PRELIMINARY INVENTORY OF CONSERVATION, RESTORATION, AND PROTECTION SITES: SAN ANTONIO BAY SYSTEM

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Prepared by:

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in conjunction with the San Antonio Bay Partnership

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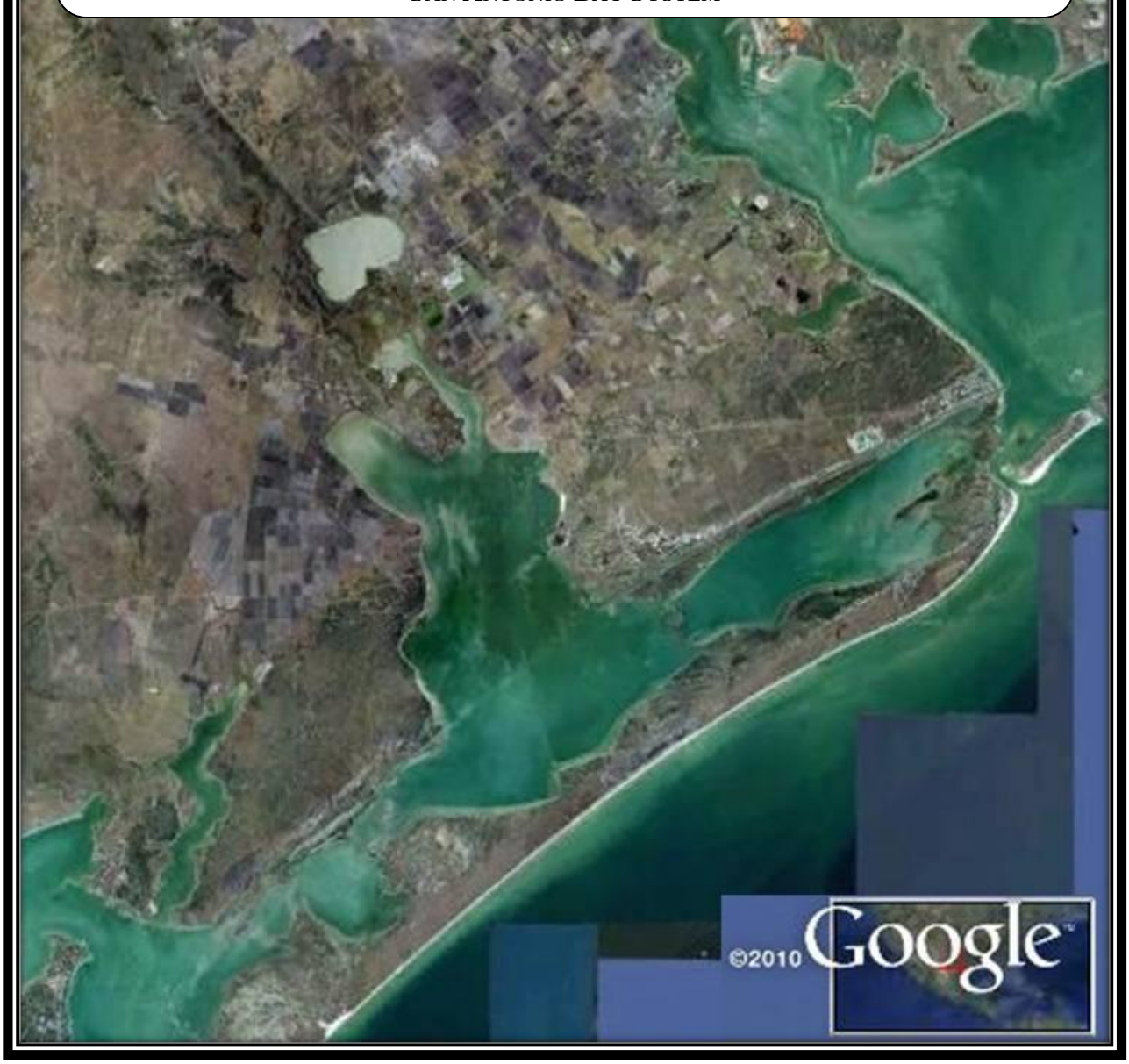

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The Center for Coastal Studies at Texas A&M University-Corpus Christi, in conjunction with the San Antonio Bay Partnership, under a contract with the Coastal Bend Bays and Estuaries Program

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CONSERVATION, RESTORATION, AND PROTECTION SITES:

SAN ANTONIO BAY SYSTEM

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31 AUGUST 2011

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PREFACE

The authors of this report would like to thank the Coastal Bend Bays & Estuaries Program and the Environmental Protection Agency for providing the funding to complete this preliminary work. The San Antonio Bay Partnership was formed to initiate a process similar to the National Estuary Program, and the support provided allowed the stakeholders to begin synthesizing information specific to the San Antonio Bay system. We thank the consistent involvement of a diversity of stakeholders who provided the information within this report. The Center for Coastal Studies, Texas A&M University-Corpus Christi was contracted to facilitate the process, and within a four-month period we were able to generate preliminary information and spatial data overviewed in this document. Additional support was provided by International Crane Foundation and U.S. Fish & Wildlife Service, Ecological Services at Corpus Christi to provide hands-on training and office space and computer equipment, respectively, for the senior author. We are hopeful that the accomplishments produced within this report will provide the impetus for the San Antonio Bay Partnership and its' volunteer stakeholders to continue promoting conservation and stewardship activities in the important coastal ecosystem.

INTRODUCTION

The Coastal Bend Bays and Estuaries Program (CBBEP) awarded the Center for Coastal Studies at Texas A&M University-Corpus Christi a grant to develop an inventory of potential wetland projects in order to provide a means of guiding investments in wetlands protection, restoration, and enhancement projects within the San Antonio Bay System. In the San Antonio Bay System, projects aimed at wetlands protection, restoration and enhancement to protect/expand essential wildlife habitat would provide an early focal point and a means to encourage stakeholders through the tedious process of compiling scientific and technical information, identifying priority issues and producing a management plan.

The overall goal of the project was to create a wetland inventory list from sites within the San Antonio Bay system recommended by local stakeholders and agencies as areas in need of "intervention" due to existing or threatened impairment of wetland quality and function. The recommended wetlands extent, type, and functional quality were characterized, at an overview level, from available data. The final wetlands inventory was then developed based on wetland site priority, proposed protection, restoration, or enhancement activity, and associated estimated costs.

Aerial photography (Google, 2010) of a portion of the Texas coast with the San Antonio Bay system outlined (red)

The San Antonio Bay System is located between Matagorda and Aransas Bay along the Texas coast and at the terminus of the San Antonio River and the Guadalupe River watersheds, approximately 10,000 mi^2 (GSMA BBEST, 2011). The average depth within the bay is approximately 4 feet and the maximum natural depth is 7 feet; exceptions include Espiritu Santo Bay with a maximum depth of approximately 8 feet and Steamboat Pass with depths down to about 31 feet. The San Antonio Bay system exchanges water with Matagorda Bay, located to the northeast, and with Aransas-Copano Bay, located to the southwest. Marine water is exchanged between the Gulf of Mexico and the estuarine system through the Pass Cavallo tidal inlet, the Matagorda ship channel, and through Cedar Bayou, when open. The San Antonio Bay System project area is composed of Espiritu Santo Bay, Hynes Bay, Guadalupe Bay, Mesquite Bay, Carlos Bay, Ayres Bay, Mission Lake, and Pringle Lake.

This large (531 km^2) estuarine complex is one of the seven major estuaries along the Texas coast and is extremely unique in that wetlands associated with large portions of the surrounding shoreline provides critical wintering habitat for the last wild flock of the endangered Whooping Crane (*Grus americana*). This iconic species is part of the higher biodiversity that is also dependent on a healthy, functioning ecosystem. Focal guilds representative of the San Antonio Bay system include nesting colonial waterbirds and migratory/wintering waterfowl and shorebirds. Additionally, the San Antonio Bay also supports important commercial (oysters and shrimp) and recreational fisheries, which depend on surrounding wetlands for maintaining water quality and providing nursery grounds for fish and shellfish.

Image of an endangered Whooping Crane feeding on a blue crab (right) and an endangered Whooping Crane pair in flight with waterfowl and shorebirds all using the habitat provided from Shoalwater Bay within the San Antonio Bay system (left)

Bays and estuaries are intermediate systems between freshwater and marine, thus governed by various controls; freshwater fluxes, flooding and inundation, runoff and inflow loads and atmospheric deposition, tides, waves, sea-level variations, tropical storms, salinity, and littoral sediment influx (Smith and Ward, 2004). The protection, restoration and enhancement of wetlands within the San Antonio Bay System has assumed a high priority as the San Antonio Bay estuary was predicted to have a 67% or greater increase in low inflow (Johns et al., 2004) and hydraulic modifications within wetland areas have affected habitat quality within the historic wintering grounds for the Whooping Crane. Additional changes in the San Antonio Bay system include increases and losses of habitat types. For example, between 1950 and 1992, approximately 10% of the emergent coastal wetlands in Texas estuaries were lost (Moulton et al., 1997) whereas an increase in submerged seagrasses has been observed in San Antonio Bay over the past 21 years (Norman Boyd, personal communication, August 19, 2011).

The developed preliminary inventory of potential wetlands projects developed in 2011 included sites aimed at wetland protection, restoration, and enhancement within the San Antonio Bay System. The recommended sites were mapped and made accessible on an open access Google Earth program (Google, 2010). The sites identified as most in need of restoration/protection will be prioritized for implementation of the proposed activities as additional funding may become available. Ideally, this preliminary inventory of potential wetlands projects will be expanded to include additional sites and activities as additional information becomes available in the future.

The effort resulted in a total of 51 recommended sites within the San Antonio Bay system, with sites representing a range of recommended conservation, restoration, and education strategies as well as a range of types based on geomorphology. A total of 16 of the 51 sites were collectively determined as priorities. Other partners and participants in the Wetland Inventory List project included Coastal Conservation Association (CCA), Ducks Unlimited (DU), International Crane Foundation (ICF), De-Go-La Resource Center Conservation and Development, Inc., Guadalupe-Blanco River Authority (GBRA), Guadalupe-Blanco River Trust (GBRT), San Antonio Bay Foundation (SABF), San Antonio Bay Partnership (SABP), Texas Parks and Wildlife (TPWD), Texas State Soil and Water Conservation Board (TSSWCB), and the United States Fish and Wildlife Service (USFWS).

CONSERVATION, RESTORATION, EDUCATION

The following activities are example project objectives for recommended sites within the San Antonio Bay system based on the Natural Resource Damage Assessment (NRDA) Project Activities (OMB Control #0648-0497). Each project site is accompanied by a proposed activity (below) to be completed with expected outcomes and the associated benefits the project is expected to have on the public and environment.

- Conservation/Protection-
  - *Land Acquisition*
  - *Conservation Easement*
  - *Land Donation*
- Restoration/Enhancement-
  - *Hydrologic Modification*
  - *Water Quality Enhancement*
  - *Vegetation Management/Maintenance*
  - *Debris Removal*
  - *Bank Stabilization*
  - *Reef/Rookery Island Creation/Enhancement*
- Education/Outreach-
  - *Signage*
  - *Kiosks*
  - *Workshops*
  - *Webpage*
  - *Volunteer training/opportunities*
  - *School partnerships*
  - *Master Naturalists*
  - *Invasive species education*

ENVIRONMENTAL LANDFORMS

Aerial imagery (Google, 2010) depicting the San Antonio Bay project area (red) and all four geomorphologic landforms (dotted-white line): 1.) Guadalupe River, San Antonio River, and Guadalupe delta; 2.) Blackjack Peninsula and Seadrift-Port O'Connor Peninsula; 3.) Open Bay including islands, rookery islands, and oyster reefs; and, 4.) Matagorda Barrier Island and a small portion of San Jose Barrier Island.

Guadalupe-San Antonio River/Delta

The Guadalupe River (250 mi) and the San Antonio River (180 mi) provide freshwater inflows to the San Antonio Bay system. The Guadalupe River is one of the most popular rivers in Texas, known for its sufficient flows for recreational use, whereas the San Antonio River is slow moving during normal conditions and known to have log jams in its lower reaches (TPWD, 2009). Both rivers provide instream habitats as well as riparian forest habitat essential for

various colonial waterbirds and waterfowl. The Guadalupe Delta is a dominant feature of the San Antonio Bay system (Tremblay and Calnan, 2011) and is located in southern Victoria County, eastern Refugio County, and western Calhoun County along the Texas coast. Texas Parks and Wildlife Department (TPWD) acquired portions of the Delta as a wildlife management area (WMA); areas in the WMA include four units: Mission Lake Unit (4,447.62 acres), Hynes Bay Unit (1007.72 acres), Guadalupe River Unit (1138 acres), and the San Antonio Unit (818 acres) (TPWD, 2009). The habitats supported within the Guadalupe Delta range from coastal marsh, estuarine marsh, and natural and manmade wetlands to uplands. Additional lands within the delta that provide essential estuarine wetlands are private ranches located adjacent to Hynes Bay and Guadalupe Bay; Swan Point Ranch lies between the two bays and Marsh Ranch is North of Hynes Bay.

Barrier Islands

Matagorda Island shelters the San Antonio Bay system from the Gulf of Mexico and is the northern barrier island located within the study area. It is jointly owned by The Texas General Land Office (TGLO) and USFWS and is managed as the Aransas National Wildlife Refuge Matagorda Unit and State Natural Area by cooperation between USFWS and TPWD. Matagorda Island is 38 miles long and ranges in width from <1 mile to 4.5 miles. The island is located between San Antonio Bay and the Gulf of Mexico in southern Calhoun County, Texas. San Jose Island is located immediately south of Matagorda Island; Cedar Bayou, an intermittent exchange channel, forms the boundary between Matagorda Island and San Jose Island. San Jose Island is privately owned and operates as a working cattle ranch.

Peninsulas

Two peninsulas border the San Antonio Bay system, Blackjack and Seadrift-Port O'Connor Ridge peninsulas. These peninsulas are part of the relict Pleistocene barrier strandplain (Tremblay and Calnan, 2011). Seadrift-Port O'Connor Ridge Peninsula is located on the northwest side of Espiritu Santo Bay and contains Seadrift and Port O'Connor communities. Blackjack Peninsula is located on the northwest side of Carlos, Mesquite, and Ayres bays. The peninsula is owned by the USFWS and is managed as part of the Aransas National Wildlife Refuge complex, which is renowned for providing wintering habitat for the last wild flock of endangered Whooping Cranes.

Open Bays Islands, Rookery Islands, and Oyster Reefs

The project area consists of multiple open water bays, with San Antonio Bay being the largest waterbody. The entire bay complex also includes Hynes Bay, Guadalupe Bay, and Mission Lake, secondary bays encompassing the Guadalupe Delta; Espiritu Santo Bay, located to the north of the mouth of the San Antonio Bay; and Mesquite Bay, located south of the San Antonio Bay. The "Open Bays" also includes natural and created islands, rookery islands, and oyster reefs.

METHODOLOGY

The development of a Wetland Inventory List for the San Antonio Bay system required input from multiple stakeholders with expert knowledge of area habitats, the changes that have occurred throughout this bay over time and about its status currently. Wetland recommendations were then recorded using available digital imagery in Arcmap 9.3.1 and 10 (ESRI, 2009, 2010.). Google Earth 6 (Google, 2010) a free, available medium, was used to visually communicate recommendations and help prioritize wetland sites.

Digital Imagery-

The initial steps, which provided base layers of the San Antonio Bay system, finding available digital imagery that adequately depicted habitats, wetlands, and boundaries of the bay system (Table 1). Tools within versions Arcmap 9.3.1 and 10 were used to depict the San Antonio Bay system and important sites included in the Wetland Inventory List. The National Wetlands Inventory (NWI) was clipped to the initial project boundaries and the wetland type symbology was generalized to emphasize target wetlands; E2EM1M and E2EM1N categorized as Tidal Marsh group. Additional layers were then re-projected to the project site and clipped to the project boundaries; roads (StratMap), seagrasses, National Hydrography Dataset (NHD), Texas Orthoimagery Project (TOP) imagery, Texas Parks and Wildlife (TPWD) Ecosystem map, Sea-Level and Accretion Marsh Model (SLAMM) (USFWS) and Texas General Land Office (TGLO) submerged lands imagery. A buffer around the initial project boundary was developed from the SLAMM model and the project boundary expanded, as recommended from involved stakeholders. Expanding the boundary required additional clipping and the establishment of a new boundary layer. Other layers included in the project were critical habitat layers for Piping Plovers and Whooping Cranes, rookery island imagery, and critical areas during an oil spill. Not all layers were used in the finalized map; however, they were used during stakeholder meetings to establish wetland inventory sites.

Stakeholder Meetings-

Involvement with stakeholders revolved around electronic communication and monthly stakeholder meetings, held on: April 15, May 12, July 12, and August 9, 2011. An additional meeting was held July 28, 2011 with Coastal Conservation Association (CCA) members. Powerpoint presentations, Google Earth 6, and handouts were used throughout the meetings to confirm each meetings objectives, progress, and future goals. The first meeting explained the Wetland Inventory List project, timeline, and expectations; determined future meeting dates; and provided directions on the use of Google Earth 6 for the selection of sites within the San Antonio Bay project area. The second meeting predominantly covered the expansion of the project boundary to include the SLAMM developed buffer and recommended sites further up the San Antonio and Guadalupe rivers. Additionally, project objectives and prioritization strategies were discussed in the second meeting. Between the first and third meetings, stakeholders electronically recommended wetland sites using Google Earth, which were then compiled into a

final recommendation Google Earth (.kml) file. The third meeting was essential to the Wetland Inventory List as recommended site locations and strategies were discussed and prioritized for each geomorphic assemblage within the San Antonio Bay system.

Google Earth 6-

Google Earth was initially released as Keyhole Earthviewer 1.0 in June 2001 and became Google Earth 3.0 in June 2005 after Google incorporation and updates. Google Earth 6 (GE 6) was released in November 2010. The use of GE 6 in the Wetland Inventory List project was essential because it is a free, useful communication tool that allows easy implementation of individual data and images (Google, 2011). Stakeholders were able to identify important sites within the San Antonio Bay system for conservation, restoration, and education, and then communicate those sites and concerns electronically. Many stakeholders were already familiar with GE 6; however, modified directions on how to download, use, and electronically communicate sites from GE 6 were provided at the beginning of the Wetland Inventory List project. Stakeholders were asked to provide information on their recommended sites for future discussion and prioritization; site name, landowner name, conservation/restoration/education strategy, and potential partners. Digital imagery downloaded in ArcMap 9.3.1 and 10 were converted into GE 6 files (.kml) for stakeholder application. For example, the project boundary and NWI wetland shapefiles were converted into GE 6 .kml files and made available to stakeholders electronically.

Files were consistently converted between shapefiles and GE 6 .kml files throughout the project. All shapefiles used were publicly available; however, ArcMap 9.3.1 and 10 are not free software programs; therefore, GE 6 was used as the primary medium. ArcMap 9.3 and 10 have more mapping and analysis tools than GE 6 and were therefore used throughout the project to format layers before converting into GE 6. The final GE 6 files include all recommended sites, prioritized sites, and additional digital imagery on the San Antonio Bay system (boundary, NWI wetlands, geographic names, etc.) that was provided to stakeholders or provided by stakeholders (oysters, spoil containment areas, etc.).

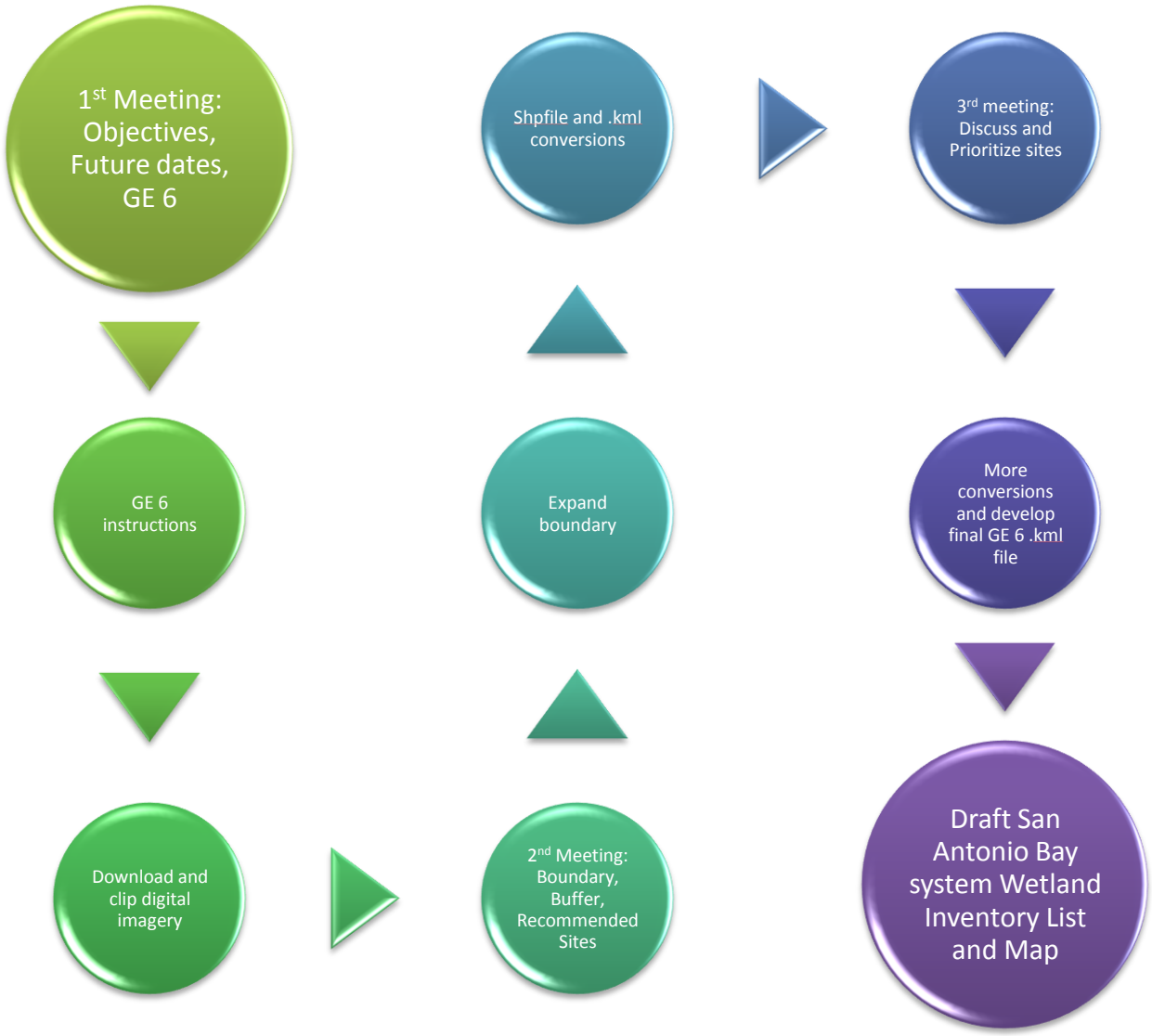
Table 1. Accessible digital imagery downloaded for the project

Data Sources:	Date	Layer	Website
TGLO	Accessed April 2011	Submerged land, leased land, critical habitat in oil spill; rookeries	www.glo.state.tx.us/
USFWS	Accessed April 2011; NWI 2009	National Wetland Inventory; critical Piping Plover and Whooping Crane habitat	http://criticalhabitat.fws.gov/crithab/ http://www.fws.gov/wetlands/Data/DataDownload.html
TPWD	Accessed April 2011	Ecosystem Map	http://www.tpwd.state.tx.us/landwater/land/maps/gis/data_downloads/
TNRIS	Accessed April 2011; TOP 2009	TOP imagery; StratMap roads; NHD streams; cities; counties	www.tnris.state.tx.us/

Note: Additional files for oysters, Refuge boundaries, and the Guadalupe Delta Management Areas were provided by TPWD (Coastal Fisheries) and USFWS (Ecological Services) employees

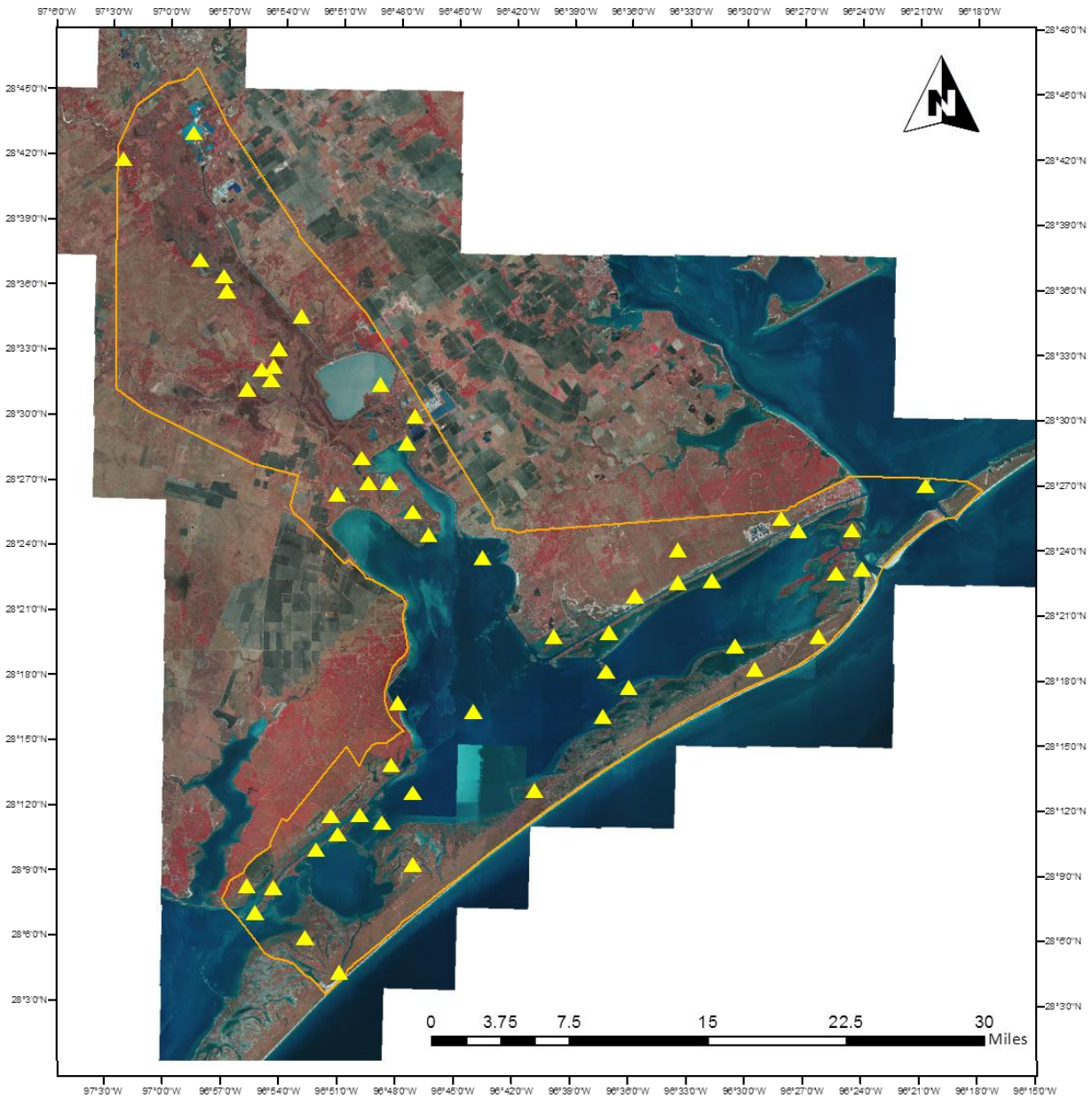
PRIORITY SITES

Prioritization of sites was accomplished following the process diagram below.



Overview Map of All Sites

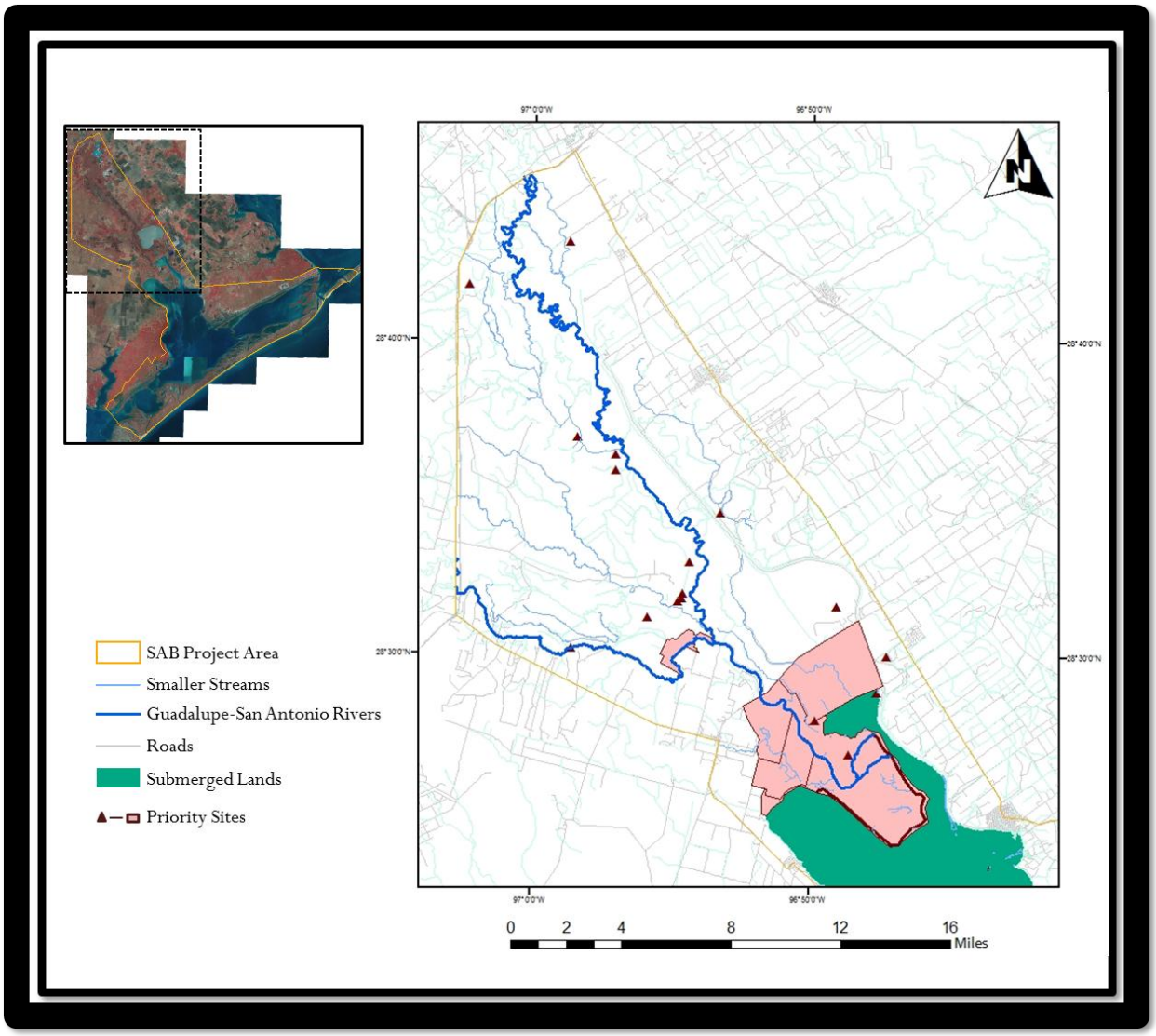
The map below depicts a mosaic of 2009 Texas Orthoimagery Program (TOP) image products (TNRIS, 2011) of the San Antonio Bay system. The map displays all sites (demarcated in maroon) recommended as part of the San Antonio Bay System Habitat Inventory Project process and provides a prospective of conservation, restoration, and education priorities along the Texas coast.



NOTE: The size, shape, and location of demarcated sites are approximate in order to increase resolution quality.

PRIORITIES BY GEOMORPHOLOGY

GUADALUPE-SAN ANTONIO RIVER/DELTA



Guadalupe-San Antonio River/Delta

The Guadalupe Delta formed as a result of the San Antonio and Guadalupe rivers depositing sediments at the mouth of the Guadalupe River where it enters San Antonio Bay. Historically, the delta gradually enclosed an open bay area, forming what is now Green Lake, and more recently the delta is in the process of filling in and around Mission Lake. Traylor's Cut, on the Guadalupe River, was excavated in 1935 and effectively diverts water and sediment under normal and high flows into Mission Lake and Guadalupe Bay. Under overbank conditions, water and sediment will flood the entire delta; however, this diversion has limited delta maintenance and erosion along the delta shoreline has resulted (Tremblay and Calnan 2011).

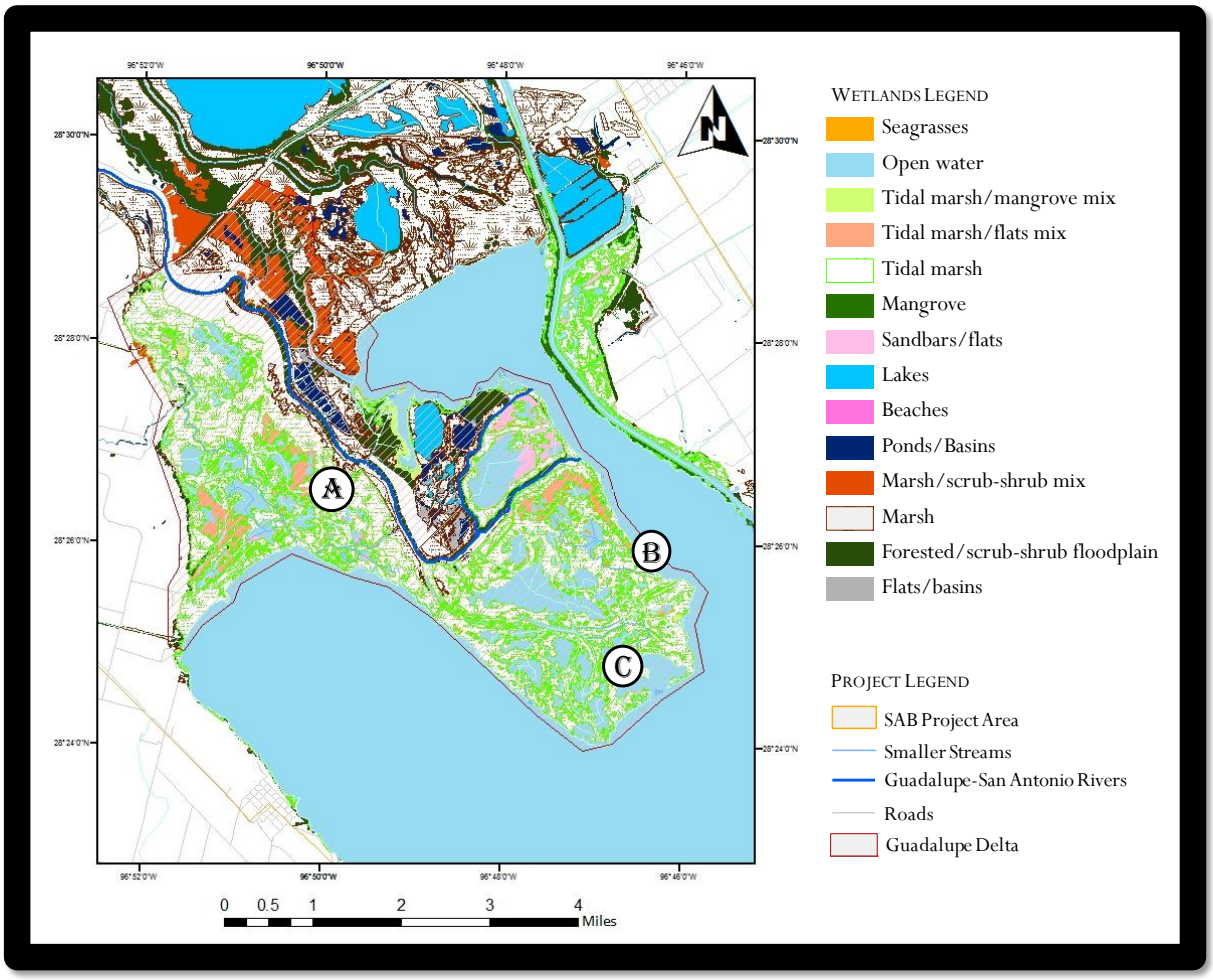
A diversity of estuarine and freshwater marsh complexes occur throughout the Guadalupe Delta, as well as shallow fresh-water lakes and flats. Sea-level rise and subsidence in the delta area has resulted in increased inundation by bay waters; over time, habitats are shifting toward estuarine habitats (White and Morton, 1987). Recent assessments indicate that palustrine habitats have been converted to estuarine habitat types, and that estuarine marshes and open water have increased while tidal/algal flats have decreased (Tremblay and Calnan 2011).

The Guadalupe Delta is subdivided into large areas of private and state-owned parcels; Guadalupe Delta Wildlife Management Area encompasses several large tracts and is managed primarily for waterfowl habitat using impoundments and water diversions. Private tracts are used for ranching, although some tracts are becoming available for sale and potential development. The lower Guadalupe River section around Hwy 35 crossing is subdivided into small riverfront parcels, and more development is occurring adjacent to these areas. Upstream of the confluence of the rivers, the land is used for ranching and farming, although some tracts are for sale and potential development.

Guadalupe River at Highway 35 (left) and the Guadalupe Delta (right) with tall, dark green trees bordering the south fork of the Guadalupe River

1a. Priority 1

GUADALUPE DELTA



Owner: Public and Private
Size: ~12,830 acres
Description-Guadalupe Delta

A. Traylor's Cut: located on the lower Guadalupe River; diverts silt and water from the delta causing the delta marsh to deteriorate and erode;
B. Guadalupe Delta Shoreline: eroding shoreline due to Traylor's Cut and wave energy
C. Swan Point Ranch: potential land acquisition or conservation easement to protect wildlife habitat;

Potential Partners: USFWS, TNC, NRCS, TPWD
Potential Funding: $500K-$3M
Conservation Status: The Guadalupe Delta encompasses habitat that supports colonial waterbirds, waterfowl, herons, egrets, and avocets. Additionally, the Delta has potential endangered Whooping Crane habitat; restoration and wetland habitat enhancement is needed to prevent marsh subsidence and erosion from the lack of siltation due to Traylor's Cut. Lastly, invasive plant removal is needed throughout the lower portion of the Guadalupe River ; i.e. elephant ears, water hyacinth, giant cane, and Chinese tallow.

1b. Priority 1

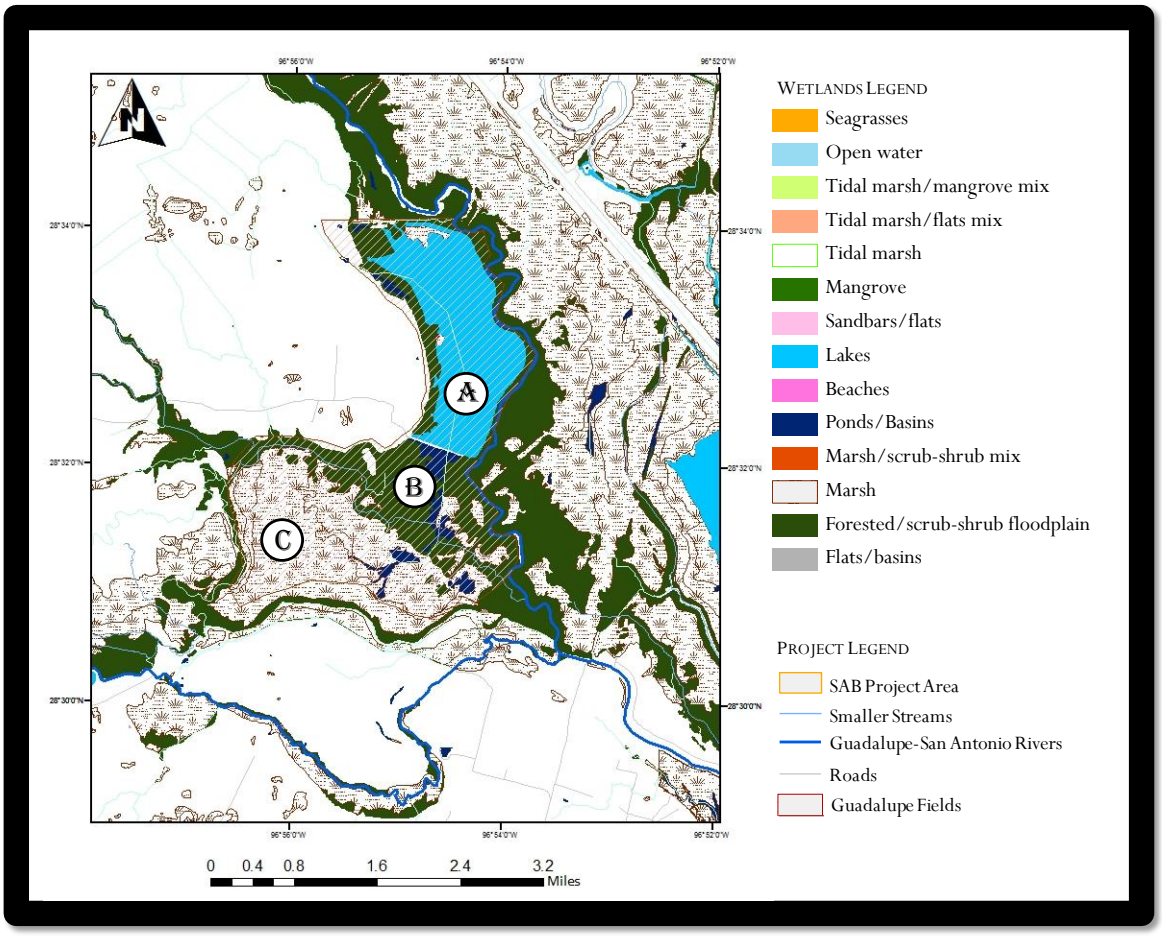
GUADALUPE DELTA

SATELLITE IMAGERY

SITE PHOTOS

2a. Priority 2

GUADALUPE FIELDS



Owner: Private
Size: ~3,862 acres
Description-Approximately 4,500 acres are within Wetlands Reserve Conservation Easements; erosion of levees from the river flooding has caused all three wetland sites to drain more quickly than before; these wetlands are no longer the last areas to dry during droughts;

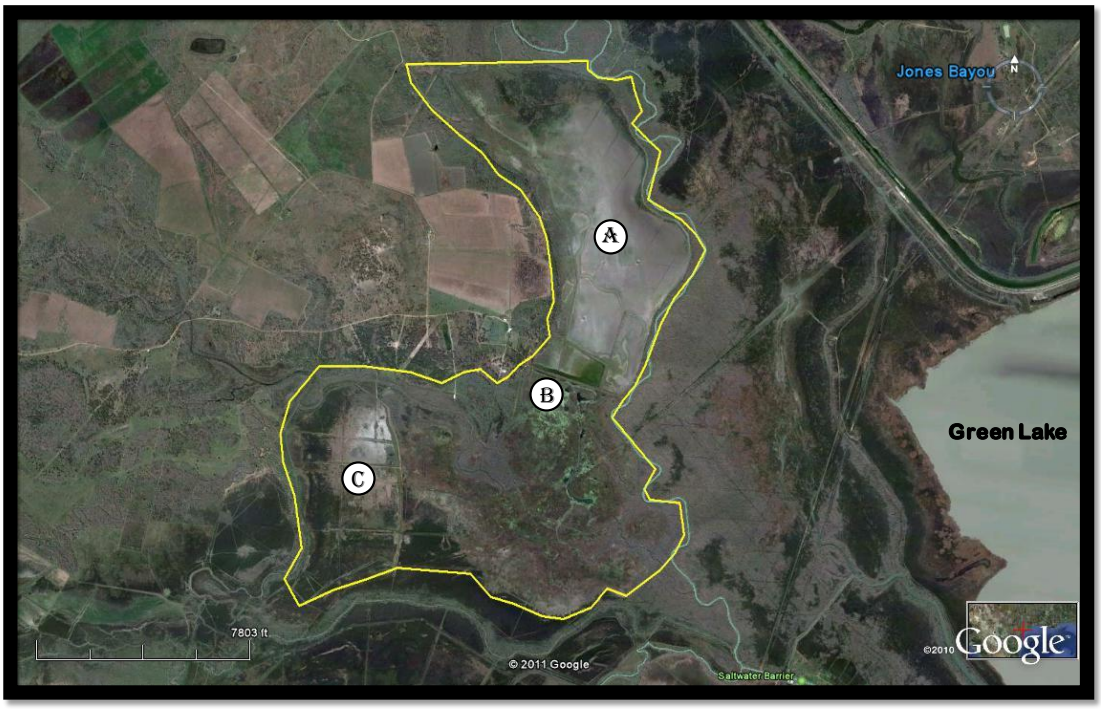
A. Guadalupe Field: influenced from eroded levees
B. Guadalupe Swamp: influenced from eroded levees
C. Guadalupe Wetland Cells influenced from eroded levees
D. Potential Partners: USFWS, TNC, NRCS, TPWD, GBRA, GBRT, SABF, Landowner contacted and involved

Potential Funding: $50K-$1M
Conservation Status: The Guadalupe Field sites provide abundant waterfowl food and are important for freshwater dependent organisms in the Guadalupe River. Before the levees were damaged from repeated river flooding and erosion the three sites supported thousands of waterfowl, 10,000 pairs of colonial nesting waterbirds, and a diversity of songbirds. Within the swamp, restoration and enhancement is needed and can include cypress tree planting.

2b. Priority 2

GUADALUPE RIVERINE FIELDS

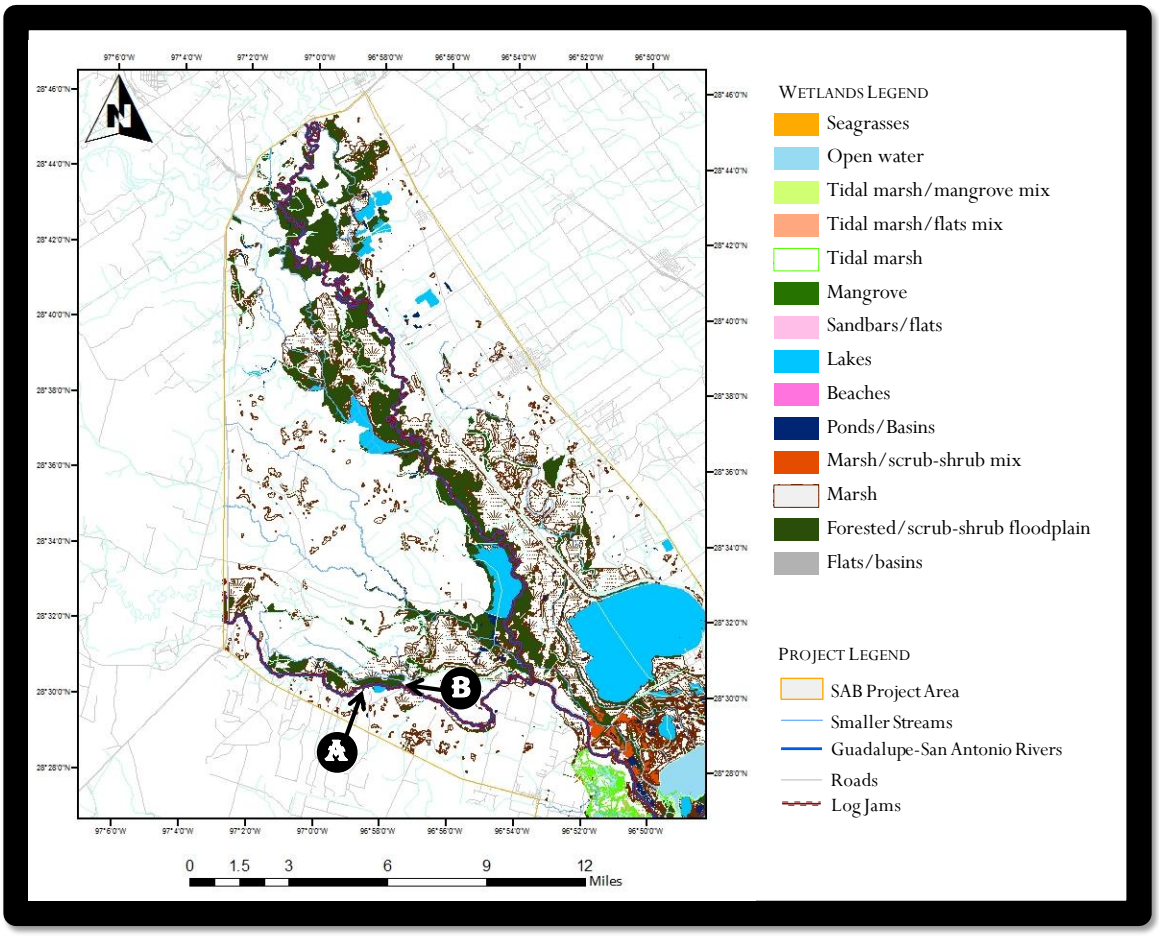
SATELLITE IMAGERY



SITE PHOTOS

3a. Priority 3

GUADALUPE AND SAN ANTONIO RIVERS LOG JAMS



Owner: Public and Private
Size: undefined
Description-Guadalupe and San Antonio Rivers Log Jams

A. Guadalupe River example: private property along the river is flooded by sheet flow caused from log jams, which erode river banks, alter river hydrology, and appear to be altering riparian vegetation complexes;
B. Guadalupe River example: trees within the floodplain die during drought years or from land management practices and, during floods, are uprooted and flow through tributaries into the Guadalupe and San Antonio Rivers;

Potential Partners: GBRA, GBRT, SABF, SARA, landowners
Potential Funding: $50K-$150K
Conservation Status: A development plan for riparian and upland management is needed to provide habitat for wildlife while also protecting human lives along the two rivers.

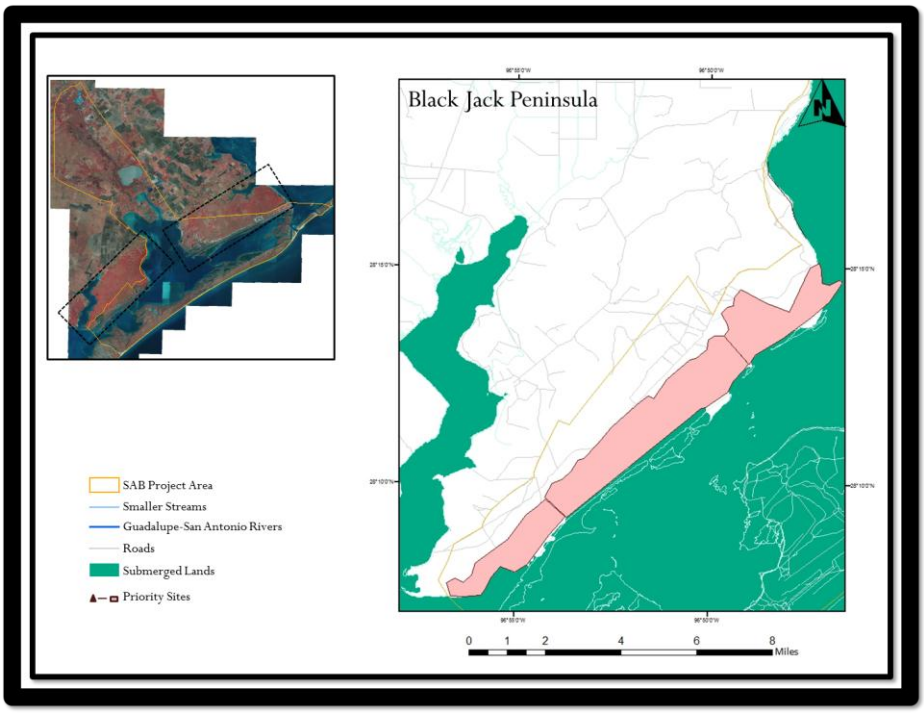
3b. Priority 3

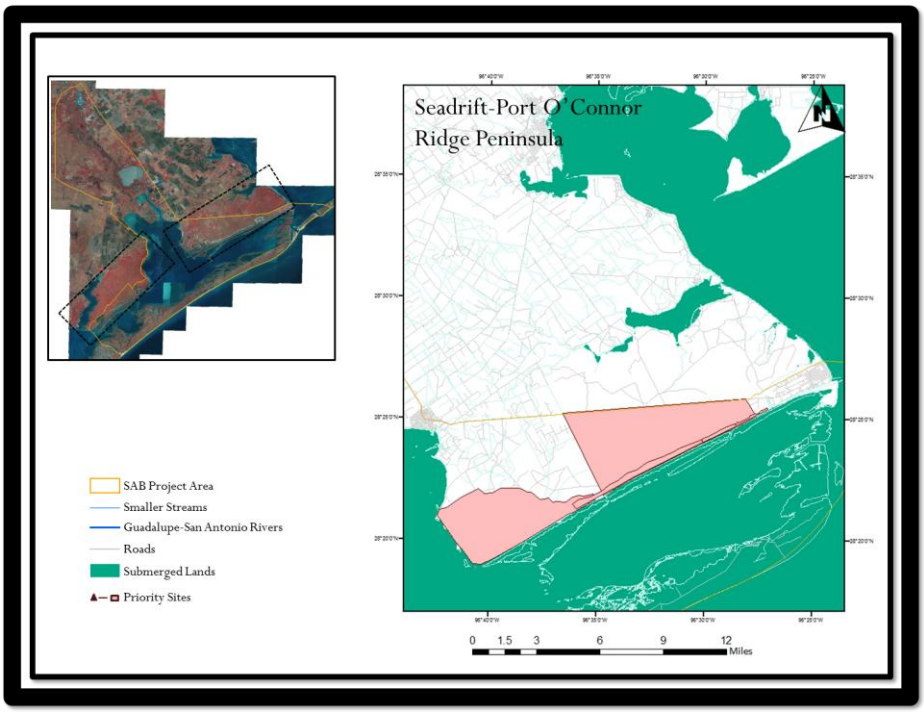
GUADALUPE AND SAN ANTONIO RIVERS LOG JAMS

SATELLITE IMAGERY

PRIORITIES BY GEOMORPHOLOGY

BLACKJACK AND SEADRIFT-PORT O'CONNOR RIDGE PENINSULAS





Blackjack and Seadrift-Port O'Connor Ridge Peninsulas

Blackjack and Seadrift-Port O'Connor Ridge peninsulas encompass the northern extent of the Pleistocene Ingleside Barrier Strandplain (Otvos and Howat, 1996). These linear landforms formed when sea level was about 6 meters higher than present. As sea-levels decreased, rivers flowing to the Gulf of Mexico incised the historic shoreline and separated the peninsulas. Although the ridge-and-swale topography ranges from 4-9m in elevation, much of Blackjack and Seadrift-Port O'Connor Ridge peninsulas are less than 5 and 4 m, respectively (March and Smith, 2011).

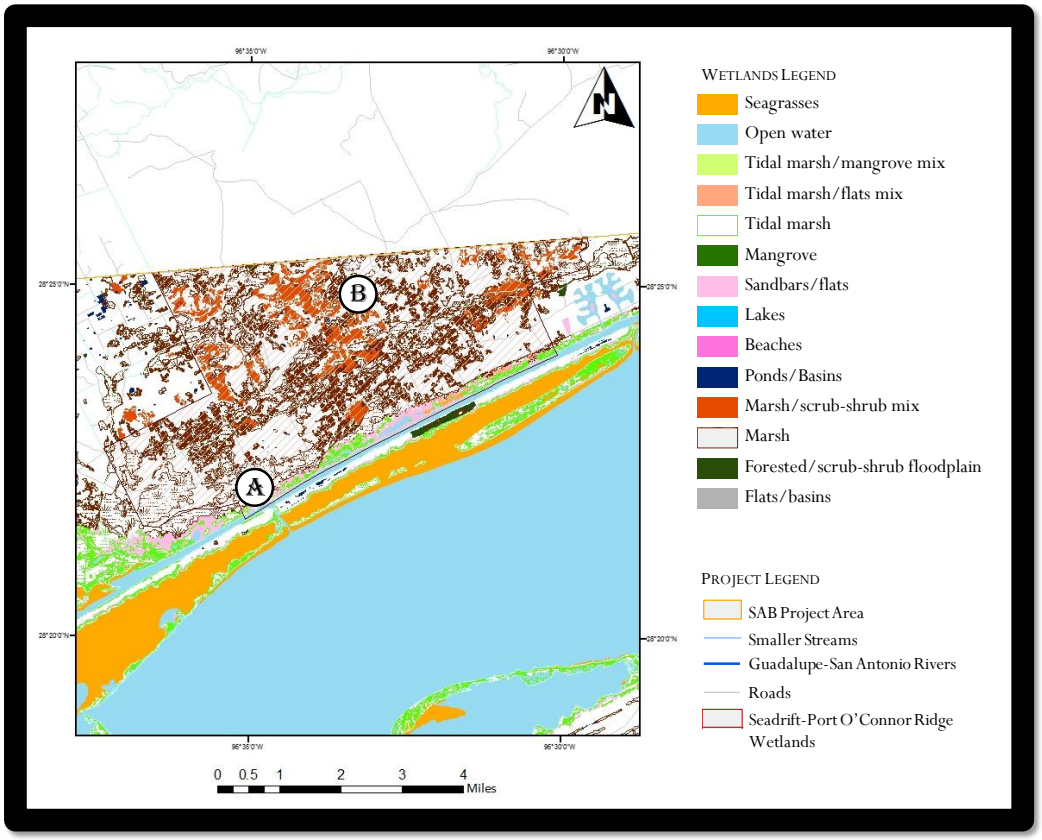
The original sand ridges are still present on higher elevations and low, flood-susceptible shorelines occur along the peninsulas. The Ingleside Barrier Strandplain contains a diversity of habitats, including coastal prairie, freshwater depressional wetlands, and live oak mottes on the uplands, grading into brackish and salt marshes to subtidal seagrass beds in the estuarine waters of the bays. From 1956-2009, estuarine marsh increased primarily from upland to salt marsh conversion along the Gulf Intracoastal Waterway (GIWW). Additionally salt marsh in 2009 was located further inland than those documented earlier from salt marsh migrating to other wetlands habitats (Tremblay and Calnan, 2011).

Development pressure is minor on Blackjack Peninsula as the Aransas National Wildlife Refuge covers most of the landform. The refuge affords protection for the endangered Whooping Crane. More development has occurred on Seadrift-Port O'Connor Ridge at the north-eastern point (Port O'Connor) and southern point (Seadrift); however, development speculation is high as all, or portions, of some large land holdings along the Gulf Intracoastal Waterway and Victoria Barge Canal are being sold to developers and sub-divided.

Pond and oak trees within Blackjack Peninsula (left) and salt marsh within Seadrift-Port O'Connor Ridge Peninsula (right)

1a. Priority 1

SEADRIFT-PORT O'CONNOR RIDGE WETLANDS



Owner: Private
Size: ~13,050 acres
Description-Both wetland areas are adjacent to documented endangered Whooping Crane territories (Stehn and Prieto, 2010) and may allow the expansion of Whooping Crane territories in the future

A. Shoreline Wetlands: close proximity to Welder Flats;
B. Arapaho Holdings: 11,000 acres of wetlands adjacent to Traditional Navigable Waters (TNW) determined to be jurisdictional by the Environmental Protection Agency (EPA Memorandum, 2010),

Potential Partners: USFWS, TNC, NRCS, TPWD, ICF, GBRA, GBRT, SABF
Potential Funding: $500K-$1M
Conservation Status: The importance of palustrine wetlands grows with increased development along the Seadrift-Port O'Connor Ridge Peninsula. Conservation, restoration, and enhancement of existing palustrine wetlands will contribute to the overall health of the San Antonio Bay ecosystem by performing valuable ecosystem services, such as nutrient cycling, improving water quality, attenuating and holding flood waters from heavy rainfall and storm surges. Additionally, palustrine wetlands in this region mitigate the effects of relative sea-level rise as well as provide valuable habitat to numerous aquatic, terrestrial, and avian species that depend on these areas for breeding, nesting, feeding, and cover. These palustrine wetlands are also important to the endangered Whooping Cranes as a source of freshwater.

1b. Priority 1

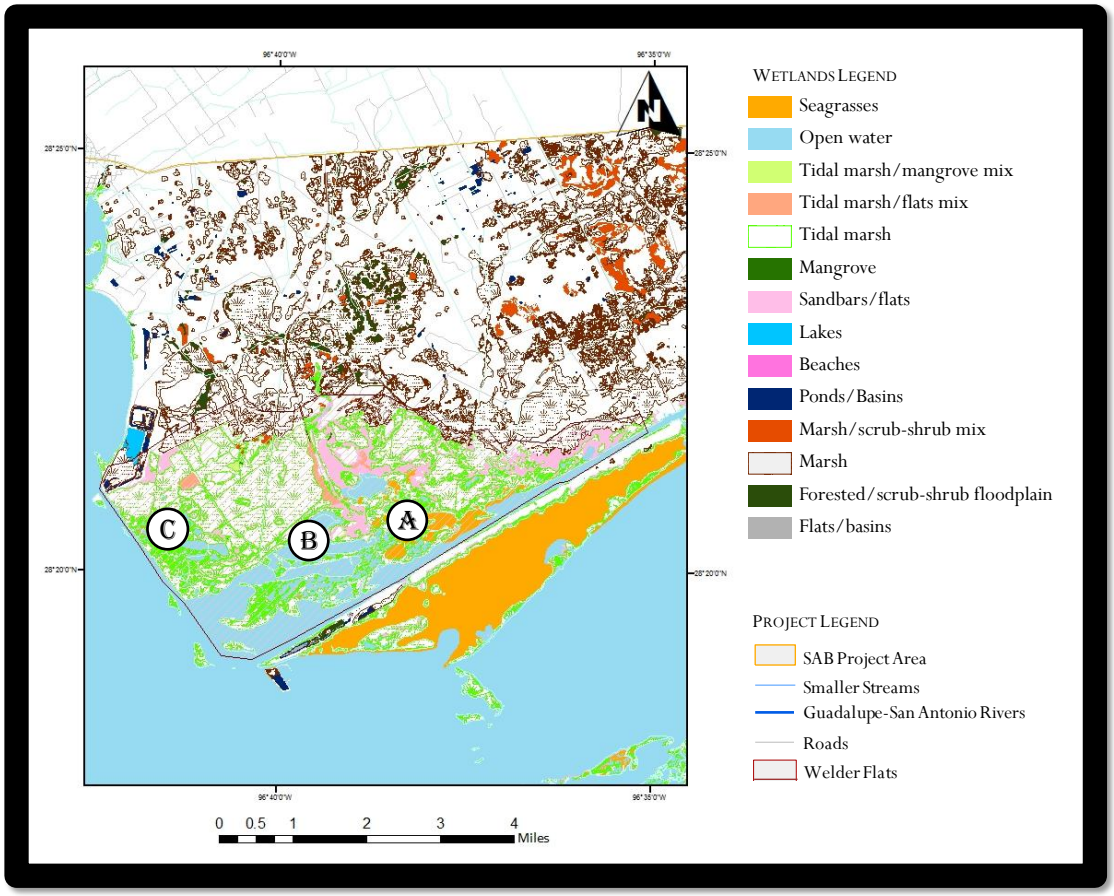
SEADRIFT-PORT O'CONNOR RIDGE WETLANDS

SATELLITE IMAGERY

SITE PHOTOS

2a. Priority 2

WELDER FLATS WETLANDS



Owner: Private
Size: ~8,991 acres
Description- Welder Flats wetlands; documented endangered Whooping Crane territories are present within all three wetland areas (Stehn and Prieto 2010)

A. Welder Flats: Whooping Crane territories;
B. Welder Flats: Whooping Crane territories;
C. Welder Flats: Whooping Crane territories;

Potential Partners: USFWS, TNC, NRCS, TPWD, ICF, GBRA, GBRT, SABF
Potential Funding: $100K-$1.5M
Conservation Status: Certain sections of Welder Flats are either in a conservation easement or a conservation strategy is being developed. The Welder Flats sites encompass essential habitat for the present and future endangered Whooping Cranes population, especially in the event of relative sea-level rise. Additionally, hydrologic restoration needs to be conducted to restore natural sheetflow from roads where it has been altered by the construction of drainage ditches, shoreline protection needs to be developed for GIWW wave erosion, and mangrove establishment needs to be managed.

2b. Priority 2

WELDER FLATS WETLANDS

SATELLITE IMAGERY

SITE PHOTOS

3a. Priority 3

NORTHERN SEADRIFT-PORT O'CONNOR RIDGE WETLANDS

Owner: Private
Size: ~1,462 acres
Description-Northern Seadrift-Port O'Connor Ridge Wetlands

A. Northern Seadrift-Port O'Connor Ridge Wetlands: land adjacent to Arapaho Holdings may potentially allow the expansion of Whooping Crane territories in the future;

Potential Partners: USFWS, TNC, NRCS, TPWD, GBRA, GBRT, SABF
Potential Funding: $100K-$1M
Conservation Status: The development of land acquisitions and conservation easements along this peninsula would limit development and would provide additional habitat for the present day and future Whooping Cranes population, especially in the event of relative sea-level rise.

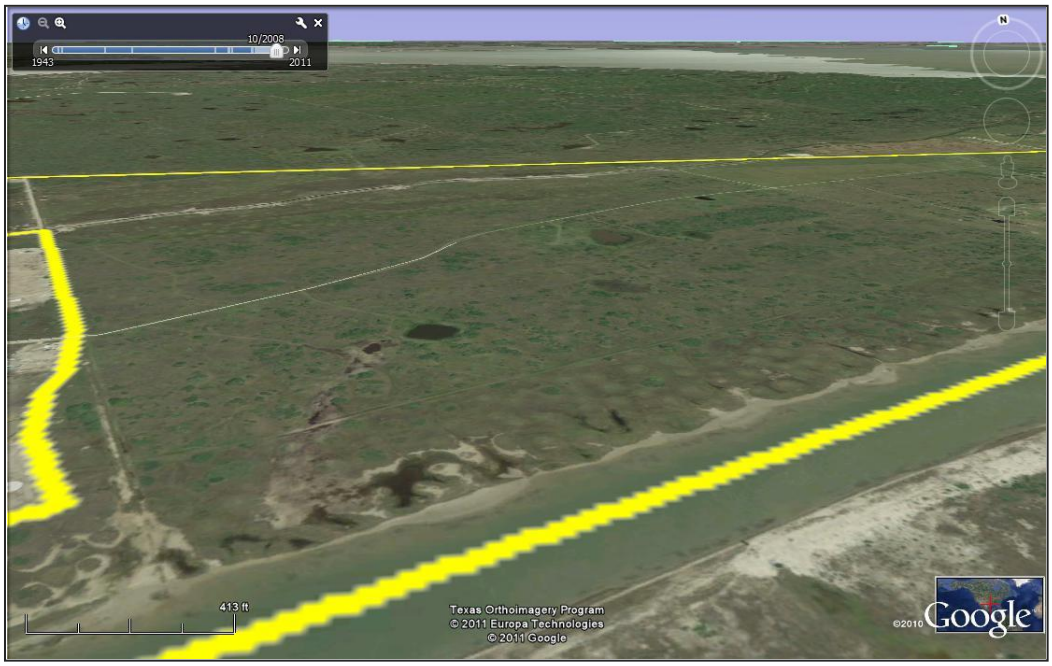
3b. Priority 3

NORTHERN SEADRIFT-PORT O'CONNOR RIDGE WETLANDS

SATELLITE IMAGERY

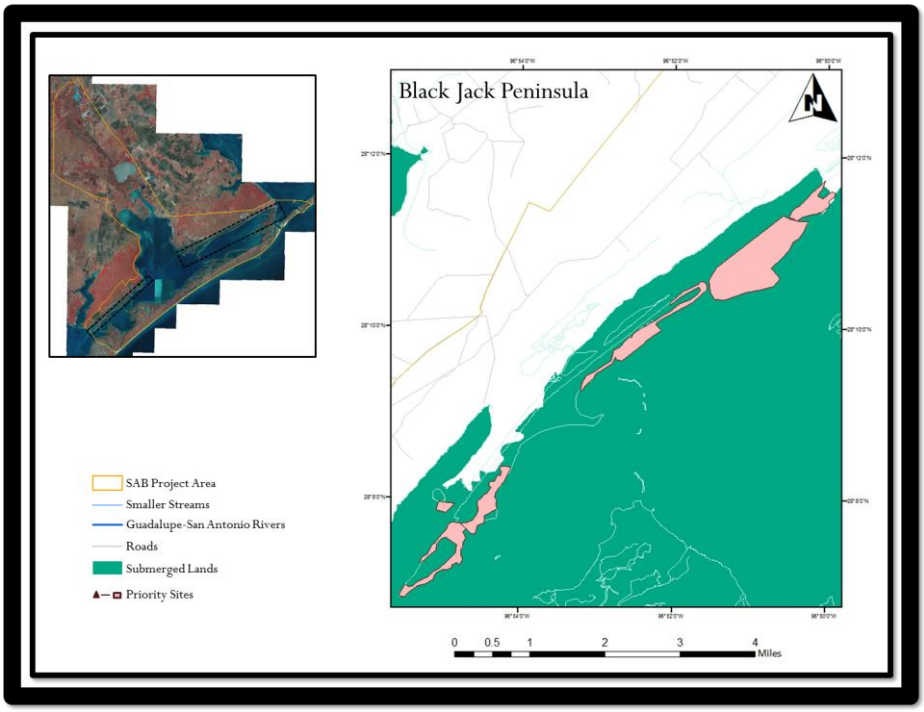
SITE PHOTOS

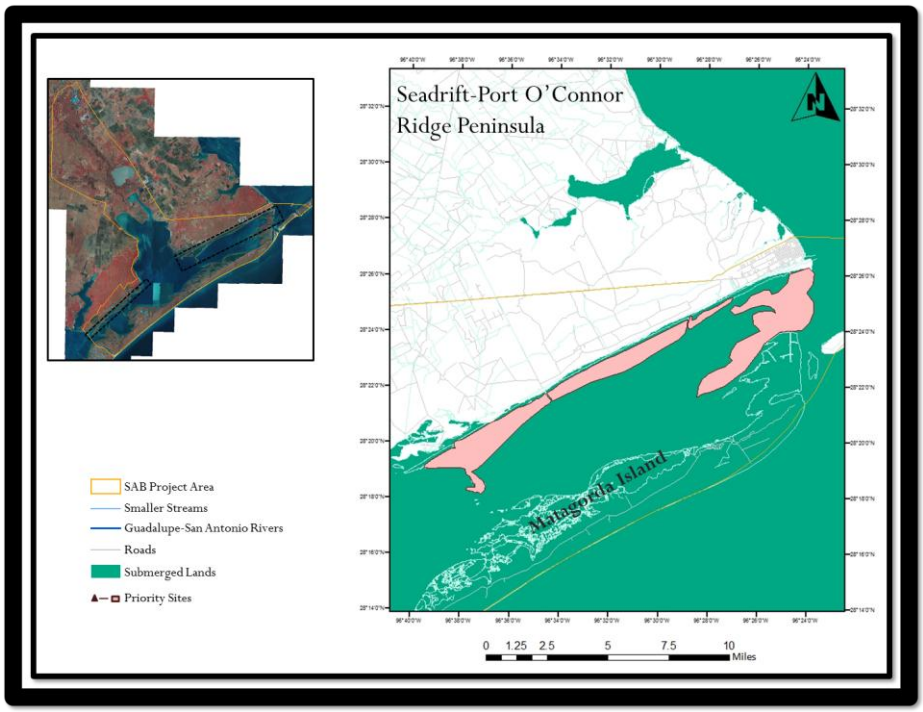
(OBLIQUE GOOGLE EARTH IMAGERY)



PRIORITIES BY GEOMORPHOLOGY

OPEN BAY ISLANDS





Open Bays Islands

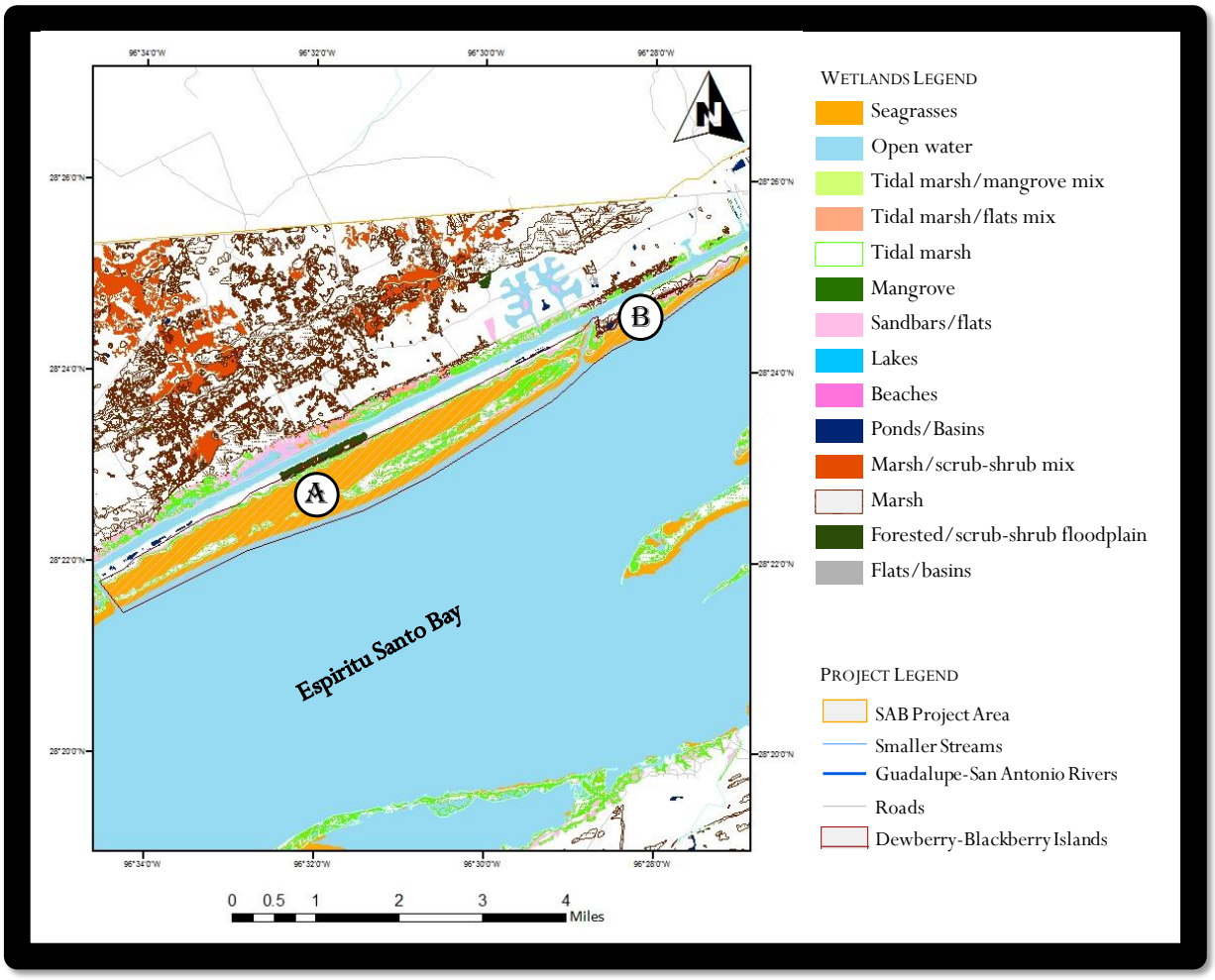
Open bays includes open estuarine waters, oyster reefs, bay islands (often used rookery islands), natural passes, and dredged material islands. Open bay habitats encompass a majority of the project area and is characterized by deeper water (> 6 ft), unvegetated bay bottoms, and well-mixed water column. Oyster reefs are generally oriented perpendicular to the shorelines and historically bisected sections of open bays. Natural bay islands typically are exposed oyster reefs where shell hash accumulated at higher elevation, therefore allowing salt-tolerant vegetation to establish.

Dredged material islands (DMIs) were constructed from excavated material when constructing and maintaining navigational waterways, the most prominent being the Gulf Intracoastal Waterway (GIWW) and Victoria Barge Canal. These islands have changed hydrologic patterns in the bay system and many are reserved for use by United States Army Corps of Engineers (USACE) as containment levees for GIWW maintenance. Some DMIs have been used beneficially for marsh creation and enhancement, and, in some scenarios, to create additional habitat for Whooping Cranes.

Mitigation project along Roddy Island (left), Roddy Island habitat (bottom right), and Bludworth Island ponds (top right)

1a. Priority 1

DEWBERRY AND BLACKBERRY ISLANDS



Owner: Private
Size: ~2,905 acres
Description-Dewberry-Blackberry Islands

A. Dewberry Island encompasses documented endangered Whooping Crane territories (Stehn and Prieto 2010);
B. Blackberry Island: island adjacent to documented endangered Whooping Crane territories (Stehn and Prieto 2010);

Potential Partners: USFWS, TNC, NRCS, TPWD, ICF, GBRA, GBRT, SABF
Potential Funding: $100K-$1M
Conservation Status: The development of conservation easements on Dewberry and Blackberry islands would provide essential habitat for the present day and future endangered Whooping Cranes population, especially in the event of relative sea-level rise. These islands are also important for waterfowl and shorebirds, including the endangered Piping Plover. Additionally, mangrove management is needed to sustain Whooping Crane and shorebird habitats.

1b. Priority 1

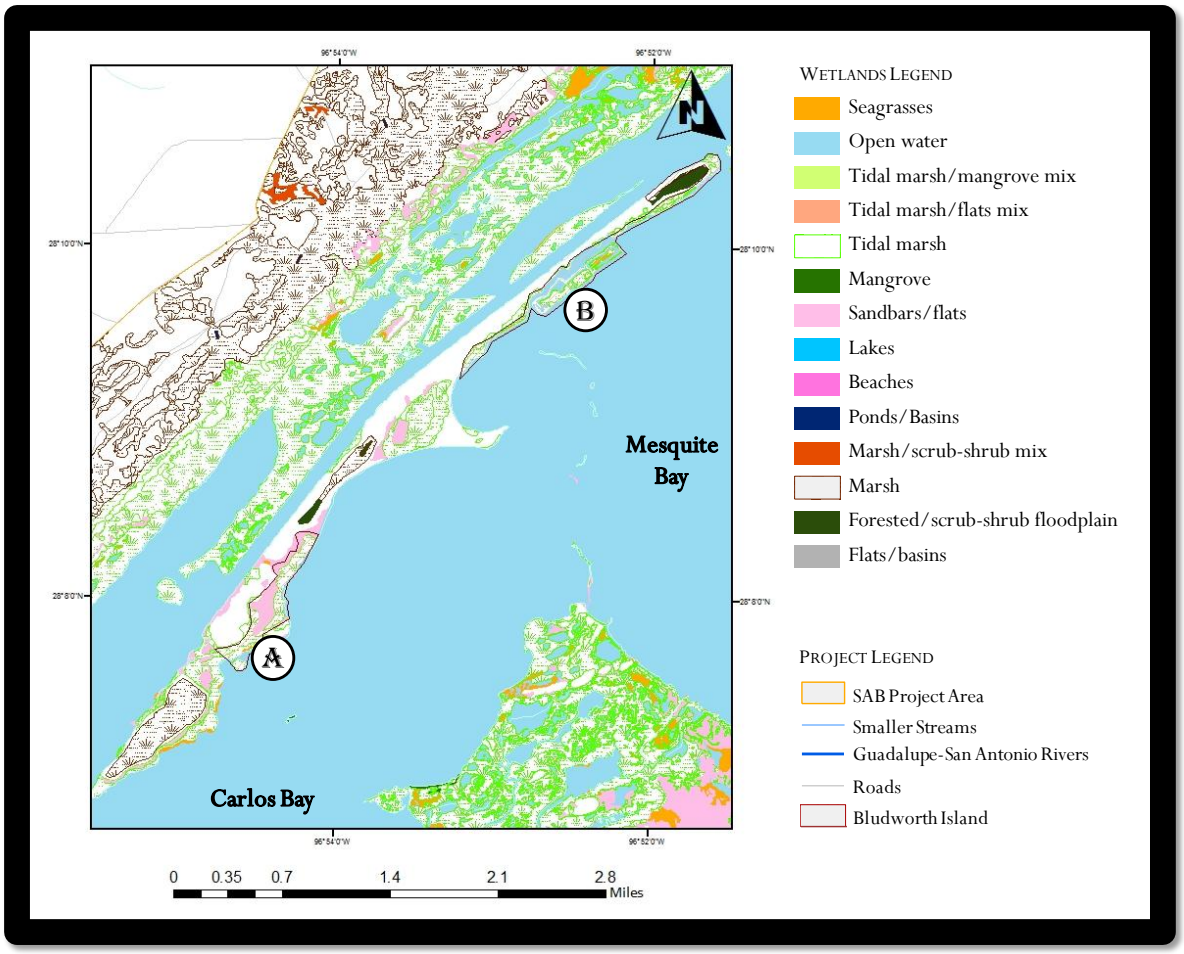
DEWBERRY AND BLACKBERRY ISLANDS

SATELITTE IMAGERY

SITE PHOTOS

2a. Priority 2

BLUDWORTH ISLAND



Owner: Private
Size: ~229 acres
Description-Bludworth Island wetlands area both encompass potential endangered Whooping Crane habitat

A. South Bludworth Island located adjacent to documented endangered Whooping Crane territories (Stehn and Prieto 2010);
B. North Bludworth Island: located adjacent to documented endangered Whooping Crane territories (Stehn and Prieto 2010);

Potential Partners: USFWS, TNC, NRCS, TPWD, ICF, GBRA, GBRT, SABF
Potential Funding: $50K-$500K
Conservation Status: The development of conservation easements on Bludworth island would provide essential habitat for the present day and future endangered Whooping Cranes population, especially in the event of relative sea-level rise. Additionally, mangrove management is needed to sustain Whooping Crane and shorebird habitats. Currently, mitigation projects are in progress on the island.

2b. Priority 2

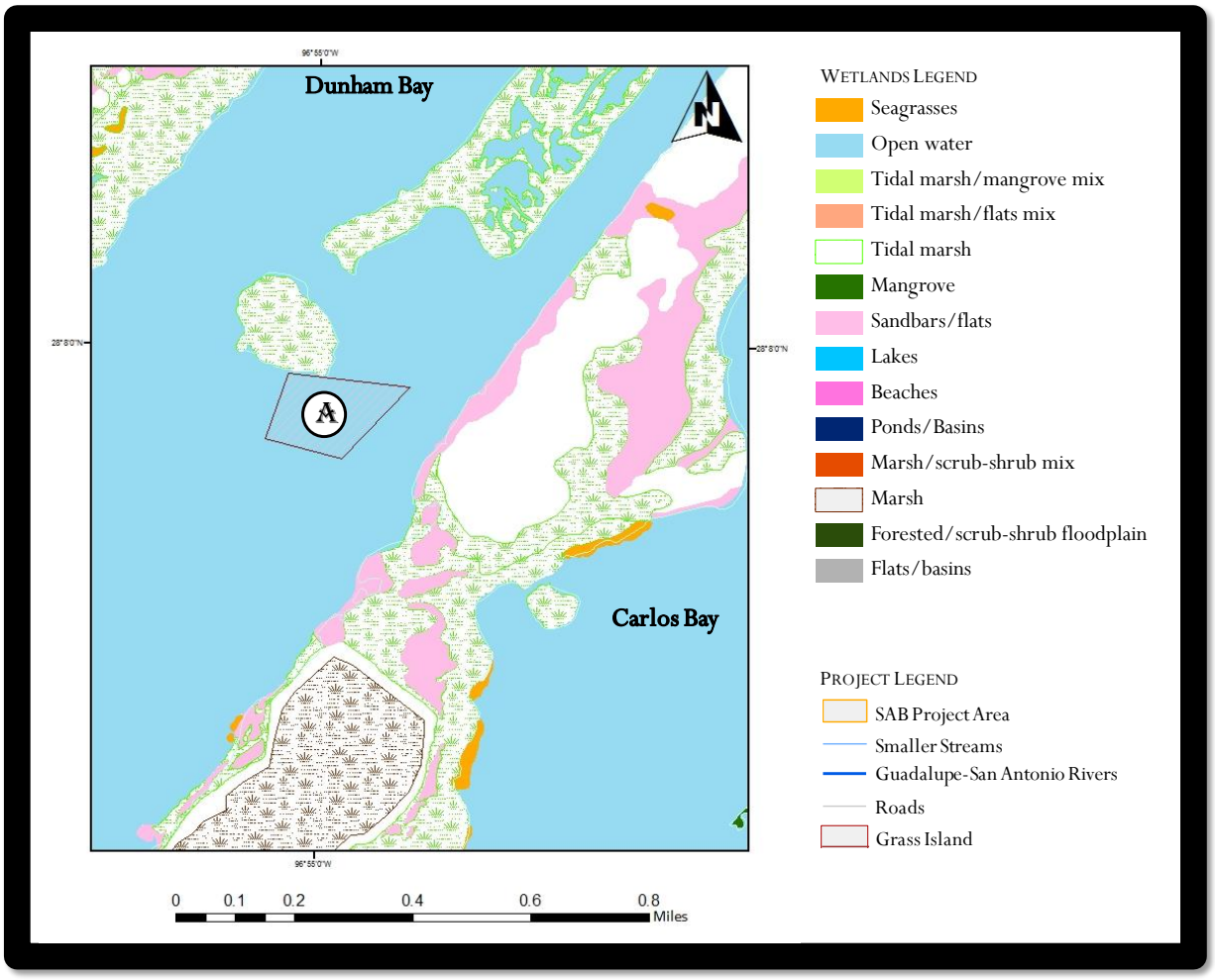
BLUDWORTH ISLAND

SATELITTLE IMAGERY

SITE PHOTOS

3a. Priority 3

GRASS ISLAND



Owner: TGLO submerged lands
Size: undefined
Description-Grass Island

A. New Grass Island: establish new land from spoil material;

Potential Partners: USFWS, TNC, NRCS, TPWD, ICF, GBRA, GBRT, SABF
Potential Funding: $100K-$2M
Conservation Status: The restoration and enhancement of Grass Island by the development of additional land from spoil material would provide habitat for colonial waterbirds, waterfowl, and shorebirds.

3b. Priority 3

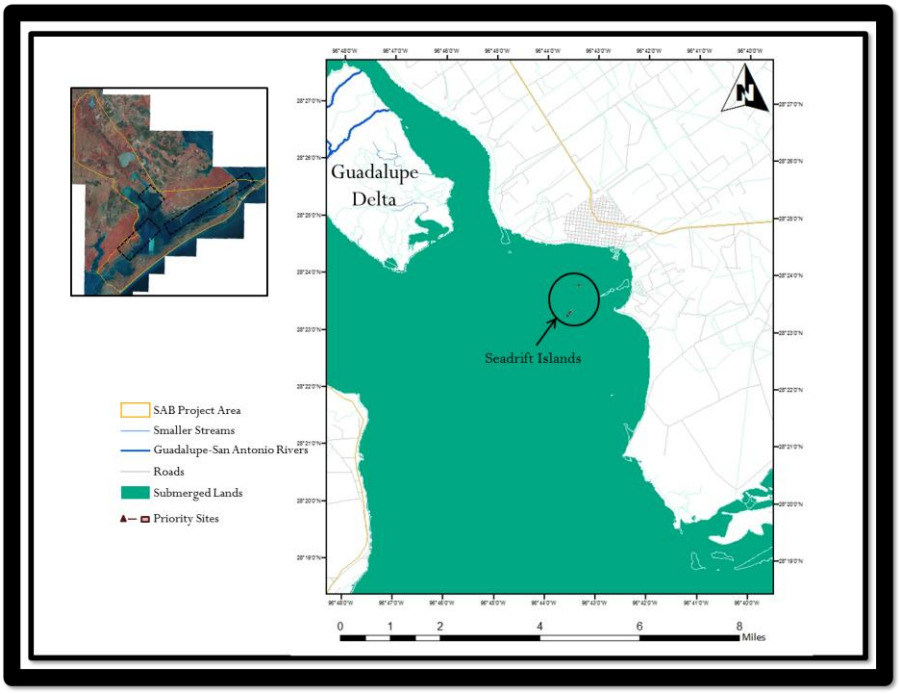
GRASS ISLAND

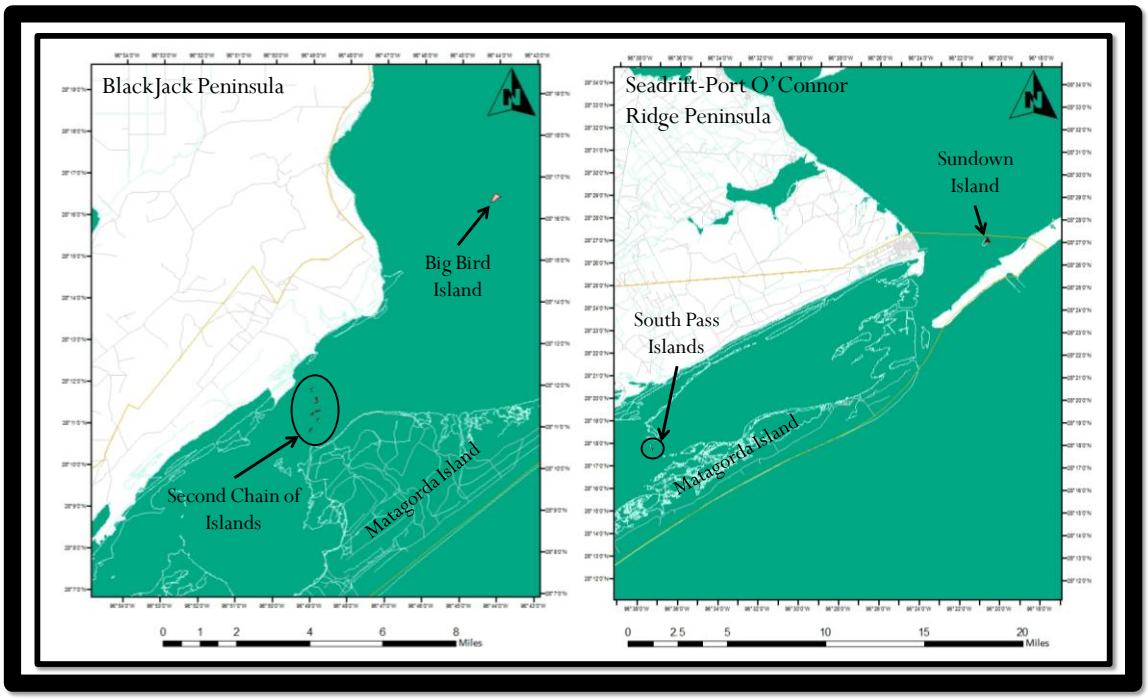
SATELITTE IMAGERY

SITE PHOTOS

PRIORITIES BY GEOMORPHOLOGY

ROOKERY ISLANDS





Rookery Islands

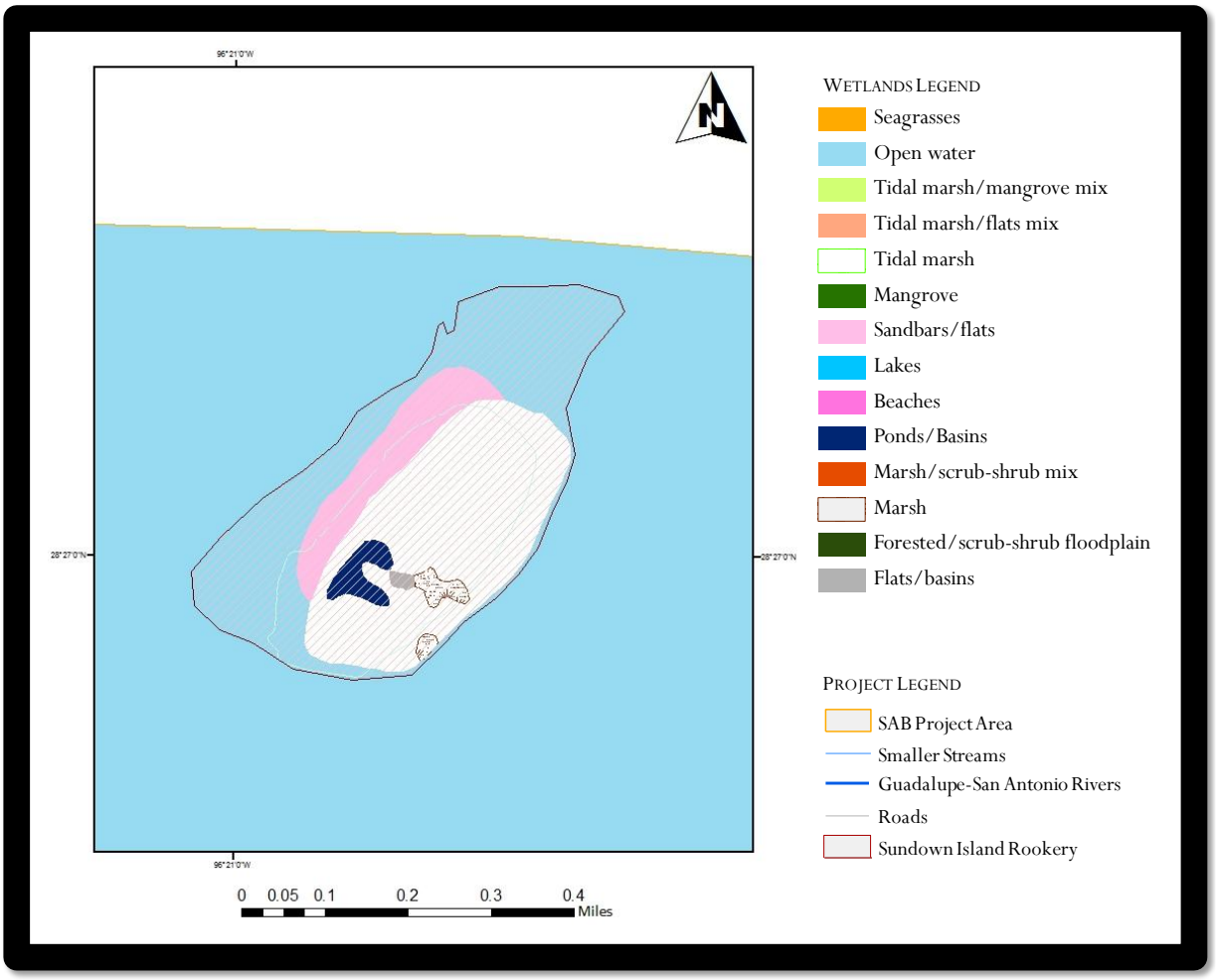
Rookery islands are seasonally used by colonial nesting waterbirds, including herons, egrets, spoonbills, terns, skimmers, and gulls. These habitats are essential to maintain the coastal populations of these species. Depending on the size and habitat complexity of a rookery island in the estuary, up to 24 species can nest during the season (generally January-August). The larger birds typically use the brush habitat, whereas the smaller species use the unvegetated shell and sandy shorelines. Additional rookeries are located in the riverine and freshwater marshes of the project area, and can harbor hundreds of pairs of herons and egrets as well as some other key species.

Each season, nesting and fledging success at rookeries is dependent on isolation from predation and human disturbance. Most mammalian predators impacts rookeries when access is available, such as shallow waters or reefs connecting to the mainland or developed areas. Predation also occurs by gulls and other birds if human activity near or on the rookery forces the breeding adults away from the nests. Over the long-term scale, estuarine rookery can diminish in size and habitat complexity from erosion and sea-level rise. In addition, wave energy from passing watercraft along navigational waterways can increase erosion effects.

Great egret (top) within forested rookery, "Do Not Land or Enter" sign on rookery island (bottom left), and adult Reddish egret with juveniles (bottom right) on Second Chain of Islands rookery

1a. Priority 1

SUNDOWN (BIRD) ISLAND ROOKERY



Owner: TGLO leased to Audubon Society
Size: ~84 acres
Description-Sundown (Bird) Island Rookery- largest colonial waterbird site in the San Antonio Bay system;
Potential Partners: USFWS, TNC, NRCS, TPWD, GBRA, GBRT, SABF
Potential Funding: $50K-$1.5M
Conservation Status: Restoration is needed to replace land lost from erosion and a management plan needs to be implemented to maintain the island for future colonial waterbird nesting.

1b. Priority 1

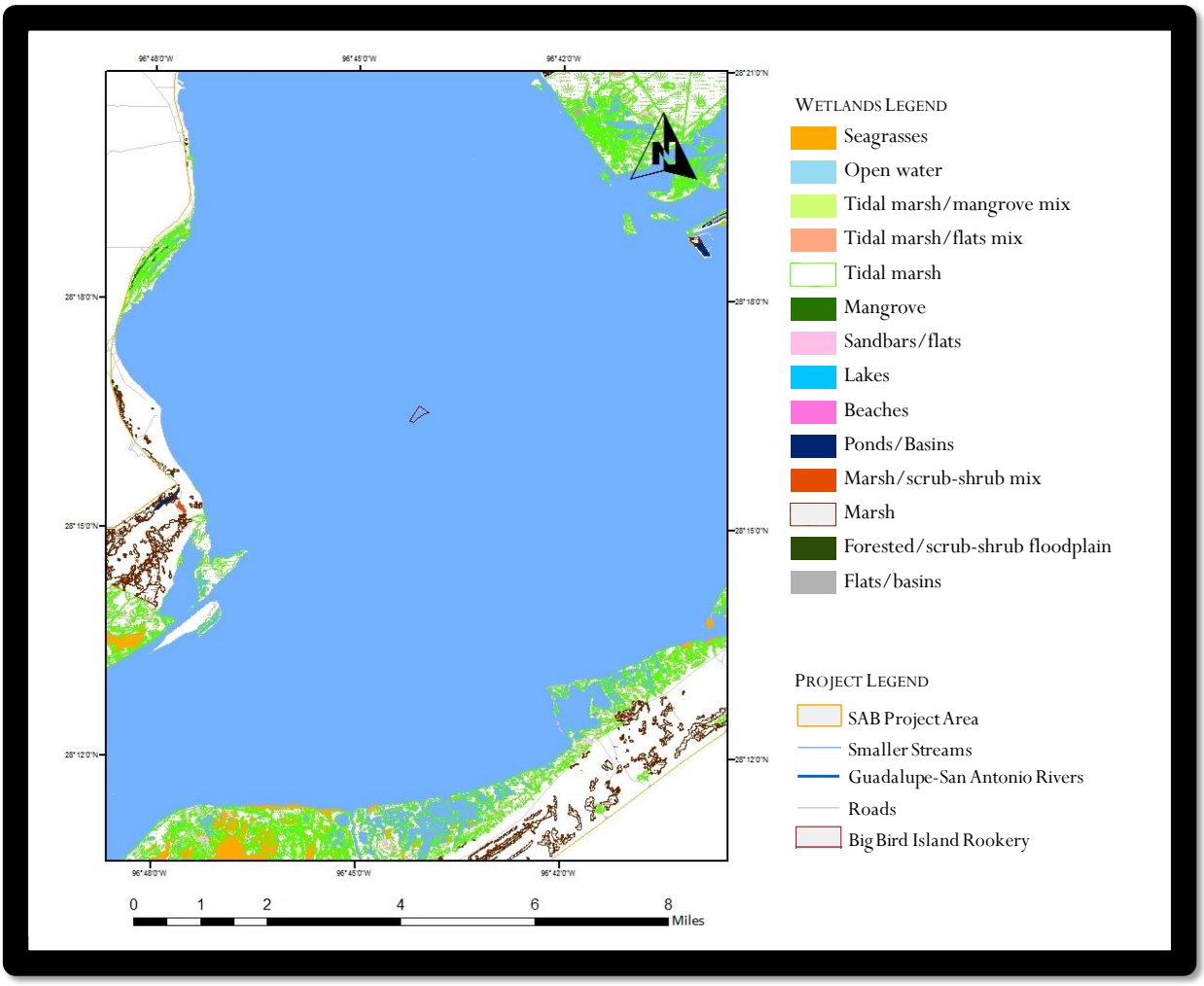
SUNDOWN (BIRD) ISLAND ROOKERY

SATELLITE IMAGERY

SITE PHOTOS

2a. Priority 2

BIG BIRD ISLAND ROOKERY



Owner: TxDOT, USACE
Size: ~16 acres
Description-Big Bird Island Rookery-exposed only during low water levels; therefore, increase the elevation to support an emergent rookery island;
Potential Partners: USFWS, TNC, NRCS, TPWD, GBRA, GBRT, SABF
Potential Funding: $100K-$2M
Conservation Status: The development of a large emergent rookery island in San Antonio Bay system along the GIWW would provide a colonial waterbird nesting site in an area where no other large rookery exists.

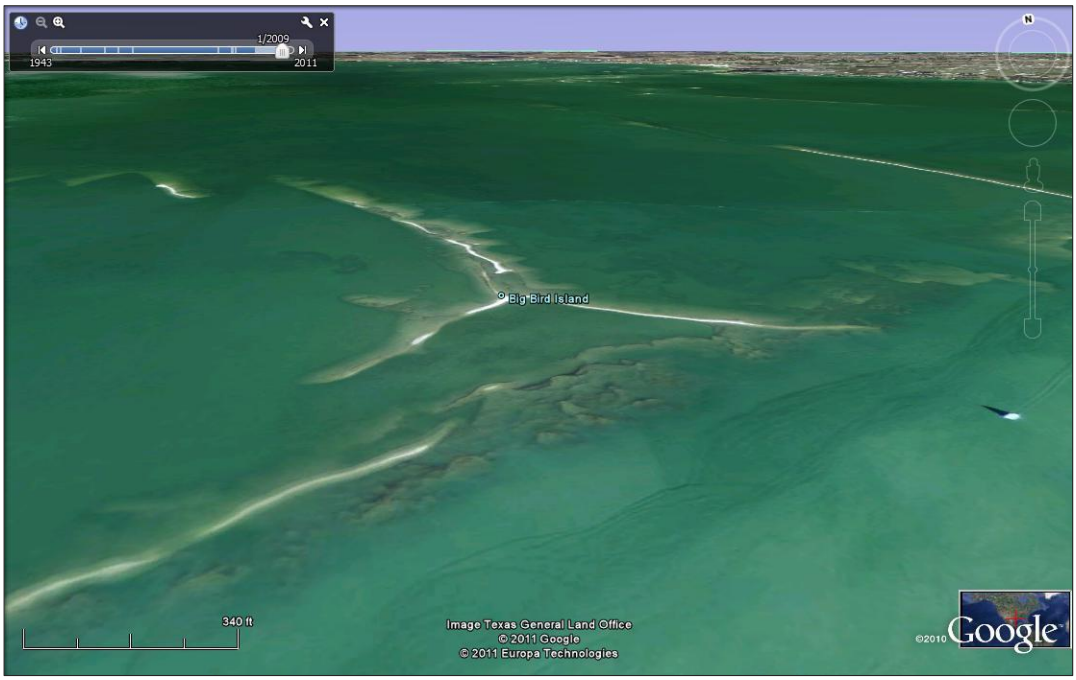
2b. Priority 2

BIG BIRD ISLAND ROOKERY

SATELLITE IMAGERY

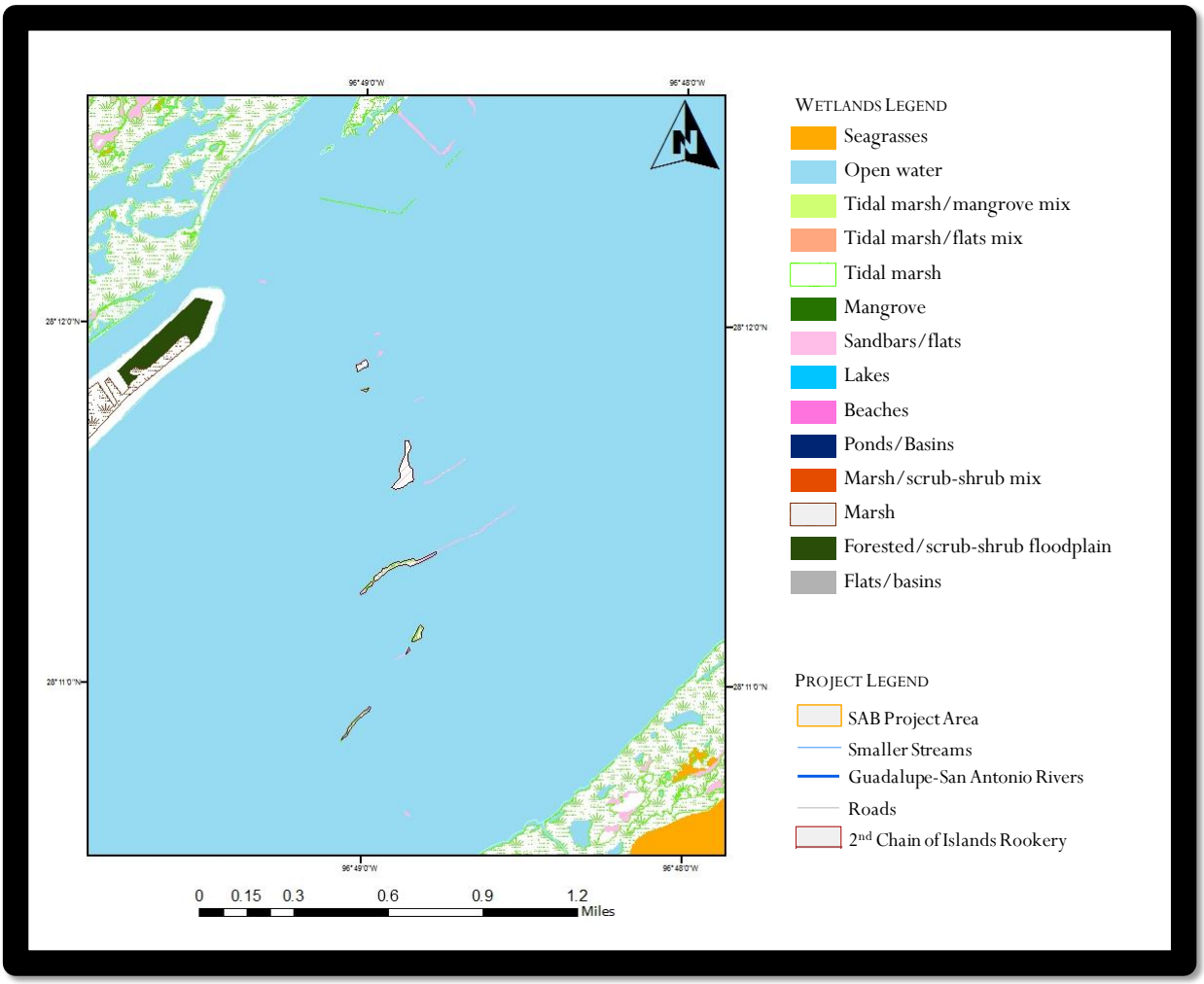
SITE PHOTOS

(OBLIQUE GOOGLE EARTH IMAGERY)



3a. Priority 3

SECOND CHAIN OF ISLANDS ROOKERY



Owner: TGLO and Audubon Society
Size: ~7 acres
Description-Second Chain of Islands Rookery;
Potential Partners: USFWS, TNC, NRCS, TPWD, GBRA, GBRT, SABF
Potential Funding: $100K-$800K
Conservation Status: Rookery islands have suffered from erosion and subsidence, thus restoration is needed to support colonial waterbirds.

3b. Priority 3

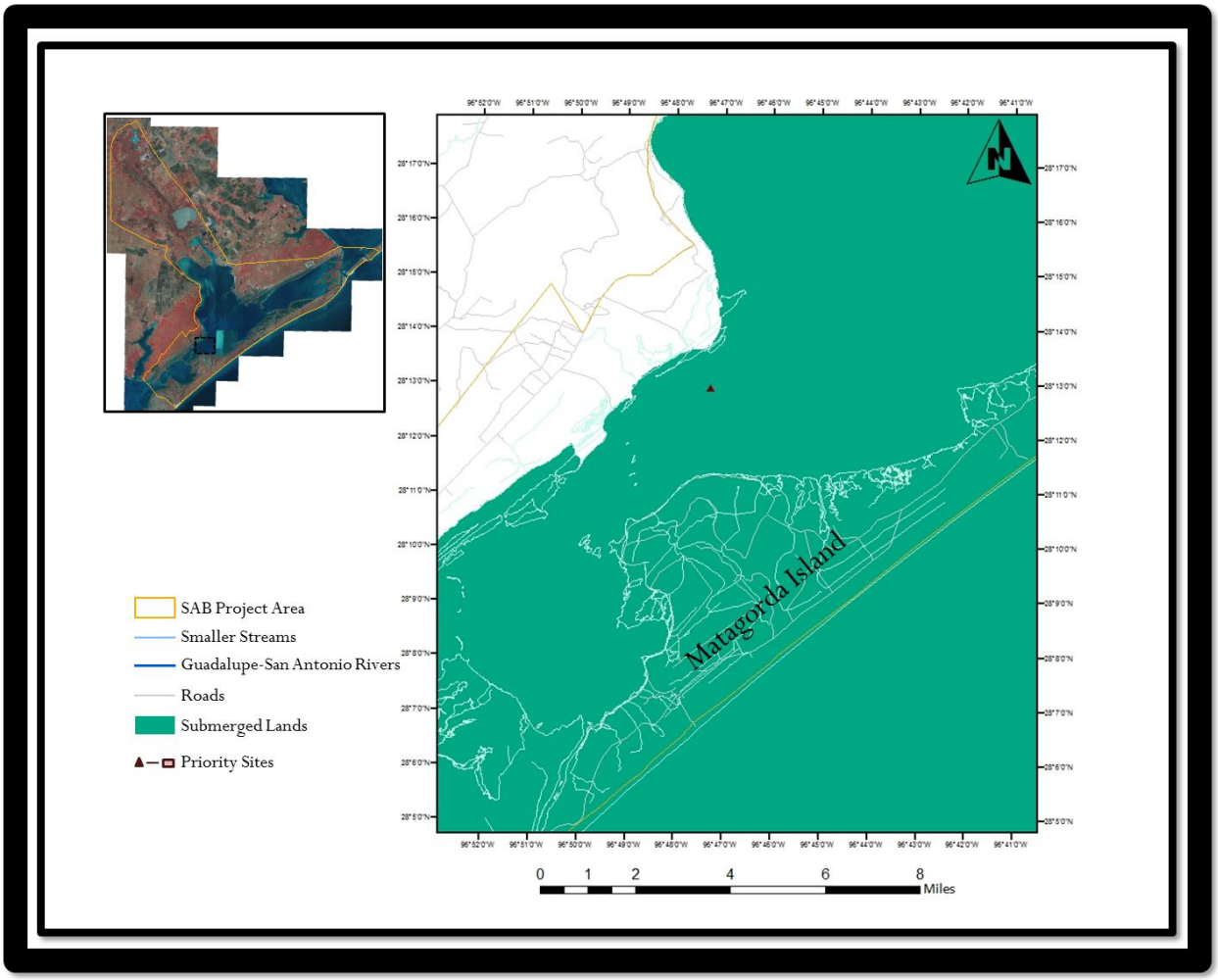
SECOND CHAIN OF ISLANDS ROOKERY

SATELLITE IMAGERY

SITE PHOTOS

PRIORITIES BY GEOMORPHOLOGY

OYSTER REEFS



Oyster Reefs

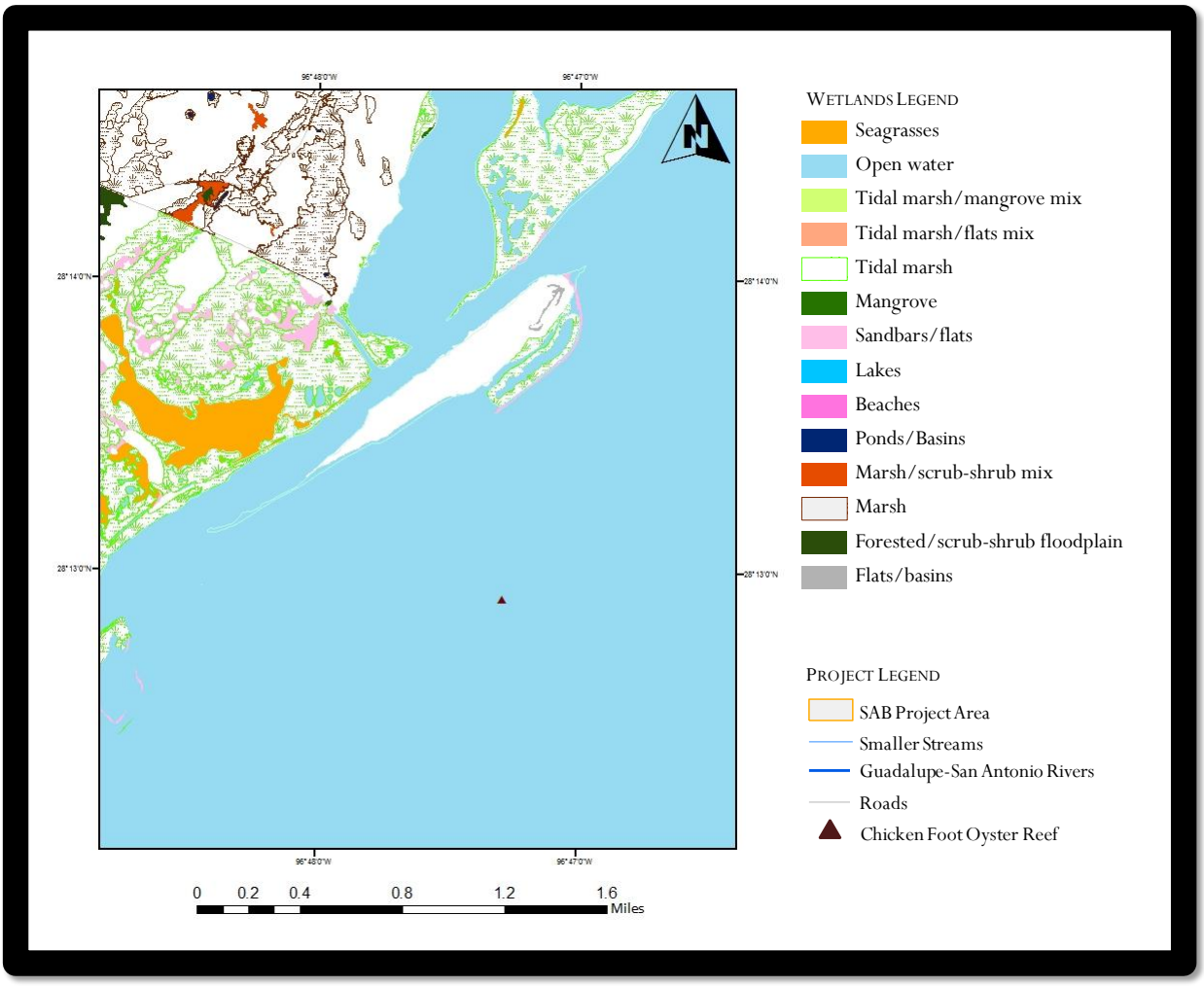
Oyster reefs provide essential habitat for estuarine aquatic species and are commercially important in Texas. Oysters are harvested from public reefs and privately leased reefs throughout Texas bays. The largest portion of public reef areas harvested commercially and recreationally is located in bays with freshwater inflows; Galveston, Matagorda, and San Antonio Bay systems (TPWD, 2011). However, no public leases are issued outside of Galveston Bay (Norman Boyd, personal communication, August 19, 2011). Additionally, oyster reefs are important filter-feeders that aid in maintaining bay and estuary water quality.

Oysters reach optimum growth, reproduction, and survival at water temperatures between 68 to 86° F and salinities between 10 to 30 ppt. However, oysters can survive in temperatures ranging from 28 to 97° F and salinities ranging from 2 to 40 ppt. Although oysters can survive at these extreme temperatures and salinities, health can be impacted by disease and parasites.

Half moon oyster reef located in San Antonio Bay (left and top right) and American oystercatcher landing on an existing oyster reef (bottom right)

1a. Priority 1

CHICKEN FOOT OYSTER REEF



Owner: TGLO submerged lands
Size: To be determined based on project scope
Description-Chicken Foot Oyster Reef;
Potential Partners: USFWS, TNC, NRCS, TPWD
Potential Funding: $100K-$1M
Conservation Status: According to local fisherman within the San Antonio Bay system, Chicken Foot reef is heavily degraded and needs to be restored back to its original potential.

1b. Priority 1

CHICKEN FOOT OYSTER REEF

SATELITTE IMAGERY

SITE PHOTOS


Field marker for the submerged Chicken Foot reef

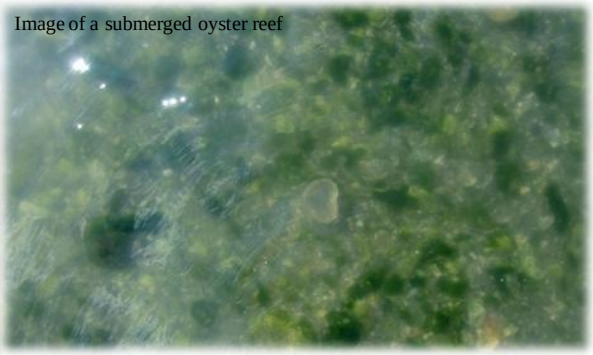
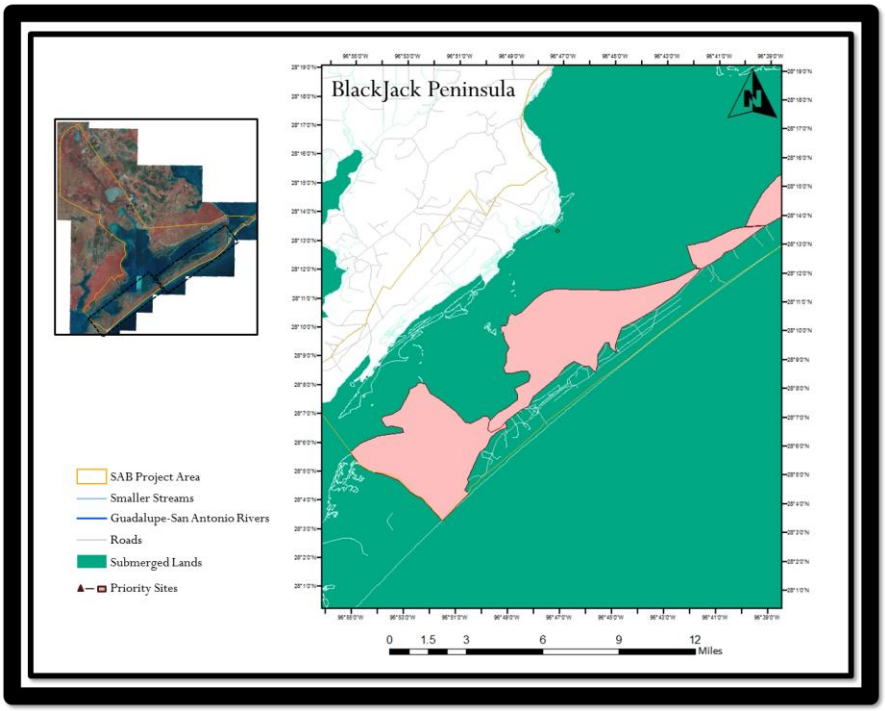
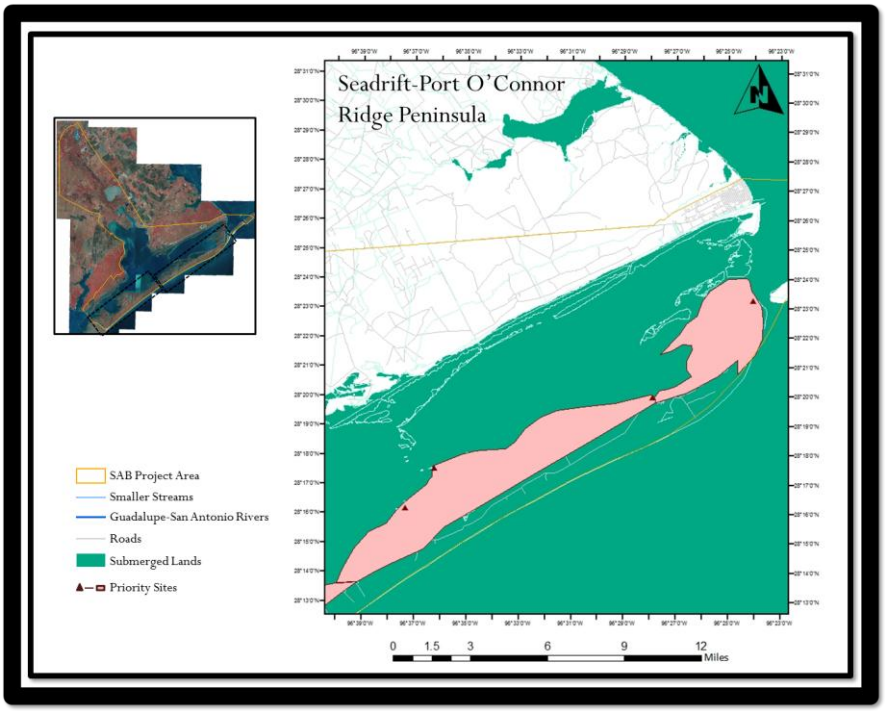


Image of a submerged oyster reef

PRIORITIES BY GEOMORPHOLOGY

BARRIER ISLANDS





Barrier Island

Matagorda and San Jose barrier islands provide the eastern boundary of the study area and were formed about 5,000 years ago as accretionary barrier spits along the mainland and Gulf of Mexico. The island profile encompasses several dynamic habitats including gulf shore, foredunes, mid-island ridge and swales, back dunes, tidal flats, and coastal marshes. Freshwater wetlands are located within the swales and temporarily fill following rain events.

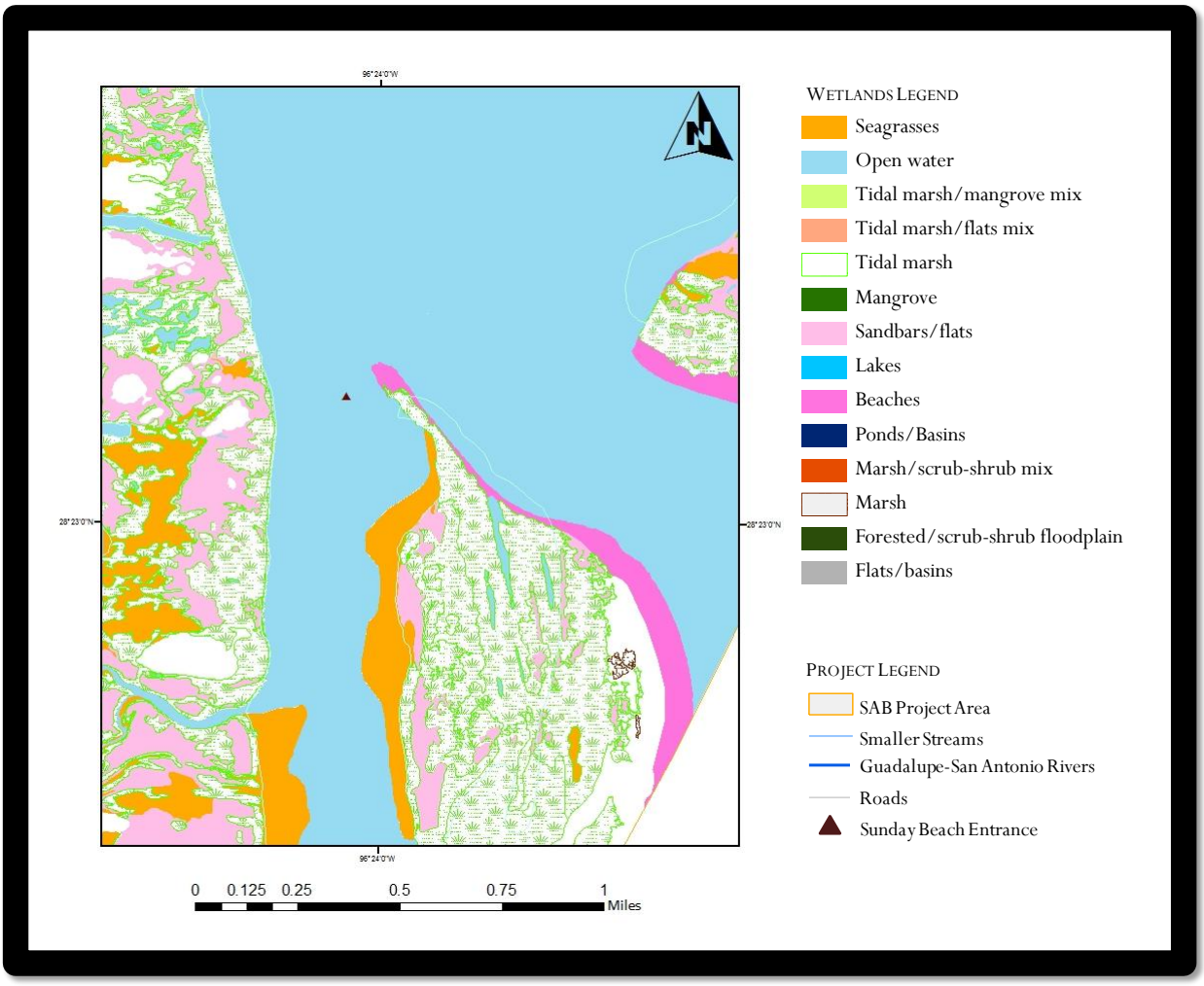
The islands have experienced minor development dating back as early as the Civil War, and include an abandoned lighthouse and airport runway on the northern tip and a lodge and ranching operation (Wynn Lodge) at the southern tip of Matagorda Island. This island is owned and managed by three governmental agencies (U.S. Fish & Wildlife Service, Texas Parks & Wildlife, and Texas General Land Office) within various agreements. San Jose Island is privately owned has lodges and ranching operations about midway along the island. Currently, no plans are being developed to build or divide on either island.

Natural passes that connected the bay system to the Gulf of Mexico included Pass Cavallo at the northern extent and Cedar Bayou Pass at the southern extent of Matagorda Island. Both passes have been hydrologically compromised from the artificially created and maintained ship channels at Matagorda Bay and Port Aransas (south of the project area). Pass Cavallo has become much shallower over time; and Cedar Bayou Pass is only open following tropical storms.

Eroding clay shoreline (right) and habitat including ponds (left) along the barrier island Matagorda Island

1a. Priority 1

SUNDAY BEACH ENTRANCE



Owner: TGLO submerged lands
Size: To be determined based on project scope
Description-Sunday Beach Entrance- important fishing and recreational area for Port O'Connor citizens and visitors;
Potential Partners: TGLO
Potential Funding: $250K-$800K
Conservation Status: Restoration and maintenance of Sunday Beach entrance from siltation is needed to preserve current hydrology and benefits.

1b. Priority 1

SUNDAY BEACH ENTRANCE

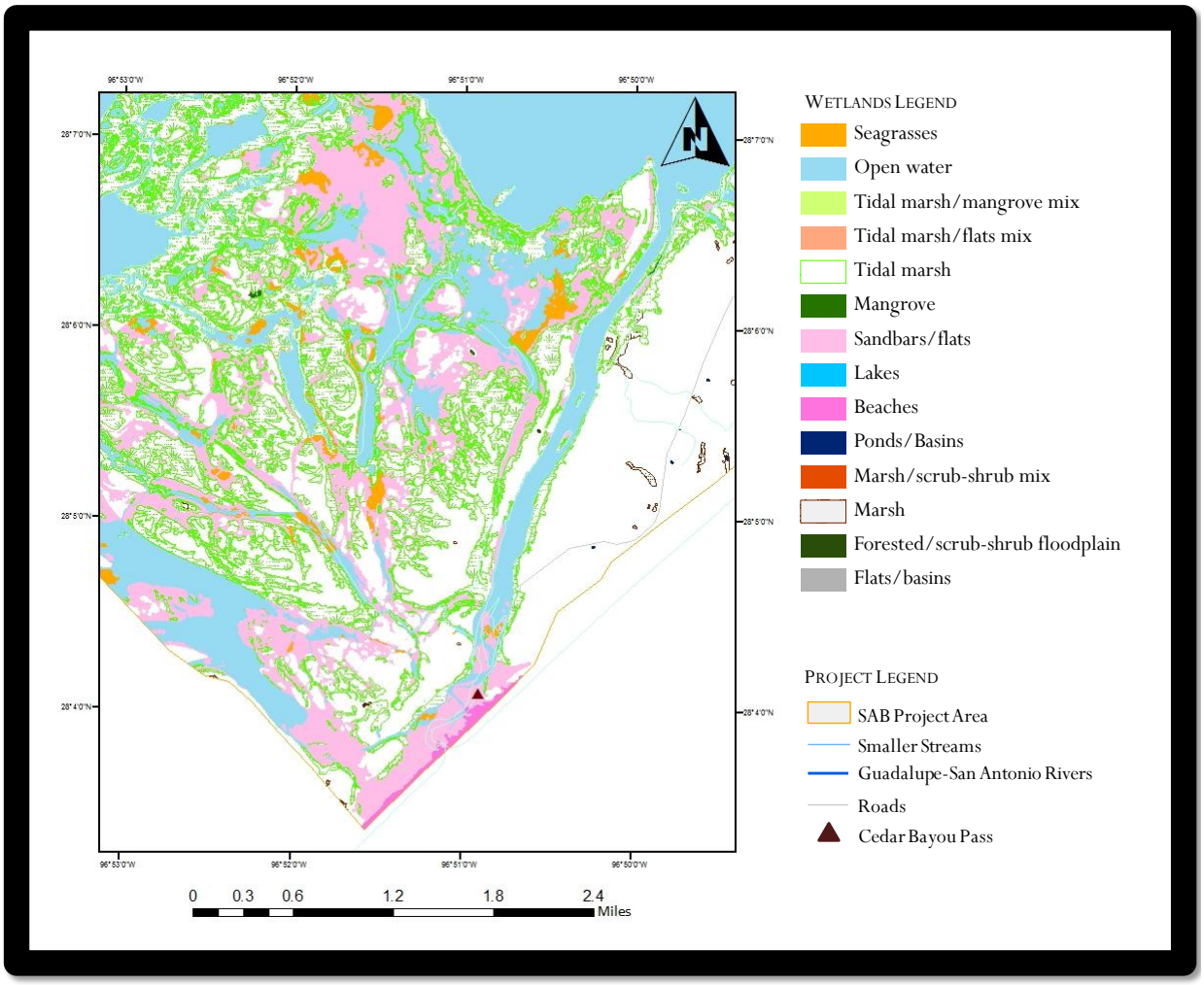
SATELITTE IMAGERY

SITE PHOTOS

(BEACH EXAMPLE AND OBLIQUE GOOGLE EARTH IMAGERY)

2a. Priority 2

CEDAR BAYOU PASS



Owner: TGLO
Size: To be determined based on project scope
Description-Cedar Bayou Pass-pass was regularly open to the Gulf of Mexico;
Potential Partners: TGLO, USFWS
Potential Funding: $2M-$4M
Conservation Status: Hydrologic restoration and enhancement is needed to allow water exchange between the Gulf of Mexico and the San Antonio Bay system.

2b. Priority 2

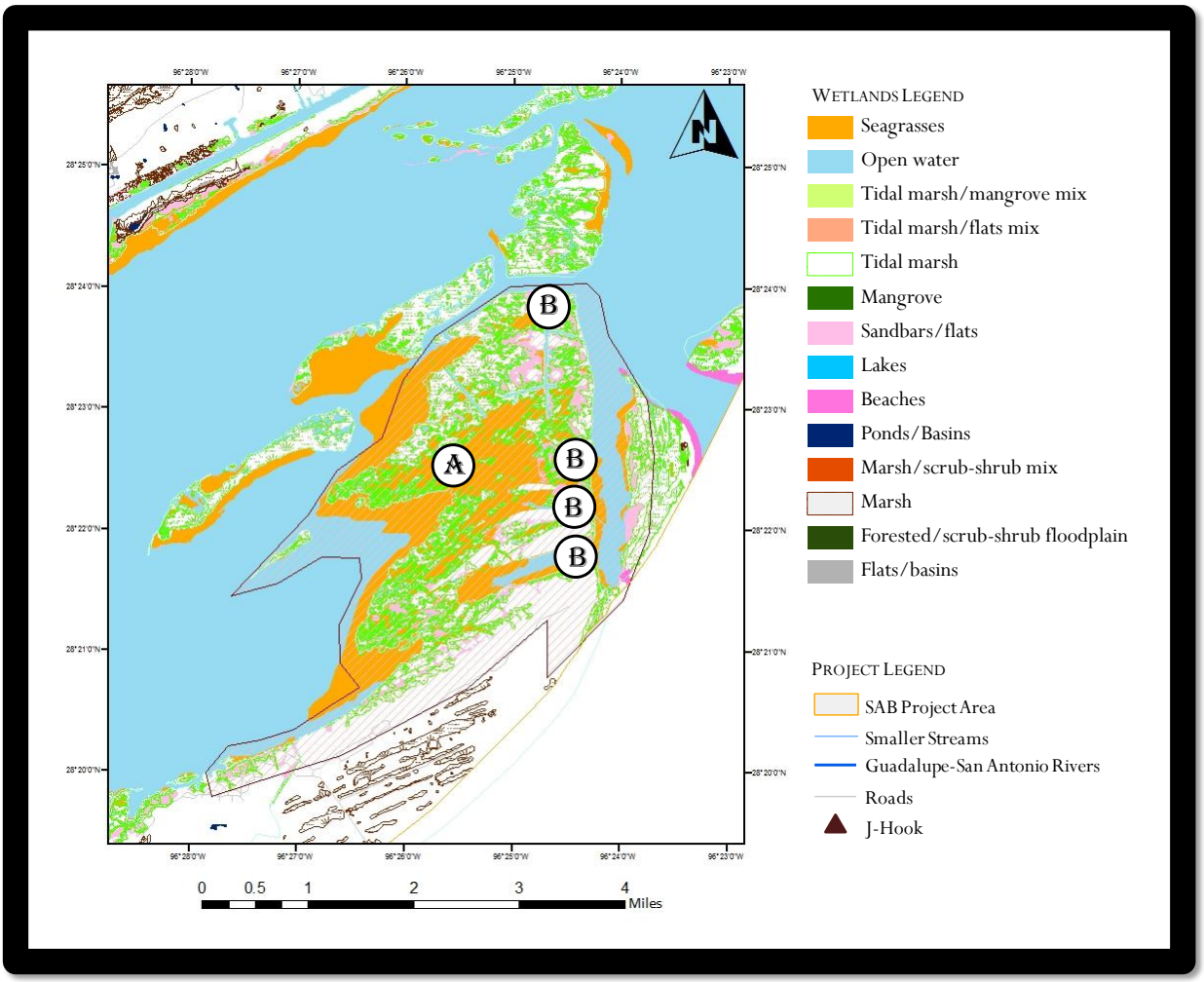
CEDAR BAYOU PASS

SATELITTE IMAGERY

SITE PHOTOS

3a. Priority 3

J-HOOK



Owner: TGLO leased to USFWS
Size: undefined
Description-J-Hook

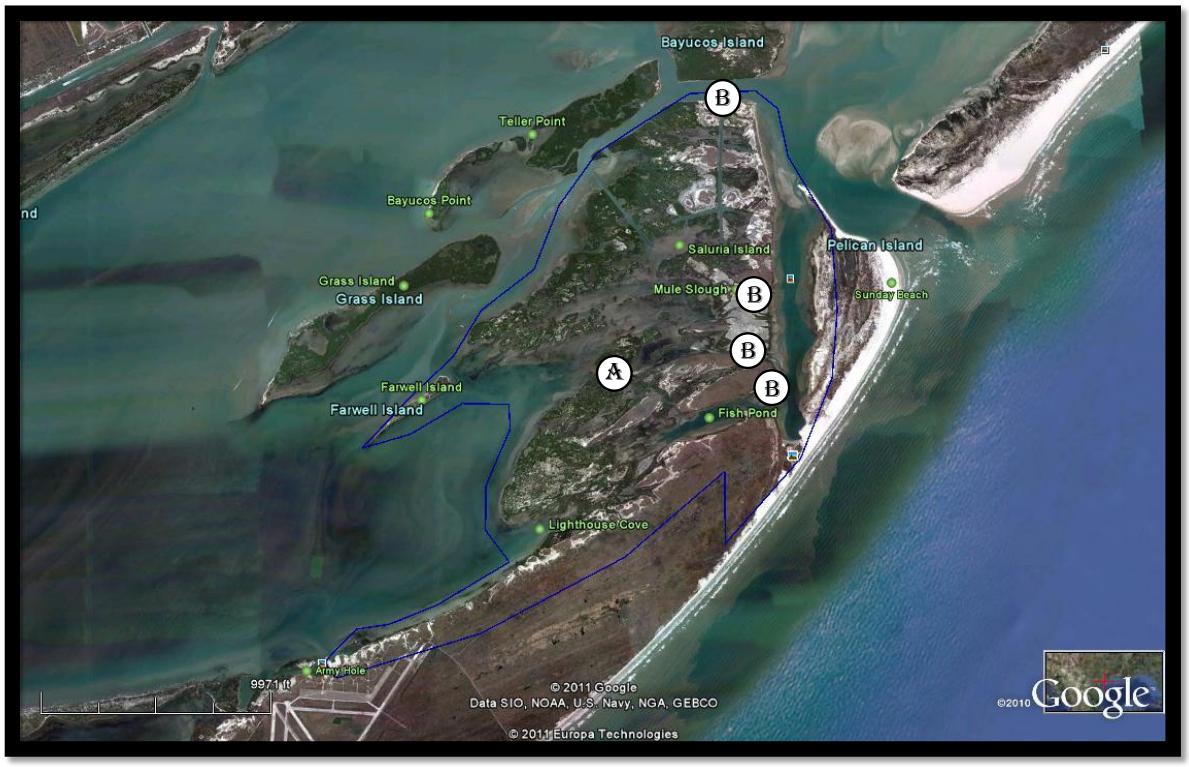
A. J-Hook Wetlands: encompass potential endangered Whooping Crane habitat;
B. Fishing Passes: various passes used by fishing guides;

Potential Partners: TGLO, USFWS, TNC, NRCS, TPWD, ICF, GBRA, GBRT, SABF
Potential Funding: $100K-$1M
Conservation Status: The J-Hook should be evaluated for hydrologic restoration and enhancement of essential fishery and shorebird wetland habitat as well as mangrove management. Additionally, the J-Hook area encompasses potential essential habitat for the present and future endangered Whooping Cranes population, especially in the event of relative sea-level rise

3b. Priority 3

J-HOOK

SATELITTE IMAGERY



SITE PHOTOS

(OBLIQUE GOOGLE EARTH IMAGERY)

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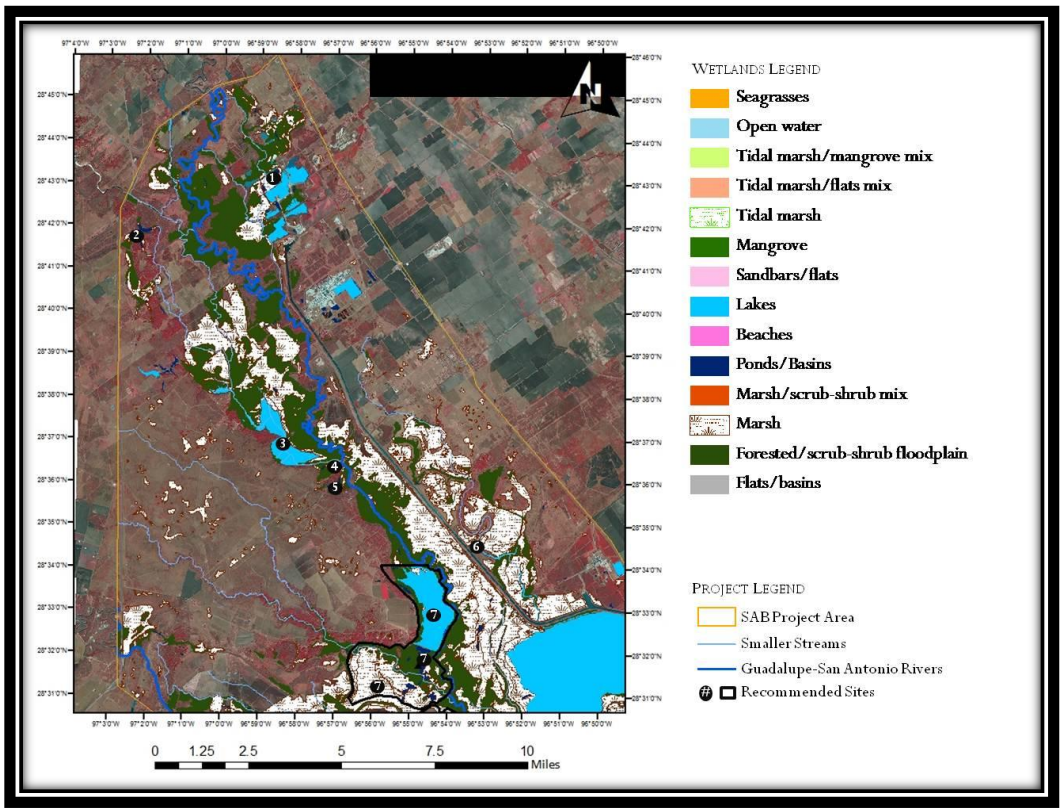
ALL RECOMMENDED PROJECT SITES

GUADALUPE DELTA-RIVERINE SITES



Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
1	1Sand Pit	Private	Restore habitat from disturbance		Colonial waterbirds including Least Tern nesting
2	Marthijohnni Swamp	Private	Restoration and management plan to keep rookery wet during nesting season	Landowner; USFWS; TPWD	Up to 8,000 nesting pairs of Herons, Egrets, Ibis, and other waterbird nesting colonies
3	Linn Lake	Private (multiple landowners)	Maintain overflow basin from siltation and local industry modification	Landowner; local industry; USFWS; TPWD	Colonial waterbirds and waterfowl nest, and Bald Eagle nests nearby
4	Linn Lake South	Private	Conservation easement or land acquisition		Herons nest

5	Bald Cypress Swamp	Private	Maintain cypress swamp rookery from siltation and modification; educate landowner on biological importance	Landowner; USFWS; TPWD	Yellow-crowned night heron, Anhinga, Great blue heron; Southernmost baldcypress swamp in Texas
6	Rookery off Barge Canal	Private	Determine ownership and develop rookery management plan; enhance rookery from Victoria barge canal modications	USFWS; TPWD; CBBEP; Westside Calhoun County Navigation District; NRCS	~ 2,000 mixed nesting pairs including colonial waterbirds; Site is an island in a former bayou
7	Guadalupe Fields*	Private	Restore hydrology of wetlands and swamp to remain wet during droughts; enhance swamp by planting cypress trees	Landowner; NRCS; USFWS; TPWD; TAMUK; GBRA; GBRT; SABF	~ 10,000 colonial nesting waterbirds, waterfowl, and freshwater dependent organisms/wetland communities

* denotes priority site

GUADALUPE DELTA-TIDAL SITES

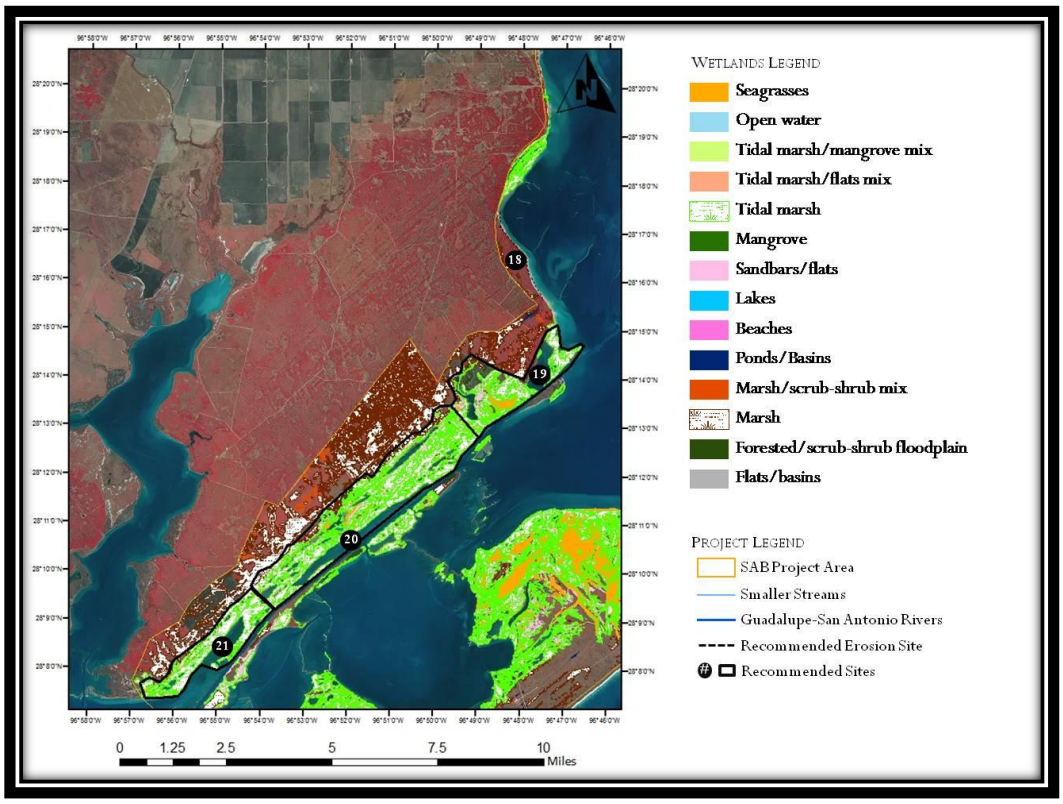
Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
8	Green Lake	Private	Develop management plan to ensure waterbird nesting and recreational use; Spread awareness of natural resource	Calhoun County; Local industry; USFWS; TPWD; CBBEP	Nesting Colonial waterbirds on island; With management, produce abundant waterfowl food and have an enhanced freshwater fishery
9	Carbide Colony	Private	Develop management plan to ensure waterbird nesting	Local industry; TPWD; USFWS; CBBEP	Several thousand pairs of colonial nesting waterbirds

10	Marsh Ranch	Private	Conservation easement or land acquisition	USFWS; NRCS; TNC; TPWD; GBRA; GBRT; SABF	Whooping Cranes, waterfowl, Egrets, Herons, Avocets, Ibis, etc
11	NE Mission Lake	Calhoun County Westside Navigation District	Develop management plan for nesting birds and predators	TPWD; USFWS; CBBEP	Colonial waterbirds
12	Guadalupe Delta Swamp Colony	TPWD and Private	Develop management plan	TPWD; USFWS; CBBEP	Supports ~2,000 nesting pairs of colonial waterbirds
13	Traylor's Cut*	Private	Restore river flow to Guadalupe Delta and reduce siltation	USFWS; TPWD; GBRA; GBRT; SABF	Wetland communities; Traylor's Cut is causing a shoaling of the river where the volume is diverted toward Mission Lake and the new river path is pirating the flow causing the old river channel to shoal and eventually will be cut off
14	Kamey Island Rookeries	Private (multiple)	Develop management plan and recogintion of colonial waterbird colonies	TPWD; USFWS; NRCS; CBBEP	Colonial waterbirds, waterfowl and songbirds in riparian woodlands
15	Guadalupe Delta Shoreline*	Private	Restore eroding shoreline and develop management plan for natural resources	USFWS, TPWD, CBBEP, NRCS, USACE	Sensitive marsh communities; eroding due to lack of siltation from flooding
16	Swan Point Ranch*	Private	Conservation easement or land acquisition	USFWS; NRCS; TNC; TPWD; GBRA; GBRT; SABF	Whooping Cranes, waterfowl, Egrets, Herons, Avocets, Ibis, etc

17	Guadalupe Delta	Private	Conservation easement or land acquisition; and restoration of marsh communities	USFWS; NRCS; TNC; TPWD; GBRA; GBRT; SABF	Whooping Cranes, waterfowl, Egrets, Herons, Avocets, Ibis, etc; and, wetland communities

* denotes priority site

BLACKJACK PENINSULA

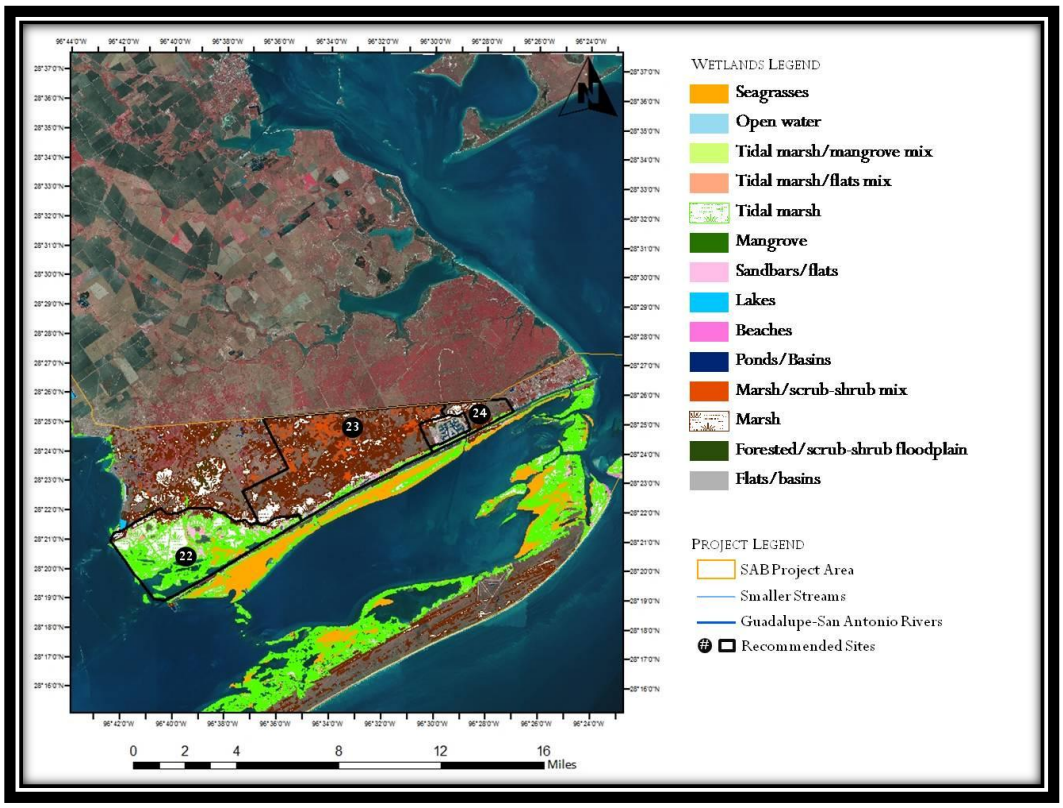


Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
18	ANWR Shoreline Erosion	Aransas National Wildlife Refuge; USFWS	Restore shoreline from erosion and maintain shoreline	USFWS	
19	ANWR Mustang Lake Wetlands	USFWS	Conservation easement or land acquisition; maintain shoreline from GIWW wave erosion; and manage mangrove development	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds

20	ANWR Sundown Bay Wetlands	USFWS	Conservation easement or land acquisition; Develop management plan and education to share land with wintering Whooping Cranes	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPW; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds
21	ANWR Dunham Bay Wetlands	USFWS	Conservation easement or land acquisition; Develop management plan and education to share land with wintering Whooping Cranes	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPW; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds

* denotes priority site

SEADRIFT-PORT O'CONNOR RIDGE PENINSULA



Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
22	Welder Flats*	Private (multiple owners)	Conservation easement or land acquisition; Restore hydrology; Manage erosion from GIWW and mangrove development	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPW; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds

23	Arapaho Holdings*	Private	Conservation easement or land acquisition to prevent development; Shoreline protection from GIWW wave erosion	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds; Upland wetlands determined jurisdictional by the EPA
24	North Seadrift-Port O'Connor Ridge Shoreline Wetlands*	Private	Conservation easement or land acquisition to prevent development; Shoreline protection from GIWW wave erosion	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds

* denotes priority site

BLACKJACK PENINSULA OPEN BAY ISLANDS

Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
25	ANWR Dunham Island Wetlands	USFWS	Conservation easement or land acquisition; Develop management plan and education to share land with wintering Whooping Cranes; Manage shoreline erosion and mangrove development	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPW; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds
26	Grass Island*	TGLO	Develop new island to enahnce present island	TGLO; CBBEP; USACE; GBRA; GBRT; SABF	Colonial waterbirds

27	ANWR S. Bludworth Island Wetlands	USFWS	Conservation easement or land acquisition; Develop management plan and education to share land with wintering Whooping Cranes; Manage shoreline erosion and mangrove development	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds
28	ANWR N. Bludworth Island Wetlands	USFWS	Conservation easement or land acquisition; Develop management plan and education to share land with wintering Whooping Cranes; Manage shoreline erosion and mangrove development	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPW; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds
29	ANWR Roddy Island Wetlands	USFWS	Conservation easement or land acquisition; Develop management plan and education to share land with wintering Whooping Cranes; Manage shoreline erosion and mangrove development	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds

30	ANWR Rattlesnake Island Wetlands	USFWS	Conservation easement or land acquisition; Develop management plan and education to share land with wintering Whooping Cranes; Manage shoreline erosion and mangrove development	USFWS; NRCS; EPA; NOAA; USACE; TXDOT; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes, waterfowl, and shorebirds

* denotes priority site

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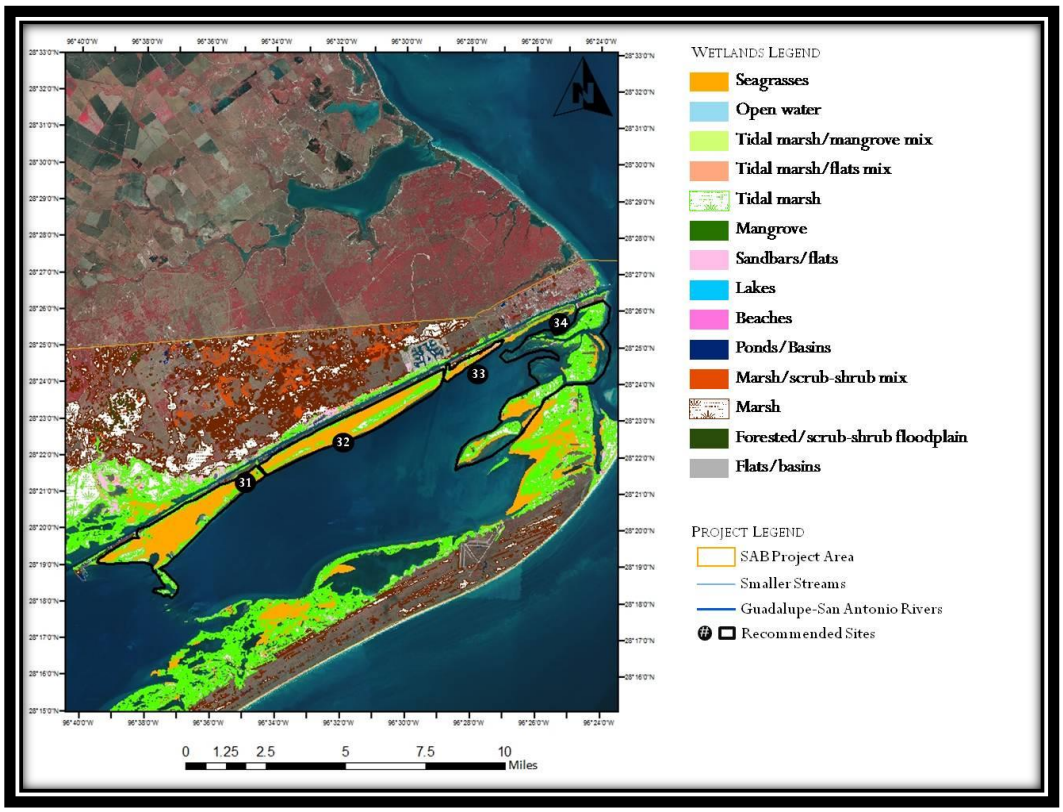
SEADRIFT-PORT O'CONNOR PENINSULA OPEN BAY ISLANDS

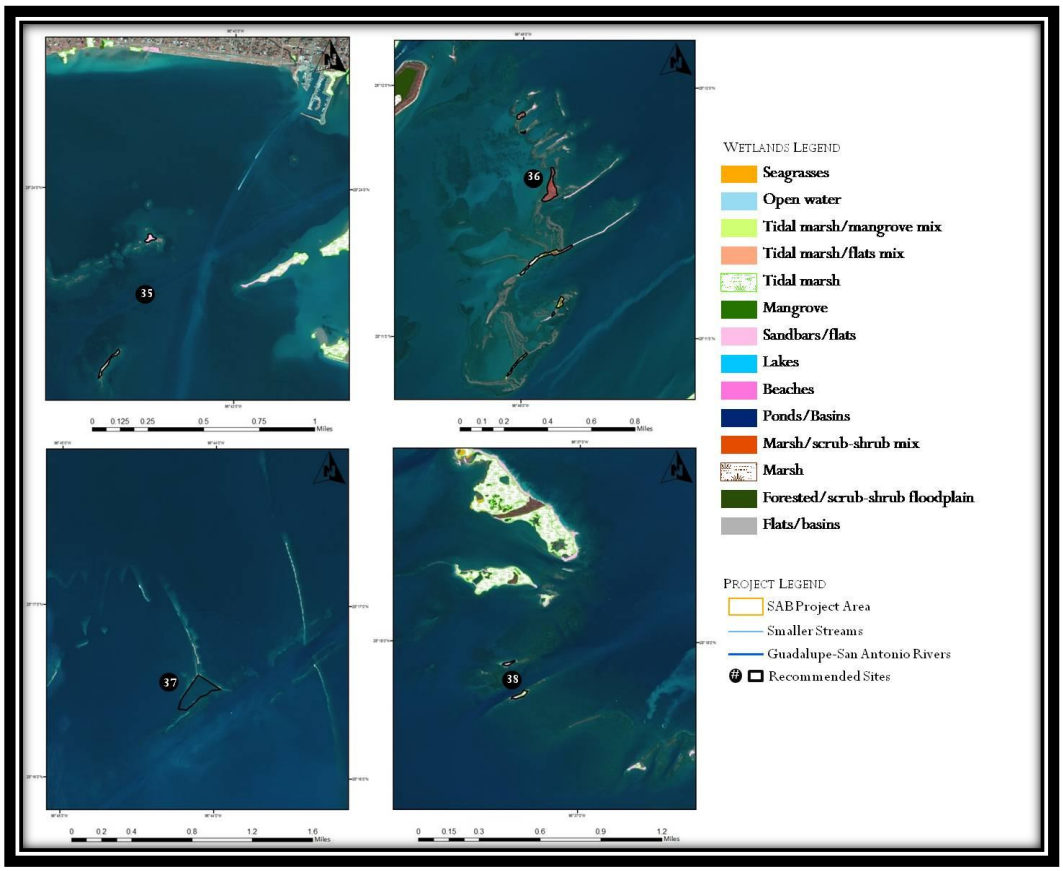


Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
31	Shoalwater Bay Wetlands	TGLO	Conservation easement of land acquisition; Develop management plan from siltation and education to share land with wintering Whooping Cranes; Manage mangrove development	USFWS; TPWD; USACE; ICF; CCA; GBRA; GBRT; SABF	Whooping Cranes, Piping plovers on flats, shorebirds, and waterfowl

32	Dewberry Island Wetlands*	Public/TGLO	Develop management plan to not raise elevation of this ridge and allow it to become vegetated; Conservation easement of land acquisition; Develop management plan from siltation and education to share land with wintering Whooping Cranes; Manage mangrove development	USFWS; TPWD; USACE; ICF; CCA; GBRA; GBRT; SABF	Piping plover on mud flats, shorebirds, waterfowl, and Whooping cranes
33	Blackberry Island Wetlands*	Public/ TGLO	Conservation easement of land acquisition; Develop management plan from siltation and education to share land with wintering Whooping Cranes; Manage mangrove development	USFWS; TPWD; USACE; ICF; CCA; GBRA; GBRT; SABF	Piping plover on mud flats, shorebirds, waterfowl, and Whooping cranes
34	Bayucos Island Wetlands	TGLO	Conservation easement of land acquisition; Develop management plan from siltation and education to share land with wintering Whooping Cranes; Manage mangrove development	USFWS; TPWD; USACE; ICF; CCA; GBRA; GBRT; SABF	Piping plover on mud flats, shorebirds, waterfowl, and Whooping cranes

* denotes priority site

LOWER & MID SAN ANTONIO BAY ROOKERY ISLANDS



Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
35	Seadrift Island 609-280B&C	TGLO owned and leased by Audubon Society	Restoration from erosion	TGLO; CBBEP; USACE; Gulf Ecosystem Restoration Task	Nesting Colonial waterbirds
36	Second Chain Islands*	TGLO owned and leased by Audubon Society	Restoration from erosion	TGLO; CBBEP; USACE; GBRA; GBRT; SABF; Gulf Ecosystem Restoration Task	Colonial Waterbird Conservation; Egrets, Herons, Skimmers, and Terns;

37	Big Bird Island*	TGLO submerged land	Develop new rookery island	TGLO; CBBEP; USACE; GBRA; GBRT; SABF; Gulf Ecosystem Restoration Task	Potential colonial waterbird island; no other rookery island in area
38	South Pass Islands	TGLO	Restoration from erosion	TGLO; CBBEP; USACE; Gulf Ecosystem Restoration Task	Nesting Colonial waterbirds; Black Skimmers

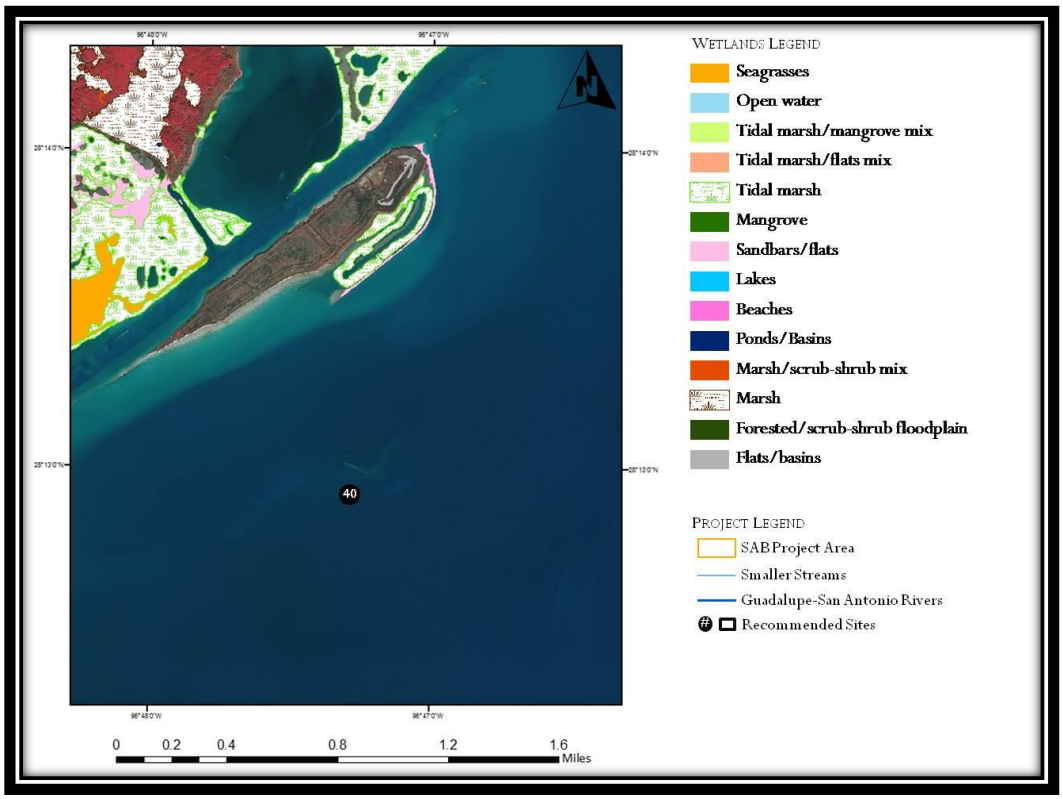
* denotes priority site

UPPER SAN ANTONIO BAY ROOKERY ISLANDS

Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
39	Sundown (Grass) Islands	TGLO owned and leased by Audubon Society	Restoration from erosion and maintanence	USFWS; TPWD; USACE; CBBEP; National Audubon Society; CCA; GBRA; GBRT; SABF	Colonial waterbirds; largest in bay system

* denotes priority site

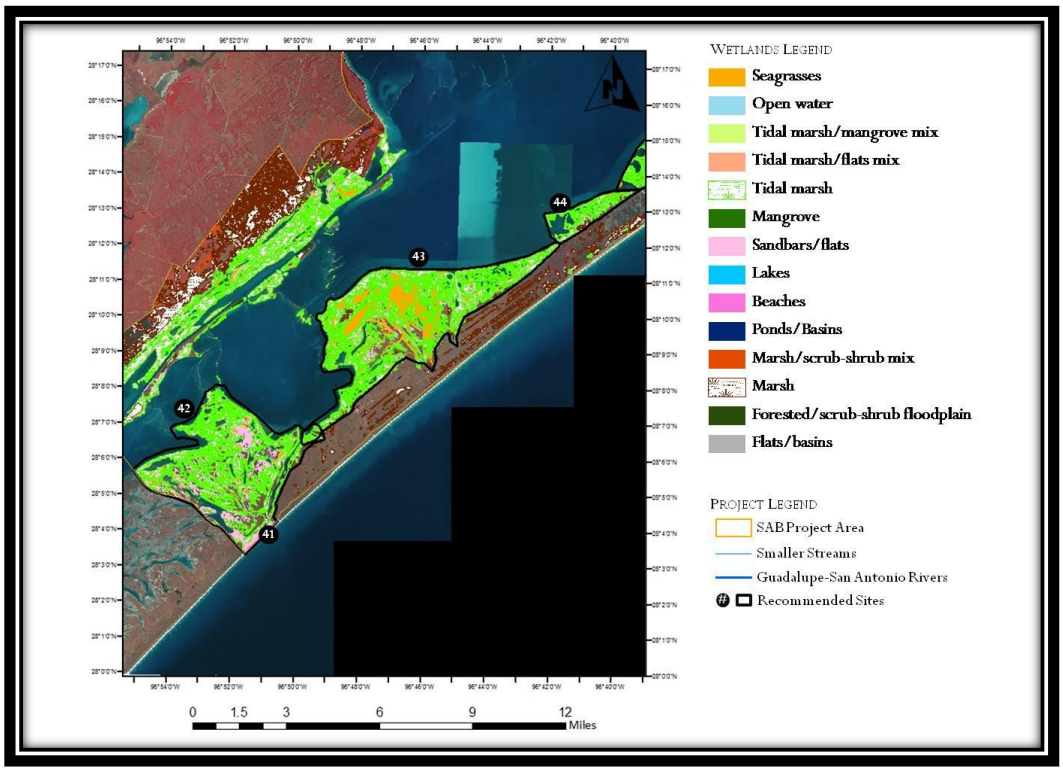
OYSTER REEFS



Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
40	Chicken Foot Oyster Reef*	TGLO submerged land	Restore degraded oyster reef	TGLO; CCA; TPWD	Oyster reef and fishery habitat

* denotes priority site

LOWER SAN ANTONIO BAY BARRIER ISLANDS

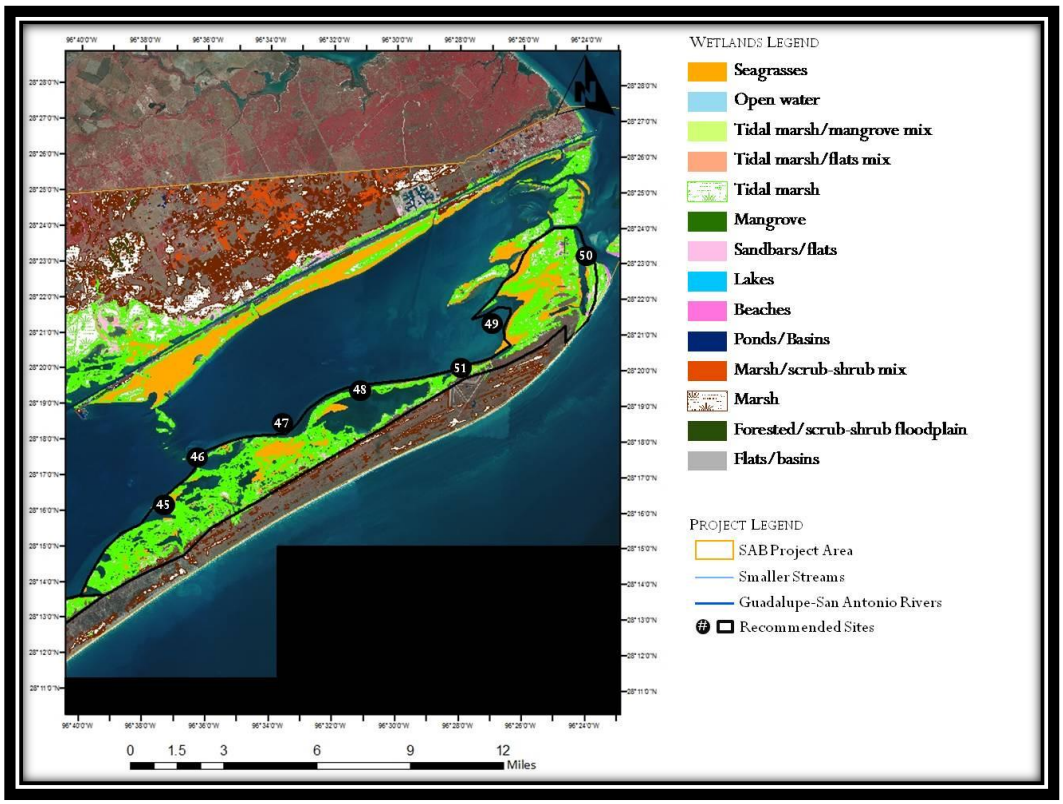


Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
41	Cedar Bayou Pass*	Private	Restore hydrologic connection between San Antonio Bay and the Gulf of Mexico	TGLO; USWFS; CBBEP; USACE; TPWD	Fishery habitat
42	St. Joe Marsh/Tidal Flat	Private	Conservation easement of land acquisition	TGLO; USWFS; CBBEP; USACE; TPWD; TNC; NRCS; GBRA; GBRT; SABF	Whooping Cranes and shorebirds

43	S. Matagorda Island Tidal Fan Wetlands	USFWS	Restore hydrologic connectivity via culverts in roads and levees, breaches in levees; and develop management plan for mangrove establishment and education to share land with wintering Whooping Cranes	USFWS; NRCS; EPA; NOAA; TPWD; TGLO; CBBEP, ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes and shorebirds
44	Panther Point Back Barrier Wetlands	USFWS	Develop management plan for mangrove establishment and education to share land with wintering Whooping Cranes	USFWS; NRCS; EPA; NOAA; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes and shorebirds

* denotes priority site

UPPER SAN ANTONIO BAY BARRIER ISLANDS



Site Number	Site Name	Land Ownership	Conservation Strategy	Potential Partners	Species
45	Long Lake Entrance	TGLO submerged land	Maintain hydrologic connectivity with San Antonio Bay system	TGLO; CCA; TPWD	Fishery habitat
46	S. Pass Lake Entrance	TGLO submerged land	Maintain hydrologic connectivity with San Antonio Bay system	TGLO; CCA; TPWD	Fishery habitat
47	Vandeveer Island S. Back Barrier Island Wetlands	USFWS	Develop management plan for mangrove establishment and education to share land with wintering Whooping Cranes	USFWS; NRCS; EPA; NOAA; TPWD; TGLO; CBBEP, ICF; SABP; GBRA; GBRT; SABF; SARA	Whooping Cranes and shorebirds

48	Pringle Lake Entrance	TGLO submerged land	Maintain hydrologic connectivity with San Antonio Bay system	TGLO; CCA; TPWD	Fishery habitat
49	J-Hook*	USFWS	Develop management plan for mangrove establishment and education to share land with wintering Whooping Cranes; Maintain hydrologic passes	USFWS; NRCS; EPA; NOAA; TPWD; TGLO; CBBEP; ICF; SABP; GBRA; GBRT; SABF; SARA; CCA	Whooping Cranes, shorebirds, and fishery habitat
50	Sunday Beach*	TGLO submerged land	Maintain hydrologic connectivity with San Antonio Bay system	TGLO; CCA; TPWD	Fishery habitat
51	Army Hole Entrance	TGLO submerged land	Maintain hydrologic connectivity with San Antonio Bay system	TGLO; CCA; TPWD	Fishery habitat

* denotes priority site

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