



Early Snow Survey Program Economics

Snow Surveys and water supply forecasting, as we know it, were first developed by Dr. James E. Church on Mt. Rose, Nevada in 1906. Church made his first forecast of the rise of nearby Lake Tahoe in 1911. Even at this early date, Lake Tahoe was carefully managed in an effort to accommodate multiple competing interests, and Church's forecast proved to be a very valuable tool in water management decisions. Within the next two decades, snow survey programs were developed by various university, state, and federal entities. By 1935, at least nine independent and uncoordinated snow survey networks were being measured in the West. Benefits of snow surveys included, but were not limited to, flood control, increased efficiency of reservoir management, power generation, agriculture, and engineering.

The severe drought of 1934 increased demands for accurate water supply forecasts. These demands led to the establishment of the Federal Snow Survey Program under the Bureau of Agricultural Engineering in 1935. An initial budget of \$36,000 was appropriated by Congress.

A valid question for any taxpayer, whether past or present, would be, "Is this program worth the money?" While very little economic information is available for the earliest years of the program, if the only benefit of these years had been the establishment of strong relationships for future forecasts, the investment has been repaid many thousands of times. In addition to this huge benefit, the water supply forecast information from these early years would have certainly benefited the tax payers in great excess to the program budget.

While few hard numbers are available for the earliest years of the program, many case studies from the 1940s and 1950s document an extremely economically viable program. A few of these case studies will be summarized here. In 1952, the estimated value of irrigated crops in the West was 3.5 billion dollars. The efficient management of those crops was very dependent on advanced knowledge of each year's growing-season water supply.

The 1946 forecast for Deschutes and Crook Counties in Oregon indicated that there would be a very plentiful water supply for the growing season. Farm operators in these counties prepared large acreages that were typically not planted, due to lack of water. Production for this extra acreage was estimated at \$650,000, or more than

eight times the annual snow survey program budget in all western states combined, at that time.

On April 9, 1946 the Boise Snow Survey Office released a flood warning for the Kootenai River, recommending flood protection measures. Based on this Forecast, the Secretary of the Kootenai Valley Reclamation Association requested flood preparedness assistance from the Army Corps of Engineers. Seven hundred troops, with heavy equipment, arrived to insure the integrity of dikes that protected 37,000 acres of fertile land. Weaknesses developed, and were successfully repaired, in portions of the dikes protecting 17,800 acres. The estimated value of the averted loss to dikes, land, and facilities totaled at least four million dollars.

The 1955 forecast for Salmon Creek Falls near San Jacinto, Nevada, is one great example of the economic value of snow survey. That year had heavy snows in the foothills and March precipitation of 183% of normal. This visual evidence indicated that there would be a good water supply. Based on the information they could gather by making their own observations, farmers would have prepared, pre-irrigated, and seeded a large portion of irrigable land. However, the water supply forecast predicted runoff to be only about 60% of normal, due to low snow pack in the high water producing areas of the mountains. Armed with this forecast, farmers prepared a far smaller area, and in this irrigation area alone, saved an estimated \$379,000. The cost of the water supply forecast was estimated at \$900.

The Columbia River Basin experienced near record low flows in the spring of 1955. Interruptible power loads were reduced for most of the spring. Snow Surveys above Hungry Horse Reservoir on the South Fork of the Flathead River, provided an inflow forecast that allowed for increased power production, while still allowing the reservoir to fill. In one 18-day period of time, power that was generated in excess of the normal release, produced a savings of \$100,000 to \$150,000.

Since the inception of the Snow Survey Program, the U.S. taxpayers have received far more than their investment's worth from accurate hydrologic data that has increased the efficiency of all aspects of water management and has also significantly reduced flood related risk to life and property.

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