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Coastal & Marine Geology Program

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Louisiana Coastal Wetlands: A Resource At Risk

USGS Fact Sheet

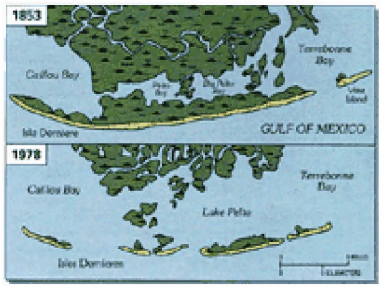
Atchafalaya delta, Louisiana. [larger version]

"The swamps and marshes of coastal Louisiana are among the Nation's most fragile and valuable wetlands, vital not only to recreational and agricultural interests but also the State's more than $1 billion per year seafood industry. The staggering annual losses of wetlands in Louisiana are caused by human activity as well as natural processes. U.S. Geological Survey scientists are conducting important studies that are helping planners to understand the life cycle of wetlands by detailing the geologic processes that shape them and the coast, and by providing geologic input to models for mitigation strategies."

- S. Jeffress Williams, U.S. Geological Survey

Louisiana's 3 million acres of wetlands are lost at the rate about 75 square kilometers annually, but reducing these losses is proving to be difficult and costly.

Approximately half the Nation's original wetland habitats have been lost over the past 200 years. In part, this has been a result of natural evolutionary processes, but human activities, such as dredging wetlands for canals or draining and filling for agriculture, grazing, or development, share a large part of the responsibility for marsh habitat alteration and destruction. Louisiana's wetlands today represent about 40 percent of the wetlands of the continental United States, but about 80 percent of the losses. The State's wetlands extend as much as 130 kilometers inland and along the coast for about 300 kilometers. Not all the wetlands are receding; in fact some wetlands are stable, and others are growing. But, at the present net rate of wetlands loss, Louisiana will have lost this crucial habitat in about 200 years. Considerable effort has been expended, and will continue to be expended, on understanding the processes that control wetlands evolution.



Over the past 150 years, the Isles Dernieres have undergone very rapid erosion and land loss due primarily to natural processes of relative sea-level rise, storms, and sand loss by coastal currents. [larger version]

U.S. Geological Survey (USGS) scientists have undertaken cooperative studies with several Federal and State agencies to study the Louisiana coast.

USGS has undertaken joint field investigations with Federal, State, and university

Related Research Projects:

Subsidence and Sea-Level Rise in Southeastern Louisiana: Implications for Coastal Management and Restoration
USGS Coastal & Marine Geology Program

Subsidence and Fault Activation Related to Fluid Energy Production, Gulf Coast Basin Project
USGS Coastal & Marine Geology Program

Geologic Framework and Processes of the Lake Pontchartrain Basin
USGS Coastal & Marine Geology Program

Related Publications:

Subsurface Controls on Historical Subsidence Rates and Associated Wetland Loss in Southcentral Louisiana
Originally published in *Gulf Coast Association of Geological Societies Transactions*

Primary Causes of Wetland Loss at Madison Bay, Terrebonne Parish, Louisiana - USGS Open File Report 03-060
USGS Coastal & Marine Geology Program

Environmental Atlas of the Lake Pontchartrain Basin - USGS Open File Report 02-206
USGS Coastal & Marine Geology Program

Related Links:

U.S. Fish and Wildlife

Service
U.S. Department of the Interior

Coastal Research Laboratory
University of New Orleans

Louisiana State University
Baton Rouge, Louisiana

partners to gather and interpret baseline information for improving scientific understanding of the critical processes responsible for creation, maintenance, and deterioration of coastal wetlands. In 1988, USGS scientists began a study of wetland processes in cooperation with the U.S. Fish and Wildlife Service and the Louisiana State University as an extension of the recently-completed Louisiana Barrier Island Erosion Study. Large data sets on topics such as storm effects, movement of water and dispersal of fine-grained sediments, soil development, marsh disintegration, and effects of land subsidence and sea-level rise have been systematically collected since 1989 from representative sediment-starved and sediment-rich basins in Louisiana. Synthesis and comparisons of these data sets enhance our knowledge of how wetlands function and the critical processes responsible for change.

USGS and other studies indicate that major shifts in the course of the Mississippi River have contributed significantly to the demise of the wetlands.

The 300 kilometer-wide Mississippi River delta plain and its associated wetlands and barrier shorelines are the product of the continuous accumulation of sediments deposited by the river and its distributaries during the past 7,000 years. Regular shifts in the river's course have resulted in four ancestral and two active delta lobes, which accumulated as overlapping, stacked sequences of unconsolidated sands and muds. As each delta lobe was abandoned by the river, its main source of sediment, the deltas experienced erosion and degradation due to compaction of loose sediment, rise in relative sea level, and catastrophic storms. Marine coastal processes eroded and reworked the seaward margins of the deltas forming sandy headlands and barrier beaches. As erosion and degradation continued, segmented low-relief barrier islands formed and eventually were separated from the mainland by shallow bays and lagoons.

The environmental and economic consequences of coastal erosion in Louisiana are significant.

Barrier islands fronting the Mississippi River delta plain act as a buffer to reduce the effects of ocean waves and currents on associated estuaries and wetlands. Louisiana's barrier islands are eroding, however, at a rate of up to 20 meters per year; so fast that, according to recent USGS estimates, several will disappear by the end of the century. As the barrier islands disintegrate, the vast system of sheltered wetlands along Louisiana's delta plains are exposed to the full force and effects of open marine processes such as wave action, salinity intrusion, storm surge, tidal currents, and sediment transport that combine to accelerate wetlands deterioration.

Human activities during the past century have drastically affected the wetlands.

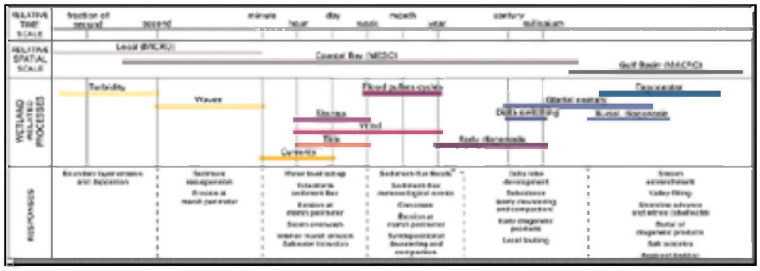
Natural processes alone are not responsible for the degradation and loss of wetlands in the Mississippi River delta plain. The seasonal flooding that previously provided sediments critical to the healthy growth of wetlands has been virtually eliminated by construction of massive levees that channel the river for nearly 2000 kilometers; sediment carried by the river is now

Fragile wetlands are readily damaged, directly and indirectly, by canals dredged for navigation and energy exploration. [larger version]

discharged far from the coast, thereby depriving wetlands of vital sediment. In addition, throughout the wetlands, an extensive system of dredged canals and flood-control structures, constructed to facilitate hydrocarbon exploration and production as well as commercial and recreational boat traffic, has enabled salt water from the Gulf of Mexico to intrude brackish and freshwater wetlands. Moreover, forced drainage of the wetlands to accommodate development and agriculture also contribute to wetlands deterioration and loss.

Methods to mitigate wetlands loss are costly and politically sensitive, affecting communities, agriculture, and industry.

A variety of ideas have been put forward as partial solutions to the dramatic loss of barrier islands and wetlands along the Louisiana coast. Most ideas include soft engineering solutions such as coastal restoration through barrier island renourishment. Dredged materials could be distributed onto wetlands. Other ideas include a strategic retreat by creating new navigation channels allowing the delta plains, such as the modern Mississippi River Delta, to erode and proceed through their normal cycles. Such solutions could affect small communities, agricultural interests, and the petroleum industry. Hard engineering solutions, such as building sea walls and breakwaters, are also possible; however, these solutions are not only expensive but have produced mixed results at best.



Temporal and spatial relationships of wetland-related processes and responses. [larger version]

Consensus on deciding the most cost-effective solutions to wetlands loss should be based on a thorough understanding of the geologic framework and physical processes that drive the barrier island-wetland system.

Many questions remain about the environment in which barrier islands evolve and wetland areas evolve and mature. A variety of coordinated studies, such as sediment budget, storm events, wave action, and sea-level fluctuations, are showing how nature intended the barrier island/wetland system to work, and can guide planners to augment the natural evolution of this system rather than operate contrary to nature. Present data collection activities are being included in models that simulate natural processes for future diversions of the Mississippi River, sea-level rise, subsidence of coastal areas, and beach nourishment. Other studies examine ways in which fine-grained sediments can be introduced into wetlands to replace sediments lost by diversion of the river; the aggravating effects of wave action as determined by moving offshore sands to onshore areas; sources of sand for nourishment activities such as sand from Ship Shoal, some 25 kilometers offshore; and whether sediment can best be removed from the ends, the top,

or the sides of the shoal. In general, human attempts to engineer coastal areas have had limited success. We still need to reemphasize the lesson from Francis Bacon almost four centuries ago: "Nature to be commanded must be obeyed." Using the latest scientific results of barrier island and wetland studies can help address problems in Louisiana and other coastal regions.

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