Bringing Back the Water

Case Study Series

Supported by LOR FOUNDATION

Water and Soil Solutions Using Sheep's Wool

Linda Poole with support from with The LOR Foundation

Snapshot:

Linda Poole manages a 320-acre property in South Phillips County, Montana, where she raises fine wool sheep. This part of Northern Montana receives an average of 11 inches of precipitation a year, however, increased climate variability has yielded lower precipitation

totals over the past few years. Linda's property includes a half-mile section of stream, which provides flood irrigation on her land.

In 2023 Linda received funding through the LOR Foundation's Field Work Initiative to support the installation of beaver dam analogs on her property using existing materials, to slow down and better utilize the water moving through her land. As part of this project Linda also created biologically rich compost from sheep's wool.

The challenge:

Linda raises fine wool sheep, not all of the wool the sheep produce meets quality standards for this market. However, this wool still has many potential uses including those explored in this project.

Climate change has caused increased variability of rainfall in this region. Linda's fields rely on flood irrigation to maintain the health of the soil and plant life. This project seeks to address the challenge of getting the greatest impact from the limited supply of water on the landscape.

When water comes into the stream it runs quickly over the dry soil of the stream bed. The dry soil limits water absorption into the soil and causes erosion such as headcuts, a hallmark of unstable drainage in intermittent streams. Biologically rich soils have greater water retention and absorption rates and also promote plant growth and carbon sequestration.

The project:

Inspiration

Linda was inspired to create beaver dam analogs by naturally occurring dams existing on her property where fallen trees or branches in the stream bed collected grasses, silt, and other detritus from the water flowing through them. Beaver dam analogs are man-made structures that mimic natural beaver dams. Beaver dams and other types of naturally occurring dams, like the ones already on Linda's property slow the flow of water through the streambed. This results in temporary pooling of water and helps direct the flow of water into a more narrow and winding stream. This has numerous benefits to the riparian ecosystem and allows more time for water to absorb into the soil and reduces erosion. This helps raise the water table, expands water storage laterally, and reduces water flow speed

across the landscape, which benefits the soil health, and promotes plant growth. Linda drew from the work of Bill Zeedyk, the author of "An Introduction to Induced Meandering" which is a technical guide to sustainable riparian restoration.

Linda also created a composting system utilizing wool which was inspired by the Johnson-Su bioreactor composting method. This method creates microorganism dense compost intended to improve carbon sequestration and improve the soil's ability to absorb water.

Design and Planning

Linda sought to use the resources already available on her property for her project, these materials included fallen cottonwood trees and wool from her sheep.

To create the beaver dam analogs trees would be dragged into the stream bed and wool would be used in place of grass and detritus to fill in the gaps between the branches. Linda planned to use both felted and loose wool for this purpose.

The stream and existing dam structures were carefully observed and Linda drew on her experience working with a US Forest Service team on watershed restoration. She selected the locations of her beaver dam analogs based on several key factors: where structures like this would occur naturally, where they would have the biggest benefit, where materials were accessible, and where structures were likely to stay in place based on stream morphology.

For this project 20 locations were selected for man-made beaver dam analogs. 10 naturally occurring dams were selected to enhance with additional materials as well as another 10 naturally occurring dams to observe as a control group.

Linda also researched the Johnson-Su bioreactor composting method. She planned to utilize some of the same materials available on the property by creating the base out of sticks rather than a pallet and using wool in place of landscaping fabric to wrap the bioreactor.

Execution

Different thicknesses and tightnesses of felt were created in addition to loose wool to fill in the gaps in the beaver dam analog structures. Felt was created using two methods. Inspired by traditional Mongolian felting techniques, wool was laid out on cotton tarps, beaten, wet, then rolled up and dragged behind a pickup truck. Loose wool was also laid out where Linda's sheep trampled it into felt.

LOR Foundation funding allowed for hired help in the form of neighbors with tractors and chainsaws to spend 5 days moving fallen trees into place in the selected locations. Material was then added to fill in the gaps between the branches. Loose wool was used in three locations, wool caged in chicken wire to control pests was used in six locations, felted wool was used in five locations, and six locations were left without any wool. Wool was also added to five of the ten naturally occurring dams selected to enhance with additional materials.

To create the composting bioreactors a base of sticks was created for aeration underneath a hog wire cage containing layers of wet barley straw, sheep corral cleanings, waste wool, chicken litter, and pine flakes in 6-8 inch layers. The cage was then wrapped in a layer of wool.

Support

Funding from the LOR Foundation's Field Work Initiative allowed Linda to take time to plan and execute this project and fund hired labor and equipment. This funding was critical in allowing the experimentation and research behind this project to move forward.

The results:

Evaluation

It will take years for the full impact of this project to be known. Since execution was completed there has been little water in the stream to determine the effectiveness of the

beaver dam analog structures. A precipitation event in February 2024 did yield some water flow, and observations during that time showed promising signs for the success of this project.

Wool has proved efficient at holding moisture and regulating temperatures in the composting bioreactors, however the use of the bioreactors did not yield improved bacterial to fungal ratios when compared to heaps of corral waste.

Reflections

The process of executing the beaver dam analogs showed that loose wool might be a favorable material to felt because it more closely mimics the debris that built up in the naturally occurring dams. It was also observed that felt and wool attracted pests such as mice which in turn attracted foxes that would tear out the material in an attempt to reach the mice. This challenge inspired the use of chicken wire to hold material in place in some structures, however as Linda expands upon this project in the future she would prefer to find a way of solving this problem using natural materials.

Support for the Bringing Back the Water case study series was provided by the LOR Foundation.
***About the LOR Foundation**: LOR works with rural communities in the Mountain West to enhance livability and prosperity while preserving the character that makes each community unique.*