



Forest Restoration in Kanaka Creek Regional Park

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A restoration project to replant a 305m² site near 108 Loop,
Kanaka Creek Regional Park in Maple Ridge, British Columbia

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Abstract

Kanaka Creek Regional Park is an ecologically significant space in Maple Ridge, British Columbia, also holding cultural and recreational value to the community. The creek meanders through protected park land, encompassing young forest that is growing on top of sandy and silty soils. Recent off trail use by bicycles has damaged vegetation growth and compacted soil at a site down trail from the 108 Loop entrance to the park. This site was selected as a suitable restoration project for the Restoration of Natural Systems program at University of Victoria. With a partnership between Metro Vancouver Regional Parks and Kanaka Education and Environmental Partnership Society (KEEPS), and with the support from Pacific Parklands Foundation's George Ross Legacy Stewardship Program, this project was made possible.

The project goals were to decrease human impact to the site by hiding unsanctioned trails, and limit visibility behind the new split-rail fence by creating a natural plant barrier. Paired with this goal is another to facilitate recovery of the native plant community by planting over ten different native species to match surrounding vegetation. Using a terrestrial ecosystem mapping (TEM) approach the goals were to be met by mapping the site, conducting a remote site analysis, and completing ground inspections before ordering materials. Soil from Nutrifor and plants from NATS nursery supported the recovery of vegetation at this site, with the help of a dedicated team of staff and volunteers. These efforts contribute to the maintenance and management of a park that provides significant habitat connectivity for black bears. To further support park management, community engagement and education initiatives helped promote positive park practices. Engagement and education are part of a tertiary goal, to improve local black bear awareness in places where bear sightings are common. This goal was met through educational displays and conversations in the park, with the Metro Vancouver Park Interpretation Team and KEEPS Education Coordinator. Together, the ecological restoration activities and community engagement made this project a success.

Acknowledgements

I would like to express gratitude to **Janice Jarvis**, Metro Vancouver Natural Resource Management Specialist for overseeing this project and coordinating materials. Her extensive knowledge provided great guidance. I would like to share an enthusiastic thanks to **Roy Teo**, Metro Vancouver Natural Resource Management Technician for the on-the-ground support towards site preparation and planting. His continuous positivity and practical suggestions are always appreciated.

Many thanks to **Ross Davies**, Kanaka Education and Partnership Society's Education Coordinator, for his involvement every step of the way in this project, including being there for photographs when I couldn't be.

I'd like to gratefully acknowledge the assistance from the Kanaka Creek Regional Park operations team, led by **Jason Leroux**. A special mention to **Rachael Dolina**, Metro Vancouver Park Ranger and former Kanaka Creek Regional Park Patroller, someone who supported this project from the very beginning, including dealing with the initial site damage and for being an advocate for environmental education.

Lastly, the efforts of **Vanessa Lee**, Metro Vancouver Park Interpretation Specialist should be recognized as she continues to act as a liaison between the Park Interpreters and partner organizations, prioritizing in-park bear education efforts.

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INTRODUCTION

1.1 Introduction to Kanaka Creek Regional Park

Kanaka Creek is a 22 km tributary of the Fraser River in Maple Ridge, British Columbia (BC). It's located in the Fraser Lowland eco-section known for its rich biodiversity (Barsanti & Iredale, 2005). Kanaka Creek meanders through lush Coastal Western Hemlock (CWH) forests, steep canyons, and open marshland fields, offering a heterogeneous habitat and suitable food source for a variety of wildlife, including black bears (*Ursus americanus*). The forest and riparian ecosystems along Kanaka Creek act as wildlife corridor, allowing migration to and from Golden Ears Provincial Park and the BC Institute of Technology woodlot (Metro Vancouver, 2004).

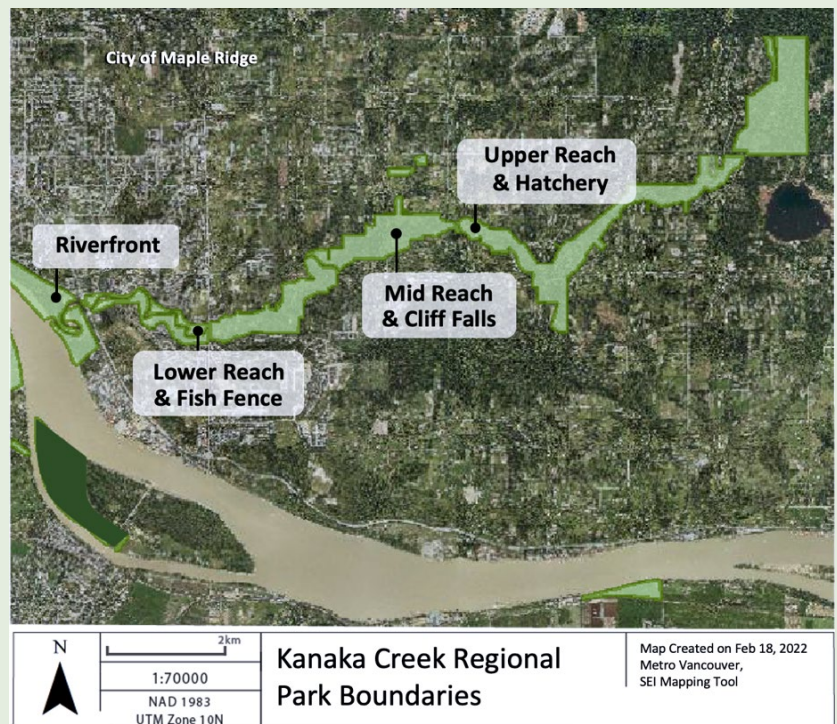
Spanning from its Blue Mountain headwaters, 12 km of this meandering creek is protected as park land by Metro Vancouver. Kanaka Creek remains an important Fraser River floodplain even as the landscape around it has been influenced by humans. This land has rich history and spiritual significance due to over nine thousand years of use, as shown by archeological records (Metro Vancouver, 2004). Kanaka Creek is the shared territory of Kwantlen, Katzie, Matsqui, Musqueam, Semiahmoo, and Tsleil-Waututh nations (Barsanti & Iredale, 2005; Metro Vancouver, 2021). The forests were used for hunting and gathering, while the creek was used for fishing and movement (Metro Vancouver, 2004). This same landscape also provided accommodation for Hawaiian labourers who worked across the river at Fort Langley, calling themselves “Kanaka’s” and giving the park its name (Metro Vancouver, 2021). They were later joined by pioneer settlers, including Samuel Robertson in 1958, James Webster in 1882 and Hector Ferguson in 1900 (Maple Ridge Museum 2022). Planted fruit trees act as evidence of these settlers’ footprint on the land, and sections of forest that were cleared for grazing livestock remain as open fields today (Metro Vancouver, 2004). By the 1920s, this area had changed into an industrial landscape, with active logging operations from Abernethy and Lougheed Lumber Company (Maple Ridge Museum, 2022). A history of logging means the park lacks a sizeable representation of original old growth forest, although mature conifers, including western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii*), western redcedar (*Thuja plicata*), and grand fir (*Abies grandis*) would have dominated (Metro Vancouver, 2004).

Figure 1: Kanaka Creek Regional Park Map

Kanaka Creek is a linear greenspace, made up of Fraser River frontage, floodplain, riparian forest, steep canyons, and upland forests.

It is split into four main sections, named Riverfront, Lower Reach & Fish Fence, Mid Reach & Cliff Falls, and Upper Reach & Hatchery. Ranging from Blue Mountain at the headwaters, the upper reach is surrounded by working agriculture and woodlands, while the lower reach is bordered by residential neighbourhoods.

The characteristics of the landscape change dramatically following the creek from the headwaters to where it meets the Fraser River, which reflects the geological diversity within the park (Metro Vancouver, 2004). The difference in geology, topography, elevation, soils, and cultural development make Kanaka Creek a unique space.



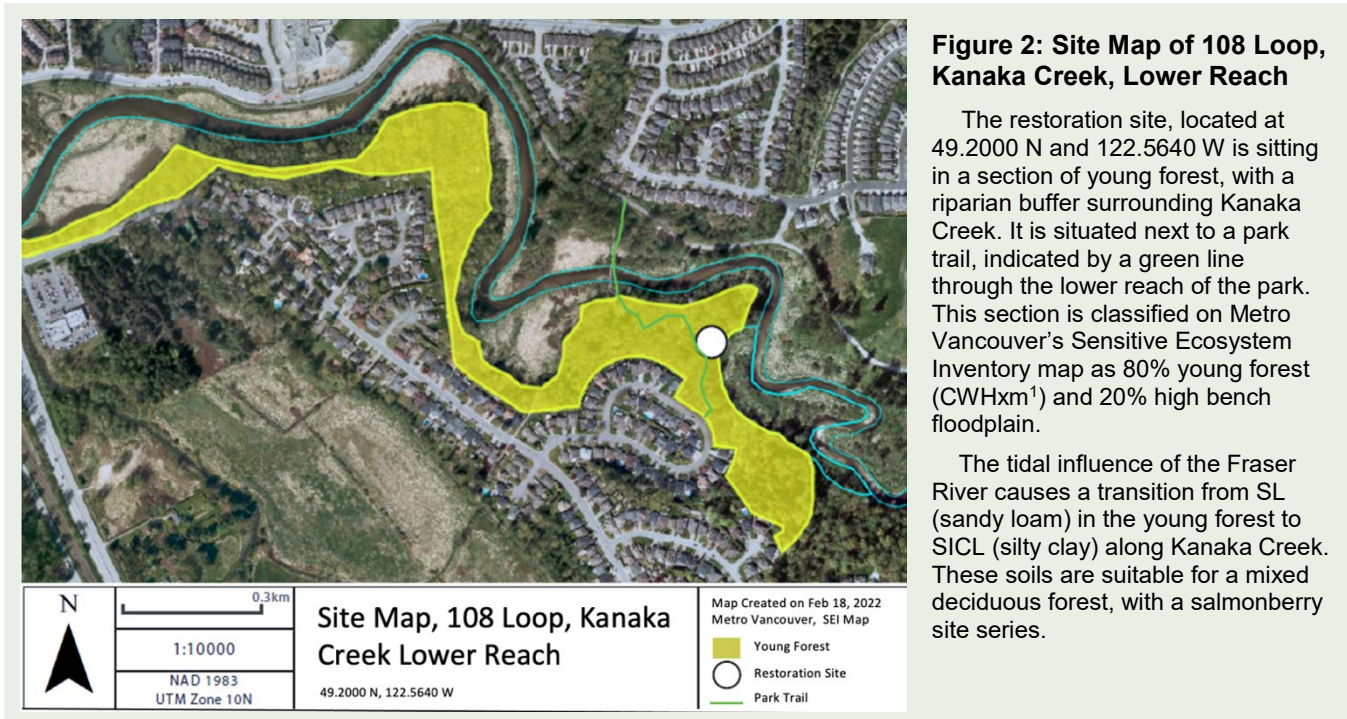
In 1967, regional planners with Vancouver-Fraser Park District, predecessor of Metro Vancouver Regional Parks secured the land to establish Kanaka Creek Regional Park, opening it to the public in 1969 (Maple Ridge Museum, 2021). The creek was designated as a sensitive habitat under the BC Provincial Fish Protection Act due to its status as a tributary for Pacific salmon species, including chum (*Oncorhynchus keta*), coho (*Oncorhynchus kisutch*), and pink (*Oncorhynchus gorbuscha*) (Metro Vancouver, 2004). The area has also been mapped by Metro Vancouver as part of a sensitive ecosystem inventory (SEI). This mapping helps establish an understanding of the value of Kanaka Creek for both ecological conservation and public recreation. These values align with Metro Vancouver's mission statement (to protect and connect), creating a continuum that influences park management, recreational use planning, and is reinforced through interpretation programming. To maintain this balance between conservation and recreation, much of the creek has limited public access to protect the sensitive ecosystem. Designated regional park trails have created easy access through Kanaka Creek Regional Park, offering places to walk, hike, birdwatch and picnic (Metro Vancouver, 2004). As development intensifies in the Albion neighbourhood surrounding the park and the need for outdoor recreation grows, Kanaka Creek becomes a space that both humans and animals seek for refuge, establishing it as an integral community amenity. With high levels of multiuse comes management challenges in this vulnerable ecosystem.

This report will share the site-specific information associated with the ecological restoration in Kanaka Creek Regional Park in October 2021. It will begin with a site description, highlighting significance of the linear wildlife corridor for black bears, and cover methods used to develop, plan and complete the restoration activities in partnership with Kanaka Creek Educational Environmental Partnership Society (KEEPS), and Metro Vancouver. Efforts for community and volunteer engagement will be described, ending with a discussion of results and recommendations for future management in Kanaka Creek Regional Park.

1.2 Site Description

Located just off the trail from the 108 Loop entrance (Figure 2), there is a piece of denuded forest floor that requires replanting to return it to a previous condition. This site has a history of misuse, with notable damage happening Summer 2019, when park users began manipulating the forest. Tree branches were slashed, trails were being cleared causing trampling of herb layer plants, and large holes were being dug into the ground, with the excess soil being used to create tall mounds for jumping bikes over. The Park Patroller made efforts to correct the activity that was breaking bylaw. Metro Vancouver enacts and enforces bylaws to establish rules and regulations for the management and maintenance of regional parks (Metro Vancouver, 2007). Bylaws intend to manage human behaviours within these natural spaces for public safety and for ecosystem protection. Metro Vancouver Bylaw 1177 (3.4) states that park users must not cut, trim, dig up, excavate, or damage any natural park feature (Metro Vancouver, 2021). Park users must also stay on designated park trails (Bylaw 1177, 5.3), and not ride bicycles in undesignated areas (Bylaw 1177, 5.5) (Metro Vancouver, 2021). These prohibited activities heavily disturbed the vegetation on the forest floor, including shrubs, herbs and moss layers, compacting soil until vegetation was unable to grow. The Park Patroller visited the site frequently, each time filling the holes and moving vegetation to hide unsanctioned trails (Communications, Dolina, 2021). The situation was even more problematic as park patrollers spotted a black bear den within 200 meters down towards the creek (Communications, Dolina, 2021). The situation was reported to the Park Operator and Park Ranger as many staff hours were being used to mitigate damage in an area that was now considered high risk due to bear activity. As attempts for temporary fencing and signage failed to be effective, a more permanent solution was decided upon (Communications, Leroux, 2022).

Along the park trail a new split-rail fence was built Summer 2020, three panels high to discourage trespassing into the damaged site (Communications, Leroux, 2022). Upon consultation with the Natural Resource Management Specialist for Metro Vancouver (East Area) in June 2021, this site was identified as a good fit for ecological restoration efforts. The constraints on this site include the proximity to a sensitive fish bearing creek, the wet nature of the soil and the compaction due to misuse, as well as the proximity of the site to a bear den. Considerations will be made to ensure this site can be successfully restored to rehabilitate the essential natural corridor for the black bear population living in the park, in an area that is otherwise surrounded by residential development.



1.3 Black Bear Habitat Corridor

As human communities have settled and developed landscapes in BC, it has resulted in the loss, degradation, and fragmentation of black bear habitat. Black bears are generally active April to November, but in areas like Kanaka Creek where the temperatures stay relatively mild and food is available all winter long, some bears do not retreat to their dens (Metro Vancouver, 2006). Bears move across large spaces, up to 150 km, and these home ranges are often made up of several feeding grounds, connected by wooded areas (BC Government, 2001). Black bears need secure travel routes to link foraging areas, allowing them to maintain their nutritional state that influences their reproductive success and individual survival (BC Government, 2001). Where bears were once able to roam freely, there are now buildings and roads that divide the city, inevitably increasing human-bear interactions as they explore into residential areas (Anderson & Jenkins, 2006). Bears are numerous in Metro Vancouver, proving their adaptability in surviving along the fringe of urban areas (BC Government, 2001). Black bears are frequent users of Kanaka Creek Regional Park, as it remains an essential corridor, providing connectivity between the Fraser River and mature forests in the upper reach (Metro Vancouver, 2007; Metro Vancouver, 2021). Conflicts arise when bears seek out food, get too close to humans or properties, and become conditioned to these unhealthy situations, putting the bear at risk of being destroyed. Considering the narrow nature of the park and black bears' natural need for movement, forest restoration and keeping park users on-trail should remain a long-term goal to support the integrity of the park (Hilty, et al., 2019).

Figure 3: Black Bear at Kanaka Fish Fence

Pictured is a black bear at Kanaka Creek Fish Fence, located up trail from the restoration site. Along the split-rail fence, the sign reads “Area Closed. Frequent bear activity. Stay away from bears, at least 100 m, 10 bus lengths.”

This photo acts a reminder that bears are wild animals with the inability to understand signs and boundaries put in place to keep them safe. Staying within designated areas and respecting wildlife is a human responsibility when sharing natural spaces.

Black bears are an important component of the local food chain, transporting seeds through digestion, and aiding in decomposition of carrion. Black bears also play a role in nutrient-cycling, moving marine nutrients from salmon into the forest (Cederholm, et al., 2011). This restoration project has a special focus on bear education to mitigate human-bear conflict and misuse of natural space.



RESTORATION GOALS

2.1 Site goals

The goals of this restoration project are as follows:

1. Decrease human impact to the restoration site

Objectives:

- 1.1 Hide access to the unsanctioned trail by planting native plants at the entrance and moving logs to cover trampled ground
- 1.2 Limit access along the new split-rail fence by planting species that decrease visibility to the site behind the fence, reducing temptation to enter the area
- 1.3 Increase public awareness by sharing reminders about park rules on social media

2. Enhance native plant community recovery and development

Objectives:

- 2.1 Plant at least ten different native species by November 2021 that will match surrounding vegetation
- 2.2 Increase the cover of salmonberry and snowberry to support the CWHxm¹ ecosystem, salmonberry site series
- 2.3 Plant low-level species, including large-leaved avens and false lily of the valley in the gully to maintain view of the creek on the east perimeter, and allow sunlight into the site

3. Improve local black bear awareness

Objectives:

- 3.1 Partner with Metro Vancouver and Kanaka Education and Environmental Partnership Society (KEEPS) in 2021 to participate in four seasonal educational roves at Kanaka Creek Fish Fence and along trails in the lower reach

2.2 Community Partnerships

This restoration project was in partnership with Kanaka Creek Education and Environmental Partnership Society, known as KEEPS. Since the start of Metro Vancouver’s Park Partnership program in 1998, KEEPS has been working as a watershed stewardship group to provide services to the community (Metro Vancouver, 2004). With the mission to maintain the health of Kanaka Creek watershed and act as an advocate for salmonoids, the society engages the surrounding community by hosting events to share information, offers school programming, and helps with the operational needs at Bell Irving Fish Hatchery (KEEPS, 2022). Restoration work was completed with the assistance of Ross Davies, KEEPS’ Education Coordinator, and Metro Vancouver Regional Parks, East Area staff. Financial support was awarded by Pacific Parklands Foundation from their *George Ross Legacy Stewardship Program* to support hands-on citizen stewardship activities in Metro Vancouver Regional Parks (PPF, 2021). The grant was submitted January 2020, and funds were received by the end of that year for restoration work in Fall 2021. This grant was integral to the project, supporting the budget for project materials (*appendix A*).

2.3 Project Timeline

The project was initiated on July 24, 2020, beginning with a site visit attended by the Natural Resource Management Specialist and Natural Resource Management Technician at Metro Vancouver Regional Parks, along with the Education Coordinator at KEEPS. A brief history of misuse was discussed along with potential restoration activities, building a timeline that would lead to project completion in Fall 2021.



METHODS & MATERIALS

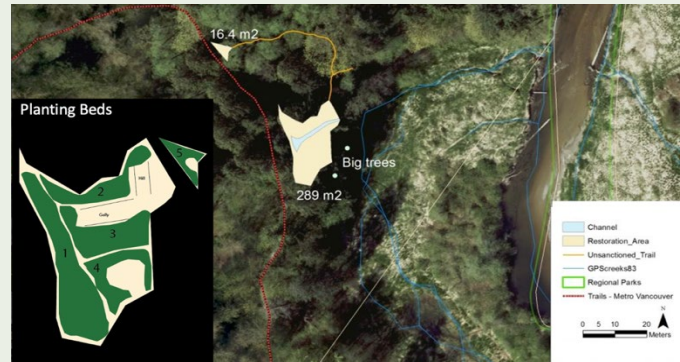
The methods for this project are based off a terrestrial ecosystem mapping (TEM) approach, including a remote site analysis to collect biophysical data, digital mapping, and site visits for further data collection and photographs. A ground inspection form was completed prior to project planning to document the slope, aspect, and elevation of the site, along with notes on soil drainage, texture, and fragment content to compare with the remote site research. Time was spent developing a plant inventory of both the designated restoration site and the surrounding areas to the north and south of the site to provide information about existing vegetation cover (*appendix B*). This data was used to establish a plant order for a volunteer planting Ecoblitz as part of the restoration project.

Figure 5: Creating Planting Beds

The restoration area was split into five sections for planting. The total area for the site is 305.4 m².

When considering how much soil to order, the area of the gully, the hill at the northeast corner, and the large tree stump at the southeast corner were measured. The new estimation was 198 m² of land to cover with soil for the plantings.

An average soil depth of 0.3 meters was estimated. The project would require a minimum of 60 m³ of soil to fill all five planting beds.



3.1 Soil

IMap BC provided remote data on soil, while site visits allowed further information to be collected on compaction, slope, and hydrology. This research revealed a transition from sandy loam (SL) in the young forest to silty clay (SiCL) soil in the riparian areas towards the creek. The site has minimal slope, and the soil materials are impervious, limiting the downward flow of water (Metro Vancouver, 2004). Due to the compaction of the soil at the restoration site from off-trail bike use, it was recommended by the Metro Vancouver Natural Resource Management Specialist and Technician that we bring in soil and create planting beds to improve success of plant growth. There is a shallow gully in the site, which will be left untouched, meaning no soil will be added to allow for downward flow of water towards the creek during heavy rains. All other areas that make up the planting beds will be covered in Nutrifor, a soil made from biosolids, derived from sewage solids that have been treated to eliminate harmful bacteria, while maintaining healthy nutrients for the park (Metro Vancouver, 2021). Adding Nutrifor to this site can benefit plant establishment, without damaging the roots beneath.

3.2 Plants

With the goal to plant a diversity of nature species, the challenge would be to select appropriate plants and integrate them into the site for continuity. A salmonberry site series was used to understand the expected vegetation cover in the process of developing a native plant list. While doing so, the human influence and site history was considered. A history of living, trading, working, and building has allowed other vegetation communities to prosper in Kanaka Creek, changing the composition of the forest that once dominated this landscape. Research revealed that the forests are spotted with deciduous plants, including red alder (*Alnus rubra*), big leaf maple (*Acer macrophyllum*), vine maple (*Acer circinatum*), and salmonberry (*Rubus spectabilis*), along with other native shrubs (Metro Vancouver, 2004). Visiting the site throughout the year and taking a series of photos allowed for a good understanding of the actual vegetation surrounding the site. A ground inspection was completed to survey the dominant and indicator plant species at the restoration site, and at the north and south site borders (appendix B). First the plants were identified at the restoration site. In the tree cover, western redcedar (*Thuja plicata*) was dominant, but there was an absence of shrubs. On the forest floor there was a limited presence of sword fern (*Polystichum munitum*), lady fern

Table 1: Native Plant List

These plants were appropriate for the site, matching the sunlight levels and soil materials. These plants also match the SS Salmonberry site series predicted species for this location. A plant order was placed with NATS Nursery in Langley, BC.

NATS fulfills many orders for Metro Vancouver Regional Parks restoration projects as they provide trustworthy and high-quality Pacific Northwest plants (NATS, 2021). They follow environmental and ecological principals for their plant propagation, and ensure their soil is free from pests and invasive species (NATS, 2021).

	Plant Names	Quantity	Size
Shrubs			
	Vine maple (<i>Acer circinatum</i>)	7	#02 Potted
	Indian Plum (<i>Oemleria cerasiformis</i>)	25	#01 Potted
	Salmonberry (<i>Rubus spectabilis</i>)	25	#02 Potted
	Snowberry (<i>Symphoricarpos albus</i>)	30	#01 Potted
	Red huckleberry (<i>Vaccinium parvifolium</i>)	20	#01 Potted
	Red elderberry (<i>Sambucus racemosa</i>)	6	#01 Potted
Ground Plants			
	Large-leaved avens (<i>geum macrophyllum</i>)	15	#01 Potted
	False lily of the valley (<i>Maianthemum dilatatum</i>)	25	#01 Potted
	Vanilla leaf (<i>Achlys triphylla</i>)	20	#01 Potted
	Sword fern (<i>Polystichum munitum</i>)	20	#01 Potted
	Lady fern (<i>Athyrium filix-femina</i>)	20	#01 Potted

(*Athyrium filix-femina*) and sparse assorted mosses. In comparison, the site directly north of the disturbed site was surveyed, revealing much higher diversity. All the same species were noted in this site, plus vine maple (*Acer circinatum*), red alder (*Alnus rubra*), and red huckleberry (*Vaccinium parvifolium*). On the forest floor, vanilla leaf (*Achlys triphylla*), false lily of the valley (*Maianthemum dilatatum*), and large-leaved avens (*Geum macrophyllum*) were also noted.

The patch of vegetation bordering the south side of the restoration site had Indian plum (*Ziziphus mauritiana*) salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*) and snowberry (*Symphoricarpos albus*) present. These findings helped develop a native plant list for purchase, and amount was based on 0.8 plants per square meter (*appendix A*). Considerations for plant selection included the soil type and low water drainage capabilities. Plants with high tolerance to wet soils would be more successful in this site. Shade-tolerant plants would also be more likely to thrive in a site with a redcedar tree cover. Thimbleberry was left off the plant list due to its higher sunlight requirements. Salmonberry, snowberry, and Indian plum were predicted to do well due to their preference for moist soils and semi-shade environments, and they would help meet project goals and objectives, reducing visibility of the site behind the fence as they grow.

3.3 Restoring the Site

As Fall 2021 approached, the restoration activities began. October was selected as an ideal time for planting due to the warm days and cool nights that provide an ideal environment for transplanting potted plants. Frequent precipitation keeps the soil moist, supporting growth. The plant order was delivered on October 5, 2021, to another site within the park (located near 108 Avenue and 248 Street, Maple Ridge). It acted as a staging area, providing time to get enough staff and volunteers to assist with soil placement at the restoration site. The soil was transferred to the site by Kanaka Creek Park Operations team on October 12, 2021. The following day, a team of people from Metro Vancouver, KEEPS, and two keen volunteers from Samuel Robertson Technical Secondary School joined together for placement of soil. Hopping over the split-rail fence onto the site, the labour began by moving soil with shovels and wheelbarrows. Soil filled the holes and covered flat areas of the site, creating even planting beds 0.3 m deep, suitable for planting. (Figure 5). Due to the sensitive fish bearing creek downslope from the restoration site acting as a constraint, soil was not placed too close to any slope to avoid downhill runoff into the creek. This buffer was approximately 1 meter wide.

October 22, 2021 was used for moving the potted plants from the staging area at the Frey Property to the restoration site, at 108 Loop. Park operations arrived onsite with a 1-ton truck for all 213 plants to be stacked up into for transport. At the trailhead the plants were unloaded from the truck, placed in wheelbarrows, and moved to the restoration site, over the fence into the fresh soil. With physical distancing considerations applicable at the time, and the fact we were close to bear habitat, the group was kept to under 15 people. A mix of



Figure 6: Soil Placement

The site location proved to be challenging for transporting materials. Using a John Deere 110 loader backhoe, Kanaka Creek Regional Park operations carried Nutrifor soil down the trail. It was lifted over the fence and dropped in large piles in the restoration site.



Figure 7: Plant Placement

Plants were laid out according to a planting plan (*appendix D*) that considers site features, like the hill, gully, and stump. The plan created a barrier of shrubs along the fence line, and a bowl of large-leaved avens and false lily of the valleys.

volunteers and staff showed up for the EcoBlitz planting event on Saturday October 23, 2021. All plants were successfully planted within two hours.

COMMUNITY ENGAGEMENT

Partnerships with regional government and a non-profit society provided unique opportunities to be involved in community engagement and work with volunteers. At both the soil placement and native planting stages of this project, volunteers were engaged in stewardship activities, which made this project possible. These stewardship activities also offered benefits to volunteers, some using the project for credit towards their secondary school graduation requirements, while others used it as experience on their resume.

Another way to engage with the community was through educational displays and conversations to improve bear awareness and assist with compliance in the park. Joining the Metro Vancouver (East Area) Interpretation Team, the KEEPS Education Coordinator, and the Kanaka Park Patroller through Summer 2021, five educational walks were completed in Kanak Creek Regional Park. The communications aimed to help keep bears wild by managing visitor interactions with wildlife, and encouraging visitors stay on-trail. Materials including bear props, signage, and brochures, paired with discussions to inform park visitors about bears in the area, appropriate behaviours, and ways to avoid human-bear conflict. Signage and verbal reminders to keep away at least 100 m from bears also aimed to reduce conflict and improve safety in the park, where bear sightings are frequent in the spring and summer seasons.

PROJECT RESULTS

After visiting the restoration site in February 2022, it appears many of the plants have survived the considerable precipitation and atmospheric river events that occurred since the restoration took place in October 2021. The ferns have transferred well, as have the avens. Red huckleberry is also starting to grow and some of the leafless shrubs are beginning to bud new leaves. As the temperatures continue to warm and the site receives more sunlight, plants should continue to grow and leaf out. This growth should support Goal 1, by limiting the visibility into the site along the fence. Continued monitoring must take place over the next year to see if all native species survived the transplant, supporting Goal 2. There also appears to be little soil run-off, which was one of the considerations during soil placement, due to the proximity of the creek below the site.

To meet Goal 3, in-park communication efforts were made to improve local black bear awareness, with the direction to encourage bylaw compliance while maintaining good relationships with park users. These efforts were built into an education strategy to coordinate messaging

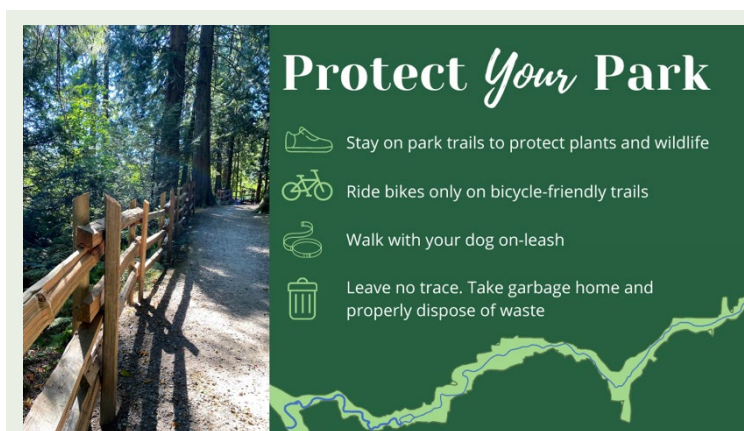


Figure 8: Social Media Post

This social media graphic was created and posted to local neighbourhood groups, paired with information and links for the upcoming restoration activities. Using Metro Vancouver Restoration Team's Meet Up account, and KEEPS Facebook account, the volunteer opportunities were shared with the community further.



Figure 9 & 10: Post Restoration Site Visit

These photos, taken in February 2022 show leaf buds beginning to grow on the left and a large-leaved avens spreading out on the right.

through stationary displays and park roving, consisting of wondering trails to spark conversation with visitors. Park Interpreters and volunteers offered education and materials, while the Park Patroller documented bear sightings and provided information about park bylaws. Between April to August 2021, five educational sessions were attended for two hours each, reaching 245 people in the park. Only interactions that led to further discussion about bears, including proper behaviour around wildlife, and other related topics were counted as they were considered the most impactful. Many of the visitors that live in Maple Ridge are accustomed to black bears and were aware of ways to share space with wildlife. On one occasion, bears were spotted in the park causing some visitors to move closer for a photograph. Everyone was reminded to keep distance from wildlife, and all were directed back down the trail to cause no further stress to the bear in the area. This situation was effective, offering an opportunity to lead by example and reinforce signage and messaging within the park.

DISCUSSION

This restoration project proved to be successful on multiple levels, including both community engagement and ecological restoration. It formed a team of people to work together towards common stewardship goals, created connections with the community through bear aware education, and included volunteers in an Ecoblitz, which contributed to the replanting of a 305m² site. The timeline for the project, spanning from July 2020 to January 2022 was more time than was needed for the restoration, considering most of the active work took place over a two-week period in October 2021. The 18-month project did allow for plenty of site visits and time to plan. The longer timeline also provided opportunities for grant writing experience, public education and relationship building with Kanaka Creek Education and Environmental Partnership Society. Partnered educational efforts as part of this project (Goal 3) proved to be effective in reaching locals and connecting on a community level. Many conversations were had about bear signs, sightings in the park, and responsibilities of staying on-trail when visiting these natural spaces. Although effective within the project timeline, these efforts are just a start to the endless education that is needed to support wildlife management in a growing region. These feet-on-the-ground tactics, paired with a system-wide communication and signage strategy should be included in an updated bear-human management plan at Metro Vancouver. This visitor services strategy can exist independently from ecological restoration, offering solutions to help prevent future conflict and off-trail damage to vegetation within regional parks. While it can stand alone, the integration of this strategy with that of natural resource management and ecological restoration would forge a stronger, more holistic approach to park management, adding another level of success to future projects.

Metro Vancouver will continue to monitor this restoration site completed in the young forests surrounding Kanaka Creek as it has now become part of the story of land-change and modification within the park. Building the split-rail fence along the damaged site greatly improves the likeliness for success of plant establishment, as this type of infrastructure adds a physical barrier and acts as an extra reminder to stay on the designated trails. Fortunately, many of the ecologically sensitive areas of the park are lined with similar fencing or natural barriers, supporting the well-maintained nature of this park. Although this project does not need to be replicated on a larger scale within the park, the site directly across the trail could benefit from similar planting methods. Requiring less resources, a planting remedy could improve the diversity of vegetation to a state before the bicycle disturbance. Another split-rail fence is not recommended due to the narrow nature of the trail, meaning restoration would be less successful over the long-term due to the lack of physical barrier to keep out wandering park visitors, dogs, and bicycles. Another consideration before planning any further restoration would be ease of access to the site. An important lesson learned from this project was the difficulty of soil transport into sites located down narrow park trails that limit vehicle access. Park operations stepped up to the job and got the soil to the site, but it was a process that required extra steps and consideration. These types of site locations also require staging areas to drop soil and plant orders, reload them into smaller trucks to deliver to the neighbourhood park entrance, and they require more staff and volunteer time to then transport materials in wheelbarrows down trail. Ease of access will be given more consideration determining the feasibility of restoration projects in the future.

CONCLUSION

Looking ahead, natural resource management will need to be given a front seat as the region continues to grow, placing more stress on regional parks, greenways, and protected spaces. Metro Vancouver planners estimate there will be one million new residents to the region by 2050, with an average growth rate of 35,000 people per year (Metro Vancouver, 2018). Rapid urbanization sparks residential and commercial growth, replacing coastal forests with homes, retail, and industry. This development fragments the land, isolating wildlife communities in the last remaining greenspaces (Hilty et al., 2019). This makes Kanaka Creek even more significant as a wildlife corridor from the expansive forests of Golden Ears Provincial Park, BCIT Woodlot 007 and Blue Mountain Provincial Forest. It acts as an essential linkage, providing safe passage for bears and other wildlife to the Fraser River frontage with new food and fresh water sources (Anderson & Jenkins, 2006).

This restoration project near the 108 Loop entrance helps maintain the forests that provide connectivity and supports the resiliency of an entire interconnected ecosystem (Hilty et al., 2019). The replanting of the denuded forest flood aimed to replicate a version of the forest at Kanaka Creek Regional Park before it was damaged by off-trail use. If plant growth appears to be effective and successful over the next two years, it is recommended that the area across from the restoration site be evaluated for potential ecological restoration work, with the challenges of access and material transport in mind. Restoration efforts wouldn't be without challenge, but adding Nutrifor soil, replanting sword ferns and huckleberry, and placing wildlife logs would support forest continuity.

Further educational initiatives are encouraged in Kanaka Creek Regional Park to help the Park Patroller in keeping visitors on-trail, cycling on appropriate paths, and dogs on-leash. Education can also support invasive species management, discouraging dumping in the park. Educational displays and walks by Park Interpreters and partner organizations improves presence in the park, offering opportunities for people to learn and alter behaviour. This is a step in the right direction towards keeping natural spaces healthy, especially as the community grows and changes.

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APPENDIX A

Project Budget

Table 2: Kanaka Creek Regional Park - Project Budget: This is an estimated overall project budget, including material orders, staff support and miscellaneous supplies. Soil was ordered from Nutrifor, which includes truck and transfer of the soil, at a rate of \$500/30 m³ load, plus taxes. Three orders were delivered to a staging area and later transported to the site. Kanaka Park operations supplied much of the equipment necessary for the project, and \$500 was provided to KEEPS Coordinator for project support. In kind labour made up a total of 35 volunteer hours, equalling \$735.00 equivalent. Actual spending was underbudget, with the remainder of the funds being put towards purchasing materials for another restoration site in the park.

Kanaka Creek Regional Park- 108 Loop Trail

Project Budget

Expenses	Itemize	Estimated Cost
Soil Order	90m3 Nutrifor truck & transfer	\$1,800.00
Plant Order	NATS native plant order (213) & delivery	\$2,200.00
Staff	Ross Davies, KEEPS Coordinator	\$500.00
Labour	Volunteer Hours (35)	<i>In Kind</i>
MISC	Work party supplies: (wheelbarrows, shovels, gloves, disposal fees)	\$600.00
	Meet Up Subscription	\$100.00
Project Total		Total \$5,200.00

Plant Order

Table 3 - Native Plant Order: Plants were calculated at 0.8 x total m² in all feasible planting areas, not including gullies, hills, and stumps. A total of 213 plants were ordered, a little over the previous calculation due to the small size of the ground layer plants. The order was purchased from NATS Nursery Ltd.

Kanaka Creek Regional Park- 108 Loop Trail

Delivery Date: October 2021

Plant Names	Quantity	Size	Unit Price Estimated	Total
Shrubs				
Vine maple (<i>Acer circinatum</i>)	7	#02 Potted	\$8.00	\$56.00
Indian Plum (<i>Oemleria cerasiformis</i>)	25	#01 Potted	\$4.00	\$100.00
Salmonberry (<i>Rubus spectabilis</i>)	25	#02 Potted	\$8.00	\$200.00
Snowberry (<i>Symphoricarpos albus</i>)	30	#01 Potted	\$4.00	\$120.00
Red huckleberry (<i>Vaccinium parvifolium</i>)	20	#01 Potted	\$4.00	\$80.00
Red elderberry (<i>Sambucus racemosa</i>)	6	#01 Potted	\$4.00	\$24.00
Ground Plants				
Large-leaved avens (<i>geum macrophyllum</i>)	15	#01 Potted	\$4.00	\$60.00
False lily of the valley (<i>Maianthemum dilatatum</i>)	25	#01 Potted	\$4.00	\$100.00
Vanilla leaf (<i>Achlys triphylla</i>)	20	#01 Potted	\$4.00	\$80.00
Sword fern (<i>Polystichum munitum</i>)	20	#01 Potted	\$4.00	\$80.00
Lady fern (<i>Athyrium filix-femina</i>)	20	#01 Potted	\$4.00	\$80.00
			Delivery	\$185.00
			Sub-total	\$1,165.00
			PST	\$81.55
			GST	\$58.25
	Total 213			
Project Total				\$1,304.80

APPENDIX B

Plant Inventory

Restoration Site

Scientific Name	Common Name	Vegetation Layer	Present Cover (%)
<i>Thuja plicata</i>	Western redcedar	Canopy	60
<i>Polystichum munitum</i>	Sword fern	Herb	15
<i>Athyrium filix-femina</i>	Lady fern	Herb	4

Sample Site A: North Side of Restoration Site

Scientific Name	Common Name	Vegetation Layer	Present Cover (%)
<i>Thuja plicata</i>	Western redcedar	Canopy	30
<i>Acer circinatum</i>	Vine maple	Shrub	40
<i>Alnus rubra</i>	Red alder	Canopy	10
<i>Vaccinium parvifolium</i>	Red huckleberry	Shrub	20
<i>Polystichum munitum</i>	Sword fern	Herb	20
<i>Athyrium filix-femina</i>	Lady fern	Herb	20
<i>Achlys triphylla</i>	Vanilla leaf	Herb	40
<i>Maianthemum dilatatum</i>	False lily of the valley	Herb	15
<i>Geum macrophyllum</i>	Large-leaved avens	Herb	5

Sample Site B: South Side of Restoration Site

Scientific Name	Common Name	Vegetation Layer	Present Cover (%)
<i>Thuja plicata</i>	Western redcedar	Canopy	80
<i>Acer circinatum</i>	Vine maple	Shrub	5
<i>Oemleria cerasiformis</i>	Indian plum	Shrub	10
<i>Rubus spectabilis</i>	Salmonberry	Shrub	30
<i>Symphoricarpos albus</i>	Snowberry	Shrub	5
<i>Rubus parviflorus</i>	Thimbleberry	Shrub	5
<i>Rubus ursinus</i>	Trailing blackberry	Herb	20
<i>Polystichum munitum</i>	Sword fern	Herb	10

APPENDIX C

Terrain Classification & Site Series

Code	Name	Description
Terrain Texture		
SIL	Silty Loam	Albion Soil, less than 2% coarse fragments. Shallow horizons. Parent material is Sifton. Bedrock is sedimentary (conglomerate, sandstone).
Surficial Materials		
WG	Glaciomarine	Ice contact with marine sediments
Surface Expression		
J	Gentle Slope	Absence of steep slope. From park trail, site gently slopes down towards Kanaka Creek
Drainage		
VP	Very Poor	Poor drainage, little downward percolation of water, impervious. High bench site for infrequent flooding
BEC Classification		
CWH xm1	Coastal Western Hemlock	Heavy precipitation, mild temperatures, dominated by Western hemlock. Very dry Maritime.
Ecosection		
FL	Fraser Lowland	Area that is influenced by the Fraser River
Site Series		
SS	Salmonberry	Mixed deciduous and coniferous, common species include Red alder, Western redcedar, Big leaf maple, Western hemlock, Salmonberry, Sword fern, Lady fern & Vanilla leaf.

APPENDIX D

Planting Plan

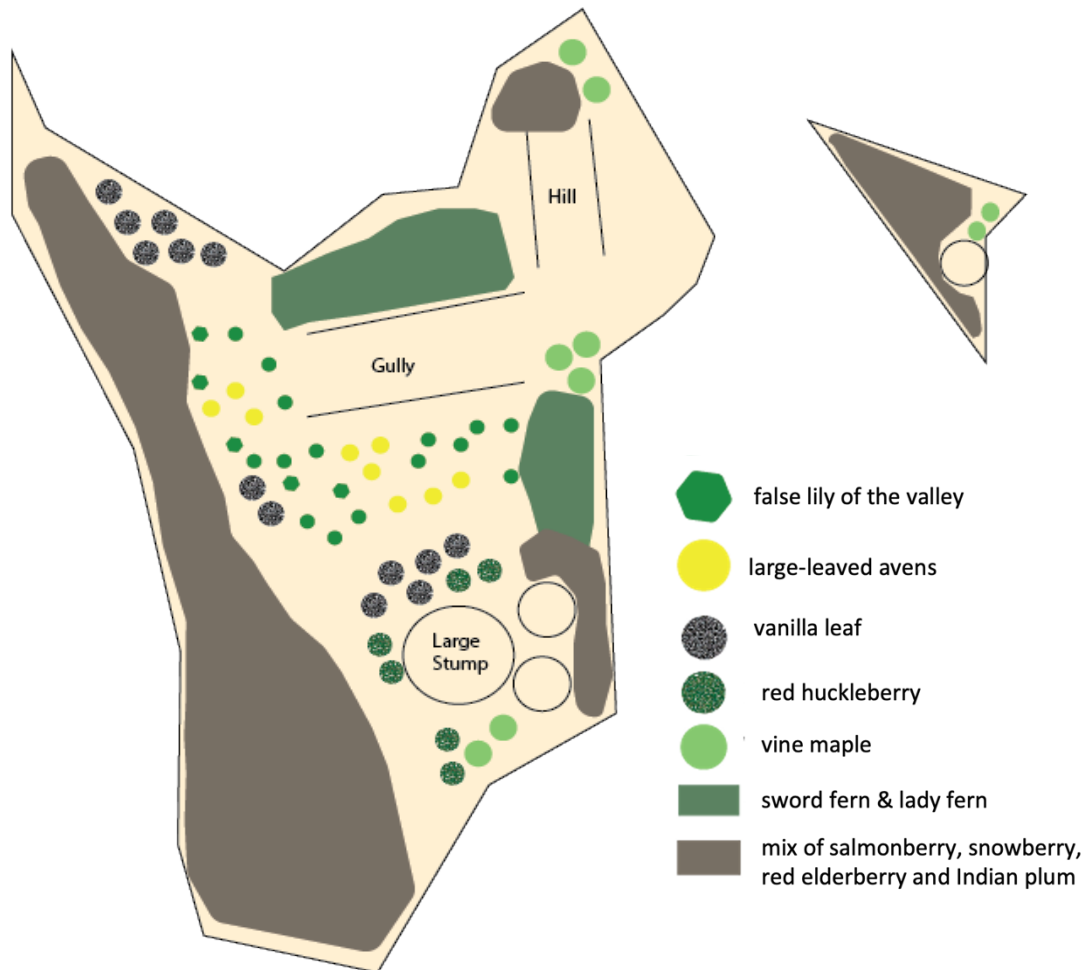


Figure 11: Restoration Area Site Map

The planting plan for this site focused on creating a line of shrubs along the new split-rail fence on the west side of the site. As these shrubs grow, they will limit the visibility into the sight. Another feature is the bowl of large-leaved avens and false lily of the valley on the downward slope into the gully. The intent was to keep this area open, planting native species that wouldn't grow tall, keeping the opening towards the creek at the east perimeter of the site open for light. Red huckleberry was planted around the western redcedar stump, vine maple was planted in areas that had others growing nearby, as it proved to be suitable conditions, and ferns were planted along the north and east edges of the site.

Located down the path was the start of the unsanctioned trail, leading into the site. Soil was added to this triangle-shaped site, behind the fence. A mix of shrubs, including salmonberry, snowberry, and vine maple were planted in attempts to hide the trail. A decomposing log was also moved across the trail to further hide trampled vegetation.