Teaching While Doing

Low-Tech Process-Based Restoration of Riverscapes Workshop: Building Partnerships and Technical Capacity to Improve Riverscape Health

Bureau of Land Management | *Montana/Dakotas* | *October 27, 2022*

Story by Alden Shallcross, State Lead - Montana/Dakotas Aquatic Habitat Management Program;
Christina Stuart, Fish Biologist – Miles City Field Office;
Christopher Morris, Hydrologist – Miles City Field Office; and
Dan Fox, Assistant Field Manager (Resources) – Miles City Field Office.

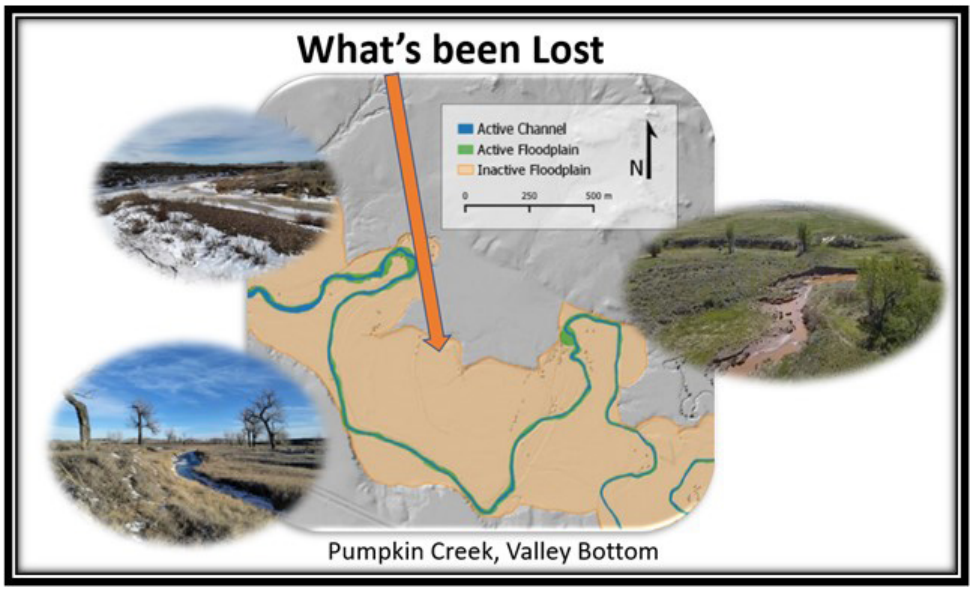
BLM photos

Riverscapes—the connected floodplain and channel habitats that together make up valley bottoms—are disproportionately important parts of the landscape that are increasingly prioritized for restoration. When healthy, the associated riparian-wetland and aquatic areas provide a wide array of ecosystem services that support our multiple use management objectives. For example, they sustain up to 80% of the region's biodiversity, improve water quality and its distribution across the landscape, attenuate floods, buffer the effects of drought, provide refugia for fish and wildlife, modulate stream temperatures, and act as fire breaks.

However, where they have been impaired by historic management practices (e.g., by the removal of wood, beaver, and riparian vegetation), ecological processes that historically maintained site attributes have correspondingly broken down. The resulting changes have been so severe in many areas that the systems no longer look or function like they did historically, even where management has improved.

Many of these impacts pre-date the BLM. Starting in the late 1700s and early 1800s, there was a rapid expansion of activities that caused a reduction in wood accumulations, riparian vegetation (especially woody plants), and beaver. These include beaver trapping to supply the fur trade, mining, railroad construction, agricultural development (crop, pasture, and rangelands), logging, channel modification, roads, invasive species, and livestock grazing. This led to an unprecedented scope, scale, and rate of structural starvation (loss or decline of biophysical functions and corresponding at-

Healthy Riverscape: *Extensive beaver dams and woody riparian vegetation retain water and sediment, which creates and maintains riparian-wetland and aquatic habitat throughout the entire valley bottom. Riverscapes in this condition act like a natural sponge, soaking up water to dampen floods, where it can later be released downstream. Such a system exhibits frequent and extensive surface water inundation throughout most/all the year, including during periods of low flow or even drought.*



Impaired Riverscape: *Without structural elements to capture, spread, and store water/sediment across the valley bottom, this incised channel functions like a ditch. Nearly all water and sediment inputs are rapidly transported out of the system, rather than distributed laterally across the valley bottom, where it historically helped sustain high water tables, saturated soils, and extensive riparian-wetland areas. As a result, the natural "sponge" has dried and most of the riparian-wetland habitat has converted to upland plant communities.*

tributes), which continues to affect the health and productivity of riverscapes throughout the region.

As a result of these activities, streams have incised and converted to simpler, straighter, single-threaded channel configurations that inundate their floodplains less frequently; floodplain aquifers have drained; and large portions of the surrounding valley bottom have dried, causing riparian-wetland areas to contract and the duration of flow to decline.

In fact, like much of the western USA, only 11 percent of the BLM-administered valley bottom area in Montana/Dakotas currently supports riparian-wetland habitat. Historically, this would have been much greater (e.g., over 80 percent).

These changes have altered riverscapes in two distinct ways. First, the absence or decline of beaver dam building activity, wood accumulations, and riparian vegetation has impaired riverscape health.

Second, the absence or decline of structural elements has negatively impacted the streams' ability to heal themselves by impacting the processes that are required to create and maintain ecologically functional riverscapes. Although most will recover naturally in the absence of further anthropogenic disturbance via erosional and depositional processes associated with successive flow events, it may take decades to centuries (or longer) without restoration intervention. Meanwhile, the riverscapes' functions that support associated resource values will remain diminished or wholly unsupported.

Given the scope and scale of these issues, traditional restoration practices (e.g., use of earth moving equipment to re-design the stream & valley bottom) are too costly to be applied at an ecologically meaningful scale (among other issues).

Instead, practitioners across the West are increasingly utilizing "low-tech" methods to mimic, promote, and sustain the keystone processes (e.g., processes of beaver dam building activity, wood accumulations, and rhizomatous root mat production) which create and maintain healthier riverscapes, over time. This strategy is illustrated conceptually in the figure below for a stream that requires beaver dam building activity to function properly.

To facilitate broader use of these methods, the Montana/Dakotas State and Miles City Field Offices hosted a Low-Tech Process-Based Restoration (LTPBR) of Riverscapes Workshop August 9-11 at Pumpkin Creek (Figure 3) via a cooperative agreement with Utah State University's Restoration Consortium. Participants learned how to utilize 'low-tech' process-based approaches for restoring streams and their associated riparian areas (riverscapes) with simple, hand-built tools, including Beaver Dam Analogues (BDAs) and Post-Assisted Log Structures (PALS), intended to mimic and promote specific ecosystem processes that benefit fish, wildlife, working lands, and other resource values.

Pumpkin Creek, a tributary of the Tongue River located approximately 11 miles south of Miles City, Montana, was selected for the training. It is a perennial prairie stream, lo-

An example from Goldfarb (2018a) of achieving a self-sustaining condition where meals of beaver dam analogues (BDAs) mimic beaver dam activity, and then the maintenance and expansion of beaver dam activity is taken over by actual beaver, and then they maintain a complex system state.

Workshop flyer

cated entirely within the Northwestern Great Plains ecoregion (level 3 EPA Ecoregions). Like most valley bottoms in the region, the historic removal of beaver, livestock grazing, and subsequent channel incision have impaired the system's health. Despite years of improved grazing management, it remains in a degraded state and recovery is exceedingly slow.

The Miles City Field and Montana/Dakotas State Offices therefore coordinated with Utah State University and the Riverscapes Consortium to write a restoration planning and design report (right) which was used to guide related workshop efforts and discussions. Further, Miles City staff will use it to restore the rest of Pumpkin Creek (their first LTPBR project), and other BLM staff and partners can use it as a template to plan and design their own projects. This report, related permits, and other project information are available on the Pumpkin Creek Workshop & Project Webpage.

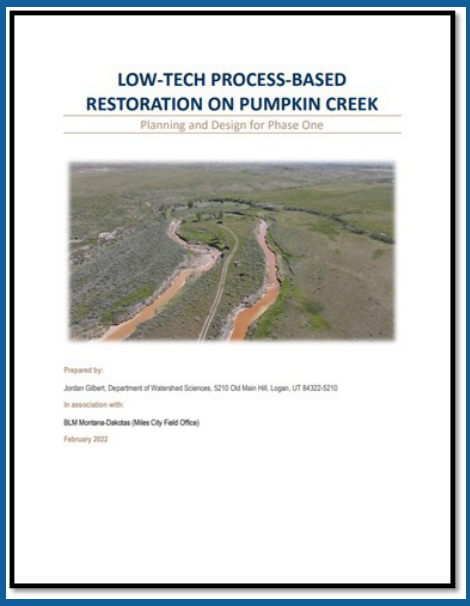
Despite challenges associated with the COVID-19 pandemic, more than 30 participants attended from across the region. This included staff from each Montana/Dakotas district (hydrologists, biologists, range cons, and soil scientists), as well as external partners from the Montana Department of Environmental Quality, Nature Conservancy; U.S. Forest Service; National & Montana Wildlife Federation Chapters; Montana Fish, Wildlife, and Parks; watershed groups, and researchers from the University of Wyoming who are assisting BLM with related studies.

This diversity was intentional, as streams span ownership boundaries and therefore, connect people and communities. Our capacity to restore them is largely dependent on our ability to coordinate around a shared vision and common methodology, then implement projects at an ecologically meaningful scale. By bringing partners together to "learn by doing," we build both technical skills and stronger working relationships.

Before the workshop, participants completed pre-recorded lessons on the underlying science; attended two days of classroom lecture with corresponding exercises; listened to rancher Jay Wilde explain his experience using these tools to restore perennial flow on his working land; and spent a day in the field constructing a variety of structures.

This workshop was a critical step towards creating the technical capacity and partnerships we need to increase the scope of restoration, so it better aligns with the scope of historic degradation. It culminated with a group review of the various structures that were installed during the field day, as well as an overview of project maintenance, the role of beaver, monitoring, and likely need for subsequent phases of treatment.

more....


LOW-TECH PROCESS-BASED RESTORATION ON PUMPKIN CREEK

Planning and Design for Phase One

Assessment, Plan, and Design Report for Phase 1 Restoration of Pumpkin Creek. This report was produced with assistance from Utah State University and the Riverscapes Consortium via a cooperative agreement with the Montana/Dakotas State Office. One aspect of the agreement is direct technical assistance to our field offices for their first low-tech riverscape restoration projects. This report, field evaluations, and the restoration workshop were a part of this technical assistance. The report, permit documents, and other resources are online, so our workshop participants can use them as templates for their own projects.

Close coordination between the BLM Miles City fire/fuels and resource programs was critical to the success of this effort. For example, the fuels program removed encroaching conifer from a nearby fuels treatment to minimize fire hazards. However, rather than burning the slash, they cut and piled it according to the guidance of BLM resources staff, who subsequently transported the woody material to Pumpkin Creek, where it was used to construct BDAs and PALS during the workshop and subsequent restoration efforts.

BLM fire and resources staff coordinated to provide woody material from a nearby fuel treatment for construction of the in-stream structures.

Teaching while doing. *BLM staff and their external partners learn to construct a beaver dam analog (top photo) and post assisted log structure (bottom photo) in Pumpkin Creek. These structures are installed in specific locations to promote transect-scale adjustments, but to work together as a complex (e.g., 20-50 structures) to achieve reach-scale objectives.*

The workshop started with lecture on the science and related restoration and planning strategies and included a "sidewalk" exercise in which participants learned the basic design considerations for an array of structures, including a post assisted beaver dam analog.

Participants evaluate the structures constructed by each of the sub-teams, in accordance with the Pumpkin Creek Plan and Design Report.

This workshop compliments two previous Montana/Dakotas trainings (Figures 5 & 6) on the tools and workflows that we co-produced with the Riverscapes Consortium to help staff plan, design, monitor, and adaptively manage riverscape restoration projects more efficiently and effectively.

Webinar *for use of the Beaver Restoration Assessment Tool (BRAT) for riverscape conservation and restoration planning.*

Webinar *on the use of an entire suite of Riverscape Consortium Tools developed via support of Montana/Dakotas BLM to help our staff and partners evaluate riverscape health, identify causal factors, and plan/design restoration projects.*