

# Wyoming Basin & Water Supply Outlook Report May 1, 2021





Photo courtesy of Wyoming NRCS hydrologist

#### Basin Outlook Reports And Federal - State - Private Cooperative Snow Surveys

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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 10 to 20 percent <u>increases</u> in snow water equivalents (SWEs) during April. Notably, the Lower North Platte, Powder, Tongue, and Bighorn Watershed's snowpack/SWE numbers were 120 to 135 percent of median by end of the month. However, SWE numbers across watersheds in western and southern Wyoming <u>decreased</u> by an average of 15 to 25 percent during the past month. The Upper Green and Upper Bear Drainages had end of April SWE averages that were 65 to 70 percent of median. Also, most of the low elevation snowpack (7,000-8,500 feet) had already melted out across basins in western and southern Wyoming by the end of April.

Except for the Bighorn and Tongue Basins, most basins in Wyoming had **below** average precipitation totals during April. Notably, the Little Snake, Upper North Platte, and Snake Watersheds only recorded **35** to **50** percent of average precipitation during the month. Additionally, current water year precipitation totals are still **below** average for majority of basins in Wyoming-especially along basins in western and southern Wyoming.

Reservoirs across Wyoming continue to average near 75% of capacity. Last year at this time Wyoming reservoirs were around 75 - 80% of capacity. Reservoir storages have remained around 110% of average through early spring.

Severe to extreme hydrologic drought conditions have <u>decreased</u> in areal coverage across central through eastern Wyoming during the past four months; however, severe hydrologic drought conditions have <u>increased</u> in areal coverage in far western Wyoming during the past two months. Water Year 2021 started out with dry to <u>very</u> dry antecedent soil and precipitation conditions throughout most of Wyoming. There was also <u>below</u> normal baseflows for several streams in central through southern Wyoming in early Water Year 2021. The outlook for the rest of spring into early summer is for warmer than average as well as drier than average basin conditions.

April streamflows across basins in southwestern to northeastern Wyoming were **below** normal; while basins in central through northeastern Wyoming had <u>near</u> normal streamflows. Earlier than normal runoff is expected to continue across basins west of the continental divide with **below** to **much below** average runoff volumes. Runoff volumes are also expected to be **below** average for many drainages east of the continental divide. The Powder and Tongue Basins are forecasted to have **above** average runoff volumes during the rest of the spring into early summer.

Snowpack and basin hydrological conditions for many basins in Wyoming continue to be very similar to what occurred Water Years 2012 and 2013. Spring runoff volumes during those water years were the lowest in the past decade.

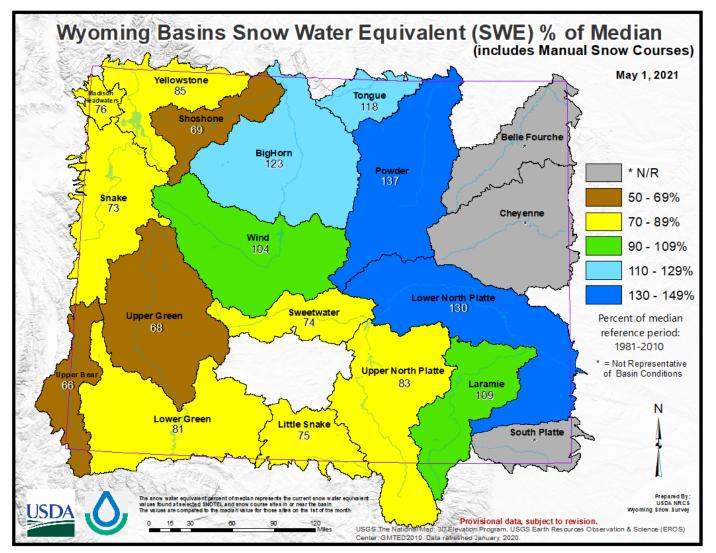
The final amount of spring runoff-especially across basins along the eastern half of Wyoming--is <u>highly</u> dependent on the amount and timing of precipitation in May into early June. Expect much higher flows and drastic increases in runoff volumes during a rapid warmup followed by a rain on a melting snowpack. Water planners need to keep abreast of the latest spring runoff forecasts and the latest weather trends for the rest of the spring into early summer.

#### Summary

- Wyoming continued to see **below** percent of median (near **90**%) of snowpack and/or snow water equivalents (SWEs)through late April.
- Precipitation totals across Wyoming for April were below (about 70%) average. Water year precipitation continues to be below (near 90%) average.
- Reservoirs across Wyoming were averaging near **75**% of capacity with **76**% of capacity reported last year. Overall reservoir storages for late April continue to be **above average**.
- State-wide stream flow snowmelt volumes for May July are forecasted to be generally **below** average at around **80**%.

#### Snowpack/SWEs

Snow water equivalents (SWEs)across Wyoming for May 1<sup>st</sup> were near **90**% of median. SWEs along the Powder and Lower North Platte River Basins were the highest at **130** to **135%** of median, while SWEs along the Upper Bear River Basin were the lowest at near **65**% of median. Last year, SWEs across the state were near **105**% of median. (**For complete tabular data, see Appendix**)



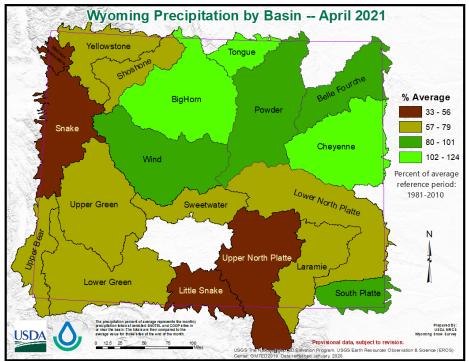
Map 1. Wyoming SWEs—May 1, 2021.

Wyoming Water Supply Outlook Report

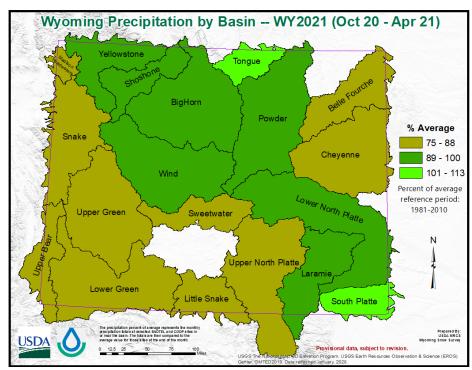
#### **Precipitation**

Basin precipitation across Wyoming was near 70% of average during April. The Tongue River Basin had the <u>highest</u> precipitation totals for the month at near 125% of average. The Snake River Basin had the <u>lowest</u> precipitation amount at near 35% of average. Water year precipitation (October - April) 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.

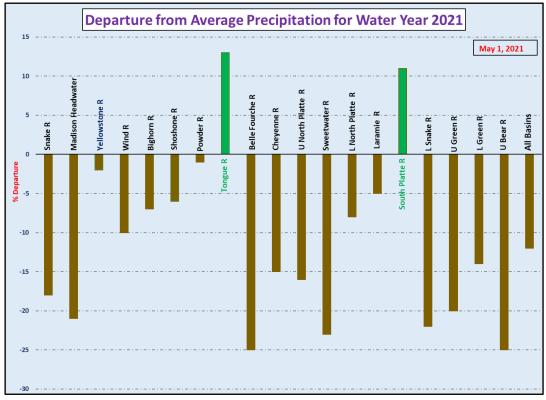


Chart 1. Departure from average precipitation (water year).

#### Reservoirs

Reservoirs across Wyoming were averaging near **75**% of capacity--down slightly from **76**% of capacity <u>last</u> year. Overall reservoir storages for late April continued to be **above** average at **112**% (**114**% last year). The <u>highest</u> average reservoir storage was across the Tongue River Basin at near **165**%. The Upper Bear River Basin had the <u>lowest</u> average reservoir storage at near **60**%.

(See Appendix for complete tabular data.)

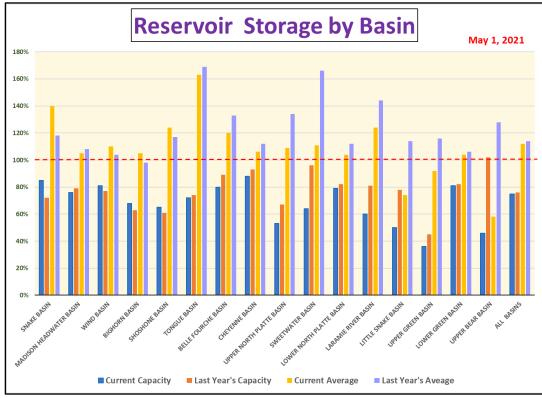
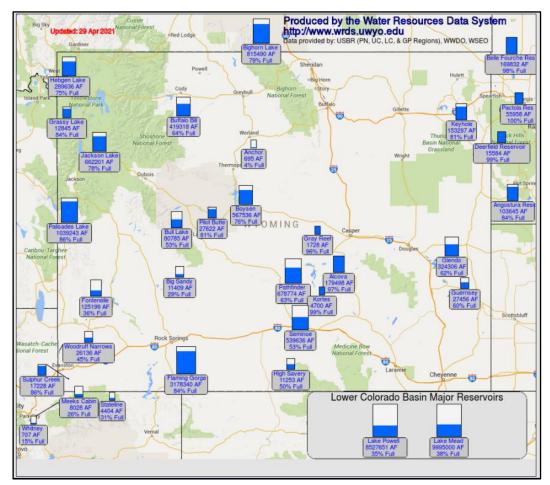


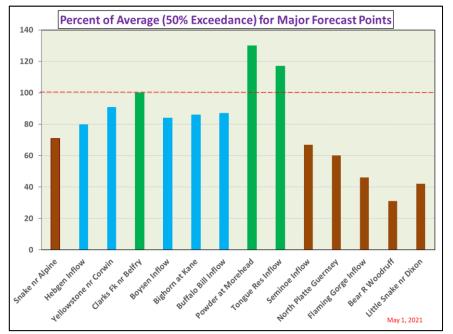
Chart 2. Reservoir storage by basin.



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

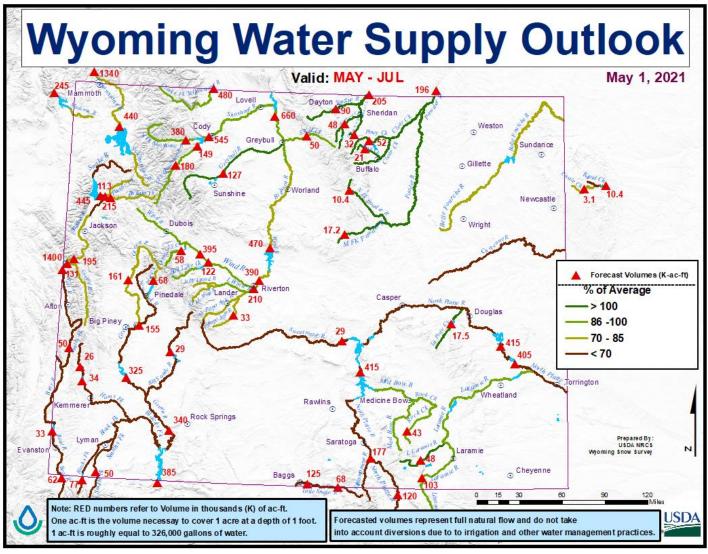
#### **Stream Flows**

Snowmelt runoff stream flow volumes for across the state are expected to be **below average** at around **85**%. The <u>highest</u> forecasted stream flows due to snowmelt are across the Powder and Tongue Basins at **110** to **120**% of normal. The <u>lowest</u> snowmelt runoff volumes are expected across the Little Snake and Upper Bear Drainages at near **50**% of average.

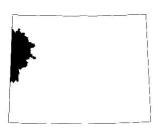


(See Appendix for complete tabular listing of stream flow forecasts.)

Chart 3. 50% exceedance for major forecast points.

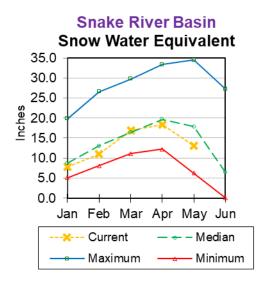


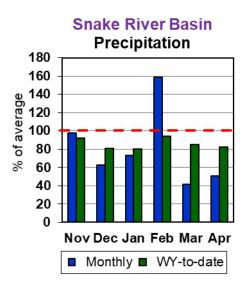
Map 4. Wyoming water supply outlook—May 1, 2021.

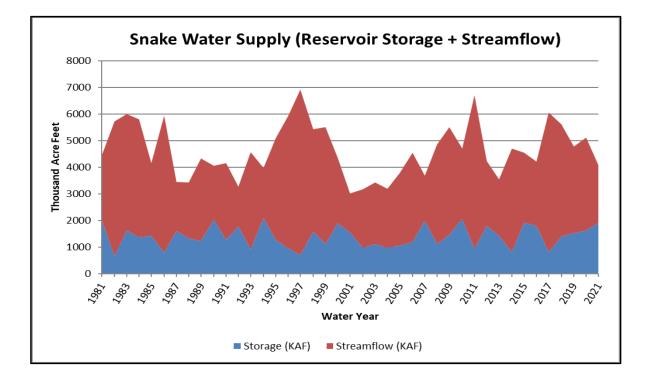


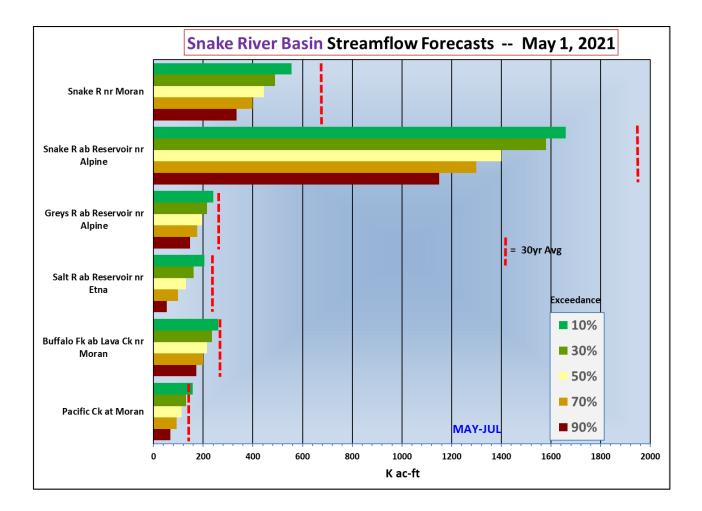
#### Snake River Basin

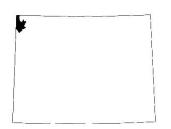
- The overall Snake River Basin SWE is near 75% of median.
- Last month's precipitation for the Snake River Basin was near 50% of average. Wateryear-to-date precipitation is near 80% of average.
- Current reservoir storage is near 140% of average for the three main reservoirs in the basin.
- The streamflow forecasts for May through July are **below** average (70%) for this basin.





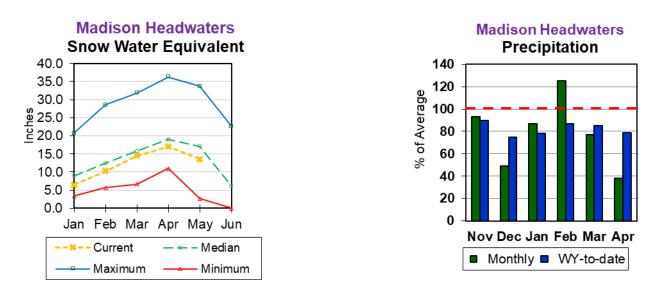


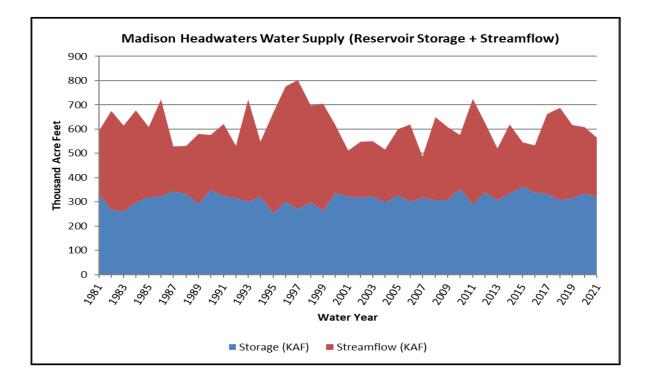


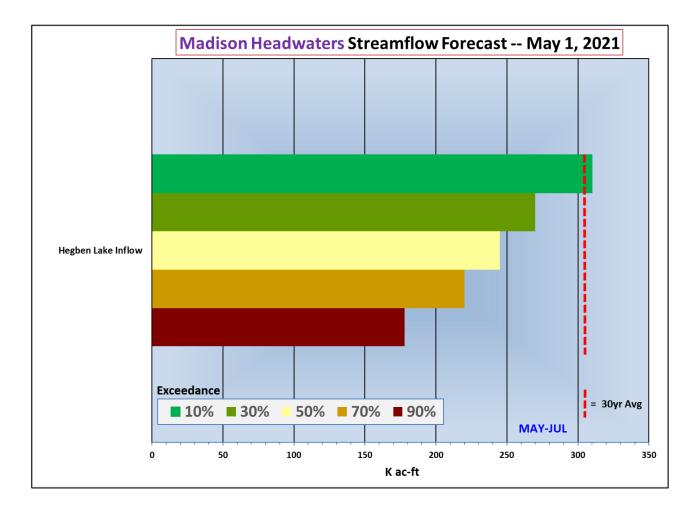


### Madison Headwaters Basin

- The overall Madison Headwaters Basin SWE is around 75% of median.
- Last month's precipitation for the Madison Headwaters River Basin was near 40% of average. Water-year-to-date precipitation is around 80% of average.
- Current reservoir storage is near 105% of average for one main reservoir in the basin.
- Hebgen Reservoir inflows (May-July) are forecasted to be **below** average at **80**%.



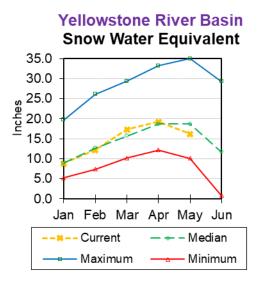


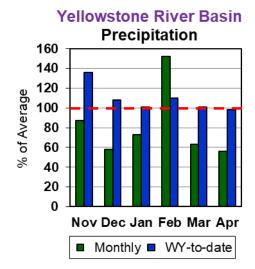




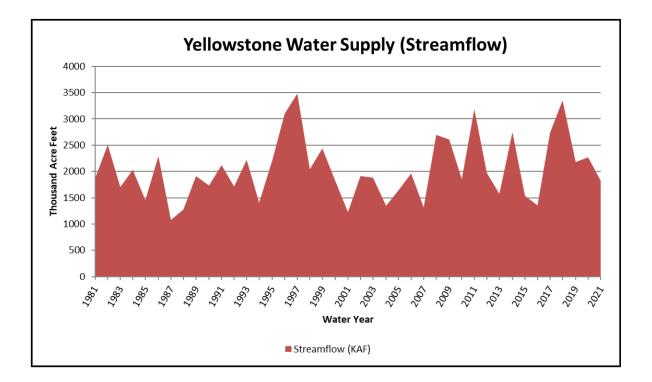
#### Yellowstone River Basin

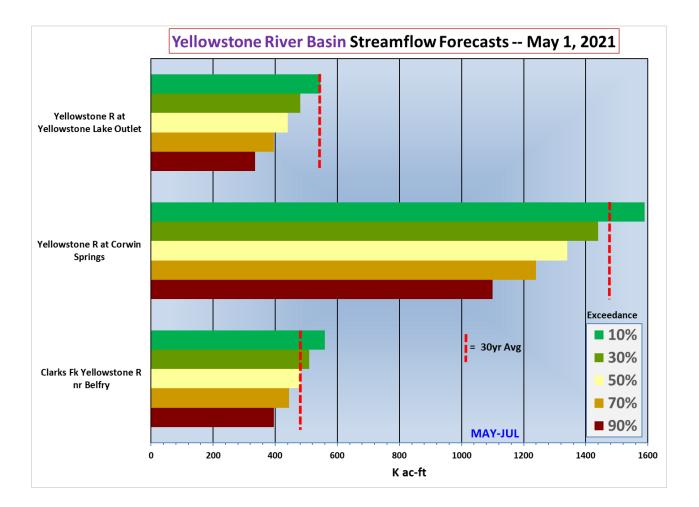
- The overall Yellowstone River Basin SWE is near 85% of median.
- Last month's precipitation for the Yellowstone River Basin was near 55% of average. Water-year-to-date precipitation is near 100% of average.
- The 50% exceedance forecasts for May through July are **below** average (**91**%) for this basin. Clarks Fork near Belfry is forecasted to have flows at **100**% of average.

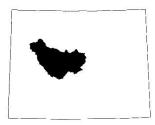




No reservoir data for the basin.

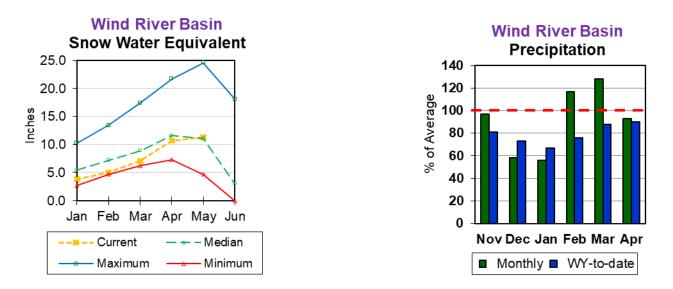


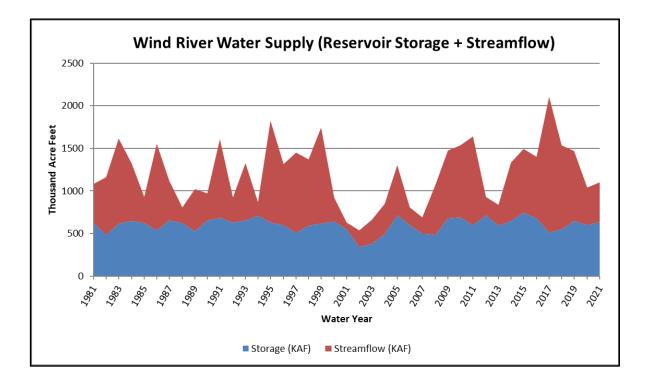


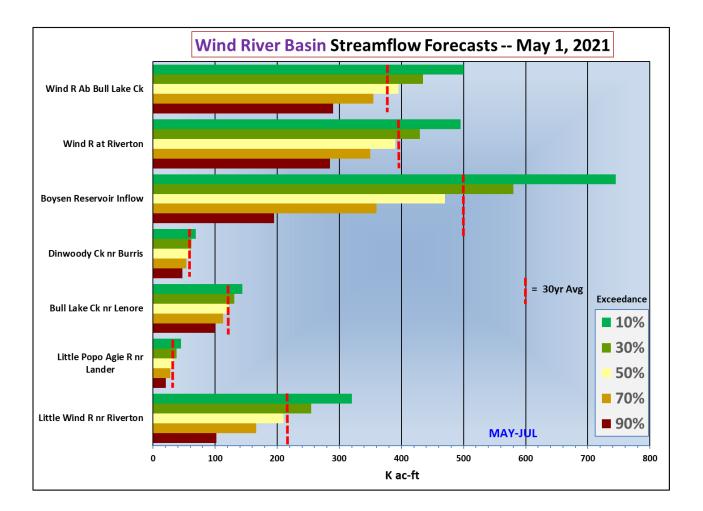


#### Wind River Basin

- The overall Wind River Basin SWE is near 105% of median.
- Last month's precipitation for the Wind River Basin was near **95**% of average. Wateryear-to-date precipitation is around **90**% of average.
- Current reservoir storage is near 110% of average for the three main reservoirs in the basin.
- The streamflow forecasts for May through July are **below** average (88%) for this basin.



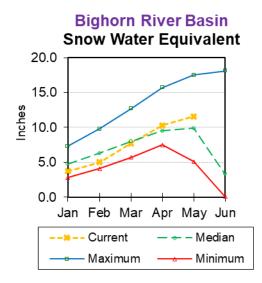


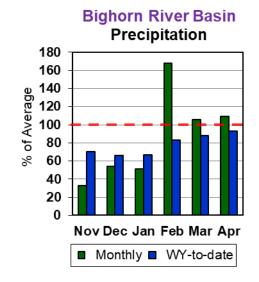


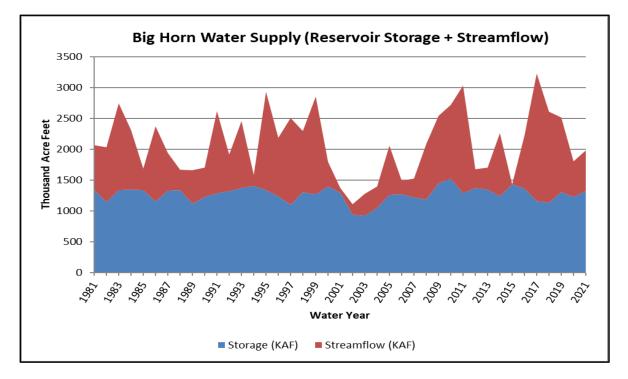


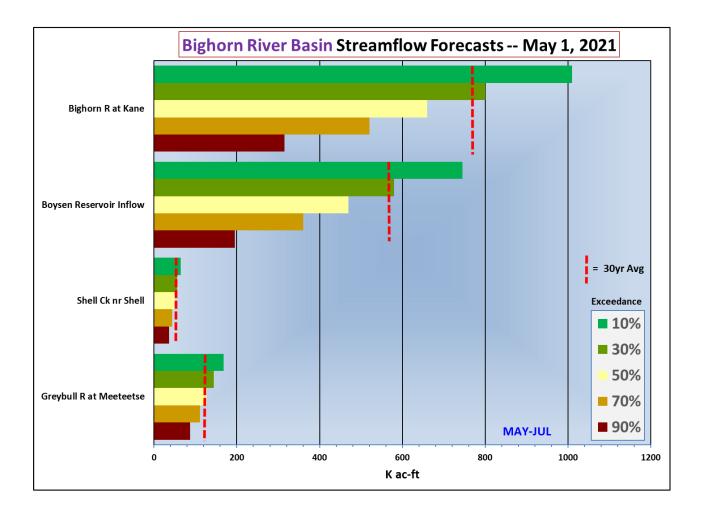
#### **Bighorn River Basin**

- The overall Bighorn River Basin SWE is near 125% of median.
- Last month's precipitation for the Bighorn River Basin was near 110% of average. Water-year-to-date precipitation is 90 to 95% of average.
- Current reservoir storage is near 105% of average for the two main reservoirs in the basin.
- The 50% exceedance forecasts for May through July are **below** average (**95**%) for this basin. Greybull River at Meeteetse is forecasted to have flows at **102**% of average.





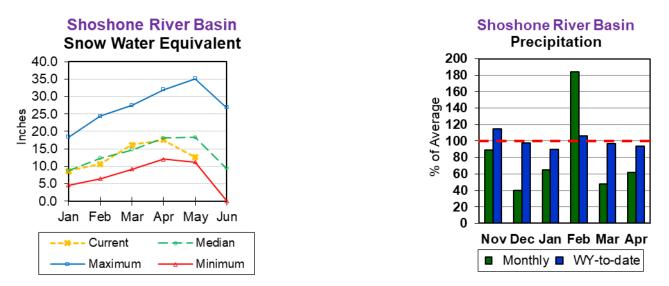


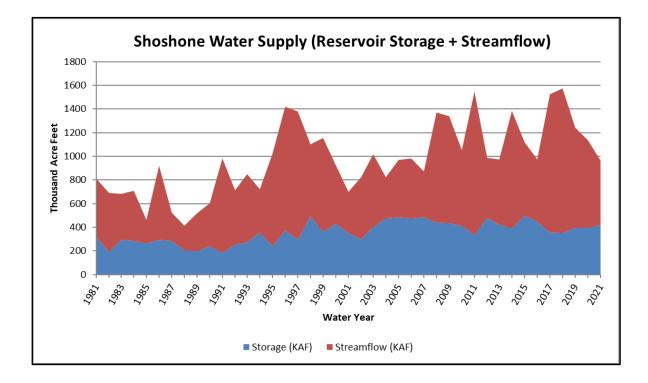


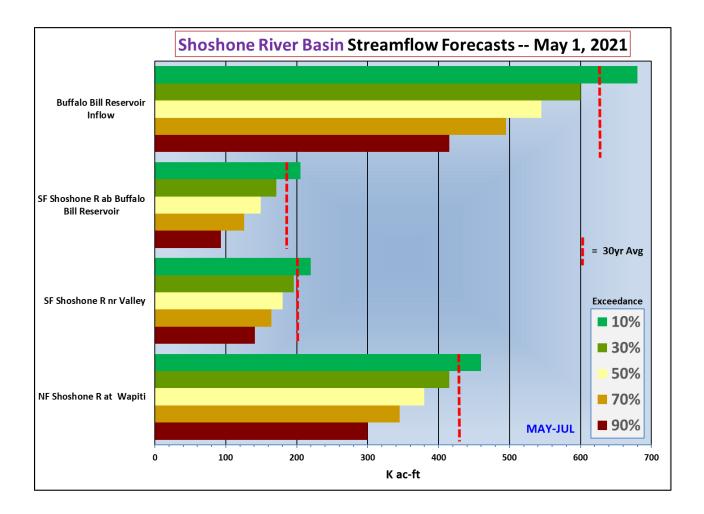


#### Shoshone River Basin

- The overall Shoshone River Basin SWE is close to 70% of median.
- Last month's precipitation for the Shoshone River Basin was near 60% of average.
  Water-year-to-date precipitation is around 95% of average.
- Current reservoir storage is near **125**% of average for one main reservoir in the basin.
- Streamflow forecasts for May through July are **below** average (87%) for this basin.



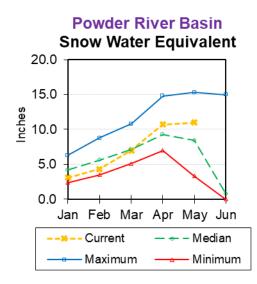


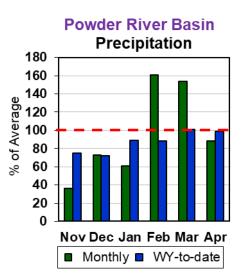




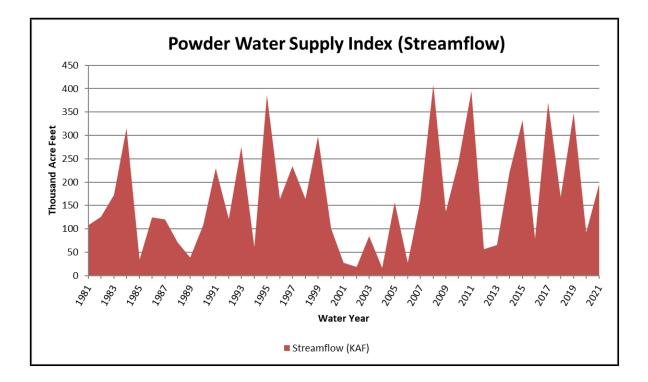
#### Powder River Basin

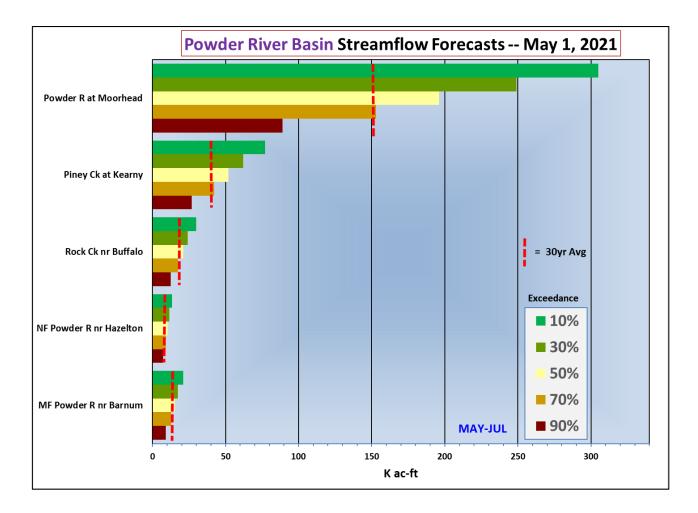
- The overall Powder River Basin SWE is near 135% of median.
- Last month's precipitation for the Powder River Basin was near **90**% of average. Water-year-to-date precipitation is near **100**% of average.
- The 50% exceedance forecasts for May through July are **above** average (**123**%) for this basin. Piney Creek at Kearney is expected to have flows at **130**% of average.





No reservoir data for the basin.

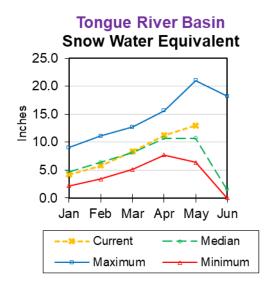


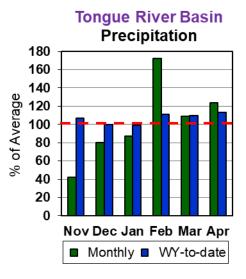


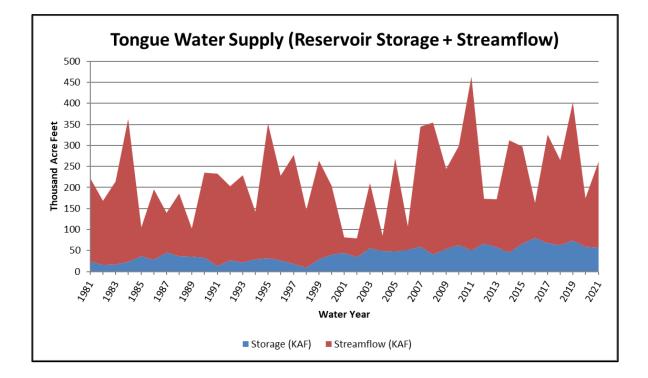


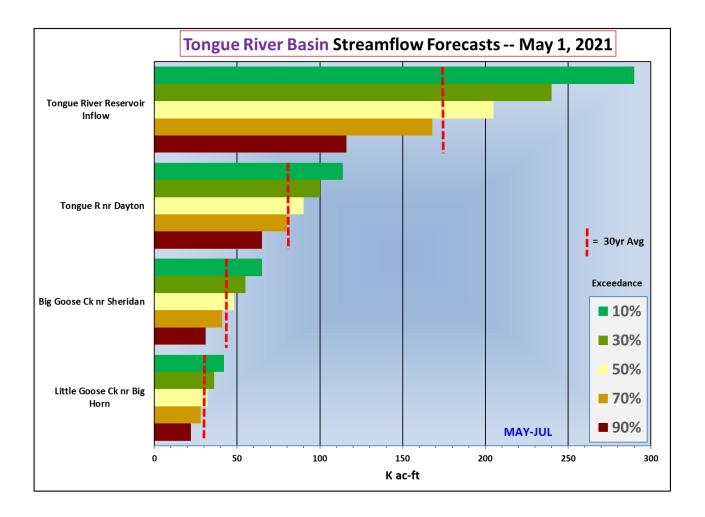
#### **Tongue River Basin**

- The overall Tongue River Basin SWE is near 120% of median.
- Last month's precipitation for the Tongue River Basin was near 125% of average. Water-year-to-date precipitation is near 115% of average.
- Current reservoir storage is near 165% of average for one main reservoir in the basin.
- The 50% exceedance forecasts for May through July are **above** average (**112%**) for this basin. Tongue Reservoir inflows are forecasted to be **117**% of average.





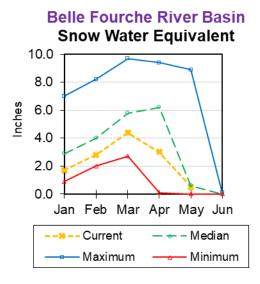


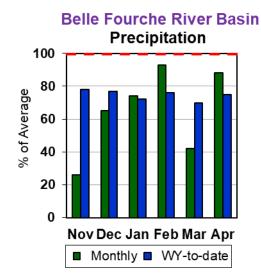


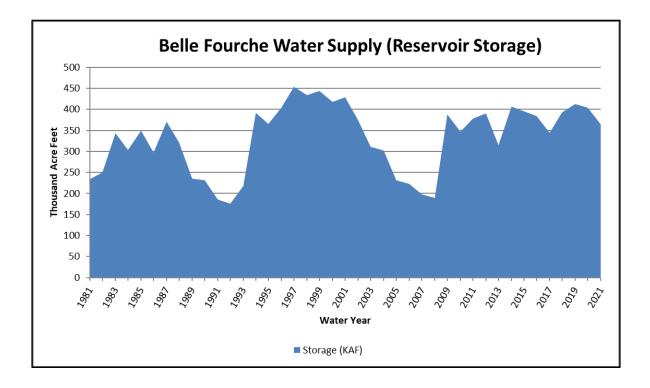


#### Belle Fourche River Basin

- Much of the Belle Fourche River Basin snowpack has melted out.
- Last month's precipitation for the Belle Fourche River Basin was near **90**% of average. Water-year-to-date precipitation is around **75**% of average.
- Current reservoir storage is near **120**% of average for three main reservoirs in the basin.





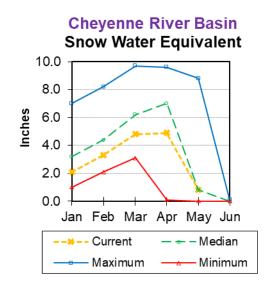


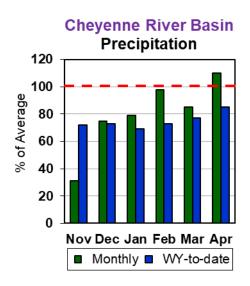
There are no streamflow forecast points for the basin.

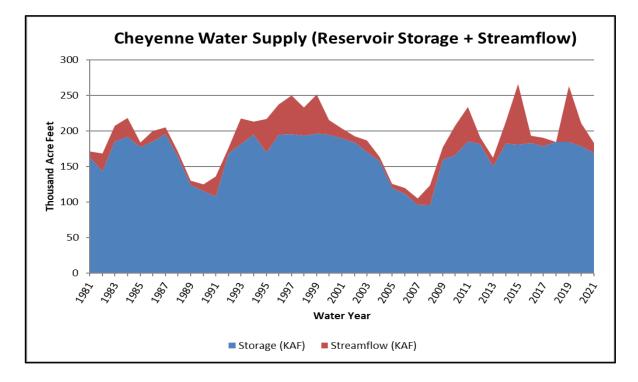


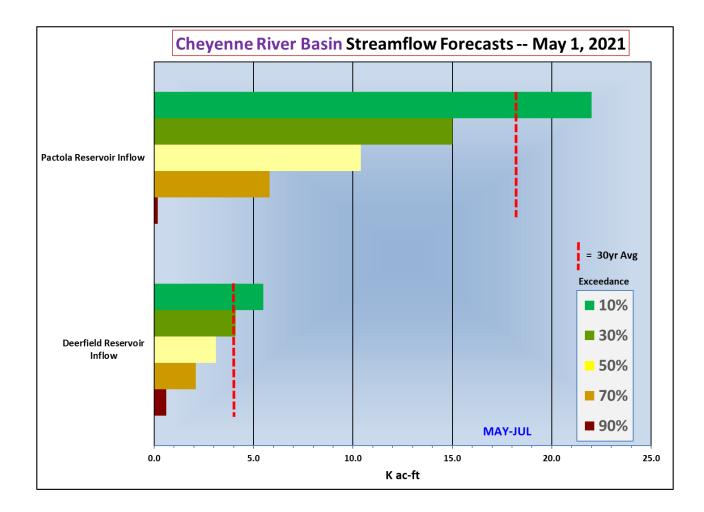
### **Cheyenne River Basin**

- Much of the Cheyenne River Basin snowpack has melted out.
- Last month's precipitation for the Cheyenne River Basin was near 110% of average. Water-year-to-date precipitation is around 85% of average.
- Current reservoir storage is near 105% of average for three main reservoirs in the basin.
- The 50% exceedance forecasts for May through July are **below** average (69%) for this basin. Deerfield Reservoir inflows are forecasted to be **79**% of average.





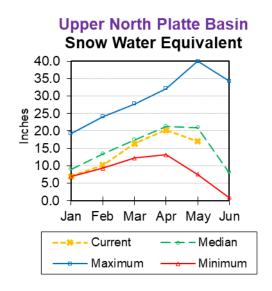


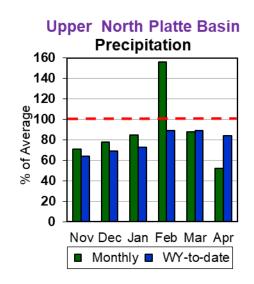


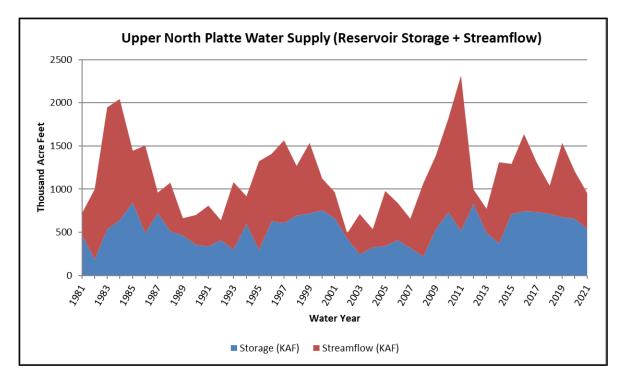


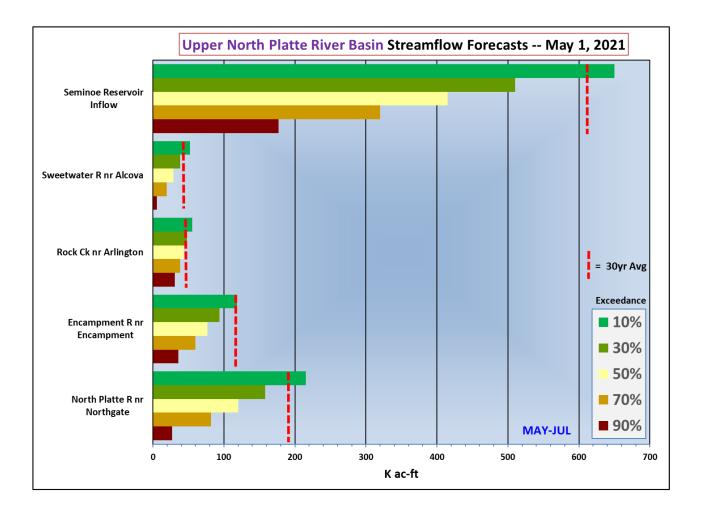
## Upper North Platte River Basin

- The overall Upper North Platte River Basin SWE is near 80% of median.
- Last month's precipitation for the Upper North River Basin was near 50% 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.
- Streamflow forecasts for May through July are **below** average (70%) for this basin. Rock Creek near Arlington is expected to have flows at **90**% of average.





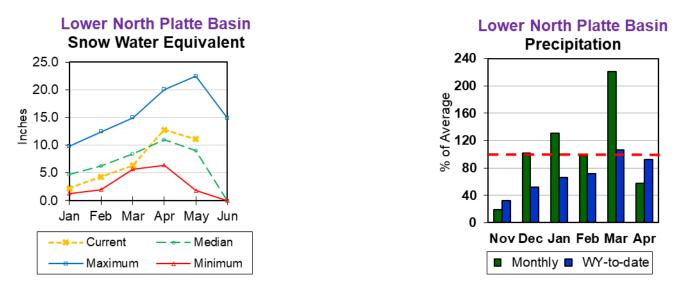


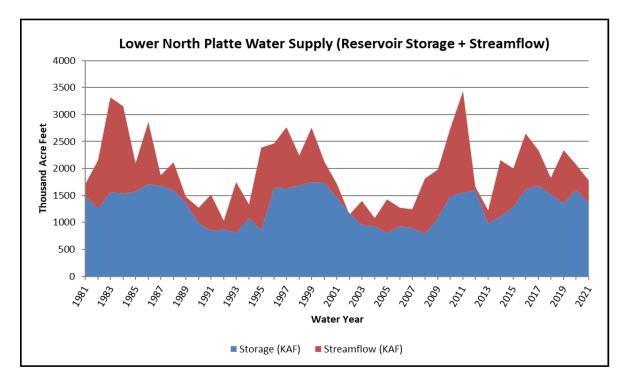


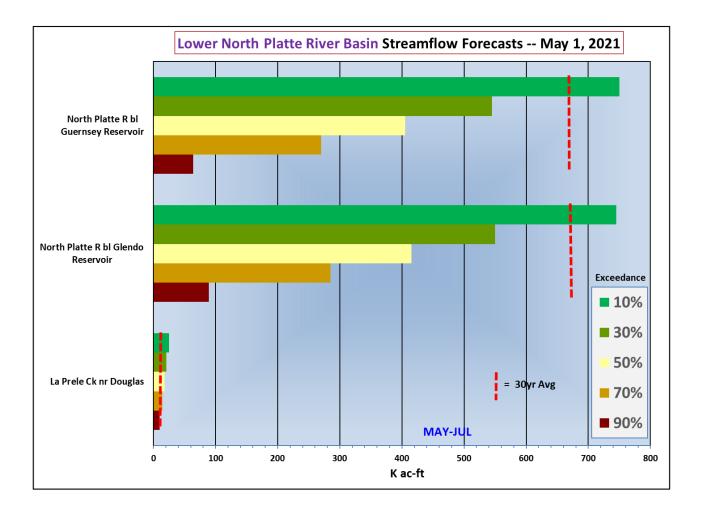


#### Lower North Platte River Basin

- The overall Lower North Platte River Basin SWE is around 130% of median.
- Last month's precipitation for the Lower North Platte River Basin was near 60% of average. Water-year-to-date precipitation is around 90% of average.
- Current reservoir storage is near 105% of average for four main reservoirs in the basin.
- The 50% exceedance forecasts for May through July are **below** average (**80**%) for this basin. However, La Prele Creek near Douglas is forecasted to have flows at **117**% of average.



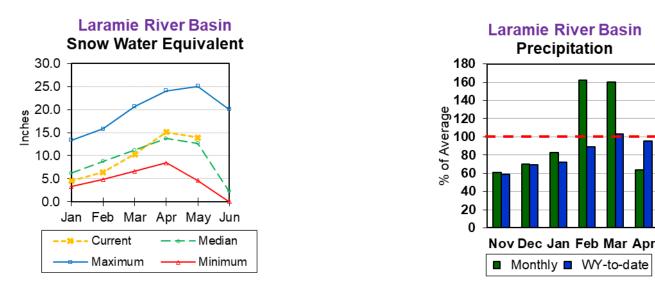


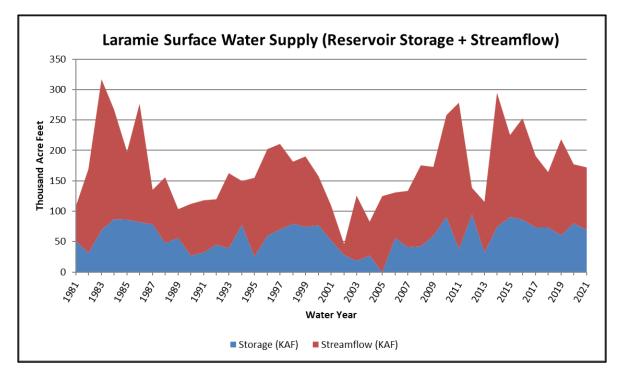


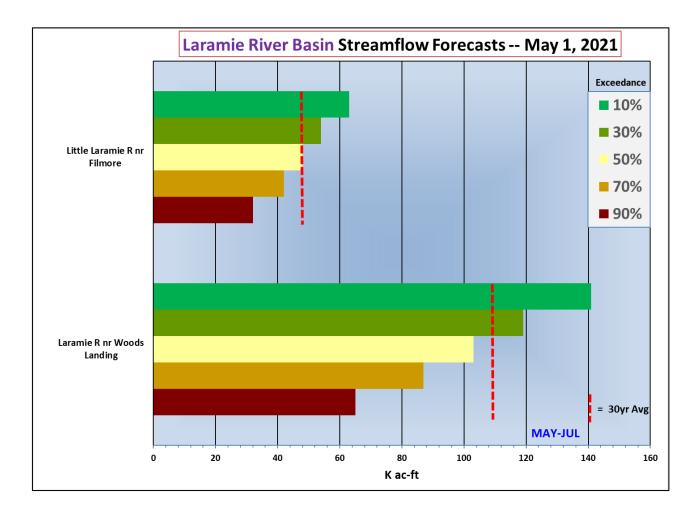


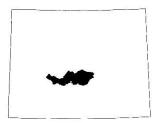
#### Laramie River Basin

- The overall Laramie River Basin SWE is around 110% of median.
- Last month's precipitation for the Laramie River Basin was around 65% of average. Water-year-to-date precipitation is near 95% of average.
- Current reservoir storage is around **125**% of average for one main reservoir in the basin.
- Streamflow forecasts for May through July are <u>near</u> average (**98**%) for this basin. Little Laramie River near Filmore is expected to have flows at **100**% of average.



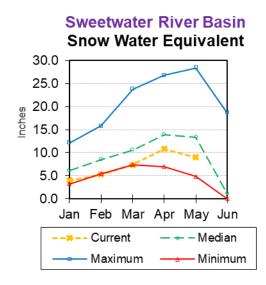


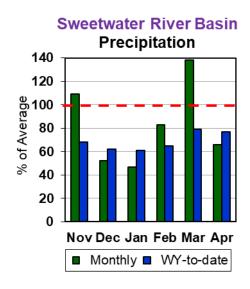


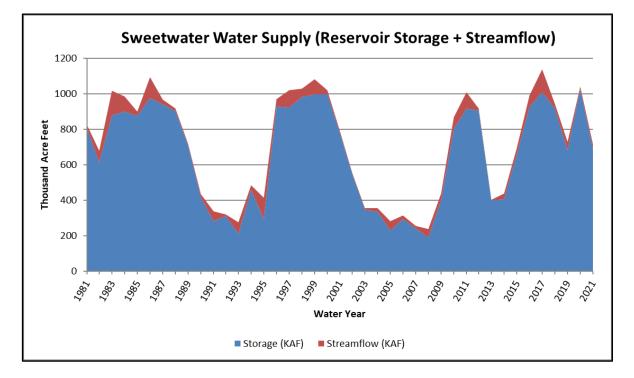


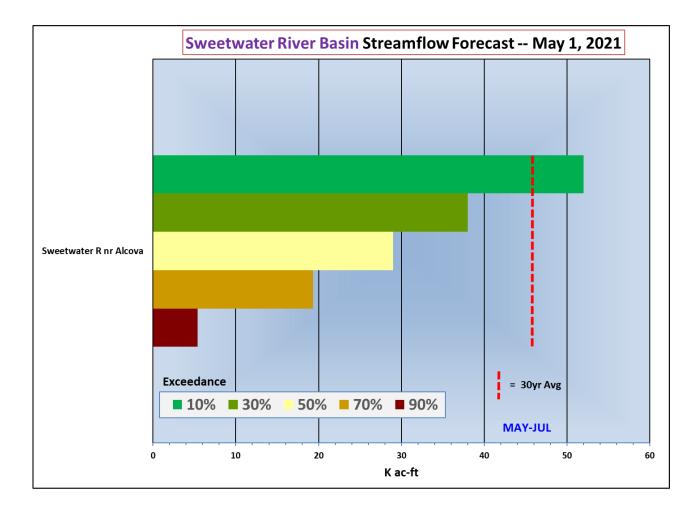
#### Sweetwater River Basin

- The overall Sweetwater River Basin SWE is around 75% of median.
- Last month's precipitation for the Sweetwater River Basin was near 65% of average.
  Water-year-to-date precipitation is 75 to 80% of average.
- Current reservoir storage is near **110**% of average for one main reservoir in the basin.
- Streamflow forecast for Sweetwater River near Alcova (May-July) is well below average at 63%.





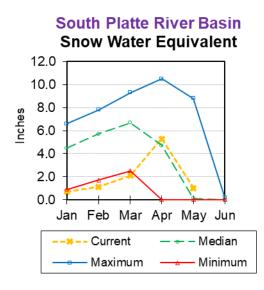


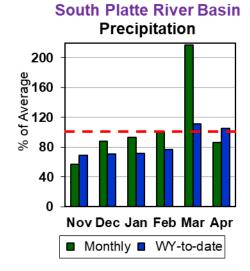




## South Platte River Basin (WY)

- Much of the South Platte River Basin snowpack has melted out.
- Last month's precipitation for the South Platte River Basin was near **85**% of average. Water-year-to-date precipitation is close to **105**% of average.





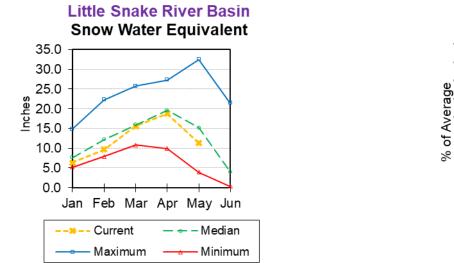
No reservoir data for the basin.

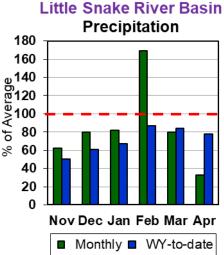
There are no streamflow forecast points for the basin.

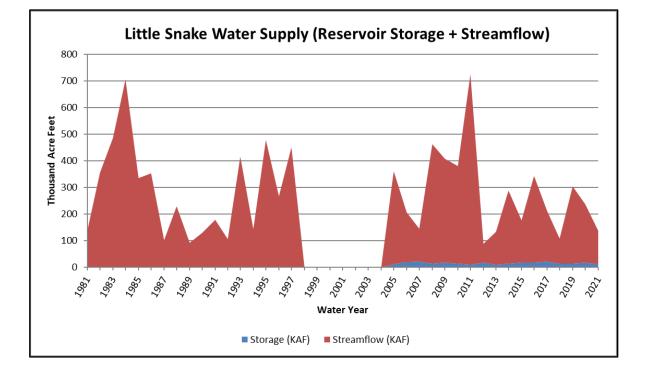


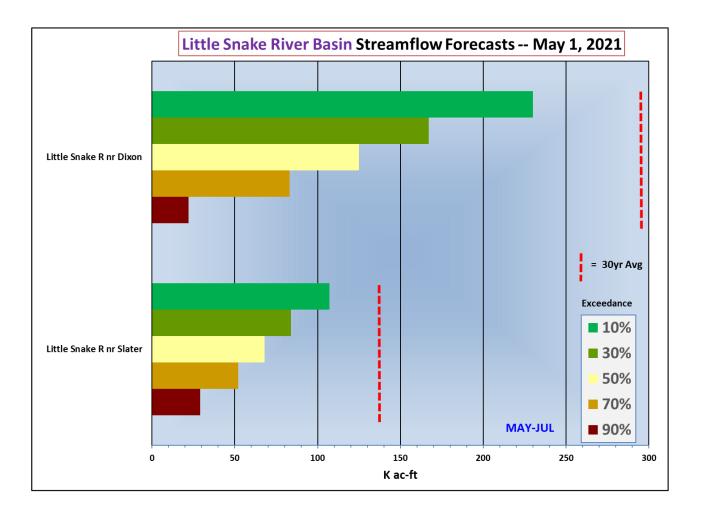
# Little Snake River Basin

- The overall Little Snake River Basin SWE is near **75**% of median.
- Last month's precipitation for the Little Snake River Basin was near 35% of average. Water-year-to-date precipitation is near 80% of average.
- Current reservoir storage is close to 75% of average for one main reservoir in the basin.
- The 50% exceedance forecasts for May through July are **well below** average (**46**%) for this basin.





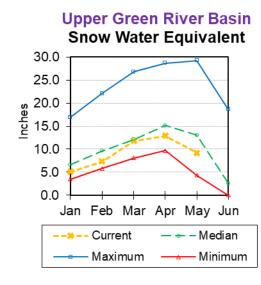


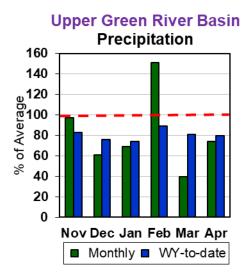


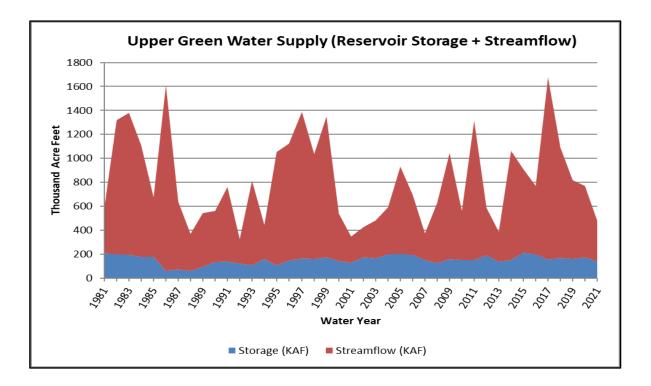


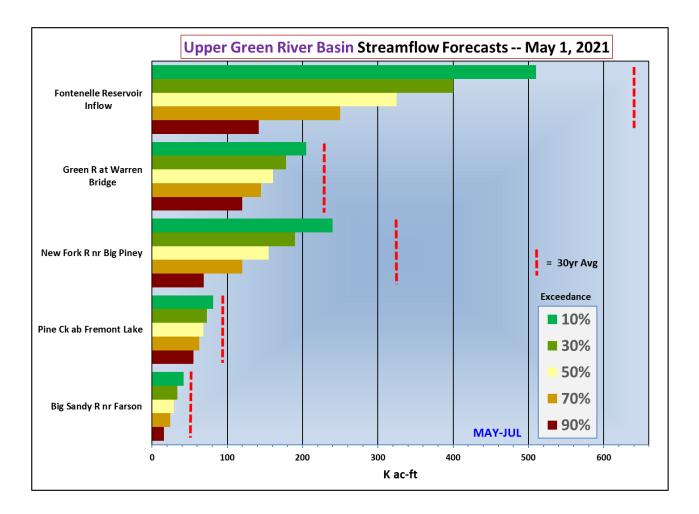
## Upper Green River Basin

- The overall Upper Green River Basin SWE is near 70% of median.
- Last month's precipitation for the Upper River Basin was near 75% of average. Wateryear-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 May through July are **well below** average (60%) for this basin.





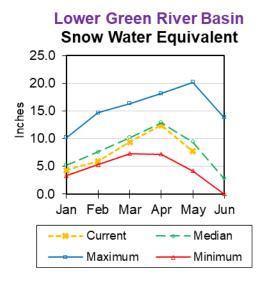


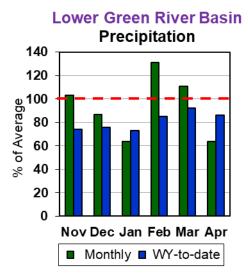


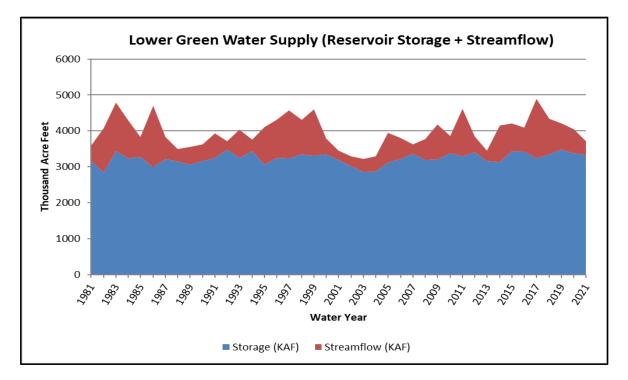


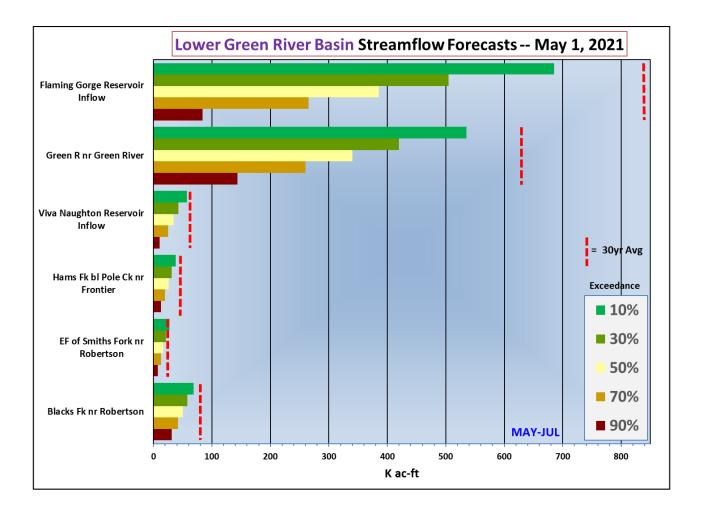
# Lower Green River Basin

- The overall Lower Green River Basin SWE is close to 80% of median.
- Last month's precipitation for the Lower Green River Basin was near 65% of average. Water-year-to-date precipitation is around 85% of average.
- Current reservoir storage is close to **105**% of average for three main reservoirs in the basin.
- Streamflow forecasts for May through July are **well below** average (**56**%) for this basin.





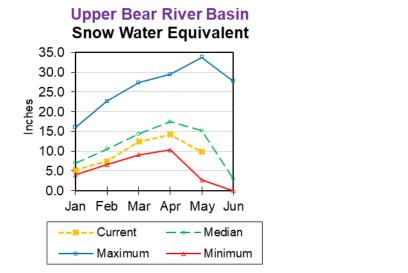


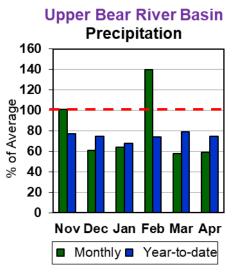


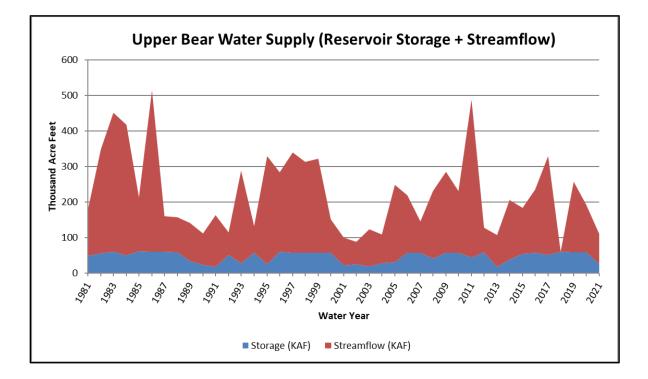


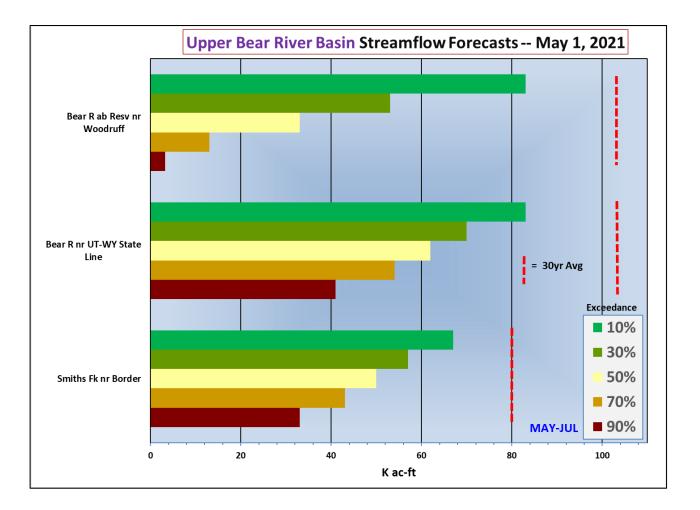
# Upper Bear River Basin

- The overall Upper Bear River Basin SWE is around 65% of median.
- Last month's precipitation for the Upper Bear River Basin was near 60% of average. Water-year-to-date precipitation is around 75% of average.
- Current reservoir storage is near 60% of average for one main reservoir in the basin.
- The 50% exceedance forecasts for May through July are **well below** average (**51**%) for this basin.



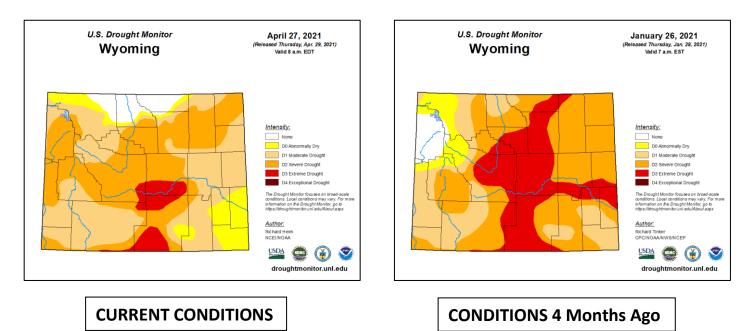


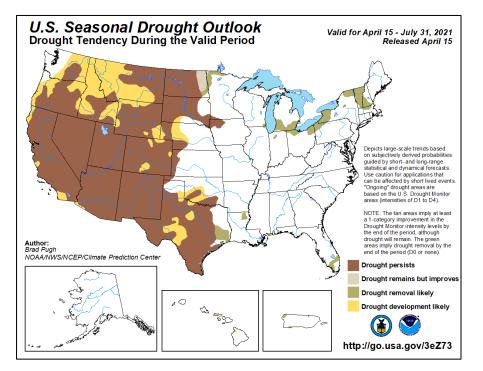




# Appendix

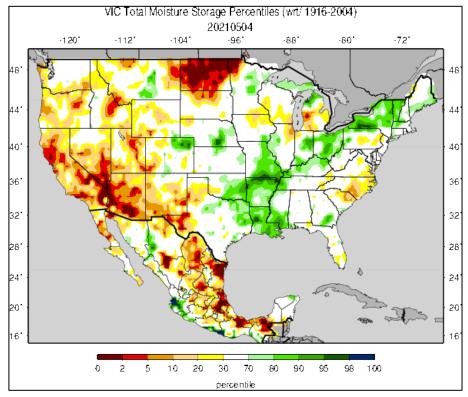
### DROUGHT



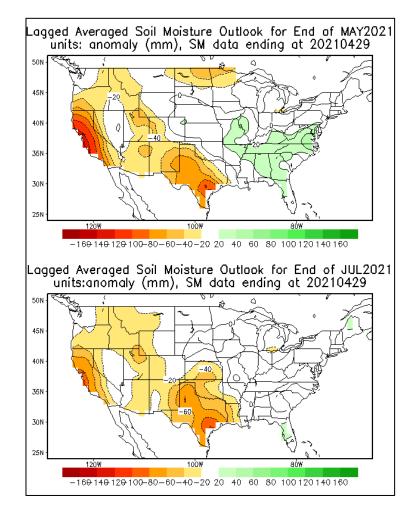


#### **OUTLOOK through July 31st**

### SOIL MOISTURE



### **CURRENT CONDITIONS**

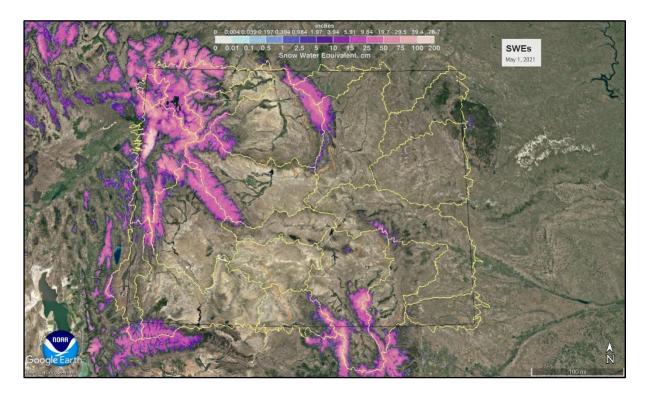


### FORECAST through JULY

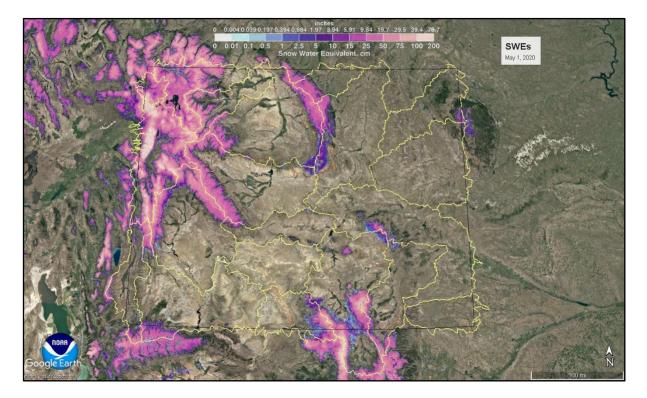
### **TEMPERATURE/PRECIPITATION OUTLOOKS**

TEMPERATURE	PRECIPITATION		
Above Average	ΜΑΥ	Equal Chances (Above/Below)	
Above Average 50 - 60% 30 - 40% Above Average	MAY - JUL	Below Average 40 - 50%	
Above Average 50-60%	JUN - AUG	Below Average 40-50% Below Average	

### SWE ANALYSIS FROM NOHRSC

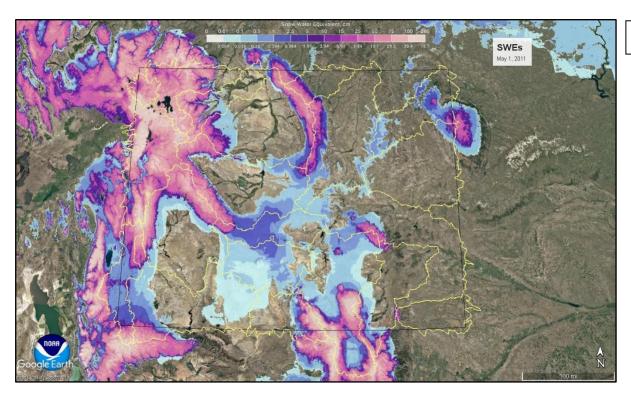


MAY 1, 2021



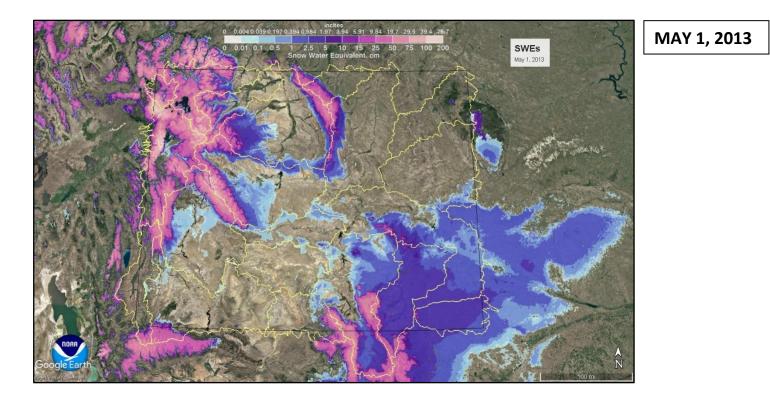
MAY 1, 2020

### Record High Runoff Water Year

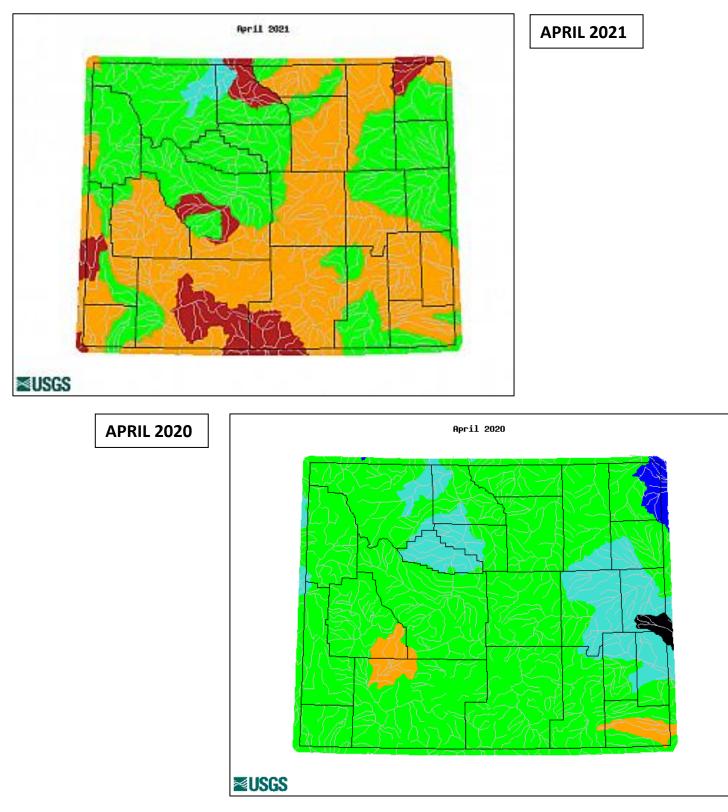


MAY 1, 2011

### Record Low Runoff Water Year

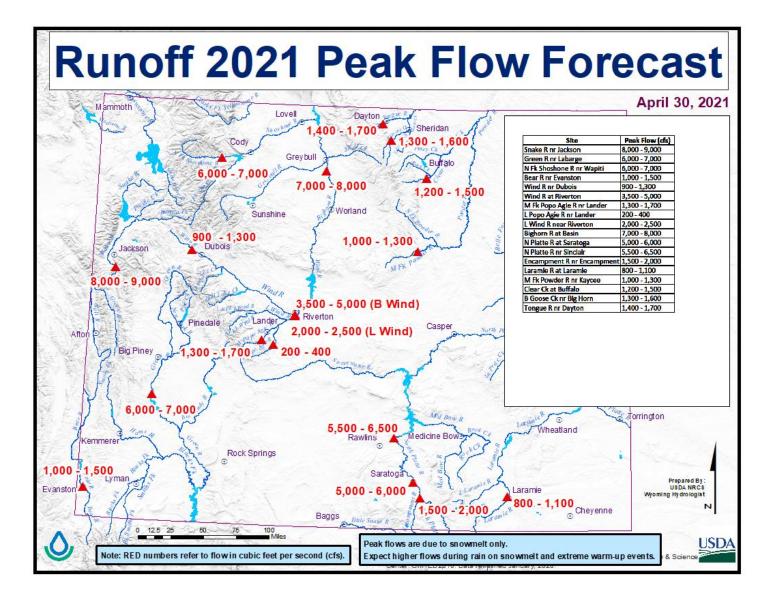


### MONTHLY STREAMFLOW



Explanation - Percentile classes								
Low	<10	10-24	25-75	76-90	>90	High	No Data	
	Much below normal	Below normal	Normal	Above normal	Much above normal			

Wyoming Water Supply Outlook Report



### TABULAR DATA

#### 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

Reservoir\_data\_050 12021.pdf

#### **Stream Flow Forecasts**

In Word double click the object below to view entire document



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

USGS WaterWatch

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

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

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# 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