

# Water Quality

## Common Issues

Water quality in the Yampa Basin is generally good, but several recurring issues threaten long-term health. Nutrient loading from fertilizers, livestock operations, and degraded septic systems can contribute to harmful algal blooms in reservoirs and slow-moving stream reaches. Elevated stream temperatures during late summer low flows place stress on fish and aquatic life, while sediment from eroding banks, road crossings, and upland runoff reduces clarity and habitat quality. In urbanized segments of the river, stormwater carries pollutants such as salts, oils, and pesticides directly to the river, and localized *E. coli* contamination may occur where livestock or failing septic systems are close to the channel.

## Questions to Consider

- Where does stormwater runoff from my property, road, or lot end up? Could it carry pollutants to the stream or river?
- Is there room within the property to add buffer zones or design stormwater runoff facilities?
- Is the septic system being inspected and pumped often enough to prevent leaks or failures?
- Could irrigation return flows from fields be carrying nutrients, sediment, salts, or warmer water to the stream or river?
- Are livestock or corrals located close enough to a stream or ditch that runoff could carry waste into the river?
- Has riparian vegetation been removed, causing the sun to shine directly on the river?

## Principles of River Health

### Too Much Aquatic Plant Growth Can Degrade River Health

Nutrients, particularly nitrogen and phosphorus, are important for plant growth. That is why they are often added to agricultural fields as fertilizers. However, when excess nutrients run off into the river, they can cause an increase in the growth of aquatic plants and algae. The problem can be especially serious in reservoirs, where nutrients build up, fuel the excess growth of plants and algae, and can lead to serious environmental and human health problems.

### Rivers are Sources and Sinks of Nutrients

Any section of river can be a source of pollution. If excess water is flowing off a pasture, it could be a source of nutrients in the river, because manure or fertilizer could be carried into the river. If excess erosion is occurring, it can be a source of phosphorus to the river, because phosphorus naturally binds to soil particles.

Alternatively, any section of river can act as a sink, capturing and absorbing nutrients and helping to solve the problem. Dense riparian vegetation can catch the excess fertilizer flowing off a pasture, and riparian plants can convert those pollutants to healthier forms. Beaver complexes capture sediment, acting as a sink and protecting downstream water quality. These examples show that a wide range of land use and river management decisions on any section of river can make a big difference regarding water quality in the river and in downstream reservoirs.

### A Healthy River Has Built-in Filters



*Riparian vegetation filters water during spring floods, improving water quality | Photo by Kent Vertrees, Friends of the Yampa*

Riparian wetlands are considered the “kidneys” of the river because they filter out sediment, nutrients, and chemicals from the water. Wetlands might be found in a secondary channel that fills during spring flood, in an off-channel swale that fills from groundwater, or in an area that is watered by irrigation return flows. Either way, an area with saturated soils will grow specialized wetland plants that are excellent filters. It is important to help the river water flow into these wetland areas so that the water can be filtered.

## River Temperatures are Influenced by Shading and Flow

The State of Colorado monitors temperature thresholds for stream segments based on the uses of the waterbody. In the case of the Yampa River, the segment from the confluence with Oak Creek to the confluence with Elkhead Creek is frequently hotter than the temperature standard, especially during times of low flow in the river (mid- to late summer). This condition leads to stress for fish and other aquatic species within this segment. Elevated temperatures are a result of many factors, including riparian vegetation which mitigates solar exposure on the river, its tributaries, and the reservoirs along its reach.

## Recommended Practices or Actions

Landowners can employ several actions to improve water quality through land management practices. As discussed below, these actions include restoring and maintaining riparian vegetation; managing livestock use in streamside areas; capturing and infiltrating stormwater runoff before it enters waterways; properly inspecting and maintaining septic systems; increasing connections between streams, floodplains, and wetlands; and encouraging or allowing beaver activity where appropriate to enhance natural filtration and nutrient processing.

### Restore Riparian Vegetation

Establish or expand vegetated buffers to shade rivers, reduce sediment, and filter runoff. Trees and shrubs create shade, which cools the water and soil. A complex riparian forest that has dense, healthy vegetation of many different species will provide the greatest water quality benefit. See the Riparian Forest & Buffer section for more discussion.



*A degraded segment (left) lacks vegetation. An intact riparian buffer (right) provides shading and water filtration  
Photos by Roddy Beall, Zenobia Consultants*

## Manage Livestock

Grazing management in riparian areas is critical to maintain soil health, productivity of grass, and the health of the riparian forest buffer. Strategic fencing and rotational grazing plans are effective at reducing direct impacts, and the installation of off-channel watering systems and other property enhancements will promote long term balance between the uplands and the riparian. For more discussion of this topic, refer to the Streamside Livestock Grazing section.

## Capture Stormwater Runoff Through Infiltration and Natural Buffering Prior to Entering Waterbody



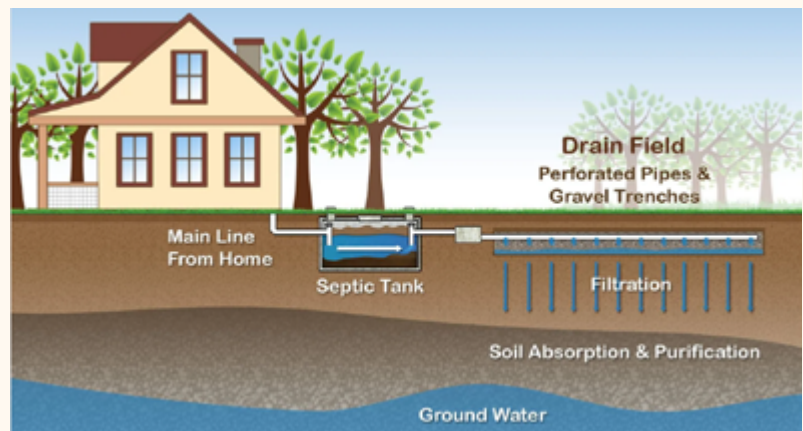
For urban runoff or irrigation return flows, an infiltration pond filters water through sedimentation and wetland plants | Photo courtesy of Bryan Malloch

Runoff from an urban landscape or a livestock pasture may carry excess nutrients, sediment, fertilizer, or pollutants. Wherever possible, direct water into a vegetated area like a filter strip, riparian buffer, natural wetland, or engineered infiltration pond instead of emission directly into waterways, ditches, or stormwater piping systems.

The plants in these buffer zones can help capture excess fertilizer, pollutants, and sediment. Infiltration ponds are shallow, engineered basins designed to temporarily store stormwater runoff and allow it to soak into the ground, improving water quality and recharging groundwater. In urbanized areas, infiltration ponds, filter strips, and permeable paving can be used together.

## Properly Inspect and Manage Septic Systems

Perform regular inspections and maintenance of septic systems. Consider replacement of outdated systems or those identified as performing poorly. As seen in the diagram below, septic tanks and leach fields are often near the water table and can introduce pollutants. Consider moving septic leach fields further from the stream corridor or replacing septic tanks with connections to municipal sewage treatment where available.



A septic tank and leach field are designed to treat household wastewater, but they may pollute nearby groundwater or waterbodies | Diagram by Clean Earth Septic

## Increase Floodplain and Wetland Connection

Look for opportunities to increase the river's ability to access secondary channels, streamside wetlands, and the floodplain. As water moves into these areas, it can be filtered by plants, and nutrient-rich sediment can be deposited. This may involve the installation of large wood to encourage water to flow into these wetlands, or the removal of streambank riprap or berms. In some cases, it could involve regrading streambanks to create floodplain benches or to create connection pathways to historic oxbows or side channels.

## Encourage or Allow Beaver on the Property

Beavers create floodplain wetland complexes that filter nutrients through a combination of physical, chemical, and biological processes. Beaver dams slow and spread water, allowing for suspended sediments and particulate-bound nutrients to settle instead of moving downstream. In addition, the low-oxygen conditions created in beaver ponds are ideal for denitrification, a microbial process that converts nitrate into nitrogen gas, facilitating removal of nitrogen from the aquatic system.

## Benefits of Implementing Recommended Practices

- Improved water quality will enhance habitat for aquatic and terrestrial wildlife
- Water quality improvements will help limit or prevent recreational closures at downstream reservoirs and river segments
- Human health benefits
- Preventing nutrient and soil runoff saves money and improves soil

## Reference and Resource Materials

For a USDA Guide on Conservation Buffers, visit [Conservation Buffers: Design Guidelines](#) or [download the PDF here](#).

The Mile High Flood District provides [details and design criteria](#) for the installation of stormwater treatment best management practices.

Water Education Colorado created a [Citizen's Guide to Colorado Water Quality Protection](#), which provides an overview of water quality issues important to Colorado. It also tackles the complex water quality protection framework, including laws and regulations, on a national, state, and local level.