Improving Community Health through Microbial Source Tracking

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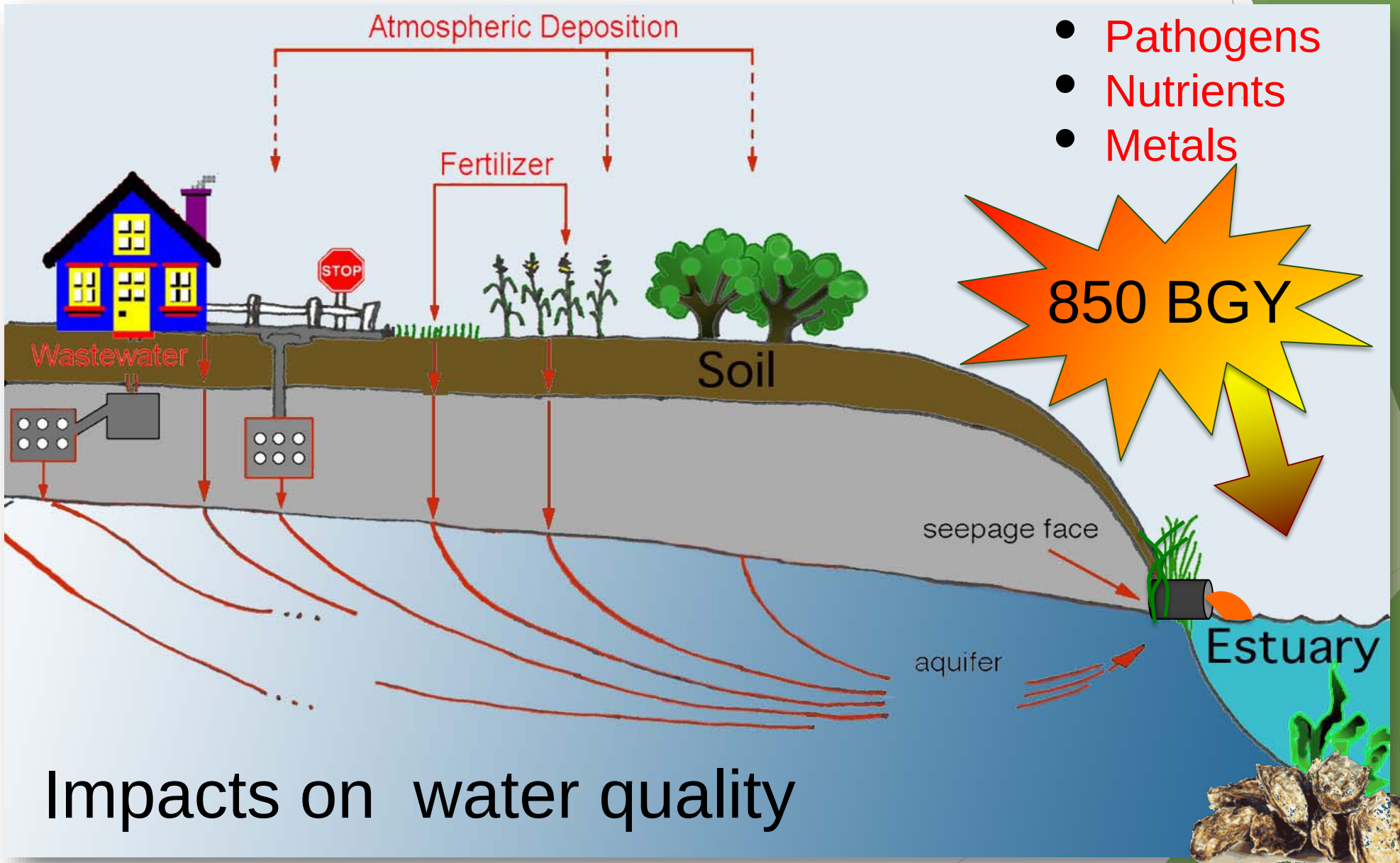
CAC meeting

14 September 2023

Stakeholders & Partners

- Alabama Association of Conservation Districts
- Alabama Department of Conservation, Marine F…
- Alabama Department of Environmental Manage…
- Alabama Marine Mammal Stranding Network
- Auburn University Shellfish Laboratory
- City of Mobile
- Dog River Clearwater Revival
- FDA Gulf Coast Seafood Laboratory
- Grand Bay National Estuarine Research Reserve
- Mississippi-Alabama Sea Grant Consortium
- Mobile Bay National Estuary Program
- Mobile Baykeeper
- Navy Cove Oyster Company
- Weeks Bay National Estuarine Research Reserve

Human activities



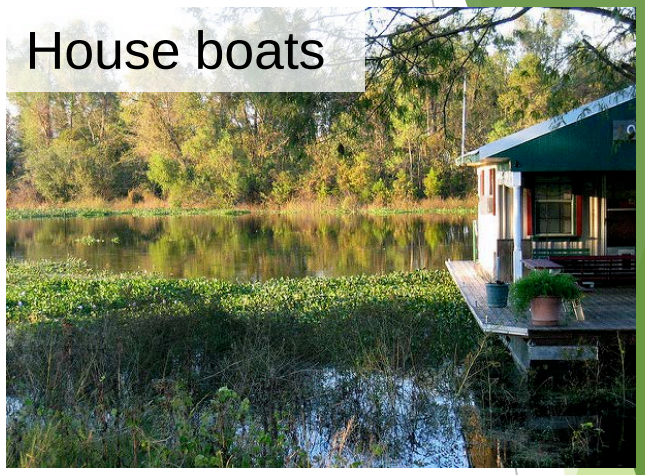
Impacts on water quality

Wastewater sources

Impervious surfaces

Wastewater treatment facility

House boats

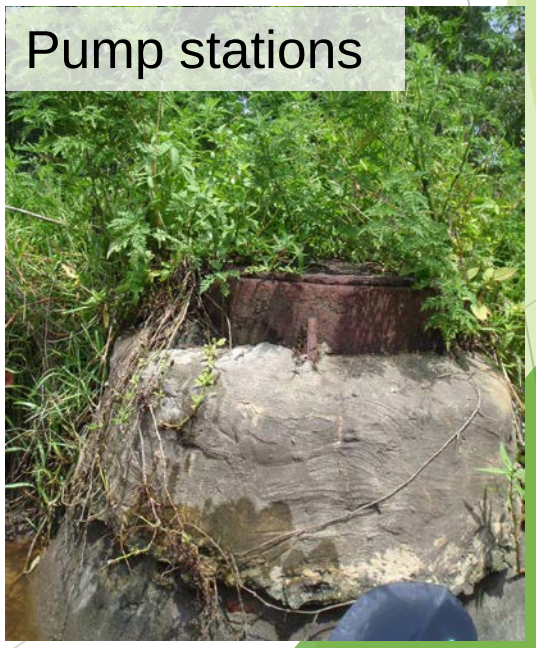


Outfall pipes

Storm drain

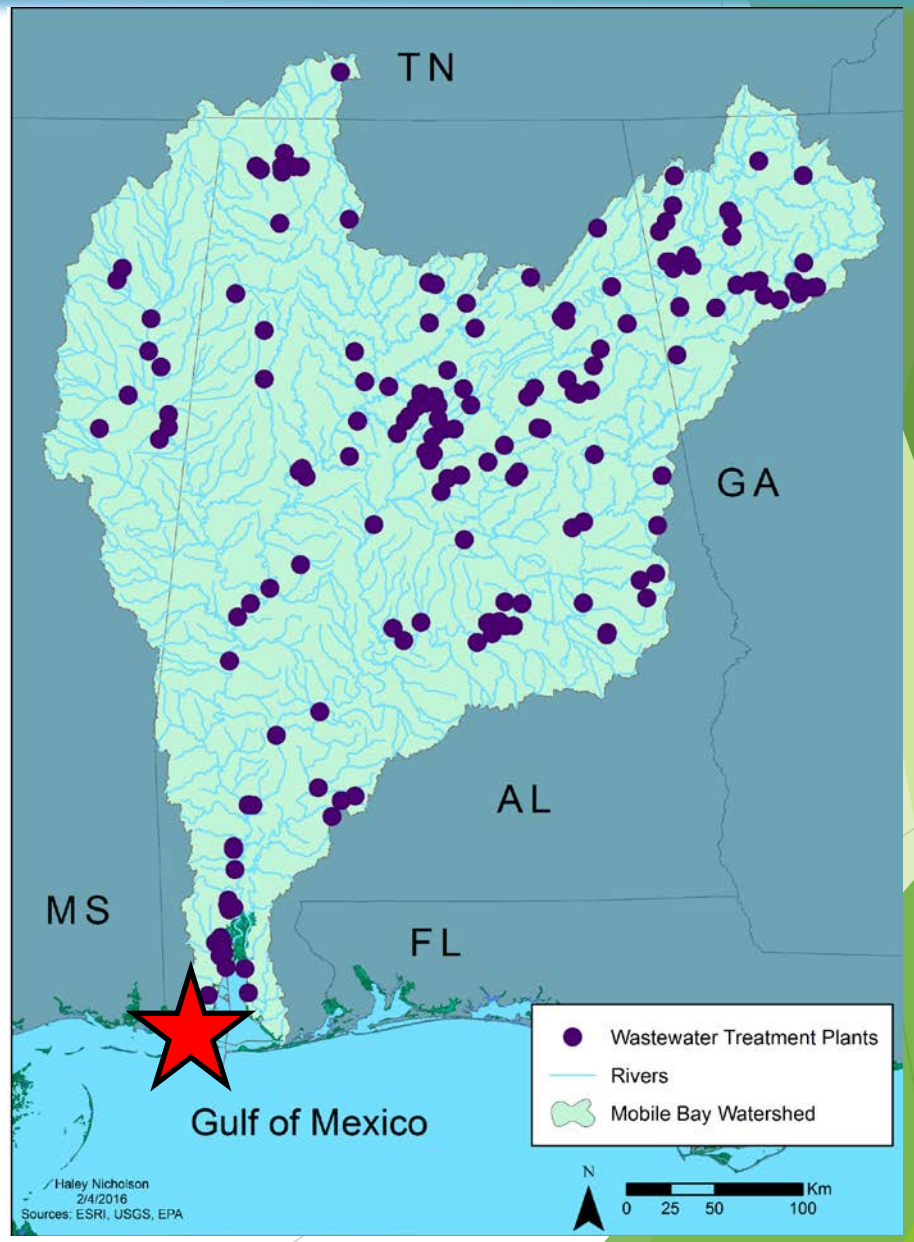
Boats

Pump stations



Human sewage

Our human impact on water quality



Microbial Source Tracking Overview

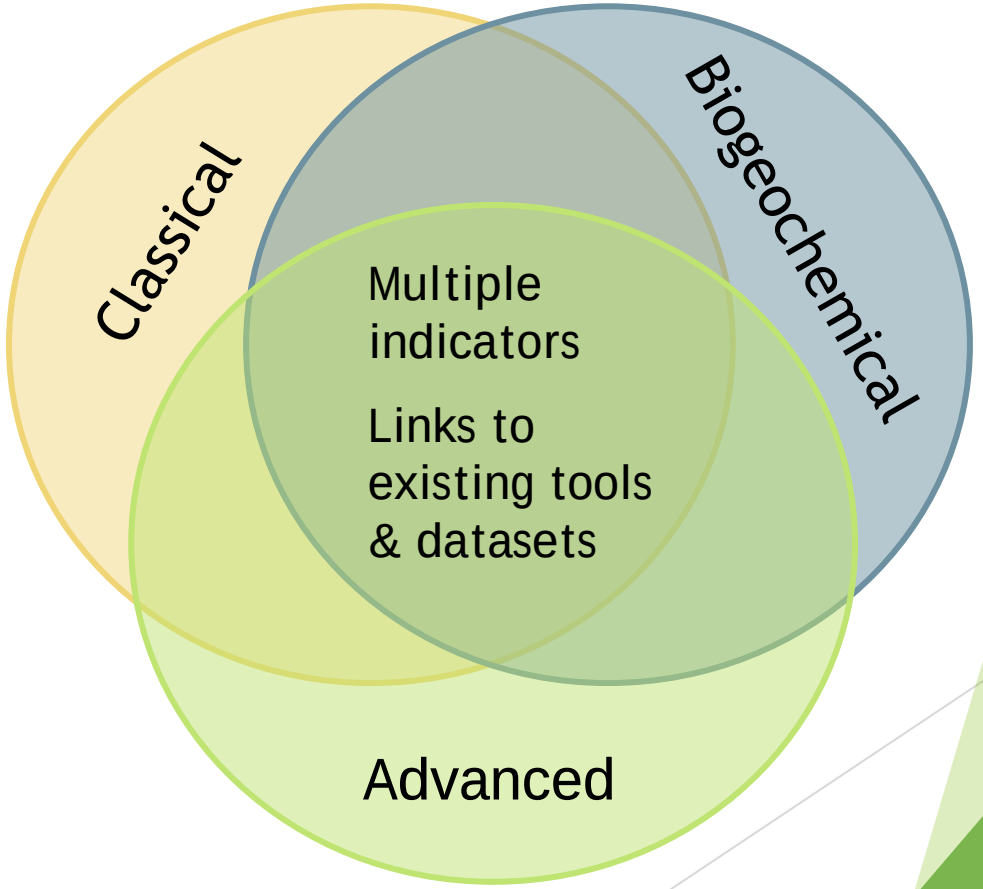
- Implications for public, economic, and ecological health

- Current water quality metrics rely on *indicators*
  - Fecal pollution
  - Non-specific indicators
  - Cannot discriminate among sources

Objectives

1. Define microbial sources to Alabama waters, with the goal to distinguish at least wastewater treatment plant, septic, wildlife (waterfowl, wild boar), livestock, and other non-human inputs.

- **Classical microbial indicators** (FC, *E. coli*, male-specific coliphage)
- **Biogeochemical indicators** (δ13C, δ15N, nutrients)
- **Advanced microbial source tracking approaches** (qPCR, eDNA)



Objectives

2. **Define the conditions ('where & when') of indicators and their influences**, specifically including factors used in determining shellfish area closures.

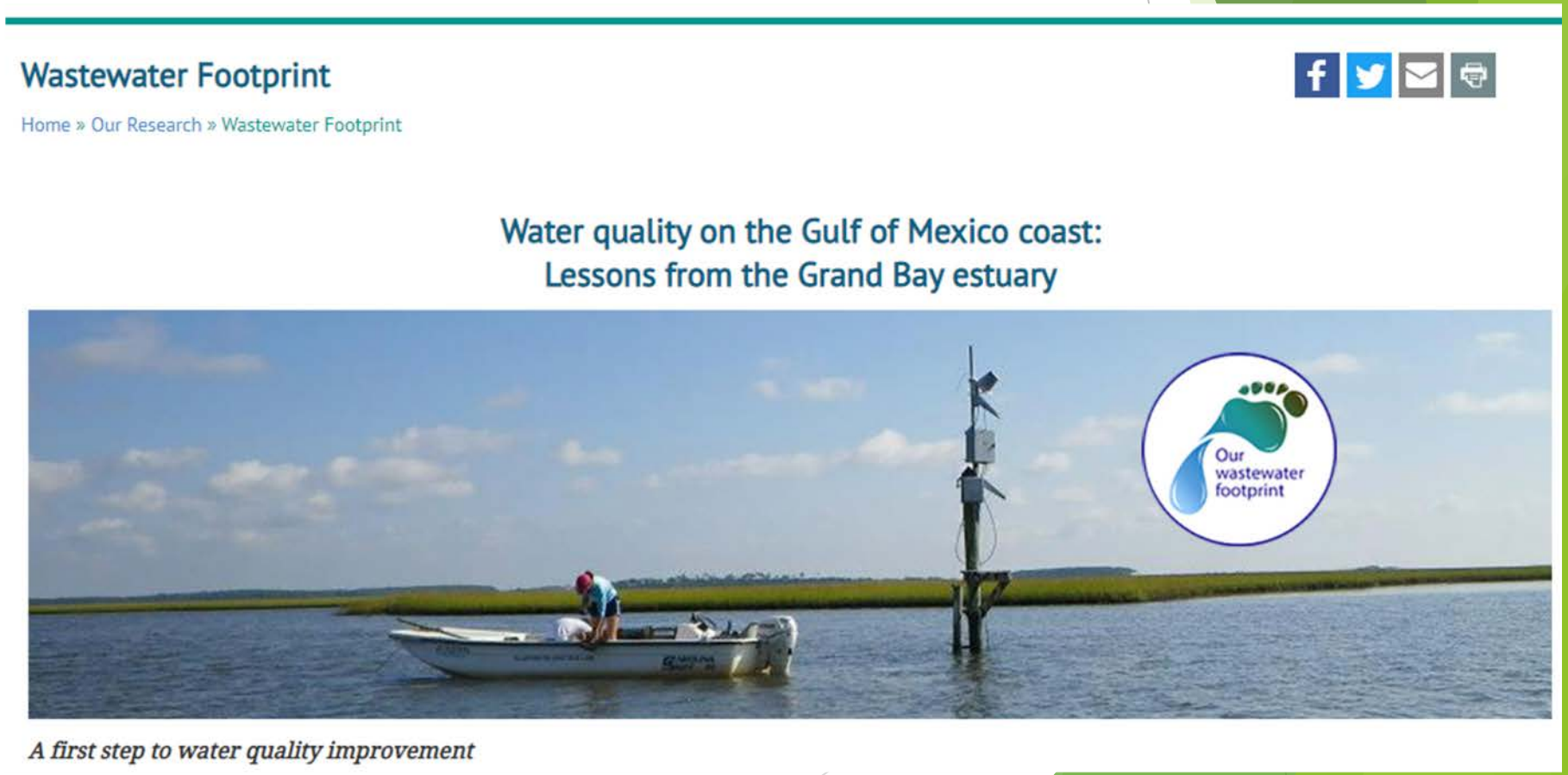
Compare data to local environmental conditions:

- Water temperature
- Salinity
- Dissolved oxygen
- Discharge/ flow patterns
- Water level
- Wind speed/ direction

Objectives

3. **D**ata sharing using an existing online platform,
"Our Wastewater Footprint" https://www.disl.org/wastewaterfootprint

Compile existing microbial indicator and source tracking data



Webpage resources

- Project Partners
- Peer-Reviewed Publications
- Data Resources

National Estuarine Research Reserve: System-Wide Monitoring Program (SWMP)

U.S. FDA: National Shellfish Sanitation Program (NSSP)

- Through the NSSP, US FDA works cooperatively with other federal, state, and tribal regulatory agencies and the shellfish industry to ensure safe consumption of molluscan shellfish such as oysters, clams, mussels, and scallops.
- Current guidelines for growth, processing, and shipping of shellfish for human consumption can be found in the NSSP Guide for the Control of Molluscan Shellfish.

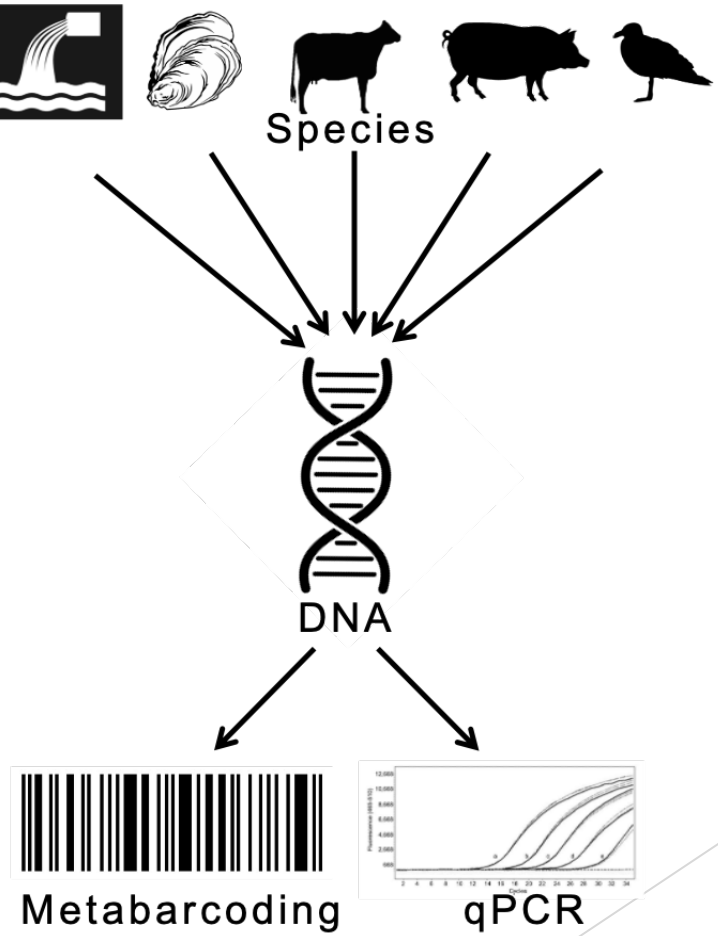
Alabama Department of Public Health (ADPH)/ Alabama Department of Environmental Management (ADEM)

- The ADEM/ADPH Coastal Alabama Beach Monitoring Program collects water quality data from 25 public recreational sites and uses a three-tiered color-coded water quality status system to illustrate levels of indicator bacteria in relation to EPA thresholds.
- Find resources on fish consumption safety including safe types of fish to eat and safe ways to prepare fish. ADEM's interactive Fish Consumption Advisories map allows users to view advisories by waterbody, species, and contaminant concern.

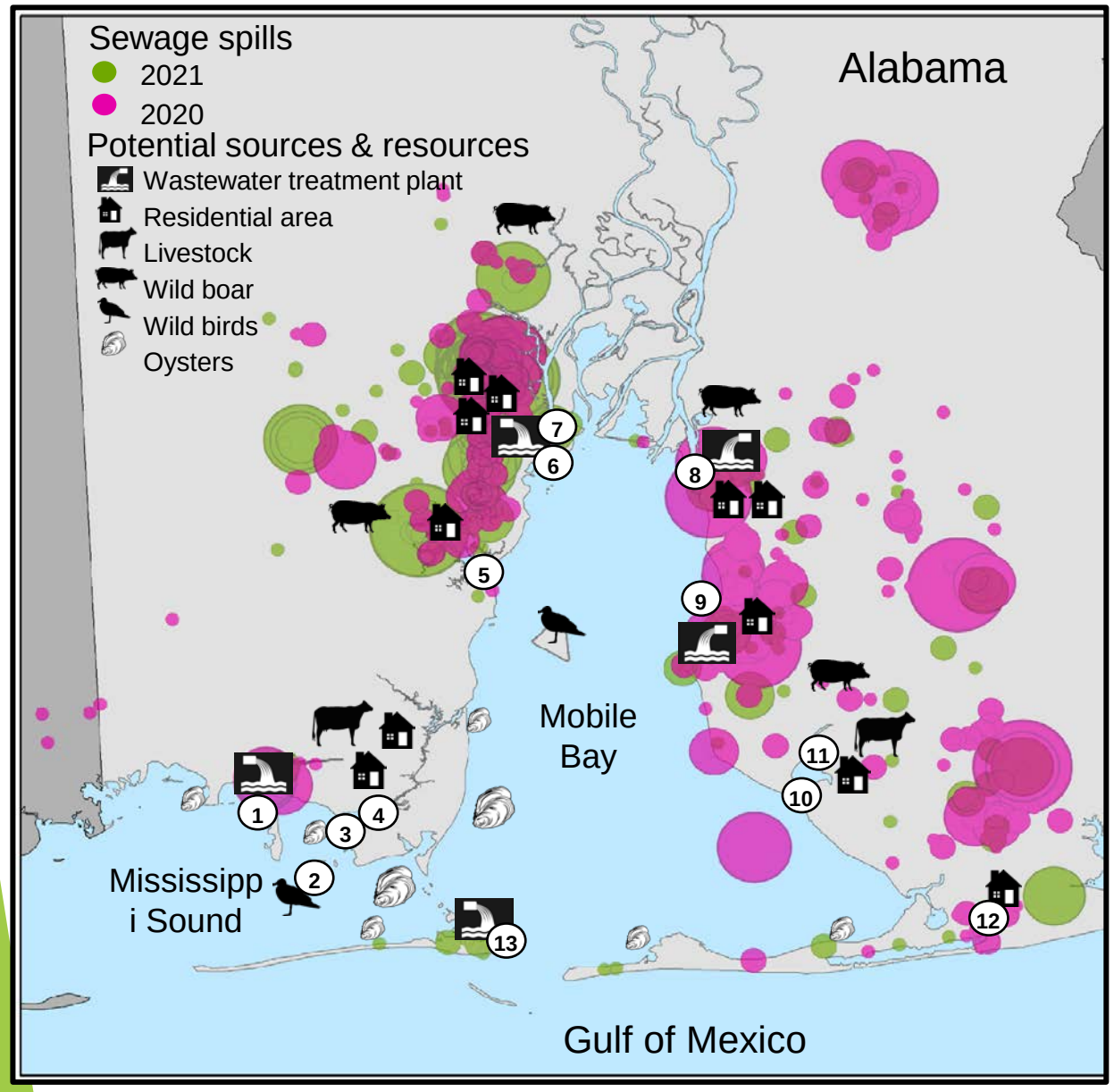
Objectives

4. **E**ducate the community about advanced microbial source tracking.

D**evelop and share an eDNA toolkit**, distributed in collaboration with community partners



Sampling locations




Intracoastal waterway


Dog River


Gator walk


Bayou la Batre WTP outfall

Field sampling schedule

START SAMPLING

PRESENT

END SAMPLING

FALL | WINTER | SPRING | SUMMER

Sept | Oct | Nov | Dec | Jan | Feb | Ma | Apr | May | June (A) | June (B) | July | Aug

Microbial processing (fc, E. *coli*, MSC)

Source tracking qPCR optimization, primer validation

Nutrient analysis (NO3-, NO2-, NH4+, TDN)

Source tracking DNA extraction

Stable isotope analysis (δ13C, δ15N)

Trace element analysis (Ba, Sr, Pb, Hg, Sr)

Pathogen analysis (E. *rhusiopathiae*, T. *gondii*)

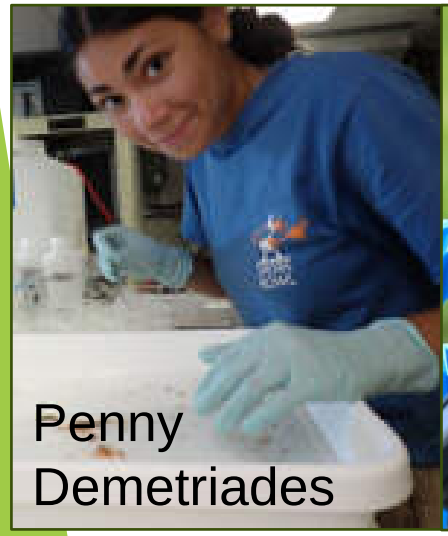
Sediment

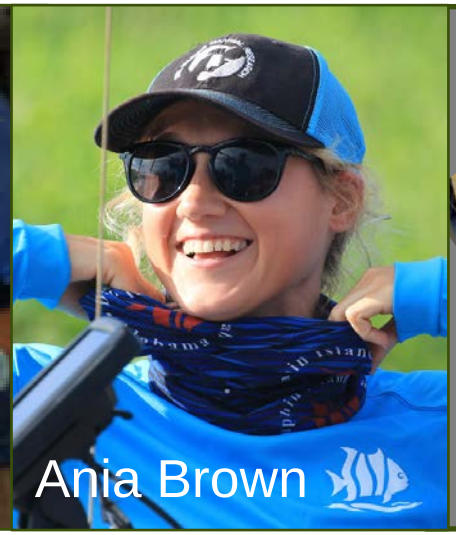
Oysters

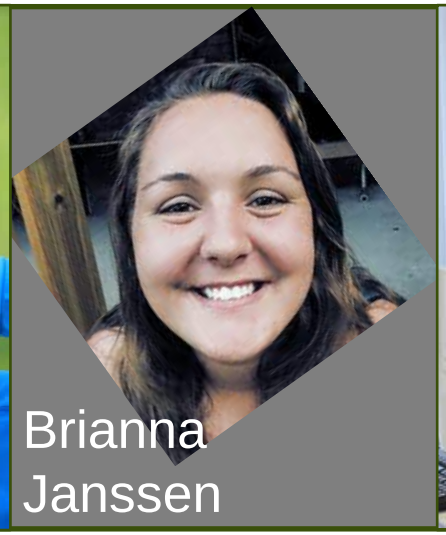
Sediment

Oysters

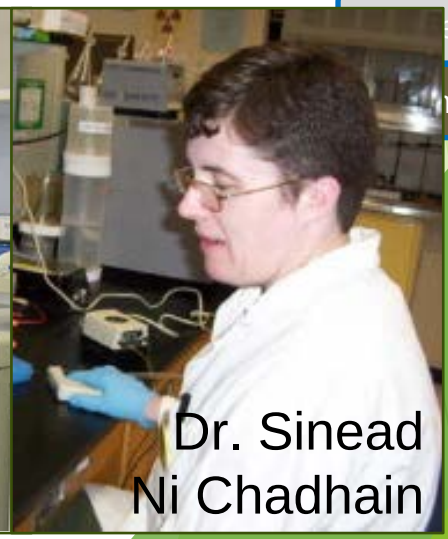
Sediment


Penny Demetriades


Ania Brown

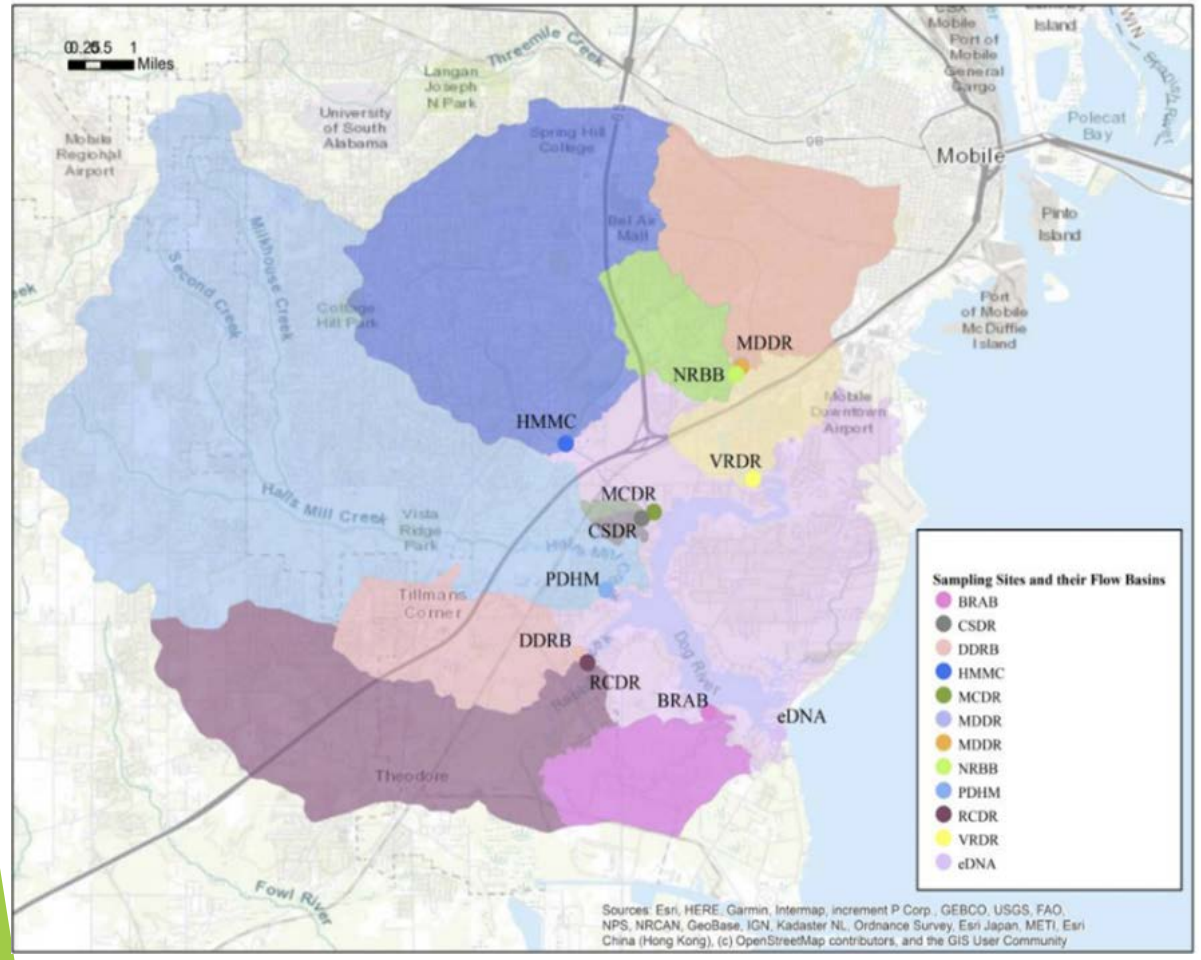

Brianna Janssen


Dr. Brandi Kiel-Reese

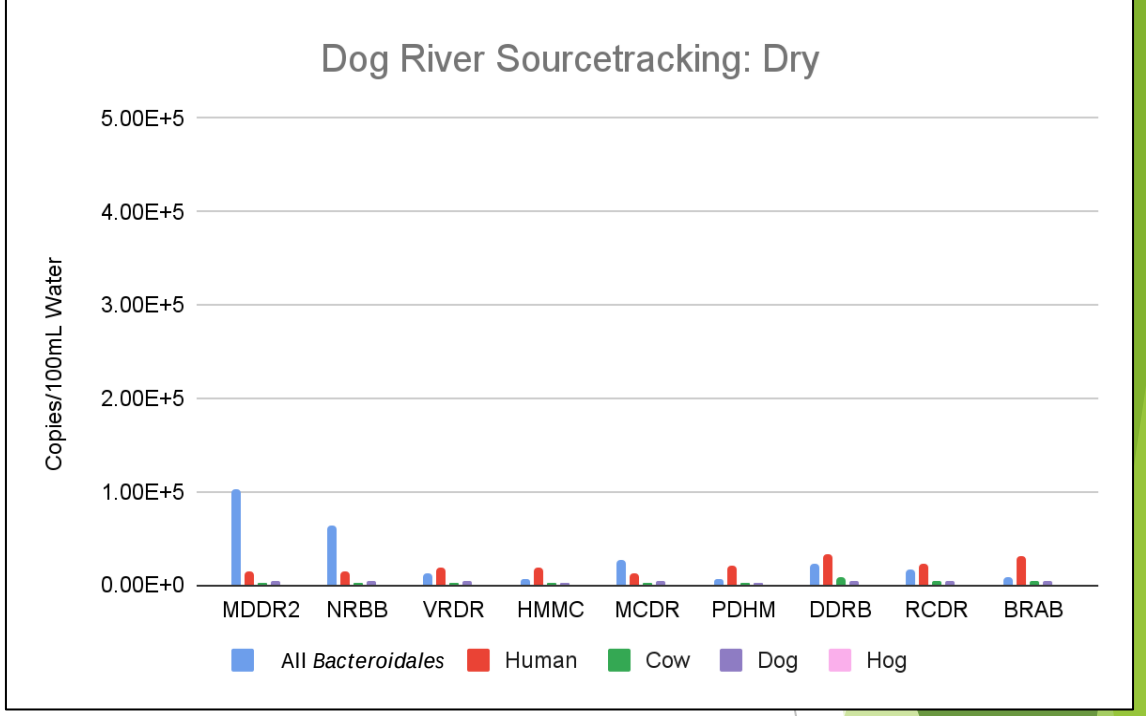

Dr. Sinead Ni Chadhain

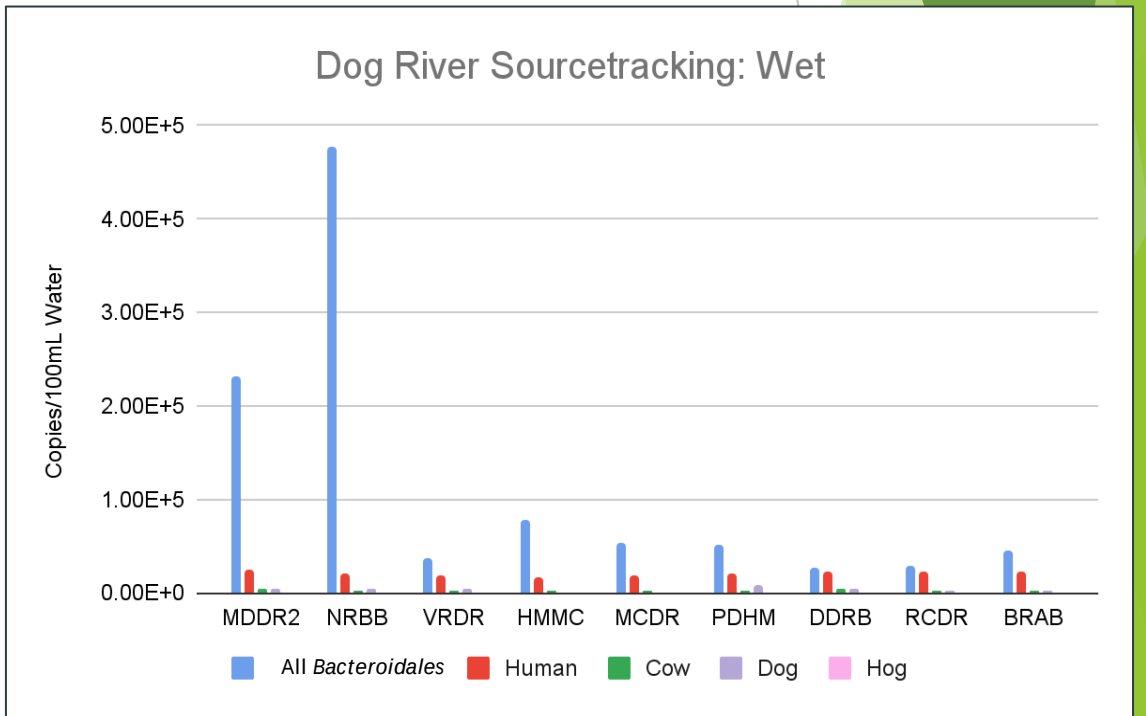
Partner example:

Mobile Baykeeper, Dog River Source Tracking



Map from Cassie Bates at Mobile Baykeeper





How to get involved…

- Become a partner

  (e.g., Baykeeper project)
- Attend stakeholder meetings
- Provide feedback
- Provide data: CLEARINGHOUSE
- Tell colleagues

Data sharing via online platform

"Our Wastewater Footprint"

https://www.disl.org/wastewaterfootprint