



THE SNOW SURVEY AND WATER SUPPLY FORECASTING PROGRAM

Snow dressed landscapes are beautiful to behold and bring thoughts of recreation fun and winter driving. However this fascinating substance also has a very practical side as it is the main source of one of our most critical natural resources – water!

2006 is the 100th year of the evolution of the science of monitoring the snowpacks and assessing our seasonal water supply. The Snow Survey and Water Supply Forecasting program (SS/WSF) is one of several dozen United States Department of Agriculture (USDA) programs that have been devised, organized and funded to assist our citizenry in wise use of our natural resources. John Wesley Powell explored much of the Western U.S. during the latter 19th century and reported that extensive development of productive society in that region would require supplemental water supply. This wise assessment was realized as the North American west began to populate. It was discovered that most of the available water in this region, except for ground water, originated from high mountain snowpacks that melted each summer, feeding the streams and rivers of the region. Additionally, these mountain snowpacks, that held 60-80% of each year's streamflow, also could vary considerably from year to year.

The American pioneering spirit rose to the water supply challenge with diversions from streams to irrigate crops, reservoirs to store up water for future use and prevent flooding, and even high-mountain canals to move waters from one basin to another. However, increasing pressure and conflicting demands on the supply required better informed decision making. One of the early pioneers seeking to answer this need was Dr. James E. Church, a professor of the classics at the University of Nevada-Reno. He led one of several efforts to develop a technique for sampling the snowpack on Mount Rose to determine the amount of water it held. This snow survey began in 1906 and was followed several years later by his successful forecasting of the annual rise in the surface of nearby Lake Tahoe. This opened the door to effective management of the lake discharge to prevent costly and hazardous flooding and meet the various demands for water on the downstream Truckee River as well. The science was born as Dr. Church's sampling method and snowmelt runoff forecasting technique was accepted. The future brightened with new possibilities to meet water management needs! Universities and scientists of the west began to explore, in earnest, ways to apply new science to better manage the seasonal water supply.

The value of a federally led activity to provide water supply information was recognized in mid-1934 by Walter Wesley McLaughlin, Chief of the Division of

Irrigation. He presented to his supervisor, Chief of USDA Bureau of Agricultural Engineering, a project proposal entitled "Snow Survey and Stream Flow Forecasting". After several years of coordination and campaigning, the U.S. Congress signed an appropriations bill that authorized and funded the proposed "Snow Survey and Stream Flow Forecasting" project.

The summer of 1935 began a busy era of establishment of new snow measuring sites called "snow courses". Locations that were inaccessible by winter travel were equipped with "aerial" snow makers that could be observed from aircraft. Data bases of snowpack information were established. A regional organization was established and water supply forecasting followed. This project was transferred from the Bureau of Agricultural Engineering to a newly formed USDA agency, the Soil Conservation Service. Increasing customer needs, organizational changes, and scientific evolution define the mature, highly cooperative, and highly valued program of today that is administered by the USDA Natural Resources Conservation Service.

The year 2006 marks the centennial of development of the basic science that remains vital to today's Snow Survey and Water Supply Forecasting program. Program operations have advanced from the humble beginnings of the federally led program in 1935 with a few snow courses and only 4 to 6 data readings per year. Today, an automated remote sensing network of over 700 remote mountain SNOTEL (SNOWTElemetry) sites provide millions of data readings per year in near real-time. The data is transmitted not by hundreds of snow surveyors on snowshoes, but through highly sophisticated meteor-burst radio technology from stand-alone remote sites in the high mountain watersheds.

The once manually tabulated databases and hand calculated statistical forecasts of streamflow issued monthly, are now replaced with computerized, integrated databases and automated forecasting tools that provide daily analysis of expected stream flows. A once-a-month value of the water equivalent in the snowpack that was sufficient in the 1940's has now been replaced by daily and hourly automated data that include snow water equivalent, precipitation, air temperatures, wind information, relative humidity, solar energy, snow depth, soil temperatures and soil moisture. Development of new technology to remotely sense these parameters is continually supported and applied. Advances in the automated quality control of the data are employed to enhance the database for many applications.

Over 60 professionals and hundreds of cooperators are employed to gather, maintain, analyze and interpret the data and forecasts. The county level infrastructure of NRCS field personal provides direct assistance to agricultural and many other water users and managers in making wise water management plans and decisions. Data resources of the program are web assessable through the Water and Climate Information System. This data supports all snowpack, water supply and other hydrometeorological analyses, including drought risk assessment and crop production potential as well as climate trend research. Over 11 million data reports and data-downloads were made during 2005 by water supply customers from the web site of the Snow Survey and Water Supply Forecasting program.

The Snow Survey and Water Supply Forecasting Program recently rated very high scores in the American Customer Satisfaction Index survey. Several public reviews of the program have determined that federal leadership for the program should continue. Program customers and cooperators include a wide spectrum of the populace, including industry, natural resource and wildlife managers, recreationists, agriculturalists and researchers. The hallmark of this federal-state-private program

remains to provide quality and timely snow survey and water supply information without charge, or influence of geo-political interests.

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