

RECLAMATION

Managing Water in the West

April 2019

**Bureau of Reclamation - Upper Snake Field Office
Upper Snake Water Supply and Operations Update**



U.S. Department of the Interior
Bureau of Reclamation

Presentation Outline Preview

Observed and Current Conditions

- Reservoir Storage*
- Temperature*
- Precipitation*
- Antecedent Conditions*

Water Supply Forecast

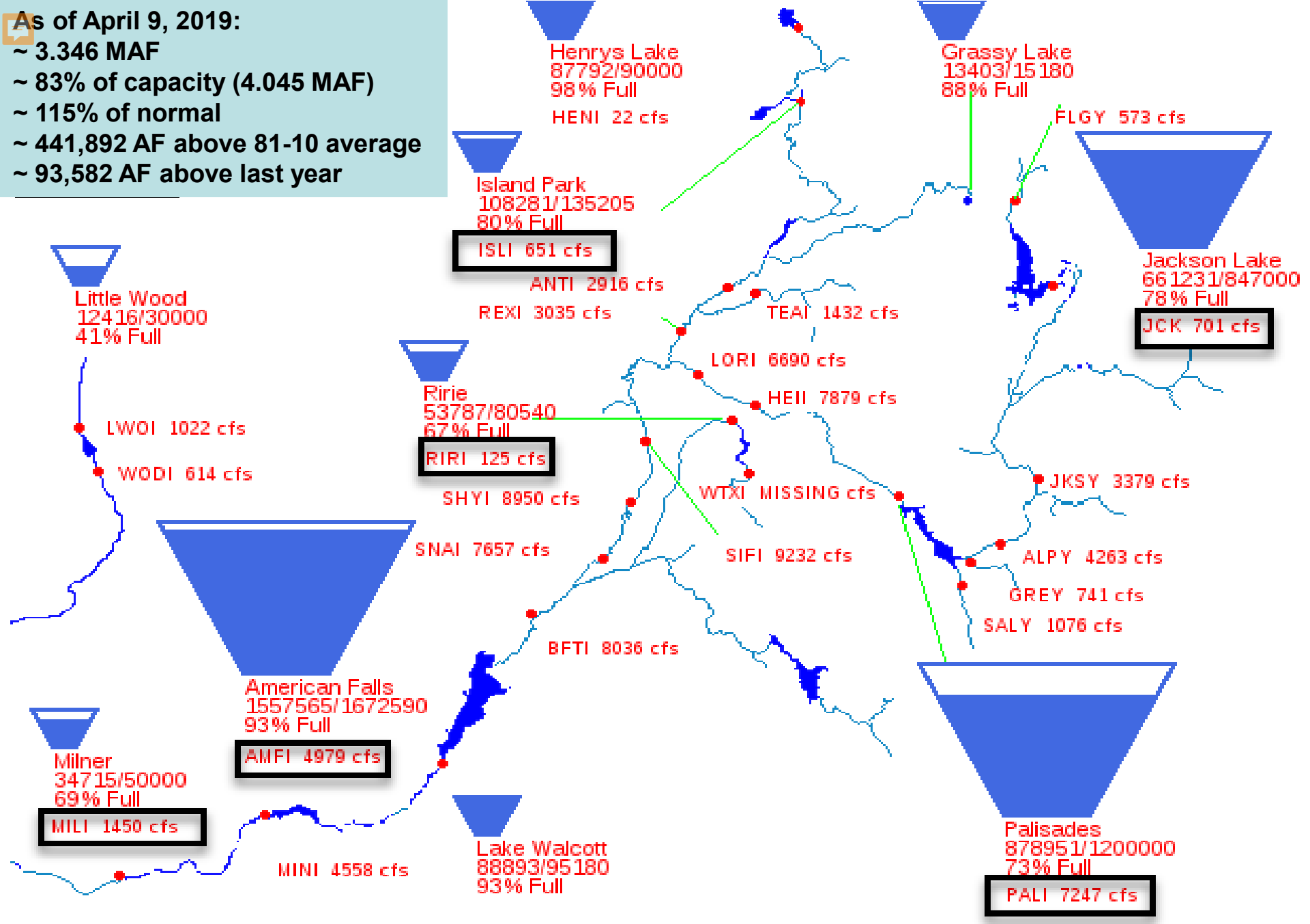
- Snowpack*
- Climate Outlook and Uncertainty*
- BOR Runoff Volume Forecast and Expected Range*

Projected Reservoir Operations

- Operational Approach*
- Projected Reservoir Operations*

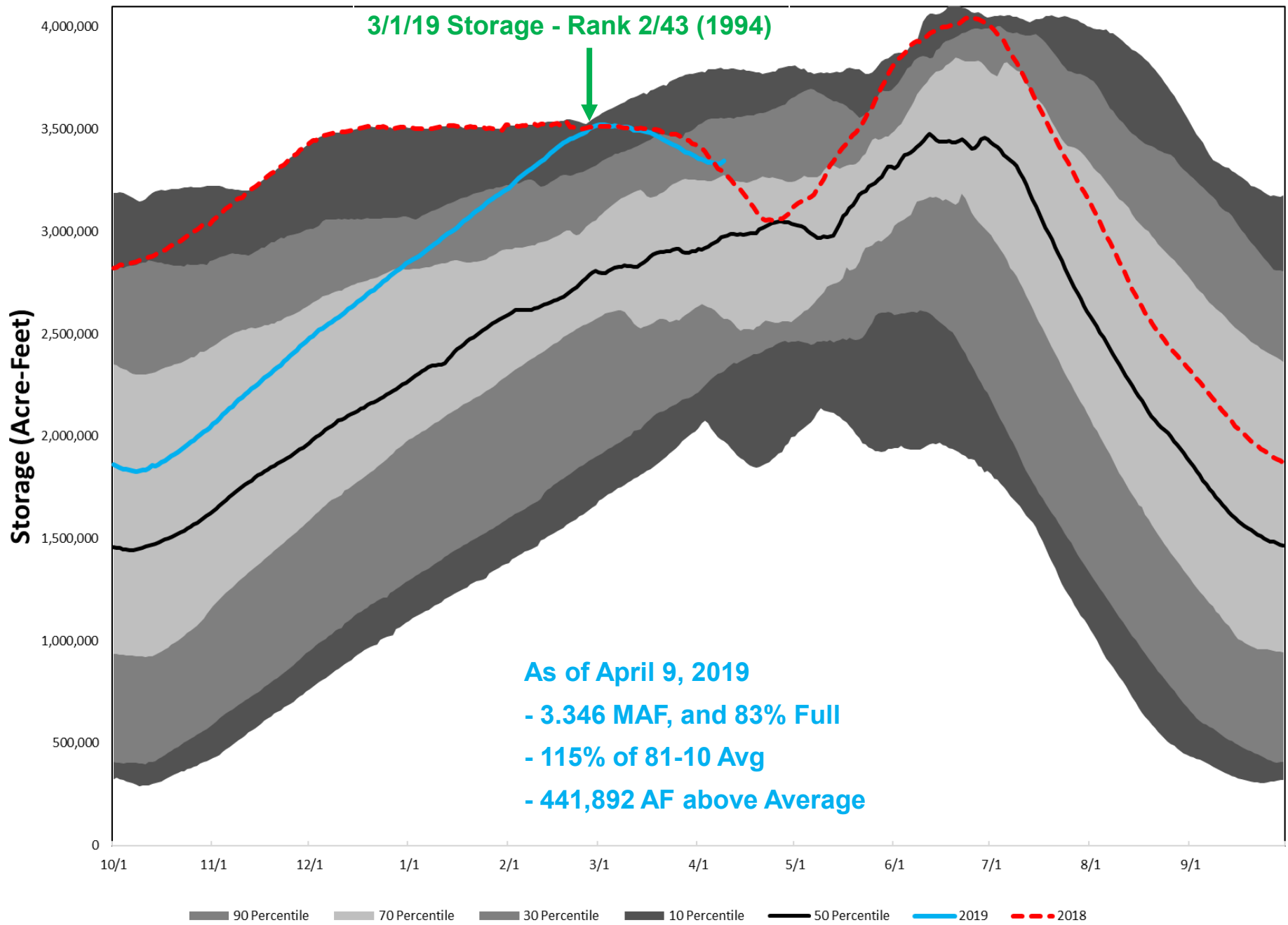
Summary and Questions

As of April 9, 2019:
 ~ 3.346 MAF
 ~ 83% of capacity (4.045 MAF)
 ~ 115% of normal
 ~ 441,892 AF above 81-10 average
 ~ 93,582 AF above last year

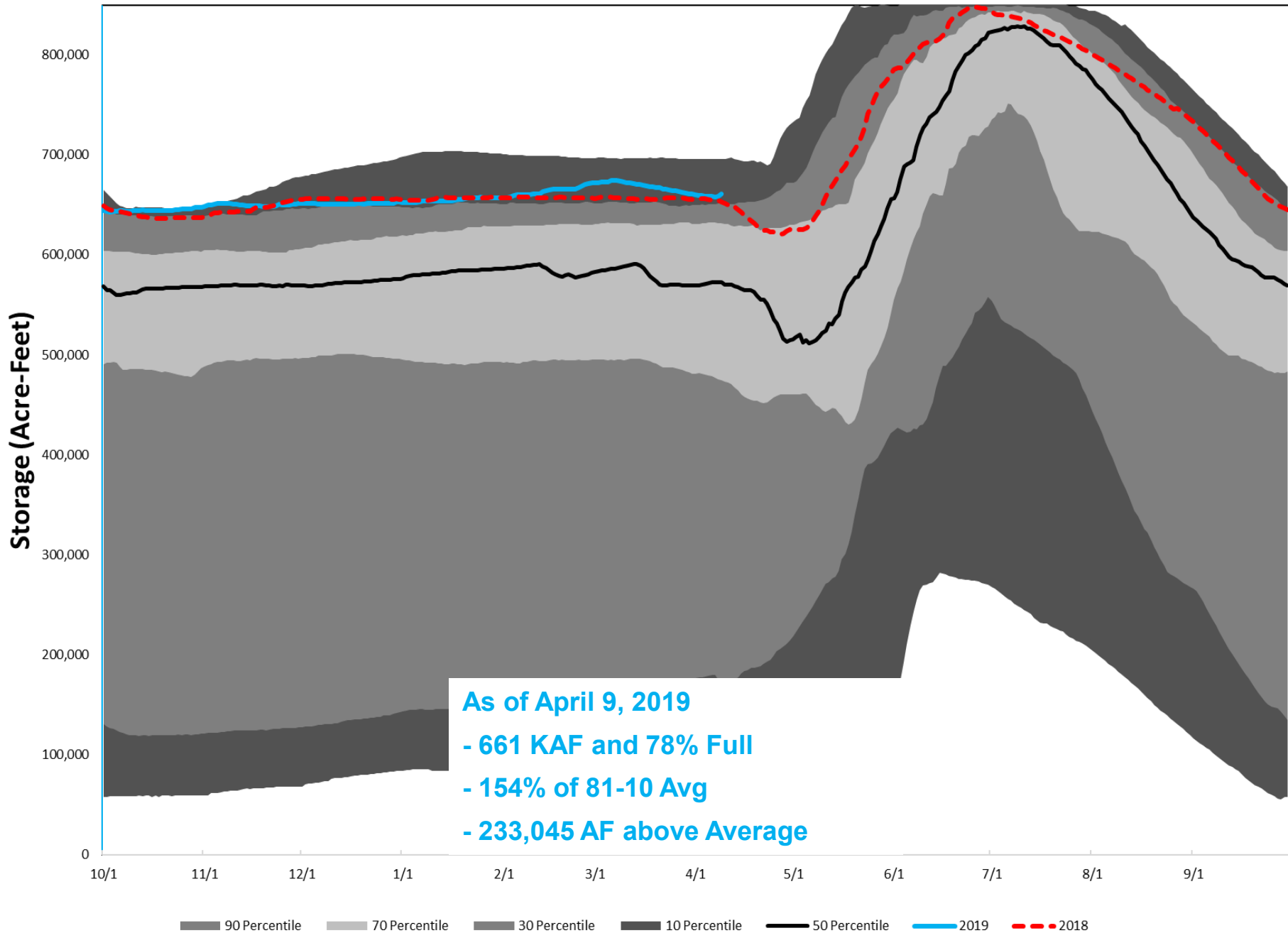


PROVISIONAL DATA - Subject to change

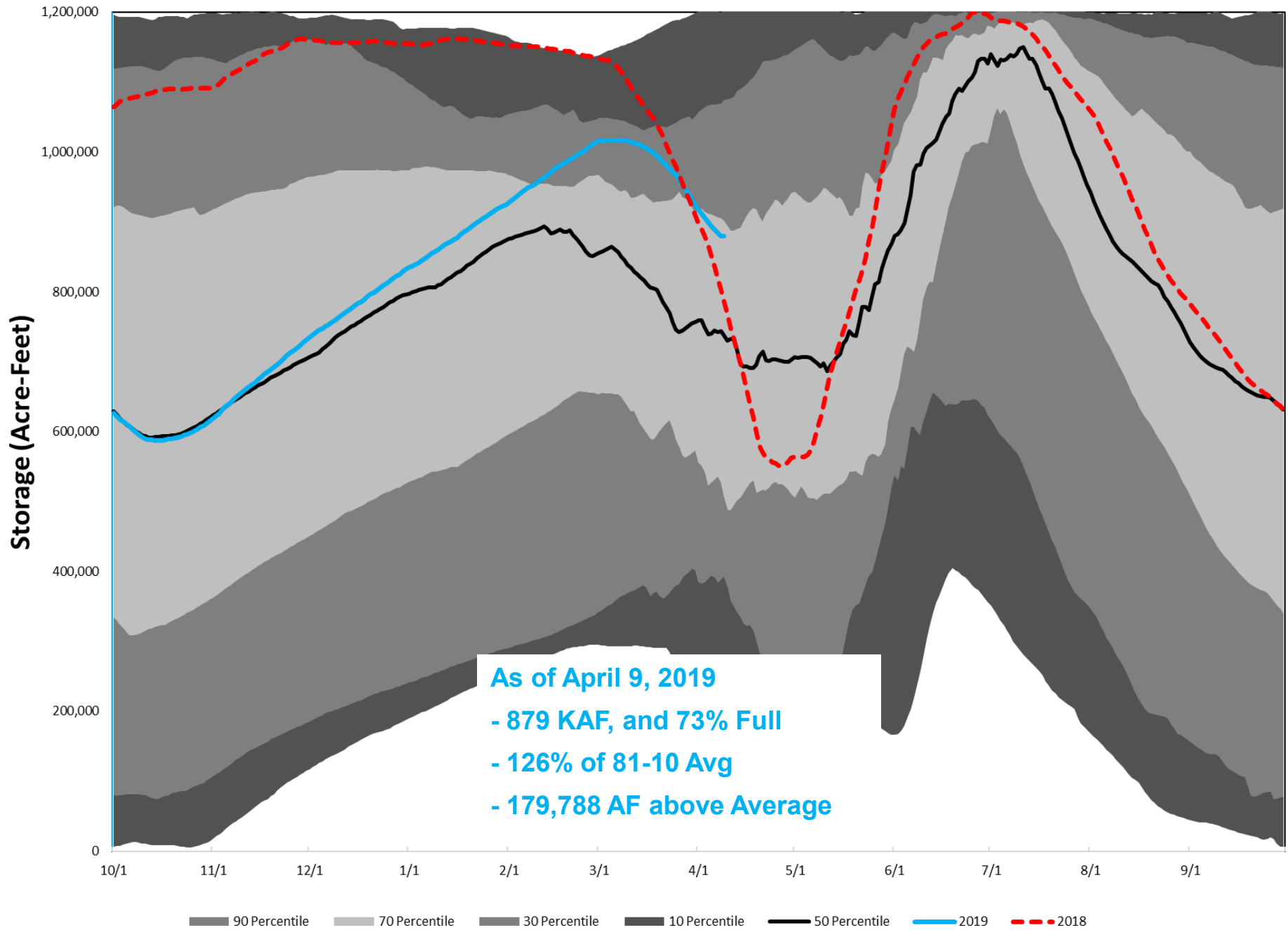
Upper Snake Reservoir System Total Storage (Acre-Feet)



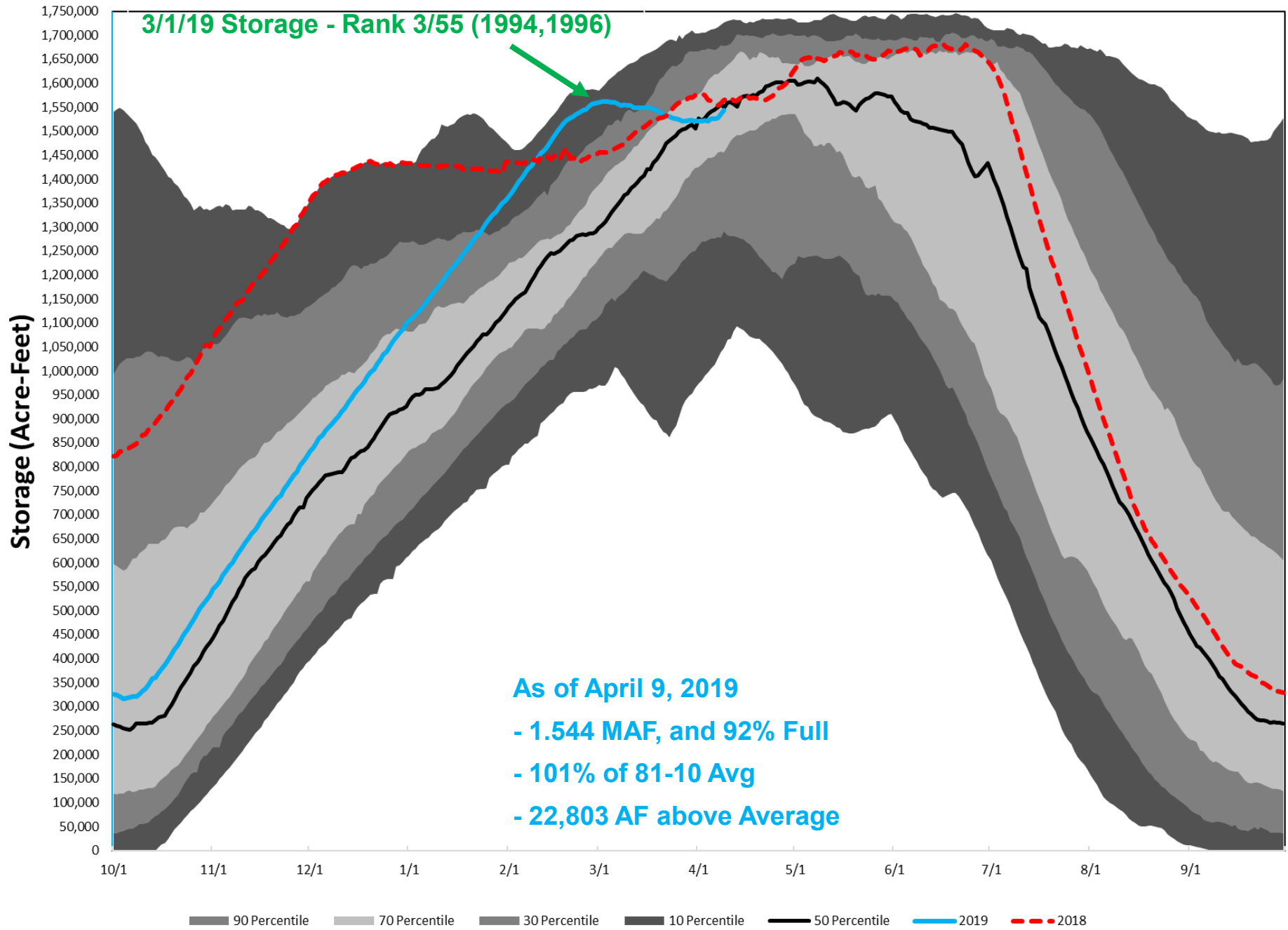
Jackson Lake Reservoir (847,000 Acre-Feet)



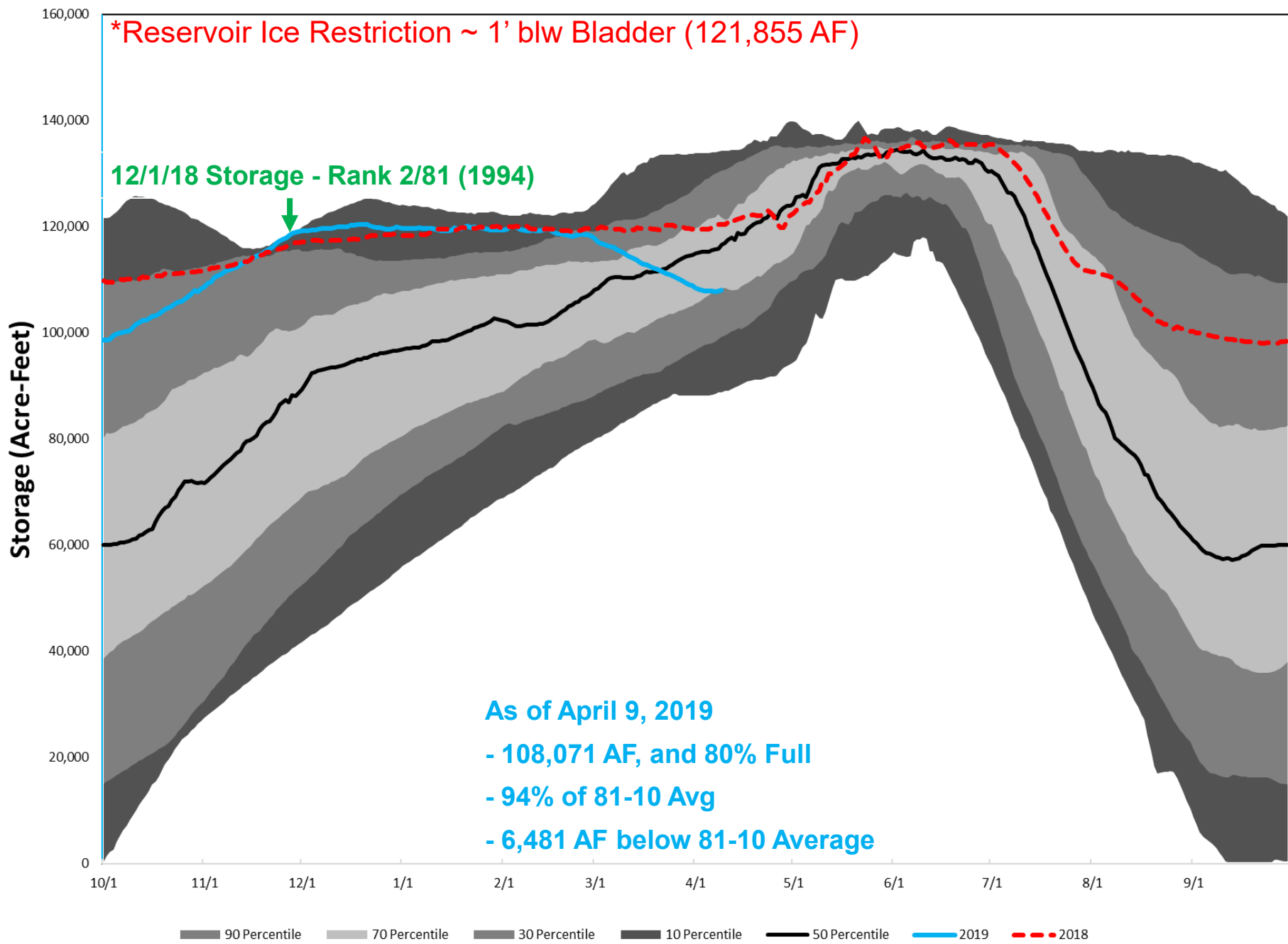
Palisades Reservoir (1,200,000 Acre-Feet)



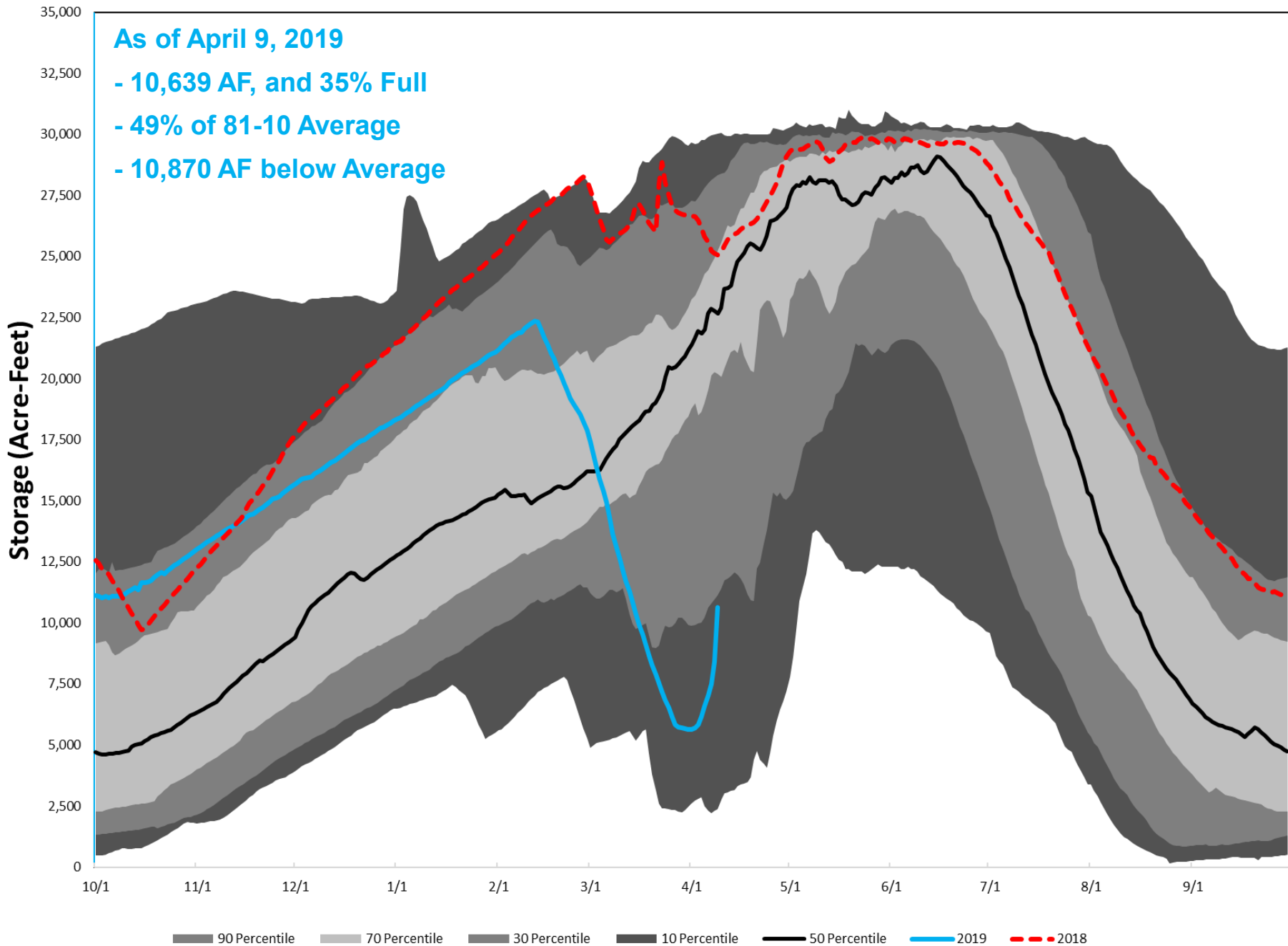
American Falls Reservoir (1,672,590 Acre-Feet)



Island Park Reservoir Storage (135,205 Acre-Feet)

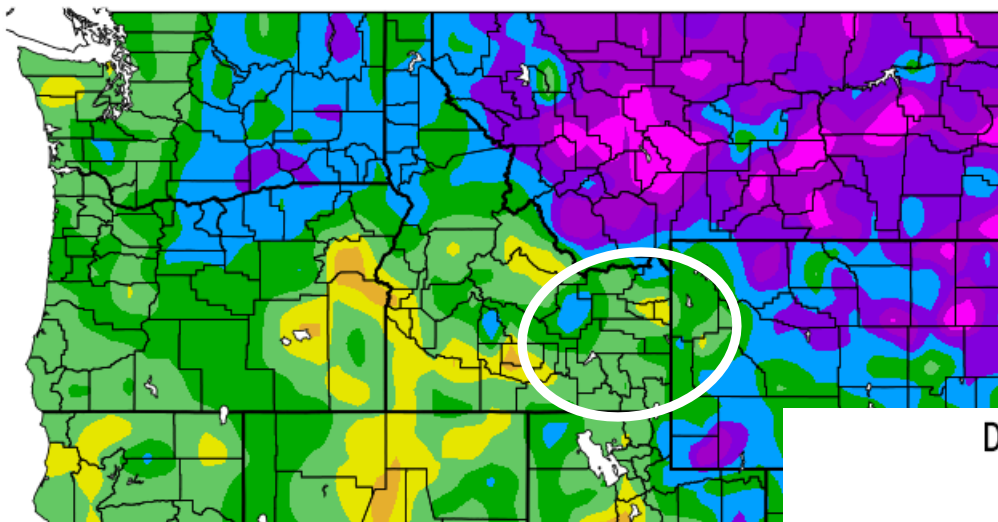


Little Wood Reservoir (30,000 Acre-Feet)



Departure from Normal Temperature (F)

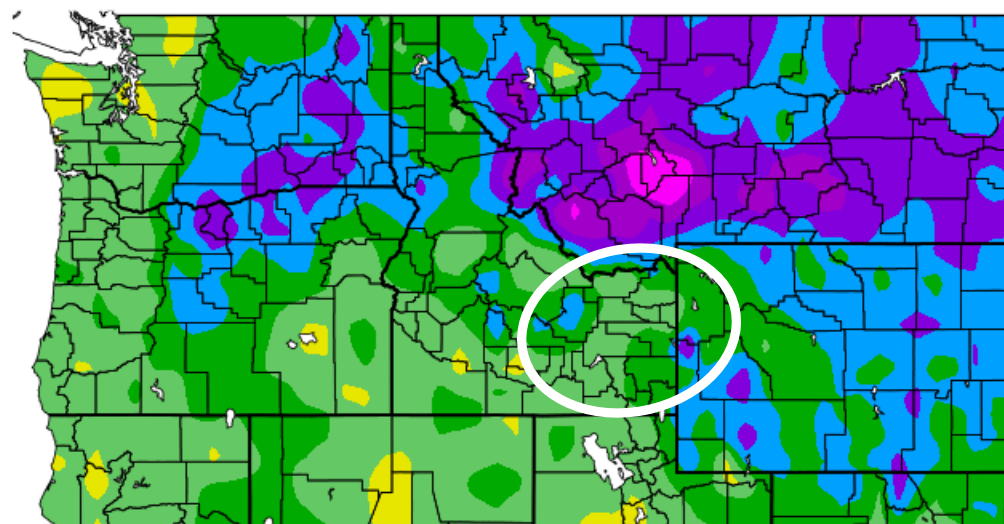
1/1/2019 - 4/9/2019



- Observed Climate Conditions**
- Temperature Anomaly
 - Jan 1 - April 9
 - Cooler than normal for most

Departure from Normal Temperature (F)

3/1/2019 - 3/31/2019

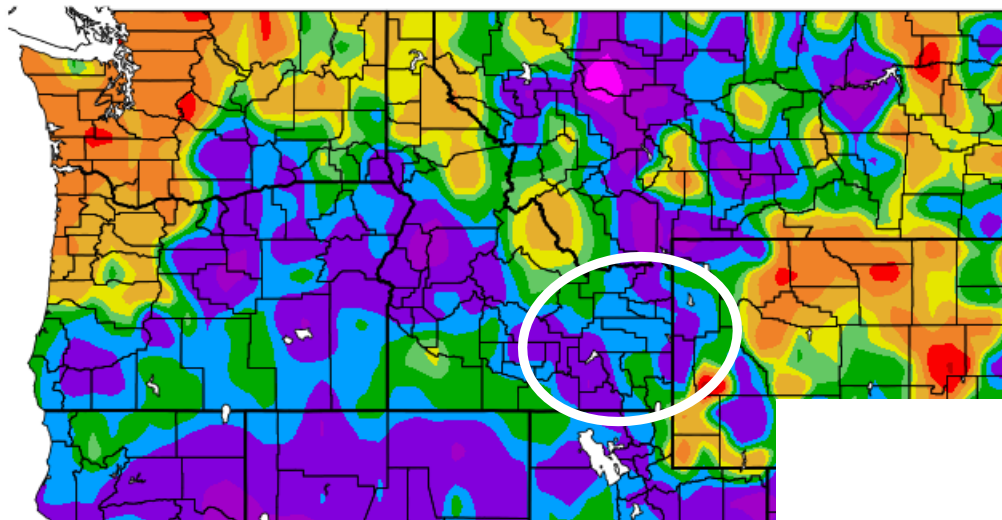


Observed Climate Conditions

- Temperature Anomaly
- March 2019
- Cooler than normal for most

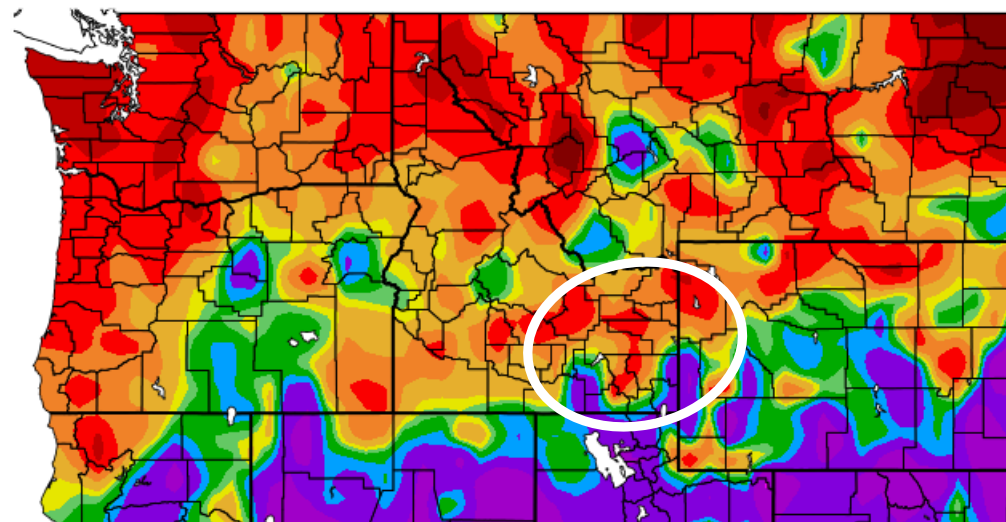


Percent of Normal Precipitation (%)
1/1/2019 - 4/9/2019

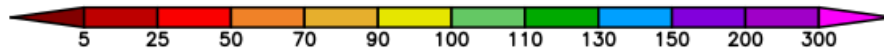


- Observed Climate Conditions**
- Percent of Normal Precipitation
 - Jan 1 - April 9
 - Near Normal to Well Above

Percent of Normal Precipitation (%)
3/1/2019 - 3/31/2019

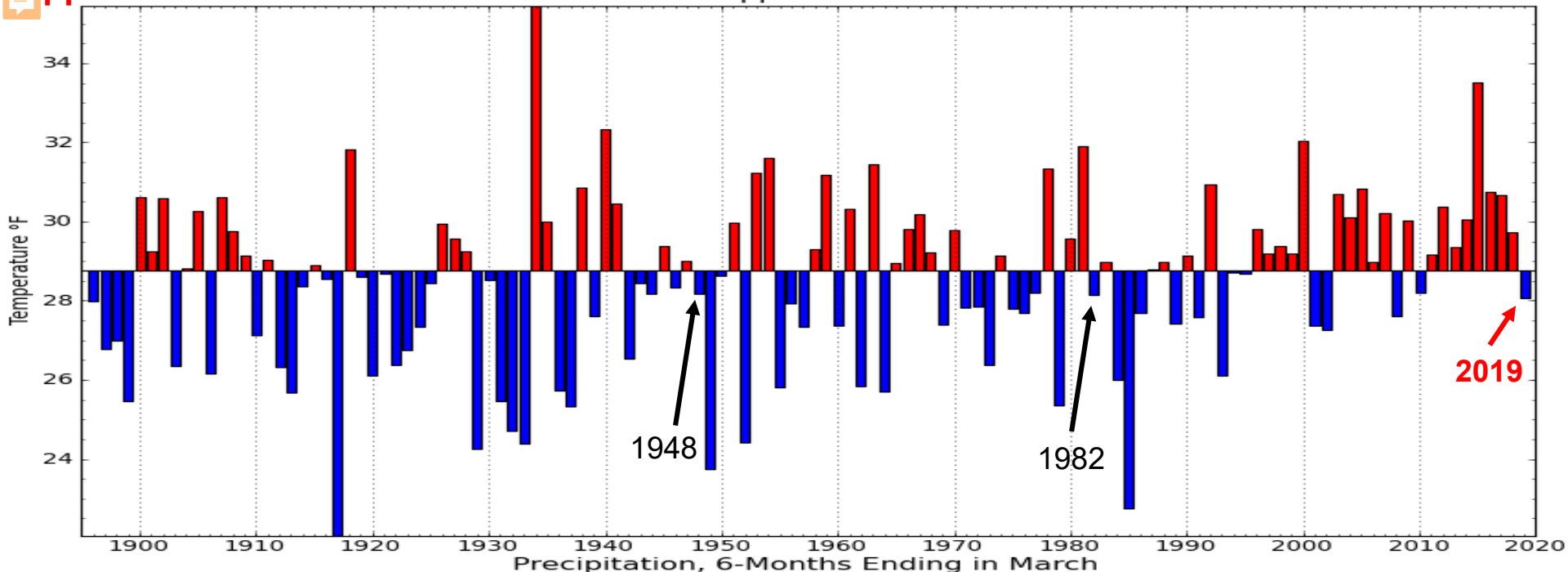


- Observed Climate Conditions**
- Percent of Normal Precipitation
 - March 2019
 - Below to Well below Normal

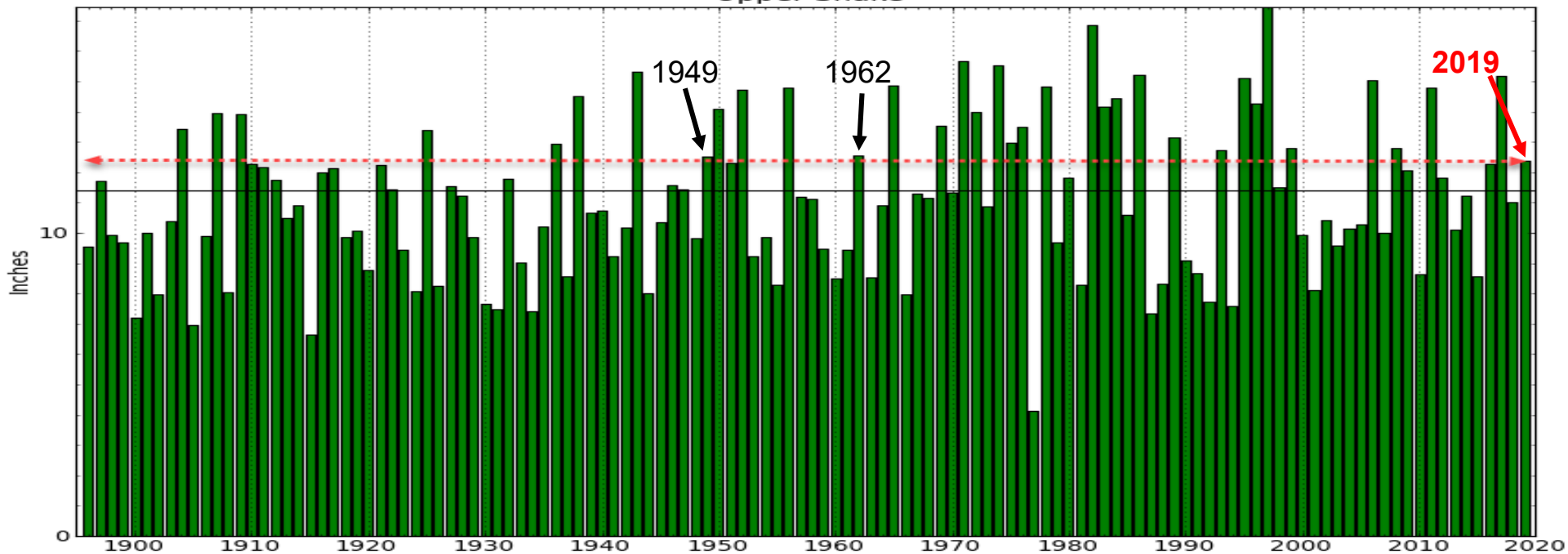


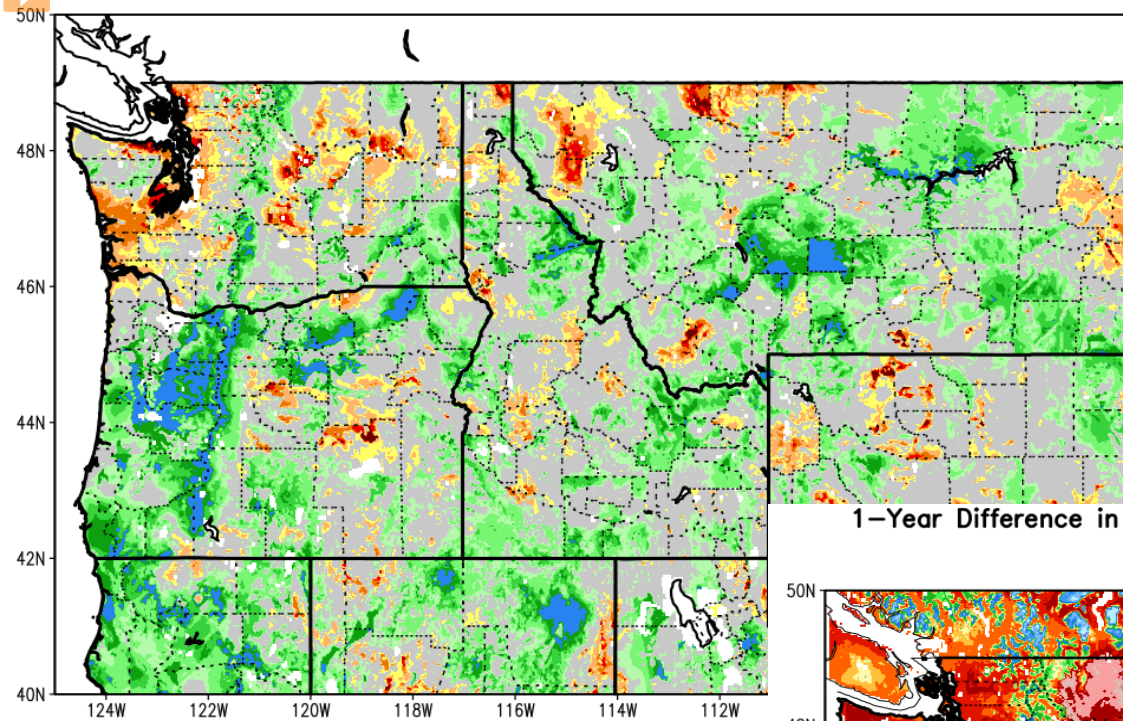
*Upper Snake Watershed

Mean Temperature, 6-Months Ending in March Upper Snake



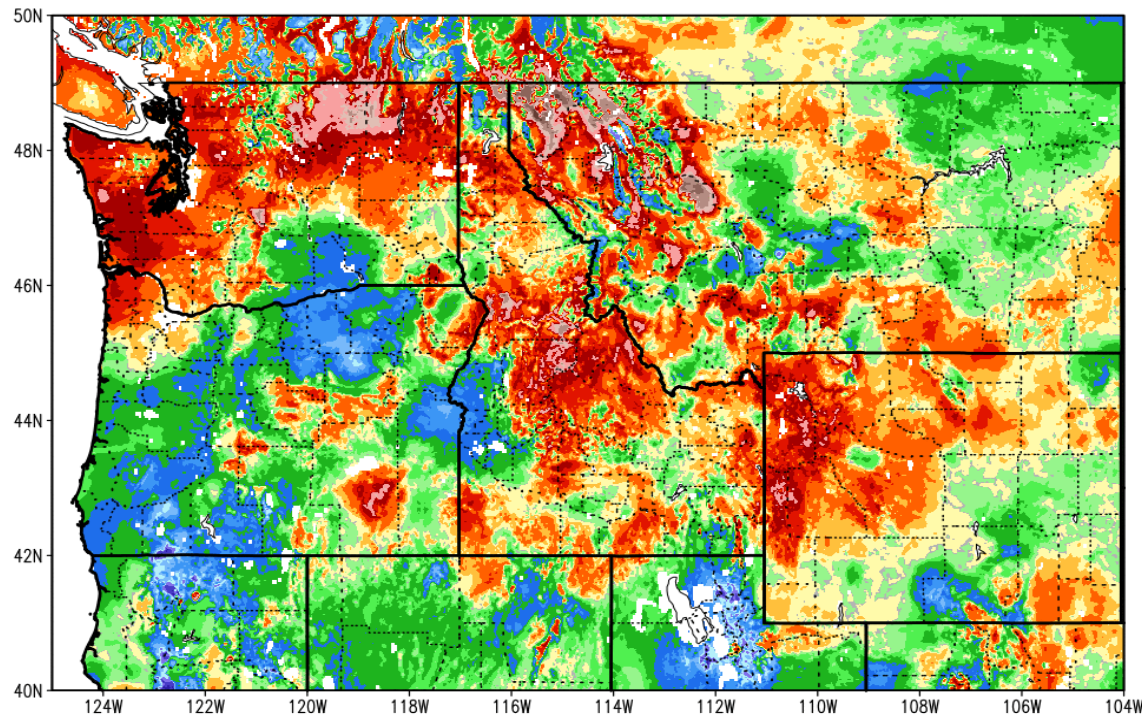
Precipitation, 6-Months Ending in March Upper Snake





- ### Water Supply Indicators
- Antecedent Conditions
 - Relative Soil Moisture
 - Current percentile (Top Left)
 - One-Year delta (Bottom Right)

1-Year Difference in Column Relative Soil Moisture (%) valid 12z 09 Apr 2019



Summary Analysis

- Overall drier to near normal
- Headwaters lagging 2018

NOHRSC/RFC Modeled and Observed Snowpack Analysis Jackson Lake Reservoir

Snake - Jackson Lake at Dam (JLKW4)

Basin Select

County: TETON State: WY

Elevation: 6728 (feet) Latitude: 43 51' 29" Longitude: 110 35' 8"

Snow Model Summary

| NWRFC Model Parameters | | | | NWRFC Model Simulations | | | | | | | | NOHRSC | |
|--------------------------------|-------------------|-------|-----------------|-------------------------|--------------|--------------|----------------------------|----------------------------|----------------------------|-------------------|------------------|--------------|-------------------|
| ID | Elev Range (feet) | SI | AccMax (inches) | Date | SWE (inches) | Pct Avg | SWE Avg 1981-2010 (inches) | SWE Max 1981-2010 (inches) | SWE Min 1981-2010 (inches) | Snow Cover Extent | Snow Line (feet) | SWE (inches) | Snow Cover Extent |
| JLKW4XL | 6772-8000 | 11.81 | ----- | 04-10 | 9.58 | 89 % | 10.8 | 24.5 | 2.9 | 1.00 | 6772 | 19.8 | 198% |
| JLKW4XU | 8000-12097 | 35.43 | ----- | 04-10 | 36.81 | 111 % | 33.2 | 60.6 | 17.5 | 1.00 | 8000 | 42.5 | 125% |
| Simulated Basin Average | | | | | | 105 % | | | | | | | |

Snow Station Summary

| ID | Name | Distance (miles) | Elevation (feet) | Date | SWE | Pct Avg | SWE Avg 1981-2010 | Snow Depth (inches) | Snow Density | Pct Curr Peak | Pct Avg Peak |
|-------------------------------|--------------------------------|------------------|------------------|-------|------|--------------|-------------------|---------------------|--------------|---------------|--------------|
| JLKW4 | SNKE R ON JACKSN LK AT DM TB20 | 0 | 6728 | 04-10 | | N/A | N/A | N/A | N/A | N/A | N/A |
| SKRW4 | SNAKE RIVER STATION SNOTEL | 2 | 6920 | 04-10 | 17.7 | 116 % | 15.2 | 42 | 42 % | 88 % | 109 % |
| BSCW4 | BASECAMP SNOTEL | 2 | 7030 | 04-10 | 17.4 | 112 % | 15.5 | 45 | 39 % | 95 % | 107 % |
| GCKW4 | GLADE CREEK NR MORAN | 0 | 7040 | 04-10 | | N/A | N/A | N/A | N/A | N/A | N/A |
| GRSW4 | GRASSY LAKE SNOTEL | 3 | 7265 | 04-10 | 33.5 | 103 % | 32.5 | -- | -- | 98 % | 103 % |
| HKBW4 | HUCKLEBERRY DIV NR MORAN TB30 | 0 | 7300 | 04-10 | 2.9 | N/A | | -- | -- | 91 % | -- |
| LWSW4 | LEWIS LAKE DIVIDE SNOTEL | 6 | 7860 | 04-10 | 36.5 | 112 % | 32.5 | -- | -- | 100 % | 112 % |
| THUW4 | THUMB DIVIDE SNOTEL NR W THUMB | 19 | 7980 | 04-10 | 19.5 | 120 % | 16.3 | 51 | 38 % | 99 % | 119 % |
| PHBW4 | PHILLIPS BENCH SNOTEL | 19 | 8200 | 04-10 | 28.6 | 104 % | 27.6 | 144 | 20 % | 97 % | 103 % |
| GTHW4 | ALTA 6ENE | 4 | 9260 | 04-10 | 45.2 | 106 % | 42.8 | 233 | 19 % | 100 % | 93 % |
| TOPW4 | TWO OCEAN PLATEAU SNOTEL | 15 | 9360 | 04-10 | 31.9 | 109 % | 29.3 | 88 | 36 % | 100 % | 102 % |
| Observed Basin Average | | | | | | 109 % | | | | | |

Please Note: Snow stations highlighted in cyan have no historic normals from the reporting agency and are not included in the basin average calculation.

Please Note: Snow stations highlighted in red have no current swe observation and are not included in the basin average calculation.

NOHRSC/RFC Modeled and Observed Snowpack Analysis Island Park Reservoir

HENRYS FORK - ISLAND PARK DAM (IPDI1)

Basin Select

County: FREMONT State: ID

Elevation: 6302 (feet) Latitude: 44 25' 0" Longitude: 111 25' 0"

Snow Model Summary

| NWRFC Model Parameters | | | | NWRFC Model Simulations | | | | | | | | NOHRSC | |
|--------------------------------|-------------------|--------|-----------------|-------------------------|--------------|--------------|----------------------------|----------------------------|----------------------------|-------------------|------------------|--------------|-------------------|
| ID | Elev Range (feet) | SI | AccMax (inches) | Date | SWE (inches) | Pct Avg | SWE Avg 1981-2010 (inches) | SWE Max 1981-2010 (inches) | SWE Min 1981-2010 (inches) | Snow Cover Extent | Snow Line (feet) | SWE (inches) | Snow Cover Extent |
| IPDI1IL | 6270-6500 | 393.66 | ---- | 04-10 | 6.45 | 87 % | 7.4 | 21.8 | 0.2 | 0.58 | 6421 | 13.5 | 0.96 |
| IPDI1IU | 6500-10020 | 23.62 | ---- | 04-10 | 18.78 | 116 % | 16.2 | 34.4 | 3.6 | 1.00 | 6500 | 22.7 | 1.00 |
| Simulated Basin Average | | | | | | 107 % | | | | | | | |

Snow Station Summary

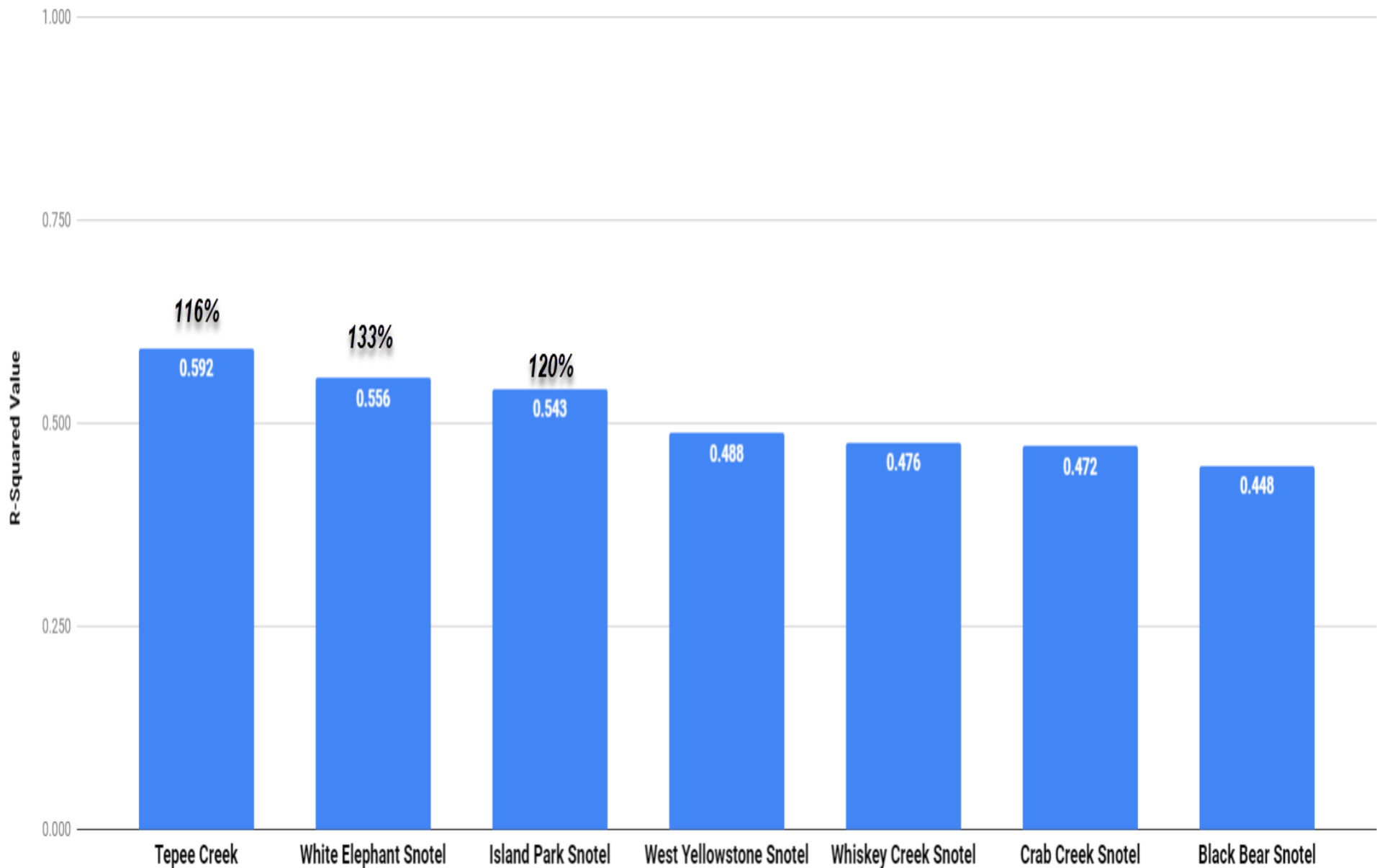
| ID | Name | Distance (miles) | Elevation (feet) | Date | SWE | Pct Avg | SWE Avg 1981-2010 | Snow Depth (inches) | Snow Density | Pct Curr Peak | Pct Avg Peak |
|-------------------------------|----------------------------------|------------------|------------------|------------------|----------------|-----------------|-------------------|---------------------|-----------------|-----------------|-----------------|
| ISPI1 | ISLAND PARK | 0 | 6290 | 04-10 | 16.0 | 120 % | 13.3 | 38 | 42 % | 82 % | 110 % |
| WYSM8 | WESTYELLOWSTONE | 11 | 6700 | 04-10 | 11.8 | 117 % | 10.1 | 28 | 42 % | 81 % | 107 % |
| WSKM8 | WHISKEY CREEK SNOTEL | 3 | 6800 | 04-10 | 19.2 | 120 % | 16.0 | 49 | 39 % | 97 % | 120 % |
| SHCM8 | SHORT CREEK SNOTEL | 1 | 7000 | 04-10 | 5.4 | 96 % | 5.6 | 182 | 3 % | 87 % | 96 % |
| LVRM8 | LAKEVIEW RIDGE SNOTEL | 5 | 7400 | 04-10 | 7.6 | 70 % | 10.9 | 16 | 40 % | 75 % | 70 % |
| WHEI1 | WHITE ELEPHANT | 0 | 7710 | 04-10 | 36.8 | 133 % | 27.7 | N/A | N/A | N/A | N/A |
| MPLM8 | MADISON PLATEAU SNOTEL | 3 | 7750 | 04-10 | 31.2 | 130 % | 24.0 | 77 | 41 % | 100 % | 129 % |
| BEVM8 | BEAVER CREEK SNOTEL | 0 | 7850 | 04-10 | 20.4 | 115 % | 17.8 | 60 | 34 % | 99 % | 111 % |
| BLBM8 | BLACK BEAR SNOTEL | 0 | 7950 | 04-10 | 41.5 | 106 % | 39.2 | 123 | 34 % | 92 % | 105 % |
| TPEM8 | TEPEE CREEK SNOTEL | 0 | 8000 | 04-10 | 15.6 | 116 % | 13.5 | -- | -- | 98 % | 114 % |
| CRRM8 | CARROT BASIN SNOTEL | 1 | 9000 | 04-10 | 30.0 | 110 % | 27.3 | 91 | 33 % | 100 % | 104 % |
| Observed Basin Average | | | | | | 112 % | | | | | |

Please Note: Snow stations highlighted in light grey are reported as questionable by the reporting agency and are not included in the basin average calculation.



NOHRSC/RFC Modeled and Observed Snowpack Analysis Island Park Reservoir

Island Park - March 31 SNOTEL Correlation Coefficient for April-July Runoff Volume



NOHRSC/RFC Modeled and Observed Snowpack Analysis

Little Wood Reservoir

LITTLE WOOD - LITTLE WOOD DAM (LWRI1)

Basin Select

County: **BLAINE** State: **ID**

Elevation: **5100 (feet)** Latitude: **43 25' 30"** Longitude: **114 1' 30"**

Snow Model Summary

| NWRFC Model Parameters | | | | NWRFC Model Simulations | | | | | | | | NOHRSC | |
|--------------------------------|-------------------|-------|-----------------|-------------------------|--------------|--------------|----------------------------|----------------------------|----------------------------|-------------------|------------------|--------------|-------------------|
| ID | Elev Range (feet) | SI | AccMax (inches) | Date | SWE (inches) | Pct Avg | SWE Avg 1981-2010 (inches) | SWE Max 1981-2010 (inches) | SWE Min 1981-2010 (inches) | Snow Cover Extent | Snow Line (feet) | SWE (inches) | Snow Cover Extent |
| LWRI1IL | 5200-7500 | 3.94 | ----- | 04-10 | 1.54 | 77 % | 2.0 | 11.7 | 0.0 | 0.62 | 6086 | 7.9 | 0.78 |
| LWRI1IU | 7500-11191 | 19.69 | ----- | 04-10 | 19.37 | 141 % | 13.7 | 29.7 | 3.9 | 1.00 | 7500 | 20.5 | 1.00 |
| Simulated Basin Average | | | | | | 133 % | | | | | | | |

Snow Station Summary

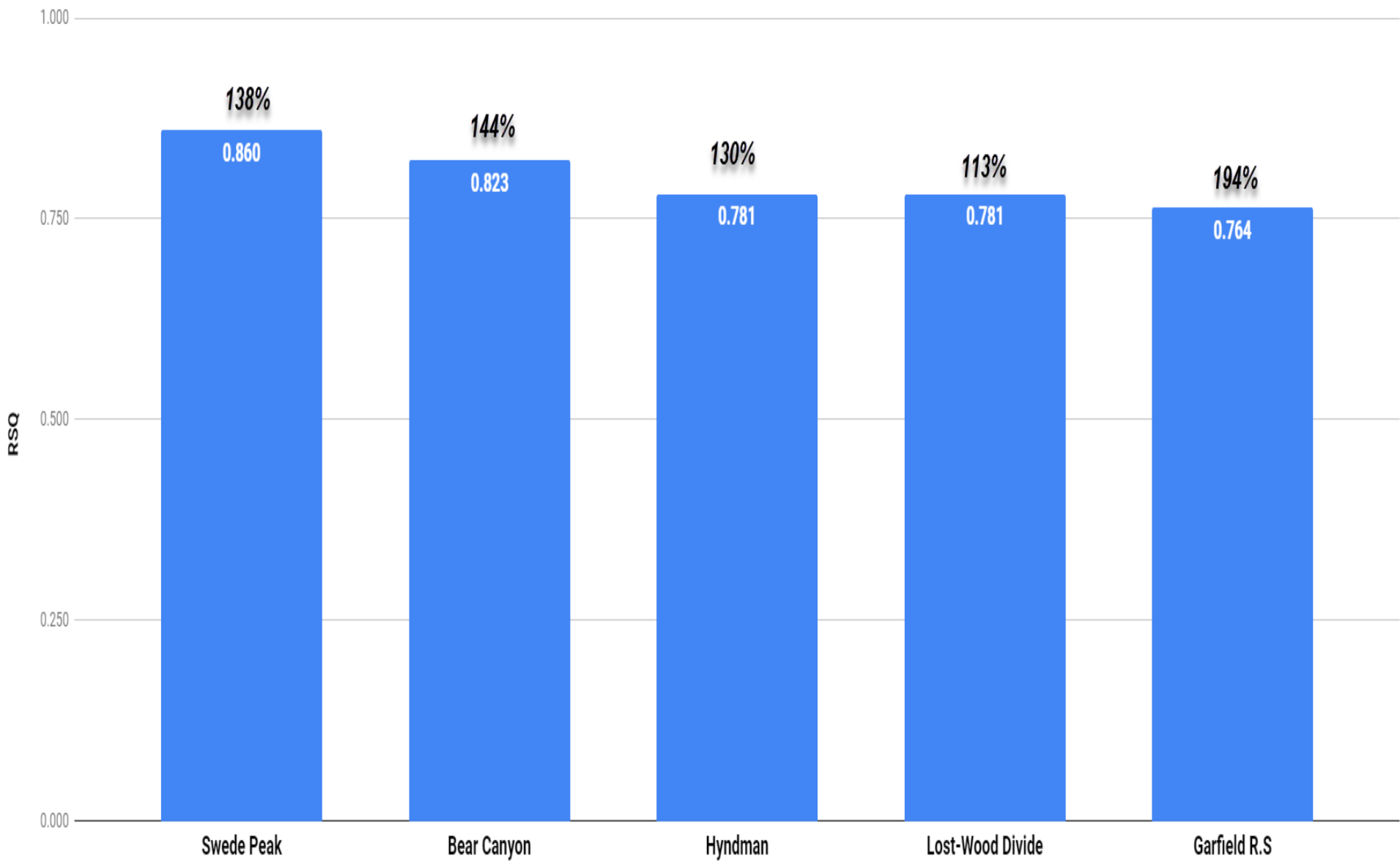
| ID | Name | Distance (miles) | Elevation (feet) | Date | SWE | Pct Avg | SWE Avg 1981-2010 | Snow Depth (inches) | Snow Density | Pct Curr Peak | Pct Avg Peak |
|-------------------------------|-------------------------|------------------|------------------|-------|------|--------------|-------------------|---------------------|--------------|---------------|--------------|
| CHOI1 | CHOCOLATE GULCH SNOTEL | 5 | 6440 | 04-10 | 14.1 | 117 % | 12.1 | -- | -- | 90 % | 112 % |
| GARI1 | GARFIELD RANGER STATION | 0 | 6550 | 04-10 | 13.4 | 194 % | 6.9 | -- | -- | 81 % | 144 % |
| HYNI1 | HYNDMAN CREEK | 3 | 7440 | 04-10 | 15.1 | 130 % | 11.6 | 41 | 37 % | 96 % | 123 % |
| STMI1 | STICKNEY MILL | 11 | 7450 | 04-10 | 9.4 | 136 % | 6.9 | 25 | 38 % | 86 % | 119 % |
| SWPI1 | SWEDE PEAK | 0 | 7650 | 04-10 | 20.2 | 138 % | 14.6 | 54 | 37 % | 96 % | 136 % |
| BECI1 | BEAR CANYON | 3 | 7900 | 04-10 | 21.0 | 144 % | 14.6 | -- | -- | 99 % | 144 % |
| LWDI1 | LOST WOOD DIVIDE | 12 | 7900 | 04-10 | 22.4 | 113 % | 19.9 | 65 | 34 % | 98 % | 113 % |
| DHDI1 | DOLLAR HIDE SUMMIT | 25 | 8420 | 04-10 | 28.9 | N/A | | 75 | 39 % | 99 % | -- |
| SMMI1 | SMILEY MOUNTAIN SNOTEL | 5 | 9520 | 04-10 | 22.3 | 113 % | 19.7 | 69 | 32 % | 100 % | 105 % |
| Observed Basin Average | | | | | | 130 % | | | | | |

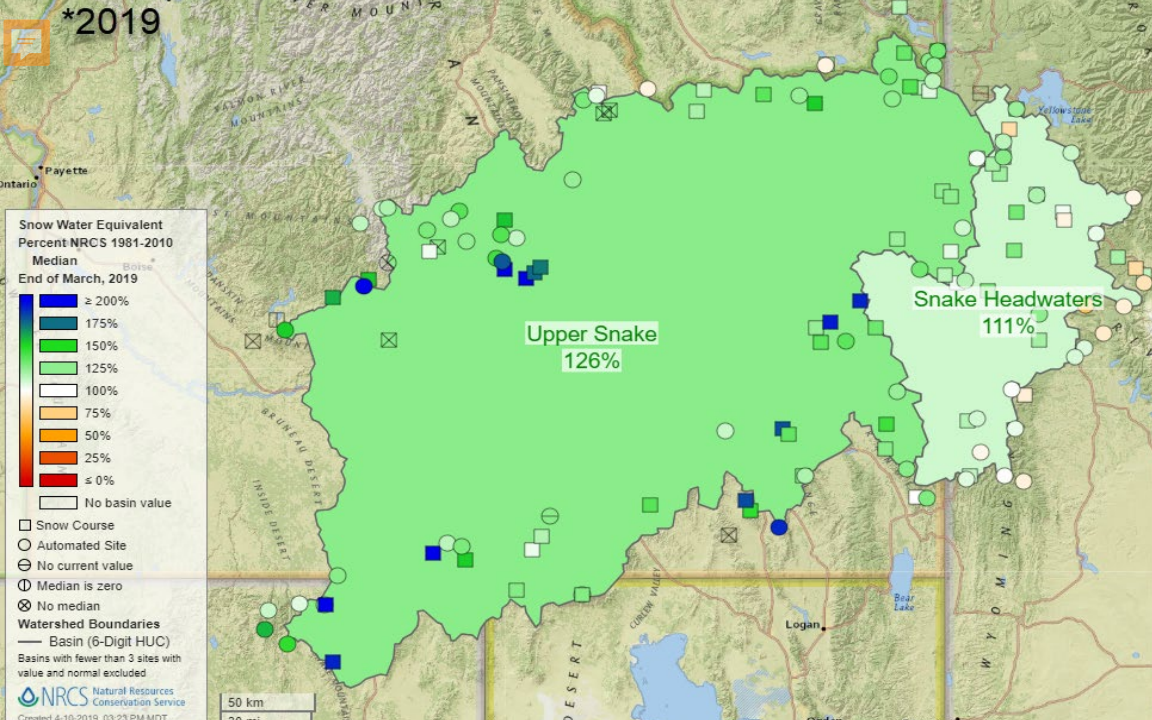
Please Note: Snow stations highlighted in cyan have no historic normals from the reporting agency and are not included in the basin average calculation.



NOHRSC/RFC Modeled and Observed Snowpack Analysis Little Wood Reservoir

Little Wood - March 31 SNOTEL Correlation Coefficient for April-July Runoff Volume



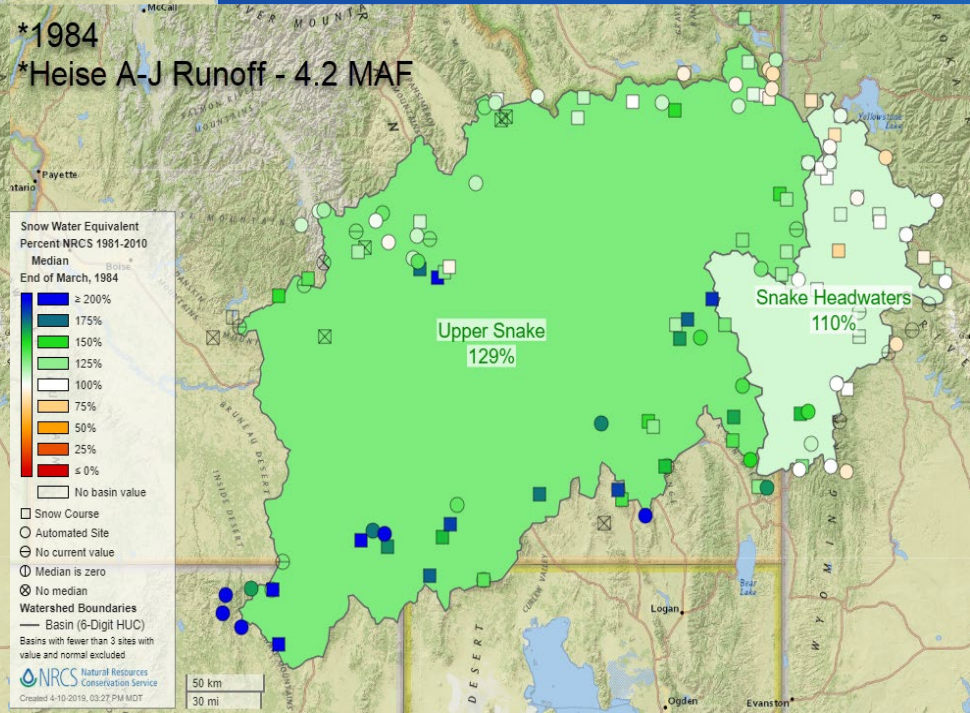
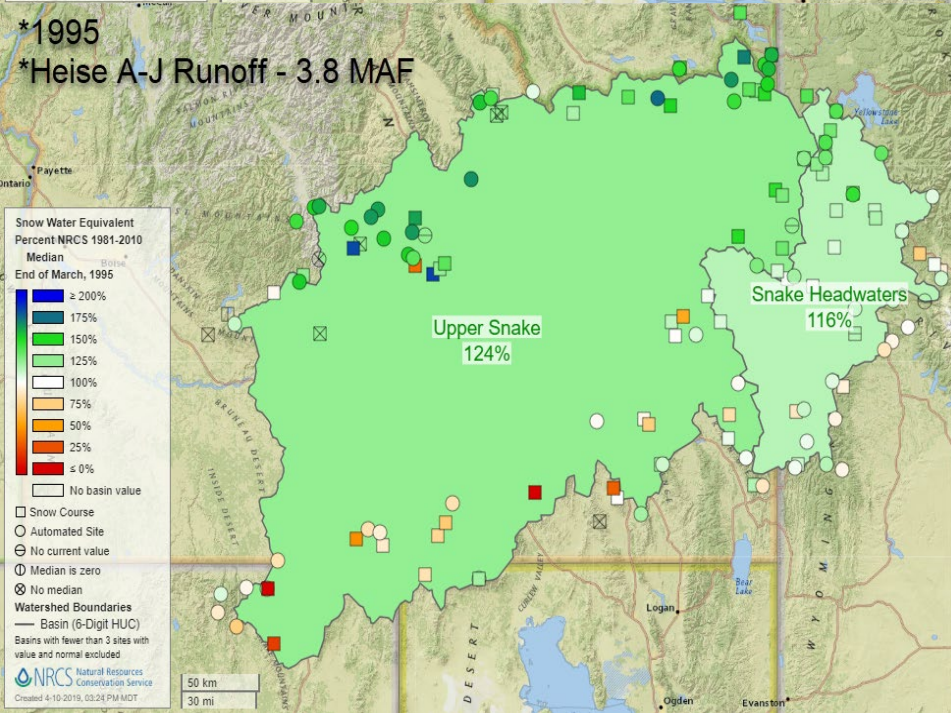


End Of March Snow Conditions

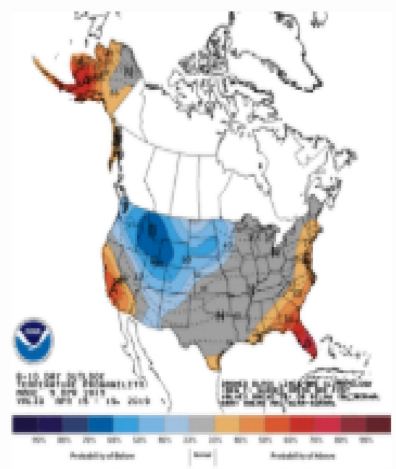
-Includes SNOTEL and Snow Course Data

-1995 and 1984 reasonable years with similar snowpack for both Western Wyoming and Eastern Idaho

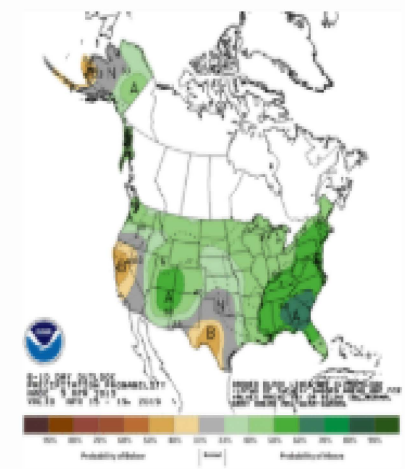
-1995 and 1984 runoff volumes were 118% and 131% of normal respectively



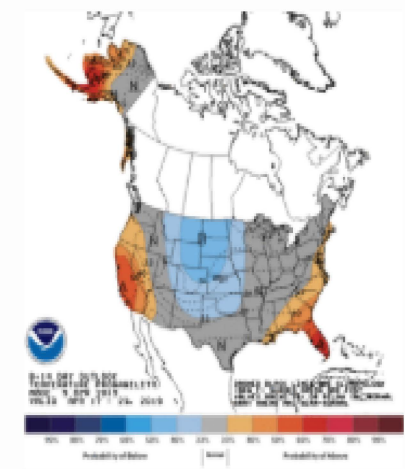
**NOAA CPC 6 to 10 Day
Temperature Probability
Outlook**



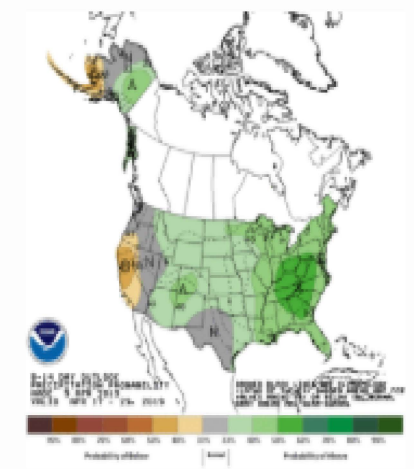
**NOAA CPC 6 to 10 Day
Precipitation Probability
Outlook**



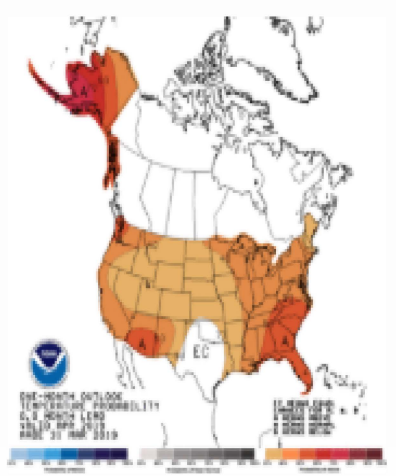
**NOAA CPC 8 to 14 Day
Temperature Probability
Outlook**



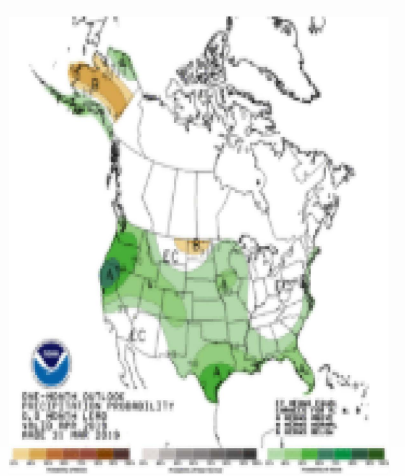
**NOAA CPC 8 to 14 Day
Precipitation Probability
Outlook**



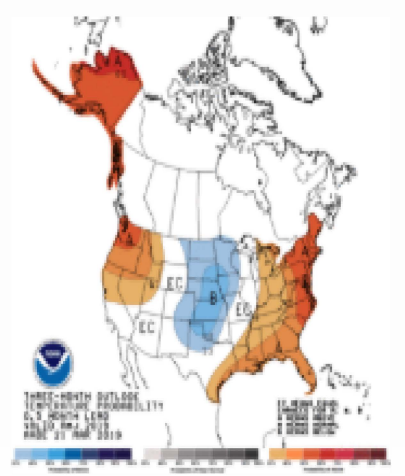
**One Month Outlook -
Temperature Probability**



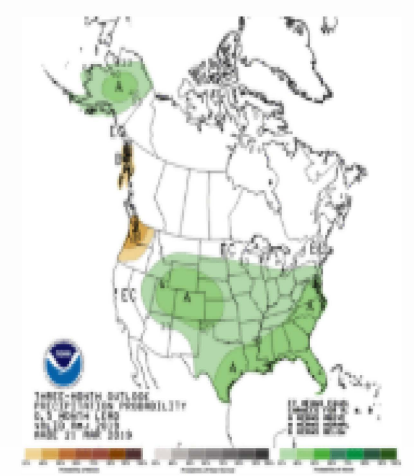
**One Month Outlook -
Precipitation Probability**



**Three Month Outlook -
Temperature Probability**



**Three Month Outlook -
Precipitation Probability**



CURRENT MONTHLY FORECAST SUMMARY

APR 1, 2019

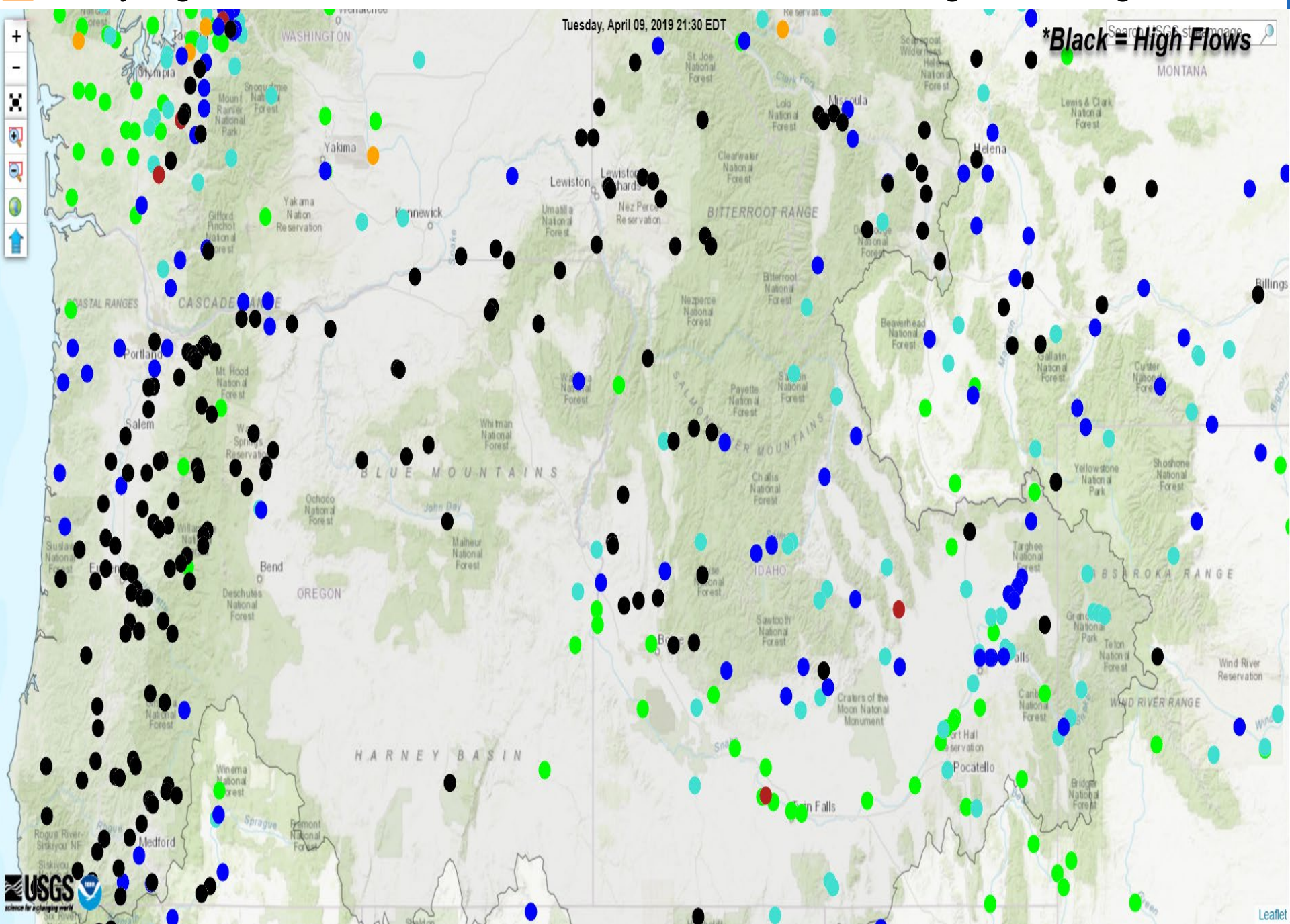
| FORECAST POINT | FORECAST PERIOD | 1981-2010 AVERAGE (KAF) | NORMAL SUBSEQUENT CONDITIONS | |
|-----------------|-----------------|-------------------------|------------------------------|----------------|
| | | | FORECAST (KAF) | PERCENT NORMAL |
| *** HEISE | APR-JUL | 3236 | 3200 | 99% |
| JACKSON LAKE | APR-JUL | 765 | 794 | 104% |
| * ISLAND PARK | APR-JUL | 216 | 247 | 115% |
| TETON | APR-JUL | 373 | 348 | 93% |
| *** RIRIE | APR-JUN | 63 | 76 | 121% |
| *** LITTLE WOOD | APR-JUL | 77 | 109 | 141% |

* PCA Forecast

** PCA & MLR Average

*** Coordinated with USACE

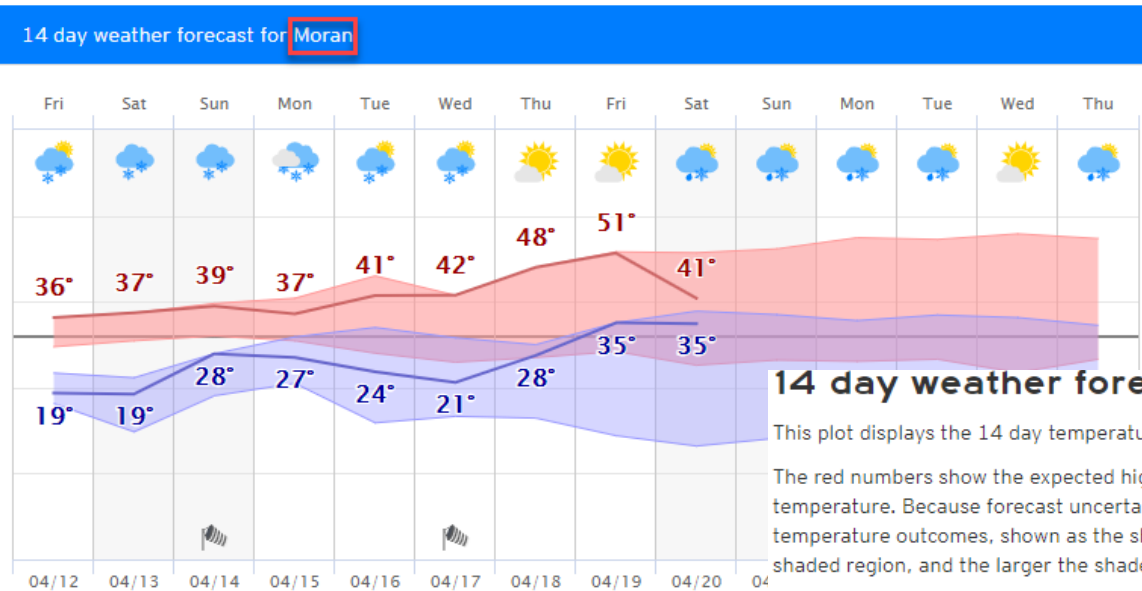
Tuesday Night Pacific Northwest Stream Conditions – Black = “High Flow Stage”



14 day weather forecast

This plot displays the 14 day temperature forecast for your selected location, Moran.

The red numbers show the expected high temperature for a given day, while the blue numbers show the expected low temperature. Because forecast uncertainty increases with time, we also display the range of possible high/low temperature outcomes, shown as the shaded red/blue regions. The actual high/low temp could fall anywhere in that shaded region, and the larger the shaded regions are, the higher the forecast uncertainty is.

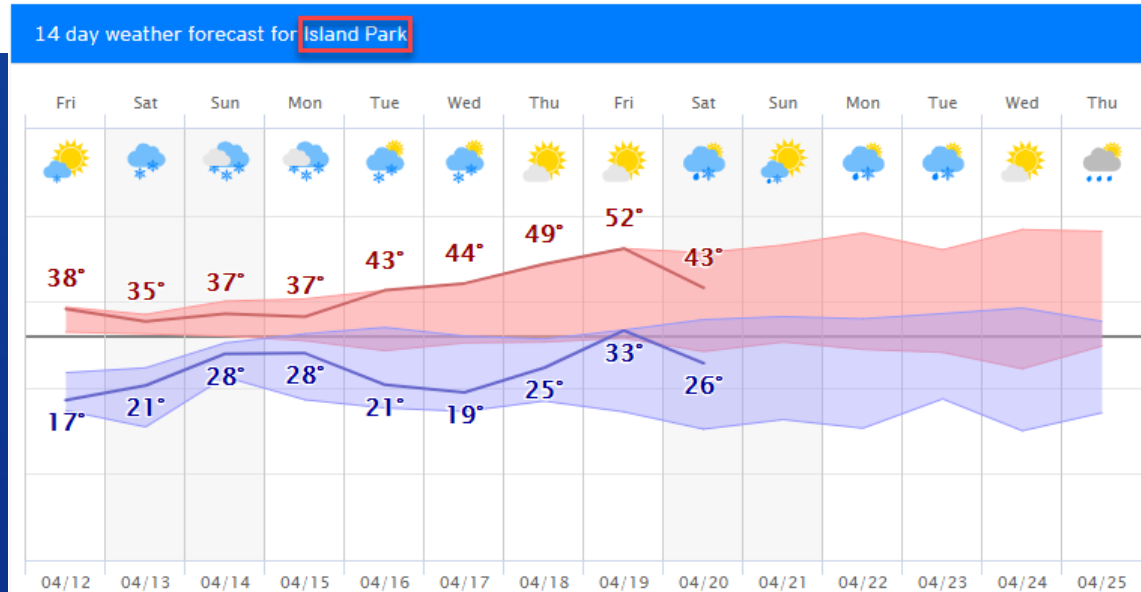


Moran, Wyoming
Cool and wet Fri-Wed
Warming trend Tue-Fri
Precip returns late next week

14 day weather forecast

This plot displays the 14 day temperature forecast for your selected location, Island Park.

The red numbers show the expected high temperature for a given day, while the blue numbers show the expected low temperature. Because forecast uncertainty increases with time, we also display the range of possible high/low temperature outcomes, shown as the shaded red/blue regions. The actual high/low temp could fall anywhere in that shaded region, and the larger the shaded regions are, the higher the forecast uncertainty is.



Island Park, Idaho
Cool and wet Fri-Wed
Warming trend Tue-Fri
Precip returns late next week

Upper Snake River Operations Summary

➤ South Fork/Mainstem

- Jackson Lake – Releasing 700 cfs, and projecting releases will be approximately 1,500-2,500 cfs by May 1
- Palisades – Releasing 7,500 cfs, and projecting more increases in the next 1-7 days. Projected drawdown to 725-775 KAF
- Ririe – Releasing 125 cfs, and projecting an operational approach of analyzing outflow adjustments with every 2,500-5,000 AF of fill

➤ Henry's Fork

- Island Park's – Releasing 700 cfs, and projecting the next fill checkpoint will be at 112,000 AF
- Grassy Lake – Projecting to fill and observe above normal discharge this spring. Likely going to initiate a release in May for operational flexibility

Lower System

- American Falls – Successfully reduced outflow this week to fill the reservoir to acceptable levels in the window prior to increases in irrigation demand. Releases will continue being adjusted as we manage the rate of fill and accommodate expected precipitation
- Minidoka Dam/Lake Walcott – Currently being maintained near summer operating levels to optimize hydraulic head for generation and diversions
- Milner – Discharge to river is projected to be in the 2,500 cfs range today and to increase over the next 1-7 days

➤ Little Wood

- Little Wood – Increased release by ~ 200 cfs to 550 cfs. Maintaining operational flexibility to reduce outflow if gains below the dam push the flow near Carey to flood stages this weekend

RECLAMATION

2019 Upper Snake Annual Windshield Snow Survey



1998

- **May 23rd**
 - Public meeting at the 49'er Inn, 5:30 PM, 49'er Inn Conference Room



1999

- **May 24th**
 - Travel through Grand Teton National Park and Yellowstone National Park to observe remaining snow in the watershed



2009

A block of rooms has been reserved at the 49'er Inn for the night of Thursday, May 23rd. The room rate is \$99.00, plus tax. **Please contact the 49'er Inn no later than Thursday, May 16th to ensure your room reservation.** The 49'er Inn can be reached at 307-733-7550; please reference confirmation number 45N658. Additionally, please RSVP with Darrin Fredrickson, at 208-678-0461 extension 17 or dfredrickson@usbr.gov with the following information:

- Facility/Organization representing
- Total number of people who will participate in the snow survey on the 24th
- Whether you would like us to provide transportation, and preferred pick-up location
- Whether you will join us for lunch on May 23rd in Idaho Falls

*****Contact Darrin Fredrickson (Reclamation) for more information*****

For More Information

Snake River Area Office

- Roland Springer - Area Manager
208-383-2246
rspringer@usbr.gov

Upper Snake Field Office

- Ryan Newman – Assistant Area Manager
208-678-0461 (x34)
rnewman@usbr.gov
- Brian Stevens – (Acting) Water Ops Group Manager
(x46) bstevens@usbr.gov
- Jeremy Dalling - Water Ops Hydrologist (x25)
jdalling@usbr.gov
- Darrin Fredrickson - Water Ops Staff Assistant (x17)
dfredrickson@usbr.gov

Snake River Operations Web Sites

- Upper Snake water information site -
<http://www.usbr.gov/pn/hydromet/upperSnake/index.html>
- USBR HydroMet - <http://www.usbr.gov/pn/hydromet/>
- Northwest River Forecast Center - <http://www.nwrfc.noaa.gov/rfc/>
- NRCS SNOTEL Data - <http://www.id.nrcs.usda.gov/snow/>

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