DATA COLLECTION IN SUPPORT OF BASIN WIDE MODEL DEVELOPMENT FOR THE DELTA MANAGEMENT STUDY

Mead A. Allison
mallison@thewaterinstitute.org

Melissa M. Baustian
mbaustian@thewaterinstitute.org
DATA COLLECTION
TEAM EFFORT

• The Water Institute of the Gulf
  – Physical Processes and Sediment Systems
    • Mead Allison
    • Cyndhia Ramatchandirane
    • Dallon Weathers
    • Brendan Yuill
  – Coastal Ecology
    • Tim Carruthers
    • Melissa Baustian
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  • Scott M. Duke-Sylvester
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• Louisiana State University
  • Sibel Bargu and Jamal Mathurin
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  • Sam Bentley
  • Tommy Blanchard

• CPRA (Project Team, Project Manager Elizabeth Jarrell)

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OVERALL PROJECT GOAL

 Produce a calibrated and validated model capable of simulating:

 Morphological evolution processes that occur during the creation of a new (diversion) delta and wetland areas

 Nutrient effects to the wetland vegetation, soil, and the estuarine primary producers of Breton Sound and Barataria Basin.
DATA COLLECTION ACTIVITIES

- Bathymetry of canals and open water bodies (model grid setup)
- Time-series network of hydrological, sediment transport and water quality stations (model c/v)
- Geotechnical and stratigraphic character of “modifiable” unit (model calibration)
- Examination of splay evolution analogue (model hindcasting ability)
- Ecological conditions in estuarine water bodies (model c/v)
- Ecological conditions of wetland vegetation (model c/v)
- Ecological conditions of wetland soils (model c/v)
BATHYMETRY

- **POLE MOUNTED ANTENNA** (LAND & AIRBOAT ACCESS)
- **SINGLE-BEAM BATHYMETRY** (SHALLOW CANALS AND OPEN WATER BODIES)
- **MULTIBEAM BATHYMETRY** (DEEPER AREAS)

Real-time kinematic positioning and Elevation (~1 inch accuracy)
TIME-SERIES NETWORK

<table>
<thead>
<tr>
<th>Season</th>
<th>Deployment Period</th>
<th>Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer/Fall</td>
<td>June 2014 – August 2014</td>
<td>Breton</td>
</tr>
<tr>
<td></td>
<td>August 2014 – October 2014</td>
<td>Barataria</td>
</tr>
<tr>
<td>Winter/Spring</td>
<td>February 2015 – April 2015</td>
<td>Barataria</td>
</tr>
<tr>
<td></td>
<td>April 2015 – June 2015</td>
<td>Breton</td>
</tr>
</tbody>
</table>

Legend:
- Davis Pond Freshwater Diversion
- Caernarvon Freshwater Diversion
- Network Stations
- End-Member Stations
TIME-SERIES NETWORK

NETWORK STATIONS
(YSI EXO2 SONDE, 6/basin)

- PRESSURE (WATER DEPTH)
- WATER TEMPERATURE
- TURBIDITY (NTU converted to mg/l)
- SALINITY
- pH
TIME-SERIES NETWORK

ENDMEMBER STATIONS
(Multiple Instr, 2/basin)

- ECOYSI SONDE
  - Pressure (water depth)
  - Water temperature
  - Turbidity (NTU converted to mg/l)
  - Salinity
  - pH
  - Dissolved Oxygen
  - Chlorophyll

- METEOROLOGY

- AQUADOPP
  - Currents (uplooking)
  - Waves (height, direction, freq.)

- Laser In Situ Scattering and Trans.
  - Particle size and volume
Example of EcoYSI (hourly averaged)

Meteorological data (hourly averaged)
Aquadopp Currents
(one month, depth averaged, July 2014)
LISST suspended particle properties (hourly averaged)
5-6 m vibracores (25/basin)
- Stratigraphy
- Sediment grain size
- Organic content
- Geotechnical properties (strength, porosity, etc.)

Additional set of 50 vibracores and subbottom seismics collected
From lower basin for earlier project
SPLAY EVOLUTION
Caernarvon Freshwater Diversion Splay Evolution

Aquadopp

Mississippi River
River diversion intake
Conveyance channel outlet
Bayou Mandeville

Big Mar receiving basin (2.6 mi²)

LPBF (2014)
SPLAY EVOLUTION

• 2014 BATHYMETRY/ELEVATION MAPPING
  • Splay, Big Mar, Surrounding Canals
  • Establish evolutionary “present”

• HYDRODYNAMICS AND SEDIMENT TRANSPORT**
  • Low and high fw input
  • Summer/fall and winter/sp.
  • Currents time series
  • Flow in canals
  • Suspended sed. character

• BOTTOM SEDIMENT
  • Grain size
  • Bulk properties

** Winter/Spring High and Low Flow postponed until 2016
SPLAY EVOLUTION

• 2014 BATHYMETRY/ELEVATION MAPPING
  • Splay, Big Mar, Surrounding Canals
  • Establish evolutionary “present”
SPLAY EVOLUTION

- BOTTOM SEDIMENT
  - Grain size
  - Bulk properties
BASIN COVERAGE
Data collection in Barataria and Breton basins along a salinity gradient (transect):

- 11 sites in Breton (2014) + 2 sites (2015)
ESTUARINE OPEN WATER SAMPLING

Estuarine Open Water Parameters

Events: June and August 2014; March and June 2015, at each site:

- Secchi disk depth
- Submerged Aquatic Vegetation (SAV, +/-); % cover
- Water column profile (salinity, temperature, depth, pH, dissolved oxygen, chlorophyll a and turbidity with YSI EXO2 water quality sonde and suspended sediment with LISST)
- Dissolved inorganic nutrients (NH4, NO2+NO3, PO4, SiO4, TN, TP)
- Phytoplankton community composition (major groups, HABs)
- Chlorophyll a
- Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC)
- Total Suspended Sediments (TSS)
- Sediment TOC, % water (4 slices: 1 cm, then every 5 cm)
- Sediment Total Nutrients (TN, TP, TC, TFe)
ESTUARINE OPEN WATER

June 2014

Barataria Bay (BB) Estuary

Breton Sound (BS) Estuary
WETLAND VEGETATION AND SOIL

CRMS wetland sites (n= 18) field sampling completed
SEDIMENT DIVERSION SITES
Mid-Breton and Mid-Barataria wetland sites (n=10)
Data collection in Barataria and Breton basins:
- 8 sites in Barataria
- 9 sites in Breton
- 3 sites in Atchafalaya
- 10 sites near Mid-Diversions

Wetland Parameters
End of growing season 2014 (1 data collection trip per basin) and for initial conditions for diversion sites (1 data collection trip per basin), at each site:
- Soil porewater nutrients (NH4, NO2+NO3, PO4, Fe, TN, TP)
- Soil porewater salinity
- Vegetation aboveground biomass (live, dead), taxa, density, stem diameter and height, tissue TN/TP content
- Vegetation belowground biomass (live, dead) and tissue TN/TP content
- Soil organic matter and bulk density
- Soil mineral content
- Soil shear strength
WETLAND VEGETATION – ABOVEGROUND BIOMASS

Mean Live Aboveground Biomass (g C m\(^2\))

<table>
<thead>
<tr>
<th>Target Vegetation Taxa</th>
<th>Biomass (g C m(^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sagittaria latifolia</td>
<td>~70</td>
</tr>
<tr>
<td>Sagittaria lancifolia</td>
<td>~70</td>
</tr>
<tr>
<td>Spartina alterniflora</td>
<td>~400</td>
</tr>
<tr>
<td>Spartina patens</td>
<td>~400</td>
</tr>
<tr>
<td>Typha spp.</td>
<td>~300</td>
</tr>
<tr>
<td>Zizaniopsis miliacea</td>
<td>~300</td>
</tr>
<tr>
<td>Phragmites spp.</td>
<td>~650</td>
</tr>
</tbody>
</table>
MID-DIVERSION SITES

Vegetation Taxa

Spartina alterniflora
Spartina patens
Typha spp.

Mean Live Aboveground Biomass (g C m$^{-2}$)
THANK YOU

MEAD ALLISON
MELISSA BAUSTIAN

@TheH2OInstitute

301 NORTH MAIN STREET, SUITE 2000
BATON ROUGE, LA 70825

(225) 448-2813
WWW.THEWATERINSTITUTE.ORG