ICLEI
Local Governments for Sustainability
Les gouvernements locaux pour le développement durable
CANADA

Restoring Nature to Build Coastal Resilience

Slide decks presented by Peter Zuzek and Francisca Olaya.



PARRARH Framework for Advancing Coastal Resilience

Pete Zuzek, MES, CFM, P.Geo

July 23, 2026

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PARA, Doberstein et al 2019

- Framework for developing approaches to reduce hazard exposure and increase resilience to climate change
- Protect, Avoid, Retreat, Accommodate



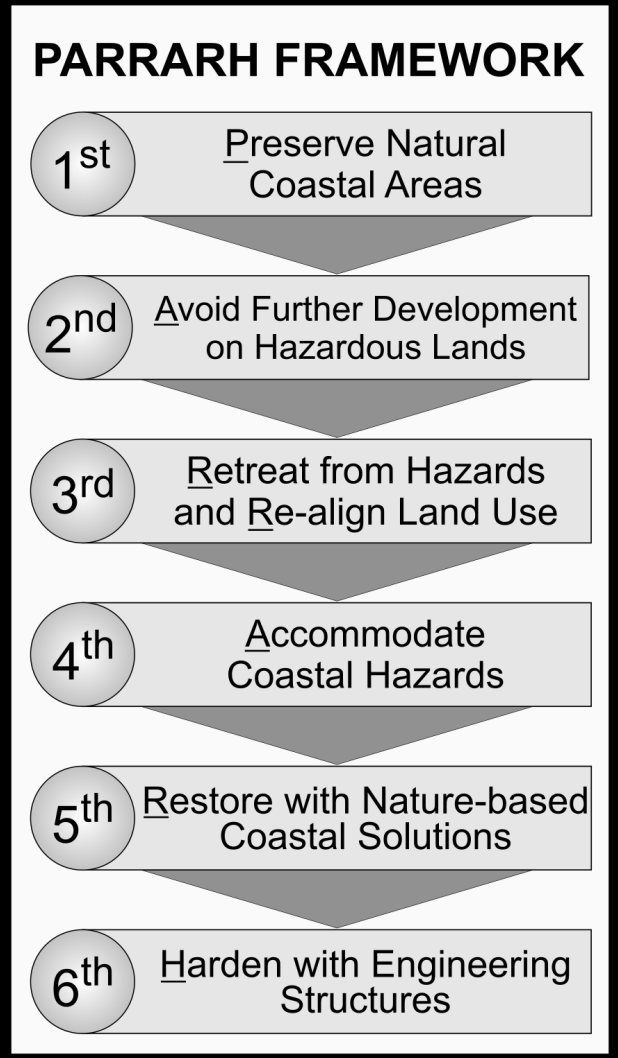
- Prioritize:

Avoid | Retreat | Accommodate | Protect

PARRARH

- Same objectives as PARA, only introduced a hierarchy for option development, expanded approaches, and changed terminology

- Hierarchy and new terms:
  - Preserve natural coastlines
  - Avoid development on hazardous lands
  - Retreat and Re-align land use
  - Accommodate
  - Restore with nature-based solutions
  - Harden with engineering structures



Preserve Natural Shorelines (PARRARH Framework)

- The objective of the Preserve strategy is to maintain natural shorelines and geodiversity (natural physical processes such as erosion and sediment transport along the shoreline). Natural shorelines are resilient to erosion and flooding, and provide extensive ecological and social benefits.







Preserve Natural Shorelines (some development versus hardened)



Sand beaches and protected areas provide public access to the lake and multiple recreational opportunities to visitors, while providing natural shoreline resilience



Avoid Development on Hazardous Lands (PARRARH Framework)

- The goal of the avoid strategy is to locate future development away from areas of natural or human-made hazards. This reduces the exposure of people and property to natural hazards and associated risks in the future.



Avoid Development on Hazardous Lands



Avoid development within the flooding hazard where properties may be exposed to floodwaters or impacts from waves





Avoid development near actively eroding bluffs



Retreat from the Hazards (PARRARH Framework)

- The goal is to relocated public or private assets exposed to significant risk associated with coastal hazards. The Retreat strategy avoids further shoreline hardening and maintains natural shorelines and coastal processes







Retreat From the Hazards

Bluff failure in early 1990s threatens home

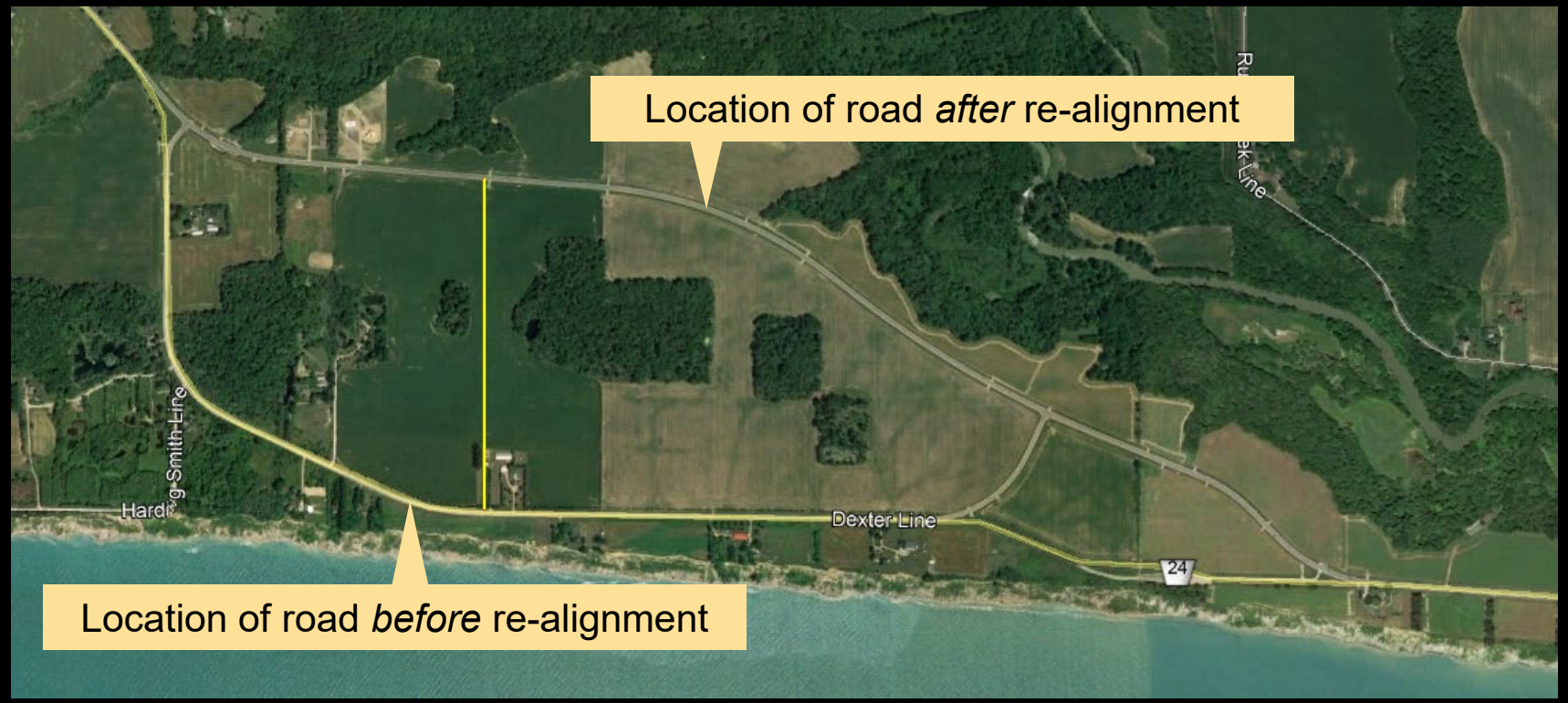


Home successfully relocated ~30 m from the bluff edge



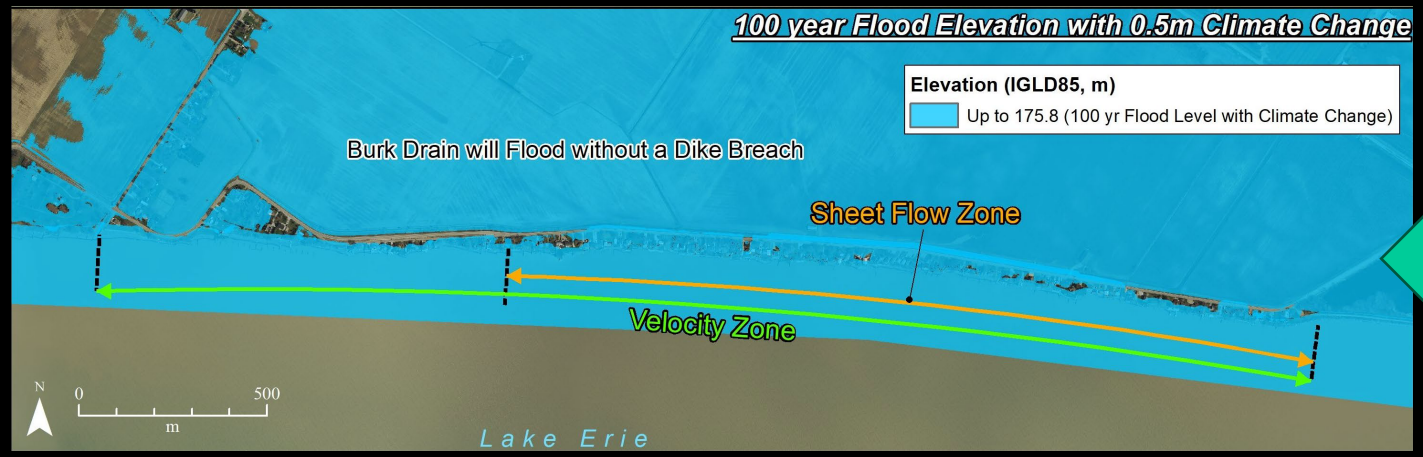
Re-align Land Uses (PARRARH Framework)

- The goal is to change land use where public or private assets are exposed to significant risk.

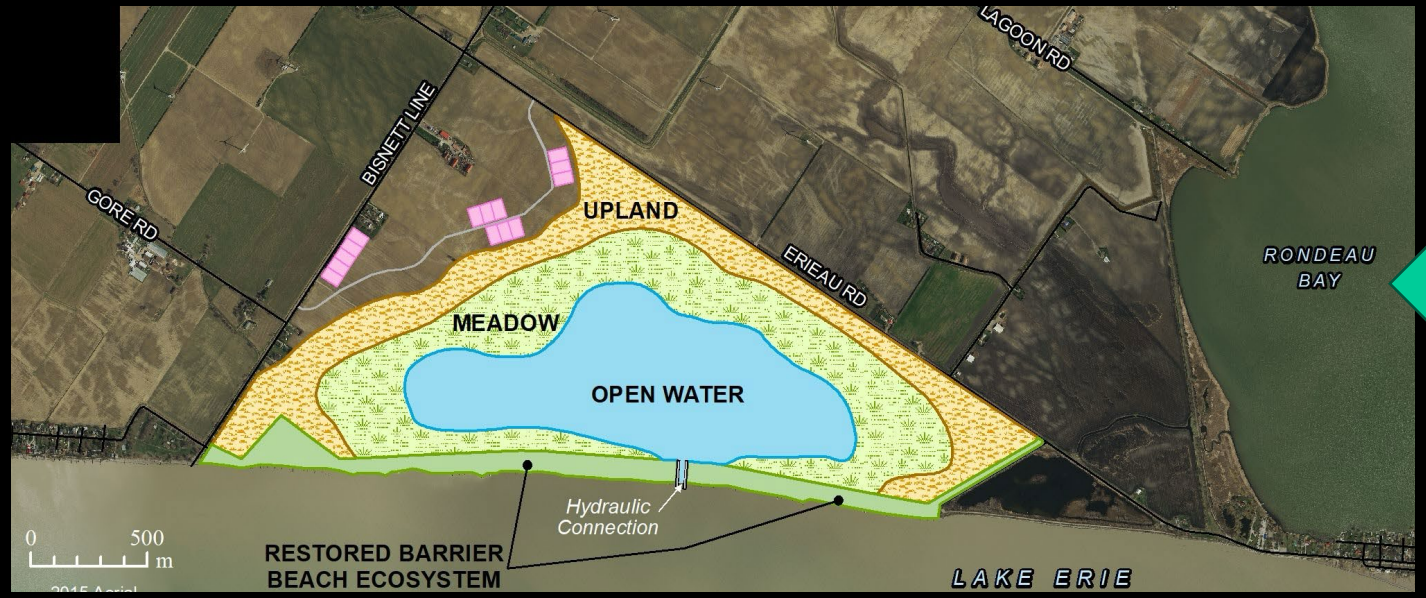




Re-align Land Uses (PARRAPH Framework)



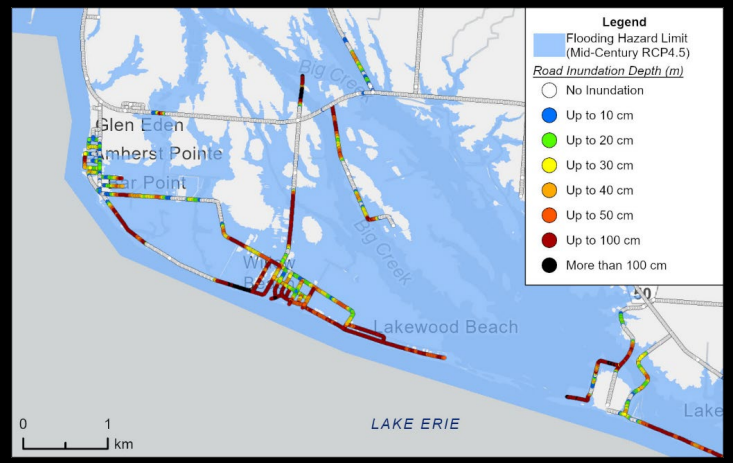
Aerial view of flood extent over road and diked farmland



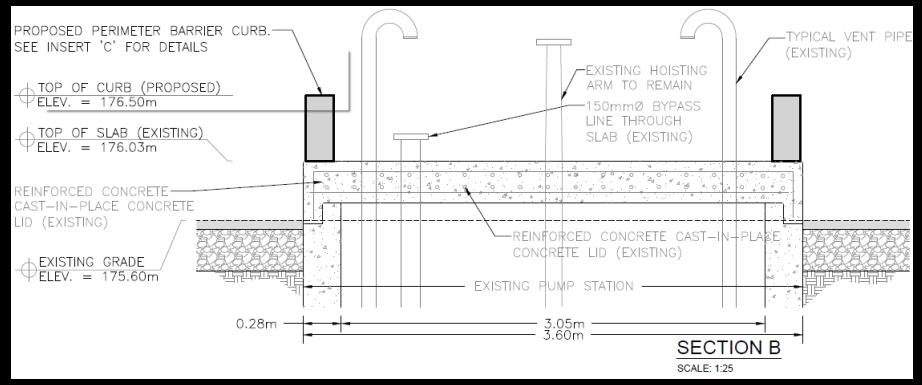
Re-align concept including long-term property buyout program and transformation of hazardous lands to a new, natural barrier beach and wetland system

Accommodate Coastal Hazards (PARRARH Framework)

- The accommodate strategy leverages adaptive approaches to reduce coastal risk and permit continued occupation of communities on hazardous lands:
  - Floodproofing existing buildings
  - Raising building foundations or road elevations
  - Improving site drainage to mitigate flooding or bluff surcharging
  - Upgrading municipal stormwater management systems
  - Upgrading emergency response plans and emergency vehicles







Accommodate Coastal Hazards (PARRARH Framework)

Floodproof existing buildings:



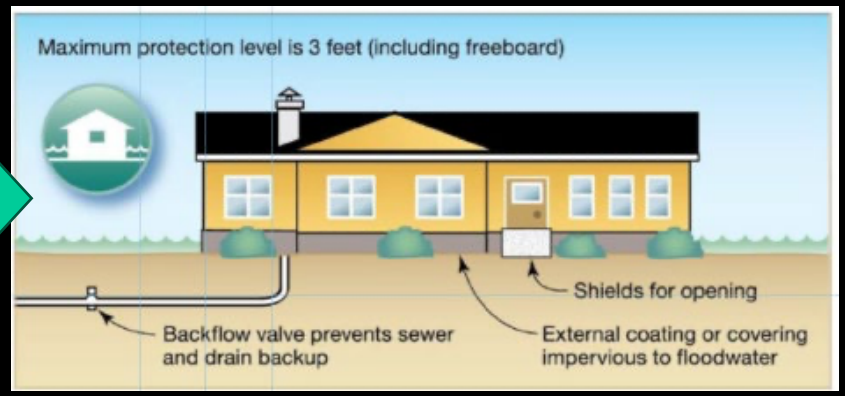
Raise building foundation to reduce flood risk



Install window coverings to prevent flood water entry into basement



Install backflow valves to prevent sewer/drain backup



Accommodate Coastal Hazards

Emergency Preparedness:



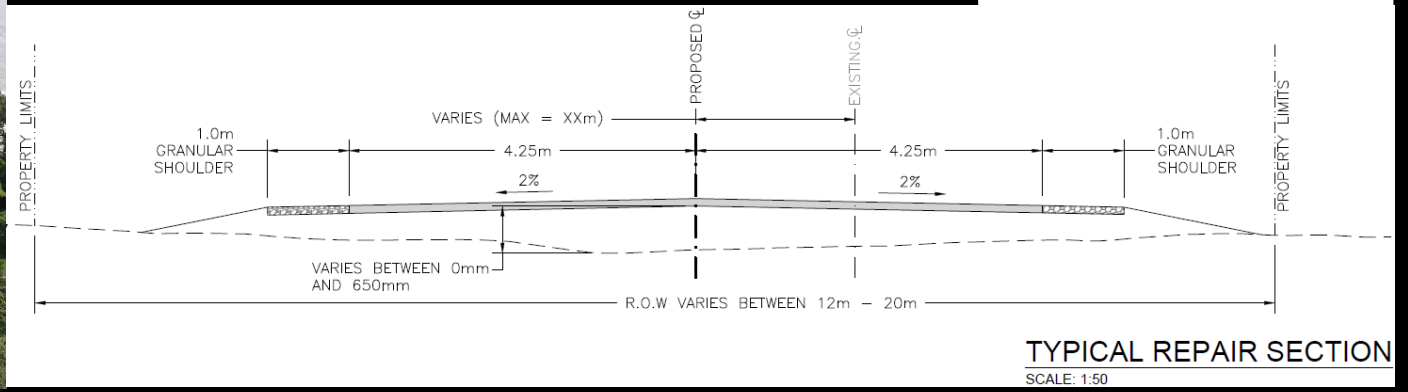
Upgrade emergency vehicles to improve access to flooded communities



EXISTING



RAISED ROAD



TYPICAL REPAIR SECTION
SCALE: 1:50

Restore with Nature-Based Solutions (PARRARH Framework)

Nature-based Solutions:

Beachgrass collected from existing colonies and prepared for transplanting



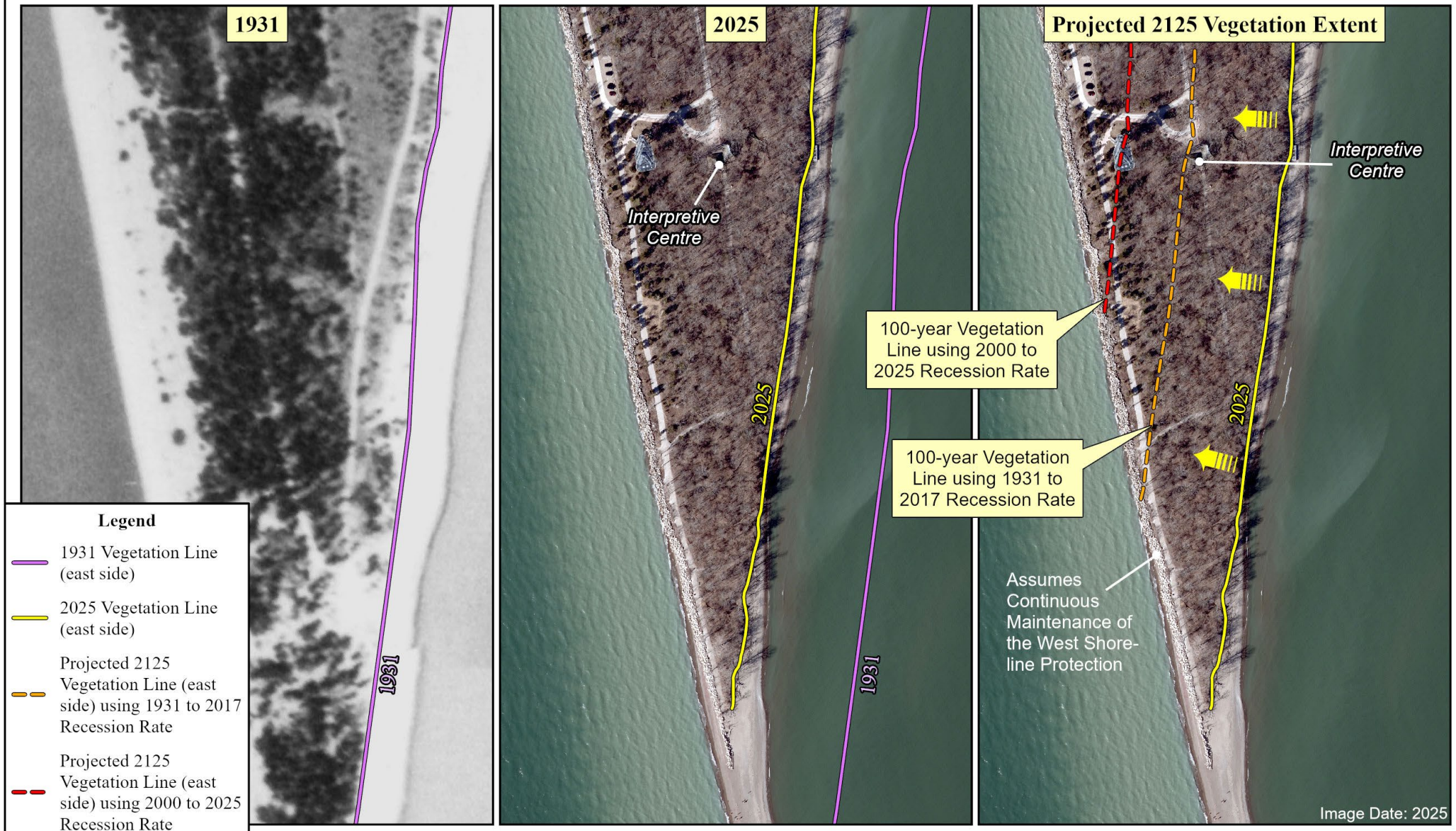


Dune restoration to increase beach resilience



Beach nourishment (sand trucked from upland)





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Vegetation Line Extent and 100-year Future Projections for East Side of PPNP Tip

Point Pelee National Park

Notes:
1) 1931 aerial photograph provided by Parks Canada.
2) 2025 SWOOP from Ontario GeoHub.

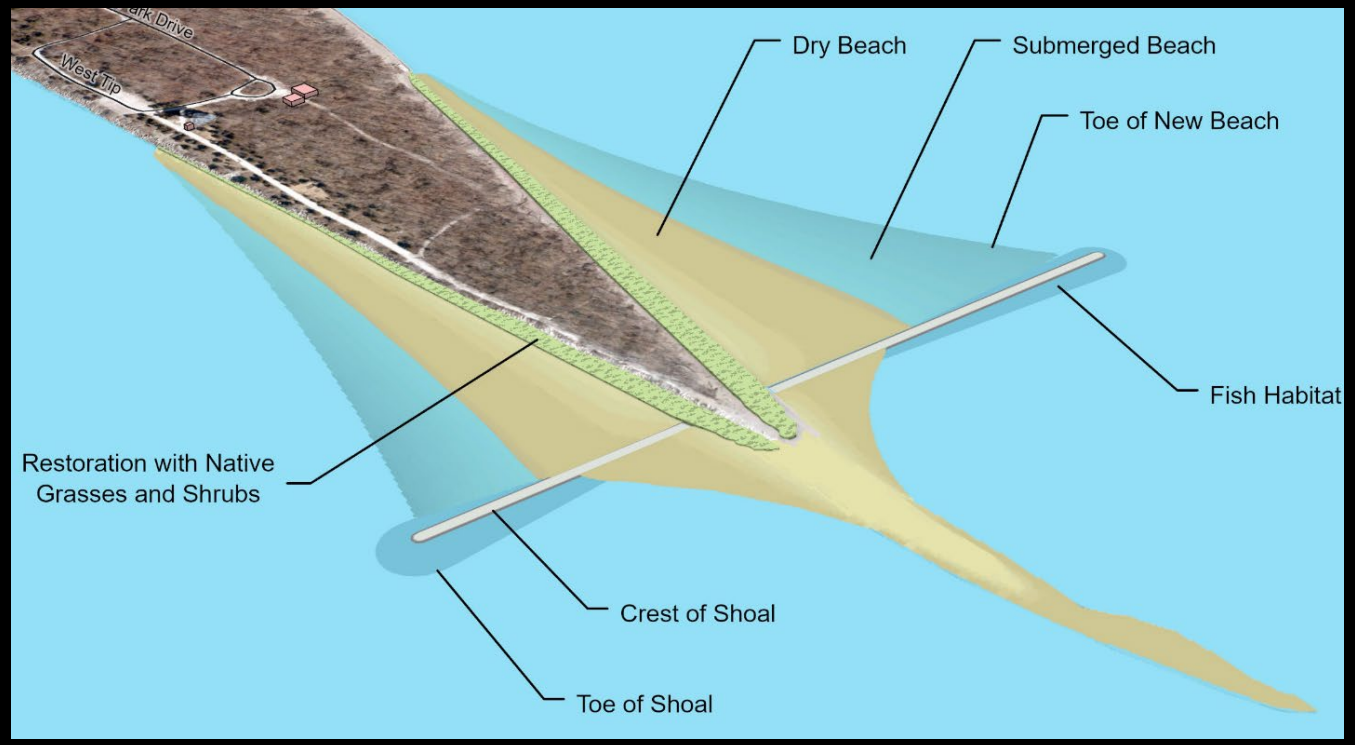
N W E S

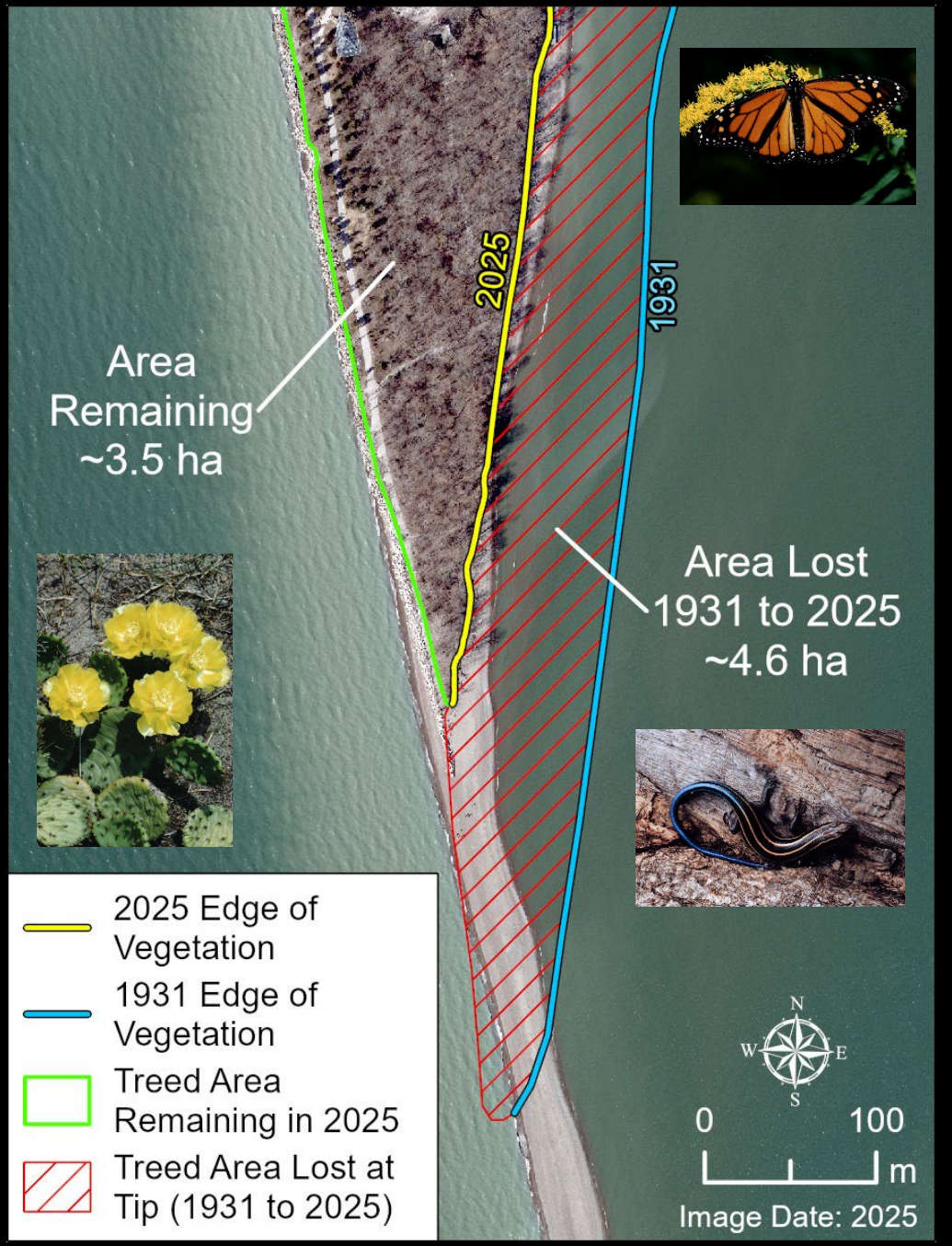
0 100 m

Summary of Habitat Loss and Shoal Concept

- Habitat loss since 1931
- Draft concept for shoals









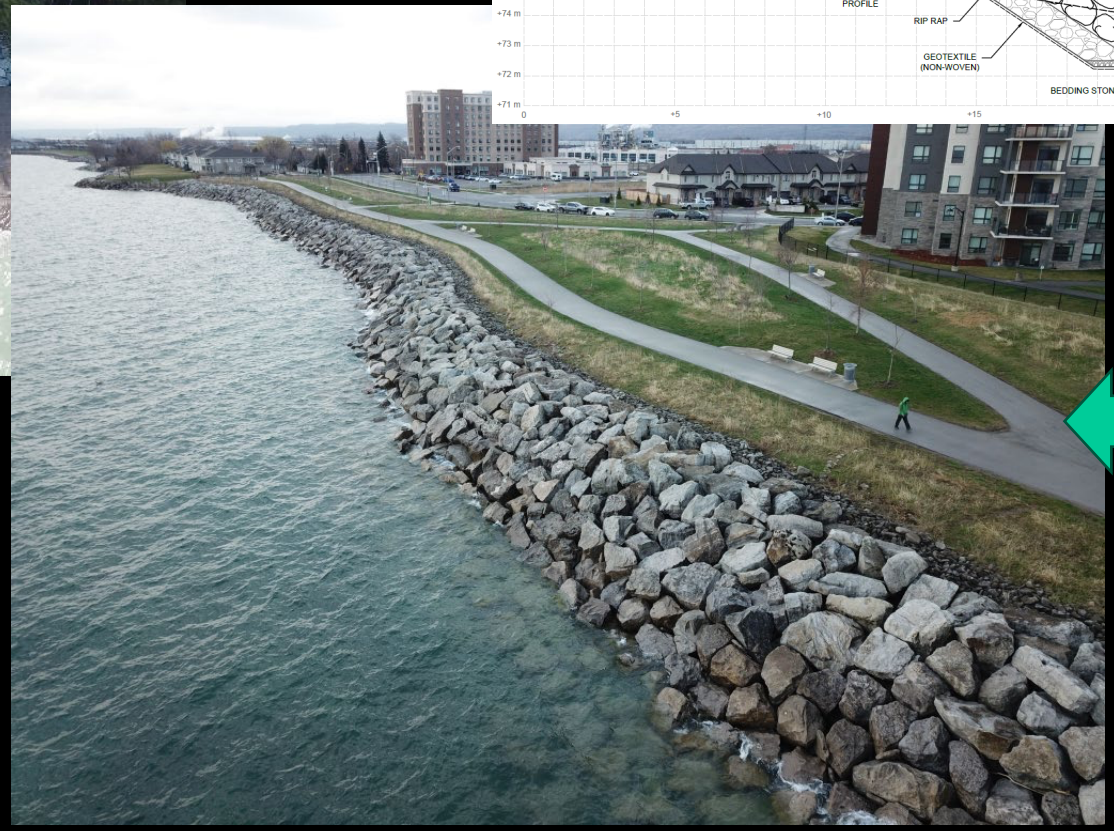
ERCA Led Project
Sketch of Phase 1A and 1B Implementation

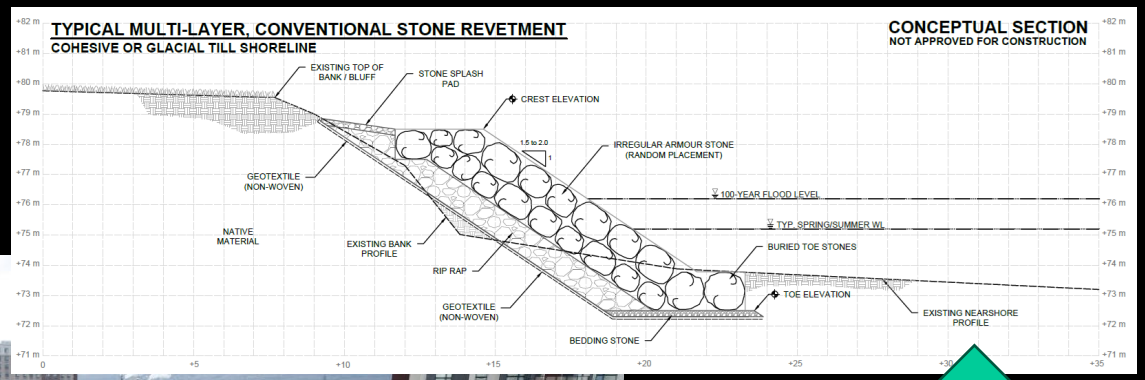


Harden with Engineered Structures (PARRARH Framework)

Traditional Engineered Structures:







Complete engineering designs for new, traditional shoreline protection structures.

QUESTIONS AND DISCUSSION





Daylighting of Canyon Creek

Coastal Climate Resilience Collaborative (**CCRC**)

July 24, 2026

VANCOUVER BOARD OF PARKS AND RECREATION

Spanish Banks Park West extension

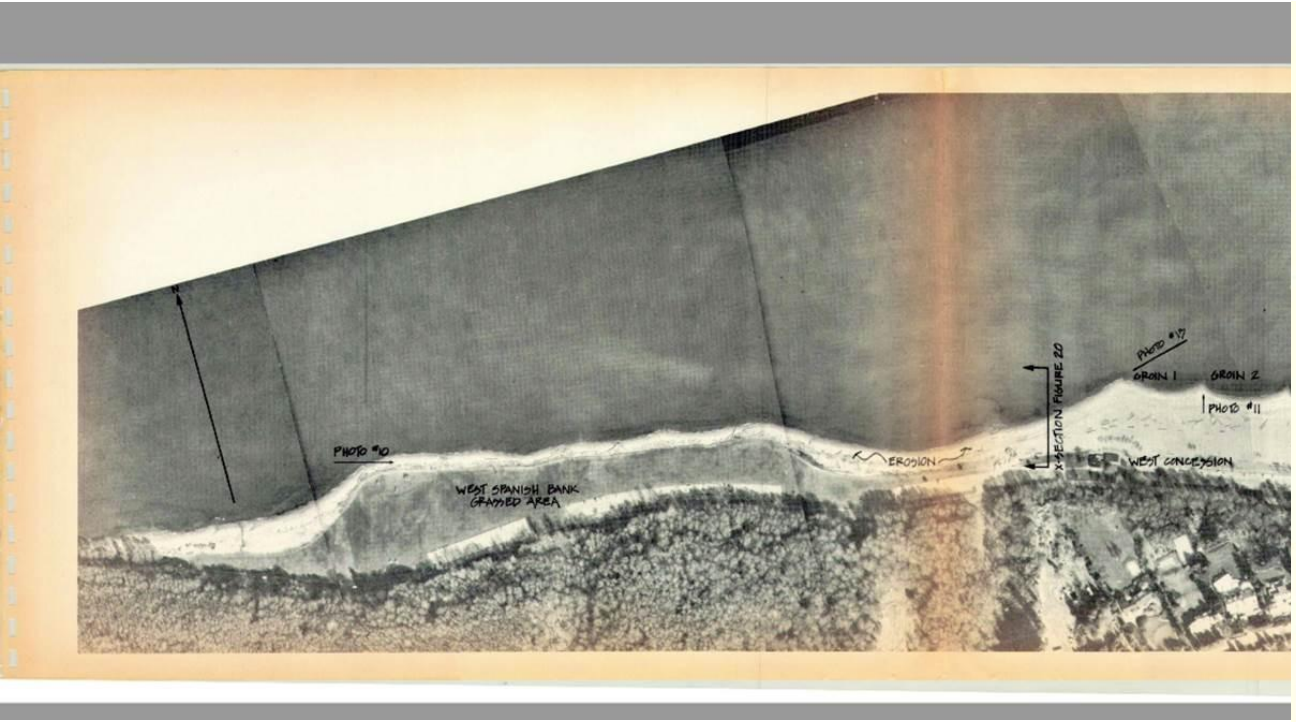




PHOTO 7 SPANISH BANK - DREDGING SAND ONTO BEACH /60



PHOTO 8 SPANISH BANK - DREDGING SAND ONTO BEACH /60

Canyon Creek Daylighting Project Location



Spanish Banks Park West extension – condition



Spanish Banks Off-leash area - turf

NW Marine Drive + Parking Lot



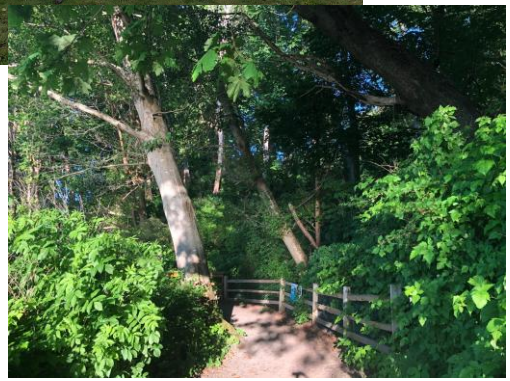


Canyon Creek outfall

Considerations - Parks

Off Leash Dog Area (OLA)





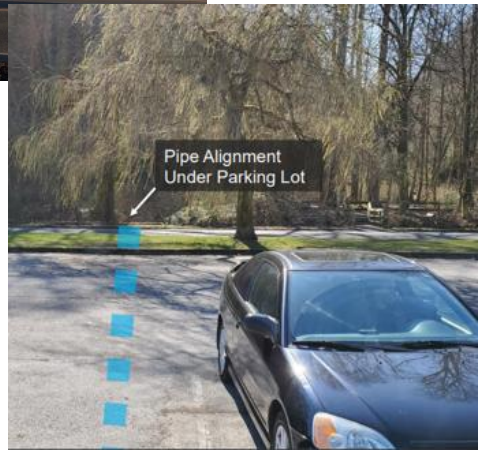
Multi-use Pathway





Vehicle Parking





Considerations - Jurisdiction



Project timing

- A 2024 Service Plan Priority Project, fitting with capital budget ‘Convert park land to healthy habitat’ goal
- Alignment with VanPlay, VanPlan, Biodiversity Strategy and Coastal Adaptation Planning:
  - Add improved and connected habitat (0.5Ha)
  - Increase biodiversity and ecological function through integration of rainwater and conversion of turf to riparian/marsh habitat
  - Few streams we can daylight in the City without land acquisition
  - Offer enhanced experiences in nature for all park users
  - Coastal adaptation pilot (replicable)

Engagement

- Board project endorsement (2020 & 2021)
- GM update March 2024 + Board meeting May 6th, 2024
- PB Operations; CoV Risk and Legal consulted
- MST Referrals – Arch + Chance Find + Env. Monitoring
- Comms:
  - CoV website live (Feb 2024)
  - Project Site signage up (Feb 2024)
  - 2 Pop-up events (Jun 2025)
- Regulators: DFO, BC Province, MoTT, MV
- Partners: Streamkeepers, Pacific Spirit Park Society



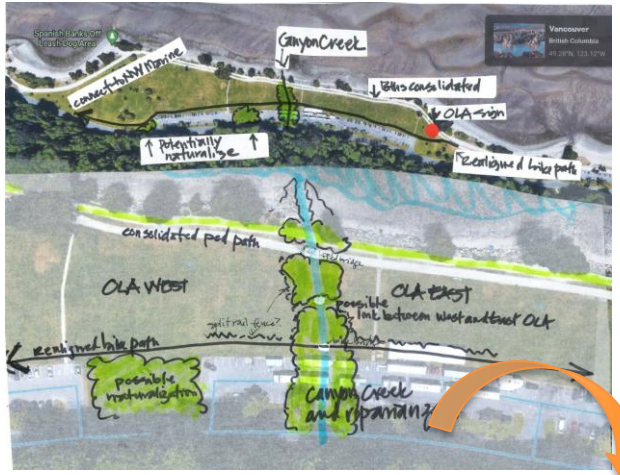




Concept Development



Evolving vision and goals



2020

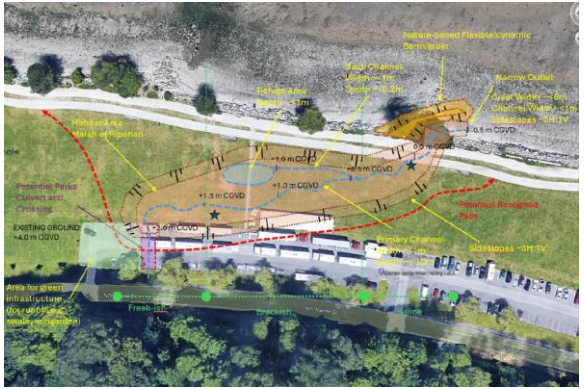


2021

2023

2024





Preferred Option: Naturalized Habitat

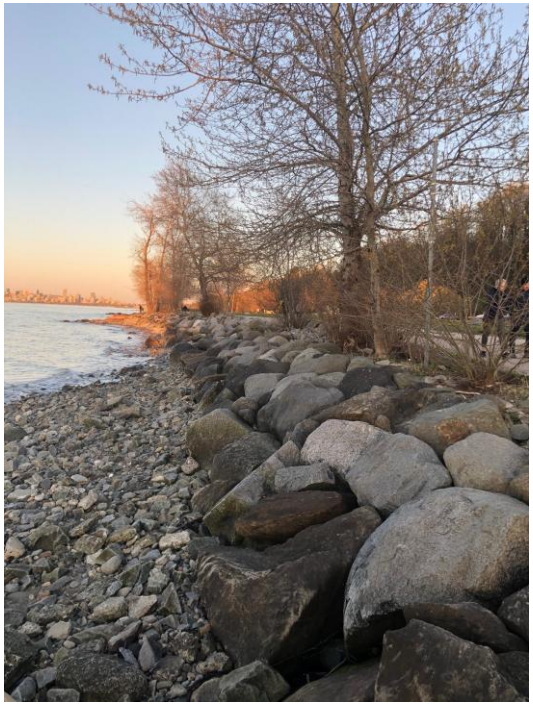


2025

Zone 1 - Grasses: **1131 m²**
Zone 2 - Coastal Wildflowers: **613 m²**
Zone 3 - Bioswale **147 m²**
Zone 4 - Vegetated Riprap/culvert: **111 m²**
Zone 5A - Coastal Riparian: **325 m²**
Zone 5B - Coastal Riparian: **450 m²**
Zone 6 - Upland: **1230 m²**
Zone 7 - Marine Interface: **62 m²**
Zone 8 - Interface Woodland: **477 m²**
Zone 9 - Bee Turf: **995 m²**

Total: 5,541 m² (0.5 Ha)

Design Considerations – shore softening







Design Considerations – Field fitted berms





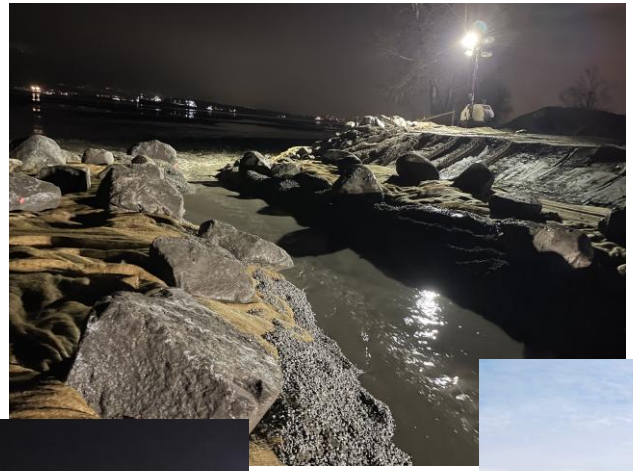


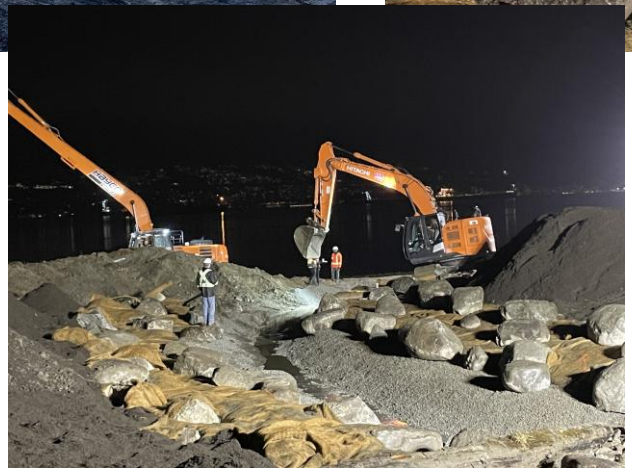


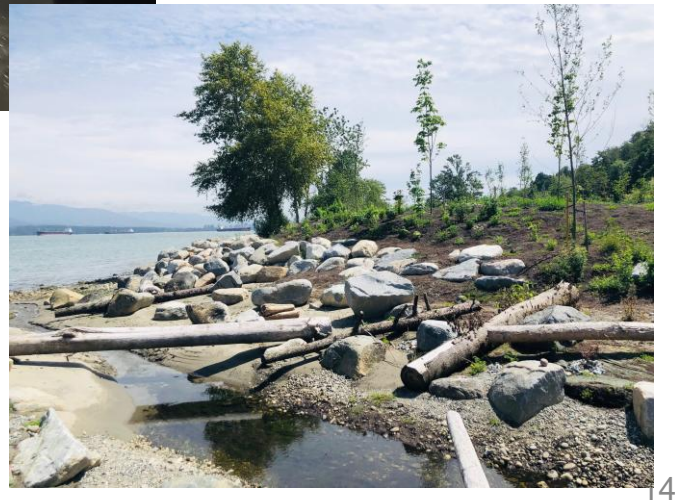


Design Considerations – Excavation Outlet channel









Design Considerations – CWD + River rock

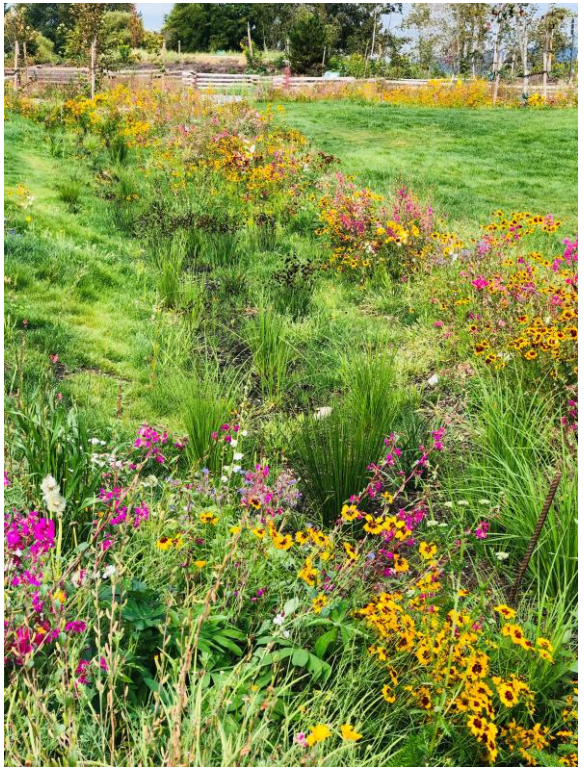




Design Considerations – Bioswales



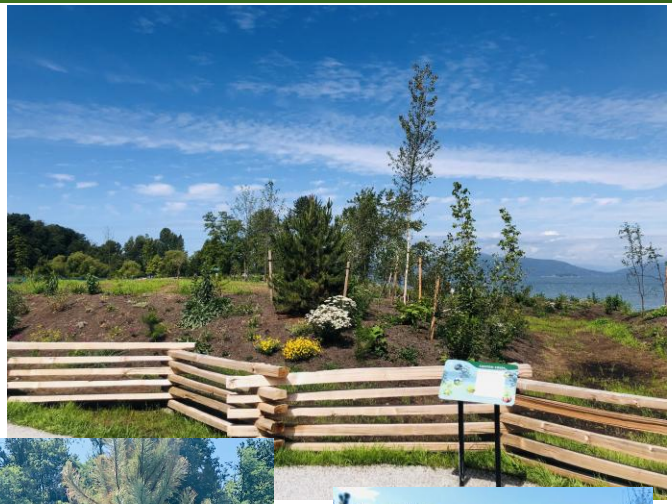




Design Considerations – Fence + Signage











Design Considerations – Irrigation and Maintenance









Canyon Creek

Project timeline

Before 2024
- Consulting Musqueam, Squamish and Tsleil-Waututh Nations (ongoing in all phases)
- Developed conceptual designs

Winter, spring and summer 2024
- Site survey and technical analyses
- Developing detailed designs and tendering
- Sharing design and information with public

Fall and winter 2024
- Construction involving land grading, planting, and temporary disruptions like noise, fencing and limited public access to construction site.

2025 onward
- Environmental stewardship and long-term maintenance



Funding + *Team composition*

Description	Cost	Year
Feasability + conceptual + detail design	$300K	2023/24
Construction	$1.4M	2024/25
EOR/CA services	$200K	2024/25
Planting and Establishment	$300K	2025-2027
Total Project Cost	***$2.2M***	
Natural Infrastructure Fund (NIF) grant	**$992,800**	



Team Composition:

- Parks: Env, Arch, Infra, Ops, Comms, Eng
- Consultant: Civil Eng., Coastal Eng., Landscape Architects, Env/Bio, Gis/CAD, Geotech/Geomorphologist

What's ongoing

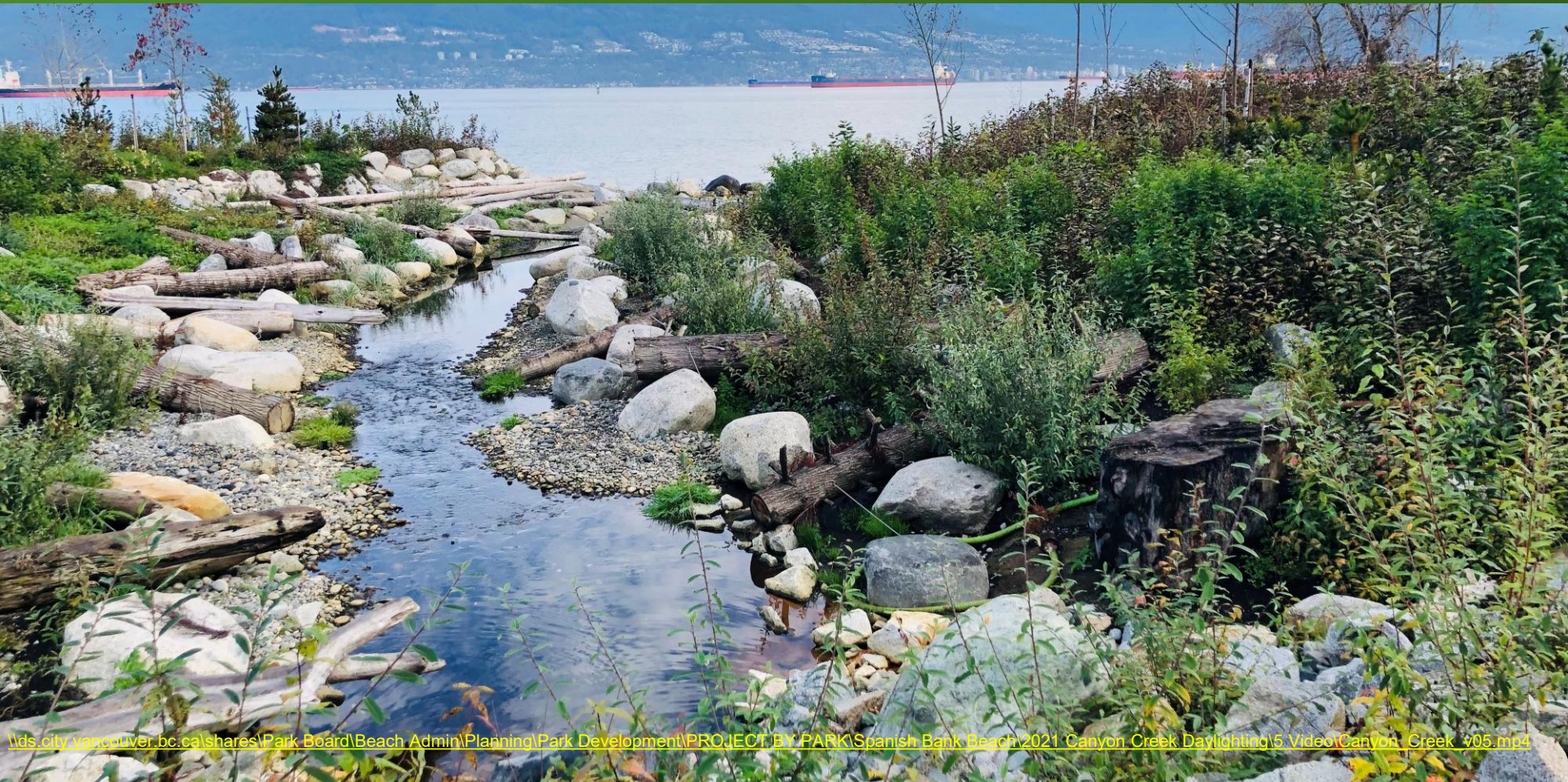








- 2-yr vegetation maintenance + establishment (Contractor)
- Ongoing public education + sensitive areas
- Effectiveness monitoring - how successful at restoring the ecosystem or component parts
- Work with Streamkeepers + DFO
- PB ops to take on maintenance



\\ds.city.vancouver.bc.ca\shares\Park Board\Beach Admin\Planning\Park Development\PROJECT BY PARK\Spanish Bank Beach\2021 Canyon Creek Daylighting\5 Video\Canyon_Creek_v05.mp4


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