It snowed. But do you know how much?

For many Wyoming residents, new snow means sidewalks to scoop, driveways to plow, and hungry livestock to feed. But snowfall is also a critical piece of the Wyoming water cycle, with snowmelt bringing welcome moisture in the spring. During the warmer months, mountain snowpacks supply water for many municipal, agricultural, and recreational uses.

Not all snow is created equal

Ask around at any coffee shop or feed store after a big winter storm, and you'll probably hear many speculations about how much snow accumulated. Snowfall is difficult to measure, and the notorious Wyoming winds don't make it any simpler.

It is commonly claimed that 10 inches of fresh snow is equivalent to 1 inch of rain, but that's not always the case. Many factors influence the water content in snow. Perhaps the most obvious is the air temperature during a winter storm. Colder air creates lighter, fluffier snow that contains more air and relatively less water. Warmer air creates heavy, wet snow that contains relatively less air—and gives you more of a workout while clearing your sidewalks.

Other factors that influence snow water content include the depth of the snowpack (snow becomes denser as it settles over time) and the age of the snowpack (water vapor sublimates off the snowpack surface over time).

Snow fills a 4-inch precipitation gauge mounted on a snow-filled feed bunk. Photo by Sam Most.

The amount of water contained in a given volume of snow is known as the snow water equivalent, or SWE (pronounced "swee"). The technical definition of SWE is the depth of the snow multiplied by the density of the snow. It is more straightforward to think about SWE being equal to the amount of water you would get from melting a column of snow of a certain depth.

Tracking local snowfall

As with community reports of liquid precipitation, community reports of snow depth and moisture content help policymakers and agency employees make informed decisions. In Wyoming, you can contribute to this information-gathering process by taking measurements and submitting them to community reporting systems like the Community Collaborative Rain, Hail, and Snow (CoCoRaHS) Network. This process is also a handy way for agricultural producers, homeowners, and citizen scientists to digitize and archive precipitation records.

Observing and submitting snowfall reports can also get you outside in a season that may restrict other outdoor activities. However, winter conditions in Wyoming can be treacherous, especially in the wake of a blizzard or fresh snowfall. Collecting an observation is not worth putting yourself at risk. While a complete and year-round data set is ideal, many folks take the winter off to keep themselves safe. Alternatively, consider recruiting a family member or neighbor to assist with the outdoor sample collection process to keep the measurements going all winter long.

Curious about CoCoRaHS?

The CoCoRaHS Network was launched in 1998 as a project of the Colorado Climate Center at Colorado State University following a severe flood in Fort Collins. In 2003, Wyoming became the second state to join the network. Today, CoCoRaHS reporters submit observations from all 50 states as well as Washington, D.C., U.S. territories, and Canada.

For more information on CoCoRaHS, check out the following resources.

- About CoCoRaHS: https://bit.ly/CoCoRaHS-about
- How much rain *didn't* you get?: https://bit.ly/bb-wcmt
- Collecting precipitation data provides information for public good: https://bit.ly/bb-CoCoRaHS

Meteorological snow boards

Meteorological snow boards are square boards painted white to minimize the amount of radiant heat picked up by the sun. Sometimes they have a snow depth tool in the center. In places with rough terrain, snow boards provide a flat surface where snow can accumulate approximately evenly without the inflating effects of turf and other plant materials.

Supplies for the task

If you are already set up with a 4-inch scientific precipitation gauge, then you're well on your way to reporting SWE data this winter. To view or purchase from a list of CoCoRaHS-approved gauges, visit https://bit.ly/SWE-gauge. To prevent damage from freezing temperatures, consider removing the gauge's funnel and inner tube during the winter.

In addition to a gauge, you'll need a ruler to measure the snow depth to the nearest tenth of an inch. When taking a snow core, it is also helpful to have a dedicated spatula, flyswatter, or other flat device to slide under the core so that it stays intact and inside the tube when lifted.

Collecting and reporting samples

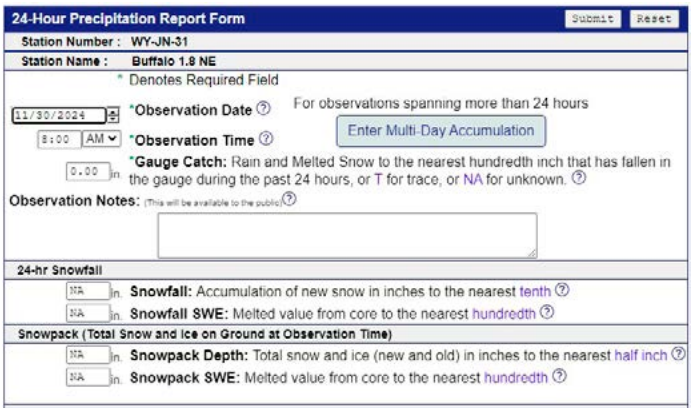
With the outer tube mounted in an open space away from structures and trees, you are ready to make your first measurement and report of snow. Anything caught in the tube can be reported in the regular gauge catch field of the precipitation report form. Melt, measure, report, and discard the water from the gauge catch sample.

Be aware that gauge catch measurements are often highly deflated by wind blowing snow past the top of the tube. Core samples help capture a more representative sample of the amount of moisture that accumulated during a storm.

To collect a core sample, find a flat location where snow is evenly distributed and drifting is minimal. Use the ruler to measure and record the snow depth to the nearest tenth of an inch. In the same location, turn the 4-inch outer tube upside down and press the open end into the snow until contact is made with the ground. Slide the spatula or other device under the tube and carefully lift to extract the snow core. If using a designated meteorological snowboard to capture each fresh snowfall every 24 hours, don't forget to clear off the board so it is ready for the next 24 hours.

Allow the sample to melt, then record the volume of water that came from this core. Log in to your free CoCoRaHS account to report your observations under the "24-hour Snowfall" section. The snow depth measured with the ruler is reported in the "Snowfall" field and the volume of water from the core sample is reported in the "Snowfall SWE" field. The density of a particular snow event will be calculated automatically in the CoCoRaHS system based on daily observations of snow depth and melted snow liquid volume observations.

Note that it's important to distinguish between new snowfall that occurred in the last 24 hours and the snowpack that accumulates over the winter in many parts of the state. Similar snow depth and snow core



The CoCoRAHS snowfall reporting interface.

measurements can be reported for the accumulating snowpack using the same tools and the "Snowpack" section of the CoCoRaHS reporting form.

The measurement and reporting process for snow is clearly more complex than it is for rain—but don't let that deter you. Making daily snow depth and snow water reports is a way to gain a new perspective on fresh snow, track local patterns, and interact with the natural environment in a new way. The process quickly becomes as routine as rainfall reporting, and your contributions to the larger community are appreciated! For helpful tips, check out a video tutorial from the CoCoRaHS team at https://bit.ly/measure-snow.


Snow drifts through sagebrush with the east slope of the Bighorn Mountains in the distance. Photo by Micah Most.

The U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a weekly report assembled by weather professionals at the National Drought Mitigation Center hosted by the University of Nebraska–Lincoln, NOAA, and the USDA. Federal agencies use the USDM to inform decisions about disaster declarations, eligibility for low-interest agricultural loans, and agricultural taxation relief. Emergency planners use the information to monitor wildfire potential and stage resources accordingly.

Individual observations submitted through the CoCoRaHS reporting network help inform the agency professionals who assemble the USDM. View the latest report for the state of Wyoming at https://bit.ly/WY-drought.

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