

# TRENDS AND STATUS OF WETLAND AND AQUATIC HABITATS IN THE GALVESTON BAY SYSTEM, TEXAS

W. A. White, T. A. Tremblay, E. G. Wermund, Jr., and L. R. Handley

## INTRODUCTION

Wetland and aquatic habitats are essential biological components of the Galveston Bay Estuarine System. Understanding the spatial and temporal distribution of these habitats is critical if they are to be effectively protected and managed. This report presents results of an investigation to determine the trends and status of wetland and aquatic habitats in the Galveston Bay system. The investigation, sponsored by the Galveston Bay National Estuary Program (GBNEP) and funded by the U.S. Environmental Protection Agency, is a cooperative effort between the Bureau of Economic Geology and the National Wetlands Research Center and National Wetlands Inventory (NWI) program of the U.S. Fish and Wildlife Service (USFWS).

### Objectives

Primary among the objectives of this investigation was to determine the trends and status of wetlands in the Galveston Bay system (fig. 1) using aerial-photographic analysis supported by field surveys. Associated objectives included characterization of wetland plant communities in the Galveston Bay system (White and Paine, 1992) and determination of the probable causes of documented wetland trends (changes).

### Wetland Classification and Definition

For the purposes of this investigation, wetlands were classified in two ways: (1) in accordance with *The Classification for Wetlands and Deepwater Habitats of the United States* by Cowardin and others (1979) and (2) in more classical terms—for example, salt, brackish, and fresh marshes, and swamps. The classification by Cowardin and others (1979), which is the classification used by the USFWS for the NWI, was used in delineating wetlands on aerial photographs and in ground-truthing delineations during field surveys. The more classical definitions were used in defining wetland plant communities (White and Paine, 1992) as specified in contract requirements. The classical terms were used because salinity regimes were not mapped using the Cowardin and others system, and subdivision of estuarine emergent wetlands into salt- and brackish-water marshes provides additional information about the distribution of plant communities. The general relationships between the two classifications are presented through numerous examples in this report.

The definitions of wetlands and deepwater habitats according to Cowardin and others (1979) are as follows:

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes<sup>1</sup>; (2) the substrate is predominantly undrained hydric soil<sup>2</sup>; and (3) the substrate is nonsoil and is saturated

<sup>1</sup>The USFWS has prepared a list of hydrophytes and other plants occurring in wetlands of the United States.

<sup>2</sup>The U.S. Soil Conservation Service has prepared a list of hydric soils for use in this classification system.

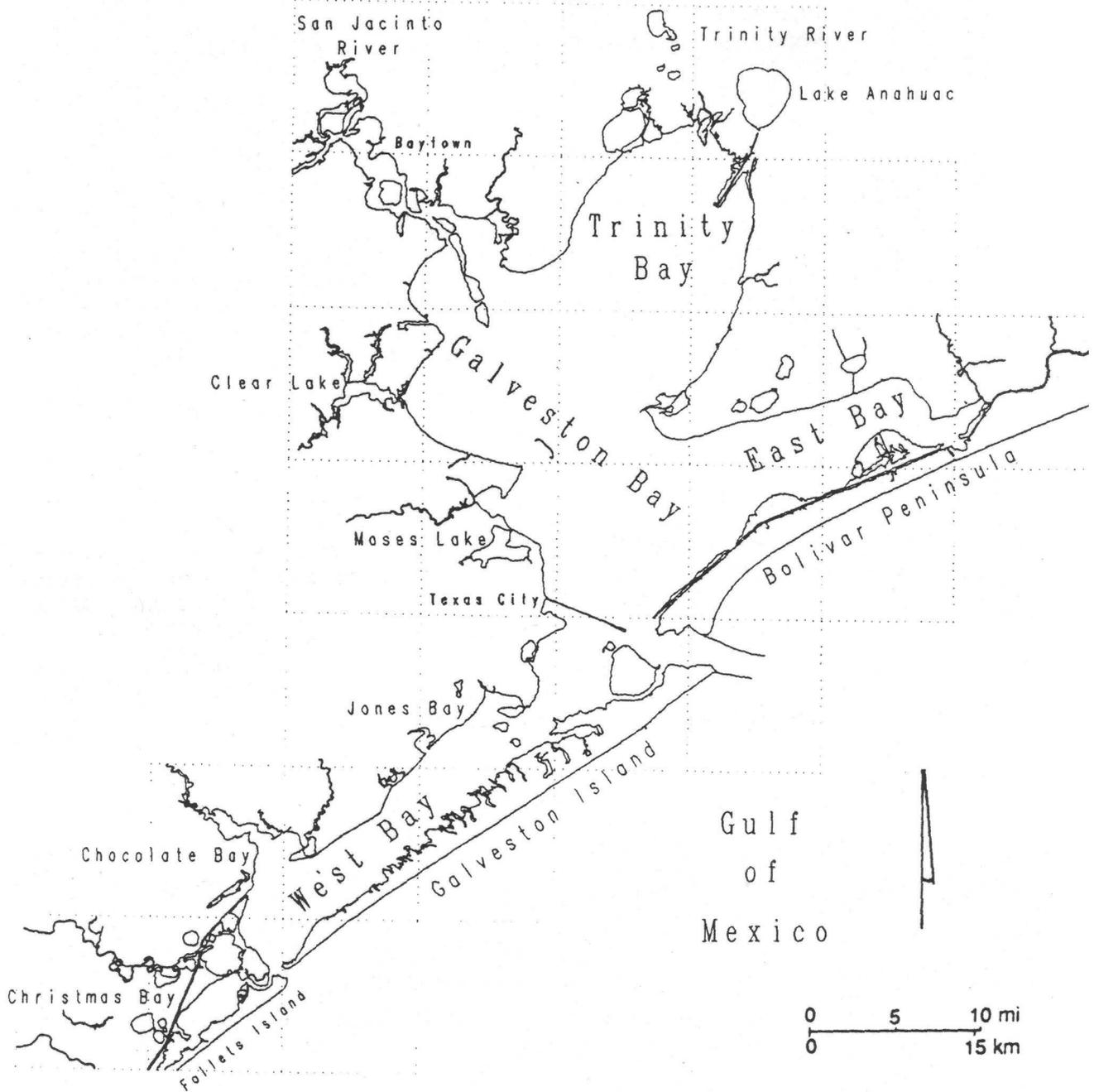


Figure 1. Index map of the Galveston Bay system.

with water or covered by shallow water at some time during the growing season of each year.

Deepwater habitats are permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live, whether or not they are attached to the substrate. As in wetlands, the dominant plants are hydrophytes; however, the substrates are considered nonsoil because the water is too deep to support emergent vegetation (U.S. Soil Conservation Service, Soil Survey Staff, 1975).

Because the fundamental objective of the GBNEP project was to determine the trends and status of wetlands in the Galveston Bay system using aerial photographs, classification and definition of wetlands are integrally connected to the photographs and the interpretation of wetland signatures. Wetlands were not defined nor mapped in accordance with the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, which is currently being revised.

## METHODS

### Mapping and Analyzing Status and Trends

The Galveston Bay project area is defined by 30 U.S. Geological Survey (USGS) 7.5-minute quadrangles (quads) (fig. 2). Status and trends of wetlands in the Galveston Bay system were determined by analyzing the distribution of wetlands mapped on aerial photographs taken in the 1950's, 1979, and late 1980's. Only the late-1980's wetlands maps were completed as part of this project. Maps of the 1950's and 1979 were prepared as part of the USFWS-sponsored Texas Barrier Island Ecological Characterization study (Shew and others, 1981) by Texas A&M University and the National Coastal Ecosystems Team of the USFWS. Final maps of the 1979 series were prepared under the National Wetlands Inventory program. Maps of the 1950's and 1979 series were digitized and initially analyzed in 1983 (USFWS, 1983).

### Interpretation of Wetlands

Wetlands for all maps (1950's, 1979, and 1980's) were delineated on aerial photographs through stereoscopic interpretation using procedures developed for the USFWS National Wetlands Inventory program. Field reconnaissance is an integral part of the interpretation process. Photographic signatures were compared to the appearance of wetlands in the field by observing vegetation, soil, hydrology, and topography. This information is weighted for seasonality and conditions existing at the time of photography and ground truthing. Extensive field surveys of wetlands were conducted as part of this study in support of the 1980's delineations (see discussions on field investigations and wetland plant communities). Still, field-surveyed sites represent only a small percentage of the thousands of areas (polygons) delineated. Most areas are delineated on the basis of photointerpretation alone, and misclassifications may occur.

The following explanation is printed on all wetland maps that were used in this project to determine the trends and status of wetlands in the Galveston Bay system:

This document (map) was prepared primarily by stereoscopic analysis of high-altitude aerial photographs. Wetlands were identified on the photographs based on vegetation, visible hydrology, and geography in accordance with "Classification of Wetlands and Deepwater Habitats of the United States" (FWS/OBS-79/31 December 1979). The aerial photographs typically reflect conditions during the specific year and season when they were taken. In addition, there is a margin of error inherent in the use of the aerial photographs. Thus, a detailed on the ground and historical analysis of a single site may result in a revision of the