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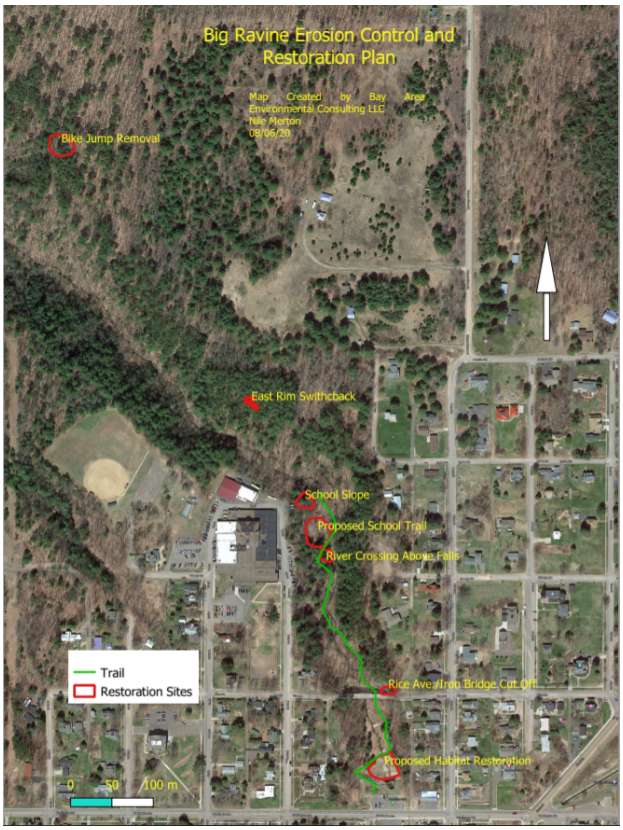
Big Ravine Preserve Erosion Control and Restoration Plan
Bayfield, WI

December 2, 2020

Big Ravine Preserve- Erosion Control Management and Restoration

Introduction: The purpose of this plan is to provide recommendations for stabilizing and restoring several areas damaged by social trails and other recreational activities along the Gil Larsen Trail in Bayfield WI. 6 potential sites were identified during the site visit 5/21/20 with Kate Kitchell. Bay Area Environmental Consulting LLC (BAEC) is responsible for preliminary designs of erosion control methods and recommendations for each site. Accompanied with these recommendations and designs is a list of materials needed, projected costs including labor and materials, installation timeline for each site, and ideas for barriers and signage to prevent foot traffic.



Overview map of the seven restoration sites covered in this plan.

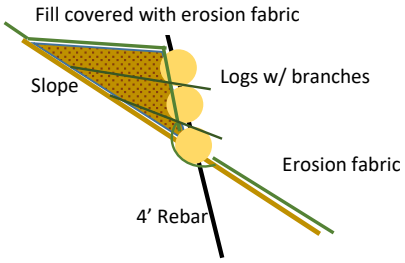
Site 1- Rice Ave./Iron Bridge Cut Off

The primary source of erosion for this site is foot traffic. Over the years the soil has been worn away and compacted around existing tree roots forming worn paths and steps down the slope. The future trail will be redirected away from the site to a more stable area and follow a series of switch backs. The existing trail path will need multiple, "check steps" in order to re-stabilize and reduce the slope angle in areas of concern.

This site receives a high level of foot traffic and will need signage and physical barriers to prevent unwanted and irresponsible travel across restoration site. Drift fencing is recommended for the first two years to deter travel.

Check Step Design:
Check steps are small platforms created by using anchors made of wood or metal and logs which is then back filled with soil. These intercept water and slow the rate of runoff, thereby reducing erosion. The check steps also offer a more stable environment to plant vegetation, which once takes root, will further help stabilize the slope. Erosion control fabric and fine woody debris will be layered into each check step to add coarse texture.

Number of Steps: 4
Height: 18"
Width(s): 1@12', 3@6'



Check Step Costs:
Logs: $150.00
Fabric and Staples: $50.00
Rebar: $25.00
Drift Fencing and installation: $100.00
Trees and Shrubs: $75.00
Native Grass Seed: $30.00
BAEC Labor: $800.00
Total: $1120.00

Site 2- Potential New Trail Site from School:

The site where the new potential trail may descend the slope currently has several canopy gaps allowing lots of sunlight to hit the forest floor. The forest floor presently does not have much understory vegetation. BAEC recommends planting seedlings of existing overstory and understory species (hemlock, white pine, oak, service berry, hazel, northern fly honeysuckle). 30-40 seedlings are recommended for ample coverage of the site.

Seedlings: $320.00
BAEC Labor: $160.00
Total: $480.00

Site 3- River Crossing Above Falls:

Overall, this site needs little to no rehabilitation. BAEC recommends 8-10 saplings of hemlock and yellow birch to be planted on the riverbank.

Seedlings: $80.00
BAEC Labor: $40.00
Total: $120.00

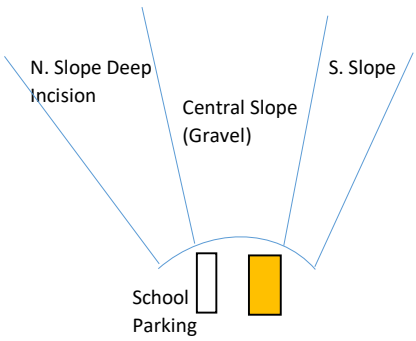
Site 4- Slope Below the School Parking Area:

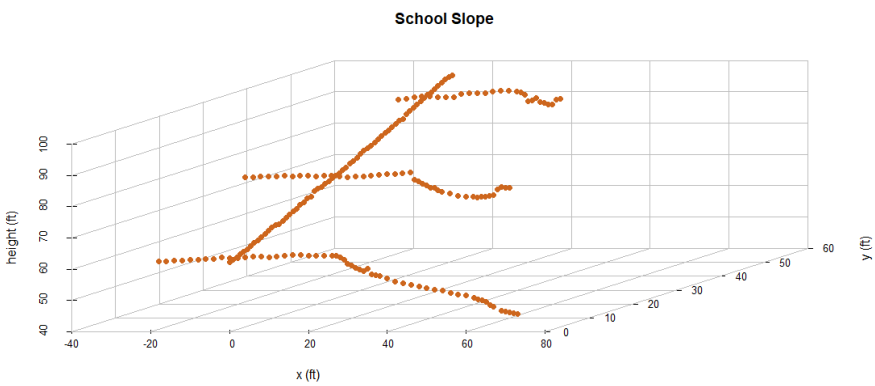
This site will require the most time, work and money to remediate. On this slope there are three sections of concern: 1) The center slope, where several layers of gravel have been pushed by past snow dumping, 2) the northern slope and 3) the southern slope. Each of these three sections will require attention with varying erosion control methods. It appears that the northern slope was an old landslide event that started to stabilize but is once again starting to erode near the top. The southern slope appears to be a historic water way with healthy vegetation but could use some light remediation in areas.

Deleted: .

To stop further degradation and to protect this slope, the school will need to stop dumping snow and gravel onto this site. We suggest that the current chain link fence be extended to stop this dumping. This will be especially important after remediation. Otherwise, as snow is pushed down, the gravel and salt would kill planted vegetation and the weight of the plowed snow could eventually compromise the installed structures.

To control foot traffic, we suggest a sign be installed at the top and bottom the slope telling people to use the designated trails. To further deter foot travel, we suggest drift fencing to act as a physical barrier.

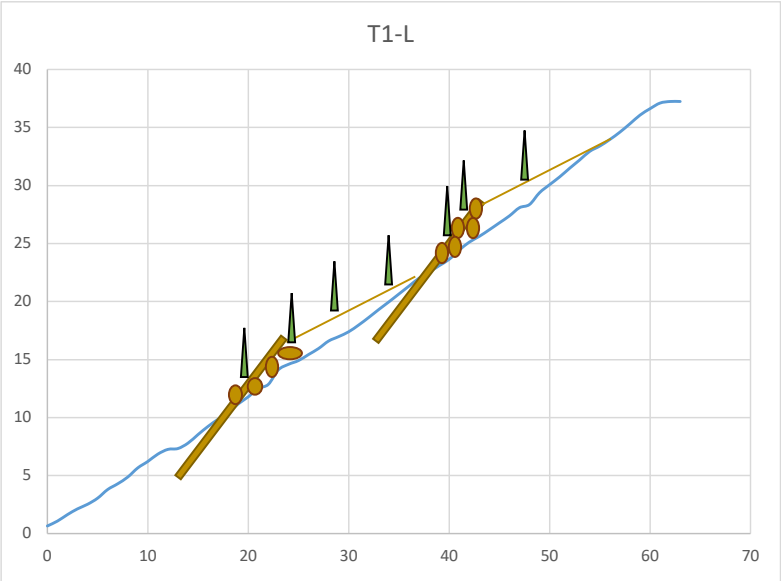




3D illustration of transects taken of eroding slope behind the school parking area. Note the scour chute on the north slope.

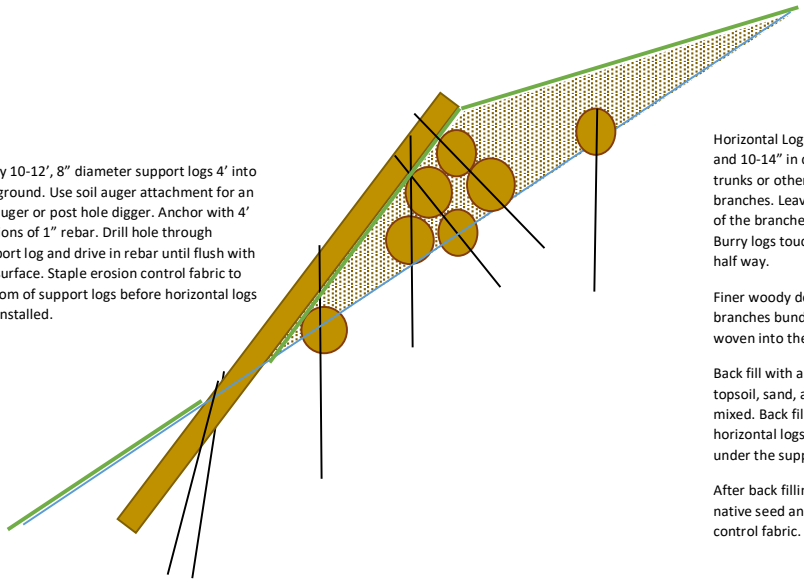
Central Slope Rehabilitation:

BAEC proposes two large log jams be installed, back filled, revegetated, and covered with erosion control fabric. These log jams will act in a similar way to the check steps at Site 1 in retaining soil but will be a shallower angle and more intensively anchored and built into the hill side. Large but varying sized logs with branches left attached to knit the logs together and to add, “texture,” for other sticks and soil to get tangled in. See the diagrams and schematics on the following page.



Graphic showing suggested, "Log Jams," on central slope.

Log Jam Schematics.



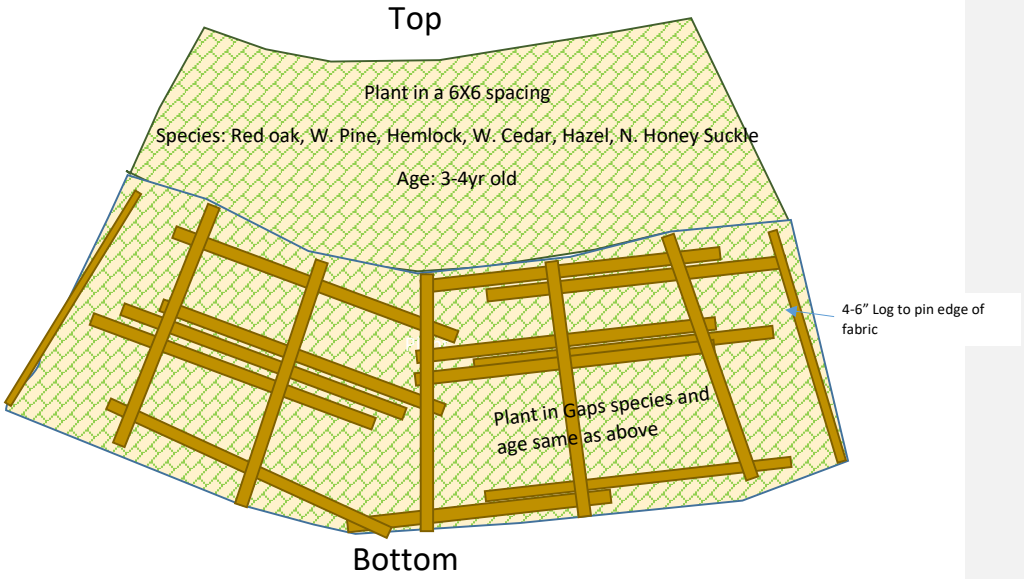
Burry 10-12', 8" diameter support logs 4' into the ground. Use soil auger attachment for an ice auger or post hole digger. Anchor with 4' sections of 1" rebar. Drill hole through support log and drive in rebar until flush with log surface. Staple erosion control fabric to bottom of support logs before horizontal logs are installed.

Horizontal Logs: 10-12' long and 10-14" in diameter. Pine trunks or other species with branches. Leave 1-2' lengths of the branches on the logs. Burry logs touching the slope half way.

Finer woody debris: ½- 1 ½ " branches bundled and inter woven into the larger logs.

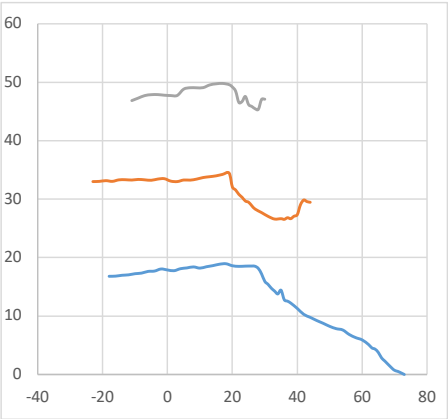
Back fill with a soil that is topsoil, sand, and gravel mixed. Back fill in stages as horizontal logs are added under the support logs

After back filling 12-15' lay native seed and erosion control fabric.

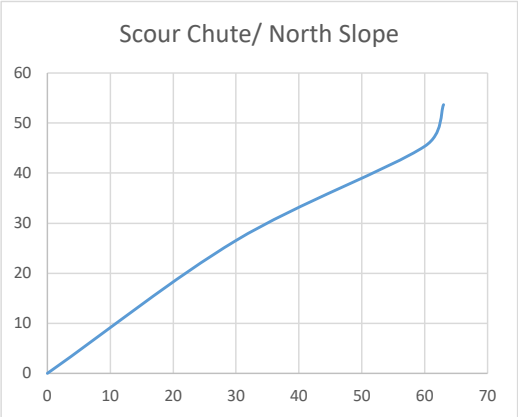

Top
Plant in a 6X6 spacing
Species: Red oak, W. Pine, Hemlock, W. Cedar, Hazel, N. Honey Suckle
Age: 3-4yr old
4-6" Log to pin edge of fabric
Plant in Gaps species and age same as above
Bottom

Northern Slope Restoration:

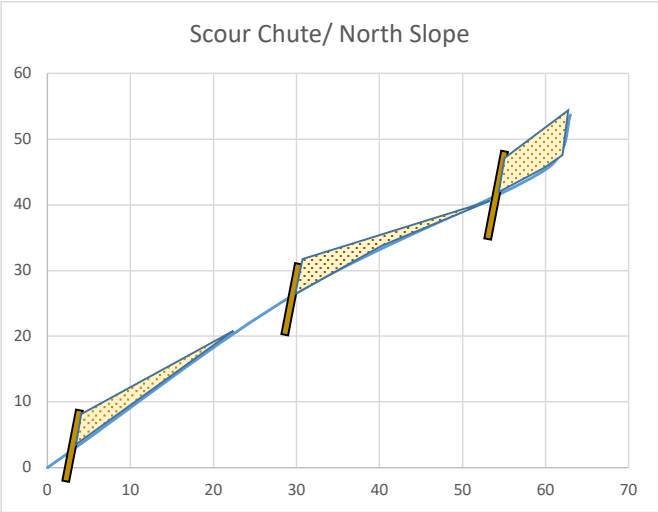
The northern slope appears to be an old erosion channel that is once again eroding near the top of the slope. This area will need to be heavily terraced to fully remediate past and future erosion. BAEC recommends three terrace steps in this area evenly spaced up the slope. Each of these steps will be varying heights based on the depth of the erosion channel. To build these steps a similar strategy to the log jam design will be built. These however will need to be more vertical due to the grade of the slope and in order to hold enough soil to reduce the grade enough for future stability.



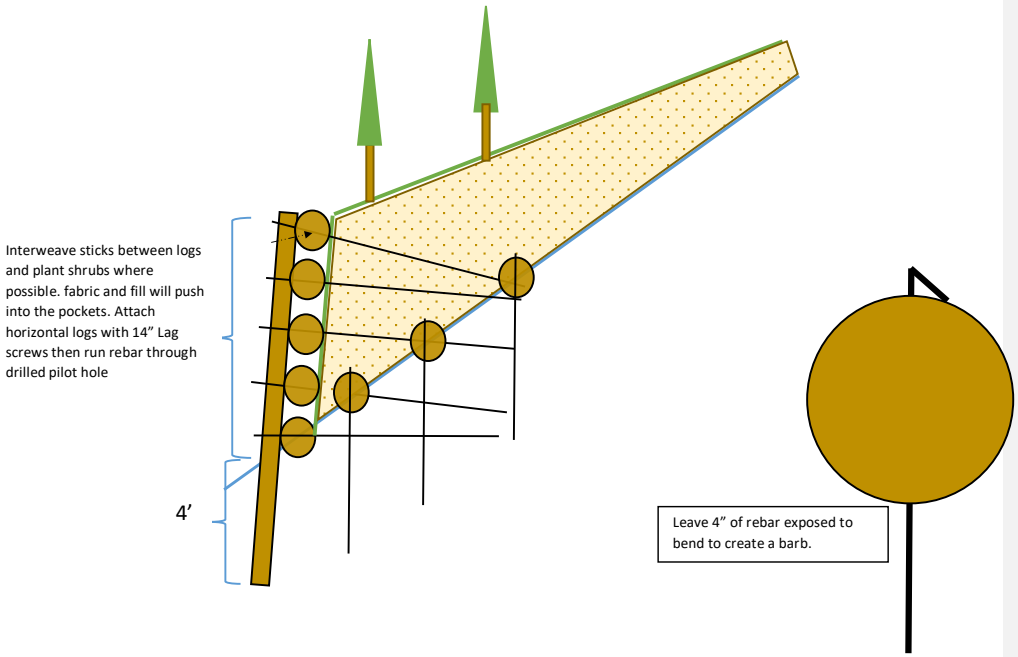
Cross Section Transects of the eroding slope. Note the old scour chute on the right hand side of each transect.



Length transect of the North slope/scour chute. Note at the top of the graph there is a steep drop. This is newer erosion that has happened in the las couple years.



Graphic depicting log wall/steps in the scour chute of the north slope.



School Slope Restoration Costs:
Fill and topsoil (185 cubic yards): $13,000 (including delivery and handling)
Logs: $1,850.00
Erosion control fabric and landscape staples: $650.00
Rebar: $500.00
Trees and shrubs: $500.00
Grass seed: $150.00
Drift fencing and installation: $100.00
BAEC labor and coordination: $8000.00

Total Projected Cost: $24,750.00

Site 5: Bike Jump Removal and Site Restoration

Location is near the northern rim of the ravine at N 46.81950, W 90.82204. A series of bike jumps were constructed along an illegal trail. The restoration area is on a gentle slope where future erosion is of little concern. The goal is to remove the jumps, matching the grade of the surrounding slope. Following removal, the area will be revegetated to mask the former trail and stabilize loose soil. BAEC suggests using hand tools such as pulaskis to scatter the soil from the jumps. BAEC then suggests planting 10 Canada fly honeysuckle and 4 balsam fir in the disturbed area. We don't believe that signs or barriers are necessary here, as the restoration area is off of currently used trails.

Cost

Materials (including estimated shipping)

- 10 Canada fly honeysuckle **$60.00**
- 4 balsam fir **$25.00**

Labor (estimated person-hours needed for a contractor to perform and estimate cost average contractor would ask)

- Remove bike jumps **1 hour, $40.00**
- Plant trees and shrubs **0.5 hour, $20.00**

Total **$145.00**

Site 6: East Rim Switchback

The switchback climbs the northern rim of the ravine and was part of an illegally constructed trail. The switchback itself is in good condition and poses little erosional threat. Below the switchback is a much steeper portion of trail which may require attention. The switchback may be used for a future trail. If it is not, then we suggest planting 15 trees and shrubs on the steep portion below the switchback including Canada fly honeysuckle, hemlock, and white pine. For the switchback, BAEC suggests planting 5 trees including red pine and balsam fir in the trail near the top. As they grow they will help stop foot traffic and stabilize soil. We do not recommend making any effort to re-contour the surface as this is more likely to destabilize the soil and potentially cause more erosion. A sign should be installed at the top of the switchback stating that the trail is closed for habitat restoration and suggest alternative routes. Immediately below the sign, a brush pile should be made to further deter anyone from following this path. Brush could be cut near the site.

Cost

Materials (includes shipping)

- 5 Canada fly honeysuckle **$25.00**
- 5 hemlock (3-year-old) **$40.00**
- 5 white pine (4-year-old) **$36.00**
- 3 red pine (4-year-old) **$23.00**
- 2 balsam (3-year-old) **$12.00**
- Dibond metal sign or similar **$50.00**

Labor

- Planting trees and installing sign **1 hour, $40.00**
- Cutting and piling brush **1.5 hours, $60.00**

Total **$226.00**

Site 7: Habitat Restoration near Trailhead and Concrete Water Control Structure

This site lies between the Washington Avenue erosion control structure and the Iron Bridge. Following a meeting of city officials and stakeholders, this goals for this site were identified as 1) enhancing the view of the Iron Bridge from Washington Avenue and the trailhead, 2) controlling invasive species present, and 3) planting and encouraging native species that fit with the viewshed goal. By doing so, the hope is to minimize the amount of cutting necessary in this area, prevent erosion, and protect the erosion control structure.

To improve the view, "culprit" trees were identified that block the view of the bridge. Most of these trees fall in the Viewshed Management Area (outlined in yellow on map below). Two tall maples were identified as particularly blocking the view, both from the trailhead and from the bridge looking toward the lake. A scraggly large black willow on the east side of the creek is also a good candidate for cutting and treatment. Two to three unhealthy red pine near the trail should also be removed to enhance the view. Additionally, several willows are encroaching on the trail and should be removed or trimmed as appropriate. All trees can be cut in any season other than spring, to avoid the spring sap push. Stumps will be treated with 15-25% triclopyr 4 in an oil carrier (diluent oil, diesel, etc) within 2 weeks of cutting. In the canopy gaps, semi-shade tolerant low-growing natives will be planted including pagoda dogwood (*Cornus alternifolia*), beaked hazel (*Corylus* cornuta), and tag alder (*Alnus incana*). The area will then be monitored to determine if other trees would merit removal in future years or if invasive species are encroaching.

At the beginning of the trail is an open area with grasses and small trees, the Floodplain Restoration Area, outlined on the map below. The site is 0.26 acres and is bounded by the trail on the north, concrete water control structure on the south, and the forest edge on the east and west.

This area has patches of invasive reed canary grass and tansy. The patches are mostly contained within the green outline below but are not continuous throughout this area. We suggest treating these invasive species for 3-5 years by applying foliar aquatic-safe herbicide (like Rodeo). Nothing should be planted within those patches until after at least 2 years of herbicide application to avoid accidentally killing

plantings. Areas not being treated could be planted sooner. Spot spraying will continue as needed to control invasives present.

Along the edges of this floodplain restoration area, taller conifers and boreal deciduous trees will be planted to mimic historic ravine forests of the region. Within the Tall Vegetation Planting Zone, outlined in blue below, black spruce, white cedar, balsam fir, tamarack, mountain maple, and striped maple will be planted at 6'x6' spacing. These taller species will be kept to the edge to prevent blocking the viewshed as they grow up and will help 'frame' the view of the bridge.

Short-statured shrub species will be planted into the open areas of the Floodplain restoration zone. Tag alder (*Alnus incana*) will be planted within 20 feet of the streambanks. Red-osier dogwood (*Cornus sericea*) will be planted across the floodplain to help shade out and prevent the spread of invasive species. To provide diversity and pollinator habitat, other short-statured species will be planted along the trail. These species will include pagoda dogwood (*Cornus alternifolia*), chokeberry (*Aronia melanocarpa*), American highbush cranberry (*Viburnum opulus*), witch hazel (*Hamamelis virginiana*), elderberry (*Sambucus canadensis* and *racemosa*), and pussy willow (*Salix discolor)*. All will be planted at 6'x6' spacing.

All the planted species other than red osier dogwood and tag alder will be sprayed with deer repellent each fall until tall enough that deer are not a threat (about 5 years).

Area between Iron Bridge and erosion control structure where vegetation will be managed to enhance the view of the Iron Bridge, to control invasive species, and encourage native species.

<u>Cost</u>

Materials

- Plants (total **$1083.68** plus about **$500** delivery fees)
    - Canopy openings (12 total)
        - 2 pagoda dogwood $8.44
        - 6 beaked hazel $31.78
        - 4 tag alder $12.03
    - Tall vegetation planting zone (70 total)
        - 15 black spruce $40.51
        - 15 white cedar $38.61
        - 15 balsam fir $42.89
        - 15 tamarack $53.96
        - 5 mountain maple $105.50
        - 5 striped maple $21.10
    - Floodplain zone (235 total)
        - 3 pagoda dogwood $12.66
        - 5 chokeberry $36.13
        - 5 American highbush cranberry $36.13
        - 5 witch hazel $22.16
        - 10 elderberry (red and white) $72.27
        - 10 pussy willow $31.65
        - 96 tag alder $288.65
        - 102 red-osier dogwood $229.21
            - Note: if planting occurs before reed canary controlled, order 65 red-osier for initial planting and 37 for planting in sprayed areas
            - Note: by the time that this order is placed, prices could go up by $300-$400 as nurseries update their costs. This is the best estimate we can provide 11/25/20.
- Rodeo herbicide **$70.00**
- Deer repellent for 5 years **$100.00**

Labor

- Volunteers will cut “culprit” trees, any season other than spring
- Applying herbicide to cut stumps **2 hours, $100.00**
- Spraying invasives (total for 2 years) **10 hours, $500.00**
- Planting trees **8 hours, $400.00**
- Applying deer repellent (total for 5 years) **10 hours, $500.00**

Total **$3,253.68**

Monitoring

At all sites, plant survival and growth will be checked annually. If die off is noted, it will be reported to land managers for remedies.

At Sites 1&4 where structures were made, reference points will be installed. Elevation will be taken at these references annually to see if the slope or structures are shifting. Number of reference points will be determined once installed. These sites will be monitored annually for invasive species, as fill could have been contaminated with invasive seeds.

Cost

$200.00 - 300.00 dependent on site conditions and extent of invasive species infestation.

References

Todd Rivas. "Erosion Control Treatment Selection Guide." United States Forest Service, January 2006, https://www.fs.fed.us/t-d/pubs/pdf/hi_res/06771203hi.pdf.

Kelly Sutton and Ryan Williams. "Erosion Control." University of Washington, https://depts.washington.edu/propplnt/Chapters/erosioncontrolchapter%5B1%5D.pdf.