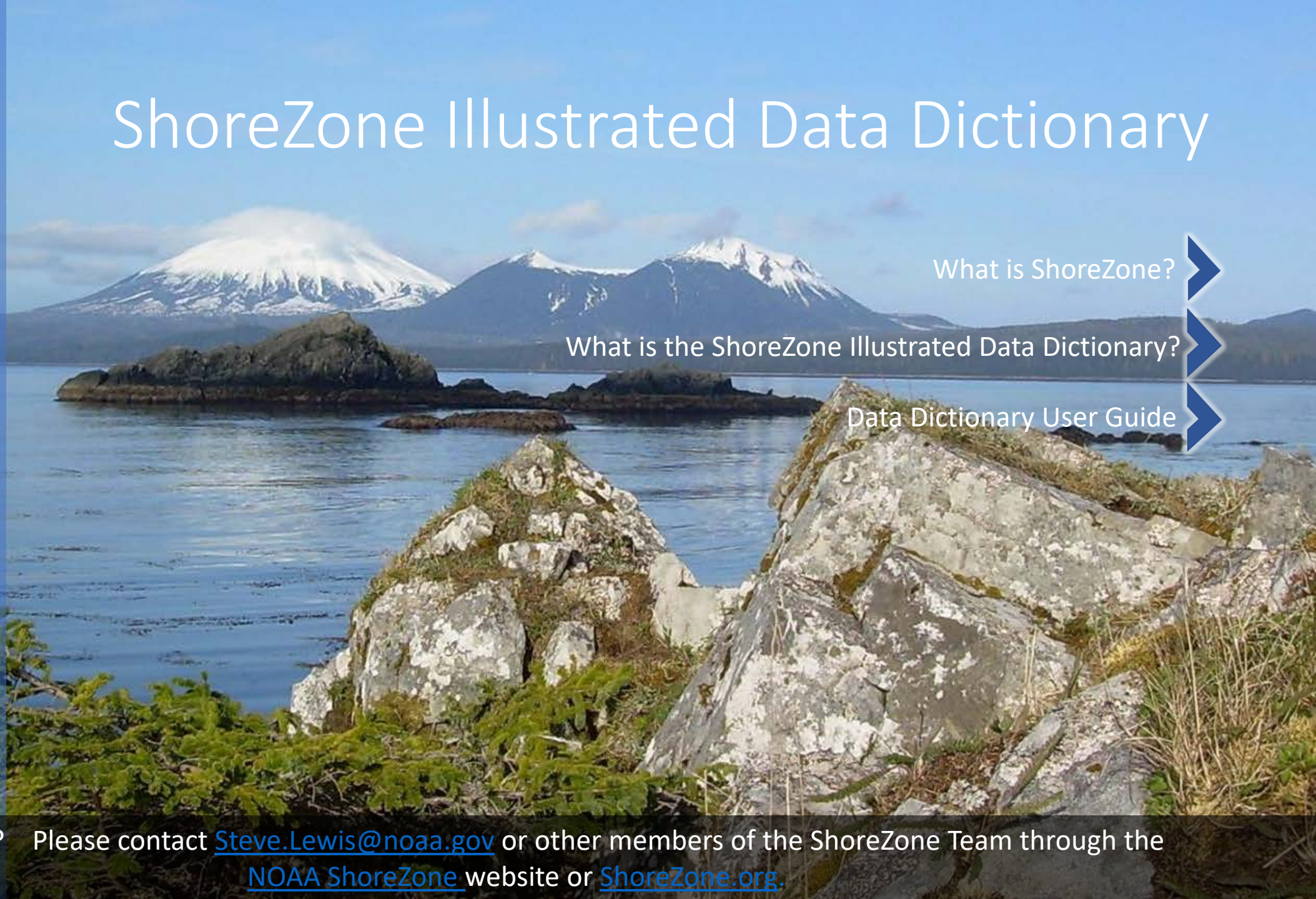
ShoreZone Illustrated Data Dictionary



Quick Links

Questions? Please contact Steve.Lewis@noaa.gov or other members of the ShoreZone Team through the NOAA ShoreZone website or ShoreZone.org.

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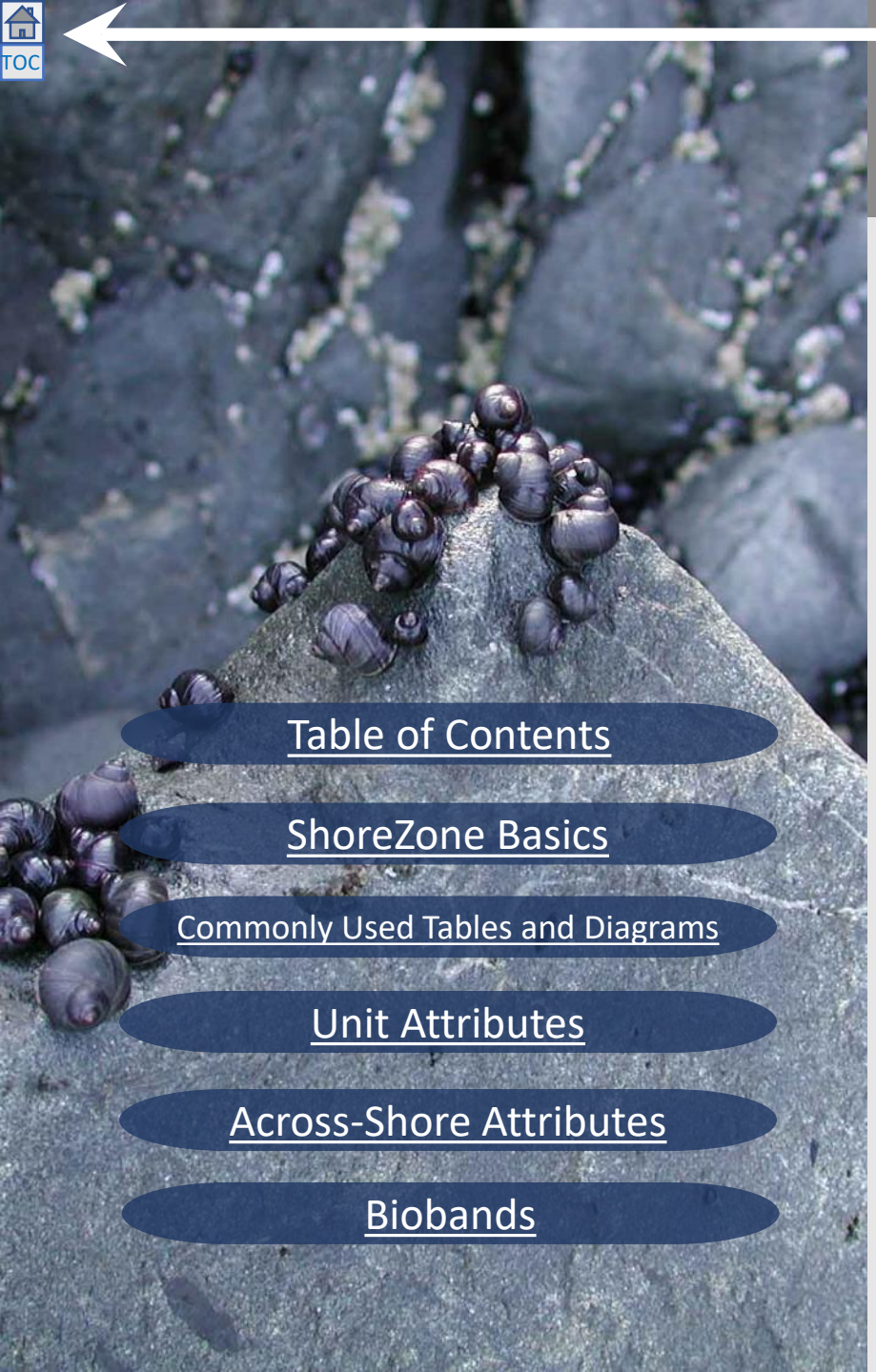
What is the ShoreZone Illustrated Data Dictionary?

- The ShoreZone Illustrated Data Dictionary is an interactive document designed to help users find information about attributes in the ShoreZone dataset, ShoreZone Protocol, and Summary Reports.
- This document contains ShoreZone definitions, tables, codes, diagrams, and photographic examples that can be accessed quickly and efficiently.
- Information ranges from general (ex. “What is a Bioband?”) to specific (Ex. “What is the definition for Coastal Class 22?”).
- The data dictionary is designed to be user friendly and suitable for casual and power users of the ShoreZone dataset alike. It is meant to be used as a companion to the ShoreZone Protocol.
- See the Data Dictionary User Guide for use and navigation tips.

Data Dictionary User Guide

Data Dictionary User Guide



- Use your browser controls: page up, page down, scroll bars, to navigate through this document,
- Use the detailed Table of Contents to jump to specific sections,
- Follow the hyperlinked words and icons ⇨ embedded within the pages to go to specific topics,
- Use the icons in the upper left corner of each page to take you:

  back to the main page, where you can use the Quick Links buttons to navigate to the ShoreZone homepage or other specific internal and external links

  TOC To the Table of Contents

What is ShoreZone?

What is ShoreZone?

- ShoreZone is a coastal aerial imaging and habitat mapping protocol that provides standards for the collection and interpretation of spatially-referenced aerial imagery of the intertidal zone and nearshore environment.
- The oblique aerial video and digital still imagery of the coastal zone is collected during the lowest daylight tides of the year.
- The objective of the interpretation is to produce an integrated, searchable inventory of geomorphological and biological features, that in combination with the imagery, can be used as a tool for science, education, management, and environmental hazard mitigation.
- The *ShoreZone Protocols* provide the standards for the imagery collection and interpretation.
- *Summary reports* present selected subsets of the ShoreZone data.
- Introduction to ShoreZone PowerPoint Presentation

What is the ShoreZone Illustrated Data Dictionary?

ShoreZone Basics

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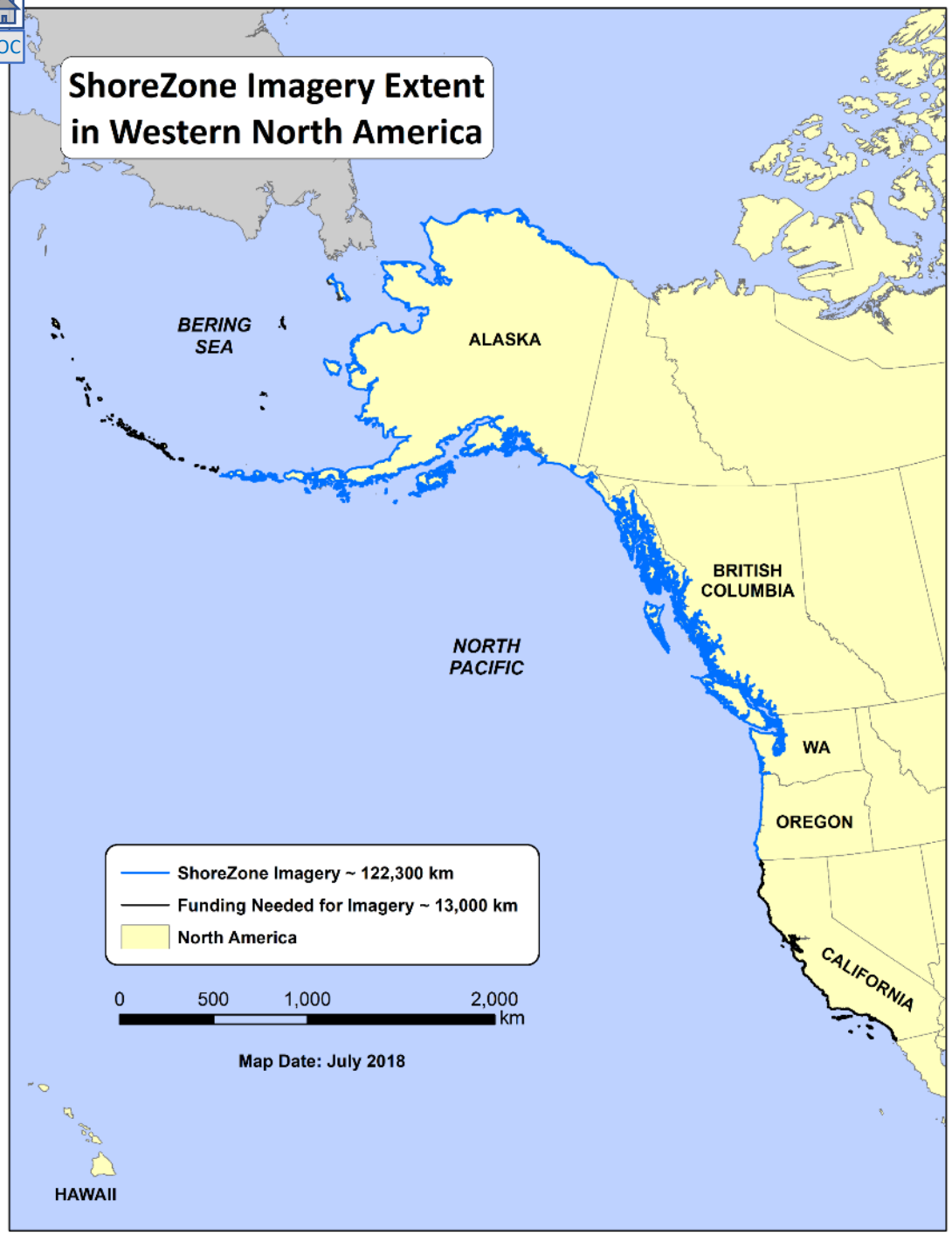
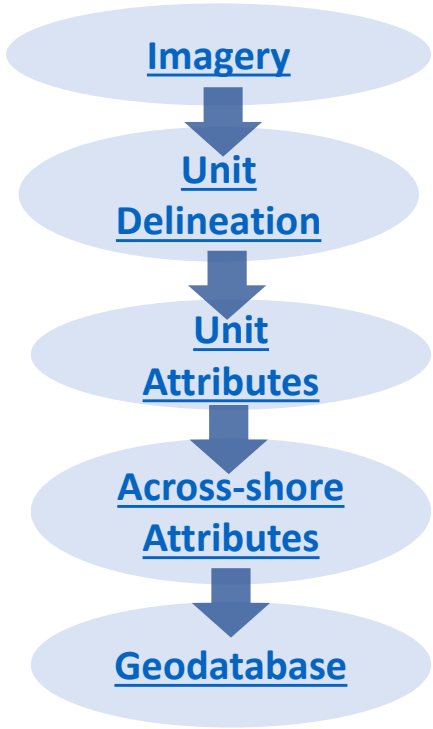


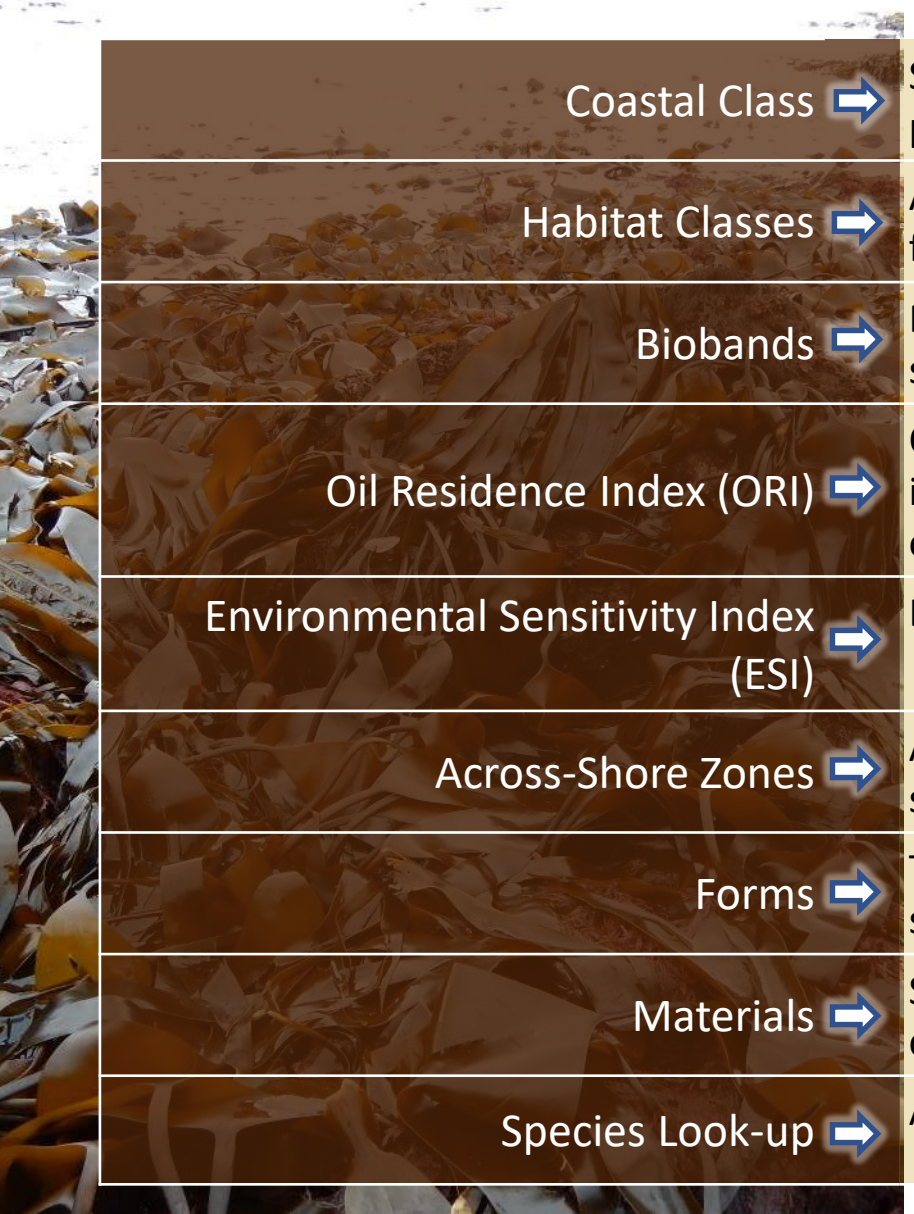
ShoreZone Basics

ShoreZone collects and uses aerial imagery of the coastline to inventory the full physical and biological attributes of each unit. The objective of the mapping process is to produce an integrated, searchable inventory (geodatabase) of geomorphic and biological features that, in combination with the imagery, can be used as a tool for science, education, management, and environmental hazard mitigation. ShoreZone now extends over more than 122,000 km of coastline from Oregon to the North Slope in Alaska.

ShoreZone Workflow and Components



Commonly Used Tables and Diagrams



Coastal Class	Shore type or dominant morphology of the unit. There are 39 Coastal Classes, based primarily on substrate type, across-shore width, and slope.
Habitat Classes	A summary classification that combines both physical and biological characteristics observed for a particular shoreline unit.
Biobands	Band-forming (visually distinct) assemblages of coastal biota and grow in a typical across-shore elevation, and at characteristic wave energies and substrate conditions.
Oil Residence Index (ORI)	ORI defines the persistence of oil residence, on the basis of substrate type, on scale of 1 to 5, in which 1 reflects probable short oil residence (days to weeks) and 5 reflects the potential of long oil residence (months to years).
Environmental Sensitivity Index (ESI)	ESI: Shore type classifications from exposed shoreline to protected shoreline.
Across-Shore Zones	A code indicating the across-shore position (tidal elevation) of the component: (A) supratidal, (B) intertidal, (C) subtidal
Forms	The principal geomorphic feature within each across-shore component, described by a specific set of codes.
Materials	Substrate and/or sediment type that best characterizes Form, described by a specific set of codes.
Species Look-up	A comprehensive catalog of biotic species for vegetation and macro-fauna

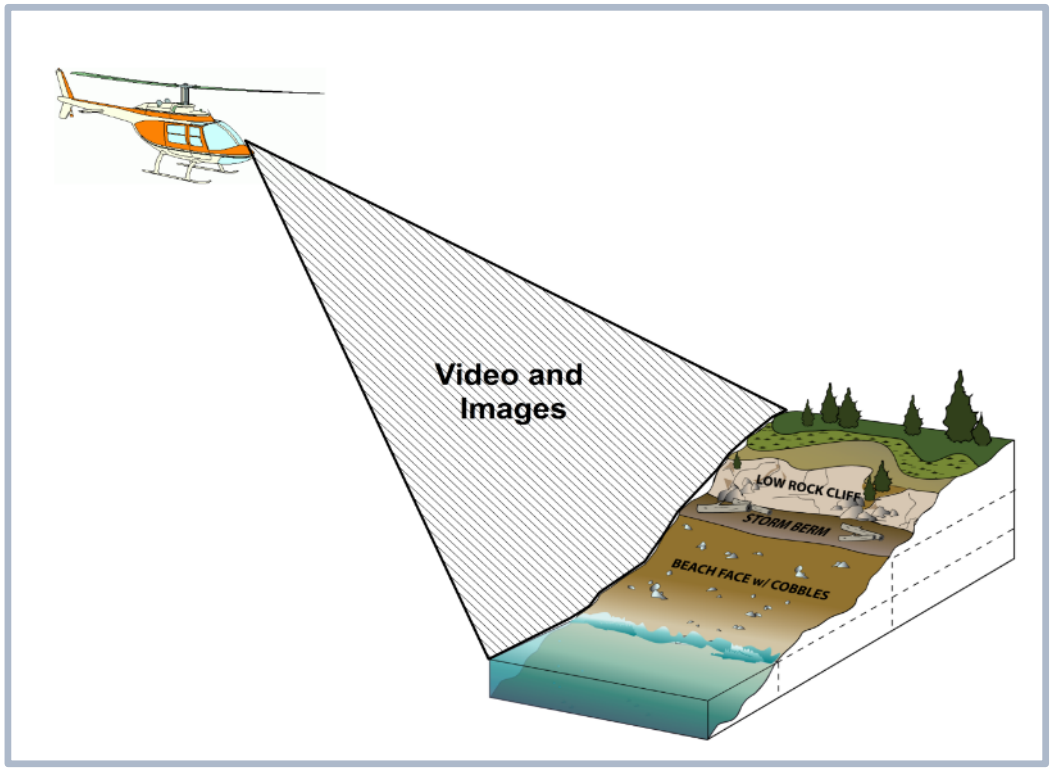
Imagery

A typical ShoreZone AVI team (from left to right):
the pilot, photographer/biologist, navigator and geomorphologist/videographer.

ShoreZone aerial imaging surveys, which are a unique and important part of the dataset, acquire oblique angle, low altitude video and high-resolution still imagery of the shoreline.

Imagery is collected during summer low tides (zero-meter tide level or lower), from a helicopter flying at <100 m altitude at ~100 km/hr.

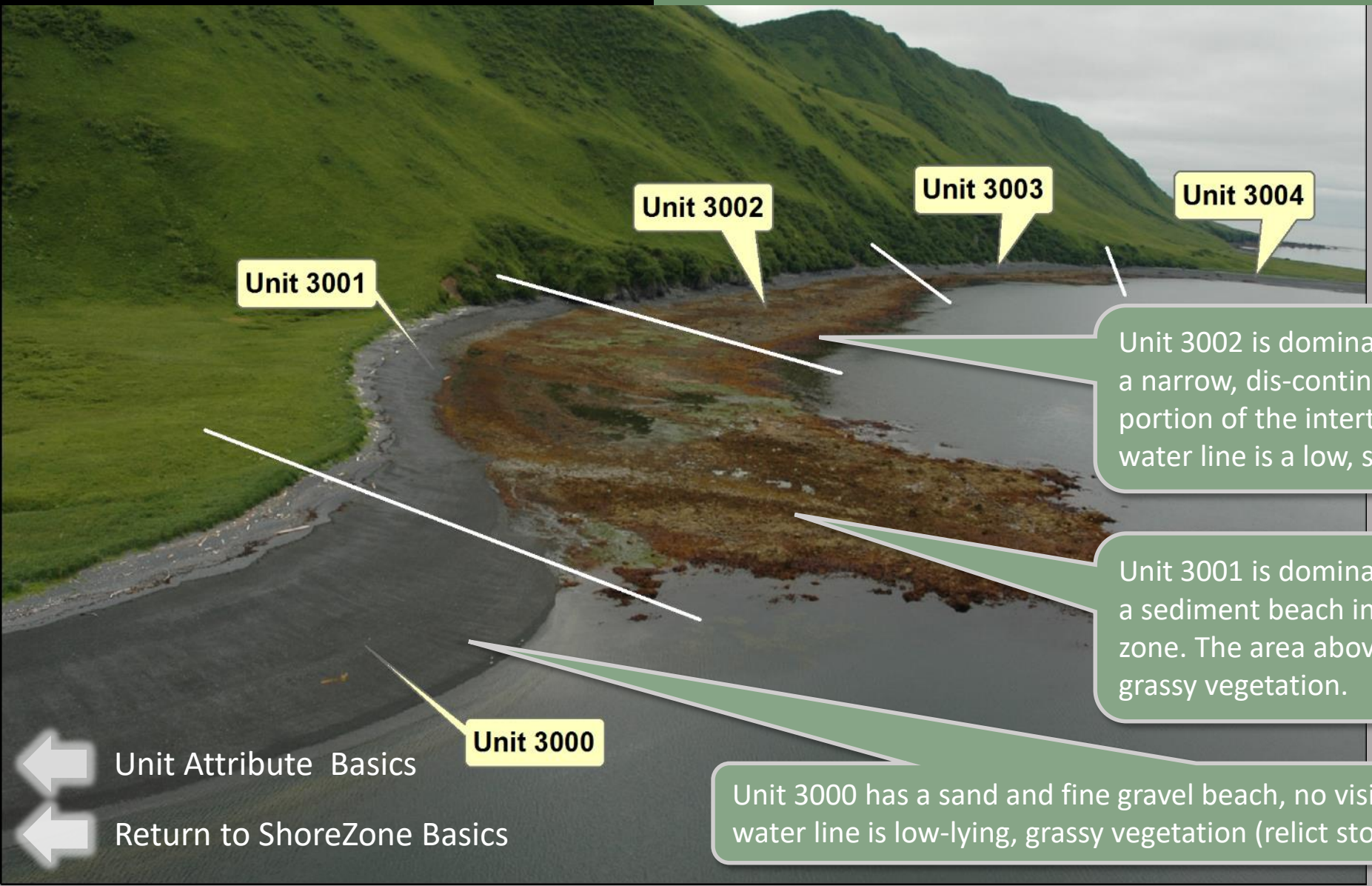
Video and still images are georeferenced with a GPS in the helicopter.



Return to ShoreZone Basics

Unit Delineation

ShoreZone mappers use the low-tide, high resolution aerial imagery to break the digital shoreline into a series of alongshore linear segments (called ‘units’) that are relatively homogenous, in terms of substrate composition, slope, width, geomorphology and wave exposure.



Unit 3002 is dominated by a wide bedrock platform, with a narrow, dis-continuous sediment beach in the upper portion of the intertidal zone. The area above the high-water line is a low, steep bedrock cliff.

Unit 3001 is dominated by a wide bedrock platform, with a sediment beach in the upper portion of the intertidal zone. The area above the high-water line is low-lying, grassy vegetation.

Unit 3000 has a sand and fine gravel beach, no visible rock. The area above the high-water line is low-lying, grassy vegetation (relict storm berm).

Unit Attribute Basics

Return to ShoreZone Basics

Spatial Framework

Linear segments of the best available digital shoreline are the main spatial feature of the ShoreZone dataset and are called ‘Units’. They are linked to the georeferenced aerial imagery by date/time and location.

Date, time and helicopter location are displayed on the video imagery. The time is in UTC (Universal Time Code, which is Greenwich Mean Time). The still imagery has the time and location information in the EXIF metadata.

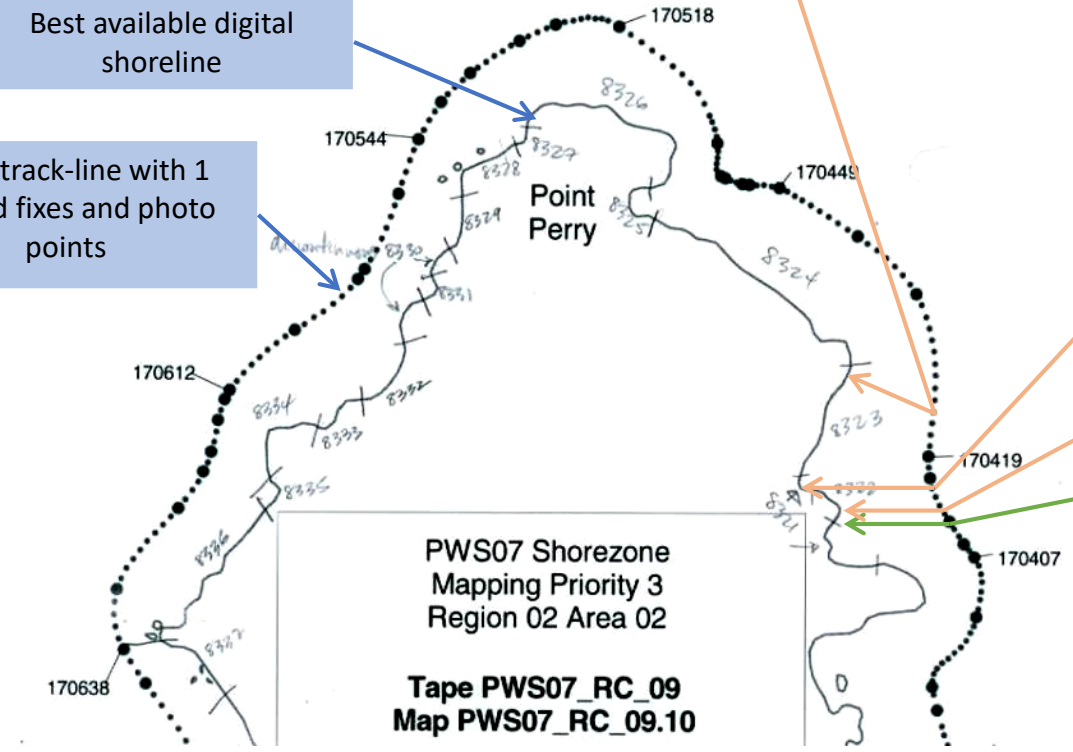
Video Still – Tape PWS07_RC_09

Video Still – Tape PWS07_RC_09

Video Still – Tape PWS07_RC_09

Best available digital shoreline

Flight track-line with 1 second fixes and photo points




Still Photograph PWS07_HA_03359.JPG

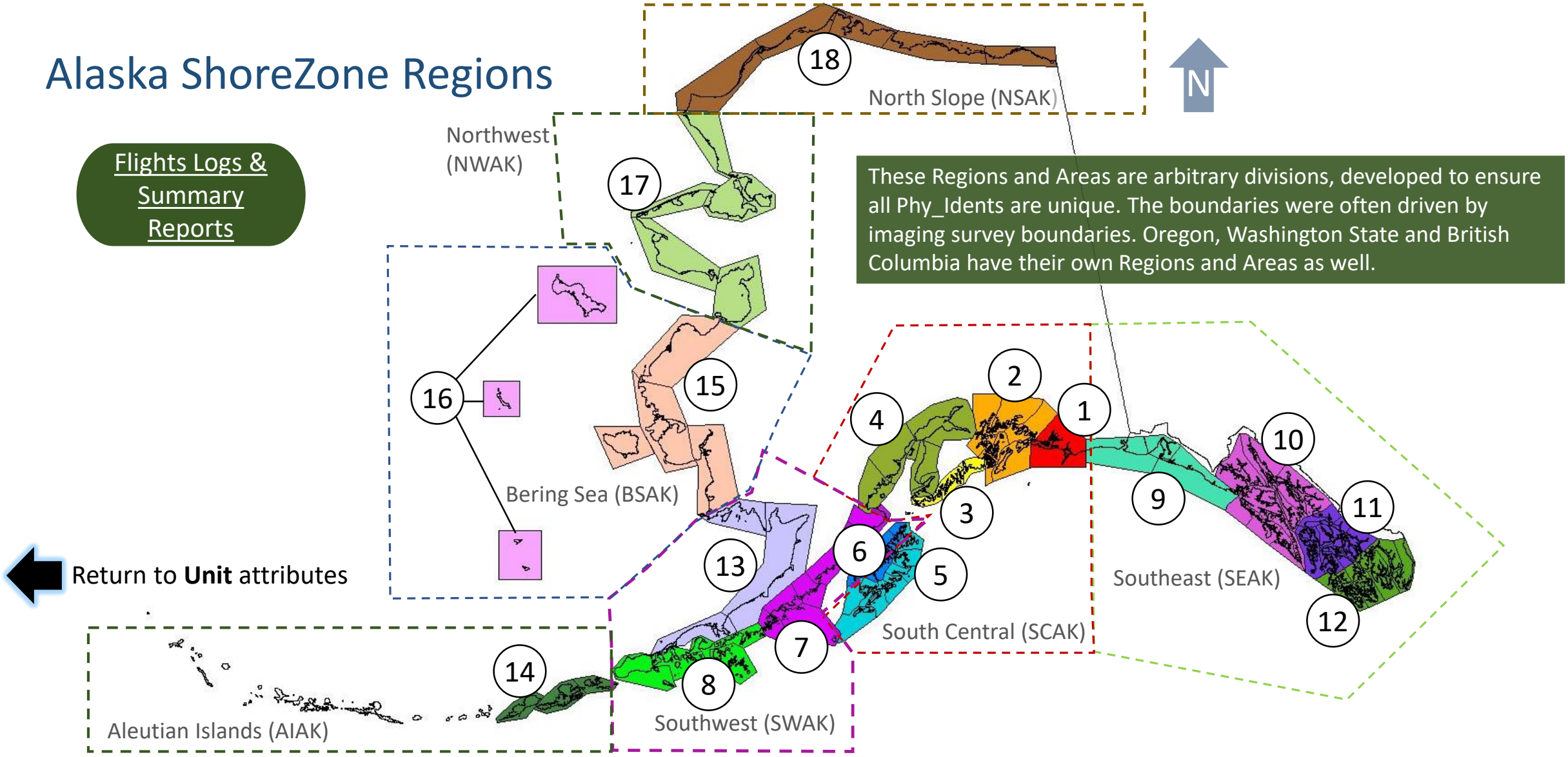
Unit Attribute Basics

Region & Area

Each ShoreZone **Unit** is assigned a unique identifier (Phy_Ident) links that unit to a physical location. The first 4 digits of that Phy_Ident are **Region** and **Area** codes. In Alaska, there are 18 main Regions, with up to 10 smaller Areas within each Region.

Alaska ShoreZone Regions

Flights Logs & Summary Reports

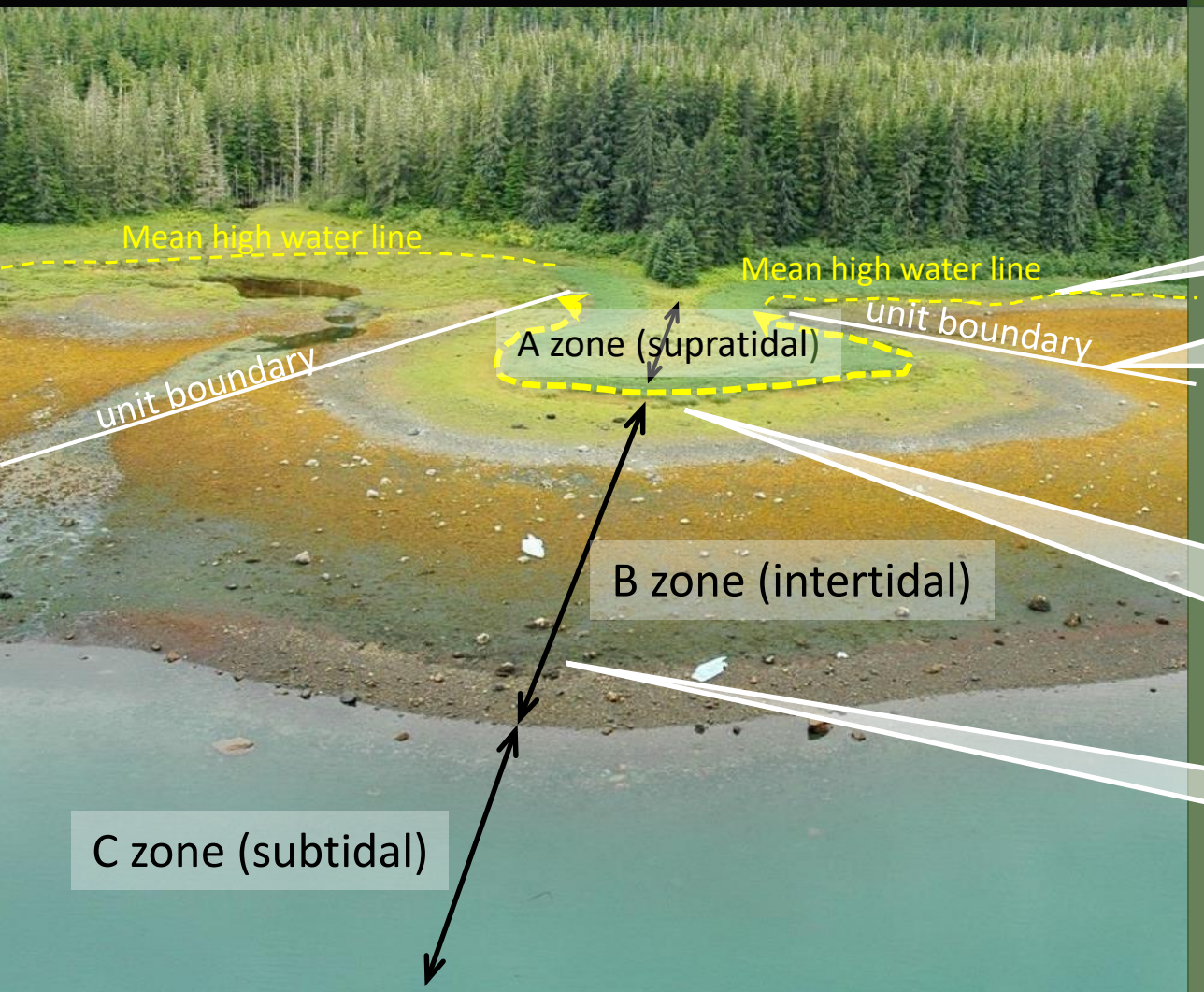


These Regions and Areas are arbitrary divisions, developed to ensure all Phy_Idents are unique. The boundaries were often driven by imaging survey boundaries. Oregon, Washington State and British Columbia have their own Regions and Areas as well.

Return to **Unit** attributes

Unit Basics

The main spatial feature of ShoreZone habitat mapping is the **Unit**: a relatively homogenous stretch of the coast, as interpreted from ShoreZone oblique, low altitude, aerial imagery.



Each **Unit** is defined as a linear segment of the digital shoreline representing the Mean High-Water (MHW) line.

Unit boundaries are created due to a significant change in any intertidal substrate, slope, width, exposure, or in the supratidal characteristics.

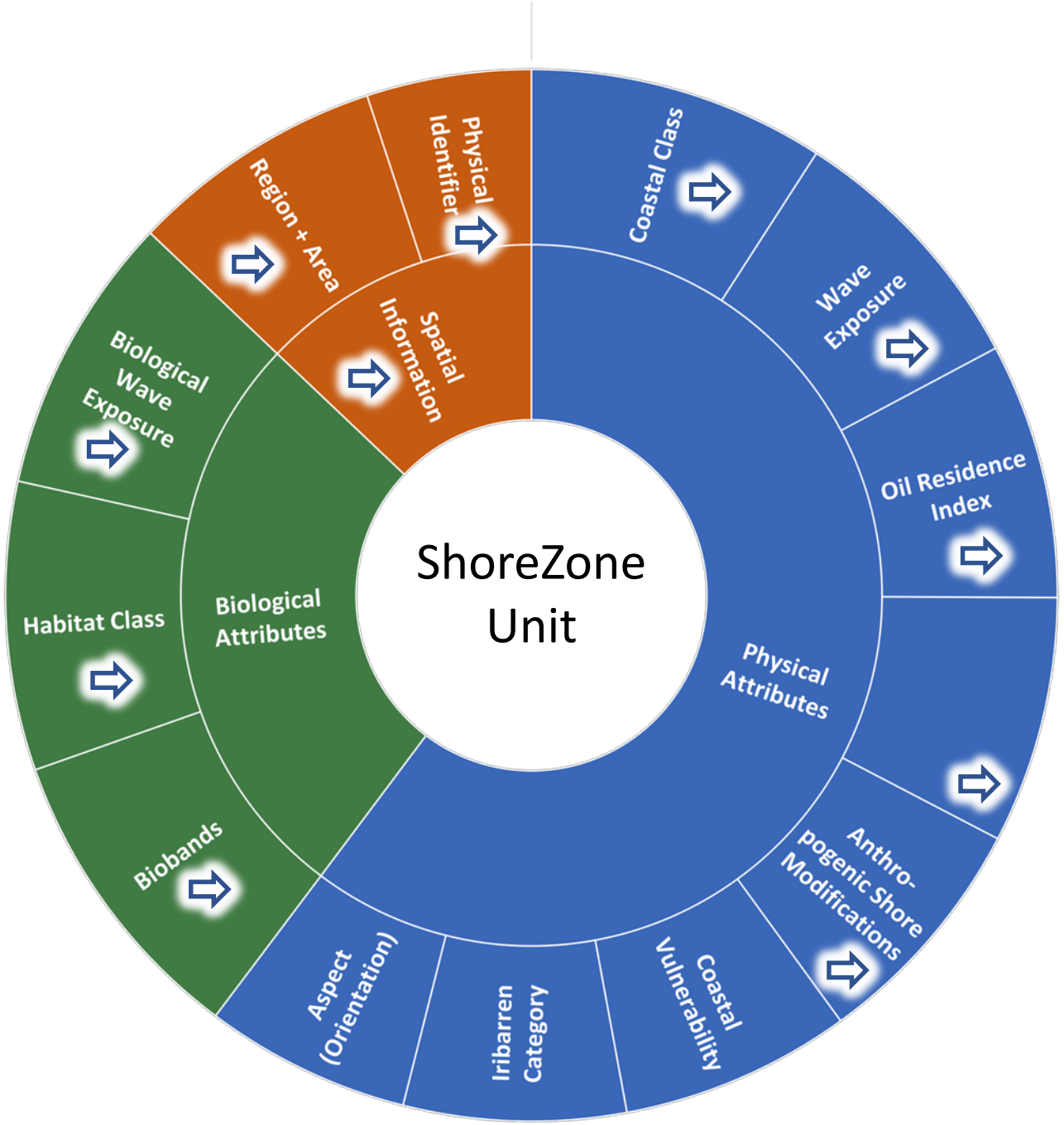
Each **Unit** is assigned a unique Physical Identifier (e.g., 10/03/0001/0) linked to its location. Characteristics that describe the entire section of shoreline, called **Unit**-level attributes, are linked to this digital line segment.

Each alongshore **Unit** is also vertically partitioned into across-shore **Zones** which correspond to tidal elevation. Each zone is further subdivided into across-shore **Components**, which are described in more detail in the section on **Across-shore** attributes .

Return to ShoreZone Basics

Unit Attributes

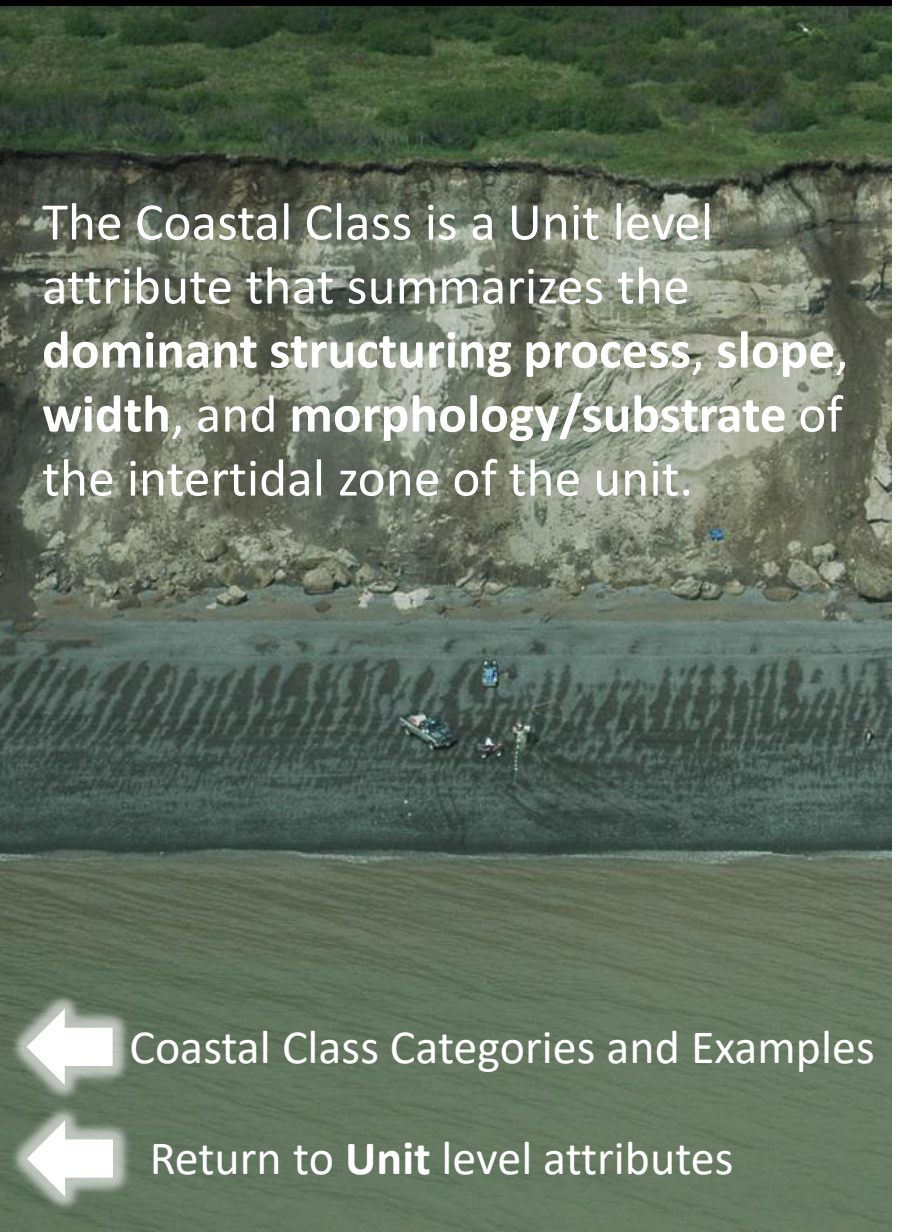
This relational diagram lists ShoreZone Unit attributes by type. Click the arrows to see more information for a given attribute. For information on attributes not included in this Illustrated Data Dictionary, please see the relevant section in the ShoreZone Protocol.



Return to Unit Basics

Return to ShoreZone Basics

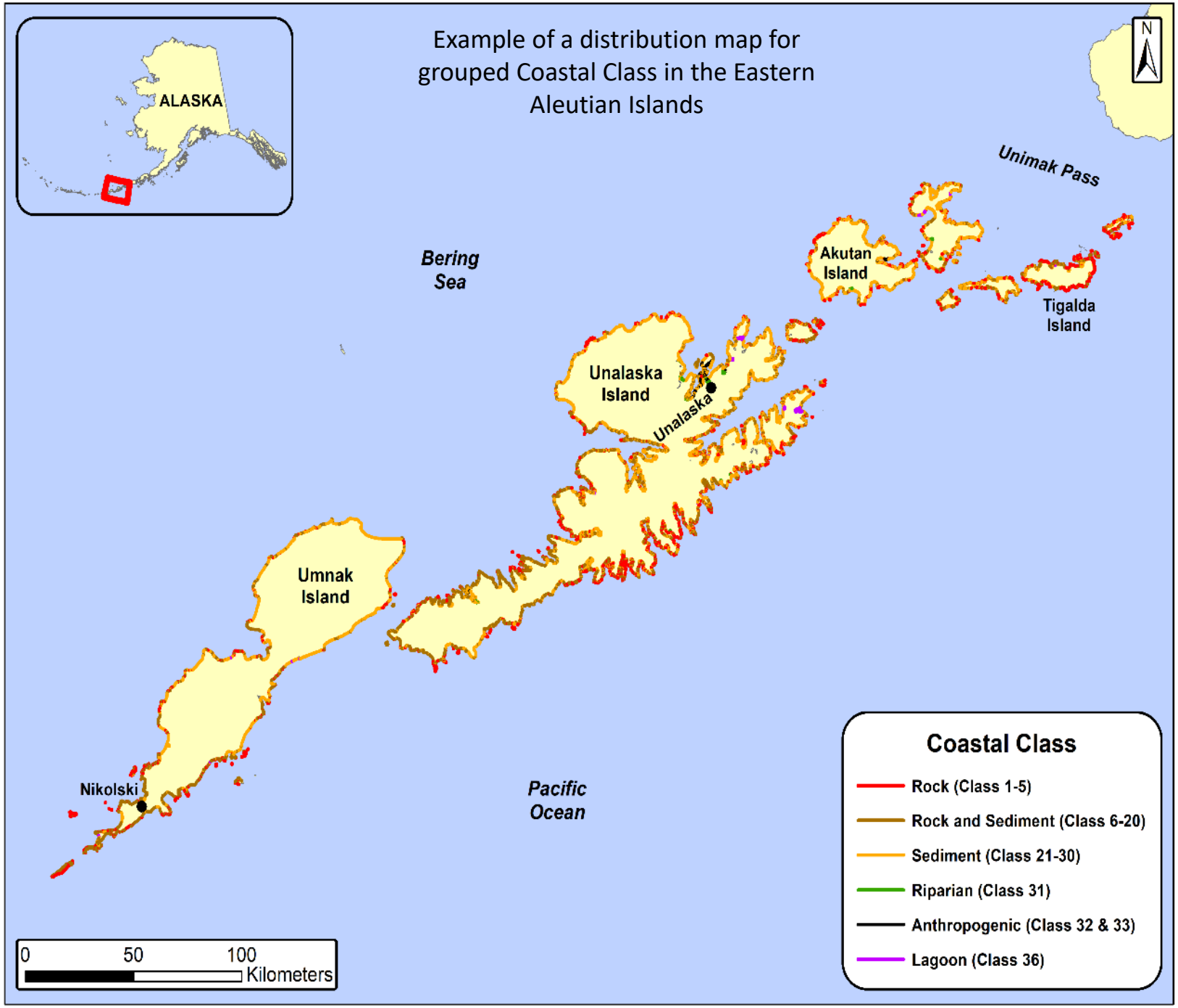
Coastal Class



The Coastal Class is a Unit level attribute that summarizes the **dominant structuring process**, **slope**, **width**, and **morphology/substrate** of the intertidal zone of the unit.

Coastal Class Categories and Examples

Return to **Unit** level attributes



Coastal Class
Definitions & Examples

TOC

Dominant Structuring Process: Wave Energy

Substrate	Width	Slope	Coastal Class	
			Description	Code
Rock	Wide	Inclined	Rock Ramp, wide	1
		Flat	Rock Platform, wide	2
	Narrow	Steep	Rock Cliff	3
		Inclined	Rock Ramp, narrow	4
		Flat	Rock Platform, narrow	5
Rock and Gravel	Wide	Inclined	Ramp with gravel beach, wide	6
		Flat	Platform with gravel beach, wide	7
	Narrow	Steep	Cliff with gravel beach	8
		Inclined	Ramp with gravel beach	9
		Flat	Platform with gravel beach	10
Rock and Sand & Gravel	Wide	Inclined	Ramp w gravel & sand beach, wide	11
		Flat	Platform with G&S beach, wide	12
	Narrow	Steep	Cliff with gravel/sand beach	13
		Inclined	Ramp with gravel/sand beach	14
		Flat	Platform with gravel/sand beach	15
Rock & Sand	Wide	Inclined	Ramp with sand beach, wide	16
		Flat	Platform with sand beach, wide	17
	Narrow	Steep	Cliff with sand beach	18
		Inclined	Ramp with sand beach, narrow	19
		Flat	Platform with sand beach, narrow	20
Gravel	Wide	Flat	Gravel flat, wide	21
	Narrow	Inclined	Gravel beach, narrow	22
		Flat	Gravel flat or fan	23
Sand & Gravel	Wide	Flat	Sand & gravel flat or fan	24
	Narrow	Inclined	Sand & gravel beach, narrow	25
		Flat	Sand & gravel flat or fan	26
Sand/Mud	Wide	Inclined	Sand beach	27
		Flat	Sand flat	28
	Narrow	Flat	Mudflat	29
		Inclined	Sand beach	30

Other Structuring Processes

Dominant Structuring Process	Description	Coastal Class Code
Riparian	Organics, fines and vegetation dominate the unit; may characterize units with large marshes in the supratidal zone. This coastal class may also be applied if a significant amount of marsh infringes on the intertidal zone.	31
	Low vegetated peat are areas of low-lying peat banks; usually vegetated in the supratidal zone, but not always vegetated in the intertidal zone.	39
Anthropogenic	Permeable man-made structures such as rip-rap, wooden crib structures where surface oil from a spill will easily penetrate the structure.	32
	Impermeable man-made structures such as concrete seawalls and steel sheet pile.	33
Current	Current-dominated shore types occur in elongate channels with restricted fetches and where currents (tidal or otherwise) are the dominant structuring process.	34
Glacial	Glacial ice dominates a few places on the Alaska coast where tide-water glaciers are present. These locations are characterized by unstable ice fronts.	35
Lagoon	Lagoons represent a special coastal feature that has some salt-water influence but may be largely disconnected from other marine processes such as tides and high wave exposure.	36
Periglacial (Permafrost)	Inundated tundra occurs where thaw-subsidence on low-relief shorelines causes the tundra surface to sink below mean sea level.	37
	Ground ice slumps are areas where the thaw of high ice content shores causes mass-wasting in distinct patterns.	38

Return to **Unit** level attributes

Return to Previous Page

Wave-energy structured shoreline

Rock-Dominated Coastal Classes

Rock substrate dominates the intertidal zone of the unit, with little or no (<10% of the overall unit area) unconsolidated sediment or organics.

(1) Rock Ramp, wide

(2) Rock Platform, wide

(3) Rock Cliff, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Rock-Dominated Coastal Classes

Rock substrate dominates the intertidal zone of the unit, with little or no (<10% of the overall unit area) unconsolidated sediment or organics.

(4) Rock Ramp, narrow

(5) Rock Platform, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Rock & Gravel Coastal Classes

The intertidal zone has rock features, and up to 75% of the overall unit area with Gravel (grain size >2 mm) sediment beaches or sediment veneer over bedrock.

(6) Rock ramp with Gravel, wide

(7) Rock platform with Gravel, wide

(8) Cliff with gravel beach, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Rock & Gravel Coastal Classes

The intertidal zone has rock features, and up to 75% of the overall unit area with Gravel (grain size >2 mm) sediment beaches or sediment veneer over bedrock.

(9) Ramp with Gravel beach, narrow

(10) Rock platform with Gravel, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Rock and Sand & Gravel Coastal Classes

The intertidal zone has rock features, and from 10% to 75% of the overall unit area with Gravel (grain size >2 mm) and Sand (grain size ≤2 mm) beaches, with sand proportion > 10% of total sediment.

(11) Ramp with Gravel & Sand, wide

(12) Platform with Gravel & Sand, wide

(13) Cliff with Gravel & Sand, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Rock and Sand & Gravel Coastal Classes

The intertidal zone has rock features, and from 10% to 75% of the overall unit area with Gravel (grain size >2 mm) and Sand (grain size ≤2 mm) beaches, with sand proportion > 10% of total sediment.

(14) Ramp with Gravel & Sand, narrow

(15) Platform with Gravel & Sand, narrow

Return to Coastal Class List

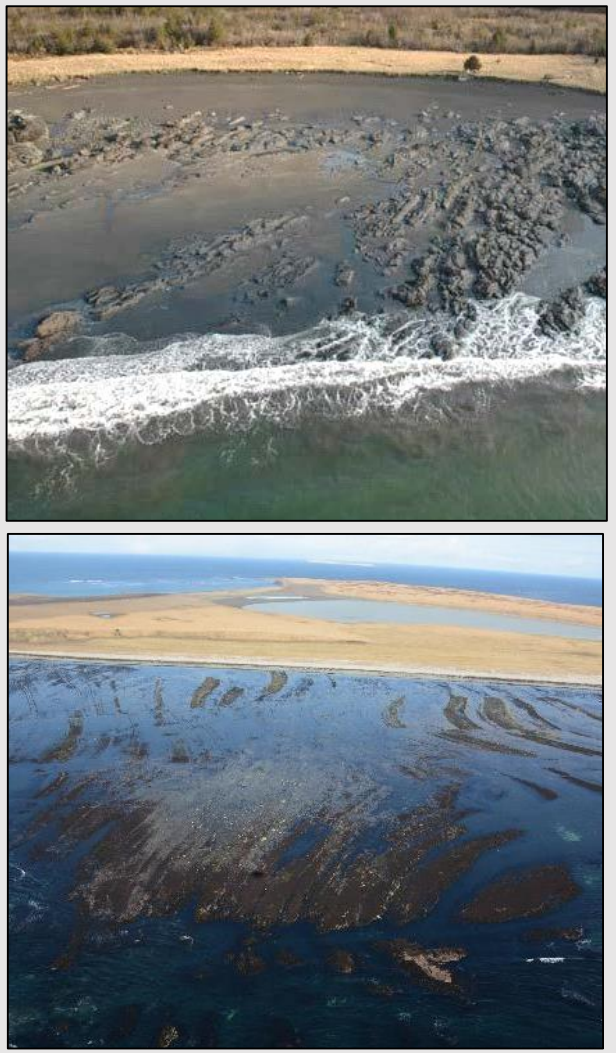
Coastal Classes continued

Wave-energy structured shoreline

Rock & Sand Coastal Classes

The intertidal zone has rock features, and from 10% to 75% of the overall unit area with Sand (grain size ≤2 mm) sediment beaches.

(16) Ramp with Sand, wide



(17) Platform with Sand, wide

(18) Cliff with Sand, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Rock & Sand Coastal Classes

The intertidal zone has rock features, and from 10% to 75% of the overall unit area with Sand (grain size ≤2 mm) sediment beaches.

(19) Ramp with Sand, narrow

(20) Platform with Sand, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Gravel Coastal Classes

Coarser sediment (grain size >2 mm) dominates the intertidal zone of the unit, with no evidence of Sand (grain size ≤2 mm).

(21) Gravel Flat, wide

(22) Gravel beach, narrow

(23) Gravel flat or fan, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Sand & Gravel Coastal Classes

More than 75% of the overall unit area is Gravel (grain size >2 mm) and Sand (grain size ≤2 mm) beaches or flats, with sand proportion > 10% of total sediment.

(24) Sand & Gravel Flat, wide

(25) Sand &Gravel beach, narrow

(26) Sand & Gravel flat or fan, narrow

Return to Coastal Class List

Coastal Classes continued

Wave-energy structured shoreline

Sand & Mud Coastal Classes

(27) Sand Beach, wide

(28) Sand Flat, wide

(29) Mud Flat, wide

(30) Sand Beach, narrow

Return to Coastal Class List

Coastal Classes continued

Riparian Process Coastal Classes




(31) Wetland/Estuary

- Deltas, estuaries, and other wetland forms, with predominantly *sediment* substrate.
- Organics, fines and vegetation dominate the unit; may characterize units with large marshes in the supratidal zone if the marsh represents >50% of the combined supratidal and intertidal area of the unit, even if the unit has another dominant intertidal feature such as a wide tidal flat or sand beach.
- This Coastal Class may also be applied if a significant amount of marsh (25% or more) infringes on the intertidal zone.

(39) Vegetated Peat

- Low areas or low-lying banks with *biogenic/organics* substrate; usually vegetated in the supratidal zone, but not always vegetated in the intertidal zone.
- Minimal mineral sediment is present.

Return to Coastal Class List

Coastal Classes continued

Anthropogenic Coastal Classes

(32) Anthropogenic (Permeable)

Permeable Structures such as: rip-rap, pile-supported structures, wooden crib structures or loose fill, where surface oil from a spill will easily penetrate the structure.

(33) Anthropogenic (Impermeable)

Impermeable Structures such as concrete seawalls and steel sheet pile.

The Anthropogenic shoreline class is assigned where man-made structures make up >50% of the intertidal area.
*Man-made structures or modifications that make up <50% of the intertidal area of a given unit are recorded as along-shore features: ***Shore Modifications***

Return to Coastal Class List

Coastal Classes continued

Current, Glacier, and Lagoon Coastal Classes

(34) Current

Current-dominated shore types occur in elongate channels with restricted fetches and where currents (tidal or otherwise) are the dominant structuring process.

(35) Glacier

Glacial ice dominates a few places on the Alaska coast where tide-water glaciers are present.
These locations are characterized by unstable ice fronts.

(36) Lagoon

Lagoons represent a special coastal feature that has some salt-water influence but may be largely disconnected from other marine processes such as tides and high wave exposure. Lagoons are distinguished from estuaries, which must have fluvial or deltaic landforms. Intertidal zones are often narrow and restricted in elevation. Saltwater influxes may be only episodic.

Return to Coastal Class List

Coastal Classes continued

Periglacial Process Coastal Classes

(37) Inundated Tundra

Inundated Tundra occurs where thaw-subsidence on low-relief shorelines causes the tundra surface to sink below mean sea level. Often the polygon fracture patterns associated with ice-wedges polygons are evident.

(38) Ground Ice Slumps

Ground Ice Slumps are areas where the thaw of high ice content shores causes mass-wasting in distinct patterns including ground ice slumps, thermo-erosional falls, and soli-fluction lobes.

Return to Coastal Class List

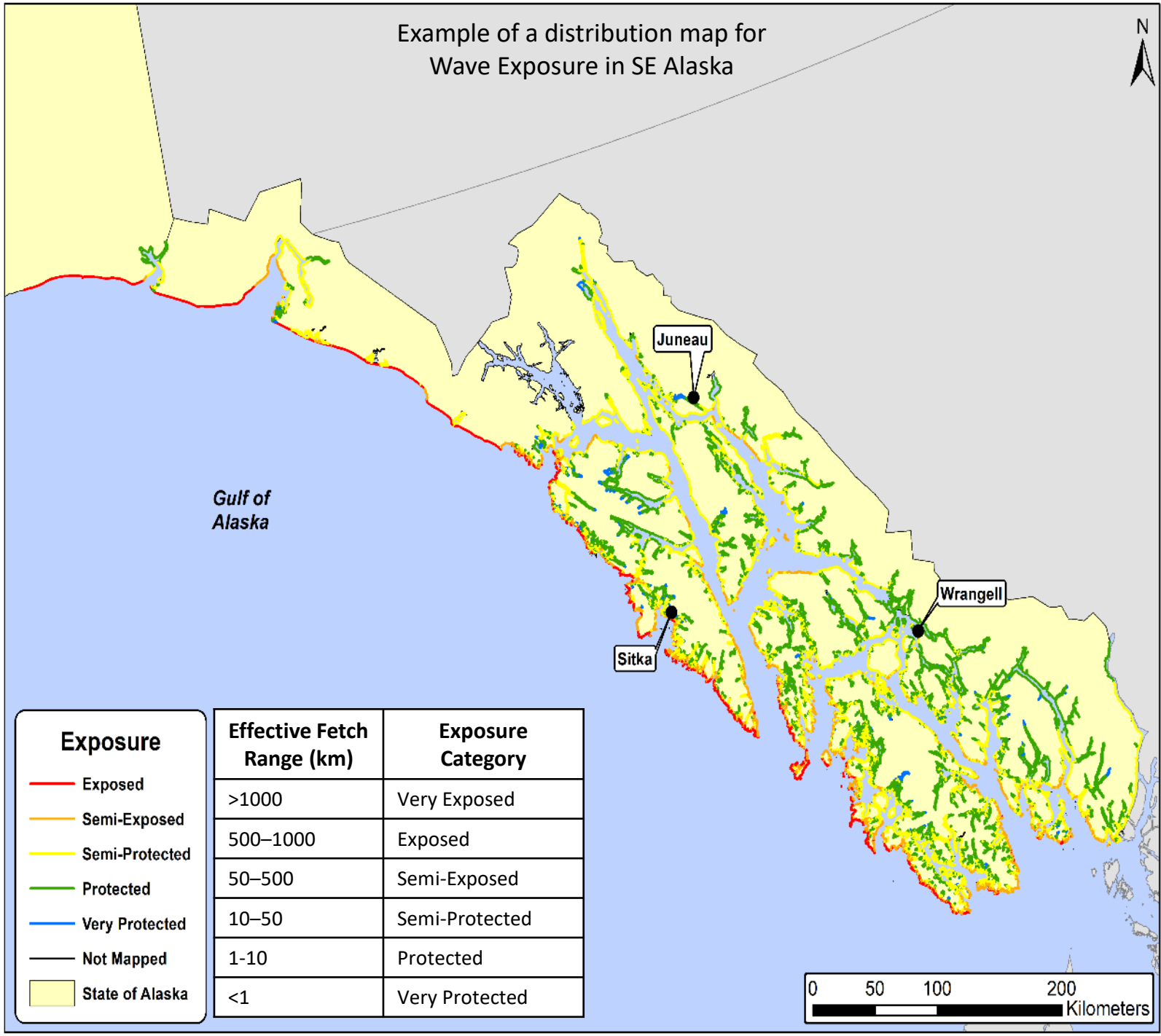
Wave Exposure

The **Wave Exposure** attribute is an estimate of the amount of wave energy that could potentially impact the intertidal zone of the unit.

- **Wave Exposure** is assumed to be a function of the fetch window of the unit.
- The standard definition of fetch is the length of water over which could blow before reaching the unit.
- The maximum fetch can be modified by several factors, resulting in an effective fetch range.
- Changes in coastal orientation, presence of offshore islands, or the proximity to shoaling bathymetry will attenuate the height and wavelength of open ocean waves.

Return to **Unit** level attributes

Example of a distribution map for Wave Exposure in SE Alaska



Effective Fetch Range (km)	Exposure Category
>1000	Very Exposed
500–1000	Exposed
50–500	Semi-Exposed
10–50	Semi-Protected
1-10	Protected
<1	Very Protected

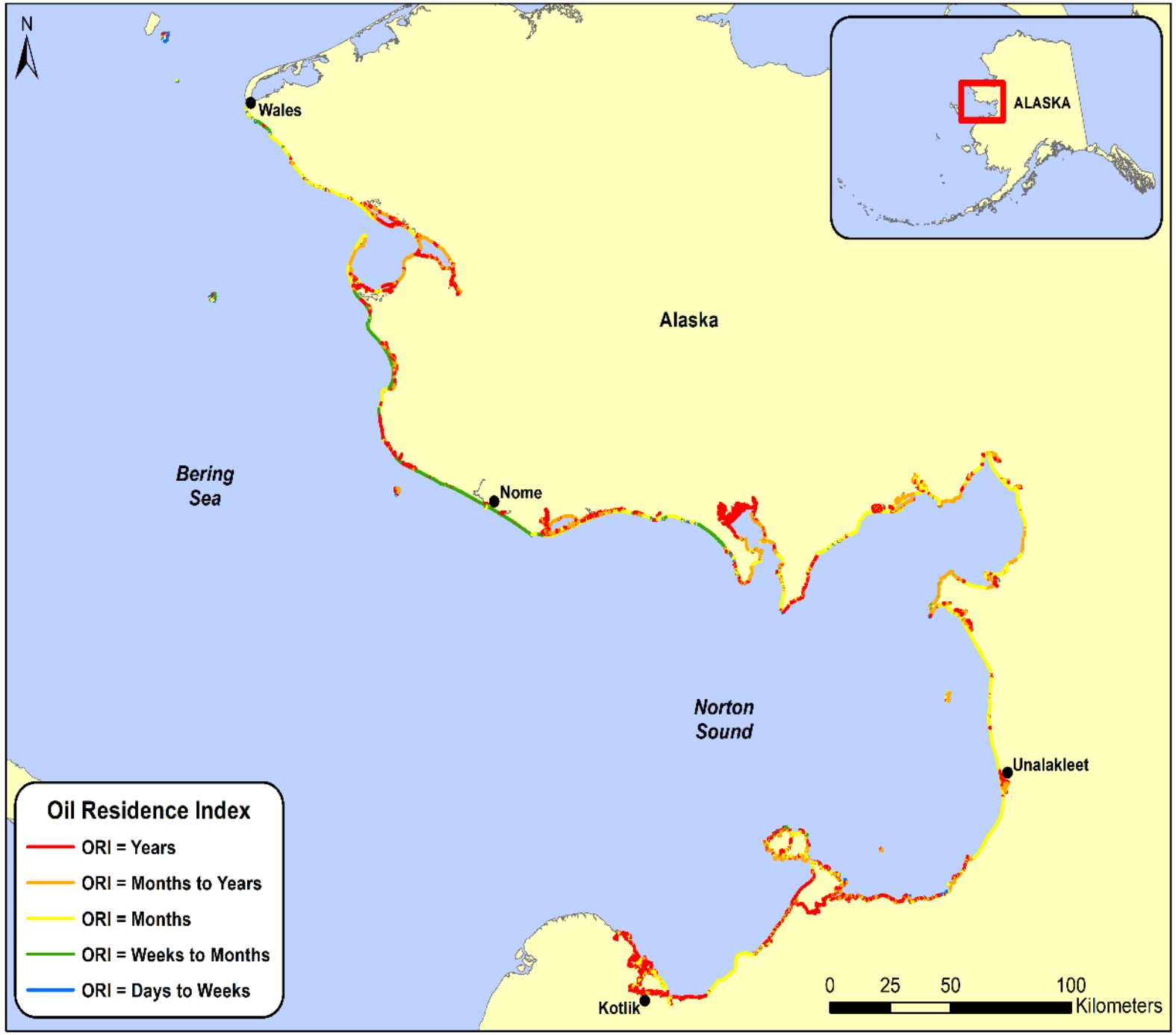
Oil Residence Index

The **Oil Residence Index** attribute is an estimate of the potential oil residence time of crude oil based on substrate type and wave exposure.

- Substrate permeability is of principal importance in estimating the residence time of oil on the shoreline.
- Impermeable surfaces such as rock or sheet piling form a barrier and have shorter oil residence times.
- In contrast, coarse sediments are highly permeable, can trap large volumes of oil, and have lengthy oil residence periods.
- In general, high-energy shorelines have short oil residence times, owing to the dissipative action of waves.
- Low-energy shorelines have lengthy oil residence times.

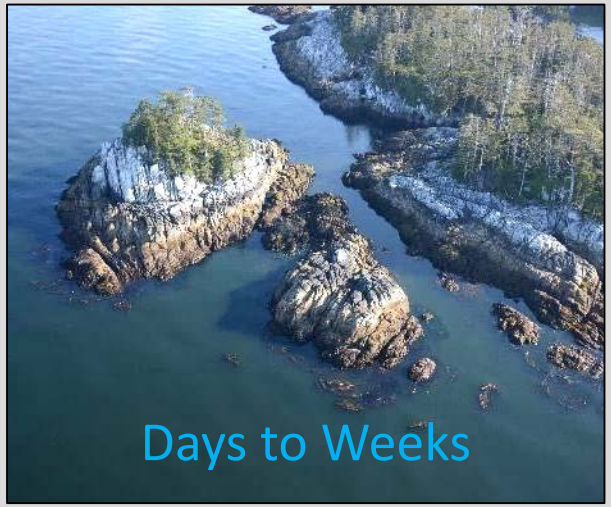
Photographic Examples of ORI

Return to **Unit** level attributes



ORI

The **Oil Residence Index (ORI)** attribute is an estimate of the potential oil residence time of crude oil based on substrate type and wave exposure.



Return to **ORI** main page

Return to **Unit** level attributes

Environmental Sensitivity Index

- The NOAA **Environmental Sensitivity Index (ESI)** is a shoreline habitat classification (Petersen *et al*., 2002) widely applied throughout the USA
- **ESI** is used by response personnel to prioritize shorelines for cleanup and mitigation following an oil spill
- **ESI** is applied to each alongshore unit
- multiple **ESI** values may be entered from landward to seaward, depending on the character of the intertidal zone
- The most sensitive **ESI** that occurs within that zone is assigned to the alongshore unit
- Please see following pages for photographic examples (codes 9C and 10C have never been mapped in ShoreZone, so no examples are given)

Return to **Unit** Level Attributes

low

sensitivity

high

ESI code	Description
1A	Exposed rocky shores; exposed rocky banks
1B	Exposed, solid man-made structures
1C	Exposed rocky cliffs with boulder talus base
2A	Exposed wave-cut platforms in bedrock, mud, or clay
2B	Exposed scarps and steep slopes in clay
3A	Fine- to medium-grained sand beaches
3B	Scarps and steep slopes in sand
3C	Tundra cliffs
4	Coarse-grained sand beaches
5	Mixed sand and gravel beaches
6A	Gravel Beaches (granules and pebbles)
6B	Gravel Beaches (cobbles and boulders)
6C	Rip rap (man-made)
7	Exposed tidal flats
8A	Sheltered scarps in bedrock, mud, or clay; Sheltered rocky shores (impermeable)
8B	Sheltered, solid man-made structures; Sheltered rocky shores (permeable)
8C	Sheltered rip rap
8D	Sheltered rocky rubble shores
8E	Peat shorelines
9A	Sheltered tidal flats
9B	Vegetated low banks
9C	Hypersaline tidal flats
10A	Salt- and brackish-water marshes
10B	Freshwater marshes
10C	Swamps
10D	Scrub-shrub wetlands; mangroves
10E	Inundated low-lying tundra

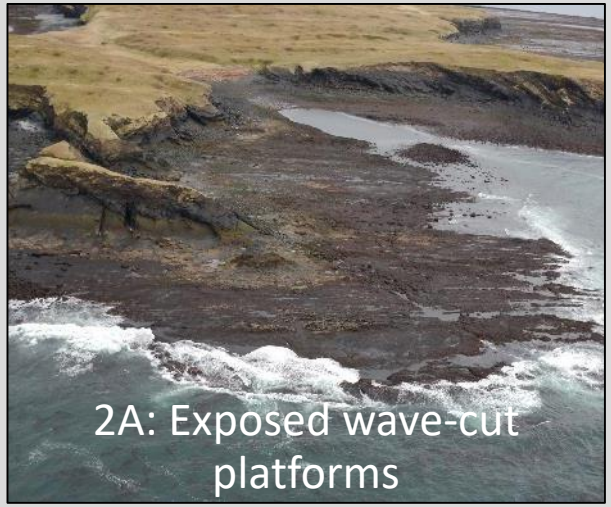
ESI

The **Environmental Sensitivity Index (ESI)** is a shoreline habitat classification widely applied throughout the USA. It is used by response personnel to prioritize shorelines for cleanup and mitigation following an oil spill.

1A: Exposed rocky shores

1B: Exposed, solid man-made structures

1C: Exposed rocky cliff with talus base



2A: Exposed wave-cut platforms

2B: Exposed scarps and steep slopes in clay

Return to **ESI** main page

Return to **Unit** level attributes

ESI

The **Environmental Sensitivity Index (ESI)** is a shoreline habitat classification widely applied throughout the USA. It is used by response personnel to prioritize shorelines for cleanup and mitigation following an oil spill.


3A: Fine and medium grained sand beaches


3B: Scarps and steep slopes in sand


3C: Tundra cliffs


4: Coarse-grained sand beaches


5: Mixed sand and gravel beaches

Return to **ESI** main page

Return to **Unit** level attributes

ESI

The **Environmental Sensitivity Index (ESI)** is a shoreline habitat classification widely applied throughout the USA. It is used by response personnel to prioritize shorelines for cleanup and mitigation following an oil spill.


6A: Gravel beaches (granules and pebbles)


6B: Gravel beaches (cobbles and boulders)


6C: Rip-rap (man made)


7: Exposed tidal flats


9A: Sheltered tidal flats


9B: Vegetated low banks

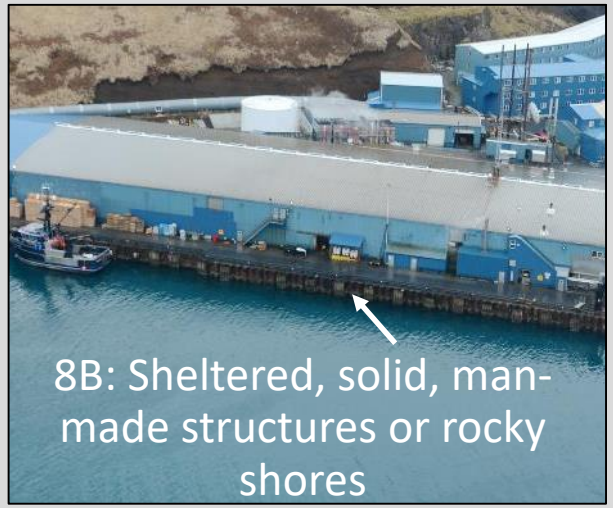
Return to **ESI** main page

Return to **Unit** level attributes

ESI

The **Environmental Sensitivity Index (ESI)** is a shoreline habitat classification widely applied throughout the USA. It is used by response personnel to prioritize shorelines for cleanup and mitigation following an oil spill.

8A: Sheltered scarps in bedrock or rocky shores



8B: Sheltered, solid, man-made structures or rocky shores

8C: Sheltered rip rap

8D: Sheltered rocky rubble shores

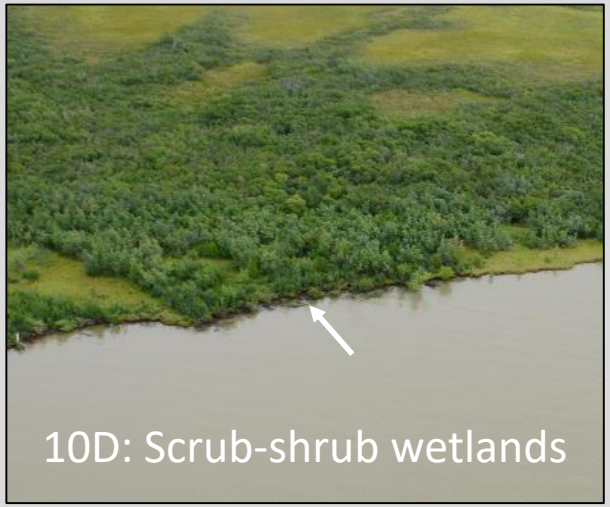
8E: Peat shorelines

Return to **ESI** main page

Return to **Unit** level attributes

ESI

The **Environmental Sensitivity Index (ESI)** is a shoreline habitat classification widely applied throughout the USA. It is used by response personnel to prioritize shorelines for cleanup and mitigation following an oil spill.

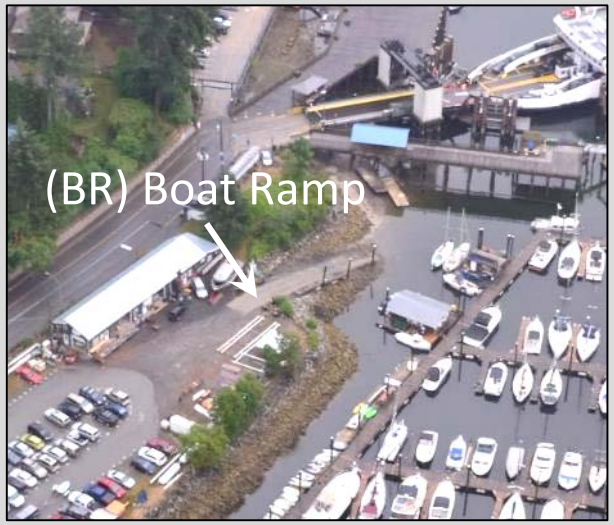


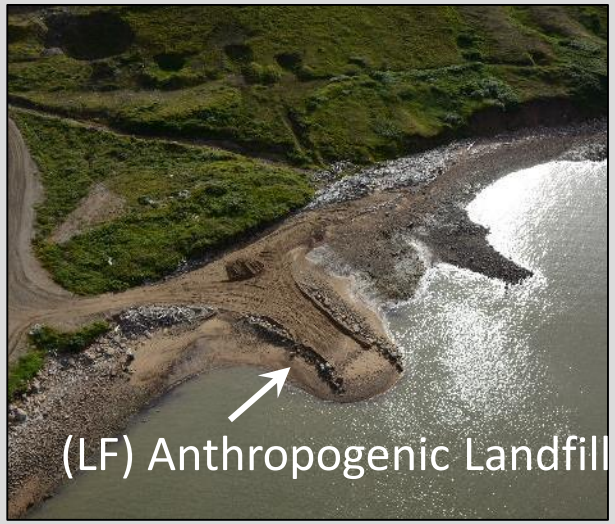
Return to **ESI** main page

Return to **Unit** level attributes

Shore Modifications

One of ShoreZone's strengths is the cataloging of human-modified or anthropogenic changes to the shoreline. This information can be used to estimate regional trends in human-modification of shores.





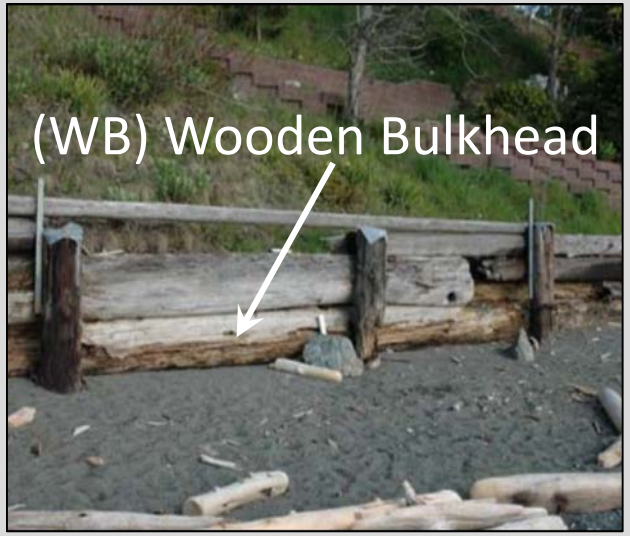
For each type of shore modification, the proportion of the alongshore length within the Unit is also estimated (in 10^{ths}). If the total occurrence of shore modifications is >50% of the intertidal area, then the unit is assigned an anthropogenic **Coastal Class (32 or 33).**

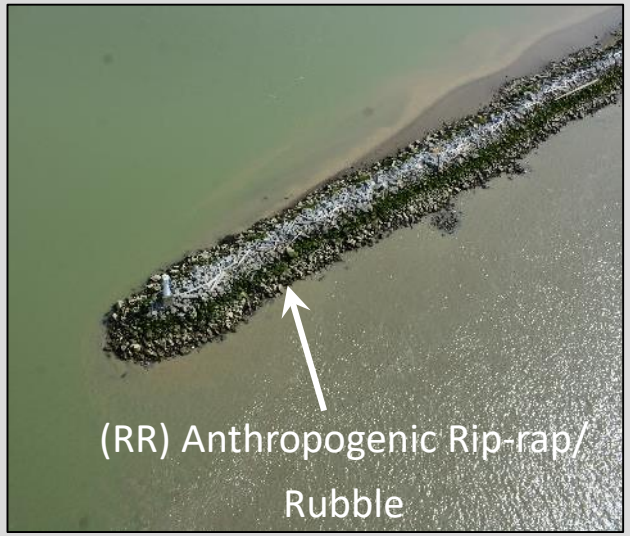
Return to **Unit** level attributes

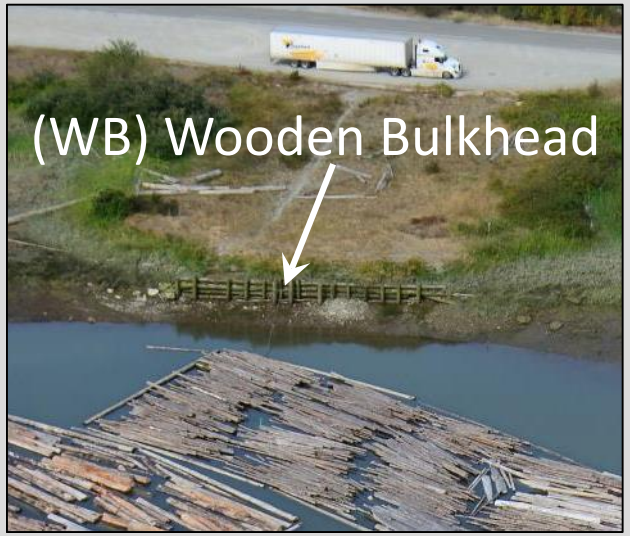
Shore Modifications continued

Shore Modifications

One of ShoreZone's strengths is the cataloging of human-modified or anthropogenic changes to the shoreline. This information can be used to estimate regional trends in human-modification of shores.







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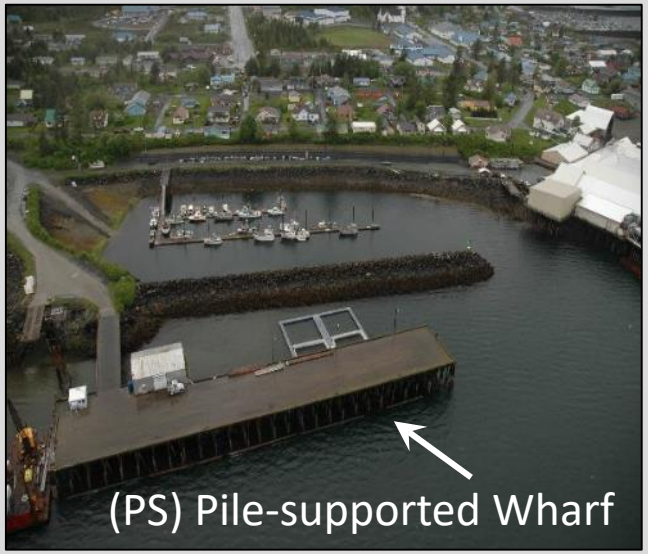
Return to **Unit** level attributes

Shore Modifications continued

Shore Modifications

One of ShoreZone's strengths is the cataloging of human-modified or anthropogenic changes to the shoreline. This information can be used to estimate regional trends in human-modification of shores.



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Return to **Unit** level attributes

Shore Modifications continued

Shore Modifications

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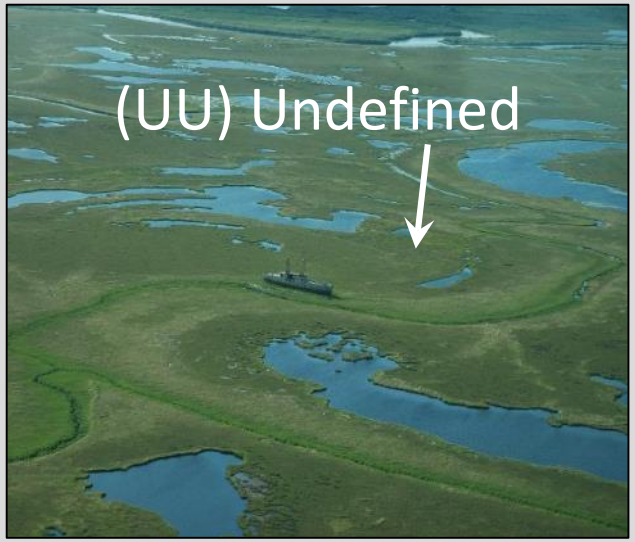

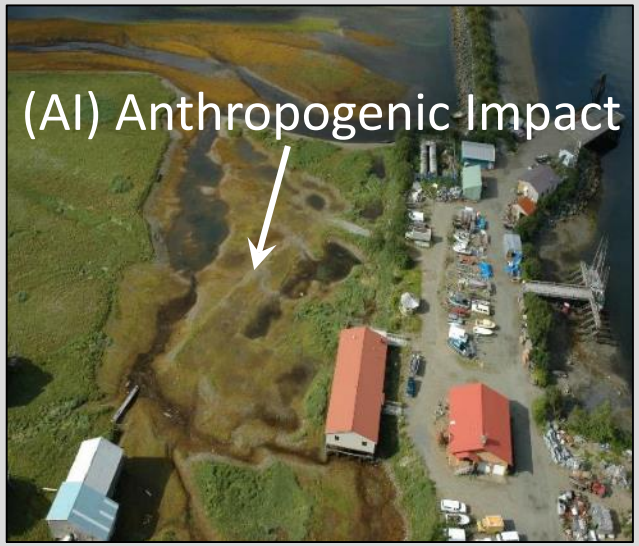

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Return to **Unit** level attributes

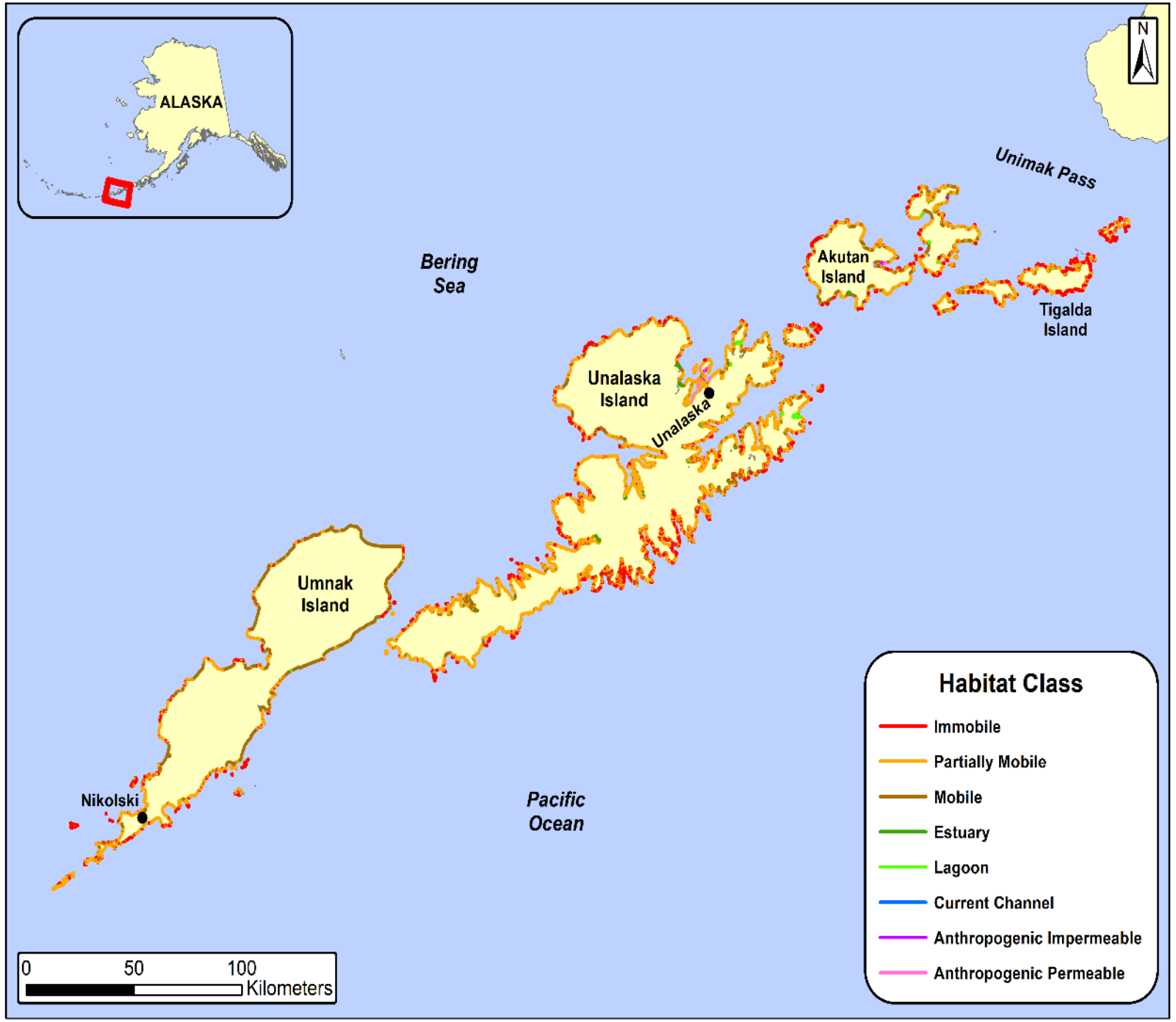
Habitat Class

The **Habitat Class** is a summary classification that combines both physical and biological characteristics observed in a shoreline unit

It is a combination of Biological Wave Exposure and an estimation of the substrate mobility in the site for wave structured shorelines. For shoreline with other dominant structuring processes, that information is included. .For wave structured shorelines, stability of the substrate determines the presence and abundance of attached biota. Where the substrate is stable, such as bedrock, a well-developed epibenthic assemblage occurs. In ShoreZone, these are recorded as Biobands . Where the substrate is mobile, such as on sandy beaches, the epibenthic community may be sparse or absent.

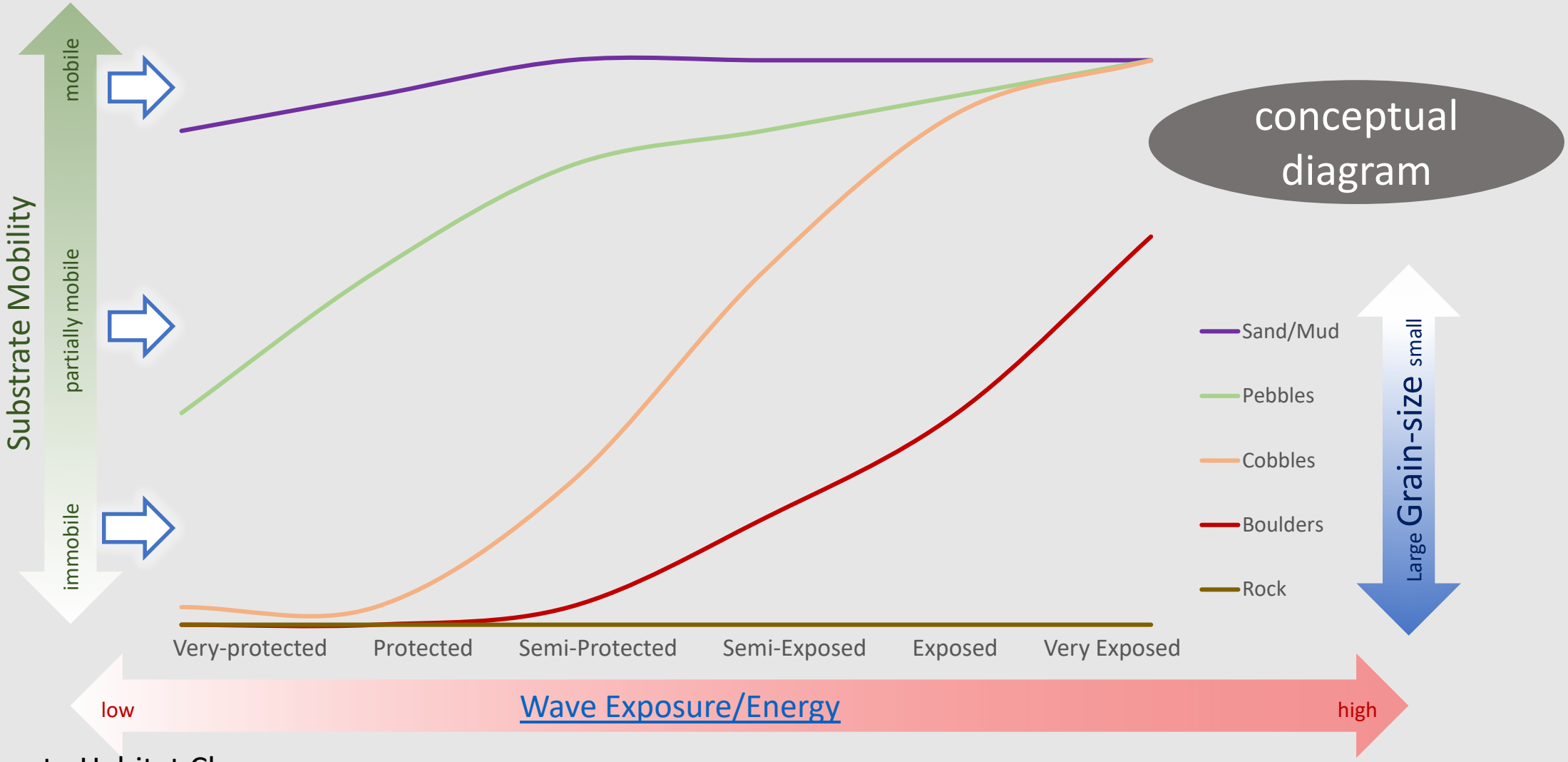
Habitat Class Categories and Examples

Return to **Unit** level attributes



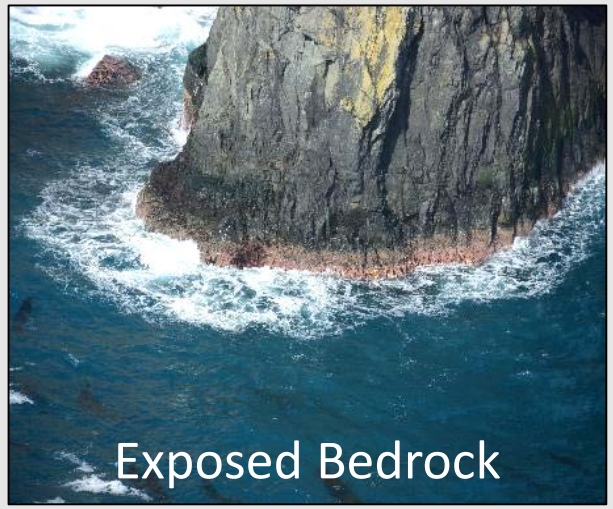
Substrate Mobility

Stability of the substrate determines the presence and abundance of attached biota. Where the substrate is stable, such as bedrock, a well-developed epibenthic assemblage occurs. Where the substrate is mobile, such as on sandy beaches, the epibenthic community may be sparse or absent.



Return to Habitat Class

Immobile Habitat Class Examples



In high wave exposures, only solid bedrock shorelines will be classified as ***immobile***. At the lowest wave exposures, this could include sediment beaches that exhibit lush epibiota.

Return to Habitat Class

Habitat Classes continued

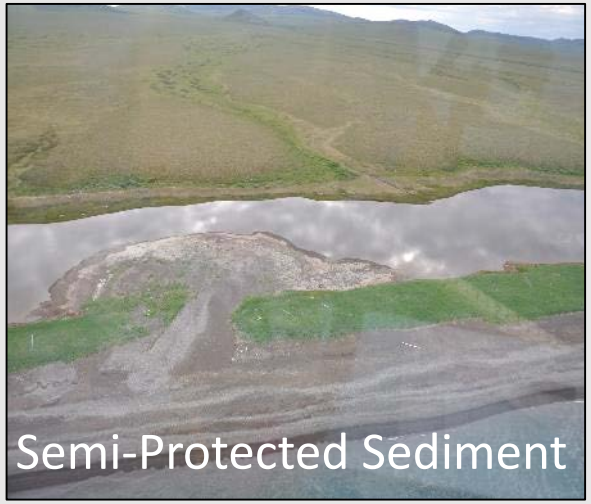
Partially Mobile Habitat Class Examples

These categories can describe units with a combination of **Immobile** and **Mobile** substrates or a unit that is composed entirely of partially mobile sediment.

Return to Habitat Class

Habitat Classes continued

Mobile Habitat Class Examples

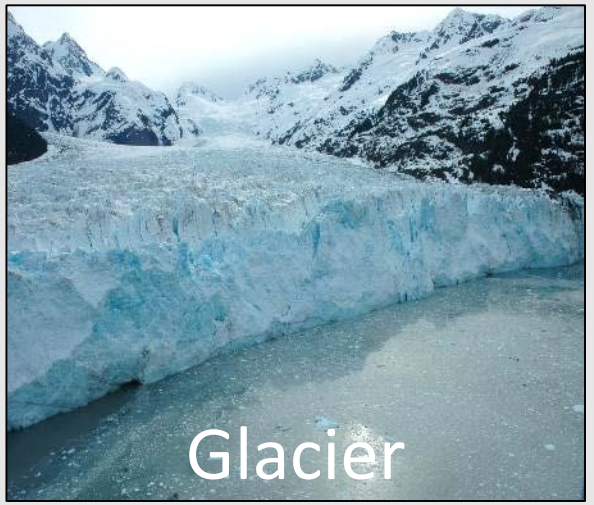


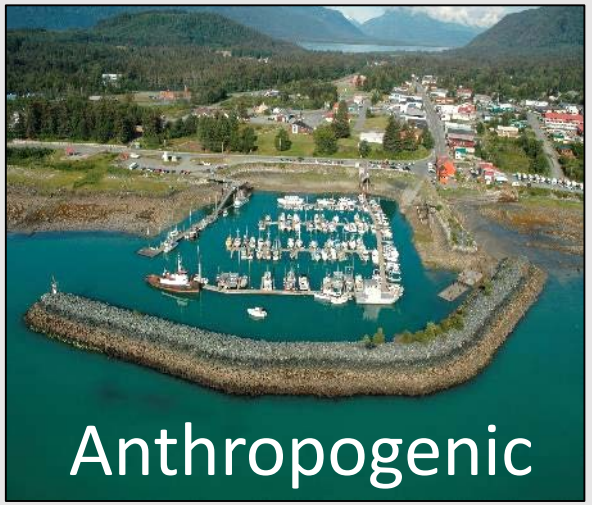
These categories are intended to indicate sediment beaches where no epibenthic macro-biota are observed. Very fine sediment may be **mobile** even at the lowest wave exposures, while at the highest wave exposures large-sized boulders could be mobile and bare.

Return to Habitat Class

Habitat Classes continued

Non-Wave Structured Habitat Class Examples





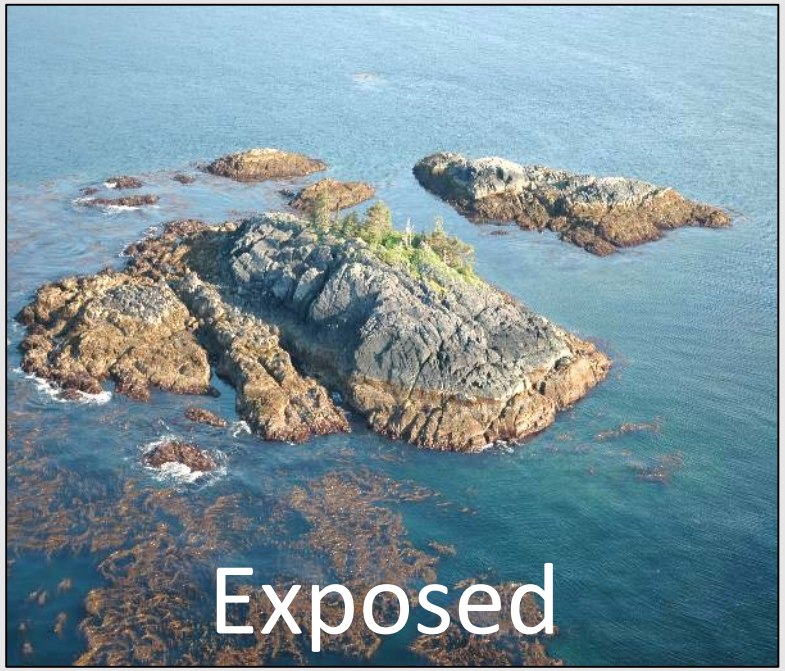
These processes may encompass a variety of substrate types and wave exposures and therefore a wide number of Habitat Class categories. In general, these units follow the dominant process defined by the Coastal Class attribute.

Return to Habitat Class

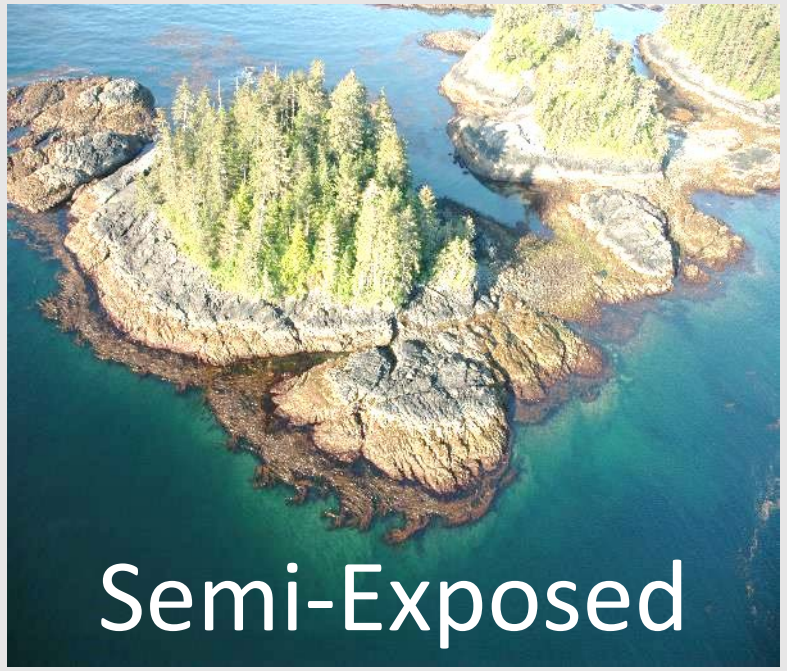
Biological Wave Exposure

The **Biological Wave Exposure** attribute is based on observations of the presence and abundance of biota in each alongshore Unit. Exposure categories are defined with a typical set of Biobands, using the known wave energy tolerances for the *indicator species*, as compiled from scientific literature and expert knowledge. The categories are the same as physical Wave Exposure.

Very Exposed: This category is used only for areas of extreme high wave energy, where the shoreline is predominantly a vertical rock cliff and there is no moderation of open ocean swells in nearshore. The Splash Zone is extremely wide (>20m) and/or high.



Exposed: The Splash Zone is usually wide to very wide (>5-20m). The upper intertidal is usually bare-looking, with only a thick Barnacle Bioband visible. The lower intertidal tends to have a lush Dark Brown Kelp Bioband mixed with Red Algae. Nearshore canopy kelp, if present, is Bull Kelp.



Semi-Exposed: The Splash Zone will usually be medium to wide in width (5-10m). This is the exposure category with the highest species diversity. It is indicated by the presence of Dark Brown Kelps , lush Red Algae (especially Coralline Red Algae), Alaria and in some locations, the Surfgrass Bioband.

Return to Habitat Class

Return to Unit level attributes

Other Biological Wave Exposure examples

Biological Wave Exposure

The **Biological Wave Exposure** attribute is based on observations of the presence and abundance of biota in each alongshore Unit. Exposure categories are defined with a typical set of Biobands, using the known wave energy tolerances for the *indicator species*, as compiled from scientific literature and expert knowledge. The categories are the same as physical Wave Exposure.

Semi-Protected: The Splash Zone is medium to narrow in width (1-5m). It is indicated by Barnacle, Rockweed and Green Algae Biobands which may be quite lush. In higher SP, Red Algae and Alaria Biobands are often observed. Eelgrass occurs in the lower Semi-Protected areas and Surfgrass can be found in the higher Semi-Protected areas.

Protected: Attached biota can be patchy due to lack of circulation, although in areas with good circulation the biobands can be quite lush. It is indicated by patchy Barnacle, Rockweed and Green Algae Biobands in the intertidal and Eelgrass or sparse Soft Brown Kelps in the subtidal. If the Splash Zone is present it is narrow (<1m). Canopy Kelps not usually present. Canopy kelps in otherwise Protected areas can indicate a current dominated Habitat Class.

Very Protected: Use of this category is limited to areas of very low wave exposure and limited diversity of biota, as are seen at the extremely sheltered heads of inlets or in ponded lagoons with a limited intertidal range. Often only the wetland Biobands will be present, and the intertidal is bare of attached biota.

Return to Habitat Class

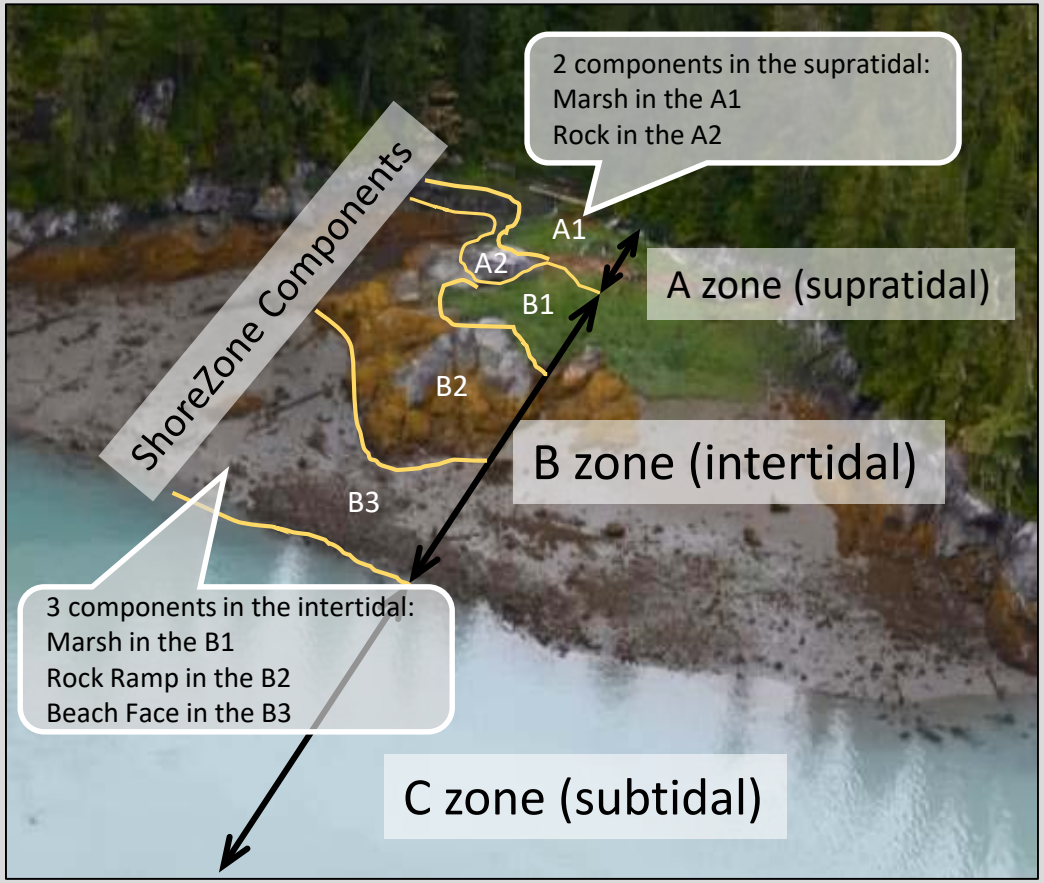
Return to Unit level attributes

Other Biological Wave Exposure examples

Across-Shore Attributes

Each zone in a ShoreZone unit can be divided into Across-shore physical components based on changes in morphology, sediment texture, width, slope, dominant coastal process, and estimated oil residence index. These components are describing changes from the highest tidal elevation to the lowest. Within each component, the main attributes are:

- **Forms**: A set of codes describing the geomorphic features,
- **Materials**: A set of codes describing the substrate that comprises each Form,
- **(ORI)**: Each across-shore component is coded for potential oil residence time on the basis of dominant substrate type and unit wave exposure. Categories are the same as the Unit-level ORI,
- **Biobands**: An observed assemblage of coastal biota with characteristic tidal heights, colours and textures.

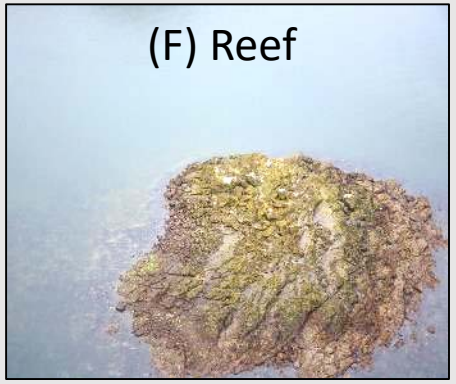


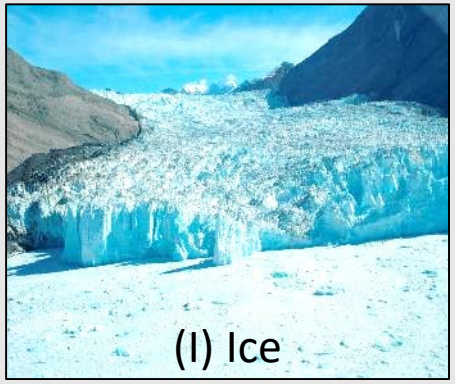
Return to ShoreZone Basics

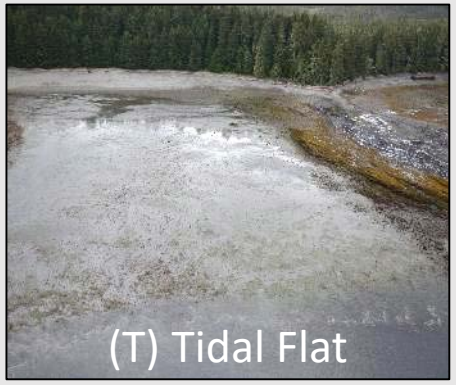
Return to Unit Basics

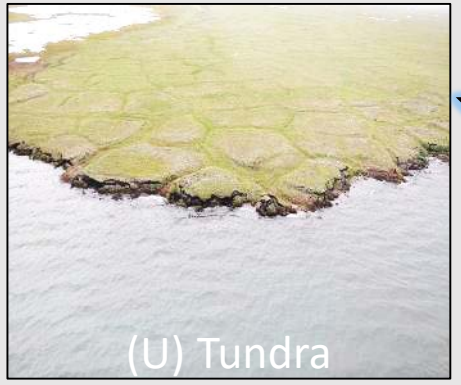
Forms

Principal geomorphic features within each across-shore component, described by a specific set of codes for the main form, followed by a number of modifier codes that provide additional detail to the form attribute.









Return to Across-Shore attributes

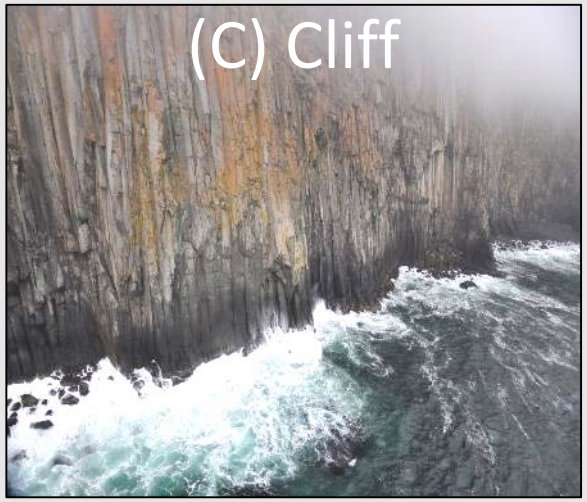
More detail on each Form code

Forms

Principal geomorphic features within each across-shore component, described by a specific set of codes for the main form, followed by a number of modifier codes, listed in decreasing order of proportion that provide additional detail to the form attribute.

Man-made features such as seawalls, pilings, floats, boat-ramps, wharves, jetties, breakwaters, port facilities, beach access.

Beach landforms are accumulations of sediment that may come from erosion of the land behind the intertidal zone, or from wave, tide, wind, or other process transport onto the shoreline.



Cliffs are steeply sloping (typically >45°) landforms most commonly of bedrock, but may also be unconsolidated (loose) sediment, or soil, or other organic material.

Deltas are formed by sediment transport by rivers or tidal currents and may be fan or arc-shaped. There are typically one or more channels cut into the delta by flowing water and may or may not have obvious bars of sediment.

Return to Across-Shore attributes

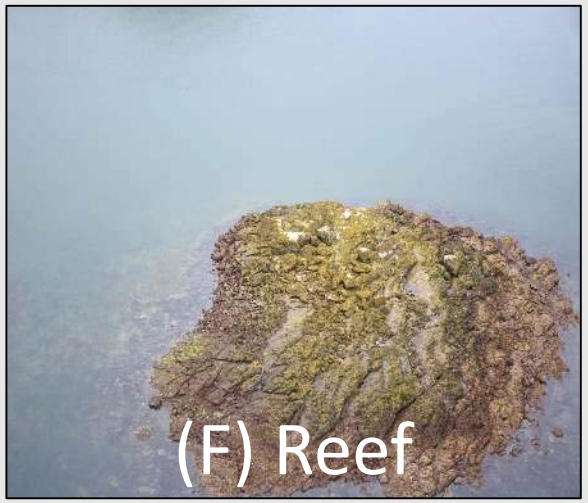
More Forms

Forms

Principal geomorphic features within each across-shore component, described by a specific set of codes for the main form, followed by a number of modifier codes that provide additional detail to the form attribute.

(E) Dune

Dunes are formed by wind-driven sand, above the high-tide line. In exposed locations, dune ridges may be evident for a considerable distance from the shoreline.
The form code (E) is derived from *eolian*, meaning wind.



(F) Reef

Reefs are low-lying/ low profile rocky outcrops, with very little or no area of supratidal substrate. They typically have no terrestrial/salt-tolerant vegetation.

(I) Ice

Steep, often dynamic, ice features are located where glaciers meet the tide-water.

(L) Lagoon

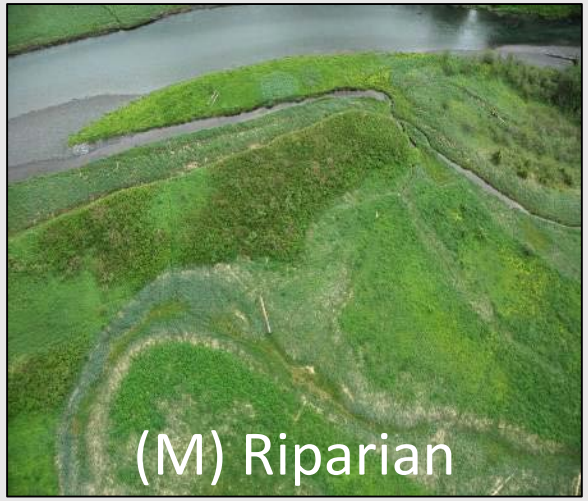
Lagoons represent a special coastal feature that has some salt-water influence but may be largely disconnected from other marine processes such as tides and high wave exposure. Lagoons are distinguished from estuaries, which must have fluvial or deltaic landforms.

Return to Across-Shore attributes

More Forms

Forms

Principal geomorphic features within each across-shore component, described by a specific set of codes for the main form, followed by a number of modifier codes that provide additional detail to the form attribute.



Riparian or wetland forms are vegetated features that are found at watershed boundaries: between terrestrial and aquatic, or, terrestrial and coastal marine geomorphologies.

The Offshore Islet form is used for smaller scale features that typically fit within the imagery field of view, and have a single intertidal morphology such as a steep rock cliff. They may be close to a main shoreline as described as secondary forms, or groups of features described as the primary unit form.

Ramps and Platforms are bedrock features: platforms are flat or slightly tilted forms (<2°), and ramps are inclined or more sloping (>2° and <20°) forms.

Cultural forms are anthropogenic (man-made) features, typically made by hand (not using modern machines) for specific cultural purposes by indigenous/First Nations peoples.

Return to Across-Shore attributes

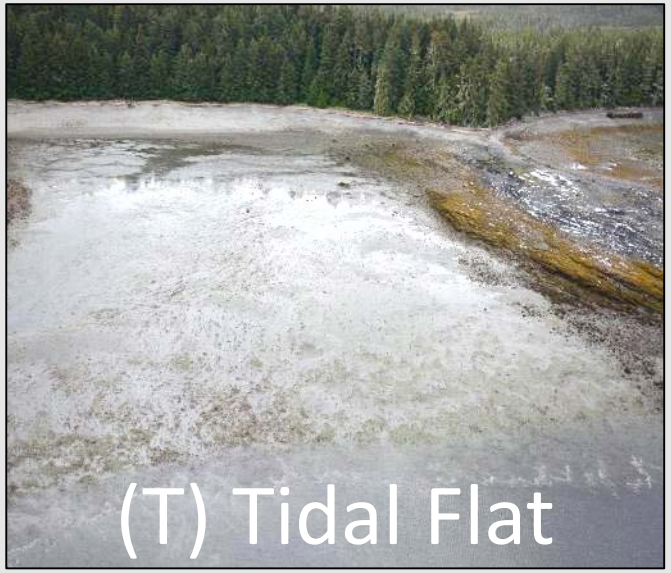
More Forms

Forms

Principal geomorphic features within each across-shore component, described by a specific set of codes for the main form, followed by a number of modifier codes that provide additional detail to the form attribute.

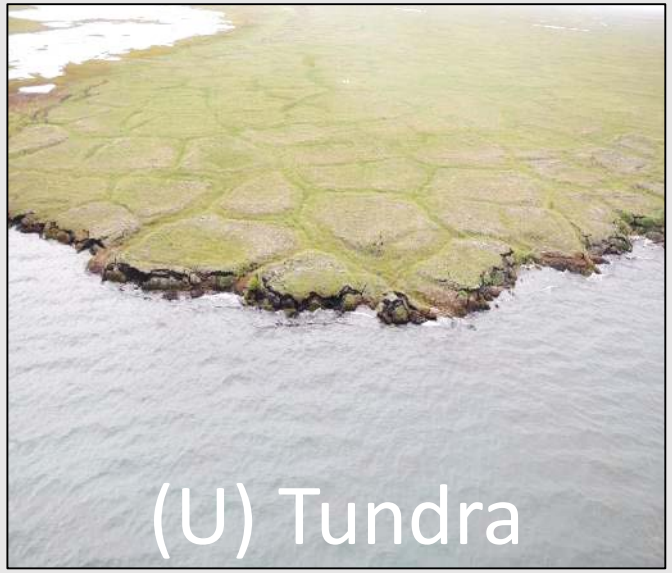
(R) River Channel

River channels are formed by the complex interaction of flowing water and sediment. Sediment transportation results in erosion in some places and deposition in other places.



(T) Tidal Flat

Tidal flats are level surfaces of typically fine sand and/or mud, exposed to air only at the lowest end of the tidal range. These forms are often associated with estuaries, but also occur where there are abundant accumulations of sediment. In areas of higher wave exposure, the finer sediments may be removed, leaving coarser sediment on the tidal flat.



(U) Tundra

Tundra forms occur in areas where there is permafrost, or other areas where harsh climatic conditions do not allow trees to grow. Tundra often has visible surface patterns of ice-wedge polygons, formed by seasonal freeze-thaw cycles.

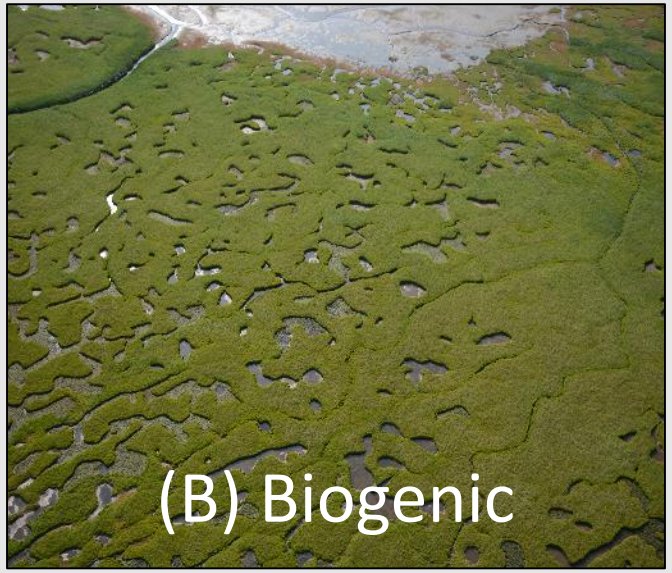
Return to Across-Shore attributes

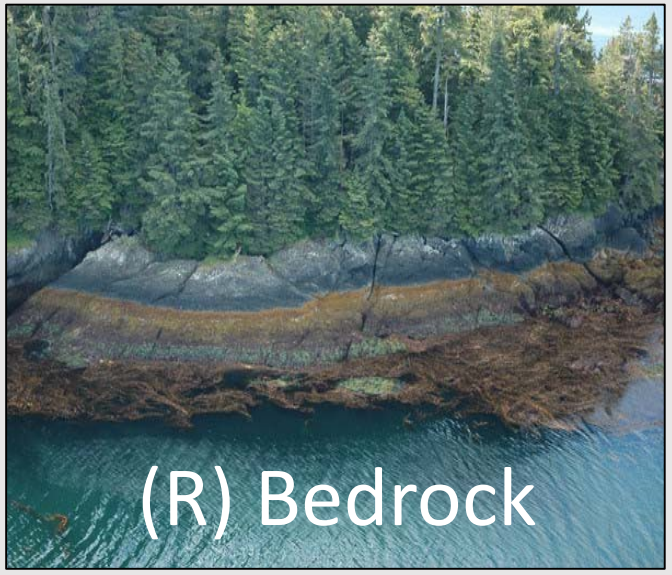
Return to Main Forms Page

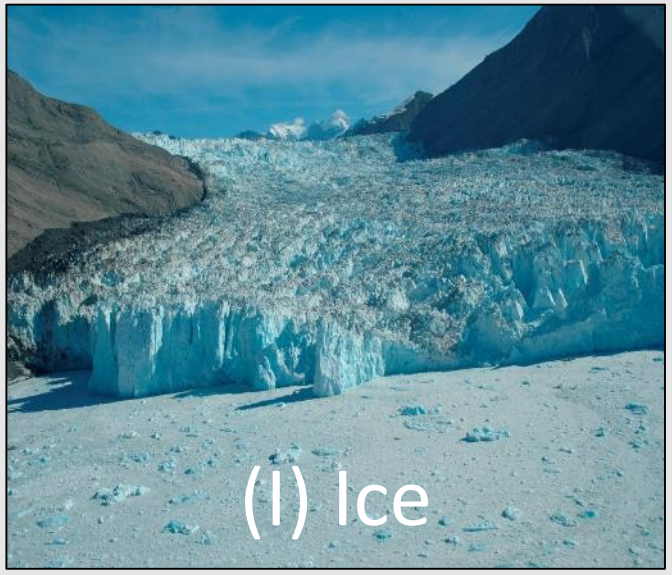
Materials

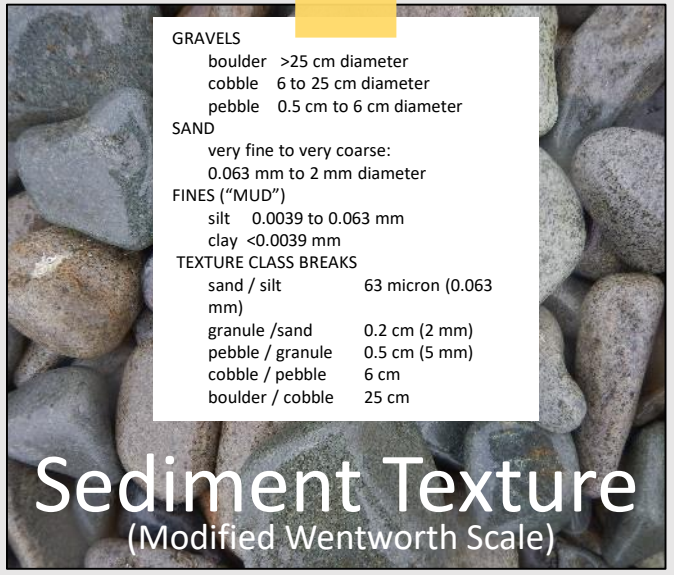
Materials for each Form within each across-shore component, described by a specific set of codes for the main category, followed by a number of modifier codes, in decreasing order of proportion, that provide additional detail to the form and materials combination.

Return to Across-Shore attributes









Biobands

A ***Bioband*** is an observed assemblage of coastal biota which are spatially distinct, with alongshore and across-shore patterns of color and texture that are visible in aerial imagery.

The Bioband names and definitions were updated in the 2017 revision of the ShoreZone Protocol to organize them in a hierarchy and to include some new biobands that were needed as ShoreZone moved into different regions and biomes. All changes were backward-compatible with the ShoreZone mapping completed up to that date.

The full ShoreZone Bioband table has definitions for each band and links to photo examples for each.

Return to Across-shore level attributes

continued

Biobands

Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***supratidal*** Biobands. This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	Secondary Level	Tertiary Level							
Terrestrial Vegetation				**TEVE**	A	N/A	N/A	Non-specific vegetation existing in the supratidal zone that does not fit into any other more specific supratidal bioband or cannot be clearly identified from the imagery.	All
	Tundra		TUN	**TUND**	A	Green to Grey-green	*Salix* spp. *Vaccinium* spp. *Dupontia fisheri*	Low turf of dwarf shrubs, herbs, grasses, sedges with lichens and mosses, in uppermost supratidal and splash zone. May be inundated in storm surge.	All
	Trees & Shrubs			**TRSH**	A	Greens and browns	N/A	Non-specific trees and shrubs in the supratidal zone that do not fit into any other more specific tree/shrub bioband or cannot be clearly identified from the imagery.	All
		Deciduous Trees		**DETR**	A	Greens and browns, white-grey	*Alnus* spp. *Betula* spp.	This bioband consists mostly of stands of alder and birch trees mixed with understory shrubs in the supratidal zone. Mostly confined to river banks.	All
		Coniferous Trees		**COTR**	A	Greens and browns	*Picea* spp. *Pinus* spp.	This bioband consists mostly of stands of pine and spruce trees mixed with understory shrubs in the supratidal zone. Mostly confined to river banks.	All
		Shrub Meadow	MSH	**SHME**	A	Pale green	*Deschampsia caespitosa* *Picea sitchensis*	A narrow strip at the uppermost marsh edge, next to the tree line; usually a transition to spruce forest, including small spruce, shrubs and mixed grasses, sedges and herbs. Created for Oregon SZ.	VP to P
	Grasses			**GRAS**	A	Green to blue-green to beige	N/A	Non-specific grass in the supratidal zone that does not fit into any more specific grass bioband or cannot be clearly identified from the imagery.	All
		High Grass Meadow	MAG	**HIGM**	A	Pale grassy green or beige	*Deschampsia caespitosa* *Trifolium wormskjoldii*	Mixed grassy meadow, on uppermost salt marsh, interfingers with Salt Marsh (TRI) or Sedge (SED) at lower elevation transition. Specific to Oregon SZ	VP to P
		European Beach Grass	AMM	**EUBG**	A	Beige-green	*Ammophila* spp.	Outer coastal sand dunes, forming clumps and stabilizing active dunes. Non-native species which is displacing native dune grass species. Specific to Oregon.SZ.	SE to E
		Dune Grass	GRA	**DUGR**	A	Pale blue-green	*Leymus mollis*	Found in the upper intertidal zone, tall grasses observed as clumps continuous on dunes, in logline or on beach berms. This band may be the only band present on high-energy beaches.	VP to E

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Biobands

Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***supratidal*** Biobands *(continued).* This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	Secondary Level	Tertiary Level							
Splash Zone			VER†	**SPZO**	A	Black, white or bare rock	N/A	Non-specific band marking the upper limit of the intertidal zone that does not fit into any more specific splash zone bioband. All bands in the splash zone are recorded by width: Narrow (<1m), Medium (1m-5m) or Wide (>5m)	All
	Lichen			**LICH**	A	Black, white to yellow/ green white	N/A	Non-specific lichen band in the supratidal zone that does not fit into any more specific splash zone bioband.	All
		Black Lichen		**BLLI**	A	Black to grey-black	*Verrucaria* sp. Encrusting black lichens	Visible as a dark stripe on bare rock marking the upper limit of the intertidal zone.	All
		White Lichen		**WHLI**	A	Creamy white to pinkish-grey	*Coccotrema maritimum* Encrusting white lichens	Visible as a bright white stripe on bare rock marking the upper limit of the intertidal zone. When present, this band usually occurs above the Black Lichen band.	All
		Yellow Lichen		**YELI**	A	Bright to dark yellow or orange	*Caloplaca* spp. *Xanthoria* spp.	Visible as bright yellow to dark orange blotches, sometimes forming a stripe, on bare rock. Usually co-occurs with the Black Lichen bioband.	SE to VE

†The previous Splash Zone Bioband (VER) has been split into several current Bioband codes (LICH, BLLI, WHLI, YELI) so these bands would need to be rolled together for comparison for the VER Bioband.

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Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***invertebrate*** Biobands. This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	Secondary Level	Tertiary Level							
Invertebrate				**INVE**	B & C	N/A	N/A	Non-specific band of invertebrates that does not fit into any more specific invertebrate bioband or cannot be clearly identified from the imagery.	All
	Crustaceans			**CRUS**	B	N/A	N/A	Non-specific band of crustaceans that does not fit into any more specific bioband or cannot be clearly identified from the imagery.	All
		Barnacle	BAR‡	**BARN**	B	Grey-white to pale yellow	*Balanus glandula* *Semibalanus cariosus*	Visible on bedrock or large boulders. Can form an extensive band in higher exposures where algae have been grazed away.	P to VE
		Mud Flat Shrimp	CAL	**MUFS**	B	Mottling on sand flats, burrows	*Neotrypaea californiensis* *Upogebia pugettensis*	On sand/mud flats in larger estuaries, where textured surface indicates presence of infauna. Specific to Oregon and Washington State SZ.	VP to P
	Molluscs			**MOLL**	B	N/A	N/A	Non-specific band of molluscs that does not fit into any more specific bioband or cannot be clearly identified from the imagery.	All
		Blue Mussels	BMU	**BLMU**	B	Black or blue-black	*Mytilus trossulus*	Visible on bedrock and on boulder, cobble or gravel beaches. Appears in dense clusters that form distinct black patches or bands, either above or below the barnacle band.	P to VE
		California Mussels	MUS	**CAMU**	B	Grey-blue	*Mytilus californianus*	Dominated by a complex of California mussels (*Mytilus californianus*) and thatched barnacles (*Semibalanus cariosus*) with gooseneck barnacles (*Pollicipes polymerus*) seen at higher exposures.	SE to VE
		Oyster	OYS	**OYST**	B	Dark beige to brown	*Crassostrea gigas*	Generally inconspicuous and of limited extent in BC. Includes areas of oyster aquaculture on mudflats in Oregon and Washington State, in particular in Coos Bay and Yaquina Bay. Specific to Oregon, BC and Washington State SZ.	VP to P

‡ The previous Barnacle (BAR) bioband has been split into BARN and WILA (described in Table 27) so these would have to be rolled together to be equal to the previous BAR band.

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Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***invertebrate*** Biobands *(continued).* This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	**Secondary Level**	**Tertiary Level**							
Invertebrate	Sponges			**SPON**	B & C	Commonly yellow, purple or red	N/A	Encrusting sponges usually occur as brightly colored patches at the waterline or in the shallow subtidal. Associated with high wave energy or current-dominated habitats.	SP to E
	Cnidarians			**CNID**	B & C	N/A	N/A	Non-specific band of cnidarians that does not fit into any more specific bioband or cannot be clearly identified from the imagery.	All
		Anemones		**ANEM**	B & C	Usually white to yellow and red	N/A	Anemones usually appear as small circular dots of colour in the low intertidal and shallow subtidal. It is usually associated with high wave energy or current-dominated habitats. Could include *Metridium* spp. and *Urticina* spp.	SP to E
	Echinoderms			**ECHI**	B & C	N/A	N/A	Non-specific band of echinoderms that does not fit into any more specific bioband or cannot be clearly identified from the imagery.	All
		Urchin Barrens	URC	**URBA**	C	Coralline pink/white	*Strongylocentrotus franciscanus*	Shows rocky substrate clear of macroalgae. Often has a pink-white color of encrusting coralline red algae. May or may not see urchins.	SP to E
		Sand Dollars	DEN	**SAND**	Lower B & Upper C	Black spots within beige sand matrix	*Dendraster excentricus*	Beds of sand dollars, usually on sand beaches. Specific to Washington State SZ.	P to SE

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Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***intertidal/subtidal vegetation*** Biobands. This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	Secondary Level	Tertiary Level							
Intertidal/ Subtidal Vegetation				**INSV**	B & C	N/A	N/A	Non-specific intertidal or subtidal vegetation that does not fit into a more specific bioband or cannot be clearly identified from the imagery.	All
	Wetland Vegetation			**WEVE**	A & upper B	Greens and browns	N/A	Non-specific wetland vegetation in the supratidal zone that does not fit into any more specific wetland bioband or cannot be clearly identified from the imagery.	VP to E
		Sedges	SED	**SEDG**	A & upper B	Bright green to yellow-green	*Carex lyngbyei*	In wetlands around lagoons and estuaries. Usually associated with freshwater. This band can exist as a wide flat pure stand or be intermingled with dune grass. Often the SAMA band forms a fringe below.	VP to SE
		Spartina	SPA	**SPAR**	Upper & mid B	Bright green	*Spartina* spp.	*Spartina*-invaded and *Spartina*-dominated salt marshes and mudflats. Specific to Washington State.	P to SP
		Salt Marsh	PUC	**SAMA**	A & upper B	Light, bright or dark green with red-brown	*Puccinellia* spp. *Plantago maritima* *Glaux maritime* *Deschampsia* spp.	Appears around estuaries, marshes, and lagoons and is usually associated with freshwater. In some areas, it can be sparse plants on coarse sediment or a wetter, peaty meadow with associated herbs and sedges.	VP to SE
		Salt Marsh (Oregon & Washington State)	TRI	**SAMO**	A & upper B	Light, bright or dark green with red-brown	*Triglochin maritima* *Distichlis spicata* *Deschampsia caespitosa.* *Scirpus americanus* *Salicornia virginica*	Appears around estuaries, marshes, and lagoons, associated with fresh water. Separated as 'high marsh' and 'low marsh' according to elevation/salt water inundation in Oregon, but describes only a 'high marsh' in Washington State. Can be sparse vegetation on coarse sediment or a wetter, peaty meadow with an assemblage of herbs, grasses and sedges. Specific to Oregon and Washington State SZ.	VP to SE
		Salt Marsh (BC & Washington State)	SAL	**SAMB**	A & upper B	Light, bright, or dusty green	*Salicornia virginica*	Salt-tolerant herbs and grasses associated with freshwater. This band is often associated with estuaries, marshes, and lagoons although it is not uncommon as a fringing meadow in the supratidal. Used to describe a 'low marsh' in Washington State and generally lacking associated grass species in that classification. Specific to BC and Washington State.	SE to VP

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Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***intertidal/subtidal*** Biobands *(continued).* This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	Secondary Level	Tertiary Level							
Intertidal/ Subtidal Vegetation	Biofilm		BFM	**BIOF**	B	Rusty orange-beige or dark green-black	Bacterial or diatom mat, blue-green algal mat	Low turf or stain on sediment. Includes moss-like turf of blue-green algal mat. Usually seen in pools of washover bars and river deltas.	P to SE
		Diatom	DIA	**DIAT**	B	Beige or bleached white	Diatoms	This band describes bare-looking lower intertidal areas in the coastal fjords of BC where a low turf of encrusting filamentous diatoms may be present. Specific to BC SZ.	P to SP
	Green Algae		ULV	**GRAL**	B	Various shades of green	*Ulva* sp. *Monostroma* sp. *Cladophora* sp. *Acrosiphonia* sp.	Found on a variety of substrates. The band consists of filamentous and/or foliose green algae. Filamentous species often form a low turf of dark green.	VP to E
	Red Algae		RED†	**REAL**	B	Various shades of red, pink, gold	N/A	Non-specific band of red algae that does not fit into a more specific red algae bioband or cannot be clearly identified from the imagery.	P to VE
		Coralline Red Algae		**CORA**	B	Pink to whitish-pink	*Corallina* sp. *Lithothamnion* sp.	A combination of foliose and encrusting coralline algae occurring in the low intertidal. Lush coralline red algae indicate highest wave exposures.	SE to VE
		Filamentous and Foliose Red Algae		**FFRA**	B	Dark to bright red and red-brown	*Odonthalia* sp. *Neorhodomela* sp. *Palmaria* sp. *Neoptilota sp.* *Mazzaella* sp.	Diversity of foliose red algae indicates medium to high exposures, with filamentous species, often mixed with green algae, occurring at medium and lower exposures.	P to E
		Winter Laver	BAR‡	**WILA**	Upper B	Pale green to greenish-gold	*Porphyra pseudolanceolata* *Porphyra hiberna*	These species of *Porphyra* grow in the high intertidal of more exposed coasts in the winter season (sometimes seen in spring or summer in colder climes). *P. hiberna* replaces *P. psuedolanceolata* south of Sitka Sound. It is associated with the Barnacle bioband.	SE to E
		Bleached Red Algae	HAL	**BRAL**	B	Olive, golden or yellow-brown	Bleached foliose/ filamentous red algae	Common on bedrock platforms, and cobble or gravel beaches. Distinguished from the FFRA band by color, although may be similar species. The bleached color usually indicates lower wave exposure.	P to SP
		Graceful Red Weed	GCA	**GRRW**	B	Dark reddish brown	*Gracilaria* spp.	Usually present as patches in the mid-intertidal on sandy and muddy tidal flats. Specific to Washington State SZ.	P to SP

†The previous Red Algae (RED) bioband has been split into CORA and FFRA. These need to be combined to be equal to the old RED band (NOT including WILA, GRRW or BRAL).

‡ WILA used to be an associate species for the old Barnacle (BAR) band and was not mapped as a separate band as the surveys were often completed in the summer months when WILA is not present.

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Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***intertidal/subtidal*** Biobands *(continued).* This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	Secondary Level	Tertiary Level							
Intertidal/ Subtidal Vegetation	Rooted Vegetation			**ROVE**	B & C	Green to green-grey	N/A	Non-specific rooted vegetation in the lower intertidal and/or shallow subtidal that do not fit in any more specific intertidal/subtidal bioband or cannot be clearly identified from the imagery.	VP to SE
		Surfgrass	SUR	**SURF**	B & C	Bright to dark green	*Phyllospadix* sp.	Appears in tide pools on rock platforms, often forming extensive beds. This species has a clearly defined upper exposure limit of Semi-Exposed and its presence in units of Exposed wave energy indicates a wide across-shore profile, where wave energy is dissipated by wave run-up across the broad intertidal zone.	SP to SE
		Eelgrass	ZOS	**EELG**	B & C	Bright to dark green	*Zostera marina*	Commonly visible in estuaries, lagoons or channels, generally in areas with fine sediments. Eelgrass can occur in sparse patches or thick dense meadows.	VP to SP
	Brown Bladed Algae			**BRBA**	B & C	Various shades of brown	N/A	Non-specific bladed brown algae in the lower intertidal and/or shallow subtidal that do not fit in any more specific kelp bioband or cannot be clearly identified from the imagery.	All
		Alaria	ALA	**ALAR**	B & C	Dark brown to red-brown	*Alaria marginata*	Common on bedrock cliffs and platforms, and on boulder/cobble beaches. This band has a distinct ribbon-like texture, and may appear iridescent..	SP to E
		Soft Brown Kelps	SBR	**SOBK**	B & C	Brown to yellow-brown to olive	*Saccharina latissima* *Cystoseira sp.* *Sargassum muticum*	This band is defined by non-floating large browns and can form lush bands in semi-protected areas. The kelp fronds have a ruffled appearance and can be encrusted with diatoms and bryozoans giving the blades a 'dusty' appearance.	VP to SE
		Dark Brown Kelps	CHB	**DABK**	B & C	Dark brown	*Laminaria setchelli* *Lessoniopsis littoralis* *Laminaria longipes* *Laminaria yeozensis*	Found at higher wave exposures, these stalked kelps grow in the lower intertidal. Blades are leathery, shiny, and smooth. A mixture of species occurs at the moderate wave exposures, while single-species stands of *Lessoniopsis* occur at high exposures.	SE to VE

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Bioband Table (ShoreZone Protocol 2017)

Definitions for the ***intertidal/subtidal*** Biobands *(continued).* This combines Biobands used in Oregon State, Washington State, British Columbia and Alaska. Not all Biobands are applicable to all areas so it is noted in the Bioband description if it is specific to a certain region.

Bioband Name			Prior Code	Current Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure
Primary Level	Secondary Level	Tertiary Level							
Intertidal/ Subtidal Vegetation	Brown Non-Bladed Algae			**BRNA**	B & C	Various shades of brown	N/A	Non-specific non-bladed brown algae that does not fit into a more specific algal bioband or cannot be clearly identified from the imagery.	All
		Rockweed	FUC	**ROCK**	B	Golden-brown to brown	*Fucus distichus*	Appears on bedrock cliffs and boulder, cobble or gravel beaches. Commonly occurs at the same elevation as the barnacle band.	VP to E
		Sargassum	SAR	**SARG**	Lower B & C	Golden-brown to brown	*Sargassum muticum*	This bioband describes continuous stands of Sargassum in the lower intertidal and nearshore subtidal. It is often 'fuzzy' looking and golden-brown in colour. Specific to Washington State SZ.	P to SP
	Brown Canopy-Forming Algae			**BRCA**	C	Dark brown	N/A	Non-specific canopy kelp that does not fit into any more specific canopy kelp bioband or cannot be clearly identified from the imagery.	P to VE
		Dragon Kelp	ALF	**DRKE**	C	Dark brown to golden-brown	*Eularia fistulosa*	Canopy-forming kelp, with winged blades on gas-filled center midrib. Usually associated with silty, cold waters near glacial outflow rivers. Range: southern Southeast AK to Aleutian Islands, AK.	SP to SE
		Giant Kelp	MAC	**GIKE**	C	Dark brown to golden-brown	*Macrocystis pyrifera*	Canopy-forming giant kelp, long stipes with multiple floats and fronds. If associated with NER, it occurs inshore of the bull kelp. Range: Baja California, Mexico to Kodiak Islands, AK.	P to SE
		Bull Kelp	NER	**BUKE**	C	Dark brown	*Nereocystis luetkeana*	Distinctive canopy-forming kelp with many long strap-like blades growing from a single floating bulb atop a long stipe. Can form an extensive canopy in nearshore habitats, usually further offshore than *Eularia fistulosa* and *Macrocystis pyrifera*. Often indicates higher current areas if observed at lower wave exposures. Range: Point Conception, CA to Unimak Island, AK.	SP to VE

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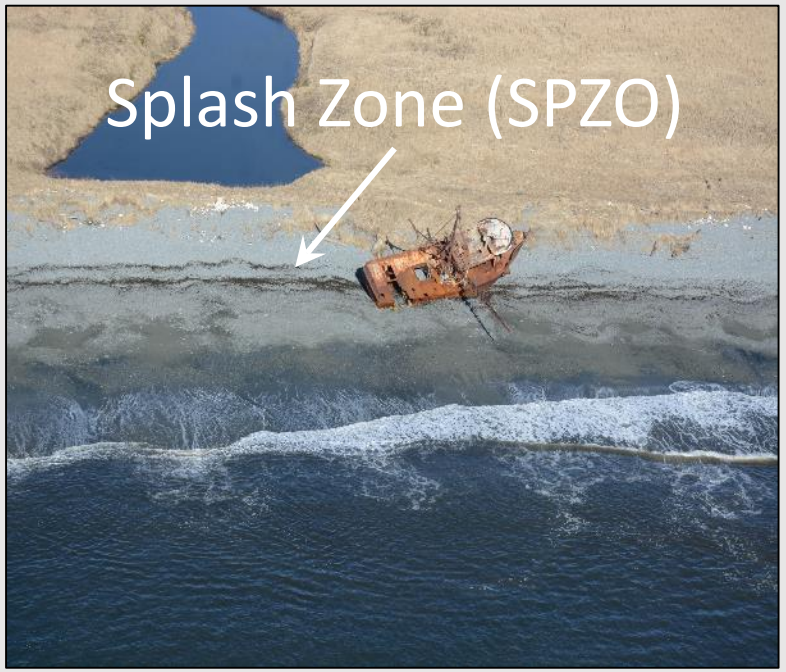
Splash Zone – Splash Zone (SPZO) Bioband



Splash Zone > Splash Zone (SPZO)

- Black, white or bare.
- Non-specific band marking the upper limit of the intertidal zone that does not fit into any more specific splash zone bioband. All bands in the splash zone are recorded by width: Narrow (<1m), Medium (1m-5m) or Wide (>5m). The SPZO bioband is often used to indicate an erosional A Zone or one that is too mobile for attached lichens or vegetation, such as a storm berm.
- historic code = VER (Note: The previous Splash Zone Bioband (VER) has been split into several current Bioband codes (LICH, BLLI, WHLI, YELI) so these bands would need to be rolled together for comparison for the VER Bioband.)

Indicator Species: None

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Biobands

Splash Zone – Lichen (LICH), White Lichen (WHLI) and Yellow Lichen (YELI) Biobands

Splash Zone > Lichen (LICH)

- Multiple colors
- A non-specific lichen band in the splash zone that does not fit into one of the more specific lichen biobands.

Indicator Species: N/A

Splash Zone > Lichen > White Lichen (WHLI)

- Creamy white to pinkish-grey.
- Visible as a bright white stripe on bare rock marking the upper limit of the intertidal zone. When present, this band usually occurs above the Black Lichen band.

Indicator Species: *Coccotrema maritimum*, Encrusting white lichens

Splash Zone > Lichen > Yellow Lichen (YELI)

- Bright to dark yellow or orange.
- Visible as bright yellow to dark orange blotches, sometimes forming a stripe, on bare rock. Usually co-occurs with the Black Lichen Bioband.

Indicator Species: *Caloplaca spp.*, *Xanthoria spp.*

The historic code for all lichens = VER (Note: The previous Splash Zone Bioband (VER) has been split into several current Bioband codes (LICH, BLLI, WHLI, YELI) so these bands would need to be rolled together for comparison for the VER Bioband.)

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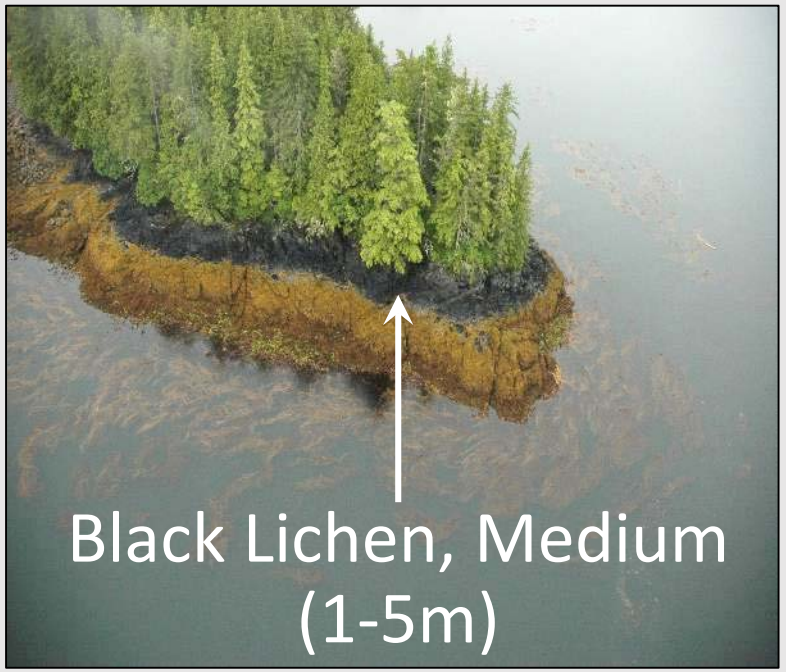
Biobands

Splash Zone – Black Lichen (BLLI) Bioband



Splash Zone > Lichen > Black Lichen (BLLI)

- Black to grey-black in color.
- Visible as a dark stripe on bare rock marking the upper limit of the intertidal zone.
- historic code = VER (Note: The previous Splash Zone Bioband (VER) has been split into several current Bioband codes (LICH, BLLI, WHLI, YELI) so these bands would need to be rolled together for comparison for the VER Bioband.)

Indicator Species: *Verrucaria* sp. Encrusting black lichens

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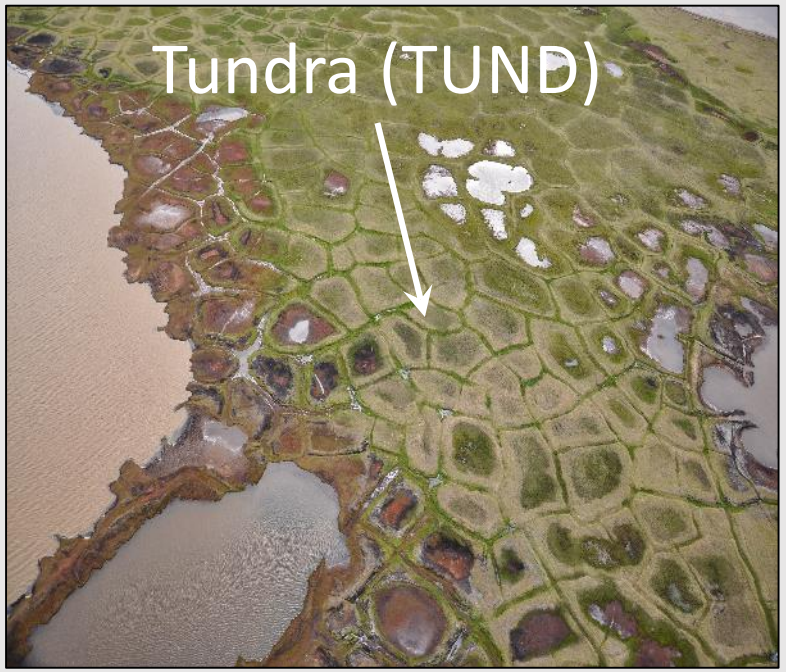
Biobands

Supratidal Biobands – Terrestrial Vegetation



Terrestrial Vegetation > Tundra

- Grey to grey-green in colour
- Low turf of dwarf shrubs, herbs, grasses, and sedges with lichens and mosses.
- This is a terrestrial vegetation band so will likely be present in uppermost supratidal. It may only be inundated during storm surge or at the highest tides.
- Previous code = TUN

Indicator Species: *Salix* spp., *Vaccinium* spp., *Dupontia fisheri*

Terrestrial Vegetation > Trees and Shrubs

- Green and brown colours
- Non-specific trees and shrubs in the supratidal that don't fit under a more specific bioband definition.
- Generally occurs in more fresh-water dominated systems such as large rivers.
- No equivalent previous code

Indicator Species: N/A

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Biobands

Supratidal Biobands – Terrestrial Vegetation

Terrestrial Vegetation > Shrub Meadow

- Pale green in color
- This bioband is a narrow strip right at the uppermost edge of the marsh, next to the tree line.
- This bioband is specific to Oregon.
- Previous code = MSH

Indicator Species: *Deschampsia caespitosa*, *Picea sitchensis*

Terrestrial Vegetation > Grasses

- Green to blue-green to beige
- Non-specific grass in the supratidal zone that does not fit under a more specific bioband.
- No equivalent previous code.

Indicator Species: N/A

Terrestrial Vegetation > Grasses > High Grass Meadow

- Pale grassy green or beige
- A mixed grassy meadow that intermixes with salt marsh and sedges in the uppermost elevation of the marsh.
- This bioband is specific to Oregon.
- Previous code = MAG

Indicator Species: *Deschampsia caespitosa*, *Trifolium wormskjoldii*

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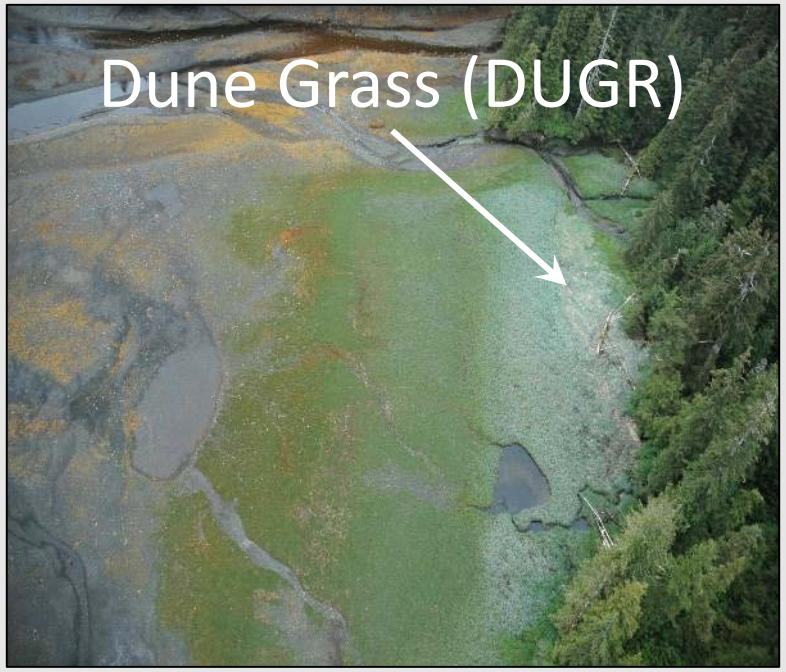
Biobands

Supratidal Biobands – Terrestrial Vegetation

Terrestrial Vegetation > Grasses > European Beach Grass

- Beige-green in colour
- Found on outer coast sand dunes in Oregon, forming clumps and stabilizing dunes. This is formed by a non-native species.
- This bioband is specific to Oregon.
- Previous code = AMM

Indicator Species: *Ammophila spp.*



Terrestrial Vegetation > Grasses > Dune Grass

- Pale blue-green grey in color, tall grass.
- Found in the supratidal zone, sometimes observed as clumps, continuous on dunes, in logline, or on beach berms. Can also be above the Salt Marsh bioband.
- This band may be the only band present on high-energy beaches.
- Previous code = GRA

Indicator Species: *Leymus mollis*

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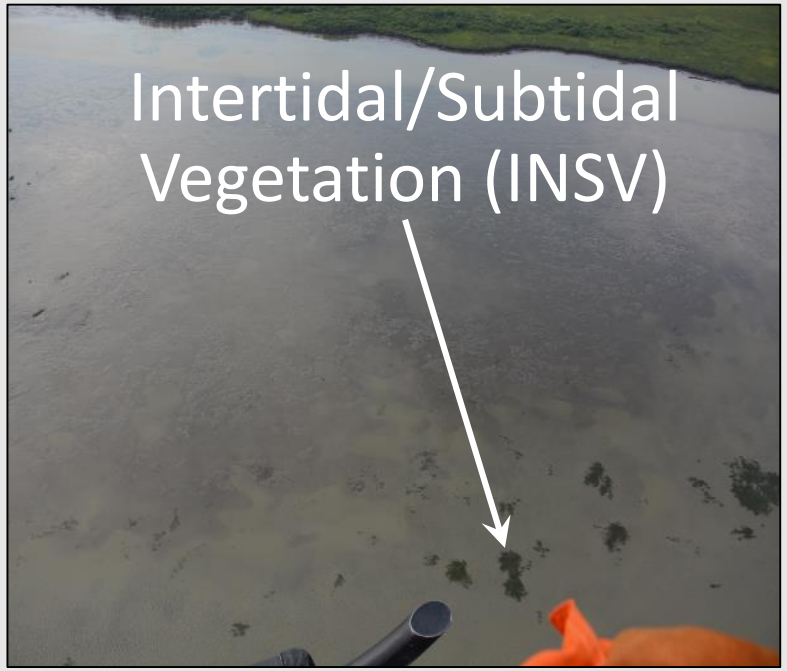
Biobands

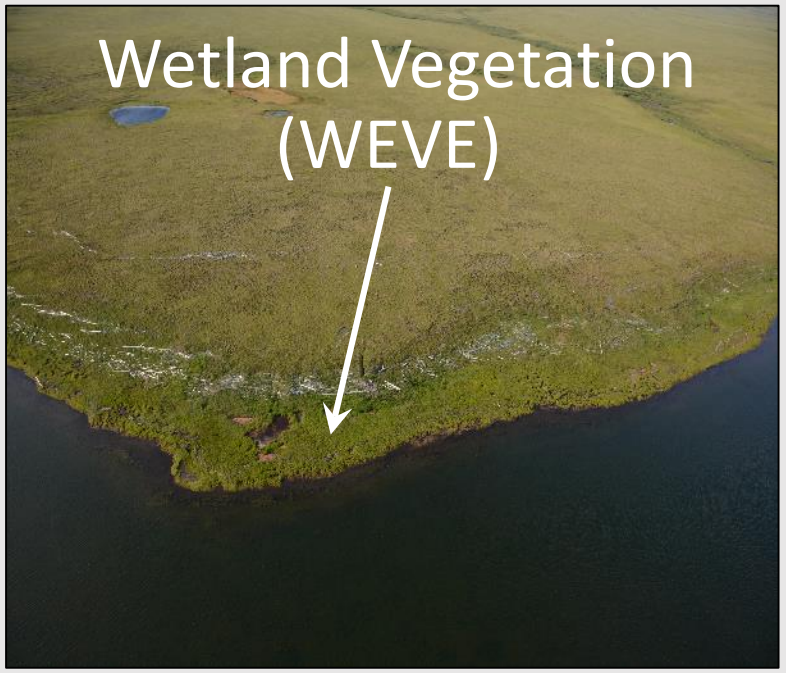
Intertidal/Subtidal Vegetation



Intertidal/Subtidal Vegetation

- No typical color
- Non-specific intertidal or subtidal vegetation that does not fit into a more specific bioband
- No equivalent previous code.

Indicator Species: N/A



Intertidal/Subtidal Vegetation > Wetland Vegetation

- Greens and browns
- A non-specific marsh habitat that doesn't fit under a more specific wetland bioband. Always associated with freshwater, often found in lagoons and rivers outside of salt water influence.
- No equivalent previous code.

Indicator Species: N/A

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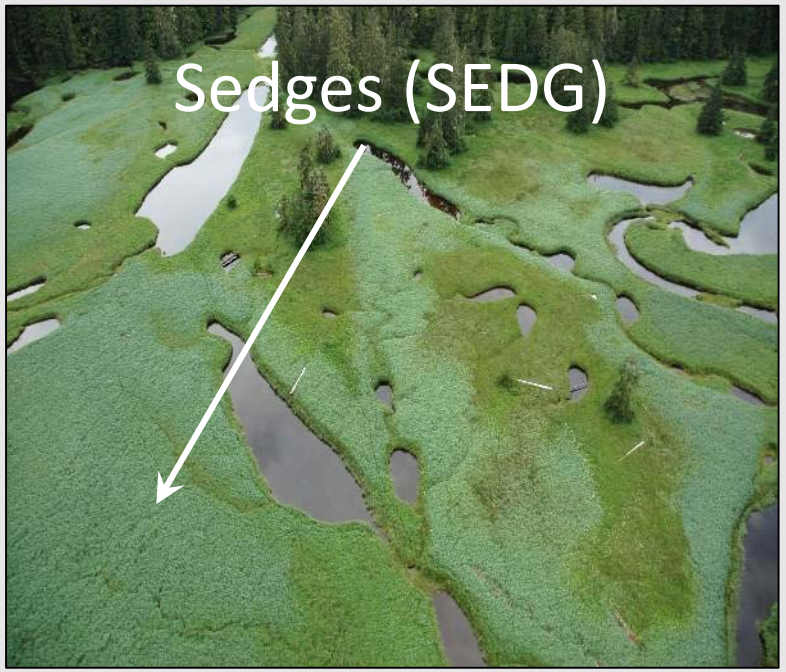
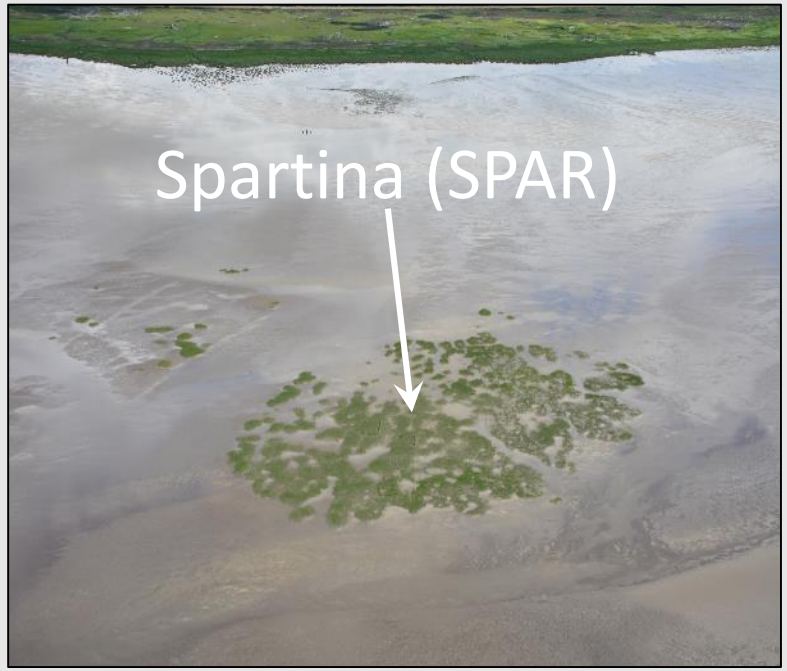
Biobands

Intertidal/Subtidal Vegetation





Intertidal/Subtidal Vegetation > Wetland Vegetation > Sedges

- Bright green to yellow-green.
- Found in wetlands around lagoons and estuaries. Usually associated with freshwater. This band can exist as a wide flat pure stand or be intermingled with dune grass. Often the Salt Marsh band forms a fringe below.
- Previous code = SED

Indicator Species: *Carex lyngbyei*

Intertidal/Subtidal Vegetation > Wetland Vegetation > Spartina

- Bright green
- The invasive cordgrass (Spartina spp.) can form thick stands in the mid to upper intertidal
- Only mapped in Washington State and a few places in the lower mainland of BC
- Previous code = SPA

Indicator Species: *Spartina spp.*

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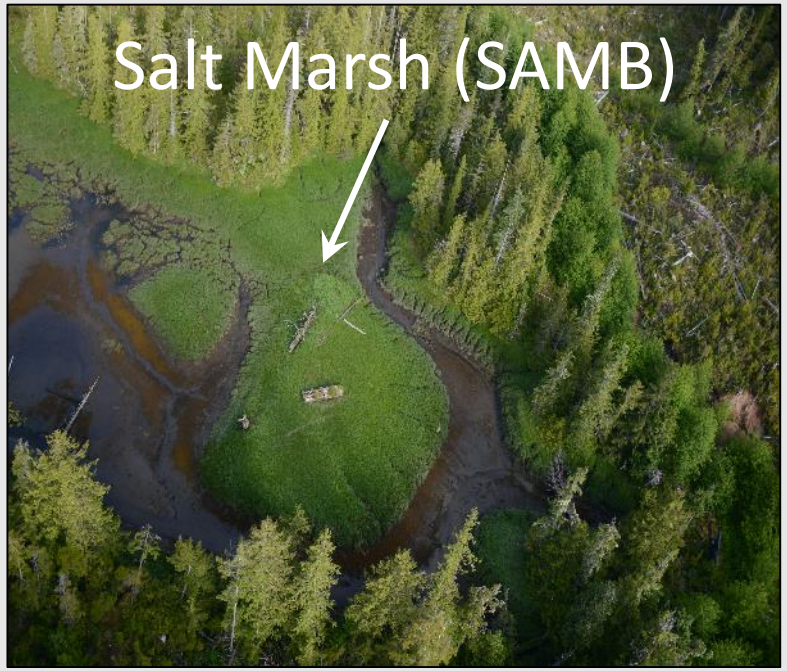
Biobands

Intertidal/Subtidal Vegetation



Intertidal/Subtidal Vegetation > Wetland Vegetation > Salt Marsh

- Light, bright or dark green with red-brown.
- Appears around estuaries, marshes, and lagoons and is sometimes associated with freshwater. In some areas, it can be sparse plants on coarse sediment or a wetter, peaty meadow with associated herbs and sedges. There are three Salt Marsh Biobands: SAMA (Alaska, Previous code = PUC), SAMO (Oregon & Washington State, Previous code = TRI), and SAMB (BC & Washington State, Previous code = SAL)

Indicator Species: *Puccinellia spp., Plantago maritima*, *Glaux maritima*, *Deschampsia spp.*, *Triglochin maritima*, *Distichlis spicata*, *Deschampsia caespitosa*, *Schoenoplectus americanus*, *Salicornia virginica*

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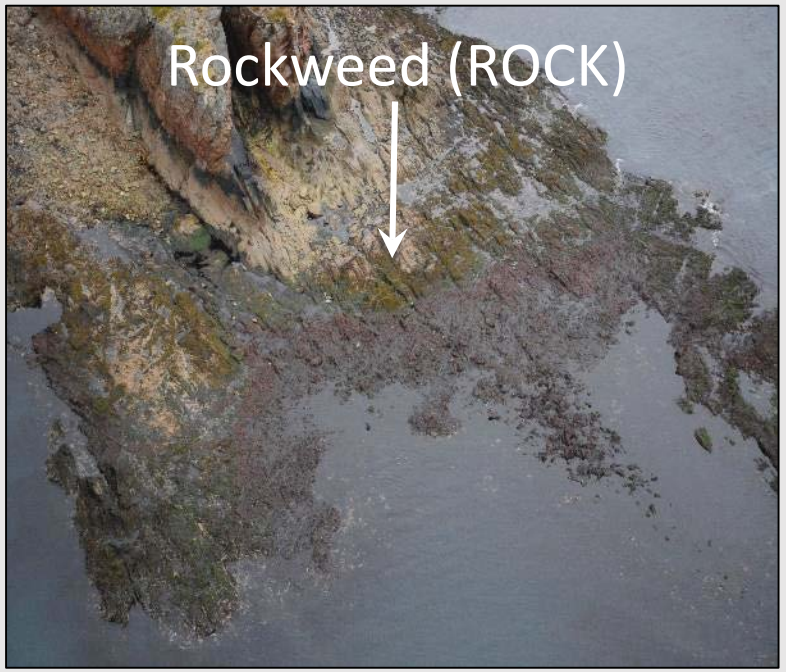
Biobands

Intertidal/Subtidal Vegetation



Intertidal/Subtidal Vegetation > Brown Non-bladed Algae

- Golden-brown to brown.
- Appears on bedrock cliffs and boulder, cobble or gravel beaches.
- Commonly occurs at the same elevation as the barnacle band.
- Previous code = FUC

Indicator Species: *Fucus distichus*

Return to Bioband Table

Biobands

Intertidal/Subtidal Vegetation

Intertidal/Subtidal Vegetation > Green Algae

- Various shades of green.
- Found on a variety of substrates.
- The band consists of filamentous and/or foliose green algae.
- Filamentous species often form a low turf of dark green.
- Previous code = ULV

Indicator Species: *Ulva sp., Monostroma sp., Cladophora sp., Acrosiphonia sp.*

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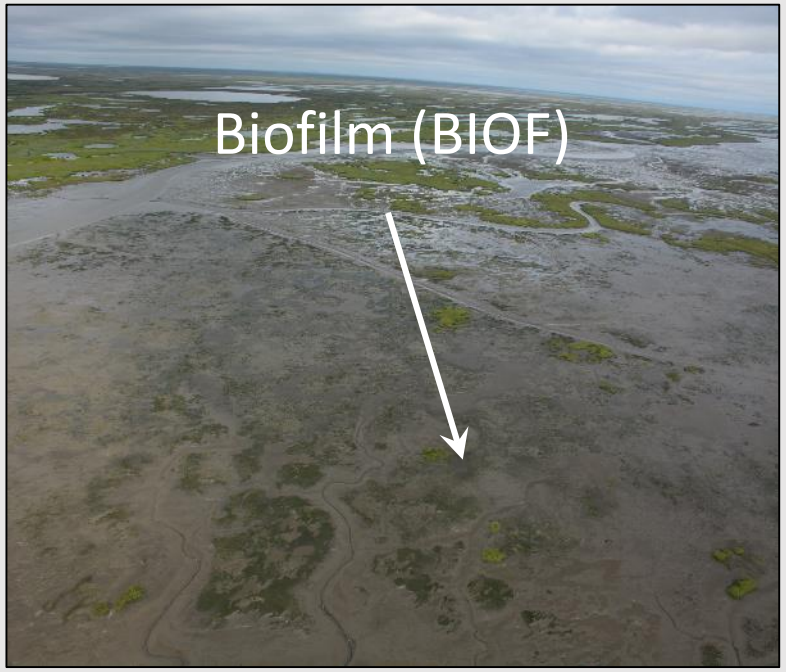
Biobands

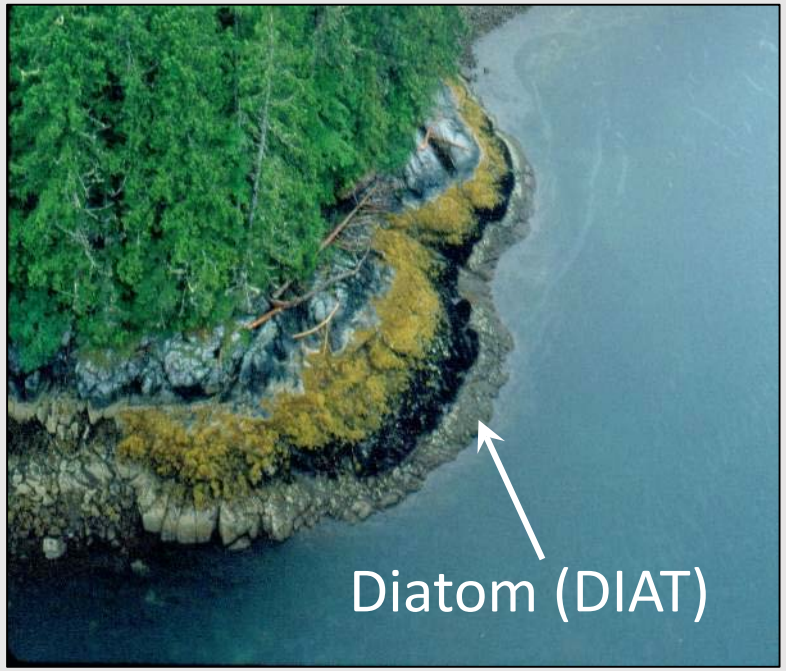
Intertidal/Subtidal Vegetation



Intertidal/Subtidal Vegetation > Biofilm

- Rusty orange-beige or dark green-black
- Low turf of blue-green algae or stain on sediment. Often seen in pools of washover bars and on river deltas and flats.
- Previous code = BFM

Indicator Species: Bacterial or diatom mat



Intertidal/Subtidal Vegetation > Biofilm > Diatom

- Beige or bleached white.
- Describes bare-looking lower intertidal areas in the coastal fjords of BC where a low turf of encrusting filamentous diatoms may be present.
- Previous code = DIA

Indicator Species: Diatoms

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Biobands

Intertidal/Subtidal Vegetation

Intertidal/Subtidal Vegetation > Red Algae > Coralline Red Algae

- Pink to whitish-pink.
- A combination of foliose and encrusting coralline algae occurring in the low intertidal.
- Lush coralline red algae indicate higher wave exposures (> Semi-Exposed).
- The previous Red Algae (RED) bioband has been split into CORA and FFRA. These need to be combined to be equal to the old RED band (NOT including WILA, GRRW or BRAL).

Indicator Species: *Corallina sp., Lithothamnion sp.*

Intertidal/Subtidal Vegetation > Red Algae > Winter Laver

- Pale green to greenish-gold
- These species of *Porphyra* grow high in the intertidal of more exposed coasts in the winter season.
- The previous Red Algae (RED) bioband has been split into CORA and FFRA. These need to be combined to be equal to the old RED band (NOT including WILA, GRRW or BRAL).

Indicator Species: *Porphyra pseudolanceolata*, *Pyropia hiberna*

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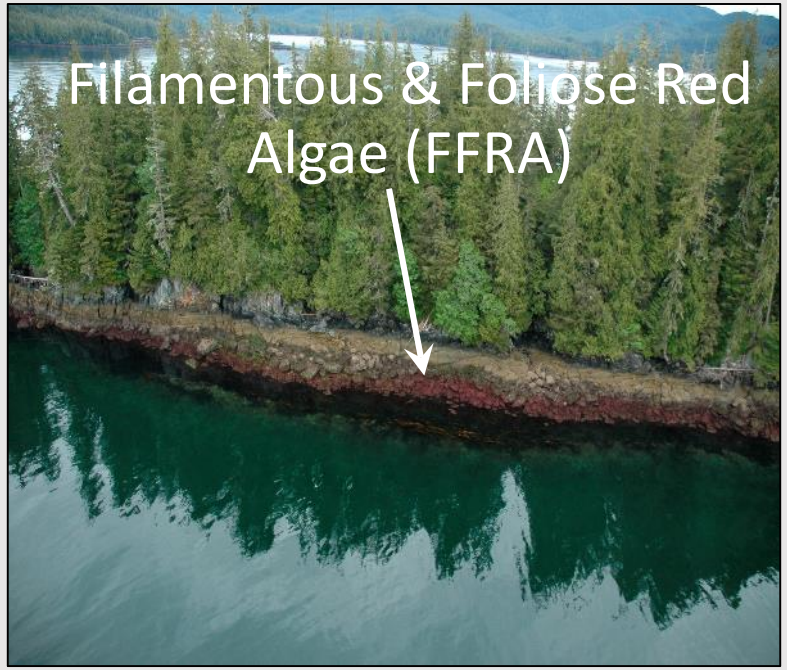
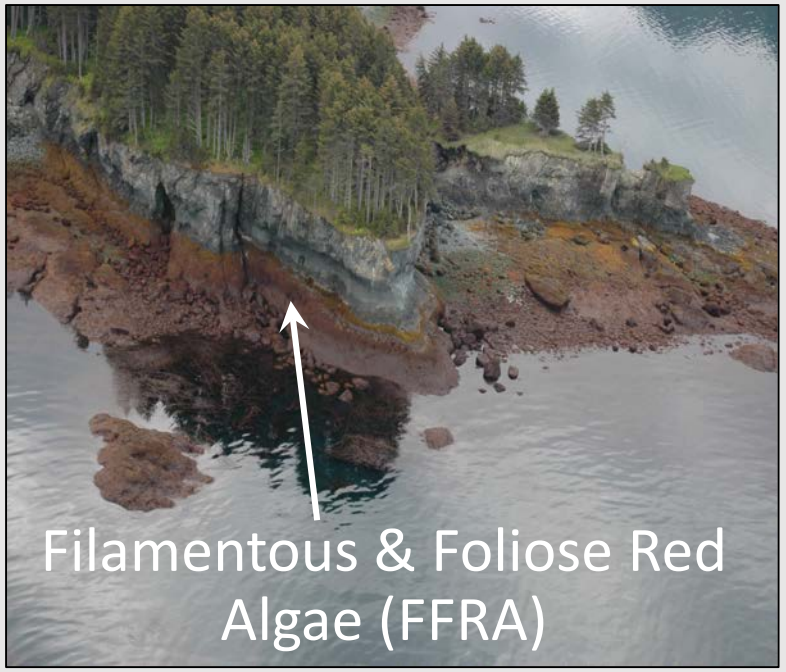
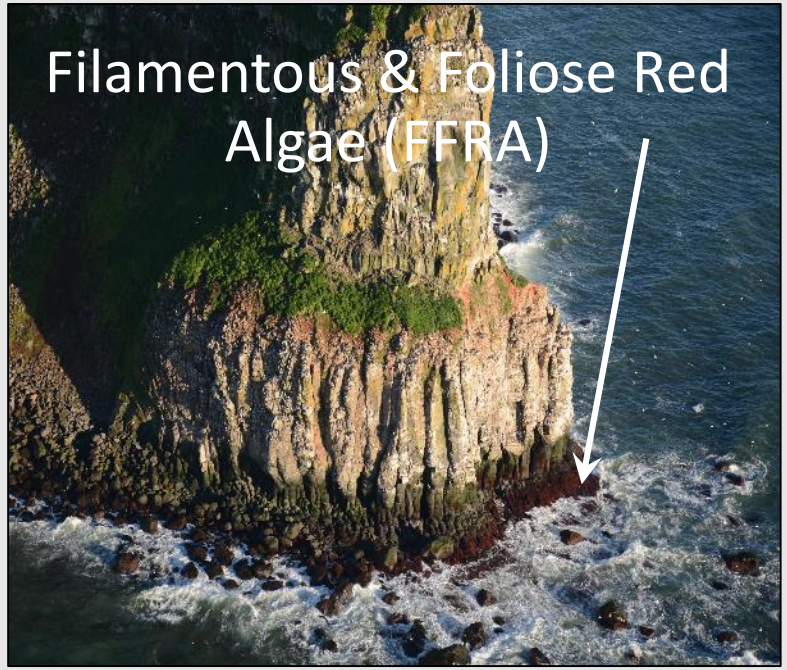
Biobands

Intertidal/Subtidal Vegetation







Intertidal/Subtidal Vegetation > Red Algae > Filamentous and Foliose Red Algae

- Dark to bright red and red-brown.
- Diversity of foliose red algae indicates medium to high exposures.
- Filamentous species, often mixed with green algae, occurring at medium and lower exposures.
- The previous Red Algae (RED) bioband has been split into CORA and FFRA. These need to be combined to be equal to the old RED band (NOT including WILA, GRRW or BRAL).

Indicator Species: *Odonthalia sp., Neorhodomela sp.*, *Palmaria sp.*, *Neoptilota sp.*, *Mazzaella sp.*

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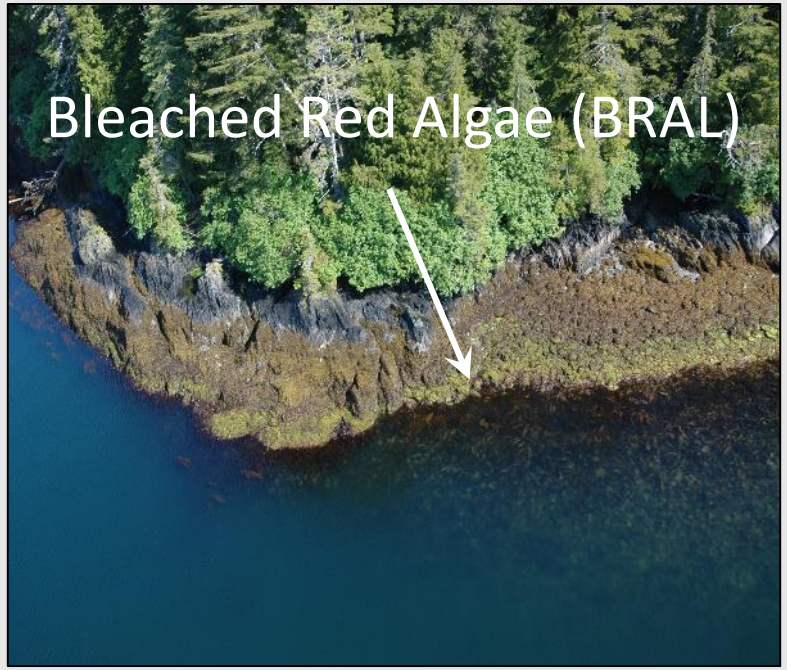
Biobands

Intertidal/Subtidal Vegetation



Intertidal/Subtidal Vegetation > Red Algae > Bleached Red Algae

- Olive, golden or yellow-brown.
- Common on bedrock platforms, and cobble or gravel beaches.
- Distinguished from the FFRA band by color, although may be similar species.
- The bleached color usually indicates lower wave exposure.
- Previous code = HAL

Indicator Species: Bleached foliose/filamentous red algae

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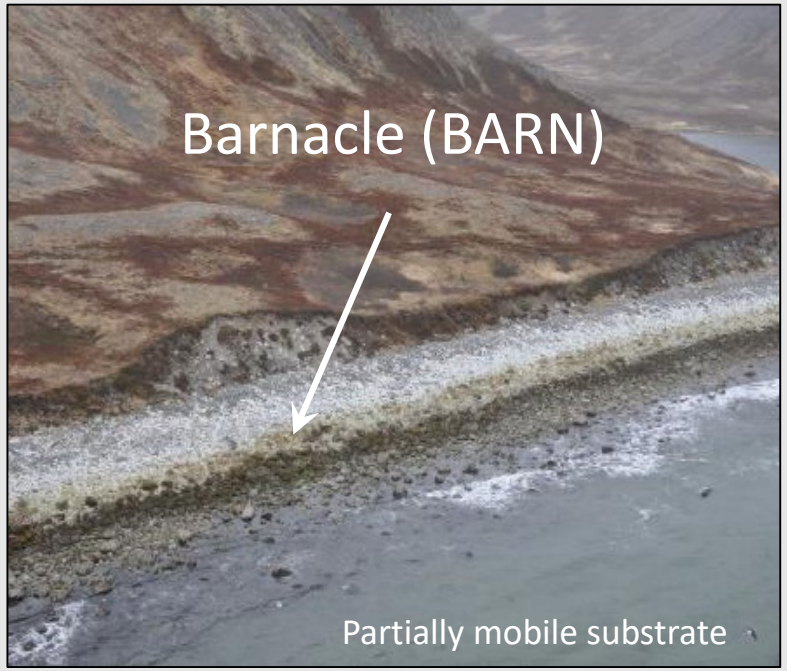
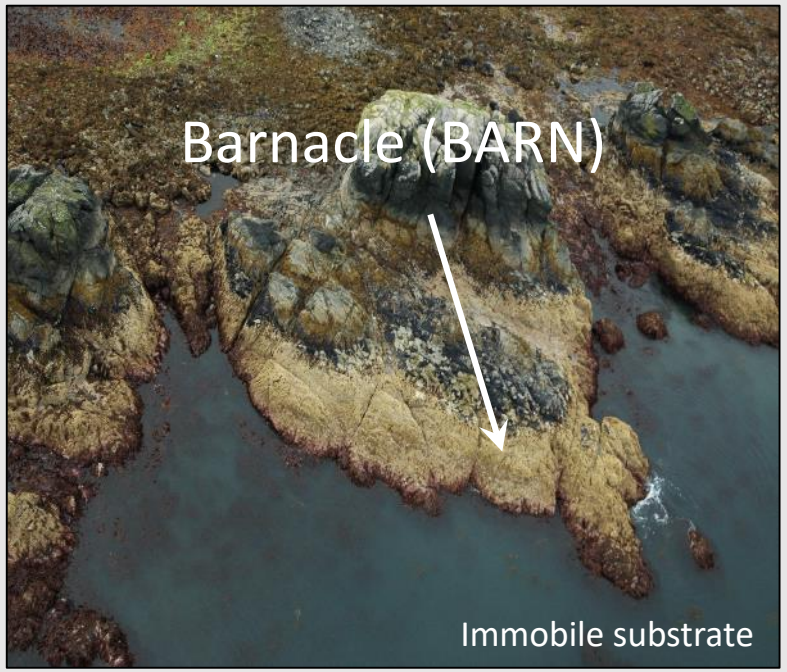
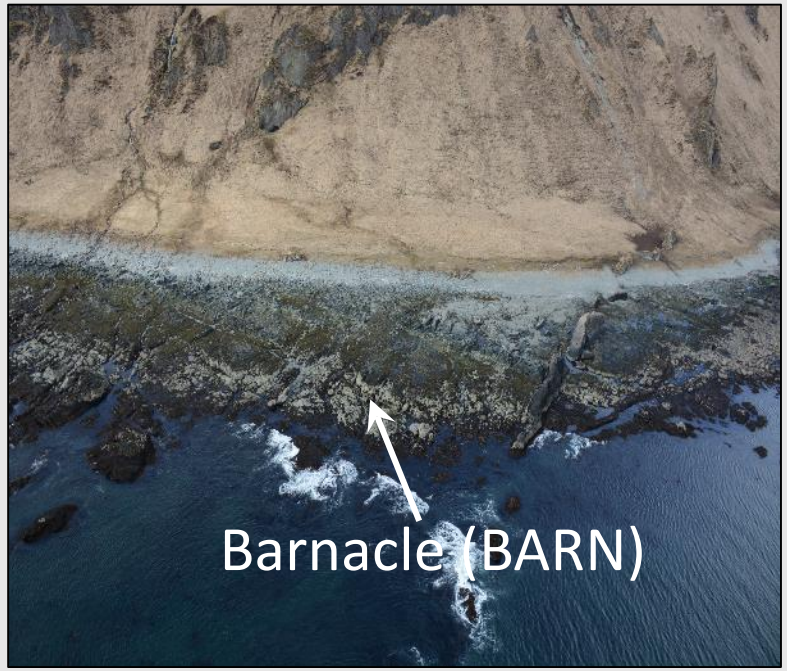
Biobands

Invertebrates







Invertebrates > Crustaceans > Barnacle

- Grey-white to pale yellow
- Visible on bedrock or large boulders. Can form an extensive band in higher exposures where algae have been grazed away.
- Previous code = BAR

Indicator Species: *Balanus glandula*, *Semibalanus cariosus*

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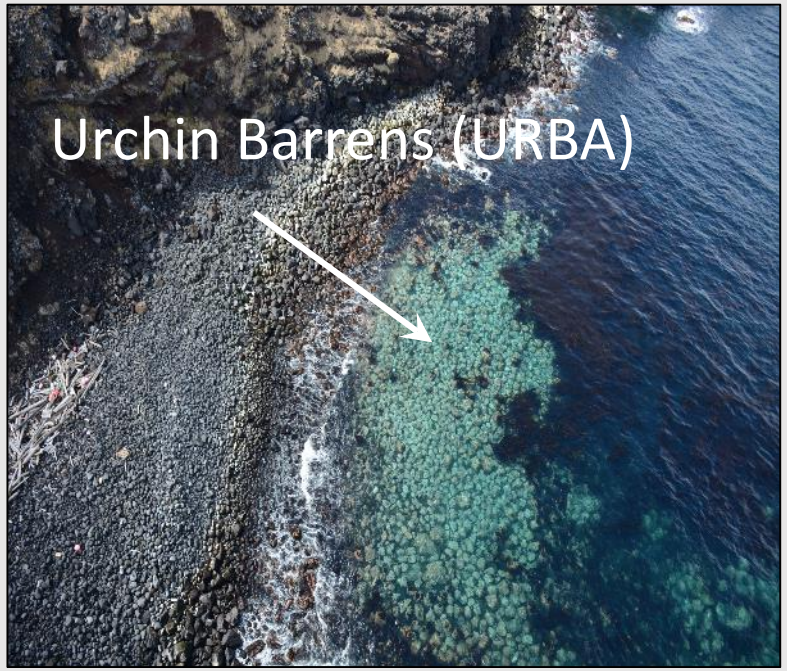
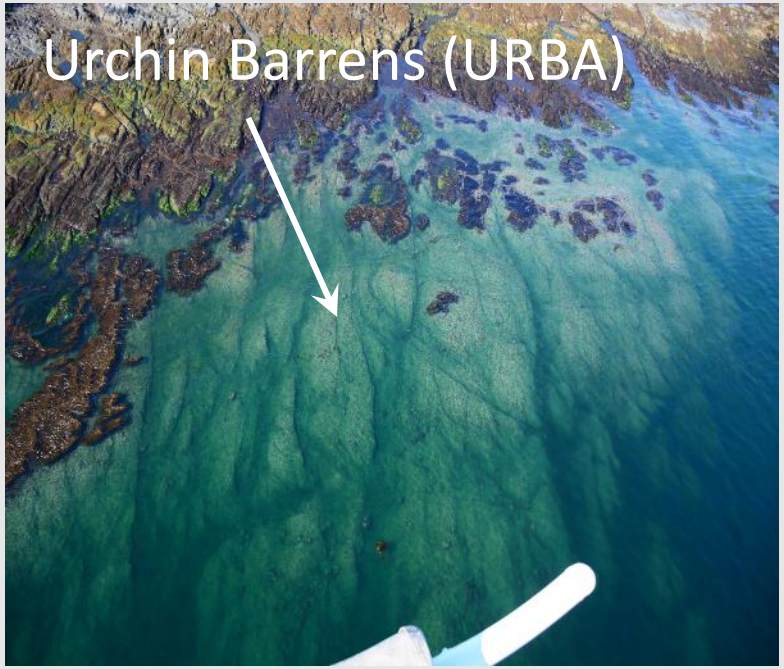
Biobands

Invertebrates





Invertebrates > Echinoderms > Urchin Barrens

- Coralline pink/white.
- Shows rocky substrate clear of macroalgae.
- Often has a pink-white color of encrusting coralline red algae. May or may not see urchins.
- Previous code = URC

Indicator Species: *Strongylocentrotus franciscanus*

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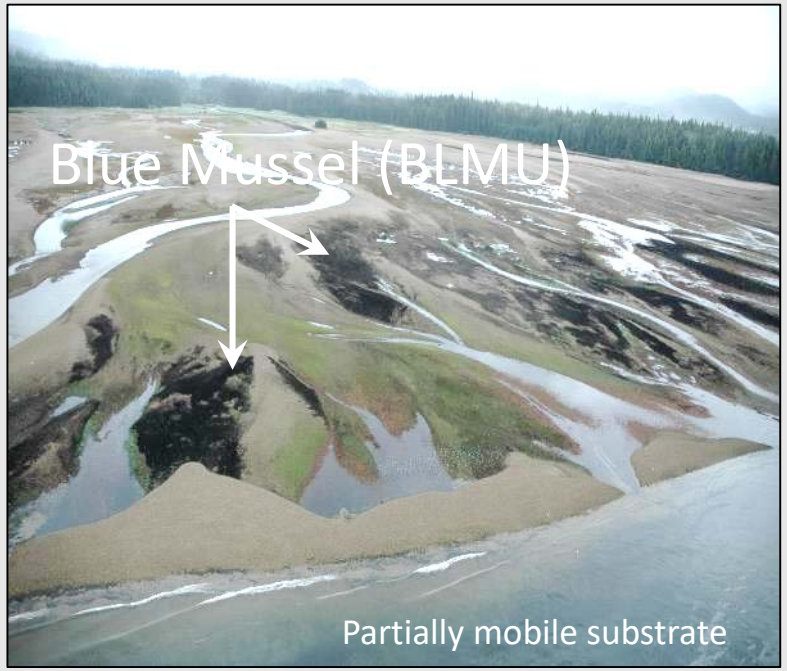
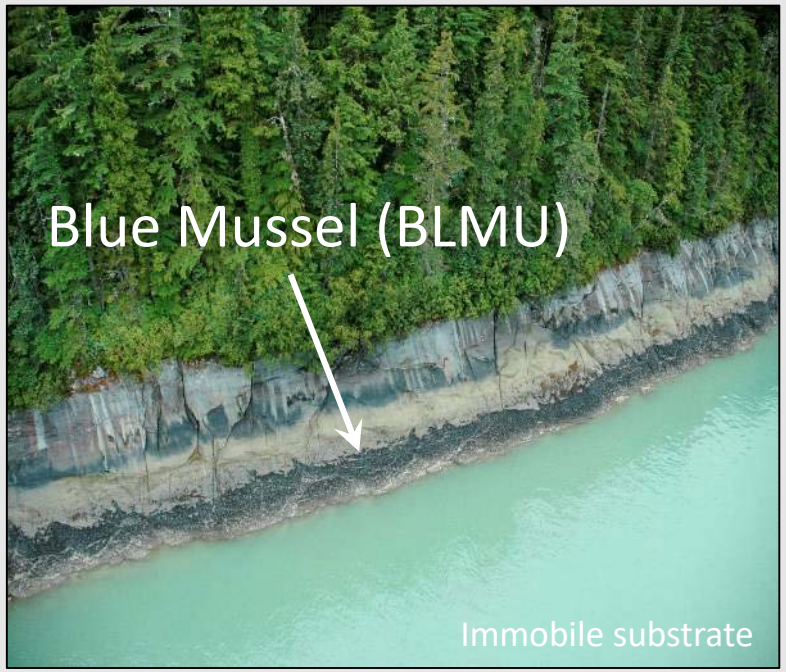
Biobands

Invertebrates





Invertebrates > Molluscs > Blue Mussels

- Black or blue-black
- Visible on bedrock and on boulder, cobble or gravel beaches. Appears in dense clusters that form distinct black patches or bands, either above or below the barnacle band.
- Previous code = BMU

Indicator Species: *Mytilus trossulus*

Invertebrates > Molluscs > California Mussels

- Grey-blue.
- Dominated by a complex of California mussels (*Mytilus californianus*) and thatched barnacles (*Semibalanus cariosus*) with gooseneck barnacles (*Pollicipes polymerus*) seen at higher exposures.
- Previous code = MUS

Indicator Species: *Mytilus californianus*

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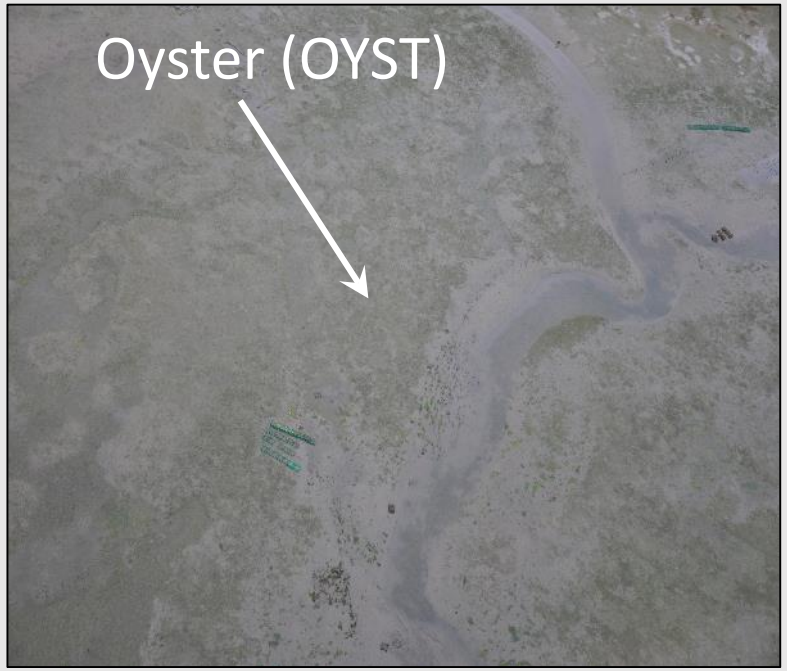
Biobands

Invertebrates



Invertebrates > Molluscs > Oyster

- Dark beige to brown
- Generally inconspicuous and includes areas of oyster aquaculture in Oregon, Washington State and BC to a limited extent
- Previous code = OYS

Indicator Species: *Crassotrea gigas*

Invertebrates > Crustaceans > Mud Flat Shrimp

- Mottled texture on sand flats
- This bioband is specific to sand/mud flats in larger estuaries and is specific to Oregon and Washington State
- Previous code = CAL

Indicator Species: *Neotrypaea californiensis*, *Upogebia pugettensis*

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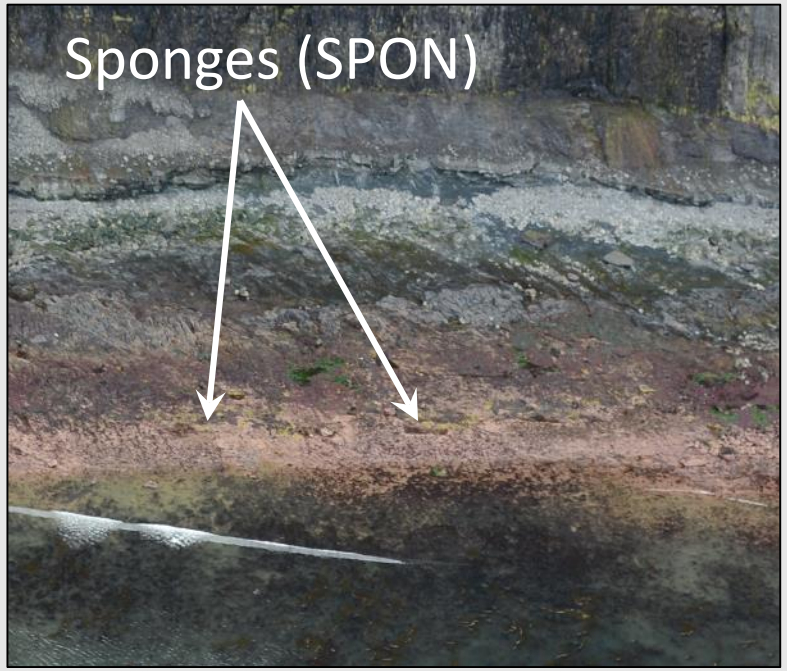
Biobands

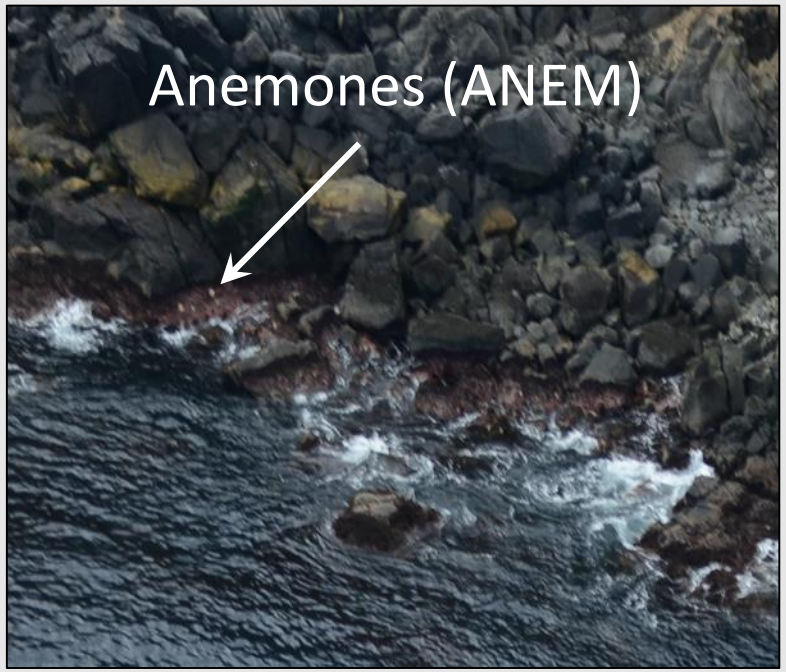
Invertebrates



Invertebrates > Sponges

- Generally yellow, purple or red but could be other colors depending on the species
- Occur as brightly colored patches at the waterline or in the shallow subtidal
- Associated with high wave energy or current-dominated habitat
- No previous equivalent code

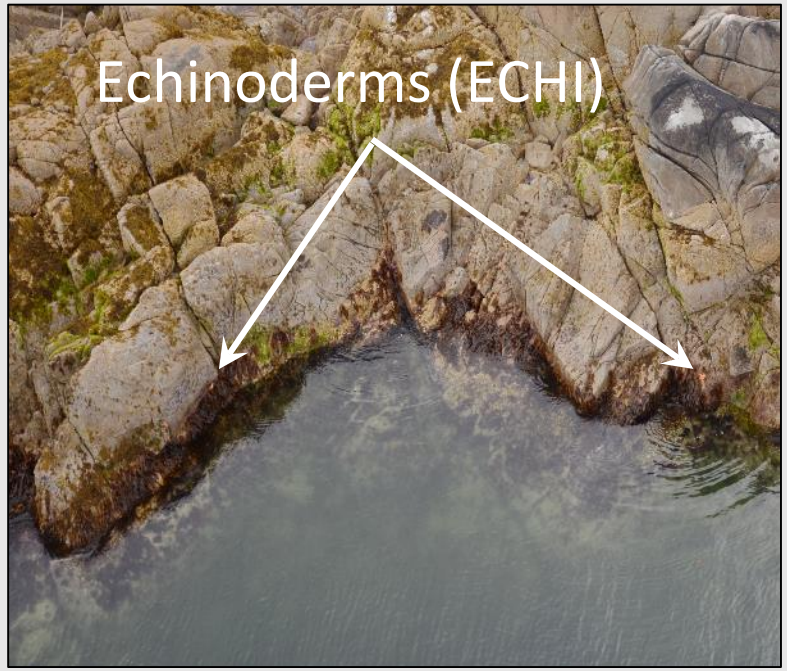
Indicator Species: N/A



Invertebrates > Cnidarians > Anemones

- Generally white, yellow or red depending on the species
- Appears as small circular dots of color in the low intertidal or shallow subtidal
- Associated with high wave energy or current-dominated habitat
- No previous equivalent code

Indicator Species: N/A



Invertebrates > Echinoderms

- Multiple colors
- Non-specific band of echinoderms that does not fit into a more specific bioband definition
- So far, this code has generally been used to indicate sea stars (often *Pisaster* sp., which are orange and purple) visible at the waterline
- No previous equivalent code

Indicator Species: N/A

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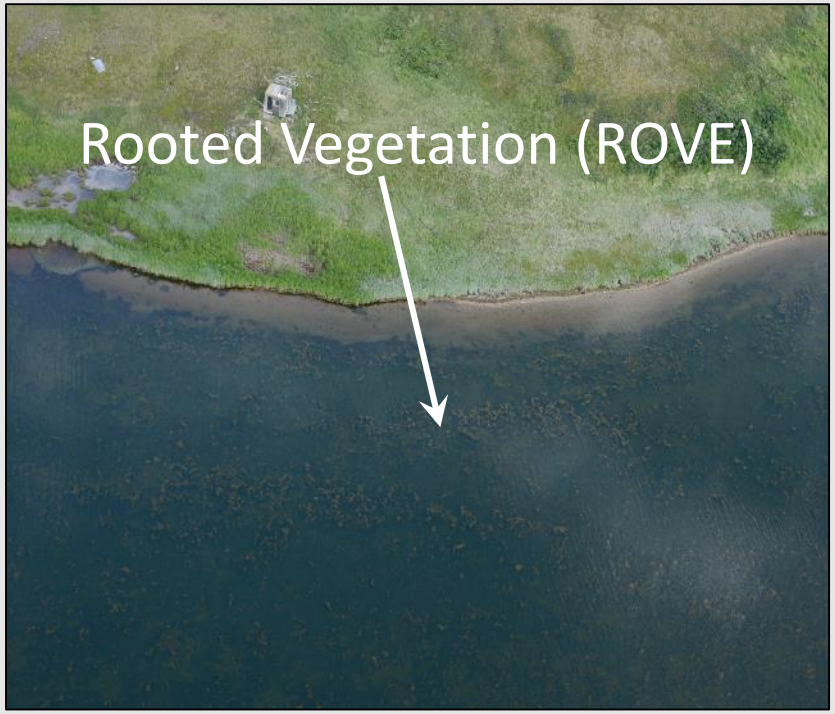
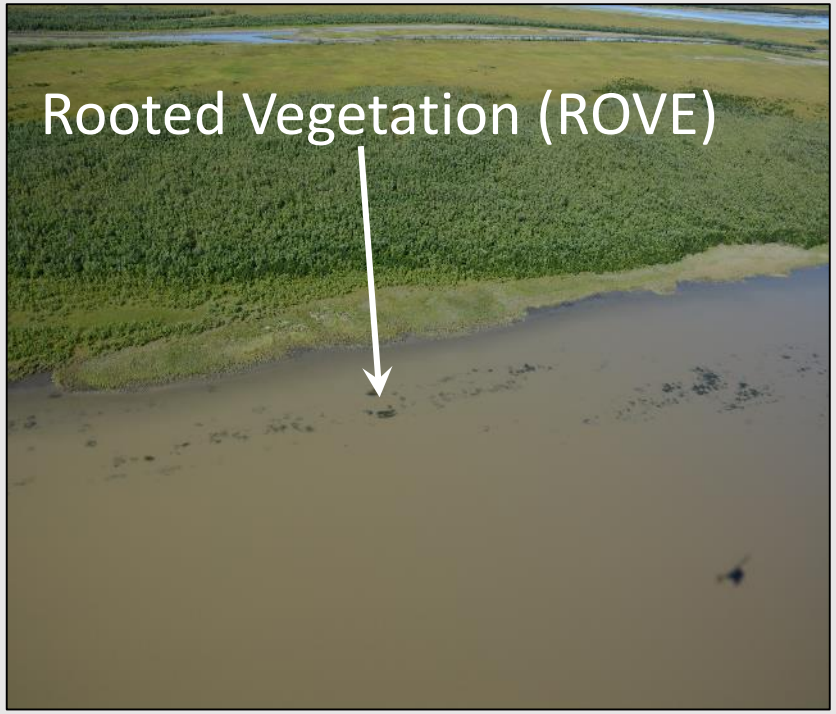
Biobands

Intertidal/Subtidal Vegetation





Intertidal/Subtidal Vegetation > Rooted Vegetation

- Green to green-grey
- A non-specific rooted vegetation in the lower intertidal and/or shallow subtidal that does not fit a more specific bioband (such as Eelgrass or Surfgrass)
- No equivalent previous code

Indicator Species: N/A

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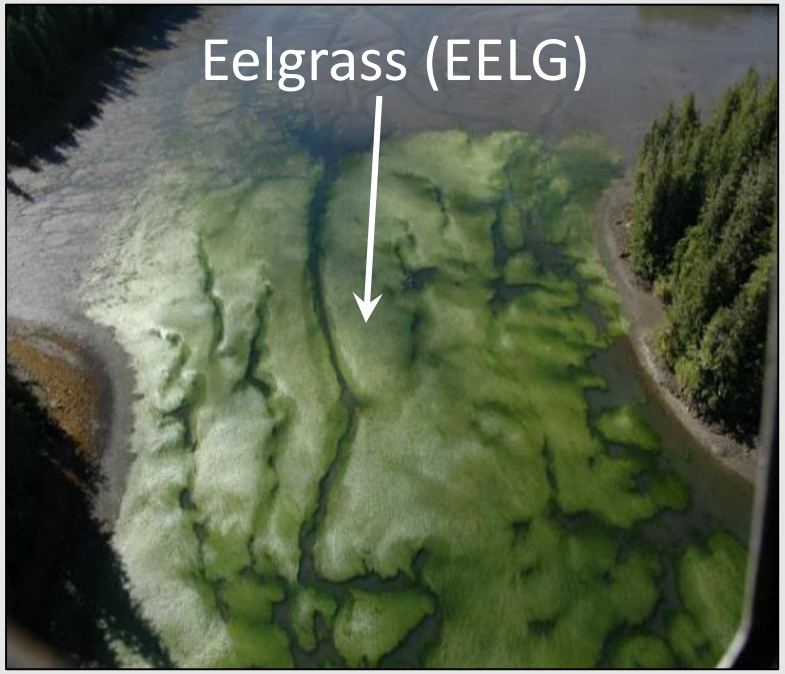
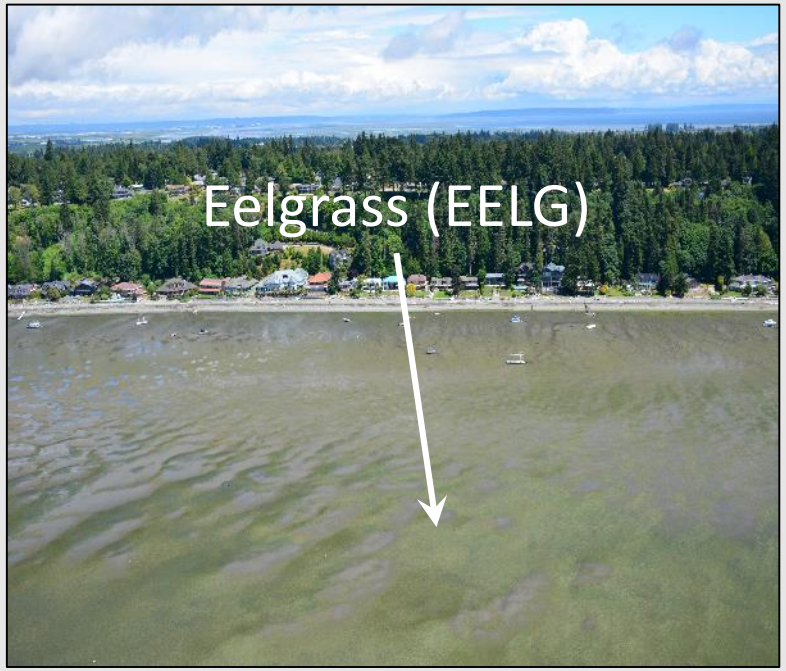
Biobands

Intertidal/Subtidal Vegetation





Intertidal/Subtidal Vegetation > Rooted Vegetation > Eelgrass

- Bright to dark green.
- Commonly visible in estuaries, lagoons or channels, generally in areas with fine sediments.
- Eelgrass can occur in sparse patches or thick dense meadows.
- Previous code = ZOS

Indicator Species: *Zostera marina*

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Biobands

Intertidal/Subtidal Vegetation

Intertidal/Subtidal Vegetation > Rooted Vegetation

- Bright to dark green.
- Appears in tide pools on rock platforms, often forming extensive beds.
- This species has a clearly defined upper exposure limit of Semi-Exposed and its presence in units of Exposed wave energy indicates a wide across-shore profile, where wave energy is dissipated by wave run-up across the broad intertidal zone.
- Previous code = SUR

Indicator Species: *Phyllospadix sp.*

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Biobands

Intertidal/Subtidal Vegetation

Intertidal/Subtidal Vegetation > Brown Non-Bladed Algae

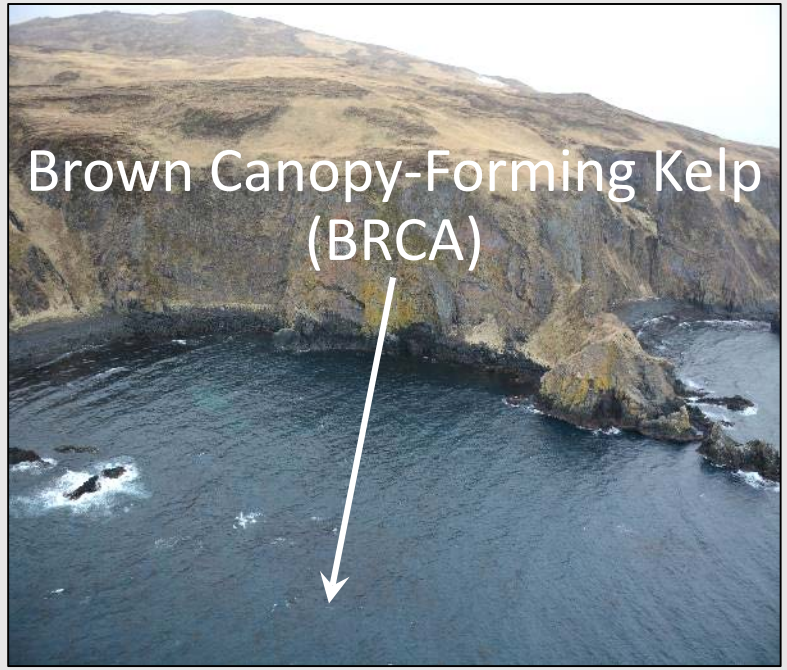
- Various shades of brown.
- Non-specific non-bladed brown algae in the lower intertidal and/or shallow subtidal that do not fit into any more specific bioband.
- No equivalent previous code

Indicator Species: N/A

Intertidal/Subtidal Vegetation > Brown Non-Bladed Algae > Sargassum

- Golden-brown to brown.
- A continuous stand of 'fuzzy-looking' Sargassum muticum, an introduced species in Canada
- To date this band has only been observed in the Strait of Georgia in BC
- Previous code = SAR

Indicator Species: Sargassum muticum



Intertidal/Subtidal Vegetation > Brown Canopy-Forming Algae

- Dark brown.
- Non-specific canopy kelp in the subtidal that do not fit into any more specific bioband or cannot be identified from the imagery.
- No equivalent previous code

Indicator Species: N/A

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Biobands

Intertidal/Subtidal Vegetation

Intertidal/Subtidal Vegetation > Brown Bladed Algae

- Various shades of brown.
- Non-specific bladed brown algae in the lower intertidal and/or shallow subtidal that do not fit into any more specific kelp bioband.
- No equivalent previous code

Indicator Species: N/A

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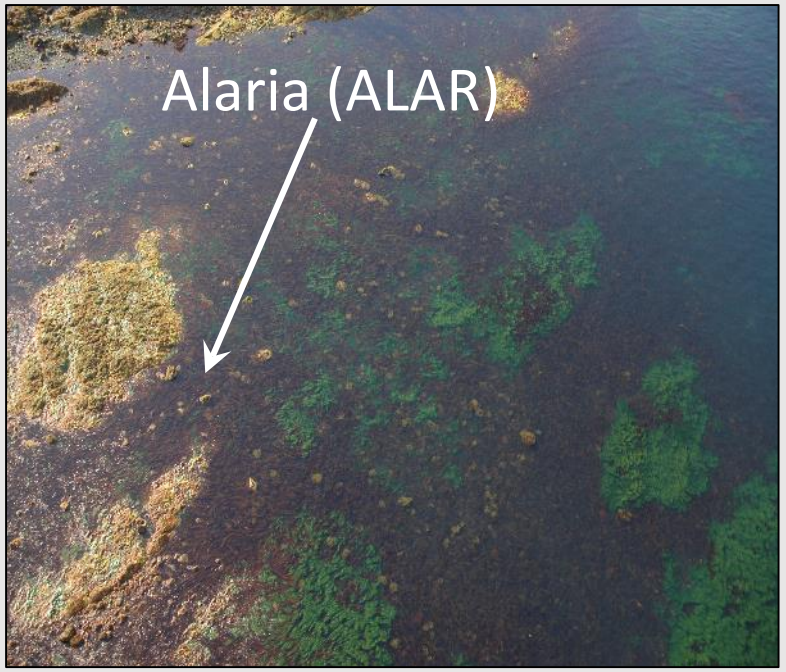
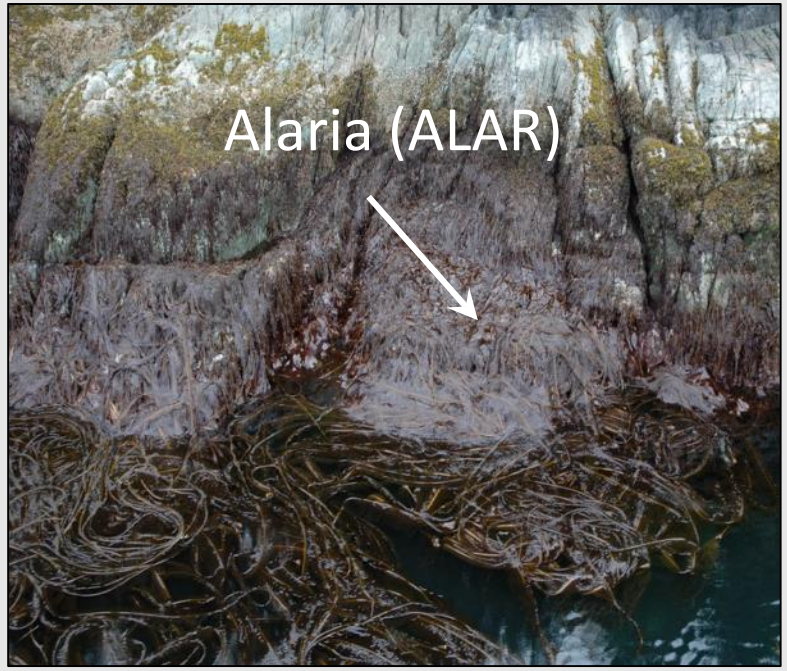
Biobands

Intertidal/Subtidal Vegetation





Intertidal/Subtidal Vegetation > Brown Bladed Algae > Alaria

- Dark brown to red-brown.
- Common on bedrock cliffs and platforms, and on boulder/cobble beaches.
- This band has a distinct ribbon-like texture and may appear iridescent.
- Previous code = ALA

Indicator Species: *Alaria marginata*

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Biobands

Intertidal/Subtidal Vegetation

Intertidal/Subtidal Vegetation > Brown Bladed Algae > Soft Brown Kelps

- Brown to yellow-brown to olive.
- This band is defined by non-floating large browns and can form lush bands in semi-protected areas.
- The kelp fronds have a ruffled appearance and can be encrusted with diatoms and bryozoans giving the blades a 'dusty' appearance.
- Previous code = SBR

Indicator Species: *Saccharina latissimi*, *Cystoseira sp.*, *Sargassum muticum*

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Biobands

Intertidal/Subtidal Vegetation

Intertidal/Subtidal Vegetation > Brown Bladed Algae > Dark Brown Kelps

- Dark brown.
- Found at higher wave exposures, these stalked kelps grow in the lower intertidal.
- Blades are leathery, shiny, and smooth.
- A mixture of species occurs at the moderate wave exposures, while single-species stands of *Lessoniopsis* occur at high exposures.
- Previous code = CHB

Indicator Species: *Laminaria setchelli*, *Lessoniopsis littoralis*, *Laminaria longipes*, *Laminaria yeozensis*

Return to Bioband Table

Biobands

Intertidal/Subtidal Vegetation

Subtidal Vegetation > Brown Canopy-Forming Algae > Dragon Kelp

- Dark brown to golden-brown.
- Canopy-forming kelp, with winged blades on gas-filled center midrib.
- Usually associated with silty, cold waters near glacial outflow rivers. Range: southern Southeast AK to Aleutian Islands, AK.
- Previous code = ALF

Indicator Species: *Eularia fistulosa*

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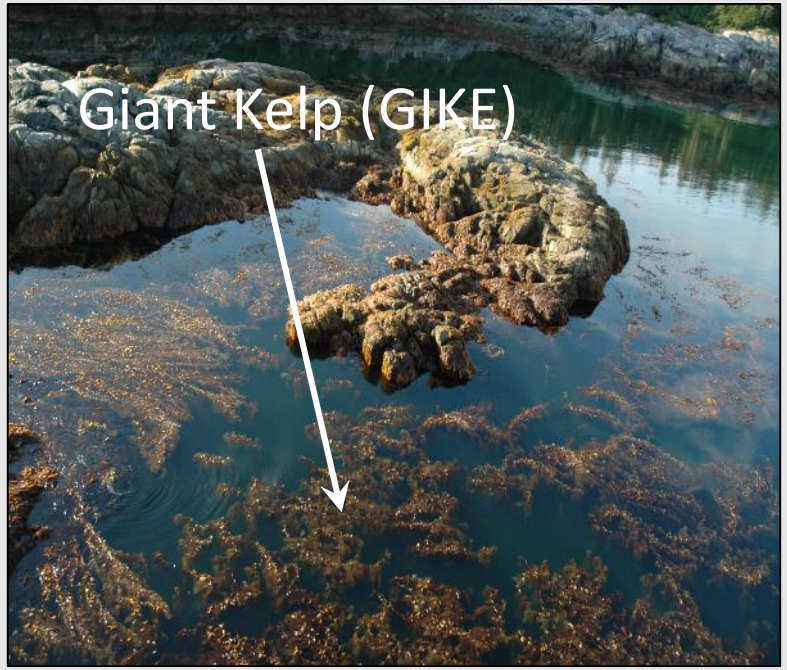
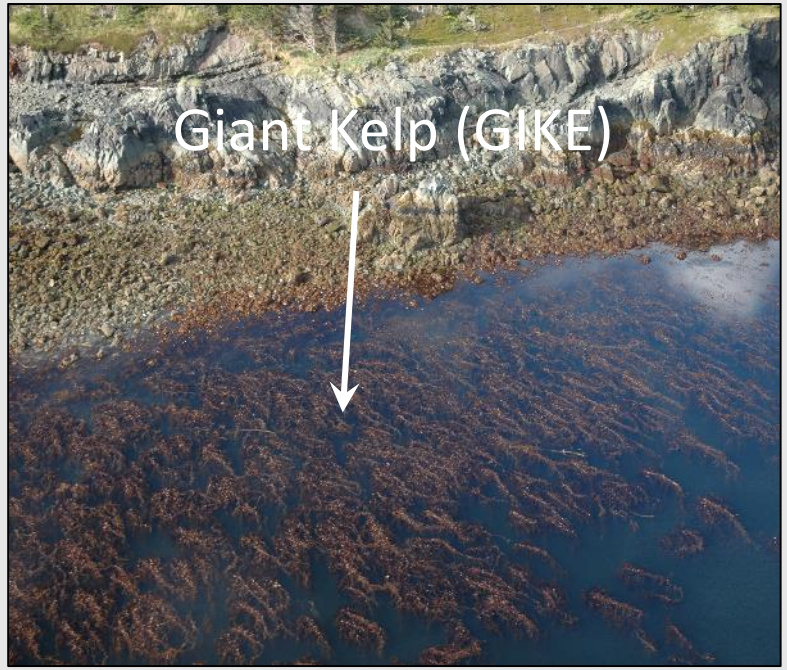
Biobands

Intertidal/Subtidal Vegetation





Subtidal Vegetation > Brown Canopy-Forming Algae > Giant Kelp

- Dark brown to golden-brown.
- Canopy-forming giant kelp, long stipes with multiple floats and fronds.
- If associated with NER, it occurs inshore of the bull kelp. Range: Baja California, Mexico to Kodiak Islands, AK.
- Previous code = MAC

Indicator Species: *Macrocystis pyrifera*

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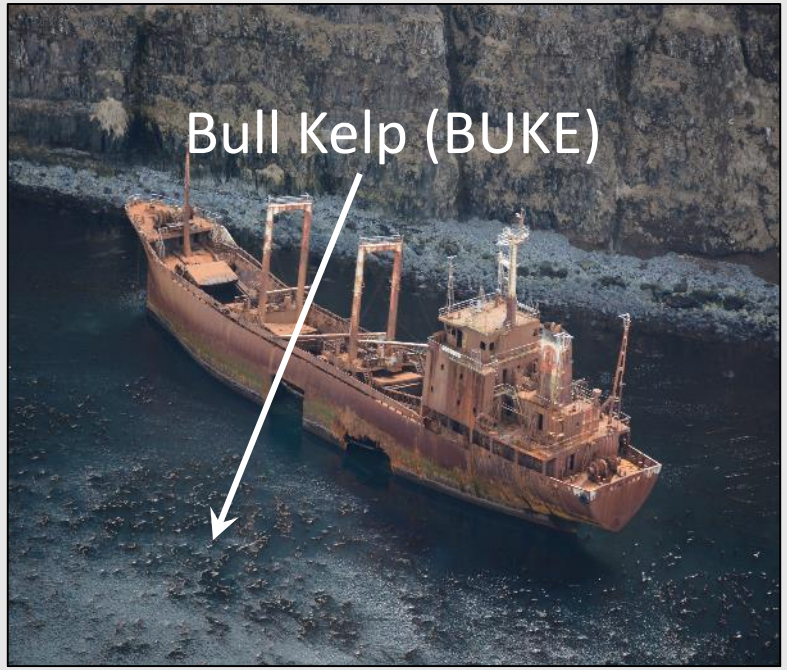
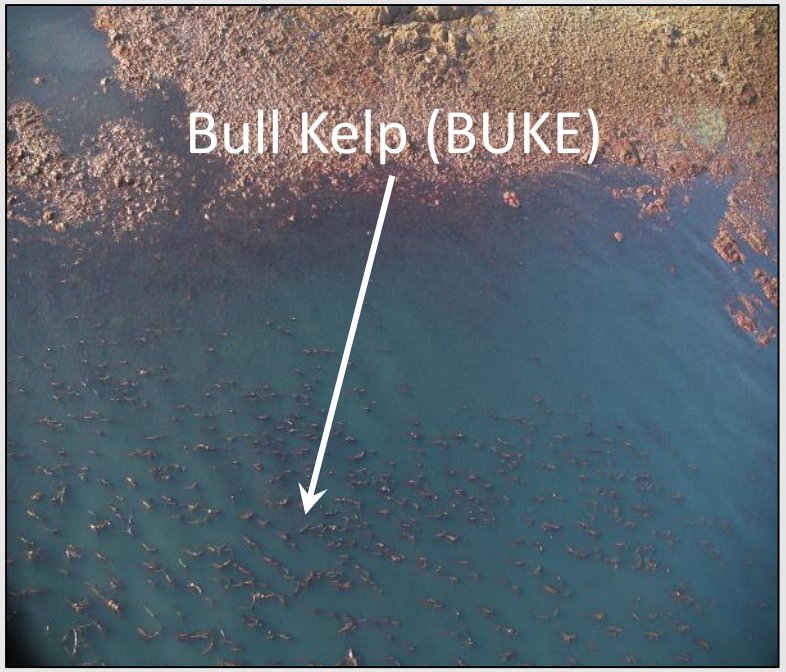
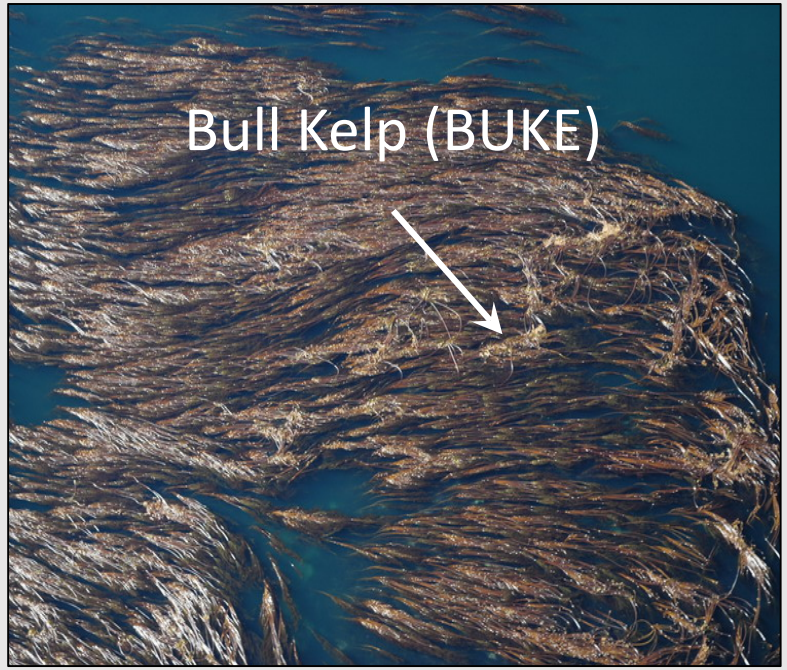
Biobands

Intertidal/Subtidal Vegetation







Subtidal Vegetation > Brown Canopy-Forming Algae > Bull Kelp

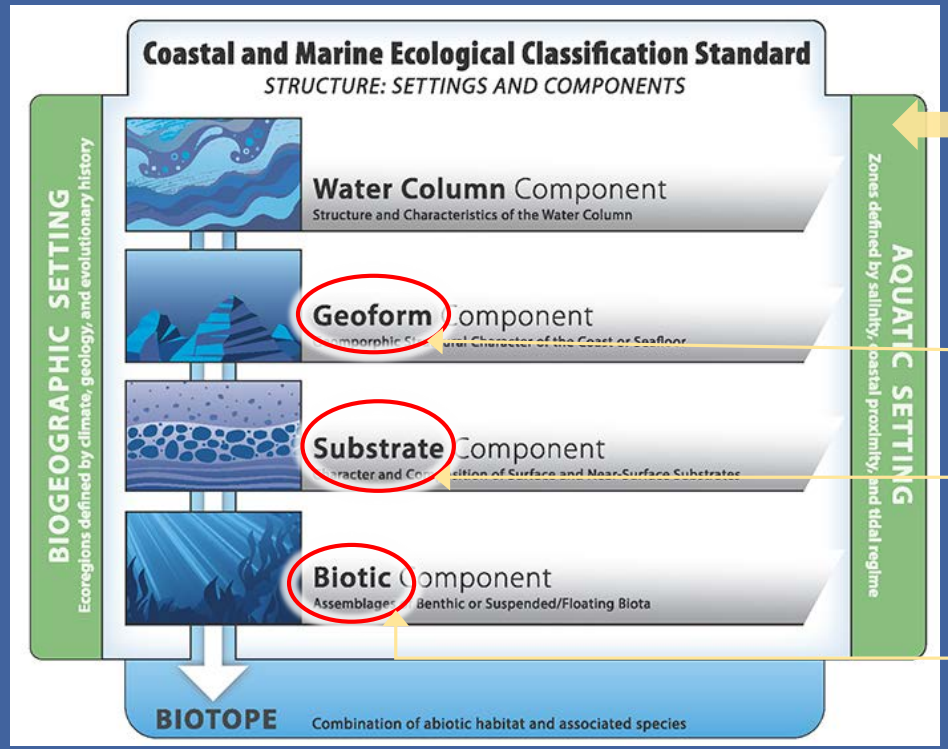
- Dark brown.
- Distinctive canopy-forming kelp with many long strap-like blades growing from a single floating bulb atop a long stipe. Can form an extensive canopy in nearshore habitats, usually further offshore than DRKE and GIKE. Often indicates higher current areas if observed at lower wave exposures. Range: Point Conception, CA to Unimak Island, AK.
- Previous code = NER

Indicator Species: *Nereocystis luetkeana*

Return to Bioband Table

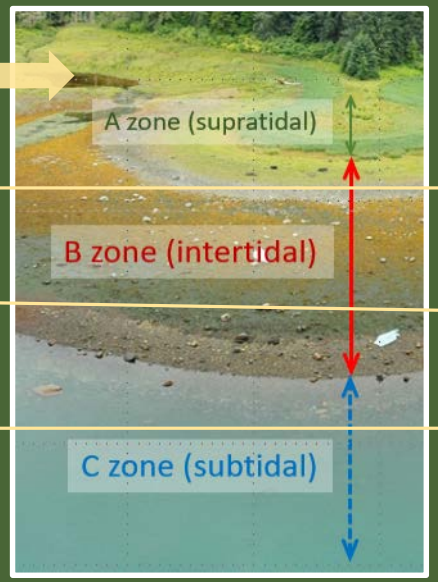
CMECS

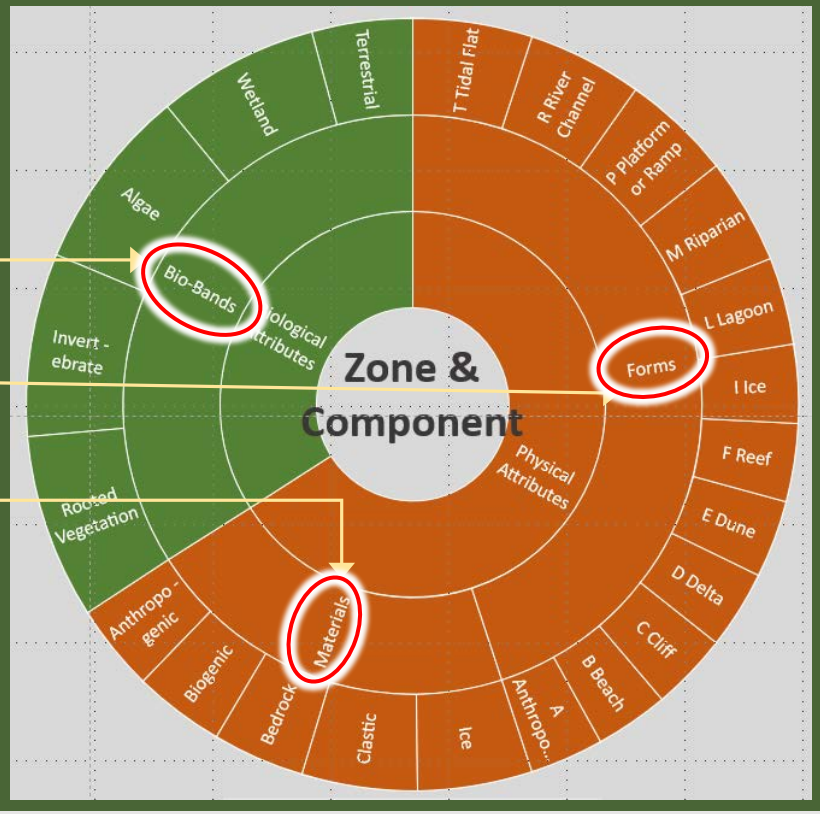
- **CMECS*** classifies the environment into biogeographic and aquatic settings that are differentiated by features influencing the distribution of organisms, and by salinity, tidal zone, and proximity to the coast.
- Within these systems are four underlying components that describe different aspects of the seascape. These components provide a structured way to organize information and a standard terminology.
- The components can be mapped independently or combined as needed.



ShoreZone and CMECS

- ShoreZone classifies delineated segments of the environment using a nested hierarchical system.
- Along-shore and Across-shore attributes describe different aspects of the shoreline segment.
- Along-shore attribute data uses terminology that aligns with the **CMECS** *Biogeographic Setting*, as well as summary indices Coastal Class and Habitat Class that can inform the **CMECS** *Biotope*.
- The intermediate division of the across-shore into main A-B-C zones corresponds to aspects of the **CMECS** *Aquatic Setting*.
- The further resolution of the across-shore into components and description of physical and biological attributes provides a data structure that conforms directly with **CMECS** *Geo-form, Substrate, and Biotic Components*.





***CMECS** provides a comprehensive national framework for organizing information about coasts and oceans and their living systems. **CMECS** was approved by the Federal Geographic Data Committee (FGDC) in August 2012. As an FGDC standard, federally funded projects working with environmental data in the coastal zone should use **CMECS** as their primary classification system or include **CMECS** attributes for their data.

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Database Structure

The main database table in the downloadable ***ShoreZone geodatabase*** combines selected data from the SQL databases Unit and UnitBiobandAttributePercent , linked to the spatial data by the unique physical identifier (PHY_IDENT field), an alphanumeric string composed of the identifier for the Region, Area, Unit, and Subunit separated by slashes (e.g. 12/03/0552/0 is Region 12/ Area 03/ Unit 0552/ and Subunit 0)

Geodatabase Table – SZ_UnitwAttributes

Geodatabase Field	Description
PHY_IDENT	A unique code to identify each unit following the format: Region/Area/Phy Unit/Subunit.
LENGTH_M	Length, in meters, of the digital shoreline as calculated in ArcGIS from the digitized unit boundaries.
VIDEOTAPE	Unique code for the video file used in the classification.
DATE_TIME	Date of imagery acquisition.
FIRSTVIDEO	Code linking shoreline unit with video imagery frame
BC_CLASS & SHORETYPE	Coastal Class code. A higher-level classification of the intertidal habitat
BC_CLASS_s & BC_CLASS_d & Shoretype_	Text description of Coastal Class, combining substrate, intertidal zone width and slope, and general morphology.
ESI	The highest numerical ESI value (highest sensitivity to a potential oil spill) for the Unit is used to populate this field.
ESI_Full	The ESI values for the intertidal zone of the unit. There may be up to three ESI values, each separated by a slash (ex. 1A/6B/10D).
ESI_Line	A code indicating the type of linear feature that is being classified.
ESI_Envir	The categories for ESI are Estuarine, Riverine, Lacustrine or Palustrine. All coastal areas are considered Estuarine for ESI purposes.
ESI_Wetlan	This is a Yes (1) or No (0) value with a Yes (1) indicating there is a wetland in the supratidal that is greater than 10m in width.
ORI & ORI_str	Unit level ORI calculated using the Biological Wave Exposure and Coastal Class.
EXP_BIO	An estimate of the wave energy in the intertidal zone based on the assemblage of biobands present in the unit. When biobands are not present in the intertidal (bare beaches, arctic coasts) the Wave Exposure value is used.
Exposure	An estimate of the physical wave exposure experienced by the intertidal zone using a modification of observed maximum fetch
HabClass	Habitat Class attribute code combines the Biological Wave Exposure with an estimate of geomorphology and processes (Coastal Class) in the unit that might affect the composition of biobands in the unit. Mobility is estimated (Immobile, Partially Mobile and Mobile) for wave process dominated shorelines with estuarine, anthropogenic, current, glacial, lagoon and periglacial processes having their own categories.
HAB_CLASS_	Text description of Habitat Class
Slope_calc	The slope of the intertidal zone, calculated using the equation: Slope = tan-1(Tidal Height/Intertidal Zone Width).
Tidal_heig	The projected (modelled) tide height or sea level elevation (in meters) taken from the designated tide station.

Geodatabase Field	Description
Orient_dir	The compass orientation (N, NW, W, SW, S, SE, E or NE) of the bottom of the intertidal zone at 90 degrees to shore normal
SHORE_PROB	A multiplier that indicates the amount the observed shoreline length differs from the digital shoreline length for a unit.
LOST_SHORE	The calculation of the actual shoreline length for those units with a Shoreline Problem modifier of greater or less than 1.
CVI_Rank	ShoreZone Coastal Vulnerability Index: A value estimating the relative sensitivity of a unit to sea-level rise on a four-point scale (Low, Moderate, High, Very High).
CMECS_Valu & CMECS_1-5	This is a crosswalk of Coastal Class values with the CMECS system.
Wave_Dissi	Wave Dissipation categories combining wave exposure index and intertidal zone slope index
Biogeograp	Biogeographic_Domain. A nested hierarchical biogeographic unit (based on CMECS biogeographic divisions) used to delineate areas with similar physical, chemical and biological characteristics.
All Bioband Fields: 3-letter codes up to 2016, and 4-letter codes from 2017	If the Bioband named as the column header was present in the Unit, it will be indicated as being either (P)atchy (<50% of the length of the unit) or (C)ontinuous (>50% of the length of the unit) or as (N)arrow (<1m), (M)edium (1-5m) or (W)ide (>5m) for the splash zone Biobands
VER	Bioband for Splash Zone (black lichen **VER**ucaria) in supratidal
PUC	Bioband for Salt Marsh grasses, including **PUC**cinellia and other salt tolerant grasses, herbs and sedges, in supratidal
GRA	Bioband code for Dune **GRA**ss in supratidal
SED	Bioband for **SED**ges in supratidal
BAR	Bioband for **BAR**nacle (Balanus/Semibalanus) in upper intertidal
FUC	Bioband for Rockweed, the **FUC**us/barnacle in upper intertidal
ULV	Bioband for Green Algae, including mixed filamentous and foliose greens (**ULV**a, Cladophora, Acrosiphonia) in mid-intertidal
HAL_wSuffi	Bioband for Bleached Red Algae, including mixed filamentous and foliose reds (Palmaria, Odonthalia, **HAL**osaccion) in mid-intertidal. A suffix number matches the bioband code to a particular bioarea.
BMU	Bioband for **B**lue **MU**ssel (*Mytilus trossulus*) in mid-intertidal
RED_wSuffi	Bioband for **RED** Algae, including mixed filamentous and foliose reds (Odonthalia, Neorhodomela, Palmaria) in lower intertidal. A suffix number matches the bioband code to a particular bioarea.
ALA	Bioband for stand of large or small morph of **ALA**ria spp

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Database Structure

The main database table in the downloadable ***ShoreZone geodatabase*** combines selected data from the SQL databases Unit and UnitBiobandAttributePercent , linked to the spatial data by the unique physical identifier (PHY_IDENT field), an alphanumeric string composed of the identifier for the Region, Area, Unit, and Subunit separated by slashes (e.g. 12/03/0552/0 is Region 12/ Area 03/ Unit 0552/ and Subunit 0)

Geodatabase Table – SZ_UnitwAttributes *(continued)*

Geodatabase Field	Description
SBR_wSuffi	Bioband for **S**oft **BR**own Kelps, including unstalked large-bladed laminarins, in lower intertidal and nearshore subtidal. A suffix number matches the bioband code to a particular bioarea.
SUR	Bioband for **SUR**fgrass (Phyllospadix) in lower intertidal and nearshore subtidal
ZOS	Bioband for **ZOS**tera (Eelgrass) in lower intertidal and subtidal
ALF	Bioband for Dragon Kelp (**AL**aria **F**istulosa) in nearshore subtidal
MAC	Bioband for Giant Kelp (**MAC**rocystis integrifolia) in nearshore subtidal
NER	Bioband for Bull Kelp (**NER**eocystis luetkeana) in nearshore subtidal
CHB_wSuffi	Bioband for Dark Brown Kelps, including stalked bladed dark **CH**ocolate-**B**rown kelps in lower intertidal and nearshore subtidal. A suffix number matches the bioband code to a particular bioarea.
MUS	Bioband for California **MUS**sel/gooseneck barnacle assemblage (Mytilus californianus/Pollicipes polymerus) in mid-intertidal
URC	Bioband for **URC**hin Barrens (Strongylocentrotus franciscanus) in nearshore subtidal
HAL	Bioband for Bleached Red Algae, including mixed filamentous and foliose reds (Palmaria, Odonthalia, **HAL**osaccion) in mid-intertidal
RED	Bioband for **RED** Algae, including mixed filamentous and foliose reds (Odonthalia, Neorhodomela, Palmaria) in lower intertidal
SBR	Bioband for **S**oft **BR**own Kelps, including unstalked large-bladed laminarins, in lower intertidal and nearshore subtidal
CHB	Bioband for Dark Brown Kelps, including stalked bladed dark **CH**ocolate-**B**rown kelps in lower intertidal and nearshore subtidal
TUN	Bioband for **TUN**dra vegetation, in uppermost supratidal and splash zone
BFM	Bioband for **B**io**F**il**M**s
AMM	Bioband for European beach Grass (**AMM**ophila spp.)
CAL	Bioband for Mudflat Shrimp
MAG	Bioband for High Grass Meadow
MSH	Bioband for Shrub Meadow
OYS	Bioband for **OYS**ters
TRI	Bioband for Salt Marsh (Oregon & Washington state) **TRI**glochin maritima
DEN	Bioband for Sand Dollars (**DEN**draster excentricus)
GCA	Bioband for Graceful Red Weed (**GRA**cilaria spp.)
SAL	Bioband for **SAL**t Marsh (BC & Washington State)

Geodatabase Field	Description
SAR	Bioband for Japanese weed (**SAR**gassum muticum)
SPA	Bioband for **SPA**rtina spp.
BBgp_SaltM	Bioband Group: Saltmarsh Biobands
BBgp_Upper	Bioband Group: Upper Intertidal Biota Biobands
BBgp_Lower	Bioband Group: Lower Intertidal Biota Biobands
BBgp_Seagr	Bioband Group: Seagrass Biobands
BBgp_Canop	Bioband Group: Canopy-forming sub-tidal Kelp Biobands
TEVE	Bioband for non-specific **TE**rrestrial **VE**getation existing in the supratidal zone that does not fit into any other more specific supratidal bioband.
TUND	Bioband for **TUND**ra vegetation, in uppermost supratidal and splash zone.
TRSH	Bioband for non-specific **TR**ees and **SH**rubs in the supratidal zone
DETR	Bioband for **DE**ciduous **TR**ees in the supratidal zone.
COTR	Bioband for **CO**niferous **TRe**es in the supratidal zone.
SHME	Bioband for **SH**rub **ME**adow: a narrow transition strip created for Oregon SZ.
GRAS	Bioband for non-specific **GRAS**s in the supratidal zone
HIGM	Bioband for **HI**gh **GR**ass meadow: mixed grassy meadow, interfingers with Salt Marsh (TRI) or Sedge (SED) at lower elevation transition. Specific to Oregon SZ.
EUBG	Bioband for **EU**ropean **B**each **G**rass: a non-native species which is displacing native dune grass species. Specific to Oregon SZ.
DUGR	Bioband for **DU**ne **GR**ass: tall grasses observed as clumps continuous on dunes, in logline or on beach berms, in the upper intertidal zone.
SPZO	Bioband for **SP**lash **ZO**ne: non-specific band marking the upper limit of the intertidal zone that does not fit into any more specific splash zone bioband. All bands in the splash zone are recorded by width: Narrow (<1m), Medium (1m-5m) or Wide (>5m)
LICH	Bioband for non-specific **LICH**en band in the supratidal zone that does not fit into any more specific splash zone bioband.
BLLI	Bioband for **BL**ack **LI**chen: visible as a dark stripe on bare rock marking the upper limit of the intertidal zone.
WHLI	Bioband for **WH**ite **LI**chen: visible as a bright white stripe on bare rock marking the upper limit of the intertidal zone.
YELI	Bioband for **YE**llow **LI**chen: visible as bright yellow to dark orange blotches, sometimes forming a stripe, on bare rock.

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Database Structure

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Geodatabase Table – SZ_UnitwAttributes *(continued)*

Geodatabase Field	Description
INVE	Bioband for **INVE**rtebrates: non-specific band of invertebrates that does not fit into any more specific invertebrate bioband
CRUS	Bioband for **CRUS**taceans: non-specific band of crustaceans that does not fit into any more specific bioband
BARN	Bioband for **BARN**acle: visible on bedrock or large boulders.
MUFS	Bioband for Mudflat Shrimp:
MOLL	Bioband for **MOLL**uscs: Non-specific band of molluscs that does not fit into any more specific bioband
BLMU	Bioband for **BL**ue **MU**ssels: Visible on bedrock and on boulder, cobble or gravel beaches. Distinct black patches or bands, either above or below the barnacle band.
CAMU	Bioband for **CA**lifornia **MU**ssels
OYST	Bioband for **OYST**ers
SPON	Bioband for **SPON**ges
CNID	Bioband for **CNID**arians
ANEM	Bioband for **ANEM**ones
ECHI	Bioband for **ECHI**noderms
URBA	Bioband for **UR**chin **BA**rrens
SAND	Bioband for **SAND** dollars
INSV	Bioband for non-specific **IN**tertidal/**SU**btidal Vegetation
WEVE	Bioband for non-specific **WE**tland **VE**getation
SEDG	Bioband for **SEDG**es
SPAR	Bioband for **SPAR**tina
SAMA	Bioband for **SA**lt **MA**rsh
SAMO	Bioband for **SA**lt **M**arsh (**O**regon & Washington)
SAMB	Bioband for **SA**lt **M**arsh (**B**C & Washington)
BIOF	Bioband for **BIOF**ilms

Geodatabase Field	Description
DIAT	Bioband for **DIAT**oms
GRAL	Bioband for **GR**een **AL**gae
REAL	Bioband for **RE**d **AL**gae
CORA	Bioband for **CO**ralline **R**ed **A**lgae
FFRA	Bioband for **F**ilamentous and **F**oliose **R**ed **A**lgae
WILA	Bioband for **WI**nter **LA**vers
BRAL	Bioband for non-specific **BR**own **AL**gae
GRRW	Bioband for **Gr**aceful **R**ed **W**eed
ROVE	Bioband for non-specific **Ro**oted **VE**getation
SURF	Bioband for **SURF**grass
EELG	Bioband for **EELG**rass
BRBA	Bioband for non-specific **BR**own **B**laded **A**lgae
ALAR	Bioband for **ALAR**ia
SOBK	Bioband for **SO**ft **B**rown **K**elps
DBKE	Bioband for **D**ark **B**rown **KE**lps
BRNA	Bioband for **BR**own **N**on-bladed **A**lgae
ROCK	Bioband for **ROCK**weed
SARG	Bioband for **SARG**assum
BRCA	Bioband for **BR**own **C**anopy-forming **A**lgae
DRKE	Bioband for **DR**agon **KE**lp
GIKE	Bioband for **GI**ant **KE**lp
BUKE	Bioband for **BU**ll **KE**lp

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SQL Database Data Dictionary

XShr Forms & Modifiers

ShoreZone Protocol 2017 Table 16

Table 16. Definitions of the Form codes (after Howes et al. 1994). Codes that are crossed out were used in previous ShoreZone mapping but are no longer in use.

A = Anthropogenic

a	pilings, dolphin
b	breakwater
c	log dump
d	derelict shipwreck
f	float
g	groin
h	*shell midden*
i	cable/ pipeline
j	jetty
k	dyke
l	*breached dyke*
m	marina
n	ferry terminal
o	log booms
p	port facility
q	aquaculture
r	boat ramp
s	seawall
t	landfill, tailings
u	*tide gates*
w	wharf
x	outfall or intake
y	intake
z	*beach access*
*	**undefined (comment)**

B = Beach

b	berm (intertidal or supratidal)
c	~~wash-over~~ channel
f	face
i	inclined (no berm)
m	multiple bars / troughs
n	relic ridges, raised
p	plain
r	ridge (single bar; low to mid intertidal)
s	storm ridge (occurs as marine influence; supratidal)
t	low tide terrace
v	thin veneer over rock (also use as modifier)
w	wash-over fan
*	**undefined (comment)**

C = Cliff *(>20º slope)*

stability/geomorphology

	a	active/eroding
	p	passive (vegetated)
	c	cave
Slope	i	inclined (20°-35°)
	s	steep (>35°)
Height	l	low (<5m)
	m	moderate (5-10m)
	h	high (>10m)

modifiers (optional)

f	fan, apron, talus
g	surge channel
t	terraced
~~r~~	~~ramp~~
e	pillar
*	**undefined (comment)**

D = Delta

b	bars
f	fan
l	levee
m	multiple channels
p	plain (no delta, <5°)
s	single channel
*	**undefined (comment)**

E = Dune

b	blowouts
i	irregular
n	relic
o	ponds
r	ridge/swale
p	parabolic
v	veneer
w	vegetated
*	**undefined (comment)**

F = Reef *(no vegetation)*

f	horizontal (<2°)
i	irregular
r	ramp
s	smooth
*	**undefined (comment)**

I = Ice

g	glacier ice
i	non-glacial ice
*	**undefined (comment)**

L = Lagoon

o	open
c	closed
*	**undefined (comment)**

M = ~~Marsh~~ Riparian

c	tidal creek
m	tidal creek complex (multiple branching channels)
d	dead from saltwater inundation
e	levee
f	drowned forest
h	high
l	mid to low (discontinuous)
o	pond
s	brackish, supratidal
t	tidal swamps, shrub/scrub
*	**undefined (comment)**

O = Offshore Island *(not reefs)*

b	barrier
c	chain of islets
t	table shaped
p	pillar/stack
w	whaleback

elevation

l	low (<5m)
m	moderate (5-10m)
h	high (>10m)

P = Platform *(<20º slope)*

f	horizontal **(<5° slope)**
g	surge channel
h	high tide platform
i	irregular
l	low tide platform
r	ramp **(5-19° slope)**
t	terraced
s	smooth
p	tidepool
e	seastack
*	**undefined (comment)**

R = River Channel

a	perennial
i	intermittent
m	multiple channels
s	single channel
*	**undefined (comment)**

T = Tidal Flat

b	bar, ridge
c	tidal channel
e	ebb tidal delta
f	flood tidal delta
l	levee
p	tidepool
s	multiple tidal channels
t	flats
w	plunge pool
*	**undefined (comment)**

U = Tundra

g	ground ice slump
i	inundated
o	isolated thaw ponds
p	plain or level surface
r	ramp
*	**undefined (comment)**

Q = Cultural

a	fish camp
b	boulder alignment
c	canoe run
d	ruins
f	fish-trap
h	house-pit
m	shell-hash midden
p	holding pond
t	clam terrace
v	anthropogenic meadow/root garden
*	undefined

X = Undefined

Return to Forms examples

SQL Database Data Dictionary

XShr Materials & Modifiers

ShoreZone Protocol 2017 Table 18

Table 18. Definitions of the Material codes (after Howes et al. 1994). Codes that are crossed out were used in previous ShoreZone mapping but are no longer in use.

A = Anthropogenic

a	metal (structural)
c	concrete (loose blocks)
d	debris (man-made)
f	fill, undifferentiated mixed
o	concrete (solid cement blocks)
r	rubble, rip rap
t	logs (cut trees)
w	wood (structural)

B = Biogenic

c	coarse shell
f	fine shell hash
g	grass ~~on dunes~~
l	dead trees (fallen, not cut)
o	organic litter
p	peat
t	trees (living)
z	permafrost

C = Clastic

a	angular ~~blocks~~ boulders (25cm – 3m diameter)
b	boulders (rounded, sub-rounded, 25cm – 3m)
c	cobbles (6 cm – 25 cm)
d	diamicton (poorly-sorted sediment containing a range of particles in a mud matrix)
f	fines/mud (mix of silt/clay, <0.0.63 mm diameter)
~~g~~	~~unsorted mix (pebble, cobble, boulder)~~
k	clay (compact, finer than fines/mud, <4 micron diameter)
p	pebbles (0.5 cm to 6 cm)
~~r~~	~~rubble (boulders>1 m diameter)~~
n	**granules (2-5mm diameter)**
s	sand (0.063 to 2 mm diameter)
t	tephra (volcanic pumice and ash)
~~$~~	~~silt (0.0039 to 0.063 mm)~~
x	angular fragments (mix of block/rubble, >3m)
v	sediment veneer (used as modifier)
z	permafrost

I = Ice

i	ice (e.g., ice wedges in permafrost)

R = Bedrock *rock type:*

i	igneous
m	metamorphic
s	sedimentary
v	volcanic

rock structure:

1	bedding
2	jointing
3	massive

U = Undefined

W = Water

f	freshwater
s	marine
u	unknown

Note: The 'Material' descriptor consists of one primary term code, followed by codes for associated modifiers (e.g. Cbc). If only one modifier is used, the material described comprises 75% of the volume of the layer (e.g. Cb); if more than one modifier is used, they are ranked in order of volume.

A surface layer can be described by prefix v for veneer, followed by Material descriptor for the veneer, with a slash (/) over the underlay Material code (e.g. vCs/R).

Return to Materials examples