

GRASSY FLATS RESTORATION PROJECT

CREATIVELY CAPPING MUCK TO RESTORE THE LAKE WORTH LAGOON

Eric Anderson and Julie Mitchell, Palm Beach County Department of Environmental Resources Management
Erin McDevitt, Florida Fish and Wildlife Conservation Commission

INTRODUCTION

- Over the past century, development in and around Palm Beach County's largest estuary, Lake Worth Lagoon (Figure 1), has resulted in water quality degradation and an extensive loss of coastal habitats.
- The Grassy Flats Project site, located in the town of Palm Beach, was selected for restoration due to its close proximity to the C-51 Canal, which discharges high volumes of sediment-loaded freshwater into the lagoon (Figure 2).

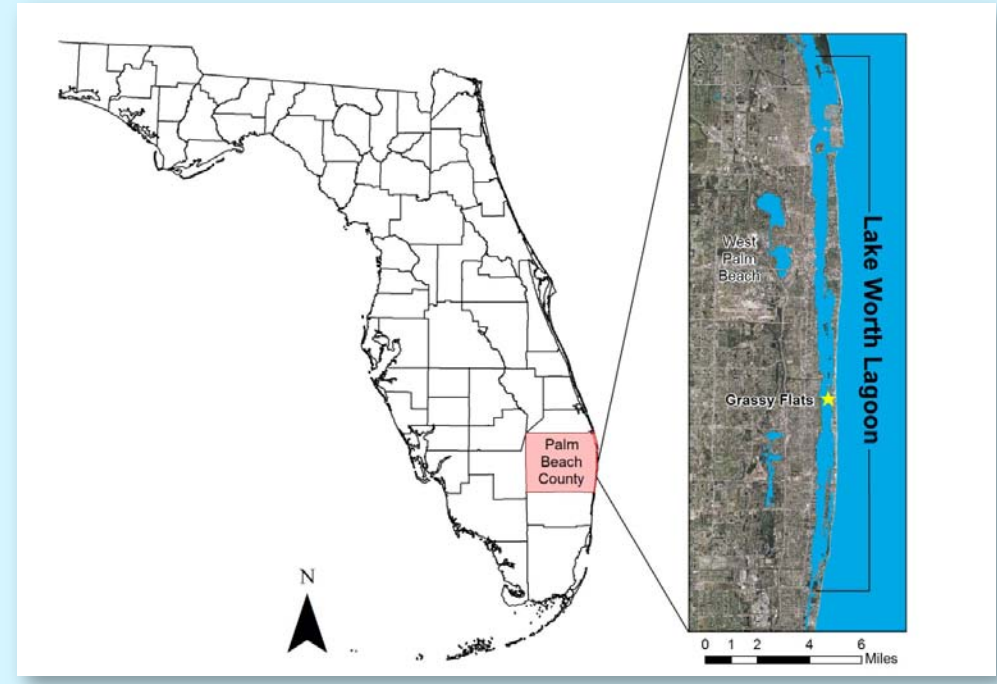


Figure 1: Map of Palm Beach County and Lake Worth Lagoon



Figure 2: Muck sediment

- The benthic community was dominated by approximately 30,000 cubic yards of muck sediments (Figure 3), characterized as low biodiversity, and occupied primarily by opportunistic feeding and deposit feeding mollusks.
- The site's shallow water conditions required creative and innovative methods to cap nearly 13 acres of muck sediments with sand and create valuable coastal habitats (Figure 4).

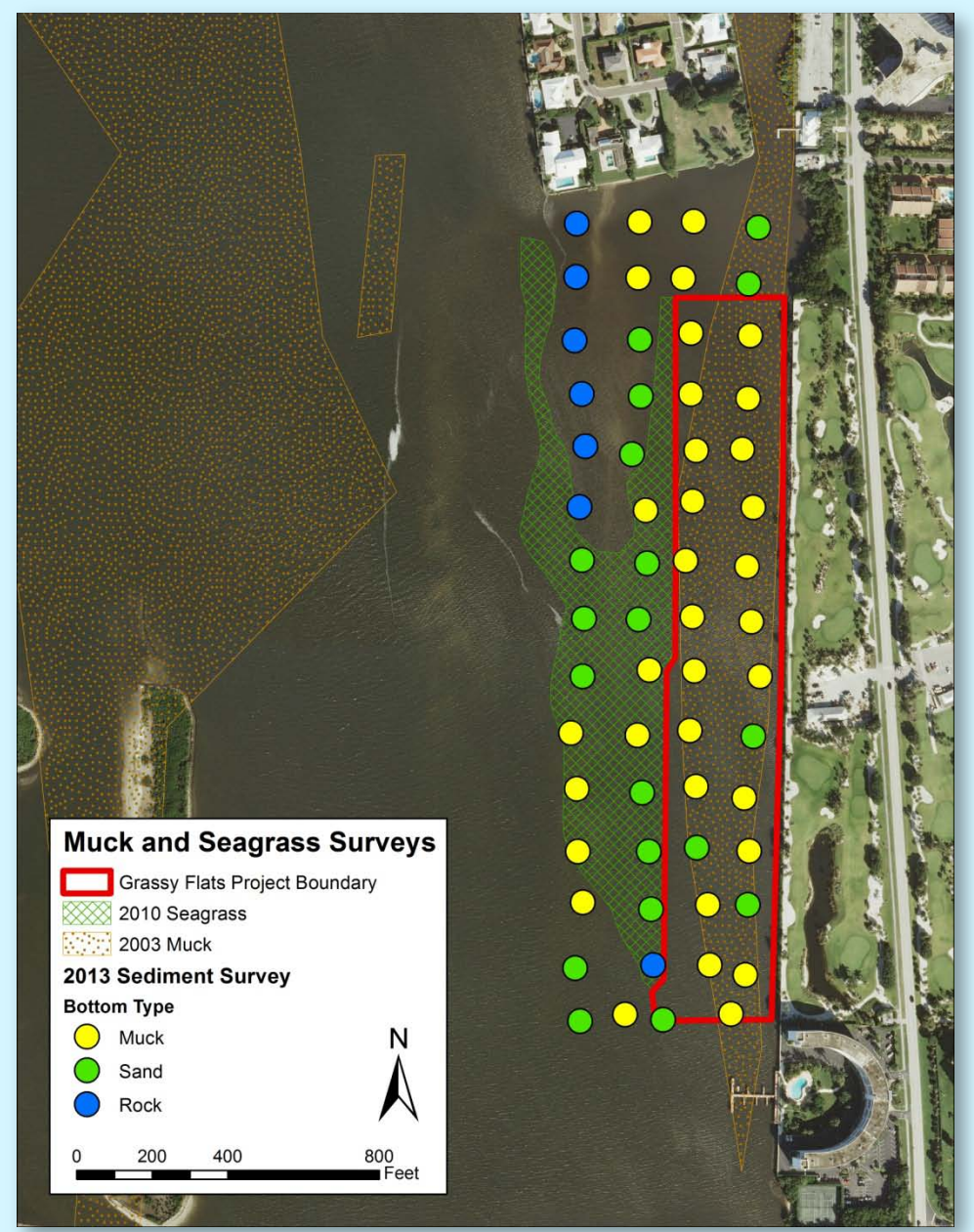


Figure 3: Muck and seagrass surveys conducted by county staff from 2003 to 2013.



Figure 4: Grassy Flats project design plan view.

OBJECTIVES

- Cap nearly 13 acres of shallow water muck sediments with 6 to 18 inches of sand without displacement, creating 10.5 acres of seagrass habitat, reducing turbidity, and improving water quality.
- Create 2.5 acres of intertidal coastal habitat suitable for mangroves, Spartina, oysters, wading birds, and shorebirds.



PROJECT METHODOLOGY

- 52,000 cubic yards of sand was transported from three different sites: the South Lake Worth Inlet/Intracoastal Waterway maintenance dredging project, Okeehetee Park South, and Hypoluxo Scrub Natural Area.
- Shallow-water barges mounted with construction equipment and up to 800 linear feet of barge-mounted conveyor belts were used to transport sand and stockpile it at the project site (Figures 5 and 6).



Figure 5: Unloading sand from barges using conveyor belts. Photo Credit: Eastman Aggregate Enterprises, LLC and Smith Aerial Photos.



Figure 6: Conveyors transporting sand from island stockpile to sand shooter.

- 2,800 tons of limestone rock was placed to protect the intertidal islands from erosion and provide oyster habitat.
- A high-speed conveyor belt ("Sand Shooter") distributed 22,500 cubic yards of sand evenly throughout the project area, "capping" the underlying muck (Figure 7 and 8).



Figure 7: Sand shooter diagram.



Figure 8: Sand shooter.

- A grid system was used to ensure an even distribution of sand. Each grid cell received an amount of sand that ensured a uniform depth at project completion. The thickness of the sand cap within each cell was checked by both probing and weekly bathymetric surveys (Figure 9 and 10).
- 29,500 cubic yards of sand was graded to form the intertidal islands, leaving two areas of high ground for nesting shorebirds.

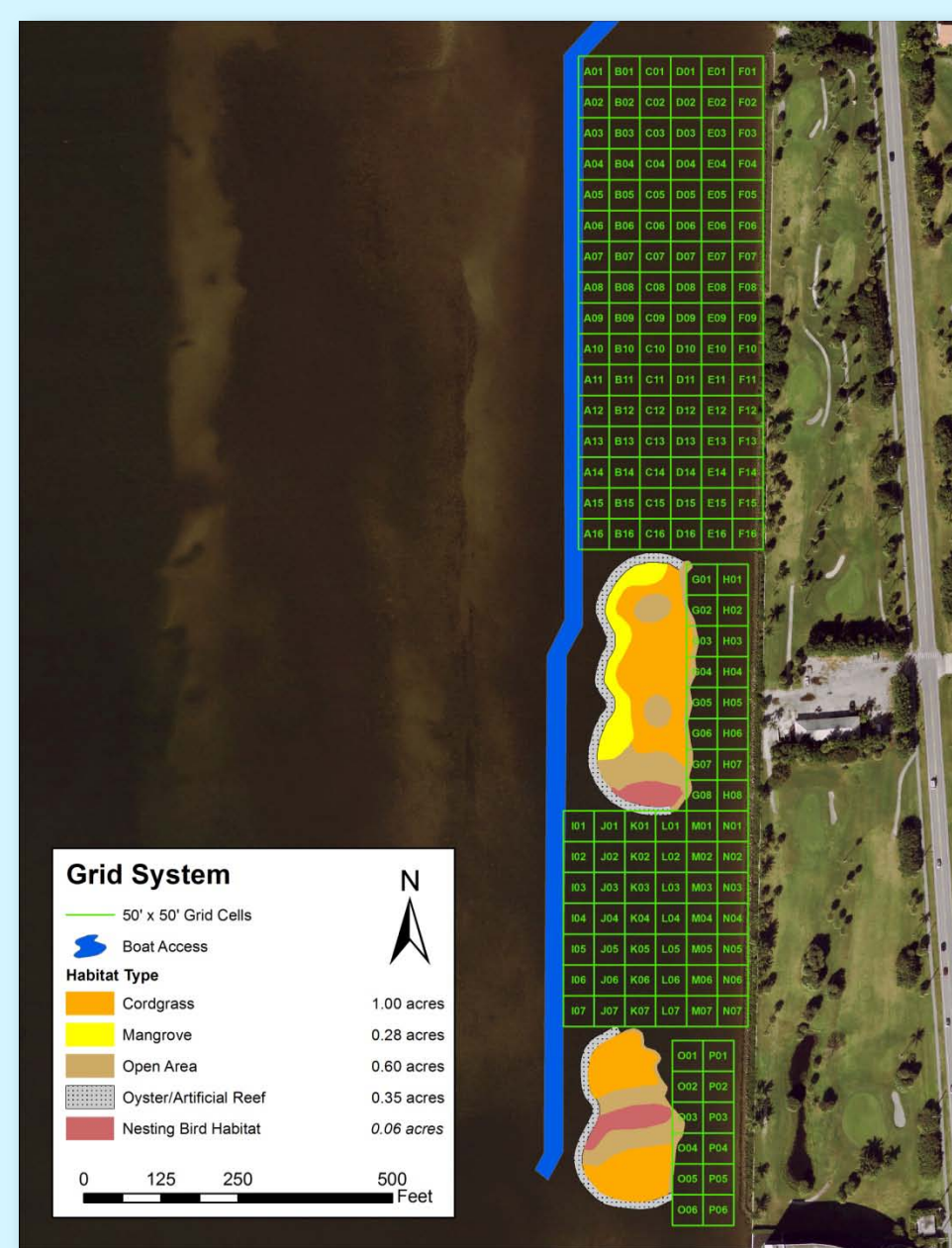


Figure 9: Grid system created in ArcMap 10.1 to evenly distribute sand.

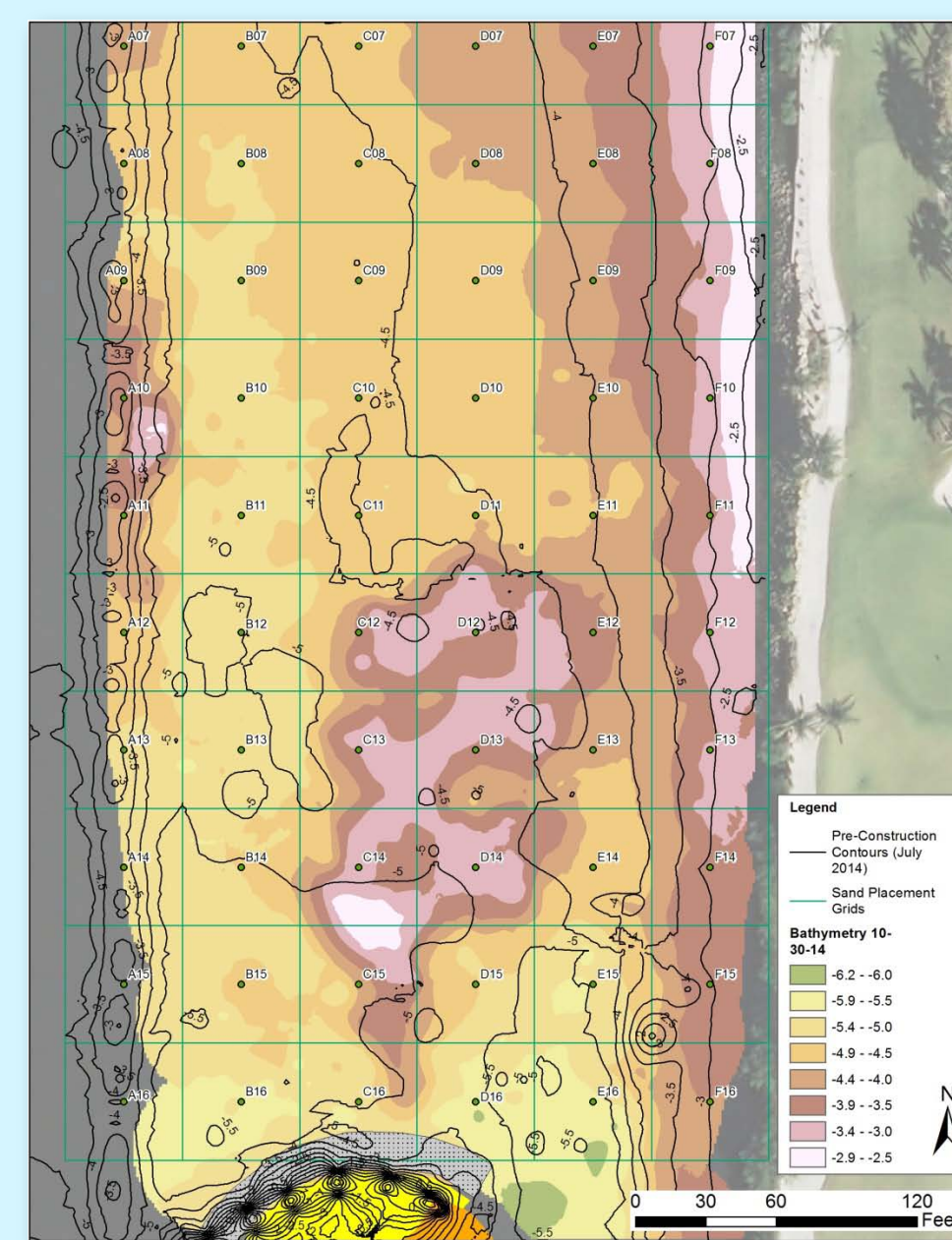


Figure 10: Example of a weekly bathymetric survey conducted during the sand capping phase.

RESULTS AND BENEFITS



Figure 11: Core sample.



Figure 12: Grassy Flats post construction.

- Thirteen acres of critical wetland habitat were successfully restored through the capping of muck sediments with 12 to 18 inches of sand (Figure 11).
- Re-suspension of muck was reduced as a result of the sand cap, which also provides clean substrate and allows for the natural recruitment of seagrass.



Figure 13: Saltmarsh cordgrass (*Spartina alterniflora*) after planting.



Figure 14: Red mangrove (*Rhizophora mangle*) after planting.

- Two intertidal islands were created (Figure 12) and planted with saltmarsh cordgrass (Figure 13) and red mangroves (Figure 14). Portions of the islands were left as open tidal flats and sandy shorelines for coastal birds to forage and nest.
- A pair of American oystercatchers and several pairs of least terns, both state-listed imperiled species, nested on the newly-created islands immediately after project completion (Figures 15 -17).



Figure 15: American oystercatcher adult and chick.



Figure 16: Least tern Fledgling.



Figure 17: Least tern scrape and egg.

- More than 40 volunteers planted saltmarsh cordgrass (4,000 plugs) and red mangroves (450 seedlings) on the islands (Figure 18).



Figure 18: Volunteer planting event.

CONCLUSION

- The Sand Shooter proved to be an effective and efficient way to cap shallow water muck conditions. Evaluation is ongoing to determine if the cap will be silted over with new muck sediments.
- Capping muck in shallow water conditions offers the potential to restore more habitat with the same amount of fill when compared to traditional dredge hole filling projects.

ACKNOWLEDGEMENTS

The project is a \$3.6 million multi-partner collaboration supported by the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Florida Fish and Wildlife Conservation Commission, Florida Department of Environmental Protection, and Palm Beach County. The project was supported by the Town of Palm Beach, City of Lake Worth, Marine Industries of Palm Beach County, and the West Palm Beach Fishing Club.

