Association of State Wetland Managers
Gulf Restoration Webinar Series

Wetland Restoration
Pre- and Post-Hurricane Katrina

Perspectives of an Environmental Manager

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New Orleans District
27 June 2016
US Army Corps of Engineers
Environmental Mission, Goals & Operating Principles

- **Goal**: focus on ecosystem structure and processes, sustainable management
- **Objective**: contribute to National Ecosystem Restoration (NER)
  - NER outputs: increases in the net quantity/quality of desired ecosystem resources
- **Ecosystem Restoration Approach**: protect or restore ecosystem structure and functions associated with hydro regime
- **Partnerships**
Environmental Operating Principles

- Foster **sustainability** as a way of life throughout the organization.
- Proactively consider **environmental consequences** of all Corps activities and act accordingly.
- Create mutually supporting economic and environmentally **sustainable solutions**.
- Continue to **meet our corporate responsibility and accountability** under the law for activities undertaken by the Corps, which may impact human and natural environments.
- Consider the environment in employing a **risk management and systems approach** throughout the life cycles of projects and programs.
- Leverage **scientific, economic and social knowledge** to understand the environmental context and effects of Corps actions in a **collaborative** manner.
- Employ an **open, transparent process** that respects views of individuals and groups interested in Corps activities.
Select Restoration (and other) Laws

- National Environmental Policy Act 1969
- WRDA 1986 – Section 103 (cost-share)
- WRDA 1990 – Environmental Protection
- Continuing Authorities Program (CAP)
  - WRDA 1986 – Section 1135
  - WRDA 1992 – Section 204
  - WRDA 1996 – Section 206
- WRDA 2007 – Section 2039 / Section 2036 (AM&M)
The Problem: Coastal Land Loss

1932 – 2010: -1.1 million acres
   Ave rate of loss (1985-2010) = -10,600 acres/year

2010 – 2060: estimated -1.35 to -2.99 million acres
Delta Cycle
Ecological Productivity

Current stage of specific delta lobes
- Plaquemine P
- Teche T
- Lafourche L
- Maringouin M
- St. Bernard SB

Growth

Delta lobe size (land area)

Biological diversity

Time

Minimum

Maximum

Submerged growth
- Open bay
- Subaqueous levees
- Mudflats
- Freshwater marsh
- Brackish marsh
- Saline marsh
- Swamp
- Lakes
- Oyster reefs
- Marginal beaches
- Barrier islands

Rapid aerial growth
- Open bay

Deterioration

Coastwide Land Building [sq. miles]

Time

Relative Dimensions

High

Low

Subaqueous Growth
Rapid Subaerial Growth
Deterioration

Marine

Restoration: Land Building
CHANS
Major Causes
Of Wetland Loss

Barrier Island Degradation
Storms
Salt Water Intrusion
Canals
Oil & Gas Development
Levee System
Sediment Reduction
Sea Level Rise
Subsidence
Pre-Katrina: Selected Restoration Efforts

Pre-1980s
- Caernarvon Freshwater Diversion authorizations 1965, 1974, 1986

1990s
- 1990 CWPPRA Program first Federal statutory mandate for restoration of Louisiana’s coastal wetlands
- 1991 Caernarvon Freshwater Diversion begins operation (see later slide)
- 1998 Coast 2050 Plan published (basis for LCA Study)
- 1999 Breton Island restoration
- Section 206 (1996 WRDA) - Aquatic Ecosystems.
Pre-Katrina Selected Restoration Efforts

2000’s

- 2002 Davis Pond Diversion begins operation
- 2003 West Bay Sediment Diversion (50,000 cfs)
- 2003 LCA Comprehensive Ecosystem Restoration Plan
- 2005 LCA Near-Term Ecosystem Restoration Plan Final Report

2005 Katrina (August) and Rita (September)
Post-Katrina Restoration Efforts

- WRDA 2007 Section 7003 authorizes 2005 LCA Plan
- 2011 LCA 6 projects feasibility completed move to PED
- 2012 MRGO Ecosystem Restoration Study completed
- 2012 LCA BBBS feasibility completed move to PED
- 2012 start LCA Mississippi River Hydrodynamic and Delta Management, 1st large scale, long term study
- 2016 Southwest Coastal Louisiana Final Integrated Report
Hurricane Katrina and Others

- Hurricane Cindy (July 2005)
- Hurricane Dennis (July 2005)
- Hurricane Katrina (August 2005)
- Hurricane Rita (September 2005)
- Hurricane Gustav (August 2008)
- Hurricane Ike (September 2008)
- Hurricane Isaac (August 2012)
Land Area Change in Coastal Louisiana After the 2005 Hurricanes: Overview

- **2005 Land**
- **2005 Water**
- **Fastlands**: Agricultural, developed, and upland areas surrounding levees that are generally considered non-wetlands (USGS, 2002) and that are excluded from calculations of net land area change.
- **2004 to 2005 New Water Areas (Decreased Land Areas)**: Includes flooded marsh, sheeted marsh, eroded marsh, and scoured marsh.
- **2004 to 2005 New Land Areas**: Includes wrack, compressed marsh, and aquatic vegetation that is possibly misclassified. These areas are included in calculations of net land area change.
- **2005 Flooded Burned Marsh Areas**: Based on imagery review of areas classified as burned marsh within a month to a few weeks of Hurricane Rita’s landfall.
- **2005 Flooded Agricultural and Developed Areas**: Based on imagery review of new water areas occurring within the “other land” class of Chincoteague and Unimproved marsh community types (unpub. data, 2001).

**Basin Boundary**: These boundaries include the shared area between the hydrologic basins defined by DWPIEA (1995) and the boundary of the LCA study (Gunn and others, 2003).

**Hurricane Track**: Data were filtered to depict areas of loss and gain greater than 2.7 acres (1.1 ha) in size to remove background noise and to increase confidence in the depicted trends.

Data Series 281

U.S. Department of the Interior
U.S. Geological Survey
Pre-Katrina: Beneficial Use of Dredged Material
# Beneficial Use of Dredged Material

(* Marsh Habitat  ** Barrier Island Habitat)

<table>
<thead>
<tr>
<th>Navigation Channel</th>
<th>Year</th>
<th>Authority</th>
<th>Marsh/ Barrier Island Acreage</th>
<th>Cubic Yards Discharge</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houma Navigation Canal (Wine Island)</td>
<td>1991</td>
<td>1135</td>
<td>18.7**</td>
<td>600,000</td>
<td>$400,000</td>
</tr>
<tr>
<td>Barataria Bay Waterway (Grand Terre)</td>
<td>1996</td>
<td>204</td>
<td>86**</td>
<td>666,258</td>
<td>$1,133,000</td>
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<tr>
<td>Barataria Bay Waterway (Grand Terre)</td>
<td>1999</td>
<td>204</td>
<td>94*</td>
<td>620,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Barataria Bay Waterway (Dupre Cut)</td>
<td>1999</td>
<td>204</td>
<td>70*</td>
<td>580,000</td>
<td>$78,000</td>
</tr>
<tr>
<td>Calcasieiu River (Brown Lake)</td>
<td>1999</td>
<td>204</td>
<td>132*</td>
<td>1,960,639</td>
<td>$1,064,000</td>
</tr>
<tr>
<td>Calcasieiu River (SNWR)</td>
<td>1993</td>
<td>1135</td>
<td>340*</td>
<td>1,840,243</td>
<td>$259,852</td>
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<tr>
<td>Calcasieiu River (SNWR)</td>
<td>1996</td>
<td>204</td>
<td>360*</td>
<td>1,291,236</td>
<td>$537,000</td>
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<tr>
<td>Calcasieiu River (SNWR)</td>
<td>1999</td>
<td>204</td>
<td>230*</td>
<td>1,394,000</td>
<td>$806,000</td>
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<tr>
<td>MR-GO (Mile 14-12)</td>
<td>1999</td>
<td>204</td>
<td>50*</td>
<td>1,600,000</td>
<td>$353,000</td>
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<tr>
<td>MR-GO (Breton Island)</td>
<td>1999</td>
<td>204</td>
<td>125**</td>
<td>1,101,000</td>
<td>$175,000</td>
</tr>
<tr>
<td>MR-GO (Mile 14-12)</td>
<td>2003</td>
<td>204</td>
<td>40*</td>
<td>1,513,221</td>
<td>$580,000</td>
</tr>
</tbody>
</table>
cubic feet per second

- 1 cubic foot per second (cfs) ≈ 7.5 gallons per second
- Average refrigerator ≈ 25 cubic feet
- 1000 cfs ≈ 40 refrigerators per second
- 8000 cfs ≈ 320 refrigerators per second
Caernarvon Diversion (1991)
Delacroix, Louisiana
Comparison of Marsh Shears Before and After Hurricanes Katrina and Rita
(Landsat 5 Thematic Mapper Satellite Imagery)

November 7, 2004
October 25, 2005

Image Source:
Landsat 5 Thematic Mapper Satellite Imagery is provided by the USGS Center for Earth Resources Observation and Science. Bands 4 (near-in), 5 (mid-in), and 3 (visible red) are displayed.
Davis Pond Freshwater Diversion (2002)
Coastal Wetlands Planning, Protection and Restoration Act Projects by Construction Status

CWPPRA Projects:
- Green: Project is Constructed
- Pink: Project is in Engineering and Design

Background Imagery: 2010 LandSat TM Mosaic Band 5
Map Date: June 16, 2016
Data accurate as of June 15, 2016
Coast 2050 Plan (1998)

Coast 2050 Ecosystem Strategies

- Protect Shoreline
  - Keep shoreline in place in critical areas
- Maintain Shoreline Integrity
  - Let shore roll back, but prevent interior marsh erosion.
- Maintain Sabine River Inflow
- Maintain Atchafalaya Mudstream
  - Continue shoreline accretion along Chenier Plain.
- Improve Hydrology Drainage
  - Lower water levels in swamps. Allow more natural flow of water. Provide flood protection if necessary.
- Reduce Sedimentation in Cote Blanche Bays and Vermilion Bay and Maintain as Brackish

- Lower Water Levels
  - Modify flow patterns to tidal marshes to the south.
- Move Fresh Water South into Tidal Marshes
  - Move Atchafalaya waters into tidal marshes. In Chenier Plain, use water from lakes to freshen southern brackish marshes.
- Beneficial Use of Dredged Material or Dedicated Dredging
  - Create marsh in various sites along the coast.
- Maximize Land Building in Atchafalaya Delta
  - Separate navigation from delta. Train sills toward Four League Bay.
- Maintain Land Bridges
  - Preserve the three land bridges to prevent marine forces from moving inland and large lakes from joining.

- Small Diversions from Mississippi River (<=5,000 cfs)
  - Allow river water and nutrients to nourish swamps and marshes. Food protection where needed. Provide outfall management.
- Optimize Atchafalaya Flow to West and East
  - Use Atchafalaya sediments and nutrients to preserve marshes.
- Conveyance Channel from Mississippi River to Build Deltas
  - Build marsh and nourish adjacent wetlands in area of highest land loss.
- Solve the Mississippi River Gulf Outlet Problem
  - Close MRGO when deep-draft container facilities are available on river. In interim, stabilize north bank, purchase oyster leases, create marsh in southern lobes of Lake Borgne.
- Delta-building Diversions from Mississippi River (15,000-100,000 cfs)
  - Build marsh and nourish adjacent marsh. Address oyster issues.
- Multi-purpose Control of Navigation Channels
  - Prevent saline waters from continuing to damage marshes to north. Retain fresh water.
West Bay
Wetland Creation
2009, 2014, & future
(adaptive mgt & monitoring)
MRGO Ecosystem Restoration (2012)
Critical restoration features:
1) Mississippi River Gulf Outlet Canal (MRGO) environmental restoration
2) Small Diversion at Hope Canal
3) Barataria Basin Barrier Shoreline Restoration
4) Small Bayou Lafourche reintroduction
5) Medium diversion at Myrtle Grove with dedicated dredging
6) Multipurpose operation of the Houma Navigation Lock
7) Terrebonne Basin Barrier Shoreline Restoration
8) Convey Atchafalaya River water to northern Terrebonne marshes
9) Small Diversion at Convent/Blind River
10) Amite River Diversion Canal Modification
11) Medium Diversion at White Ditch
12) Gulf Shoreline at Point Au Fer Island
13) Land bridge between Caillou Lake and the Gulf of Mexico
14) Modification to the Caernarvon diversion
15) Modification to Davis Pond diversion
WRDA 2007 Authorized LCA Program Components

- Sec. 7006(c)(1) – LCA 5 near-term projects conditionally authorized for construction.
- Sec. 7006(e)(1) – LCA 4 additional projects contingently authorized, subject to feasibility studies.
- Sec. 7006(e)(3) – LCA 6 addition projects contingently authorized, subject to Chief of Engineers Report.
- Four (4) other program elements
  - Sec. 7002 - Comprehensive Plan
  - Sec. 7005 - Modifications to Existing Projects (Mod to Davis Pond; Mod to Caernarvon)
  - Sec. 7006(b)(1) - Demonstrations Projects
  - Sec. 7006(d) - Beneficial Use of Dredged Material (BUDMAT)
- Sec. 7002 Investigations of other large scale concepts.

*Total LCA Ecosystem Restoration $1,996,500,000
### LCA 5
1. Barataria BBS
   - Chief’s Report 22 June 2012
   - Feasibility completed never initiated PED
   - State submitted permit request to construct a 75,000 CFS diversion – permit request under MVN review; LCA feasibility study being brought to orderly shutdown due to lack of required State cost-share funding

2. Myrtle Grove
   - FCSA 19 May 2010
   - Feasibility Study not initiated under LCA at State’s request
   - State pursuing outside LCA program


### LCA 6
   - Design Agreement 9 Dec 2011
   - State formally requested suspension 20 Aug 2012; PED suspended

11. Convent/Blind River
   - Design Agreement 9 Dec 2011
   - State formally requested suspension 20 Aug 2012; PED suspended

### Other LCA Components
- Science and Technology
  - Orderly shutdown 11 July 2011 in accordance w/ MG Walsh letter
  - State unwilling to execute PPA, State developed The Water Institute of the Gulf

- Beneficial Use of Dredged Material
  - Director’s Report February 2010
  - Currently Executing Construction Funds for various BUDMAT project

- Demonstration Projects
  - MVN developing Implementation Plan for ASA (CW) approval
  - State has been inconsistent in their interest in pursuing Demo Projects

- Miss River Hydro/Delta Management
  - TSP 26 Apr 2016
  - Feasibility study ongoing; TSP Apr; ADM 9 Sep 16 Chief’s Report for DM scheduled for 28 Apr 2017

- New Orleans District Coastal Restoration Scorecard
As of 12 Feb 2016
LCA Update

- May 25, 2016 Letter LA State signed credit agreements seeking credit for design & construction of:
  - Terrebonne Basin Barrier Shoreline Restoration (Whiskey Island)
  - Barataria Basin Barrier Shoreline (Caminada Headland & Shell Island)
  - Amite River Diversion Canal Modification
  - Small Bayou Lafourche Reintroduction

- State requests utilize credit granted for above in order to implement following:
  - Terrebonne Basin Barrier Shoreline
  - Barataria Basin Barrier Shoreline (Back Barrier Marsh Creation)
  - Beneficial Use of Dredged Material
  - Small Diversion at Convent/Blind River
  - Southwest Coastal Louisiana
Southwest Coastal Louisiana (2016)

- Study Area: 4,700 square mile (3,000,800 acres)
- NED Plan had nonstructural risk reduction for about 4000 structures
- NER Plan: 49 ER measures address critical land loss and ecosystem degradation, stabilize the wetland perimeter geomorphology
- Restore net total 15,448 acres
  - 9 marsh restoration: net total 7,900 acres
  - 5 shoreline protection: net total 6,135 acres
  - 35 chenier reforestation: 1,413 acres live oak and hackberry

* Includes protection of 335 acres of designated critical wintering habitat threatened piping plover / rufus red knot
Southwest Coastal Louisiana Feasibility Study Measures
Calcasieu-Sabine Basin - NER Recommended Plan

Measure ID | SWCLA Measure Name
--- | ---
124c | Marsh Creation at Mud Lake
124d | Marsh Creation at Mud Lake
2a1 | Beneficial Use of Dredged Material from Calcasieu Ship Channel
3c1 | Beneficial Use of Dredged Material from Calcasieu Ship Channel
416 | Chenier, Ridges: Grand Chenier, Ridge
510a | Restore Blue Buck Ridge
510b | Restore Blackberry Ridge
510d | Restore Front Ridge
5a | Holly Beach Shoreline Stabilization

Southwest Coastal Louisiana
Southwest Coastal Louisiana Feasibility Study Measures
Mermentau/Teche-Vermilion Basin - NER Recommended Plan

Southwest Coastal Louisiana

- Southwest Coastal Louisiana Feasibility Study Measures
- Mermentau/Teche-Vermilion Basin - NER Recommended Plan

Measure ID | SWCLA Measure Name
---|---
127c-3 | Marsh Creation at East Pecan Island
16b | Fortify Spill Banks of GIWW & Freshwater Bayou
306a1 | Rainey Marsh Restoration - Southwest Portion (Christian Marsh)
416 | Chenier Ridge: Grand Chenier Ridge
47a1 | Marsh Restoration Using Dredged Material South of Highway 82
47a2 | Marsh Restoration Using Dredged Material South of Highway 82
47c1 | Marsh Restoration Using Dredged Material South of Highway 82
509c | Restore Bill Ridge
509d | Chenier Ridge: Cheniere au Tigre
510d | Restore Front Ridge
5b1 | Gulf Shoreline Restoration: Calcasieu River to Freshwater Bayou
5b2 | Gulf Shoreline Restoration: Calcasieu River to Freshwater Bayou
5b3 | Gulf Shoreline Restoration: Calcasieu River to Freshwater Bayou

Legend:
- Bankline/Shoreline Stabilization
- Ridge Restoration
- Marsh Creation
- Mermentau and Teche-Vermilion Basins
- Southwest Coastal Study Boundaries
- Parish Boundaries

Map Scale: 1:475,000

Coastal Protection and Restoration Authority of Louisiana
1M 2008 Digital Orthoimagery Quartet Quadsheets
Map Date: April 25, 2014
File path: C:\1404214\0000
Mississippi River Hydrodynamic and Delta Management Study (ongoing)
LAND CHANGE BY YEAR 2070

MID DIVERSIONS

Net Land Gain
34,200 acres

Mid-Diversions Year 50
Landscape Change Referenced to FWOP

- Land Loss
- Land Sustained
- Land Gained

0 3 6 12 18 24 Miles
USGS (2013):

Our findings suggest that despite the efficacy of restoration projects in mitigating losses in certain areas, net loss of wetlands in coastal Louisiana is likely to continue. Model results suggest certain areas may eventually be lost regardless of proposed restoration investment, and, as such, other techniques and strategies of adaptation may have to be utilized in these areas.
Future

- FY1991 $9.4 billion budget
  - Ecosystem restoration: $1 billion
- FY2017 (proposed): $4.6 billion requested
  - Ecosystem Restoration: $374 million

HOW CAN YOU MAKE A PROPOSAL?

WRRDA 2014 Section 7001: Proposals for Future Water Resources Development projects:

http://www.wrrda7001proposals.us/

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