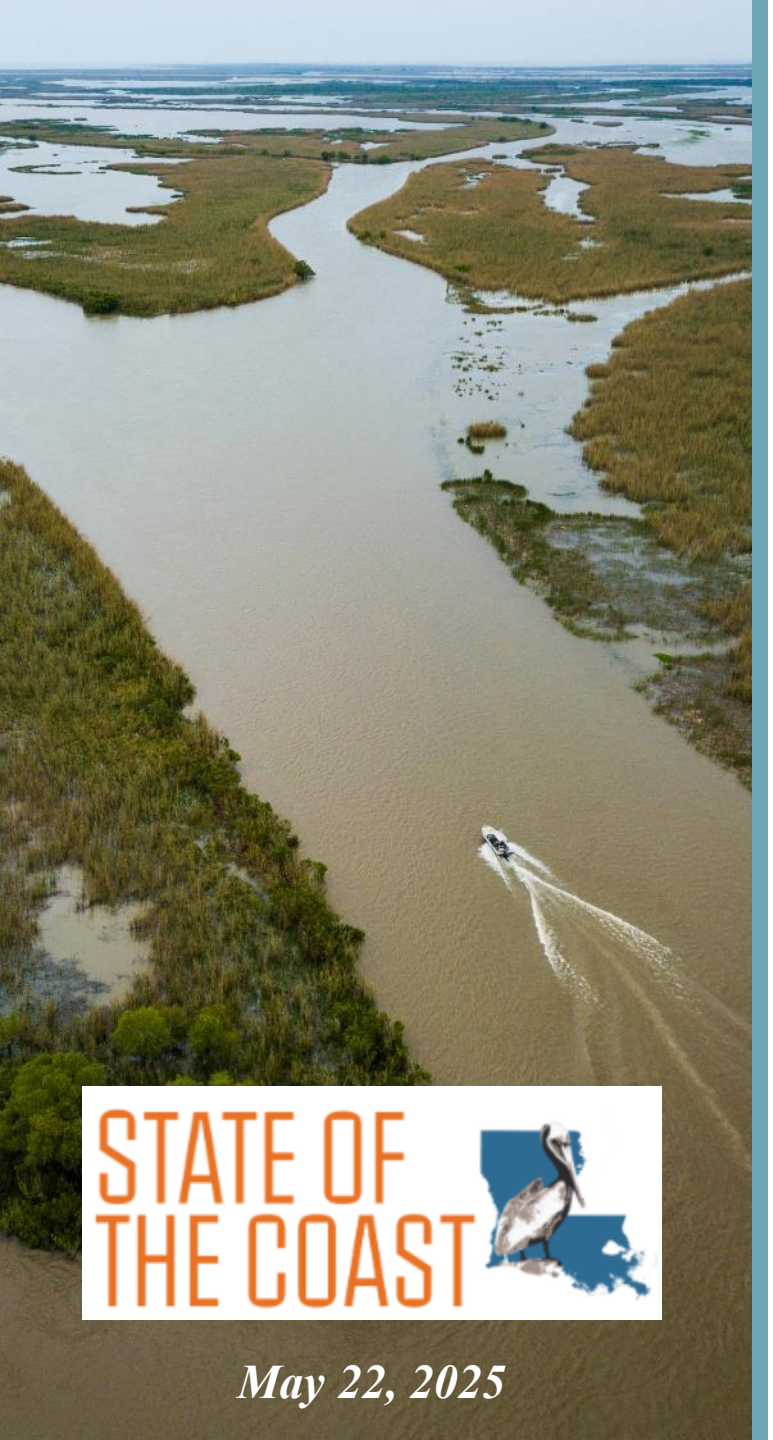

Implementing lower trophic level baseline data collection to support ecosystem restoration in Barataria Estuary, LA

Erin Kiskaddon

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Co-authors: Sibel Bargu, Melissa M. Baustian, Melissa Carle, Jennifer C. Doerr, Cassandra N. Glaspie, Emelia Marshall, Michael J. Polito, David Reeves, Shaye Sable, Malinda Sutor, Ian C. Zink

Acknowledgements

Thanks to many collaborators for their help with this project, including those from:

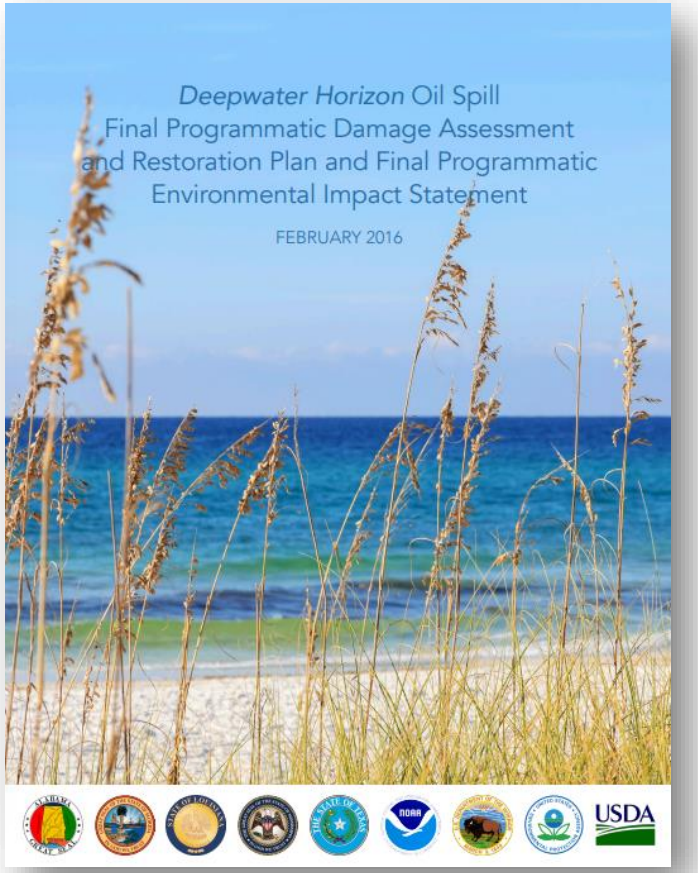
- NOAA
- USGS
- The Water Institute
- Louisiana State University
- University of Louisiana at Lafayette
- Dynamic Solutions, LLC
- University of California Santa Cruz

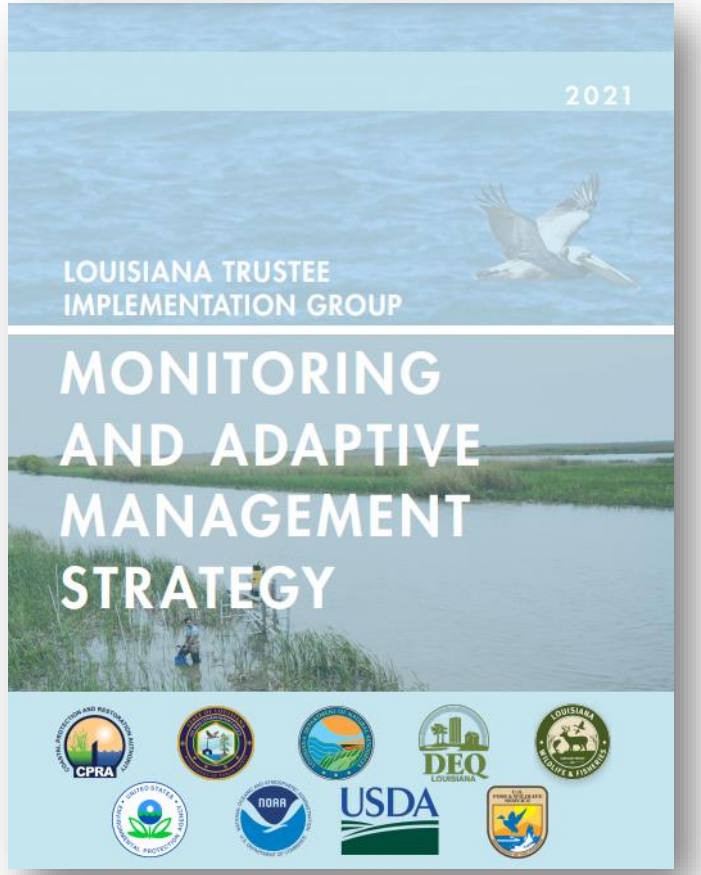
Funded by:

- Louisiana Trustee Implementation Group (LA TIG). DIVER Portal Project ID: 269

How we got here...

Recognized the need to evaluate ecosystem-wide impacts of NRDA restoration





2010
Deepwater Horizon oil spill

2016
Damage Assessment & Environmental Impact Statement

2021
Louisiana Trustees made a tool to track recovery and guide MAM funding

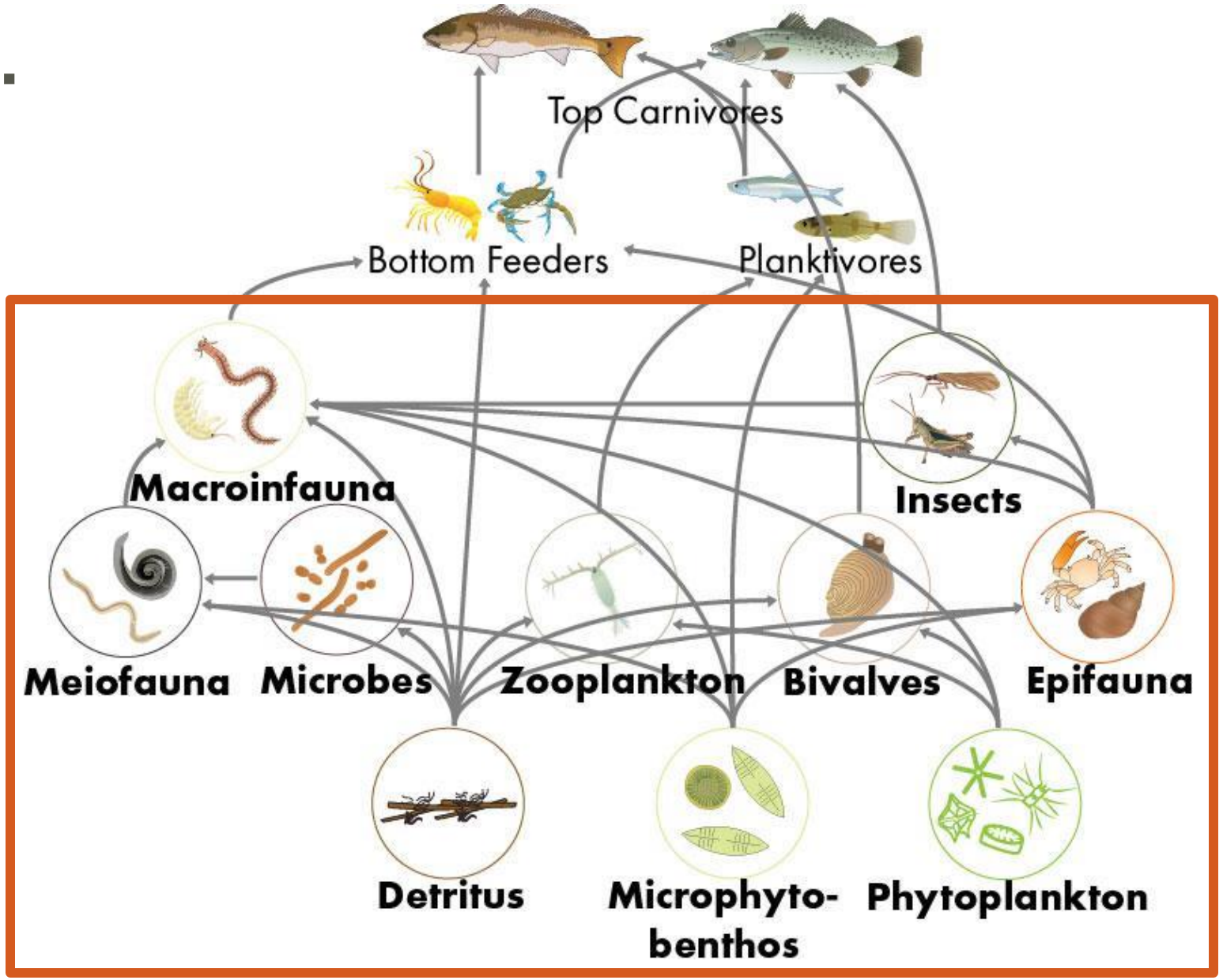
How we got here..

One possible way to inform and evaluate programmatic restoration is to look at the **base of the food chain:**

Lower Trophic Levels

Understanding these organisms can inform:

- Estuarine function & heath
- Habitat and ecosystem recovery
- Progress towards NRDA restoration goals

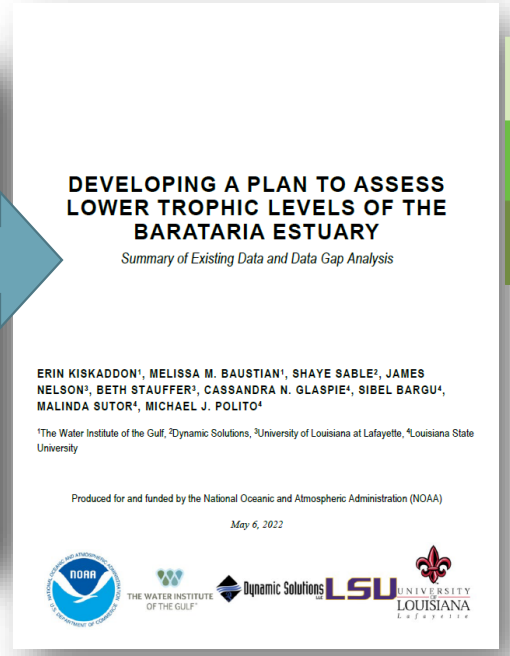


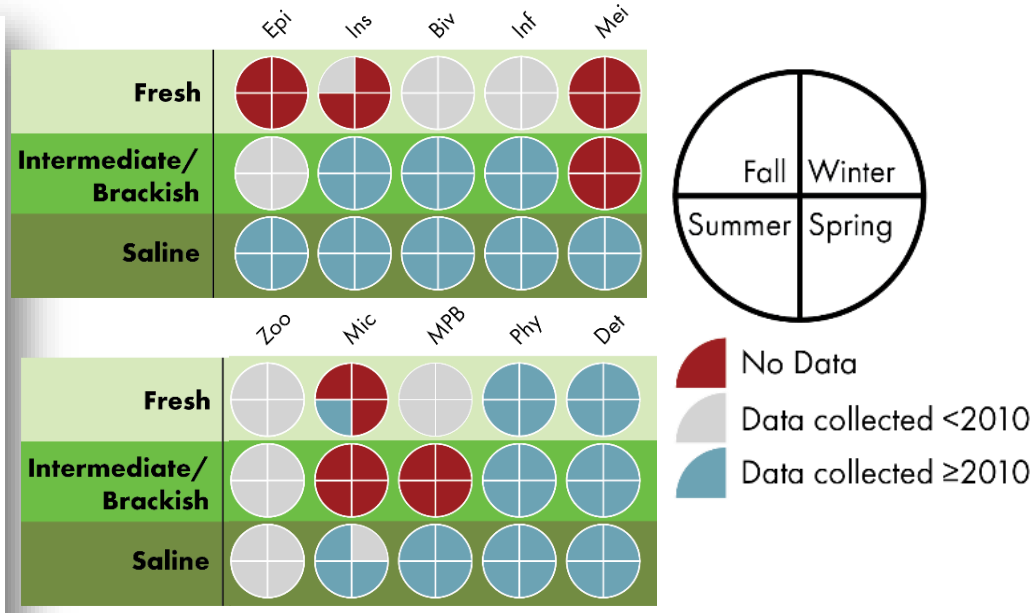
Kiskaddon et al., *in review*

How we got here…

2021-2022

Louisiana Trustees funded a project to evaluate existing lower trophic level data and to develop a plan to collect new data that fills knowledge gaps

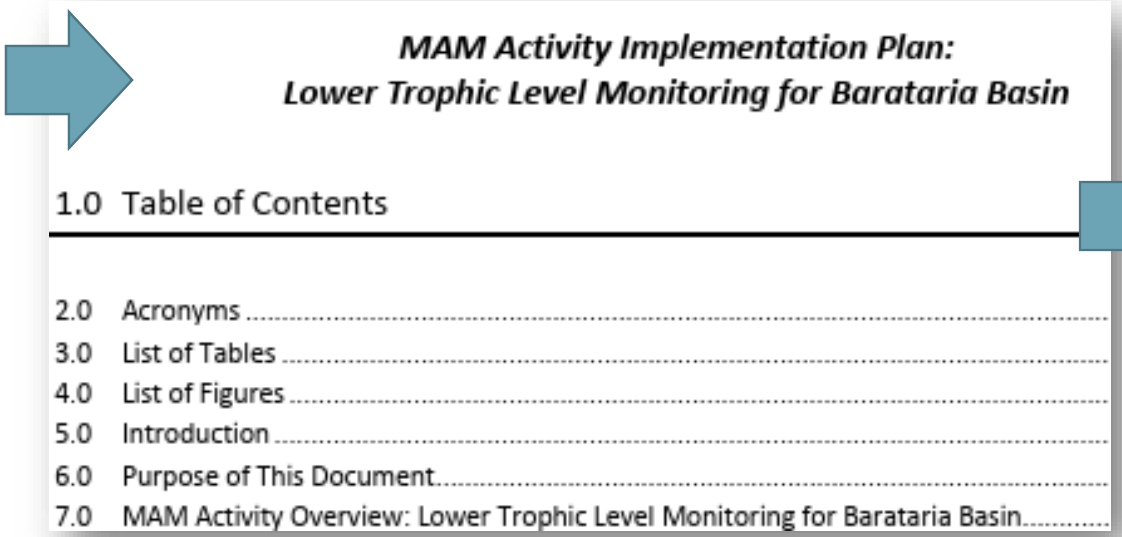




Significant data gaps were found (Kiskaddon et al., *in review*)

All reports associated with this project can be found at: https://www.gulfspillrestoration.noaa.gov/project?id=269

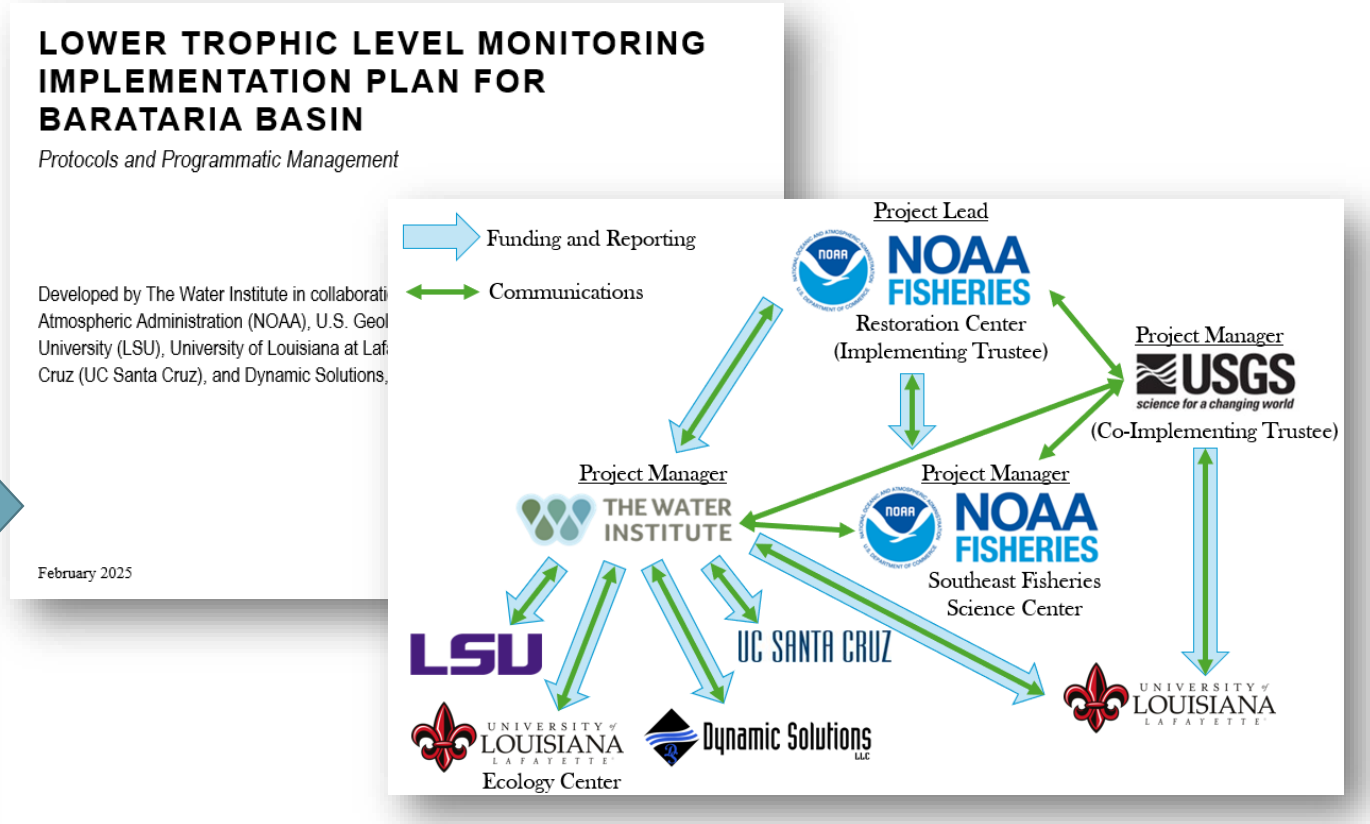
How we got here...



MAM Activity Implementation Plan:
Lower Trophic Level Monitoring for Barataria Basin

1.0 Table of Contents

2.0 Acronyms
3.0 List of Tables
4.0 List of Figures
5.0 Introduction
6.0 Purpose of This Document
7.0 MAM Activity Overview: Lower Trophic Level Monitoring for Barataria Basin



LOWER TROPHIC LEVEL MONITORING IMPLEMENTATION PLAN FOR BARATARIA BASIN

Protocols and Programmatic Management

Developed by The Water Institute in collaborati
Atmospheric Administration (NOAA), U.S. Geol
University (LSU), University of Louisiana at Laf
Cruz (UC Santa Cruz), and Dynamic Solutions,

February 2025

2023

Based on findings from the first effort, Louisiana Trustees allocated $7.6 M for a 6-year project to **collect new lower trophic level data** from the Barataria Basin and use it to inform restoration evaluation

2024-2025

The project team developed a Monitoring Implementation Plan which outlines the specifics of the **who, how, and when** lower trophic level data will be collected

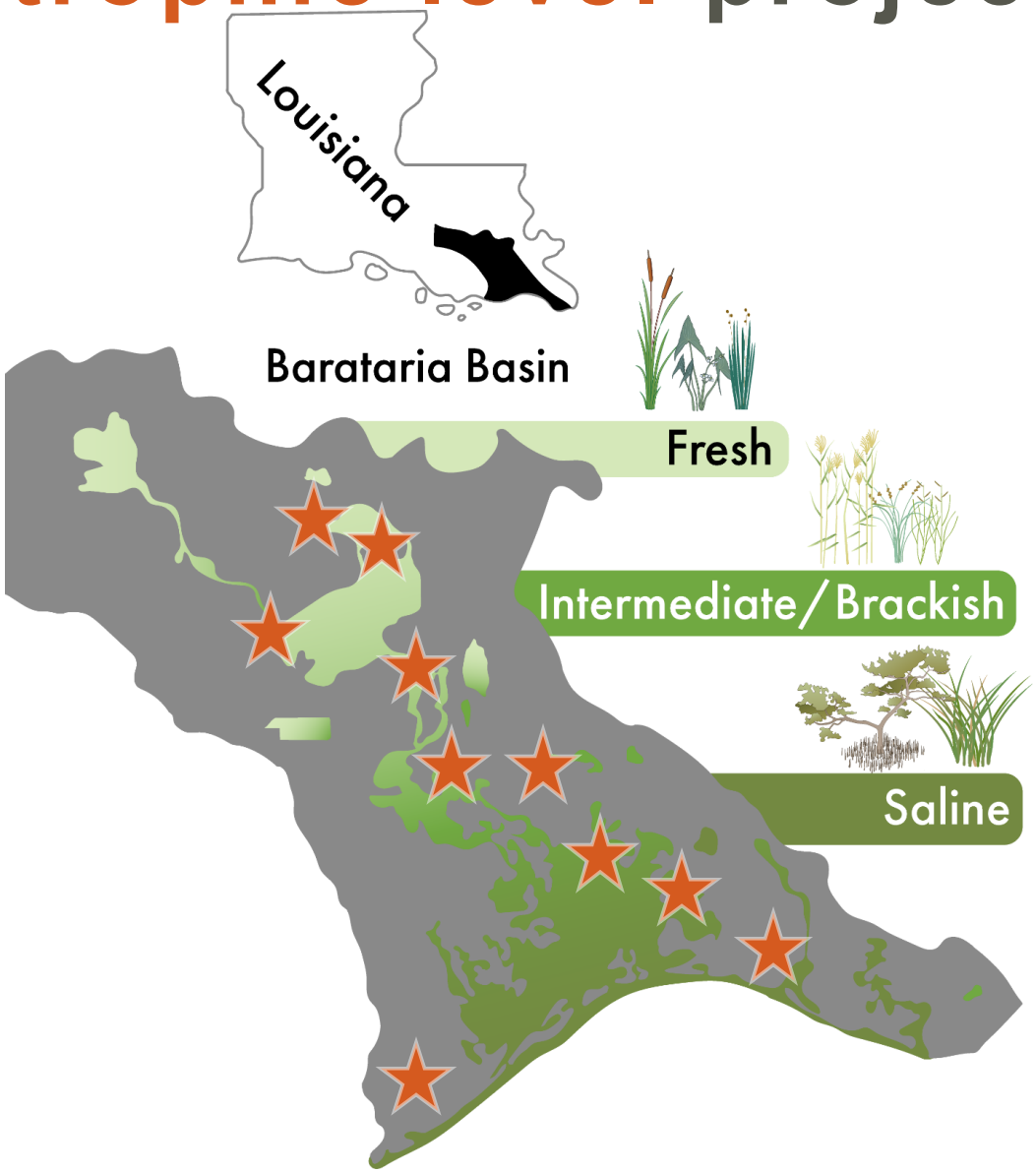
All reports associated with this project can be found at: https://www.gulfspillrestoration.noaa.gov/project?id=269

Implementing the lower trophic level project

This project is expected to produce hundreds of datapoints collected across:

- The Barataria estuarine salinity gradient (10 stations from fresh to saline)
- All four seasons
- Three consecutive years (2025-2027)

This project links temporally and spatially with other ongoing monitoring effort to assess higher trophic consumers (nekton)

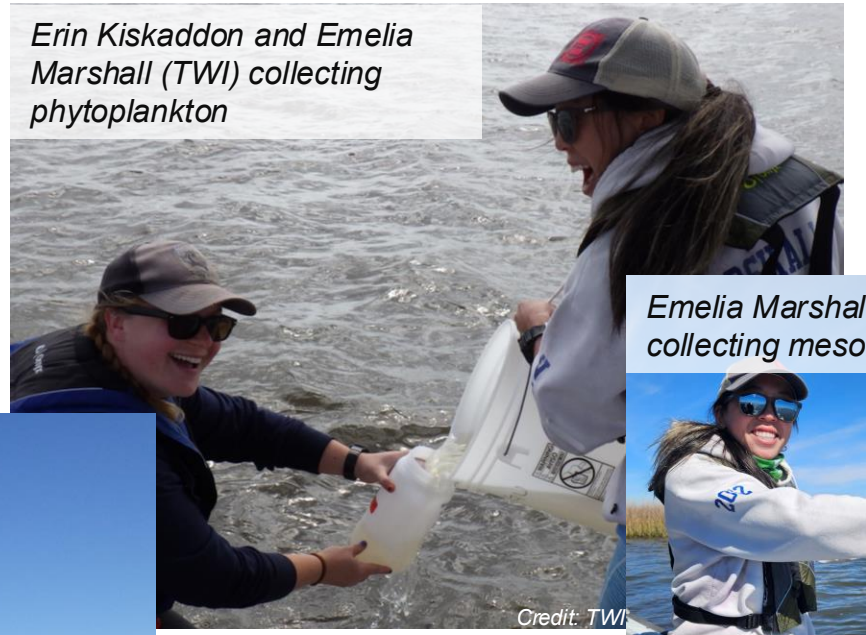


All reports associated with this project can be found at: https://www.gulfspillrestoration.noaa.gov/project?id=269

Implementing the lower trophic level project

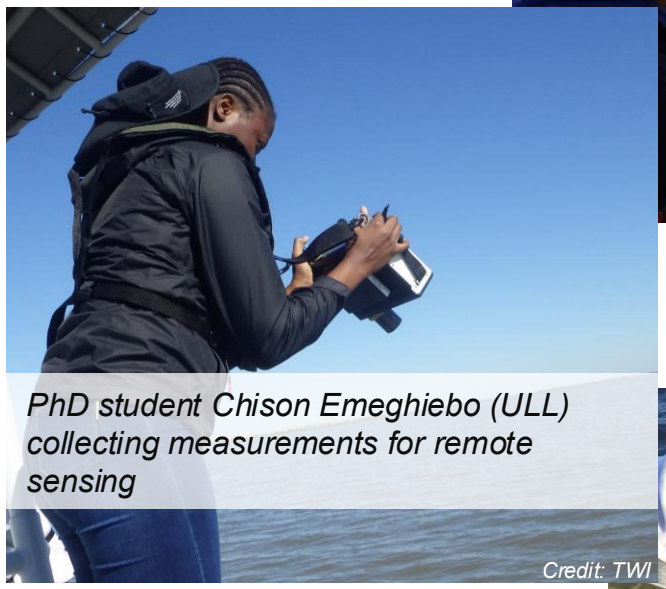
Monthly Field Campaigns

- **Phytoplankton** biomass, community composition, and cyanobacteria
- **Micro- and mesozooplankton** density, biomass, and taxonomic composition
- Water column **nutrients** and suspended solids
- In-situ measurements for **remote sensing** data products
- **Environmental parameters** (water temperature, salinity, DO, etc.)



Erin Kiskaddon and Emelia Marshall (TWI) collecting phytoplankton

Credit: TWI



PhD student Chison Emeghiebo (ULL) collecting measurements for remote sensing

Credit: TWI

Emelia Marshall (TWI) collecting mesozooplankton

Credit: TWI

Credit: TWI

Erin Kiskaddon and Emelia Marshall (TWI) rinsing a plankton net for mesozooplankton

Implementing the lower trophic level project

Seasonal Field Campaigns

Same as monthly ***PLUS*** samples collected from wetland edge and open water habitats:

- **Microphytobenthos** biomass, cell density, and community composition
- **Macroinfauna** density, biomass, and community composition
- **Sediment characteristics** (grain size, bulk density, % organics)

Emelia Marshall and Erin Kiskaddon (TWI) collecting a sediment core in emergent vegetation

Brenae Bergeron, Melissa Baustian, and Emily Lain (USGS) with a microphytobenthos core

> Gina Woods and MS student Kohinur Akter (LSU) collecting a sediment core in open water

MS student Kohinur Akter (LSU) with a sediment core

Melissa Baustian and Emily Lain (USGS) collecting microphytobenthos samples from a sediment core

Implementing the lower trophic level project

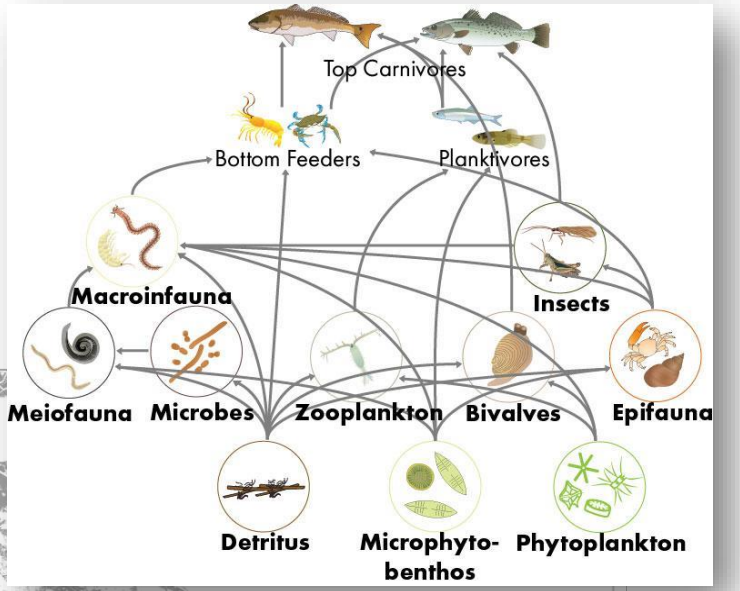
But wait, there's more!

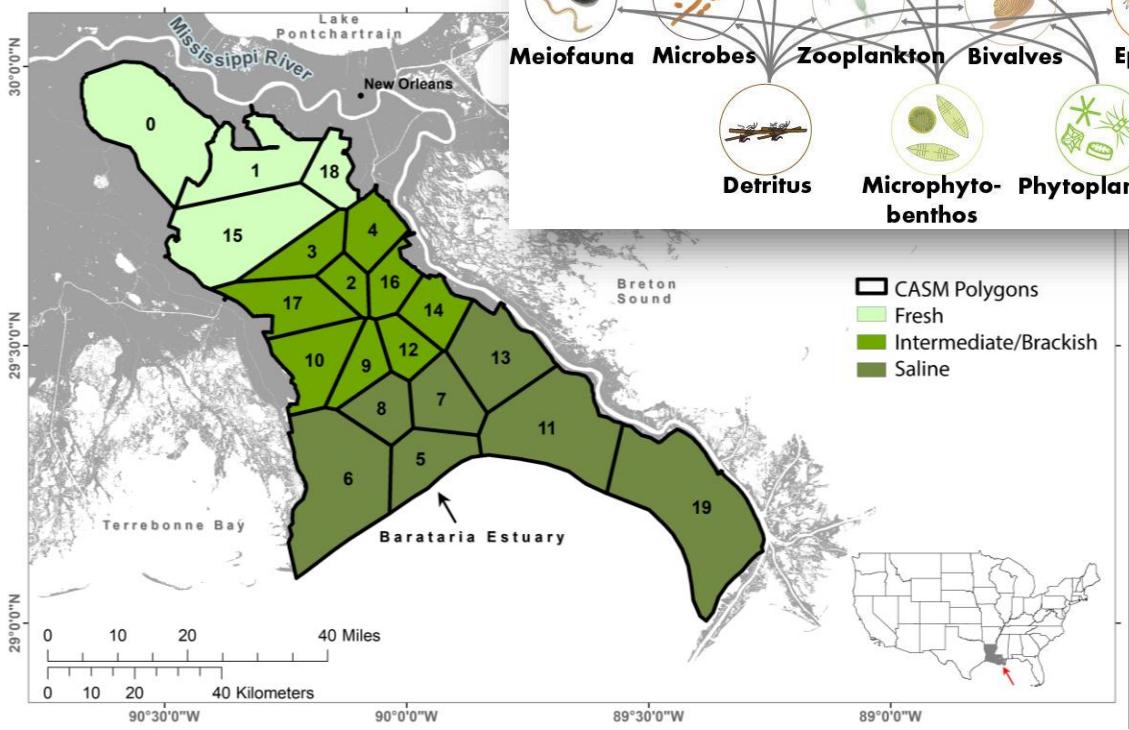
Four Seasons of $\delta^{13}C$, $\delta^{15}N$, $\delta^{34}S$, and %CNS Stable Isotope Data Collection

- Zooplankton & Phytoplankton/POM
- Microphytobenthos
- Macroinfauna
- Surface Sediment Organic Matter
- C3/C4 Vegetation, SAV, and Epiphytic Macroalgae

These data will be used to

- **Improve existing food web models,** including the Comprehensive Aquatic Systems Model (CASM)
- Inform ecosystem-wide restoration planning & evaluation

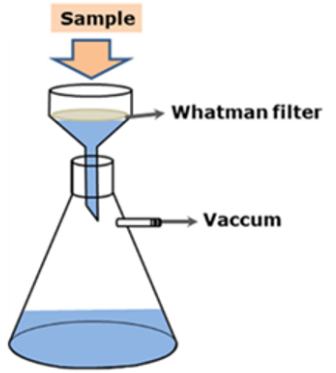


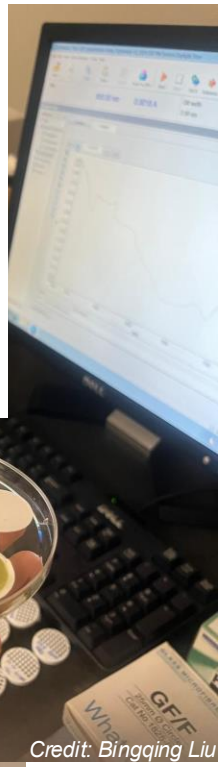


(Kiskaddon et al., *in review*)

Implementing the lower trophic level project

Work to process samples is just getting started!

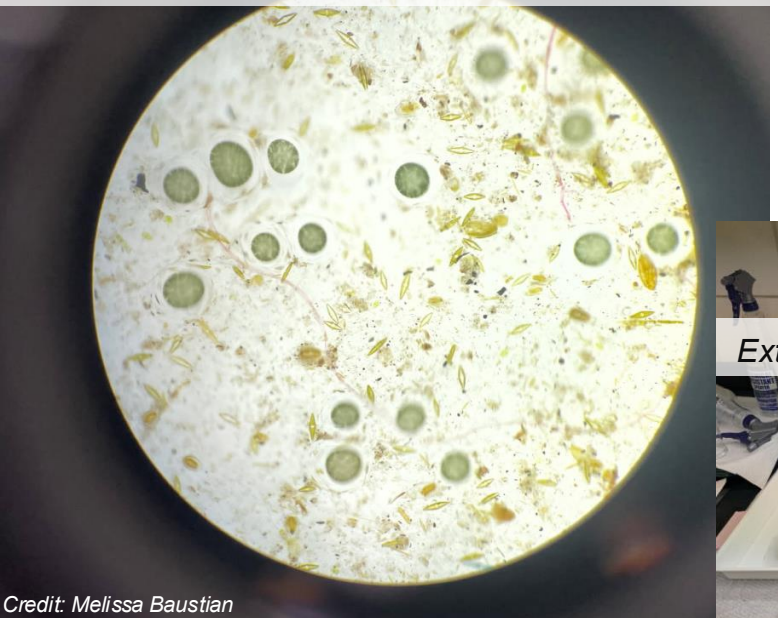




Emily Lain (USGS) preparing microphytobenthos samples

Credit: Melissa Baustian

Microphytobenthos diatoms under a microscope



Credit: Melissa Baustian

Credit: Bingqing Liu

Extracting microphytobenthos on the lab bench

Credit: Melissa Baustian

Credit: Bingqing Liu

Bingqing Liu (ULL) analyzing samples for remote sensing at the HyperCoast Lab, School of Geosciences

Implementing the lower trophic level project

Site scouting team, October 2024. Left to right: Ian Zink (NOAA), Shaye Sable (Dynamic Solutions, LLC), Emelia Marshall (TWI), Malinda Sutor (LSU), Erin Kiskaddon (TWI), Gina Woods (LSU), Melissa Baustian (USGS), Bingqing Liu (ULL), David Reeves (NOAA), Jennifer Doerr (NOAA)

A project of this magnitude and complexity requires **special planning** and **coordination**

Spring seasonal field effort field team, April 2025. Left to right: Melissa Baustian (USGS), Emily Lain (USGS), Brenae Bergeron (USGS), Erin Kiskaddon (TWI), Emelia Marshall (TWI), Cassie Glaspie (LSU), Gina Woods (LSU)

9 project Principal Investigators spanning Academic, Non-Profit, and Federal organizations

Supported by the work of many technicians, graduate students, undergraduate students, and volunteers

Challenges, Roadblocks, and Lessons Learned

Land rights

- Locations of monitoring ultimately dictated by amenable landowners
- Working with private landowners is time consuming, but also essential and rewarding

Logistics

- Planning successful field campaigns around dynamic Basin conditions is challenging
- Our first field events were test cases of timing and feasibility
- Navigated sample transfer for same-day processing with field teams located in remote areas

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OF THE GULF®

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