

WMO Solid Precipitation Measurement
Interpretation at the
Sleepers River Research Watershed

Poster Presentation

by

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Abstract

During the winter of 1986-87, the U.S. Army Cold Regions Research and Engineering Laboratory and NOAA/National Weather Service jointly conducted a World Meteorological Organization (WMO) solid precipitation measurement gauge intercomparison evaluation at the Sleepers River Watershed, in Danville, Vermont. Solid precipitation measurement gauges and supporting meteorological instrumentation were installed in November 1986. This post presentation displayed photographs of the Danville site, locations of the various solid precipitation gauges being evaluated, objectives of the project and future research to be conducted at the Danville field site in support of the WMO program. For future information relative to this project refer to the paper "WMO Solid Precipitation measurement Intercomparison at Sleepers River Watershed" by Bates, Pangburn and Greenan which is also part of this same Eastern Snow Conference Proceedings.

Water Conservation Begins with ...

SNOW SURVEYS

Water 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 varies greatly from season to season and from year to year, and water is often located great distances from where it is needed. Snowmelt from winter accumulations in the high mountains is the source of about 70 percent of the region's water supply. Typically, irrigators and communities collect, store, and transport water to regulate quantity and ensure availability when and where it is required. With about 40 million acres under irrigation, modern agriculture together with the pressures of a rapidly expanding society make heavy demands on this water.

Since the development of new supplies has become extremely costly and not feasible in many cases, conservation of existing water resources is critical to the West.

Early westerners realized the ties between the size of the winter snowpack in the high mountain ranges--Rockies, Cascades, Sierra Nevada--and their summer water supply. Some 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 classics professor at the University of Nevada in Reno, made surveys on Mt. Rose in the Sierra Nevada. He developed measuring equipment and sampling techniques that led to the first water supply forecasts. Success in Nevada soon spread to other states and agencies. By 1935, at least nine independent snow surveys were being conducted.

Drought is a part of life in the West. In 1934, a particularly severe drought resulted in farmers demanding better predictions of the streamflows available for growing crops. Others who counted on water for industry, power generation, and domestic use echoed this request. Congress responded in 1935 by passing legislation creating a federal snow survey and water supply forecasting program under the direction of the Bureau of Agricultural Engineering in the Department of Agriculture. In 1939, the bureau was transferred to the Soil Conservation Service (SCS); this agency continues to direct a cooperative federal, state, and private snow survey program. The National Weather Service is a major cooperater with SCS in making these water supply forecasts. Today, forecasts are routinely issued for over 600 locations in the West.

Manual surveys, similar to those initiated by Dr. Church and performed by teams of trained surveyors, have been the backbone of the measurement network. With the advent of mechanized oversnow machines and aircraft, the surveyor's task has been eased somewhat, but snowshoes and skis are still required to reach many remote sites. Periodic measurements at some 1400 snow courses provide the insight into snowpack accumulation patterns. Forecasters still use this information advantageously, but more frequent data are needed to improve the accuracy and timeliness of forecasts. Various methods of remote data acquisition have been tested, including conventional line-of-sight radio telemetry, satellite based telemetry, and a new technique called meteor burst telemetry.

Meteorburst telemetry relies on the physical phenomenon that enables radio signals to be reflected off ionized meteorite trails 50-75 miles above the earth's surface. Utilizing this principle, sites as far apart as 1200 miles can communicate with one another for very short periods ranging from fractions of seconds up to several seconds. This interval is sufficiently long to "burst" relatively short data messages between sending and receiving stations. This method of communications is ideally suited for interrogating remote data sites on a schedule of several polls per day. The interference that mountains often cause in conventional communications is not a problem for a meteor burst system.

In 1977, SCS began modernizing its snow surveys by introducing meteor burst technology for acquiring snowpack data. The project, called SNOTEL (for SNOW TELEmetry) measures and transmits snowpack, precipitation, and temperature on a daily basis throughout the West. A snow pillow serves as a hydraulic weighing platform to measure the snow water content.

About 550 SNOTEL sites are in operation. Most sites are powered by solar panels and are visited only a few times each year. Data are transmitted daily by meteor burst to a master station in Boise, Idaho, or Ogden, Utah, and then automatically forwarded by telephone to a central computer in Portland, Oregon.

Hydrologic data gathered from the SNOTEL system, snow course network, and other climatological stations are assembled in the computer system at the West National Technical Center in Portland, Oregon, 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 current water supply outlook. This information is made immediately available to over 300 SCS field offices and other interested users through dial-up telecommunications.

Water supplies are no longer a mystery thanks to this systematic snowpack inventory and monitoring program and advanced computer technology. Managers are alerted early in the water year to expect normal flows, water shortages, or floods, and they can make plans while there is still time to take effective action. Snow surveys and water supply forecasting do not create water, but they do the next best thing: They provide the tools for conservation of this most precious of the West's resources. For more information on this program, contact your local conservation district or SCS office. All programs and services of USDA are available to everyone without regard to race, creed, color, sex, age, handicap, or national origin.

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