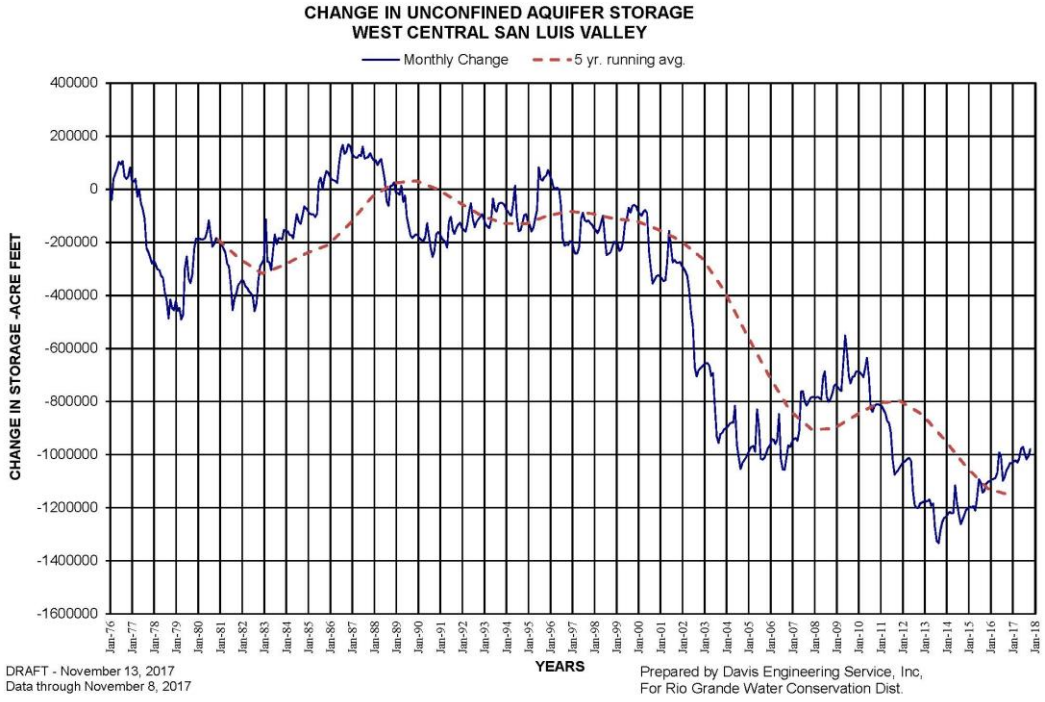
You Can't Manage What You Don't Measure

Heather Dutton
Rio Grande Basin Representative on the CWCB Board &
Manager, San Luis Valley Water Conservancy District

"In the Rio Grande Basin, there are more people that want water than there is water available. We live in a high mountain desert and every drop of water is spoken for." This is how I explain water in the San Luis Valley to people that would like to drill a new well for their home or business and call me to discuss obtaining well augmentation. Living in an area where both the surface and groundwater supplies have been fully appropriated (which, in water speak means fully allocated to water users for beneficial uses) has challenges, but also many opportunities.



Because you can't manage what you don't measure, there is a long history of studying the water supplies in the Valley. In 1976, the Rio Grande Water Conservation District (RGWCD) began tracking the change in storage of the unconfined aquifer. This program has provided a greater understanding of aquifer levels and interactions with climate and well pumping, and has provided data for groundwater management efforts throughout the basin. The striking visual of the change in groundwater volume over time emphasizes the urgency to act. Efforts to increase groundwater to a sustainable level are underway by groundwater management

subdistricts through the RGWCD and well rules and regulations by the Colorado Division of Water Resources (DWR). While the data are a call to action, they also provide reassurance that efforts to conserve water and reduce pumping can be successful; in years with average or above average water supply, gains in recharge are evident and prove that management strategies can work.

Another key piece of water supply measurement is the system of Snotel sites, which are automated sensors that measure snowpack and climate at over 730 locations in the United States. The Natural Resources Conservation Service (NRCS) manages 13 Snotels in the Upper Rio Grande Basin. The data from these sites are compiled in models by NRCS staff and used to estimate the percent of average basin-wide snowpack throughout the winter, which is then used to forecast expected streamflows in the next year.

Beartown Snotel, photo credit: Heather Dutton

The forecast is utilized for planning throughout the basin. For example, the San Luis Valley Water Conservancy District (SLVWCD) uses the forecast to estimate water rights yields and plan reservoir storage. The RGWCD and groundwater management subdistricts base their annual operations, including conservation incentives and river replacements on the forecast. Farmers and ranchers review the forecast to make decisions about crop types and acreages, grazing plans, hay sales, and livestock management.

Arguably the most important user of the forecast is the Division Engineer for DWR. The Division Engineer uses the streamflow forecast, weather data, information from the historical record, various models, and his intuition to predict the flows in the major rivers and the associated annual delivery obligation to New Mexico under the Rio Grande Compact. The annual delivery obligation increases or decreases from year to year depending on the actual flow of the Rio Grande and Conejos Rivers.

A lot rests on the streamflow forecast. When it is incorrect, the adjustments that must be made at the district, farm, or administration level have direct impacts on the flows in the river and to the water users' bottom line. When the forecast is low and there is more water in the river than anticipated, water users in the basin can be curtailed (not allowed to divert water) during the height of the growing season in order to send the required amount of water downstream. When the forecast is high and there is less water in the river than planned, the water users are often curtailed early in the growing season, but allowed to divert later when the error in the forecast becomes apparent. Either scenario has great impacts on the water users and local farming operations, and is difficult for the Division Engineer to manage. Inaccuracy in the forecast occurs more frequently as changes in climate, precipitation patterns, and the timing of runoff have impacted the accuracy of the annual forecast.


Rented radar unit, photo credit: Christi Bode

In an effort to improve the "crystal ball," water users and managers in the basin banded together with the CWCB and other local, state, and federal agencies to evaluate existing forecasting tools and examine additional opportunities. Using rented radar units and LiDAR data, the team collected precipitation and topographic data across a large area of the San Luis Valley and surrounding mountains, including places that are inaccessible for traditional measurements. This data provides the location and amount of precipitation that, coupled with traditional snow measurements, were used to create a more robust and complete model for streamflow forecasting.

Realizing the unmatched potential of improved forecasting and the added benefits for transportation coordination and public safety, an incredible team has assembled to bring a permanent radar unit to the Rio Grande Basin. Partners include the CWCB, local water conservancy and conservation districts, the Counties within the Valley, the Rio Grande and Conejos water users, DWR, Colorado Department of Transportation, Rio Grande Watershed Emergency Action Coordination Team, and many others. Further, the project partners have secured permits to establish new snow measuring sites on U.S. Forest Service land, which will expand the network of measuring sites available to ground truth the radar data and populate the forecasting models. These methods will provide unprecedented coverage and clarity in the Rio Grande Basin, leading to models that will be more adaptive and accurate in the face of changing conditions. The feature of water measurement, and therefore management, in the Rio Grande Basin is on the cutting edge of science, thanks to the bold ideas and commitment of the project team.

About the author: Heather is the district manager of the San Luis Valley Water Conservancy District. The SLVWCD shepherds well augmentation water from the Rio Grande Reservoir above Creede into the river to support agricultural, domestic, municipal, and commercial uses in the Valley's heartlands in cooperation with the Rio Grande Water Conservation District.