



Tidal Marshes & Rising Tides:

Facilitating ecological resilience in the Fraser River delta

Eric Balke, MSc

South Coast Conservation Land Management Program

Eric.Balke@gov.bc.ca

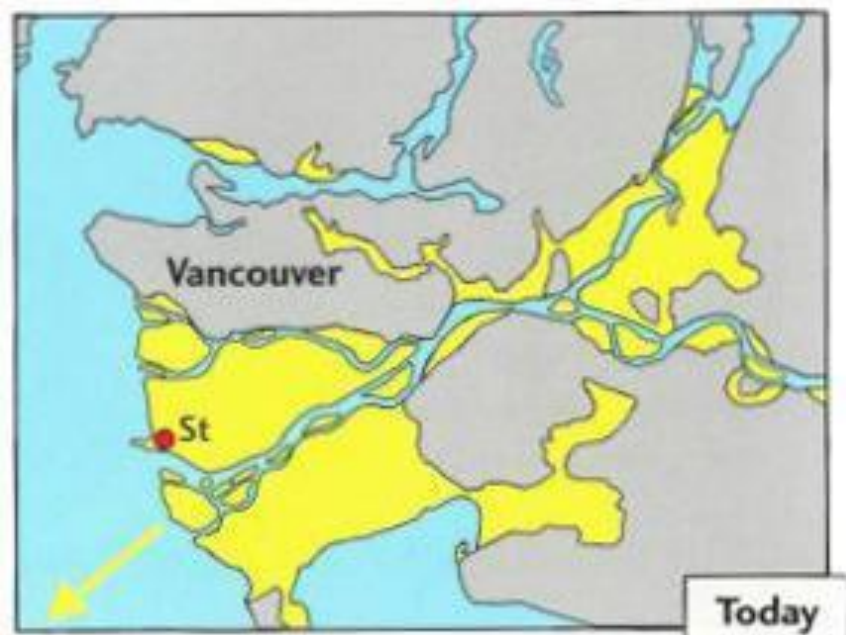
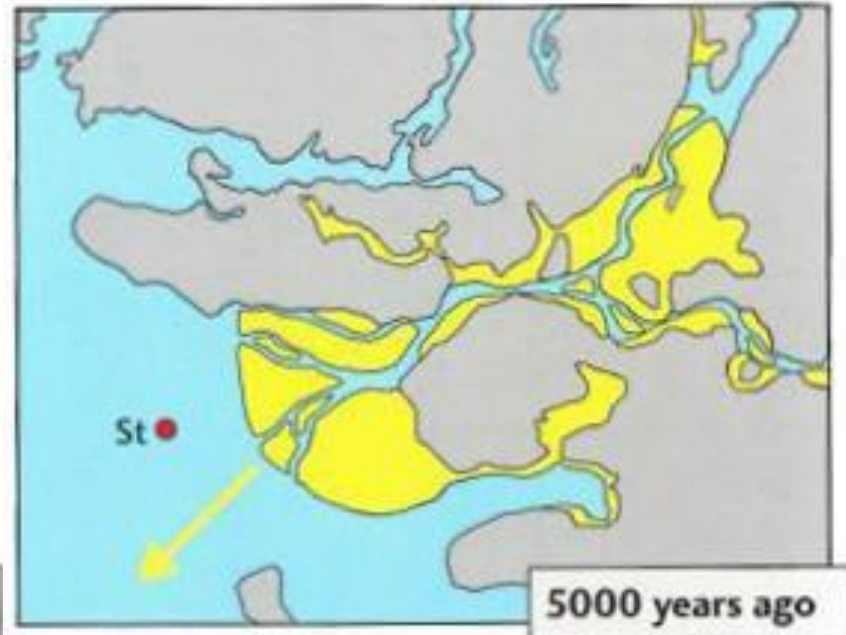
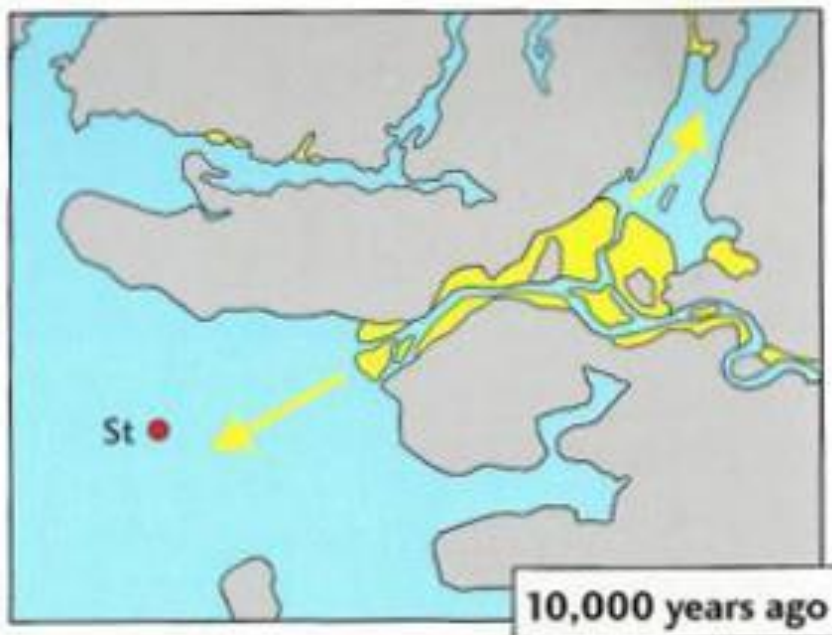
South Coast Conservation Land Management Program



43 km

Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google Earth



St ● Present site of Steveston



North Arm

Vancouver

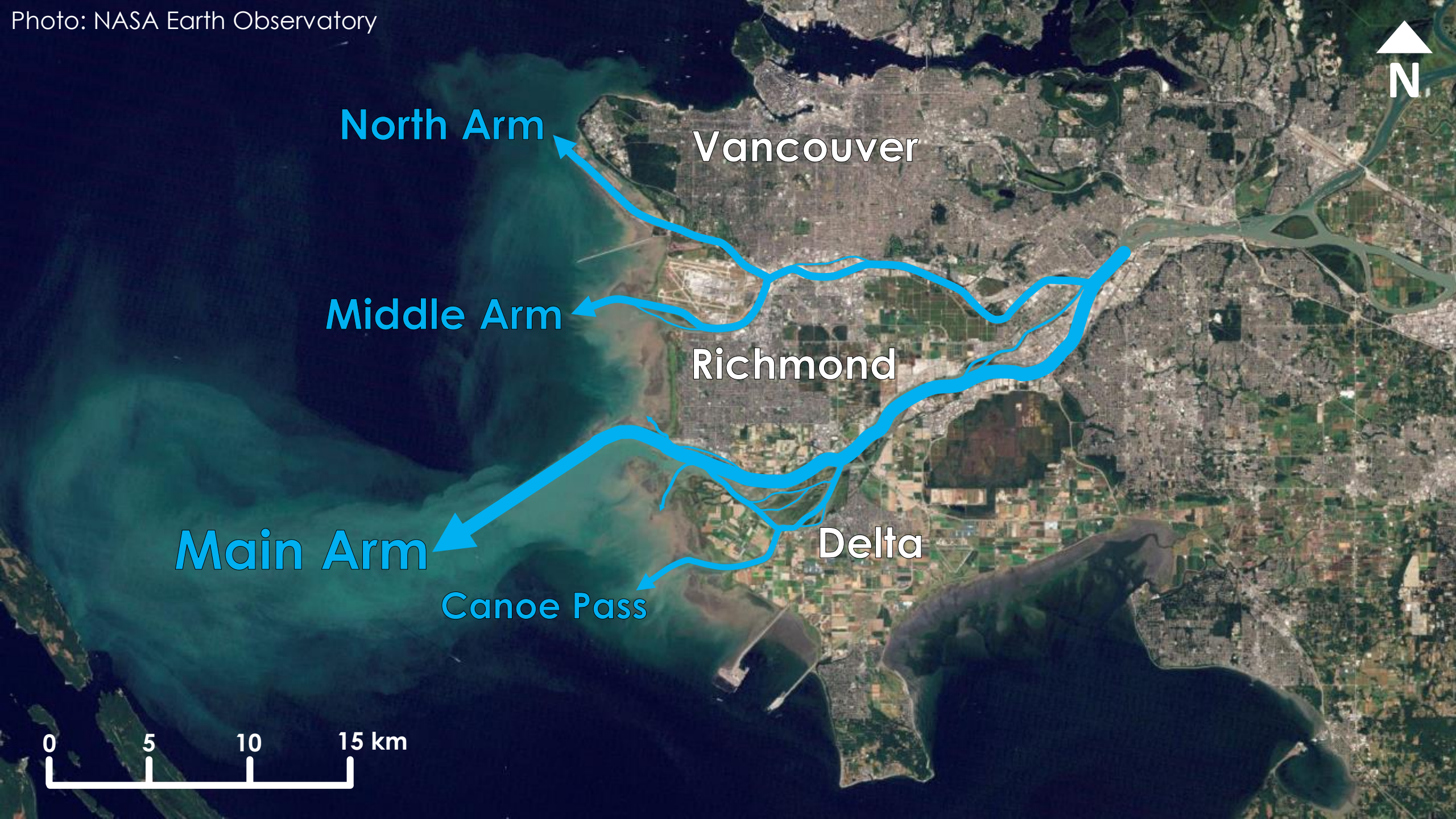
Middle Arm

Richmond

Main Arm

Delta

Canoe Pass





Vancouver

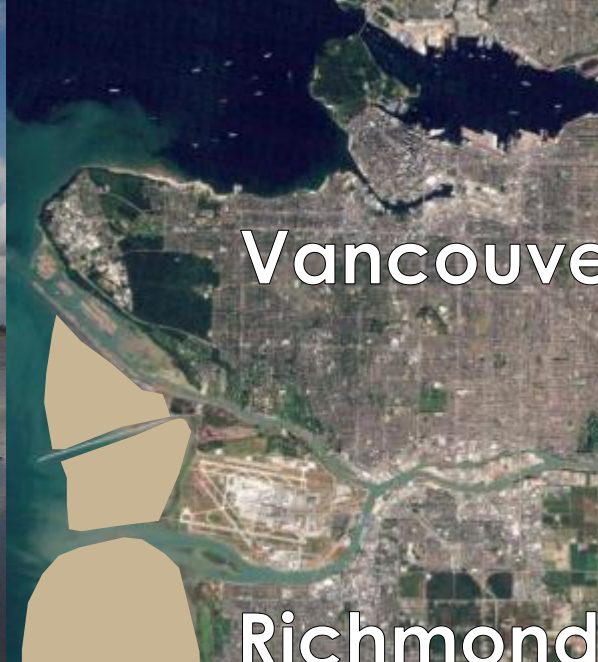
Richmond

Delta





Photo: E. Balke



Vancouver

Richmond



Photo: Tomohiro Kuwae



Delta

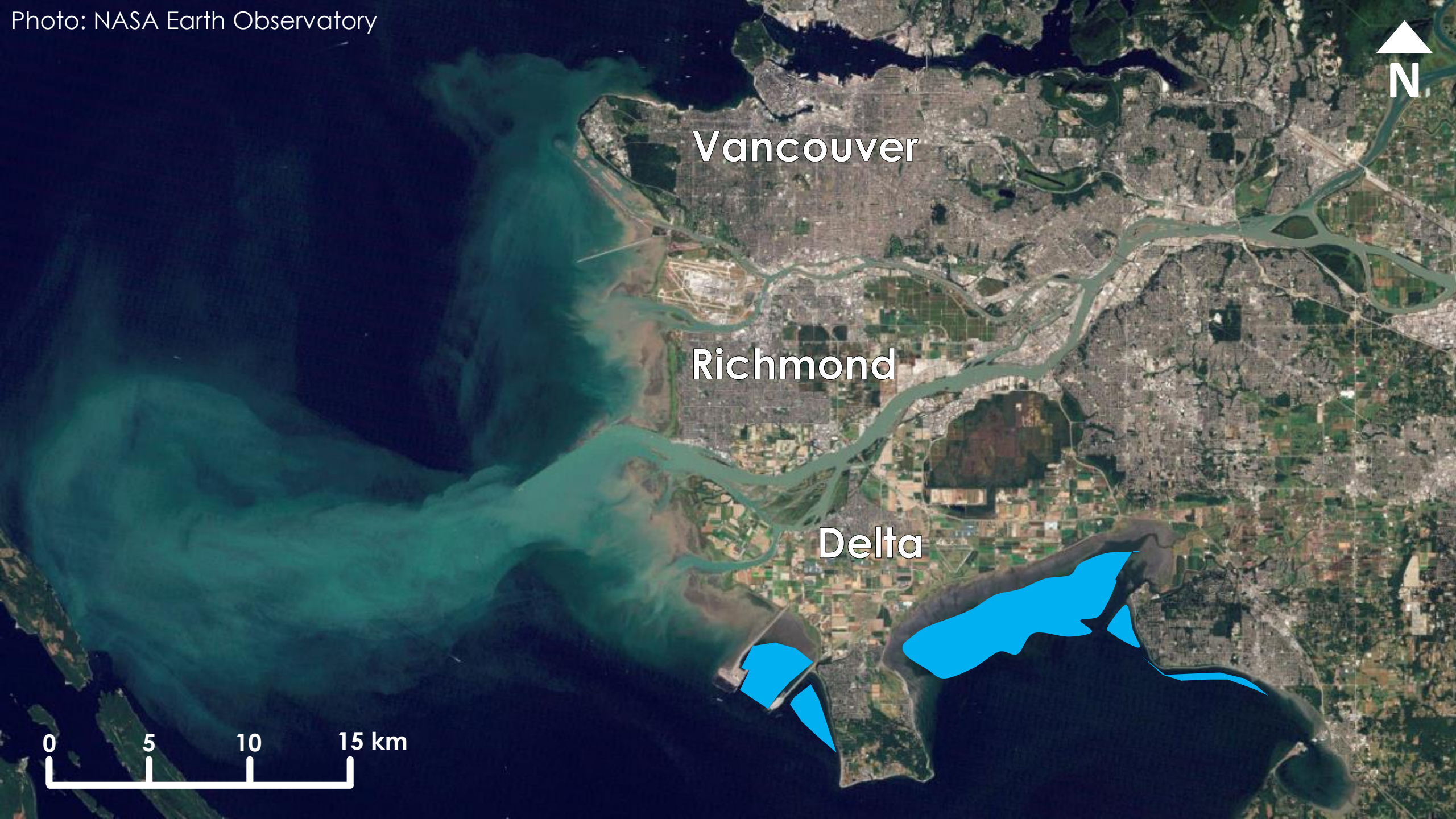
0 5 10 15 km



Vancouver

Richmond

Delta



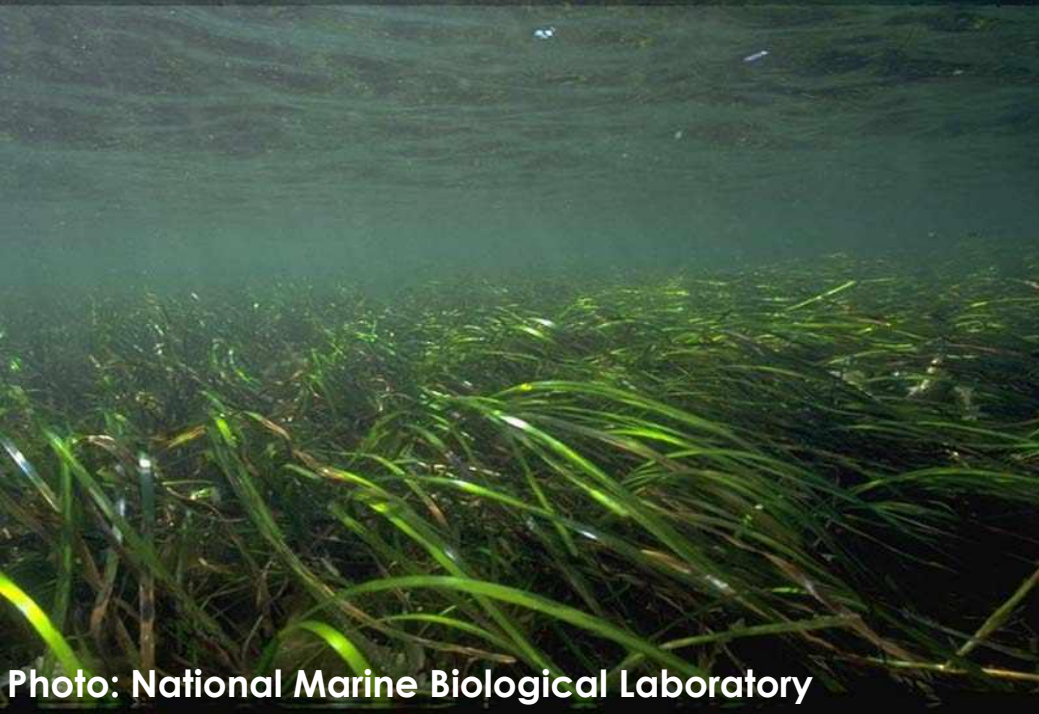


Photo: National Marine Biological Laboratory



Photo: Tavish Campbell



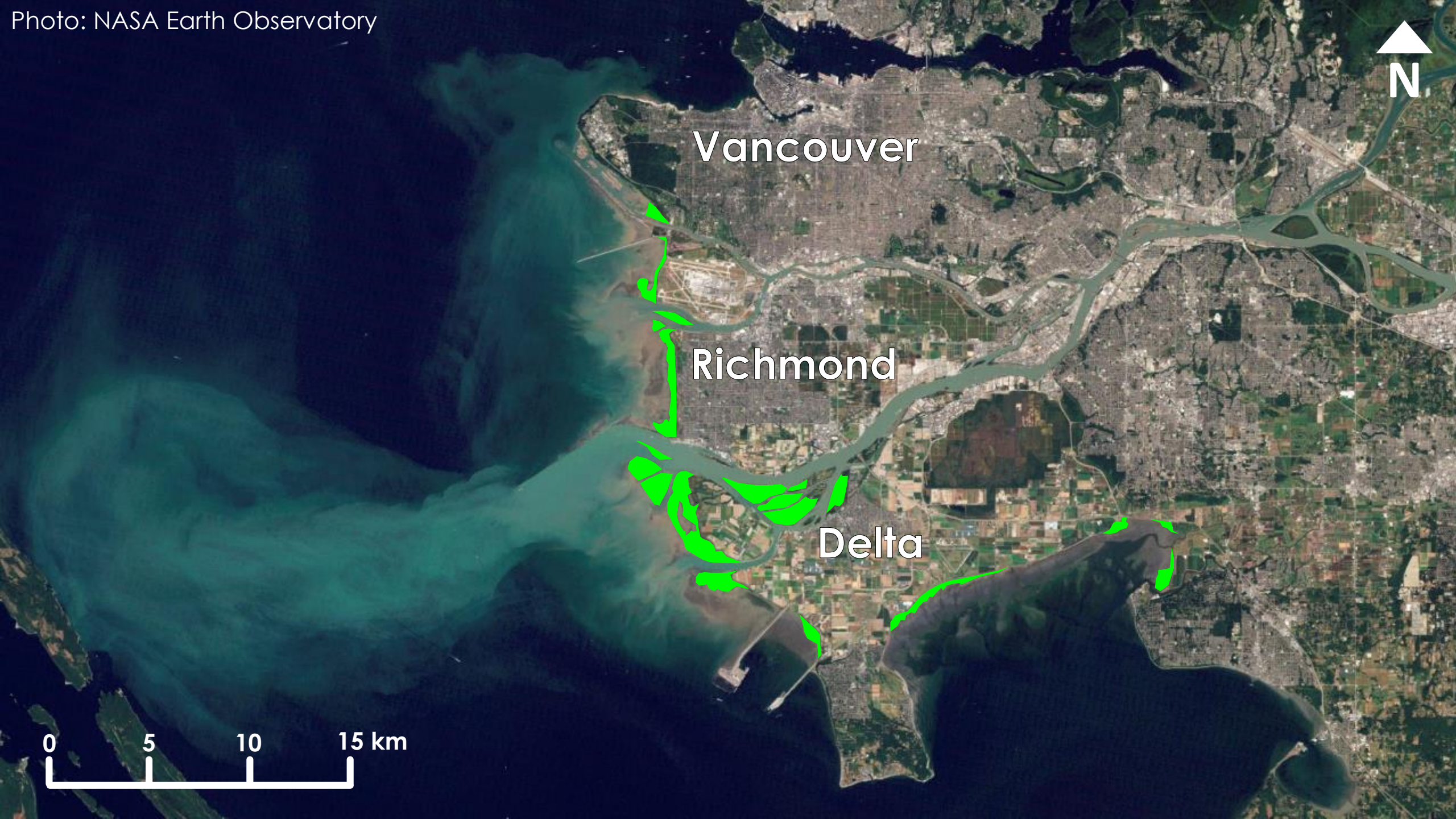
0 5 10 15 km

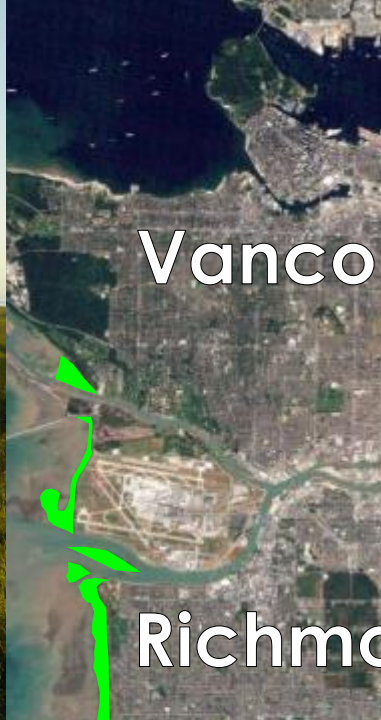


Vancouver

Richmond

Delta







Vancouver

Richmond

Delta





Vancouver

**Sturgeon
Bank**

Richmond

Wildlife Management Areas

**South Arm
Marshes**

**Roberts
Bank**

Delta

Serpentine

**Boundary
Bay**

14.8 km

Image © 2018 DigitalGlobe
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Image © 2018 IMTCAN

Google Earth



North Arm

Vancouver

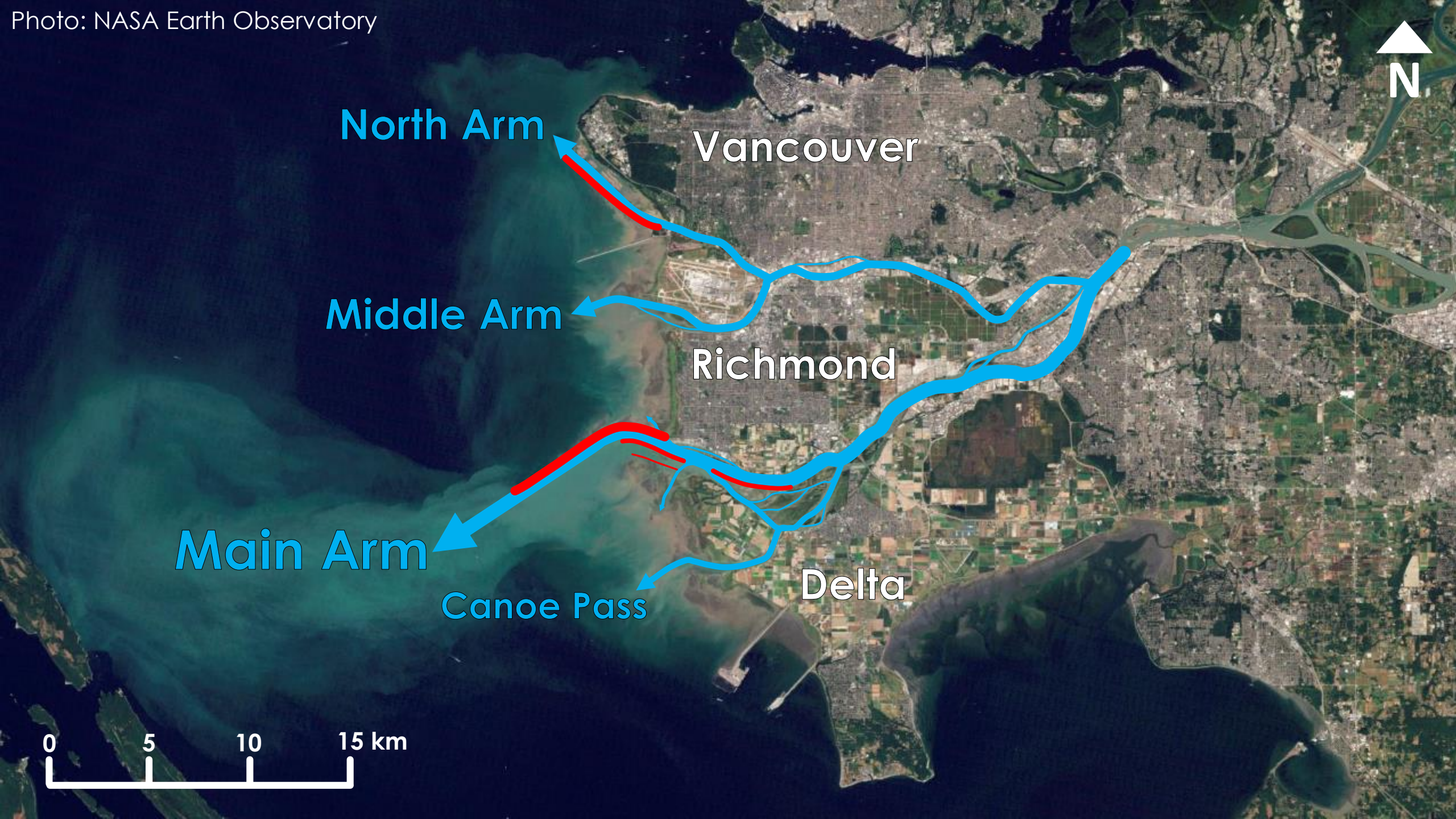
Middle Arm

Richmond

Main Arm

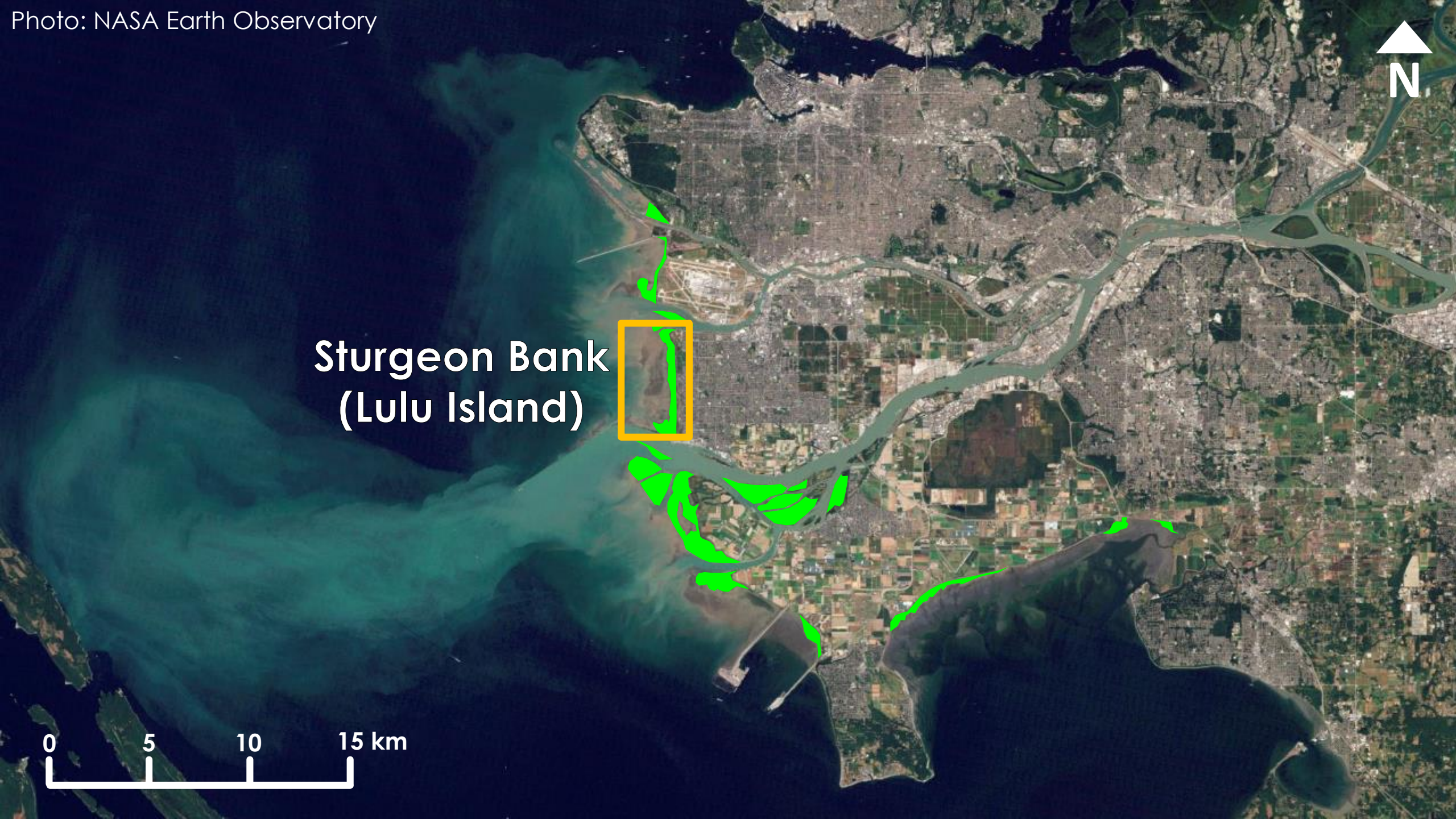
Canoe Pass

Delta





**Sturgeon Bank
(Lulu Island)**



July 1979



July 2011



Images: S. Boyd (L), S. Northrup (R)

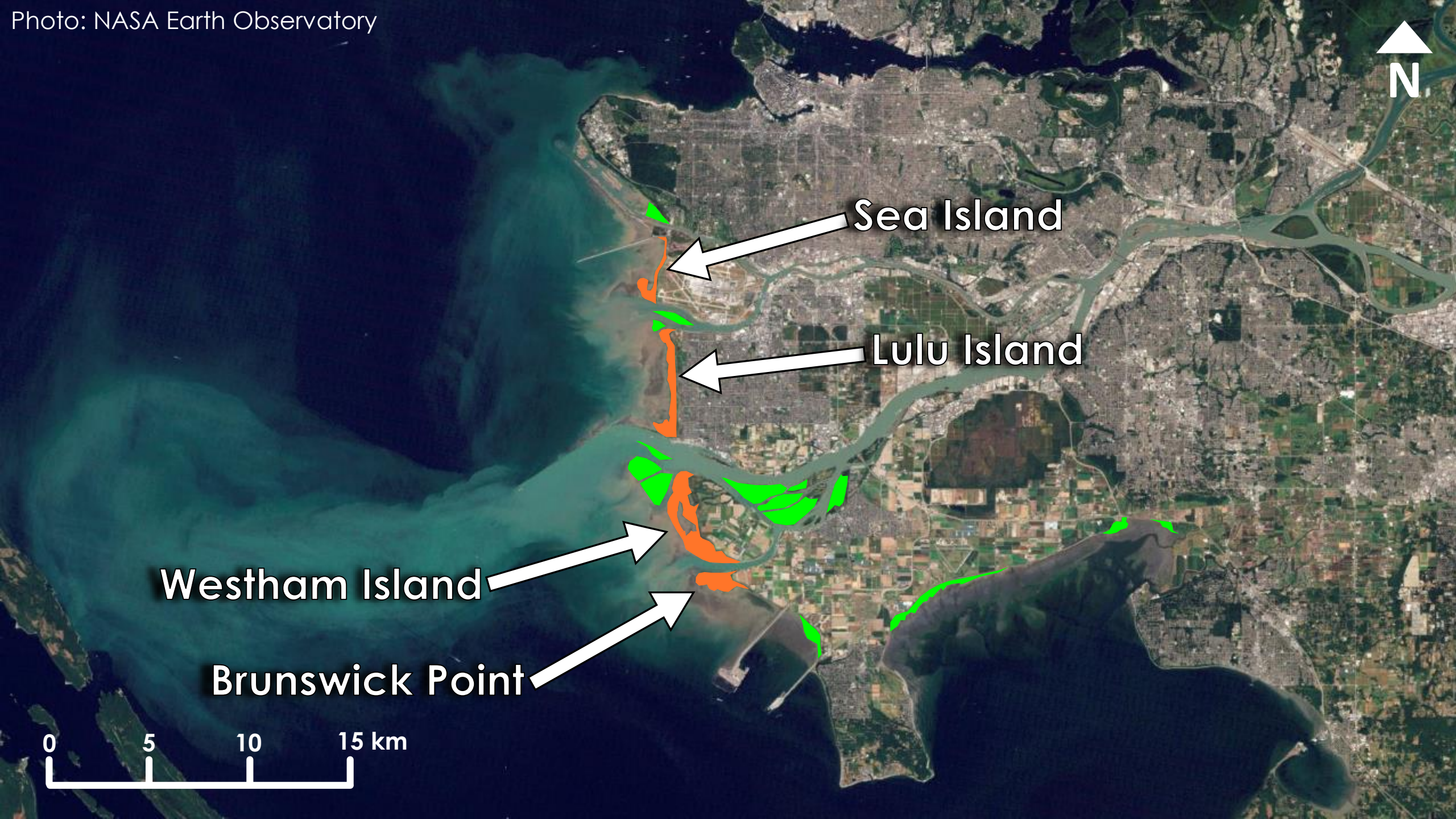


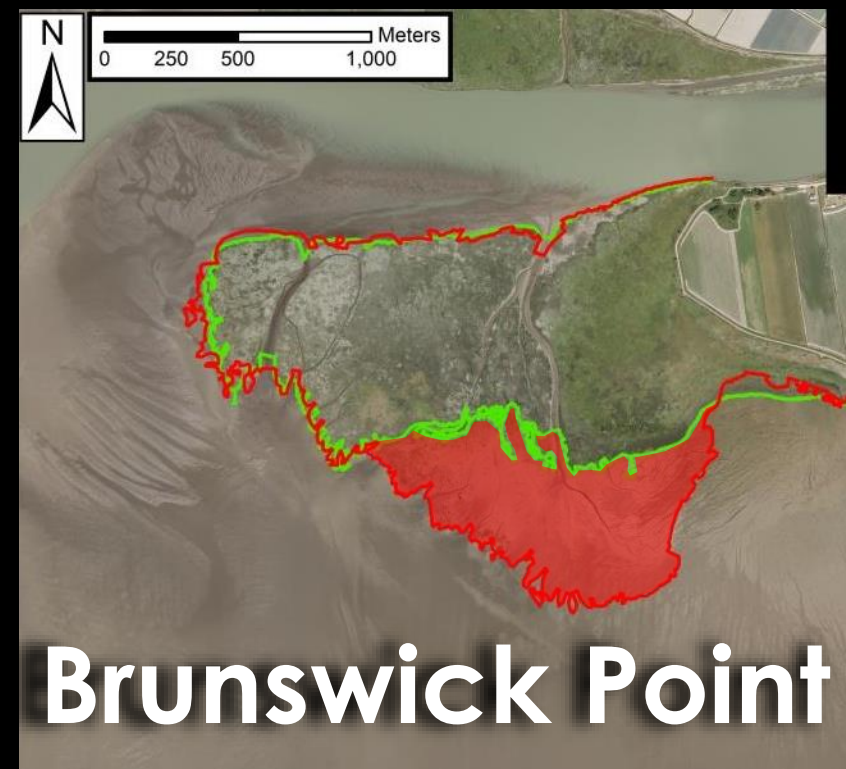
Sea Island

Lulu Island

Westham Island

Brunswick Point







Vancouver

YVR

Richmond

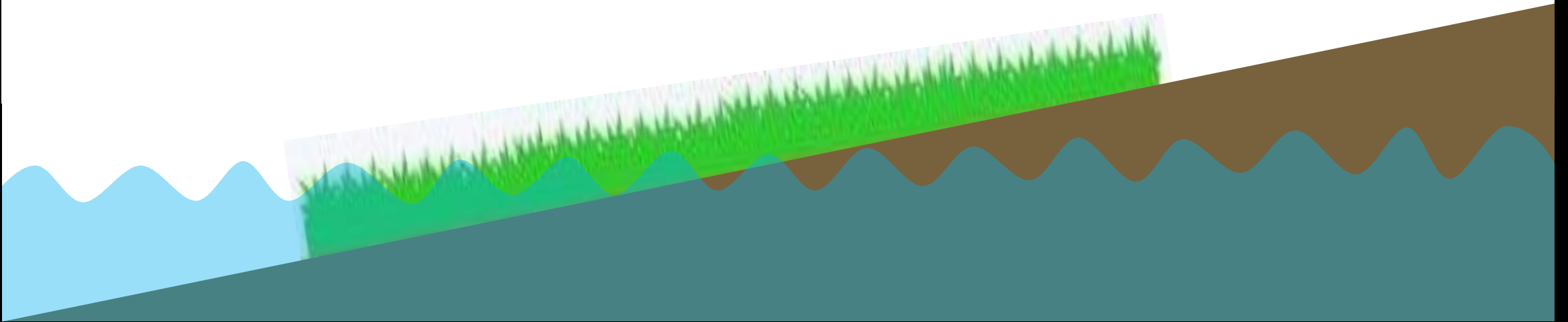
Delta

Surrey

Map: Community Mapping Network and Fraser Basin Council

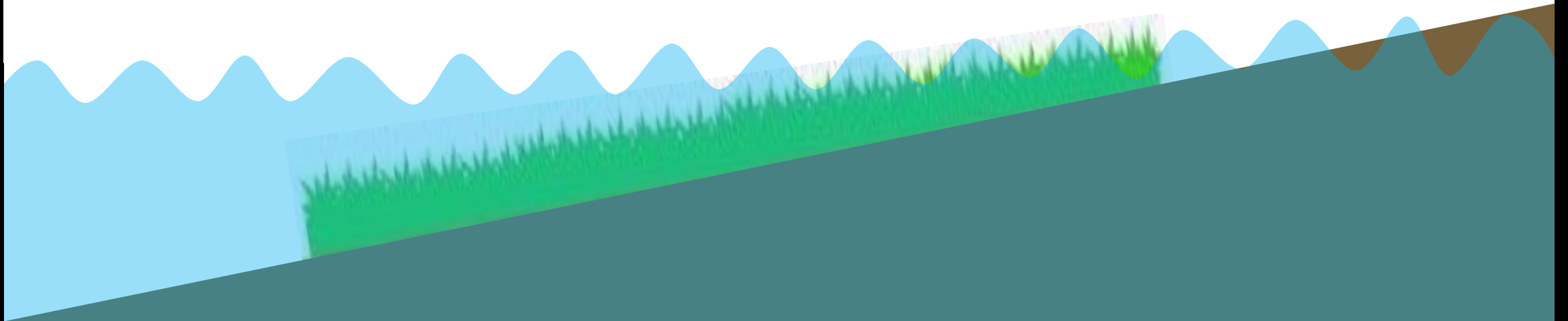
Landward Migration

Costal marshes



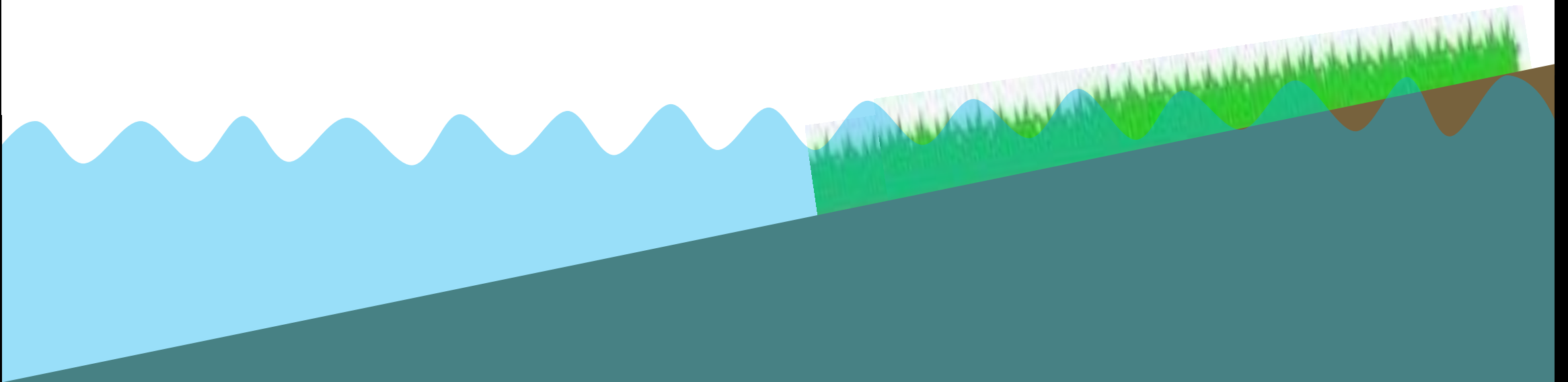
Landward Migration

Sea-level rise



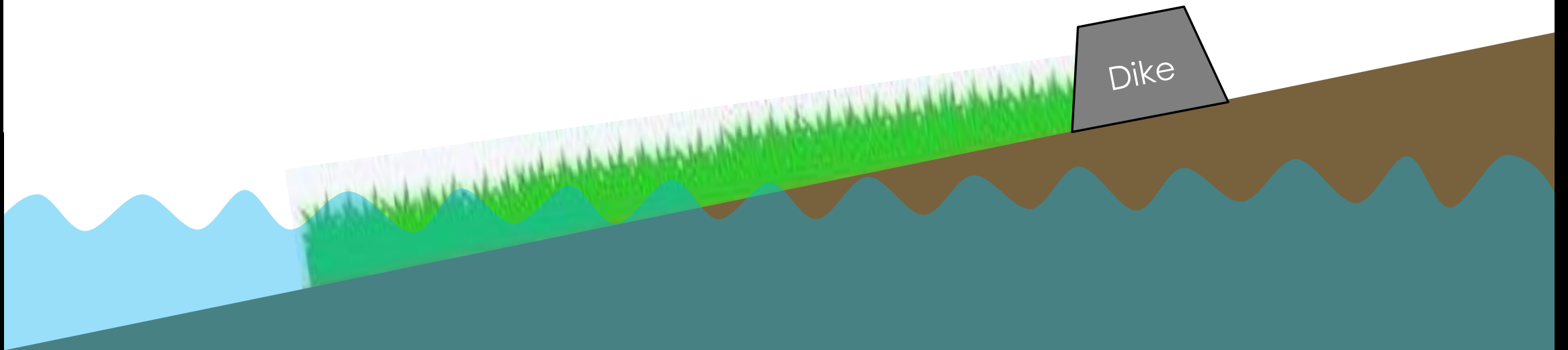
Landward Migration

Sea-level rise → marsh migrates landward



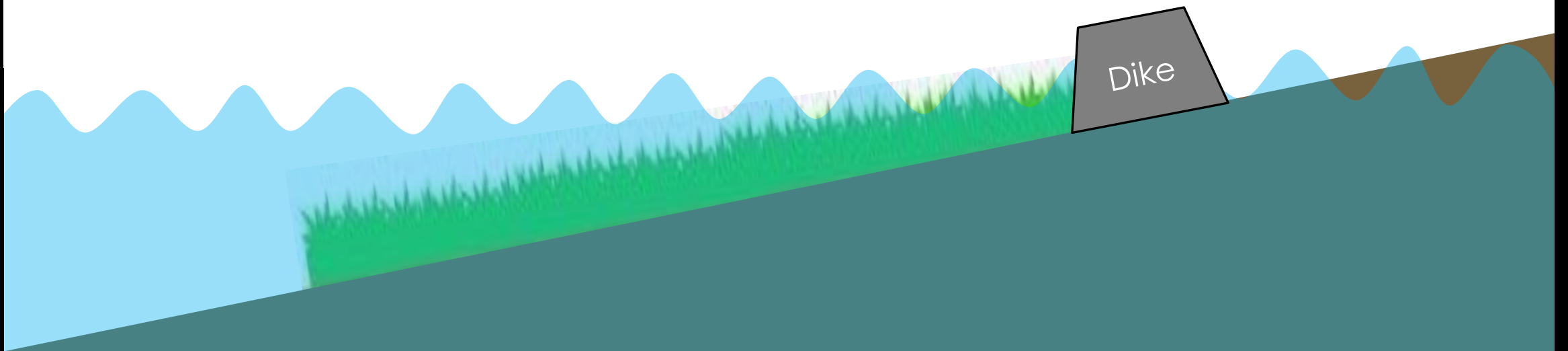
Coastal Squeeze

Costal marshes with dike



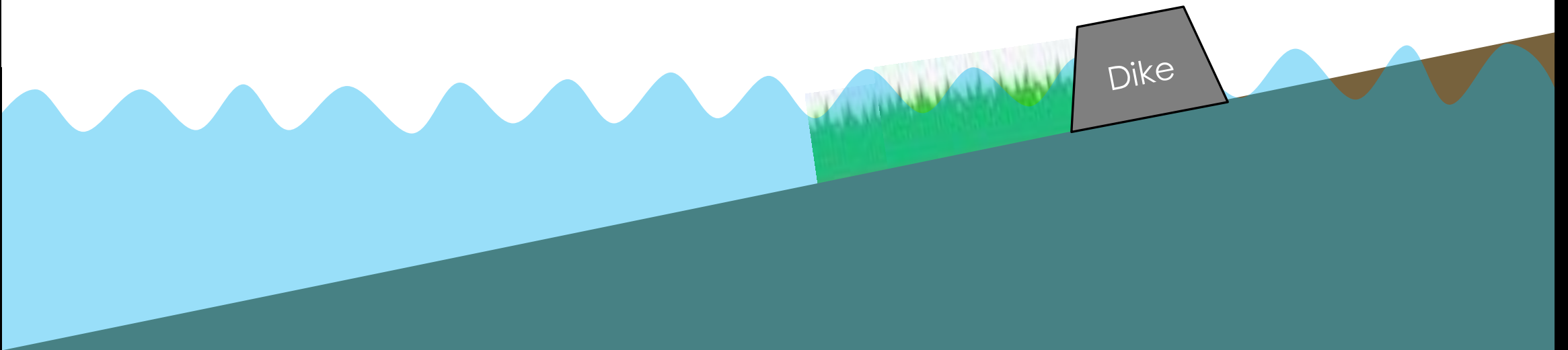
Coastal Squeeze

Sea-level rise with dike



Coastal Squeeze

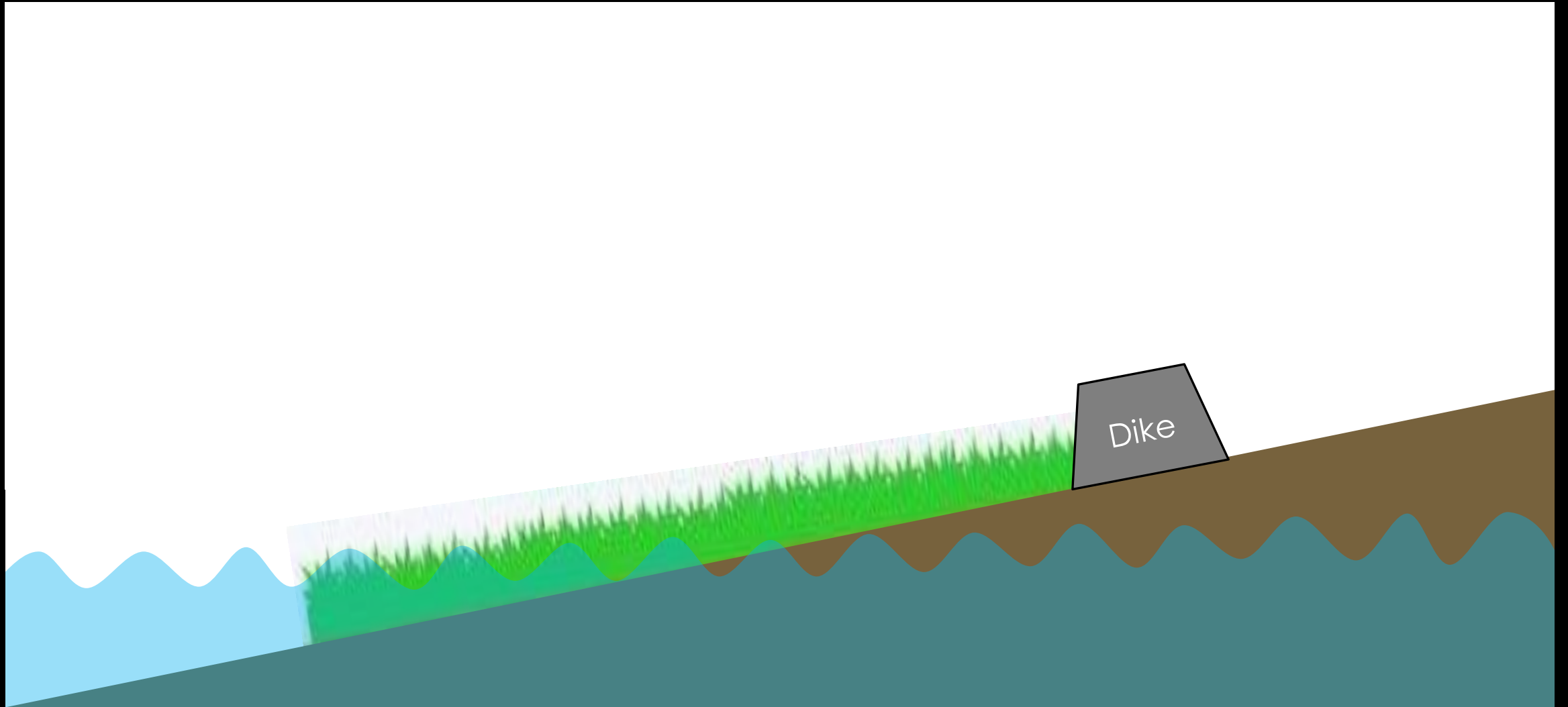
Sea-level rise with dike → coastal squeeze





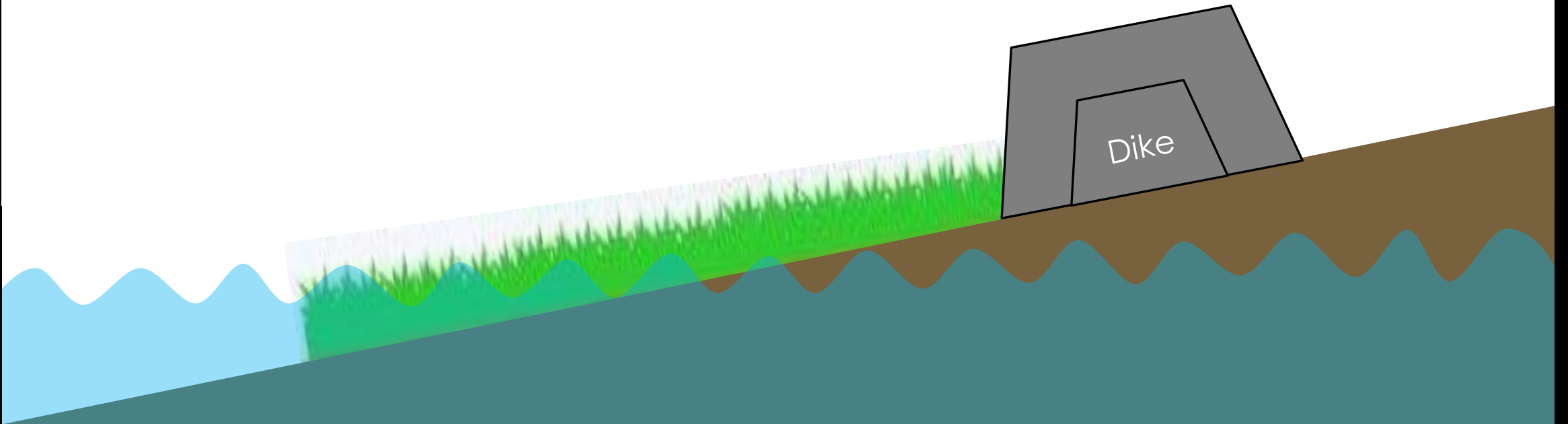
Map: Community Mapping Network and Fraser Basin Council

Status Quo



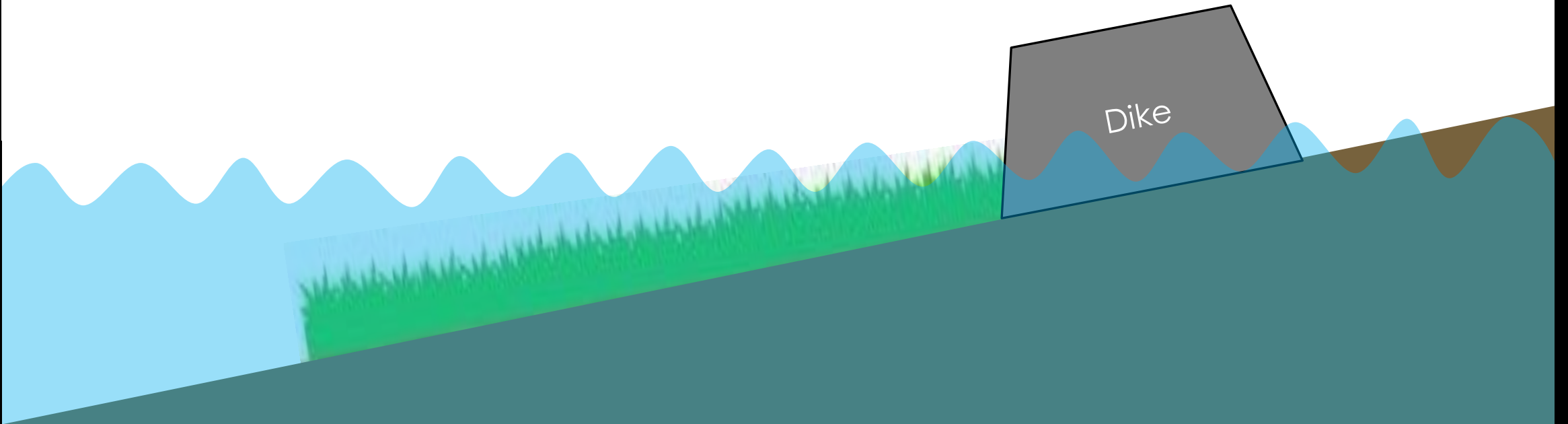
Status Quo

Build dike higher



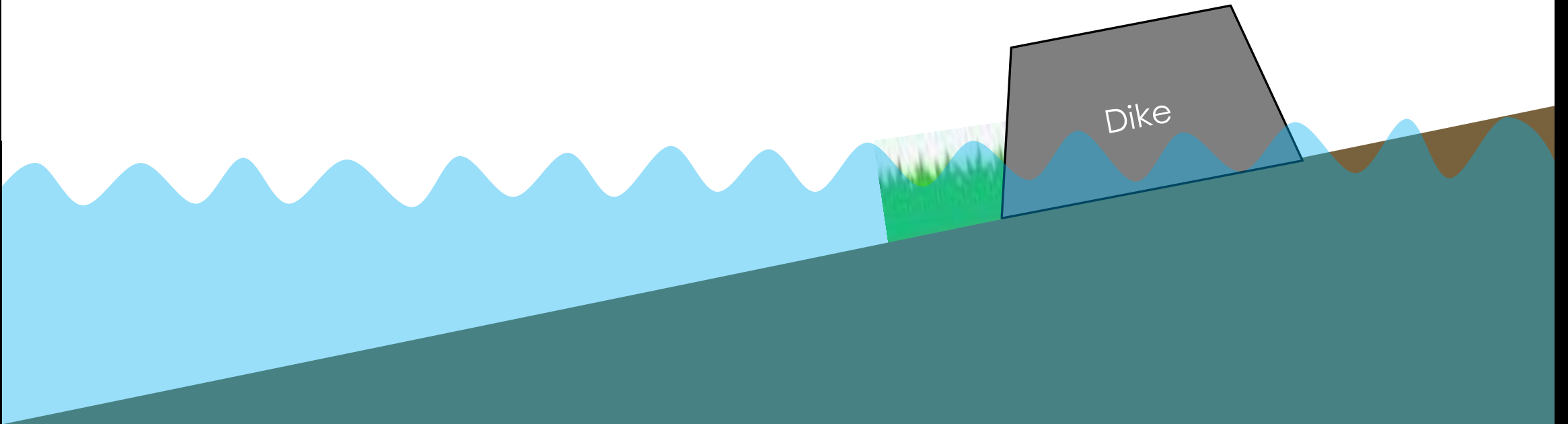
Status Quo

Build dike higher

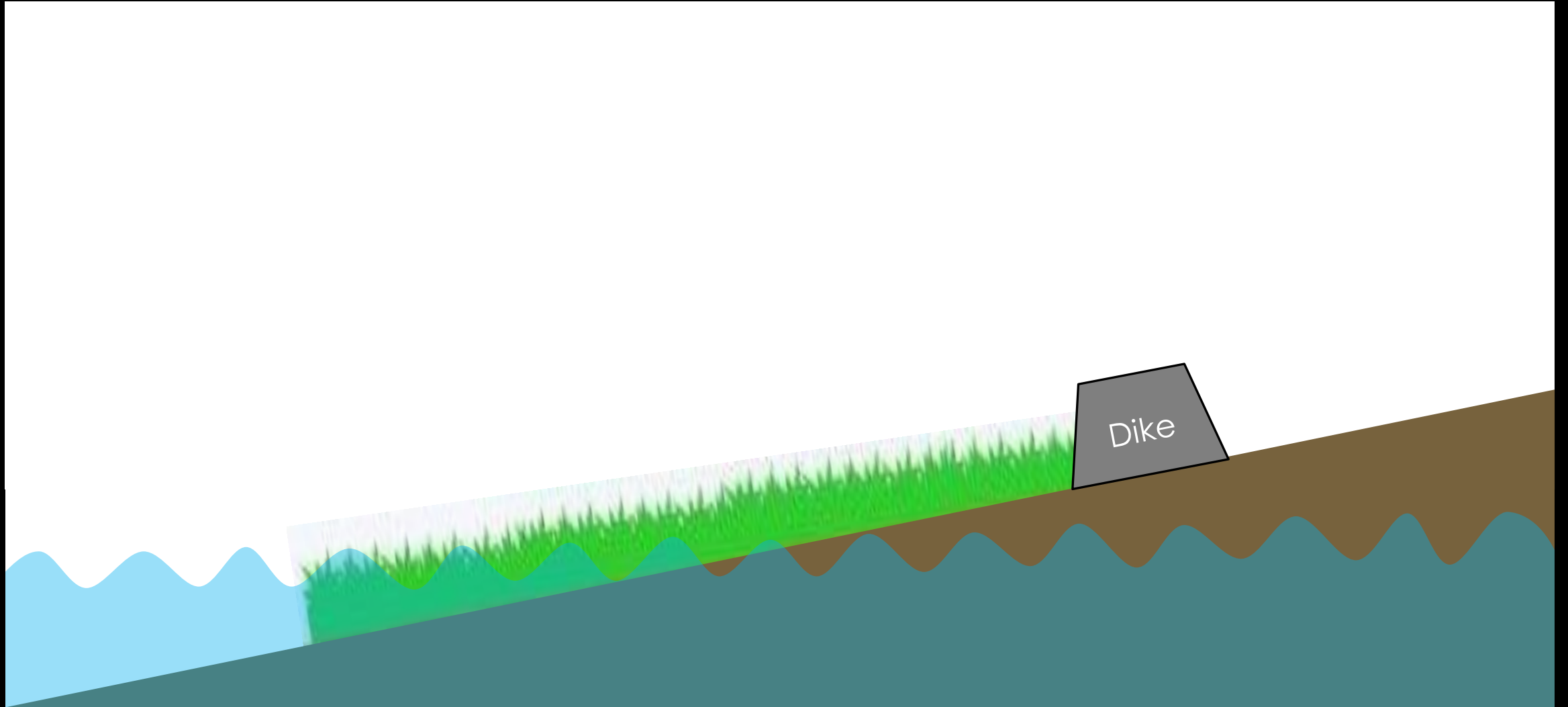


Status Quo

Build dike higher → marsh loss

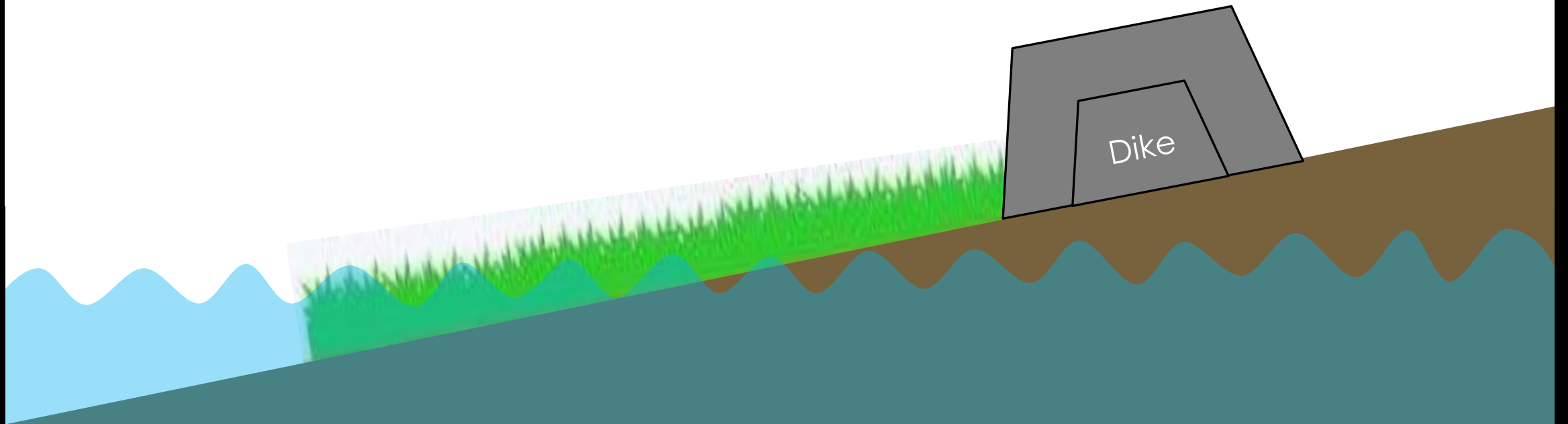


“Living Dike” Concept



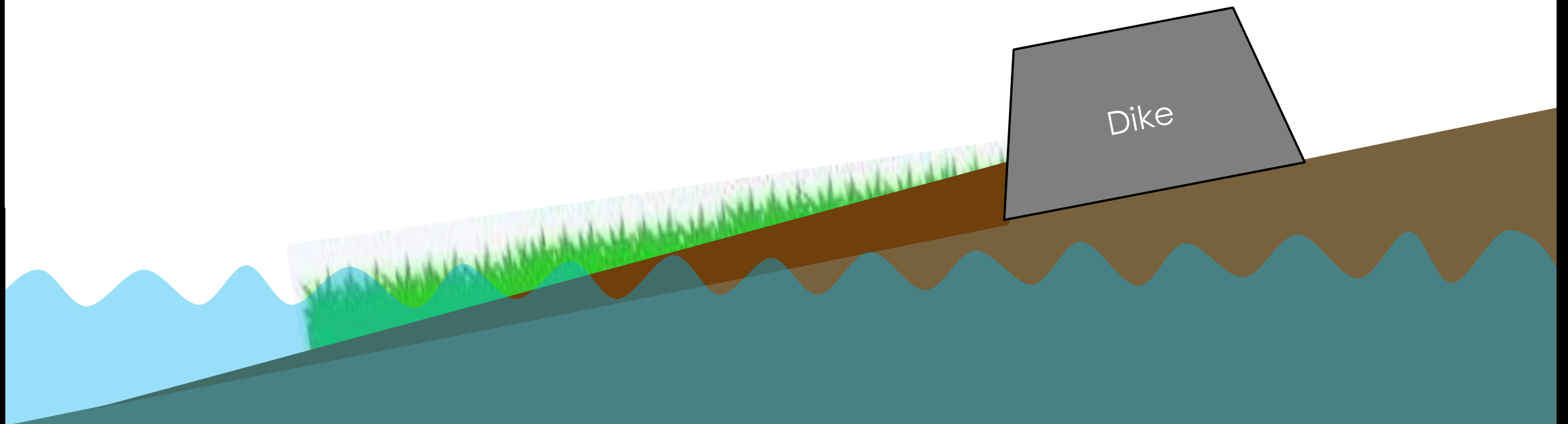
“Living Dike” Concept

Build dike higher



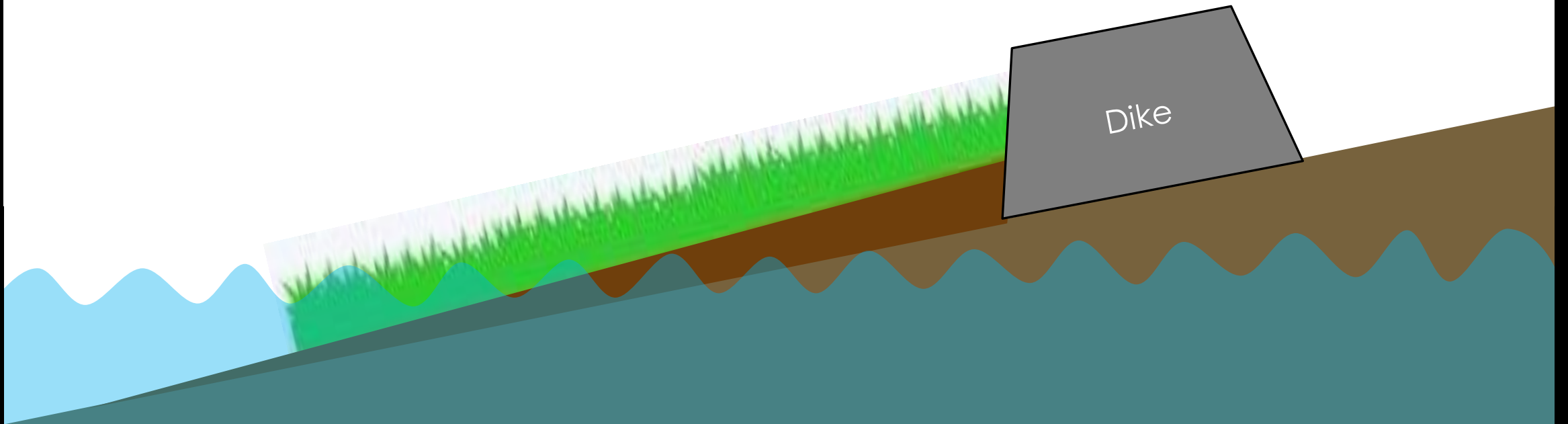
“Living Dike” Concept

Build dike higher + gradually widen dike toe



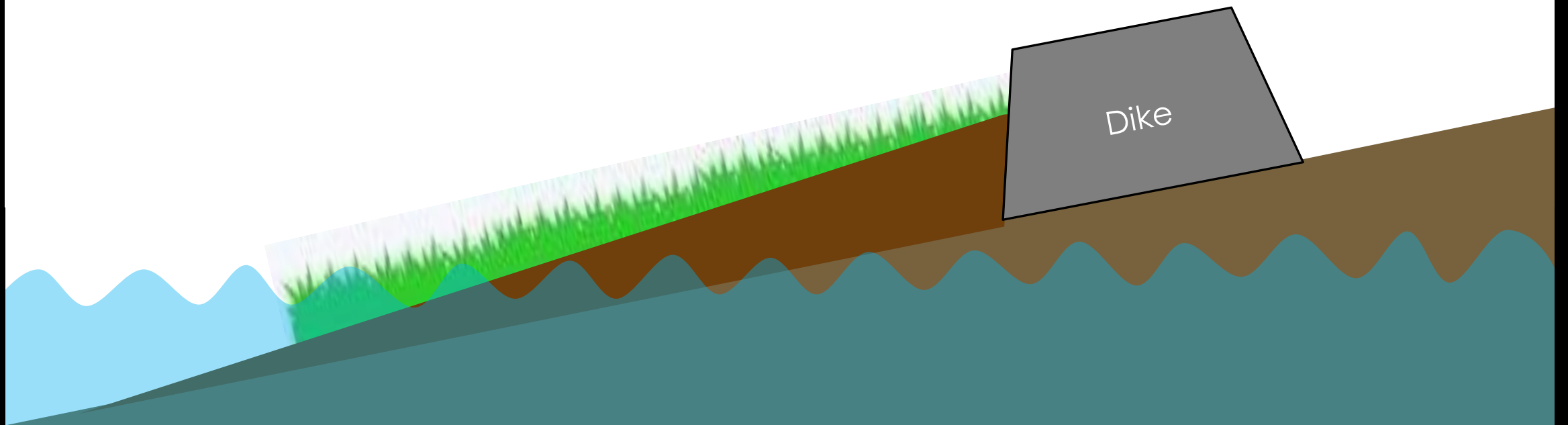
“Living Dike” Concept

Build dike higher + gradually widen dike toe



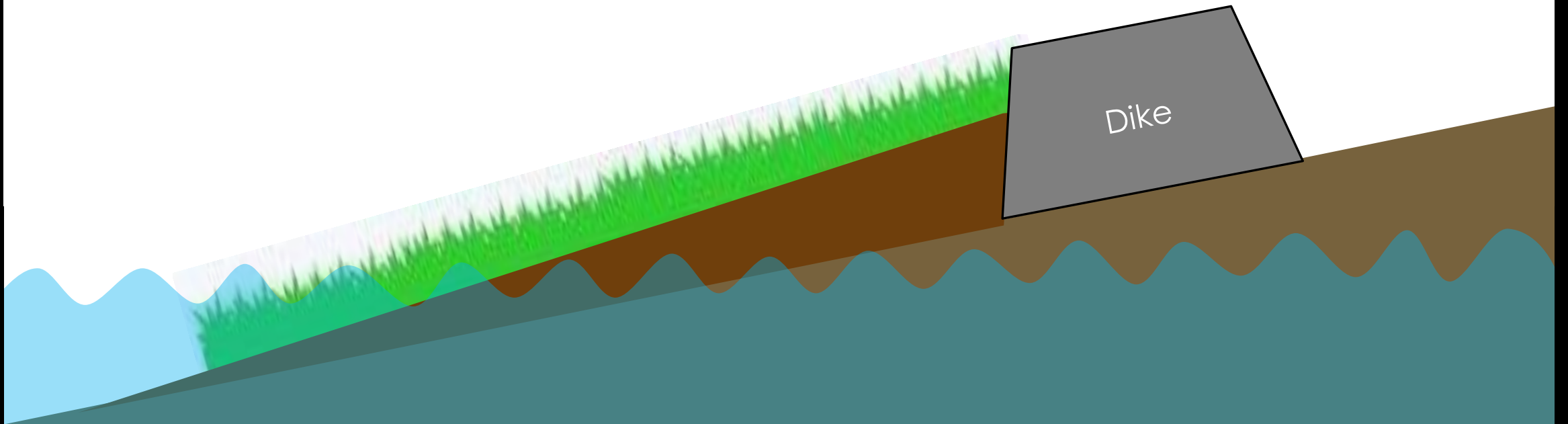
“Living Dike” Concept

Build dike higher + gradually widen dike toe



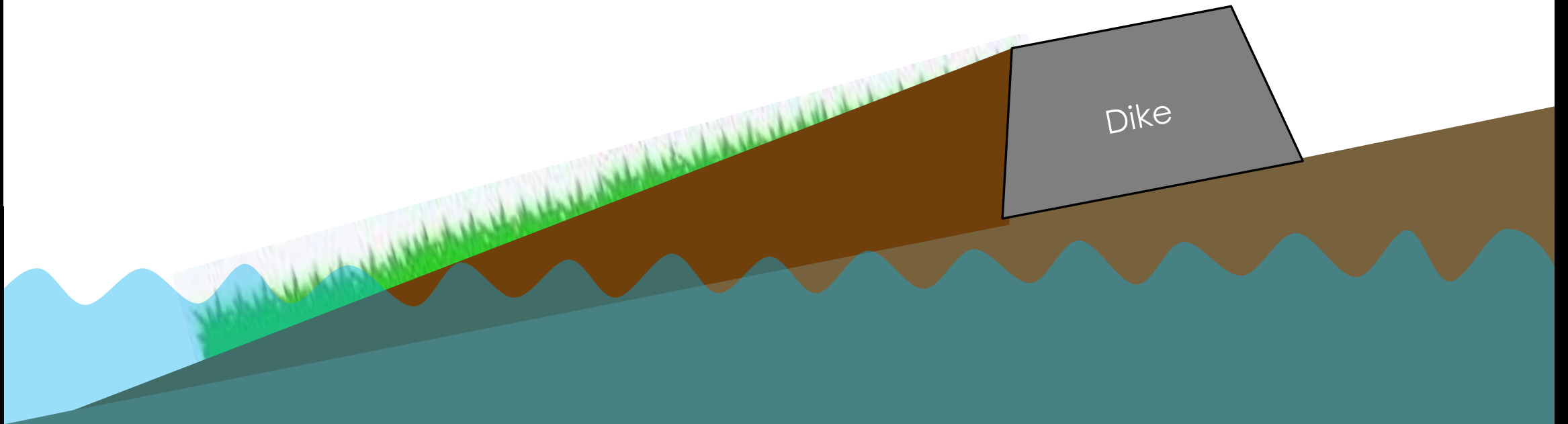
“Living Dike” Concept

Build dike higher + gradually widen dike toe



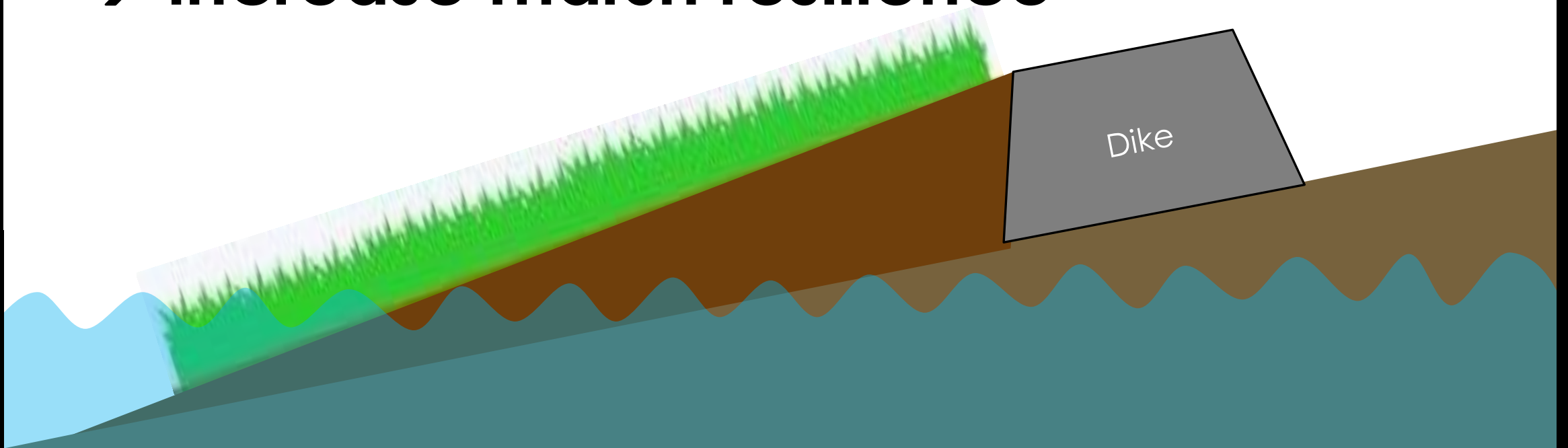
“Living Dike” Concept

Build dike higher + gradually widen dike toe



“Living Dike” Concept

**Build dike higher + gradually widen dike toe
→ increase marsh resilience**



“Living Dike” Concept

**Build dike higher + gradually widen dike toe
→ marsh survives with SLR?**

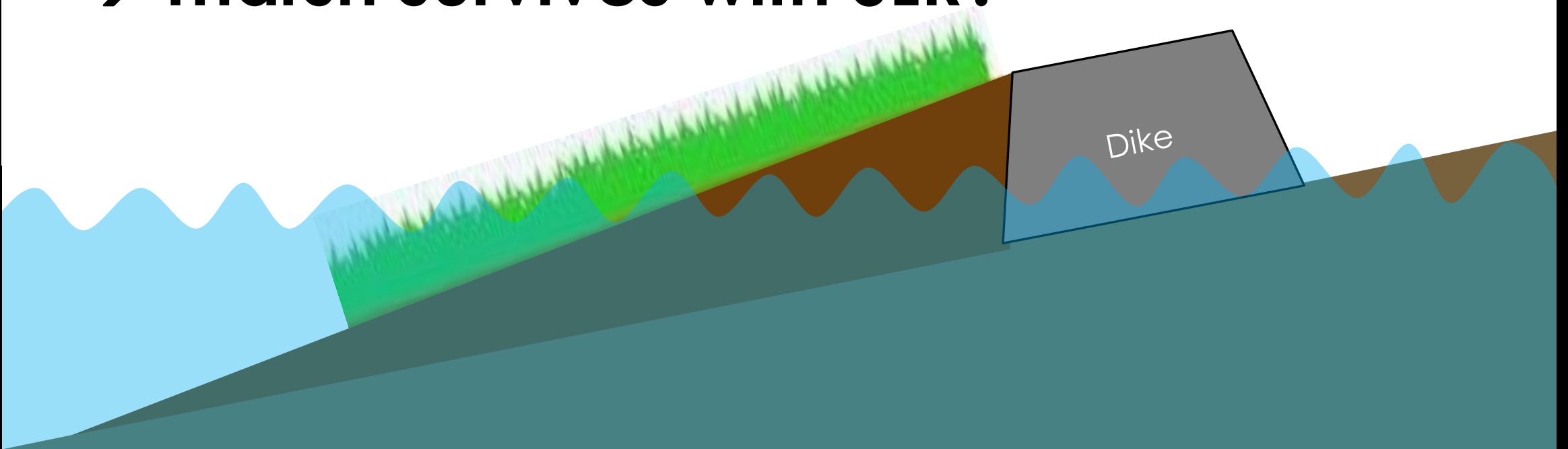


Photo: NASA Earth Observatory

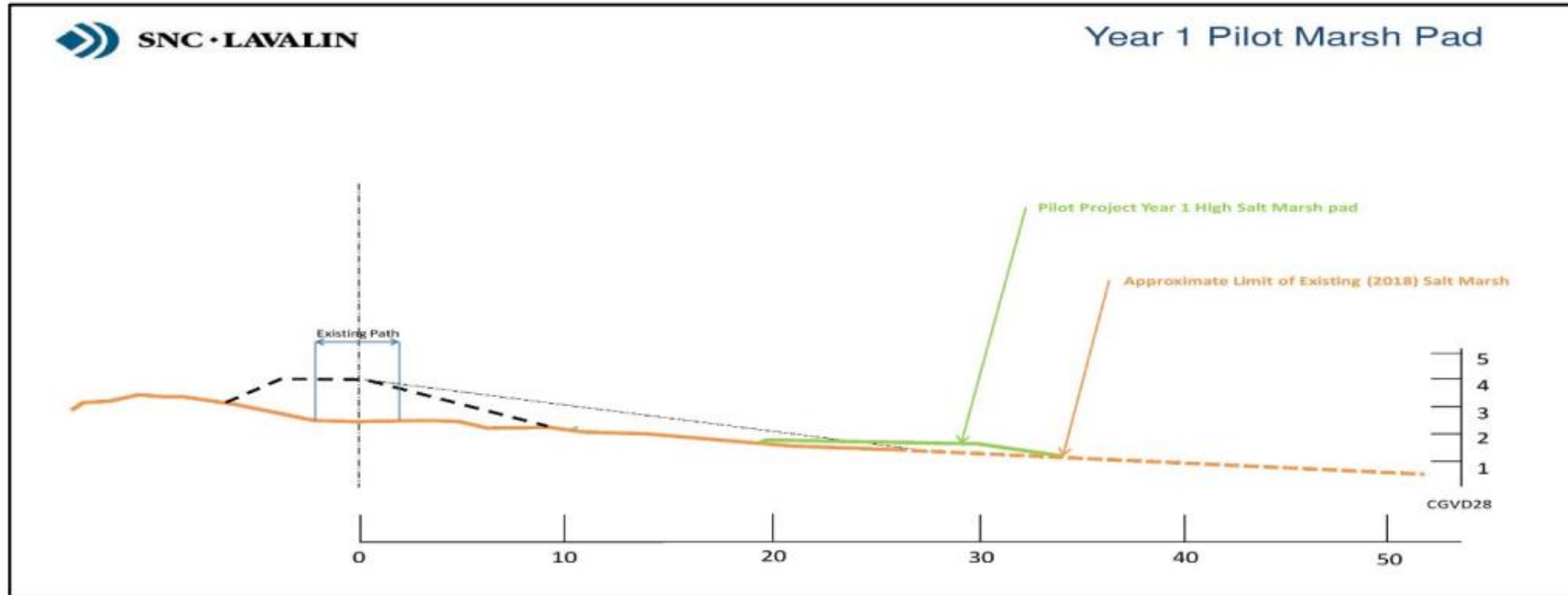



0 5 10 15 km

Depicting maximum extents of living dike pilot extents under consideration



Year 1 Marsh Pads

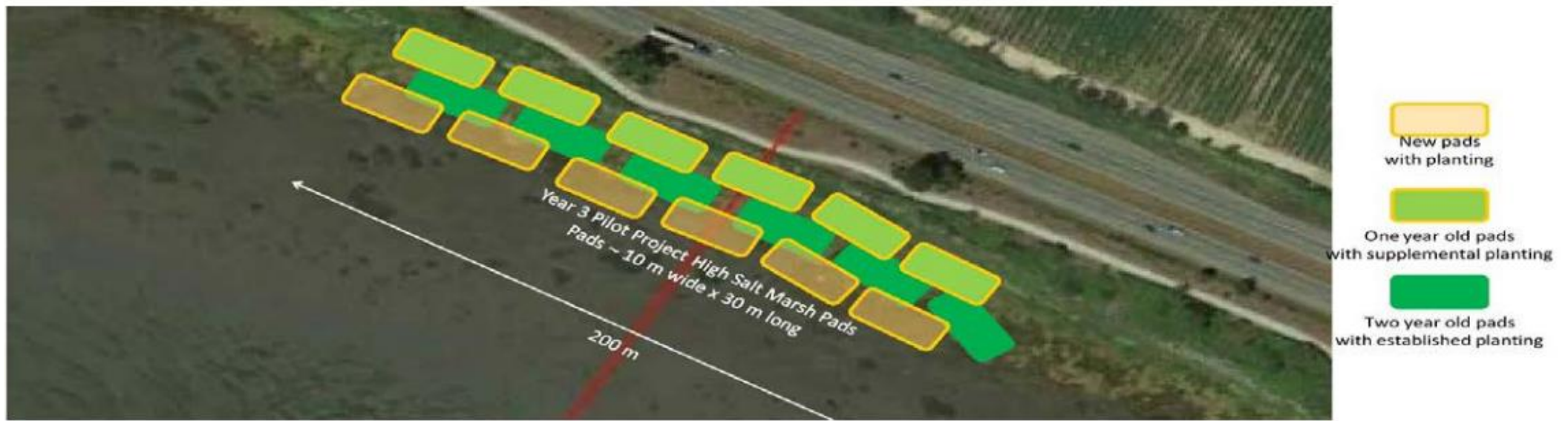
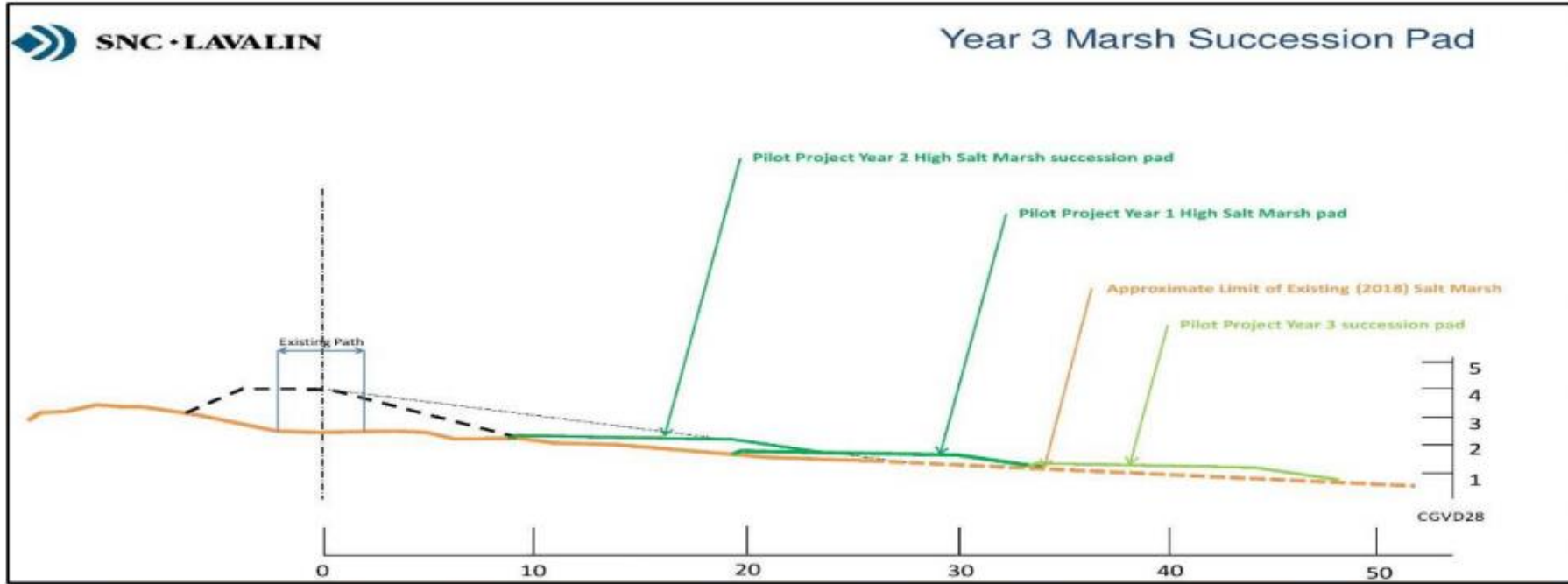



New pads
with planting


One year old pads
with supplemental planting


Two year old pads
with established planting

Years 1-3 Marsh Pads





Take Away

1. Estuary is unique, important, degraded, at risk of continued loss
2. Sea-level rise poses an unprecedented threat
3. Ecosystems are infrastructure!

Acknowledgements



Contact:
Eric.Balke@gov.bc.ca

