

Lizard Creek Riparian Restoration Pilot Project



FWCP Area: Columbia Region

Project Reference Number F-15-26

Habitat Type: Terrestrial

Project Type: Habitat-Based Action: Ecosystem/Watershed Restoration/Enhancement

Project Name: Lizard Creek Riparian Restoration Pilot Project

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Executive Summary

In fall 2014, the Elk River Alliance completed a pilot riparian restoration project on Lizard Creek with the financial support of the Fish and Wildlife Compensation Program. The purpose of the project was to use bioengineering techniques to restore two sites along Lizard Creek within Mount Fernie Provincial Park. The streamside restoration used native plants in order to increase shade on the stream and reduce erosion, improving habitat for local Westslope Cutthroat Trout and Bull Trout.

The techniques used included enhancement of existing rip-rap with native plant seedlings and slope stabilization using live cuttings of willow, red-osier dogwood and cottonwood along with erosion cloth. Elk River Watershed Alliance volunteers and staff in coordination with Mount Fernie Provincial Park Staff successfully completed the project.

This pilot project will serve as a model for stream restoration and bank stabilization that positively influences aquatic ecosystems.

This project was prepared with financial support of the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, Fisheries and Oceans Canada, First Nations and the public.

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Introduction

The Elk River Watershed Alliance (doing business as Elk River Alliance ERA) is not-for-profit society based in Fernie, British Columbia. ERA is a community-based water group that aims to connect people to the Elk River ensuring it is drinkable, fishable and swimmable for future generations. Their vision for the Elk River is a watershed where human actions result in a healthy ecosystems and a robust economy. The goals of the Elk River Alliance are to use education to raise watershed literacy stimulating water stewardship, facilitate dialogue to inform sustainable water decision-making and monitor aquatic health to prioritize involvement in activities that enhance and restore aquatic ecosystems.

The impetus for *Lizard Creek Riparian Restoration Pilot Project* came from the results of ERA's community based water monitoring (CBWM) project. ERA's CBWN project began in 2011 and uses Sensitive Habitat Inventory Mapping (SHIM), Streamkeeper's and Canadian Aquatic Biomonitoring Network (CABIN) protocols to assess stream health and water quality on Lizard Creek and Alexander Creeks. There are four monitoring sites along each creek. There are two significant erosion sites near Site 3 on Lizard Creek: one upstream and one downstream. In spring of 2013, Mount Fernie Provincial Park re-routed the hiking trail that went alongside the stream bank due to the failure of the bank upstream of Site 3. There have been efforts by the Provincial Park to stabilize both of these sites using rip-rap and in-stream large woody debris (LWD). While this effort has been somewhat effective, there is continued erosion and un-vegetated slopes remain.

Lizard Creek Riparian Restoration Pilot Project seeks to stabilize the two identified erosion sites using innovative bioengineering techniques. Bioengineering is the process of increasing the strength and structure of a stream bank with mechanical and biological elements (Bentrop & Hoag, 1998). Municipal and regional leaders will be able to use these demonstration projects as an example of preventing flood damaging soil erosion while protecting aquatic ecosystems. The stabilization of two key sites along the creek that are within park boundaries will benefit threatened Westslope Cutthroat and Bull Trout spawning and rearing habitat. The two sites are showcased in the *Forest and Fish* interpretive trail installed by ERA in September 2014.

Goals and Objectives

The goals of this project are to reduce future erosion, decrease sedimentation, and increase in-stream shade and cover, while providing an example of innovative riparian restoration techniques. The benefits of the project are the provision of more stable banks, decreased sedimentation in the creek, in-stream shade for fish habitat and increased learning opportunities for visitors to Mount Fernie Provincial Park, as well as Municipal/Regional leaders and industries in the area.

Study Area

Figure 1 outlines the location of the two restoration sites relative to the ERA monitoring site on Lizard Creek adjacent to Mount Fernie Provincial Park Campground. Site 1 Rip Rap is adjacent to the trail and has been previously re-enforced with large rip-rap. Site 2 Slope Failure is a slide with bare soil exposed caused by two large trees falling into the creek. Both restoration sites are on the left bank or river left when facing downstream. ERA's water monitoring site is downstream of Site 2 and upstream of Site 1.



Figure 1 - Restoration site locations on Lizard Creek

Methods

Site 1 Rip Rap

Site 1 is a section of the bank that has been enforced with rip rap forming a steep and hard bank. A heavily used trail is directly adjacent to the rip rap slope. The rip rap was placed several years ago in order to prevent further erosion of the bank and protect the adjacent trail. The initial erosion was likely caused due to clearing of vegetation to build the trail along with the direct hydrologic force at a 45 degree angle as the stream channel has a sharp meander at this bend. The energy of the stream flow is being deflected off the hard surface of the rocks towards the opposite bank downstream. Fortunately, erosion is limited downstream as the point bar bank is heavily rooted with red-osier dogwood and willow.

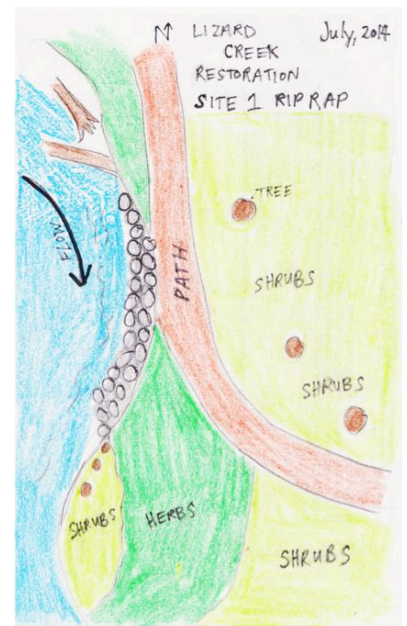


Figure 2 - Drawing of Site 1 Rip Rap

Table 1 illustrates the current characteristics of Site 1 Rip Rap. Figure 3 shows a photograph of Site 1 during site assessment. The surface above the bank is flat with a variety of herbs and shrubs in the surrounding area. A list of plant species observed at site 1 is listed below. While the shrubs are beginning to propagate naturally, there is still a large area of exposed sunny area. A few black cottonwood trees were beginning to grow in between the large boulders as shown in Figure 4. The soils are silty clay loam about 4-6 inches deep with very rocky soil below.



Figure 3 – Photo of Site 1 Rip Rap restoration site, July 2014

Table 1- Plants present at Site 1

Common Name	Scientific Name	Plant Type
black cottonwood	<i>Populus trichocarpa</i>	tree
Engleman spruce	<i>Picea engelmannii</i>	tree
black hawthorn	<i>Crataegus douglasii</i>	shrub
black twinberry	<i>Lonicera involucrata</i>	shrub
current	<i>ribes sp.</i>	shrub
prickly rose	<i>Rosa acicularis</i>	shrub
red-osier dogwood	<i>Cornus stolonifera</i>	shrub
saskatoon	<i>Amelanchier alnifolia</i>	shrub
Sitka alder	<i>Alnus viridis ssp. sinuata</i>	shrub
snowberry	<i>Symphoricarpos albus</i>	shrub
soopalallie	<i>Shepherdia canadensis</i>	shrub
thimbleberry	<i>Rubus parviflorus</i>	shrub
American vetch	<i>Vicia americana</i>	herb
common horsetail	<i>Equisetum arvense</i>	herb
dandelions	<i>Taraxacum officinale</i>	herb
false Solomon's-seal	<i>Maianthemum racemosum</i>	herb
fireweed	<i>Epilobium angustifolium</i>	herb
forget me not	<i>Myosotis spp.</i>	herb
meadow buttercup	<i>Ranunculus acris</i>	herb
scouring-rush	<i>Equisetum hyemale</i>	herb
stream violet	<i>Viola glabella</i>	herb
wild strawberry	<i>Fragaria virginiana</i>	herb



Figure 4 - Black cottonwood growing out of the rip rap

Site 2 Slope Failure

Site 2 is a failed slope adjacent to the decommissioned trail. Two large trees fell into the creek as a result of ongoing erosion, exposing a slope of bare soil about 9m tall and 7m wide. The slope is an average about 22 degrees or a percent slope of 40%. The bare slope is continuing to erode and cause increased sedimentation. A variety of trees, shrubs and herbs exist in the surrounding area, as shown in Table 2. Common horsetail has begun to pioneer the exposed slope. Figure 5 shows a to-scale drawing of site 2. Figure 6 shows a photograph of the site.



Figure 5- Site 2 Slope Failure Drawing



Figure 6 - Photo of Site 2 Slope Failure, July 2014

Table 2 - Plants present at Site 2

Common Name	Scientific Name	Plant Type
black cottonwood	<i>Populus trichocarpa</i>	tree
Engleman spruce	<i>Picea engelmannii</i>	tree
western redcedar	<i>Thuja plicata</i>	tree
black hawthorn	<i>Crataegus douglasii</i>	shrub
black twinberry	<i>Lonicera involucrata</i>	shrub
current	<i>ribes sp.</i>	shrub
prickly rose	<i>Rosa acicularis</i>	shrub
red raspberry	<i>Rubus idaeus</i>	shrub
red-osier dogwood	<i>Cornus stolonifera</i>	shrub
Douglas maple	<i>Acer glabrum</i>	shrub
saskatoon	<i>Amelanchier alnifolia</i>	shrub
Sitka alder	<i>Alnus viridis ssp. sinuata</i>	shrub
snowberry	<i>Symphoricarpos albus</i>	shrub
thimbleberry	<i>Rubus parviflorus</i>	shrub
willow	<i>salix sp.</i>	shrub
American vetch	<i>Vicia americana</i>	herb
common horsetail	<i>Equisetum arvense</i>	herb
false Solomon's-seal	<i>Maianthemum racemosum</i>	herb
meadow buttercup	<i>Ranunculus acris</i>	herb
plantain	<i>Plantago major</i>	herb
red clover	<i>Trifolium pratense</i>	herb
wild strawberry	<i>Fragaria virginiana</i>	herb

Results

Site 1 Rip Rap

In order to increase shade and overhanging riparian vegetation at Site 1, native plant species were planted behind the existing rip rap and in large holes between the rip rap. The plants were sourced from Tipi Mountain Native Plants near Kimberley, BC and included: willow, red-osier dogwood, prickly rose and black hawthorn. The plants were in 1 gallon pales and were planted with extra soil around them to provide nutrients.



Figure 7- Red Osier Dogwood Planted at Site 1

Twenty-five seedlings were planted approximately 1 m apart to allow adequate space and sun. The bases of the seedlings were wrapped with burlap material to help hold moisture and prevent damage from frost.

The trail was moved by about 1.5m away from the stream to allow enough room for growth of the plants. Some undergrowth was removed with clippers, but no trees were removed. As the small seedlings grow next to the stream, there will be a net increase in riparian vegetation.

Planting of the seedling was completed by ERA staff who engaged fifteen youth volunteers that were part of the College of the Rockies Mountain Adventure Skills Training Program (MAST) on September 10th, 2014. Shovels, wheel barrows and clippers were borrowed from the Eco-garden and the Fernie Trails Alliance. Below are some photos from the planting.



Figure 8- Volunteers being prepped for Site 1 planting



Figure 9- Work crew for Site 1 planting



Figure 10- Planting in action at Site 1



Figure 11- MAST students hard at work at Site 1

Site 2 Slope Failure

On October 8, 2014, in order to restore Site 2 on the slope failure we implemented a bioengineering technique called brush layering (as shown in Figure 12). One-hundred and fifty cuttings of red-osier dogwood, willow and cottonwood were taken from sources within 500m of the site by two ERA staff and three volunteers. The cuttings were harvested from an area close by the site with permission from BC Parks and soaked in the stream for 24hours. These cuttings were buried horizontally across the slope in layers. Each cutting was placed about 10cm apart. The layers were installed in approximately 1m increments in elevation, a little closer at the bottom, with coir erosion control cloth wrapped between the layers, in a similar fashion as shown in Figure 12. An additional mix of topsoil, peat moss and mycorrhizal fungi was placed between the brush layers and wrapped with coir fabric in order to increase success of the cuttings.

Black hawthorn and prickly rose bushes were planted along the top of the slope in order to deter visitors from walking on the high end of the slope. A small spruce tree was placed along the bottom of the slope and held in place with cable in order to deflect some of the hydraulic energy of the sharp bend.

The slope stabilization work was carried during an eight-hour period with eight ERA volunteers and three ERA staff. The trail that led past the failed slope was decommissioned by placing large logs horizontally along the path. Tools were borrowed from the Fernie Trails Alliance and the Wildsight Elk Valley Branch Eco-garden.

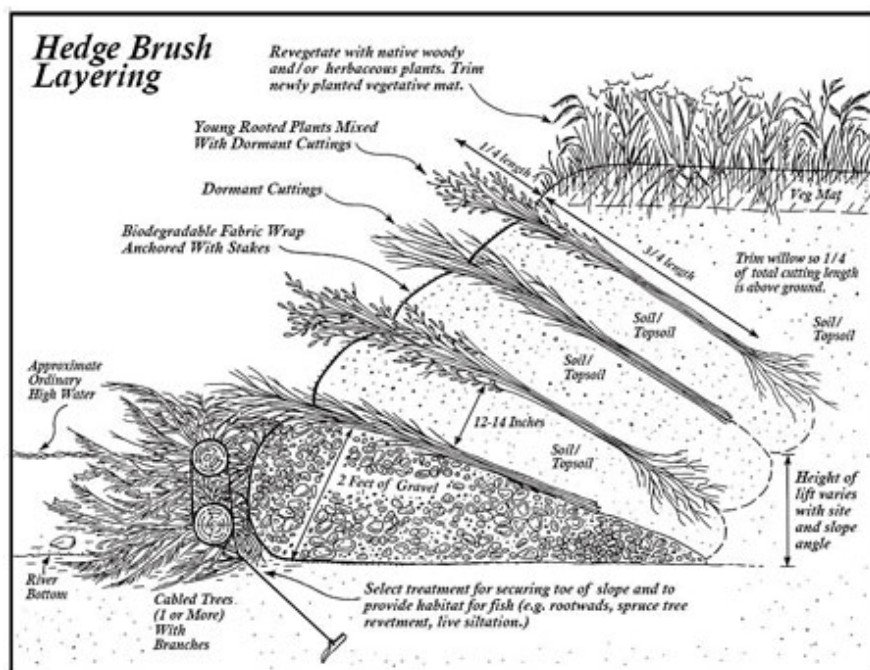


Figure 12- Brush layering diagram (Walter & Hughes, Alaska Department of Fish and Game, 2005)



Figure 13- Volunteer crew preparing Site 2 for planting



Figure 15- Field crew installing live cuttings



Figure 14- Cuttings with latex paint on ends to prevent drying



Figure 16- Live cuttings were planted between layers of coir erosion control cloth

Discussion

The Lizard Creek Riparian Restoration Pilot Project was completed in the fall of 2014. The true success of the project will be determined in the following years as the cuttings and seedlings begin to grow. If the cuttings and seedlings grow with rigor they will enhance fish habitat by providing shade as well stabilizing the bank to reduce siltation into Lizard Creek. The sites will be monitored regularly throughout the first summer by ERA staff and community based water monitoring volunteers. Photos of the sites will be taken to monitor the growth of the plants.

The project engaged local citizens and volunteers to learn about stream restoration and feel a sense of contribution by helping with

the installation. Mount Fernie Provincial Park staff were also thrilled with the restoration efforts and the value it has added to the park.

The project is mentioned in the newly installed *Forest and Fish* interpretive trail through the park trail close to the campground. The project will also be featured in the Elk River Alliance's 2015 *Elk River Flood Solutions Strategy* as a way to stabilize stream banks in a manner that promotes streambank protection, prevents erosion/siltation and as an enhancement to diking.

Less funding than was requested was used for the project, primarily due to the fact that motorized equipment was not used for project installation which greatly decreased costs.

Recommendations

In the future, if another site is chosen as a pilot project it is recommended that the site be situated in a place that is more accessible for public to view. Site 1 is easily viewed from beside the path, while Site 2 is not visible from the path as the trail was rerouted and decommissioned in order to avoid further erosion of the site. Site 2 can only be viewed from Lizard Creek and the bridge across the tributary just north of the site.

If the *Lizard Creek Riparian Restoration Pilot Project* proves to be successful with ongoing monitoring, it should be used as a model for further stream restoration in creeks that are identified as important trout habitat, in particular those streams used for spawning. Next year, the Elk River Alliance would like to pilot some other restoration techniques along a significantly degraded riparian area on Alexander Creek near ERA's community-based water monitoring Site 3.

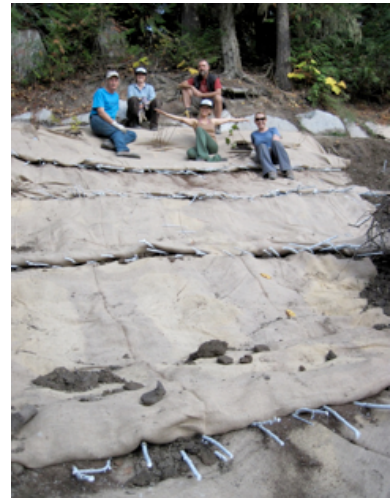


Figure 17- Completed project at Site 2

Acknowledgements

The Elk River Alliance would like to acknowledge the financial support of the Fish and Wildlife Compensation Program, on behalf of its program partners BC Hydro, the Province of British Columbia, the Department of Fisheries and Oceans Canada, First Nations and Public Stakeholders. We would also like to acknowledge the contributions of professionals and their advice on the methods of the project including: Mike Robinson of Lotic Environmental, Jim Miller PEng Civil Engineering (retired and ERA Vice Chair), Stella Swanson Ph.D. Aquatic Toxicology (ERA Chair), Ryan MacDonald Ph.D. Hydrologist (Lotic Environmental and ERA's Elk River Flood Solutions Strategy), and James Byrne (University of Lethbridge Integrated Resource Management and ERA's Elk River Flood Solutions Strategy).

The Elk River Alliance would like to thank the Fernie Trails Alliance and Wildsight Elk Valley Branch Ecogarden for the use of their tools for project implementation. Also many thanks to the Mount Fernie Provincial Park, Park Facility Operations staff who were extremely supportive and helpful throughout the project.

Confirmation of FWCP Recognition

- The *Lizard Creek Riparian Restoration Pilot Project* was mentioned and FWCP recognized in front of 30 guests attending the ribbon cutting and public tour to the restoration sites at the ERA Swim Drink Fish Festival as part of BC Rivers event unveiling of the *Forest and Fish* interpretive trail Saturday September 27, 2014.
- This project will receive recognition in the report and will be part of the municipal training on flood solutions in July 2015, a key element of the Elk River Flood Solutions Strategy.

References

Bentrup, G., & Hoag, J. (1998). *The Practical Streambank Bioengineering Guide*. Aberdeen, Idaho: USDA Natural Resources Conservation Centre.

Walter, J., & Hughes, D. (2005). *Streambank Revegetation and Protection; a Guide for Alaska*. Alaska Department of Fish and Game.

Attachments

- Final Statement of Accounts (Excel Spreadsheet)