Fraser Valley Watersheds Coalition
Unit 1 - 45950 Cheam Avenue
Chilliwack, B.C. V2P 1N6
www.fvwc.ca

March 31,2020

Sqwuakum Creek (Lake Errock) Salmon Spawning Habitat Gravel Augmentation and Enhancements - 2019

Sqwuakum Creek (Lake Errock Outlet channel) prior to gravel augmentation 2019.

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Prepared for DFO Coastal Restoration Fund

Fisheries and Oceans Canada | Pêches et Océans Canada

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Acknowledgements

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Together, we are working towards "*healthy watersheds and healthy communities*."

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Introduction

Sqwuakum Creek represents an important area within the Heart of the Fraser and the Harrison Stronghold and offers habitat for wild pacific salmon. The objectives of this project were to enhance chum spawning habitat at the outlet of Lake Errock and; improve the local riparian and foreshore areas of the lake to support more resilient ecology through replanting, bioengineering and invasive plant control. This report summarizes the results of work completed between July 01, 2019 and March 31, 2020 under the financial contribution of DFO Coastal Restoration Fund.

As described in this report, this project resulted in:

- 42 m^2 augmented salmon spawning gravel habitat at Lake Errock Outlet channel (Sqwuakum Creek)
- A total of 2,037 trees, shrubs and emergent aquatics were planted (Of which, represent 2697 tonnes of carbon annually offset)
- 10 m^2 of yellow flag iris removed.
- 10 m^2 of lamiastrum removed.
- 14 m^2 of English ivy removed.
- 90 m^2 of native plants and bioengineering efforts completed.
- 15 Landowners and community volunteers participated in the project.

Thanks to the momentum of on-the-ground restoration activities, the strength in partnerships, and importance of this project, further restoration plans are being developed to continue building on the long-term biodiversity of the area.

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Project Location

Lake Errock is situated on the west side of Harrison Bay, within the Fraser Valley Regional District and within proximity to Scowlitz First Nation IR lands and traditional territory.

Map 1. Annotated scope of works. A. red dashed polygon represents Squakum Creek, Laker Errock outlet channel gravel augmentation. B. Yellow dashed polygons represent riparian and foreshore planting, bioengineering and invasion control.

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Goals and Objectives

The primary objective of this project was to enhance chum spawning habitat at the outlet of Lake Errock. Natural recruitment of gravels downstream of lakes often is low as lakes serve as a catch basin. As the outlet channel flows over time these gravels get moved further downstream leaving larger boulders and substrate that is not as suitable for salmonid species for spawning. In nature, these cycles are reversed through natural erosion processes, and occur over greater periods of time. Augmentation efforts help provide suitable habitat in the interim between these natural gravel recruitment pulses (if/when they occur).

A. **Restoration of Habitat:** Augment Sqwuakum Creek, Lake Errock Outlet channel with salmon spawning gravels.
Goal: minimum 375m^2

The secondary objective was to improve the local riparian and foreshore areas of the lake to support more resilient ecology through replanting, bioengineering and invasive plant control. Lake and creek enhancements assist in developing resilient riparian and aquatic ecology, as they are adapted to the region, typically have root structures that can support bank stability, support leaf detritus and insect drop for food and nutrients to support aquatic and salmon species.

B. **Enhancement of Habitat:** Improve the riparian and foreshore areas of Squakum Creek and Lake Errock.
Goal: minimum 50m^2

Methods and Outcomes

Augment Sqwuakum Creek, Lake Errock Outlet channel with salmon spawning gravels.

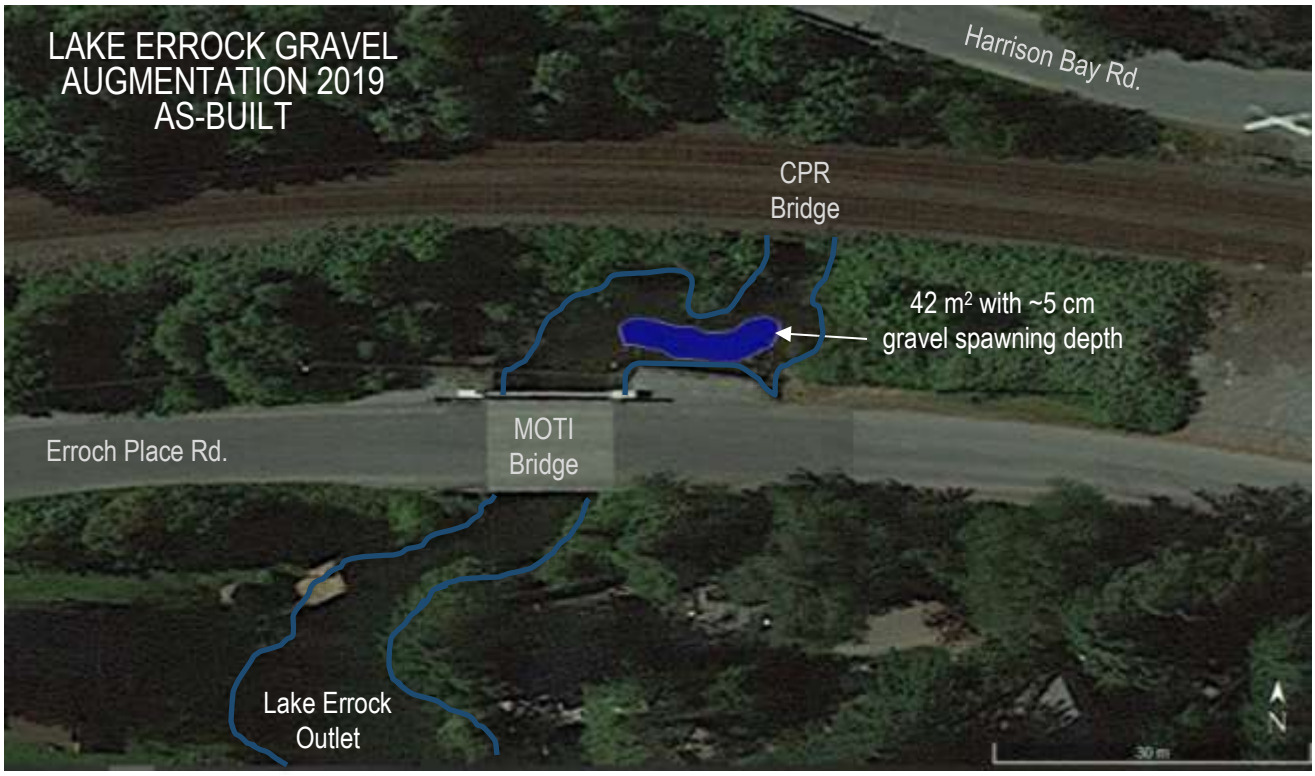
Prior to instream the works area was isolated. The instream construction was completed during the 2019 Instream fisheries works window. A Stone slinger was used to spread 3" minus washed cobbles and gravels into the outlet channel between the road bridge (on the north side) and the CPR bridge (on the south side). The slinger would periodically stop adding gravel to ensure turbidity levels remained equal to or greater than 8 NTU in a 24 hours period.

Once all the gravel was placed in the outlet channel, the gravels were hand spread over the substrate to create 2" of gravel cover of the existing substrate. A total of 42m^2 of new spawning habitat was enhanced A key consideration was to prevent any backwatering effect into the Lake, which could result in potential flooding of residential properties. As such, the gravel augmentation was reduced in scope and in depth. Follow-up water height assessment and augmentation is planned for 2020.

Figure 1. Stone slinger augments gravels. Northview towards CPR track.

Figure 2. Eastview gravel augmentation.

Figure 3. Spreading out the gravels.



Improve the riparian and foreshore areas of Squakum Creek and Lake Errock.

Two areas were targeted for enhancement and bioengineering activities to soften lake foreshore, stabilize the bank and improve riparian areas.

Area B1 – located at the south-eastern edge of the Lake, this area had a few issues: significant invasive yellow-flag iris invasion within the foreshore and other invasive plants in the riparian area, bank instability and need for additional riparian trees and shrubs.

Area B2 – located at the north-eastern edge of the lake, this area had a few issues: lack of foreshore habitat (all grass), active wave-induced bank erosion and invasive species encroachment (English ivy and blackberry).

FVWC staff met with the landowners to discuss design plans to achieve foreshore goals and develop a conceptual plan. Once developed, FVWC staff and 15 community volunteers and the Lake Errock Community Association participated in hand pulling and bagging of the yellow flag iris on the foreshore, lamaistrum, blackberry and English ivy through the forested areas, plant layout and planting of the potted stock and harvested whips for bioengineering (Table 1, Figures 5-13).

Plants selected for the site were comprised of pioneering plants species. Majority of the selected species can withstand drought and can tolerate some inundation. The strategy was to plant each species at different slightly varied topographic locations, as this can have a substantial effect on survival due to moisture differences over the years. The shrub selected are very tolerant to drought, fast growing and aggressive. A large portion of the shrubs selected are multi-stemmed species, as this helps them to colonize the area faster and tolerate some browsing. The native plants such as salmonberry and thimbleberry will aid in bank stabilization and provide food for wildlife; provide important leaf litter and detritus for salmon, and additional habitat for birds and wildlife.

Planting was done in meandering rows to incorporate preferred microsites to produce a more natural appearance. Woody shrubs were placed mid to low bench depending on their moisture needs. The goal was to establish tree/shrub thickets along lake to reduce edge effects and create strong boundaries against invasive species such as Reed canary grass and yellow flag iris.

The results of enhancement efforts at these two sites was:

- A total of 2,037 trees, shrubs and emergent aquatics were planted (Of which, represent 2697 tonnes of carbon annually offset)
- 10 m^2 of yellow flag iris removed.
- 10 m^2 of lamiastrum removed.
- 14 m^2 of English ivy removed.
- 90 m^2 of native plants and bioengineering efforts completed.

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Table 1. Native vegetation planted at Lake Errock October 01, 2019- March 31, 2020.

Latin name	Common name	Size	Quantity
Spiraea douglasii	Hardhack	1 gal	58
Myrica gale	Sweet gale	1 gal	30
Cornus serica	Red osier dogwood [GHG]	1 gal	30
Adiantum aleuticum	Maiden hair fern	1gal	20
Athyrium filix femina	Lady Fern	1gal	20
Polystichum munitum	Sword fern	1 gal	25
Ribes sanguineum	Red flowering currant	2 gal	60
Osmaronia cerasiformis	Oso berry	1gal	30
Philadelphus lewisii	Mock orange [GHG]	2 gal	30
		1 gal	10
Mahonia aquifolium	Oregon Grape	1 gal	50
Cornus unalaschkensis	Bunch berry	9cm	24
Aquilegia formosa	Western red columbine	9cm	25
Rubus spectabilis	Salmonberry	1gal	10
Rubus parviflourus	Thimbleberry	1 gal	10
Symphoricarpos albus	*Snowberry Coastal*	1 gal	5
Carex obnupta	*Slough Sedge*	Plug	250
Scirpus lacustris validus	*Soft-Stemmed Bullrush*	Plug	250
Myrica gale	Sweet gale	Live-stake	300
Cornus serica	Red osier dogwood [GHG]	Whip	300
Salix spp.	Willow [GHG]	Whip	500
Total			2037

[GHG] Represents species used to calculate approximate annual GHG Carbon offset

Figure 5. Conceptual image representing the planting areas B1.

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Figure 6. Annotated image illustrating targeted area to remove yellow flag iris.

Figure 7. Volunteers plant the foreshore with native shrubs and aquatics.

Figure 8. Volunteers install bioengineering wattle fence at active bank erosion site on lake foreshore.

Figure 9. FVWC field staff remove Yellow flag Iris -pods and rhizomes.

Figure 10. Northview of B1 with volunteers planting, removing iris and installing the whips.

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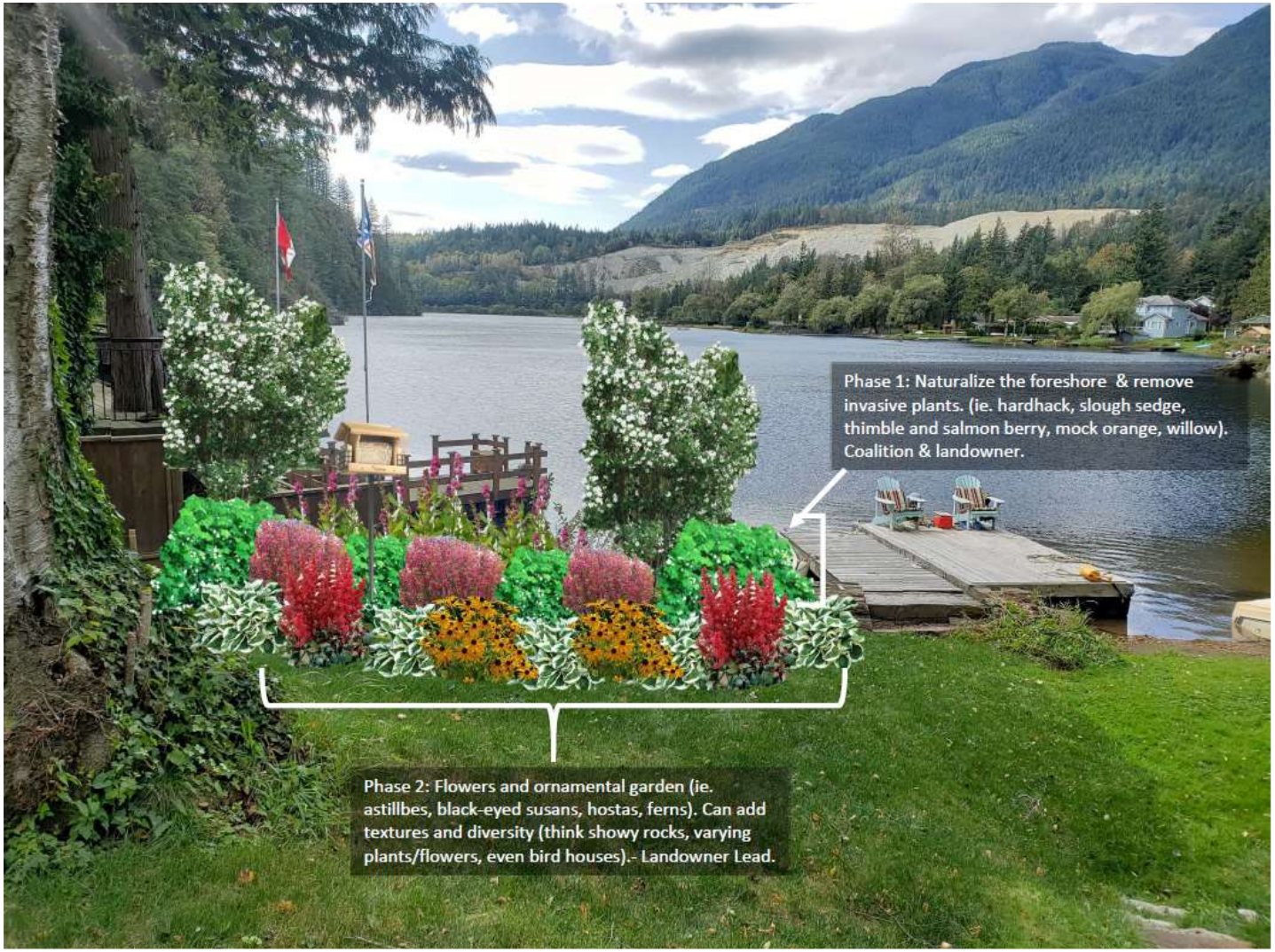

Figure 11. West-view B2 location conceptual image of potential enhancement opportunities for lakeshore planting (resilient lake ecology) and support aesthetics values.

Figure 12. Volunteers planting willows and native species establishing foreshore.

Figure 13. Recognizing amazing volunteers!

Recommendations and Next Steps

Further actions recommended for this project include:

- Monitor lake water levels
- Add follow-up Gravel Augmentation at Outlet
- Continue to enhance lake foreshore and work with community to design foreshore plans.
- Continue to monitor and control key invasive plans that can negatively impact the lake and riparian ecology: Yellow flag iris, lamiastrum, English Ivy and Japanese Knotweed.
- Monitor for water quality and fish use.

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