

Groundwater and Streamflow Information Program

Next Generation Water Observing System— Headwaters of the Colorado and Gunnison River Basin

Emergency managers and water resource managers rely on the USGS's water monitoring system and the associated water data delivery and instrument testing infrastructure to provide monitoring data to address complex water challenges involving too much, too little, or poor-quality water. Each year, floods, droughts, and water quality issues remind us of the vulnerability of our physical and socioeconomic well-being and the importance of monitoring our Nation's water. This monitoring system is currently functioning, but it was designed many decades ago to address 20th century challenges and needs major upgrades to meet the increasingly complex water challenges facing communities across the Nation. In fiscal year 2020, the USGS selected the headwaters of the Colorado and Gunnison River Basin as the second basin for implementing the Nation's next-generation integrated water observing system (NGWOS) to provide high-fidelity, real-time data on water quantity and quality necessary to support modern water prediction and decision support systems for water emergencies and daily water operations.

Substantial advances in water science, together with breakthroughs in technological and computational capabilities, have resulted in sophisticated new capabilities that can provide managers and decision support systems with the information, insights and data needed to address today's water challenges. Modern models require high-density data describing all of the major hydrologic characteristics that the models represent, such as streamflow, evapotranspiration, water storage in snowpack, soil moisture, groundwater, and many others. However, these models and tools require more extensive observational data than the current hydrologic monitoring networks can provide.

When fully implemented, the USGS NGWOS will intensively monitor at least 10 medium-sized watersheds (10,000-20,000 square miles) and underlying aquifers that represent larger regions across the Nation. Data from this suite of intensively monitored watersheds will be used, alongside data from existing monitoring networks, to address data gaps that limit integrated water availability assessments and water prediction. This advanced observing system will provide quantitative information on streamflow, evapotranspiration, snowpack, soil moisture, a broad suite of water quality constituents (nutrients, salinity, turbidity, and wastewater indicators), connections between groundwater and surface water, and water use. It will be directly coupled with the National Water Model and other advanced modeling tools to provide state-of-the-art flood and drought forecasts, drive emergency and water-management decision support systems, and to provide data necessary to address difficult questions such as:

- What are the near-term and long-term risks of floods and droughts, and what scenarios change these risks?
- Are we in the early stages of a drought? How long will drought recovery take?
- How much water is stored in seasonal snow packs, and how will changes affect water supplies?
- How much water is lost to evapotranspiration?
- What is the quality of water and how will it change during wet/dry periods?
- How much does groundwater contribute to streamflow, or vice-versa?



Photo by Alan Cressler (USGS)

Next Generation Water Observing System in the Headwaters of the Colorado and Gunnison River Basin

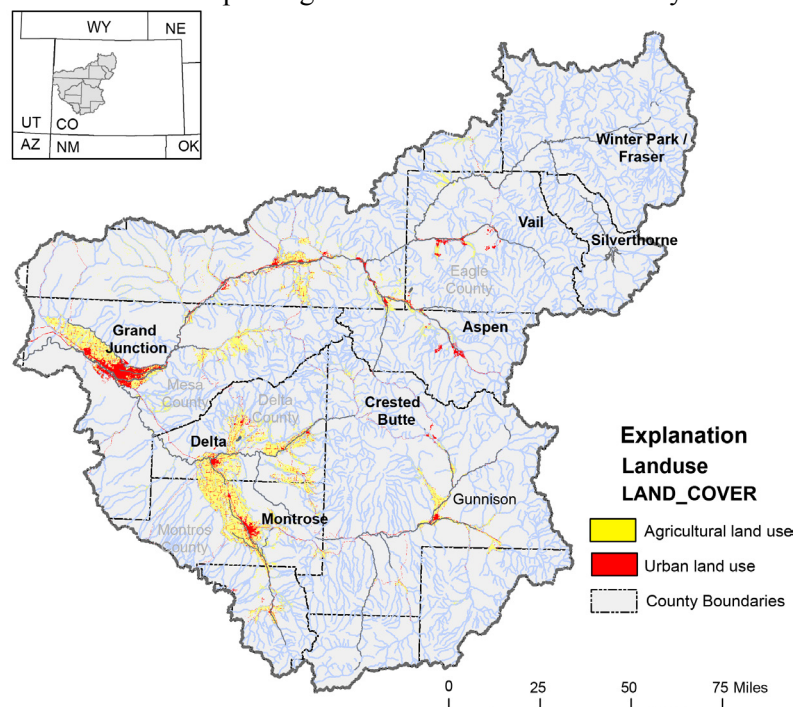
The USGS has selected the headwaters of the Colorado and Gunnison River Basin (Upper Colorado River Basin) in central Colorado as its second NGWOS basin. This decision was based on rigorous quantitative ranking of western basins, input from USGS Regions and Science Centers, and feedback from targeted external stakeholders in the west.

The Upper Colorado River Basin ranked high among western basins because nearly all flow in the Colorado River originates in the upper basin states and runoff from the Upper Colorado River Basin is nearly three times that of other basins in the area. Thus, the Upper Colorado River Basin is particularly critical for downstream users. The Colorado River Basin supplies water for more than 40 million people and nearly 5.5 million acres of farmland across the western United States and Mexico.

Long-term drought conditions facing the Upper Colorado region, interstate ramifications of the drought, water-quality issues, stakeholder support, and alignment with Department of Interior and USGS priorities also factored into basin selection. Of note, a newly released (October 2019) Federal Action Plan for Improving Forecasts of Water Availability includes a milestone to pilot long-range water prediction in the Upper Colorado River Basin, an activity that will greatly benefit from the newly selected USGS NGWOS basin.

An integrated data-to-modeling approach in the Upper Colorado River Basin will help improve regional water-availability assessments and water prediction in other snowmelt dominated systems in the Rocky Mountains and beyond.

Planning and stakeholder engagement for the NGWOS in the headwaters of the Colorado and Gunnison River Basin will be initiated in fiscal year 2020.



The USGS will begin planning for the next generation water observing system in fiscal year 2020 in the headwaters of the Colorado and Gunnison River Basin.

For Additional Information

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Next Generation Water Observing System

<https://www.usgs.gov/NextGenWOS>

Gallaudet, T., and Petty, T.R., 2019, Federal action plan for improving forecasts of water availability: Prepared pursuant to Section 3 of the October 19, 2018 Presidential Memorandum on Promoting the Reliable Supply and Delivery of Water in the West, at <https://www.noaa.gov/sites/default/files/atoms/files/Federal%20Action%20Plan%20for%20Improving%20Forecasts%20of%20Water%20Availability.pdf>.