5-17-2014

Eelgrass Distribution in the Great Bay Estuary and Piscataqua River for 2013

Seth Barker

Eelgrass Distribution in the Great Bay Estuary and Piscataqua River for 2013

Report submitted to the
Piscataqua Region Estuaries Partnership

UNH PO # P14UZM13

Seth Barker
Independent Contractor
15 Little Pond Road
East Boothbay, Maine 04544

May 17, 2014

Table of Contents

Abstract

Eelgrass distribution and cover in Great Bay, Little Bay, and the Piscataqua River Estuary were mapped from aerial photography acquired on August 24, 2013. The total area of eelgrass beds with 10% or greater cover was 1683.4 acres. The largest concentration of eelgrass was found in Great Bay with lesser amounts in the vicinity of Portsmouth Harbor. Comparisons to previous years are not made here.

Introduction

The report that follows provides details of the mapping of eelgrass distribution in Great Bay and the Piscataqua River for the year 2013. Aerial photography was obtained in August, 2013 and was followed closely by field work to establish signatures for photointerpretation and to aid in the accurate mapping of bed boundaries and cover categories. An independent accuracy assessment was carried out by the Piscataqua Region Estuary Parntership. A summary of those results will be included in the final report. At the time of this report the mapping described here is the latest regional documentation of the status of eelgrass beds in the area. The project area is described and illustrated in the Appendix, A1.

Methods

Mapping of the distribution of eelgrass was based on photointerpretation of aerial photography obtained on August 24, 2013, under a contract with Kappa Mapping, Bangor, Maine. Preliminary georeferenced photographs were made available in September, 2013 and were used for field logistics. This initial photography did not have the locational accuracy of the final photomosaic and had not been color balanced but provided sufficient detail to locate features of interest and select stations to be visited. Stations were selected in Great Bay, Little Bay, and the Piscataqua River and provided information on presence/absence, cover, and nature of the edge of eelgrass beds. Since there was a variety of photographic signatures, field stations were important for the understanding of the nature of the signatures.

Field visits for this project took place on September 7, 8, 17, 18, 23 and October 6, 21. In addition, an aerial overflight was carried out on November 6, 2013. The first four visits were carried out aboard a 17' Seaway equipped with a high accuracy GPS and a drop camera. The last three field visits were done from a kayak in shallow areas, primarily in the eastern side of Great Bay. A drop camera was not used from the kayak but the locations of observations were recorded using high accuracy GPS. GPS units used during field visits were either a Trimble GeoXH or GeoXH, both of which are capable of sub-meter accuracy.

A total of 36 stations (Figure 1) were visited and observations made with a drop camera. In most cases the boat either drifted or motored at low speed over the station and one or more observations were recorded on a field sheet (Appendix A.2). Observations were coded as to presence of eelgrass, eelgrass cover, presence and type of macroalgae, and substrate. The time of the observation was recorded and used in conjunction with the time of GPS observations which were recorded as points in a GPS file. In many locations, a video recording was made which was time stamped and allowed for location specific review at a later date. Using the kayak in late September and October, a total of 139 observations were recorded in the area from the Stratham Station boat launch to Woodman Point. The November aerial overflight was carried out as a final check of outlying areas. The flight path is shown in Figure 2.

The final photomosaics were received in January, 2014, from Kappa Mapping. These were added to a GIS along with field information and other data layers to aid in photointerpretation. Eelgrass beds were first outlined and screen digitized using the GIS software package QGIS and saved to a ESRI shape file. Digitizing was generally done at a screen scale of 1:1000 or less. The projection used was New Hampshire State Plane, NAD83, and the units were feet.

During the initial digitizing process areas with a coverage of less than 10% and greater than 0% were included. The bed polygons were subsequently subdivided and coded by cover category using the standard categories for NH eelgrass mapping used in previous years. See Appendix A.3 for the categories and the visualization aid used in this process. After beds were outlined to form polygons, areas with less than 10% eelgrass coverage as visible from the aerial photography were deleted from the GIS file leaving the standardized categories. Polygons that were interior to other polygons and having less than 10% cover were coded as NULL in the cover attribute. Shapefile attributes included “id”, “Density”, “Hectares”, “Acres”, and “Year”. The attribute, “id”, is a unique consecutive number; “Density” is coded using the standard NH code for cover; “Hectares” is the area of the polygon in hectares; “Acres” is the area of the polygon in acres; and “Year” is equal to 2013, the year of the aerial photography.

During the digitizing process and when the final file was produced, the topology of the shapefile was checked using the QGIS topology routine. The topology rules enforced included no gaps, no duplicates, no overlap, no invalid geometry, or no multi-part geometry. A final topology check will be made using ESRI ArcGIS software after the independent accuracy assessment has been carried out.

Results and Discussion

In general very little eelgrass was observed in Little Bay or the Piscataqua River above Seavey Island. In Great Bay, many of the beds were a mix of macroalgae and eelgrass, particularly on the eastern side of the bay. Widgeon grass was also found in shallow areas of the eastern side of Great Bay and was particularly prevalent in the vicinity of the Winnicut River. The distribution of eelgrass for 2013 is shown in Figure 3.

The total area of eelgrass mapped in the entire project area was 1683.4 acres. This has been broken down by region as shown in Table 1. Great Bay had by far the greatest area of eelgrass, 1524.8 acres. The Portsmouth Harbor area which includes Little Harbor and Back Channel had 157.9 acres. Only 0.7 acres were found in the Little Bay/Piscataqua River area.

Figure 1. Field stations and GPS track logs.

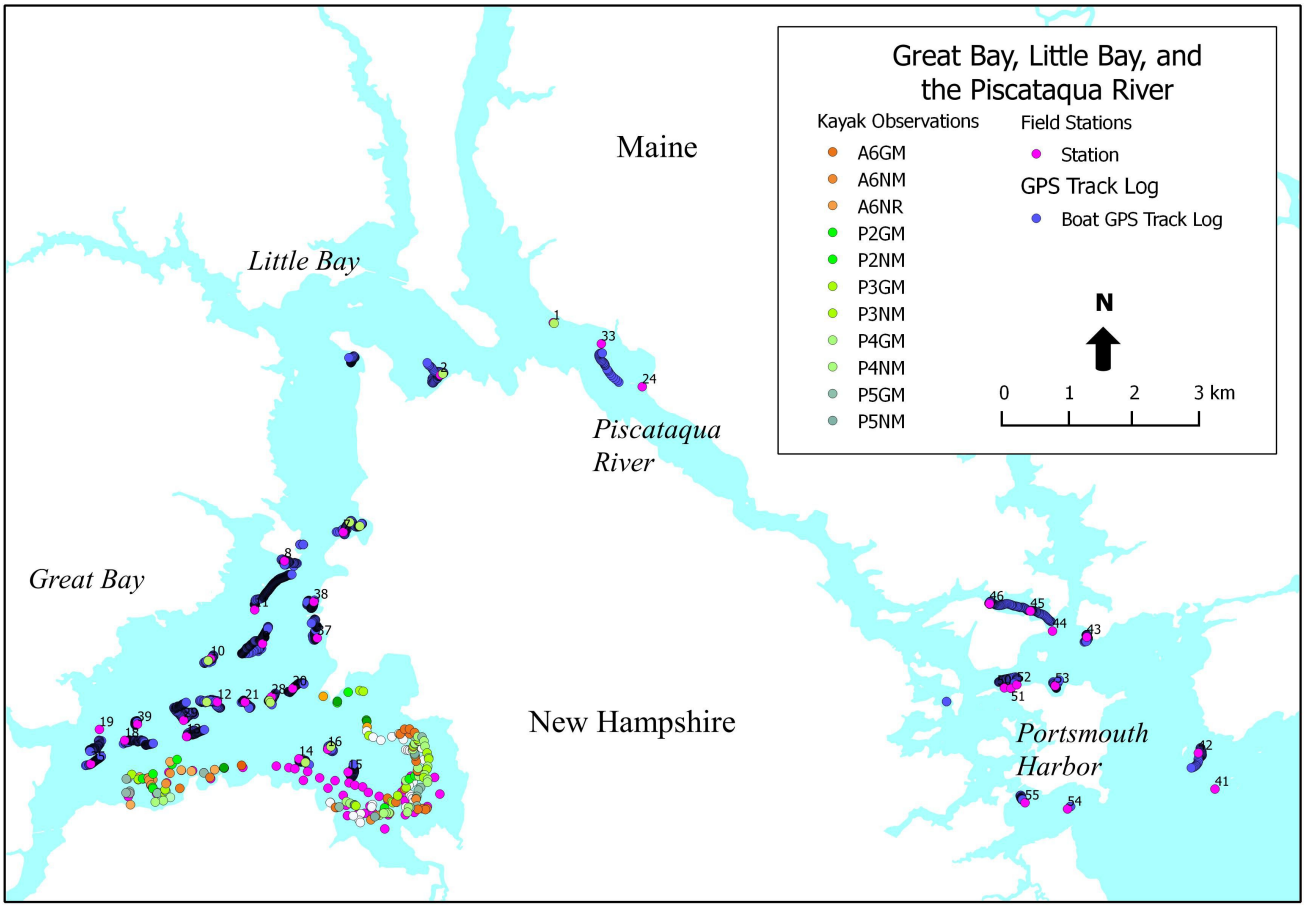


Figure 2. Flight path from overflight on Nov. 9, 2013.

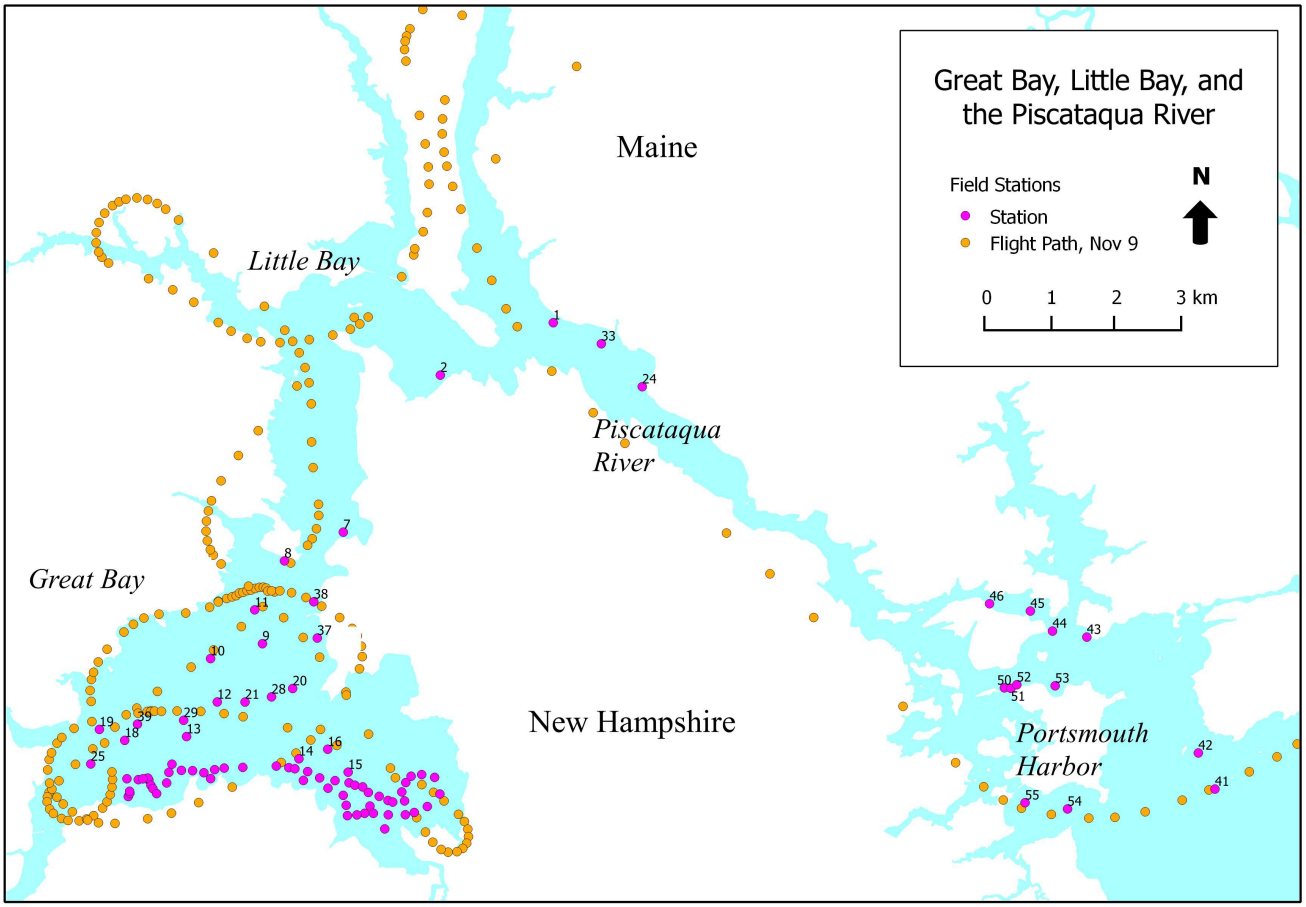


Figure 3. Distribution of eelgrass, 2013.

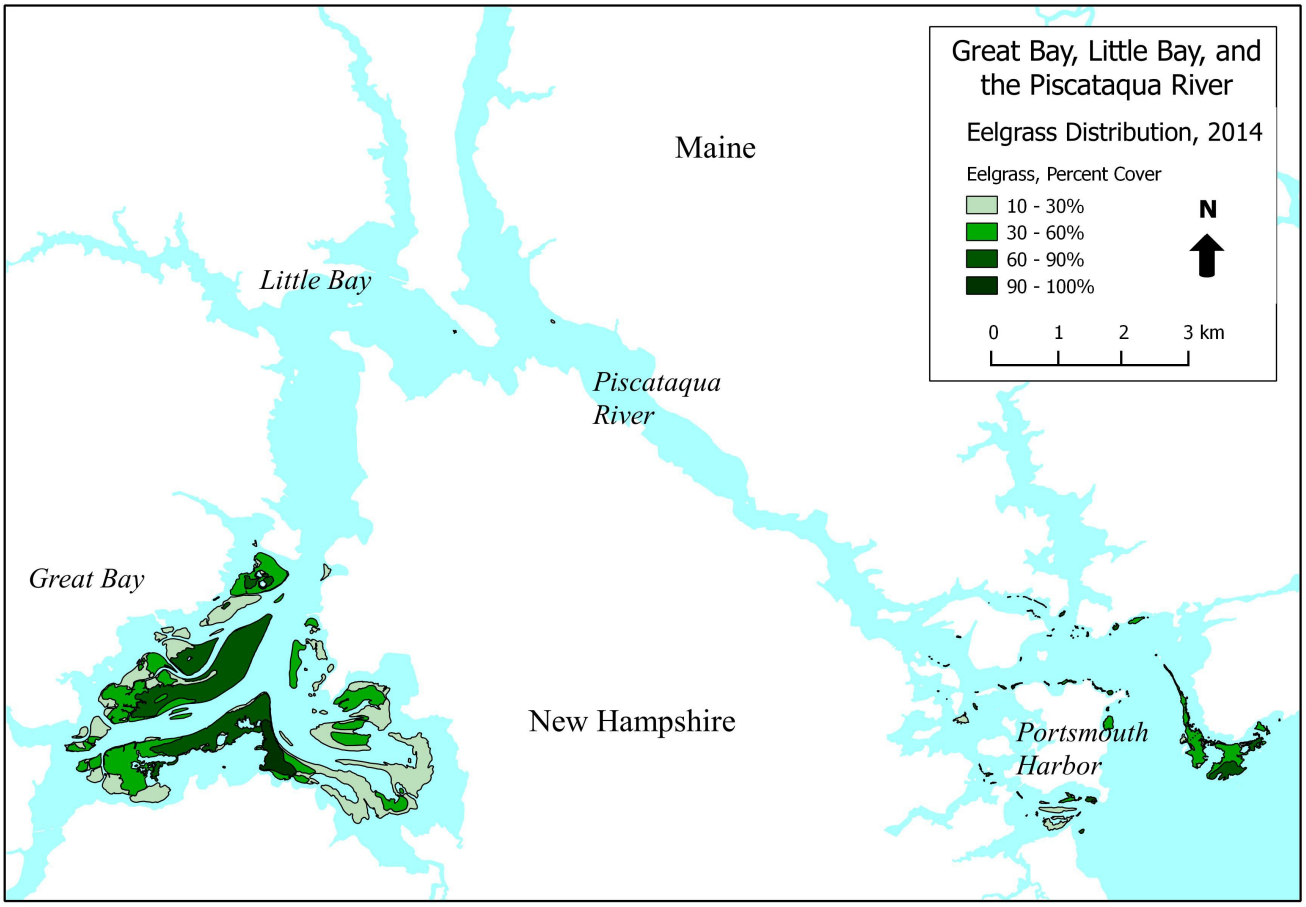


Table 1. Eelgrass area (acres) by location and cover category, 2013.

Cover Category / Region	10-30%	30 -60%	60-90%	90-100%	Total
Great Bay	588.1	455.7	429.8	51.2	1524.8
Little Bay/ Piscataqua River	0.7	0.0	0.0	0.0	0.7
Portsmouth Harbor	30	91.4	35.8	0.6	157.9
Total	618.8	547.1	465.6	51.8	1683.4

Appendix

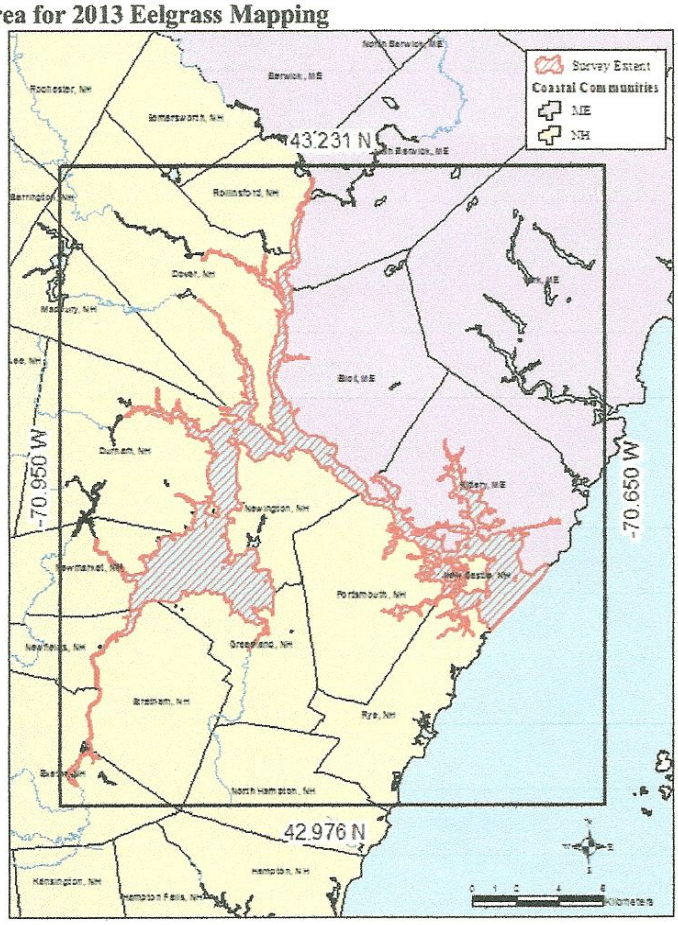
A.1 Description of study area from QAPP.

A5 – Problem Definition/Background

Eelgrass (*Zostera marina*) is essential to estuarine ecology because it filters nutrients and suspended particles from water, stabilizes sediments, provides food for wintering waterfowl, and provides habitat for juvenile fish and shellfish, as well as being the basis of an important estuarine food web. Healthy eelgrass both depends on and contributes to good water quality. Therefore, PREP tracks the cover and density of eelgrass in the Great Bay Estuary as an indicator of estuarine health.

The objective of this project is to map eelgrass habitat in the Great Bay Estuary during the summer growing period of 2013. The Great Bay Estuary is 21 square miles of tidal waters located in southeastern New Hampshire. The area for eelgrass mapping extends from the head-of-tide of all tidal rivers and creeks to the mouth of Portsmouth Harbor. The mouth of Portsmouth Harbor is defined by lines extending from Odiorne Point in Rye, NH to White Island to Horn Island to Sewards Point on Gerrish Island in Kittery, ME. The total area to be mapped is approximately 22 square miles. The study area in which eelgrass will be mapped for this project is shown in Figure 2.

Figure 2: Study Area for 2013 Eelgrass Mapping



Appendix

A.2 Field sheet used for photointerpretation.

Station Number				Date (MMDDYY)	
Crew Chief				Crew Member 1	
Crew Member 2				Crew Member 3	
Purpose				GPS File	

Weather Condition				
Sea Condition				
Start Time			End Time	

Drop Camera Observation

Start Time	Observation	Depth	Offset	End Time	Notes

Eelgrass Presence
P - Present
A - Absent

Eelgrass Cover
1 Dense
2 Some Bottom
3 Half
4 Patchy
5 Sparse
6 None

Macro Algae
N – None
U – Ulva/Enteromorpha
G – Gracilaria
O – Other

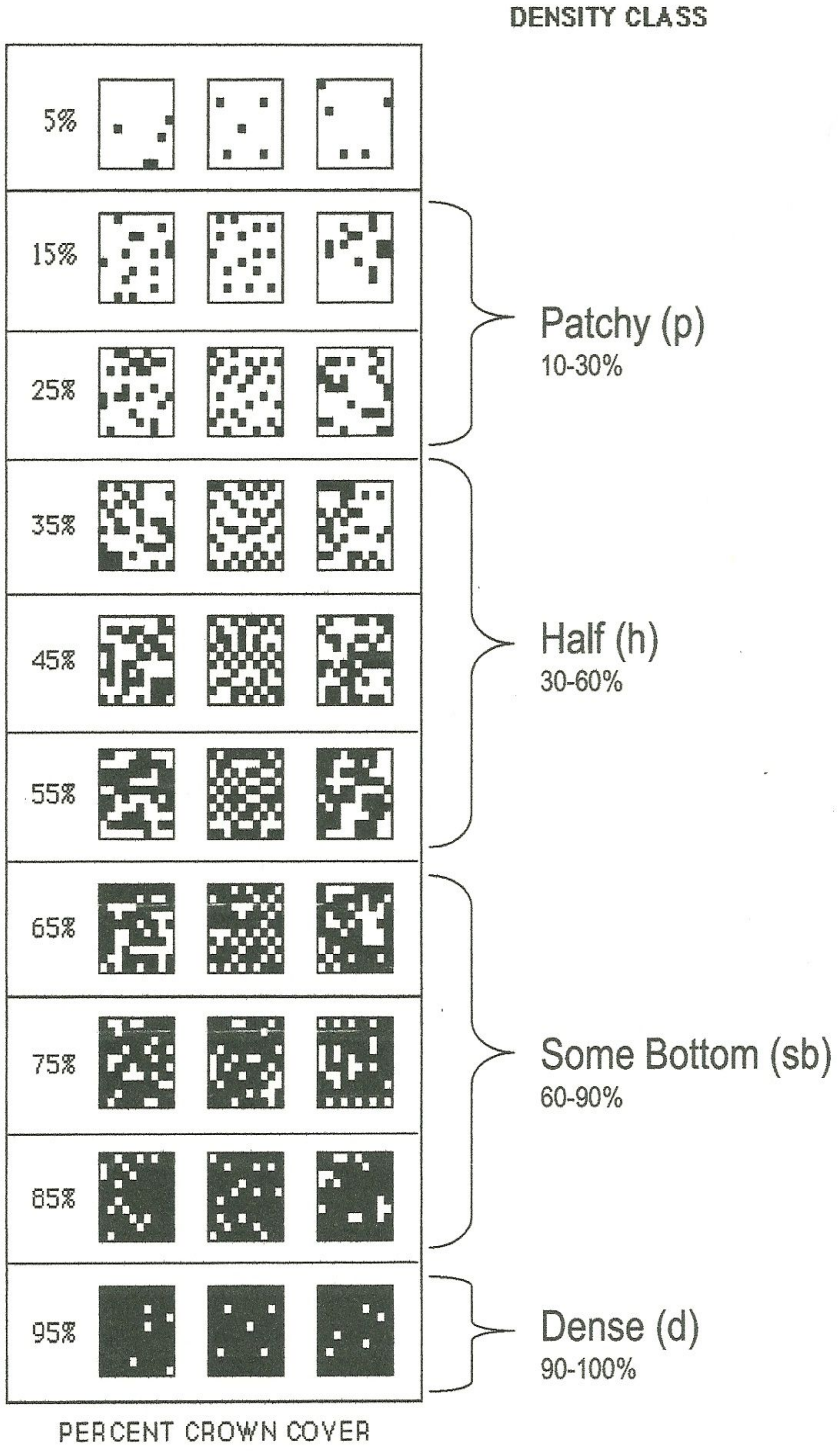
Substrate
M – Mud
S – Sand
R – Rock
N – Not observed

Appendix

A.3 Description of cover categories and photointerpretation aid (from QAPP).

Appendix F

Visual Guide for Eelgrass Percent Cover for Photointerpretation



Source: http://web.vims.edu/bio/sav/sav11/crown_density.html

A.4 1:24000 scale maps showing eelgrass beds in the Great Bay, Little Bay, Portsmouth Harbor area. Only locations with eelgrass are shown.

List of Maps: