ShoreZone Summary Report
Nootka Sound Survey Area
February 2022

Prepared for:
Departement of Fisheries and Oceans

Coastal and Ocean Resources
a MER company

ShoreZone

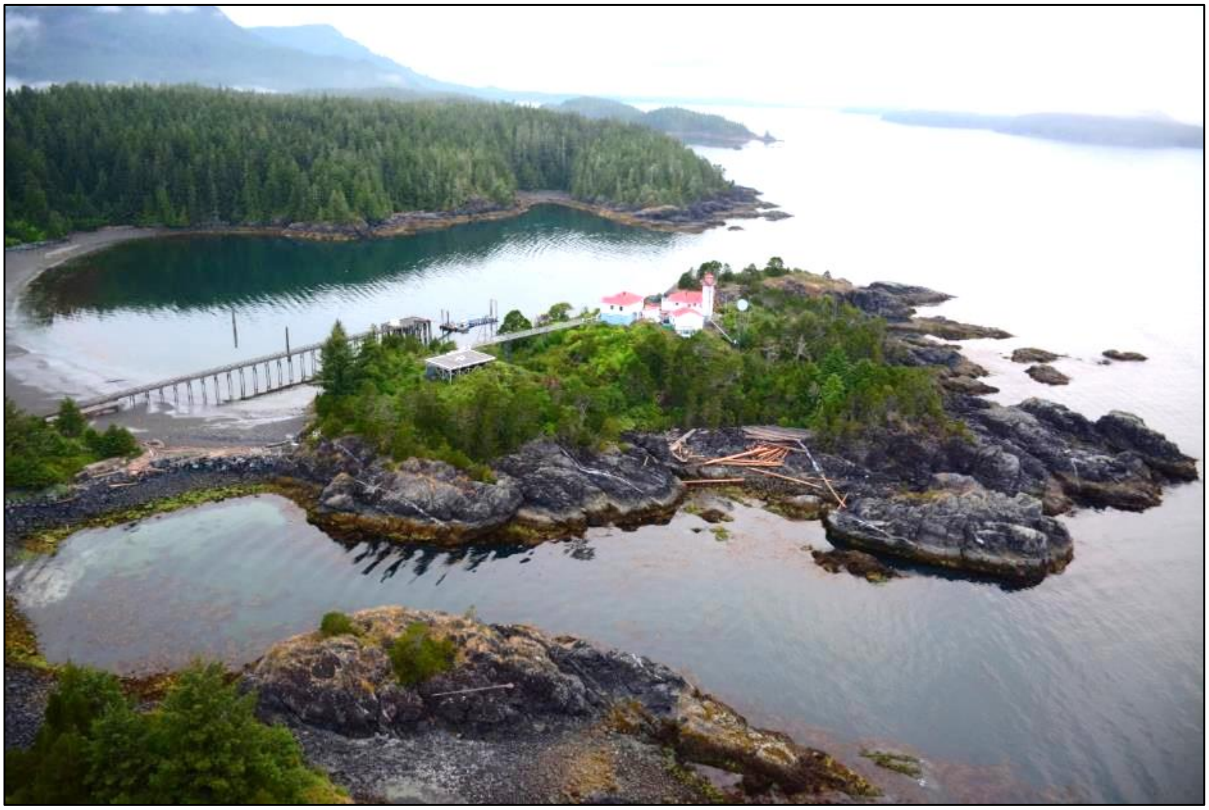
Coastal and Ocean Resources

On the cover:
Burman River, Matchlee Bay
Kendrick Inlet
Bligh Island

Coastal and Ocean Resources

ShoreZone Habitat Mapping Summary Report

Nootka Sound Survey Area



Nootka Lighthouse, San Rafael Island

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Nootka Sound Survey Area Summary

616 km of shoreline mapped

2,779 shoreline units created

Average unit length is **222 m**

38% of the intertidal is classified as **Rock and Sediment-dominated** and **36%** is classed as **Rock**

57% of the shoreline has a high Oil Residence Index value (residence of months to years)

2% of the shoreline has a **Shoreline Modification** of some type

15 biobands were classified in the **intertidal** with **Green Algae, Barnacle** and **Rockweed** being the most common (**over 88%** of units each)

7 biobands were classified in the **supratidal** with **Black Lichen** (**86%** of units) and **Salt Marsh** (**30%** of units) being the most common

8 biobands were classified in the **subtidal** with **Brown Bladed Kelps** being the most common (**24%** of units)

Burdwood Point

Head Bay

Escalante Island

Tahsis Inlet

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1 INTRODUCTION

ShoreZone is an imaging and habitat classification system for the coastal nearshore margin including the shallow subtidal, intertidal shoreline and supratidal fringe. One objective of ShoreZone is to produce a georeferenced, searchable inventory of the physical and biological attributes of coastal habitats. ShoreZone imagery and habitat mapping attributes can provide a useful baseline from which to study change over time, while the attributes mapped (such as shoreline sediments, predicted oil residence and biotic communities) provide an important resource for scientists, managers and responders. The ShoreZone mapping system provides a decision support tool with many potential uses including community planning, facilities citing, conservation planning, research and fisheries management, emergency planning and response, search and rescue, education and habitat modeling.

The ShoreZone system was developed in the 1980s and 1990s to map coastal habitats in British Columbia and Washington State (Howes 2001; Berry *et al.* 2004). In 2001 ShoreZone was implemented in Alaska, beginning with Cook Inlet, Outer Kenai, Katmai, and portions of the Kodiak Archipelago (Harper and Morris 2004). ShoreZone has since expanded to a spatially continuous database of over 122,000 km of coastal Alaska, British Columbia, Washington State and Oregon (see Figure 1). Figure 2 shows the extent of the shoreline mapped around Nootka Sound and is the section of shoreline covered by this summary report.

The ShoreZone imaging surveys conducted around Nootka Sound in July 2021 acquired aerial video and digital still images of the coast during minus tides (zero-meter tide levels and lower). The imagery and associated audio commentary were used to map the physical and biological attributes of the shoreline. The entire shoreline was mapped according the most recent ShoreZone coastal habitat mapping protocol (Cook *et al*. 2017). The purpose of this report is to provide a summary of the physical (Section 2) and biological (Section 3) data imaged and classified in the Nootka Sound survey area. Please see the Acknowledgments section included in this report for the imaging and mapping funding partners in British Columbia.

The length of shoreline mapped is **616 kilometers** in **2,779 along-shore segments** (units), averaging 222 m in length. The digital shoreline used for the ShoreZone habitat mapping was the CHS_Highwaterline_BCalbers.shp.

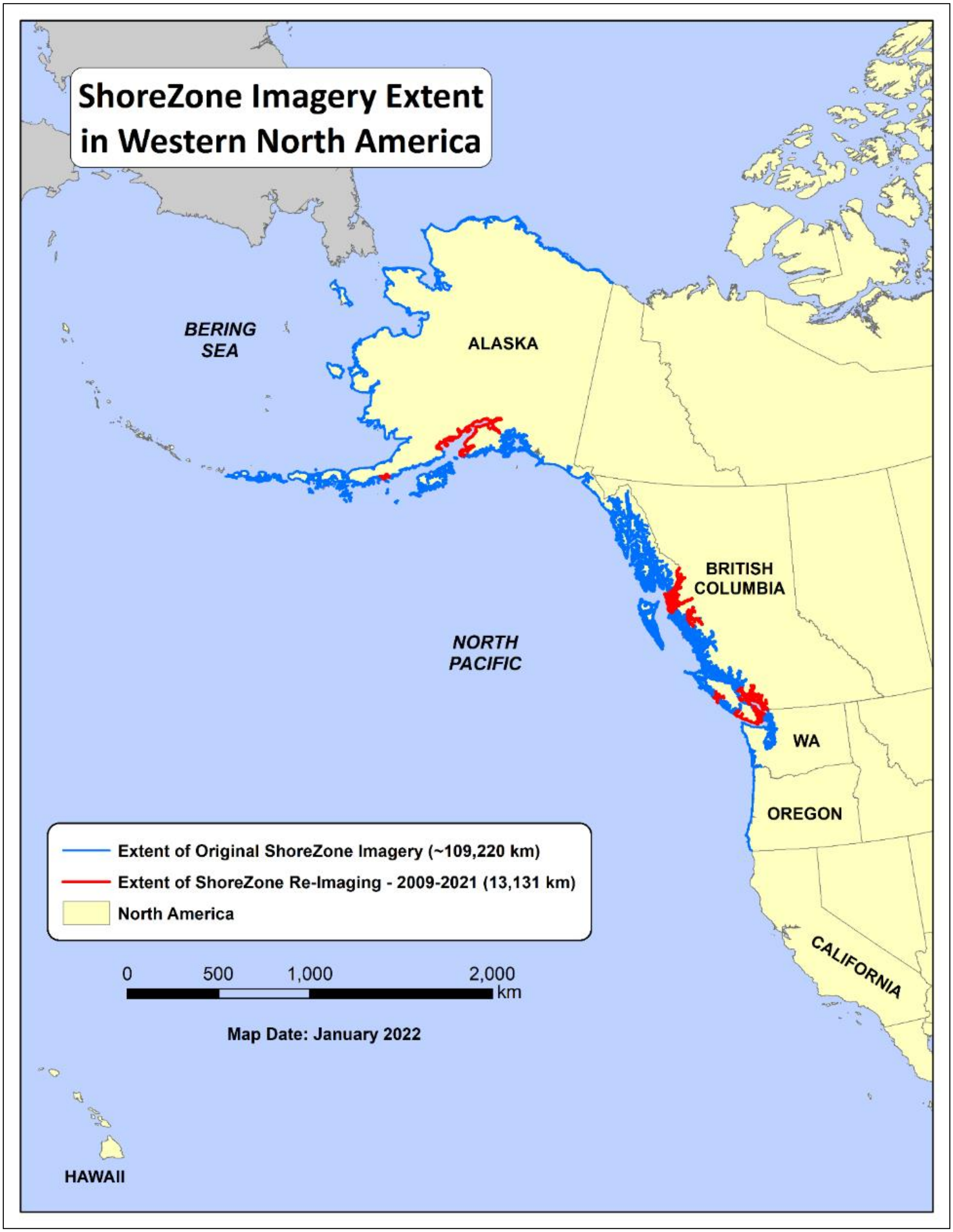

Figure 1. Extent of ShoreZone imagery in Alaska, British Columbia, Washington State and Oregon as of February 2022.

Figure 2. Extent of ShoreZone mapping for Nootka Sound covered in this report.

2 PHYSICAL ATTRIBUTE DATA SUMMARY

2.1 Coastal Class

Figure 3. Map of the Coastal Class categories grouped by type (also known as Shore Type).

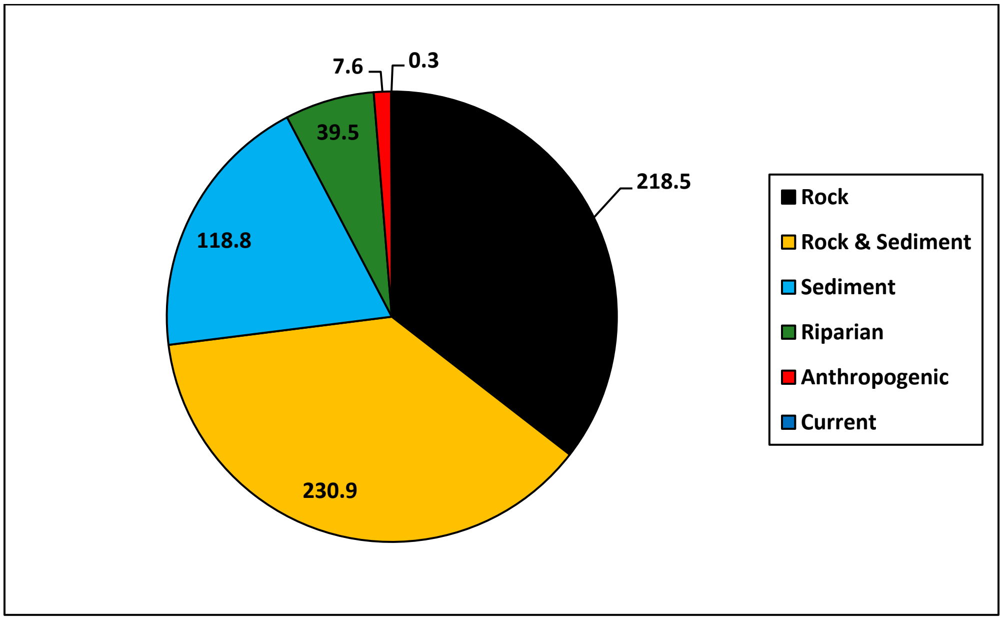

Figure 4. Grouped Coastal Class categories by shoreline length (km).

The Coastal Class is used to define along-shore coastal units based on the dominant process, geomorphic features and other attributes such as substrate size, across-shore width, and slope (Cook *et al*., 2017 after Howes *et al*., 1994). The principal characteristics of each along-shore unit are used to assign one of 39 overall unit classifications. Rock and sediment shorelines (37.5%) were prominent along with Rock shorelines (35.5%) and Sediment shorelines (19.3%) in the Nootka Sound survey area. Riparian, Anthropogenic, and Current shorelines all comprised the rest of the coast (see Figures 3 and 4 for distribution and summary statistics). The description for each Coastal Class category in the survey area is given in Table 1. Photographic examples of the major Coastal Classes mapped in the Nootka Sound survey area are found in Appendix A, Table A-1.

Table 1. Summary of Coastal Classes for the Nootka Sound survey area.

Substrate Type	Shore Type No.	Shore Type Description	Sum of Unit Length (km)	# of Units	% Occurrence (by length)	Cumulative Occurrence (%, km)
Rock	1	Rock Ramp, wide	6	12	1	36% 219 km
	2	Rock Platform, wide	11	37	2	
	3	Rock Cliff	192	846	31	
	4	Rock Ramp, narrow	10	50	2	
Rock & Sediment	6	Ramp w gravel beach, narrow	3	13	1	38% 231 km
	7	Platform w gravel beach, wide	3	6	<1	
	8	Cliff with gravel beach	105	541	17	
	9	Ramp with gravel beach	23	147	4	
	11	Ramp w gravel & sand beach, wide	13	48	2	
	12	Platform with G&S beach, wide	26	65	4	
	13	Cliff with gravel/sand beach	29	213	5	
	14	Ramp with gravel/sand beach	26	189	4	
	16	Ramp w sand beach, wide	2	2	<1	
	17	Platform w sand beach, wide	3	7	<1	
	19	Ramp with sand beach, narrow	<1	1	<1	
Sediment	21	Gravel flat, wide	<1	2	<1	19% 119 km
	22	Gravel beach, narrow	11	83	2	
	24	Sand & gravel flat or fan	58	149	9	
	25	Sand & gravel beach, narrow	43	275	7	
	26	Sand & gravel flat or fan	1	1	<1	
	27	Sand beach	1	2	<1	
	28	Sand flat	4.4	9	1	
Organics	31	Organics/Estuarine	40	41	6	1% 8 km
Man-made	32	Man-made, permeable	7	37	1	1% 8 km
	33	Man-made, impermeable	1	1	<1	
Current	34	Channel	<1	2	<1	<1% <1 km
Totals:			***616***	***2,779***	***100***	***100%***

Note: This table only includes Coastal Classes observed in the survey area.

2.2 Environmental Sensitivity Index (ESI)

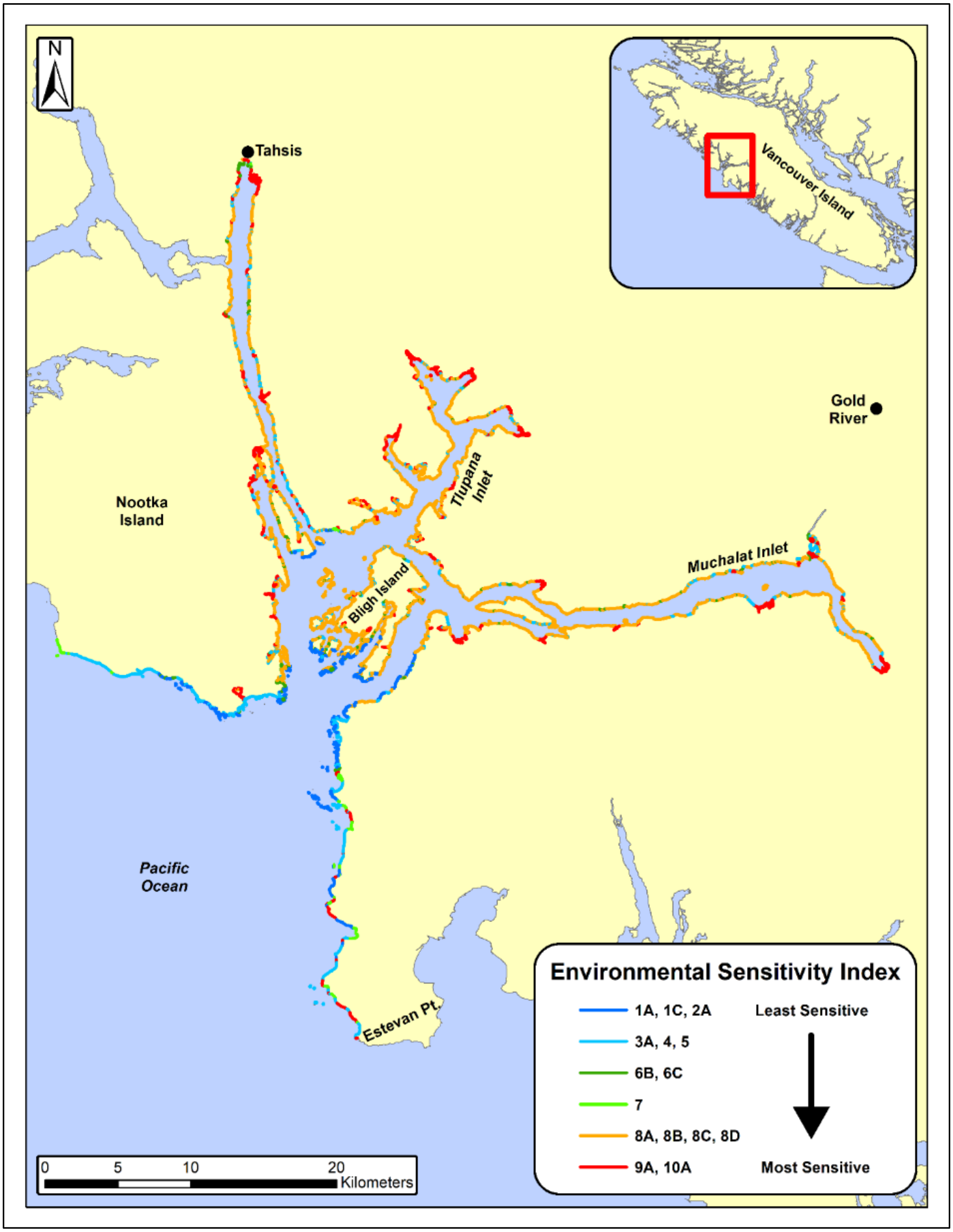

Figure 5. Distribution of the grouped ESI categories from least to most sensitive to oiling.

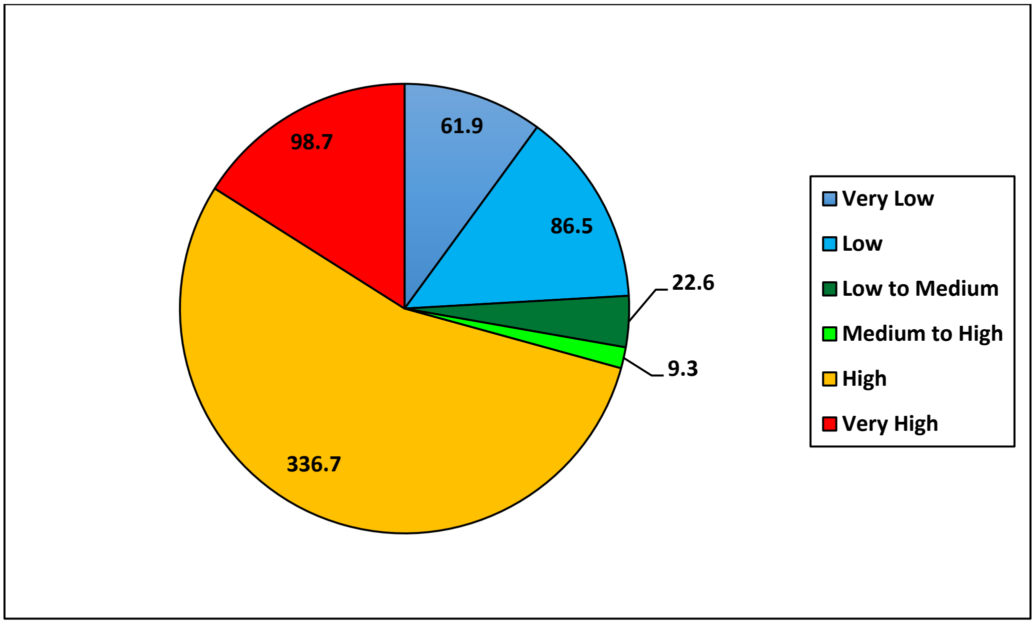

Figure 6. Grouped most sensitive ESI categories by shoreline length (km).

The NOAA Environmental Sensitivity Index (ESI) is a shoreline classification system developed to characterize coastal regions based on sensitivity to potential oil spills (Petersen *et al*., 2002). The ESI system uses wave exposure and principal substrate type to assign a rank of 1 to 10 (with 10 being the most sensitive to oil) to alongshore units. Up to three ESI numbers can be assigned to each ShoreZone unit (high, mid and low intertidal) if applicable. The highest ESI number for each unit, which is the most sensitive, is used in this analysis.

The majority of the Nootka Sound coastline is represented by the grouped High and Very High categories (70.7% of shoreline length). These sections of the shoreline have a potentially high sensitivity to oil. At the other end of the spectrum, only 24.0% of the shoreline was mapped with a potentially low sensitivity to oil (Figures 5 and 6). The summary of Coastal Class by ESI class can be seen in Table 2.

Table 2. Summary of Coastal Classes by ESI Class for the Nootka Sound survey area.

Environmental Sensitivity Index (ESI)		Sum of Unit Length (km)	# of Units	% of Total Shoreline Length
No.	**Description**			
1A	Exposed rocky shores; Exposed rocky banks	46	140	7
1C	Exposed rocky cliffs with boulder talus base	1	5	<1
2A	Exposed wave-cut platforms in bedrock, mud, or clay	16	56	3
3A	Fine- to medium-grained sand beaches	5	10	1
4	Coarse-grained sand beaches	6	14	1
5	Mixed sand and gravel beaches	76	359	12
6B	Gravel beaches (cobbles and boulders)	19	124	3
6C	Rip rap	4	22	1
7	Exposed tidal flats	9	27	2
8A	Sheltered scarps in bedrock, mud, or clay; sheltered rocky shores (impermeable)	189	997	31
8B	Sheltered, solid, man-made structures; sheltered rocky shores (permeable)	44	244	7
8C	Sheltered Rip Rap	3	17	<1
8D	Sheltered rocky rubble shores	101	566	16
9A	Sheltered tidal flats	13	48	2
10A	Salt- and brackish-water marshes	85	150	14
	Totals:	***616***	***2,779***	***100***

Note: ESI Classes not observed in this survey area were not included in the table.

2.3 Oil Residence Index (ORI)

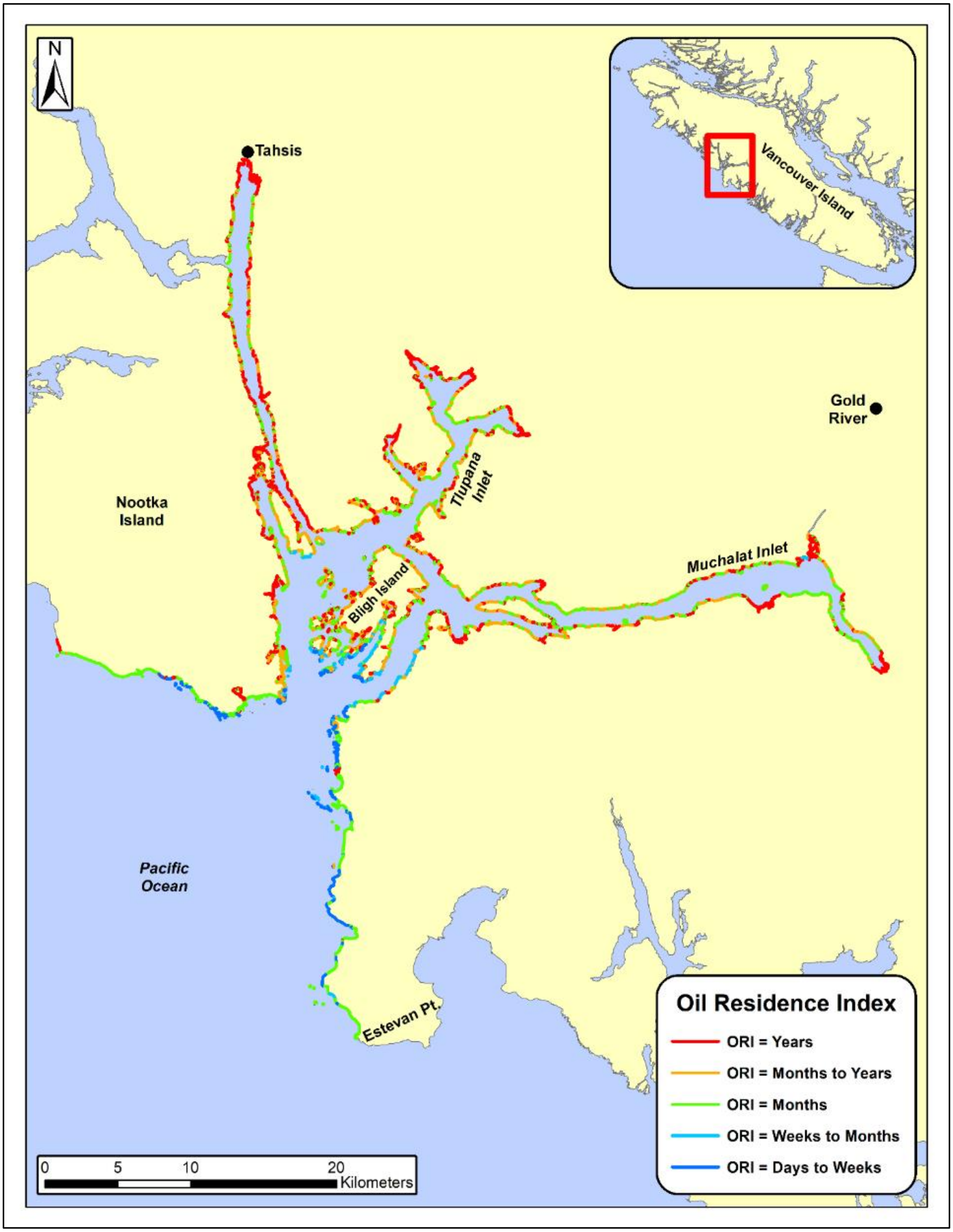

Figure 7. Distribution of the Oil Residence Index (ORI) categories.

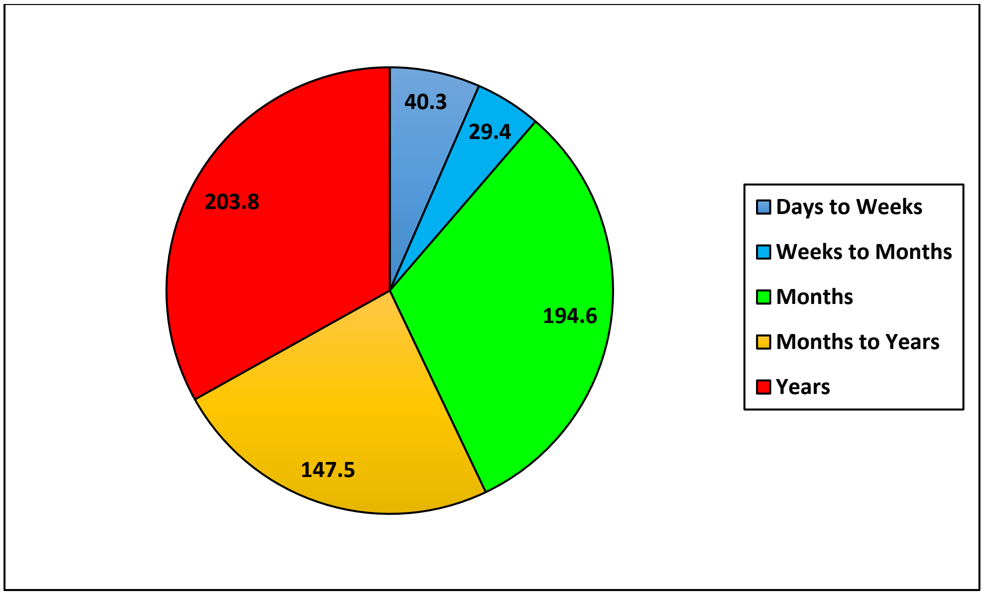

Figure 8. Oil Residence Index (ORI) categories by shoreline length (km).

The Oil Residence Index (ORI) is a rating between 1 and 5 with a value of 1 indicating a relatively short oil residence (days to weeks) while a value of 5 reflects potentially very long oil residence times (years). An ORI value is applied to each alongshore unit and to each across-shore component based on sediment texture and wave exposure (Cook *et al*., 2017). The ShoreZone ORI was developed by Dr. John Harper based on his many years of experience with cleaning up oiled shorelines, starting with the Exxon Valdez spill in Prince William Sound in Alaska. Lower wave exposures and mobile sediments lead to higher ORI values for 57.1% of the shore segments in the Nootka Sound survey area, indicating oil residence times are on the order of months to years (see Figures 7 and 8 for distribution and summary statistics).

2.4 ShoreZone Coastal Vulnerability

2.4.1 Flood Zone Width

Figure 9. Distribution of the Coastal Vulnerability Flooding Class.

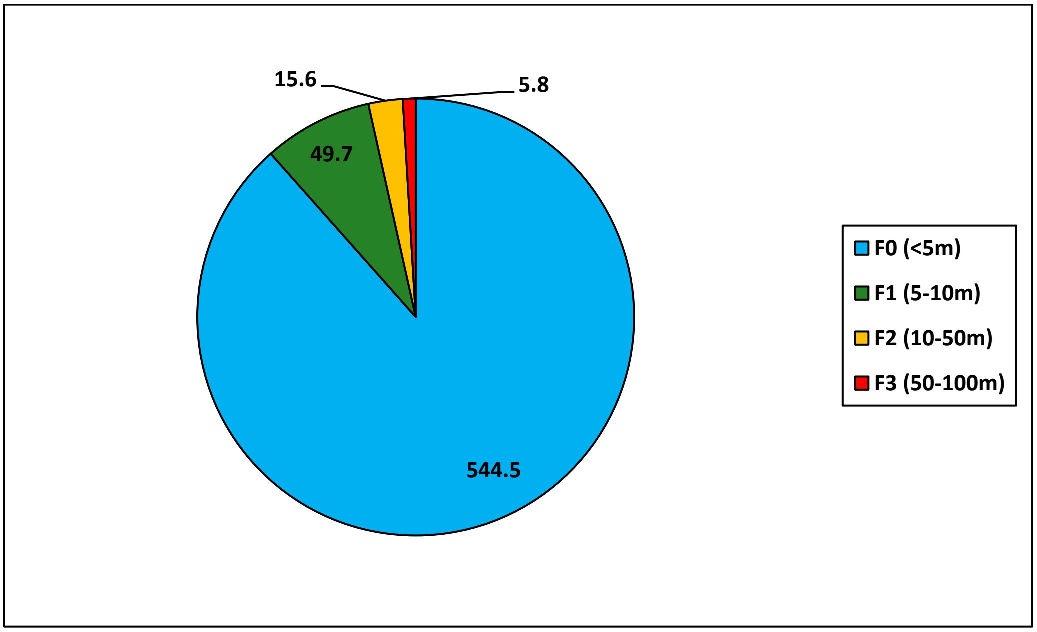

Figure 10. Flooding Class categories by shoreline length (km).

The Coastal Vulnerability Module (CVM) includes a classification of flooding sensitivity based on the across shore profile and photographic evidence of historical flooding such as an unambiguous marine debris line. The Flooding Class is an estimate of vulnerability to inundation of the terrestrial area beyond the supratidal. The distance to the debris line is measured and used to classify the flooding potential. Flat shorelines with very low gradients that show evidence of historical flooding have a higher risk of being inundated by storm surges. Potential for damage due to flooding is generally low in the Nootka Sound study area, with 88.4% of the shoreline at a low risk of flooding <5m from the Mean High Waterline (MHW) (see Figures 9 and 10 for distribution and summary statistics). The flooding class is a parameter of the Coastal Vulnerability Index (see Page 16).

2.4.2 Coastal Vulnerability Observations

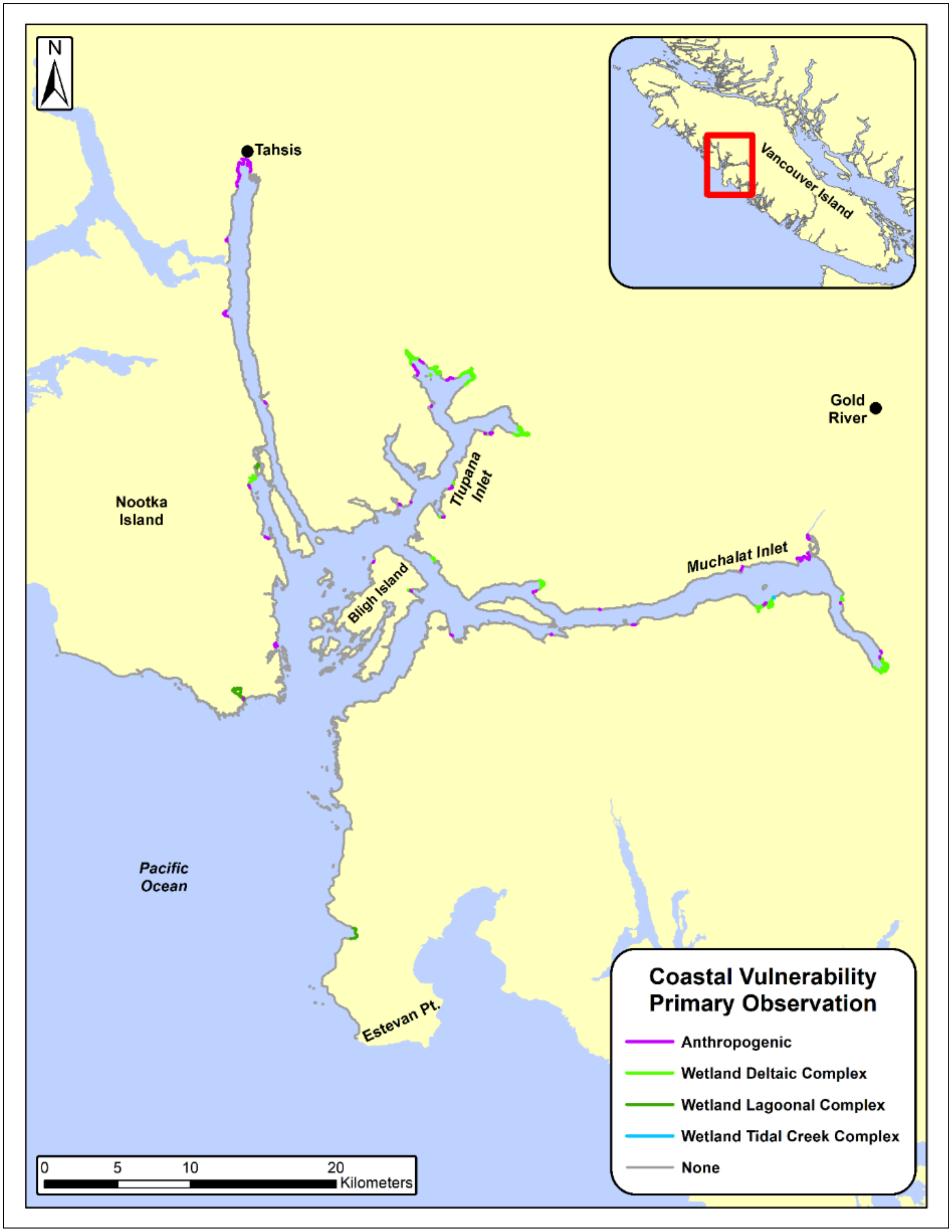

Figure 11. Distribution of the Coastal Vulnerability Observations categories.

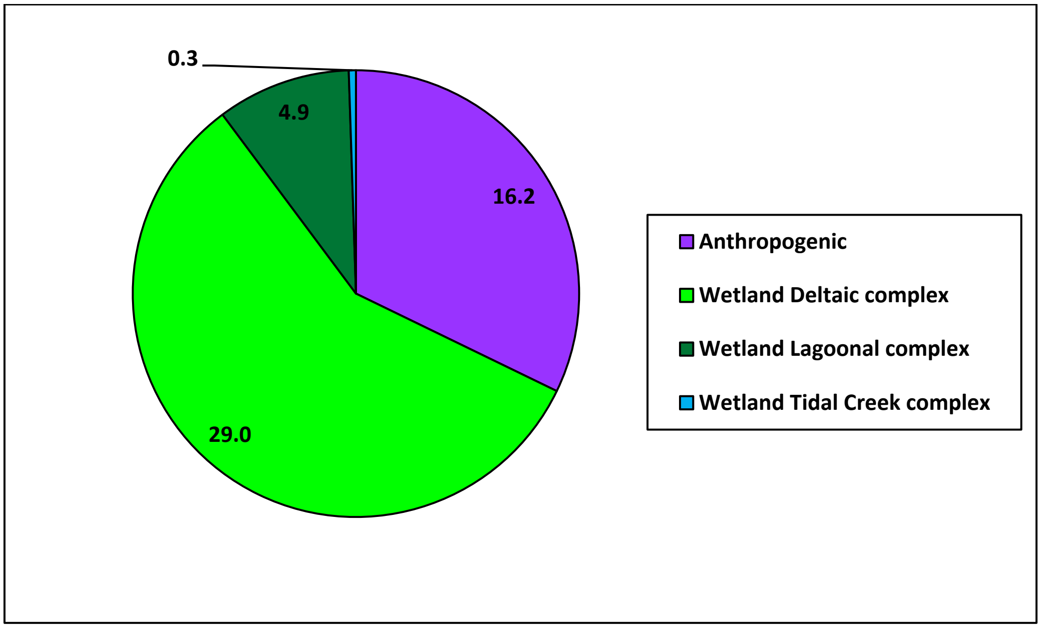

Figure 12. Coastal Vulnerability Observations categories by shoreline length (km). Category 'None' not shown.

The Coastal Vulnerability Observations are features important for estimating the frequency and extent of coastal inundation. In the Nootka Sound survey area, apart from the 'None' category, the majority of observations were from the Wetland Deltaic complex category with 57.6 km. The subsequent category was the Anthropogenic category with 32.2 km (see Figures 11 and 12 for distribution and summary statistics). With regards to the Anthropogenic category, it is important to point out that these areas are not necessarily areas of vulnerability, but areas potentially impacted.

2.4.3 Coastal Vulnerability Index

In the 2017 ShoreZone protocol (Cook *et al*., 2017), the methods of Thieler and Hammer-Klose (2000) (http://woodshole.er.usgs.gov/project-pages/cvi/) were adapted to calculate a Coastal Vulnerability Index (CVI) using five ShoreZone attributes: Coastal Class, Max Tide Range, Shoreline Erosion index, Flood Zone Width, and Significant Wave Height. When we first attempted to calculate the CVI for the portion of the shoreline funded in the Eastern Aleutians by the Oil Spill Response Institute, it did not match the observations of the mappers as it appeared to rank too much of the rocky, steep shoreline as High or Very High in terms of vulnerability to sea level rise. After analysis of the data, we determined this was due to the use of a relative ranking system where the values from the study area were only compared to each other to determine the CVI rank. To resolve this issue, we calculated an absolute value for each CVI rank which is described in the latest version of the protocol (Cook *et al*., 2017). The distribution of ranks in Nootka Sound is shown in Figure 13. Due to the protected and generally rocky nature of the coastline, few units in the survey area were ranked Moderate in terms of vulnerability to sea level rise, while the rest were ranked as Low. The Coastal Class and Wave Exposure were likely the driving factors behind the rankings in this survey area.

Figure 13. Distribution of Coastal Vulnerability index ranks in Nootka Sound.

2.5 Anthropogenic Shore Modifications

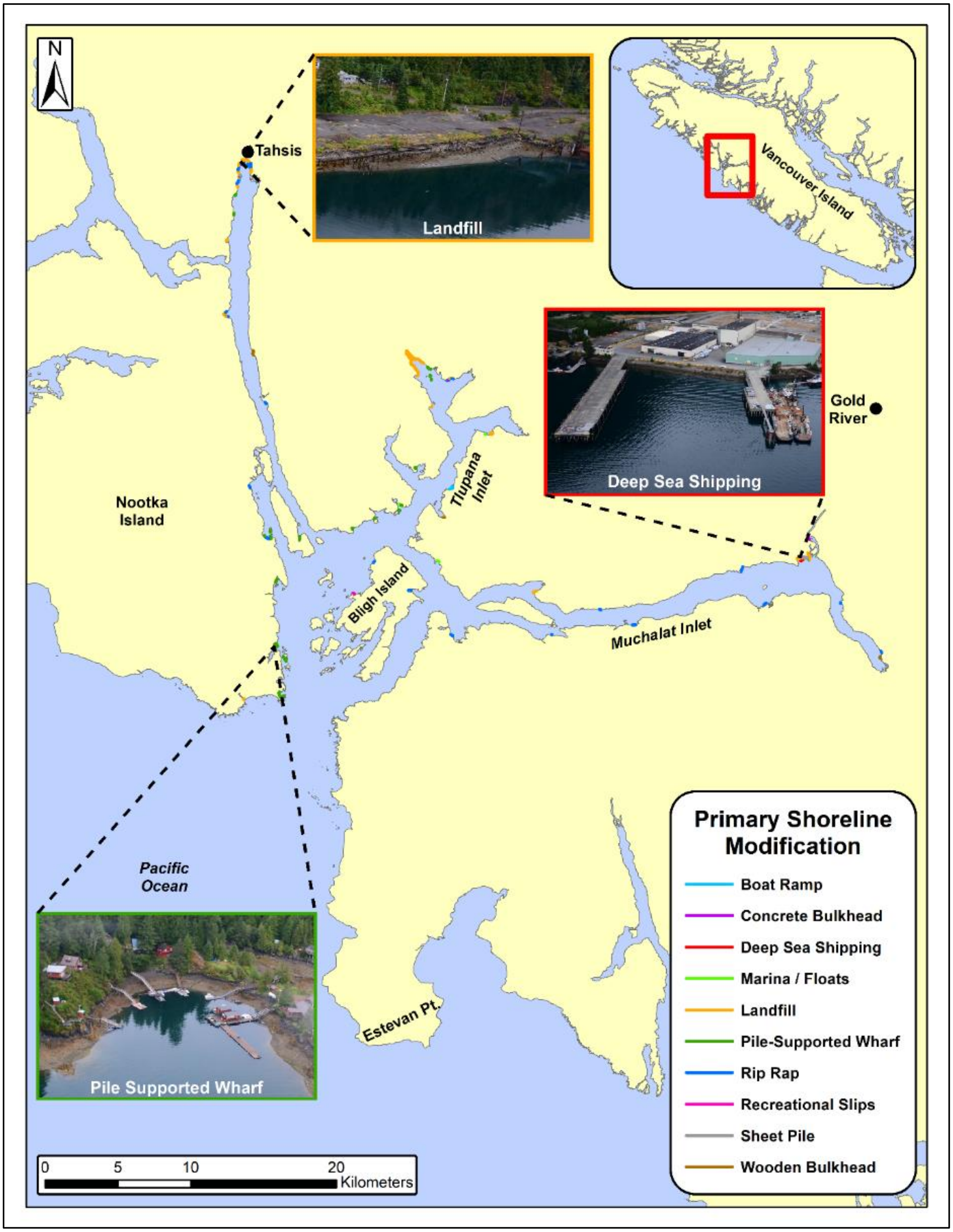

Figure 14. Distribution of types of the primary Shore Modifications. There may be other shore modifications in any given unit. That data would be found in the Shore Modifications table in the geodatabase.

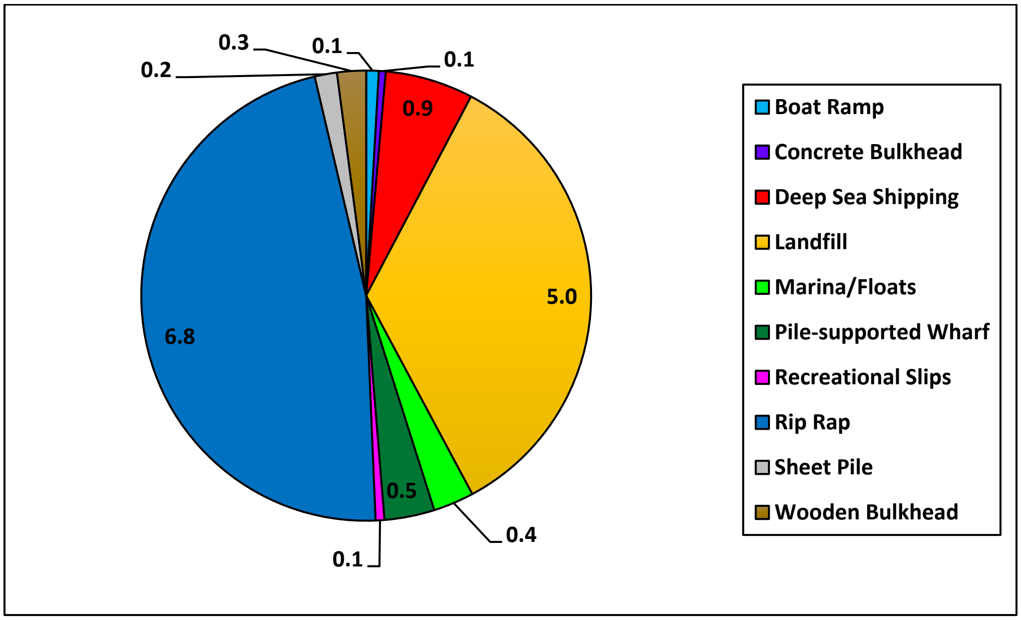

Figure 15. Shore Modifications by estimated shoreline length (km) of each modification type.

The Shoreline Modification attribute provides a thorough catalogue of the specific types of anthropogenic modification in each unit (Cook *et al*., 2017). This includes many modifications within a given unit. For example, if both riprap and a pile-supported wharf occur, both are catalogued in the appropriate zone of that unit with an estimate of the alongshore length of the unit that modification covers. A total of 2.4% of the shoreline (taking the estimated length of that modification within the unit into account) exhibits shore modifications in the Nootka Sound study area (Figure 15). Rip Rap was the most commonly recorded observation (47.0%) with Landfill (34.5%) and Deep-Sea Shipping (6.3%) rounding out the top three shoreline modifications along the coast. The associated map (Figure 14) shows the distribution of primary shore modifications, though it should be noted that any given modification is possible along the entire length of the indicated shore unit. The Geodatabase delivered with this report displays each shore modification with a specific length category (meters) along the shoreline pertaining to each unit as well as the specific zone (supratidal or intertidal) the modification occurs in.

3 BIOLOGICAL ATTRIBUTE DATA SUMMARY

3.1 Biobands

Biobands represent assemblages of coastal biota found on the shoreline at characteristic wave exposures, substrate conditions and typical across-shore elevations. Biobands are spatially distinct, with alongshore and across-shore patterns of color and texture that are visible in aerial imagery (see Appendix A, Table A-2 for photographic examples of the common biobands from the Nootka Sound survey area). Full descriptions of all biobands, including indicator and associated species, can be found in the ShoreZone protocol (Cook *et al*., 2017).

There are several metrics used for the biobands within each unit. All biobands are classified as Patchy (in <50% of the length of the unit) or Continuous (in >50% of the length of the unit). The zone in which a bioband was observed determines how the bioband is further described. For example, biobands found in the supratidal (A Zone) and subtidal (C Zone) are described by percent of alongshore length of unit and a width category. The intertidal (B zone) biobands are described by percent of alongshore length of the unit and percent cover of the zone. All metrics are described in the 2017 ShoreZone protocol (Cook *et al*. 2017). The data presented in this report uses Patchy and Continuous as metrics as that is consistent across all biobands.

Biobands mapped in the Nootka Sound survey area are summarized in Tables 3 and 4. The most commonly occurring intertidal biobands in the survey area was Green Algae in 92% of units as well as Rockweed and Barnacle which were found in 89% and 88% of units, respectively. The most common supratidal bioband was Black Lichen, occurring in 86% of the units, while the supratidal/high intertidal Salt Marsh bioband was found in 30% of units. The most common low intertidal/subtidal biobands were Brown Bladed Kelps (24%), Eelgrass (23%) and Sargassum (17%), although it should be noted that some of the Brown Bladed Kelps may include Sargassum. Distribution maps, statistics and observations about some specific biobands are found in the following pages. The Echinoderm bioband, consisting exclusively of Pisaster ochraceous seastars, was noted in 24% of units, which is an unusually high abundance. This may be an indication that the population in this area is starting to recover from the effects of sea star wasting disease.

Table 3. Bioband abundances for non-splash zone biobands mapped on the Sunshine Coast.

Bioband		Patchy		Continuous		Total (km)	% of Total Mapped
Name	Code	(km)	%	(km)	%		
Trees and Shrubs	TRSH	2	<1	<1	<1	2	<1
Dune Grass	DUGR	85	14	24	4	109	18
Salt Marsh	SAMB	81	13	102	17	182	30
Barnacle	BARN	59	10	484	79	543	88
Rockweed	ROCK	150	24	399	65	549	89
Green Algae	GRAL	237	39	327	53	564	92
Oysters	OYST	53	9	32	5	85	14
Blue Mussel	BLMU	148	24	128	21	275	45
Echinoderms	ECHI	150	24	0	0	150	24
Bleached Red Algae	BRAL	21	3	18	3	40	6
Filamentous and Foliose Red Algae	FFRA	132	21	327	53	459	75
Coralline Red Algae	CORA	29	5	4	1	33	5
Anemones	ANEM	2	<1	<1	<1	2	<1
Brown Bladed Kelps	BRBA	66	11	84	14	150	24
Sargassum	SARG	62	10	41	7	103	17
Eelgrass	EELG	101	16	42	7	144	23
Surfgrass	SURF	42	7	53	9	94	15
Urchin Barrens	URBA	<1	<1	0	0	<1	<1
Bull Kelp	BUKE	37	6	21	3	58	9
Giant Kelp	GIKE	34	5	60	10	94	15

Table 4. Bioband abundances for splash zone biobands mapped on the Sunshine Coast.

Bioband		Narrow (<1m)		Medium (1-5m)		Wide (>5m)		Total (km)	% of Total Mapped
Name	Code	(km)	%	(km)	%	(km)	%		
Black Lichen	BLLI	277	45	232	38	19	3	528	86
Splash Zone	SPZO	8	1	2	<1	<1	<1	11	2
White Lichen	WHLI	127	21	22	4	1	0	149	24
Yellow Lichen	YELI	0	0	<1	<1	<1	<1	<1	<1

The Oyster bioband tends to be unusual in BC and is generally only seen where concentrations of the introduced Pacific Oyster (*Magallana gigas*) are high enough that it is visible from the aerial imagery. This was generally noted to occur in areas where there is or has been oyster aquaculture in Nootka Sound, with a concentration of observations in Tlupana Inlet, which does have an active aquaculture lease within it (Nootka Resource Board 2001). Figures 16 shows a graph of the proportion of the shoreline with the Oyster bioband and Figure 17 for a photographic example. A map of the distribution of the Oyster bioband is in Figure 18.

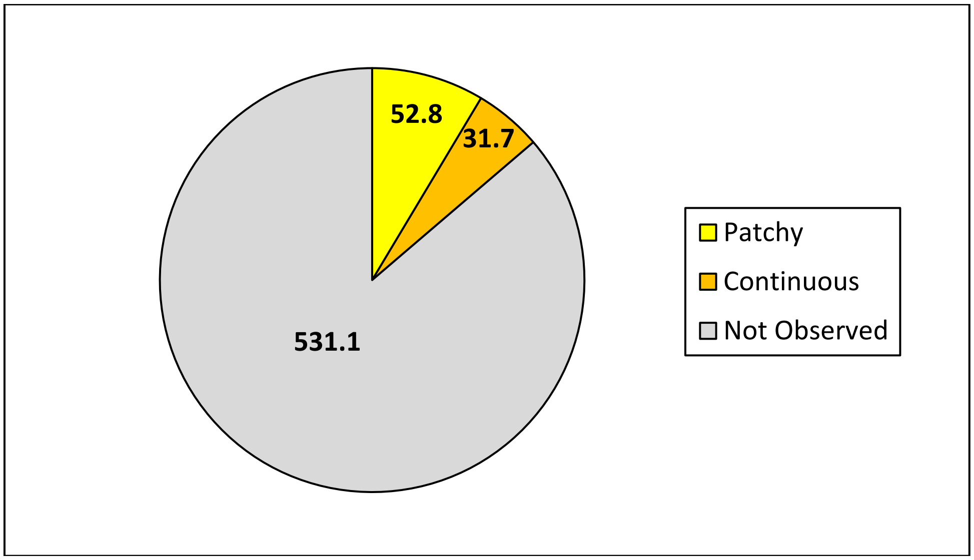

Figure 16. Proportion of shoreline length (km) of the intertidal Oyster (OYST) bioband by category.

Figure 17. Photo of Oyster bioband (discreet white dots) in Nesook Bay in Tlupana Inlet (bc21_nk_03466).

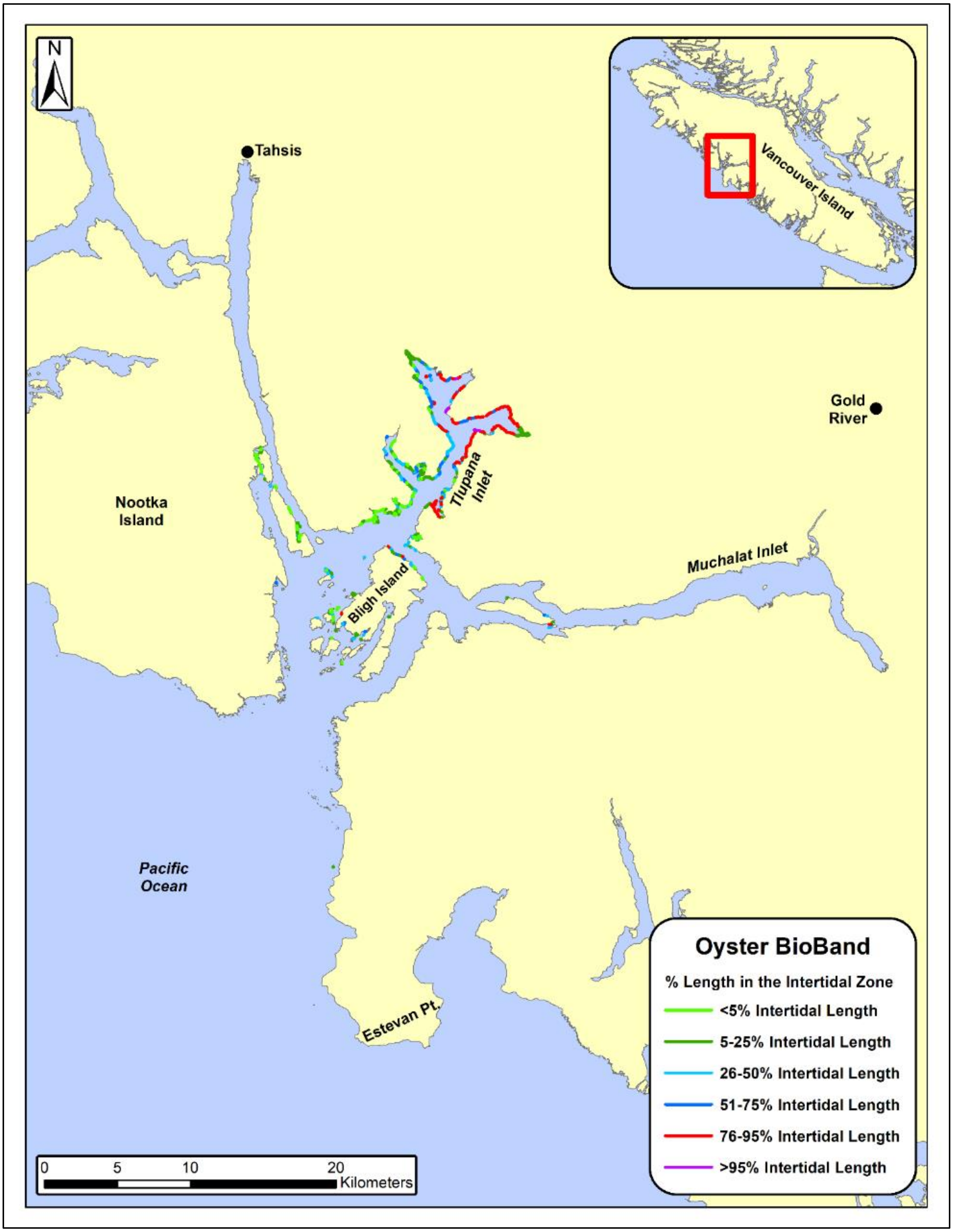

Figure 18. Distribution of the Oyster (OYST) bioband in Nootka Sound.

Two seagrass biobands were observed in Nootka Sound: Eelgrass (EELG) and Surfgrass (SURF). Seagrasses are an important component of coastal ecosystems with Eelgrass beds forming in sandy substrate at Semi-Protected and lower exposures while Surfgrass generally attaches to hard substrate on Semi-Protected or Semi-Exposed beaches. Eelgrass beds are nursery habitats for juvenile fish and also sequester and store atmospheric carbon (called ‘Blue Carbon’) in addition to other valuable ecosystem services. See Figures 19 and 20 for statistics on the distribution of the individual seagrass biobands and a distribution map for both in Figure 21.

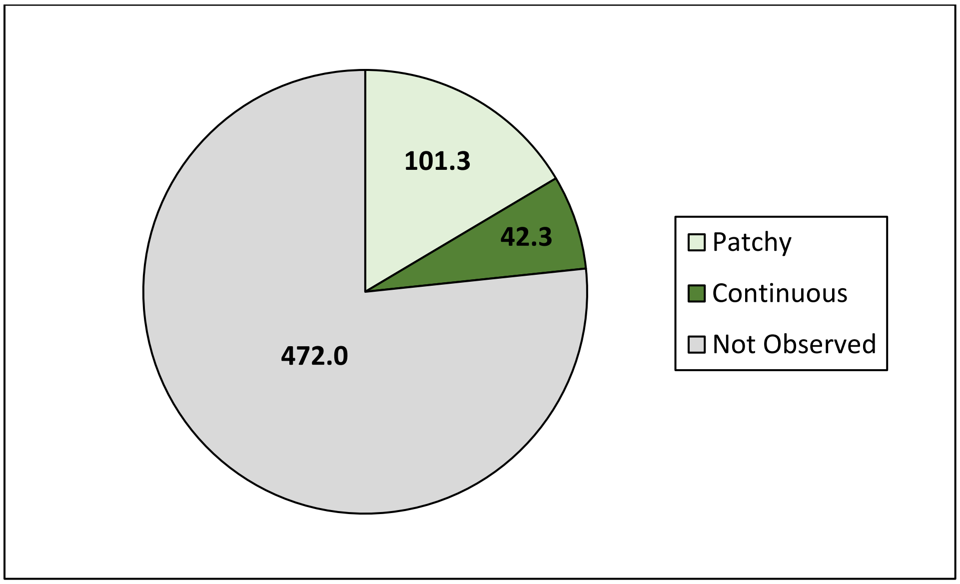

Figure 19. Distribution of the intertidal/subtidal Eelgrass bioband by shoreline length (km).

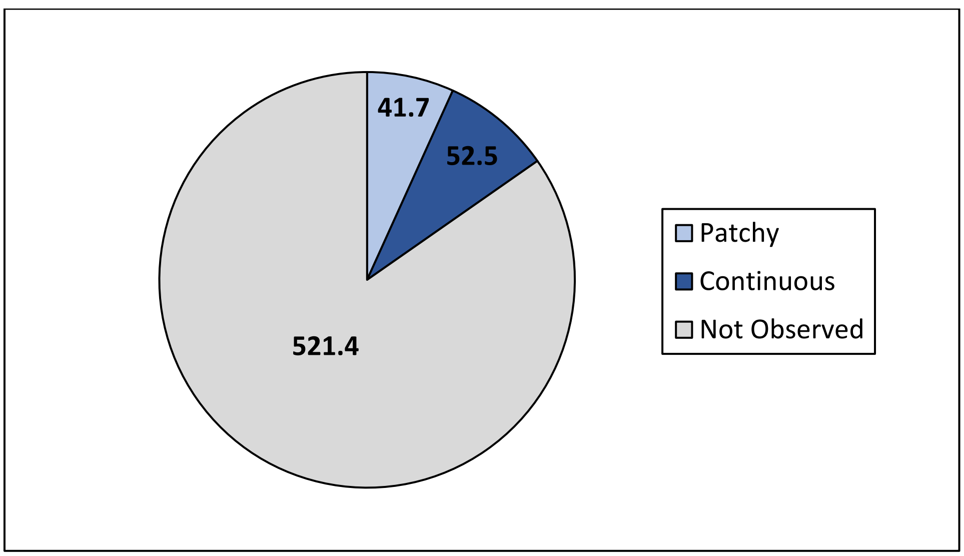

Figure 20. Distribution of the intertidal/subtidal Surfgrass bioband by shoreline length (km).

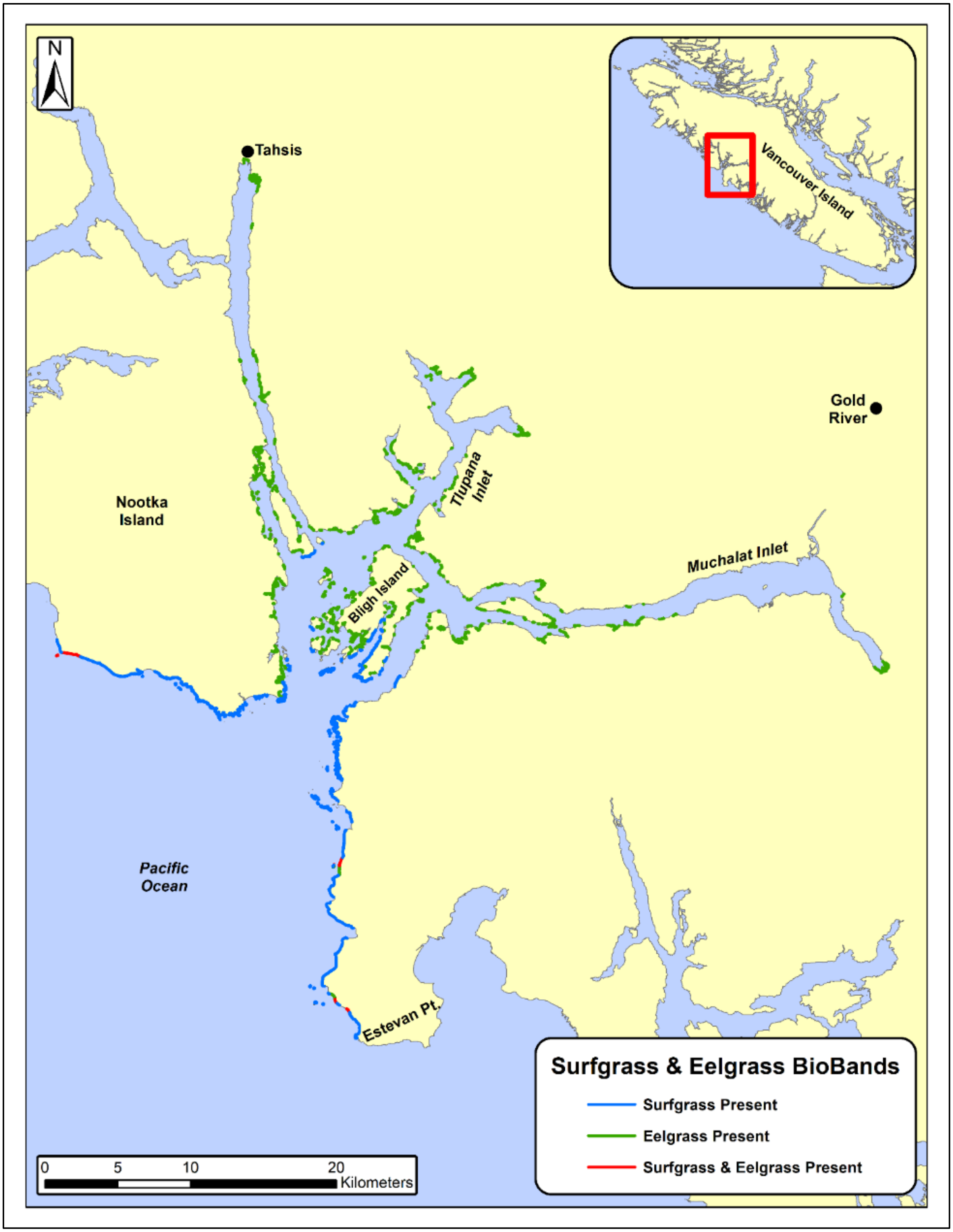

Figure 21. Distribution of the Surfgrass (SURF) and Eelgrass (EELG) biobands in Nootka Sound.

Canopy kelps form valuable habitat for fish, invertebrates and other algae and are an important part of a healthy coastline and healthy fisheries. Bull Kelp (*Nereocystis leutkeana*) and Giant Kelp (*Macrocystis pyrifera*) were both noted in the survey area, although they were not widespread and were generally absent from the more protected, inner coastline except where tidal currents are likely more pronounced. See Figures 22 and 23 for statistics on the distribution of the individual seagrass biobands and a distribution map for both in Figure 24.

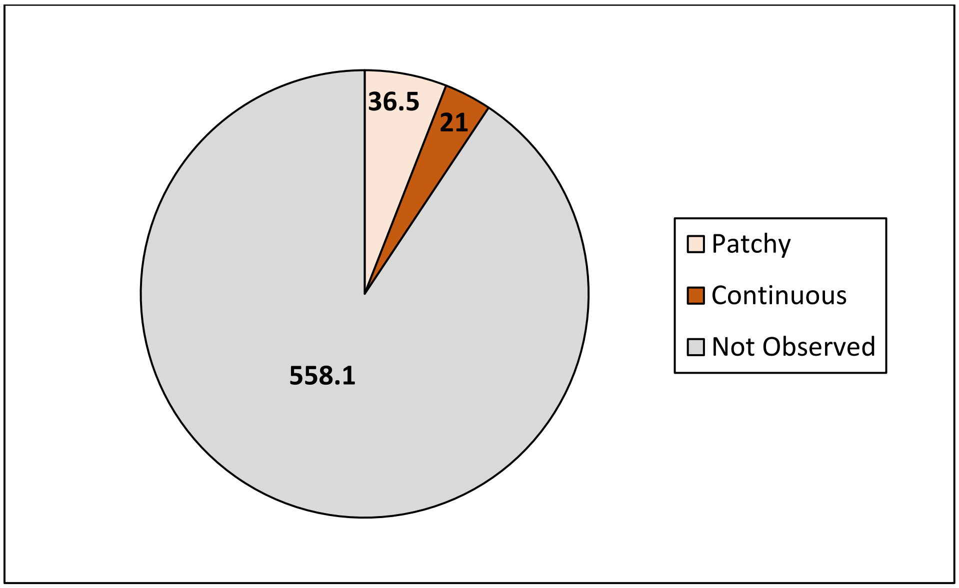

Figure 22. Distribution of the Bull Kelp (BUKE) bioband by shoreline length (km).

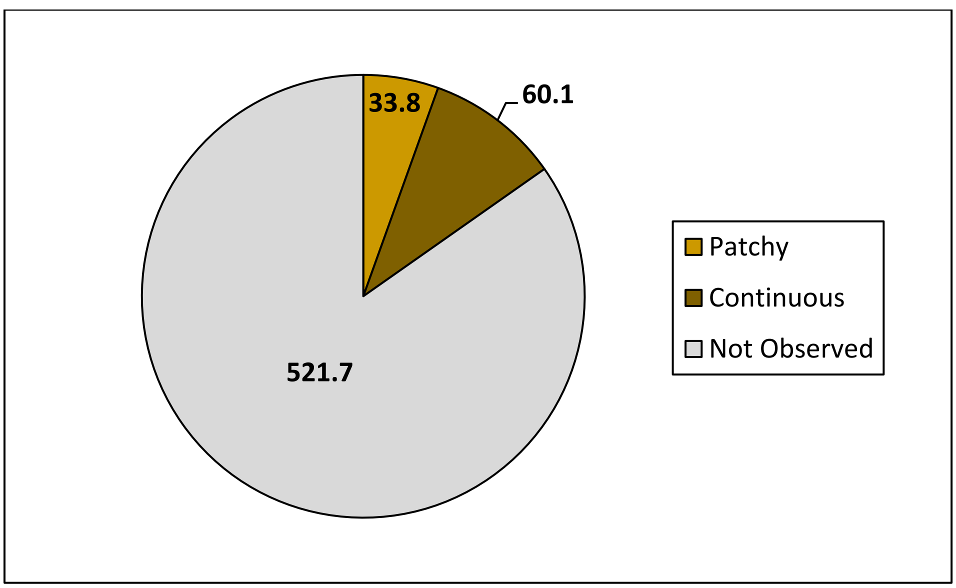

Figure 23. Distribution of the Giant Kelp (GIKE) bioband by shoreline length (km).

Figure 24. Distribution of the Bull Kelp (BUKE) and Giant Kelp (GIKE) biobands in Nootka Sound.

Sargassum and Bladed Brown Algae were the two kelp biobands observed on the Sunshine Coast. See Figure 25 for statistics on the distribution of Sargassum with a distribution map in Figure 26. The Sargassum bioband is defined by the presence of Japanese Wireweed (*Sargassum muticum*). The Sargassum band was observed in 17% of the units although it is possible much of the Brown Bladed Kelp that was recorded was actually Sargassum (or other kelps mixed with Sargassum) as there were areas where browns could be observed in the subtidal but not enough detail could be seen to determine if Sargassum was present. It can therefore be assumed it was more widely distributed than indicated by the ShoreZone mapping. There is significant literature available on the impacts of introduced Japanese Wireweed with somewhat conflicting conclusions, as some studies find negative impacts on native species (DeWreede and Vandermeulen, 1988; Britton-Simmons, 2004) and some finding little to no impacts (Sanchez and Fernandez, 2005; Olabarria *et al*., 2009). White (2003) studied the effects of *S. muticum* on macroalgal communities and grazing invertebrates in BC and found that the effects of introduction were both density and time dependent and were mediated through competition for light and also that the effects went in both positive and negative directions depending on the species being studied.

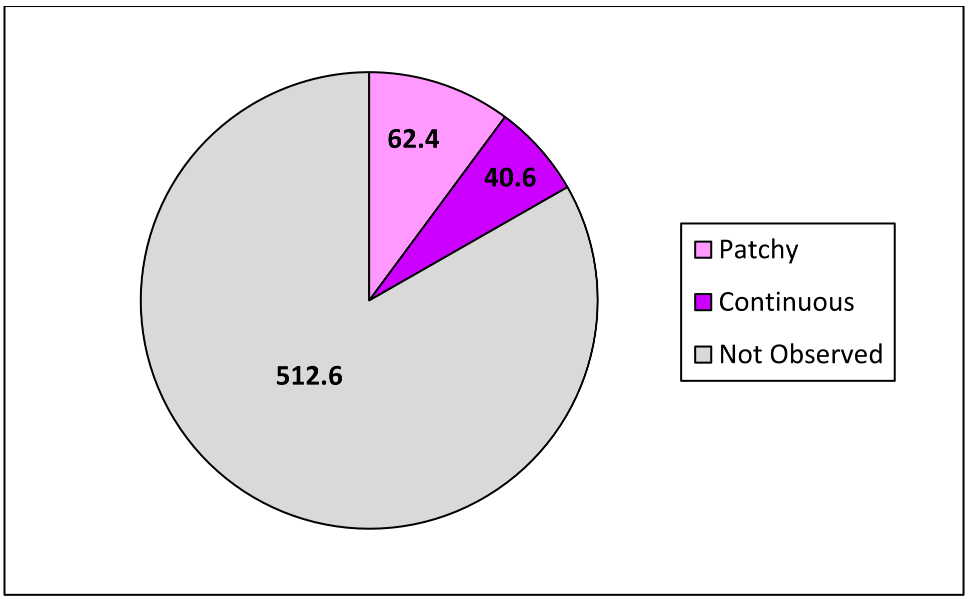

Figure 25. Distribution of the Sargassum (SARG) bioband by shoreline length (km).

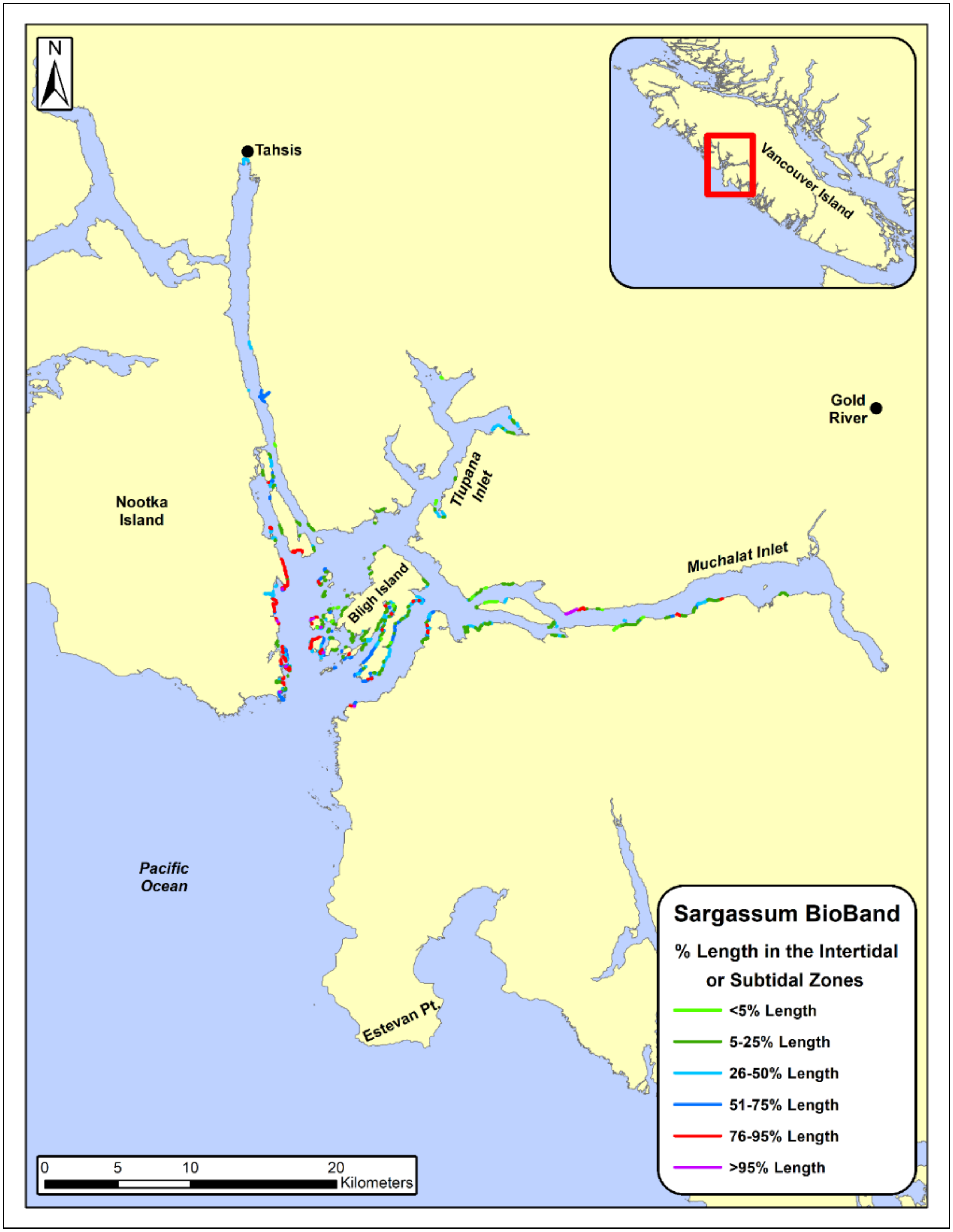

Figure 26. Distribution of the Sargassum (SARG) bioband in Nootka Sound.

3.2 Biological Wave Exposure

Biological wave exposure categories range from Very Protected (VP) to Very Exposed (VE) and are usually defined in ShoreZone on the basis of a typical set of biobands. When present, the relative abundance of biota in each alongshore unit is used as a proxy to determine the wave exposure at that site. For definitions of the Biological Wave Exposures and the exposure ranges of the biobands see the most recent ShoreZone protocol (Cook *et al*., 2017).

The distribution of the wave exposure categories mapped in Nootka Sound are summarized in Figure 27 and a distribution map of the categories is shown in Figure 28. Most of the coastline (85.7%) was in the lower to moderate wave exposures (Very Protected to Semi-Protected), with most of that Protected (78.1%).

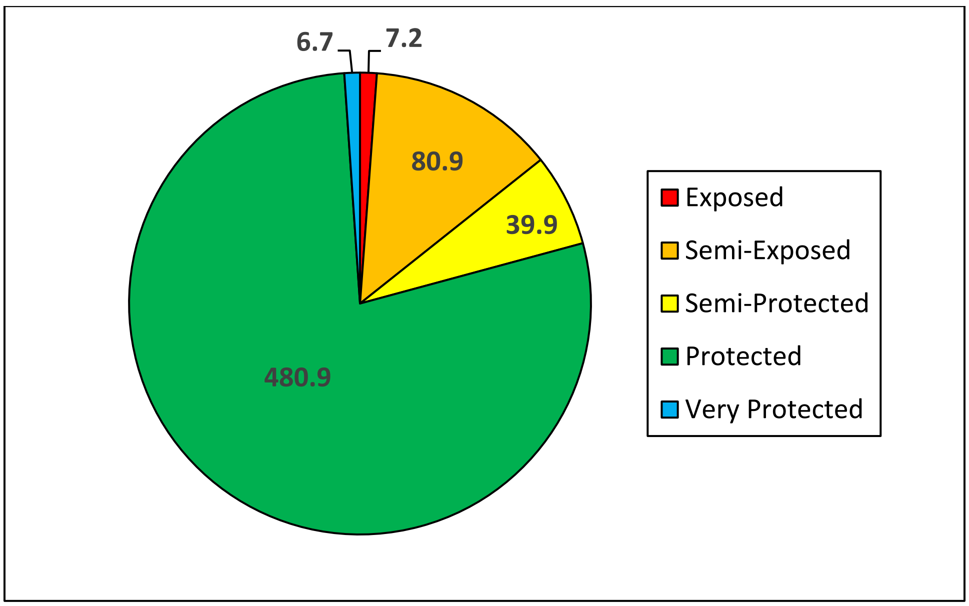

Figure 27. Distribution of Biological Wave Exposures mapped in Nootka Sound by shoreline length (km).

Figure 28. Distribution of the Biological Wave Exposure on the Sunshine Coast of BC.

3.3 Habitat Class

Habitat Class is a classification based on wave exposure and geomorphic characteristics observed in an alongshore unit. The habitat class is intended to provide a single attribute to characterize the biophysical features of each unit. The habitat class is assigned by the biological mapper and weighted according to the dominant structuring process. Wave action is the most common structuring process with less commonly observed habitats being those structured by current, estuarine/fluvial processes, and anthropogenic structures. For habitat classes structured by wave action substrate mobility determines the presence of epibenthic biota. Where the substrate is highly mobile, biota is sparse or absent, and where the substrate is stable, biota can be abundant. For further definitions and explanations of Habitat Class codes please see the most recent ShoreZone protocol (Cook *et al*., 2017).

The distribution of the Habitat Class categories mapped in Nootka Sound are summarized in Figure 29 and a distribution map of the categories is shown in Figure 30. Partially mobile substrate is the dominant shoreline type (51.6%), with Immobile only slightly less common (35.4%). The Estuary classification made up a larger than usual amount of the shoreline (10.7%) and is associated with spawning and nursery habitats for fish as well as breeding and foraging grounds for birds and other wildlife. The Anthropogenic classification occurred in only 1.5% of units with much of that occurring near the communities of Tahsis and Gold River.

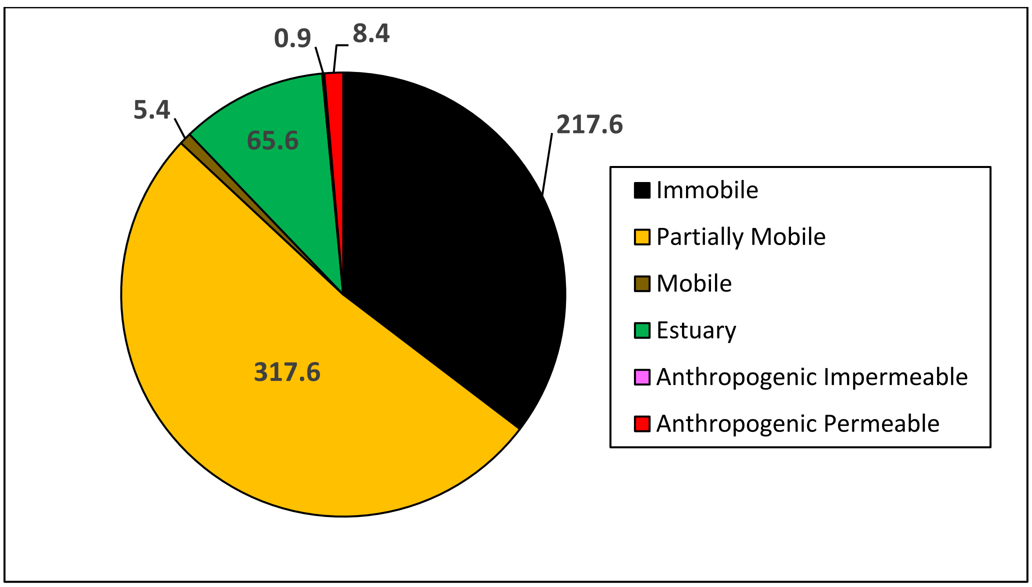

Figure 29. Distribution of Habitat Class categories in Nootka Sound by shoreline length (km).

Figure 30. Distribution of Habitat Class categories in Nootka Sound.

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5 ACKNOWLEDGMENTS

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Protocols for data access and distribution are established by the program partner agencies. Please see www.ShoreZone.org for a list of partner agencies and related web sites. Video imagery can be viewed and digital stills for the US dataset can be downloaded online at www.ShoreZone.org or the NOAA ShoreZone Page and the BC imagery dataset can be accessed through the Coastal and Ocean Resources' ArcGIS site. The mapping geodatabases and summary reports (as well as ground survey data and reports) can be downloaded through the Coastal and Ocean Resources download center. Further ShoreZone resources, including a newly updated Illustrated Data Dictionary, can be accessed through the NOAA ShoreZone Page.

Any hardcopies or published data sets utilizing ShoreZone products shall clearly indicate their source. For questions regarding the protocols or information in this report, please contact Sarah Cook, General Manager of Coastal and Ocean Resources at Sarah@coastalandoceans.com (250-658-4050). For data requests or analytical support contact Kalen Morrow at Kalen@coastalandoceans.com.

APPENDIX A

Photographic Examples of Coastal Classes and Biobands

Table A-1. Examples of the Coastal Classes in the Nootka Sound survey area (Page 38).
Table A-2. Examples of the Biobands in the Nootka Sound survey area (Page 46).

Table A-1. Examples of the Coastal Classes in the Nootka Sound survey area.

Photo bc21_nk_00904: Example of Coastal Class 2; Rock Platform, wide.
South of Escalante Point.

Photo bc21_nk_01518: Example of Coastal Class 3; Rock Cliff.
Maquinna Point.

Photo bc21_nk_04985: Example of Coastal Class 4; Rock Ramp.
Spanish Pilot Group.

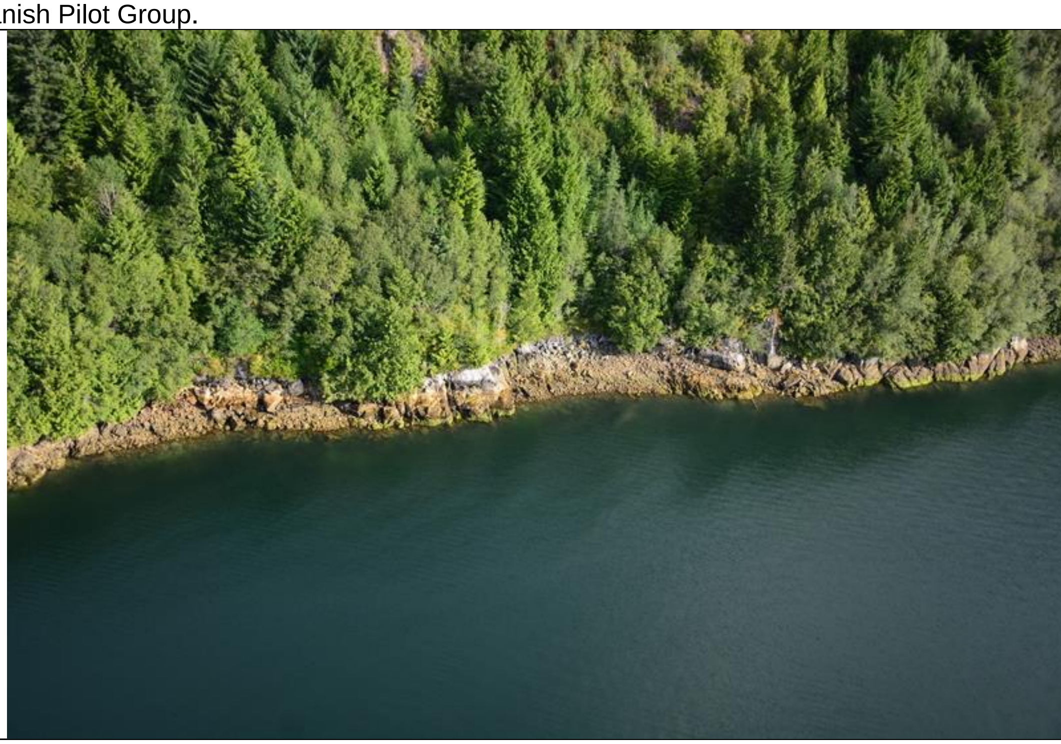

Photo bc21_nk_06049: Example of Coastal Class 8; Cliff gravel beach.
Williamson Passage.

Photo bc21_nk_02239: Example of Coastal Class 9; Ramp with gravel beach.
Saavedra Islands.

Photo bc21_nk_00626: Example of Coastal Class 11; Ramp with gravel & sand beach.
Burdwood Point.

Photo bc21_nk_01371: Example of Coastal Class 12; Platform with gravel & sand beach, wide. South of Bajo Point.

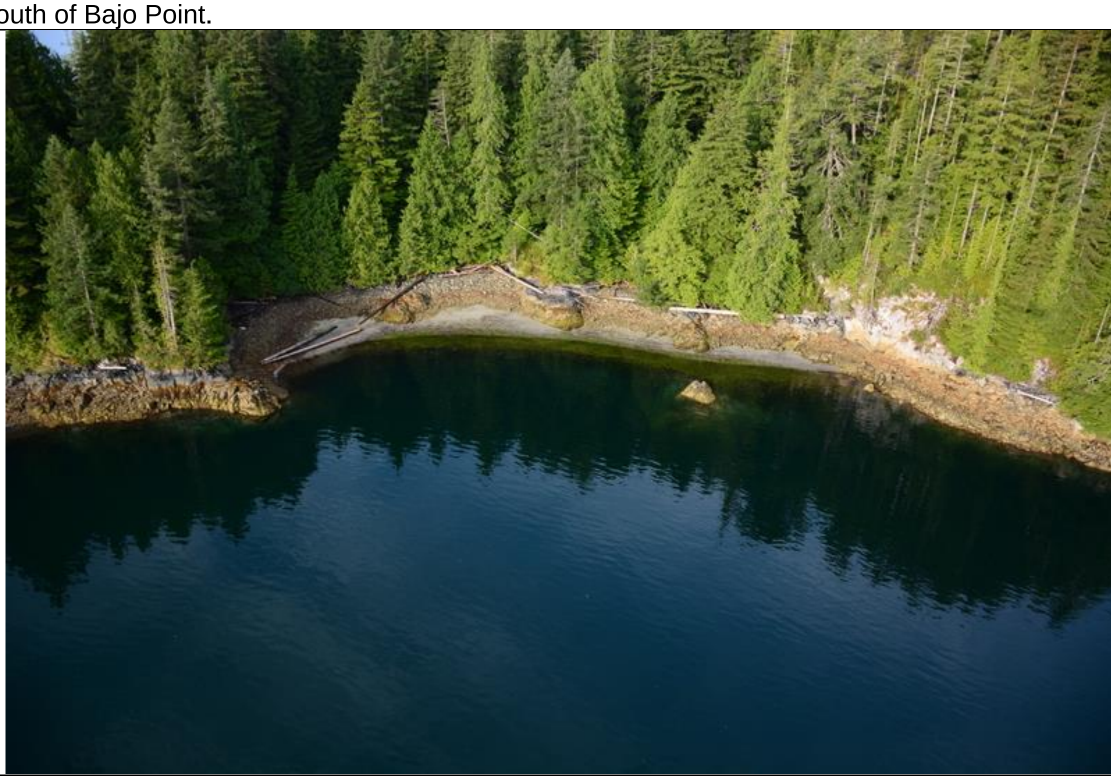

Photo bc21_nk_05307: Example of Coastal Class 13; Cliff with gravel & sand beach. Bligh Island.

Photo bc21_nk_02749: Example of Coastal Class 14; Ramp with gravel & sand beach.
Eliza Passage.

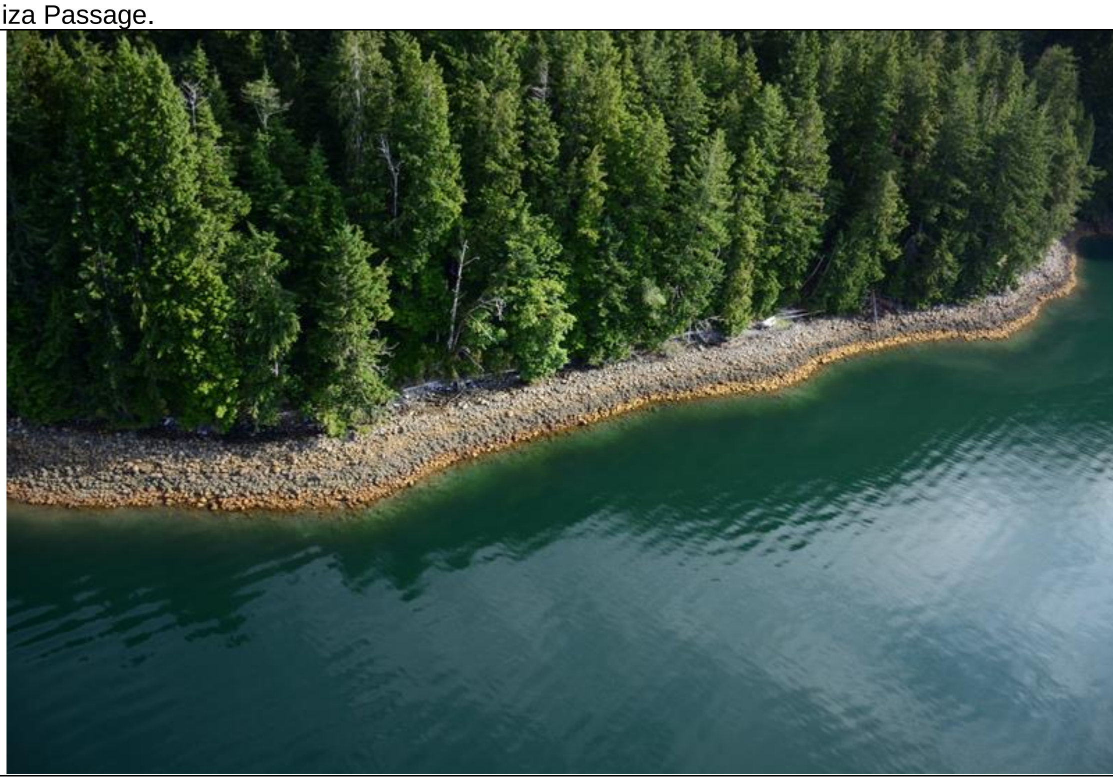

Photo bc21_nk_06085: Example of Coastal Class 22; Gravel beach, narrow.
Williamson Passage.

Photo bc21_nk_00268: Example of Coastal Class 24; Sand & gravel flat or fan.
King Passage.

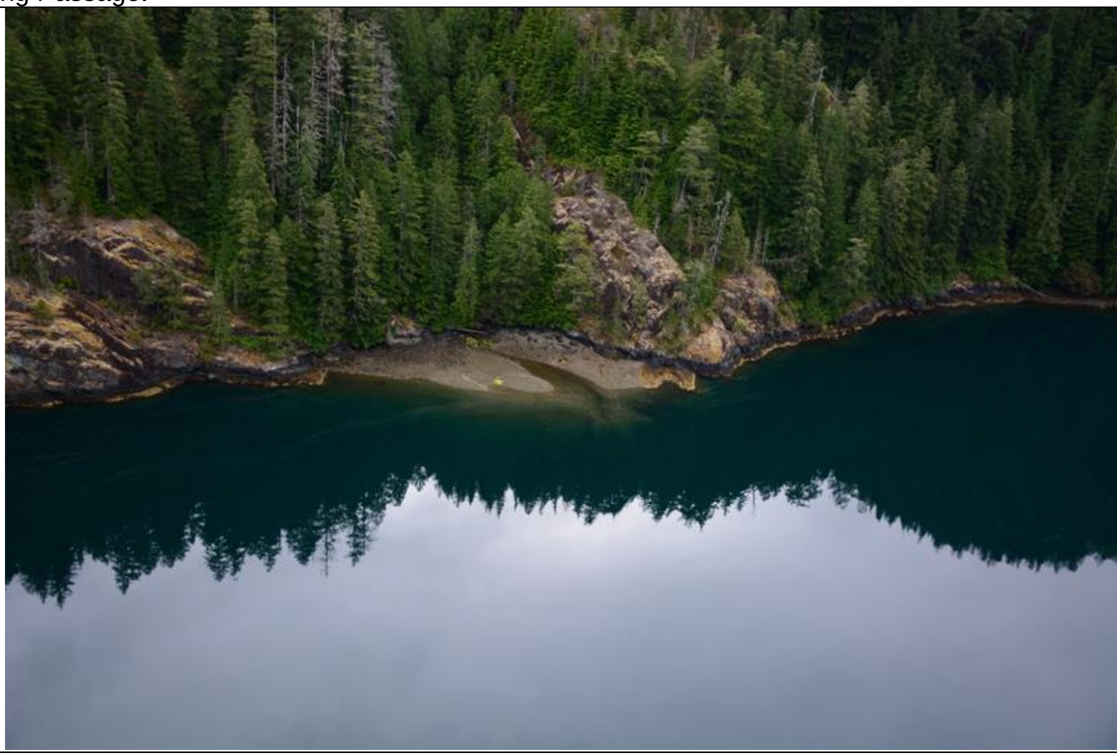

Photo bc21_nk_01924: Example of Coastal Class 25; Sand & gravel beach, narrow.
Matchlee Bay.

Photo bc21_nk_00563: Example of Coastal Class 27; Sand beach.
Burdwood Point.

Photo bc21_nk_01052: Example of Coastal Class 28; Sand flat.
Barcester Bay.

Photo bc21_nk_01554: Example of Coastal Class 31; Organics/Fines.
Maquinna Point.

Photo bc21_nk_01772: Example of Coastal Class 32; Permeable man-made structures.
Muchalet Inlet.

Table A-2. Examples of the Biobands in the Nootka Sound survey area.

Photo bc21_nk_01850: Good example of the Trees and Shrubs (TRSH) bioband in the upper intertidal. Mouth of the Gold River.

Photo bc21_nk_01424: Good example of the Splash Zone (SPZO) bioband which is an erosional or active A Zone without attached vegetation. Between Bajo Point and Maquinna Point.

Photo bc21_nk_06079: Good example of White Lichen (WHLI) bioband in the supratidal zone, above the Black Lichen band. Williamson Passage.

Photo bc21_nk_03351: Good example of the Black Lichen (BLLI) bioband which is a black band in the supratidal zone, usually caused by the lichen *Verrucaria* sp. Moutcha Bay.

Photo bc21_nk_04349: Good example of blue-green Dune Grass (DUGR) bioband in the supratidal zone. Tahsis Inlet.

Photo bc21_nk_02477: Good example of Salt Marsh (SAMB) bioband in the supratidal/intertidal zone. North of Plumper Harbour.

Photo bc21_nk_00780: Good example of the Barnacle (BARN) bioband in the intertidal zone. South of Burdwood Point.

Photo bc21_nk_05115: Good example of the golden-brown Rockweed (ROCK) bioband. Clotchman Island, Spanish Pilot Group.

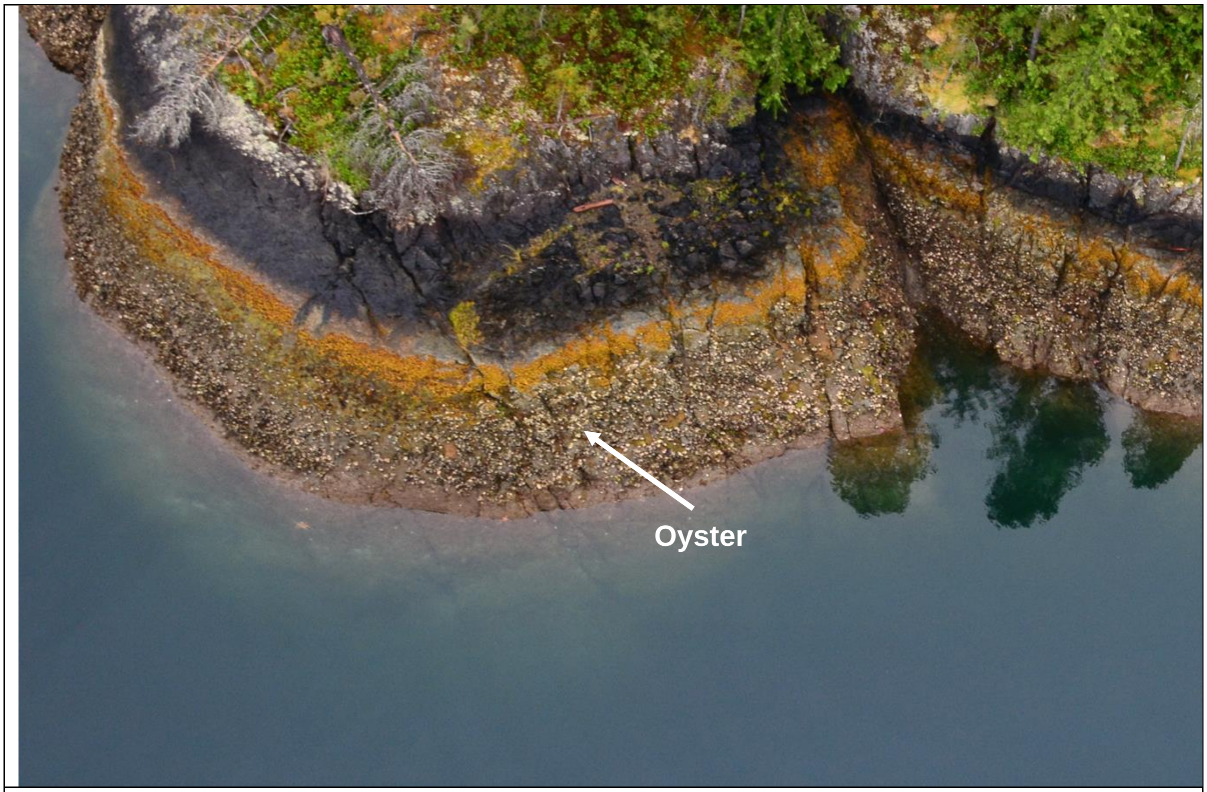

Photo bc21_nk_03551: Good example of the white spots of the Oyster (OYST) bioband. Nesook Bay.

Photo bc21_nk_00518: Good example of the black Blue Mussel (BLMU) bioband in the mid-intertidal. Near Burdwood Point.

Photo bc21_nk_04598: Good example of the Green Algae (GRAL) bioband in the lower intertidal. East Tahsis Inlet.

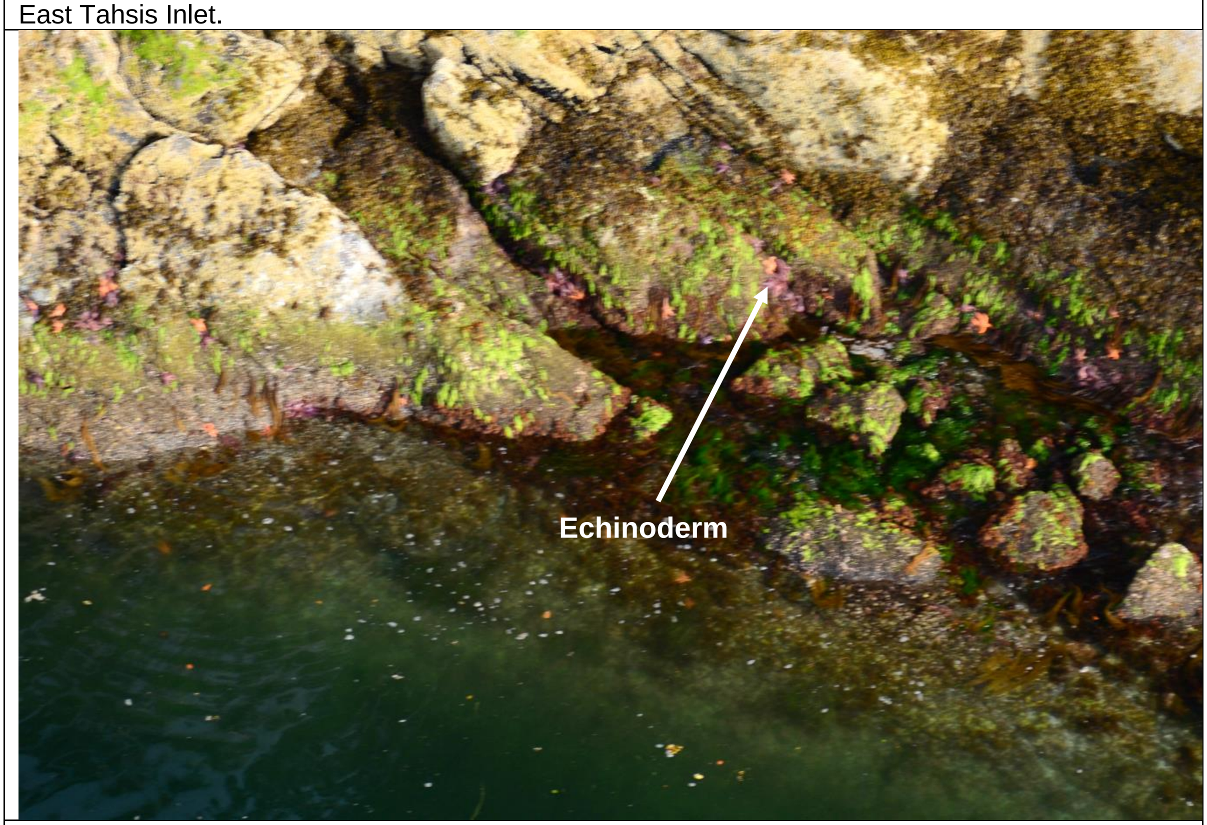

Photo bc21_nk_06039: Good example of the Echinoderm (ECHI) bioband which was all *Pisaster* sp. in this study area. Bligh Island.

Photo bc21_nk_0556: Good example of the golden Bleached Red Algae (BRAL) bioband in the lower intertidal. Burdwood Point.

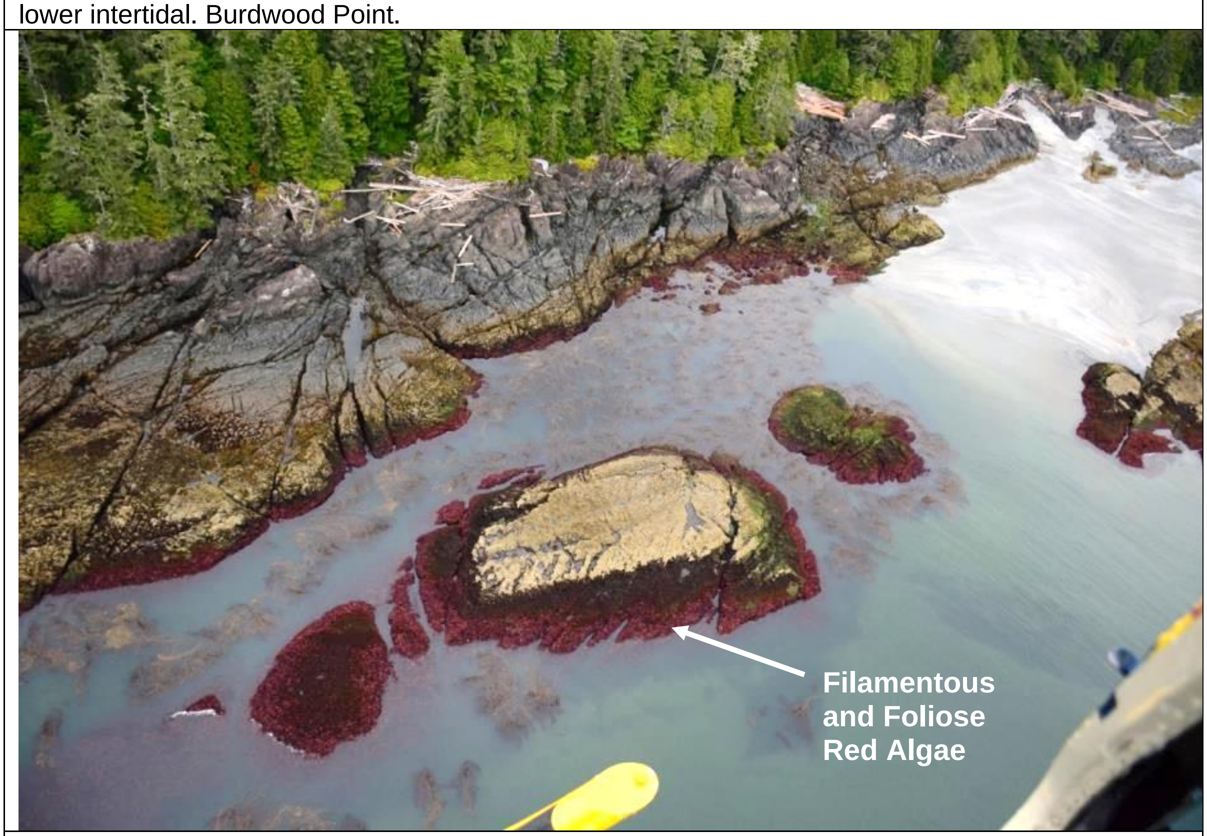

Photo bc21_nk_00739: Good example of the Filamentous and Foliose Red Algae (FFRA) bioband in the lower intertidal. South of Burdwood Point.

Photo bc21_nk_01734: Good example of the Coralline Red Algae (CORA) in the lower intertidal. Muchalet Inlet.

Photo bc21_nk_00796: Good example of Bladed Brown Algae (BRBA) in the lower intertidal. South of Burdwood Point.

Photo bc21_nk_00641: Good example of the Surfgrass (SURF) bioband in the lower intertidal. South of Burdwood Point.

Photo bc21_nk_03936: Good example of the fluffy, floating Sargassum (SARG) bioband. Princesa Channel, North of Strange Island.

Photo bc21_nk_04090: Good example of the Eelgrass (EELG) bioband in the subtidal. Bodega Island.

Photo bc21_nk_00812: Good example of the Giant Kelp (GIKE) bioband offshore. South of Burdwood Point.

Photo bc21_nk_00794: Good example of the Bull Kelp (BUKE) bioband in the nearshore. South of Burdwood Point.