Florida Panhandle

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Background

The area included in the Florida Panhandle vignette spans from Pensacola Bay eastward to Choctawhatchee Bay (Figure 1) and includes portions of Escambia, Santa Rosa, Okaloosa, and Walton Counties. Major rivers in this region include the Escambia/Conecuh, Blackwater, Yellow/Shoal, and Choctawhatchee Rivers. The Florida Panhandle is part of the Gulf Coastal Plain, a gentle topographic feature with little elevation or relief (Whitney, 2004). Pensacola and Choctawhatchee Bays are known for their crystal clear waters containing a quilted mosaic of highly productive seagrass beds on sandy-bottomed bays. Each of these bays is fed by rivers which have been designated Outstanding Florida Waters and Special Waters since the 1970s (Florida Department of Environmental Protection, 2011). The bays' shorelines are lined with emergent vegetation, which serves as a nursery ground to many species and acts to stabilize the coast during storms by absorbing the high-energy waves. The Florida Panhandle, along with the rest of the Gulf Coast region, is well known for its coastal estuaries, wetlands, and barrier islands that provide important habitat for large populations of wildlife,

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including shrimp, crabs, a variety of finfish, alligators, and many species of birds, including egrets and herons.

Historically, Pensacola Bay was one of only a handful of naturally occurring deep water passes in the Gulf of Mexico. The timber and logging industries were highly active in the Coastal Plain, and especially in Pensacola Bay, from the mid-1800s through the early 1900s, when most of the longleaf pine had been harvested (Green, 1998). One small and three large rivers discharge into Pensacola Bay daily. The largest of these systems is the Escambia/Conecuh River, which drains 10,938 km^2 (4,223 mi^2) of low lying land, mostly in agriculture, to the Escambia Bay portion of the Pensacola Bay System. The second largest river system that enters upper East Bay in the Pensacola Bay System is the Yellow/Shoal River, which drains 3,535 km^2 (1,365 mi^2) of land. The Blackwater River drains 2,227 km^2 (860 mi^2) of land, which is mostly located in the Concecuh National Forest in Alabama and the Blackwater River State Forest in Florida. The smallest of the watersheds contributing to the Pensacola Bay System, and often forgotten, is the small East Bay River which is 24 km (15 mi) in length and drains approximately 298 km^2 (115 mi^2). The headwaters of East Bay River form near Hurlburt Field Air Force Base and empty into the lower eastern portion of Pensacola Bay near the towns of Holley and Navarre. The river forms the southern boundary of Eglin Air Force Base and has been left mostly undeveloped. The East Bay River receives surface water from several unspoiled creeks, including Turtle Creek and Live Oak Creek.

The Panhandle region experiences a mild, subtropical climate and can support a number of tropical and semi-tropical flora and fauna. This region is located at the extreme limits for both tropical and temperate forage species. Species inhabiting this region are able to tolerate the heat and drought stress that typifies the variable southern environment. Rainfall averages 165 cm (65 in) per year, with many rain events occurring in concert with tropical weather and ranging from 8-13 cm (3-5 in) or upwards of 25-51 cm (10-20 in) per event. These rain events play a crucial role in sediment and nutrient transport within the Coastal Plain.

The areas of highest sediment deposits are the same areas where emergent vegetation can be found, whether a bayou or a river delta. These discharge areas share similar characteristics in that as they widen and slow, they become a braided system, thus allowing sediments to drop or precipitate out. These sediments also harbor nutrients which the plants utilize. The intertidal salt marshes and other natural shoreline features such as intertidal mud flats perform critical functions in the overall riverine and estuarine ecosystems. The marshes act as a filter and sediment trap for upland runoff and serve to buffer the immediate inshore lands from high-energy waves (Day, 1989).

The health and productivity of wetlands rely on their ability to remove, retain, and/or store nutrients, such as nitrogen and phosphorus, within the substrate or their vegetation. The capacity of wetlands to remove or store these nutrients depends upon several attributes that include the capacity of the vegetation, on a net annual basis, to assimilate and transfer to deep sediments more nutrients than are released through leaching and decay (Day, 1989). Emergent wetland vegetation in the Panhandle is dominated by *Juncus roemerianus* (black needlerush), *Spartina alterniflora* (saltmarsh cordgrass), *S. patens* (saltmeadow hay or cordgrass), and *Distichlis spicata* (salt grass). The uplands and lowlands are connected through rainfall and other means of water flow, which can transport nutrients to creeks, swamps, rivers, or bays. Finer particles remain suspended and travel farther. Coarse-grained sand moves through the bays and is then carried by stronger currents to beaches farther west. Sediment transportation in the Panhandle has been interrupted by anthropogenic activity for the last 75 years.

Methodology Employed to Determine and Document Current Status

The mapping protocol consisted of stereoscopic photointerpretation, cartographic transfer, and digitization in accordance with strict mapping standards and conventions. Other important aspects of the protocol included the use of the Cowardin Classification System (Cowardin et al., 1979), groundtruthing, quality control, and peer review. Land, water, and areas where emergent wetlands were present were included on the maps.

The information derived from the photography was subsequently transferred using a zoom transfer scope onto a stable medium overlaying U.S. Geological Survey (USGS) 1:24,000-scale quadrangle basemaps. The 1979 and 1996 data were derived from 1:65,000 scale, color infrared aerial photography collected by National Aeronautics and Space Administration. In those cases where the data were inadequate or incomplete, contemporary supplemental data were acquired from other sources and used to complete the photographic coverage.

Groundtruthing included the participation of field staff from the USGS National Wetlands Research Center and the USFWS during two separate phases of the project. The first phase was during the time of aerial photo acquisition through pre-interpretation. The second phase was during project groundtruthing at the time of completion of the draft maps. Draft maps were sent to Florida Department of Environmental Protection, Florida Marine Research Institute, USFWS, Northwest Florida Water Management

District, EPA Gulf Breeze Lab, and USGS staff for review and comments. All comments received were incorporated into the final maps.

Methodology Employed to Analyze Historical Trends

Historical emergent wetland trends were analyzed by comparing changes in total areal coverage of emergent wetland habitat along a time sequence for 1979 and 1996. Emergent wetland acreages were analyzed for 1979 and 1996 by watershed to determine overall losses and gains and potential causes and effects of changes within the estuary. Maps of emergent wetland distribution for these years were studied to determine the location of major changes of coverage.

Status and Trends

Emergent wetland monitoring during 1979 and 1996 (Figures 2-3) illustrates the changes in areal extent of emergent wetland habitat in the Florida Panhandle (Table 1). This portion of the Florida Panhandle lost 7,569 hectares (18,703 acres), or 42.9%, of its total emergent wetlands between 1979 and 1996. Between 1979 and 1996, the area lost 176 hectares (436 acres), or 4.0%, of salt marsh and 7,393 hectares (18,267 acres), or 55.8%, of coastal fresh marsh.

Table 1. Emergent wetland acreage in the Florida Panhandle for 1979 and 1996.

Emergent Wetland Type	**1979**		**1996**		**Total Change 1979-1996**	
	Hectares	Acres	Hectares	Acres	Hectares	Acres
Estuarine	4,401	10,876	4,225	10,440	-176	-436

Palustrine	13,238	32,713	5,846	14,446	-7,393	-18,267
Total	17,640	43,589	10,071	24,885	-7,569	-18,703

Causes of Change

The Florida Panhandle region is one of the fastest growing regions in the state, particularly around cities such as Pensacola and Destin (U.S. Census Bureau, 2010). This development affects surrounding ecosystems by causing increased urbanization and industrialization, sewage and effluent discharge, dredge and fill operations, modified river flow, and stormwater runoff. Clear-cutting causes increased runoff and sediment loads entering streams that flow into estuaries, decreasing photosynthesis and plant and animal life. Natural events such as sea-level rise, climatic perturbations, and erosion also affect the functionality of emergent wetlands in the Florida Panhandle. Sea-level rise and subsidence threaten marshes with increased tidal flooding and wave-induced erosion. Subsidence is exacerbated by the construction of sediment diversions such as dams, canals, and levees. Oil pollution and nonpoint source pollution from development and industries along the coast, such as paper mills, detrimentally affect primary production, water quality, and plant and animal life in marshes. Other factors contributing to emergent wetland loss and degradation include pesticide use, erosion from boat wakes, dredging canals, using marsh buggies and other transportation vehicles, and improper waste disposal. Many of these activities are the result of increasing residential development and coastal tourism.

The greatest physical alterations to emergent wetlands likely began when dredging activities were utilized to deepen access to shallow areas. This activity interrupted the sediment transport, which starved emergent grasses from their substrate and nutrients. Prior to the 1930s, few rivers in the Florida Panhandle were routinely dredged. Early records indicate the Army Corps of Engineers dredged the Escambia River in the 1880s.

In addition to dredging, the area began to develop bridges to connect shorelines which were once only accessible by ferry system. Railroads were also crossing the upper bays, connecting the rural areas with larger cities. These engineered systems often were supported by multiple pilings which stabilized the bridge, but served to interfere with the sediment transport of the rivers and bays. The Escambia River Delta has become a braided system cut off from sediment transport by the Hwy 90 causeway. Sediments are no longer able to move downstream with the river currents. The Army Corps of Engineers dredges the main channel of the Escambia River on a routine basis to allow daily barges to travel to industry plants.

The greatest chemical alterations to surface waters, which likely impacted emergent wetlands, occurred as industry began developing its footprint near large bodies of water in the 1950s. Early accounts (Bailey 1954 and McFarlin 1941) describe the high ecological diversity and productivity of the region, whereas Blanchard (1968) provides a solid overview of the decline and degradation resulting from the establishment of industry near the bays. The Pensacola Bay system was the focus of a historical submerged macrophyte study and inventory by Rogers and Bisterfield in 1975. They reported that the entire system experienced an overall recession and disappearance of grass beds from 1949 to 1974. Industrial location and development of the upland and surrounding bay area were directly related to activities dependent upon water. Industry co-located their plants close to water for their cooling, industrial process, and discharge needs. As industry developed in the rural areas, the communities followed the jobs, and development increased. The upper bay systems began experiencing sewage and industrial waste, dredging and filling, and beachfront alterations, which changed the watershed characteristics.

Activities in the upper portions of the watershed ultimately resulted in repercussions downstream, as was observed when the Pensacola Bay System declined in productivity in the early 1970s and fish kills were measured in miles (USEPA, 1975). Today, all the major industries located on the greater Pensacola Bay System have removed their effluents from discharging into surface waters. However, legacy chemicals are known to persist and can still be detected in sediments or in the tissue from upper trophic level species. A ten year study, Partnership for Environmental Research and Community Health, conducted by the University of West Florida in the 2000s (Rao, 2009), identified legacy contaminants (PCBs, dioxin, etc.) in sediments throughout the upper Escambia Bay System, as well as heavy metals in a variety of fish, shrimp, and crab species known to live their life span in relatively small range areas within these systems.

As Northwest Florida continues to grow and develop, the area has begun a marked shift of displacement from land-based economies, such as nature-based tourism, military, and agricultural lands, to other economic realities, such as the urbanized metropolitan landscape—also known as sprawl and tourism (Heinz, 2008). This growth in low-lying areas, coupled with the response to upcoming community needs (such as shops/stores, gas stations, roads), creates challenges for the region which require an understanding of the greater landscape system. Development rarely discriminates between riparian zones and upland areas, so many flood control areas are being inadvertently eliminated. Already, Northwest Florida is confronted with heavy population growth, including poor community and regional planning, and the continued loss of natural resources. For example, three new missions assigned to Eglin AFB in late 2005 have resulted in additional pressure placed on the Yellow/Shoal River system because of development in once rural areas such as Crestview and Mossy Head, and additional pressure on Niceville and Shalimar in the Choctawhatchee Bay System. The Nature Conservancy conducted a threats assessment on the condition of the Yellow/Shoal River in 2010 and identified areas below Mossy Head as high priority sites for sedimentation due to unpaved roads, and the main stem of the Yellow River below Crestview as having destabilized bank erosion due to riparian zone clearing (Herrington, 2010). Sediments from these areas will travel the main-stem of the river before being deposited in the delta. The future of the Florida Panhandle's natural resources could be in jeopardy if communities do not modify their methods and approaches towards growth.

Another cause of coastal changes includes seasonal storms, which can cause intense flooding, sedimentation, vegetation damage, and habitat changes in an extremely short period of time. The area experienced several named storms between 1979 and the present (in 1985, Elena at 92 mph; in 1995, Erin at 85 mph and Opal at 125 mph; in 2004, Ivan at 130 mph; and in 2005, Dennis at 120 mph) which altered coastal areas and vegetation. Many invasive species of plants were noted after hurricanes passed through the area, likely filling a niche after disturbances. During June and July 2012, the Escambia, Pensacola, and East Bay Systems were reconnoitered to gather information and ground truth the status of the coast. Many coastal homes continue to show storm effects in the form of unusable docks, abandoned homes, or remnant seawalls or other hardening structures.

Monitoring for Emergent Wetland Health

Choctawhatchee Bay

The ecological importance of emergent wetlands is well known. While there is no ongoing, comprehensive monitoring of emergent wetlands on Choctawhatchee Bay, several agencies have conducted various qualitative and quantitative assessments of this vital estuarine habitat.

Quantitative assessments of the emergent wetlands in Choctawhatchee Bay have largely been conducted remotely, with no ground-truthing component. Estimates derived from photographs dated 1972 to 1985 placed the extent of emergent vegetation at 1,093 hectares (2,700 acres) (NOAA 1991). Livingston (1986) converted 1976 USGS topographic maps to digital format and calculated 751 hectares (1,855 acres) of marsh bordering the Bay. The discrepancy between these two estimates may be attributed to differences in methods used to calculate area.

In 2005, Northwest Florida State College (formerly Okaloosa-Walton Community College), through its Choctawhatchee Basin Alliance (CBA) program, sponsored a Choctawhatchee Bay watershed water quality assessment (Okaloosa-Walton Community College, 2005). The study included a qualitative survey of emergent vegetation communities occurring on or adjacent to Choctawhatchee Bay. Thirty-two emergent marsh areas were identified through aerial imagery and maps, followed by site visits conducted to collect GPS coordinates, digital photographs, and notes detailing dominant vegetation, general condition, and potential threats to each site. Predominant species present at these sites were *Juncus roemerianus* (black needlerush), *Spartina alterniflora* (smooth cordgrass), *Scirpus* spp. (bulrush), *Cladium jamaicense* (sawgrass), *Phragmites australis* (common reed), and *Typha* spp. (cattail).

The Northwest Florida Water Management District (NWFWMD) commissioned a 2006 study designed to generate recommendations for marsh shoreline protection for the approximate 191 hectares (473 acres) of District-owned lands at Live Oak Point (NWFWMD, 2006). Live Oak Point, at approximately 405 hectares (1000 acres), is the largest salt marsh on Choctawhatchee Bay. The study encompassed a survey of the 2006 ecological condition of the nearly 3.9 km (2.4 mi) of Live Oak Point shoreline; a 63-year trend analysis relative to the accretion and/or erosion of the nearshore environment; and a calculated rate of shoreline loss for 9 specific time periods from 1941-2006. Based on the study's observations, average shoreline erosion rate for Live Oak Point over the 63-year time period was 0.2 hectares/year (0.6 acres/year), with a projected loss rate of 0.3 hectares/year (0.7 acres/year) by 2020.

CBA and the Florida Department of Environmental Protection (FDEP) monitor survival and growth of marsh vegetation planted as part of small (< 0.2 hectares [0.5 acres]), "living shoreline" projects constructed at private waterfront residences as well as waterfront public parks. These living shoreline projects incorporate oyster reefs and plant material to recreate nearshore environments and the ecosystem services while offering a viable alternative to shoreline hardening. As of 2012, the emergent wetland portion of these living shoreline restoration projects collectively totals approximately 0.8 hectares (2 acres). Parameters monitored include plant density, salt marsh area, sediment accumulation, and associated fauna.

Pensacola Bay

Currently little monitoring of Pensacola Bay's natural resources is occurring. A large-scale, long-term effort is needed, but funding for these efforts remains difficult to secure. An August 2011 workshop was convened to better understand which agencies, industries, and stakeholders in the community are currently active in the natural resource arena. The workshop focused on an integrated plan for measuring water quality in the Florida Panhandle and associated Alabama watersheds to enhance the information available to resource managers and the public. The aquatic environment, from freshwater streams to the ocean, is critical for human water use and to healthy aquatic ecosystems. A watershed approach is essential because land and water use in inland areas affects the quality of rivers that flow into coastal bays, estuaries, wetlands, and the ocean. Monitoring is essential to determining whether goals for protection of these resources are being achieved.

Within the workshop, there was a consensus among the participants for the need to control sediment, fertilizers, pesticides, and nutrient discharges into freshwater systems. Additionally, although best management plans exist, the implementation is not always the norm; particularly the use of fertilizers in agriculture or golf courses. Another topic of concern was the presence of fecal contamination in fresh and estuarine waters, and the fluctuations of state and federal programs testing for fecal indicators for political reasons rather than need.

Mapping and Monitoring Needs

Choctawhatchee Bay

More information is needed on marsh grass composition and coverage in Choctawhatchee Bay. Historically, data collection activities have occurred at irregular intervals and have used different methods for determination. Monitoring the extent of marsh area coverage through periodic examination of aerial photographs, coupled with GPS ground-truthing, could provide a more accurate determination of the status of emergent vegetation in the Bay. Information on species composition and productivity of emergent vegetation is also lacking and would provide important information on diversity and energy flow processes in the Bay (Eglin AFB, 1996).

An inventory map of shoreline type would provide essential baseline information that would guide shoreline restoration and enhancement efforts. An initiative to map and monitor the extent and health of oyster reefs and other habitats associated with emergent wetlands, as well as threatened and endangered species and species with designated critical habitat, would likewise increase baseline knowledge of the Choctawhatchee Bay.

Applying the methods used in the 2006 Live Oak Point study (NWFWMD, 2006) to other tracts of emergent wetlands on Choctawhatchee Bay to yield an erosion/accretion rate could also help prioritize restoration efforts.

Pensacola Bay

The main stressors on the coastal region include development; inappropriate fire management; inadequate best management practices; roads, utility corridors, and bridges; incomprehensive land management; public access/public use; and unstable or inadequate management funding. As long as these stressors continue, the more alterations are expected. Currently, monitoring is conducted in the Pensacola Bay System for localized projects. To better understand the complexity of the entire system, the following recommendations would be helpful:

• Regular sampling conducted quarterly at USEPA stations in Escambia, East and Pensacola Bays;

• Maintain existing Department of Health fecal monitoring stations on a weekly basis, and trace the source of the problem;

• Routine Biological Monitoring;

• Seagrass Mapping;

• Stream Condition Indices;

• Benthic Analysis;

• Shoreline Assessments (in all the bays correlated with land use changes over time); and

• Periodically Assess Legacy Parameters (heavy metals, dioxins, hydrocarbons, pharmaceuticals, etc.)

When problems are identified, separate efforts should be implemented to target problem areas and develop project-specific monitoring.

Restoration and Enhancement Opportunities

Choctawhatchee Bay

The NWFWMD (2002) USFWS Coastal Program (2007), CBA (Okaloosa-Walton Community College 2005), and various other agencies give high priority to restoration and enhancement of emergent wetlands in Choctawhatchee Bay. The NWFWMD presently owns approximately 191 hectares (473 acres) of wetlands at the Live Oak Point Peninsula and is pursuing acquisition of an additional 89 hectares (220 acres) of Section 16 School Lands and other privately-held tracts (NWFWMD, 2011). Currently, NWFWMD has partnered with CBA to execute a shoreline stabilization project along 483 m (1585 ft) of shoreline. Since the District land encompasses approximately 0.8 km (0.5 mi) of shoreline, this project could be expanded to provide further restoration and enhancement opportunities.

CBA, the FDEP Ecosystem Restoration section, and the Coastal Program are committed to promoting living shorelines as an alternative to shoreline hardening where appropriate. CBA and FDEP work with homeowners on Choctawhatchee Bay to achieve sustainable shoreline restoration and protection. Presently, these living shorelines consist of *Spartina alterniflora* (smooth cordgrass), *Juncus roemerianus* (black needlerush), and/or *Spartina patens* (saltmeadow cordgrass), coupled with oyster reef breakwaters.

Eglin AFB owns approximately one-third of the shoreline of northern Choctawhatchee Bay. This undeveloped shoreline offers unique opportunities for restoration of eroded wetlands. As a landowner, Eglin AFB is committed to sustainable environmental stewardship of its shoreline and other natural areas (Eglin AFB, 1996), and often seeks partnerships with other agencies to achieve these goals. Presently, a partnership with USFWS Public Lands Program and CBA has been proposed, with the purpose of restoring and protecting Eglin AFB’s shoreline property on Choctawhatchee Bay. The proposed project will employ oyster reef breakwaters in combination with wetland plantings to restore and protect emergent wetlands. Restoration efforts on the northern shores of Choctawhatchee Bay would be well-served by identifying appropriate reference sites, so that planted wetland grasses mimic those species present at non-disturbed shorelines.

Pensacola Bay

Restoration and habitat enhancement continue to be a high priority for the state and federal agencies which provide oversight and regulation to the area. Unfortunately, little support is provided to surface water quality, which is vital to the success of these restoration and enhancement projects.

The Pensacola Bay System is home to one of the oldest citizen volunteer organizations in the US, namely the Bream Fishermen Association (BFA). This group organized in 1968 and has been conducting water quality sampling in northwest Florida and south Alabama for over 50 years. BFA is seeking funding to reestablish the Pensacola Bay water quality sampling, which overlaps with the USEPA Bay Sampling Stations. A partnership already exists with the BFA and the state FDEP, and the USEPA is well aware of the activities and assistance provided by this group over the decades.

Other recommendations for restoration and enhancement might include:

• An integrated water quality program for the Pensacola Bay system that focuses on the entire watershed and includes routine profiles across the bay to integrate organic loading and bay bottom anoxia to the overall health of the system.

• Remove remnants of homesteads, boat houses, piers, and other anthropogenic features to restore area to a natural saltmarsh system that provides shoreline stability.

• Address surface water and groundwater legacy issues where known to be degraded.

• Restore urban creeks by daylighting them. Many creeks in urban areas have been rerouted into culverts and cut off from the hydrologic cycle. If these systems were returned to their previous natural states, they may function properly. In turn, this may bring a new awareness to the community that lives within these areas and might be disconnected from the natural world.

• Develop additional outreach programs within our underprivileged and rural communities to connect these populations to their watershed and coastal regions.

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Figure 1. Watershed for the area covered in the Florida Panhandle vignette.

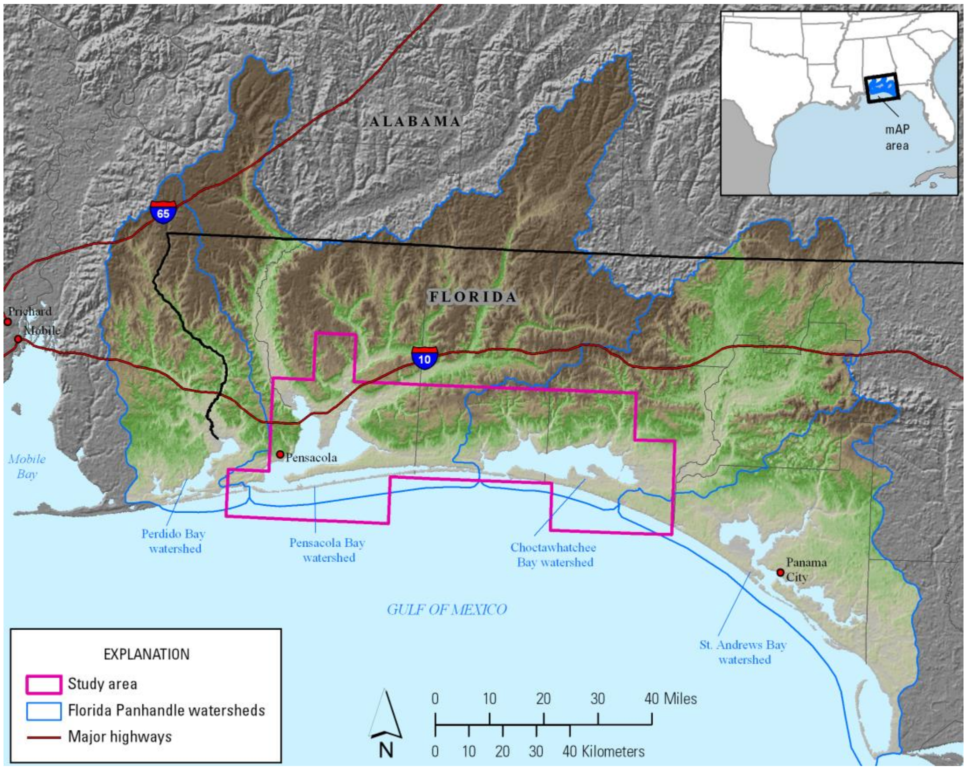

Figure 2. Distribution of emergent wetlands in the Florida Panhandle, 1979.

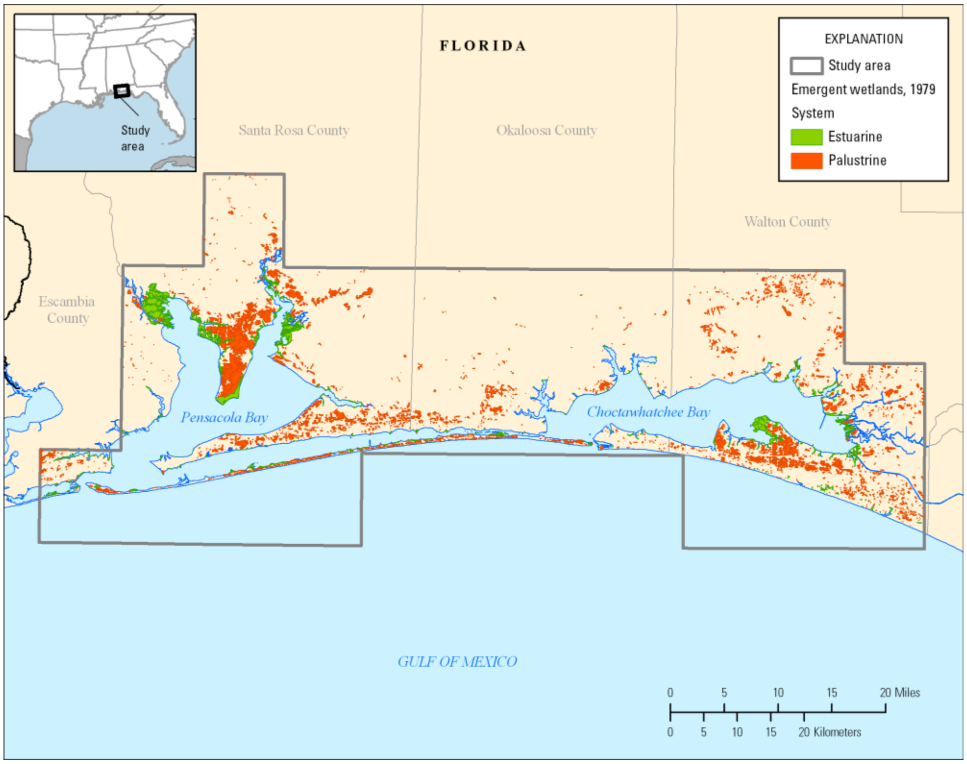

Figure 3. Distribution of emergent wetlands in the Florida Panhandle, 1996.