Under the Big Sky

e-Letter

April 2023

Photo Credit: Ryan Bernhart Meteorologist at NWS Glasgow.

National Weather Service

Glasgow, MT

A Peak Inside:

National Weather Service

Glasgow, MT

The Winter of 2022-3

By Ted Jamba, Lead Forecaster at NWS Glasgow

Now that we're into May, we think it's safe to review this past winter (Without Mother Nature giving us a backlash, although if you've lived here long enough, you've probably experienced the white stuff in May).

Obviously, there was more snow than normal this winter. Here are the tallies for the season (so far– official end of the snow season is June 30):

Location	Snowfall 2022-3	Normal Snowfall	Liquid Equivalent*	Normal Liquid Equiv.
Glasgow	64.9"	40.7"	5.76"	4.11"
Glendive	36.3	22.6	4.27	4.76
Sidney	46.9	29.7	4.85	4.75
Plentywood	37.3	N/A	6.39	4.32
Saco	54.1	N/A	5.00	4.19
Culbertson	33.2	N/A	4.12	3.93

Figure 1: Table summary of seasonal snowfall and water equivalent compared with normal for various locations in NE Montana. Note: Observed data is since October 1, 2022 (Water Year).

For the country, precipitation was higher than normal, mainly in California and northeastward into parts of Montana, while it was lower than normal for the Plains states. A much needed drought relief has been observed for much of the West:

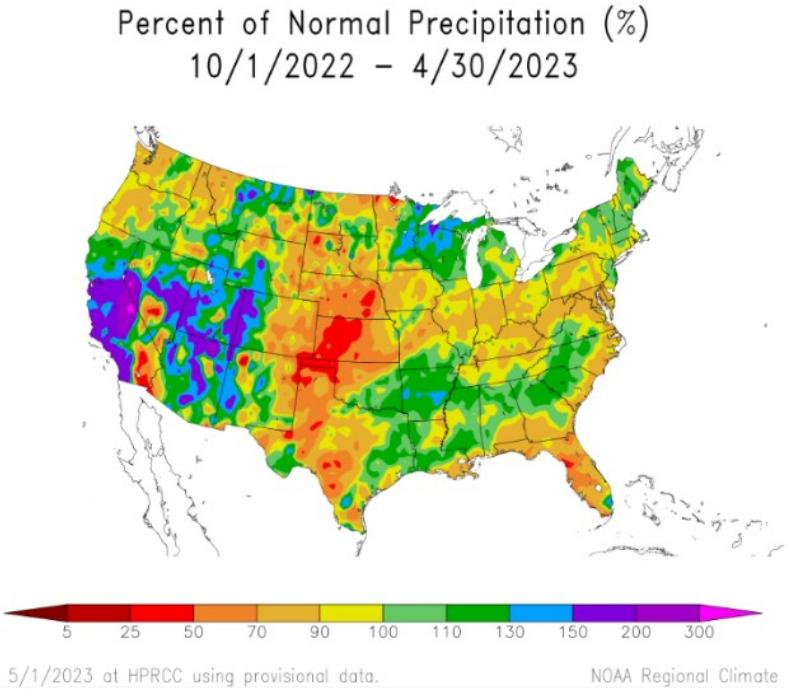


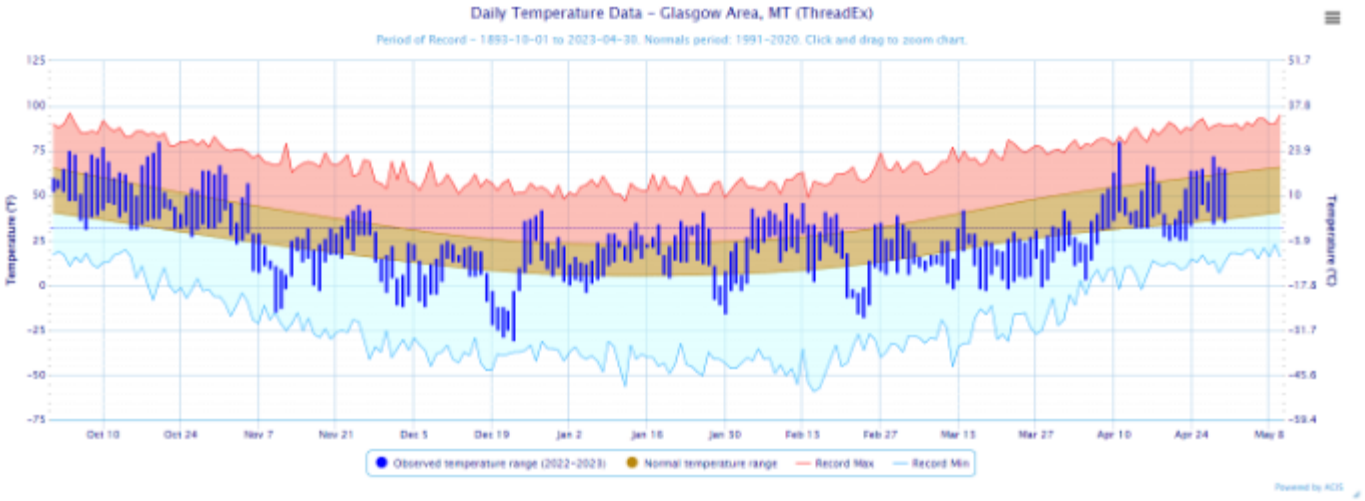
Figure 2: Percent of normal precipitation across the U.S. from October 1, 2022 through April 30, 2023.

The Winter of 2022-3 (Continued)

By Ted Jamba, Lead Forecaster at NWS Glasgow

Temperatures from October through April for northeast Montana fluctuated with several periods where temperatures were below normal. The most notable one was from late February until around April 8th. Glasgow's daily average temperature was below normal for an astounding 47 consecutive days!

Glasgow:



Glendive:

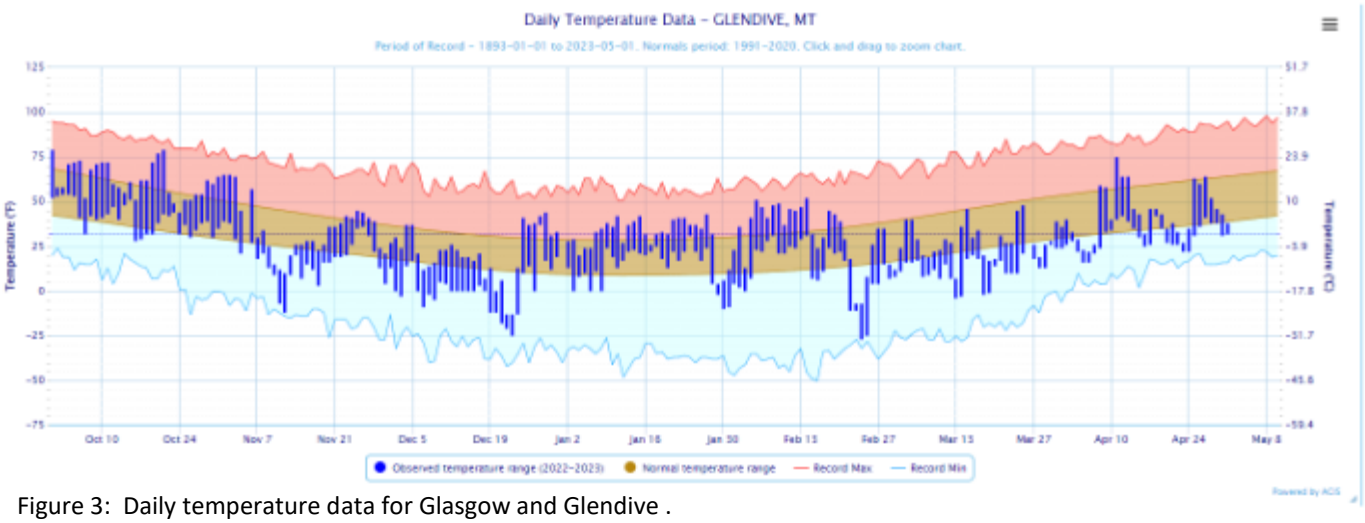


Figure 3: Daily temperature data for Glasgow and Glendive .

Some interesting things that we noticed this past winter:

- For Glasgow, it was the third snowiest season on record.
- March was colder than February.
- January had 25 days with fog reported, but April (approximately 90 days later) had below normal precipitation.
- La Nina conditions existed for three consecutive winters. La Niñas typically bring colder than normal conditions to Montana, yet this was the only winter where below normal temperatures were experienced.

The Winter of 2022-3 (Continued)

By Ted Jamba, Lead Forecaster at NWS Glasgow

Here are the typical La Niña conditions:

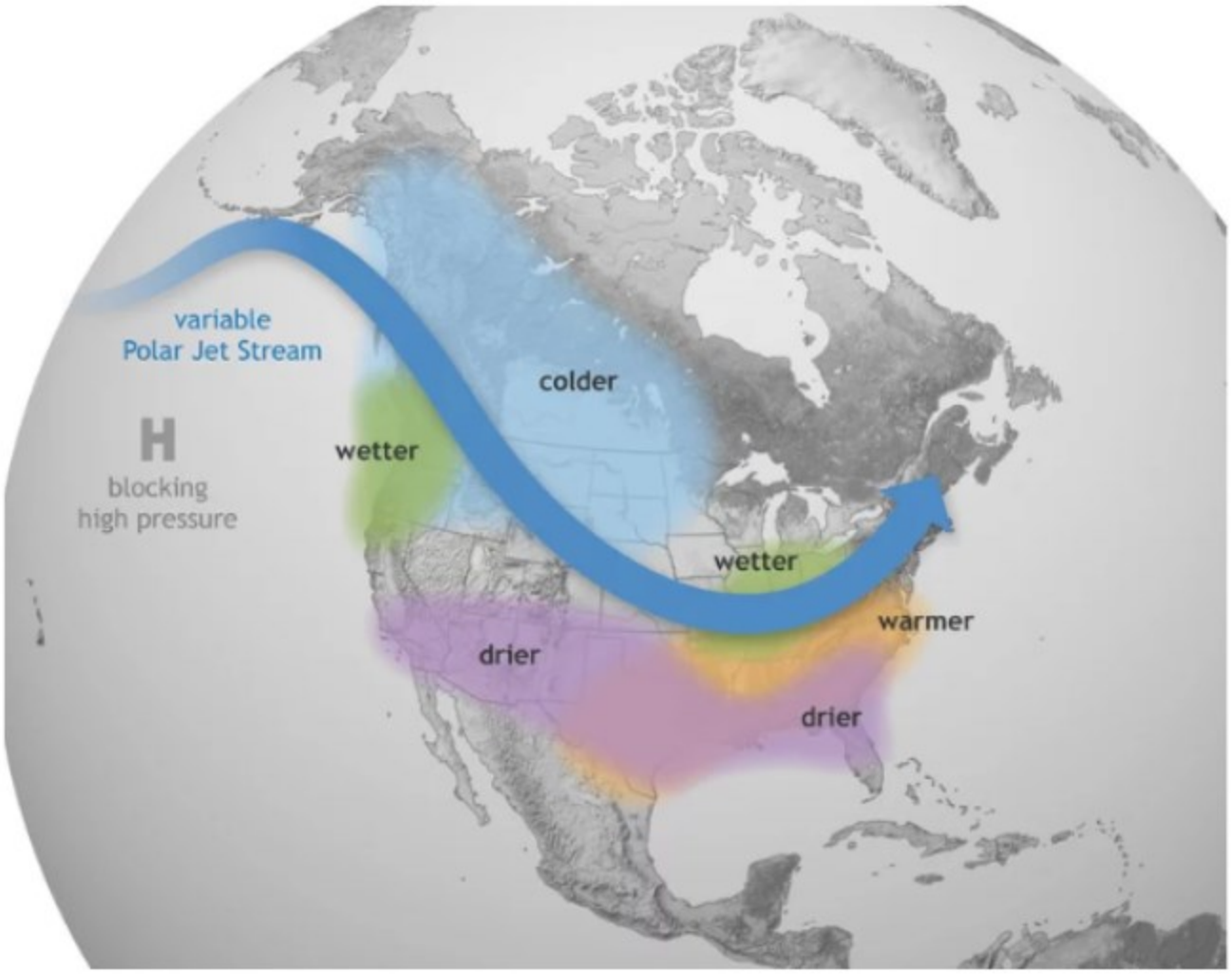


Figure 4: Typical pattern observed during a La Niña.

*

Note the position of the jet stream with colder the normal temperatures over the Northern High Plains and wetter conditions across the Pacific Northwest.

Join CoCoRaHS Today!

CoCoRaHS is a grassroots organization with a network of highly committed observers who report daily precipitation such as rain, hail, or snow from all across the country. The data are used by meteorologists, insurance adjusters, mosquito control, those in academia, etc.

Participating in the CoCoRaHS program is a great way to make a difference in your community. Check out the CoCoRaHS main page to learn more! We are still accepting new observers so feel free to join through the main CoCoRaHS website today. All you'll need is a ruler and a rain gage to get started!

Need a refresher?: Are you new to CoCoRaHS and need help getting started? Or, maybe you need help remembering how to take certain kinds of observations. The CoCoRaHS webpage has a number of available slide presentations that you can check out to learn more about these topics and more!

Are you looking to become a new CoCoRaHS observer? Then sign up to join today to get started! Just fill out the electronic form and the CoCoRaHS Coordinator from NWS Glasgow will follow up with you to help you get underway.

2023 Skywarn Training Schedule:

May 17th—Dawson County Courthouse in Glendive at 6PM

May 19th—Daniels County Nemont Friendship Room in Scobey at 5PM

May 30th—McCone County Senior Center in Circle at 6pm

This is your chance to become an NWS trained storm spotter and help us with our warnings! We hope to see you there!

Percent of Normal Precipitation (Montana)

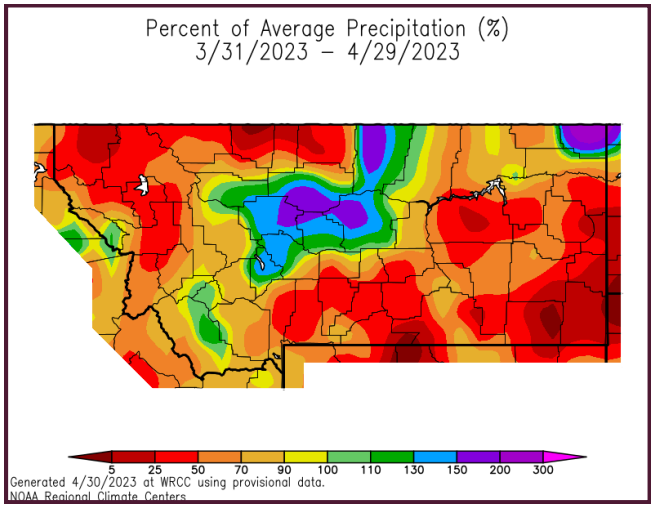


Figure 5: 30-day percent of normal precipitation across Montana.

Avg. Temp Departure from Normal (Montana)

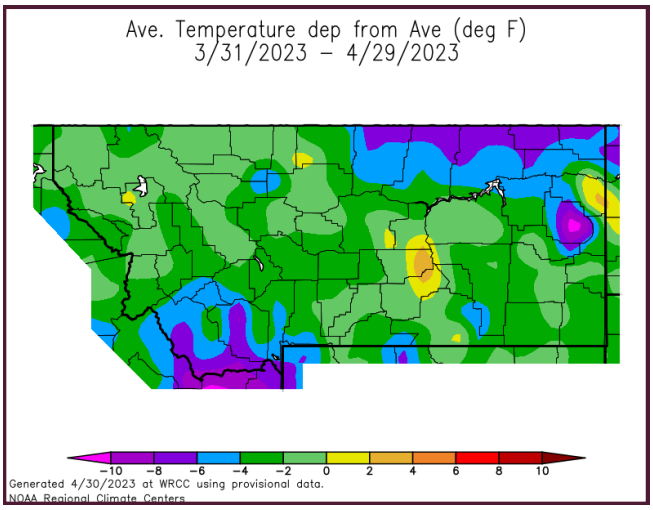


Figure 6: 30-day temperature anomalies across Montana.

Summary: Over the past 30 days, much of Montana has trended toward drier than normal conditions. Exceptions occurred across portions of Central Montana as well as extreme northeastern parts of the state. Meanwhile, temperatures were near or slightly below normal for most of the state. Conditions were much cooler than normal over portions of NE Montana and southwestern areas.

Preliminary Hydrologic Summary for March 2023, By Greg Forrester Lead Forecaster at NWS Glasgow:

February was a cold and snowy month for most of northeast Montana. The wet spots were Hinsdale 4SW with 1.93 inches, Glasgow 46SW with 1.71 inches, and Plentywood with 1.44 inches. The dry spots were Cohagen with 0.12 inch, Hoyt with 0.13 inch, and Brockway with 0.22 inch. Glasgow received 1.06 inches which was 226 percent of normal. Temperatures varied from 10 to 17 degrees below normal across the region. Glasgow averaged 16.8 degrees which was 14.8 degrees below normal.

Frequent snow during March raised snow water equivalent to 2 to 4 inches over most of the region. The exceptions were little or no snow cover over most of Petroleum and Garfield Counties and 4 to 6 inches of SWE in northern Phillips County.

There was some improvement in the drought across northeast Montana. At the end of March, severe drought was limited to along US 2 and McCone County with moderate drought covering most of the remainder of northeast Montana.

The Milk River, Yellowstone, Poplar, and Missouri Rivers remained frozen with cold temperatures. Streamflow information was not available.

The Fort Peck Reservoir elevation rose slightly to 2219.5 feet during the month. The reservoir was at 64 percent of capacity and 81 percent of the mean pool.

Background Photo Credit: Ryan Bernhart Meteorologist at NWS Glasgow.

CPC Outlook:

The Climate Prediction Center released its latest three month outlook for temperature and precipitation for May through July 2023 on April 20, 2023. The outlook shows above normal temperatures favored across the Pacific Northwest extending into far western Montana, with equal chances for above normal, below normal, or normal temperatures for the remainder of the state. Below normal precipitation meanwhile is favored for this same region though extending east into much of Montana. Only eastern and southeastern parts of the state currently have equal chances for below average, average, or above average precipitation.

The latest outlook is always available here. In addition, you can check out the Climate Prediction Center Interactive site! You can zoom in on our area, and navigate to see the climate outlook for your specific location.

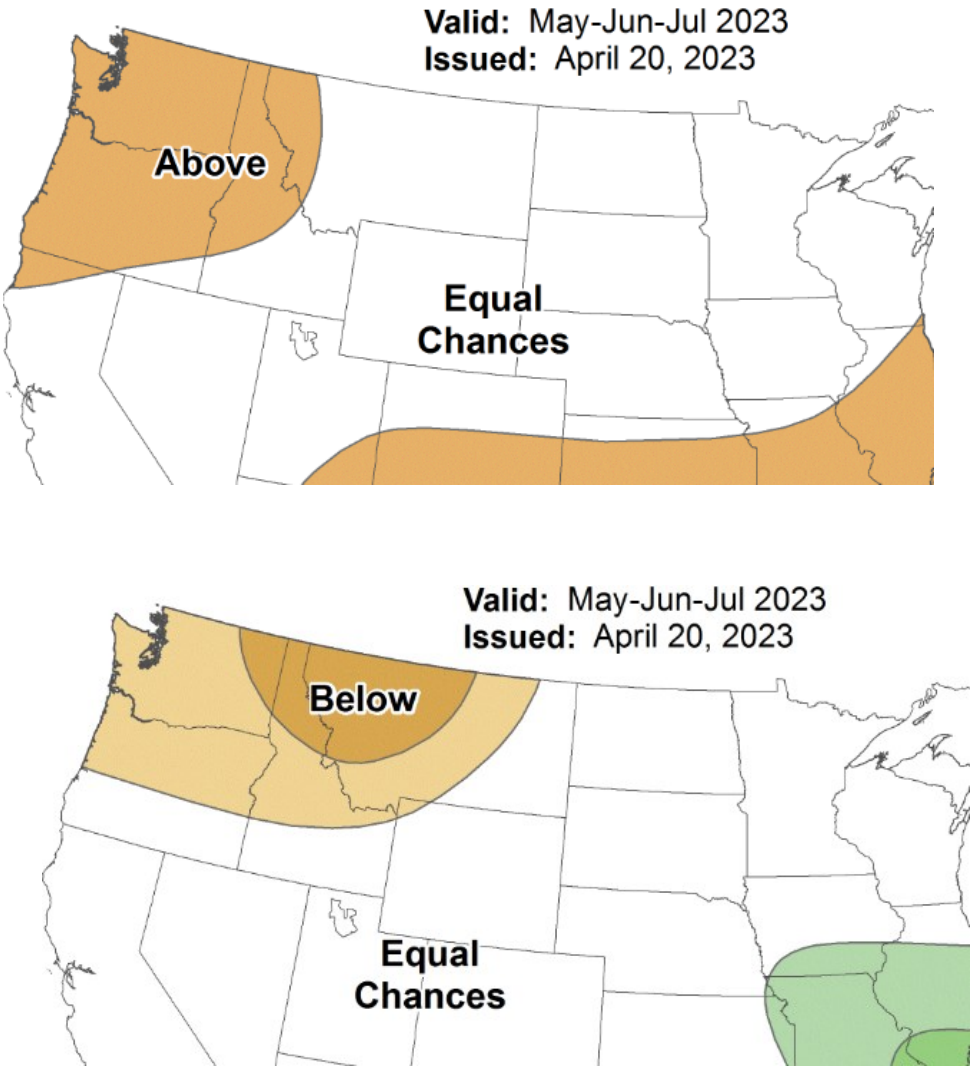


Figure 7: Climate Prediction Center three month outlook (May through July 2023) for temperature (top) and precipitation (bottom).

U.S. Drought Monitor:

The latest U.S. Drought Monitor was released on Thursday May 4, 2023. Much of NE Montana as well as north-western parts of the state were in moderate drought status or were considered abnormally dry with the latest update. Meanwhile, southern parts of the state are currently void of drought concerns. That said, the latest 3 month outlook from the Climate Prediction Center has been tipping toward drier conditions prevailing across the region. This may have the effect of limiting a continuation of the trend toward improvement that had been ongo-ing in recent weeks.

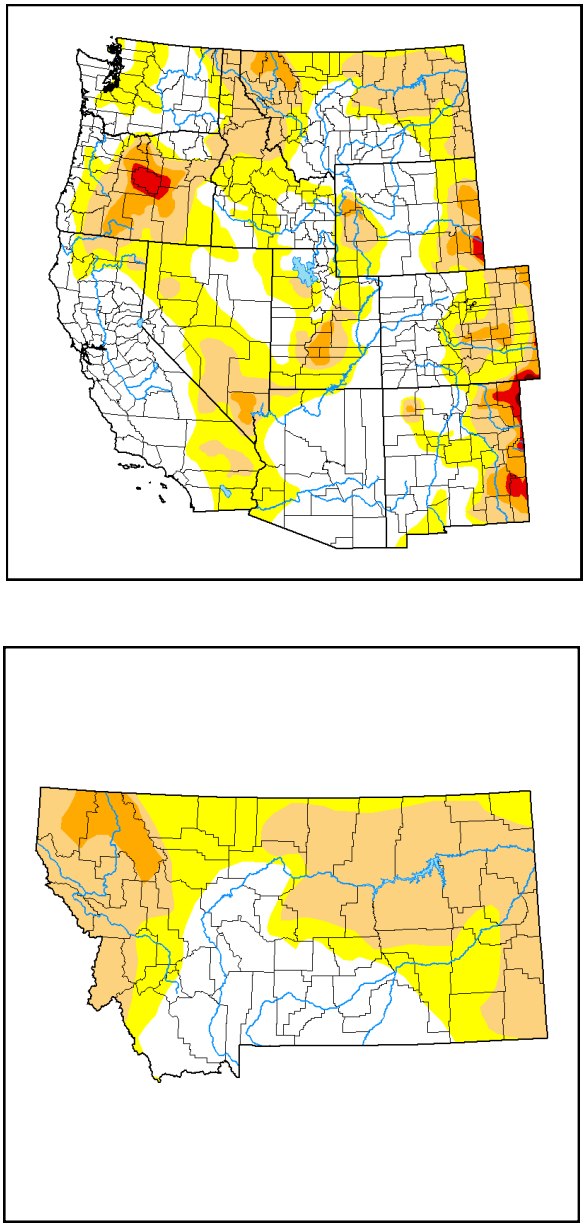


Figure 8: U.S. Drought Monitor updated May 4, 2023.

U.S. & Global Climate Highlights (March): The U.S. & Global climate highlights for March 2023 have been released, the latest month for which data was available. A few points for you to take home are provided below.

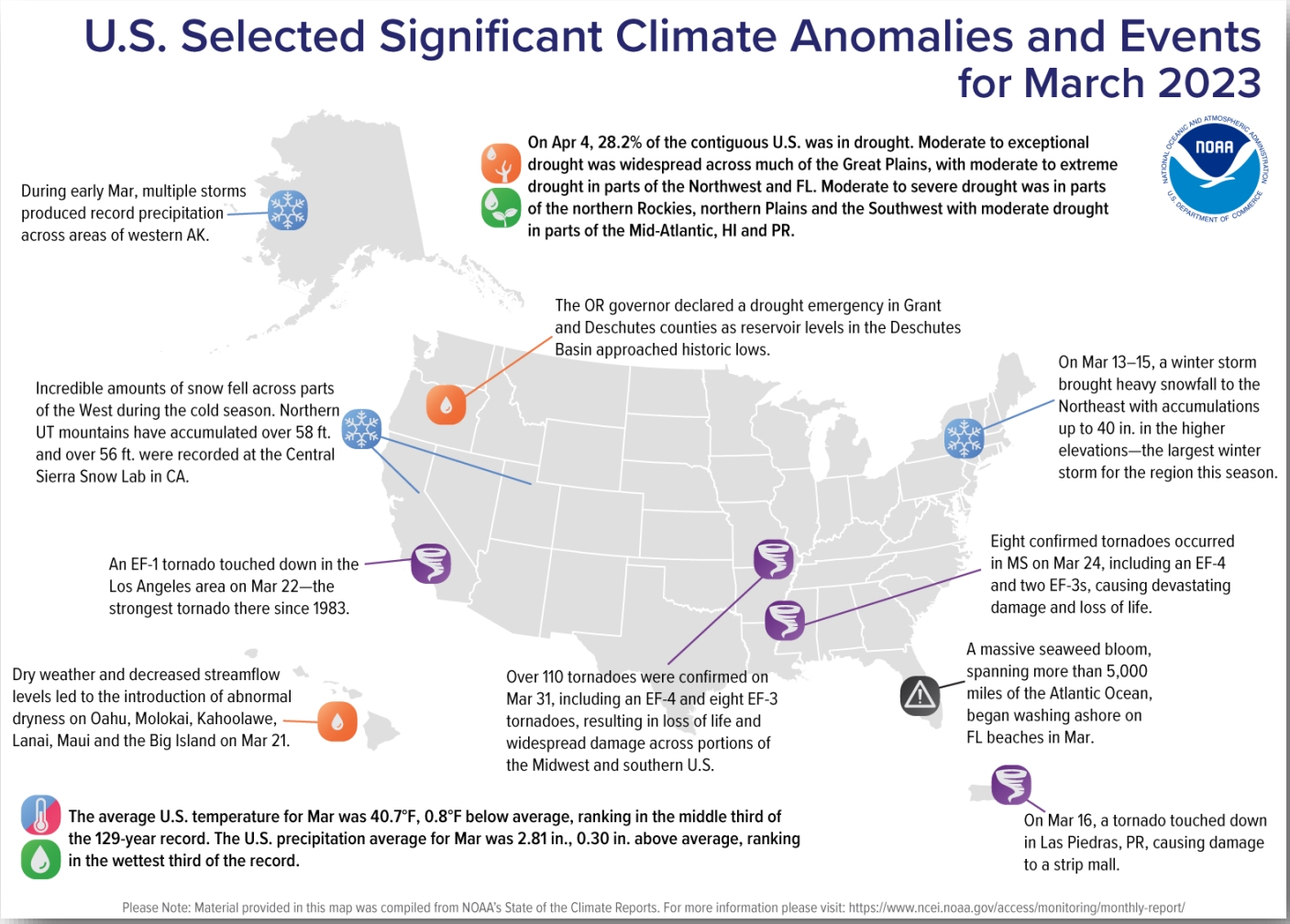


Figure 9: Significant Climate anomalies and events in March 2023.

U.S. Highlights for March 2023

1) The contiguous U.S. average temperature for March 2023 was 40.7 °F, ranking within the middle third on record.

2) The average March 2023 precipitation was 2.81 inches, ranking within the upper third on record.

Global Highlights for March 2023

1) March 2023 saw the second warmest March in a 174 year period of record.

2) On March 9th, the three year La Niña came to an end. El Niño is favored through spring and early summer.

2023 Milk River Flood Season Recap

- While impacts were kept to a minimum along the Yellowstone River this season, several river gages reported near record crests due to snowmelt this year. Below is a summary of where things peaked.

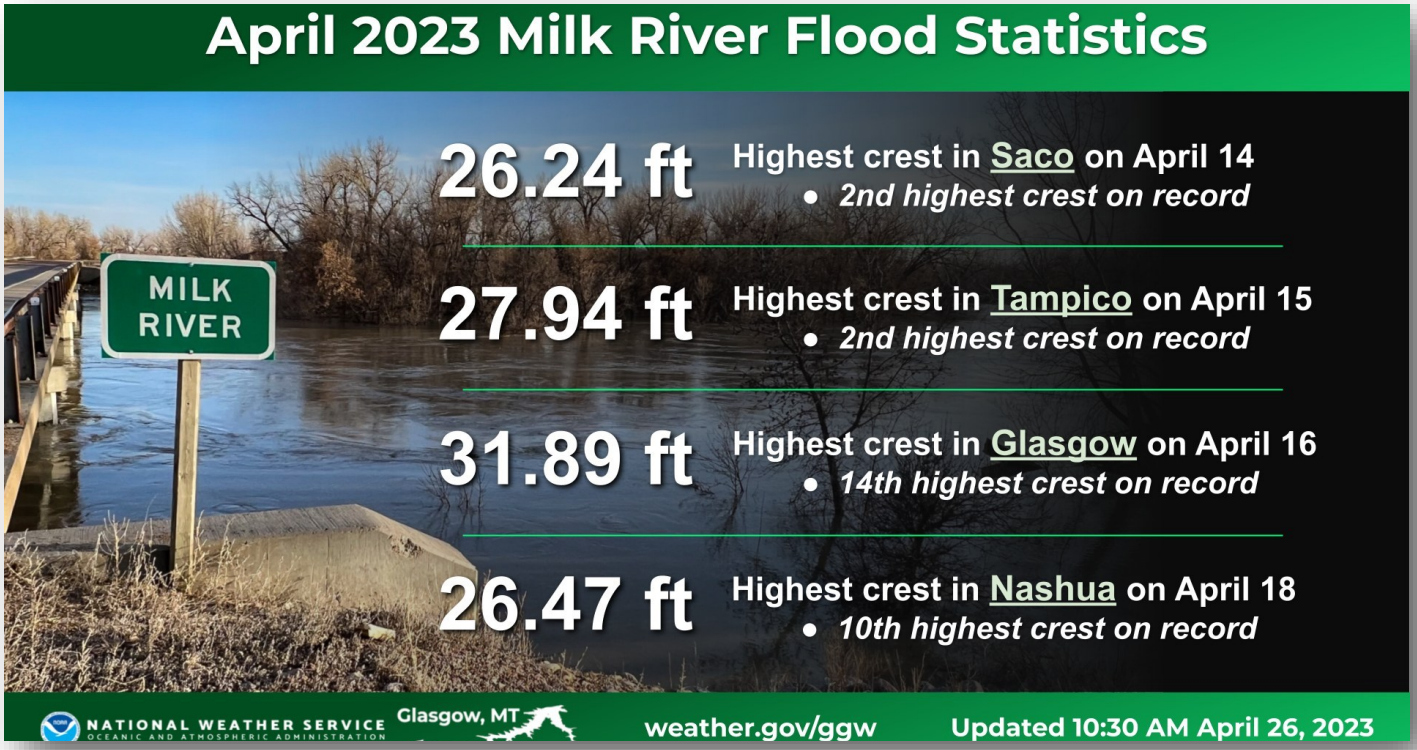


Figure 10: Milk River Flooding Summary for April 2023.

Links You May Like:

[April ENSO Update]

[NOAA FY2024 Budget for a Climate Ready Nation]

[Rapid Sea Level Rise]

[Greenhouse Gases Continued Soaring in 2022]

[Improving Weather and Climate Forecasting]

[Indicators for Ocean Acidification]

COOP Precipitation Totals for March 2023 (Preliminary)

Station	Precipitation	Location
BAYM8	0.21	Baylor
BRDM8	0.77	Bredette
BTNM8	M	Brockton 17 N
BKNM8	0.89	Brockton 20 S
BKYM8	0.22	Brockway 3 WSW
BRSM8	M	Brusette
CLLM8	0.75	Carlyle 13 NW
CIRM8	0.45	Circle
CHNM8	0.12	Cohagen
COM8	M	Cohagen 22 SE
CNTM8	0.82	Content 3 SSE
CULM8	0.22	Culbertson
DSNM8	M	Dodson 11 N
FLTM8	0.60	Flatwillow 4 ENE
FPKM8	0.68	Fort Peck PP
GLAM8	1.22	Glasgow 14 NW
GGWM8	1.06	Glasgow WFO
GGSM8	1.71	Glasgow 46 SW
GNDM8	0.94	Glendive WTP
HRBM8	M	Harb
HINM8	1.93	Hinsdale 4 SW
HNSM8	1.36	Hinsdale 21 SW
HOMM8	0.48	Homestead 5 SE
HOYM8	M	Hoyt
JORM8	M	Jordan
LNDM8	0.64	Lindsay
MLAM8	1.13	Malta
MLTM8	1.01	Malta 7 E
MTAM8	M	Malta 35 S

Station	Precipitation	Location
MDCM8	M	Medicine Lake 3 SE
MLDM8	0.38	Mildred 5 N
MSBM8	M	Mosby 4 ENE
OPNM8	M	Opheim 10 N
OPMM8	M	Opheim 12 SSE
PTYM8	0.54	Plentywood
PTWM8	0.50	Plentywood 1 NE
POGM8	1.28	Port of Morgan
RAYM8	M	Raymond Border Station
SAOM8	1.16	Saco 1 NNW
SMIM8	0.57	St. Marie
SAVM8	M	Savage
SCOM8	0.43	Scobey 4 NW
SDYM8	M	Sidney
SIDM8	0.84	Sidney 2S
TERM8	0.89	Terry
TYNM8	0.64	Terry 21 NNW
VIDM8	M	Vida 6 NE
WSBM8	M	Westby
WTRM8	M	Whitewater
WHIM8	M	Whitewater 18 NE
WBXM8	M	Wibaux 2 E
WTTM8	M	Winnett
WNEM8	0.45	Winnett 6 NNE
WNTM8	0.46	Winnett 8 ESE
WITM8	0.25	Winnett 12 SW
WLFM8	0.69	Wolf Point
ZRTM8	1.29	Zortman

Monthly Trivia:

Last time we asked…

When it warms up on a routine basis this spring and the snow begins to melt, where does the water ultimately end up? We'll explore some of the science of snow melt processes in the next newsletter!

Answer: Snowmelt season is a primary concern during the late winter and spring season as it can lead to a number of hydrology concerns ranging from rising river levels and river flooding to flooding of low-lying areas and fields, and more.

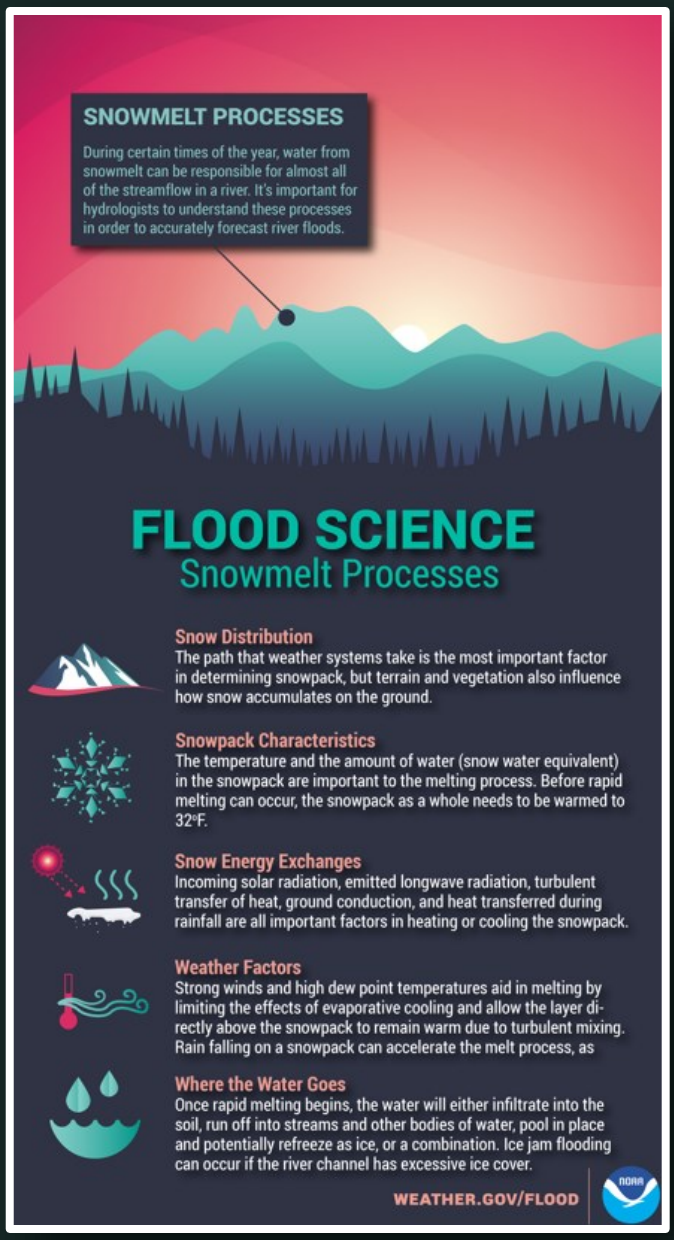


Figure 11: Info graphic showing the science of snowmelt.

Alt text: Flood Science - Snowmelt Process. Snowmelt Processes: During certain times of the year, water from snowmelt can be responsible for almost all of the streamflow in a river. It's important for hydrologists to understand these processes in order to accurately forecast river floods. Snow Distribution: The path that weather systems take is the most important factor in determining snowpack, but terrain and vegetation also influence how snow accumulates on the ground. Snowpack Characteristics: The temperature and the amount of water (snow water equivalent) in the snowpack and important to the melting process. Before rapid melting can occur, the snowpack as a whole needs to be warmed to 32 degrees F. Snow Energy Exchanges: Incoming solar radiation, emitted longwave radiation, turbulent transfer of heat, ground conduction, and heat transferred during rainfall are all important factors in heating or cooling the snowpack. Weather Factors: Strong winds and high dew point temperatures aid in melting by limiting the effects of evaporative cooling and allow the layer directly above the snowpack to remain warm due to turbulent mixing. Rain falling on a snowpack can accelerate the melt process as well. Where the Water Goes: Once rapid melting begins, the water will either infiltrate into the soil, run off into streams and other bodies of water, pool in place and potentially refreeze as ice, or a combination. Ice jam flooding can occur if the river channel has excessive ice cover. www.weather.gov/

New Question: We have had an increase in interest in the aurora as of late, leading to our next trivia question—How do forecasts for the aurora vary depending on the time scale?

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