



Today's Program Economics

In the middle of the winter of 2004-2005, a perilous situation was brewing in many communities that sit at the bases of various mountain ranges in the State of Utah. In the mountains above these communities, larger and larger accumulations of snow were building up with each successive snowstorm. As spring approached, these snowpacks lay waiting for the warmer weather ahead to release the water they held, and they threatened to cause widespread damage and economic losses in the valleys below.

Fortunately, civic leaders in the threatened communities were not taken by surprise by the oncoming floods. Thanks to the work of the NRCS' Snow Survey crews and analysts, early warnings of the impending danger had been widely distributed and publicized. Advance preparations were made by cities and counties, including clearing of clogged stream channels, construction of temporary dikes and other water diversion structures, and sandbagging of critical weak points and around buildings along the soon-to-be flooded rivers and streams. While some unavoidable flood damage still occurred, the communities at risk were able to avoid a majority of the losses that they would have suffered had they not been warned ahead of time that the spring streamflows would reach flood levels.

When an economist evaluates whether or not a program or project is worthwhile from the standpoint of economics, he or she takes a close look at the benefits generated by that activity and compares those benefits with the costs associated with carrying out the activity. The evaluating economist is charged with identifying all of the benefits of the program—both market valued and non-market-valued—to whomsoever they may accrue within the U.S. In other words, he or she is asked to identify as many as possible of the good things that are provided to the American public by the program. These benefits are weighed against the budget costs of the program in order to determine whether or not what the country as a whole is getting out of it is worth what we're putting into it from a real resource and budget standpoint. So for an economist looking at the flood-damage prevention measures taken in Utah in 2005, the question that arises is, "Was the value of what society was able to protect—because of the information provided by Snow Survey reports—worth the cost to American taxpayers of generating those reports?"

Before we can give credit to Snow Survey for the benefits created by the flood-protection measures that were put in place last spring, we have to make sure that Snow Survey reports really were the cause of the advance steps taken by local officials. Two key questions to ask are, "Did the work of Snow Survey in the winter

of 2004-2005 actually influence local leaders to take action?" and, "Was there another way in which the people who had to make decisions could have learned of the high probability of severe spring flooding?"

To answer the first question, we can take a look at the situation that existed during the winter of 2004-2005. First, Utah and the rest of the Upper Colorado River Basin had been in a drought for quite a few years prior to this particular winter season. Lake Powell had dropped to its lowest level since the 1960's. Drought-related disaster areas had been declared in many counties in Utah during 2004. Given those conditions, it was both a relief and something of a surprise that snow accumulated in record amounts in many locations in the State of Utah. In February of 2005, with record snowpacks piling up in the mountains of southern Utah, Utah Snow Survey Supervisor Randy Julander told news media in Salt Lake City that, "There are some areas down there where we need to watch very carefully." He also said, "I'm tickled to death we're finally getting some decent snowpacks in southern Utah. I just hope it doesn't turn out to be too much of a good thing." Julander's words of caution were based on what he was seeing in the data generated by SNOTEL data collection stations. Based on those data, the Snow Survey report issued on January 1 predicted that spring streamflows in drainages across the state would range from 83% to 238% of average. Later reports indicated that spring runoff in at least one watershed in southern Utah would be well over 300% of normal. Throughout the late winter and spring seasons, Julander appeared repeatedly on news programs and was quoted in news articles, warning of the potential for flooding.

Eventually, parts of the snowpack above the community of Cedar City grew to as much as 372% of average. Beginning in January, Julander gave many public presentations aimed at local civic leaders during which he informed audiences about the impending threat of flooding. His presentations included graphs showing the levels of snowpacks in the mountains of Utah, snowpack water content data, statistical predictions of the possible ranges for streamflows, weather maps giving drought information and weather predictions, and various maps and graphs explaining the significance of local and regional SNOTEL data.

Given the winter and spring activities of the Snow Survey Program in 2005, including media appearances, involvement in public meetings, and issuances of SNOTEL-based reports that predicted spring flooding, it is safe to conclude that the work of Snow Survey did indeed influence local officials to take action to try to prevent as much flood-caused damage as possible.

To answer the question as to whether civic leaders could have learned from some other source that there was a growing threat of flooding, we can turn to statements made by a key official in the State of Utah's Department of Public Safety (DPS). According to Ryan Pietramalie of Utah's Emergency Services and Homeland Security division of the DPS, both State and local governments based their 2005 flood preparedness decisions on information provided by the Snow Survey Program. When asked whether they could have obtained that same information from another source, Pietramalie said that Snow Survey *is the only source*. While real-time National Weather Service storm data and U.S. Geological Survey streamflow data can add additional layers of helpful information, data on the existing snowpack are essential to understanding the implications of real-time precipitation and streamflow data. The answer to the question as to whether civic leaders could have obtained information on potential flooding from some other source is an unequivocal "no". Snow Survey data provided the only scientific source of information upon which local officials could base their early flood-damage prevention decisions.

By the end of February in 2005, towns and cities were rushing to prepare their communities for oncoming floods. In Cedar City, crews raised the bed of a state highway, cleaned out and strengthened ditches and creek beds, filled sandbags, and created a new course for Coal Creek to channel water away from major housing areas and into a dry lake bed. When the anticipated flooding arrived, some houses, roads, and facilities sustained damages. The total extent of damages, however, was much less than it would have been without the advance preparations.

In Vernal, a community in northeastern Utah, local officials worked with the Army Corps of Engineers to make provisions for strengthening streambanks, and workers stockpiled sandbags in preparation for flood waters. As the anticipated flooding began occurring in May, those stockpiled sandbags were placed where they could protect the most vulnerable properties.

A preliminary look at some of the statistics seems to indicate that, "Yes, what we got out of the Snow Survey Program in 2005 was definitely worth what we paid for it." Preliminary estimates have put the value of properties protected by the advance preparations in Cedar City alone at as much as \$15 million¹. During the runoff season of 2005, the Yellowstone, Whiterocks, Uinta, Escalante, Virgin, Santa Clara, and Sevier Rivers and Mammoth and Coal Creeks all set new record high flows. In spite of these high flow levels, flood damages were very limited in scope. Local and State officials give credit for the low level of flood damages to the advanced warnings supplied by means of Snow Survey reports and presentations. Further study will give a clearer picture of the specific dollar value of the flood-damage prevention measures. The cost of the entire Snow Survey Program at the national level in fiscal year 2005 was about \$11 million, meaning that the value of flood-damage prevention in Utah in 2005 is estimated as justifying the entire national budget of the Snow Survey Program for that fiscal year.

Of course, flood-damage protection is not the only benefit resulting from the work of the Snow Survey Program. The primary users of Snow Survey data are agricultural producers, who use the data to help them make decisions each year about how many acres to plant of different crops. Each year, having an early-season estimate as to how much water will be available for irrigation, arms farmers with the knowledge necessary for them to mostly avoid either over- or under-planting their cropland acres.

Other users of Snow Survey data include reservoir and irrigation company managers, recreation administrators, national, state, and local governments, transportation managers, public and private utilities, in particular power companies that generate hydroelectric power, scientific researchers, wildlife interests, and financial entities that work with any of the above categories of data users.

During the upcoming year, NRCS has planned to undertake a thorough economic analysis of the Snow Survey program. While the final results of this analysis will not be available until some point in the future, the experience of 2005 in Utah demonstrates the value of knowing just how much snow there is in the mountains.

Julie Suhr Nelson
State Economist, NRCS
Salt Lake City, Utah

¹ Approximately 75 properties with an estimated average value of \$200,000.