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CUMBERLAND ISLAND RESEARCH PROGRAM

NATIONAL PARK SERVICE

AND

DEPARTMENT OF THE NAVY

PROGRAM DESCRIPTION

Construction of coastal engineering works and channel dredging over the past 100 years have had noticeable effects on the St. Mary's River Entrance and Cumberland and Amelia Islands. The additional construction and channel development at the Kings Bay Naval Trident Submarine Base and further deepening of the channel through St. Marys River Entrance may have significant impacts on the resources of Cumberland Island and Cumberland Sound estuary. The potential biophysical impacts of this construction project will be evaluated by the National Park Service through the following series of research projects: 1. Assessment of Changes of Cumberland Island Marsh, Mudflat and Tidal Creek Morphology and Sediment Accretion Rates, 2. Assessment of Health and Population Dynamics of Bivalve Populations, 3. Geographic Information System: Implementation and Data Management, 4. Assessment of the Groundwater Hydrology in the Vicinity of the King's Bay Ship Channel, and 5. Rare and Endangered Species Survey: Manatee Movements and Foraging in Cumberland Sound. The Navy, through the Corps of Engineers, will monitor the physical aspects of the ocean shoreline of Cumberland and Amelia Islands and the Cumberland Sound estuary. This research consists of the following studies: 1. Coastal Monitoring research will provide information which can be used to establish the effects of Navy construction activities on shoreline processes, and 2. Estuarine Monitoring will provide a data base which can be used to establish the effects of project dredging on estuarine resources and processes.

JUSTIFICATION:

The research is required by Congressional mandate and is being carried out under agreement between the Departments of Interior and Defense: National Park Service and Navy, respectively. Additionally, the research will document the potential for short- and long-term impacts on the resources of Cumberland Island and Cumberland Sound estuary, and allow management to plan for mitigative measures. Failure to perform this research could lead to short- and long-term impacts on the resources of Cumberland Island and Sound, which ultimately threaten the very integrity of the insular ecosystem.

NATIONAL PARK SERVICE RESEARCH

1. Assessment of Changes of Cumberland Island Marsh, Mudflat and Tidal Creek Morphology and Sediment Accretion Rates.

COST ESTIMATE: \$80,000.00 per year for five (5) years. Total
Cost: \$400,000.00

DESCRIPTION:

Cumberland Island lies in a region in which net sea level change over the past one hundred years has been approximately +30 cm. Presumably, there have been sufficient sediment supplies available to allow mudflats and marshes to accrete at a rate sufficient to compensate for this increase in sea level, although this has not been documented. It is possible that the construction and subsequent deepening of the entrance channel to the U. S. Navy's East Coast Trident Submarine base at King's Bay, Georgia, may affect the deposition rate of sediments on the mudflats and tidal marshes of Cumberland Island. There is particular concern that the recent deepening of the channel to a 46 foot operating depth (51 foot actual depth) may further affect accretion and erosion on the mudflats and in the tidal marshes of the Island. The purpose of this study will be to investigate and document impacts of the deepening of the King's Bay ship channel on the marshes, mudflats and marsh tidal creeks of Cumberland Island National Seashore.

2. Assessment of Health and Population Dynamics of Bivalve Populations.

COST ESTIMATE: \$40,000.00 per year for five (5) years. Total
Cost: \$200,000.00

DESCRIPTION:

It is possible that the initial construction and subsequent deepening of the entrance channel may have altered environmental conditions in Cumberland Sound sufficiently to affect the native bivalve mollusk populations. Possible impacts could come from changes in accretion rates and types of sediments on the eastern and southern shores of Cumberland Island, erosion and steepening of the banks on the western shore and changes in suspended sediment loadings. While this may have affected many different organisms including fishes, decapod crustaceans, etc. this investigation is intended to look at the benthic infauna, principally the bivalves, because of their lack of mobility. The purpose of this study is to monitor the population dynamics and degree of physiological stress of populations of local bivalves, most probably the hard clam, Mercenaria

mercenaria, and the oyster Crassostrea virginica in the vicinity of Cumberland Island National Seashore.

3. Geographic Information System: Implementation and Data Management.

COST ESTIMATE: \$40,000.00 per year for five (5) years. Total Cost: \$200,000.00.

DESCRIPTION:

There is particular concern that the recent deepening of the channel to a 46 foot operating depth (51 foot actual depth) may induce changes in island erosion/deposition patterns, causing loss of forest, modification of dunes, and disruption of present vegetation and surface water patterns, particularly in low lying areas. Dredging initiated changes may modify endangered species habitat, reduce the area of both fresh and salt water marshes, modify surface and groundwater resources, and modify recreational uses of the region. In order to evaluate and mitigate the impacts of dredging, it is necessary to establish a systematic monitoring system to identify the responses of the barrier island ecosystem to dredging. As part of this long term monitoring effort, a geographic information system is necessary to store data on changes in geological and biological systems and to facilitate modeling efforts. The purpose of this study will be to implement and manage an existing geographic information system for Cumberland and Amelia Islands, and Cumberland Sound, including the marshes on the western shore. The primary function will be the input, management, and output of data (both Navy and NPS) collected during all phases of the Cumberland Island Research Program.

4. Assessment of the Groundwater Hydrology in the Vicinity of the King's Bay Ship Channel.

COST ESTIMATE: \$25,000.00 per year for five (5) years. Total Cost: \$125,000.00

DESCRIPTION:

It has been suggested that the deepening of the entrance channel to King's Bay, may have altered environmental conditions in Cumberland Sound sufficiently to effect the surface and groundwater resources of Cumberland Island. Channel development which intercepts the edge of the groundwater lens could result in loss of groundwater confinement causing alterations in the groundwater resources of the entire island. Such changes include lowering of the surface- and groundwater tables, and salt water intrusion. Since the plant and animal communities of the island are dependent on the quantity and quality of the surface- and groundwaters, adverse changes in this resource would have adverse consequences for the islands ecology. The purpose of this study

will be to investigate the relationship between Cumberland Island's freshwater resources and the salt water of Cumberland Sound. The study will document actual and potential impacts of the deepening of the King's Bay channel on the island's freshwater.

5. Rare and Endangered Species Survey: Manatee Movements and Foraging in Cumberland Sound.

COST ESTIMATE: \$20,000.00 per year for five (5) years. Total
Cost: \$100,000.00

DESCRIPTION:

The development of the naval facility will increase ship traffic in Cumberland Sound. Further, the continuous, year-round dredging that will be required to maintain the channel will shift boat traffic towards Cumberland Island. These developments may threaten endangered species and other elements of the local fauna through direct impacts (increase in traffic), and indirect impacts (habitat modification). Known concerns include the manatee population in Cumberland Sound and adjacent waters. Manatees are now over-wintering in Georgia at warm water effluents and are thus dependent on the availability of suitable feeding sites throughout the year. Manatees forage along the coast of Cumberland Island and may be disturbed or injured as a result of increased boat traffic. The purpose of this study will be to determine how many manatees are using the Sound and which areas they are using. The project will also determine which areas are most frequently used for feeding and thus need protection from high speed boat traffic. The project will also evaluate the impact of potential shoreline changes on manatee habitat.

DEPARTMENT OF THE NAVY RESEARCH

COST ESTIMATE: \$680,000.00 per year for five (5) years. Total
Cost: \$3,400,000.00

DESCRIPTION

1. Coastal Monitoring.

The following studies, which comprise the Coastal Monitoring project are associated with monitoring the ocean shoreline at Cumberland and Amelia Islands:

History: The purpose of the historical substudy is to establish the long term shoreline and inlet behavior of

Cumberland and Amelia Islands in the vicinity of St. Mary's entrance channel. Analysis efforts will focus on the evaluation of historic bathymetric surveys, shoreline maps, profile and land surveys, dredging records, previous studies of the area, and aerial photography.

Monitoring: The five year physical processes substudy will consist of monitoring the near- and offshore wave climate, beach profiles, ocean and estuarine bathymetric profiles, ocean and channel sediment characteristics, St. Mary's ebb tidal delta profile, and shoreline changes through aerial photography.

Shoreline Evolution Modeling: This substudy will use the results of the Historic and Monitoring substudies to simulate the recent, past, and the future shoreline behavior patterns for Cumberland and Amelia Islands. The simulation will be performed using numerical models calibrated with the historical data. The substudy will simulate shoreline evolution both with and without the effects of Navy construction activities. Differences in shoreline evolution resulting from Navy construction activity will be evaluated.

2. Estuarine Physical Processes.

The following studies, which comprise the Estuarine Processes project are associated with monitoring the channel and near-channel environment of Cumberland Sound:

Long Term Monitoring: This substudy involves seasonal long term continuous monitoring of tides, conductivity, temperature, and suspended sediments in the study area.

Salinity Impacts: The purpose of this substudy is to assess the differences in Cumberland Sound salinities associated with pre- and post-dredging conditions of the new channel. The pre-dredging model, verified in 1982 will be used for the comparisons.

Sediment Sources and Redistribution: The purpose of this task will be to assess the impacts of current dredging on the sources and distribution of sediments within Cumberland Sound. Existing numerical models will be used with information collected during the monitoring phase.

Cumberland Sound Hydrodynamics: This substudy will be to compare the pre-dredging hydrographic conditions with post-dredging conditions. The project will take place after the channel dredging has been completed and will consist of a 13-hour survey of current speed and direction, salinity, suspended sediment, and ambient water temperature in Cumberland Sound.

Fernandina Long Term Tide Gage Analysis: This substudy includes analyses of tide data from the Fernandina gage to determine differences in mean water level and mean tidal range that may be due to dredging.

Bathymetric Profiling: This substudy will be carried out to provide estimates of in-fill and erosion within the channel.

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