Englishman River Estuary Restoration

A Partnership Approach to Promoting Climate Change Resiliency and Ecosystem Health

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"Partners in Conservation"

Outline

- What is the WCCLMP?
- Restoration Objectives
- Driving Forces in Estuaries
- Context and History of Englishman River Estuary
- Modelling the Estuary
- Restoration Activities
- Monitoring and next steps



WCCLMP Mandate



Englishman Estuary



Restoration Objectives

- Restore coastal estuary processes to promote climate change resiliency
- Enhance fish and wildlife habitat and improve access
- Community buy-in for the project



Three-pronged approach for studying natural systems



Driving Forces in Estuaries

- Water and sediment
 from uplands
- Tides
- Waves
- Geological Setting
- History
 - Longer-term (<10,000 yr)</p>
 - Recent (<150 yr)



Geologic formation of the estuary











Tidal influence on the estuary

The degree of tidal amplification or attenuation between ocean and estuary levels varies depending on:

- the shape and characteristics of the estuary,
- the tidal elevation,
- the size of the opening at the mouth of the estuary, and
- the variability of (ground and surface) water inflow.

Estuary model - Overview



Estuary model fine grid



Inundation assessment



Assessment of tidal currents



Wave set-up

- Increases the still water level landward of the breaker zone
- Wind-generated waves are responsible for most waves experienced in the Strait of Georgia.



Storm surge

- Occurs over large areas of the Strait of Georgia in response to intense low pressure zones that pass across Vancouver Island during storms.
- May be 0.5 m to 0.8 m under some conditions.
- Other factors such as large climatic cycles (El Niño) can raise water levels above the astronomic tide level for several months.
- There is much uncertainty on how climate change is expected to change the pattern and severity of storms and other climatic cycle.

Assessing Wave Effects SWAN model



SWAN model results



Longshore and onshore drift



Sea level rise

- Will increase the area, duration, and depth of flooding of the tidal flats.
- Over time, more of the estuary will become intertidal.
- By the year 2100 the influence of waves will extend well into the western portion of the estuary and could affect most of the area during large tides.

Morphological response of the estuary

Depends on:

- Rate of sea level rise,
- Rate and degree of onshore drift of coastal sediment and Englishman River sediment,
- Future riverine processes that may change the inter-relationship between the Englishman River and Estuary,
- Future alteration of the estuary or foreshore areas around the estuary, and
- Success of colonizing vegetation.

Restoration Activities Overview

<u>Year 1:</u>

- Remove remnant dike on west side and install large wood structures
- 2. Remove additional berms
- 3. Enhance tidal channels
- 4. Remove invasives/replant
- 5. Monitor effectiveness of restoration activities



1. Dike Removal



1. Dike Removal



1. Dike Removal: Before



1. Dike Removal: Before



1. Dike Removal: Before



1. Dike Removal: During



1. Dike Removal: During



1. Dike Removal: During











2. Inner Berm Removal



2. Inner Berm Removal: Before



2. Inner Berm Removal: After



2. Inner Berm Removal: After



3. Tidal Channel Excavation



3. Tidal Channel Excavation: During











4. Restore Native Vegetation



5. Monitoring

• Restoration monitoring: veg, birds, water quality, fish, benthic invertebrates



5. Monitoring

- Long-term objectives:
 - Assess the project outcomes
 - Assess the long-term health of the estuary
 - Is the estuary resilient to sea-level rise?



What Next?

<u>Years 2-5:</u>

- Assess potential distributary channels
- Enhance tidal channels
- Continue invasive plant removals and replanting of riparian vegetation
- Re-establish sedge communities
- Continue monitoring restoration success
- Investigating water quality issues
- Begin looking at Mine Road Dike

Project Funding and Partners

• Multi-partner: DFO, BCCF, Arrowsmith Naturalists, MVIHES, HCTF, ECCC





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