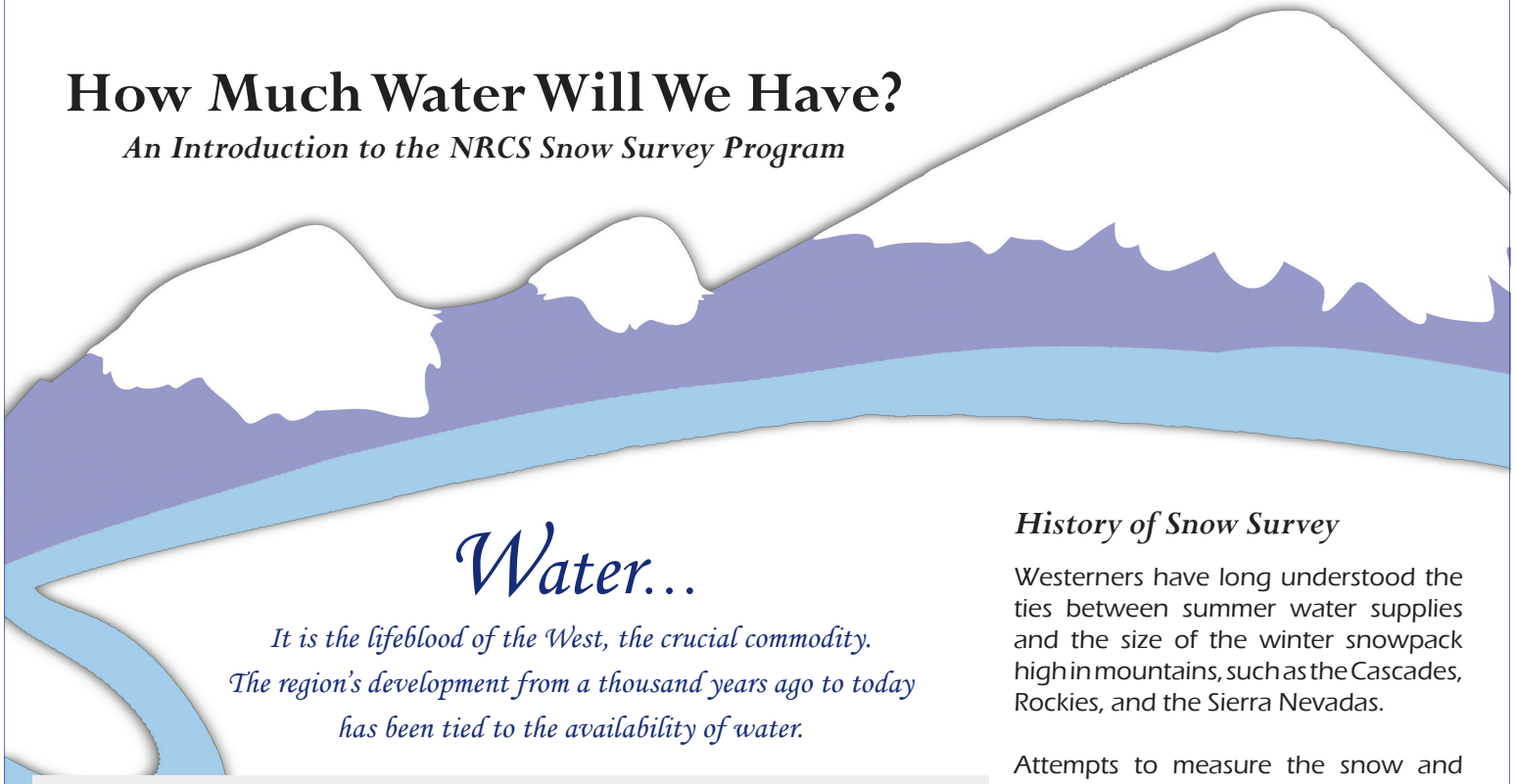
NRCS United States Department of Agriculture
Natural Resources Conservation Service

www.or.nrcs.usda.gov

How Much Water Will We Have?

An Introduction to the NRCS Snow Survey Program



Water...

It is the lifeblood of the West, the crucial commodity.
The region's development from a thousand years ago to today
has been tied to the availability of water.

Water Supply

Water supply varies greatly from season to season and from year to year. Snowmelt from winter accumulations high in the mountains is the source of about 70 percent of the water supply in much of the western United States.

Typically, water managers collect, store and transport water to ensure availability when and where it is needed for:

- **Communities:** An average American uses between 50 and 100 gallons of water daily. This adds up to nearly four billion gallons for Oregon's 3.7 million citizens daily. [1]
- **Agriculture:** About 6,800 gallons of water are needed to grow enough food to feed a family of four for just one day. [2]
- **Industry:** Many manufacturers and industries require volumes of water, as well as hydropower, to operate.
- **Hydropower:** Flowing surface water running through hydroelectric dams supply about 50 percent of Oregon's electricity. [2]
- **Fish and Wildlife:** Nationwide, about 600 of 1,200 species listed as threatened or endangered depend on rivers and streams for survival. [2]

Water Conservation

Water conservation is critical to the West. The pressures of expanding communities, growing industries, and modern agriculture together make heavy demands on our water resources. Development of new water supplies is extremely costly and not feasible in many cases.

The NRCS Snow Survey program helps us predict how much water will be available during the year. When water supplies are expected to be below normal, water managers must determine how to efficiently allocate available water. Learn how you can help conserve and wisely use water every day. An abundance of information and useful links can be found by doing an online search for water conservation tips.

History of Snow Survey

Westerners have long understood the ties between summer water supplies and the size of the winter snowpack high in mountains, such as the Cascades, Rockies, and the Sierra Nevadas.

Attempts to measure the snow and predict runoff had been made in the East as early as 1834, but it wasn't until 1904 that a systematic survey was undertaken in the West. Dr. James Church, a professor at the University of Nevada in Reno, conducted surveys on Mt. Rose in the Sierra Nevada mountains and developed equipment and techniques that led to the first water supply forecasts. These methods soon spread to other states and agencies. By 1935, at least nine independent snow surveys were being conducted, but more were needed. After a severe drought in 1934, farmers demanded a better way to predict the stream flows available for growing crops. Others who relied on water for industry, power generation, and domestic use echoed this request. Congress responded in 1935 by passing legislation that created a federal snow survey and water supply forecasting program. As a result, the federal agency now known as the Natural Resources Conservation Service (NRCS) has directed the NRCS Snow Survey program for nearly 70 years.

NRCS conducts these surveys in cooperation with federal, state, and private entities, including the National Weather Service, state departments

of natural resources, private irrigation districts, and municipal water districts. Today, reports are routinely issued for hundreds of locations across the West.

Thanks to the NRCS Snow Survey's snowpack monitoring program and advanced technology, water managers are alerted early in the water year to expect normal flows, shortages, or the potential for floods. This information allows them to plan ahead for shortages or surpluses while there is still time to take effective action.

Snow surveys and water supply forecasts do not create water, but they do the next best thing; they provide the tools for conservation of the most precious of the West's natural resources—water.

Oregon SNOTEL Snow/Precipitation Update

Based on Mountain Data from NRCS SNOTEL Sites
Provisional data, subject to revision
Data based on the first reading of the day (typically 00:00) for February 06, 2007

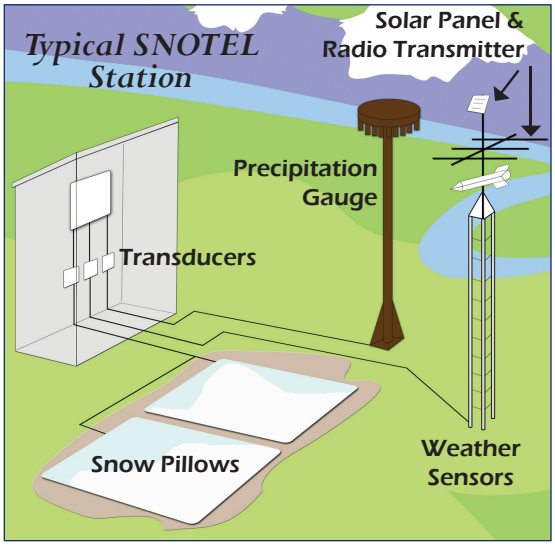
Basin Site Name	Elev (ft)	Snow Water Equivalent			Year-to-Date Precipitation		
		Current (in)	Average (in)	Pct of Avg	Current (in)	Average (in)	Pct of Avg
WILLAMETTE							
MT HOOD TEST SITE	5400	36.2	39.4	92	59.6	59.9	99
CASCADE SUMMIT	5100	22.5	21.8	103	39.6	38.4	103
SANTIAM JCT	3750	8.4	15.0	56	44.2	43.3	102
MILLER WOODS	450	0.0	N/A	*	39.4	N/A	*
Basin-wide percent of average				**88**			**105**

This condensed version of a daily snow and precipitation update was generated from the Snow Survey Web page, which contains data on 120 sites in Oregon. The table shows current and average snow water equivalent and precipitation for the year. Additional reports in either tabular or narrative format provide streamflow forecasts and information on water stored in major reservoirs.

How Snowpack is Measured

Regular measurements taken at some 1,400 snow courses provide insight into snowpack accumulation patterns. Manual surveys require teams of trained surveyors to snowshoe or ski to remote mountain sites during times of maximum snowpack accumulation, usually March 1, April 1 and May 1.

Thanks to new technology, however, much of this information is now measured every hour at automated data collection sites. The system is called SNOTEL (for SNOw TELmetry). It measures and transmits snowpack, precipitation, and temperature data on an hourly basis. About 800 SNOTEL sites are in operation in the West. Most sites are powered by solar panels and are visited only a few times a year for upkeep.



SNOTEL sites collect data, such as temperature, wind, rainfall and soil moisture. In addition, the system employs a snow pillow as a hydraulic weighing platform to measure the weight of accumulated snow. An on-site transducer then calculates the snow water equivalent (SWE), which is the amount of water in the snowpack.

Data collected at SNOTEL sites are transmitted by meteor burst telemetry to a master station in Boise, Idaho or Ogden, Utah.

Meteor burst telemetry relies on the physical phenomenon that enables radio signals to be reflected off ionized meteorite trails 50 to 75 miles above the Earth's surface. In this way, sites as far away as 1,200 miles can communicate to a base station for up to several seconds. This is sufficient time to "burst" short data messages. The system can query remote data sites hourly without interference from surrounding mountains.

Water Updates and Forecasts

The data are then transmitted to a central computer at the NRCS National Water and Climate Center in Portland, Oregon. Here, hydrologic information from the SNOTEL system, snow course network, and other climatological stations are compiled for analysis and interpretation. A series of computer programs, known collectively as the Centralized Forecasting System (CFS), is the analytical tool used to generate streamflow forecasts, data summaries, and narratives that describe the water supply outlook for streams and reservoirs.

Water and snowpack information for all SNOTEL sites nationwide is available on the Snow Survey Web site in a variety of formats. The reports are updated every 15 minutes and are available on the NRCS Web site and through variety of relevant local, state and national sites. To view Snow Survey data, go to:

www.or.nrcs.usda.gov/snow

Notes

1. Water Science for Schools. 30 Aug. 2005. US Geological Survey. 28 Sept. 2007 <http://ga.water.usgs.gov/edu/qahome.html>.
2. The Oregon Story. Oregon Public Broadcasting. 28 Sept. 2007 <http://www.opb.org/programs/oregonstory/water/resources/page_2.html>.