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Assessing the Legacy of Large Woody Debris as Coastal Protection in BC and Washington

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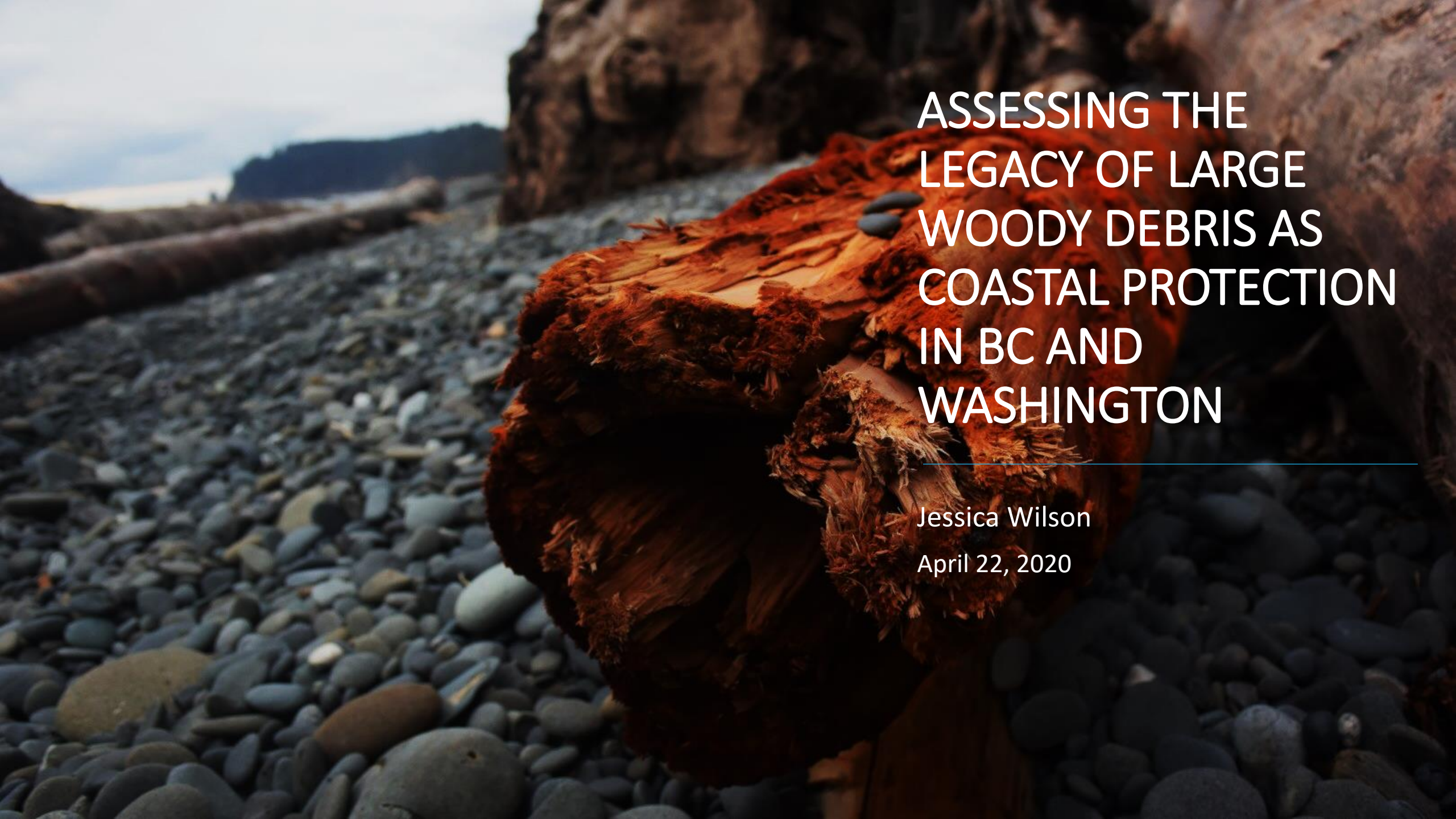

ASSESSING THE LEGACY OF LARGE WOODY DEBRIS AS COASTAL PROTECTION IN BC AND WASHINGTON

Jessica Wilson

April 22, 2020

OUTLINE

- Background
- Methodology
- Results
- Take-Aways
- Questions

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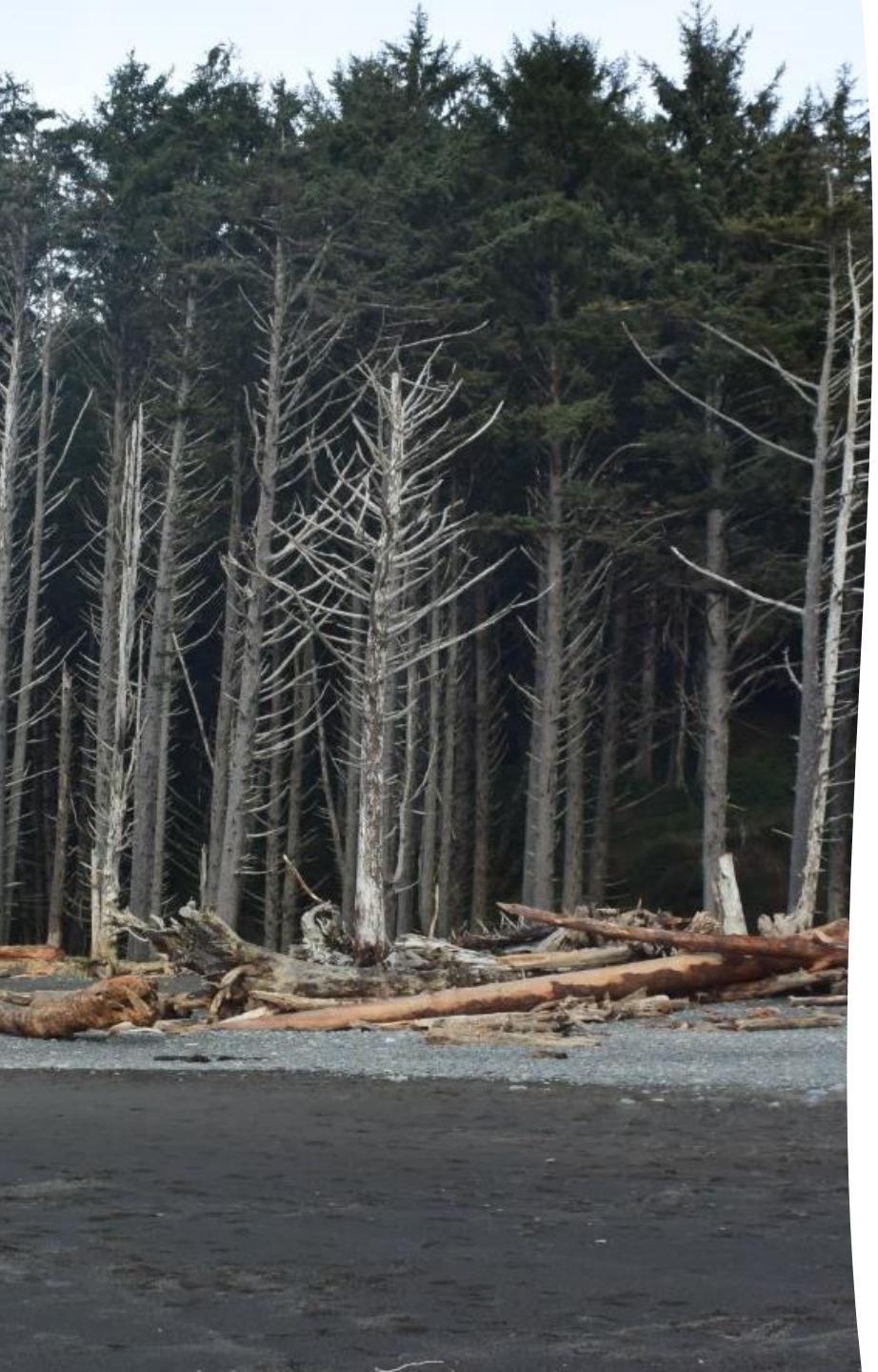


BACKGROUND

NATURAL WOODY DEBRIS (DRIFTWOOD)

- Large Woody Debris (LWD):

  Logs or driftwood larger than 0.3m in diameter and 2.0m in length, with or without root masses

- Considered to be a vital component of a diverse coastal habitat
- Historically in abundance around the Salish Sea

BACKGROUND

ANCHORED LARGE WOODY DEBRIS

- Strategically placed and anchored logs on the shoreline with the aim of stabilizing the shoreline and/or reducing wave run-up
- Used for 30+ years in BC and Washington
- Increased installation in recent years, driven by:
  - Decreasing quantities of ‘natural’ LWD
  - Increasing demand for nature-based solutions
  - Continuity of design practices from river engineering
  - Relatively cheap installation

BACKGROUND

THE ISSUES

1. Design guidance for rivers is generally not applicable.
2. Little academic research on Large Woody Debris
3. No systematic field studies in a coastal environment.
4. **Multiple public documents already recommend using LWD as coastal protection.**

METHODOLOGY

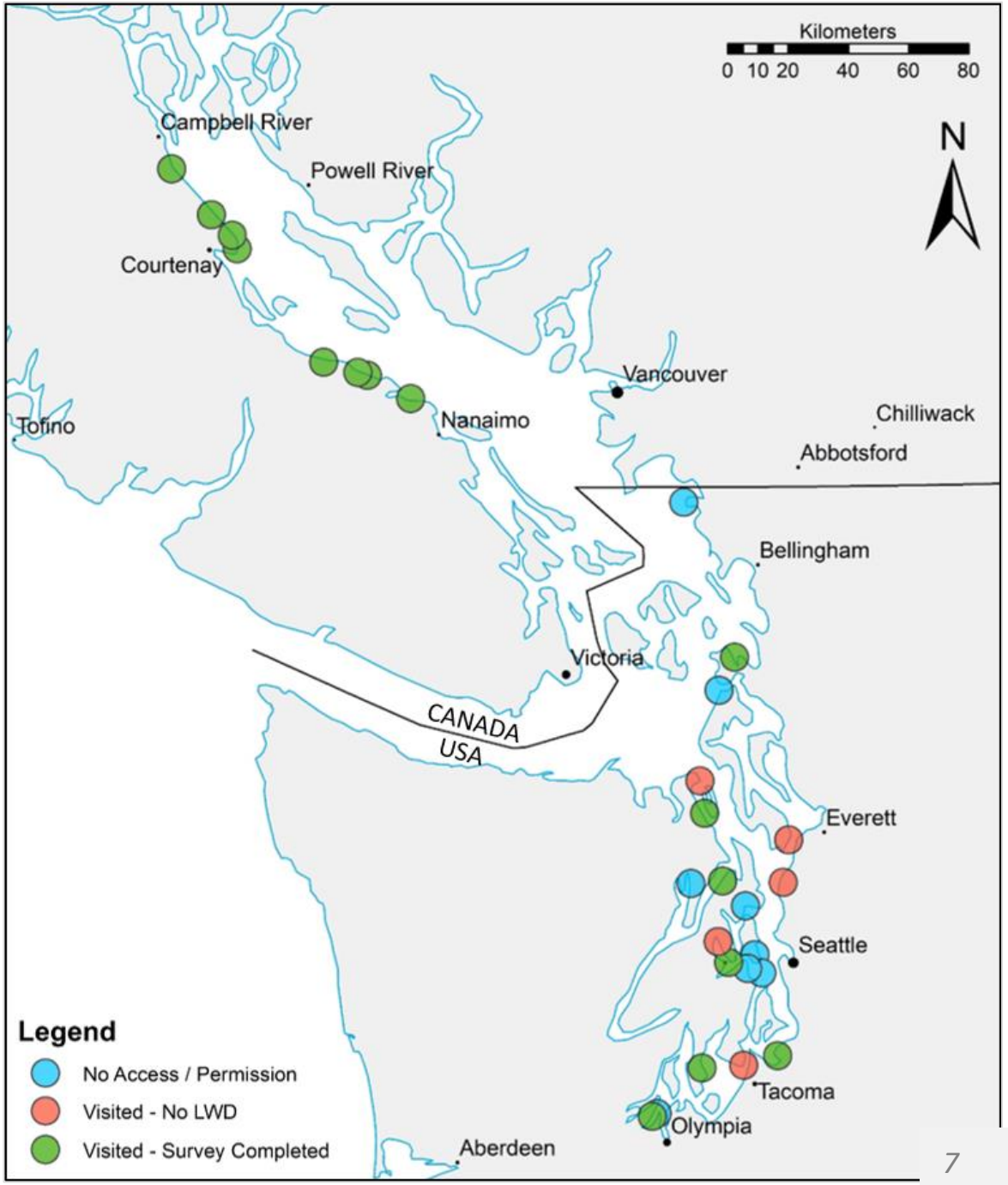
THE RESEARCH PROJECT

- Research Questions:
  1. Are LWD effective at **stabilizing the shoreline**?
  2. Are LWD effective at **reducing wave run-up**?
  3. Are LWD **durable enough to meet engineering requirements**?
  4. What is the **optimum configuration** for design purposes?

METHODOLOGY

SITE VISIT LOCATIONS

- 28 potential sites:
  - 8 sites with site access or permission issues
  - 5 sites visited, but no LWD
  - 15 sites with completed surveys



RESULTS

SITE CHARACTERISTICS

- Sediment type: Sand – Gravel - Cobble
- Beach slopes: 6:1 – 500:1 (H:V)
- Fetch*: 1 – 200 km

Result:

Vastly different erosion and flooding potentials

Fetch: The open-water distance which wind can blow unimpeded and generate waves. For example, when storm duration is sufficiently long (fetch-limited conditions), a 20km fetch may generate an ~1.5m significant wave height.

RESULTS

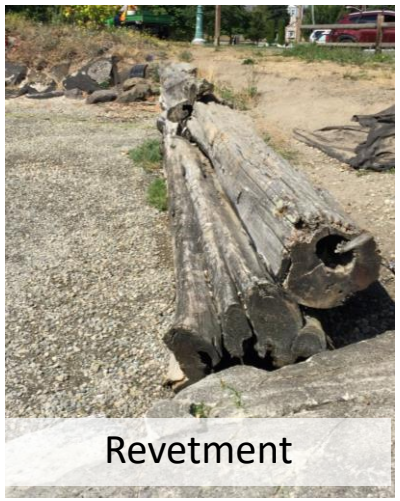
ANCHORED LWD DESIGN CHARACTERISTICS

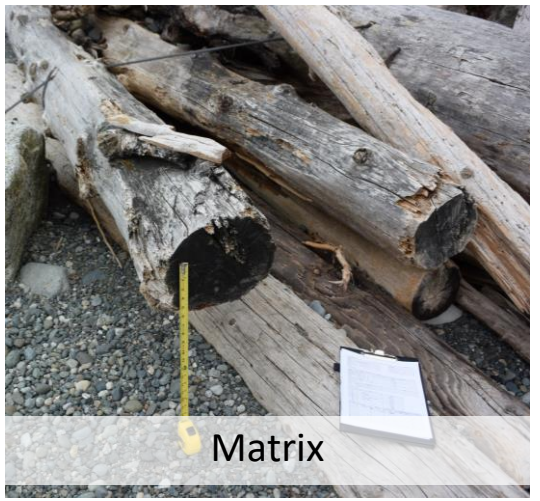
- Installation Types:


Single


Matt-Style


Benched


Revetment


Matrix


Groyne

RESULTS

ANCHORED LWD CHARACTERISTICS

- Installation Types: Single, Matt-Style, Benched, Revetment, Matrix, Groyne
- Anchor Types: Cable, Chain, Rope, & Pins
- Ballast Types: Rocks/Boulders, Concrete Blocks, & Soil Pins/Nails

Cable and Rock Ballast

Chain and Rock Ballast

RESULTS

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- LWD Elevation: 0.2 – 2.2m above HHWMT

RESULTS

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- Installation Types: Single, Matt-Style, Benched, Revetment, Matrix, Groyne
- Anchor Types: Cable, Chain, Rope, & Pins
- Ballast Types: Rocks/Boulders, Concrete Blocks, & Soil Pins/Nails
- LWD Elevation: 0.2 – 2.2m above HHWMT
- LWD Diameter: 0.27 – 0.86m

Result:

Vastly different design characteristics

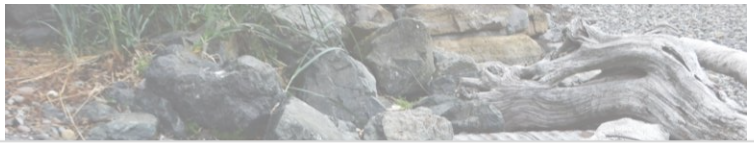
RESULTS

LWD DURABILITY & EFFICACY

- LWD missing at several sites
- Erosion
- Fire damage/arson
- Anchor corrosion
- Wood decomposition

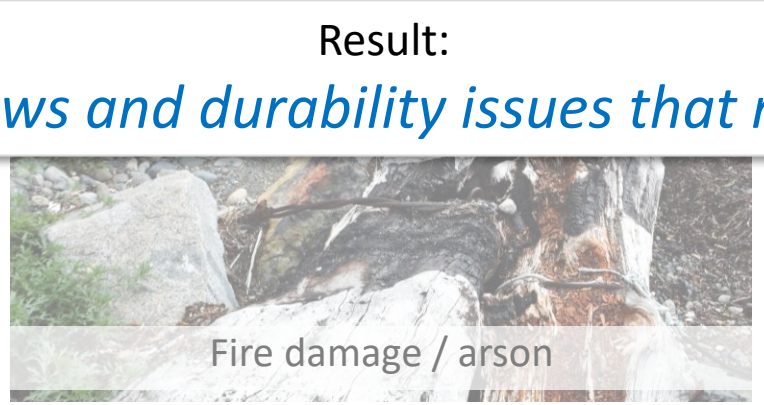
Missing LWD & corroded anchor

Backshore erosion



Result:

Significant design flaws and durability issues that need to be addressed



Fire damage / arson

Wood decomposition

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TAKE-AWAYS

1. Anchored LWD is already being used and promoted as a nature-based coastal protection technique.
2. There is little to no design guidance available.
3. Projects are lacking long-term monitoring.
4. **Research and guidance is now being developed from this research.**

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