



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

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THE WATER INSTITUTE  
OF THE GULF™



# DATA COLLECTION TEAM EFFORT

- **The Water Institute of the Gulf**
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    - Cyndhia Ramatchandirane
    - Dallon Weathers
    - Brendan Yuill
  - Coastal Ecology
    - Tim Carruthers
    - Melissa Baustian
    - Ann Hijuelos
    - Leland Moss
    - Kelly Darnell
    - Caitlin Pinsonat, Blake Thompson, Dominique Henson, Kinsey Vernon, Shannon Matzke
- **University of Louisiana-Lafayette**
  - Scott M. Duke-Sylvester
  - Jenneke M. Visser
- **Louisiana State University**
  - Sibel Bargu and Jamal Mathurin
  - Dubrakvo Justic
  - John White
  - Sam Bentley
  - Tommy Blanchard
- **CPRA (Project Team, Project Manager Elizabeth Jarrell)**

WITH THANKS TO THE LANDOWNERS WHO SUPPORTED THIS WORK



# 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

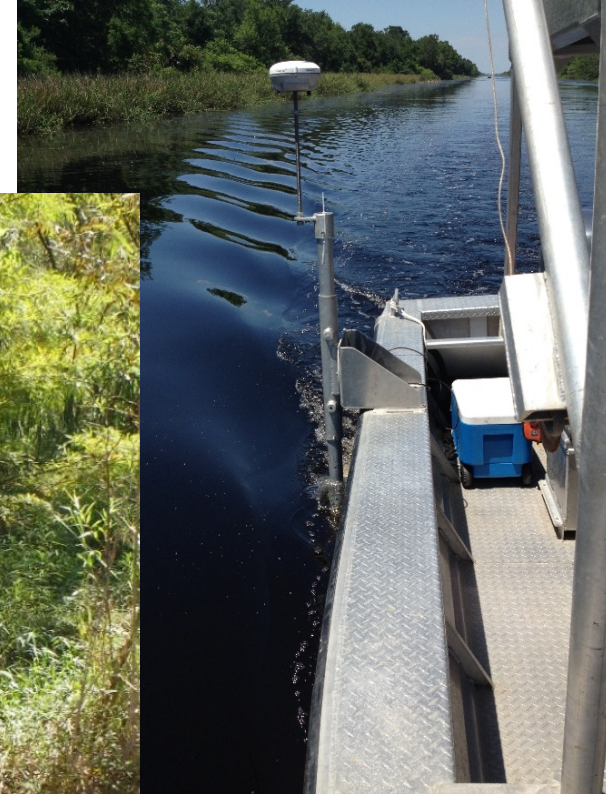
- ◆ Bathymetry of canals and open water bodies (model grid setup)
- ◆ Time-series network of hydrological, sediment transport and water quality stations (model c/v)
- ◆ Geotechnical and stratigraphic character of “modifiable” unit (model calibration)
- ◆ Examination of splay evolution analogue (model 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)



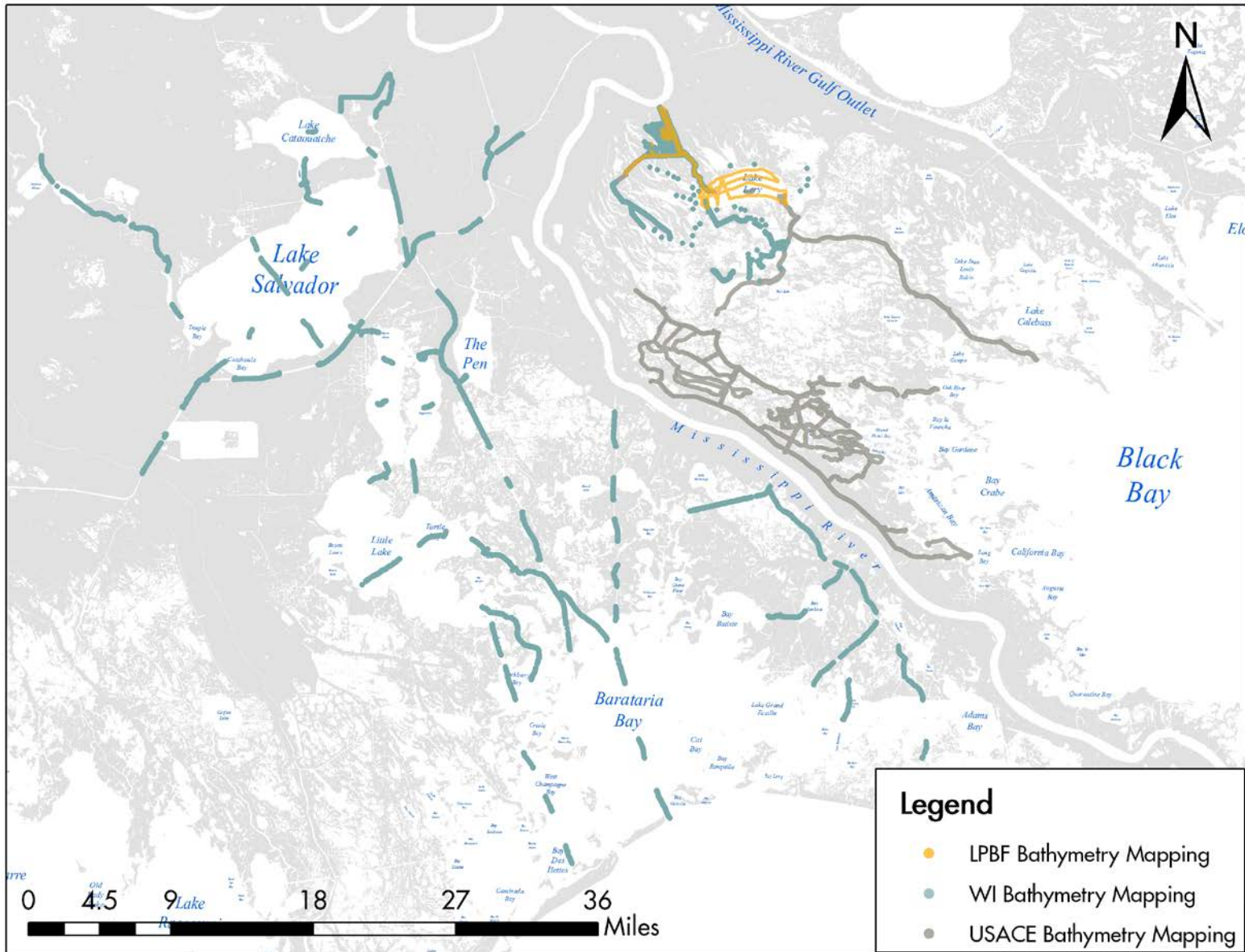
# BATHYMETRY

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

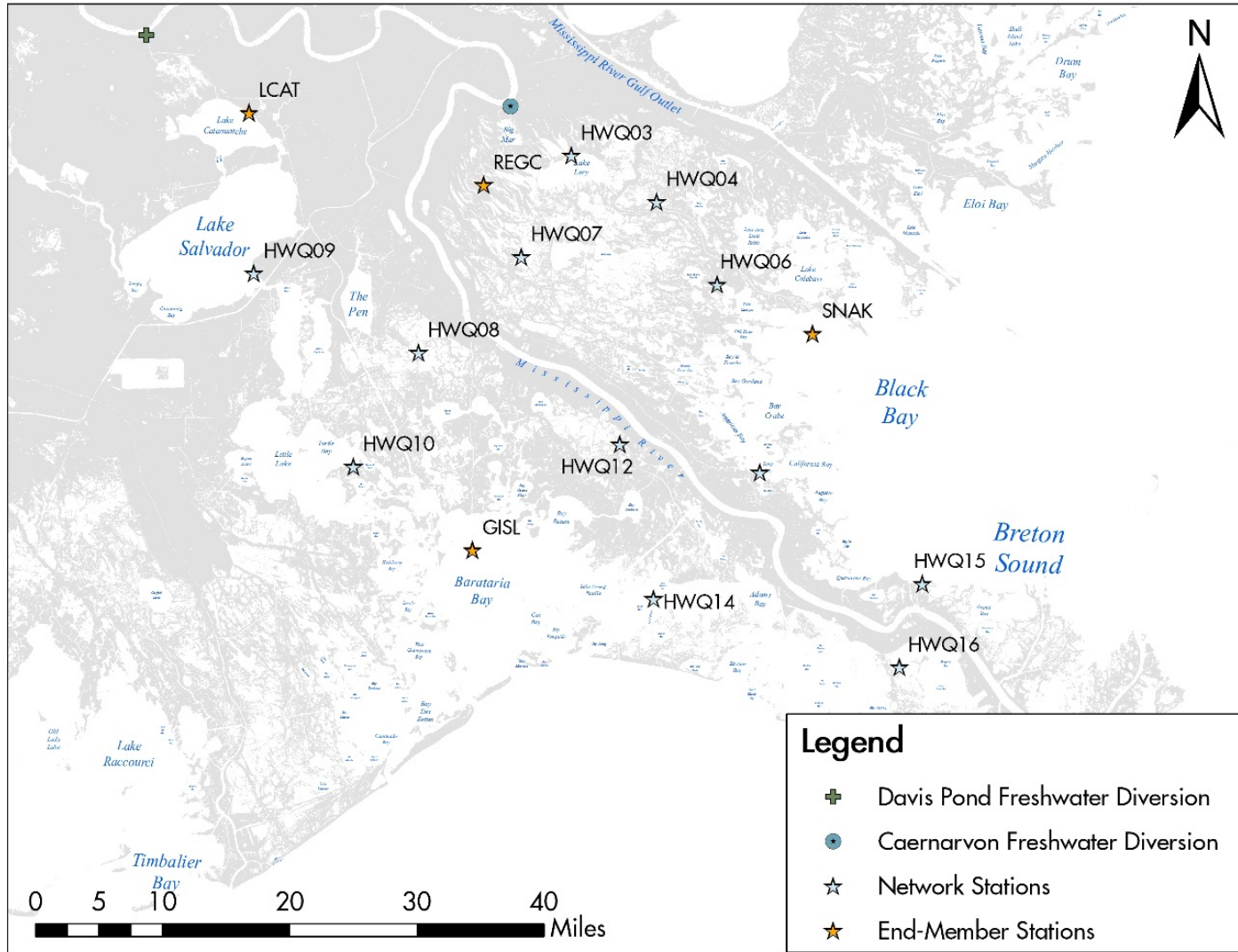
Real-time kinematic positioning and  
Elevation (~1 inch accuracy)



# BATHYMETRY



# TIME-SERIES NETWORK

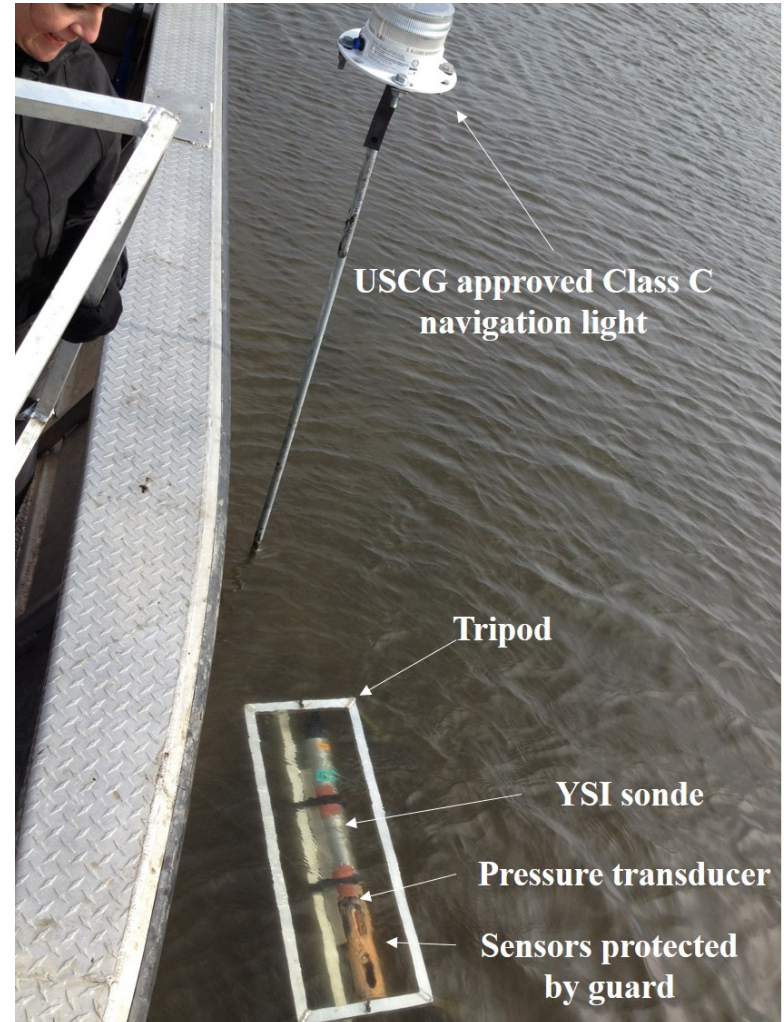


Season	Deployment Period	Basin
Summer/Fall	June 2014 – August 2014	Breton
	August 2014 – October 2014	Barataria
Winter/Spring	February 2015 – April 2015	Barataria
	April 2015 – June 2015	Breton

# 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

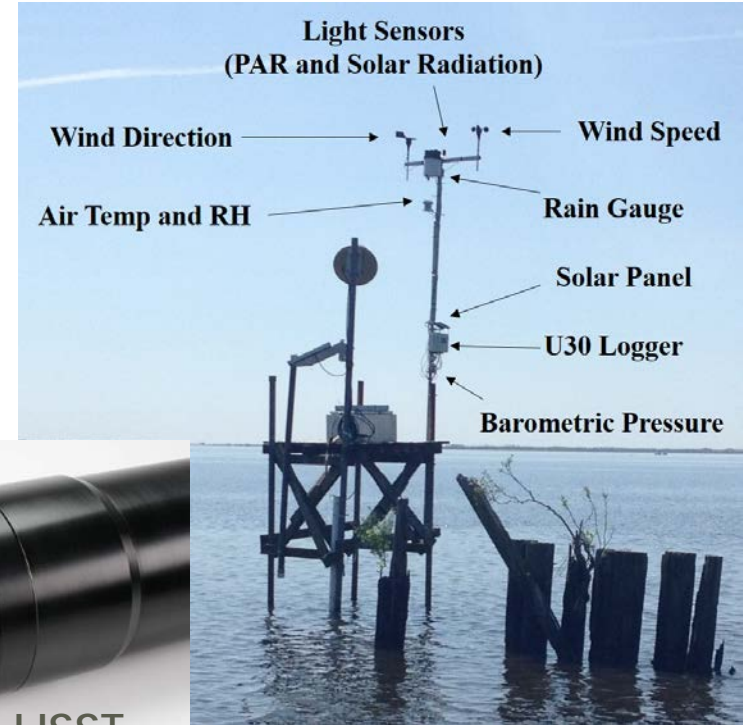
- METEOROLOGY

- AQUADOPP

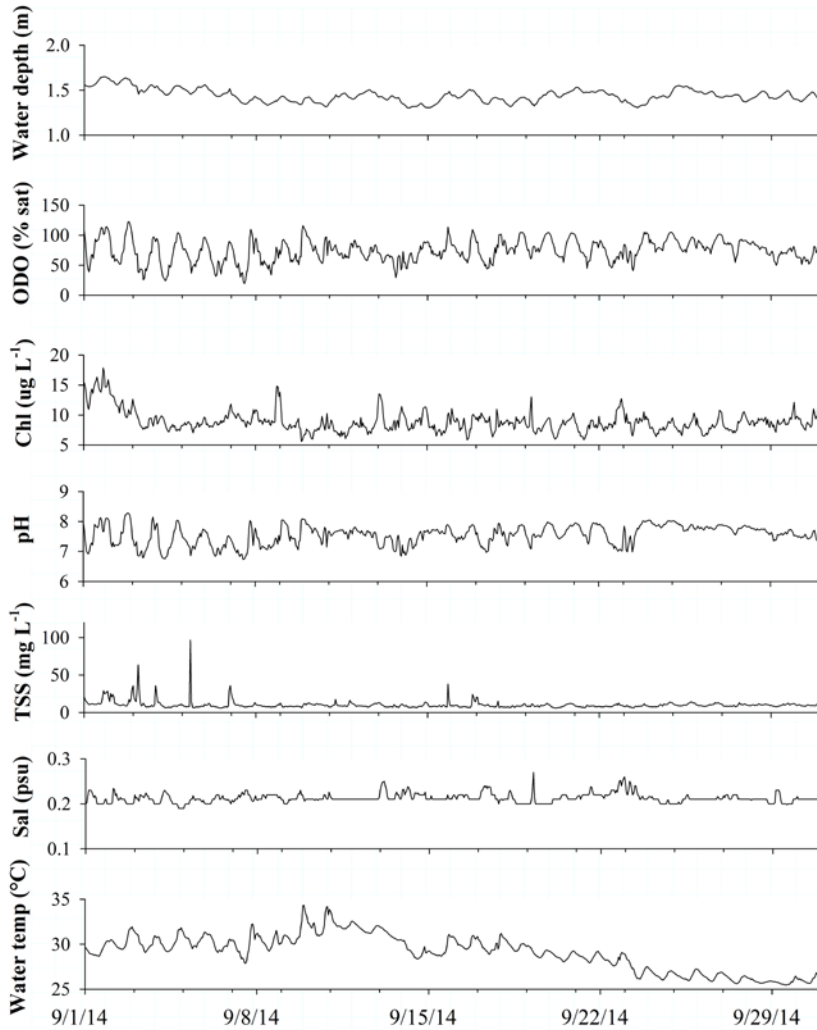
- Currents (uplooking)
- Waves (height, direction, freq.)

- Laser In Situ Scattering and Trans.

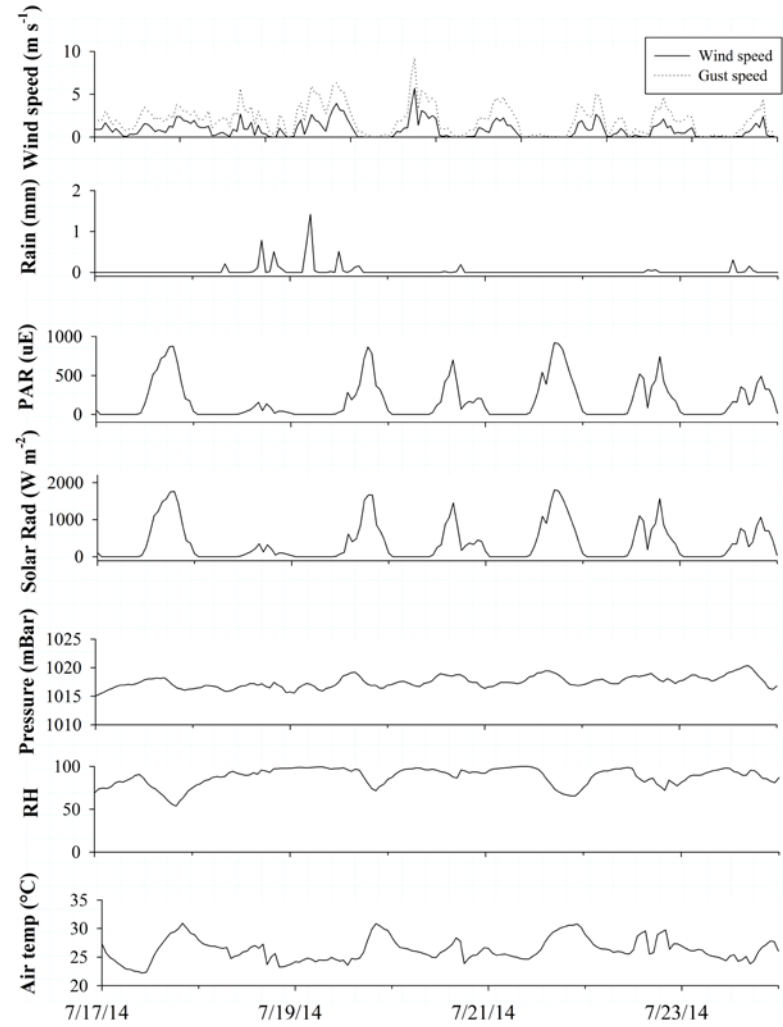
- Particle size and volume



# TIME-SERIES NETWORK



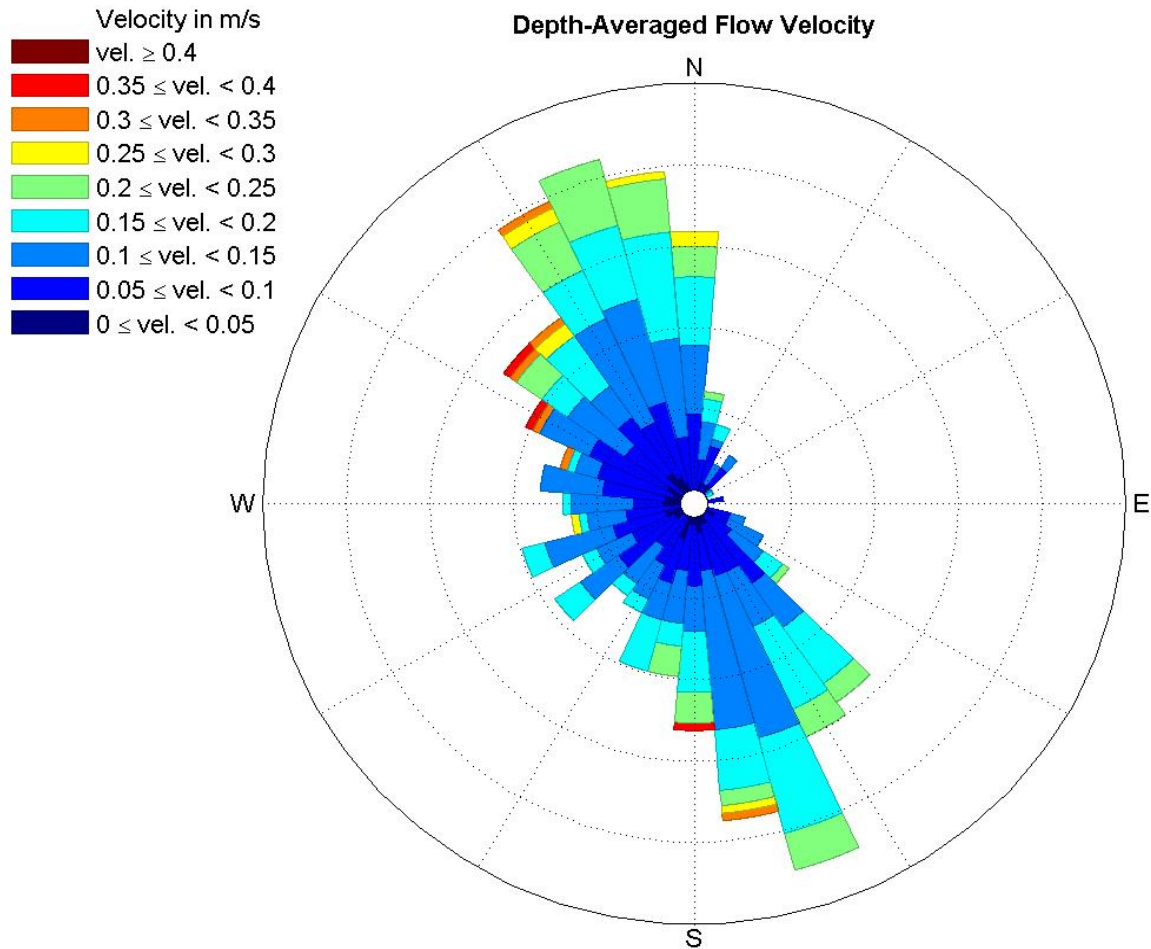
Example of EcoYSI (hourly averaged)



Meteorological data (hourly averaged)



# TIME-SERIES NETWORK

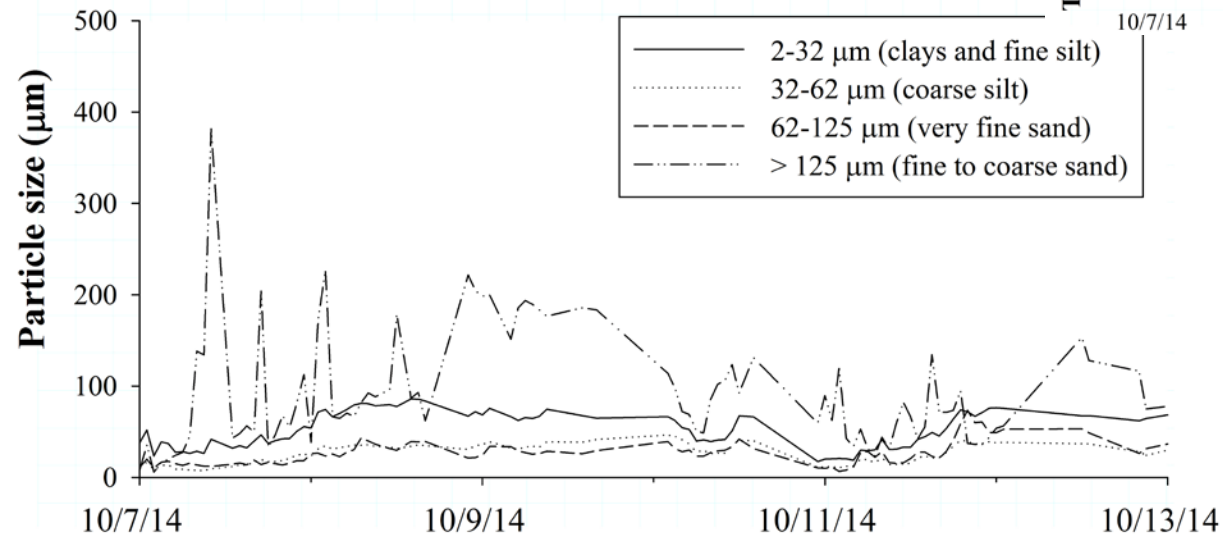
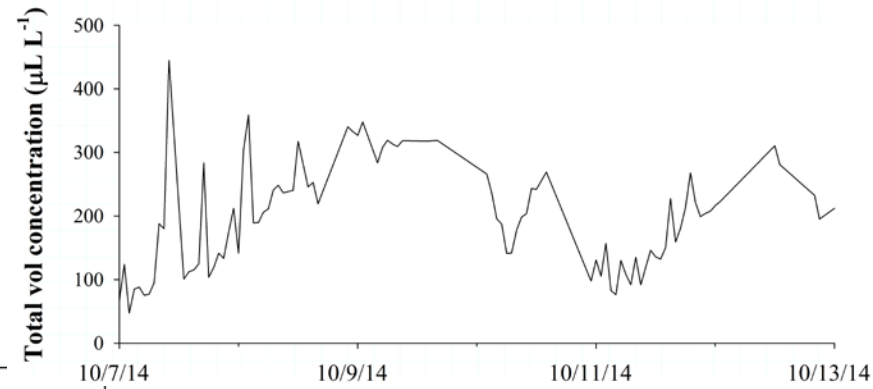
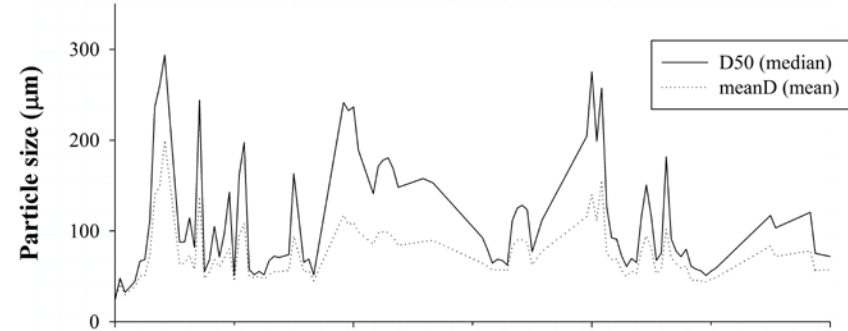


Aquadopp Currents  
(one month, depth averaged, July 2014)



# TIME-SERIES NETWORK

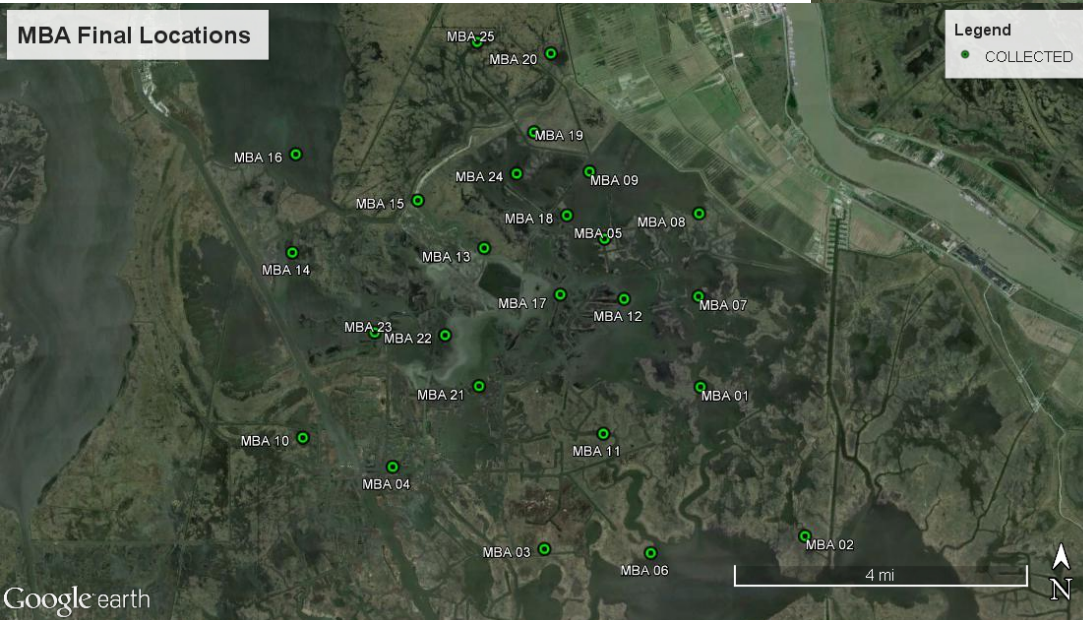
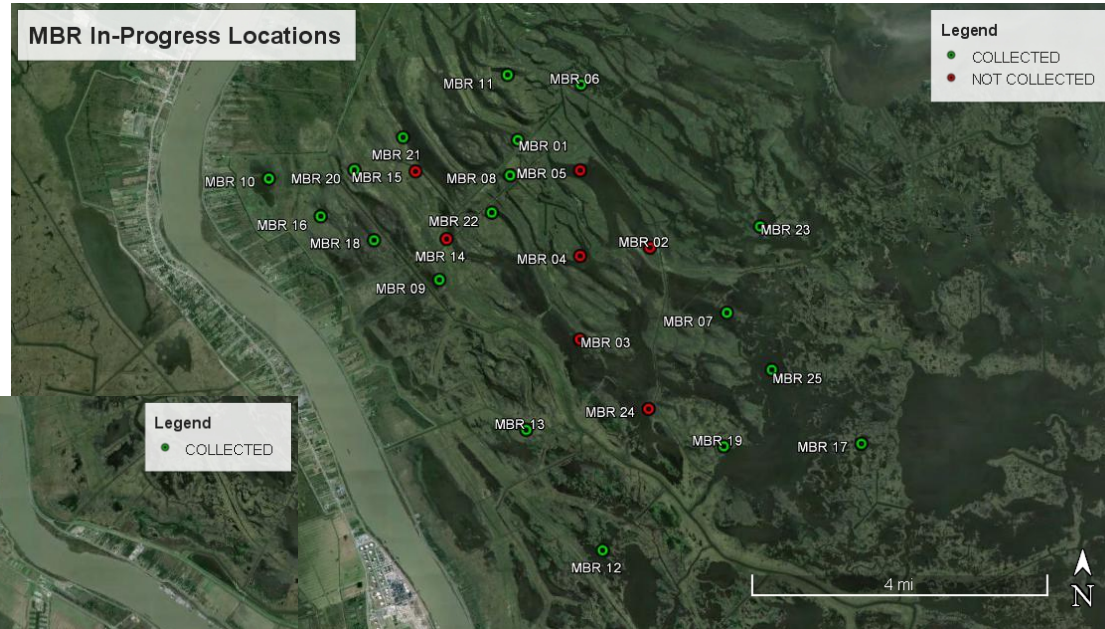
LISST suspended particle properties  
(hourly averaged)



# BASIN GEOTECHNICS AND STRATIRAPHY (LSU, BENTLEY)

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



LPBF (2014)



# SPLAY EVOLUTION

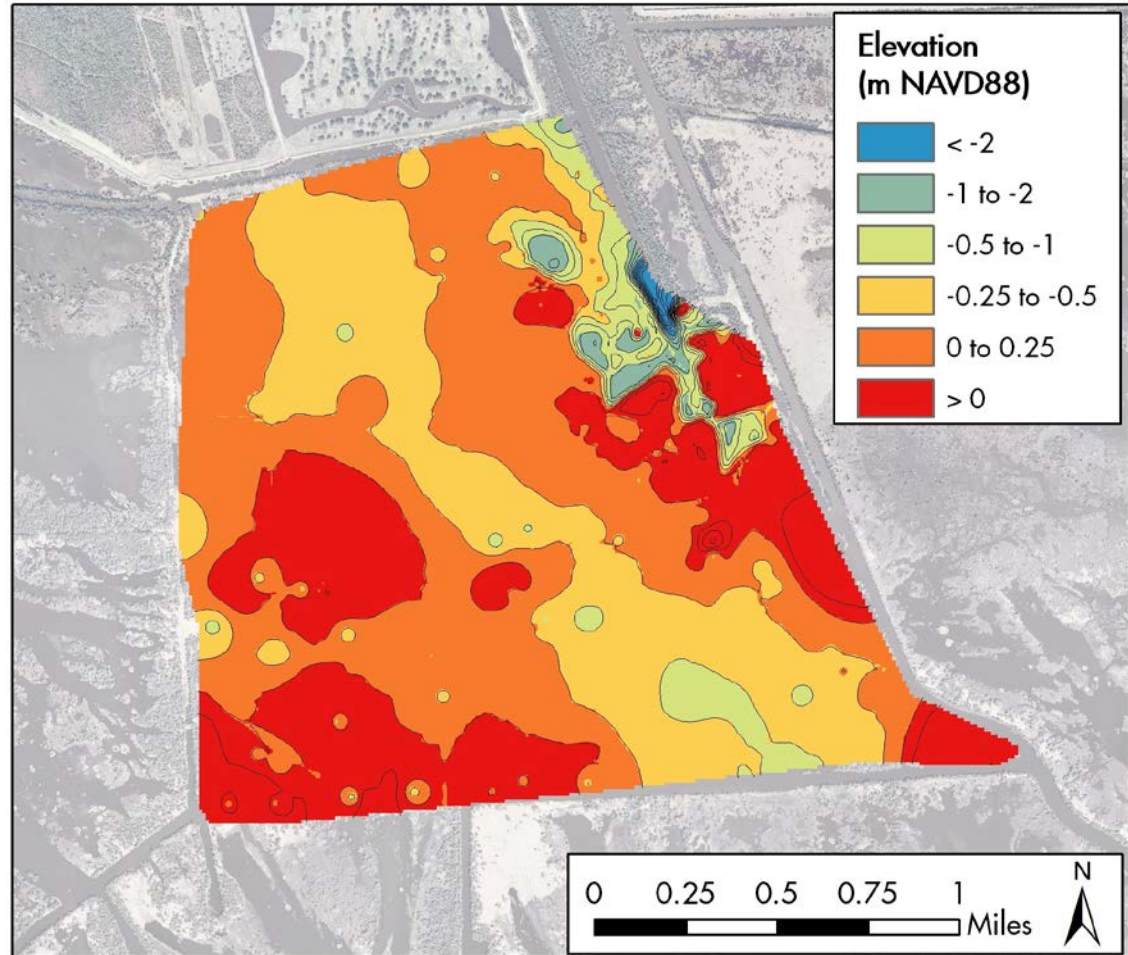
- 2014 BATHYMETRY/ELEVATION MAPPING
  - Splay, Big Mar, Surrounding Canals
  - Establish evolutionary “present”
- HYDRODYNAMICS AND SEDIMENT TRANSPORT\*\*
  - Low and high fw input
  - Summer/fall and winter/sp.
  - Currents time series
  - Flow in canals
  - Suspended sed. character
- BOTTOM SEDIMENT
  - Grain size
  - Bulk properties

\*\* Winter/Spring High and Low Flow postponed until 2016



# SPLAY EVOLUTION

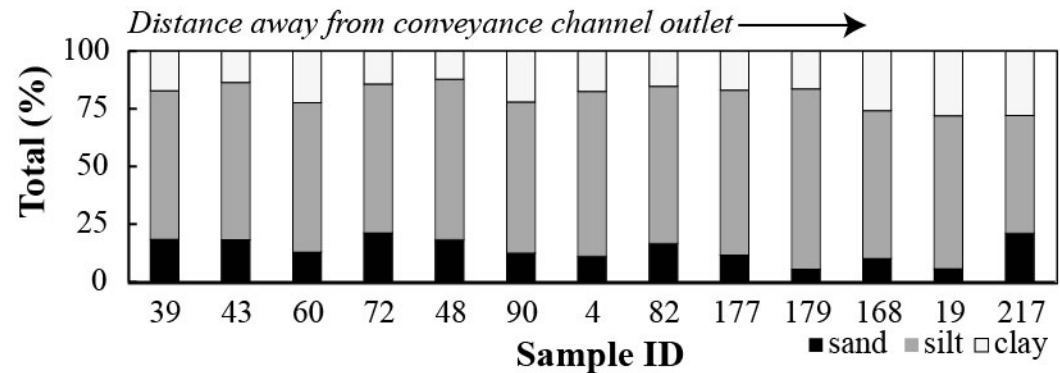
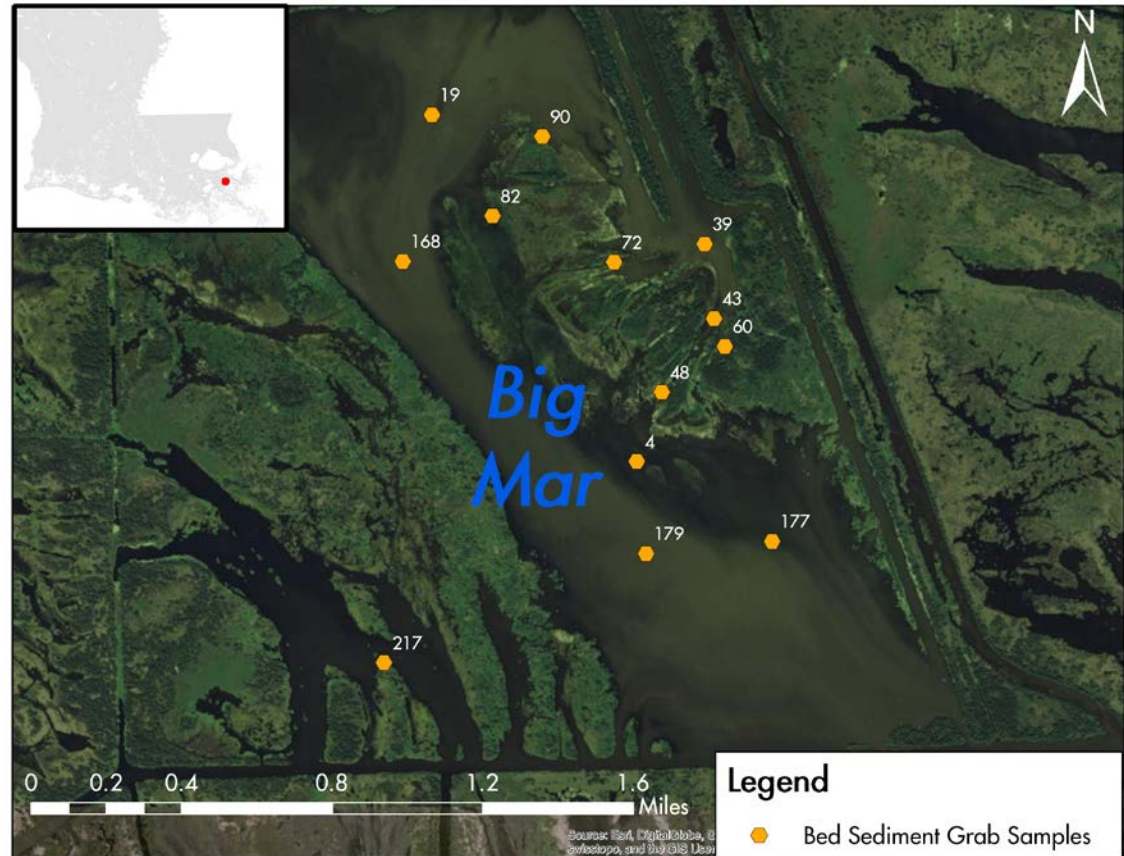
- 2014 BATHYMETRY/ELEVATION MAPPING
  - Splay, Big Mar, Surrounding Canals
  - Establish evolutionary “present”



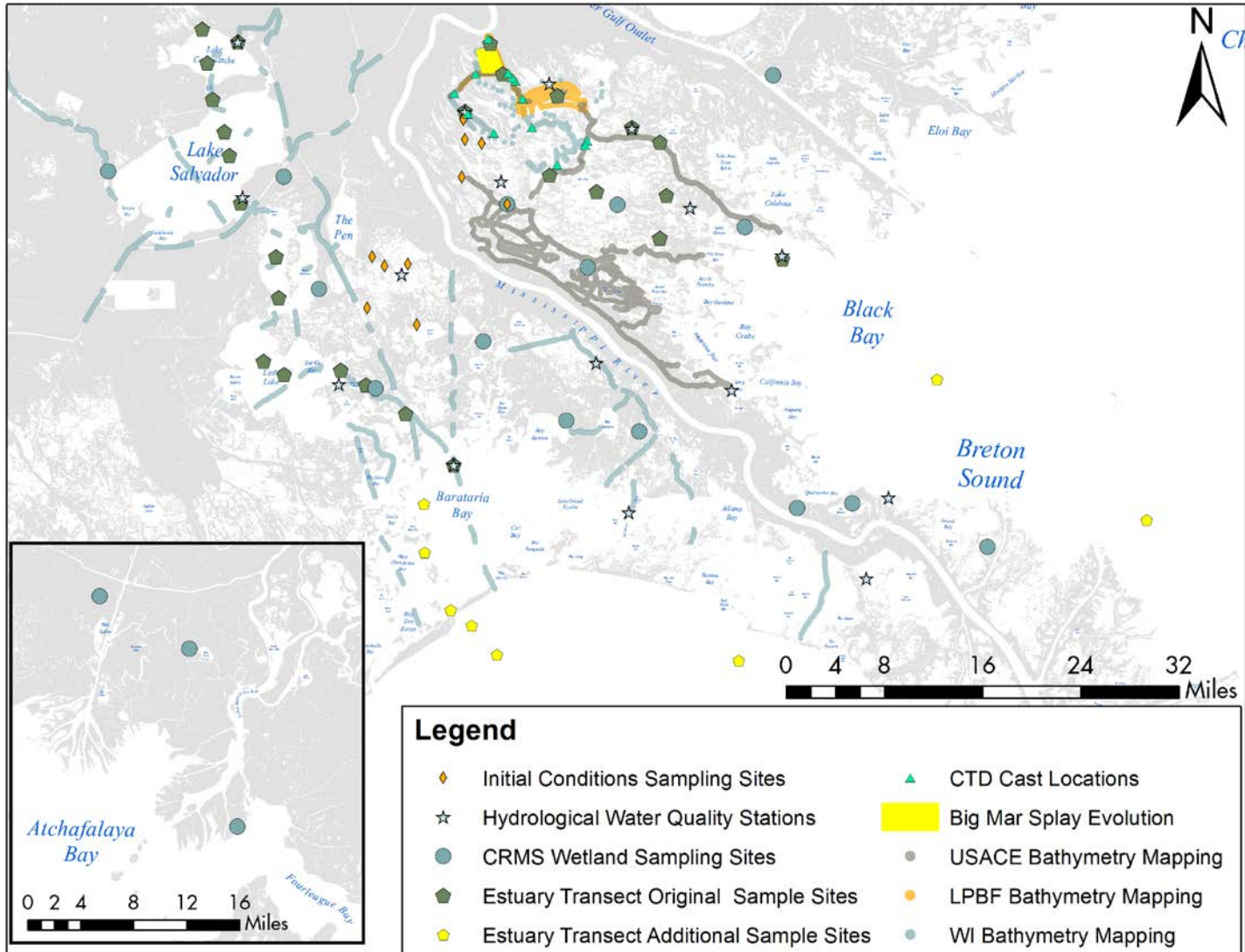


# SPLAY EVOLUTION

- BOTTOM SEDIMENT
  - Grain size
  - Bulk properties



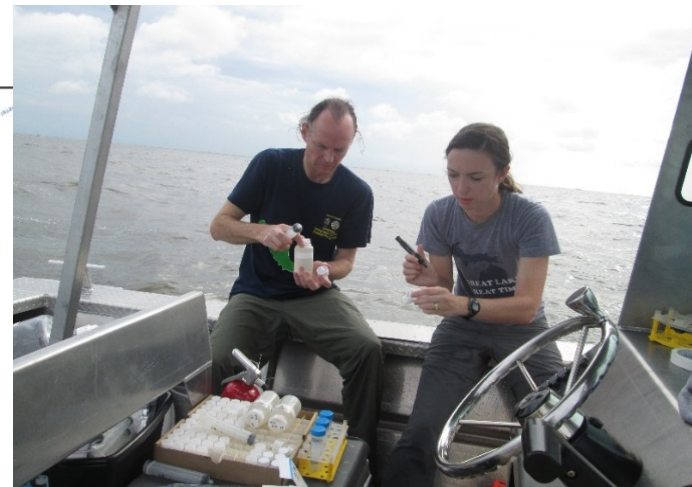
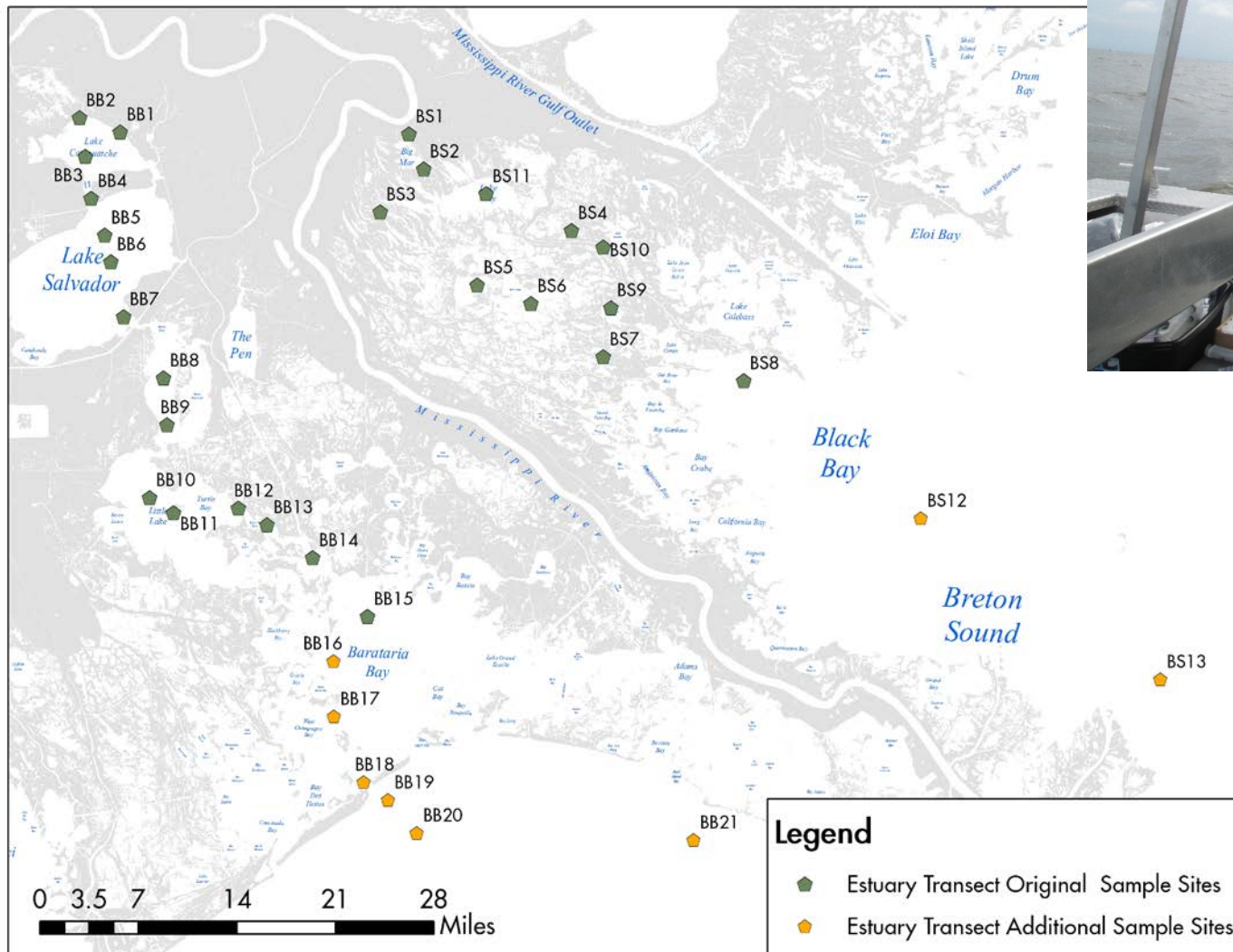
# BASIN COVERAGE



# ESTUARINE OPEN WATER

Data collection in Barataria and Breton basins along a salinity gradient (transect):

- 15 sites in Barataria (2014) + 6 sites (2015)
- 11 sites in Breton (2014) + 2 sites (2015)



# ESTUARINE OPEN WATER SAMPLING

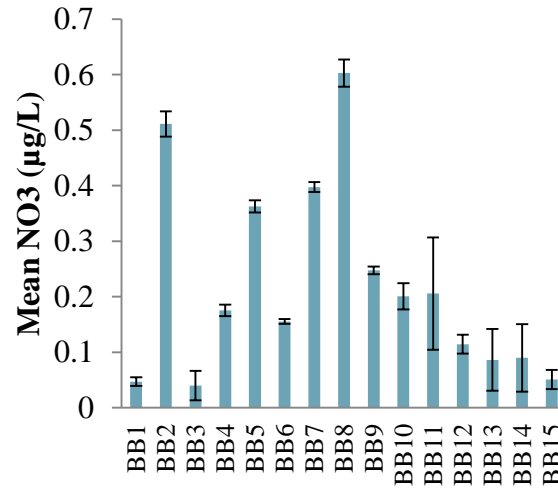
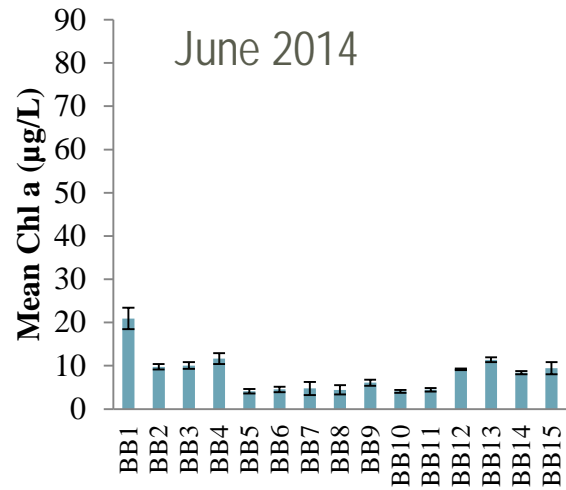
## Estuarine Open Water Parameters

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

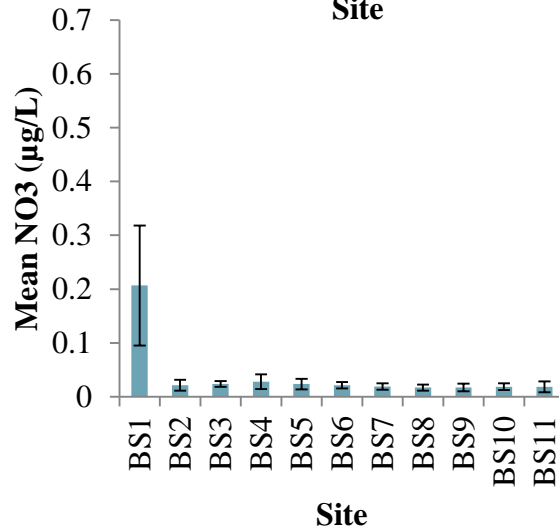
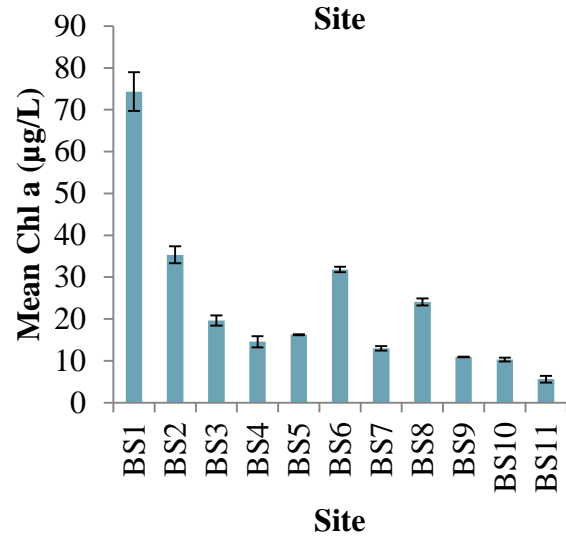
- Secchi disk depth
- Submerged Aquatic Vegetation (SAV, +/-); % cover
- Water column profile (salinity, temperature, depth, pH, dissolved oxygen, chlorophyll *a* and turbidity with YSI EXO2 water quality sonde and suspended sediment with LISST)
- Dissolved inorganic nutrients ( $\text{NH}_4$ ,  $\text{NO}_2+\text{NO}_3$ ,  $\text{PO}_4$ ,  $\text{SiO}_4$ , 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



Barataria Bay  
(BB) Estuary



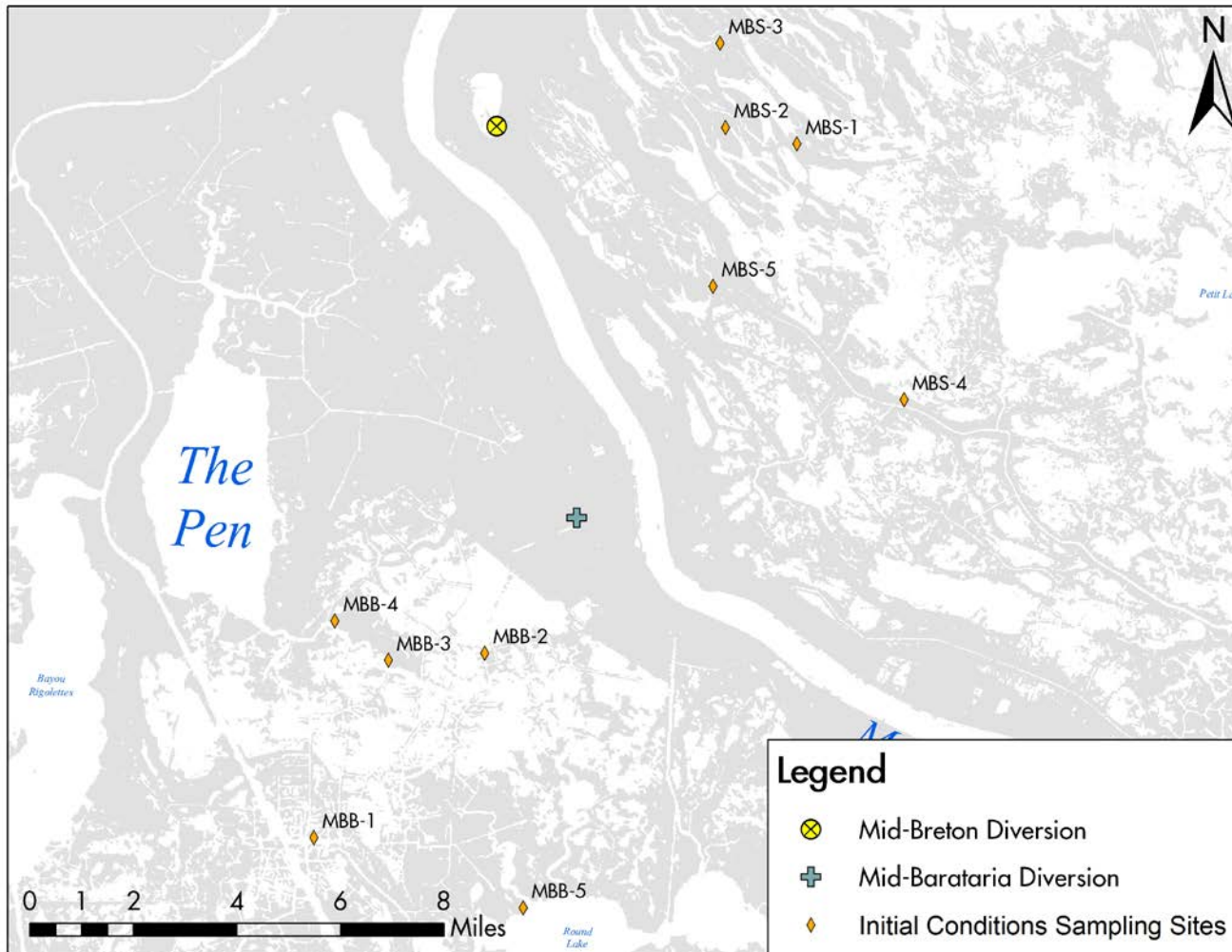
Breton Sound  
(BS) Estuary





# SEDIMENT DIVERSION SITES

Mid-Breton and Mid-Barataria wetland sites (n=10)



# WETLAND VEGETATION AND SOIL SAMPLING

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

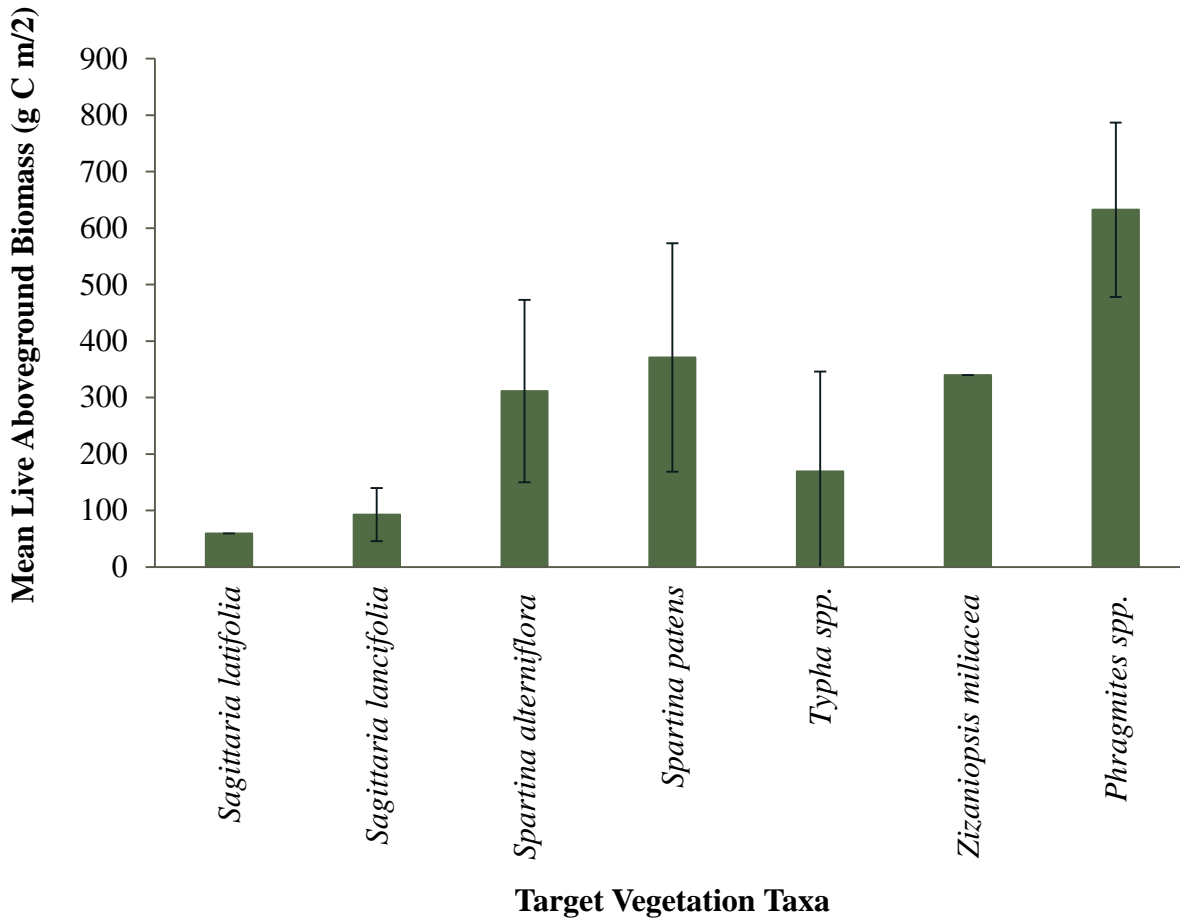
End of growing season 2014 (1 data collection trip per basin) and for initial conditions for diversion sites (1 data collection trip per basin), at each site:

- Soil porewater nutrients ( $\text{NH}_4$ ,  $\text{NO}_2+\text{NO}_3$ ,  $\text{PO}_4$ , 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

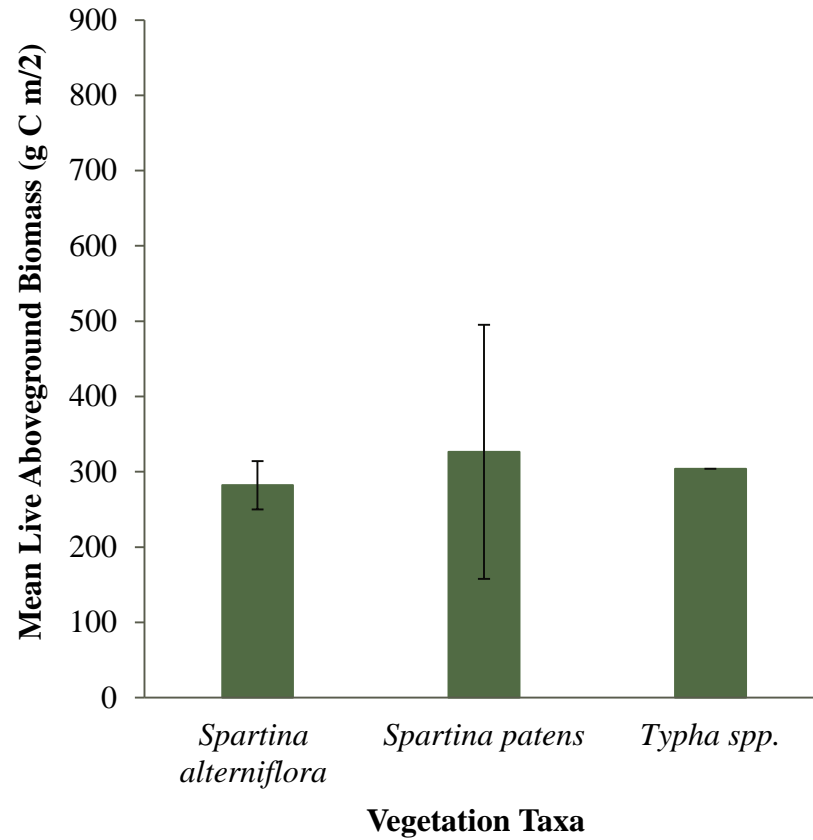




# WETLAND VEGETATION – ABOVEGROUND BIOMASS



# MID-DIVERSION SITES





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THANK YOU

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