“In depth”
Snow Measuring
Measuring Snow

• Snowfall measurement is typically more difficult than rainfall
• Snowfall measurement takes a little more time

Accurate and timely snowfall measurements can be extremely important to your local National Weather Service office, public works departments, media outlets, climatologists, and other scientists
Tools of the Trade

- Rain Gauge
- Snow board
  - A 24”x16” piece of ½ or ¾” plywood painted white
- Yardstick or snow stick
Where to Measure

- Your snowboard should be on the ground in an area not subject to drifting
Where to Measure

• It’s a good idea to mark the location of your snow board with a flag or reflector
IF SNOW IS ANTICIPATED . . .

Remove the **funnel** AND **inner tube**, otherwise snow will clog the funnel.
Daily Precipitation - Snow
YOU MAY HAVE AN ACCUMULATION OF SNOW ON THE RIM OF YOUR GAUGE
How do I know what to measure and what not to??

Take your snow-swatter and tap gently on the rim of the gauge
What falls in gauge we measure

We will disregard the snow that lands outside the gauge.

Go ahead and clear away the snow from the gauge.
MELTING SNOWFALL

Notice that you have two cylinders

Add some warm water to the inner cylinder
Carefully measure your tap water before adding to outer cylinder.

Be sure to measure to nearest hundredth of an inch.
ADD THE WARM WATER TO THE SNOW SAMPLE

Pour water directly into sample

Allow sample to completely melt
Measure the liquefied snowfall sample

Pour snow sample into smaller tube

Remember “Every drop counts!”
Carefully read to the nearest one hundredth of an inch.
Remember to subtract the amount of warm water that you’ve added to the tube.

- Reading of 0.79 inches of water minus 0.50 inches of water added gives a final reading of 0.29 inches.

<table>
<thead>
<tr>
<th>Tube full</th>
<th>0.79</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water added</td>
<td>0.50</td>
</tr>
<tr>
<td>Final reading</td>
<td>0.29</td>
</tr>
</tbody>
</table>
Four CoCoRaHS Snow Measurements

1. The depth of new snow (new snowfall)
2. Liquid water equivalent of new snow
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)
Measuring the Depth of New Snowfall
What is Snowfall?

Snowfall is the accumulation of new snow and ice in the past 24 hours prior to melting or settling.
The 10:1 Myth

Do NOT estimate snowfall by converting the liquid in your rain gage to a snowfall amount!

- The adage that one inch of rain equals 10 inches of snow is a myth!
- The snow/water equivalent ratio is dependent on many factors, not just surface air temperature
- Snow to water ratios can vary from 8:1 or less to 20:1 or more!
When to Measure New Snow

• Measure new snowfall as soon as possible after it ends, before settling and melting occur.

• This often will not be at your regular observation time.

Note that we do not ever measure the depth of the snow in the rain gauge itself. Any frozen precipitation in the rain gauge must first be melted, then measured.
A Snow Event

Monday 7:00 am

Snow begins 9:00 a.m.

Snow ends 1:00 p.m.

Tuesday 7:00 am

2.4 inches of snow

Some melting and settling occurs

Measure snow as close to 1:00 p.m as possible

1.2 inches
WHERE TO MEASURE NEW SNOWFALL

1. Find a nice, level place to measure where drifting or melting has not occurred (like a snowboard)

2. Slide snow stick or ruler into snow until it reaches the ground/board surface

3. Read value on snow stick (value is always to nearest tenth of an inch, like 3.4 inches)

4. If using snowboard, sweep it clean.
Notice that only 3.0 inches of snow has accumulated here
Snow measured in the open

Whereas 6.5 inches has fallen in the open
Measure at eye level, as an angle will give you an inaccurate measurement.
Replace the Board

After you have measured the snow on your board, clean it off and replace it on top of the newly fallen snow. Be sure to mark its location. Now you are ready for the next snowstorm.
Four CoCoRaHS Snow Measurements

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Measuring the Water Equivalent of New Snow
Taking a Snow Core of New Snow

• Use your snow board or other hard surface

• Take core after you have measured snow depth, but before you have cleared the board or surface of snow.

• For example, if you determined the total depth of the new snow is 4 inches, then take your core sample from an area where the depth of new snow is 4 inches.
Taking a Snow Core of New Snow

- Capture a core by inverting the outer cylinder and pushing straight down into the snow

- Use something thin and sturdy to slide under the cylinder (aluminum flashing, spatula, snow swatter)
Taking a Snow Core of New Snow

- Melt and measure
Four CoCoRaHS Snow Measurements

1. The depth of new snow (new snowfall)
2. Liquid water equivalent of new snow
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)
Measuring the Total Depth of Snow on the Ground
Snow depth is the average depth of snow (including old snow as well as new) that remains on the ground at observation time.
Measuring Total Snow on the Ground

• Snow is rarely uniform in coverage, so take several measurements and average them to obtain your total depth of snow.
• Slide snow stick through all layers of snow (new and old).
• Read value on snow stick and record (values are to the nearest ½” like 4.5 or 5.0).
• Don’t measure “artificial accumulations”, such as plowed piles, large drifts, or shoveled snow.
Snow on the ground

On some days snow will only partially cover the ground. To record this take an average of both covered and bare areas.
If half the ground has 2.0” and half the ground is bare, report 1.0” as your total depth.

If more than half the ground is bare report “T” (trace) and mention the range of depths in your comments.
PLEASE
REMEMBER!

If possible, please report
“Total Snow Depth”
EVERY day there is any snow on the ground!
Four CoCoRaHS Snow Measurements

1. The depth of new snow (new snowfall)
2. Liquid water equivalent of new snow
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)
Measuring Snow Water Equivalent (SWE)

• This is a measurement that is useful to hydrologists and river forecasters.

• It provides an estimate of how much water is “on the ground” that can potentially run off into rivers and streams.
How to Measure “SWE”

• Take a “core sample” from the snow
• Melt the core sample
• Measure the amount of water in the core
First find a representative location

- The location should have not drifted, melted, or blown clear

- For example, if you determined the total depth of the snow is 3 inches, then take your core sample from an area where the depth of snow is three inches

“This looks like the best place!”
Steps to cutting a core sample

Place gauge upside down and push down into the snow

Clear snow from around the gauge
CAPTURING THE CORE

Slide snow-swatter (spatula works, too) under gauge

Carefully lift and get ready to flip the gauge

Bring the sample inside to melt
Snow Cores in Deeper Snow

Push down

Turn

Pull
In wetter snow, the core will come out in one piece.
Snow Water Equivalent (SWE)

- Melt and measure
- Report this on your Daily Report form

<table>
<thead>
<tr>
<th>Total Snow on Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of total snow in inches to the nearest half inch</td>
</tr>
<tr>
<td>Melted value from core to the nearest hundredth</td>
</tr>
</tbody>
</table>
Special Situations
Windy conditions may create a situation where the amount of snow in the gauge is not representative of what fell on the ground.

• In this case, we need to take a “core sample” from the snowboard or an area representative of the average new snow depth.

• Melt and measure the core sample

• If you feel this is more representative of the actual precipitation, then report this amount as your Daily Precipitation and make a note in the Comments. Include the melted amount from the snow that actually fell in the gauge in your comments.
What if’s:
Some additional situations you may encounter
What if: Snow melts as it falls and never accumulates

- Report the precipitation in your gauge (melted) as the Daily Precipitation

- Report a Trace of new snow

- In your comments write "Snow melted as it fell"
What if: Snow or sleet is mixed with rain and doesn't actually accumulate on the ground

- Report the precipitation in your gauge (melted) as the Daily Precipitation

- Report a “T” Trace of new snow

- Make a note as above in your comments such as “Snow and sleet was mixed with rain but melted as it fell.”
What if: Snow and rain are mixed and there is snow that accumulates

- Report the precipitation in your gauge (melted) as the Daily Precipitation
- Report the maximum accumulation of the new snow as your new snowfall
  - *If possible, it is best to measure the depth of the new snow as soon as possible after it ends before it has a chance to melt*
- Make a note that you had mixed precipitation in your comments.
What if: Snow accumulates, melts, and accumulates again

- The snowfall is the sum of each accumulation before melting.

**EXAMPLE**

Three separate snowfalls occur during the day. You go out and measure the snow after each has ended. The first snowfall is 2.0 inches, the second is 1.5 inches, and the third is 1.0 inch. The snow melts after each snowfall, and there is nothing on the snowboard at observation time the next morning.

The snowfall for the 24-hour period should be recorded as the sum of the individual events, or **4.5 inches**.
What if: Miscellaneous

• New snowfall of less than a tenth of an inch is reported as a Trace. This could be a few flurries, or a very light dusting of snow. Snow does not have to end up in the rain gauge!

• In some situations you might have measurable snow of a couple of tenths, but the snow in the rain gauge only melts down to a Trace. This can happen when the snow is very dry and/or it is windy.
“Freezing rain” is rain that falls in liquid form but freezes on contact with a surface.

Do NOT report freezing rain as "Snow". Melt and measure the moisture that has accumulated inside your gauge and report that as your daily precipitation amount.

Report ZERO for your new snow amount (assuming that it all fell as rain, and no sleet or snow fell or accumulated).

Report the total depth of freezing rain remaining on the ground at time of observation and enter that in the "Total Snow on Ground" column. Make a note in your comments section so that we know it's freezing rain.
Snow Measurement Review

- Melt any snow/ice in your rain gauge, and report this as your Daily Precipitation.

- Measure the depth of new snow on your snowboard.

- Take a core from your snowboard, melt, and report in the “New Snow” section (optional)

- Measure the total snow on the ground (new snow plus old snow and ice).

- Report the water equivalent of the total snow on ground (optional)