NRCS Natural Resources Conservation Service

USDA

Montana
Water Supply Outlook Report
May 1st, 2020

Shown above are the high elevation Black Bear SNOTEL site (top) and lower elevation Pike Creek SNOTEL (bottom). As of May 1st, high elevation SNOTEL sites like Black Bear continue to gain or hold onto snow water on May 1st. Lower elevations began melting during April, starting the snowmelt driven runoff across the state. Accelerated melt during the last week of the month at these lower elevations, coupled with well below April average precipitation, has decreased the volumes forecasted from April 1st for the May 1st – July 31st period for some river basins.

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

How Forecasts Are Made

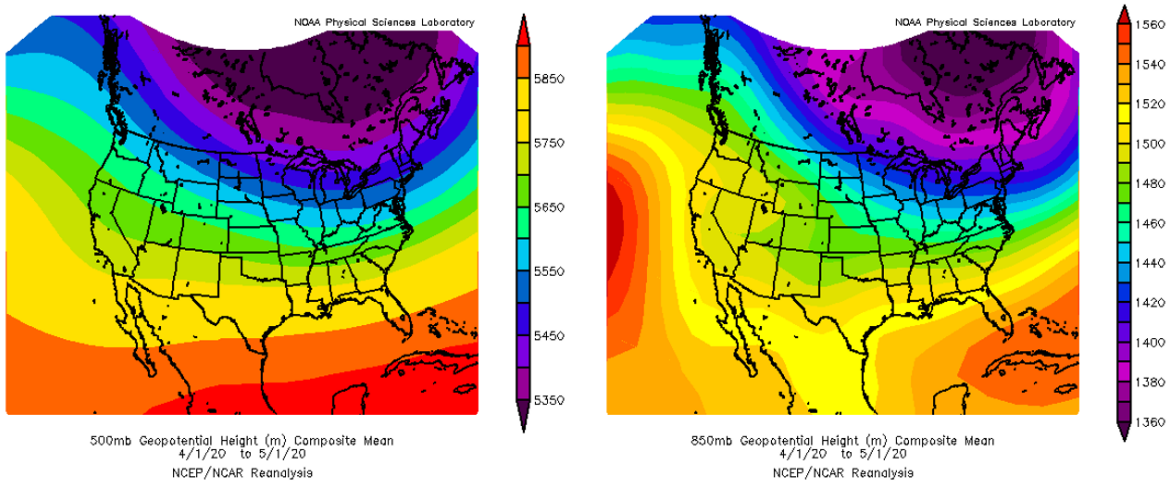
Most of the annual streamflow in the Western United States originates as snowfall that has accumulated high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow 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.

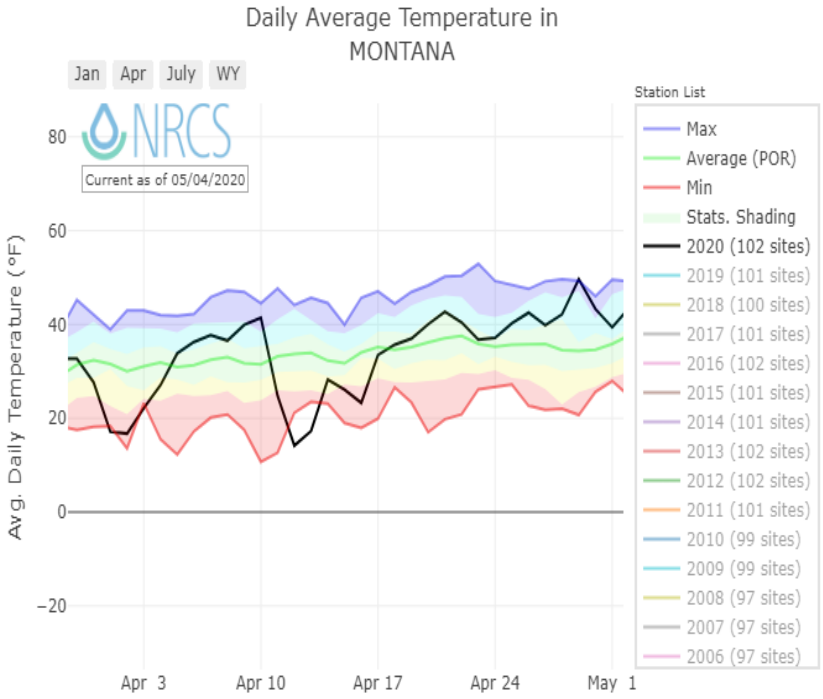
Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed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

Monthly Weather – General Summary

There weren't a lot of showers during April (snow or rain) at mountain and valley locations across Montana, which resulted in below normal monthly gains of mountain snowpack, and valley precipitation totals which continued to decline for the water year (beginning October 1st). Weather patterns during the first three weeks of April were dominated by dry, but cool, west-northwest flow. Although snowpack gains were below normal, the above to well above normal snowpack in place on April 1st held strong through the end of the month due to the below-average temperatures.

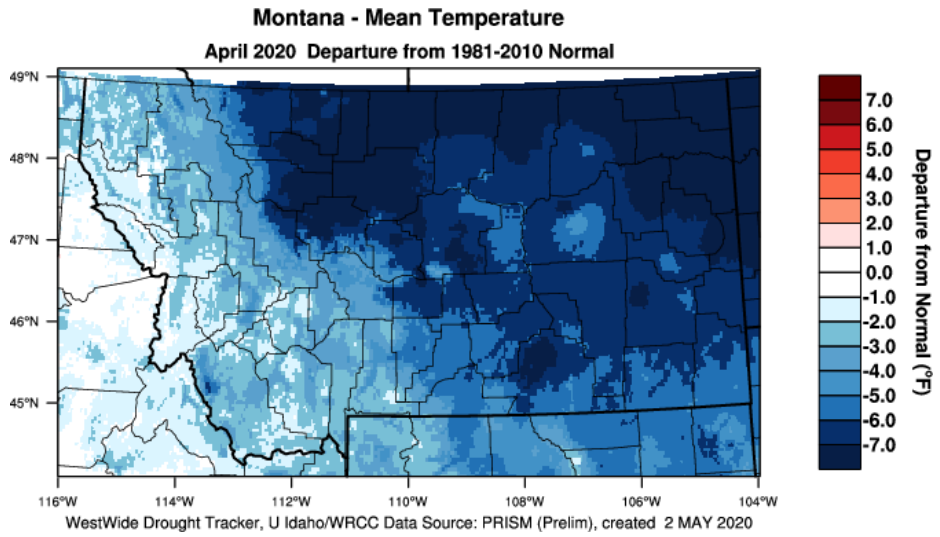


500mb and 850mb Geopotential Heights. Composite mean for 4/1/2020 to 5/1/2020.



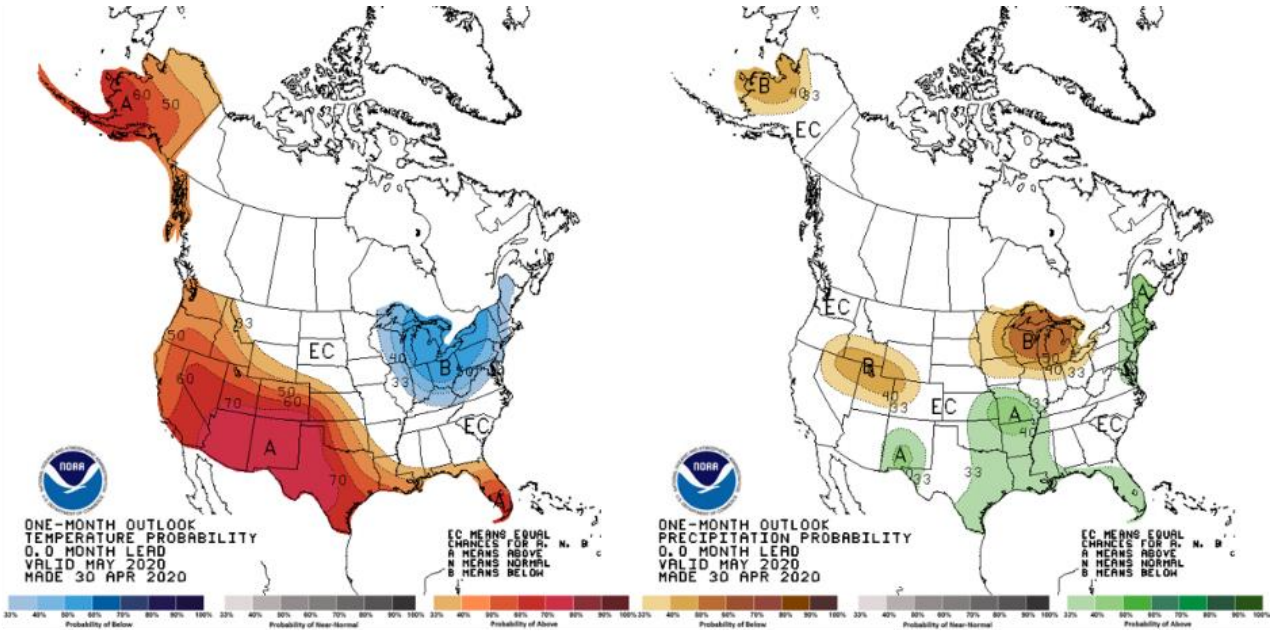
The arctic air, which spilled into the state during the first week of the month, and mid-month, would set new records for lowest daily average temperature on record (30+/- years of record) for April 2nd and April 12th at many mountain locations. The moisture associated with this front would drop snowfall at most SNOTEL sites east of the Divide, where the biggest gains of the month were experienced.

A significant pattern change took place towards the end of the third week, with warm air spilling into the state from the Pacific through May 1st. New records for highest daily average temperatures were recorded at many mountain locations for April 29th with some high-elevation SNOTEL sites approaching 50 degrees Fahrenheit.



Although temperatures were above average in many locations during the last week of the month, daily average temperatures were below average across Montana for April as a whole. Cold air during the first half of the month was predominant, as reflected in the monthly average.

Long-range forecasts issued by the NOAA's Climate Prediction Center for May indicate near-normal chances for precipitation, but increased chances for above-average temperatures in some parts of western Montana. Should this pan out, mountain snowpack is primed for melt and could come out faster than desired. Beyond the one-month time frame, forecasts for the next three months indicate chances of below-average precipitation in western Montana and increased chances of above-average temperatures across the whole state. Discussion on the potential impacts of this coming to fruition will be discussed in the snowpack and streamflow sections of this report.



One Month Outlook – Temperature and Precipitation Outlook for May 2020.

Snowpack – Overview

Although snowfall totals were less than impressive for April, snowpack remains near to above normal in many river basins for May 1st. The abundance of moisture earlier this winter built a strong mountain snowpack by April 1st, and cold temperatures helped to delay melt and prolong runoff at many low and mid-elevation sites. Currently, the snowpack is near to above normal in almost all river basins across the state.

This year's basin-wide snowpack peak for many river basins occurred either during the second week of April in two river basins west of the Divide, or at the end of the third week of April for all other river basins. Peak snowpack this year, timing-wise, was very close to average across the state and was above normal for most river basins. After the warm weather moved in during the fourth week of the month, mountain snowpack has been melting in earnest, causing locals rivers and streams to swell with snowmelt. In some regions of southwest Montana (Jefferson and Madison River basins), the snowpack has been melting quickly and ahead of schedule, which could be of concern later in the summer when water demand is highest.

Precipitation - Overview

There have almost been two separate stories happening this year with regards to precipitation, mountain precipitation and valley precipitation. In most years, the disparity between these two different areas, with regards to the percentage of normal, isn't so distinct. This year it bears mentioning since it is impacting the forecasts and could play a role in irrigation water supply if the weather patterns stay warm and dry.

Mountain precipitation, which falls mostly as snow that forms our mountain snowpack reservoir, has vacillated between below average during early winter, to well above to near record-setting during January and February, and back to below normal for April. Overall water year precipitation (beginning October 1st) for mountain SNOTEL sites varies widely from well below normal to well above normal. In some regions, the low totals for the water year have impacted the forecasted volumes, even though snowpack is normal for this date.

On the other hand, valley precipitation in some regions has been well below normal since early November, and April followed suit. April precipitation was well below average across valley locations in southern Montana. Many valley weather stations reported 20% to 40% of normal for the month. This is significant as April 1st typically marks the beginning of a metric called "Crop Year" precipitation, which indicates precipitation during the growing season. East of the Divide, May and June are typically two of the "wettest" months of the year and could make up for some of the current deficits.

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.

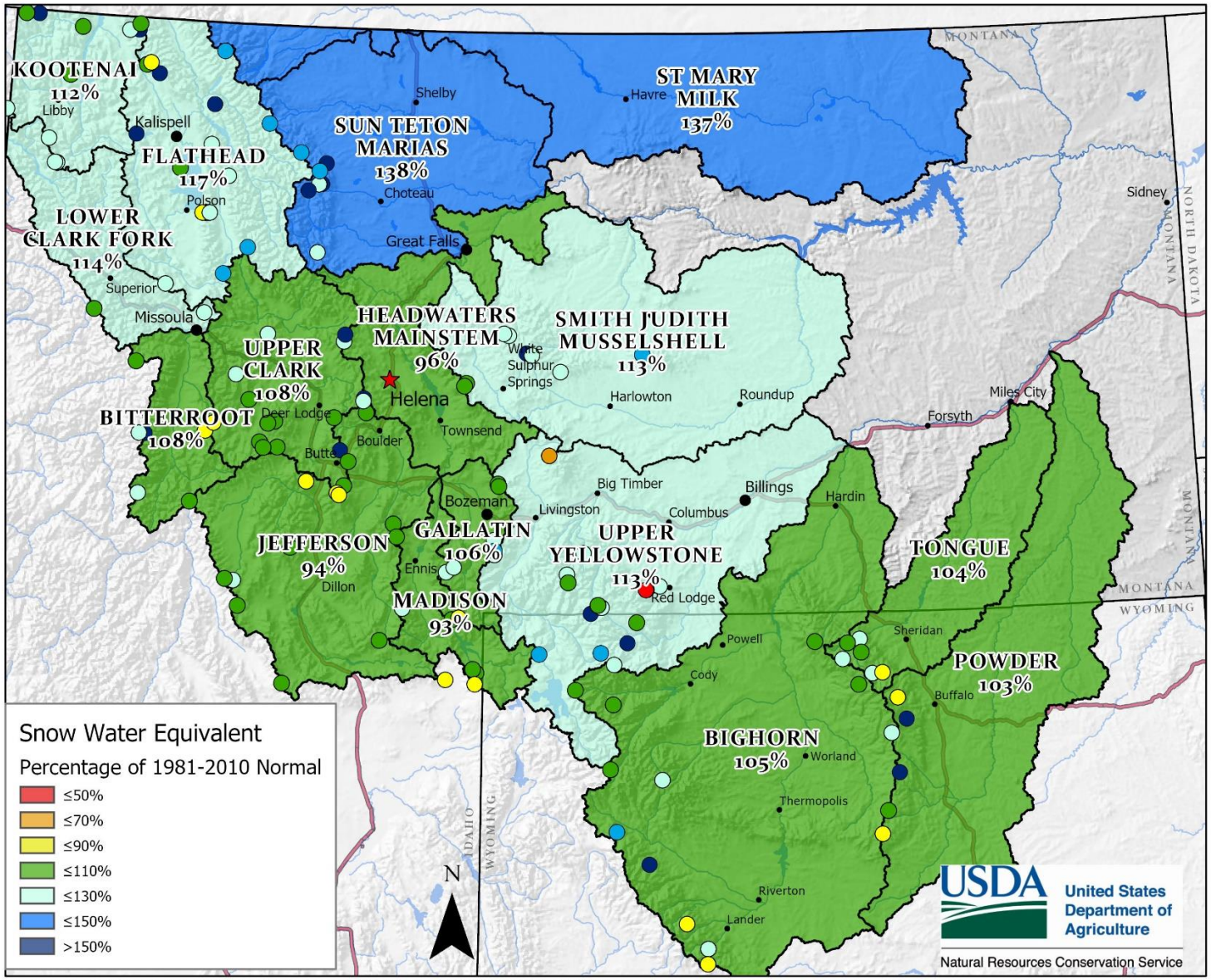
Streamflow Forecasts

Streamflow forecasts for most rivers in the state continue to indicate near to slightly above average flows for the May 1st to July 31st period. However, there are some areas in southwest Montana that have declined to below average due to accelerated snowmelt at low and mid-elevations. Forecasts for the upper reaches of the Clark Fork River and its tributaries (Flint Creek, Rock Creek) have declined to slightly below average, and some forecasts within the Jefferson River basin have decreased to below average for the spring and summer. The good news is that reservoir storage has been above average due to last year's abundant runoff in these regions. Water users are encouraged to visit the individual basin narratives this month for their river(s) of interest for more detailed information.

Data Table – Basin-Wide Values

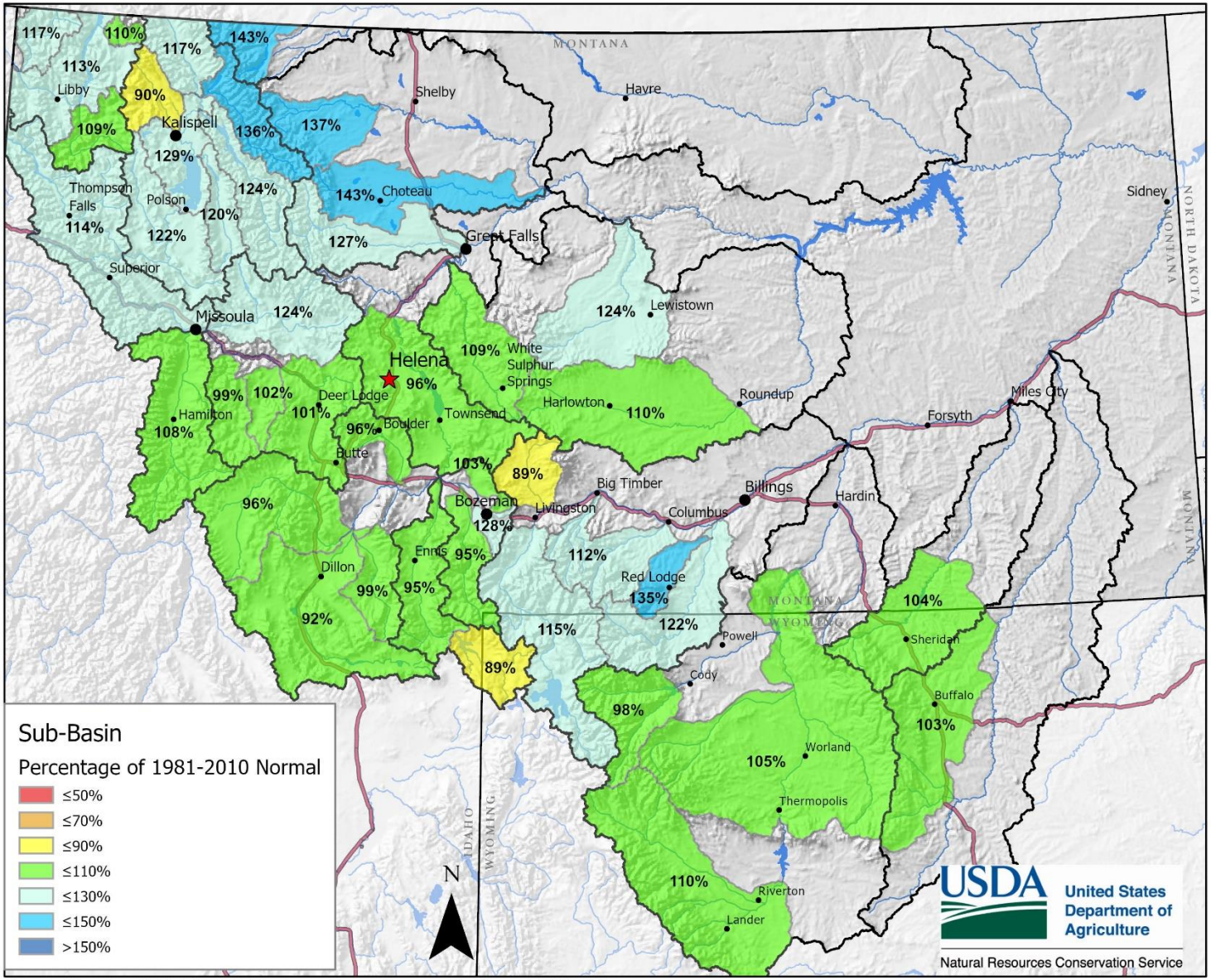
5/1/2020	Snow Water Equivalent	Precipitation		Reservoir Storage	
	% Normal	*Monthly % Avg*	*Water Year % Avg*	*% Average*	*% Capacity*
Columbia River Basin	113	88	92	121	65
Kootnenai in Montana	112	74	88	136	62
Flathead in Montana	117	91	97	112	67
Upper Clark Fork	108	90	90	105	84
Bitterroot	108	86	91	106	65
Lower Clark Fork	114	104	91	95	87
Missouri River Basin	103	70	94	115	79
Jefferson	94	66	91	118	72
Madison	93	65	89	109	80
Gallatin	106	62	103	98	60
Headwaters Mainstem	96	73	94	118	82
Smith-Judith-Musselshell	113	81	95	142	94
Sun-Teton-Marias	138	99	97	110	61
St. Mary-Milk	137	63	104	129	68
Yellowstone River Basin	110	77	96	101	57
Upper Yellowstone	113	77	102	124	57
Bighorn	105	85	99	97	55
Tongue	104	67	89	169	74
Powder	103	60	95		
Montana State-Wide	109	77	94	116	74
Color Scale	<50%	51 to 70%	71 to 90%	91% to 110%	>110%

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



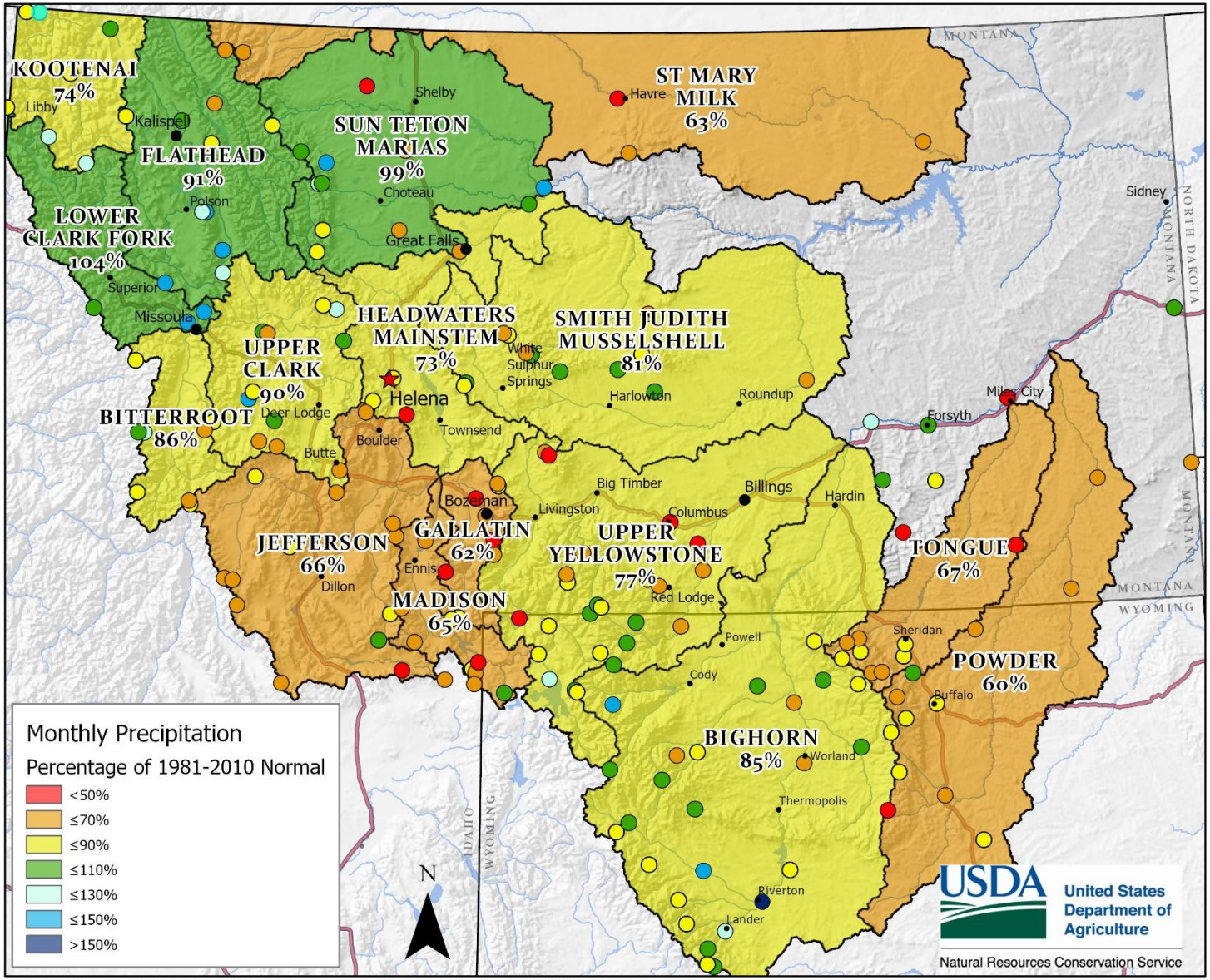
Created by the USDA-NRCS Montana Snow Survey Staff on: 5/6/2020

Sub-Basin Snow Water Equivalent - Percentage of 1981-2010 Normal
May 1st, 2020



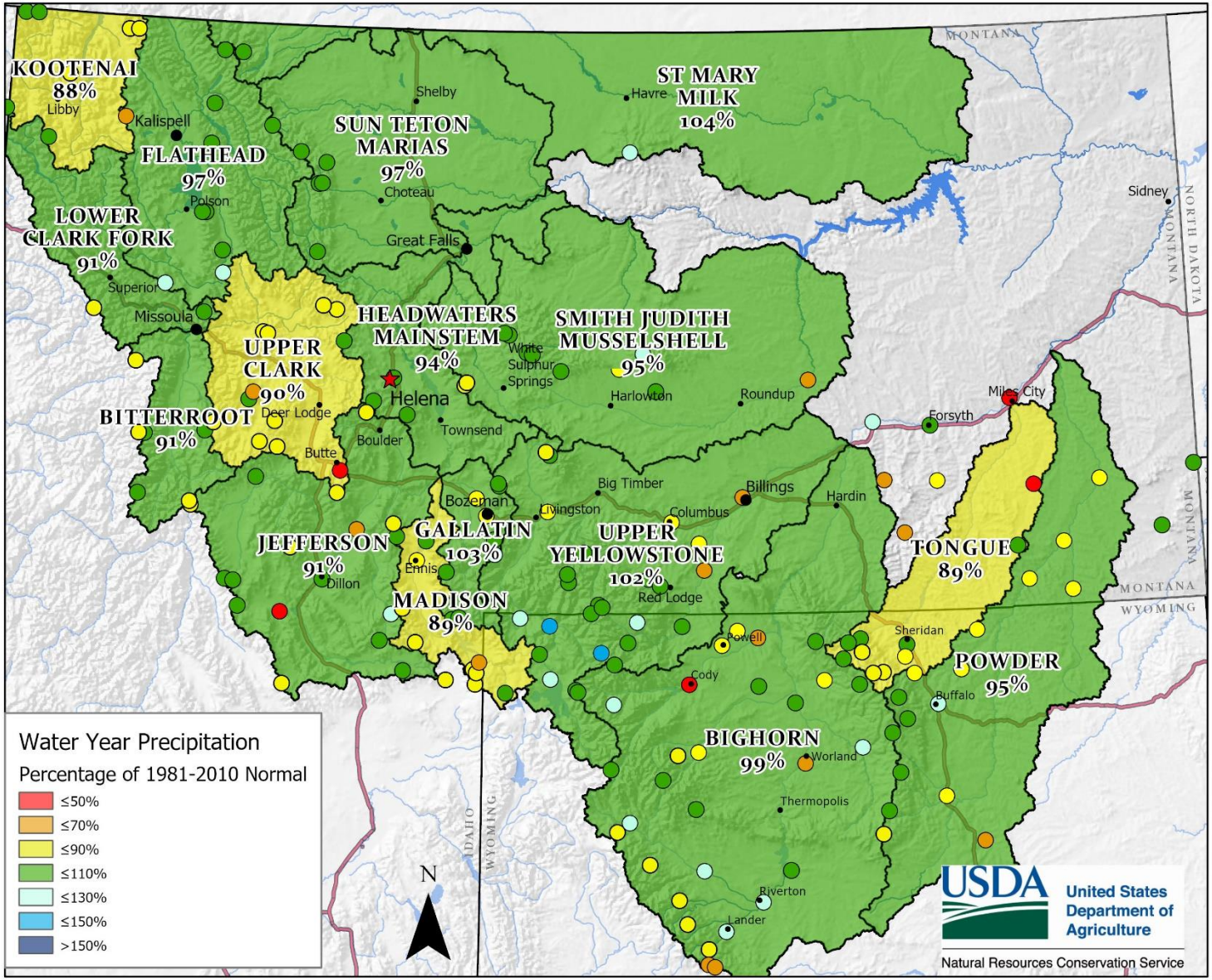
Created by the USDA-NRCS Montana Snow Survey Staff on: 5/6/2020

Monthly Precipitation - Percentage of 1981-2010 Normal
April1st, 2020 - April 30th, 2020



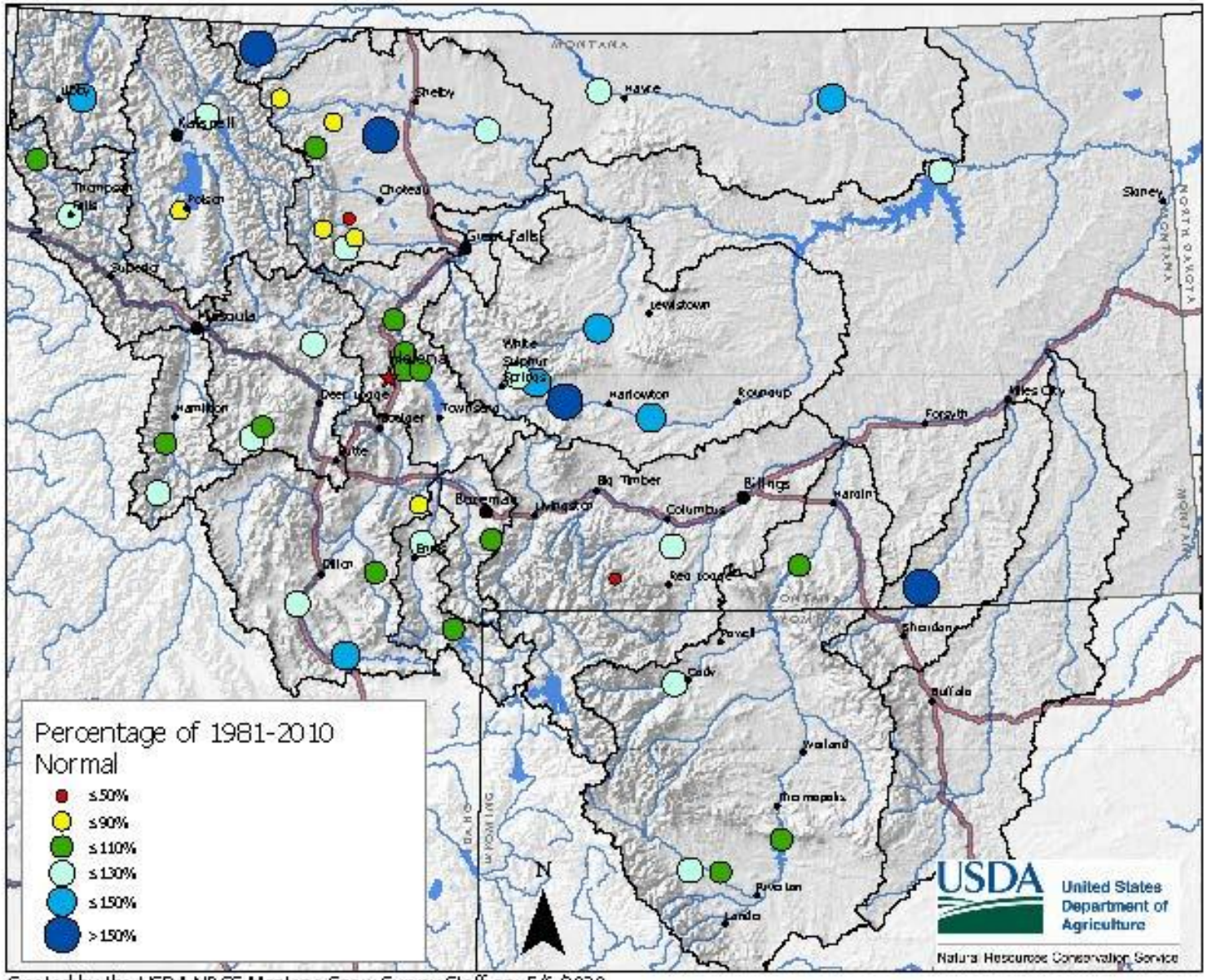
Created by the USDA-NRCS Montana Snow Survey Staff on: 5/6/2020

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



Created by the USDA-NRCS Montana Snow Survey Staff on: 5/6/2020

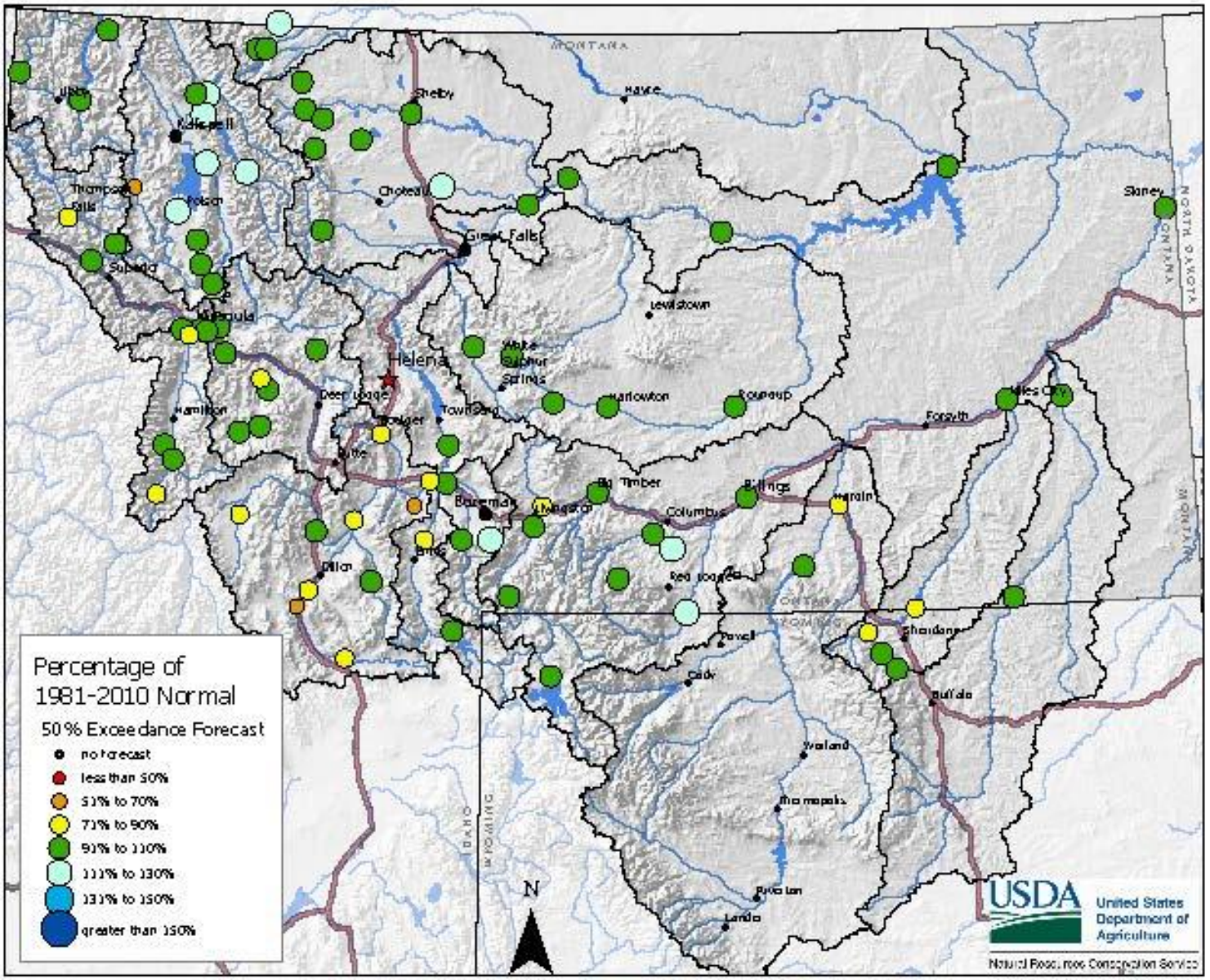
Reservoir Contents - Percentage of 1981-2010 Normal
May 1st, 2020



Created by the USDA-NRCS Montana Snow Survey Staff on: 5/6/2020

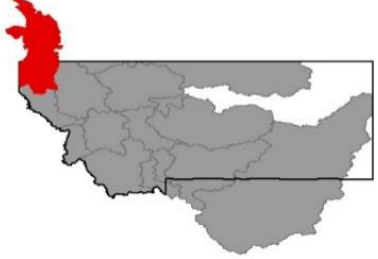
Streamflow Forecasts (May 1st - July 31st) - Percentage of 1981-2010 Normal

May 1st, 2020



Created by the USDA-NRCS Montana Snow Survey Staff on: 5/7/2020

Kootenai River Basin



While snowpack remains above normal in the Kootenai thanks to January and February storms, water year to date precipitation continues to be below normal, resulting from lackluster November and December precipitation. April totals have continued this trend, bringing the lowest monthly precipitation total to Stahl Peak SNOTEL on record, and continued the record-setting dry year at Hand Creek SNOTEL. The silver lining is that below average temps during April have helped to slow the melt of snowpack, stretching out our mountain reserves a little longer. Snowpack to the north in Canada remains above normal for May 1st as well. All sites in the Kootenai have reached their snowpack peak for the year and are in the melt phase of spring. As a result of the above-normal snowpack and below-normal water year to date precipitation, forecasts are near normal for the mainstem Kootenai, but below normal for some sub-basins such as the Fisher River. Please reference the table below to see conditions in your region of interest.

Kootenai River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
KOOTENAY in CANADA	119%	80%
KOOTENAI MAINSTEM	113%	86%
TOBACCO	110%	88%
FISHER	109%	94%
YAAK	117%	96%
KOOTENAI RIVER BASIN in MONTANA	112%	90%
KOOTENAI ab BONNERS FERRY	114%	88%
Basin-Wide Snowpack	**112%**	**90%**

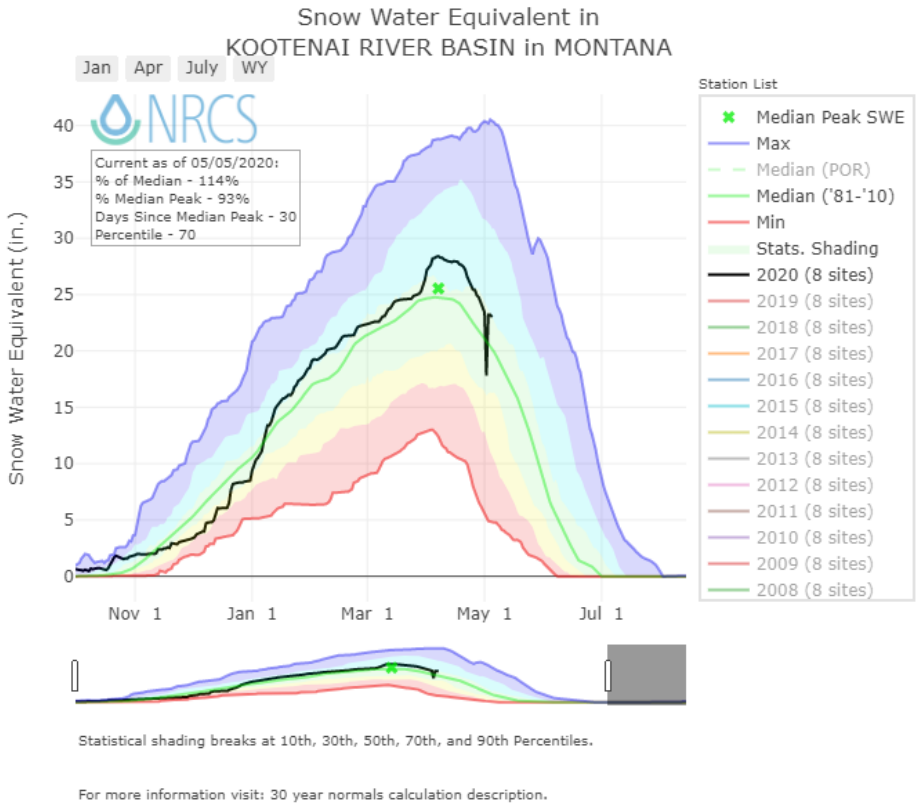
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	73%	88%	81%
Valley Precipitation	98%	77%	102%
Basin-Wide Precipitation	**74%**	**88%**	**81%**

**WYTD Precipitation is October 1st- Current*

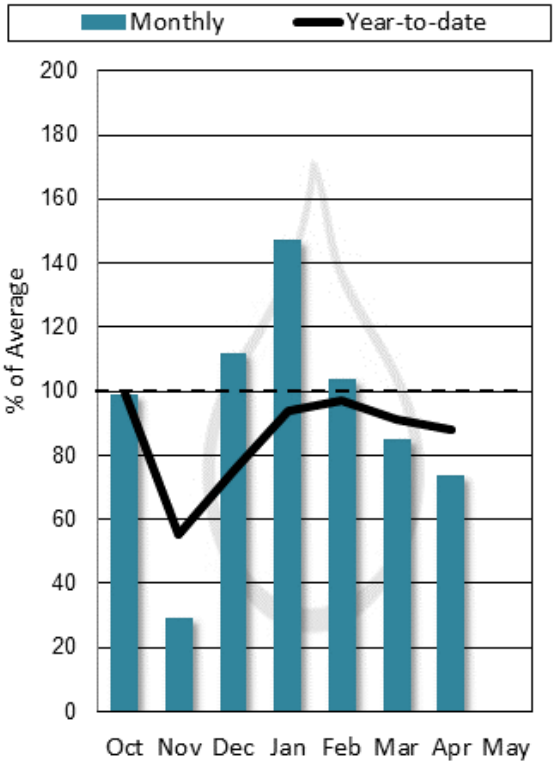
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Reservoir Storage	**136%**	**62%**	**141%**

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

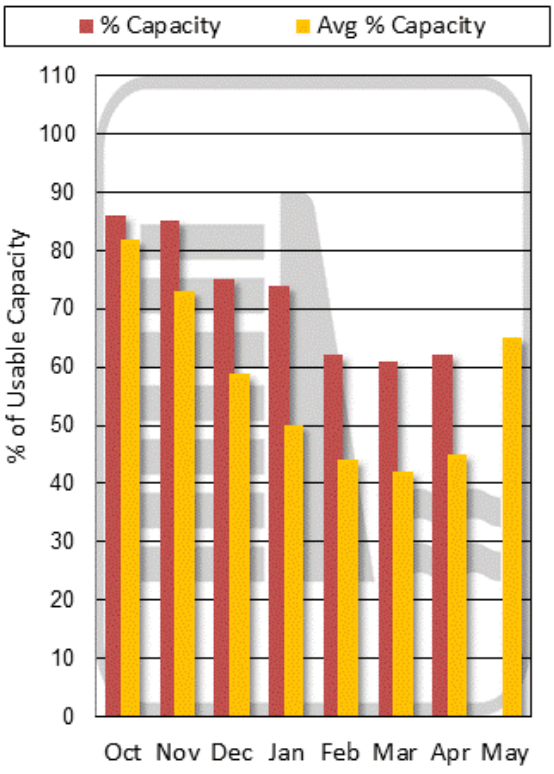
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

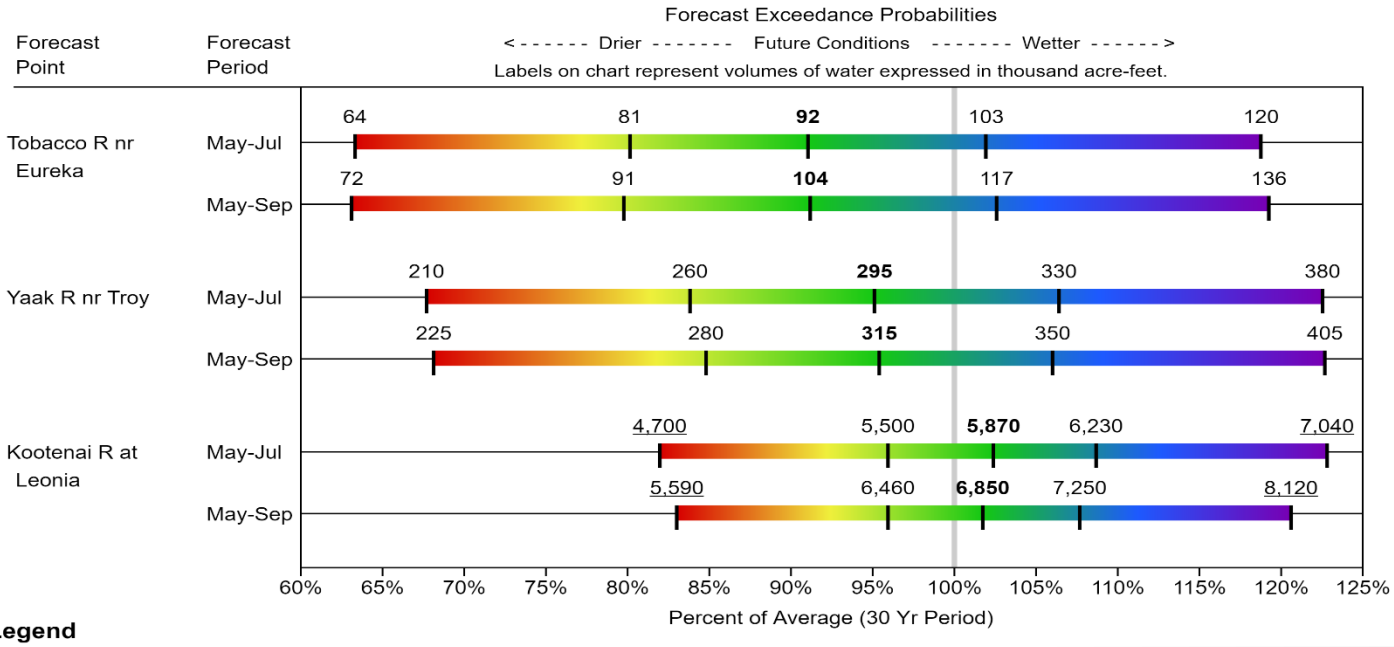


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

KOOTENAI RIVER BASIN in MONTANA

Water Supply Forecasts

May 1, 2020



Legend

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

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

Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

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

Flathead River Basin

Aside from December, snowpack in the Flathead River basin has been above normal every month this winter. April precipitation has built on these totals. Storms favored the lower Flathead throughout the month, but northern reaches of the drainage also received near to slightly below normal precipitation. The Salish Mountains and Ashley Lake Divide caught a few much-needed storms, bolstering snowpack and precipitation totals for the month. This region has been largely missed in storm tracks this year, as reflected in the record-setting dry year at Hand Creek SNOTEL, and 60-70% of normal conditions at Ashley Lake Divide Snow Course for much of the winter. Snowpack at mid-elevation sites reached their water year peak in the first or second week of April and have melted slowly. High elevation sites in the Swan and Northern Flathead drainages reached their water year peak only in the last couple days, as daily max temperatures are starting to eat away at the snowpack, and overnight lows are creeping above freezing. Mainstem Flathead flows forecasted for May 1st through July 31st are above normal due to the abundant snowpack in the high reaches of the drainage. However, individual streams should be referenced in the table below for expected tributary flows.

Flathead River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
NF FLATHEAD in CANADA	103%	62%
NF FLATHEAD in MONTANA	117%	88%
MIDDLE FORK FLATHEAD	136%	85%
SOUTH FORK FLATHEAD	124%	91%
STILLWATER-WHITEFISH	90%	98%
SWAN	120%	92%
MISSION VALLEY	108%	109%
LITTLE BITTERROOT-ASHLEY	129%	244%
JOCKO	122%	98%
FLATHEAD in MONTANA	117%	95%
Basin-Wide Snowpack	***117%***	***94%***

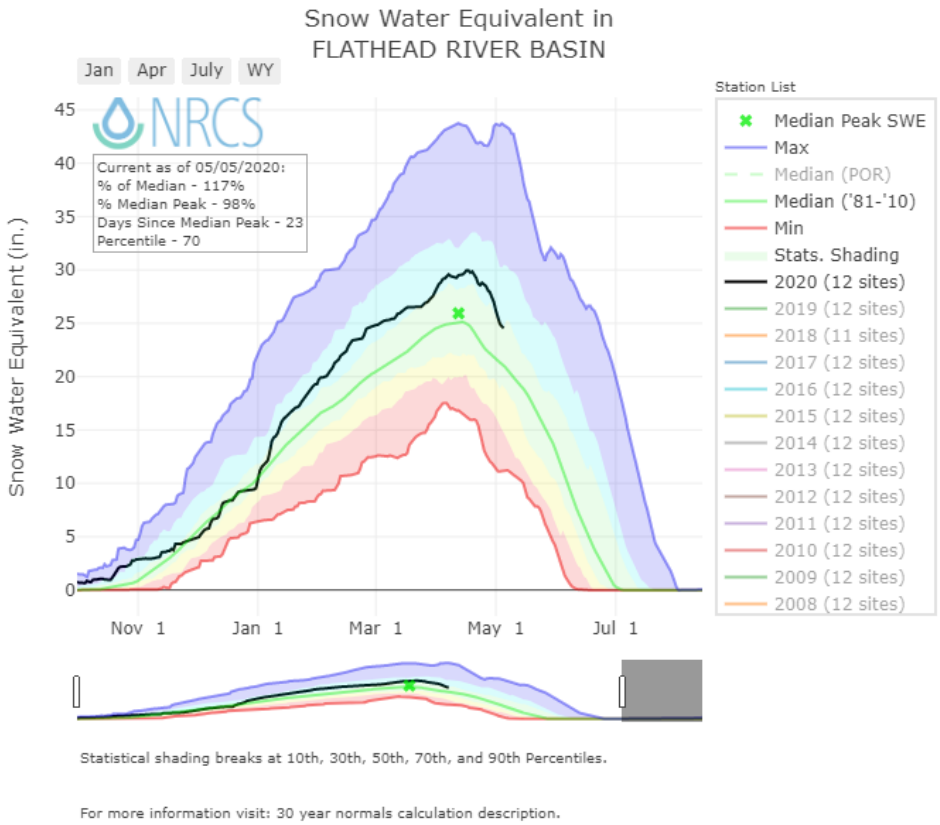
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	90%	97%	91%
Valley Precipitation	99%	77%	106%
Basin-Wide Precipitation	**91%**	**97%**	**91%**

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

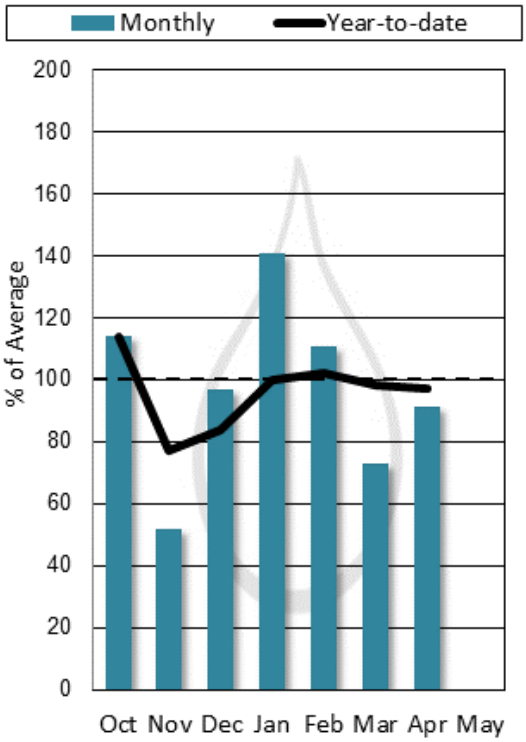
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Reservoir Storage	112%	67%	125%

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

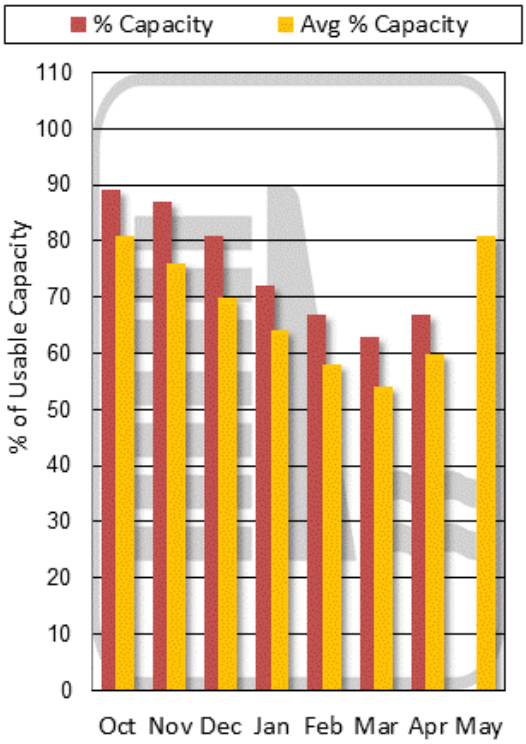
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

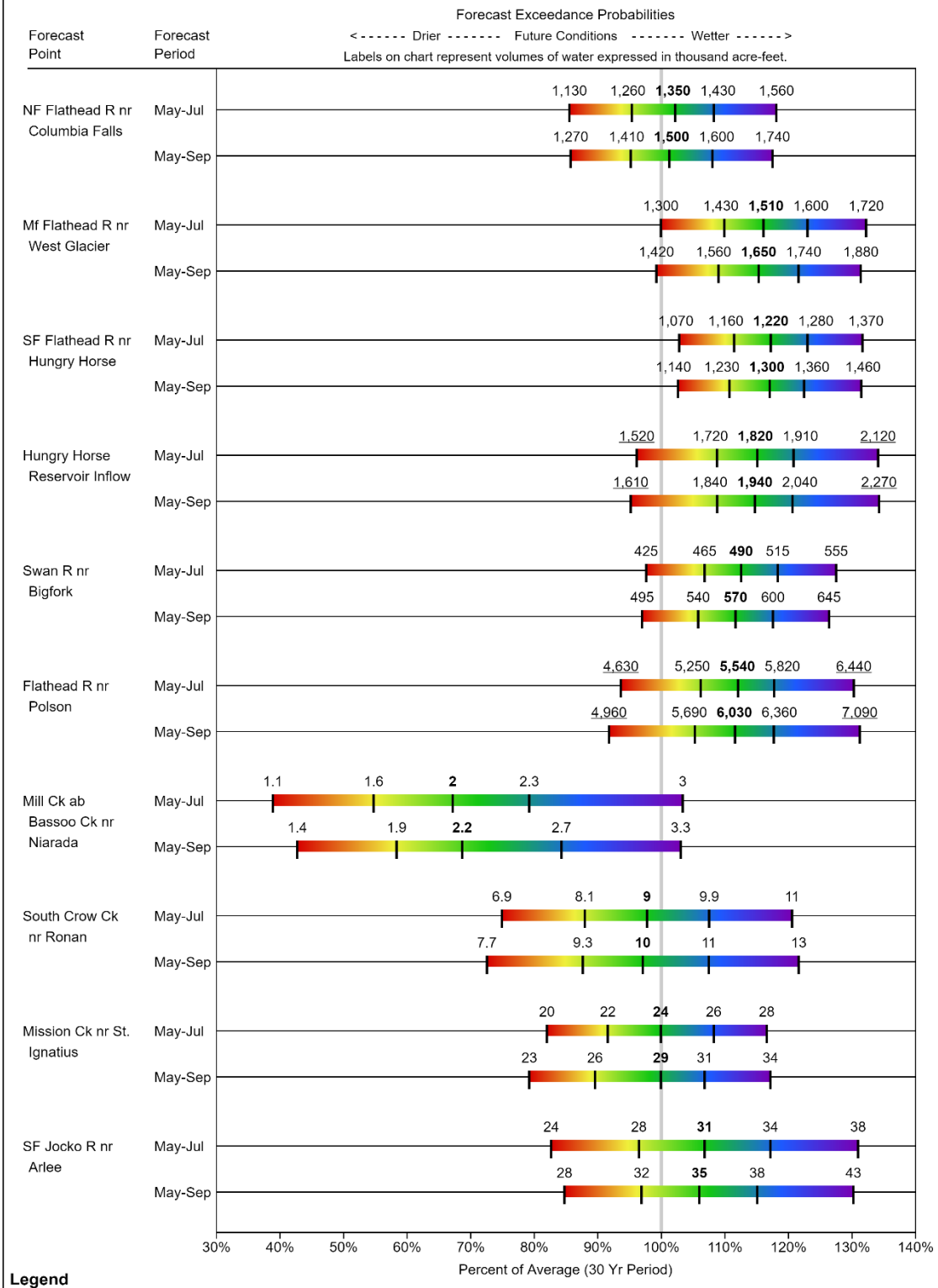


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

FLATHEAD RIVER BASIN

Water Supply Forecasts

May 1, 2020



Legend

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

Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

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

Upper Clark Fork River Basin

The Upper Clark Fork continues to hold slightly above normal snowpack, which was mostly built during February this year. March storms largely missed the region, and April continued this trend for much of the drainage, sparing the Clearwater that received above-normal precipitation. Most high elevation sites reached peak snowpack in the third week of April, which is typical for this area, and have transitioned into the melt phase of spring. Overnight lows are still reaching the freezing mark at high elevations, but as these temps gradually rise with the expected springtime conditions (NOAA 30-day prediction), the melt will continue to accelerate. Hopefully, with these conditions, snowmelt progresses slowly, stretching out our mountain reserves. In general, forecasts within the basin have declined from April 1st due to low elevation snowmelt, and abnormally dry April. Upper Clark Fork forecasts for the May 1st through July 31st period vary widely from slightly below average for some streams, to near average for the Blackfoot River. Water users are encouraged to view the individual streamflow forecasts, which can be seen in the forecast table below.

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	103%	115%
FLINT CREEK	102%	121%
ROCK CREEK	99%	102%
CLARK FORK ab BLACKFOOT	101%	114%
BLACKFOOT	124%	101%
Basin-Wide Snowpack	**108%**	**109%**

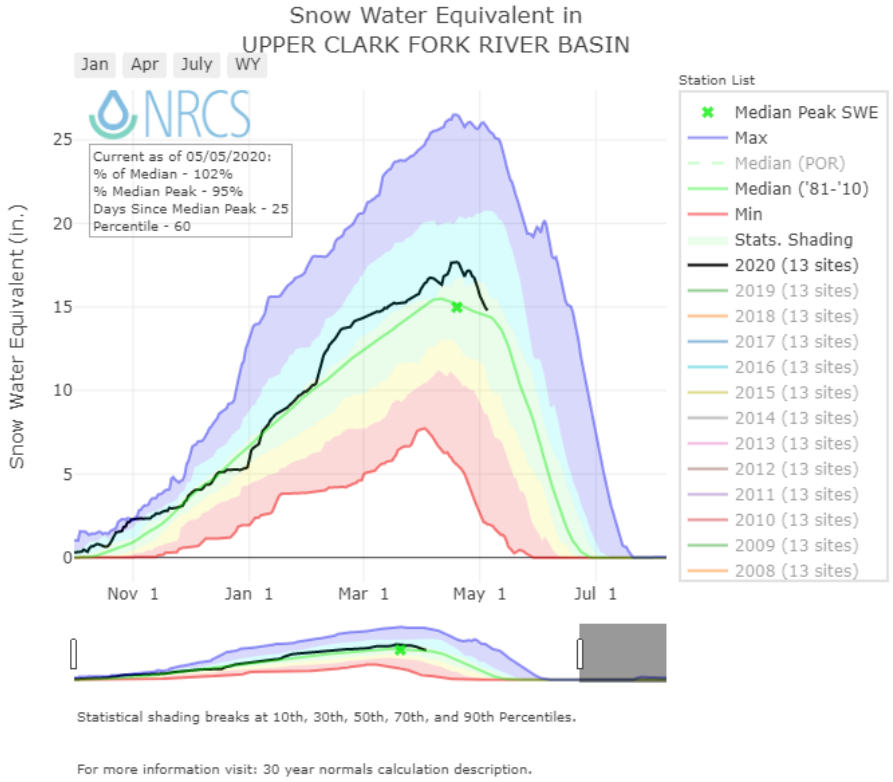
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	91%	90%	100%
Valley Precipitation	55%	49%	113%
Basin-Wide Precipitation	**90%**	**90%**	**100%**

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

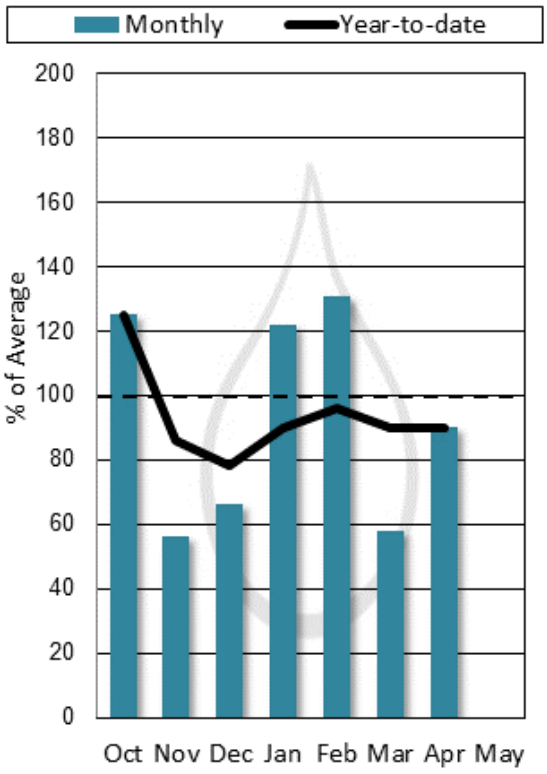
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**105%**	**84%**	**105%**

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

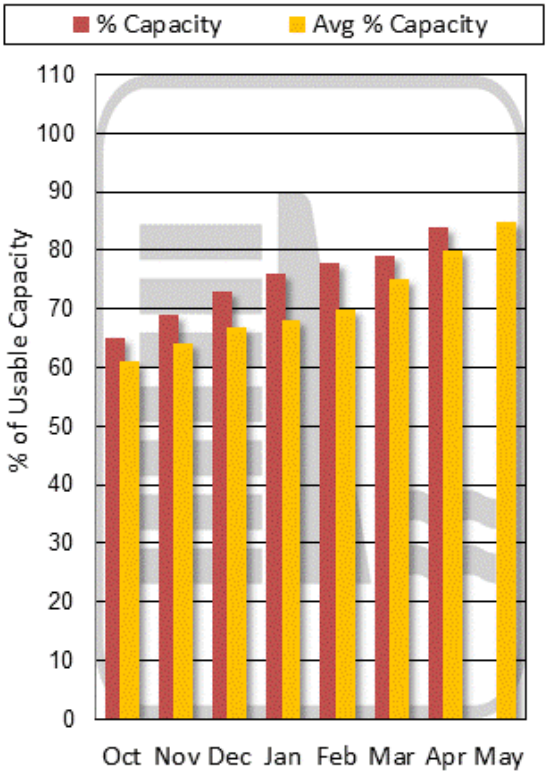
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage



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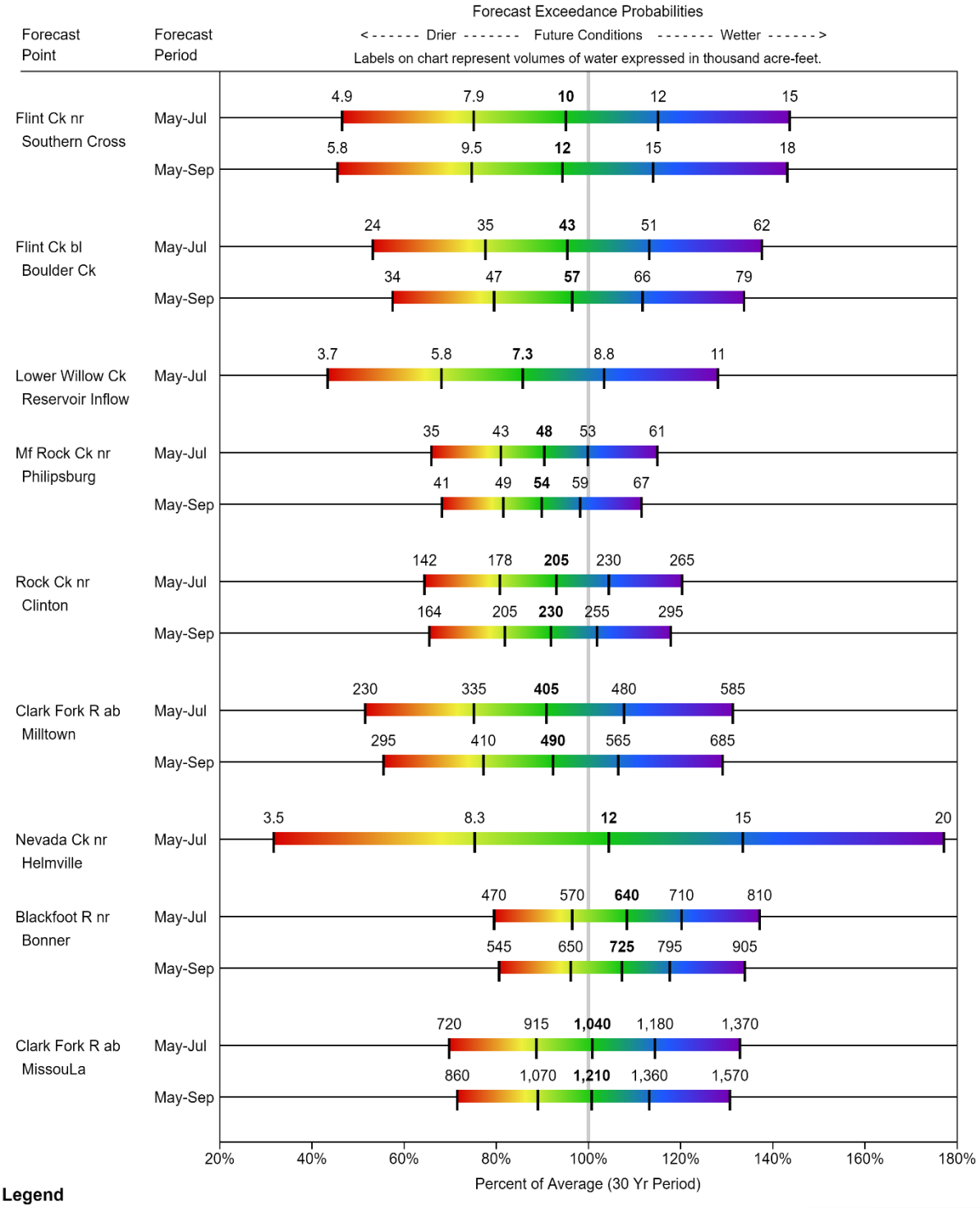
UPPER CLARK FORK RIVER BASIN

Water Supply Forecasts

May 1, 2020



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

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

Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

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

Bitterroot River Basin

The Bitterroot snowpack continues to be slightly above normal as of May 1st, with the Sapphires reporting ~80% of normal, while the Bitterroot Mountains are ~120% of normal. January and February storm systems stacked up snowpack in the basin, followed by average March precipitation, and April has capped off the accumulation season with a slightly below-average monthly total. All high elevation sites in the basin reached their snow water equivalent peak mid-month while mid-elevations peaked within the first week, very close to the median date. The slow warming trend of spring has gradually melted off low elevation snowpack while prolonging high elevation reserves that are still experiencing below freezing overnight lows. As the snowpack begins to react to above freezing overnight lows, melt-off will accelerate, and with seasonal temperatures expected hopefully it comes off gradually. The May 1st through July 31st streamflow forecasts reflect these conditions with near-average flows expected. Please reference the table below for conditions in your area of interest.

Bitterroot River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
WEST FORK BITTERROOT	109%	98%
EAST SIDE BITTERROOT	93%	103%
WEST SIDE BITTERROOT	120%	123%
Basin-Wide Snowpack	**108%**	**111%**

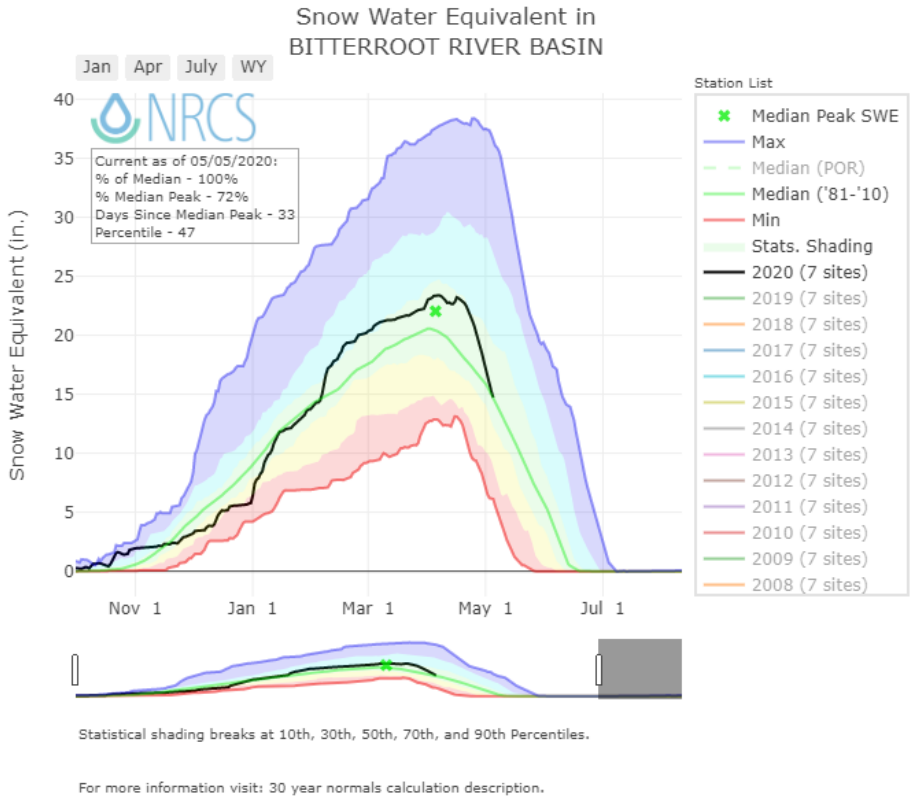
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	86%	91%	103%
Valley Precipitation	%	%	%
Basin-Wide Precipitation	**86%**	**91%**	**103%**

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

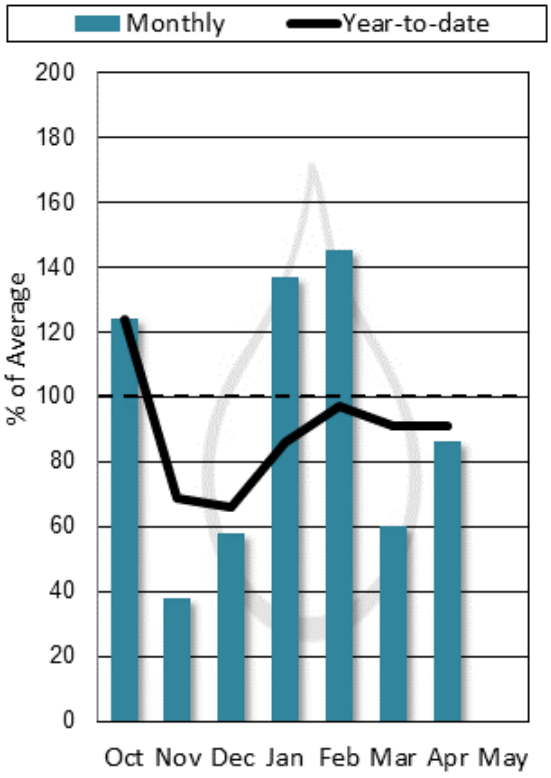
	Percentage of Average	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**106%**	**65%**	**134%**

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

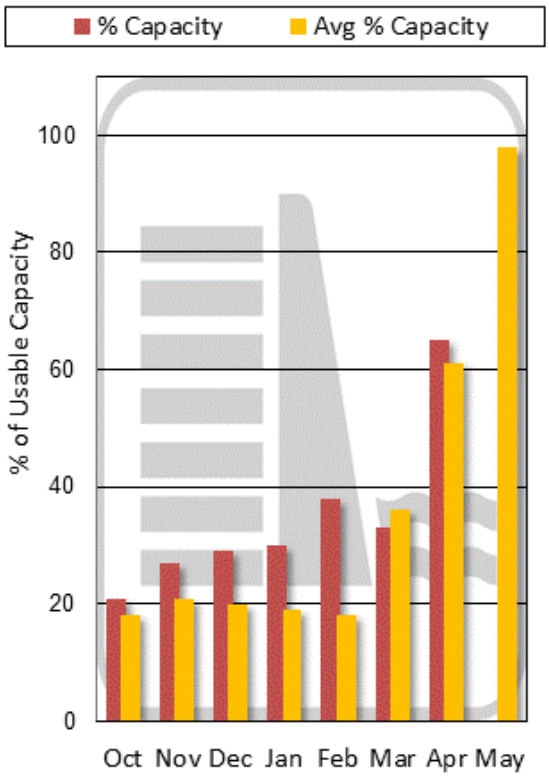
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

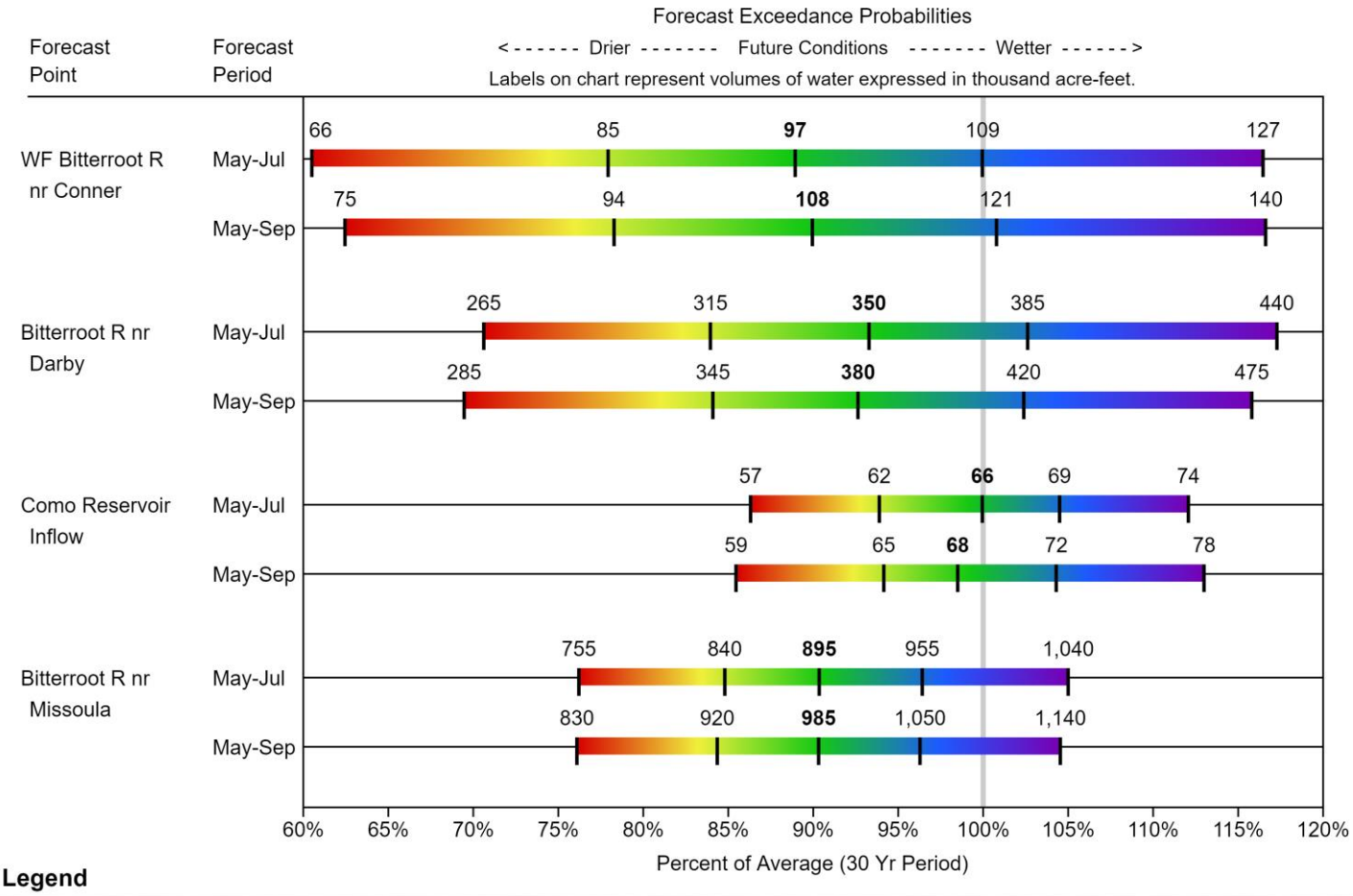


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

BITTERROOT RIVER BASIN

Water Supply Forecasts

May 1, 2020



Legend

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

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

Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

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

Lower Clark Fork River Basin

The Lower Clark Fork was one of the only basins in the state to receive near-normal precipitation during April. In particular, Reservation Divide and the Southern Swan Range captured several storms, receiving 150% of normal April precipitation. Snowpack continues to hold strong as of May 1st. Upstream of the Lower Clark Fork, snowpack in the Bitterroot, Upper Clark Fork and Flathead drainages are all near or above normal. All of these basins have also reached, if not passed their snowpack peak for this winter, and have entered the melt phase of spring. With near or above-normal snowpack in the Lower Clark Fork and all tributaries upstream, mainstem flows are expected to be near normal for the May 1st – July 31st period. For individual streamflow forecasts, please reference the table below.

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	114%	106%
Basin-Wide	**114%**	**106%**

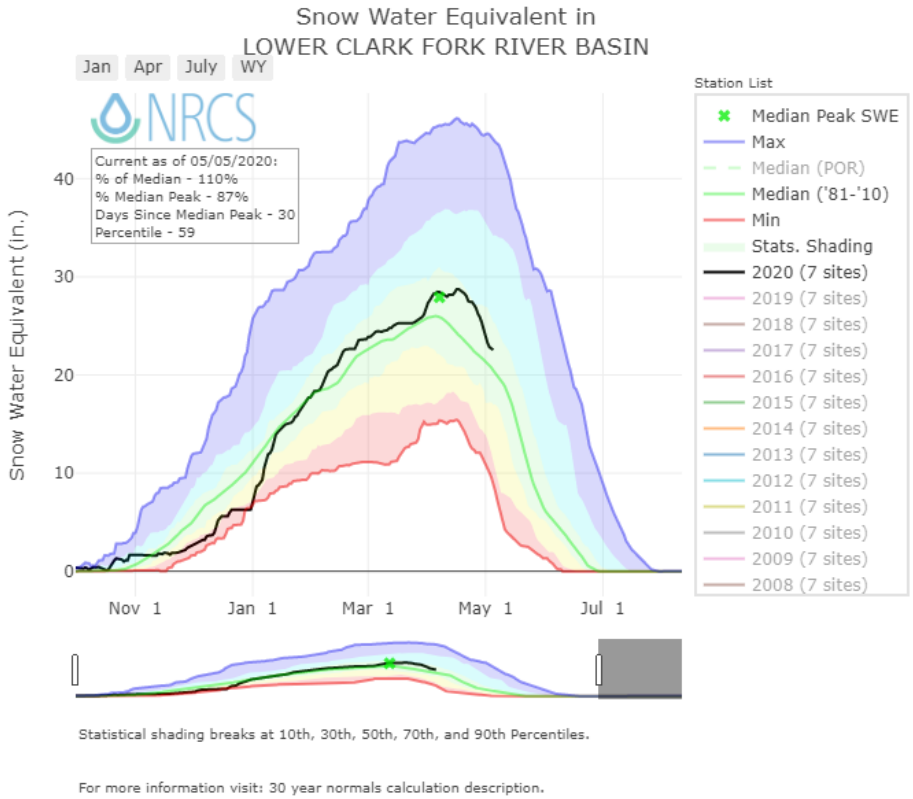
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	102%	91%	91%
Valley Precipitation	148%	90%	159%
Basin-Wide Precipitation	**104%**	**91%**	**93%**

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

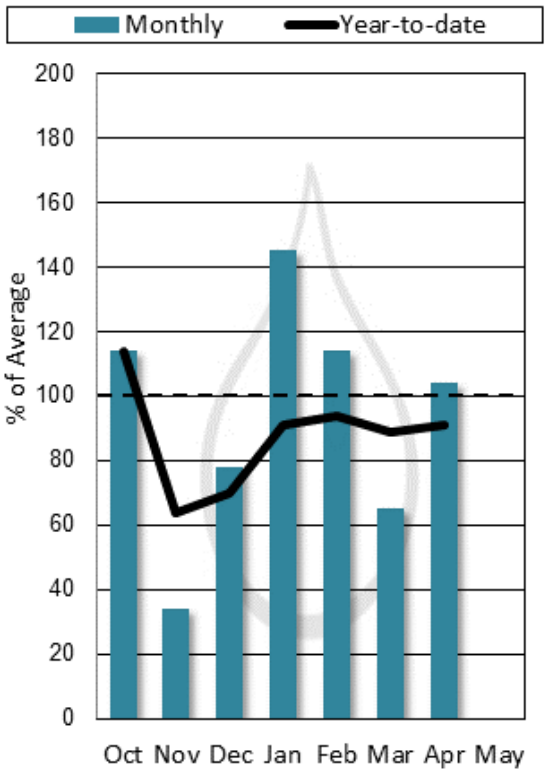
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**95%**	**87%**	**97%**

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

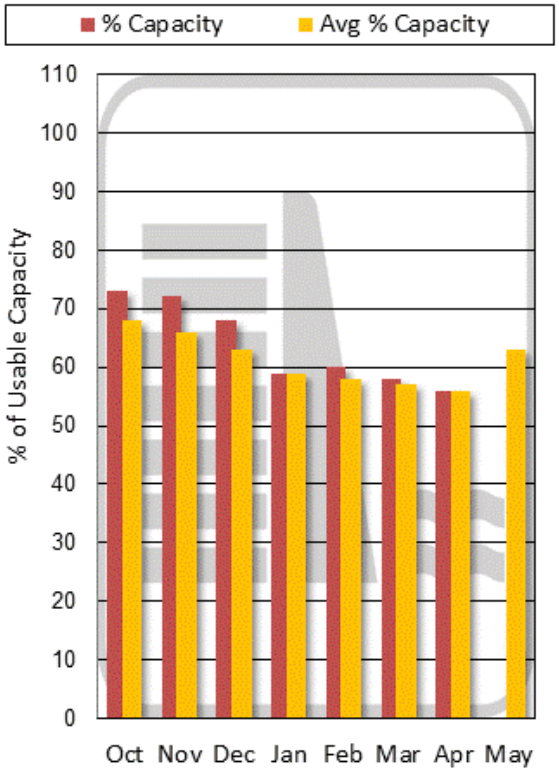
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

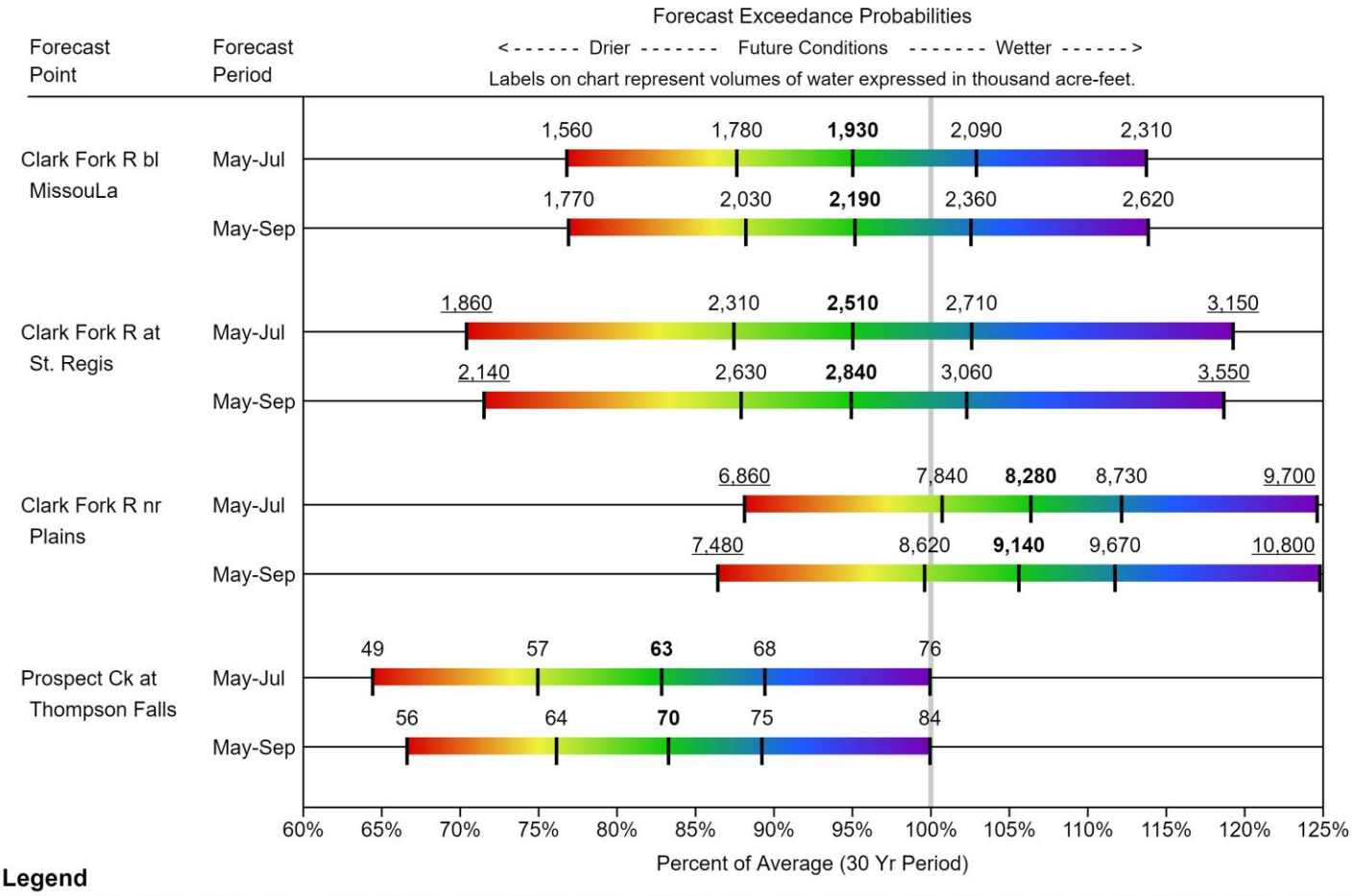


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

LOWER CLARK FORK RIVER BASIN

Water Supply Forecasts

May 1, 2020



Legend

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

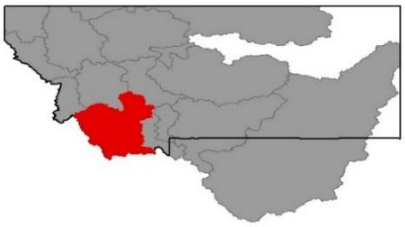
Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

Period of Record Maximum Streamflow KAF (Year)

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



Jefferson River Basin

The month of April didn't yield much in the way of mountain or valley precipitation; most weather stations reported well below normal totals for the month. Although it was a dry month, the snowpack was able to hold strong in many locations, with some small gains occurring through mid-month at mid and high elevation weather stations. Low elevation SNOTEL sites in the basin made the transition to melt at the beginning of April, and mid-elevation SNOTEL sites made the transition to melt at the end of the third week of the month. Only one high elevation site, Darkhorse Lake SNOTEL located in the southern Beaverhead Range, continues to gain snowpack as of May 1st. Peak snowpack this year was near to slightly above normal for most sites within the basin. With most of the basin transitioning to melt, streams in the region are on the rise, with some of them rising quickly due to accelerated snowmelt. Currently, snowmelt is ahead of schedule in many areas due to the abundant sunshine and above-average temperatures. The dry April and early snowmelt have resulted in streamflow forecasts for the May 1st to July 31st period which are decreased from last month, with some forecast points now having below average volumes forecasted. Water users are encouraged to review the forecast graphic below for specific rivers of interest.

Jefferson River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
BEAVERHEAD	92%	99%
RUBY	99%	106%
BIGHOLE	96%	100%
BOULDER	96%	121%
Basin-Wide Snowpack	**94%**	**105%**

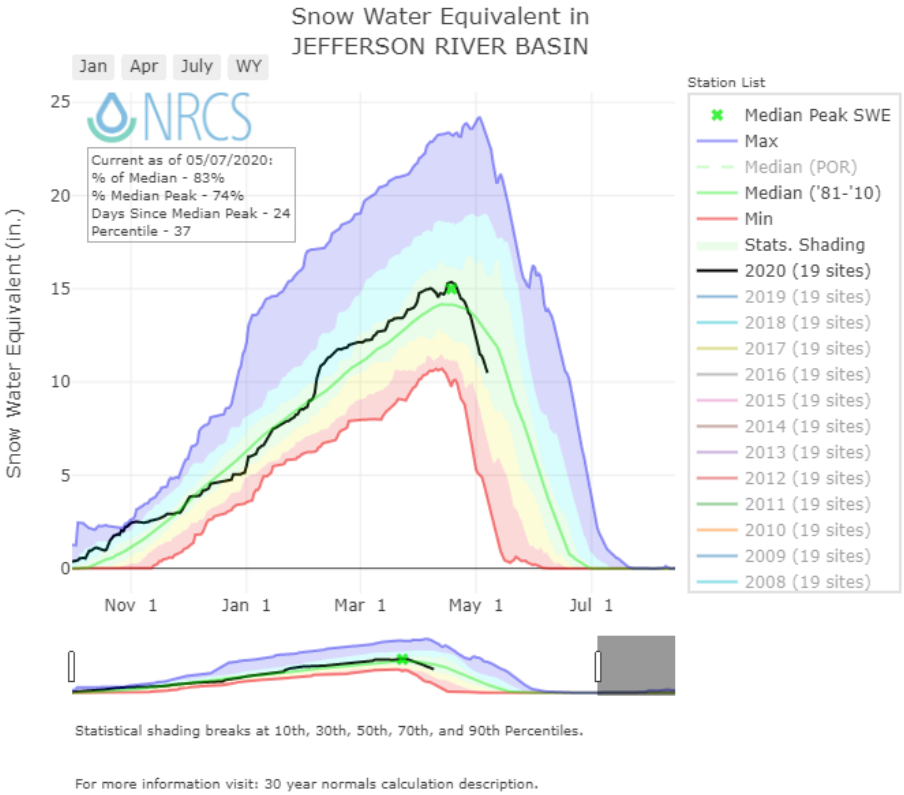
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	66%	91%	104%
Valley Precipitation	%	%	%
Basin-Wide Precipitation	**66%**	**91%**	**104%**

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

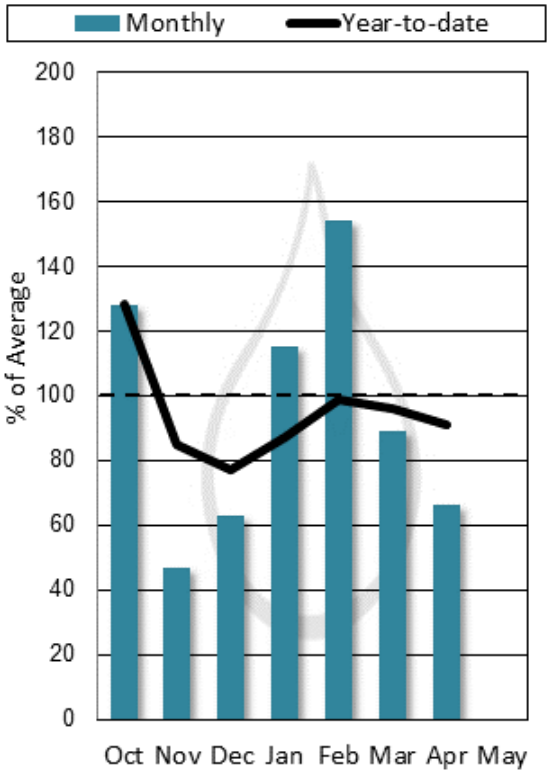
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**118%**	**72%**	**120%**

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

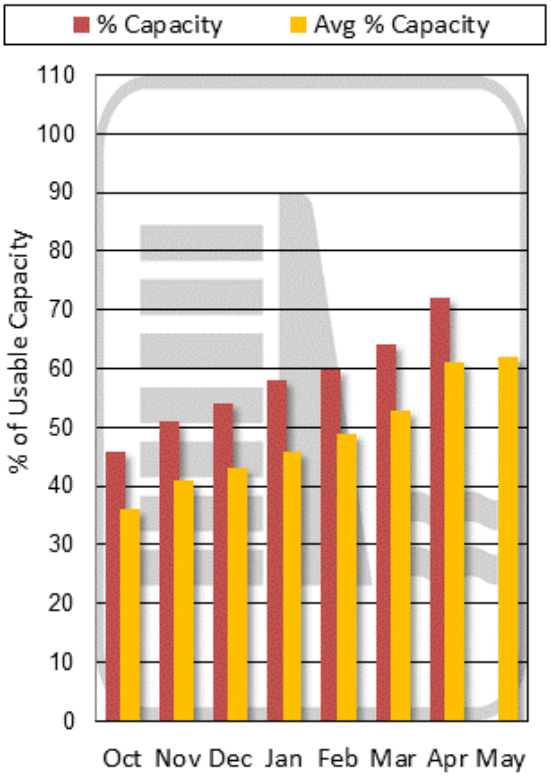
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

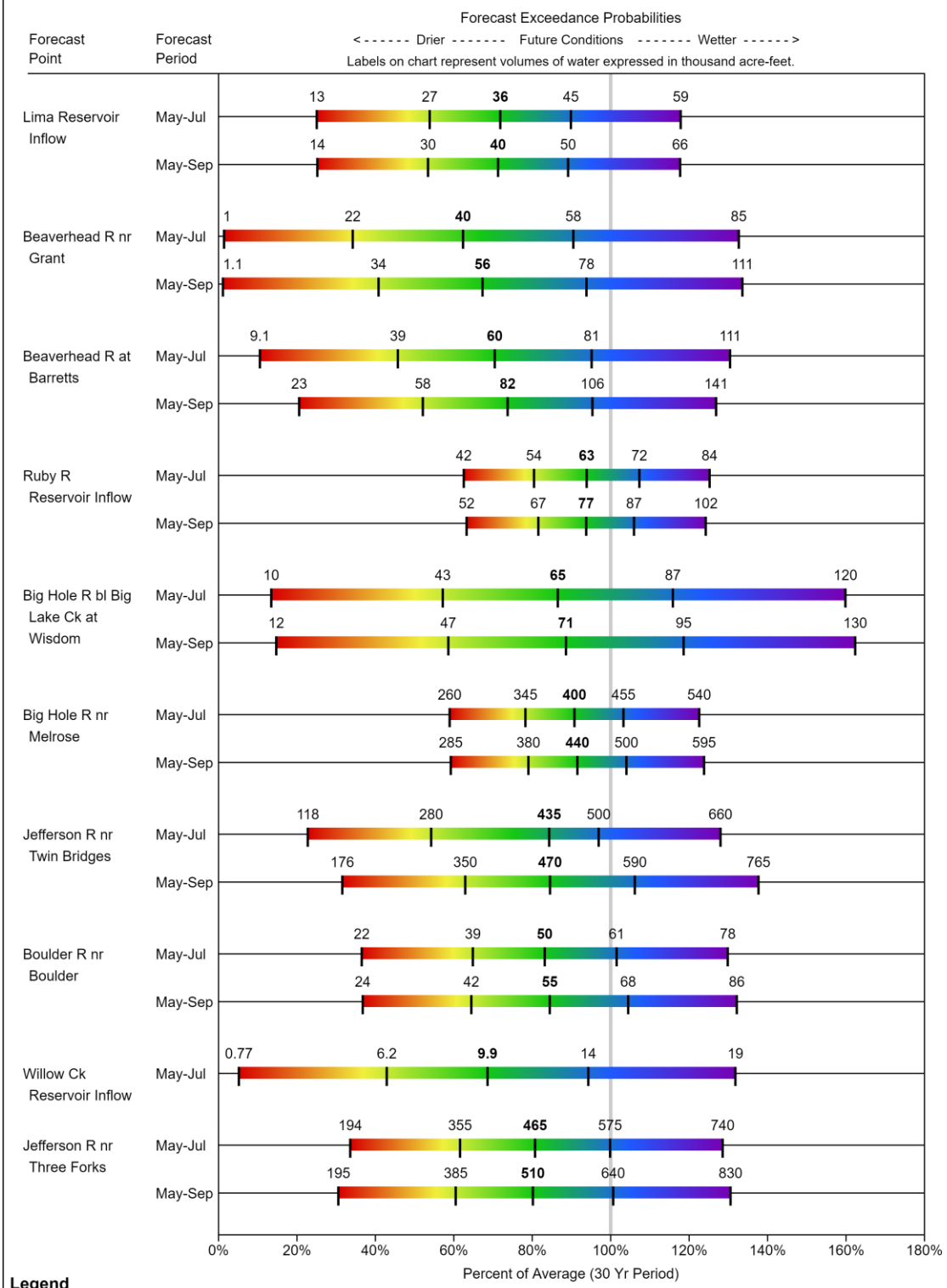


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

JEFFERSON RIVER BASIN

Water Supply Forecasts

May 1, 2020



Legend

95% or 90% Exceedance — There is a 95%/90% chance that flows will exceed this volume

70% Exceedance — There is a 70% chance that flows will exceed this volume

50% Exceedance — There is a 50% chance that flows will exceed this volume

30% Exceedance — There is a 30% chance that flows will exceed this volume

10% or 5% Exceedance — There is a 10%/5% chance that flows will exceed this volume

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

Period of Record Minimum Streamflow KAF (Year)

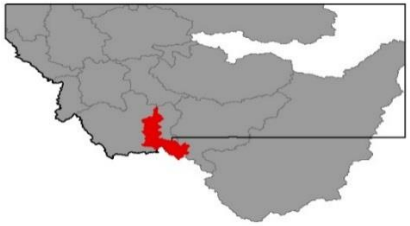
1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

Period of Record Maximum Streamflow KAF (Year)

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

Madison River Basin



If April showers bring May flowers, what happens if it doesn't rain (or snow) during April? Well, you must rely on the snowpack that you had in place on April 1st to get you through the runoff season. Fortunately, snowpack was near to slightly above normal within the Madison River basin on April 1st, and it remains near to slightly above normal on May 1st. The snowpack made marginal gains through the middle of the month at most mid and high elevation locations before transitioning to accelerated melt during the third week of the month, which wiped out what little gains there were. Low elevations began their transition to melt at the end of the first week of the month, and some low elevation SNOTEL sites and snow courses were snow-free on May 1st. The persistence of bright sunny days and above-average temperatures has taken its toll on the snowpack, which is coming out an accelerated rate. The combination of below-normal April snowfall/precipitation and faster than normal melt at low and mid-elevations, has resulted in decreased streamflow forecasts from last month. Inflow forecasts for Hebgen Lake and Ennis Lake are slightly below average for the May 1st – July 31st period. However, above-average carryover storage from last year's runoff may help to offset the decreased inflows this spring and summer.

Madison River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
MADISON abv HEBGEN LAKE	89%	120%
MADISON blw HEBGEN LAKE	95%	108%
Basin-Wide Snowpack	**93%**	**112%**

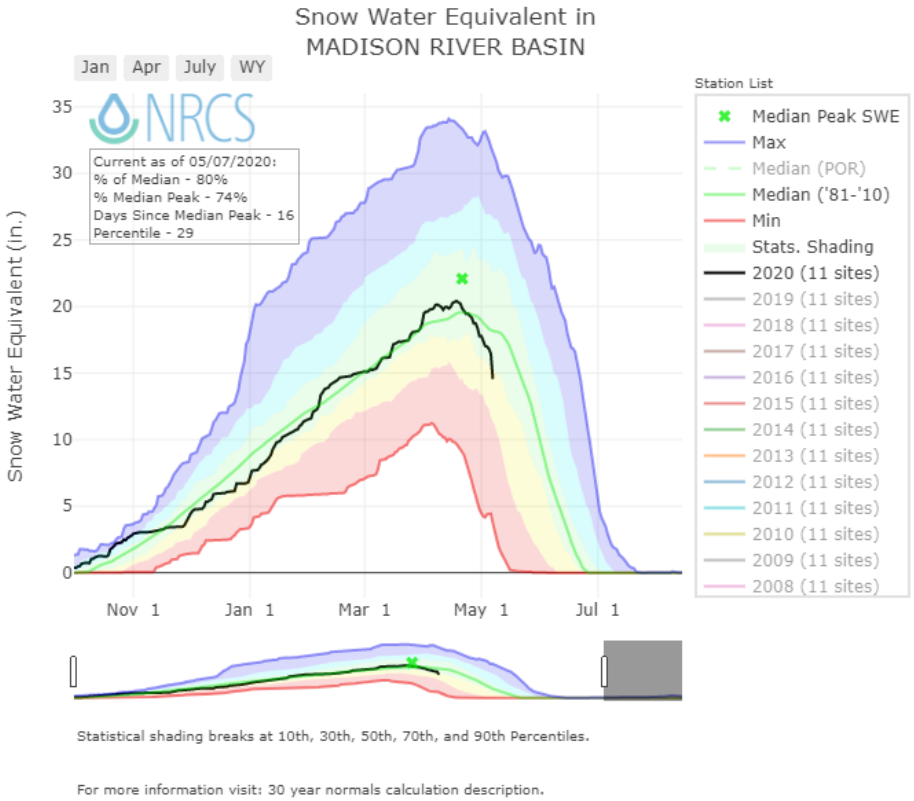
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	65%	88%	112%
Valley Precipitation	69%	93%	148%
Basin-Wide Precipitation	**65%**	**89%**	**115%**

*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%**	**80%**	**102%**

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

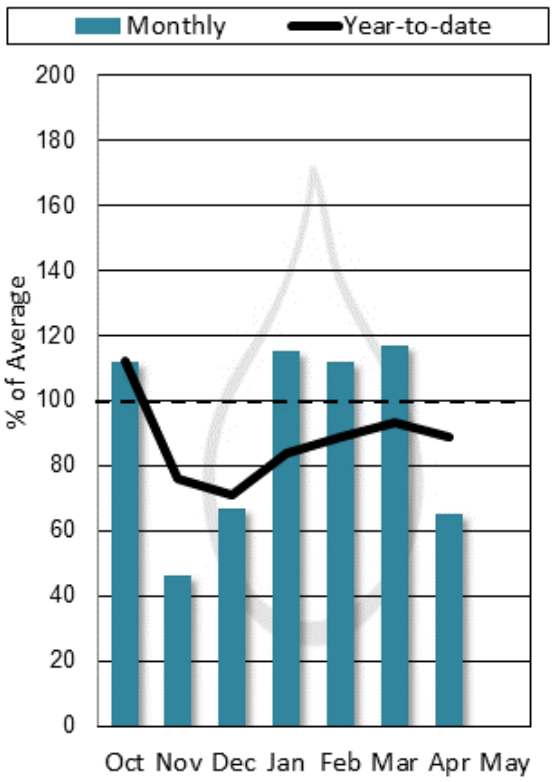
(click to navigate to online version with additional features)



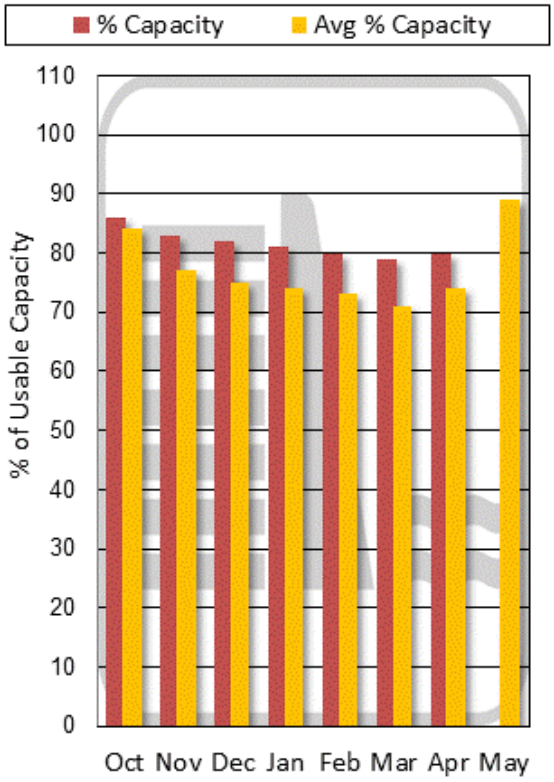
Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.

For more information visit: 30 year normals calculation description.

Mountain and Valley Precipitation



End of Month Reservoir Storage

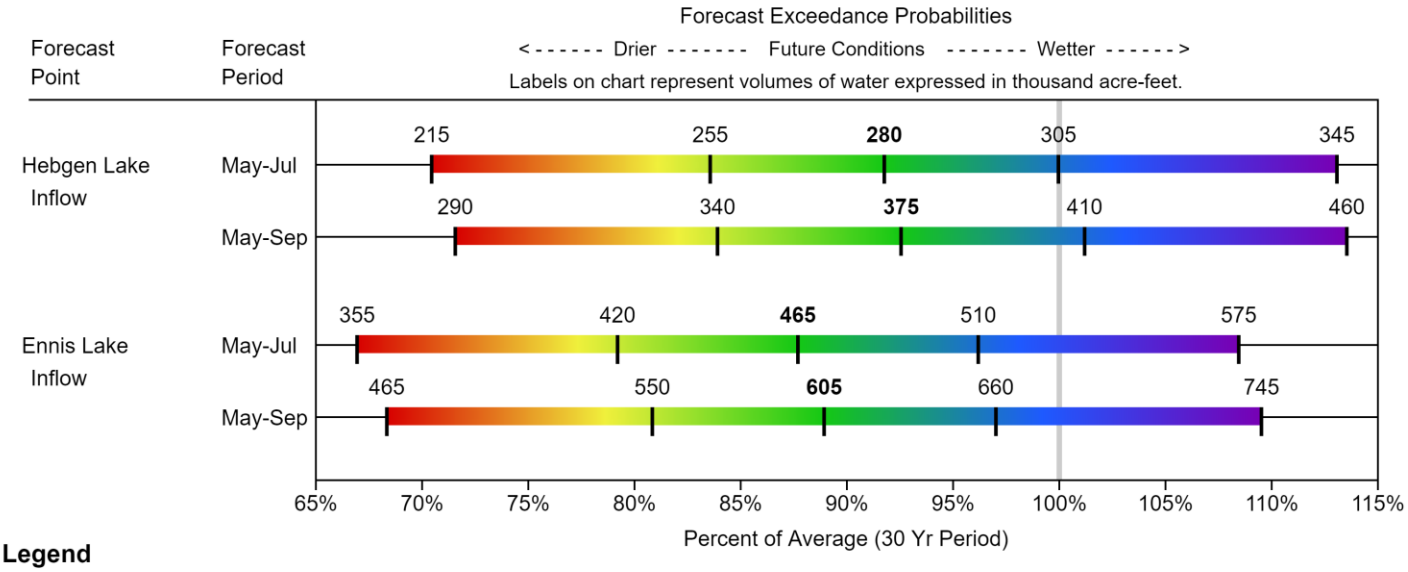


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

MADISON RIVER BASIN

Water Supply Forecasts

May 1, 2020



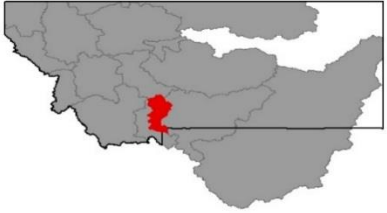
Legend

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

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

Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

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



Gallatin River Basin

The significant gains in snow water as a result of the cool and snowy March were eroded by a very dry April. A couple of modest storms in the first half of the month favored the northern half of the Gallatin River basin, where 70%-80% of normal precipitation fell in the form of snow in the Bridger and northern Gallatin ranges. Sites further south and west in the Madison range only picked up 40-60% of normal precipitation for the month. Overall basin-wide precipitation in the mountains for April was 64% of average while valley precipitation was even less impressive at 49% of average. Despite the dry April, mountain locations have received above-average precipitation for the water year, and current snowpack remains at 106% of average, which bodes well for streamflow and reservoir storage. Upper elevations are still holding deep snow and will either maintain or continue to accumulate during significant spring snow events in the first half of May. Snowpack at low and mid-elevations reached its seasonal peak in mid-April and began to decline rapidly during the last week of the month. Forecasts issued on May 1st indicate slightly above average flows for the spring and summer. May and June are traditionally wet months in southwest Montana, so volumetric river forecasts will partially hinge on the weather pattern that develops over the next six weeks.

Gallatin River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
UPPER GALLATIN	*95%*	*111%*
HYALITE	*128%*	*109%*
BRIDGER	*103%*	*140%*
Basin-Wide Snowpack	**106%**	**117%**

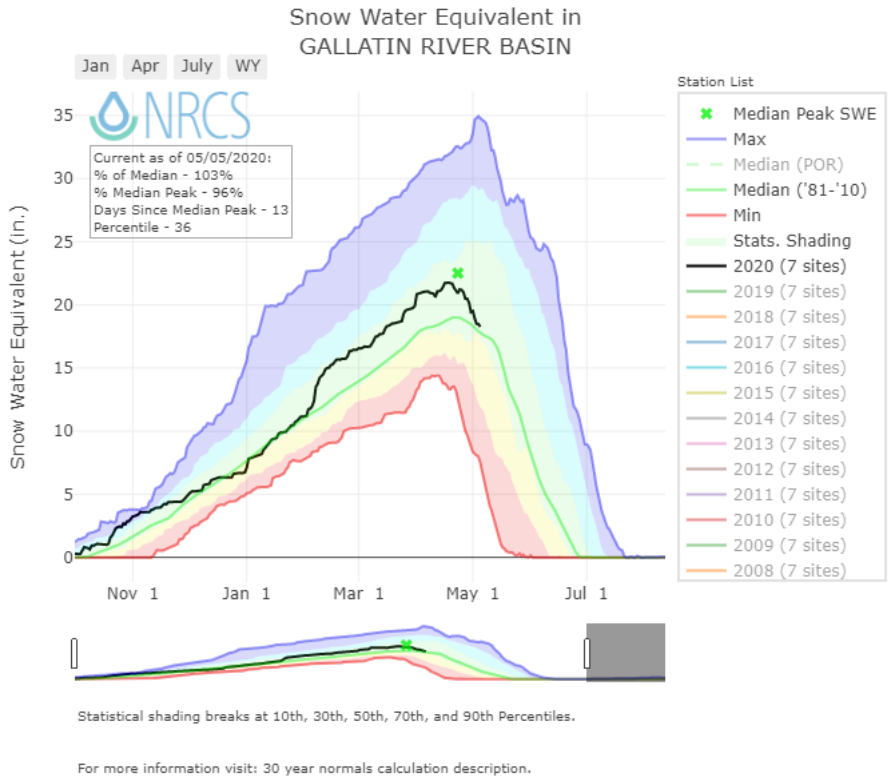
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	64%	105%	120%
Valley Precipitation	49%	78%	130%
Basin-Wide Precipitation	**62%**	**103%**	**121%**

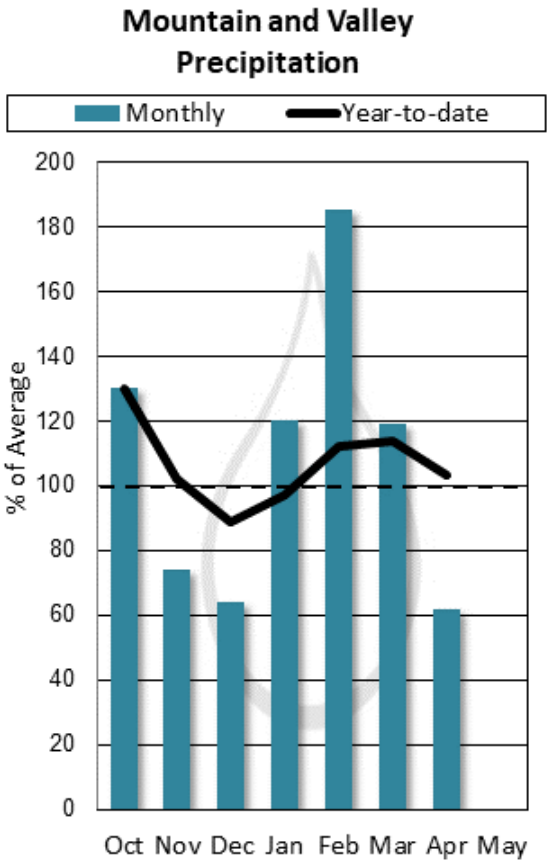
*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

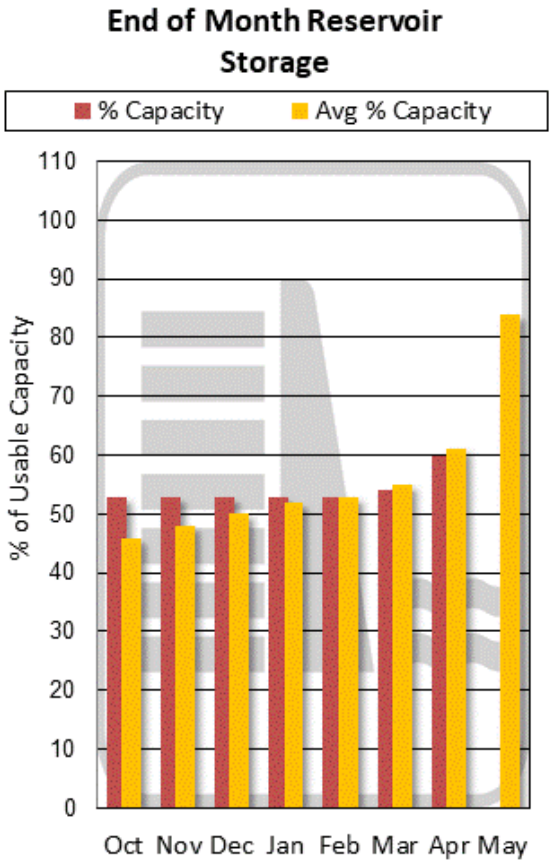
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**98%**	**60%**	**104%**

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

(click to navigate to online version with additional features)





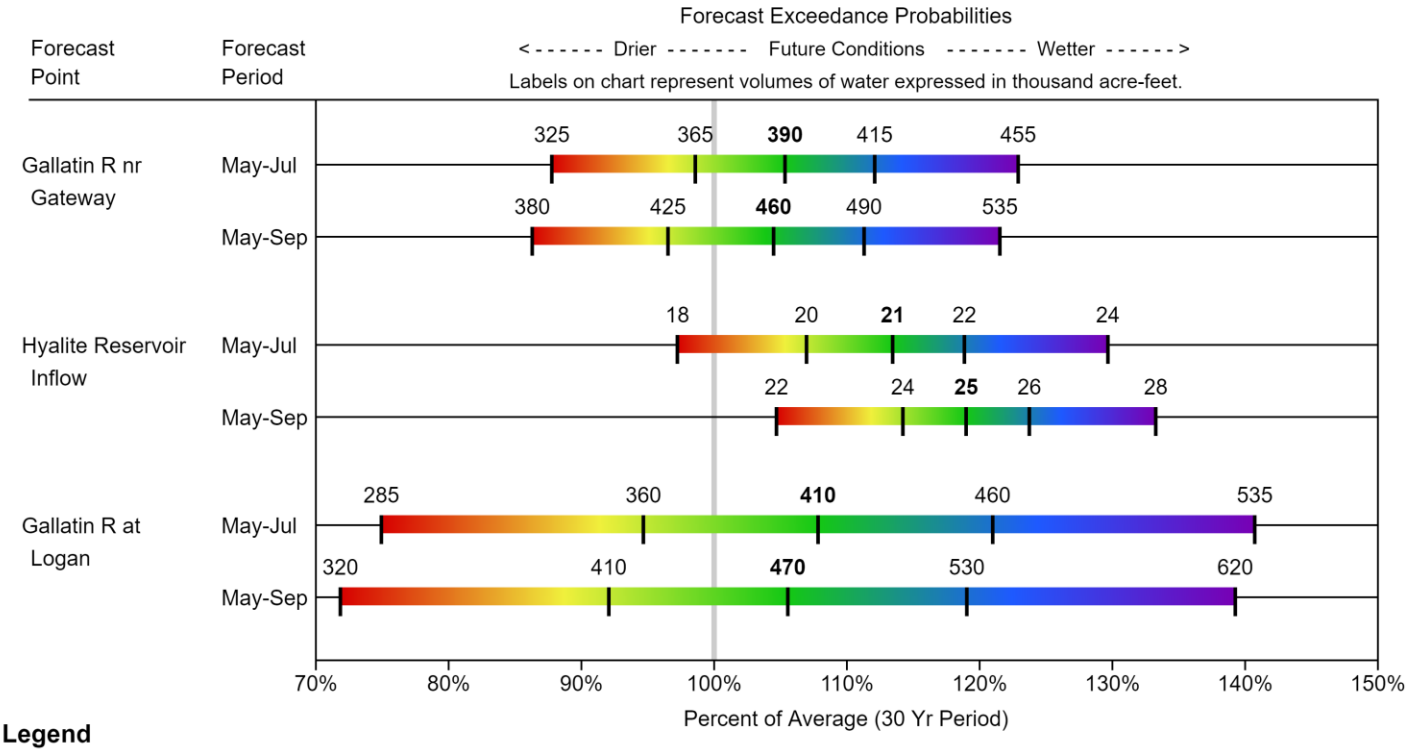


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

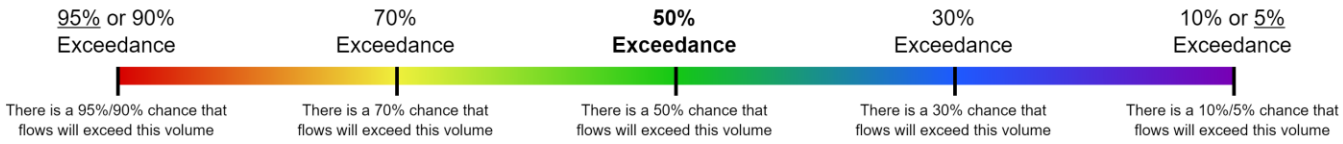
GALLATIN RIVER BASIN

Water Supply Forecasts

May 1, 2020



Legend



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

Period of Record Minimum Streamflow KAF (Year)

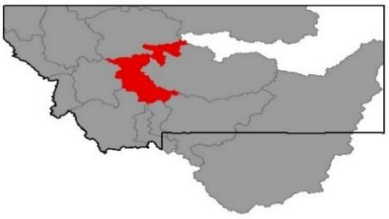
1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

Period of Record Maximum Streamflow KAF (Year)

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

Headwaters Mainstem (Missouri) River Basin



April didn't yield the precipitation we were hoping for in the mountains and valley surrounding the Missouri River below Toston. Unlike last month, valley locations received below-average precipitation for the month, and mountain locations would suffer the same fate. Snowmelt would begin in earnest during April. Lower elevation SNOTEL sites began melting mid-month and have melted at an accelerated rate this year. Both the Tizer Basin SNOTEL and Frohner Meadows SNOTEL are snow-free on May 1st, which is about two to three weeks earlier than expected. Mid and high elevation sites have also been melting at an accelerated rate since late April and range from below normal to near normal on May 1st. The dry April and early snowmelt have resulted in streamflow forecasts for the May 1st to July 31st period which are decreased from last month, with some forecast points now having slightly below average volumes forecasted. Water users are encouraged to review the forecast graphic below for specific rivers of interest.

Headwaters Missouri Mainstem River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
HEADWATERS MAINSTEM	96%	116%
Basin-Wide Snowpack	**96%**	**116%**

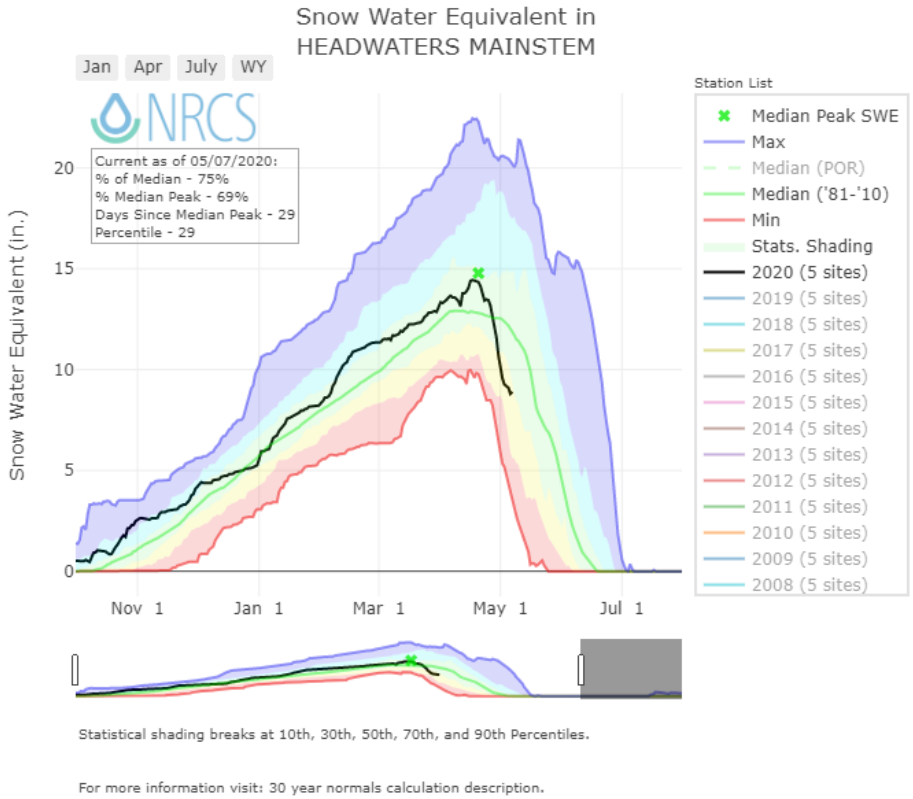
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	73%	94%	110%
Valley Precipitation	73%	101%	156%
Basin-Wide Precipitation	**73%**	**94%**	**112%**

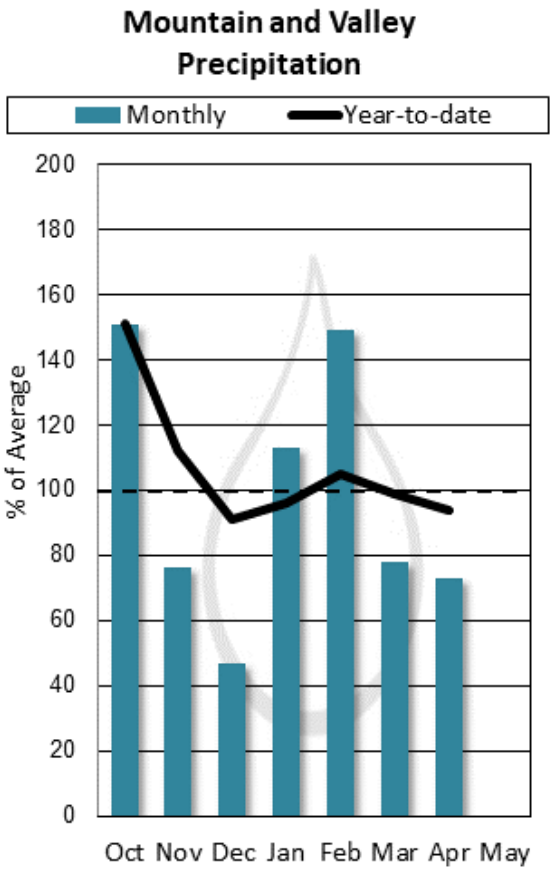
*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

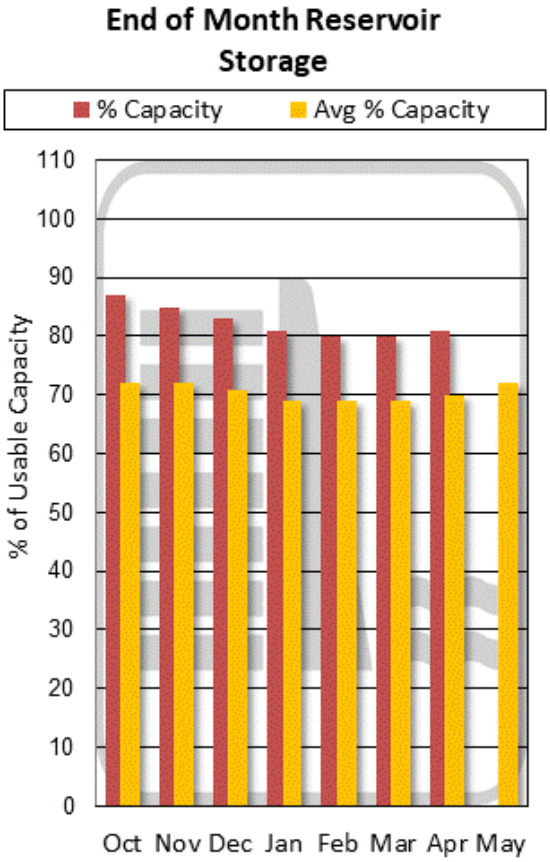
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**115%**	**81%**	**122%**

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

(click to navigate to online version with additional features)





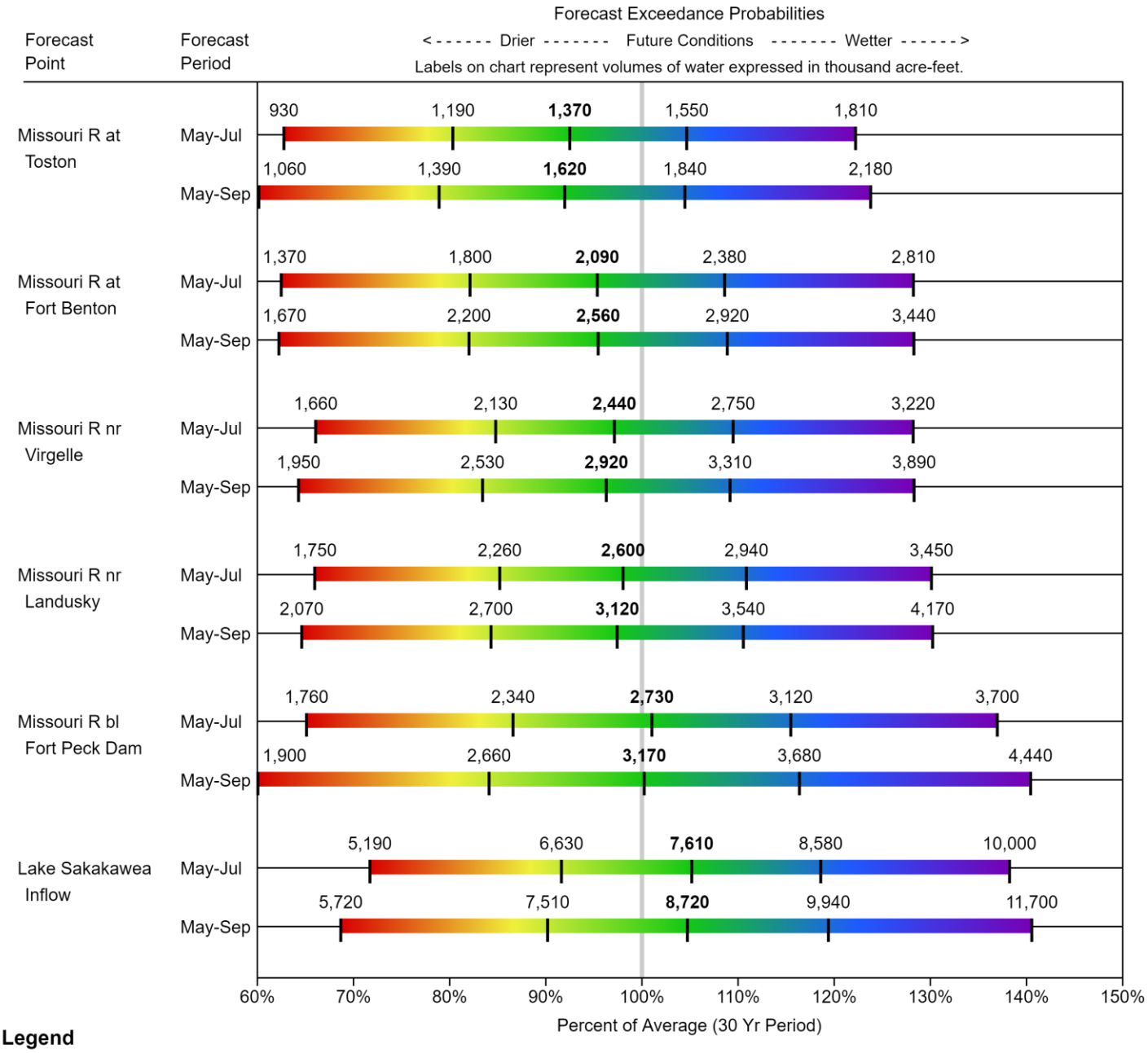


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

MISSOURI MAINSTEM BASIN

Water Supply Forecasts

May 1, 2020



Legend

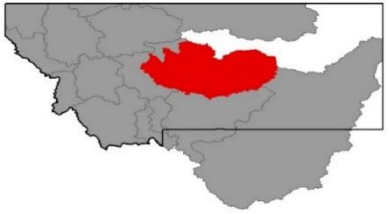
95% or 90% Exceedance	70% Exceedance	**50% Exceedance**	30% Exceedance	10% or 5% Exceedance
There is a 95%/90% chance that flows will exceed this volume	There is a 70% chance that flows will exceed this volume	There is a 50% chance that flows will exceed this volume	There is a 30% chance that flows will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

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

Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

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

Smith-Judith-Musselshell River Basin



Precipitation was slightly below average at most SNOTEL sites in the Smith-Judith-Musselshell River basin during April. Most of the precipitation arrived during the first half of the month when temperatures were cool. On the night of April 13th, temperatures dropped to -4 degrees F, which is a near-record low for that date. The 2nd half of the month brought significantly warmer temperatures, and on April 29th, temperatures reached 70 degrees F, a near-record high. The basin-wide snowpack peaked for the season with a well above normal conditions on April 19th, which is about a week later than typical. High temperatures combined with a lot of sunshine initiated significant snowmelt during the last week of April. Currently, the basin-wide snowpack is above normal, and streamflows are on the rise. Streamflow forecasts for the May 1st – July 31st period indicate near to slightly above average volumes are possible this spring and summer.

Smith Judith Musselshell River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
SMITH	109%	121%
HIGHWOOD	%	%
JUDITH	124%	112%
MUSSELSHELL	110%	148%
Basin-Wide Snowpack	**113%**	**122%**

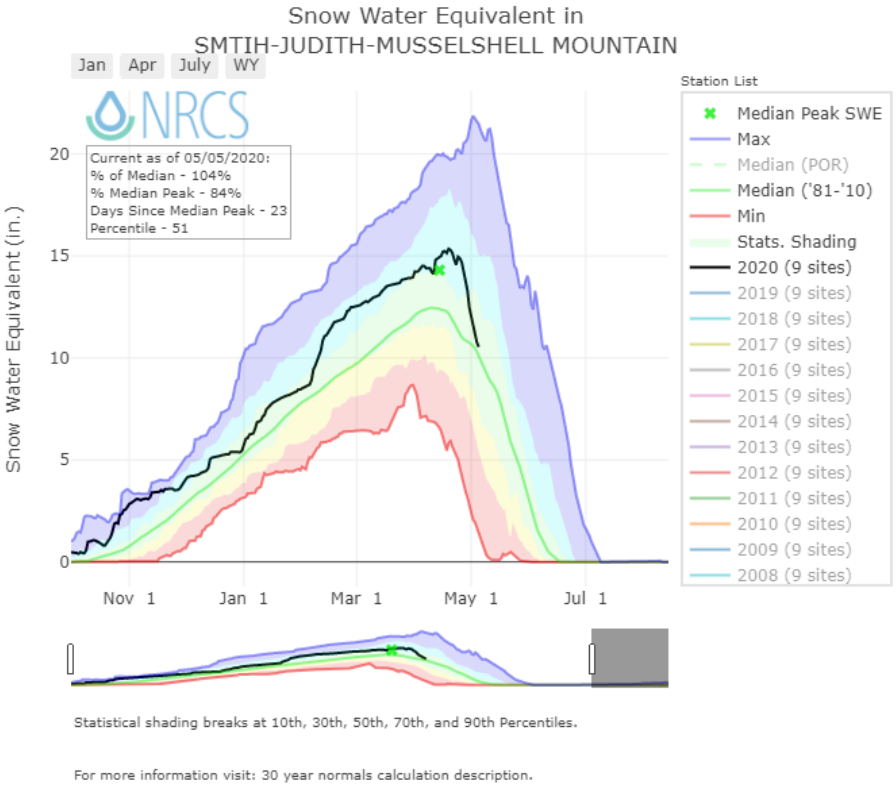
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	82%	96%	107%
Valley Precipitation	71%	80%	107%
Basin-Wide Precipitation	**81%**	**95%**	**107%**

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

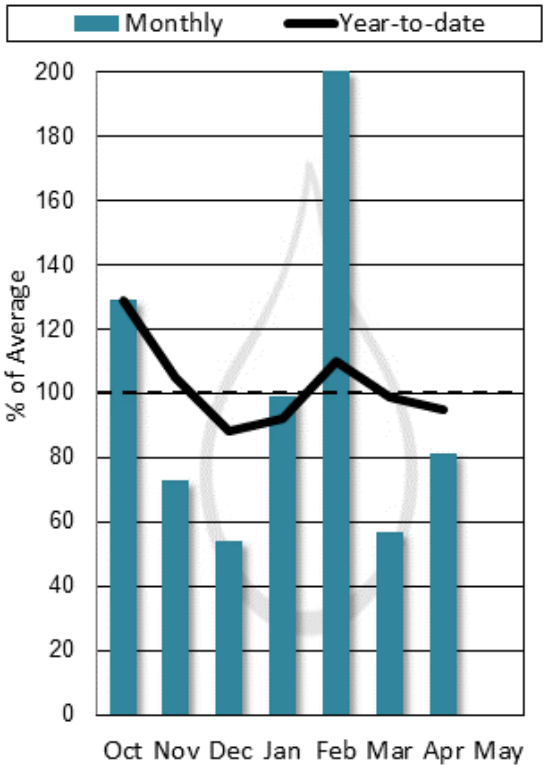
Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**142%**	**94%**	**142%**

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

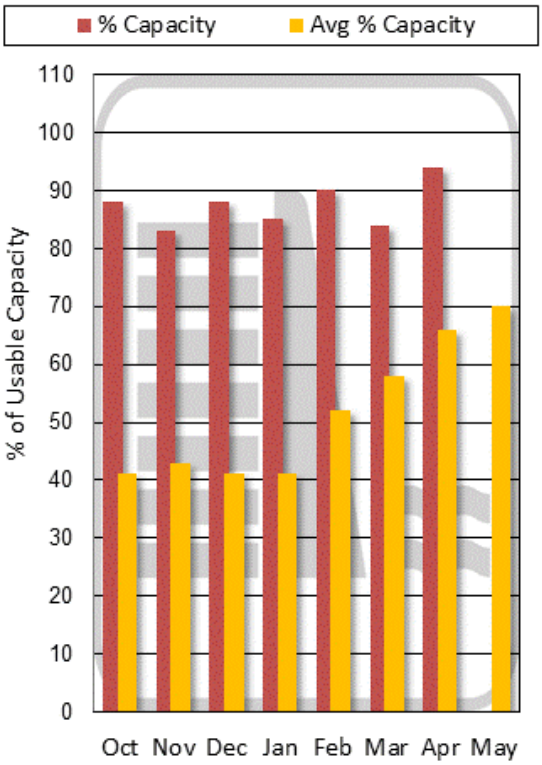
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

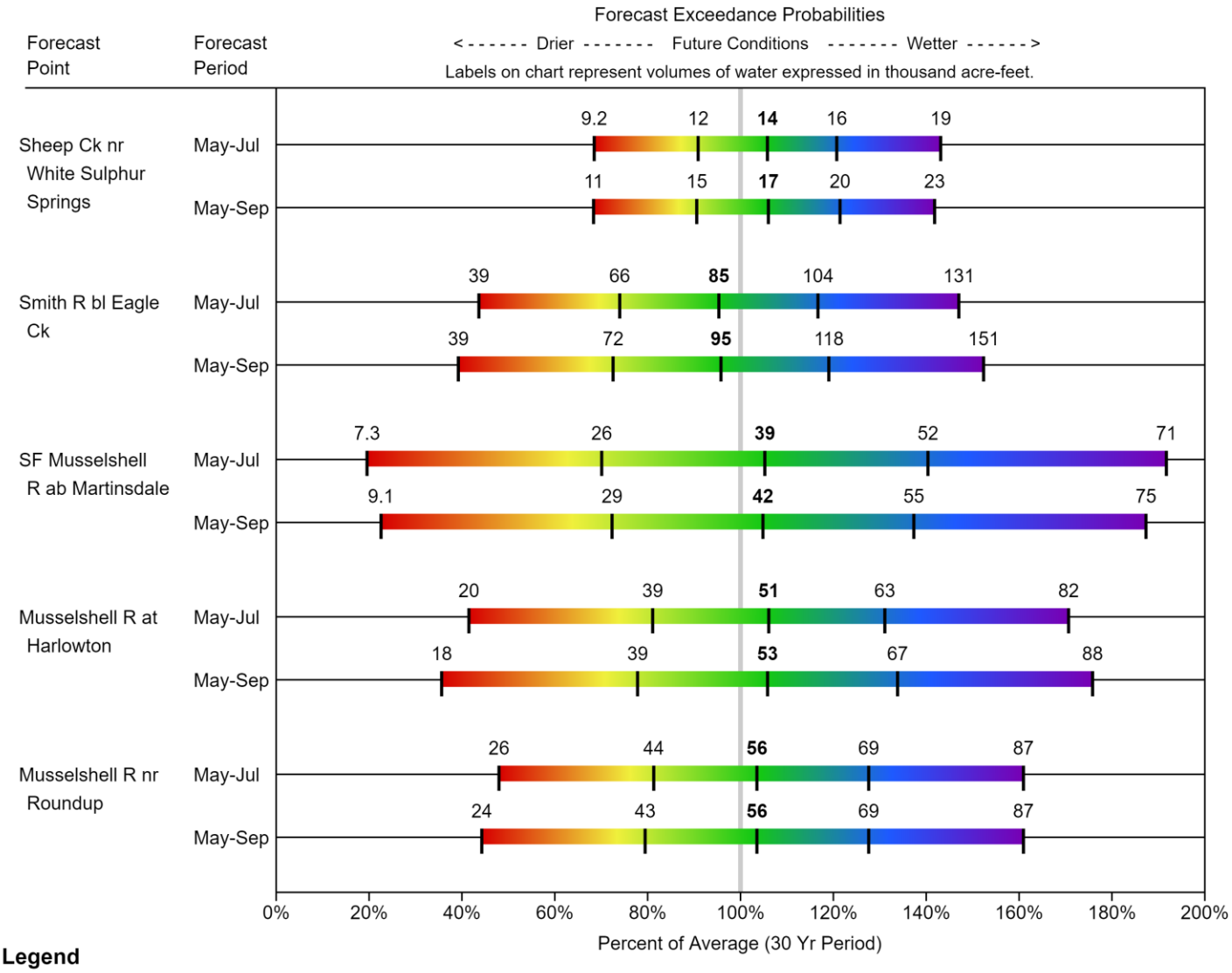


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

SMITH-JUDITH-MUSSELSHELL

Water Supply Forecasts

May 1, 2020



Legend

95% or 90% Exceedance | 70% Exceedance | **50% Exceedance** | 30% Exceedance | 10% or 5% Exceedance

There is a 95%/90% chance that flows will exceed this volume

There is a 70% chance that flows will exceed this volume

There is a 50% chance that flows will exceed this volume

There is a 30% chance that flows will exceed this volume

There is a 10%/5% chance that flows will exceed this volume

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

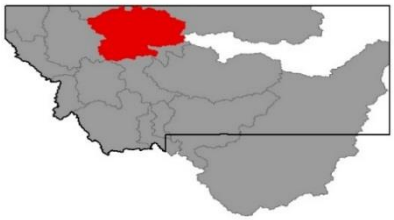
Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

Period of Record Maximum Streamflow KAF (Year)

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



Sun-Teton-Marias River Basin

This snow accumulation season started with the record-breaking storms of late September and October. November was a relatively dry month, but since then, precipitation has been near average. April continued the trend with average precipitation. The first part of the April brought well below-average temperatures, while the second half of the month brought sunshine and near-record high temperatures. At Badger Pass SNOTEL (6900 ft elevation), located above Swift Reservoir, temperatures reached nearly 70 degrees on April 29th. The wide basin snowpack peaked above normal on April 19th, which is about a week later than normal, and it is currently melting fast. Streams and rivers are on the rise, including the North Fork of the Sun and Dearborn Rivers, which are flowing at near-record high stages for May 1st. Streamflow forecasts for the May 1st – July 31st period indicate near to slightly above average volumes are possible this spring and summer.

Sun-Teton-Marias River Basin Data Summary

Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
SUN	127%	102%
TETON	143%	121%
MARIAS	137%	97%
Basin-Wide Snowpack	**138%**	**103%**

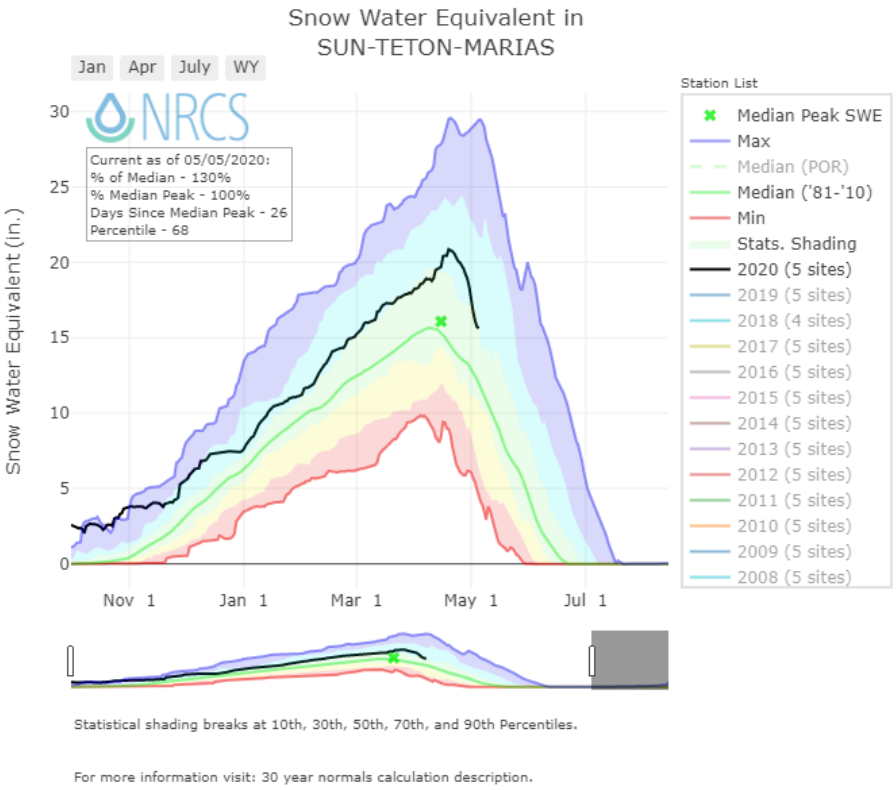
Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	103%	96%	87%
Valley Precipitation	73%	118%	142%
Basin-Wide Precipitation	**99%**	**97%**	**91%**

*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	**110%**	**61%**	**110%**

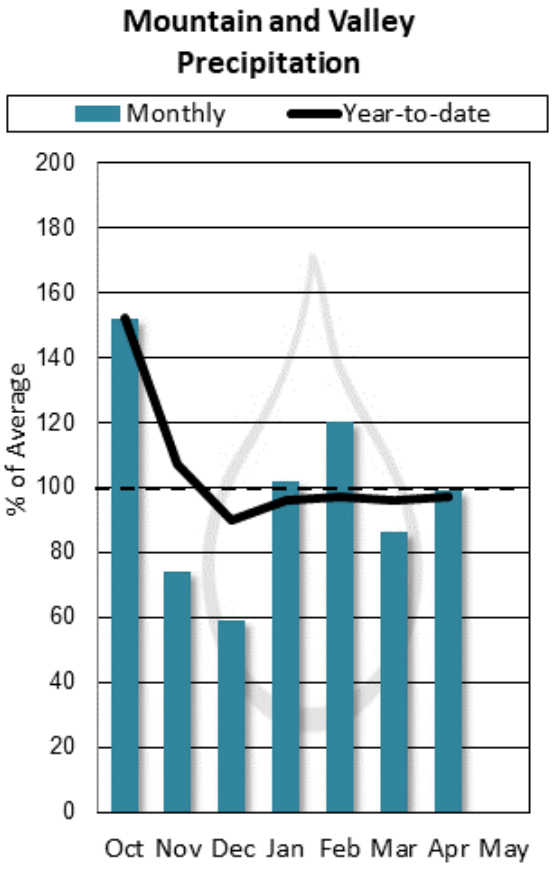
**See Reservoir Storage Table for storage in individual reservoirs*

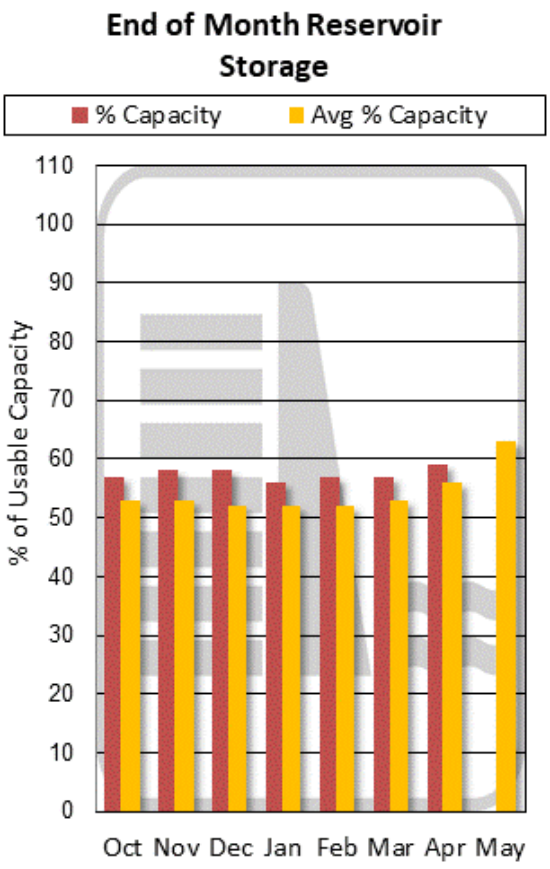
(click to navigate to online version with additional features)



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

For more information visit: 30 year normals calculation description.



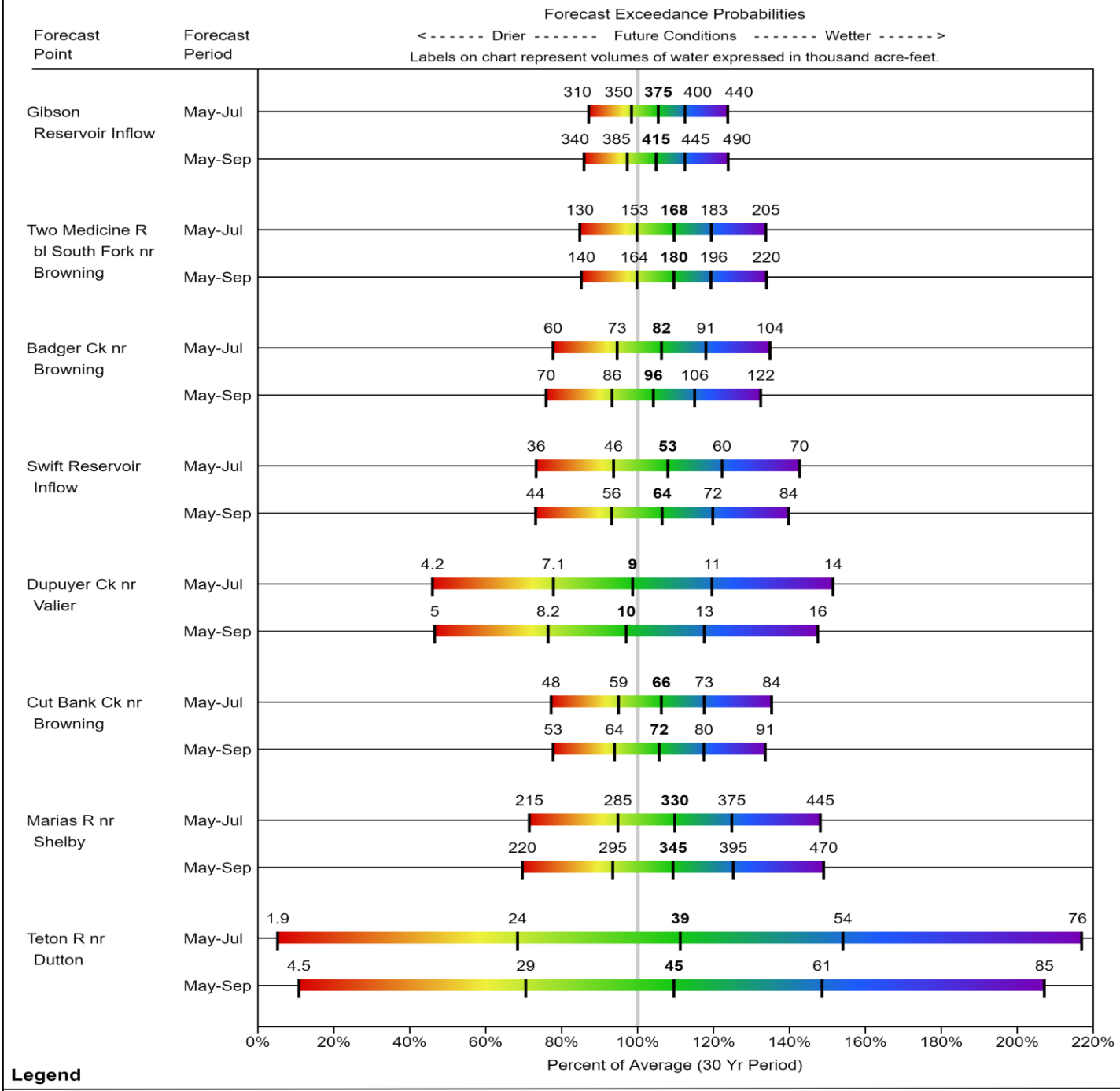


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

SUN-TETON-MARIAS

Water Supply Forecasts

May 1, 2020



Legend

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

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

Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

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

St. Mary-Milk River Basin

April precipitation was well below average in the Sun-Teton-Marias River basin. With that said, overall water year precipitation is near average and is mostly a result of the significant amount precipitation received in October and February. April brought notable temperature fluctuations with near-record low temperatures during the 2nd week and near-record highs during the last week of the month. The Saint Mary River basin snowpack peaked above normal on April 17th, which is about a week later than normal. Further east in the Milk River basin near Havre, Rocky Boy SNOTEL peaked for the season with its highest April 17th water content (8.4 inches) in 53 years of record. Most of the basin's precipitation arrived during the first half of the month, which was followed by warm sunny days during the second half that initiated snowmelt. As of May 1st, the Saint Mary and Milk Rivers are flowing at near normal conditions. Streamflow forecasts for the May 1st – July 31st period indicate slightly above average volumes are possible this spring and summer.

St. Mary-Milk River Basin Data Summary

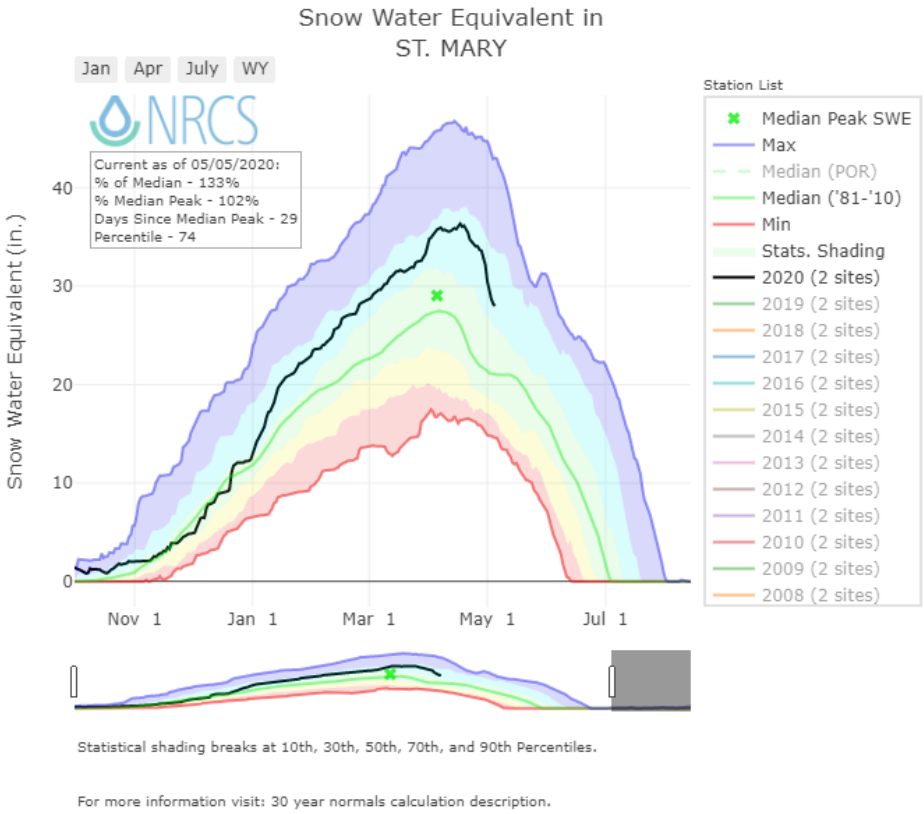
Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
ST. MARY	143%	88%
BEARPAW MOUNTAINS	0%	338%
MILK RIVER BASIN	0%	338%
Basin-Wide	**137%**	**97%**

Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation (St. Mary)	68%	102%	82%
Mountain Precipitation (Bearpaw Mtns)	64%	128%	112%
Valley Precipitation	40%	96%	133%
Basin-Wide Precipitation	**63%**	**104%**	**90%**

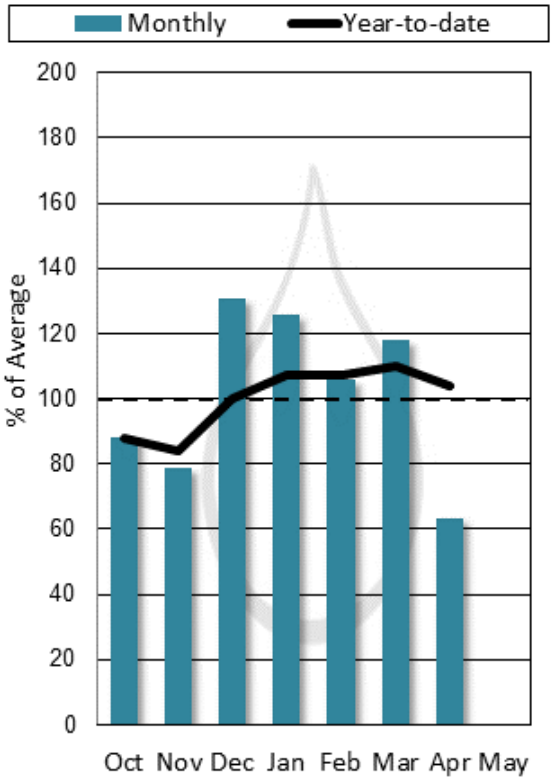
*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**129%**	**68%**	**118%**

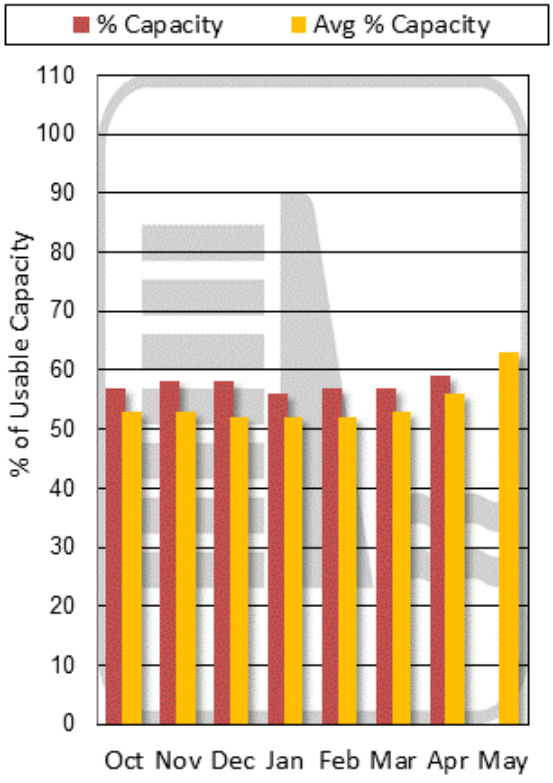
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

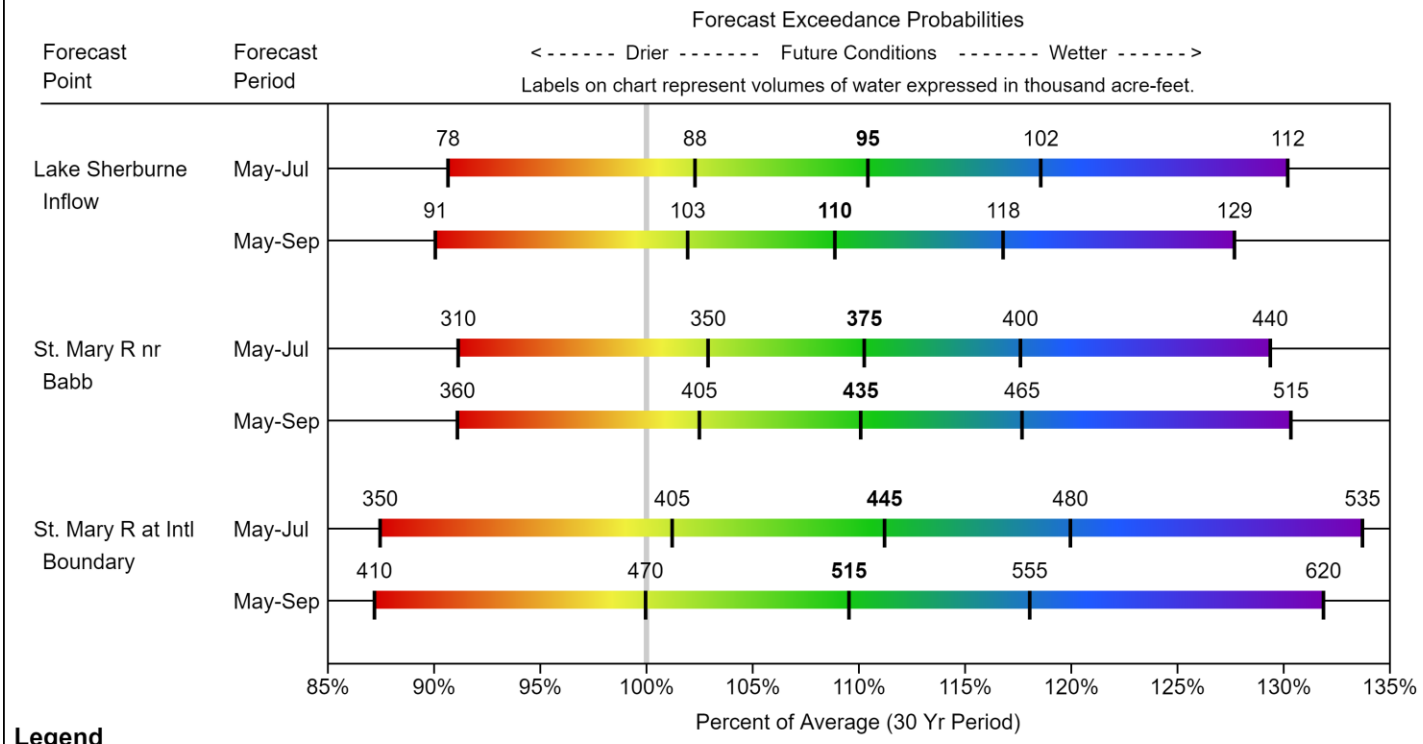


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

ST. MARY & MILK BASINS

Water Supply Forecasts

May 1, 2020



Legend

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

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Upper Yellowstone River Basin

Unlike most of this winter and spring, April yielded paltry amounts of precipitation to most locations within the Upper Yellowstone River basin. Valley locations received less than 50% of average precipitation, with most stations reporting 20% to 40% of the average for the month. Mountain locations also experienced a dry April, with many sites reporting well below-average precipitation for the month. Fortunately, the abundance of moisture this winter and spring had put a solid snowpack in place by April 1st, and snowpack totals remain near to slightly above normal for May 1st. Only one range, the Crazy Mountains, has snowpack which is below normal for this date. Basin-wide snowpack, which considers all elevations, peaked during the third week of April, and the peak was above normal this year. Snowmelt has been occurring at low elevations throughout the month, and mid-elevations made the transition to melt during the third week of April. High elevations either continue to hold onto snowpack or are beginning to melt as of May 1st. Although snowpack remains near to above normal for this date, forecasts have decreased since April 1st due to the lack of April precipitation. However, they remain slightly above average for spring and summer runoff. Water users are encouraged to review the forecast graphic below for specific rivers of interest, as forecasts vary widely within the basin.

Upper Yellowstone River Basin Data Summary

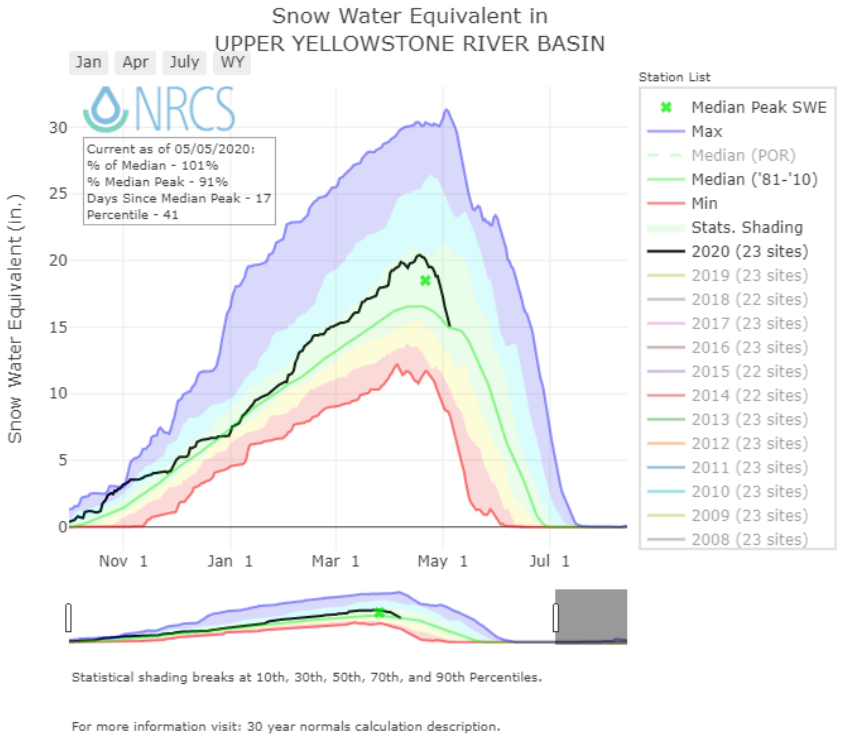
Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
YELLOWSTONE ab LIVINGSTON	115%	110%
SHIELDS	89%	135%
BOULDER-STILLWATER	112%	107%
RED LODGE-ROCK CREEK	135%	136%
CLARK'S FORK	122%	117%
Basin-Wide Snowpack	**113%**	**116%**

Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	80%	103%	111%
Valley Precipitation	40%	78%	117%
Basin-Wide Precipitation	**77%**	**102%**	**111%**

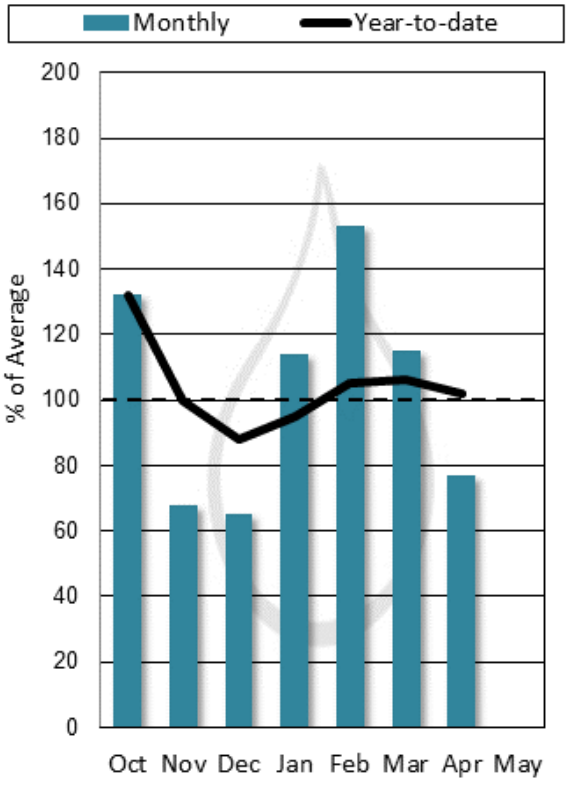
*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**124%**	**57%**	**113%**

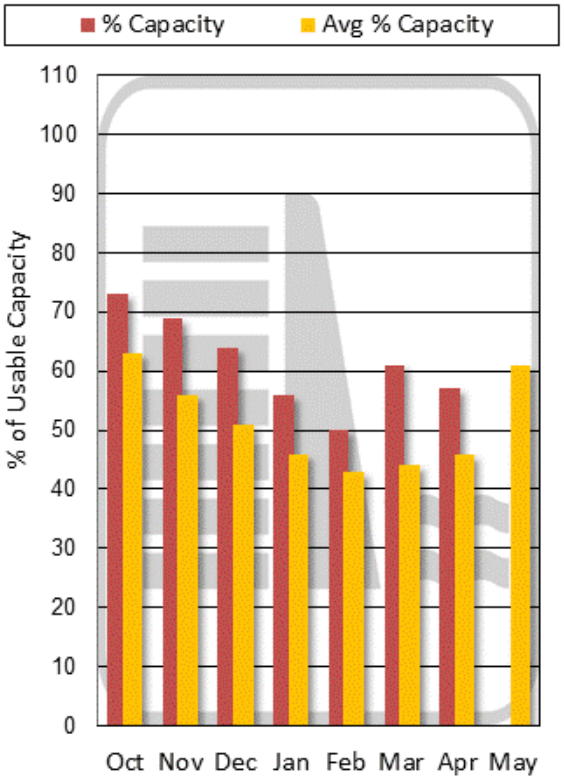
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage



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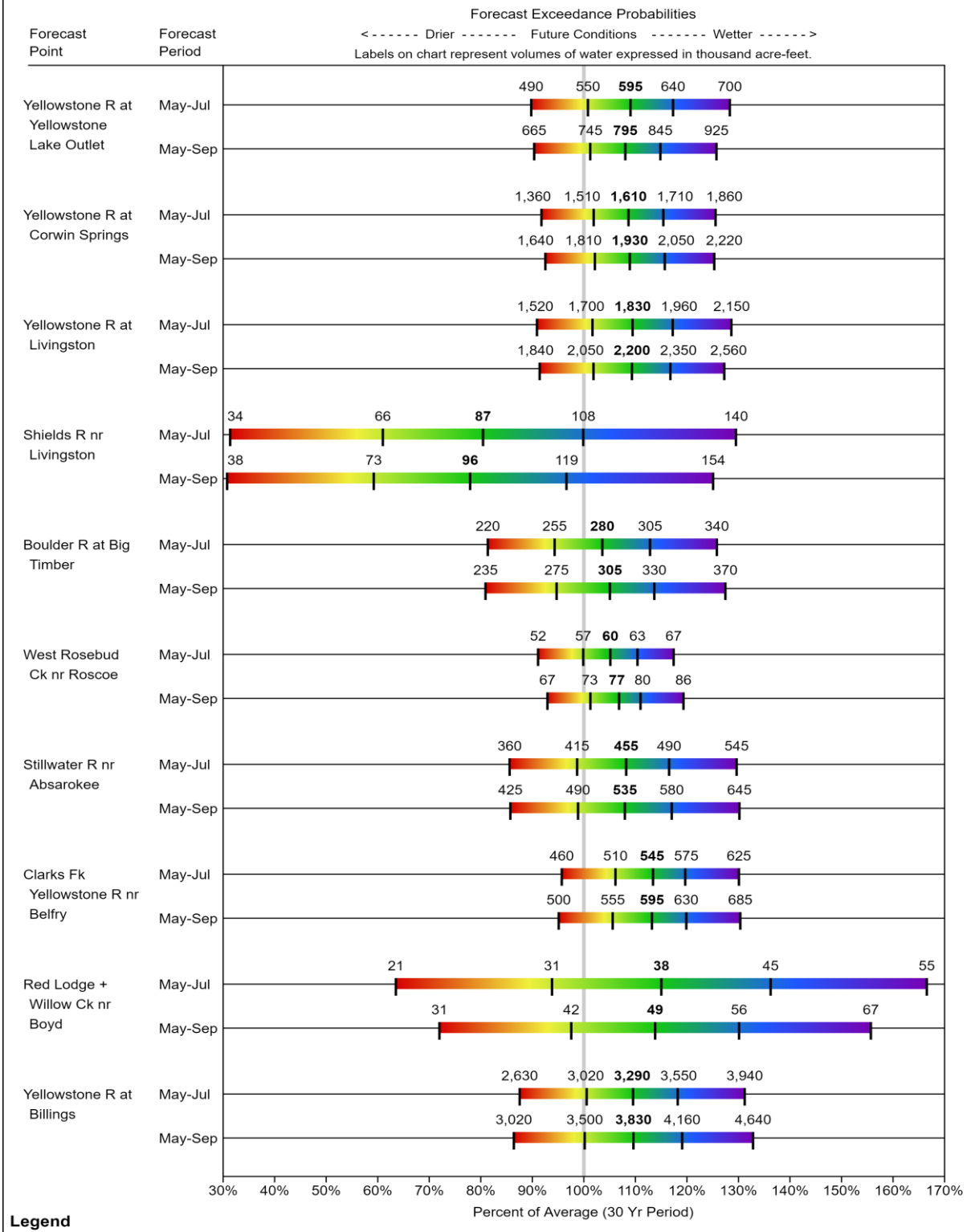
UPPER YELLOWSTONE RIVER BASIN

Water Supply Forecasts

May 1, 2020



Legend

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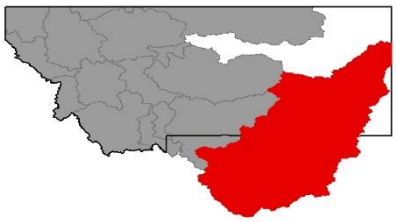


Lower Yellowstone River Basin

April precipitation was well below average at most SNOTEL sites in the Lower Yellowstone River basin. An exception was the Absaroka Mountains southwest of Cody. Several sites in the Bighorns set records for the lowest April precipitation in over 20 years (42 years for Middle Powder SNOTEL). Fortunately, April didn't represent the entire water year. October, November, and February delivered above-average precipitation and basin-wide water year precipitation has been near average overall. Furthermore, the snowpack across the basin is slightly above normal. The basin-wide seasonal snowpack peaked around the weekend of April 18th, and due to near-record high temperatures combined with sunny days, the snow is melting fast. Rivers are on the rise in the Lower Yellowstone basin. As of May 1st, the Shoshone River and the Wind River are flowing at near-record levels. Streamflow forecasts for the May 1st – July 31st period range from slightly below average to slightly above average depending on the river. Water users are encouraged to look at the forecast graphic below for their river(s) of interest.

Lower Yellowstone River Basin Data Summary

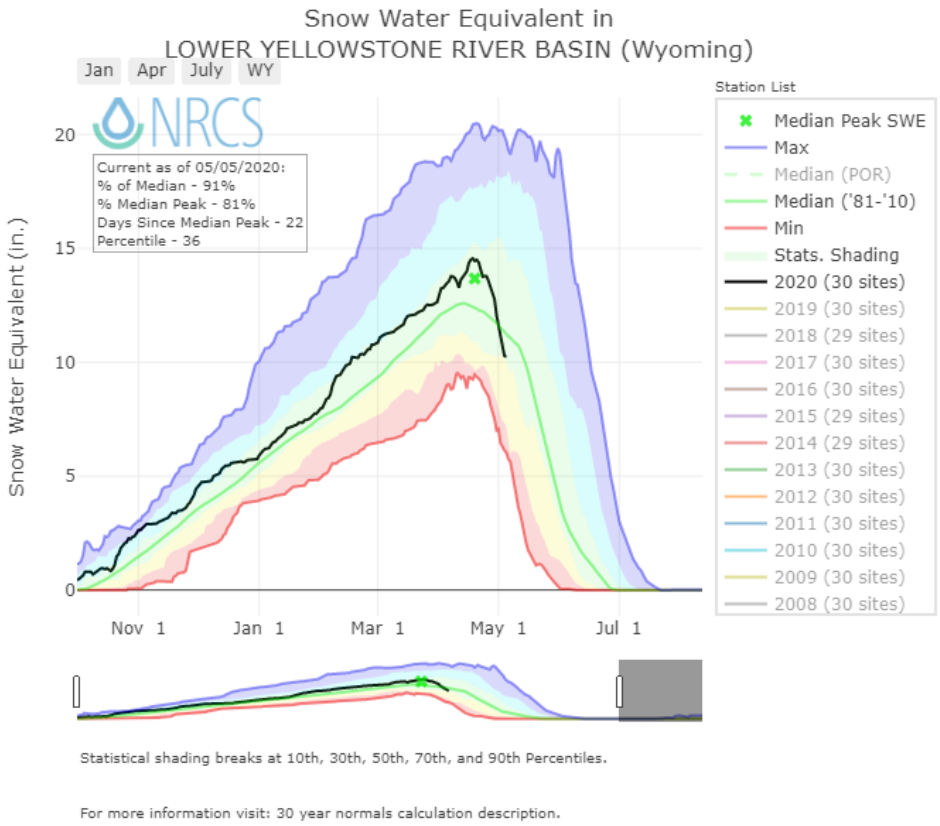
Snowpack	**Percent of 1981-2010 Normal (Median)**	**Last Year Percentage of Normal (Median)**
WIND RIVER BASIN	110%	99%
SHOSHONE RIVER BASIN	98%	100%
BIGHORN RIVER BASIN	105%	89%
LITTLE BIGHORN BASIN	102%	76%
TONGUE RIVER BASIN	104%	75%
POWDER RIVER BASIN	103%	76%
Basin-Wide Snowpack	**106%**	**90%**

Precipitation	**Monthly Percentage of Average**	**WYTD Percentage of 1981-2010 Average***	**WYTD Last Year Percentage of Average**
Mountain Precipitation	82%	92%	89%
Valley Precipitation	71%	91%	108%
Basin-Wide Precipitation	**78%**	**92%**	**94%**

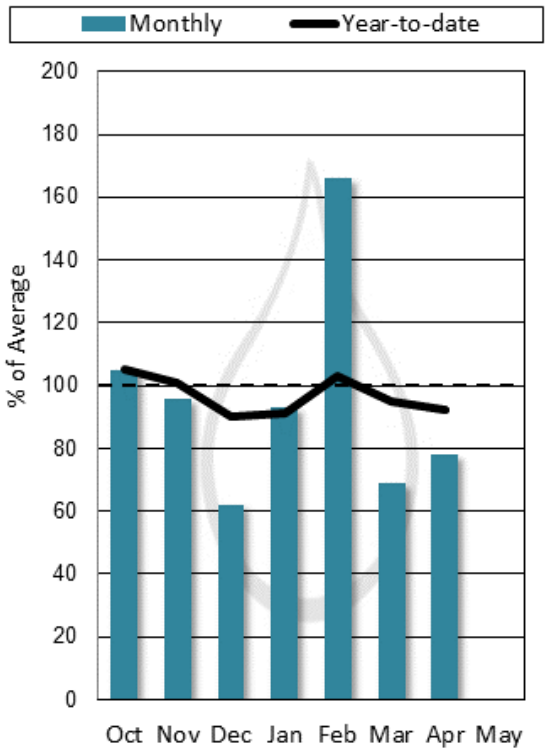
*Water Year-to-Date (WYTD) Precipitation is October 1st - Current

Reservoir Storage	**Percentage of Average**	**Percentage of Capacity (Total)**	**Last Year Percentage of Average**
Basin-Wide Storage	**100%**	**56%**	**105%**

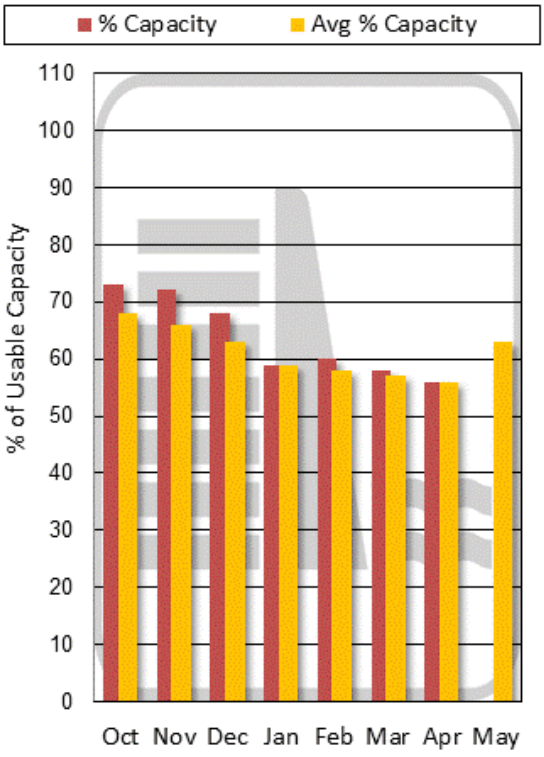
(click to navigate to online version with additional features)



Mountain and Valley Precipitation



End of Month Reservoir Storage

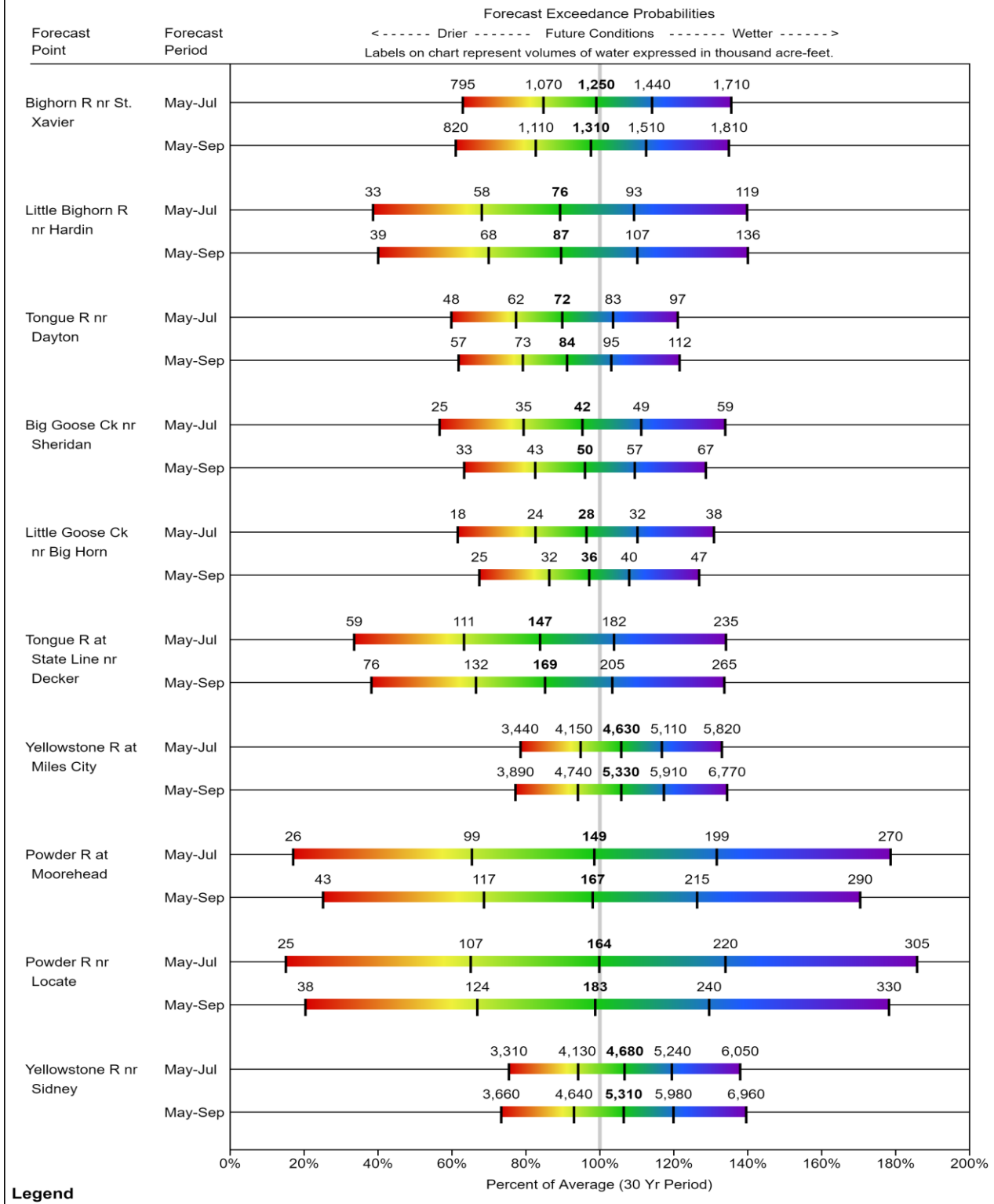


Storage above is averaged for all reservoirs in the basin. For individual reservoirs see table below.

LOWER YELLOWSTONE RIVER BASIN (Wyoming)

Water Supply Forecasts

May 1, 2020



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Bozeman, Montana

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Montana Water Supply Outlook Report

Natural Resources Conservation Service