

Operational Collection and Assessment of Snowpack Data at National Weather Service Burlington, Vermont

GREG HANSON¹

EXTENDED ABSTRACT

The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) in Burlington, VT has forecast and warning responsibility for northern New York and most of Vermont. Part of this responsibility is to assess the flood potential due to snowmelt. Snow survey information provides the basic information needed to assess the amount of liquid water held in the snowpack. The snow survey information is combined with current and forecast weather conditions to give an indication of the possibility of flooding if a rapid snowmelt event were to take place. This information is conveyed to the public in a biweekly Winter/Spring Flood Potential Outlook.

Snow surveys, to obtain snow depth and snow water equivalent values, are performed by a wide variety of observers. Official NWS cooperative observers, river association volunteers, power companies, and several state and federal government agencies all contribute information. Several observers hike or ski into the back country to obtain high elevation snow samples.

The primary tool used to obtain snow survey information is the snow tube. The commercially manufactured Adirondack Snow Sampler is the preferred snow tube, consisting of a fiberglass tube with metal teeth, and a calibrated scale to read the snow water equivalent in inches. The snow tube is pushed into the snow until it reaches the ground below. When the tube is removed, a core of snow is held inside. The tube and snow core are then suspended from the calibrated scale which accounts for the tube's weight, providing a reading of the liquid water content of the snow core.

A low-cost alternative to the Adirondack Snow Sampler was developed, and is used by several volunteer observers to provide snowpack information. The low-cost version can be produced locally, and costs less than \$200 to make, compared to approximately \$700 for the Adirondack Snow Sampler. Instructions for making the low-cost snow tube have been posted to the internet at: <http://www.erh.noaa.gov/btv/html/snowtubeinstr.htm>.

The low-cost snow tube consists of 3 inch diameter household PVC plumbing pipe or auto exhaust pipe with serrated teeth cut into one end. A snow core is obtained with the tube (Fig. 1), as described above for the Adirondack Snow Sampler, and weighed on a hanging dial scale (Fig. 2). The scale is calibrated to account for the weight of the empty tube, and displays the snow water equivalent of the snow core. An inch of liquid water in a 3 inch diameter cylinder weighs 4 ounces. The specified scale is accurate to the nearest ounce, or ¼inch of liquid water, which provides sufficient accuracy for snow water equivalent measurements.

¹ NOAA/National Weather Service, Burlington International Airport, 1200 Airport Dr, South Burlington VT 05403. gregory.hanson@noaa.gov

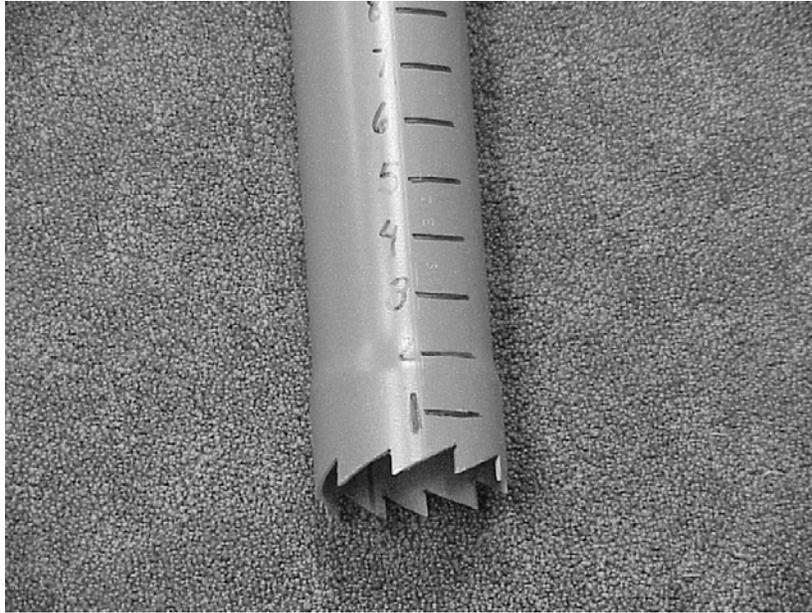


Figure 1: Low-Cost Snow Tube.

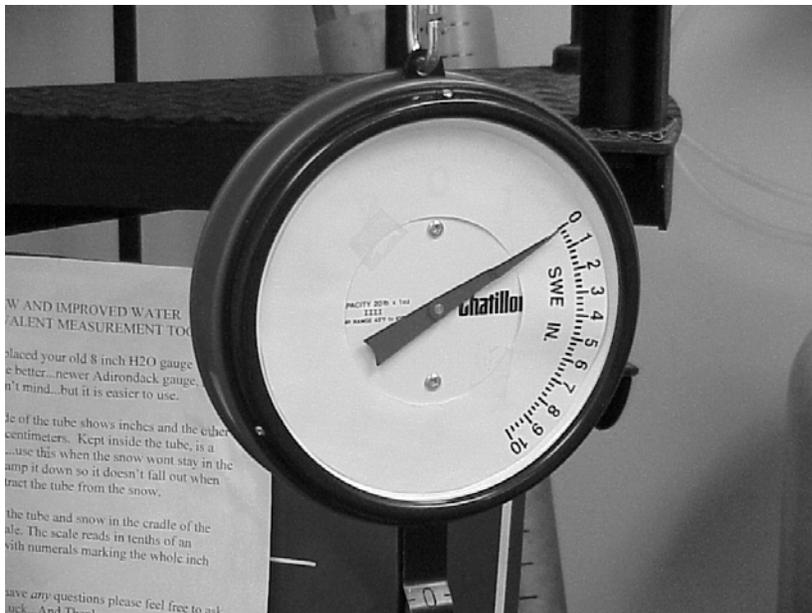


Figure 2: Low-Cost Snow Tube Scale.

An alternative to the weighing method is to use a snow melt method. A 4 inch diameter PVC plumbing pipe is used to obtain a snow core, and the snow core is then melted and the liquid water measured in a standard 4 inch rain gage. This method is even less expensive than the weighing method. By replacing the \$120 scale with a \$25 rain gage, the cost of the entire snow tube unit is below \$50. This method is only preferred if there are nearby facilities available to melt the snow. However, if measurements are to be made in remote locations where melting the snow is not possible, then the weighing method is preferred.

Observations are made biweekly according to a standardized schedule set by NWS Eastern Region Headquarters. Observations are reported to NWS Burlington, VT by fax, telephone, and email.

Snow depth and water equivalent data collected by NWS Burlington, VT are encoded in Standard Hydrologic Exchange Format (SHEF), and disseminated via the NWS Advanced Weather Information and Processing System (AWIPS) to other users. The snow data is also compiled in a Geographic Information System (GIS) database, then using ArcView, a map is plotted and posted to NWS Burlington's snow information web page at: <http://www.erh.noaa.gov/btv/html/snow.shtml>. Figure 3 is an example of snow depth and water equivalent data for Essex County. The location elevation is plotted to aid in correlating changes in snow depth with changes in elevation.

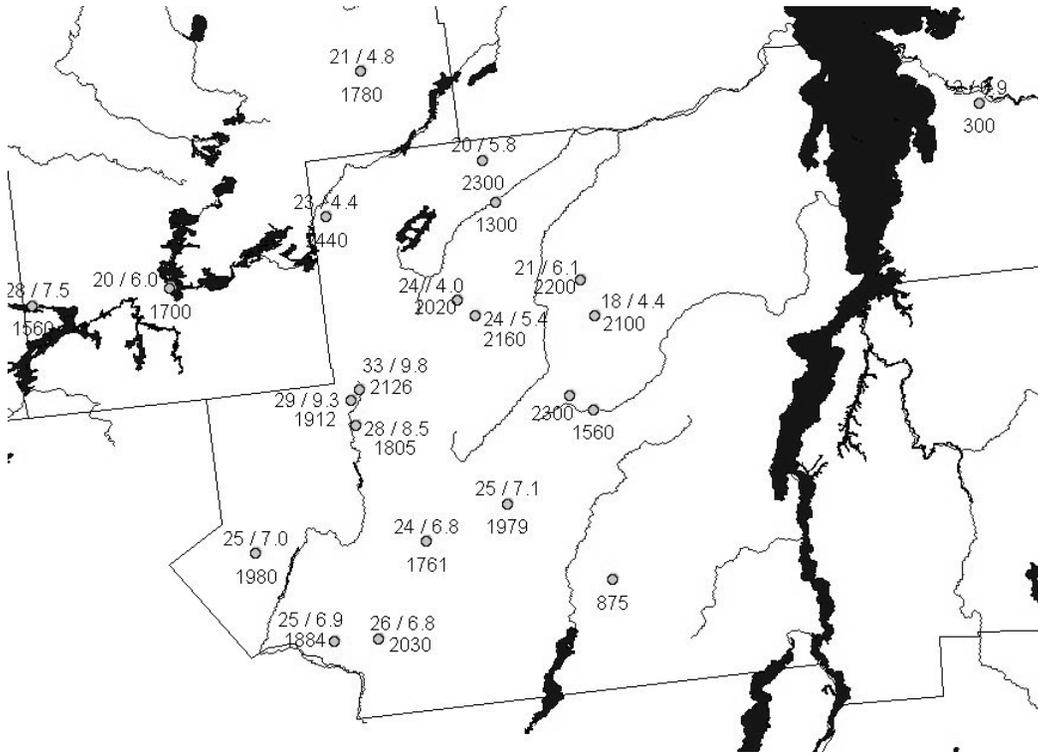


Figure 3: Snow Depth (in)/Snow Water Equivalent (in) and Elevation (ft) plot for Essex County NY. The dot represents the observation location. The two numbers plotted above the dot are the snow depth (in) and snow water equivalent (in) for that location. The number plotted below is the elevation of the location (ft).

Assessing the spring flood potential is a subjective blend of snowpack information, river and soil moisture conditions, and short and long term weather forecasts. For example, if a below normal snowpack exists, river levels are low, and below freezing temperatures are forecast, then the flood threat would be deemed to be low. Conversely, if an above normal snowpack exists, river levels are high, and warm temperatures and rain are forecast, then the flood threat would be considered high.

The Spring Flood Potential Outlook product issued by NWS Burlington, VT conveys the snowmelt flood threat to NWS Burlington, VT's partners and customers. The Outlook is issued biweekly, following the same schedule as the snow surveys. The long term trends of the snowpack and spring flood threat can then be followed, as the snow depth builds through the winter months, then melts away in the spring.

Keywords: National Weather Service, snow survey, snow tube