Effectiveness of American Beachgrass for Coastline Restoration

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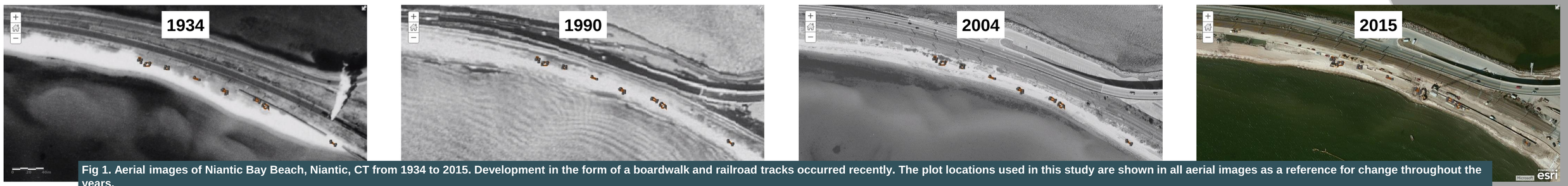


Fig 1. Aerial images of Niantic Bay Beach, Niantic, CT from 1934 to 2015. Development in the form of a boardwalk and railroad tracks occurred recently. The plot locations used in this study are shown in all aerial images as a reference for change throughout the years.

ABSTRACT

Coastal erosion is a serious threat facing beaches worldwide. Climate change has increased the intensity and frequency of hurricanes affecting coasts which results in, among other things, coastal erosion. A number of prevention methods are used to minimize erosion impact, such as methods that promote dune formation. Planting specific vegetation such as American beachgrass (*Ammophila breviligulata)* (ABG) is a known way to help form a dune.

Partnering with East Lyme Public Trust Foundation and CT Sea Grant at Niantic Bay Beach (Fig. 1), this study compared the effectiveness of ABG and native plant species in dune formation. The slope of four beachgrass plots and four native plots was measured every two weeks from August-November, 2016. Our finding shows that the native species plots had steeper slopes than the ABG plots. However, the plants in the native plots were established for longer (two-three years) as compared to ABG plots (one year). As such, all plots will continue to be monitored during 2017, and in the coming years, by the East Lyme Public Trust to assess the effectiveness of ABG in dune creation.

INTRODUCTION

Coastal erosion is a major problem for beaches in the United States (US), largely due to rising sea levels or increasingly severe storms (Leatherman, 2000). A natural way to inhibit coastal erosion is the formation of dunes. Dune formation typically begins when sand dries out, and wind pushes sand in a jumping motion uphill called saltation. Large sand particles then accumulate, and continue to grow when wind blows sand into a concentrated area (Doing, 1985). Dunes are effective at alleviating coastal erosion because they can serve as a barrier for wave events, absorbing the impact.

Vegetation also promotes dune formation by trapping sand, providing structure from root systems, and preventing erosion. American beachgrass (*Ammophila breviligulata*) (ABG; Fig. 2a) is an important species in the process of dune formation. ABG has a type of root system called a rhizome, which grows continuously as a long underground stem that sprouts lateral shoots. When buried by sand, ABG will still grow and spread its rhizomes (Seliskar, 1994). As such, ABG is able to withstand the thin deposits of sand that create the dune.

Although ABG does not grow on every beach, other common beach plants involved in dune formation include Beach pea (*Lathyrus japonicus*), Saltwort (*Kali turgidum*), and Sea rocket (*Cakile edentula*). While these plants are regularly found on the Northeastern US coast, they are usually not as effective at aiding dune formation as compared to ABG (Moreno-Casasola, 1986).

This study was conducted to determine the effectiveness of ABG at dune formation, as compared to other vegetation. Because of ABG's unique characteristics, we hypothesize that ABG will form greater dune slopes as compared to other plants. Thus, ABG will better protect the coast from coastal erosion.

METHODS

Study Site and Plot Setup

- Four ABG plots and 4 native plant plots (control) of identical size (20 ft X 5 ft) were set up on August 9, 2016 on Niantic Bay Beach, Niantic, CT (Figs 1 & 2c,d).
- Plots were positioned along the beach's boardwalk with interference with rocks put in from construction.

Slope & Survey Protocol

- Using a slope apparatus (Fig. 2e), level, rulers, and tape measurer, the slope of each plot was determined by measuring the distance (length and height) from the leveled apparatus.
- The slope of each plot was measured every other weekend between August and November, 2016.
- The total number of clumps of ABG in each planted plot were counted.
- All measurements and visual observations were hand recorded in a journal (Fig. 2a,b).
- Permanent photo station were set-up to monitor vegetation cover.
- Track Kit was used to create the plots drawn on the aerial photos (Fig. 1).
- ArcGIS was used to map plots and track large scale changes in the coming years.

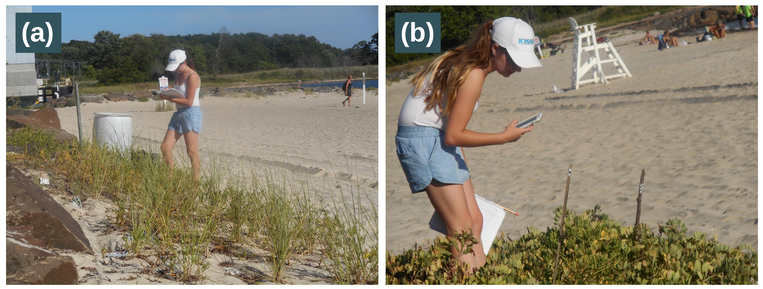
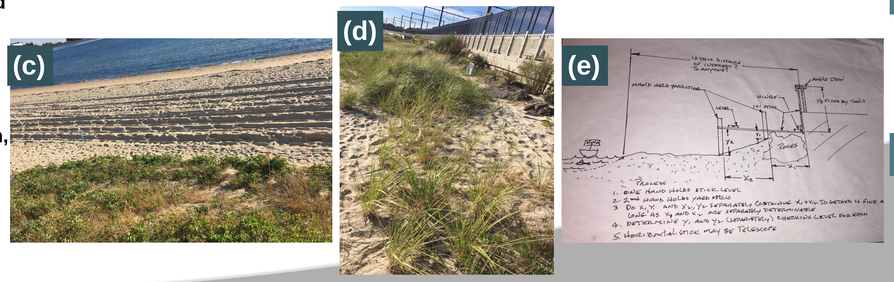


Fig 2. Starting in July 2016, I established and monitored (a) 4 ABG plots and (b) 4 control native plant plots to measure changes in slope and vegetation cover. (c) A native plant plot was established near each (d) ABG plot. (e) Slope was measured using the schematic of the slope apparatus protocol. Drawn by: James Gallagher



RESULTS

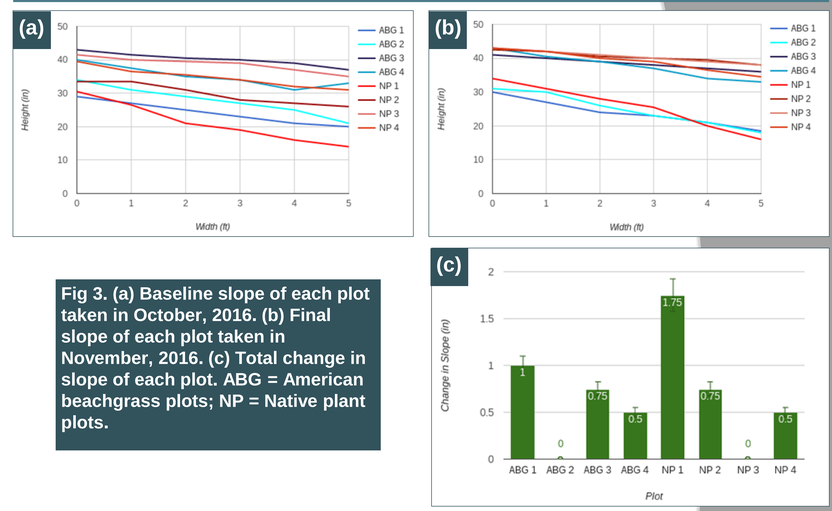


Fig 3. (a) Baseline slope of each plot taken in October, 2016. (b) Final slope of each plot taken in November, 2016. (c) Total change in slope of each plot. ABG = American beachgrass plots; NP = Native plant plots.

CONCLUSIONS

This study helped establish a baseline dataset on the role of ABG plants in dune formation. Although the findings show that the native plant plots exhibited steeper slopes than ABG plots (Fig. 3), it is important to note the difference in timing of these plantings, prior to this experiment. The native plants were initially planted two-three years ago, while the ABG was initially planted in March 2016. Hacker (2011) showed that ABG grows and thrives over time, which suggests that once ABG becomes more established, it may spread and improve beach stabilization. Further, other ABG studies have shown that the plant is ideal for dune creation (Kuckinski and Eisenmenger, 1943). As such, all plots will continue to be monitored during 2017, and in the coming years, by the East Lyme Public Trust to assess the effectiveness of ABG in dune creation.

ACKNOWLEDGEMENTS

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