

## Shoreline Erosion Analysis of Hancock County Marsh

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### Introduction

Erosion of marsh shoreline in Hancock County has been occurring steadily throughout the past several thousand years, since the abandonment of the Saint Bernard delta lobe of the Mississippi River (Otvos, 1985). The Hancock County marsh is located in the southwest corner of Mississippi, adjacent to Louisiana. This natural process is driven by relative sea-level rise (combination of sea-level rise and land subsidence) (Figure 1) and



wave attack, and is offset somewhat by the conversion of upland areas to wetlands. Today, however, the process of upland conversion is limited, and in many cases reversed, by development, making marsh erosion more problematic. The importance of marsh to the coastal ecosystem has been well documented (Mitsch and Gooselink, 1986, among others). This update on shoreline position in the Hancock County marsh system is meant to highlight recent trends associated

with coastal erosion.

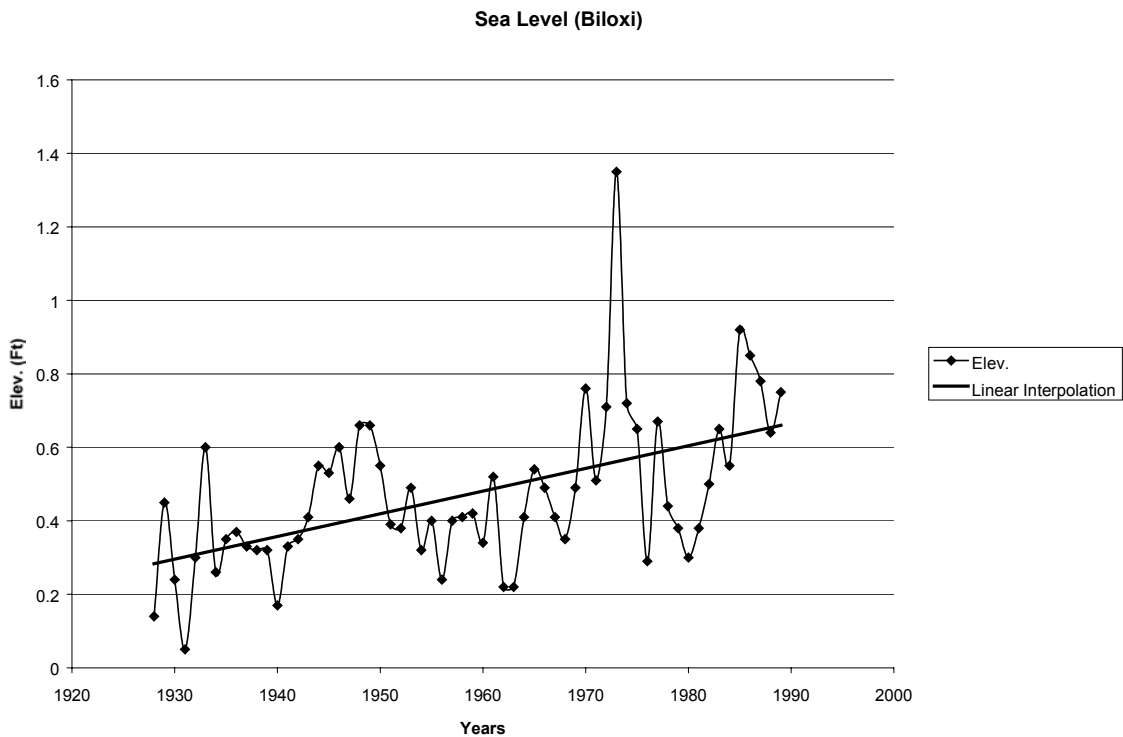


Figure 1. Sealevel rise in Mississippi (from W.W. Burdin, 1990).

## **Methods**

Shoreline positions of the wave-exposed marsh shorelines were surveyed using Global Position System (GPS) techniques in 1993 and 1999. Additionally, the position of the entire 1986 shoreline was digitized from aerial photographs and maps by the Mississippi Office of Geology, and NOAA Coastal Service Center. The 1993 and 1999 GPS data cover the area from Bayou Caddy to the start of the mouth of the Pearl River. All of the data were added to a Geographic Information System (GIS) and analyzed to determine erosion trends. Accuarcies of both methods are better than 5 m (16 ft.). Erosion thresholds of more than 15 meters were used to highlight critical areas between 1993 and 1999, and 39 meters between 1986 and 1999. These values are significantly large to minimize over-estimating critical erosion areas. Using an estimation technique, total area loss from shoreline erosion has been computed for the wave-exposed shoreline from Bayou Caddy to the mouth of the Pearl River.



Figure 2. High-altitude aerial photograph of part of the most critically eroding portion of the Hancock County Marsh and the circulation pattern in the area.

## **Results**

### **1993-1999**

Areas of the shoreline with erosion of more than 2.5 m/yr. (8 ft./yr.) from 1993 to 1999, which yields a total of 15 m (50 ft.), are highlighted (Map 1). The erosion trends from 1993 to 1999 clearly indicate that the shorelines exposed to prevailing SSE (summer) and NE (winter) winds and waves have the highest rates of shoreline erosion. The shoreline from Three Oaks Bayou to Lighthouse Point comprises 65% of the eroding shoreline, although it only represents 25% of the total shoreline. Within Heron Bay, erosion is limited and dense vegetation including shrubs is well developed. The prevailing wave conditions and not the shoreline morphology appear to be the driving force. For example, between Bayou Bolan and Point Clear the immediate shoreline is sandy but still shows

signs of retreat similar to the stretch between Three Oaks Bayou and Bayou Bolan that has a marsh shoreline. The shoreline orientation of these two areas is similar and should see similar wave characteristics, except during south to southwest winds.

### 1986-1999

Areas of the shoreline with a long-term erosion rate of 3 m/yr. (10 ft./yr.) from 1986 to 1999, which yields a total of 39 m (127 ft.), are highlighted in Map 2. Like the period of 1993 to 1999, the Three Oaks Bayou to Lighthouse Point area shows the effect of long-term wave attack. This area accounts for 93% of the critical erosion; the other small portion is located at the mouth of Bayou Caddy (north of Point Clear).

### ***Discussion***

Wave erosion is one of the primary causes of wetland loss in Mississippi, although it pales in comparison to human modification. On the Hancock County marsh shoreline, about 13% has eroded at more than 15 meters (50 ft.) since 1993. Although only 13% of the shoreline has shown erosion of more than 2.5 m/yr., nearly the whole shoreline has eroded at some level. Comparing the 1993 and 1999 Hancock County marsh shoreline data shows that a total of roughly 175,000 square meters, or slightly less than 45 acres, has been lost. This is about 7 acres per year since 1993 or about 0.6 acre per mile of exposed shoreline. Initial results suggest that wetland loss from 1993 to 1999 in the Grand Bay National Estuarine Research Reserve (NERR) marsh, also open to wave attack, is significantly higher per linear mile of shoreline than in the Hancock County Marsh. Thus, in summary, shoreline data from the Hancock County marsh indicate that only a moderate amount of erosion is occurring each year and that it is clustered on the shoreline from Lighthouse Point to Three Oaks Bayou. Protection of the Hancock Marsh by the offshore marshes in Louisiana may be an important factor in limiting erosion.

### ***References***

- Burdin, Walter W., 1990, Sea level rise in coastal Alabama and Mississippi: Proceedings, Long Term Implications of Sea Level Change for the Mississippi and Alabama Coastlines, Biloxi, MS, September 27-28, pp. 35-46.
- Mitsch, W.J. and J.G. Gooselink, 1986, Wetlands: New York, Van Nostrand Reinhold Co., 539 p.
- Otvos, Ervin G., 1985, Coastal Evolution – Louisiana to Northwest Florida: Guidebook, American Association of Petroleum Geologists Annual Meeting, March 27-29.