

Water Quantity

Common Issues

Water quantity (streamflow) can be extremely low, particularly in the summer and fall, impacting irrigation, instream flow needs for aquatic organisms, and recreation. As discussed in the Fisheries and Irrigation Infrastructure sections, having a minimum instream flow is important for aquatic wildlife and riparian forest health. Furthermore, the amount of snowpack and timing of snowmelt has changed in the last few decades. As climate change advances, it is especially important to work cooperatively among neighbors to find collaborative solutions. Under warmer, drier conditions, the timeframes that the basin's rivers and streams are "on-call" will increase, meaning not all water rights holders will receive their decreed amount of water. Although Yampa Basin landowners cannot change the amount of snow that falls in the mountains, or the timing of snowmelt, there are opportunities to implement innovative and cooperative solutions to meet the realities of a changing world.

Questions to Consider

- What is the residence time of rain or snowmelt on the property? Are there opportunities to increase the amount of time the water is retained on the property, rather than sending it downstream too quickly?
- Are upstream neighbors employing effective practices to slow and detain water, such as flood irrigation, beaver coexistence, or beaver mimicry?
- Are upstream neighbors supporting riparian forests and wetlands to slow and retain water?
- Are upstream neighbors diverting water, causing flows to decrease or causing dry-up points?
- Are there instream flows in the reach? If so, are these instream flows consistently being met?

Principles of River Health

Residence Time

When a drop of water enters the upstream end of a property, it will be on the property for a certain amount of time before it flows off the downstream end. If the river is straight and fast, it may only take a few minutes for that drop to be gone. If, however, the river bends in many meanders, and then a logjam pushes the water out of the main channel into a wetland area, the water could stay much longer. It could stay in the willows and cattails of the wetland, and then seep down into an aquifer before returning to the river channel. In total, the residence time of that drop could be weeks or months. If every landowner increases the complexity of water's path across their property, the overall residence time of water in the Yampa Basin, could be increased significantly.

Nature's Reservoirs

In a lush, healthy riparian corridor, everything holds water. Wetlands, pools, and ponds along the river corridor fill with water in the spring and hold water for many months. The soil itself holds a significant amount of moisture. Water that pools on the floodplain enters the groundwater and underground aquifers, which can be expansive and slow moving. If the riparian corridor has healthy vegetation, the duration of water retention can be extended further. A dense forest of willows, cottonwoods, and alders is a powerful tool to hold water.

Flood Irrigation Fills Aquifers

Flood irrigation can recharge groundwater and retune flows, delaying them until later in the season when they flow back into the river as return flows. Flood irrigation may not change the amount of water in the system overall, but it does change the timing of flows down the river. This delay in river flow may help increase the amount of water in the river in the summer and fall when flows are at their lowest.

Existing Reservoirs and Natural Dams Provide Late-Season Flow Support

Upstream reservoirs are important water storage assets. Private dams and stock ponds also store water. Beaver dams detain water and spread water into lateral channels across the floodplain. In some places where beaver coexistence is not possible, low-tech process-based restoration treatments like post-assisted log structures and beaver dam analogs (described in the section on Bank Erosion) can help to detain water and increase groundwater storage. A downed cottonwood tree in the river, even though it is not a dam, increases storage of water because it creates friction in the water column that pushes water sideways into the soil. Even small dams can have a big impact—in small ephemeral streams high in the watershed, small dams that are only one rock tall can noticeably increase soil saturation and help protect and build wet meadows.

The River Needs Water

Water quantity is important for our needs, but fish, plants, and animals in the river depend on water being in the stream for their very survival. “Dry-up points” are caused when an irrigation structure diverts all of the water from the river into a ditch. Taking all of the water is called “sweep,” and it can be catastrophic to the aquatic wildlife in the stream segment below the diversion. As water users seek ways to improve water quantity for beneficial uses, it is also important to maintain a minimum instream flow so that a source of cool, clean water is available for the plants and animals that need it. CPW or other organizations or experts can help to assess flow needs using models such as R2Cross, which is specifically developed for Colorado streams.

Recommended Practices or Actions

Landowners can employ several actions to help address water quantity concerns. As discussed below, these actions include reconnecting the river to its floodplain to enhance natural storage; slowing the movement of water using natural and low-tech structures; allowing water to remain in the river during low-water periods; developing instream flow protections; and temporarily leasing water rights to support river health while maintaining water rights security.

Allow Water onto the Floodplain

The floodplain serves as a natural reservoir. Wherever possible, allow the river to access its natural historic floodplain. Do not armor banks or build berms and where they already exist, consider their removal. A historic oxbow, secondary channel, or floodplain swale could be managed as a bog, marsh, or wetland: filling with water during spring floods and slowly releasing water through the aquifer back to the river. Collectively, a watershed-wide effort to increase floodplain wetlands could increase late summer water for all users. Restoring wetlands could qualify for NRCS cost sharing through practice 643: Restoring Rare or Declining Community, or through Conservation Reserve Program land rental rates. Wetlands can be incredibly valuable habitat for diverse plants and wildlife species, even if they are only inundated during part of the year.

Slow the Water



A post-assisted log structure detains water in the channel | Photo by Eli Smith, National Forest Foundation

Historically, logjams and beaver dams filled most streams, creating a series of pools like beads on a string. These pools detain water and extend flows into the late summer. Beaver complexes can even turn some ephemeral streams into perennial streams. To help maintain water quantity, support and increase natural or natural-like structures in the river, such as trees, boulders, large wood, logjams, and beaver dams. Build low-tech process-based structures to jump start natural processes. Water will pool above and below these structures, slowing its flow downstream.

Allow Water to Flow Past the Headgate in Times of Low Water

“Use it or lose it” is a phrase heard often in Western water law. However, a landowner choosing not to divert their full water right does not necessarily put that water right at risk of loss. In fact, having records that show use of the water right once every 10 years can be sufficient to maintain the right. This means that water rights do not need to be used in full every year. During a low-water year, voluntarily reducing water diversions to keep water in the river is a valuable tool to protect river health. This ethic has been traditionally understood in the Yampa Valley, as neighbors let water flow past their headgates to help downstream neighbors and to protect the health of the river. Keeping that tradition alive is a key tool to maintain flows in the river.

Develop Instream Flow Rights

Over the decades, state lawmakers have officially recognized new “beneficial uses,” including in-channel water for recreation and instream flows for the environment. Only the CWCB can hold rights for instream flows, and only government entities can hold recreational in-channel diversion rights. These flows can be evaluated using stream flow modeling to identify flow needs to support river health.

Lease Water Rights

Landowners may consider a temporary lease of some or all of their water right as a useful way to support river health. This can be a beneficial part of managing a water rights portfolio without the risk of abandoning the water right. A water rights lease is an option for absolute water rights only. Water can be leased in 5 out of 10 years to the CWCB with support from the Colorado Water Trust. This agreement protects against loss of the water right, keeps the water right tied to the land, and can be a source of income. A surface right water lease could be a good option in connection with upgrades to improved irrigation efficiency, irrigation structure upgrades, or rotational management of pastures. When changing irrigation management, it is important to monitor for and respond promptly to any landscape changes, such as the emergence of invasive plant species. Landowners can discuss their water rights portfolio with the Colorado Water Trust if they are seeking creative ways to keep water in the river when they do not need it for their operations.

Benefits of Implementing Recommended Practices

- Increased summer and late season water
- Increased wildlife habitat
- Improved instream habitat for fishing and recreation
- Source of income or support through surface water right lease

Reference and Resource Materials

Utah State University developed a [Design Manual for Low-Tech Process-Based Restoration of Riverscapes](#) that provides practical, low-tech tools and training to repair degraded riverscapes using natural processes.

The CWCB developed the [R2Cross Model](#) with technical contributions from CSU to support ecological assessment and streamflow modeling for river health.

NRCS Conservation Practice 643 is [Restoration of Rare or Declining Natural Communities \(Code 643\)](#), which can be used through EQIP. EQIP provides payments to restore and manage riparian corridor habitat.

The [Colorado Water Trust](#) is a statewide nonprofit organization whose mission is to restore water to Colorado's rivers and streams. They are an excellent resource to consult for creative ways to use market-based solutions within the confines of Colorado water law to secure water for environmental purposes.