



WY Conditions & Outlooks:

Precipitation, Temperatures, Drought, Floods, & Everything In-between

December 16, 2021



Presentation Outline

- Current Conditions
- Outlooks
- How to Get Involved



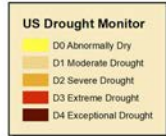
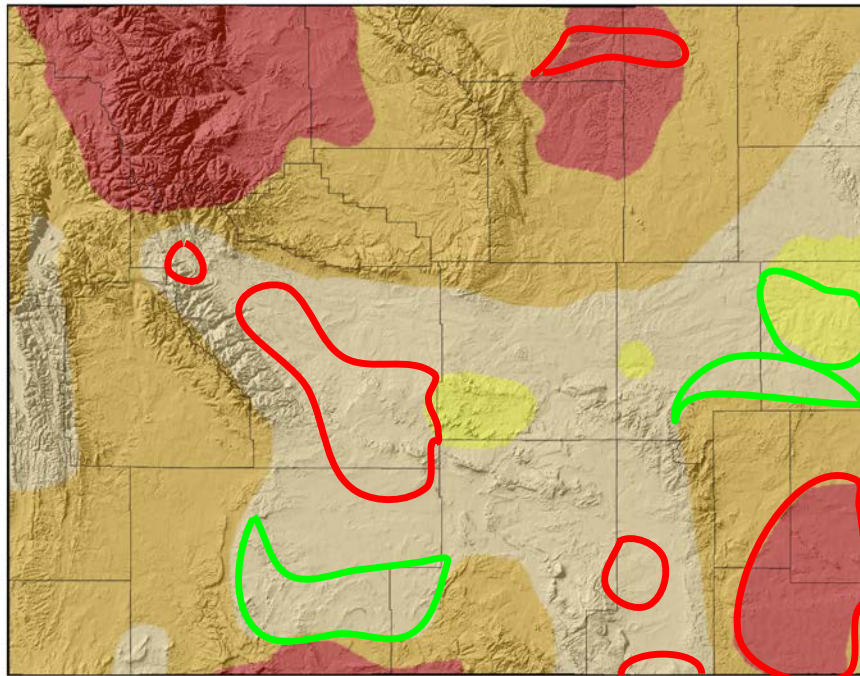
Current Conditions

US Drought Monitor for December 14, 2021

(Released Thursday, December 16, 2021)

Valid 8 a.m. EDT

US Drought Monitor for 14 Dec 2021



Map Created by:
National Drought Mitigation Center
<https://droughtmonitor.unl.edu>



Map Layout Prepared by:
Wyoming State Climate Office
<http://www.wrds.uwyo.edu>



The U.S. Drought Monitor, is a weekly map of drought conditions produced jointly by the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln. The U.S. Drought Monitor website is hosted and maintained by the NDMC. <http://droughtmonitor.unl.edu>

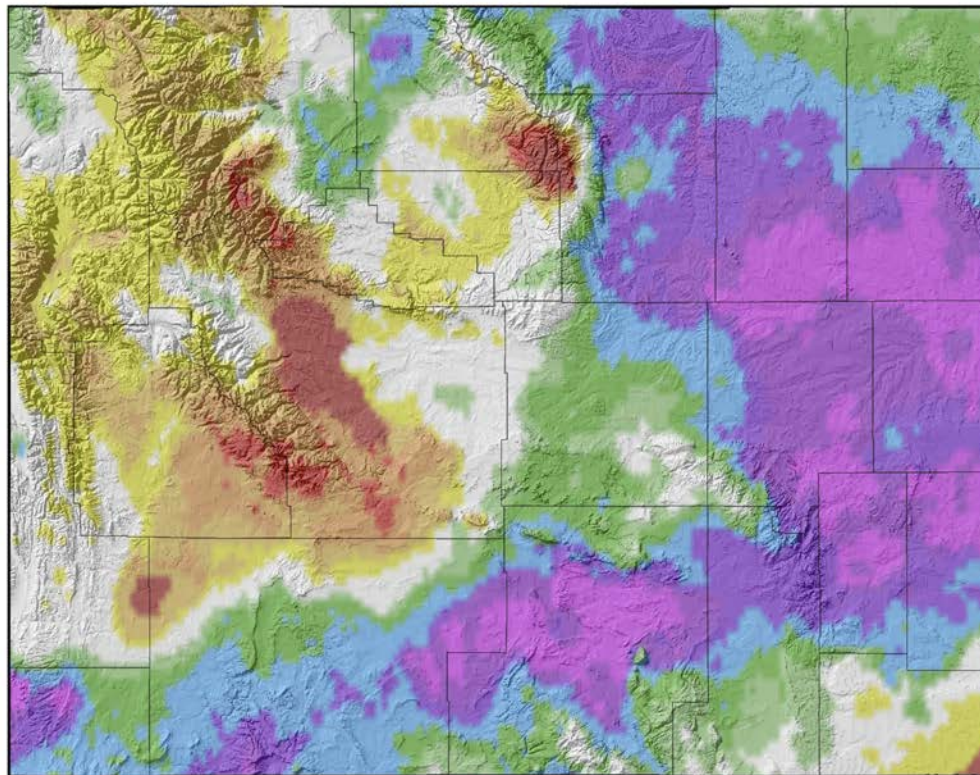
Map Layout Created 16 Dec 2021 <http://www.wrds.uwyo.edu>

Drought Level	Percentile
None	>30
D0 (Abnormally Dry)	21 to 30
D1 (Moderate Drought)	11 to 20
D2 (Severe Drought)	6 to 10
D3 (Extreme Drought)	3 to 5
D4 (Exceptional Drought)	0 to 2

Improvements throughout the state where soil moisture improved from recent snows but also **degradations** in northern, central, and southeastern Wyoming where precipitation deficits continued through November and into December.

14-Day Precipitation Percentile (02 Dec 2021 to 15 Dec 2021)

14-Day Precipitation (Percentile) for 02 Dec 2021 to 15 Dec 2021



Precipitation Data
PRISM Climate Group
<http://prism.oregonstate.edu>



Map Prepared by:
Wyoming State Climate Office
<http://www.wrds.uwyo.edu>



Provisional data, subject to revision

Daily precipitation data from PRISM Climate Group, Copyright ©2021, PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>
Daily percentiles created from PRISM daily precipitation grids

Above Median:

- Eastern and Southwestern WY

Below Median (Areas of Concern):

- Fremont County
- Lincoln-Sweetwater Border
- SE Big Horn/NE Washakie
- Far SE Laramie County

90-Day Precipitation Percentile (17 Sep 2021 to 15 Dec 2021)

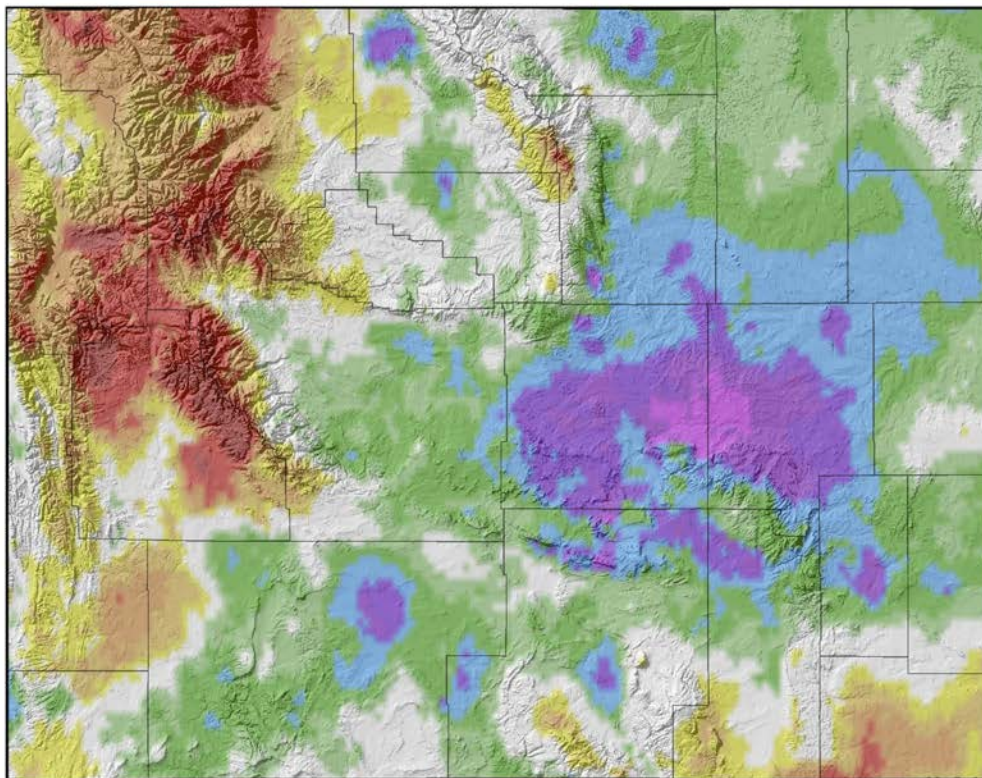
90-Day Precipitation (Percentile) for 17 Sep 2021 to 15 Dec 2021

Above Median:

- Central to East Central WY

Below Median (Areas of Concern):

- Laramie County
- High elevation western Wyoming



Precipitation Data
PRISM Climate Group
<http://prism.oregonstate.edu>



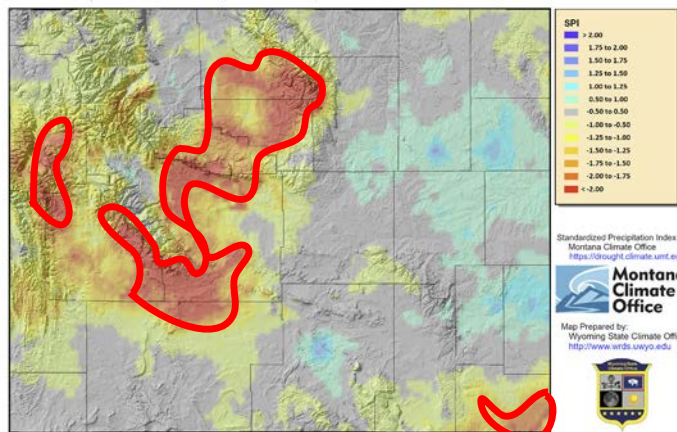
Map Prepared by:
Wyoming State Climate Office
<http://www.wrds.uwyo.edu>



Provisional data, subject to revision

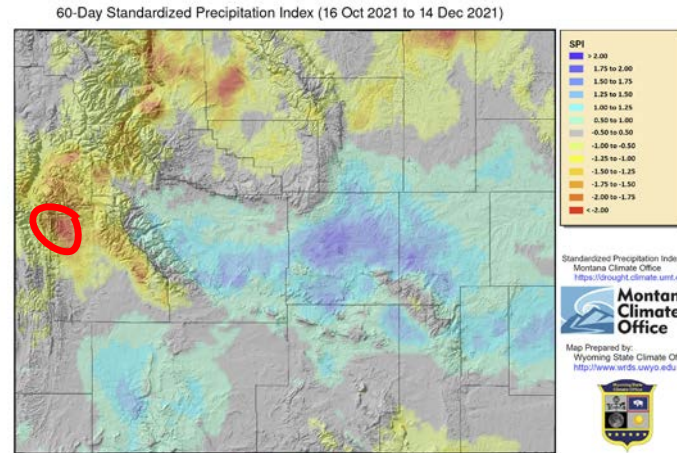
30-Day Standardized Precipitation Index (15 Nov 2021 to 14 Dec 2021)

30-Day
→



Provisional data, subject to revision
Standardized Precipitation Index Created by Montana Climate Office <https://drought.climate.umt.edu>
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>

60-Day
→

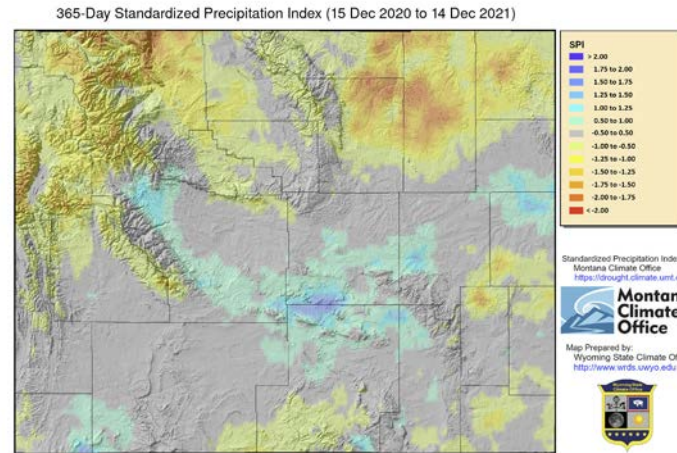


Provisional data, subject to revision
Standardized Precipitation Index Created by Montana Climate Office <https://drought.climate.umt.edu>
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>

Standardized Precipitation Index (SPI)

- Areas of concern re-emerging.

1-Year
→

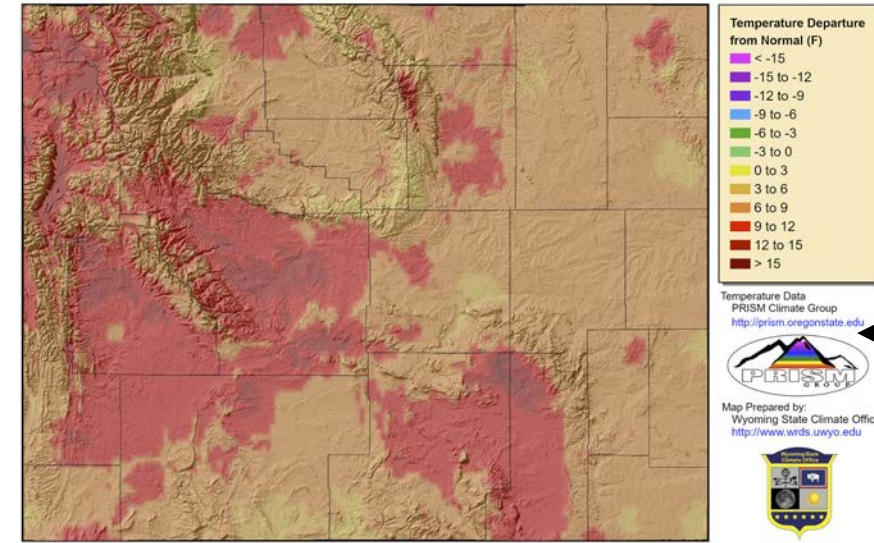


Provisional data, subject to revision
Standardized Precipitation Index Created by Montana Climate Office <https://drought.climate.umt.edu>
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>

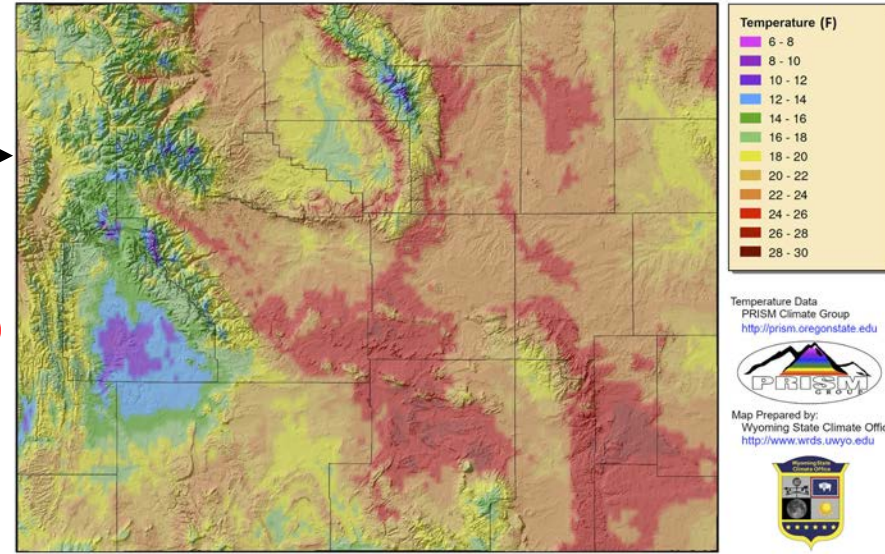
14-Day Average Minimum Temperature (02 Dec to 15 Dec)

- Lows below freezing
- Coldest in Upper Green (Sublette County)

14-Day Average Minimum Temperature (Departure from 1991-2020 Average) for 02 Dec 2021 to 15 Dec 2021



Provisional data, subject to revision



Provisional data, subject to revision

Daily Temperature data from PRISM Climate Group, Copyright ©2021, PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>
Temperature averages created from PRISM daily temperature grids

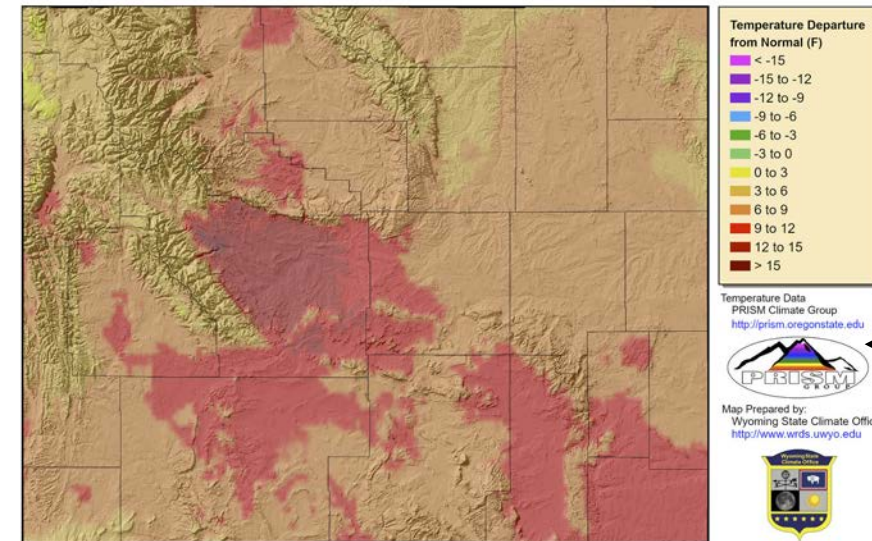
14-Day *Departure from Normal* Average Minimum Temperature

- 9F to 12F above average NW, Fremont, Upper Green, Carbon, Albany
- 6F to 9F above average for most lower elevation plains and the higher elevations

14-Day Average Maximum Temperature (02 Dec to 15 Dec)

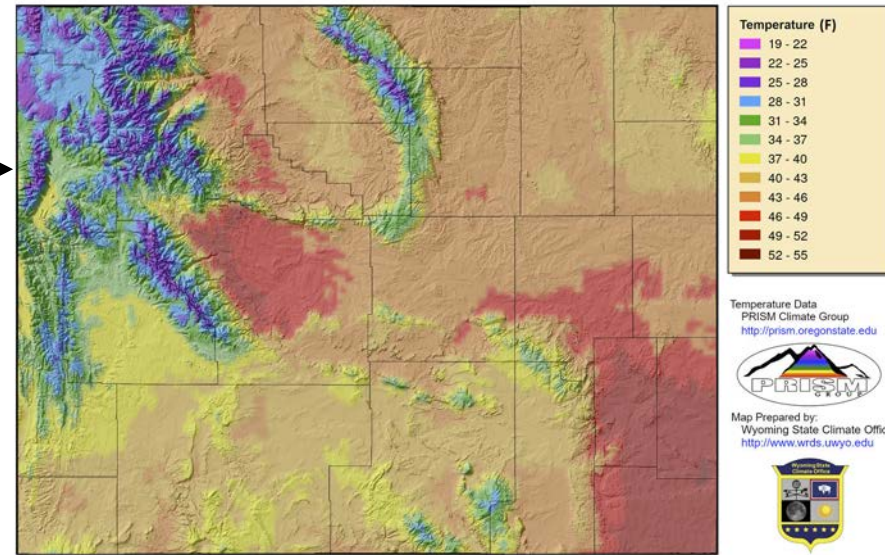
- High elevations < 32F for highs
- Low 50s Platte/Goshen/Laramie

14-Day Average Maximum Temperature (Departure from 1991-2020 Average) for 02 Dec 2021 to 15 Dec 2021



Provisional data, subject to revision

Daily Temperature data from PRISM Climate Group, Copyright ©2021, PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>
Temperature averages created from PRISM daily temperature grids



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Daily Temperature data from PRISM Climate Group, Copyright ©2021, PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>
Temperature averages created from PRISM daily temperature grids

14- Day *Departure from Normal* Average Maximum Temperature

- Fremont County 12F to 15F+ above avg
- Much of southeast WY and Sweetwater County 9F to 12F above avg
- 3F to 9F above average for remainder

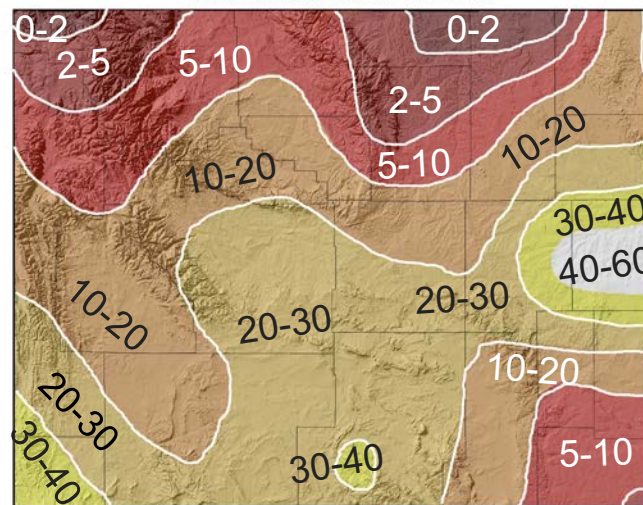
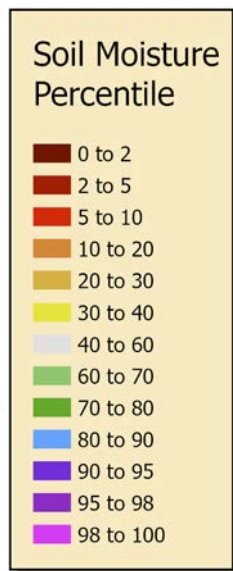
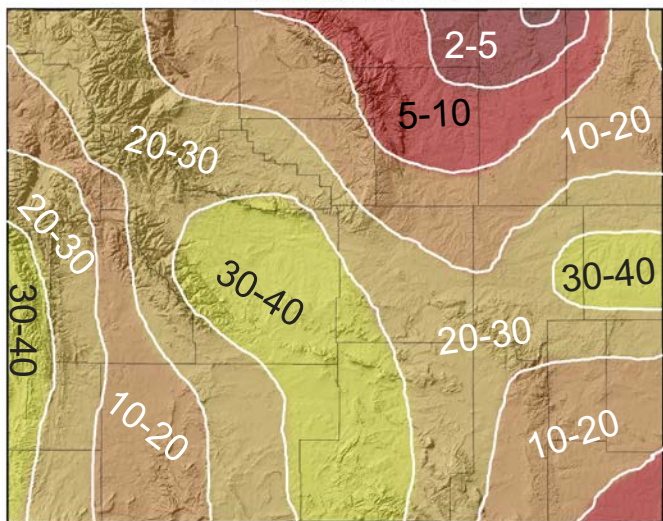
Soil Moisture Percentile

Two Weeks Ago
02 Dec 2021

Soil Moisture Percentile for 02 Dec 2021

15 Dec 2021

Soil Moisture Percentile for 15 Dec 2021



Provisional data, subject to revision

Provisional data, subject to revision

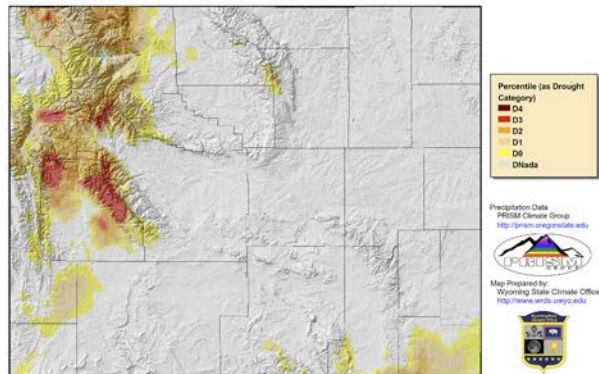
Modeled Soil Moisture Percentile https://www.cpc.ncep.noaa.gov/products/GIS/GIS_DATA/USDM_Products/soil/soil_percentile.php
Map Created 03 Dec 2021 <http://www.wrds.uwyo.edu>

Modeled Soil Moisture Percentile https://www.cpc.ncep.noaa.gov/products/GIS/GIS_DATA/USDM_Products/soil/soil_percentile.php
Map Created 16 Dec 2021 <http://www.wrds.uwyo.edu>

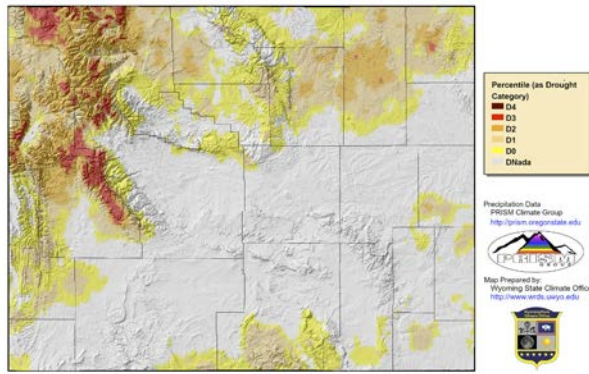
Conditions deteriorating especially in northwest and southeast. Some improvement in east central and southwest Wyoming.

Input to the US Drought Monitor

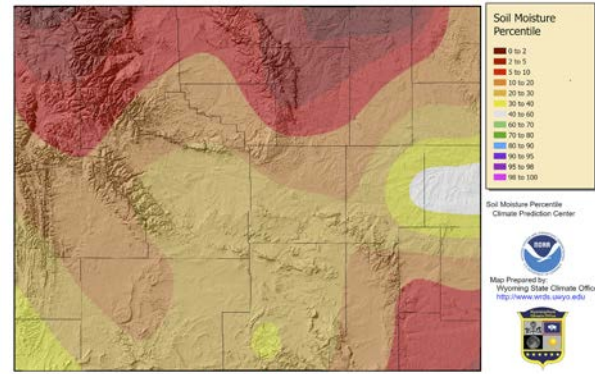
90-Day Precipitation Percentile (as Drought Category) for 17 Sep 2021 to 15 Dec 2021



365-Day Precipitation Percentile (as Drought Category) for 16 Dec 2020 to 15 Dec 2021



Soil Moisture Percentile for 15 Dec 2021

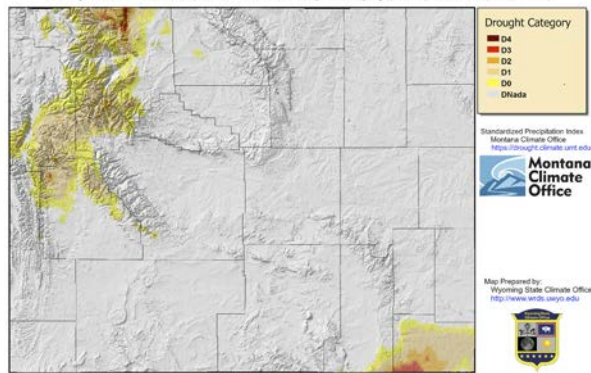


Daily precipitation data from PRISM Climate Group, Copyright ©2021, PRISM Climate Group, Oregon State University.
<http://prism.oregonstate.edu>
Map Created 16 Dec 2021 <http://www.wrds.wyo.gov>
Daily percentiles created from PRISM daily precipitation grids

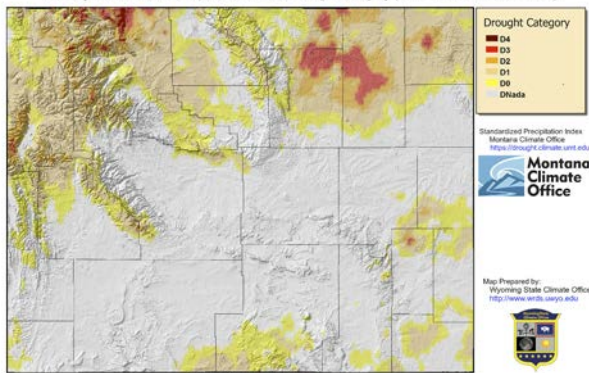
Daily precipitation data from PRISM Climate Group, Copyright ©2021, PRISM Climate Group, Oregon State University.
<http://www.wrds.wyo.gov>
Map Created 16 Dec 2021 <http://www.wrds.wyo.gov>
Daily percentiles created from PRISM daily precipitation grids

Modeled Soil Moisture/Percentile https://www.cpc.ncep.noaa.gov/products/GIS/GIS_DATA/USDM_Products/soilmoist_percentile.php
Map Created 16 Dec 2021 <http://www.wrds.wyo.gov>

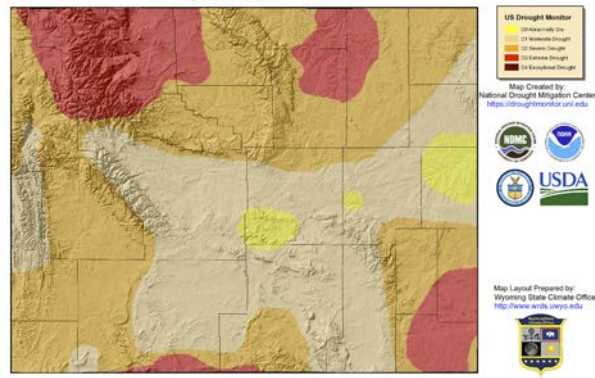
90-Day Standardized Precipitation Index as Drought Category (16 Sep 2021 to 14 Dec 2021)



365-Day Standardized Precipitation Index as Drought Category (15 Dec 2020 to 14 Dec 2021)



US Drought Monitor for 14 Dec 2021



Standardized Precipitation Index Created by Montana Climate Office <https://droughtclimate.umt.edu>
Map Created 16 Dec 2021 <http://www.wrds.wyo.gov>

Standardized Precipitation Index Created by Montana Climate Office <https://droughtclimate.umt.edu>
Map Created 16 Dec 2021 <http://www.wrds.wyo.gov>

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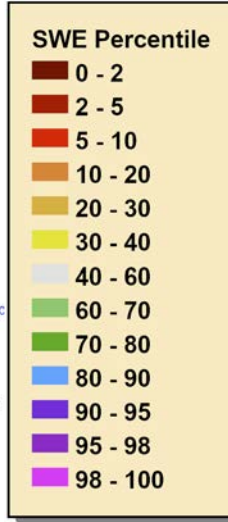
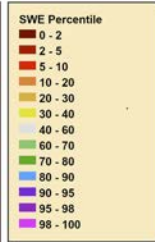
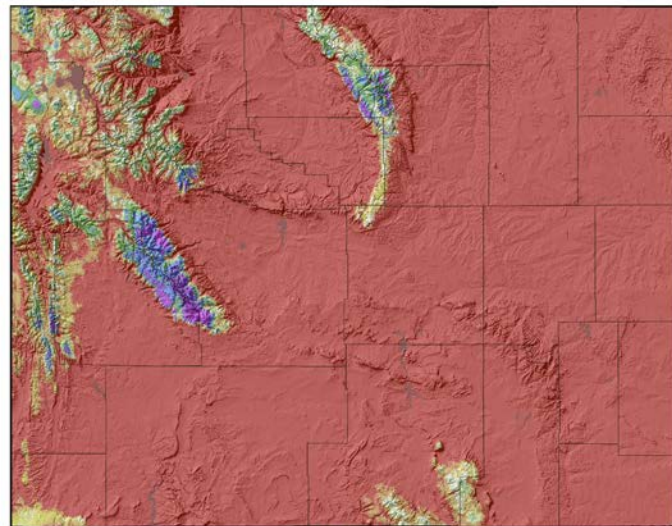
Map Layout Created 16 Dec 2021 <http://www.wrds.wyo.gov>

Modeled Snow Water Equivalent (SWE)

2-Week Comparison

02 Dec 2021

Snow Water Equivalent Percentile for 02 Dec 2021 (2004-2021 Period)



Snow Water Equivalent
NOHRSC
<https://doi.org/10.7265/N5TB14TC>

Map Prepared by:
Wyoming State Climate Office
<http://www.wrds.uwyo.edu>

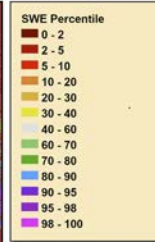
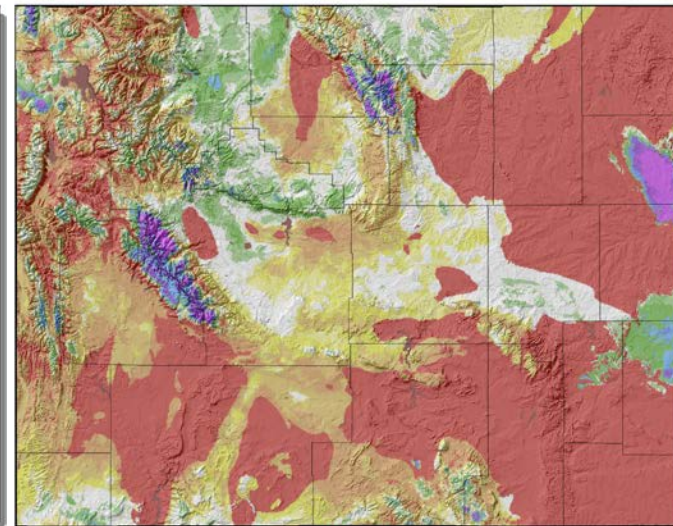


Provisional data, subject to revision

Modeled Snow Water Equivalent from National Operational Hydrologic Remote Sensing Center, 2004. Snow Data Assimilation System (SNODAS) Data Products at NSIDC, Version 1. Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center.
doi: <https://doi.org/10.7265/N5TB14TC>.
Daily Percentiles and Percents created by Wyoming State Climate Office
Map Created 02 Dec 2021 - <http://www.wrds.uwyo.edu>

16 Dec 2021

Snow Water Equivalent Percentile for 16 Dec 2021 (2004-2021 Period)



Snow Water Equivalent
NOHRSC
<https://doi.org/10.7265/N5TB14TC>

Map Prepared by:
Wyoming State Climate Office
<http://www.wrds.uwyo.edu>



Provisional data, subject to revision

Modeled Snow Water Equivalent from National Operational Hydrologic Remote Sensing Center, 2004. Snow Data Assimilation System (SNODAS) Data Products at NSIDC, Version 1. Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center.
doi: <https://doi.org/10.7265/N5TB14TC>.
Daily Percentiles and Percents created by Wyoming State Climate Office
Map Created 16 Dec 2021 - <http://www.wrds.uwyo.edu>

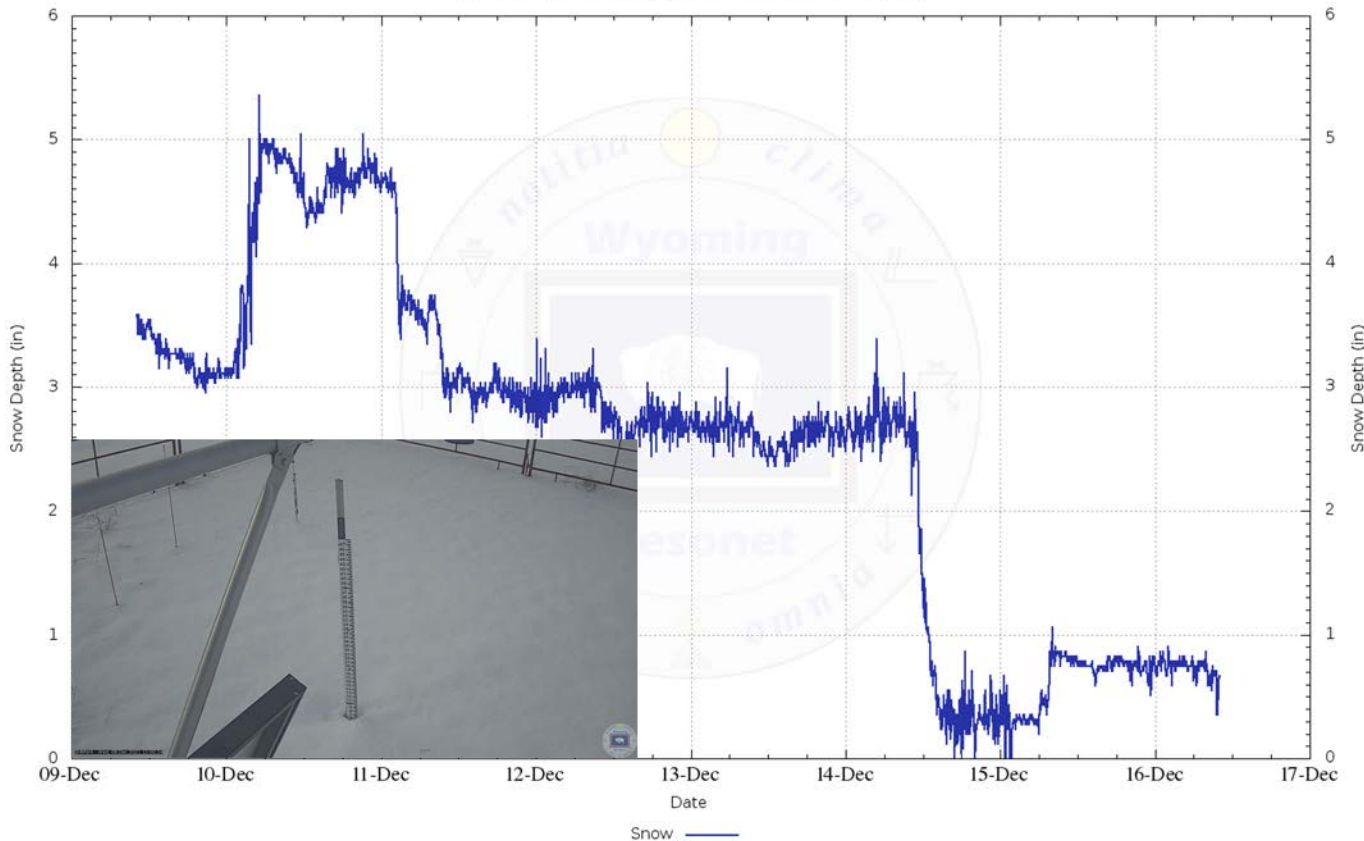
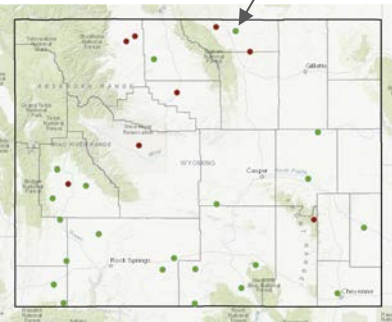
Lost some ground compared to two weeks ago



Snow Depth at Sheridan

~7 Miles ESE Sheridan

Sheridan - Snow Depth (Graph Created 10:02 16-Dec-2021)

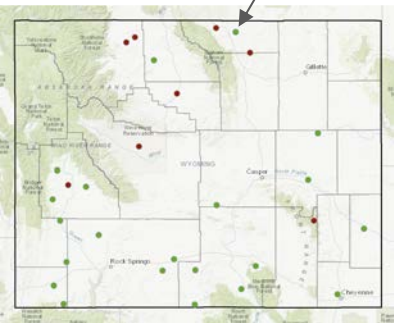


07 Dec storm brought 7" snow with some bump ups in following days. Mostly melted.

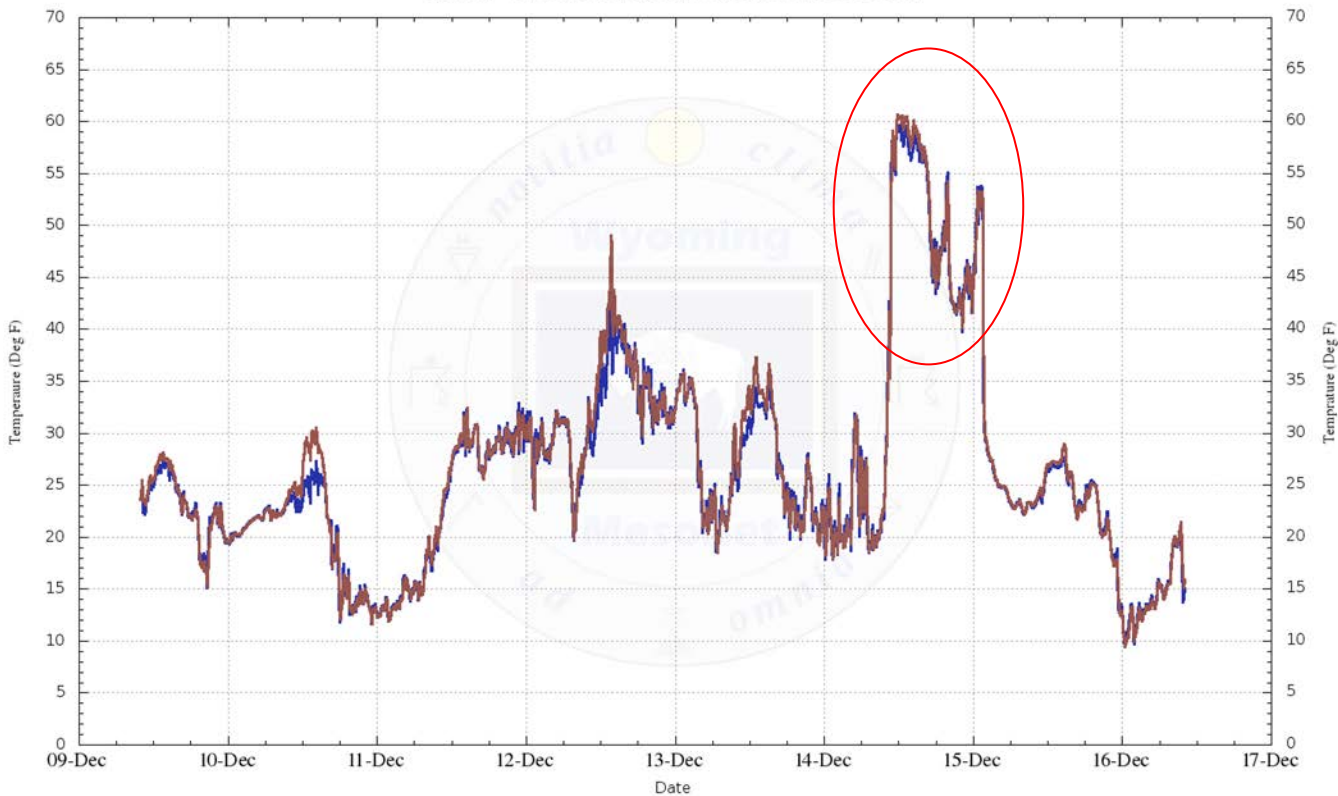


Temperature at Sheridan

~7 Miles ESE Sheridan



Sheridan - Air Temperature (Graph Created 10:04 16-Dec-2021)



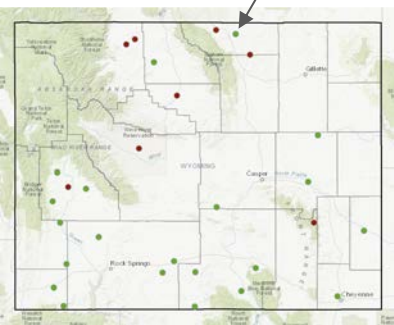
High Temperatures...

2m FMO — 10m Psychro

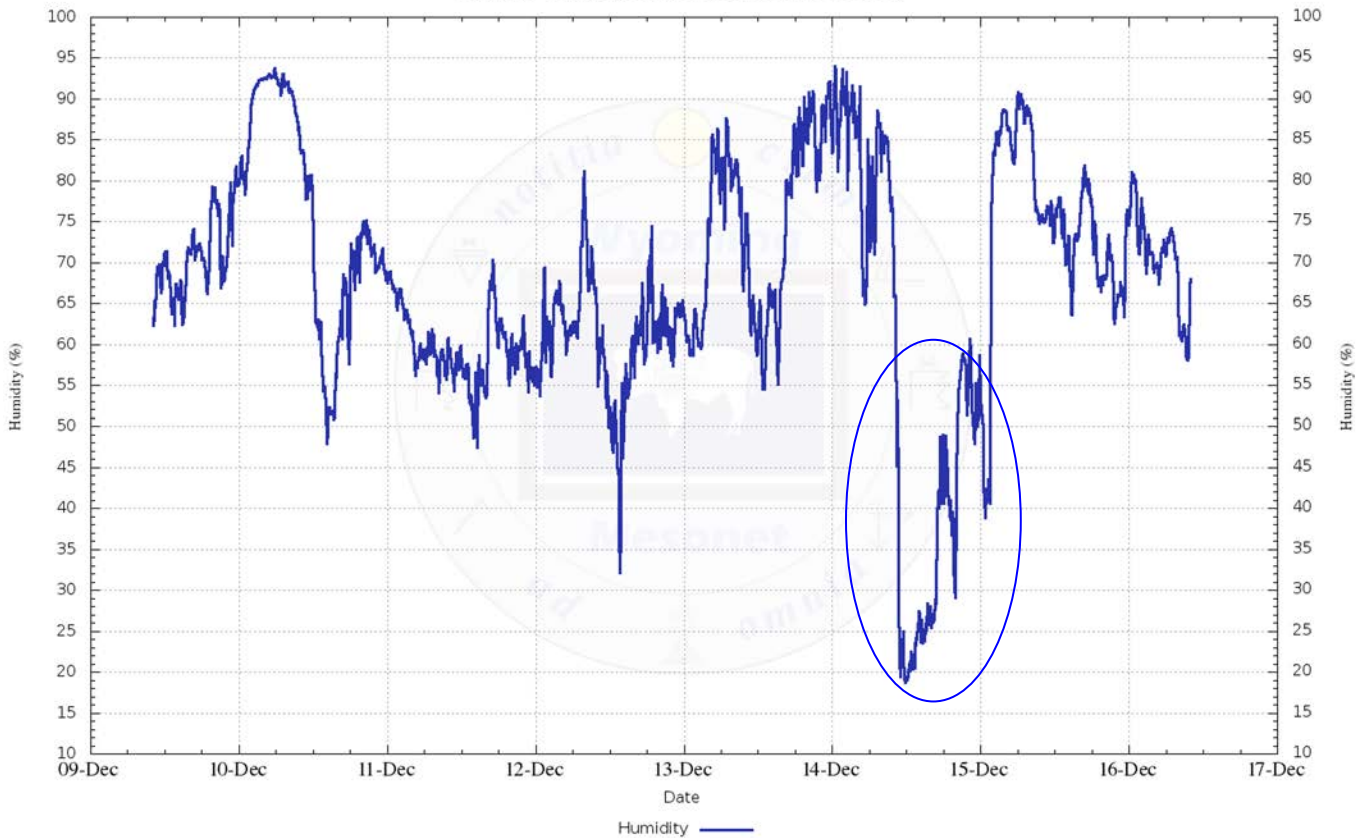


Humidity at Sheridan

~7 Miles ESE Sheridan



Sheridan - Humidity (Graph Created 10:04 16-Dec-2021)



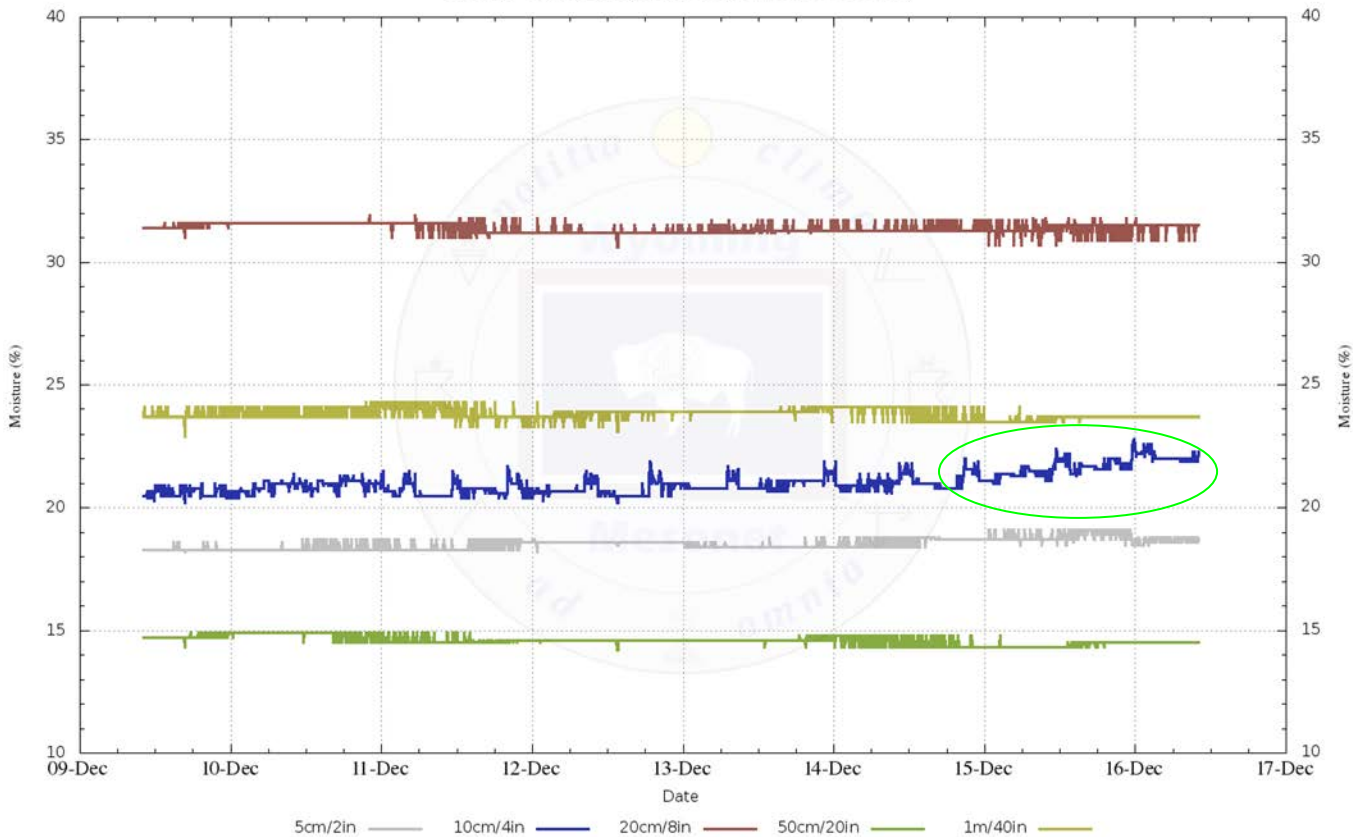
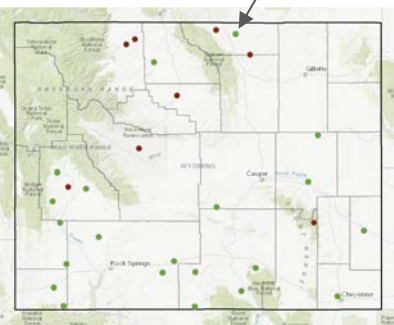
...with Low Humidity



Soil Moisture at Sheridan

~7 Miles ESE Sheridan

Sheridan - Soil Moisture (Graph Created 10:02 16-Dec-2021)

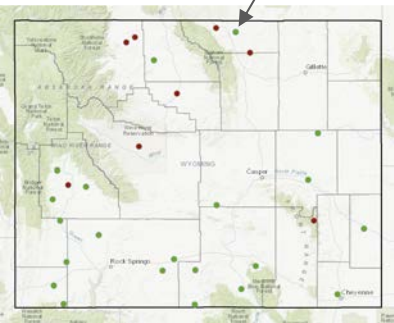


Barely-perceptible rise in soil moisture at shallow depths.

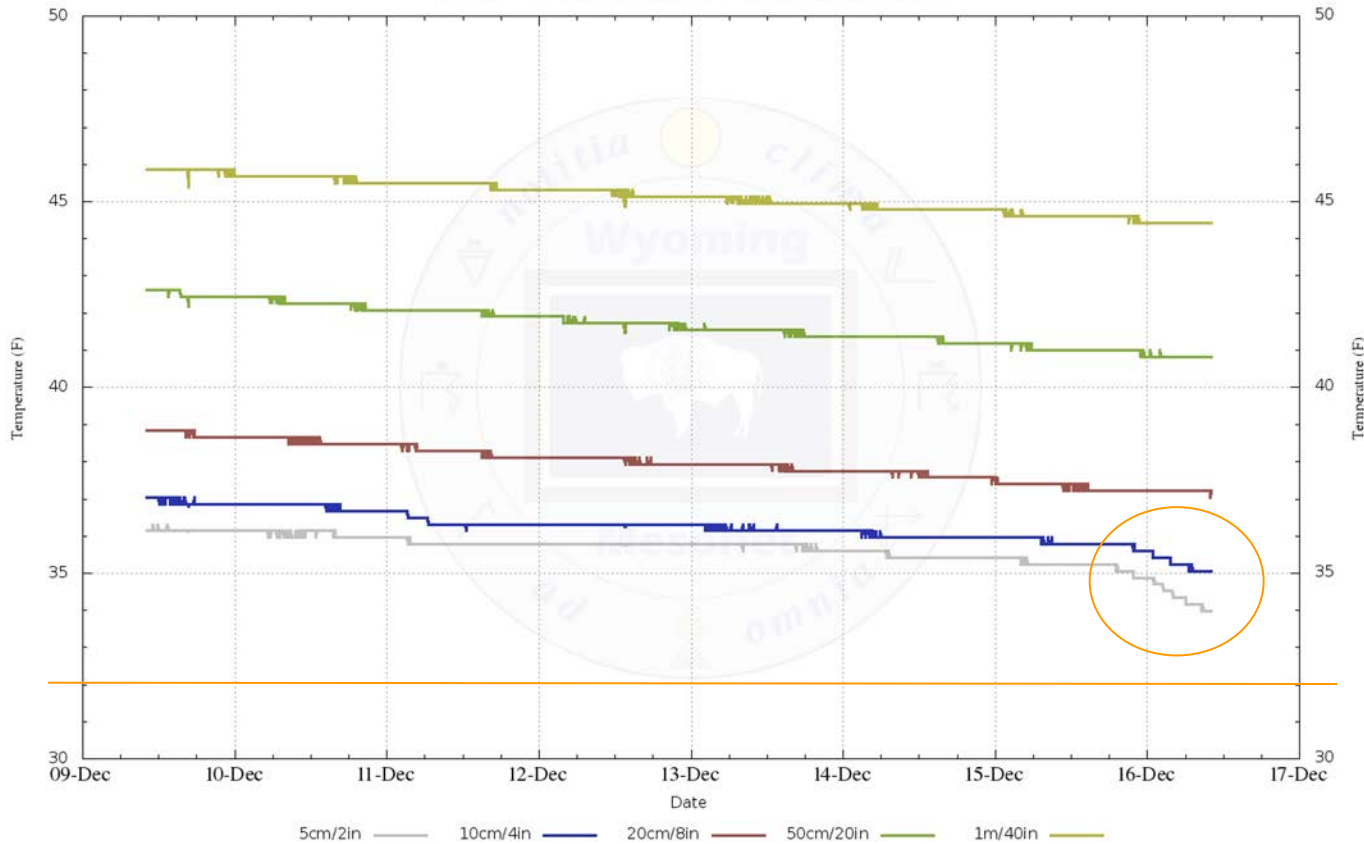


Soil Temperature at Sheridan

~7 Miles ESE Sheridan



Sheridan - Soil Temperature (Graph Created 10:02 16-Dec-2021)

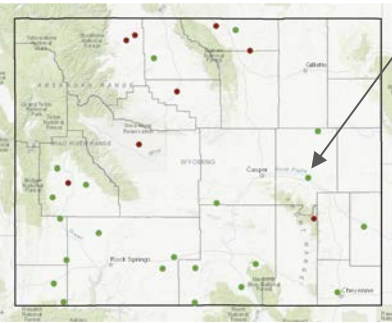


Blanket of snow has insulated the ground but soil temperatures gradually dropping.

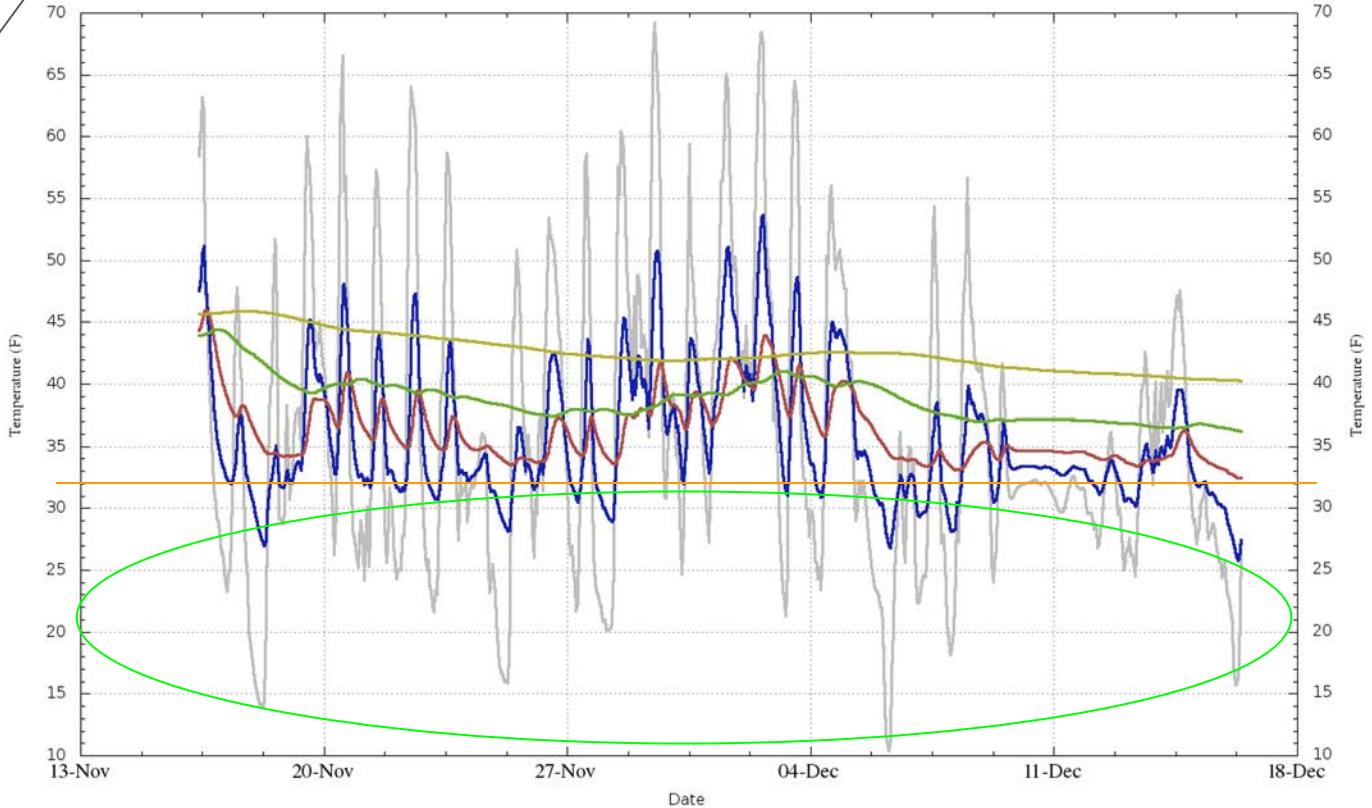


Soil Temperature at Douglas

Douglas



Douglas 4NW - 2021-12-16 09:00:00



Soil temperature colder and for longer durations.

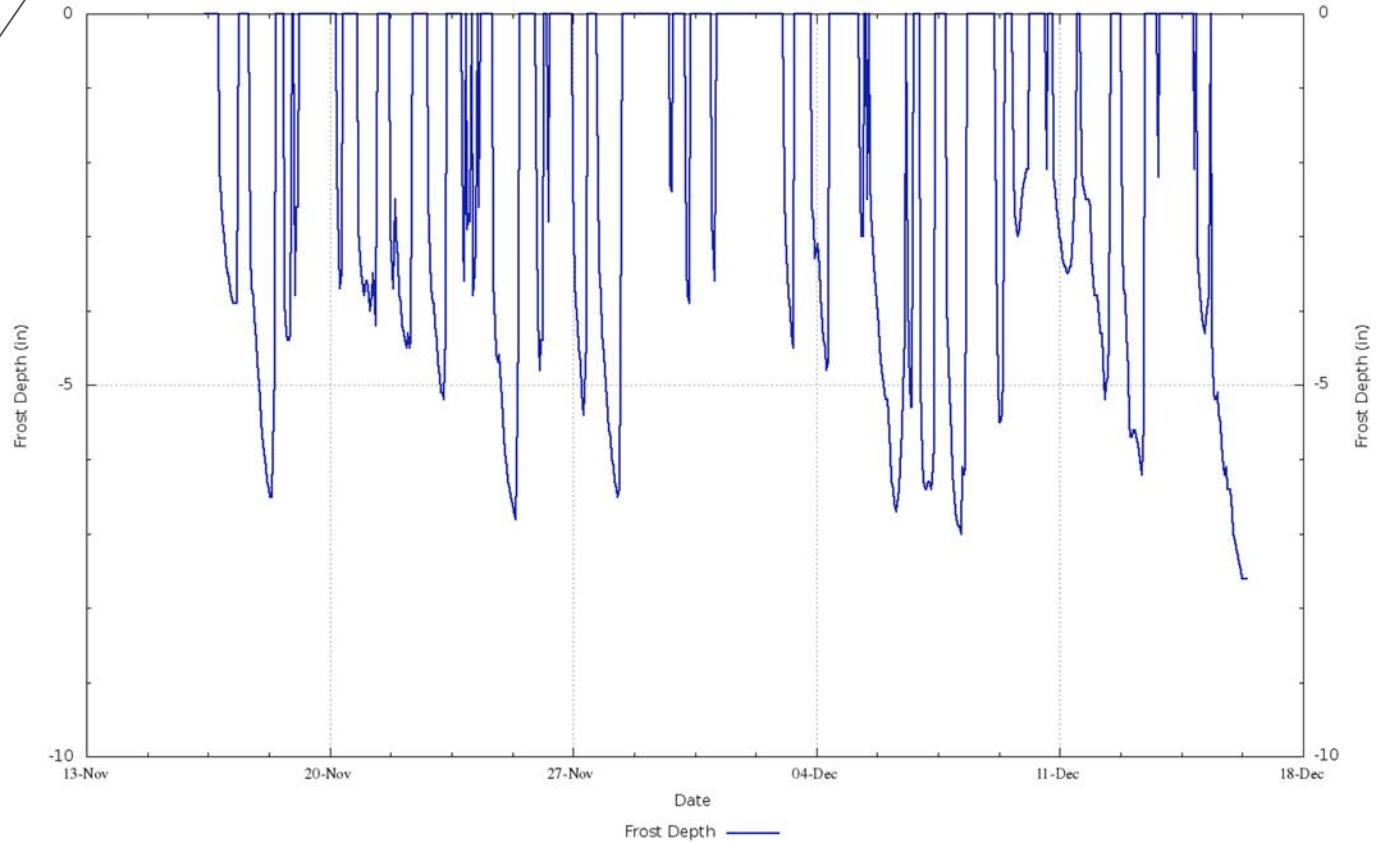
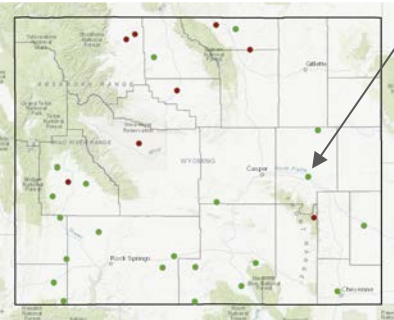
5cm/2in — 10cm/4in — 20cm/8in — 50cm/20in — 1m/40in



Frost Depth at Douglas

Douglas

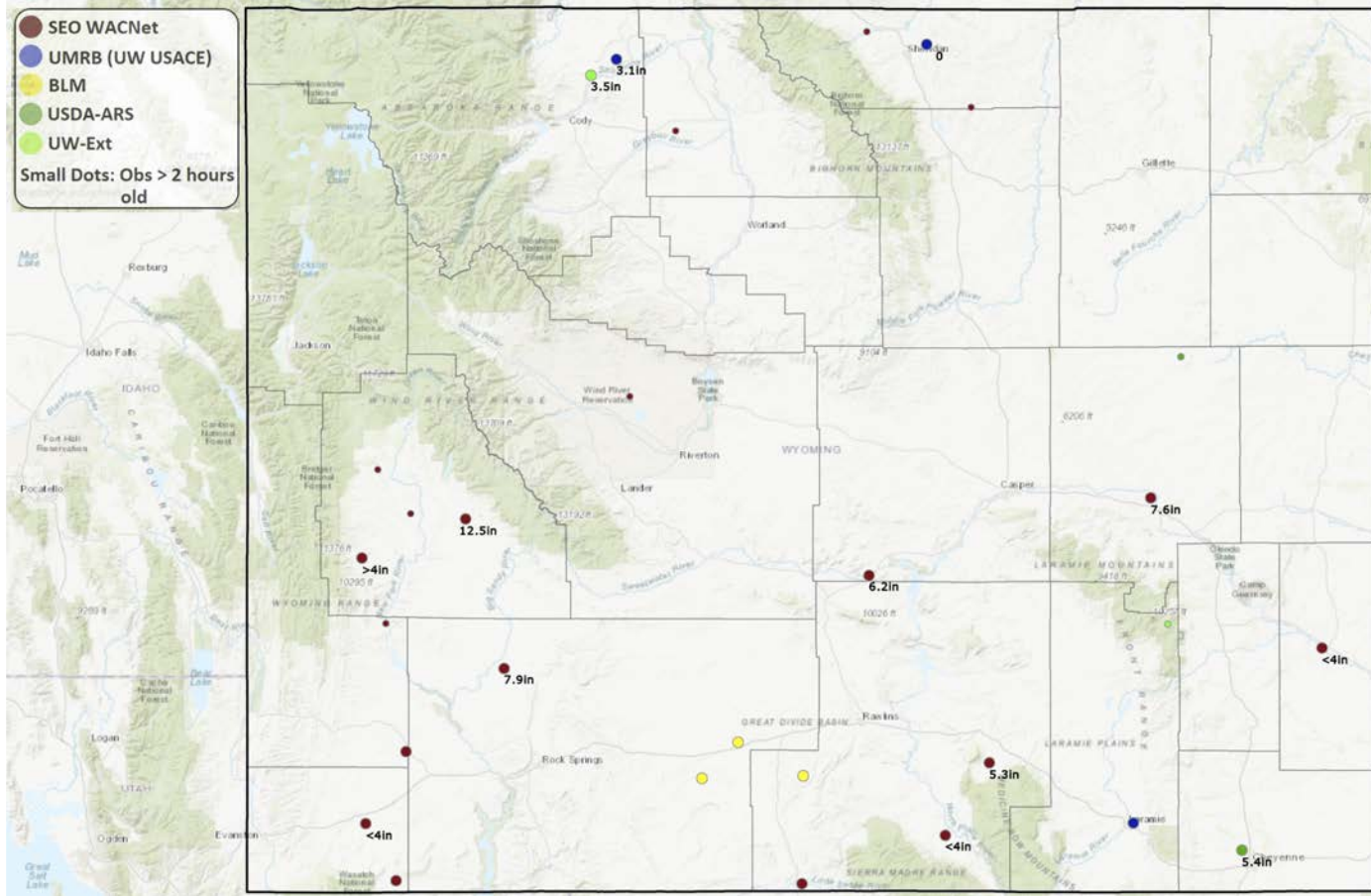
Frost Depth (inches) Douglas 4NW - 2021-12-16 09:00:00 (Created Thu Dec 16 10:14:35 MST 2021)



Frost depth reaching down over a half foot

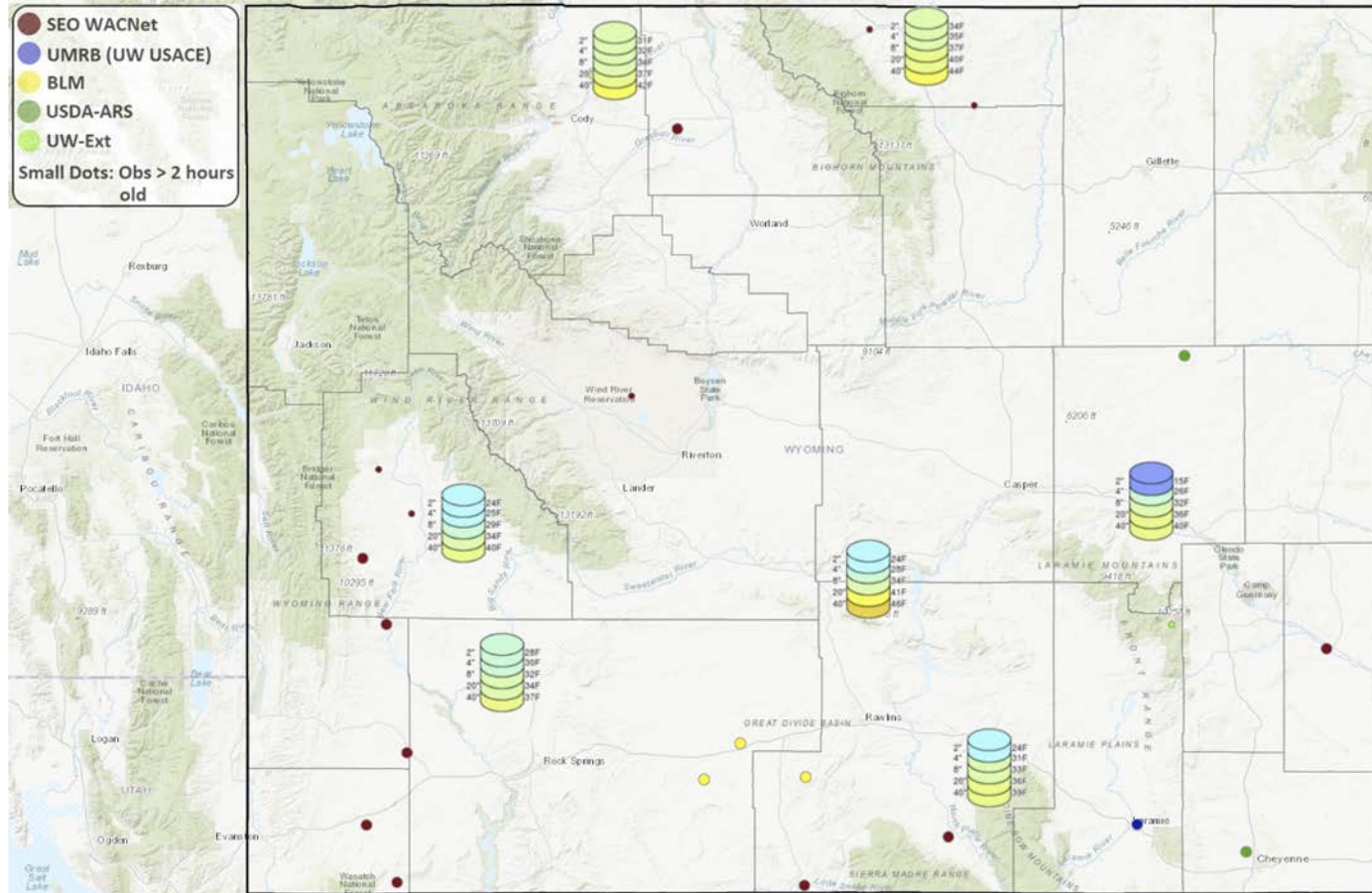


Frost Depths at 0800 16 Dec 2021

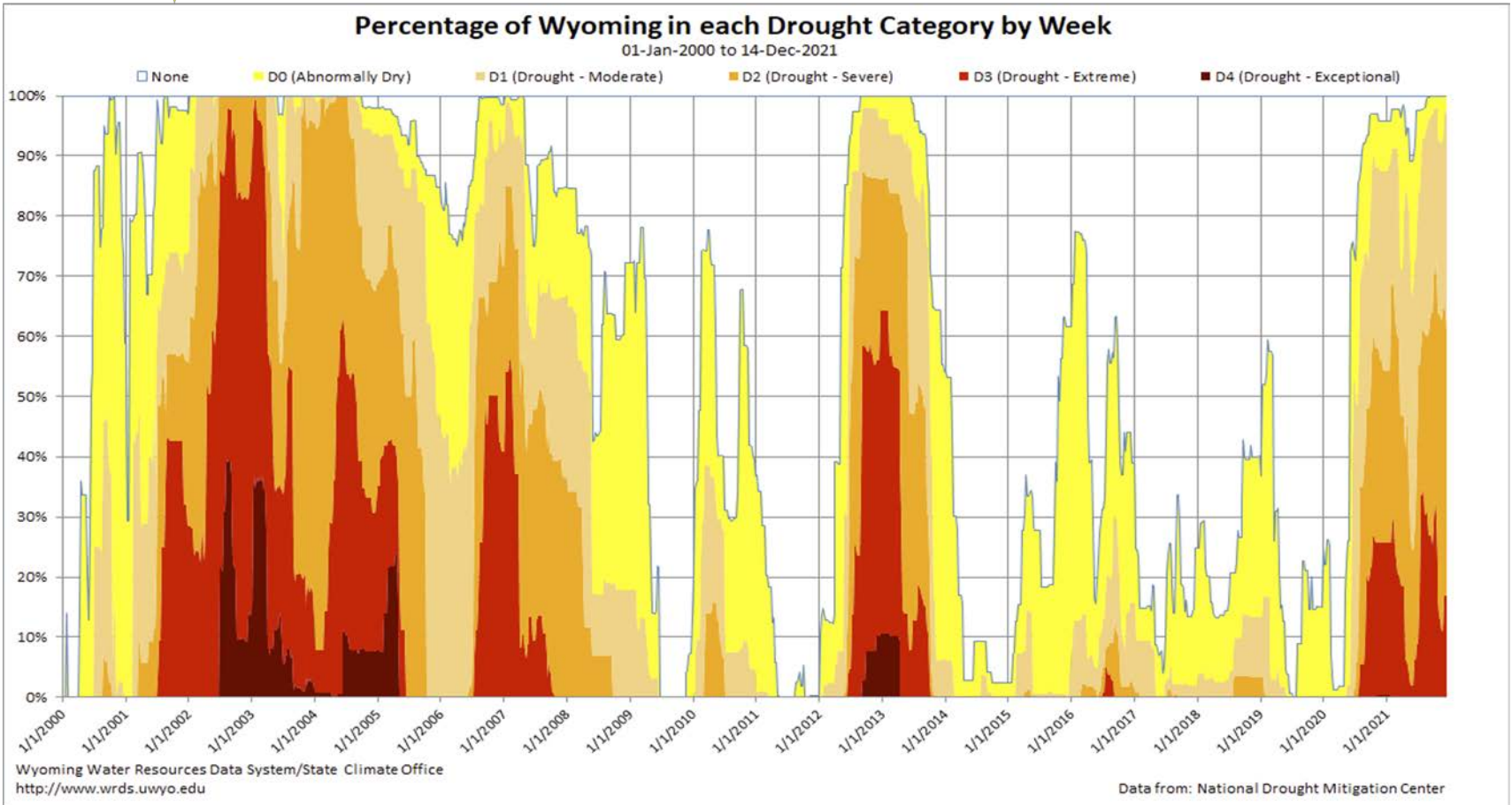




Soil Temperatures at 0800 16 Dec 2021



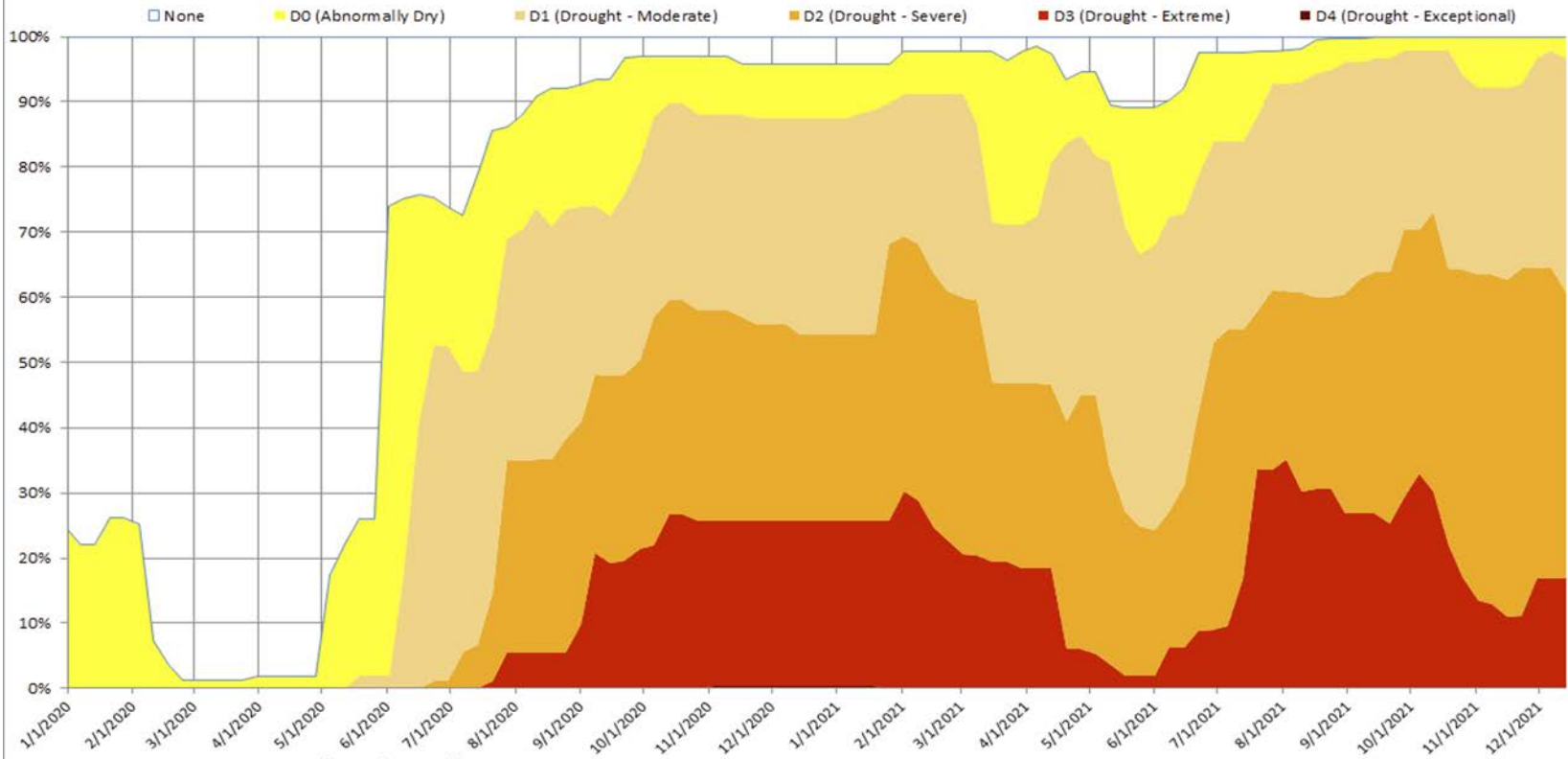
Wyoming Area Affected: 100% D0-D4 ; 96.7% D1-D4





Percentage of Wyoming in each Drought Category by Week

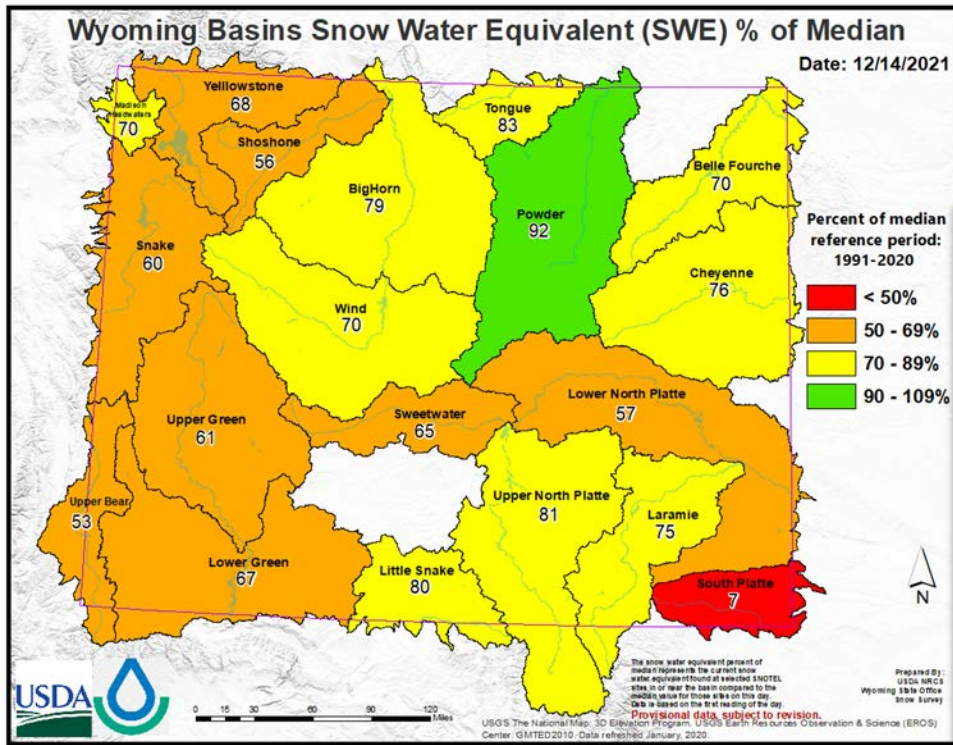
01-Jan-2020 to 14-Dec-2021



SWEs % Median

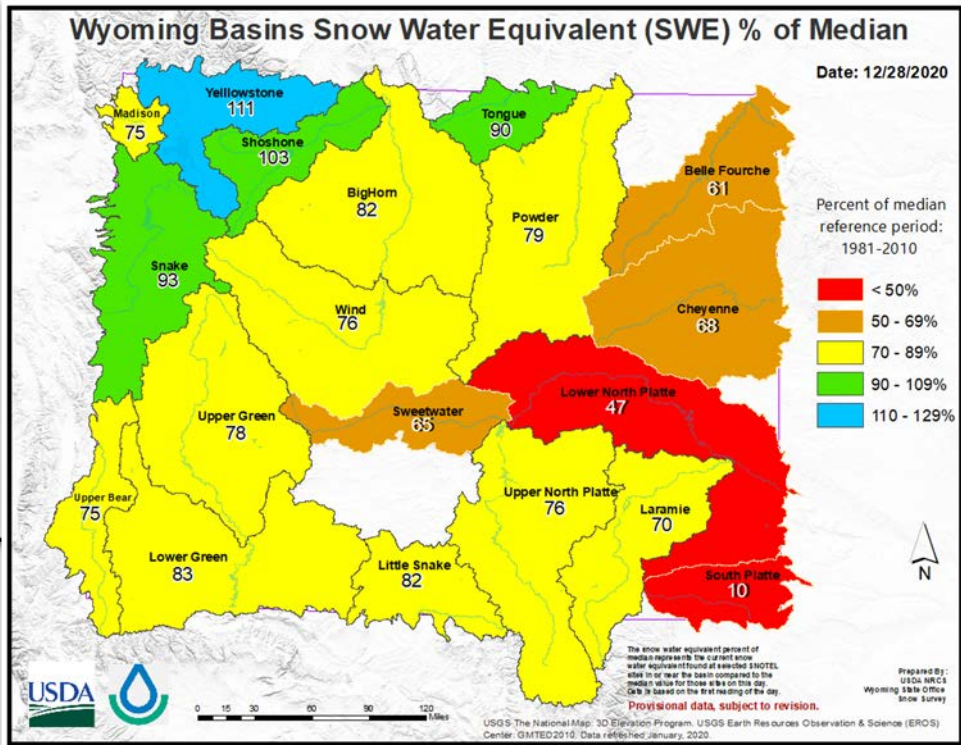


<https://www.nrcs.usda.gov/wps/portal/wcc/home/>



State Wide = **71%**

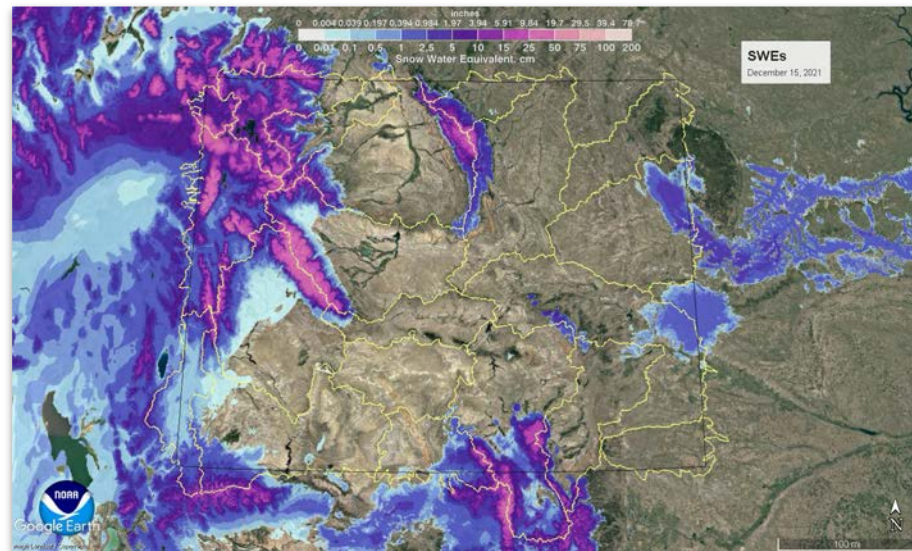
2020



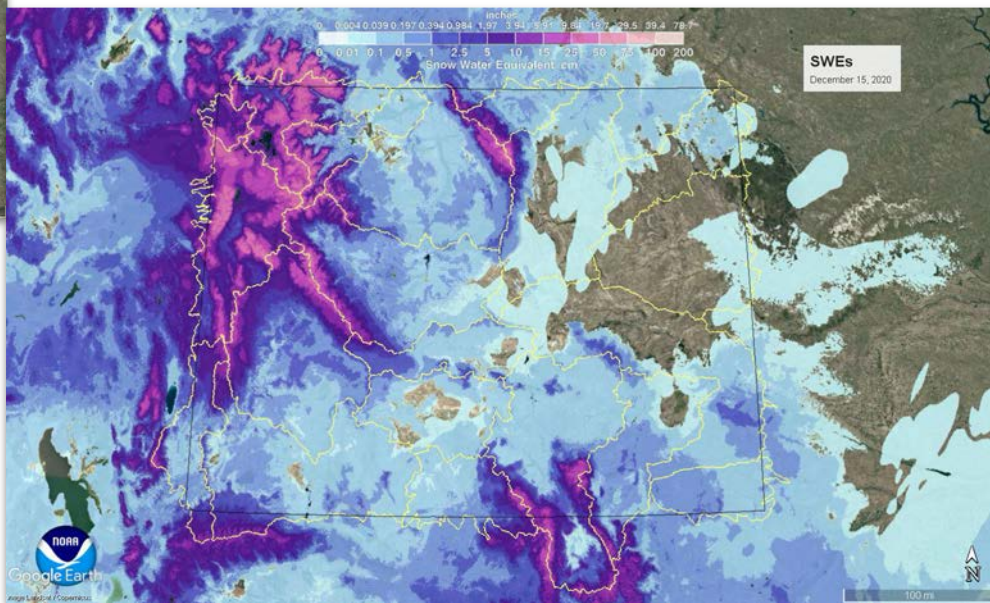
2021

State Wide = **66%**

SWEs – NOHRSC Analysis

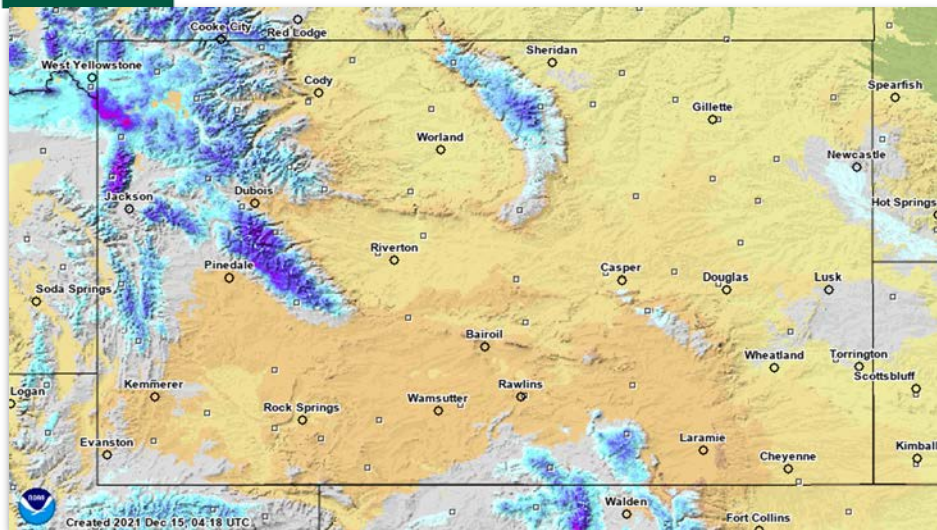


2021



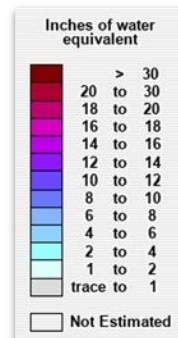
2020

December 2016 – Quick Changes

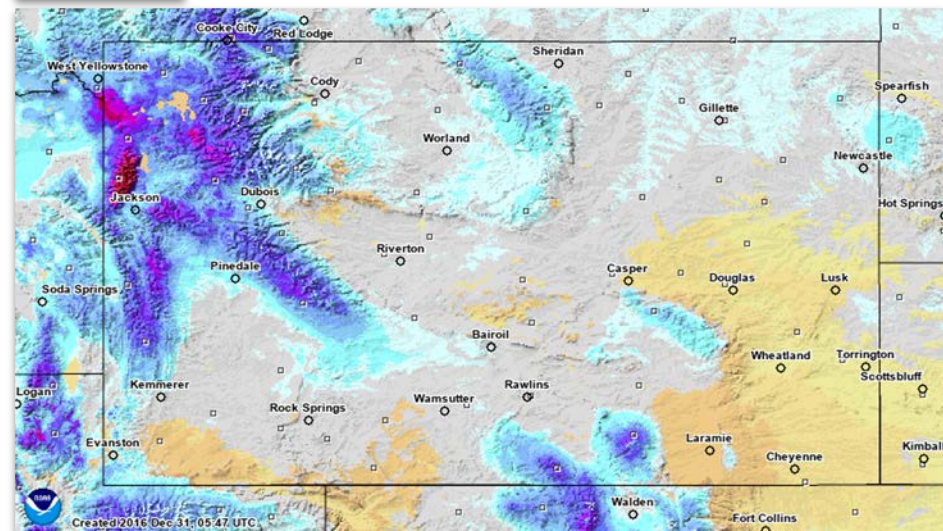


December 15, 2016

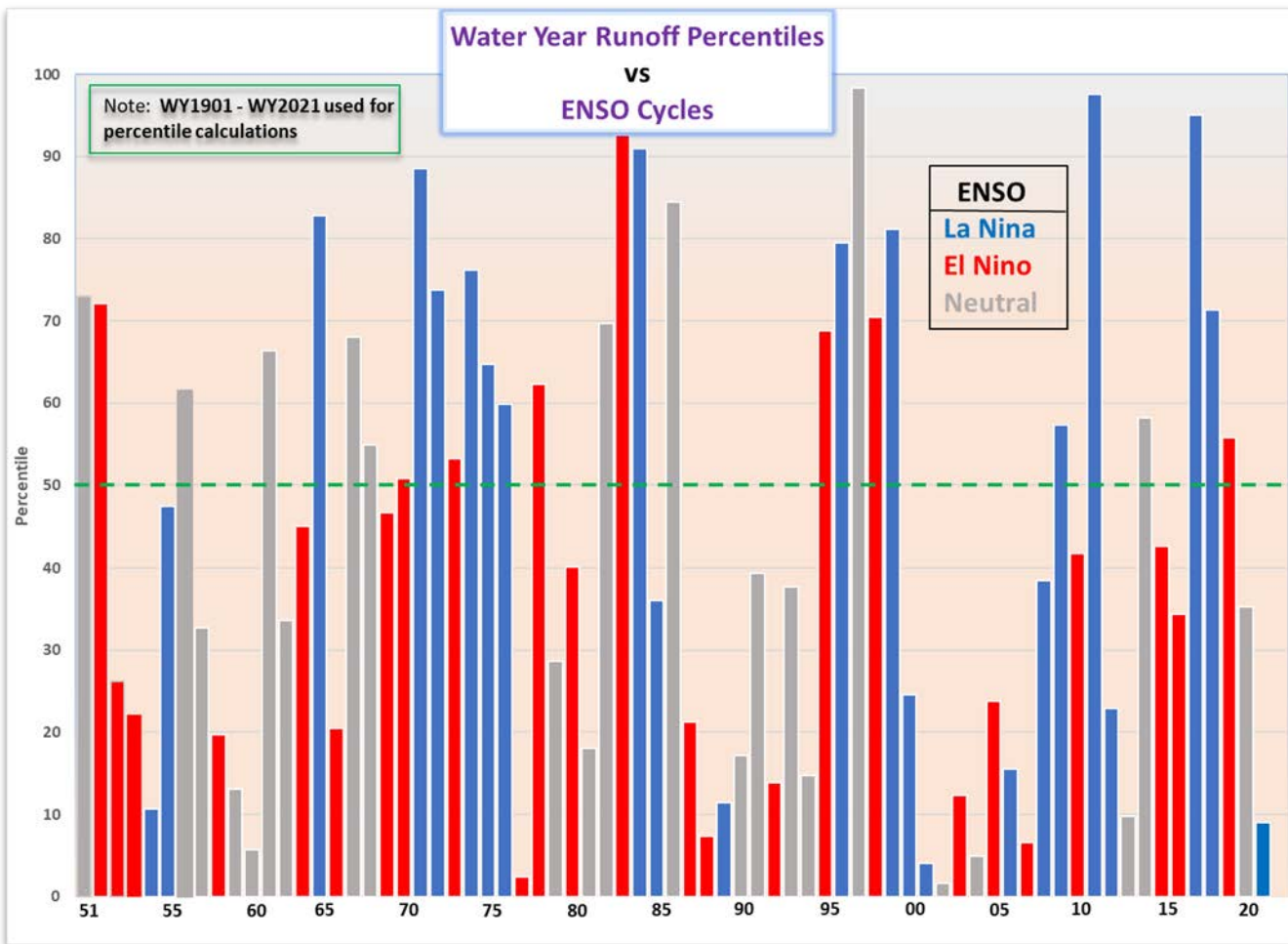
Runoff 2017 was **6th** highest (120 yrs of data)



December 31, 2016



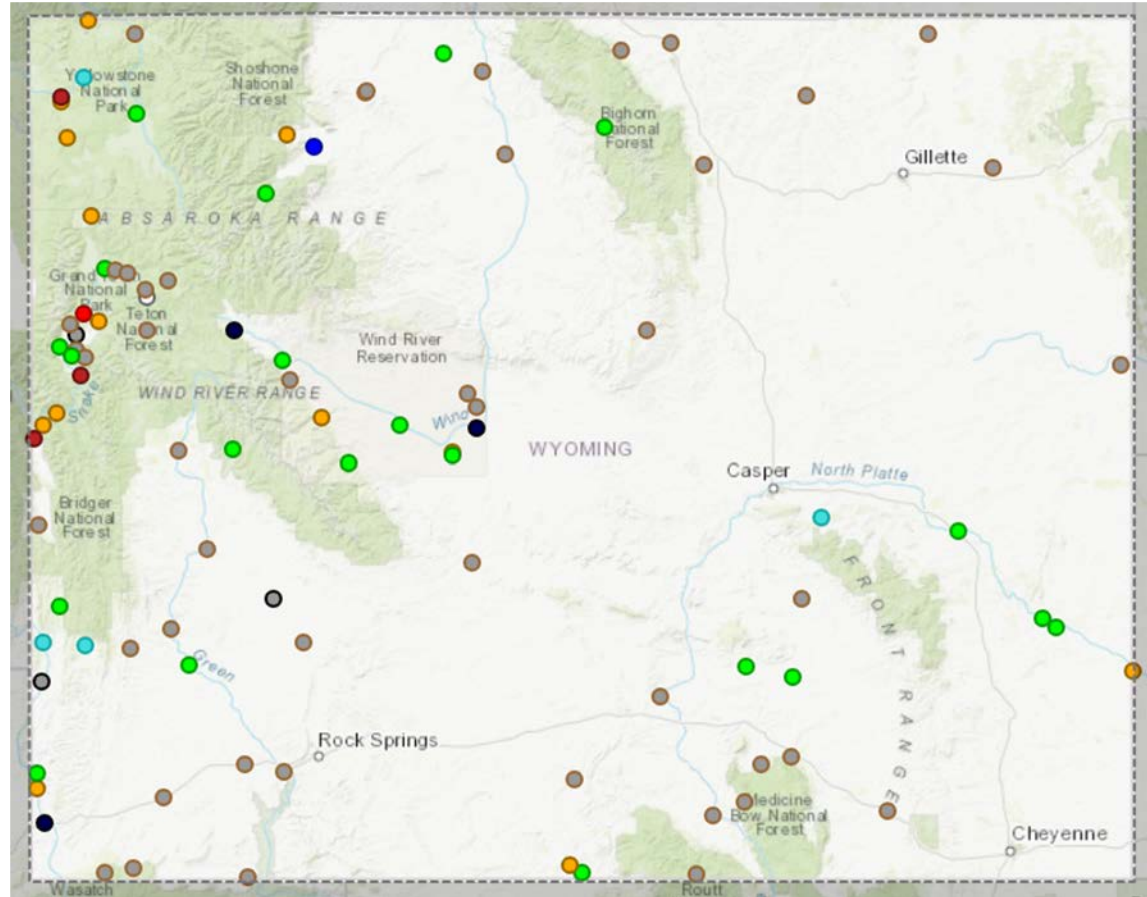
ENSO and Runoff



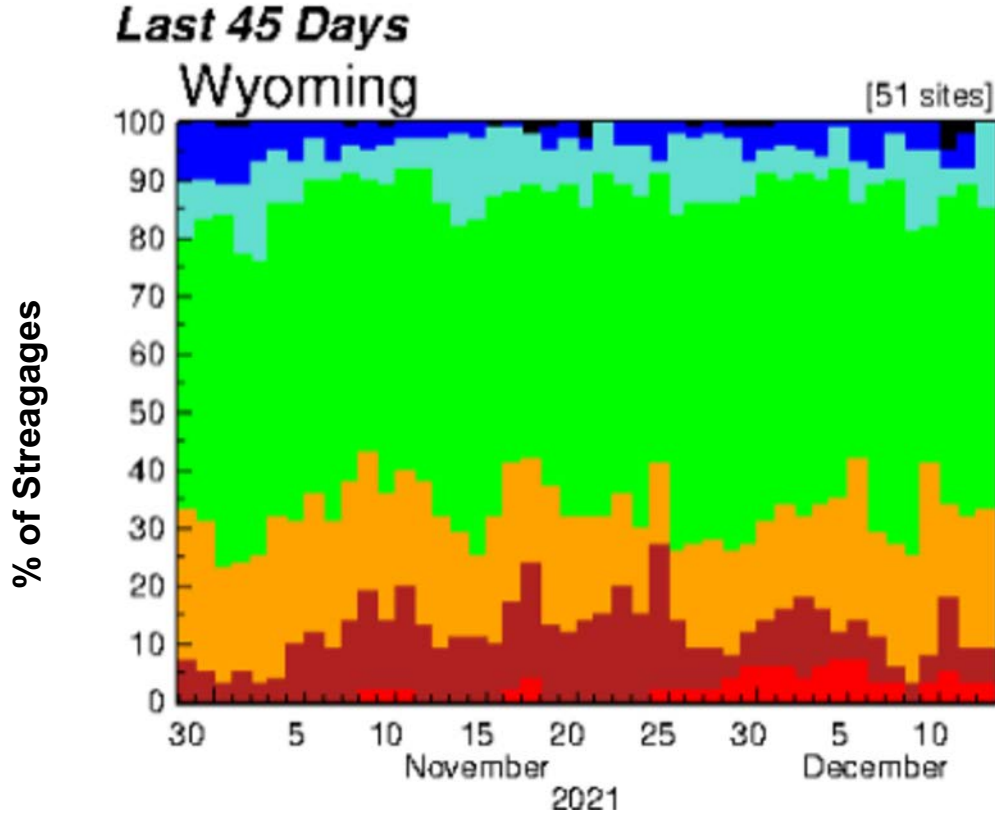
Streamflow Status

Streamflow: Status

- Above flood stage
- All-time high for this day (100th percentile (maximum))
- Much above normal (>90th percentile)
- Above normal (76th – 90th percentile)
- Normal (25th – 75th percentile)
- Below normal (10th – 24th percentile)
- Much below normal (<10th percentile)
- All-time low for this day (0th percentile (minimum))
- Not flowing
- Not ranked
- Measurement flag
- Recent measurement unavailable



Flow Trends since Early November











Only sites with 30 yrs record and no missing values.

Stable conditions

Trend since late November
increase in **Low**

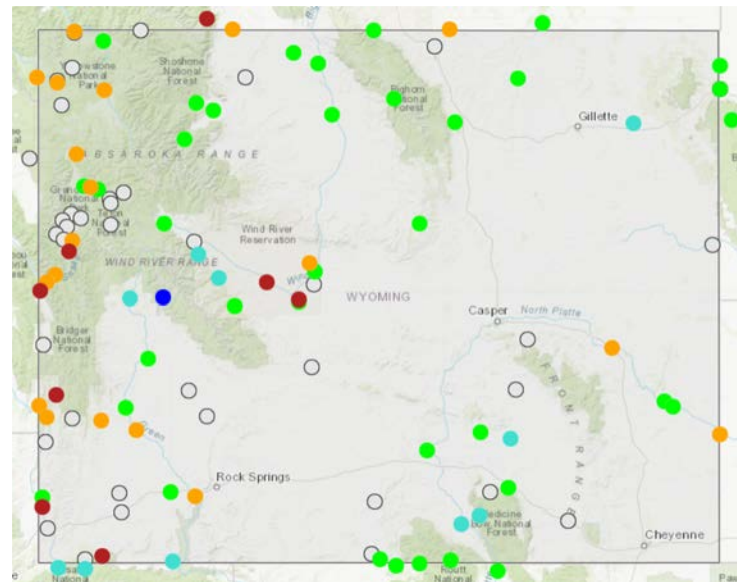
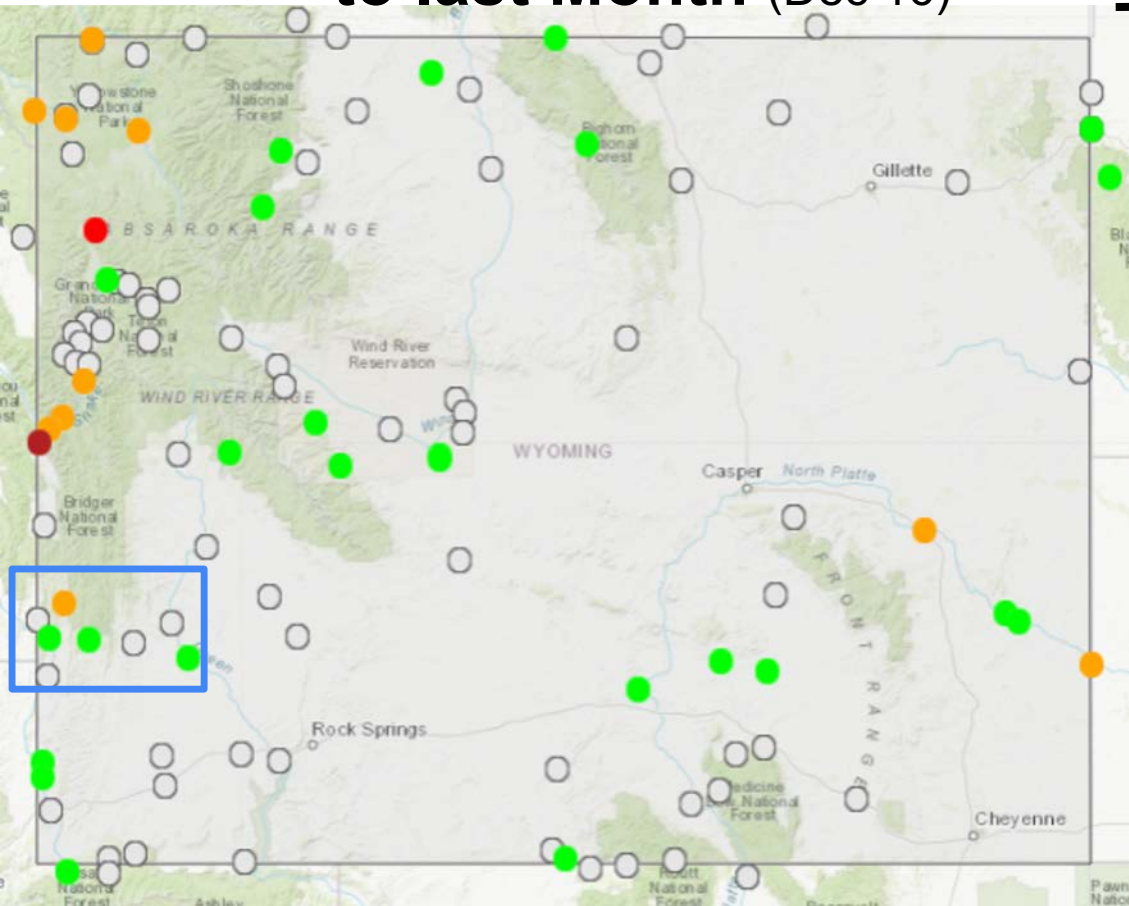
Record Daily Low Flow

- Snake River ab Jackson Lake

Explanation - Percentile classes								
								
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked	
	Much below normal	Below normal	Normal	Above normal	Much above normal			

7-Day Avg Compared to last Month (Dec 16)

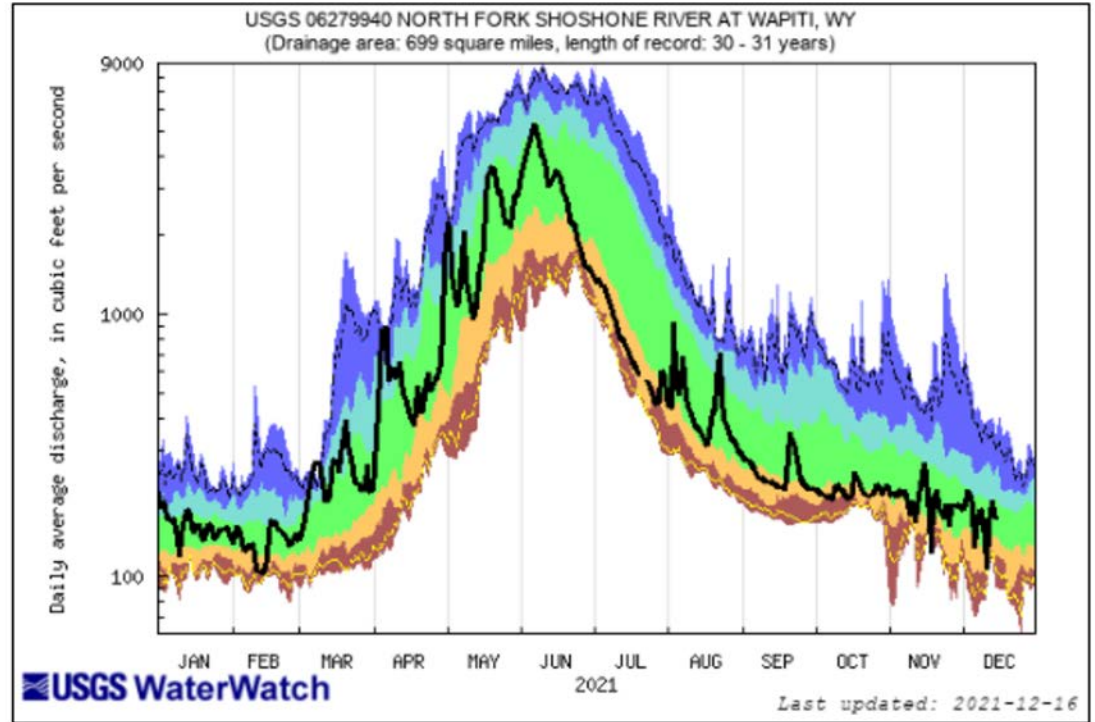
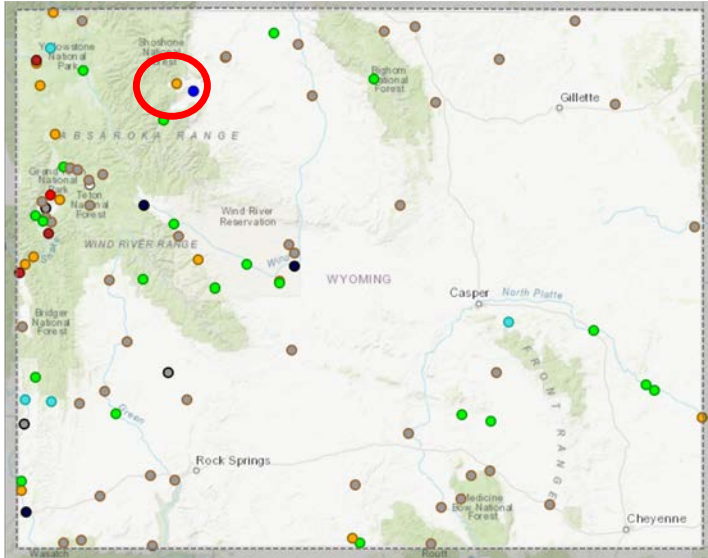
Nov 18



- Many sites in ice
- WC - improvements
- NW - Still dry

Select WY Streamflows

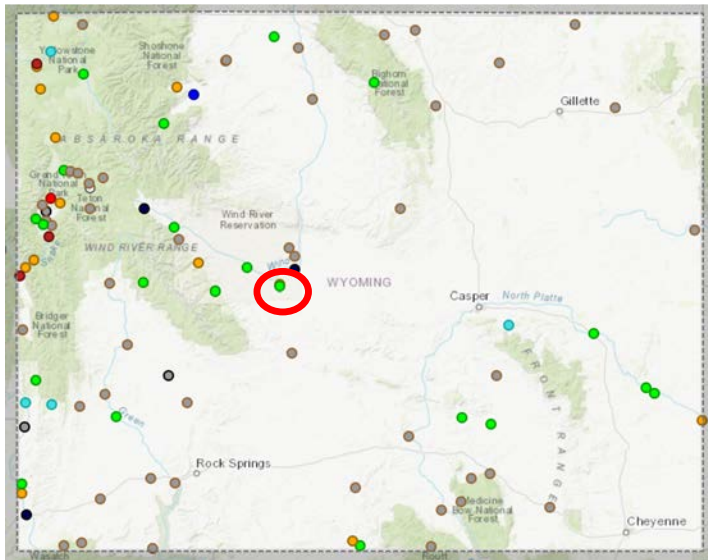
North Fork ShoShone, WY Last updated Dec 16, 2021



<https://dashboard.waterdata.usgs.gov/>
<https://waterdata.usgs.gov/>

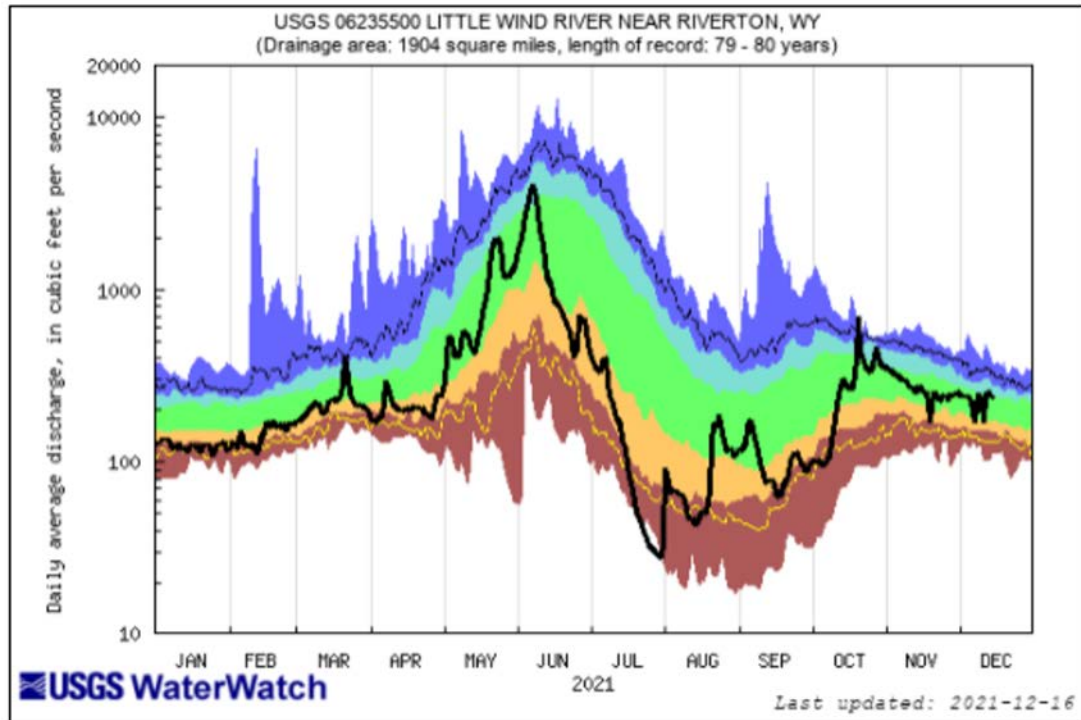
Explanation - Percentile classes							
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile -highest	Flow
Much below Normal	Below normal	Normal	Above normal	Much above normal			

Select WY Streamflows



Little Wind River near Riverton, WY

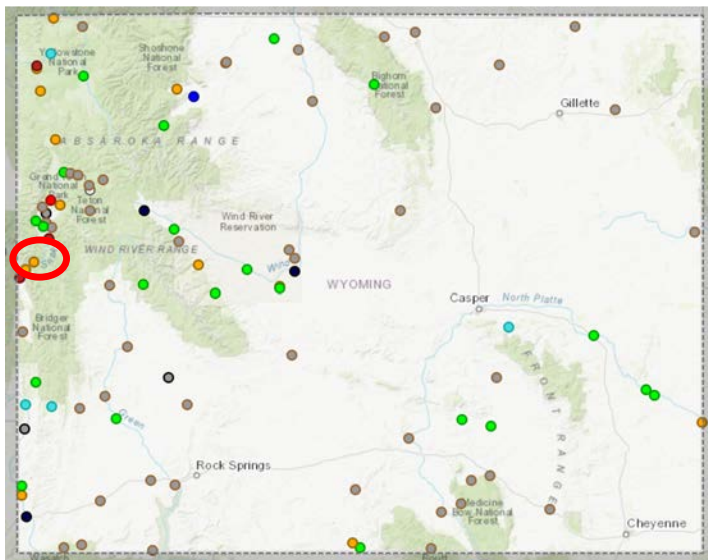
Last updated Dec. 16, 2021



<https://dashboard.waterdata.usgs.gov/>
<https://waterdata.usgs.gov/>

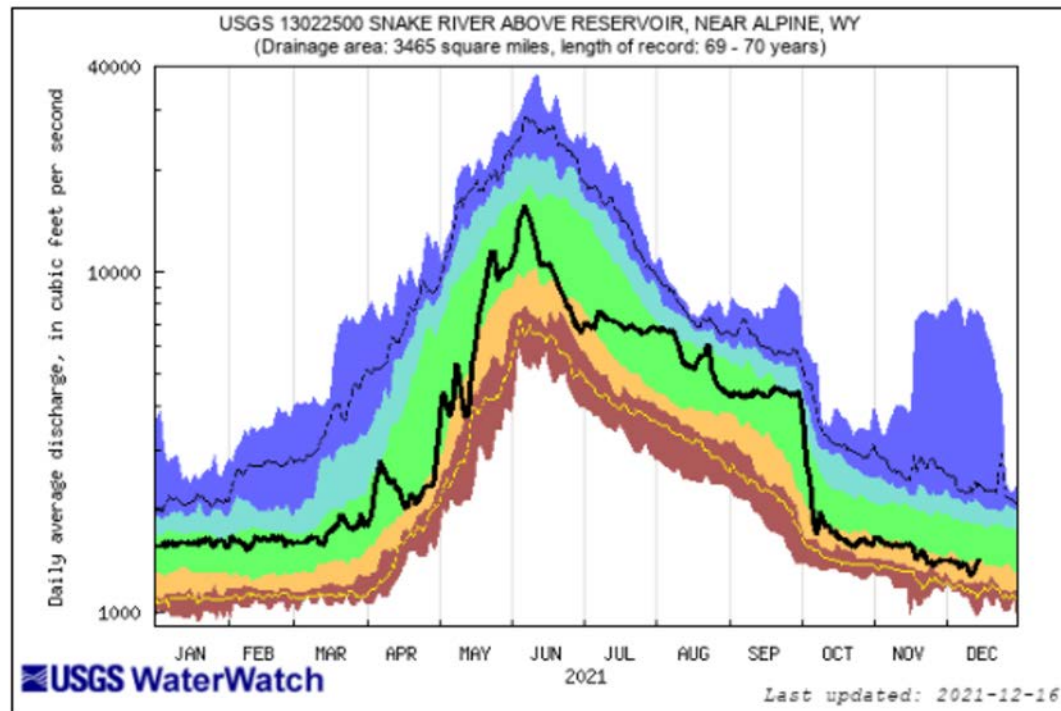
Explanation - Percentile classes						
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile - highest
Much below Normal	Below normal	Normal	Above normal	Much above normal		Flow

Select WY Streamflows



Snake River Above Reservoir Near Alpine, WY

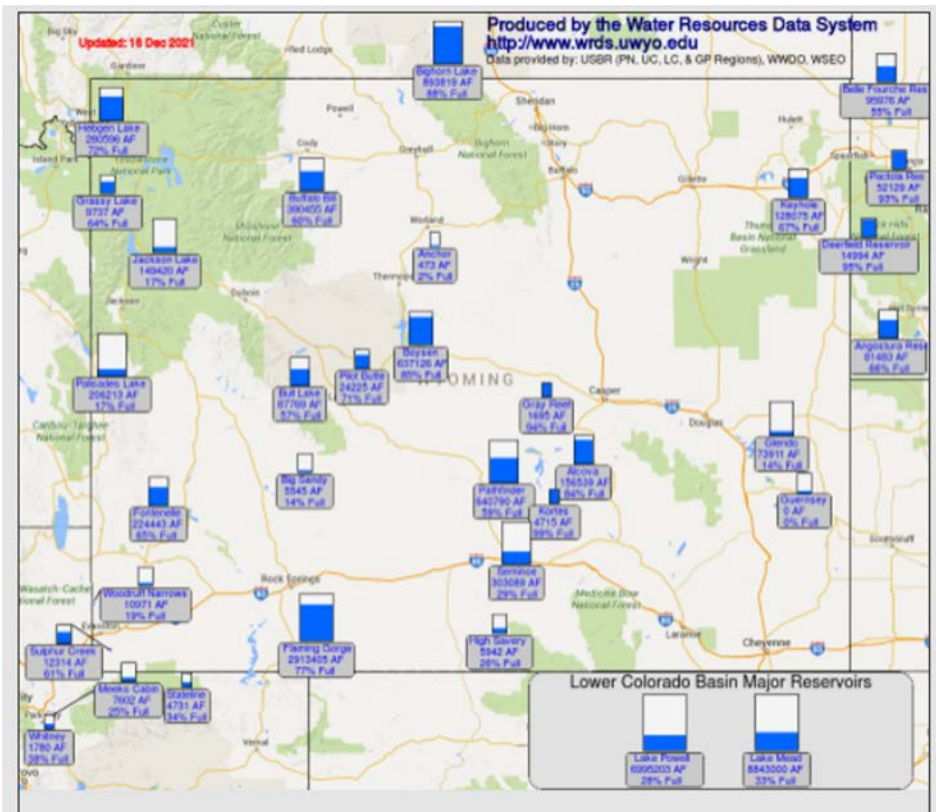
Last updated Dec. 16, 2021



<https://dashboard.waterdata.usgs.gov/>
<https://waterdata.usgs.gov/>

Explanation - Percentile classes						Flow
lowest-10th percentile	5	10-24	25-75	76-90	95	
Much below Normal		Below normal	Normal	Above normal	Much above normal	

WY Reservoirs (Updated 12/16/21)



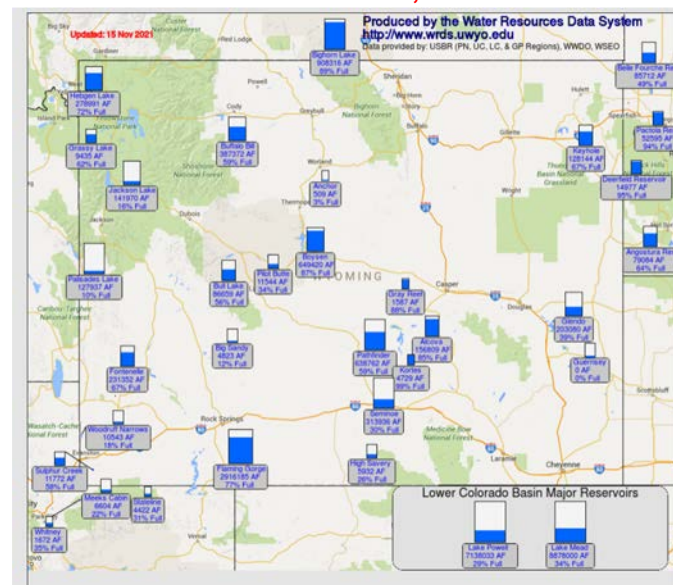
December 16, 2021

http://www.wrds.uwyo.edu/surface_water/teacups.html

Compared to November

- No significant changes
- Some minor increases and decreases in storage.

November 18, 2021





Forecasts & Outlooks



7-Day Quantitative Precipitation Forecast November 18-24

7-Day Quantitative Precipitation Forecast 16 Dec 2021



Provisional data, subject to revision

Quantitative Precipitation Forecast
= Liquid Precipitation Forecast

- Minimal precipitation on the lower elevations
- Snow Showers today - Friday
- Drier Conditions early next week
- More mountain snow showers possible near Christmas but limited in lower elevations
- Windy late week and weekend

The Quantitative Precipitation Forecast shows the liquid amount of forecasted precipitation over the next 7 days
The Forecast is created by the National Weather Service Weather Prediction Center
Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, National Centers for Environmental Prediction,
and Weather Prediction Center - <https://www.wpc.ncep.noaa.gov>
Map Layout Created 16 Dec 2021 <http://www.wrds.uwyo.edu>

<https://bit.ly/3bZXQeN>



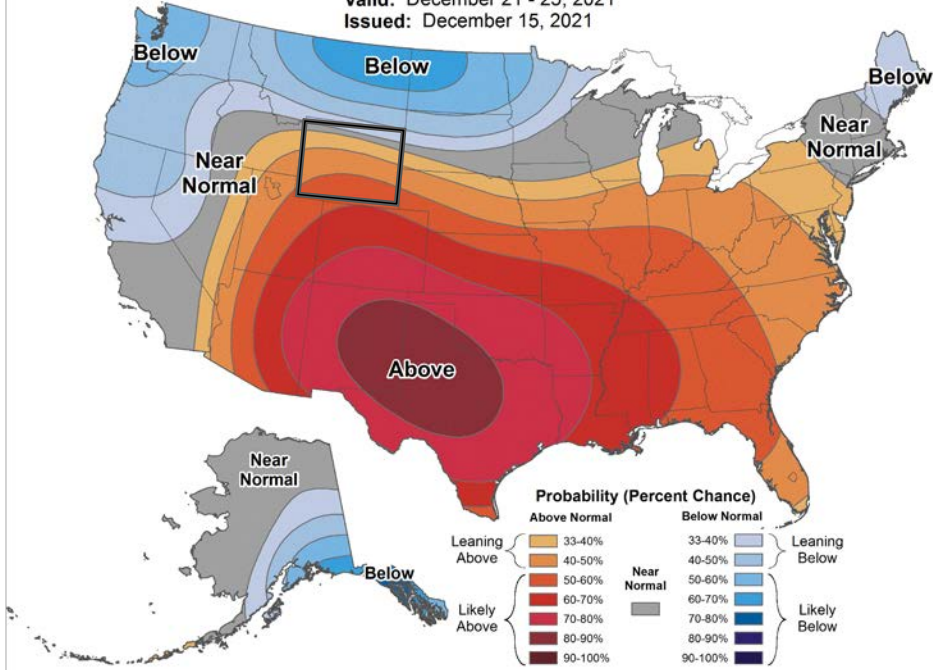
6-10 Day Outlooks December 21 - 25

Probability = Chance

6-10 Day Temperature Outlook



Valid: December 21 - 25, 2021
Issued: December 15, 2021

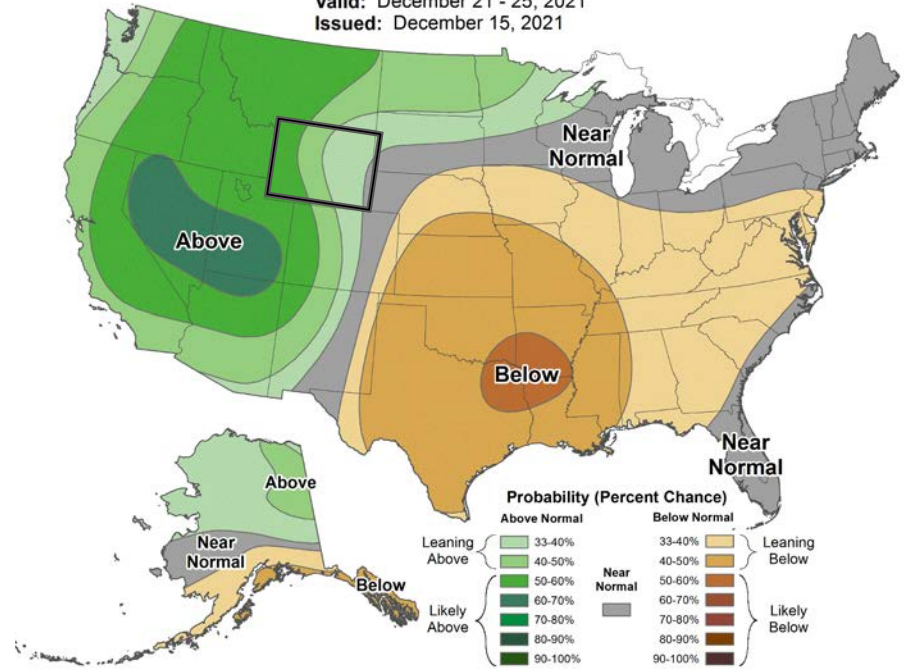


Favored warmer than normal

6-10 Day Precipitation Outlook



Valid: December 21 - 25, 2021
Issued: December 15, 2021



Favored slightly above normal, especially west



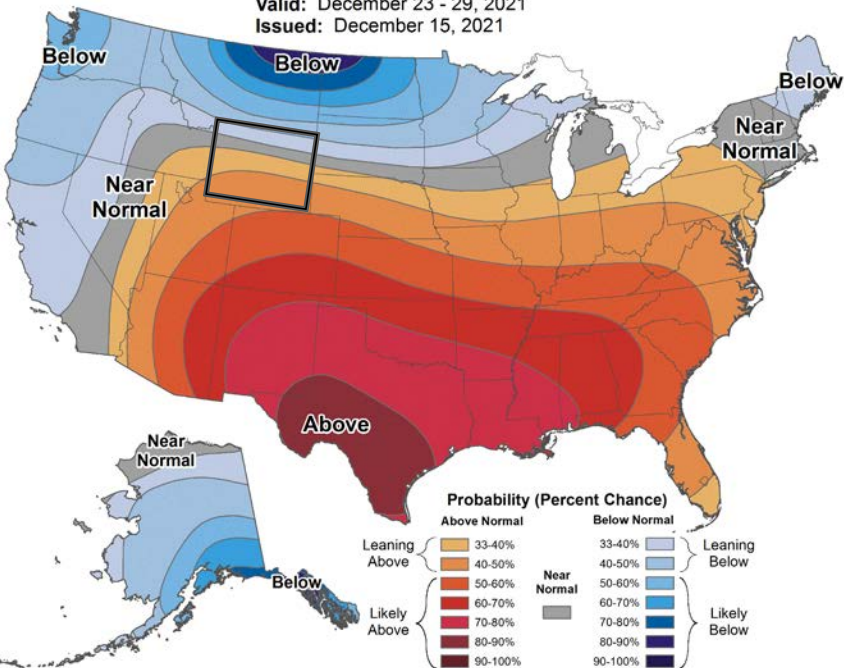
8-14 Day Outlooks December 23 - December 29

Probability = Chance

8-14 Day Temperature Outlook



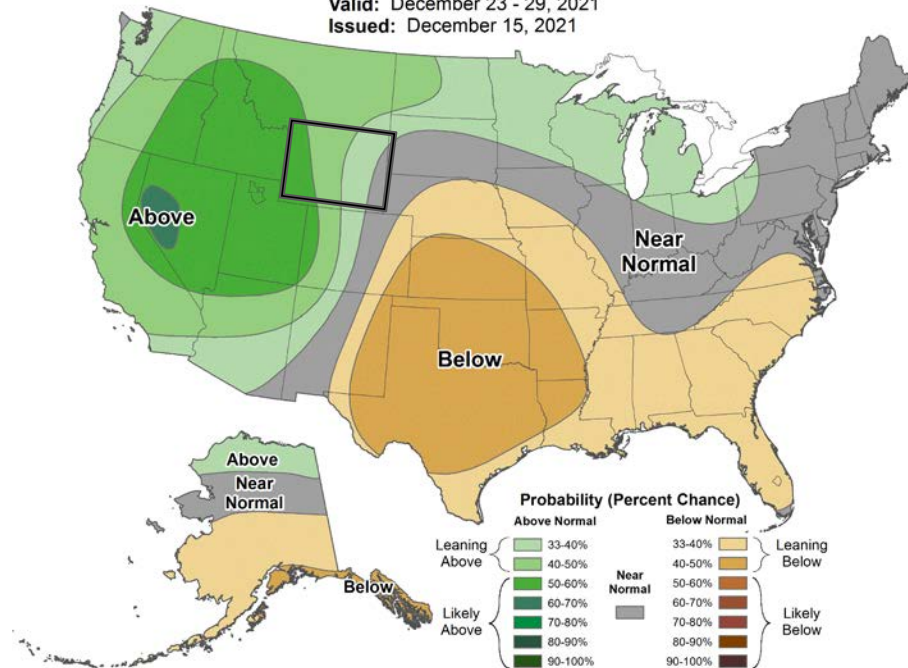
Valid: December 23 - 29, 2021
Issued: December 15, 2021



8-14 Day Precipitation Outlook



Valid: December 23 - 29, 2021
Issued: December 15, 2021

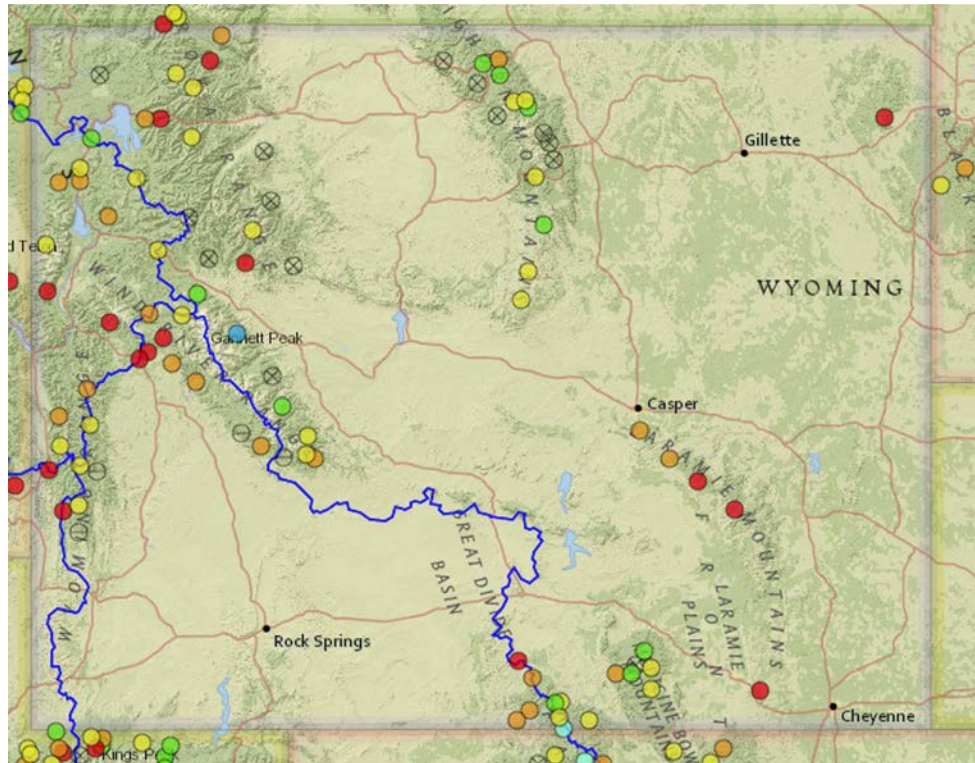
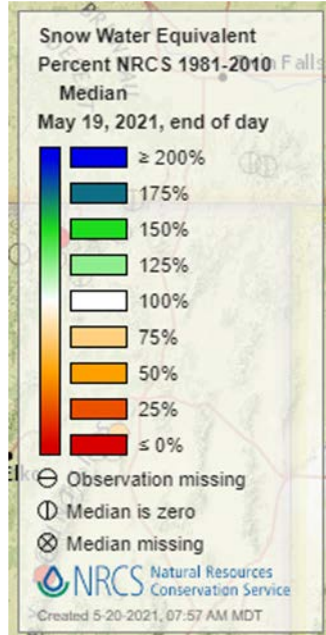


Favored warmer than normal to near normal

Favored generally above normal, especially west



Wyoming Snotel Snapshot Update



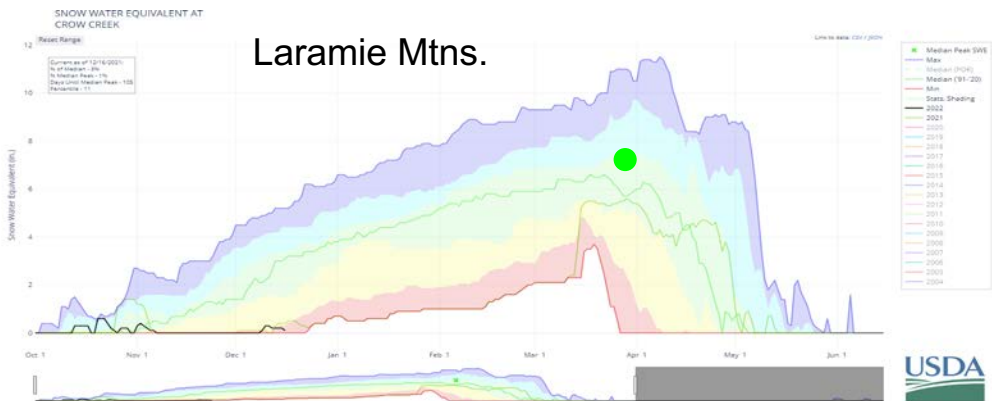
Snotel Sites - (Snow Telemetry) - are monitoring stations measuring snowpack, precipitation, temperature & other climate conditions.

- Pockets of near normal snow water equivalent values in Big Horn Mountains, Snowys, and a few in the Wind River Range.
- However, many areas on Laramie Range, Sierra Madre, and Wine to Wyoming Ranges plus Absorkas remain below to well below normal.



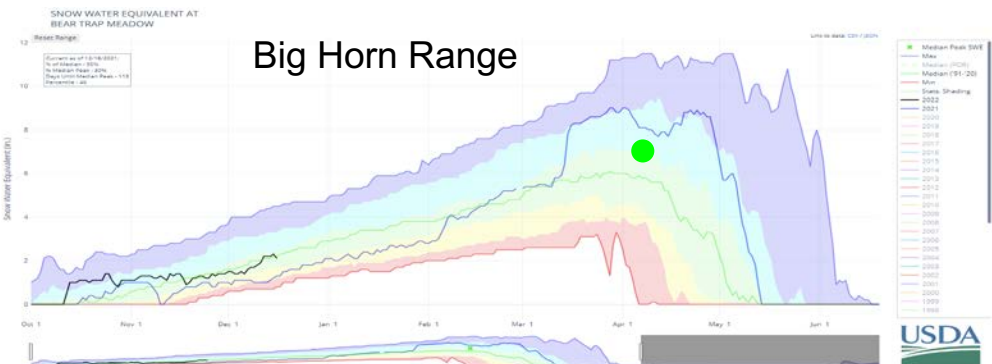
Wyoming Snotel Snapshot Update

Laramie Mtns.



- Laramie Mountains are off to a poor start regarding snow water equivalent.
- Near all record minimums in a few locations and running similar to last year at this time.

Big Horn Range



- Mix of near normal to slightly below normal for the Big Horns currently.
- Trends are slightly above this time last year.



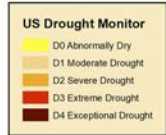
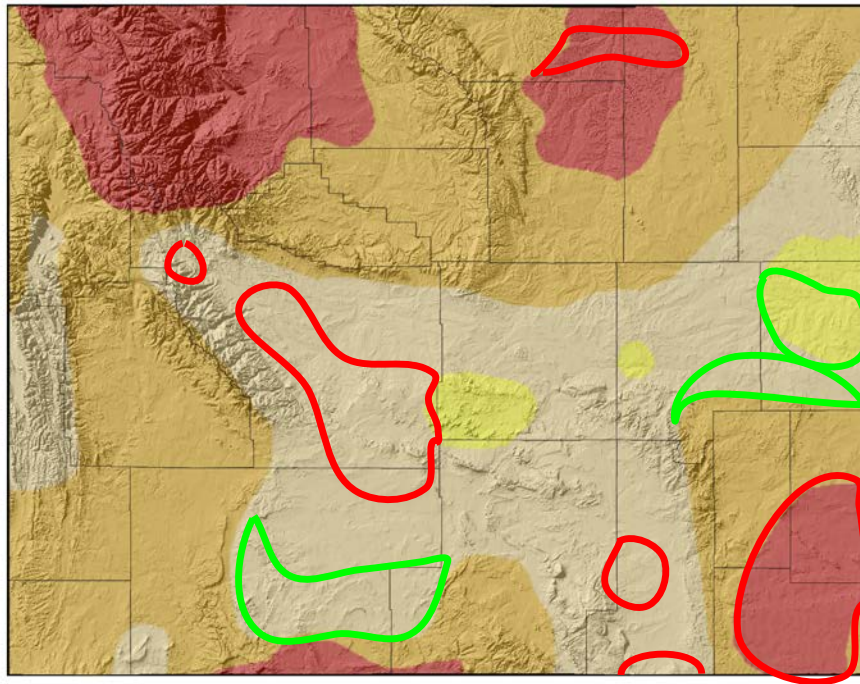
How to get involved ...

US Drought Monitor for December 14, 2021

(Released Thursday, December 16, 2021)

Valid 8 a.m. EDT

US Drought Monitor for 14 Dec 2021



Map Created by:
National Drought Mitigation Center
<https://droughtmonitor.unl.edu>



Map Layout Prepared by:
Wyoming State Climate Office
<http://www.wrds.uwyo.edu>



The U.S. Drought Monitor, is a weekly map of drought conditions produced jointly by the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, and the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln. The U.S. Drought Monitor website is hosted and maintained by the NDMC. <http://droughtmonitor.unl.edu>

Map Layout Created 16 Dec 2021 <http://www.wrds.uwyo.edu>

Drought Level	Percentile
None	>30
D0 (Abnormally Dry)	21 to 30
D1 (Moderate Drought)	11 to 20
D2 (Severe Drought)	6 to 10
D3 (Extreme Drought)	3 to 5
D4 (Exceptional Drought)	0 to 2

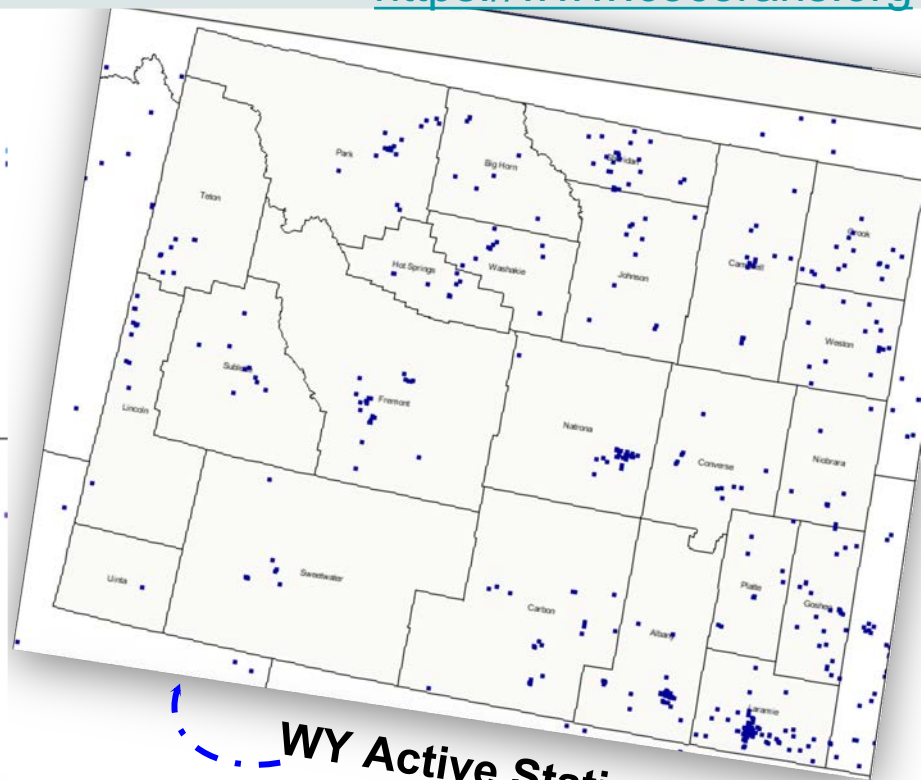
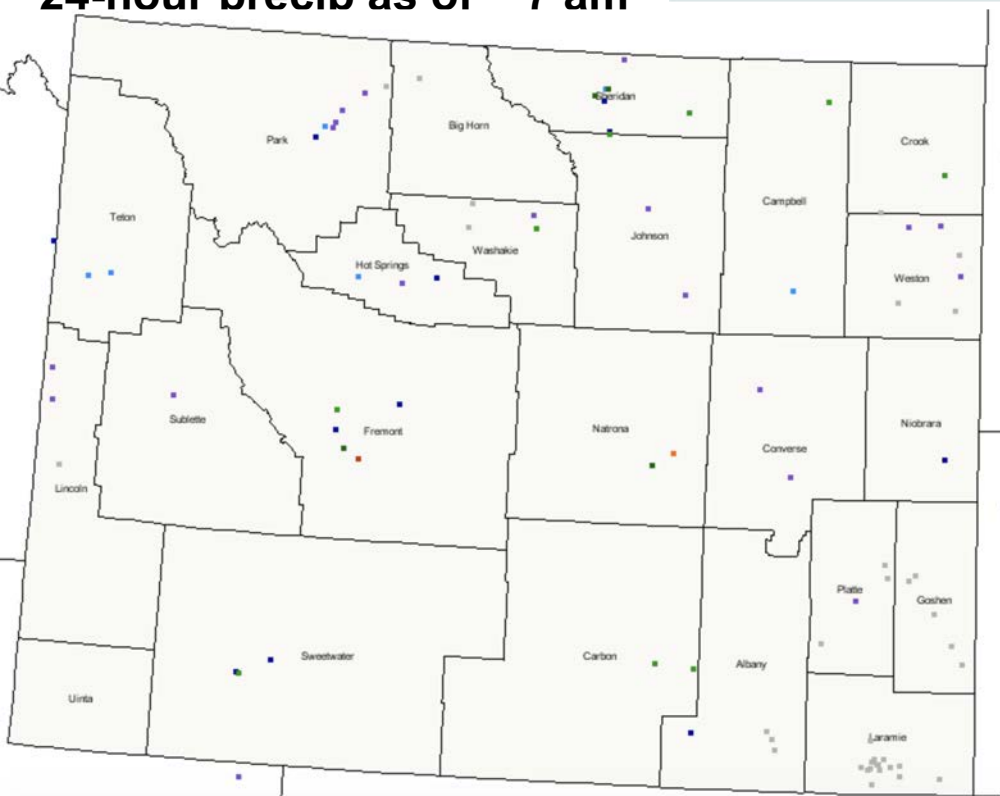
Improvements throughout the state where soil moisture improved from recent snows but also **degradations** in northern, central, and southeastern Wyoming where precipitation deficits continued through November and into December.



CoCoRaHS Mapping System

<https://www.cocorahs.org>

December 16, 2021:
24-hour precip as of ~ 7 am



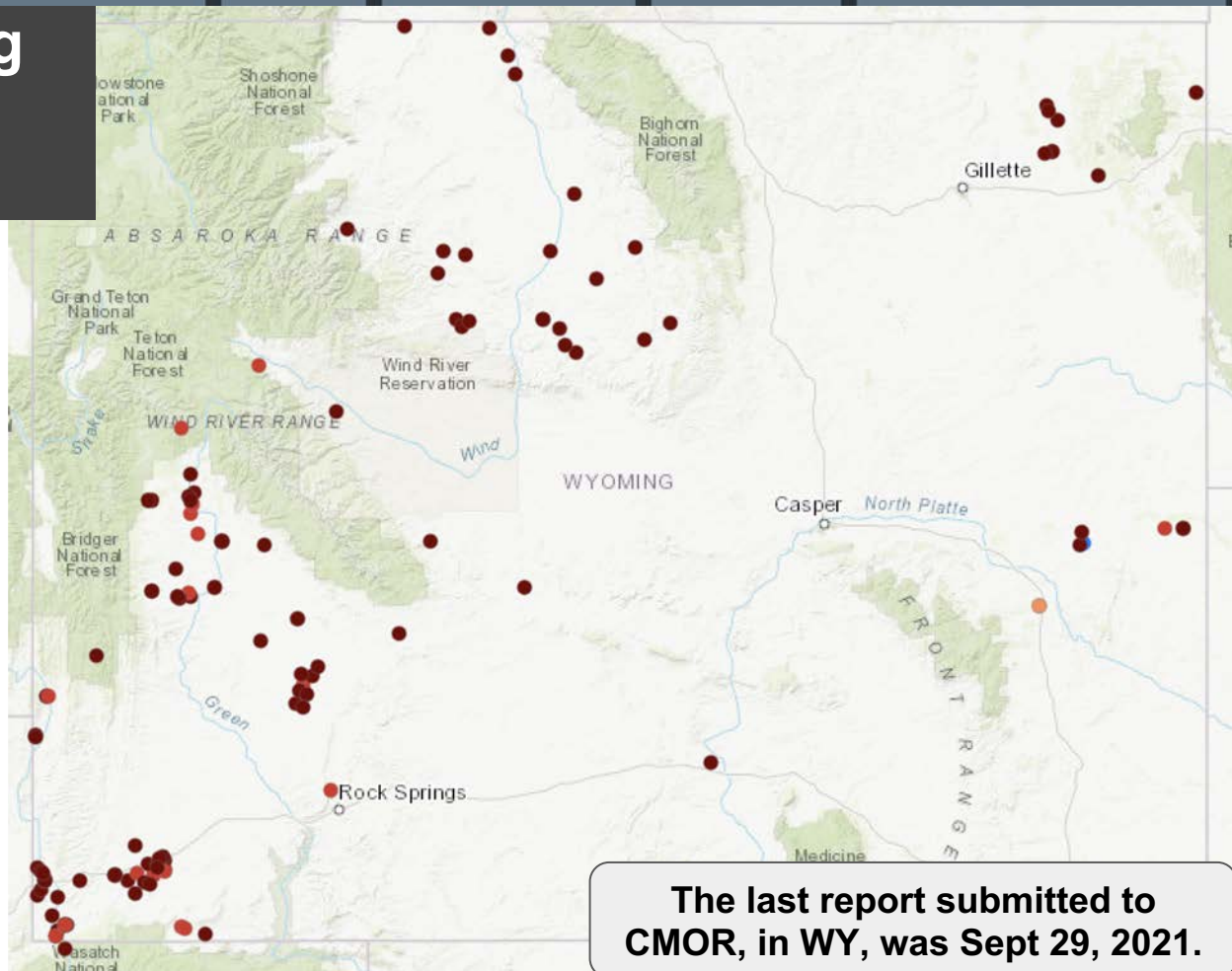
WY Active Station Locations



Condition Monitoring Observer Reports

<https://bit.ly/CMOReports>

- Severely Dry
- Moderately Dry
- Mildly Dry
- Near Normal
- Mildly Wet
- Moderately Wet
- Severely Wet



**The last report submitted to
CMOR, in WY, was Sept 29, 2021.**

Condition Monitoring Observer Reports

<https://bit.ly/CMOReports>

- Comparison photos → resource conditions
- Regular reporting is helpful (e.g., monthly)
- **Note:** Reports and photos are available to the public.

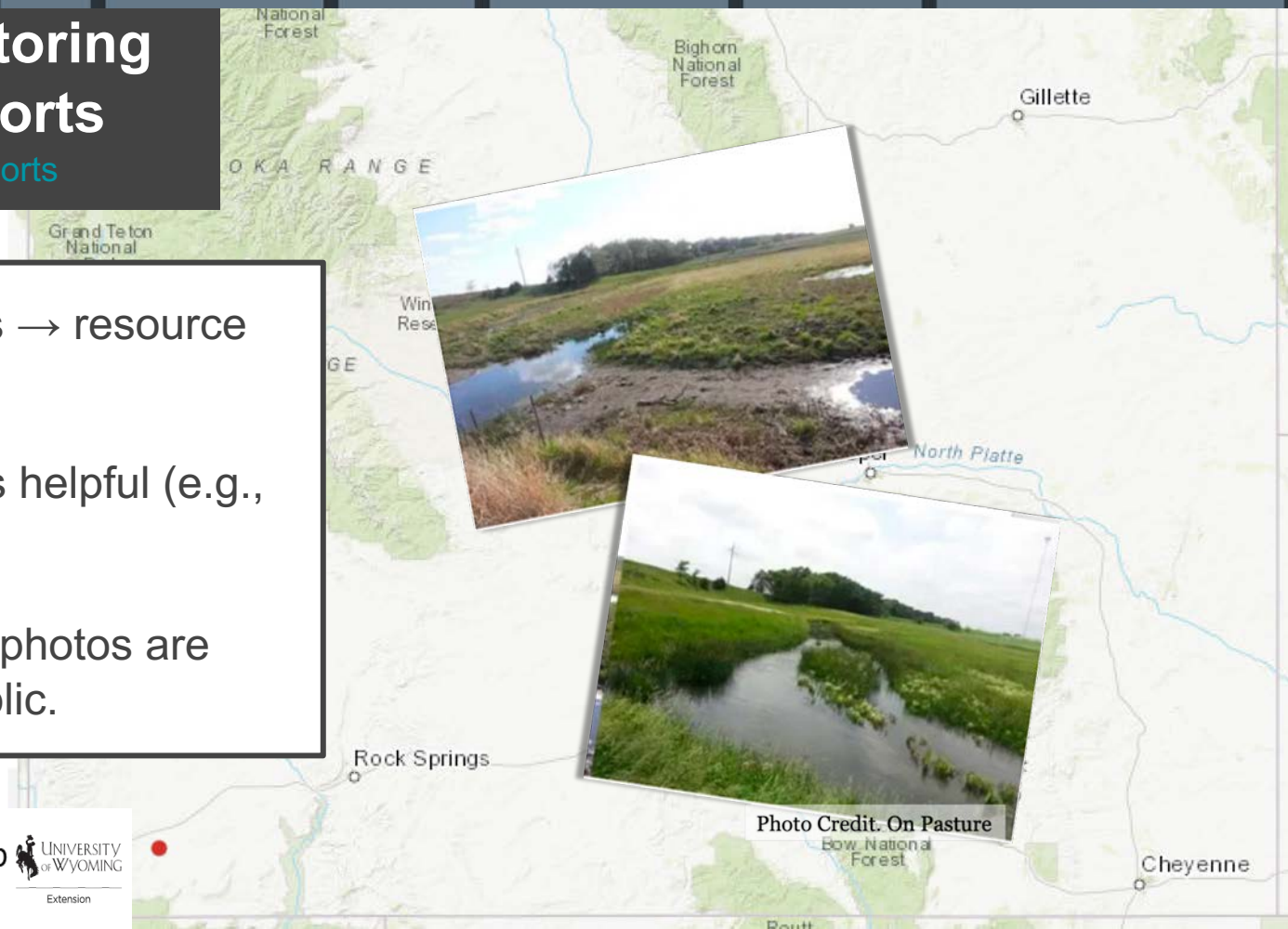


Photo Credit. On Pasture



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Aaron Fiaschetti

USGS
afiaschetti@usgs.gov

WY Drought Info & Resources

<https://drought.wyo.gov>

CoCoRaHS

<https://www.cocorahs.org>

Condition Monitoring Observer Reports (CMOR)

<https://bit.ly/CMORreports>

Thank you! Questions?