

Wyoming Basin & Water Supply Outlook Report

March 1, 2021



Photo courtesy of NRCS Snow Survey

Basin Outlook Reports

And

Federal - State - Private Cooperative Snow Surveys

For more Wyoming water supply information, contact:

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How forecasts are made

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snow courses and automated SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to prepare runoff forecasts. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertain the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

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Hydrologic Discussion

Many basins across Wyoming had a **15** to **25** percent increase in snow water equivalents (SWEs) during the month of February. Basins in far western Wyoming and across northern Wyoming are seeing SWE numbers near to **above** medians for late February; while watersheds in central-southern-eastern Wyoming still have SWE numbers **below** to **well below** medians. Notably, there was also a lack of significant low elevation snow (6500-8000 feet) across many basins in central through southern Wyoming.

Several basins across Wyoming had **120** to near **180** percent of average precipitation totals for February. However, current water year precipitation totals are still **below** average for majority of basins in Wyoming—especially basins east of the continental divide.

Reservoirs across Wyoming were averaging near **75%** of capacity. Last year at this time Wyoming reservoir were **80%** of capacity. Reservoir storages have remained around **110%** of average during the winter season.

Extreme to **severe** drought conditions continue for several basins east of the continental divide. Water Year 2021 started out with dry to very dry antecedent soil conditions throughout most of Wyoming. There was also below normal baseflows for several streams in central through southern Wyoming in early Water Year 2021. The latest spring outlook indicates that there will be a warmer than average as well as a drier than average spring—especially during late spring and into early summer. As a result of current hydrological and expected climate conditions, there is very good chance that there will be an earlier than normal runoff with an overall below average streamflows. Runoff volumes are expected to be near average for drainages in far western and northern Wyoming and **below** average for the rest of the basins in Wyoming.

Wyoming snowpack and basin hydrological conditions—especially for several basins east of the continental divide—are very similar to what occurred in Water Years 2012 and 2013. Spring runoff volumes during those water years were the lowest in the past decade.

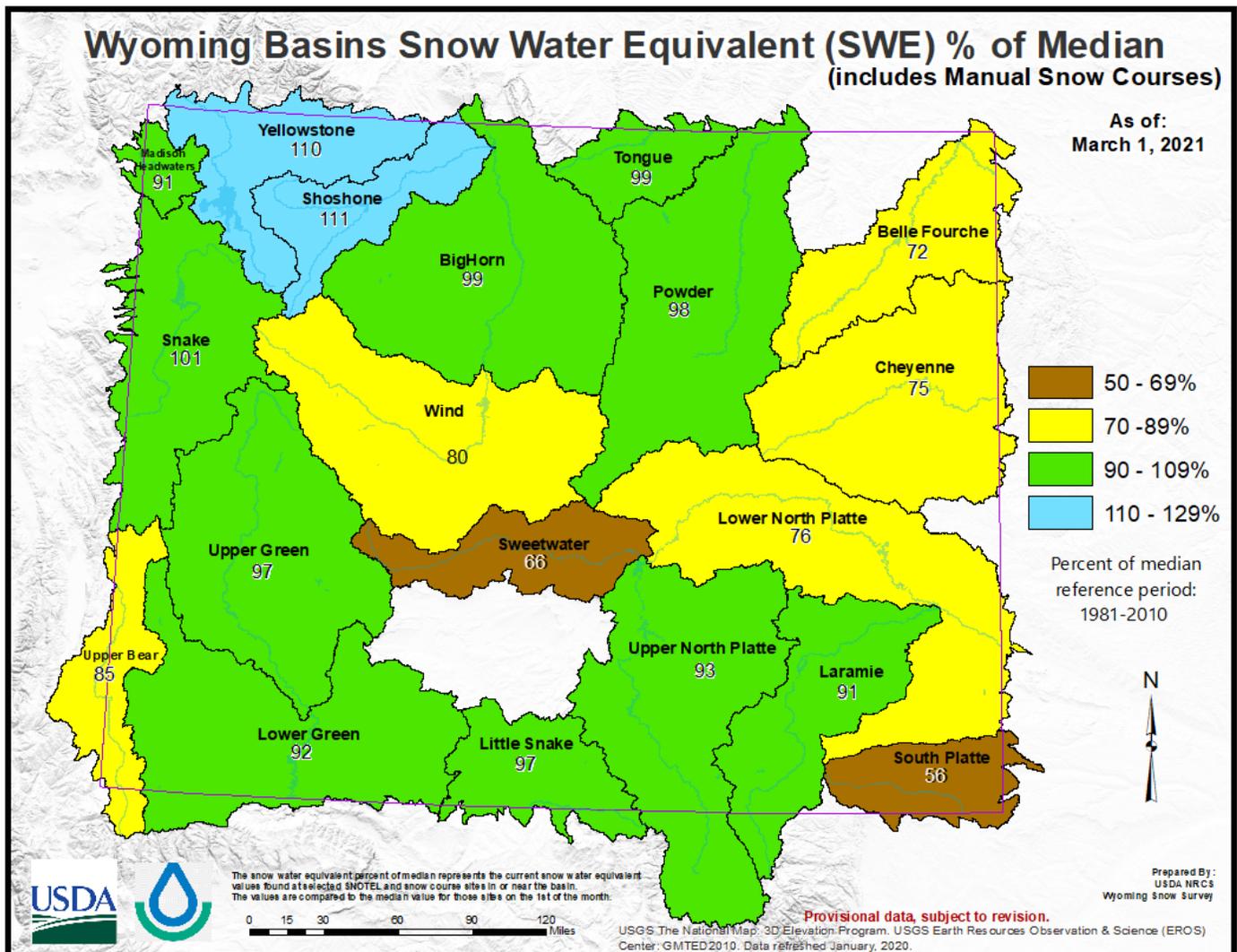
There is still much uncertainty in the final snowmelt runoff volume forecasts due to the uncertainty of the timing and the amount of the upcoming spring precipitation. Many locations along east of the continental divide receive up to 60% of their annual precipitation during late March into early June. Much higher flows and drastic increases in volumes can be expected during a rapid warmup followed to by rain on a melting snowpack. Water planners need to keep abreast of the latest spring runoff forecasts as well as the latest weather trends during the upcoming spring.

Summary

- Wyoming continues to see **below** median percent of snowpack and/or snow water equivalents (SWEs) through late February.
- Precipitation totals across Wyoming for February were **well above** average. Water year precipitation continues to be **below** average.
- Reservoirs across Wyoming were averaging near **73%** of capacity—down from **80%** reported last year. Overall reservoir storages for late February continue to be **above average**.
- Stream flow snowmelt volumes are forecasted to be **below** average for almost all major drainages across Wyoming.

Snowpack/SWEs

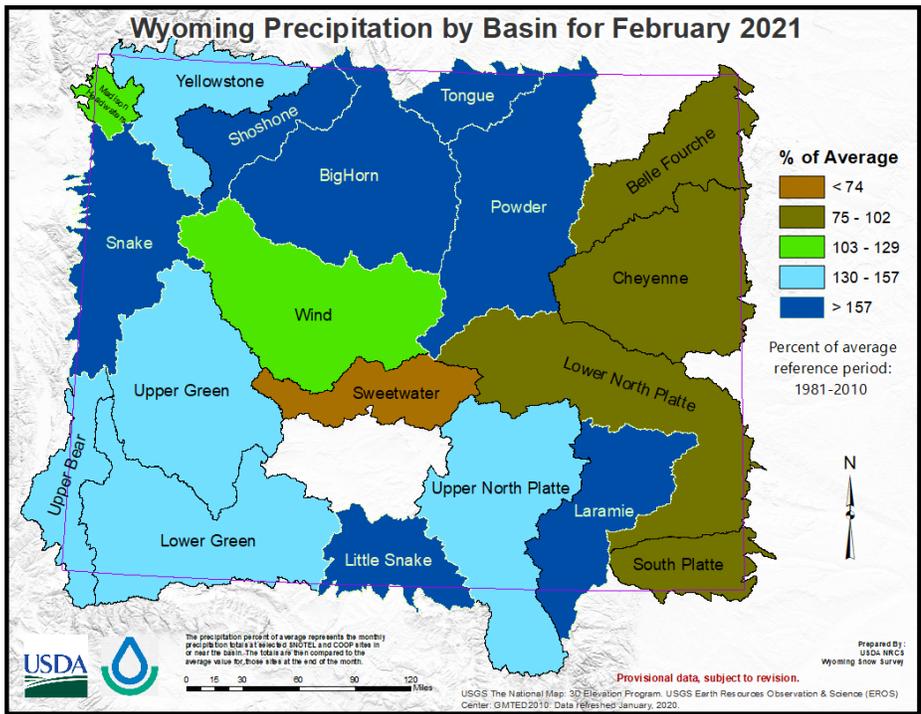
Snow water equivalents (SWEs) across Wyoming for March 1st were near **90%** of median. SWEs in the Shoshone and Yellowstone River Basins were the highest at near **110%** of median, while SWEs in the South Plate River Basin were the lowest at near **55%** of median. Last year, SWEs across the state were **117%** of median. (For complete tabular data, see Appendix)



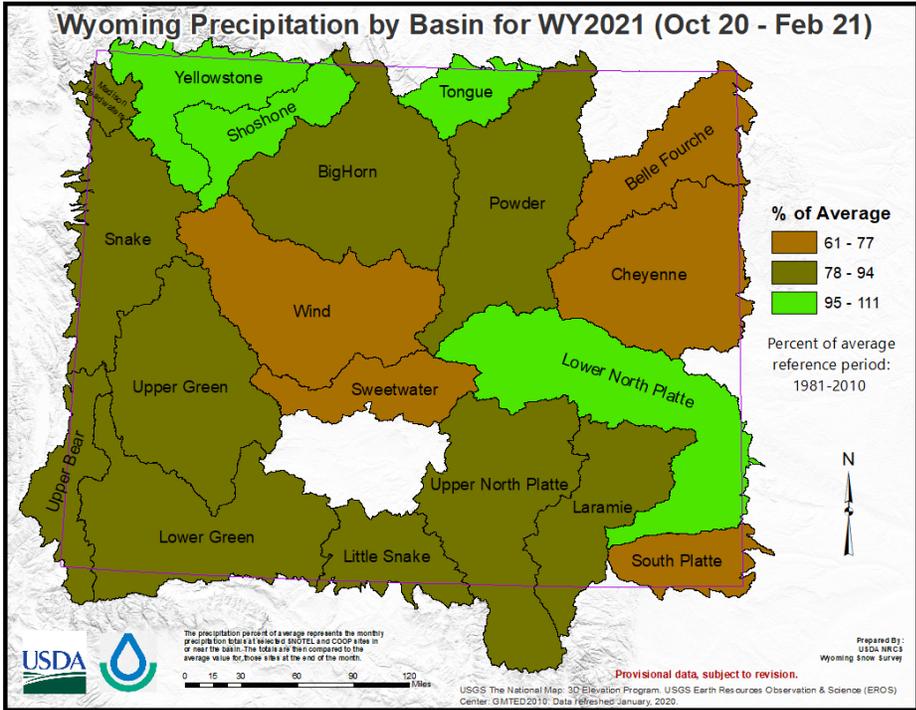
Map 1. Wyoming SWEs—March 1, 2021.

Precipitation

Basin precipitation across Wyoming was near **135%** of average during February. The Shoshone River Basin had the highest precipitation totals for the month at near **185%** of average. The Sweetwater River Basin had the lowest precipitation amount at **45** to **50%** of average. Water year precipitation (October - February) is currently at **85** to **90%** of average. (See Appendix for complete tabular data.)



Map 2. Current monthly precipitation by basin.



Map 3. Water year to date precipitation by basin.

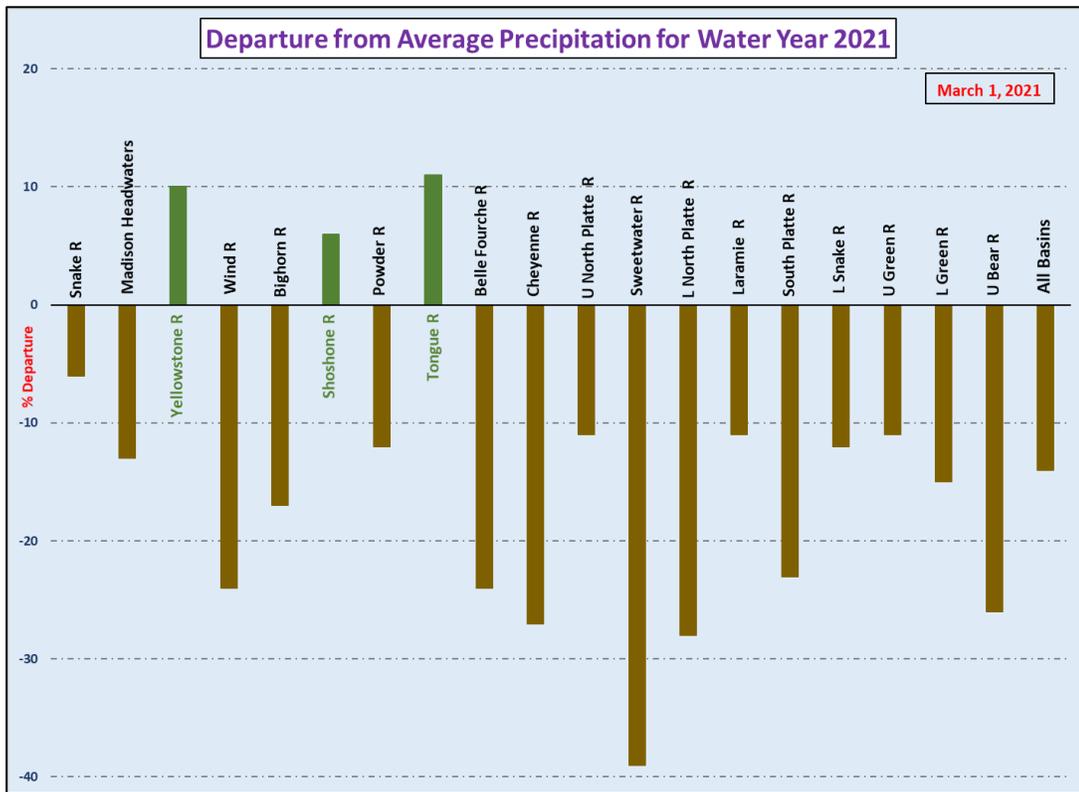


Chart 1. Departure from average precipitation (water year).

Reservoirs

Reservoirs across Wyoming were averaging near **73%** of capacity (**80%** last year). Overall reservoir storages for late February were **above** average at **110%** (**122%** last year). The highest average reservoir storage was across the Tongue River Basin at near **155%**. The Little Snake River Basin had the lowest average reservoir storage at **70-75%**.

(See Appendix for complete tabular data.)

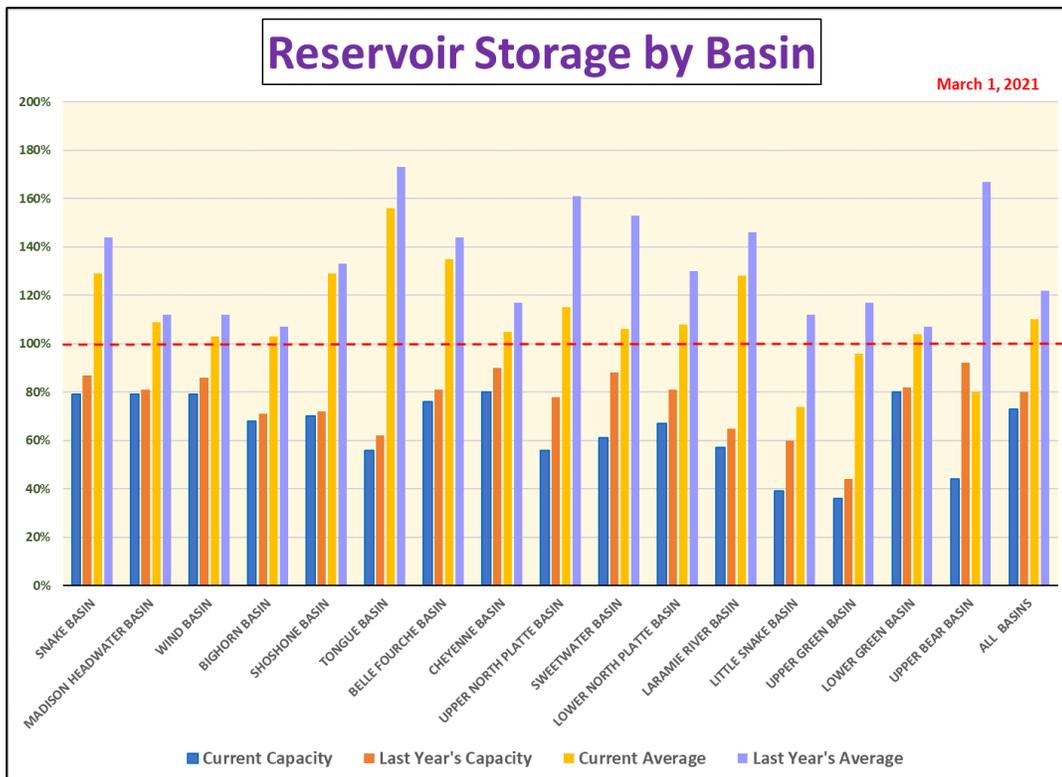
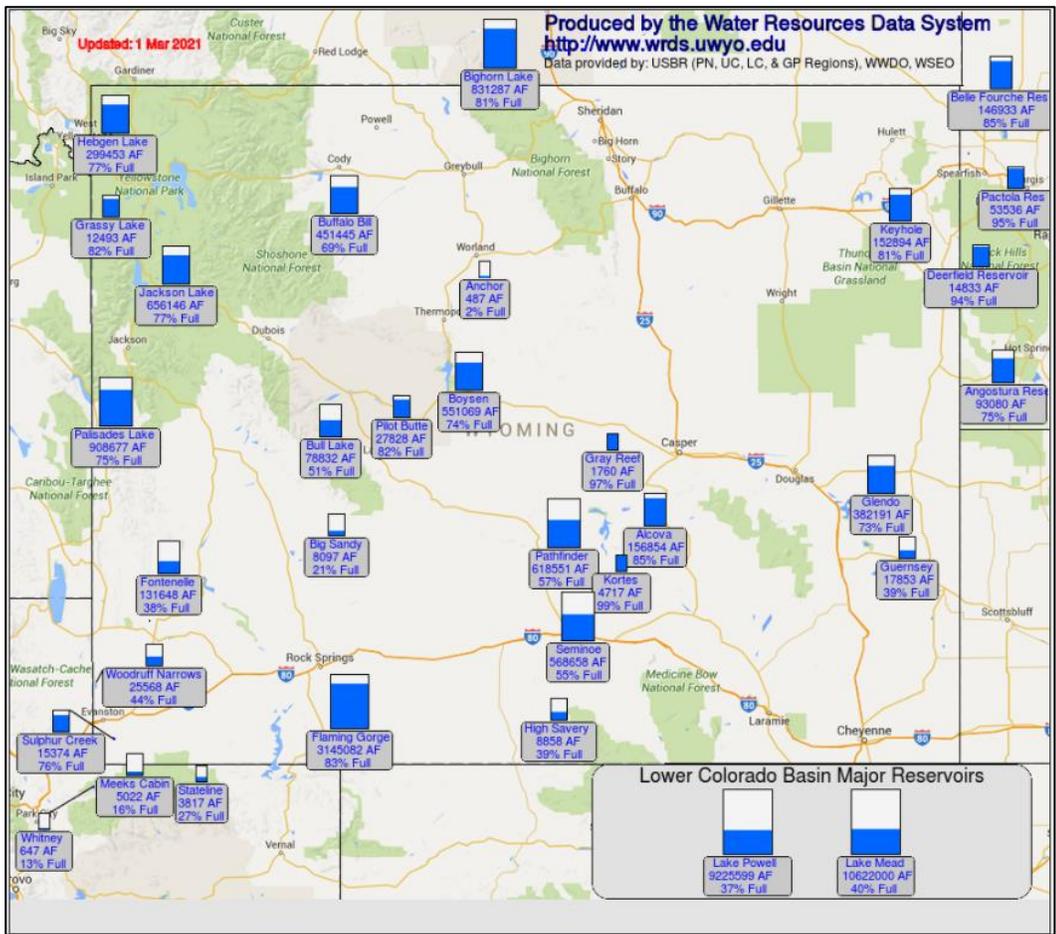


Chart 2. Reservoir storage by basin.



Map 4. Teacup diagrams of Wyoming reservoirs. (provided by WRDS)

Stream Flows

Snowmelt runoff stream flow volumes across the state are expected to be **below average** at **80 to 85%**. The highest forecasted stream flows due to snowmelt are across the Yellowstone Basin at near **110%** of normal. The lowest snowmelt runoff volumes are expected across the Sweetwater Drainage at **32%** of average.

(See Appendix for complete tabular listing of stream flow forecasts.)

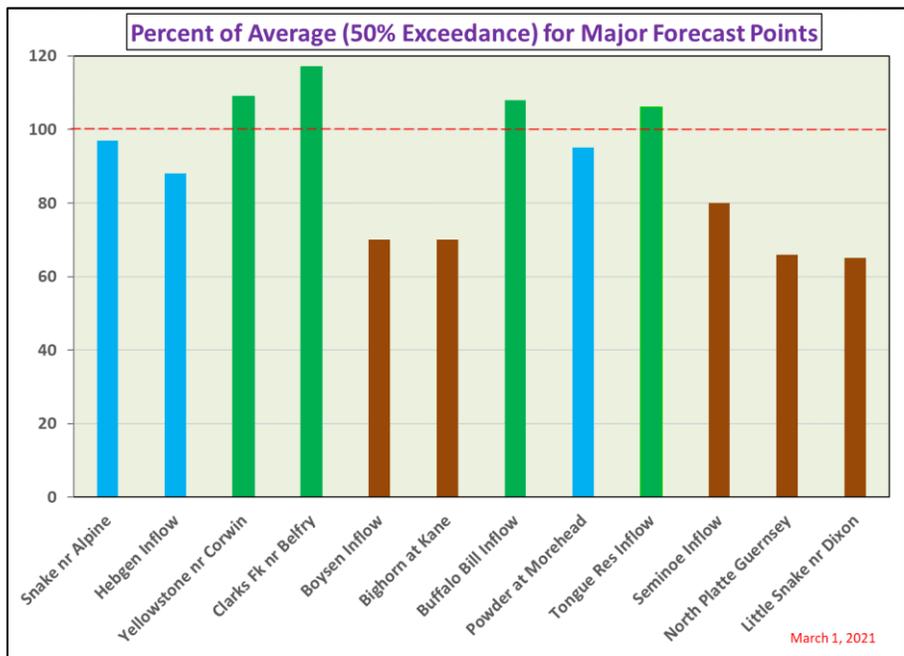
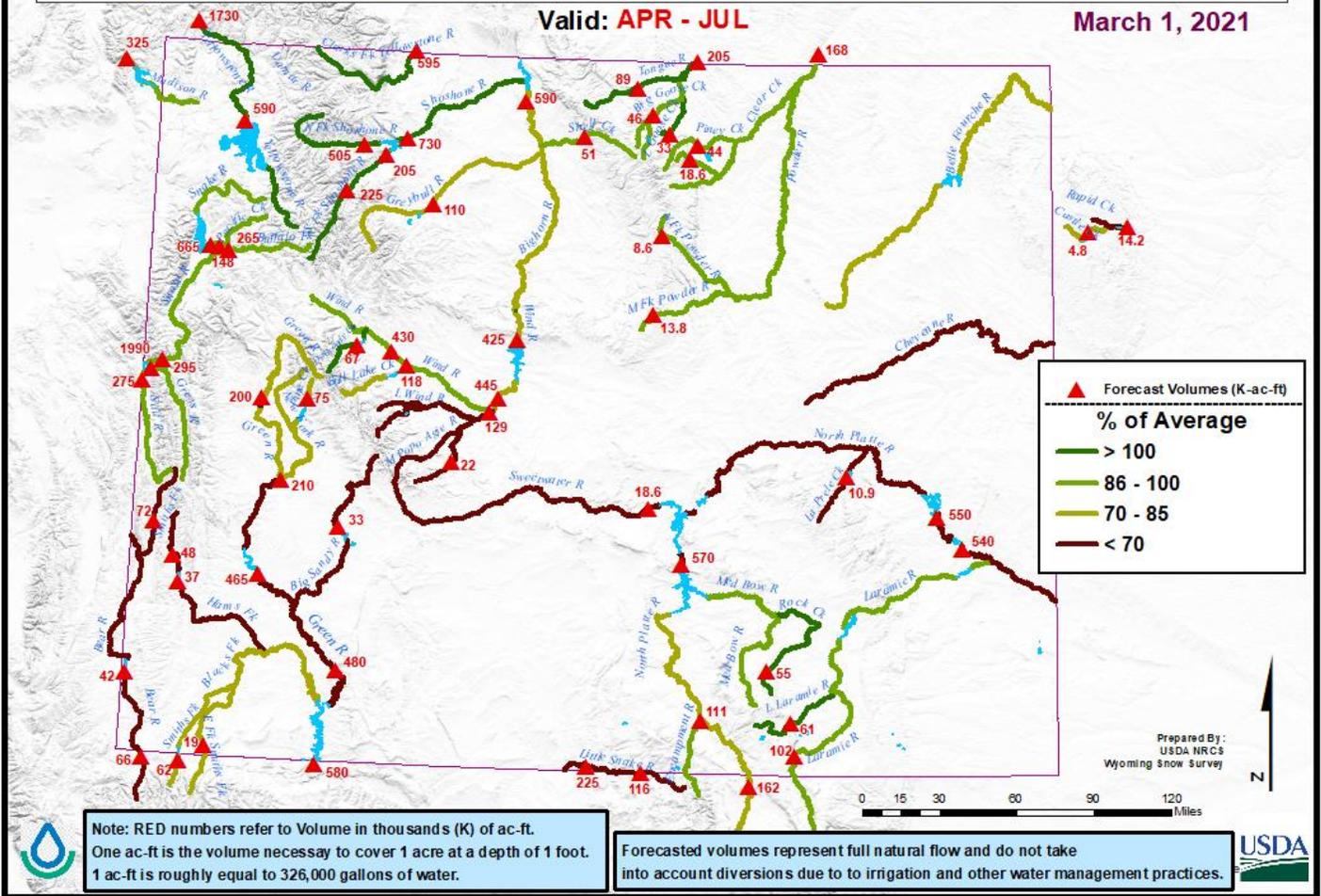


Chart 3. 50% exceedance for major forecast points.

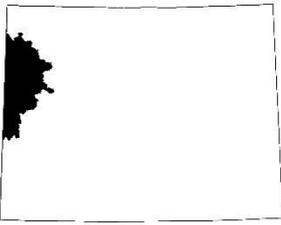
Wyoming Water Supply Outlook

Valid: APR - JUL

March 1, 2021

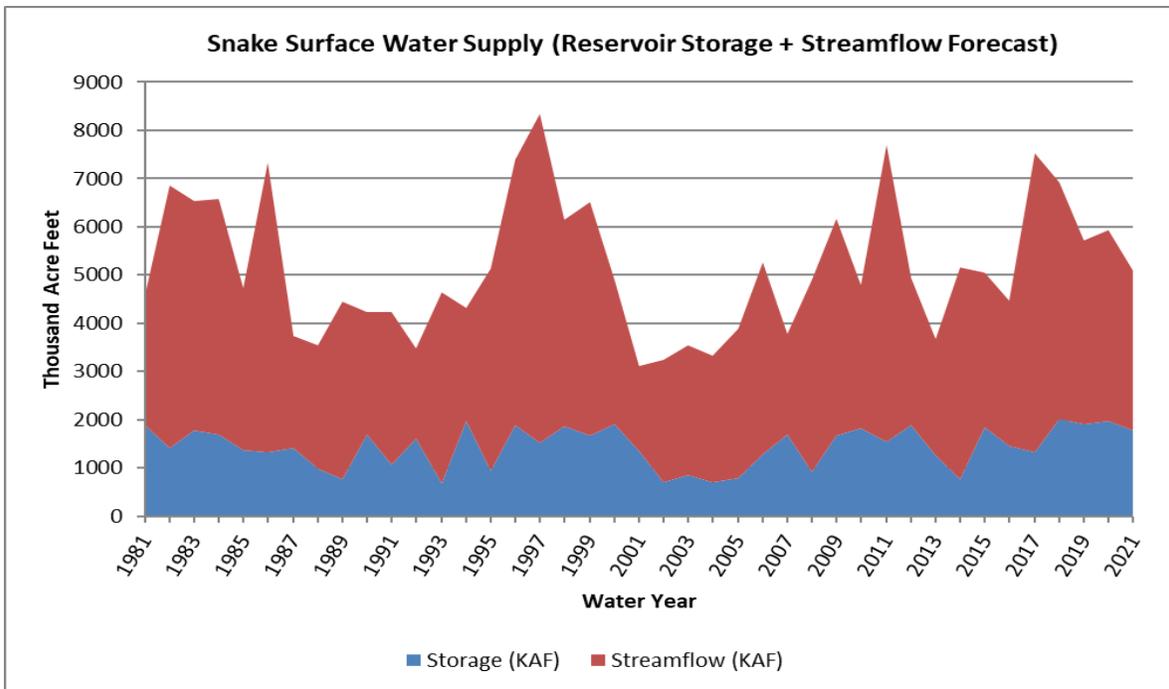
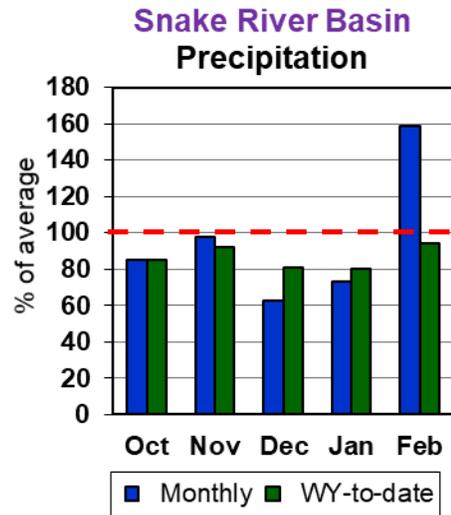
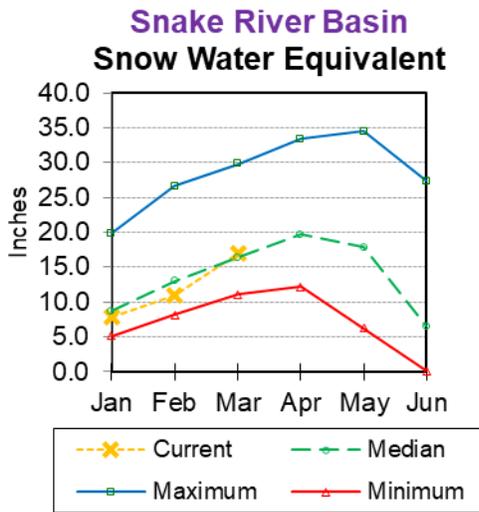


Map 4. Wyoming water supply outlook—March 1, 2021.

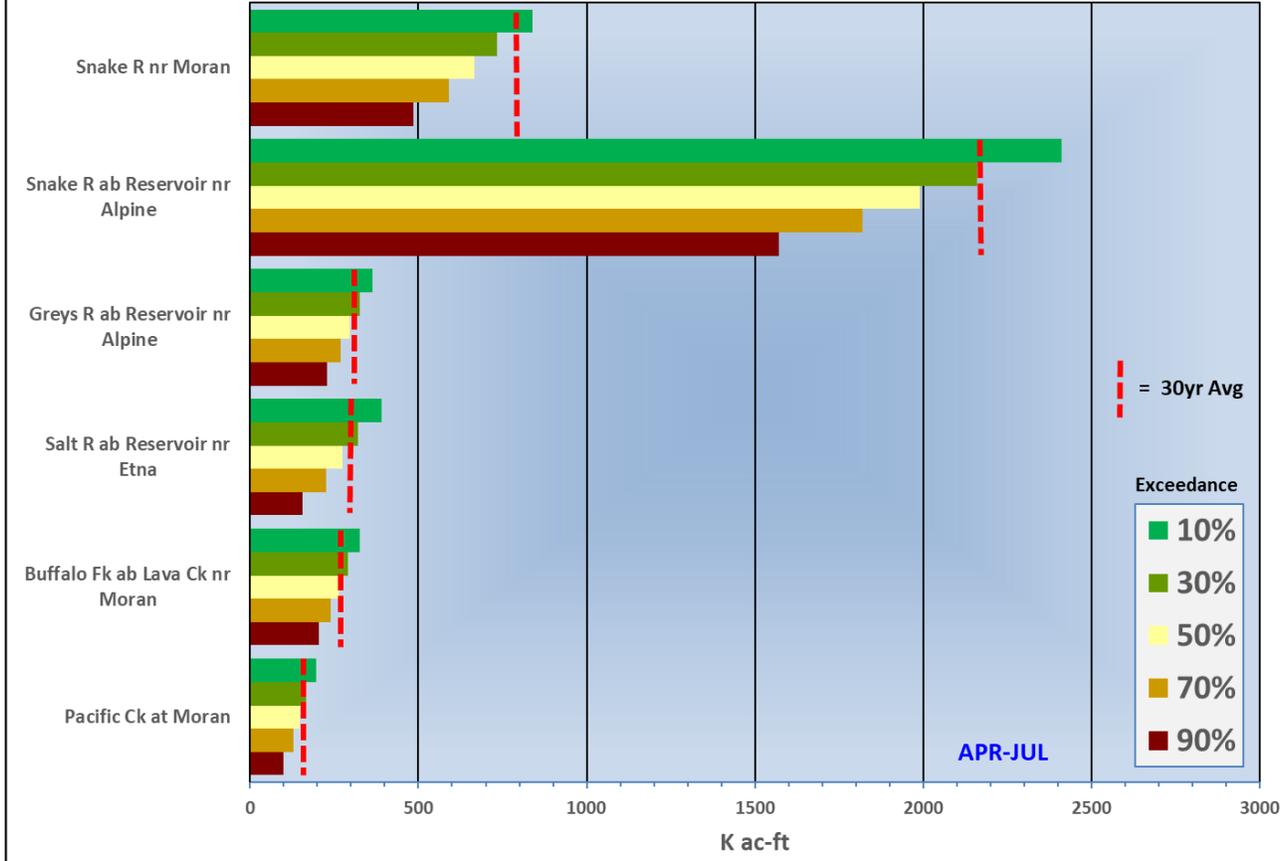


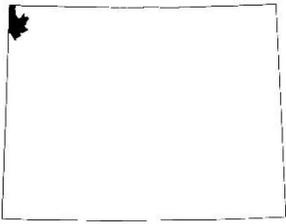
Snake River Basin

- The overall Snake River Basin SWE is near **100%** of median.
- Last month's precipitation for the Snake River Basin was **155** to **160%** of average. Water-year-to-date precipitation is near **95%** of average.
- Current reservoir storage is near **130%** of average for the three main reservoirs in the basin.
- The streamflow forecasts for April through July are **below** average (**92%**) for this basin. Greys River near Alpine is expected to have flows at **97%** of average.



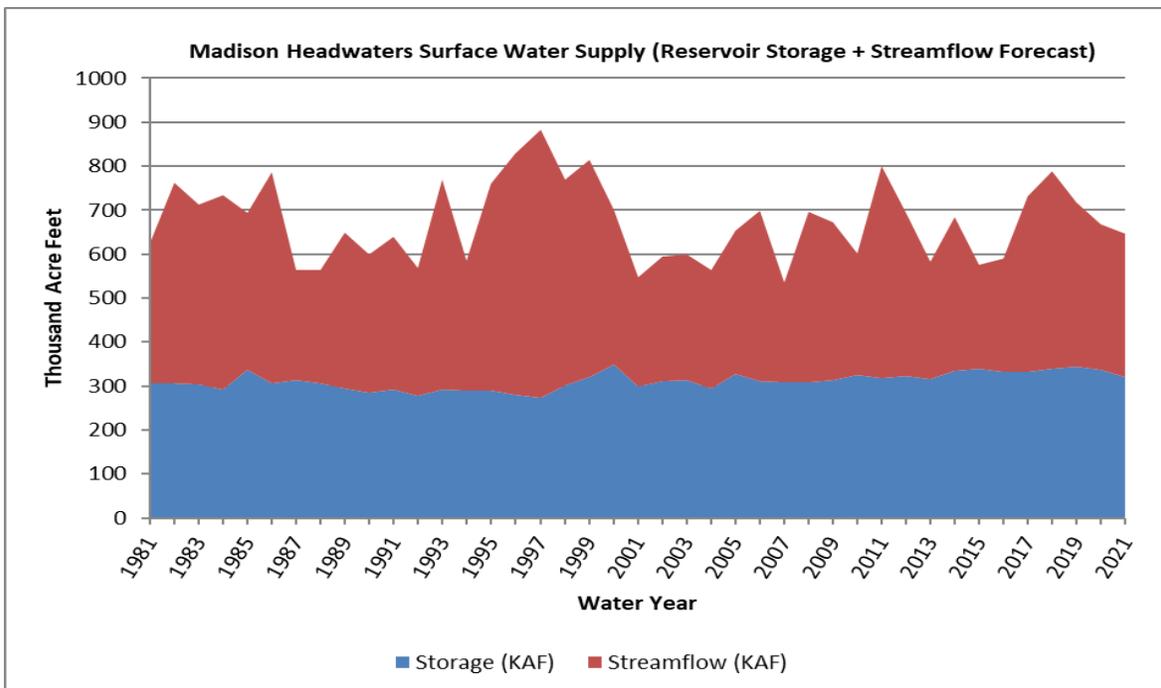
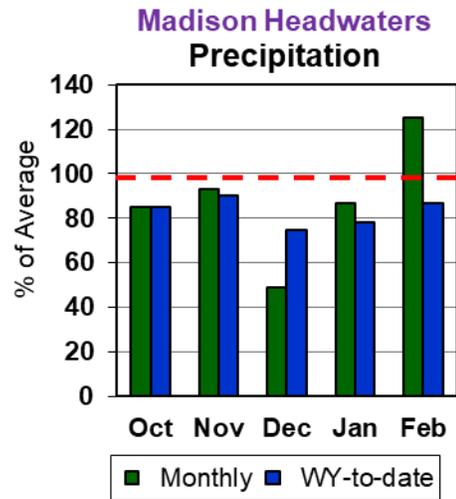
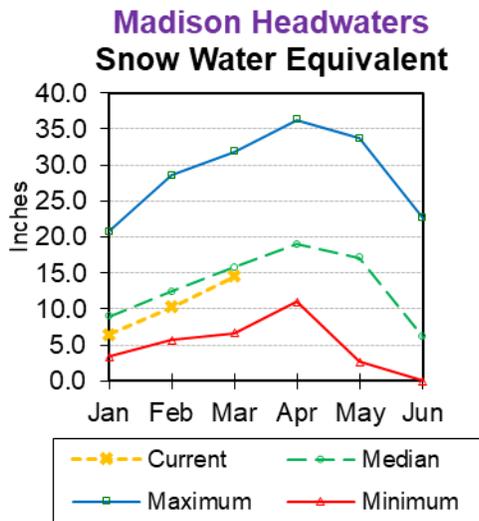
Snake River Basin Streamflow Forecasts -- March 1, 2021



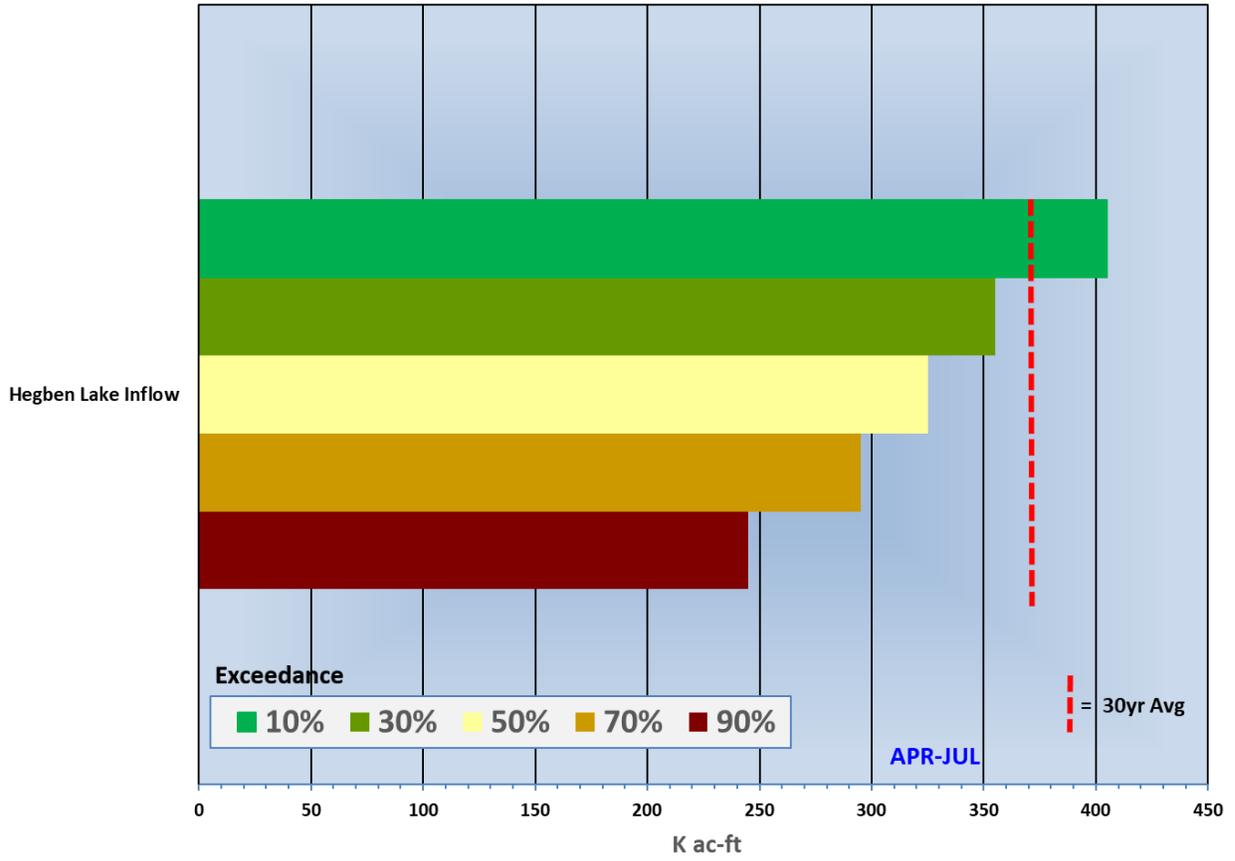


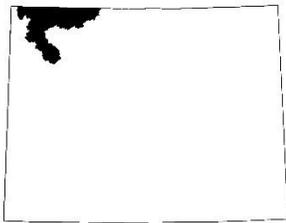
Madison Headwaters Basin

- The overall Madison Headwaters Basin SWE is around **90%** of median.
- Last month's precipitation for the Madison Headwaters River Basin was near **125%** of average. Water-year-to-date precipitation is around **85%** of average.
- Current reservoir storage is near **110%** of average for one main reservoir in the basin.
- Hebgen Reservoir inflows (April-July) are forecasted to be **below** average at **88%**.



Madison Headwaters Streamflow Forecast -- March 1, 2021

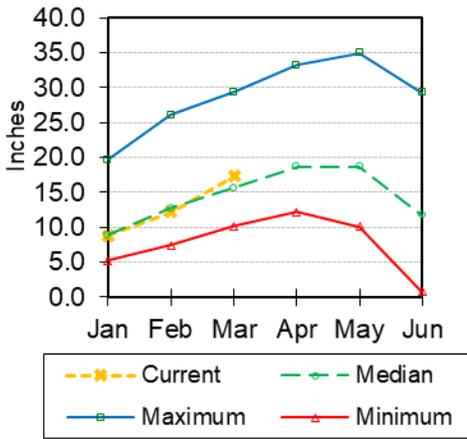




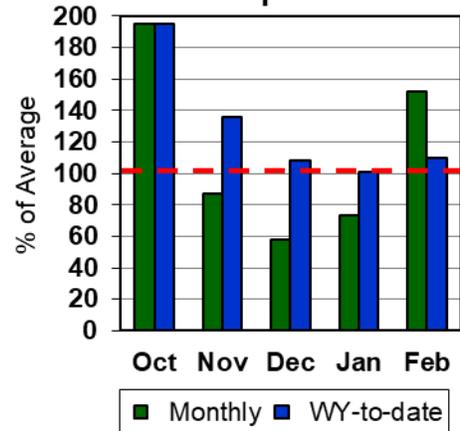
Yellowstone River Basin

- The overall Yellowstone River Basin SWE is near **110%** of median.
- Last month's precipitation for the Yellowstone River Basin was **150** to **155%** of average. Water-year-to-date precipitation is near **110%** of average.
- The 50% exceedance forecasts for April through July are **above** average (**110%**) for this basin. Clarks Fork near Belfry is forecasted to have flows at **117%** of average.

**Yellowstone River Basin
Snow Water Equivalent**

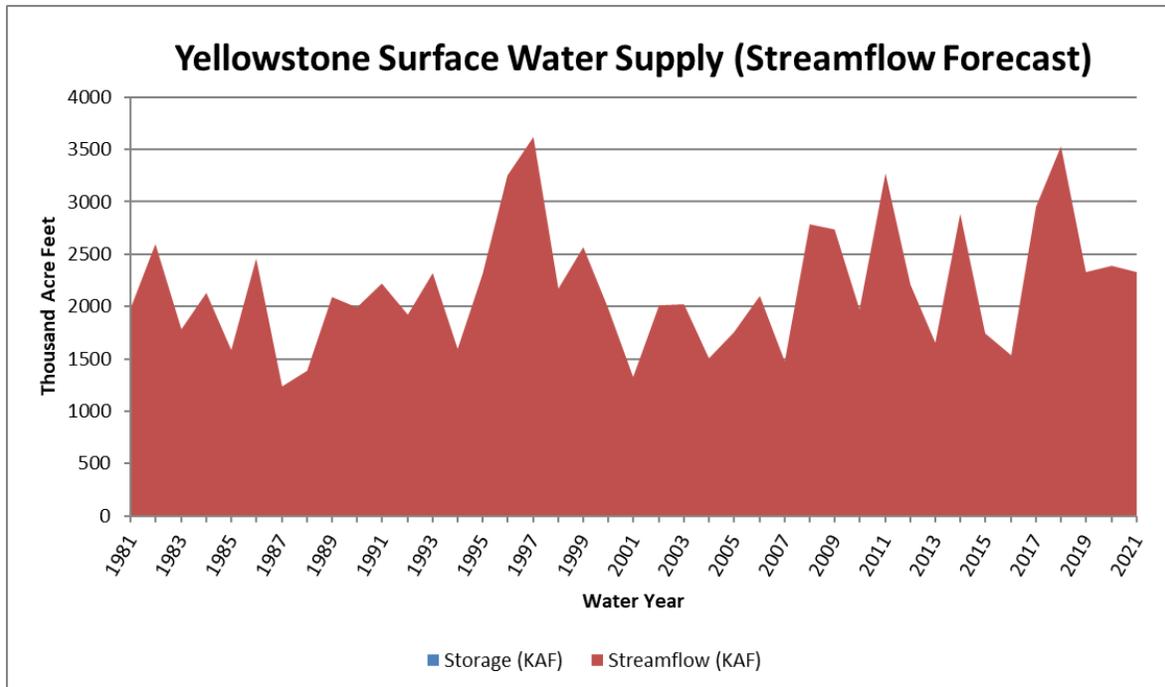


**Yellowstone River Basin
Precipitation**

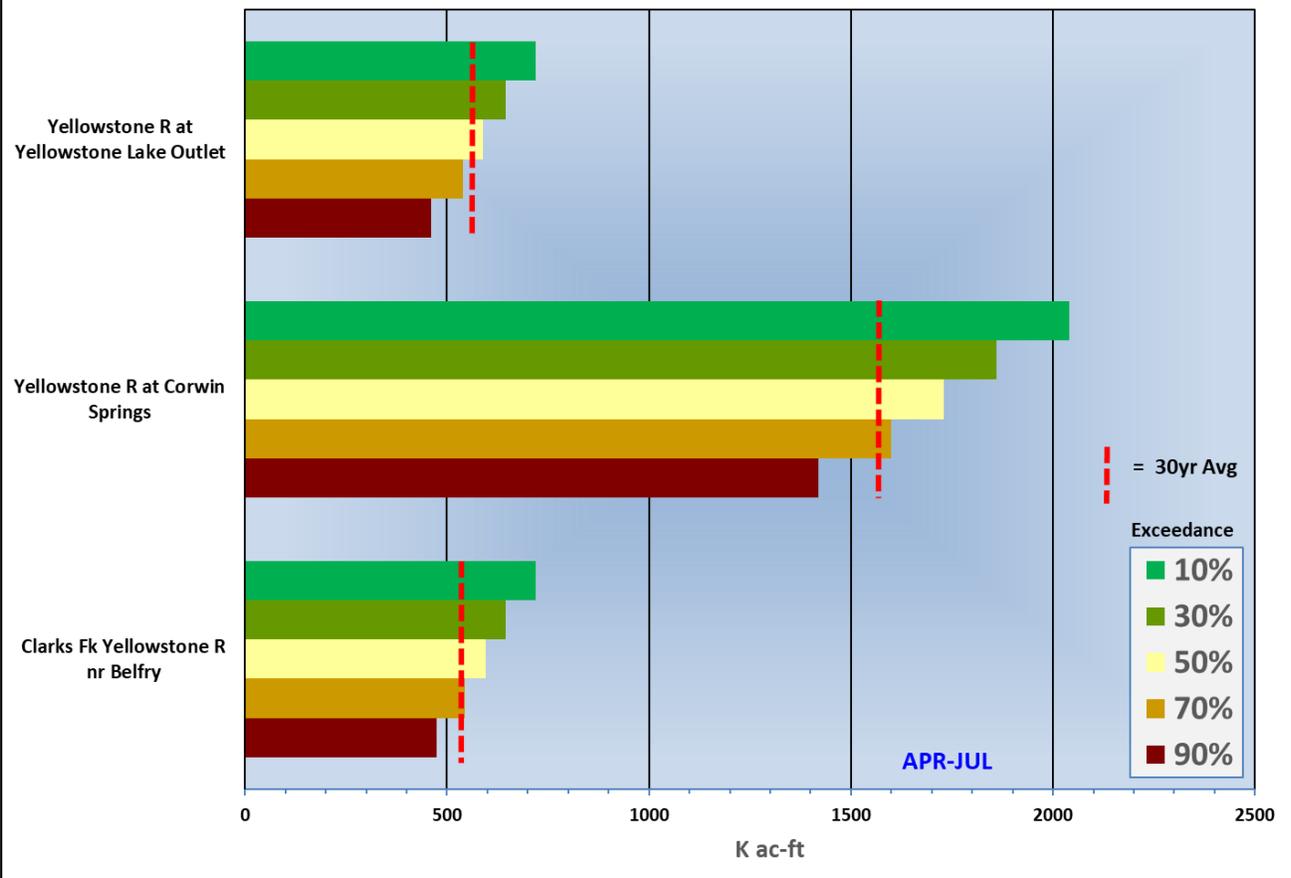


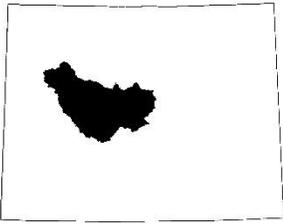
No reservoir data for the basin.

Yellowstone Surface Water Supply (Streamflow Forecast)



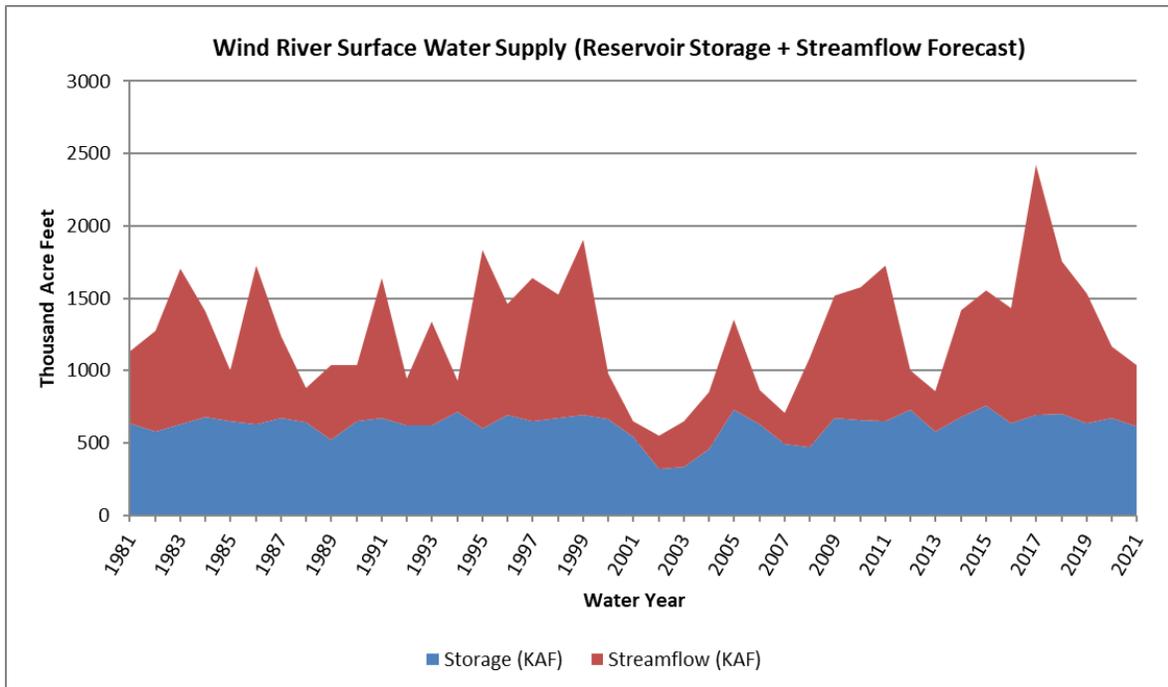
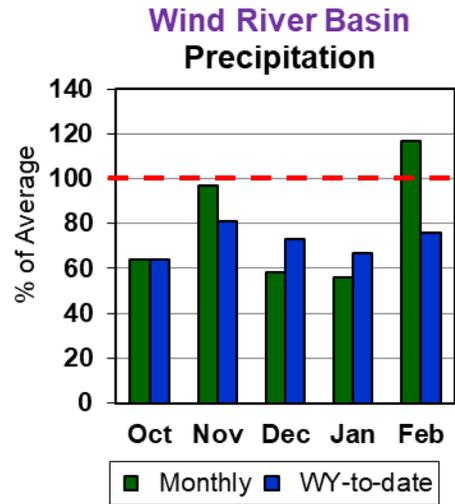
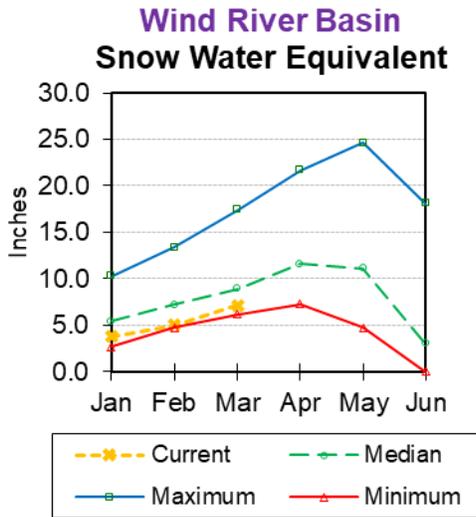
Yellowstone River Basin Streamflow Forecasts -- March 1, 2021



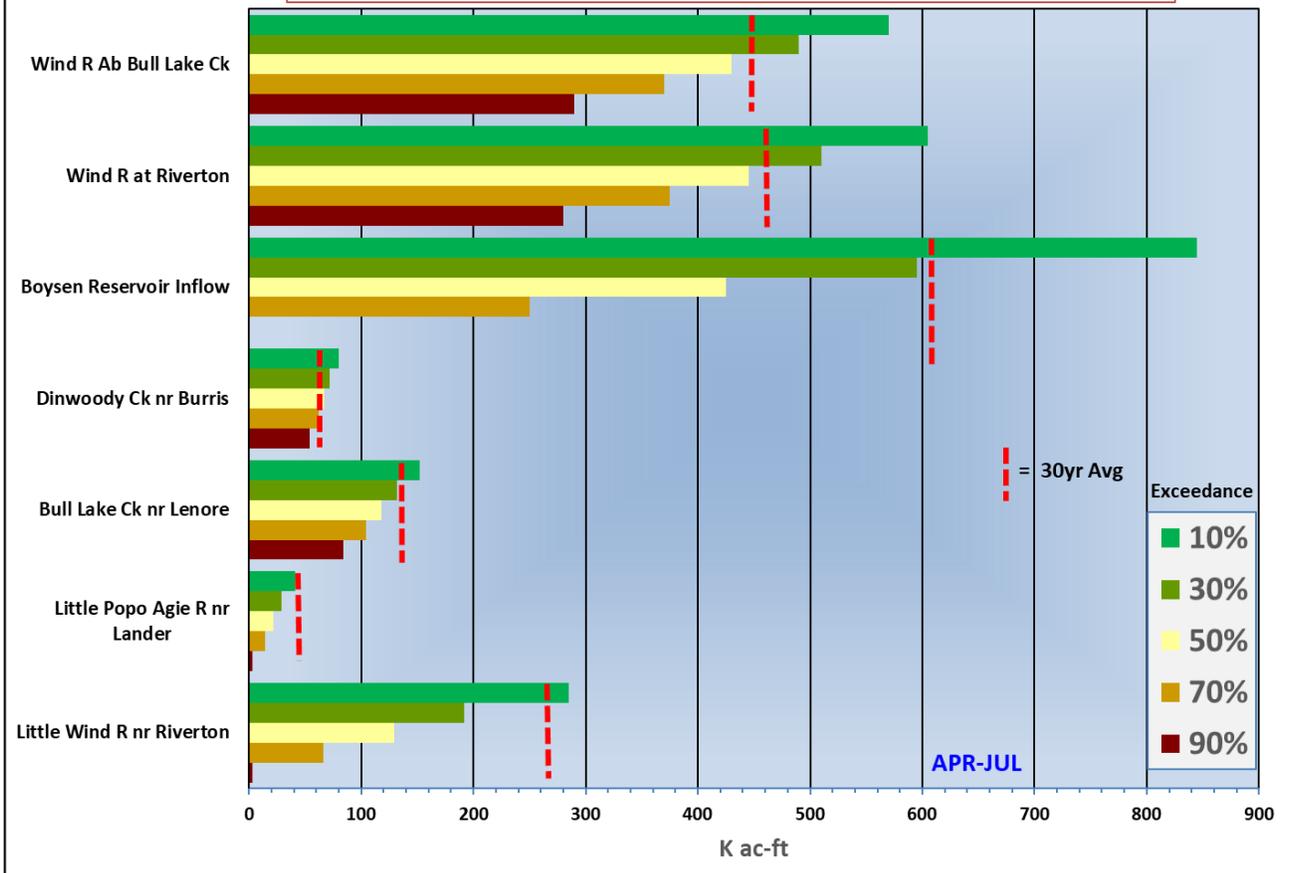


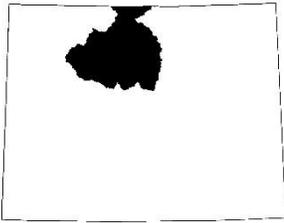
Wind River Basin

- The overall Wind River Basin SWE is near **80%** of median.
- Last month's precipitation for the Wind River Basin was near **115%** of average. Water-year-to-date precipitation is around **75%** of average.
- Current reservoir storage is **100 to 105%** of average for the three main reservoirs in the basin.
- The streamflow forecasts for April through July are **below** average (**78%**) for this basin. Dinwoody Creek near Burris is expected to have flows at **102%** of average.



Wind River Basin Streamflow Forecasts -- March 1, 2021

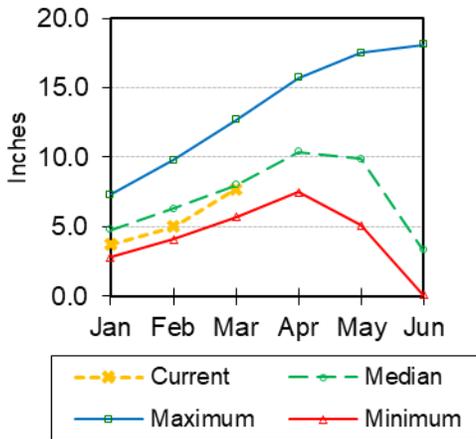




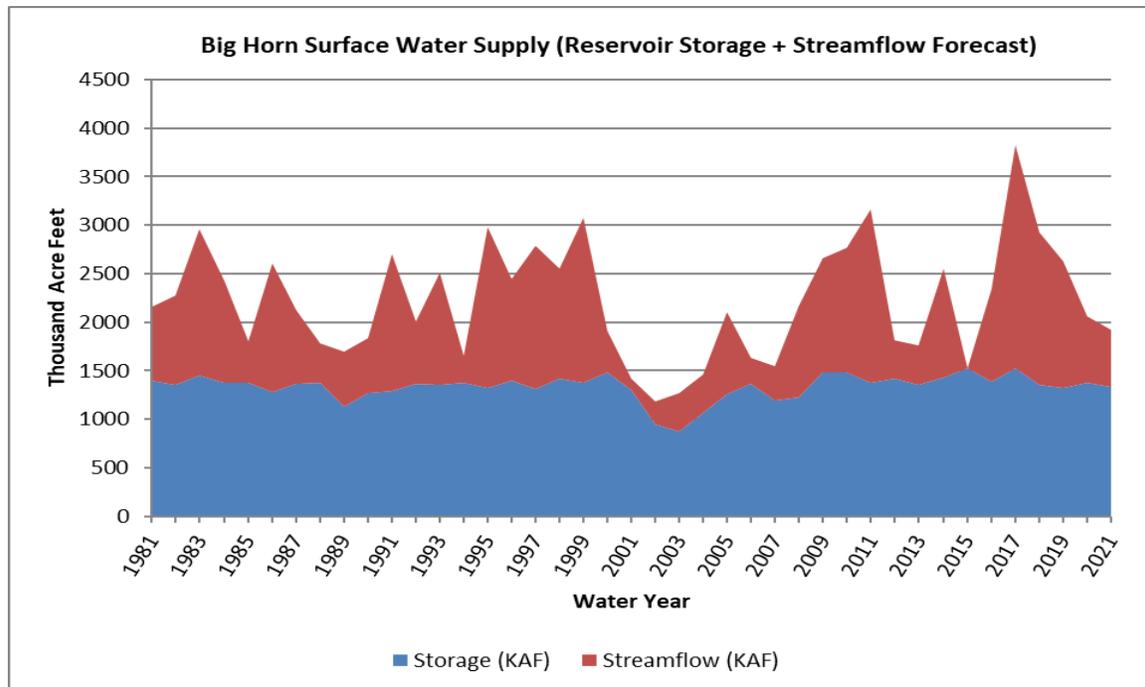
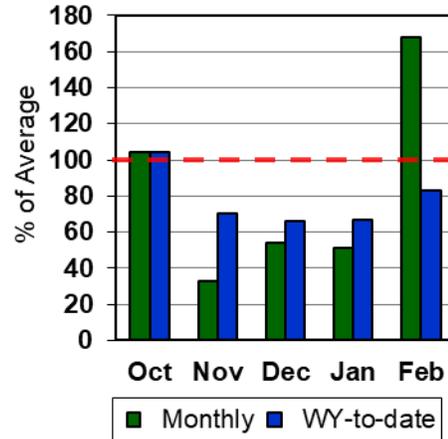
Bighorn River Basin

- The overall Bighorn River Basin SWE is near **100%** of median.
- Last month's precipitation for the Bighorn River Basin was **165** to **170%** of average. Water-year-to-date precipitation is **80** to **85%** of average.
- Current reservoir storage is near **105%** of average for the two main reservoirs in the basin.
- The 50% exceedance forecasts for April through July are **below** average (**82%**) for this basin. Shell Creek near Shell is forecasted to have flows at **93%** of average.

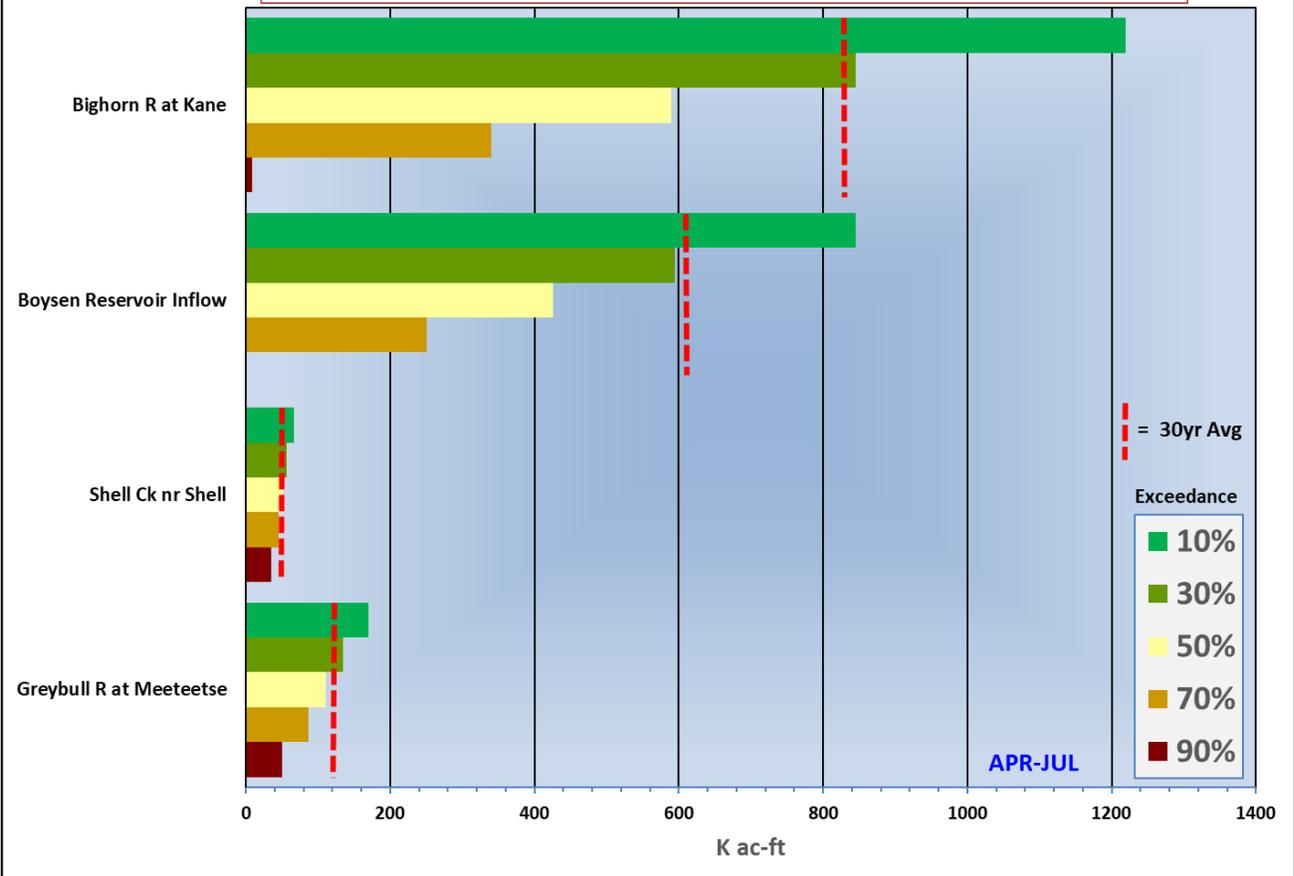
**Bighorn River Basin
Snow Water Equivalent**

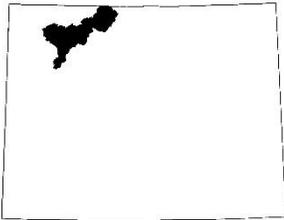


**Bighorn River Basin
Precipitation**



Bighorn River Basin Streamflow Forecasts -- March 1, 2021

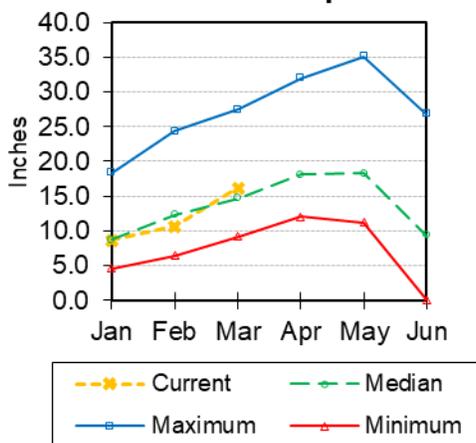




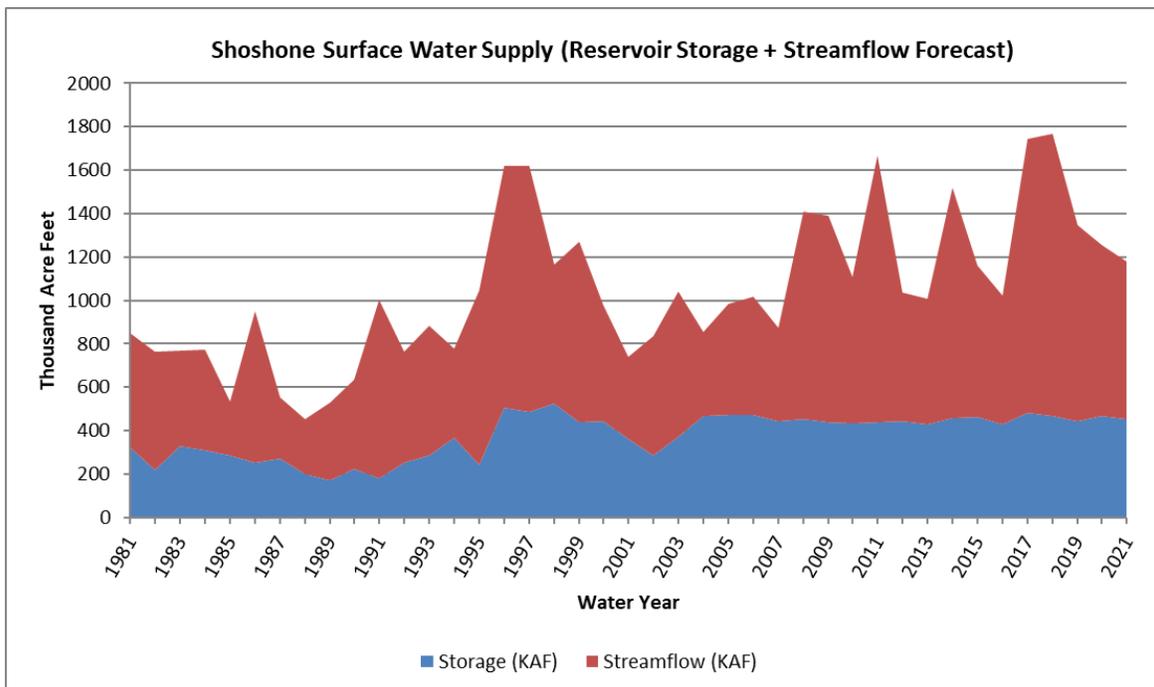
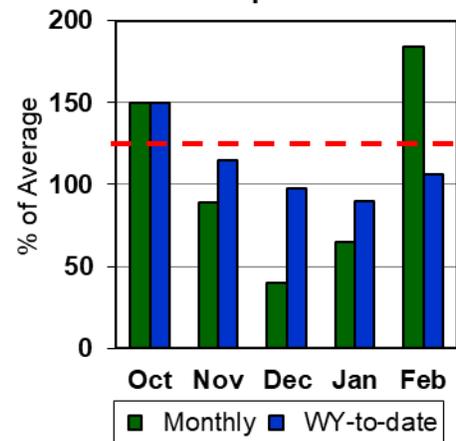
Shoshone River Basin

- The overall Shoshone River Basin SWE is around **110%** of median.
- Last month's precipitation for the Shoshone River Basin was near **185%** of average. Water-year-to-date precipitation is around **105%** of average.
- Current reservoir storage is near **130%** of average for one main reservoir in the basin.
- Streamflow forecasts for April through July are **above** average (**107%**) for this basin. North Fork Shoshone River at Wapiti is expected to have flows at **110%** of average.

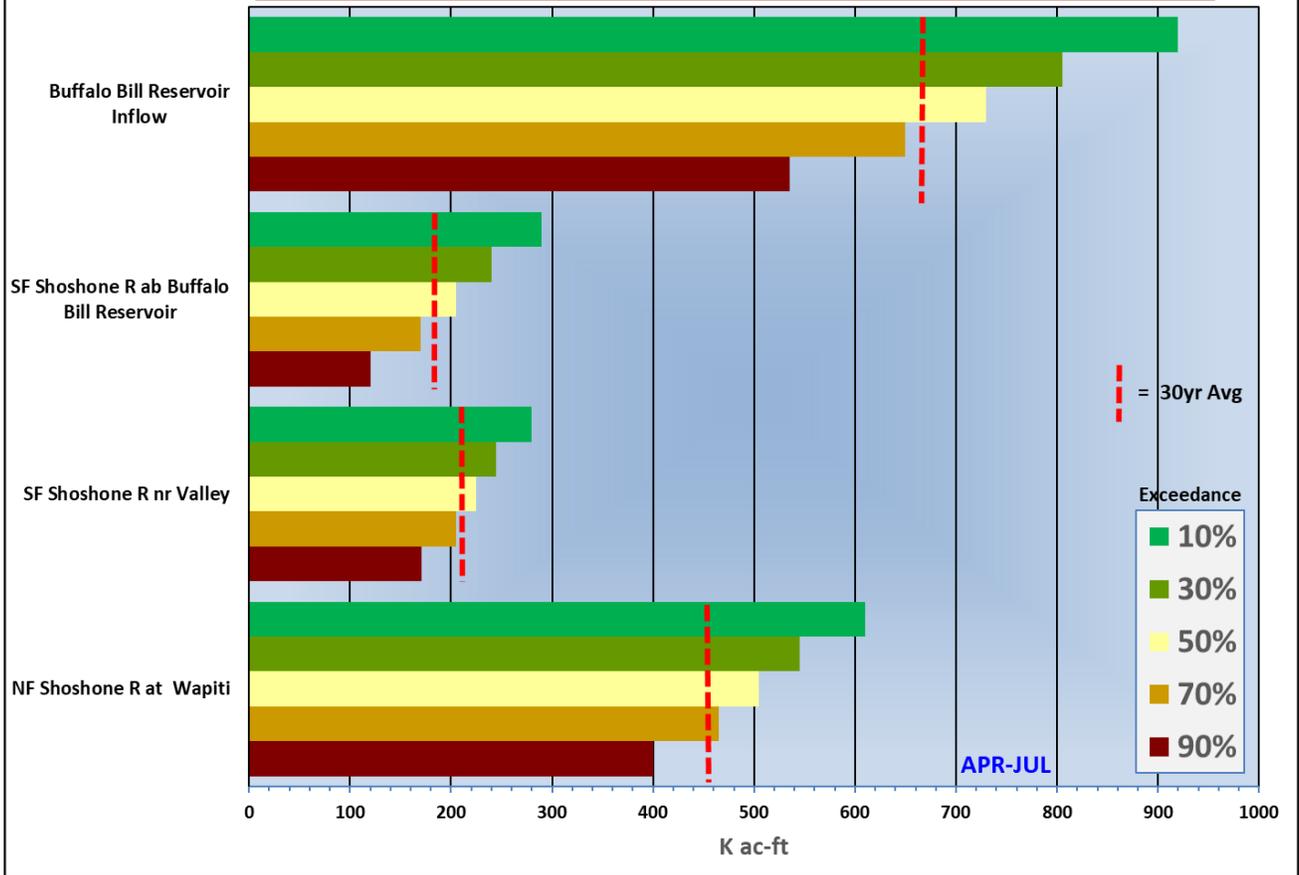
**Shoshone River Basin
Snow Water Equivalent**

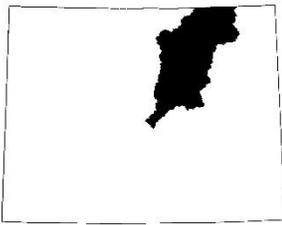


**Shoshone River Basin
Precipitation**



Shoshone River Basin Streamflow Forecasts -- March 1, 2021

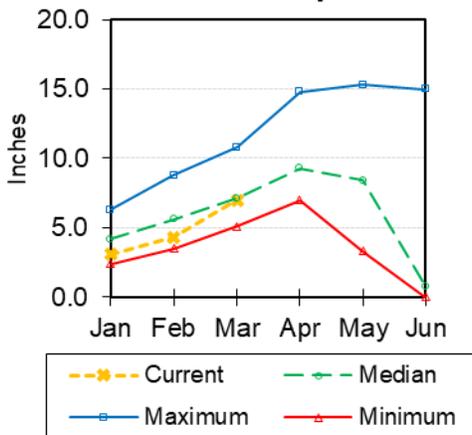




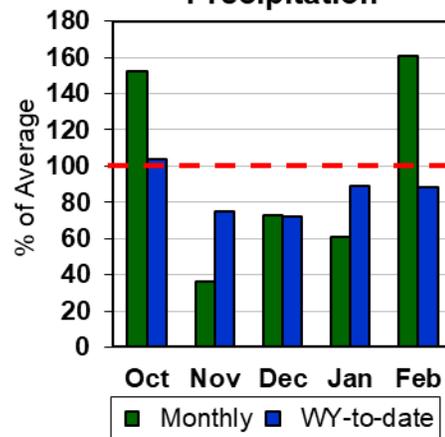
Powder River Basin

- The overall Powder River Basin SWE is near **100%** of median.
- Last month's precipitation for the Powder River Basin was near **160%** of average. Water-year-to-date precipitation is near **90%** of average.
- The 50% exceedance forecasts for April through July are near average (**95%**) for this basin.

**Powder River Basin
Snow Water Equivalent**

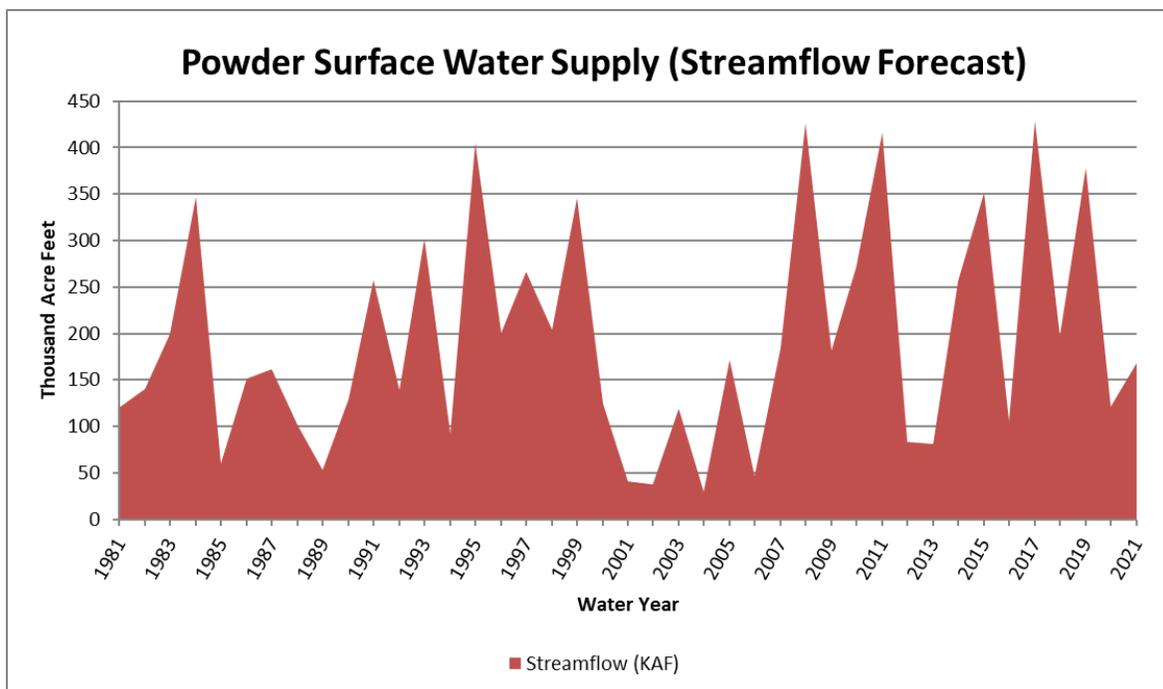


**Powder River Basin
Precipitation**

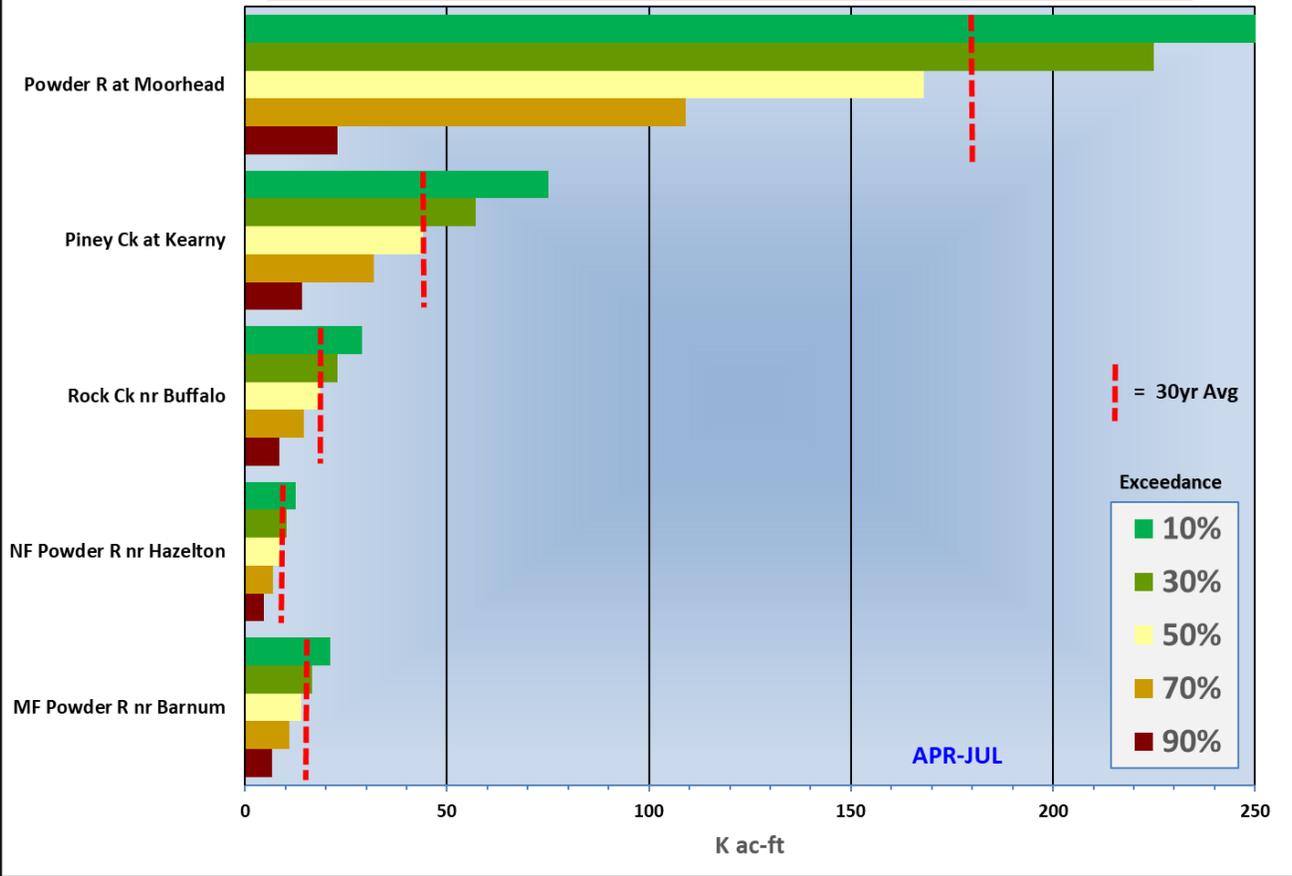


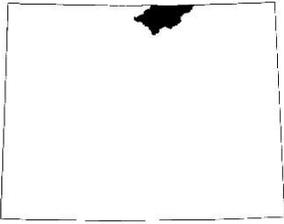
No reservoir data for the basin.

Powder Surface Water Supply (Streamflow Forecast)



Powder River Basin Streamflow Forecasts -- March 1, 2021

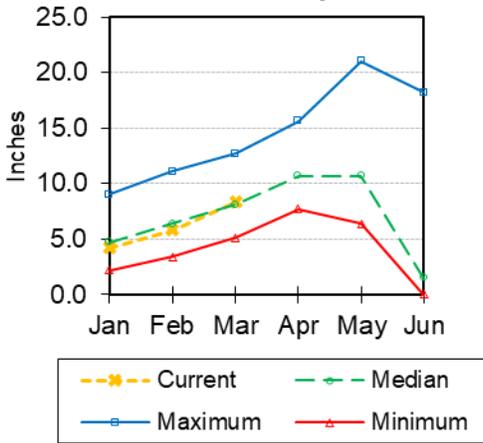




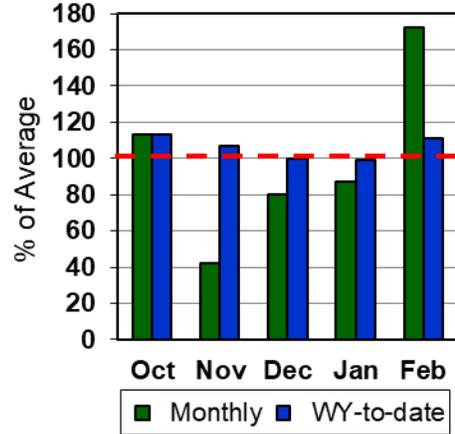
Tongue River Basin

- The overall Tongue River Basin SWE is near **100%** of median.
- Last month's precipitation for the Tongue River Basin was **170** to **175%** of average. Water-year-to-date precipitation is near **110%** of average.
- Current reservoir storage is near **155%** of average for one main reservoir in the basin.
- The 50% exceedance forecasts for April through July are **above** average (**104%**) for this basin. Little Goose Creek near Big Horn is forecasted to have flows at **106%** of average.

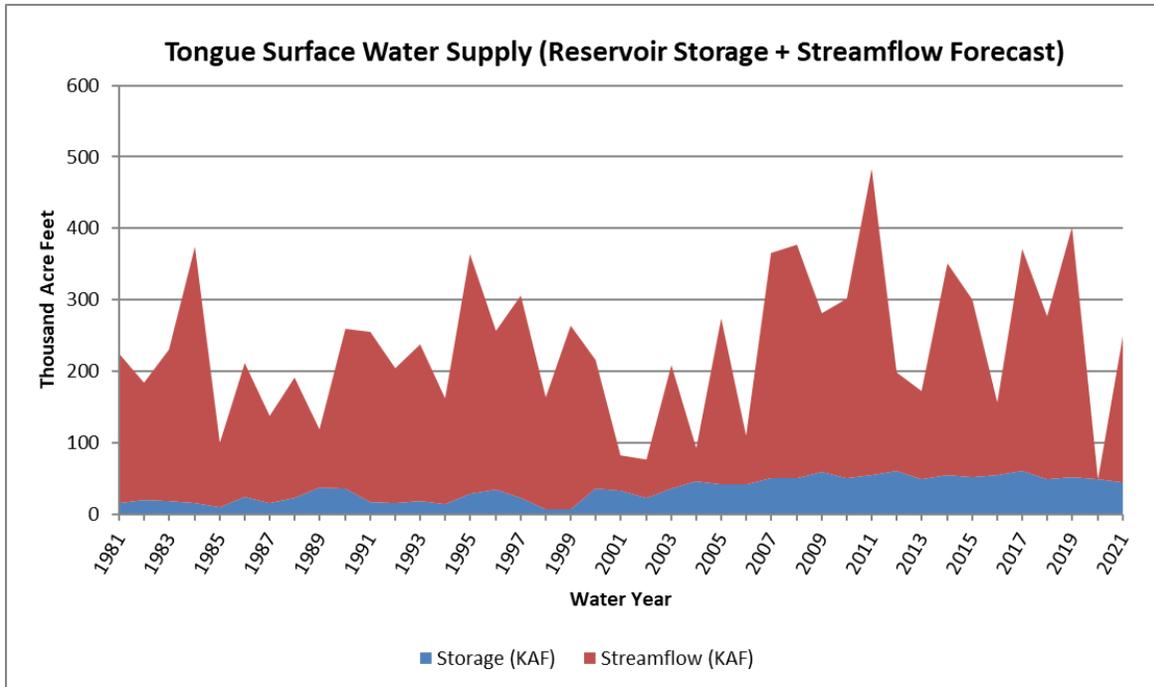
**Tongue River Basin
Snow Water Equivalent**



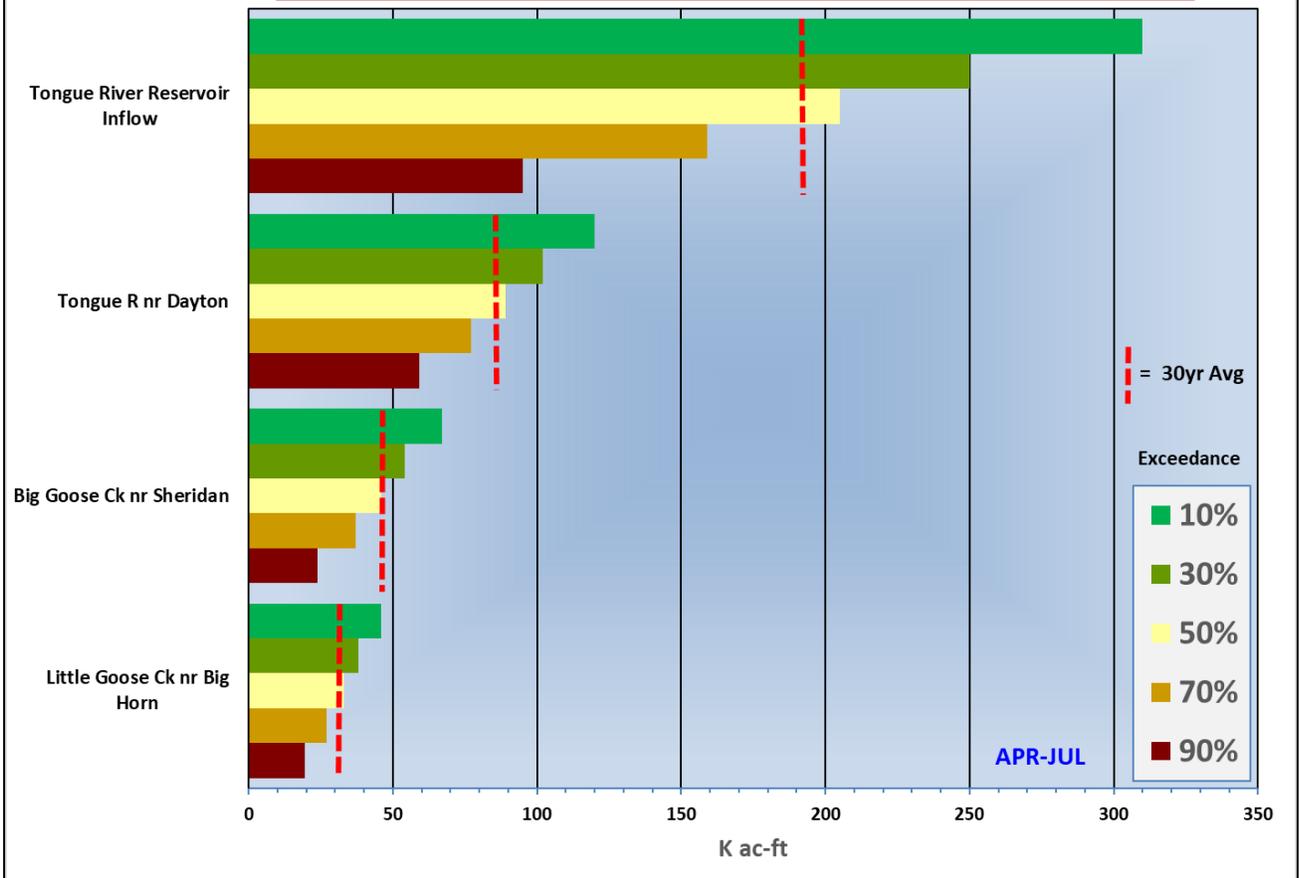
**Tongue River Basin
Precipitation**

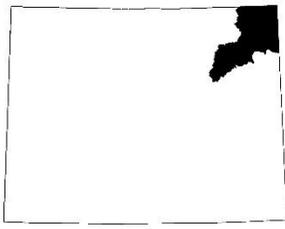


Tongue Surface Water Supply (Reservoir Storage + Streamflow Forecast)



Tongue River Basin Streamflow Forecasts -- March 1, 2021

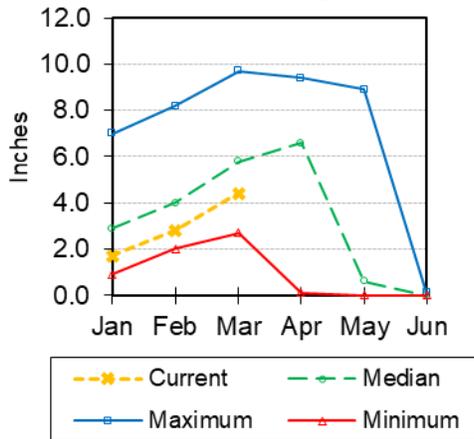




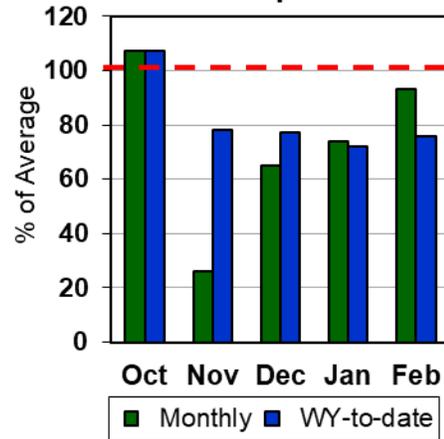
Belle Fourche River Basin

- The overall Belle Fourche River Basin SWE is **70** to **75%** of median.
- Last month's precipitation for the Belle Fourche River Basin was near **95%** of average. Water-year-to-date precipitation is around **75%** of average.
- Current reservoir storage is near **135%** of average for three main reservoirs in the basin.

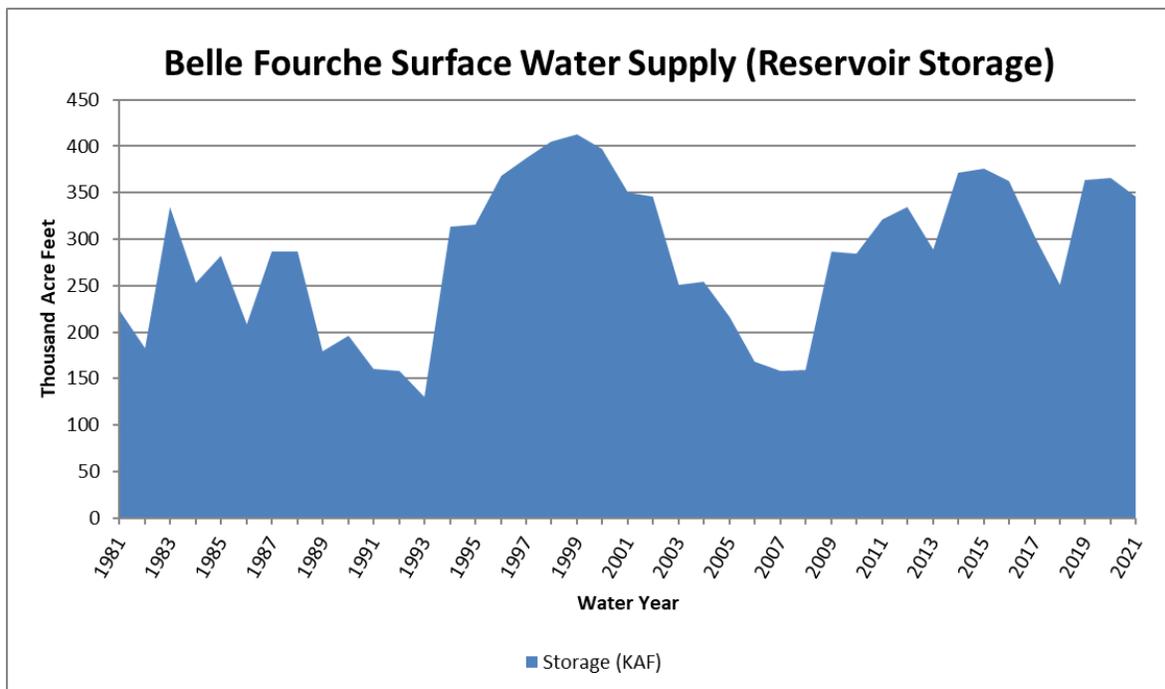
**Belle Fourche River Basin
Snow Water Equivalent**



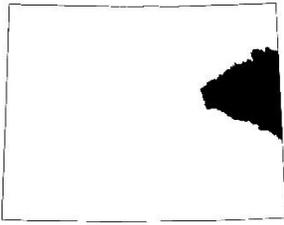
**Belle Fourche River Basin
Precipitation**



Belle Fourche Surface Water Supply (Reservoir Storage)



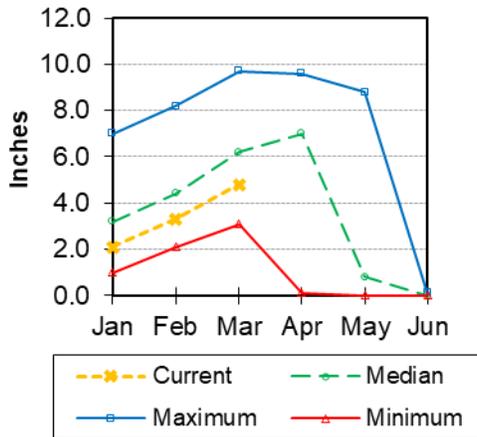
There are no streamflow forecast points for the basin.



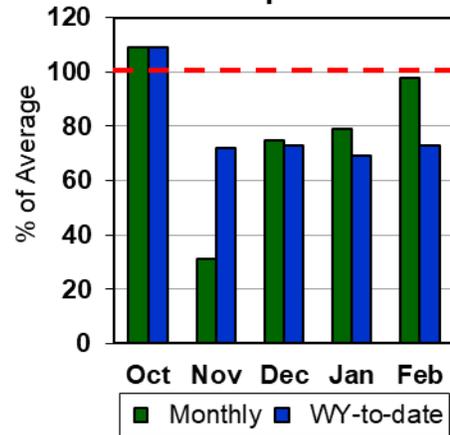
Cheyenne River Basin

- The overall Cheyenne River Basin SWE is near **75%** of median.
- Last month's precipitation for the Cheyenne River Basin was near **95** to **100%** of average. Water-year-to-date precipitation is around **75%** of average.
- Current reservoir storage is near **105%** of average for three main reservoirs in the basin.
- The 50% exceedance forecasts for April through July are **below** average (**67%**) for this basin. Deerfield Reservoir inflows are forecasted to be **77%** of average.

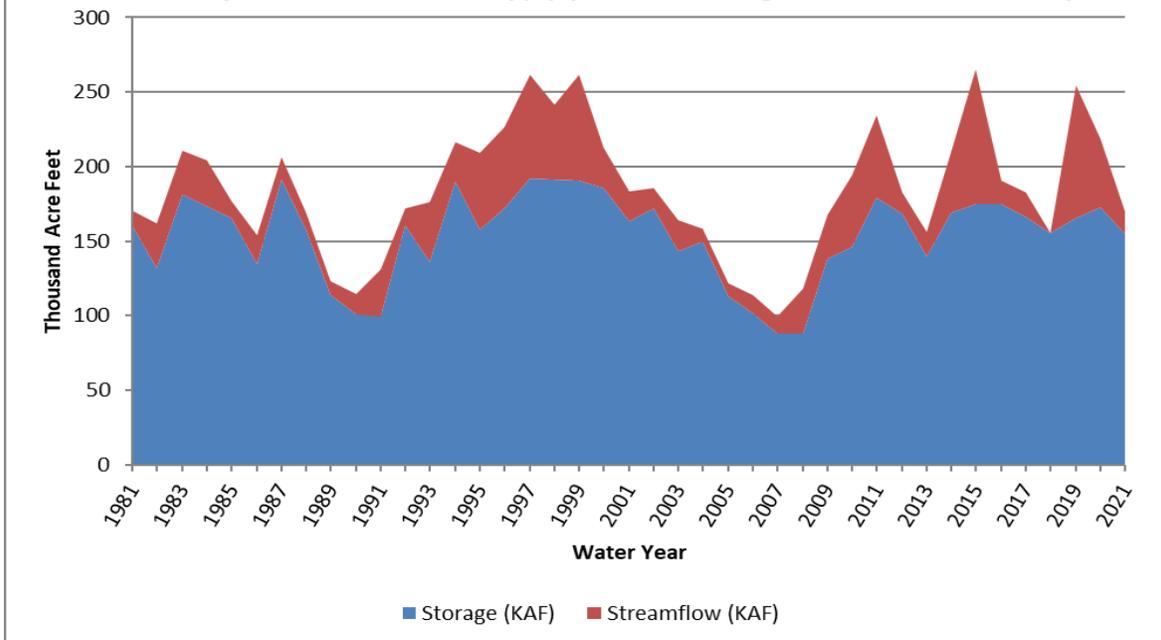
**Cheyenne River Basin
Snow Water Equivalent**



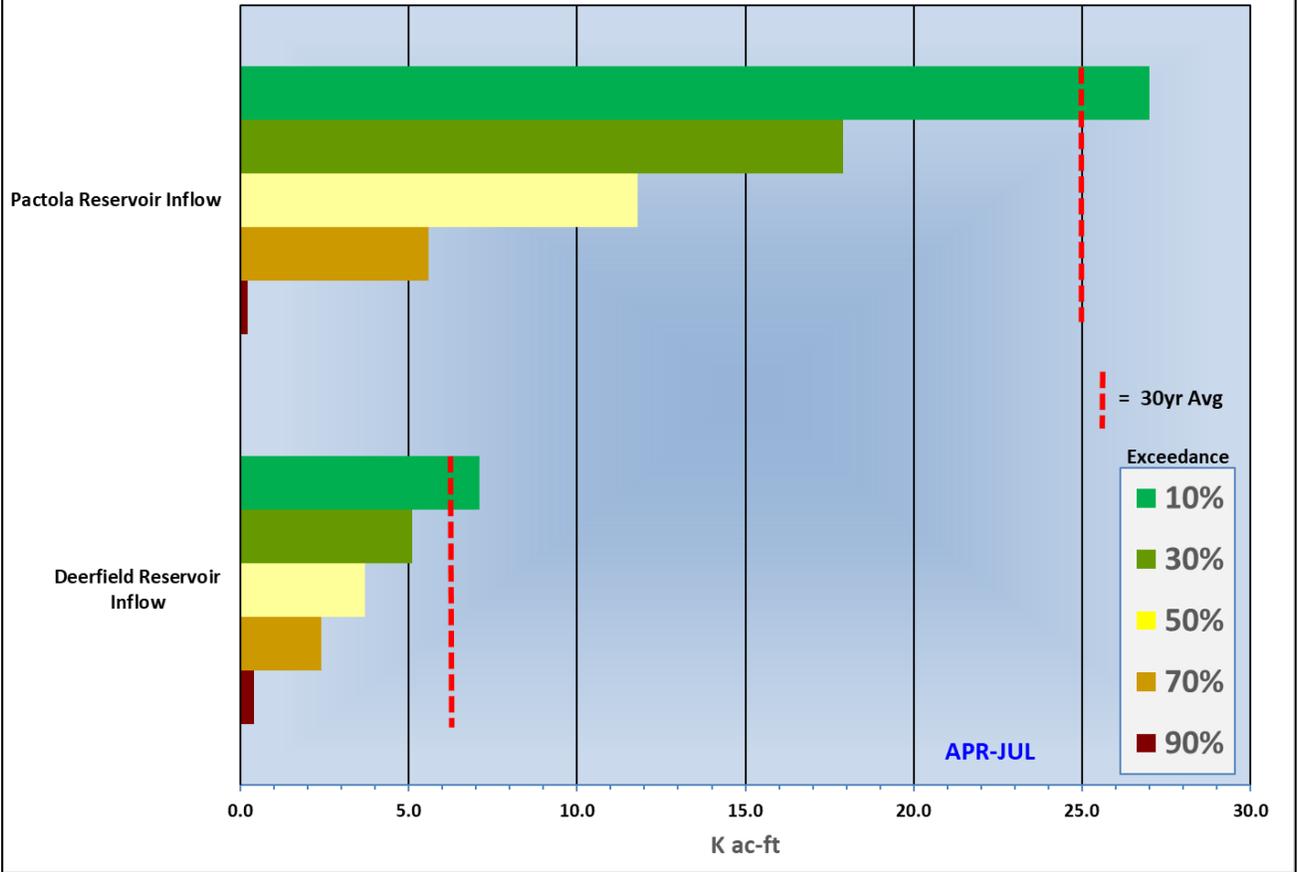
**Cheyenne River Basin
Precipitation**

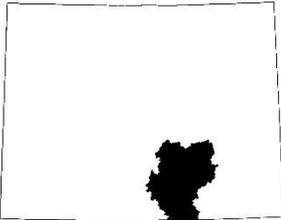


Cheyenne Surface Water Supply (Reservoir Storage + Streamflow Forecast)



Cheyenne River Basin Streamflow Forecasts -- March 1, 2021

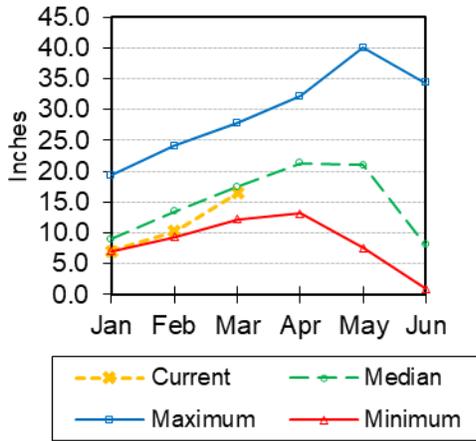




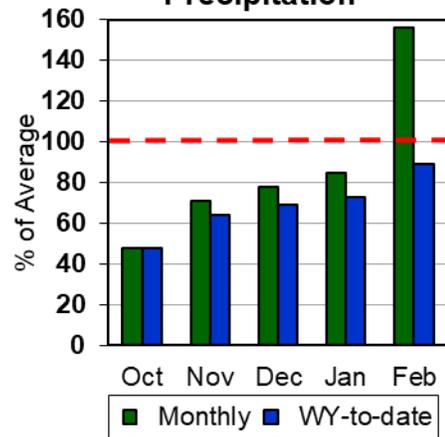
Upper North Platte River Basin

- The overall Upper North Platte River Basin SWE is **90** to **95%** of median.
- Last month's precipitation for the Upper North River Basin was near **155%** of average. Water-year-to-date precipitation is around **90%** of average.
- Current reservoir storage is near **115%** of average for one main reservoir in the basin.
- Streamflow forecasts for April through July are **below** average (**76%**) for this basin. Rock Creek near Arlington is expected to have flows at **112%** of average.

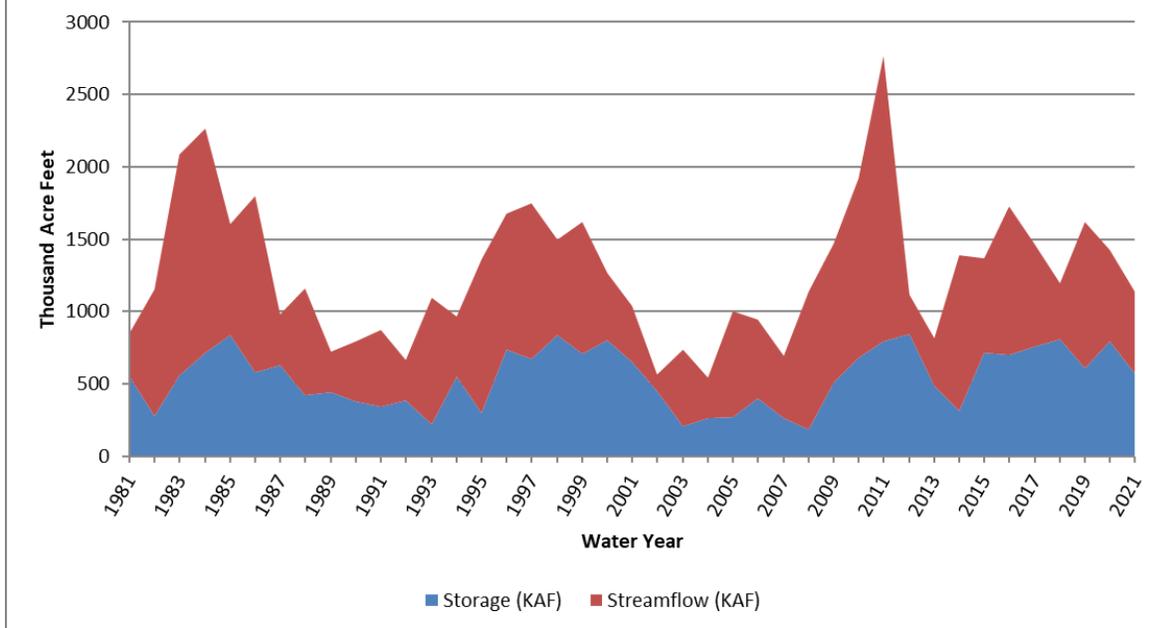
**Upper North Platte Basin
Snow Water Equivalent**



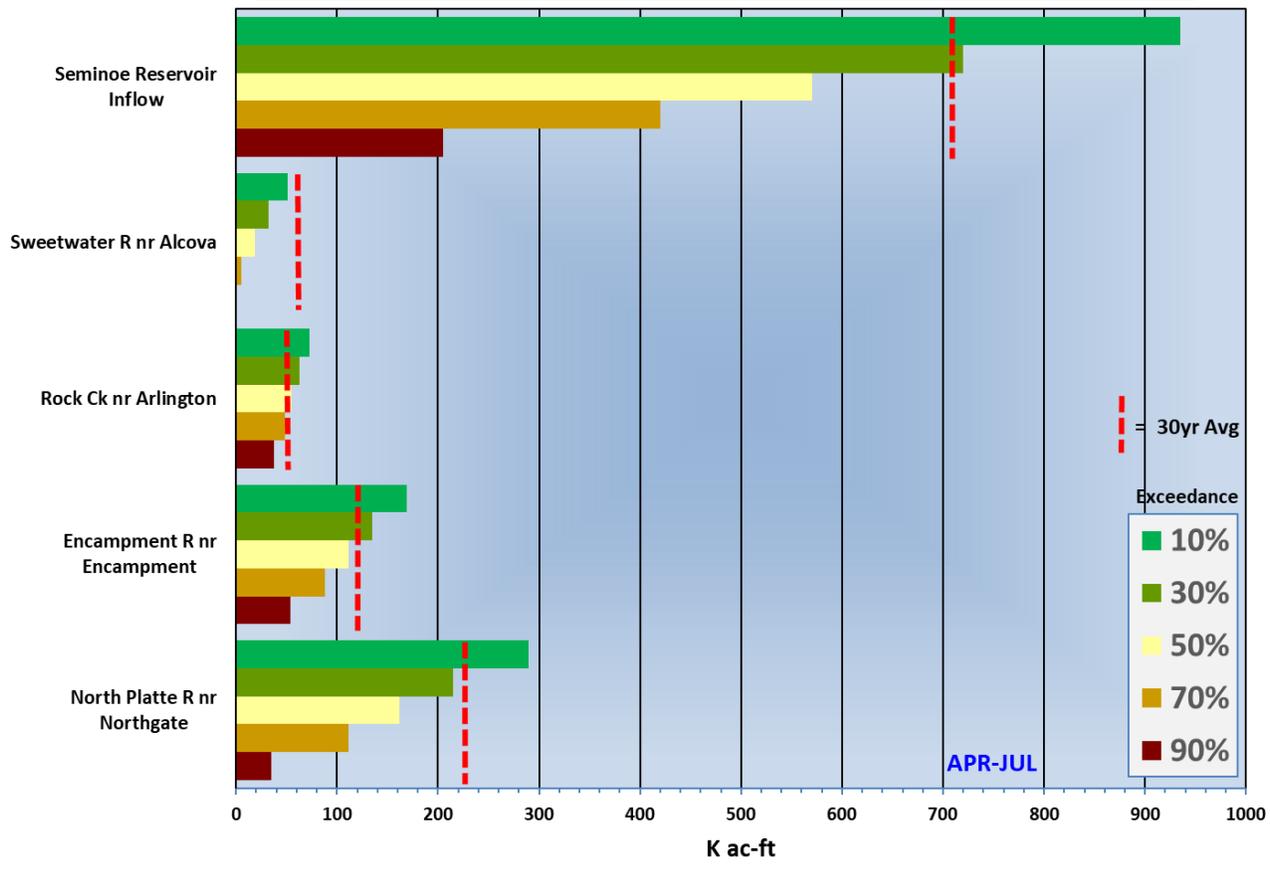
**Upper North Platte Basin
Precipitation**

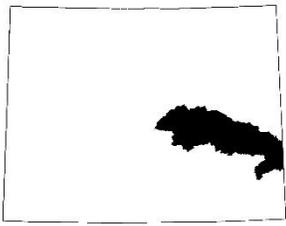


Upper N Platte Surface Water Supply (Reservoir Storage + Streamflow Forecast)



Upper North Platte River Basin Streamflow Forecasts -- March 1, 2021

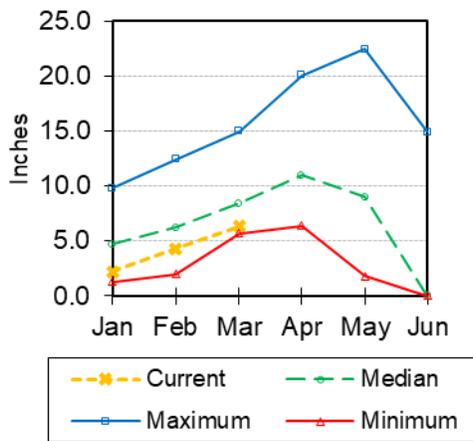




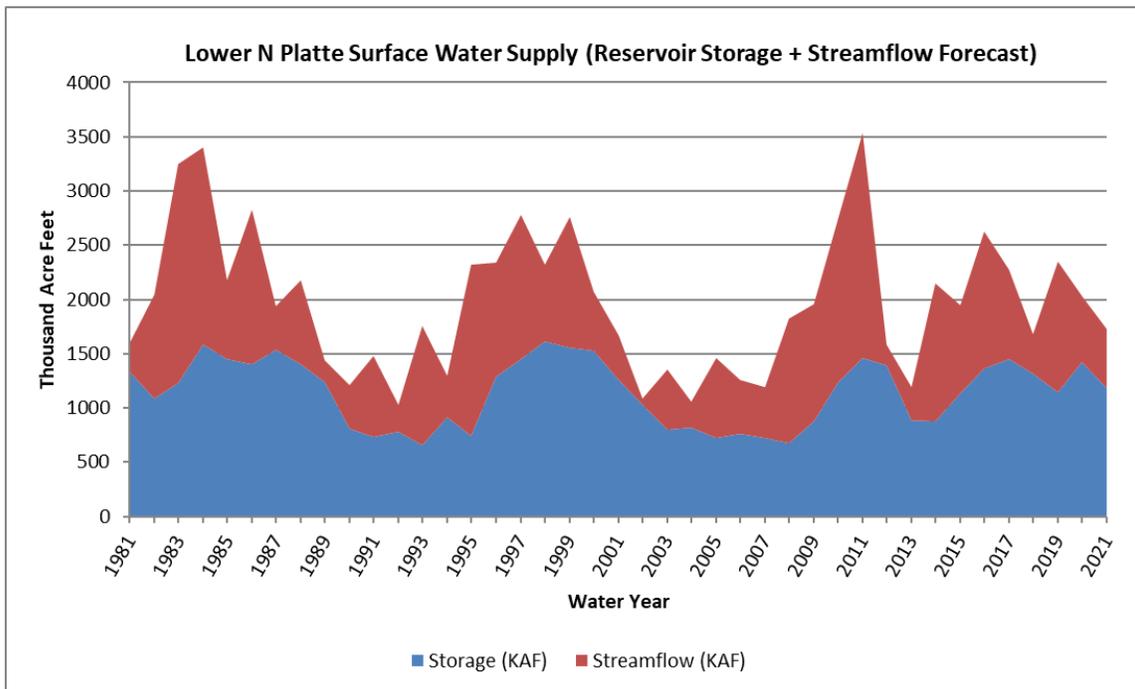
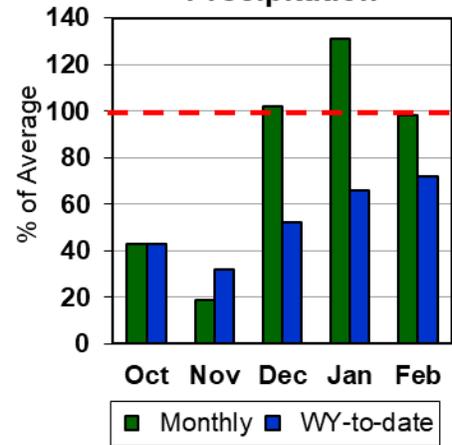
Lower North Platte River Basin

- The overall Lower North Platte River Basin SWE is **75** to **80%** of median.
- Last month's precipitation for the Lower North Platte River Basin was near **100%** of average. Water-year-to-date precipitation is around **70%** of average.
- Current reservoir storage is near **110%** of average for four main reservoirs in the basin.
- The 50% exceedance forecasts for April through July are **below** average (**63%**) for this basin. La Prele Creek near Douglas is forecasted to have flows at **55%** of average.

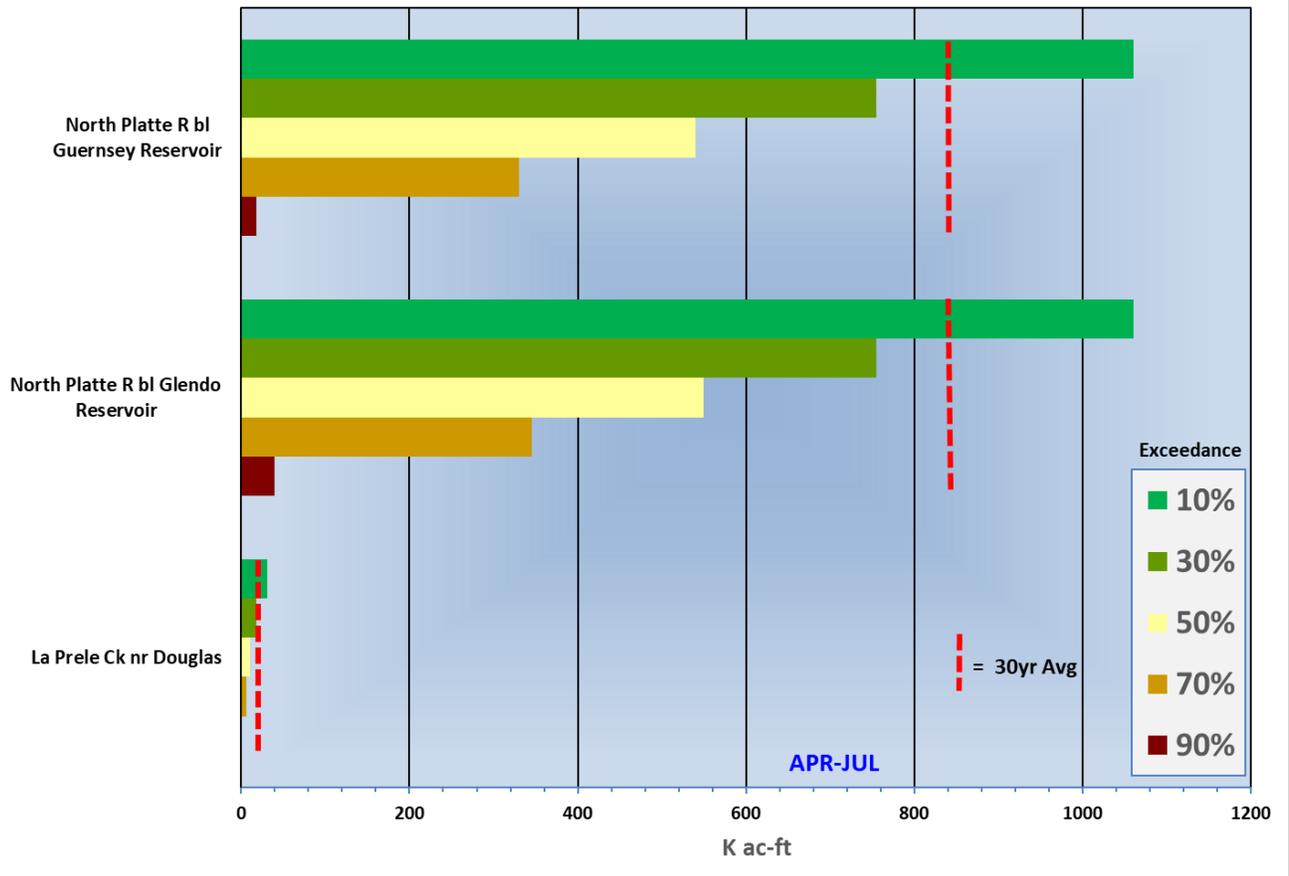
**Lower North Platte Basin
Snow Water Equivalent**

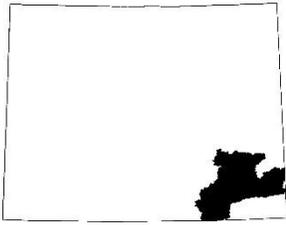


**Lower North Platte Basin
Precipitation**



Lower North Platte River Basin Streamflow Forecasts -- March 1, 2021

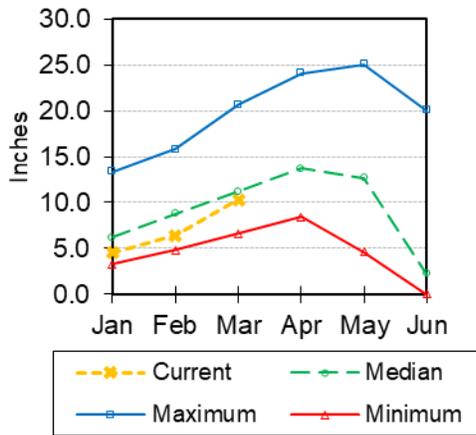




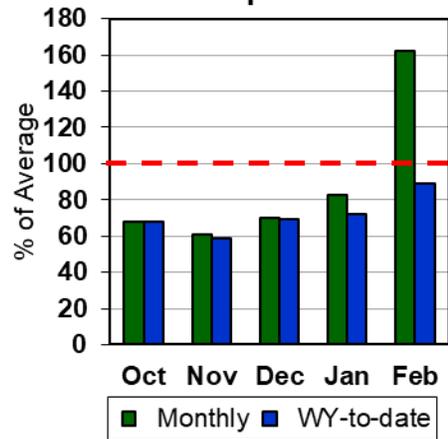
Laramie River Basin

- The overall Laramie River Basin SWE is around **90%** of median.
- Last month's precipitation for the Laramie River Basin was **160** to **165%** of average. Water-year-to-date precipitation is near **70%** of average.
- Current reservoir storage is around **130%** of average for one main reservoir in the basin.
- Streamflow forecasts for April through July are **above** average (**105%**) for this basin. Little Laramie River near Filmore is expected to have flows at **120%** of average.

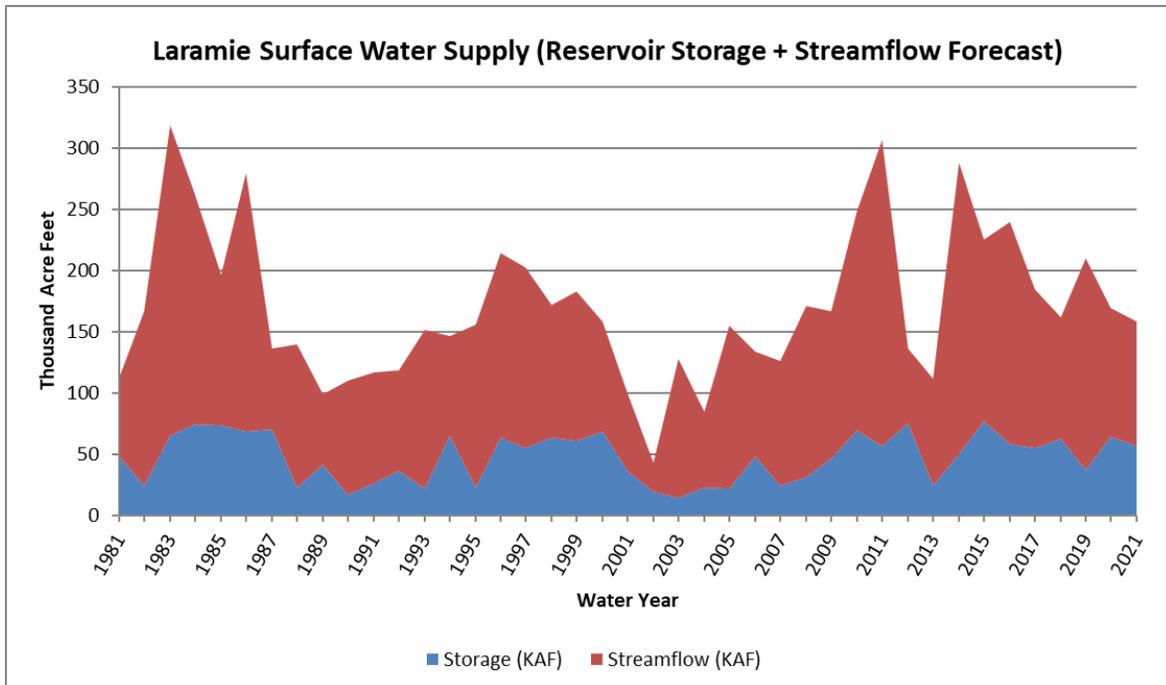
**Laramie River Basin
Snow Water Equivalent**



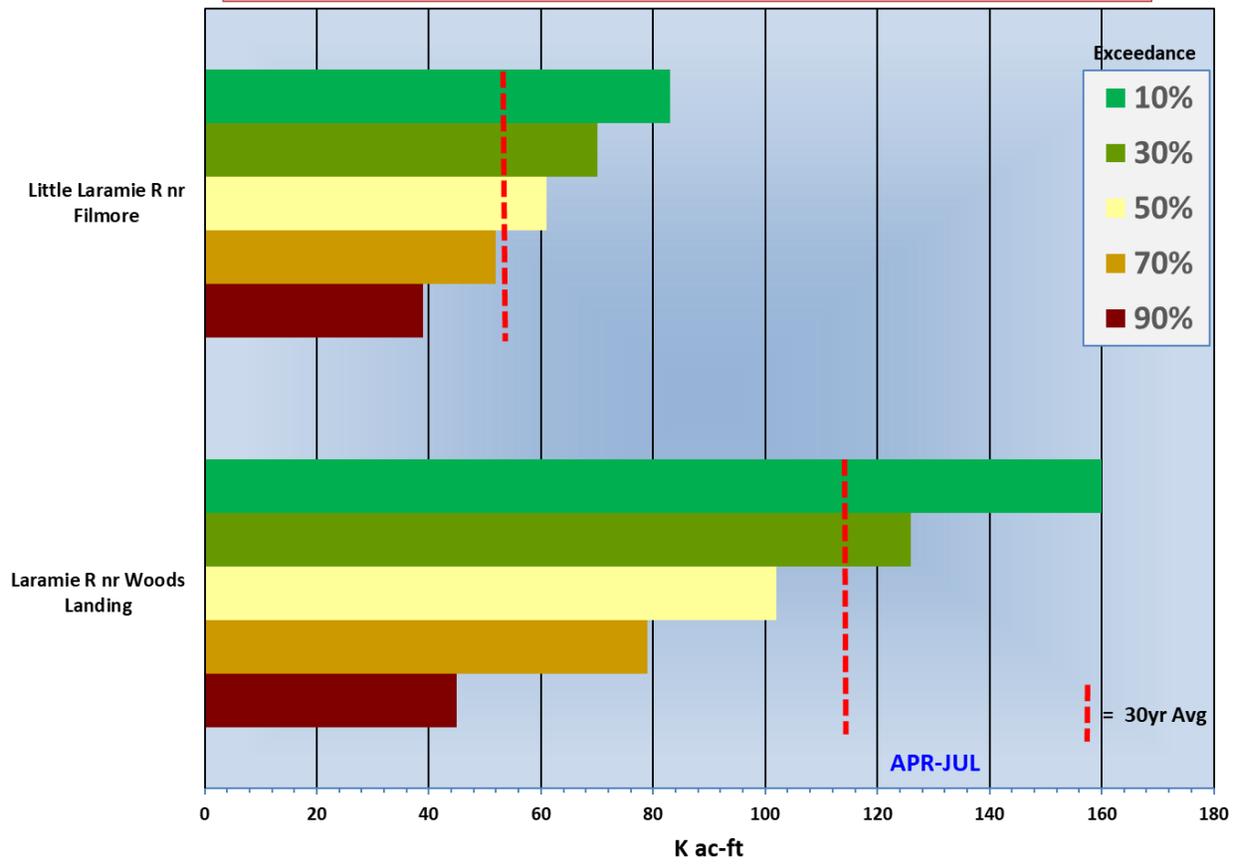
**Laramie River Basin
Precipitation**

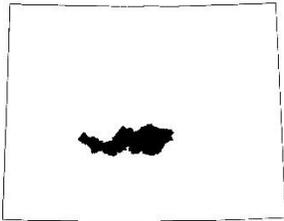


Laramie Surface Water Supply (Reservoir Storage + Streamflow Forecast)



Laramie River Basin Streamflow Forecasts -- March 1, 2021

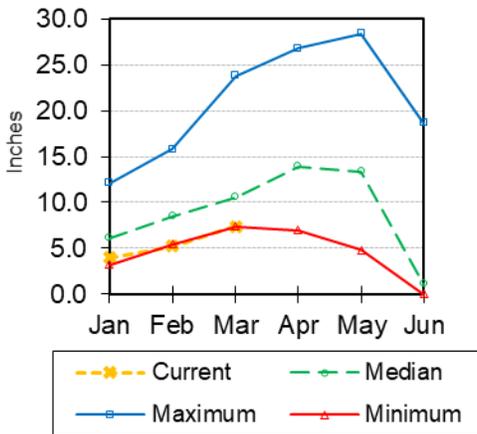




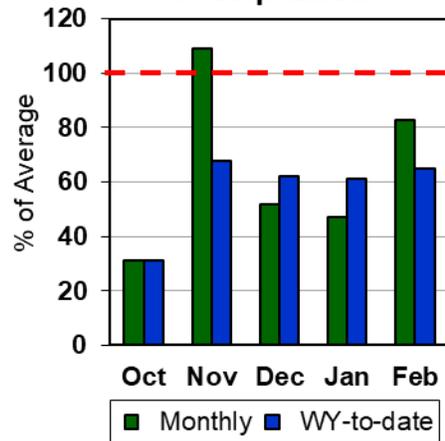
Sweetwater River Basin

- The overall Sweetwater River Basin SWE is around **65%** of median.
- Last month's precipitation for the Sweetwater River Basin was **80** to **85%** of average. Water-year-to-date precipitation is near **65%** of average.
- Current reservoir storage is near **105%** of average for one main reservoir in the basin.
- Streamflow forecast for Sweetwater River near Alcova (April-July) is **well below** average at **32%**.

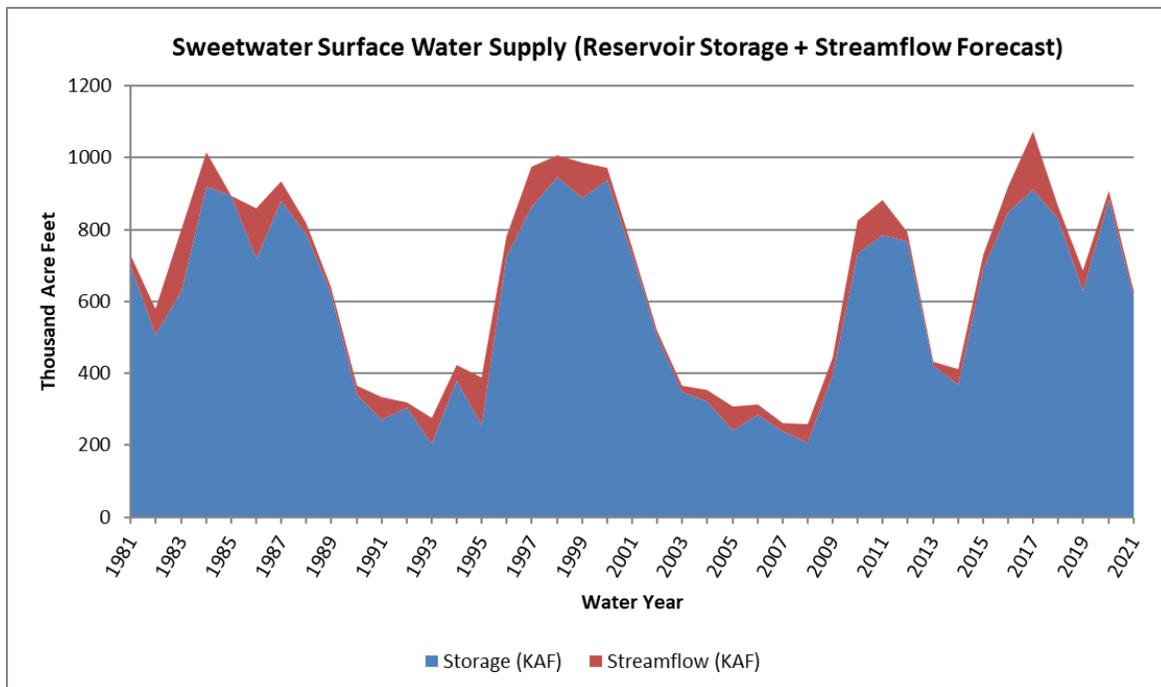
Sweetwater River Basin Snow Water Equivalent



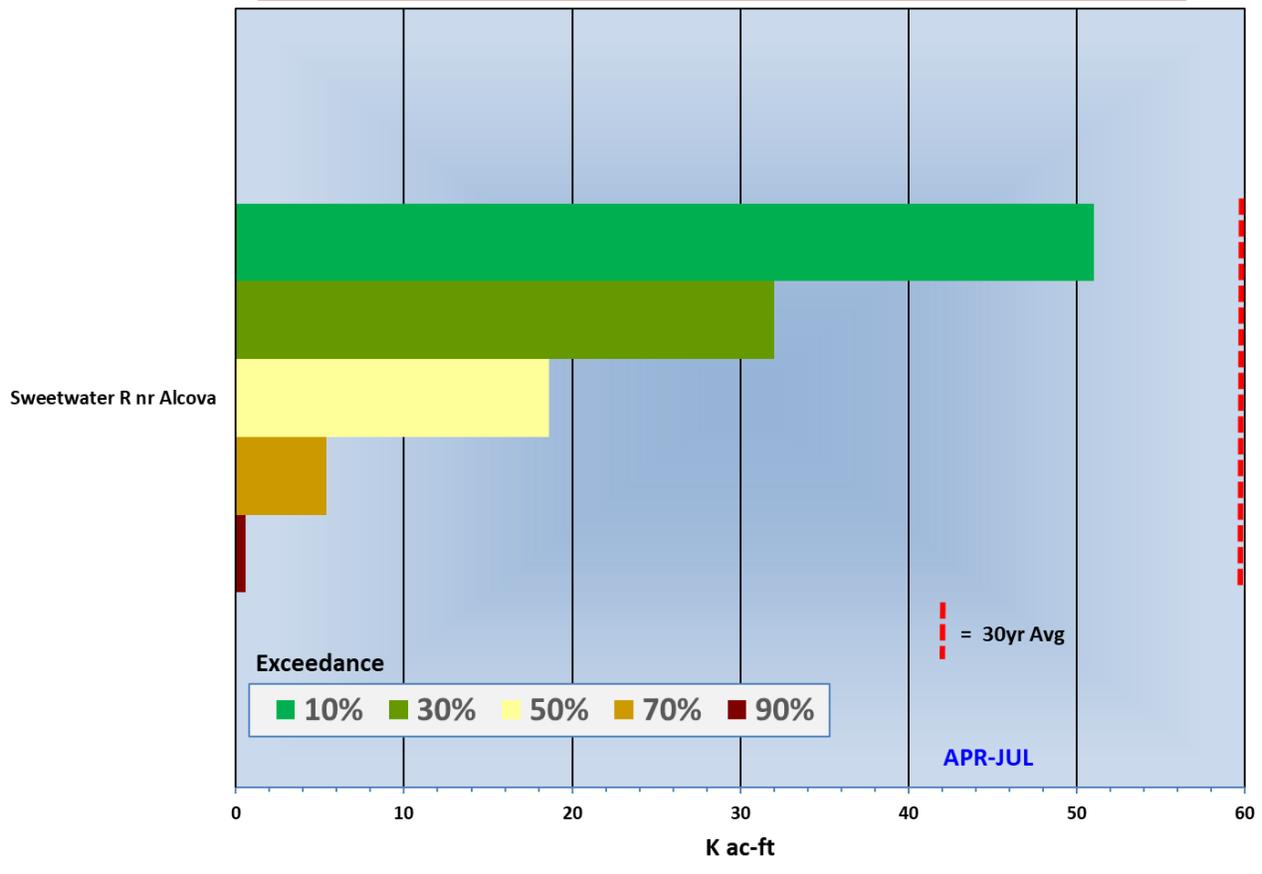
Sweetwater River Basin Precipitation

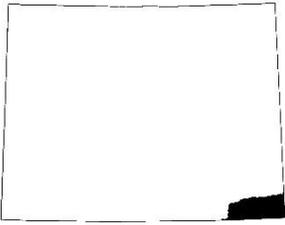


Sweetwater Surface Water Supply (Reservoir Storage + Streamflow Forecast)



Sweetwater River Basin Streamflow Forecast -- March 1, 2021

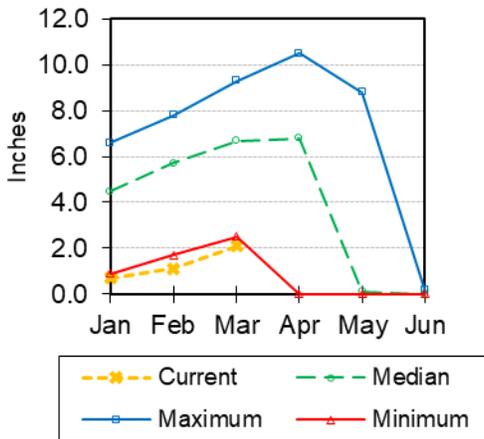




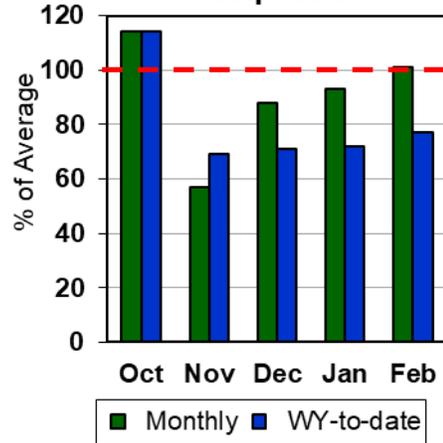
South Platte River Basin (WY)

- The overall South Platte River Basin SWE is **55** to **60%** of median.
- Last month's precipitation for the South Platte River Basin was near **100%** of average. Water-year-to-date precipitation is at **75** to **80%** of average.

**South Platte River Basin
Snow Water Equivalent**

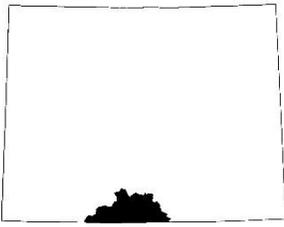


**South Platte River Basin
Precipitation**



No reservoir data for the basin.

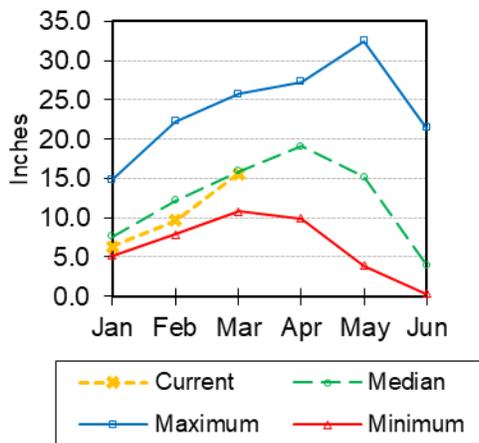
There are no streamflow forecast points for the basin.



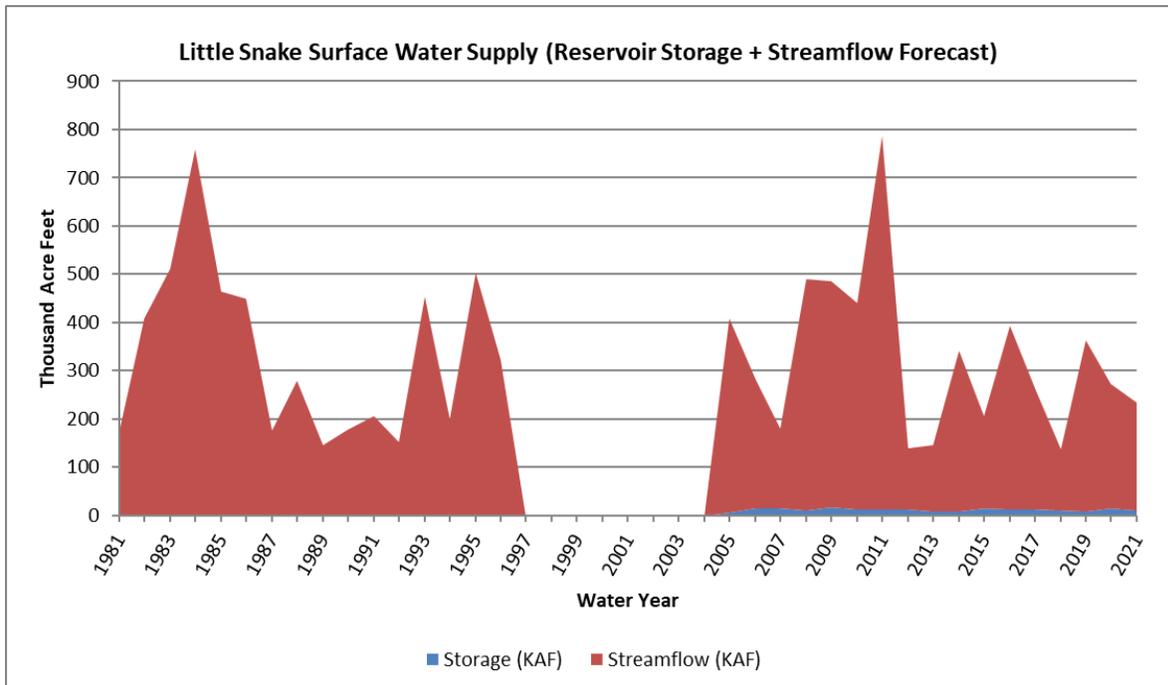
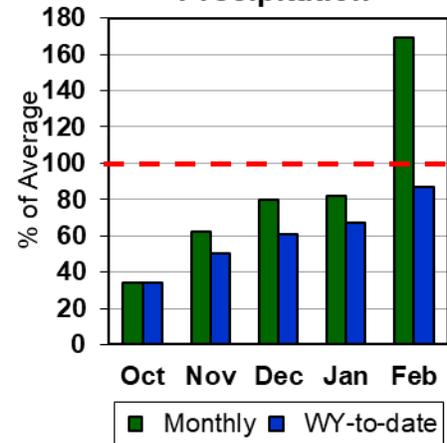
Little Snake River Basin

- The overall Little Snake River Basin SWE is near **95** to **100%** of median.
- Last month's precipitation for the Little Snake River Basin was near **170%** of average. Water-year-to-date precipitation is **85** to **90%** of average.
- Current reservoir storage is **70** to **75%** of average for one main reservoir in the basin.
- The 50% exceedance forecasts for April through July are **below** average (**74%**) for this basin.

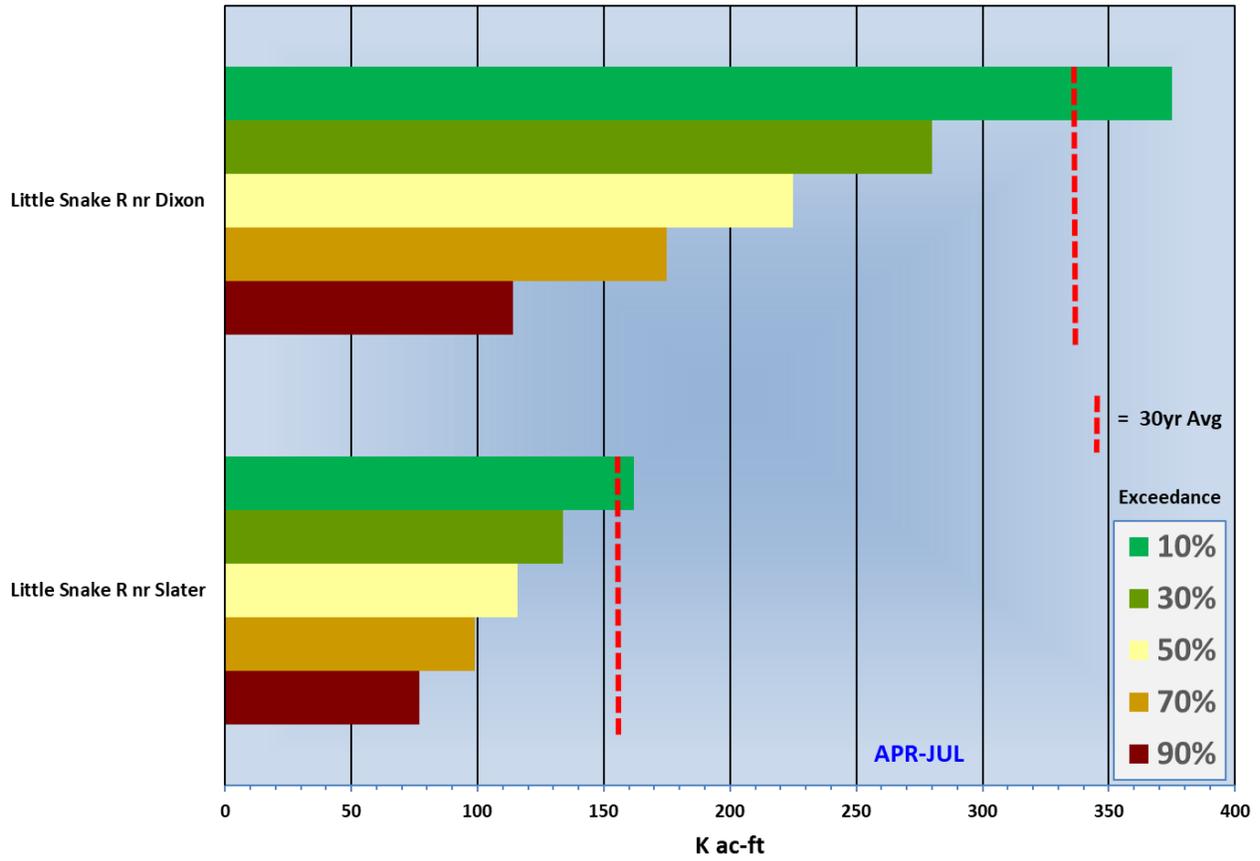
**Little Snake River Basin
Snow Water Equivalent**

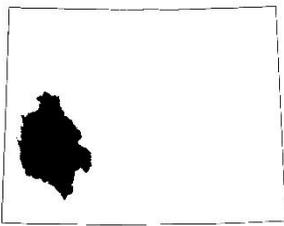


**Little Snake River Basin
Precipitation**



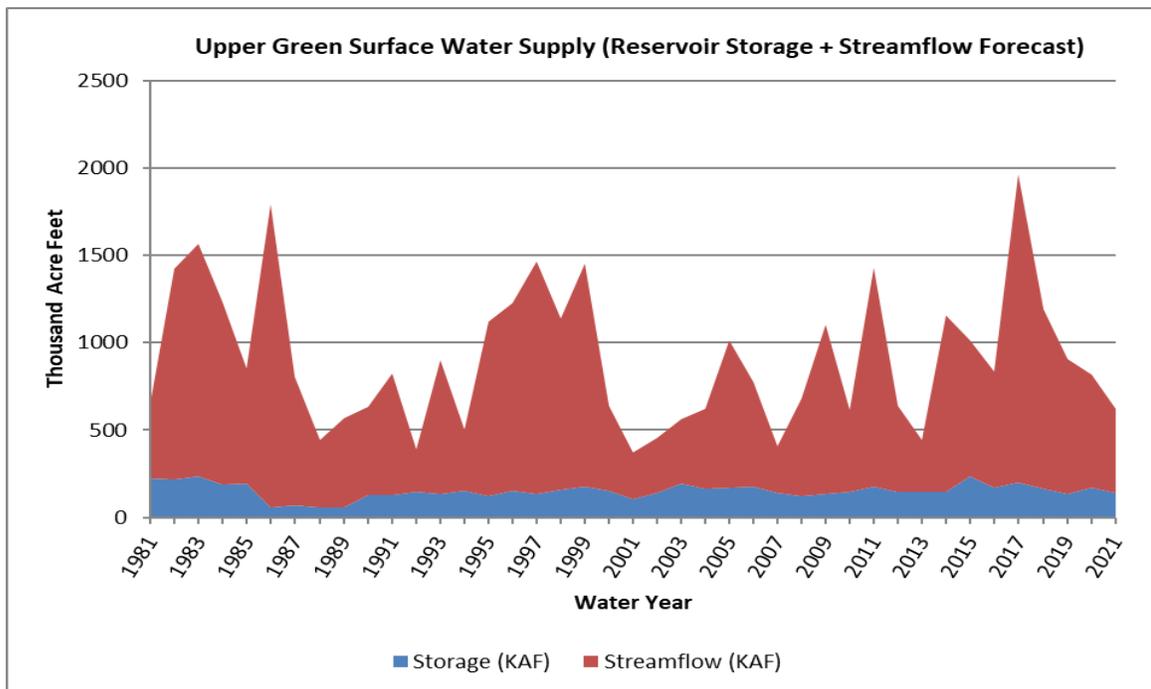
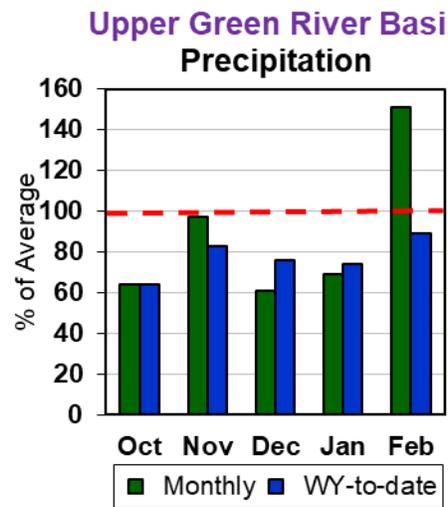
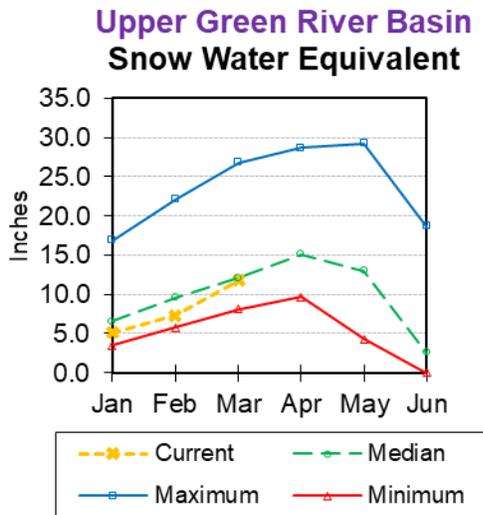
Little Snake River Basin Streamflow Forecasts -- March 1, 2021



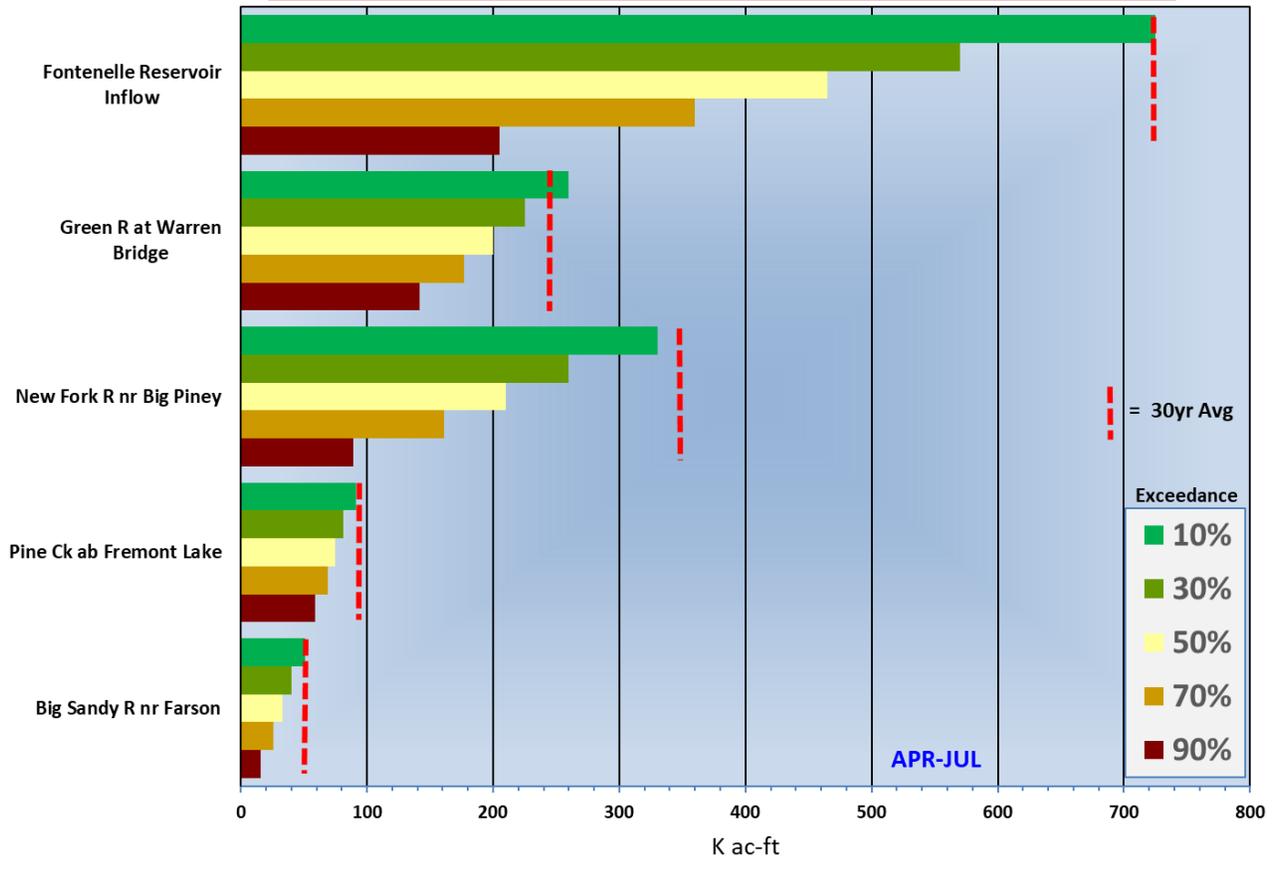


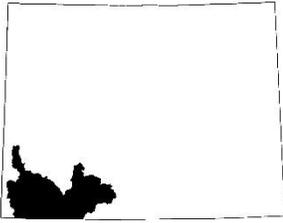
Upper Green River Basin

- The overall Upper Green River Basin SWE is near **95** to **100%** of median.
- Last month's precipitation for the Upper River Basin was near **150%** of average. Water-year-to-date precipitation is around **90%** of average.
- Current reservoir storage is **95** to **100%** of average for two main reservoirs in the basin.
- Streamflow forecasts for April through July are **below** average (**69%**) for this basin. Green River at Warren Bridge is expected to have flows at **82%** of average.



Upper Green River Basin Streamflow Forecasts -- March 1, 2021

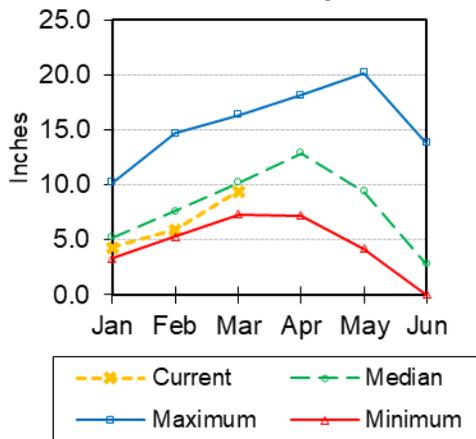




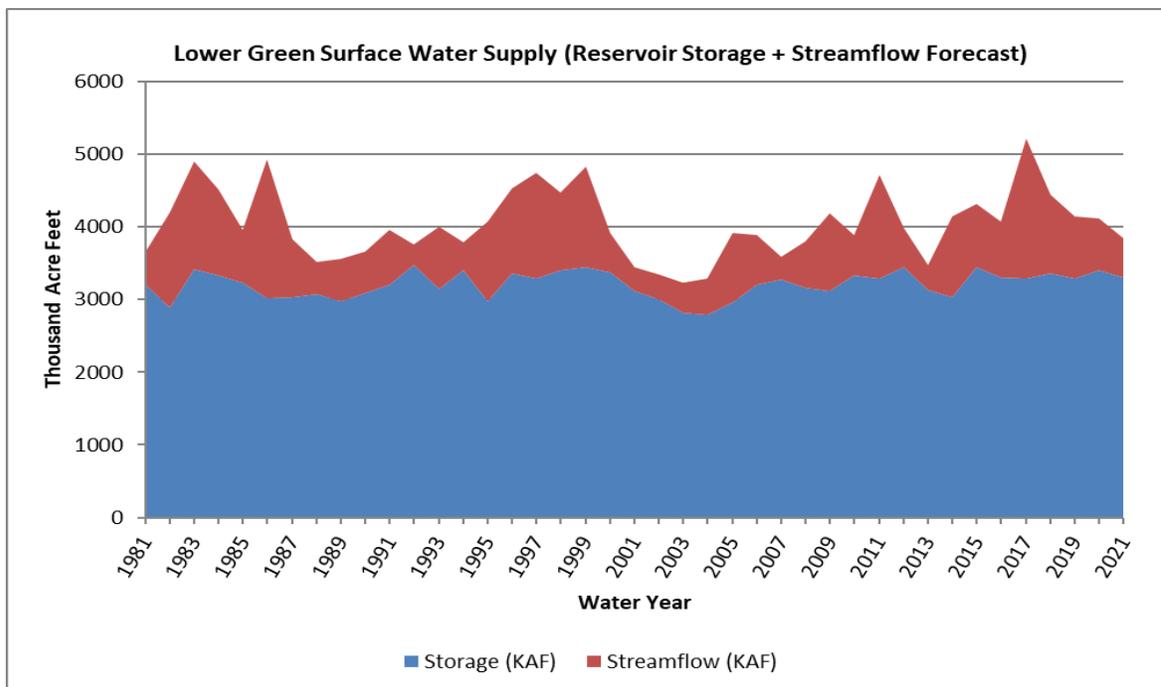
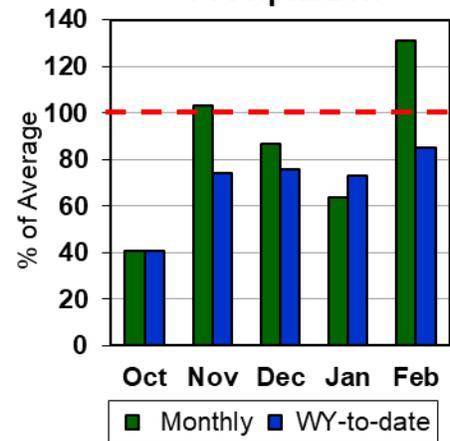
Lower Green River Basin

- The overall Lower Green River Basin SWE is near **90%** of median.
- Last month's precipitation for the Lower Green River Basin was near **130%** of average. Water-year-to-date precipitation is around **85%** of average.
- Current reservoir storage is **100** to **105%** of average for three main reservoirs in the basin.
- Streamflow forecasts for April through July are **below** average (**67%**) for this basin.

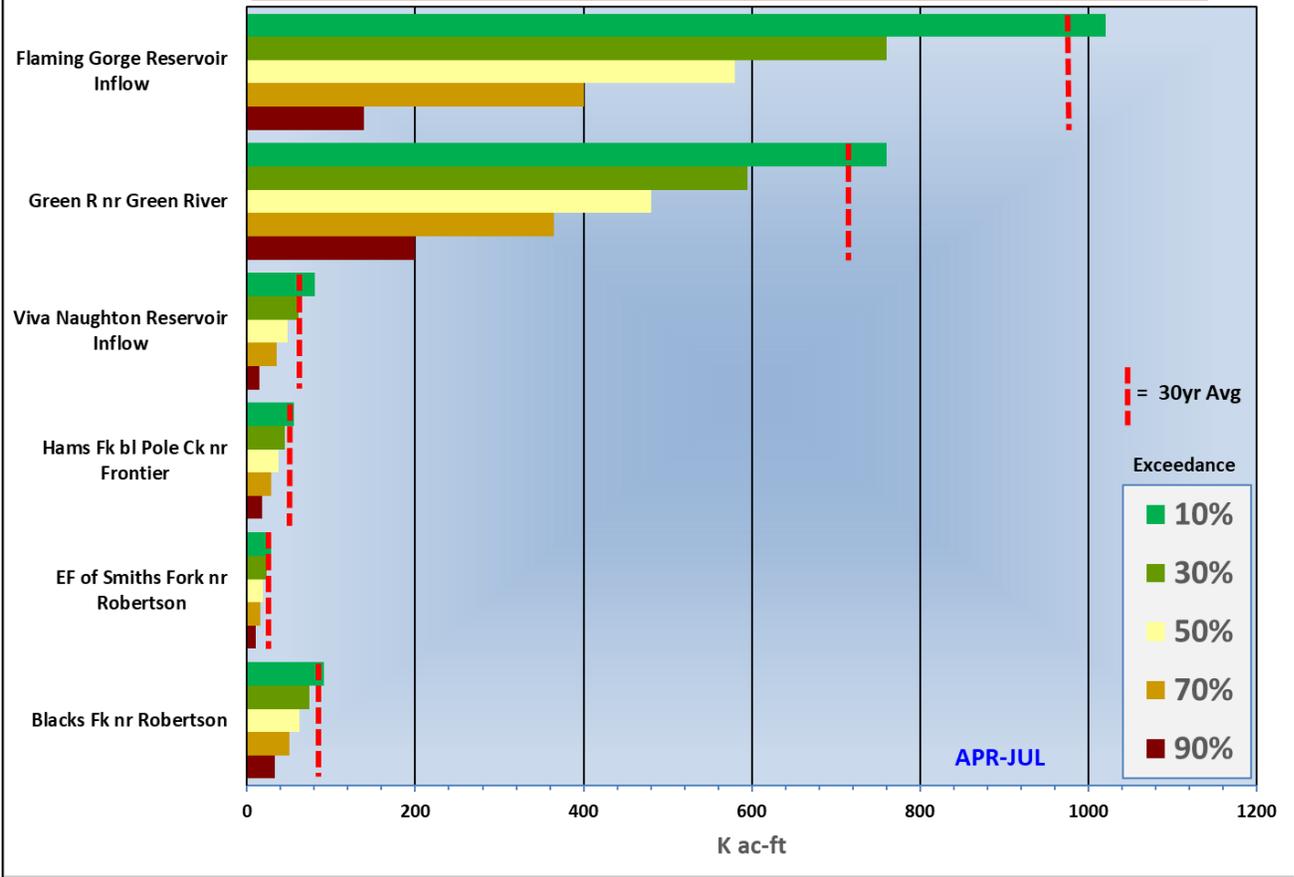
**Lower Green River Basin
Snow Water Equivalent**

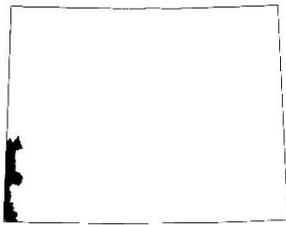


**Lower Green River Basin
Precipitation**



Lower Green River Basin Streamflow Forecasts -- March 1, 2021

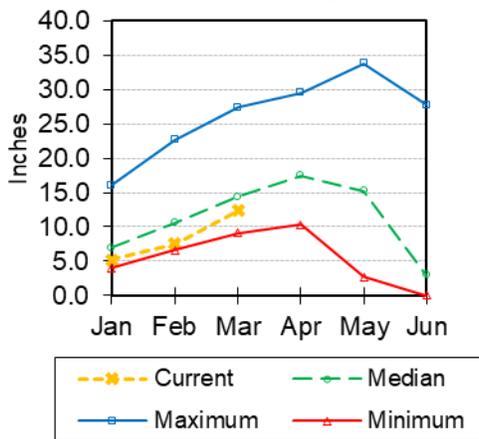




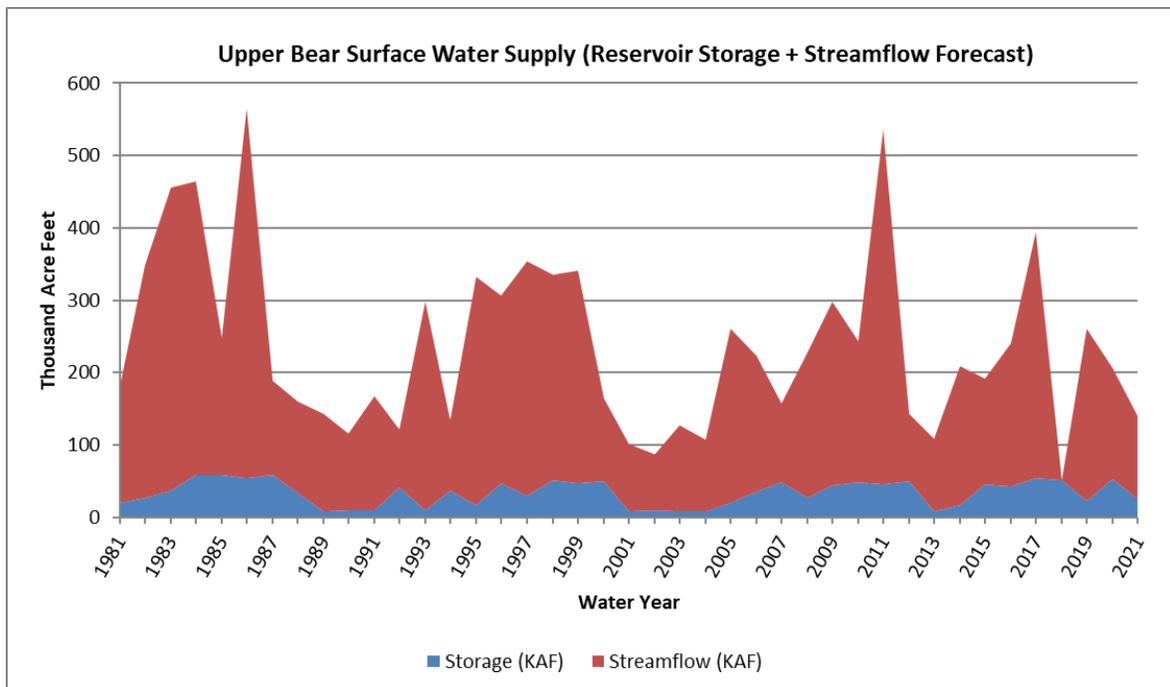
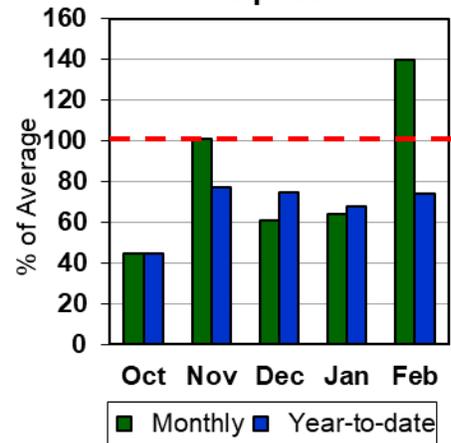
Upper Bear River Basin

- The overall Upper Bear River Basin SWE is near **85%** of median.
- Last month's precipitation for the Upper Bear River Basin was near **140%** of average. Water-year-to-date precipitation is around **75%** of average.
- Current reservoir storage is near **80%** of average for one main reservoir in the basin.
- The 50% exceedance forecasts for April through July are **well below** average (**58%**) for this basin. Smiths Fork near Border is expected to have flows at **81%** of average.

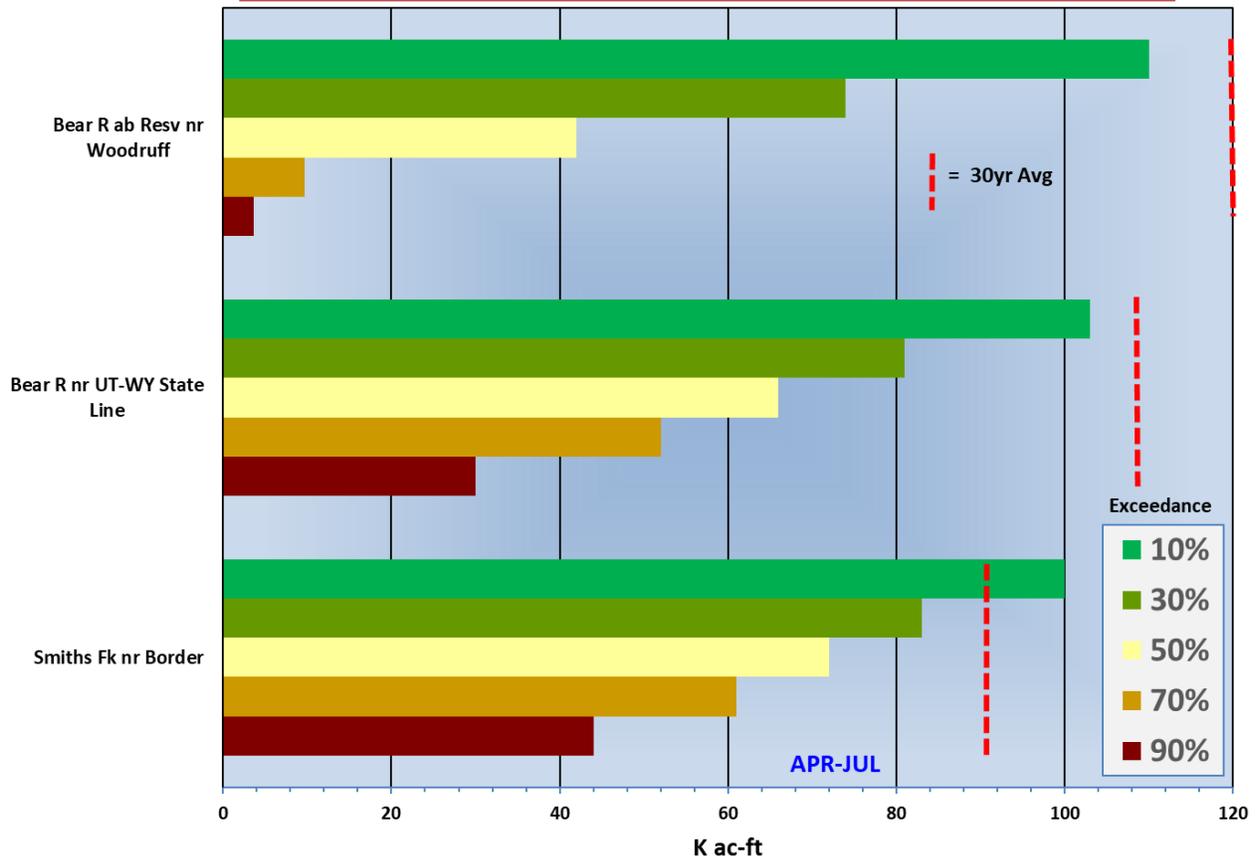
**Upper Bear River Basin
Snow Water Equivalent**



**Upper Bear River Basin
Precipitation**

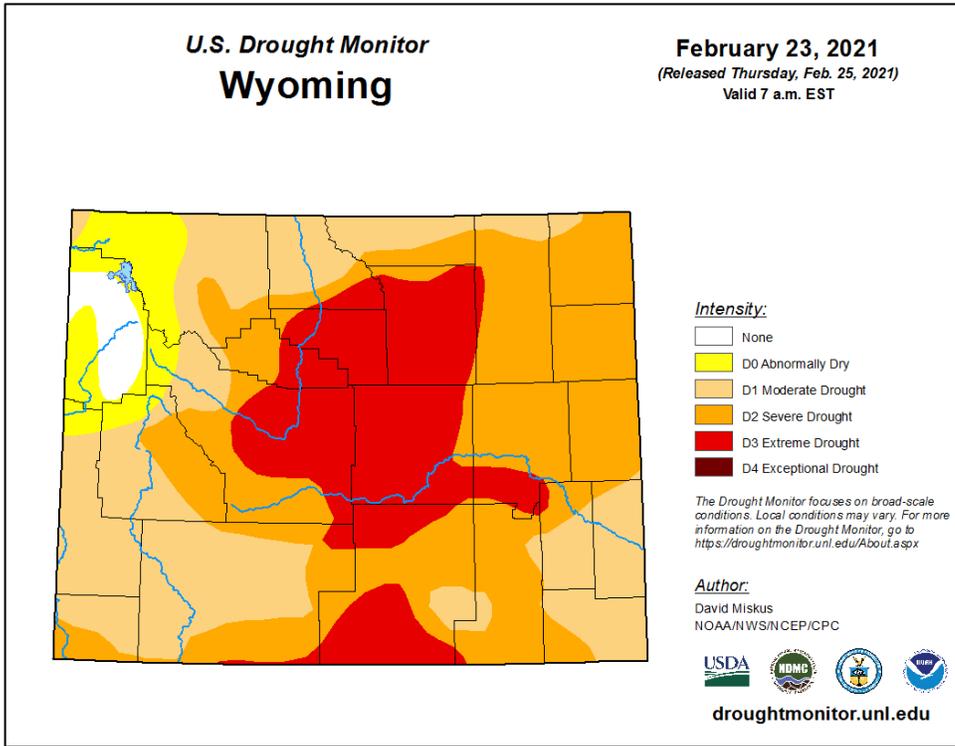


Upper Bear River Basin Streamflow Forecasts -- March 1, 2021



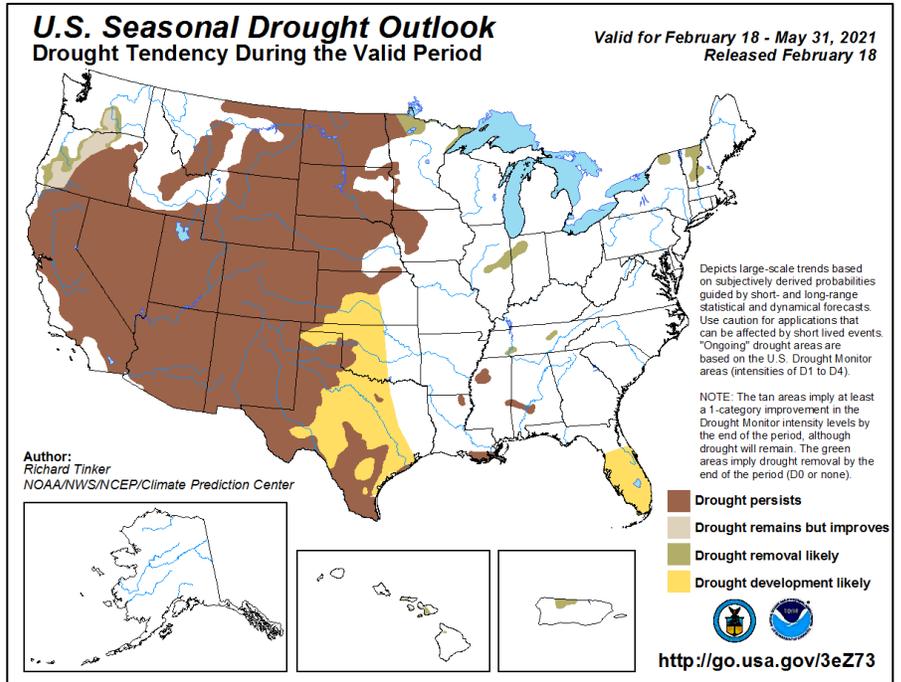
Appendix

DROUGHT

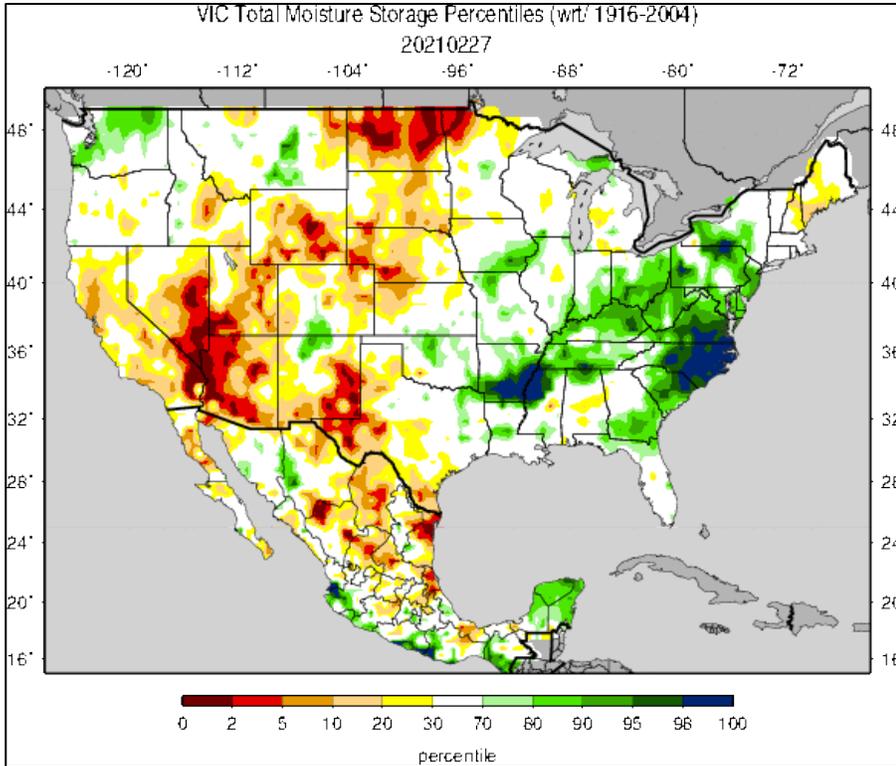


CURRENT CONDITIONS

OUTLOOK through May 31st

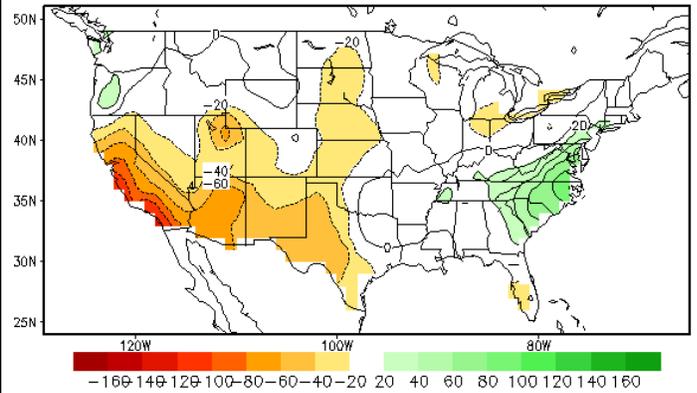


SOIL MOISTURE

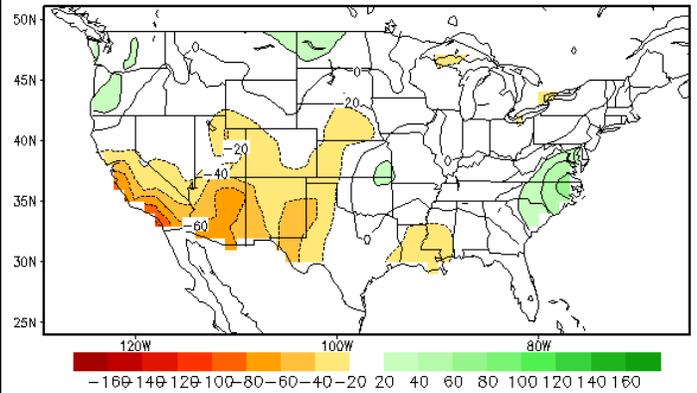


FORECAST through MAY

Lagged Averaged Soil Moisture Outlook for End of MAR2021
units: anomaly (mm), SM data ending at 20210228



Lagged Averaged Soil Moisture Outlook for End of MAY2021
units: anomaly (mm), SM data ending at 20210228

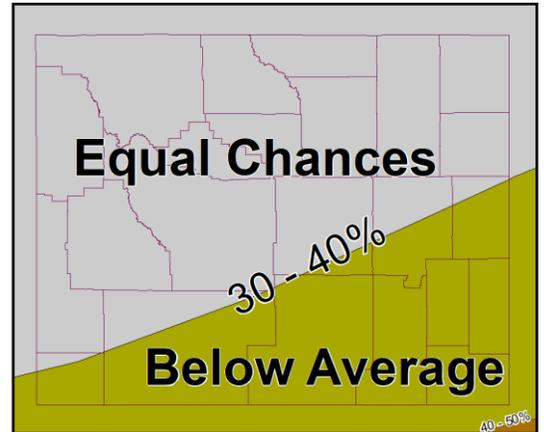
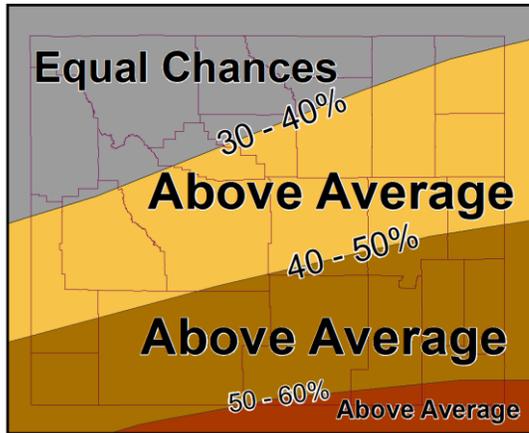


TEMPERATURE/PRECIPITATION OUTLOOK

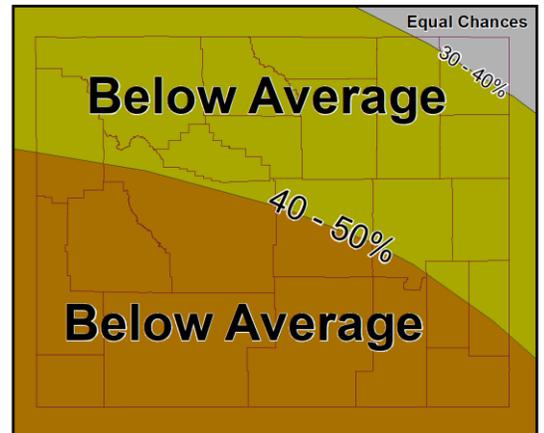
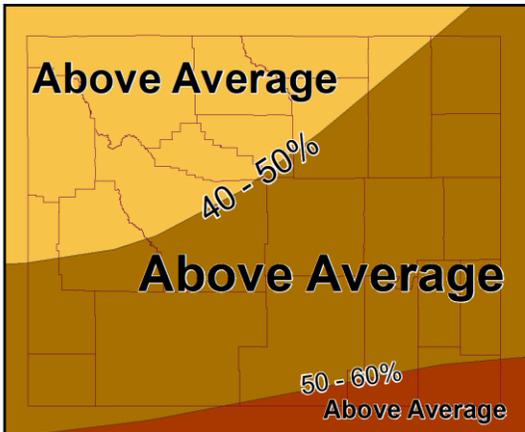
TEMPERATURE

PRECIPITATION

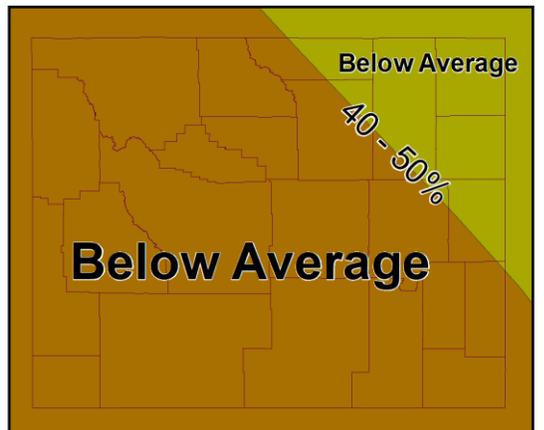
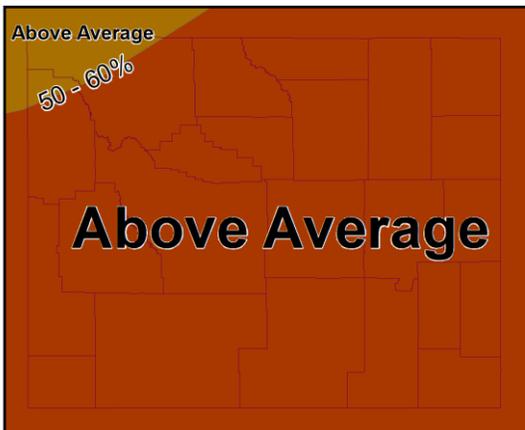
MAR - MAY



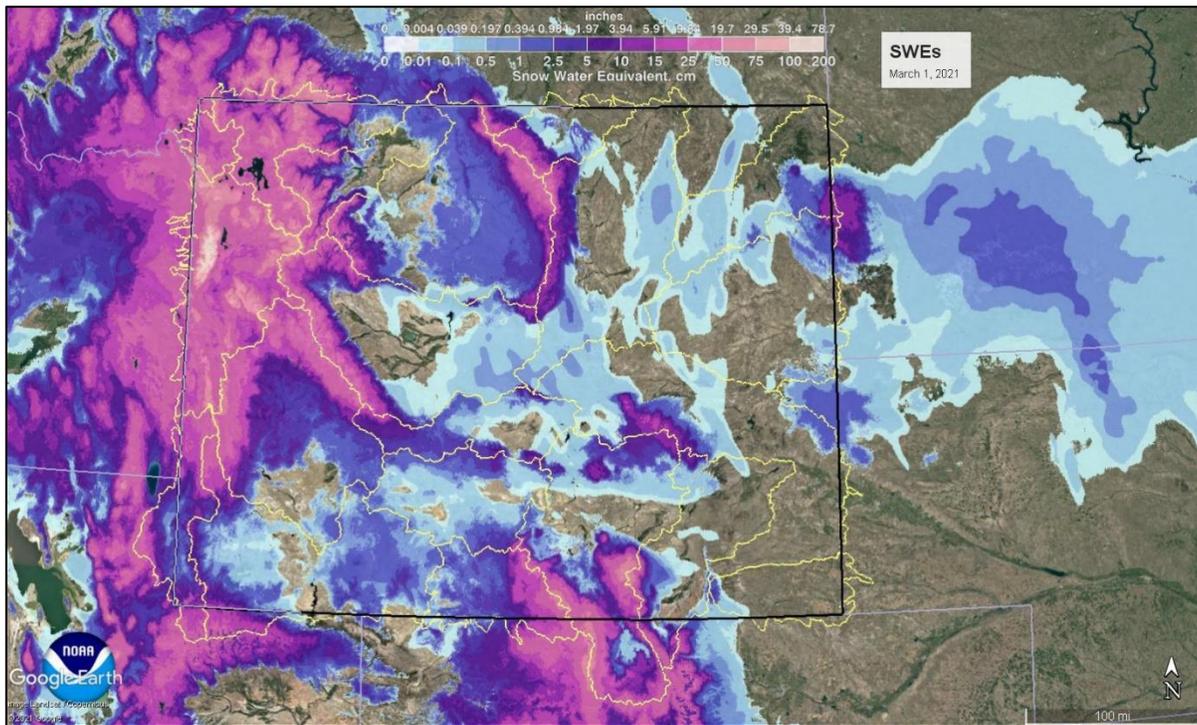
APR - JUN



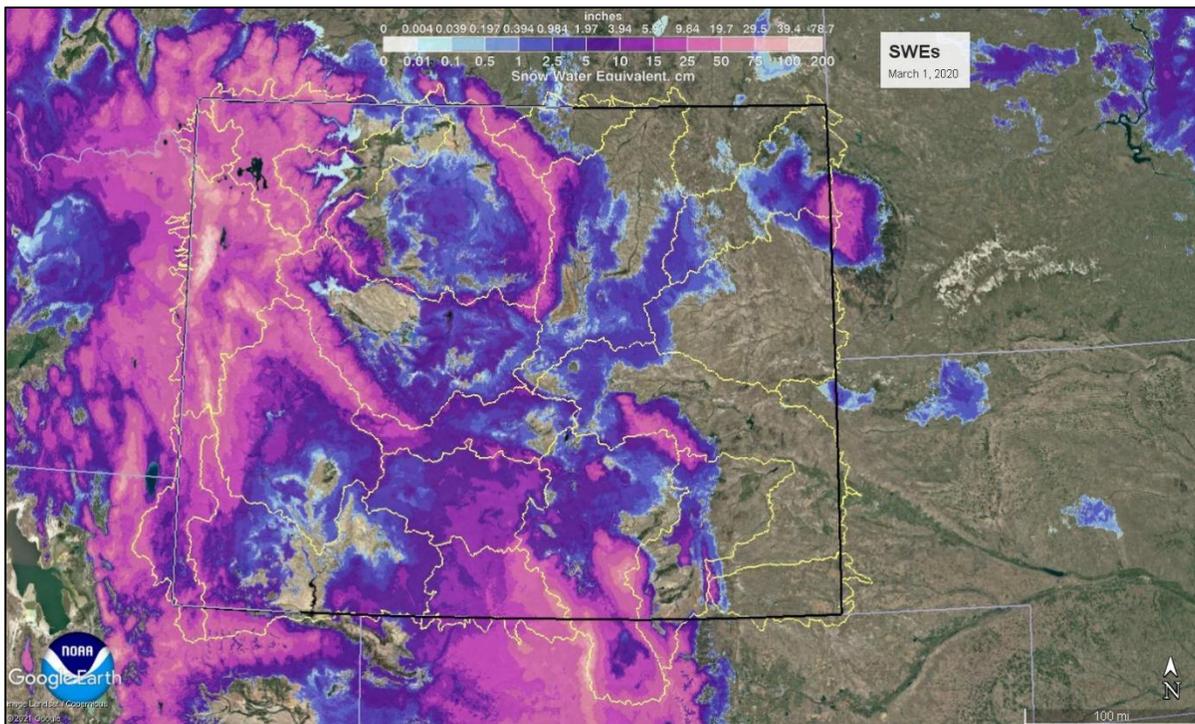
MAY - JUL



SWE ANALYSIS FROM NOHRSC

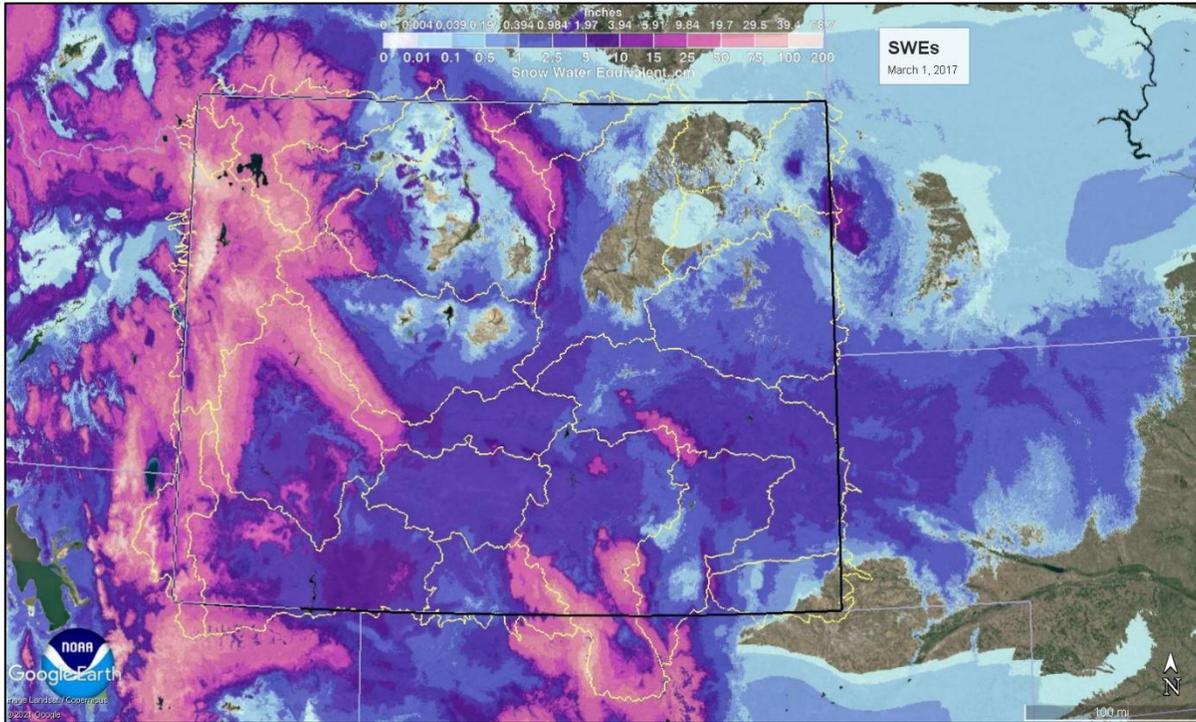


MARCH 1, 2021

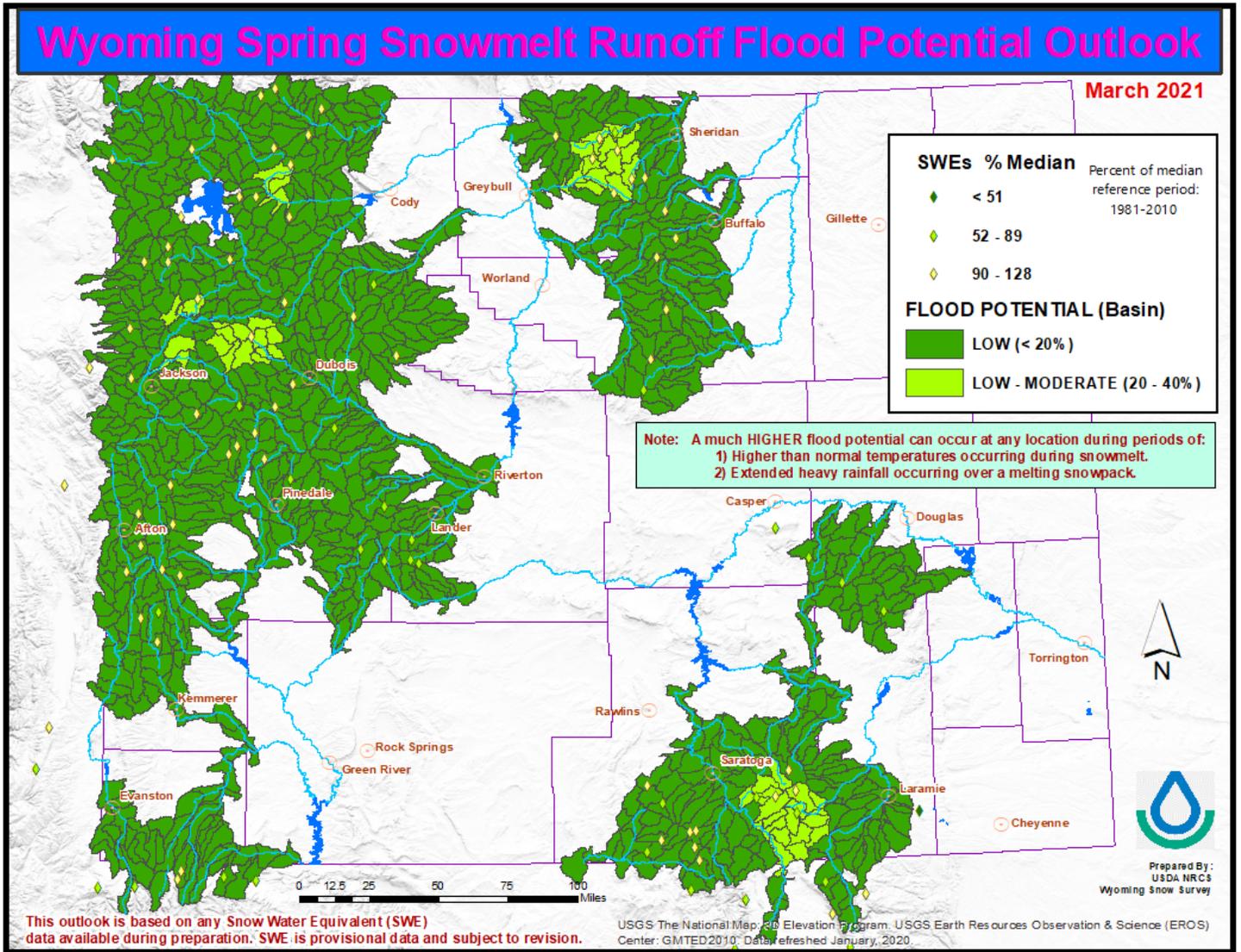


MARCH 1, 2020

Record Water Years



SPRING SNOWMELT RUNOFF FLOOD OUTLOOK



TABULAR DATA

Snowpack (SNOTEL/Snow Course) Data

In Word double click the object below to view entire document



SWE_data_0301202
1.pdf

Precipitation Data

In Word double click the object below to view entire document



Precip_data_030120
21.pdf

Reservoir Data

In Word double click the object below to view entire document



Reservoir_data_030
12021.pdf

Stream Flow Forecasts

In Word double click the object below to view entire document



Streamflow_forecas
ts_03012021.pdf

LINKS (for more information/graphics)

National Water Climate Center (NWCC)

- Interactive maps featuring current conditions of snow, precipitation, reservoir storages:

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

Water Resources Data System and State Climate Office (WRDS)

- Clearinghouse of hydrological and climatological data for the State of Wyoming:

<http://www.wrds.uwyo.edu/>

USGS WaterWatch

- Tools and products to monitor streamflow, runoff, drought, and floods:

<https://waterwatch.usgs.gov/index.php>

Wyoming Basin Outlook Report

National Resources Conservation Service

Casper, Wyoming

Issued by:

Terry Crosby (Acting Chief)
U.S.D.A.
Natural Resources Conservation Service
Washington D.C.

Released by:

Astrid Martinez
State Con.
N R C S
Casper, Wyoming

The Following Agencies and Organizations Cooperate with the Natural Resources Conservation Service with Snow Surveys and/or with Data:

FEDERAL:

United States Department of the Interior (National Park Service)

United States Department of the Interior (Bureau of Reclamation)

United States Department of Agriculture (Forest Service)

United States Department of Commerce NOAA (National Weather Service)

STATE:

The Wyoming State Engineer's Office

The University of Wyoming

LOCAL:

The City of Cheyenne