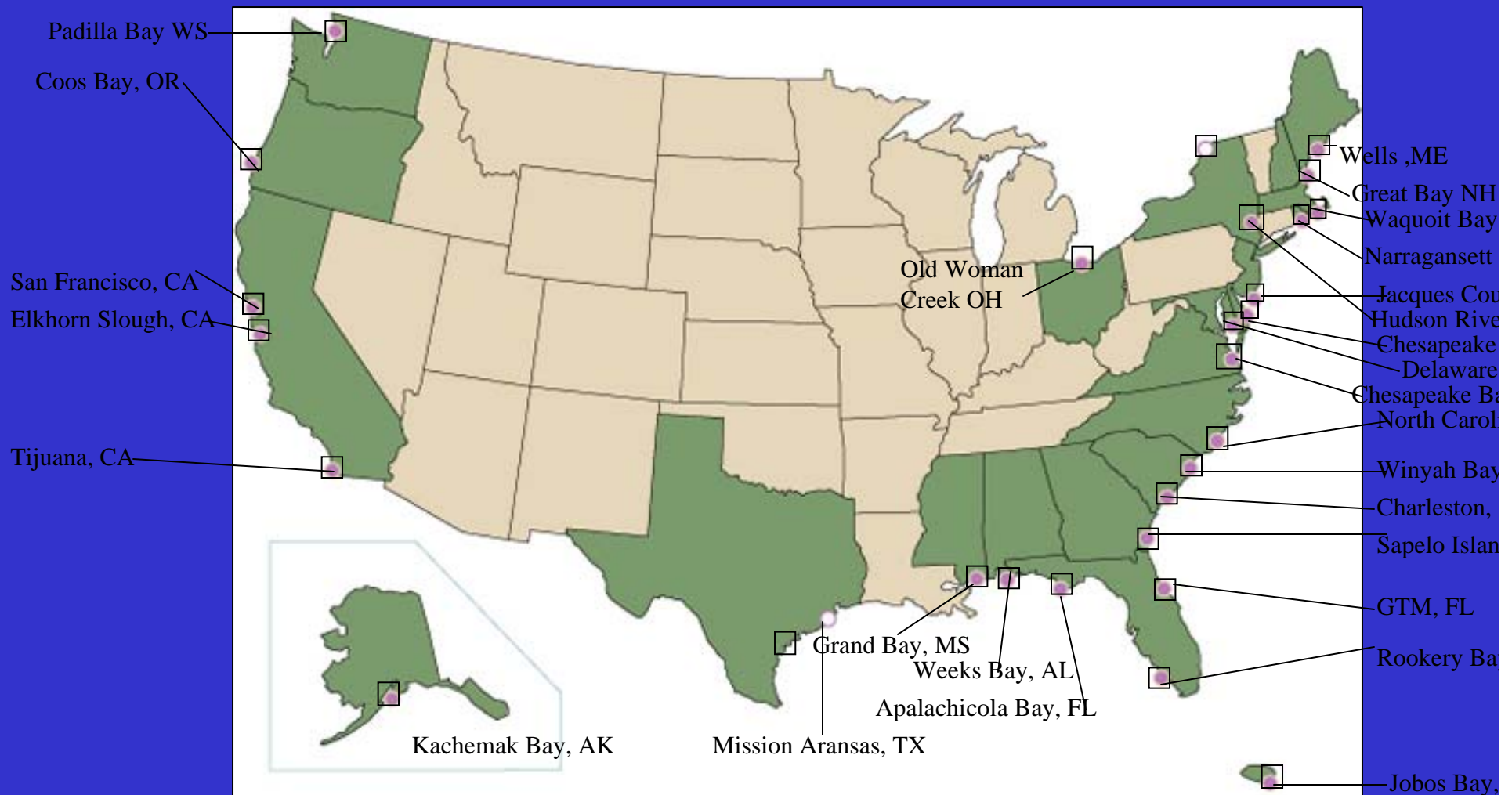


# NERR Locations: 27 Reserves serving the nation as scientific, ecological living laboratories and as high quality estuarine reference sites.



## Current Sapelo NERR Research Program Highlights

### Comparative Ecological Assessment of the Duplin River marshes

- Objective: Developing appropriate rapid assessment methods (RAM) for marsh systems (vegetation, benthos and water column) of the Southeastern U.S.. A partnership project with the following agencies and programs: EPA, NOAA, NCCOS, Savannah State U., CDC, DNR:CRD, GACMP, MAREX...and growing!

### Living Shorelines Project

- Objective: Building a better mousetrap. Experimentation and comparative research with alternative shoreline stabilization construction for GA tidal areas. Partners: TNC, MAREX, GA CMP, EPA, DNR:CRD, WRD

### The Dean Creek Restoration Project

- Objective: hydrological restoration of a 58 acre salt marsh.

# The Dean Creek Restoration Project

Hydrological uplift within a salt marsh: characterization and assessment of ecosystem level changes with reductions in impacts

## Brief project description:

Creation of a causeway and culvert pipe engineering (circa 1945) over Dean Creek (using 3; 24" diameter pipes and an associated concrete bulkhead) has restricted normal tidal flow servicing the upper 58 acre salt marsh.



## Overall Project Objectives:

Phase I : Collection of as much biological, hydrological and geological data as possible above (affected area) and below (control area) the culvert system prior to spanning bridge implementation.

Phase II: Collation and analysis of data to compare pre vs. post construction ecological function in the areas of sedimentation, hydrology, vegetation and faunal components.

Phase III: Continued long-term monitoring and distribution of the results toward meeting coastal management (CMP) policy information needs related to culvert pipe/bulkhead effects on salt marsh ecosystem services.

## Conservation planning and documentation of the project.

The Nature Conservancy (TNC) lead a coastal restoration initiative with it's state and federal partners SINERR, GA CMP, GA DNR: CRD, WRD and Parks. Assessed within this document were state owned lands with restoration needs within Liberty and McIntosh Counties (High density TNC conservation target areas in coastal Georgia)

The Dean Creek Project was one of over 40 documented restoration target needs within this initiative.

Awareness of this Project has been promoted through lecture opportunities and programming based upon developing restoration science methods for salt marsh ecosystems.



## Restoration Solution

Replacement of concrete bulkhead and culvert pipe using standard modular concrete bridgework spanning approximately 200 ft over creek basin similar to the Oakdale Creek “solution”.



## Potential Impacts and characterization emphasis

- Vegetation community consequences (growth, diversity)
- Faunal communities consequences (occurrences, densities)
- Altered sediment regime: creation of a salt panne , channel scouring, Sediment retention in the upper basin.
- Altered hydrological regimes: near-bulkhead water velocity increases (erosion/deposition and scouring), reductions in tidal water volume, enhanced freshwater retention (stochastic events)

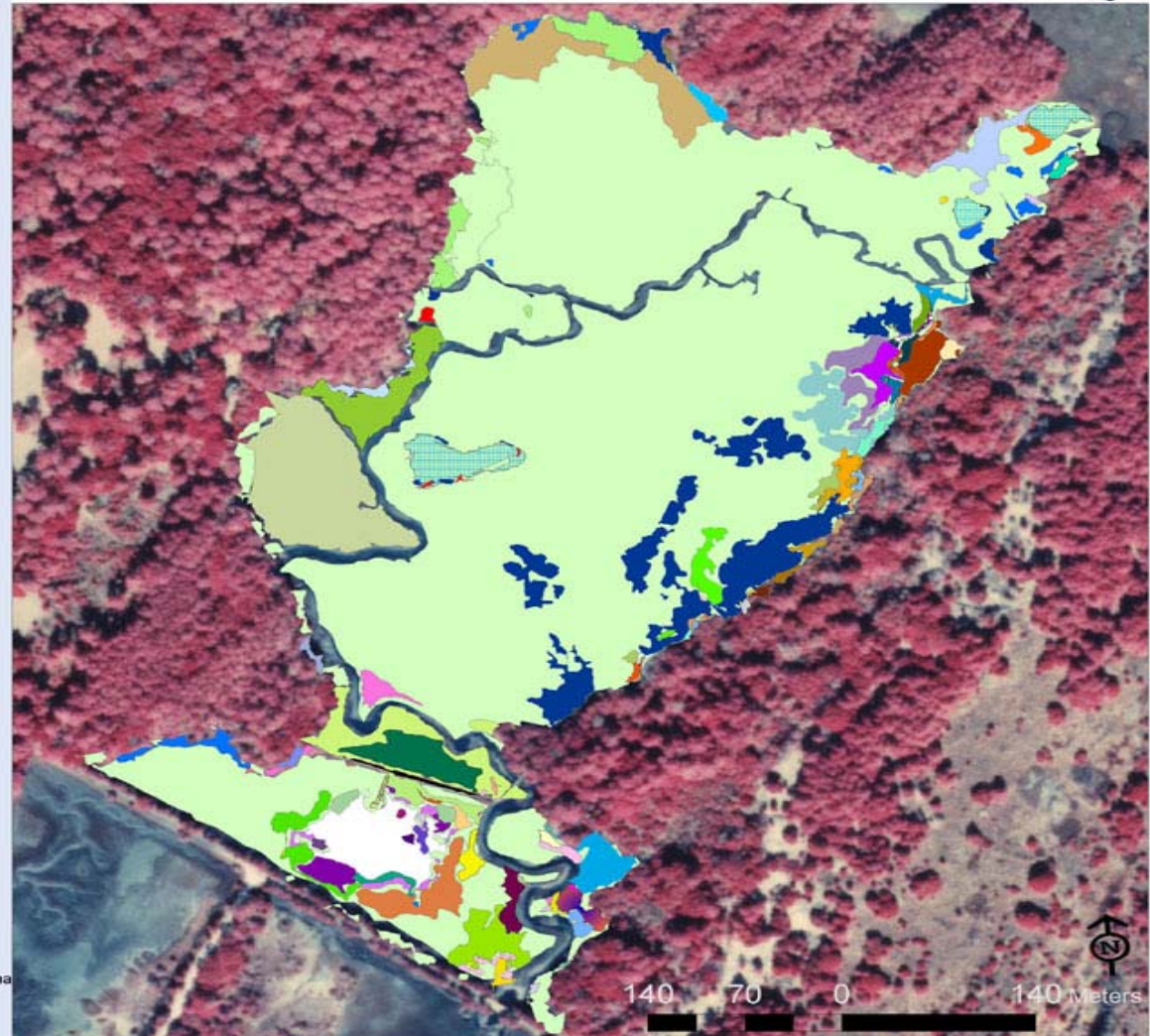


# Vegetation community characterization

## Legend

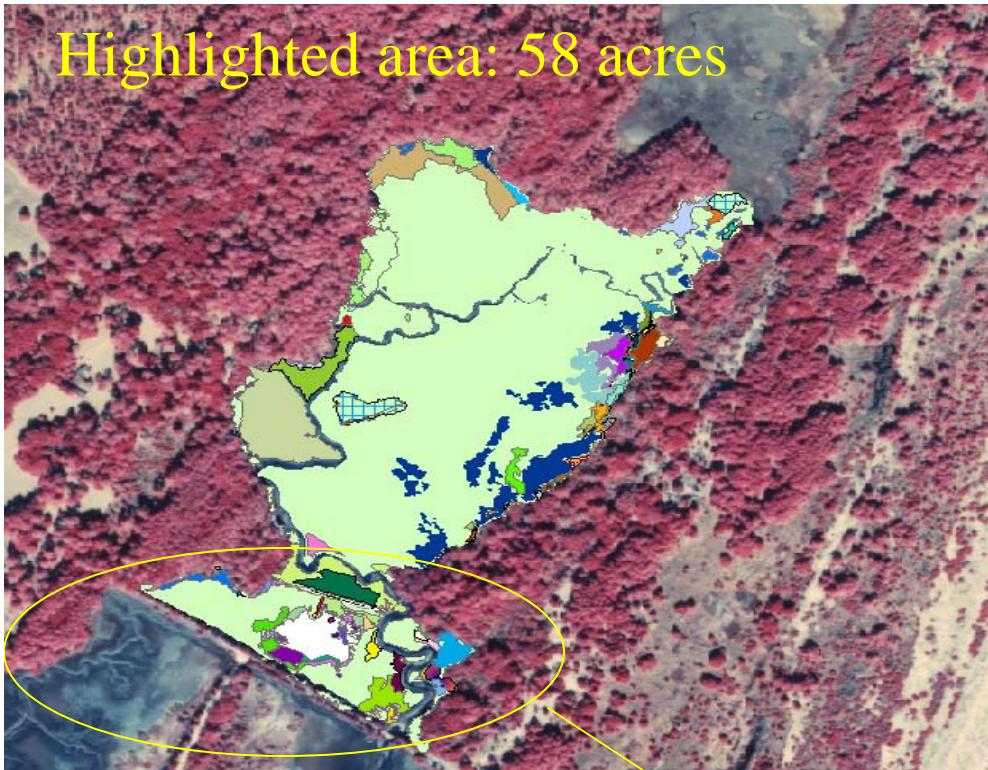
Batis	JuncusSpartinaDistichlisBatisLimonium
BatisBorrighia	JuncusSpartinaSpartinapdens
BatisDistichlisLimonium	Manipulated Causeway
BatisLimonium	Manmade Structure
BatisSalicornia	MUD
BatisSpartina	SalicorniaeSalicorniav
BatisSpartinaBorrighia	Salicornia
BatisSpartinaSalicornia	SalicorniaBatis
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BorrighiaBatisLimonium	SalicorniaBatisLimonium
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BorrighiaSalicornia	SalicorniaDistichlisLimoniumBatis
BorrighiaSalicornialva	SalicorniaDistichlisLimoniumSpartinaBatis
BorrighiaSpartina	SalicorniavSalicorniae
Distichlis	SalicorniavSalicorniaeBatis
DistichlisFimbristylis	SalicorniaSpartina
DistichlisHydrocotyle	SalicorniaSpartinaDistichlisLimonium
DistichlisHydrocotyleTypha	Saltpan
DistichlisLimoniumSpartina	Spartina
DistichlisSalicorniaBatis	SpartinaBatis
DistichlisSalicorniaSpartinaBatis	SpartinaBatisDistichlis
DistichlisSpartina	SpartinaBatisDistichlisSalicornia
DistichlisSpartinaBatis	SpartinaBatisSalicornia
DistichlisSpartinaBatisLimonium	SpartinaDistichlisLimonium
DistichlisSpartinaBatisSalicorniaBorrighia	SpartinaDistichlisSalicornia
DistichlisSpartinaSalicorniaLimonium	SpartinaJuncus
Hammock	SpartinaJuncusDistichlis
HydrocotyleSporobolusPhloxeris	SpartinaLimonium
Iva	SpartinaLimoniumSalicornia
Juncus	SpartinaSalicornia
JuncusBatis	SpartinaSalicorniaBatisDistichlis
JuncusBatisBorrighia	SpartinaSalicorniaDistichlis
JuncusBatisDistichlisLimonium	SpartinaSalicorniaJuncus
JuncusBatisSalicornia	Spartinapdens
JuncusBatisSpartina	SpartinapdensDistichlis
JuncusBorrighiaBatis	SpartinapdensFimbristylis
JuncusDistichlis	SpartinapdensSpartina
JuncusDistichlisBatis	SporobolusHydrocotyle
JuncusDistichlisBatisLimonium	SporobolusHydrocotyleTypha
JuncusIva	SporobolusViciaHydrocotyle
JuncusSalicornia	SporobolusDistichlisHydrocotyleSpartinaTypha
JuncusSalicorniaLimoniumBorrighiaIva	
JuncusSpartina	

## Dean Creek Vegetation Communities





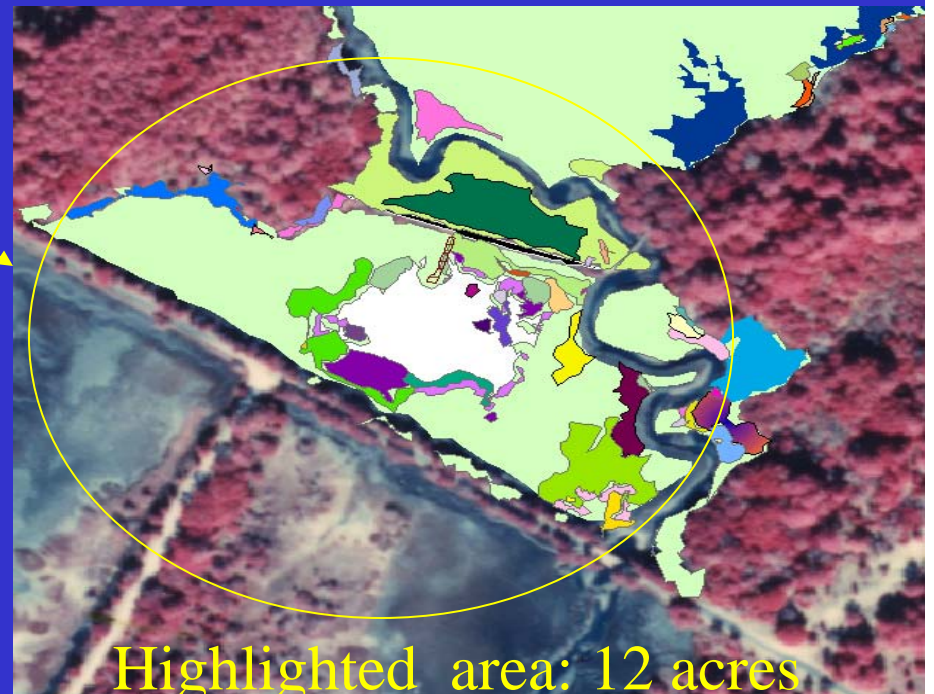
Highlighted area: 58 acres



## Estuarine Marsh-System Complexity

Upper Dean Creek vegetation community and habitat map. Complexity of converging vegetative communities equals 190 based upon dominant and co-dominant vegetation descriptors.

GIS/GPS mapping and ground-truth data collected and processed. Plots: 3;  $1/4\text{m}^2 \times 1/4\text{m}^2$  per habitat shift including plant species and densities  
Overlay upon 2003, False color, Infrared imagery, 1:18000 scale.



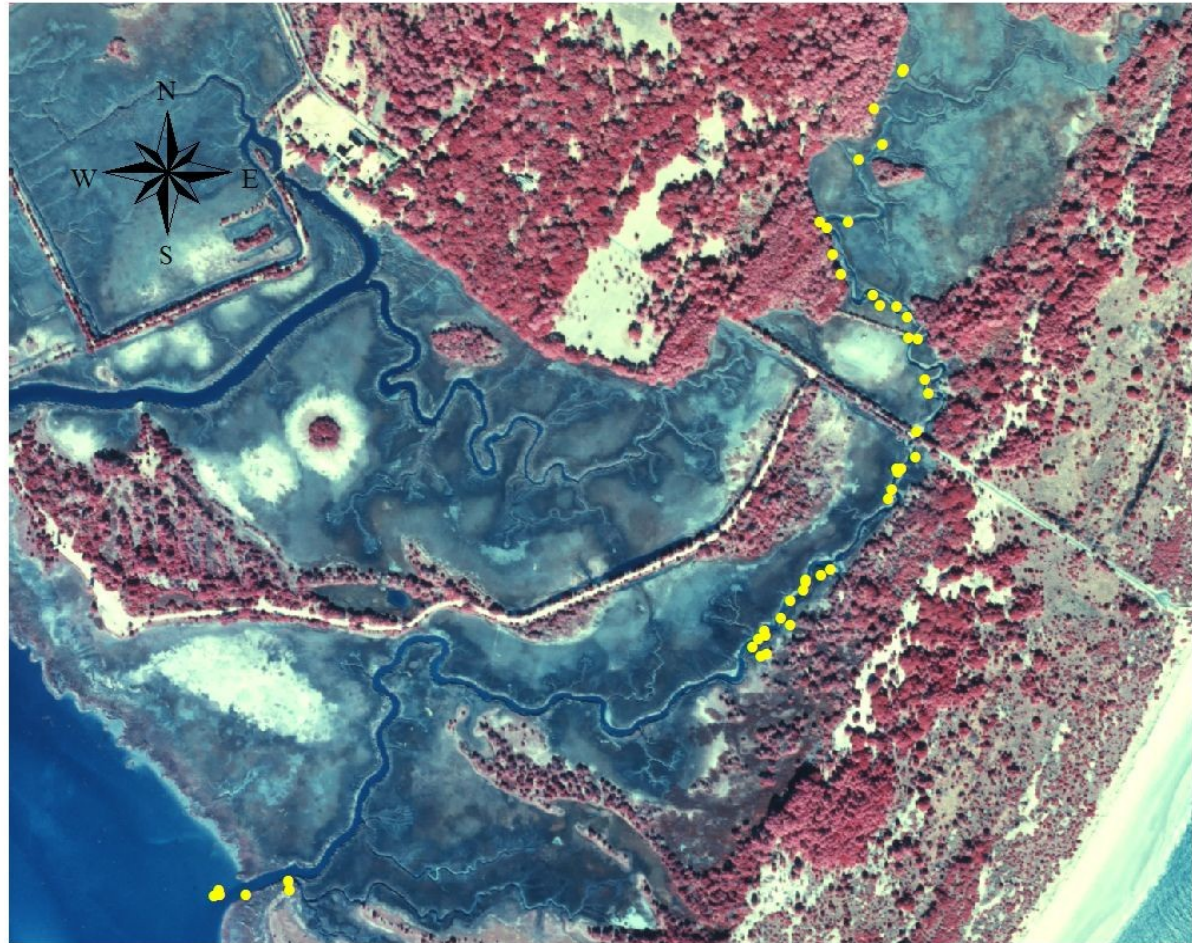
Highlighted area: 12 acres



# Faunal community characterization

GIS map of all existing intertidal oyster reef beds ( $n=44$ ) within Dean Creek. June, '04

Metadata includes oyster numbers, spatial dimensions, and GPS location.



Dean Creek oyster reefs



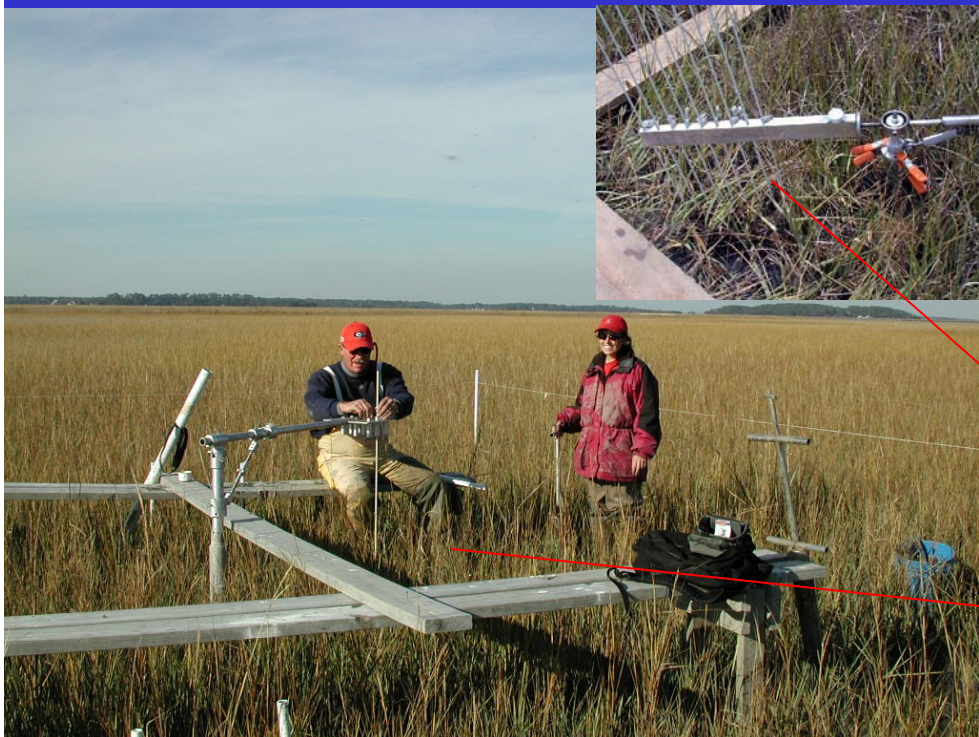
Intertidal community characterization was accomplished on several (n=12) of the mapped oyster reefs. Sampling also included the placement of green porcelain crab habitat trays which were monitored by the LTER Schoolyard participants Summer 06.

Invertebrate inbenthic communities were also characterized up and downstream of the slated spanning bridge.



Dr. Dale Bishop (GCE-LTER principal investigator) organizes and analyses the data collected by the schoolyard in addition to his own research revolving around macro invertebrate communities.

Altered sediment regime: Potential sediment retention in the upper basin as compared to the lower basin.



### Sedimentation/ Erosion Tables

Four (4) Sediment Erosion Tables (SETs) have been placed in the Dean Creek area. Two (2) are in close proximity to the spanning bridge for assessment of effects within the immediate proximity of the construction site with the other two located near the mouth and headwaters of the creek.

Photos courtesy of Dr. Chris Craft



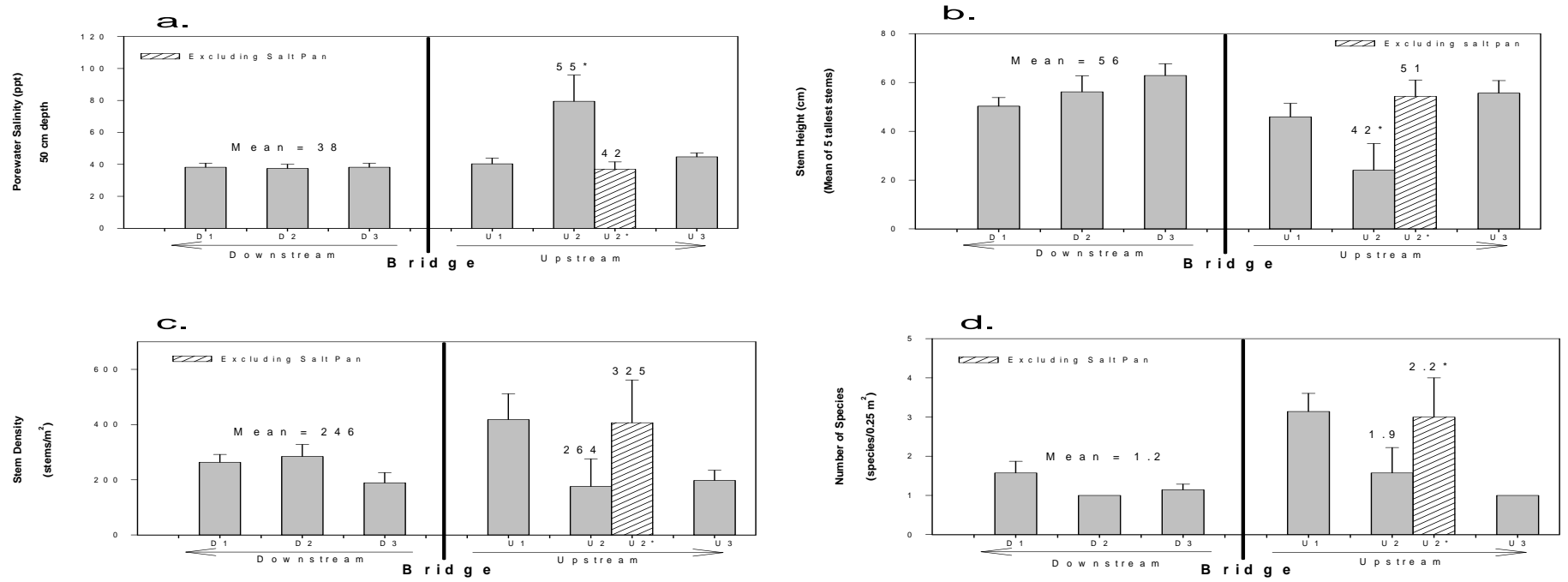
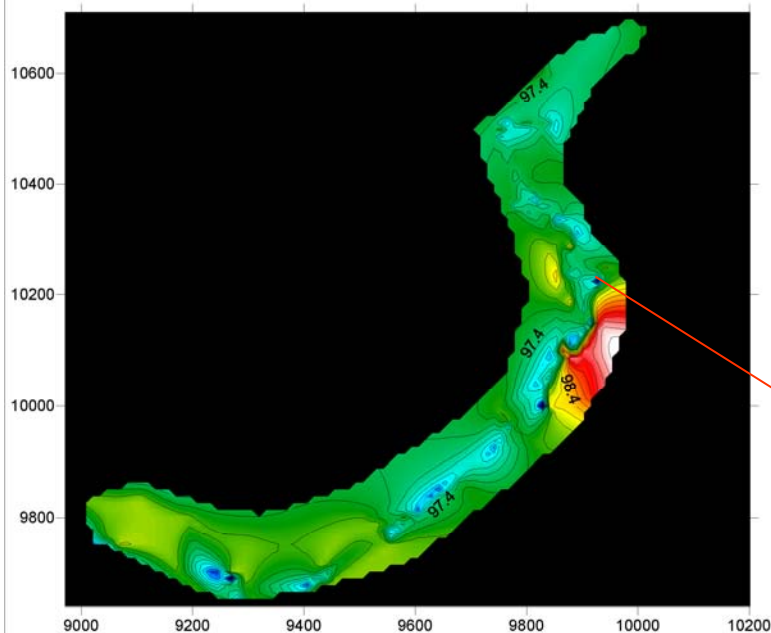
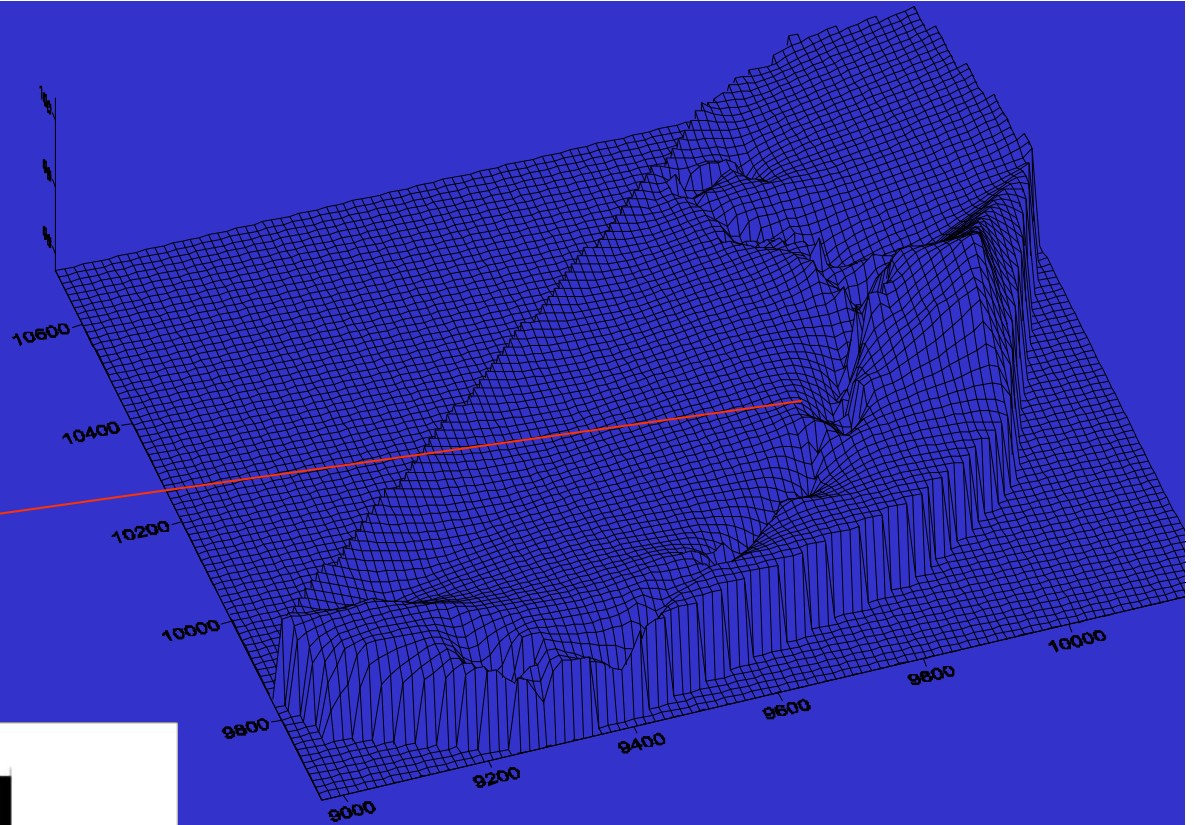


Figure 1. Mean (a) porewater salinity, (b) stem height, (c) stem density and (d) species richness along transects upstream and downstream of the bridge.

Wire Model Of Dean Creek's  
basin morphology showing  
creek channels and pools.

Spanning bridge construction  
site with scoured pools of  
current culvert pipe system.

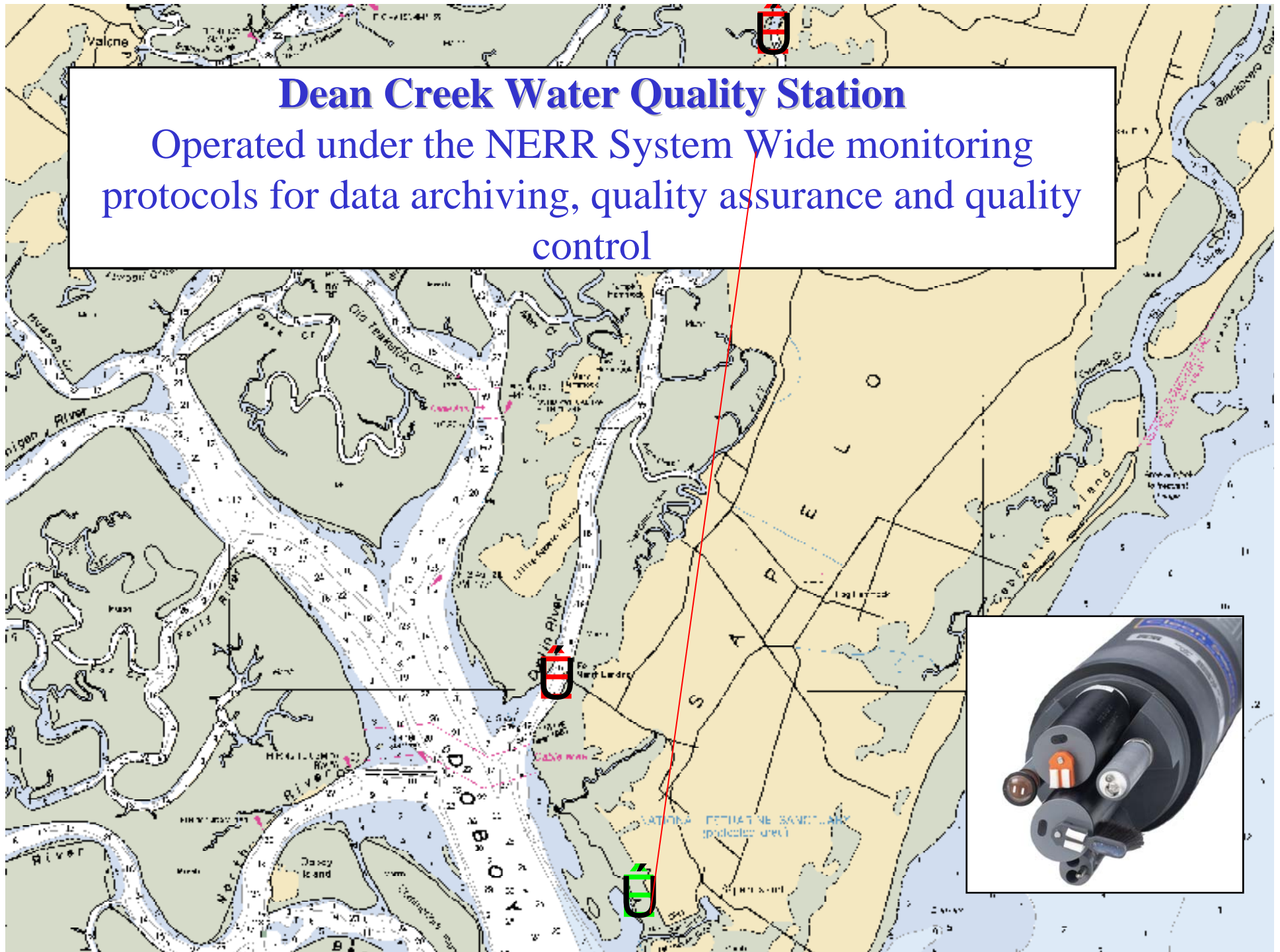


Colorgramic elevation model of  
Dean Creek

Continuous water quality  
monitoring site.

## Dean Creek Water Quality Station

Operated under the NERR System Wide monitoring protocols for data archiving, quality assurance and quality control





Water quality data has been collected on the following parameters from fall 2004:

Interval of data collection

Parameters

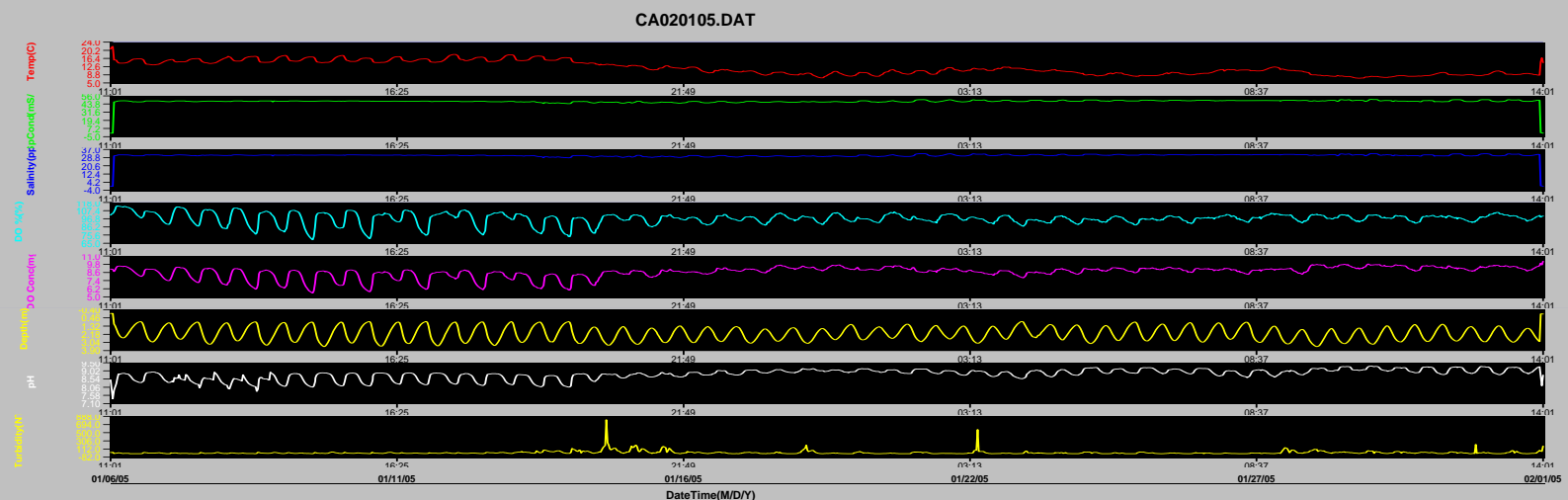
15 minute 24/7:

S', DO, pH, Turbidity, Temperature, Tidal amplitude

Monthly triplicate replication sampling surface/benthic

Nutrients:  $\text{NO}_2$ ,  $\text{NO}_3$ ,  $\text{NH}_4$ , Total N, Ortho- $\text{PO}_4$ , fecal coliforms (in near cooperation with MAREX)

Typical graphed 5 day YSI data sonde download



## Auxiliary Data Delivery Programs

National Atmospheric Deposition (NADP) and Mercury Deposition Network (MDN) partnerships

Site Operator: Aimee Gaddis

The NADP, MDN and atmospheric monitoring programs are co-operated by the SINERR and funded in collaboration with the UGA Marine Institute (NADP and weather ) which monitors weekly rainfall constituents including: CA, Mg, K, NA,  $\text{NH}_4$ ,  $\text{NO}_3$ , CL,  $\text{SO}_4$ ,  $\text{PO}_4$ , Methyl Hg and Total Wet Hg





## Contributing Dean Creek Restoration Scientific Partners

NOAA: National Oceanic and Atmospheric Administration

National Estuarine Research Reserve System

Graduate Research Fellows

Sapelo Island NERR staff

The Georgia Department of Natural Resources

Wildlife Resources Division

Coastal Resources Division

The Nature Conservancy (TNC): Georgia Chapter: Altamaha BioReserve

The Georgia Coastal Ecosystems: Long Term Ecological Research (GCE-LTER)

National Fish and Wildlife Service

The United States Geological Survey (USGS)

The National Atmospheric Deposition Program (NADP)

The National Mercury Deposition Network (MDN)

The University of Georgia:

Marine Extension Service

School of Marine Programs

Marine Institute

Indiana University

Savannah State University

The University of Kentucky

Armstrong State University