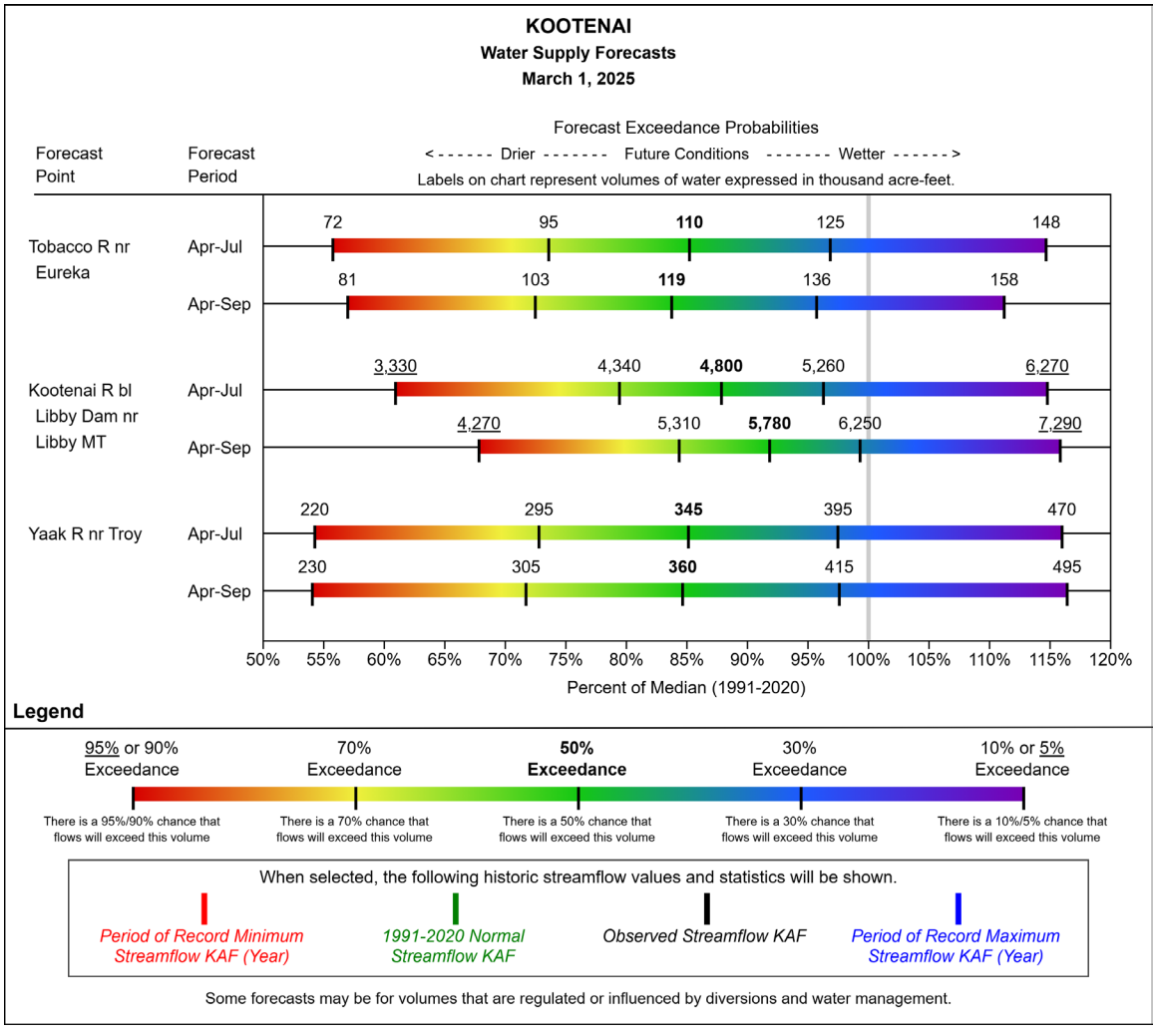
Precipitation in February was above normal at 106%, which brings the seasonal accumulation (October-February) to 79% of median. The snowpack in the Kootenai is below normal at 82% of median, compared to 79% at this time last year.



# Basin Overview

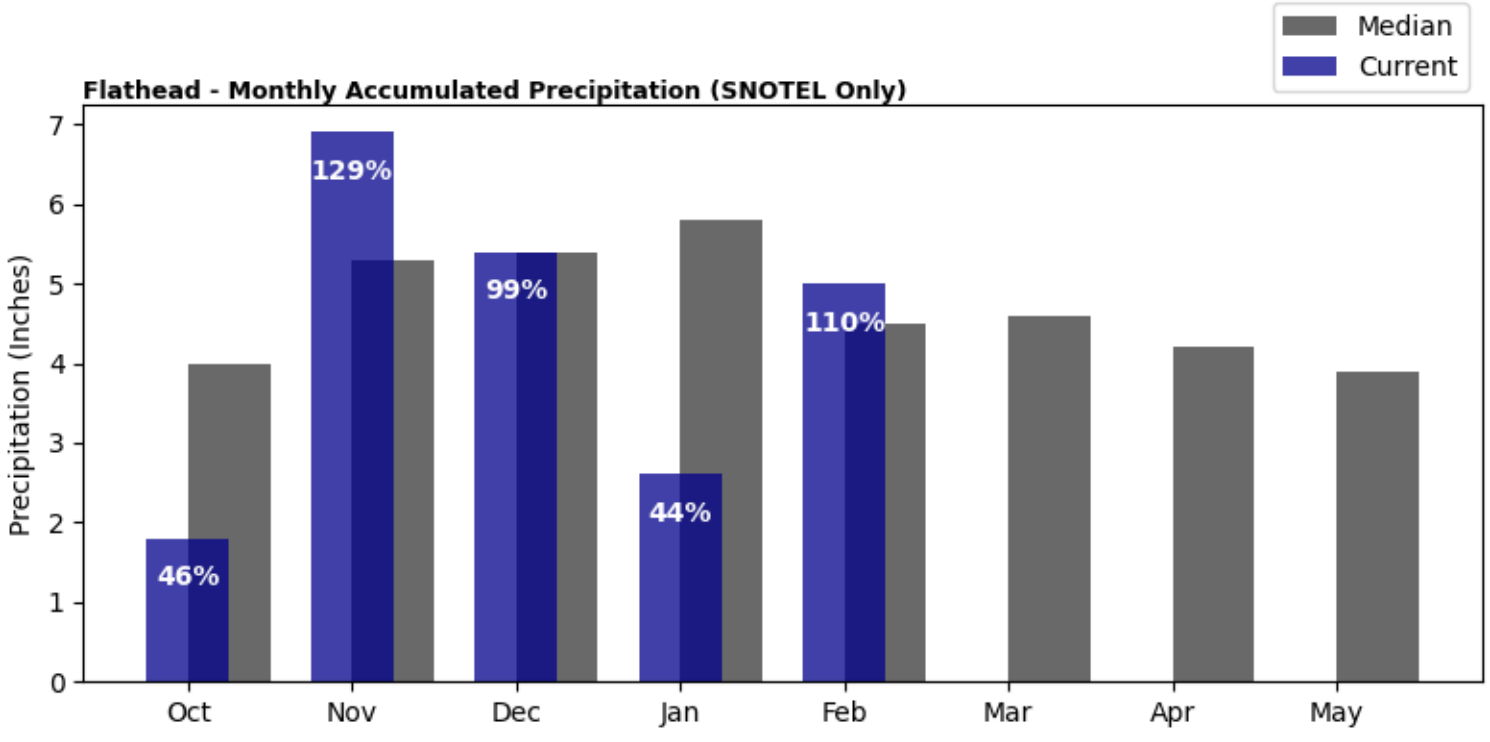
## Kootenai (Continued)

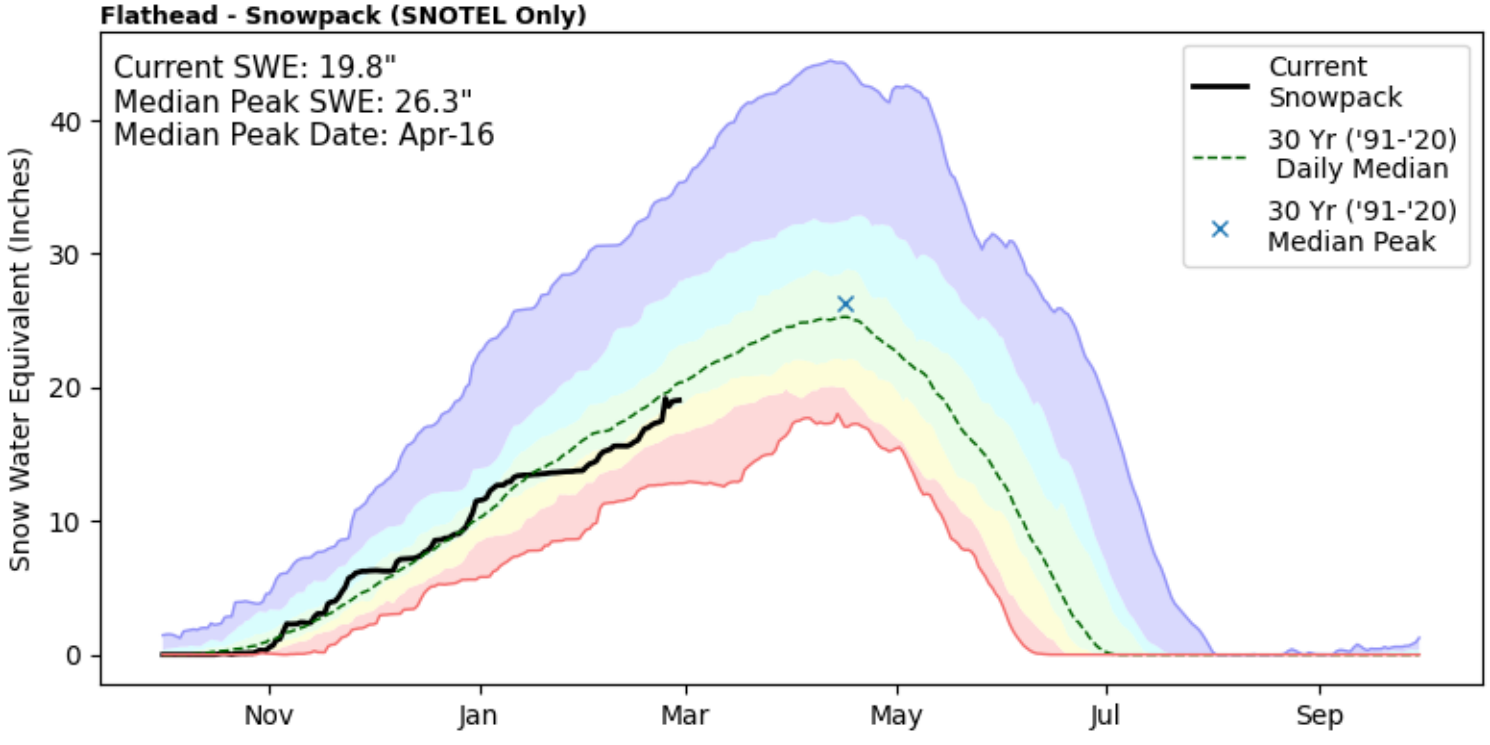


# Basin Overview

## Flathead

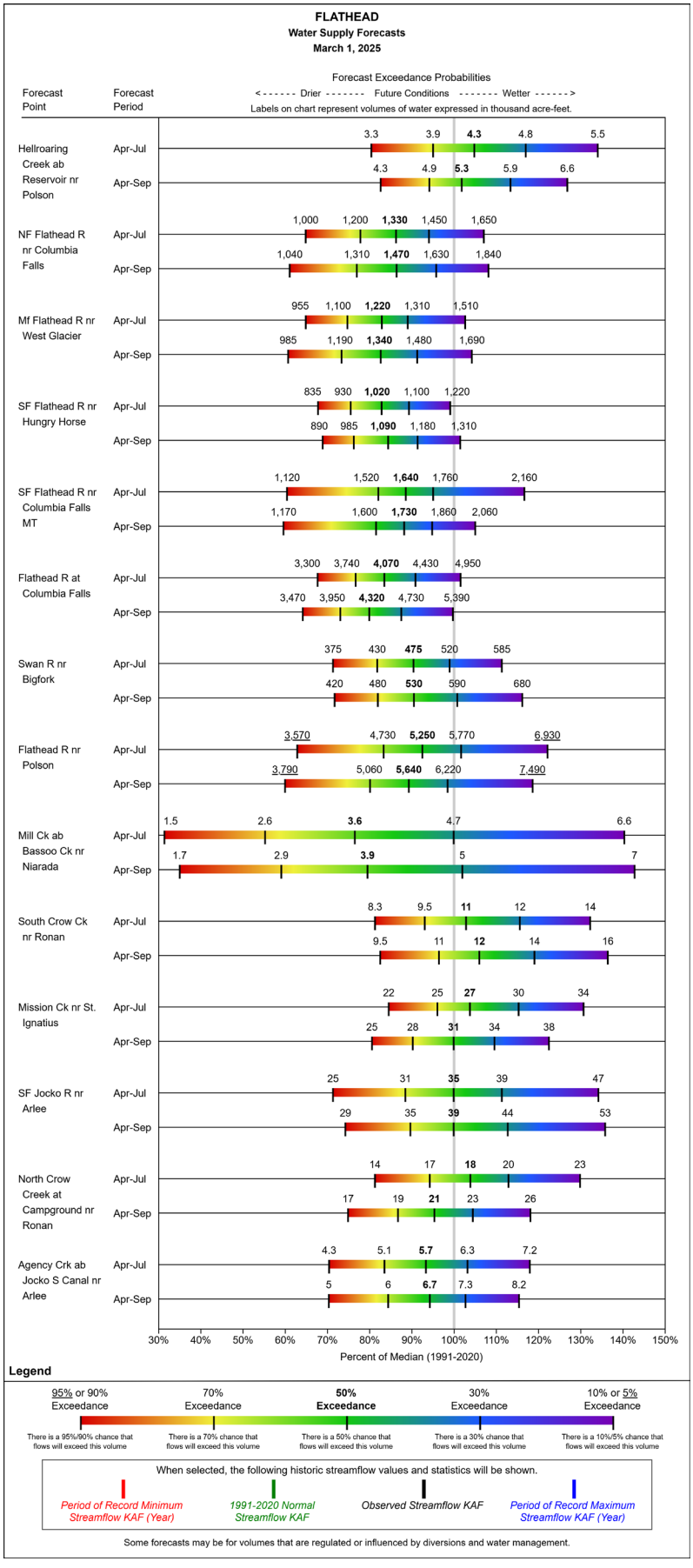
Precipitation in February was above normal at 110%, which brings the seasonal accumulation (October-February) to 84% of median. The snowpack in the Flathead is below normal at 84% of median, compared to 71% at this time last year.



# Basin Overview

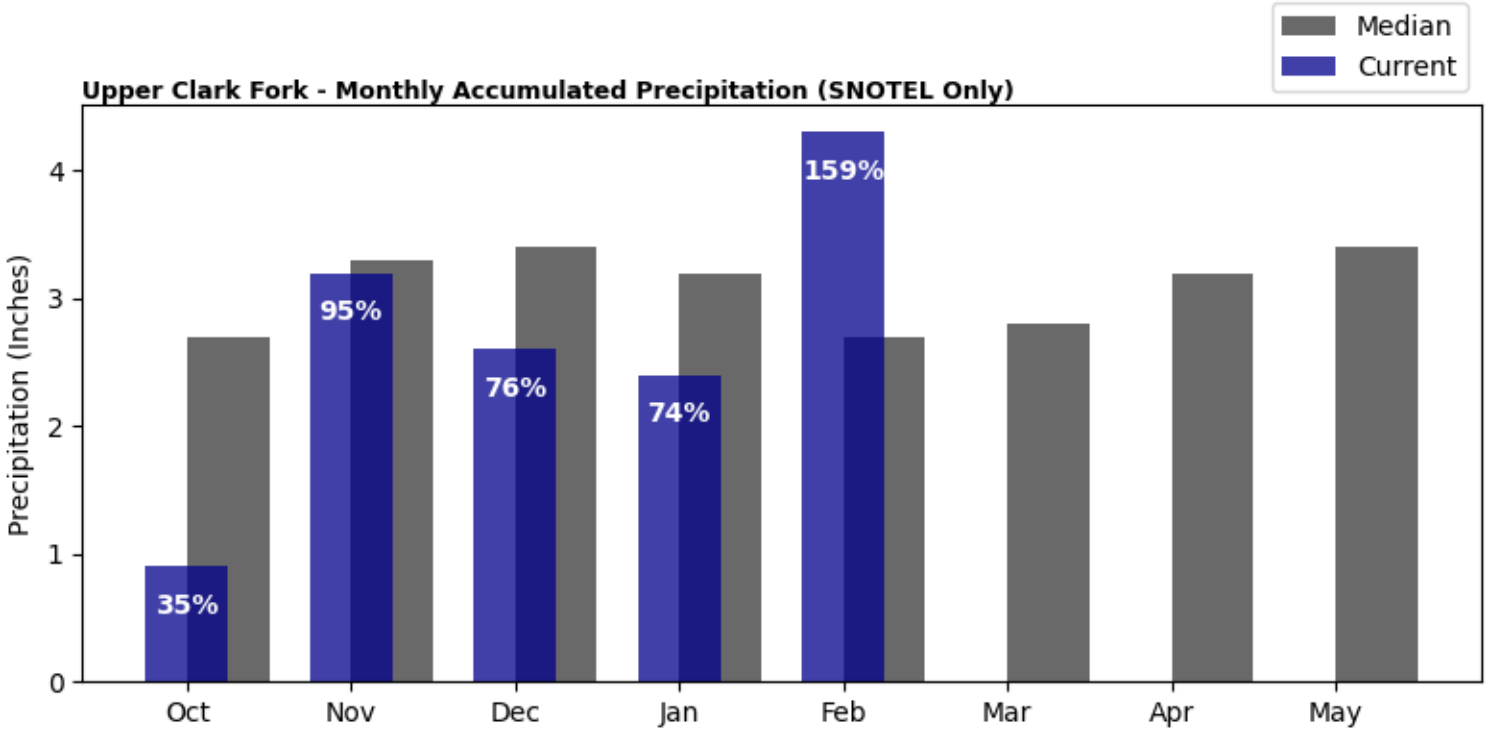
## Flathead (Continued)

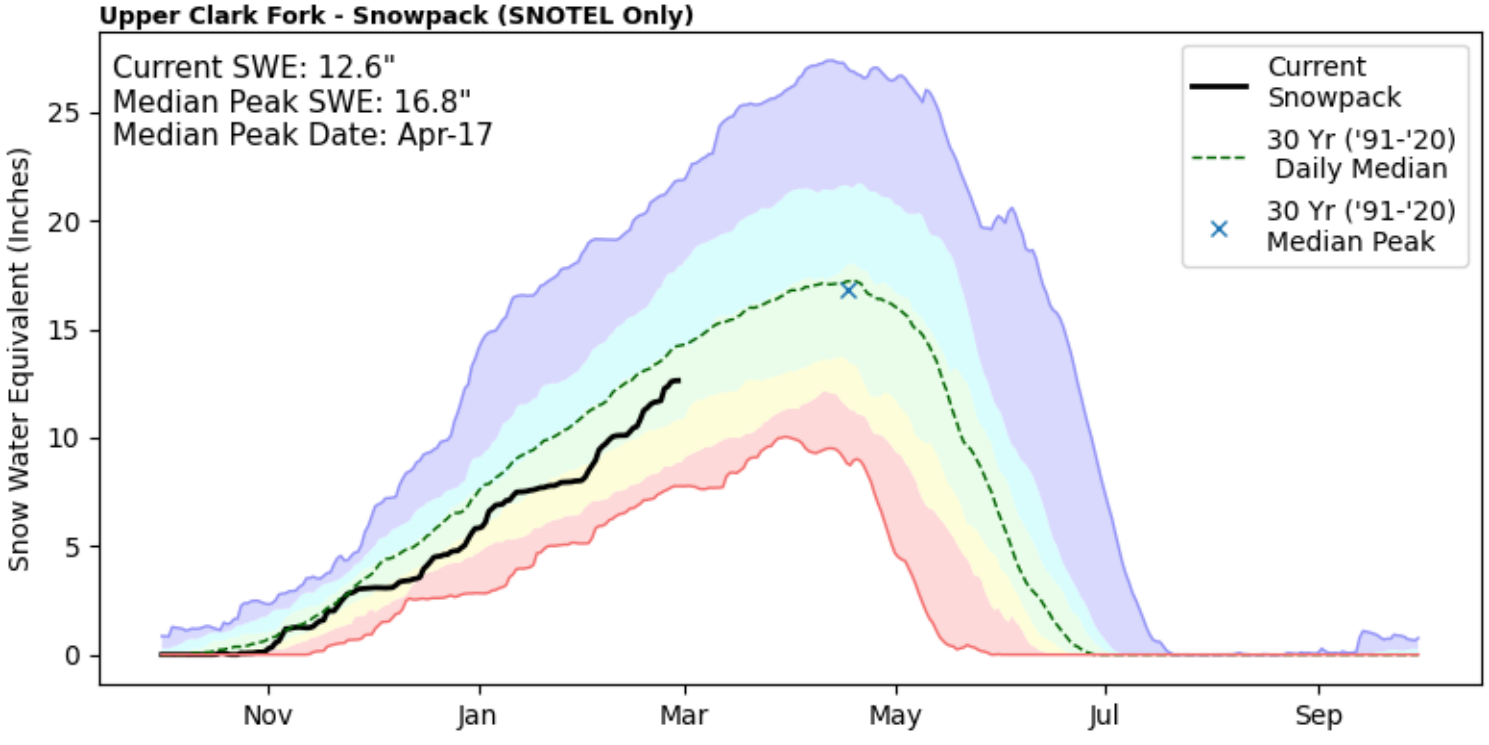


# Basin Overview

## Upper Clark Fork

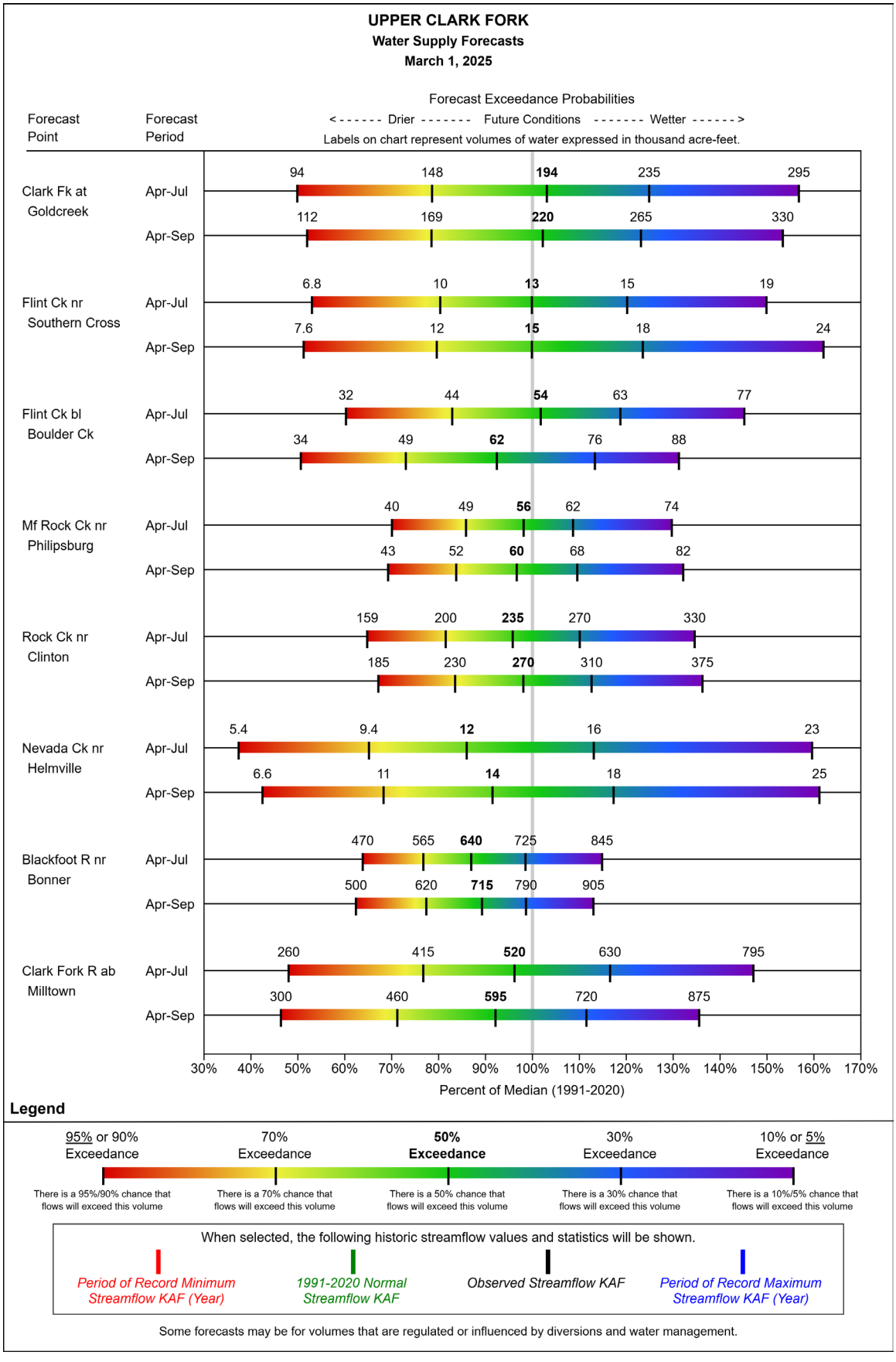
Precipitation in February was well above normal at 159%, which brings the seasonal accumulation (October-February) to 85% of median. The snowpack in the Upper Clark Fork is below normal at 93% of median, compared to 66% at this time last year.



# Basin Overview

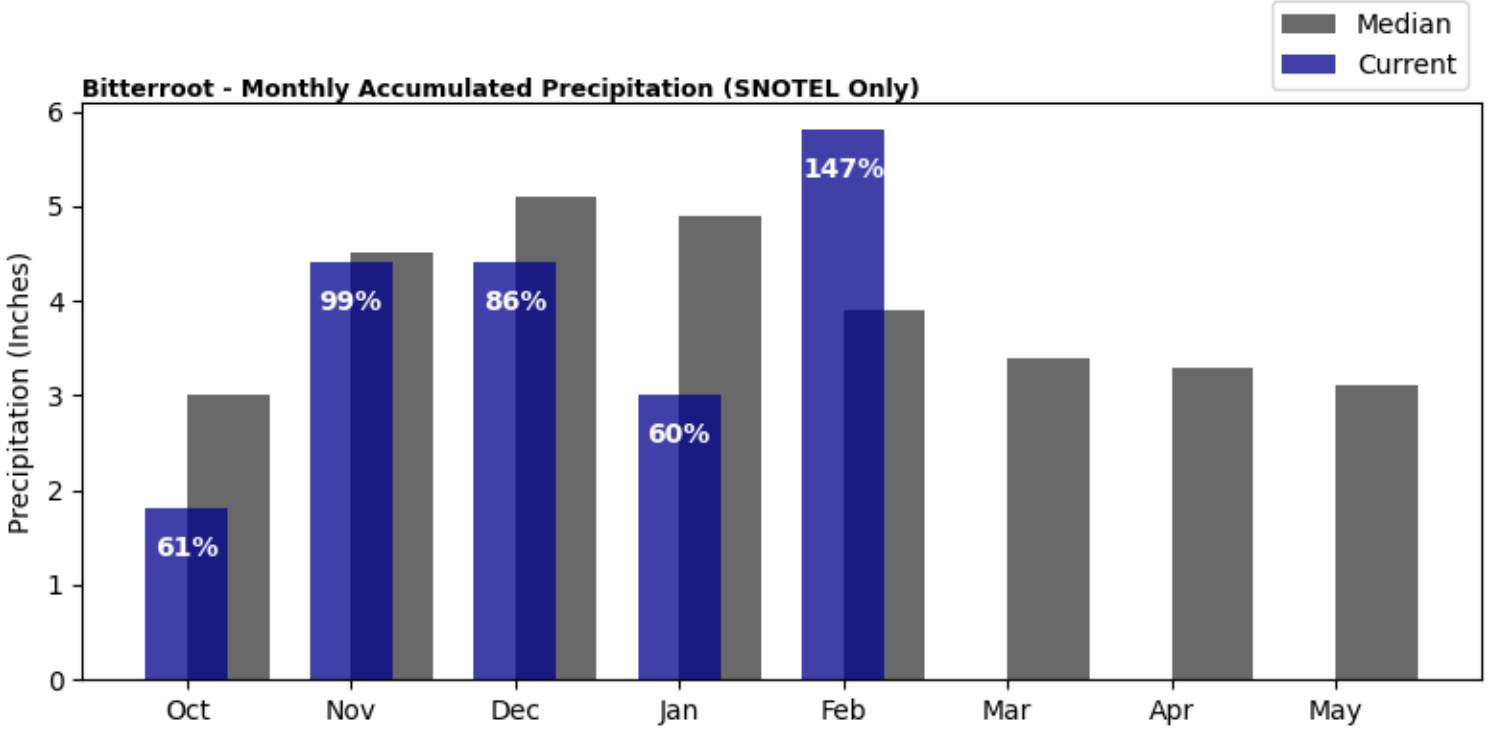
## Upper Clark Fork (Continued)

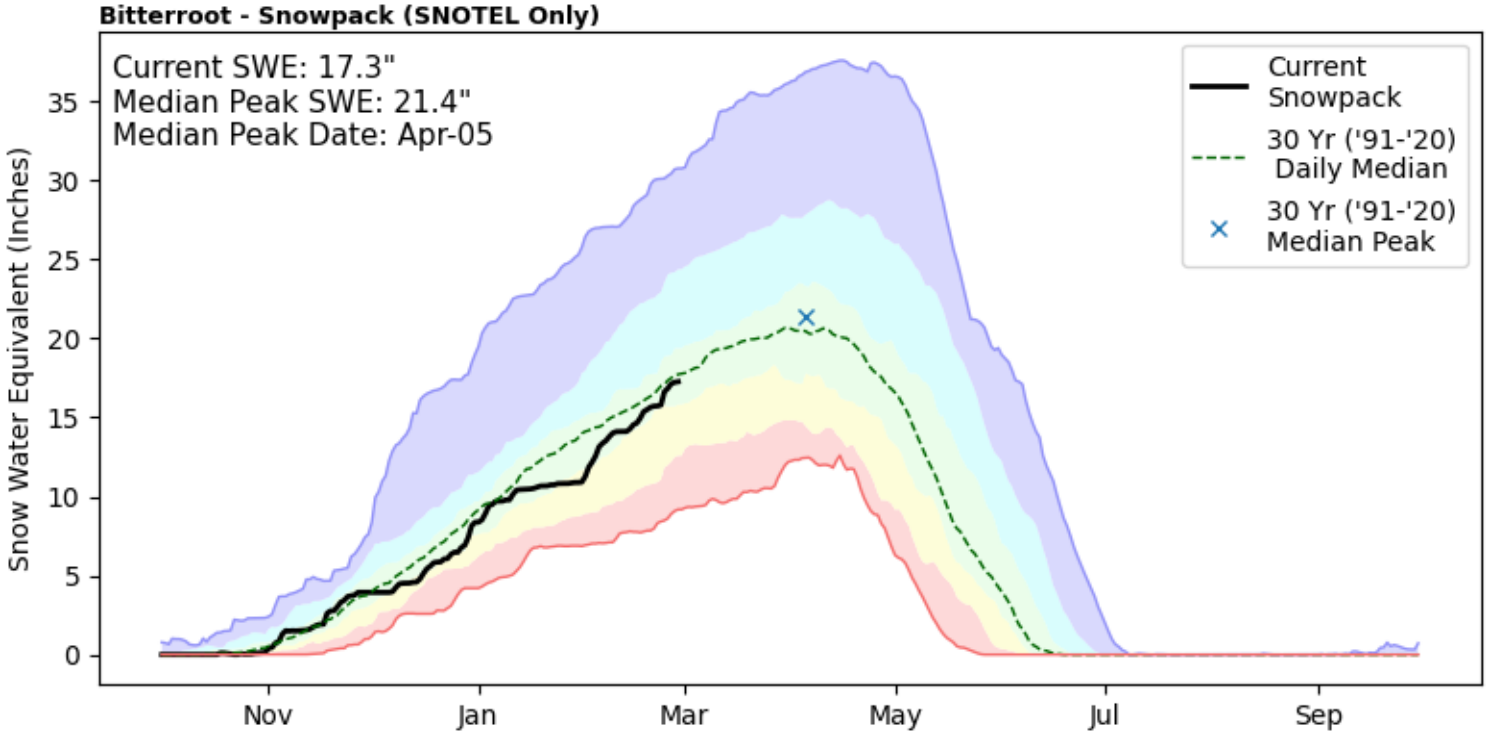


# Basin Overview

## Bitterroot

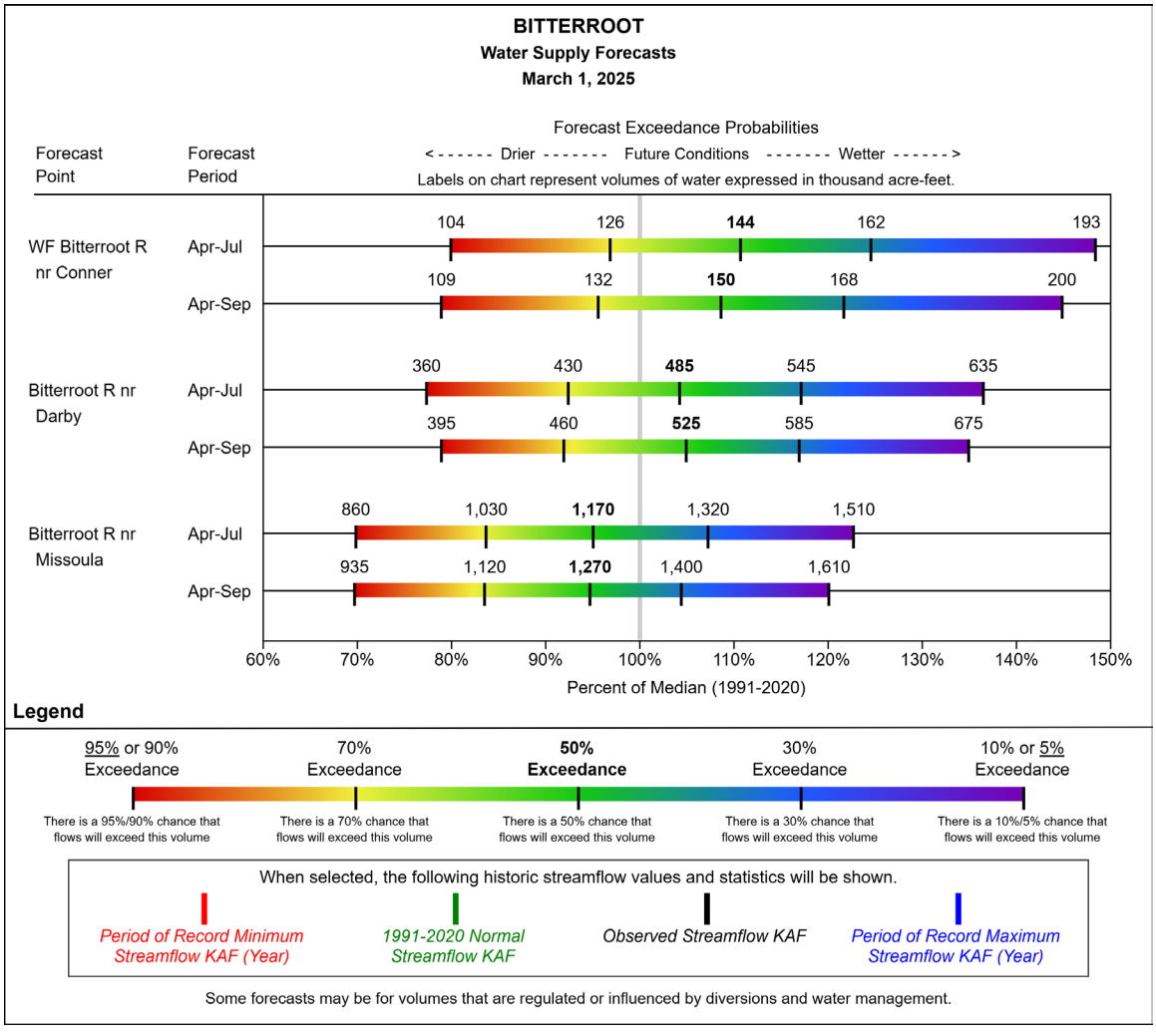
Precipitation in February was well above normal at 147%, which brings the seasonal accumulation (October-February) to 87% of median. The snowpack in the Bitterroot is near normal at 97% of median, compared to 73% at this time last year.



# Basin Overview

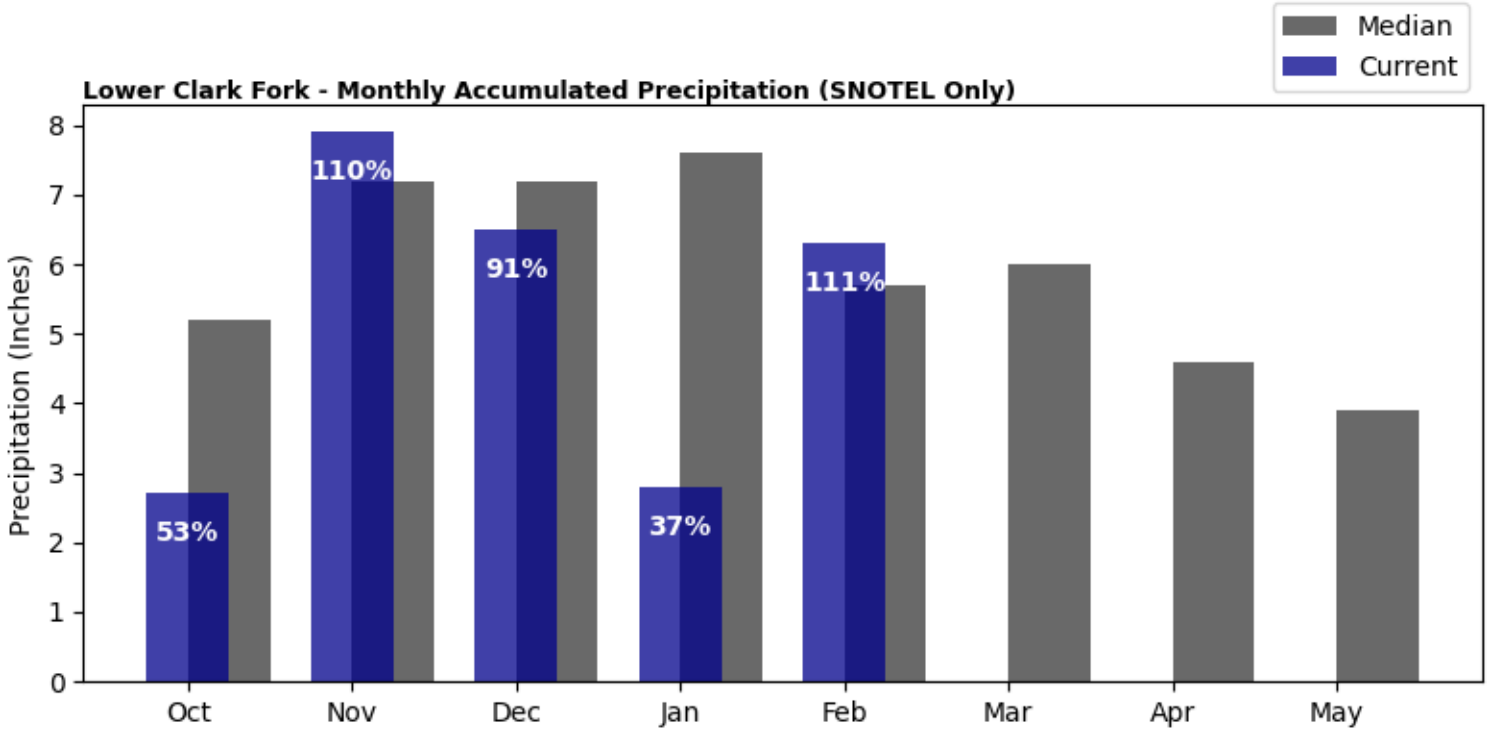
## Bitterroot (Continued)

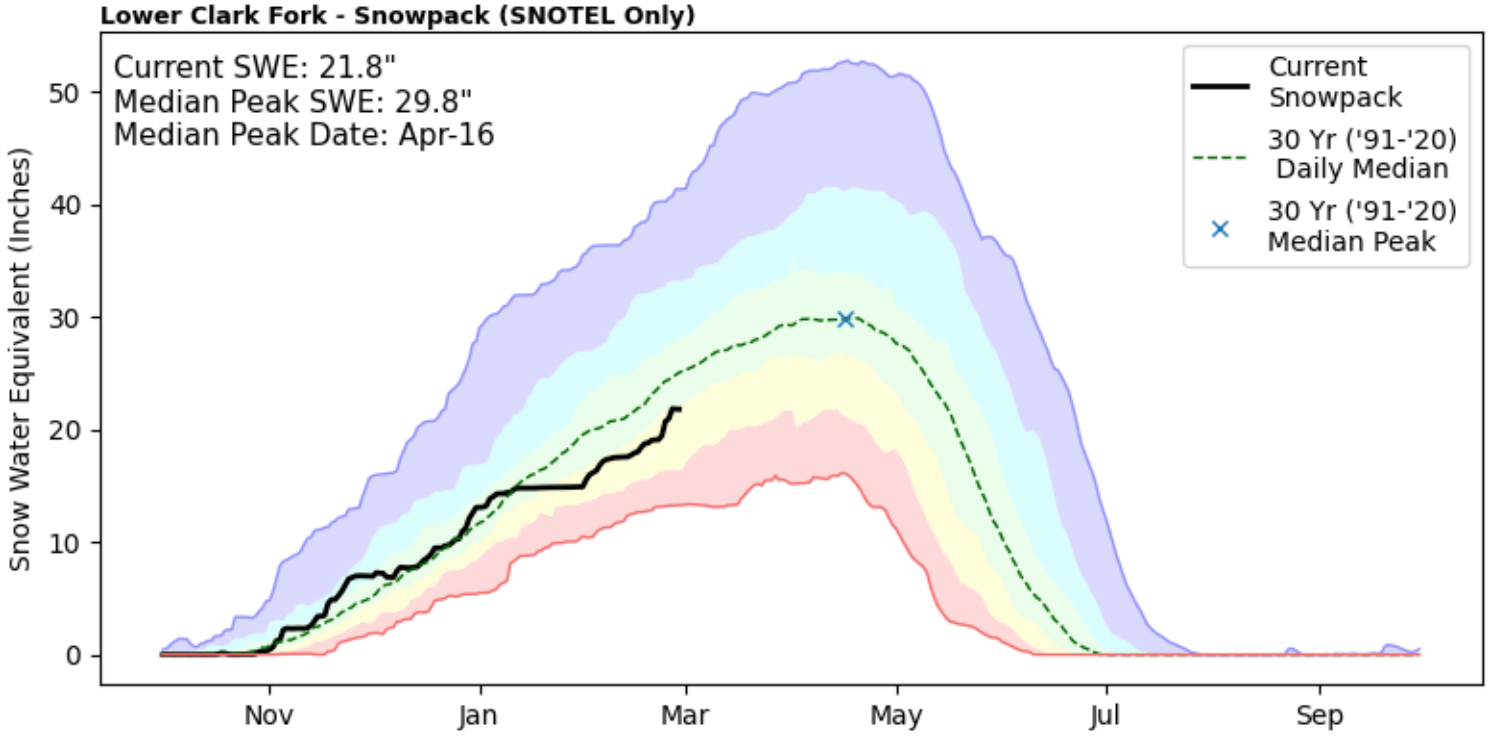


# Basin Overview

## Lower Clark Fork

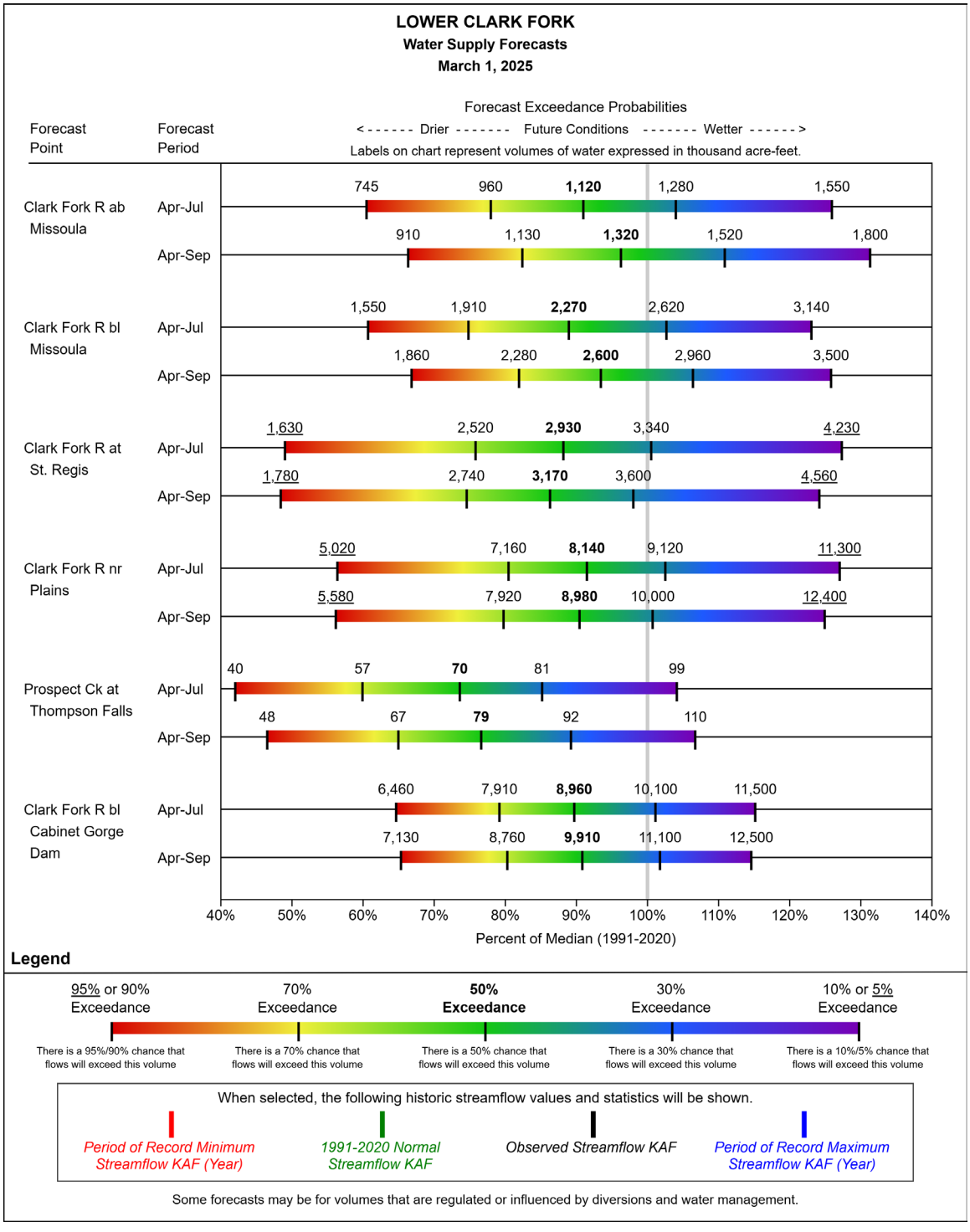
Precipitation in February was above normal at 111%, which brings the seasonal accumulation (October-February) to 75% of median. The snowpack in the Lower Clark Fork is below normal at 85% of median, compared to 66% at this time last year.



# Basin Overview

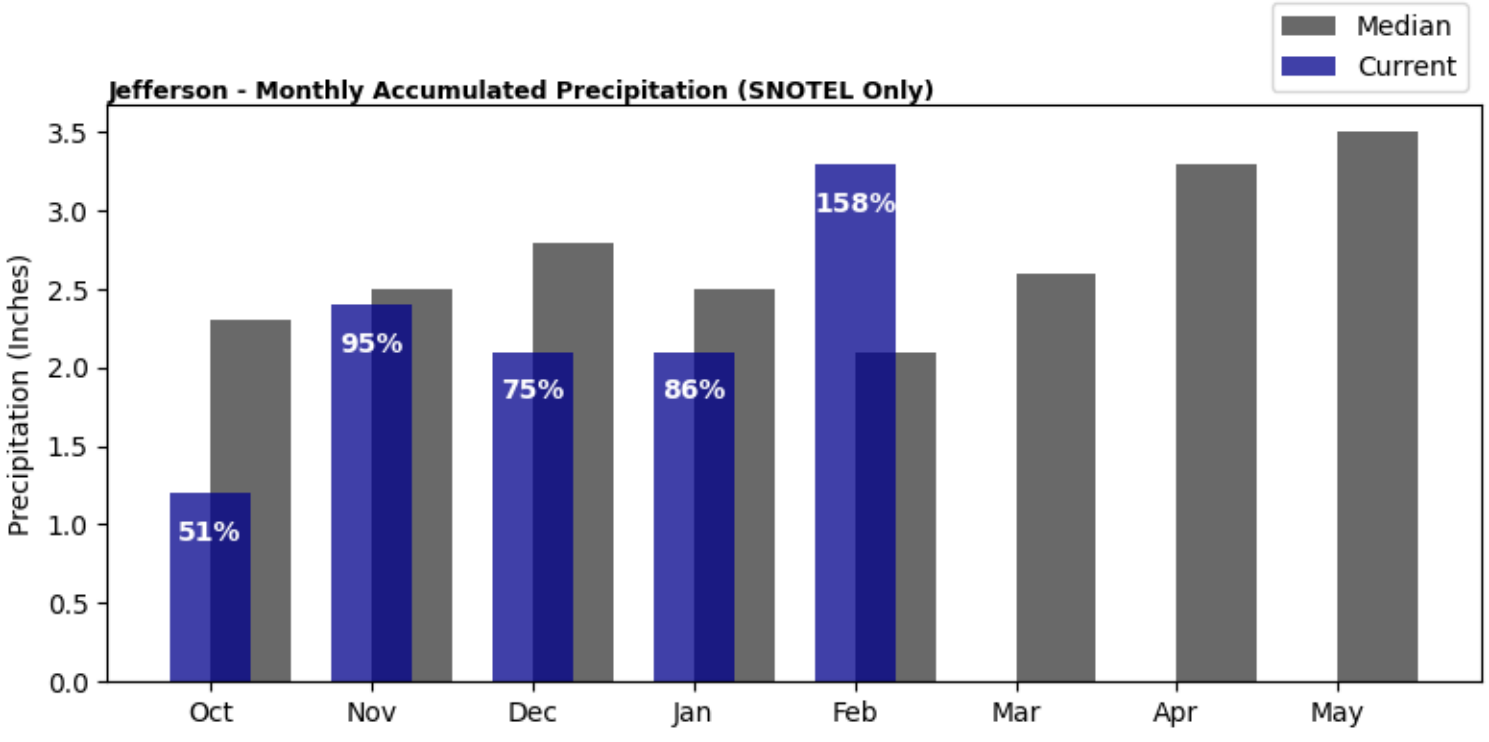
## Lower Clark Fork (Continued)

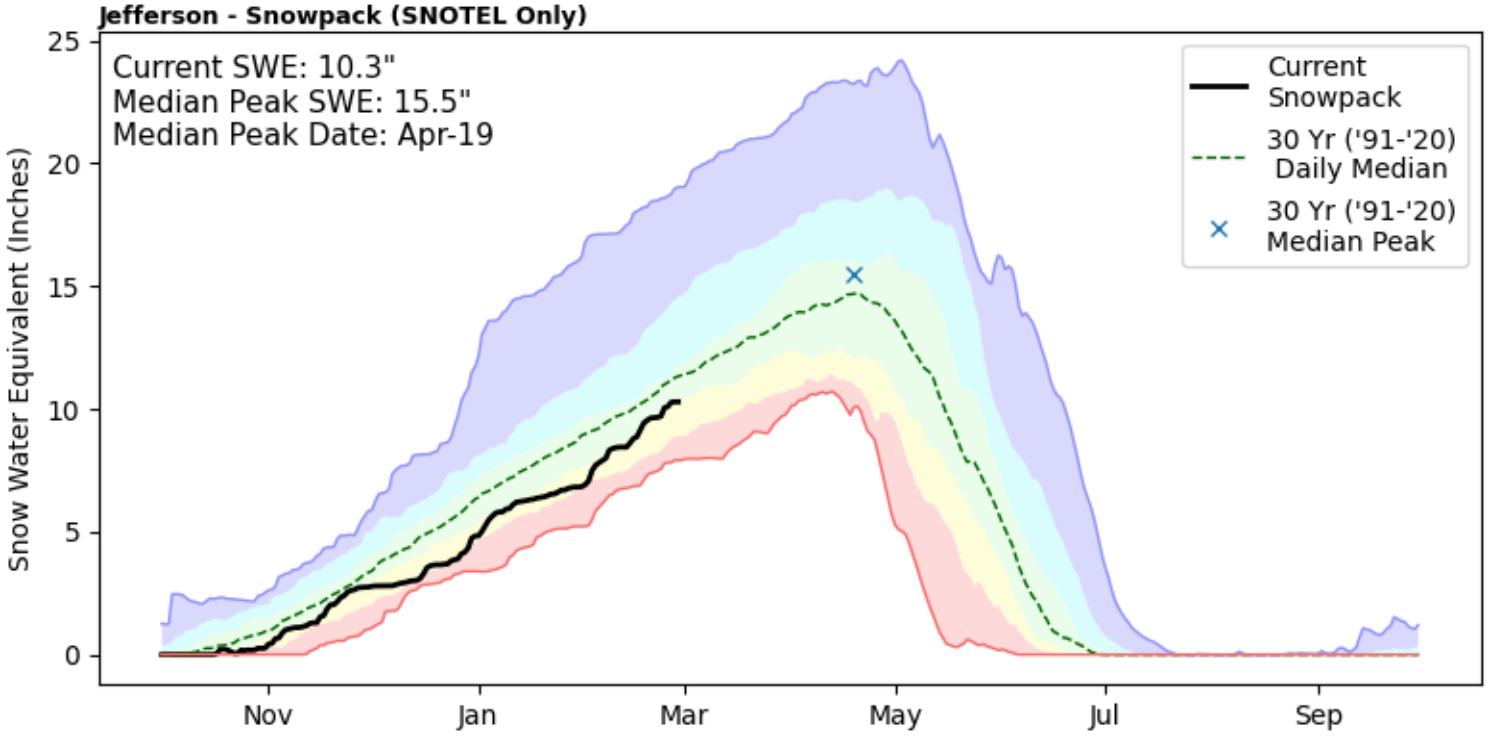


# Basin Overview

## Jefferson

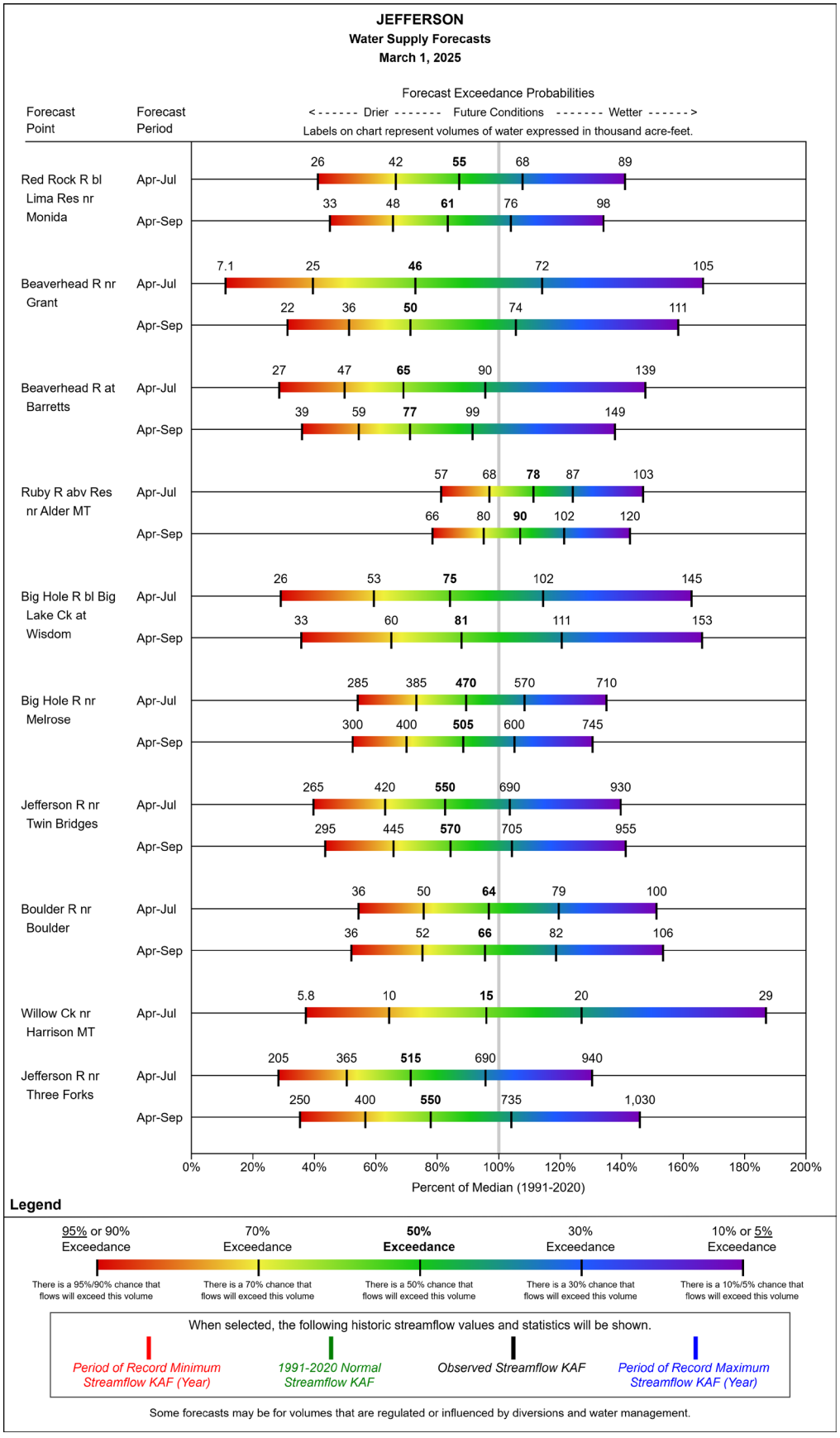
Precipitation in February was well above normal at 158%, which brings the seasonal accumulation (October-February) to 88% of median. The snowpack in the Jefferson is near normal at 95% of median, compared to 73% at this time last year.



# Basin Overview

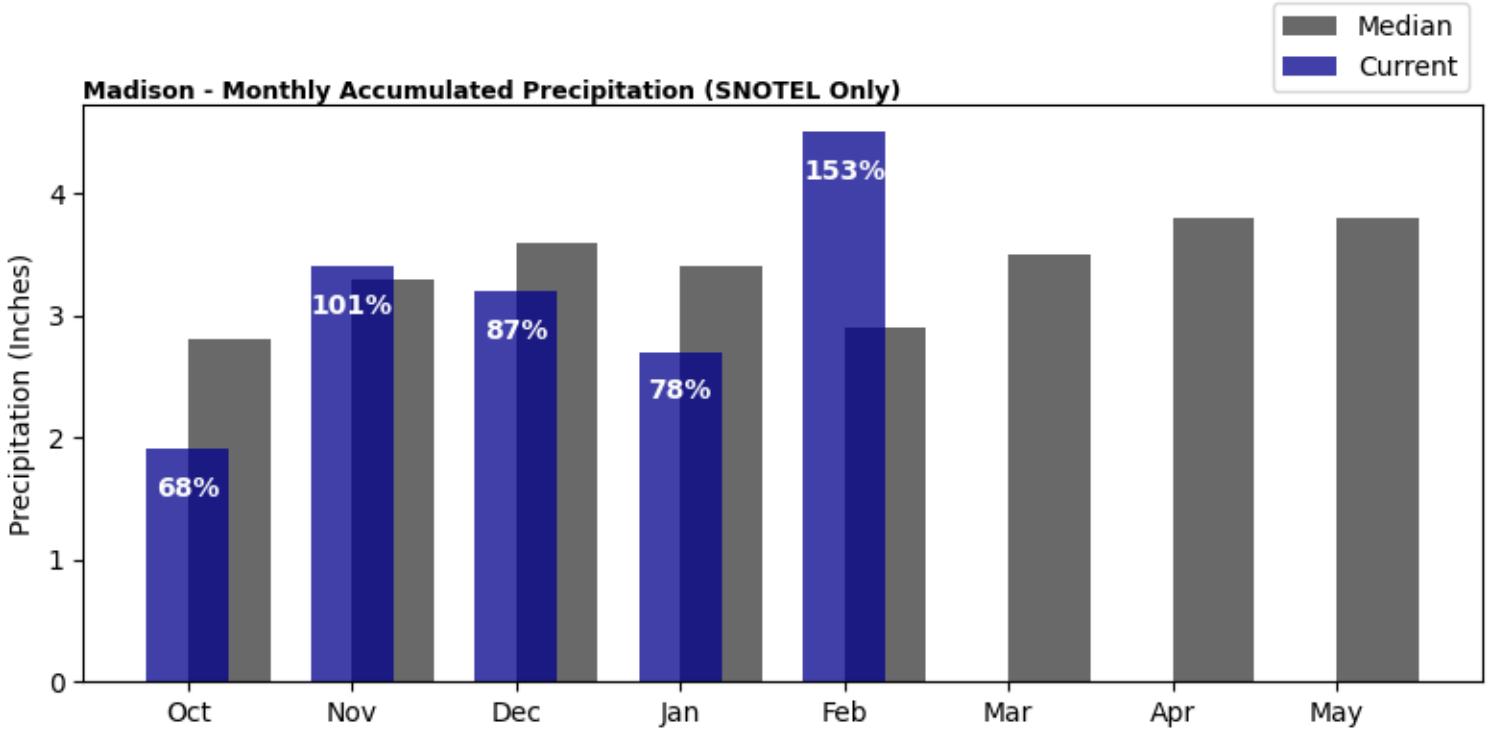
## Jefferson (Continued)

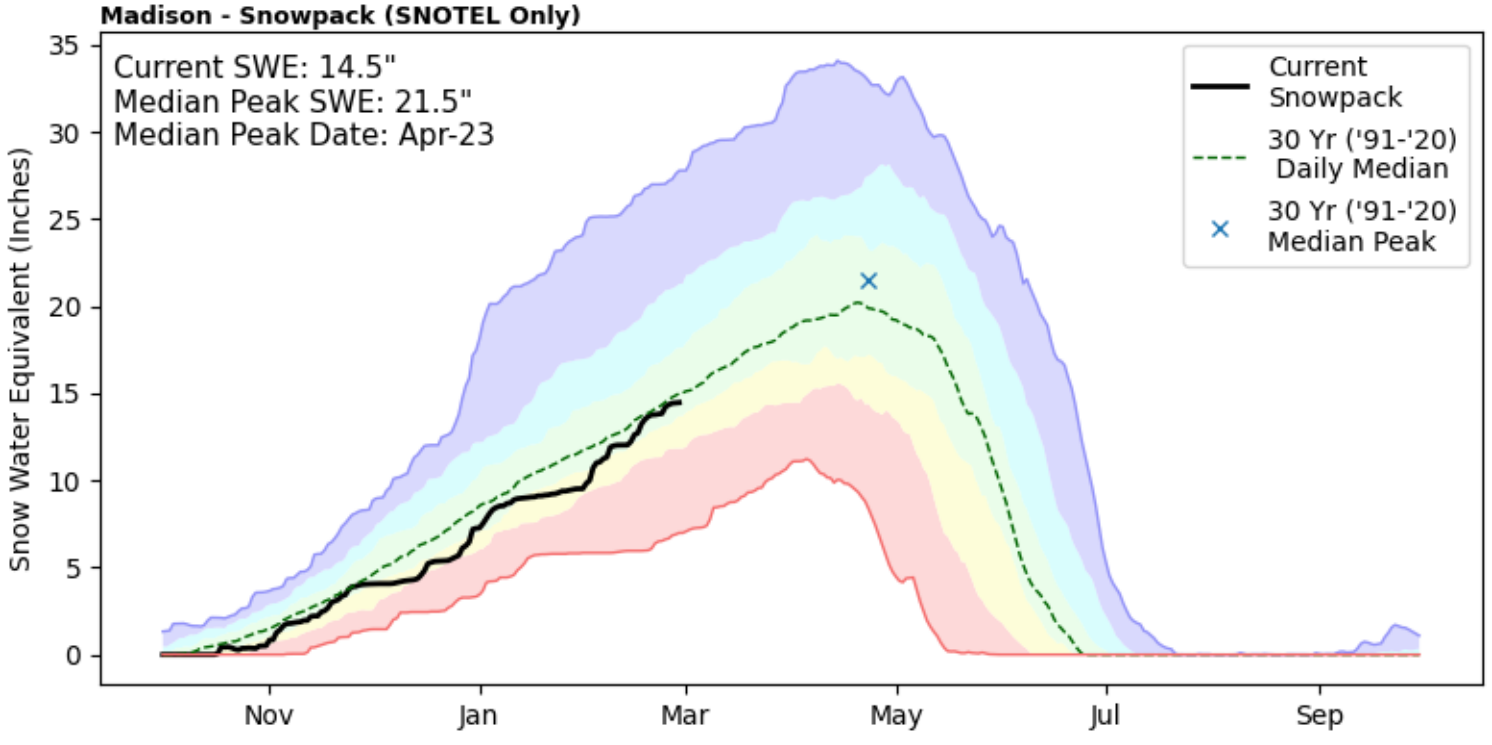


# Basin Overview

## Madison

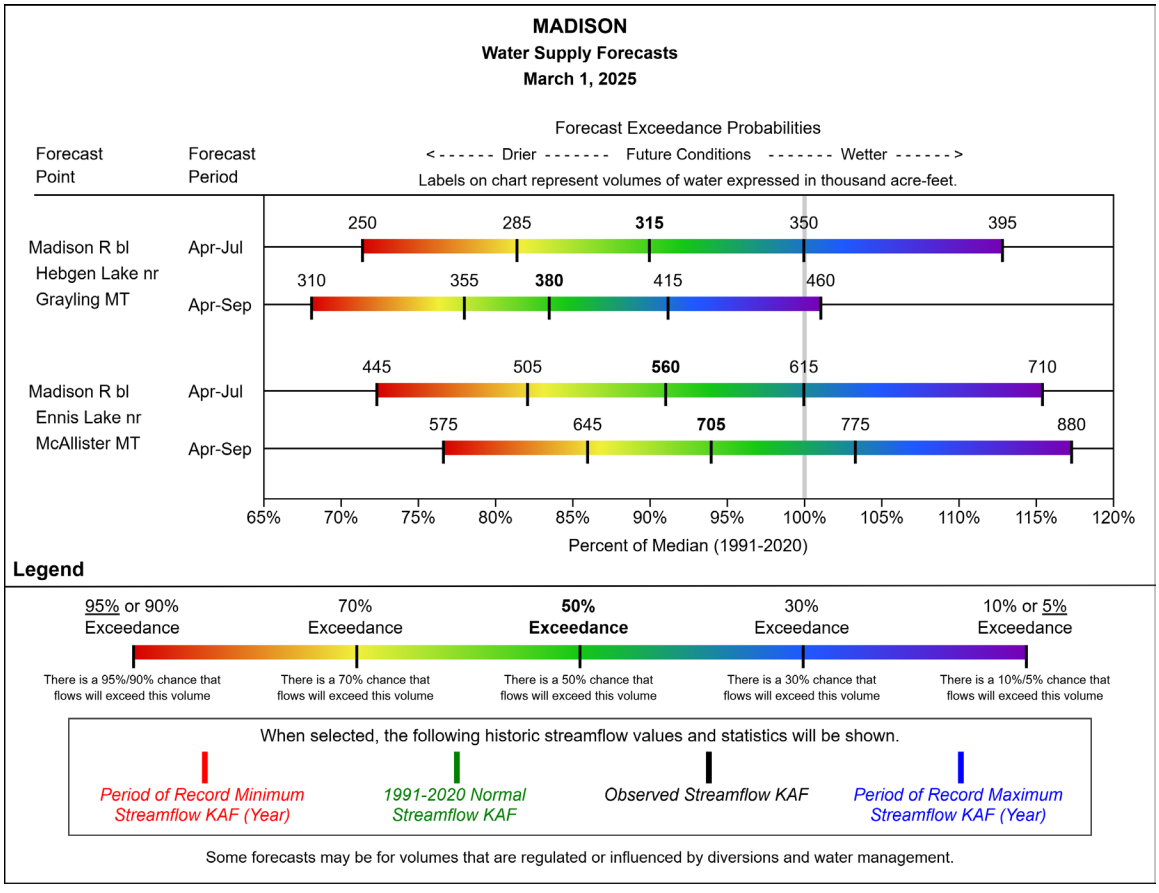
Precipitation in February was well above normal at 153%, which brings the seasonal accumulation (October-February) to 94% of median. The snowpack in the Madison is below normal at 94% of median, compared to 73% at this time last year.



# Basin Overview

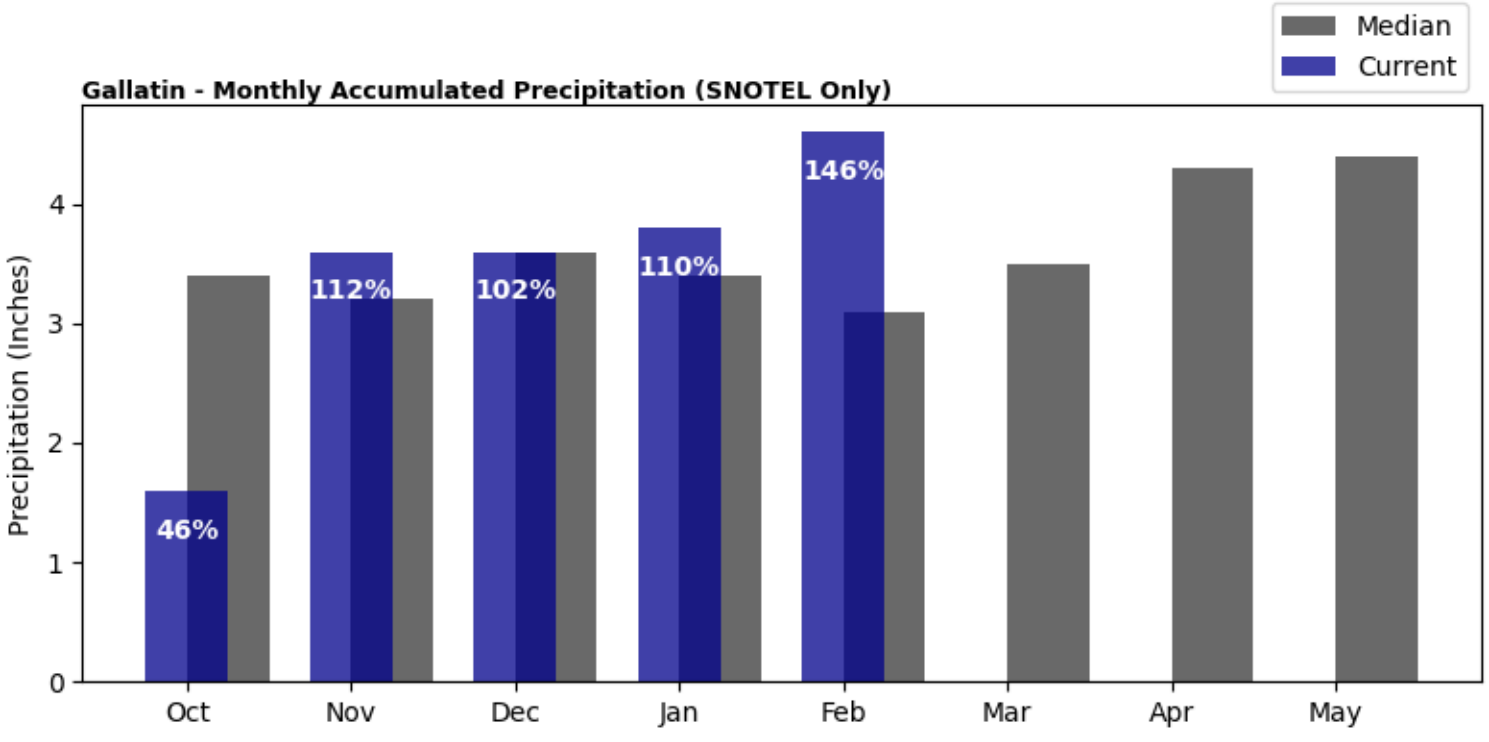
## Madison (Continued)

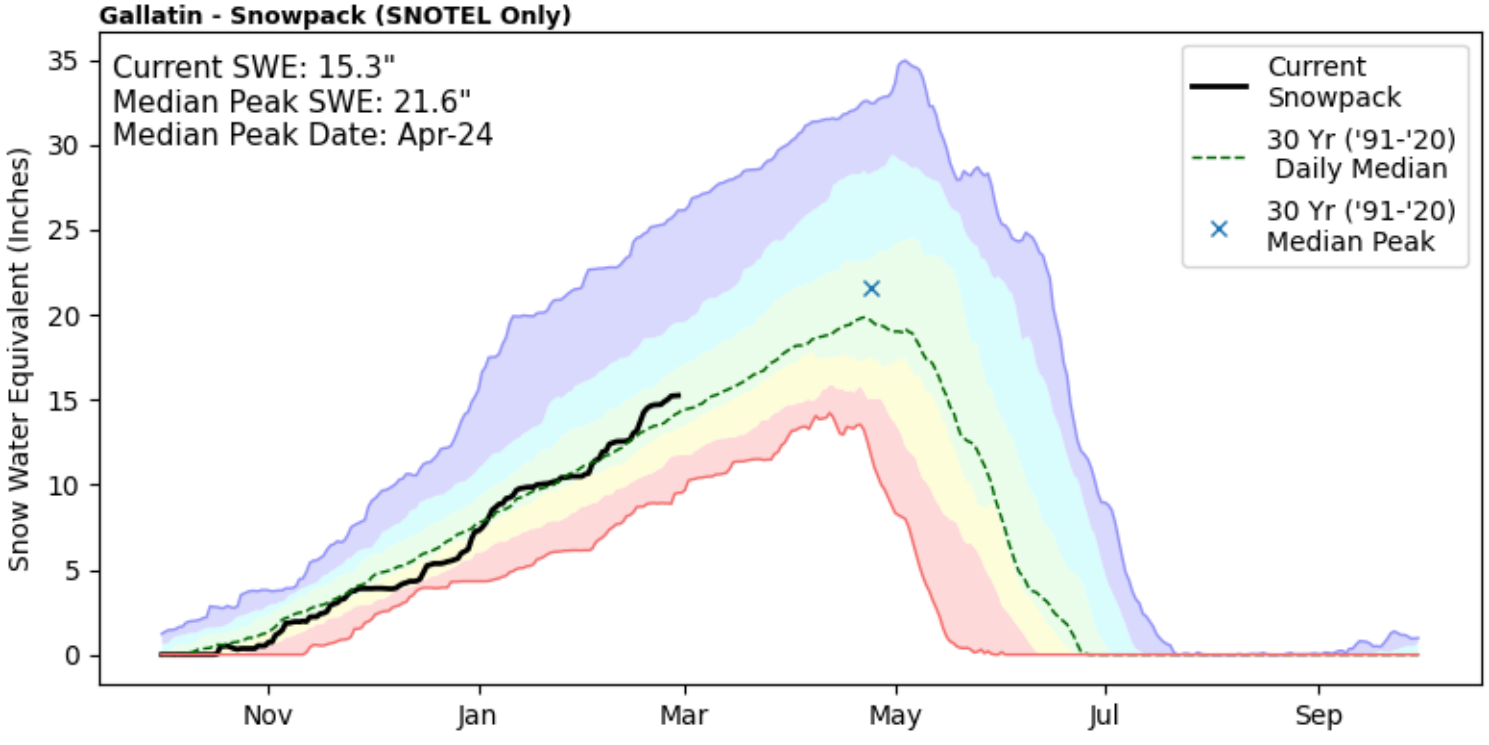


# Basin Overview

## Gallatin

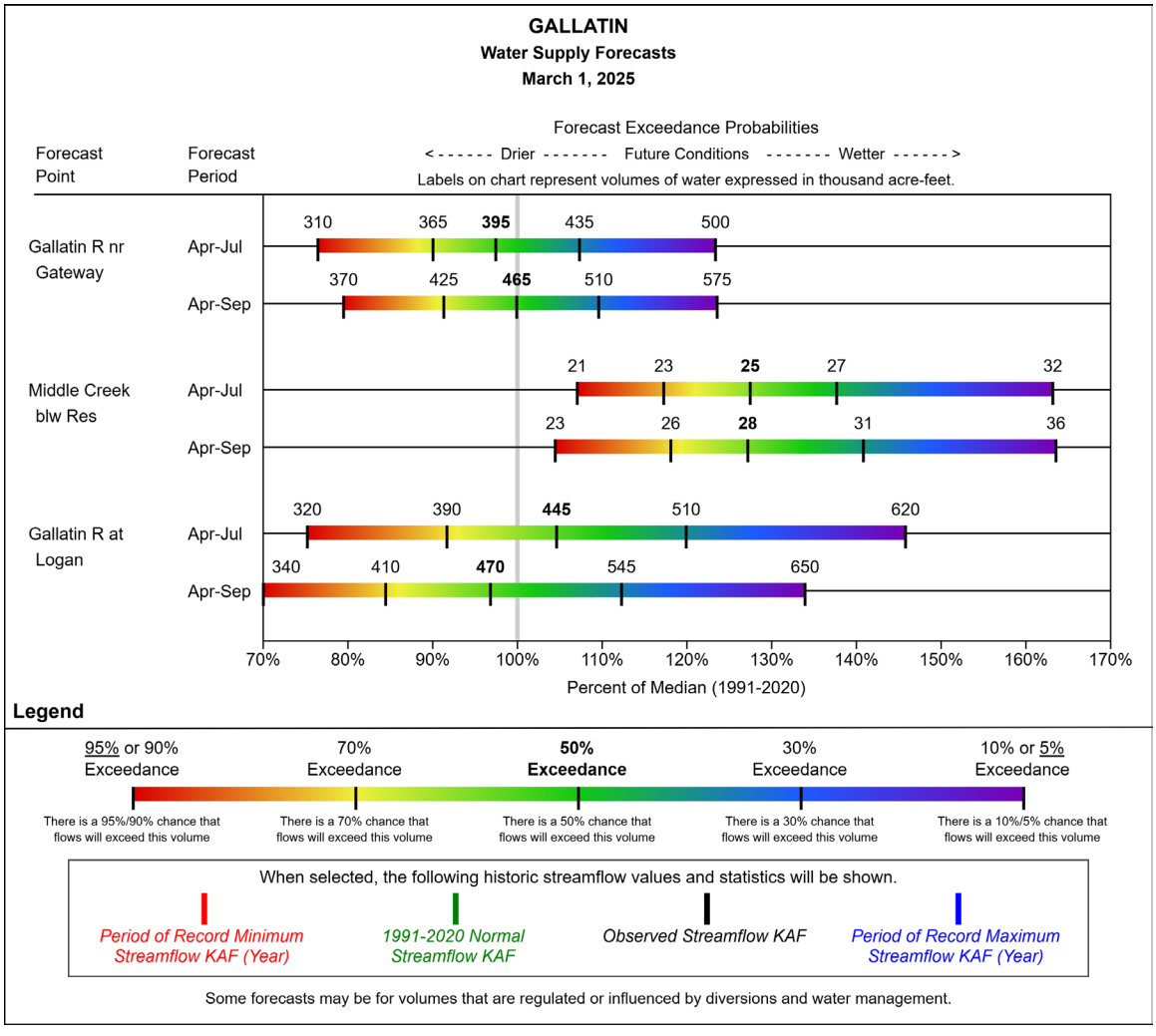
Precipitation in February was well above normal at 146%, which brings the seasonal accumulation (October-February) to 100% of median. The snowpack in the Gallatin is above normal at 110% of median, compared to 65% at this time last year.



# Basin Overview

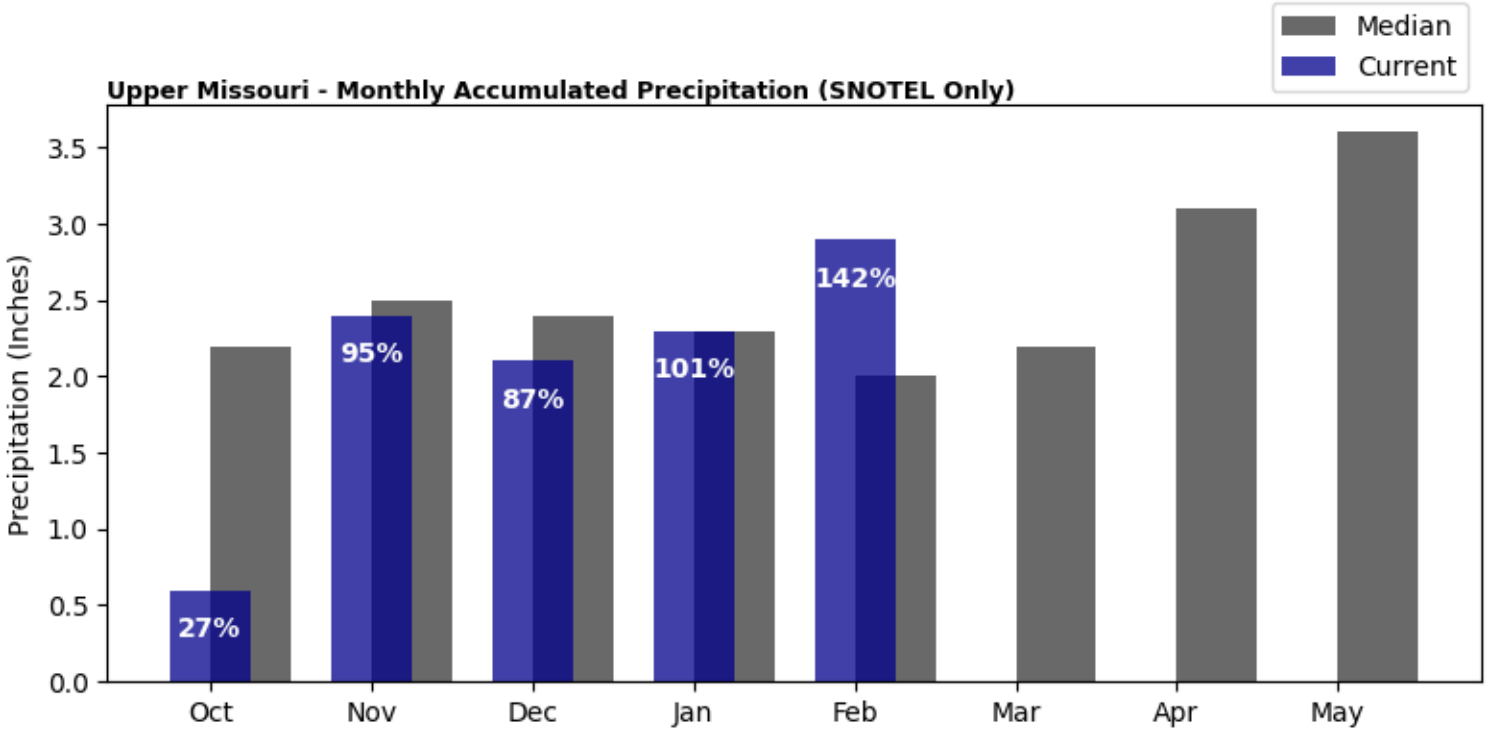
## Gallatin (Continued)

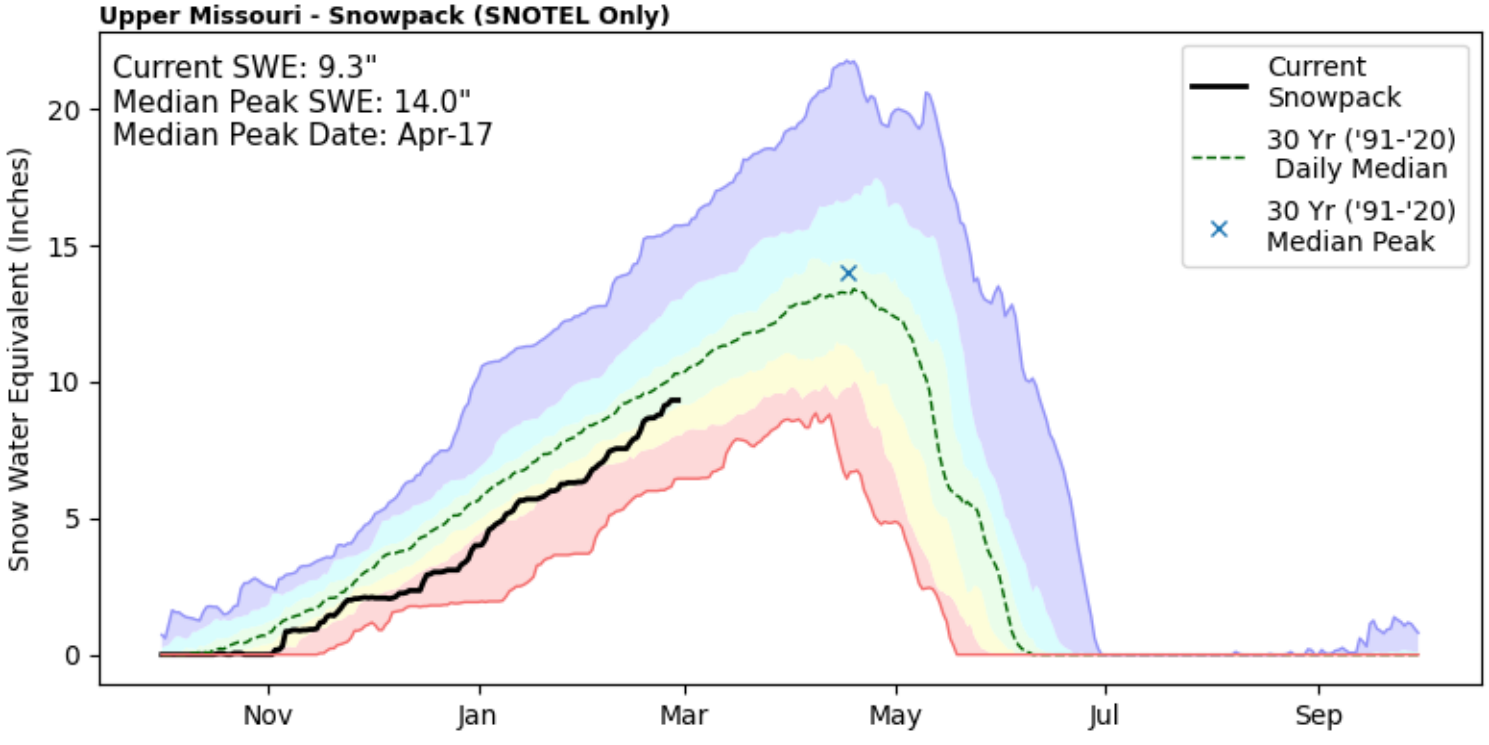


# Basin Overview

## Upper Missouri

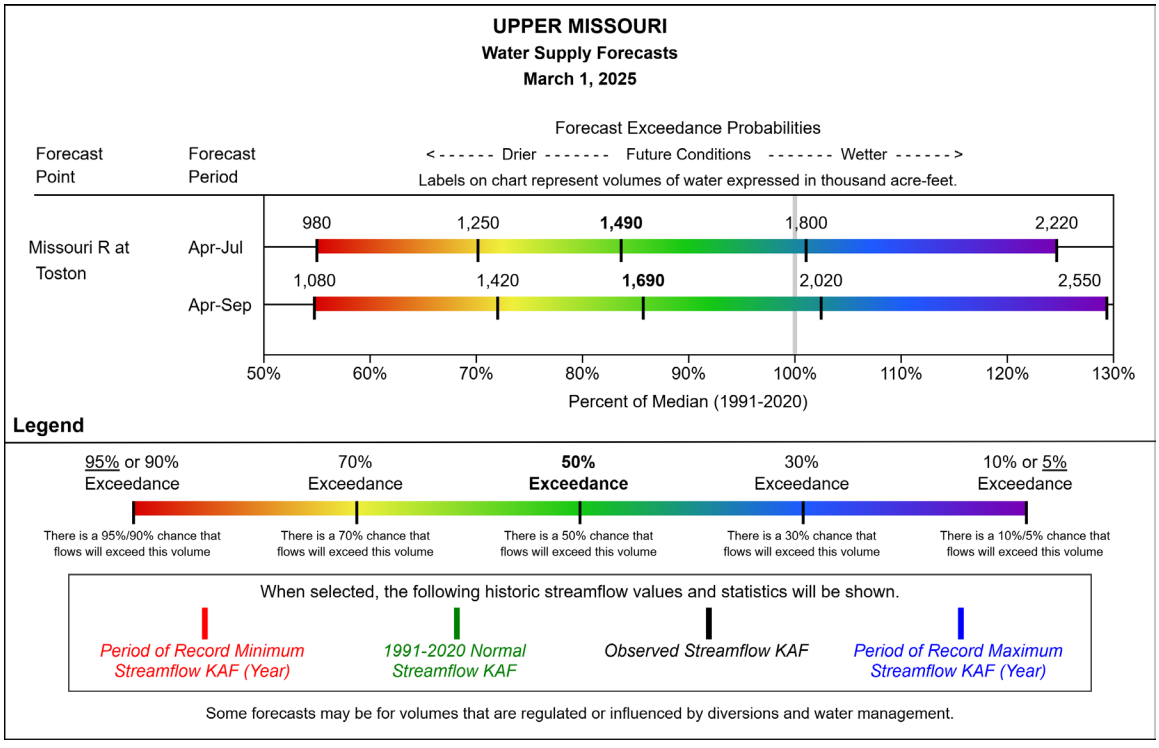
Precipitation in February was well above normal at 142%, which brings the seasonal accumulation (October-February) to 87% of median. The snowpack in the Upper Missouri is below normal at 93% of median, compared to 71% at this time last year.



# Basin Overview

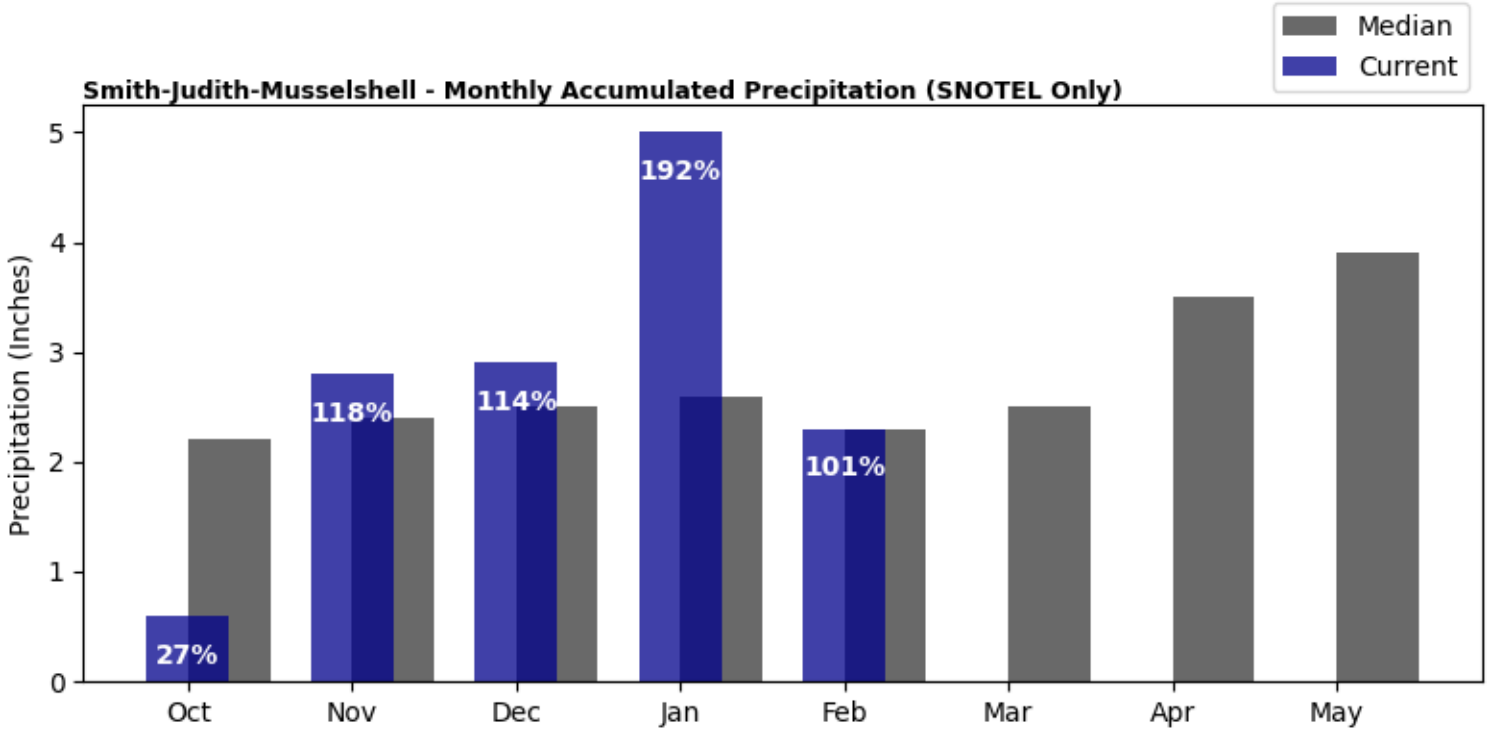
## Upper Missouri (Continued)

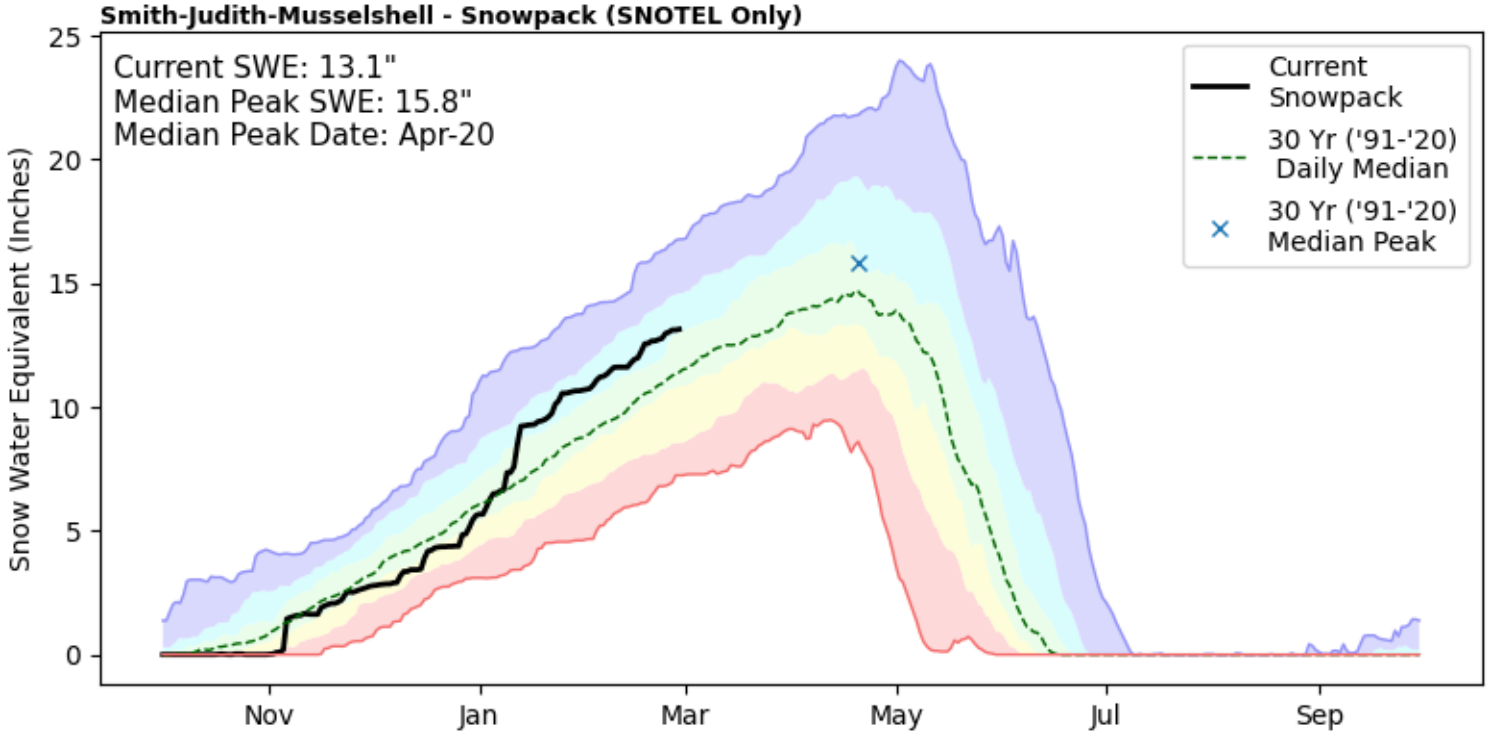


# Basin Overview

## Smith-Judith-Musselshell

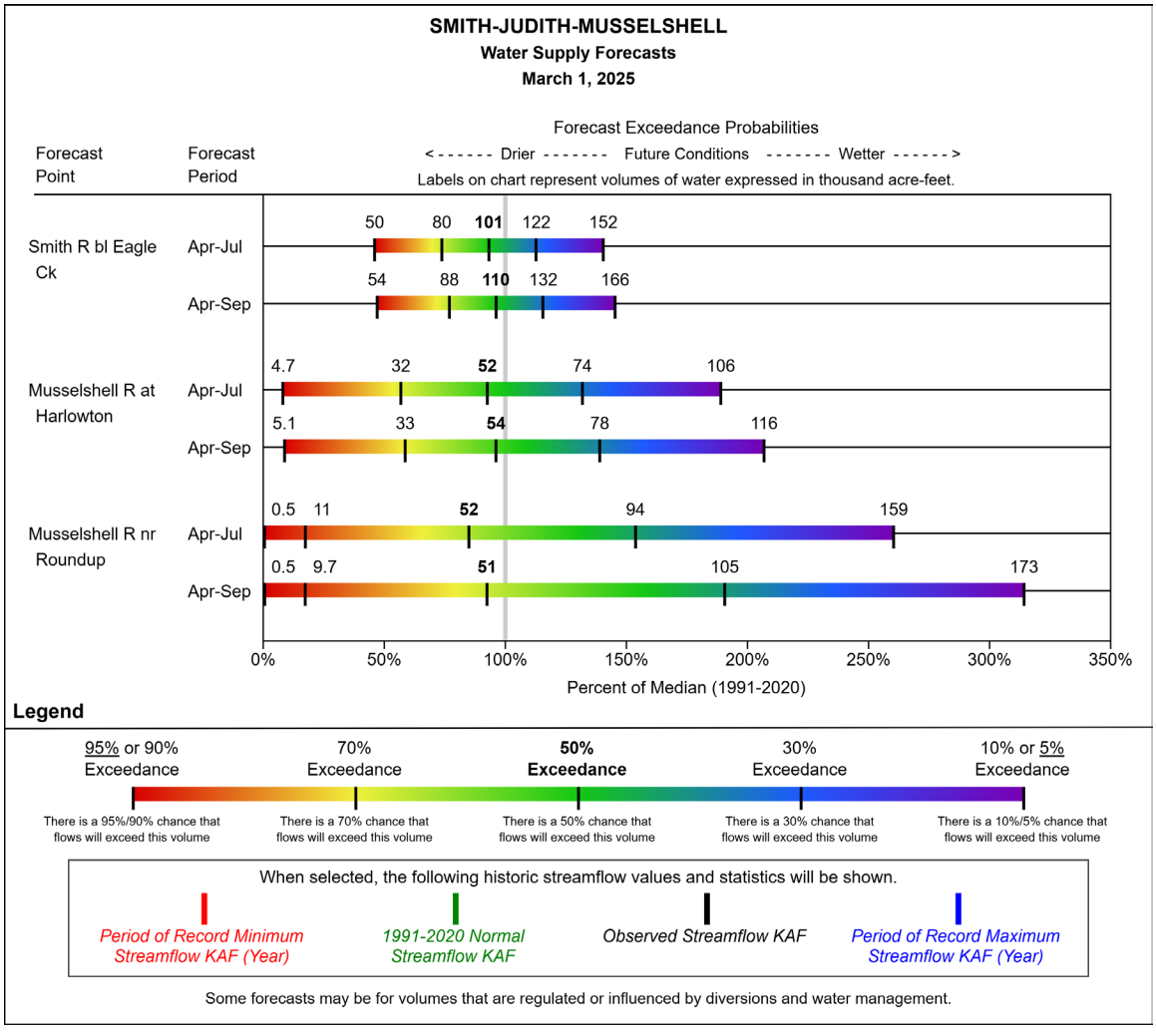
Precipitation in February was near normal at 101%, which brings the seasonal accumulation (October-February) to 105% of median. The snowpack in the Smith-Judith-Musselshell is above normal at 118% of median, compared to 65% at this time last year.



# Basin Overview

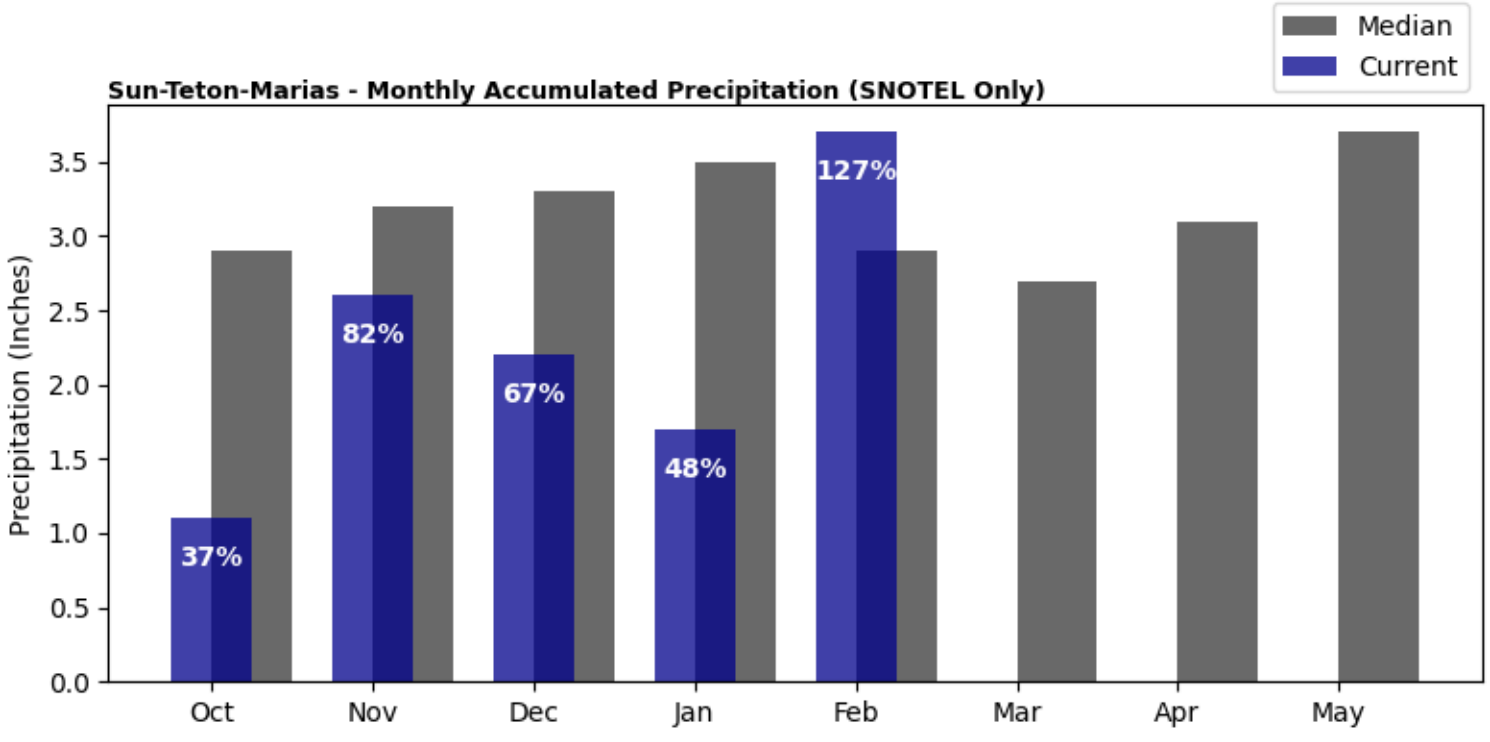
## Smith-Judith-Musselshell (Continued)

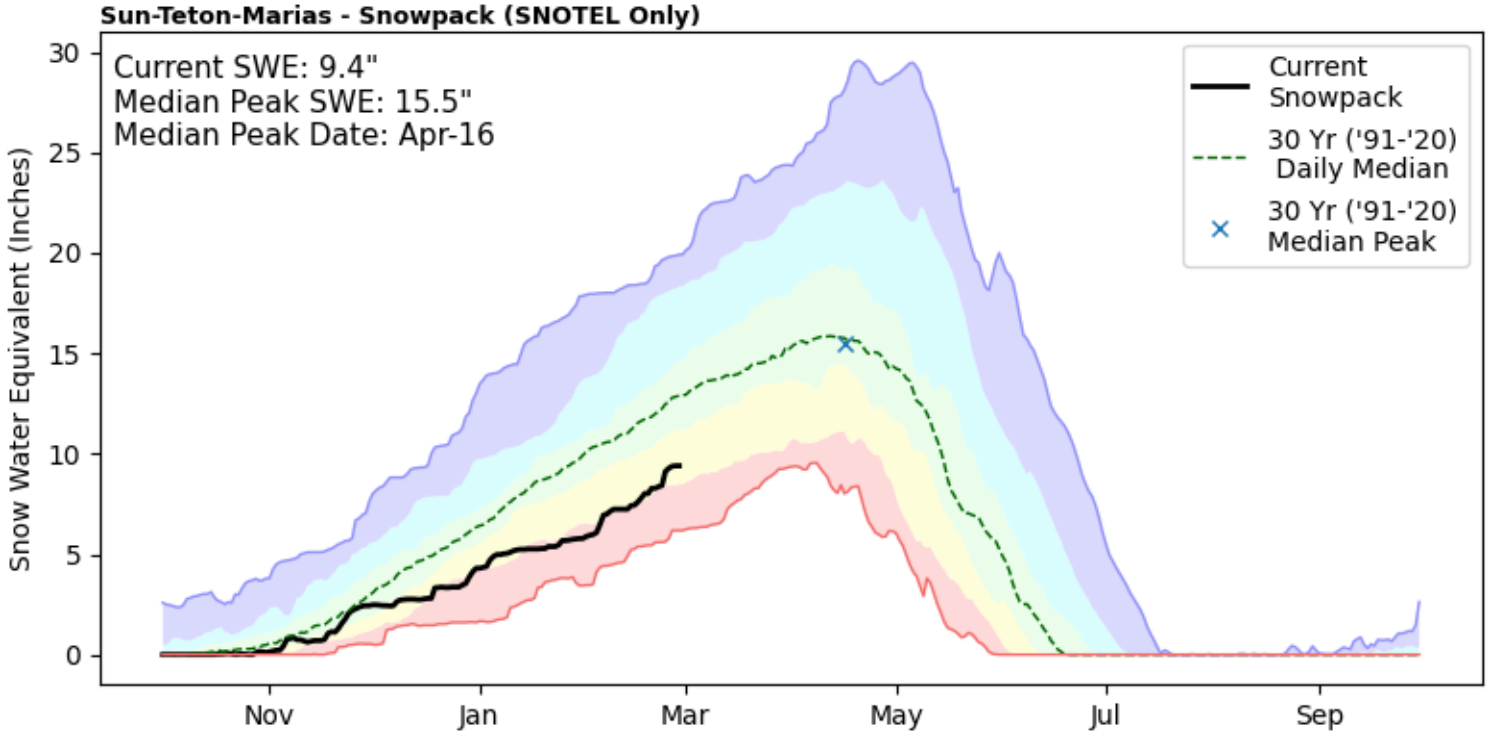


# Basin Overview

## Sun-Teton-Marias

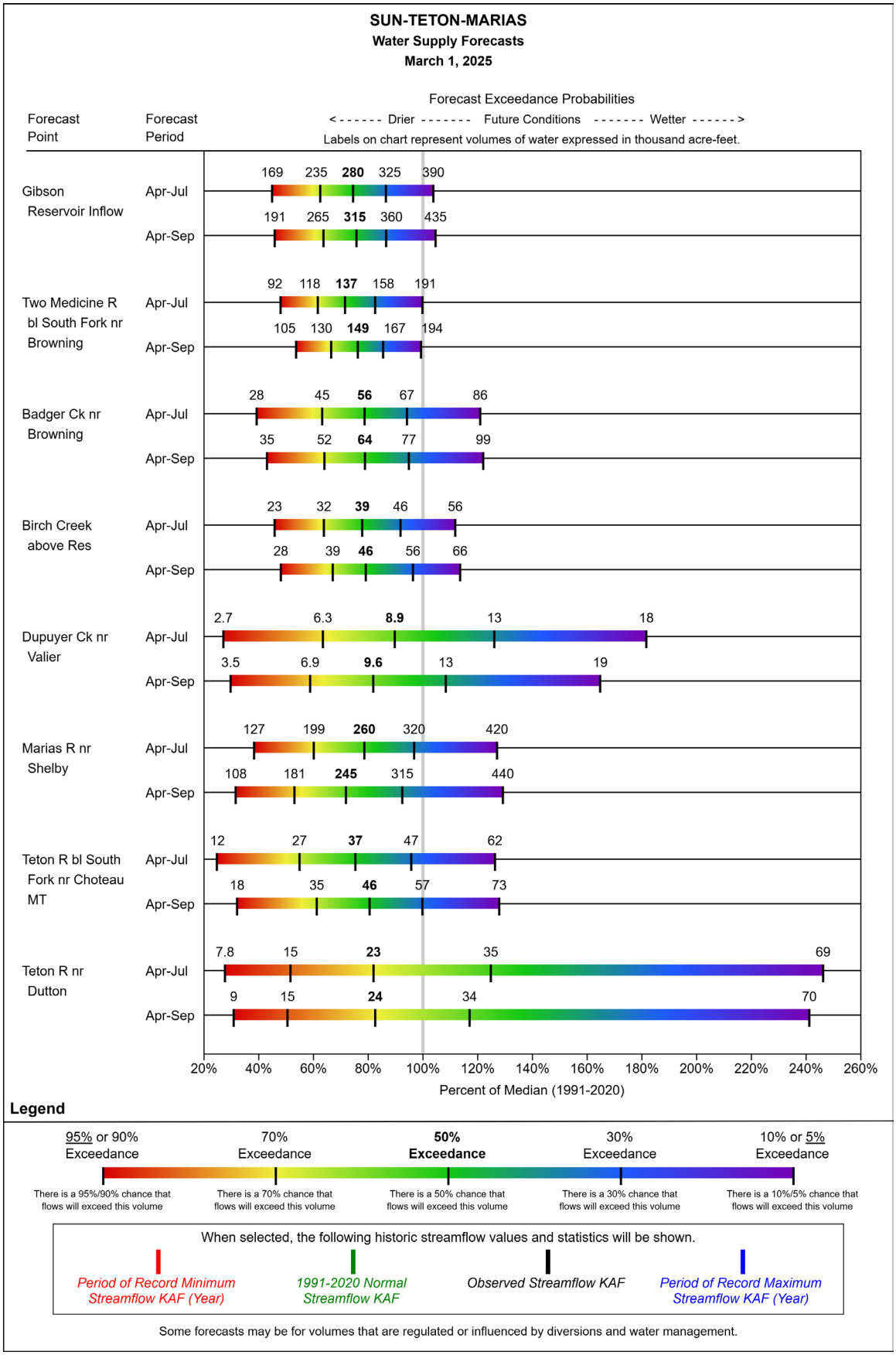
Precipitation in February was well above normal at 127%, which brings the seasonal accumulation (October-February) to 69% of median. The snowpack in the Sun-Teton-Marias is well below normal at 71% of median, compared to 53% at this time last year.



# Basin Overview

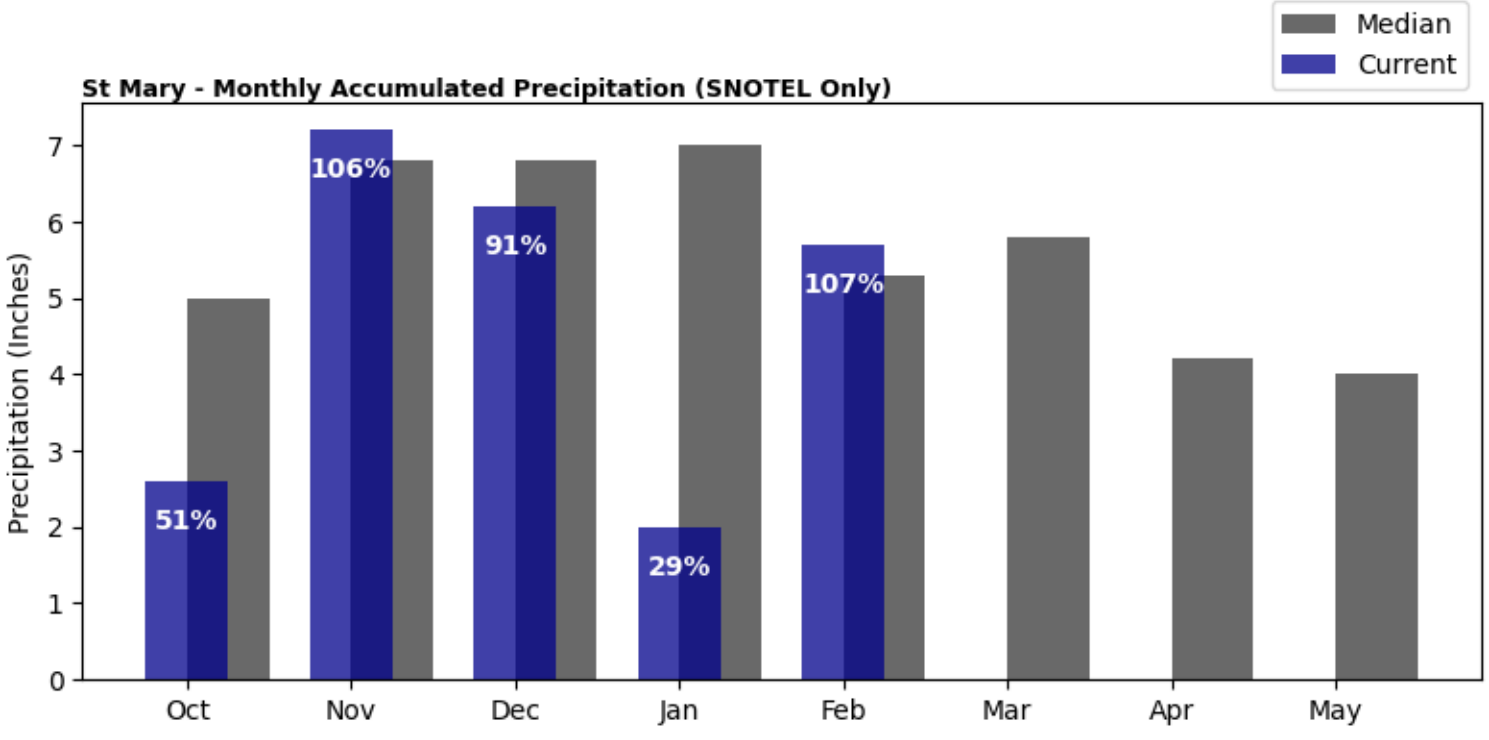
## Sun-Teton-Marias (Continued)

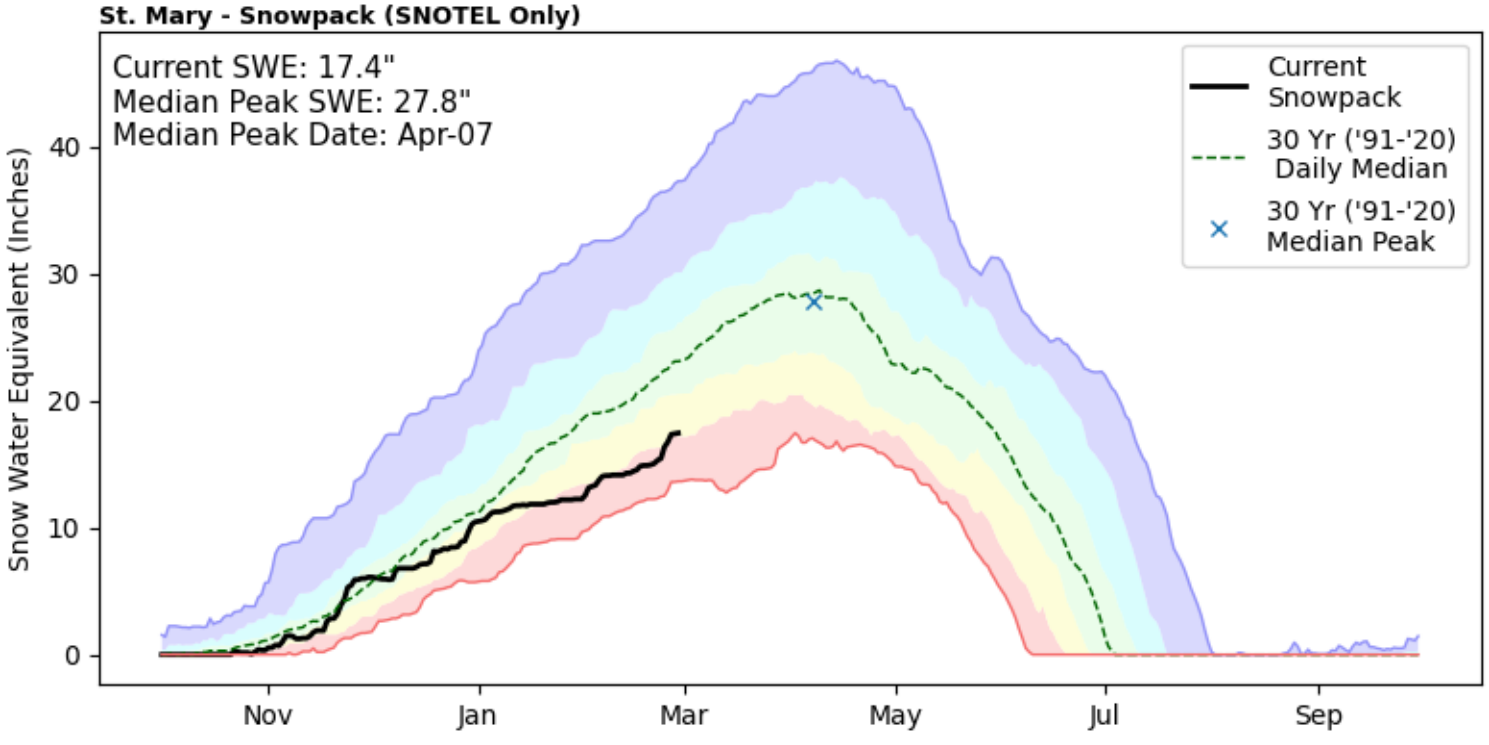


# Basin Overview

## St. Mary

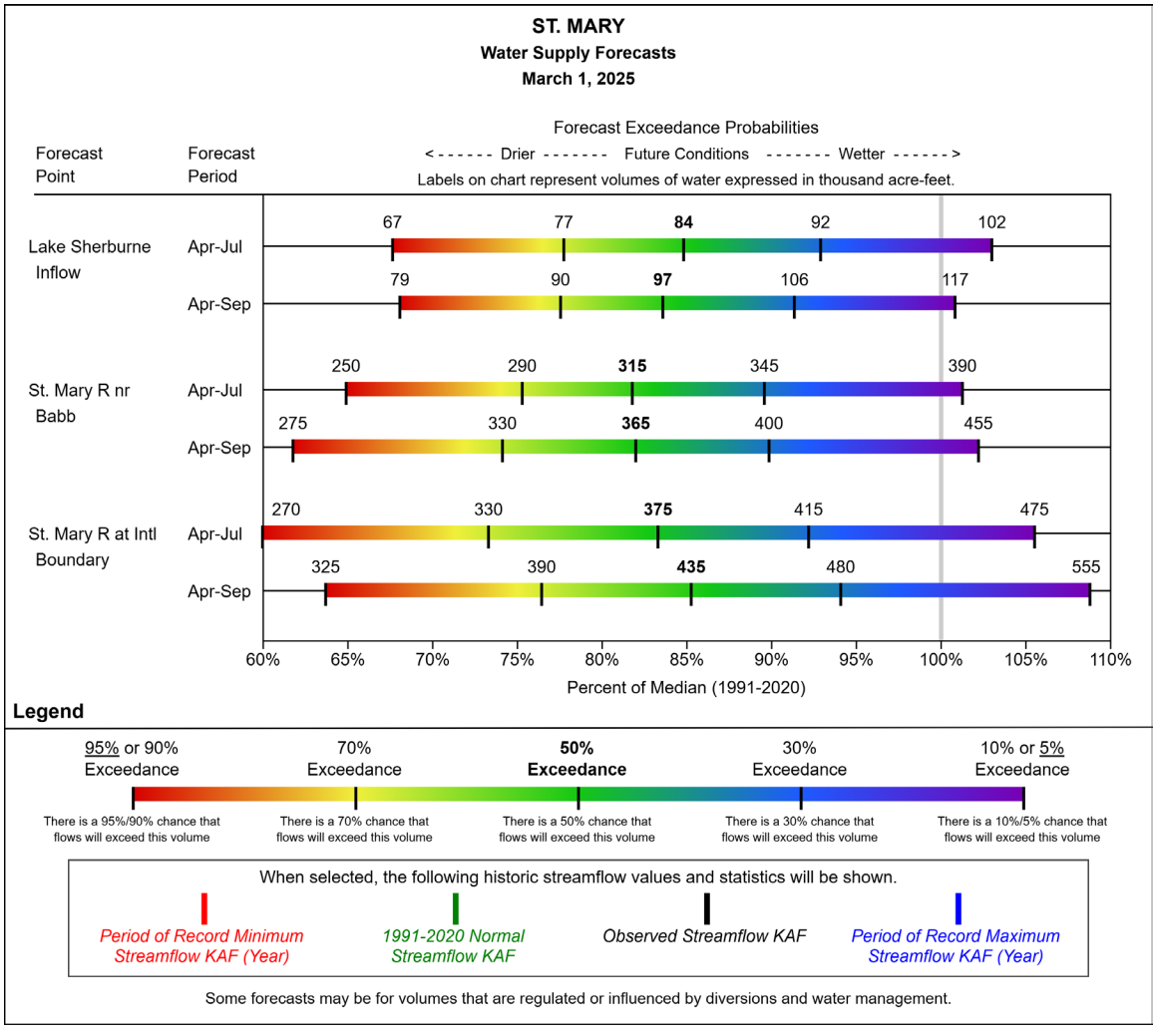
Precipitation in February was above normal at 107%, which brings the seasonal accumulation (October-February) to 69% of median. The snowpack in the St. Mary is well below normal at 72% of median, compared to 65% at this time last year.



# Basin Overview

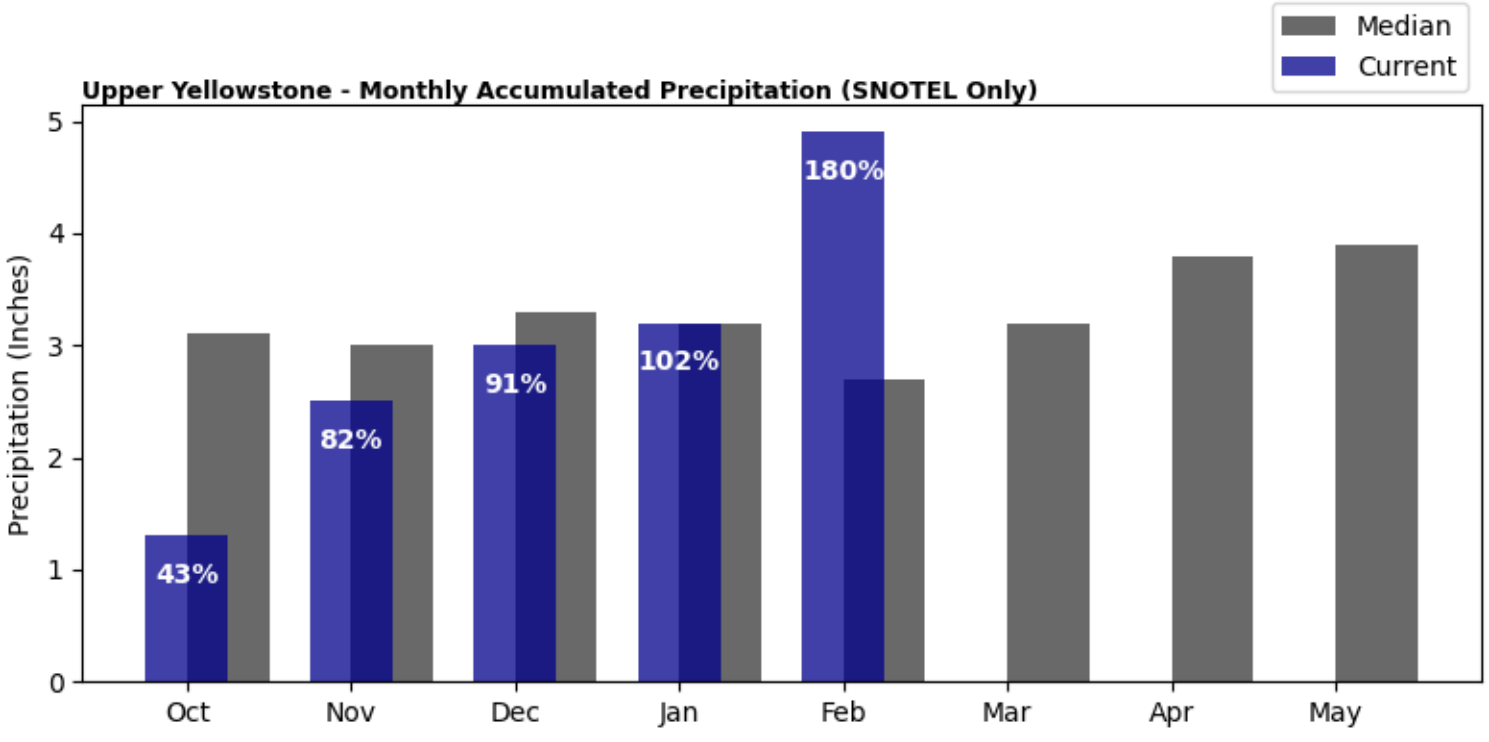
## St. Mary (Continued)

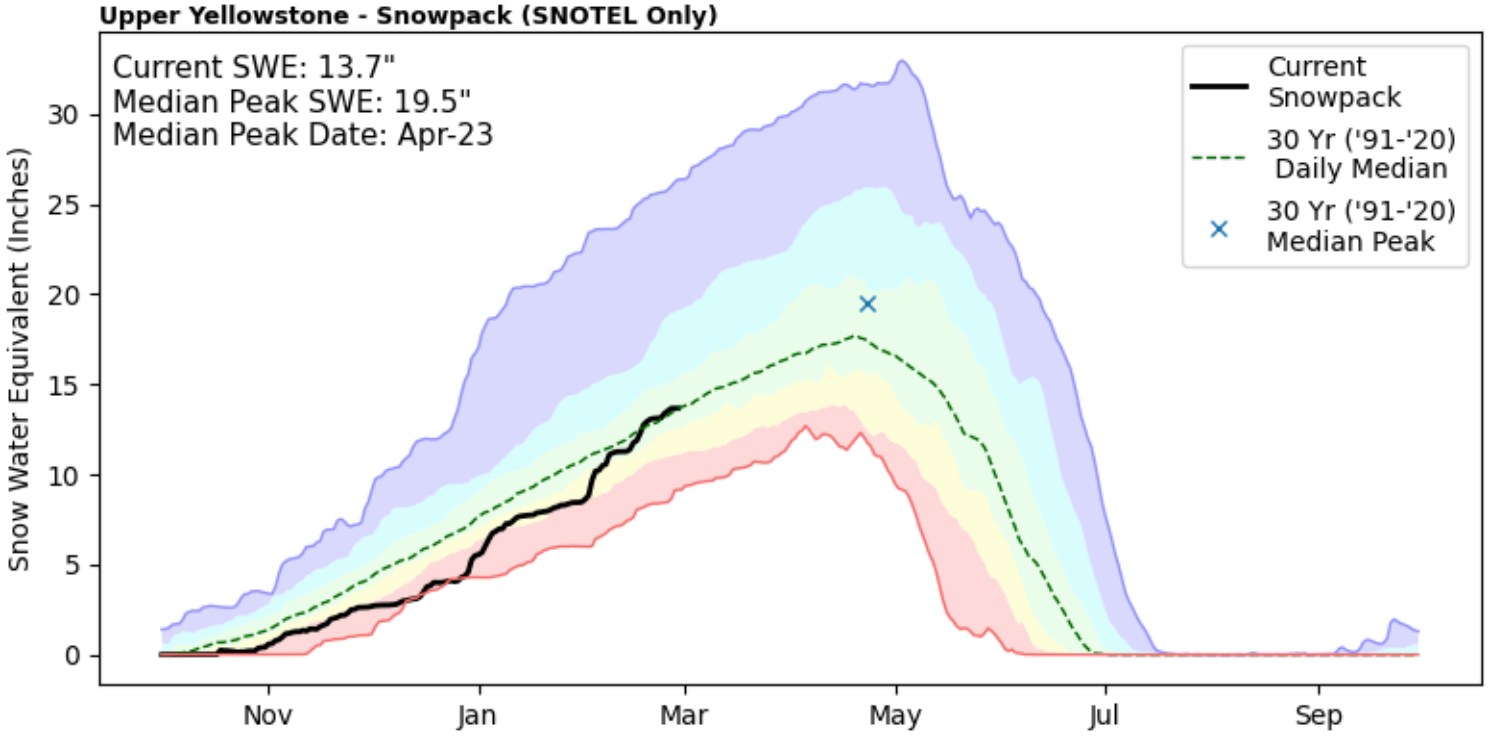


# Basin Overview

## Upper Yellowstone

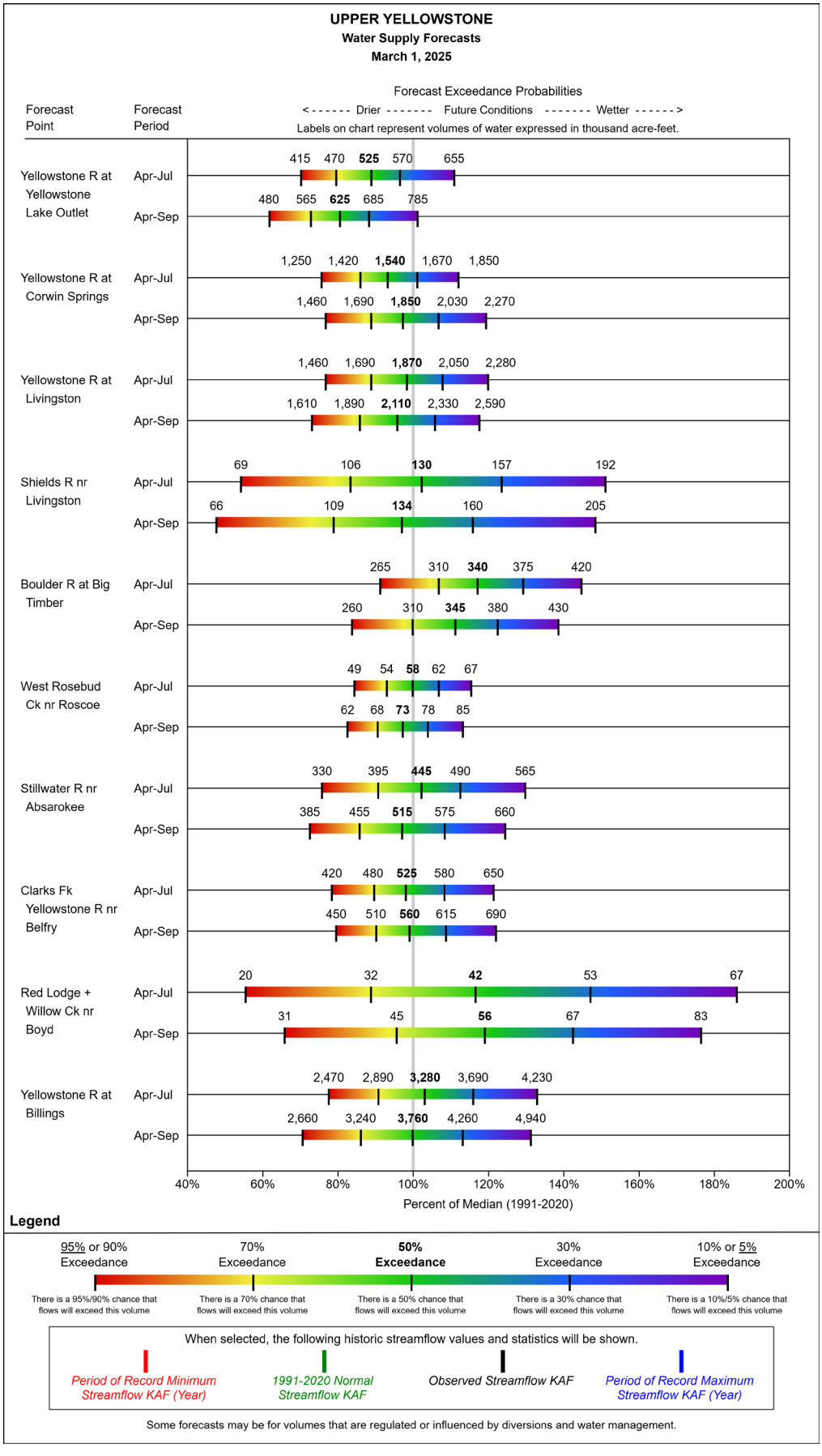
Precipitation in February was well above normal at 180%, which brings the seasonal accumulation (October-February) to 95% of median. The snowpack in the Upper Yellowstone is near normal at 98% of median, compared to 65% at this time last year.



# Basin Overview

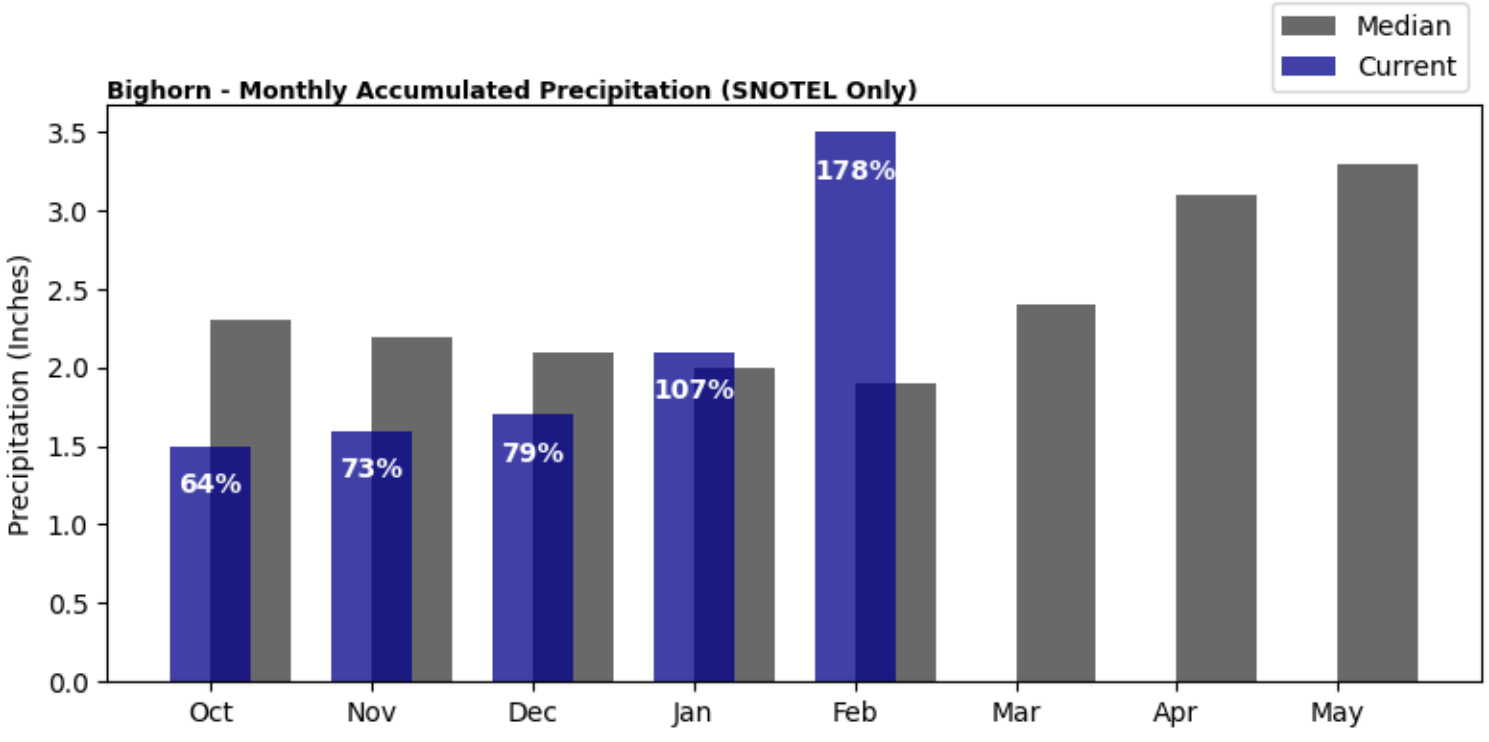
## Upper Yellowstone (Continued)

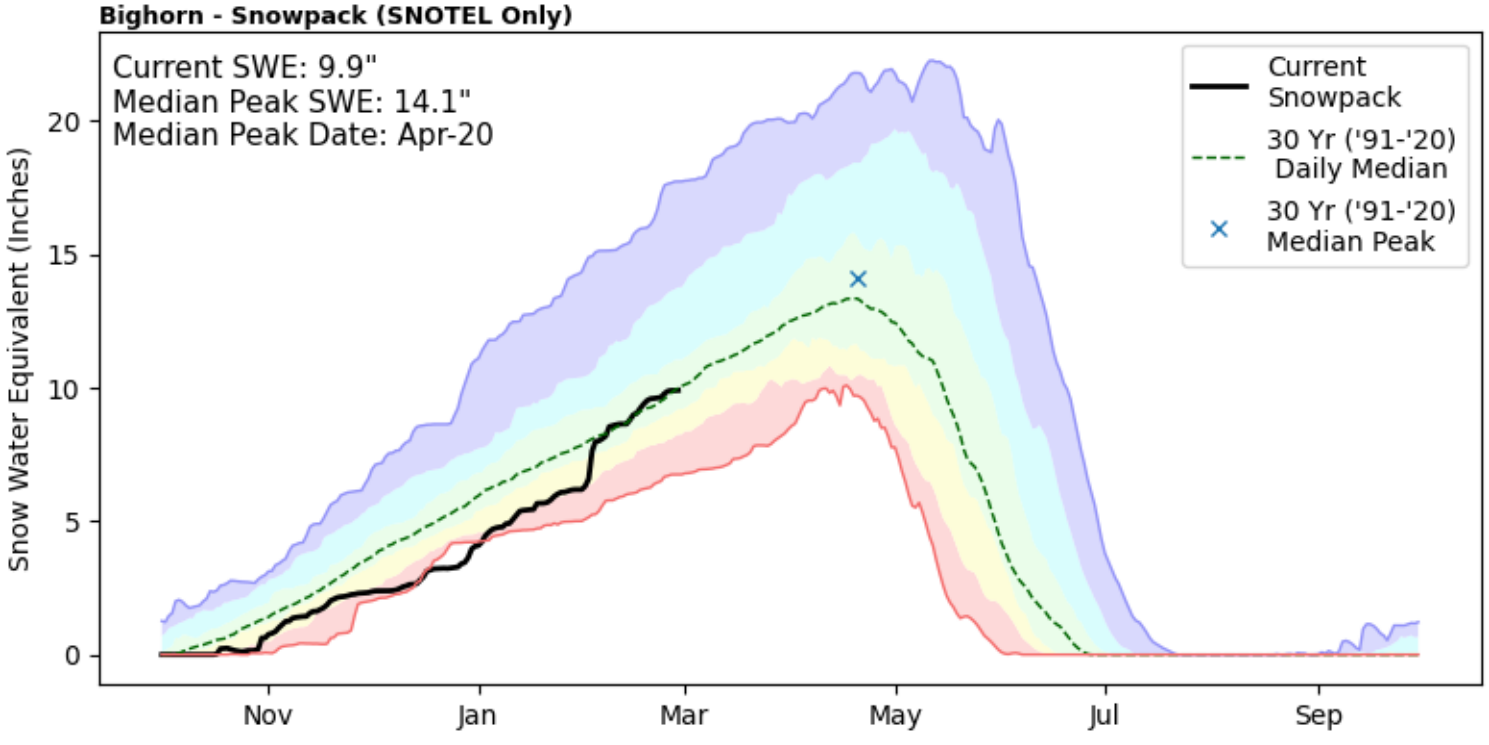


# Basin Overview

## Bighorn

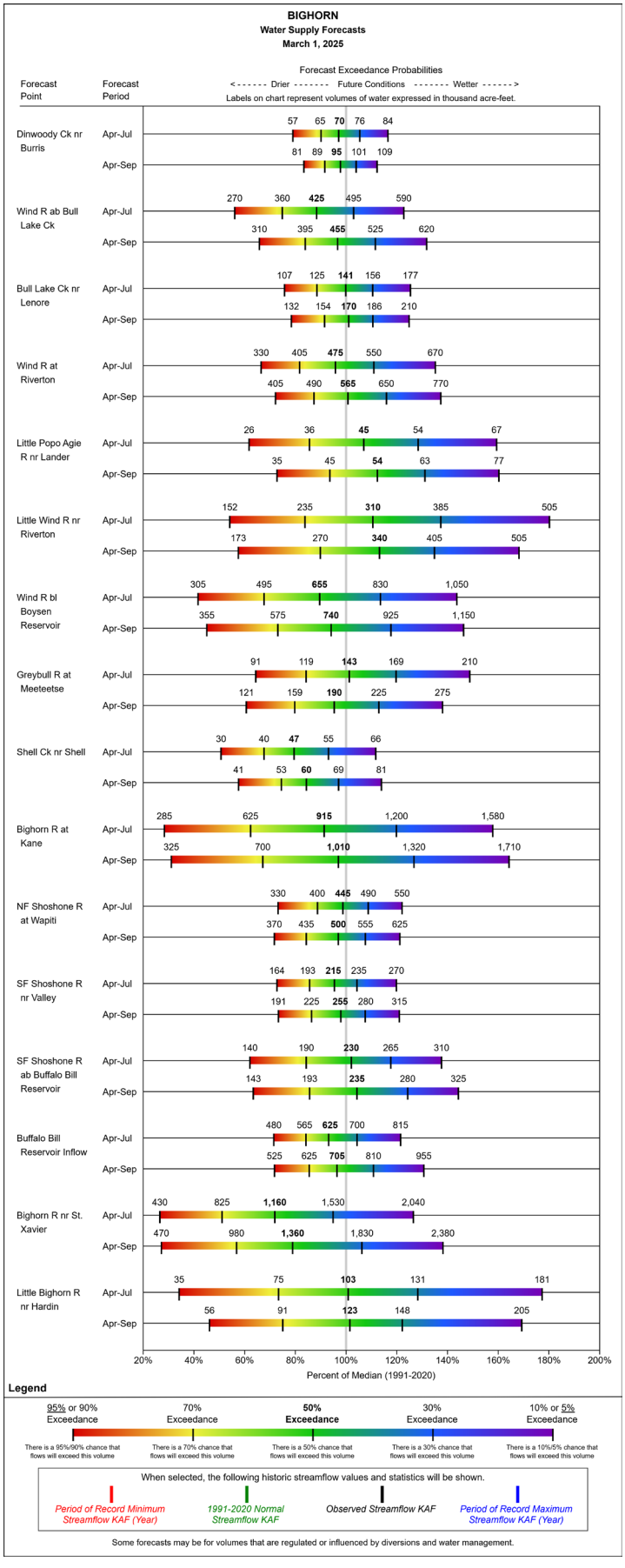
Precipitation in February was well above normal at 178%, which brings the seasonal accumulation (October-February) to 96% of median. The snowpack in the Bighorn is near normal at 99% of median, compared to 85% at this time last year.



# Basin Overview

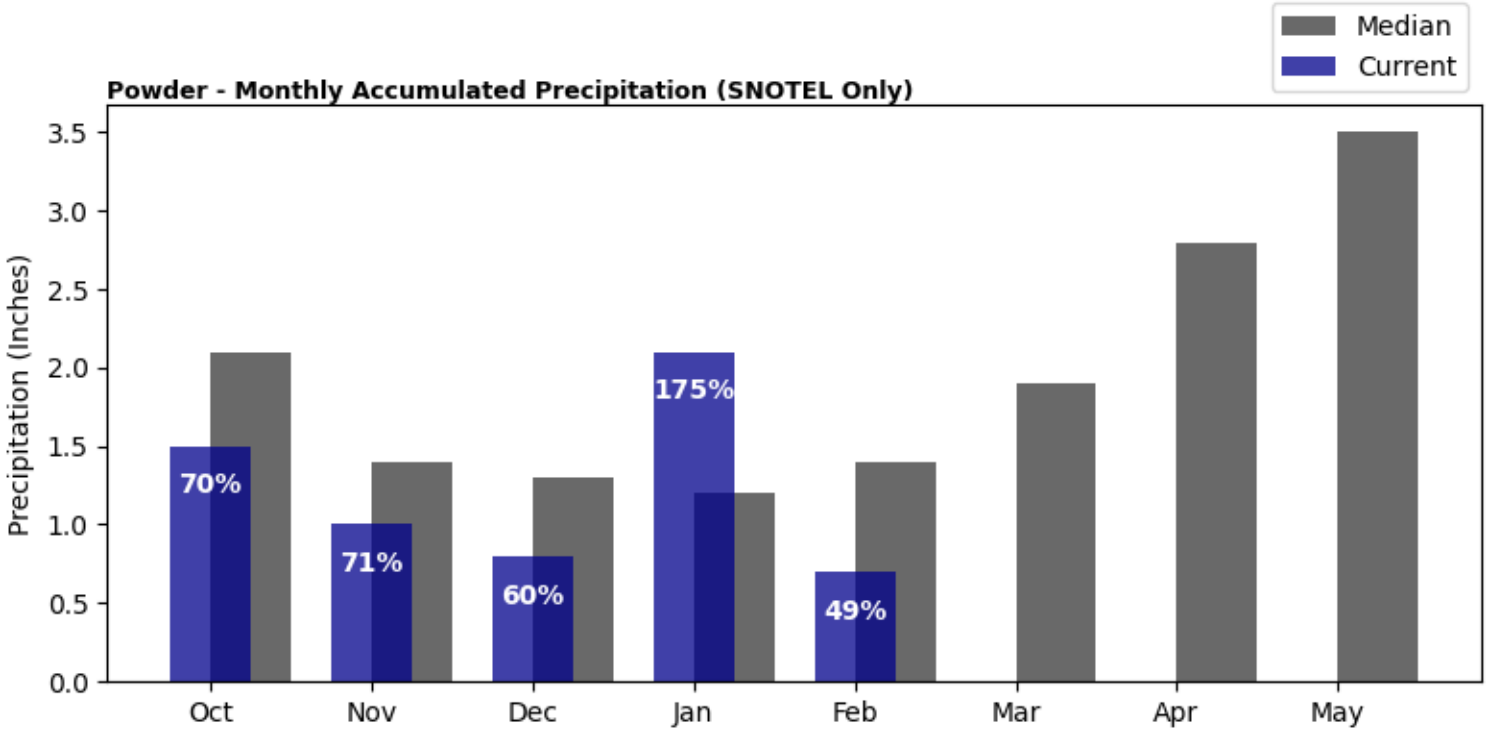
## Bighorn (Continued)

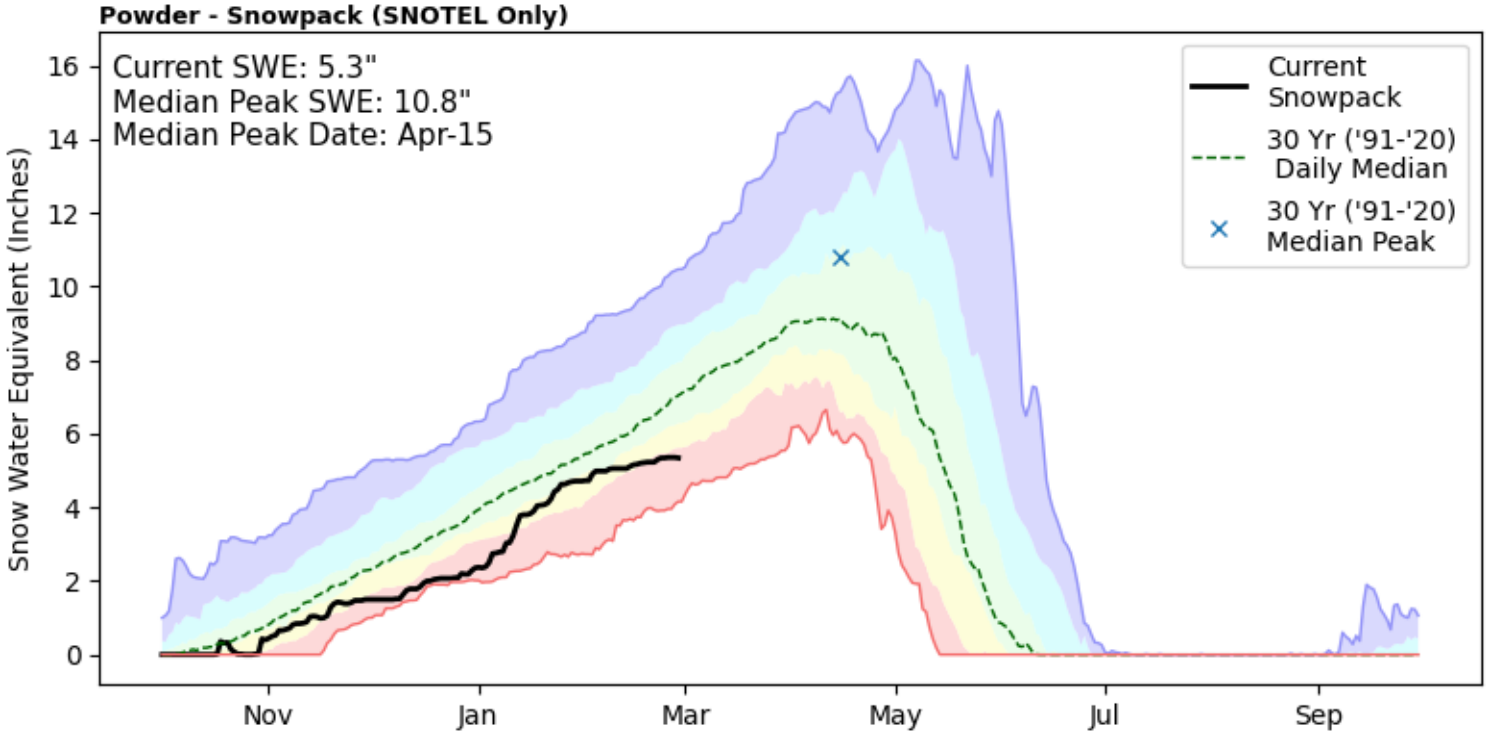


# Basin Overview

## Powder

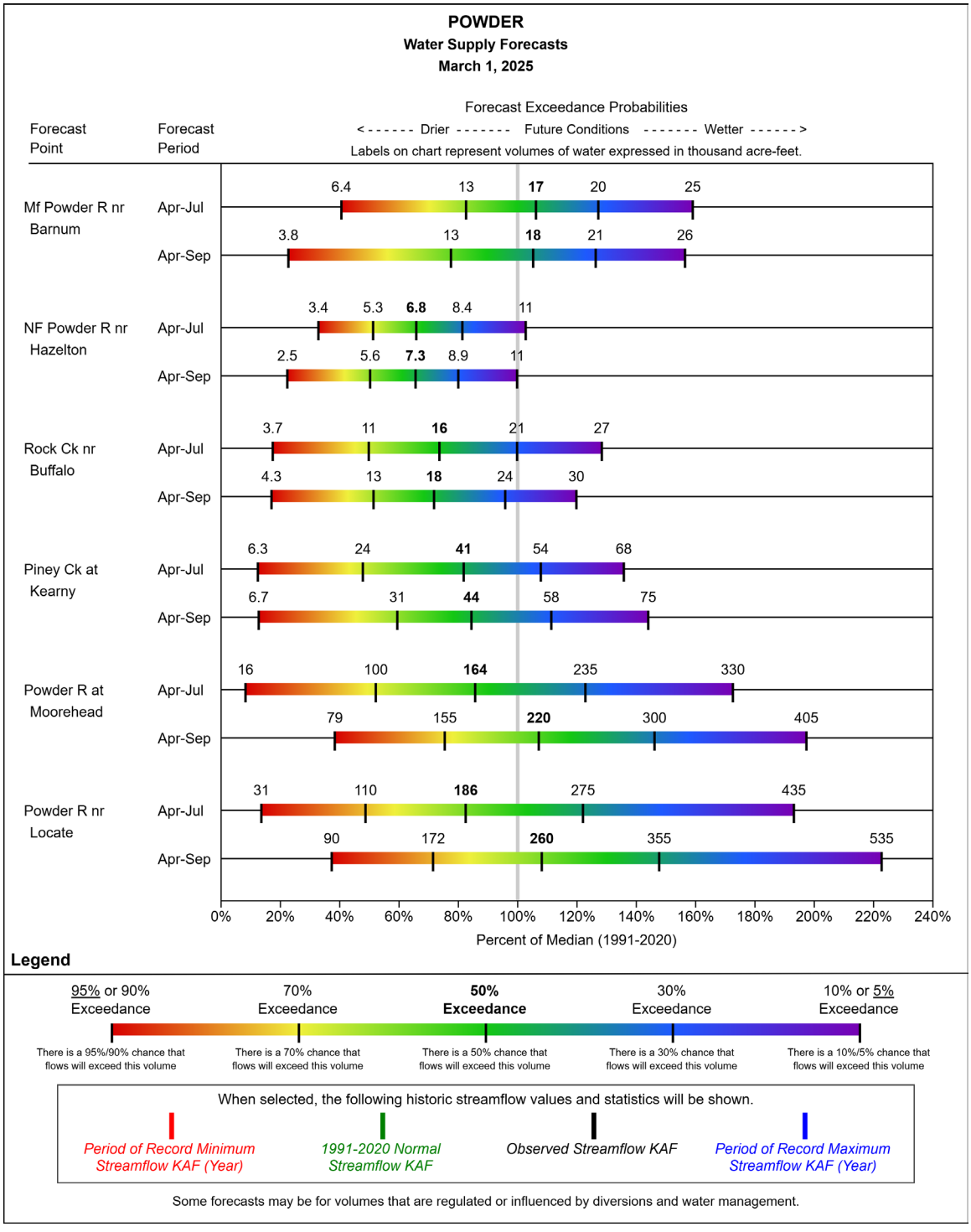
Precipitation in February was well below normal at 49%, which brings the seasonal accumulation (October-February) to 80% of median. The snowpack in the Powder is well below normal at 74% of median, compared to 63% at this time last year.



# Basin Overview

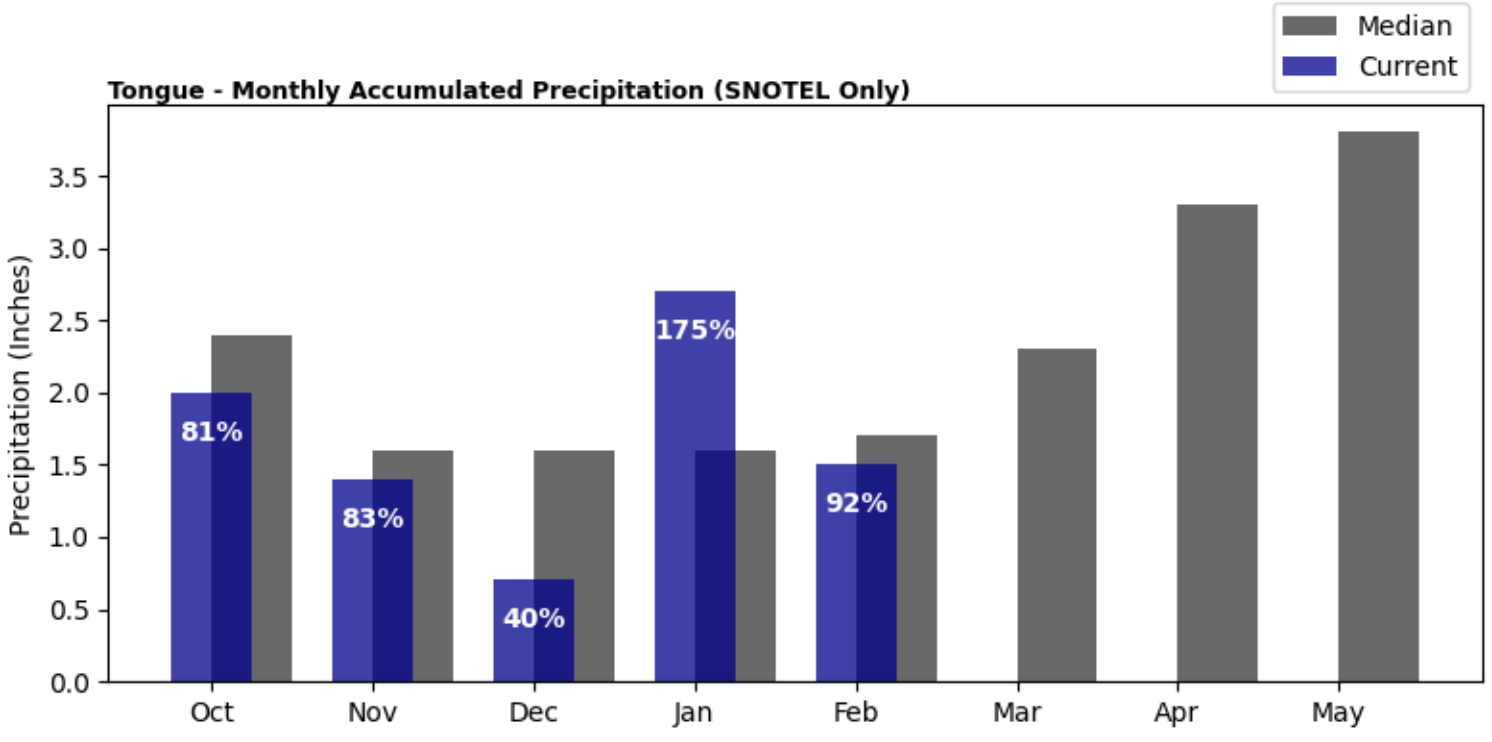
## Powder (Continued)

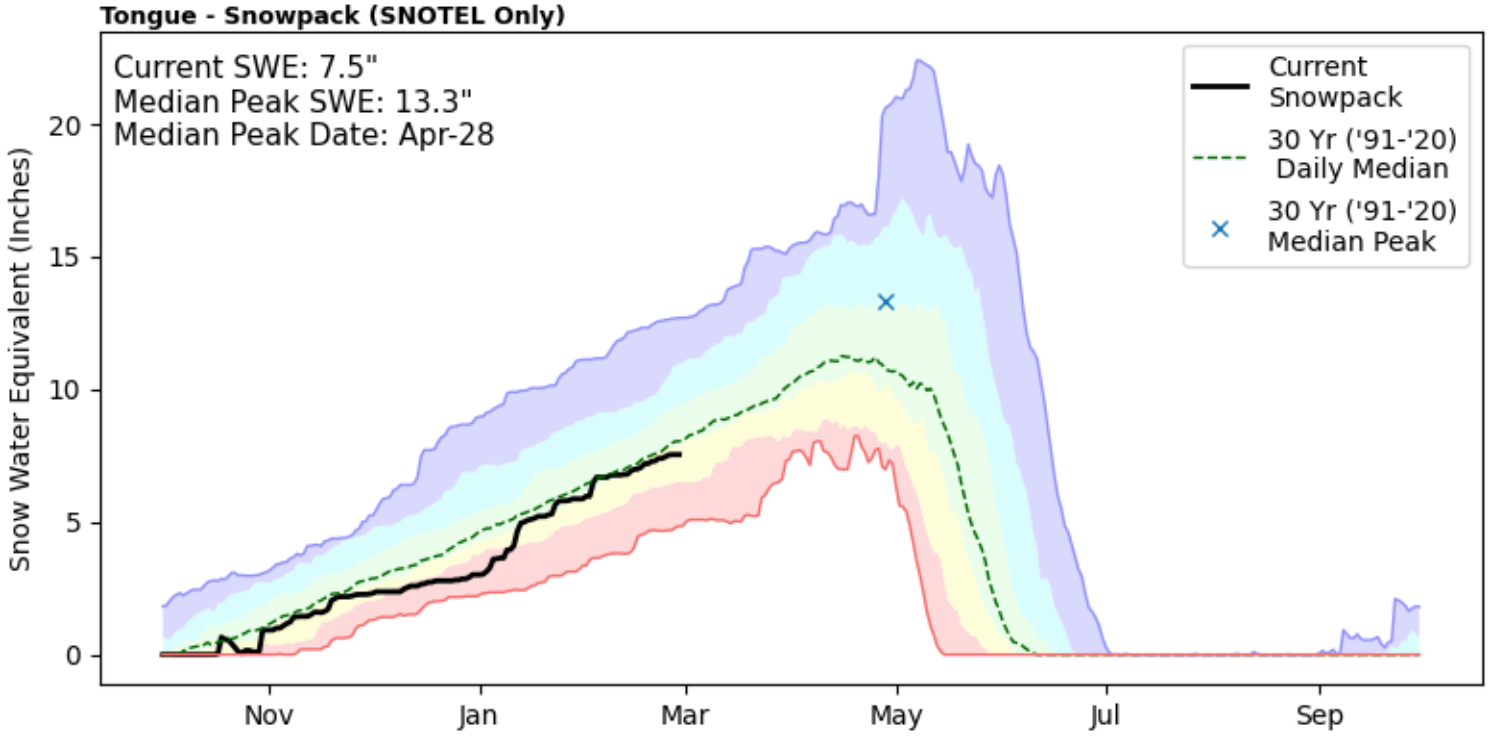


# Basin Overview

## Tongue

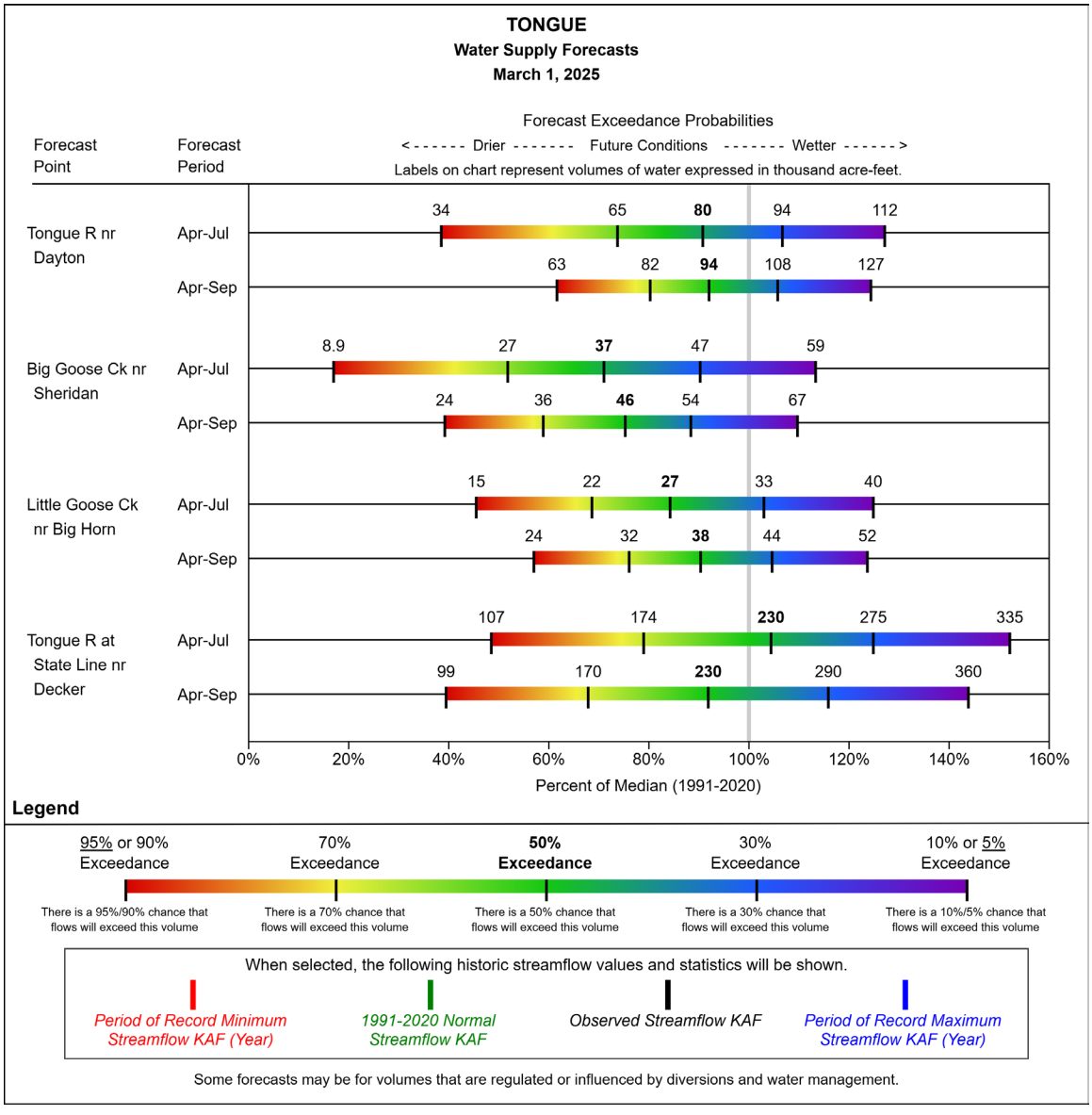
Precipitation in February was below normal at 92%, which brings the seasonal accumulation (October-February) to 86% of median. The snowpack in the Tongue is below normal at 94% of median, compared to 65% at this time last year.



# Basin Overview

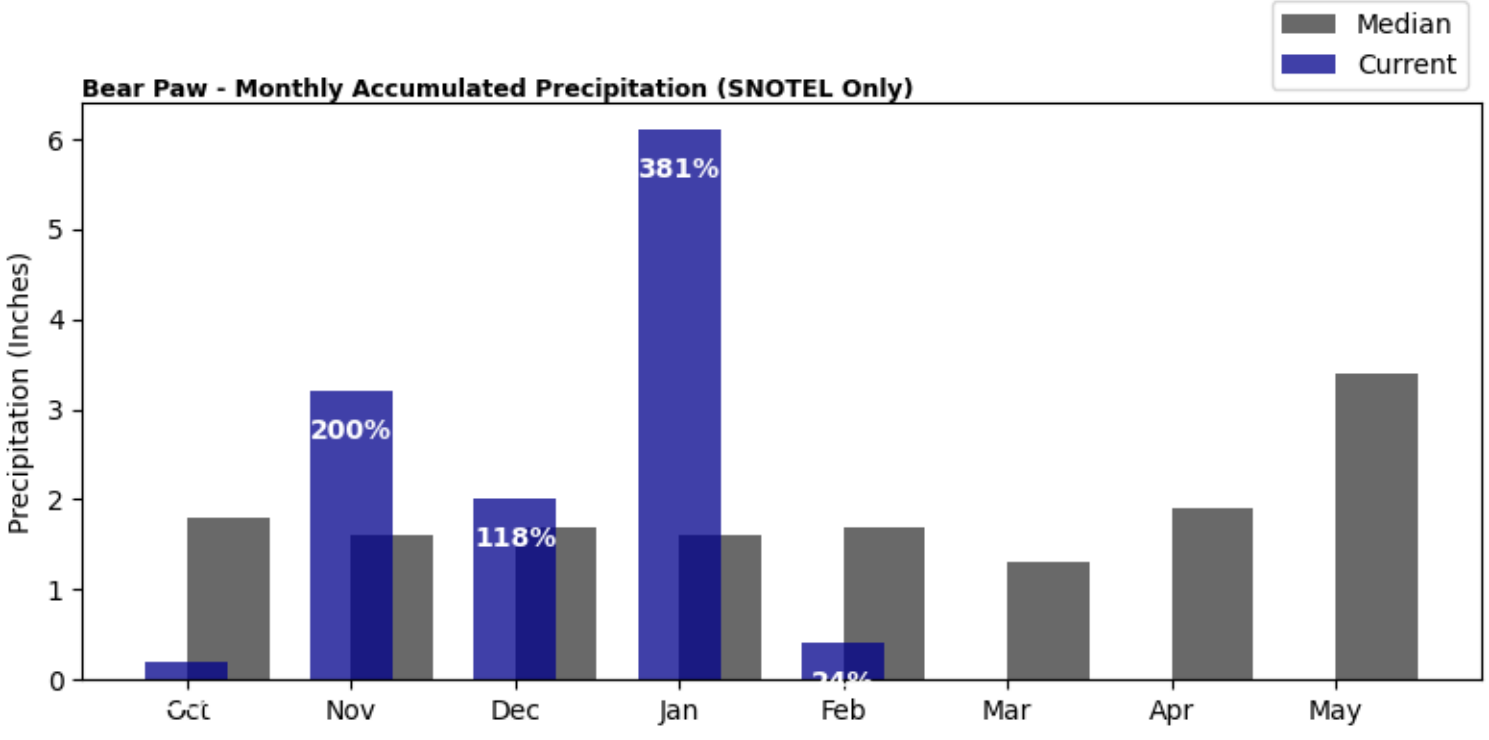
## Tongue (Continued)

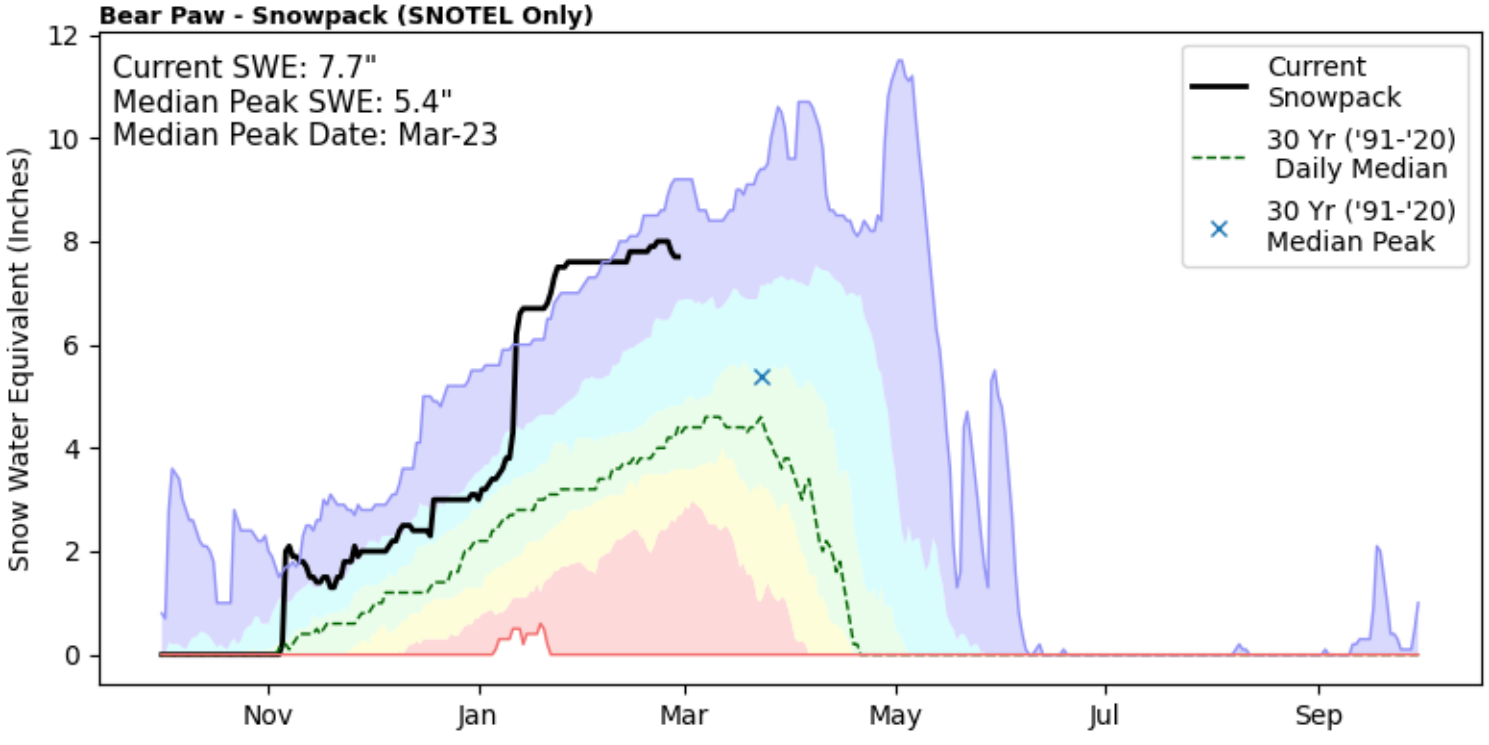


# Basin Overview

## Bear Paw

Precipitation in February was well below normal at 24%, which brings the seasonal accumulation (October-February) to 137% of median. The snowpack in the Bear Paw is well above normal at 158% of median, compared to 50% at this time last year.



# Appendix

## Water Supply Forecast Information

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.

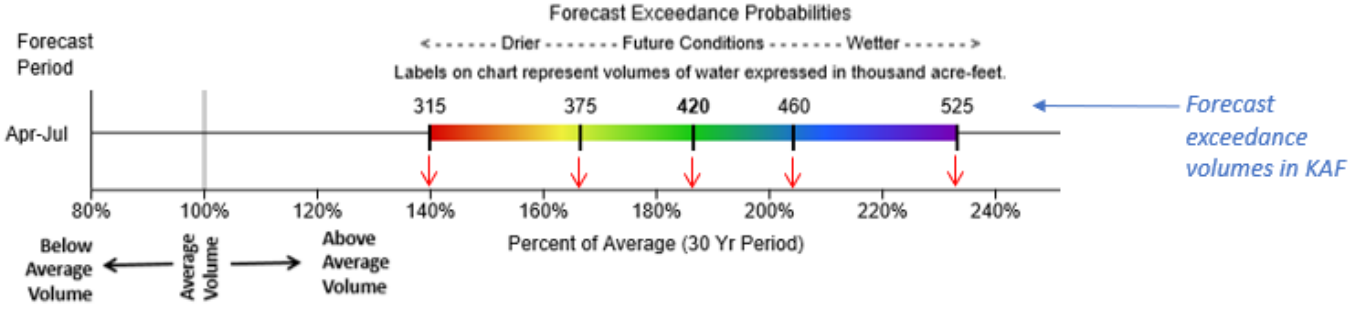
Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed 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.

### Interpreting Water Supply Forecast Charts

Typically, the Natural Resources Conservation Service (NRCS) has presented streamflow forecasts as a table format showing the five exceedance probabilities compared to the 30-year average as follows:

| | Forecast Exceedance Probabilities for Risk Assessment<br>Chance that actual volume will exceed forecast | | | | | | |
|---|---|---|---|---|---|---|---|
| Forecast Period | 90% (KAF) | 70% (KAF) | 50% (KAF) | % Avg | 30% (KAF) | 10% (KAF) | 30yr Avg (KAF) |
| APR-JUL | 315 | 375 | 420 | 187% | 460 | 525 | 225 |

The Forecast Chart provides a visual alternative to the table. The forecast range is represented by a colored bar. Vertical lines on the bar signify the five forecast exceedances. Below is an example. The numbers above the forecast bar are the five exceedance probability volumes in thousand acre-feet (KAF). Each exceedance forecasts percent of median can be estimated by looking at the horizontal axis. The gray line centered above 100% on the horizontal axis represents the 1991-2020 historical median streamflow for the forecast period.



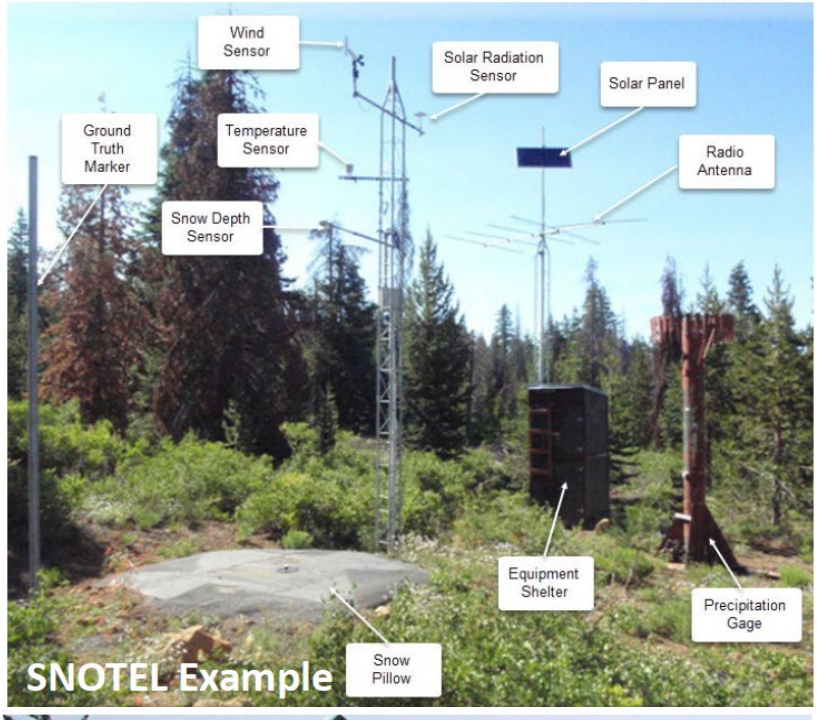

In the example, the entire forecast bar is shifted right of the gray line indicating a forecast for above normal streamflow. The 50% exceedance is represented by the black line in the green portion of the colored bar. This represents a forecast volume of 420KAF which is ~185% of average. If drier than normal future conditions occur the 70% exceedance forecast may be more likely (375KAF or ~165% of average). If future conditions turn wetter than normal, the 30% exceedance forecast may be more likely (460KAF or ~205% of average). Water users are encouraged to consider the range of forecast exceedances instead of relying solely only on the 50% forecast.

# Appendix

## Monitoring Station Overview

### SNOTEL

The NRCS operates an extensive, automated data collection network called SNOTEL (short for Snow Telemetry). SNOTEL sites are designed to operate unattended in remote mountain locations. Data are collected and transmitted hourly and available on the internet. Daily data (midnight values) are quality checked by NRCS hydrologists on at least a weekly basis. SNOTEL sites provide snowpack water content data via a pressure-sensing snow pillow. Other data include snow depth, water year precipitation accumulation, air temperature with daily maximums, minimums, and averages. The earliest NRCS SNOTEL sites have data back to the mid-1970s.



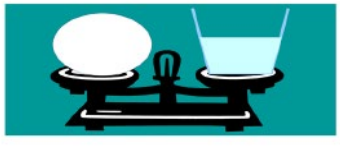

### Snow Course

Snow courses are measurement transects where snow tubes are used by snow surveyors during the winter season to determine the depth and water content of the snowpack. Hollow snow tubes are used to vertically core the snowpack. The tubes are then weighed to determine the water content of the snow. Generally, snow courses are situated in meadows or forest openings protected from the wind. A snow course measurement is the average of a number of sample points, typically 5 or 10. Snow courses are measured on a monthly basis typically between January 1 and June 1. Snow courses provide a longer record than SNOTEL. The earliest snow courses in the Montana have data back to the 1920s.


### Snow Water Equivalent (SWE)

Sometimes also called snow water content, this is the amount of water contained within the snowpack. It can be thought of as the depth of water (in inches) that would result if you melted the snowpack. For example, if a snowpack containing 12 inches of SWE melted instantaneously, there would be a puddle of water 12 inches deep on the ground.

SWE measurements made by snow pillows or snow tubes rely on the fact that water weighs the same whether it is liquid or frozen.



Weight of frozen water = Weight of liquid water

Snow core inside snow tubes

# Appendix

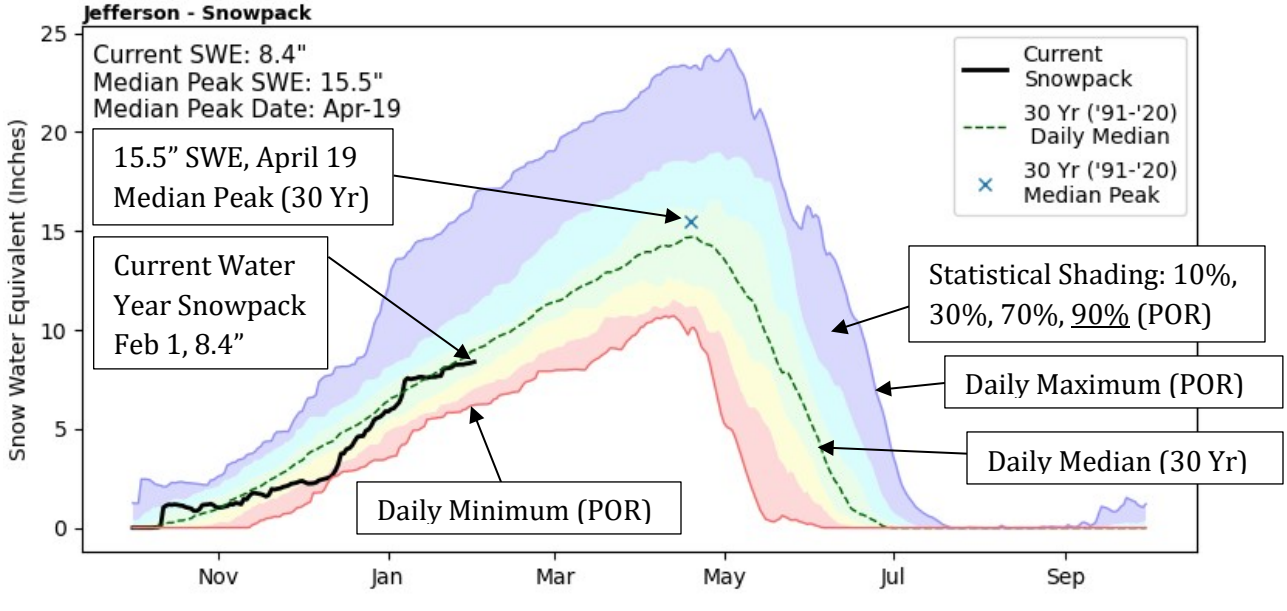
## Additional Information

### Climatic and Hydrologic Normals

The Snow Survey and Water Supply Forecasting (SSWSF) normals are site-specific measures of central tendency (either the median or average) for a data type, such as snow water equivalent (SWE). The statistics are calculated over a 30-year period and updated each decade, in agreement with World Meteorological Organization (WMO) standards. This 30-year reference period was chosen to characterize the current hydroclimatology at each station. The most recent medians and averages have been updated to include data for the water years 1991-2020. The National Water and Climate Center (NWCC) also provides medians and averages for the 1981-2010 and 1971-2000 reference periods for stations with sufficient data. The normals available from the NWCC include the median and average for SWE, snow depth (snow courses only), precipitation, volumetric streamflow, and reservoir storage. Values are calculated from data collected by NRCS-managed stations and external agencies such as the U.S. Geological Survey (USGS), National Weather Service (NWS), state agencies, and private organizations. Normal is calculated for various durations including daily, month-to-date, semi-monthly, monthly, seasonal, and annual based on the data type. More information is available here: https://www.nrcs.usda.gov/resources/data-and-reports/climatic-and-hydrologic-normals

### Interpreting Snowpack Charts

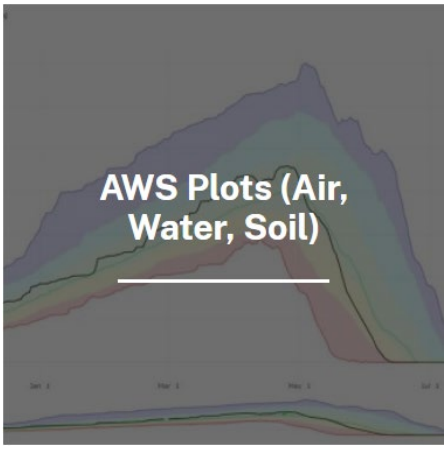
Snowpack charts displayed in this report are created using daily (midnight) snow water equivalent (SWE) values at SNOTEL sites determined to represent the basin. Snow Course data is not included. Plotted lines are the average of each SNOTEL's individual values. For example, the "Current Snowpack" on January 1st is the average all SNOTEL SWE values in that basin for that day. The "30 Yr. ('91-'20) Daily Median" is the average of each SNOTEL's median SWE value for a given day. The upper and lower extent (blue/red lines) show the maximum/minimum daily SWE values, which is determined using the "Current Snowpack" SWE value for all days in the period of record (POR). Snowpack peak SWE dates differ from season to season, as a result the high point on the "30 Yr. ('91-'20) Daily Median" line is not the true median peak SWE. The point "X" is plotted by calculating the median peak date and median peak value independently. Similar charts with other basin definitions are available here: https://nwcc-apps.sc.egov.usda.gov/basin-plots/#mt

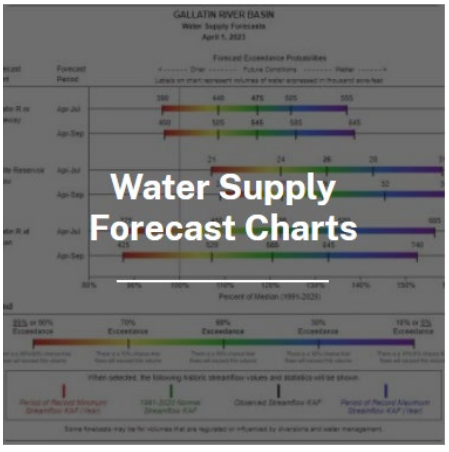


# Appendix

## Links and Resources

**Products and Reports** (click image)





**Interactive Map Predefined Links**

Snow

- Snow Water Equivalent > Daily > Percent of 1991-2020 Median > **Stations** | **Basins**
- Snow Water Equivalent > End of Previous Month (SNOTEL and Snow Course) > Percent of 1991-2020 Median > **Stations** | **Basins**
- Snow Depth > Daily > **Stations**
- Snow Density > End of Previous Month (SNOTEL and Snow Course) > **Stations**

Precipitation

- Month-to-Date > Daily > **Stations**
- Water Year-to-Date > Daily > Percent of 1991-2020 Median > **Stations** | **Basins**
- Previous Month > Percent of 1991-2020 Median > **Stations** | **Basins**
- Previous 3 Months > Percent of 1991-2020 Average > **Stations** | **Basins**

Streamflow

- Observed (Adjusted Volume) > Previous Month > Percent of 1991-2020 Median > **Stations** | **Basins**
- Forecast (Adjusted Volume) > Most Recent (Available March 1 through June 1) > Percent of 1991-2020 Median > **Stations** | **Basins**

Reservoir Storage

- End of Previous Month > Percent of 1991-2020 Median > **Stations**

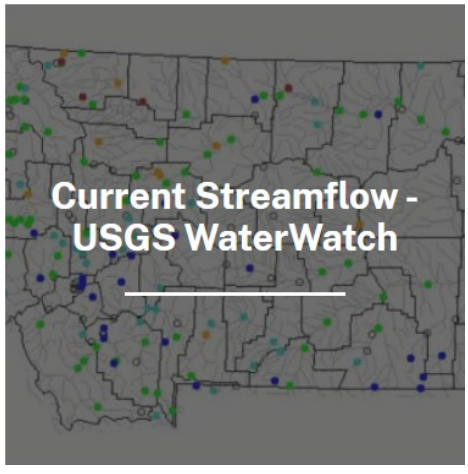
Other

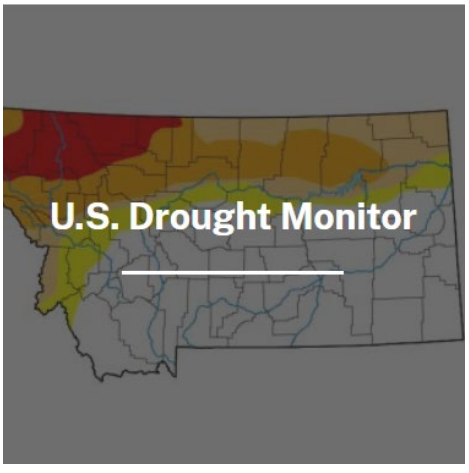
- Snow Water Equivalent > Daily > Compared to POR > **Stations**
- Snow Water Equivalent > End of Previous Month (SNOTEL and Snow Course) > Percentile > **Stations**
- Water Year-to-Date Precipitation > Daily > Compared to POR > **Stations**

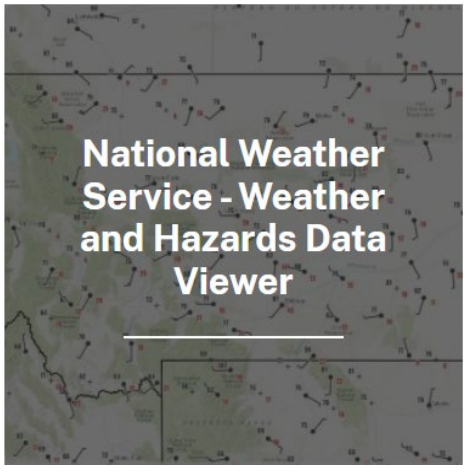
# Appendix

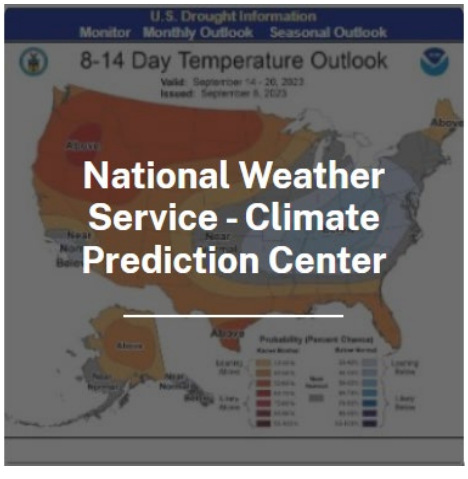
## Links and Resources (Continued)

**External Agencies** (click image)






**Additional Drought Information**

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

**Snow Survey Program FAQ**

Frequently Asked Snow Survey Questions - Montana | Natural Resources Conservation Service (usda.gov)

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# Montana Water Supply Outlook Report

**Natural Resources Conservation Service**