Environment Canada Environnement Canada

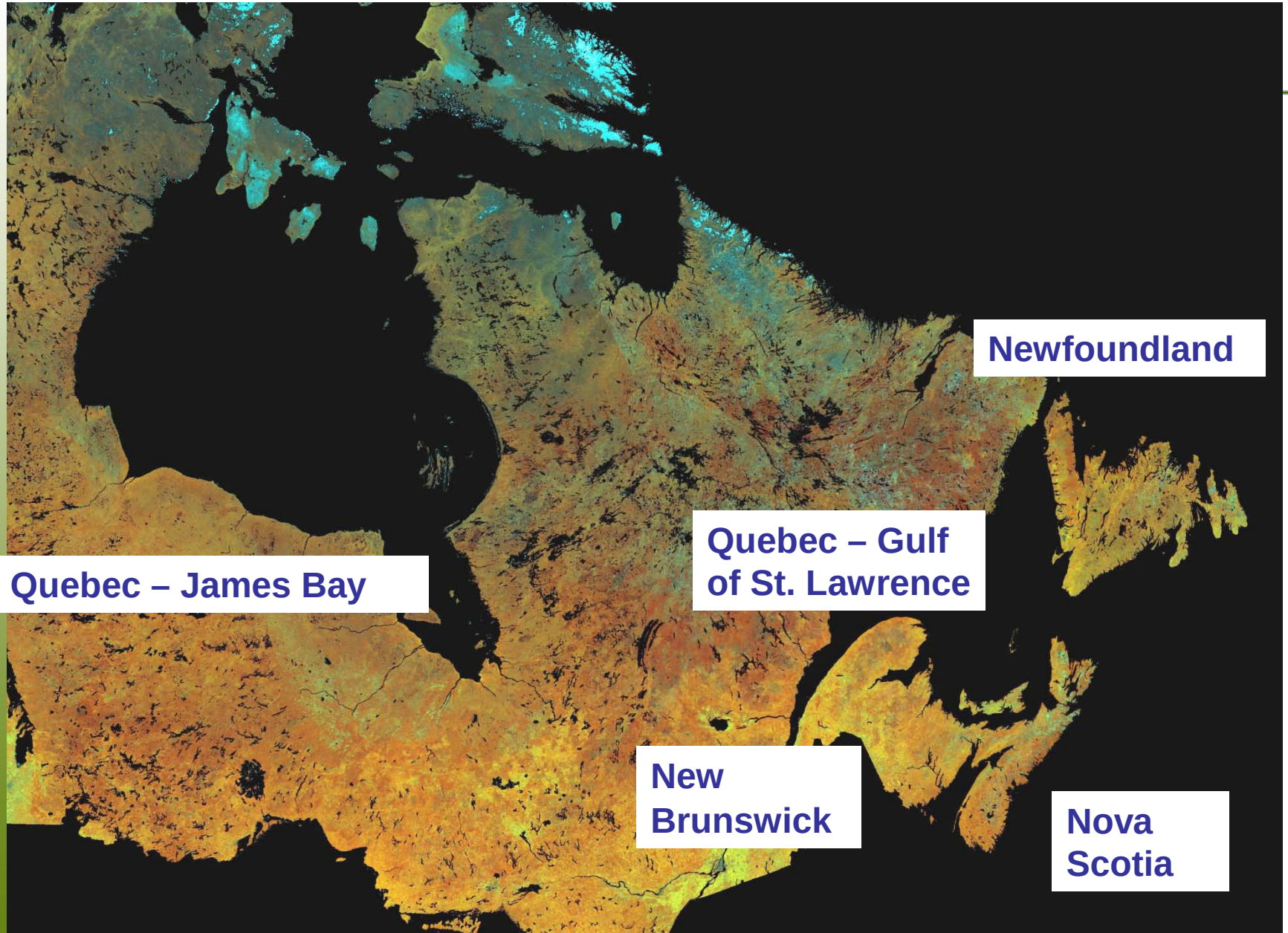
Canada

Status and Trends of Eelgrass in Eastern Canada

Northeast Eelgrass Workshop, Portland Maine
February 24, 2009

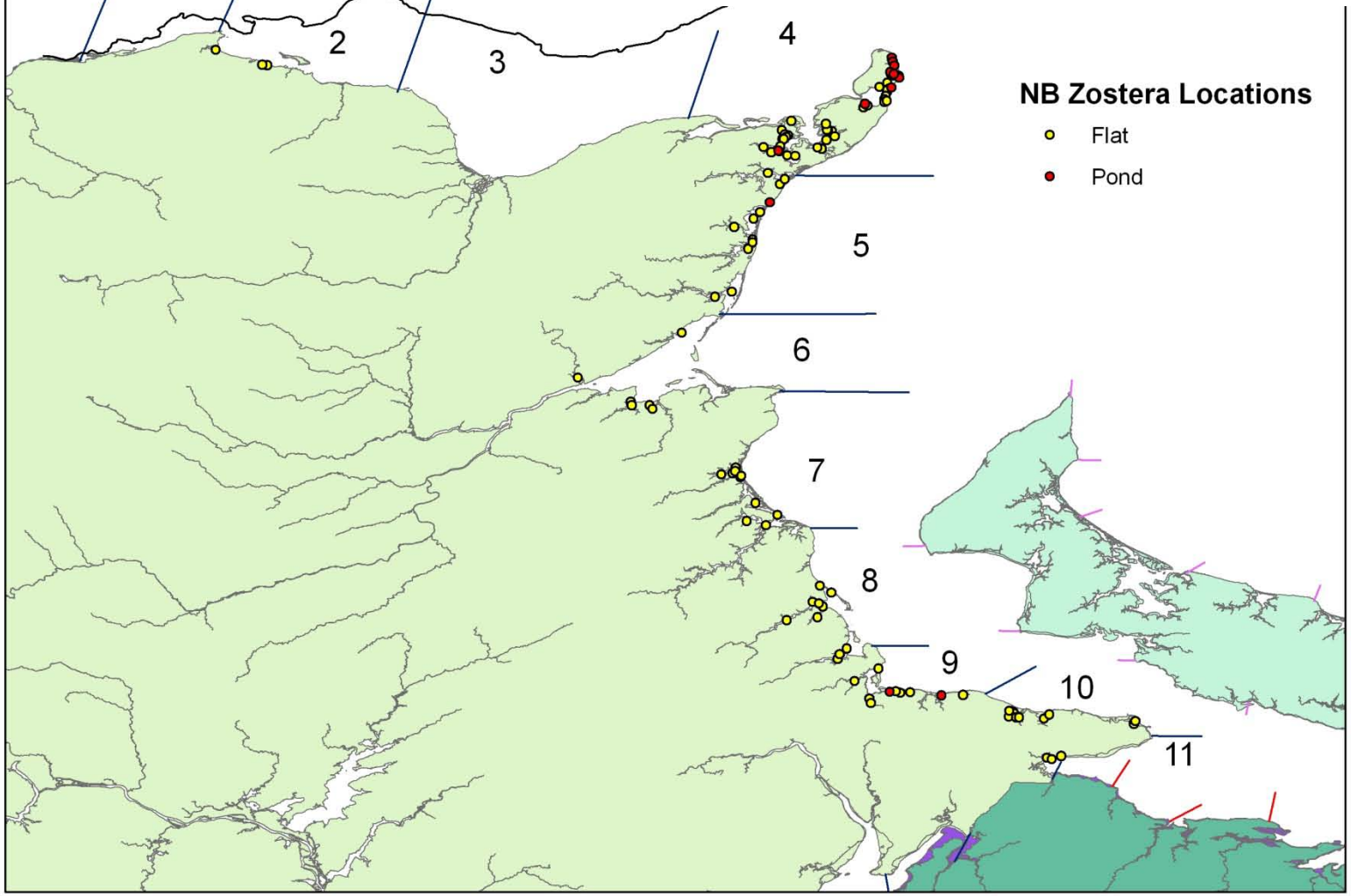
Al Hanson, Canadian Wildlife Service, Sackville NB
Al.hanson@ec.gc.ca

Presentation on Eelgrass in Eastern Canada



New Brunswick

Data from Maritime Wetland Inventory (MWI)
Hanson and Calkins 1996
Summarized by Coastal Unit



Issues: Water Quality, Green Crabs, Oyster Aquaculture

New Brunswick MWI Eelgrass Data

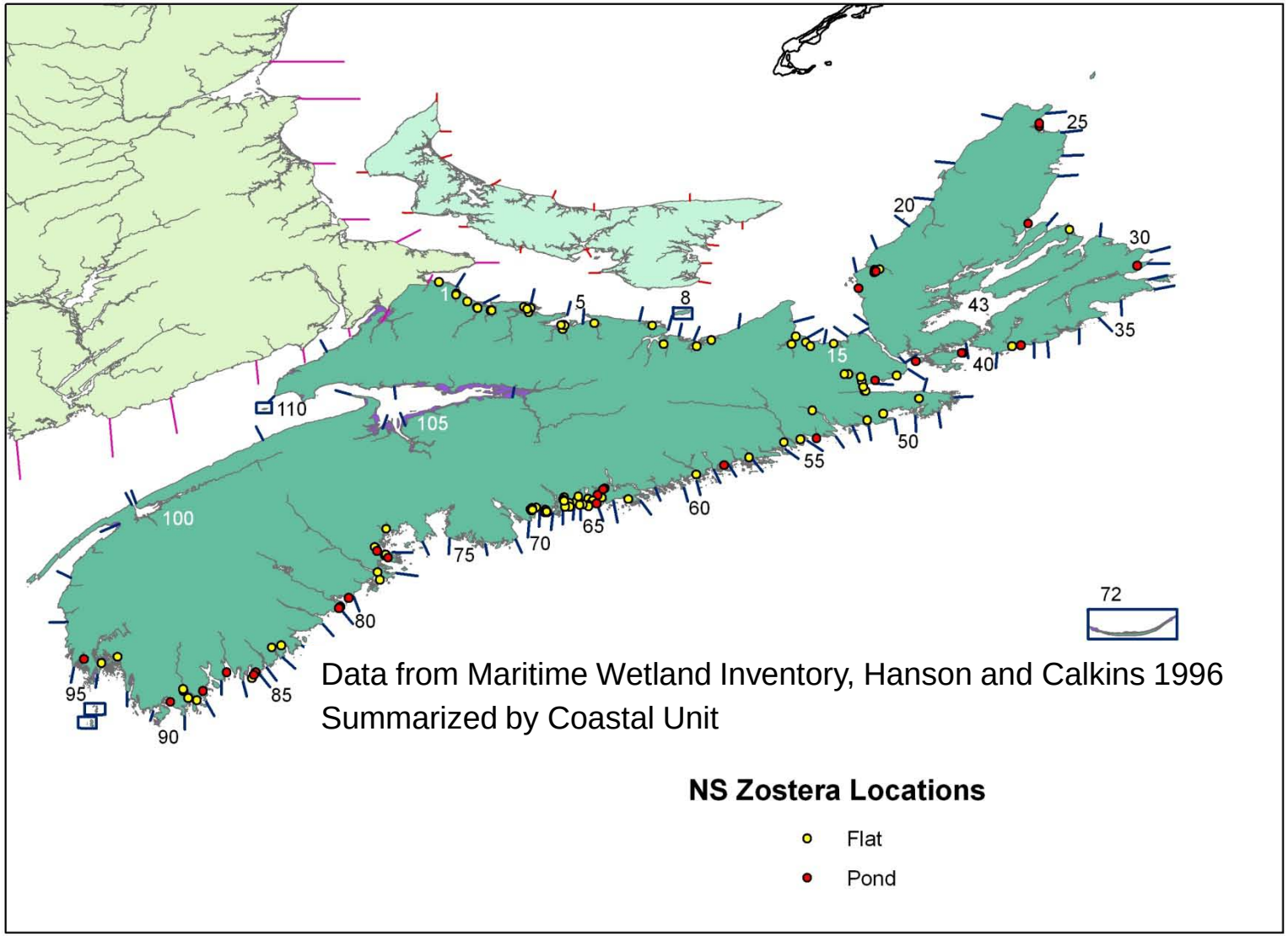
	Estuarine Sites			Ponds		
Coastal Unit	**No. Sites**	**%**	**Eelgrass Area (ha)**	**No. Sites**	**%**	**Eelgrass Area (ha)**
1						
2	3	3	62.1			
3						
4	33	34	1558.5	12	85	302.7
5	12	12	6863.2	1	10	35.6
6	6	6	348.4			
7	11	11	7392.7			
8	10	10	2045.1			
9	8	8	277.4	2	5	18
10	12	12	818.3			
11	3	3	568.4			
Provincial Total	98	100	19934.1	15	100	356.3

Limited Data on Trends in Gulf of St. Lawrence Aboveground Biomass % Change 2001-2002

Locke and Hanson 2004

Baie Verte	-72.3
Cocagne	-65.0
Kouchibouguac	-39.3
Richibucto	-49.7
Caribou	-8.7
Merigomish	-37.8
Pomquet	-22.6
Tatamagouche	-61.1
Bedeque	-61.0
Cascumpec	-29.7
Hillsborough	+64.7
Rustico	-87.7
St. Mary's	-50.4
MEAN CHANGE	-40.1

Nova Scotia



Issues: Green Crabs and other Invasive Species

Nova Scotia MWI Eelgrass Data

Coastal	Estuarine			Ponds		
Unit Number	No. Sites	% of Sites	Zostera (ha)	No. Sites	% of Sites	Zostera (ha)
1	1	0.21	40			
2	3	0.20	37.3			
3	4	1.65	310			
4	4	9.18	1726.3			
5	6	3.52	661.5			
6	1	0.19	36			
7	1	6.38	1200			
9	1	2.20	413			
11	2	11.63	2188			
13	2	6.75	1270			
14	2	4.10	772			
15	1	1.35	254			

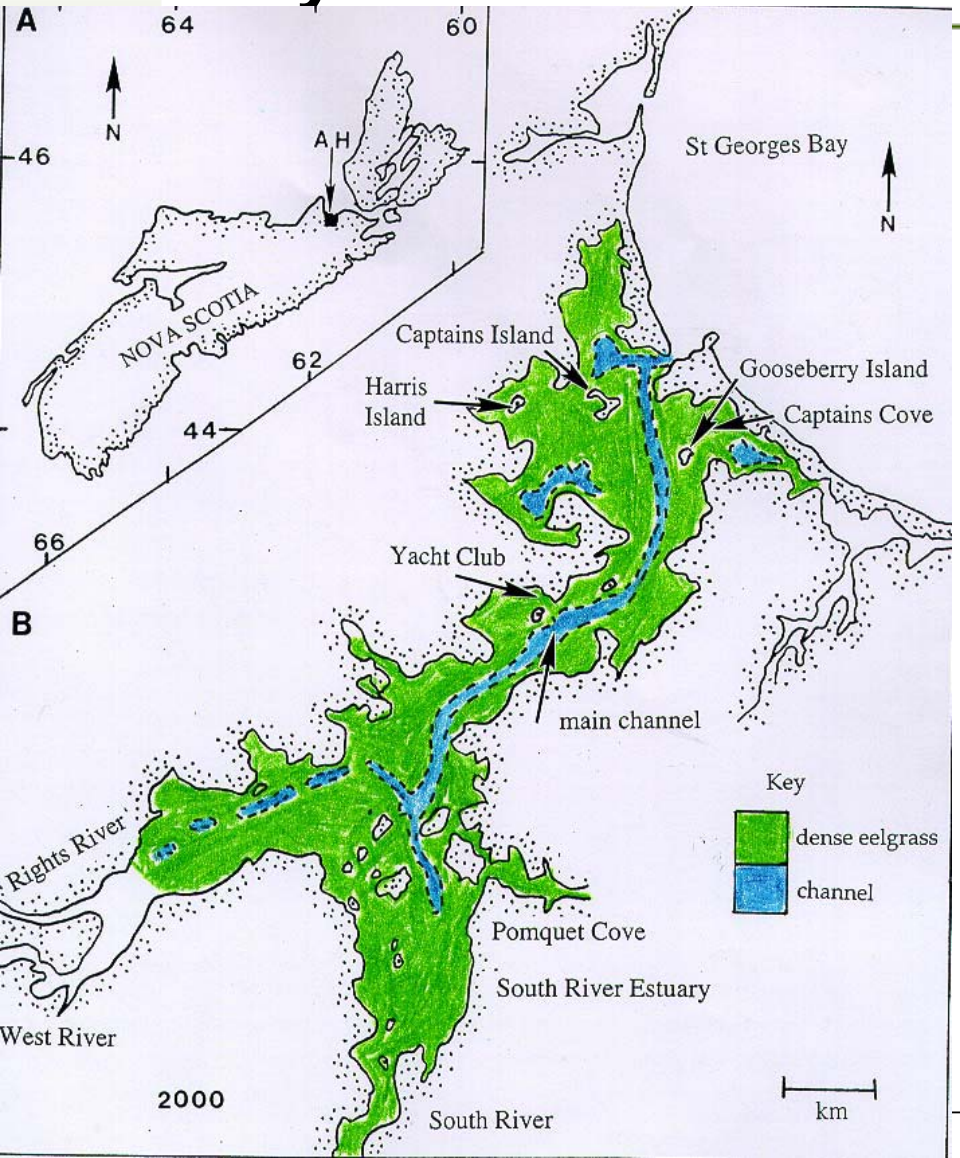
Nova Scotia MWI Eelgrass Data

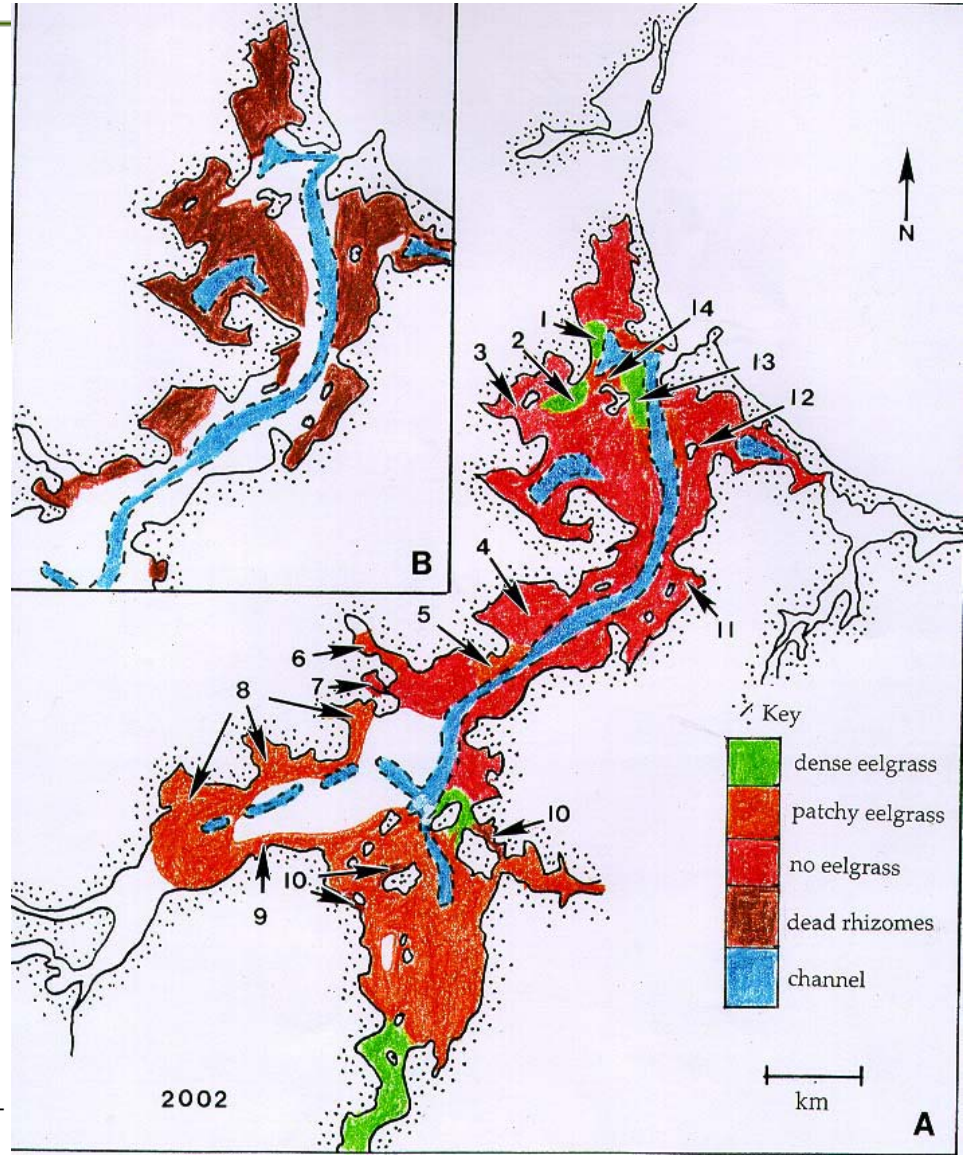
Coastal	Estuarine			Ponds		
Unit Number	No. Sites	% of Sites	Zostera (ha)	No. Sites	% of Sites	Zostera (ha)
17				1	0.5	7.5
18	2	0.11	20.7	2	0.8	11.3
25				2	31.7	465
28				1	2.2	31.6
29	1	0.20	37			
31		0.00		1	15.0	219.9
39	1	0.80	150.5	1	0.9	12.7
41	0		0	3	6.8	99.9
45	2	0.22	41.8	1	1.4	21.2
46	8	5.13	965.4			
49	1	0.03	5.1			
50	1	0.10	18.8			
51	2	0.20	37.9			
53	2	0.67	126.3			
54				1	0.6	8.1
55	3	6.01	1130.3			
57	1	0.39	73.2			
59				1	1.0	14.6
60	1	0.13	25			
64	1	0.85	160			
65	2	0.42	78.9	3	5.9	86.4

Nova Scotia Eelgrass MWI Data

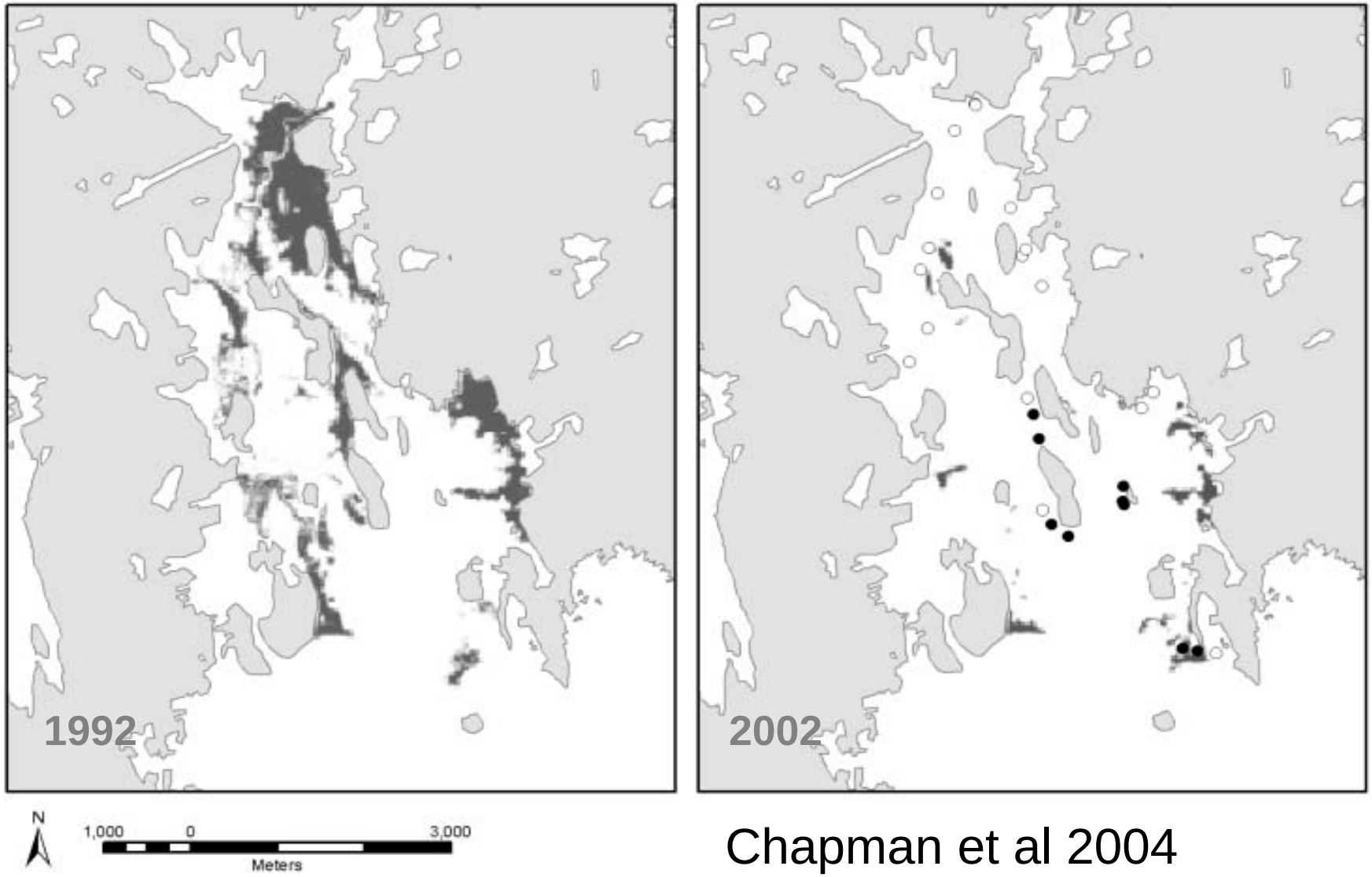
Coastal	Estuarine			Ponds		
Unit Number	No. Sites	% of Sites	Zostera (ha)	No. Sites	% of Sites	Zostera (ha)
66	9	4.13	777.3	1	4.6	67.9
67	4	0.98	184.1			
68	8	1.86	349			
70	6	1.83	343.5			
71	5	2.60	489.9			
77	4	0.58	109.1	1	0.1	1.9
78	3	0.69	130.2	1	1.8	26.2
79	2	0.17	32.3			
80	1	0.37	69.1	2	2.9	42.6
83	1	1.18	222.1			
84	1	2.37	446			
86	4	0.02	3	2	11.1	163.4
87				1	0.6	8.3
88				1	6.0	88
89	4	1.38	258.9			
90				1	2.3	33.1
94	2	19.24	3620			
95				1	3.9	56.5
Provincial Total	106	100	18813.5	28	100	1466.1

Limited Information on Trends in GSL
Decline in Antigonish Harbour
Garbary et al. 2004



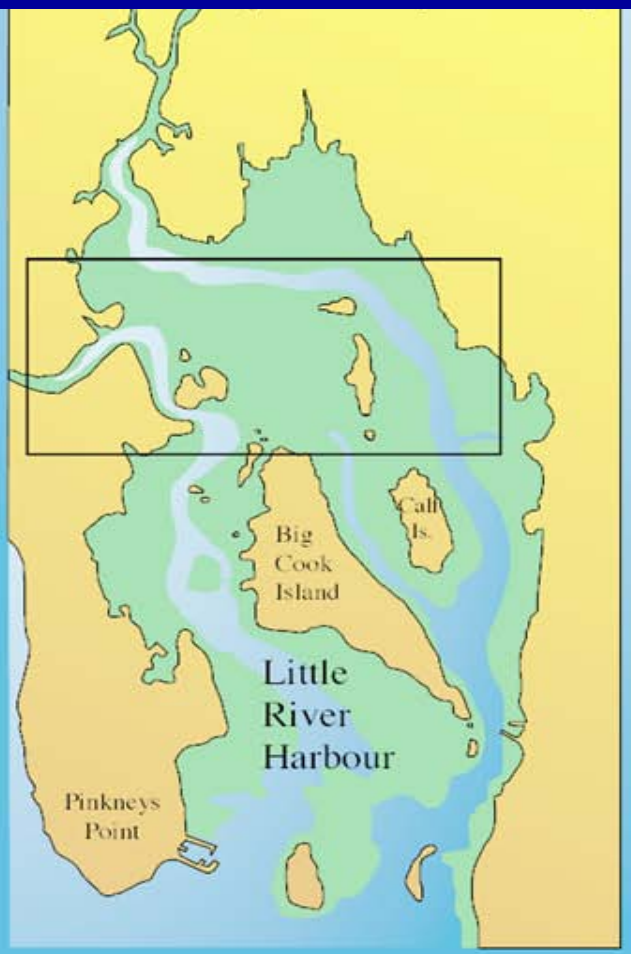


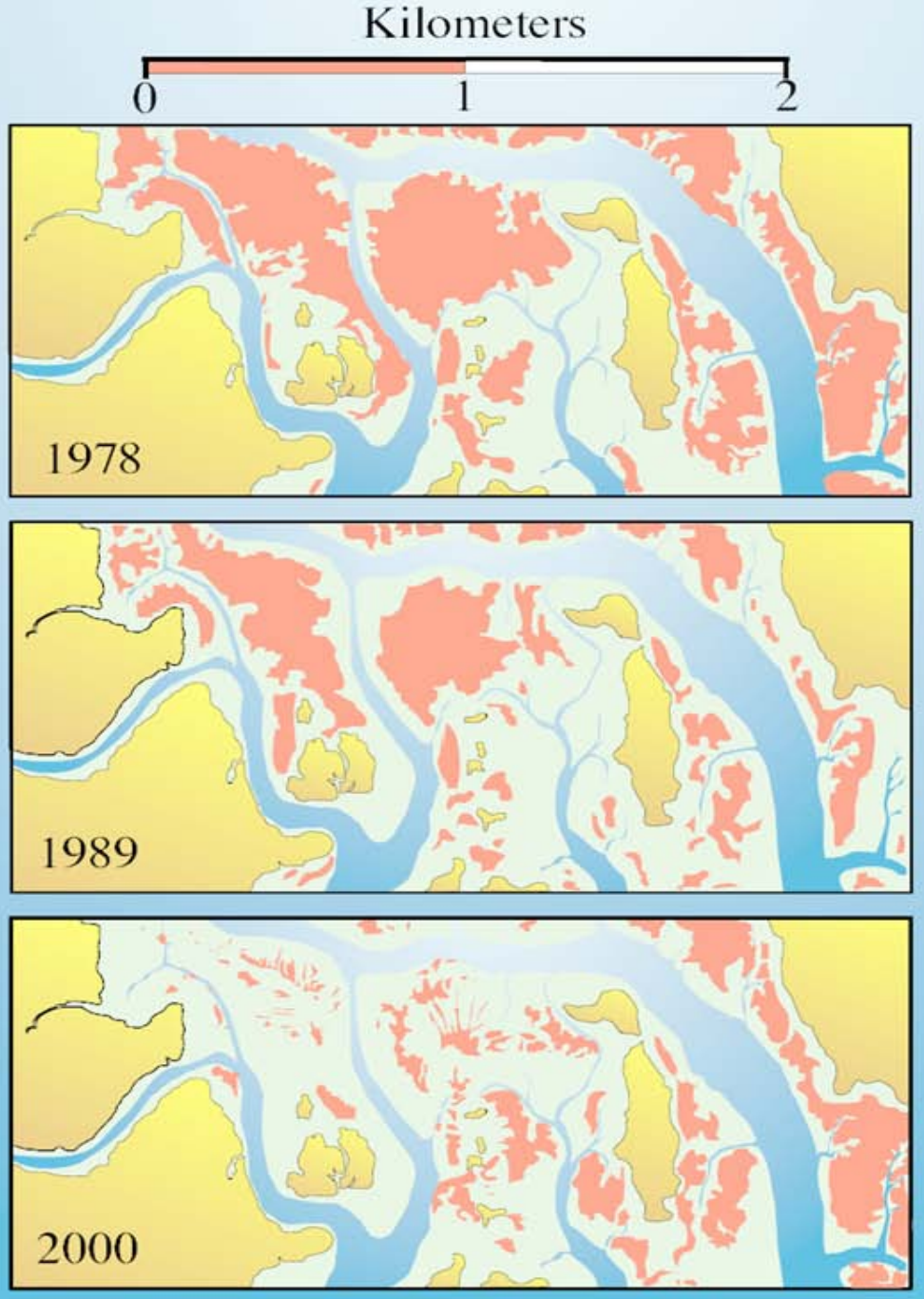
Limited Information for Atlantic Coast of NS Decline in Chezzetcook, Dark Denotes Eelgrass



Chapman et al 2004

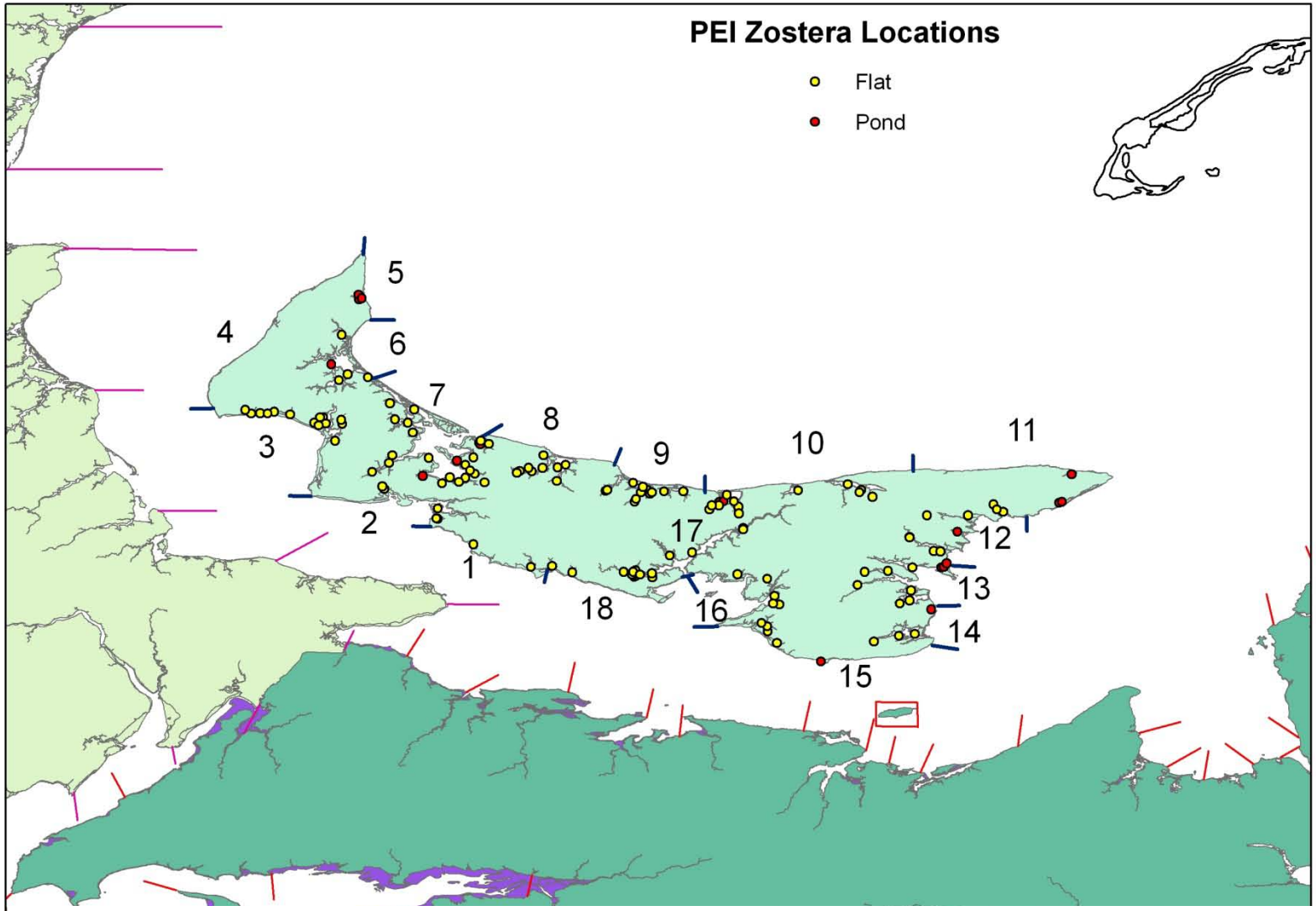
NS – Gulf of Maine
Little River Harbour
Air Photo Interpretation
Pink Denotes Eelgrass





Sharp & Semple 2004

Prince Edward Island



Data from Maritime Wetland Inventory, Hanson and Calkins 1996

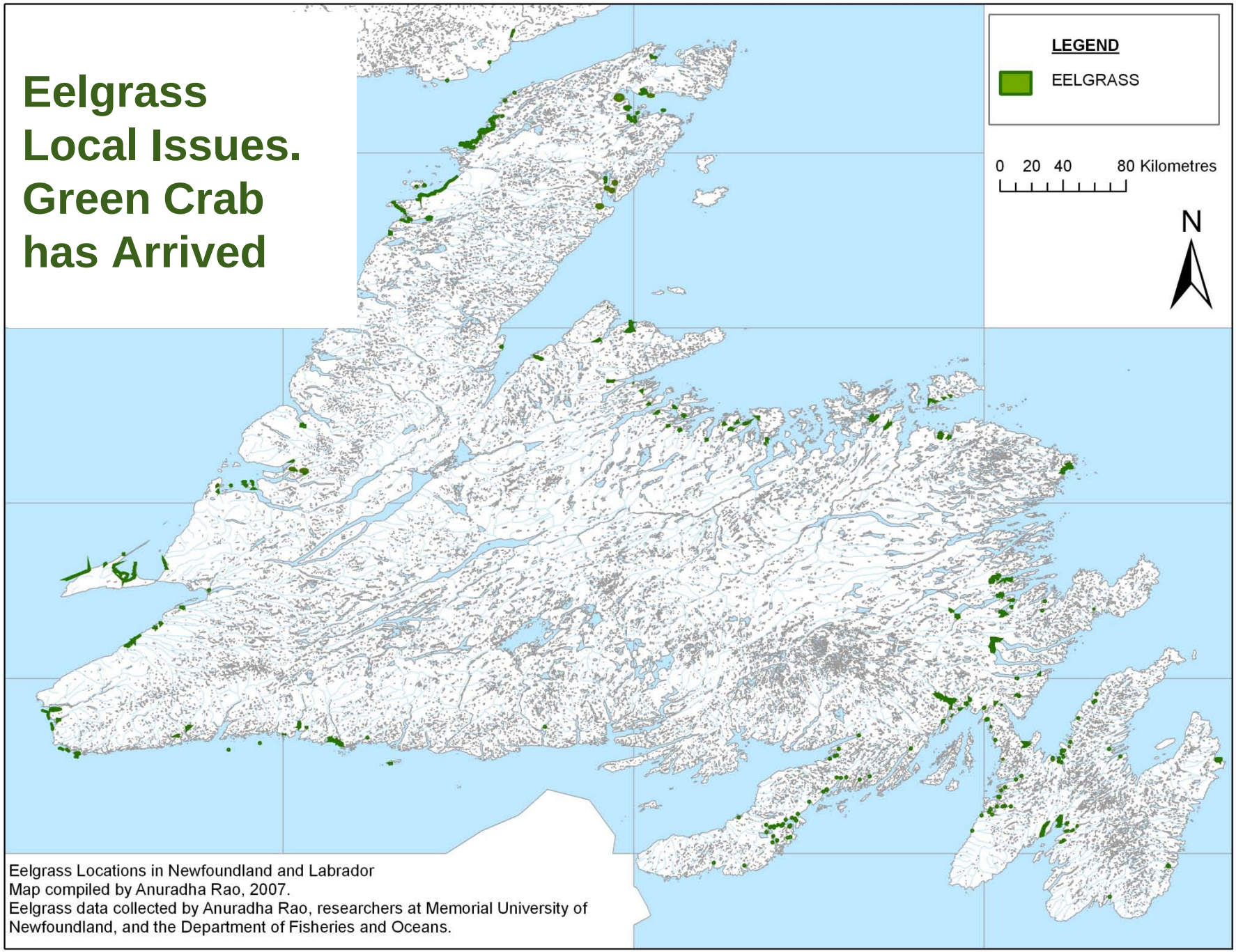
Summarized by Coastal Unit

Issues: Water Quality, Ulva

PEI – MWI Eelgrass Data

Coastal	Estuarine			Ponds		
Unit	No. Sites	% of Sites	Zostera (ha)	No. Sites	% of Sites	Zostera (ha)
1	3	2	148.7			
2	4	3	903.1			
3	15	11	2148.6			
4						
5				3	16	142.9
6	3	2	1716.5	1	5	1.8
7	31	23	3829.1	4	21	4.4
8	10	7	715.4			
9	12	9	2482.2			
10	13	10	3429.8	2	11	37.7
11				3	16	126
12	10	7	425.5	2	11	76.4
13	7	5	5947.4	2	11	2
14	3	2	1769.6	1	5	3.5
15	4	3	304.3	1	5	46.5
16	5	4	849.5			
17	13	10	1638			
18	3	2	191.7			
Provincial Total	**136**	**100**	**26499.4**	**19**	**100**	**441.2**

Eelgrass Local Issues. Green Crab has Arrived



Eelgrass Locations in Newfoundland and Labrador
Map compiled by Anuradha Rao, 2007.
Eelgrass data collected by Anuradha Rao, researchers at Memorial University of Newfoundland, and the Department of Fisheries and Oceans.

Quebec - St. Lawrence

Distribution and description of eelgrass beds in Québec and presentation of data gathered by the Eelgrass Monitoring Network

M.-C. Martel, L. Provencher, P. Nellis et C. Grant

February 2009

Quebec - St. Lawrence Distribution

- Eelgrass beds are geographically distributed throughout the estuary and Gulf of St. Lawrence in the Province of Québec.

- Westernmost eelgrass beds off Les Prairies near Baie-Saint-Paul.

- Eelgrass beds are scattered all along the Upper, Middle and Lower North Shores.

- Beds are present at the tip of the Gaspé Peninsula, in Chaleur Bay and in the waters off the Magdalen Islands.

Quebec - St. Lawrence Size of Beds

The largest eelgrass beds are:

a) bed off Manicouagan,
b) L'Isle-Verte eelgrass bed in the lower estuary,
c) the one off Île Crescent and in Aylmer Sound bay on the North Shore,
d) and the Cascapédia bed in Chaleur Bay.

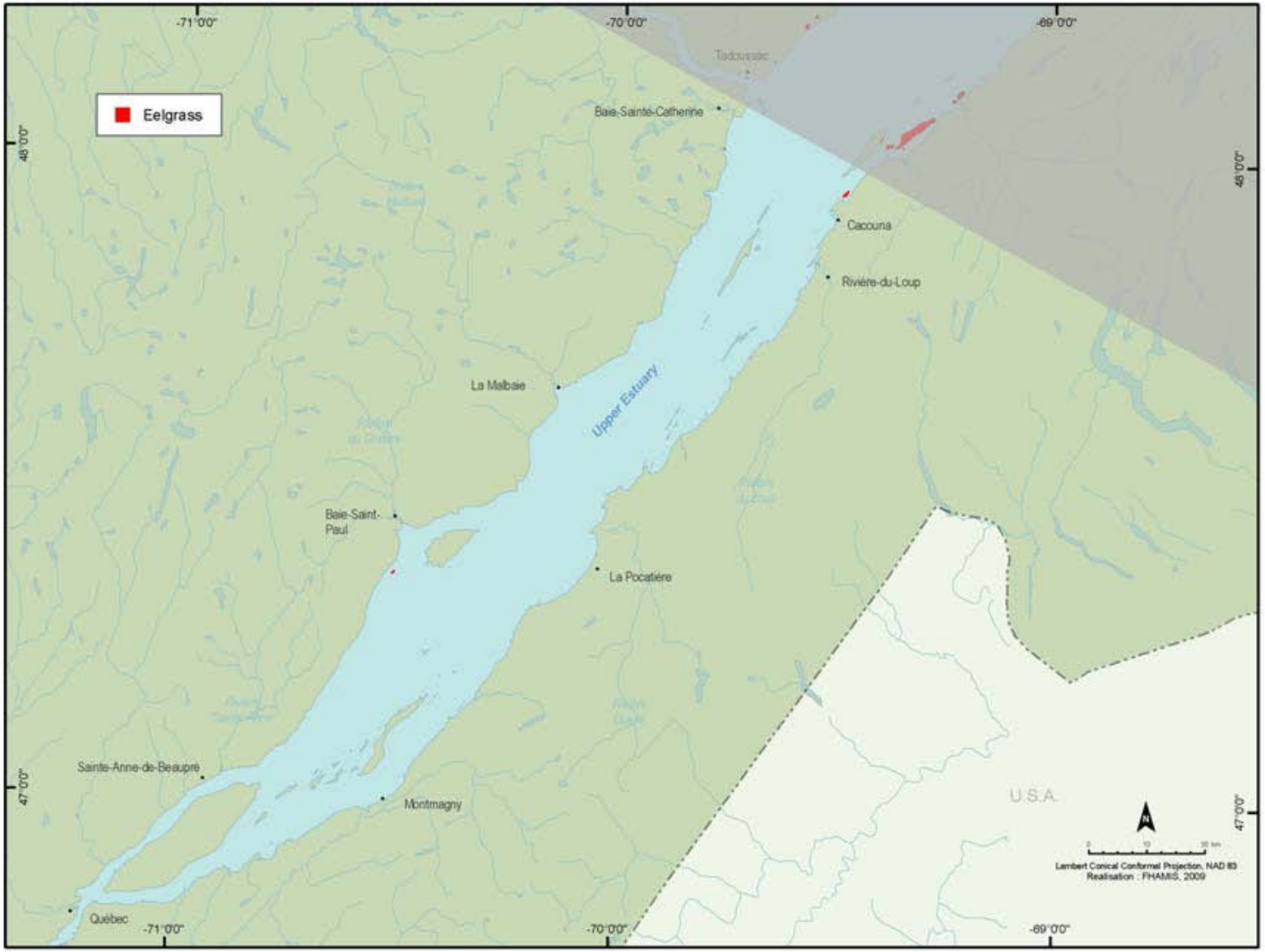
Quebec - St. Lawrence Size of Beds

- Lemieux and Lalumière (1995) have estimated the total areal surface occupied by various eelgrass beds to be:

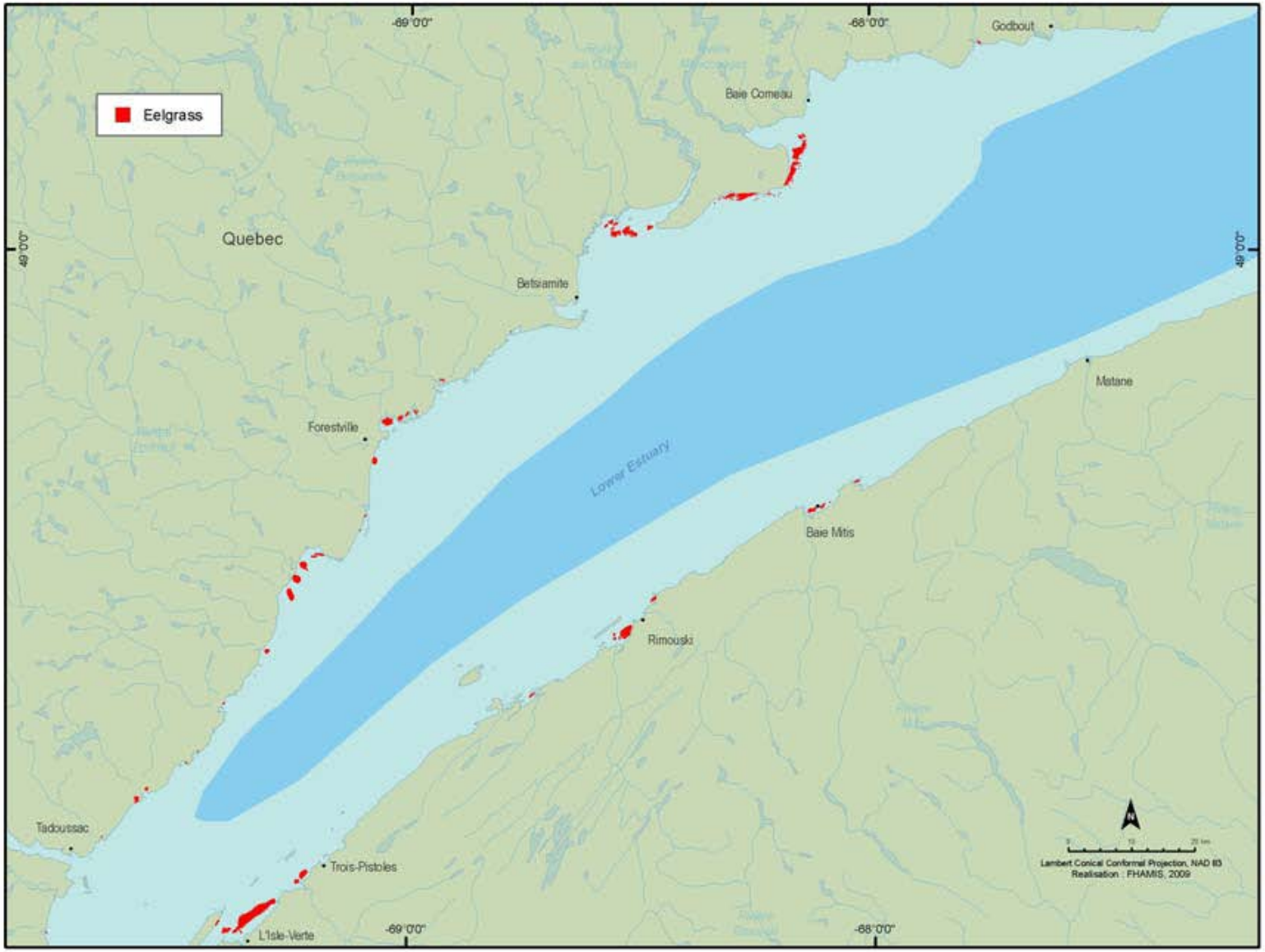
a) upper estuary - 53 ha;
b) north shore - 937 ha
c) south shore - 1,340 ha;
d) northeastern portion of the Gaspé Peninsula – 837 ha ;
e) Chaleur Bay – 3,266 ha.

- The total area occupied by all eelgrass beds along the Middle and Lower North Shore is unknown, but known beds occupy over 3,000 ha (Calderon, 2000).

Quebec - Upper St. Lawrence Estuary



Quebec - Lower St. Lawrence Estuary



Quebec - Gulf of St. Lawrence

Status of Eelgrass – Gulf of St. Lawrence

Evolution in the spatial distribution of Manicouagan peninsula eelgrass from 1986 (red) to 2002 (pink) to 2004 (all colours) obtained through segmentation and analysis of LANDSAT-5 (1986), ASTER (2002) and IKONOS (2004) satellite images

Status of Eelgrass – Gulf of St. Lawrence

- Because of the great variability in the techniques used by various studies consulted, trends in eelgrass bed size over the years cannot be quantified

- Data for Rimouski and Manicouagan eelgrass beds suggest they are expanding.

- The Conseil régional de l'Environnement de la Gaspésie et des Îles-de-la-Madeleine, which surveyed various eelgrass beds in 2004, believes eelgrass beds have become larger since the 1995 survey.

- In addition, information obtained from residents of coastal communities confirms that most eelgrass beds are either stable or expanding, often replacing shellfish beds.

- Taken altogether, we conclude that eelgrass beds have remained stable or expanded over the last 20 years.

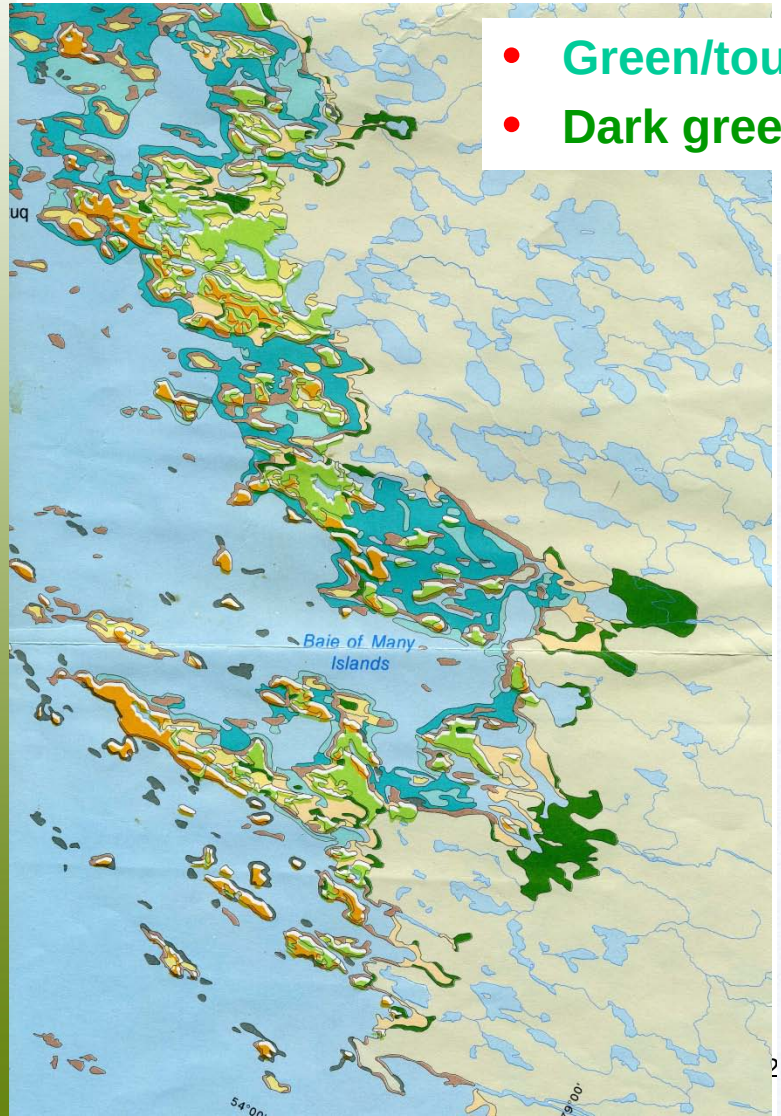
Environment Canada Environnement Canada

Canada

Status of Eelgrass in James Bay

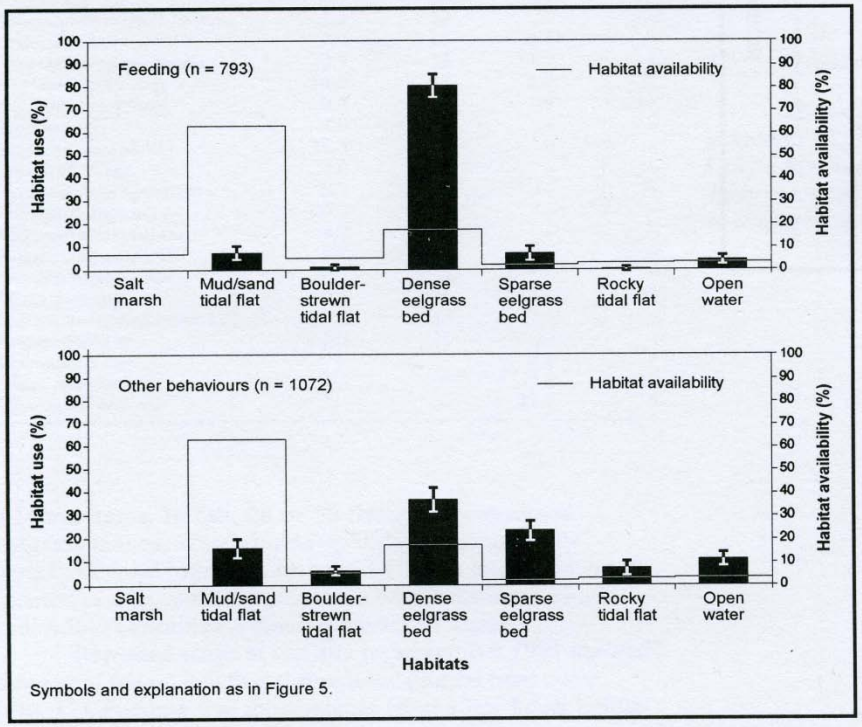
Based on Information Supplied by:
Dr. Austin Reed, Canadian Wildlife Service
Dr. Fred Short, UNH, 'Report to the Cree Nation of Chisasibi'

Eelgrass James Bay (Reed 1990)



- **Green/tourquoise** = dense eelgrass
- **Dark green** = salt marsh

Figure 14
Distribution of Brant by habitat type at site S02 on 6 and 8 June 1990

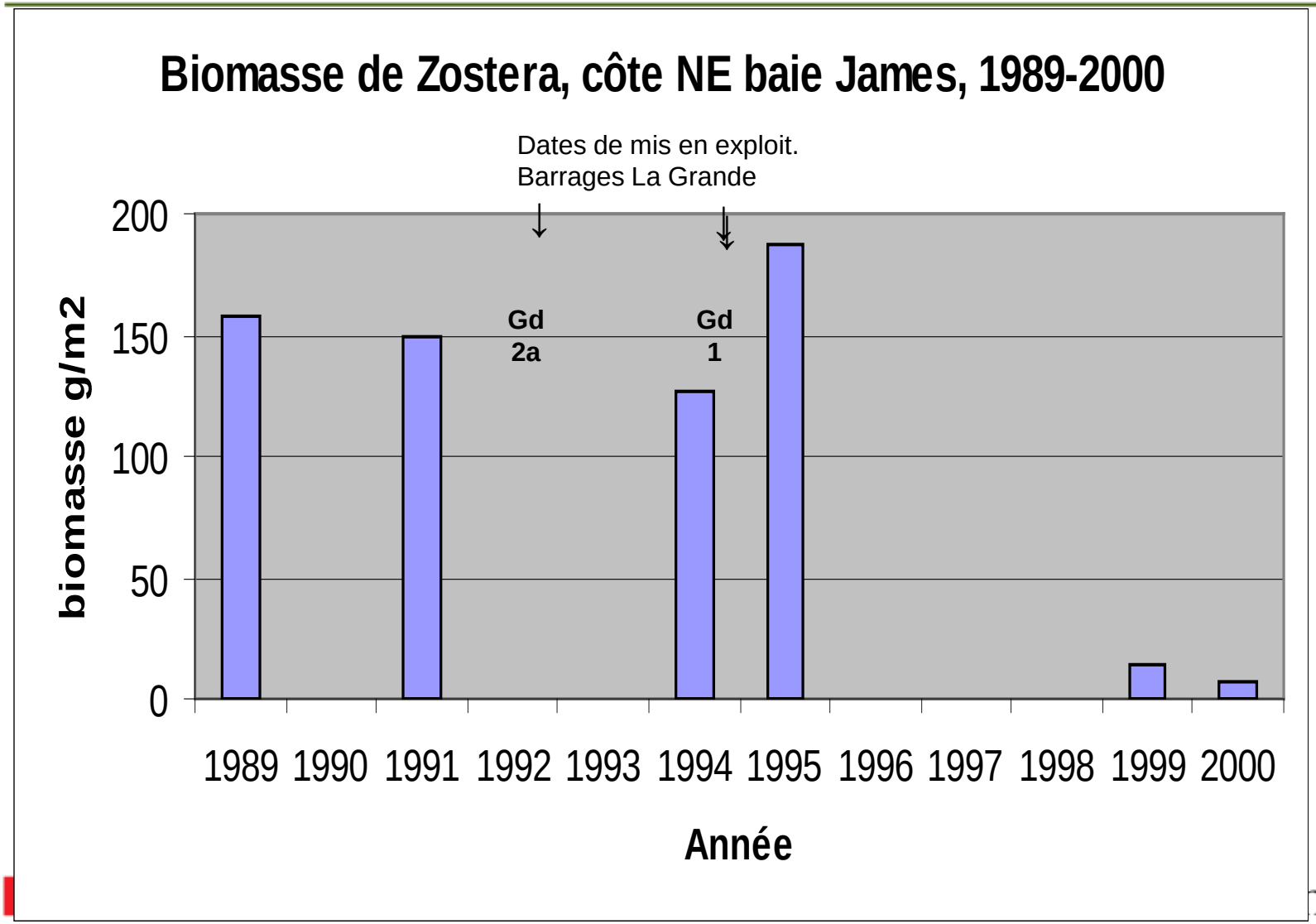


Symbols and explanation as in Figure 5.

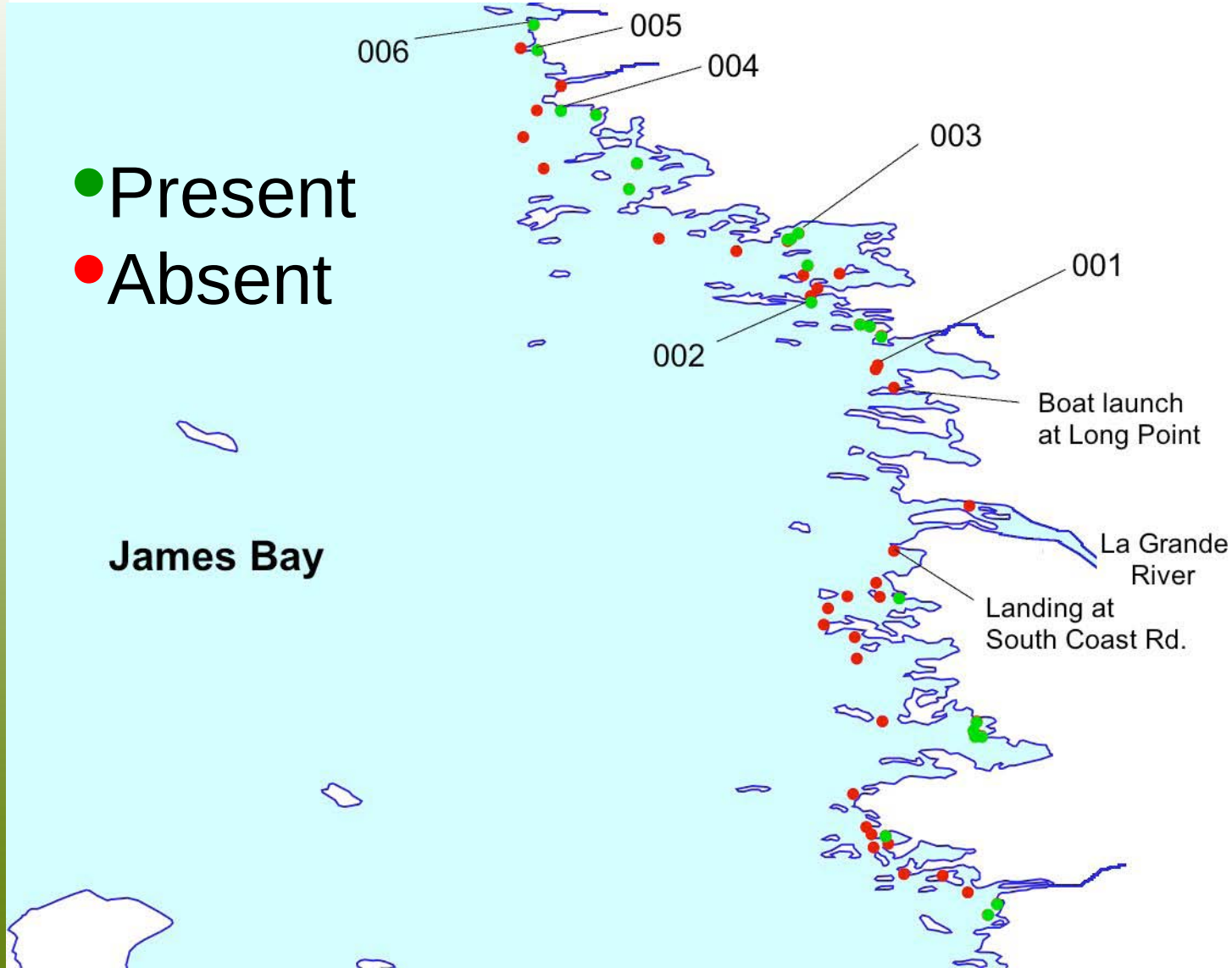
Most of the James Bay eelgrass beds are subtidal

- **Many of the long, narrow blades grow to more than two meters in length**

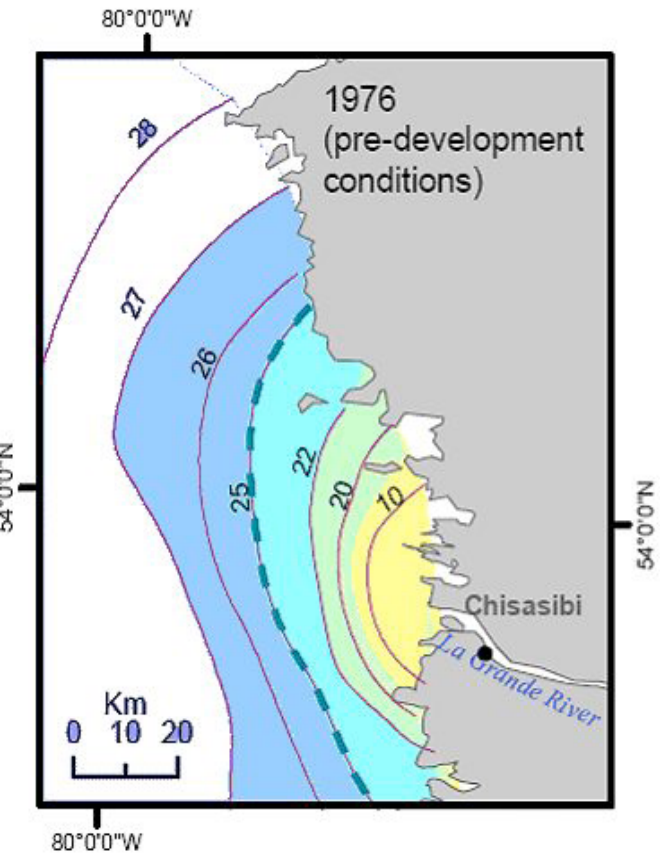
Status of Zostera, (Lemieux et Lalumière 2000)

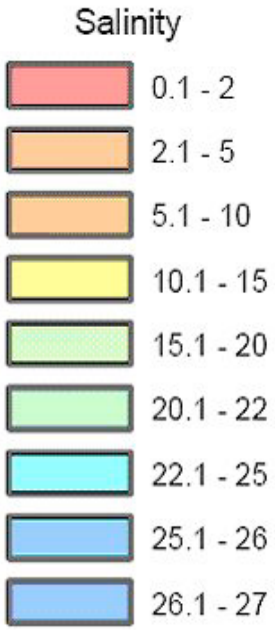


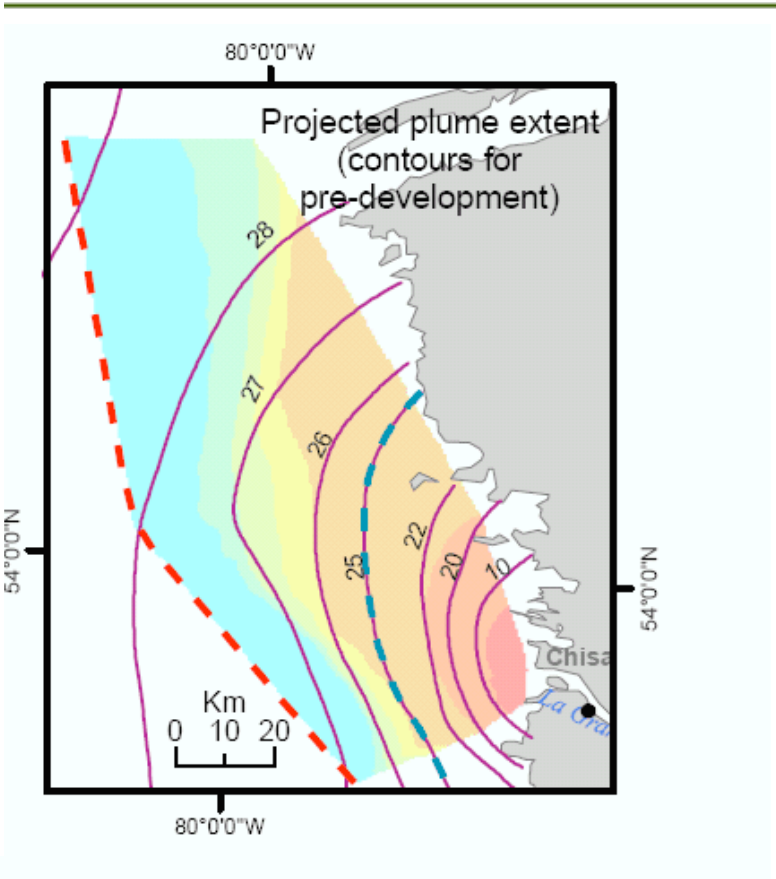
Short 2009 – Eelgrass Survey James Bay



James Bay – Short (2009)







James Bay – Short 2009

“The UNH study has concluded that the reason for the decrease in eelgrass abundance and health is reduced salinity of the water in James Bay, which results from the larger and more frequent discharges of fresh water from the Hydro-Quebec plants that use the La Grande River.”

Environment Canada Environnement Canada

Canada

Methodological Developments for Eelgrass Mapping in the Maritimes

Environment Canada Environnement Canada

Canada

Mapping eel-grass along New Brunswick's gulf-coast using high-resolution imagery

Al Hanson, Environment Canada
Matt Mahoney, Environment Canada
Herb Vandermeulen, Department of Fisheries and Oceans
Venitia Joseph, Department of Fisheries and Oceans
Guy Robichaud, Department of Fisheries and Oceans

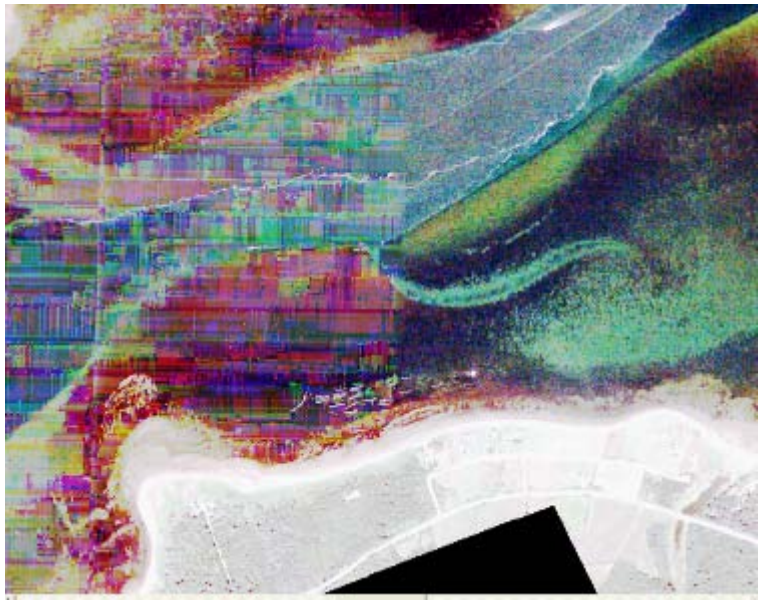
2007 - Richibucto & Shippagan Bay

Canada

Two types of Imagery Used

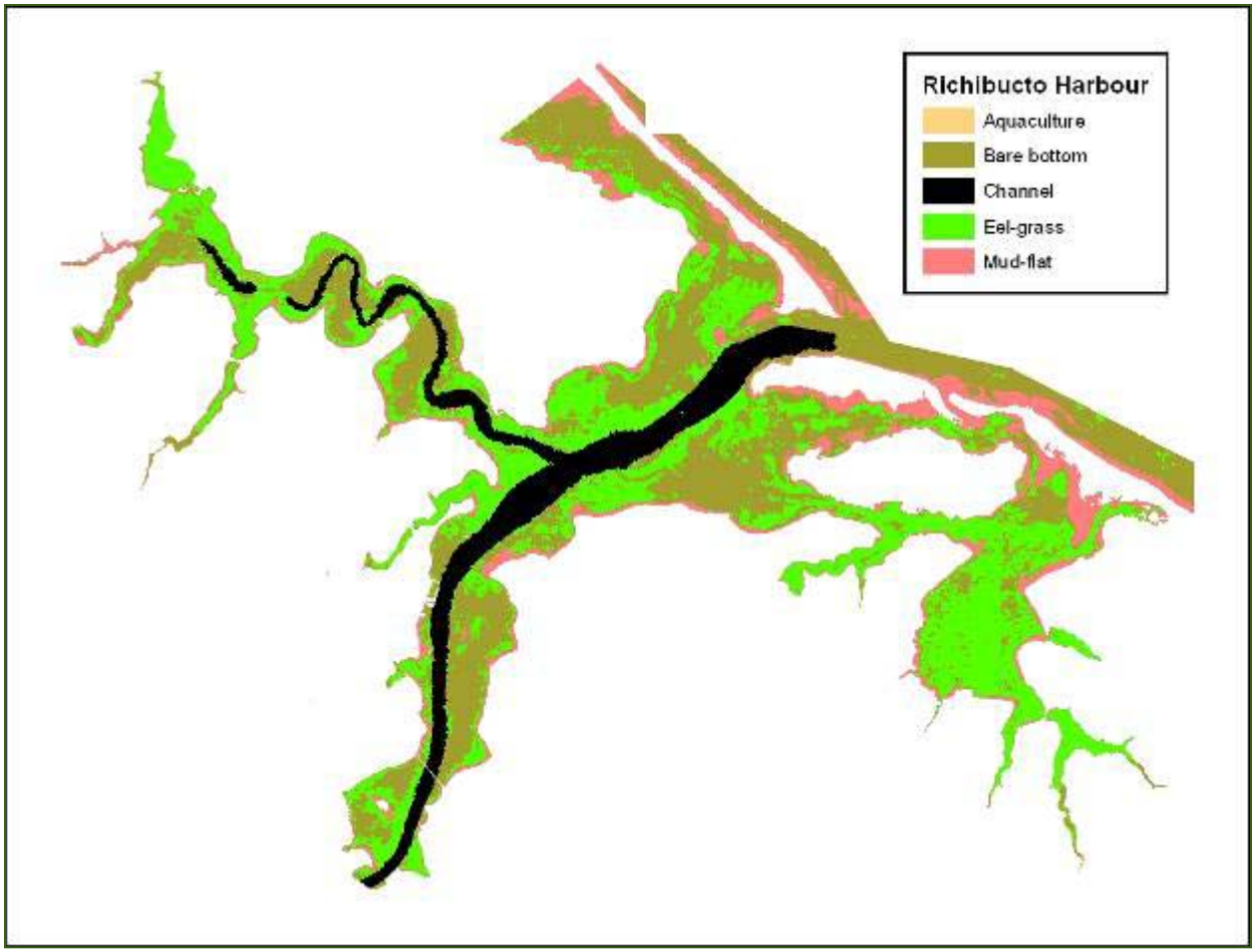
1. QuickBird Imagery
2. Aerial Photography: 2001/2002 provincial 1:12,500 series
3. Mission Specific Air Photos were not obtained due to scheduling problems

Quikbird Image – Problem with Banding over Water

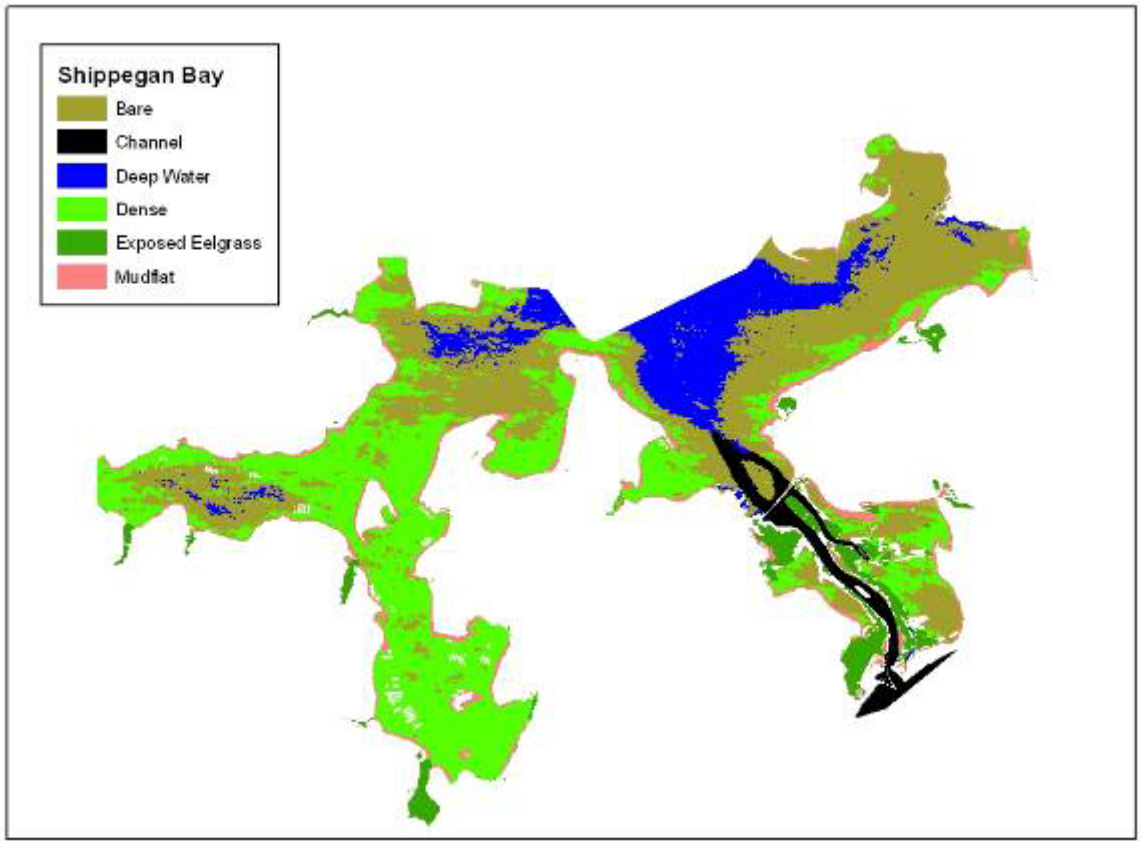


Problem occurs in approximately half of Richibucto Harbour

Richibucto Harbour- Classified

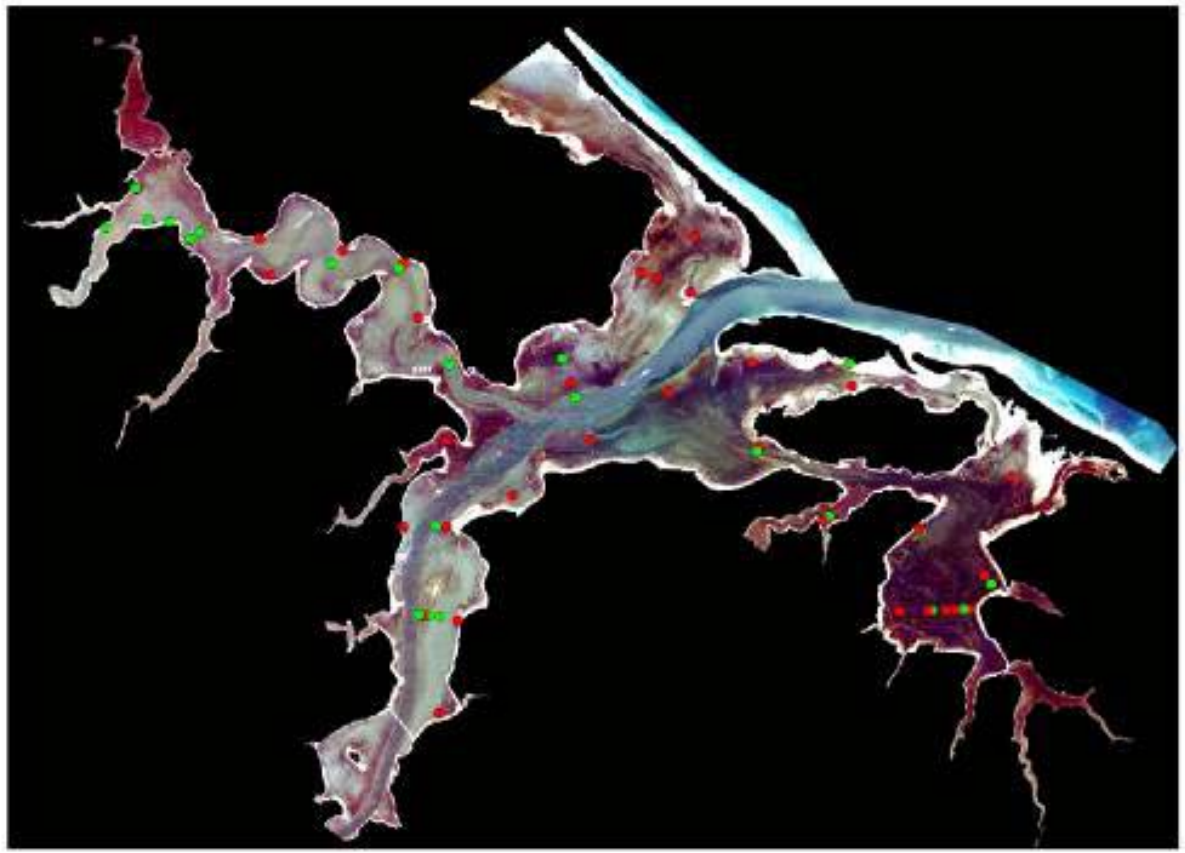


Shippagan Bay Classified



Accuracy Assessment

- Data used for accuracy and training was collected along transects using a differential GPS positioned towfish holding sidescan sonar, and a video camera that was later transcribed as XY points to describe eel-grass presence. Each observation extended over a 3 m window.



Canada

Results:

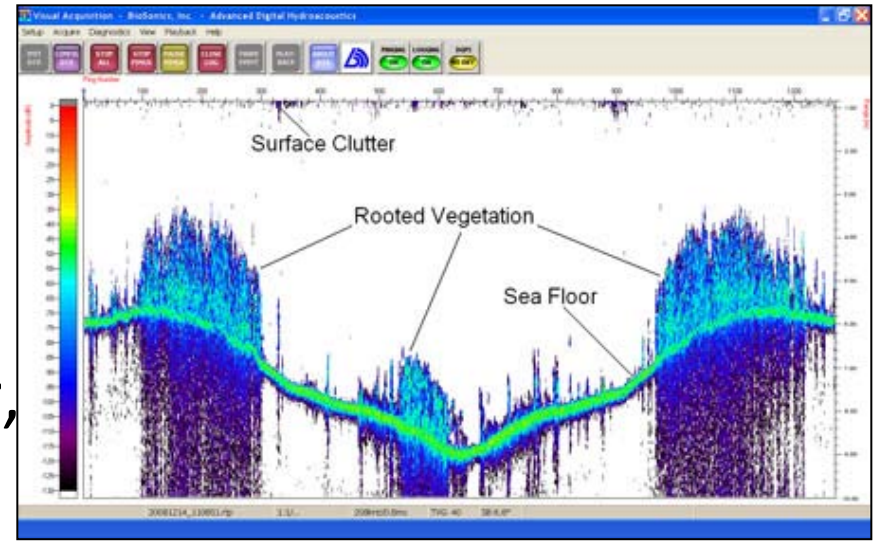
- Using QuickBird, results were very different for Richibucto & Shippagan.
- Richibucto QuickBird: 82% of reference polygons were at least partially overlapped by the mapped class.
- Shippagan QuickBird: 61% of reference polygons were correct.
- Shippagan Air Photos: 73 % accuracy based on the 2007 field-data.

In 2008 efforts focused on mission specific air photos collected according to NOAA – CCAP protocol.

SAV Mapping

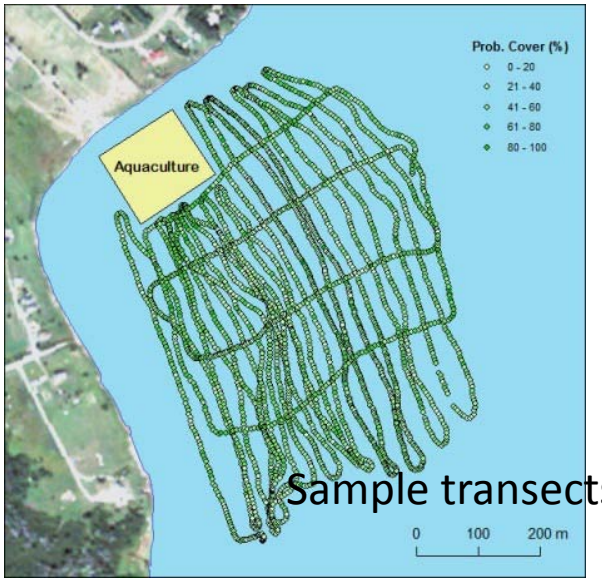
Jeff Barrell@dal.ca

DALHOUSIE UNIVERSITY
Inspiring Minds



BioSonics 2008

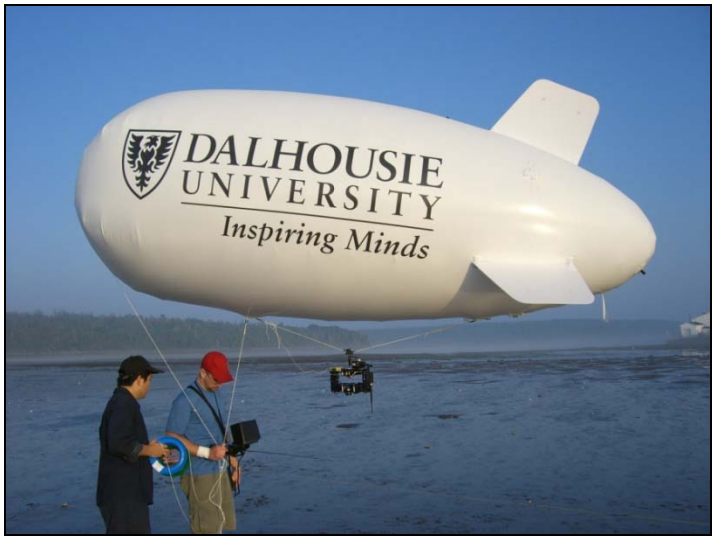
- BioSonics single-beam sonar, optimized for SAV
  - High freq. (430 kHz)
- Multi-scale data
- Georeferenced output:
  - SAV cover
  - Canopy height
  - Bathymetry



SAV Mapping

- Blimp-based digital aerial photography platform
  - Remote-controlled, pan/tilt/preview
- High resolution
- Multi-scale data

(bridging the gap between satellite and point sampling)



Intertidal *Zostera/Mytilus* beds in Halifax Harbour

SOUTHERN BALLOON WORKS

DALHOUSIE UNIVERSITY
Inspiring Minds

Canadian Situation

- Varied by biophysical area and jurisdiction.
- Stay Informed: Sign up for www.bofep.org Eelgrass Working Group.
- DFO Regional Assessment Process, March 4-5, 2009.
- Published as Canadian Science Advisory Secretariat (CSAS) Proceedings.

Corey and Catska Ench 2004 c

References

Chapman, A and J. Smith. 2004. Quantifying the rapid decline of eelgrass beds on the eastern shore of Nova Scotia between 1992 and 2002. In Hanson, A.R. (ed.) Status and conservation of eelgrass (*Zostera marina*) in Eastern Canada. Technical Report Series No. 412. Canadian Wildlife Service, Atlantic Region. viii. + 40 pp.

Garbary, D.J., A.G. Miller, N. Seymour and J. Williams. Destruction of eelgrass beds in Nova Scotia by the invasive green crab. 2004. in CWS Tech Report 412

Hanson, A. and Calkins, L. 1996. Wetlands of the Maritime Provinces: Revised Documentation for the Wetlands Inventory. CWS Technical Report No. 267. Canadian Wildlife Service - Environment Canada. Sackville, New Brunswick, Canada. 67 pp.

Sharp,G. and R. Semple. 2004. Status of eelgrass beds in south-western Nova Scotia. CWS Tech Report 412

Locke A. and M. Hanson. 2004. Changes in eelgrass in southern Gulf of St. Lawrence estuaries. CWS Tech Report 412

Lemieux, C. et R. Lalumière. 1995. Répartition de la zostère marine. (Zostera marina) dans l'estuaire du fleuve Saint-Laurent et dans la baie des Chaleurs (1994). Rapport présenté au Service canadien de la faune, Environnement Canada, préparé par le Groupe-conseil Génivar inc. 58 p.