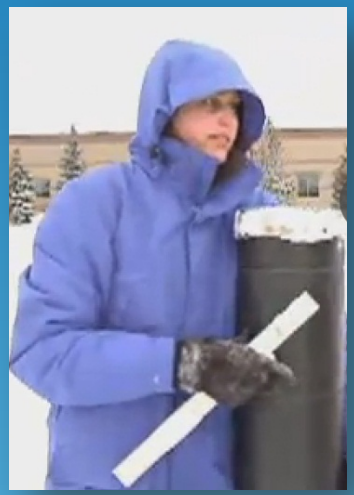
# Winter Weather Observations at NWS Co-op Sites



**National Weather Service – Chanhassen, Minnesota**

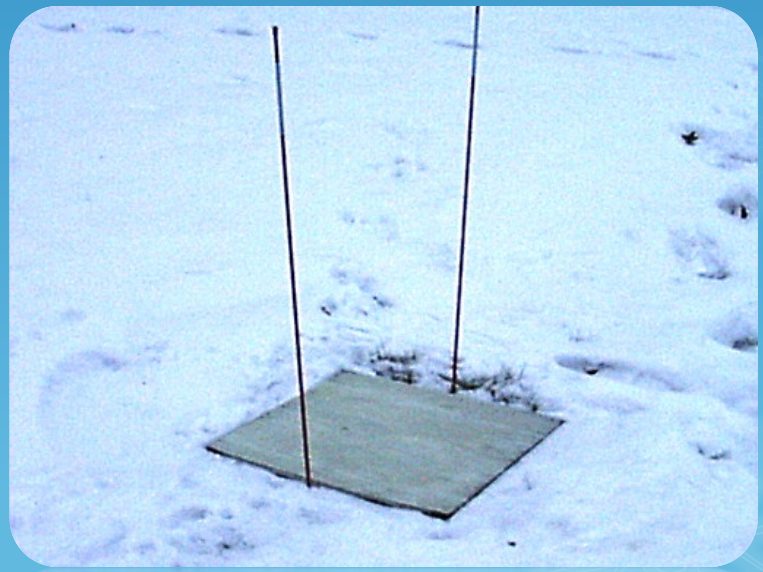
# Presentation Outline

- Getting the station **ready for winter**
- **How to measure freezing and frozen precipitation** using the rain gauge, snowboard, and snow stick
- **How to record** precipitation, snowfall, snow depth, and snow core **in WxCoder**
- **How your data are used**
- **Resources** available for Co-op observers

# Getting Ready for the Snow Season

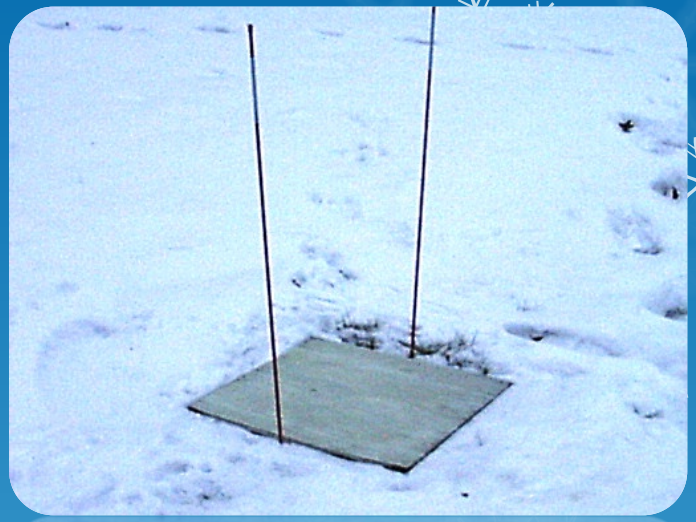
- Remove the inner tube and funnel from rain gauge


- Place snowboard outside, with a flag next to it



**Need a snowboard, flag, snow measuring stick?**

# Where should the snowboard go?



- Near the rain gage - generally good
- What to look for:
  - Flat location
  - Away from areas where drifts form
  - Away from areas where the wind blows the ground clean of snow
  - Away from areas where plowed snow piles up

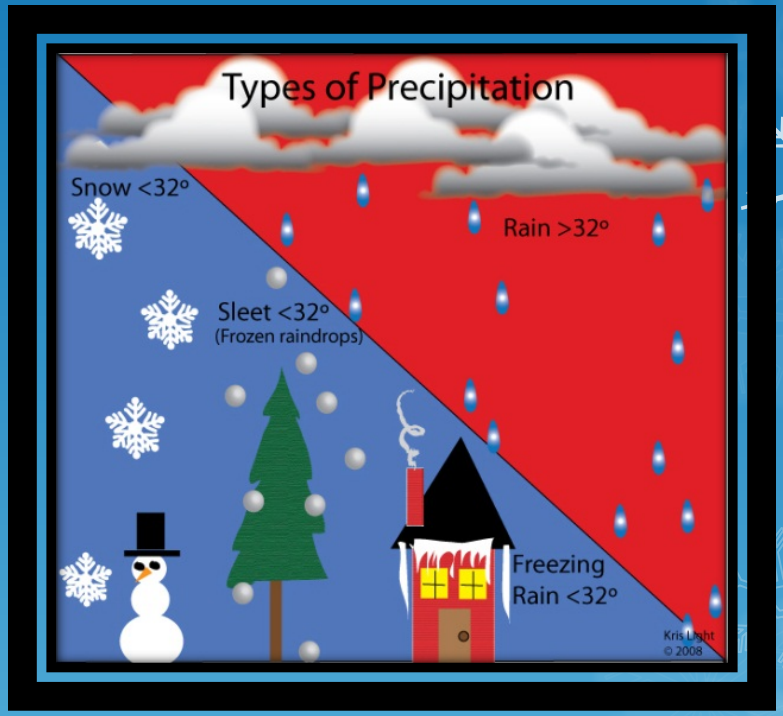
**Move the snowboard if you discover a better place to measure snowfall. May want to attach flag to board.**

# If you have a frost tube…

- Pull frost tube out and turn it upside down. Make sure fluid color is yellow green from top to bottom (if not, let us know)
- Make sure frost tube is in dry environment. Use sponge on stick to remove any water.
- If cap is sticking, apply Vaseline to threads.
- Take measurement every Monday through spring
- Report both the depth of frost and “depth of surface frost thawed”, even if they are zero.

# Measuring Winter Precipitation

- Types of precipitation
  - **Snow**
  - **Sleet / Ice Pellets**
  - **Freezing Rain / Ice**
  - **Rain**

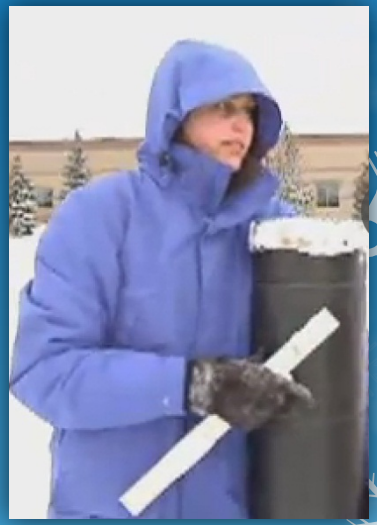



All forms of precipitation that fall into the rain gauge during the past 24 hours are melted down.

**The liquid value is reported as 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.**



# 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 gage into the container
  - Return the gauge back to the stand
  - Take the bucket inside so the precipitation can be melted down and measured.

# Q: There's ice in the rain gauge, and I can't take it inside to melt because precipitation is falling!

- A: Leave the rain gauge outside so it captures the current precipitation.
- Enter missing for today's precipitation. Report snowfall and snow depth as normal.
- The next day, measure the precipitation at your normal observation time (if the ice has melted), and report the amount as a 2-day precipitation total.

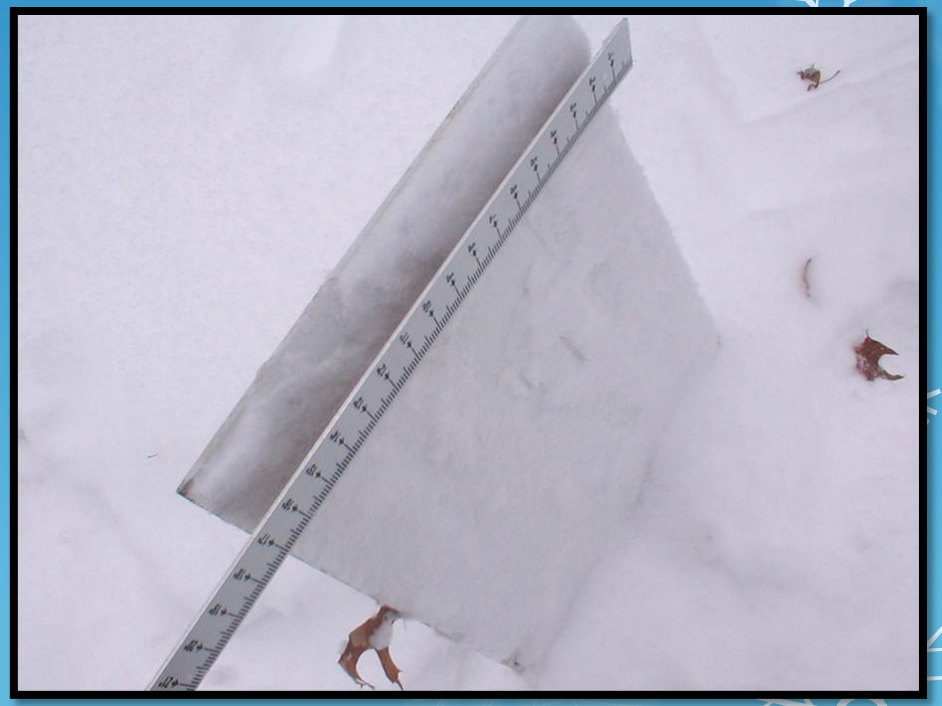
**Q:** The precipitation didn't fall into my rain gage due to gusty winds…or my precipitation value looks really low!


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

1. Report the precipitation as M for missing (the only option, unless the precipitation was pure snow)
2. Take a "biscuit" of the new snowfall on the snowboard (or other location) using the rain gauge, melt the snow down, measure the liquid and report the value as precipitation.

# Measuring 24 hour Snowfall

- **Use snowboard so you can tell 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 board over, or take it inside, to remove frozen precip



# Q: My snowboard was wiped clean by the wind!

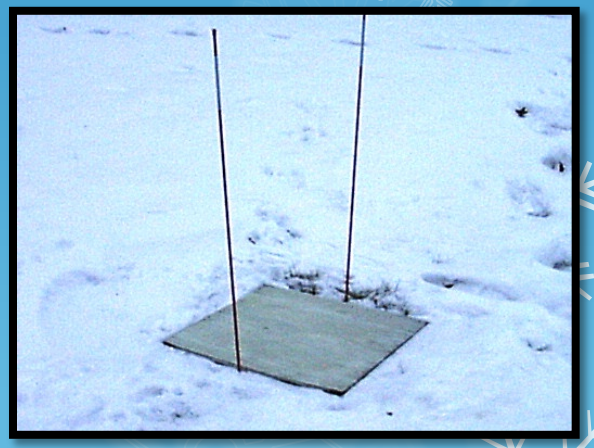
- **A: Snowfall can be estimated. It's important to note in remarks when snowfall is estimated.**
- Is there another location on your property (i.e. a driveway, sidewalk, deck, picnic table) you can use to measure/estimate the new snowfall?
- If not, call us with your precipitation total, and we can help determine a snowfall estimate for your station. (Snowfall to precip ratio is NEVER 10 to 1!)

**Don't report zero for snowfall if it snowed! Zero means that it didn't snow.**

# **Q:** The snow melted off my snowboard before I could measure it.

- A: 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 you're not sure how deep the snow got, and the snow melted before your observation time, report "M" (missing). Mention in remarks that the snow melted before it could be measured.

**Don't report zero for snowfall if it snowed! Zero means it didn't snow.**



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

- **A: If the snow melted as it hit the ground** (common when the ground is still warm in the fall), report a “T” (trace) for snowfall.
- Flurries (even if they don’t reach the ground) are considered precipitation and snowfall. **Flurries are reported as both a trace of precipitation and a trace of snowfall.**

# Q: The wind blew snow onto my snowboard. Does that count?

- A: Blowing and drifting snow does not count as new snowfall.
- If it didn't snow during the past 24 hours, and you find snow on your snowboard, disregard the snow on the board, wipe the board clean, and report zero for snowfall.
- You can report blowing and drifting snow in remarks.

# Measuring Snow Depth

- Best locations to measure snow depth
  - Relatively flat area not subject to drifts caused by buildings, fences, or plowing
  - An area that shows a representative amount of snow through the winter (i.e. not the highest or lowest depth of snow on your property).
  - You can move your snow depth measurement area during the winter if you find a more representative location.

**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**

- If the bare spots cover less than 50% of snow depth area, average the bare spots 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 trace for snow depth.
- **Don't report 0 snow depth until all but the man-made piles of snow are gone.**

## What if there are bare spots?

# Co-op Daily Observation: 3 Elements Reported During Winter Season

- October 1st through April 30th make sure to report each day:
  - **Precipitation**
  - **Snowfall**
  - **Snow Depth**

**Even if it's zero!**

# Extra Credit Observation: *Snow Core*

- **Snow Core = amount of water in the snow pack**
- Used to gage risk of flooding when snow melts
- **Measurement taken once a week (on Sunday or 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 snow depth. Snow 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”)


1


2


3


4

# Tips for Snow Cores

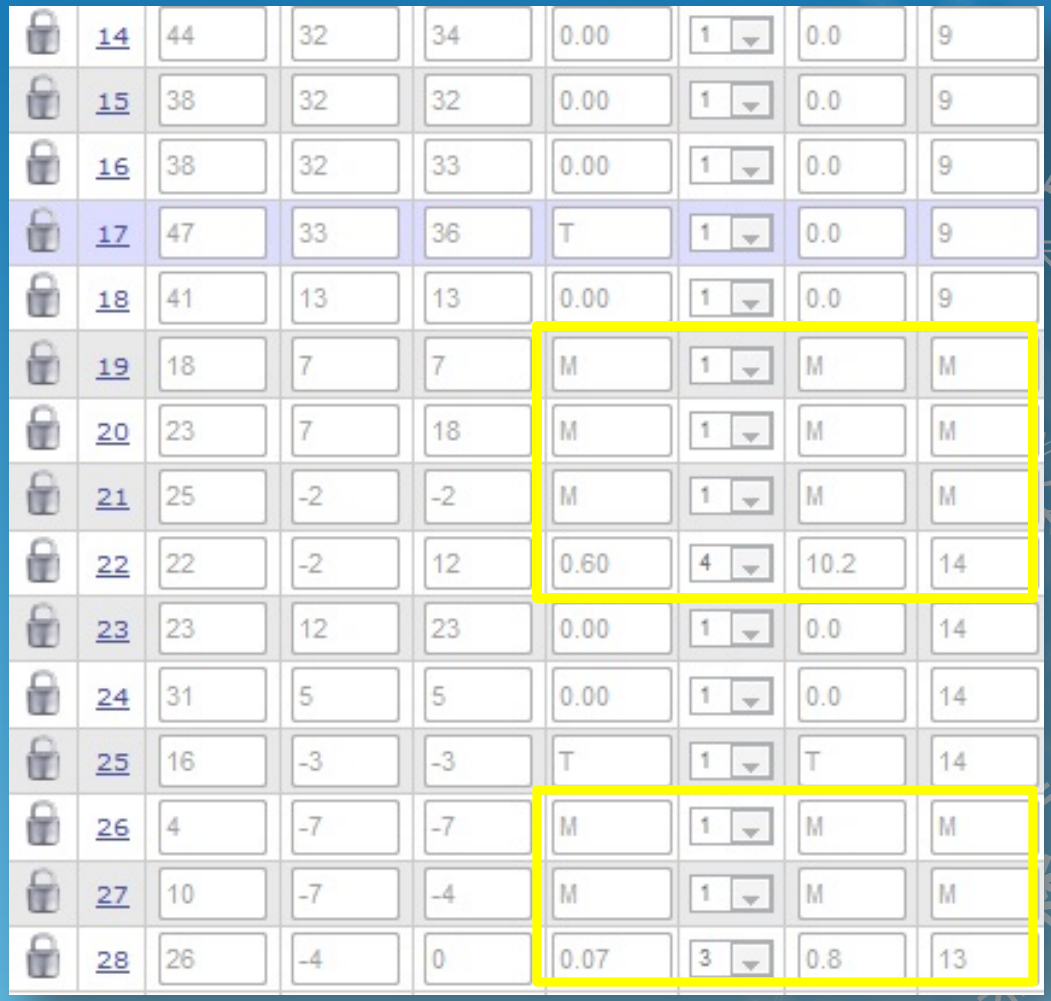
- Try to avoid areas that were sampled before, if possible. The snow density in a previously sampled spot will not be representative of the overall snowpack
- If you see an ice layer in the snow core, note the thickness and where it is in the snow pack (top, middle, bottom) in remarks.
- If you see grass 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, tell us 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

## Using Monthly Page

| | | TEMPERATURE | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 24 HRS | | | 24 HRS | | | AT OBS |
| lock | Day | Max | Min | At obs | Rain | Accum. | Snow | Depth |
| | 1 | 19 | 9 | 9 | T | 1 | T | 3 |
| | 2 | 18 | 9 | 18 | T | 1 | T | 3 |
| | 3 | 21 | 1 | 10 | 0.00 | 1 | 0.0 | 3 |
| | 4 | 20 | 10 | 14 | 0.39 | 1 | 6.5 | 10 |
| | 5 | 20 | -5 | -3 | T | 1 | T | 9 |
| | 6 | 17 | -3 | 9 | T | 1 | T | 9 |
| | 7 | 17 | -3 | -3 | T | 1 | T | 9 |
| | 8 | 14 | -4 | 5 | 0.00 | 1 | 0.0 | 9 |
| | 9 | 21 | 4 | 21 | 0.00 | 1 | 0.0 | 9 |
| | 10 | 34 | 21 | 23 | 0.00 | 1 | 0.0 | 8 |
| | 11 | 26 | 19 | 19 | 0.22 | 1 | T | 8 |
| | 12 | 25 | -4 | -4 | 0.47 | 1 | 7.0 | 15 |
| | 13 | 2 | -15 | -15 | 0.00 | 1 | 0.0 | 15 |
| | 14 | -1 | -15 | -1 | 0.00 | 1 | 0.0 | 14 |
| | 15 | 15 | -1 | 15 | 0.00 | 1 | 0.0 | 14 |
| | 16 | 19 | 14 | 15 | 0.31 | 1 | 4.8 | 17 |
| | 17 | 18 | 2 | 3 | 0.11 | 1 | 2.8 | 21 |
| | 18 | 18 | 2 | 3 | T | 1 | T | 18 |
| | 19 | 14 | -2 | -2 | 0.00 | 1 | 0.0 | 17 |
| | 20 | 22 | -5 | 22 | 0.00 | 1 | 0.0 | 16 |

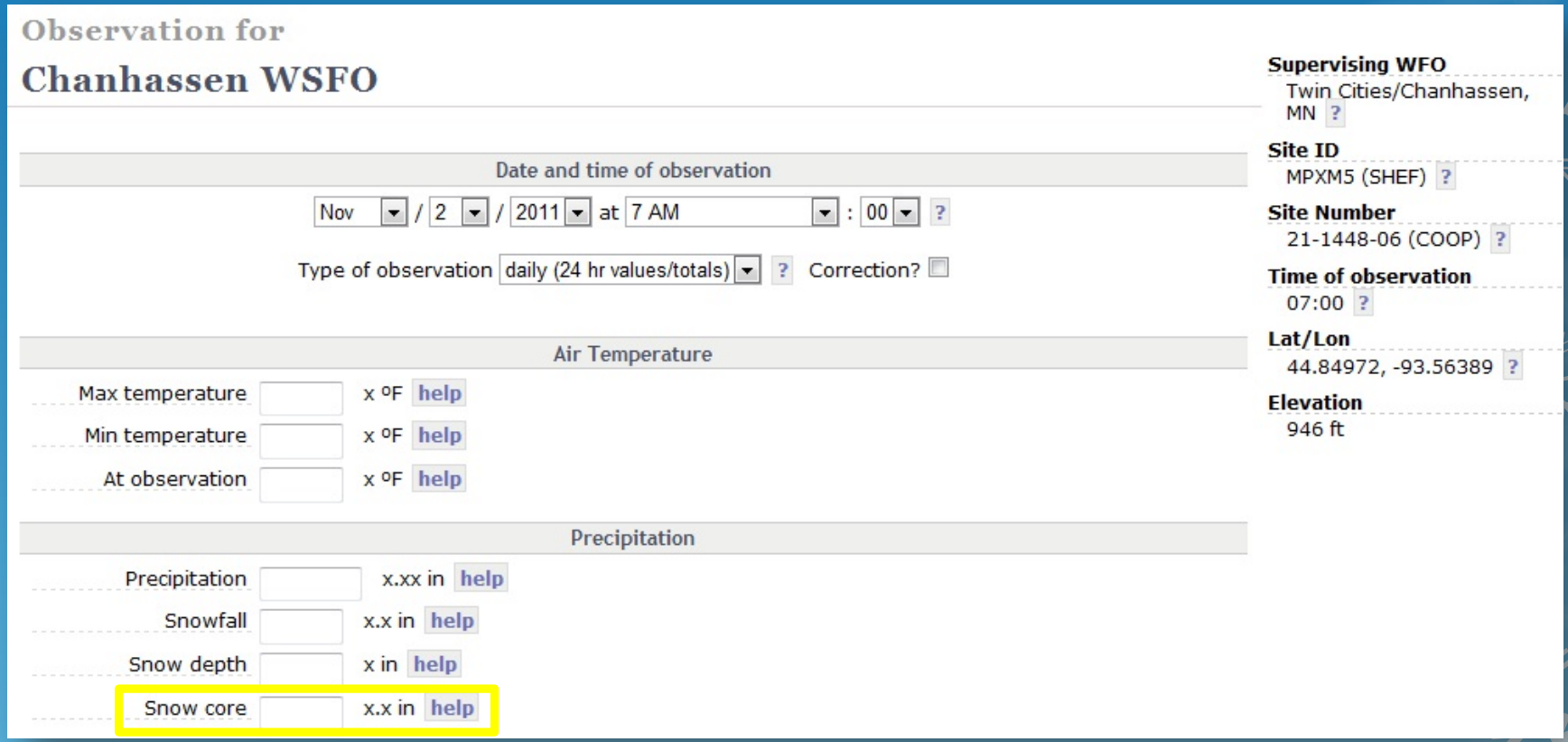
# Multi-day precipitation, snowfall, and snow depth



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 14 | 44 | 32 | 34 | 0.00 | 1 | 0.0 | 9 |
| | 15 | 38 | 32 | 32 | 0.00 | 1 | 0.0 | 9 |
| | 16 | 38 | 32 | 33 | 0.00 | 1 | 0.0 | 9 |
| | 17 | 47 | 33 | 36 | T | 1 | 0.0 | 9 |
| | 18 | 41 | 13 | 13 | 0.00 | 1 | 0.0 | 9 |
| | 19 | 18 | 7 | 7 | M | 1 | M | M |
| | 20 | 23 | 7 | 18 | M | 1 | M | M |
| | 21 | 25 | -2 | -2 | M | 1 | M | M |
| | 22 | 22 | -2 | 12 | 0.60 | 4 | 10.2 | 14 |
| | 23 | 23 | 12 | 23 | 0.00 | 1 | 0.0 | 14 |
| | 24 | 31 | 5 | 5 | 0.00 | 1 | 0.0 | 14 |
| | 25 | 16 | -3 | -3 | T | 1 | T | 14 |
| | 26 | 4 | -7 | -7 | M | 1 | M | M |
| | 27 | 10 | -7 | -4 | M | 1 | M | M |
| | 28 | 26 | -4 | 0 | 0.07 | 3 | 0.8 | 13 |

# How to report snow core in WxCoder

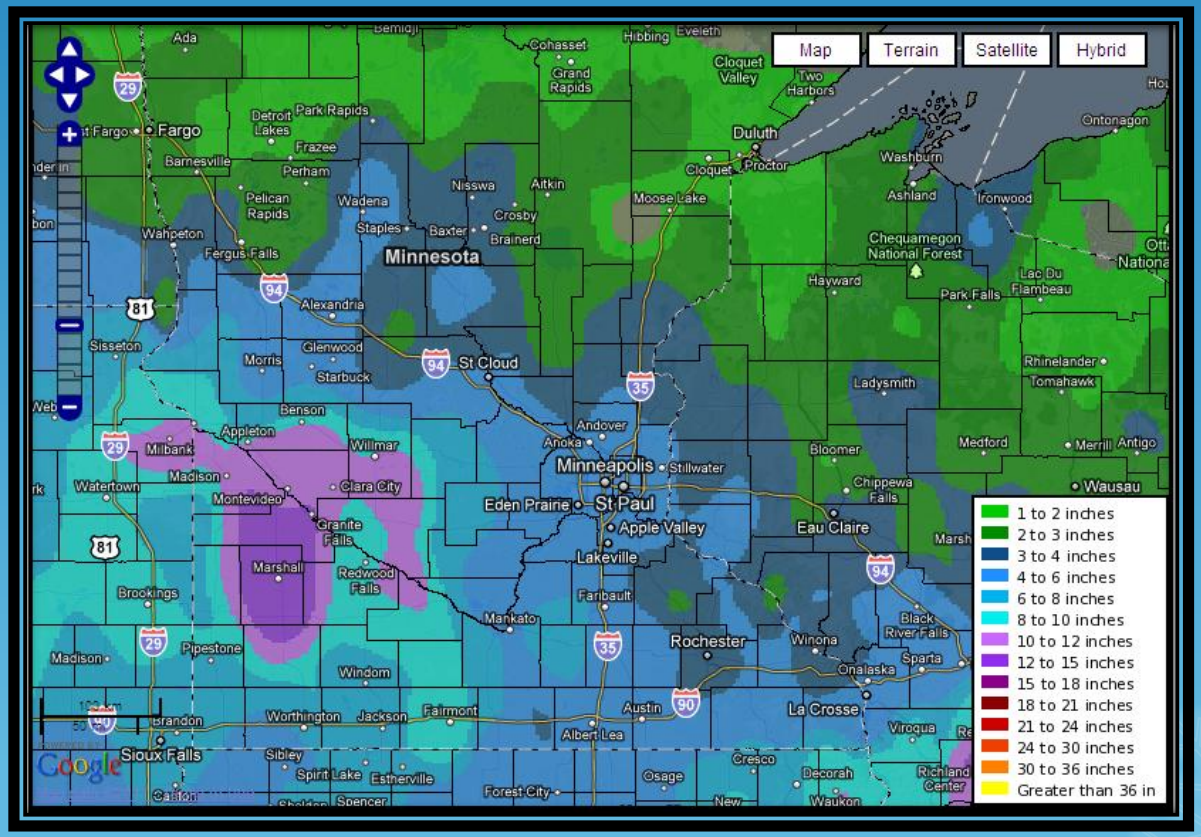
***Must use daily entry page to transmit snow core data***




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

# When to report?

- **Enter your daily weather report in WxCoder as close to your observation time as possible.**
- We can't share data from your community, or use it in maps or weather/river models, until we receive it.



# Sharing Your Data With Others

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

You can also call us with intermediate reports during significant winter storms (i.e. when you receive new snow amounts like 6”, 9”, 12”, your storm total snowfall, etc).

Please report dangerous weather conditions like whiteouts, blowing snow covering roads, ice accumulations, etc. We pass these reports onto law enforcement, and issues warnings or advisories to warn others.

**You are the trained weather observer for your community, so your reports are the official total! We need the official total as soon as it’s available.**

# Winter Weather Observing Resources

- **National Weather Service Observer Hotline (available 24 hours a day)**
- NWS Co-op Observer Quick Reference Guide (PDF)
- Snow Measuring DVD (25 minutes long)
- Winter Co-op Newsletter
- Snowboard, Snow Measuring Stick, Snow Flags
- Winter Weather Observing Presentation
- **Contact Michelle Margraf at 952-368-2520 or michelle.margraf@noaa.gov**