

Flooding & Floodplains

Common Issues

High spring flows are an important natural process, and something that sets the Yampa apart from other large western rivers. However, they can be challenging for landowners and land managers. When snow melts, spring floods inundate the floodplain, creating conditions for a fertile river corridor and the renewal of riparian forests and wildlife habitat. This flooding, however, can be unpredictable, endangering infrastructure and livestock, and creating unwanted wet areas. Historically, landowners have used berms, rocks, concrete, and even car bodies to keep water in the channel and off the floodplain. As time goes on, bank stabilization and channelizing the river causes problems such as increased erosion, unhealthy riparian forests, degraded water quality, and a lowered water table.

Questions to Consider

- Is seasonal flooding currently a problem for the operation, or can seasonal flooding be supported and increased to benefit the riverscape?
- What areas of the property can safely handle flooding?
- Which structures or infrastructure (roads, irrigation ditches, buildings, trails etc.) are vulnerable to high seasonal flows? Is it possible to relocate those structures or infrastructure outside of the area of concern?
- Are there historic side channels that flood waters could be directed into?
- Are there armoring and channelization structures that might be increasing flood power and causing bank erosion and channel incision?

Principles of River Health

Flooding is the Primary Driver of Riparian Health

High flows deliver fine sediment and nutrients to the floodplain, building the soil that agricultural producers depend on. Floodwaters also carry native plant seeds to the floodplain, encouraging germination and establishment of trees, shrubs, flowers, and grasses. This seasonal pulse of water recharges wetlands and groundwater tables, which supports wetland plants and animals, and holds water in the soil into the late summer and fall. In addition, fish use the side channels and backwaters filled by these floodwaters for refuge and spawning.

Flooding Protects Downstream Properties

When floodwaters spill out of the river channel and onto the floodplain, stream energy is dissipated. As the energy of water is reduced, its ability to erode and carry sediment decreases. The floodplain acts as a giant sponge, storing water, sediment, and nutrients while reducing the volume of water carried by the channel during spring runoff. Therefore, allowing or encouraging flooding in places where it is safe reduces the potential for dangerous flooding downstream.

The Riverscape Includes the Channels and the Floodplains

The location of a river channel is only one part of a bigger picture. The entire floodplain is part of the riverscape, and the sediments should move as the stream moves dynamically across the valley bottom. Peak flows from spring snowmelt are a key driver of this process, which mobilizes sediments and creates new habitat areas like side channels, gravel bars, islands, and backwaters. Currents separate fine sediment, sand, and cobble into distinct bars, which maintains a diverse landscape that supports diverse plants and wildlife. The annual pulse of water into the valley bottom is critical for many river processes.

Recommended Practices or Actions

Landowners can undertake a variety of actions to improve the natural cycle of flooding on their property while protecting their infrastructure and livestock. Several recommendations are discussed below, including restoring side channels, removing berms, creating room for the river with floodplain terraces, protecting critical infrastructure with off-channel berms or riprap installed at a distance from the bank, relocating infrastructure, adding floodplain roughness, and restoring gravel pits.

Restore Side Channels

If historical side channels no longer receive seasonal flows due to blocking or intentional berm placement, restoring the connection should be a priority. Excavation can reconnect the side channel to the main channel, or large wood jams can be installed to direct flow into the side channel or encourage bank movement to occur. This allows high flows to spread out and reoccupy natural pathways that have been cut off by past land use. These channels act as safety valves, carrying excess water during floods, reducing pressure on the main river channel, and creating valuable habitat for fish and wildlife. Reconnecting these pathways can also recharge groundwater and improve soil health on adjacent lands.



*Side channels can be reconnected to reduce flood power and improve floodplain connection
Drawings by Lauren Brown, LVBrown Studio*

Remove Berms



*Seek opportunities to expand the floodplain | Image by
Gregory Leichty, Michael Van Valkenburgh Associates Inc.*

Berms or levees built along riverbanks often confine water to the main channel, increasing flood velocity and downstream damage. Removing, ricking, breaching, or lowering unnecessary berms gives the river room to spread out into its natural floodplain. This slows water down, reduces erosion, and allows sediment and nutrients to be deposited across the valley floor, benefiting pastures and riparian vegetation.



*The downstream end of Bear River Park lacks a streamside levee, allowing for healthy seasonal inundation of the riparian wetland as indicated by the arrows
Photo by Roddy Beall, Zenobia Consultants*

Create Room for the River with Floodplain Benching

Floodplain benching involves cutting terraces or “benches” into the riverbank to create an “inset floodplain,” or a set of gradual steps that reconnect the river to its floodplain. These benches provide areas where water can spread during peak runoff, dissipating energy, recharging groundwater, and lowering flood risk. They also create space for riparian vegetation to establish, which further stabilizes banks and improves habitat.

Relocate Infrastructure and Buildings

Where possible, moving access roads, trails, diversion, headgate structures, or even buildings to areas less susceptible to flooding can reduce risk to infrastructure, lower long-term maintenance costs, and lead to improved river health. These actions also reduce the risk of loss of these structures during snowmelt runoff and other high-water events.

Protect Infrastructure with Off-Channel Berms

Avoid the installation of berms right at the channel edge, which disconnects the channel from its floodplain and interrupts important river processes. Instead, consider off-channel berms that are strategically placed alongside or around vulnerable structures such as barns, homes, or roads. These off-channel berms protect specific assets while leaving the river corridor itself more open and functional. The area between the river and the berm can create forest and swale that supports habitat, mitigates flooding, and improves visual appeal. This approach protects infrastructure and also helps to alleviate flood risk to downstream properties by giving the river room to dissipate power.



Setback levees (blue) allow room for a natural river corridor and an active floodplain | Illustration courtesy of Tony Melone



A setback berm in Washington replaces an old levee located close to the river | Photo by Tiffany Royal, Jamestown S'Klallam Tribe

Add Floodplain Roughness



Brush trenches installed on a hydrologically connected floodplain
Photo from the Colorado Stream Corridor Construction Manual

On some properties, the land has been leveled and cleared of vegetation and downed trees. When these elements are lacking, floodwaters can gain momentum in unwanted ways. Adding floodplain roughness elements like riparian forest improvements, large wood on the landscape, brush trenches (installation of live dormant willow or cottonwood cuttings buried in a trench on the floodplain or an eroding streambank), and contouring can help dissipate energy and mitigate flooding effects. Landowners can place wood, allow fallen trees to remain, and engage in riparian forest planting to develop natural roughness elements.

Restore Gravel Pits

Abandoned gravel pits traditionally leave deep, featureless ponds that are disconnected from the river by levees. These disconnected ponds do not provide good wetland or fisheries habitat nor space to accept high spring flows. If the river accesses the gravel pit through channel migration or breaching of levees, these ponds can introduce invasive fish or aquatic species into the river system. Restoration of gravel pits can rehabilitate the floodplain to improve river health. Generally, this involves placing fill into the gravel pit to create shallow banks and benches with undulating bottoms. These projects can be costly and difficult, but the restored wetland can become valuable habitat and floodplain.



Gravel pits like these degrade river health because they are surrounded by artificial levees that prevent the river from accessing its floodplain. They can also be a source of invasive fish and warm, polluted water. | Photo by Roddy Beall, Zenobia Consultants

Benefits of Implementing Recommended Practices

- Reduced impacts on infrastructure
- Increased groundwater storage and raising of water table
- Support of riparian vegetation
- Increased nutrients deposited onto pastures
- Deposition of new topsoil
- Off-channel habitat for young fish during spring runoff
- Reduced erosion during peak runoff

Reference and Resource Materials

American Rivers authored an informative paper called [Reconnecting Rivers to Floodplains](#), which explores the hydrologic and ecological functions that floodplains provide.

The US Army Corps of Engineers developed a [Floodplain Reconnection Guide](#) that includes examples and construction diagrams of floodplain restoration projects.

The Colorado Water Conservation Board's (CWCB's) [Floodplain Stormwater and Criteria Manual](#) is a resource for contractors and practitioners who were designing and implementing projects in the floodplain.

A guide to the [Best Practices for Ecological Reclamation of Gravel Mines](#) was created by the Middle Colorado Watershed Council. It can guide practice and policy. Note that this document must be requested at the link, and will be emailed or mailed to you.