THE WATER INSTITUTE
OF THE GULF ®

INTEGRATED NATURAL SYSTEMS MODELING

The Water Institute of the Gulf develops and applies world-class integrated hydrologic, morphodynamic, and ecosystem numerical tools to understand short- and long-term conditions of complex coastal and deltaic systems. These models can be applied at various spatial scales ranging from local or water body-specific project feasibility and design to coastwide or system-wide planning. These predictive numerical models support and inform decision-makers on how to manage and sustain valuable natural resources and infrastructure.

Our interdisciplinary approach allows us to effectively validate integrated numerical models against comprehensive field-observation datasets, and to utilize these advanced numerical tools to evaluate and understand the effects of protection and restoration projects on coastal and deltaic landscapes. We also recognize the importance of incorporating the effects of climate change and extreme weather into ecosystem models to assess their impact on the sustainability and effectiveness of coastal restoration and protection strategies.

MODELING CAPABILITIES

Modeling Tools Currently in Use

Delft3D*

HEC-RAS

Flood Forecasting System (Delft-FEWS)

HEC-HMS

FLOW3D

MIKE-FLOOD

Integrated Compartment Model

MIKE-11

MIKE-21

Processes and Variables of Interest

Hydrodynamics

Sediment Transport

Water Quality

Nutrient Dynamics

Morphodynamics

Soil and Organic Matter

Vegetation Dynamics

Climate Patterns

*The Institute is a certified Delft3D Modeling Center

YEAR 0 - YEAR 50

PREDICTED LAND LOST

PREDICTED LAND GAINED
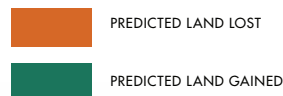
Background image: Predicted land change from sediment diversions 50 years into the future, from the Institute's work to understand Mississippi River sediment diversion projects.

Because life happens at the water's edge

Above: The Institute's groundbreaking models show impacts of proposed sediment diversions on a number of variables, including future vegetation coverage.

Left: Comparing model outputs across multiple years allows us to understand long-term trends across a variety of variables such as sediment accretion, as illustrated here.
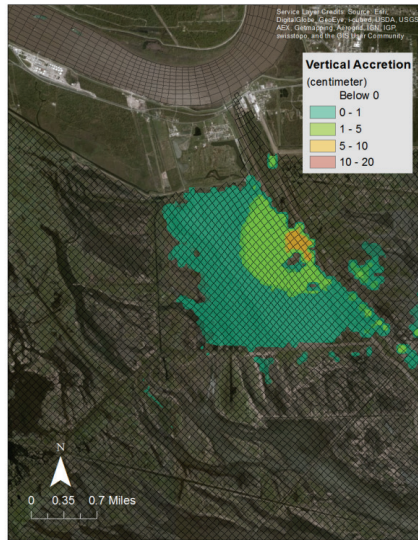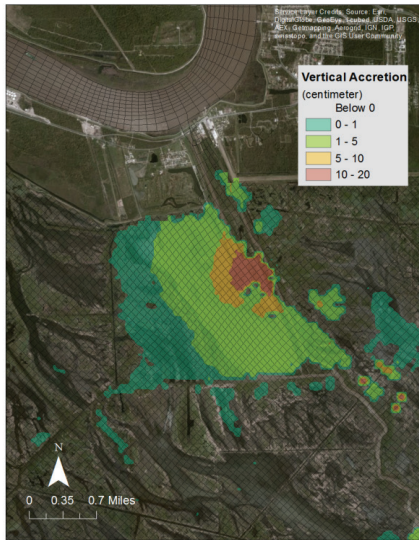
The Institute brings a unique diversity of backgrounds, expertise, and experiences to bear on understanding, developing, and applying numerical tools to address complex challenges. In addition to the in-house depth of talent, the Institute actively collaborates with external partners from academia, federal research laboratories, and non-profit organizations, as well as the private sector – locally, nationally, and internationally. Such collaboration has resulted in the development of advanced and integrated numerical models for coastal and deltaic systems.

Our team utilizes a wide range of numerical models and is continually seeking to identify the best available tools in the research and practitioner communities. We boast high proficiency in the use of a wide variety of public and proprietary modeling tools. Jointly with a large team of collaborators, the modeling team at the Institute has developed a comprehensive ecosystem model (Integrated Compartment Model (ICM)) that will soon be publicly available. The ICM will be a useful tool to support large-scale modeling efforts.

Finally, the modeling team at the Institute has developed a Real-Time Forecasting system for part of the Louisiana Coast. The system provides a 7-day forecast for parameters such as Tide, Salinity, and Temperature, and in the near future will expand into sediment and nutrient concentrations. The system is an effective tool for managing and operating existing fresh-water diversion and possible future sediment diversions.

LET'S WORK TOGETHER

We look forward to the chance to work with you to understand and predict future conditions, as well as potential solutions, so that you can make the decisions regarding which investments are needed for the long-term sustainability of your interests – from infrastructure, to communities, to the environment.

For more information about the Institute's research capabilities and how they can benefit your organization, visit **www.thewaterinstitute.org** or contact info@thewaterinstitute.org.

THE WATER INSTITUTE OF THE GULF | 1110 RIVER ROAD S., STE. 200, BATON ROUGE, LA 70802 USA | +1 (225) 448-2813