



# THE ATMOSPHERIC RESERVOIR

*Examining the Atmosphere and Atmospheric Resource Management*

## Measuring Snow

By Daniel Brothers

Snow measurements in North Dakota are important, but getting accurate data can be difficult. The snow rarely settles nicely to the ground, creating an even layer that's easily measured. Usually the snow is accompanied by windy conditions, creating large drifts in some areas while leaving others almost bare. Where do you measure the snow when it's blowing all over the place? What if the snow is melting as it hits the ground, or starts melting shortly after the storm, when the sun comes out? What if it's mixed with rain or sleet?

Most people are interested in the amount of new snow that fell in a storm. While there are some more exotic snow gauges and systems used for research, most daily snow measurements are made with a good old-fashioned ruler or yard stick. In order to keep the new snow separate from the older snowpack that was already on the ground, observers are encouraged to use a snow board. A snow board is just a regular plywood board, painted white to help prevent heat absorption, placed on the ground in an area away from obstructions and not prone to drifting. The board is usually about 16" x 16", but can be larger. An observer will use their ruler to measure the depth of snow on the board. If the snow did not settle evenly on the board they measure a few different spots on the board and use an average of the depths as their report for the new snowfall. After taking the measurement, the board is cleared of snow and placed on top of the snowpack so it is ready for the next snow event. The snow board should be

marked with a pole or flag so it can be found after the next snowfall. A picnic table, deck, or other flat surface away from obstructions and drifting can also be used if it was previously free of snow and the snow accumulated on its surface is representative of the snow that fell.

Another aspect of snow measurement important for organizations such as the National Weather Service (NWS) is the water content of the snow that fell. This can be important in forecasting runoff from spring snow melt that can lead to flooding. The ratio of water to snow depth can vary considerably from one storm to the next, so it is important to measure the water equivalent each time new snow falls. Observers in precipitation networks for the NWS, Atmospheric Resource Board (ARB), and the Community Collaborative Rain, Hail & Snow Network (CoCoRaHS) use a 4-inch diameter rain gauge for measuring both rain and snow. When new snow falls it is collected in the gauge (without its funnel or smaller inner cylinder). The snow that collects in the gauge is melted and poured carefully into the smaller cylinder for measuring. Observers can add warm (but not boiling) water to the snow to aid in melting, but that warm water must be subtracted from the total to get an accurate measurement.

In windy conditions it is better to use the gauge to collect a sample from the snow board for melting, since the gauge may not have collected a representative amount of snow. To do this, an observer places the gauge upside down on the snow board and carefully collects the amount of snow inside the gauge's circumference.

Measuring the depth and water content of the total snowpack is also very helpful. Observers find any area where the ground is relatively level and free of drifting to measure the snowpack. Some observers will find a good spot and stake a pole with the measurements marked into the ground so they can just read it each time. If an observer is bringing their yard stick out with them, they must be sure to measure through all layers of snow and ice. Measuring the water content is done by taking a core sample with the 4-inch gauge, much like getting a sample of daily snowfall off a snowboard. Since the snow rarely settles in a uniform pattern, it is often a good idea to take a few samples from different areas and average the depths to get a proper measurement. If some of the ground is covered and some is bare, measure the area with snow and average it with the percent of bare ground. For example, if the covered areas have two inches of snow but 50 percent of the ground is bare, an observer would report an average snow depth of one inch. In those instances it is also recommended to leave a remark with the percentage of snow cover.

The Atmospheric Resource Board operates a volunteer network known as ARBCON in North Dakota. More observers are always appreciated to help with rain and/or snow reporting. If you would like to volunteer please contact the ARB at 1-800-654-5981 or via email at [dabrothers@nd.gov](mailto:dabrothers@nd.gov).

Atmospheric Resource Board  
North Dakota State Water Commission  
900 East Boulevard, Bismarck, ND 58505  
(701) 328-2788 • <http://swc.nd.gov>

ND Weather Modification Association  
PO Box 2599, Bismarck, ND 58502  
(701) 223-4232