



Ecosystem Modeling Framework: An integrated assessment of the northern Gulf of Mexico

For several years now, a team of scientists from research institutions across the Gulf coast has worked together to develop an Integrated Ecosystem Assessment (IEA) model for the northern Gulf of Mexico. Researchers, including oceanographers, ecosystem modelers, and population ecologists came together shortly after the Deepwater Horizon oil spill to set up the framework for examining the ecological impacts of the disaster. The team includes scientists from the Harte Research Institute (Texas A & M), Louisiana State University, University of Southern Mississippi, Mississippi State University, Dauphin Island Sea Lab, Florida State University, and US EPA Gulf Ecology Division.

The environment is in a constant state of change. There are gradual variations that take place over time in the plant and animal communities that drive ecosystems, as well as changes in non-living factors like air and water. It is this perpetual state of change, and the *interconnectedness* of the components of an ecosystem, that makes it essential to manage ecosystems as a whole. An IEA is one management technique that uses a holistic evaluation of information on physical, chemical, ecological, and human activities and processes with regard to specific ecosystem management goals, like commercial fishing and recreation. It takes advantage of multiple sets of expertise in different fields and benefits from a variety of perspectives. The four estuaries selected for this assessment represent a variety of northern Gulf of Mexico estuarine ecosystems: *Galveston Bay*, Texas; *Barataria Basin*, Louisiana; *Mississippi Sound* in Louisiana, Mississippi, and Alabama; and *Perdido Bay*, Florida. These systems offer a range of geographic, hydrologic, and population characteristics that are typical of much of the northern Gulf coast.



An Integrated Ecosystem Assessment incorporates human, biotic, and physical interactions of an ecosystem that result from human and natural system disturbance.

After categorizing the factors affecting coastal systems, researchers found that human-related activities put the most pressure on all four of the estuaries. Strains on the ecosystem include fishing, urban and coastal development, boat traffic, nutrients from runoff, and pollution. Habitat change and loss were also common impacts in each system.

A comprehensive assessment like this one can provide resource managers with information to make critical decisions. The management plans offered as a result of this assessment will pave the way for sustainable environmental and economic development as they are adaptable to many human-impacted systems in the northern Gulf of Mexico.

Education Extension

Key Terms: *ecosystem, habitat, community, ecosystem management*

Classroom Activity: Ecosystems

Scientists study ecosystems by learning about their living and non-living components and how they are connected to one another. In this lesson, students will discover what an ecosystem is and explore one, either in person or virtually, to better understand all of the components.

Supplies: *paper, pencil, camera*

Directions: 1) Discuss ecosystems and provide examples, including the processes that drive them. 2) Visit an ecosystem (pond, forest, estuary, etc.) and ask the students to draw or take pictures of plants and animals in the ecosystem. 3) Ask them to describe non-living components to the ecosystem. 4) Back in the classroom have a discussion about what the students observed. 5) Ask the students how they would manage that ecosystem. What measures would they take to protect its resources while still allowing human use?

Visit <http://dhp.disl.org/resources.html> for lesson plans and additional marine-related activities.

**Use the key terms above to search for additional lesson plans on the web!*

Ocean Literacy Principles: 5. The ocean supports a great diversity of life and ecosystems, 6. The ocean and humans are inextricably interconnected

National Science Standards: A. Science as Inquiry: Abilities necessary to do scientific inquiry; C. Life Science: Populations and ecosystems; G. History and Nature of Science: Science as a human endeavor

Did You Know...

Interconnectedness refers to the idea that all of the living and non-living components of an ecosystem are intricately linked. In 1911, John Muir wrote, "When we try to pick out anything by itself, we find it is hitched to everything else in the universe." While the concept has been around for 100 years or more, it has only recently become the standard in the management of natural resources.

Galveston Bay, located near Houston, Texas, covers approximately 600 square miles and is fed by the San Jacinto and Trinity Rivers. Wetlands (salt, brackish, and fresh marsh), oyster reefs, seagrass meadows, and mud flats make up the dominant habitats.

The **Barataria Basin** is located west of the Mississippi River in southeastern Louisiana. This large system has a surface area of 2,400 square miles and consists of fresh water swamp forest and marshes ranging from fresh to saline.

Mississippi Sound extends from Lake Borgne, Louisiana to Mobile Bay, Alabama and contains approximately 780 square miles of open water and 100 square miles of partially submerged salt marsh.

Perdido Bay is a relatively small and shallow estuary covering 50 square miles and averaging a depth of 6.5 feet. It is situated along the border of Alabama and Florida and is fed by the Perdido River.

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The Northern Gulf Institute (NGI) is a National Oceanic and Atmospheric Administration (NOAA) Cooperative Institute addressing the research needs of the northern Gulf of Mexico. Mississippi State University leads this collaboration of the University of Southern Mississippi, Louisiana State University, Florida State University, Alabama's Dauphin Island Sea Lab, and NOAA scientists at laboratories and operational centers.

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