

Winter Weather Observations at National Weather Service Coop Sites

National Weather Service - Chanhassen, Minnesota



Contents:

- ❖ Getting the station ready for winter
- ❖ How to measure freezing and frozen precipitation using the rain gauge, snowboard, and snow measuring stick
- ❖ How to record precipitation, snowfall, snow depth, and snow core in WxCoder
- ❖ How your official data are used

Observations

Reported Year Round: **Precipitation, Snowfall and Snow Depth (even if they are zero)**

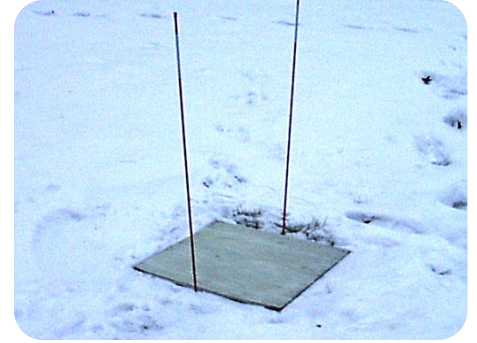
Optional Report in Winter: **Snow Core on Mondays when 2" or more of snow is on ground**

Preparing Station for Snow Season

- Remove the inner tube and funnel from the rain gauge when temperatures start to drop below freezing in the fall. This prevents the inner tube from cracking if liquid precipitation freezes in the tube, and allows the snow to fall directly in the outer can so it won't clog up the small opening in the funnel.



- Place snowboard outside with a flag next to it. A good location is generally near the rain gauge. Look for a flat location away from where drifts form or where the wind blows the ground clean. Avoid areas where plowed or shoveled snow piles up. Feel free to move the board during the winter if you find a better place to measure snowfall.



Measuring Winter Precipitation

Types of Winter Precipitation

- Snow
- Ice Pellets/Sleet (frozen raindrops)
- Snow Pellets/Graupel (snowflakes coated by super cooled water droplets)
- Freezing Rain (rain that freezes on impact)
- Rain



All forms of precipitation that fall into the rain gauge during the past 24 hours are measured. The contents of the rain gauge are melted down, and the liquid value is reported as precipitation.

How to Melt Winter Precipitation in Rain Gauge

If no precipitation is falling at the observation time, take the rain gauge inside to melt down the contents by one of these three methods:

- Wait for the precipitation in the gauge to melt (may take a while), then pour the melted precipitation into the funnel and inner tube for measurement.
- Or pour a measured amount of hot water into the gauge and stir. Subtract the measured amount of hot water from your final liquid measurement.
- Or set the rain gauge in a bath of hot water to help speed up the melting process, then pour the melted precipitation into the funnel and inner tube for measurement.



If precipitation is falling at the observation time:

- Take a bucket, trash can, or other container out to the rain gauge.
- Dump the precipitation from the rain gauge into the container.
- Return the rain gauge to the stand.
- Take the container inside so the precipitation can be melted down and measured, using one of the 3 methods mentioned in the section above.

Tips for Measuring Winter Precipitation during Windy Conditions

Snowfall may blow across the top of the rain gauge and not be collected in the outer rain gauge can when it's windy. If this happens, or if the amount of winter precipitation that you have melted down looks too low, you have two options:

- Precipitation can't be estimated. Report the precipitation as M (for missing) if you believe the melted value isn't representative. This is the only option unless the precipitation was only snow during the past 24 hours. If you report the precipitation as missing, mention the original measurement in remarks.
- If pure snow falls, you can take a "biscuit" of the new snowfall on the snowboard (or other representative location) using the rain gauge to gather a new snow sample to melt down for the liquid precipitation value. See the instructions in the snow core section later in this guide for an example. Simply amend the instructions to take the biscuit in a spot which only includes snow that has fallen in the past 24 hours, and report the value to the hundredth of an inch.



Measuring Snowfall

- Using a snowboard makes it easier to determine the difference between newly fallen snow and old snow, because it is wiped clean after each daily measurement.
- Use a snow measuring stick which can measure to the nearest tenth of an inch. Do not round the snowfall to the nearest quarter inch or inch. It needs to be reported to the tenth of an inch for official records (i.e. 0.4" or 1.3").



- After the observation is done, wipe the snowboard clean and place it on top of the existing snow. If frozen precipitation is on the board (like ice), you can turn it over and use the other side if precipitation is still occurring, or take it inside to thaw if the precipitation has ended, then return it outside when done.
- Make sure not to report 0 for snowfall if it snowed. Zero means that it didn't snow. Flurries count as a trace of snowfall (and precipitation.)



Tips for Measuring Snowfall during Challenging Conditions

What if the snowboard was blown clean by the wind?

Snowfall can be estimated. Is there another location on your property (i.e. a driveway, sidewalk, deck, picnic table) you can use to measure/estimate the new snowfall? If not, enter your precipitation, leave the snowfall blank and mention in remarks why a snowfall measurement wasn't available.

We will use the precipitation to determine a snowfall estimate for your site, based on the storm's calculated precipitation to snowfall ratio (which generally ranges between 13 to 1 and 40 to 1 based on the type of storm). Don't use a 10 to 1 precipitation to snowfall ratio to estimate snowfall, which is rarely accurate.

What if it snowed, but nothing accumulated?

If the snow melted as it hit the ground (common when the ground is warm in the fall and spring), report a T (for trace) for snowfall. Even if the flurries don't reach the ground, they are still counted. They should be entered as a trace for both precipitation and snowfall.



What if the snow melted before I could measure it?

Do you know how much snow was on your board before it started to melt?

- If so, report the maximum depth of new snow on your board (or alternate measuring area) during the past 24 hours as your snowfall.
- If not, report M (missing) for snowfall. Mention in remarks that the snowfall melted before it could be measured.

Measuring Snow Depth

Best locations to measure snow depth:

- Relatively flat area not subject to drifts from buildings, fences, or plowing/shoveling
- An area that collects a representative amount of snow through the winter. Stay away from areas that routinely have the highest or lowest amounts.
- Areas near the rain gauge are generally good spots to take snow depth measurements.

Measure the snow depth in 4-6 locations. Average the measurements together to get the official snow depth, reported to the nearest inch.

Example:

$5'' + 3'' + 8'' + 10'' + 6'' + 7'' = 6.5''$ average. Would be reported as 7'' snow depth.

What if there are bare spots?

If the bare spots cover less than 50% of snow depth area, average measurements from the bare spots (0'' snow depth) in with measurements from areas that have snow, and report the average value as your snow depth.

If the bare spots cover more than 50% of area, regardless of how deep the snow is in the rest of the snow measuring area, report a T (for trace) for snow depth.

Don't report 0 snow depth until all but the man-made piles of snow are gone.



Optional Observation - Snow Core

A snow core is the amount of water that is contained in the snow pack. It's used to determine risk of flooding when snow melts in the spring. This optional measurement is taken once a week on Sunday or Monday when 2 or more inches of snow is on the ground.

How to take a snow core measurement

The rain gauge is turned upside down and pressed down to the ground in the snowpack in a location that is equal to the reported snow depth. It is sometimes referred to as taking a "biscuit" of the snow pack. The following images (using a plastic rain gauge to make it easier to see the snow) show how the rain gauge is used to gather the snow sample.

Snow Core Steps – Taking Sample of Snowpack Using Rain Gauge



If the snow is deeper than the rain gauge, go as far down as you can in the snow until the gauge is full. Then put a flat object like a spatula or clipboard over the opening on the rain gauge to keep the snow in the gauge while it is upside down. Next, dump the snow in the rain gauge into a bucket or trash can, then push the empty rain gauge back into the snow at the same location and collect the remainder of the snow down to the ground. Put the additional snow sample into the bucket or trash can with the first sample you collected.

The snow core sample is taken inside, melted down, and the liquid amount is reported as the snow core to the nearest tenth of an inch (i.e. 1.32" of water would be rounded to 1.3").

Tips for Taking Snow Core

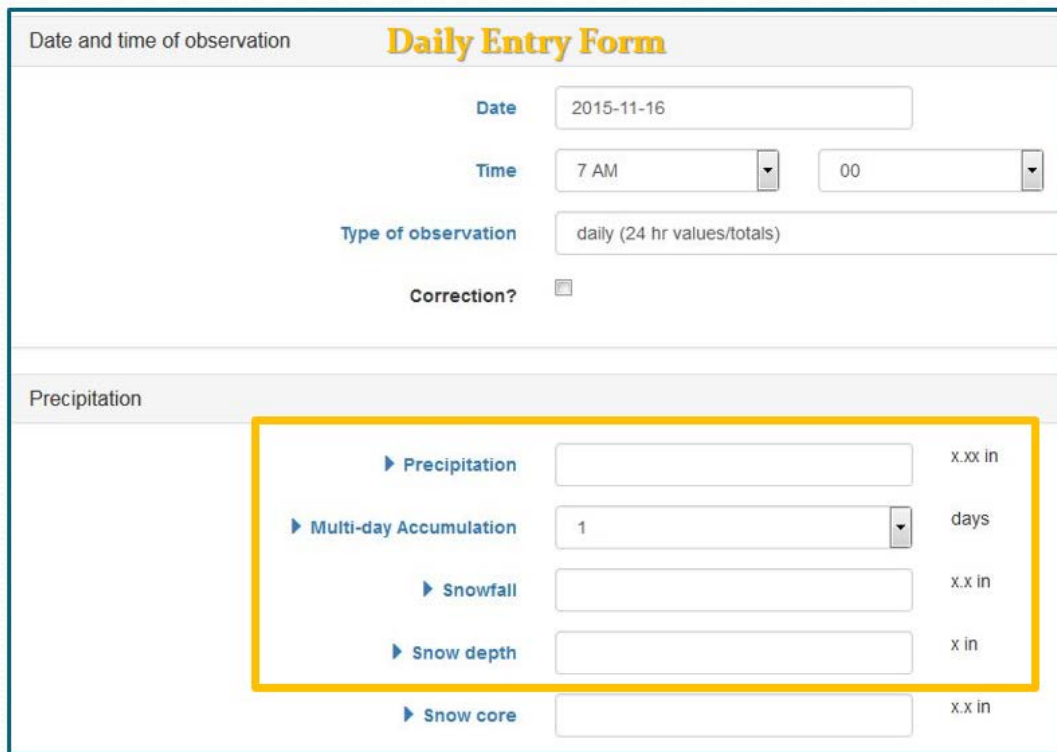
- Try to avoid areas that were sampled before, if possible. The snow density in a previously sampled spot will not be representative of the overall snowpack.
- If you see an ice layer in the snow core, note the thickness and where it is in the snow pack (top, middle, or bottom) in remarks.
- If you see grass in your snow core, you know you have a good sample (i.e. reached the ground)
- If ice is at the bottom of the snow pack, and you can't include it in your measurement, note in remarks how thick the ice layer was below the snow. We can estimate the water in that layer if we know how thick the ice is.



Reporting Precipitation, Snowfall and Snow Depth in WxCoder

Please report your observations daily using the WxCoder website on your PC, tablet, or smartphone. The website will render the page to fit the screen of the device you are using. If you're entering the data on a smartphone, use the daily entry form.

Here's where to enter the precipitation, snowfall and snow depth on the daily entry form:



The image shows a screenshot of the 'Daily Entry Form' on the WxCoder website. The form is titled 'Daily Entry Form' in yellow text. It has a header section for 'Date and time of observation' and a main section for 'Precipitation'. The 'Date' field is set to '2015-11-16'. The 'Time' field is set to '7 AM' and '00'. The 'Type of observation' is set to 'daily (24 hr values/totals)'. There is a 'Correction?' checkbox which is unchecked. The 'Precipitation' section contains five rows of input fields, each with a blue arrow icon to its left and a unit label to its right. The first row is 'Precipitation' with a unit of 'x.xx in'. The second row is 'Multi-day Accumulation' with a dropdown menu set to '1' and a unit of 'days'. The third row is 'Snowfall' with a unit of 'x.x in'. The fourth row is 'Snow depth' with a unit of 'x in'. The fifth row is 'Snow core' with a unit of 'x.x in'. A yellow rectangular box highlights the first four rows of the 'Precipitation' section.

If you're on a PC or tablet, the Superform is an easy way to enter data, to see past data, as well as enter more than one day's worth of data, if needed.

Here's where to enter the precipitation, snowfall and snow depth on the Superform:

Jan 2015 – Chanhassen WSFO (MPXM5, 21-1448-06) : --- Closed: YES --- Closed by WFO: YES [Save changes](#)

Day	Max temperature	Min temperature	At observation	Precipitation	Snowfall	Snow depth
1	30	9	11	T	T	3
2	26	4	23	0.00	0.0	3
3	32	9	9	0.02	0.3	3
4	9	-9	-9	0.00	0.0	3
5	-1	-14	-8	0.04	0.5	3
6	7	-10	-4	0.00	0.0	2
7	-2	-10	-8	0.00	0.0	2
8	15	-9	1	0.13	1.6	3
9	4	-6	-2	0.00	0.0	3
10	19	-8	7	0.00	0.0	3
11	13	3	4	T	T	3
12	4	-13	-13	0.00	0.0	3

Monthly data entry form looks similar, but we recommend using the superform because you don't have to unlock lines or confirm changes.

If you take an optional weekly snow core measurement, here's where to enter it on the daily entry page:

Observation for Chanhassen WSFO **Daily Entry Page**

Supervising WFO: Twin Cities/Chanhassen, MN

Site ID: MPXM5 (SHEF)

Site Number: 21-1448-06 (COOP)

Time of observation: 07:00

Lat/Lon: 44.84972, -93.56389

Elevation: 946 ft

Date and time of observation: Nov / 2 / 2011 at 7 AM : 00

Type of observation: daily (24 hr values/totals) Correction?

Air Temperature

Max temperature: x °F [help](#)

Min temperature: x °F [help](#)

At observation: x °F [help](#)

Precipitation

Precipitation: x.xx in [help](#)

Snowfall: x.x in [help](#)

Snow depth: x in [help](#)

Snow core: x.x in [help](#)

Leave snow core blank unless you have a snow core to report!

Here's where to enter the optional weekly snow core measurement on the Superform. Leave the snow core blank unless there is a snow core value to report.

Superform

Day	Max temperature	Min temperature	At observation	Precipitation	Multi-day Accumulation	Snowfall	Snow depth	Snow core
1	13	-10	13	0.00	1	0.0	4	
2	24	-5	-4	0.00	1	0.0	4	
3	26	-5	24	0.00	1	0.0	4	
4	32	1	1	0.15	1	2.5	6	
5	3	-18	-14	0.00	1	0.0	6	
6	-2	-17	-7	0.03	1	0.3	5	0.6
7	6	-11	-11	0.00	1	0.0	5	
8	-2	-11	-2	T	1	T	5	
9	10	-5	-4	0.11	1	2.0	7	

How Your Data are Used

- Daily Weather Maps (if received on the same day)
- Storm Event Summaries (if received by the end of the storm)
- State, regional, and national climate sites (as soon as the data are received)

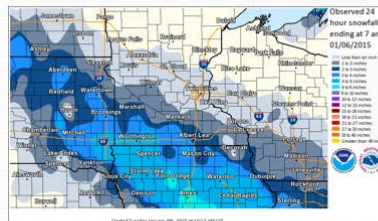
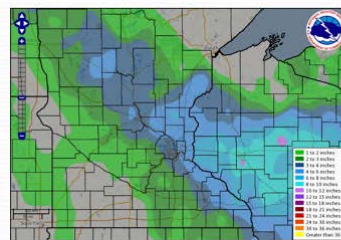
Your reports are the official total! We need your measurements as soon as possible.

You are welcome to contact us with intermediate snowfall reports during significant winter storms.

Please also report dangerous weather conditions like whiteouts, deteriorating road conditions, ice accumulations, etc.

We pass your reports onto our public safety partners at the local, county and state level; and issue warnings or advisories to notify citizens of the dangerous conditions.

Thank you for volunteering as a Coop Observer for the National Weather Service!



INCHES	LOCATION	ST	COUNTY	TIME
16.50	CAMBRIDGE	MI	ISANTI	0530 PM
16.50	ST AUGUSTA	MI	STEARNS	0302 PM
15.50	2 N NORTH BRANCH	MI	CHISAGO	0813 AM
15.00	4 NE PESH CITY	MI	CHISAGO	0859 PM
15.00	STARBUCK	MI	POPE	0337 PM
14.50	8 S2E PRINCETON	MI	ISANTI	1010 PM
13.80	MILACA	MI	MILLE LACS	0730 AM
13.60	3 N KIMBALL	MI	STEARNS	0600 AM
13.50	ST CLOUD	MI	STEARNS	0600 AM
13.00	4 SW WOLF CREEK	MI	CHISAGO	0840 AM
	OCCURRED OVER ANADOR TOWNSHIP.			
13.00	ENE BRANAH	MI	ISANTI	0720 AM
13.00	RICE	MI	BENTON	0938 PM
13.00	MILAN	MI	CHIPPewa	0700 PM
13.00	KIMBALL	MI	STEARNS	1210 PM
12.50	1 SW LITTLE FALLS	MI	NORFOLK	0510 AM
12.50	7 NE MAPLE LAKE	MI	WRIGHT	0933 PM
12.50	NORTH BRANCH	MI	CHISAGO	0300 PM
12.50	5 NW MADISON	MI	LAC QUI PARLE	0300 PM
12.00	8 ENE NORTH BRANCH	MI	CHISAGO	0600 PM
12.00	ST FRANCIS	MI	ANOKA	0401 PM
11.50	SADE RAPIDS	MI	BENTON	0816 AM
11.50	ELF RIVER	MI	SHERBORNE	0620 PM
11.00	ANNANDALE	MI	WRIGHT	0530 PM
11.00	MADISON	MI	LAC QUI PARLE	0420 PM
11.00	3 W BECKER	MI	SHERBORNE	0403 PM
11.00	5 SW FOLEY	MI	BENTON	0310 PM
11.00	RICE LAKE	WI	BARRON	0254 PM
11.00	ISANTI	MI	ISANTI	1235 PM
10.50	ST JOSEPH	MI	STEARNS	0542 PM
10.50	WOPROCK	MI	SWIFT	0255 PM
10.50	1 ENE BRANAH	MI	FANARBEC	0120 PM
10.10	WILLMAR	MI	RANDIYOWE	0445 PM
10.00	SADE RAPIDS	MI	BENTON	0325 PM
10.00	ANOKA	MI	ANOKA	0310 PM
10.00	5 NNE WILLMAR	MI	RANDIYOWE	0230 PM
10.00	KINGSTON	MI	MEESER	1258 PM
10.00	BENSON	MI	SWIFT	1225 PM
10.00	ST CLOUD	MI	STEARNS	1210 PM
10.00	4 SE OFSEGO	MI	WRIGHT	0745 AM

Your reports truly make a difference!