

# Yellowtail Dam Water Supply and Projected Operations



— BUREAU OF —  
RECLAMATION

April 2020



Bighorn River Basin Map Source: DEMIS Mapserver

| April Operating Range                      |                       |        |         |
|--|-----------------------|--------|---------|
| Forecast                                   | Minimum               | Median | Maximum |
| <b>Monthly Average Inflow (cfs)</b>        | 2,775                 | 4,780  | 5,455   |
| <b>Monthly Average River Release (cfs)</b> | 3,735                 | 5,385  | 7,150   |
| <b>End of April Elevation (feet)</b>       | 3604.8                | 3608.8 | 3597.2  |
| April 2020 Inflow Forecast                 |                       |        |         |
| April-July Volume                          |                       | 1,469  |         |
| Percent of Average                         |                       | 117    |         |
| Water Year                                 | Historic Inflow (kaf) | Rank   |         |
| 2019                                       | 1,678                 | 12     |         |
| 2018                                       | 2,318                 | 3      |         |
| 2017                                       | 2,953                 | 1      |         |
| 2016                                       | 1,032                 | 33     |         |
| <b>30 Year Average</b>                     | 1,256                 |        |         |

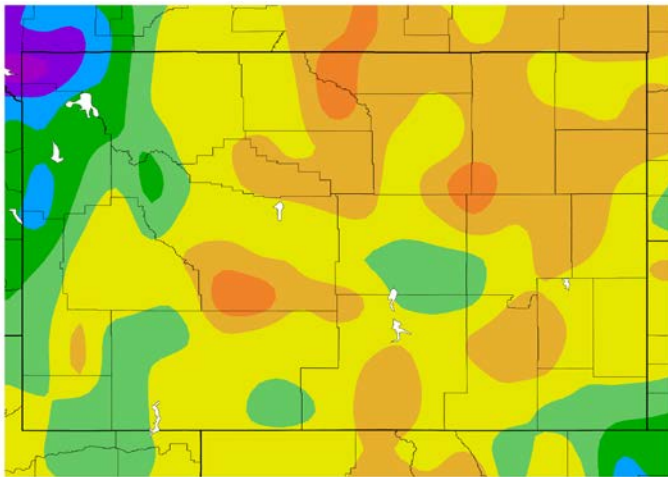


## Climate Departure from Normal

March 1 through March 31, 2020

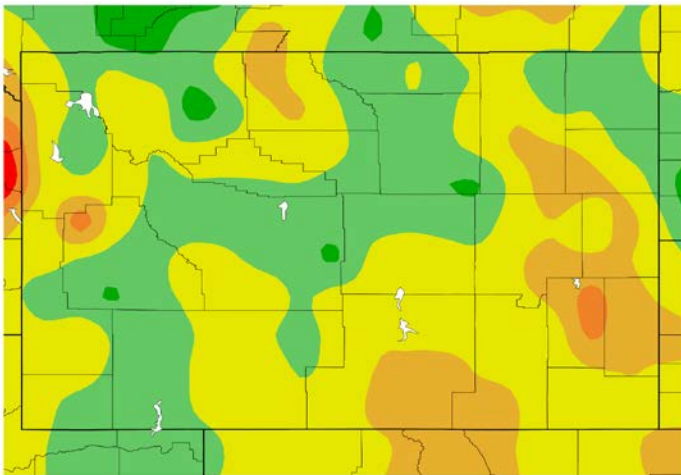
### Precipitation

Departure from Normal (inches)



### Temperature

Departure from Normal (°F)



HPRCC using provisional data NOAA Regional Climate Centers

## CLIMATE SUMMARY

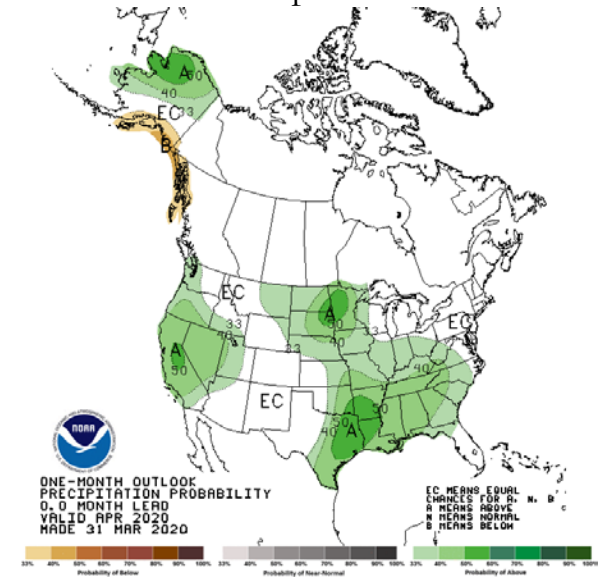
The climate in the Bighorn Basin above Yellowtail Dam was drier than average with near average temperatures during March.

Warm temperatures in early March melted low elevation snowpack resulting in higher tributary gains above Yellowtail Dam.

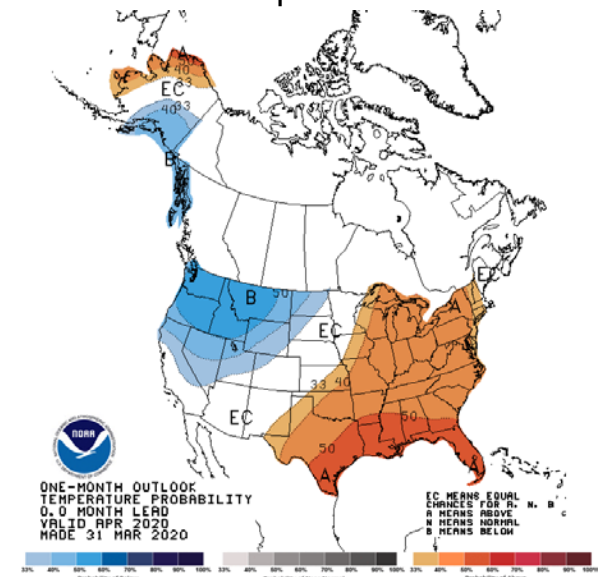
The climate outlook for April shows there is an equal chance precipitation will be above average, below average or average. in the Bighorn River Basin. There is a 33-50 percent change temperatures will be below average.

## April Climate Outlook

### Precipitation



### Temperature

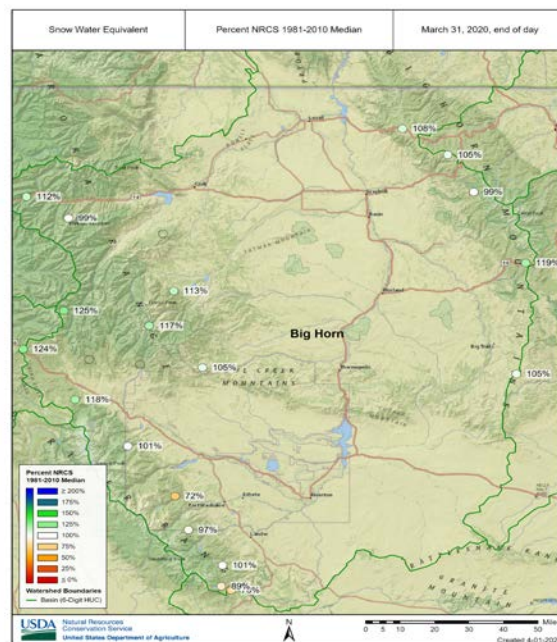
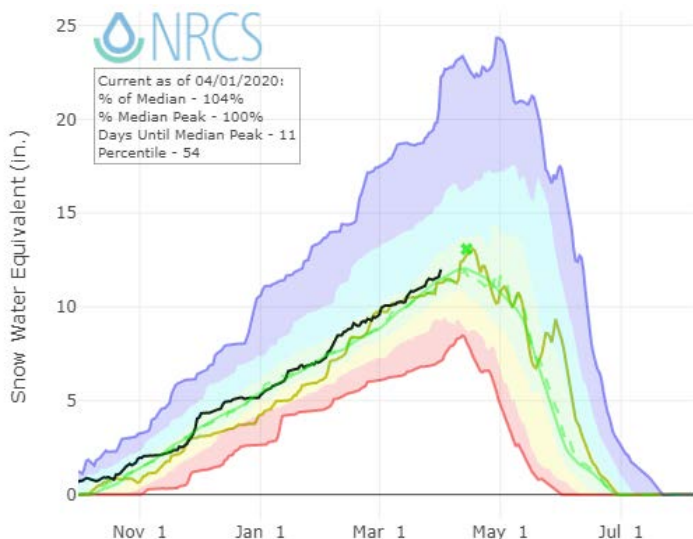




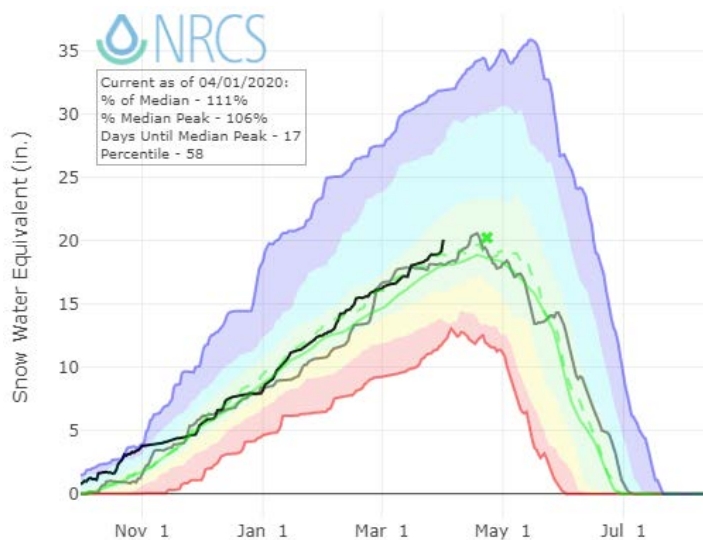
# SNOWPACK SUMMARY

The snow water equivalent (SWE) graphs are a composite of SNOTEL sites within the Bighorn River Basin managed by the Department of Natural Resources Conservation Service (NRCS).

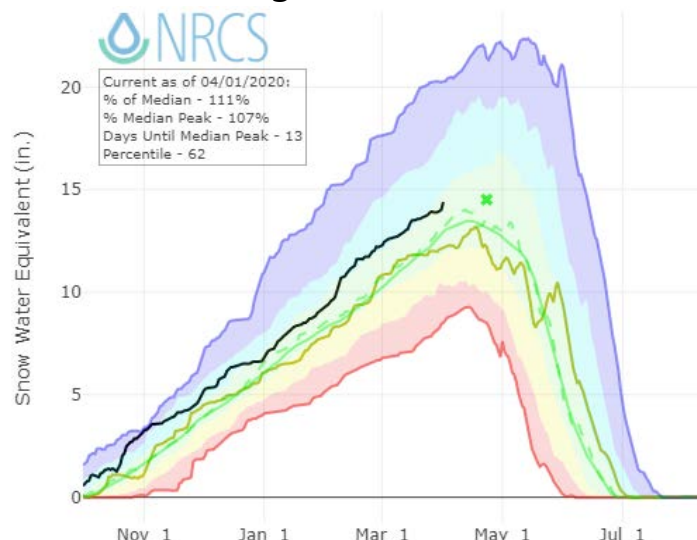
## Wind River



## Shoshone River



## Bighorn River



NRCS Montana Snow Survey Website: <https://www.nrcs.usda.gov/wps/portal/nrcs/mt/snow/>

Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles  
 Normal ('81-'10) – Official median calculated from 1981-2010 data  
 Normal (POR) – Unofficial mean calculated from Period of Record data

- ✱ Median Peak SWE
- Max
- Median (POR)
- Median ('81-'10)
- Min
- Stats. Shading
- 2020 (15 sites)
- 2019 (15 sites)

# FORECAST SUMMARY

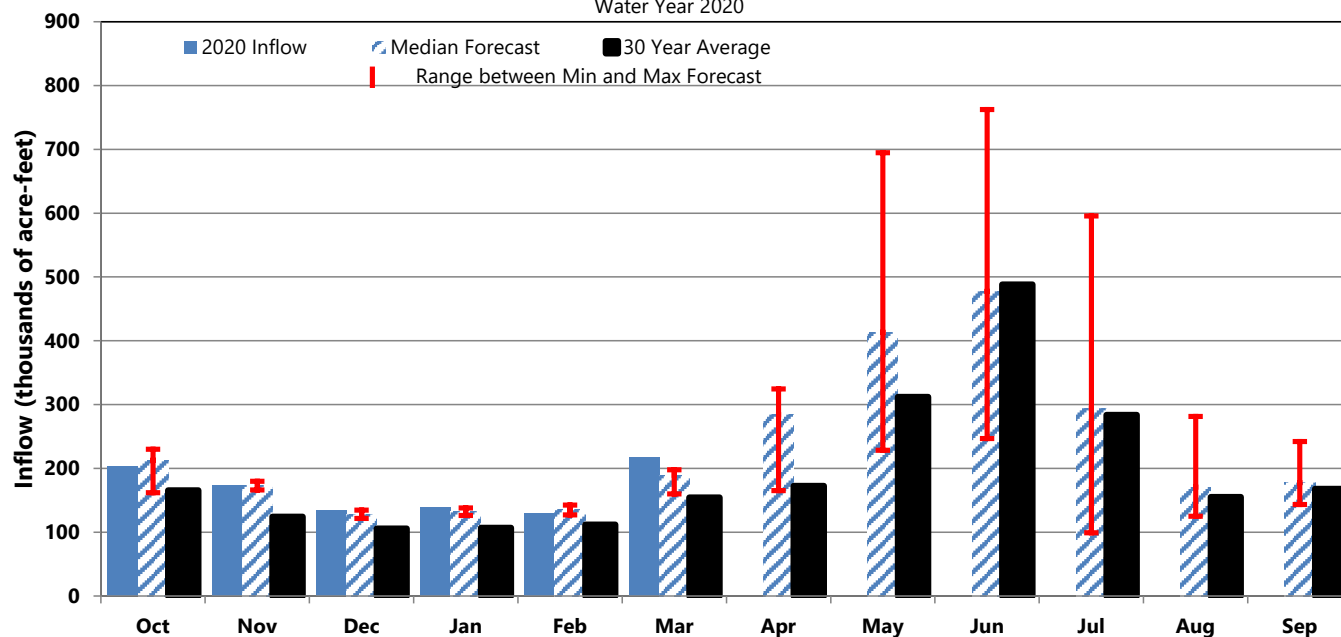
SNOTEL data, streamflow data and planned releases from Boysen and Buffalo Bill Reservoirs are used to compute an inflow forecast for Bighorn Lake.

## March Forecast Review

|              | Median Forecast (kaf) | Actual (kaf) | Difference (kaf) | Actual (% of Avg) |
|--------------|-----------------------|--------------|------------------|-------------------|
| March Inflow | 189.1                 | 217.6        | 28.5             | 141               |

## Bighorn Lake Inflow

Water Year 2020

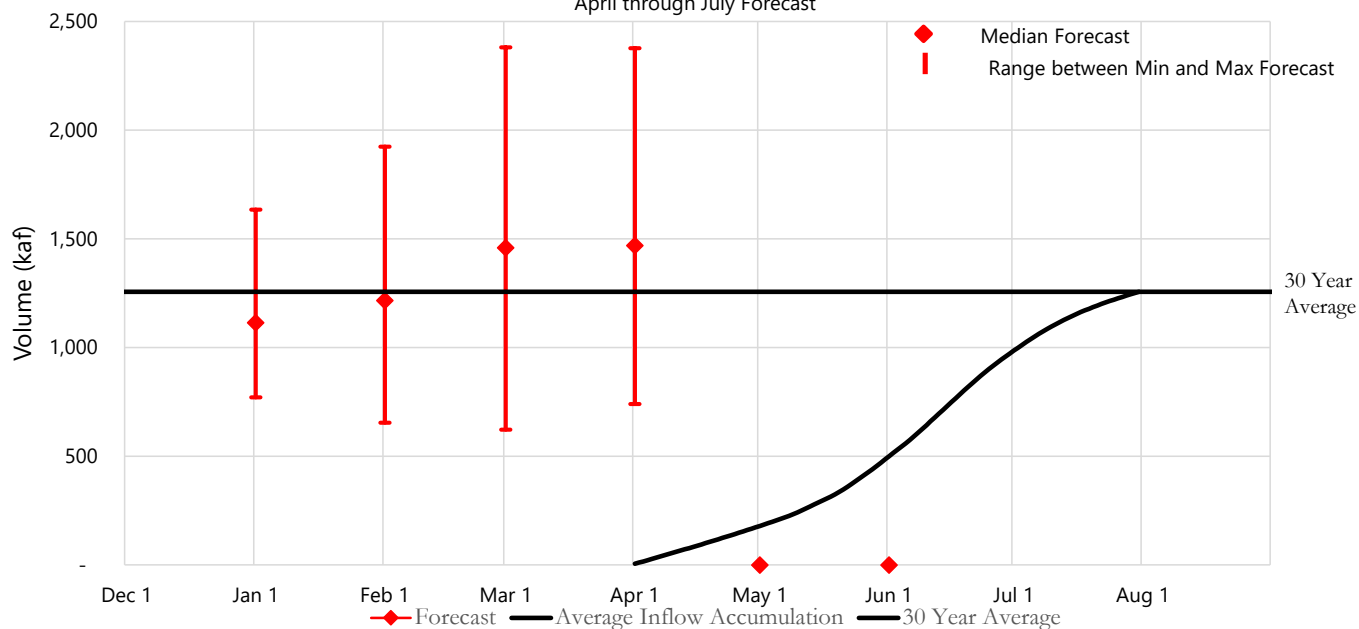


## April through July Inflow Forecast for April 1

|                           | Median Forecast (kaf) | % of Average            | Minimum Forecast (kaf) | Maximum Forecast (kaf) |
|---------------------------|-----------------------|-------------------------|------------------------|------------------------|
| April through July Inflow | 1,468.9               | 117                     | 739.5                  | 2,377.2                |
| Historic Maximum (2017)   | 2,953.1 kaf           | Historic Minimum (2004) | 392.1 kaf              | Average 1,256.4 kaf    |

## Bighorn Lake Inflow

April through July Forecast



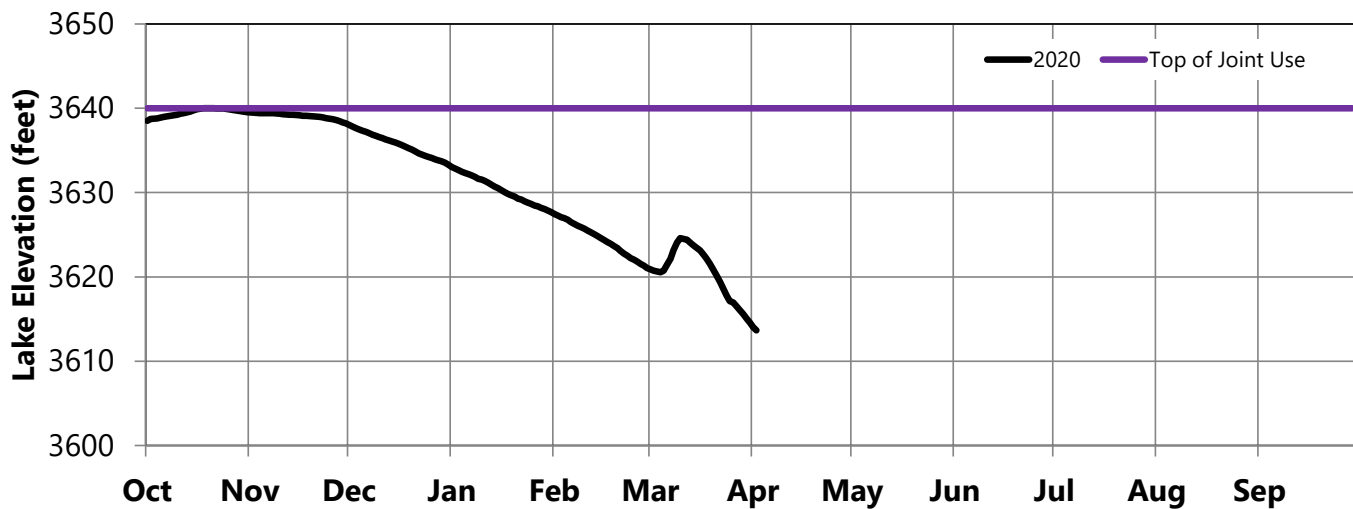
# OPERATIONS REVIEW (October 1 through April 1)

River releases were increased to 5,250 cfs during March due higher than forecasted tributary gains along with a April 30 elevation target of 3611.9 feet. Storage in Bighorn Lake decreased by 6.5 feet or 45,200 AF during March. The reservoir elevation on March 31 was approximately 4 feet higher than what forecasted under median inflow conditions.

## April 1 Storage Conditions

|              | Elevation<br>feet | Storage<br>acre-feet | Percent of<br>Average | Percent<br>Full |
|--------------|-------------------|----------------------|-----------------------|-----------------|
| Bighorn Lake | 3614.6            | 791,971              | 103                   | 78              |
| Buffalo Bill | 5368.3            | 455,710              | 108                   | 70              |
| Boysen       | 4715.9            | 579,711              | 105                   | 78              |

## Bighorn Lake Operations Water Year 2020



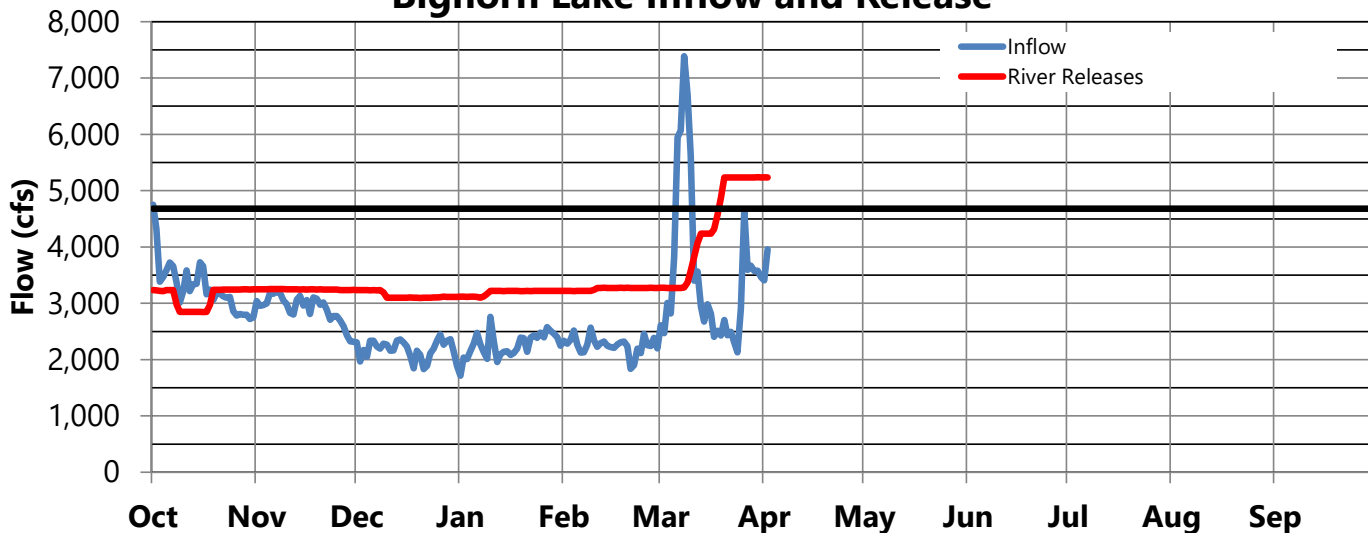
## Average March Release

|                            | Monthly Avg<br>cfs | Percent of<br>Average |
|----------------------------|--------------------|-----------------------|
| Bighorn River              | 4,340              | 151                   |
| Buffalo Bill Total Release | 485                | 116                   |
| Boysen Release             | 1,432              | 157                   |

## Average March Inflow

|              | Monthly Avg<br>cfs | Percent of<br>Average |
|--------------|--------------------|-----------------------|
| Bighorn Lake | 3,538              | 141                   |
| Buffalo Bill | 336                | 95                    |
| Boysen       | 1,228              | 143                   |

## Bighorn Lake Inflow and Release



# OPERATIONS OUTLOOK (April 1 through July 31)

The river release rate from Yellowtail Dam may increase or decrease during April based on actual conditions. In accordance with current criteria, releases from Yellowtail Dam are adjusted as needed based on actual and revised forecasted inflows to stay on track with the April 30 elevation target. The end of April elevation target based on the current April through July inflow forecast, 1,468 kaf, is 3611.8 feet. Releases towards the end of April are expected to increase based on the maximum drawdown rule curve target of 3609.3 feet.

## Median Inflow Conditions (April through July Inflow 1,469 kaf)

|                               | Apr    | May    | Jun    | Jul     |
|-------------------------------|--------|--------|--------|---------|
| Boysen Release (cfs)          | 2,149  | 2,287  | 2,287  | 2,287   |
| Buffalo Bill Release (cfs)    | 1,933  | 3,243  | 3,363  | 3,436   |
| Tributary Gain (cfs)          | 696    | 1,190  | 2,373  | -942    |
| Monthly Inflow (cfs)          | 4,778  | 6,720  | 8,023  | 4,781   |
| Monthly Inflow (kaf)          | 288.5  | 417.5  | 481.6  | 298.3   |
| Monthly Release (kaf)         | 323.6  | 390.9  | 287.7  | 254.7   |
| Afterbay Release (cfs)        | 5,439  | 6,357  | 4,835  | 4,143   |
| River Release (cfs)           | 5,383  | 6,163  | 4,452  | 3,686   |
| End-of-Month Content (kaf)    | 756.8  | 783.4  | 977.3  | 1,020.9 |
| End-of-Month Elevation (feet) | 3608.8 | 3613.2 | 3636.4 | 3640.0  |

## Minimum Inflow Conditions (April through July Inflow 740 kaf)

|                               | Apr    | May    | Jun    | Jul    |
|-------------------------------|--------|--------|--------|--------|
| Boysen Release (cfs)          | 1,501  | 1,051  | 1,250  | 1,251  |
| Buffalo Bill Release (cfs)    | 998    | 2,597  | 3,166  | 2,176  |
| Tributary Gain (cfs)          | 277    | 67     | -269   | -1,815 |
| Monthly Inflow (cfs)          | 2,776  | 3,715  | 4,148  | 1,612  |
| Monthly Inflow (kaf)          | 169.4  | 232.7  | 251.0  | 103.4  |
| Monthly Release (kaf)         | 226.1  | 138.6  | 160.9  | 166.4  |
| Afterbay Release (cfs)        | 3,801  | 2,254  | 2,704  | 2,707  |
| River Release (cfs)           | 3,733  | 2,000  | 2,250  | 2,250  |
| End-of-Month Content (kaf)    | 735.2  | 829.3  | 919.4  | 856.4  |
| End-of-Month Elevation (feet) | 3604.8 | 3620.0 | 3630.9 | 3623.5 |

## Maximum Inflow Conditions (April through July Inflow 2,377 kaf)

|                               | Apr    | May    | Jun    | Jul     |
|-------------------------------|--------|--------|--------|---------|
| Boysen Release (cfs)          | 2,250  | 3,755  | 3,756  | 4,178   |
| Buffalo Bill Release (cfs)    | 1,933  | 4,887  | 5,006  | 5,082   |
| Tributary Gain (cfs)          | 1,271  | 2,656  | 4,050  | 426     |
| Monthly Inflow (cfs)          | 5,453  | 11,298 | 12,813 | 9,687   |
| Monthly Inflow (kaf)          | 328.7  | 699.0  | 766.6  | 599.9   |
| Monthly Release (kaf)         | 425.5  | 696.7  | 523.9  | 520.1   |
| Afterbay Release (cfs)        | 7,150  | 11,330 | 8,804  | 8,459   |
| River Release (cfs)           | 7,150  | 11,233 | 8,557  | 8,039   |
| End-of-Month Content (kaf)    | 695.2  | 697.5  | 940.2  | 1,020.0 |
| End-of-Month Elevation (feet) | 3597.2 | 3597.6 | 3633.0 | 3640.0  |

# OPERATIONS OUTLOOK (April 1 through July 31)

There is approximately 70 cfs of gain between Yellowtail Dam and Yellowtail Afterbay Dam from spring flowing into Yellowtail Afterbay. Total release from Yellowtail Dam is 70 cfs less than total release from Yellowtail Afterbay Dam. Yellowtail Powerplant is limited to 3 units due to on-going refurbishment project. Irrigation diversions are expected to begin during April.

## Irrigation Demands Outlook

### Bighorn Canal (cfs)

|                  | Apr | May | Jun | Jul |
|------------------|-----|-----|-----|-----|
| Median Forecast  | 55  | 194 | 383 | 457 |
| Minimum Forecast | 67  | 254 | 454 | 457 |
| Maximum Forecast | 0   | 98  | 247 | 420 |

## Power Generation Outlook

Current Number of Units Available: 3 of 4

Approximate Yellowtail Powerplant Turbine Capacity: 6,150 cfs

Approximate Yellowtail Powerplant Generation Limit: 4,615 cfs

### Yellowtail Powerplant Release (cfs)

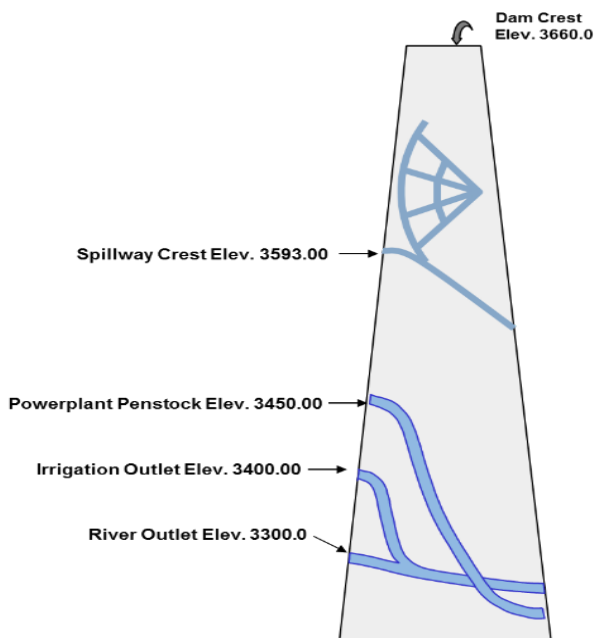
|                  | Apr   | May   | Jun   | Jul   |
|------------------|-------|-------|-------|-------|
| Median Forecast  | 4,648 | 4,665 | 4,435 | 4,069 |
| Minimum Forecast | 3,569 | 2,184 | 2,634 | 2,637 |
| Maximum Forecast | 4,644 | 4,799 | 4,552 | 4,386 |

### Yellowtail Powerplant Generation (gwh)

|                  | Apr   | May   | Jun   | Jul   |
|------------------|-------|-------|-------|-------|
| Median Forecast  | 145.0 | 145.0 | 145.0 | 135.3 |
| Minimum Forecast | 110.1 | 68.6  | 87.3  | 87.8  |
| Maximum Forecast | 145.0 | 145.0 | 145.0 | 145.0 |

### Yellowtail Spill (cfs)

|                  | Apr   | May   | Jun   | Jul   |
|------------------|-------|-------|-------|-------|
| Median Forecast  | 720   | 1,622 | 330   | 0     |
| Minimum Forecast | 162   | 0     | 0     | 0     |
| Maximum Forecast | 2,436 | 6,461 | 4,182 | 4,003 |



## Release Outlook by Outlet

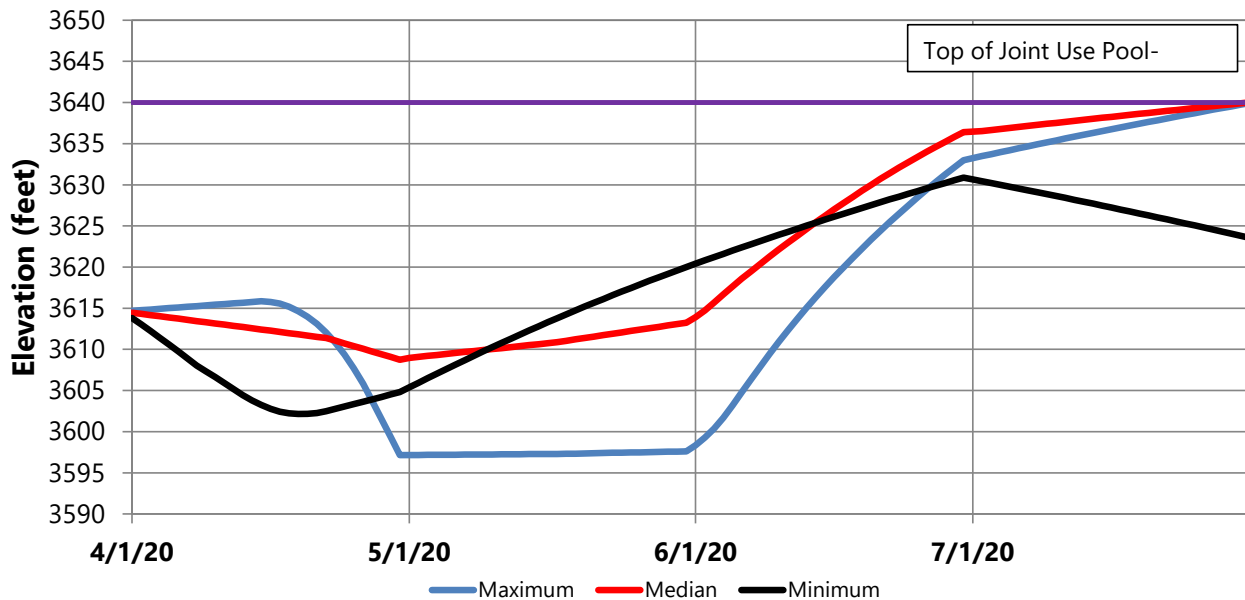
Current releases through the river outlet works are 500 cfs. Powerplant bypass releases are expected to continue to through June under median probable conditions and into July under maximum probable conditions.

# OPERATIONS OUTLOOK (April 1 through July 31)

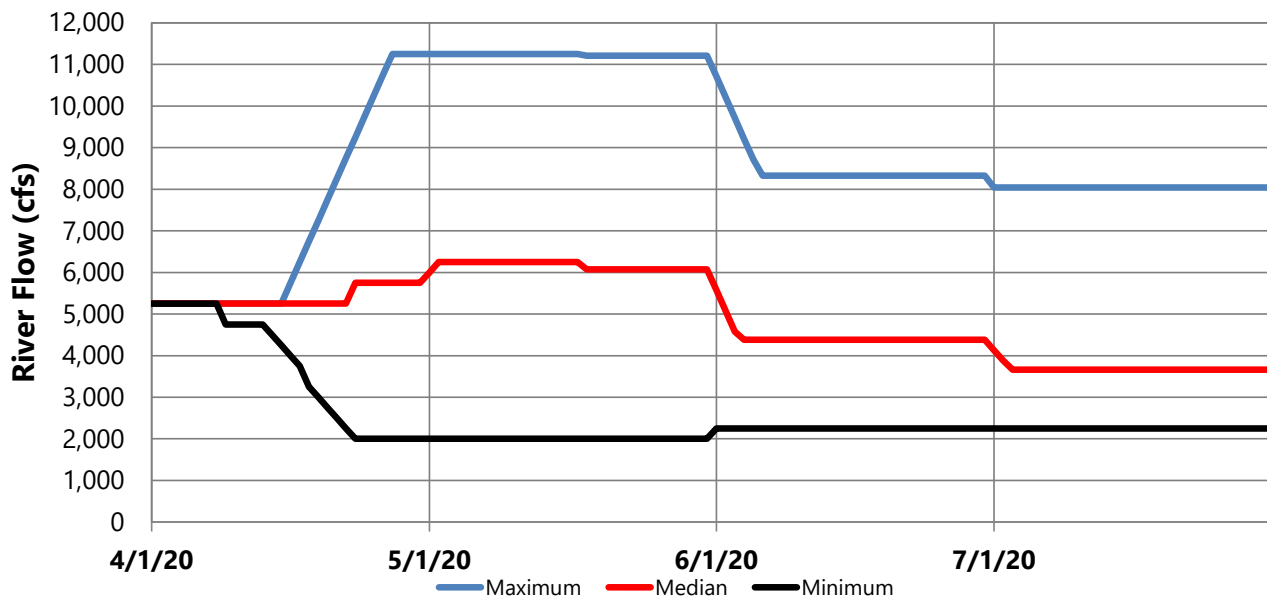
Projected elevations and the range of river releases are based on the median, minimum, and maximum inflow forecasts. End-of-month elevations and river releases vary based on the difference between forecasted inflow scenarios.

The elevation of Bighorn Lake at the end of April is expected to be between 3597.1 and 3608.8 feet. Bighorn Lake is expected to fill to normal full pool, elevation 3640 feet, under median and maximum inflow conditions.

## Bighorn Lake Elevation



## River Release



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Monthly Operating Plans, Current Conditions, Snowpack and Other Water Management Information  
[https://www.usbr.gov/en/lakes/reservoirs/warents/main\\_menu.html](https://www.usbr.gov/en/lakes/reservoirs/warents/main_menu.html)