frenchman bay partners

Eelgrass 2017

The Frenchman Bay Partners are guided by a conservation plan, the Frenchman Bay Action Plan, which identifies four conservation priorities: Eelgrass, Benthic Habitats, Mudflats, and Diadromous Fish.

Why Eelgrass?

Frenchman Bay's eelgrass beds contribute to a healthy coastal marine ecosystem. Historically, Frenchman Bay contained dense eelgrass populations with abundant marine life.

The benefits of eelgrass are many. Commercially important organisms, such as winter flounder, striped bass, and Atlantic cod, as well as juvenile mollusks and crustaceans, utilize the beds as nursery grounds. Thick mats of roots anchor eelgrass to the ocean bottom, stabilizing sediment, and reducing erosion. Eelgrass improves water quality by mitigating wave energy and helping sediment settle out. Eelgrass areas sequester carbon, which is useful in mitigating the impacts of ocean acidification.

Researching eelgrass and observing changes in the habitat leads to a greater understanding of eelgrass loss and the relationships between variables that are related to the health of eelgrass beds.

Eelgrass in Frenchman Bay

Eelgrass has been declining in Frenchman Bay since it was first mapped by the Maine Department of Marine Resources (DMR) in 1996. In 2007, a variety of community partners began working together to restore eelgrass at Hadley Point; by 2012, there was a 47-fold increase in eelgrass coverage at this site.

At the end of 2012, all eelgrass died back in upper Frenchman Bay, and did not reemerge throughout the entire 2013 growing season. This included restored eelgrass as well as naturally occurring eelgrass. 2014 saw the reemergence of eelgrass at different areas of upper Frenchman Bay. Eelgrass seedlings were observed at Hadley Point and Berry Cove, overlaying restoration areas from previous years in many cases. These areas have continued to grow and expand ever since (Fig. 1).

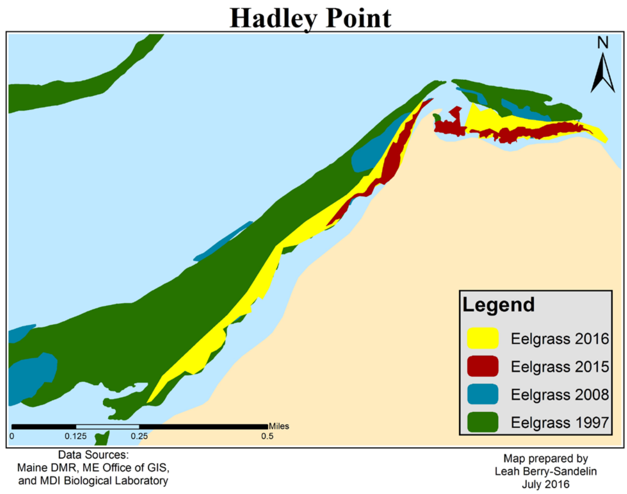


Figure 1. Eelgrass presence at Hadley Point, 1997-2016.

FBP efforts to restore eelgrass beds

There are strong economic, environmental, and social incentives for restoring eelgrass in Frenchman Bay. MDI Biological Laboratory, working together with various community partners, began restoration efforts in a 14-acre area at Hadley Point in 2007. In 2013, they set goals to restore eelgrass at Hadley Point, Thomas Island, Berry Cove, and the Jordan River to 1996 levels by 2030, and to maintain good water quality (3-4 meter transparency).

The basic model for restoring eelgrass in Frenchman Bay involves collecting plants from the subtidal area of Stave Island, which hosts an expansive eelgrass bed. The plants are transplanted to a variety of areas using different methods.

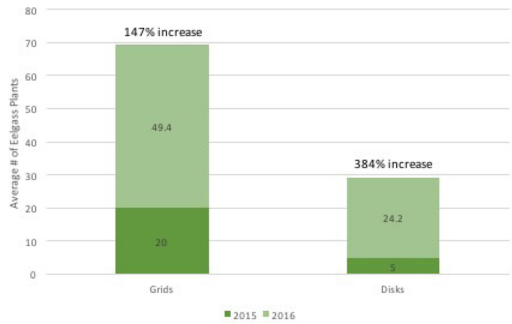
Methods for restoring

Methods for transplanting have evolved to fit the scale of the restoration. In 2016, 2,175 vegetative eelgrass plants were transplanted to Berry Cove in upper Frenchman Bay. Transplanting is accomplished best in two ways:

1. Grids: This proven method has evolved into its current model, a biodegradable 2' x 2' wooden frame. Eelgrass is either tied onto twine strings or woven through burlap (*top right*).
2. Weights: Seven eelgrass plants are woven onto dissolvable ceramic disks that sink the eelgrass transplants to the ocean bottom where they root and spread (*bottom right*).

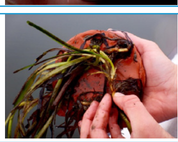
Ceramic Weights as Primary Method for Restoring

Figure 2. One Year Post Restoration Plant Counts



We know grids are a successful method for restoring eelgrass, but they are also expensive, labor intensive, and must be deployed at low tide. In 2015, the New York State College of Ceramics at Alfred University designed several ceramic disk prototypes for us to test during our eelgrass restorations. Weights can be: mass produced, prepared before the restoration day and stored in saltwater, and deployed at any tide stage. They degrade much faster than our biodegradable grids, and show a 348% increase in eelgrass plants in a restoration area versus a 147% increase for grids (Figure 2).

We trialed three types of dissolvable disks in 2016. Types and results of this experiment are in Table 1 (below). The Gypsum-based weights dissolved more quickly than expected, and the transplanted eelgrass did not have time to take root. The third type of weight, made of terracotta, was fired at 900 degrees so it would take longer to dissolve. Six weeks post-restoration, the disks were still intact, and the eelgrass transplants had taken root. We noticed new rhizomal growth on individual plants. In the spring of 2017, we will check the restoration area to see how the disks and the eelgrass overwintered.

Material: Gypsum **Outcome**: Dissolved within a week.	
Material: Gypsum/ Portland Cement **Outcome**: Dissolved within a week.	
Material: Terracotta **Outcome**: Still intact 6-weeks post restoration	

Interannual Variation in Carbon Stock

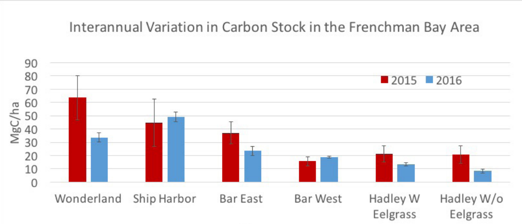


Figure 3.

In summer 2015 and 2016, we investigated the capacity of eelgrass to mitigate near shore ocean acidification and climate change using different methods to determine carbon stock. In both years, sediment cores showed a significant difference between the carbon stock in eelgrass areas where eelgrass was thriving (Wonderland, Ship Harbor, and Bar East), and areas with eelgrass loss (Bar West and Hadley Point) (Figure 3). However, there was no significant difference between 2015 and 2016 at any site. Hadley Point does have significantly higher carbon stock in areas with than without eelgrass in 2016 (t-test, P=0.030).

Results of 2016 Efforts

The Community Environmental Health Laboratory (CEHL) has placed a priority on eelgrass restoration in Frenchman Bay since 2007. In addition to restoring eelgrass, CEHL is dedicated to understanding eelgrass loss and determining the most effective routes to protect eelgrass areas. With the help of volunteers, interns, AmeriCorps Environmental Stewards, the Frenchman Bay Partners, and numerous other partners, CEHL accomplished the following over the past year:

- Collaborated with Alfred University to design and trial three different types of restoration disks.
- Placed 125 disks and 65 grids bearing 2,175 plants in restoration plots in Berry Cove in Frenchman Bay, Maine.
- Researched carbon sequestration capabilities of eelgrass, and pH variability inside and outside of eelgrass beds.
- Engaged 76 volunteers in eelgrass-related activities.
- Hosted a NH/ME Eelgrass Collaborators meeting in January 2017.

Next Steps

- Work with collaborators throughout the New England area to continue to try and understand eelgrass loss.
- Continue to refine eelgrass mapping techniques and generate annual maps for Frenchman Bay.
- Define new parameters for assessing eelgrass health.
- Continue to document the carbon stock of Frenchman Bay.
- Date sediment carbon to determine a carbon sequestration rate for Frenchman Bay.
- Continue to restore and protect eelgrass in Maine.

Partners

Collaboration is critical to any Frenchman Bay Partner undertaking. Key partners on eelgrass projects include: Long Cove Foundation, the Alex C. Walker Foundation, MDI Biological Laboratory, Maine Coast Heritage Trust, The Nature Conservancy, and the New York State College of Ceramics at Alfred University.

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