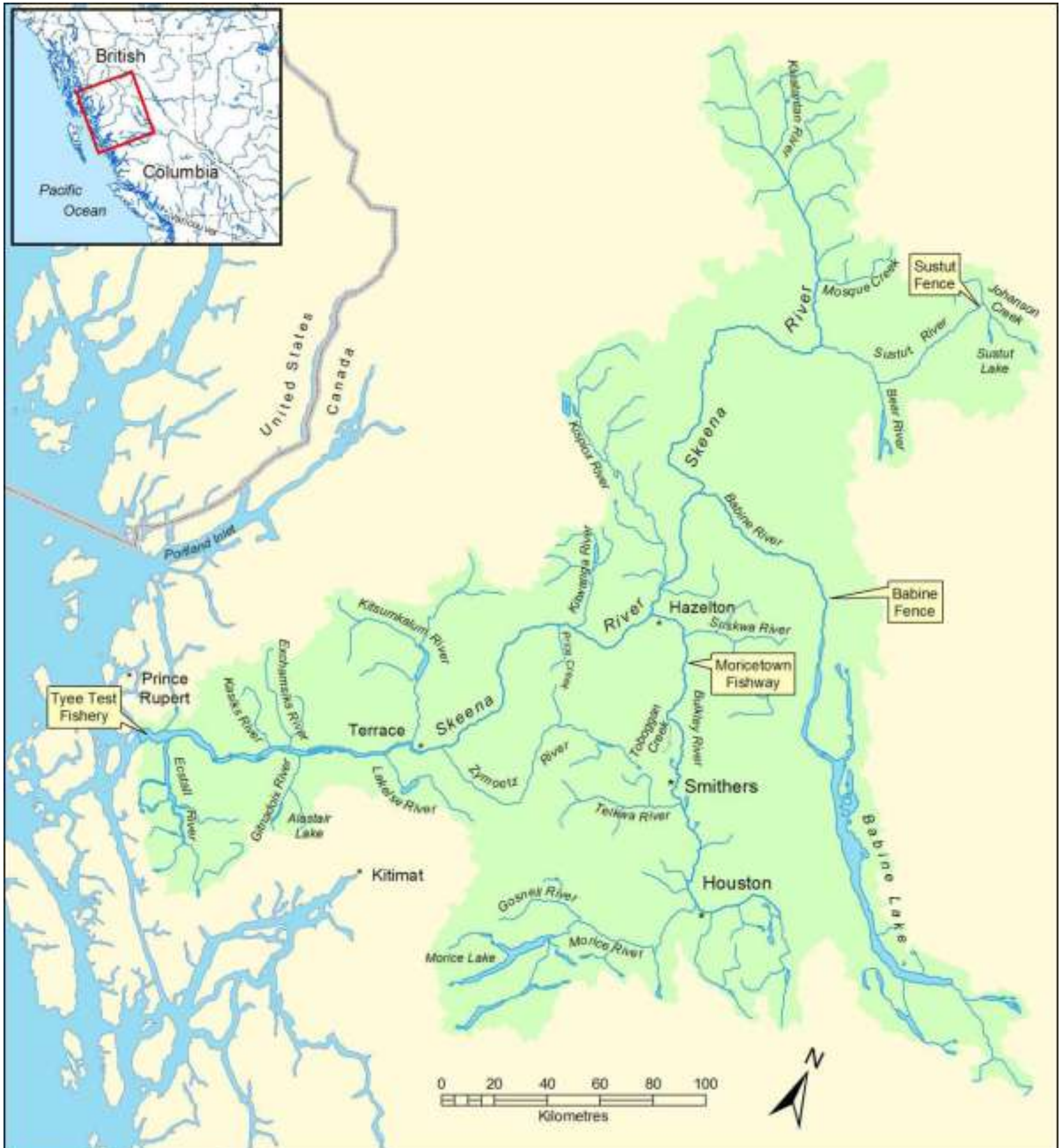
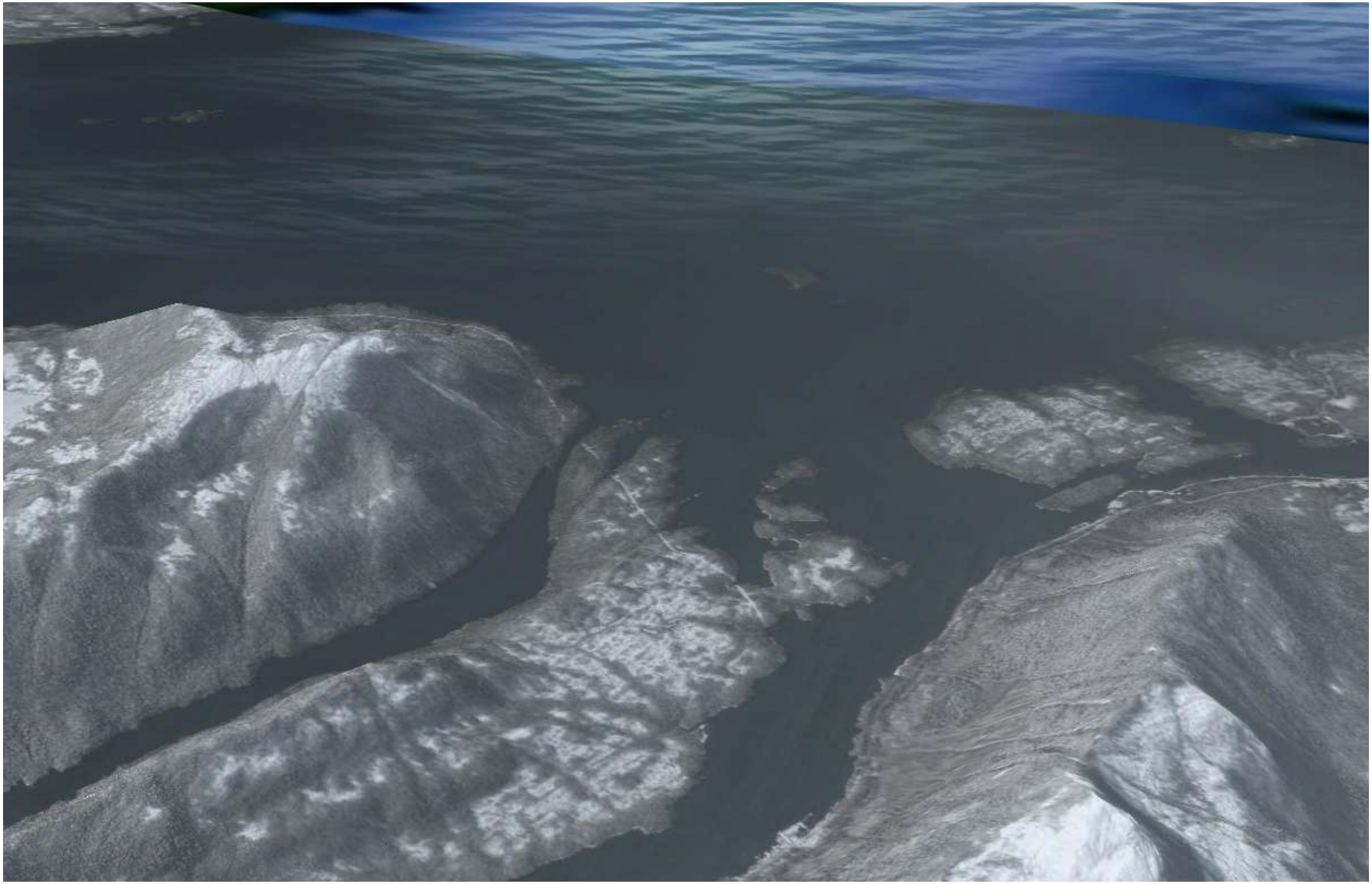
# Flora Bank Eelgrass Survey

Ocean Ecology

# Introduction




The Skeena River originates at the edge of the Spatsizi Plateau and flows 570 km to reach the Pacific Ocean. It is the second largest river in the province.



Suspended sediments from the Skeena River are deposited in shoals along the lower river and the channels which connect the estuary to the open ocean.

**Flora Bank Eelgrass Survey**

**Figure 1.** Skeena River plume and Flora Bank.


**Projection:** WGS 1984 UTM Zone 9N

**Scale:** 1:54,000

## Legend

Flora Bank

0 375 750 1,500 Meters

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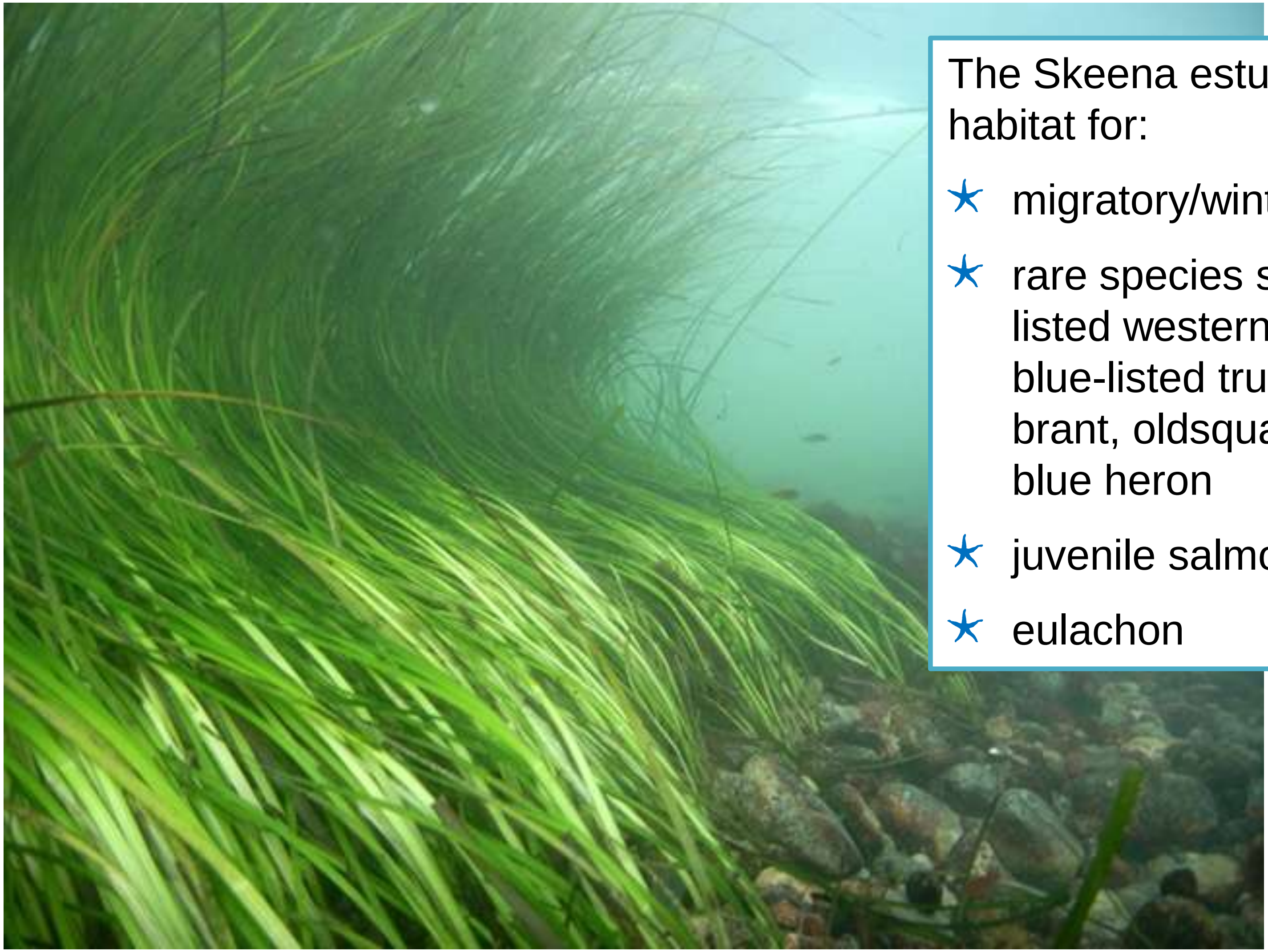
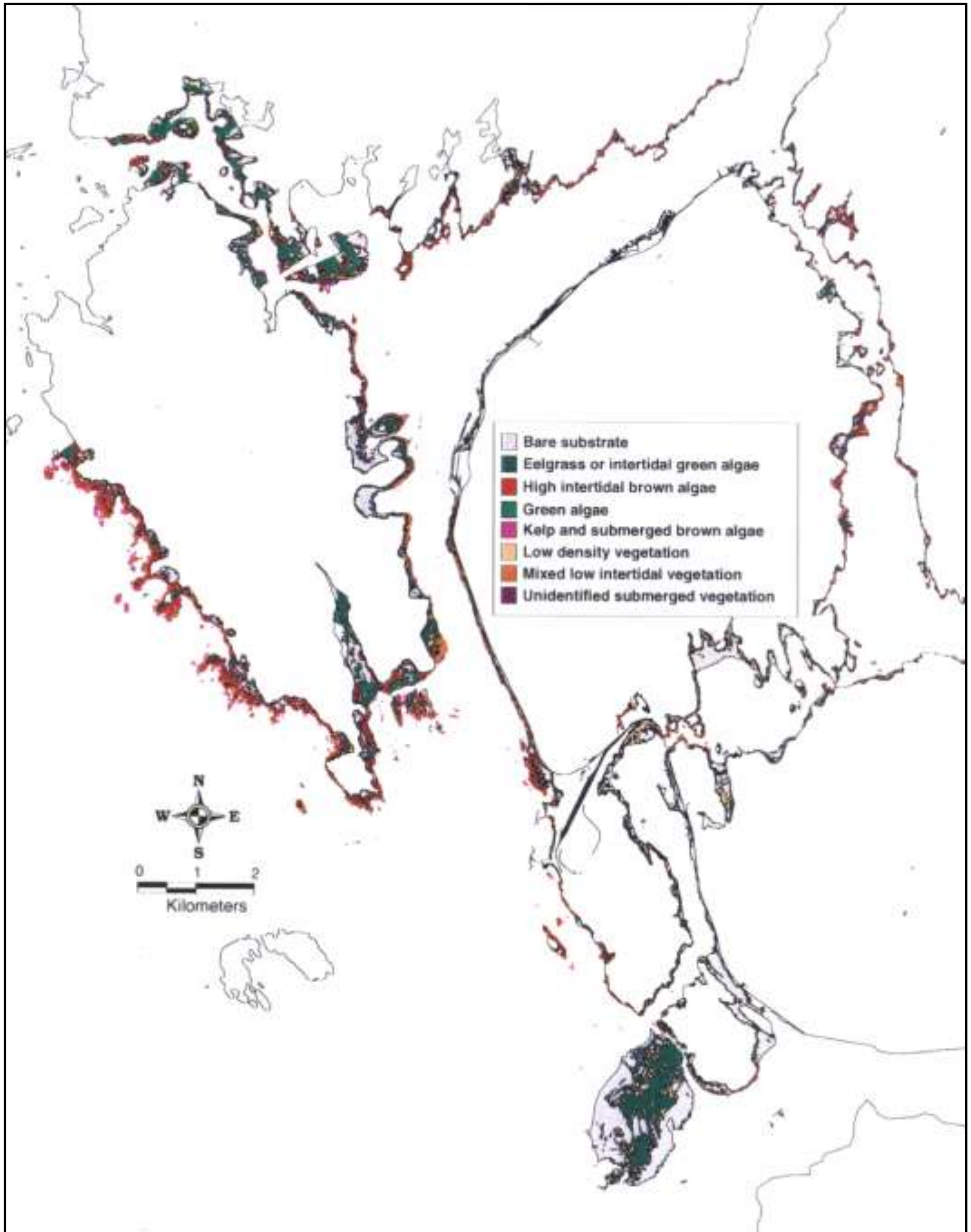
The Skeena River estuary consists of a region of extensive mudflats and shallow, intertidal passages around DeHorsey Island, through Inverness Passage, and between Kitson Island and Lelu Island (Flora Bank).



The Skeena estuary is important habitat for:

- migratory/wintering waterfowl
- rare species such as the red-listed western grebe and the blue-listed trumpeter swan, brant, oldsquaw and great blue heron
- juvenile salmon
- eulachon




In August, 1997, a Compact Airborne Spectrographic Imager (CASI) survey of Prince Rupert Harbour and vicinity was carried out. Mapped habitats included kelp and eelgrass beds, sandflats, and intertidal vegetation.

Ground-truthing of the CASI survey was carried out both aerially and from shore.  Shown above is a photograph taken of Flora Bank during a flight at low tide.

**Flora Bank Eelgrass Survey**

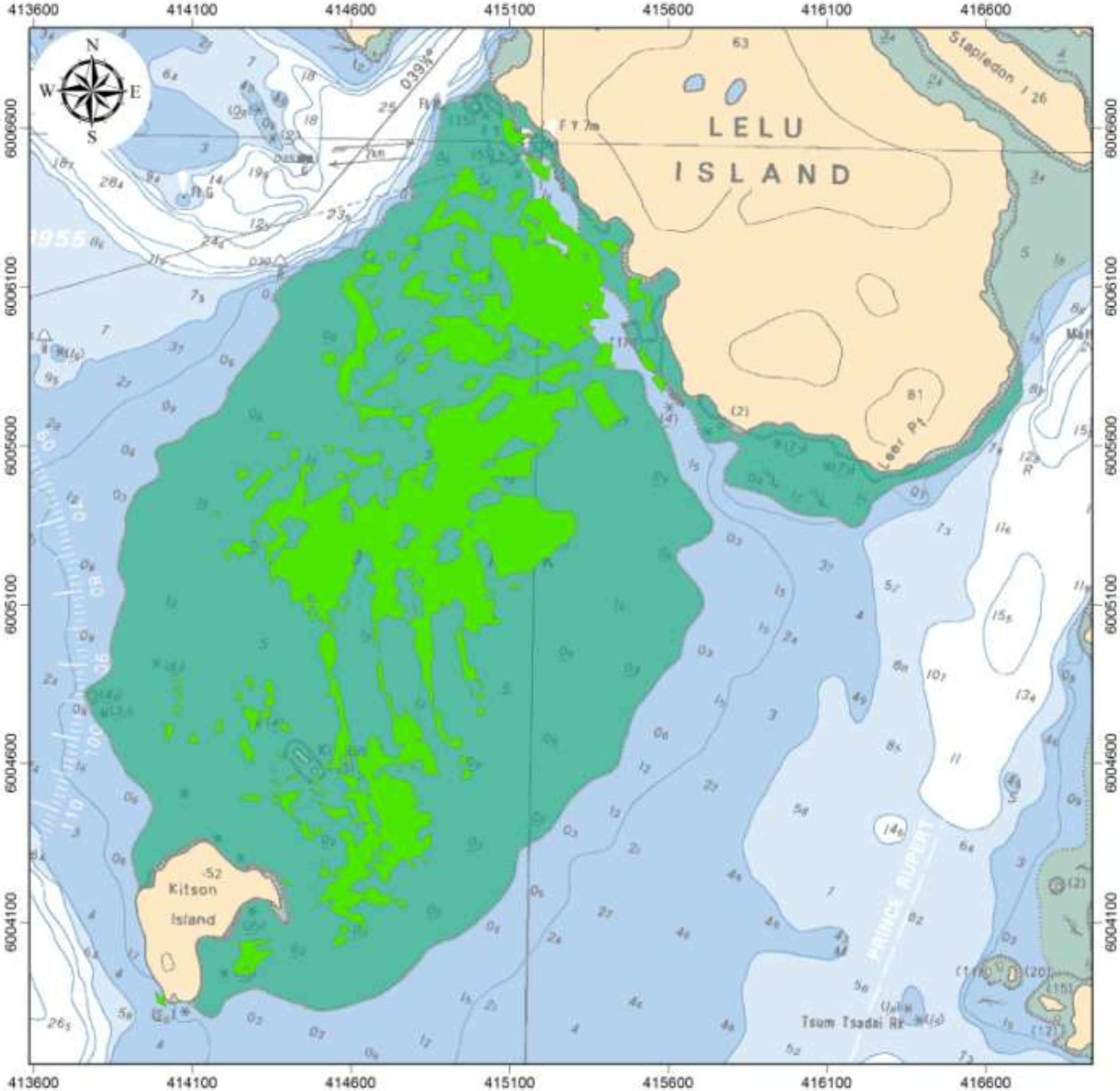



**Figure 2.** Eelgrass distribution as reported by the Borstad CASI study.

**Chart used for navigation:** CHS 395502 (Porpoise Harbour)

**Chart datum:** LNT

**Projection:** WGS 1984 UTM Zone 9N

**Scale:** 1:17,000

**Legend**

- Borstad eelgrass extent
- Intertidal regions

0 125 250 500 Meters

OCEAN ECOLOGY

# Equipment

The *Moody Blue* is a 40-foot fiberglass gillnet/halibut boat which has been converted into an oceanographic research vessel.


The *Moody Blue* is equipped with a hydraulic drum with 500 feet of armored oceanographic cable, slip-rings, and a hydraulic A-frame.

The *Moody Blue* has a draft of 6 feet and has bat-wing stabilizers and a forward-scanning sonar.

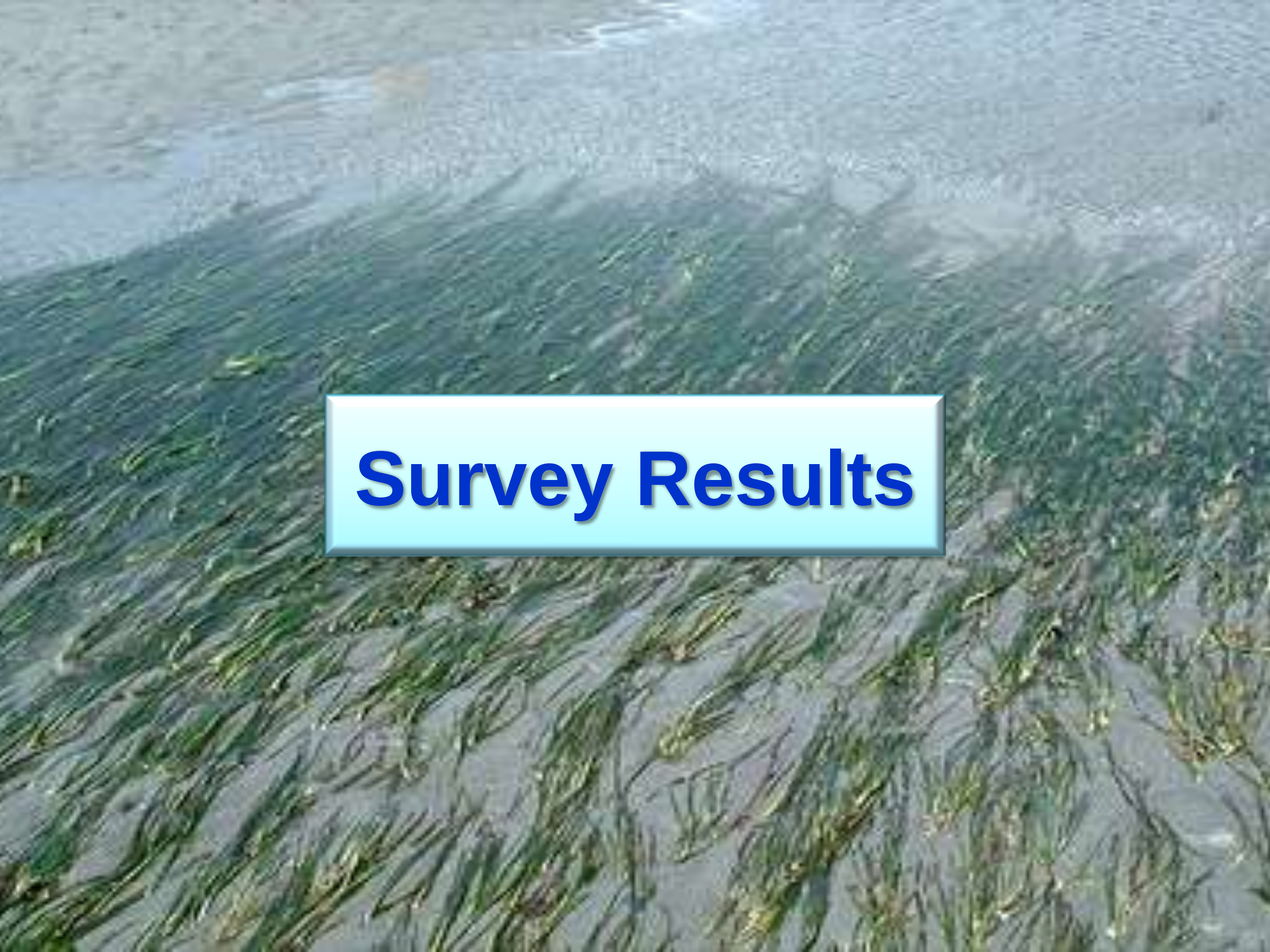
The towed video system used by Ocean Ecology has two video cameras - one in a forward-looking orientation and one in a downward-looking orientation. This system is a custom-built model designed for use in the steep, rugged terrain characteristic of British Columbia fjords.  However, the system is also highly suitable for use in more shallow water environments, such as eelgrass beds.

The video system is stream-lined and heavily weighted, reducing layback and allowing the unit to be towed directly below the DGPS antenna.

High intensity white LEDs are mounted on each camera to provide additional illumination.

The altitude of the camera is controlled using the drum which is operated from the bridge while monitoring the real-time video feed from the camera.

Sidescan sonar images of the eelgrass were collected using a Humminbird 997c SI sonar unit. The transducer for the Humminbird unit was mounted in a towfish.



# Survey Results

**Flora Bank Eelgrass Survey**

**Figure 3.** Survey design showing transect bearings.

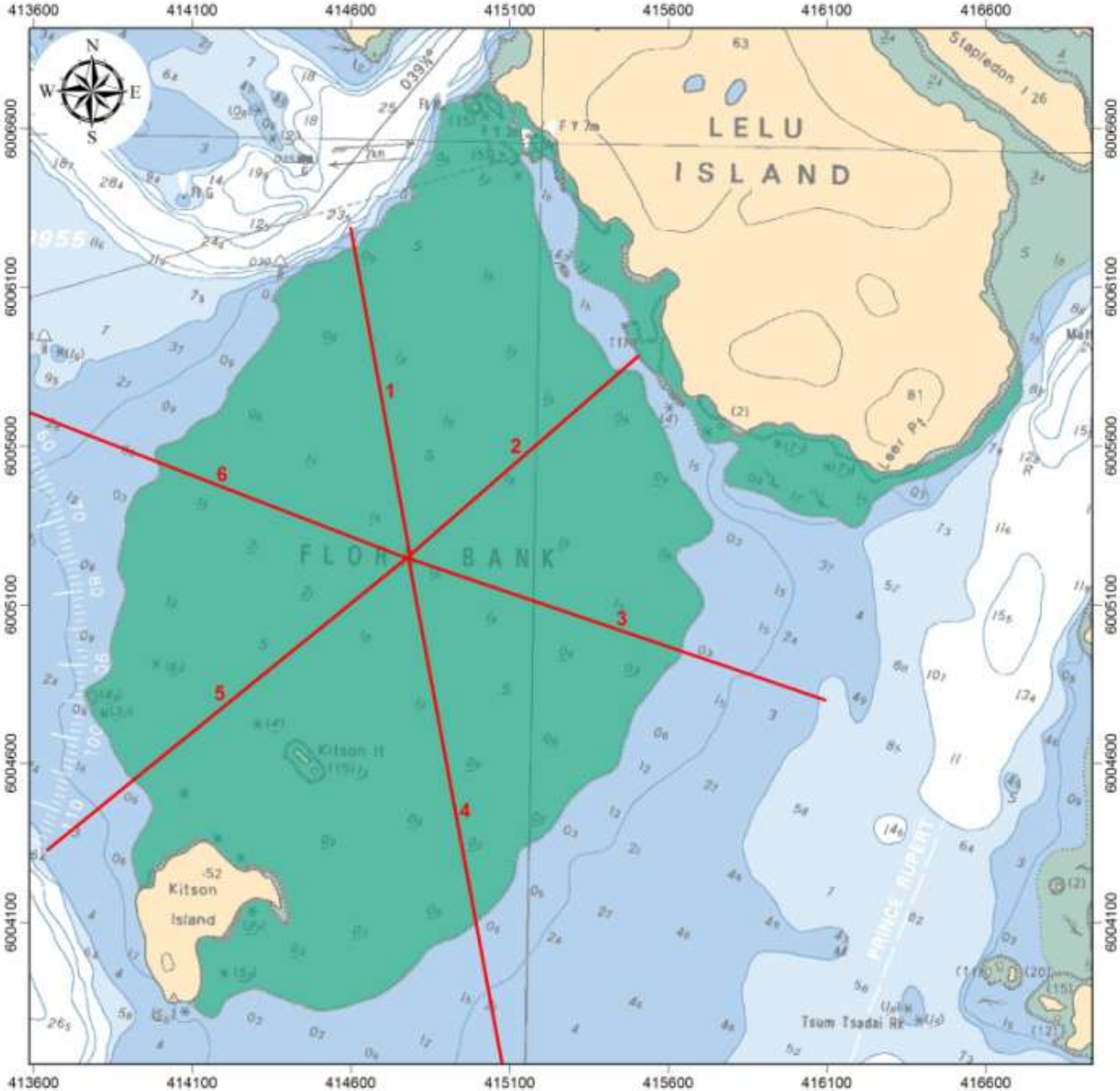



**Chart used for navigation:**
CHS 395502
(Porpoise Harbour)

**Chart datum:** LNT

**Projection:** WGS 1984 UTM Zone 9N

**Scale:** 1:17,000

**Legend**

Proposed transect bearings

Intertidal regions

0 125 250 500 Meters

OCEAN ECOLOGY

**Flora Bank Eelgrass Survey**

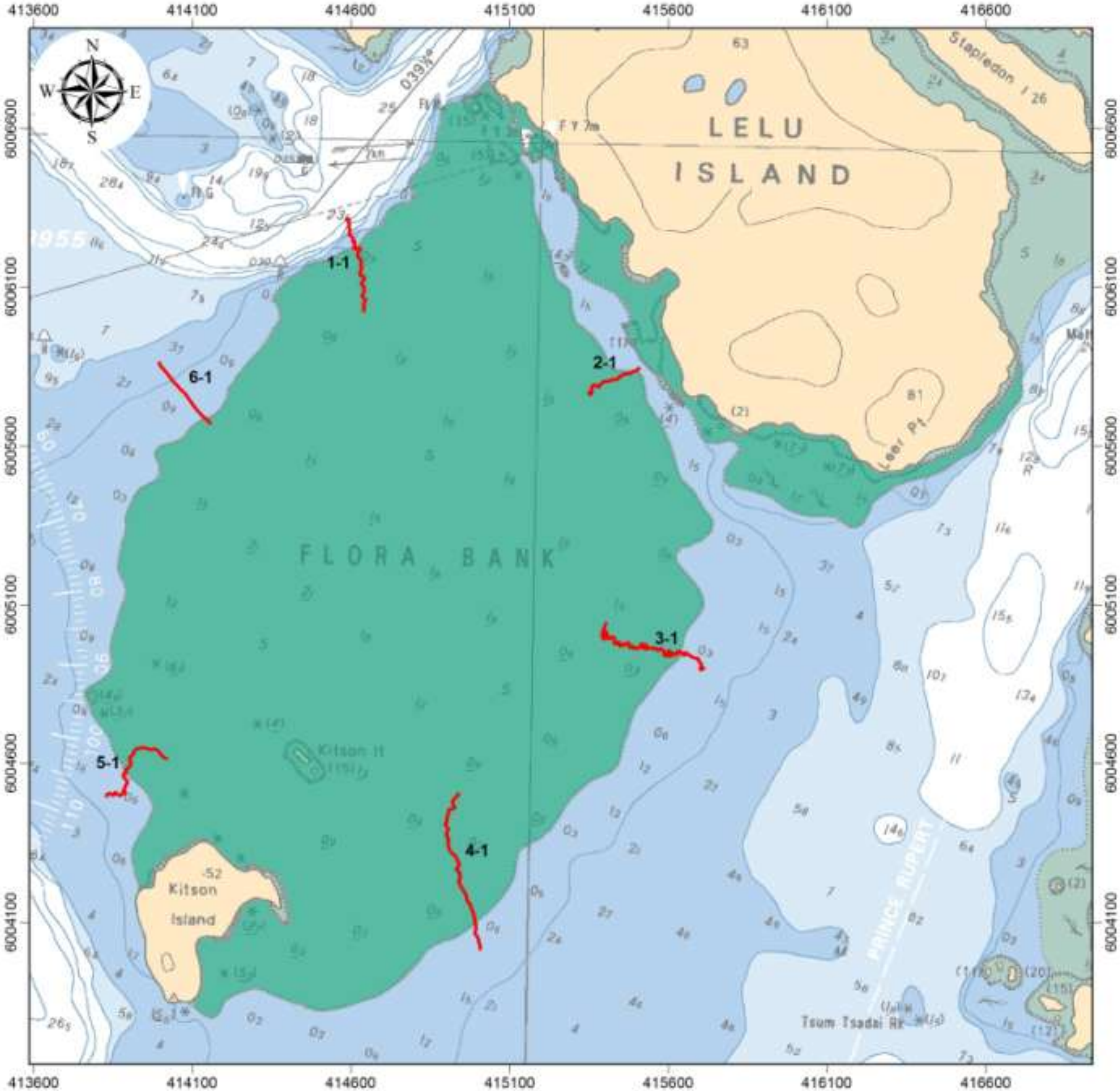



**Figure 4.** Completed survey showing transects.

**Chart used for navigation:** CHS 395502 (Porpoise Harbour)

**Chart datum:** LNT

**Projection:** WGS 1984 UTM Zone 9N

**Scale:** 1:17,000

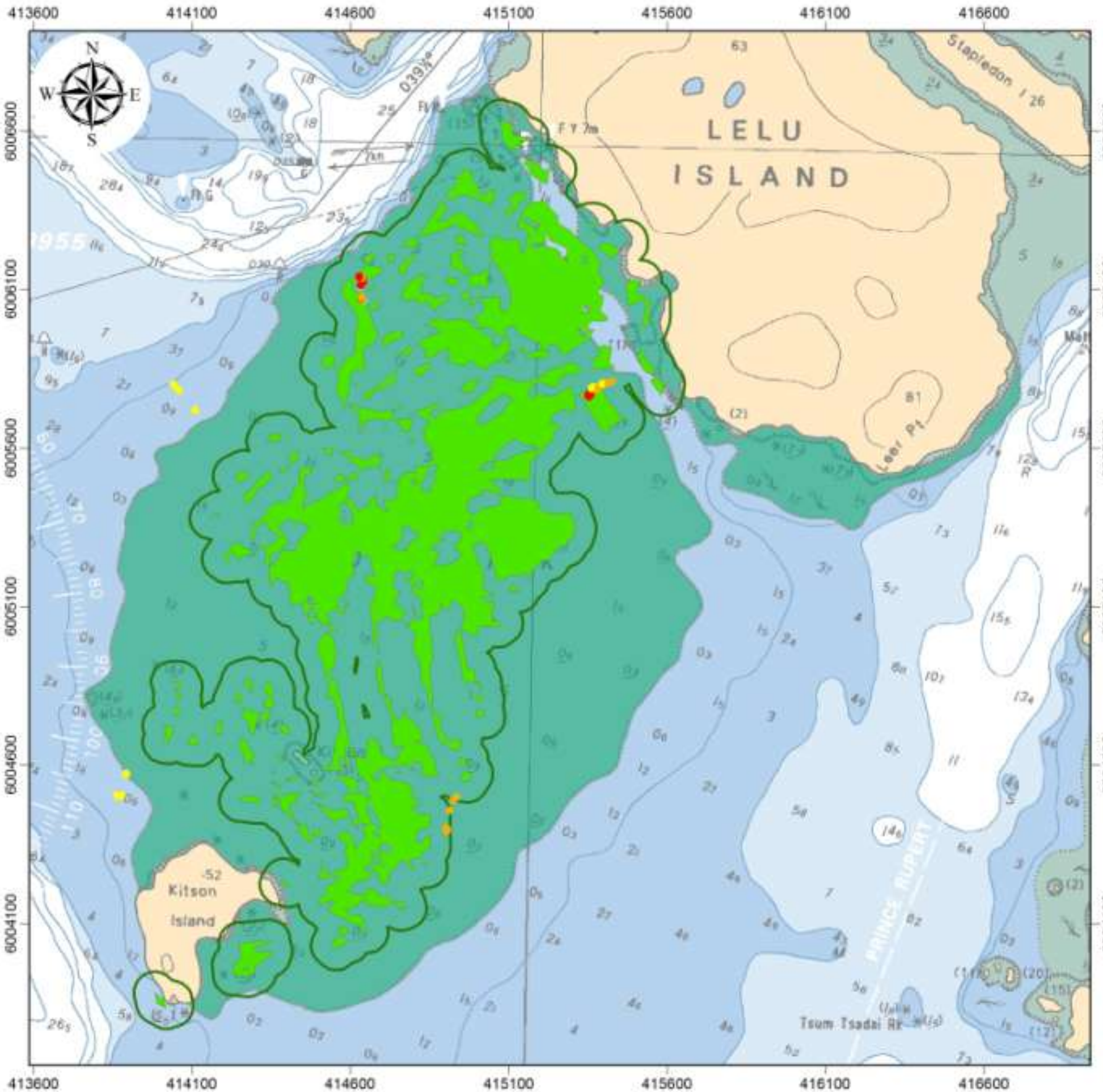
**Legend**

- Transect lines
- Intertidal regions

0 125 250 500 Meters

OCEAN ECOLOGY


Example of eelgrass as viewed by the camera system.




**Flora Bank Eelgrass Survey**

**Figure 5.** Eelgrass observations.

**Bathymetric system:**
JRC 130 single-beam echosounder

**Transducer:**
50 kHz operating at 1 kW power

**Beam angle:** 9 degrees

**Positioning system:**
Electronic charting software using DGPS

**Station for tide height corrections:**
Port Edward,
CHS reference station 10933

**Chart used for navigation:**
CHS 395502
(Porpoise Harbour)

**Chart datum:** LNT

**Projection:** WGS 1984 UTM Zone 9N

**Scale:** 1:17,000

**Legend**

**Eelgrass observations**

Percent cover

- < 5%
- 5% - 25%
- 26% - 75%

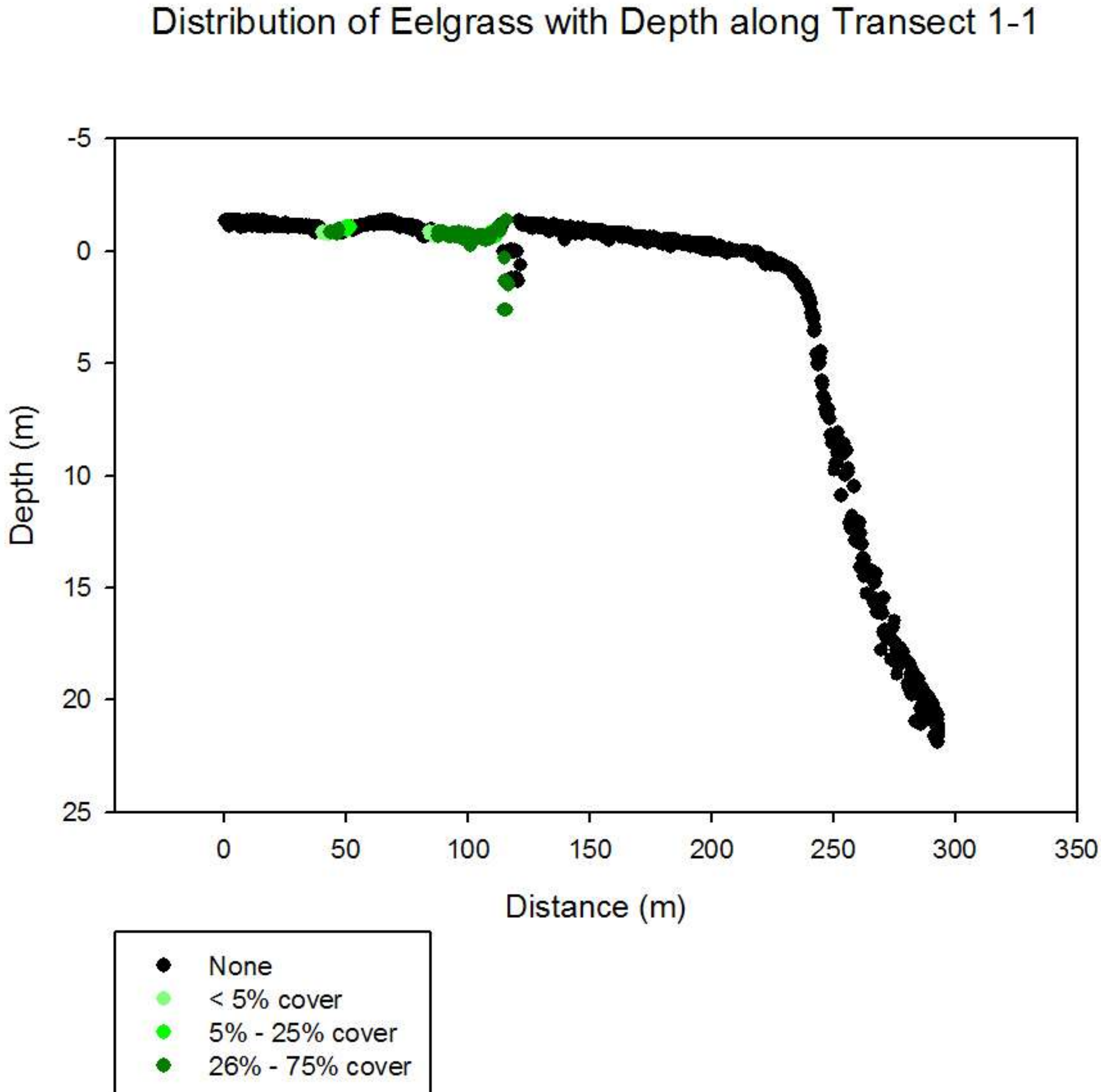
Borstad eelgrass extent

65 m buffer

Intertidal regions

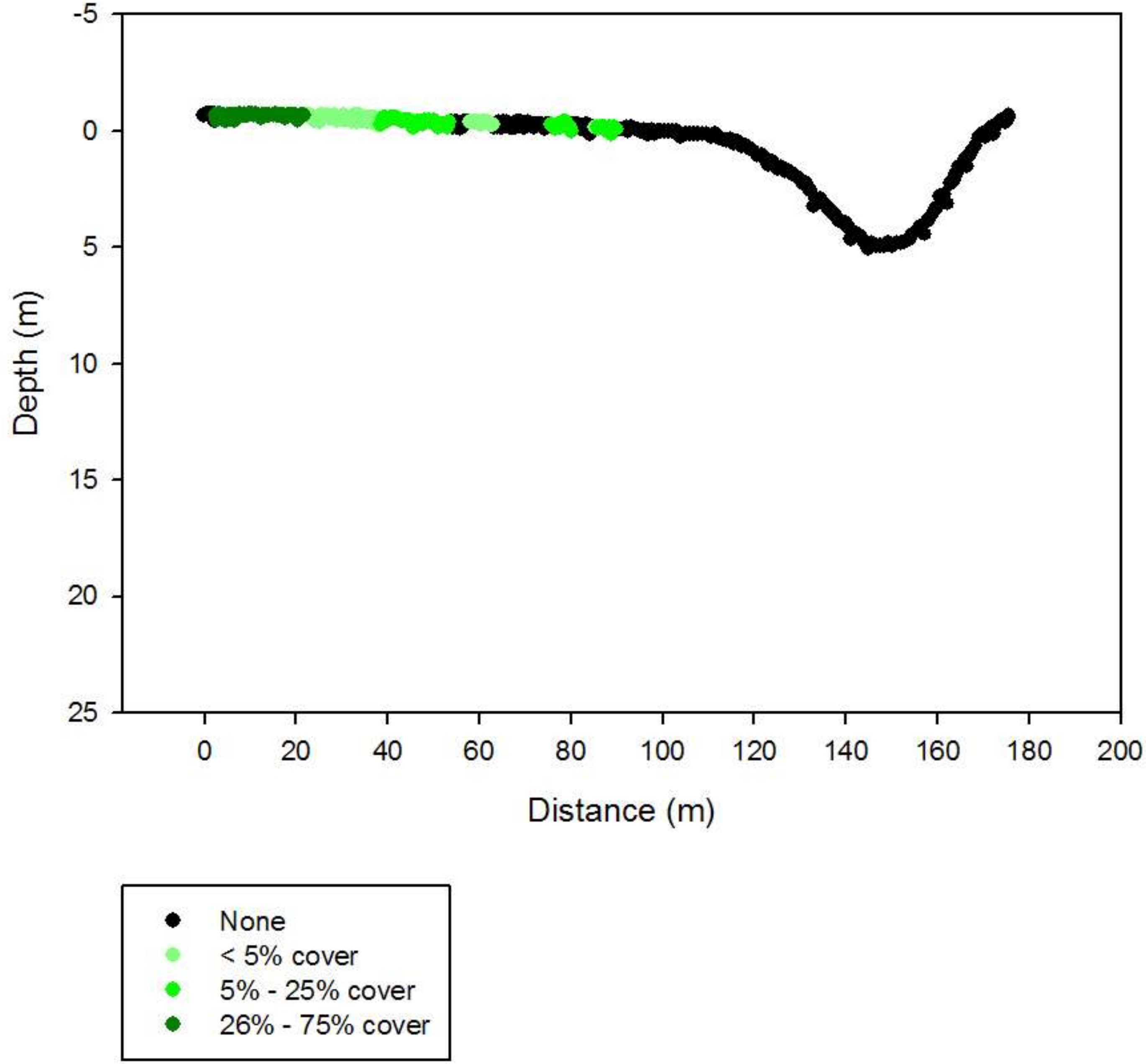
0 125 250 500 Meters

OCEAN ECOLOGY

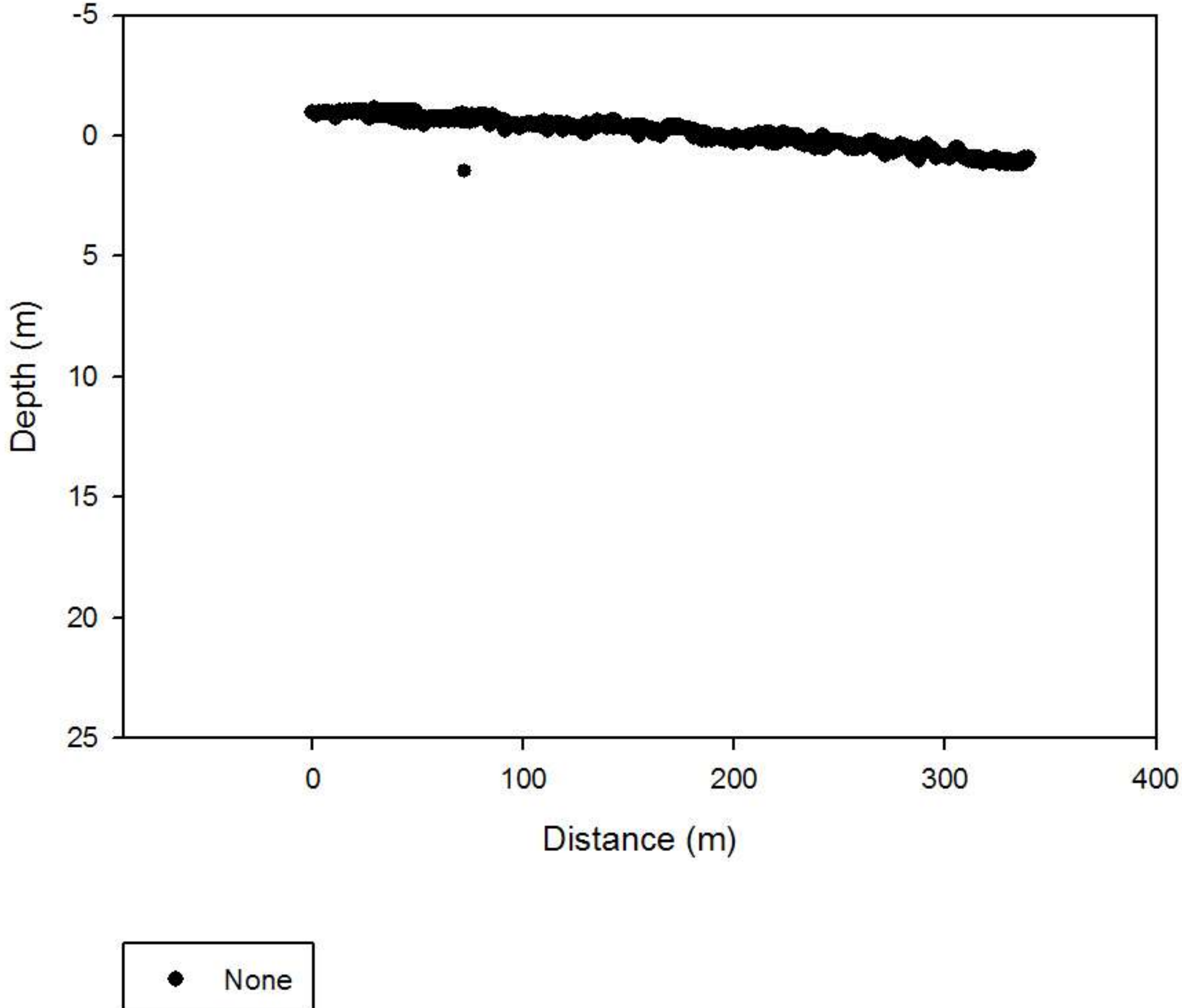


Distribution of Eelgrass with Depth along Transect 1-1
Depth (m)
-5
0
5
10
15
20
25
Distance (m)
0
50
100
150
200
250
300
350
None
< 5% cover
5% - 25% cover
26% - 75% cover

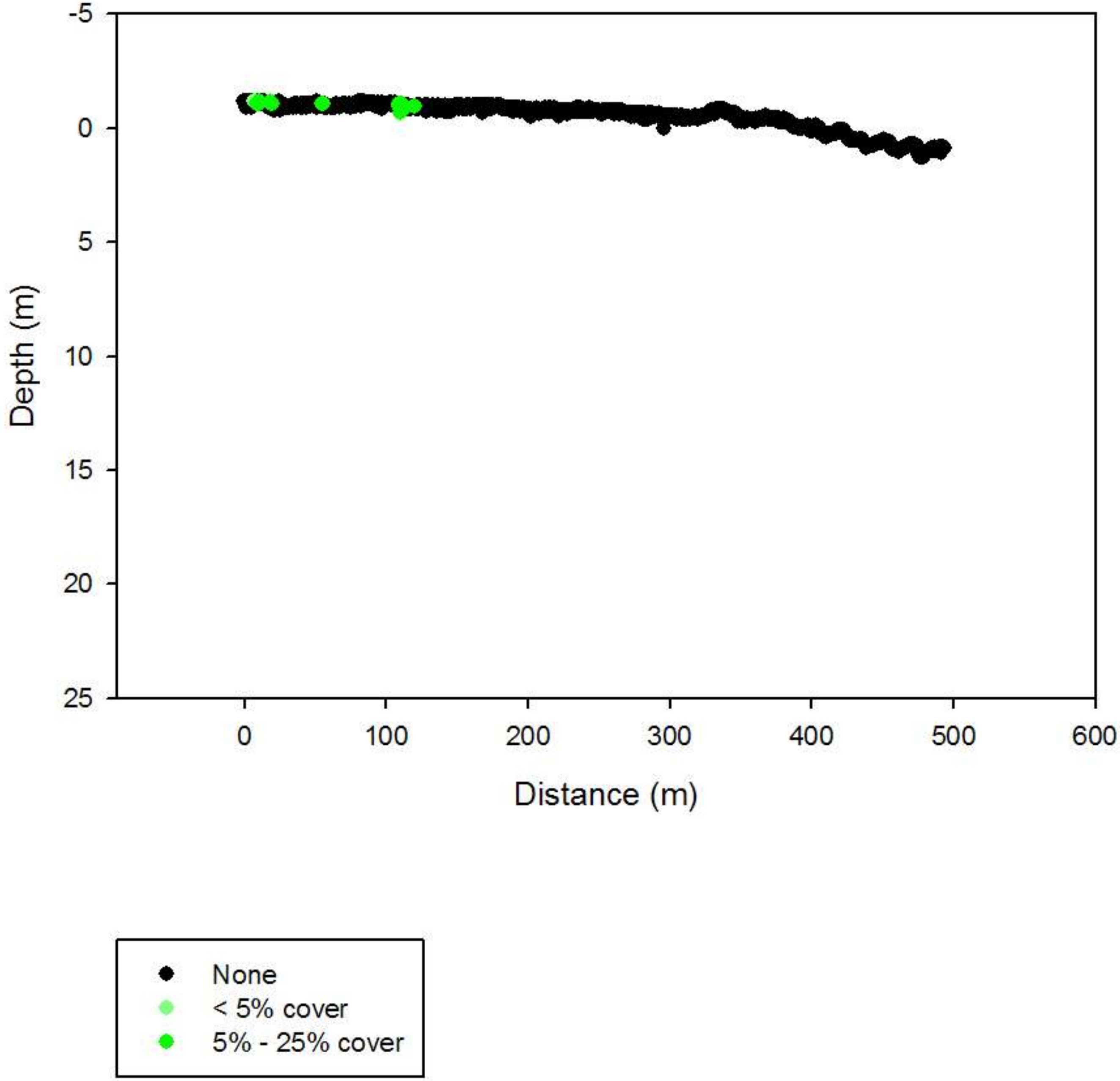
Distribution of Eelgrass with Depth along Transect 2-1



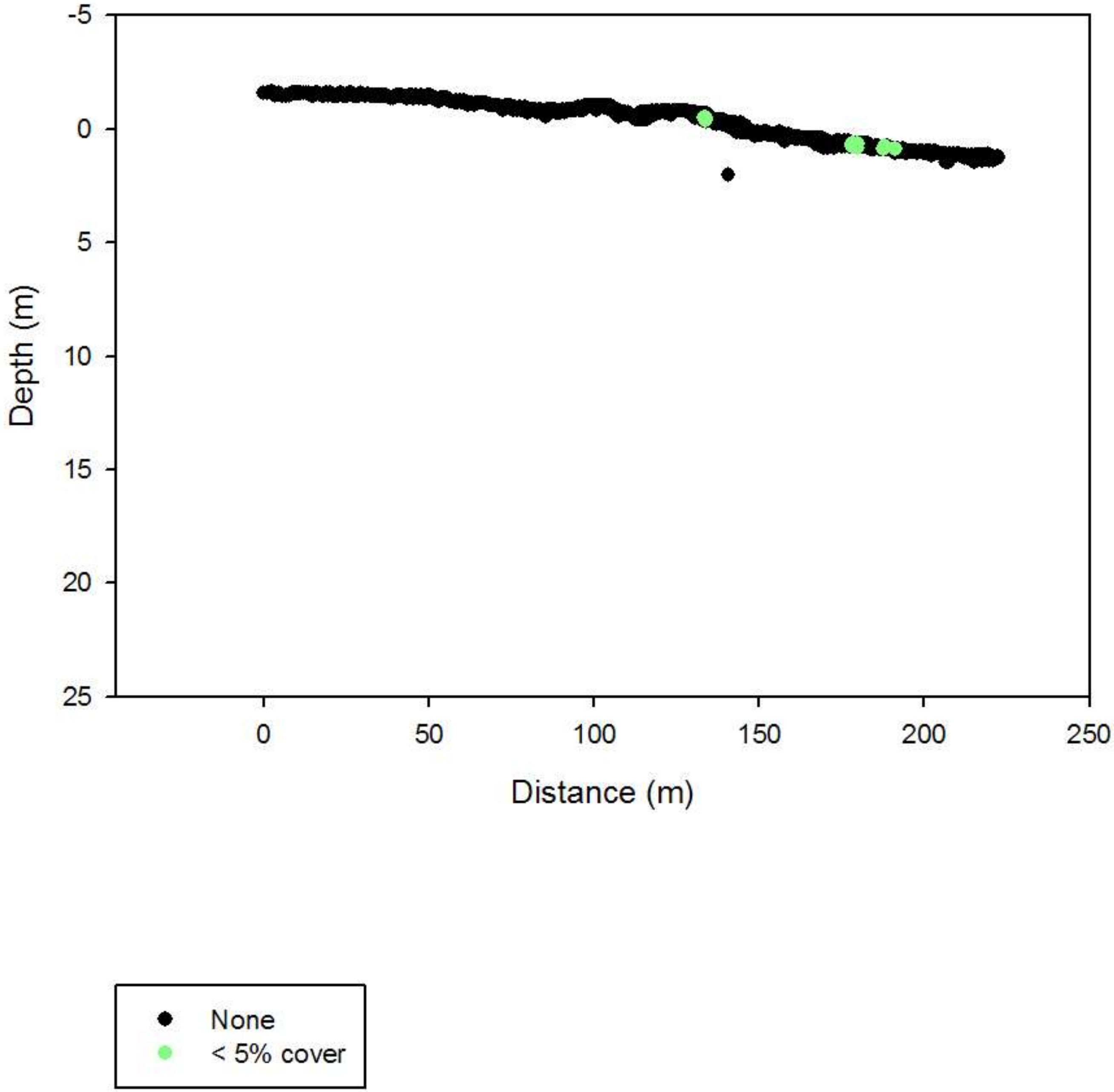
Distribution of Eelgrass with Depth along Transect 3-1

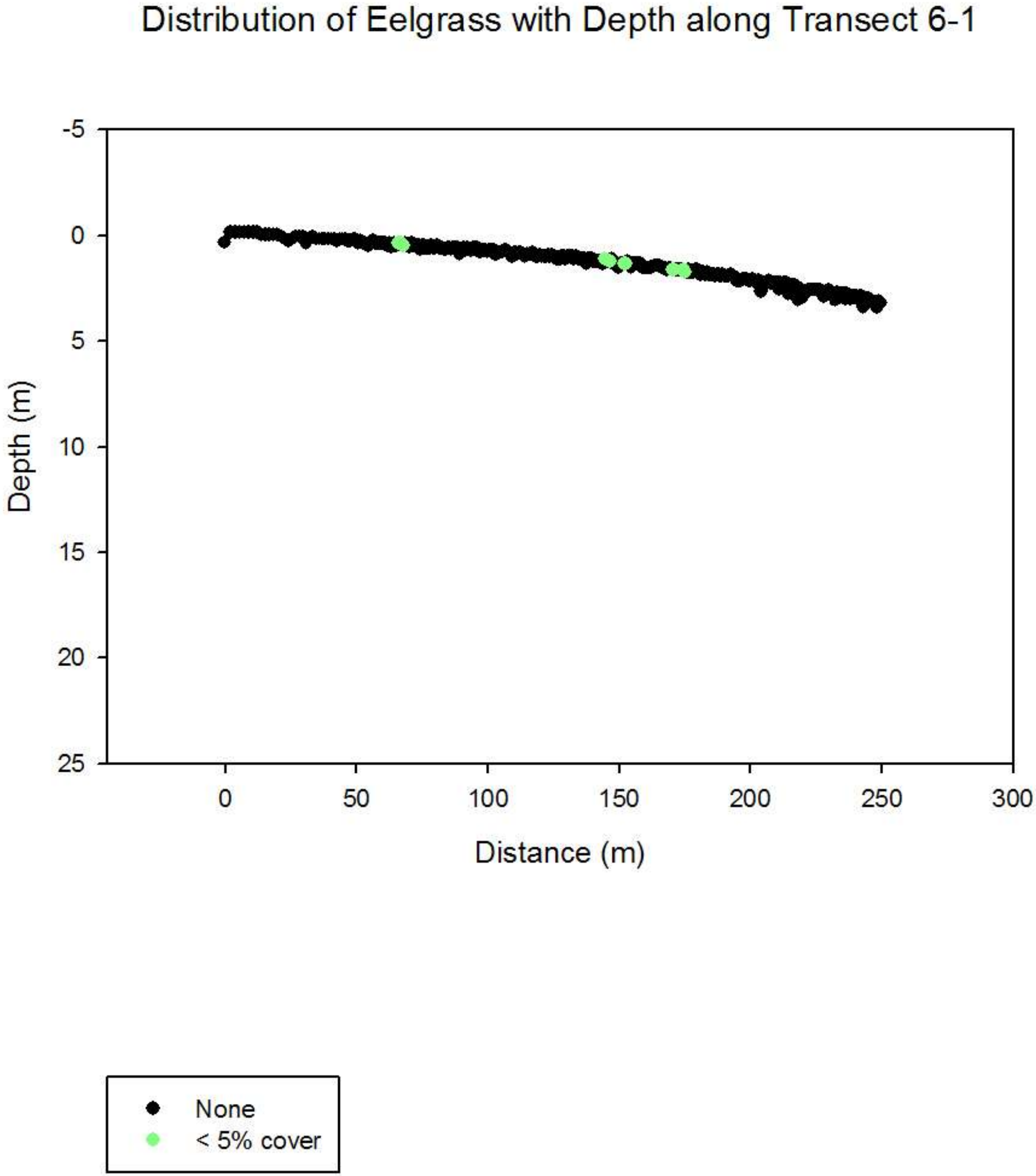


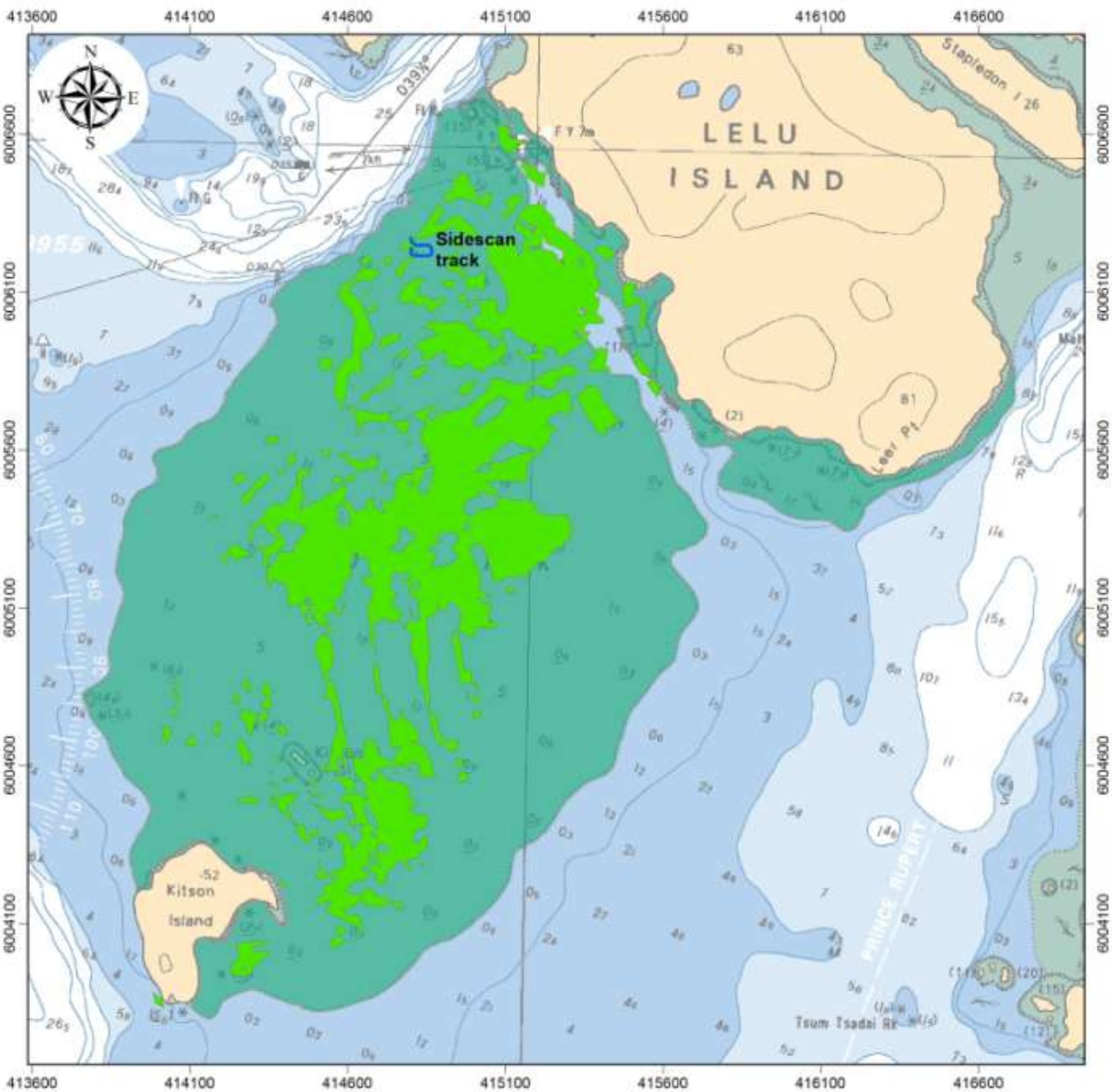
Distribution of Eelgrass with Depth along Transect 4-1



Distribution of Eelgrass with Depth along Transect 5-1




Distribution of Eelgrass with Depth along Transect 6-1
-5
0
5
10
15
20
25
Depth (m)
0
50
100
150
200
250
300
Distance (m)
None
< 5% cover




**Flora Bank Eelgrass Survey**

**Figure 12.** Location of experimental sidescan track.

**Bathymetric system:**
Humminbird 997c SI

**Transducer:**
455 kHz and 200 kHz
operating at 1 kW power

**Positioning system:**
Electronic charting software using DGPS

**Station for tide height corrections:**
Port Edward,
CHS reference station 10933

**Chart used for navigation:**
CHS 395502
(Porpoise Harbour)

**Chart datum:** LNT

**Projection:** WGS 1984 UTM Zone 9N

**Scale:** 1:17,000

**Legend**

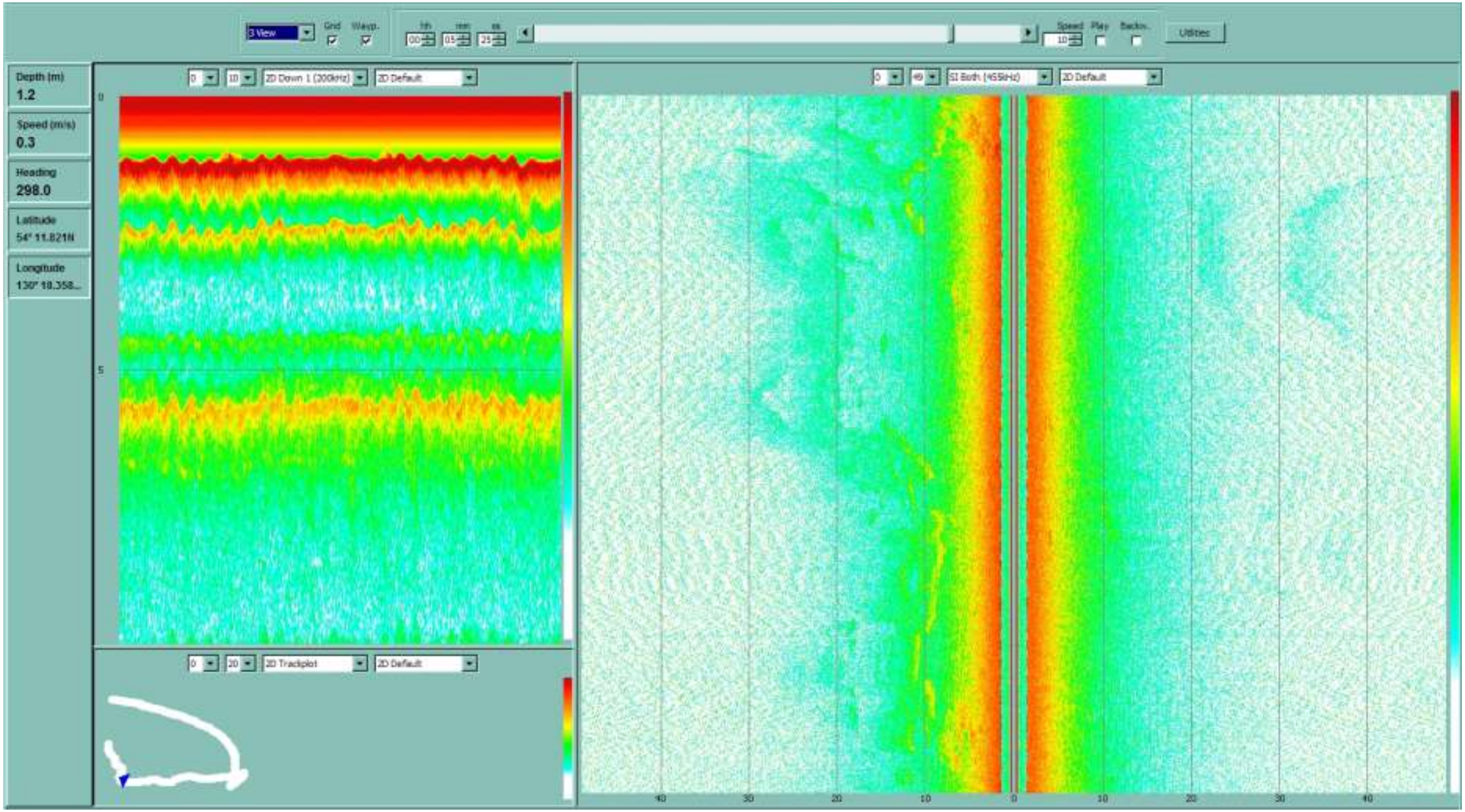
Sidescan track

Borstad eelgrass extent

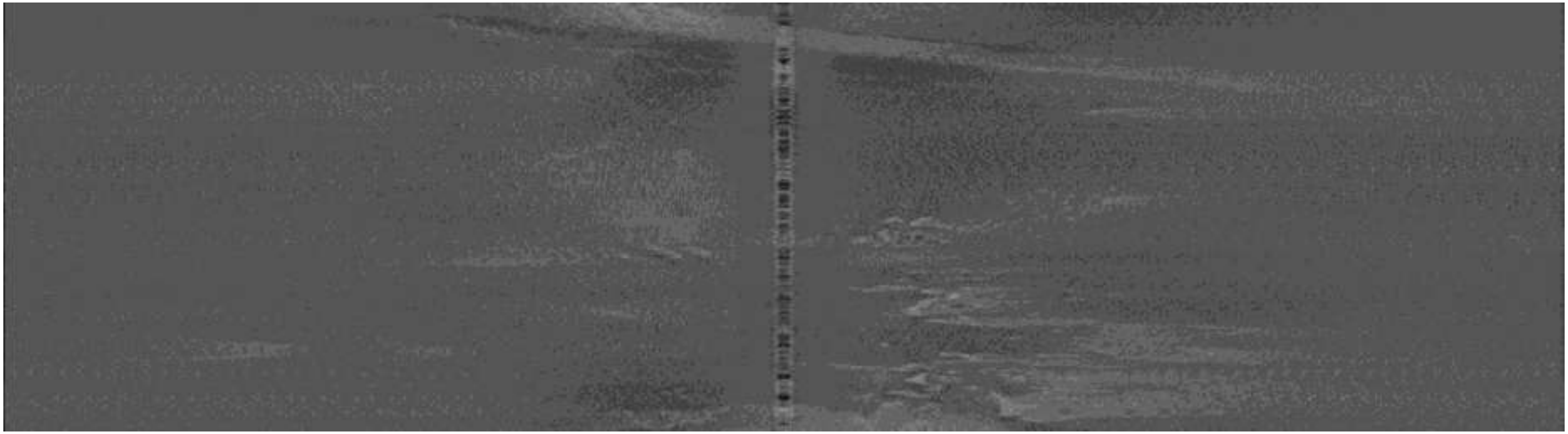
Intertidal regions

0 125 250 500 Meters

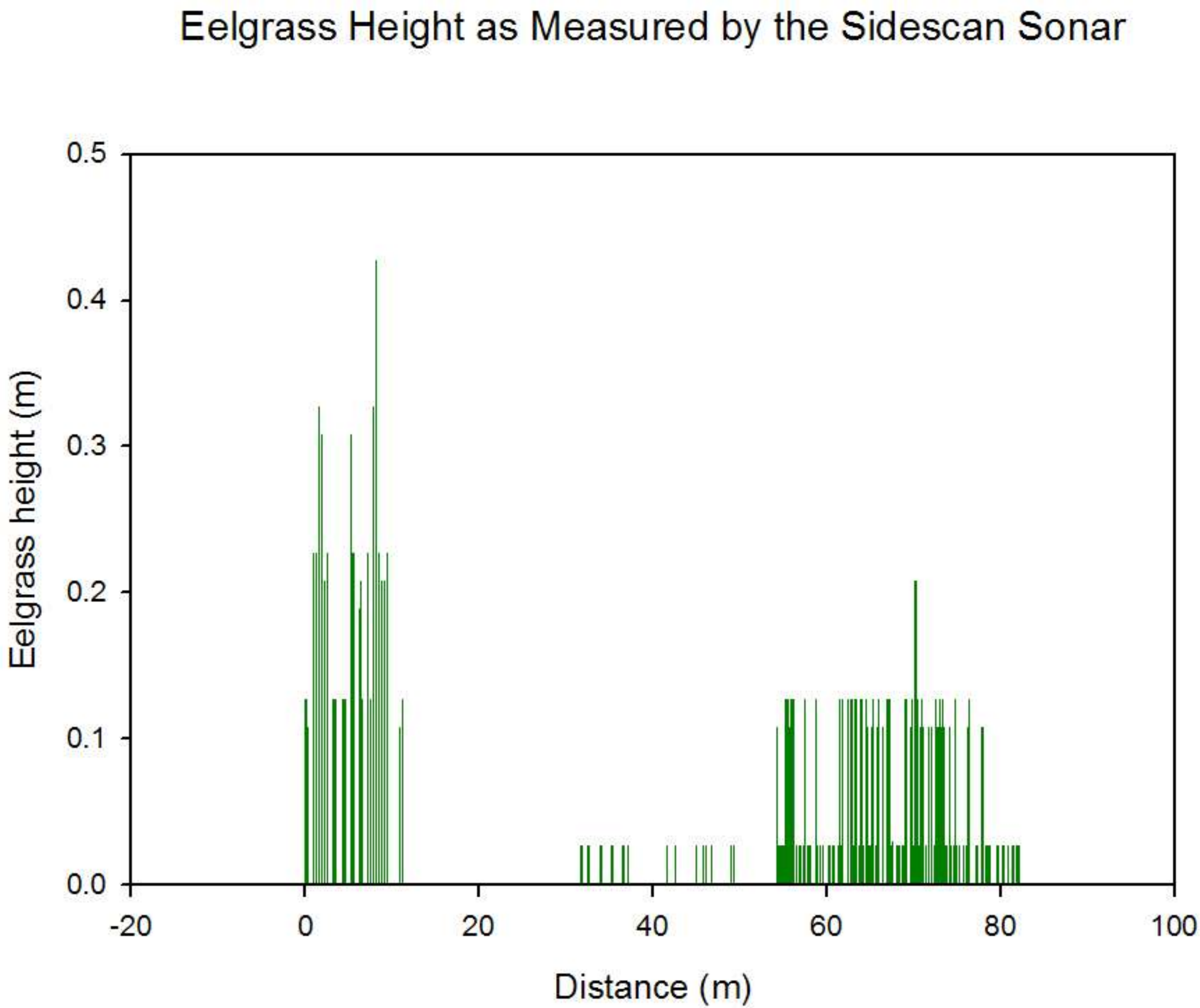
OCEAN ECOLOGY




Screen capture of raw sidescan data using the HumViewer software.



Sidescan data after processing with the Mini Image Processing System (MIPS).


Eelgrass Height as Measured by the Sidescan Sonar
Eelgrass height (m)
0.0
0.1
0.2
0.3
0.4
0.5
-20
0
20
40
60
80
100
Distance (m)

# Conclusions and Recommendations

## Some general observations about the eelgrass survey

- Approximately 97% of the observed eelgrass was intertidal, and appeared to be *Zostera marina typica*
- Approximately 96% of the observed eelgrass was either within, or in very close proximity to, those areas where the 1997 Borstad CASI survey indicated eelgrass to be present
- The fact that there was very little eelgrass observed in areas at a distance from the previously identified beds seems to suggest that the eelgrass has not been actively expanding since 1997

## Navigational hazards

- **Conclusion**: shallow water depths, strong tidal currents, high turbidity, and large woody debris made conditions for towed video work difficult.

- **Recommendation**: based on the intertidal nature of the Flora Bank eelgrass bed, and the significant navigational hazards associated with Flora Bank, it is suggested that future surveys of the eelgrass bed be undertaken at low tide using light-weight, highly mobile craft, such as kayaks, which can be carried along the bed as the survey progresses, thus reducing the risk of stranding. Utilizing experienced paddlers would also be highly recommended.

## Distribution of Eelgrass on Flora Bank

- **Conclusion**: given the high turbidity of the site, eelgrass growing in the subtidal environment is probably light limited. Thus, the Flora Bank eelgrass bed is most likely limited to only those regions where the depth is shallow enough to allow good light penetration.

- **Recommendation**: since the Skeena River plume plays an important role in controlling the growth of eelgrass on Flora Bank through changes in turbidity, further studies on the relationship between the volume, timing, and sediment load of the Skeena River freshet and the growth of eelgrass on Flora Bank should be undertaken, particularly in light of possible changes in the river's seasonal patterns as a result of global climate change.

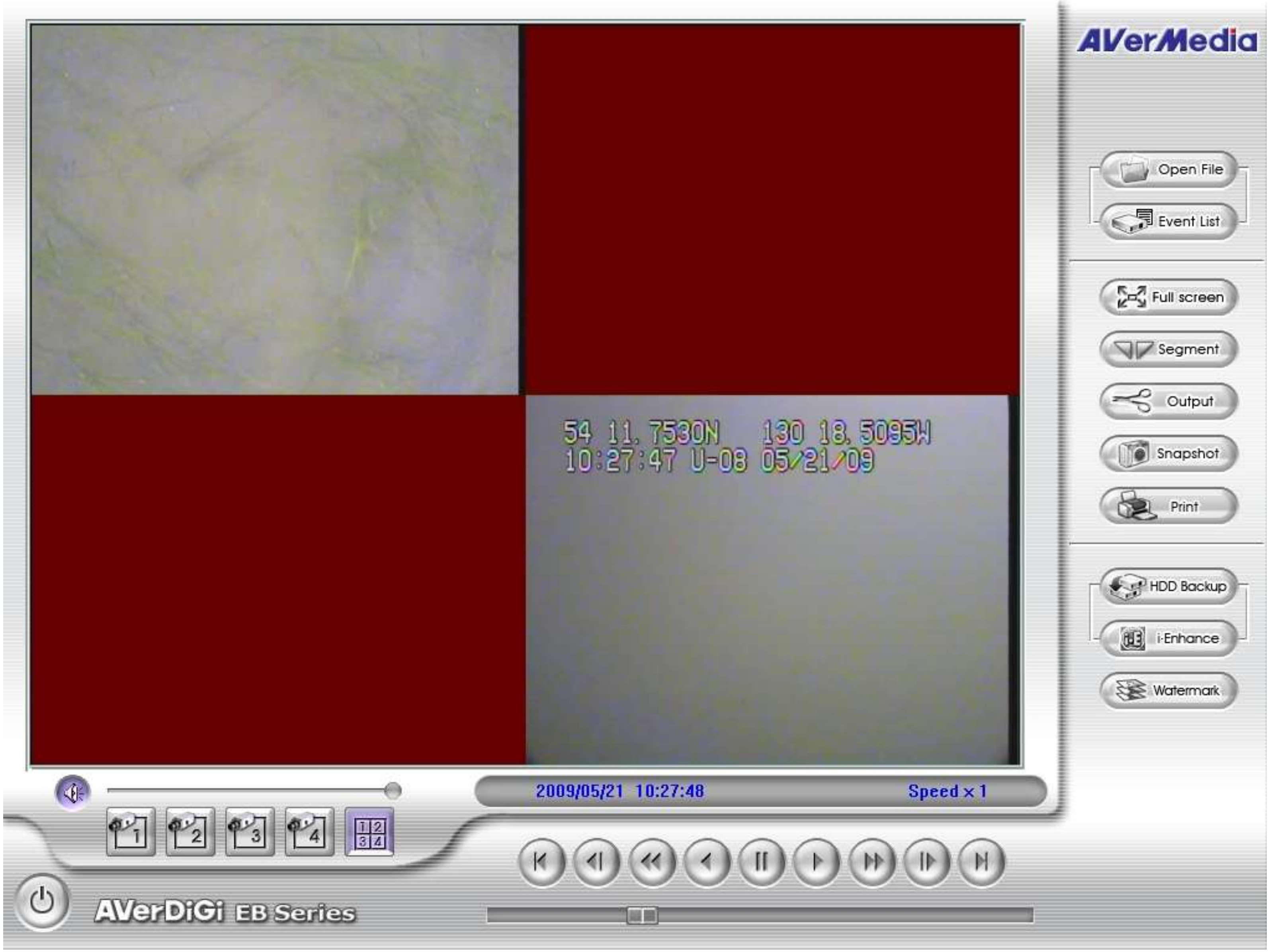
# New Approaches for Monitoring Eelgrass

- **Conclusion**: eelgrass was successfully visualized using the Humminbird sidescan sonar. The image quality of the sidescan data produced by this unit was comparable with that of images produced by more expensive systems. This may allow small organizations with limited funding to be able to collect high quality sidescan data.

- **Conclusion**: the use of the downward-looking sonar to quantify eelgrass height may prove valuable in deeper water habitats.

- **Recommendation**: based on the results obtained so far with the Humminbird sidescan unit, it is recommended that further experimental trials be carried out on subtidal eelgrass beds.

# Project Data




Raw video data

# Flora Bank Eelgrass Survey


May 2009

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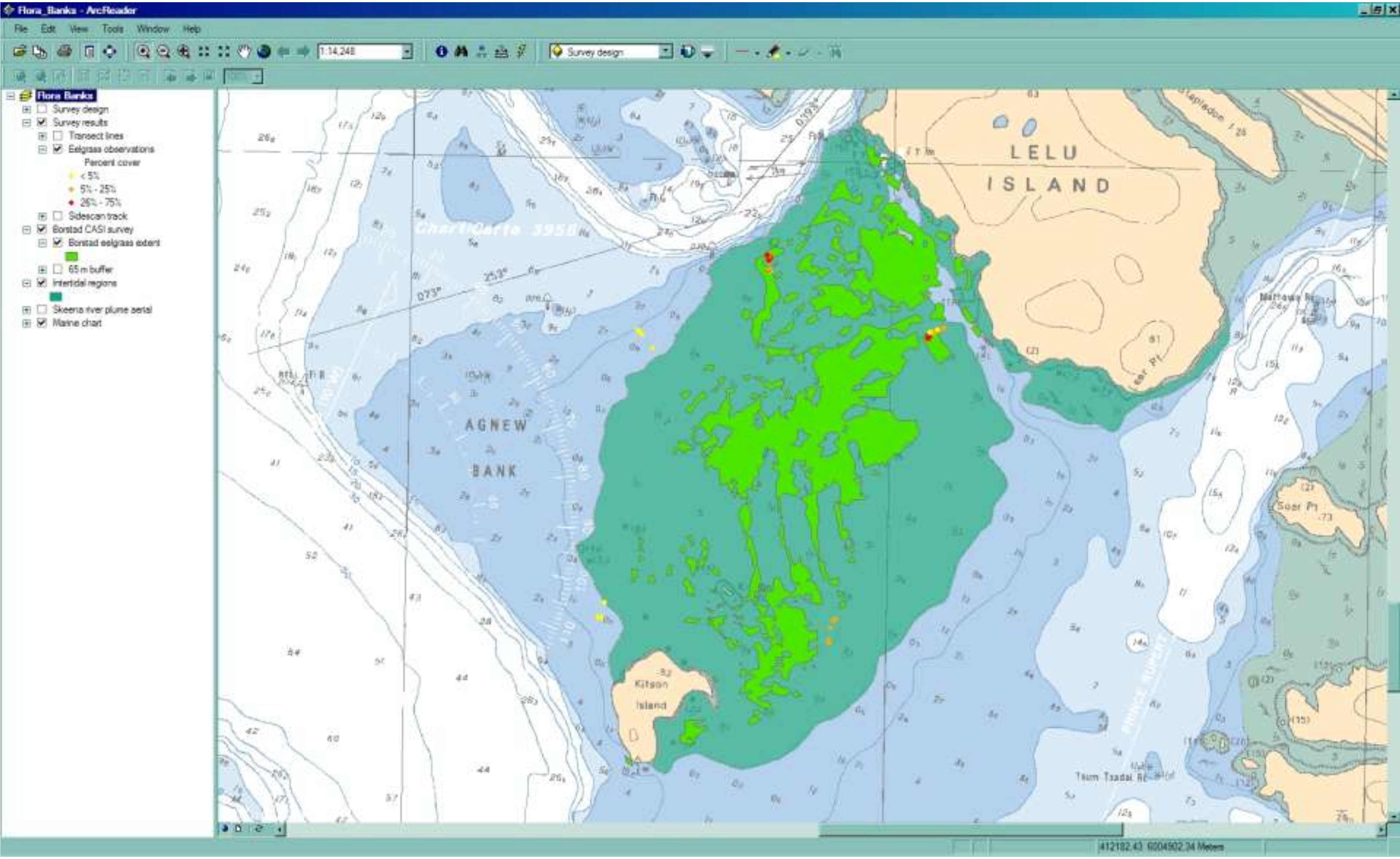
Email: blueseas@oceanecology.ca

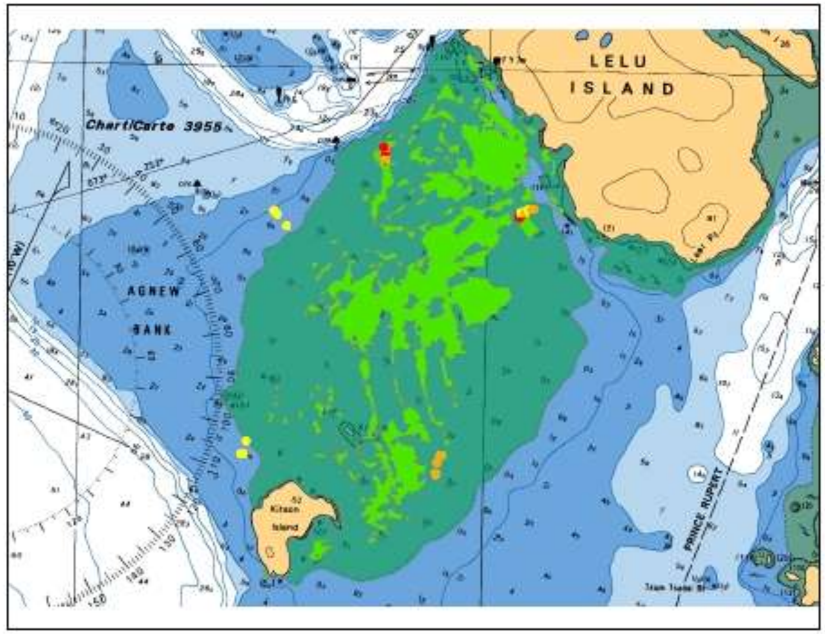
Written report


Flora_Banks - ArcReader
File Edit View Tools Window Help
1:14,248
Survey design
Flora Banks
Survey design
Survey results
Transect lines
Eelgrass observations
Percent cover
< 5%
5% - 25%
26% - 75%
Sidescan track
Borstad CASI survey
Borstad eelgrass extent
65 m buffer
Intertidal regions
Skeena river plume aerial
Marine chart
LELU
ISLAND
AGNEW
BANK
Kitson
Island
Tsum Tsadai Rf
412182.43 6004902.34 Meters

ArcGIS maps

# Flora Banks

- ☐ Survey design
- ☒ Survey results
  - ☐ Transect lines
  - ☒ Eelgrass observations
    - Percent cover
      - < 5%
      - 5% - 25%
      - 26% - 75%
  - ☐ Sidescan track
- ☒ Borstad CASI survey
  - ☒ Borstad eelgrass extent
  - ☐ 65 m buffer
- ☒ Intertidal regions
- ☐ Skeena river plume aerial

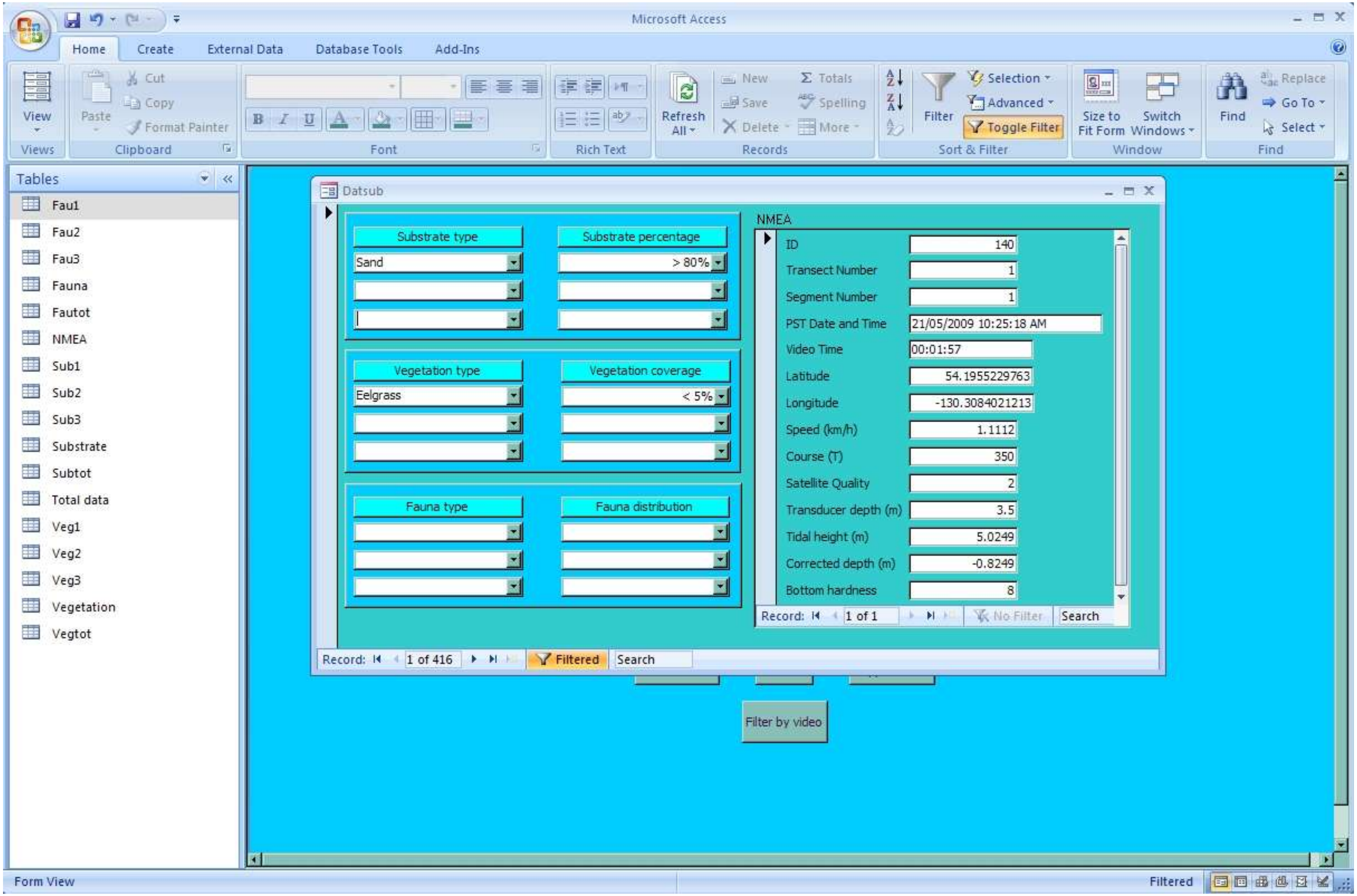



Scale 1: 32748 OK

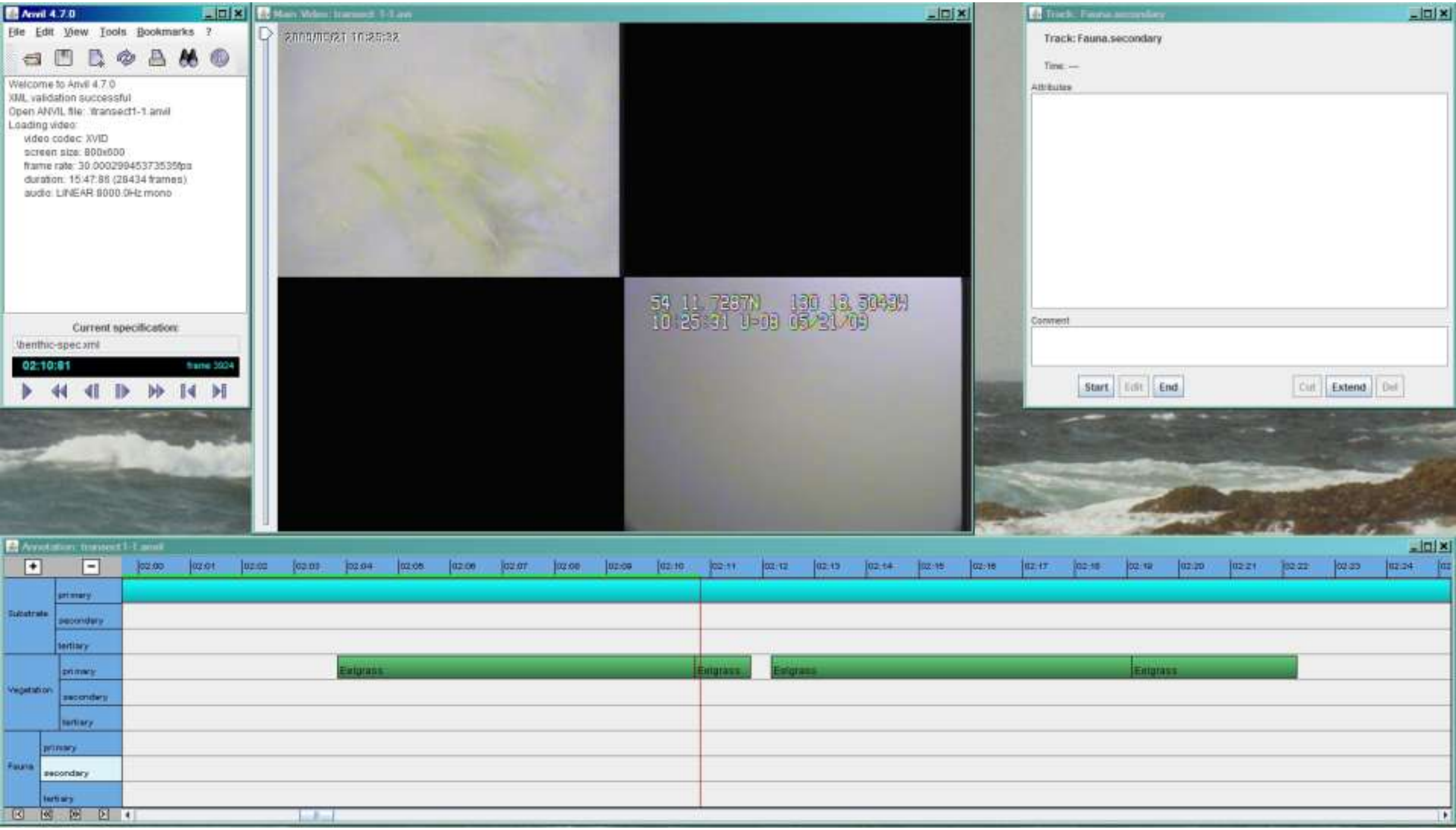
0 500 1000
m

Author: Barb Faggetter/Kennard Hall
Company: Ocean Ecology
E-Mail: blueseas@oceanecology.ca
Date: August 06, 2009
Projection: WGS 1984 UTM Zone 9N
Created with MapViewSVG by uismedia

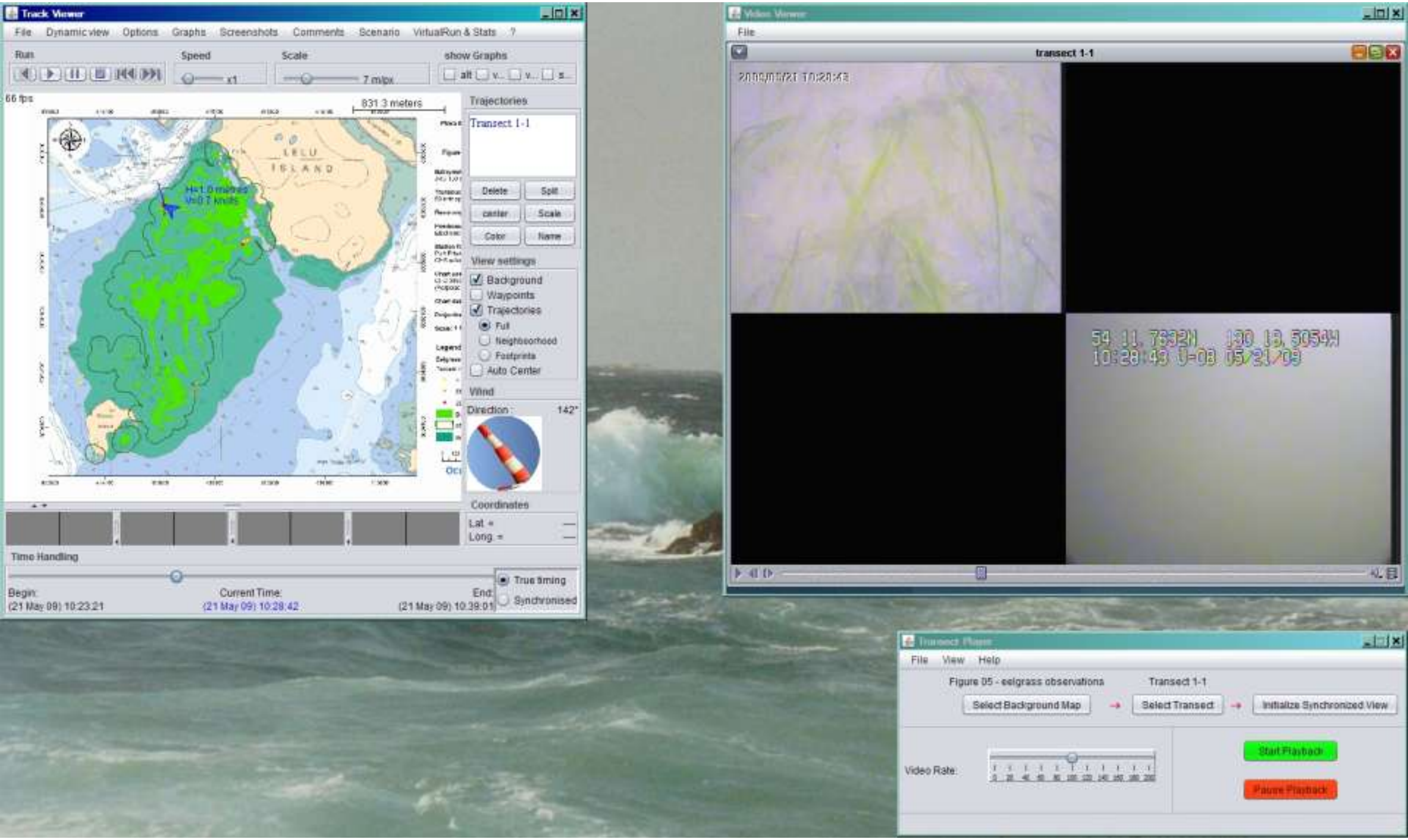
Web GIS maps




Access database

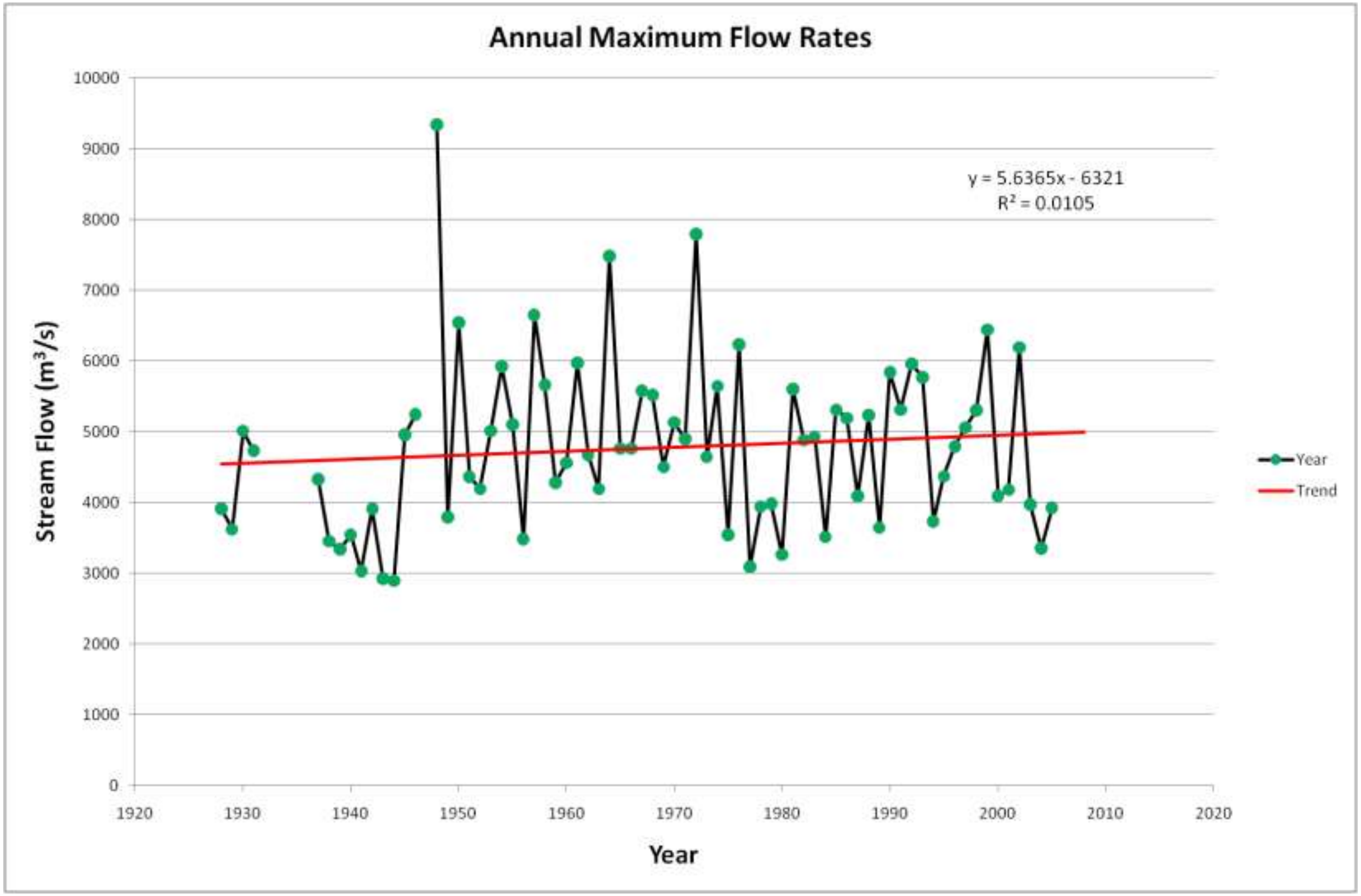



Library of video annotations

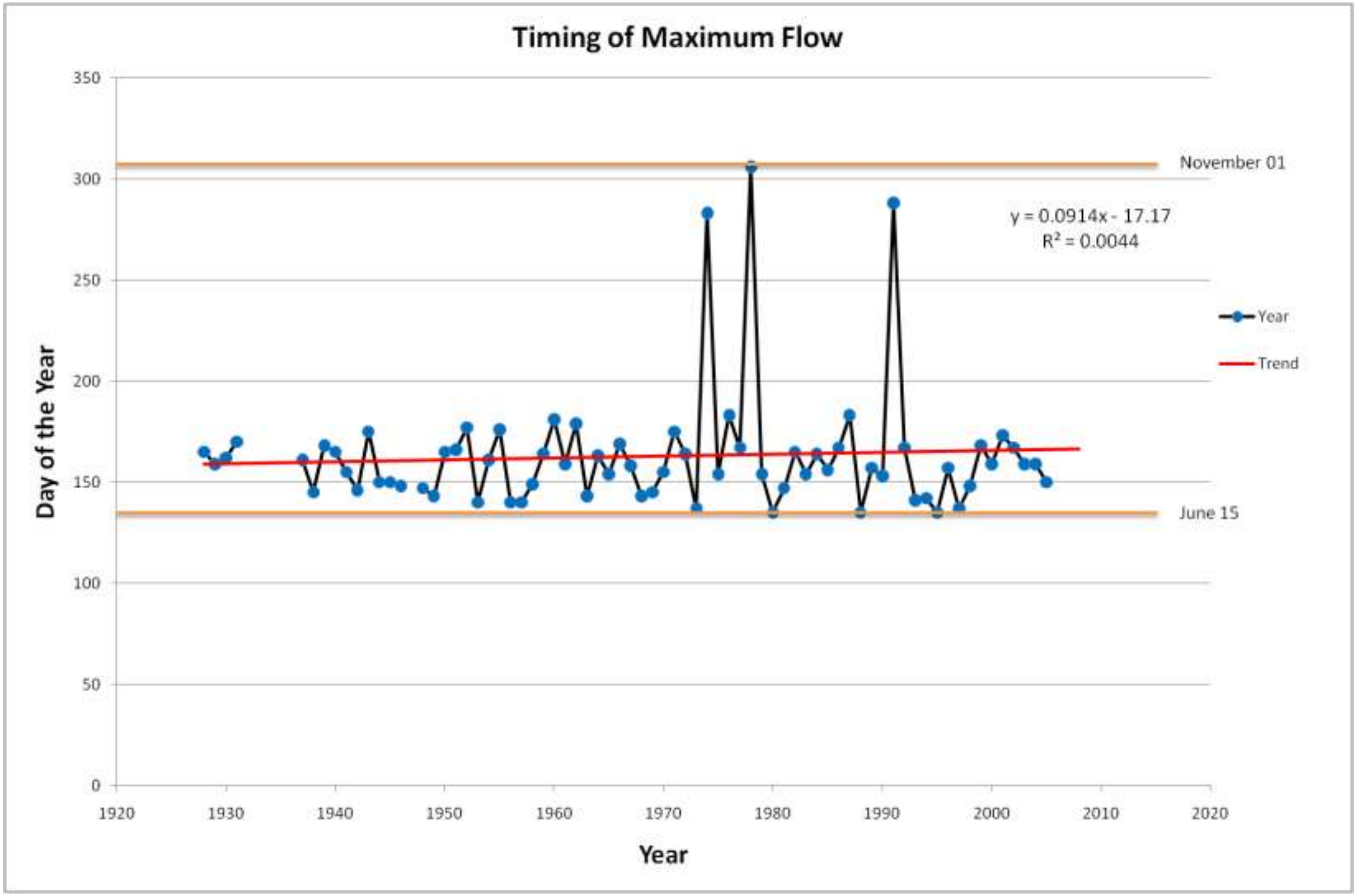



Video mapping

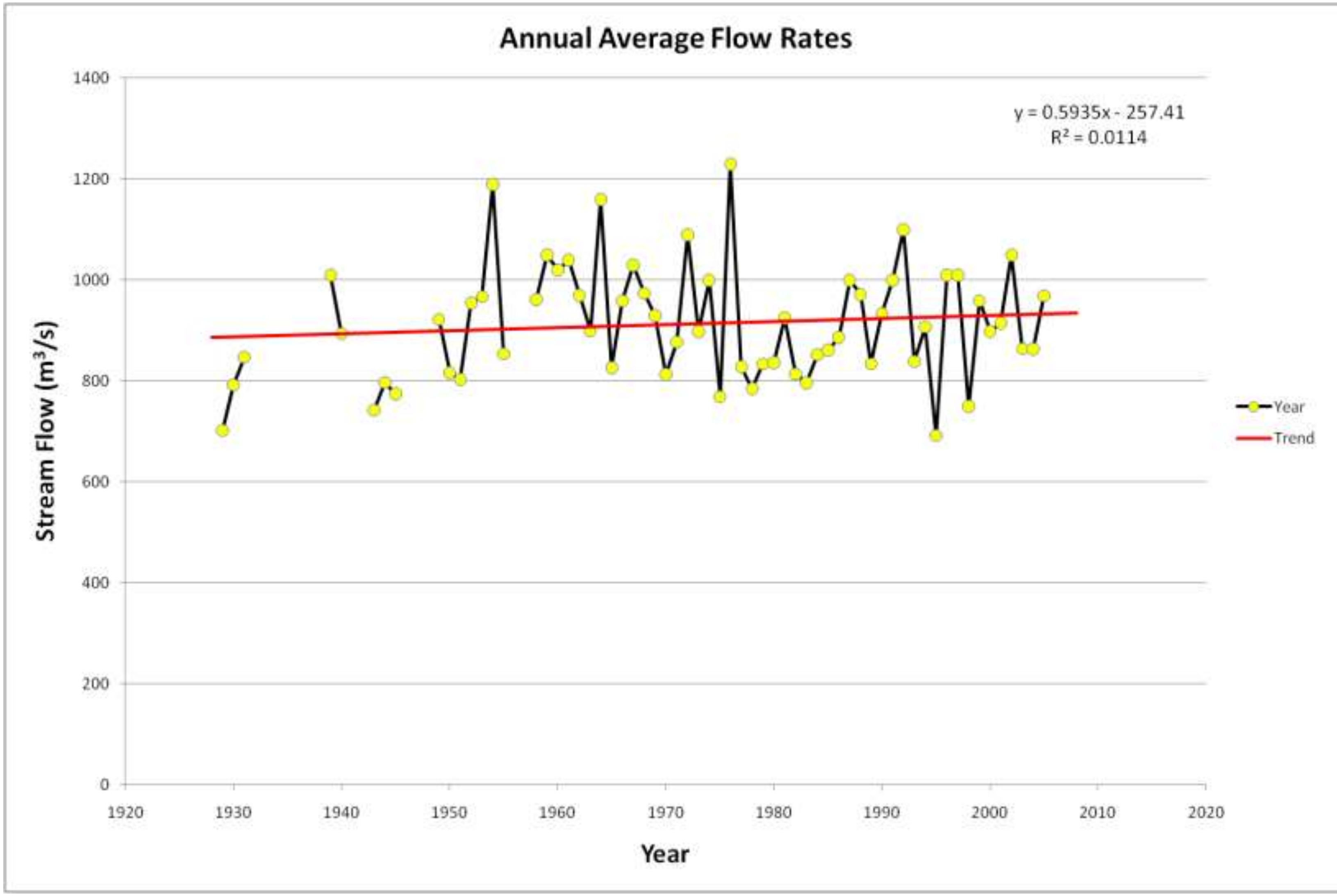
# Future Directions



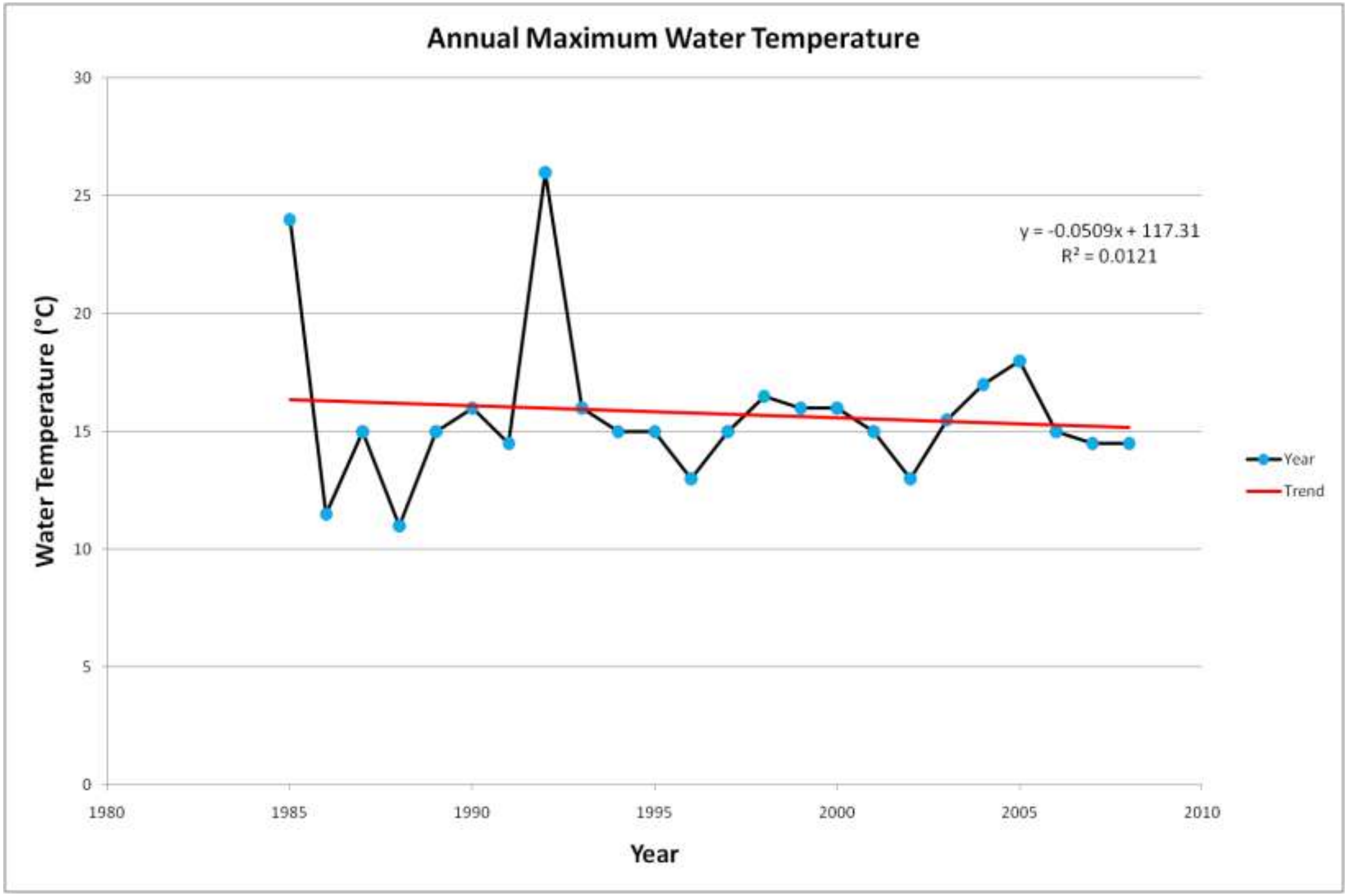

**Further studies on the relationship between the volume, timing, and sediment load of the Skeena River flows and the growth of eelgrass on Flora Bank** - shown above is the annual maximum flow rate at Usk on the Skeena River. Note the slight trend towards increased flow rates.



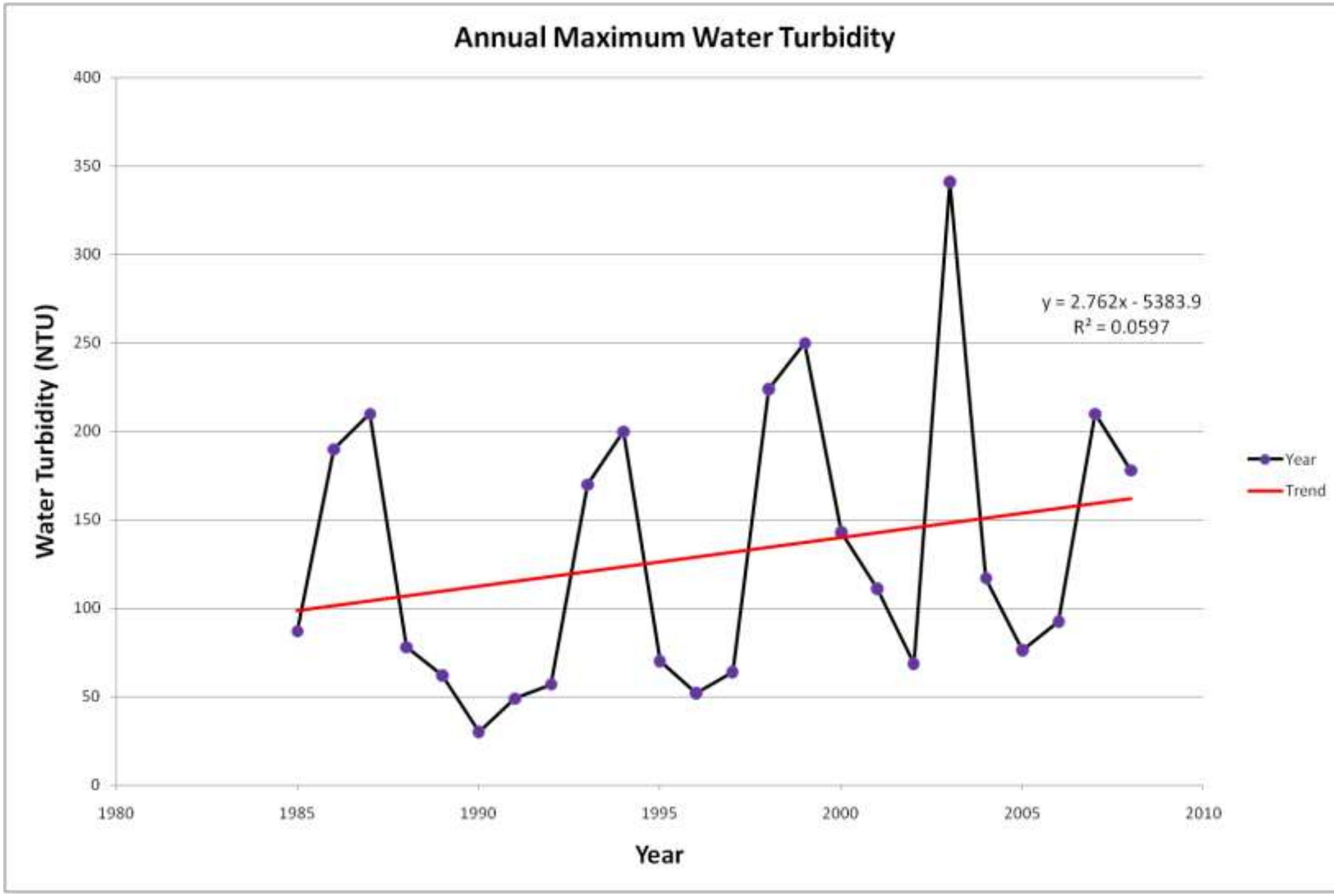

Shown above is the timing of the annual maximum flow rate at Usk on the Skeena River. Note the slight trend towards maximum flow rates occurring later in the season.



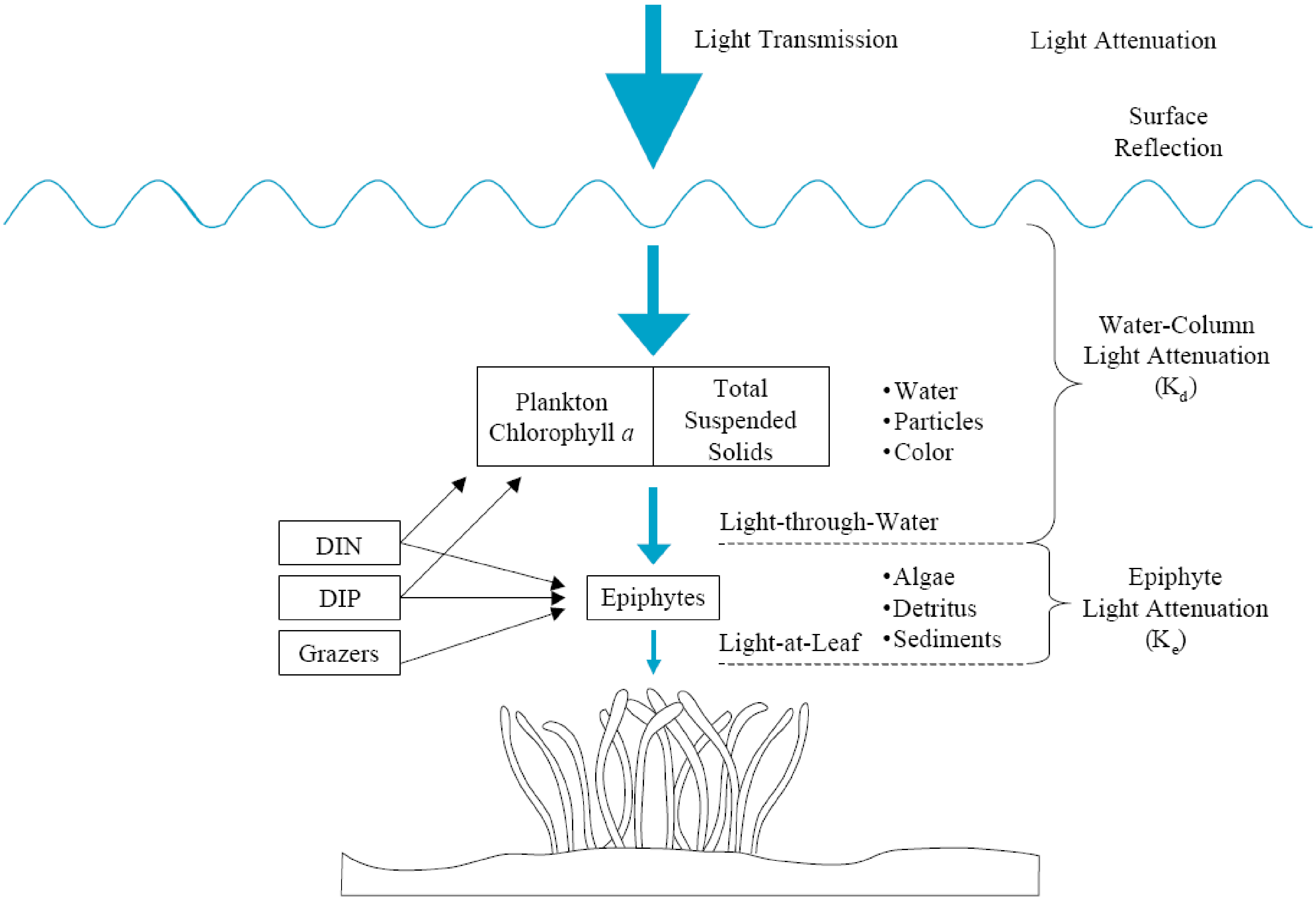

Shown above is annual average flow rate at Usk on the Skeena River. Note the slight (unexpected?) trend towards higher average flow rates.



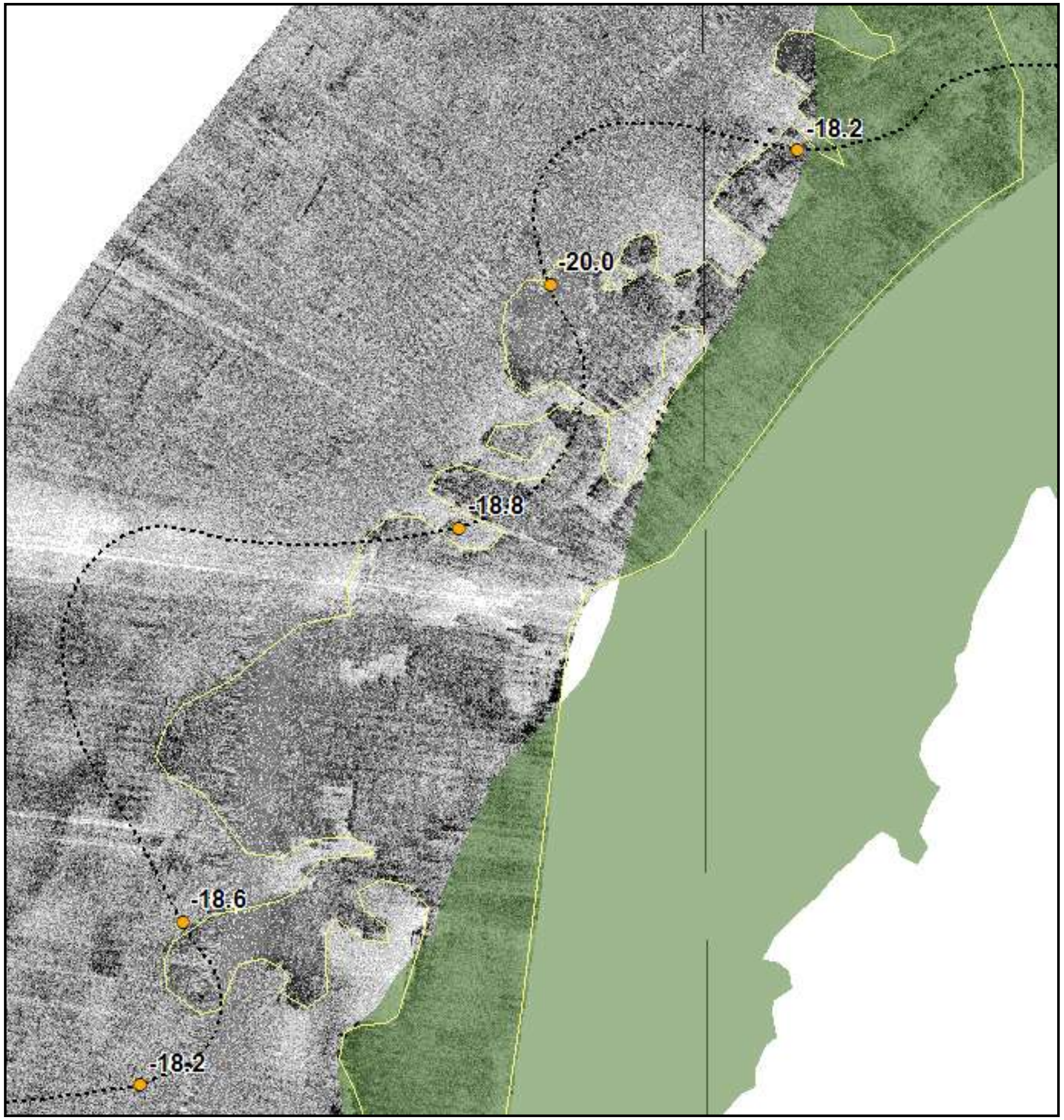

Shown above is annual maximum water temperature at Usk on the Skeena River. Note the slight (unexpected?) trend towards lower maximum water temperatures.




Shown above is annual maximum water turbidity at Usk on the Skeena River. Note the trend towards lower higher maximum turbidity levels.

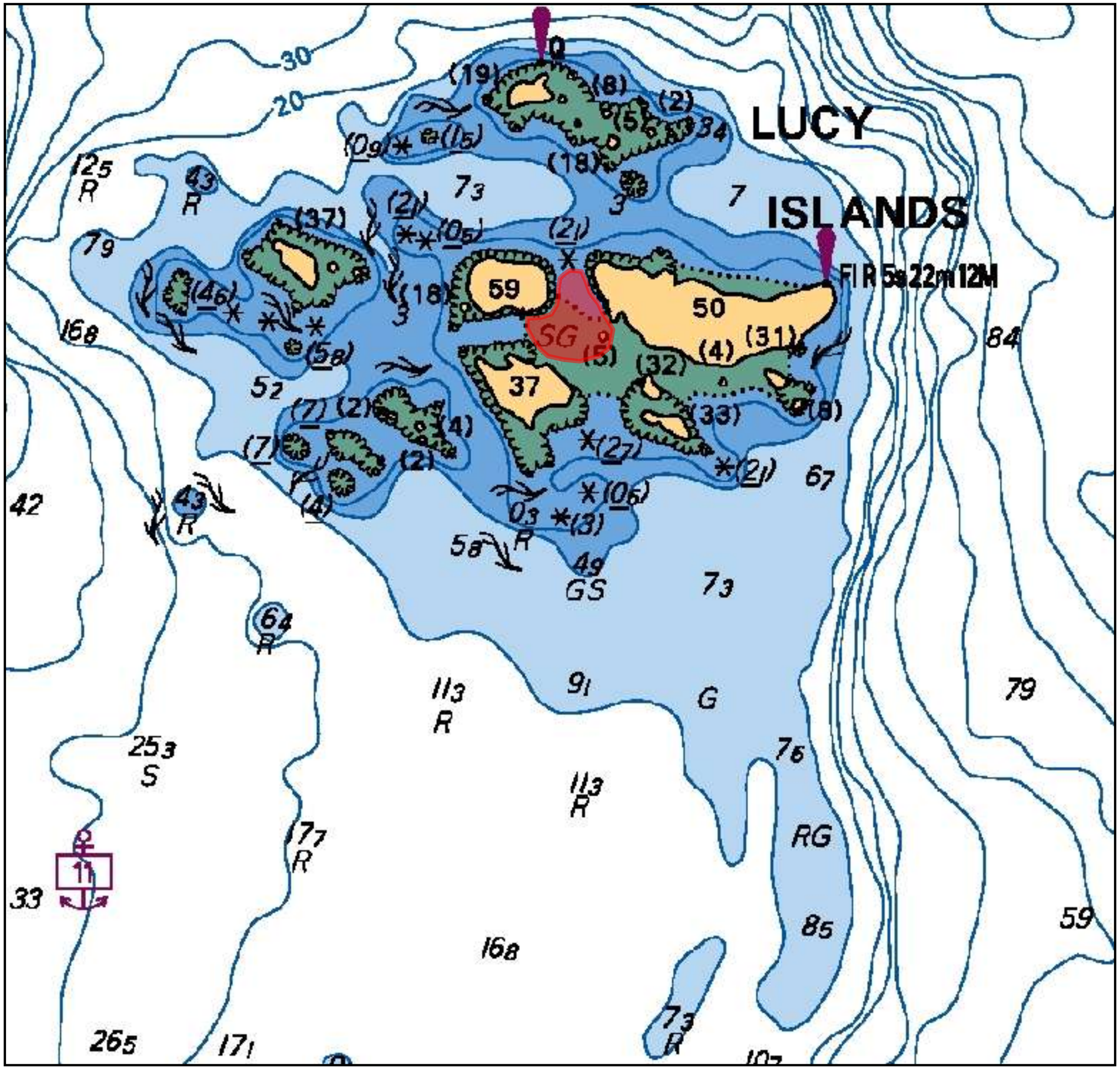



Processes which can limit light reaching eelgrass.

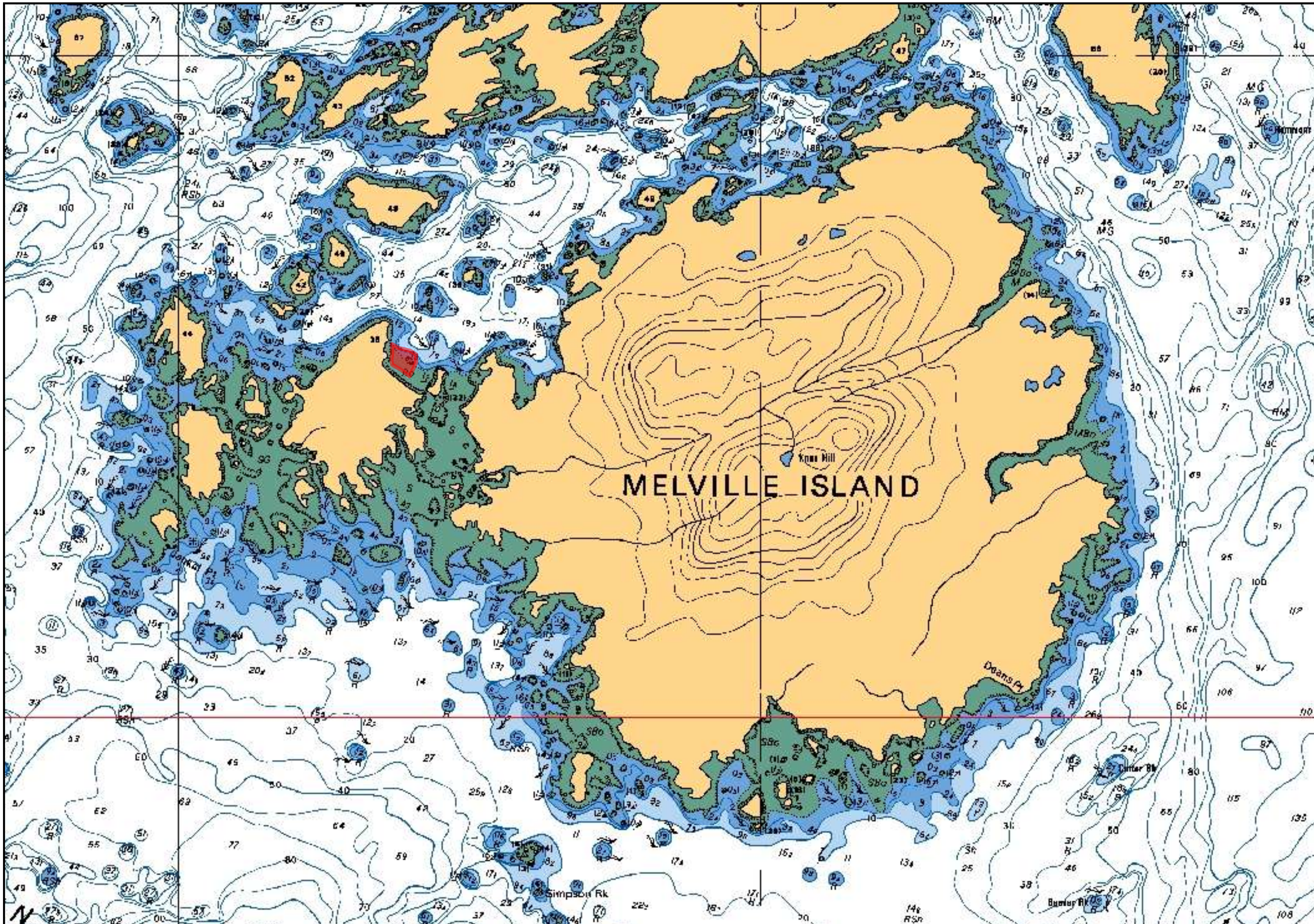



**Further studies on the use of side scan sonar for mapping of subtidal eelgrass beds** - shown at left is an example of an eelgrass mapping project using side scan sonar in the Snohomish County, Washington.

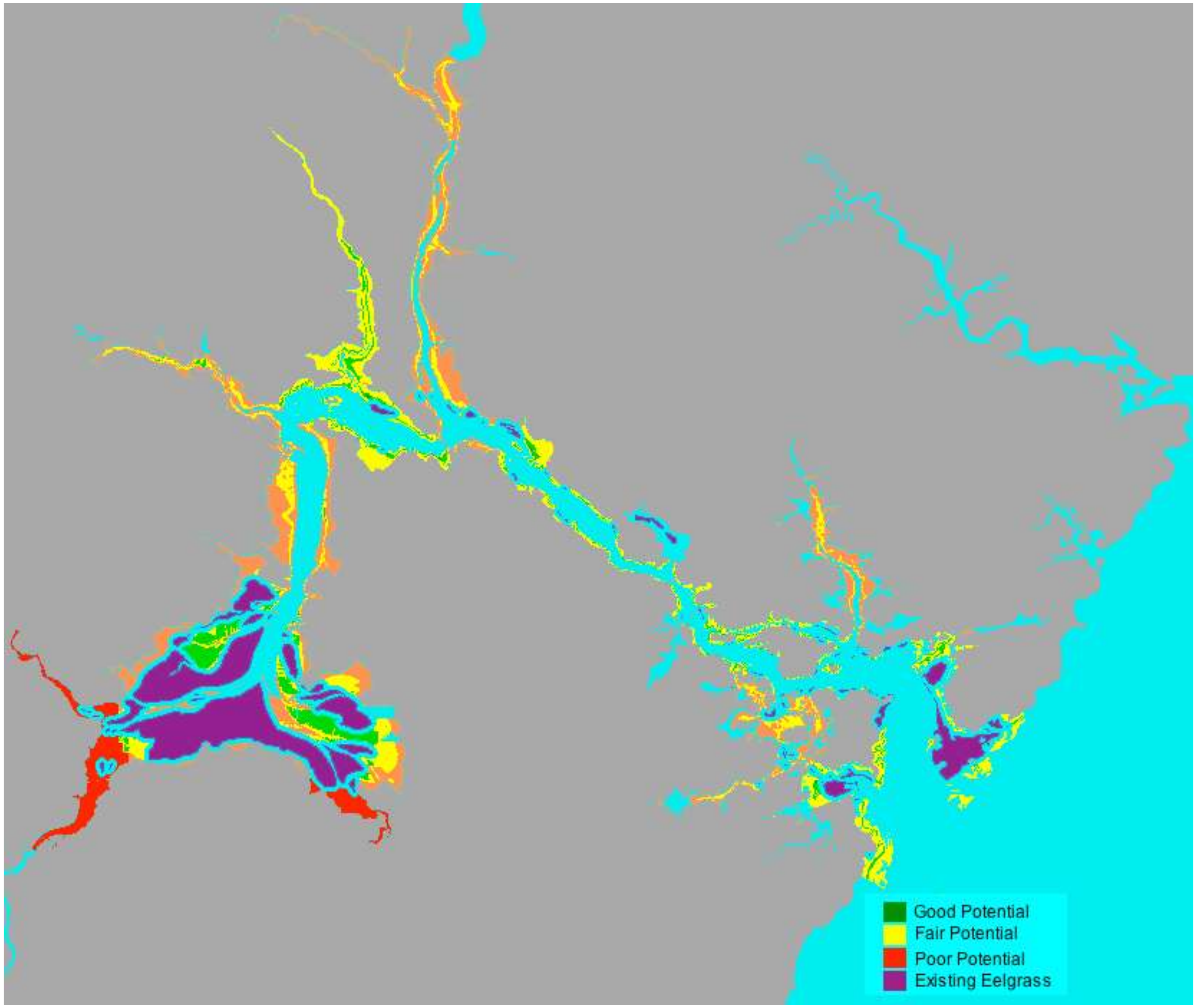

**Studies on eelgrass beds with less "stress" as baseline examples of what a "healthy" Northcoast eelgrass bed should look like** – both Lucy Island (some impact due to an anchorage in the bed) and Melville Island (very low level impacts) would be good local projects for this type of study.



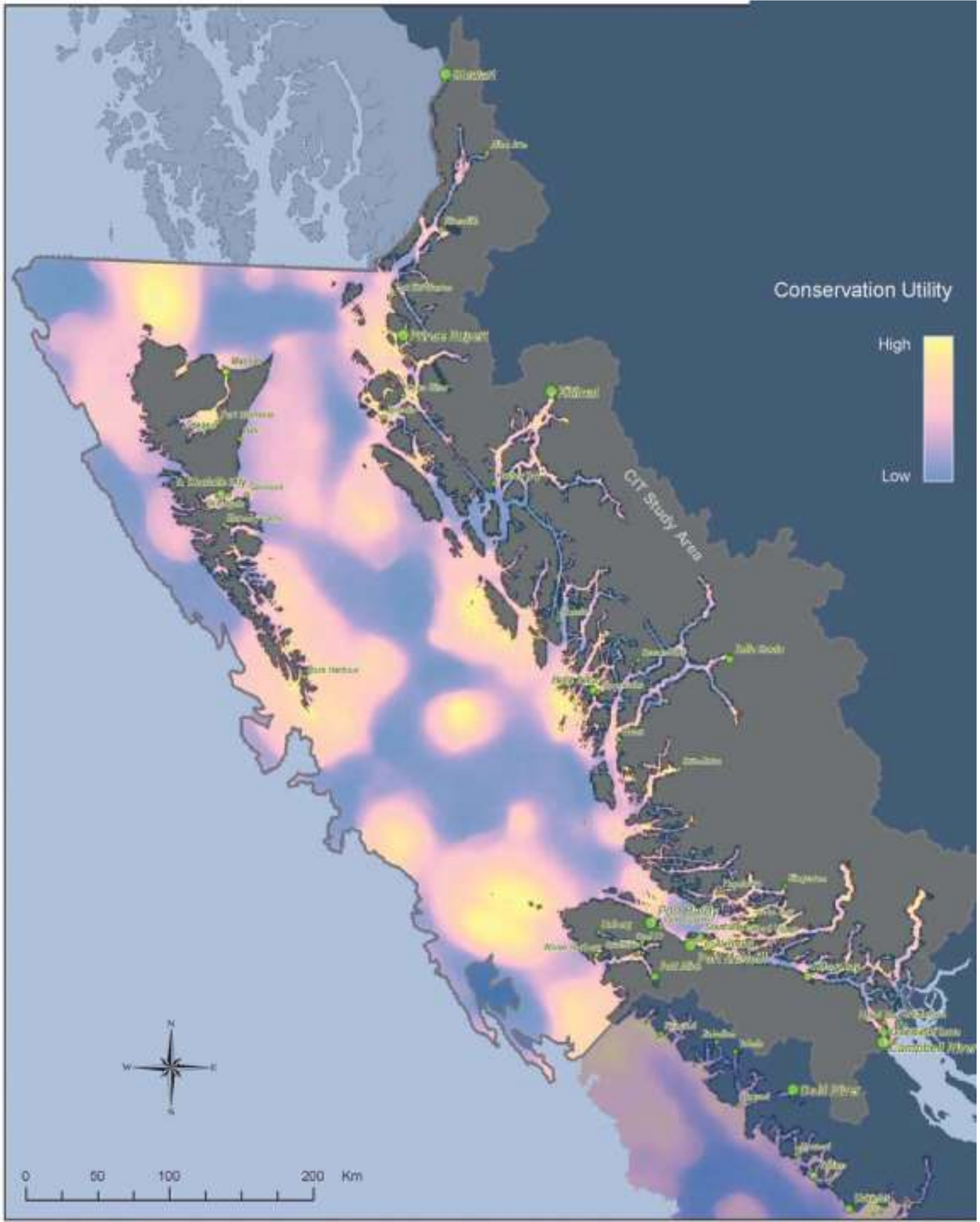

Shown above is the location of the Lucy Island eelgrass bed.




Shown above is the location of the Melville Island eelgrass bed.




**Studies on spatial modeling of eelgrass habitat** – a variety of modeling programs can be used to identify potential eelgrass habitat, both for restoration purposes and to identify locations where eelgrass may exist but has not yet been assessed.  Shown above is the "Eelgrass Site Selection Model" output for Great Bay Estuary, New Hampshire.




**Studies on conservation strategies for eelgrass beds using modeling software** – shown to the left is an example of conservation modeling using Marxan. Modeling can be performed on a smaller scale for local eelgrass areas and the resource utilization and other activities which impact them.