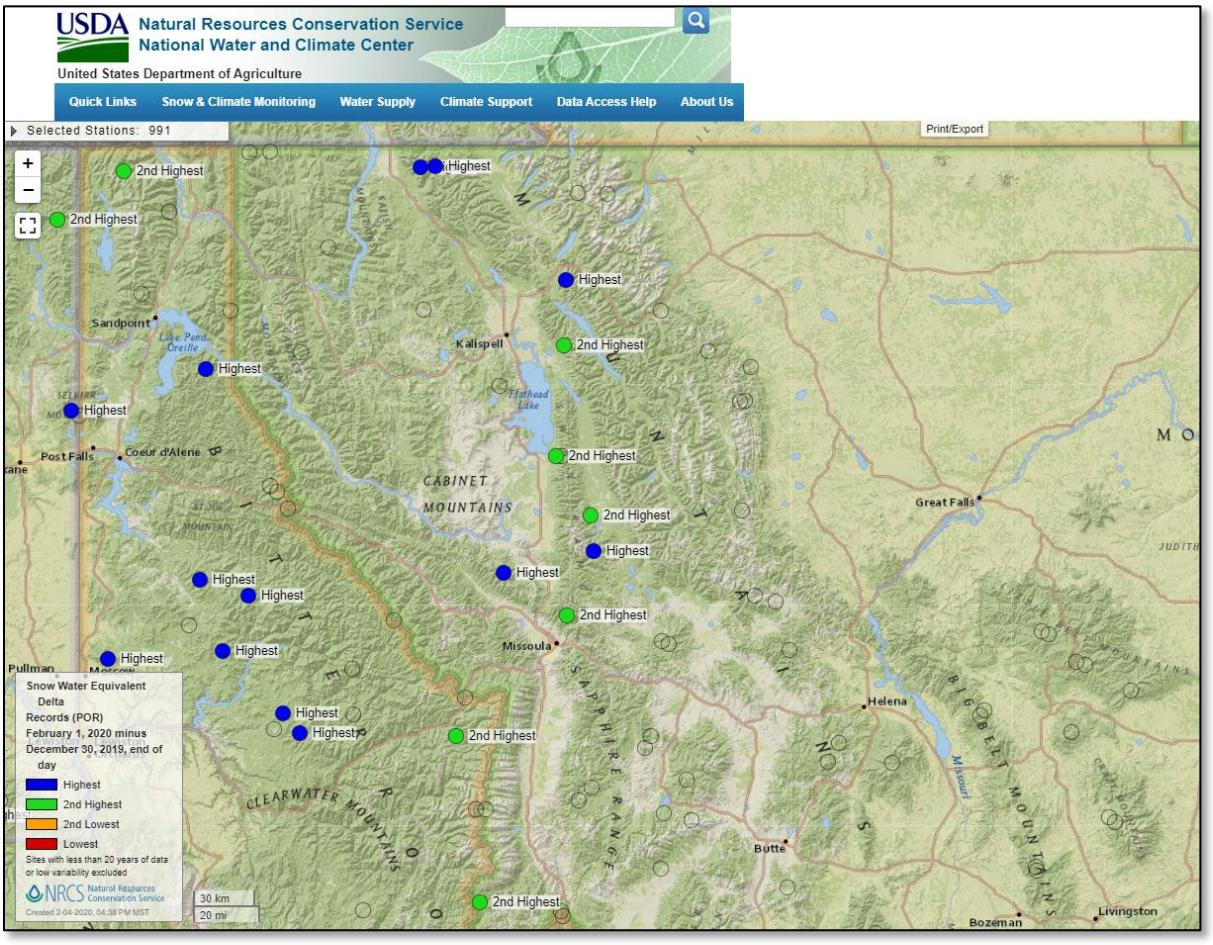
Montana
Water Supply Outlook Report
February 1st, 2020



New records set for January snowfall in northwest Montana. A steady stream of moisture from the Pacific yielded a significant amount of snowfall in the northwest River basins between December 30th, 2019 and February 1st, 2020. Many mountain SNOTEL sites would report the highest, or second-highest January snow totals on record. Although basins west of the Divide would receive the most snowfall, the entire state benefited from the weather patterns during the month, with all river basins increasing their basin snowpack totals since January 1st. All major river basins in the state are now near or above normal for snowpack for this date.

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Montana Water Supply Outlook Report as of February 1st, 2020

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. Streamflow forecasts are coordinated by Natural Resources Conservation Service and National Weather Service hydrologists. This report presents a comprehensive picture of water supply conditions for areas dependent upon surface runoff. It includes selected streamflow forecasts, summarized snowpack and precipitation data, reservoir storage data, and narratives describing current conditions.

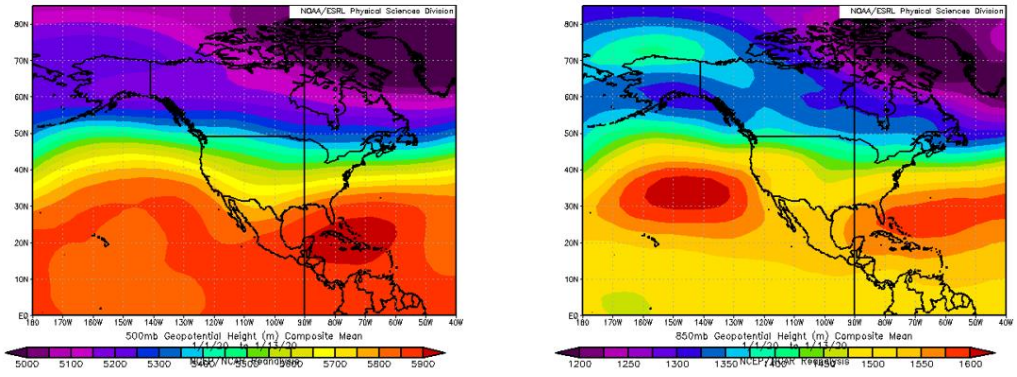
Snowpack data are obtained by using a combination of manual and automated SNOTEL measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. In addition, snow water equivalent, precipitation and temperature are monitored on a daily basis and transmitted via meteor burst telemetry to central data collection facilities. 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; 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 forecast.

Overview

Over the last month, there has been quite a turnaround in the western mountains, with abundant snowfall in almost all mountain areas. The shift in weather patterns, which began in mid-December in northwest Montana, stayed favorable throughout most of the month. Last month, we highlighted the "big picture" weather patterns as they are essential in understanding why we have experienced what occurred throughout the month. Shown below are composite mean 500mb height and 850mb height graphics for two periods of the month, which help to explain the dominant weather patterns in the mid and lower levels of the atmosphere. You can think of them like this; the 500mb height approximates the jet stream, which steers the overall weather patterns, while the 700mb or 850mb height is closer to the surface and gives a better indication of precipitable water and temperatures in the atmosphere.

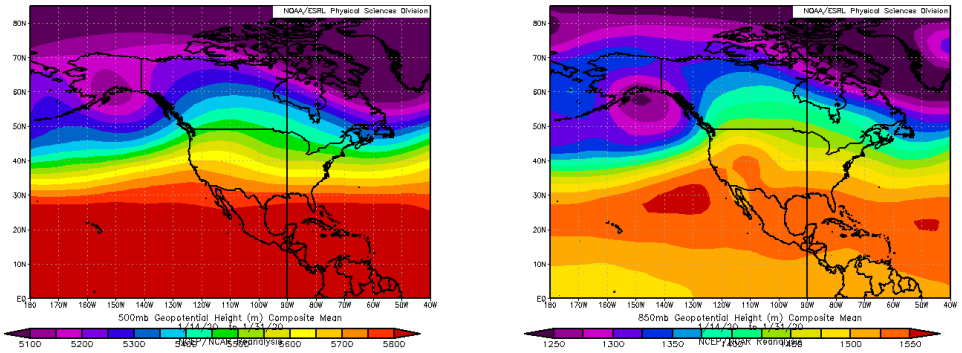
From December 31st through January 12th, the moist west-northwest flow delivered abundant precipitation to the river basins west of the Divide. Some of this moisture would spill over into basins east of the Divide, but the region along the Montana/Idaho border was favored. Daily average temperatures from mountain SNOTEL sites were above the period of record average at many mountain locations throughout much of the period.



Average 500mb and 850mb heights for the January 1st – January 13th period

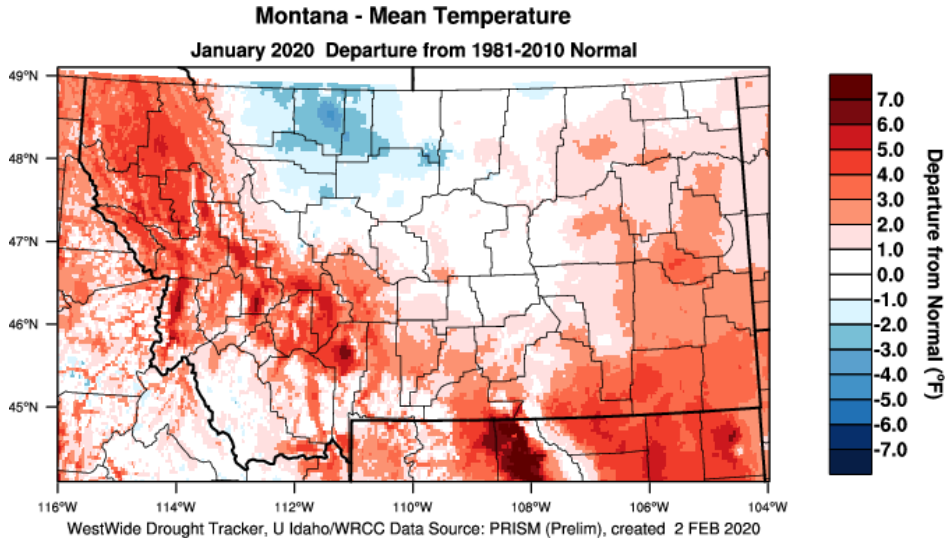
Cold air spilled into the state from the north for a short time between January 12th and 14th as an Arctic cold front pushed south out of Canada, resulting in well below average temperatures in much of central and northern Montana east of the Divide. This cold front would provide the perfect combination for snowfall in southwest and south-central Montana, with moist air approaching from the west-southwest colliding with the cold air sitting over the state.

While the west-southwest flow would stay in place, the Arctic cold front would move out, allowing warm air and moisture to spill into the state from the Pacific. Many mountain ranges benefitted from this moisture between January 14th and the end of the month, however, some east facing and island ranges would receive below-normal snowfall as the moisture didn't make its way into central and eastern Montana.

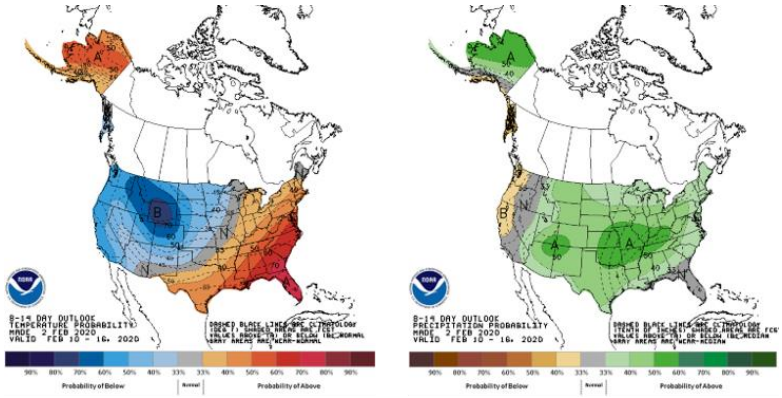


Average 500mb and 850mb heights for the January 14th – January 31st period

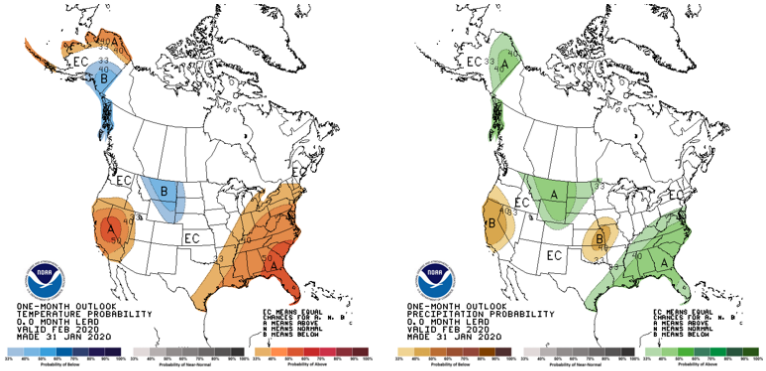
Overall daily average temperatures for January would be recorded as above average in many locations across the state, except in north-central Montana, where the cold period mid-month would lower the overall monthly temperature.



Looking forward, the beginning of February looks to get off with a bang with snow forecasted over a good portion of the state during week of the month. Forecasts issued by NOAA's Climate Prediction Center indicate better than normal chances of below normal temperatures and above-normal precipitation for the short and medium-range forecasts. As the ranchers across the state begin to calf, it could have impacts on livestock production if the forecasts play out. However, for valley residents who are more concerned with shoveling, the hard work is more than worth it if the rivers are full of water through the spring and summer.



8 to 14 day outlook issued 1/31/2020.



One month outlook (Feb 2020) issued 1/31/2020.

Changes to the Water Supply Outlook Report in Water Year 2020

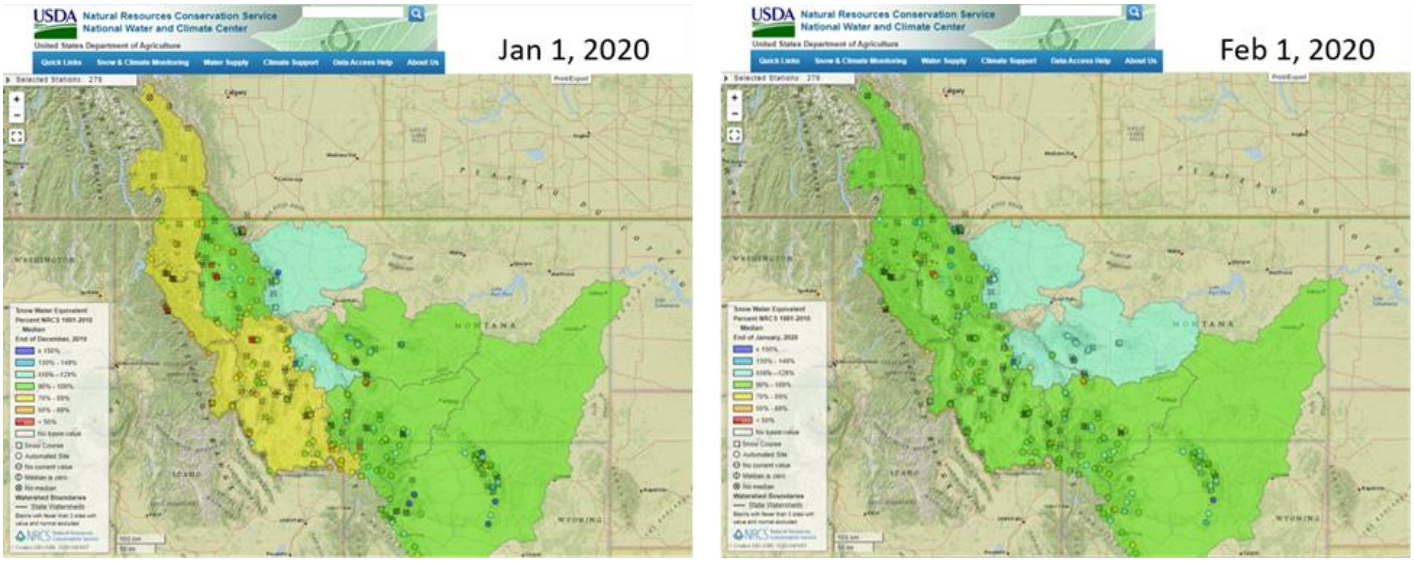
To reduce the file size of the Snowpack and Water Supply Outlook Report, and streamline its delivery to customers, the maps provided by the NRCS partnership with the Montana State Library will not be included in the monthly publication. However, the partnership will continue, and the high-quality statewide and basin maps will remain available through their website. The water supply maps, archived maps, as well as other useful tools developed through this partnership can be found here:

http://geoinfo.msl.mt.gov/nrcs_partnership/climate_and_water_supply

Snowpack

The mountain snowpack across the state of Montana made vast improvements during January, with many SNOTEL sites in northwest Montana reporting the highest or second-highest January totals on record for monthly snowfall. The amount of water added to the snowpack in some locations west of the Divide was staggering and incredibly well-timed. On December 30th, the high elevation Hoodoo Basin SNOTEL site in the Lower Clark Fork River basin was reporting 8.6 inches of Snow Water Equivalent (SWE), which was only 53% of normal for that date. After receiving nearly 16 inches of SWE since that time, the site would report more than 24.5 inches of SWE, tripling the snowpack at the site, and improving to 98% of normal on February 1st. This site was not alone; at many locations west of the Divide, the snowpack has more than doubled since the January 1st report, helping snowpack in the northwest river basins to recover from well below normal to near or above normal on February 1st.

While the bulk of the moisture was focused on northwest Montana, many other mountain locations east of the Divide would make notable gains in snowpack during the month. The Jefferson and Madison River basins in southwest Montana improved from below normal at the beginning of the month to near normal at this time, with the most significant gains made in the West Yellowstone area in the headwaters of the Madison River. Other river basins east of the Divide, which were near to above normal for SWE beginning the month, would receive sufficient snowfall to improve their snowpack percentages slightly from January 1st.



Snowpack has improved dramatically since January 1st across the state of Montana. River basins west of the Divide improved from well below normal on January 1st (shown on left) to near or above normal for snowpack on February 1st.

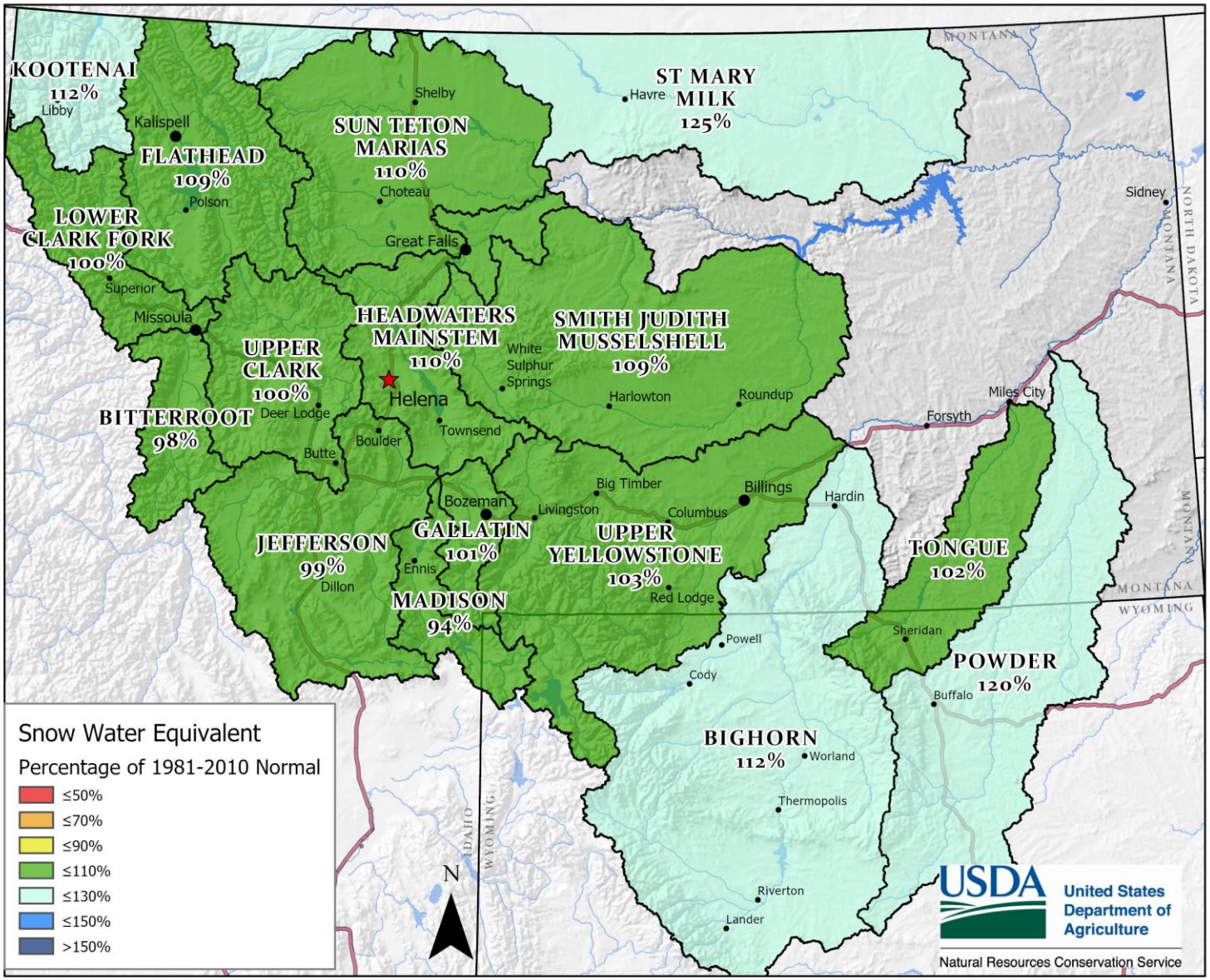
As we approach the middle of winter on February 5th, snowfall patterns historically begin to change across the state of Montana. Statistically, February is usually a month of transition and doesn't favor one side of the Divide over the other. Compared to other months, February typically yields some of the lowest snow totals of the winter and spring. However, as last year taught us when the term "Februburied" was coined, it can also be a big month given a favorable atmospheric setup. For now, a desirable atmospheric pattern looks to be in place during the first week of the month.

Snow Water Equivalent

2/1/2020	*% Normal*	*% Last Year*
Columbia River Basin	**105**	**122**
Kootnenai in Montana	112	138
Flathead in Montana	109	133
Upper Clark Fork	100	102
Bitterroot	98	113
Lower Clark Fork	100	119
Missouri River Basin	**101**	**109**
Jefferson	99	109
Madison	94	113
Gallatin	101	95
Headwaters Mainstem	110	99
Smith-Judith-Musselshell	109	108
Sun-Teton-Marias	110	138
St. Mary-Milk	125	139
Yellowstone River Basin	**104**	**112**
Upper Yellowstone	103	108
Bighorn	112	119
Tongue	102	111
Powder	120	124

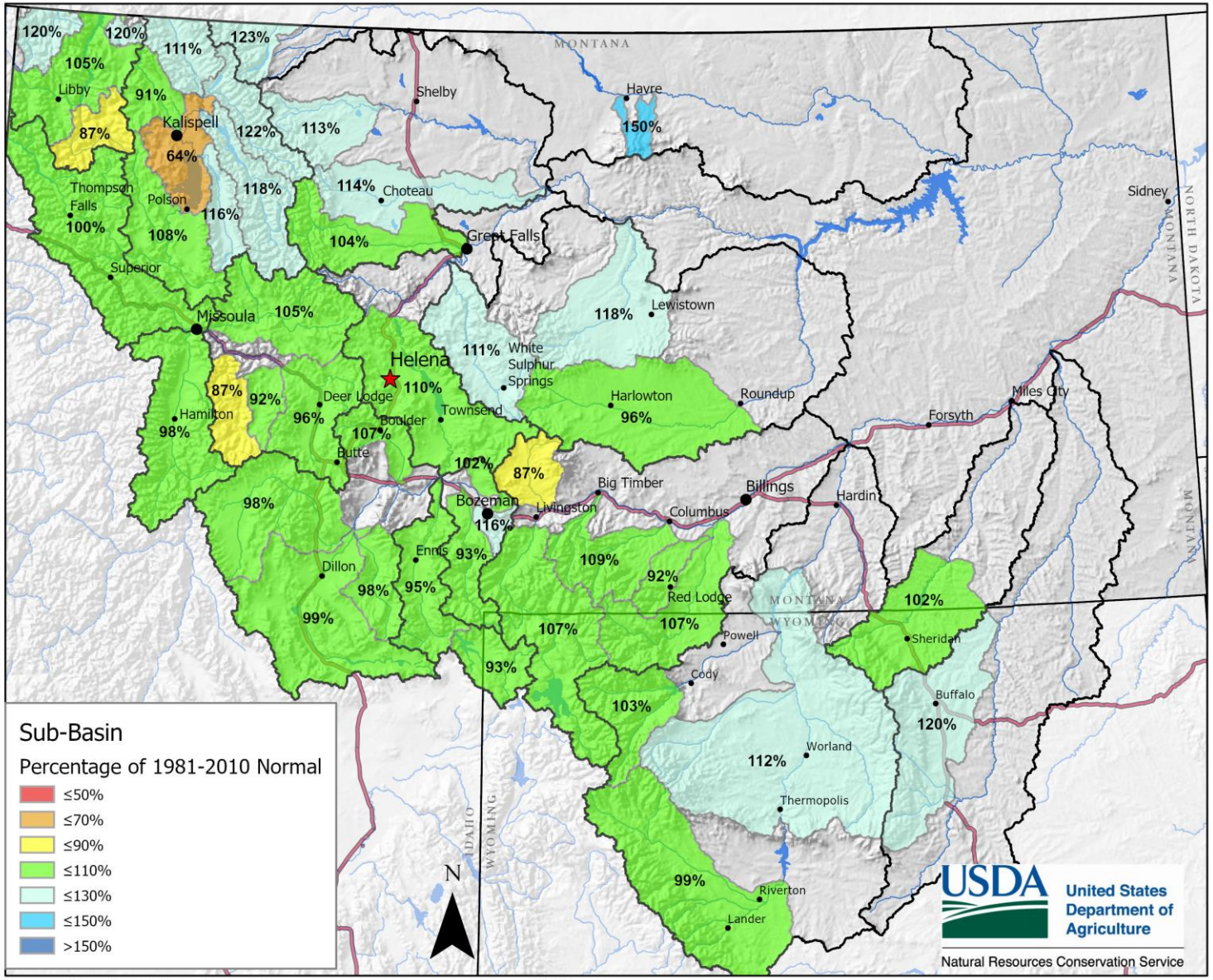
West of Divide	105	122
East of Divide	103	112
Montana State-Wide	**104**	**117**

Snow Water Equivalent - Percentage of 1981-2010 Normal
February 1st, 2020



Created by the USDA-NRCS Montana Snow Survey Staff on: 2/5/2020

Snow Water Equivalent - Percentage of 1981-2010 Normal
February 1st, 2020



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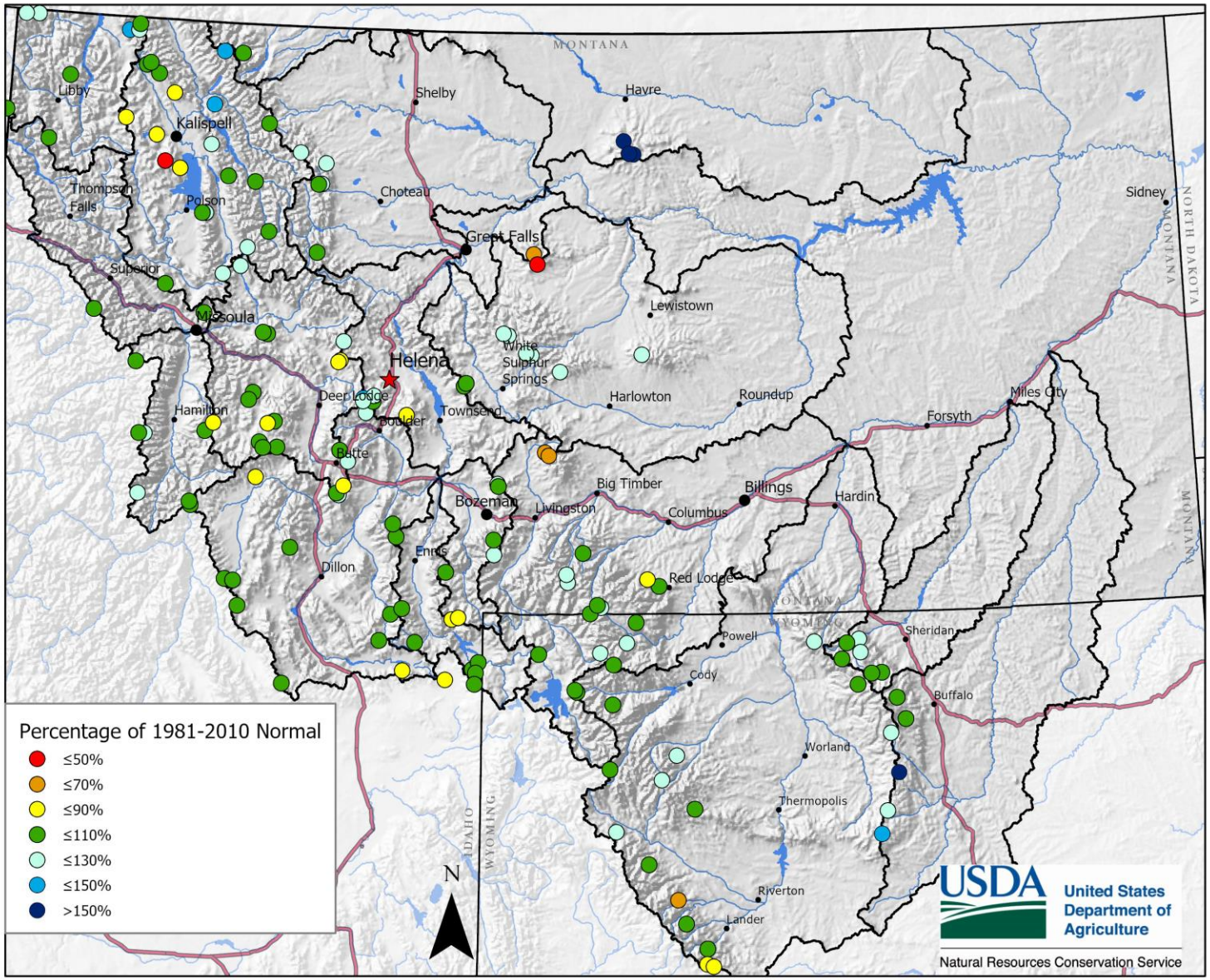
Snow Water Equivalent - Percentage of 1981-2010 Normal
February 1st, 2020



Created by the USDA-NRCS Montana Snow Survey Staff on: 2/4/2020

Precipitation - Overview

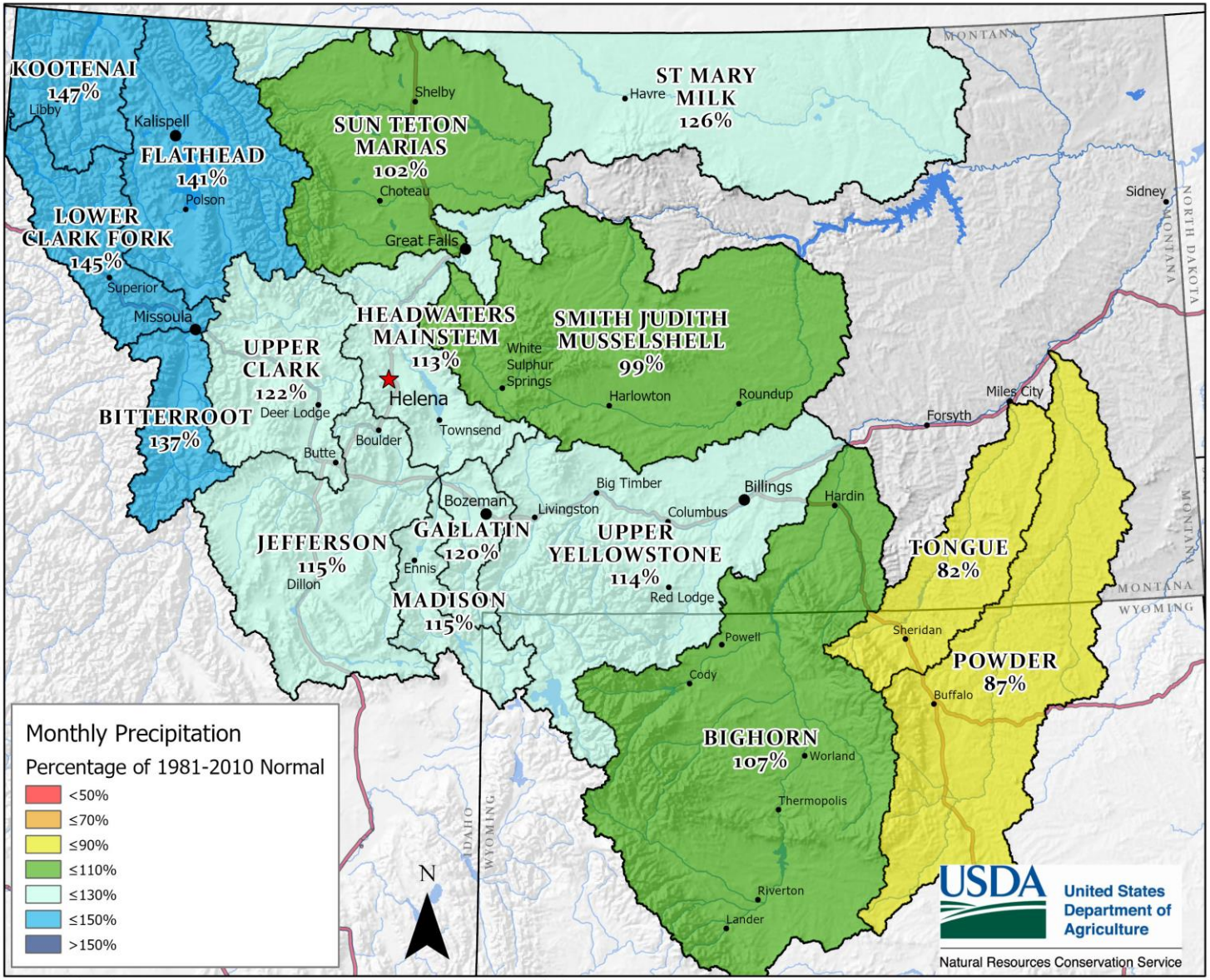
Precipitation totals for January were well above average for many locations in the western mountains of Montana due to the moist westerly flow which dominated the month. This would help to make up for large deficits in northwest Montana, where the dry November and December resulted in low water year totals on January 1st. After the wet month, many mountain locations in the Kootenai and Flathead River basins have improved to near normal for water year precipitation. While other areas west of the Divide received above normal monthly precipitation, it was not enough to make up for the early season deficits and water year precipitation remains below normal. Mountain locations east of the Divide were also able to make up some ground during January, but many areas remain below normal for water-year precipitation on February 1st.

Precipitation

2/1/2020	*Monthly % Avg*	*Water Year % Avg*	*WY % Last Year*
Columbia River Basin	**138**	**93**	**106**
Kootnenai in Montana	147	94	121
Flathead in Montana	141	100	112
Upper Clark Fork	122	90	95
Bitterroot	137	86	91
Lower Clark Fork	145	91	103
Missouri River Basin	**108**	**91**	**96**
Jefferson	115	87	96
Madison	115	84	97
Gallatin	120	97	85
Headwaters Mainstem	113	96	93
Smith-Judith-Musselshell	99	92	92
Sun-Teton-Marias	102	96	110
St. Mary-Milk	126	107	120
Yellowstone River Basin	**101**	**93**	**98**
Upper Yellowstone	114	95	96
Bighorn	107	100	111
Tongue	82	92	105
Powder	87	110	125

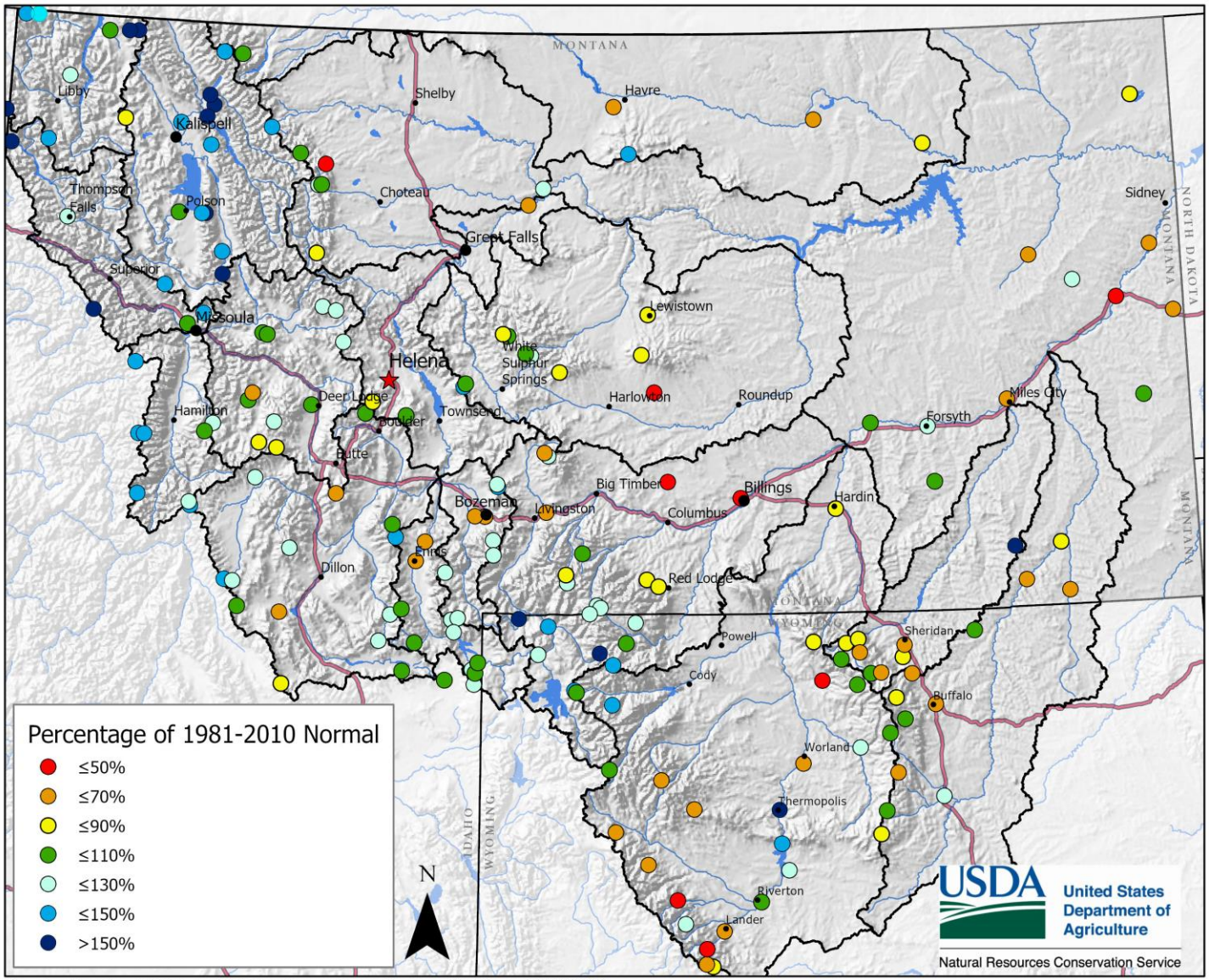
West of Divide	138	93	106
East of Divide	106	92	99
Montana State-Wide	**125**	**93**	**101**

Monthly Precipitation - Percentage of 1981-2010 Normal
January 1st, 2020 - January 31st, 2020



Created by the USDA-NRCS Montana Snow Survey Staff on: 2/5/2020

Monthly Precipitation - Percentage of 1981-2010 Normal
January 1st, 2020 - January 31st, 2020



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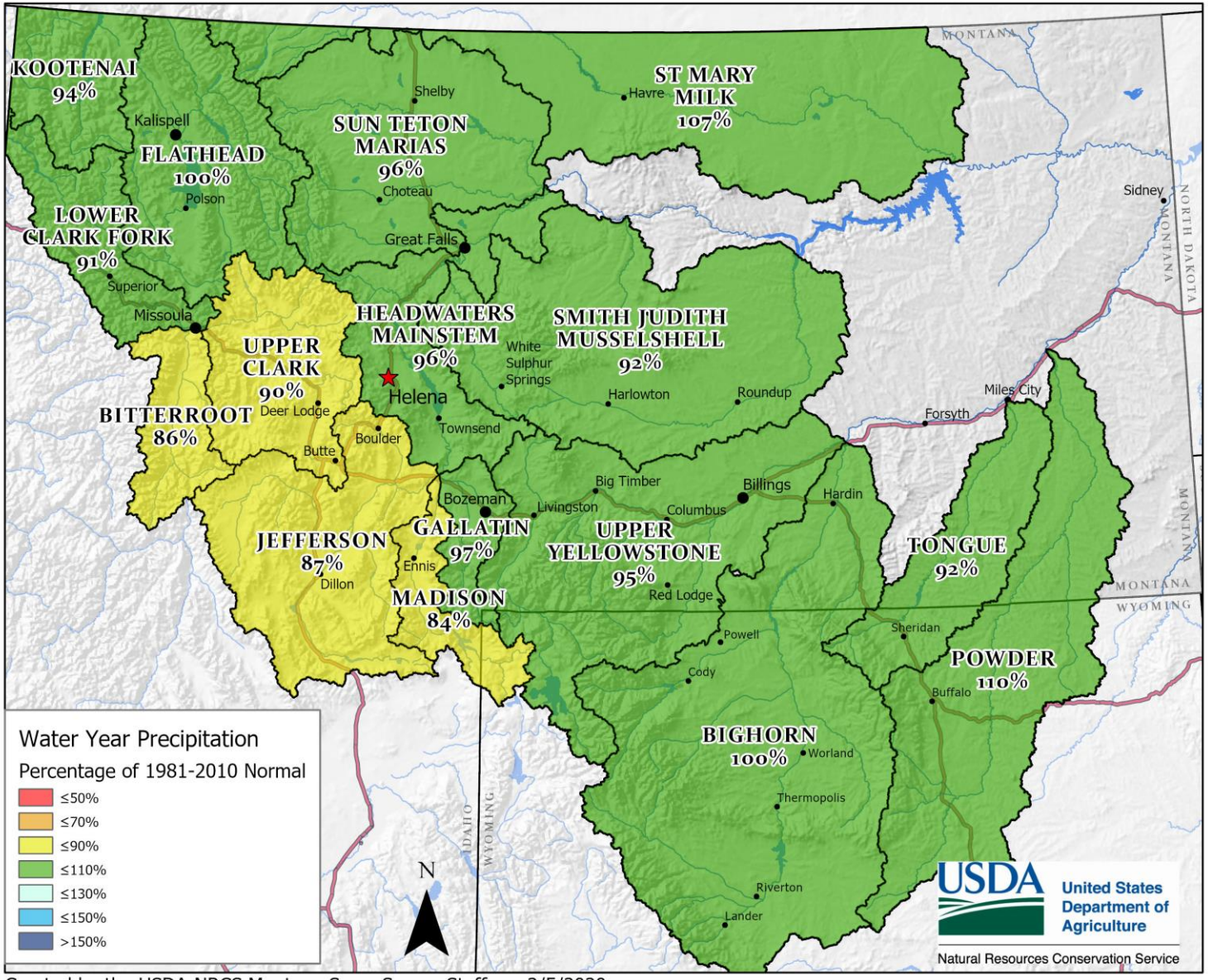
Water Year Precipitation - Percentage of 1981-2010 Normal
February 1st, 2020



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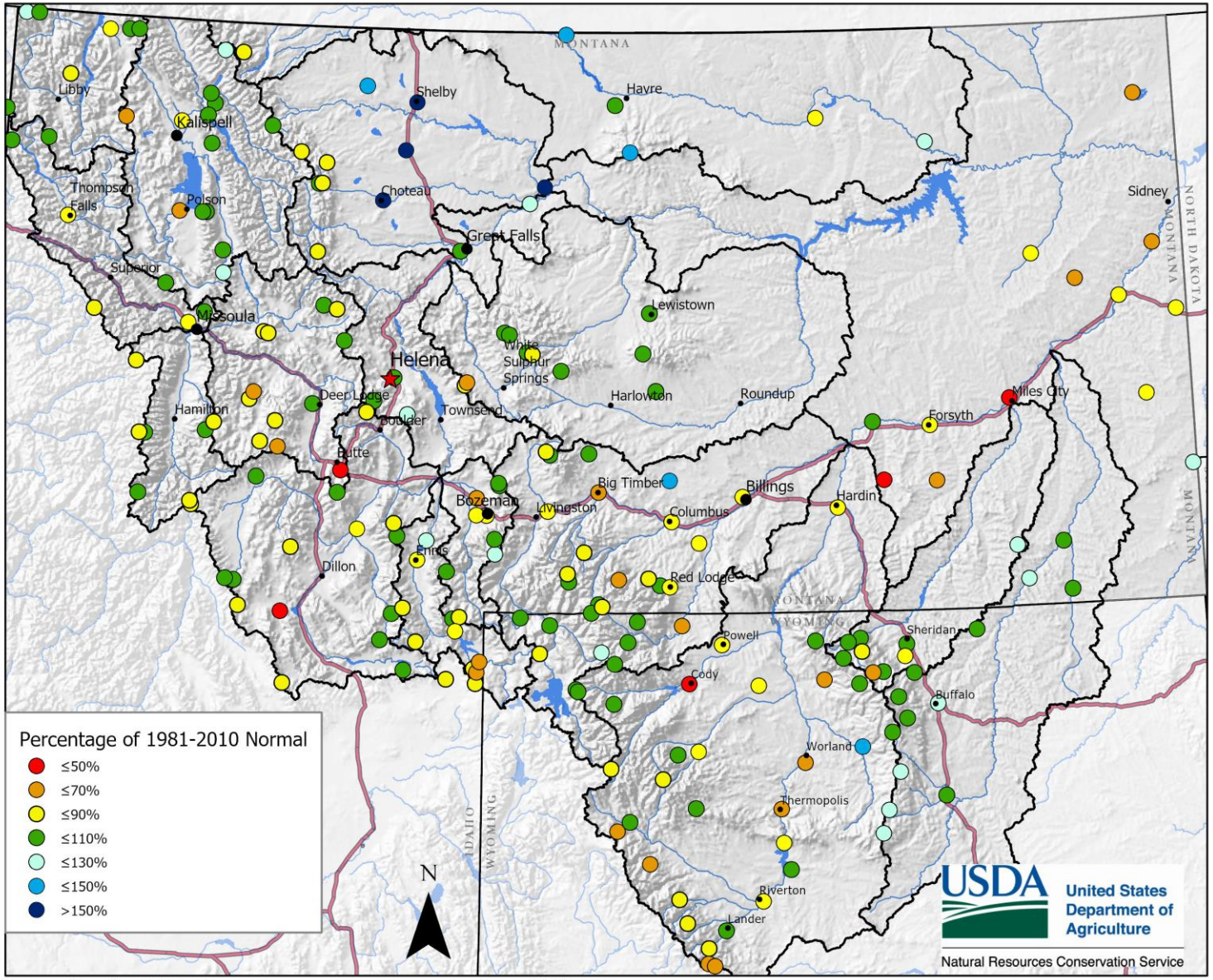
Water Year Precipitation - Percentage of 1981-2010 Normal
February 1st, 2020



Created by the USDA-NRCS Montana Snow Survey Staff on: 2/4/2020

Reservoirs - Overview

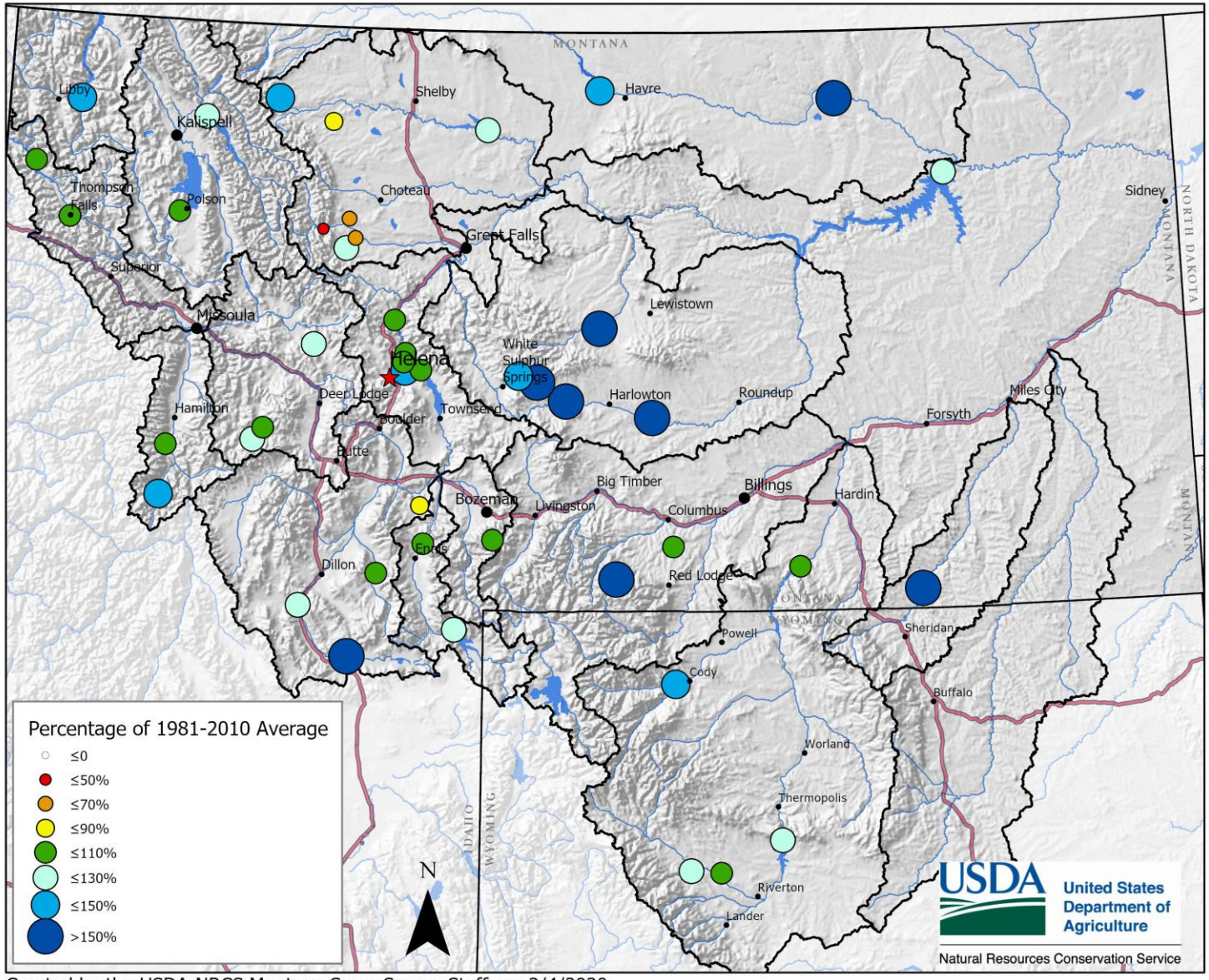
Reservoir storage continues to be near to above average for this time of year in most reservoirs across the state of Montana. The only exceptions can be found in the Rocky Mountain Front, where some reservoirs are below the 1981-2010 average. Upstream reservoirs in the Wind, Bighorn, and Shoshone River basins in Wyoming are storing above average volumes for this date.

Reservoir Storage

2/1/2020	*% Average*	*% Capacity*	*% Last Year*
Columbia River Basin	**129**	**74**	**107**
Kootnenai in Montana	149	74	111
Flathead in Montana	114	72	101
Upper Clark Fork	111	76	104
Bitterroot	119	30	100
Lower Clark Fork	99	93	102
Missouri River Basin	**116**	**78**	**100**
Jefferson	125	58	95
Madison	111	81	99
Gallatin	102	53	102
Headwaters Mainstem	118	81	99
Smith-Judith-Musselshell	171	85	102
Sun-Teton-Marias	108	56	106
St. Mary-Milk	151	57	125
Yellowstone River Basin	**109**	**64**	**106**
Upper Yellowstone	121	56	104
Bighorn	106	65	106
Tongue	178	60	94

West of Divide	129	74	107
East of Divide	115	77	100
Montana State-Wide	**119**	**76**	**102**

Reservoir Contents - Percentage of 1981-2010 Normal
February 1st, 2020



Created by the USDA-NRCS Montana Snow Survey Staff on: 2/4/2020

Kootenai River Basin

It was quite the month in the Kootenai River basin moisture wise. Snowpack made dramatic gains through the month, rising from well below normal to near or above normal for snowpack on Feb 1. Two sites outside of Eureka would set new records for SWE gain during the month, both the low-elevation Grave Creek SNOTEL and high-elevation Stahl Peak SNOTEL set new all-time high monthly totals. Stahl Peak would receive over 15.1 inches of SWE between Dec 30, 2019, and Feb 1, 2020. Snowpack north of the border in Canada would also benefit from the moist flow during the month with most sites in British Columbia in the headwaters of the mainstem of the Kootenai reporting above normal snowpack for this date. Water year precipitation, which begins on Oct 1, was well below normal for almost all mountain locations last month, but the abundant moisture has helped many sites to recover to near normal on Feb 1. Only one site, the Banfield mountain SNOTEL, continues to report well below normal water year precipitation. The reductions in these early deficits were timely. Northwest river basins are historically favored during the early winter months, and as spring approaches, monthly snowfall totals typically are lower than the November through January period.

Kootenai River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
KOOTENAY in CANADA	108%	84%
KOOTENAI MAINSTEM	105%	76%
TOBACCO	120%	87%
FISHER	87%	75%
YAAK	120%	83%
KOOTENAI RIVER BASIN in MONTANA	112%	81%
KOOTENAI ab BONNERS FERRY	111%	83%
Basin-Wide Snowpack	**112%**	**81%**

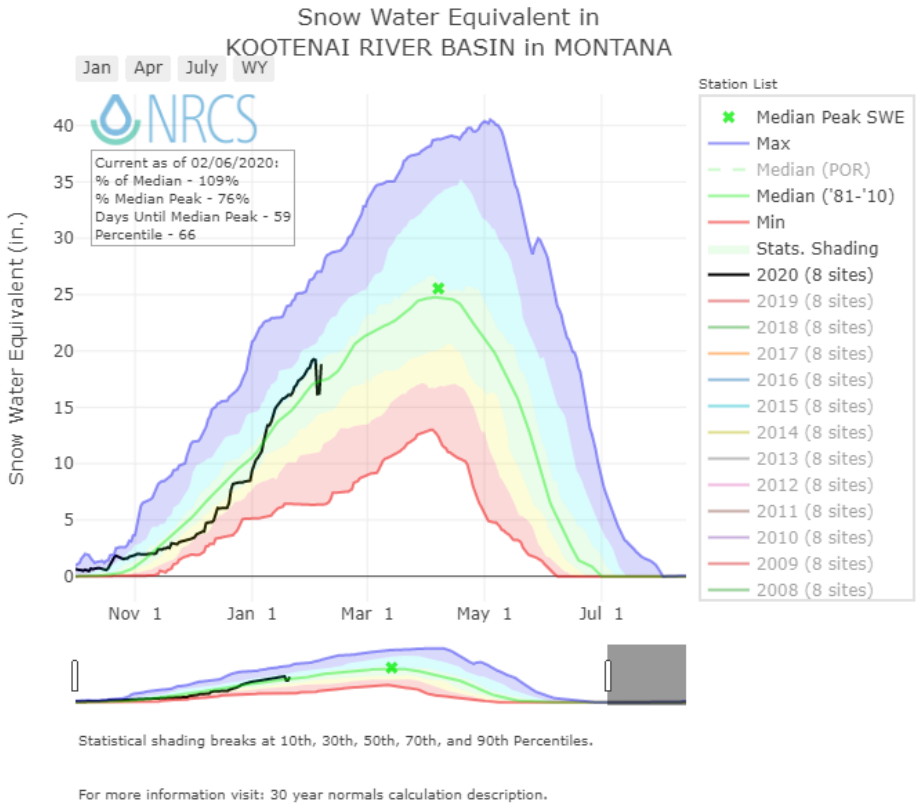
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	148%	95%	78%
Valley Precipitation	103%	78%	81%
Basin-Wide Precipitation	**147%**	**94%**	**78%**

**WYTD Precipitation is October 1st- Current*

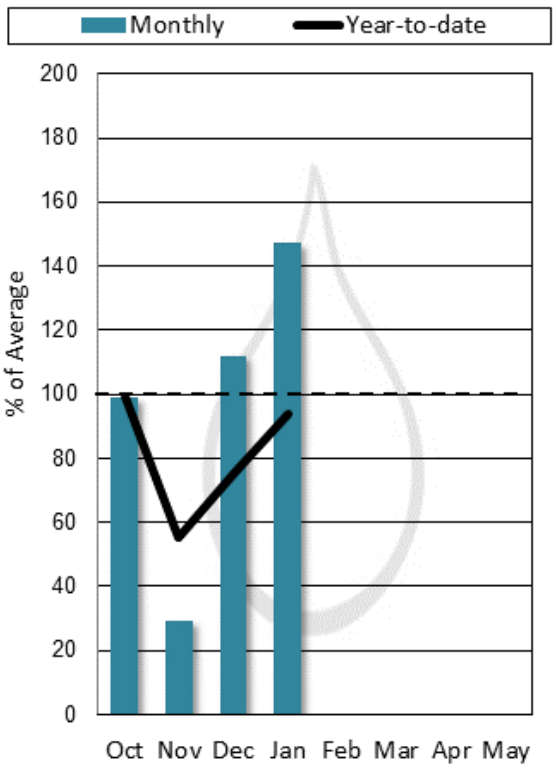
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Reservoir Storage	**149%**	**74%**	**134%**

**See Reservoir Storage Table for storage in individual reservoirs*

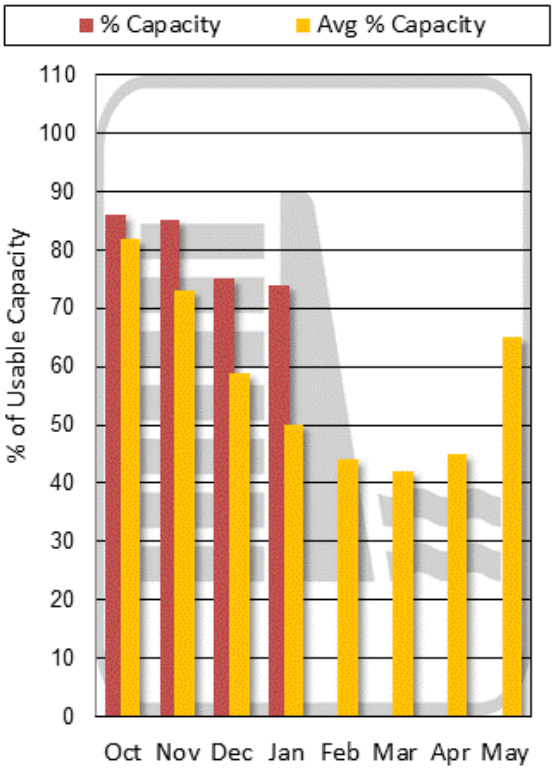
(click to navigate to online version with additional features)



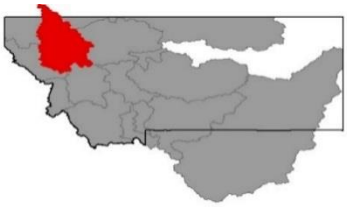
Mountain and Valley Precipitation



End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.



Flathead River Basin

It was a big month for snowfall in the Flathead River basin. Every SNOTEL site in the Mission and Swan mountain ranges would experience monthly SWE totals that were in the top three of all years recorded, with most reporting the second-highest or highest totals on record for January. In most cases, the snowpack would double, or even triple, during the month. On Jan 1, the high-elevation North Fork Jocko SNOTEL site in the southern Mission Range was reporting 14.8 inches of SWE, which was 84% of normal for that date. Between Dec 30 and Feb 1, the site would receive over 18.2 inches of SWE, boosting the site to 114% of normal on Feb 1, and more than doubling the water contained within the snowpack. Snowpack in the Mission and Swan Ranges is near to above normal at all locations for this date. Only one region, the lower elevation Salish Mountains west of Kalispell, has snowpack which is below normal on Feb 1. The abundant moisture would also help to put a dent in early deficits in water year precipitation, with most mountain locations recovering to near normal by the time of this report. Only valley locations are reporting below normal water year precipitation on Feb 1.

Flathead River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
NF FLATHEAD in CANADA	%	%
NF FLATHEAD in MONTANA	111%	82%
MIDDLE FORK FLATHEAD	122%	81%
SOUTH FORK FLATHEAD	118%	82%
STILLWATER-WHITEFISH	91%	80%
SWAN	116%	82%
MISSION VALLEY	102%	85%
LITTLE BITTERROOT-ASHLEY	64%	83%
JOCKO	108%	82%
FLATHEAD in MONTANA	109%	82%
Basin-Wide Snowpack	***109%***	***82%***

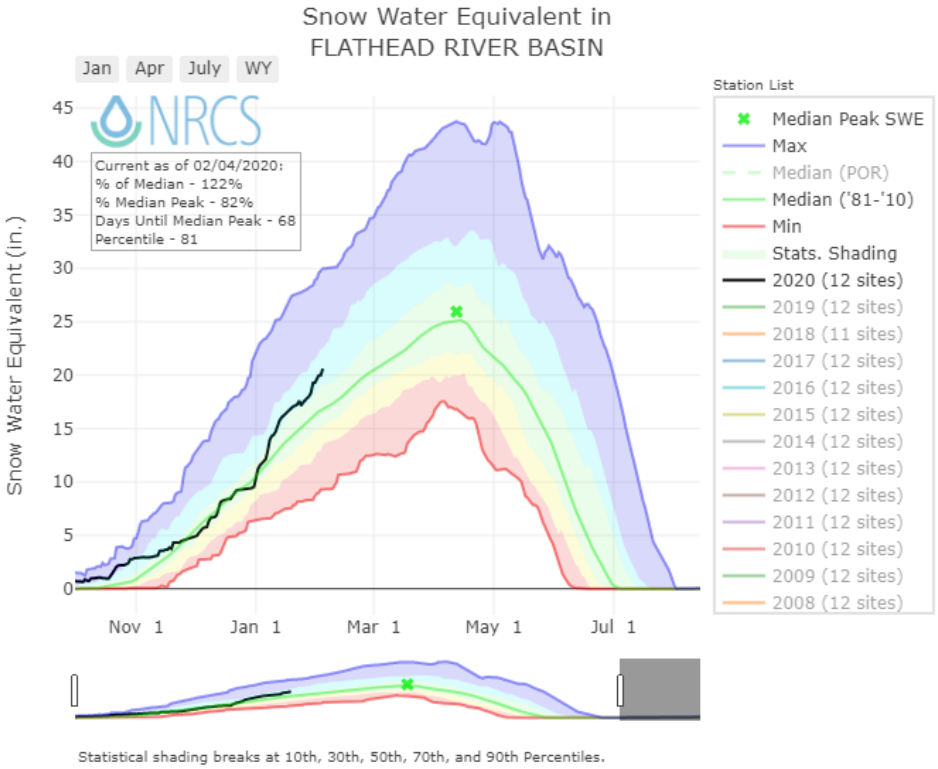
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	141%	100%	88%
Valley Precipitation	117%	79%	93%
Basin-Wide Precipitation	**141%**	**100%**	**89%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Reservoir Storage	114%	72%	113%

**See Reservoir Storage Table for storage in individual reservoirs*

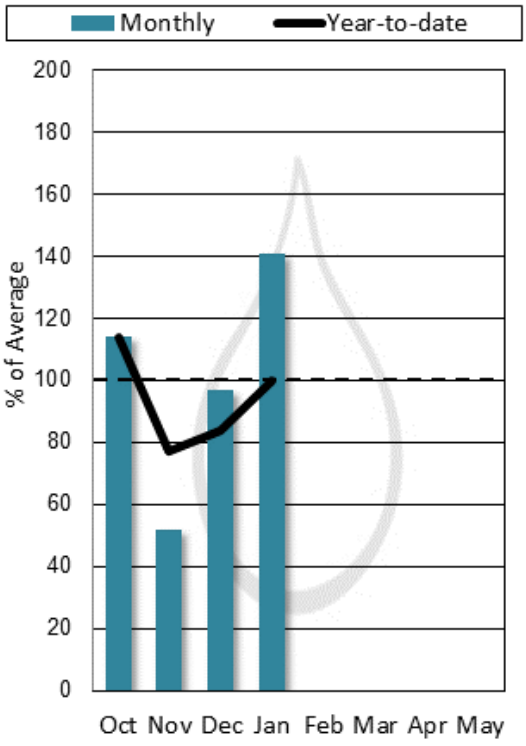
(click to navigate to online version with additional features)



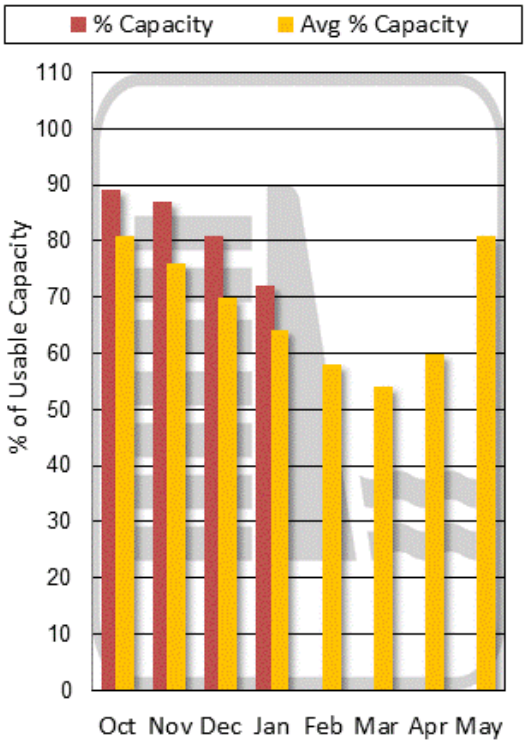
Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.

For more information visit: 30 year normals calculation description.

Mountain and Valley Precipitation



End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Upper Clark Fork River Basin

Snow totals for January weren't record-setting like many of the other river basins west of the Divide in the Upper Clark Fork, but they were near to above normal in many locations. This would help the basin-wide snowpack percentage to increase from Feb 1, and many sites have improved from below normal at the beginning of the month to near or above normal on Feb 1. The best snow totals can be found in the Blackfoot River basin, where snowpack is near to above normal. The Rock and Flint Creek basins also made improvements through the month, but snowpack remains near to slightly below normal on Feb 1. Although snowpack made improvements during the month due to above-normal snowfall, the totals weren't significant enough to make up for the dry November and December with regards to water year precipitation. Most SNOTEL sites in the basin remain below normal for this date. Since snowpack totals are near to above normal at mountain locations, these early season deficits aren't particularly concerning at this point with the historically wet spring months yet to come. However, they bear mentioning, should future weather not make up for them by the time the growing season comes around.

Upper Clark Fork River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
CLARK FORK ab FLINT CREEK	101%	105%
FLINT CREEK	92%	118%
ROCK CREEK	87%	99%
CLARK FORK ab BLACKFOOT	96%	106%
BLACKFOOT	105%	86%
Basin-Wide Snowpack	**100%**	**98%**

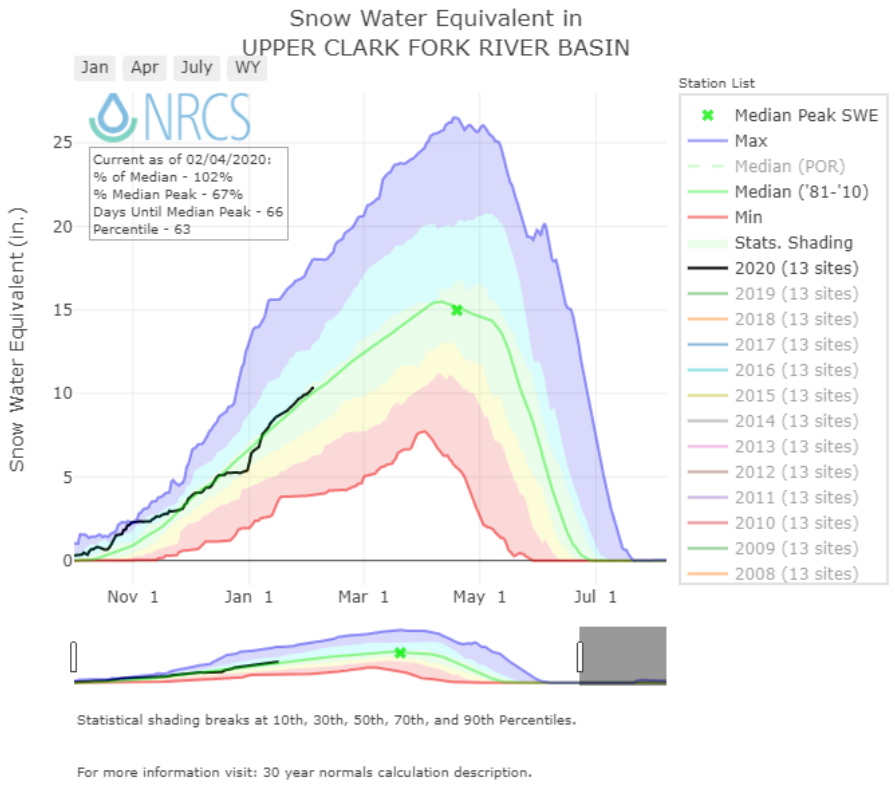
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	123%	90%	95%
Valley Precipitation	19%	31%	75%
Basin-Wide Precipitation	**122%**	**90%**	**95%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

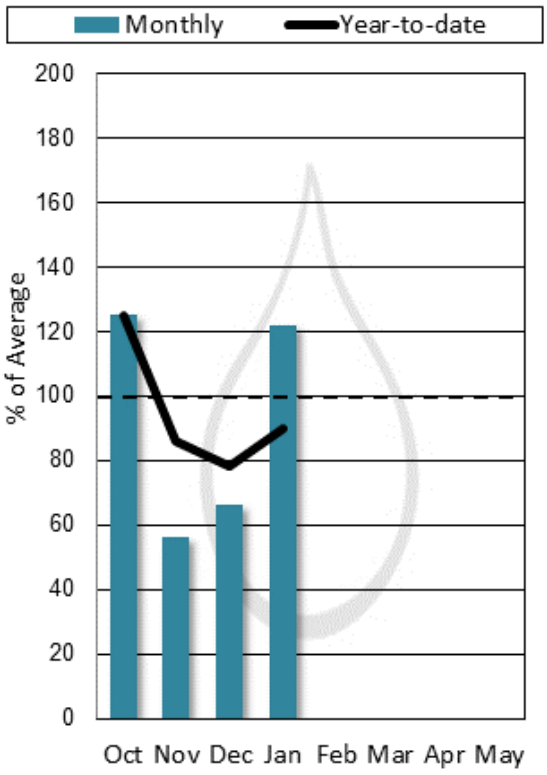
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**111%**	**76%**	**107%**

**See Reservoir Storage Table for storage in individual reservoirs*

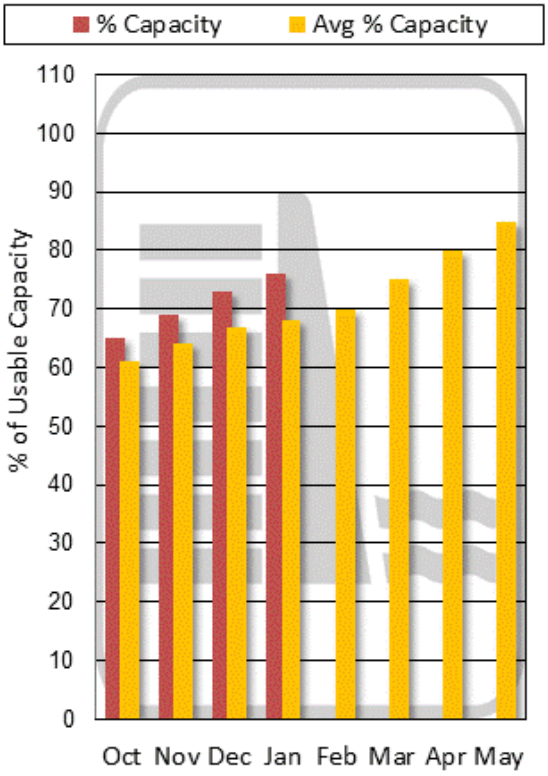
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Bitterroot River Basin

January snowfall wasn't record-setting for the mountains feeding the Bitterroot River, but it came close. SNOTEL sites in the Bitterroot Range were in the top 15th percentile for monthly snowfall, and vast improvements occurred from last month. In most cases, the snowpack has doubled or even tripled since Jan 1. The abundant Pacific moisture that streamed into the area between Dec 30 and Feb 1 would yield close to 16 inches of SWE at the Twin Lakes SNOTEL, which caused the snowpack to increase from a well below normal 10.2 inches on Dec 30 to a slightly above normal 26.1 inches at the end of the month. The lower elevation Twelvemile Creek SNOTEL site, also located in the Lost Horse drainage, would nearly triple during the month, increasing from 4.6 inches of SWE on Dec 30 to 12.9 inches. While considerable gains were made along the Montana/Idaho border, SNOTEL sites on the east side of the basin in the Sapphire Mountains experienced only slight increases in snowpack percentages from Jan 1. The large deficits in water year precipitation that existed on Jan 1 have shrunk due to the abundant moisture during the month, but remain in many locations. The impact of the lack of early precipitation at mountain locations is uncertain at this time, but valley location deficits will be monitored as we approach growing season this spring.

Bitterroot River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
WEST FORK BITTERROOT	102%	78%
EAST SIDE BITTERROOT	89%	81%
WEST SIDE BITTERROOT	101%	91%
Basin-Wide Snowpack	**98%**	**87%**

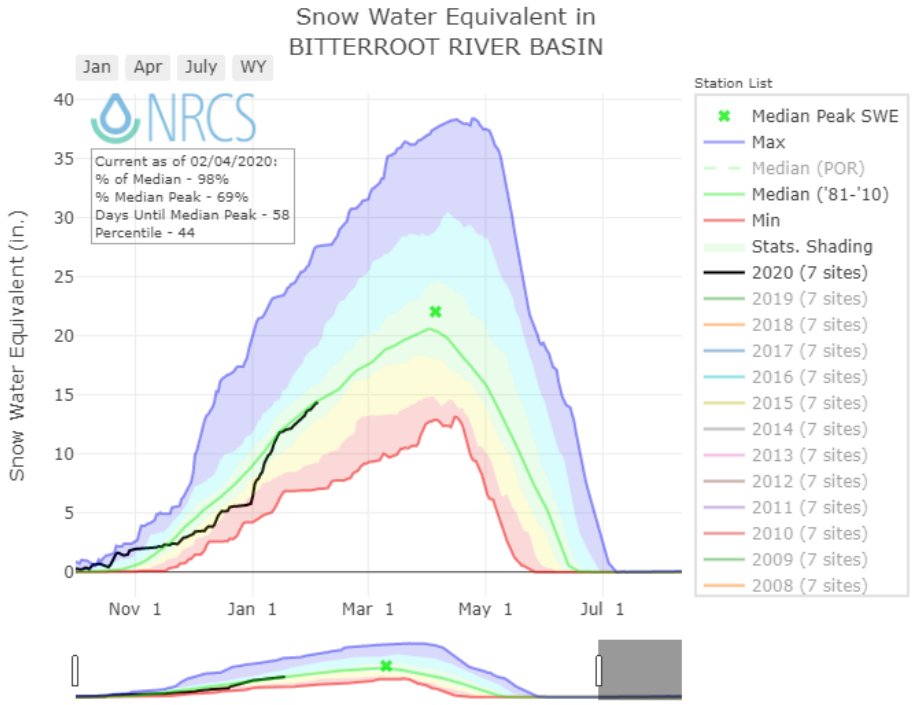
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	137%	86%	95%
Valley Precipitation	%	%	%
Basin-Wide Precipitation	**137%**	**86%**	**95%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

	Percentage of Average	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**119%**	**30%**	**119%**

**See Reservoir Storage Table for storage in individual reservoirs*

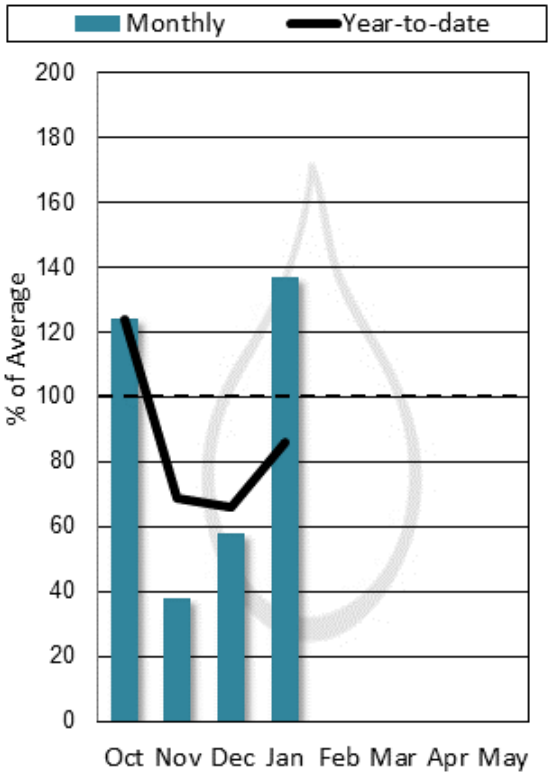
(click to navigate to online version with additional features)



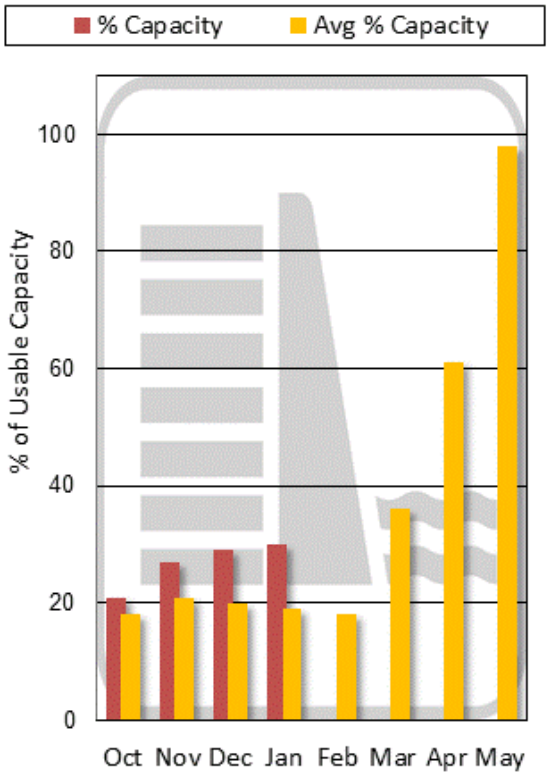
Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.

For more information visit: 30 year normals calculation description.

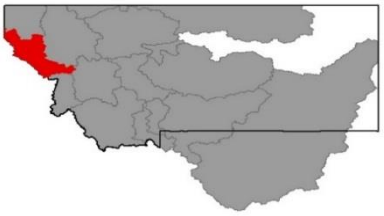
Mountain and Valley Precipitation



End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.



Lower Clark Fork River Basin

Last month, the snowpack was looking bleak in the Lower Clark Fork River basin. What a difference a month can make. The moisture stream was almost constant during the month, adding to the mountain snowpack and doubling the amount of water contained within it at mountain monitoring sites. In some locations, the basin-wide snowpack has recovered from record low on Jan 1, to near normal on Feb 1. The amount of water added this month was astounding in some locations. The Hoodoo Basin SNOTEL site added 17.4" of snow water to the snowpack during January, and the depth of the snowpack increased from 35 inches on Dec 30 to 90 inches on Feb 1. While this site experienced the most significant gains in SWE, all other SNOTEL sites reported well above normal snowfall for the month. While snowpack has improved to near normal within the basin, the abundant moisture wasn't enough to wipe out the early season water year precipitation deficits. Percentages have improved during the month, but the deficits from the lack of precipitation in November and December still linger, and water precipitation totals are near to slightly below normal on Feb 1. With snowpack now near normal for this date, the impact of the lack of early precipitation at mountain locations is uncertain. Still, valley location deficits will be monitored as we approach spring and summer.

Lower Clark For River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
LOWER CLARK FORK RIVER BASIN	100%	84%
Basin-Wide	**100%**	**84%**

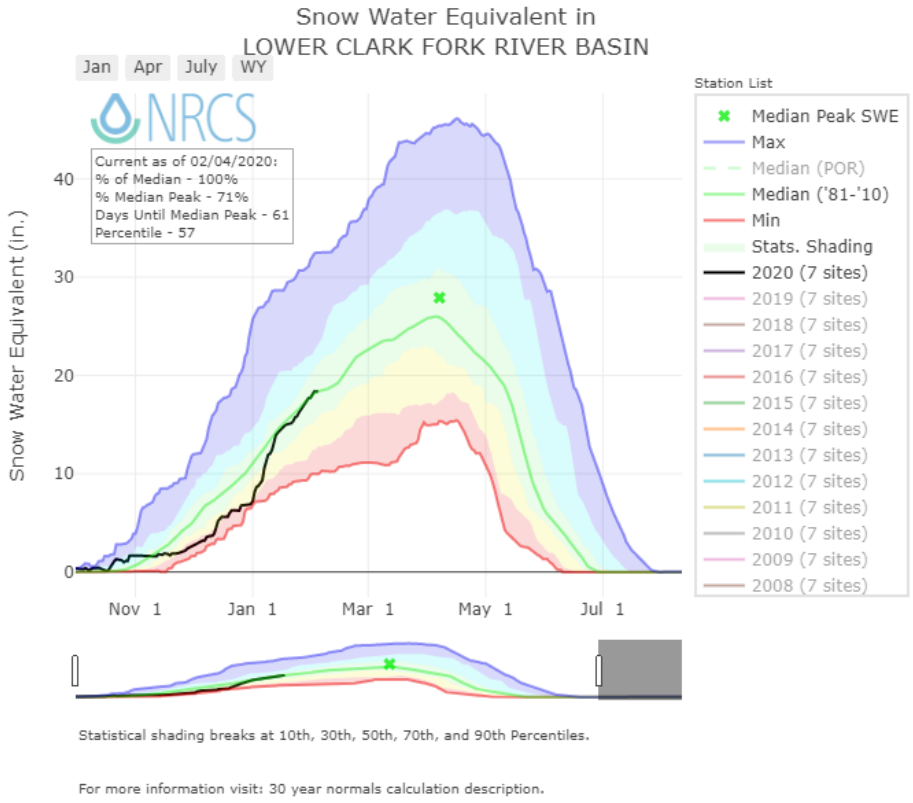
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	143%	90%	87%
Valley Precipitation	164%	98%	100%
Basin-Wide Precipitation	**145%**	**91%**	**88%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

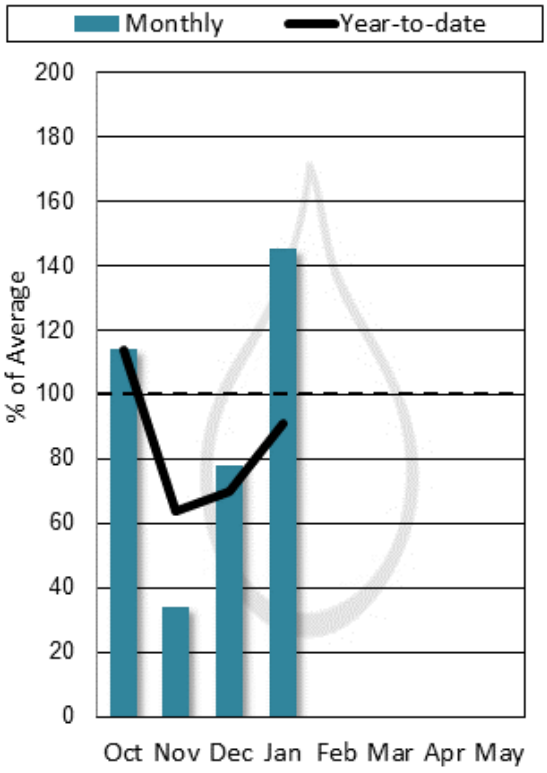
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**99%**	**93%**	**97%**

**See Reservoir Storage Table for storage in individual reservoirs*

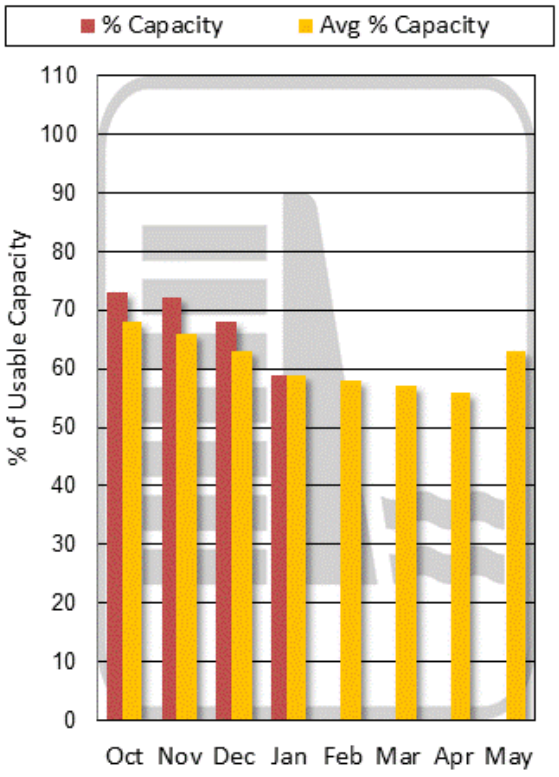
(click to navigate to online version with additional features)



Mountain and Valley Precipitation

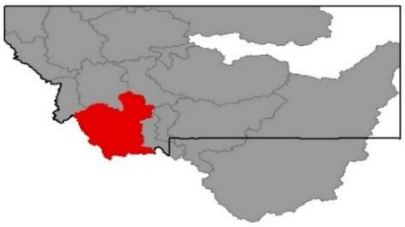


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Jefferson River Basin



Just as the cattle ranchers in the Big Hole started to worry that this year was going to be a bust with regards to snowpack runoff, weather patterns made an abrupt switch slightly before the calendar year ended. While the northwest part of the state was most heavily favored during January, the moisture stream went far enough south to make significant improvements to the snowpack in the Beaverhead, Pioneer, and Pintler Ranges during the month. The snowpack has improved in the Big Hole from well below normal on Jan 1, to near normal on Feb 1. The high elevation Darkhorse Lake SNOTEL site, located near the divide between the Beaverhead and Big Hole Rivers, would add 9.4 inches of SWE to the snowpack, increasing the site from 83% of normal at the beginning of the month to 109% of normal at the end of the month. While the Big Hole was treated to well above normal snowfall during January, the rest of the Jefferson River basin experienced snowfall that ranged from near to slightly above normal in mountain monitoring sites located in the eastern and southern portions of the basin. Currently, only two low elevation SNOTEL sites have snowpack that is well below normal for this date, Lakeview Ridge SNOTEL in the headwaters of the Red Rock River, and Calvert Creek SNOTEL on the southern side of the Pintler Range. Overall, basins snowpack conditions have improved since last month, a welcome change from the drier patterns experienced in November and December. Water year precipitation, which begins on Oct 1, remains below normal in many areas due to those dry patterns in early winter, but the impact of the lack of early precipitation at mountain locations is uncertain at this time.

Jefferson River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
BEAVERHEAD	99%	80%
RUBY	98%	95%
BIGHOLE	98%	86%
BOULDER	107%	113%
Basin-Wide Snowpack	**99%**	**91%**

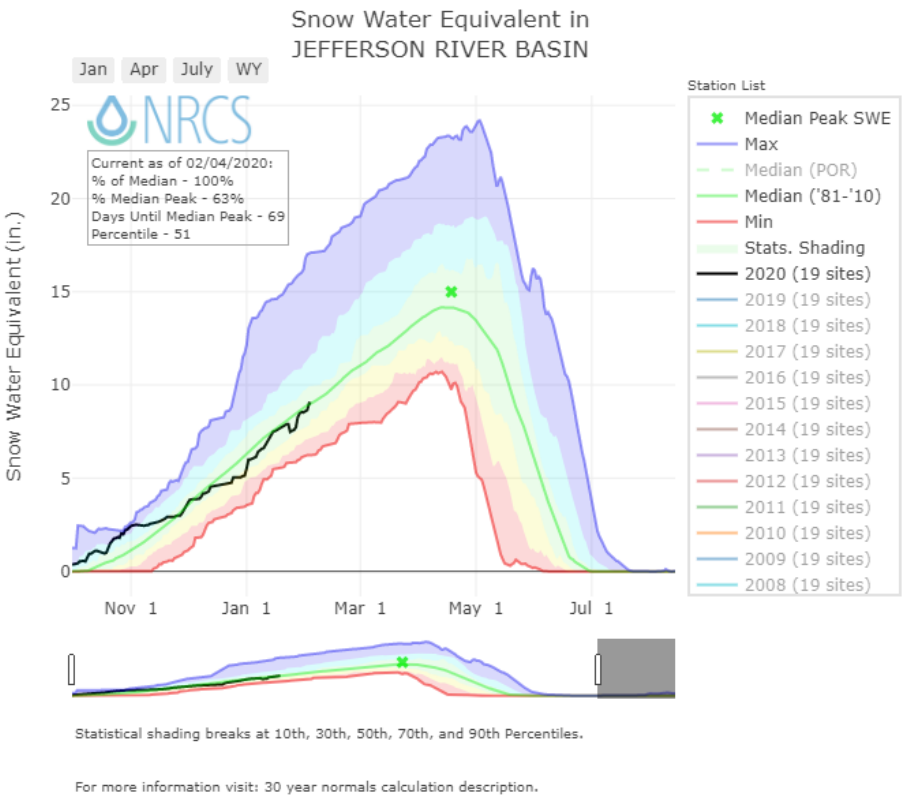
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	115%	87%	91%
Valley Precipitation	%	%	%
Basin-Wide Precipitation	**115%**	**87%**	**91%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

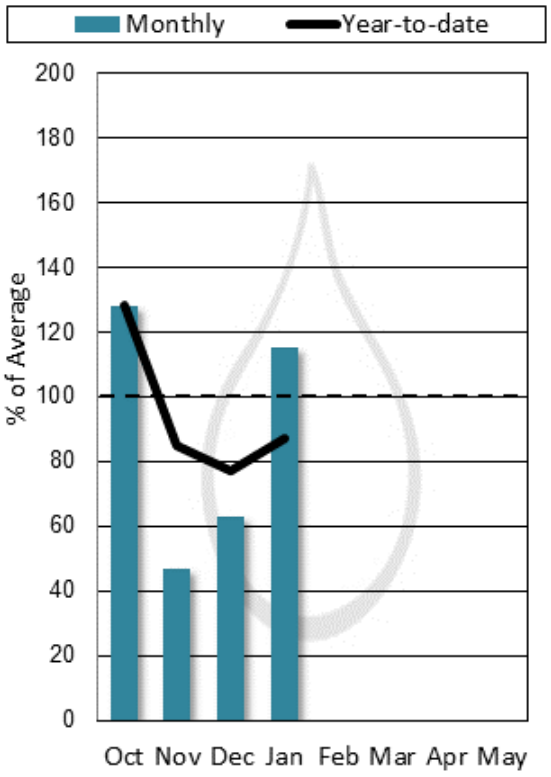
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**125%**	**58%**	**131%**

**See Reservoir Storage Table for storage in individual reservoirs*

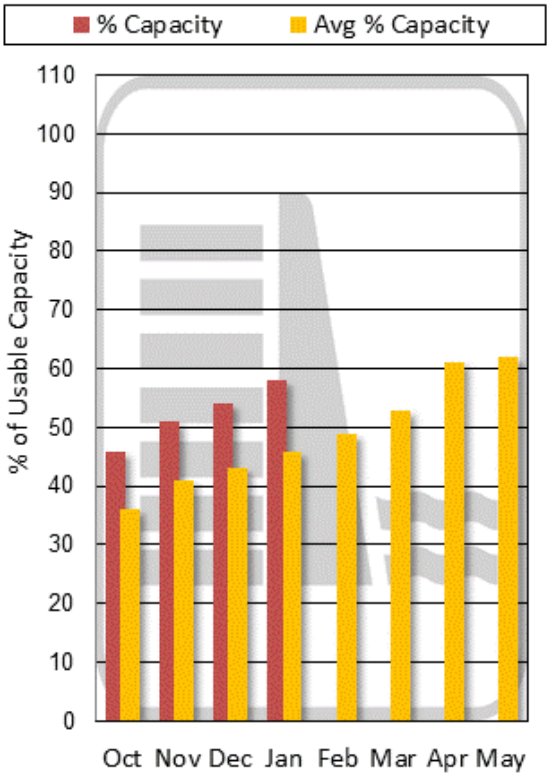
(click to navigate to online version with additional features)



Mountain and Valley Precipitation

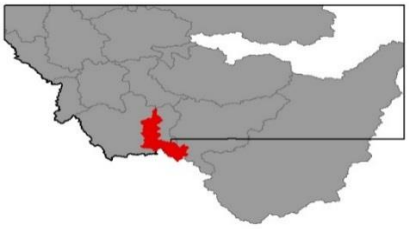


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Madison River Basin



The highlight in the Madison River basin last month was the lack of snowpack in the headwaters above Hebgen Lake. That region is again highlighted this month, but for a completely different reason. January yielded abundant snowfall to that region, with moist flow delivering 128% to 171% of normal snowfall between Dec 30 and Feb 1. The high-elevation Black Bear SNOTEL site, which was only 65% of normal on Jan 1, added 10.6" of snow water to the snowpack during the month, almost doubling the snowpack, and improving the site to 92% of normal on Feb 1. Low and mid-elevations would also improve through the month and now range from 94% of normal to 104% of normal. Snowfall below Hebgen in the Madison and Gravelly Ranges would also end up being above normal for the month, and SNOTEL sites improved slightly and remain near normal for this date. Overall, basin-wide snowpack has improved to near normal for this date and the basin is in much better shape than last month at this time. With some of the climatologically favored months for precipitation yet to come, the runoff picture is still far from certain, as typically only 60% to 65% of the seasonal peak snowpack has accumulated by Feb 1. With current forecasts indicating a continuation of the wet weather patterns during January (only colder), the picture is looking much more promising than earlier this year.

Madison River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
MADISON abv HEBGEN LAKE	93%	73%
MADISON blw HEBGEN LAKE	95%	91%
Basin-Wide Snowpack	**94%**	**83%**

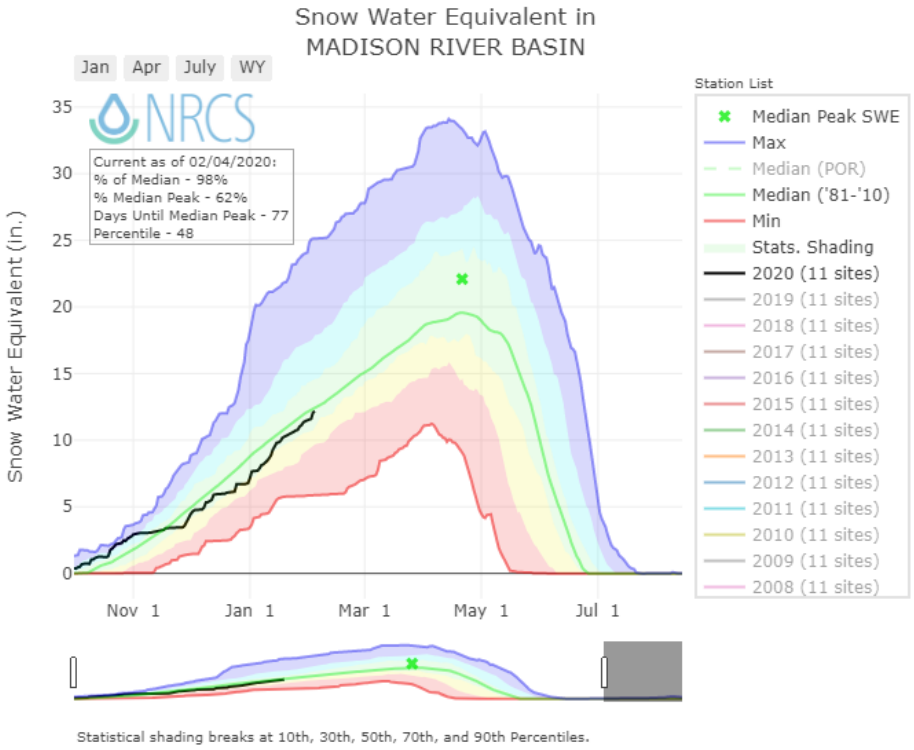
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	117%	83%	85%
Valley Precipitation	55%	96%	138%
Basin-Wide Precipitation	**115%**	**84%**	**87%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

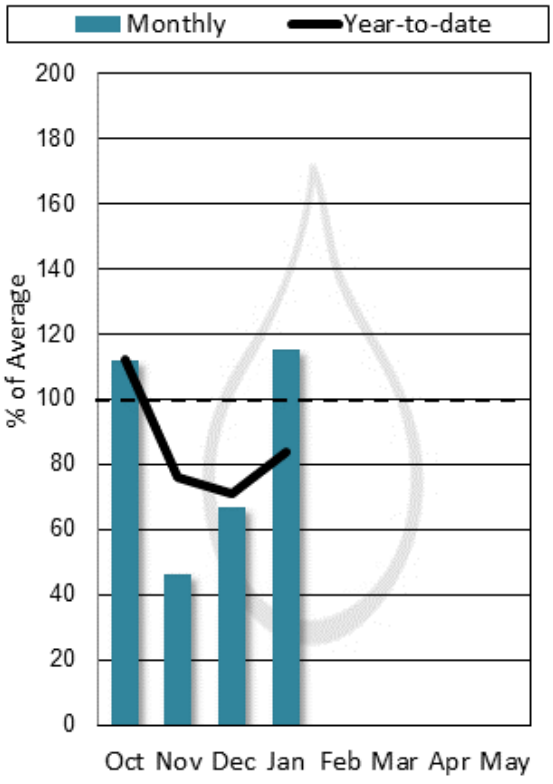
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**111%**	**81%**	**112%**

**See Reservoir Storage Table for storage in individual reservoirs*

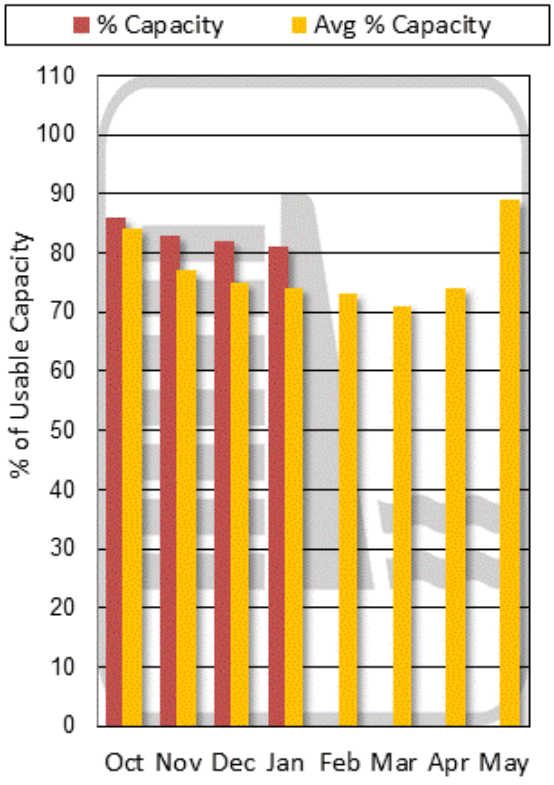
(click to navigate to online version with additional features)



Mountain and Valley Precipitation

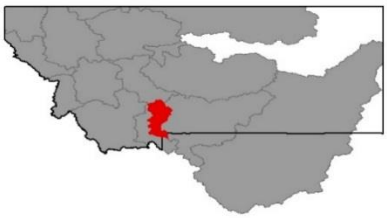


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Gallatin River Basin



Unlike November and December, snowfall was much more consistent during January in the Gallatin River basin, helping snowpack to improve in all mountain areas. While not record-setting, SWE totals for January were above normal. They ranged from 111% to 133% of normal in the Bridger Range, 124% to 153% of normal in the Hyalite drainage, and 110% to 128 % of normal in the headwaters of the Gallatin above Gateway. As such, all sub-basins experienced improvements from Jan 1 and are near to above normal for snowpack on Feb 1. There were some abnormal conditions through the month, which bear mentioning. While January is climatologically one of the driest months of the year in the Gallatin Valley, this January was abnormally dry. Only a few precipitation events dropped snow and even some rain during the month. Typical monthly totals only range from 0.5" to 0.8", so the impact of below-average precipitation is minimal, but if it felt like it was on the dry side in the valley this month, it's because it was. Another interesting fact about the end of the month was how anomalously warm temperatures were on Feb 1. The warm and windy weather set new records at mountain SNOTEL sites in the Bridger and Hyalite drainages, with all SNOTEL sites in these basins reporting the highest daily average air temperature recorded for that date. Following that, the old saying "if you don't like the weather, wait a day" played out perfectly. The next day air temperatures would drop below seasonal normals, and the valley would get blanketed with 4-8" of new snow.

**It should be noted that most SNOTEL sites only have air temperature recorded consistently since the early 1990s, so comparisons to longer running valley temperature records may not correspond with regards to record daily average temperatures.

Gallatin River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
UPPER GALLATIN	*93%*	*86%*
HYALITE	*116%*	*126%*
BRIDGER	*102%*	*126%*
Basin-Wide Snowpack	**101%**	**106%**

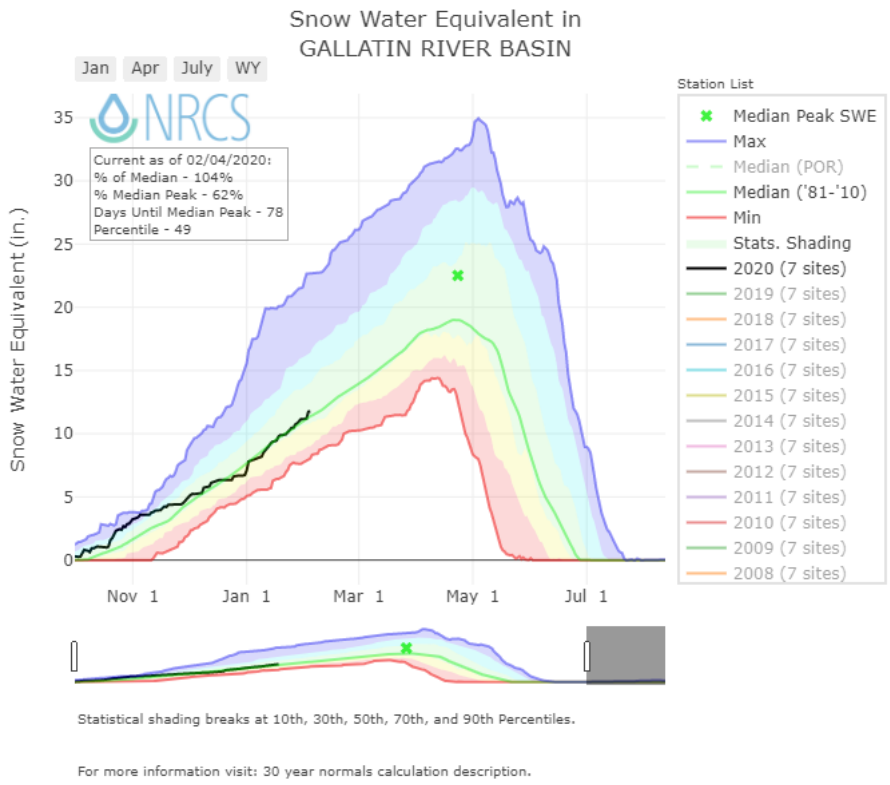
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	124%	98%	113%
Valley Precipitation	59%	79%	117%
Basin-Wide Precipitation	**120%**	**97%**	**114%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

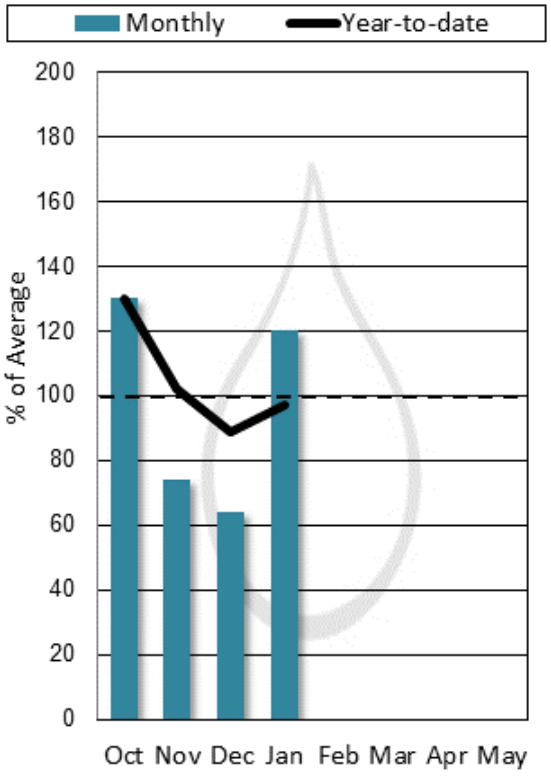
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**102%**	**53%**	**101%**

**See Reservoir Storage Table for storage in individual reservoirs*

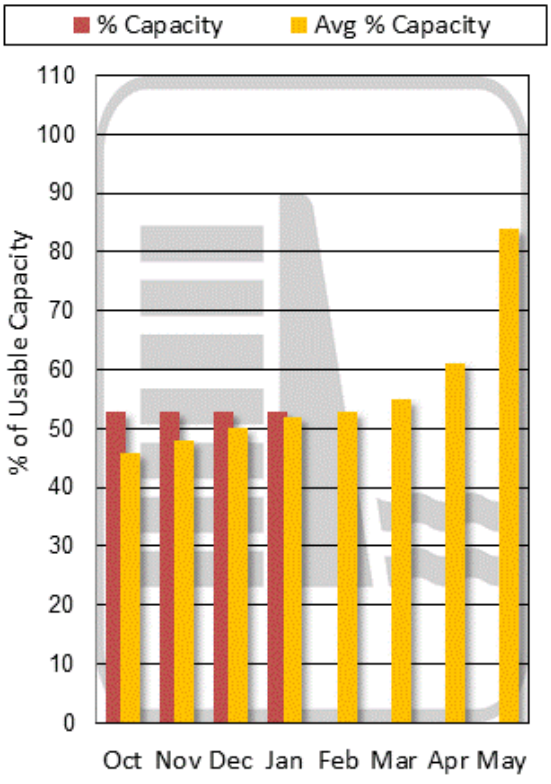
(click to navigate to online version with additional features)



Mountain and Valley Precipitation

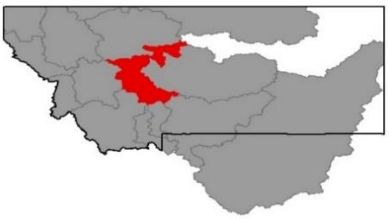


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Headwaters Mainstem (Missouri) River Basin



Last month, a few SNOTEL sites were reporting below-normal snowpack in the Big Belt and the Elkhorn Mountains, after the dry November and December left the mountains high and dry. The change in weather patterns this month benefitted mountain locations, where snowpack totals generally improved by Feb 1. Currently, the only mountain monitoring site which continues to have below-normal snowpack is the Tizer Basin SNOTEL, located in the Elkhorn Mountains. All other regions have snowpack which is now near to above normal for this date. Valley monitoring locations reported below normal precipitation for the month of January, but this should be put into context. January precipitation totals generally range from 0.25 inches to 0.4 inches for the month, and this month valley locations reported ~0.1 inch of precipitation. If you thought it was on the dry side, you were right. But what does it really mean? It might be useful to look at it by putting multiple months together. Valley locations average only a total of 0.9 to 1.3 inches between the Nov 1 through Jan 31 period (early winter). In late winter/early spring between Feb 1 and Apr 30, they average 1.5 to 1.9 inches, and during the late spring/early summer between May 1 and Jul 31, they average 5.1 to 5.4 inches. It just goes to show that the bulk of the moisture is yet to come, and for now, the snowpack is right where we'd like to be in most mountain locations.

Headwaters Missouri Mainstem River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
HEADWATERS MAINSTEM	110%	111%
Basin-Wide Snowpack	**110%**	**111%**

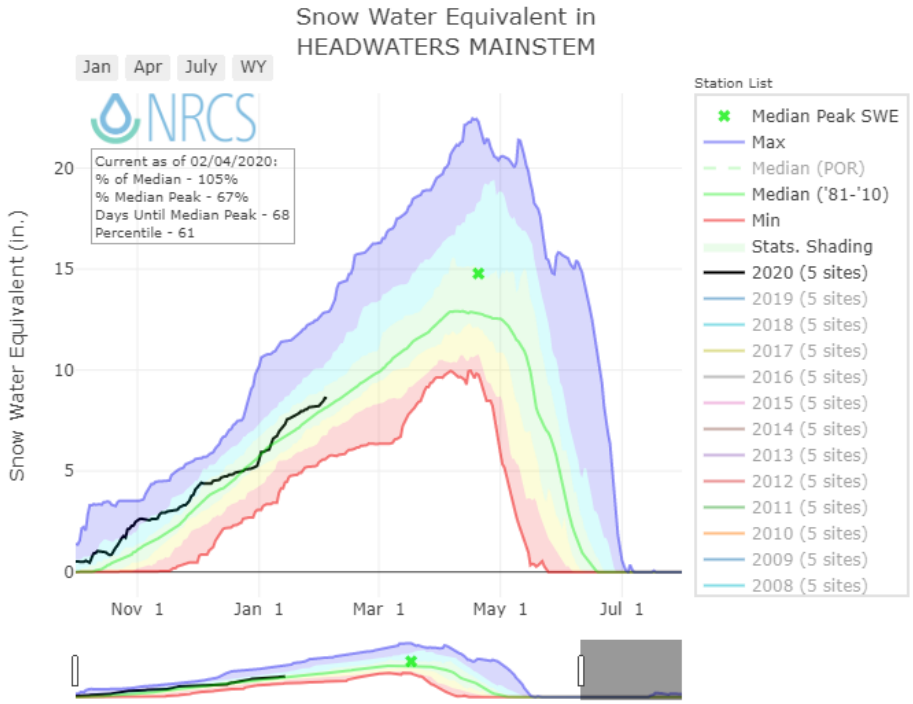
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	116%	96%	105%
Valley Precipitation	28%	101%	72%
Basin-Wide Precipitation	**113%**	**96%**	**103%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**116%**	**80%**	**117%**

**See Reservoir Storage Table for storage in individual reservoirs*

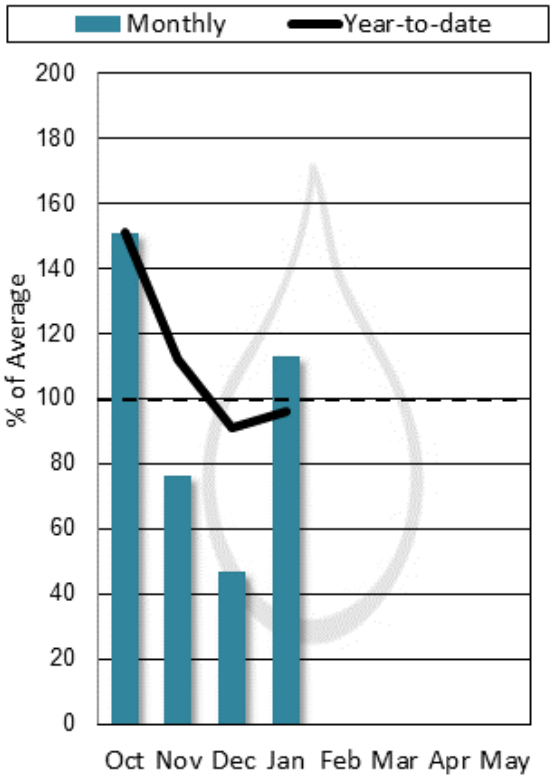
(click to navigate to online version with additional features)



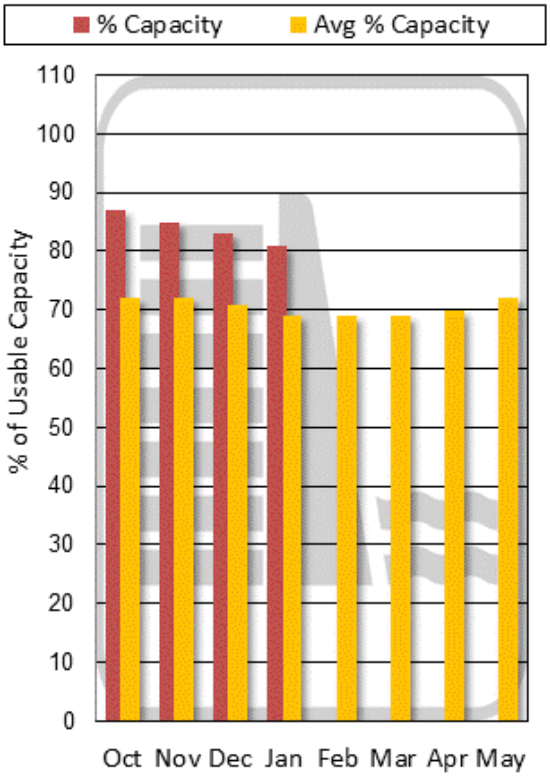
Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.

For more information visit: 30 year normals calculation description.

Mountain and Valley Precipitation

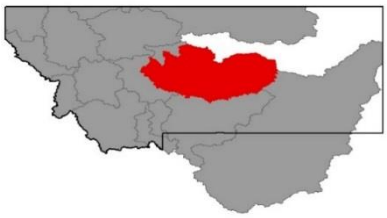


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Smith-Judith-Musselshell River Basin



January was a relatively quiet month in the Smith-Judith-Musselshell River basin. High elevation SNOTEL sites reported near average January precipitation, while low elevation SNOTEL sites and valley weather stations reported below-average January precipitation. The most significant storm of the month storm occurred during the second week of January. Boulder Mountain SNOTEL received just over an inch of snow water from this 4-day storm. Currently, water year to date precipitation is slightly below average, and the snowpack is slightly above normal in the Smith-Judith-Musselshell River basin.

Smith Judith Musselshell River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
SMITH	111%	99%
HIGHWOOD	57%	125%
JUDITH	118%	106%
MUSSELSHELL	96%	90%
Basin-Wide Snowpack	**109%**	**101%**

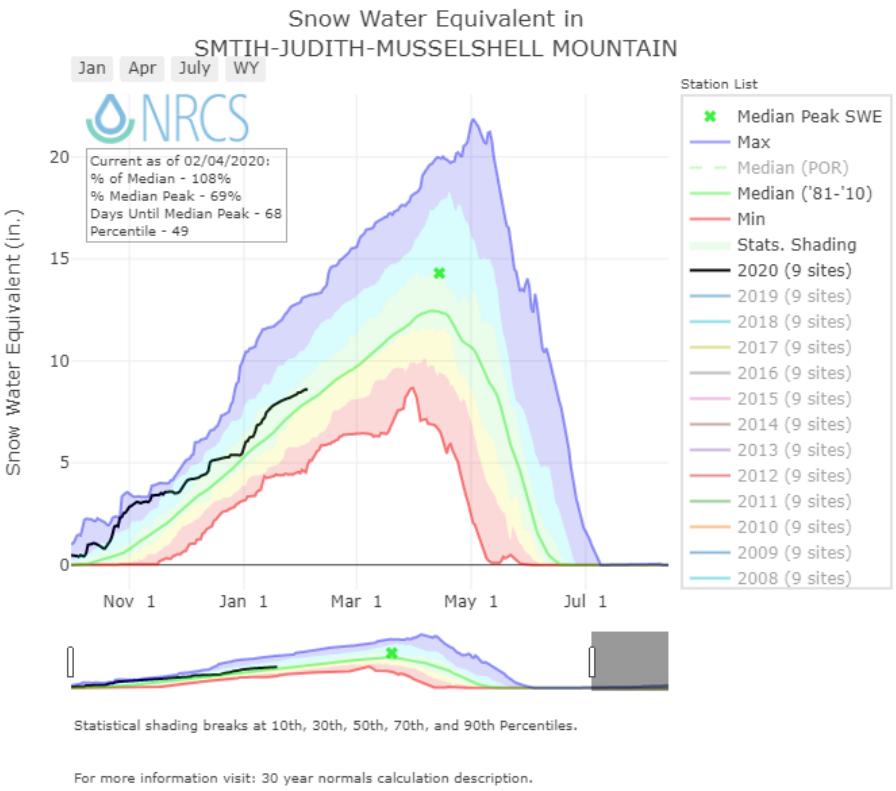
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	100%	91%	100%
Valley Precipitation	63%	99%	97%
Basin-Wide Precipitation	**99%**	**92%**	**100%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

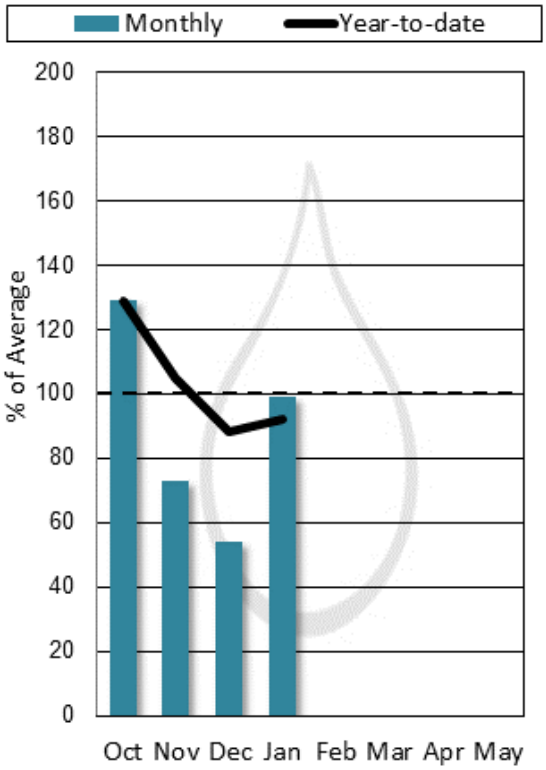
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**171%**	**85%**	**168%**

**See Reservoir Storage Table for storage in individual reservoirs*

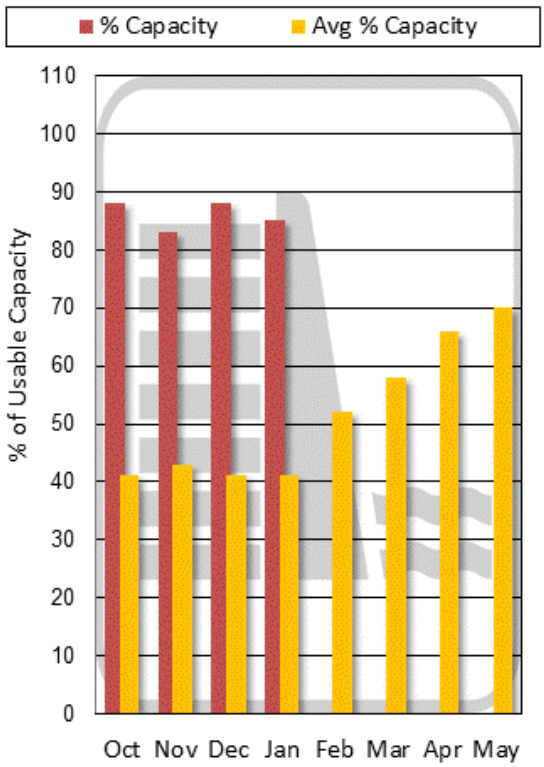
(click to navigate to online version with additional features)



Mountain and Valley Precipitation

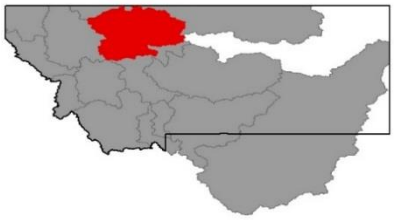


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Sun-Teton-Marias River Basin



During January in the Sun-Teton-Marias, upper elevation SNOTEL sites received near to above-average precipitation, while lower mountain elevations and valley weather stations received well below-average precipitation. Over 70% of January precipitation came during the first two weeks. Most of this precipitation trickled in, but the brunt of it occurred during the first several days of the month. During January 1st – 3rd, Badger Pass SNOTEL received about 1.5 inches of snow water. Currently, the Sun-Teton-Marias River basin is reporting slightly below average water year-to-date precipitation and an above-normal snowpack.

Sun-Teton-Marias River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
SUN	104%	81%
TETON	114%	86%
MARIAS	113%	79%
Basin-Wide Snowpack	**110%**	**80%**

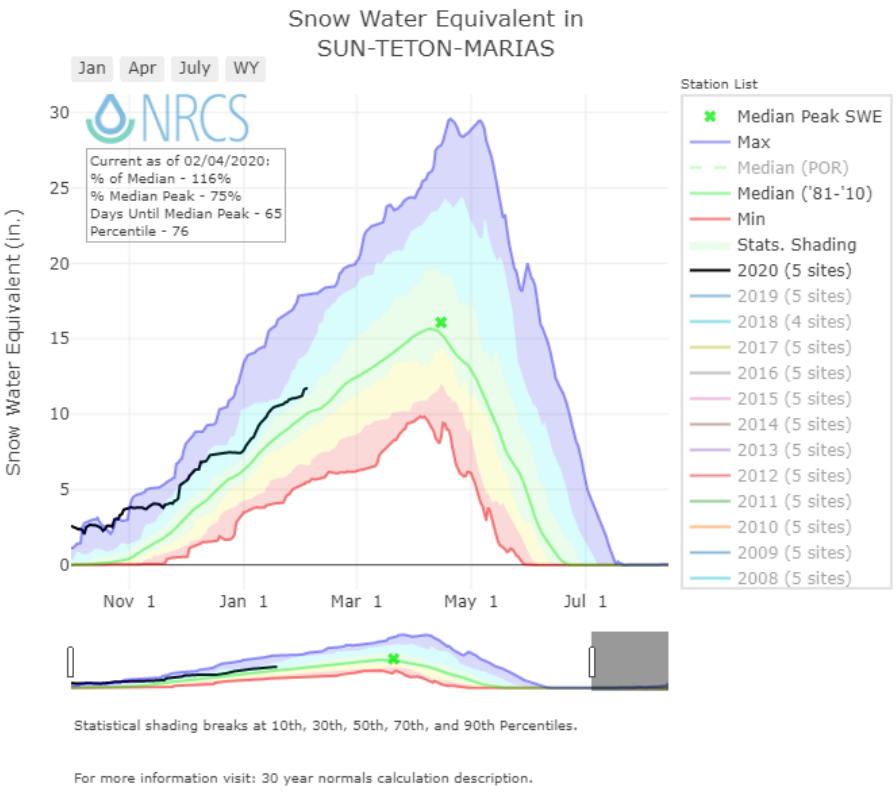
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	105%	91%	83%
Valley Precipitation	12%	198%	177%
Basin-Wide Precipitation	**102%**	**96%**	**87%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

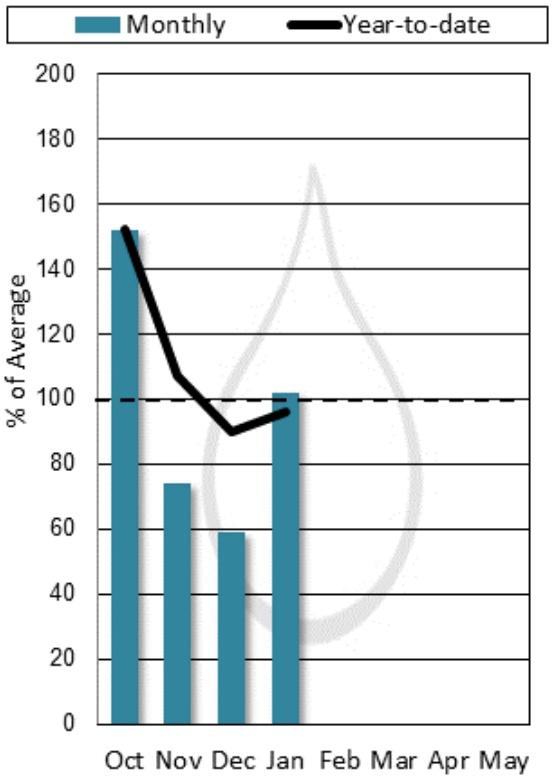
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**108%**	**56%**	**102%**

**See Reservoir Storage Table for storage in individual reservoirs*

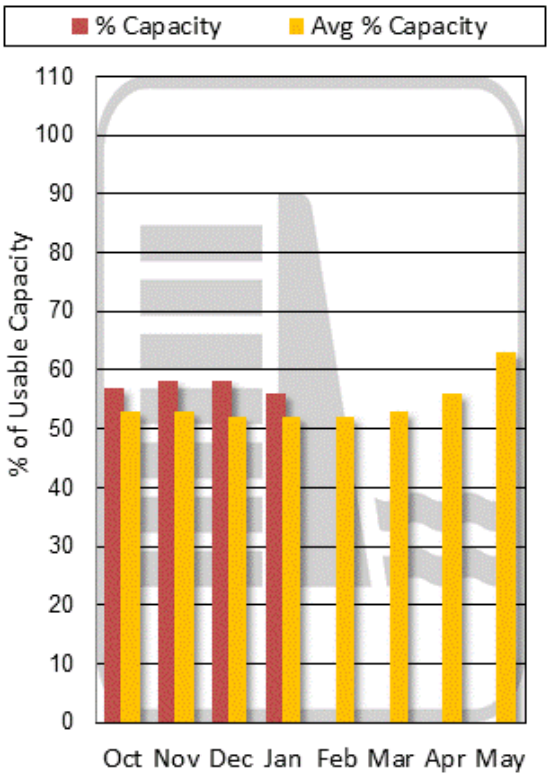
(click to navigate to online version with additional features)



Mountain and Valley Precipitation

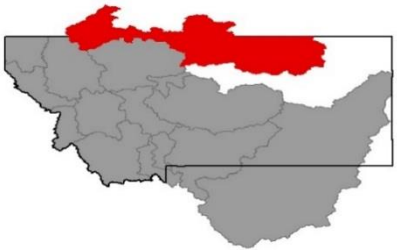


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

St. Mary-Milk River Basin



January precipitation was above average in the mountains but below average in the valleys of the Saint Mary-Milk River basin. Other than a short dry spell during 3rd week of the month, snow trickled in throughout the month. The most significant storm of the month occurred during the end of the second week. Flattop Mountain SNOTEL received about 3 inches of snow water during this storm, which brought its settled snow depth up to 118 inches on January 14th. All mountain weather stations currently have an above-normal snowpack except for Many Glacier SNOTEL, which is only slightly below normal. Further east, the Bears Paw Mountains also have a well above average snowpack.

St. Mary-Milk River Basin Data Summary

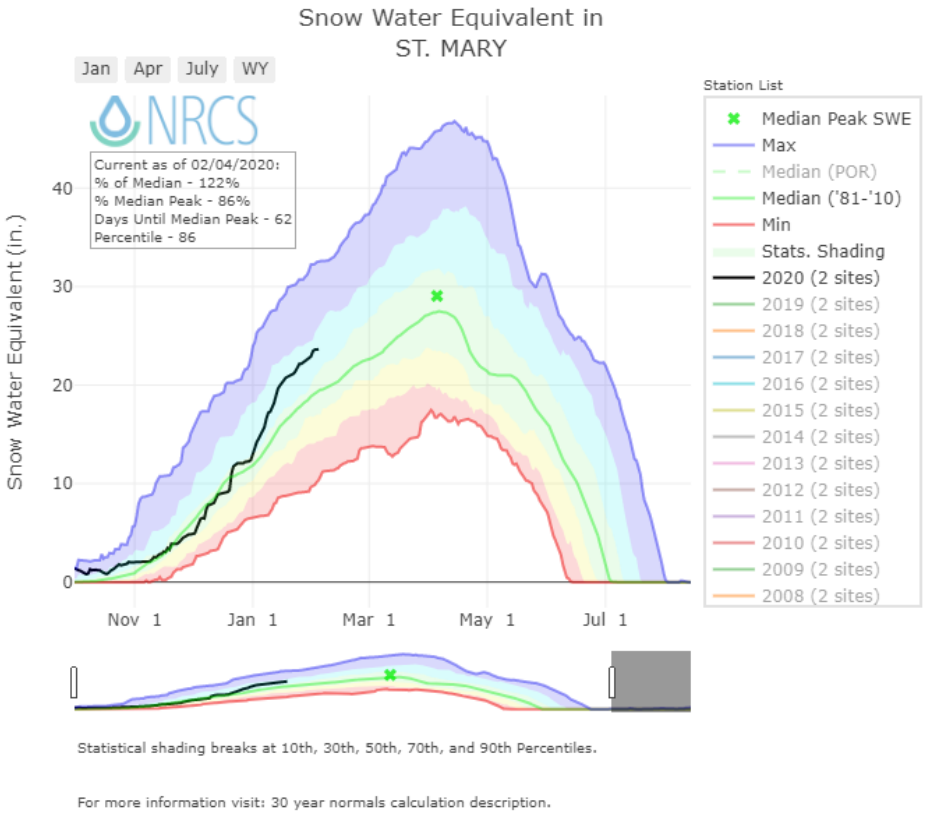
Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
ST. MARY	123%	85%
BEARPAW MOUNTAINS	150%	147%
MILK RIVER BASIN	150%	147%
Basin-Wide	**125%**	**90%**

Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation (St. Mary)	129%	104%	80%
Mountain Precipitation (Bearpaw Mtns)	144%	137%	148%
Valley Precipitation	62%	95%	103%
Basin-Wide Precipitation	**126%**	**107%**	**89%**

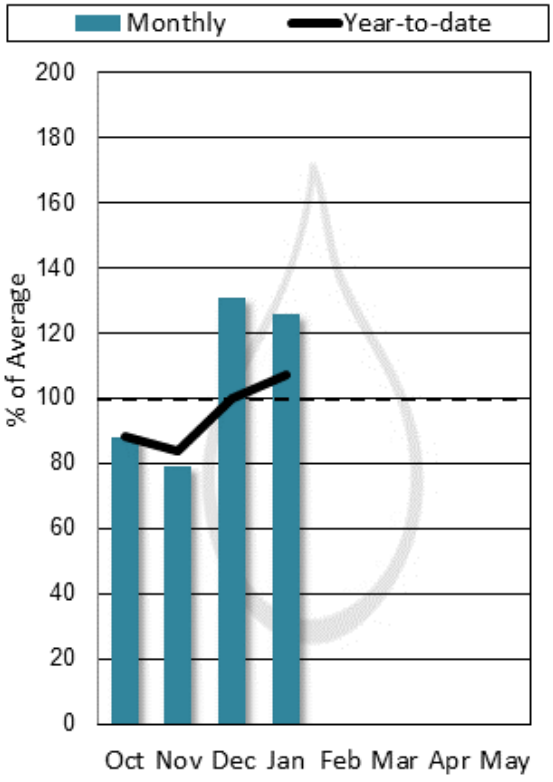
*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**151%**	**57%**	**121%**

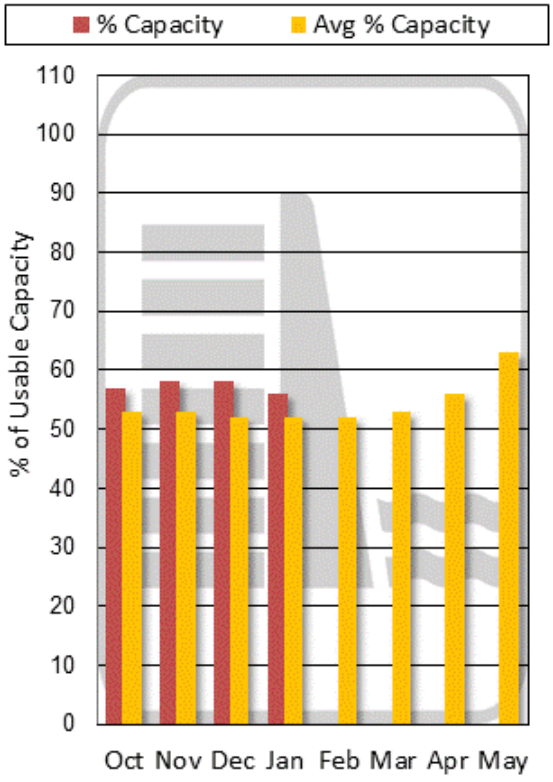
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Upper Yellowstone River Basin

Snowfall for January was near to above normal in many of the sub-basins contributing to the Upper Yellowstone, an excellent turnaround from the dry weather patterns experienced in November and December. Only a few isolated regions received below normal snow totals for the month. One SNOTEL site in the Crazy Mountains reported below-normal snowfall, and both SNOTEL sites located south of Red Lodge on the northeastern side of the Beartooth Range reported below normal snow totals for the month. Overall, snowpack for Feb 1 is near to above normal in most areas, with the Crazy Mountains feeding the Shields River being the only region reporting below-normal snowpack. Looking at the bigger picture, January isn't typically one of the "big" snowfall months in the region, and historically, valley precipitation is also minimal during the month. On average, valley weather stations receive between 0.5 inches to 1 inch of precipitation during the month, so totals are usually low. However, if it felt on the "dry" side at valley locations, it's because it was. Most valley locations received less than 0.3 inches of precipitation this month, which was below normal for January. The good news is, for now, the snowpack is right where we'd like it to be, and the early weeks of February look to deliver more snowfall to both mountain and valley locations.

Upper Yellowstone River Basin Data Summary

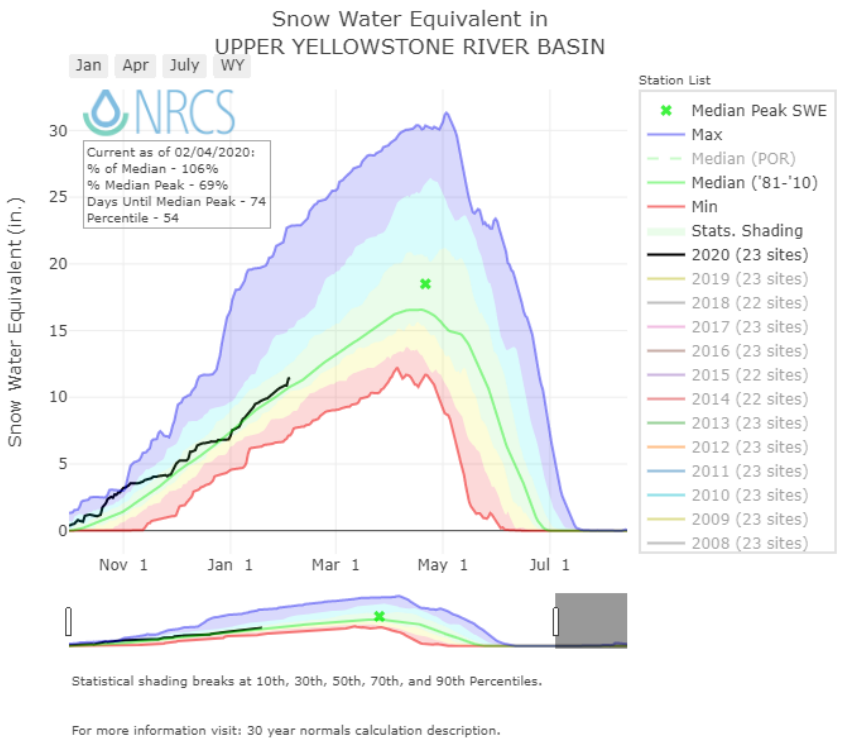
Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
YELLOWSTONE ab LIVINGSTON	107%	87%
SHIELDS	87%	113%
BOULDER-STILLWATER	109%	102%
RED LODGE-ROCK CREEK	92%	156%
CLARK'S FORK	107%	83%
Basin-Wide Snowpack	**103%**	**95%**

Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	119%	95%	98%
Valley Precipitation	37%	87%	107%
Basin-Wide Precipitation	**114%**	**95%**	**99%**

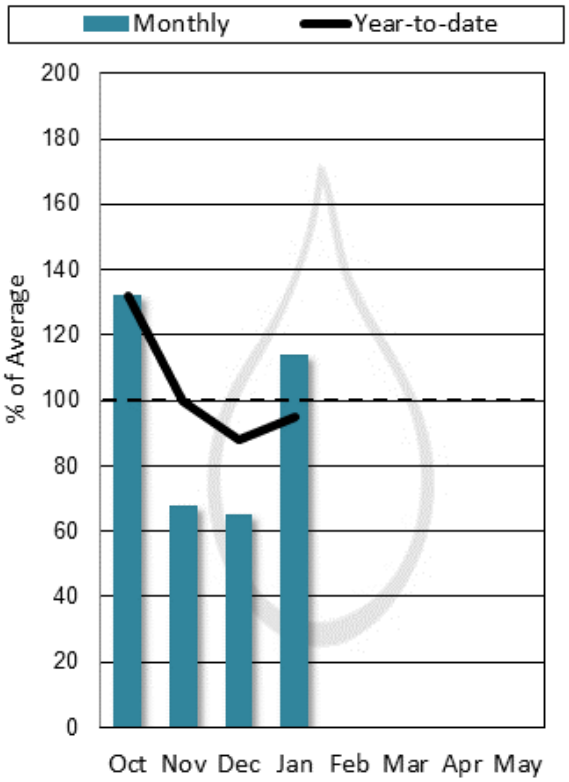
*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**121%**	**56%**	**116%**

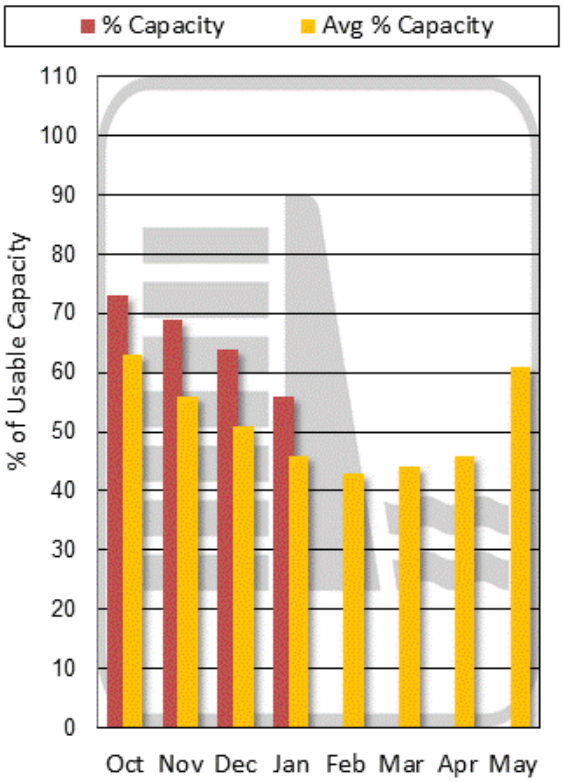
(click to navigate to online version with additional features)



Mountain and Valley Precipitation

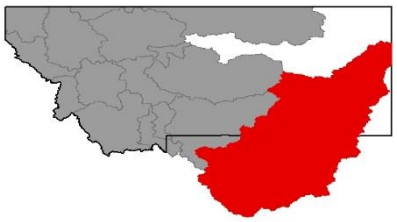


End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

Lower Yellowstone River Basin



Precipitation totals varied across the Lower Yellowstone River basin during January. In general, the Bighorn and Wind River ranges received below-average precipitation, while the Absaroka near Cody received above-average monthly precipitation. Except for a storm during the last day of the month, much of the January precipitation occurred during the first half of the month. The basin's most significant storm of the month occurred during the 2nd week. Hobbs Park SNOTEL in the Wind River Range and Blackwater SNOTEL in the Absaroka received about 1 inch of snow water from this storm. Water year precipitation is below average in the Wind River range. Deer Park SNOTEL is reporting its 2nd lowest water year precipitation total in 23 years. With that said, some of the basin's high elevation SNOTEL sites have received near-average precipitation this water year, and overall, the snowpack in the Lower Yellowstone River basin is currently near to above normal.

Lower Yellowstone River Basin Data Summary

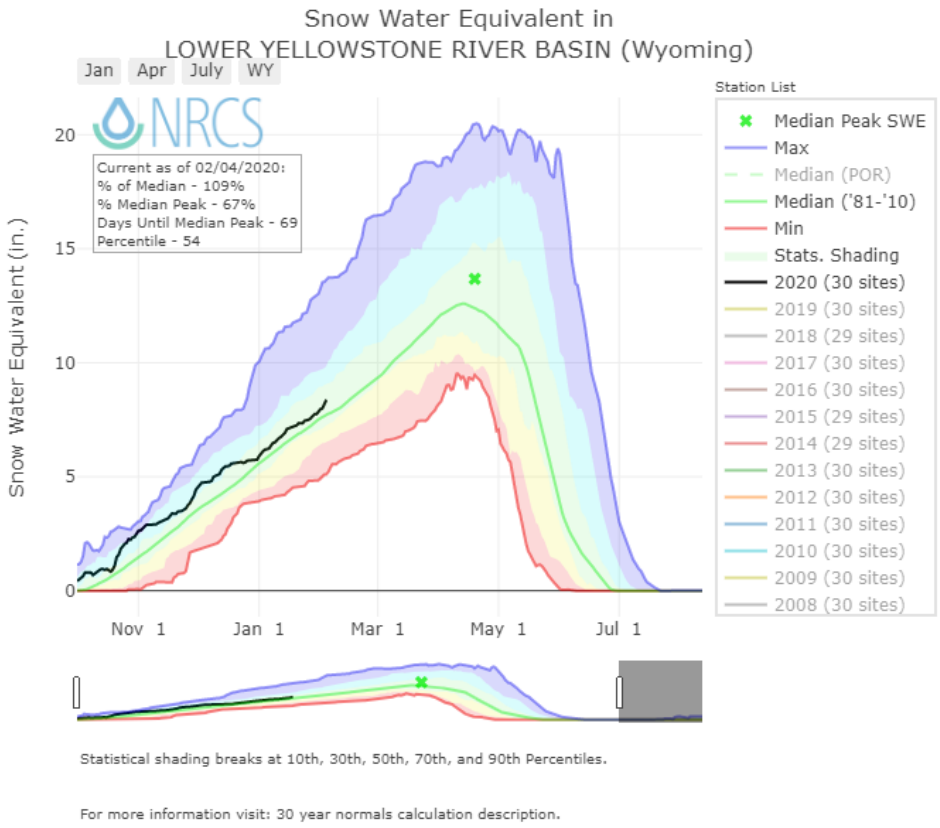
Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
WIND RIVER BASIN	99%	85%
SHOSHONE RIVER BASIN	103%	87%
BIGHORN RIVER BASIN	112%	94%
LITTLE BIGHORN BASIN	109%	97%
TONGUE RIVER BASIN	102%	92%
POWDER RIVER BASIN	120%	97%
Basin-Wide Snowpack	**105%**	**92%**

Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	95%	91%	86%
Valley Precipitation	86%	91%	107%
Basin-Wide Precipitation	**93%**	**91%**	**91%**

*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**109%**	**65%**	**103%**

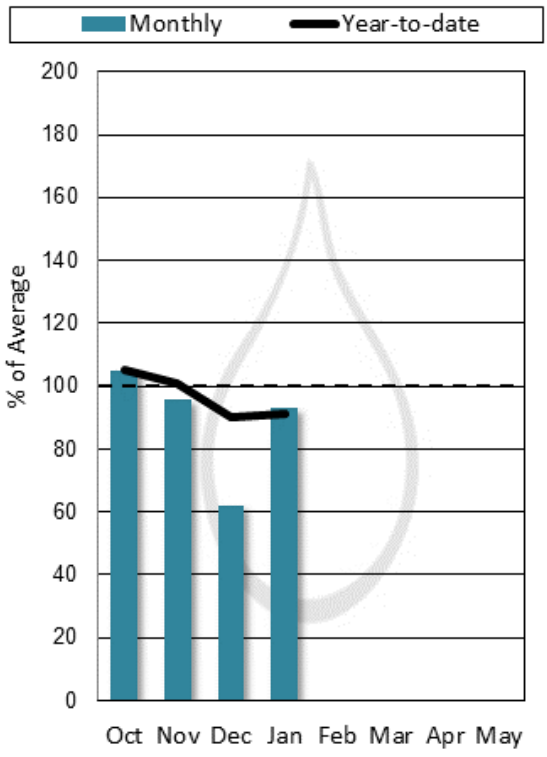
(click to navigate to online version with additional features)



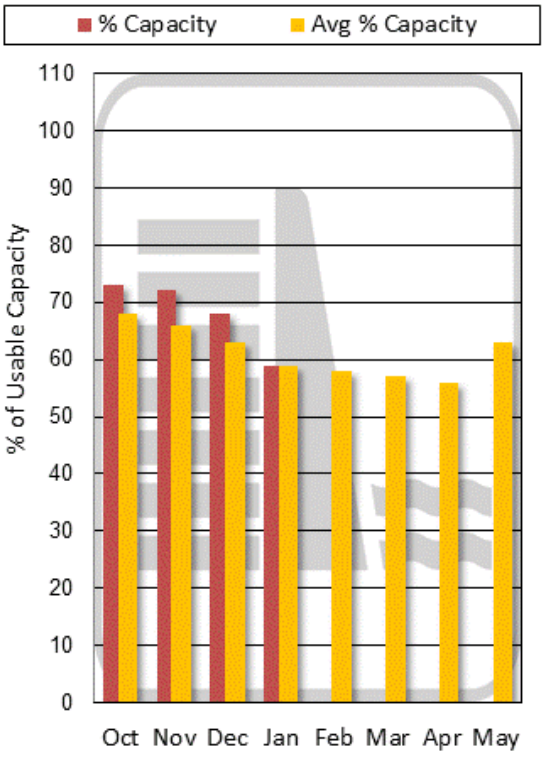
Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.

For more information visit: 30 year normals calculation description.

Mountain and Valley Precipitation



End of Month Reservoir Storage



Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

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Montana Water Supply Outlook Report

Natural Resources Conservation Service