

D. Water Use Measurement and Estimation

Introduction

It has been estimated that 65 to 75 percent of the total water withdrawn annually from groundwater and surface water sources in Nevada is either measured with detailed diversion records, or estimated annually in detailed pumpage and crop inventories. Only a portion of these data are maintained in an electronic database. Much of the available water use data are collected for regulatory purposes (compliance with permits, decrees, etc.) and may lack the detail needed to fully characterize water usage for planning purposes.

Water use information (whether measured or estimated) is critical for effective water planning and management at both the local and state levels. Managing and planning water resources without accurate water use information is comparable to managing a checking account without tracking the outgoing checks. In general, most of the groundwater basins in Nevada are managed as individual water sources. The State has tended to focus its water use measurement and estimation efforts as needed to implement the prior appropriation system. As a result, most of the data are compiled for those basins with declining water tables, increasing competition for the available resources, or usages with potential impacts to others. The lack of readily available and comprehensive water use information has complicated the *State Water Plan* development process.

Water use measurement is a key component to any conservation program. Meters and other measurement devices can be used as a tool in evaluating program effectiveness in terms of water usage changes. In addition, meters can provide a basis for billing with a rate structure such that customers pay for what is used and waste is discouraged.

Additional information on water use and measurement is presented in Part 2, Section 1, “Historic and Current Water Use”, of the *State Water Plan*.

Water Metering in Nevada

Upon issuance of a permit, the State Engineer has always required some type of measuring device be placed near the point of diversion and that records of these measurements be kept; however the type of measuring device used was at the discretion of the permittee. These use records are the basis for establishing the beneficial use amount, except in the case of irrigation use. The beneficial use amount for irrigation is based on various items such as total irrigated acreage, crop type, geographic location, and length of growing season. In the early 1970s, requirements changed for permits issued for an underground source and totalizing meters were required on most wells. However, not all permittees were required to submit this information to the State Engineer. Beginning in the mid-1980s, all permits issued for an underground source required a totalizing meter except for some irrigation permits. In critical groundwater basins, totalizing meters were required for all irrigation permits. Today all new permits for major groundwater uses of all types have conditions requiring the

installation of totalizing meters on wells and the submittal of pumpage records to the State Engineer.

In the Truckee, Carson and Walker rivers, agricultural surface water diversions are measured with the data recorded and maintained by federal water masters and irrigation districts. On the Humboldt River system, flow measuring devices are installed and used to ensure compliance with the applicable decrees. Historically no detailed diversion records are kept for the Humboldt River system with surface water diversions monitored by the State Engineer's Office.

A majority of the public water system withdrawals (in terms of volume) are metered, however, service connections may or may not be metered (about 15 percent of the service connections in Nevada are unmetered). For example, only about 25 percent of residences in Reno/Sparks have water meters. Water meters were initially prohibited in the cities of Reno and Sparks by the 1913 State Legislature. Since that time, gradual changes have occurred which require meters on all businesses (1977), require meters on all new homes built after 1988, allow meters on residences upon owner request, and allow retrofit of meters on residences under certain conditions tied to the Negotiated Settlement (1990).

Comprehensive Water Use Estimation in Nevada

Since 1950, the U.S. Geological Survey (USGS) has estimated statewide water use at 5-year intervals and published these estimates as part of a national program. USGS water use estimates for Nevada and other states are included in the national summary report, but a detailed Nevada water use report with individual county breakdowns is not published by USGS (although this information is compiled). In developing these estimates, the USGS obtains available water use data and related information from a variety of entities such as the Nevada Division of Water Resources, U.S. Bureau of Reclamation, U.S. Census Bureau, U.S. Department of Agriculture, irrigation districts, federal water masters, water purveyors and other USGS studies. Since much of the water use in Nevada is not measured, the USGS has to rely upon estimation techniques for filling in data gaps and developing comprehensive county and state total water use values.

The water use estimation program in Nevada had been cooperatively funded by the Nevada Division of Water Resources (State Engineer's Office) until funding was cut in 1991. Since that time, the USGS has continued the program with other limited funds and the State has had little involvement in the process. The Division of Water Planning has requested funds to resume this program on a small scale in the current budget cycle (FY 2000 and 2001). Since the entire *State Water Plan* is predicated on water use data, resumption of the program is viewed by many as vital to the integrity of the water planning program and development of future water plan updates.

Water Use Data Currently Compiled by the State

The Nevada Division of Water Resources (NDWR) compiles a majority of the detailed water use data and estimates available within the State. Groundwater use estimates are developed for selected basins and compiled in pumpage and crop inventories. NDWR also collects other pumpage data which are submitted to satisfy water right permit requirements. According to the State Engineer's Office, these data account for about 90 percent of all groundwater use in Nevada. While these sources account for most of the statewide groundwater usage, the data are generally not maintained in an electronic database for easier access and analysis for statewide planning purposes.

Pumpage and Crop Inventories

NDWR annually compiles pumpage and crop inventories for selected basins. NDWR estimates the total groundwater pumpage for about 16 of the 256 hydrographic areas. Generally these groundwater pumpage inventories are based upon a mixture of both actual measurements and estimates. The groundwater pumpage amounts estimated in these inventories accounts for over 95 percent of the total groundwater used by municipal water systems in Nevada. As part of the crop inventories, NDWR estimates irrigated crop acreage and associated water withdrawals for about 30 of the 256 hydrographic areas.

Miscellaneous Pumpage Data

In about 80 of the 256 hydrographic areas, some water right holders are required by permit conditions to submit surface water and groundwater pumpage data to NDWR. These data are specific to a particular users such as public supply systems, mining and other self-supplied users, and may not account for all water uses within a hydrographic area.

Public Water Supply Systems. About 20 percent of the approximately 300 systems in Nevada submit water withdrawal information to NDWR. These systems serve about 95 percent of the total population and account for about 95 percent of statewide public system withdrawals. However, data may not include all surface water withdrawals by these systems, and details such as population served, consumptive use estimates and breakdowns by domestic, commercial, industrial, and thermoelectric deliveries are not requested by the State.

Other Data. NDWR collects groundwater withdrawal information for approximately 50 mining operations in Nevada. The mining operations continuously measure water withdrawals, mining consumptive uses, irrigation uses of excess mine withdrawals, reinjection volumes, and water discharges to surface streams. It is estimated that these data account for over 95 percent of the statewide mining groundwater usage. Miscellaneous commercial and industrial operations also submit groundwater withdrawal information to NDWR.

Water Use Estimation in Other States

Utah

The Utah Water Use Program is a cooperative effort between the State of Utah and the U.S. Geological Survey. As required by Utah Administrative Code R309-102-8, all community water systems are required to complete annual water use forms furnished by the state. The state also collects data from self-supplied industrial users with questionnaires mailed to these users. In 1985, the State of Utah started delineating irrigated acreages on 7.5 minute topographic map sheets, in lieu of outdated U.S. Natural Resources Conservation Service estimates. Utah updates about one-tenth of these maps every year. Irrigated water usage is then estimated from these data.

California

The Department of Water Resources has surveyed retail water agencies and analyzed their water production data for more than 35 years. This information is used in updating the California State Water Plan. In addition, the Department has been performing land use surveys since the 1950s to quantify acreage of irrigated land and corresponding crop types, and currently maps irrigated acreage in six to seven counties per year. Water use estimates are derived from water use requirements and the irrigated acreage amounts.

Other States

Many other states have water use reporting and estimation programs. Wyoming has a cooperative water use program with the USGS and mails out survey forms similar to those used by Utah. In Indiana, all entities with water use greater than 100,000 gallons per day are required to report their water use annually to the state. This requirement came about in response to declining water tables and competition for available water.

Issues

One of the major obstacles to improved comprehensive water planning and management is the State's lack of an overall water use and estimation program. The resulting lack of readily available water use data complicated development of the *State Water Plan* and has hindered other efforts. At this time, the U.S. Geological Survey (USGS) is the only agency that estimates statewide water use for Nevada. The USGS program for Nevada had been cooperatively funded by the Nevada Division of Water Resources (State Engineer's Office) until funding was cut in 1991. Since that time, the USGS has continued the program with other limited funds and the State has had little involvement in the process.

Recommendations

The following recommendations are offered as a method for improving water use measurement and estimation, and ultimately future water planning and management efforts, in Nevada:

1. The State should develop and fund a comprehensive water use measurement and estimation program. Some elements of this program could include the following:
 - A. Enter water use data and estimations currently being compiled by the State Engineer into electronic databases, and link this data with water right permits database;
 - B. Acquire more detailed public supply, commercial, industrial and thermoelectric usage data through one of the following mechanisms:
 - a. request that municipal water systems provide additional details of water usage for data currently submitted to State Engineer’s Office (for compliance with water right permit conditions) such as population served, number of connections, consumptive use estimates and breakdowns by domestic, commercial, industrial, thermoelectric deliveries, etc.;

OR

- b. require all of the following water users to submit detailed water use information (measured or estimated) if not currently submitted:
 - public supply systems;
 - self-supplied commercial/industrial/thermoelectric users with usage over a threshold value to be determined; and
 - mining operations with water usage over a threshold value to be determined.

Information should include the following as applicable:

- number of persons served;
- monthly/annual withdrawals by source;
- monthly/annual deliveries by category (domestic, commercial, industrial);
- estimated consumptive use;
- anticipated future needs

- C. Expand existing program for estimating irrigated acreage and associated water use;
- D. Encourage public supply systems to meter all water deliveries; and
- E. Initiate a water measurement program for all water users to install water measurement devices, or implement water use estimation techniques (based upon power use, etc.) for certain users over a threshold use amount and for certain basins. Funding support would be a necessary component.
- F. Provide state funding for the Division of Water Planning to match the USGS cooperative water use estimation program so that all of the water use information could be compiled in

a comprehensive and integrated manner.

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