

Wyoming Basin & Water Supply Outlook Report April 1, 2021



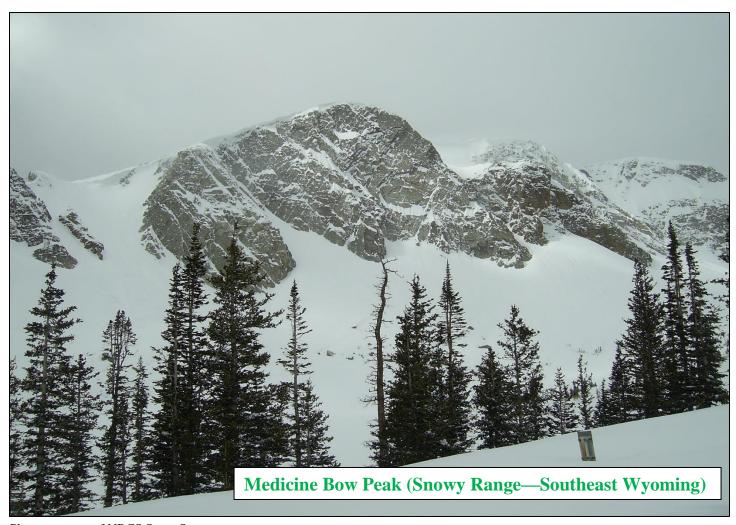


Photo courtesy of NRCS Snow Survey

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

Several basins east of the continental divide had **15** to **40** percent <u>increases</u> in snow water equivalents (SWEs) during the month of March. Notably, the Lower North Platte, Powder, and Laramie Watersheds <u>increased</u> snowpack/SWE numbers to **above** median by the last half of the month. However, SWE numbers across watersheds in western and southwestern Wyoming <u>decreased</u> by an average of **10** percent during the past month. The Upper Green and Upper Bear Drainages had end of month SWE averages that were **80** to **85** percent of median. Also, there was also a lack of significant low elevation snow (6500-8000 feet) across many basins in western through southwestern Wyoming. Several basins east of the continental divide had **120** to near **220** percent of average precipitation totals for March. However, current water year precipitation totals are still **below** average for majority of basins in Wyoming—especially basins in northeastern and western Wyoming.

Reservoirs across Wyoming continue to average 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.

Severe to extreme drought conditions continue for several basins in central through southern Wyoming. Water Year 2021 started out with dry to very dry antecedent soil moisture and precipitation 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 continues to advertise 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 general below average streamflows. Runoff volumes are expected to be below average for many drainages in central through western Wyoming; while the Powder and Tongue Basins are forecasted to have snowmelt runoff volumes near normal to just above average.

Wyoming snowpack and basin hydrological conditions—especially for a majority of 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.

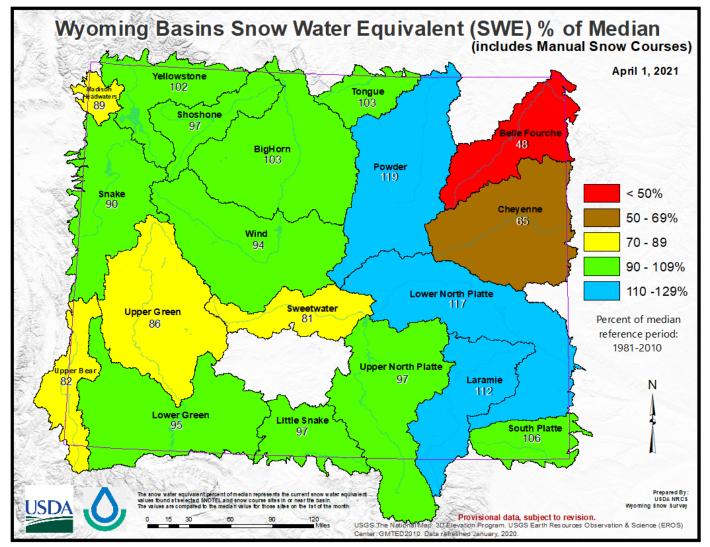
There is still uncertainty in the final snowmelt runoff volume forecasts mainly due to the uncertainty of the timing and the amount of the upcoming spring precipitation. The amount of spring runoff across basins along the eastern half of Wyoming is highly dependent on the amount and timing of precipitation from April through early June. Expect much higher flows and drastic increases in runoff volumes during a rapid warmup followed by a rain on a melting snowpack. Water planners need to keep abreast of the latest spring runoff forecasts and the latest weather trends for the rest of the spring.

Summary

- Wyoming continued to see **below** percent of median (near **95**%) of snowpack and/or snow water equivalents (SWEs)through late March.
- Precipitation totals across Wyoming for March were **above** (about **105**%) average. Water year precipitation continues to be **below** (near **90**%) average.
- Reservoirs across Wyoming were averaging near 74% of capacity-down from 80% reported last year. Overall reservoir storages for late March continue to be above average.
- State-wide stream flow snowmelt volumes are forecasted to be generally **below** average at **80** to **85**%.

Snowpack/SWEs

Snow water equivalents (SWEs) across Wyoming for April 1^{st} were near 95% of median. SWEs along the Lower North Platte and Powder River Basins were the highest at 115 to 120% of median, while SWEs along the Belle Fourche River Basin were the lowest at near 50% of median. Last year, SWEs across the state were near 110% of median. (For complete tabular data, see Appendix)

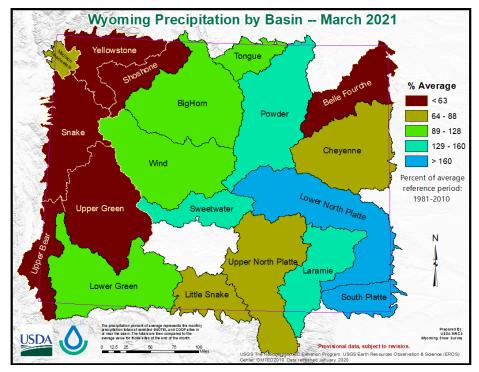


Map 1. Wyoming SWEs—April 1, 2021.

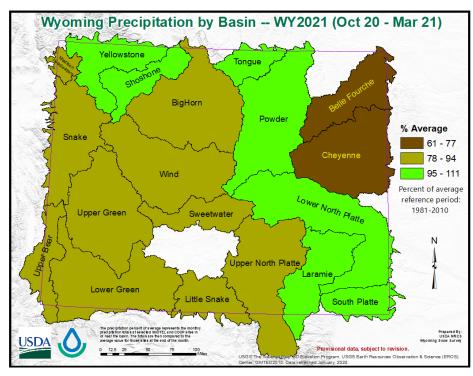
Precipitation

Basin precipitation across Wyoming was near 105% of average during March. The Lower North Platte River Basin had the <u>highest</u> precipitation totals for the month at near 220% of average. The Upper Green River Basin had the <u>lowest</u> precipitation amount at near 40% of average. Water year precipitation (October - March) is currently about 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.

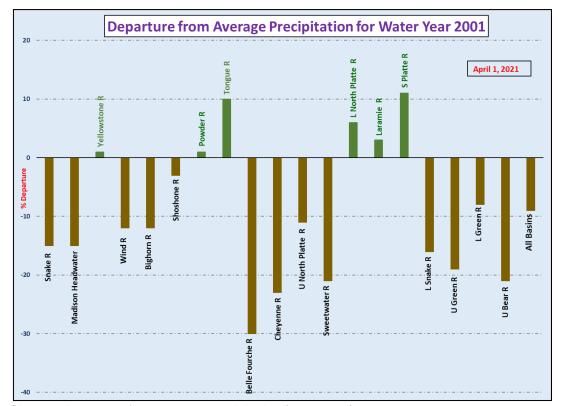


Chart 1. Departure from average precipitation (water year).

Reservoirs

Reservoirs across Wyoming were averaging near 74% of capacity—down from 80% of capacity last year. Overall reservoir storages for late March continued to be above average at 112% (121% last year). The highest average reservoir storage was across the Tongue River Basin at near 165%. The Little Snake River Basin had the lowest average reservoir storage at 70-75%.

(See Appendix for complete tabular data.)

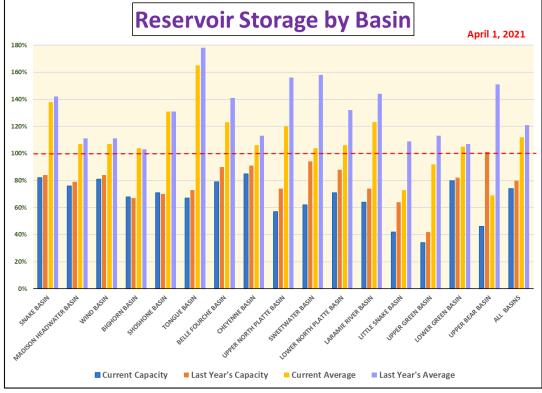
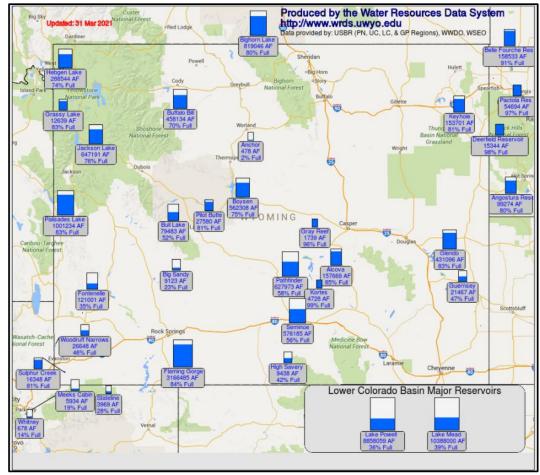


Chart 2. Reservoir storage by basin.



Map 4. Teacup storage 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 Powder and Laramie Basins at near 110% of normal. The lowest snowmelt runoff volumes are expected across the Sweetwater and Upper Bear Drainages at near 55% of average.

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

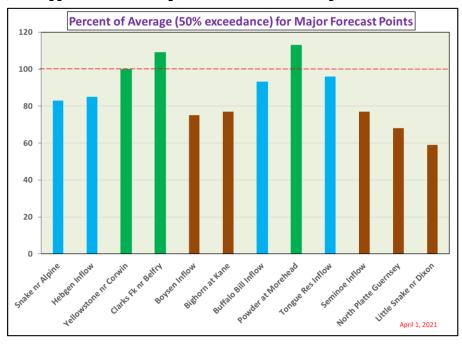
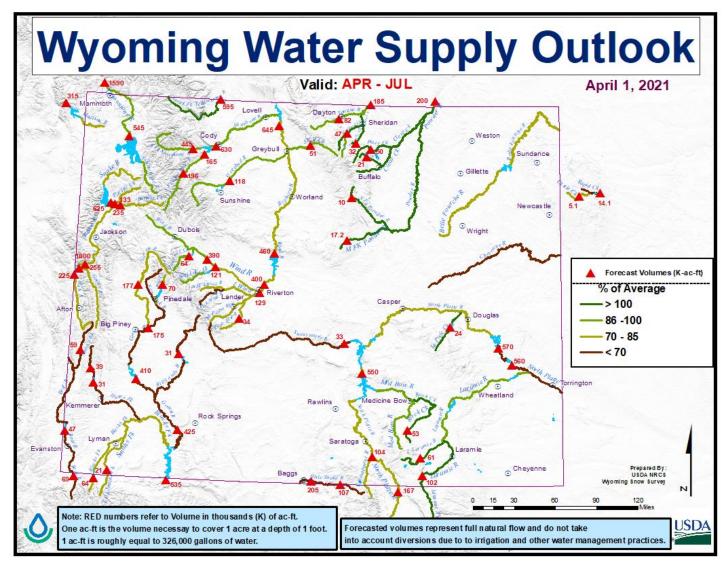


Chart 3. 50% exceedance for major forecast points.

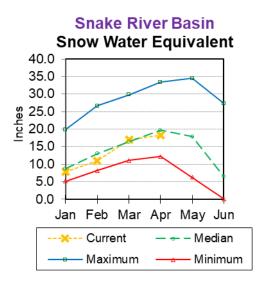


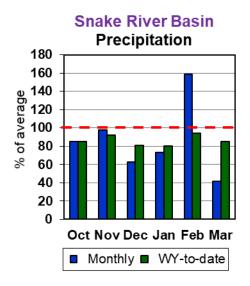
Map 4. Wyoming water supply outlook—April 1, 2021.

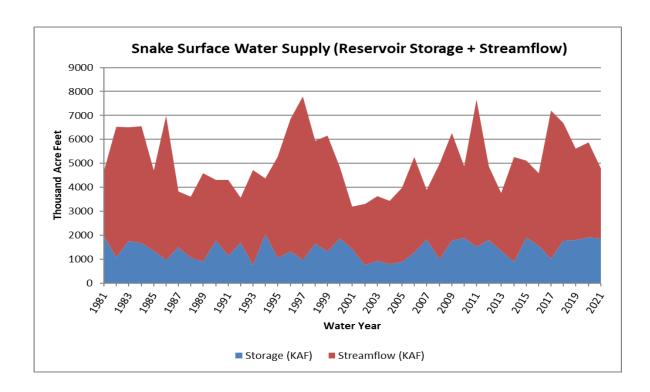


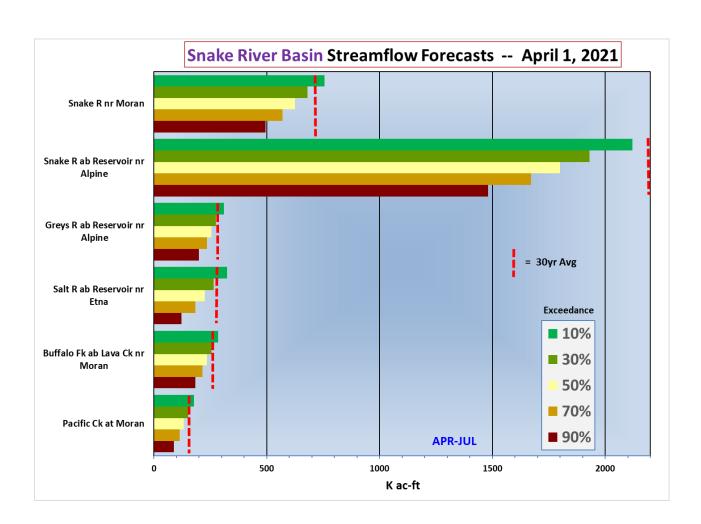
Snake River Basin

- The overall Snake River Basin SWE is near 90% of median.
- Last month's precipitation for the Snake River Basin was near 40% of average. Water-year-to-date precipitation is near 85% of average.
- ullet Current reservoir storage is near 140% of average for the three main reservoirs in the basin.
- The streamflow forecasts for April through July are below average (82%) for this basin.





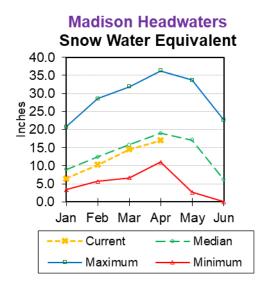


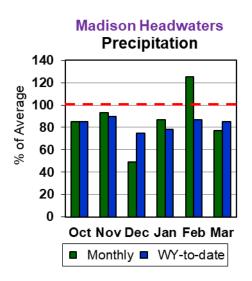


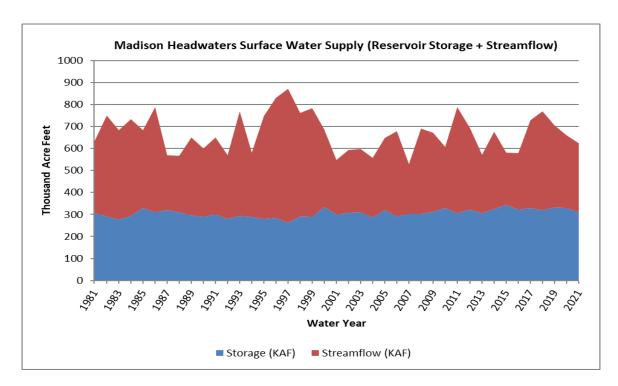


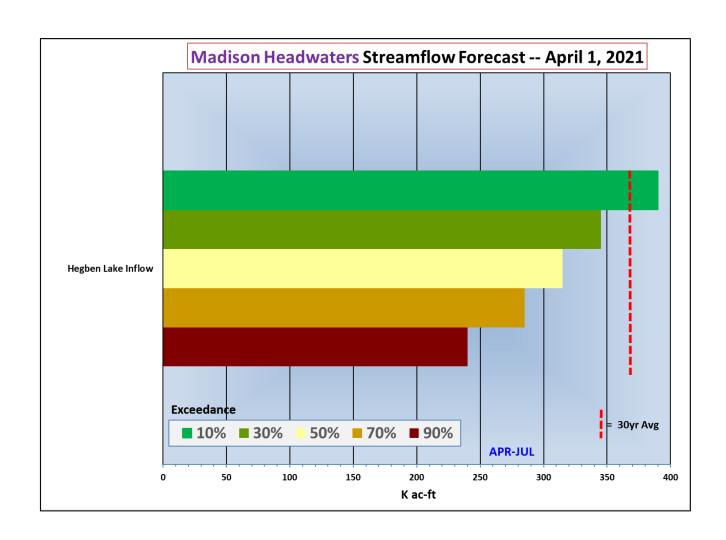
Madison Headwaters Basin

- The overall Madison Headwaters Basin SWE is around 90% of median.
- Last month's precipitation for the Madison Headwaters River Basin was near **75**% of average. Water-year-to-date precipitation is around **85**% of average.
- Current reservoir storage is near 105% of average for one main reservoir in the basin
- Hebgen Reservoir inflows (April-July) are forecasted to be below average at 85%.





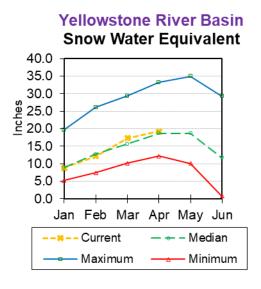


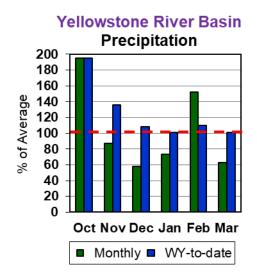




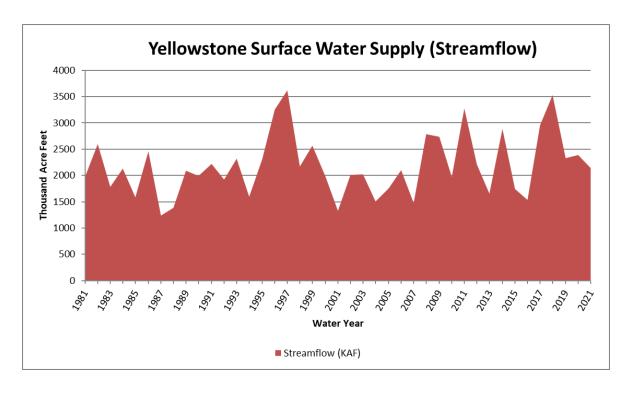
Yellowstone River Basin

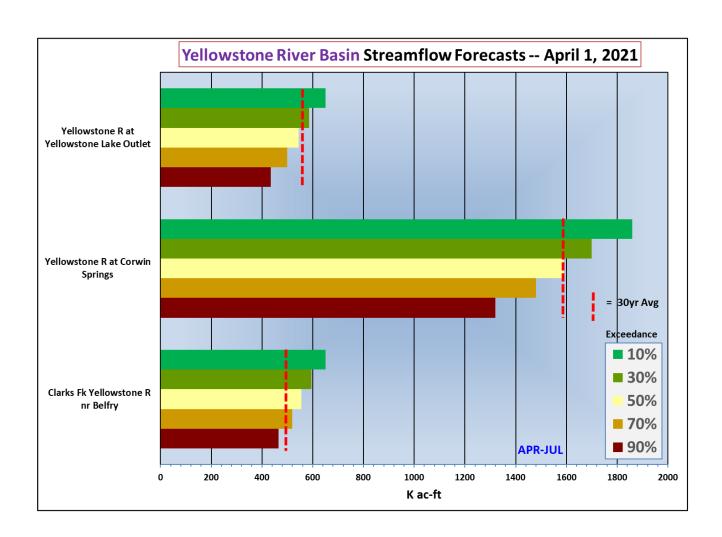
- The overall Yellowstone River Basin SWE is near 100% of median.
- Last month's precipitation for the Yellowstone River Basin was near 65% of average. Water-year-to-date precipitation is near 100% of average.
- The 50% exceedance forecasts for April through July are **above** average (101%) for this basin. Clarks Fork near Belfry is forecasted to have flows at 109% of average.





No reservoir data for the basin.

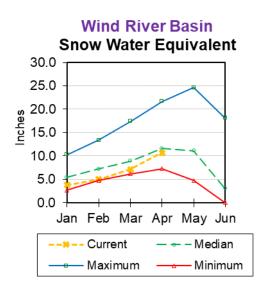


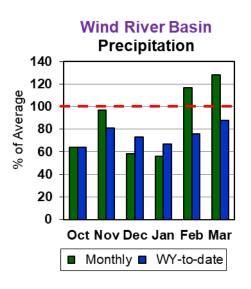


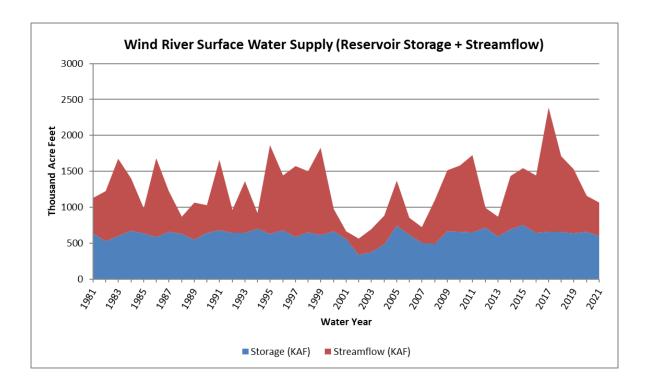


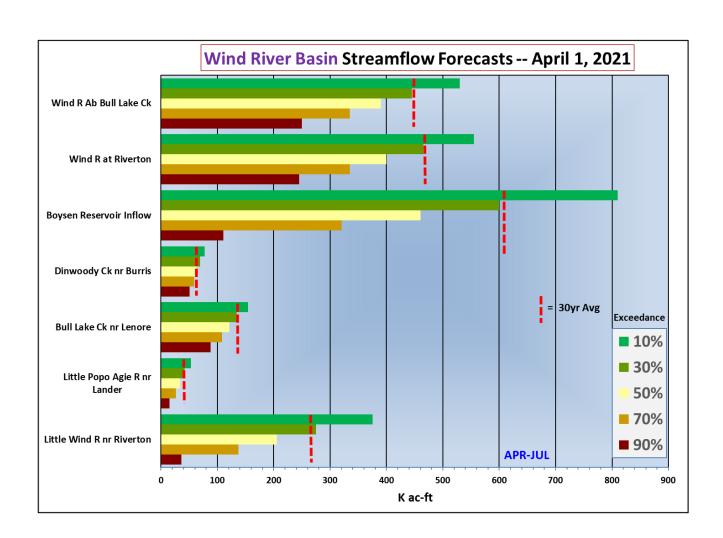
Wind River Basin

- The overall Wind River Basin SWE is near 95% of median.
- Last month's precipitation for the Wind River Basin was near 130% of average. Water-year-to-date precipitation is around 90% of average.
- Current reservoir storage is near 105% of average for the three main reservoirs in the basin.
- The streamflow forecasts for April through July are **below** average (84%) for this basin. Dinwoody Creek near Burris is expected to have flows at 97% of average.







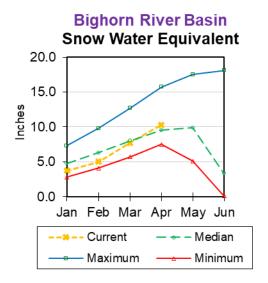


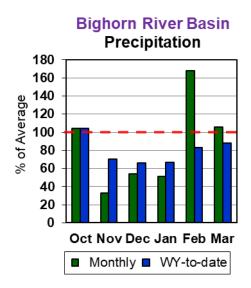
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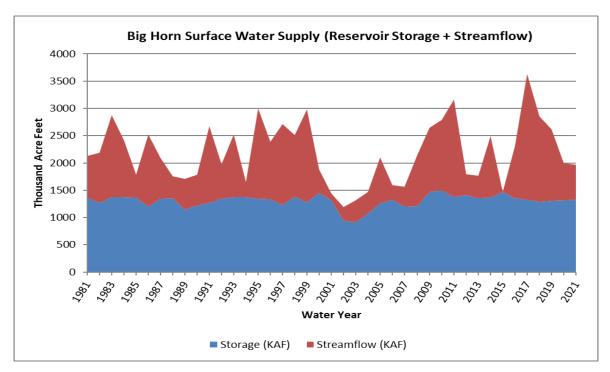


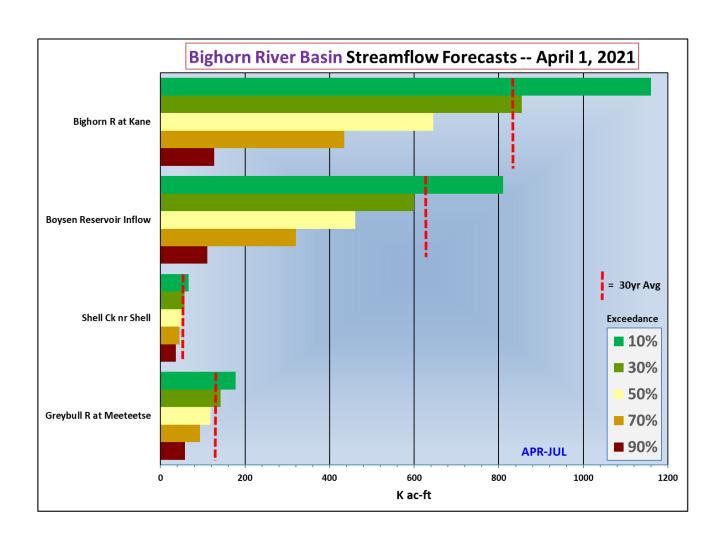
Bighorn River Basin

- The overall Bighorn River Basin SWE is near 105% of median.
- Last month's precipitation for the Bighorn River Basin was near 105% of average. Water-year-to-date precipitation is 85 to 90% 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 (**87**%) for this basin. Shell Creek near Shell is forecasted to have flows at **93**% of average.





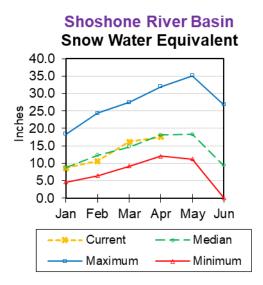


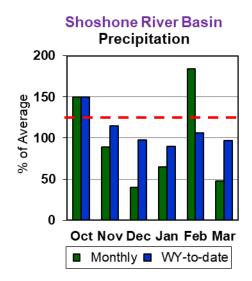


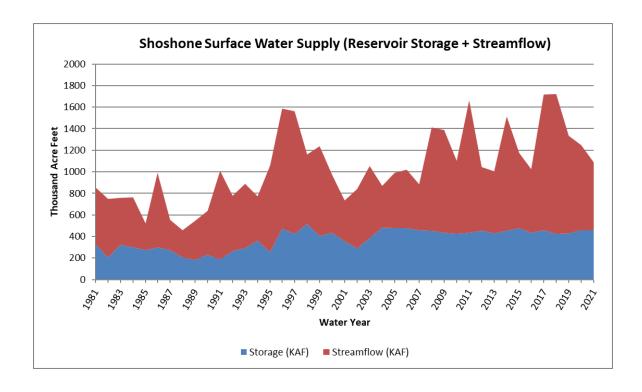


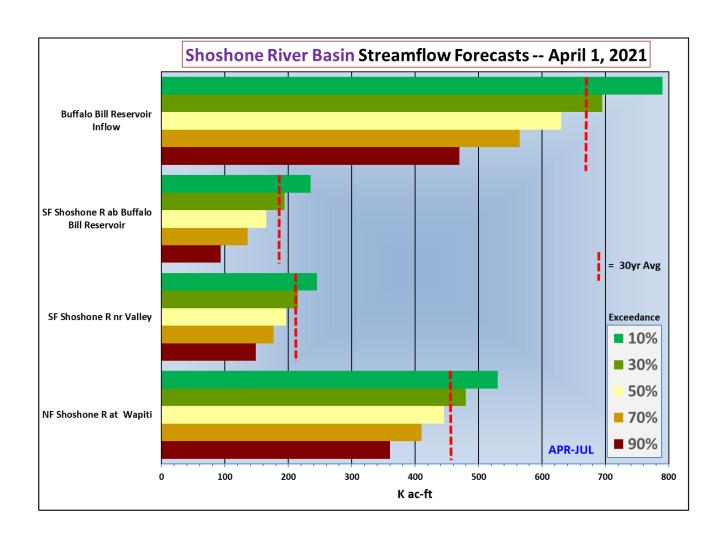
Shoshone River Basin

- The overall Shoshone River Basin SWE is 95 to 100% of median.
- Last month's precipitation for the Shoshone River Basin was near 50% of average. Water-year-to-date precipitation is around 95 to 100% of average.
- Current reservoir storage is near 130% of average for one main reservoir in the basin.
- Streamflow forecasts for April through July are **below** average (**93**%) for this basin. North Fork Shoshone River at Wapiti is expected to have flows at **97**% of average.





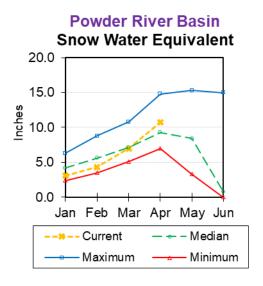


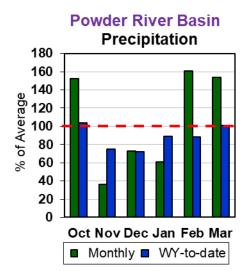




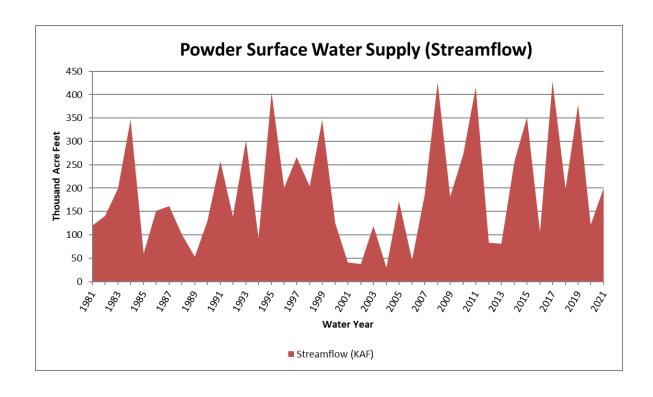
Powder River Basin

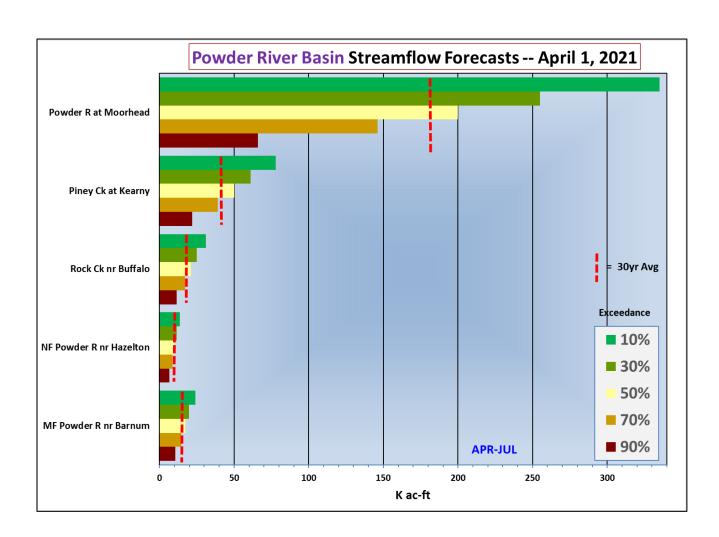
- The overall Powder River Basin SWE is near 120% of median.
- Last month's precipitation for the Powder River Basin was near 155% of average.
 Water-year-to-date precipitation is near 100% of average.
- The 50% exceedance forecasts for April through July are **above** average (111%) for this basin. Piney Creek at Kearney is expected to have flows at 114% of average.





No reservoir data for the basin.

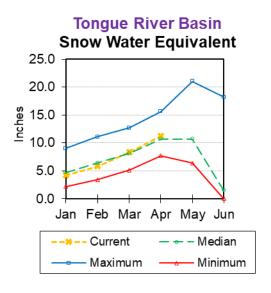


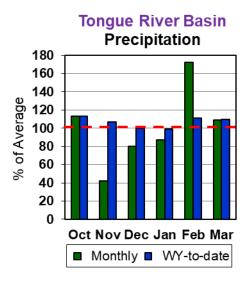


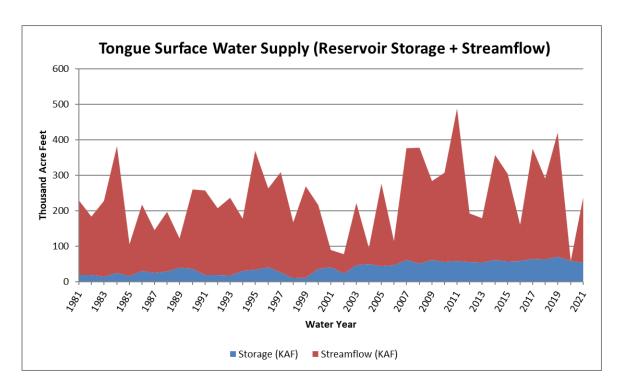


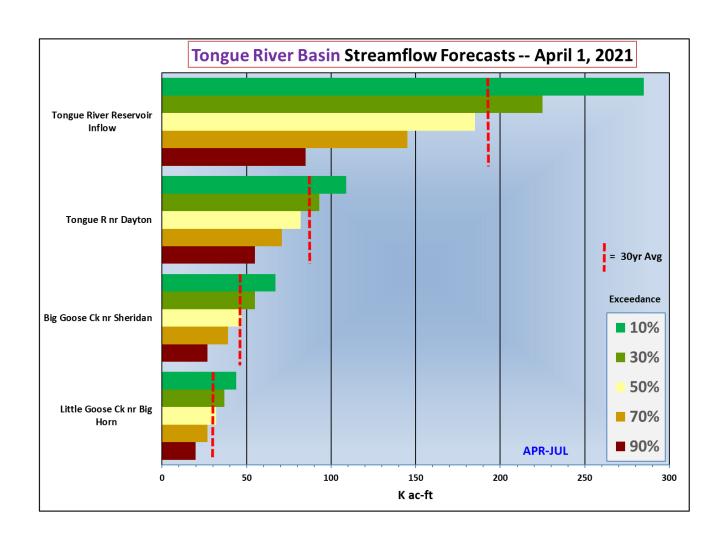
Tongue River Basin

- The overall Tongue River Basin SWE is near 105% of median.
- Last month's precipitation for the Tongue River Basin was near 110% of average. Water-year-to-date precipitation is near 110% of average.
- Current reservoir storage is near 165% of average for one main reservoir in the basin.
- The 50% exceedance forecasts for April through July are <u>near</u> average (99%) for this basin. Little Goose Creek near Big Horn is forecasted to have flows at 103% of average.





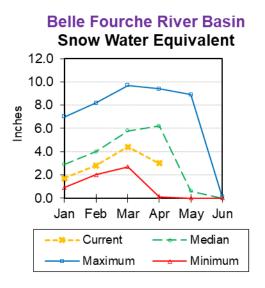


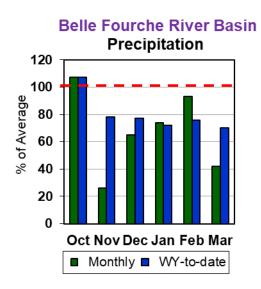


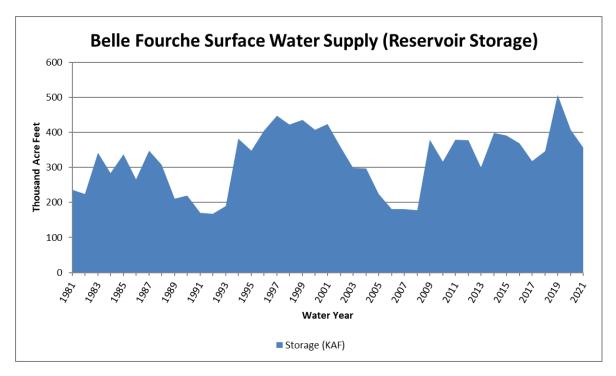


Belle Fourche River Basin

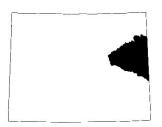
- The overall Belle Fourche River Basin SWE is around 50% of median.
- Last month's precipitation for the Belle Fourche River Basin was near 40% of average. Water-year-to-date precipitation is around 70% of average.
- Current reservoir storage is near 125% of average for three main reservoirs in the basin.





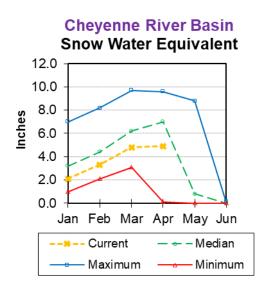


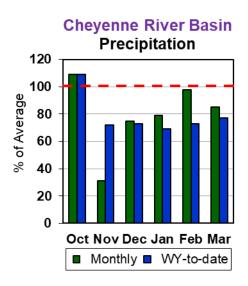
There are $\underline{\text{no}}$ streamflow forecast points for the basin.

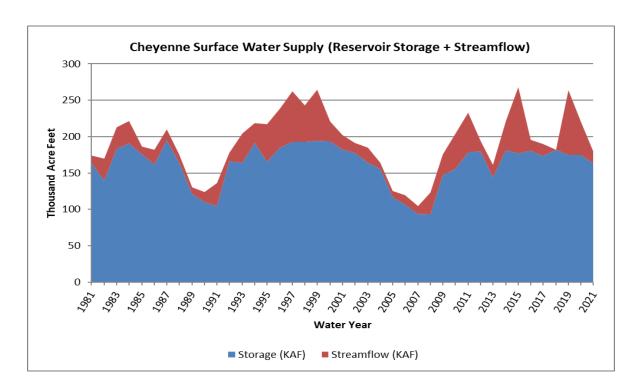


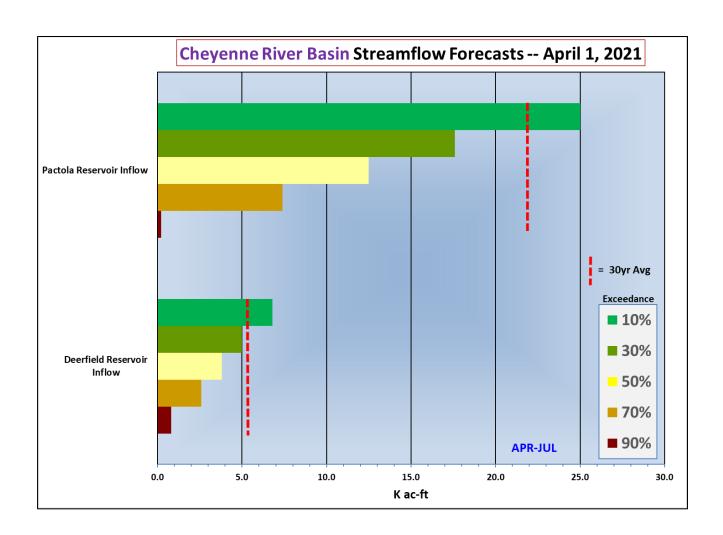
Cheyenne River Basin

- The overall Cheyenne River Basin SWE is near 65% of median.
- Last month's precipitation for the Cheyenne River Basin was near **85**% of average. Water-year-to-date precipitation is around **75**% of average.
- ullet 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 (65%) for this basin. Deerfield Reservoir inflows are forecasted to be 73% of average.





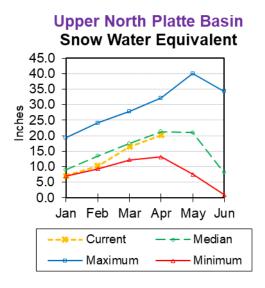


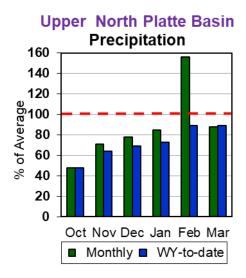


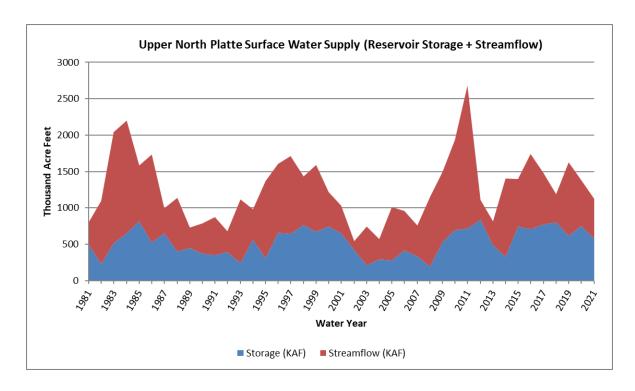


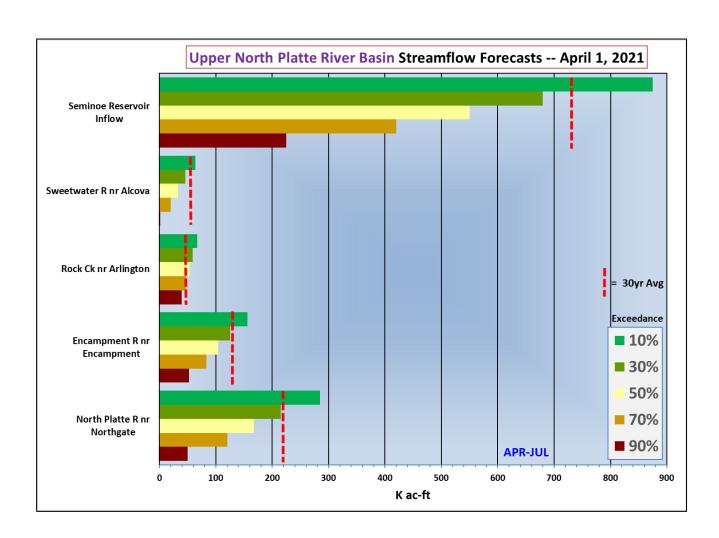
Upper North Platte River Basin

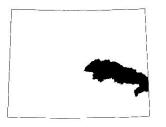
- The overall Upper North Platte River Basin SWE is near 95% of median.
- Last month's precipitation for the Upper North River Basin was near 90% of average. Water-year-to-date precipitation is around 90% of average.
- Current reservoir storage is near 120% of average for one main reservoir in the basin.
- Streamflow forecasts for April through July are below average (79%) for this basin.
 Rock Creek near Arlington is expected to have flows at 108% of average.





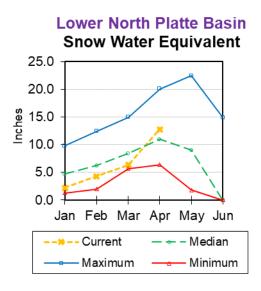


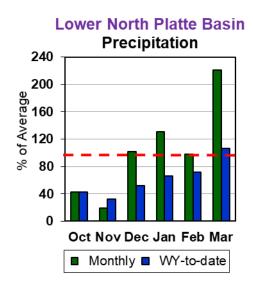


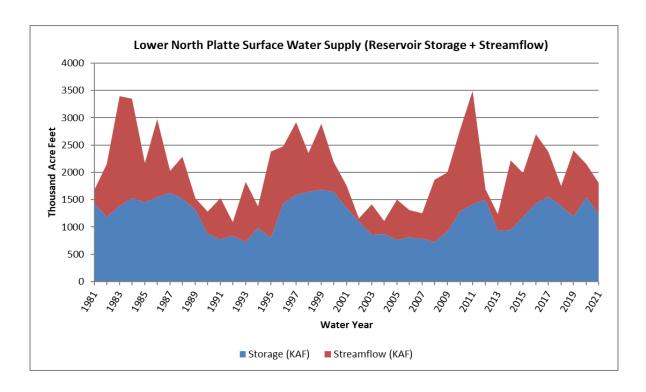


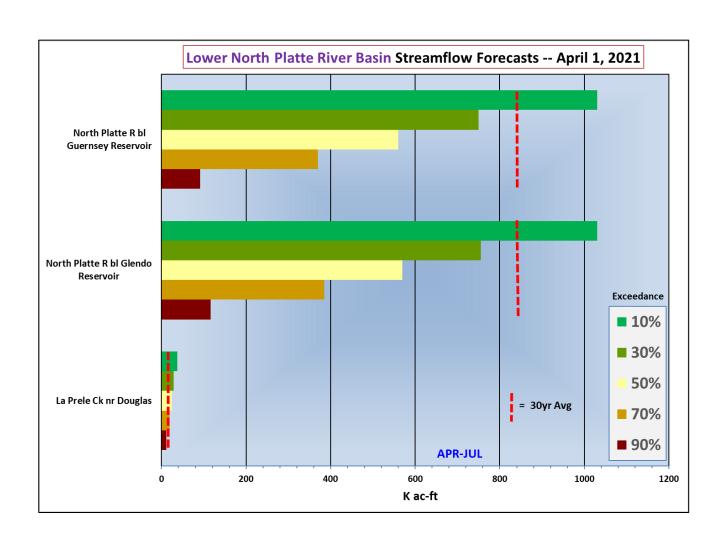
Lower North Platte River Basin

- The overall Lower North Platte River Basin SWE is near 115% of median.
- Last month's precipitation for the Lower North Platte River Basin was near 220% of average. Water-year-to-date precipitation is around 105% of average.
- \bullet Current reservoir storage is near 105% of average for four main reservoirs in the basin.
- The 50% exceedance forecasts for April through July are below average (86%) for this basin. However, La Prele Creek near Douglas is forecasted to have flows at 121% of average.





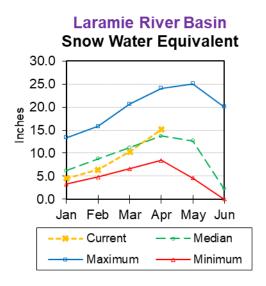


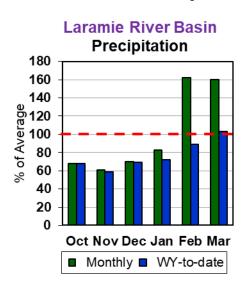


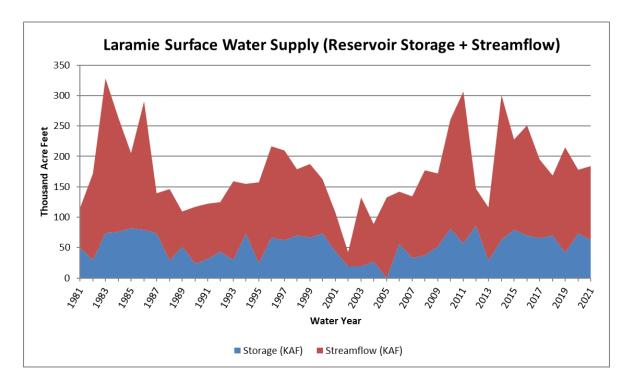


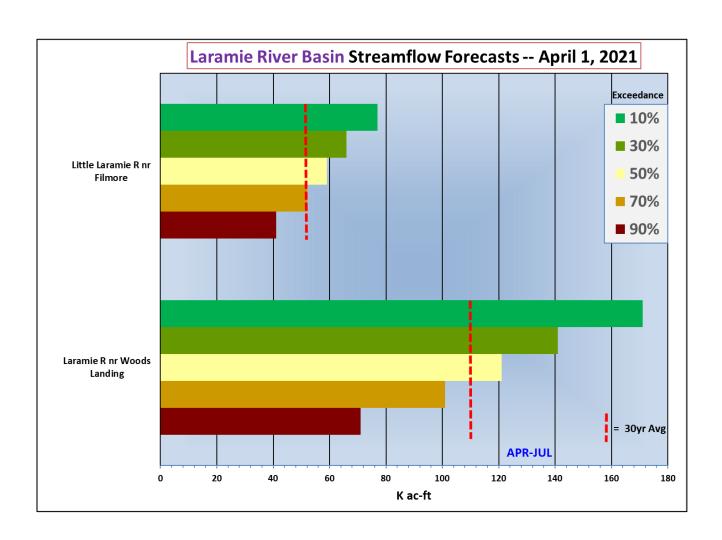
Laramie River Basin

- The overall Laramie River Basin SWE is around 110% of median.
- Last month's precipitation for the Laramie River Basin was around 160% of average. Water-year-to-date precipitation is near 105% of average.
- Current reservoir storage is around 125% of average for one main reservoir in the basin.
- Streamflow forecasts for April through July are **above** average (111%) for this basin. Little Laramie River near Filmore is expected to have flows at 116% of average.





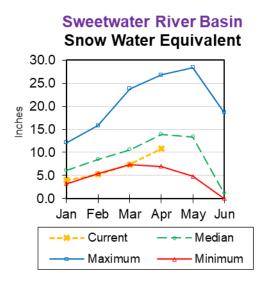


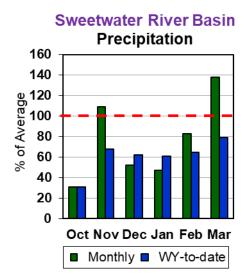


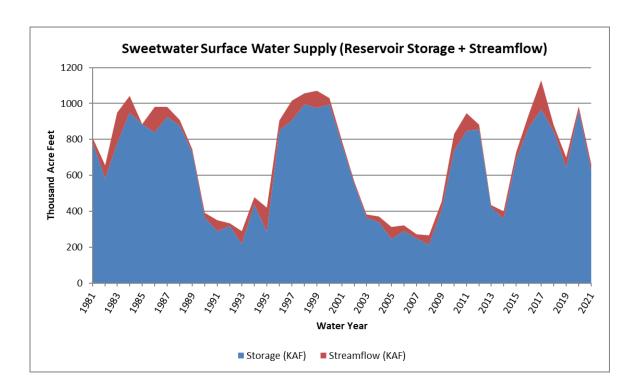


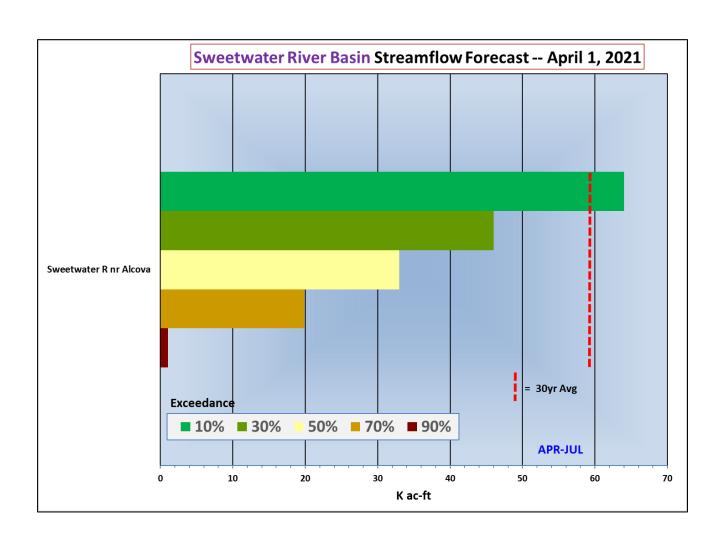
Sweetwater River Basin

- The overall Sweetwater River Basin SWE is around 80% of median.
- Last month's precipitation for the Sweetwater River Basin was near 140% of average.
 Water-year-to-date precipitation is near 80% 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 56%.





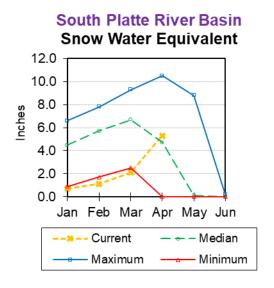


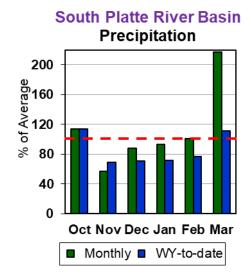




South Platte River Basin (WY)

- The overall South Platte River Basin SWE is close to 105% of median.
- Last month's precipitation for the South Platte River Basin was near 215% of average. Water-year-to-date precipitation is close to 110% of average.





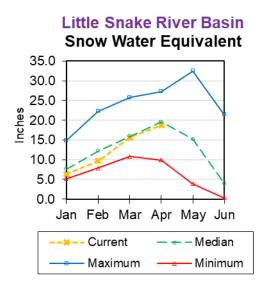
No reservoir data for the basin.

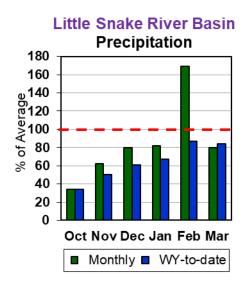
There are no streamflow forecast points for the basin.

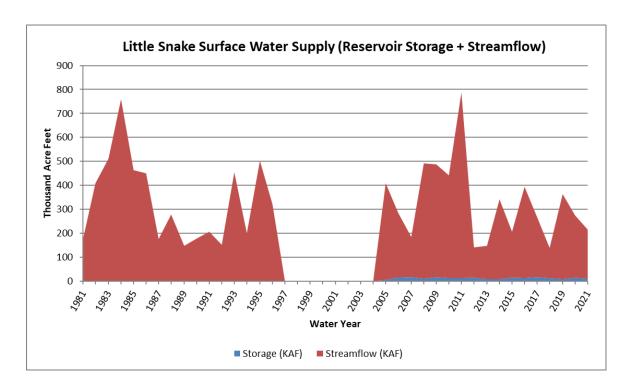


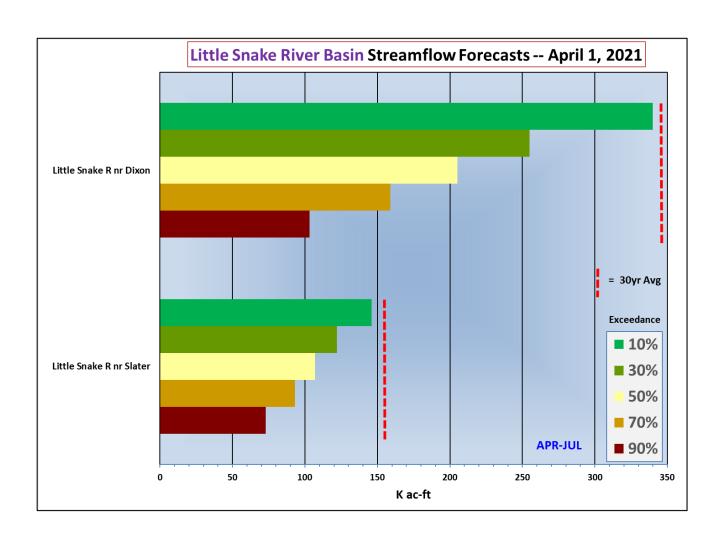
Little Snake River Basin

- The overall Little Snake River Basin SWE is near 95% of median.
- Last month's precipitation for the Little Snake River Basin was near **80**% of average. Water-year-to-date precipitation is **80** to **85**% of average.
- Current reservoir storage is close to 75% of average for one main reservoir in the basin
- The 50% exceedance forecasts for April through July are below average (64%) for this basin.





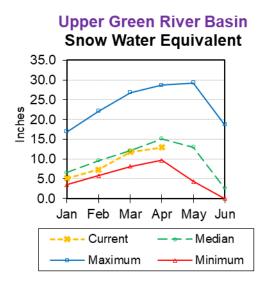


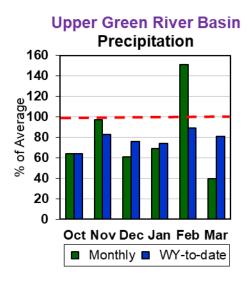


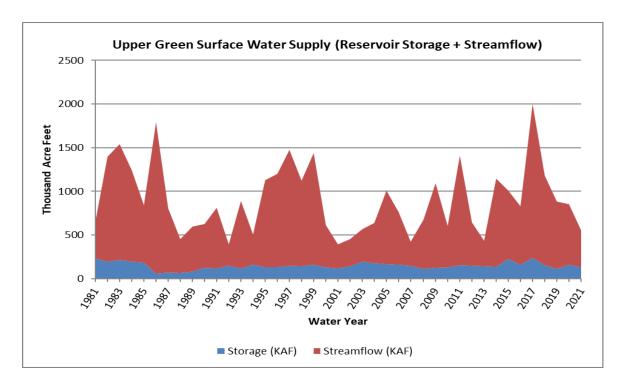


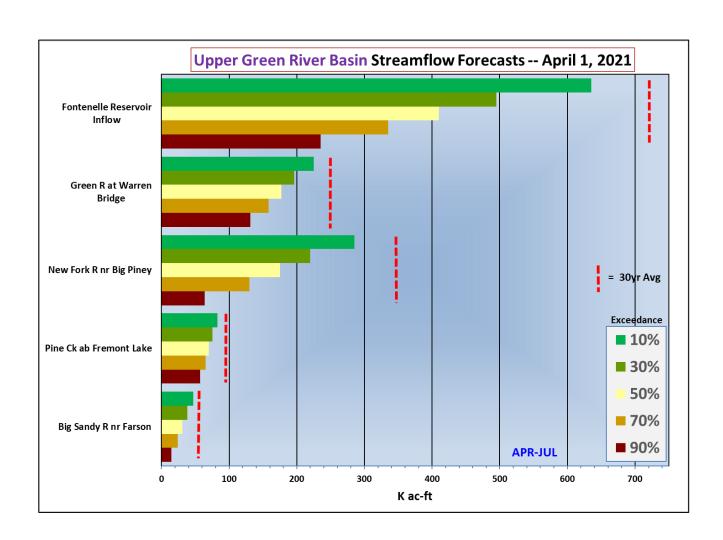
Upper Green River Basin

- The overall Upper Green River Basin SWE is near 85% of median.
- Last month's precipitation for the Upper River Basin was near 40% of average. Water-year-to-date precipitation is around 80% of average.
- Current reservoir storage is near **90**% of average for two main reservoirs in the basin.
- Streamflow forecasts for April through July are **well below** average (62%) for this basin. Green River at Warren Bridge is expected to have flows at 72% of average.





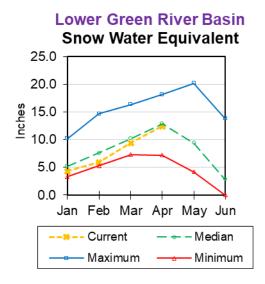


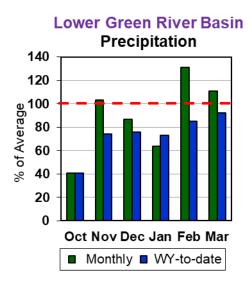


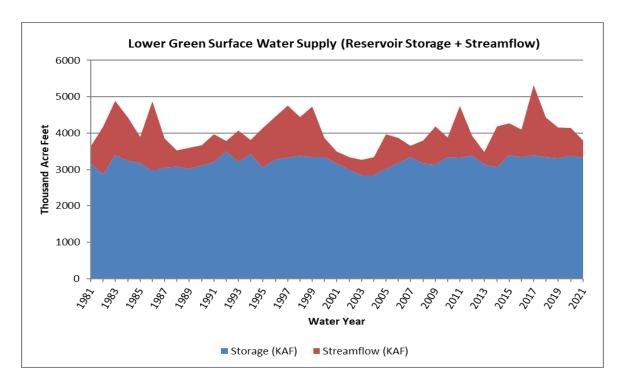


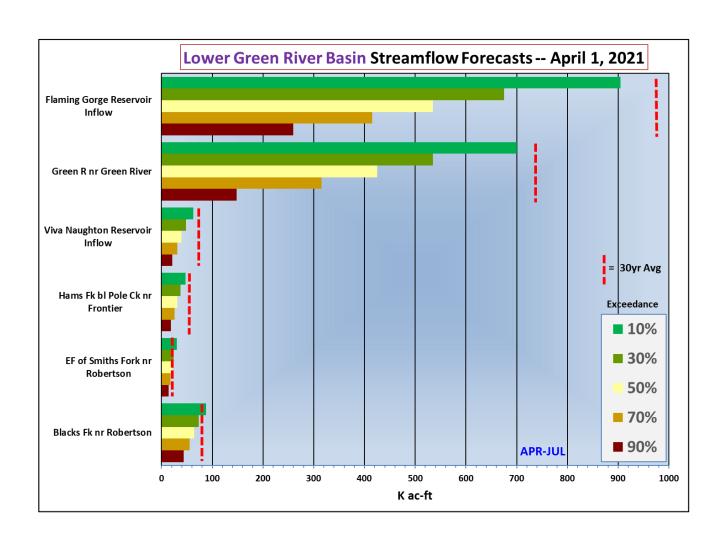
Lower Green River Basin

- The overall Lower Green River Basin SWE is near 95% of median.
- Last month's precipitation for the Lower Green River Basin was near 110% of average. Water-year-to-date precipitation is around 90% of average.
- \bullet Current reservoir storage is close to 105% of average for three main reservoirs in the basin.
- Streamflow forecasts for April through July are well below average (63%) for this
 basin





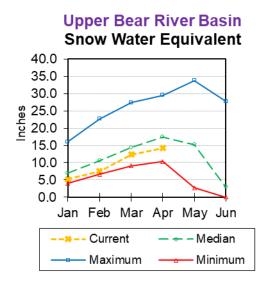


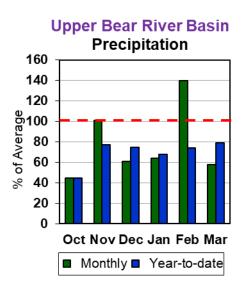


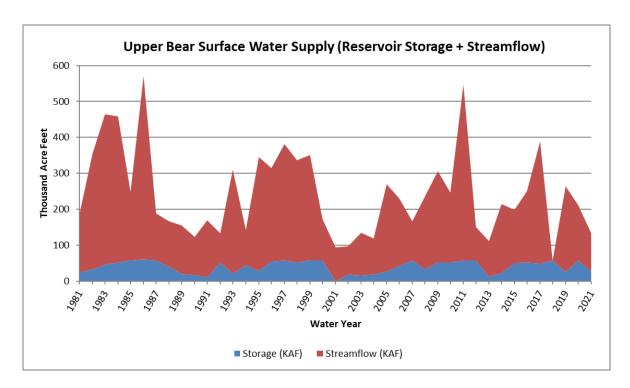


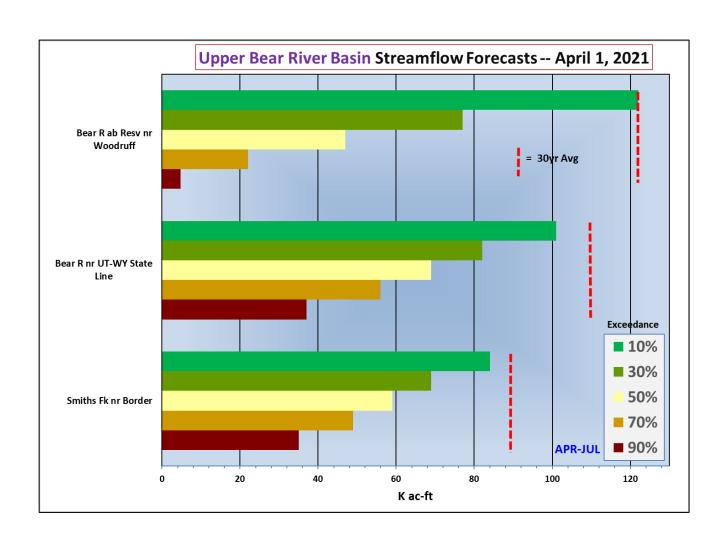
Upper Bear River Basin

- The overall Upper Bear River Basin SWE is near 80% of median.
- Last month's precipitation for the Upper Bear River Basin was near 60% of average. Water-year-to-date precipitation is around 80% of average.
- Current reservoir storage is near 70% of average for one main reservoir in the basin.
- The 50% exceedance forecasts for April through July are **well below** average (**56**%) for this basin.



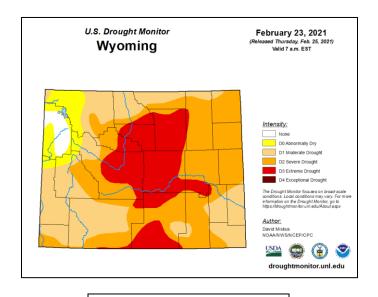


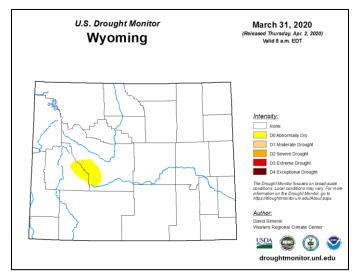




Appendix

DROUGHT

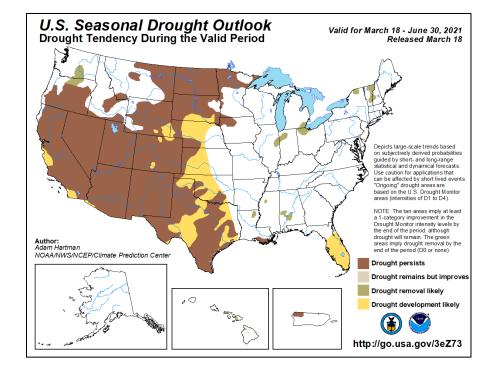




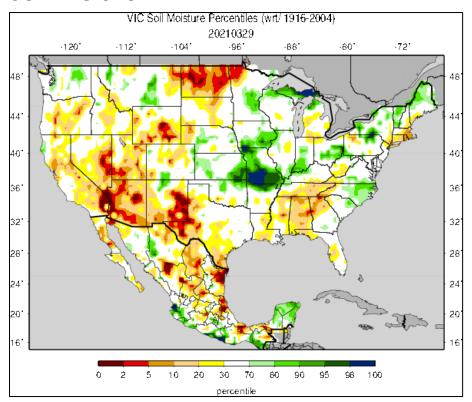
CURRENT CONDITIONS

CONDITIONS 1 Year Ago



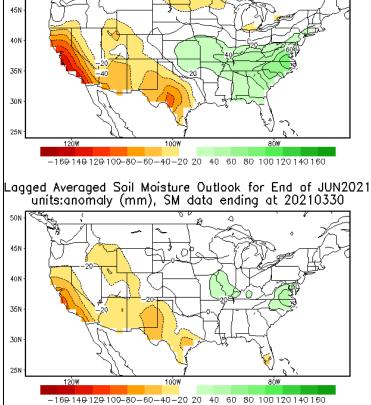


SOIL MOISTURE



CURRENT CONDITIONS



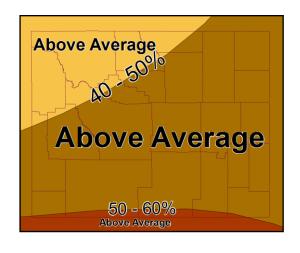


Lagged Averaged Soil Moisture Outlook for End of APR2021 units: anomaly (mm), SM data ending at 20210330

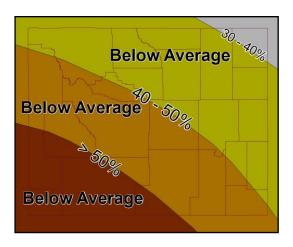
TEMPERATURE/PRECIPITATION OUTLOOKS

TEMPERATURE

PRECIPITATION

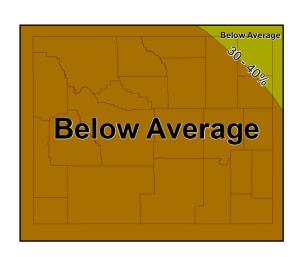


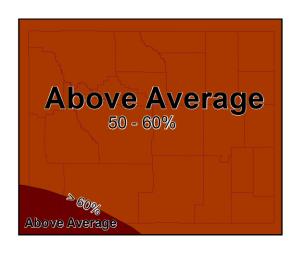
APR - JUN



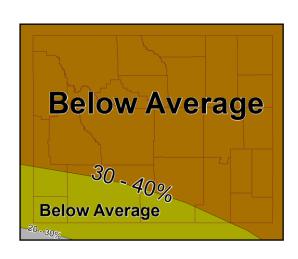


MAY - JUL

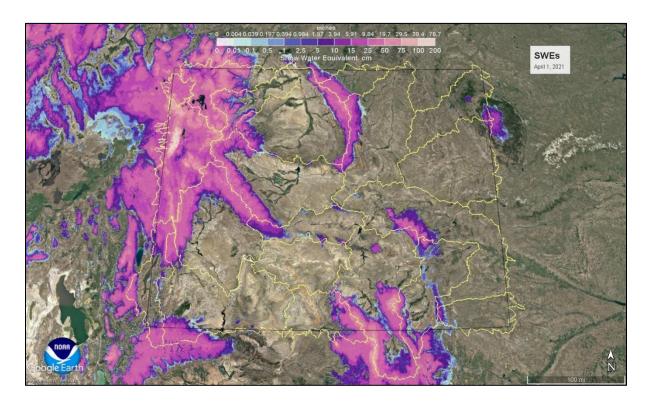




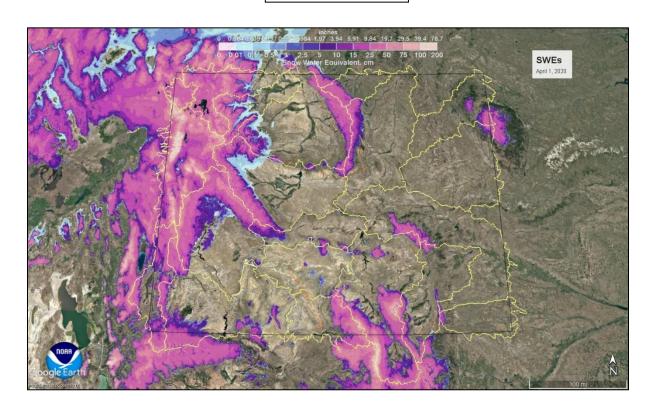
JUN - AUG



SWE ANALYSIS FROM NOHRSC

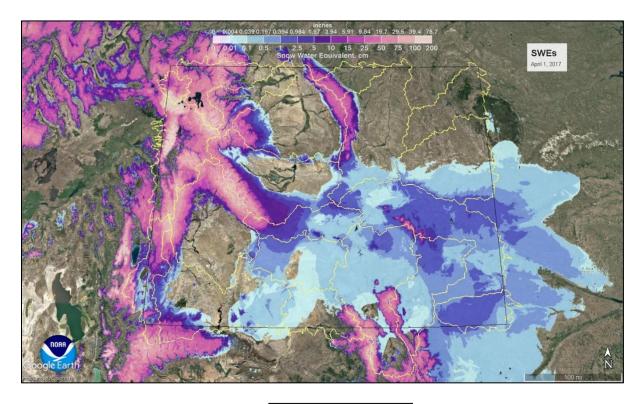


APRIL 1, 2021

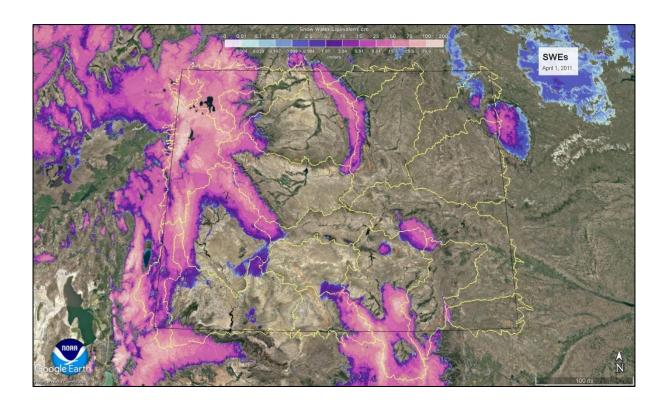


APRIL 1, 2020

Record Water Years

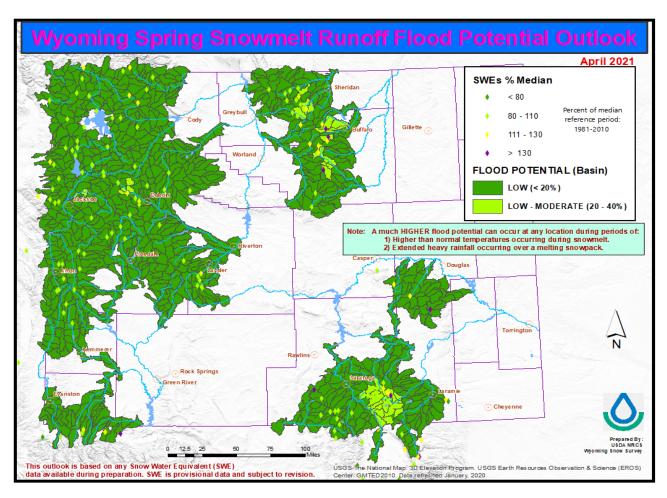


APRIL 1, 2017



APRIL 1, 2011

SPRING SNOWMELT RUNOFF FLOOD OUTLOOK



Snowpack (SNOTEL/Snow Course) Data

In Word double click the object below to view entire document



Precipitation Data

In Word double click the object below to view entire document



Reservoir Data

In Word double click the object below to view entire document



Stream Flow Forecasts

In Word double click the object below to view entire document



Streamflow_forecas ts_04012021.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:

Released by:

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

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