

USES and BENEFITS

Data collected and transmitted by SNOTEL stations and from manual collection sites are processed rigidly for quality and packaged in both raw and formatted versions on the NWCC web page. That data and information are used by many governmental and private entities as seen in the following paragraphs.

- Program information influences production decisions on millions of acres of surface-water dependent, irrigated agricultural lands. Knowing how much water they will receive based on the available water supply and the relative seniority of their water rights helps producers make cropping decisions about what, when, and how much to plant to optimize their production outcome.
- In several communities, local water commissioners operate reservoir and diversion systems based on a drought-response management plan using SNOTEL data.
- In Utah, after data indicated that a river's conditions would render traditional rafting equipment inoperable, a company purchased \$50,000 of smaller craft that would function in the environmental conditions predicted by the data. That decision resulted in a \$600,000 revenue year where the outfitter stated they would have had "a zero dollar year."
- One city began flood diversion preparations early based on SNOTEL and SS-WSF data. In spite of the extremely high volume of spring runoff (approximately 75,300 acre-feet of water compared to an historic average of 21,000 acre-feet), flood damages were minimal. City managers estimated losses would have been over \$15 million in homes; not including the value of businesses, public facilities, schools, and other infrastructure.

SNOTEL sites and the SS-WSF Program continue to be of critical value to producers and residents throughout the West.

For More Information on local Snow Survey data, contact the NRCS State Office at the numbers listed below.

Alaska:	907-271-2424	x113
Arizona:	602-280-8786	
California:	530-792-5624	
Colorado:	720-544-2852	
Idaho:	208-685-6983	
Montana:	406-587-6991	
Nevada:	775-857-8500	x152
New Mexico:	505-761-4431	
Oregon:	503-414-3267	
Utah:	801-524-5213	x12
Washington:	360-428-7684	x141
Wyoming:	307-233-6749	

For information on the Snow Survey and Water Supply Forecasting Program, contact NWCC director Mike Strobel at 503-414-3055 or michael.strobel@por.usda.gov.

NWCC Homepage: www.wcc.nrcs.usda.gov



SNOTEL Site - Bison Lake, CO

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NWCC Rev3/09

National Water and Climate Center

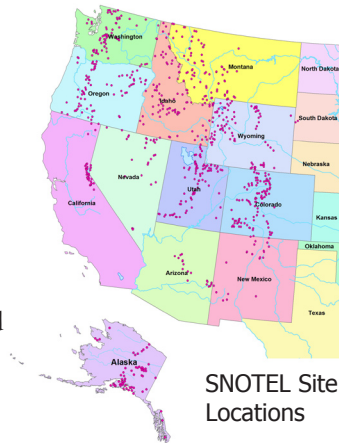
SNOTEL And Snow Survey & Water Supply Forecasting

Helping People Help the Land

Introduction

The Natural Resources Conservation Service (NRCS) installs, operates, and maintains an extensive, automated system (SNOWpack TELEmetry or SNOTEL) designed to collect snowpack and related climatic data in the Western United States and Alaska. In 1935, NRCS, then the Soil Conservation Service, established a formal cooperative Snow Survey and Water Supply Forecasting (SS-WSF) Program to conduct snow surveys and develop accurate and reliable water supply forecasts. The Program operates under technical guidance from the NRCS National Water and Climate Center (NWCC).

With 50-80 percent of the water supply in the West arriving in the form of snow, data on snow pack provide critical information to decisionmakers and water managers throughout the West. SNOTEL provides a reliable and cost effective means of collecting snowpack and other meteorological data needed to produce water supply forecasts and support the resource management activities of NRCS and others.



SNOTEL Site Locations

The SS-WSF Program has grown into a network of more than 1,200 manually-measured snow courses and over 750 automated SNOTEL stations in 13 Western States, including Alaska. The Program provides streamflow forecasts for over 740 points in the West. The data, as well as related reports and forecasts, are made available—in near real time for the automated SNOTEL sites—to private industry; to Federal, State, and local government entities; and to private citizens through an extensive Internet delivery system and other distribution channels.

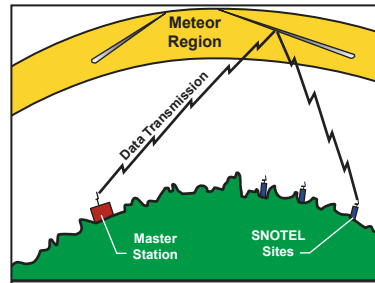
The modern SNOTEL network also provides data for climate studies, air and water quality investigations, climate change, and endangered species habitat analysis. The high-elevation watershed locations, broad coverage, and real time operation of the network provide important data to researchers, river and reservoir managers, emergency managers for natural disasters such as floods and droughts, recreational area managers, and power generation companies.

Meteor Burst Technology

SNOTEL uses meteor burst communications technology to communicate data in near real time. VHF radio signals are reflected at a steep angle off the ever-present band of ionized meteors existing from about 50 to 75 miles above the earth. Satellites are not involved. NRCS operates and controls the entire system.

SNOTEL sites are generally located in remote high-mountain watersheds where access is often difficult or restricted. They are designed to operate unattended and without maintenance for a year or longer with batteries charged by solar cells. Access for maintenance can involve hiking, snowmobiles, skiing and snowshoeing, and/or helicopters.

Six NRCS Data Collection Offices monitor daily site statistics. Three meteor burst master stations are the central collection points for all transmitted remote station data. These master stations are located near Boise, Idaho; Ogden, Utah; and Anchorage, Alaska. When the data are received, it is converted to engineering units and screened for errors, then stored in a database and made available to the public via the NWCC web site (www.wcc.nrcs.usda.gov).



SNOTEL Meteor Burst System

SNOTEL System Capabilities

The basic SNOTEL station provides snowpack water content data via a pressure-sensing snow pillow. It also collects data on snow depth, all-season precipitation accumulation, and air temperature with daily maximums, minimums, and averages. Many of the enhanced SNOTEL stations are also equipped to take soil moisture and temperature measurements at various depths.

The atmospheric and, where installed, soil moisture and soil temperature measurements are generally reported multiple times per day with some reporting hourly. Other sensors such as water quality sensors can be added to any of the enhanced SNOTEL stations. System performance is usually above 99%.

SNOTEL Site - Standard Configuration

Parameter Measured	Data Sensing
Air Temperature	Shielded thermistor
Precipitation	Storage type gage
Snow Water Content	Snow pillow device and a pressure transducer
Snow Depth	Sonic sensor

SNOTEL Site - Enhanced Additions

Parameter Measured	Data Sensing
Barometric Pressure	Silicon capacitive pressure sensor
Relative Humidity	Thin film capacitance-type sensor
Soil Moisture	Dielectric constant measuring device. Measurements are taken at standard depths of 4", 8", and 20" with some at 2" and 40" .
Soil Temperature	Encapsulated thermistor. Typical measurements are taken at standard depths of 4", 8", and 20" with some at 2" and 40" .
Solar Radiation	Pyranometer
Wind Speed and Direction	Propeller-type anemometer