

Colorado CoCoRaHS Winter Recap/Welcome to Spring

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Photo credit: Noah Newman

You made it! Meteorological winter (December-February) has ended. Cold weather is not entirely behind us, but every sunny day is a longer and brighter day than the day before it. So long and good riddance, 4:40 PM sunsets. While we did lose an hour (I would prefer we just stayed on standard time), we do now have sunsets of 7:00 PM or later for the next six months.

Denver Sunrise/Sunset Times from Gaisma.com

Generated 3/13/2023

Future		Past						
Date	Sunrise	Sunset	Length	Change	Dawn	Dusk	Length	Change
Today	07:15	19:05	11:50		06:48	19:32	12:44	
+1 day	07:13	19:06	11:53	00:03 longer	06:46	19:33	12:47	00:03 longer
+1 week	07:04	19:12	12:08	00:18 longer	06:37	19:39	13:02	00:18 longer
+2 weeks	06:52	19:19	12:27	00:37 longer	06:25	19:46	13:21	00:37 longer
+1 month	06:27	19:35	13:08	01:18 longer	05:59	20:03	14:04	01:20 longer
+2 months	05:48	20:05	14:17	02:27 longer	05:18	20:35	15:17	02:33 longer
+3 months	05:31	20:28	14:57	03:07 longer	04:59	21:00	16:01	03:17 longer
+6 months	06:37	19:15	12:38	00:48 longer	06:10	19:42	13:32	00:48 longer

Notes: Daylight saving time. * = Next day. Change preferences.

Figure 1: Sunrise and sunset times over the coming days and months.

Winter Recap

Winter CoCoRaHS Observations: Congrats to our snowiest station this winter, CO-DL-45. This station notched 281.6" of snowfall from December 1st-February 28th. Honorable mentions are shown in the table below: CO-DL-45 has been our snowiest station several times as it sits atop the Grand Mesa. I would also like to recognize some excellent observing from several locations on the Eastern Plains: CO-YU-59 and CO-WA-80 measured 59.5 and 51.9" of snowfall respectively this winter season. While that might not sound like a lot to mountain folks, it is considerable out on the plains where December-February is typically the dry season. Furthermore, snow on the eastern plains comes with strong winds, biting cold, and drifts. Staying on top of things out east in a snowy winter is a challenge. My last shoutout of the winter goes to CO-FM-1, who measured only 7" of snowfall all winter with only two missed observations (both on dry days). Thanks for reminding us that not everybody received generous snowfall this winter.

Station Number	Daily Snow	# of Reports
CO-DL-45	281.6	90
CO-LP-79	213.7	87
CO-GN-18	187	90
CO-RT-43	184	82
CO-MZ-71	182.8	88
CO-RT-53	157.4	90
CO-JK-23	151.9	90
CO-RT-16	151.8	79
CO-RT-28	148.9	82
CO-GN-66	146.5	86

Table 1: Top 10 snowiest CoCoRaHS stations this winter: December-February.

Cold conditions: Here in Fort Collins we just measured our 4th straight month that was cooler than the current 1991-2020 climate normals. The last time we had four straight cooler than normal months was February-May 2021. However, March is also well on its way to being a cooler than normal month. The last time we had five straight cooler than normal months was July-November 2009! I’ve heard several farmers describe this winter as being like an “old Colorado winter.” Looking at long-term climate records, that appraisal appears to be accurate.

Cold conditions have been by no means confined to Fort Collins. Most of the state had a cooler than normal winter. With few exceptions, our December-February temperatures were on the cool side of normal. The map below shows our temperature anomalies for winter 2023.

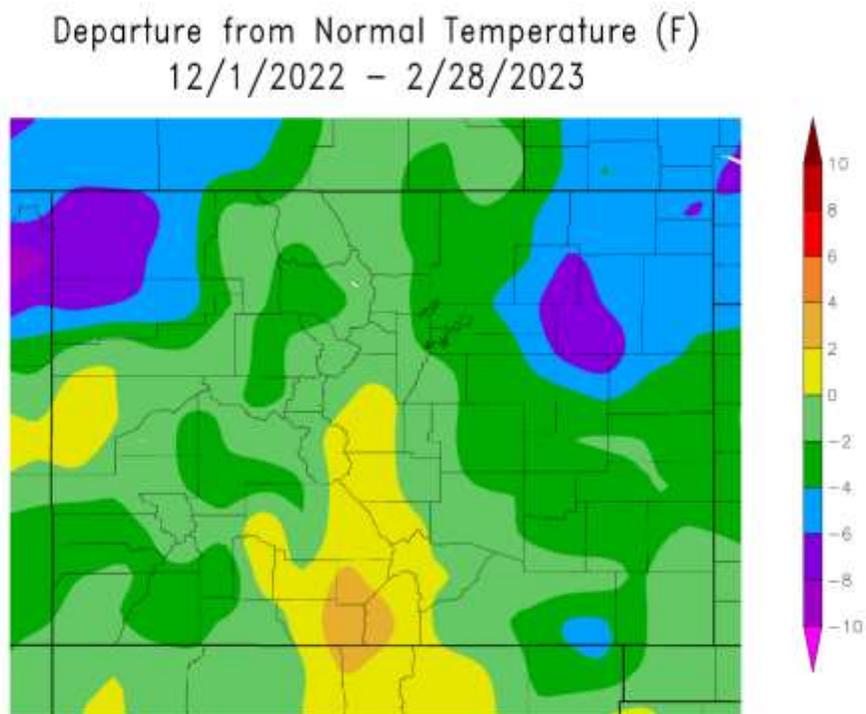


Figure 2: Winter 2023 Colorado departure from normal temperatures. Source: High Plains Regional Climate Center.

The role of snowpack: You might notice that the San Luis Valley in south-central Colorado stands out on the temperature map above. It was warmer than normal. How can this be? This is much ado about snowcover! Than San Luis Valley is often covered by snow through the majority of the winter. If a good snow hits the valley in December it sets in for months. Snowcover reflects sunlight during the day, and more efficiently emits infrared radiation out to space at night, cooling surface temperatures. This year, the San Luis Valley did not have persistent snowcover, which had a significant impact on seasonal temperatures. Conversely, temperatures in northeastern Colorado were much below normal. Northeastern Colorado is usually quite dry during the winter. Thanks in part to you volunteers, we know parts of northeastern Colorado received over 700% of normal precipitation in January and February, and experienced persistent snowcover. The persistent snowcover amplified what would have already been a cold winter! The average temperature in Akron, CO this winter was about the same as a normal winter in Des Moines, Iowa. Brrr!

Colorado CoCoRaHS Recruiting Drive

As many of you CoCoRaHS veterans know, March is when CoCoRaHS does our annual recruiting drive! If you have any friends or family who you think would be interested in joining, this is a great time to share. Colorado CoCoRaHS participation has held steady for a few years now. Much like the population of the state, we have grown in suburban areas around Denver and Colorado Springs, but we have lost population in rural areas. Those rural areas, in both eastern and western Colorado, are key data gaps. We care deeply about what happens there. It is paramount for drought, flood, and severe weather monitoring purposes to know what is happening in these agricultural and forested areas. If you know people in rural Colorado please encourage them to sign up!

You can find more information about our recruiting drive here:

<https://www.cocorahs.org/marchmadness.aspx>. Colorado usually finishes the month in a top 15, if not top 10 position. This year we are buried in the middle of the pack. Let's change that if we can! I see no reason our neighbors to the north, Wyoming, should be beating us in signups with less than 10% of our population.

One note about our recruiting drive: I have no idea how we are getting away with calling it "March Madness." We have called it "March Madness" since the beginning, but the way things have gone with trademark laws I'm just waiting for that "cease and desist." That's why I am sticking with "Annual Recruiting Drive." If you can think of a more fun, non-trademarked name please let me know!

Snowpack and Drought

We are grateful to be having a good snow year across most of the state. Snowpack in western Colorado, where roughly 80% of our runoff is generated statewide, is boasting 124-149% of normal current snowpack conditions. For some of these basins, we are already above our typical seasonal peak values, which generally occur in the first half of April.

Snow has been particularly impressive in southwest Colorado. The Gunnison and San Juan Basins sit at nearly 150% of normal snowpack for the year-to-date. These numbers are similar to what we saw at this time in 2019, our last great snow year. 2019's snowpack did lead to some flood control management

and dam safety concerns, such as with Hidden Treasure Dam, but it is also a symbol of how much our water supplies can recover in just one year. Our largest reservoirs in southwest Colorado, Blue Mesa and McPhee, were near record lows after a horrible season in 2018. They filled completely in 2019.

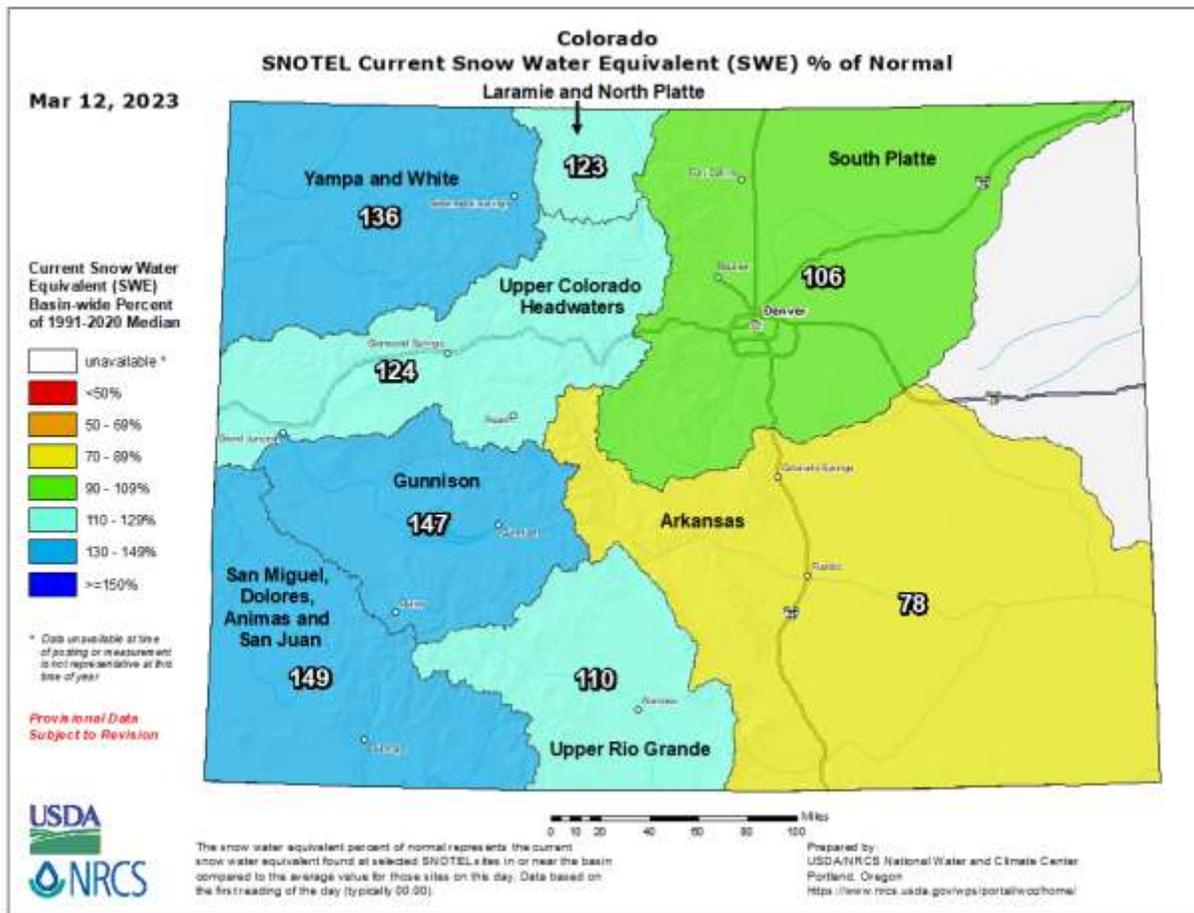


Figure 3: Percent of normal snowpack (March 12th) for major watersheds across Colorado. Source National Resource Conservation Services (NRCS) Snowpack Telemetry (SNOTEL) Network.

What about our larger-scale regional drought? Snowpack has also been excellent not only in western Colorado, but in California, Utah, and even parts of Arizona and Nevada as well. Unfortunately our Colorado River Basin reservoir giants, Lake Powell and Lake Mead, are only at 22 and 29% of capacity respectively. Those are humongous deficits. Whether its climate change, climate variability, population growth, mismanagement of water, or all of the above (probably that), those reservoirs cannot be filled from current levels in one good year. At this point it would take a streak of several banner snowpack years to bring Powell and Mead back to 20th century levels. On the plus side, good snowpack conditions this year may temporarily alleviate some tensions over Colorado River Compact renegotiation.

Other locations in the state: Colorado is a large state with a diverse climate. Most of our storms do not equally impact the entire state. There are “winners” and “losers.” This year’s water supply forecast does not look good everyone. The Arkansas River Basin is only hold 78% of normal snowpack. Southern tributaries of the Arkansas River, such as the Purgatoire River, are only forecasted to receive 50-70% of

normal runoff. Furthermore, agricultural drought still plagues portions of the eastern plains. Last summer was hot and dry. The southeast corner of the state has not recovered.

This Coming Spring

We are finally saying “goodbye” to a three-year, or “triple dip” La Niña event in Colorado. Seasonal forecasts now favor the development of El Niño conditions by summer or fall. This is arguably the best time of year for Colorado to transition from La Niña to El Niño. Since 1951, the only time/place in Colorado in which La Niña has been historically wetter than El Niño is during the winter months in the northern Rockies. El Niño is preferred in other seasons. We just finished the winter season, and snowpack in the northern Rockies was good. Now is a great time for conditions to flip given spring, summer, and fall are all more likely to be wet during El Niño. Hopefully we see plenty of cool, wet, long-lasting, soil-recharging rains this April and May. As winter gives way to spring I am looking forward to putting my inner tube back in the gauge and measuring all the rain.

Correlation Between ENSO ONI and Seasonal Precipitation in Colorado (1951-2020)

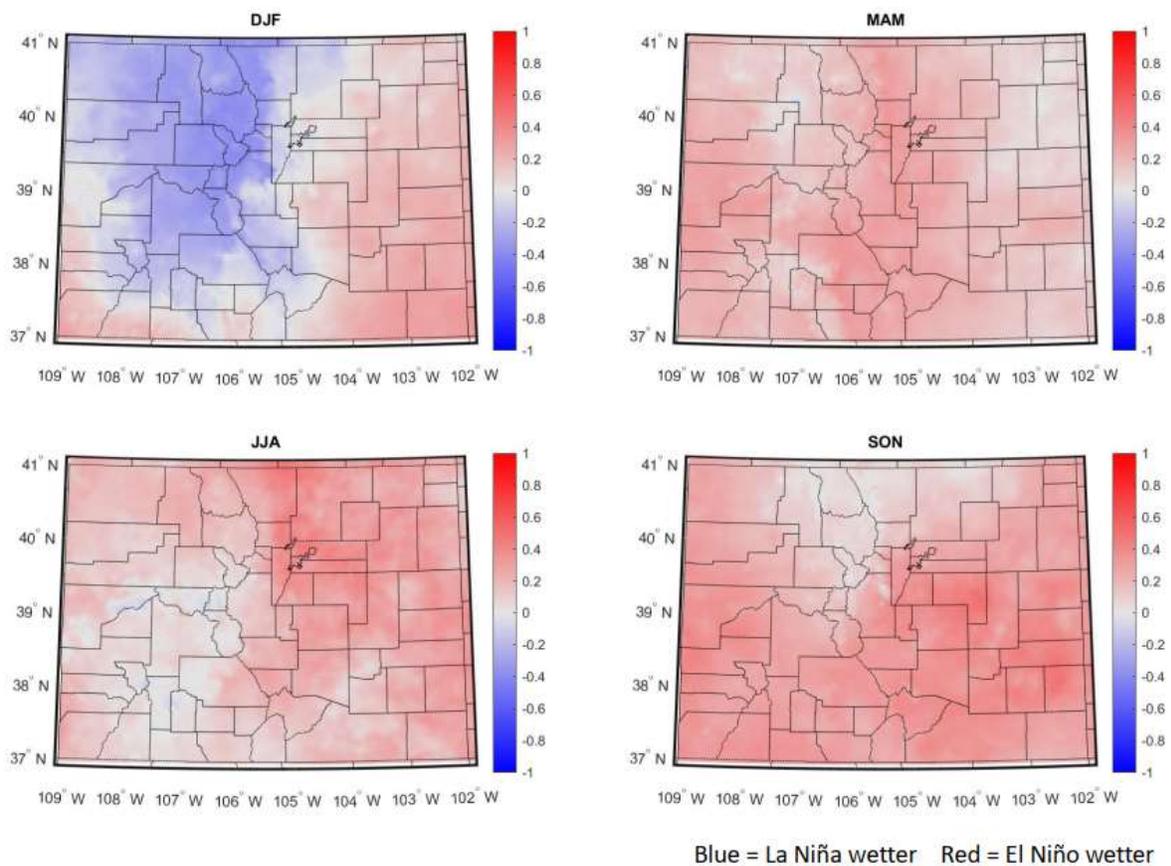


Figure 4: Relationship between El Niño Southern Oscillation (ENSO) Oceanic Niño Index (ONI) and seasonal precipitation in Colorado. Upper left: December-February. Upper right: March-May. Lower left: June-August. Lower right: September-November. Red = El Niño wetter. Blue = La Niña wetter.

That’s it from me. Happy measuring and happy recruiting! If you have any questions or concern please feel free to reach out to me via email any time! Peter.goble@colostate.edu