## Focus Area

Environmental Resource Management

Problem

Ecosystem models and circulation/wave/transport process models are typically developed separately, although output from the transport models are processed and used as input to the ecosystem models. This external processing generally requires reduction in spatial and temporal process, scale and variability which reduces fidelity of the subsequent ecosystem modeling. Increased CPU capacity and transport process understanding now permits model coupling. Organizations such as DHI and Deltares are developing coupled modeling systems and are using these to evaluate system evolution and compare design alternatives (example: Delft3D simulations of West Bay Diversion hydrodynamics, transport, ecosystem evolution, and response to events). To address dredged sediment management, including beneficial use and creation of natural and nature-based features, ERDC requires coupled models that include fidelity necessary to compare alternatives.

Louisiana Wetland evolution
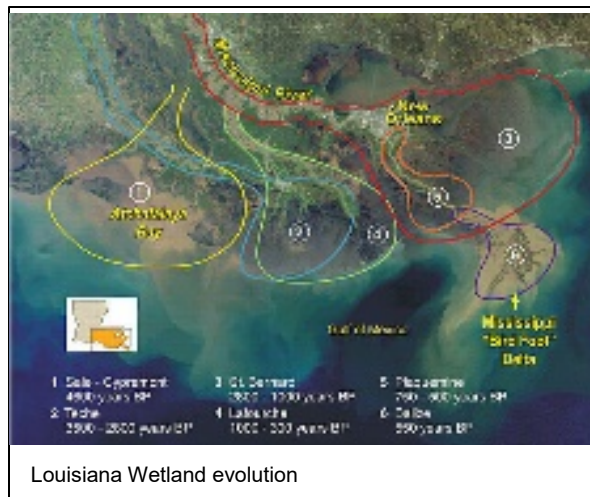
Study Description

The project will develop a coupled modeling system for waves, circulation, sediment transport, water quality, and coastal wetland ecosystem evolution. Existing physical, chemical, and ecological models will be applied and modified to develop this system. Ecosystem evolution, including morphology change, stem density, and ecosystem filtering of water will provide feedback to the circulation, wave transformation, sediment transport, and water chemistry model components. The model will operate on appropriate scales to support evaluation of waterway, sediment, and ecosystem management alternatives which can support resilient ecosystems which support ecosystem restoration and flood risk management USACE business lines.

Products

- Coupled physical/chemical/ecological modeling system
- Documentation and Guidance for system
- Training/Workshop

Summary

This research will develop a coupled physical processes/ water quality/ wetland ecosystem evolution model with fidelity required to evaluate design alternatives for sustainable, resilient ecosystems, including sustainable dredged material management strategies to support wetlands. Guidance for developing similar modeling systems for other habitats will also be developed.
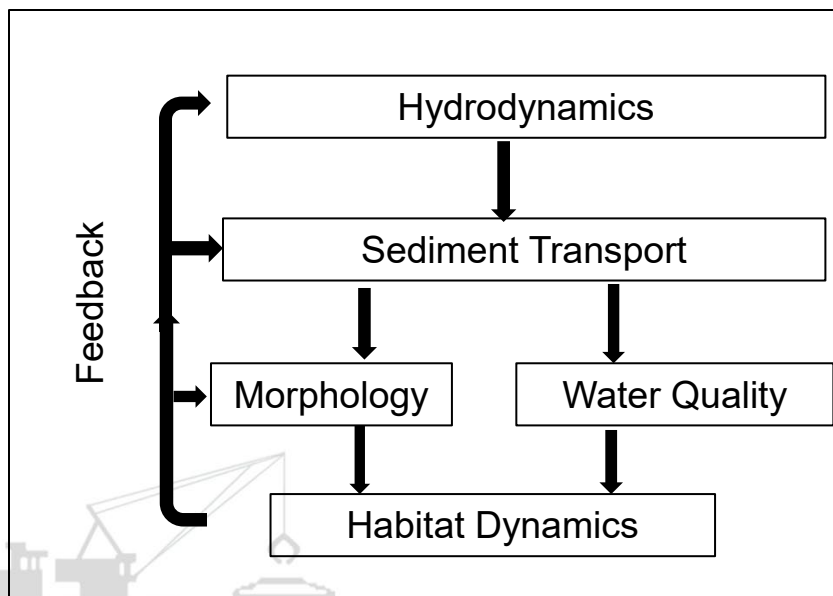
Balancing operational and environmental initiatives and meeting complex challenges of dredging and dredged material placement in support of the navigation mission.

Todd Swannack • ERDC Environmental Laboratory • todd.m.swannack@usace.army.mil
Joe Gailani • ERDC Coastal and Hydraulics Laboratory • Joe.Z.Gailani@usace.army.mil

January 2020