Elk River Alliance

Coal Creek Cottonwood Project Pilot Restoration Plan

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"The aim of ecological restoration is to fully restore the components and processes of a damaged site or ecosystem to a previous historical state, to a contemporary standard, or towards a desired future condition."
~Gayton, 2001

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Introduction

In 2019 the Elk River Alliance (ERA) identified a degraded floodplain area adjacent to Coal Creek where human activities have removed the mature cottonwood overstory and replaced it with an open grass field and compacted bare soil susceptible to invasive plant colonization. Natural cottonwood colonization requires specific hydrologic conditions, such as high floods to expose nursery sites, which is not possible in this area do to the presence of historical bridge remnants and upstream riprap. ERA proposes to restore the site by revegetating the site with cottonwood saplings to increase the area's habitat potential. Proposed restoration activities include: (1) removal of invasive species from site and surrounding area; (2) tilling restoration site soil and implanting water pipes, and; (3) revegetating with Fm02 plant species and grass seeds. This project should also include a community awareness component to improve public understanding of habitat conservation and the importance of protecting and restoring natural ecosystems. The success of this project will be measured by several metrics including: area of habitat restored, plant survival rate, amount of invasive species removed, and number of collaborators/volunteers attending restoration and community events.

Project Rational

Due to human activity resulting in fragmentation and habitat destruction, riparian cottonwood ecosystems have been significantly reduced from their historical range and are considered an endangered ecosystem in the southern interior of British Columbia (Egan, Cadrin, and Cannings 1997). Cottonwood ecosystems are incredibly important in this region for providing landscape level connectivity for a number of different animals, several of which are at risk or endangered either provincially or federally. These include a number of birds such as the yellow-breasted chat (Red listed in BC; Environment and Climate Change Canada 2016) and Lewis' Woodpeckers and Western Screech-owls (Blue listed in BC; Environment and Climate Change Canada 2017; Ministry of Environment 2008) that use mature cottonwoods for nesting habitat, reptiles such as the Rubber Boa (Blue listed in BC; B.C. Ministry of Environment 2015), and several blue listed bats including the Fringed Myotis and Western Small-footed Myotis (BC MOE 2016). Fish species also benefit from cottonwood ecosystems, as these forests provide necessary stream shade that maintains cool stream temperatures, supply leaves and other organic matter into the stream that becomes part of the aquatic food chain, and provide cover and habitat for fish in the form of snags and large woody debris.

In the Elk Valley, Westslope Cutthroat Trout (WCT; *O. clarkii lewisii*) benefits from cottonwood riparian ecosystems. WCT are blue listed in British Columbia and are listed as being of Special Concern under Schedule 1 of the federal Species at Risk Act (SARA; Fisheries and Oceans Canada 2017). As of 2006, the species is provincially blue-listed as Special Concern according to the Committee on the Status of Endangered Wildlife in Canada (Fisheries and Oceans Canada 2017). The species faces many threats in the Elk Valley, including habitat loss, degraded water quality from coal mining, logging, riparian clearing due

to industrial and urban development, and an increase in angling pressure (Fisheries and Oceans Canada 2017; Tepper 2008). The species has experienced dramatic population declines throughout their historic range due to habitat loss and degradation, overexploitation, competition, predation by non-native salmonids, and introgressive hybridization with other trout species (Fisheries and Oceans Canada 2017; Shepard et al. 1997).

Coal Creek provides habitat to adult and rearing WCT as well as a number of other wildlife. Restoration to Coal Creek's riparian cottonwood ecosystems will improve not only its capacity to support healthy wildlife populations, but also improve landscape connectivity. The site in question would benefit from restoration efforts to mitigate the damaging effects of human impacts on the area. Benefits include increased biodiversity, improved habitat connectivity, reduced soil erosion, limited invasive species presence, and overstory stream shade for WCT. Long-term benefits would include improved habitat complexity with the eventual introduction of LWD from a mature riparian zone (Hartman, Scrivener, and Miles 1996). The site was determined to be a high priority area due to the positive impact that simple restoration measures will have on the stream and on WCT, and also the ease at which the area can be accessed and likelihood of success.

Site Description

The site is located at 49.486251, -114.979861 on Coal Creek, approximately 7 km east of Fernie and upstream of the Elk River - Coal Creek confluence (Figure 1). To access the site from Fernie, travel east on Fernie Coal Rd approximately 6.2 km, parking beside main road at site.

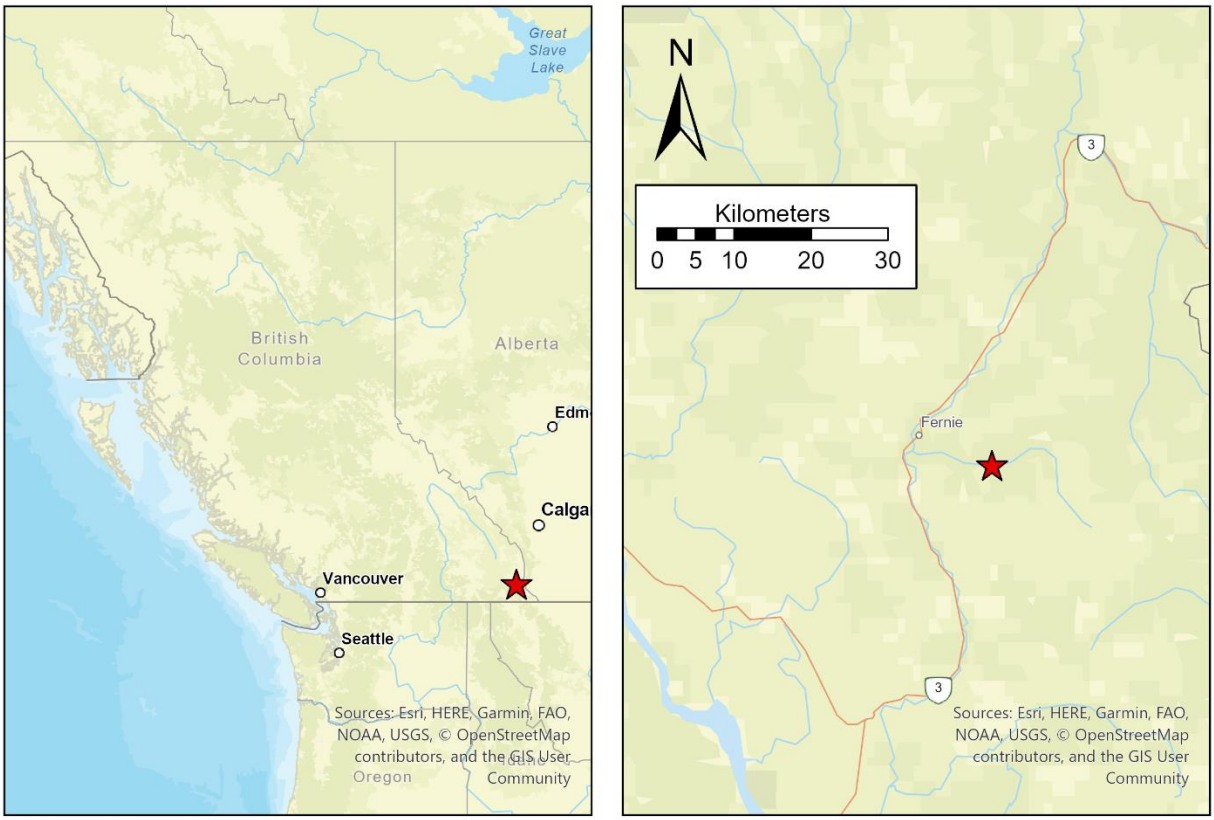

Figure 1: Location of proposed restoration site for cottonwood trial on Coal Creek near Fernie, BC

The site is situated within the Elk Moist Cool Interior Cedar – Hemlock BEC zone (ICHmk4; MacKillop et al. 2018) and includes the Fm02 Cottonwood Floodplain Ecosystem.

The following vegetation groupings were identified at the site during site inspections. These are mapped in Figure 4. Information for these descriptions was taken from LMH 25 (BC MFR and BC MOE 2010) and LMH71 (MacKillop et al. 2018)

- **111 (CwSxw – Devil's club):** Spruce (*Picea engelmannii x glauca*) and cedar (*Thuja plicata*) are the dominant overstorey trees, often with Subalpine Fir (*Abies lasiocarpa)*. In the understoreys, devil's club and/or lady fern are typically abundant (> 10%). Black gooseberry (*Ribes lacustre*), thimbleberry (*Rubus parviflorus*), oak fern (*Gymnocarpium dryopteris*), and one-leaved foamflower (*Tiarella unifoliata*) are also common, along with minor cover of false-hellebore (*Veratrum viride*; particularly on colder sites) and stinging nettle (*Urtica dioica*). Leafy mosses and ragged-mosses are usually common and can be abundant.

- **111/At**: Similar to 111 above, on northern side of site. Contains a significant Trembling Aspen (*Populus tremuloides*) component.
- **Fa (Stream Channel)**: Active channel ecosystem, includes gravel bar and islands. Often scoured for prolonged periods. Exposed and are usually immediately adjacent to the river channel at lower water levels and under water at high water levels. On unstable substrates, such as gravel bars and islands, Fa ecosystems are usually dominated by opportunistic annuals or perennial herb species with extensive root systems that are able to re-sprout after the aboveground structures have been removed by flooding and scouring. This unit also includes a smaller gravel bar and island component dominated by willows.
- **Fm02 (Fm02 Cottonwood – Spruce – Dogwood)**: Black cottonwood is dominant in the overstorey, often with minor spruce (*Picea engelmannii x glauca*), and sometimes with cedar (*Thuja plicata*). Red-osier dogwood (*Cornus serica)* is dominant in the shrub layer and frequently occurs with mountain alder (*Alnus incana*), black gooseberry (*Ribes lacustre*), and/or highbush-cranberry (*Viburnum edule*). Willows (*Salix* spp.) and snowberry (*Symphoricarpos)* are also sometimes common. Horsetails (*Equisetum*), sweet-cicely (*Myrrhis odorata*), and pink wintergreen (*Pyrola asarifolia*) are usually present, often with minor cover of bluejoint reedgrass (*Calamagrostis canadensis*), false Solomon's-seal (*Maianthemum racemosum*), oak fern (*Gymnocarpium dryopteris*), and/or blue wildrye (*Elymus glaucus*).
- **Vt (Avalanche Treed)**: A small component of the site includes an avalanche track.
- **Xa (Cleared Area)**: Cleared area makes up a majority of the site. This area is utilised as a laydown/staging area by recreationalists and logging companies, and likely an informal campsite. This would be an ideal area for moderate revegetation and restoration of cottonwood forest. However, should revegetation activities occur in this area it is recommended local users be consulted to determine if ongoing recreational or forestry use of the area is anticipated.
- **XaR (Cleared roads)**: Two access roads pass through the site. The southern road is a well used forestry road utilized by recreationalists and logging trucks. The northern track is a less utilised forestry/historical road used by recreationalists. Both will be required for site access.

While most of the Coal Creek watershed is disturbed, a reference site was inspected 100 m upstream to compare the impacts of human activity at the historical bridge and assess the variation in the vegetation community. Black Cottonwood (*Populus trichocarpa*) is the dominant tree species, with a mix of trembling aspen (*Populus tremuloides*) and spruce (*Picea cross*). Shrub composition consists of red osier dogwood (*Cornus serica)*, snowberry (*Symphoricarpos*), paper birch (*Betula papyrifera*), and baldhip rose (*Rosa gymnocarpa*). Grasses and forbs could not be identified due to the timing of the habitat assessments in late fall, but will be assed in the spring to determine appropriate grass seed blends for reseeding.

Significant invasive species presence is notable at the proposed restoration site and along the adjacent roadways. Species include spotted knapweed (*Centaurea biebersteinii*), burdock (*Arctium spp.*), hound's tongue (*Cynoglossum officinale*), and common tansy (*Tanacetum vulgare*).

Figure 2: Proposed restoration site. Note lack of native overstorey and understory vegetation, ground compaction and vehicle rutting

Currently the land is owned by CanWel Building Materials Group Ltd and operated as a Private Managed Forest (Figure 3). It is unlikely to undergo any logging activities due to the composition of the forest and proximity to a fish-bearing stream. The site is located near to a major logging road and is frequented by recreationalists including limited cattle grazing, fishers, campers, hunters, hikers, and bikers.

The area is recreationally used for RV and 'car camping', in order for this project to be successful care needs to be taken to restore the area while also leaving area for recreational use.

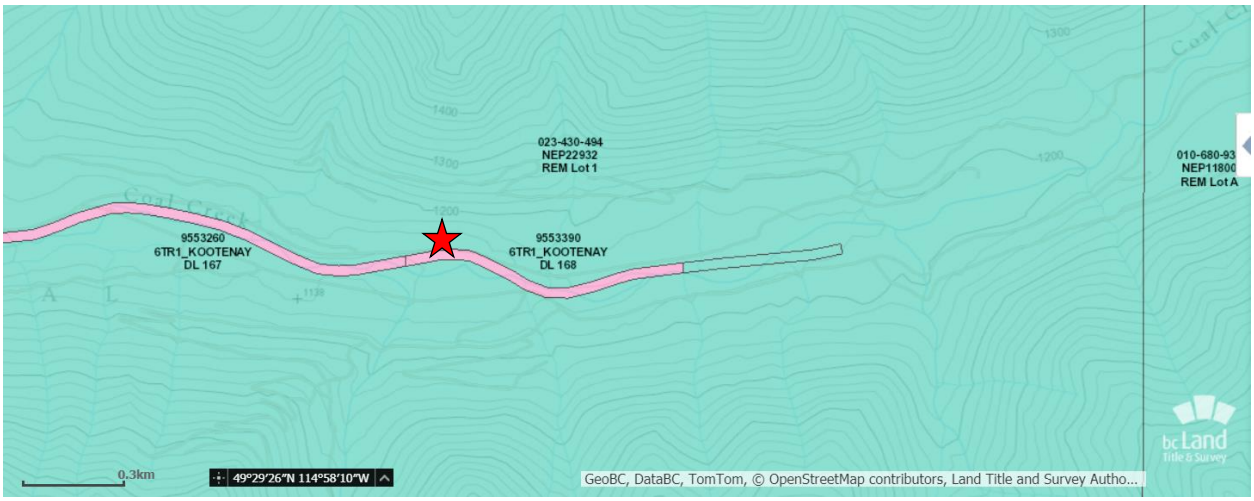

Figure 3: Land ownership of restoration site (Pink: No owner, Green: Private Managed Forest)

Site History

Historical impacts to Coal Creek include an abandoned township, defunct coal mine, and logging. Contemporary impacts include ongoing extensive private-land logging and public use of forestry roads. Remnants of historical debris include a concrete embankment failing into Coal Creek and large metal debris in and out of the stream stemming from a historical town and mine site further upstream. Riprap to stabilize the streambanks and reduce meandering is frequently employed near existing and historical infrastructure on Coal Creek. The site currently is frequented by ATVs and dirt bikes.

Project Goals

The proposed restoration site is part of an endangered ecosystem, though it has been heavily disturbed by human activities resulting in a reduction in habitat values and decreased connectivity throughout the watershed. Invasive species are common in the area, further reducing the habitat and browsing value and increasing erosion.

The goal of this project is to improve habitat values provided by this site and return it to a more natural pre-disturbance state in accordance to its BEC ecological classification. Specifically, this will be done by meeting the following objectives:

1) Removing invasive species from the riparian and upland zones to make up less than 5% of the understorey canopy;
2) Removing all manmade debris that can be removed by hand, and;
3) Revegetating the area with native cottonwoods, forbs, and grasses in order to outcompete invasive plants, and provide overstorey cover. The goal is to establish a greater than 75% survival

in both the shrub and tree canopies in alignment with species compositions found in Fm02 ecosystems.

In addition to the above objectives, any restoration activities should, given the close proximity to Fernie, also include a community awareness component. This will help improve public understanding of habitat conservation, the importance of protecting natural areas, and improving water quality.

Details of Restoration Activities

Locations of proposed restoration activities are detailed in Figure 4.

Invasive species should be removed throughout the growing season through a series of five weed pulls. Weedpulls should begin in May and June when the rosettes are emerging; these can more easily be removed than adults and will not have gone to seed. Between 10 and 20 people providing between 30 and 50 volunteer hours for each weedpull should be able to effectively remove invasive species on site.

If possible, root systems should be removed along with the main body of the invasive plant and disposed of in garbage bags as general landfill items. In instances where the root system cannot be removed, a greater number of weedpulls may be required.

Deep ripping of compacted soils will be required in order to improve moisture movement and rooting through the soil layer. A backhoe, bobcat or similar machinery will be contracted to perform this work. Soil should be ripped to approximately 12 inches (Eubanks 2004).

Planting should occur in either in the spring after the snow has melted or in the fall before the ground freezes. Vegetation should consist of mostly deciduous shrubs and trees with the occasional conifer.

Target deciduous trees will primarily consist of native Black Cottonwood (*Populus trichocarpa*), but will also include the following Fm02 shrubs and trees identified in the local area: red osier dogwood (*Cornus stolonifera*), trembling aspen (*Populus tremuloides*), snowberry (Symphoricarpos), saskatoon (*Amelanchier alnifolia*), Engelmann Spruce (*Picea engelmannii*) and baldhip rose (*Rosa acicularis*).

Trees should be spaced 3 m apart; with an area of 1ha (10,000m2), this will require 1000 trees, although these can be either 1-gallon potted plants or lives stakes depending on nursery availability and available funding. Shrub spacing intervals vary depending on the type of installation (live stakes, saplings, etc.) and between 0.2 and 3 m spacing is recommended. Red osier dogwood, aspen, snowberries, roses and willows should be spaced 1 m apart to ensure high survival and reduce invasive species presence by shading (4000 shrubs total).

Fencing will be required to keep animals and recreationalists out of the restoration area for the first few years.

To improve plant survival, plants should be watered throughout the growing season, ideally with pipes to allow for deep watering. Construction of approximately 400 reusable deep watering pipes will allow for watering over the following 12 months and ongoing projects. These can be constructed by staff and volunteers for around $8 each. While this will not be sufficient to water all the planted vegetation, it will allow for a comparison of deep watered vs watered vs unwatered restoration. The outcome of this trial will inform future restoration planning.

Re-vegetation of the nearby streambanks with native plants is not a primary focus of the project. However if a permit can be secured and time permits, installation of livestakes on eroding locations may be conducted as a value addition to the project. Planting should not occur during high water events to ensure safety of personnel working on site.

If there is greater than 50% mortality (due to grazing, drought, or other factors), additional plantings will need to take place at a later time. Less than 25% mortality will require thinning at a later date to reduce competition. The area should be seeded with a native grass seed mix to discourage invasive species colonization and decrease erosion.

The success of the project will be measured by several metrics including:

- Area of habitat restored (goal: 1ha);
- Survival of planted vegetation (75%);
- Amount of debris removed (goal: five large garbage bags);
- Presence of invasive species remaining (goal: <5% understory coverage), and;
- Number of collaborators and volunteers assisting in restoration and community events (goal: 30).

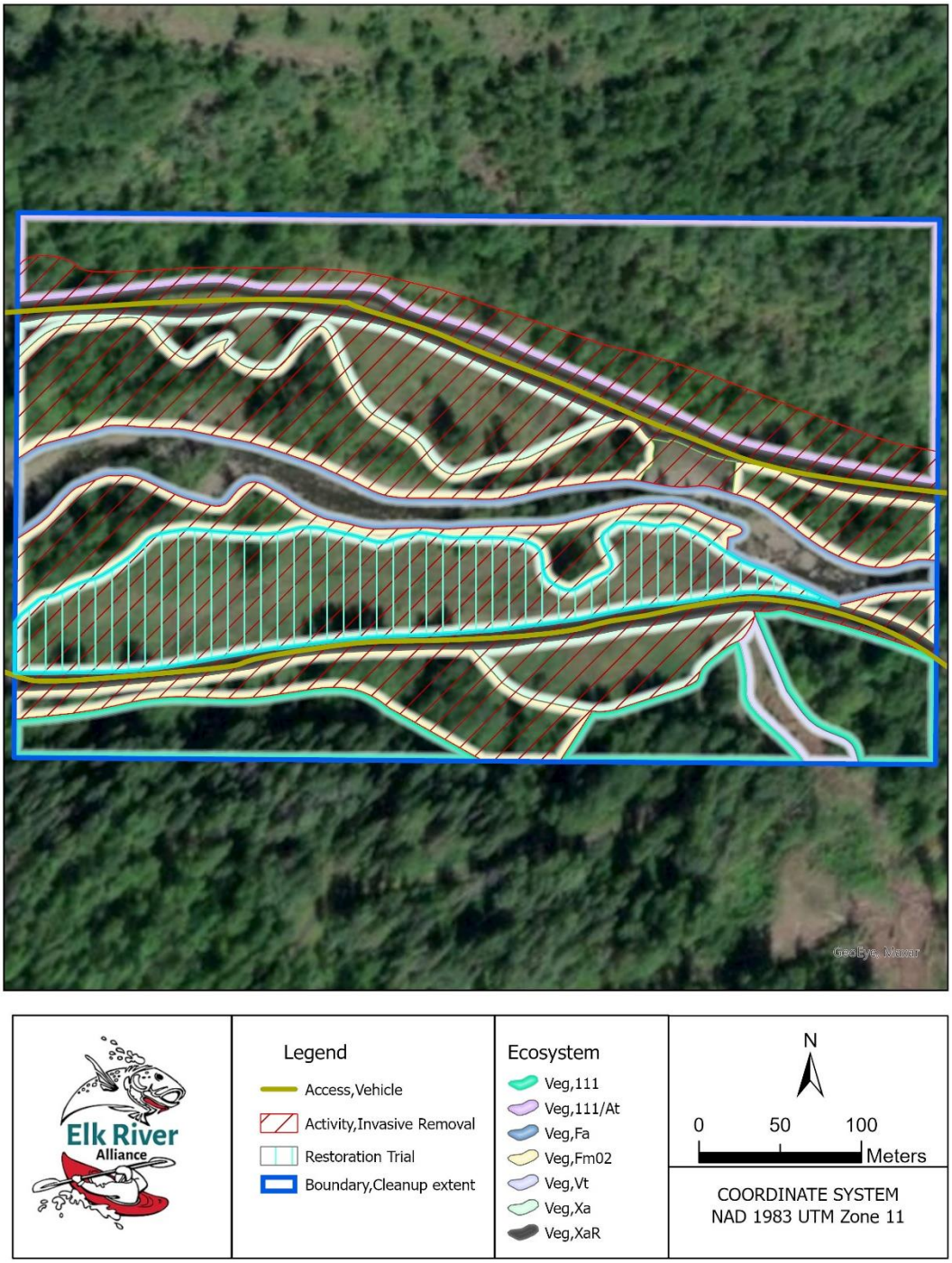

Figure 4: Site map detailing vegetation associations present and proposed restoration activities.

Project Costs

The following costs exist for the first year of the project (Table 1). Ongoing monitoring and maintenance will be required (see Long-Term Maintenance and Project Monitoring), with associated costs dependant on monitoring results. Between $5000 and $8000 should be budgeted for 1 to 5 years following project implementation to meet the outlined objectives.

Table 2: Project cost estimate for year one of project activities.

Project Activity	Details	Estimated Cost (Cash)	Estimated Cost (In-kind)
Project Management	Project development and coordination, permit applications, etc.	$1680	$0
Planning	Site inspections, professional review of restoration plans	$1472	$480
Volunteer outreach	Recruitment and organising volunteers	$336	$0
Field work (coordinating and maintenance)	Gathering supplies, field prep, overseeing and conducting restoration activities. Watering, Maintenance	$3360	$6000
Watering equipment construction and prep (deep watering)	Construction of 300 deep watering pipes	$1746	$1000
Education and Outreach	Project inclusion into workshops, social media posting etc	$420	$0
Mileage	Transporting plant and supplies	$275	$0
Materials for deep watering pipes	Materials for deep watering pipes	$1000	$0
Fencing	Wire and posts	$2300	$0
Hospitality	Volunteer appreciation	$200	$0
Seedlings	Seedlings and plants	$5000	$0
Admin (15%)	Associated overhead	$3081	$0
Total		$23,618	$7,480

Permits

As the site and site access exist on land owned by CanWel Building Materials Group Ltd and is operated as a Private Managed Forest, permission will be required form the landowner. As no earthworks will occur, a Change Approval under the Water Sustainability Act will not be required, but however if watering is required (see Long-Term Maintenance and Monitoring), a water use permit will be required should stream water be utilized. Alternatively a small water truck would be a viable alternative.

Additionally, if value-add stream installation of cottonwood stakes is possible, this may require a work in and about a stream permit

Safety

As the restoration site is located on a logging road, it is advisable to travel with a radio set to the appropriate resource road frequency. The onsite project coordinator should be trained in first aid and equipped with a first aid kit and bear spray. As there is no cell service at the site the project coordinator should bring an emergency communication device such as a Spot or inReach, and/or have and have an acceptable safety plan. The project coordinator should be prepared for potential hazards and provide a safety briefing for volunteers prior to their attendance in activities. Potential hazards include risks associated with moving water, vehicle interaction, slips and trips on uneven ground, wildlife interaction, insect and poisonous plant contact, repetitive stress injuries, etc. Volunteers should be advised of potential risks and asked to wear appropriate clothing and footwear for restoration activities.

Long-Term Maintenance and Monitoring

Monitoring of invasive species presence, vegetation survival rates, and overstory canopy will be required to ensure the success of the project and assess next steps required in maintenance.

Ongoing removal of invasive plant species from site will be required for the next 3 to 5 years to ensure the seedbank is depleted. This will involve at minimum annual weedpulls during the growing season. Weedpull intensity will depend on invasive species growth.

Seedlings and live stakes are unlikely to survive dry spells and drought conditions. Over the past three years the Elk Valley has experienced level 2 and 3 droughts during the summer months, with increased mortality of restoration project planted vegetation. In order to counteract dry conditions short-term maintenance for the first year would include watering with deep watering pipes between once a week and once a month throughout the first growing season. Without regular watering restoration projects are likely to fail. Therefore, the above project costs allow for plants to be watered 5 times throughout the growing season in the first year of planting, and a further 10 times during the summer of the year following restoration.

The budget allows for the construction and implementation of 400 deep watering pipes. The restoration area will be separated into three treatments: Deep watering, surface watering and unwatered.

The three treatments will be monitored and watered as required (according to treatment). Vegetation mortality will be recorded over the year following restoration, and allowing the effectiveness of treatments to be evaluated for future restoration in the elk valley.

If there is greater than 50% mortality, either due to grazing, drought, or other factors, additional plantings will need to take place at a later time. If less than 25% mortality shrubs and trees will likely require thinning at a later date to reduce competition.

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