WETLAND PLANT COMMUNITIES, GALVESTON BAY SYSTEM

INTRODUCTION

Wetlands and aquatic habitats are critical components of the biologically productive Galveston Bay estuarine system. Mapping and describing the composition of these important habitats are essential steps in defining their status and in measuring and anticipating the effects of the numerous coastal activities that directly and indirectly influence them. Understanding cause-and-effect relationships can be promoted only through such detailed scientific investigations.

This report is the culmination of a field investigation of wetland plant communities, and is one phase of the project to determine the "Trends and Status of Wetland and Aquatic Habitats of the Galveston Bay System, Texas," sponsored by the Galveston Bay National Estuary Program (GBNEP).

General Objectives of Field Investigations

The purpose of these field investigations was to characterize wetland plant communities through representative field surveys, fundamental to the comparison of various wetland plant communities in the field with corresponding "signatures" on aerial photographs used to define wetland classes, including water regimes, for mapping purposes. In fact, all field work was done with reference to aerial photographs. This topical report presents results of representative field surveys and focuses principally on characterizing prevalent plant associations in the Galveston Bay System. For the grander objectives of the GBNEP contract, these characterizations also provided vital plant community information for defining the appropriate wetland classes and water regimes during the extensive "ground truthing" surveys in which wetland signatures delineated on aerial photographs were correlated with plant communities in the field. Characterization of plant communities in the field surveys allowed mapped wetland classes to be better defined in terms of typical vegetation associations.

General Project Objective and Wetland Definition

The fundamental objective of the GBNEP project, for which this reported study is one phase, is to determine the trends and status of wetlands in the Galveston Bay System using aerial photographs. The definition and identification of wetlands, therefore, is integrally connected to the photographs. Wetlands were delineated on mid-1950's, 1979, and 1989 photographs as part of the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory program using the Cowardin and others (1979) wetland classification system. Even though wetlands delineated on aerial photographs are supported by field surveys (especially for the 1989 delineations), field-identified wetlands represent only a small percentage of all the wetlands delineated. During ground-truth surveys, prevalent plant species associations were characterized "within the constraints imposed by the resolution of the photos" (as stated in the Project Scope of Work, 1990). Wetlands were not identified in accordance with the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (this manual is currently being revised). Thus, the wetlands mapped and defined in this study are not jurisdictional wetlands. The following is printed on all wetland maps that are used in this project to determine the status and trends 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:

Federal, State, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, State or local government or to establish the geographical scope of the regulatory programs of government agencies.

For purposes of this report, and in accordance with project requirements, wetlands are defined and classified in terms of more classical definitions, for example, salt, brackish, and fresh marshes. The relationship of these wetland classes to the Cowardin and others (1979) classification system is presented through various examples.

Field Surveys

More than 150 sites were examined in the Galveston Bay system (fig. 1) at locations that included the Brazoria and Anahuac National Wildlife Refuges, Armand Bayou Nature Center, Follets and Galveston Islands, Bolivar Peninsula, Smith Point, High Island area, Trinity River delta, and other areas. Plant communities were surveyed during the months of June, July, and November 1990, and May and September 1991. The surveys were conducted principally by the authors; other personnel involved in one or more surveys included Larry Handley (USFWS, National Wetlands Research Center), Warren Hagenbuck and Curtis Carley (USFWS National Wetlands Inventory), Todd Mecklenborg (Geonex Martel, Inc.), and Warren Pulich (Texas Parks and Wildlife Department). In addition, Ron Bisbee (Refuge Manager), Richard Antonette and Mike Lange of the Brazoria National Wildlife Refuge, and Jim Neaville and Ed Jackson of the Anahuac National Wildlife Refuge accompanied field parties to their respective areas.

Methods

During the initial field investigations, methods were developed to characterize prevalent species associations. The primary method was one in which wetland plants were identified at selected field survey sites, principally along transects aligned perpendicular to the hydrologic gradient so that plant assemblages from the water's edge to upland areas were intercepted. A second approach was to conduct a topographic survey along selected transects that crossed representative plant communities to identify relative elevations at which various plant species occur. This is helpful in defining water regimes and in differentiating between high- and low-marsh communities. The boundaries between some plant assemblages are controlled in part by elevation, so elevation measurements focus on such boundaries. Plant species that were difficult to identify in the field were collected for identification in the laboratory or with reference to the plant collection at The University of Texas Hebarium.

Topography surveys were conducted along several transects. Measurements of elevation, distance, and plant community composition were made along the survey lines, which crossed salt marshes (Smith Point, Follets Island, and mainland margin of West Bay) and brackish to

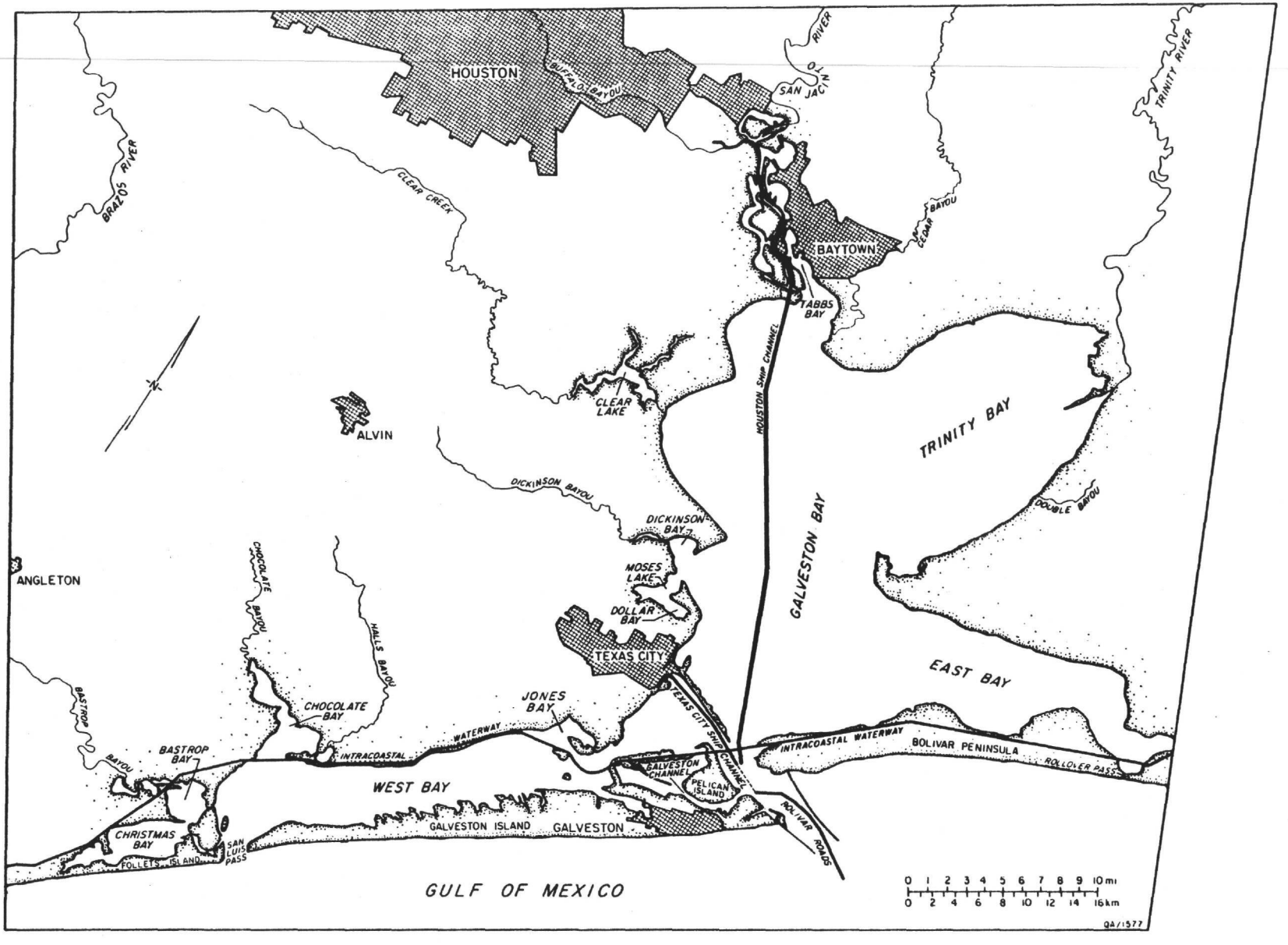

Figure 1. Index map of the Galveston Bay area. (From White and others, 1985)

fresh marshes (Anahuac National Wildlife Refuge, Brazoria National Wildlife Refuge, and Trinity River Delta). Elevations were measured to the nearest 0.5 cm (2 inches) and distances were measured to the nearest meter. Compass bearings of the transects were also recorded.

County soil surveys (Brazoria, Chambers, Galveston, and Harris Counties) were used to define and characterize soils at the various field check sites. Information obtained from the soil surveys included soil type, salinity, drainage, frequency of flooding, position of water table, and prevalent vegetation.

The locations of field survey sites were plotted on aerial photographs, and later accurately transferred to USGS 7.5-minute quadrangle topographic maps using a Zoom Transfer Scope where necessary. Universal Transverse Mercator (UTM) coordinates were determined for each site and these data were entered into computer data management systems, including the geographic information system, ARC-INFO.

WETLAND COMMUNITIES IN THE GALVESTON BAY AREA

General Setting of the Galveston Bay System

The geologic framework of the Galveston Bay area consists of Modern-Holocene and Pleistocene systems including the modern wetland, or marsh and marsh-swamp systems (fig. 2). The geomorphic features on which the various types of coastal wetlands have developed are the result of numerous interacting processes. Physical processes that influence wetlands include rainfall, runoff, fluctuations in the water table, streamflow, evapotranspiration, waves and longshore currents, astronomical and wind tides, storms and hurricanes, deposition and erosion, subsidence, faulting, and sea-level rise (table 1). These processes have contributed to the development of a gradational array of permanently inundated to infrequently inundated environments ranging in elevation from the submerged lands of the estuarine system through the topographically higher wetland system, which grades upward from the astronomical-tidal zone through the wind-tidal zone to the storm-tidal zone.

Exchange of marine waters with bay-estuary-lagoon waters in the Galveston Bay system occurs primarily through two major tidal inlets: Bolivar Roads at the north end of Galveston Island and San Luis Pass at its south end (fig. 1). Additional exchange occurs at Rollover Pass, a narrow dredged channel at the east end of Bolivar Peninsula. The predominant sources of fresh-water inflow are the Trinity and San Jacinto Rivers (fig. 1). Salinities in the Galveston Bay system are generally highest in West and Christmas Bays where mean salinities are typically above 20 parts per thousand (ppt) and may range into the 30's. These salinities are in marked contrast to Trinity Bay, where Trinity River fresh-water inflows have a moderating influence; mean monthly salinities in Trinity Bay are usually less than 15 ppt and occasionally are below 5 ppt (Pulich and White, 1991).

These numerous interacting processes in the Galveston Bay system have a major bearing on the location and composition of wetland plant communities.

Classification of Wetland Communities: Background and Previous Studies

Classification of wetland communities ranges from broad, general systems in which the entire coastal wetland system is encompassed within a single unit (usually as part of a statewide vegetation classification), to the more detailed classifications that focus specifically on coastal