

USGS - National Wetlands Research Center

The mission of the U.S. Geological Survey's National Wetlands Research Center (NWRC) is to develop and disseminate scientific information needed for understanding the ecology and values of our Nation's wetlands and aquatic habitats and for managing and restoring these habitats and associated plant and animal communities.

What Are Wetlands and Aquatic Habitats?

Wetlands are transitional areas, sandwiched between permanently flooded deepwater environments and well-drained uplands. They include mangroves, marshes (salt, brackish, intermediate, and fresh), swamps, forested wetlands, bogs, wet prairies, prairie potholes, and vernal pools. They often contain more plants and animals and produce more organic material than either the adjacent water or land areas. Aquatic habitats include permanently flooded parts of estuaries and nearshore environments like seagrass beds, rivers, ponds, and lakes. Aquatic habitats are also critical to fish and wildlife as

well as economically and recreationally valuable to humans.

Why Are Wetlands and Aquatic Habitats Important?

Wetlands are among the most productive habitats on earth providing shelter and nursery areas for commercially and recreationally important animals like fish and shellfish, as well as wintering grounds for migrating birds. Coastal marshes are particularly valuable for preventing loss of life and property by moderating extreme floods and buffering the land from storms; they also form natural reservoirs and help maintain desirable water quality.

Aquatic habitats

like those along the Gulf of Mexico are vital to seabirds, fish, and shellfish; economically the gulf alone contributes billions to the economy. Riverine deep water—like the Mississippi River and its many channels—is not only essential for navigation, industry, and recreation and therefore responsible for billions of dollars to the economy, but is also invaluable for natural resources. Songbirds and waterfowl use rivers as migratory guides, and rivers and lakes are both essential to countless species of fish, amphibians like frogs and salamanders, and reptiles like turtles, snakes, and alligators.



Among wetlands scientists study are coastal marshes (above) and cypress swamps (left)

What's Happening to Wetlands and Aquatic Habitats?

Wetlands have come under natural and human threats (from subsiding or sinking land to draining or filling for new development). Scientists estimate that the lower 48 United States have lost more than half of their wetlands since colonial times. Coastal wetlands especially have been seriously threatened. For example, Louisiana alone has 40 percent of the





Pitcher plants

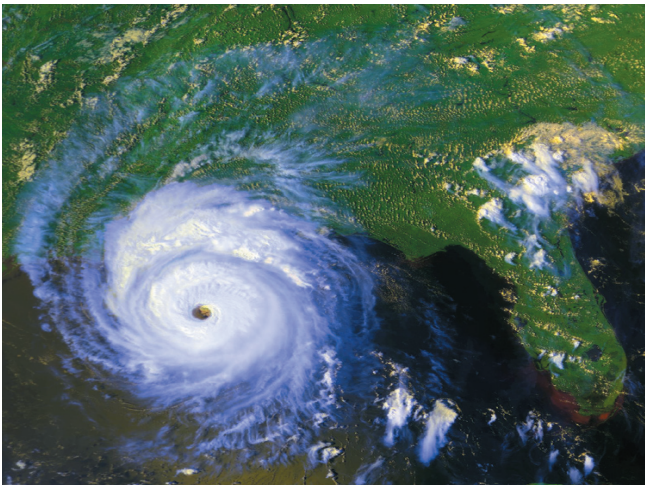
coastal wetlands in the lower 48 States and is still losing from 25 to 35 square miles a year of wetlands to open water because of erosion and subsidence.

In addition

to coastal wetlands, seagrasses in the estuaries along the coast of the Gulf of Mexico and worldwide have been depleted. Serious problems also include the tremendous loss of forested wetlands in the South; while they account for more than a third of all wetlands in the lower 48 States, they also account for two thirds of the annual loss of all wetlands in the continental United States. Wildlife, especially migratory birds like waterfowl and Neotropical birds have experienced population declines and distributional shifts, partly because of habitat alteration.

Rivers and other aquatic habitats have also undergone huge changes. They suffer impacts from various causes, ranging from dredging to both point and nonpoint source pollutants to contaminants. Estuaries have also seen enormous changes in water quality and structure from dredging, fringing urban development, industries, and shipping. All of these, in turn, change the ecological structure and functions of

Hurricane Andrew, NASA photo



these habitats and their ability to support fish, shellfish, and wildlife.

Restoring these wetlands and improving aquatic habitats have become imperative to maintaining an ecological balance. To restore and manage these valuable wetlands and deepwater habitats, however, requires scientific research because much remains unknown about which restoration and management techniques work best and how restored ecosystems work compared to natural ones.



Greenhouse studies

About NWRC

To solve problems in wetlands and aquatic habitats, NWRC has a 71,000-square foot facility on 20 acres of the Research Park at the University of Louisiana at Lafayette. It has saltwater and freshwater laboratories, greenhouses, created wetlands, conference accommodations, a library, and computer laboratories for graphics, training, data analysis, and processing satellite and mapped data.

Field stations and offices are located in Texas, Louisiana, Mississippi, and Florida. Study sites are found in the United States, Caribbean, Mexico, Honduras, Micronesia, Australia, and Europe.

Staff at the Center includes biologists, ecologists, geographers,



Fire ecology research

statisticians, engineers, chemists, computer specialists, and information professionals. NWRC maintains active partnerships with Federal and State agencies, universities, conservation organizations, industries such as timber and oil and gas, and professional organizations.

Issues and Capabilities

Wetland Ecology: Scientists address wetland loss and

restoration through studies of global climate change, accretion and subsidence, succession dynamics, genetic diversity and mutational effects from pollutants,



Measuring subsidence

herbivory, saltwater intrusion, shading, nutrient cycling, and fire. They conduct research on—

- mangrove forests in the north Gulf of Mexico and Central America;
- seagrasses, one of the most valuable of fish nursery grounds and beach stabilizers;
- coastal marshes, particularly in Louisiana, susceptible to annual losses of 25-35 square miles;
- wet prairies in Texas and Louisiana,

where only one tenth of one percent remains of the nine million acres present during colonial times;

- hurricane damage to mangroves and marshes; and
- ecology of restoring coastal wetlands to ecologically and genetically viable status.



Black and white warbler

Animal Ecology: Researchers analyze the survival of animal species and quality of habitat through studies of population dynamics, inventorying and surveying, examining effects of environmental changes on ecosystem food webs, and applying telemetry technologies in bird migration studies. Research studies include—

- migratory birds that are declining in numbers because of habitat loss or alterations;
- waterfowl along the Gulf of Mexico Coast that use coastal wetlands for wintering grounds as well as the resident shorebirds;
- effects of habitat change on songbirds, that use the gulf coast as a stopover in their winter trips to the Neotropics;
- effects of wetland damage by nutria;
- ecology and distribution patterns of amphibians;
- use of restored coastal wetlands by marine and estuarine invertebrates like shrimp, crabs, amphipods, and polychate worms;
- effects of pollutants that can be “endocrine disruptors” on fish and aquatic invertebrates; and

- impacts of releases from shrimp farms in Central America on the genetic health of natural shrimp populations.



Tree coring

Forested Wetland Ecology: Scientists analyze loss, fragmentation, and degradation of forested wetlands from hydrologic alterations and past management practices by studying bottomland hardwood forests, longleaf pine forests, cypress-tupelo swamps, and mangrove forests. Investigations include—

- functions of southern forested wetlands;
- computer models to predict what will grow in forests if hydrology or other factors change;
- reforestation and restoration;
- annual growth rings of trees to assess the effects of ecological disturbances on forested wetlands;
- fire ecology;
- genetics;
- global climate change; and
- amphibian status and trends.

Spatial Analysis: Scientists and others provide information to natural resource managers by conducting research on habitat changes (1956-2000) and restoration of wetlands, uplands, and seagrasses; by using satellite and airborne



Map photointerpretation

images to characterize landcover and physical processes of ecosystems; by investigating contaminants for U.S. and Mexican estuaries and bayous; by studying waterfowl and birds of the gulf coast and Mississippi Valley; and by examining the hydrology and vegetation for the Southeastern United States and gulf coast.

Technologies being used include—

- geographic information systems for analysis of trends, natural resource inventories, and modeling/monitoring;
- remote sensing for habitat monitoring, mapping biomass and vegetation stress, identifying invasive species, and measuring hydrological conditions and water quality;
- habitat mapping to represent ecological, biological, and other data derived from current and historical aerial photography, photointerpretation, and map transformation;
- adaptive management approaches for natural resource management decisions;
- telemetry to monitor bird movements;
- interactive Web sites for information management and map servers; and
- decision-support and advanced electronic systems technologies such as virtual reality, 3-D, and artificial intelligence.



Access to real and virtual information

Related Web Sites:

- Barataria-Terrebonne National Estuary Program: www.btnep.org
- Coastal Wetlands Planning, Protection and Restoration Act: www.lacoast.gov
- Ducks Unlimited: www.ducks.org/
- Energy and Environmental Information Resources Center: <http://cuadra.nwrc.gov>
- Gulf of Mexico Program: www.gmpo.gov
- LA Coast 2050: www.coast2050.gov
- LA Department of Environmental Quality: www.deq.state.la.us
- LA Department of Natural Resources: www.dnr.state.la.us
- LA Department of Wildlife and Fisheries: www.wlf.state.la.us
- National Association of Government Communicators: www.nage.com
- National Park Service: www.nps.gov
- Natural Resources Conservation Service's Wetland Science Institute: www.pwrc.usgs.gov/wli
- Society for Technical Communication: www.stc.org
- Society of Wetland Scientists: www.sws.org
- University of Louisiana at Lafayette: www.louisiana.edu/
- U.S. Fish and Wildlife Service: www.fws.gov
- USFWS Office of Migratory Bird Management: www.birds.fws.gov
- USFWS National Wetlands Inventory: <http://wetlands.fws.gov/>
- U.S. Geological Survey: www.usgs.gov
- Wetland Education Through Maps and Aerial Photography (WETMAAP): www.rac.louisiana.edu/wetmaap/index.html

Information and Outreach: Information professionals provide data, information, and outreach services for scientists and the public through the library, computer operations, publishing, exhibits, and educational programs. Partnerships include the University of Louisiana at Lafayette and the Department of Energy, with whom NWRC formed the Energy and Environmental Information Resources Center. Additionally, the Center is a publishing partner with many agencies and centers, and three interagency publications produced by NWRC have been named notable Federal documents of the year by the American Library Association. Information services of note include—

- data management;
- database development;
- printed and electronic publishing;
- tailored bibliographic and information searches;
- tours and educational programs;
- special events (Acadiana Migratory Bird Day, Earth Day, GIS Day);
- media interaction including Science and the Media Seminars; and
- Career Day, School to Work, and volunteer programs.



Snowy egret

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