



Spike Road Regional Park Vegetation Types and Disturbance History: An Overview Survey

YER Phase II Project August 14-18, 2023



**Tanis Gower, Fernhill Consulting
#210 – 2202 Lambert Drive
Courtenay, BC V9N 1Z8**

**Graham Hilliar, Youth and Ecological Restoration
4327 Minto Road
Courtenay, B.C. V9N 9P7
<https://youthecology.ca>**

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Acknowledgements

This report describes the enthusiastic efforts of Olivia Neufeld and Greg Hanson and their mentors. Youth and Ecological Restoration (YER) was created by Wendy Kotilla in 2004. This study was a YER Phase II project, organized and overseen by Graham Hilliar, YER Youth Support Worker, and Registered Professional Biologist Tanis Gower. YER is mainly funded by the BC Ministry of Children and Family Development and Comox Valley School District #71. The majority of this YER Phase II project was funded by the Parks Department of the Comox Valley Regional District. We thank Andrew Burger, Senior Park Technician, for his support in developing this project.

1. Introduction

The purpose of the study was:

1. To document the vegetation types and disturbance history in a large wetland partly within the property, with the aim of supporting CVRD Parks management and wetland restoration planning.
2. To collect water quality data and sample for aquatic life.
3. To provide a meaningful opportunity for vulnerable youth within the Comox Valley by providing them with hands-on opportunities to engage with nature and adult mentors.

1.1. YER Program

Youth and Ecological Restoration (YER) provides youth aged twelve to eighteen with one-on-one work experience through ecological restoration methods, ecotherapy practices and mentoring support. Youth learn social, practical and communication skills to motivate them in becoming confident, respectful, and productive members of society.¹

All youth involved in the program begin with Phase I, where they work with a YER staff person and with environmental organizations and volunteers focused on restoring local watersheds and ecosystems. On program completion, youth give an oral presentation for a community group.

Some graduates of Phase I are accepted into Phase II. In Phase II, two youth, a YER staff person, and an environmental professional work on a project together. The focus is on a specific environmental project for advanced learning about ecological information, research techniques, and collaboration and communication.¹ The project is completed to a professional standard to provide useful information and assistance to land managers. YER II is five days, which consists of three days of field work, and two days of tour preparation and delivery. On the final day, the youth co-facilitate a public tour to complete the project.

1.2. Study Location

The subject property at 1893 Spike Road is approximately 30 hectares in size and is bisected by the former rail line of the Comox Logging and Railway Company (Grantham and Wong 2022), which operated from approximately 1909 to 1943. The former rail corridor is now a legal right-of-way for emergency evacuation - see Figure 1. The fill imported for the railway extends into the subject property on either side of the right-of-way and underlies the existing buildings. On either side of the fill are two wetlands. The study focused on the east wetland, though water quality sampling and aquatic life sampling were done in both wetlands.

¹ <https://youthecology.ca>

A reconnaissance visit in June 2023 helped identify areas for sampling vegetation in the eastern wetland, as well as confirming the location and functionality of some of the drainage ditches along the edge of this wetland.

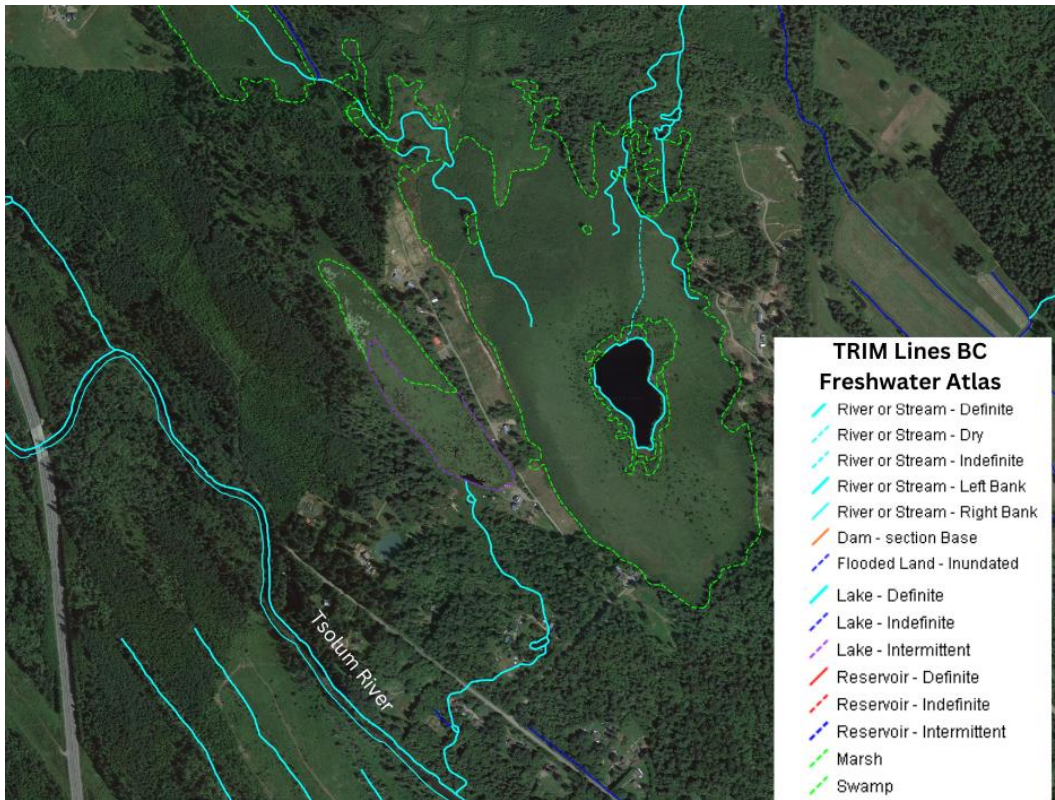


Figure 2: The wider context of the Spike Road property showing provincially mapped wetlands, drainage to the Tsolum River from the west part of the property, and drainage north towards Black Creek from the eastern wetland, part of which is within the Spike Road property.

2.2. Field Program

Water quality sampling was conducted in the afternoon of Monday, August 14 in three locations in the ditches along the eastern wetland, and in one location along the shore of the western wetland – see Figure 3. Temperature, pH, and dissolved oxygen were measured. The samples were taken using a HANNA multi-parameter water quality meter, and an OxyGuard Handy Beta Portable DO Meter H01B meter was used to document dissolved oxygen.

Aquatic life was sampled at the same locations as water quality, using a total of 7 baited minnow traps placed on the afternoon of Monday, August 14 and removed the morning of August 15.

Vegetation and soils were surveyed at two locations in the east wetland on August 14 and 16 – see Figure 3. Plot 1 was a 100 m² (10 x 10 m) plot within a representative location of wetland shrubs, while Plot 2 was chosen to characterize the vegetation on a road built into the wetland. Plot 2 was a 60 m² plot (12 meters long and on average 5 m wide, i.e., the width of the road). The vegetation sampling methodology was adapted from the relevant procedure in the Field Manual for Describing Terrestrial Ecosystems, 2nd Edition (Province of BC 2010). This manual provides a standardized methodology to describe vegetative cover and plant species according to the following vegetation layers: trees, shrubs,

herbs, moss/lichen/liverworts/seedlings, and epiphytes. Based on the needs of this project and experience with past YER II projects (Ennis and Kotilla 2019, Gower and Kotilla 2022) the methodology was simplified. The percent vegetative cover was noted for each of the two plots in the following categories: trees, shrubs, herbs, moss, and bare ground. Within these layers (as applicable), all species were noted and placed into one of four cover categories: 1: one or two plants 2: a few plants 3: many plants 4: dominant. A soil pit was dug at the centre of each of the two plots.

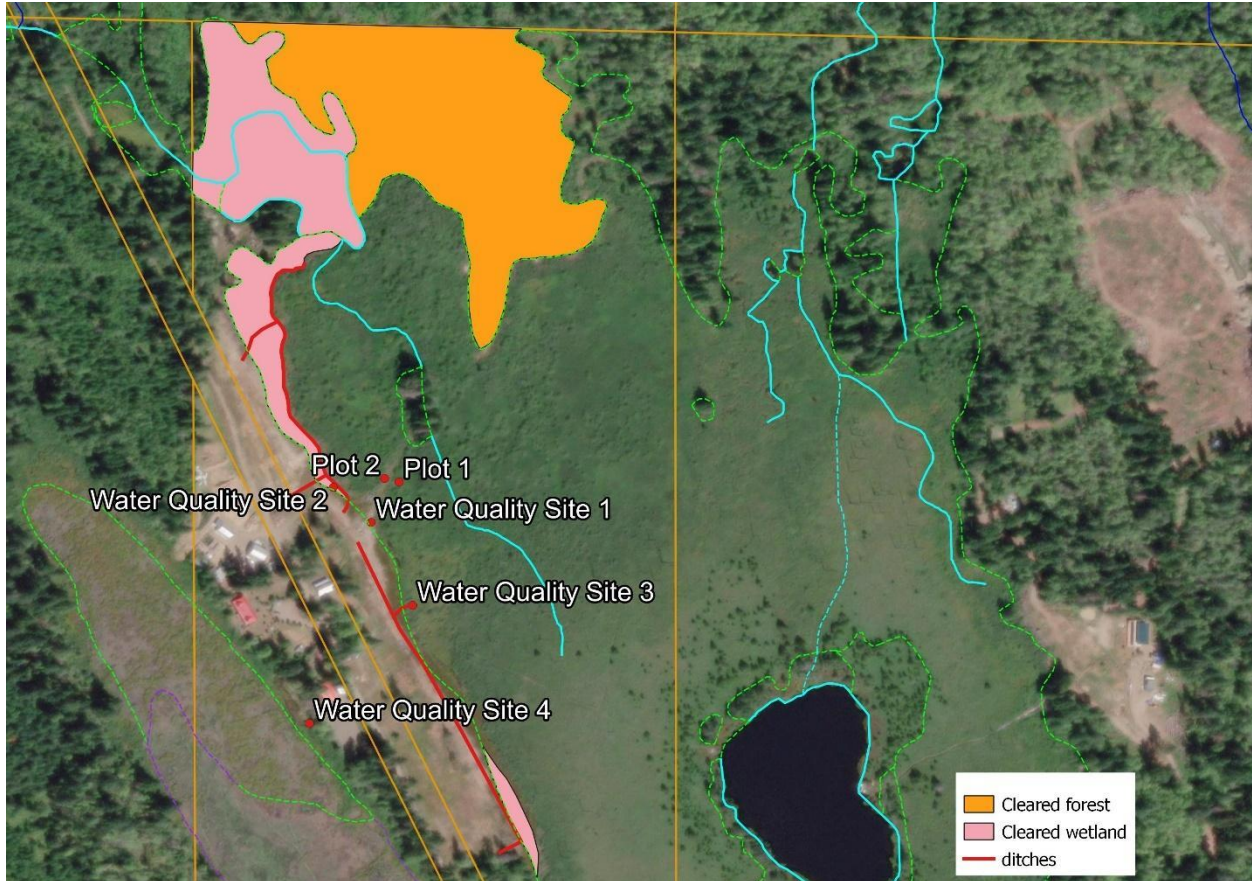


Figure 3: Vegetation plot locations, water quality and aquatic life sampling locations, ditches and cleared areas.

2.3. Guest Speaker

Neighbour and wetland advocate Sally Gellard gave a talk on August 15, providing history about the local railway and about logging-related fire events in 1922 and 1938. Sally also provided information about the presence and life cycle of the western toad, and the presence of other wetlands nearby, many of which are located beside the railway grade.

2.4. Public Tour

Neighbours and the wider public were invited to a tour of the property as it related to the project, at 1:00 p.m. on Friday, August 18.

2. Results

2.1. Background review

The review of historical aerial imagery (Appendix 1) began with imagery taken in 1985, approximately 75 years after the property was altered to build the railway, and 42 years after the railway ceased operation. In 1985, the former rail line and the surrounding fill was largely treed. The image is too low resolution to determine whether there is any infrastructure present in 1985. In 1992, a narrow access road/driveway is visible along with buildings at 1893, 1881 and 1884 Spike Road. Each building has a small clearing around it. In 1996 there is additional modest clearing of trees. No significant changes are apparent until 2002, when vegetation has been cleared along the eastern wetland in the adjacent property to the west. Further changes occur in 2012 with more clearing of trees on the fill on both sides of the right-of-way (ROW), and logging in the northern part of the property. By 2018, strips of vegetation along more than half of the margin of the eastern wetland have been removed, and a dead-end road has been built into the wetland. By 2022 ditches have been excavated between the cleared zone and the wetland, and a finger of the ditch extends into the wetland.

Reconnaissance during the youth program confirmed the recent excavation of ditches as seen in the aerial imagery and confirmed the presence of smaller perimeter and “feeder” ditches in the cleared former wetland in the northern part of the property, on the east side of the ROW – see Figure 3.

The biophysical assessment completed by Current Environmental in 2022 for the CVRD (Grantham and Wong 2022) identified sensitive habitats and reviewed existing information with a focus on the Streamside Protection and Enhancement Areas (SPEA) for the boundaries of each wetland adjacent to developed infrastructure. SPEA boundaries are typically 15 meters in width, or more when there is a zone of sensitivity (e.g., 30 meters). Current Environmental found there was only one encroachment into the SPEA which would be addressed by re-naturalization of the site. Their background review for species at risk and eagle and heron nests did not reveal any records for the property.

The wetlands on the property are included in the Provincial Sensitive Ecosystem Inventory for Southern Vancouver Island

2.2. Summary of vegetation sampling

Plot 1 characterized the east wetland vegetation accessible from the Spike Road Park property. The vegetation consisted of tall shrubs with a minimal understory. Hardhack (*Spirea douglasii*), Pacific willow (*Salix lucida*) and sweet gale (*Myrica Gale*) provided 95% cover in the shrub layer. The herb layer was sporadic and included slough sedge (*Carex obnupta*), marsh cinquefoil (*Comarum palustre*) and buckbean (*Menyanthes trifoliata*). A pit dug approximately 0.75 meters deep revealed a moist, loose substrate of dark, decomposed organic matter and roots and twigs (Figure 4). The depth of this layer is unknown as it extended deeper than 0.75 meters. Based on Plot 1 data and the classification system from MacKenzie and Morin (2004), this portion of the eastern wetland is best classified as a tall shrub swamp.



Figure 4: The photo on the left shows a sample of the soil/peat extracted from a pit dug in Plot 1. The right-hand photo shows the soil pit in Plot 2. The soils in these two locations were very different with respect to compaction, organic matter, and moisture.

Plot 2 sampled the road that was built on imported fill. The main vegetative cover consisted of reed canary grass. The plot also included a diverse mix of native shrubs, trees and herbs, and some additional non-native species such as comfrey, oxeye daisy and thistle. A soil pit approximately 0.75 m deep revealed fine, hard packed soils. In contrast to Plot 1, the soil was dry and low in organic matter.

Data for Plots 1 and 2 are included in Appendix 2.

2.3. Summary of water quality sampling

Water quality data are included in Appendix 3 and the sample locations are shown in Figure 3. All four locations had similar water temperatures ranging from 19 - 22°C. These relatively high temperatures are likely related to the high air temperatures during the week of the program, which exceeded 30°C some afternoons.

Dissolved oxygen (DO) and pH levels were similar at sites 1, 3 and 4, ranging from 32 - 38% DO saturation and a pH of 5.2 to 5.6. At site 2 DO was at 19% saturation and pH was 6.1.

As a point of reference for DO levels, waters that support salmon will have DO levels higher than 6 mg/L (BCMECCS 2023), or approximately 67 % DO saturation at 21°C. With respect to pH, most aquatic organisms prefer a pH of 6.0 to 8.5 (Taccogna and Munro 1995). If the area is influenced by a nearby bog, that could account for the lower pH sampled at sites 1, 3 and 4.

2.4. Summary of aquatic life sampling

Aquatic life samples were collected at the water quality sampling sites shown in Figure 3. Organisms collected in order of abundance were bullfrog tadpoles (*Lithobates catesbeianus*) three-spined stickleback (*Gasterosteus aculeatus*), stick insects (order *Phasmida*), diving beetles (genus *Dysticus*), Northwestern salamander (*Ambystoma gracile*), and leeches (subclass *Hirudinea*). In addition to what

was collected in the minnow traps, the team saw high numbers of metamorphosed juvenile bullfrogs in at Sites 3 and 4. Data are included in Appendix 3.

2.5. Public tour

The tour was attended by 42 family members, neighbours, and members of the wider community. The two youth successfully explained the project in an engaging and informative way. After the tour, the youth were presented with completion certificates, letters of reference, YER hoodies and a one-hundred-dollar honorarium.

3. Discussion

A neighbour mentioned that the eastern wetland likely contained acid-loving vegetation characteristic of bogs, based on their experience of a nearby connected property⁴. However, the wetland that the crew sampled in Plot 1 was a swamp, which is characterized by the presence of trees and/or shrubs (MacKenzie and Morin 2004), and which does not contain acid-loving vegetation. It is common for different types of wetlands to occur together in complexes, so a bog type of wetland may be adjacent to or even within parts of the Spike Road Park property.

The eastern wetland on the Spike Road property and the properties to the west and southwest include many large dead trees. It's possible that these trees were killed in one of two major fires in 1922 and 1938. It may also indicate that the site was previously forested and not a wetland. The divide between the Tsolum River watershed and the Black Creek watershed currently runs through the Spike Road Park property: according to provincial mapping, the west side of the ROW drains south to the Tsolum River while the east side of the ROW drains north and connects to ditches on agricultural lands and ultimately to Black Creek. Before the railway was installed, some or all of the eastern wetland within Spike Road Park may have been forest draining to the Tsolum River. However, the former boundary between the two watersheds is not evident as the area is very flat.

4. Recommendations

The following recommendations were developed by the youth with support from their mentors:

1. Fill in the ditches along the boundary of the eastern wetland, after removing all aquatic life.
2. Remove the road built into the wetland and use the material to fill in the ditches.
3. Conduct a detailed vegetation inventory of both wetlands.
4. Remove existing fencing and add fencing to both sides of the new trail to prevent public access to the wetlands.
5. Plant trees on the terrestrial elevations outside of the public path and evacuation route, particularly along the eastern wetland margins. See Grantham and Wong (2022) for more detailed information.
6. Assess the logged area in the north of the property to determine how the forest is regenerating.
7. In remaining areas with reed canary grass, undertake reed canary grass control efforts including shading with native plantings.
8. Remove bullfrogs to support the health of native wildlife populations.

⁴ Sally Gellard, personal communication



Figure 5: A recently constructed ditch dividing intact wetland from disturbed wetland. The spoil materials are visible and could be used to fill in the ditch.

5. Conclusion

The CVRD has purchased an ecologically valuable property, and the YER Program was pleased to help assess its condition. The youth participants gained valuable experience and the public tour attendees were keenly interested in the YER II project and in the new park. Restoration actions are recommended to address damage to the eastern wetland, plant native vegetation in disturbed areas, and to control the large invasive bullfrog population. A more comprehensive vegetation inventory would be helpful to understand the baseline conditions in both wetlands and in the logged area.

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Appendix 1: Site Disturbance History 1985 to Present

Review of satellite imagery available online:

1985 Google Earth satellite imagery⁵ (low resolution): indicates the right of way (abandoned rail line) and associated fill is mostly or entirely vegetated with trees

1992 CVRD iMap imagery⁶ (black and white): shows a narrow road/driveway and house addresses 1893, 1881 and 1884 on the railway fill, with small clearings/access for each

1996 CVRD iMap imagery (black and white). shows additional modest clearing of trees on railway fill and trails/roads into the lake, one from the subject property and one from the property to the east of the lake, at 2030 Spike Road

1999 CVRD iMap imagery (black and white): same as 1996

2002 CVRD iMap imagery (black and white): same clearings as 1996 and same trails. New triangular field cleared in adjacent property to the west (east of the ROW), with a narrow buffer between it and the east wetland.

2005 Google Earth imagery: similar clearing and tree cover as in 1996

2005 CVRD iMap imagery: similar clearing and tree cover as in 1996

2007 CVRD iMap imagery: similar clearing and tree cover as in 1996

2012 CVRD iMap imagery: more clearing on and near the property as follows:

- to the north of the house at 1893 Spike Road from the west property line through the ROW
- Most trees cleared between the east wetland and road ROW. This includes trees cleared in the small triangle of property to the south at 1881 Spike Road. Trees also cleared around the house at 1881 Spike Road
- The road passing through property appears more visible (better used)
- The finger of trees extending into the east wetland from the north is recently logged
- Cleared area (triangle) in property to the west is revegetating

2018 CVRD iMap imagery: changes as follows:

- Clearing extends a bit further into the east wetland from the right of way and all remaining vegetation removed (same in triangle in property to the south). New road along the east wetland in the cleared area
- A new road partly built into the east wetland. It looks like it would be planned to connect with the older road in the clearcut
- Margin of east wetland in north of property appears to be cleared of vegetation and with standing water on the surface

⁵ <https://www.google.ca/earth/> accessed June 2023

⁶ <https://www.comoxvalleyrd.ca/about/about-cvrd/imap> Accessed June 2023

2020 CVRD iMap imagery: same as 2018, with larger area of standing water along the margin of the east wetland in the north of the property.

2022 CVRD iMap imagery:

- New wide ditch along the eastern wetland edge adjacent to the cleared zone. A finger of the ditch extends a short way into the bog.
- Appears to be a smaller ditch along what had been standing water area in the north.

2022 Google imagery

- The area with standing water to the north is dry and appears as cleared ground with a ditch through it. Unknown whether the ditch was present in 2018 and 2020. Previous provincial mapping included this altered area within the wetland

Appendix 2: Vegetation plot data

Youth and Ecological Restoration Program - Site Description Field Form				
Date: August 14, 2023		Weather: hot and sunny, 30 °C		
Crew: TG, GH, ON, GH				
Site/plot name: Plot 1 Spike Road Park wetland shrubs			Site coordinates (center): Easting: -13929360 Northing: 6409764	
Cover by Layer (%)				
Trees: 0	Shrubs: 95	Herbs: 10	Moss: 3	Bare Ground:0
Cover categories by layer/species 1 = one or two plants; 2 = a few; 3 = many; 4 = dominant				
Species in Tree layer (>10 m tall) N/A			Cover category	
Species in shrub layer (woody plants 0.15 to 10m including trees greater than 2 years old)			Cover category	
			willow (pacific)	4
			Hardhack	4
			Sweet gale	4
Species in herb layer (including woody spp < 0.15 m)			Cover category	
			bracken fern	1
			slough sedge	2
			marsh cinquefoil	1
			buckbean	2
Species in moss lichen and seedling layer (including trees < 2 years old)			Cover category	
Moss not determined to species level			1	
<p>Additional Notes (location description, slope, aspect, successional status, structural stage, types of disturbance, presence of invasive species, species names of any epiphytes, site and plot diagram and measurements):</p> <p>Access through the dense tall shrubs was extremely difficult, so the plot was located close to the road. An earlier reconnaissance visit verified that this plot was representative of vegetation in this general area. To access the plot, we cut a trail to the plot centre and then we cut perpendicular trails passing through the centre of the plot so we could see to the corners.</p> <p>A soil pit was dug in the plot centre to approximately 0.75 m depth. Despite the hot weather the soil was moist. It was entirely composed of loose organic materials including some intact twigs and roots. The depth of the organic layer is unknown as it extended deeper than 0.75 m.</p>				

Youth and Ecological Restoration Program - Site Description Field Form				
Date: August 16, 2023		Weather: Sunny, hot 31°C		
Crew: TG, GH, ON, GH				
Site/plot name: Plot 2 Spike Road Park - road built in wetland			Site coordinates (center): Easting: -13929379 Northing: 6409769	
Cover by Layer (%)				
Trees: 0	Shrubs: 10	Herbs: 90	Moss: 0	Bare Ground:0
Cover categories by layer/species 1 = one or two plants; 2 = a few; 3 = many; 4 = dominant				
Species in Tree layer (>10 m tall)			n/a	
Species in shrub layer (woody plants 0.15 to 10m including trees greater than 2 years old)			Cover category	
Hardhack			3	
Nootka rose			2	
Bracken fern			2	
Cottonwood			1	
Alder			1	
salmonberry			1	
willow species			1	
evergreen blackberry			1	
thimbleberry			1	
pacific willow			1	
Species in herb layer (including woody spp < 0.15 m)			Cover category	
Reed canary grass			4	
common rush			3	
Carex spp.			3	
St. John's wort			2	
horsetail			2	
pearly everlasting			1	
comfrey			1	
Canada thistle			1	
grass species #2			1	
oxeye daisy			1	
dagger rush			1	
trailing blackberry			1	
Species in moss lichen and seedling layer (including trees < 2 years old)			Cover category	
n/a				
Additional Notes:				
Reed canary grass formed a significant portion of the overall site cover – approximately 60%				
Soil pit approx. 0.75 m deep revealed fine-grained, light-colored soil low in organic matter that was compact and very dry.				

Appendix 3: Water quality and aquatic life data

Table 1: Water quality data collected August 15, 2023

Site	Time	Water Temperature	Dissolved Oxygen (% saturation)	Water pH
1	9:55	19.3°C	32.0%	5.54
2	9:30	N/A	19.0%	6.14
3	10:20	21.7°C	37.6%	5.26
4	11:20	19.4°C	37.1%	5.16

Table 2: Aquatic life sampled August 14 & 15, 2023. Time in refers to when the minnow traps were set.

Site	Time in Aug 14	Time out Aug 15	Three Spined Stickleback	Diving Beetle	Stick Bug	Leech	North-western salamander	Bullfrog Tadpole	Notes
1	13:00	9:55	3	0	1	0	0	0	
2	13:20	9:30	3	1	3	1	0	0	
3	13:30	10:20	0	1	0	0	5	0	many juvenile metamorphosed bullfrogs observed
4	13:50	11:20	0	2	1	0	0	10	many juvenile metamorphosed bullfrogs observed