Shoreline Stabilization at MacDill AFB: An Ecosystem-based Solution

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Tampa Bay Watch, Inc.
About Tampa Bay

• Largest open-water estuary in Florida
• Encompasses nearly **400 square miles**
• Watershed covers a land area of about **2,200 square miles**
• More than **100 tributaries** drain into Tampa Bay
Water Quality on the Upswing

(Chart Courtesy of Tampa Bay Estuary Program)

1981 – Tampa Ship Channel Completed
1984 – Henderson Wetlands Protection Act / Stormwater Legislation
1985 – Advance Wastewater Treatment Requirements
1993 – Founding of Tampa Bay Watch

Tampa Bay gained 3,250 acres of seagrass between 2008 and 2010—an 11% increase that is the largest 2-year expansion of seagrasses since scientists began regular surveys of this critical underwater habitat.
What’s Making the Difference?

- Dredging the Tampa ship channel completed in 1981
- City of Tampa improved wastewater management practices in the mid-’80s
- Wetlands protection (controls on dredging and filling, stormwater treatment) in 1982
- Community education
- Youth stewardship
- Habitat restoration
That’s Where We Come In.

TAMPA BAY WATCH

Restoring the Bay Every Day
Restoration in Action

- Salt Marsh Plantings
- Oyster Domes & Bars
- Fishing Line Recycling
- Coastal & Bird Nesting Island Cleanups
- Stormwater Runoff Awareness
- Derelect Crab Trap Removal
- Seagrass Transplanting & Monitoring
- Bay Scallop Monitoring
- Cockroach Bay Oil Boom Program
- Native Plants & Invasive Plant Removal
The Problem

Increased erosion along eastern shoreline particularly at southeast corner

- Loss of natural resources
- Loss of coastal habitat
- Impacts to government assets

The few remaining mangroves are being undermined

Uplands are now wetlands
Historic dredging left a trench along SE corner of Interbay peninsula. Over time the trench has begun to be filled with sand eroding from the shoreline.
Partnering effort between DOD, USFWS, NOAA and Others with Tampa Bay Watch

Low-tech, low cost approach for shoreline stabilization and restoration

Triple benefit – shoreline stabilization, improves habitat diversity, water quality improvement

Currently being constructed!
The Solution

• Reef ball - a flat-bottom, hollow, concrete half dome with holes
  – Originally developed for off-shore coral reef creation and reconstruction
  – smaller version is used for oyster reef creation

• Oyster shell bag - plastic mesh bag filled with fossilized oyster shell
Benefit #1 – Shoreline Stabilization:

Reduces wave energy
Traps/holds sediment
Encourages marsh grass
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• Benefit #2 – Water Quality Improvement:
  Oysters filter water
  Stabilize sediments

Sediment accumulation behind domes
• Benefit #1 – Shoreline Stabilization:
  - Reduces wave energy
  - Traps/holds sediment
  - Encourages marsh grass

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• Benefit #3 – Habitat Enhancement:
  - Increased habitat diversity
  - Diverse food sources
  - Encourages mangrove recruitment
Domes delivered on trailer

Midpoint staging area – reduces lifting

Two-man teams carry domes

Happy volunteers at the end of a job!

Domes are placed to form a new reef
Oyster Domes
Oyster Shell bags
Phases 2 thru 4: 2006 thru 2010

Phase 4 project (2009 - 2010)

Initial Sediment Accumulation Behind Domes

Phase 4 project (completed FY10)

Salt Marsh Established, Mangrove Recruitment

Phase 4 project (completed FY10)

Sediment Accumulation

Base-to-base perimeter with random interior

Phase 3
November 2010
Sediment Accumulation Data

5” to 6” of sediment accumulation within 24 months at Phase I Site

6” of sediment accumulation in 18 months at Phase III Site
Sediment accumulation monitoring point

Installed $\frac{3}{4}$" PVC so that the top of PVC is 18" above the substrate.
Marsh Grass Planting

Over 800 High School and Junior high students have visited MacDill to participate in marsh grass planting events through the “Bay Grasses to Classes” program through Tampa Baywatch
Phase 1 site – Reef Constructed (2004) but No Grass yet
Phase 1 site – September 2007: Stabilized site!
Phase 2 Reef Constructed, No Grass yet
Phase 3

Oyster shell bar (Phase 2)

Oyster domes
February 2008 Phase II and III
Phase 2 & Phase 3 Reef Constructed – Grass is fully established
## Monitoring Data

<table>
<thead>
<tr>
<th>Phase</th>
<th>% Oyster Coverage</th>
<th>Avg Oyster Size (mm)</th>
<th>Green Mussels present</th>
<th>Avg Sediment Accumulation</th>
<th>Wildlife Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 (2004)</td>
<td>100%</td>
<td>45</td>
<td>No</td>
<td>3.6”</td>
<td>Crabs, baitfish, mullet, minnows, conch, blue crabs, sheephead, heron, ibis, egret, raccoon</td>
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<tr>
<td>Phase 2 (2005)</td>
<td>100%</td>
<td>52</td>
<td>No</td>
<td>NA</td>
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<tr>
<td>Phase 3 (2006-2008)</td>
<td>90%</td>
<td>57</td>
<td>No</td>
<td>4.8”</td>
<td></td>
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<tr>
<td>Phase 4 (2008-2010)</td>
<td>~30%</td>
<td></td>
<td>No</td>
<td>~2”</td>
<td></td>
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</tbody>
</table>
Phase 4

Southern end of Phase 4

Oyster domes
(Dec 08 & Oct 10)

Northern end of Phase 4

Oyster shell bar
(to be installed)
Google Image 2010

Phase 1

Phase 4

Phases 2 & 3

Gadsden Pt
Costs & Partnering

- **Phase 1** - $60K (2004 {910 domes} 800 feet of reef)
  - $30K DoD
  - $30K USFWS
- **Phase 2** – $10K (2005 {shell bags} 300 feet of reef)
  - $10K DoD
- **Phase 3** - $160K (2006-2007 {1,568 domes} 1,300 feet of reef)
  - $110K DoD
  - $30K USFWS
  - $10K Tampa Bay Estuary Program
  - $10K Hillsborough County EPC
- **Phase 4** - $405K (2009-2010 {3,530 domes} 1,900 feet of reef)
  - $295K DoD
  - $90K USFWS
  - $20K Hillsborough County EPC
- **Phase 5** – Est $450K (2011-2012 {4,000 domes} 4,150 feet of reef)
  - $180K Estuarine River Restoration Council / NOAA

- ~75% of costs go to materials/supplies
- ~25% to permitting, design, agency coordination
- Volunteers used to installed domes and construct shell bags
- Loader/Gators/Trucks/Tractor – In house (CE and Golf Course)
Important Considerations

- Permitting – *long lead time*
- Timing for oyster spat (spring)
- Volunteers
- Site Accessibility
- Reef Ball production rate – *order ahead*
- Heavy equipment to move oyster shell
- ATV/tractor to move oyster domes
Many Thanks To…

- DOD- United States Air Force
- US Fish & Wildlife Service
- Tampa Bay Environmental Restoration Fund
- MacDill AFB Groups and Squadrons
- Tampa Bay Estuary Program
- NOAA Fisheries
- VOLUNTEERS!!!