

Statement of Andrew Mueller, General Manager
Colorado River Water Conservation District
Glenwood Springs, Colorado

Why We Need to Store More Water and What's Stopping Us

Hearing of Subcommittee on
Water, Wildlife, and Fisheries
United States House of Representatives
Committee on Natural Resources

March 28, 2023

Chairman Bentz, Ranking Member Huffman, members of the subcommittee, thank you for the opportunity to speak with you today about these important issues.

My name is Andrew Mueller, and I am the General Manager of the Colorado River Water Conservation District. On Colorado's Western Slope, water is everything. Our rivers form the backbone of a rural economy that depends on multi-generational farms and ranches, thriving recreation industries, and the environmental beauty for which our state is so renowned.

For 85 years, the Colorado River District has worked to protect the water interests of western Colorado. We work every day to manage, conserve, develop and protect West Slope water on behalf of the state of Colorado and the citizens in the 15 Colorado counties that form the headwaters of Colorado River and its principal tributaries in the state.

Importantly, melting snowpack, occasional rain, and the associated runoff from within our District alone provides 65% of the natural flow of the mainstem of the Colorado River. When you include runoff from our sister conservation district to the south, the Southwestern Water Conservation District, snowmelt and runoff from Colorado's Western Slope provides for 70 percent of the River's natural flow.

The Colorado River is aptly referred to as the hardest working river in America, and its headwaters are vital to the health and future of the American Southwest. The high-elevation forests west of the Continental Divide capture the snow that becomes the water that supports over forty million people, five million acres of agricultural land, two countries, thirty sovereign Tribal nations, seven states and eleven national parks.

Hot temperatures over the last 23 years have diminished the flows of the Colorado River by 20%, and sound science tells us we should anticipate and plan for further significant reductions. Even in wet years, the river no longer reaches its natural mouth at the Sea of Cortez and legal claims to the Colorado River's water significantly exceed the average annual flow.

Thankfully, on the slopes across Colorado’s high country, the snow-water equivalent of 2023 winter storms soared past the seasonal averages of the last thirty years – but if history tells us anything, we can’t rely on that to continue. Colorado experienced a similarly robust snowpack in 2011 and 2019, but both followed closely on the heels of 2012 and 2020, both brutally dry years.

Managing a system where the only certainty is uncertainty means looking both at long term and short-term solutions. In the long term, one of the largest variables over which we have any control is the health of our forests and their ability to collect, filter and convey water. In the short term, accessible and easily adaptable storage solutions mean that our communities, our agriculture and rivers can continue to thrive year to year.

I. Managing High-Elevation Forests to Support Healthy Watersheds

The Role of High-Elevation Forests as our Largest Reservoirs

The role played by high-elevation forests in capturing, preserving, and filtering water is critical not only to the health and economies of the Western Slope, but to the entire Colorado River basin. Forests above 9,000 feet in elevation are the most productive when it comes to collecting snowfall during the winter and releasing it throughout the summer, and the vast majority of these super-collector regions are on federally owned land. As the snowpack in those high-elevation forests slowly melts, it is filtered through soils, recharging groundwater, filling reservoirs, and flowing downstream to thirsty farms, ranches, cities, and industrial users. Snow is the primary form of Colorado River water storage, and our forests are, by far, the largest natural reservoirs of the Colorado River Basin – the critical natural counterparts to the built reservoirs of Lakes Mead and Powell.

Across the West, federally owned forested lands are the dominant water source, providing approximately 52% of the total water supply¹. In the state of Colorado, specifically, 80% of residents depend on a water source which comes from high-elevation forests.

Our forest lands also enhance the drought resilience of irrigated agriculture and water-related outdoor recreation. They help sustain river base flows in the summer when crops, boaters, and fish need water. Well-managed forests and their supporting natural water infrastructure provide numerous additional public benefits, including preventing soil erosion, improving water quality, lowering water treatment costs, capturing carbon, and benefiting wildlife habitat and fisheries.

The economic impact of the clean, reliable water sources which depend on healthy forests cannot be overstated. According to a study in 2020, Upper Basin of the Colorado River in the southwestern United States supports municipal, industrial, agricultural, and recreational activities worth an estimated \$300 billion per year within the state of Colorado alone².

¹ Liu, N., et al (2021). Forested lands dominate drinking water supply in the conterminous United States. *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/ac09b0>

² Hadjimichael, A., et al (2020). Defining Robustness, Vulnerabilities, and Consequential Scenarios for Diverse Stakeholder Interests in Institutionally Complex River Basins. *Earth's Future*. <https://doi.org/10.1029/2020EF001503>

Wildfire Impacts on Watersheds

Since 2000, the headwaters communities of the Colorado River have experienced back-to-back-to-back years of hot, windy springs and early summer heat, which have caused our snowpack to sublimate – or turn snow directly from its solid state to a gas – leading it to disappear into the atmosphere instead of melting and flowing into our rivers.

The multidecadal drought in the Upper Colorado River Basin has also brought on a historic soil moisture deficit that severely impacts runoff from snowmelt. Year after year, unusually dry soils from warmer than normal temperatures and a lack of moisture are absorbing more of the water that melts from our snowpack in the Rocky Mountains. As temperatures rise, moisture evaporates from our plants and soils, creating a massive water debt which comes due when snows melt, consuming water before it reaches the rivers and streams creating both quality and quantity problems for many municipalities who rely on high mountain streams for their water³.

Higher temperatures and dryer conditions in recent years have also led to catastrophic wildfires that have laid bare large swaths of our forested lands in the heart of our most important watersheds. Take 2020 for example, when Colorado experienced the three largest wildfires in the state's recorded history – all in the same season. Recent studies project a 50 to 200 percent increase in annual area burned in Colorado by approximately 2050, compared to conditions of the late 20th Century, based on projected warming of 2.5 to 5 degrees F⁴.

Certain severe fires can create water repellent or “hydrophobic” soils. After these fires, rain events can flush ash, sediment, and nutrients into waterways and impact essential water infrastructure and water quality. Without that natural filtration of a healthy forest, sediment flushes directly into the river, requiring expensive infrastructure upgrades to drinking water sources. Chemicals and nutrients which would otherwise not have made it into the water also build up, leading to algae outbreaks and unhealthy water quality.

Watersheds and water infrastructure on both sides of the Continental Divide have been seriously impacted by wildfire, resulting in hundreds of millions of dollars in restoration and mitigation expenses in the Centennial State alone. Nationwide, the National Oceanic and Atmospheric Administration estimates that wildfires cost \$16.5 billion in 2020 and \$67.3 billion between 2016 and 2020.

Suffice to say, negative impacts on both water quality and quantity are widespread in the aftermath of mega-fires in the headwaters and downstream users, in this case, the 40 million who live in the Colorado River Basin, ultimately pay the price.

Funding Forest Management

Current efforts to manage Colorado's forests are not keeping pace with the realities of a changing climate and hydrology. In 2019, federal agencies (primarily the Forest Service and BLM) reported

³ Dale et al., 2001; Westerling et al., 2006; Millar and Stephenson, 2015; Abatzoglou and Williams, 2016; Westerling, 2016).

⁴Spracklen et al., 2009; Yue et al., 2013; Olivia L. Miller; et al, Journal of Hydrology, vol. 11, May, 2021

over 100 million acres of federal land at high risk of wildfire⁵. The Colorado Forest Action Plan recently identified 2.4 million acres of forested land in our state in urgent need of treatment to reduce wildfire risk and protect watersheds at an estimated cost of \$4.2 billion⁶.

In Colorado, just over 65% of all forest land is federally owned⁷. In our district alone, 67% of the lands are owned by the federal government, making organizations such as the United States Forest Service (USFS) and the Bureau of Land Management (BLM) critical players in the long-term health of our forests and the water resources that originate within them.

Intentional, well-funded forest management strategies based in science are one of the most critical tools to protect Colorado's headwaters landscapes. We applaud the large-scale investments dedicated to forest health in the Bipartisan Infrastructure Law and the Inflation Reduction Act. However, these investments are largely prioritizing forested lands within the wildland-urban interface. For example, although the USFS' 10-year strategy to address the wildfire crisis contains selection criteria such as critical watersheds, sources of drinking water, and habitats for native fish and wildlife, USFS priority landscapes in Colorado almost exclusively focus on forests located near Colorado's Front Range and urban core⁸. Because the dollar value of man-made infrastructure is weighted so heavily in these decisions, the important head waters of the Colorado River, natural infrastructure and high-elevation forests are not receiving adequate funds to address the compounding threats they face.

While we appreciate the Forest Service's efforts to scale forest health treatments strategically, we also believe there is a moral and economic responsibility to take seriously the stewardship of our headwaters landscapes. Preliminary conversations have begun to allocate more funding with this in mind, but we cannot underscore the urgency of fully supporting these efforts expeditiously. Knowing what we do about predicted forest conditions over the next few decades, it is important to recognize that the immediate cost to man-made infrastructure may not be the greatest one. Timely intervention and accessible funding will be the difference between effective mitigation of health and economic impacts, versus a spiraling crisis which will threaten our nation's water and food security.

Finally, we encourage our federal partners to engage with local stakeholders and allies to spend the initial investments provided through the BIL and IRA strategically and wisely, and to support consistent, large-scale investments in our nation's forests. In March, The Nature Conservancy, American Forests, and NWF proposed increasing funding by at least \$1 billion annually for

⁵ (2019). WILDLAND FIRE Federal Agencies' Efforts to Reduce Wildland Fuels and Lower Risk to Communities and Ecosystems. <https://doi.org/GAO-20-52>

⁶ Colorado State Forest Service, (2020). Colorado Forest Action Plan. <https://doi.org/https://csfs.colostate.edu/wp-content/uploads/2020/10/2020-ForestActionPlan.pdf>

⁷ DiMaria, J., et al (2017). Forest Management to Protect Colorado's Water Resources. https://doi.org/https://www.fs.usda.gov/rm/pubs_journals/2017/rmrs_2017_venable_n001.pdf

⁸ (2023). Confronting the Wildfire Crisis: Expanding Efforts to Deliver on the Wildfire Crisis Strategy. https://doi.org/https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/WCS-Second-Landscapes.pdf

proactive, climate-informed forest restoration and management⁹. The investment required to be able to adapt to our hotter, drier reality is considerable, but if we do not start soon, the cost will be that much greater.

II. Small-Bucket Storage as an Effective Drought-Mitigation Tool

High-elevation Storage and Coordinated Releases

Western Slope water managers, including local, state, and federal stakeholders, are currently working with existing tools to mitigate the impacts of increased uncertainty in water supply and quality. No singular entity can make a measurable impact on a problem of this scale, however. Through strategic, cooperative efforts, stakeholders across the West Slope have been able to implement small-scale, effective measures to mitigate some of the immediate impacts of hotter summers and lower river levels.

By applying best practices developed over decades and informed by science, we can utilize these small buckets – ranging from 10 thousand acre-feet to 100 thousand acre-feet in strategic high mountain locations – to time the releases of water to address a wide array of consumptive and non-consumptive needs along the river. For example, anytime we have reservoirs which are reasonably full or projected to fill, we coordinate storage releases into the Colorado River to create a peak in the hydrograph to benefit river health, endangered species, and downstream agricultural users. This practice allows for greater flexibility for management of limited water resources even in dry years. Two examples of reservoirs which the Colorado River District has utilized to achieve these benefits are included below:

Elkhead Reservoir

The Yampa River starts in the mountains above Steamboat Springs and runs through the northwest corner of Colorado to its confluence with the Green River in Dinosaur National Monument. Elkhead Reservoir is a small, 25,500-acre-foot capacity reservoir located on a tributary to the Yampa and partially owned and operated by the Colorado River District.

In the summer of 2021, low snowpack and an early, hot and dry summer reduced the flow of the Yampa River to historic low levels, and, for only the second time in history, a “call” was put on the river. In this case, a call meant that the Division Engineer, or local water administrator for the State of Colorado, cut off the access to water for many junior local agricultural producers just at the time these same families’ cattle herds were being forced off of federal high country grazing allotments due lack of feed.

In order to take the call off and protect our farmers and ranchers, the Colorado River District coordinated a release of 677 acre-feet of water from Elkhead Reservoir. The

⁹ T. N. C. (2020). Revitalizing America’s National Forests Policy Recommendations for Restoring Forests to Deliver Natural Climate Solutions and Ecological Benefits. <https://doi.org/https://forestclimateworkinggroup.org/wp-content/uploads/2020/11/Revitalizing-Americas-National-Forests.Sep-2020.pdf>

releases were timed not only to allow irrigators to have access to the water during the hottest months of the year, but also to alleviate the impacts of high water temperatures on local fish populations.

Ruedi Reservoir

Ruedi Reservoir is a federally owned reservoir built on the Fryingpan River, a tributary of the Roaring Fork River, and when full, it holds approximately 102,000 acre-feet of water. Ruedi is another example of small-bucket reservoirs providing outsized benefits to sections of the Colorado River in support of productive agriculture and endangered fish habitats.

In 2018, an exceptionally dry, hot summer led to low streamflow in the Roaring Fork River, a river with an exceptional trout fishery that provides millions in economic inputs for local communities. The resulting rise in water temperature threatened native trout species and caused concern for irrigators downstream.

In response to this extremely difficult season, the Colorado River District and Ute Water Conservancy District contributed a combined total of 8,000 acre-feet of water from late July into September. Those contributions were used to substitute water that would have typically come from Green Mountain Reservoir's "Historic Users Pool" to satisfy the Cameo Call. Five municipalities from Aspen to Palisade also agreed to contribute more than 1,500 acre-feet of unscheduled "contract water" held in Ruedi for agricultural and environmental needs along the lower Roaring Fork River and farther downstream on the Colorado River.

ExxonMobil followed suit in September by contributing 5,000 acre-feet of Ruedi releases to provide water for endangered fish species in what is known as the 15-Mile Reach between Palisade and the Colorado River's confluence with the Gunnison River.

These carefully timed releases, the product of local, federal, and private entities' commitment to watershed health, were able to provide flows that also supported local ranchers and farmers for 110 miles of the river. By protecting the endangered fish critical habitat flows of the 15-Mile Reach, the releases also protected those same producers by maintaining long-term compliance with the Endangered Species Act, allowing them to continue irrigation operations without interruption.

Funding and Permitting Small-Bucket Storage

On the Western Slope of the Rockies, we do not live below major reservoirs like Lakes Mead and Powell, which provide multi-year carry over storage for the Lower Basin states. As mentioned, the snowpack of high-elevation forests is our largest reservoir, providing only a single year or partial year supply; once the snow has melted or sublimated, our largest storage bucket is gone. Manmade storage is a foundational piece of the management strategies on which Western Slope water managers have relied on and benefits productive agriculture, municipal water systems, recreation, and programs like the Upper Colorado River Endangered Fish Recovery Program. Many of our

major streams do not even have small capacity reservoirs to assist with mitigating the impacts of hotter, drier years, and many of the small existing reservoirs were built over 100 years ago and need enlargement or significant rehabilitation.

We encourage directing additional federal resources to bolster new and existing storage opportunities that collaboratively address multiple needs and are strategically positioned to minimize evaporative loss, while capturing critical runoff patterns. In addition to funding, regulatory approvals must be streamlined, and our federal programs need to work efficiently and effectively. For example, the Colorado River District views the Watershed Protection and Flood Protection Act (PL-566 Program) as an important and impactful funding source to advance strategic storage opportunities and irrigation modernization projects across the West. However, current approval authorities largely rest within the national headquarters of the NRCS, far from local staff. The Colorado River District supports delegated authority to State Conservationists to streamline approval processes, while avoiding non-linear, duplicative processes that result in long-term delays.