Engineering With Nature

Dr. Todd S. Bridges

Senior Research Scientist, Environmental Science
Engineer Research and Development Center

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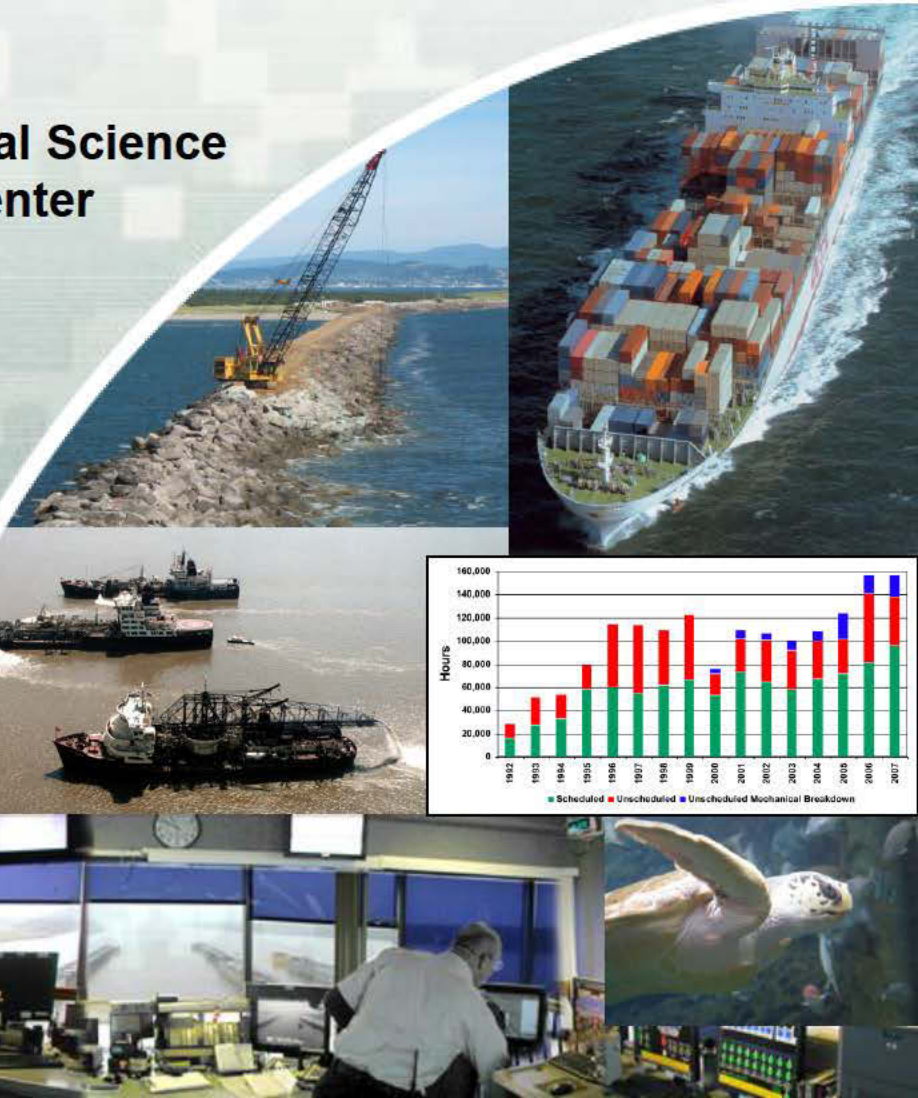
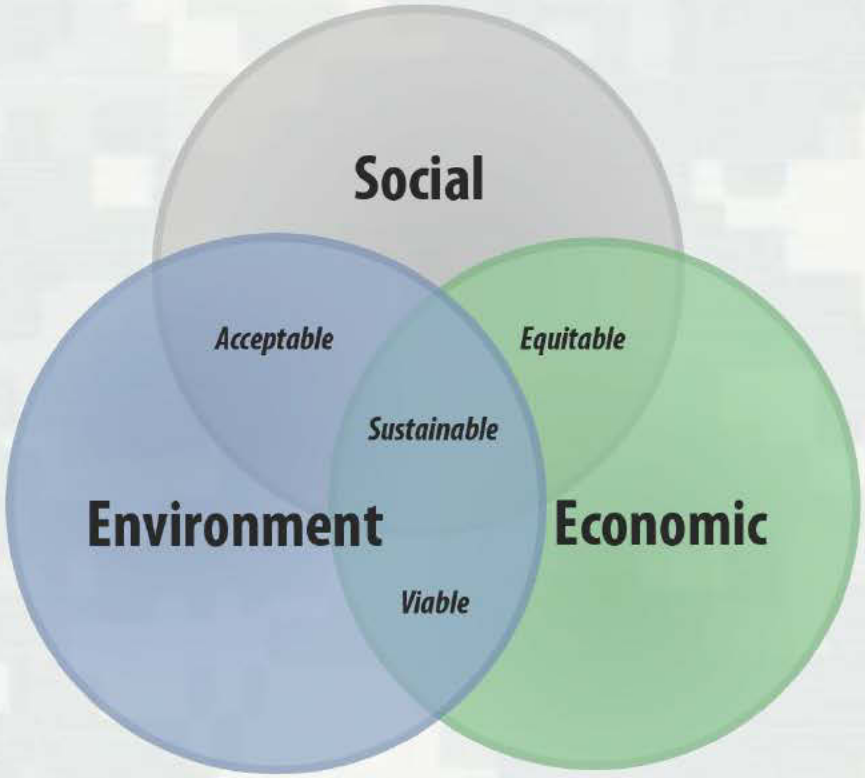


US Army Corps of Engineers
BUILDING STRONG®

The Challenge:
The *Status Quo is Not An Option*

The need:

- Efficient, cost effective engineering and operational practices
- More collaboration and cooperation with our partners and stakeholders.
  - Ports, commercial interests, regulators, NGOs, and others
- Sustainable projects. Triple-win outcomes integrating social, environmental and economic objectives.



Definition

Engineering With Nature is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

Key Ingredients

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners

Background

- *Engineering With Nature* initiative was started by USACE Navigation program in 2010. Over that period we have:
  - Engaged > 200 ind. across USACE Districts (23), Divisions, HQ; other agencies, NGOs, academia, private sector, international collaborators
    - Workshops (9), dialogue sessions, project development teams, etc.
  - Developed a strategic plan for the initiative
  - Initiated research to support the intent of EWN
  - Implementing our communication plan

Working with Nature

Building with Nature ↔ **Engineering With Nature**

EWN, A Natural Extension of RSM

- EWN- An *ecosystem approach* to infrastructure development and operations
  - Applied across missions and business lines
  - Expanding environmental benefits and services provided by infrastructure

Example EWN Solutions

Upper Mississippi River Training Structures: Chevrons

River Bendway Weirs

Environmentally Enhanced Breakwater Toe Blocks

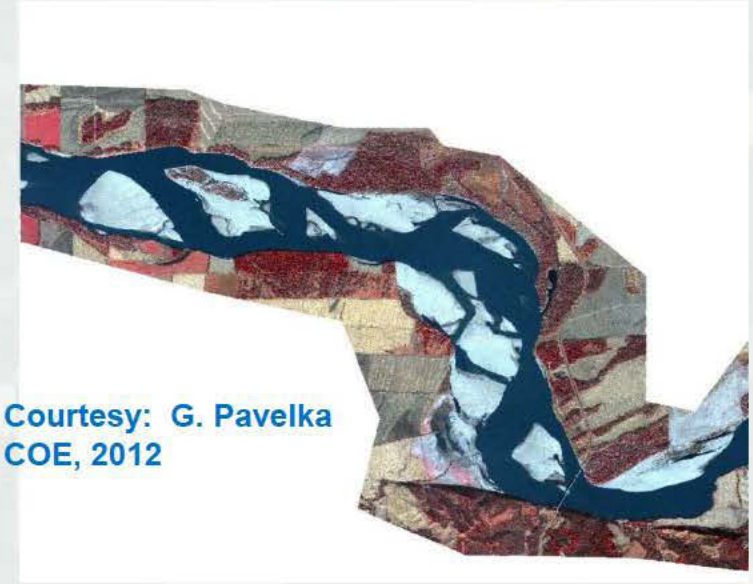
Example EWN Solutions

Upper Missouri River Sandbar Habitat

- $25 Million to construct 650 acres of sandbar
- Buried under 16,000 acres, 2011 flood

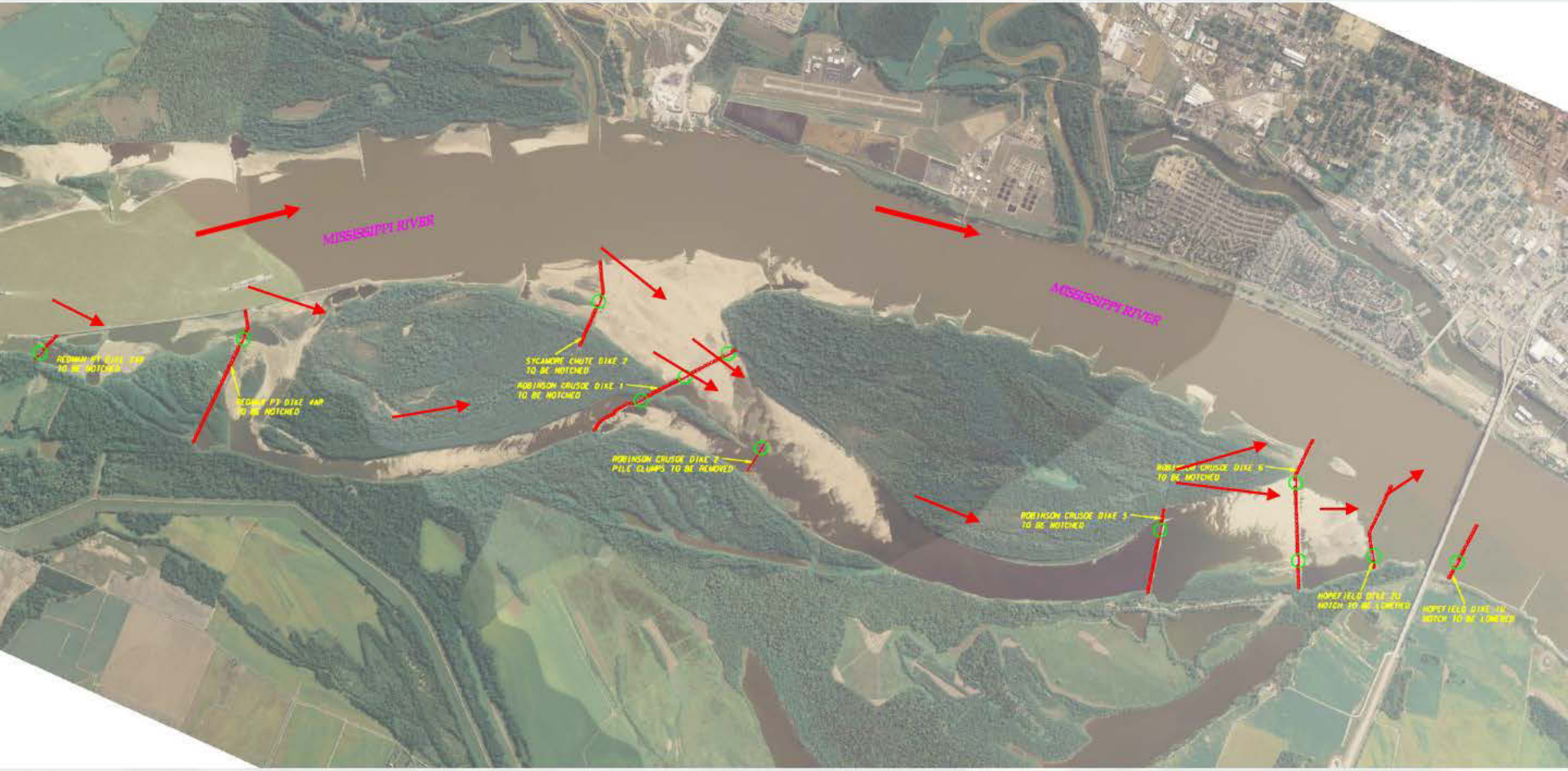
July 2009

November 2011



Courtesy: G. Pavelka
COE, 2012

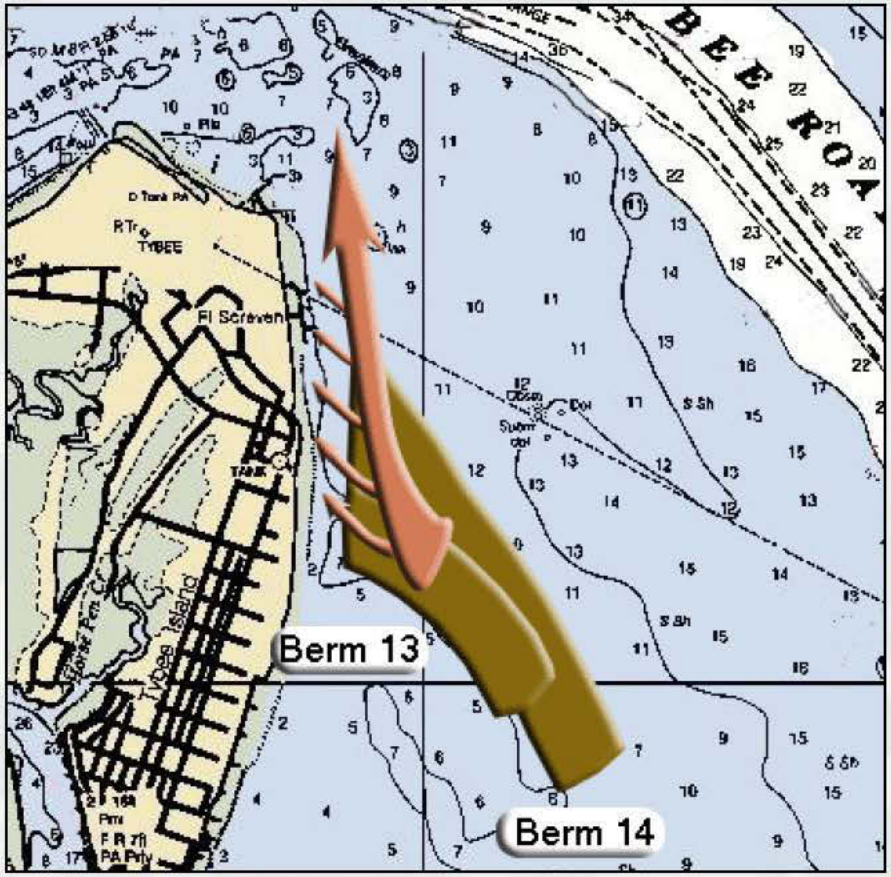
Example EWN Solutions



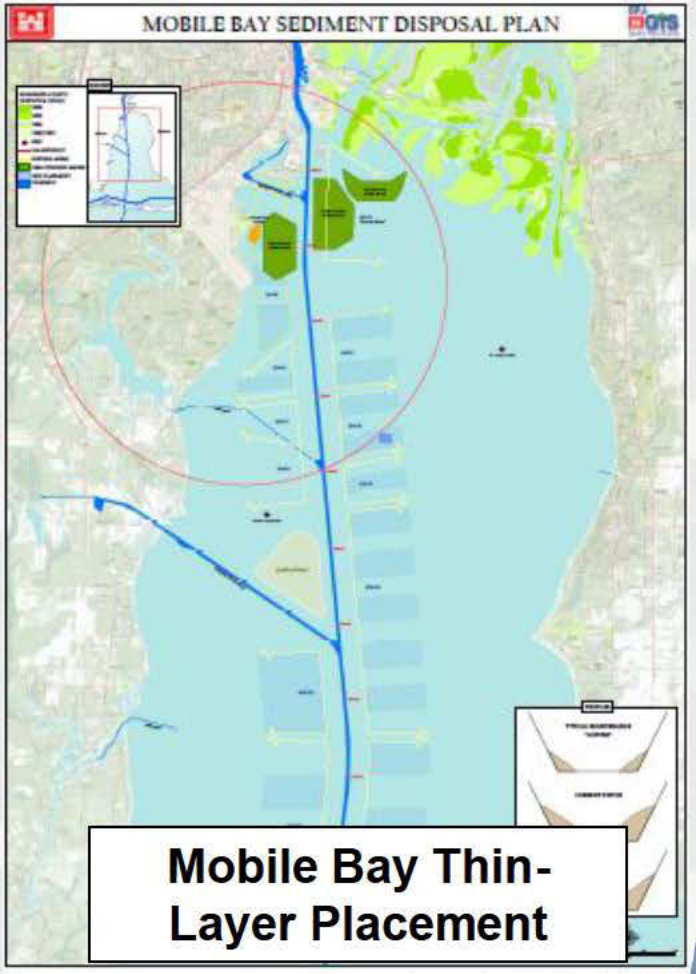
Loosahatchie Bar
Aquatic Habitat Rehabilitation

Example EWN Solutions

Strategic Sediment Placement

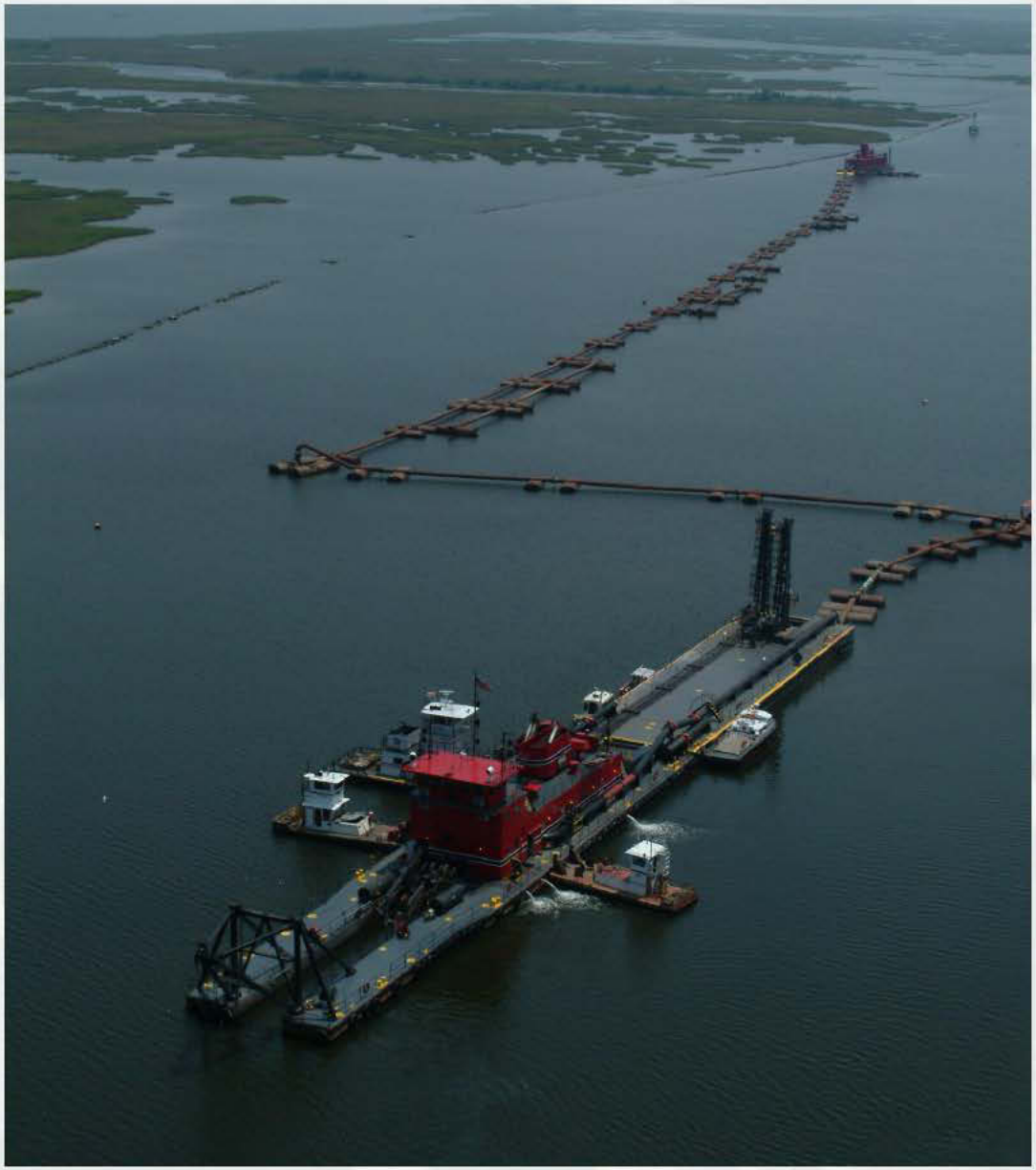


North Tybee Island
Savannah, Georgia



Mobile Bay Thin-Layer Placement

Example EWN Solutions

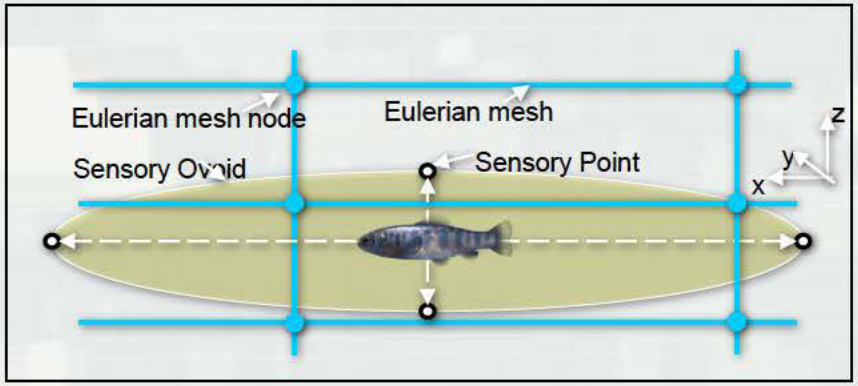


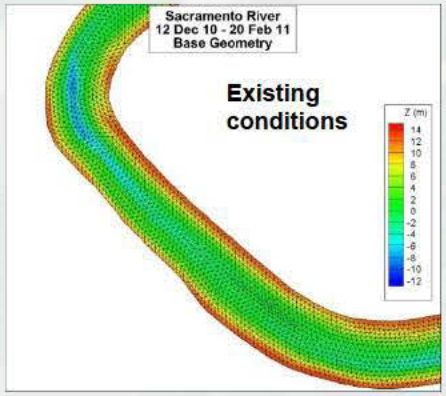
Long-distance pumping of dredged material for wetlands creation in coastal Louisiana, USA

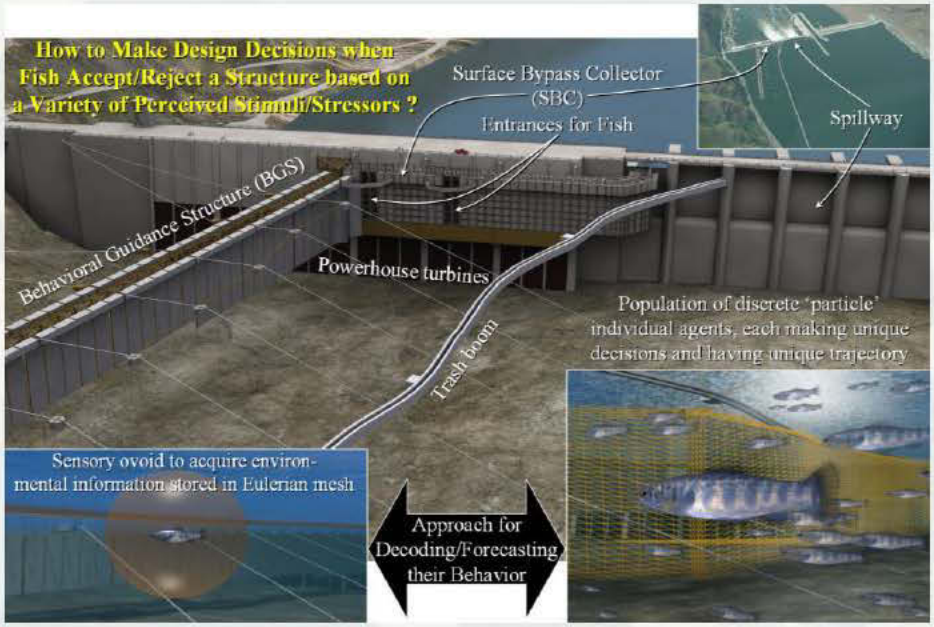
- ***How to marry LDC with natural transport processes to expand opportunities?***

Example EWN Solutions

Fish Modeling in the Columbia and Sacramento Rivers







EWN for Coastal Resilience

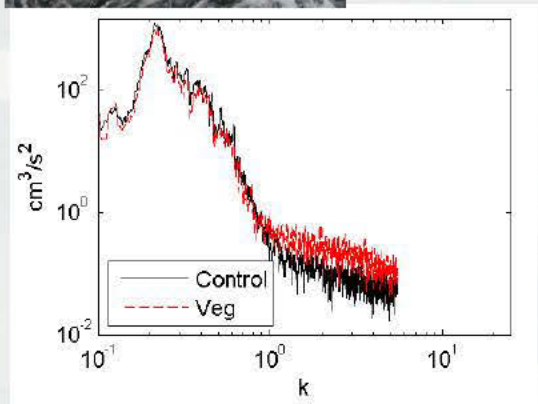
DOER-EMRRP research collaboration to improve the efficiency of engineering and operational practices, expand and extend project benefits, and improve the resilience and sustainability of coastal systems under climate change.

Field Research Activities:

- Wetland primary productivity
- Sediment processes
  - Cohesive sediment settling
  - Sediment resuspension
  - Marsh platform erosion

Laboratory Analyses:

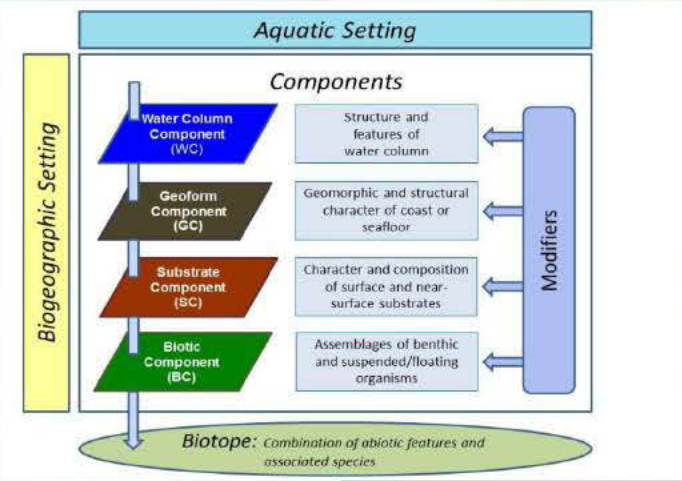
- Transport in vegetation
- Wave energy transformation

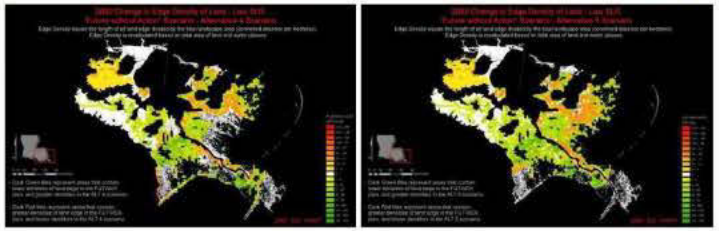


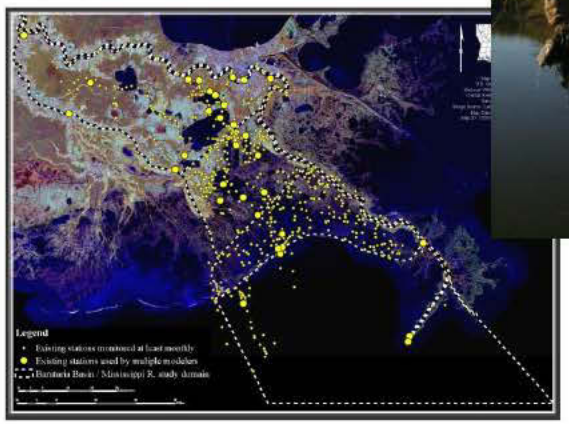
EWN for Coastal Resilience

Products

- Classification system
- Conceptual Models
- Web portal
- Enhanced numerical models & tools
  - PTM/LTFATE
  - SLAMM
  - SAND
  - D2M2







Collaborative Efforts

- Primary productivity and marsh accretion (USGS NWRC)
- Sediment bulk density and sediment transport (NRCS & USFWS)
- SLAMM improvements (Audubon, USFWS, & Maryland)

Example R&D Targets for EWN

- Improved modeling systems that engage users, stakeholders and decision-makers
- Understanding critical, fundamental processes
  - E.g., sediment transport through wetlands, fish and wildlife responses to engineered features, engineering performance of environmental structures
- Reliable, cost-efficient monitoring technologies for measuring environmental outcomes
- Coastal engineering/infrastructure producing benefits for the environment, and *vice versa*

Engineering With Nature

- Expand the range of benefits provided through water-based infrastructure
  - "Doing more with less"
- Balancing consideration of environmental risks with **benefits**
- A path to more sustainable projects