

ShoreZone Polygon Mapping Summary Report

Eelgrass in the Islands Trust Area



Boat Cove, Lasqueti Island (bc20_sc_16658)

Prepared for:
The Islands Trust Council
Suite 200-1627 Fort Street
Victoria, BC, V8R 1H8

Prepared by:
Coastal and Ocean Resources
759A Vanalman Ave.
Victoria, BC, V8Z 3B8 Canada
(250) 658-4050
www.coastalandoceans.com

The suggested citation for this report is:
Coastal and Ocean Resources, 2022. ShoreZone Polygon Mapping Summary
Report: Eelgrass in the Islands Trust Area. Produced for the Islands Trust Council,
Victoria, BC. Produced by Coastal & Ocean Resources, Victoria, BC. 11p.

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
	Table of Contents	ii
	List of Figures and Tables	iii
1	INTRODUCTION	1
2	EELGRASS POLYGON DATA SUMMARY	3
2.1	Methodology	3
2.2	Results	8
3	REFERENCES	11

LIST OF FIGURES AND TABLES

<u>Figure</u>	<u>Description</u>	<u>Page</u>
1	Extent of ShoreZone imagery within the Islands Trust area	2
2	Example of a Sparse Density category Eelgrass in the Islands Trust area	4
3	Example of a Moderate Density category Eelgrass in the Islands Trust area	4
4	Example of a Dense Density category Eelgrass in the Islands Trust area	5
5	Example of an area where the ShoreZone image and the satellite image show a large disparity	6
6	Example of a ShoreZone image where SeaChange indicated Eelgrass was present but it was not visible	7
7	Example of the Eelgrass habitat polygons mapped around Lasqueti Island	8
8	Example of the Eelgrass habitat polygons mapped around Thetis and Penelakut Islands	9

<u>Table</u>	<u>Description</u>	<u>Page</u>
1	Definitions of the ShoreZone Eelgrass bioband	3
2	Totals of Eelgrass habitat polygons mapped in the Islands Trust area by Density category	10
3	Totals of Eelgrass habitat polygons mapped in the Islands Trust area by Confidence category	10

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 siting, 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; Harper and Morris 2014). ShoreZone has since expanded to a spatially continuous database of over 122,000 km of coastal Alaska, British Columbia, Washington State and Oregon. The most current ShoreZone protocol was updated in 2017 (Cook *et al.* 2017).

A ShoreZone imaging survey was conducted in the local trust areas administered by the Islands Trust Council (Figure 1). This survey acquired aerial video and digital still imagery of the coast during the August 6-9, 2021, low-tide window where the tides were lower than 1m in elevation. This imagery was then used, in conjunction with other data sources such as satellite imagery, to create polygons that delineate the boundaries of the Eelgrass beds in the survey area. Eelgrass beds form valuable habitat for fish and invertebrates, including serving an important nursery habitat function for juvenile salmonids, and are an important part of a healthy coastline and healthy fisheries. This information can be used to inform management and planning decisions that may impact Eelgrass in the Islands Trust area as well as to provide a baseline for monitoring of the extent and health of these habitats in the future.

The purpose of this report is to detail the Eelgrass polygon mapping work with summaries of the data and descriptions of the challenges involved. The length of shoreline imaged was **1,360 kilometers** according to the CHS Highwater line shapefile.

Full ShoreZone (linear and polygon) mapping of this survey area has been funded by DFO Science in support of the PIER program and this mapping is currently underway. That data will be made publicly available on the [CORI Download site](#) in April or May 2022.

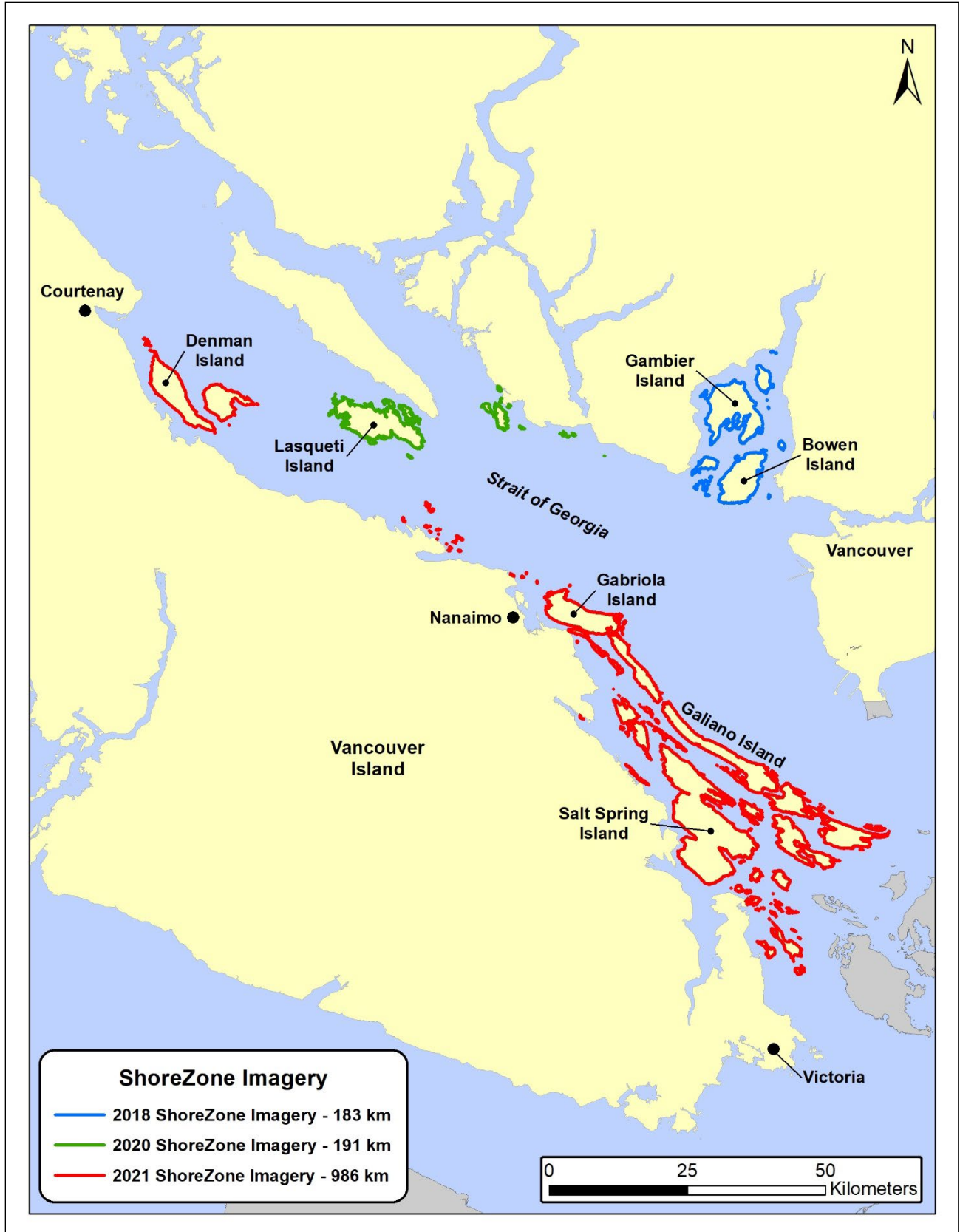


Figure 1. Extent and year of ShoreZone imagery within the Islands Trust area.

2 EELGRASS POLYGON DATA SUMMARY

2.1 Methodology

ShoreZone habitat mapping uses low altitude (100 m elevation), high resolution aerial imagery taken from helicopters to classify the biological attributes in each ShoreZone unit. These attributes are called **biobands** and are defined by a typical tide height, colour and texture. For this project, we focused on the Eelgrass bioband, the definition of which is provided in Table 1 (taken from Cook *et al.*, 2017).

Table 1. Definition of the Eelgrass bioband.

ShoreZone Code	Zone	Typical Color	Indicator Species	Description	Biological Wave Exposure Range
EELG	B (intertidal) & C (subtidal)	Bright to dark green	<i>Zostera marina</i>	Commonly visible in estuaries, lagoons or channels, generally in areas with fine sediments. Eelgrass can occur in sparse patches or thick dense meadows.	Very Protected to Semi-Protected

Our method for creating polygons of the Eelgrass bioband was to take the high resolution ShoreZone imagery in conjunction with the best available public satellite imagery (which varied depending on the area), to define the shape and position of each polygon. The satellite imagery (which is orthorectified) was used as a guide to provide positional data for all boundaries but the ShoreZone imagery (which is not orthorectified) was used as the final guide for shape and extent of the polygon. We also relied on a shapefile of previous eelgrass mapping done by SeaChange Marine Conservation Society in 2014/15 for the Islands Trust. In most areas this indicated linear presence of eelgrass rather than polygons but helped guide the classifiers when telling the difference between eelgrass and green algae or other subtidal vegetation; however, SeaChange did map polygons of the eelgrass beds around Bowen Island and Mayne Island. The mapping on Mayne Island was done in collaboration with the Mayne Island Conservancy Society.

We provided an estimate of the density of the Eelgrass with each polygon. Our density categories were Sparse (S), Moderate (M) and Dense (D). Sparse indicates few or scattered plants within the polygon, Moderate indicates plants are loosely packed or patchy within the polygon, and Dense indicates the plants were tightly packed with little space between. Figures 2 through 4 provide photographic examples of these categories from the Islands Trust ShoreZone imagery. There was also an Undetermined density category for areas where the imagery did not allow for density estimation. These density estimates are qualitative and are based on the classifier observations rather than quantitative assessments; however, these categories should still be useful for any calculation of biomass or for monitoring efforts, understanding that Eelgrass distribution and density can vary on an annual and a seasonal basis.

Each polygon was also assigned a Confidence value (Low, Medium or High) which indicates how certain the classifier was that they accurately captured the extent and location of that polygon. This could vary depending on such things as imaging conditions (glare, shade), water conditions (turbidity, waves), and satellite image quality.



Figure 2. Example of Sparse Density category Eelgrass in the Islands Trust area. Photo bc20_sc_16103 at the Finnerty Islands.



Figure 3. Example of Moderate Density category Eelgrass in the Islands Trust area. Photo bc21_gi_09122 in Henry Bay on Denman Island.



Figure 4. Example of Dense Density category Eelgrass in the Islands Trust area. Photo bc20_sc_16877 in Rouse Bay on Lasqueti Island.

We did encounter some challenges in the creation of the Eelgrass polygons using this methodology, most of which were around the varying resolution and quality of the ShoreZone images and the satellite imagery and how those two things interacted. Figure 5 shows an example where the ShoreZone image and the satellite image had a large disparity in the tide level and also where the satellite tiles were from two different time periods, which made it challenging to see landmarks that allowed for accurate location of any sensitive habitat polygons in that area. Figure 6 shows an example of a ShoreZone image with a Low Confidence polygon (Undetermined Density) where the previous eelgrass mapping completed by SeaChange indicated eelgrass was present but where it was not visible in the ShoreZone image. A placeholder polygon was created in these areas to indicate that further surveying by boat is required to create an accurate polygon of that bed. It should also be noted that the new ShoreZone imagery taken for this project in August 2021 was during a low tide window, but there appeared to be areas where the tide was higher than would be typical for a ShoreZone survey. This meant the eelgrass was further under the water than would be typical in ShoreZone imagery, making it more challenging to define in those areas.

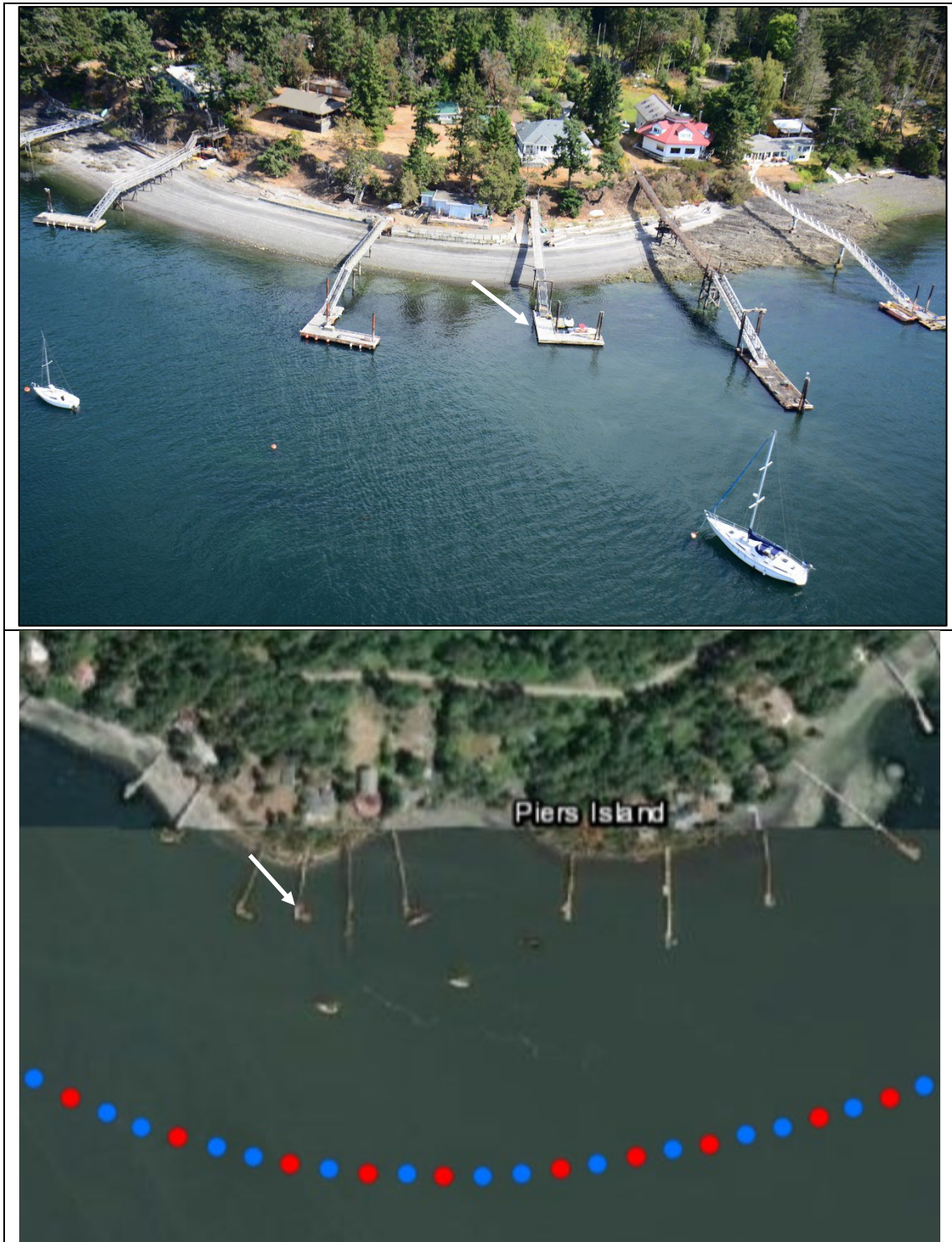


Figure 5. Example of an area where the ShoreZone image (bc21_gi_11717) (top) and the satellite image (bottom) (which shows the same headland on Piers Island) has a large disparity in terms of tide level and also where the satellite image was poor quality. The white arrow on each image indicates the same location. The blue and red dots in the lower image represent the ShoreZone imaging survey helicopter flightline.



Figure 6. Example of a ShoreZone image where previous SeaChange mapping indicated eelgrass was present but where the eelgrass was not visible. The glare on the water and the turbid nature of the nearshore contributed to the low quality of the image. Photo bc18_vr_05140 on Bowen Island.

2.2 Results

In total, CORI created **1,566** Eelgrass habitat polygons. These polygons covered **~1,613.5 ha** of the intertidal/subtidal zones of the Islands Trust area. These polygons were delivered as a shapefile along with this report. Some examples of the polygons created are presented in Figures 7 and 8 while Tables 2 and 3 give a breakdown of the number and area of the Eelgrass polygons by Density and Confidence categories.

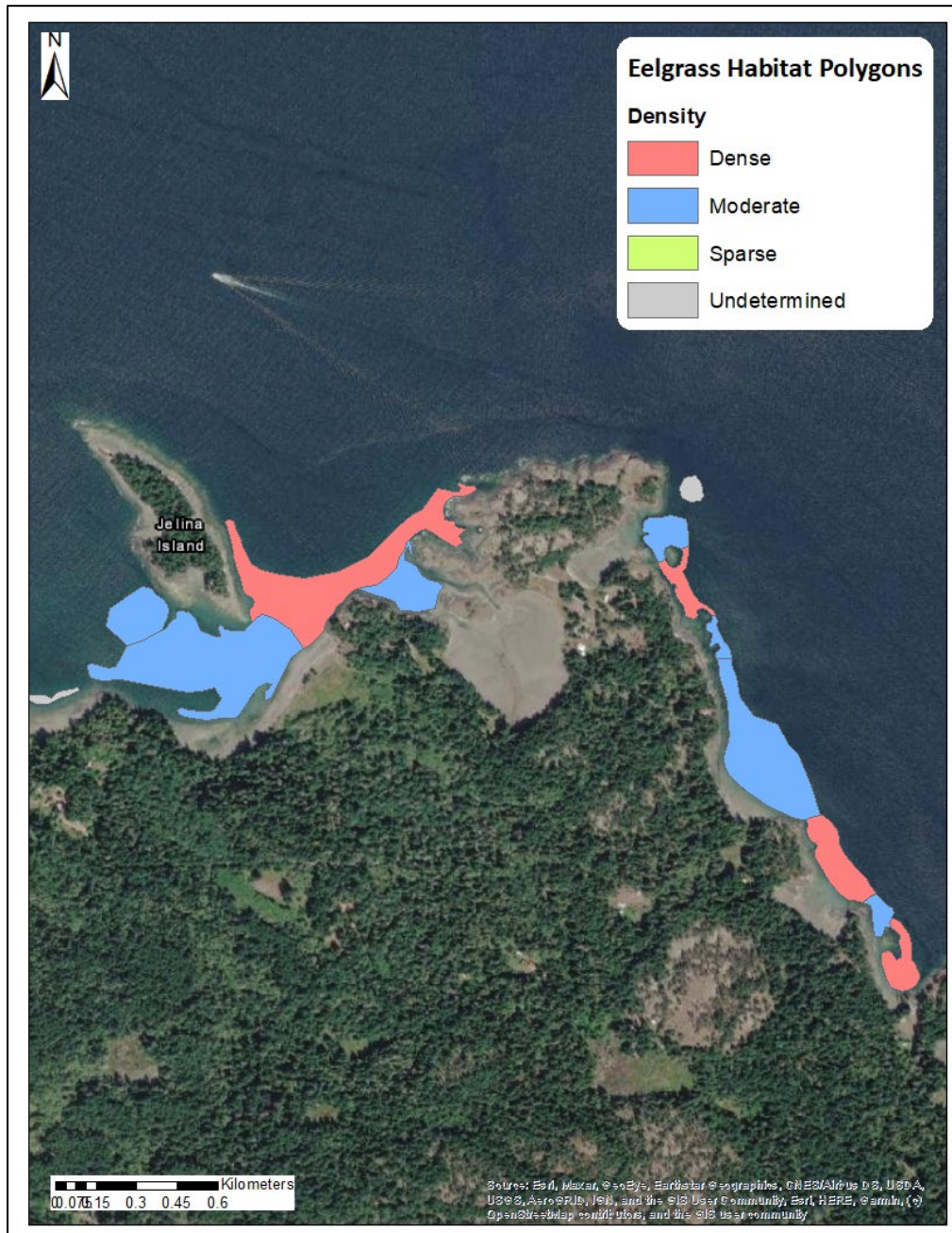


Figure 7. Example of the Eelgrass habitat polygons mapped around Lasqueti Island in the Islands Trust Area.

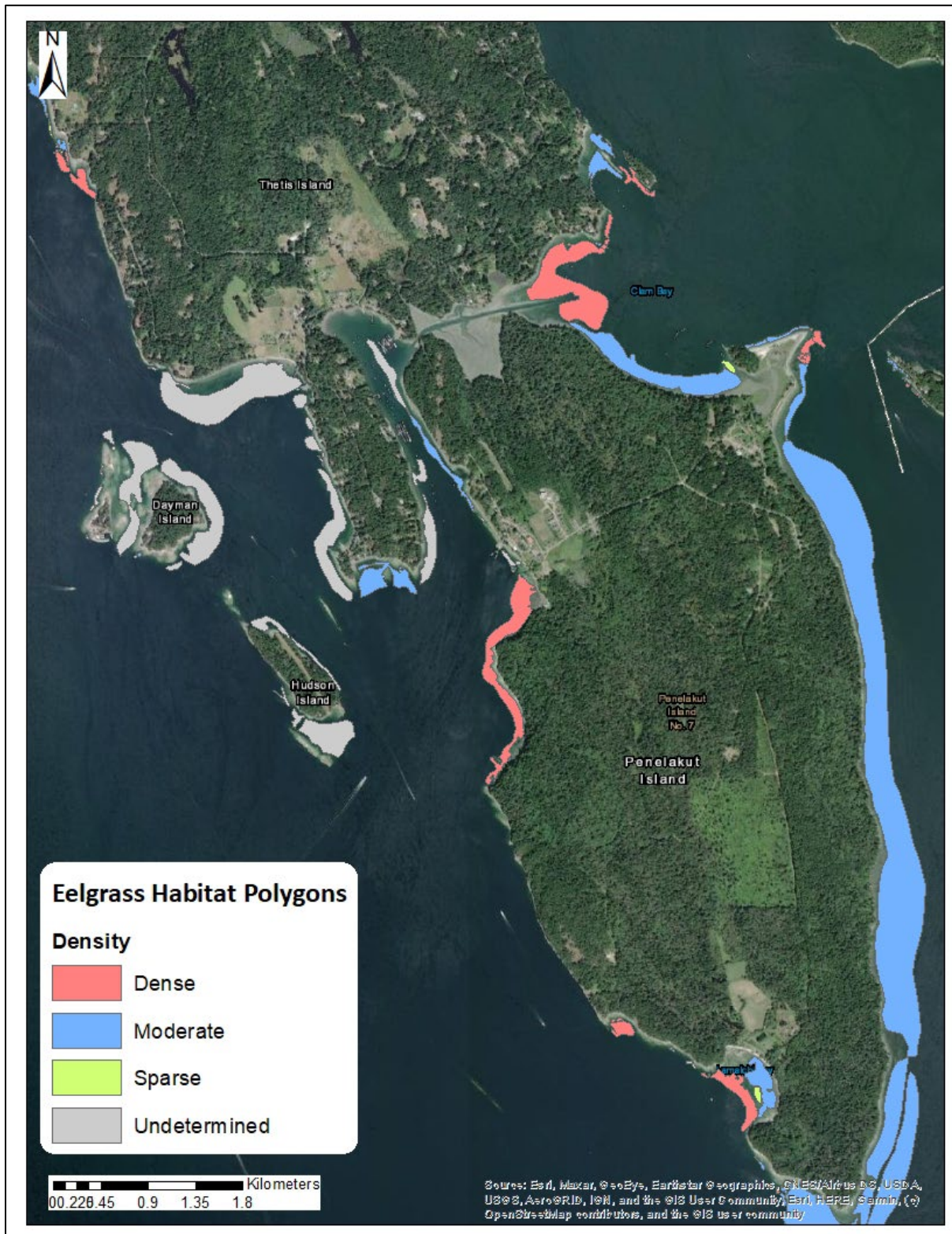


Figure 8. Example of the Eelgrass habitat polygons mapped around Thetis and Penelakut Islands. This was a particularly complex area.

Table 2. Totals of Eelgrass habitat polygons mapped in the Islands Trust area by Density category. The areal extent of the Undetermined polygons should not be taken as accurate as the majority of these are Low Confidence.

Density Category	Number of Polygons	Area of Polygons (ha)
Dense	356	233.7
Moderate	428	622.3
Sparse	125	73.8
Undetermined	657	683.8

Table 3. Totals of Eelgrass habitat polygons mapped in the Islands Trust area by Confidence category. The areal extent of the Low polygons should not be taken as accurate as these could not be properly defined from the imagery.

Confidence Category	Number of Polygons	Area of Polygons (ha)
High	157	48.7
Medium	757	882.8
Low	652	682.0

Over half (59%) of the Eelgrass polygons were of High or Medium Confidence, with 41% having Low Confidence. Those Low Confidence polygons should not be considered accurate in terms of either overall placement or area for management or monitoring purposes and should be surveyed by other means in the future (towed camera, sidescan or dive surveys) to create accurate polygons.

3 REFERENCES

- Berry, H.D., J.R. Harper, T.F. Mumford, Jr., B.E. Bookheim, A.T. Sewell and L.J. Tamayo, 2004. Washington State ShoreZone Inventory User's Manual, Summary of Findings, and Data Dictionary. Reports prepared for the Washington State Dept. of Natural Resources Nearshore Habitat Program.
- Cook, S., S. Daley, K. Morrow and S. Ward. 2017. ShoreZone Coastal Imaging and Habitat Mapping Protocol. Coastal and Ocean Resources, Victoria, BC. 78p.
- Harper, J.R., and M.C. Morris, 2004. ShoreZone Mapping Protocol for the Gulf of Alaska. Report prepared for the Exxon Valdez Oil Spill Trustee Council (Anchorage, AK). 61 p.
- Harper, J.R. and M.C. Morris, 2014. Alaska ShoreZone Coastal Habitat Mapping Protocol. Report prepared by Nuka Research and Planning LCC of Seldovia for the Alaska Bureau of Ocean Energy Management (BOEM), Anchorage, AK, 144 p.
- Howes, D.E., 2001. British Columbia biophysical ShoreZone mapping system – a systematic approach to characterize coastal habitats in the Pacific Northwest. Puget Sound Research Conference, Seattle, Washington, Paper 3a, 11p.