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U.S. DEPARTMENT OF AGRICULTURE

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Ms. Chairwoman, thank you for the opportunity to testify today about the USDA Natural Resources Conservation Service's perspectives on water data management and challenges and opportunities for the Bureau of Reclamation (BOR) and the Water Resources Division of the United States Geological Survey (USGS). My name is Michael Strobel and I am the Director of NRCS's National Water and Climate Center in Portland, Oregon. The Center directs the Snow Survey and Water Supply Forecasting Program and works directly with both of the agencies mentioned above.

The collection and dissemination of water data is a critical role for BOR, USGS, and NRCS. Each agency has its own specific mission, data sets, and unique expertise. More importantly, each agency utilizes the data collected and disseminated by the other agencies and therefore both rely and depend on each other. Monitoring, managing and understanding water resources is vital to all aspects of our society and BOR, USGS, and NRCS, both individually and cooperatively, play key roles in providing this information. Today, I would like to discuss NRCS's role in this process and how we work with BOR and USGS to deliver water information to a broad range of users throughout the United States.

NRCS has been a leader in providing water resources information to assist decision making associated with agricultural activities and natural resource conservation since 1935. In that year, the Soil Conservation Service (as NRCS was then known) established a formal cooperative Snow Survey and Water Supply Forecasting (SS-WSF) Program. Since that time, the SS-WSF has grown in scope and in the number and diversity of users that rely on the water supply forecasts developed by NRCS. In addition to the Snow Survey program, in 1991 the National Water and Climate Center began a pilot program that later turned into the Soil Climate Analysis Network (SCAN), a soil moisture and climate information system designed to provide data to support natural resource assessments and conservation activities.

I will now discuss the Snow Survey Program and SCAN in more detail—how they work, why they are important, and who uses the information.

SNOW SURVEY and WATER SUPPLY FORECASTING

From its beginnings in 1935, the SS-WSF Program has grown into a network of more than 1,200 manually-measured snow courses and over 780 automated Snowpack Telemetry (SNOTEL) weather stations in 13 Western states, including Alaska. The SS-WSF Program provides water supply data; modeled water supply and streamflow volume data; and streamflow forecasts for over 760 locations in the West. SNOTEL is a reliable and cost effective means of collecting snowpack and other weather data needed to produce water supply forecasts used by water managers in the west from irrigators to municipalities. The data and information is also important in achieving the objectives of the Western Governors Association as noted in their report, *Water Needs and Strategies for a Sustainable Future*.

With 50-80 percent of the water supply in the West arriving in the form of snow, data on snowpack provide critical information to decision makers and water managers throughout the West. The basic data becomes even more valuable when used in concert with partner organizations to provide water supply forecasting tailored to meet end-user needs.

Reliable information helps reduce the uncertainty in making critical environmental, agricultural, industrial, and municipal management decision regarding annual and multi-year water supplies and streamflows within specific watersheds and sub-basins in the western United States. These decisions may be long-term strategic-planning decisions; logistical, tactical, and operations planning decisions; short-term planning decisions; or immediate, emergency decisions.

Below are examples of how customers use SS-WSF data and analyses:

- Reservoir management
- Irrigation water management
- Cropping decisions
- Crop futures forecasting
- Risk management related to agriculture in general and agricultural finance in particular
- Planning and scheduling of water-related business or government activities
- Flood damage reduction
- Drought risk reduction
- Climate change risk assessments for long-term water availability
- Emergency response and emergency preparedness
- Protection of threatened and endangered species
- Power generation and other energy contracting and management
- Recreation management and other recreation-related decision-making
- Municipal and industrial water supply management

CASE STUDIES OF NRCS CLIMATE SERVICES USERS

SS-WSF data and 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. Following are some examples of how these data and reports are used by NRCS customers.

Case Study—Agricultural Producers

Despite the great variety of agricultural operations in the Western U. S., a common denominator is some degree of dependence on a diverted or stored water supply. In some areas, snowpack is the only significant water storage available. In other areas, reservoirs provide a means of stretching water storage into the summer and sometimes into the fall growing and harvesting seasons.

In southern Idaho, producers in the Salmon Falls and Twin Falls irrigation tracts rely on SNOTEL data and stream forecast information as input in making decisions about what, when, and how much to plant. Irrigation district managers within this region use SS-WSF data and forecasts early in the season to inform their water users on the percentage of their full irrigation allotment they should expect to receive in the upcoming growing season. These irrigation allotment predictions are based on SS-WSF data that show (1) the probability of varying levels of water supply given existing snowpack, soil moisture, and water content; and (2) historic probabilities for additional snowpack and water content accumulations.

These reports are crucial to producers who use them to make cropping and operation decisions well in advance of the growing season. Based on modeling of the typical cropping patterns in the area for a 160-acre farm, the value of the SS-WSF data to producers in this region is estimated as ranging from $27 per acre in a normal year to $111 per acre in a water short year. Based on irrigated acres in those areas, the total value to producers is estimated to be as much as $21.8 million in a water short year.

Case Study—National Weather Service River Forecast Centers

The Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) works jointly with NRCS to provide official water supply forecasts in the West. NOAA's National Weather Service (NWS) operates River Forecast Centers (RFCs) covering all of the landmass of the U.S. In the mountain regions, the RFCs produce river flow, flood prediction, and other hydrologic and weather-related data products for the Western regions of the U.S. and part of lower British Columbia. They depend on NRCS SS-WSF data for the snowpack component of their data analysis and forecasting systems.

The river forecasts, along with NWS flood warnings, help save lives and give communities time to take appropriate actions to lessen flood damage. SNOTEL data is used to validate and adjust the amount of snow and snowmelt simulated in a hydrologic model which produces more accurate forecasts of river flows. These daily river forecasts are also used during non-flood periods for recreational

purposes (rafting, kayaking, fishing, etc.).

Case Study –Recreation Industry
Recreation is an important industry in Western States and many categories of tourism and recreation are—in one way or another—dependent on or affected by either snowpack levels, water supply volumes, or both. Potential commercial and private users of SS-WSF data include recreation associations, hunters, fishermen, boaters, skiers, snowmobilers, campers, tourists, and others whose recreational activities or travel plans might be affected by snow depths or streamflows.

An outfitter operating a river rafting business in the Intermountain West reported that SNOTEL data had indicated that river conditions would render their traditional rafting equipment inoperable in the 2002 season—ultimately the worst season on record for rafting in the area. Based largely on SS-WSF information, the firm purchased smaller craft that would be operable in the environmental conditions predicted by the data. Without the advantage of streamflow projections prior to the beginning of the rafting season, the low water levels would have resulted in a year with little to no revenue. Instead, the decision to purchase the smaller craft resulted in a $600,000 revenue year.

Case Study—Denver Water Board
Power, utility, and water companies use the SS-WSF data in their daily operations and long-range planning decisions. They can also use the data in forward contracting for purchasing and selling power in the wholesale market.

The Denver Water Board uses SNOTEL real-time snowpack and water supply forecast information as input for their reservoir management decisions. If decisions were based only on the historic water supply averages, the Board could lose as much as $5.5 million annually in potential revenue due to suboptimal transfers of water between the various storage reservoirs within their collection and distribution system.

SOIL CLIMATE ANALYSIS NETWORK

Started as a pilot program in 1991, the Soil Climate Analysis Network (SCAN) has evolved into a system supported in part by NRCS and by various Federal, State, local, tribal and university groups that assist in funding and field operations. SCAN monitors soil moisture and other climate parameters and makes the data available to users on a real time basis. The system is used primarily for monitoring and mitigating the affects of drought and flooding. The current SCAN system consists of 151 stations located in 40 States.

National resource management issues for which long term soil-climate information is needed include:

- Monitoring drought development and triggering plans and policies for mitigation.
- Predicting changes in runoff that affect flooding and flood control structures.

Here are a few examples of how SCAN data are used across the nation:

- The Newby Farm SCAN station in Alabama helps poultry farmers monitor local conditions so they can mitigate odor issues when managing poultry waste.
- Data from 15 SCAN sites in Mississippi are used by local farming communities near each site to determine when soil temperature and soil moisture are optimal for planting.

NRCS's National Water and Climate Center works closely with the NOAA/USDA Joint Agricultural Weather Facility (JAWF), located in USDA's Office of the Chief Economist. JAWF meteorologists monitor weather conditions and crop developments on a daily and seasonal basis, and prepare agricultural assessments for USDA commodity analysts and the Office of the Secretary of Agriculture. JAWF relies heavily on SCAN data for U.S. soil temperature maps which are published in the Weekly Weather and Crop Bulletin; temperature and precipitation data used in the U.S. Drought Monitor which is also released every week and followed closely by decision-makers; and weekly agricultural weather information disseminated by the USDA Stoneville Data Center to the agricultural community.

The National Integrated Drought Information System (NIDIS), an interagency, multi-partner approach to drought monitoring, forecasting, and early warning led by NOAA, builds on existing systems infrastructure, data, and operational products from various agencies. For example, it incorporates data from the SNOTEL network.

COLLABORATION WITH BOR AND USGS

The relationship between NRCS with BOR and USGS with regard to water resource data occurs on two levels: one at a national/regional level and also at the State/local level. On the national and regional level, NRCS utilizes USGS and BOR streamflow and reservoir data in our water supply forecasts as both dependent and independent variables in our equations and to verify the accuracy of our forecasts. The basins we analyze for water supply forecasts are tied to streamflow gaging stations operated by USGS. Likewise, reservoirs managed and measured by BOR often are either within our forecast basins or are supplied by the snowmelt from these basins, and therefore sharing of data is critical. All three agencies make data available through the Internet and that is how the data is most commonly shared.

On a State/local level, NRCS often works closely with BOR and USGS to provide data specific to their needs and we have provided specific forecasts and products for certain areas, basins, and projects when requested. Likewise, BOR and USGS have provided data to NRCS for specific needs when requested. The level of interaction varies greatly between locations. In general, though, the relationship has been one of collaboration and cooperation to provide information and analysis to benefit the public. The level of communication and sharing of data can always be improved, but I feel that all three agencies make their data available as needed and are willing to assist whenever requested.

SUMMARY

NRCS produces critical data, forecasts and analyses for a wide variety of public and private users. Users rely on NRCS's near-real time data and unbiased forecasts to plan and execute short- and long-term decisions ranging from individual farmers' planting dates to basin-wide water management planning. In the future, we hope to increase the percentage of Snow Survey sites that are automated. This would result in more accurate water supply forecasts and snow pack reports, as well as decrease the safety risks for NRCS employees who monitor remote sites in challenging weather conditions. We enjoy a strong relationship with BOR and USGS and look forward to exploring more ways to collaborate and cooperate in the future. Thank you again, Ms. Chairwoman, for the opportunity to appear before you today, and I would be happy to respond to any questions.