Monitoring Wetlands and Waters in Coastal Louisiana

Richard Raynie
*Coastal Protection and Restoration Authority*
Monitoring Program Evolution

- WATER-LEVEL and SALINITY RECORDER
- FELDSPAR PLOT FOR MEASURING ACCRETION RATES
- Topo/Bathy Surveys
- Habitat Mapping
- Land Loss
- Sediment Characterization
- Vegetation Characterization
- Shoreline Position

CWPPRA Project Areas and Coastwide Reference Monitoring Stations

Vegetation Plot (1m and 2m)
CWPPRA Restoration Projects
Project Specific to Programmatic Monitoring

Project-Specific
- Inconsistent variables
- Short term data records
- Inadequate spatial coverage
- Unsuitable or no reference areas

Programmatic (CRMS)
- Coverage in all marsh types
- Consistent variables
- Monitoring sites inside and outside of project boundaries
- Provides improved baseline for unconstructed projects
- Population of reference sites
- Evaluate wetlands at multiple scales

1990’s

2000’s
Coastwide Reference Monitoring System (CRMS) Site Design

Non-spatial data collection

Spatial data collection

2000’s
Aerial Photos –
   Habitat Mapping - (7 habitats – beach, marsh, bare land, barrier vegetation, inter-tidal, structure, water)
   Land Loss

Topographic Surveys - LiDAR (entire sandy beach or entire island if not attached to headland)

Bathymetric Surveys - 1500’ perpendicular line spacing bayside to 6600’ offshore, 3000’ and 6000’ shore parallel lines, 2500’ grid outside of 2 mi

Sediment Sampling - 7 grab samples from offshore DoC, cross-shore to bays
Data Management & Analytical Tools
Coastwide Reference Monitoring System (CRMS) Data Management

[Image of the Coastwide Reference Monitoring System (CRMS) website, showing a map with various data layers and a pop-up window with site information and data availability.]
CRMS Indices
Comparison across multiple spatial scales

- **Hydrologic – HI**
  suitability of average salinity and % time flooded in maximizing vegetative primary productivity

- **Floristic Quality - FQI**
  Species assigned scores based on fidelity to a marsh type and whether they indicate wetland stability or disturbance
CRMS Report Cards

- Baseline period from 2006-2009 was established to assess existing distribution of index scores of all CRMS sites
- FQI=Floristic Quality
- HI=Hydrologic
- SVI=Submergence Vulnerability
- LI= Land Index (in development)
How are Data Utilized?

Coastal Protection and Restoration Authority of Louisiana
Office of Coastal Protection and Restoration
2009 Operations, Maintenance and Monitoring Report

For

DELTA WIDE CREVASSES

State Project Number M2.09
Project Project Lot 6

August 1, 2009
Plaquemines Parish

Prepared by:

Bryan Grossman
CPRA Office of Coastal Protection and Restoration
New Orleans Field Office
6000 Jefferson Highway
New Orleans, LA 70122
Data Utilization
Master Plan Models

Stage, Salinity, Water Quality
- Stage, Salinity
- Land Configuration, Elevation

1. Ecohydrology
   - Stage, Salinity, Sediment
   - Land Configuration, Elevation

2. Wetland Morphology
   - Dominant Vegetation
   - Land Configuration, Elevation

3. Vegetation
   - Dominant Vegetation
   - Island Configuration
   - Surge, Waves

4. Ecosystem Services

5. Barrier Shoreline Morphology
   - Stage
   - Storm Surge/Waves

6. Storm Surge/Waves
   - Surge, Waves
   - Risk Assessment
Data Utilization
Project Planning: hydrologic models

CRMS-2418

Water Level (ft)

-2.0
-1.0
0.0
1.0
2.0
3.0

Jan-12 Feb-12 Mar-12 Apr-12 May-12 Jun-12 Jul-12 Aug-12 Sep-12 Oct-12 Nov-12 Dec-12

Observed
Sim

Cameron-Creole Watershed
Data Utilization
Engineering & Design:

Water Level Range - CRMS4103-H01 2014

CRMS4103
Elevation Change and Vertical Accretion (cm)

Recolonized Marsh Vegetation Data
Site CRMS4103 - All Plants
Sample Date 08/27/2012

CRMS 4103
Bayou DuPont
Marsh Creation
Data Utilization (operation, maintenance, monitoring, and adaptive management)

OMMAM and Performance Assessment

Cameron Creole Watershed Salinity

Graph showing salinity levels over time in the Cameron Creole Watershed.

Graph showing continuous hydrographic salinity and discrete soil porewater salinity daily means of continuous (H01) and means of discrete porewater (P01, P02, P03).

Coastal Protection and Restoration Authority of Louisiana
Data Utilization

Damage Assessment: following a major disturbance

Damage assessments underway when sites are accessible
Original Concept for System-Wide Assessment and Monitoring Program

• Proposed in LCA program in 2004
• Original concept was restoration-centric
Data Needs

- Support Master Plan tools
- Resolve Uncertainties
- Actively and adaptively manage projects and programs
- Evaluate effectiveness of projects and collective effects
- Evaluate socio-economics
- Evaluate risk reduction
SWAMP Scalability

- System-wide Monitoring
- Basin-wide Monitoring Plan
- Project Monitoring Plan
- Applied Research
SWAMP Milestones

1. Develop a **framework** that:
   - Identifies the key parameters necessary for understanding the overall coastal system (**natural and built**) and supporting the coastal protection and restoration program.

2. Develop an **inventory** of ongoing/active monitoring efforts.

(from: Water Institute, 2014)
What are the drivers that cause change to the coastal environment?

**Human Activities**
- Restoration
- Ecosystem Utilization

**System Processes**
- Atmospheric & Oceanic Processes
- Geological Processes
- Groundwater & Surface Water Inputs

**System Responses**
- Land
- Water
- Atmosphere
- Groundwater
- River
- Fish and Wildlife

(from: Water Institute, 2014)
Agencies Currently Collecting Data

State Agencies
- CPRA
- LDWF
- LDEQ
- LDNR
- DHH
- LED
- GOHSEP
- Dept. Insurance

Federal Agencies
- USGS
- USACE
- NOAA
- USFWS
- EPA
- NRCS
- FEMA
- US. Census Bureau

Other
- National Audubon Society
- Lake Pontchartrain Basin Foundation
- The Nature Conservancy
- Levee Districts
- Local Governments and Communities
SWAMP Data Inventory
What do we need?

- What data do we need to address CPRA’s objectives

**Landscapes: Land Area**
- Satellite Imagery
- Aerial Photography

**Biotic Integrity: Vegetation Community**
- Vegetation Survey
- CRMS Veg Data
- Remote Data (NDVI, etc.)

**Socio-economics: Ecosystem Dependency**
- Census Data
- Community Surveys
- Tourism and Recreational Data

**Community Resources: Protection Level**
- Miles of Levees
- Height of Levees
- Protected Acres
- Homes Above BFE
- Severe or repetitive loss

**Data Needs**
- Satellite
- Aerial
- Veg Survey
- CRMS Veg
- NDVI
- Census Data
- Levee Surveys
- Home Surveys
SWAMP Development Process

1. Identify Monitoring Variables and Objectives
   - Population and Demographics
   - Biotic Integrity
   - Water Quality

2. Identify Data Gaps
   - Existing monitoring: No additional monitoring needed
   - Supplemental monitoring may be needed
   - No existing monitoring; plan; Monitoring plan needed

3a. Design and Analysis
   - Barataria: Data Density Required
   - N = 65
   - Coastwide: N = 50

3b. Feasibility and Reassessment
   - Site Selection (Barataria Only)

4. Monitoring Plan
   - Detailed Assessment of Required Additional Monitoring
   - Conceptual Framework and Broad Data Needs

(from: Water Institute, 2014)
SWAMP supports:

- Adaptive Management
- Planning
- E&D
- Construction
- O&M
- Project/Program assessment
- Focused Applied Research
- Support predictive models
- Informed Decision-making
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<th>SWAMP DESIGN &amp; IMPLEMENTATION TIMELINE</th>
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*Design* through *Implement* with specific milestones and phases indicated.

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*Adaptive Management (living doc)* is ongoing throughout the timeline.

*SWAMP Design* includes:
- Coastwide Framework
- BA Pilot Plan
- BS, PO, MR Plans
- Add’l Basins

*SWAMP Implementation* includes:
- BA Pilot Plan
- BS, PO, MR Plans
- Add’l Basins
SWAMP Design/Implementation Timeline

Decision: ALTERNATIVES for Cost/Benefit

Winter 2014/
Spring 2015

Summer 2015/
Fall 2015

Decision: ALTERNATIVES for E&D