



Streamflow Forecasting 101

WHO FORECASTS STREAMFLOWS?

The Natural Resources Conservation Service and its predecessors in the U.S. Department of Agriculture have conducted snow surveys and provided streamflow forecasts since 1935. More recently, scientists at the National Center for Atmospheric Research have developed the Weather Research and Forecasting Model (WRF-Hydro). Forecasts from both entities have are used by the Colorado Division of Water Resources to help determine deliveries under the Rio Grande Compact.

WHY DO ACCURATE FORECASTS MATTER?

Colorado has an annual delivery obligation under the Compact that varies according to the size of streamflows. In wet years, the state is required to send more water down the Rio Grande and the Conejos River and its tributaries to New Mexico. In dry years, Colorado keeps a greater share of the flows. DWR's main tool in setting those deliveries is the curtailment of diversions on those two river systems. If forecasts overestimate a wet year and DWR sets a large curtailment, irrigators are left watching runoff surge past their headgates during early season high flows. Conversely, if forecasts underestimate flows, water users are curtailed late in the season when water is already limited.

GO WITH THE SNOW

Since streamflows in Colorado's portion of the Rio Grande Basin are almost entirely dependent on mountain snowpack, snow gauges play an important role in forecasting. The NRCS operates 17 SNOTEL sites in watersheds that drain into the San Luis Valley. Those gauges transmit precipitation and temperature data daily. The NRCS also operates nine snow courses that are checked manually during the winter. The Conejos Water Conservancy District, which had only three SNOTEL sites for its watersheds, struck a partnership with NCAR in 2015 to add six snow monitoring stations and five new stream gauges that helped refine the WRF-Hydro model and increase the accuracy of local stream forecasts.

EYE ON THE SKY

While the snow gauges and snow courses provide important data, they do so from fixed points on a map. Valley water managers looked to radar to broaden that picture and add data for forecasters. Prior to the 2019 installation of a Doppler radar at San Luis Valley Regional Airport, the nearest radars were operated by the National Weather Service in Grand

Junction and Pueblo. In addition to increasing the accuracy for water supply forecasting, the radar also improved public storm warnings, travel management, and emergency response.

FUTURE STEPS

Using funding secured through the Colorado Water Conservation Board by the San Luis Valley Water Conservancy District, Valley water managers are hoping to add six to eight more snow gauges in the basin that would measure temperature, humidity, wind speed, snow depth, soil moisture, soil temperature and solar radiation. Water managers across the state are also looking into potential funding to make Light Detection and Ranging flights a regular occurrence. LiDAR, as the technology is known, uses lasers to measure topography from the air in the dry season and to provide a snapshot of snowpack during a subsequent winter or spring flight.