Constructing Oyster Reef for Shoreline Stabilization and Restoration

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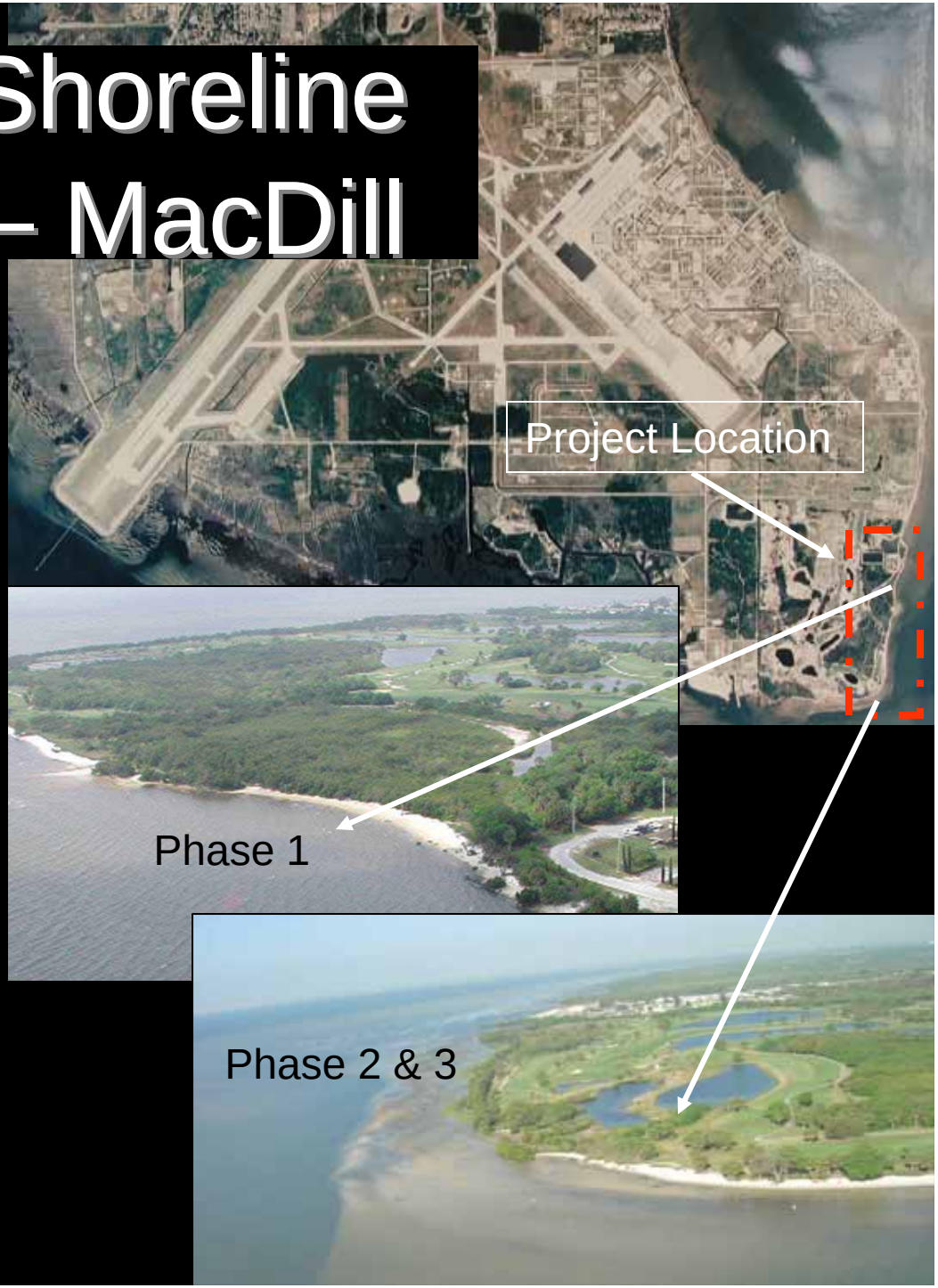
Oyster Reef Shoreline Stabilization – MacDill

- Five Year, Multi-Phase Project
- Partnering effort involving DOD, USFWS, Tampa Bay Watch, EPC, TBEP, others
- An innovative, cost-effective approach for ‘natural’ shoreline stabilization
- Triple benefit – shoreline stabilization, improves habitat diversity, water quality improvement



The Problem

Increased erosion along eastern shoreline, particularly at southeast corner

- Loss of natural resources
- Loss of coastal habitat
- Impacts to archeological site (National Register eligible)
- Impacts to government assets (golf course)

Alternative Stabilization Approaches

- Planting *Spartina alternaflora* and seedling mangroves
- SWFWMD and local high school nursery program
- Two efforts, planted over 3,000 grass plugs during each event – both were washed away within days under normal conditions

The Solution

Reef Balls and Oyster Shell Bags

- 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


Lo Pro Reef Ball

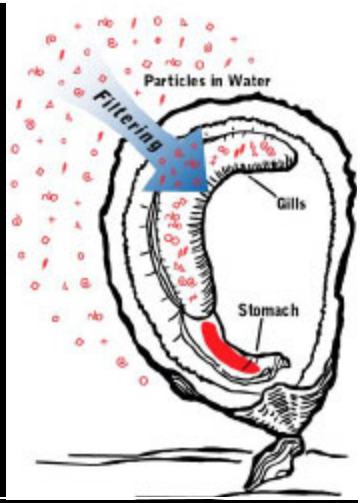
- Oyster shell bag - plastic mesh bag filled with fossilized oyster shell

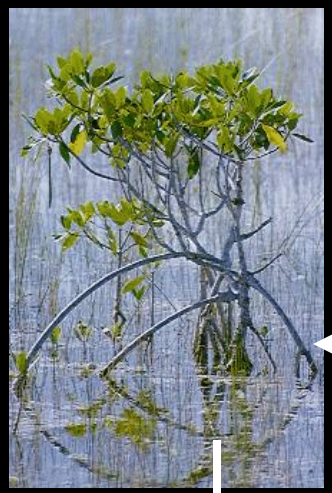

Oyster Shell Bags

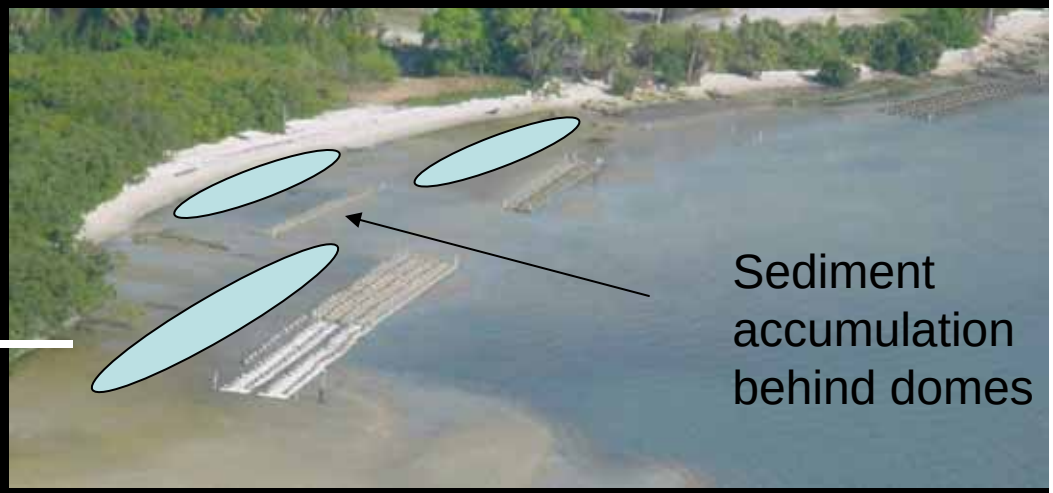
3 Benefits:

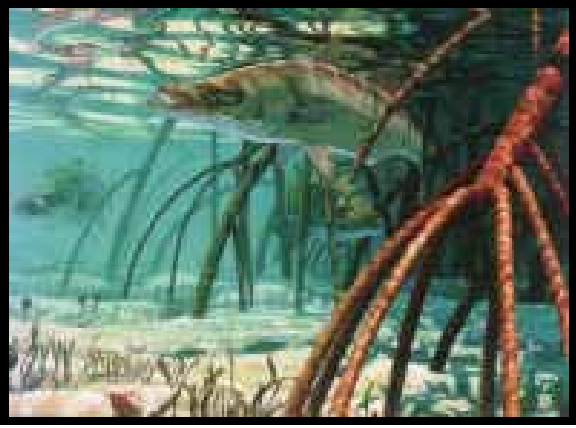
Water Quality Improvement
Shoreline Stabilization
Habitat Enhancement

- Oysters can filter up to 9.8 gallons of water per HOUR
- Filter algae in nutrient laden waters
- Stabilize bottom sediments, reduce turbidity









The Demonstration Site – Phase I

- Constructed six 100 ft oyster reef zones with four different configuration of Reef Balls
- Constructed two 100 ft oyster bars with shell bags

The Demonstration Phase - *Installation*

Five half-day events

~70 MacDill Community Volunteers

~12 NOAA Volunteers

~23 Off-base Volunteers

- Naval Reserve
- GE ELFUN
- Local Community

MacDill Environmental

Tampa Bay Watch staff

Total Man-hours ~430

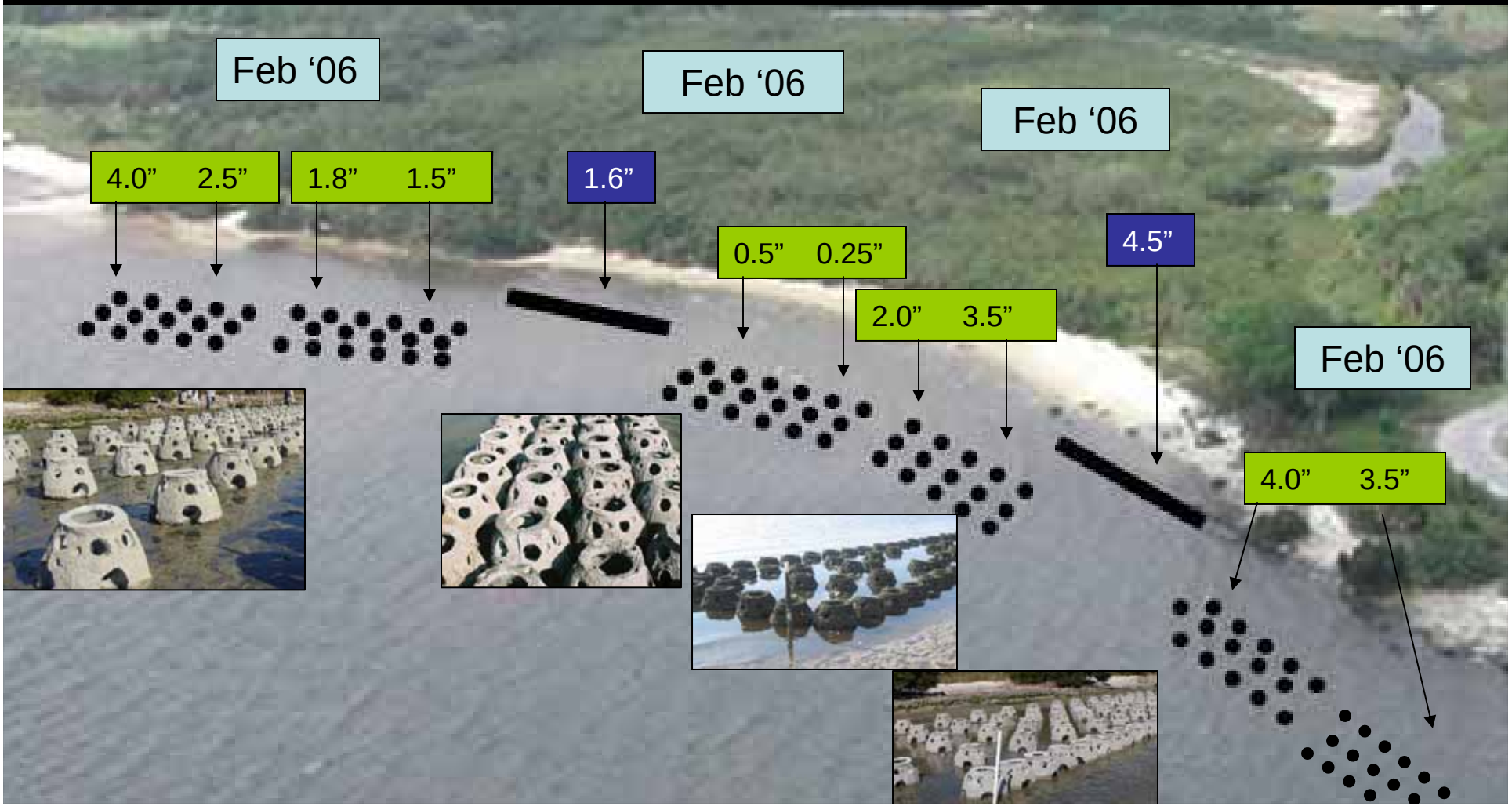
The Demonstration Phase

Spacing between reef zones

- Allows movement of water (flushing)
- Permits access to back side of reef for fish and other sea life
- Creates habitat diversity, allows movement of sea life

Monitoring Results

Sediment accumulation as of February 2006



February 06 - Monitoring Data

Oyster Size & Coverage

Configuration	*% Oyster Coverage*	*Avg Oyster Size (mm)*	*Green Mussels present*	*Avg Sediment Accumulation*	*Wildlife Usage*
Base to base	100%	54	No	<1.0”	Crabs, baitfish, mullet, minnows, conch, blue crabs, sheephead, heron, ibis, egret, raccoon
Base to base – front row only	~75%	41	No	3.5”	
Base to base – outer edge all around	~75%	45	No	2.8”	
3 foot spacing	~30%	44	No	2.3”	
Oyster Bag Reef	~75%	43	No	3.1”	

Site Photographs

Oyster Dome Reef

Base-to-base configuration

January 2005

Oyster Shell Bar (Bar) Reef

January 2005

Sediment Accumulation

Base-to-base perimeter with random interior

January 2005

5” of sediment accumulation

Marsh Grass Planting – November 2005 & April 2006

Over 400 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

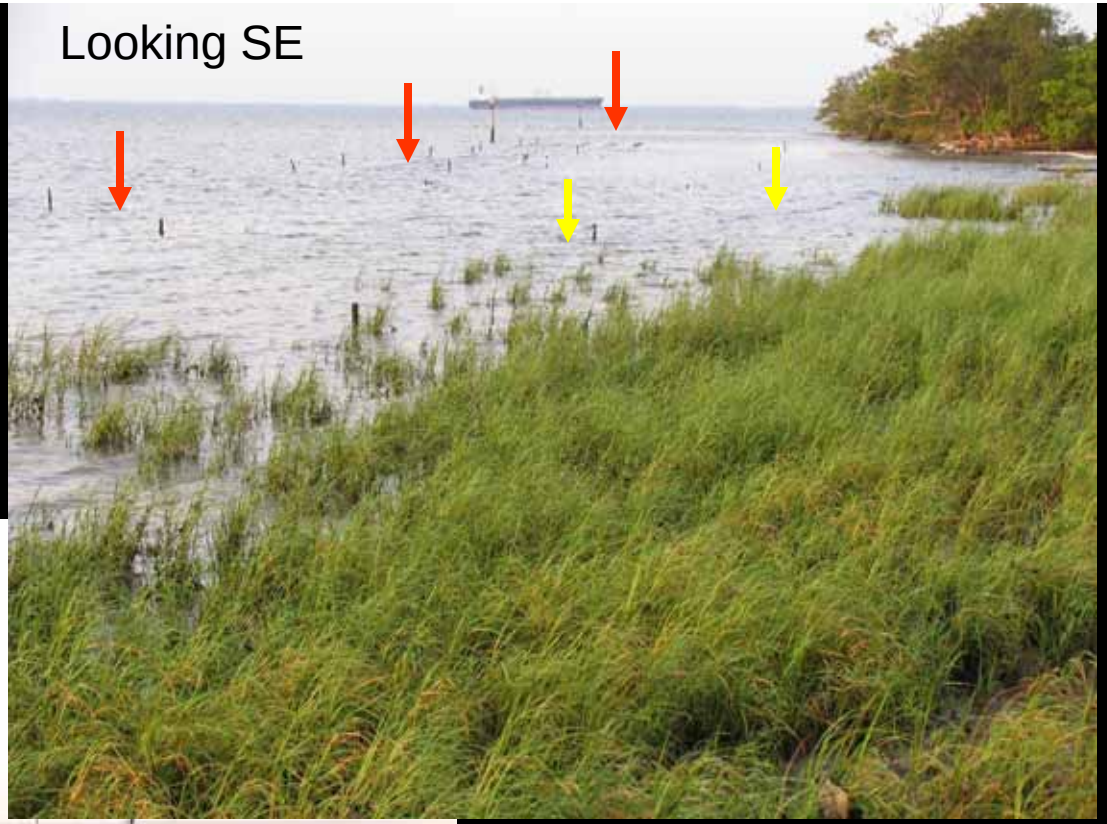

2004


2006
Oyster bar

Site Photographs
July 2006

Looking South

Marsh Grass Growth



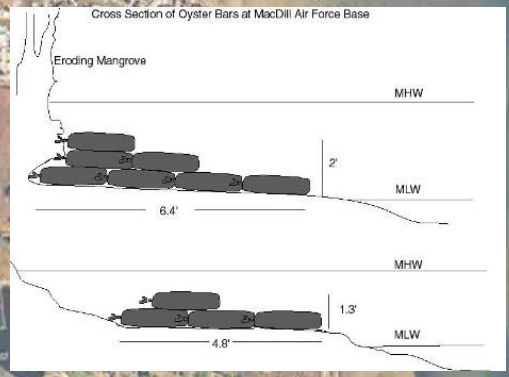
July 2006

Phases 2 & 3

- Phase 2 installed 1,500 oyster shell bags to create 350-ft oyster reef
- Phase 3 began installation of 1,500 Reef Balls and 1,700 oyster shell bag bar (28 tons of shell) to create 975-ft oyster reef

PHASES 4 & 5

- Phase 4 will construct 800+ foot reef between Phase 1 and Phase 3 site
- Phase 5 will construct 800+ foot reef west of Phase 3 site



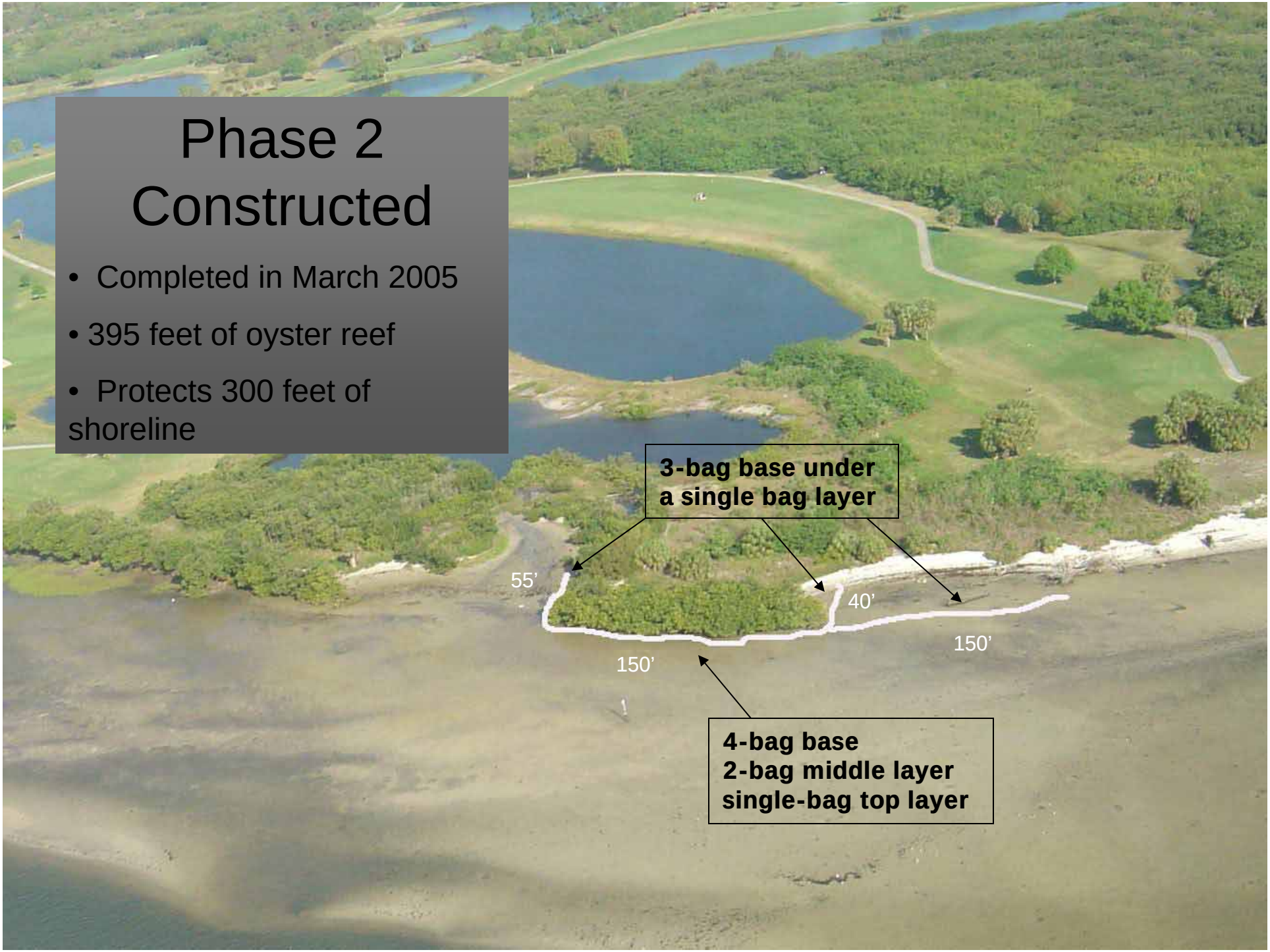
Phase 1

Phase 4

Phases 2 & 3

Phase 5

Gadsden Pt

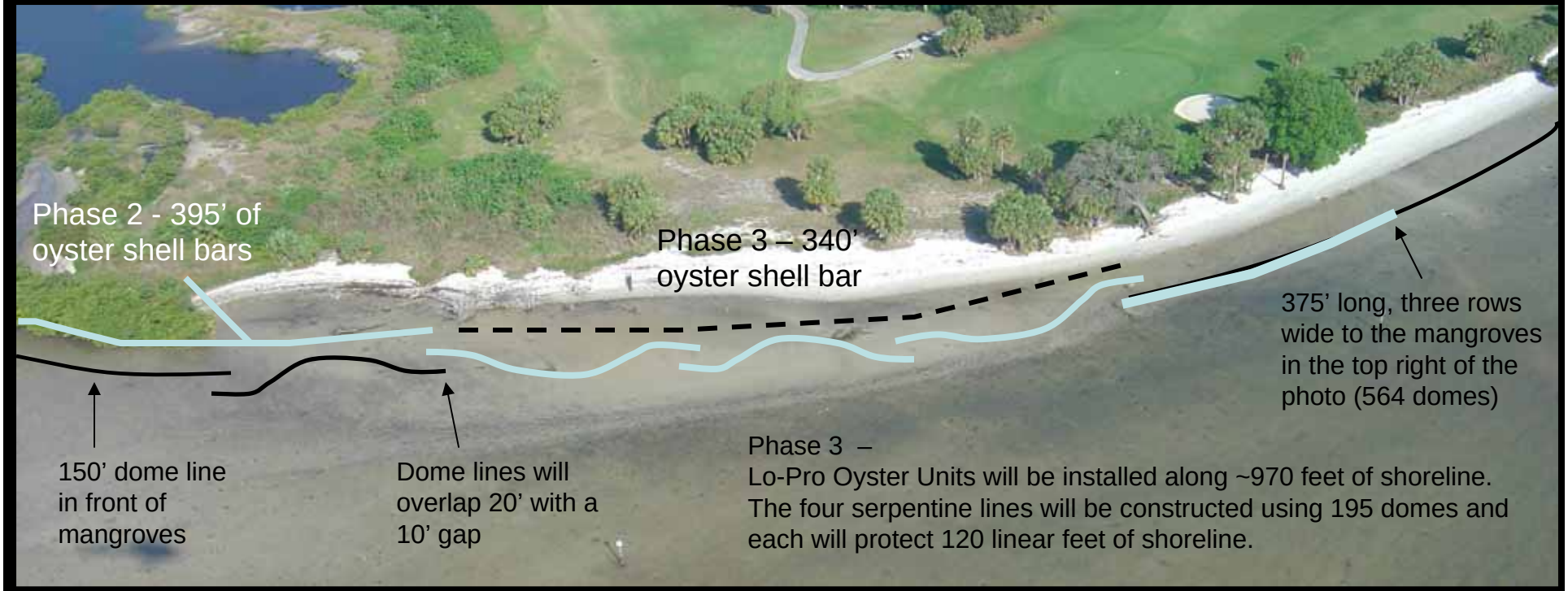

Phase 2 Constructed
• Completed in March 2005
• 395 feet of oyster reef
• Protects 300 feet of shoreline
3-bag base under a single bag layer
55’
40’
150’
150’
4-bag base
2-bag middle layer
single-bag top layer

Phase 2&3

Started 2006

Completion 2007

1,569 domes + 1,725 shell bags = 970 feet protected



Costs & Partnering

- $100K for Phase 3 (2007)
  - $30K Air Force
  - $30K USFWS (?)
  - $30K ??
- $120+ K for Phases 4 & 5 (2008 & 2009)
  - $60K Air Force
  - $60K Other
- ~75% of costs go to materials/supplies (reef balls + delivery)
- Remainder of funds to permitting, design, agency coordination
- Volunteers used to installed domes and construct shell bags
- NOAA typically supplies oyster shell for shell bags
- Loader/Gators/Trucks/Tractor – In house (CE and Golf Course)

Thanks Too….

- US Fish & Wildlife Service
- Tampa Bay Watch
- MacDill AFB Groups & Squadrons
- MacDill AFB Environmental & CE
- NOAA Fisheries
- Tampa Naval Reserve
- VOLUNTEERS!!

U.S. AIR FORCE

TAMPA BAY Estuary Program

TAMPA BAY WATCH
Restoring the Bay Every Day


QUESTIONS?