Where did the Beaver Go? A Qualitative Study of Change Within the Beaver Creek Watershed

Final Report

ER 412/ES 471 Galiano Island Field Study

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Created for the Galiano Conservancy Association

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Land Acknowledgement

We conducted our research on the shared, asserted, unceded and traditional territories of the Lamalcha, Penelakut, and other Hul'qumi'num-speaking Peoples. The land and waters of what is now known as Galiano Island hold deep cultural importance and have been stewarded by Coast Salish First Nations for time immemorial. We want to recognize and acknowledge our responsibility to participate in decolonial efforts to work towards reconciliation in the face of colonial violence. We acknowledge the complex history of the land and water on which our project was conducted. This area is home to traditionally important creeks, rivers, and village sites that were given traditional place names providing meaning, purpose, and context on the land. It is fundamental to understand the place in which we conduct our work to make informed decisions and move with intentionality and respect. We want to highlight the importance of Indigenous resurgence throughout the landscape, as it is fundamental to ecological and cultural revitalization and continued stewardship.

Special Thanks

Thank you to Adam Huggins and Eric Higgs for guiding our project and helping us set up and find our repeat photopoints. Thank you to the Galiano Conservancy Association for hosting us throughout our course.

Summary

The North American Beaver (*Castor canadensis)* is an ecological engineer that shapes ecosystems all throughout North America with its native global range extending through Canada, United States and Mexico. The North American Beaver is absent from the Arctic tundra, peninsular Florida and deserts of southwestern United States (Cassola, 2016). The North American Beaver has been introduced in Russia, Argentina and Chile (Cassola, 2016). Beavers are present on Galiano Island and have shaped several watersheds, including the Beaver Creek watershed. In the late 1990s and early 2000s, the North American Beaver disappeared from the lower regions of the creek. The Galiano Island Conservancy Association is currently working to restore the watershed and hopes to bring back the beaver. The beavers' re-establishment will return ecological function from anthropogenic degradation by improving habitat for native wildlife, water quality, stream structure and ecosystem health. Through photo point monitoring, informational conversations with Galiano Island Conservancy Association staff members and contributors, habitat assessment, trail camera monitoring, and research, we aim to understand why the beavers left Lower Beaver Creek and what barriers may be preventing their return.

These goals are achieved by conducting our observational and interactive methodology. We determined that The Great Beaver Swamp, one of the largest wetlands on Galiano and now a part of the Mid-Island Protected Areas Network is most

suitable for beavers, but reach two of the creek has promising habitat with sufficient food and building material. The reaches of Beaver creek were determined by the Galiano conservancy, dividing the creek into three sections in order to organize restoration projects within the creek.

Reach one is 222m long and is the lowest part of the creek. Reach one starts at the shoreline along the coast and ends at the second creek crossing, it is a steep and narrow section (Huggins et. al 2026). Reach two extends 250m between the second creek crossing and the first crossing. Reach two has the lowest gradient of all the reaches providing great potential for future restored flood plains (Huggins et. al 2026). This reach has been heavily disturbed by anthropogenic activity. Lastly, reach three is 537m in length and exists between crossing one and the border of the project area (Huggins et. al 2026). This area is variable with steep narrow sections and broader areas. Reach three historically had 9 of the 10 beaver dams that were mapped in the year 2000 (Huggins et. al 2026). These three reaches allow us to better understand the habitat characteristics, and observe each area at a greater depth (Huggins et. al 2026).

Reaches one and three had below optimal conditions for beavers with steep gradients and limited resources. Further insight was provided through informational conversations; Galiano Island Conservancy staff and contributors believe that the Great Beaver Swamp provides enough suitable habitat for the current population of beavers. It was suggested that finding new habitat may be too great a risk to their lives that beavers do not choose to establish themselves again on the creek. Although some characteristics of the creek are not optimal for beavers, the installation of structural attributes beaver dam analogues (BDAs) and post assisted log structures (PALs) to help restore the creek could create better habitat conditions and lead to the return of the beaver. The Beaver Creek Restoration Plan is a great start to address the barriers affecting beavers' return (Huggins et. al 2026). The Beaver Creek Restoration plan is a detailed synopsis of the restoration that will occur within the creek and provides all project details that will be laid out in three main stages (Huggins et. al 2026). The restoration plan focuses on low-tech process-based restoration (Huggins et. al 2026). Our photo point monitoring and habitat suitability analysis provides a reference to address habitat suitability over time and provide future comparison of ecological changes.

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1.0 Introduction

The ecological integrity of Beaver Creek on Galiano Island has been compromised by two episodes of clear-cutting in 1967 and 1978 and the loss of beaver in its lower reaches (Erickson, 1998). Intensive timber extraction along the banks of the creek and subsequent monocultural plantings of Douglas fir (*Pseudotsuga menziesii*) have reduced the diversity and productivity of terrestrial ecosystems and altered the natural hydrology of the Beaver Creek watershed. For reasons unknown, beavers left the lower reaches and moved upstream to Great Beaver Swamp in the early 2000s, thereby degrading the stream's condition. The Galiano Conservancy Association (GCA) has approved a restoration project on Beaver Creek to upgrade the channels, plant riparian vegetation, and invite beavers back into the lower reaches of the creek using low-tech process-based restoration methods. Our project aims to uncover the mystery behind the disappearance of beavers and gauge if Beaver Creek has suitable habitat for their return. Additionally, we established a series of photographic monitoring points along Beaver Creek to compare changes within the creek before and after the low-tech structures, known as beaver dam analogues (BDAs) and post-assisted log structures (PALs), are installed.

Beaver Creek is part of the 182 ha Beaver Creek watershed and consists of three main Reaches determined by the Galiano Island Conservancy. Reaches one to three are the subjects of our study including the Great Beaver Swamp. Beaver Creek is a perennial stream, sourcing water from southeast of the Vanilla Leaf Land Nature Reserve, through the Great Beaver Swamp, and finally discharging into Qw'xwulwis Cable Bay Conservation Area. See Figure 8a. in the Appendix for a map of the three Reaches and the Great Beaver Swamp even in its degraded state, the creek supports a diversity of riparian plants and provides high-quality habitat for wildlife, including the blue-listed northern red-legged frog (*Rana aurora*). Beaver Creek is also valuable to Galiano Island locals and visitors. Thousands of people visit the creek every year as the main trail leading to Cable Bay and Pebble Beach.

Although Beaver Creek still produces many ecological and cultural values, the lower reaches of the stream have been degraded by clear-cut logging and missing beaver activity. The creek itself has incised by roughly 0.5 m to 1.5 m in some areas, causing a disconnection of the channel from its floodplain. Erosion and slope failure can be observed within the channel and along the valley. The condition of the creek will continue to deteriorate if no restorative action is taken, as high stream power promotes trenching, lowers water residence time, and increases flashiness of flood waters. Ultimately, the creek's increasingly flashy hydrology will diminish its resilience, making it more vulnerable to climate-driven disturbances, such as flooding, drought, and landslides.

2.0 Site Description

Our site includes reaches one, two, and three of Beaver Creek. Beaver Creek starts at The Great Beaver Swamp and extends through a Douglas fir (*Pseudotsuga menziesii*) ecosystem down to Cable Bay where fresh water meets the ocean. The creek has a 15 foot steep rock face at the mouth of the river where water flows into the Strait of Georgia. Present on our site are Douglas Fir, red alder (*Alnus rubra*), big leaf maple (*Acer macrophyllum*), and western redcedar (*Thuja plicata*), which are suitable building materials for beavers. Herbaceous vegetation includes skunk cabbage (*Symplocarpus foetidus)*, slough sedge (*Carex obnupta*), stinging nettle *(Urtica dioica*), salal (*Gaultheria shallon*), lady fern (*Athyrium filix-femina*), bracken fern (*Pteridium aquilinum*), trailing blackberry (*Rubus ursinus*), and vanilla leaf (*Achlys triphylla*). The incised creek follows a steep gradient and a 5-10% slope. The watershed has ownership by Galiano Island Conservancy (Pebble Beach Reserve) and Crown protected land (Great Beaver Swamp); our research focuses strictly on the land owned by the Galiano Island Conservancy. Our project site follows alongside the Cable Bay trail, and contains old floodplains that are now overgrown mud flats, degraded riparian areas, deep creek channels due to erosion and incision, and disconnected floodplains. As we surveyed the site, we observed that the channel acts more as a ditch than a creek.

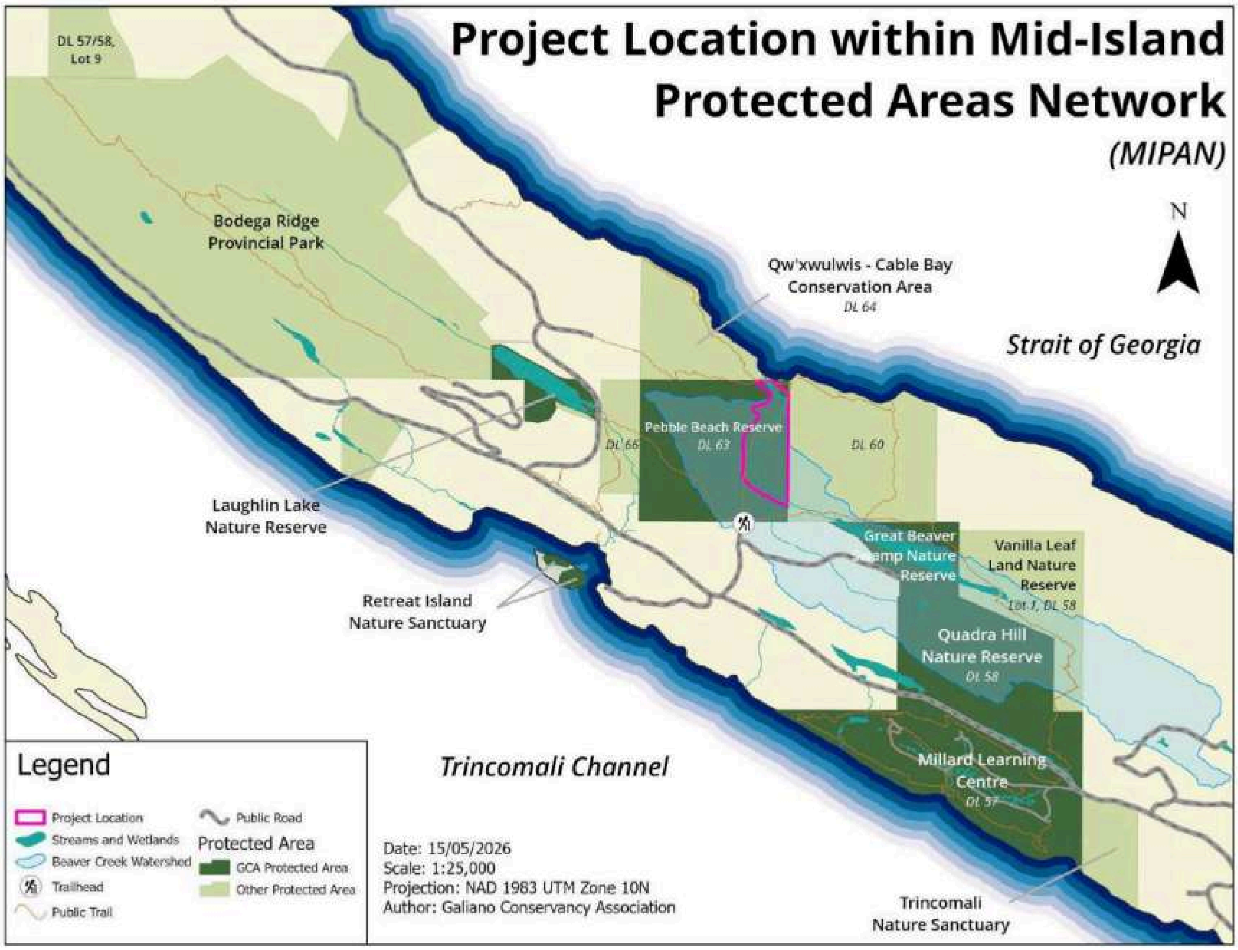

Figure 1. Map of the Beaver Creek restoration area within the Pebble Bay Reserve. **Note.** Map reproduced from the Beaver Creek Restoration Plan: Pebble Beach Reserve, Galiano Island (GCA Working Paper Series No. 3), by Huggins et al., (2026), Galiano Conservancy Association.

3.0 Goals and Objectives

Goal 1: Assess the current ecological condition of the Beaver Creek watershed and establish a baseline for future restoration efforts

Objectives:

- Conduct a comprehensive assessment of the current abiotic, biotic, and ecological conditions within the Beaver Creek watershed.
- Document existing habitat characteristics, including:
    - Riparian vegetation
    - Channel morphology
    - Hydrology

    - Floodplain status
    - Evidence of wildlife use
- Identify changes in watershed conditions since historical periods from the early 2000s when beavers were present through comparison with historical photographs and available ecological records from said time period.
- Establish baseline data that can be used to evaluate future restoration success and monitor ecosystem recovery.

Goal 2: Investigate the potential causes contributing to the decline and absence of beavers within the Beaver Creek watershed

Objectives:

- Develop hypotheses explaining the factors that may have contributed to the departure of beavers from the watershed.
- Incorporate local ecological knowledge through discussions with experienced watershed users to gather historical observations of beaver presence, habitat changes, and wildlife activity.
- Identify potential limiting factors affecting beaver recolonization, including:
    - Lack of suitable food resources and riparian vegetation.
    - Changes to stream morphology or hydrology.
    - Barriers to movement and habitat connectivity.
    - Human disturbance or infrastructure impacts.
    - Potential predation pressures.

Goal 3: Identify and assess barriers preventing natural beaver recolonization

Objectives:

- Assess habitat conditions to determine whether Beaver Creek currently provides suitable resources for beaver occupancy.
- Identify physical and ecological barriers that may prevent beavers from returning or establishing colonies.
- Evaluate opportunities for improving habitat suitability, including:
    - Increasing riparian vegetation
    - Reversing stream incising
    - Enhancing habitat connectivity.

Goal 4: Establish a long-term photo-point monitoring system to document ecological change within the Beaver Creek watershed

Objectives:

- Establish twelve fixed photo-point monitoring locations throughout the watershed to document changes in habitat conditions over time.
- Install permanent metal stakes and attach red flagging tape at each monitoring location to ensure consistent relocation.Record GPS coordinates for all photo-point locations to support future monitoring efforts.
- Establish six different 360-degree photo-monitoring locations to provide broader spatial documentation of watershed conditions (separate from the twelve fixed photo-points).Record GPS coordinates and establish repeatable methods for future 360-degree photo monitoring.

Goal 5: Monitor wildlife activity and evaluate potential factors influencing beaver recolonization

Objectives:

- Install two remote trail cameras within the Beaver Creek watershed to document wildlife activity.
- Monitor for evidence of beaver presence, including movement, feeding activity, dam-building behaviour, and habitat use.
- Document potential predators and other wildlife species that may influence beaver occupancy.
- Use wildlife monitoring data to improve understanding of ecological interactions within the watershed.
- Evaluate whether current wildlife activity suggests suitable conditions for future beaver return.

Goal 6: Develop recommendations and identify future restoration actions to support beaver recolonization and watershed recovery

Objectives:

- Analyze monitoring data and assessment results to determine the primary factors limiting beaver return to the Beaver Creek watershed.
- Develop prioritized recommendations to improve habitat conditions and restore ecological processes.
- Identify potential restoration actions, such as riparian habitat enhancement, improving stream complexity, increasing habitat connectivity, or addressing identified barriers to beaver movement.

- Establish future monitoring priorities to track changes in watershed conditions and evaluate restoration success.

4.0 Methods

4.1 Beaver Habitat Suitability Assessment

To evaluate and address Goal 1 the current ecological condition of the Beaver Creek watershed and identify factors influencing beaver recolonization, a habitat suitability assessment chart (see Table A1. in the Appendix) was created to be filled out across four study reaches: reach 1, reach 2, reach 3, and the Great Beaver Swamp. Each reach was surveyed independently using the same standardized habitat assessment protocol to ensure consistency throughout the watershed. The habitat suitability assessment chart was developed by synthesizing habitat requirements for beavers from multiple published sources and adapting them to the conditions of the Beaver Creek watershed (Allen, 1982; Matechuk, 2024; Newman et al.,1994; Salandre et al., 2017; Severud et al., 2011). Based on the objectives of this study, the project team developed an assessment framework consisting of three primary components: geomorphology, vegetation, and disturbance. These categories were selected to capture key physical, biological, and anthropogenic factors that may influence beaver habitat suitability and recolonization potential within the Beaver Creek watershed.

For each reach, field observations were used to complete a habitat suitability assessment checklist. Individual assessment criteria were assigned a "Yes" or "No" rating. A "Yes" indicated that the observed condition was considered favourable for beaver occupancy, whereas a "No" indicated that the condition could reduce habitat suitability. Qualitative observations were recorded alongside each criterion to provide supporting evidence and site-specific context. The geomorphology assessment evaluated channel characteristics including stream incision, stream width, channel gradient, water velocity, valley width, floodplain connectivity, and stream substrate. The vegetation assessment examined the availability of preferred beaver building materials and forage within approximately 30 m of the stream channel, including the presence of suitable woody species, vegetation age structure, plant vigour, aquatic and riparian food plants, and canopy openness. The disturbance assessment documented natural and anthropogenic factors that may influence beaver occupancy, including evidence of human activity, domestic dogs (*Canis familiaris*), anthropogenic noise, and the presence of large herbivores or potential predators.

Following completion of the field assessments, habitat suitability scores were calculated separately for each study reach by dividing the number of favourable "Yes" responses by the total number of applicable assessment criteria. These preliminary assessments were used to support hypotheses regarding beaver absence, identify barriers to recolonization, and inform future restoration recommendations.

4.2 Community Knowledge Conversations

We had conversations with two community members who have extensive experience researching and working within the watershed.

Conversations were had to gather information regarding past beaver presence, changes in watershed conditions, and observations of wildlife activity. Conversation topics included the length of time individuals had been visiting the Beaver Creek watershed, the last known observations of beavers and their locations, and recollections of historical beaver activity within the watershed. Community members were also encouraged to share any additional observations, knowledge, or experiences they believed were relevant to understanding changes within the ecosystem. Information gathered from these conversations was used as supplementary qualitative data to support the habitat assessment, historical condition analysis, and development of hypotheses regarding factors contributing to beaver absence within the Beaver Creek watershed.

4.3 Repeat Photography

Repeat photography was conducted to compare historical and present-day conditions within the Beaver Creek watershed and to establish a standardized long-term monitoring program to document future ecological changes. A total of 12 permanent repeat photography monitoring locations were established throughout the Beaver Creek watershed at sites selected for their unobstructed views of the surrounding landscape and their proximity to areas where Beaver Dam Analogs (BDAs) are planned for installation. Of the twelve monitoring locations, four were established by relocating historical photo points from the early 2000s to facilitate direct comparisons of habitat conditions over time. Because the historical photographs did not include GPS coordinates, the original camera locations were approximated by aligning mature trees and other persistent landscape features with their younger counterparts visible in the historical photographs. The remaining eight photo points were established to provide baseline imagery for future repeat photography.

Each monitoring location was permanently marked by installing a metal rebar stake fitted with a safety cap and red flagging tape labeled with a unique site identifier to assist relocation during future monitoring events. GPS coordinates for each photo point were recorded in the field and uploaded to an online database using the QuickCapture app. To ensure photographs could be replicated as accurately as possible, a tripod was levelled prior to image capture, and the height from the centre of the camera lens to the ground surface was measured and recorded for each location. We also recorded the direction the camera was pointed and included a meter stick in the photos for size referencing, and we recorded a brief description of the location where the camera was located. In addition, one or more reference photographs were taken from positions of at least 2m to the side of the camera location to assist future field technicians in relocating the photo point and reproducing the original camera angle (Higgs & Huggins, 2026). All photographs were captured using a Fujifilm X-T1 digital camera. Following field collection, image brightness and saturation were adjusted using GIMP (Version 3.0.2-1) to improve image clarity and facilitate visual comparison between historical and contemporary photographs.

4.4 360-Degree Repeat Photo Monitoring

A 360-degree repeat photo monitoring system was established within the Beaver Creek watershed to provide baseline imagery for future assessments of ecological change. Unlike the repeat photography monitoring locations, these sites did not have historical photographs available for comparison and therefore represent a new long-term monitoring framework established for future repeat surveys. A total of six 360-degree photo monitoring locations (distinct from the fixed 4.3 repeat photo-point monitoring locations) were selected throughout the watershed based on having clear views of surrounding habitat conditions and their proximity to areas where Beaver Dam Analogs (BDAs) are planned for installation (Higgs & Huggins, 2026). At each monitoring location, the 360-degree camera was mounted to a permanent rebar stake fitted with a safety cap and red flagging tape labeled with a unique site identifier to assist relocation during future monitoring events. The height from the centre of the camera lens to the ground surface was measured and recorded to ensure future photographs could be collected from a consistent height. In addition, one or more reference photographs were taken from positions of at least 2m to the side of the camera location to assist future field technicians in relocating the photo point and reproducing the original camera angle, as instructed by Eric Higgs and Adam Huggins (Personal communication, 2026).

Images were captured using an Insta360 X3 camera, which provided a complete panoramic view of the surrounding landscape. Due to the panoramic nature of 360-degree imagery, field technicians ensured they were positioned outside the camera's field of view during image capture to prevent obstruction of the recorded landscape. GPS coordinates for each monitoring location were recorded in the field and uploaded to an online database using the QuickCapture app to support future relocation and repeat monitoring efforts.

4.5 Trail Camera Monitoring

Trail camera monitoring was conducted to document wildlife activity within the Great Beaver Swamp and evaluate evidence of current beaver occupancy and potential factors influencing habitat use. Two Bushnell trail cameras were deployed at strategically selected locations based on observations made during the habitat assessment and the methods described by Beskid et al. (2022).

The first trail camera was positioned facing an active beaver lodge to monitor beaver activity and estimate the number of individuals utilizing the lodge. The second trail camera was installed along the edge of the swamp, overlooking established wildlife trails that provided access to suitable woody vegetation used for beaver foraging and dam-building. Camera placement was further informed by evidence of beaver activity, including felled trees and active feeding sites observed during field surveys (see Figure 2). For each trail camera location, we also documented their GPS-coordinates for easy camera retrieval and in case future field technicians want to relocate the locations. Both trail cameras remained deployed from July 8 to July 11, 2026. Images captured during the monitoring period were reviewed to identify wildlife species present, document beaver activity, and record the occurrence of potential predators or other wildlife that may influence beaver habitat use. The information collected supplemented the habitat suitability assessment and provided additional evidence of wildlife use within the Beaver Creek watershed.

Figure 2. A felled tree displaying characteristic beaver chew marks along the edge of the Great Beaver Swamp.
Note. Beaver activity at this location was used to guide placement of the second trail camera overlooking established travel paths to suitable building materials.

5.0 Results

5.1 Beaver Habitat Suitability Assessments

Our assessments of the habitat along Beaver Creek suggest that Great Beaver Swamp was the most suitable for beavers. Unlike the creek, the swamp is stagnant, promoting the growth of many suitable food plants for beavers, such as duckweed (*Lemna spp.*), western yellow pond lilies (*Nuphar polysepala*), slough sedges, and broad-leafed cattail (*Typha latifolia*). Several tree species at the swamp, such as red alder, western red cedar, and Douglas fir, could be used as building materials by beavers. There was also a diverse age structure of building materials, with young red alders growing along the perimeter of the swamp. The main issues with the habitat at the Great Beaver Swamp were human disturbances, such as off-leash dog walking along the trail, and the presence of possible nest predators and competitors, such as river otters (*Lontra canadensis*), raccoons (*Procyon lotor*), and Columbian black-tailed deer (*Odocoileus hemionus columbianus*).

Out of the three creek reaches, reach two was the most suitable for beavers, followed by reach one, then reach three. Overall, the geomorphological characteristics in reach two were suitable for beavers, and there were many possible sources of food and building materials. This reach did not have significant incising and had a gentle gradient (Average = 5%), which is preferred by beavers. The stream substrate, however, was very rocky, and straight bedrock in some areas. Many suitable building materials of diverse age were found in this reach, such as alder, Douglas fir, western red cedar and big leaf maple. Possible food sources on this reach included skunk cabbage, slough sedge, panicled bullrush (*Scirpus microcarpus*), salal, bracken fern, trailing black berry, and stinging nettle. There were human disturbances nearby, such as off-leash dog walking, and deer droppings indicating their presence.

Reach one showed substantial incising and had a stream slope average of over 10%. The substrate was mostly sandy, which is a well-draining material. Reach one also did not have a very diverse age structure of building materials, although plenty of materials were available. No aquatic plants were found along Reach one, but many herbaceous species were present, such as salal (*Gaultheria shallon*), panicled bull rush (*Scirpus microcarpus*), ocean spray (*Holodiscus discolor*) and stinging nettle (*Urtica dioca*). This reach also contained disturbances, such as off-leash dog walking, litter, and noticeable browsing on the ocean spray.

Reach three had a steeper gradient than ideal, with an average slope of 7.5 %. There were a few incising areas along the creek, but some shallower areas as well. This reach had very rocky substrate and exposed bedrock, similar to reach two. Tree species that may be used as building materials along this reach included red alder, Douglas fir, western red cedar, and big leaf maple. This reach had a less diverse age class of building materials, with only a few young maple trees observed. Possible food materials found on this reach were salal, slough sedge, skunk cabbage, red huckleberry (*Vaccinium parvifolium*), and alpine enchanter's nightshade (*Circaea alpina*). As with all the other sites, off-leash dog walking was observed on the nearby trail. Deer droppings were also found in this reach.

5.2 Community Knowledge Conversations

Our participants reported 13 beaver dams between the mouth of Beaver Creek and Great Beaver Swamp since 1999. As beavers are quite elusive and crepuscular, our interviewers did not recall any recent beaver sightings along the creek. Most of the beaver sightings on Galiano Island are on agricultural lands, rather than in remote areas with low foot traffic at night, such as Beaver Creek.

Neither of our sources mentioned a specific barrier preventing Beavers from returning downstream. There is a grated culvert downstream of Great Beaver Lake where a beaver had been trapped before. However, when asked about the grate, one interviewee said it is unlikely to be a significant barrier blocking beaver migration.

One possibility proposed by a respondent is that the beavers might not have enough kits for dispersal throughout the watershed. Beavers can be quite prolific. A typical beaver pair will have three kits a year on average, and a family unit can hold up to 8 (Taylor et al., 2017). However, visual observation of the swamp revealed two potential nest predators in the area: otters and raccoons. It is possible their populations are not rising due to external pressures, such as nest predation.

It is common for beavers to abandon certain locations and migrate to more suitable habitat. Both of our respondents suggested the beavers may have moved upstream to find more suitable habitat, as there has been a clear fluctuation in the beaver populations on Galiano Island. One suggested that the water levels in the creek are too low in the summer for beavers to build a proper reservoir. Another suggestion was that there may have been more young alders in the area previously, but many have been shaded out by the plantation Douglas fir trees. Beavers may have originally moved down the creek because they had reached carrying capacity within the swamp regions; they may now have enough resources to sustain the population and have no need to travel downstream.

Because beavers are hardy generalists and do not require a specific type of food, geomorphology and hydrology are likely a stronger predictor of beaver presence than food source. However, to explain why they have not returned downstream in over two decades, it may be that food is plentiful at the Great Beaver Swamp. Finding new habitat is a risk that may not be worth taking if they already have enough food where they are.

5.3 Repeat Photography

ES471 - Beaver Creek

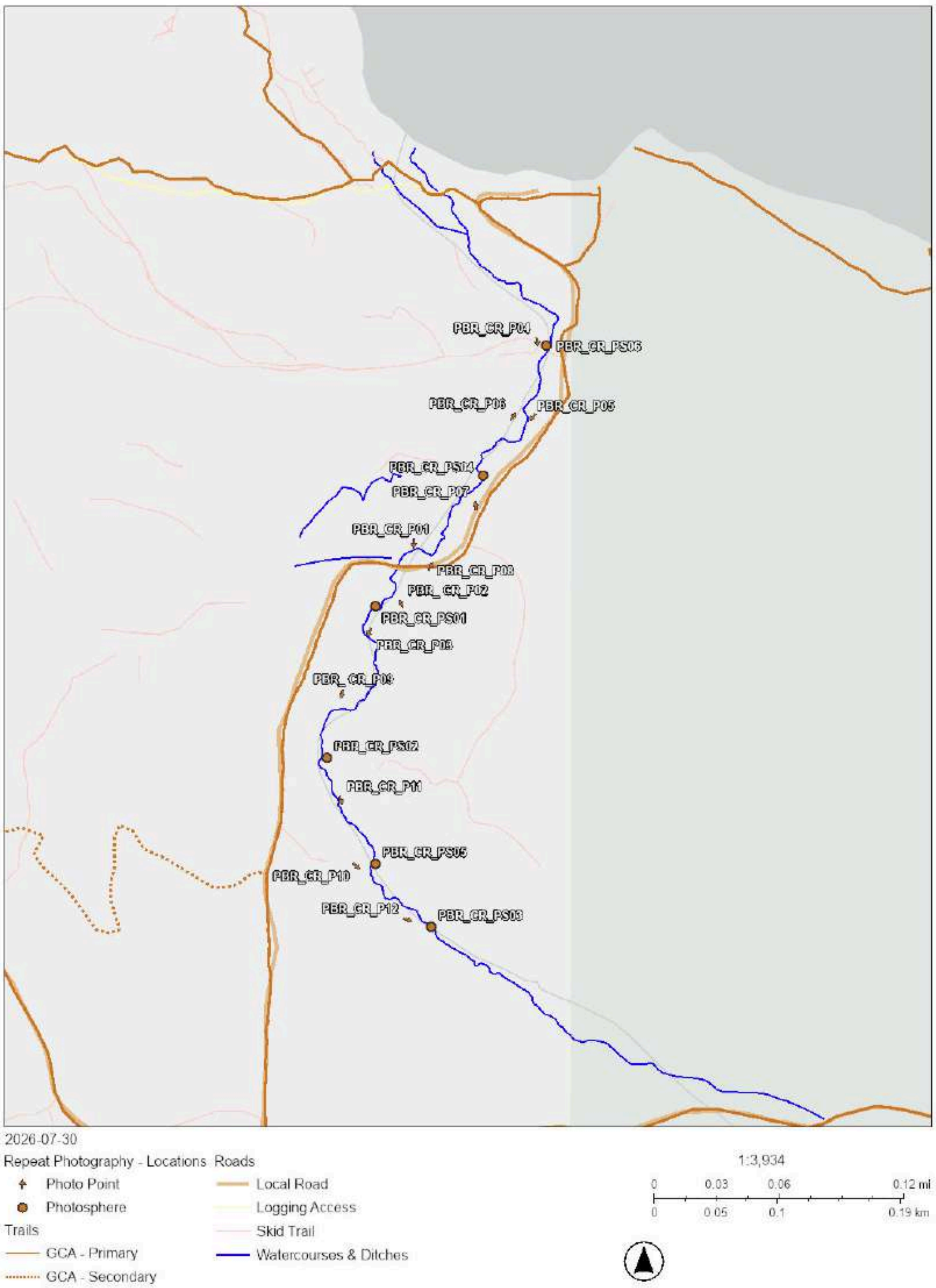

Figure 3. Photo-point locations along reach 2 and 3 of Beaver Creek
Note. See Appendix for coordinates and Figure 8a. in the Appendix for a map of the three Reaches and the Great Beaver Swamp.

A total of six landscape photographs were taken in reach two of Beaver Creek and six more were taken in reach three. Figure 3 demonstrates the locations for each of the photopoints, and the reference photos can be viewed in Section 10.0, the Appendix. In preparation for Beaver Dam Analogue (BDA) construction, the Galiano Conservancy Association (GCA) logged multiple conifers along Reach three of the creek. Cedar and fir branches were placed in water to prevent dessication, and logs were left along the creek floor. Some of the logs and branches were captured in our images and are not part of the natural landscape.

Figure 4. Repeated photograph of Photo CR_PBR_P01 in Reach 2 of Beaver Creek. The first photo was taken in 2004 (left) and the second photo was taken in 2026 (right).

Figure 5. Repeat photograph of Photo CR_PBR_P02 in Reach 2 of Beaver Creek. The first photo was taken in 2004 (left) and the second photo was taken in 2026 (right).

Figure 6. Repeat photograph of Photo CR_PBR_P03 in Reach 3 of Beaver Creek. The first photo was taken in 2004 (left) and the second photo was taken in 2026 (right).

Figure 7. Repeat photograph of Photo CR_PBR_P11 in Reach 3 of Beaver Creek. The first photo was taken in 2004 (left) and the second photo was taken in 2026 (right). **Note.** The red dot indicates the same tree in both photos.

Figures 4 to 7 demonstrate 22 years of change along Beaver Creek. Although the photos from 2004 were taken in the winter, a significant shift can be observed in the structure and composition of the vegetation. Each figure shows the extent of floodplain loss. The floodplain has been replaced by a narrow incised creek, and bracken ferns are the dominant understory plant. Figures 4 and 7 show the most dramatic changes in hydrology, as a large beaver dam has been lost along with its water reservoirs. Figure 7 also shows the conifer branches placed within the creek for BDA construction.

5.4 360 Photos

Two photosphere images were taken in each reach of Beaver Creek. The photos can be found in the Appendix.

5.5 Trail Cameras

Two trail cameras were set on the south side of the Beaver Swamp. Our cameras captured a racoon, but no other wildlife including beavers.

6.0 Discussion

As stated previously, beavers are ecosystem engineers creating and sustaining biodiversity within a landscape. Beavers have the ability to modify ecosystems in order to fulfill their ecological needs (Brazier et al. 2021). As ecosystem engineers, beavers have large geomorphic, hydrological, and ecological impacts (Brazier et al. 2021). Not only do they modify the landscape to their benefit they create valuable habitat for other species that thrive in wetland ecosystems (Brazier et al. 2021). When beavers are lost from an ecosystem areas of stored surface water disappear, river velocity increases, and flash floods become more prominent (Brazier et al. 2021). The loss of these ecosystem engineers also leads to a decrease of carbon in the water, wetlands drying up, losing the biodiversity they once facilitated, and simplification of riparian ecosystem structure and function (Brazier et al. 2021).

When beaver(s) inhabited lower Beaver Creek in the late 1990s and early 2000s, they significantly altered the creek's morphological and hydrological conditions. Since then, the habitat has changed in ways that may no longer benefit the beavers' return. Habitat characteristics that determine whether a beaver will reside within a creek include geomorphological, hydrological and vegetative characteristics as well as patterns of disturbance. Here we have analyzed the results of our habitat assessment to examine what the barriers may be to the beavers' return.

6.1 Geomorphology

Habitat suitability decreases with increasing stream gradient and many studies have found that stream gradient is the most significant variable in habitat selection for beavers (Touihiri et al., 2018; Suzuki & McComb, 1998). In their study in the Oregon Basin, Suzuki and McComb (1998) did not observe beaver dams on streams with a gradient greater than 10% and they concluded that gradients of less than 3% are optimal. They assumed that the slope suitability decreased linearly from 3% to 10% (Suzuki & McComb, 1998). Another study in Colorado found that the majority of beaver colonies were located on streams with gradients less than 6% (Matchuk, 2024). Reaches one and three had a slope greater than 6%, meaning their conditions are not optimal for beaver colonization (Matechuk, 2024). The construction of BDAs in these areas may decrease the stream gradient over time by trapping sediment and thereby raising the streambed directly upstream of the BDA (Pearce et al., 2021).

In Suzuki and McComb's (1998) study, they found that narrow streams that are 3 to four meters wide are optimal and they did not observe any dams on streams greater than 10 meters or less than two meters wide. This is because wide, steep, deep streams tend to have high discharge and velocity, which can make it difficult for beavers to build dams strong enough to withstand floods (Suzuki & McComb, 1998; McComb et al., 1990). Every reach had a width of less than 10 meters, meaning that stream width should not be a barrier to dam construction.

Suzuki and McComb's (1998) also found that floodplain size was an important variable in determining habitat suitability. They recorded no dams in valleys narrower than 10 meters and found that most dams were in valleys 25-35 meters wide (Suzuki & McComb, 1998). Beavers prefer valleys wider than 10 meters because steep, narrow valleys facilitate easy transport of food and materials and slow the velocity of water and valleys with narrow or non-existent floodplains often have steep gradients (Slough and Sadleir, 1977; Touihiri, 2018). None of the reaches had an active floodplain and Reaches two and three had valleys narrower than 10 meters wide.

McComb et al. (1990) found that a shallow riparian slope was optimal for beaver habitat. Conversely, a previous study by Dieter and McCabe (1989) on the prairie river found that beavers preferred a steep riparian slope because the sloping bank would create a deeper stream, allowing for multiple underwater entryways. Since there were conflicting results regarding the effects of riparian slope, we did not include this factor as a habitat suitability indicator in our survey.

We assessed streambed substrate because beavers tend to build dams on soils such as silt, dirt and clay rather than on rocky substrate or bedrock (Slough and Sadleir 1977; Touihiri et al., 2018). However, there is some uncertainty in the literature on whether this tendency is due to beaver substrate preferences or because coarse rocky substrate and bedrock are often correlated to steep stream gradients. Reaches two and three had rocky streambeds with exposed bedrock, meaning that the substrate characteristics here were less than optimal for beavers (McComb et al., 1990). A community member also mentioned that when beaver dams were present on the lower stream, they likely stopped or slowed water flow, allowing sediment to settle to the bottom and raising the streambed. Following the BDA installation, the dams could function to trap sediment, providing the type of substrate beavers like.

Physical characteristics of a stream are more important determinants in site selection for beavers than vegetation composition (Suzuki and McComb, 1998; McComb et al., 1990). If only one of the geomorphological requirements for beaver establishment is not met, it can prevent beavers from establishing in the area (Suzuki and McComb, 1998).

6.2 Hydrology

A consistent year-round supply of water with seasonally stable discharge and water level is widely considered essential for suitable beaver habitat (Allen 1983; Slough and Sadlier 1977; Rosell, 2022). We were not able to measure the variability in stream discharge throughout the year, but we were able to gather qualitative information on hydrological discharge through conversations with community members and observations while visiting the site in mid-July 2026. We established that there is a year-round flow of water, but it drops to very low levels in the summer, which is not optimal. Gathering quantitative streamflow data would provide useful information to examine whether consistent and stable streamflow is a barrier.

Beavers prefer streams with slow-moving water and a depth of at least 0.6–1.0 m (Rosell, 2022). All three reaches had channel widths of less than 10 meters, meaning stream width is unlikely to be a limiting factor for beavers' return to the lower creek. We were not able to measure and compare the year-round depth of the stream. The installation of analog beaver dams may help improve hydrological conditions by lowering the stream gradient, widening the floodplain, and slowing and retaining water flow (Pearce et al., 2021).

While watershed size has been considered in some studies to determine the likelihood of beaver colonization in an area, we did not include this in our study given we know that beavers currently inhabit the Beaver Creek watershed in the Great Beaver Swamp.

6.3 Vegetation

Beaver foraging decreases with increasing distance from the stream channel and it is widely agreed that beavers remain within 100 meters of the shoreline when foraging (Touihiri et al., 2018). Building materials include alder, Douglas fir, western red cedar and big leaf maple. They prefer to use deciduous trees as building materials but they can survive in predominantly coniferous areas if necessary (Touihiri et al., 2018; Rosell, 2022). Previous findings suggest that the choice of materials depends more on the trunk diameter rather than on the species with beavers preferring trees with small stem diameters (Touihri et al., 2018; Barnes & Mallik, 1996). Reaches one and three lacked a diverse age range of building materials within 30 meters of the channel. Most of the trees at sites one and three were young and of a similar age. However, all the reaches had suitable building materials within 30 meters of the channel. Near the Beaver Swamp, we observed that beavers had cut down alder, fir and cedar close to the shoreline.

Beavers have a diverse diet and will eat woody trees, herbaceous plants, shrubs and aquatic plants. Common tree food sources for North American beavers are trembling aspen (*Populus tremuloides*), cottonwood (*Populus deltoides*), alder trees, willow (Salix spp.), balsam poplar (*Populus balsamifera*), paper birch (*Betula papyrifera*), and american mountain ash (*Sorbus americana*) (Jenkins, 1980; Touihri et al., 2018; Slough and Sadleir, 1977; *Beaver; Canadian Beaver; North American Beaver,* 2021). Beavers typically prefer herbaceous vegetation to woody vegetation such as salmonberry (*Rubus spectabilis*), bracken ferns and some grasses and sedges (Allen, 1982; Touihri et al., 2018; Suzuki & McComb, 1998; Government of British Columbia n.d.; Jenkins, 1975). Aquatic plants are also an important food source for them. They eat the rhizomes and roots of aquatic vegetation, including duck potato (*Sagittaria latifolia*) , pondweed, cattail, water lilies (Jenkins, 1975; Allen, 1982).

In all reaches of the stream, there were abundant woody and herbaceous food sources, but there was a widespread lack of aquatic plants, which may pose a barrier to their return. However, beavers are highly adaptable in their food sources and can survive in areas dominated by coniferous trees (Touihiri et al., 2018). Given their opportunistic feeding habits, the topographic and hydrological conditions of a site are likely more important than food types in determining habitat suitability (Jenkins, 1980). The installation of analog dams could create better hydrological conditions that promote more aquatic and herbaceous vegetation growth.

6.4 Disturbance

Beavers are known to live close to some human activity if their habitat requirements are met. However, large disturbances such as roads, vegetation removal, development and railways can affect habitat suitability (Rue 1964; Slough and Sadleir 1977). The human disturbances around Beaver Creek are minor and include only trails, litter, and noise pollution therefore, this should not be a barrier to their reestablishment.

We observed river otters and raccoons in and around the Great Beaver Swamp. A study in Maine by Dubuc et al. (1990) found that river otters were abundant in beaver ponds because they preyed on their young. As suggested by one of our interviewees, nest predation could be keeping the beaver population from growing, which in turn discourages dispersal downstream by sub-adults.

6.5 Behaviour

Our in-the-field habitat assessment did not consider beaver behaviour in terms of recolonization barriers. To determine how beaver behaviour may affect recolonization of Lower Beaver Creek, we have looked at previous studies on beaver behaviour to determine what may inhibit or encourage their return.

When beavers inhabit an area, they tend to use a landscape intensively for approximately two to five years before they move away to let it recover for approximately two to ten years before returning (Touihri et al., 2018). This may be what happened in Lower Beaver Creek; the timeline roughly matches this behavioural pattern, but the reason they never returned to work the landscape again is more elusive. Sometimes, beavers will inhabit a site for multiple generations, such as in the case of the Great Beaver Swamp (Hood, 2020). Beavers have inhabited the Great Beaver Swamp for much longer than five years therefore, we hypothesize that there are still abundant resources for the number of beavers living in the area.

Beaver colony territories do not overlap and are distinct (Hatler & Beal, 2003). Colony sizes vary between one or two beavers and up to 12 or 15 beavers (Hatler & Beal, 2003). In Alaskan rivers, where habitat was optimal, the average distance between colonies was 1.59 km, with the closest colonies 0.48 km apart (Touihiri et al., 2018). If beavers behave similarly here, we expect a new colony to want to establish at least half a kilometre away from the dams and lodges. Beavers' home range (the area they regularly use for daily activities) varies depending on sex, age, social organization, habitat type, season and family unit organization (Touihiri et al., 2018). Colonies may establish and use multiple lodges or bank burrows and when populations are low, colonies will recolonize vacant dams and lodges of nearby colonies (Slough and Sadleir, 1977). Beavers would rather recolonize abandoned lodges or dams instead of building new ones (Slough and Sadleir, 1977)

Young beavers will leave the colony when they are between one and three years old to search for new habitat. The age at which they leave the colony depends on the quality of their habitat and the carrying capacity (Slough and Sadleir, 1977). Subadult beavers have been documented emigrating long distances (an average of 8 to 16 stream km) during the late winter or early spring of their second year (Slough and Sadlier, 1977; Touihiri et al., 2018). Young beavers' high mobility means that travelling between the Great Beaver Swamp and Lower Beaver Creek should not be a barrier to emigration. Adult beavers are non-migratory.

6.6 Conversations

In conversations with one current employee of the Galiano Conservancy, a former employee of the Galiano Conservancy, and a master's student studying wetlands on Galiano Island, we were able to learn more about the history of the creek and record their observations and insights into when and why the beavers left and what may be inhibiting their return.

The individuals had several hypotheses about why the beavers may have come and left the lower Creek. One mentioned that following the reconstruction of dams in the Great Beaver Swamp, the beaver population may have experienced a boom and resources may have begun to dwindle, thereby incentivizing beavers to emigrate down the creek. They also said that the resources at the Great Beaver Swamp may currently be abundant enough to support the present beaver population that the beavers would have no incentive to emigrate downstream. One mentioned that they did not feel like any significant barriers were preventing them from moving downstream, other than maybe the metal grate near the head of the creek where a beaver once got trapped.

One mentioned that the forest around the lower creek looks relatively similar to what it looked like when the beavers were there over 20 years ago. However, the trees are older now and they observed that there are fewer alders at the site, possibly because they are being shaded out by the plantation Douglas firs. There is also less salmonberry at the site which could be due to the booming deer population on the island. They noted that, with a changing climate, water levels may be lower than before, which may make the site less appealing.

Similar to our observations of the photo points taken in 2004, two residents noted that the stream was much wider and the water level was higher in the early 2000s. The last confirmed sighting of a beaver on the lower creek was in 1998.

6.7 Photo Point Monitoring

Our photo points on the Lower Beaver Creek will provide baseline data prior to the installation of BDA's along the stream, allowing future researchers to go back and repeat post-project to document how the stream and ecosystem have changed. By returning to the approximate location of four previous photos taken in 2004, we were also able to get a visual of how the stream has changed since then, which reinforces the significant role beavers play in shaping the creek and provides a permanent visual record of how much the landscape has changed between 2004 and 2026. By looking at the conditions in 2004, we can gather a sense of what we are aiming for post-BDA construction. Recording changes on the landscape also can build community trust in the project and show the benefits of restoration in what is a very publicly accessible location.

Due to time constraints and physical landscape barriers, we were not able to capture every area of the Creek, meaning some sections are not featured in our photos. There were no coordinates associated with the photos taken in 2004 therefore, the locations and height at which we repeated the photos from 2004 were not exact. Lastly, the 2004 photos were taken sometime during the winter when the trees did not have any leaves, whereas our photos were taken in July on sunny days, which makes it more difficult to compare.

7.0 Recommendations and Future Directions

The findings of this study indicate that the Beaver Creek watershed currently provides suitable habitat to support an active beaver colony. However, several opportunities exist to improve understanding of the watershed and enhance conditions that may facilitate the continued expansion of beaver activity throughout the system.

7.1 Habitat Enhancement

Improving the availability of preferred beaver forage and construction materials should also be considered as part of future restoration efforts. Although suitable vegetation was present within portions of the watershed, increasing the abundance of preferred construction woody species such as red alder (*Alnus rubra*) and willow (*Salix* spp.) could improve the long-term carrying capacity of the site. These species are commonly selected by beavers for both forage and construction material (Barnes & Mallik, 1996; Jenkins, 1975). Similarly, increasing the abundance of aquatic vegetation, used by beavers as winter food resources, would help ensure a reliable food supply throughout the year and further enhance habitat suitability. It is also of note that beavers prefer herbaceous plants over woody plants in all seasons as food plants, therefore herbaceous plants need to be planted as well as woody construction species (Allen, 1982).

7.2 Beaver Population Monitoring

A primary recommendation is to continue trail camera monitoring over a longer time period. The three-day monitoring period provided only a brief snapshot of wildlife activity and was insufficient to accurately estimate the size of the resident beaver colony or evaluate seasonal patterns in habitat use. Extending trail camera monitoring over several months would allow for a more reliable assessment of colony size, lodge occupancy, reproductive success, and the frequency of beaver activity. Long-term monitoring would also help determine whether the existing colony is large enough to disperse downstream (Allen, 1982) and colonize additional sections of Beaver Creek where future Beaver Dam Analogs (BDAs) are planned.

7.3 Wildlife Predation and Human Disturbance

Future monitoring should also continue to evaluate the influence of predators and human disturbance on beaver behaviour. Field surveys documented the presence of a river otter with their long, slender body, short legs, brown fur, and a long, thin, tapered tail, unlike the broad, flat tail of a beaver within the watershed. Along with recorded frequent off-leash dog activity along recreational trails. Predator presence has been shown to influence beaver movement patterns and foraging behaviour, often resulting in reduced use of feeding areas when predation risk is perceived (Salandre et al., 2017; Severud et al., 2011). River otters have been documented to occupy similar wetland habitats and may interact with beavers, particularly at lodges and waterways (Newman & Griffin, 1994) in other regions, so this may be the case for Galiano island too. Although domestic dogs are not natural predators, repeated disturbance from a perceived predator like off-leash dogs may also discourage beavers from utilizing otherwise suitable habitat (Severud et al.,2011). Continued monitoring would improve understanding of how these factors influence beaver occupancy and whether management actions are required.

7.4 Public Education and Stewardship

During field surveys, litter was observed at several locations along the watershed. Although the quantity of litter was relatively low, discarded waste has the potential to negatively affect wildlife through ingestion, entanglement, and habitat degradation. Installing updated educational signage at trailheads and other high-use access points could encourage responsible recreation by informing visitors about the ecological importance of Beaver Creek, the role of beavers as ecosystem engineers, and the impacts that litter and disturbance can have on wildlife and habitat quality. Educational signage may also encourage trail users to properly dispose of waste and keep dogs under effective control in sensitive habitat areas.

7.5 Long-Term Monitoring and Adaptive Management

Following the installation of Beaver Dam Analogs (BDAs), the monitoring methods established in this study should be repeated at regular intervals to evaluate restoration success. Repeat habitat suitability assessments, photo-point monitoring, 360-degree photography, trail camera surveys, and community knowledge interviews will provide valuable long-term datasets for measuring changes in floodplain connectivity, riparian vegetation, wildlife activity, and overall habitat suitability. Comparing this data with the baseline conditions documented in this study will allow restoration practitioners to determine whether BDAs are successfully restoring ecosystem processes, improving habitat quality, and encouraging the downstream expansion of the resident beaver colony. Continued long-term monitoring will also support adaptive management by identifying when restoration objectives are being achieved or when additional management actions are required (Touihri et al., 2018; Rosell & Campbell-Palmer, 2022).

8.0 Conclusion

This study provides a wide-ranging assessment of the current ecological condition of the Beaver Creek watershed and establishes an important baseline for future restoration and monitoring efforts. Through habitat suitability assessments, repeat photography, 360-degree photo monitoring, trail cameras, and community knowledge conversations, we identified several factors that may be influencing the absence of beavers from the lower reaches of Beaver Creek while confirming that much of the watershed continues to provide suitable habitat for beaver occupancy. Although geomorphological challenges such as stream incision, reduced floodplain connectivity, seasonal low water levels, and limited aquatic vegetation may reduce habitat suitability in some reaches, the watershed retains abundant forage, construction materials, and the capacity to support beaver activity.

The long-term monitoring network established through this project will allow future practitioners to evaluate ecological change following the installation of Beaver Dam Analogs (BDAs) and other restoration initiatives. By documenting pre-restoration conditions, this study provides a valuable reference against which future changes in channel morphology, hydrology, riparian vegetation, and wildlife activity can be measured. Continued monitoring will also improve understanding of how beaver populations respond to restoration efforts and whether habitat conditions continue to improve over time.

Ultimately, the return of beavers to the lower reaches of Beaver Creek would restore a key ecological process that has historically shaped the watershed. As ecosystem engineers, beavers have the potential to reconnect floodplains, increase water storage, enhance habitat complexity, and improve ecosystem resilience in the face of ongoing environmental change (Rosell & Campbell-Palmer, 2022; Touihri et al., 2018). While the exact reasons for their continued absence remains uncertain, the findings of this study suggest that targeted habitat enhancement, long-term monitoring, and adaptive management provide a promising path toward restoring the ecological function of Beaver Creek and supporting the eventual downstream expansion of its resident beaver population. Our project pairs well with the Galiano Island Conservancy's "Beaver Creek Restoration Plan" and will provide foundational knowledge that can be referred to throughout the restoration process as the landscape begins to change.

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10.0 Appendices

10.1 Repeat Photography

Photo Code: CR_PBR_P01
Reach: 2

Site Coordinates: 48.947234°N, 123.489206°W

Type: Photo

Photo Number: 1

Comments: Northside of bridge. Across from the creek. In Salal and sword fern, with 3 fallen logs in front of the camera placement.

Photo Code: CR_PBR_P02
Reach: 3

Site Coordinates: 48.946818°N, 123.489339°W

Type: Photo

Photo Number: 2

Comments: On the south side of the bridge. Around 30m away. At the foot of the trunk of Douglas fir. Looking at potential flood zones.

Photo Code: CR_PBR_P03
Reach: 3

Site Coordinates: 48.946620°N, 123.489676°W

Type: Photo

Photo Number: 3

Comments: In sedge mound, next to original creek. A large fallen tree south of camera. Leaning alders on the river right. Tripod set within sword ferns not on plain soil.

Photo Code: CR_PBR_P04
Reach: 2

Site Coordinates: 48.948631°N, 123.487903°W

Type: Photo

Photo Number: 4

Comments: Facing upstream. In an area of at risk trees. Perched in fern and salal. Just at the first river crossing at the beginning of reach 2 end of reach 1.

Photo Code: CR_PBR_P05
Reach: 2

Site Coordinates: 48.9948110°N, 123.487950°W

Type: Photo

Photo Number: 5

Comments: Between BDA 39 and 40, closest to 40. Looking upstream SW into the cedar conglomerate. 7 alders across the creek. 5-8 meters away from the trail.

Photo Code: CR_PBR_P06
Reach: 2

Site Coordinates: 48.948114°N, 123.488156°W

Type: Photo

Photo Number: 6

Comments: Across from P05. Looking NE down stream. 3 cedars behind us. One big alder in front. Stream on our right if facing down stream. In an open understory area to the left of the tripod. Above salal and sword fern.

Photo Code: CR_PBR_P07
Reach: 2

Site Coordinates: 48.947496°N, 123.488550°W

Type: Photo

Photo Number: 7

Comments: 2 meters off trail in Salal and sword fern bush. Facing downstream N. Alder to the left. Facing sedge meadow/old flood zone.

Photo Code: CR_PBR_P08
Reach: 2

Site Coordinates: 48.947076°N, 123.489027°W

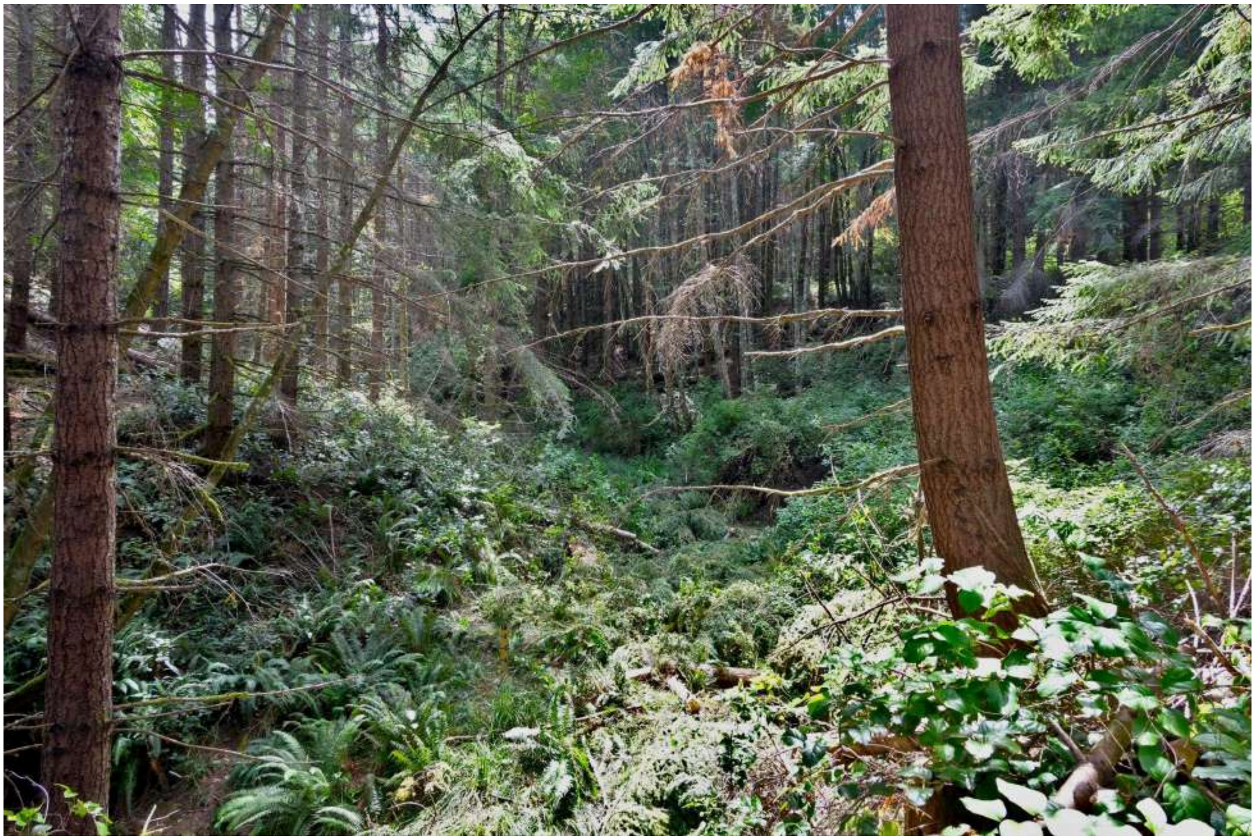
Type: Photo

Photo Number: 8

Comments: Along trail after second crossing bridge. Right before reach 3 ends. Camera looking NE down stream. Right beside Douglas fir and a hemlock tree on left and trail on right.

Photo Code: CR_PBR_P09
Reach: 3

Site Coordinates: 48.946193°N, 123.489964°W



Type: Photo

Photo Number: 9

Comments: On the side of the river bank uphill. Looking up stream on hillside. Nursery stump to the right with huckleberry on it.

Photo Code: CR_PBR_P10
Reach: 3

Site Coordinates: 48.945000°N, 123.489809°W

Type: Photo

Photo Number: 10

Comments: Facing up stream. 5 alders coming out of the same trunk on left and Douglas fir on right. Looking at sedges. It is on hill side 4-5m up from the creek. In an open potential flood plain.

Photo Code: CR_PBR_P11
Reach: 3

Site Coordinates: 48.945455°N, 123.489976°W

Type: Photo

Photo Number: 11

Comment: Repeat photo facing upstream. Two alders coming out of one twisty trunk. Left side of creek if facing upstream. Near an old dam.

Photo Code: CR_PBR_P12
Reach: 3

Site Coordinates: 48.944627°N, 123.489267°W

Type: Photo

Photo Number: 12

Comments: Camera facing upstream. 2 alders in the middle/front of the shot. Tripod location between 2 mossy alders about 3m up from the stream. Behind us is a mossy nursery stump with huckleberry.

Photo Code: CR_PBR_PS01
Reach: 2

Site Coordinates: 48.946800°N, 123.489608°W

Type: 360 Photo Sphere

Photo Number: 13

Comments: In flood plain. 1m ish from the original meandering creek. South side looks at 4 alders, North facing side looks toward bridge. Located slough sedge mound.

Photo Code: CR_PBR_PS02
Reach: 3

Site Coordinates: 48.945750°N, 123.490121°W

Type: 360 Photo Sphere

Photo Number: 14

Comments: By BDA 21, downstream of a large set of alders.

Photo Code: CR_PBR_PS03
Reach: 3

Site Coordinates: 48.944578°N, 123.489020°W

Type: 360 Photo Sphere

Photo number: 15

Comments: Upstream of PAL 7, next to the eroded bank.

Photo Code: CR_PBR_PS04
Reach: 2

Site Coordinates: 48.947706°N, 123.488474°W

Type: 360 Photo Sphere

Photo Number: 16

Comments: By BDA 48

Photo Code: CR_PBR_PS05
Reach: 3

Site Coordinates: 48.945016°N, 123.489610°W

Type: 360 Photo Sphere

Photo Number: 17

Comments: Directly upstream of BDA 30. Next to downed logs on the left side of the creek.

Photo Code: CR_PBR_PS06
Reach: 1

Site Coordinates: 48.948605°N, 123.487805°W

Type: 360 Photo Sphere

Photo Number: 18

Comments: In reach, within a small clearing. On the left side of the creek facing down. Directly in front of a stand of dead alders and behind salal.

10.2 Beaver Habitat Suitability Assessment Table

GEOMORPHOLOGY	YES/NO	OBSERVATIONS
Stream incision does not reduce beaver habitat suitability		
Stream width is less than 10 m		
Stream gradient is under 6 % (3% gradient is optimal and over 10% is inhospitable)		
Stream is moving slowly		
The valley width is larger than 20 m		
There is an active floodplain		
Stream substrate is not rocky and is composed of poorly drained soil		

VEGETATION	YES/NO	OBSERVATIONS
Suitable building materials are found within 30 m (e.g. poplar (*Populus* spp.), willow (*Salix* spp.), alder (*Alnus* spp.) or birch (*Betula* spp.))		
Diverse age structure of building materials		
Plants exhibit high vigor and strong root masses		
Presence of suitable food		

plants (salmonberry, alder (*Alnus spp.*), aspen, cottonwood, willow, birch, maple, cherry, sedges, pondweed, cattail duckweed, bracken fern, and water lilies)		
There are gaps in the canopy		

DISTURBANCE	YES/NO	OBSERVATIONS
Are there signs of human disturbance?		
Are there signs of dog walking?		
Is there a lot of anthropogenic sound?		
Are there signs of deer or otter activity?		

Table A1. Blank Beaver Habitat Suitability Assessment checklist used during field surveys of the Beaver Creek watershed.
Note. The assessment evaluated geomorphological, vegetation, and disturbance characteristics relevant to beaver habitat suitability.

10.3 Reach Maps

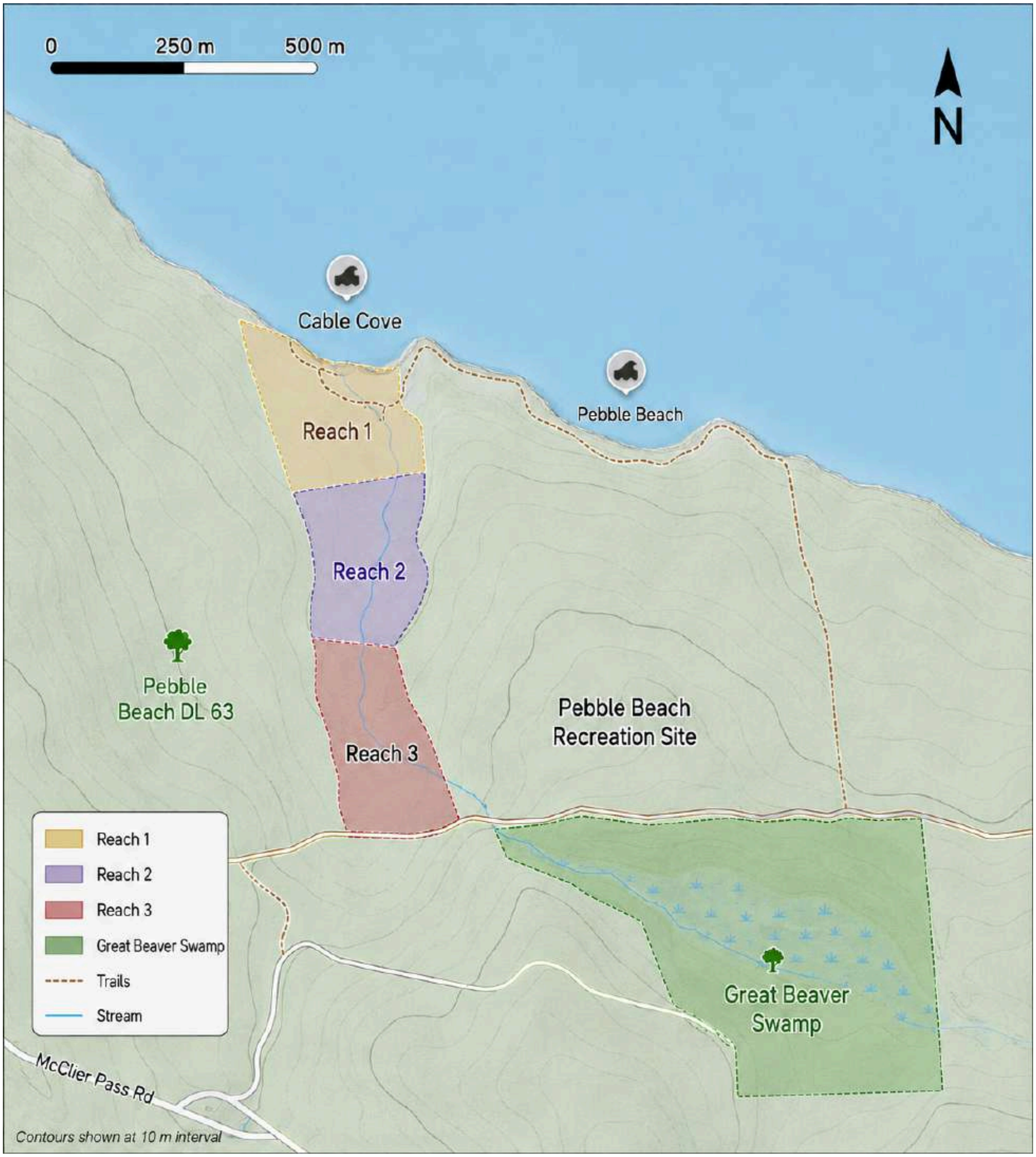


Figure A1. Map of the three reaches along Beaver creek.