



Webcast sponsored by EPA's Watershed Academy

# Assessing Wetland Loss/Conditions and Restoration

September 26, 2007 Webcast

Kerry St. Pé, Executive Director, Barataria-Terrebonne National Estuary Program

Michael Scozzafava, Environmental Protection Specialist, USEPA

Jan Smith, Director, Massachusetts Bays National Estuary Program

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Resurrection of the Bayou People, 2007 A.D.

Wetlands, Hurricanes, and Restoration in the Deep Delta Region of the Mississippi River



2



“Pouring down out of North America’s heart, the Mississippi  
nears the end of its long travels; and suddenly it finds itself in a  
new land, a region in some ways like no other in the world  
...and it can be admitted that the terrain and the population alter  
before the eye.

To some it has a sodden almost terrifying aspect. Others have  
observed more closely and more accurately, to discover here a  
rare and untamed quality, beauty in rich profusion and  
turbulence.”

*Deep Delta Country*, by Harnett T. Kane, 1944

3

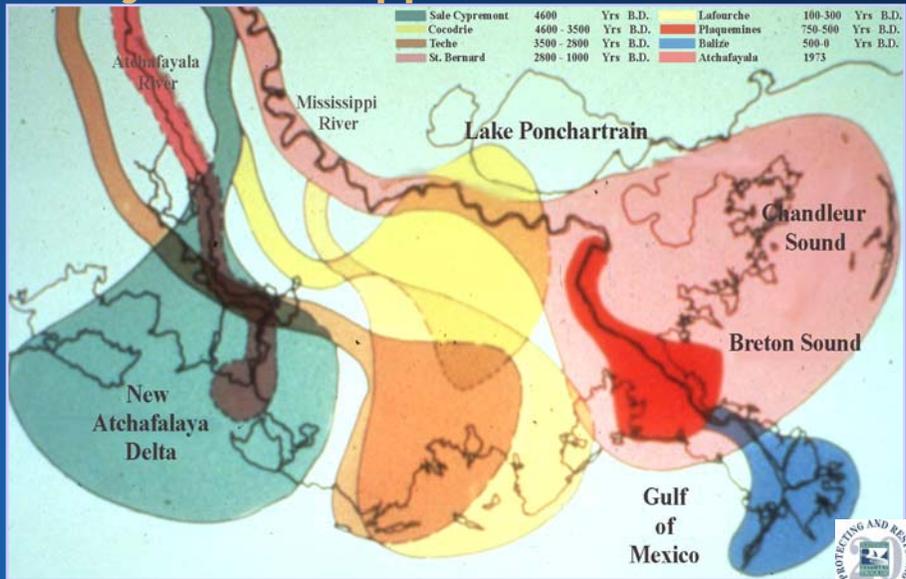


BTNEP is one of the 28 estuary programs throughout the United States



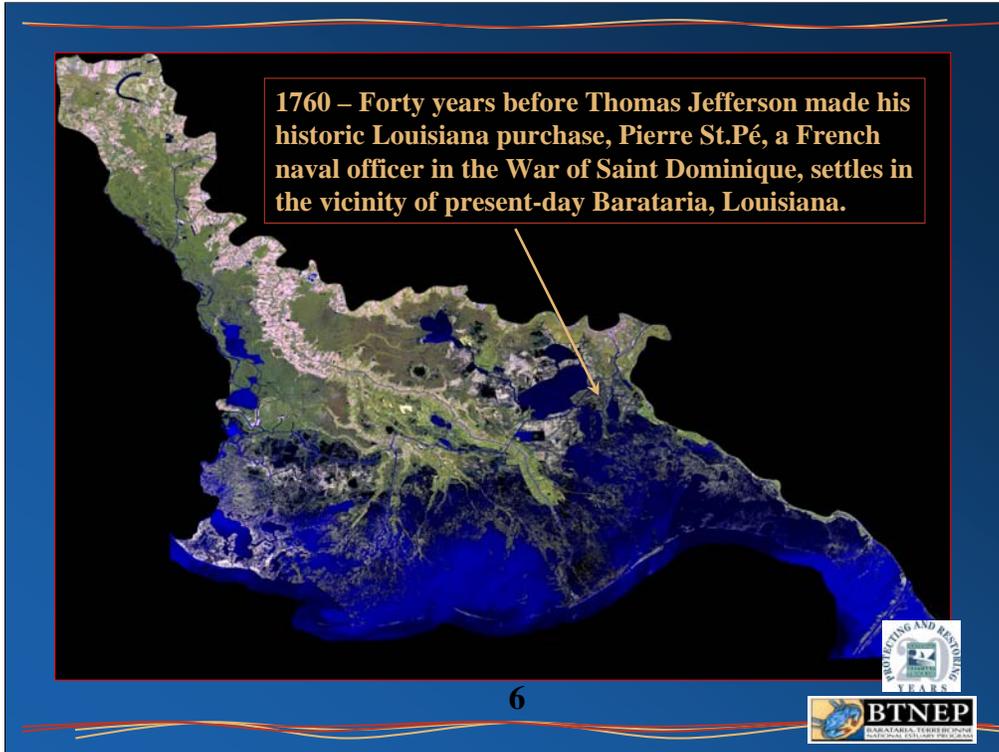
BTNEP is one of the 28 estuary programs throughout the United States

# Major Mississippi River Delta Lobes



5

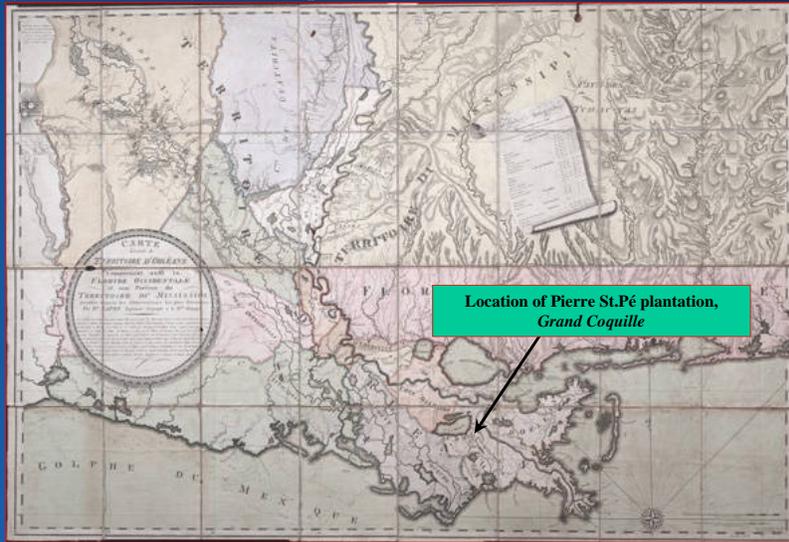




BTNEP is one of the 28 estuary programs throughout the United States



Very Rare Barthélemy Lafon Map, 1806



Bartholemy Lafon was a New Orleans surveyor and nationally recognized scientist who was involved in President Jefferson's efforts to map and understand the area covered by his Louisiana Purchase. This map was a direct result of Thomas Jefferson's interests.



## Habitat types of the Barataria-Terrebonne Basins



9



## Habitat types of the Barataria-Terrebonne Basins



10



## Habitat types of the Barataria-Terrebonne Basins



11



## Habitat types of the Barataria-Terrebonne Basins



12



## Habitat types of the Barataria-Terrebonne Basins



13



## Habitat types of the Barataria-Terrebonne Basins



Chenier (French for oak) ridges have been designated as critically-imperiled habitats in the BTNEP, particularly for Neo-tropical Migrant Birds

Grand Isle Maritime Forests



14



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The BTNEP nomination document (in 1989) identified 7  
Priority issues affecting the region:

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- Wetland Loss Issues {
- Hydrologic Modification
  - Reduced Sediment Inflow
  - Habitat Loss / Modification

- Water Quality Issues {
- Eutrophication
  - Pathogen Contamination
  - Toxic Substances

- Wildlife Issues {
- Changes in Living Resources



# Hydrologic Modification



Man-made changes in the way water moves through the system



# Reduction in Sediment Availability



Silt deposition in wetlands  
no longer offsets subsidence



The Father of Waters...  
The Beginning at Lake Itasca



The Father of Waters...  
The Mother of the  
Barataria-Terrebonne National Estuary

At the Gulf of Mexico



Since 1850, the suspended sediment load in the Miss. River  
has declined by 80% !



20



Golden Meadow, La.



# Habitat Loss

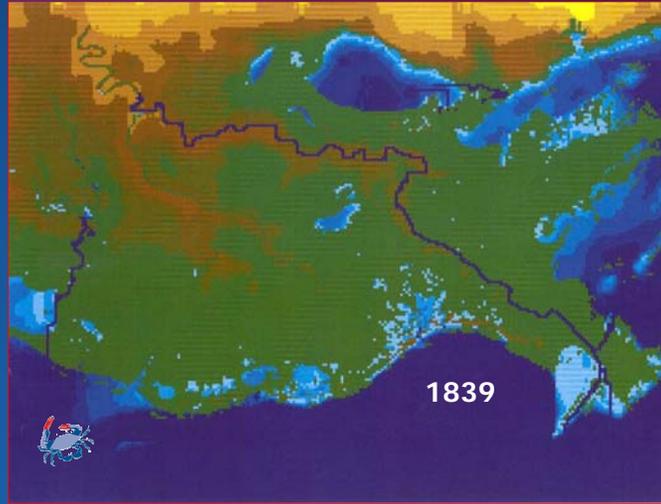
Barataria-Terrebonne  
is disappearing  
faster than any other  
area in the world



Port Sulphur, La

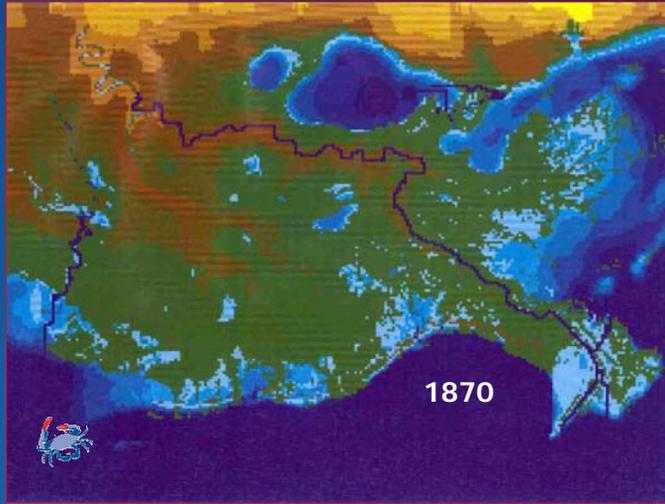


Past and Projected Wetland Loss in the BTNEP (1839 to 2020)



22





1870

23

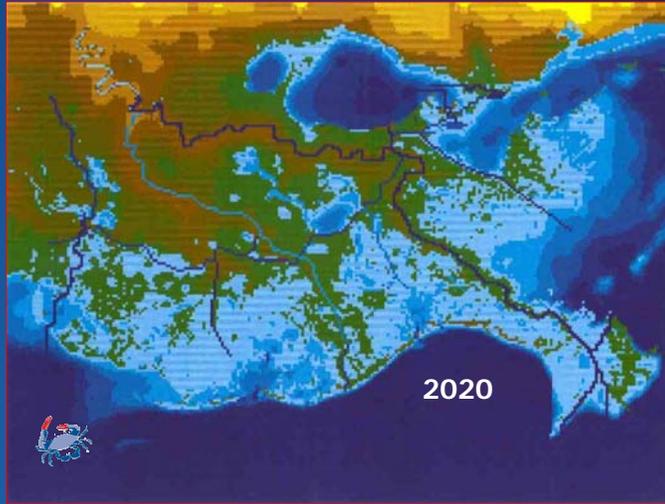




1993

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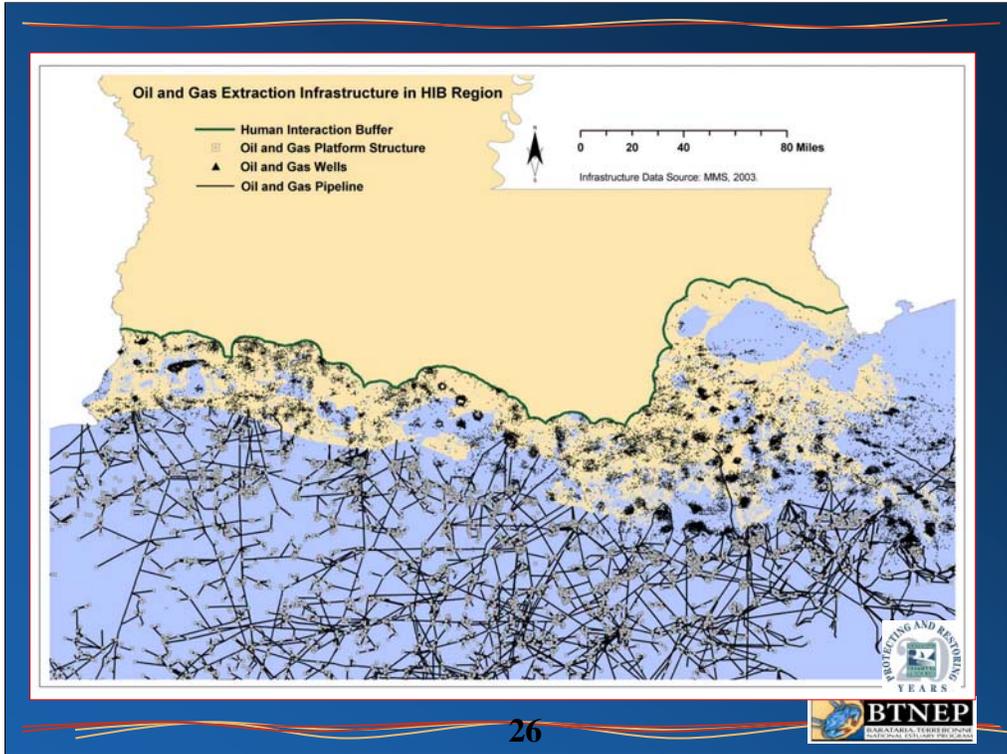


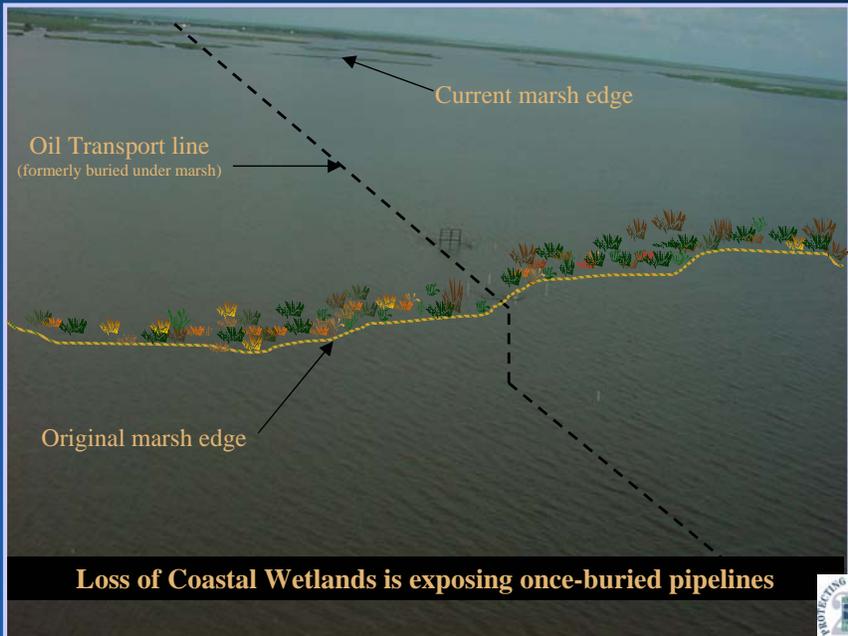


2020

25



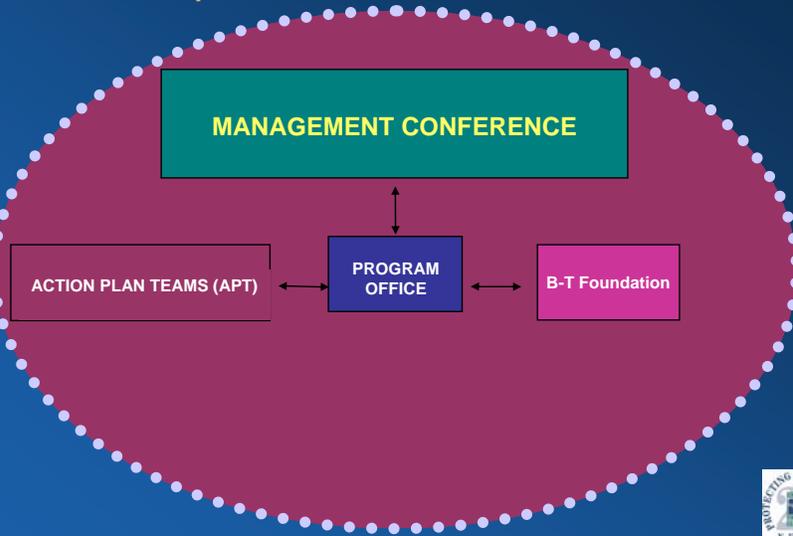




**Loss of Coastal Wetlands is exposing once-buried pipelines**

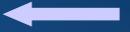


# BTNEP Implementation Phase Structure



US Environmental Protection Agency, EPA  
 Natural Resources Conservation Service  
 La Dept. of Environmental Quality  
 La Dept of Economic Development  
 Coalition to Restore Coastal La.  
 The Nature Conservancy  
 National Park Service  
 La. Assoc. of Levee Boards  
 US Geological Survey  
 Plaquemines Parish  
 NOAA Sea Grant  
 US Coast Guard  
 Jefferson Parish  
 La Science Teachers Assoc.  
 South La Economic Council  
 La Dept of Natural Resources  
 American Sugar Cane League  
 Greater Lafourche Port Commission  
 La Independent Oil and Gas Assoc.  
 La. Assoc. of Conservation Districts  
 NOAA, National Marine Fisheries Service

## The B-T Management Conference



La. Universities Marine Consortium, LUMCON  
 La Dept of Culture, Recreation and Tourism  
 La Dept of Health and Hospitals  
 La Mid Continent O & G Assoc  
 US Army Corp. of Engineers  
 US Fish & Wildlife Service  
 La Wildlife Federation  
 Nicholls State Univ.  
 Assumption Parish  
 Lafourche Parish  
 St Charles Parish  
 Land Owners. Assoc.  
 La Dept of Education  
 Terrebonne Parish  
 La Oil Spill Coordinators Office  
 La. Dept. of Wildlife & Fisheries  
 La Seafood Management Council  
 Coastal Conservation Assoc of La.  
 La. Dept of Agriculture & Forestry  
 Bayou Lafourche Freshwater District  
 Gov. Office of Coastal Activities  
 South Central Planing & Development Com.



## A Conceptual Model for the BTNEP Approach to System Restoration

"Most people are concerned about the environment but feel overwhelmed by the complexity and scale of the problems." - Maurice Strong, Chairman of the Earth Council, 2001

### Question:

Given the overwhelming complexity and scale of our problems, what factors need to be considered in a restoration plan?

### Answer:

Any and All Factors that result in a holistic, consensus driven *agreement*.



## A Conceptual Model for the BTNEP Approach to System Restoration

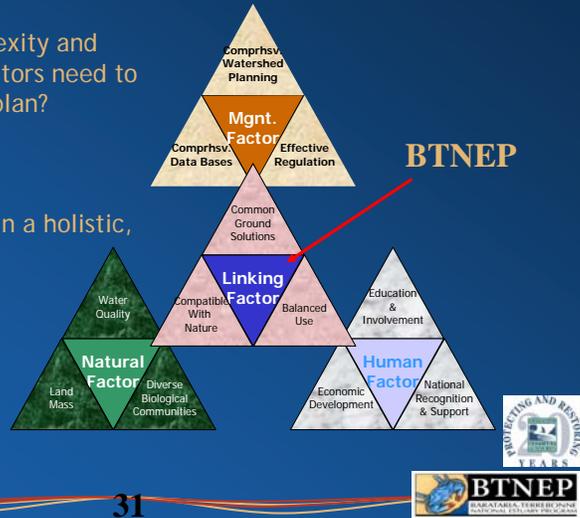
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## Barataria-Terrebonne National Estuary Program Comprehensive Conservation and Mgt. Plan

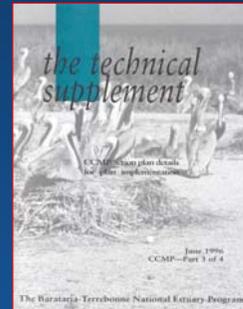


51 Action Plans address living resources, habitat, and water quality issues

**PLUS...**

Cultural Heritage, Education, National Recognition, Economic Development,  
and Coordinated Planning.

 This broader, holistic approach is the greatest strength of the NEPs and can be used to effect positive change among program partners.



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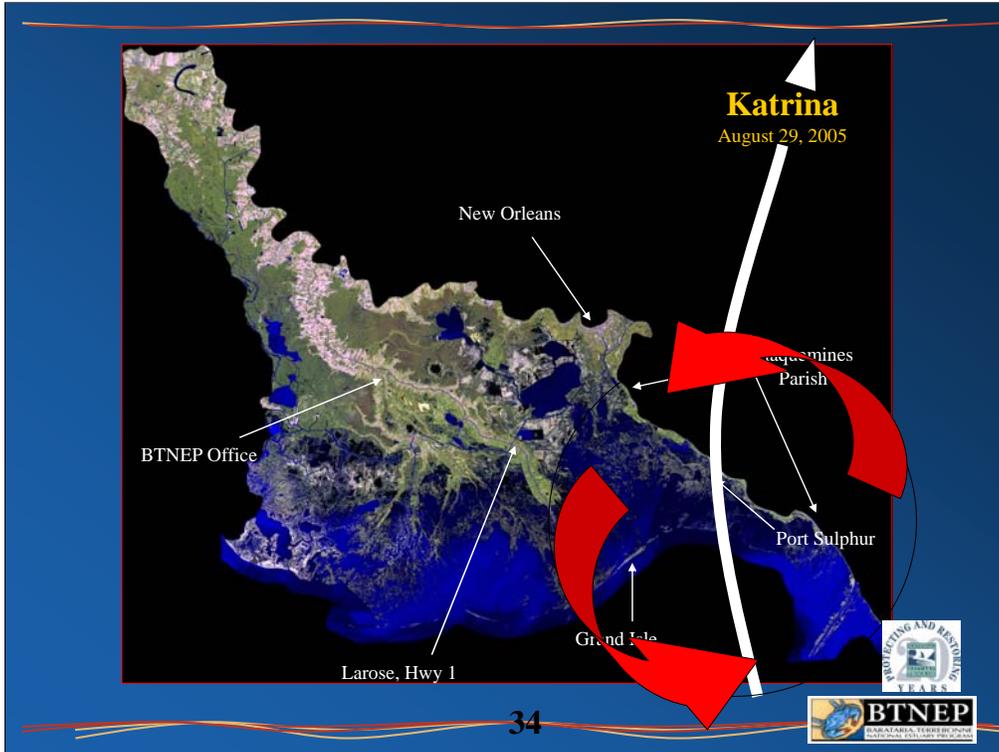


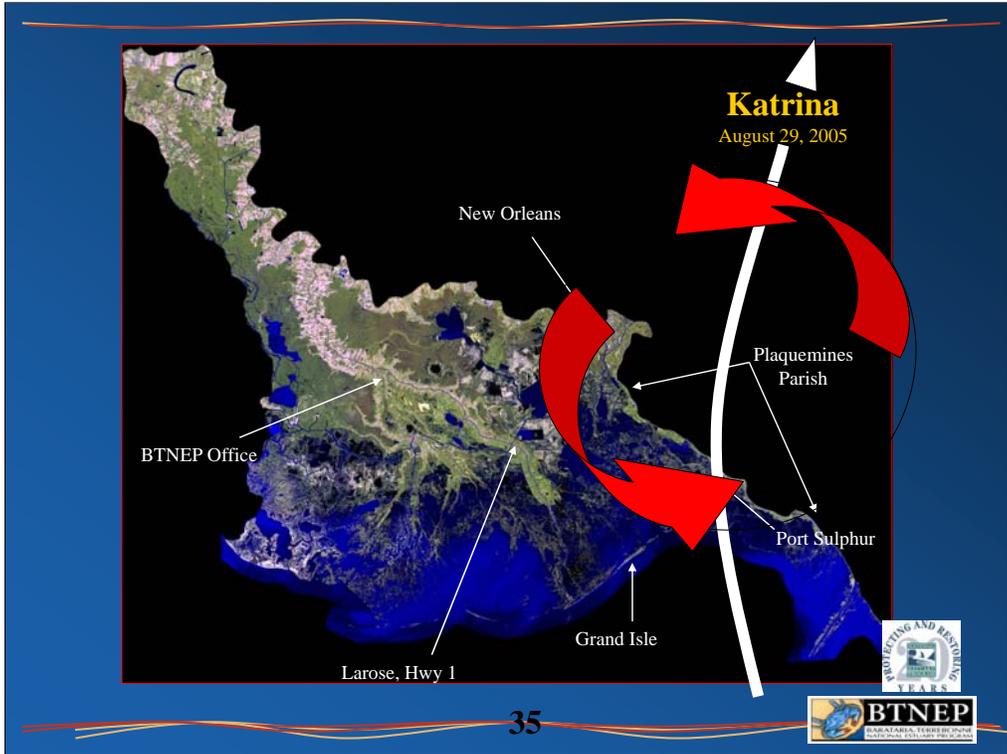
# Hurricane Katrina

August 29, 2005

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Port Sulphur, La.  
Plaquemines Parish

The Old Neighborhood - July 2002



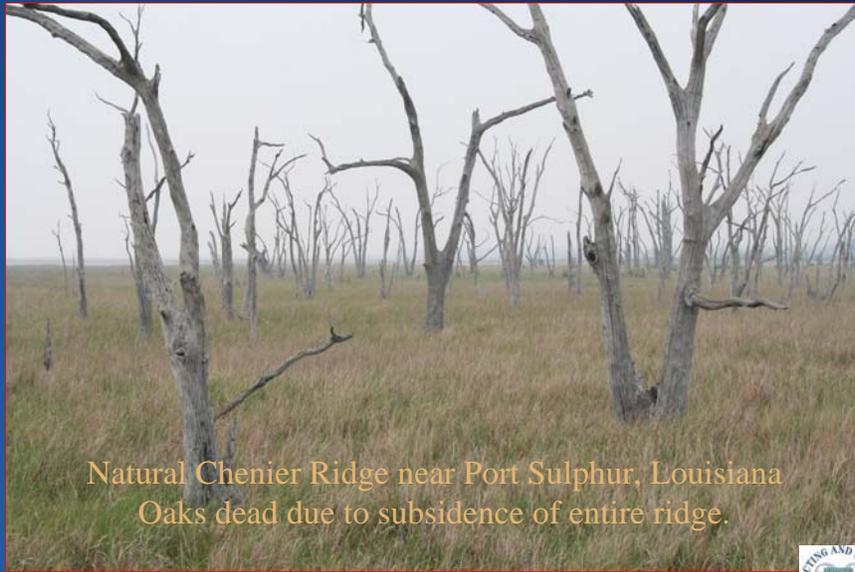
Port Sulphur, La.  
Plaquemines Parish

The Old Neighborhood - September 16, 2005



The St.Pé Childhood home Post Katrina  
Port Sulphur, LA





Natural Chenier Ridge near Port Sulphur, Louisiana  
Oaks dead due to subsidence of entire ridge.

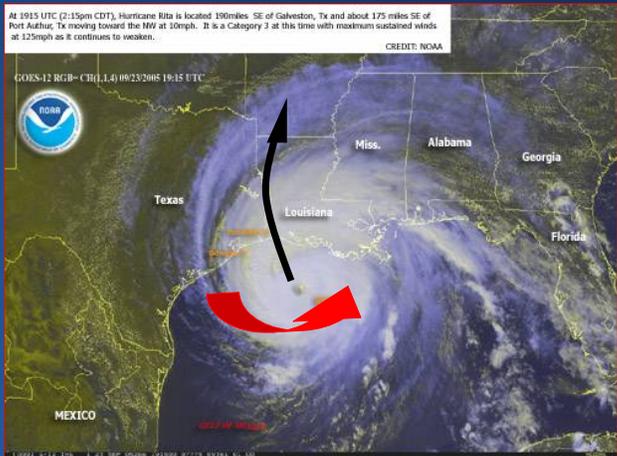


# Hurricane Rita

September 24, 2005

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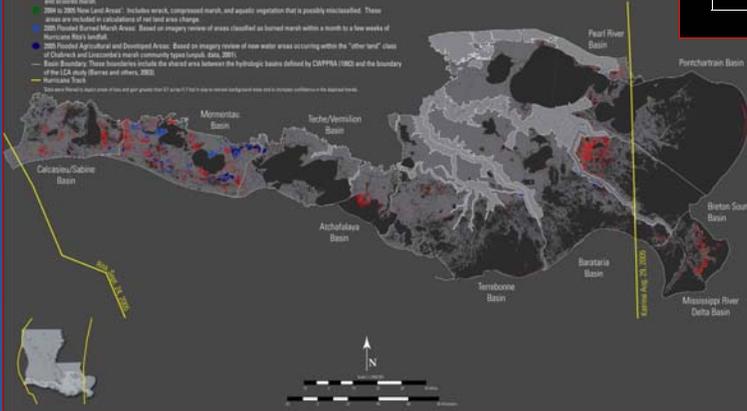
Levee Breach at Montegut, Terrebonne Parish, La.





### Land Area Change in Coastal Louisiana After the 2005 Hurricanes: Overview

- 2005 Land
- 2005 Wetlands
- 2005 Wetlands: Agricultural, developed, and upland areas surrounded by forests that are generally considered non-wetlands (USGS, 2002) and that are excluded from calculations of net land area change.
- 2004 to 2005 Net Wetland Area (Net Wetland Land Area): Includes flooded marsh, elevated marsh, eroded marsh, and elevated marsh.
- 2004 to 2005 Net Land Area: Includes marsh, compressed marsh, and aquatic vegetation that is possibly misclassified. These areas are included in calculations of net land area change.
- 2005 Potential Burned Marsh Area: Based on imagery review of areas classified as burned marsh within a month to a few weeks of Hurricane Rita's landfall.
- 2005 Potential Agricultural and Developed Areas: Based on imagery review of rice water areas occurring within the "other land" class of Chiricua and considered a rural community (Barras, 2006).
- Basin Boundary: These boundaries include the shared area between the hydrologic basins defined by COTYMA (1982) and the boundary of the U.S. study basins and others (2005).
- Hurricane Track



Data Source:  
 Barras, John A., 2006, Land area change in coastal Louisiana after the 2005 hurricanes—a series of three maps: U.S. Geological Survey Open-File Report 06-1274

Land Area Changes October 2004 to October 2005	
Basin	Land area (mi <sup>2</sup> )
Calcasieu/Sabine	-22
Mermentau	-62
Teche/Vermilion	-5
Atchafalaya	-19
Terrebonne	-19
Barataria	-18
Mississippi River Delta	-16
Breton Sound	-41
Pontchartrain	-19
Pearl River	-4
<b>Total</b>	<b>-217</b>



## FACTS

Each of us agree that restoration must occur.

1000s of individual ideas of what should be done.

We will never succeed until we implement from a point of agreement.

So how can we “fix” our coastal landscape?

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# Davis Pond Freshwater Diversion

- Largest diversion to date in the Barataria Basin
- Completed in 2002
- Cost = \$119.6 million
- 10,650 cubic feet per second (max)



## Sediment Delivery from Miss and Atchaf. River Bottoms

- Need? Obviously, we need sediments! (Barrier Islands, marshes, ridges, etc.)
- Public Support? Get needed sediment with little water, so publicly acceptable!
- Is this possible? ...We've been doing it for decades!





**Miss. and Atchafalaya convey over  
180 million cu. yds. sediment annually.**

**Corps N.O. District alone dredges about  
22 million cu. yds annually (net) from  
Miss. River**

**100 million metric tons annually flows off continental shelf (Miss.)**

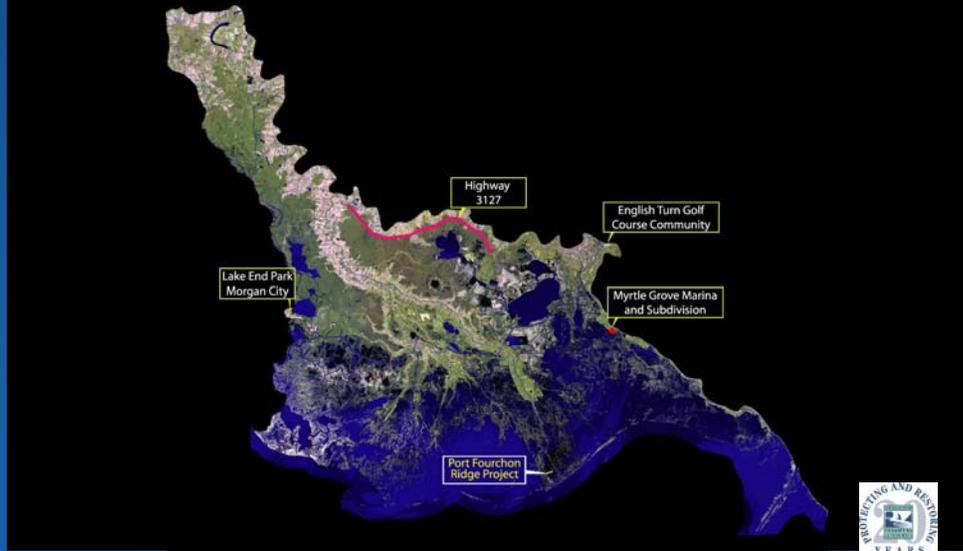
**Dredged from Atchaf. 1996 to 2006\*:**

178,112,814 total cubic yards @ cost of \$136,102,281.  
(Annual average = 5,238,612 cubic yards @ cost of \$4,124,312.)

\*U.S. Army Corps of Engineers data



## Sediment Slurry Projects Built within BTES from Pumped River Materials

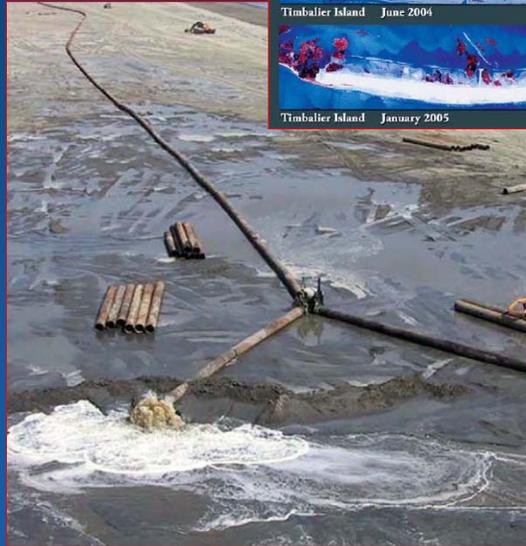


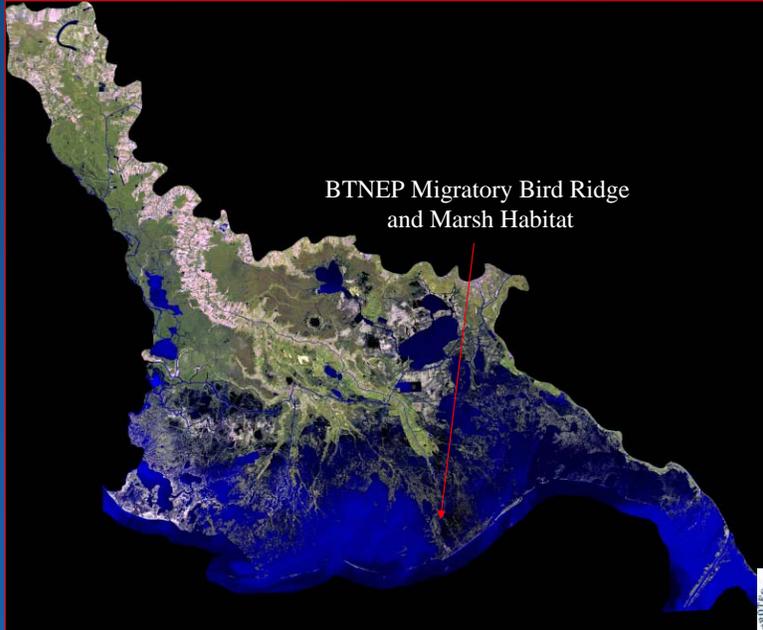
48



Recent Barrier Island Restoration  
using dredge-harvested sediment.

Timbalier Island, La.





BTNEP Migratory Bird Ridge  
and Marsh Habitat

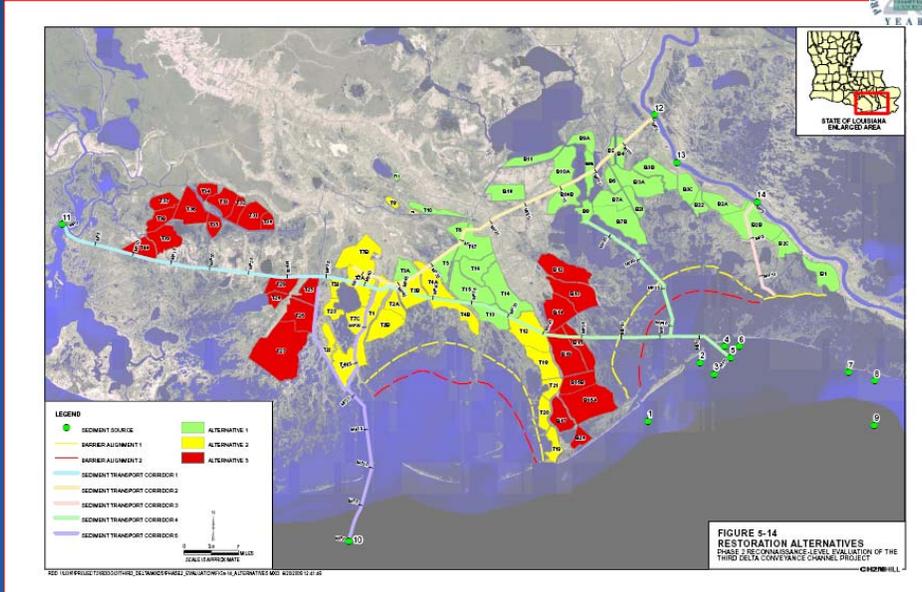


# BTNEP Ridge Project...Post Katrina





Wetlands and ridges can be restored from sediments transported through pipelines with minimal amounts of water



**TABLE 5-30**  
 Summary of Planning-level Project Costs  
 Phase 2 Reconnaissance-Level Evaluation

Restoration Project	Cost (billion \$)	Cost per Acre vs. Future with No Action (at 2060 \$)
Pipeline Conveyance Alternative 1	9.4	72,000
Pipeline Conveyance Alternative 2	21.1	94,000
Pipeline Conveyance Alternative 3	31.7	116,000

\* Costs are for 50-year period.

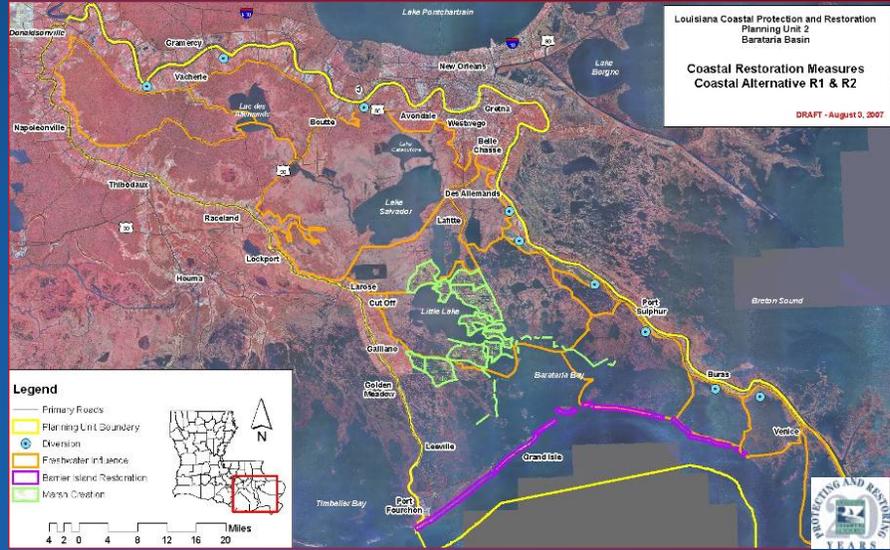
**Annualized costs for Pipeline Sediment Transport**

- Alt. 1.....\$180 million per yr.
- Alt. 2.....\$422 million per yr.
- Alt. 3.....\$634 million per yr.





# Corps of Engineers Restoration Alternative (LaCPR) Barataria Basin













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## Resurrection

But when the rain comes,  
resurrection fern  
springs up in a green mass  
of strong backs and arched fronds  
making leaf out of water  
and the reservoirs of hope  
hidden in their wiry roots...

If you listen you can hear them singing  
the gospel of life's stubborn return.

©2005 Aurora Levins Morales, Friend and Poet





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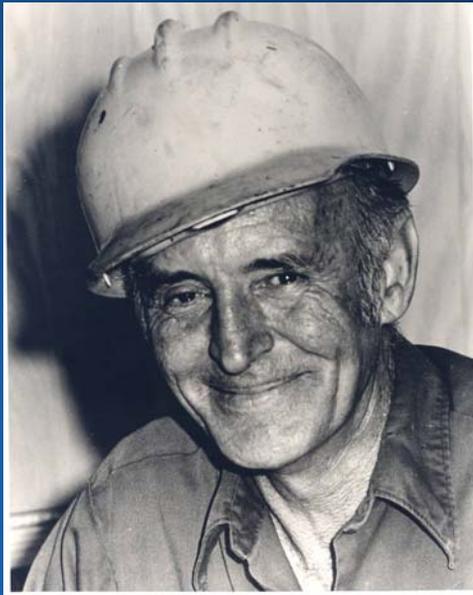
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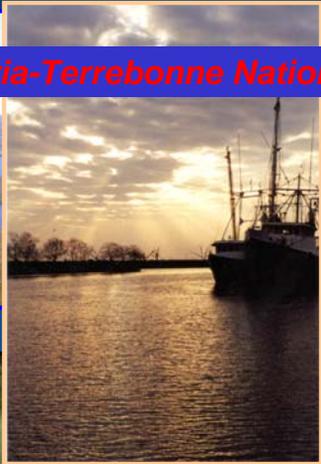
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©2005 Aurora Levins Morales, Friend and Poet

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*The Barataria-Terrebonne National Estuary...*



*Like No Other Place on Earth*



# Questions?



**Kerry St. Pé, Executive Director,  
Barataria-Terrebonne National Estuary Program (BTNEP)**

# Wetlands Monitoring and Assessment

- EPA's National Program
  - The National Wetland Condition Assessment
    - Gulf of Mexico Coastal Wetland Pilot
- Wetland Assessment Data to Inform Decisions-Making

Michael Scozzafava  
U.S. EPA  
Office of Wetlands, Oceans, and  
Watersheds

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September 26, 2007



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# 3-Level Technical Approach



## Level 1 - Landscape Assessment:

Use GIS and remote sensing to gain a **landscape view of watershed and wetland condition**. Typical indicators include wetland coverage (NWI), land use, and land cover.

## Level 2 – Rapid Wetland Assessment:

Evaluate the **general condition of individual wetlands using relatively simple field indicators**. Assessment is often based on the characterization of stressors known to limit wetland function. (e.g. road crossings, tile drainage, ditching).

## Level 3 – Intensive Site Assessment

**Produce quantitative data with known certainty of wetland condition within an assessment area**. Used to refine rapid wetland assessment methods and diagnose the causes of wetland degradation. Typically accomplished using indices of biological integrity or HGM function

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# National Wetland Condition Assessment (2011)



## Activities

2007-2009	2010	2011	2012	2013
<b>Research</b>	<b>Design</b>	<b>Field</b>	<b>Lab/Data</b>	<b>Report</b>
Scientific issues Policy issues Supplemental data analysis Methods refinement	Target population Indicators Field/ Lab practices Quality assurance plan	Training Site reconnaissance Sample collection Field quality assurance	Lab analysis Lab quality assurance Data entry Data quality assurance	Data analysis Presentations Peer review Final report

## Collaboration with FWS

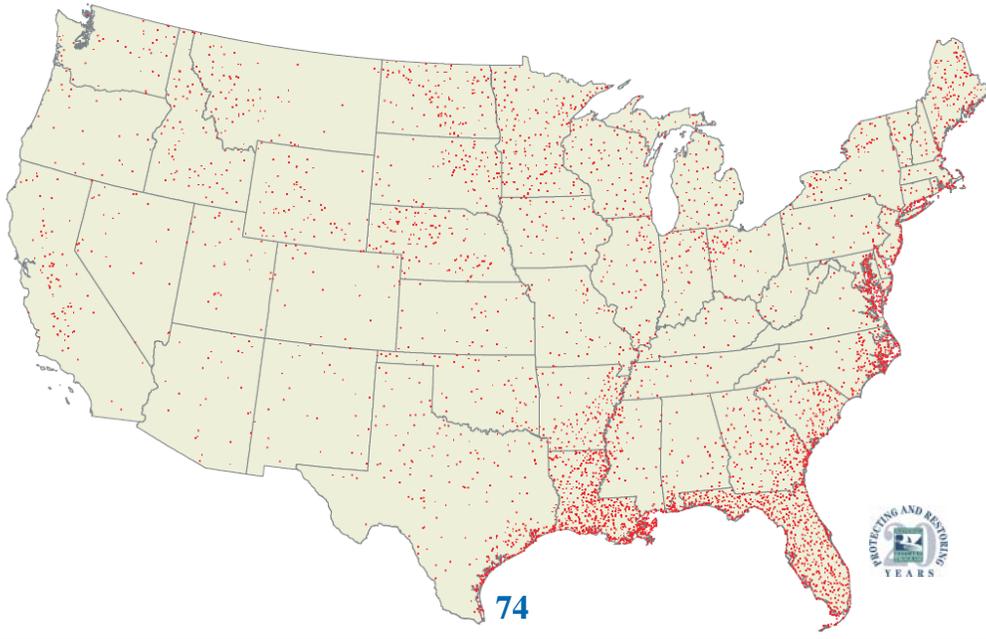


- FWS Status and Trends reports document trends in wetlands acreage
- NWCA will evaluate the ambient condition of the nation's wetlands resources.
- EPA will collaborate with FWS in designing NWCA
  - ensure the national condition assessment most effectively complements the Service's Wetlands Status and Trends Study.
- Together these reports will offer the most comprehensive ecological evaluation





## Status and Trends 2005 Plot Locations



# Gulf of Mexico Coastal Wetlands Pilot Survey

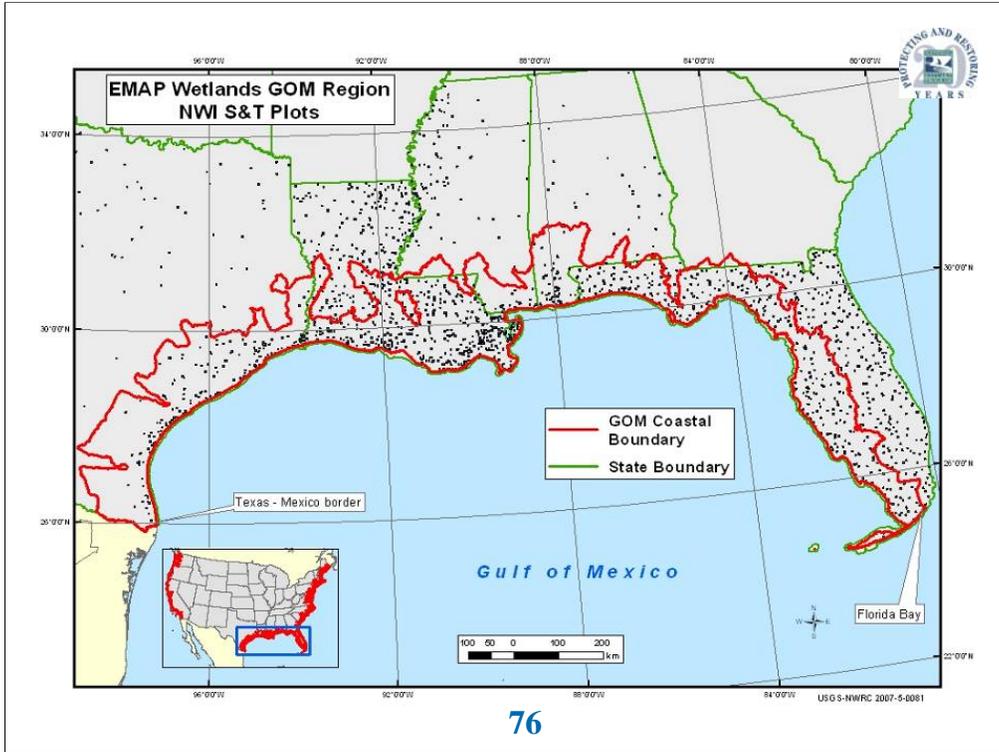
## ➤ Objectives

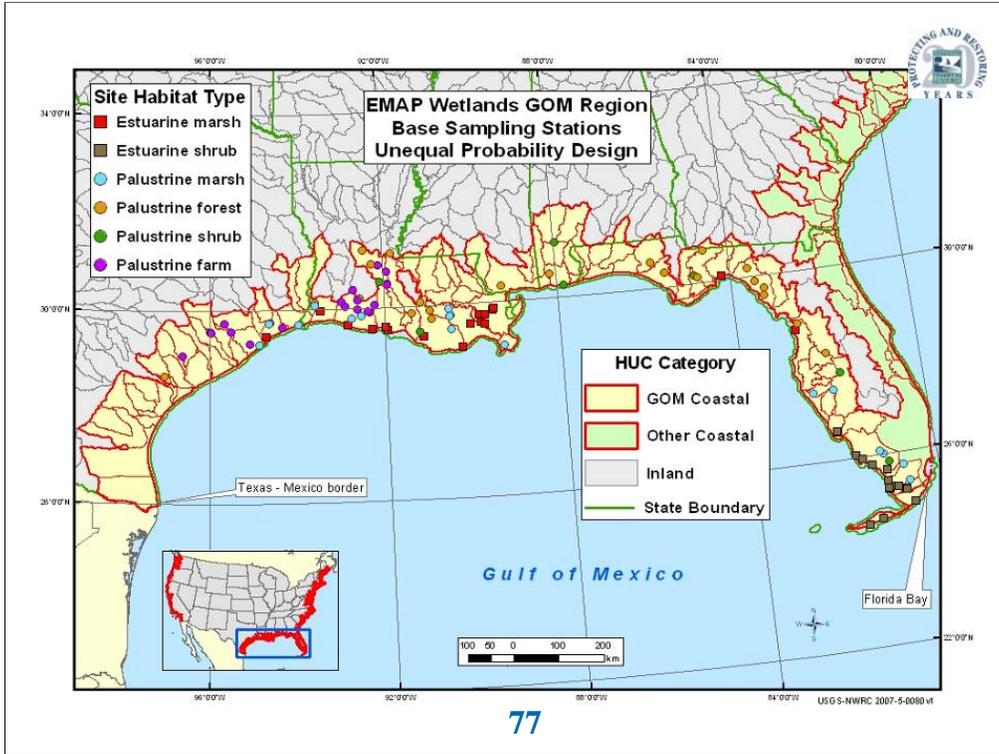
- Evaluate feasibility of implementing probability survey design for wetlands on regional scale
- Evaluate applicability of condition indicators across multiple wetland types
- Assess condition of GoM coastal wetlands

## ➤ Partnership between EPA & USGS

- ORD Gulf Ecology Division
- National Wetlands Research Center

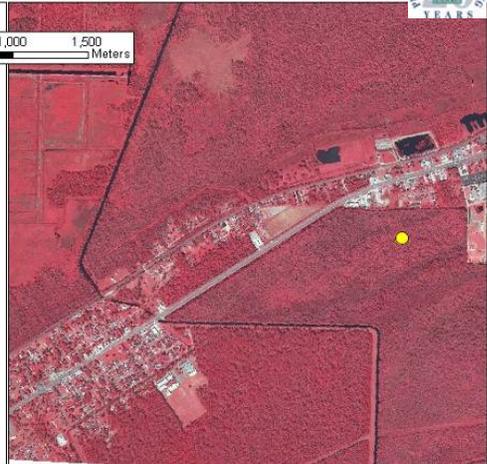






NWI Status and Trends Habitats  
PFO Example

DOQQ 2005

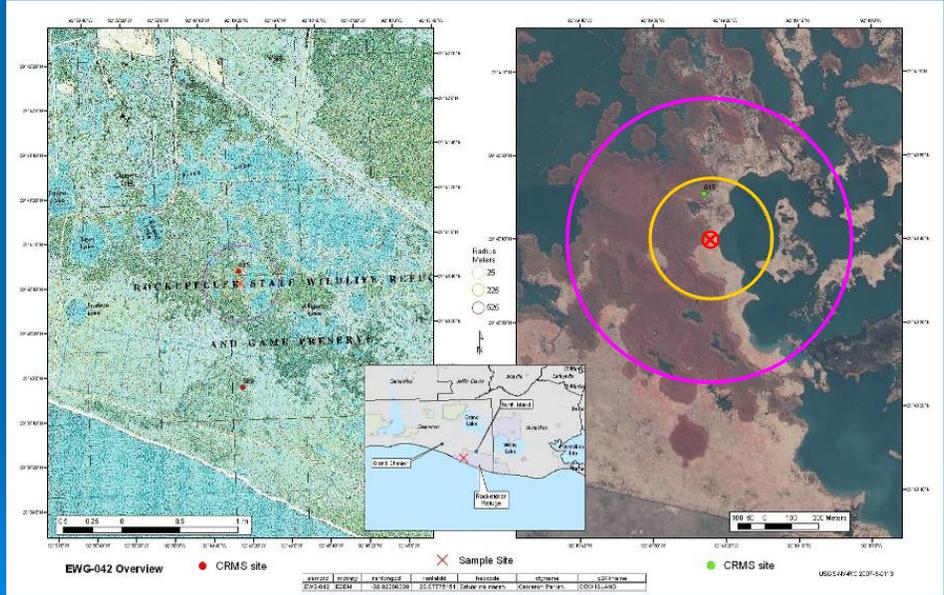


- |       |        |
|-------|--------|
| Water | PEM    |
| E2EM  | PFO    |
| E2SS  | PSS    |
| E2US  | PUS    |
| OUT   | Pf     |
|       | Upland |

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USGS-NWRC 2007-5-0042



# 3-Tiered Assessment

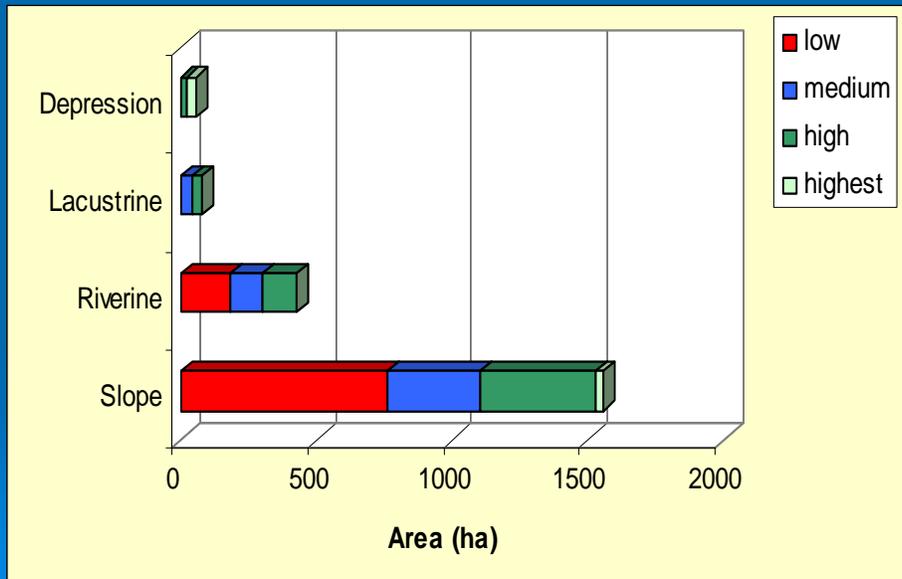


- Tier 1 – Landscape Assessment
  - GIS, remote sensing, ATtLA
  - Landscape, Stressors, Physical, & Hydrologic characteristics
- Tier 2 – Rapid Assessment
  - On-site field observations
  - Measure condition & stressors
  - Scores, metrics
- Tier 3 – Intensive Assessment
  - On-site sample collection
  - Calibrate and validate Tiers 1 & 2
  - Vegetation, water, soils



Application of Elements of a State Water Monitoring and Assessment Program For Wetlands  
<http://www.epa.gov/owow/wetlands/monitor/#elements>

# Condition Profile

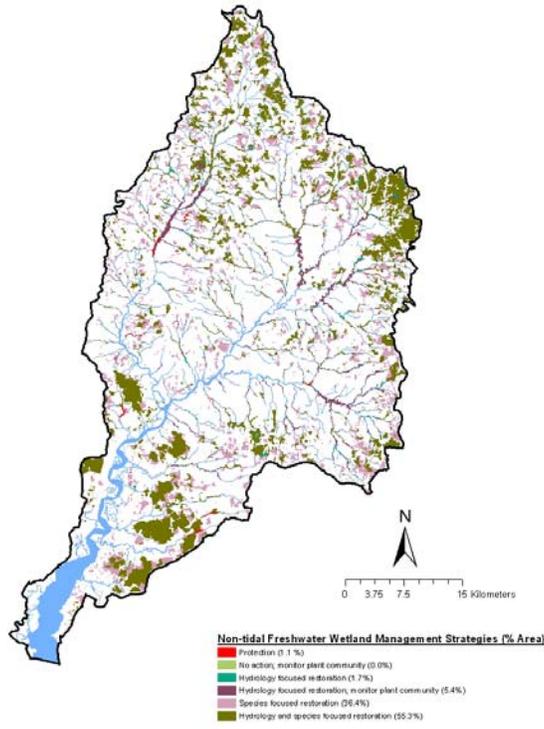


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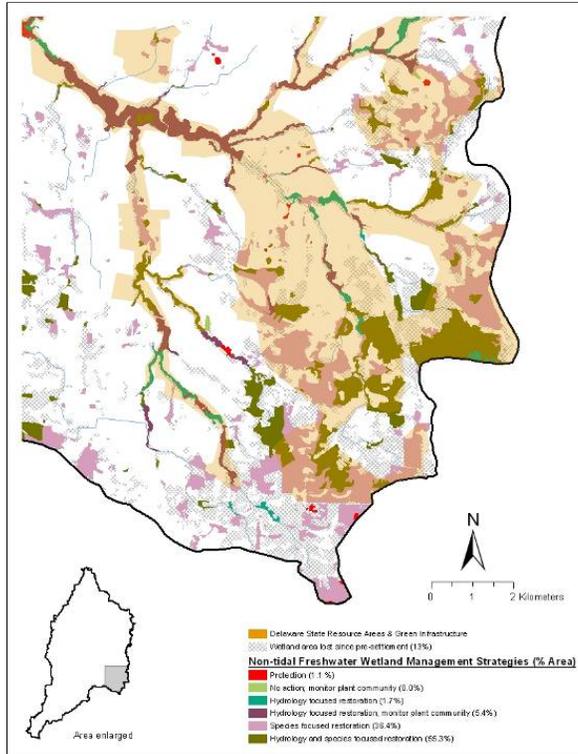


Use wetland assessment information to establish management categories for all wetlands in the watershed





Integrate with other conservation strategies and current land use to prioritize efforts



## Additional Resources

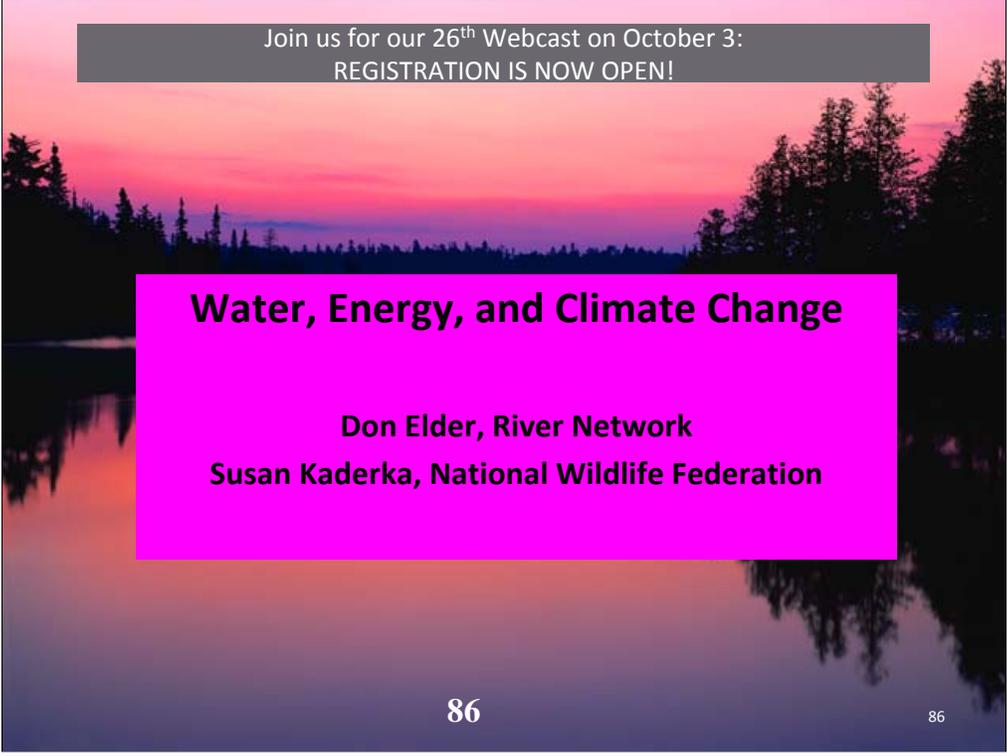


- Wetlands Program Development Grants
  - CWA 104(b)(3) – Demonstration Projects
  - <http://www.epa.gov/owow/wetlands/grantguidelines/>
  
- *Elements of a State Water Monitoring and Assessment Program for Wetlands*
  - Development of a State or Tribal Wetlands Monitoring Strategy
  - [http://www.epa.gov/owow/wetlands/pdf/Wetland\\_Elements\\_Final.pdf](http://www.epa.gov/owow/wetlands/pdf/Wetland_Elements_Final.pdf)
  
- Wetlands Monitoring Webpage
  - <http://www.epa.gov/owow/wetlands/monitor/>
  
- National Wetlands Monitoring and Assessment Work Group (NWMAWG)
  - Webpage: Coming Soon
  - QuickPlace Site:
    - Email Elizabeth Riley ([riley.elizabeth@epa.gov](mailto:riley.elizabeth@epa.gov))

# Questions?



**Michael Scozzafava,  
Environmental Protection Specialist, USEPA**



Join us for our 26<sup>th</sup> Webcast on October 3:  
REGISTRATION IS NOW OPEN!

## **Water, Energy, and Climate Change**

**Don Elder, River Network**  
**Susan Kaderka, National Wildlife Federation**

Massachusetts Coastal Zone Management  
Massachusetts Bays National Estuary Program



Wetland Assessment Program



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## Program Goals

- To develop and evaluate techniques for assessing the ecological integrity of coastal wetlands
- To utilize information for management action:
  - ✓ Identifying degraded wetland sites
  - ✓ Monitoring restoration efforts
  - ✓ Inventory of wetland sites in localized area
- To transfer techniques to interested parties



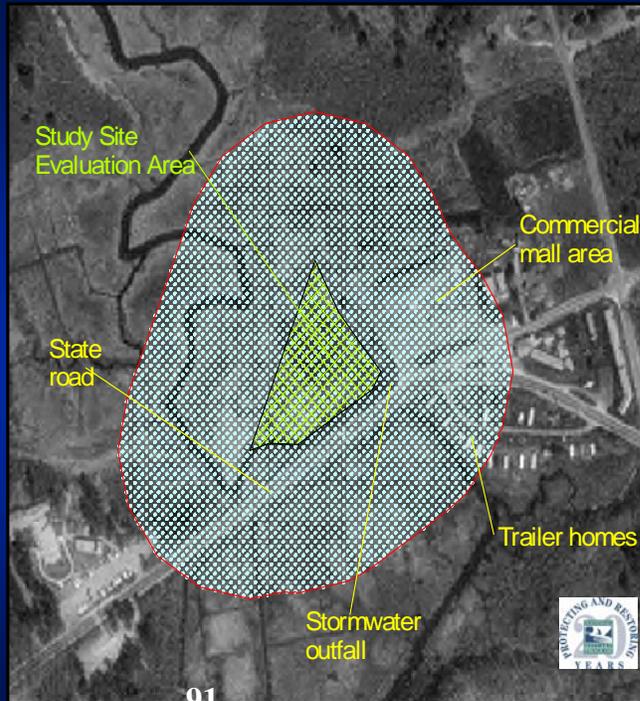


# Human Disturbance

- Accurate assessment of the “quality” of a natural system must involve the measurement of [some] biological response to human disturbance
- Human disturbance comes in all shapes and sizes:
  - toxic contamination
  - urbanization
  - fill / dumping
  - impervious surface
  - eutrophication
  - draining / ditching
  - pesticide application
  - stormwater
  - septage
- The challenge is to develop method(s) to capture these stressors in a quantitative score/output
- CZM and MBP utilize two human disturbance scales:
  - Land Use Index
  - Tidal Restriction Ratio



Land Use  
Index:  
GIS  
Analysis  
100m  
Buffer



## Key Components of Assessment Technique

- Utilize direct measurements of biology, supported by hydrology and chemistry:
  - Vegetation
  - Macro Invertebrates
  - Avifauna
  - Fish/Nekton (as of 2000)
- Relies on a comparative design approach: study sites and reference (or control) sites
- Consistent Quality Assurance Project Plan (QAPP) protocol with standardized evaluation areas
- Biological data analyzed in a multi-metric framework, generating a quantitative index score



## Biological Multi-Metric Indices

- Index is a tool utilized to integrate a number of different metrics (measurements, variables or attributes) into a single rank or score (ex: Dow Jones Industrial Average)
- Metrics might include, for example:
  - species diversity
  - community composition
  - abundance of rare or pollution-tolerant species
- Multi-metric approaches/protocols have been widely used for wadeable rivers and streams fish
- Metrics are scored based on reference site or control criteria then summed to produce final index score

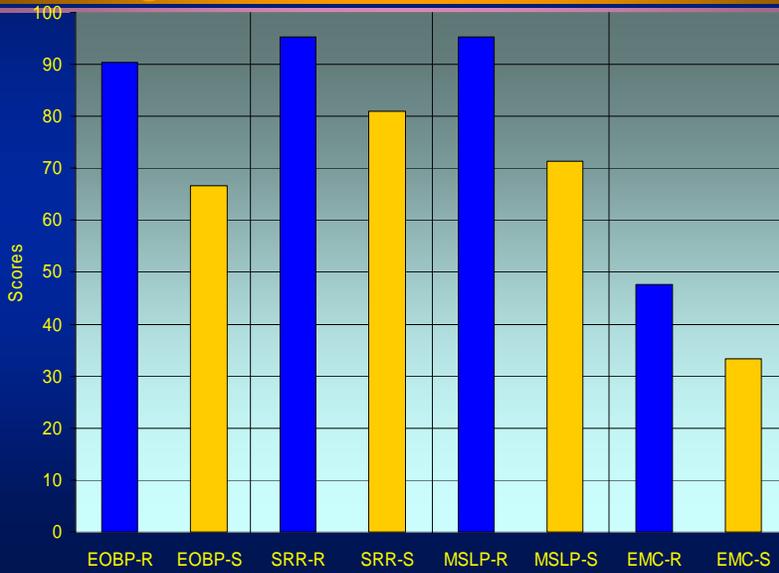


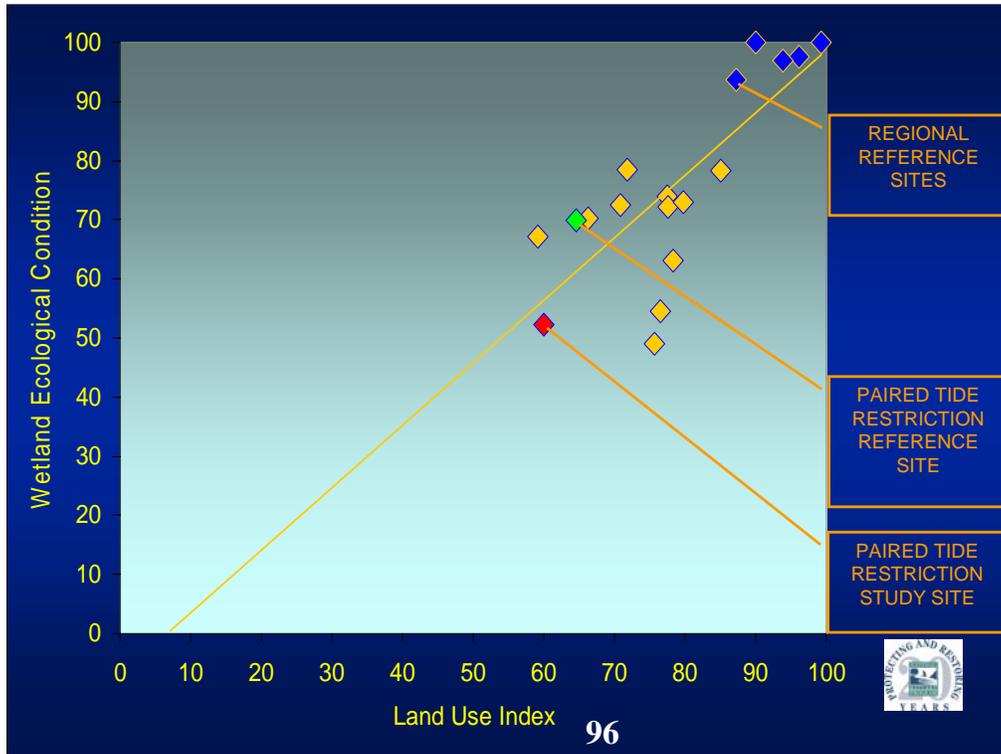
## Output: Index Scores and Use of Data

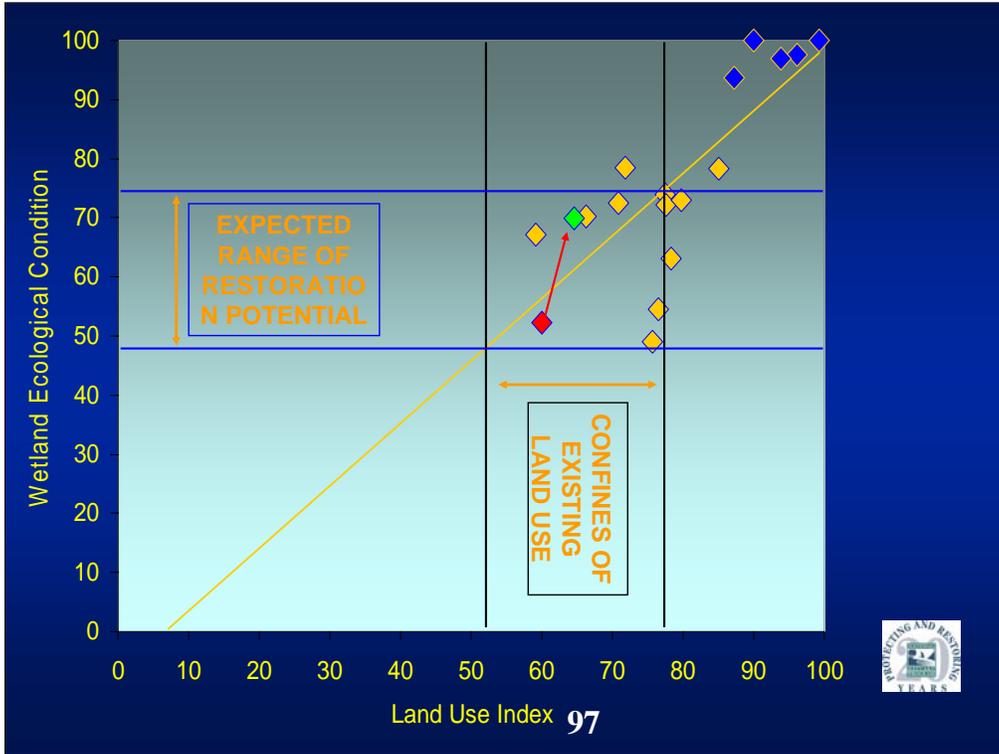
- Four biological indices:
  - **Index of Vegetative Integrity** > Fish&Nekton Integrity Index
  - Invertebrate Community Index > Avifauna Integrity Index
- Cumulative: Wetland Ecological Condition
- Individual and cumulative index scores can be examined in many ways:
  - compare many sites to one another: inventory
  - same site over time: track degradation
  - same site after restoration action: track restoration
  - sites versus human disturbance variables: land use and tidal restrictions



# Cape Cod 2000 Tidal Restriction Investigation : Vegetation Integrity Index Scores







# NERAM Characterization Indicators

- ƒ Landscape Position
- ƒ Size
- ƒ Shape
- ƒ Exposure
- ƒ Aquatic Edge
- ƒ Connected Habitat
- ƒ Tidal Flushing



## Disturbance Indicators

- ƒ Land Use in Unit Buffer
- ƒ Ditching; Draining
- ƒ Fill/Fragmentation
- ƒ Diking/Restriction
- ƒ Land Use at Survey Point
- ƒ Point Sources of Pollution
- ƒ Barriers to Landward Migration



# Condition Indicators

- ƒ Plant Communities
- ƒ Plant Species
- ƒ Bearing Capacity
- ƒ Plant Fragments
- ƒ Invasive Plants
- ƒ Higher Trophic Levels



OPERATIONAL DRAFT: For internal use only

## Rapid Method for Assessing Estuarine (Salt) Marshes in New England

Version 1.4 -- Oct 2006



### Introduction

This document is an operational draft of a Rapid Method for Assessing Estuarine (Salt) Marshes in New England (version 1.4). It was developed by the authors and contributors listed in Appendix 3. The intent of this rapid assessment method is obtain sound information on selected estuarine marshes with a relatively small investment of time and effort (as compared to intensive, long-term studies). The data will serve to characterize the selected study sites (units) in terms of geomorphological properties, types and degree of stressors and disturbances, and the relative integrity of selected biotic and abiotic components of the salt marsh.



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## Examples of Disturbance Metrics

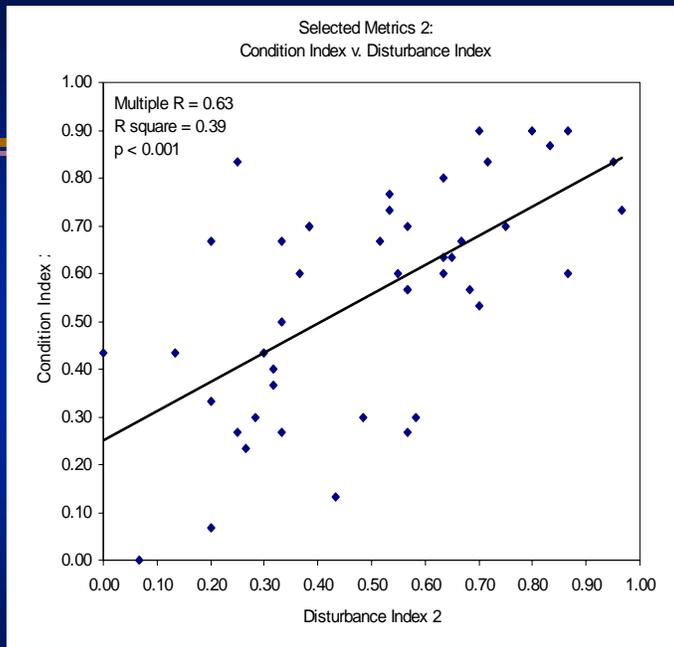
- ƒ Percent Area of Natural Condition
- ƒ % Area in Developed Land Uses
- ƒ Extent of Ditching
- ƒ Type and Extent of Stressors
- ƒ Extent of Filled and Fragmented Marsh
- ƒ Extent of Flushing



## Examples of Condition Metrics

- ƒ % Salt Marsh Obligate Species
- ƒ # of Marsh Habitat Types
- ƒ % of High Marsh Species
- ƒ % of Invasive Species
- ƒ Average Area of High Marsh Habitat
- ƒ % of short form *Spartina alterniflora*





**Figure 4.4. Scatter plot showing the relationship between Condition and Disturbance Indices for Selected Metrics 2.**



# QUESTIONS?



**Kerry St Pé, Barataria-Terrebonne National Estuary**



**Michael Scozzafava, USEPA**



**Jan Smith, Massachusetts Bays Program**



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