VISUALIZING A RESTORED AND RESILIENT FRASER ESTUARY

A Graphic Rendering of “North Arm Intertidal Habitat Park”

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ACKNOWLEDGEMENTS

The author would like to begin this report by acknowledging her position as an uninvited guest, living, studying and working on the ancestral and unceded territory of the xʷməθkʷəy̓ əm (Musqueam), Sḵwx̱wú7mesh Úxwumixw (Squamish) and səl̓ilw̓ ətaʔɬ (Tsleil-Waututh) Nations.

This report considers the role of marshland restoration in ecological stewardship for the area now known as the 'Fraser River Watershed'. Historically, Canada's approach to conservation has been grounded in colonial notions of preserving natural landscapes, often without the consent of those who have stewarded these lands for thousands of years, and with little regard for their health and well-being. This report acknowledges the continuing influence of colonialism that is exerted upon these lands and these waters.

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This project was conducted under the mentorship of Rivershed Society of BC staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of Rivershed Society of BC or the University of British Columbia.

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EXECUTIVE SUMMARY

The Fraser River is one of British Columbia's most important ecological assets, and is the lifeline of the entire Fraser Watershed. Comprised of separate riversheds, the Watershed is a large network of habitats, transitioning through diverse freshwater ecosystems while moving to the ocean.

The Lower Fraser rivershed contains some of the most complex and ecologically important ecosystems of these regions. Habitat in the Lower Fraser plays a vital role in the lifecycle of one of British Columbia's most culturally, ecologically and economically signifcant creatures: Pacific salmon.

The Fraser River Estuary is the tidal mouth of the Fraser, located where the River meets the ocean. It is the largest estuary in British Columbia (Ducks Unlimited Canada, 2022), with a complex 21,696 hectare network of tidal marshes, channels, mudflats, sandflats, and eelgrass meadows. It is the lifeblood of biodiversity for the West Coast (Pacific Estuary Conservation Program, 2021).

Tidal marshes are a particularly productive and important ecosystem in the estuary. They allow for the mixing of freshwater (with nutrients and sediment from the Fraser River) and ocean water.

In addition to salmon species, millions of migratory and resident waterfowl, shorebirds, songbirds, and gulls depend upon the estuary and its productive marshes for foraging, resting, and roosting habitat.

The Fraser River Estuary is the largest estuary on Canada's Pacific Coast, and it is estimated to have lost between 70 – 90% of its vegetated tidal wetlands since European settlement (Dorcey 2004, as cited in Stewart et al., 2022). Decline in the extent, function and resilience of these marsh ecosystems is detrimental to the many species that depend upon them.

One of the most effective methods of curtailing habitat loss in the Fraser River Estuary is the creation and protection of new tidal marshes (Stewart, Hennigar, Ingham and Balke, 2022).

To help address the concerning lost of tidal marsh in the Fraser Estuary, this report proposes the creation of a tidal marsh park in the Lower Fraser by Raincoast Conservation Foundation, supported by Rivershed Society of BC (Rivershed).

This park has the potential to enhance ecological functioning of the Fraser Estuary, and benefit native species by re-establishing a natural ecological network. This is especially important for Fraser salmon species wich are currently in decline or at risk.

The park also has the potential to increase ecosystem services in the estuary, as marshes provide numerous benefits such as carbon sequestration, storm buffering, and water quality management (Broome, Craft and Burchell, 2019).

Restoration projects such as this park provide shoreline access, educational and recreational opportunities, and benefit all creatures who call the Lower Fraser rivershed home.

The intentions of this project are:

1. To visually communicate the importance of marsh restoration efforts in the Fraser River Estuary.

2. To support partner organizations in achieving Rivershed's goal to restore 5% (1 million hectares) and protect 30% of the Fraser Watershed.

3. To generate support for the North Arm Intertidal Park Project, to restore and protect up to 15 acres of tidal marsh in the Fraser Estuary.

THE MIGHTY FRASER

stalʼ əẇ (the Fraser River)[1] is one of British Columbia's (BC) most important and precious ecological assets, and the lifeline of the Fraser Watershed.

Originating as a trickle in the Rocky Mountains, BC's longest river grows in volume as it winds through Mount Robson Provincial Park and travels nearly 1400 km to meet the Salish Sea (Rivershed, 2021).

This journey takes the River through five climatic zones, with varied landscapes including alpine tundra, pine forest, grasslands, desert-like canyons, old growth rainforest, and lowland valleys (Fraser Basin Council, 2013). The Fraser River is an integral part of a complex and vibrant ecosystem, which supports endangered species such as salmon, caribou and grizzly bears in the Fraser Watershed.

The Fraser Watershed is an area comprised of 6 riversheds: Fraser Headwaters, Nechako, Cariboo Chilcotin, Thompson, Fraser Canyon and the Lower Fraser. The Lower Fraser is the most densely populated rivershed in the entire Fraser River system (Fraser River Basin, 2013). It encompasses the area from Hope, all the way to the mouth of the River at its estuary. All communities within the Fraser Valley and Metro Vancouver areas live within this rivershed.

People, communities and wildlife alike all depend on the Fraser River and its riversheds for their prosperity and survival (Rivershed, 2021).

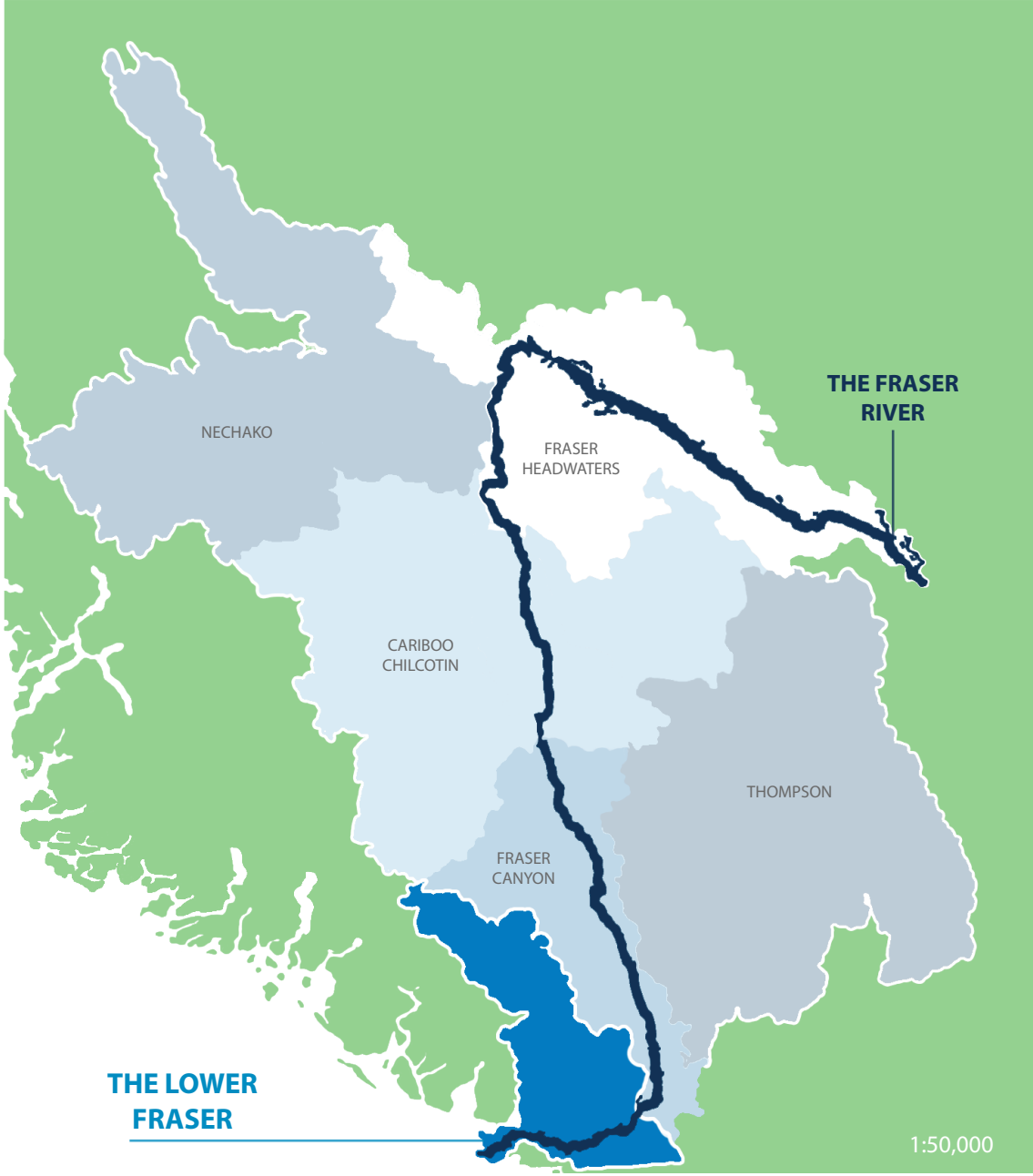


Image adapted from Rivershed Society of BC

[1] "staɬəẇ" is the hən̓q̓əmiń əm̓ word for the Fraser River. hən̓q̓əmiń əm̓ is the Downriver dialect of Halkomelem; one of many Indigenous languages spoken across the Fraser Watershed.

Wherever possible, the author will use hən̓q̓əmiń əm̓, the Downriver dialect of the broader Halkomelem language. This dialect does not use capital letters. If a hən̓q̓əmiń əm̓ translation is unavailable, the author may use the alternative Hul̓q̓umiń um̓ dialect, which does use capitals.

THE FRASER ESTUARY

Where the River Meets the Sea

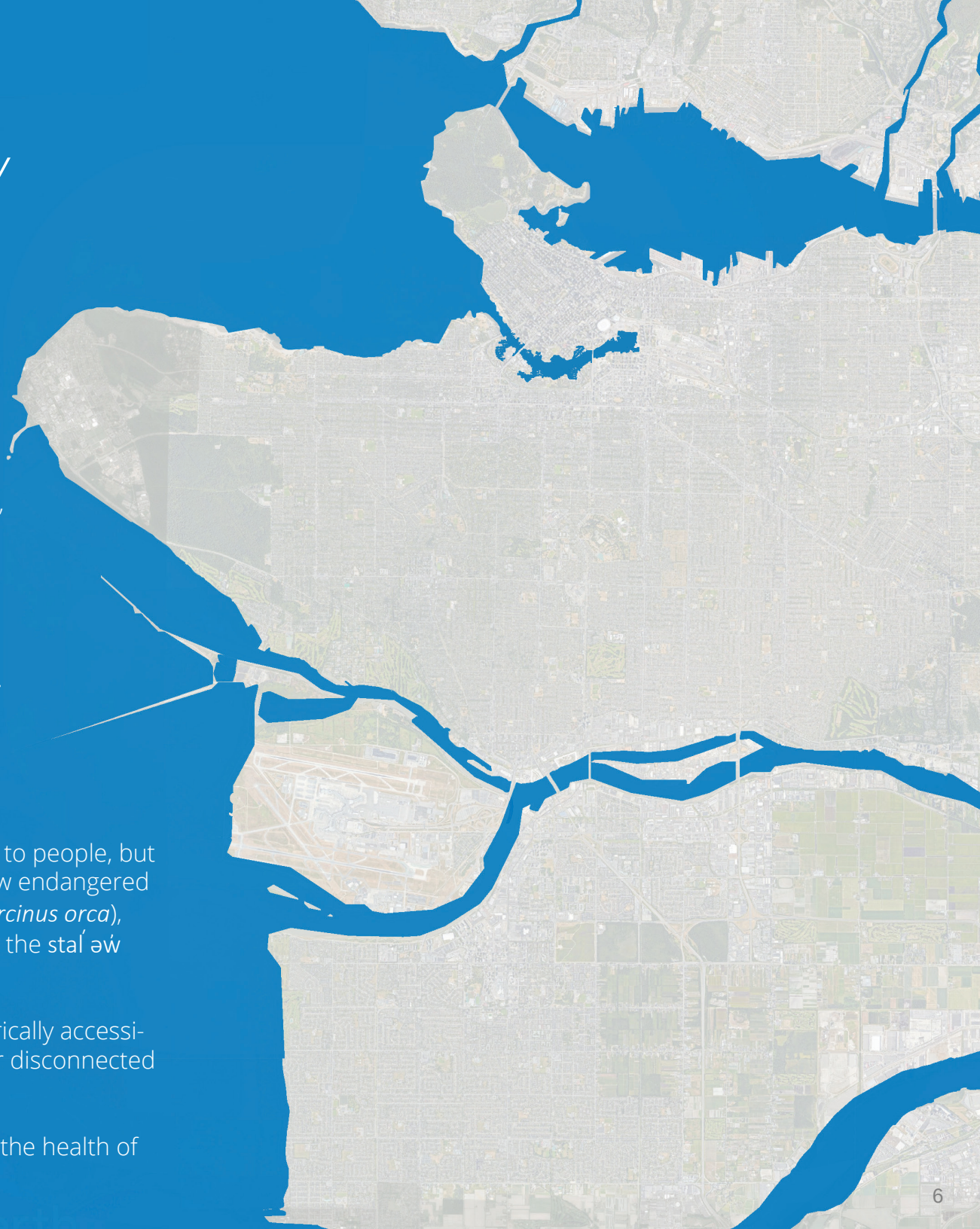
The Fraser River Estuary is the tidal mouth of the Fraser River. The largest estuary in British Columbia (Ducks Unlimited Canada, 2022), it is a complex 21,696 hectare network of tidal marshes, channels, mudflats, sandflats, and eelgrass meadows. It is the lifeblood of biodiversity for the West Coast (Pacific Estuary Conservation Program, 2021).

Coast Salish First Nation communities have lived on the stalʼəẇ (Fraser River) since time immemorial, utilizing its resources and cultivating a relationship with the land, the water and its creatures. One of the most cherished and essential of these creatures is the mighty sce:lhtun (salmon). Historically, the estuary supported the largest wild salmon runs in the world (Kehoe et al., 2020).

These salmon provided crucial resources not only to people, but to numerous animal species. This includes the now endangered œullhánumucun (southern resident killer whale, *Orcinus orca*), who primarily eat stʼ$^{\theta}$aq^{w}əẏ (chinook salmon) from the stalʼəẇ (the Fraser River) (Krahn et al., 2002).

Currently, over 70% of the estuarine habitat historically accessible to salmon in the Lower Fraser has been lost or disconnected (Raincoast Conservation Foundation, 2021).

Wildlife, ecosystems, and people all depend upon the health of the Fraser's crucial and unique estuarine habitat.



Fraser River Salmon

stalʼ əẇ (the Fraser River) was once the most productive salmon river in the world (Slaney et al., 1996). Historically, 50 million sθəqəýˀ (sockeye salmon, *Oncorhynchus nerka*) returned annually to the Fraser River (Rivershed, 2021). In 2019, fewer than 400,000 returned, and in 2020 it was only 288,000.

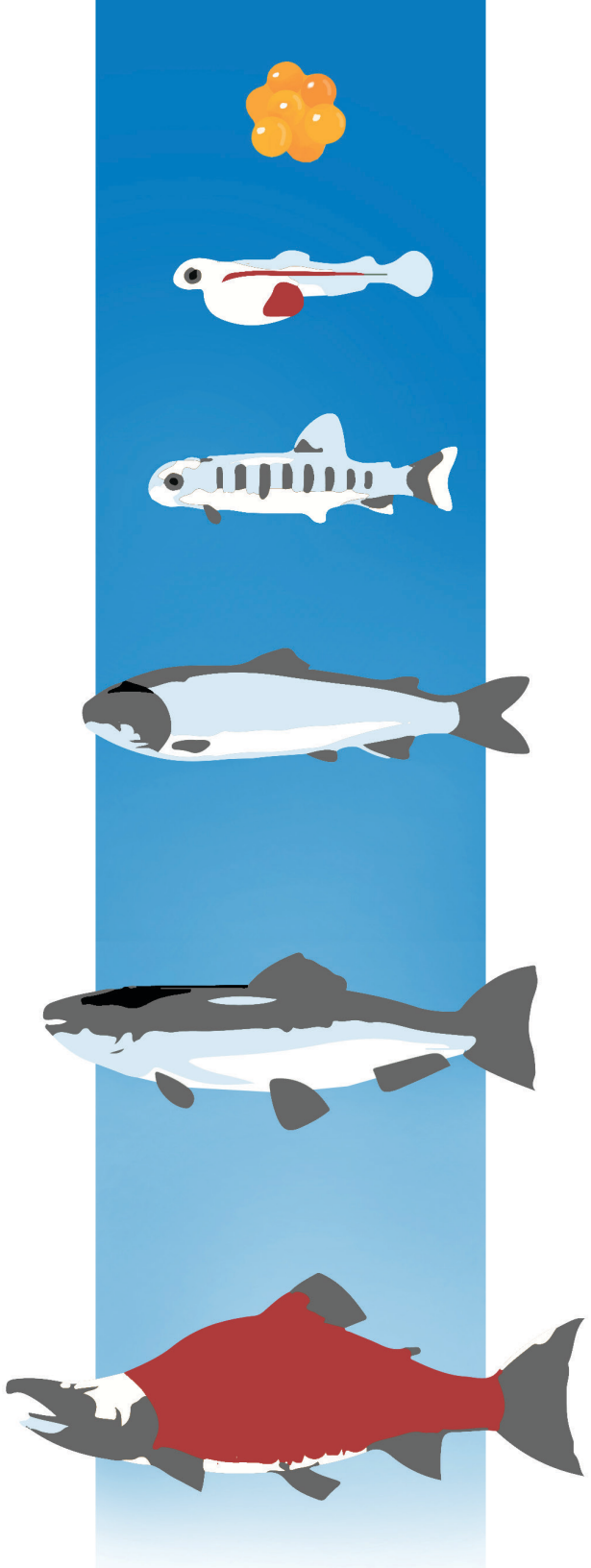
While salmon are still one of the Fraser River's most iconic and significant species groups, holding immense cultural, ecological and economic value, wild salmon populations are at a critical crossroads.

More than 50% of Fraser salmon populations are either threatened or endangered. In particular, some populations of sθəqəýˀ (sockeye), stʼ ᶿaqʷəýˀ (chinook, *Oncorhynchus tshawytscha*), and qiẇχ (steelhead, *Oncorhynchus mykiss*) reached their lowest numbers on record in the last several years.

Estuaries are a transitional zone for salmon migrating from freshwater to marine waters (Chalifour et al., 2021). All five Fraser salmon populations rely on the Lower Fraser River and its estuary to complete their life cycle, including migration, spawning and rearing (Raincoast Conservation Foundation, 2021).

The final leg of the salmon migration journey ends in the Fraser Estuary, the largest Class 1 estuary in all of British Columbia (Pacific Estuary Conservation Program, 2021). This means that millions of juvenile salmon inhabit the estuary during the final stages of their journey out to the Pacific Ocean.

Unfortunately, habitat loss and degradation in critical salmon habitat have been identified as key stressors on Fraser salmon populations (Walsh et al., 2020). The resulting net loss of quality habitat area poses a significant threat to the success of salmon.



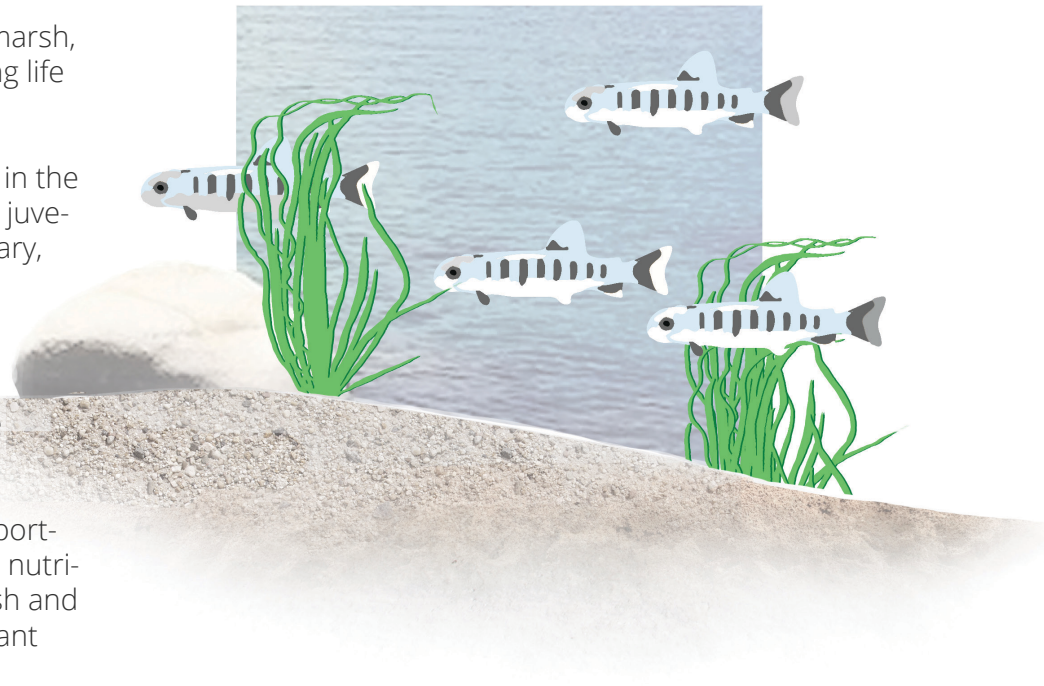
The Importance of Tidal Marsh to The Estuary

The Fraser River Estuary contains a diverse mosaic of habitat types. Tidal marsh, eelgrass and sandflat ecosystems are all essential for juvenile fish at varying life stages (Chalifour et al., 2019).

Each spring, juvenile ocean-type Chinook will spend an average of 41 days in the estuary on their journey to the Pacific Ocean (Chalifour et al., 2021). These juvenile fish rely heavily on the marsh habitat when they first arrive in the estuary, for feeding and rearing.

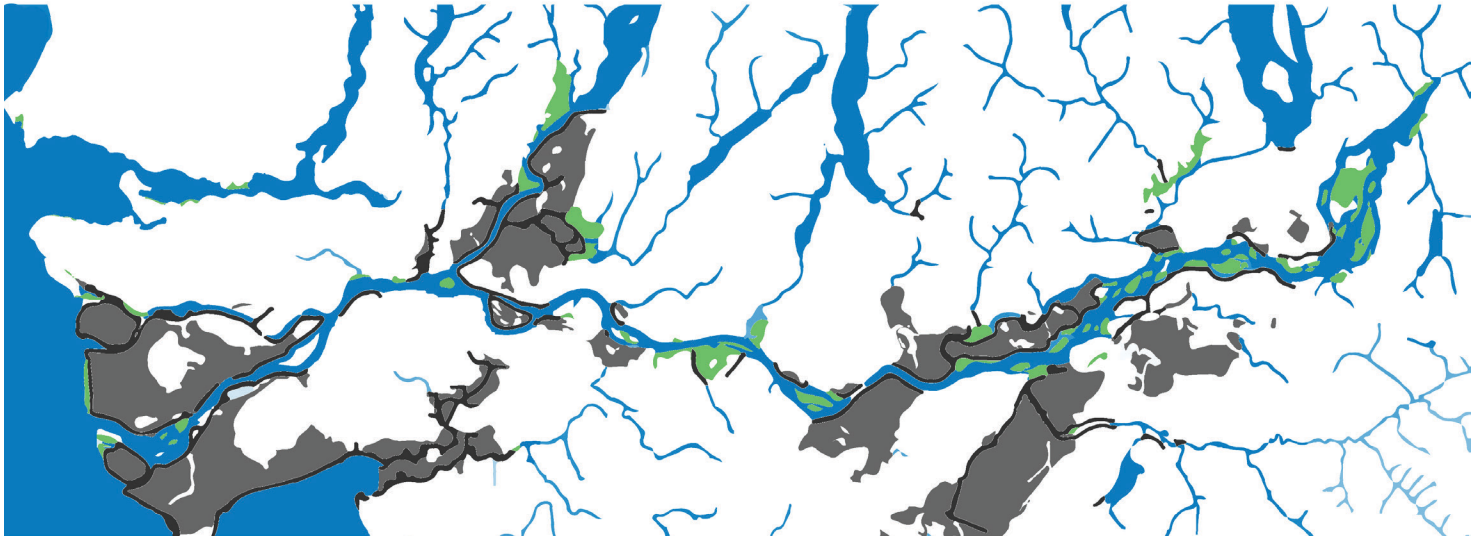
Although these areas comprise a small portion of BC's coastline, estuaries are some of the most productive ecosystems in the province; they are seasonally or annually important to an estimated 80% of all coastal wildlife (Pacific Estuary Conservation Program, 2021; Austin et al., 2008).

Salt and brackish water tidal marshes are a particularly productive and important ecosystem in the estuary. They allow for the mixing of freshwater (with nutrients and sediment from the Fraser River) and ocean water. The mix of fresh and saltwater form a unique brackish water habitat where many animal and plant species flourish.



This unique combination provides essential ecosystem services. Ecosystem services are the ecological, cultural and economic benefits derived from the natural world (IUCN, 2016). Examples of ecosystem services include provision of clean water, and the storage of carbon (Benayas et al., 2009). In addition to habitat and food sources for wildlife, the marshes manage water quality, address stormwater storage, buffer storm waves, reduce shoreline erosion, sequester carbon, and provide numerous socioeconomic opportunities and benefits (Broome, Craft and Burchell, 2019).

In addition to salmon, the Fraser Estuary provides critical stopover points for migratory bird species traveling along the Pacific Flyway, a mass migration from Russia to South America (WHSRN, 2021). Millions of migratory and resident waterfowl, shorebirds, songbirds, and gulls depend upon the estuary for productive foraging, resting, and roosting habitat (Butler & Campbell 1987; Sutherland et al. 2013, as cited in Stewart et al., 2022). Here they feed, in particular, on the plants and insects found in the rich tidal marsh ecosystems (Ducks Unlimited Canada, 2022).



MARSH HABITAT LOSS IN THE LOWER FRASER

Currently accessible marsh floodplain

Current diking infrastructure

Historical marsh floodplain

Image adapted from Finn et al., 2021.

The Loss of Lower Fraser Tidal Marsh

Today, the Fraser River Estuary contains the Greater Vancouver area, Canada's third largest metropolitan region (Kehoe et al., 2020). With less than 30% of its habitat intact, the estuary is home to over half of British Columbia's expanding population. Unfortunately, estuaries all along the West Coast of North America have been altered, fragmented and lost due to exponentially expanding human populations. The Fraser River Estuary has been heavily modified since the 1800's, including the installation of jetties throughout its leading edge, and the creation of extensive dike infrastracture (Balke, 2017). Urban expansion and industrial activities continue to negatively impact the estuary's ability to sustain its immense diversity of life (Boundary Bay Conservation Committee, 2016).

The Fraser River Estuary is the largest estuary on Canada's Pacific Coast, and it is estimated to have lost between 70 – 90% of its vegetated tidal wetlands since European settlement (Hoos & Packman 1974; Boyle 1997; Dorcey 2004, as cited in Stewart et al., 2022). This includes 250 hectares of tidal marsh at the front of the River's delta (Balke, 2017). In the map above, you can see the marsh floodplain that is currently accessible to fish shown in green, versus the historical marsh floodplain habitat shown in grey.

Marshes are also being altered by herbivory by ʼe$u (Canada goose, *Branta canadensis*) and †leˀwu$un (snow goose, ***Chen caerulescens***), and coastal squeeze, the loss of habitat due to sea-level rise. As marsh habitat is pushed to higher elevations, marsh species will be unable to adapt, and this will lead to further marsh disappearance and even greater herbivory pressure (Ducks Unlimited Canada, 2022).

Decline in the extent, function and resilience of these marsh ecosystems is detrimental to the many at risk species that depend upon them. Continued habitat loss and fragmentation is one of the most pervasive threats to global estuaries and their species, as coastal human population and industrial activity continue to increase (Kennish 2002, as cited in Stewart et al., 2022).

MARSH RESTORATION

Re-marshing the Estuary

There are 102 species at risk of local extinction within Canada's most diverse, heavily urbanized coastal region, the Fraser River Estuary (Kehoe et al., 2020). These species and the unique, tidal habitat that they call home, require urgent protection and restoration.

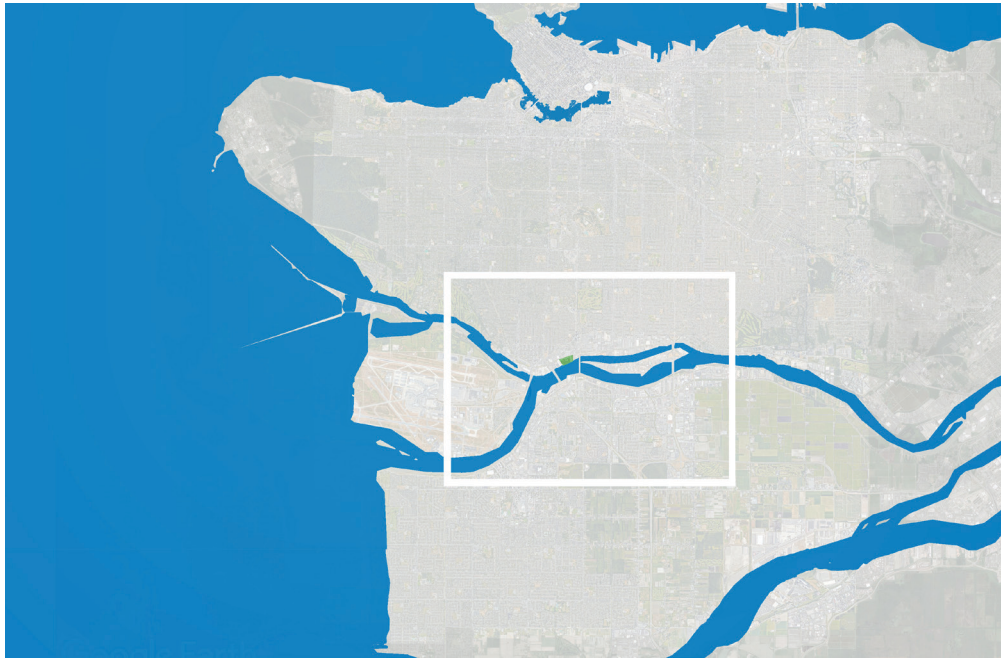
According to a 2022 report by Ducks Unlimited Canada (DUC), one of the most effective methods of curtailing habitat loss in the Fraser River Estuary is the creation of new tidal marshes (Stewart, Hennigar, Ingham and Balke, 2022). The goal of tidal marsh creation is to create and restore these unique ecosystems, providing habitats similar in structure and function to natural marshes (Broome, Craft, & Burchell, 2019).

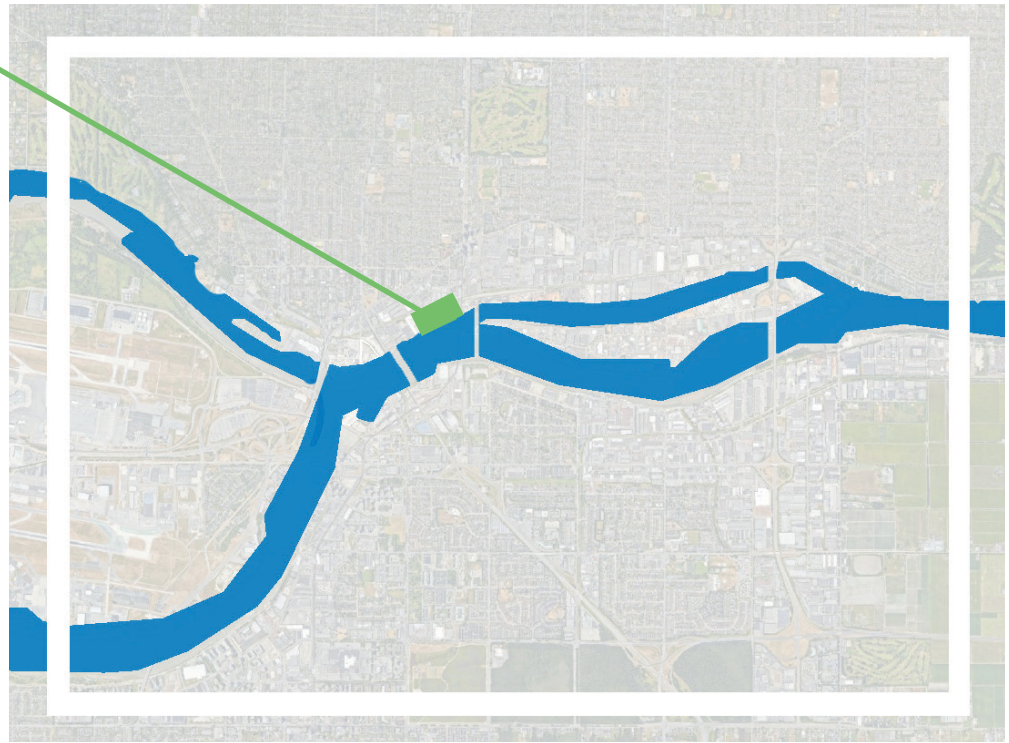
North Arm Intertidal Habitat Park

To help address the lost of tidal marsh in the Fraser Estuary, this report proposes the creation of a tidal marsh park in the Lower Fraser River. This project would be achieved by Raincoast Conservation Foundation, with the support of Rivershed through the use of their visualization tool.

The potential site for the proposed intertidal habitat park is located in the North Arm of the River, near the southernmost end of Cambie Street, next to the Canada Line SkyTrain bridge.

Currently, it is a series of vacant, privately owned lots totalling 20 acres, in a densely industrial and commercial area of the City of Vancouver. This area is also very close to neighborhoods with high-density housing developments with very little access to green spaces.





PROJECT OVERVIEW

WHAT: An intertidal marsh park restoration project

WHERE: The North Arm of the Lower Fraser River, located at the southern foot of Cambie Street

SIZE: Up to 20 acres, restoring 15 acres of marsh

CURRENT PROJECT PARTNERS: Raincoast Conservation Foundation, Rivershed Society of BC

KEY SPECIES: Chinook salmon, all Fraser River salmon, juvenile fish of many species, migratory birds

CURRENT AERIAL VIEW OF THE SITE

FUTURE AERIAL VIEW OF THE PARK

Base image retrieved from GoogleEarth, 2022

Project Goals

The creation of this park would represent a crucial step in the protection and restoration of the Fraser Estuary.

The specific goals of the park project are:

1. To benefit native estuarine species (espescially Chinook salmon and other juvenile fish species) by creating essential tidal marsh habitat.

2. To contribute towards re-establishing a natural ecological network along the Lower Fraser River.

3. To provide shoreline access, educational opportunities, wildlife viewing, and recreational enjoyment opportunities along the mighty Fraser.

4. To contribute to understanding of successful ecological restorational practices in the Fraser Estuary.

To be successful in achieving these goals, the project would first require Indigenous collaboration, and support from the community. Addressing both environmental and cultural concerns, this project would take a decolonized approach to habitat restoration. Indigenous knowledge and language should inform and be integrated into all aspects of the park, including design, construction and maintenance, to create a collective vision for restoration.

Second, part or all of the land would need to be acquired or designated for habitat creation. Significant capital investment would be required for the building of the site, and appropriate site management and maintenance would be required to ensure the longterm success of the marsh.

A Graphic Rendering of North Arm Intertidal Habitat Park

PARK DESIGN

Components

As shown in Design Scheme A, the proposed design for the intertidal park would consist of a combination of habitat types, to mimic the form and function of a natural marsh ecosystem. Success of the marsh would be ensured by using examples from healthy, flourishing tidal marsh ecosystems to inform the design.

DESIGN SCHEME A

The proposed park would require constructing a setback dike, designed to account for predicted future sea-level rise. This would create a new habitat aea on the inside of the dike. This concept is similar to the design for the Pitt River Intertidal Habitat Park, which was built in 2012, and successfully created 23 acres of habitat for fish, birds, and other wildlife (The City of Port Coquitlam).

For this park, the setback dike would have an accessible perimeter walking path, shown in grey above, made of compressed aggregate material. This would allow all park users to view and enjoy the marsh and its inhabitants year round. There could also be smaller, seasonal walking trails (shown with a grey dashed line) through the marsh, which would allow visitors a closer look at certain times of the year.

Because of the size of this park, there would also be opportunities to provide recreational space to benefit the neighborhood, including play-grounds, picnic tables and benches. This design also proposes rerouting an existing and highly trafficked cycling route through the park, shown with the black dashed line above, providing a safer and more scenic route for pedestrians and cyclists crossing the Canada Line SkyTrain bridge.

Creation of the habitat would involve daylighting two historical streams which have been buried under ashphalt on the site, converting them into tidal channels. It would create lower elevation intertidal wetland (shown in blue) with channels necessary for juvenile fish, higher evelation wetland (shown in brown), and a perimeter of naturalized woodland plantings (shown in green) which would benefit an abundance of species, including birds.

The proposed Design Scheme A would result in the creation of roughly 15 acres of brackish tidal marsh habitat, providing many ecological and recreational benefits. While this is the prefered design option, there are also 2 alternative designs which can be seen in Appendix A on page 21.

Marsh plants

Marshes are ecotones between land and sea (a transitional area between two adjacent and different patches of landscape), occuring in the upper intertidal zone (Broome, Craft and Burchell, 2019).

To create a marsh habitat that is temporally stable, resilient to environmental change, and achieves a high level of ecological functioning, a diverse plant community is essential (Tilman 1997; Naeem 1998; Allan et al. 2011, as cited in Stewart et al., 2022).

Native species richness supports marsh stability at the community level, as a diversity of species ensures variable responses to environmental fluctuations, increases resilience to disturbances, and reduces inter-species competition (Loreau & de Mazancourt 2013, as cited in Stewart et al., 2022).

For the proposed park, vegetation would be carefully selected and placed appropriately, according to elevation. Sedges and rushes would be of particular importance, as they are the plants with the highest value for fish habitat (Levings, Conlin and Raymond, 1991).

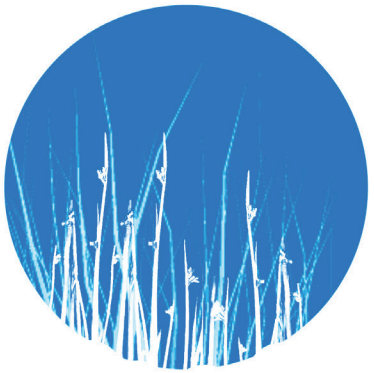
Lyngbye's sedge (*Carex lynbei*), is a foundational marsh sedge species, and would be planted in large benches in the low intertidal zone. It is important that these sedges be planted at low elevation in the marsh, just high enough to be exposed from the water during low tides (Patrick Mooney, private communication, 2022).

Rushes such as sṯhequn (common bulrush, *Typha latifolia*) and the common three-square bulrush (*Schoenoplectus pungens*), would be planted at a higher elevation from the sedges, along with grasses such as tufted hair grass (*Deschampsia caespitosa*) and Pacific potentialla (*Potentilla pacifica*).

Marsh-edge woody species such as Hooker's willow (*Salix hookeri*), Scouler's willow (*Salix scouleriana*) and twinberry honeysuckle (*Lonicera involucrata*), would be planted along the edge of the tidal channels. These plants are crucial for ensuring success of juvenile salmonoids by providing shade, protection and detritus (food materials) as they navigate the channels.

In the upland regions of the park, a naturalized woodland area would be planted. In these areas, trees like cəẃiːɬp (black cottonwood, *Populus balsamifera ssp. trichocarpa*), œumuɬulhp (bigleaf maple, *Acer macrophyllum*), and qʷəʔap (crab apple, *Malus coronaria*) would be planted. As well as shrubs like ṯ́ eć̓əɬp (hardhack, *Spiraea douglasii*).

Lyngbye's sedge
Carex lynbei



Common three-square bulrush
Schoenoplectus pungens

ṯ́ eć̓əɬp
Hardhack
Spiraea douglasii

PROJECT SIGNIFICANCE

The Importance of a Living Shoreline

The existing shoreline of the site is currently comprised of an old metal retaining wall, and large pieces of rip-rap (a rocky material). This riprap is placed in front of shoreline structures to protect from scour and erosion, however erosion may still occur behind the wall.

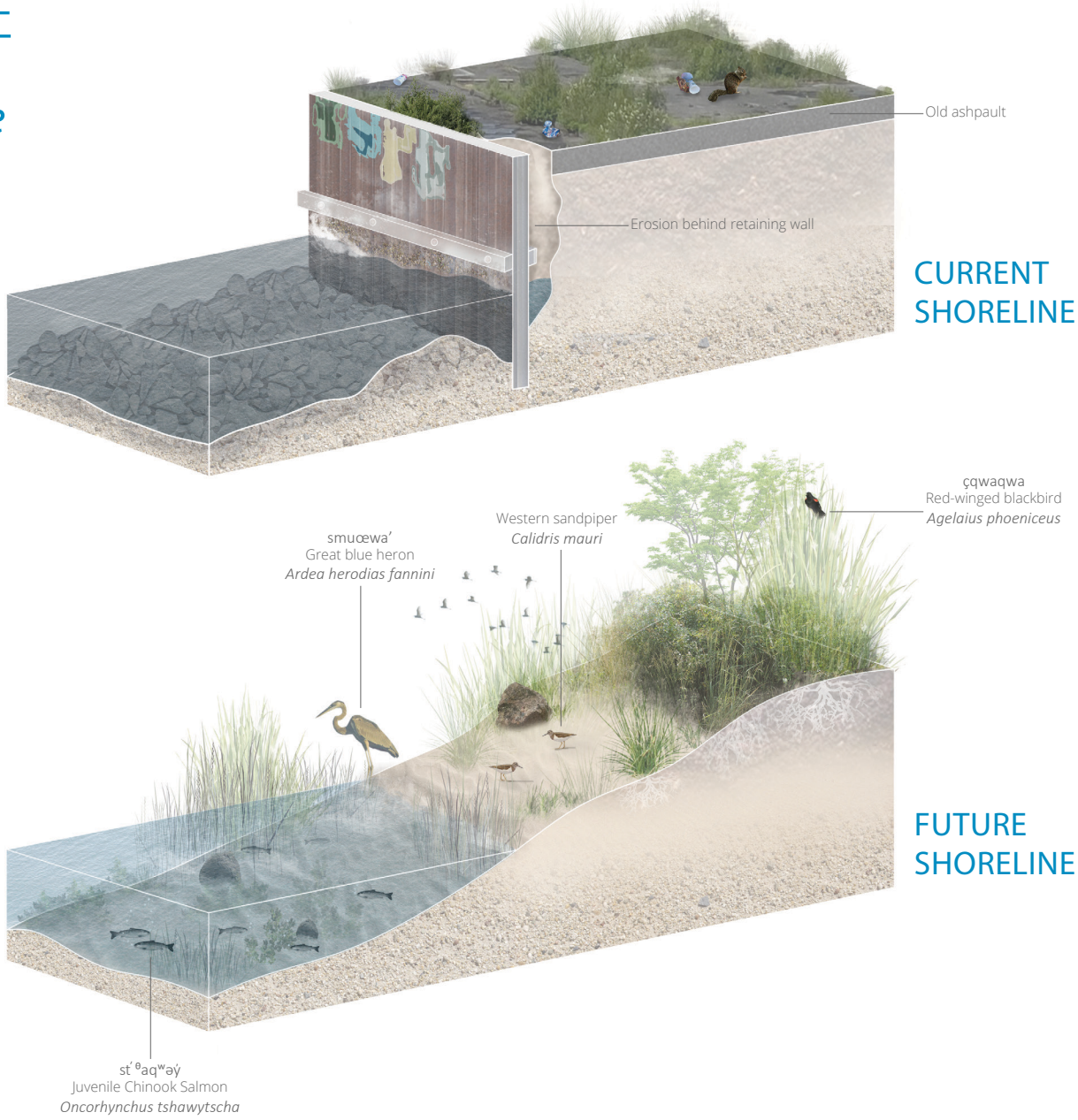
There is very little wildlife along the waters edge, and the only plants on site are opportunists who have broken through cracks in the dilapated ashphault.

This hard infrasture abruptly severs the ecological connection between the coast and the water, providing very little-to-no ecosystems services or habitat value.

A living shoreline would provide a nature based solution, an attempt to mimic natural ecosystems in order to receive the ecosystem services provided by these systems.

It would be a tidal marsh ecosystem brimming with life, with a diversity of plant and animal species including smucəwa', the great blue heron. The marsh edge shoreline would also allow for recreational enjoyment of the site and rich wildlife viewing opportunities.

In additional to habitat value and recreational value, the marsh edge would also be resilient to changing sea levels (Caldicott, 2020). Marshes assist with climate change adaptation by naturally providing the essential services of water quality management, stormwater storage, storm wave buffering, and carbon sequestration (Broome, Craft and Burchell, 2019).



CURRENT SHORELINE VIEW OF THE SITE

FUTURE SHORELINE VIEW OF THE PARK

VISUALIZING A RESTORED LOWER FRASER

Living With the River

Ecological (or green) corridors are essential for biodiversity, by maintaining interconnected habitats for species (Niemala et al., 2010). The creation of this park would not only improve the interconnectivty of habitat and health of the estuary, but it would also allow people increased access to the outdoors, and enjoyment of the Fraser River.

This park would be located in an otherwise industrial and commercial area of the City of Vancouver. This area is adjacent to extremely high-density neighborhoods, close to the SkyTrain, and located on a major cycling route.

Despite its density and proximity to the River, this neighborhood has very few spaces which allow access to the shoreline. In general, there are very few green spaces in the area.

It is proven that access to the outdoors is essential for physical and mental well-being (Benedict and McMahon, 2002). Access to the outdoors is also essential for connection to the natural environment, and thus essential for conservation.

Everyone who lives in the Lower Mainland lives in the Fraser Watershed. This park would provide an opportunity for individuals to enjoy the River, but also to connect with it, and to learn about its crucial habitats and its estuarine species.

Rather than living *in* the Watershed we have to live *with* the Watershed, if we are to properly protect it.

Considerations and Limitations

Aquatic habitat restoration is the most beneficial direct management strategy for estuary conservation (Kehoe et al., 2020). In the last 40 years, more than 100 tidal marshes have been constructed in the Fraser River Estuary, with the intention of off-setting habitat loss (Stewart et al., 2022).

According to a 2022 survey of these created marshes by Ducks Unlimited Canada (DUC), 40 of 78 sites experienced some degree of marsh-die off or recession.

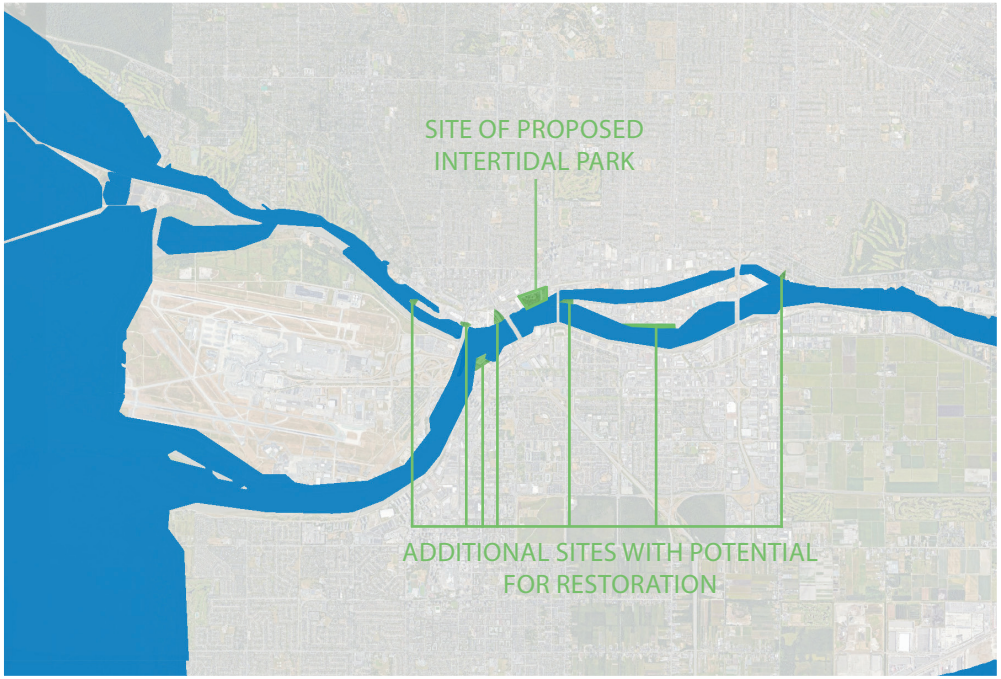
Because tides are the controlling abiotic factor of tidal marshes, the most critical requirement for creating new marshes is construct-ing sites at the correct elevation relative to the local tidal regime (Broome, Craft, & Burchell, 2019).

Some sites were degraded by erosion related to site elevation, boat wake and driftwood accumulations (Stewart et al., 2022). The results of DUC's marsh recession model suggest that a project protected from erosional processes is likely to experience reduced recession compared to exposed sites (Steward et al., 2022).

Sites in the North Arm are more vulnerable to recession from boat wake energy, based on morphology of the River (Steward et al., 2022). According to Steward et al., protection of the site through offshore structures would help to mitigate potential recession (2022).

To reduce the potential degradation on this site, the proposed tidal marsh park would utilize offshore sheer booms for forshore pro-tection. Additionally, the park would be constructed carefully, at the correct elevation relative to the tide regime, taking into account a prediction for future sea level rise.

Additionally, the site would require careful and regular maintenance, to ensure that plant communities remain in proper balance and that Lyngbye's sedge growth is not being hampered by Canada Goose grazing.



Additional Sites for Restoration

The creation of this intertidal habitat park would be an important step towards restoring and protecting the ecological functioning of the Fraser River and its estuary.

With Design Scheme A, this project would restore 15 acres of tidal marsh. While this restoration has the potential to make a large positive impact in the estuary, it is a relatively small number when compared to the 250 hectares (617 acres) of tidal marsh that has been lost at the front of the River's delta alone.

There are other sites in the Lower Fraser River with the potential to become re-wilded intertidal wetlands, highlighted above. However, they are few and far between. Because the area is so densely developed, it is rare to find vacant land directly on the River's edge.

This project represents an important and unique opportunity to re-store a crucial piece of this mighty River.

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APPENDIX A

Alternative Designs

The best case scenario for this project would be restorting 20 acres of the estuary and 15 acres of marsh, by converting the entire site into a tidal marsh park (as shown in Design Scheme A on page 14). Design Scheme A would prioritize the creation of the park, and impede any other form of development on the site.

The proposed site is located in a densely commercial and industrial area, as discussed earlier. This means there is very little vacant land available in the region, making these lots very expensive and very valuable for potential development. If it is not feasible that the entire park be procured for conversion into a park, there are two other design alternatives, as shown in Design Scheme B and C to the right.

Design Scheme B focuses around the central daylighted stream, connecting to Heather Street. This design would still allow for a large portion of riverfront to be converted into marshland, and for pedestrian and cyclist connectivity to the site. However in this scenario, development could still occur in parcels on either side of the park.

Design Scheme C focuses primarly on the shoreline. This would allow for maximum development of the site, and means that the total area which was converted into tidal marsh habitat would be much smaller. It also would not be possible to daylight any of the streams. However, adding a living shoreline would be a huge improvement for the River, and would greatly increase the habitat value of the site. There would also still be connectivity to Heather Street, making a shoreline walking path feasible.

Base image retrieved from GoogleEarth, 2022