

United States Geological Survey

Programs in Florida



The USGS provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, and land resources. We help find natural resources needed to build tomorrow, and supply scientific understanding needed to help minimize or mitigate the effects of natural hazards and environmental damage caused by human activities. The results of our efforts touch the daily lives of almost every American.

Hydrologic and Geologic Issues

Widespread population growth and land-use modification in Florida threaten the quantity and quality of drinking water, alter natural wetlands, and increase human exposure to geologic hazards. Rationing Florida's freshwater resources was necessary recently in several urban centers of the State. State and local leadership is keenly interested in current and future environmental conditions in Florida. Results of this concern are exemplified by such initiatives as the Strategic Assessment of Florida's Environment, the Comparative Risk Assessment, and the Ecosystem Management Program that have identified critical environmental issues. Major problems with water quantity and quality result from the integrated consequences of saltwater intrusion, changing lengths of wet and dry periods, dewatering, ditching, withdrawal, the multitudinous effects of domestic wastes, industrial/hazardous and solid wastes, atmospheric deposition, and contaminated soils and sediments. Geologic hazards, such as radon, sinkhole development and natural oil seeps, are additional environmental issues.

National Water-Quality Assessment Program

In 1991, the USGS began a full-scale National Water-Quality Assessment Program (NAWQA), which is a regional approach to understanding solutions to environmental stresses. The two NAWQA studies in Florida will provide a basis for evaluating the effectiveness of water-quality-management programs and for predicting the likely effects of changes in land- and water-management practices.

Georgia-Florida Coastal Plain NAWQA

The Georgia-Florida Coastal Plain NAWQA study began in 1991. The study area is about 54,000 square miles and is approximately coincident with the area of outcrop and the principal area of public water-supply use of the Floridan aquifer system (fig. 1). Major population centers in the study unit include Brunswick, Georgia, and Jacksonville, Orlando, Tallahassee, and Tampa, Florida. This population of more than 7 million people relies mostly on ground water for public and domestic water supplies. Water withdrawn in the study unit consists of about



Figure 1. Study areas of the Georgia-Florida Coastal Plain and Southern Florida National Water-Quality Assessments and the South Florida Ecosystem Initiative.

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2,700 million gallons per day of ground water (more than 80 percent of which is withdrawn in Florida) and about 1,350 million gallons per day of surface water (55 percent of which is withdrawn in Georgia).

Water quality in the study unit has been adversely affected by agricultural practices, mining, waste disposal, storage and use of toxic chemicals, stormwater disposal, and saltwater intrusion in coastal areas. Preliminary findings indicate that nitrate enrichment of ground water is widespread in agricultural areas and pesticides applied to some crops are washing into nearby surface waters. These and future results will have an important influence on future land-use and growth-management policies of the region.

Southern Florida NAWQA

The Southern Florida NAWQA study, which began in 1993, encompasses an area of about 19,500 square miles and is the basin of a large regional ecosystem (fig. 1). Southern Florida is characterized by highly urbanized areas near the coast, intensive agriculture, vast areas of wetlands, and what remains of the historic Everglades. The upper Floridan aquifer system is the principal source of water in the northern part of the study area. The surficial aquifer system which includes the highly

permeable Biscayne aquifer, is the principal source of potable water for southeastern Florida and has been designated as a "sole-source" drinking water supply by the U.S. Environmental Protection Agency.

Agricultural, industrial, and urban areas are sources of water-quality degradation in southern Florida. Agricultural production involves the use of numerous chemicals, including fertilizers, insecticides, herbicides, and fungicides, that can leak into the ground water or nearby surface waters. Stormwater runoff from urban areas commonly transports heavy metals and nutrients into canals and the Biscayne aquifer.

Florida Bay has undergone changes during the past 10 years that are unprecedented in the period of recorded observations. Seagrasses have died in large areas of the bay, algal blooms have increased in frequency and duration, and fisheries have declined. These changes have been attributed to a variety of causes, including altered freshwater and nutrient inflows from the basin.

Big Bend Coastal Wetlands

The Big Bend region of Florida (fig. 1) includes more than 120,000 acres (20 percent of all estuarine wetlands in the lower 48 States) of undisturbed coastal wetlands along the Gulf of Mexico north of Tampa where the population has increased 250 percent in the last 20 years. These wetlands are very sensitive to environmental stresses; for example, sabal palms along these wetlands have been dying, and recent freezes have killed mangroves in the area, causing significant alteration of environments. The USGS, in cooperation with the Florida Geological Survey, the University of South Florida, the National Biological Survey, and the University of Florida, is pursuing a 5-year study to document the changes of wetlands in this region and to identify the factors contributing to the variability in loss. These cooperative efforts are leading to an understanding and potential prediction of the response of wetlands to sea-level changes and the migration of marshes into uplands areas. Data will identify areas of critical change and also benefit the management of public lands, such as National wildlife refuges and State parks.

South Florida Ecosystem Restoration Initiative Program

A recent program of the USGS is the South Florida Ecosystem Initiative, which is providing information needed for restoring the South Florida ecosystem (fig. 1). Although not proved, it is commonly assumed that restoration of the South Florida Ecosystem will follow restoration of natural hydrologic conditions. The South Florida Ecosystem Initiative is part of a coordinated interagency effort to provide the needed scientific information through a multidisciplinary approach that involves the entire USGS. The initiative complements such ongoing and planned USGS programs as the NAWQA and the Federal-State Cooperative Programs, marine and regional geology programs, and topographic mapping and digital cartographic data.

The South Florida Ecosystem Initiative focuses on developing key scientific information to assist Federal, State, and local resource-management agencies and the private sector:

- assess the availability of water for competing requirements (public water supply, agriculture, fisheries, ecosystem protection/restoration) in south Florida and the Florida Bay area by measuring and modeling the movement of water;
- assess the water quality within south Florida, Florida Bay, and the Keys/Reefs by collaborating with other planned efforts (for example, NAWQA) and focusing on the additional needs for information such as identifying processes that transform and transport nutrients and mercury;
- determine the ecosystem history or "natural state," for the south Florida, Florida Bay, and Keys/Reefs ecosystems;
- provide topographic maps and related data needed to support the scientific investigations and the design of ecosystem restoration alternatives.

The South Florida Ecosystem Initiative is a collaborative effort by the USGS with a large number of other Federal and State agencies to provide scientific insight on the Everglades and south Florida coastal hydrology, geology, and ecology, which are inextricably linked. The USGS is working with the National Park Service, the U.S. Army Corps of Engineers, and the South Florida Water Management Dis-

trict to develop the quantitative tools needed to define how the hydrogeologic system operates and with the U.S. Environmental Protection Agency (USEPA), the National Biological Survey, the U.S. Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration to identify the importance of that system to Everglades and Florida Bay ecology. Coordination of the work of the USGS is being conducted through participation on the South Florida Interagency Task Force and associated working groups and subgroups, which include representation of the following Federal agencies: the National Park Service, the U.S. Fish and Wildlife Service, the Bureau of Indian Affairs, the National Biological Survey, the U.S. Army Corps of Engineers, the National Marine Sanctuary, the National Marine Fisheries Service, the USEPA, the Natural Resources Conservation Service, the Agricultural Research Service and the U.S. Department of Justice (U.S. Attorney). The South Florida Water Management District, the Florida Department of Environmental Protection, the Florida Geological Survey, the Florida Institute of Oceanography, and the Office of the Governor provide input to the Federal groups:

Geologic Radon Potential

The USGS is mapping the geologic radon potential in Florida. Indoor radon is commonly found in homes across the Nation at levels that are considered to be hazardous to human health with long-term exposure. Studies by USGS scientists and others have shown that indoor radon levels are related to the chemical and physical characteristics of the underlying rocks and soils. At the request of the Florida Department of Community Affairs and the U.S. Environmental Protection Agency, the USGS has collaborated with experts from Rogers and Associates Engineering, the Soil and Water Science Department and the GEOPLAN Center of the University of Florida, the Florida Geological Survey, and the Florida Department of Health and Rehabilitative Services to develop a map of the geologic radon potential of the State. Once approved, this map will serve to guide building construction standards designed to lower radon entry into residences and commercial buildings.

Natural Oil Seeps

Although not known as a major oil- and gas-producing State, Florida still has a resource potential. Florida has a very special and delicate ecosystem that, like arctic regions, is impacted heavily by either natural or man-made petroleum discharges. The geology of the region makes natural oil seeps a real environmental hazard, and investigations into the past occurrences of natural oil seeps provide important information in predicting future occurrences. The USGS is using several geologically oriented mathematical and statistical procedures to try to predict future episodes and identify what can be done to mitigate them. Because Florida is considered to have petroleum-producing potential, it also is included in the USGS's National Gas and Oil Assessment effort. Recently, a moratorium was imposed on drilling in the Gulf of Mexico just offshore of the western coast of Florida. This was done after leases were granted to companies that gave them the right to drill in these waters. As a result of this action, the companies are now in litigation with the U.S. Government and are trying to recover monies representing the amount that they would have made had they found and produced gas and (or) hydrocarbons from the area. The USGS has included this area as part of its ongoing National Gas and Oil Assessment and has been asked by the U.S. Department of Justice to supply resource potential information to the government as part of the litigation. This is an important issue for two reasons. First, this area in the Gulf of Mexico may have a significant resource potential, but without actual drilling, its real importance to increasing the Nation's petroleum reserves is unknown. Second, if the U.S. Government is required to reimburse the companies for potential lost revenue, the amount would be based on the potential for finding economically recoverable reserves. These numbers would be based on an assessment of the petroleum potential in the area.

Trends in Marine Coral

USGS research has documented an important proxy indicator of environmental change in the Florida Keys. Coral skeletons show annual growth bands similar to growth rings in trees. Analysis of the ratio of two carbon isotopes contained

in the rings of Florida corals (gray line) has become significantly more negative (black line) since 1963 (fig. 2). This ratio reflects organic productivity and light in sea water at the site of coral growth and serves as a natural record of environmental change.

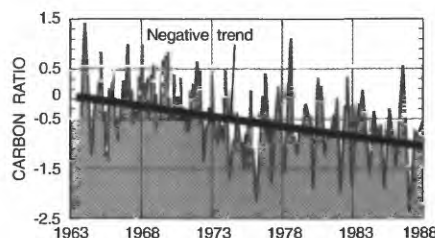


Figure 2. Carbon isotopic ratio in coral skeletons.

Hydrologic Monitoring and Studies

Scientists of the USGS are collaborating with resource-management agencies in all major hydrologic matters of concern in Florida. Program development among the USGS and State and local agencies is an evolving solution-oriented activity. Programs are reviewed regularly by par-

ticipants, and future needs for data collection and hydrologic investigations are projected. Typically, USGS investigations are of the following major types: data collection, problem-oriented appraisals, and applied research. The historic and current data-collection programs in Florida consist of statewide monitoring networks for water quality (fig. 3) and surface and ground water. In addition to hydrologic surveillance, these sites furnish data for appraisal studies and research. Some networks are unique. For example, the USGS's streamflow program is the primary source of long-term discharge data in the State. Information from various USGS networks is combined for all the States to establish a national computerized data base.

In 1994, the USGS managed about 60 hydrologic studies, most of which pertained to problem-oriented appraisals and applied research. These include, by broad category, the determination of the availability of regional water resources for growth-management planning (17 studies), the assessment and mitigation of water-quality degradation (24 studies), and

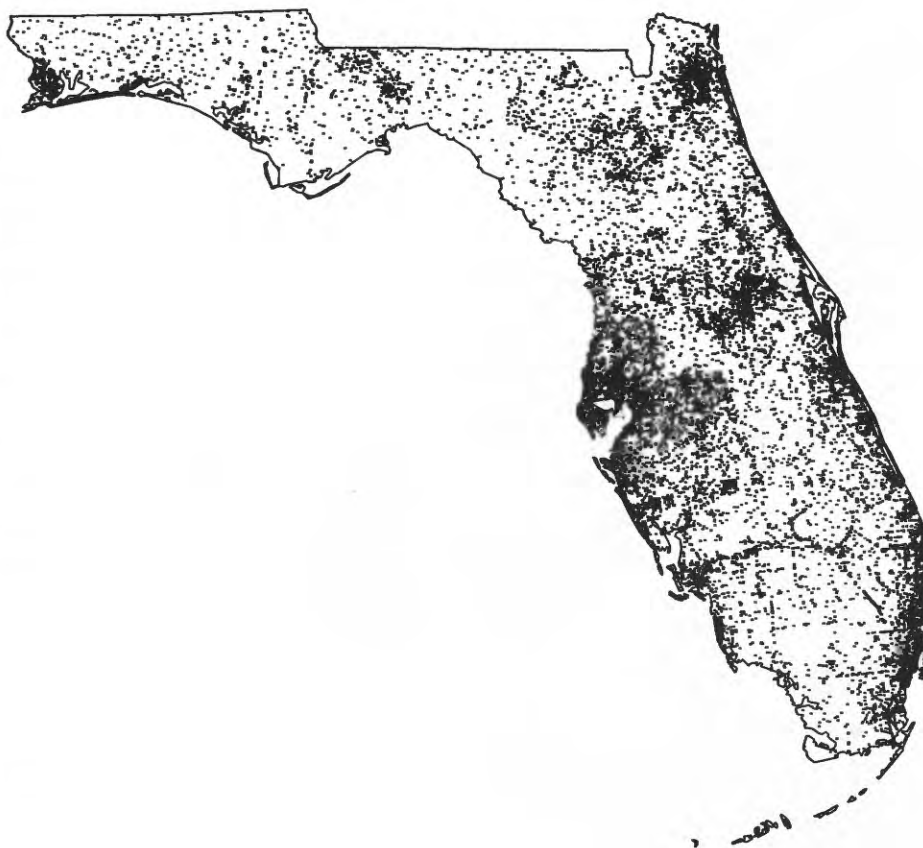


Figure 3. Water-quality data-collection sites in Florida.

current research programs (evapotranspiration, hydrodynamic and chemical modeling of surface- and ground-water flow, chemical solute transport and wetland processes) that are important to water-resources management (14 studies).

National Mapping Program

Among the most popular and versatile products of the USGS are its 1:24,000-scale topographic maps (1 inch on the map represents 2,000 feet on the ground). These maps depict basic natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines are used to depict the elevation and shape of terrain. The entire State is covered by 1,041 maps at this scale, which is useful for civil engineering, land-use planning, natural-resource monitoring, and other technical applications. These maps have long been favorites with the general public for outdoor uses, including hiking, camping, exploring, and back-country fishing expeditions. By 1996, the public land survey system boundaries, hydrography, and transportation features shown on these maps will also be available as computer-readable files.

Geologic Mapping

Recent and ongoing geologic mapping and sampling in South Florida provide information necessary for delineation of the connection between surface and ground water and for the determination of ground-water availability and chemical

constituents. These studies have been carried out in cooperation with the Florida Geological Survey and researchers at several Universities.

Earth Observation Data

Through its Earth Resources Observation Systems (EROS) Data Center near Sioux Falls, South Dakota, the USGS distributes a variety of aerial photographs and satellite image data products that cover the entire State. Mapping photographs of some sites go back at least 40 years. Satellite images dating from 1972 can be used to study changes in regional landscapes. The EROS Data Center has completed a satellite image mosaic of the south Florida ecosystem study area. The maps are scheduled for printing in early 1995.

Center for Coastal Geology

The USGS Center for Coastal Geology and Regional Marine Studies was established in 1988 in cooperation with the University of South Florida. The Center occupies a 25,000-square-foot building on the St. Petersburg campus. The Center conducts a wide variety of research on mineral resources and on coastal and regional marine problems, including coastal erosion, climate change, wetlands deterioration, and coastal pollution. This research is leading to more accurate predictions of future coastal erosion, the evolution of wetlands, the fate of polluted sediments, and the location of economically valuable sand and gravel, as well as other minerals.

Cooperative Programs

Work is pursued in partnership with many State and local agencies; for example, the Florida Department of Environmental Protection, the St. Johns River Water Management District, the Southwest Florida Water Management District, the South Florida Water Management District, Northwest Florida Water Management District, and the Suwannee River Water Management District. Several Florida counties, including Broward, Dade, Hillsborough, Orange, Pinellas, and Leon, and such municipalities as Jacksonville, Tallahassee, Tampa, and Orlando also are important cooperators. Studies by the USGS are designed largely in collaboration with these State and local entities to ensure that the work has relevance to regional and local problems, as well as meeting national needs. Many of the studies are done by the USGS under a cost-sharing arrangement with State and local agencies; thus the relevance and value of the work to solving "real-world" problems is controlled by agreement of regional and local interests with the national agency interest. This collective effort to understand the hydrology and geology of the State is a management keystone to the continuation of Florida's high quality of life.

The USGS provides support to the Florida Water Resources Research Institute (Center for Wetlands and Water Resources), which conducts a program of research, education, and information and technology transfer.

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Additional earth science information can be found by accessing the USGS "Home Page" on the World Wide Web at "<http://www.usgs.gov>".

For more information on all USGS reports and products (including maps, images, and computerized data), call 1-800-USA-MAPS.