

# **Eelgrass Distribution in the Great Bay Estuary 2004**

A Final Report to

The New Hampshire Estuaries Project

Submitted by

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## Introduction

Eelgrass (*Zostera marina*) is an essential habitat for the Great Bay Estuary (GBE) because it provides food for wintering waterfowl and habitat for juvenile fish and shellfish. Eelgrass is the basis of an estuarine food chain that supports many of the recreationally, commercially and ecologically important species in the estuary. Additionally, eelgrass filters estuarine waters, removing both nutrients and suspended sediments from the water column. Eelgrass in the Great Bay Estuary is the largest monoculture in the State of New Hampshire and is considered a vital resource to the State's marine environment. The UNH Seagrass Ecology Group has mapped the distribution of eelgrass in Great Bay every year from 1986 to 2001 (Short, unpublished data). Eelgrass in the entire Great Bay Estuary system (Great Bay, Little Bay, tidal tributaries, Piscataqua River, and Portsmouth Harbor) was mapped in 1996, and from 1999 through 2004.

Eelgrass cover in Great Bay has been relatively constant for the past 10 years at approximately 2,000 acres, although over that period, the biomass of eelgrass (grams of eelgrass per meter square) has declined steadily (Trowbridge 2006). Earlier, in 1989, there was a dramatic decline in eelgrass area to only 300 acres (15% of normal levels). The cause of this crash was an outbreak of a slime mold, *Labryrinthula zosterae*, commonly called "wasting disease". More recently, the greatest extent of eelgrass in the GBE was observed in 1996 after the beds had recovered from the wasting disease episode. The decline in eelgrass biomass seen over the past decade (1996 – 2006) is not a result of wasting disease, and shows all the signs of being caused by anthropogenic impacts, namely nutrient loading and sedimentation.

The University of New Hampshire provided digitized eelgrass distribution information in Great Bay Estuary for the years 1999-2001 to NHEP database. Additionally, the 2002 and 2003 eelgrass coverages are now in the NHEP database.

In 2004, the NHEP funded annual monitoring for eelgrass in GBE. We collected aerial photography of eelgrass coverage for 2005 and mapped eelgrass distribution for 2004 from the information gathered in the summer of 2004 (aerial photography and ground truthing). Here, I report on the eelgrass distribution information for 2004 in the Great Bay Estuary.

## Project Goals and Objectives

UNH has now completed the 2005 project under contract to the NH Estuaries Project. The project goals and objectives of the contract were to:

- (1) map eelgrass distribution in GBE for 2004 based on aerial photography and ground truth;
- (2) acquire aerial photography of the Great Bay Estuary in 2005;
- (3) conduct eelgrass ground truth observations of the 2005 aerial imagery..

The final work product is ArcInfo files of eelgrass distribution throughout the Great Bay Estuary

in 2004, including all necessary documentation/metadata for the ArcInfo files, and this final report describing the results and any deviations from the protocols established in the QA Project Plan.

## Methods

The methods for this project followed the procedures specified in the approved QA Project Plan (Short and Trowbridge, 2003).

## Results and Discussion

The shapefiles containing the eelgrass distribution data were provided to the NHEP Coastal Scientist by email. Metadata for the shapefiles is as follows:

Codes for cover classes:

p = 10 to 30 % cover

h = 30 to 60 % cover

sb = 60 to 90 % cover

d = 90 to 100 % cover

Eelgrass cover below 10% cannot be detected in the aerial photography.

In 2004, eelgrass distribution and percent cover slightly increased in the Great Bay Estuary over 2003, mostly due to increases in Great Bay itself. Loss of habitat was seen in the eelgrass meadow between Fishing Island and Gerrish Island and in Little Harbor, both of which lost distribution and percent cover, as well as in the Piscataqua River. Eelgrass was present throughout much of its expected range in the estuary, although there are still large areas of the estuary that historically supported eelgrass and currently do not. Due to the increases in Great Bay and at the mouth of the estuary, there was higher percent cover than in 2003, representing a slight overall increase in eelgrass abundance between 2003 and 2004.

Eelgrass in the central part of Great Bay increased in percent cover and extent over 2003 conditions. Many of the eelgrass beds lost between 2001 and 2002 in the northwest area of the Great Bay adjacent to Adams Point were reestablished in 2003 and continued to increase in percent cover in 2004. Further south, along the western side of Great Bay, a large flat of eelgrass missing in 2003 made a partial recovery in 2004. In the mid-bay region, the extent of dense eelgrass increased slightly. The eelgrass bed along the eastern side of Great Bay near Thomas Point increased in size, but was patchier and with lower percent cover than in 2003. In Greenland Bay, some areas increased in extent while other areas showed reduced percent cover.

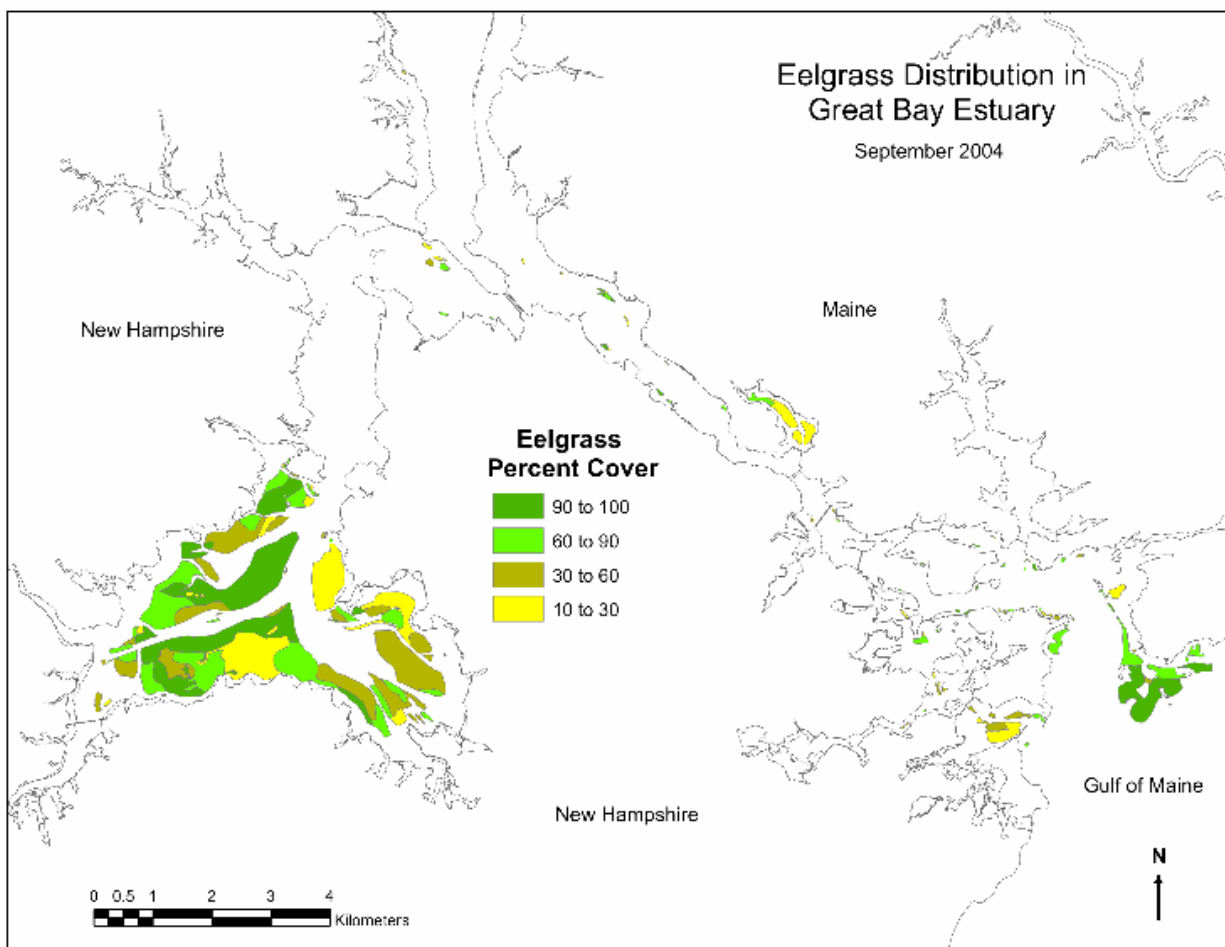
In Little Bay between 2003 and 2004, there was little change in eelgrass bed extent or percent cover, although the Dover Point bed appears less cohesive. There was no eelgrass present in the Oyster River. There are still large areas of Little Bay and the Bellamy River which historically supported eelgrass that remain unvegetated. However, there was one patchy eelgrass bed in the upper Bellamy River.

In the upper Piscataqua River, the size, percent cover, and number of eelgrass beds decreased from 2003 to 2004. The two new eelgrass beds seen in 2003 on the Maine side of the river across from the General Sullivan Bridge greatly contracted in 2004. On the New Hampshire side of the Piscataqua River, the predominant eelgrass beds remain those restored in the 1993 – 95 New Hampshire Port Mitigation Project. These restored eelgrass beds remained roughly the same from

2003 to 2004, although percent cover decreased slightly.

In Portsmouth Harbor and Little Harbor, some eelgrass beds increased in percent cover while others decreased. The eelgrass meadow between Gerrish and Fishing Islands in Portsmouth Harbor remained severely impacted by grazing Canada geese, but the offshore eelgrass bed southwest of Gerrish Island increased in percent cover.

For all the areas surveyed for 2004, only Great Bay itself retains eelgrass distributions similar to historic levels, although eelgrass percent cover in Great Bay is much lower than seen historically. Eelgrass in Great Bay increased somewhat between 2003 and 2004. Little Bay showed little change between 2003 and 2004, with very low levels of eelgrass compared to historical distributions. In the Piscataqua River an overall decrease was apparent in 2004, while the Portsmouth Harbor area showed both increases and decreases in eelgrass between 2003 and 2004. Overall, eelgrass in 2004 in the Great Bay Estuary was very slightly increased in percent cover and extent, although not consistently throughout the estuary. All of the estuary has vastly decreased eelgrass beds compared to historic distributions, with percent lower than seen historically.



## Conclusions and Recommendations

1. Continue annual monitoring of eelgrass in the Great Bay Estuary.
2. Determine the cause of loss of eelgrass percent cover in Great Bay itself.
3. Restore eelgrass in Little Bay and the Oyster and Bellamy Rivers.
4. Conduct quantitative monitoring of the wasting disease in the Great Bay Estuary.
5. Institute best management practices in the Great Bay Estuary to reduce boating and mooring impacts to eelgrass.
6. Create a map of potential eelgrass habitat for the Great Bay Estuary.
7. Avoid both actual and potential eelgrass habitat when siting other restoration activities in the estuary.

## References

Short and Trowbridge (2003) UNH Eelgrass Monitoring Program, Quality Assurance Project Plan, Version 1, Final. University of New Hampshire and NH Estuaries Project, June 30, 2003.