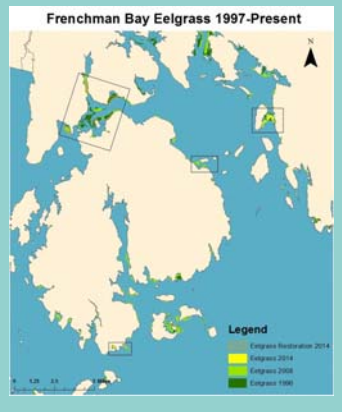
Eelgrass Mitigation of Sediment Acidification in Frenchman Bay, Maine

Leah Berry-Sandelin[1], Anna E. Farrell[2], and Jane E. Disney[2]
[1]Bard College, Annandale-on-Hudson, NY, [2]MDI Biological Laboratory Salisbury Cove, ME

Introduction



- *Zostera marina* (eelgrass) is found around Mt. Desert Island (MDI), ME.
- Eelgrass has declined significantly over the past 20 years.
- It sequesters carbon, and stores it in the sediment.
- Seagrasses are a type of coastal blue carbon ecosystem, like mangroves and salt marshes.
- CO_2 and ocean acidification:

$$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3 \leftrightarrow H^+ + CO_3$$

- Eelgrass beds also help prevent erosion, attenuate wave action, and shelter commercially important species.

Objective

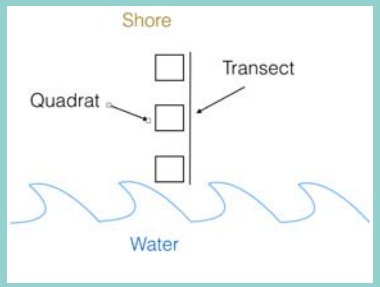
Determine if there is there a relationship between the presence of eelgrass and pH levels at Hadley Point.

Conclusions

- Eelgrass may help mitigate acidification of mudflats, which is important habitat for commercially important clams and mussels.
- pH is higher in surface sediments of natural and restored eelgrass areas than areas without eelgrass along transects perpendicular to the shoreline.
- Additional research is necessary to determine if shellfish grow better in the vicinity of eelgrass

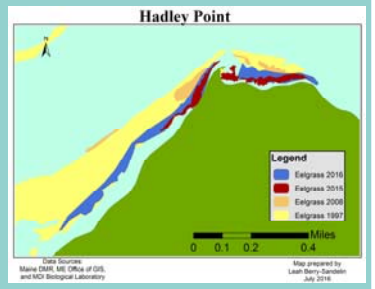
Process

- 10 meter transects were laid perpendicular to shore.
- Areas within three 25 cm x 25 cm quadrats were assessed for pH using a Hanna soil pH meter during the morning and afternoon.
- Three 2cm deep and three 5 cm deep pH readings were made within each quadrat.



Perpendicular Transect

Lowest quadrats were in eelgrass at low tide.
Three pH readings were made inside each quadrat at depths of 2 cm and 5 cm.

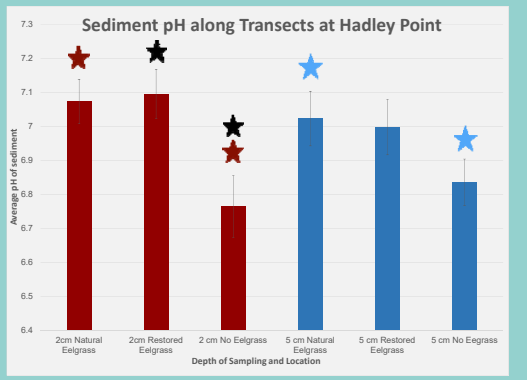


Sites

The sites were all at Hadley Point on MDI.
- Areas with restored eelgrass
- Areas with no eelgrass
- Areas with naturally occurring eelgrass

Results

- Natural Eelgrass and No Eelgrass:
  2cm: The P-Value (0.0083) is significant
  5cm: The P-value (0.0299) is significant
- Restored Eelgrass and No Eelgrass:
  2cm: The P-Value (0.0065) is significant
  5cm: The P-value (0.1331) is not significant
- Natural Eelgrass and Restored Eelgrass:
  2cm: The P-Value (0.8308) is not significant
  5cm: The P-value (0.8289) is not significant



Sediment pH averages found in transects perpendicular to shore (n=27 per site). There was a significant difference in sediment pH between areas with naturally occurring or restored eelgrass and areas without eelgrass at a depth of 2 cm and between areas with naturally occurring eelgrass and no eelgrass at a depth of 5 cm.

Morning		Afternoon	
2cm	5cm	2cm	5cm
7.68	8.02	6.89	6.26
7	7.01	8.84	5.74
7.2	6.67	6.63	5.68
7.32	6.84	6.86	6.85
6.8	6.78	6.85	6.86
6.74	6.49	6.87	6.86
7.27	7.46	6.83	6.85
7.27	7.39	6.84	6.86
7.24	7.66	6.85	6.85
Ave: 7.17	Ave: 7.15	Ave: 7.05	Ave: 6.53

Average sediment pH varied between morning and afternoon low tides in areas with naturally occurring eelgrass at 5 cm (t-test, P = 0.021), but not at 2 cm (t-test, P = 0.637); in order to standardize results, all pH readings for perpendicular transects were made on morning low tides.

Acknowledgements

Hancock County Soil and Water Conservation District
Stephanie Phippen, AmeriCorps Environmental Steward
Dakota Holmes, Mercyhurst University
Brian Moriarty, High School Intern
James Slater Murphy MD. Fund, Maine Scholars Program,
Alex C. Walker Foundation, Long Cove Foundation

References

Bertness, D. *Ecology of Atlantic Shorelines*. Sinauer Associates Sunderland, MA **1999.**
Howard et al. *Coastal Blue Carbon* **2014**.
JMP®, <*Macintosh*>. SAS Institute Inc., Cary, NC, 1989-2007.