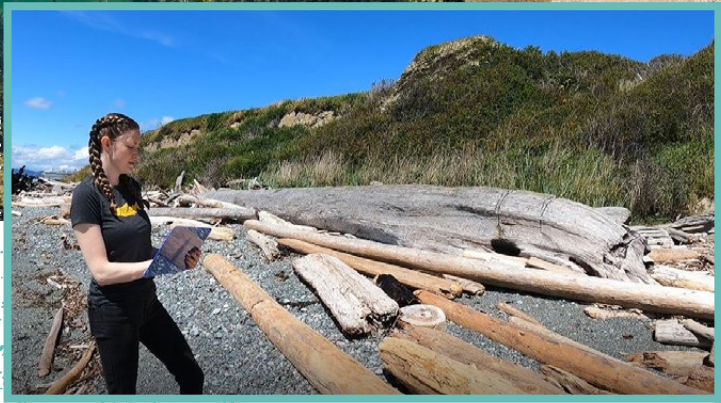
RESILIENT COASTS FOR SALMON



FIELD GUIDE TO SHORELINE MAPPING

PACIFIC SALMON FOUNDATION

This project was undertaken with the financial support of the Government of Canada.

Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.

Canada

STEWARDSHIP CENTRE FOR BRITISH COLUMBIA

GREEN SHORES

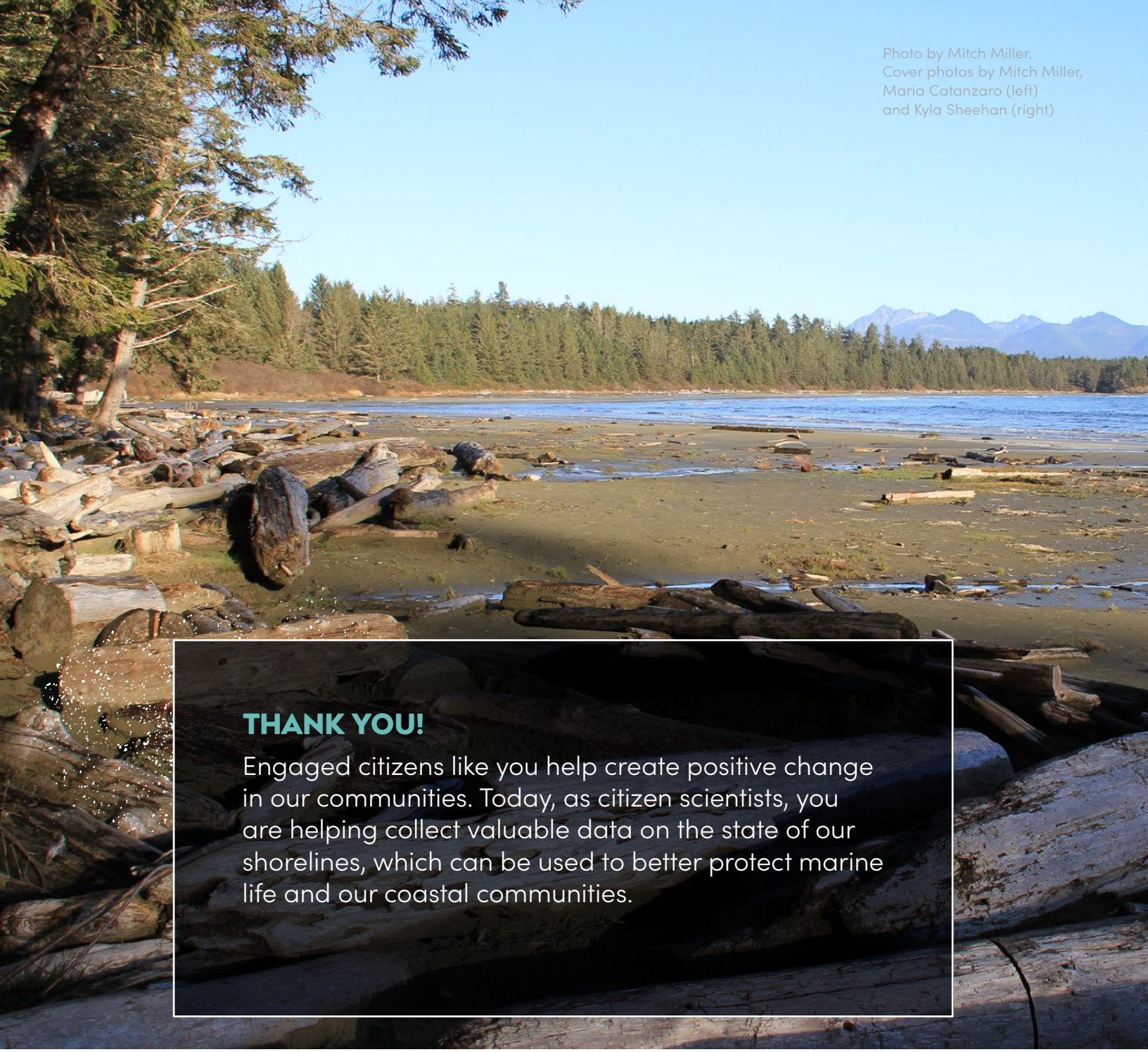


Photo by Mitch Miller.
Cover photos by Mitch Miller, Maria Catanzaro (left) and Kyla Sheehan (right)

THANK YOU!

Engaged citizens like you help create positive change in our communities. Today, as citizen scientists, you are helping collect valuable data on the state of our shorelines, which can be used to better protect marine life and our coastal communities.

WHAT IS RESILIENT COASTS FOR SALMON?

Resilient Coasts for Salmon is a PSF-led collaborative initiative that is raising awareness on how to re-naturalize shorelines and protect existing undeveloped shorelines to advance salmon recovery and build resilience to climate change. Find out more about the project on our website: **resilientcoasts.ca**.

RESILIENT COASTS
FOR SALMON

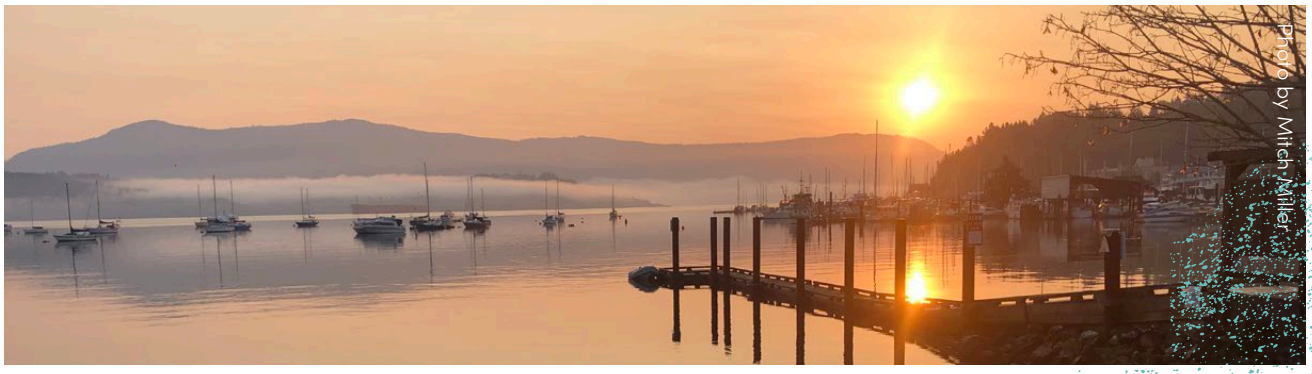


Photo by Mitch Miller

MAPPING WORKSHOP OVERVIEW:

One of the key components of the **Resilient Coasts for Salmon** project is developing a meaningful dataset of the extent of hard armouring along the east coast of Vancouver Island. We are collecting data and high resolution imagery of the entire coastline from Victoria to Port McNeill by boat and by foot with local citizen scientists — why we are here today!

For today's workshop, we have selected this beach of interest based on variables like shoreline type, vulnerability to sea level rise and flooding, predicted suitable forage fish spawning sites and subtidal habitat for Pacific sand lance. The boundaries we will use have been defined by Shore Zone (shorezone.org). Using this existing dataset helps ensure compatibility with other datasets in the region.

All of the data will be uploaded to the **Strait of Georgia Data Centre (sogdatacentre.ca)** and overlaid on interactive maps that you can explore. There is currently a gap in the knowledge of the extent of hard armouring. So, this work is helping to build a valuable dataset that will be publicly available for researchers, municipal planners, and other government staff!

Using these data, we can advocate for removal of armouring, encourage policy change for shoreline development, and the protection or restoration of valuable habitat. This dataset will also be particularly important to the forage fish research community, whose work could help track how hard armouring is impacting forage fish habitat.

We hope this workshop helps create a local understanding of vulnerability and the importance of collaborative approaches. Have fun, and ask questions!

LET'S GET STARTED!

We are providing the following materials:

- Clipboard, pencil etc.
- Garmin GPS
- Sediment grain size card
- Two types of data collection sheets:

> **Linear Features Data Sheet**

  - for describing segments of the shore as natural or modified
  - use a new data sheet for each time there is a change (e.g., from natural to armoured, seawall to riprap, concrete to large boulders etc.)
  - there may be multiple data sheets per shore unit

> **Point Features Data Sheet**

  - for collecting beach access, groynes, outfalls, debris, etc.
  - one data sheet per shore unit
  - there may not be any point features to record, in this case write N/A on the page

You can collect both line and point data at the same time, or you can collect line data while walking the beach in one direction, then capture the point features as you walk back.

Linear features data sheet and **Point features data sheets** can also be found on **resilientcoasts.ca**.

USING THE GARMIN GPS UNIT

We will use a Garmin GPS unit to record 'waypoints' — locations that you record and store in the GPS device — as GPS coordinates. We will mark the start and end of each new segment along the beach as well as point features with unique points and record the corresponding numbers in the data sheet.

1. **Zoom Functions.** Use these buttons to zoom in and out on the screen.
2. **Back/Return.** Use this to return to the previous menu.
3. **Navigation stick/button.** Move directionally to scroll or highlight an item, then press to select an item.
4. **Menu button.** Press to open the menu for a page. Press twice to return to the main menu.
5. **Power Button.** Hold on to turn the device on and off. Once the device is turned on, press the power button to adjust the backlight.

You can use the "Where To" menu to find a destination to navigate to. For the workshops, we have preloaded waypoints to help you find the start of the shore unit.

How to find the start of a Shore Unit:

On your Garmin, navigate to find a waypoint by:

1. On the main menu, select "Where To" → Waypoints.
2. Select a waypoint.
3. Select "Go."

When you get to a new shore segment, you will mark down the start with a waypoint.

How to create a new waypoint:

Walk to the start of your shore segment, then on your device:

1. Select "Mark Waypoint."
2. If necessary, select a field to make any changes to the waypoint.
3. Select "Done."

THE DATA COLLECTION SHEETS

The data sheets have been designed to be stand alone and self-explanatory. Provided in the following pages are photographs and definitions to help you identify and assess features along with simple brief instructions.

Start each data sheet by entering the basic information into the top. Be sure to fill out the contact information of one person on your team, in case we need to follow up on any details. Record the time and date on the data sheet so we can refer back to find the height of the tide at the time of data collection.

COLLECTING LINE FEATURE DATA

1. On your data sheet, record waypoints to start and stop your shore segment.

Mark where you are starting, then, walk along the shore until there is either:

1. A distinct change in the shoreline feature type (e.g. an area of natural shoreline ends and a concrete seawall begins).
2. The type of the armouring changes.
3. The material of the armouring changes (e.g. from concrete to rock).
4. The position of the toe changes (e.g. a seawall wraps around a corner and intersects closer to the tide line than it did on another part of the section). This would be a notable change, rather than just a small outcrop within the same elevation region of the shore.

Stop when you notice one of these changes above and record the end waypoint on the datasheet.

Our shorelines have been divided into different Shore Units. We may focus on one or several different continuous Shore Units in our workshop, and we will describe the segments within those Shore Units as natural, modified or rocky outcrop.

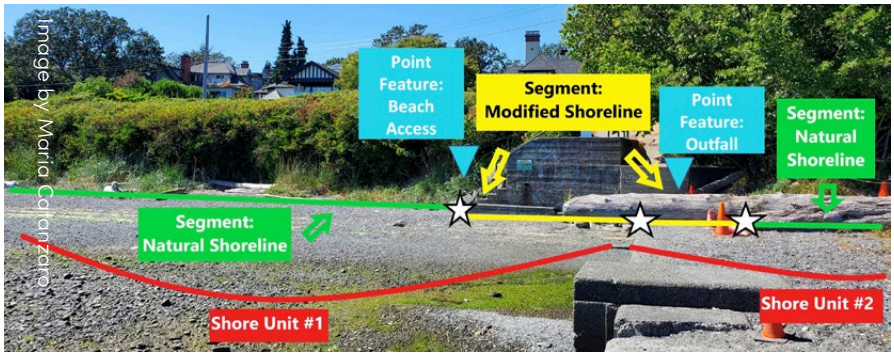


Image by Maria Carranzato

We will mark a new shore segment with a waypoint (shown as white stars in the photo). Point features like stormwater outfalls and beach access will be marked on the Point Feature Data Sheet.

2. Determine Shore Type

Notice what features describe this segment of the beach. Is there a seawall or other armouring feature at your starting point, or is it a natural shore?

Select the best answer for how you would describe this section of shoreline.


Photo by Kyla Sheehan

If a feature, like this low rock wall is well above the high water mark, it can be considered a landscaping feature and does not need to be included as mapped armouring.

NOW, IF IT WAS ROCKY,
PROCEED TO #3;
IF IT WAS ANTHROPOGENICALLY MODIFIED SKIP TO #4;
IF NATURAL SKIP TO #8.

3. Note and Describe any Armouring (Rocky Shoreline)

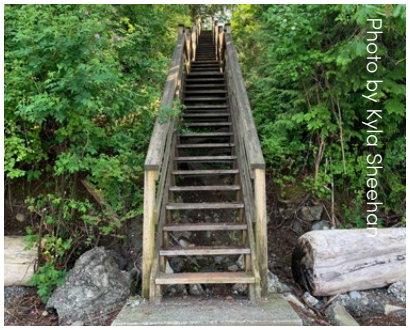
4. Determine Modification Type (Modified)

- **Selecting all that apply** Use the keys on the next two pages to help you select the most appropriate terms to describe the form and materials of the modified shoreline sections.

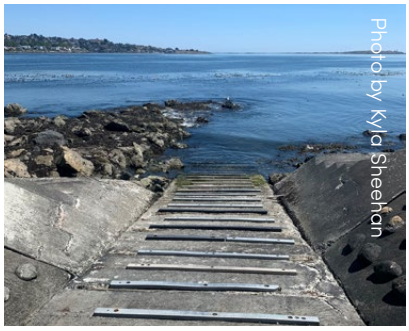
SHORELINE MODIFICATION – TYPES:

Seawall

Riprap



Beach Access (path/stairs)

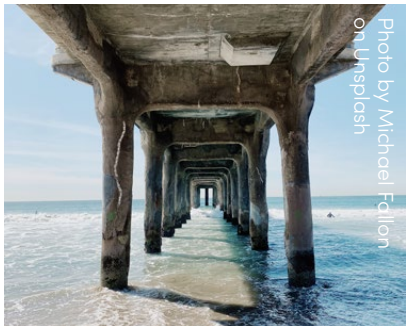


Boat Ramp

Groyne

Dock

Stormwater Outfall



Jetty/Pier/Breakwater

Marina

Gabion Basket

Ferry Terminal

Fill (sand, soil or other material added)

Logging infrastructure

Aquaculture infrastructure

?

Other

HELP! WHAT DO I DO IF THERE IS A DOCK OR BOAT RAMP IN THE MIDDLE OF MY SHORE SECTION?

- Features such as intersecting paths, access stairs, docks, jettys, groynes or stormwater drains/outfalls will be recorded as Point Data using **the Point Features Data Sheet**.

5. Material Make Up (Modified)

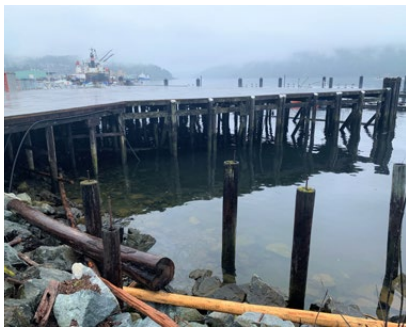
What is the material of the structure, select all that apply.

You may encounter shoreline armouring built from a variety of materials, and often combined materials.

Concrete

Rock

Wood



Creosote wood

Masonry

Photos by Kyla Sheehan

Metal

6. Assess the Toe Elevation of Armouring (Modified)

The toe elevation, or where the bottom of structure intersects the beach at the most waterward point, affects its exposure to wave energy and erosion. With sea levels rising, toe elevation will impact how much room habitats have to adjust — or whether they are 'squeezed'.

We can look to other features on the beach to help us describe this. The definitions on the following page may help you make this determination.

A. Above Extreme High Water (Upland) — Presence of upland vegetation, fewer halophytes, low gradient, waterward storm berm, Presence of driftwood or Large Woody Debris (LWD).

B. Ordinary High Water Mark to Extreme High Water — Presence of dunegrass and other halophytic vegetation, low slope gradient, presence of LWD and beach wrack.

C. Mean Higher High Water to Ordinary High Water Mark — Presence of LWD, beach wrack deposits, patches of halophytic vegetation, higher gradient.

D. Mean Sea Level to Mean Higher High Water — Waterward beach is generally bare, higher gradient, signs of waves battering structure.

E. Below or at Mean Sea Level — Higher gradient, coarser mid-beach sediment composition, signs of waves battering structure, Fucus algae or barnacles growing on structure.

Backshore

The zone of the shore lying above the high-water mark (indicated with a yellow arrow).

Foreshore

The zone from the low water mark to the high-water mark (indicated with a red arrow).

Halophylic vegetation

Salt-tolerant plants that come in contact with saline waters either through salt spray, their roots or occasional inundation and can thrive in sandy soils. They typically grow in buffers along estuaries and marine environments. Examples of halophytes to look for include sea asparagus (*Salicornia spp.*) and sea plantain (*Plantago maritima*) (pictured), beach pea, dunegrass, and pink sand verbena.

Beach wrack

A line of dried seaweeds, kelp and other debris gets deposited at high tide. Use the beach wrack line to help choose the best answer for toe elevation when looking at armouring structures.

What does the presence or absence of vegetation in front of hard armouring tell us about the coastal processes on this shoreline?

IF YOU STILL FEEL UNCERTAIN OF THE TOE ELEVATION, YOU CAN **MAKE NOTE OF THE TIME AND DISTANCE FROM THE WATER'S EDGE.** THIS WILL ALLOW US TO DEDUCE THE ELEVATION BASED ON THE TIDE AT THE TIME YOU MEASURED.

7. Assess the Condition of Armouring (Modified)

Take a look at the armoured sections of shoreline, noticing any signs of wear, cracking, erosion, undercutting, slumping, scour, etc. Assess its condition based on the categories provided in the data sheet.

- **Good:** No visual signs of degradation appear on the feature.
- **OK, some cracks:** Often the first signs of weakness will appear as cracks. Some cracks are present but otherwise in good condition.
- **Functional but failing:** If the structure still appears to be functioning as shore protection but is compromised by leaning slightly, thinning, or toppling in areas.
- **Not functioning:** Not serving any function, toppled or eroded so that it is no longer providing shore protection.
- **Low quality methods, but not degraded:** Structure is made with low quality materials or installed poorly, but show no signs of failure or erosion.
- **Unknown:** Sometimes features may be covered with vegetation and the condition can not be assessed.

Now, answer what proportion (%) of the segment that is in this condition by selecting the percentage option that best describes it.


Photo by Kyla Sheehan


Photo by Kyla Sheehan


Photo by Maria Catanzaro

Even hard structures like pathways and seawalls can erode and fail! This erosion of the Vancouver seawall occurred during the intense winter storms of 2021.

What factors might contribute to the erosion, wear or failure of armouring that you see on this shoreline?

THE NEXT TWO QUESTIONS (#8 AND #9) ARE FOR NATURAL SECTIONS, IF YOU ARE ASSESSING A MODIFIED FEATURE SKIP AHEAD TO #10.

8. Assess the for signs of Erosion (Natural shoreline)

Erosion of natural shorelines can look like bare soil or sediment where plants would otherwise be growing. This could be from slumping on slopes, trampling by humans or animals, or repeated wave splash.

Have a look at the natural shoreline section. Are there signs of erosion at the base of the shoreline, such as undercutting of the shoreline bank, exposed soil or other visible damage from storms above the high tide mark?

If so, answer accordingly and take a photo.

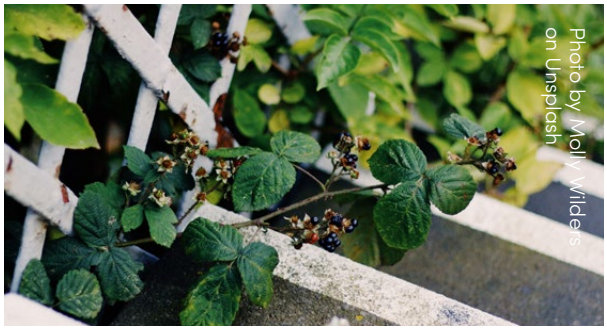
If there is evidence of erosion, what are some potential reasons for it?

9. Backshore Plant Species Present (Natural Shoreline)

On this section of natural shoreline, take a look at the backshore area (eg. On slope, bluff, bank). Are there plants? If so, are they invasive species?

Look below for some examples of common invasive species that you may run into along the shoreline.

Examples of Invasive Shoreline Plants



Himalayan Blackberry (*Rubus armeniacus*)

Scotch Broom (*Cytisus scoparius*)

English Holly (*Ilex aquifolium*)

English Ivy (*Hedera helix*)

Why do invasive plants matter?

Invasive plants threaten sensitive or rare ecosystems and negatively impact biodiversity. Along the shoreline invasive plants can easily spread from wind or longshore drift carrying seeds to other shorelines.

10. Log accumulation

Historically, drift wood logs and other large woody debris would have been present on our shorelines. Today, however, most of the logs that we see on the beach have clearly been cut, and are considered logging debris. Take a close look at the logs on the beach, are there accumulations of cut logs and are they likely to be mobile during a high tide or storm event?


Photo by Maria Catanzaro


Photo by Kyla Sheehan

Why might natural source logs with roots and branches attached be less harmful to beaches than processed logs?

11. Riparian Vegetation

Riparian areas are the lands adjacent to aquatic ecosystems like rivers, estuaries and marine shorelines. Marine riparian areas provide many benefits to the shoreline including stabilizing the soil to prevent excessive erosion, filtering runoff to prevent contaminants from entering waterways and providing habitat to many species.

Record whether there are shrubs and trees in the riparian zone, the amount and type.

Overhanging vegetation casts shade and keeps the upper areas of the beach much cooler. This is important for forage fish like Pacific sand lance which spawn on beaches.


Photo by Kyla Sheehan

What plant species do you see in the riparian area? Is there one species that is dominant, or is it mixed? Do you notice any invasive species? What benefits other than shade might these plants provide?

12. Anthropogenic Backshore Features

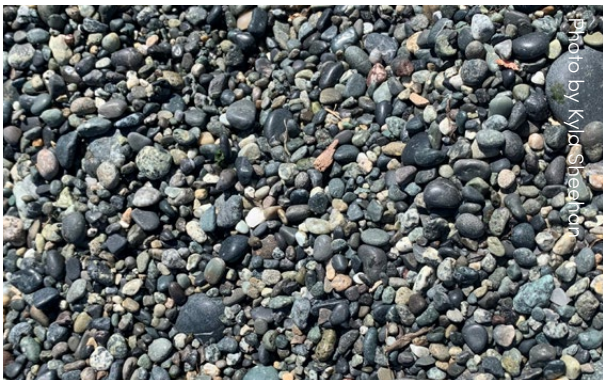
Take a look past the backshore vegetation and consider the area within approximately 15 meters of the shoreline. Are there human-made structures? For example, a house, building, road or parking lot.

Thinking about runoff and coastal squeeze, how might these anthropogenic backshore features impact the shoreline?

13. Record Any Additional Details and Notes

YOU MAY WISH TO CONSIDER FORAGE FISH SPAWNING POTENTIAL.

Sediment beaches act as spawning habitat for forage fish like Pacific sand lance, but not all beaches are created equal. Forage fish species are particular about the type and size of sediment that will work for them. Use the sediment classification card to take a look at the texture of the beach sediment!



Forage fish must also have the right type of sediment. Fine particles like sand (left) and gravel (right) are necessary for their spawning habitat.

Lay the card on the beach, grab a handful of the top layer of sediment and drop it onto the card. *Note what size class it belongs to.*

Tell us whether you think this is good forage fish spawning habitat. Why did you give this answer?

YOU MAY WISH TO CONSIDER RESTORATION POTENTIAL.

Shoreline restoration aims to maintain or restore natural coastal processes and habitat values. This will help ensure that the shoreline functions and is resilient to change, including sea level rise or intense storm energy.

What to Look for

On both natural shorelines and armoured shorelines, you likely noticed some indications of erosion, presence of invasive species, or failure of armouring. Their presence often indicates that coastal processes are not functioning as they should. Armoured shorelines are often great candidates for restoration.

On this shoreline, were there areas that you think would be good for restoration? Why, or why not?

COLLECTING POINT FEATURE DATA

Point Features that we collect are beach access paths, structures like docks, groynes, jetties, boat ramps, anthropogenic debris, or stormwater drains/outfalls, among others. We will mark a waypoint at each point feature by standing in front of, or in the middle of, the feature.

Collect all point data on a single set of data sheets. You will create a list of waypoints and circle the corresponding choices that best describe the feature you have identified.

Examples of point features to collect on your data sheet:

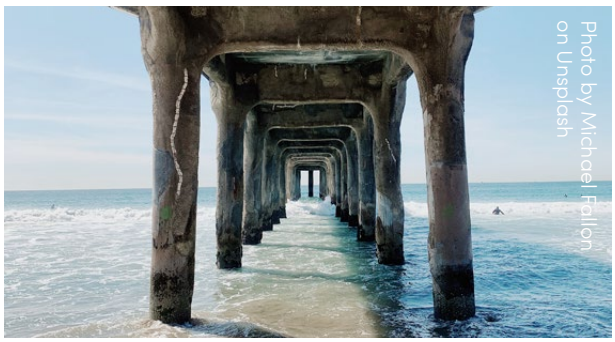
Stormwater outfall

Public beach access

Boat Ramp

Groyne

Dock



Jetty/Pier/Breakwater

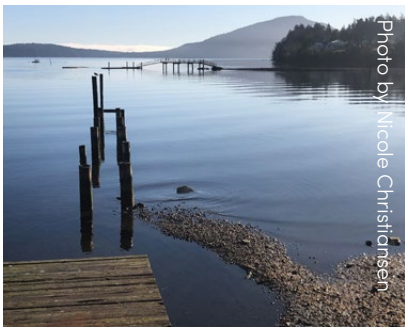
Anthropogenic debris

Active log boom

If you found 'anthropogenic debris, describe it further in the next column of the data sheet.

Debris types:

Tires



Abandoned Docks

Wood waste: wood chips, bark or saw dust that were deposited from an industrial activity (log dump, saw mill etc.). Often creates a blanket over the sediment.

Derelict/Sunken Vessels

Metal Objects

How might the debris that was found impact habitat and living organisms on the shoreline?

Creosote logs (horizontal)

What is Creosote?

Creosote is a chemical treatment that is commonly used on marine pilings to help prevent it from breaking down. Creosote is a product made from the distillation of tar from wood or coal and is very toxic.

The easiest way to identify creosote is its distinctive tar smell (think fresh asphalt), often you can smell it before you even approach the log in question. Creosote logs also tend to be darker in colour than natural logs which get bleached by the sun.

The remaining columns pertain to creosote logs, answer if they apply.

DONE!

We hope this workshop has inspired you to be a steward of the shoreline and consider the value of these brilliant ecosystems.

Notes: _____

_____

_____

_____

_____

References:

Cook, S., Daley, S., Morrow, K., and S. Ward. 2017. ShoreZone Coastal Imaging and Habitat Mapping Protocol.Coastal and Ocean Resources.

MacLennan, A., Johannessen, J., and A. Lubeck. 2018. Armor Mapping Methods for the Puget Sound Region.

Friends of the San Juans. San Juan County Shoreline Mapping Project 2019. Courtesy of Tina Whitman.

SeaChange Marine Conservation Society. 2020. SIPAS (Saanich Inlet and Peninsula Atlas of Shorelines) 2020 Technical Report — Draft 3.

Acknowledgements:

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Got the Mapping Bug?

Let us know if you are interested in getting a group together to continue mapping other beaches of interest. We are more than happy to supply the data sheets and lend out equipment for this work.

A NATURAL SHORE OFFERS HABITAT FOR MANY SPECIES, INCLUDING US!

Illustration by: Holly Sullivan

Photo by Mitch Miller

RESILIENT COASTS
FOR SALMON

WANT TO LEARN MORE?

Check out our educational primer titled: *Impacts of Climate Change on Shorelines, People, and Salmon: Nature-Based Approaches for Ecosystem Health*
and our online Tool Kit!

And don't forget to sign up for our newsletter through PSF's Marine Science Program at marinescience.ca

PACIFIC SALMON FOUNDATION

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Canada

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