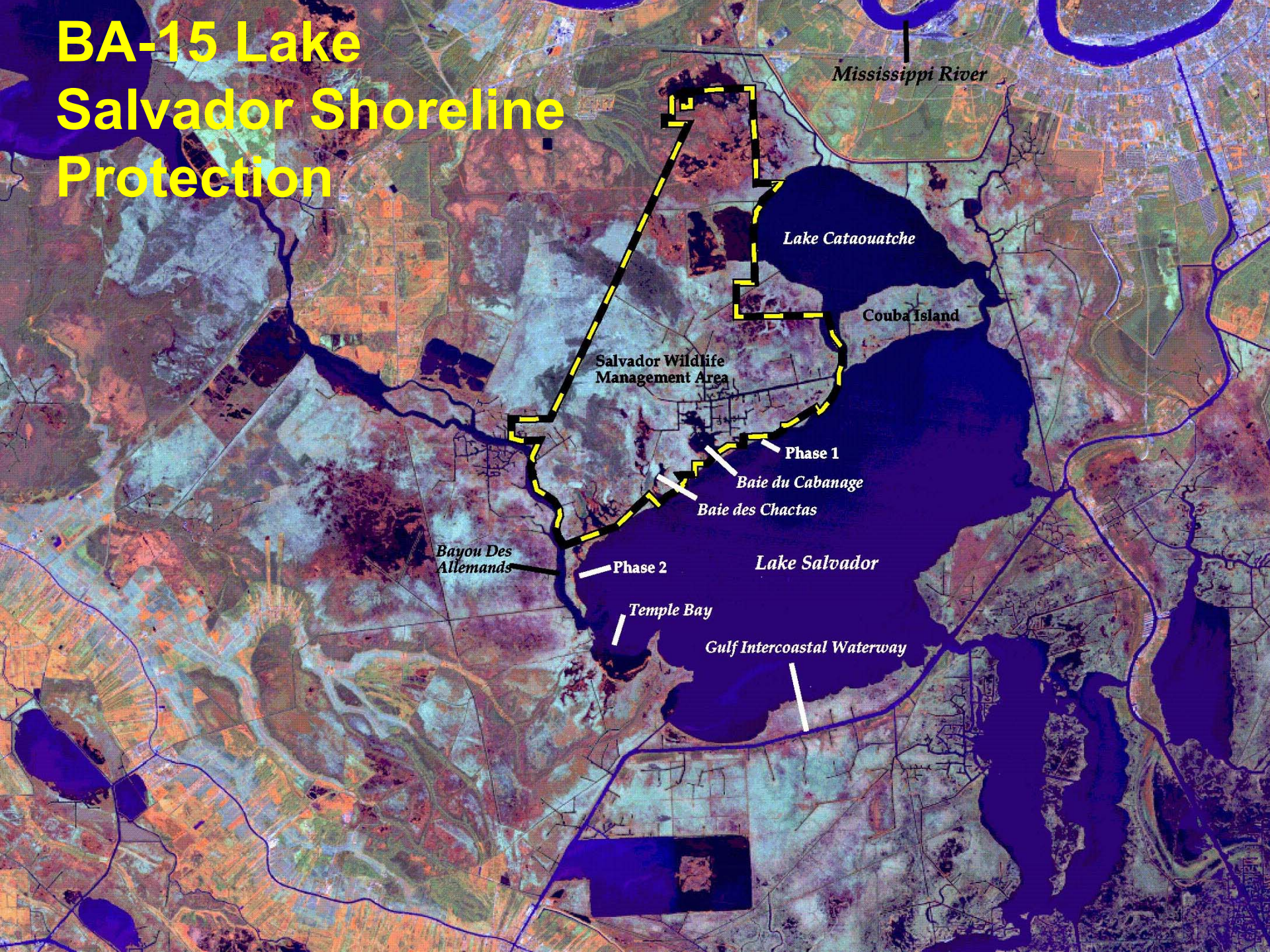


Lake Salvador Shoreline Protection – Demonstration Project BA-15

- Selected on PPL-3
- Location: St. Charles and Lafourche parishes
- Construction completed:
 - Phase I October 1, 1997
 - Phase II June 16, 1998



BA-15 Lake Salvador Shoreline Protection



Planning

- Shoreline erosion of 13 ft/yr (4 m/yr)
- Assumed Causes of Loss:
 - Wind generated waves**
 - Susceptible shoreline**
 - Long fetch**
 - Vulnerable shoreline configuration**
 - Highly unconsolidated sediment base**

Why?

- Limited shore protection methods in eroding, unconsolidated, organic soils
- Need to test various kinds of structures

Project Features

- **Four Demonstration Structures**
 - Geotextile Tubes**
 - Grated Apex**
 - Angled Timber Fence**
 - Vinyl Sheet Pile**
 - Supported**
 - Unsupported**

Construction

- **Phase I**
 - 5,900 ft of four structures**
 - 300 ft from shoreline**
- **Phase II**
 - 8,000 ft of continuous rock rip rap**
 - 75 ft from shoreline**
 - Dredge spoil Island**

Goals and Objectives: Phase I

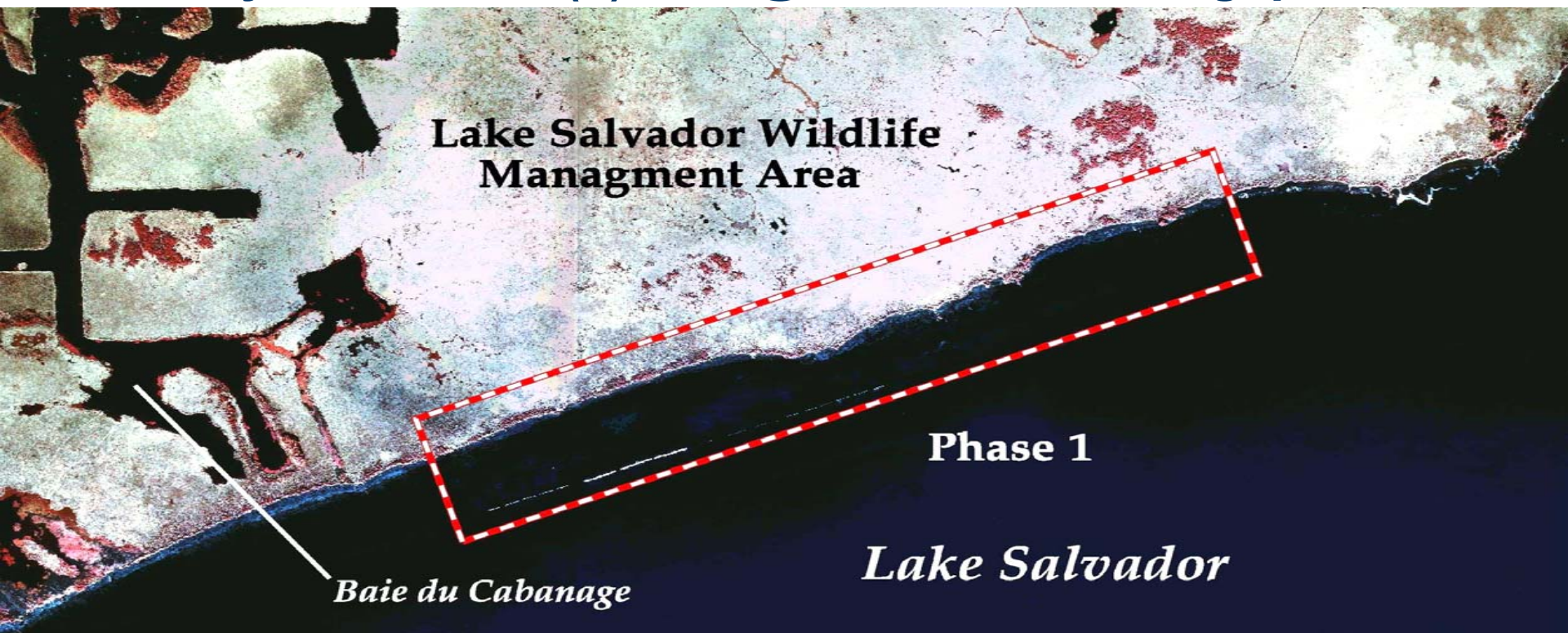
- Demonstrate effectiveness of four types of segmented breakwaters
- Reduce wave height and marsh edge erosion
- Maintain or recreate historical shoreline (dropped during design stage)

Goals and Objectives: Phase II

- Provide shoreline protection in areas having highly organic, unconsolidated sediments
- Reduce the rate of marsh edge erosion
- Compare with other methods

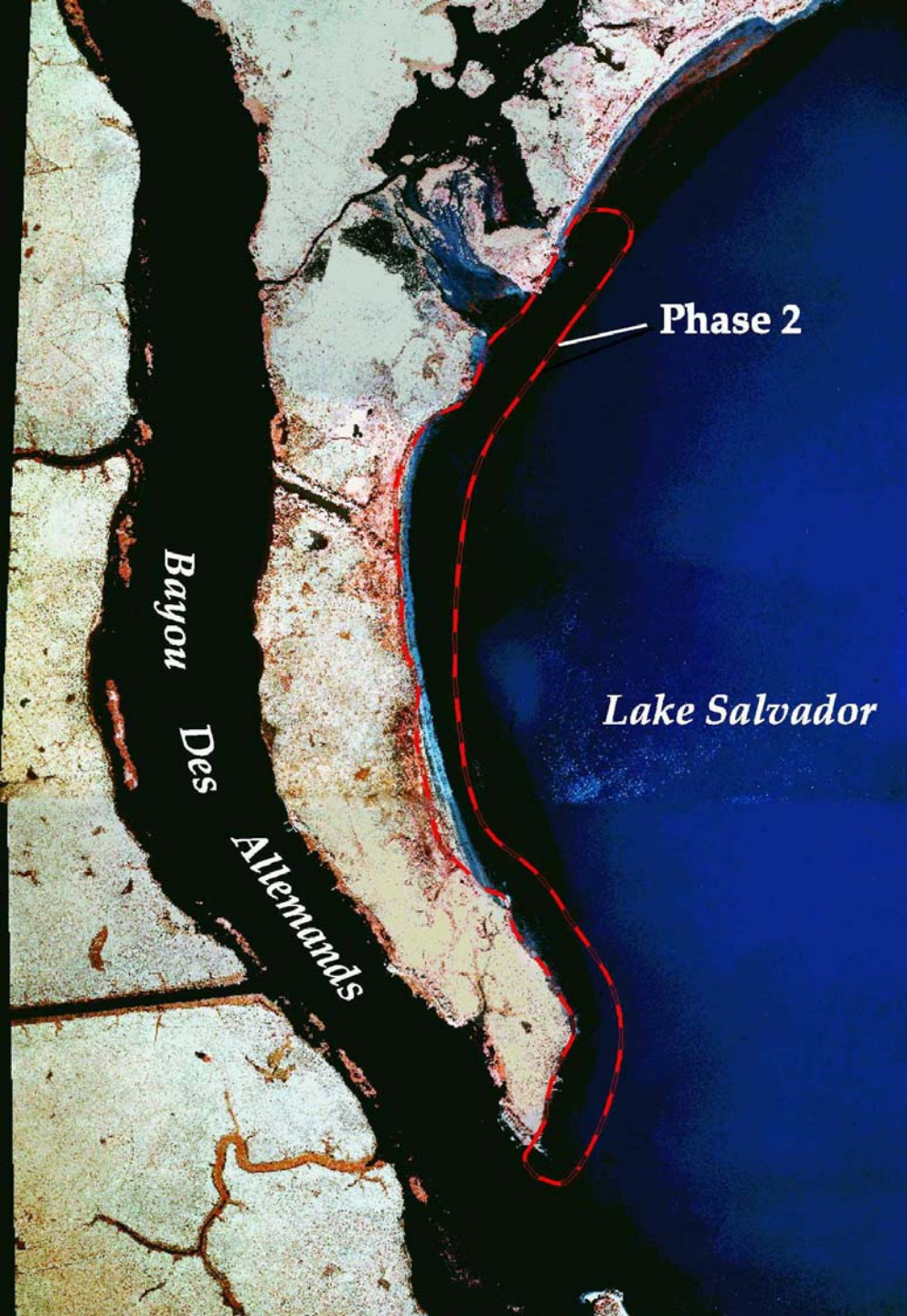
Phase I Features – 5,900 ft

Geotextile Tubes	3 @ 250 ft with 30 ft gaps
Grated Apex	5 @ 100 ft with 30 ft gaps
Angled Fence	3 @ 167 ft with 30 ft gaps
Vinyl Sheet Pile (2)	6 @ 100 ft with 30 ft gaps



Phase II Features

- 8,000 ft rock rip rap
- Dredge spoil islands



Monitoring Variables

Phase I

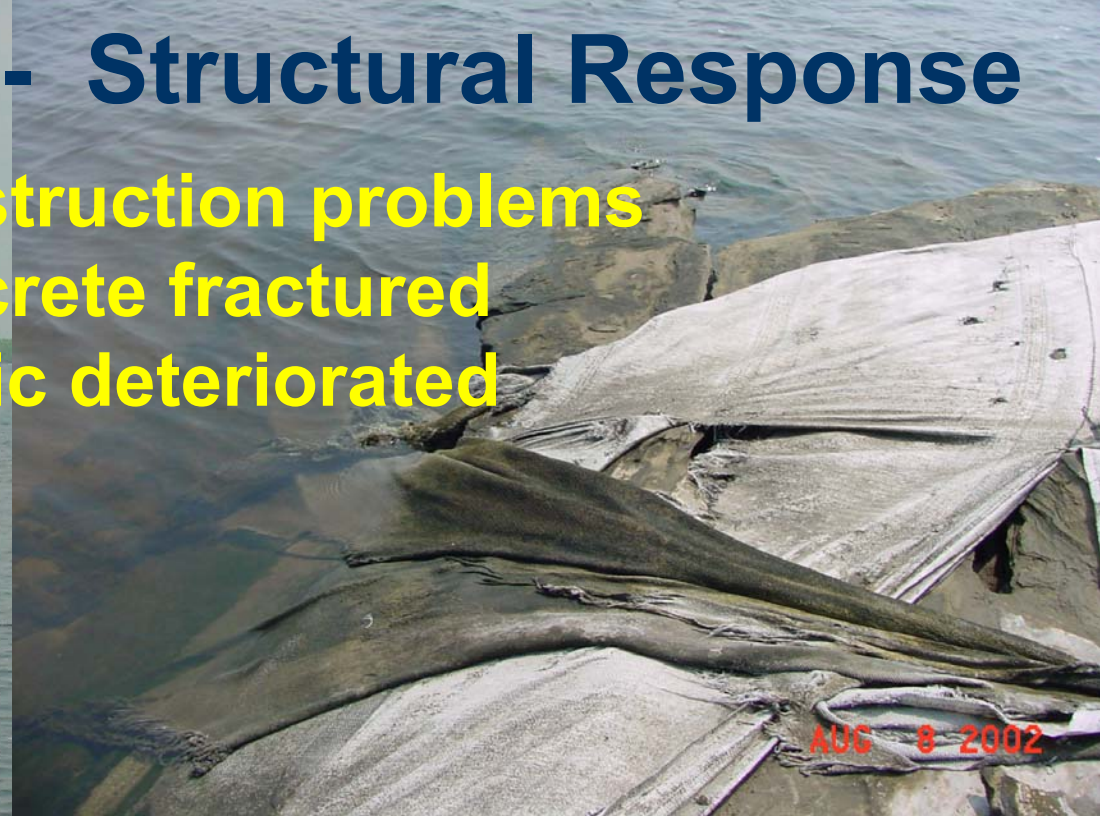
- Shoreline change
- Wave height reduction

Phase II

- Shoreline change

Geotextile Tubes - Structural Response

Construction problems
Concrete fractured
Fabric deteriorated



Subsided
Horizontal movement



Grated Apex – Structural Response

Timber weathered/warped
Piling attachment damaged
Loose/missing timbers
Corroded hardware

Minimal vertical movement
Horizontal tilt/shift < 1ft
Movement /damage
below water line

29 23:23

Angled Timber Fence – Structural Response



Most stable
Minor deterioration/damage
Hardware in good condition

**Minimal vertical and
horizontal movement**

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Vinyl Sheet Pile Supported – Structural Response

A photograph showing a long pier constructed from interlocking vinyl sheet piles extending from the foreground into a large body of water. The water is dark blue with small ripples. The sky is a pale, clear blue. In the distance, a line of trees is visible on the horizon. The pier structure is composed of vertical sheet piles connected by horizontal beams, with some vertical piles protruding from the top. The pier appears to be in good condition and is straight, indicating structural integrity.

Maintained structural integrity
Hardware intact
Sheeting intact

Little or no vertical or horizontal movement

Vinyl Sheet Pile Unsupported – Structural Response

Structural failure

Vinyl cracked, loose, missing

Walers weathered, warped, cracked or missing

Hardware corroded, loose, broken, missing

Major visible movement with wave action

In 2000 30-70% intact

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Phase II – Structural Response



Structure intact

Minimal settling

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Physical Response

	Wave Height %	Shoreline Change m/yr
Phase I		
<i>Reference</i>	-	-2.90
Geotextile Tubes	>90	-0.71
Grated Apex	30-80	-1.44
Vinyl Sheet Pile	>90	-1.97
Angled Timber Fence	20-80	-2.65
Phase II		
<i>Reference</i>	-	-2.12
Rock Rip Rap	-	+0.87

Physical Response

Wave Height:

Reduced behind all structures

Dependent on wind direction and water level

Data specific to structure

Geotextile tubes and Vinyl Sheet Pile
very effective

Grated Apex and Timber Fence variable
dependent on water level, wind direction
and wave velocity and height

Landscape Response

Phase I

- Change rates not reliable
- Structures too close
- Structure placement

Phase II

- Shoreline accreted (2 yrs)
- Scouring has occurred

Project Adaptive Management

- Implemented Changes
 - Phase I location changed
 - Phase II added
 - Imported sand for Geotextile Tubes
 - Shoreline markers were replaced with DGPS
 - SAV sampling was discontinued
 - Bathymetric surveys and inspections were conducted for Phase I

Project Adaptive Management

- Recommended Improvements
 - Prior to construction
 - Determine optimal structure orientation
 - Determine optimal distance from shoreline
 - Use site specific data to incorporate in structure design
 - Place structures in statistically independent positions

Project Adaptive Management

- **Recommended Improvements**
 - **Design and construct demonstration projects to last CWPPRA life**
 - **Project manager and sponsors need representation on site during construction**
 - **Conduct post construction inspection and maintenance**
 - **Conduct structural integrity inspections**
 - **Remediate structure failure immediately**

Lessons Learned for Future Projects

- **Specific to Demonstration Projects**
 - Design and construct for CWPPRA standard life
 - Include O & M for demonstration projects
 - Use fewer treatments with more replication
 - Monitoring should occur over an extended period with variable environmental conditions to yield reliable results
 - Include sufficient funds for removal
 - Without structural integrity, the performance of the structures cannot be adequately evaluated

Lessons Learned for Future Projects

- **Shoreline Protection**
 - **Structure placement is as important as structure type**
 - **Porous structures are not as effective in reducing energy as nonporous ones**
 - **Vinyl Sheet Pile should be built with support**
 - **Dredge spoil islands can provide additional shoreline protection**

Lessons Learned for Future Projects

- **CWPPRA process**
 - Clarify goals and objectives to specific target rates
 - Project design should account for 3-D dynamic movement of structures
 - Post construction and regular inspections are important to prevent or arrest structural failure
 - Structural failure should be remediated immediately