Winter Weather Observations at CoCoRaHS Stations

National Weather Service
Chanhassen, Minnesota

Presentation Outline

-Getting the station **ready for winter**

-How to measure freezing and frozen precipitation using the rain gauge, snowboard, and measuring stick

-How to record precipitation, snowfall, snowpack depth, and snowpack SWE on the CoCoRaHS website

-How your data are used

Co-op Station Daily Observation: 3 Elements Reported Year Round

Precipitation

Snowfall

Snowpack Depth

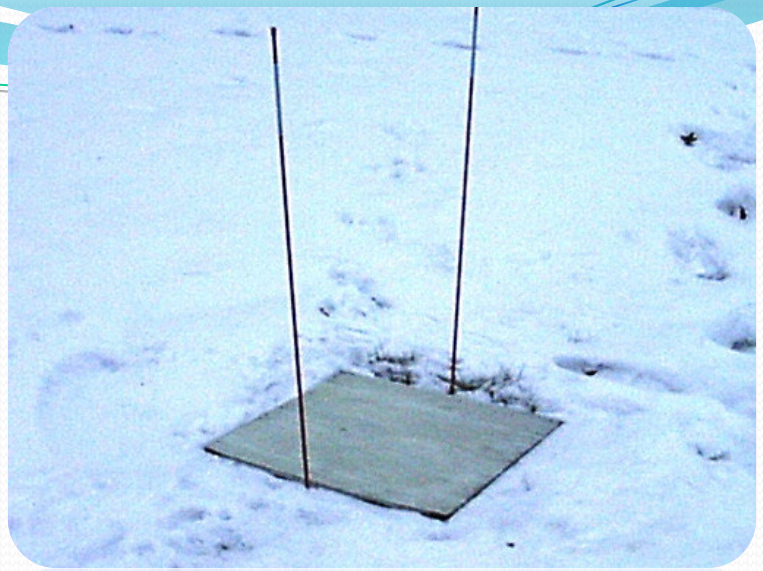
Even if they are zero!

Also, a snowpack SWE can be reported on Mondays when 2 or more inches of snow is on the ground.

Getting Ready for the Winter Season

- Remove the inner tube and funnel from the rain gauge
- Optional: Place a snowboard outside, with a flag or stake next to it

How to Make a Snowboard

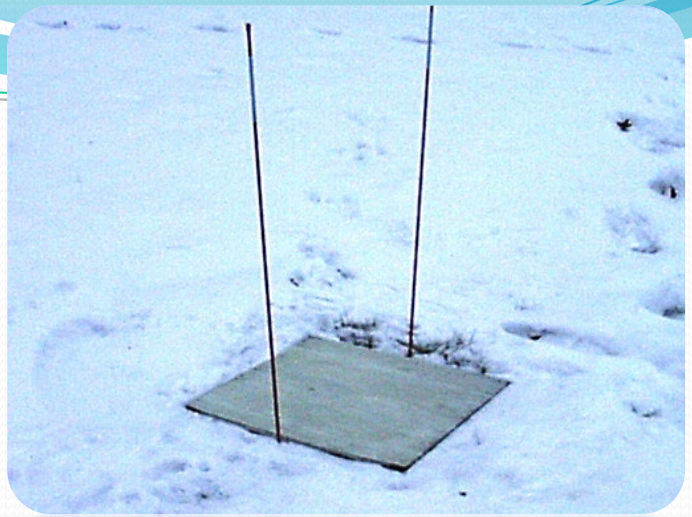


- Plywood board around 12” x 16”
- Painted white
- Need flag or stake nearby to find board in the snow

Why use a snowboard?
-Helps us tell the difference between old and new snow

Snowboard is not required! Other options for snowfall measurements will be discussed.

Where should the snowboard go?



Near the rain gage - usually a good location

What to look for:

-Flat location

-Away from areas where drifts form

-Away from areas where the wind blows the ground clean

-Away from areas where plowed snow piles up

Move the snowboard if you discover a better place to measure snowfall.

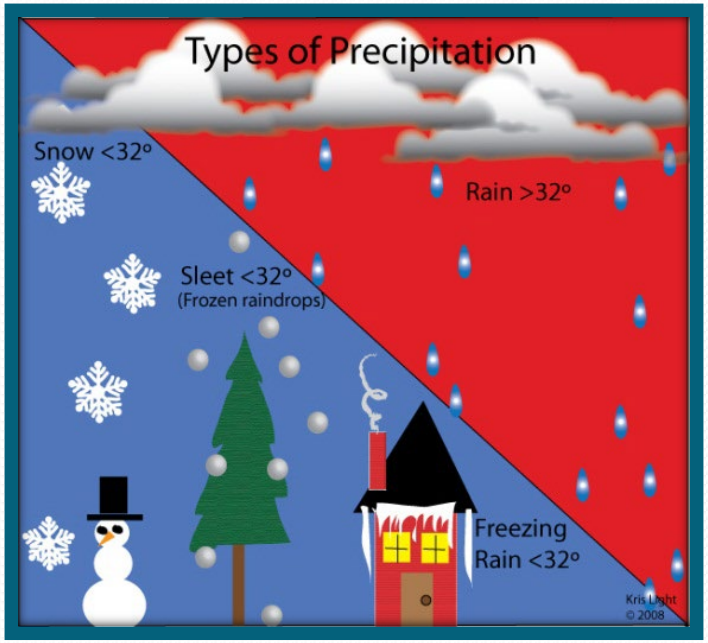
Measuring Winter Precipitation

Types of Winter Precipitation

- Snow
- Sleet (Ice Pellets)
- Freezing Rain
- Rain

All forms of precipitation that fall into the rain gauge during the past 24 hours are melted down.

The liquid value is reported as the precipitation.



Options for Melting Precipitation

If no precipitation falling at observation time:

Take the rain gauge inside, and either:

-Wait for the precipitation in the gauge to melt (may take a while), then pour melted precipitation into 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.

Options for Melting Precipitation

If precipitation is falling at observation time:

-Take a bucket, trash can, or other container out to the rain gauge

-Dump the precipitation from the gauge into the container

-Return the gauge back to the stand

-Take the bucket inside so the precipitation can be melted down and measured.

What if snow accumulates on the top of my gauge?

Take a spatula, or other flat object, and push straight down on the gauge to force the snow directly over the opening into the gauge.

In the extreme case pictured at right, you have two options. You can report missing precipitation (NA), since the gauge didn't appear to capture a good sample of the fallen snow; or you can follow option 2 on the next page to gather the precipitation value directly from the newly fallen snow.

What if the precipitation didn't fall into my rain gauge due to high winds…or my precipitation value looks too low?

Precipitation **cannot** be estimated, so there are two options:

1. Report the precipitation as NA for missing (the only option, unless the precipitation was pure snow)
2. Take a "biscuit" of the new snow in your snowfall measuring area using the rain gauge, melt the snow down, measure the liquid and report the value as the "Snowfall SWE" (i.e. snow water equivalent).

Measuring Snowfall

-Use snowboard so you can tell the difference between newly fallen snow and old snow

-Use snow measuring stick to determine snowfall to nearest tenth of an inch (i.e. 0.4” or 1.3”)

-Wipe snowboard clean after daily measurement, and place it on top of existing snow (i.e. level with surrounding snow) to reset board for next day

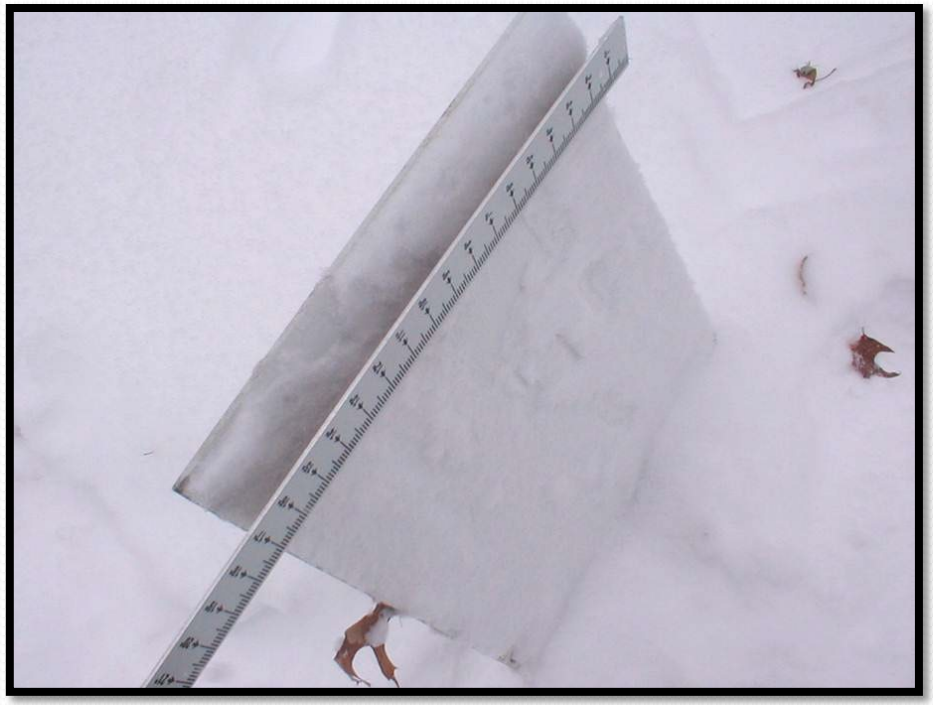
-Can flip the board over, or take it inside, to remove frozen precipitation

Measuring Snowfall

- Use ruler or yardstick to determine snowfall to nearest tenth of an inch (i.e. 0.4" or 5.3")

- Conversion Chart to Tenths of an Inch

1/16 & 1/8=	0.1
3/16 =	0.2
1/4 & 5/16 =	0.3
3/8 & 7/16=	0.4
1/2 =	0.5
9/16 & 5/8 =	0.6
11/16 =	0.7
3/4 & 13/16=	0.8
7/8 & 15/16 =	0.9



Measuring Snowfall: Other Methods if No Snowboard

- Sidewalk, driveway, picnic table that was clear of snow at start of 24 hour period, and remained undisturbed.
- Other options: back of pickup truck, hood of car, top of dumpster, dock, other relatively flat surface.
- As last resort (windy events, no other options), can use difference between yesterday's snowpack depth and today's snowpack depth to calculate a new snowfall estimate.
  - Example: Yesterday snowpack depth was 5.0" and today's was 8.0", so new snowfall estimate = 3.0". Make sure to mention in remarks that the snowfall was estimated.
- Do not use grassy areas to measure new snowfall without a snowboard– you will get the depth of the grass plus the depth of the snow!

Don't report zero if it snowed! If a snowfall report is not available, report "NA".

What if the snow melted off my snowboard 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 snow on your board during the past 24 hours as your snowfall.
- ✓ If not, report NA (missing) for snowfall. Mention in remarks that the snowfall melted before it could be measured.

Don't report zero for snowfall if it snowed. Put NA for missing, or an estimated value, if a snowfall measurement is not available.

What if it snowed, but nothing accumulated on the ground?

If the snow melted as it hit the ground (common when the ground is still warm in the fall), 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 of precipitation and snowfall.

What if the wind blew snow onto my snowboard? Does that count?

Blowing and drifting snow does not count as snowfall.

-If it didn't snow during the past 24 hours, disregard the snow that has blown onto your board, wipe the board clean, and report zero for snowfall.

-You can report blowing and drifting snow in remarks.

Measuring Snowpack Depth

Best locations to measure:

-Relatively flat area not subject to drifts from buildings, fences, or plowing

-An area that collects a representative amount of snow through the winter. Stay away from areas that routinely have the highest or lowest amounts.

Measure the snowpack depth in 4-6 locations. Average the measurements together to get the average snowpack depth, reported to the nearest half inch.

Example:

5” + 3” + 8” + 10” + 6” + 7” = 6.5” average.

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 snowpack depth) in with measurements from areas that have snow, and report the average value as your snowpack 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 snowpack depth.

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

Optional Observation: Snowpack SWE

Snowpack SWE (i.e. Snow Water Equivalent) is the amount of water in the snowpack

Used to determine risk of flooding when snow melts

Measurement taken once a week on Monday when 2 or more inches of snow is on the ground

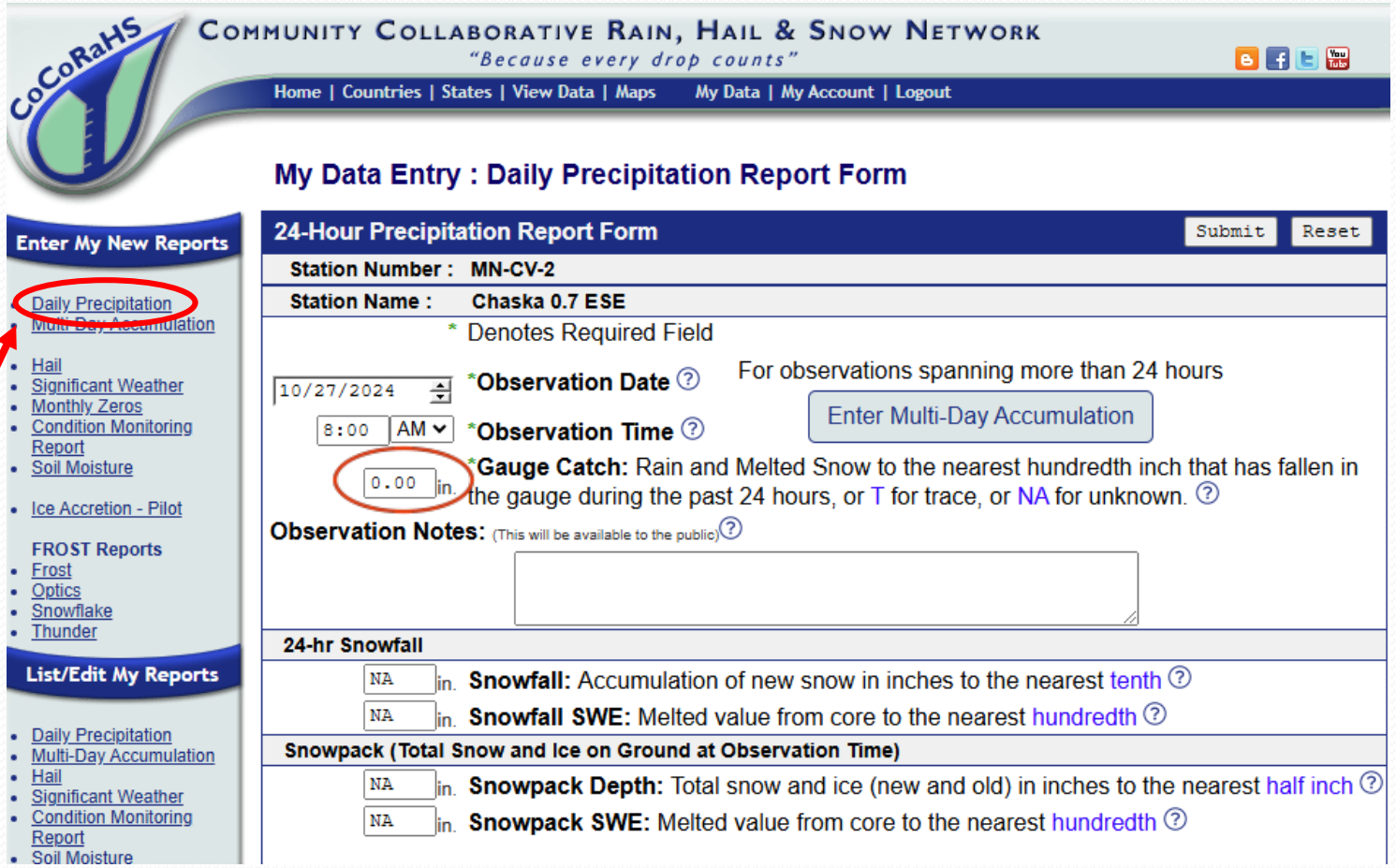
Rain gage is turned upside down and pressed down into snowpack in location equal to the reported snowpack depth. The snow in the rain gauge is taken inside, melted down, and the liquid amount is reported as the Snowpack SWE (i.e. melted value from core under "Total Snow and Ice on Ground"

Snowpack SWE Steps – Taking Sample of Snowpack Using Rain Gauge

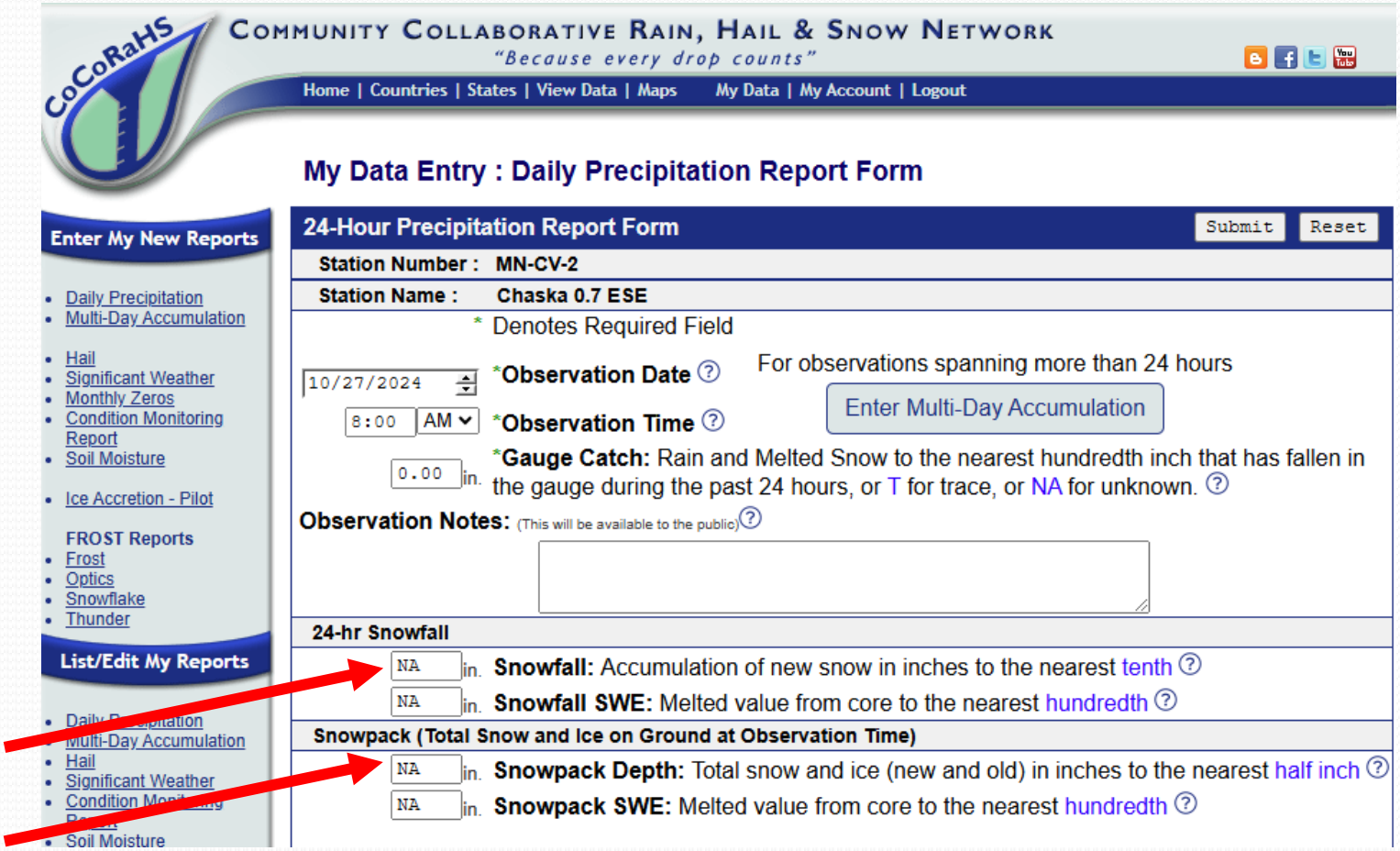
Tips for Snowpack SWE

- ✓ 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 snowpack SWE, note the thickness and where it is in the snowpack (top, middle, bottom) in remarks.
- ✓ If you see grass in your snowpack SWE, you know you have a good sample (i.e. reached the ground)
- ✓ If ice is at the bottom of the snowpack, and you can't include it in your measurement, mention 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.

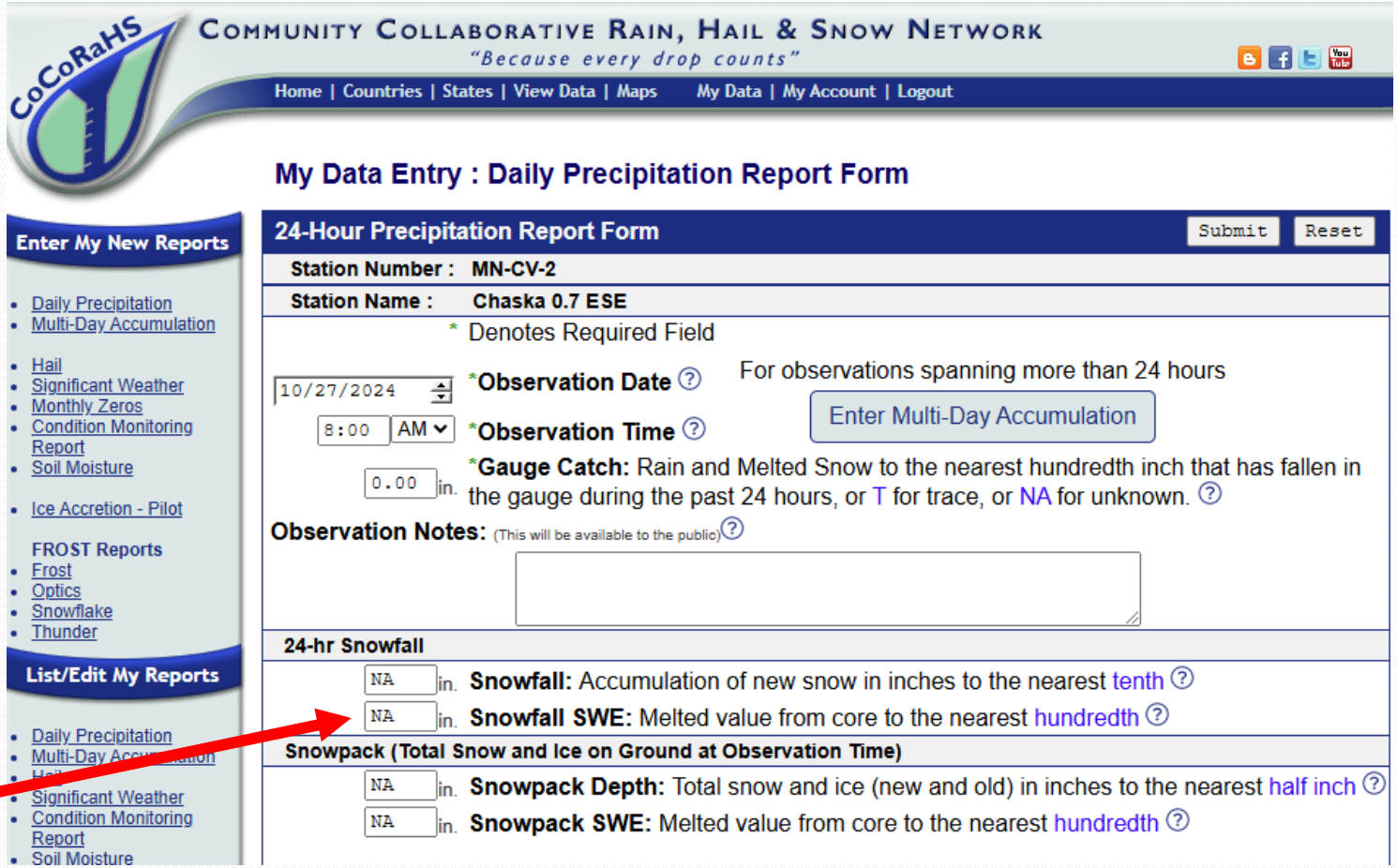
Recording Daily Precipitation



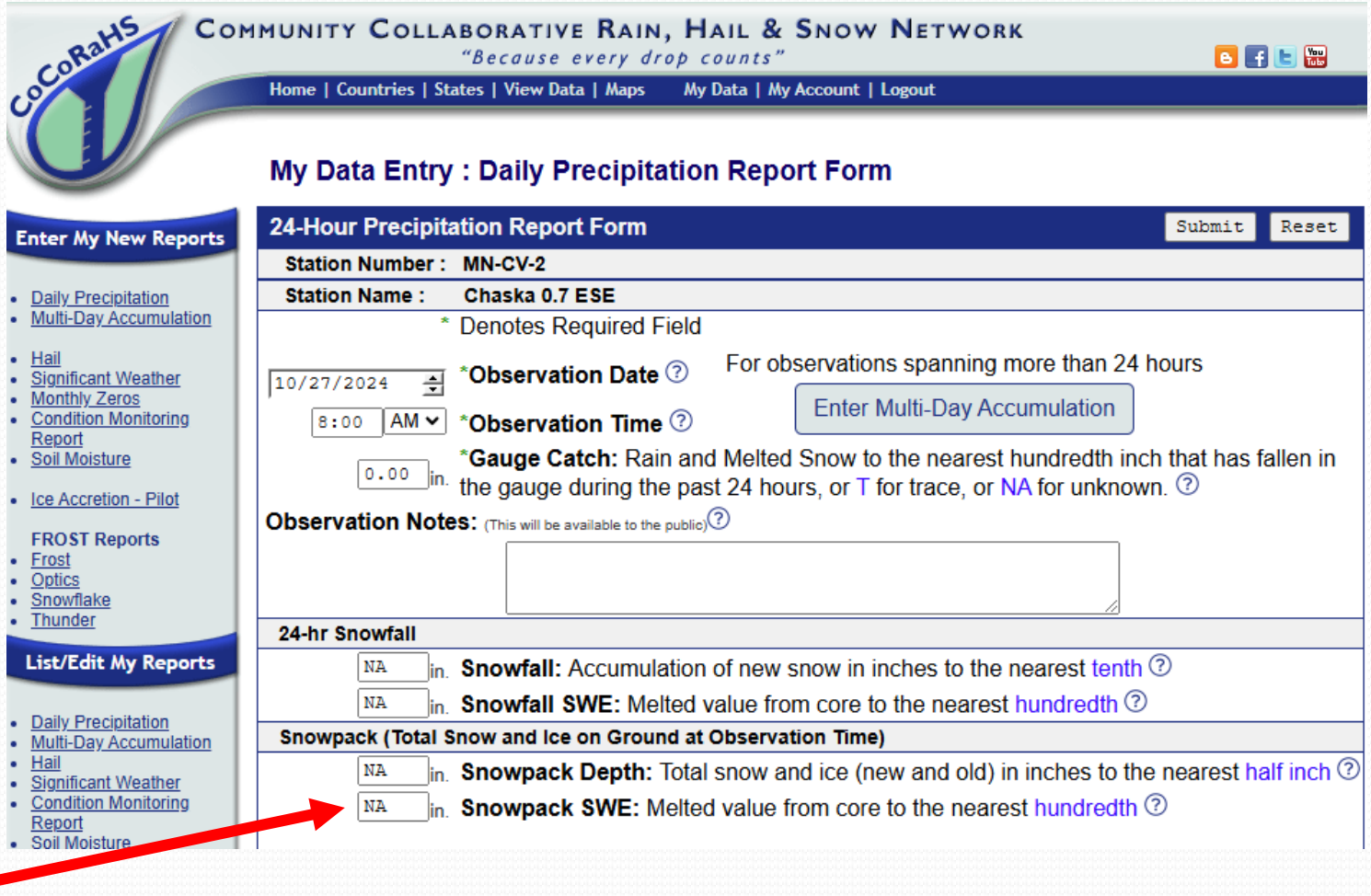
Reporting Snowfall and Snowpack Depth



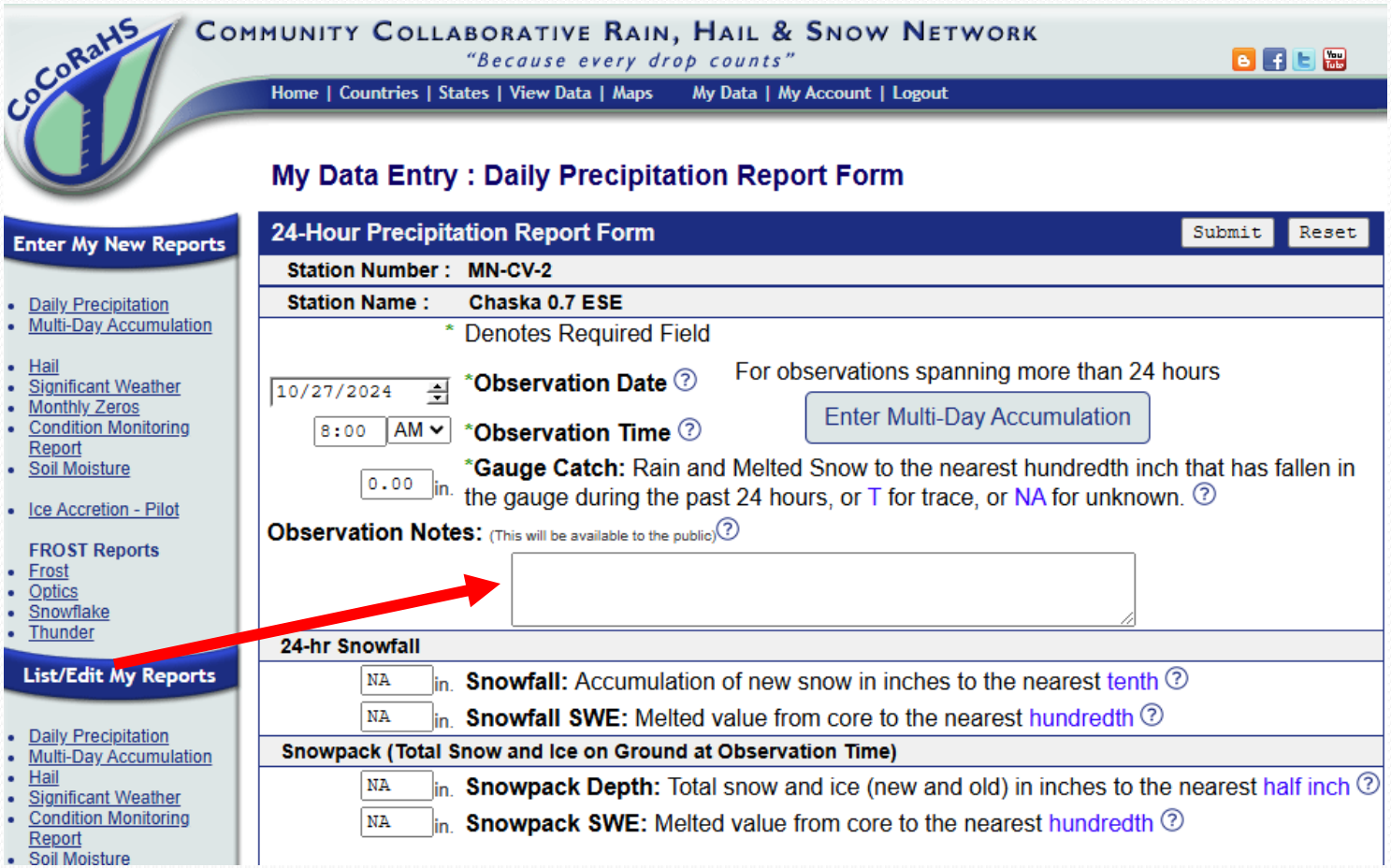
Reporting Precipitation Measurement from Snowfall SWE (if measurement is taken)



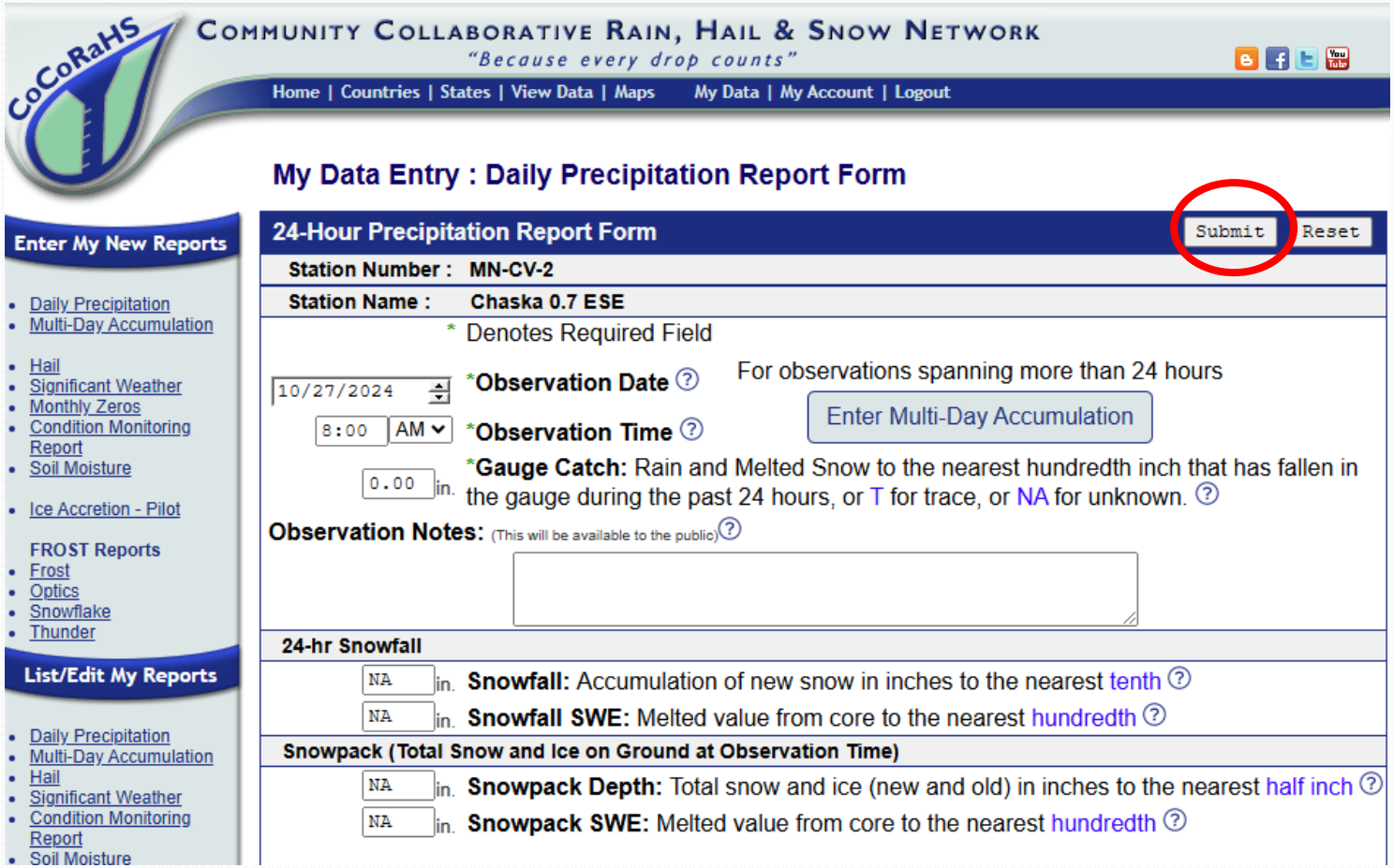
Reporting Snowpack SWE (if measurement is taken)



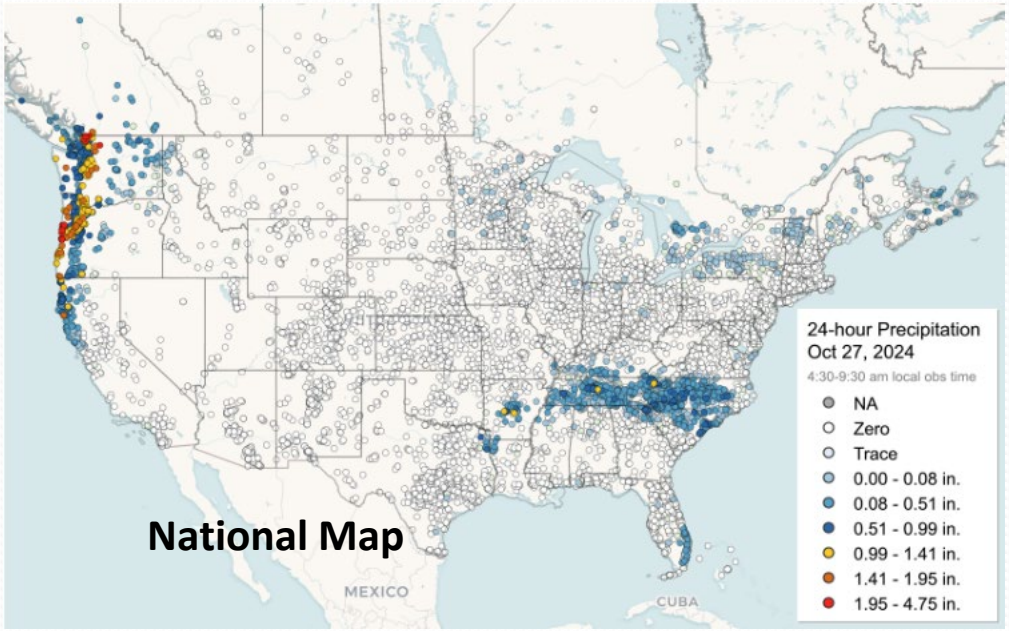
Adding Observation Notes



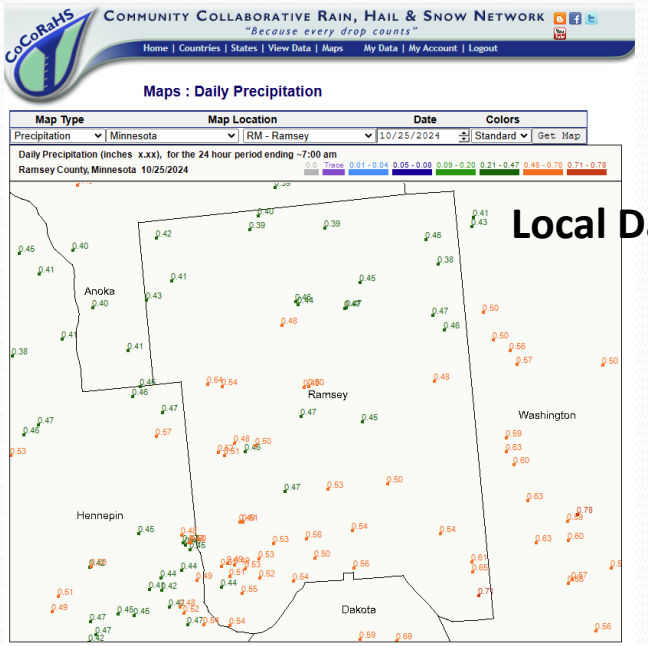
Submit your report



Your data will appear on CoCoRaHS.org website within a few minutes. Also transmitted to partner agencies like the National Weather Service, and state and national climate centers.



National Map



Local Data

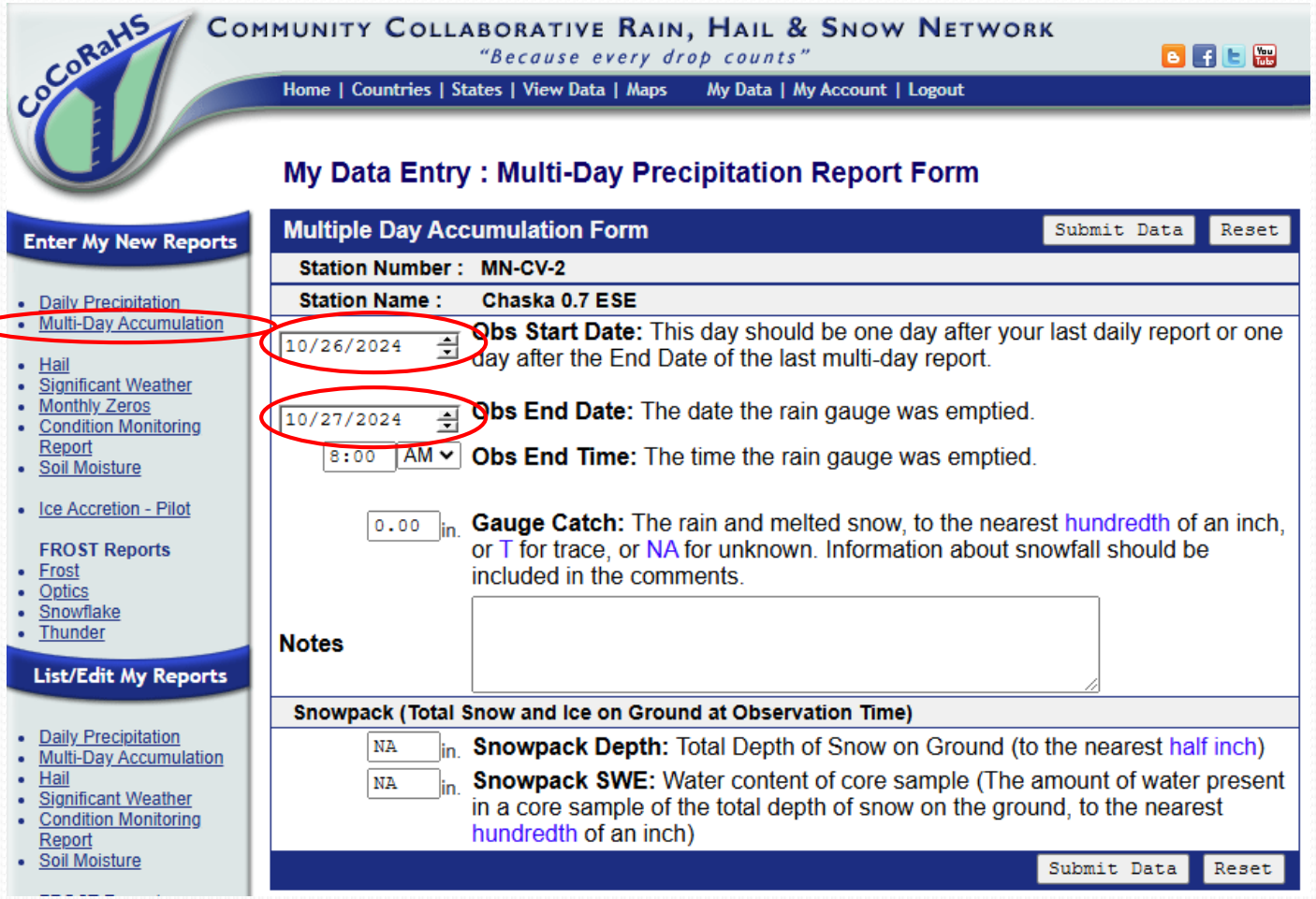
Obs Date	Obs Time	Station Number	Station Name	Gauge Catch in.	24hr Snowfall ❄ in	24hr Snowfall 💧 in	24hr Snowfall SLR	Snowpack ❄ in	Snowpack 💧 in	Snowpack Density	State	County
10/25/2024	9:00 AM	MN-RM-120	Maplewood 5.6 SSE	0.71	0.0	0.00	NA	0.0	0.00	NA	MN	Ramsey
10/25/2024	7:00 AM	MN-RM-180	Maplewood 4.6 SSE	0.65	NA	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	6:00 AM	MN-RM-15	Roseville 2.1 NW	0.64	0.0	NA	NA	0.0	NA	NA	MN	Ramsey
10/25/2024	8:00 AM	MN-RM-116	Maplewood 4.3 SSE	0.61	0.0	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	7:00 AM	MN-RM-149	Saint Paul 1.5 SSE	0.56	NA	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	8:00 AM	MN-RM-145	Saint Paul 1.0 W	0.56	NA	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	7:00 AM	MN-RM-223	Saint Paul 4.0 WSW	0.55	NA	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	10:05 AM	MN-RM-201	Saint Paul 1.8 ENE	0.55	NA	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	7:00 AM	MN-RM-54	Saint Paul 5.1 SW	0.54	NA	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	7:00 AM	MN-RM-56	Roseville 1.6 NW	0.54	NA	NA	NA	NA	NA	NA	MN	Ramsey
10/25/2024	7:00 AM	MN-RM-115	Saint Paul 0.8 E	0.54	NA	NA	NA	NA	NA	NA	MN	Ramsey

Multi-Day Precipitation Report

If you are away on vacation or out of town, this is the form to use.

Put the dates that the measurement is covering, and record the precipitation you found in the gage.

Don't file daily reports for these dates.



How Your Data Are Used

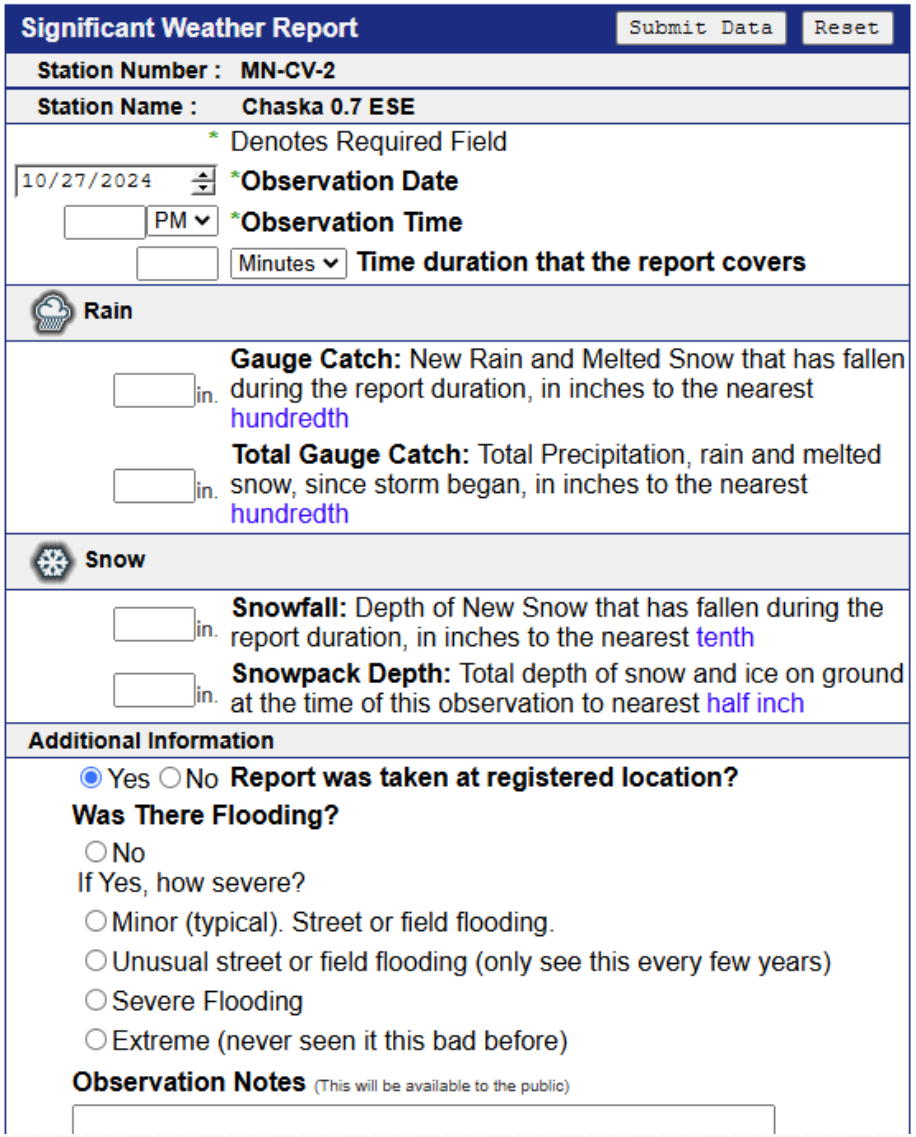
Daily Weather Maps (if received on the same day)
Storm Event Summaries (if received by end of storm)
State, regional, and national climate sites (as soon as data are received)

The sooner you send in your data, the more ways it can be used!

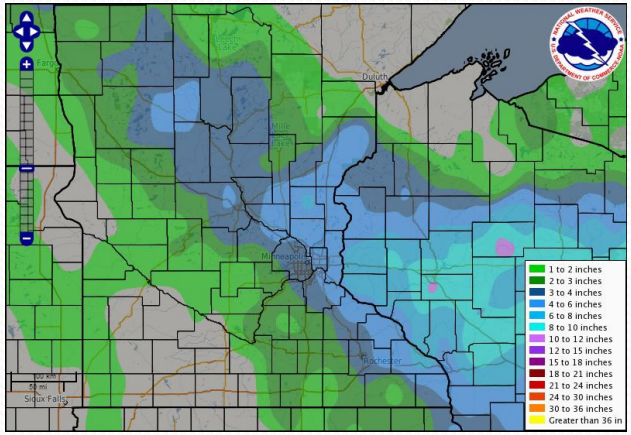
You're welcome to share intermediate reports during significant winter storms. (i.e. when you receive new snowfall amounts like 6", 9", 12", your storm total snowfall, etc.) Intermediate reports can be sent via the 'Significant Weather Report' on CoCoRaHS.

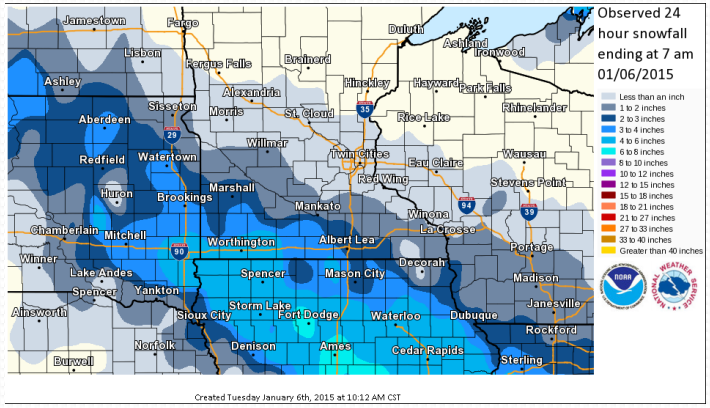
Please also report dangerous weather conditions like whiteouts, deteriorating road conditions, ice accumulations, etc. via the Significant Weather Report. We pass your reports onto our safety partners and the public, and issue warnings or advisories to notify others of the dangerous conditions. Your reports truly make a difference!

Significant Weather To Report? Here's How:



Thank you for volunteering as a CoCoRaHS Observer!





Report List:

INCHES	LOCATION	ST	COUNTY	TIME
16.50	CAMBRIDGE	MN	ISANTI	0530 PM
16.50	ST AUGUSTA	MN	STEARNS	0302 PM
15.50	2 N NORTH BRANCH	MN	CHISAGO	0813 AM
15.00	4 NE RUSH CITY	MN	CHISAGO	0859 PM
15.00	STARBUCK	MN	POPE	0337 PM
14.50	8 ESE PRINCETON	MN	ISANTI	1010 PM
13.80	MILACA	MN	MILLE LACS	0730 AM
13.60	3 N KIMBALL	MN	STEARNS	0600 AM
13.50	ST CLOUD	MN	STEARNS	0600 AM
	MEASURED AT THE PRISON.			
13.00	4 SSW WOLF CREEK	MN	CHISAGO	0840 AM
	OCCURRED OVER AMADOR TOWNSHIP.			
13.00	ENE BRAHAM	MN	ISANTI	0720 AM
13.00	RICE	MN	BENTON	0938 PM
13.00	MILAN	MN	CHIPPEWA	0700 PM
13.00	KIMBALL	MN	STEARNS	1210 PM
12.50	1 SW LITTLE FALLS	MN	MORRISON	0610 AM
12.50	7 NE MAPLE LAKE	MN	WRIGHT	0933 PM
12.50	NORTH BRANCH	MN	CHISAGO	0300 PM
12.50	5 NW MADISON	MN	LAC QUI PARLE	0300 PM
12.00	8 ENE NORTH BRANCH	MN	CHISAGO	0600 PM
12.00	ST FRANCIS	MN	ANOKA	0401 PM
11.50	SAUK RAPIDS	MN	BENTON	0816 AM
11.30	ELK RIVER	MN	SHERBURNE	0620 PM
11.00	ANNANDALE	MN	WRIGHT	0630 PM
11.00	MADISON	MN	LAC QUI PARLE	0420 PM
11.00	3 N BECKER	MN	SHERBURNE	0403 PM
11.00	5 SW FOLEY	MN	BENTON	0310 PM
11.00	RICE LAKE	WI	BARRON	0254 PM
11.00	ISANTI	MN	ISANTI	1235 PM
10.50	ST JOSEPH	MN	STEARNS	0542 PM
10.50	MURDOCK	MN	SWIFT	0255 PM
10.50	1 ENE BRAHAM	MN	KANABEC	0120 PM
10.10	WILLMAR	MN	KANDIYOHI	0445 PM
10.00	SAUK RAPIDS	MN	BENTON	0325 PM
10.00	ANOKA	MN	ANOKA	0310 PM
10.00	5 NNE WILLMAR	MN	KANDIYOHI	0230 PM
10.00	KINGSTON	MN	MEEKER	1258 PM
10.00	BENSON	MN	SWIFT	1225 PM
10.00	ST CLOUD	MN	STEARNS	1210 PM
10.00	4 SE OTSEGO	MN	WRIGHT	0745 AM

Your reports truly make a difference!