



August 18, 2015

City of Nanaimo.
Parks, Recreation and Culture
89 Prideaux Street
Nanaimo, BC, V9R 1Z7

VIA E-mail:

Attention:

Manager, Parks and Recreation

**RE: Community Paddle Dock and Boathouse
Year 6 Eelgrass Transplant Monitoring Survey (2015)
Protection Island, Nanaimo, BC**

1.0 INTRODUCTION AND BACKGROUND

The following letter report identifies eelgrass transplant results for the Brechin Boathouse and Community Paddle Dock project located in Nanaimo, BC. This report is the final eelgrass monitoring report at year 6 following the initial installation.

In 2008, Aquaparian Environmental Consulting (Aquaparian) staff members were retained by the City of Nanaimo (CON) to complete habitat compensation measures for the loss of 350m² of eelgrass habitat resulting from the construction of a Boathouse and Community Paddle Dock. Fisheries and Oceans (DFO) required the replacement of approximately 700m² of eelgrass as 2:1 compensation for the project. The eelgrass was transplanted in patches approximately 20cm x 20cm on one metre centres.

The eelgrass site was originally surveyed in 2008 and determined to be a suitable transplant location due to its existing substrate conditions, presence of eelgrass patches and due to recent changes to log boom management with the Nanaimo River Estuary and Nanaimo Harbour to better control log boom use areas. A log boom does exist with 75m of the dock location, however, it was understood that the booms would not be operating closer than the 75m.

The transplanted eelgrass bed is located north and south of a private dock in Corsair Bay on the west side of Protection Island. Both beds were originally planted in a rectangular shape with a shallow sandstone shelf delineating the hard shoreline and east boundary of the two transplanted beds. The west side is delineated by open water (Nanaimo Harbour). Past monitoring works were previously completed in June of 2009, August 2010 and August 2011. The results during the surveys indicated moderate growth and infilling of the both eelgrass transplant beds.

2.0 EELGRASS MONITORING METHOD

Aquarian completed the 5-year survey on June 16, 2014 between 11:00 am and 2:30 pm. Tidal changes were falling during the time between 2.6m (11:00am) and 0.55m (2:30pm) chart datum. Water clarity was poor during the survey (algal bloom) with visibility varying between 0.50 m to 0.10 cm.

Divers used a 50m long measuring reel tape to determine the length and width of both north and south transplanted beds. While one diver held the start of the measuring tape, the other diver swam the length of each bed adjacent to the sandstone shelf. Divers then repeated the same method to determine the width of each bed starting at the edge of the sandstone shelf completing a series of cross-sectional (perpendicular) width measurement of the beds. The density of eelgrass shoots was determined using a 50cm x 50cm sized quadrat randomly placed within the two beds. Approximately 15 random quadrat samples were taken within each bed.

A summary of data collected during the survey was provided in this report as Table 1. Recorded measurements from the underwater survey are included in Appendix A. A generated map of the survey results is included as Appendix B.

3.0 EELGRASS MONITORING RESULTS

3.1 2009 Monitoring Summary (Year 1)

The August 2009 (Year 1) assessment of the eelgrass beds planted north and south of the dock indicated the beds have survived the transplant and had started to fill in forming continuous beds from their original plantings of bunches (10 plants) planted every 1.0 m². The 200m² transplant bed south of the dock had been forming a dense patch approximately 10m x 15m in area. The transplant bed on the north side of the dock was also found to have increased in density and to have expanded outside its original planting area. The beds were surveyed to have an eelgrass density of approximately 80 stems per m². Some portions of the beds were patchy but other sections of the both beds were identified to have infilled with good expansion of plant rhizomes. The north bed was determined to have expanded to approximately 580m².

3.2 2011 Monitoring Summary (Year 3)

The 2011 assessment of the north eelgrass bed indicated the bed had expanded since the 2010 survey and filled in to form one single bed. The bed had a maximum width of 18.5m, minimum width of 8m and an average width of 12.4m. Eelgrass was observed growing at a depth between 0.5 to 3.5m. A gap between 2m to 18.5m from the edge of the sandstone shelf to the edge of the eelgrass bed over the length of the bed was indicating that seasonal wave action reflecting off the sandstone shelf during low tide conditions prevented eelgrass from filling in close to the rocky shoreline. The size of the bed was estimated to have expanded to approximately 682m² in size. Density of eelgrass within the bed was estimated between 75 to 100 stems/m². The length of eelgrass blades was estimated between 1.5 to 2.0m in length.

An assessment of the south eelgrass bed in 2011 also indicated that the bed had also expanded and filled in. The bed was measured over a length of 28m, a maximum width of 20.6m, a minimum width of 14.2m and an average width of 16.5m. A gap also exists from the edge of this bed and from the sandstone shelf varying from 10.9m to 21m. The eelgrass bed was also observed to have densely grown in. The density of eelgrass was similar to the north bed with numbers of stems between 75 to 100/m² and blade lengths estimated between 1.5 to

2.0m. The size of the bed was estimated at 414m².

3.3 2015 Monitoring Summary

Aquaparian completed a brief assessment in June 2014. It appeared that the eelgrass cover had decreased from the 2011 observations but the timing was early in the growing season (May 2014) which may have led to an inaccurate comparison. It was therefore decided to postpone the survey until later in the season. The repeat survey did not occur until August 12, 2015.

Two divers swam both transplant areas along a transect line following the previous methodology to record observations. Significant reduction in eelgrass was observed estimated to be approximately a 95% loss. Two surviving patches of eelgrass were observed on the north side of the dock approximately 5mx5m in size located near the zero tide line. One sparse patch survived on the south side approximately 5mx10m in area.

4.0 SUMMARY AND DISCUSSION

In 2008, approximately 500m² of eelgrass was planted on the north side of the dock and approximately 200m² was planted on the south side. Monitoring results during the 2011 survey indicated the both the north and south eelgrass bed had expanded and filled in. The beds had expanded to the west into deeper water and at a much thicker density. The north and south eelgrass beds had a 136% and 207% growth success rate, respectively.

Anecdotal observations in 2014 indicated a decline that was thought to be seasonal growth variation; however the 2015 survey confirmed a significant loss (95%). Substrate composition in the site was observed to be predominantly soft silt and an increase in scattered bark waste within the area of the eelgrass beds.

Various factors can impact the growth of eelgrass including water quality, turbidity that impacts light penetration, direct physical impact such as scouring and changes in substrate. Nearby eelgrass beds in Newcastle Channel and elsewhere in the Nanaimo River estuary were observed to be thriving in 2015. The 2015 growing season has been very dry; lack of run-off may have contributed to high water clarity and excellent light penetration for promoting eelgrass growth. The cause of impact to the transplant area is therefore assumed to be localized.

Subsequent observations by one of Aquaparian's Biologists a few days after the survey noted boom boats working on the log booms located adjacent to the eelgrass transplant beds. Google earth images of the log booms located next to the dock and transplant beds indicate and viewed over the past number of years indicate that the booms are continually being re-positioned to deal with boom size requirements and that the booms have been active as close as 50m (April 2014 Google earth image) from the docks. A series of Google Earth aerial photo images for 2011, 2012 and 2014 have been included in this report as Figure

Boom boats have a deep keel and powerful engines that have the potential to produce significant propeller wash or substrate scour in low water depths. The boats may need to work outside the actual boom area to move the logs into place and secure them. As the boats swing around, suspended sediments can be propelled away from their immediate working area. It is assumed that sections of the eelgrass beds may have be affected by prop scour or sediment smothering during boom boat activity. A few patches of eelgrass still survive and if there are

additional surviving rhizomes in the substrate they may regenerate over time, however, present observations indicate the beds to have undergone an 80% reduction as from what was identified in 2011.

5.0 CONCLUSION

This monitoring assessment has been completed based on site observations by Aquaparian Environmental Consulting biological staff and in accordance with generally accepted biological practices, methods and practical solutions recognized by the Department of Fisheries and Oceans Canada. No other warranty is made, either expressed or implied. Aquaparian trusts that the information provided in this report meets the City of Nanaimo's DFO requirements.

If you have any questions regarding the information provided in this document, please contact the undersigned, and we would be please to discuss them with you.

Yours truly,

Aquaparian Environmental Consulting



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Senior Biologist, Principal

\\AQUAPARIAN\Documents\Projects\Projects\N109 CON Protection Is Eelgrass Monitoring\2015 Protection Island Eelgrass Survey.doc

6.0 REFERENCES

BC Ministry of Environment 2012. Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia.

http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare2012/develop_with_care_intro.html

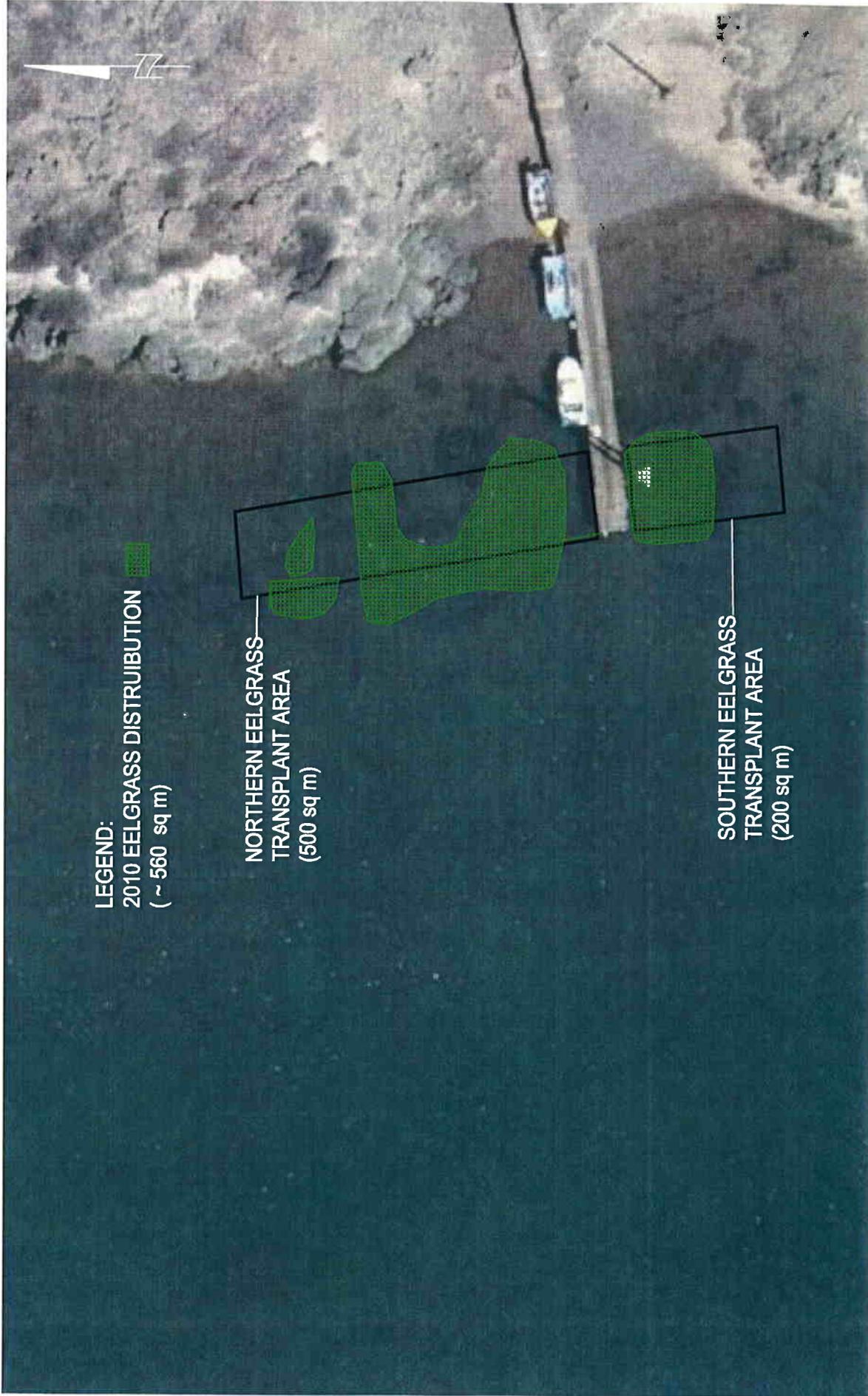
BC Ministry of Environment. Sensitive Ecosystem Inventory of the East Coast of Vancouver Island and the Gulf Islands. <http://www.env.gov.bc.ca/sei/>

FIGURE 1
PROTECTION ISLAND SITE LOCATION MAP

Protection Island Eelgrass Transplant Site Location Map



FIGURE 2
EELGRASS TRANSPLANT SITE PLAN



LEGEND:
 2010 EELGRASS DISTRIBUTION
 (~ 560 sq m)

NORTHERN EELGRASS
 TRANSPLANT AREA
 (500 sq m)

SOUTHERN EELGRASS
 TRANSPLANT AREA
 (200 sq m)

PROJECT
 BRECHIN BOAT RAMP
 EELGRASS MONITORING 2010

CHATWIN
 ENGINEERING
 LIMITED

CLIENT
 CITY OF NANAIMO

DRAWING TITLE
 2010 EELGRASS MONITORING

DATE: AUGUST 16, 2010 DRAWING NO. N063-01-F5

**FIGURE 3A, 3B & 3C
AERIAL PHOTO IMAGES**

Figure 3A June 2010 Google Earth Image
Eelgrass Transplant Project

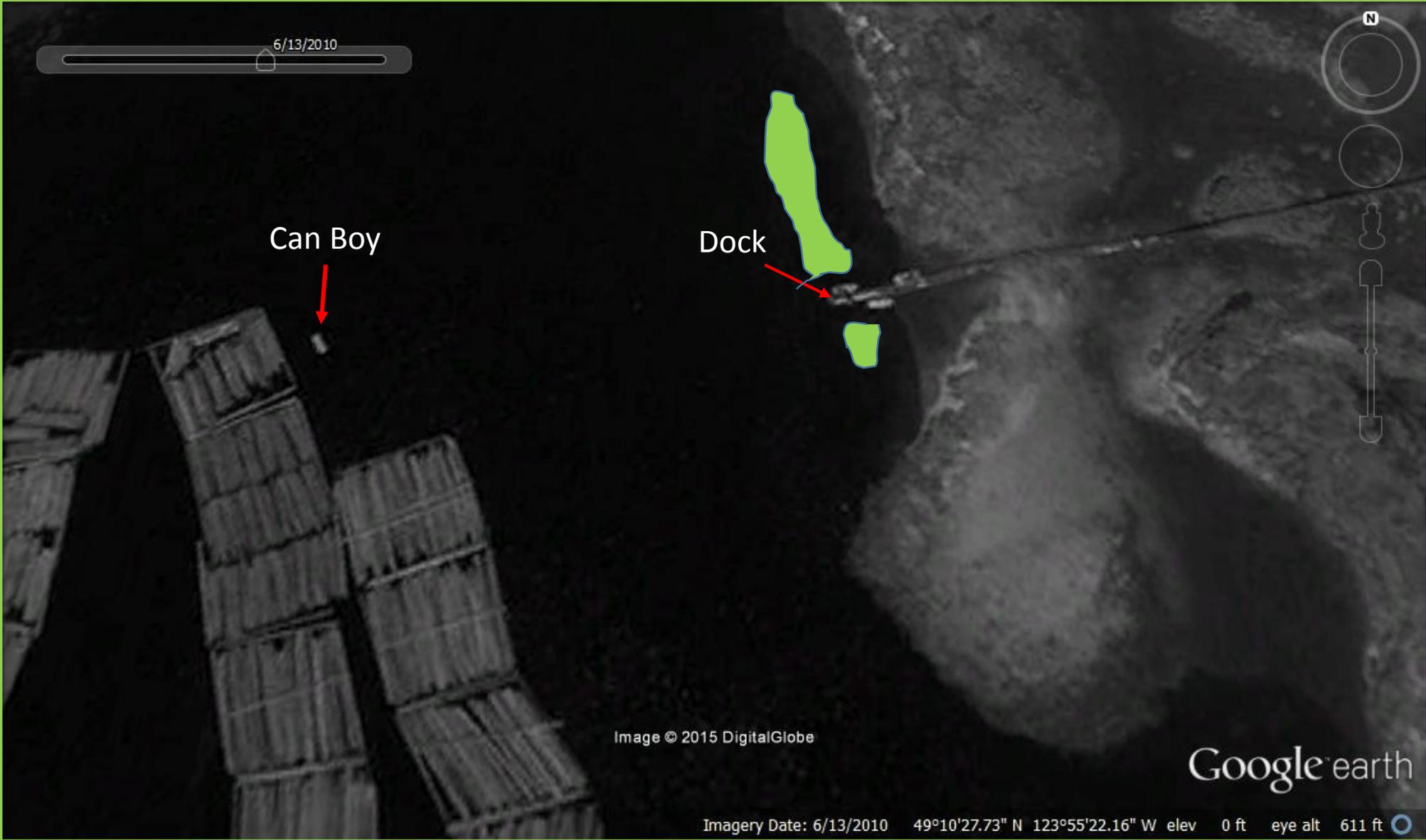


Figure 3B July 2012
Google Earth Image

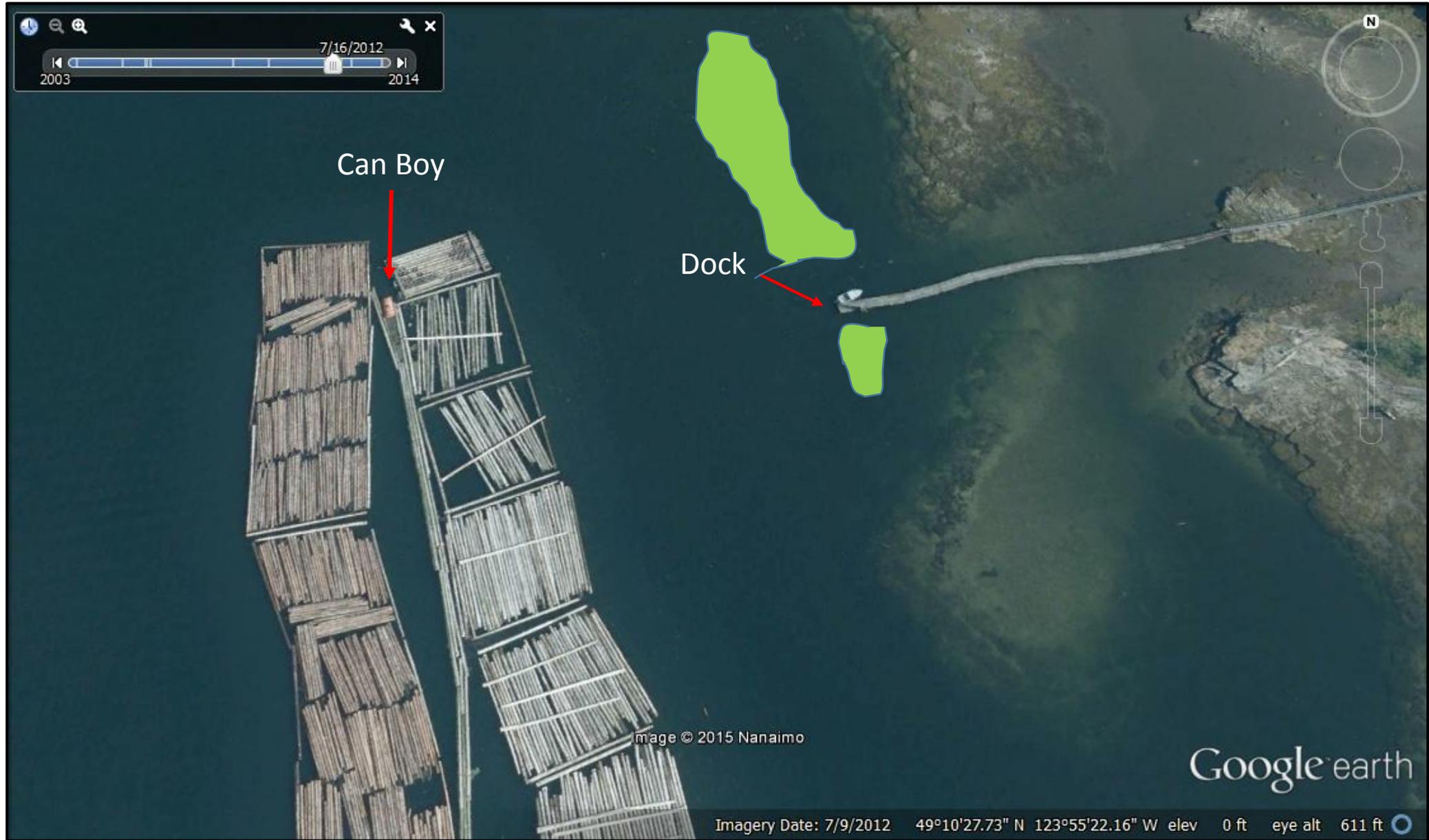


Figure 3C April 2014
Google Earth Image



**2014 Protection Island Eelgrass
Monitoring Survey**

North Eelgrass Bed				South Eelgrass Bed			
Quadrat # Stem per m ²	Plant Length cm	Blade Width mm	Comment	Quadrat # Stem per m ²	Plant Length cm	Blade Width mm	Comment
1-0	1.1		Rock Crab	1-0			
2-8	1.1	0.8		2-0			
3-12	1.2			3-20	1.2	0.8	
4-0				4-76	1.3	0.7	
5-16	1.2	0.7	Rock Crab	5-12	1.2	0.8	Pacific Oyster
6-4	1.3	0.8	2 Dungeness crabs	6-8	1.1	0.8	Debris
7-28	1.2			7-12	1.1		
8-4	1.1			8-8	1.2		
9-20	1.2	0.8		9-48	1.3	0.7	
10-4	1.4		Dungeness crab	10-52	1.3	0.8	
11-8	1.3	0.8		11-0			
12-0				12-0			
13-0				13-36	1.2	0.8	
14-4	1.0			14-0			
15-4	1.1			15-0			