DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

NATIONAL COASTAL GEOLOGY PROGRAM

STATUS OF RESEARCH ACTIVITIES
FY 1992

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TABLE OF CONTENTS

U.S. GEOLOGICAL SURVEY

NATIONAL COASTAL GEOLOGY PROGRAM

Problem: More than 50 percent of the population of the United States live within 50 miles of one of the Nation's oceans or Great Lakes. These coastal areas are presently being stressed by both human activities and natural processes.

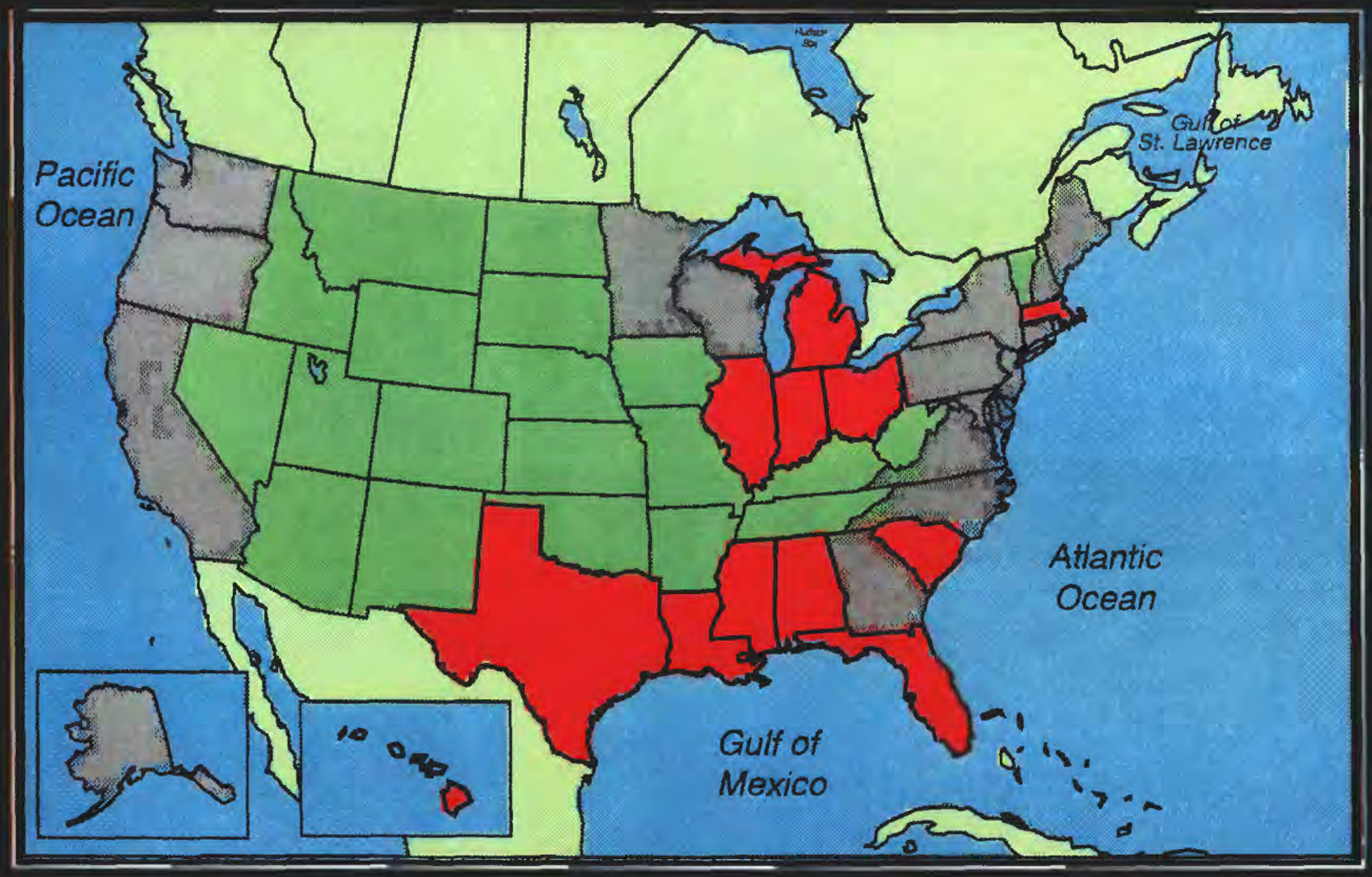
- All of the 30 coastal states and the island territories are experiencing problems related to coastal erosion.
- Over the past 200 years, more than 50 percent of our wetlands have been lost due to a combination of natural and man-made causes.
- Nationwide, approximately one-third of the shellfish beds are closed or restricted because of polluted sediments.
- Onshore sources for hard-mineral resources, such as sand and gravel used for construction purposes, are becoming increasingly difficult to find. New sources are being sought in coastal waters.

Strategy and Objectives: Developing effective solutions to these major societal problems requires a thorough understanding of coastal geology, i.e., coastal sediments and landforms, how the landforms evolved, and the processes responsible for coastal changes. The U.S. Geological Survey (USGS), as the Nation's principal earth science agency, conducts research on coastal geology through the National Coastal Geology Program. The overall research objective is to increase predictive capabilities required to properly manage and utilize the Nation's coast. Many of the physical processes critical to prediction, and the geologic framework within which the processes operate, are unknown or poorly understood. With increased understanding, we could accurately predict future coastal erosion, the deterioration of wetlands, where polluted sediments accumulate, and the location of economically valuable hard minerals.

Status and FY 1992 Plans: The National Program conducts two complementary types of research: fundamental studies focusing on critical processes which can be applied nationally, and regional studies to improve understanding of natural and man-induced processes within specific regions. During FY 1992, the National Program supported ten regional studies, with five studies addressing erosion, two addressing pollution, and three addressing wetlands deterioration. An additional study on erosion was recently completed. Present studies are located in ten states distributed along the Gulf of Mexico coast, the Great Lakes, and the east coast (see figure on next page). All studies are cooperative with appropriate state agencies and universities. At present, the Program has cooperative agreements with seven state agencies and ten universities. In addition, Congress directed the USGS to prepare a plan for a potential regional study in Hawaii and the U.S. possessions in the Pacific (American Samoa, Baker Island, Guam, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Atoll, Northern Mariana Islands, Palmyra Atoll, and Wake Atoll). Fundamental research was not funded in the FY 1992 budget.

Products: The research provides a wide variety of products ranging from Geographic Information Systems, which are computer map displays showing overlays of data useful for management purposes, to research papers describing processes important to predicting specific coastal problems. Research results are used by a wide range of clients, including coastal managers, engineers, and other research scientists, to protect and preserve the coastal environment.

FY1992 Studies



National Coastal Geology Program. States where the Program has active studies in FY 1992 are shown in red. Also shown in red is Hawaii where, at the direction of Congress, the USGS is preparing a study plan addressing critical coastal problems.

Regional Studies

Coastal Erosion

- Southern Lake Michigan
- Western Louisiana /East Texas
- Lake Erie
- Great Lakes Mapping
- South Carolina

Coastal Pollution

- Alabama / Mississippi Pollution and Erosion
- Massachusetts Bay

Wetland Deterioration

- Louisiana
- Florida
- Great Lakes

Study Plan

- Hawaii / South Pacific

LOUISIANA BARRIER ISLAND EROSION STUDY

Problem: Louisiana's barrier islands are eroding at very rapid rates, in places over 20 m (60 ft) per year. These barrier islands serve to protect coastal wetlands from the marine environment. Louisiana contains 41 percent of the Nation's wetlands, which support a one billion dollar a year fishery. As they migrate landward, the barrier islands have decreased in area 37 percent between 1890 and 1979. If this landloss continues, the barrier islands will disappear, accelerating the already rapid loss of coastal wetlands.

Objective: Many of the processes responsible for barrier island erosion are poorly understood. Without this understanding, mitigation of barrier island erosion is difficult, if not impossible. The primary objectives of the study were to define the processes causing the rapid erosion and improve our ability to predict future erosion. These results are being used by state and Federal agencies to decide whether and how to mitigate erosion of Louisiana's barrier islands.

Status: In Fiscal Year 1986, the study was initiated as a cooperative effort between the U.S. Geological Survey and the Louisiana Geological Survey; the study was completed in FY 1990. The USGS continues to be represented on an inter-agency task force to decide what measures should be employed to mitigate erosion and landloss in coastal Louisiana.

Results:

- All available surveys, including new surveys completed as part of this part of this study, have been used to assess rates of erosion of Louisiana's barrier islands. Two comprehensive atlases have been prepared, one showing shoreline changes and the other offshore bottom changes over the past 100 to 150 years (see figure on next page).

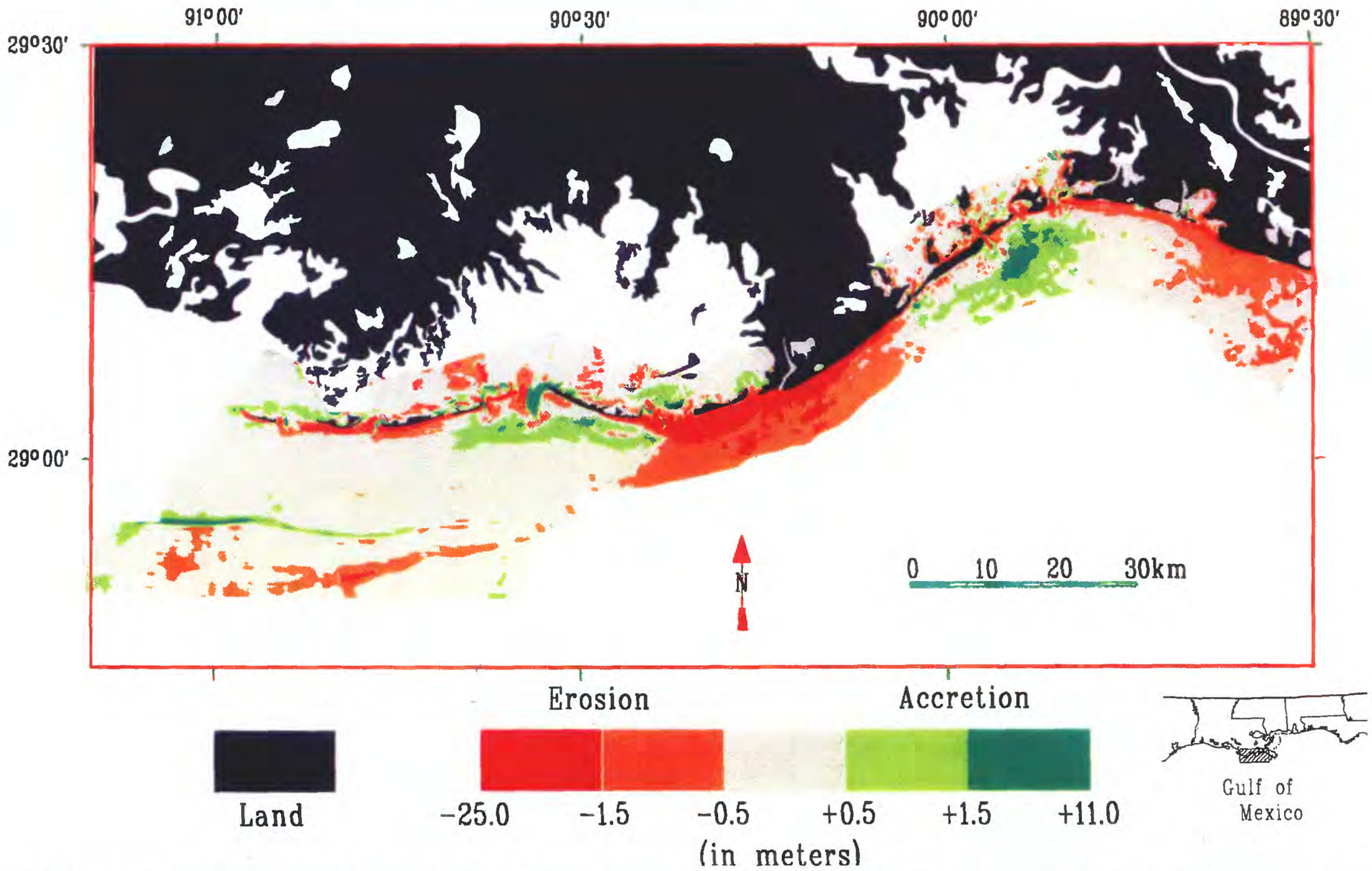
- Rates of sea-level rise relative to the land have been compiled from all available sources. Sea level is rising rapidly, up to 1.3 cm (0.5 in) per year. Roughly 90 percent of the rise is a result of land subsidence.

- Prior to the study, sea-level rise was hypothesized as being the primary cause of barrier island erosion. However, through model results and comparisons of historical surveys, the net movement of sand along the shore by waves and offshore currents appears to be the dominating process causing the observed erosion. Strategies to mitigate erosion due to sea-level rise may be very different than strategies to mitigate erosion due to longshore transport.

- Prevailing understanding prior to the study assumed that most transport of sand along the shore occurred in very shallow water where waves break. However, the study found that on the inner continental shelf seaward of breaking waves, longshore transport was much greater than near the shore. As a consequence, trying to mitigate the transport close to the beach would not necessarily mitigate erosion.

- Surveys have documented 55 potential sediment sources suitable to be used to mitigate erosion, (e.g., for beach nourishment, barrier island restoration, and back barrier marsh creation).

Bathymetric Change 1930s to 1980s



Louisiana Barrier Island Erosion Study. Seafloor changes between the 1930s and 1980s for the central Louisiana coast. Green patterns represent areas of sand deposition (accretion) whereas red areas represent areas of sand removal (erosion). Large scale patterns of erosion and accretion are apparent with subtle headlands (former delta lobes of the Mississippi River) eroding with deposition in embayments between headlands. This type of analysis was instrumental in determining the different processes causing erosion of Louisiana's barrier islands.

SOUTHERN LAKE MICHIGAN COASTAL EROSION STUDY

Problem: During 1985-86, Lake Michigan experienced record high lake levels, resulting in extensive erosion and property damage along the shoreline. Geologic evidence indicates that prior to written records, lake levels exceeded the 1985-86 high stand. This suggests lake levels may be higher in the future. Understanding lake level changes and their impacts on the shore is important to engineers and planners who need to consider the variations when planning lakeshore use.

Objective: The U.S. Geological Survey, in cooperation with the Illinois State Geological Survey and the Indiana Geological Survey, are investigating the potential for future high lake levels and the important geologic and hydrologic processes that have contributed to the high erosion rates of the shoreline. An integral part of the study is understanding the geologic framework of the region, which provides information on sand availability to the rapidly eroding beaches.

Status and FY 1992 Plans: FY 1992 is the final year of the extensive five-year investigation. Plans for FY 1992 involve data analyses and report preparation.

Results: Examples of important results that can be used to predict shoreline damage and erosion:

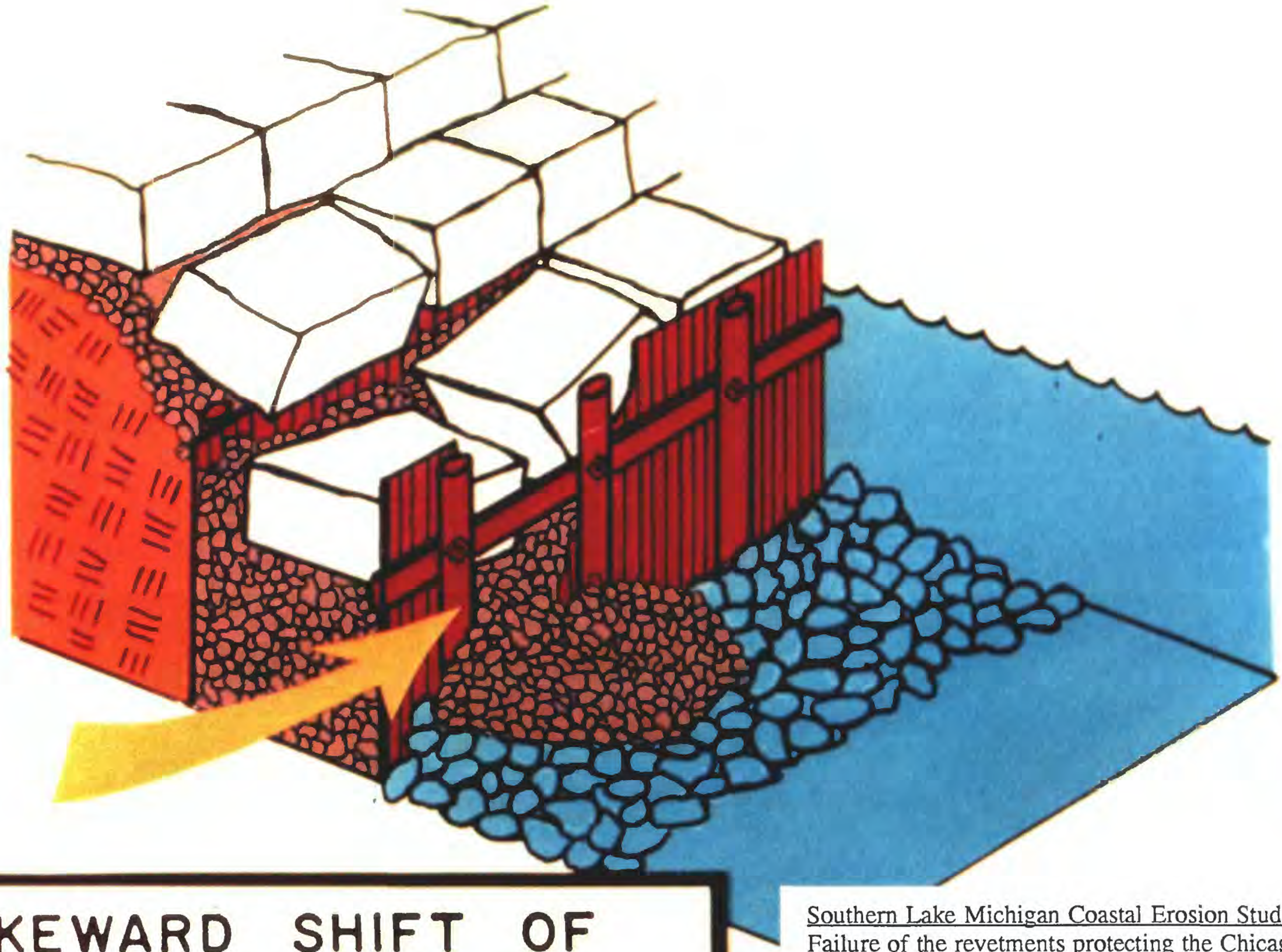
- Sidescan sonar surveys showed conclusively where, how, and why the revetments protecting the Chicago lakeshore are failing (see figure on next page). Input of this information to new shoreline protection designs potentially will save millions of dollars.

- The natural sand supply, mostly from erosion of bluffs, to the beaches apparently has been severely depleted over the last 20 years, causing erosion of the beaches and exposing the nearshore lake bottom to increased erosion.

- Studies of lake level show that since the turn of the century, each period of high water has been higher than the last, culminating in the 1985-86 event that flooded the streets of Chicago. During the last few thousand years, fluctuations from high to low levels of about 1.7 m (5.6 feet) appear to be equal to or slightly greater than historical fluctuations.

- Bluff retreat between Wilmette and Waukegan vary from 10-75 cm/yr (4-30 in/yr) and average about 20-25 cm/yr (8-10 in/yr). Shoreline erosion rates north of Waukegan, however, have been as high as 3 m/yr (9 ft/yr).

- Ice appears to be an important agent contributing to shoreline erosion by transporting sands from the beach to deeper water.



Southern Lake Michigan Coastal Erosion Study. Failure of the revetments protecting the Chicago shoreline. USGS sidescan sonar surveys have documented the location and extent of underwater collapse of structures. This schematic shows an example of interpretations of the underwater surveys of the structures.

WEST LOUISIANA, EAST TEXAS COASTAL EROSION STUDY

Problem: The coastal parishes of western Louisiana and the coastal counties of northeastern Texas are experiencing high rates of shoreline erosion and wetlands loss. Shoreline erosion rates exceed 10 m/yr (30 ft/yr) in some areas, and wetlands are being lost at rates that exceed 31 square kilometers per year (10 square miles per year). Erosion threatens many coastal communities, including Holly Beach and Constance Beach in Louisiana (see photograph on next page) and Surfside and Caplen in Texas. Louisiana State Highway 82 and Texas State Highway 87 are in danger of being lost to erosion, and valuable coastal wetlands are endangered. Also, the Gulf Intracoastal Waterway near Sargent Beach, Texas, is threatened by coastal retreat, which could lead to the loss of a major commercial shipping route. If predictions of an increased sea-level rise rate are accurate, the intensity of these problems will accelerate in the coming decade.

Objective: The central objective is to better understand the causes of shoreline erosion in the study area so that future conditions can be predicted and critical information can be provided to coastal engineers and planners considering mitigation efforts. This objective requires the quantification of long-term erosion rates of both the shoreline and offshore areas and processes-oriented studies that will improve our ability to predict the coastal response under conditions of major storm impacts, accelerated sea-level rise, and man-induced changes in sediment input to the coastal region.

Status and FY 1992 Plans: The project is in its second year of a planned six-year effort being conducted cooperatively with the Texas Bureau of Economic Geology (BEG) and the Louisiana Geological Survey (LGS). Work by BEG and LGS is focusing on digitizing historical shorelines and analyzing rates of shoreline retreat. USGS work includes digitizing historical bathymetric surveys and conducting initial sea-floor change comparisons between different survey years. Additionally, joint BEG/LGS/USGS field work has been planned for this year to begin investigations of the study area's geologic framework.

Results:

- Over 100,000 soundings have been digitized from historical bathymetric charts. Compilation and digitization of the 1880's, 1930's, and 1960's data is nearly complete.

- Historical shorelines from the 1930's and 1960's have been digitized.

- Over 50 vibracores were collected in Louisiana in support of the geologic framework activity. Other geologic framework activities include a workshop to prioritize field work for the 1992 summer field season and acquisition and compilation of existing shallow subsurface data.

- GPS technology has been evaluated and tested as a means of acquiring high precision shoreline and bathymetric data.

- Wave and current prediction models to be applied to the study area's coastal erosion problems have been implemented and tested.

W. Louisiana/E. Texas Coastal Erosion Study. Abandoned coastal road in Constance Beach, Louisiana. Numerous houses have been destroyed along this section of coast where shoreline erosion rates exceed 10 ft/yr (3m/yr.).

LAKE ERIE COASTAL EROSION STUDY

Problem: The Lake Erie shoreline of Ohio is undergoing widespread recession. Over much of this region, recession rates are less than 1 m/yr (3 ft/yr). However, local rates may exceed 2 m/yr (7 ft/yr). Even where rates are slow, the highly developed nature of the coast makes recession a serious property-damage problem.

Objectives: The Lake Erie Coastal Erosion Study is designed to identify the factors controlling the temporally and spatially varying erosion rates along the Ohio shoreline. The primary objective is to better constrain predictive models of future shoreline recession. Improved measures of historic shoreline recession and detailed observations of the geologic and physical factors controlling shoreline recession have been identified as critical needs. Geophysical investigations in the lake basin will address transport pathways and identify potentially valuable sand and gravel resources which may be utilized in future shoreline protection activities. A comprehensive digital data base will provide improved input into coastal-management decision-making processes.

The most important objective of the study is to improve the decision making process, not only on how to mitigate an erosion problem, but also on whether to mitigate a problem. For example, whether to mitigate erosion commonly develops into a polarized discussion (pro and con) with neither side having the technical information available to fully support their positions. The study is designed to provide this technical information.

Status and FY 1992 Plans: The study, now in the second year of a planned five-year effort, is being conducted cooperatively with the Ohio Division of Geological Survey. Thus far, the study has focused on the collection of existing data sources and the development of a comprehensive data base. Improved estimates of shoreline recession, utilizing available aerial photography, are being constructed. Offshore mapping of the Lake Erie basin has begun in an attempt to identify potentially valuable sand and gravel resources and to identify sediment transport pathways.

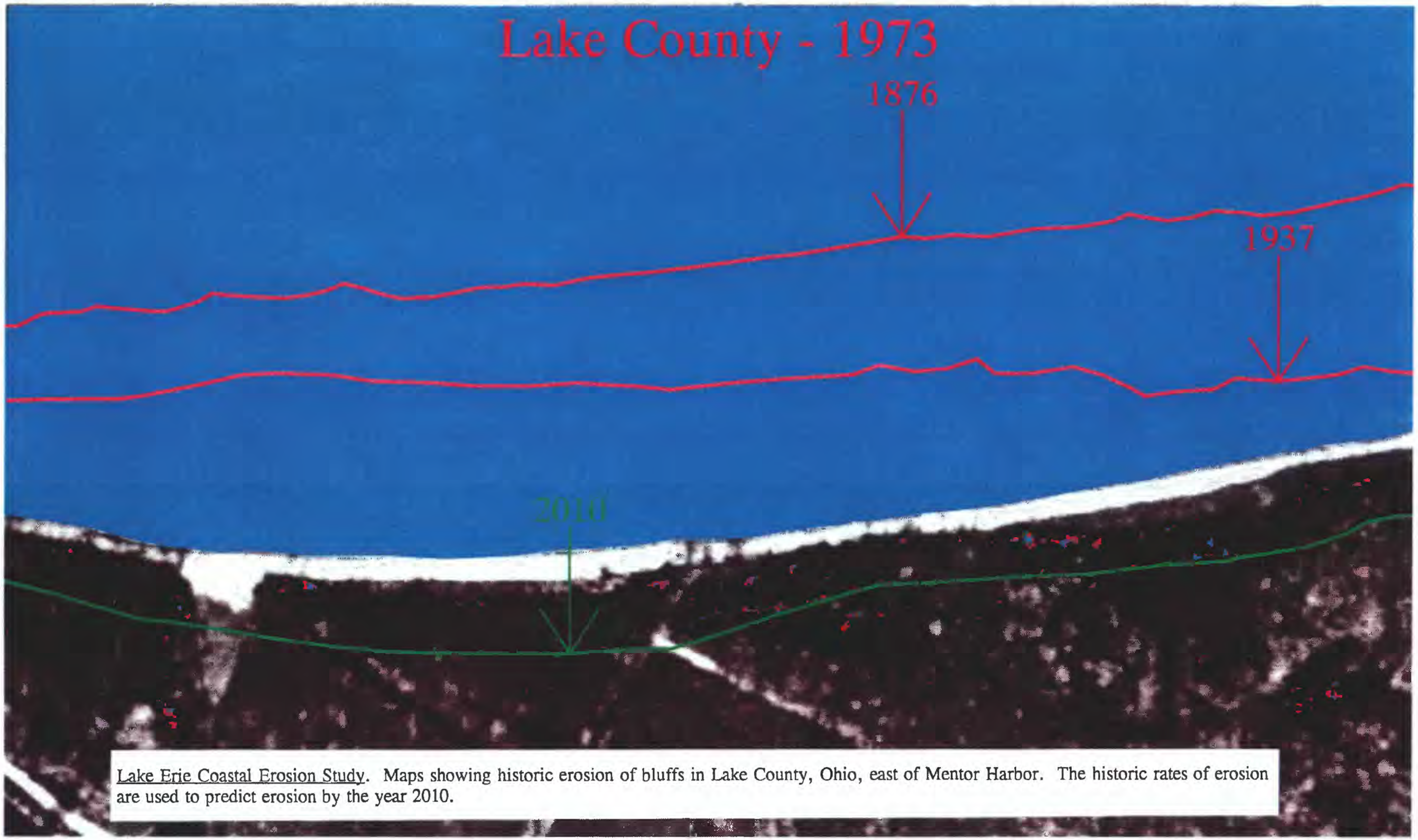
Results:

- Initial fieldwork has focused on determining the extent of nearshore sand, which is basic information needed to predict erosion. Offshore surveys over approximately one-third of the Ohio portion of the lake suggest that surficial sand deposits are variable and restricted in spatial extent.

- Review of previous investigations show that recession rates are spatially and temporally variable, depending on lake levels, bluff composition, and the emplacement of engineering structures (see figure on next page).

- Discussions have been initiated with the U.S. Army Corps of Engineers (USACE) on the feasibility of a joint comprehensive shoreline recession data base.

- An ambitious nearshore surveying program to monitor shoreline and bluff erosion has begun to update existing data previously obtained by the USACE and the Ohio Division of Geological Survey.



Lake Erie Coastal Erosion Study. Maps showing historic erosion of bluffs in Lake County, Ohio, east of Mentor Harbor. The historic rates of erosion are used to predict erosion by the year 2010.

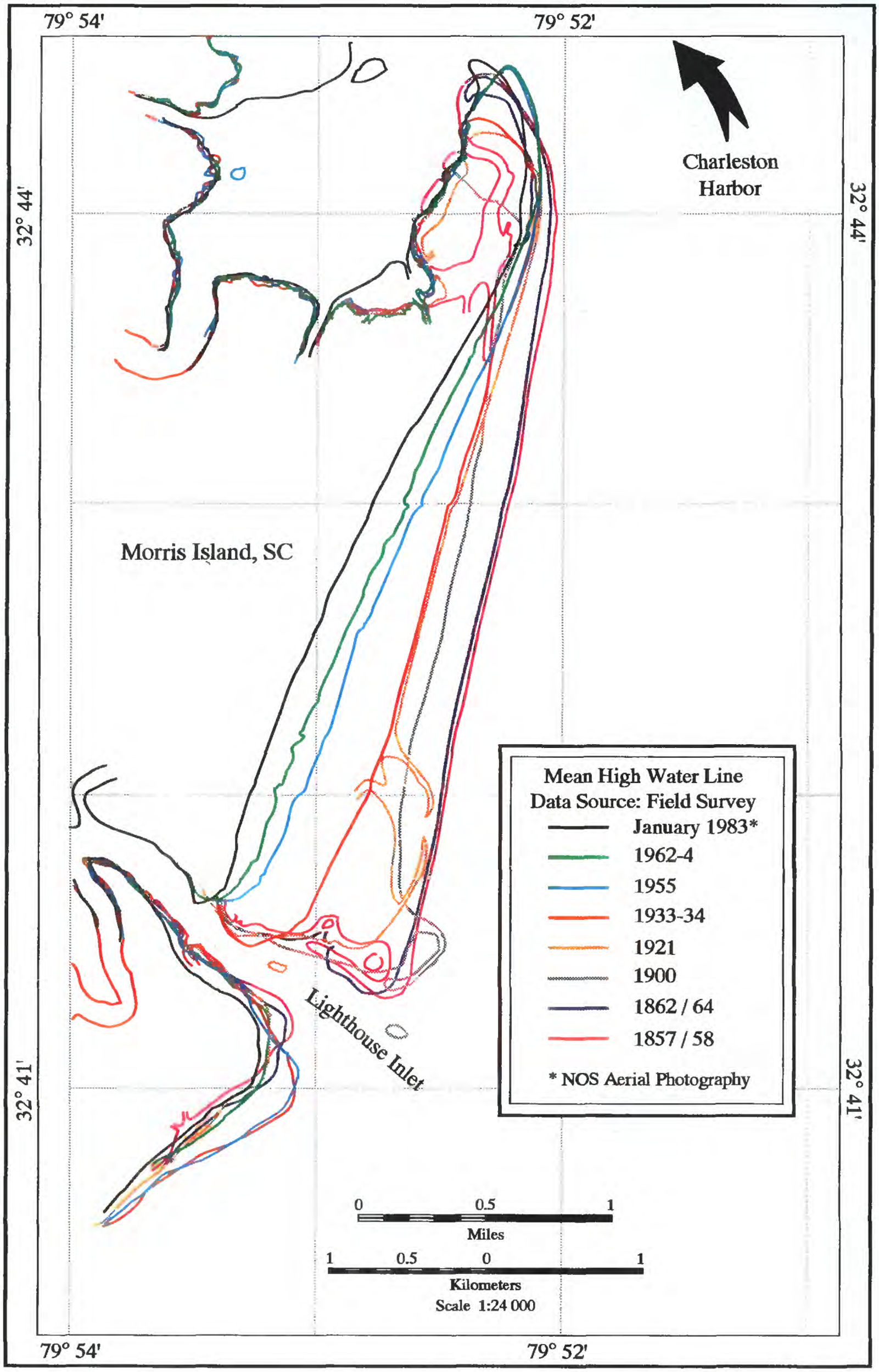
SOUTH CAROLINA COASTAL EROSION MONITORING

Problem: The 280 km (160 mile) South Carolina coastline represents one of the most valuable resources in the State. However, the South Carolina coast is undergoing erosion and is impacted by hurricanes, such as Hugo in 1990. A particularly severe example of coastal erosion is shown in the figure on the next page. In order to preserve and enhance this important resource, the State of South Carolina has begun to implement a comprehensive coastal zone management act, which requires monitoring of the State's beaches.

Objectives: The primary objective of the study is to assist the State of South Carolina with the gathering of scientific information needed to better manage the State's coastline. The U.S. Geological Survey will assist the South Carolina Coastal Council in setting up and conducting a state-of-the-art beach monitoring program that will help implement South Carolina's Beachfront Management Act of 1979. The monitoring includes the development of a rapid, high-resolution, bathymetric survey system to measure sea floor changes; collection of semiannual wading depth and deep water surveys; and error analyses to assess the accuracy of semi-annual beach surveys and the accuracy of the shoreline positions determined from aerial photographs. Equipment and methodologies developed can be used in other parts of the country.

Status and FY 1992 Plans: FY 1992 is the first year of a planned long term monitoring program.

Results: During this first year of funding, an initial survey program and accuracy studies have been initiated. Work is also underway to develop a new surveying system using the Global Positioning Satellites to correct depth records obtained from small boats for both vertical and horizontal control.



South Carolina Erosion Monitoring. Historical shoreline changes at Morris Island, SC, showing a particularly severe example of shoreline erosion.

REGIONAL GREAT LAKES MAPPING PROJECT

Problem: Coastal maps of bathymetry and geology along much of the Great Lakes are obsolete. Because of intense erosion, especially during the high water periods of the 1970's and 1980's, many existing maps are no longer useful for planning the environmental, recreational, and industrial development of the shores of the U.S. Great Lakes.

Objective: The primary objective is to provide the necessary bathymetry and geologic information that will serve as the basis for rational development and management of Great Lakes coastal resources.

Status FY 1992 Plan: In FY 1991, the National Oceanic and Atmospheric Administration (NOAA), in cooperation with U.S. Geological Survey and with researchers from the University of Michigan, Michigan State University, and Western Michigan University, carried out a pilot study of the southwest shoreline of Michigan. An additional pilot effort will be conducted in FY 1992.

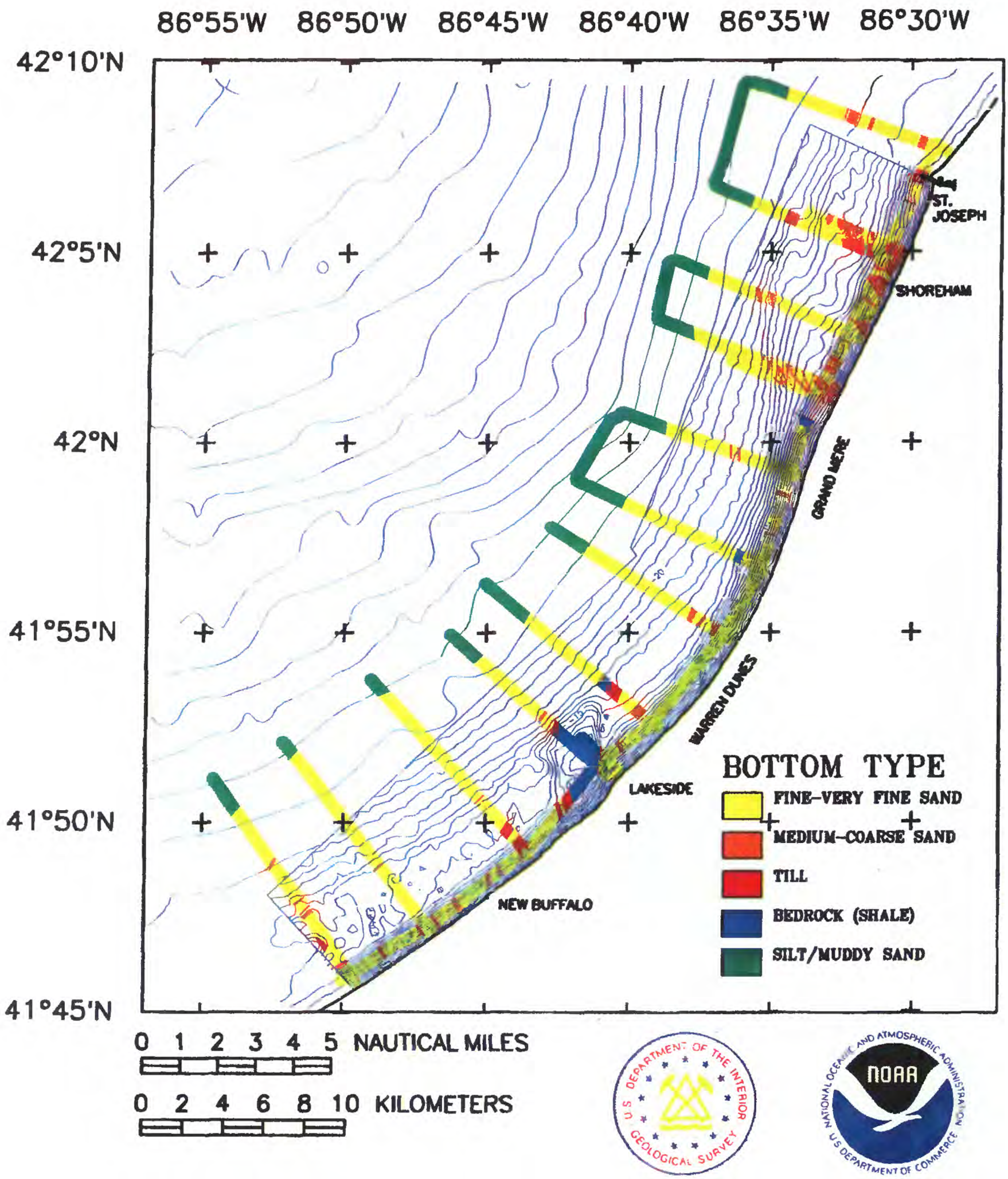
Results: This pilot study demonstrates that the joint, cooperative effort between the two Federal Agencies, state agencies, and universities, produce, expeditiously and efficiently, valuable usable results that will benefit the entire Great Lakes user community and contribute to the prevention of costly environmental, real estate, industrial, and recreational losses. For example:

- Aerial photography of the coastline was acquired, and bathymetric, geophysical, and geologic data were collected as far as 6 km offshore, and geologic data as far as 2 km inland.

- Nearshore sands that provide protection for the underlying glacial till and for the bluffs that form the margin of the lake are thin to non-existent in many areas (see figure on next page).

- Near St. Joseph, MI, as much as 4 m of the bottom has been removed during the past 50 years and the adjacent beach has been severely eroded.

- The first Regional Great Lakes Workshop was held in March 1992 to review progress being made in this study. Results from NOAA and USGS investigations were published in a USGS open-file report, and maps and cross-sections shown in the report will be incorporated into a CD-ROM that will include the data on which they are based. The University data will be presented in a separate report.



Regional Great Lakes Mapping. Map of the southwestern shoreline of Michigan showing bottom sediment type based on interpretation of 1991 NOAA bathymetric data and USGS sidescan sonar and sediment sample data. Sand cover is thin or patchy. Between St. Joseph and Grand Mere, Michigan, till and lag gravel deposits are exposed on the lake floor. A comparison of NOAA 1945 and 1991 bathymetric data confirm that this area has undergone significant lake bed erosion.

ALABAMA-MISSISSIPPI COASTAL EROSION AND POLLUTION STUDY

Problem: The coasts of Alabama and Mississippi have diverse usage. The region supports a multi-million dollar commercial fishery, is a major resource for recreation, is the terminus of the Tenn-Tom Waterway, and is home to a rapidly growing natural gas exploration program. These coastal areas are being stressed by a variety of problems of societal importance.

- Mobile Bay sediments have elevated concentrations of metals and have had occurrences of low-oxygen water, causing stress on commercially important fisheries.
- The region is frequently swept by devastating hurricanes and has severe problems with barrier island movement and erosion.

Objective: The objectives of this study are (1) to determine coastal erosion rates and causes, and recent sedimentologic history and geologic framework; and (2) to determine the transport and deposition of pollutants and the extent of sediment-related pollution in the area. This research will lead to improved predictions of future erosion and where pollutants will accumulate. Techniques include:

- High-resolution seismic surveys and coring
- Mapping current and historical shoreline change
- Measurement of contaminants in bottom sediments
- Long-term monitoring of circulation and sediment transport through moored instrumentation, hydrographic surveys and satellite imagery

Status and FY 1992 Plans: The study is in the third of a planned five year effort. Major cooperating agencies include the Alabama Geological Survey and the Mississippi Office of Geology.

- Stratigraphic studies have now included Mobile Bay and portions of Mississippi Sound. Work continues in Mississippi Sound and on the inner continental shelf.
- Circulation studies in Mobile Bay have continued for over one year. Studies in Mississippi Sound have been curtailed due to limited funds.
- Monitoring of beach changes in Mississippi and Alabama will continue.

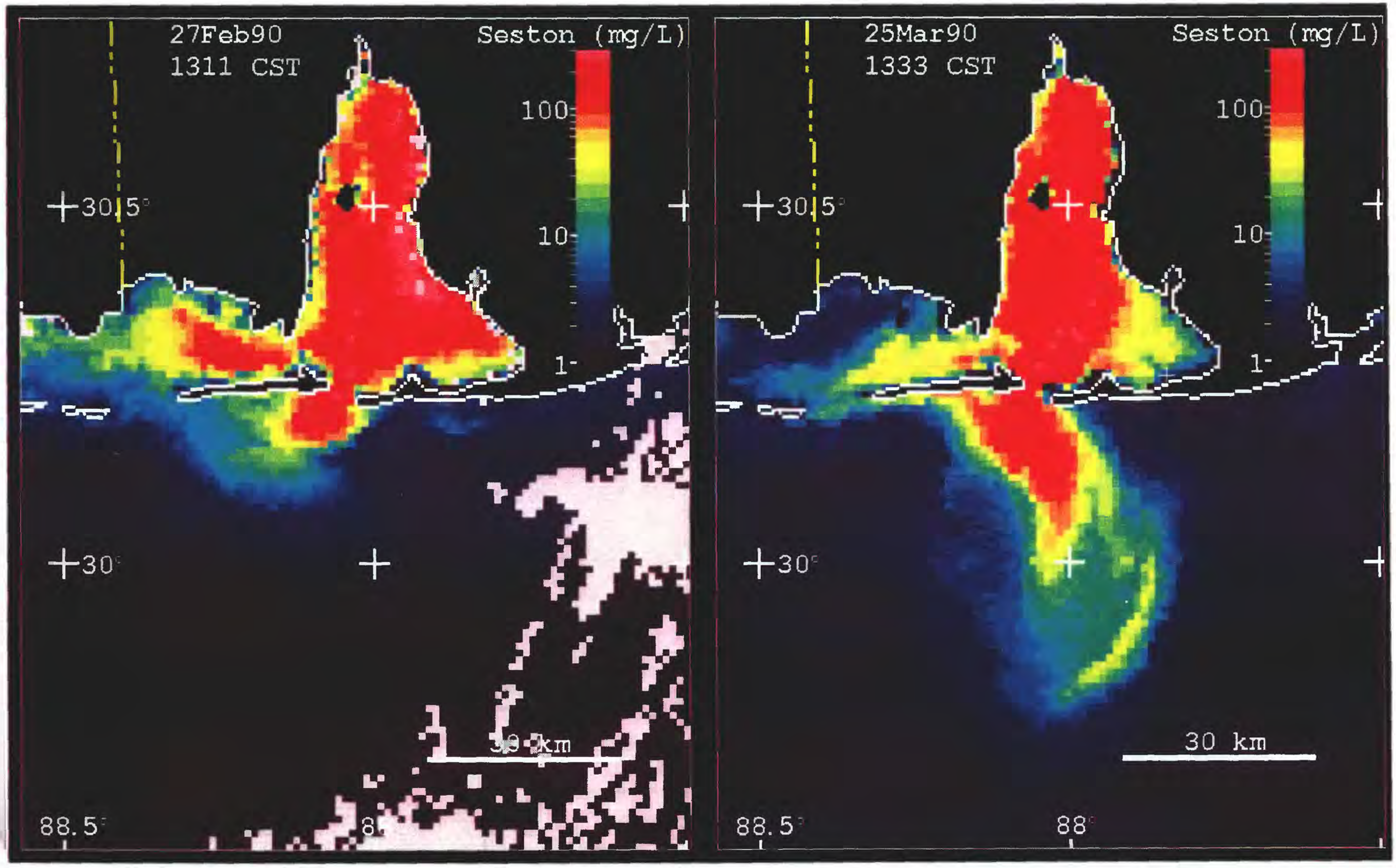
Results:

o Bottom sediment characteristics, including major metal pollutants, are being mapped for the Alabama coast.

o Regional circulation is being described showing the impact of high river flow, wind, and tide on Mobile Bay and the adjacent Gulf of Mexico (see figure on next page).

o Preliminary observations on both the stratigraphic studies and circulation studies have been reported at scientific meetings and in technical journals.

o Initial assessments have been made on the rates of coastal erosion in Mississippi and Alabama.



Alabama/Mississippi Coastal Erosion and Pollution Study. Satellite images of Mobile Bay showing suspended sediments on February 27 and March 25, 1990. Reds indicate high sediment concentrations; purple indicates clear water. Clouds are shown in gray. These images show the transport of extremely high sediment loads resulting from high river discharge. Sediment passes through Mobile Bay and into Mississippi Sound or into the Gulf of Mexico. The location of the sediment plume in the Gulf differs between the images as a result of changes in the wind direction. For the February scene, easterly winds caused the plume to move along the coast. In the March scene, northerly winds helped force the plume over 37 miles (60 km) offshore. The sites where fine-grained sediments and associated pollutants deposit on the ocean floor can vary considerably as a result of such factors as river discharge and wind.

CONTAMINANT TRANSPORT AND ACCUMULATION IN MASSACHUSETTS BAY AND BOSTON HARBOR

Problem: Boston Harbor has been cited as the most contaminated harbor in the Nation. As part of the $6 billion dollar Boston Harbor cleanup (the largest public works project in the world), treated sewage effluent, currently released into the harbor, will be discharged 14.5 km (9 miles) into Massachusetts Bay in 1995. There is tremendous concern about the long-term impact of contaminants on the Massachusetts Bays and the adjacent Gulf of Maine because these areas are used extensively for transportation, recreation, fishing, and tourism as well as waste disposal. Stellwagen Bank, located at the eastern side of Massachusetts Bay, is a critical habitat for endangered whales. Knowledge of the pathways, mechanisms, and rates at which pollutants are transported through this coastal system, typical of many coastal areas adjacent to major population centers, is needed to address a wide range of management questions.

Objective: Because many contaminants are associated with particles in sea water, the U.S. Geological Survey studies are designed to understand the transport and accumulation of contaminated sediments. The fundamental questions addressed are:

- How are water and materials transported through the system?
- What are the present levels of contaminants in the sediments?
- Where do sediments and associated contaminants accumulate and at what rate?
- What are the texture and morphology of the sea floor environment?

The USGS program is closely coordinated with studies conducted by the Massachusetts Bays Program (EPA) and the Massachusetts Water Resources Authority.

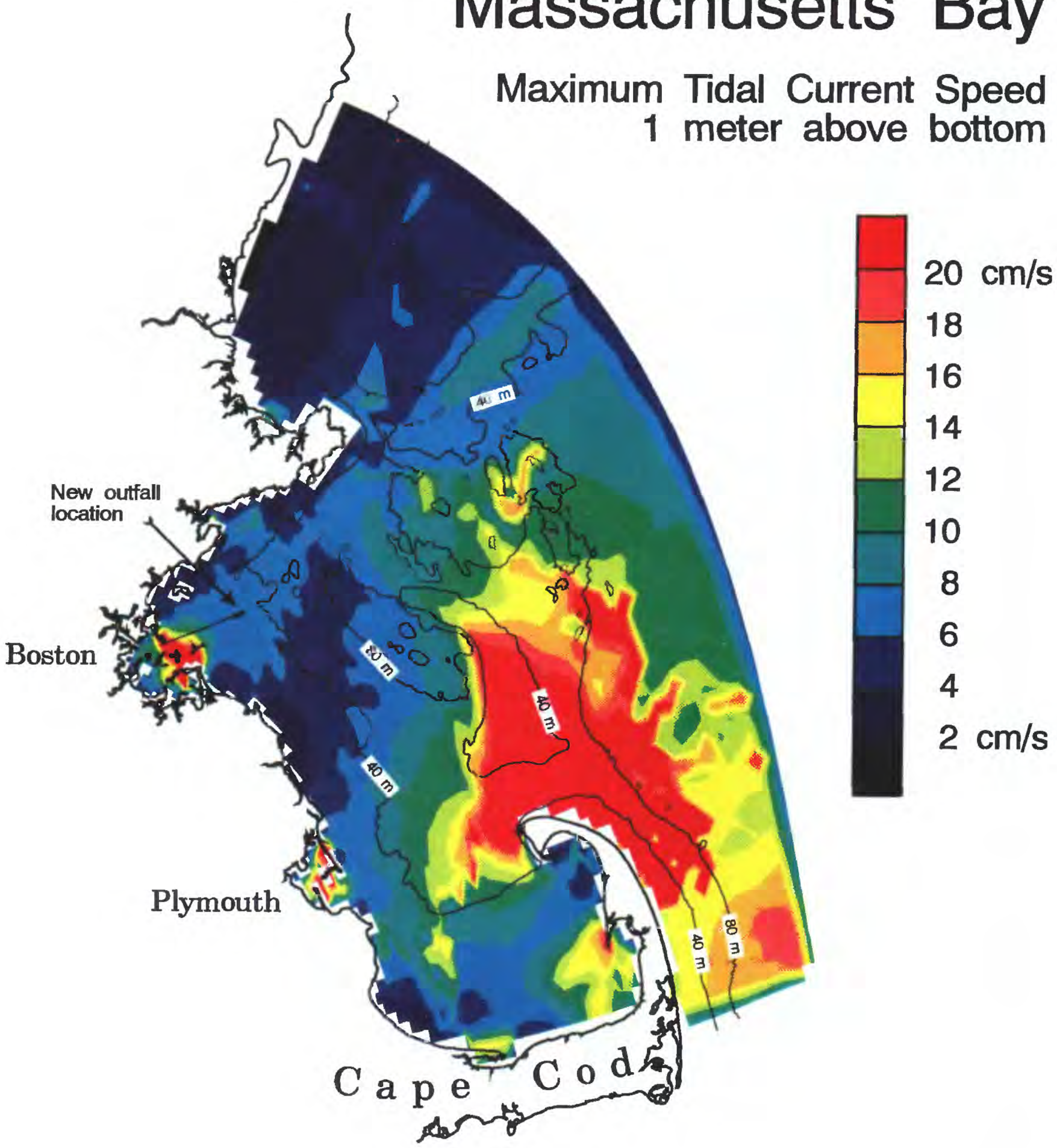
Status and FY 1992 Plans: FY 1992 is the second year of a planned five-year study. FY 1992 plans include continued modelling of water circulation, continued long-term observations of bottom currents and sediment movement, and acquisition of new data on polluted sediments.

Results:

o Mapping of the seafloor has revealed a complex pattern of sediment texture and identified areas of erosion and deposition. These maps have been used to select sites for sampling to assess long-term environmental change.

o Levels of contaminants within the harbor and in parts of Massachusetts Bay are elevated both near the surface and with depth in the sediments. A comprehensive inventory of sediment and contaminant information provides insight into transport pathways and provides a baseline to assess and understand future change.

o Extensive observations document the seasonal flow patterns and sediment movement. Winter storms periodically resuspend sediments and transport them throughout the Bays. A three-dimensional model of the circulation and transport has been implemented to interpret flow patterns and will form the basis of a water quality model (see figure on next page).



Contaminant Transport and Accumulation in Massachusetts Bay and Boston Harbor. Maximum tidal current speed at 1 meter above the bottom from a three-dimensional circulation model of Massachusetts and Cape Cod Bays. The model encompasses all of Massachusetts and Cape Cod Bays, as well as Stellwagen Bank and the Merrimack River, and will be used by the Massachusetts Water Resources Authority to provide transport information for a water quality model of the region. In this figure of tidal currents, the regions in red, where tidal currents exceed 0.7 feet per second (20 cm/s) occur north of Race Point and at the constricted entrances to harbors.

LOUISIANA WETLANDS LOSS STUDY

Problem: A combination of natural processes and human activities have resulted in the filling and loss of more than 50 percent of the wetlands that existed in the contiguous United States at the start of European settlement over 200 years ago. These wetlands losses are continuing, and nowhere is the problem greater than in the Mississippi River delta plain of Louisiana, an area which accounts for an estimated 25 percent of the vegetated wetlands and 40 percent of the tidal wetlands in the 48 conterminous states. Louisiana is undergoing the greatest amount of wetlands loss and deterioration of any state in the Nation; an estimated 80 percent of the Nation's tidal wetlands loss has occurred in Louisiana, and by current estimates, approximately 100 km^2 (32 square miles) are lost each year.

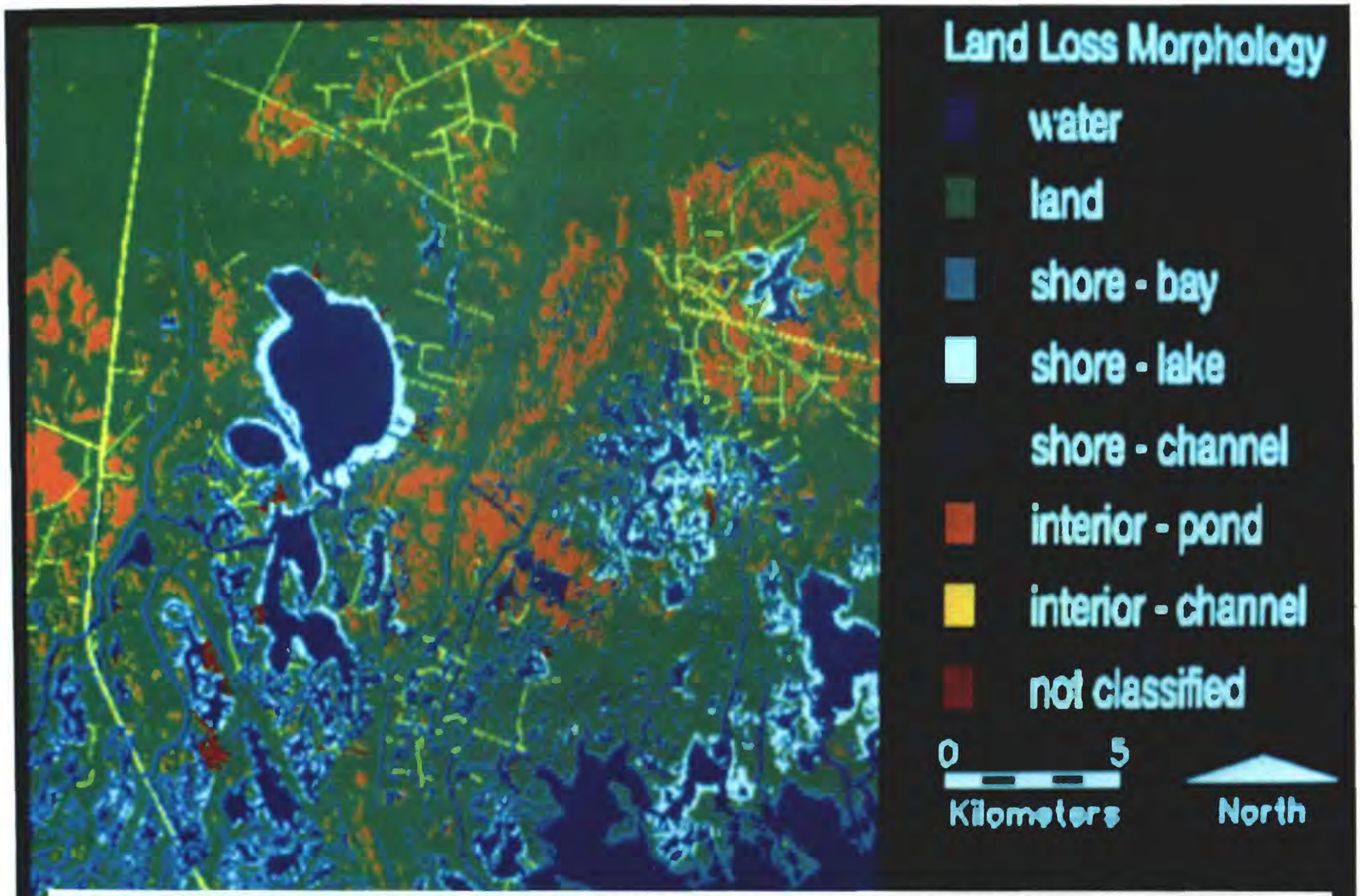
Objectives: The U.S. Geological Survey, as part of its National Coastal Geology Program, is conducting geologic research throughout the delta plain of south central Louisiana. The objective is to provide basic information necessary to improve our understanding of the geological processes responsible for coastal erosion and wetlands deterioration. The Louisiana Geological Survey, Louisiana State University, U.S. Fish and Wildlife Service (USFWS), and the Argonne National Laboratory are cooperating partners with the USGS in wetlands studies.

Status and FY 1992 Plans: FY 1992 marks the fourth year of investigations of a half dozen critical processes responsible for wetlands deterioration in the Louisiana delta plain. During this year, field data collection activities will be completed in the sediment-rich Atchafalaya basin. Comparisons of the large data sets from vastly different wetlands environments in the Terrebonne/Barataria and Atchafalaya basins are greatly enhancing our knowledge of how wetlands function. Processes investigated in both wetland basins include:

- Storm effects
- Freshwater and saltwater dispersal
- Fine-grained sediment dispersal
- Marsh deterioration
- Soils development
- Subsidence and sea-level rise

Results:

- o Field investigations in the Atchafalaya basin are nearing completion, analysis and synthesis of the data is underway, and reports are being prepared.
- o Development of a Louisiana Coastal Geographic Information System Network (LCGISN), incorporating all the major data bases from a variety of Federal, state, and local agencies is being completed. These data are proving valuable in implementing project recommendations of the Louisiana Coastal Wetlands Restoration Task Force. (P.O. 101-646, Title III, Section 303, Coastal Wetlands Planning, Protection and Restoration Act.)
- o A comprehensive mapping effort continues in cooperation with the U.S. Army Corps of Engineers to quantify and classify wetlands loss over the past 50 years (see figure on next page).
- o Joint studies with the USFWS in Louisiana are underway investigating the effects of various management techniques on protecting and conserving Louisiana marshes.



Louisiana Wetlands Study. Coastal land loss classification of the Dulac, Louisiana, area. Geographical Information System's technology is being utilized to quantify the form and processes of coastal land loss in Louisiana for coastal restoration planning. In addition to water and land, six types of wetland loss are color coded on the map. The wetland losses occurred over the period 1933 to 1983.

FLORIDA WETLANDS STUDY

Problem: Florida contains over 20 percent of all estuarine wetlands in the lower 48 states. The northwest Florida coast alone has over 120,000 acres of nearly undisturbed coastal wetlands.

- The northwest Florida region has rapid growth, 250 percent increase in population since 1970.

- Stress in the wetland habitat has appeared recently through the dieout of thousands of Sabal palms (see photograph on next page). Recent freezes have killed mangroves (which are at the northern limit of their range) found in this area.

- The wetlands of the Big Bend area are exposed directly to the gulf, which makes them more susceptible to storm damage and salt water intrusion. In addition, the Floridan Aquifer, the major source of drinking water in central Florida, may supply freshwater to the coast to support brackish water vegetation.

Objective: To determine the geologic characteristics and critical processes that would cause erosion or decline of the wetlands in the Big Bend area of northwest Florida. These investigations involve:

- geophysical surveys
- coring and sediment sampling
- sea level rise analyses
- historic changes
- erosion/accretion processes
- salinity effects
- storm effects

Status and FY 1992 Plans: The project is now in the second year of a planned five years. Cooperating agencies include the Florida Geological Survey, the University of South Florida, the U.S. Geological Survey Water Resources Division, and the U.S. Fish and Wildlife Service (USFWS).

- Framework studies are being conducted in Apalachee Bay, Suwannee River, and Crystal River. Work has begun with USFWS providing geologic information on the St. Marks National Wildlife Refuge.

- Instrumentation has been installed at Crystal River for studies on soil salinity and sedimentation processes. Measurement of coastal salinities and water levels has begun for the Suwannee River region.

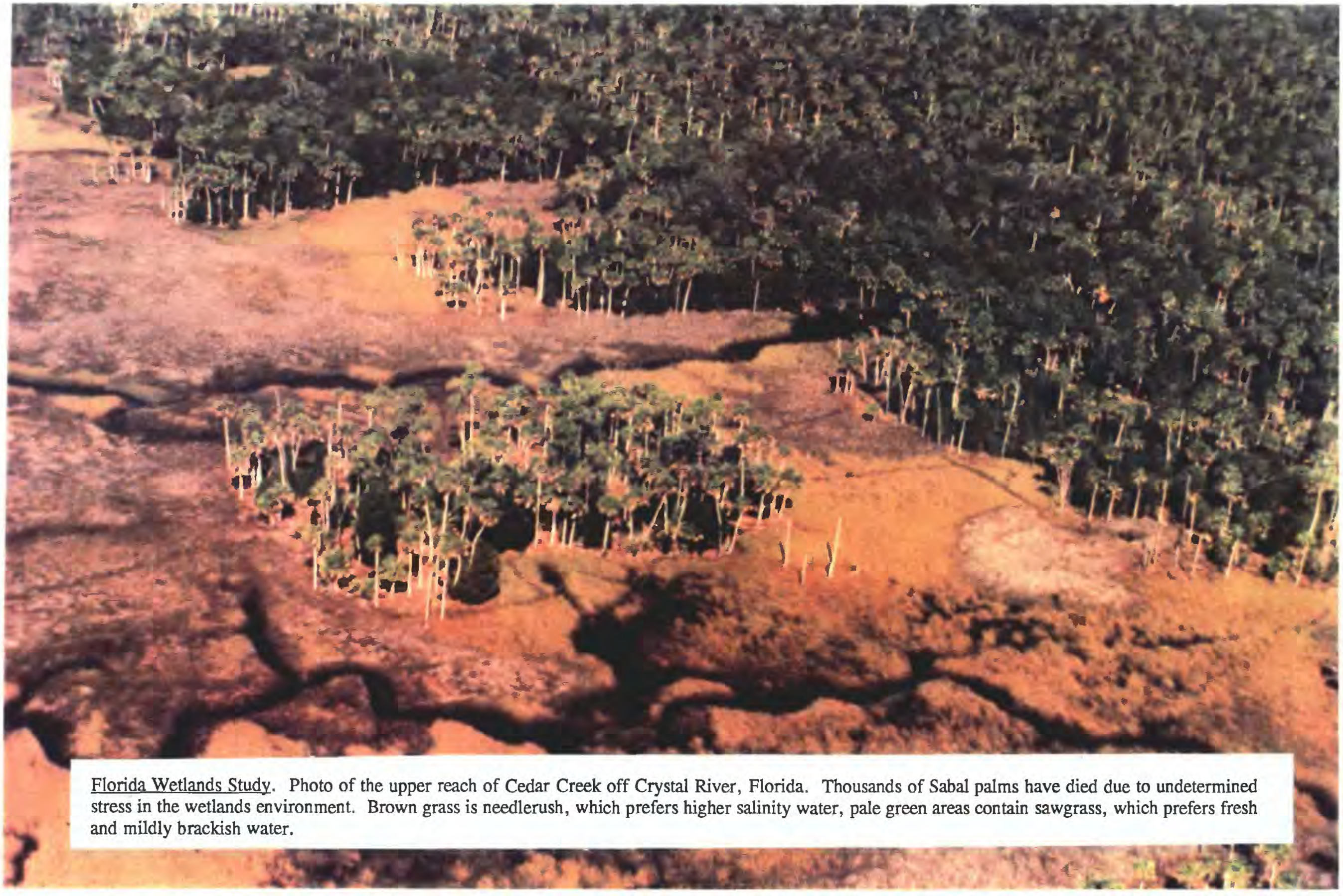
- The coast is being mapped with satellite and aerial photos to determine change.

Results: Data sets are now being processed from the first year of effort.

o Initial results show limited amounts of fine sediments in the region.

o Marsh deposits are less than 1-2 m thick lying on top of limestone.

o Sediment transport within the marsh appears to be limited during normal tides.



Florida Wetlands Study. Photo of the upper reach of Cedar Creek off Crystal River, Florida. Thousands of Sabal palms have died due to undetermined stress in the wetlands environment. Brown grass is needlerush, which prefers higher salinity water, pale green areas contain sawgrass, which prefers fresh and mildly brackish water.

GREAT LAKES WETLANDS PROCESSES STUDY

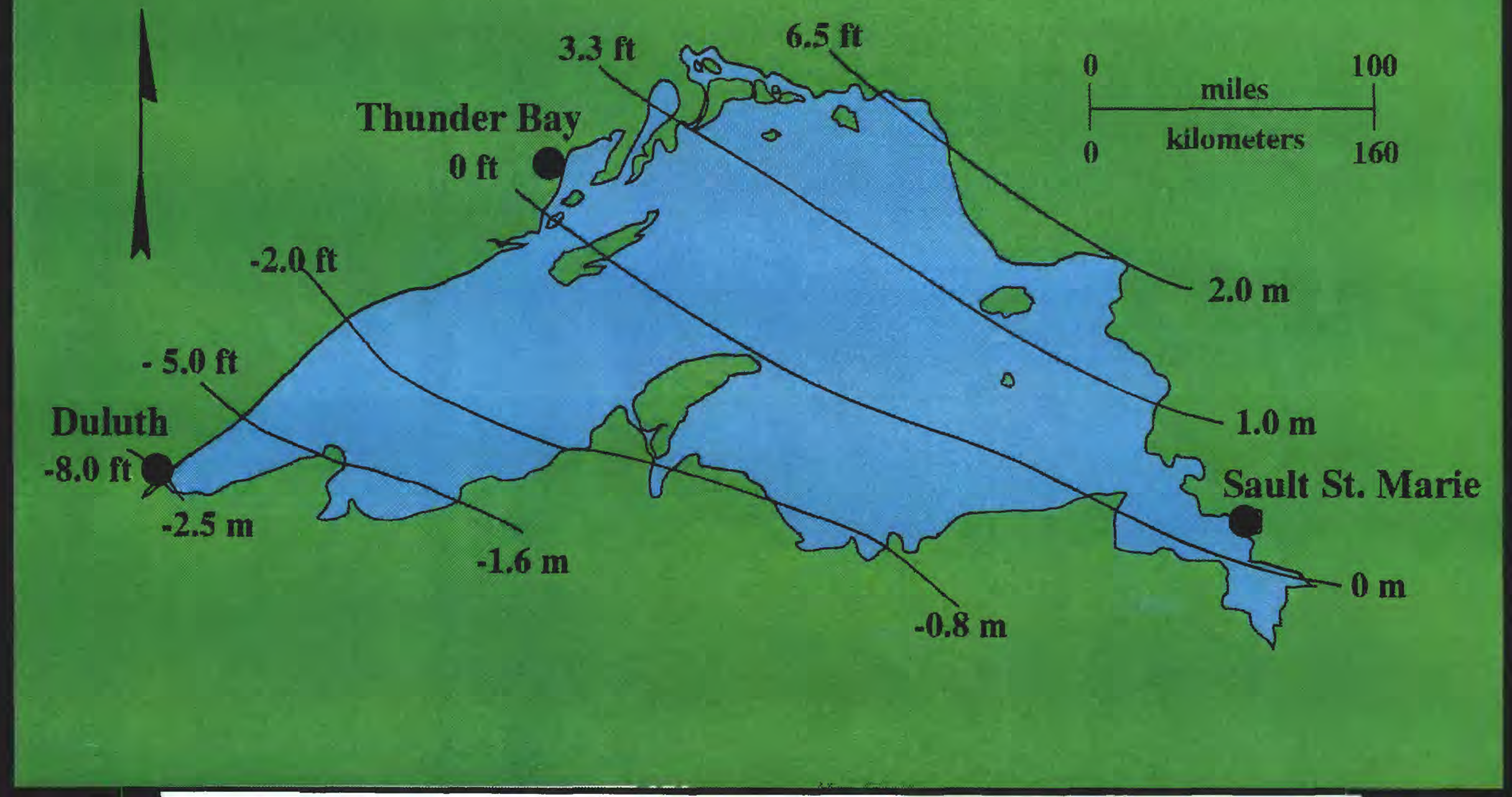
Problem: A combination of natural processes of wetlands degradation and destruction and alteration by human activities have resulted in the filling and loss of more than 50 percent of the wetlands that existed in the contiguous United States at the start of European settlement over 200 years ago. These wetlands losses are continuing, and the problems are especially acute in the Great Lakes region. In fact, natural processes and man's activities of ditching, draining, and filling have been responsible for about 80 percent of the loss of wetlands in the region. The wetlands that remain are under considerable stress, and their continued health and vitality is dependent on understanding geologic processes and reducing human impacts.

Objective: The U.S. Geological Survey, as part of its National Coastal Geology Program, is conducting coastal geologic research throughout the Great Lakes region. The objective is to provide baseline information necessary to improve our understanding of the geological processes responsible for wetlands deterioration. Various state geological surveys as well as the U.S. National Park Service and the U.S. Fish and Wildlife Service are cooperating partners with the USGS in wetlands studies. An important aspect of the study is to understand past lake fluctuations so that we may better predict future fluctuations (see figure on next page).

Status and FY 1992 Plans: FY 1992 is the second year of a multiyear effort focused on delineating the wetlands environments of the Great Lakes and better understanding the physical processes, both natural and man-induced, affecting the wetlands. The major emphasis of the study thus far is on wetlands around Lake Michigan (Manistique, Sleeping Bear Dunes), Lake Superior (White Fish Point), and Lake Erie (north-central Ohio). These areas will continue to be studied in FY 1992. Wetlands adjacent to the other Great Lakes will be investigated in subsequent years.

Results:

- Mapping and field investigations of former and current wetlands adjacent to Lake Erie have been completed.
- Beach ridges and wetlands occupying the swales between ridges have been thoroughly investigated in Indiana Dunes National Lakeshore Park, and reports are available detailing the origins, evolutionary history, and relationships to lake-level fluctuations and sediment budgets.
- Similar geologic investigations of mapping and coring ridges and wetlands at two other sites along Lake Michigan are underway.



Great Lakes Wetlands Study. An important aspect of the study is investigating future lake level changes by understanding how past lake levels have changed. For example, this figure shows the approximate altitude of the 3000 years before present shoreline (O contour) of Lake Superior relative to the historic mean level.