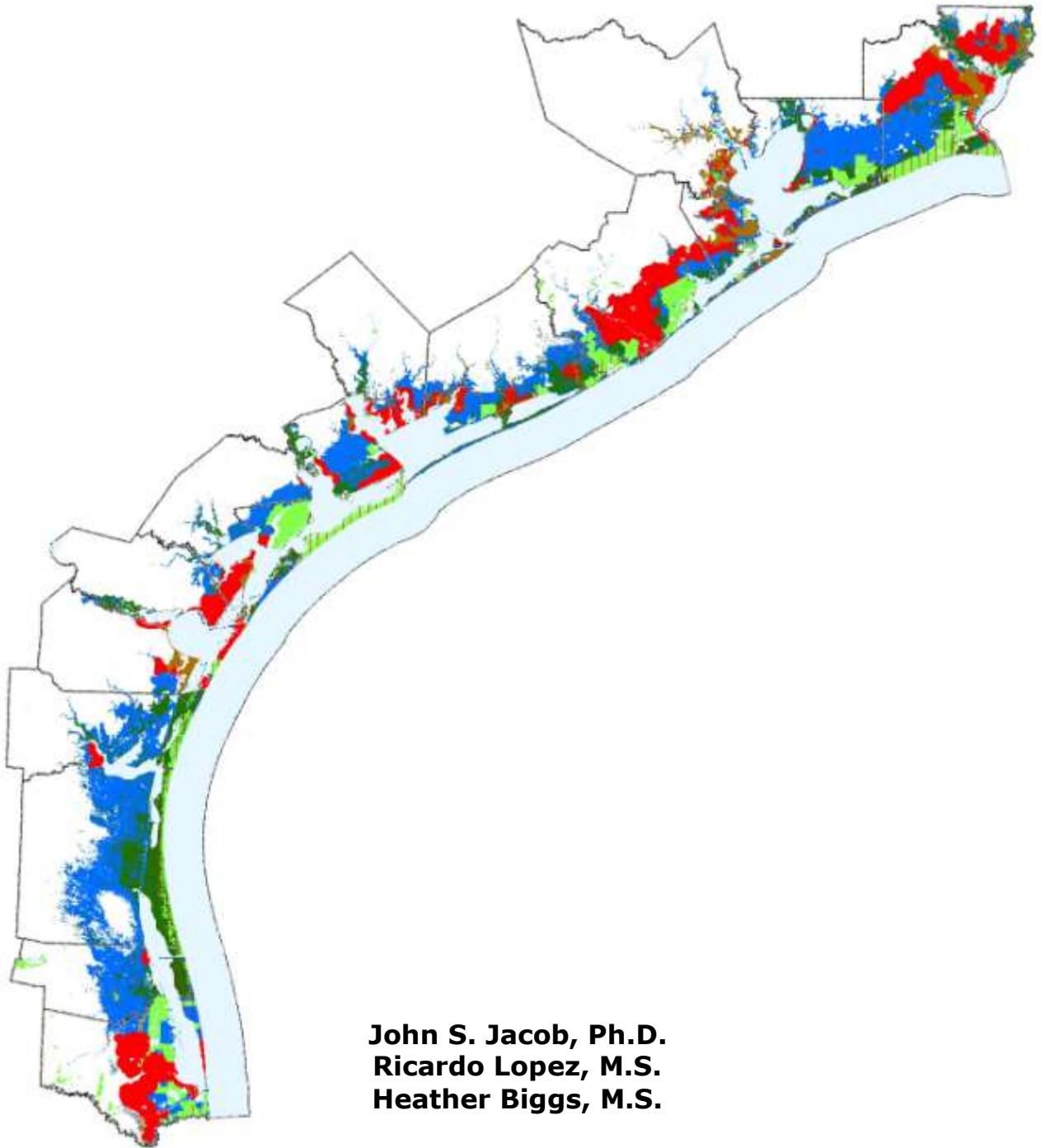


Anticipated Local Response to Sea Level Rise Along the Texas Coast: A First Approximation



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INTRODUCTION

This report was prepared under contract to Industrial Economics, Inc., in consultation with Jim Titus of the EPA. The purpose of this project was to prepare a set of maps showing anticipated local response to sea level rise in 17 Texas Coastal Counties: Jefferson, Orange, Chambers, Galveston, Harris, Brazoria, Matagorda, Jackson, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. This report is part of a national effort on the part of the Environmental Protection Agency to begin a national assessment of the impacts of sea level rise and to begin to encourage long-term thinking and planning for sea level rise by local officials.

The maps presented here are based on extensive conversations with local experts as well as our own local knowledge (particularly in Galveston Bay region counties).

The principal assumption of this report is that people will protect developed areas along threatened shorelines. We make no assumptions as to the degree of effort that people might make, nor as to the effectiveness of their efforts. Our maps show where these efforts can be expected to take place in the next 20-30 years. There can be little doubt that greater or lesser efforts will be made as sea level rises, and difficult choices have to be made. The maps in this report basically assume that if resources were sufficient, all of the indicated areas where protection is certain or likely would have a substantial protection effort.

In order to represent the areas that would mostly likely be affected by sea level rise, a mask for the study area was created. Two main components for the study area include:

1. Elevation: Less or equal to 20 feet (6.096 m)
2. Shoreline Buffer: Less or equal to 1000 feet. The buffer was used to complement the first criterion (elevation) in shoreline areas with high elevation values where otherwise only a very small strip would be shown.

The following categories, laid out by Industrial Economics and the EPA, were used for this project:

1. Shore Protection Almost Certain: Any currently developed areas, including areas of somewhat spotty development, where we assume that the whole area would be subject to protection. We used no strict rule or protocol to make this determination. Certainly if an area had 50% or more development, we would categorize the entire area as Almost Certain. But many areas of significantly less than 50% development were also categorized as almost certain protection. If substantial infrastructure (especially roads) were already in place, then it seemed obvious to us that protection would occur in the entire area.

Within this category we also included areas not yet developed, but that are already slated for development, or where there is good agreement that development is "imminent". The printed maps delivered with this project show a single "Almost

Certain" category, but information on existing and yet-to-be-developed areas is preserved within the GIS shapefiles associated with this project .

2. Shore Protection Likely: Areas forecast to be developed within the next 30 or so years, and not within currently developed or very soon-to-be-developed areas. The current map is based on personal and expert knowledge of areas undergoing development and corridors that will likely see development in the future.

We did not include areas that were excluded from insurance under the Coastal Barrier Resources Act (CBRA) in this category. Many of these areas are already protected as state parks (e.g., Matagorda Island and Mustang Island State Parks). The non-state park CBRA areas theoretically could be developed by self-insured developers with deep pockets, but our informants did not think this was likely within the time frame of this report.

3. Shore Protection Unlikely: All croplands, rangelands, and woodlands that are not wetlands or areas otherwise shielded from development. No development is foreseen for these areas.
4. Wetlands. Wetlands from the NWI maps (1993). These include both palustrine, estuarine, and lacustrine wetlands. We excluded diked, excavated, and farmed wetlands. The printed maps do not differentiate between palustrine and estuarine wetlands, but the information is preserved in the digital GIS associated with this project.
5. Conservation Lands. Known conservation areas with permanent or long term (+100 yrs) easements. Most of these areas probably would not be subject to protection against sea level rise.

Table 1. Public and Private landowner classifications

Ownership	Land Area	Shore Protection Likelihood	Data Used to Identify Land Area
Public	County-owned parks ¹	No protection	Local maps and maps.google.com
	State-owned parks and open space	No protection	Texas General Land Office website.
	State-owned submerged lands ²	No protection	Estuarine wetlands from National Wetland Inventory
Private	Wetlands ³	Unlikely (with some areas Likely)	NWI
	Developed or imminently slated to be developed lands.	Certain	New land use map developed for this project and expert interviews.
	Lands forecast to be developed in next 30 or so years	Likely	Expert interviews.
	Undeveloped areas with no development forecast.	Unlikely	New land use map developed for this project and expert interviews.
	CBRA areas	Unlikely	FEMA maps ⁴
<p>1. Counties in the area have no formal policy precluding shore protection.</p> <p>2. The tidal wetland line is not shown on the printed maps, but is preserved in the digital files. State owned or controlled lands also include the rolling easement sea-ward of the vegetation line on the Gulf side. This is a narrow strip of land too small to show on the maps.</p> <p>3. Most of the wetlands in the study area are estuarine or tidal, but non-tidal palustrine wetlands are also included in the printed maps..</p> <p>4. The underlying land area was left as blue to preserve the information that there is no other restriction here.</p>			

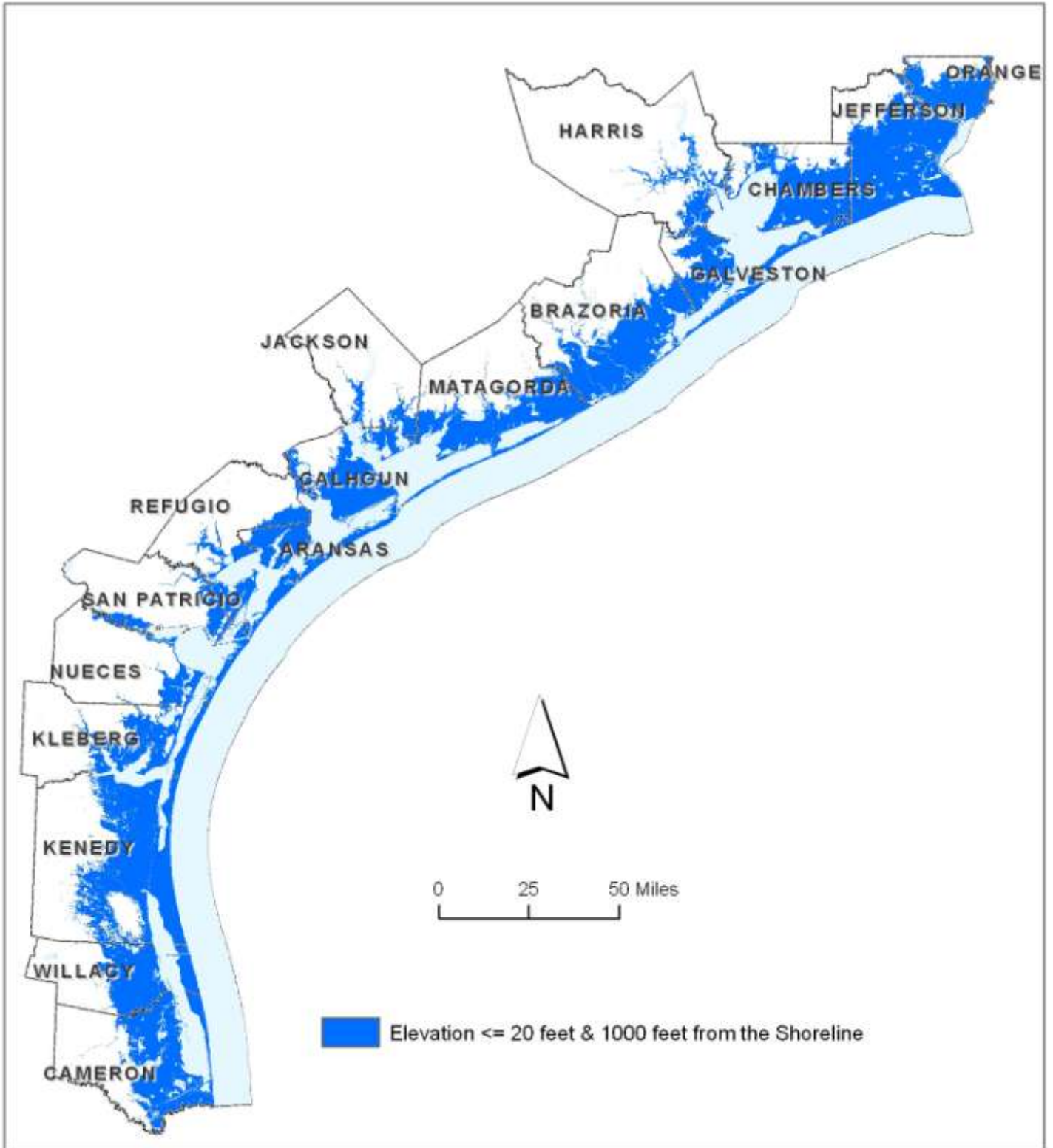


Figure 1: Project Study Area

CONTROLLING LEGAL ISSUES FOR SEA LEVEL RISE RESPONSE IN TEXAS

After market forces, the next largest controlling factor of where development will go is the law, i.e., where can one legally build? The focus of this section is on laws and regulations that control or limit development near the shoreline.

The major state controlling laws for development in Texas coastal areas are the Open Beach Law (Title 12, Section 61), the Coastal Public Lands Management Act (Title 12, Section 33), and the Dune Protection Act (Title 2, Subtitle E, Chapter 63). The major federal controlling law is Section 10 of the Rivers and Harbors Act, and to a lesser extent Section 404 of Clean Water Act. Figure 1 graphically displays the spatial controls of these laws. There are no state wetland laws of any significance.

The State of Texas has exclusive control over state lands. The most important category of state lands in the coastal zone is "submerged lands", defined as lands within tidewater limits (§33.004). Within these lands, the State, through the Texas General Land Office, can control any construction or significant land modification. The state rarely cedes complete control of its lands; the applicant or potential user of the land must obtain a lease or an easement from the state.

Submerged coastal lands in Texas are also governed by Section 10 of the federal Rivers and Harbors Act. The submerged lands are owned by the State of Texas, but are also considered "waters of the U.S." Because most of the submerged lands are owned by the State of Texas, relatively few development projects are likely to occur directly on these lands. But permits can be obtained for piers, jetties, bulkheads, etc, that impinge on these waters, and it is unusual that one or another of these structures is not present where development occurs adjacent to these waters or submerged lands. For these kinds of developments, an easement or lease from the General Land Office must be obtained as well as Section 10 permit from the U.S. Army Corps of Engineers.

Through the Open Beaches Act, additional state control above the mean high tide is extended to the vegetation line on beaches fronting the Gulf of Mexico, even though these lands are for the most part privately owned. In addition, critical dune areas behind the vegetation line on the Gulf of Mexico are subject to additional protection through the Dune Protection Act. All dunes on Gulf-of-Mexico-fronting shorelines are considered to be "critical".

Although the Gulf of Mexico beaches are theoretically well protected against development through the Open Beaches Act, the private lands adjacent to these beaches are subject to intense development pressure. The prohibition against development on private lands between the mean high tide and the line of vegetation (LV) is well established in state law. Landward of the LV, the state Dune Protection Act (Natural Resources Code, Chapter 63) requires that local governments establish a dune protection plan, and most of these require a minimum setback landward of the LV. The dunes landward of the LV usually have some kind of protection, but development on them can and does occur under permit conditions of "no net loss".

The use of the Line of Vegetation, as the landward line of public access and state control, means that the state essentially has a "rolling easement" on these lands, given that the line is subject to change from storms and sea level rise. Sellers are in fact required to notify potential buyers of property fronting the Gulf of Mexico of the potentially changing line.

Gulf of Mexico beach-front development cannot legally be protected from erosion by armoring, except under a few exemptions. The rolling easement and prohibition against armoring does not mean that landowners cannot undertake protective measures. Beach nourishment is allowed and in fact encouraged along most of the coast, as long as it follows the stipulations of the state Coastal Erosion Protection and Recovery Act. Structural methods such as sand-filled geotubes are also allowed under current interpretation of state law. Where these geotubes are in place, they have become the effective LV (Ray Newby, TXGLO, personal communication). It remains to be seen how interpretations will change if a major storm effectively moves the LV landward of existing geotubes. If geotubes are used, then the landowners are also required to maintain the existing beach width through nourishment.

The bottom line for this area of Texas is that development is likely to occur near the Gulf shoreline for the foreseeable future as long as federal flood and state wind and hail insurance can be obtained. The only areas where this insurance is not available are in areas governed by the federal Coastal Barriers Resource Act (CBRA).

On bayside shorelines, there is no guaranteed public access or state control above the mean high tide line. Marina developments will continue to occur on bayside properties, and easements will be granted to dig canals through submerged lands to open bay waters, but relatively little development is likely to occur in Section 10 estuarine wetlands/ submerged lands of Texas because both a Section 10 permit is required as well as a lease or easement from the state. Development adjacent to these lands can occur with little or no restrictions. Bulkheads can be built just adjacent to submerged lands without a permit as long as they are just inside the upland line.

Section 404 of the Clean Water Act theoretically prohibits development in wetlands other than those covered by Section 10 of the Rivers and Harbors Act, but permits are generally easier to obtain for inland wetlands than for estuarine wetlands.

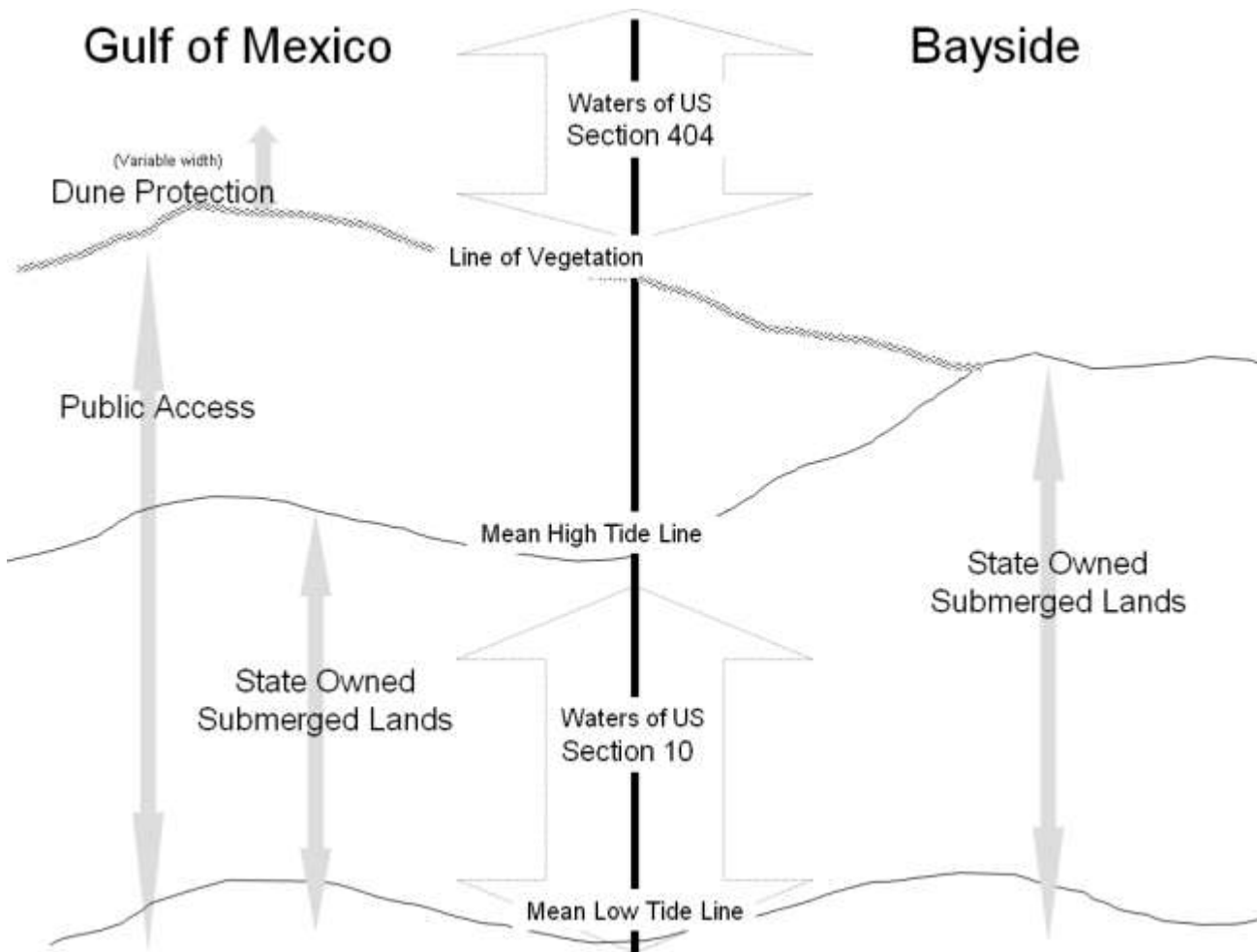


Figure 2. Schematic of Legal Controls on Development on Gulf and Bayside Shorelines

COUNTY DESCRIPTIONS

The majority of the Texas coastal counties are increasing in population. Over 6 million more people are expected to move to the Texas Coast over the next 30 years. This is over twice the current amount. Kenedy county, where the majority of the land is primary owned by the Kenedy and King Ranches, is the only county that is expected to decrease in population. A brief description of the growth patterns as well as the current land uses for each of the coastal counties is explained in the county summaries below. Table 3 and Figure 3 depict the percent of change as well as the increase of population within each county between 2005 and 2040. The maps corresponding to each county description demonstrate the categories outlined by Industrial Economics and the EPA mentioned earlier in this report.

Table 3. Projected Population Growth in Texas Coastal Counties

	2005	2040	Pop Change	% Change
Chambers	30,745	81,551	50,806	165%
Harris	3,750,871	8,561,661	4,810,790	128%
Brazoria	276,453	627,769	351,316	127%
San Patricio	77,295	156,199	78,904	102%
Cameron	382,961	729,138	346,177	90%
Nueces	338,366	525,119	186,753	55%
Jefferson	258,053	405,972	147,919	57%
Aransas	24,893	33,333	8,440	34%
Kleberg	35,682	46,545	10,863	30%
Galveston	262,485	339,658	77,173	29%
Willacy	21,551	26,198	4,647	22%
Matagorda	39,971	48,365	8,394	21%
Calhoun	21,996	26,049	4,053	18%
Jackson	15,236	17,499	2,263	15%
Orange	87,892	93,480	5,588	6%
Refugio	8,258	8,762	504	6%
Kenedy	447	400	-47	-11%
Total	5,633,155	11,727,698	6,094,543	108%

Source: Derived from Texas State Data Center and Office of the State Demographer, Data from the Texas State Demographer's Office. Accessed October 2007. <<http://txsdc.utsa.edu/>>

Projected Population Growth for Texas Coastal Counties 2005-2040

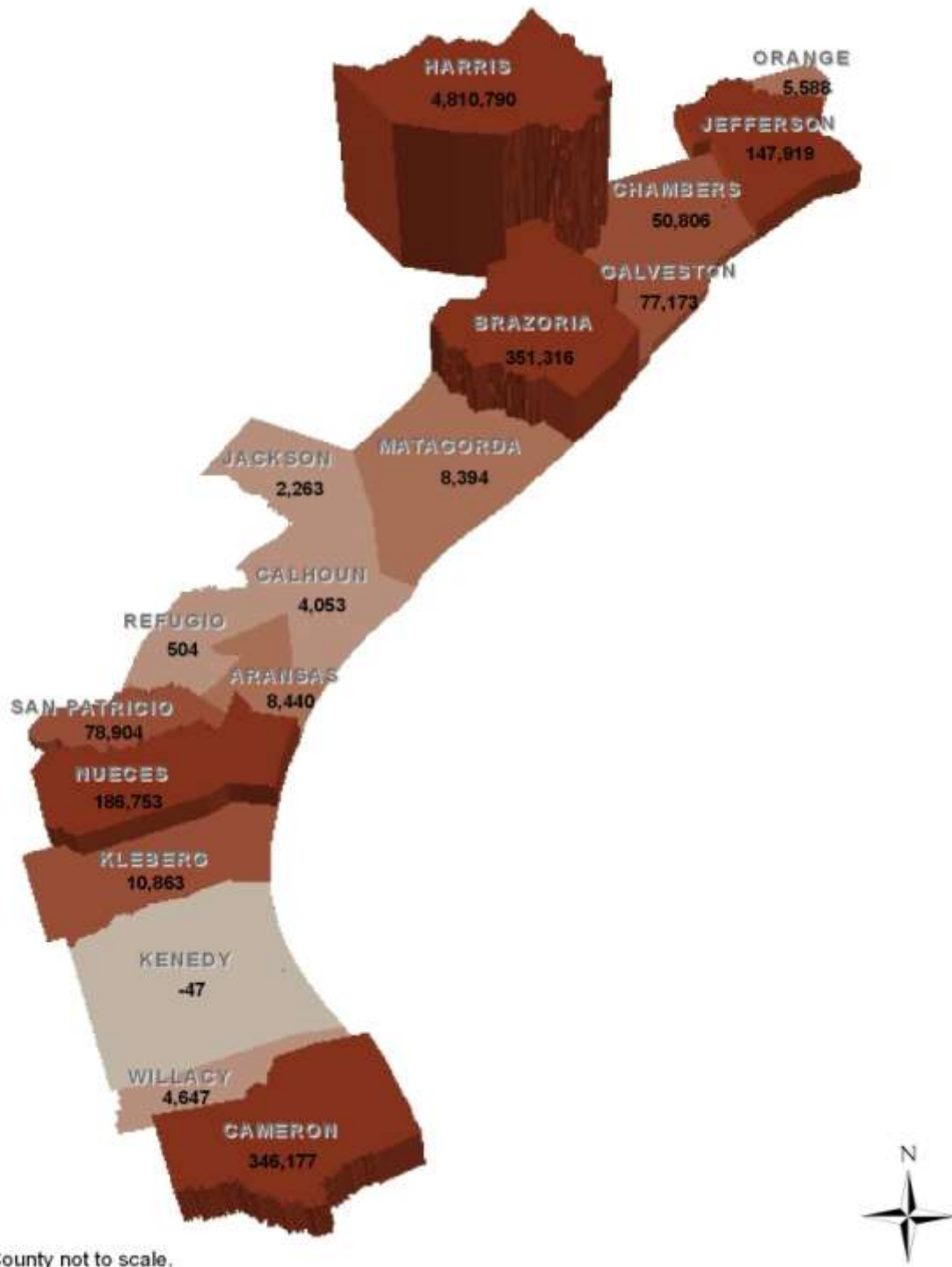


Figure 3: Map of the Projected Population Increase from 2005 to 2040 (Harris County increase not to scale)

Source: Derived from Texas State Data Center and Office of the State Demographer, Data from the Texas State Demographer's Office. Accessed October 2007.
<http://txsdc.utsa.edu/>

ORANGE COUNTY

Orange County borders Louisiana to the east and Jefferson County to the south and west. Although it is not adjacent to the Gulf of Mexico, about three-fourths of the county is below 20 feet in elevation and within the project study area. The southern portion of the county is nestled between Sabine Lake and the Sabine River to the south and east and the Neches River to the west, creating a "V" shape appearance.

Large patches of emergent herbaceous and forested wetlands line the Sabine and Neches Rivers floodplains. Development is constrained in these areas because of frequent and long-term flooding in these river bottoms.

Small patches of low and high intensity development are located near Bridge City in the south, Vidor to the west, and the city of Orange to the east. Amongst the development in the southern "bowl" of the county, small areas of pastures, grasslands and mixed forest remain.

Our informants predict that most of the future growth will be along FM 1442 and FM 105 near Bridge City, as well as in and around Vidor, as Beaumont, in eastern Jefferson County, expands due to projected construction of industrial complexes. The corridors connecting Vidor to Bridge City and Mauriceville are also expected to experience significant growth. Additional growth is also expected along Interstate 10 which straddles the midsection of the county

Although the State Demographer only expects minimal growth (6%), the Orange County Economic Development Director suggested that significant growth is likely. This growth is likely a function of refinery expansion in neighboring Jefferson County.

Sea Level Rise Response in Texas

Orange County

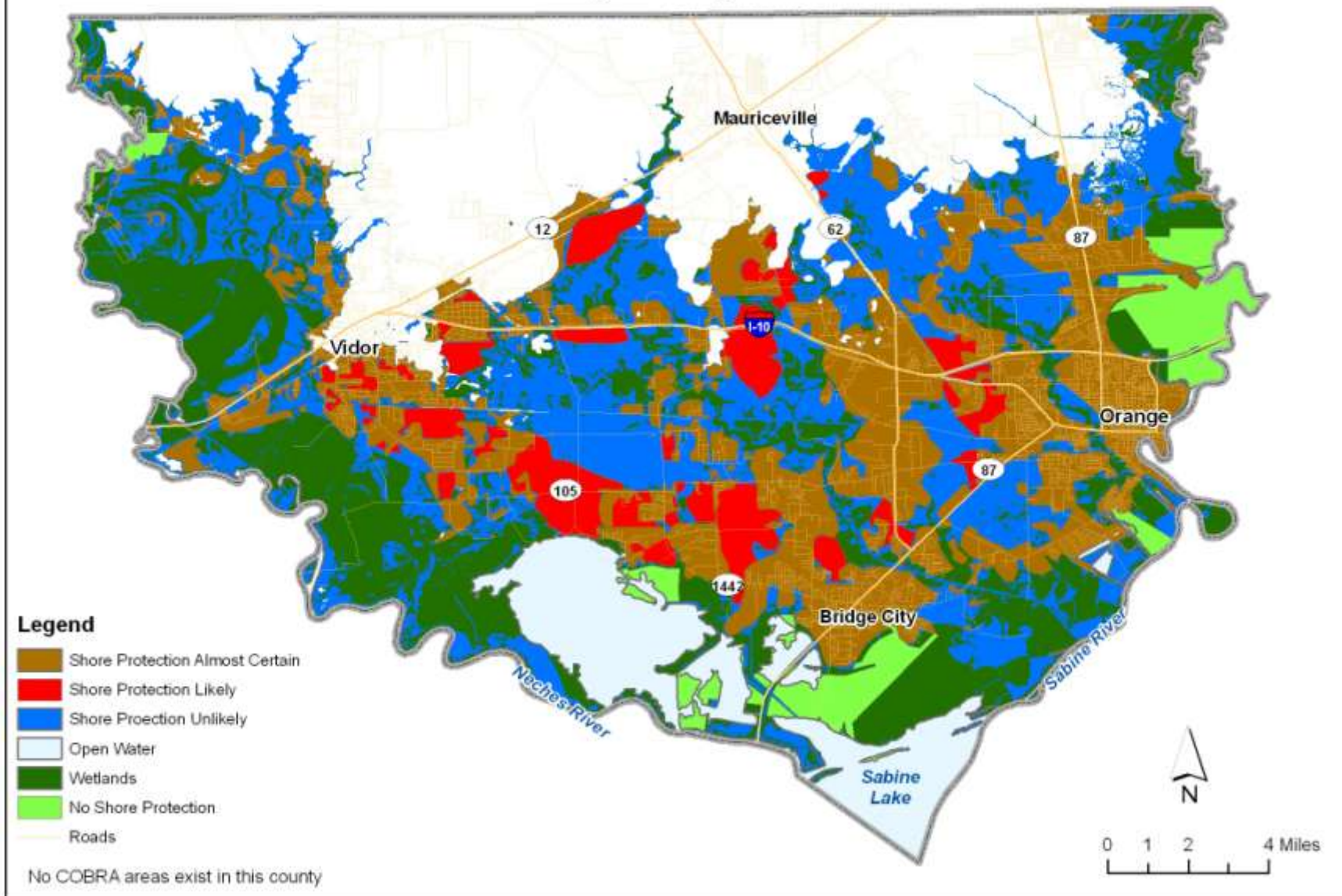


Figure 4. Sea Level Rise Response in Orange County

JEFFERSON COUNTY

Jefferson County borders Louisiana to the east and Chambers County to the west. This county is predominately pasture and agricultural land. Much of the coastal areas are made up of emergent herbaceous wetlands. However, dense development exists along the eastern border of the county in and around Beaumont, Nederland, Port Neches and Port Arthur, the famous "Golden Triangle" of Texas.

Jefferson County is not currently experiencing much growth. More than one informant, in fact, said they did not expect much new growth at all. Interviews with more savvy informants, however, reveal that significant growth is very likely, and some of it has already started.

Beaumont's major growth direction will be to the west along Hwy 90 and to the north, for the most part outside of our study zone.

Significant growth may occur to the southwest along I-10. New subdivisions are spouting up in Hamshire towards Winnie. It is not clear how dense this new development will be, but there will likely be some kind of development in this corridor, even if dispersed.

Not much is expected to happen to the east of the I-10 corridor toward Port Neches, primarily because of what are perceived to be "bad school districts". We show here some expansion of Port Neches back to the west and some infill to the east.

The main driver of new growth in this county will be new activity associated with the refinery industry. Shell will invest at least \$7 billion in new refinery capacity in Port Arthur, and several other refineries are gearing up for major expansion.

The southern flank of Jefferson County is well protected from development by state and federal preserves and CBRA designation. Little growth is expected between State Hwy 73 and the preserves.

Sea Level Rise Response in Texas Jefferson County

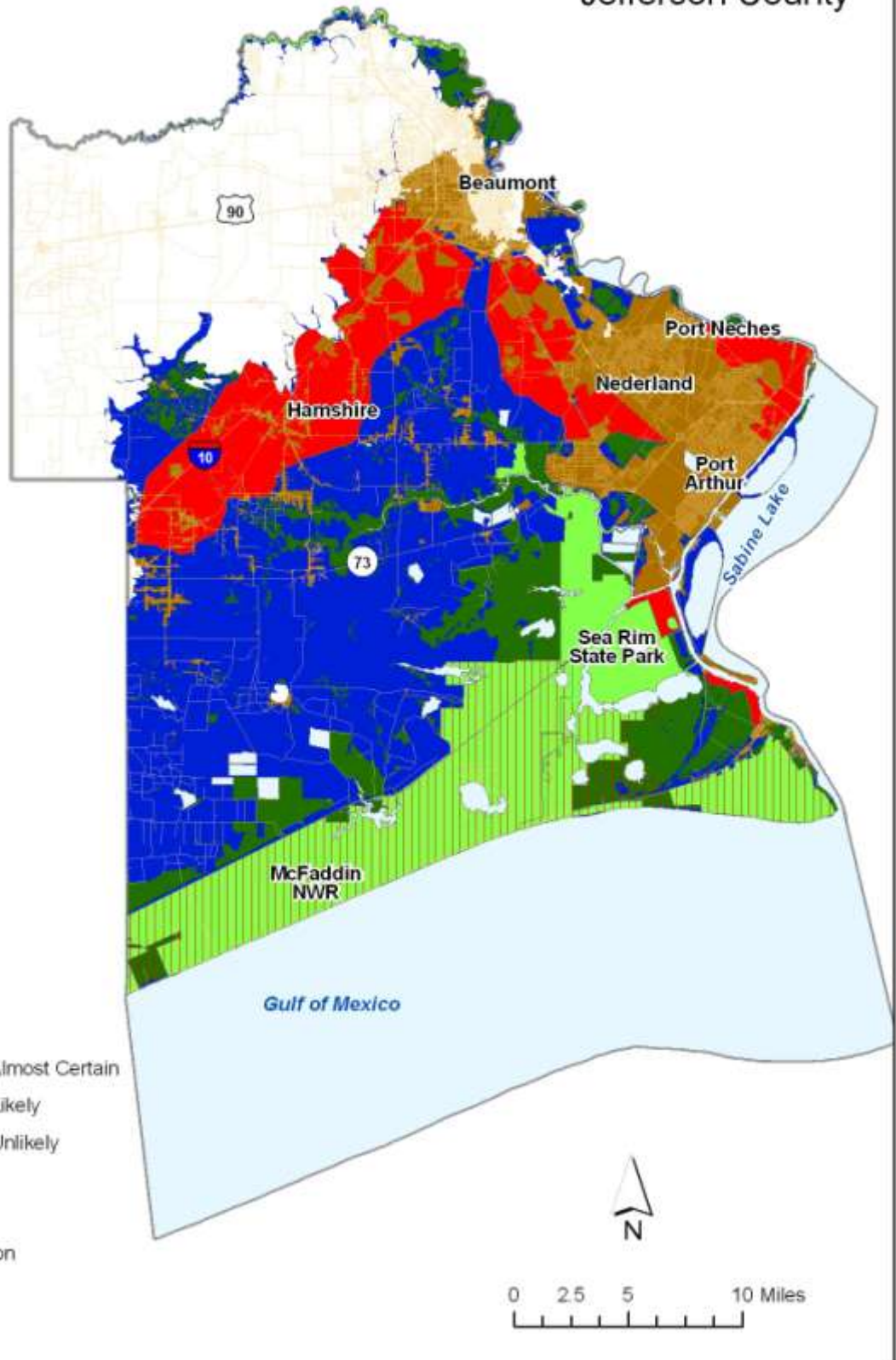


Figure 5. Sea Level Rise Response in Jefferson County

CHAMBERS COUNTY

Chambers County is lightly populated, mostly along Interstate 10 in the northern portion of the County near the cities of Mont Belvieu, Anahuac and Winnie.

Chambers County is adjacent to Harris County with the majority of its western and southern boundary draining into Galveston Bay. The Trinity River flows north-south to the Trinity River Delta near Lake Anahuac. Emergent and woody wetlands line the floodplains of this major river. Emergent herbaceous wetlands drape the southern border along East Bay, a sub-bay of Galveston Bay. The remaining part of the county to the north-west is predominately rice fields and other agriculture crops.

Currently, Houston is growing to the west, north, and south, but very little to the east, particularly to the east of Cedar Bayou. The Trinity River has a fairly large floodplain that may be a bit too wide for the hopscotch development that Houston is famous for. Lack of growth may also have to do with a perception of less than adequate school districts.

Even though the Texas State Demographer expects a 167% increase in population by 2040 - equating to approximately 50 thousand new people - the increase is still extremely low compared to the increase of 4.8 million people in Harris County.

The Houston-Galveston Area Council population forecast maps showed only very diffuse growth in the county, with a small concentration on the east side of Anahuac. The spotty pattern of new development is how HGAC shows new growth in this county.

We think it prudent to project at least some waterfront development on the east side of Galveston Bay. There has been some talk in the past about some kind of high speed hydrofoil or similar craft traffic to Smith Point, so there is some possibility of development on the high ground in this area. We have also suggested some additional waterfront development on high ground on the waterfront to the north of Smith Point. These developments seem somewhat unlikely today, but given the amount of waterfront development occurring in Calhoun County far to the south, far from any major metropolitan area or airports of any note, it would be unusual that some developers would not seek to build waterfront developments in this area in the next 30-50 years.

Sea Level Rise Response in Texas Chambers County

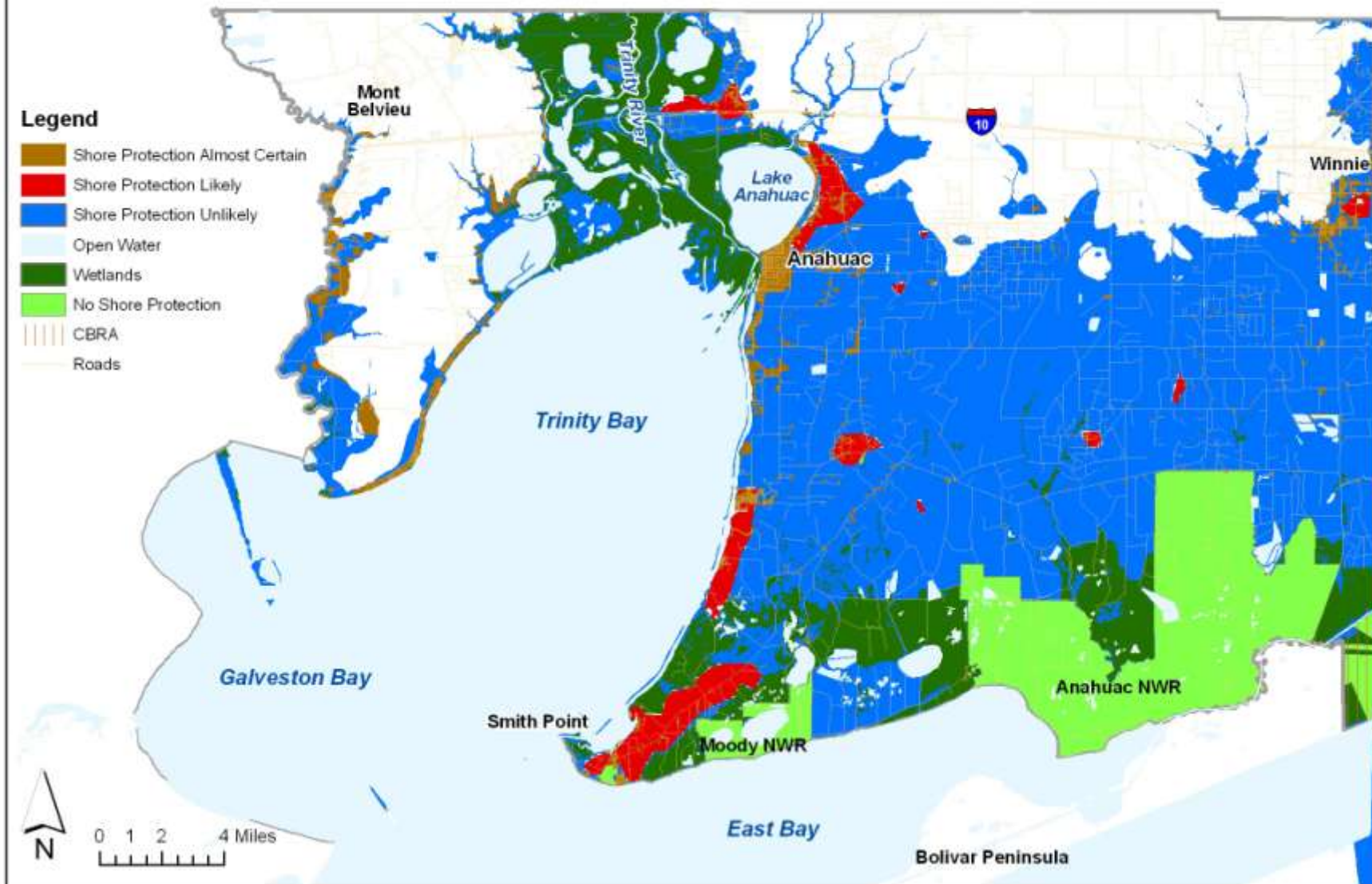


Figure 6: Sea Level Rise Response in Chambers County

GALVESTON COUNTY

Galveston County borders Galveston Bay to the east and south and includes all of Galveston Island and Bolivar Peninsula. Harris County is to the north and Brazoria County to the west. Galveston County is beginning to become densely populated, but significant areas of emergent wetlands still exist along areas bordering West Bay, south of FM 2004 and small patches of mixed evergreen and deciduous forest still exist in the mid west section of the County.

Galveston County is currently experiencing a growth explosion. Major growth corridors are along I-45, State Hwy 96, and FM 646. Most of the current growth is occurring north of Dickinson Bayou, but many new developments are also planned for areas south of Dickinson Bayou. There are many areas east of I-45 shown as Protection Almost Certain that are not yet developed, but development is pretty much imminent in this area. Development will certainly occur east of I-45, but it is more in the future and thus labeled Likely rather than Almost Certain.

The southern flank of mainland Galveston County is fringed by some fairly wide stretches of estuarine wetlands that will be relatively difficult to develop. The only current development in this area is Harborwalk, right on the coast, but this is a development constructed on the old Flamingo Isles property that was dredged for marinas and canals more than 20 years ago in another regulatory environment, but not developed at that time. The Flamingo Isles project was laid out and excavated just before the 1980's oil bust.

Galveston Island is undergoing a development boom—both in high-rise condos and beach houses. We can be fairly certain that all areas not in wetlands and not otherwise protected will be developed. We have labeled all of these areas as Almost Certain, even though the entire island has not all been developed yet. The only “red” or Protection Likely areas we designated on Galveston Island were Port of Galveston properties on Pelican Island and the far west end of Galveston Island. It is not completely certain, but there is talk of port facilities sometime in the future for these properties.

The situation for Bolivar Peninsula is similar to that of Galveston Island. Any area not preserved will be developed. There are some significant areas already preserved—mainly the area on the west end of the Peninsula associated with the world-famous Bolivar Flats complex and some significant CBRA areas near High Island.

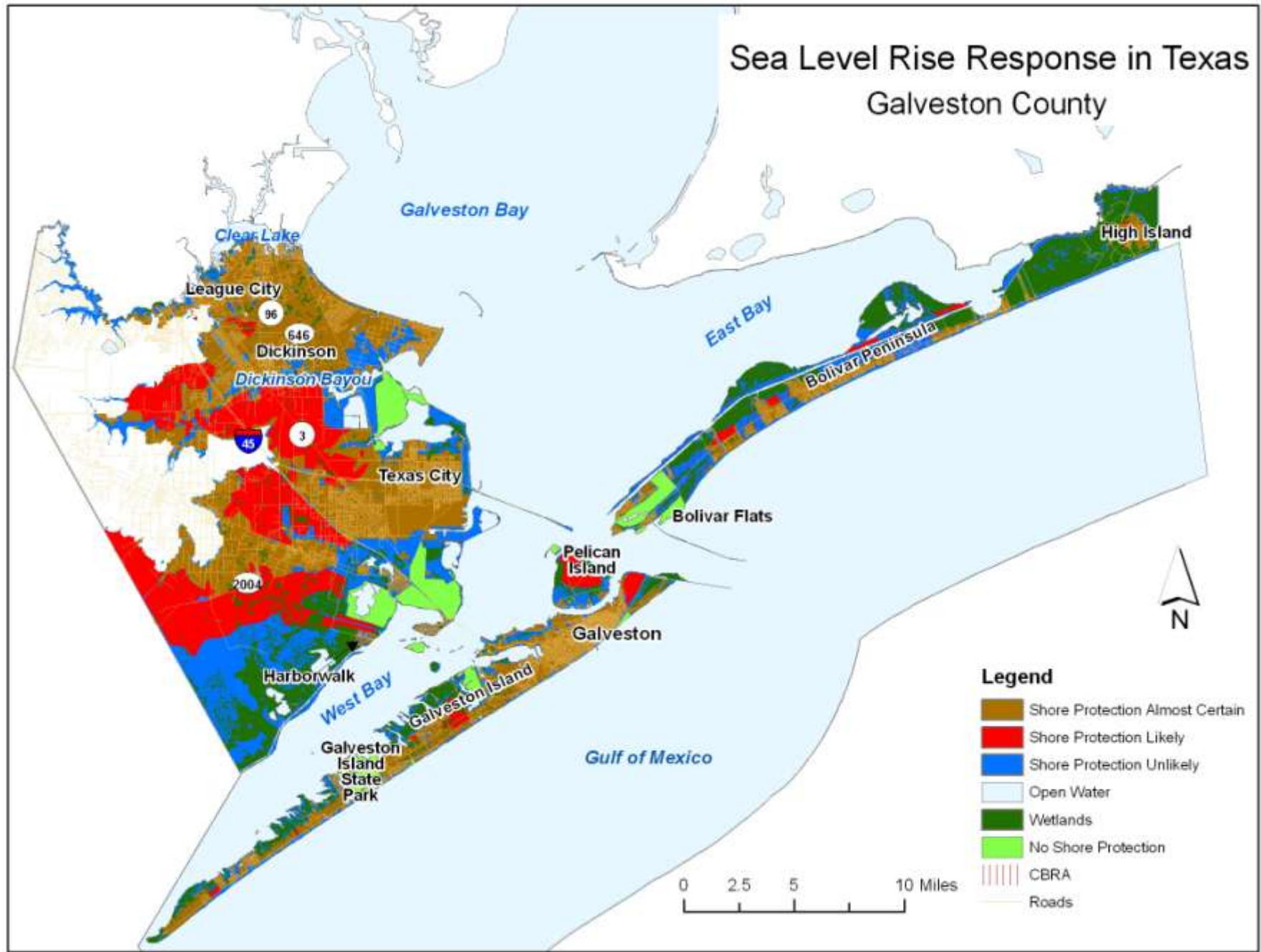


Figure 7: Sea Level Rise Response in Galveston County

HARRIS COUNTY

Harris County is densely developed with some areas of pasture and grasslands to the northeast. Harris County does not directly border the Gulf of Mexico, but a small portion in the south-east corner reaches Galveston Bay with the San Jacinto River running north-south and Buffalo Bayou extending west-east in central section of the county. Some wetlands still exist in the northern floodplain of the San Jacinto River just south of Lake Houston.

Very little of Harris County in the 20-ft elevation zone is undeveloped. A few areas have yet to fill in, but there is little doubt that they will based on the prediction that 4.8 million people will move to Harris County by 2040. Most of the undeveloped areas in the study zone are in frequently-flooded floodplains unlikely to ever develop.

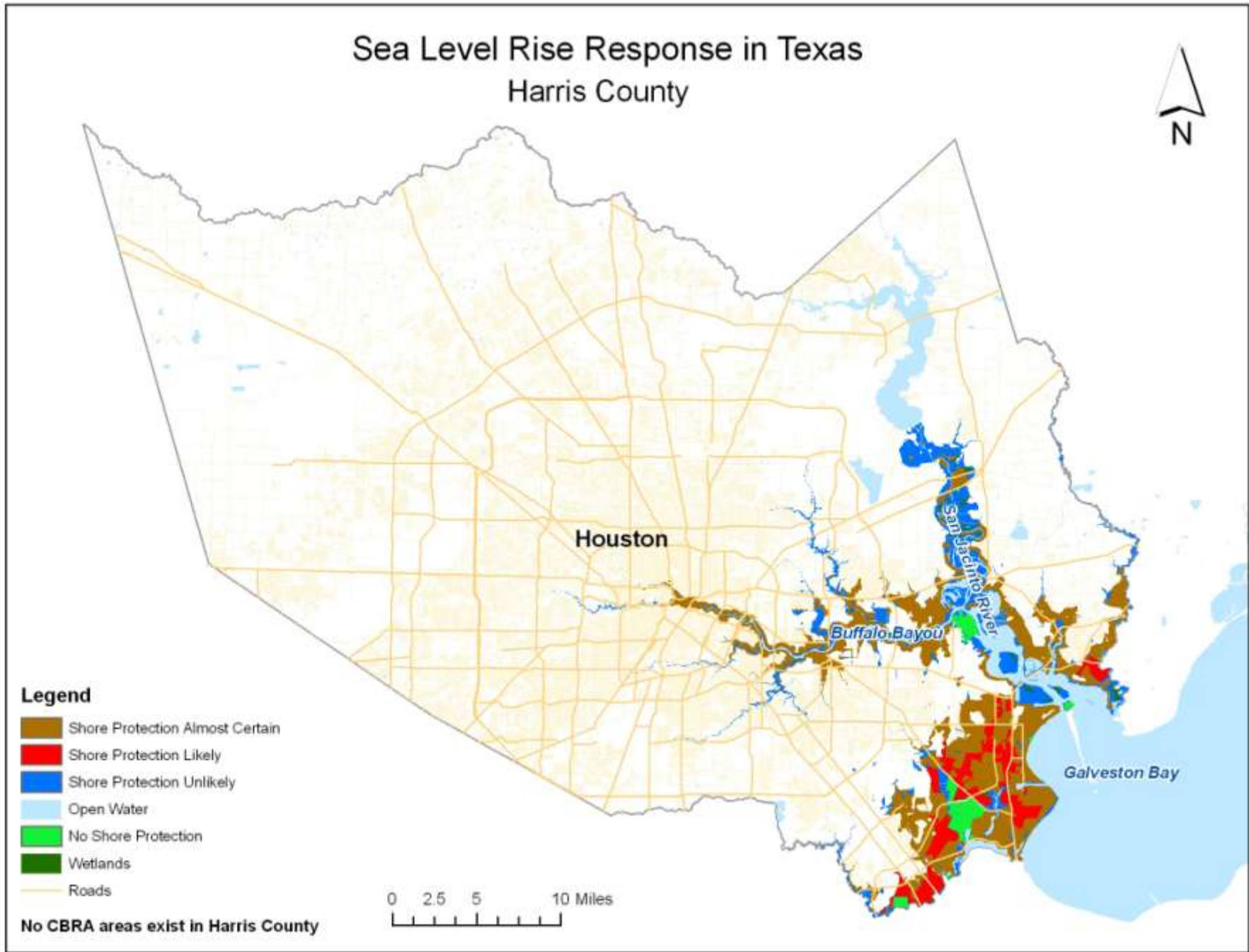


Figure 8: Sea Level Rise Response in Harris County

BRAZORIA COUNTY

Brazoria County borders West Bay to the South, Galveston County to the east and Matagorda County to the West. Fort Bend and Harris Counties are to the North. Most development in Brazoria county centers mainly in and around the cities of Alvin and Pearland. A large section of southern Brazoria County is covered by emergent herbaceous wetlands. The remaining land uses include agricultural crops and mixed forest.

Brazoria County follows Harris County in terms of rate and amount of growth among the Texas Coastal counties. Brazoria County has a considerable amount of land tied up in state and federal reserves, and a good part of the coastline is sheltered by CBRA.

We forecast most of the growth to occur along the State Hwy 288 corridor centered in Lake Jackson and Angleton. Some growth could occur along the FM 2004 corridor coming into the Lake Jackson area from the west, but this growth is much less likely than along the 288 corridor. We left some Protection Likely areas in the eastern side of the study area, mainly because the HGAC model showed growth here.

There is a large effort to preserve as much land as possible along West Galveston Bay, likely tying in with Brazoria NWR. We do not forecast much growth in this area. Most of the other blue areas are limited because of floodplains and/or large land holdings unlikely to be developed.

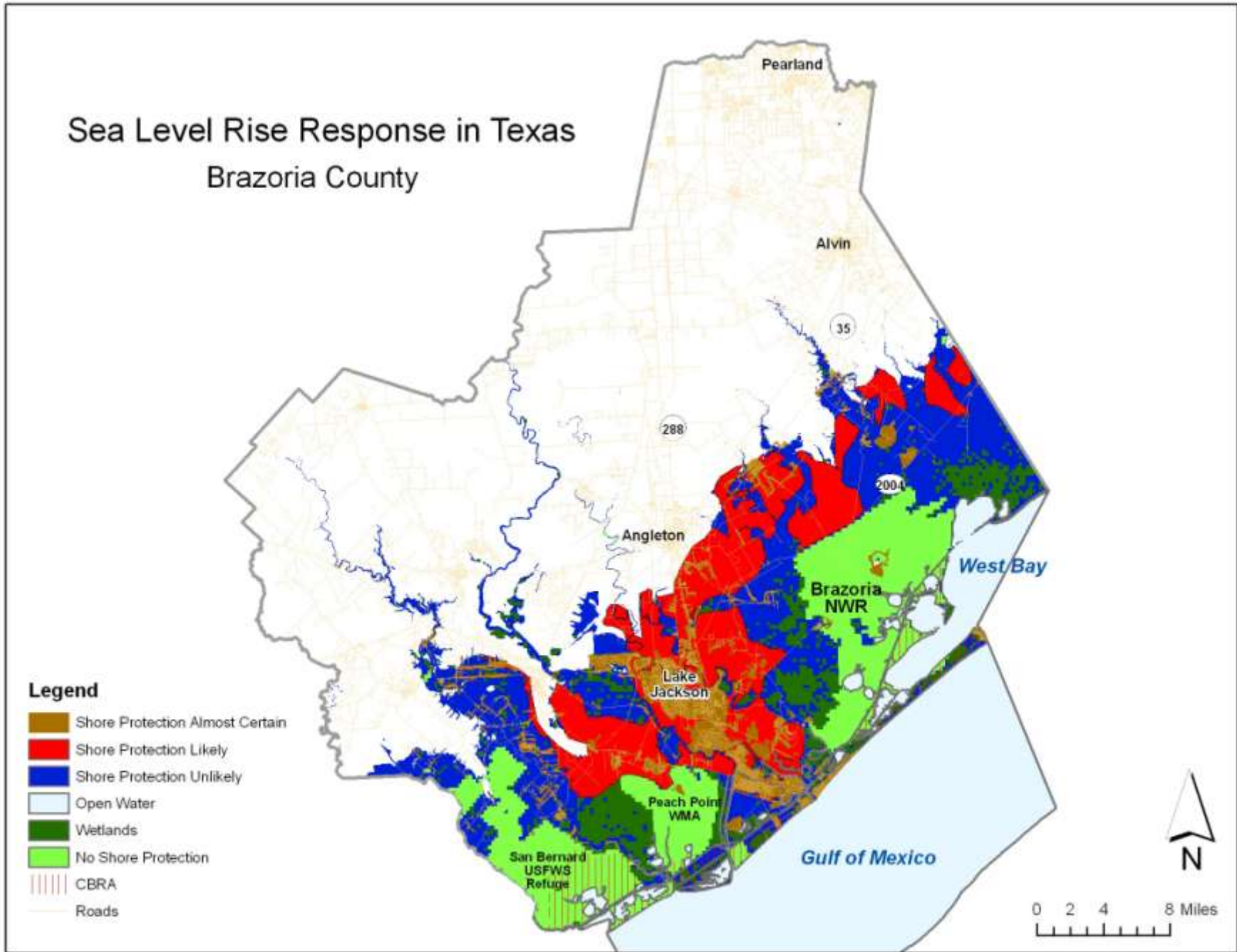


Figure 9. Sea Level Rise Response in Brazoria County

MATAGORDA COUNTY

Matagorda County lies along the south central region of the Texas coast with the majority of the coastal area bordering Matagorda Bay and East Matagorda Bay. Matagorda Peninsula stretches almost the entire portion of the coast in the County. Brazoria County is to the northwest. Fishing resorts and vacation homes are beginning to become more abundant. Although most of Matagorda Peninsula is covered by CBRA, the Bay area is increasing in population. Bay City, the county's main population center, is in the north central area of the county. Currently, Palacios, Ashley, Matagorda, and Sargent are all small cities that drape the Bay coastline.

Several mid-sized conservation lands exist along the Bay and Gulf of Mexico coast. Mad Island Wildlife Management Area is on the mainland side of Matagorda Bay just west of the City of Matagorda. The Big Boggy National Wildlife Refuge is on the north, mainland side of East Matagorda Bay. The San Bernard National Wildlife Refuge is adjacent to the Gulf of Mexico in northern Matagorda County. Emergent wetlands exist along the shoreline of Matagorda Bay and the north section of the County adjacent to the Gulf of Mexico.

Matagorda County has the most extensive CBRA coverage of any county along the Texas coast, a fact that does not sit well with our informants in the real estate industry. Only a small fraction of Matagorda Peninsula just east of the Colorado River outlet has any development on it. No development is forecast for any other part of the barrier island complex off of Matagorda County.

Palacios on the west end of the county is just beginning to experience some growth. It is likely that the waterfront areas to the west of Palacios will be developed in the coming decades.

A new nuclear plant is already in the works near the existing South Texas Nuclear Plant (STNP). Collegeport will likely experience significant growth as a result of this new venture. We expect the area from Collegeport north along Tres Palacios Bay to the head of the bay to be developed. The area south of Collegeport to the Bay and east to Mad Island Reserve is owned by a single landowner with no interest in selling or developing.

The little town of Matagorda, where the Colorado River crosses the Inter Coastal Waterway, is showing some signs of growth. Tilman Fertita, a very active Galveston entrepreneur and developer, has bought significant acreage in this area. The water front along the ICWW between the Mad Island Preserve and the Big Boggy preserve is likely to be developed.

Sargent is another focal point for some development in the coast zone of eastern Matagorda County. This growth will mainly be to the west because of Texas Parks and Wildlife holdings to the east of Sargent.

Sea Level Rise Response in Texas

Matagorda County

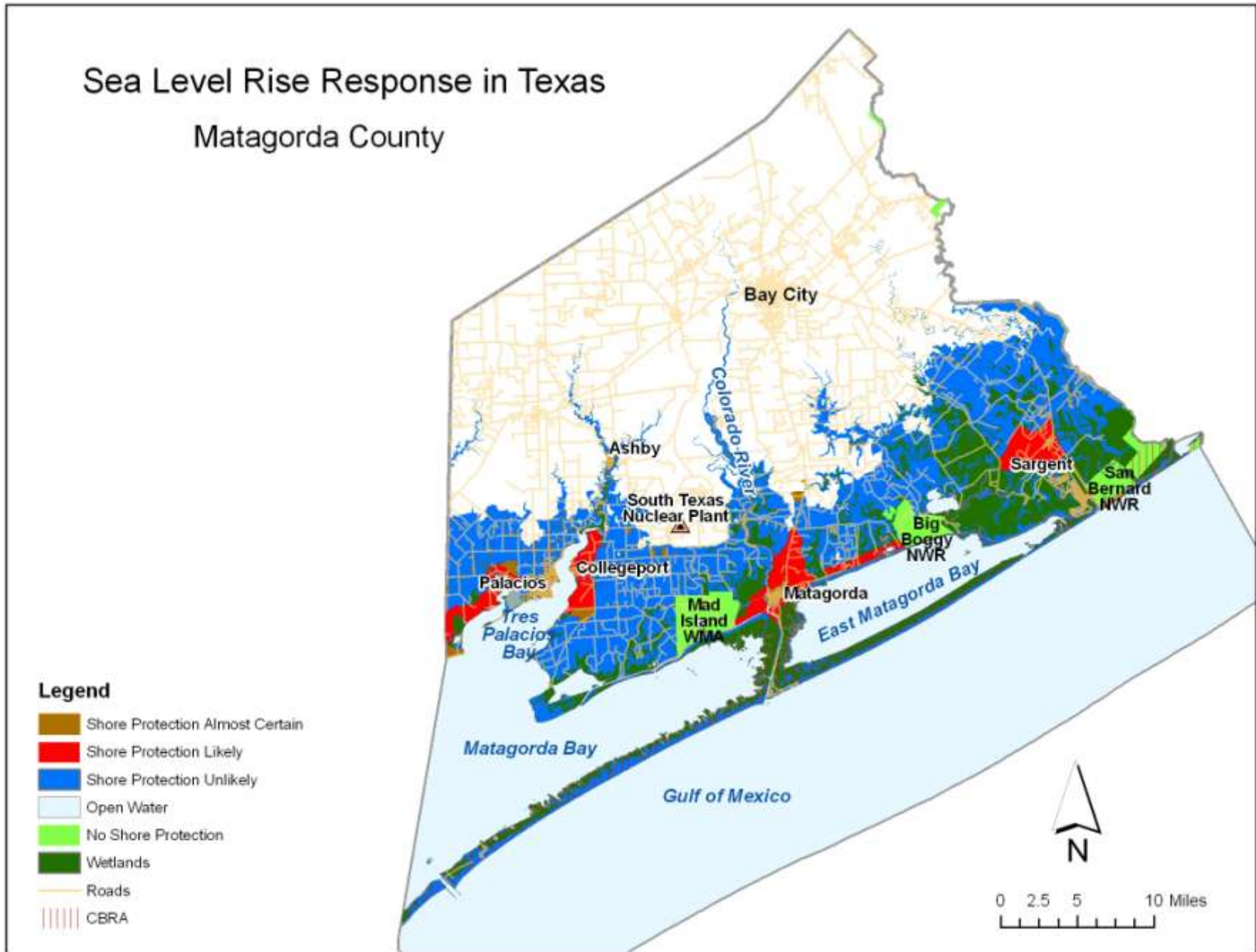


Figure 10. Sea Level Rise Response in Matagorda County

JACKSON COUNTY

Jackson County does not directly border the Gulf of Mexico. However, the southern portion of the county lies on Lavaca Bay and Caranchaua Bay, subbays of Matagorda Bay, which is adjacent to the Gulf of Mexico. Edna and Ganado are mid sized cities in the central part of the county along Highway 59. Two small cities, Vanderbilt and Lolita are on opposite sides of the Lavaca River bottom, which runs north to south from Lake Texana. The majority of the County is agricultural cropland, with estuarine marshes found along the Lavaca River and Lavaca Bay. Small parcels of deciduous and evergreen forest line the border of Carancahua Bay and Carancahua Creek in the southeastern section of the county.

Since Highway 59 runs through the midsection of the county, straddling the north side of Lake Texana, potential development is likely around the Lake. Lake Texana stretches approximately 10 miles north to south in central Jackson County. The majority of the lake front property is suitable for development. A small portion of land on the west side of the lake is protected by the Lake Texana State Park. Although the majority of the land surrounding the lake is above 20 foot in elevation, it is possible that sea level rise could affect the amount of allowable discharge from the lake during storm events, ultimately increasing flooding in the lake front communities.

Only a small portion of Jackson County is in the 20-ft study area. We expect no growth or development in the Lavaca-Navidad river bottom that feeds into Lavaca Bay. There is considerable new activity in terms of waterfront development occurring in adjacent Calhoun County, and some of this will likely spill over into southeastern Jackson County along Carancahua Bay. Other than waterfront development in this area, we expect no further development in this part of the county through the next 30 or so years. Jackson County ranks near the bottom for growth amongst the coastal counties according to the Texas State Demographer.

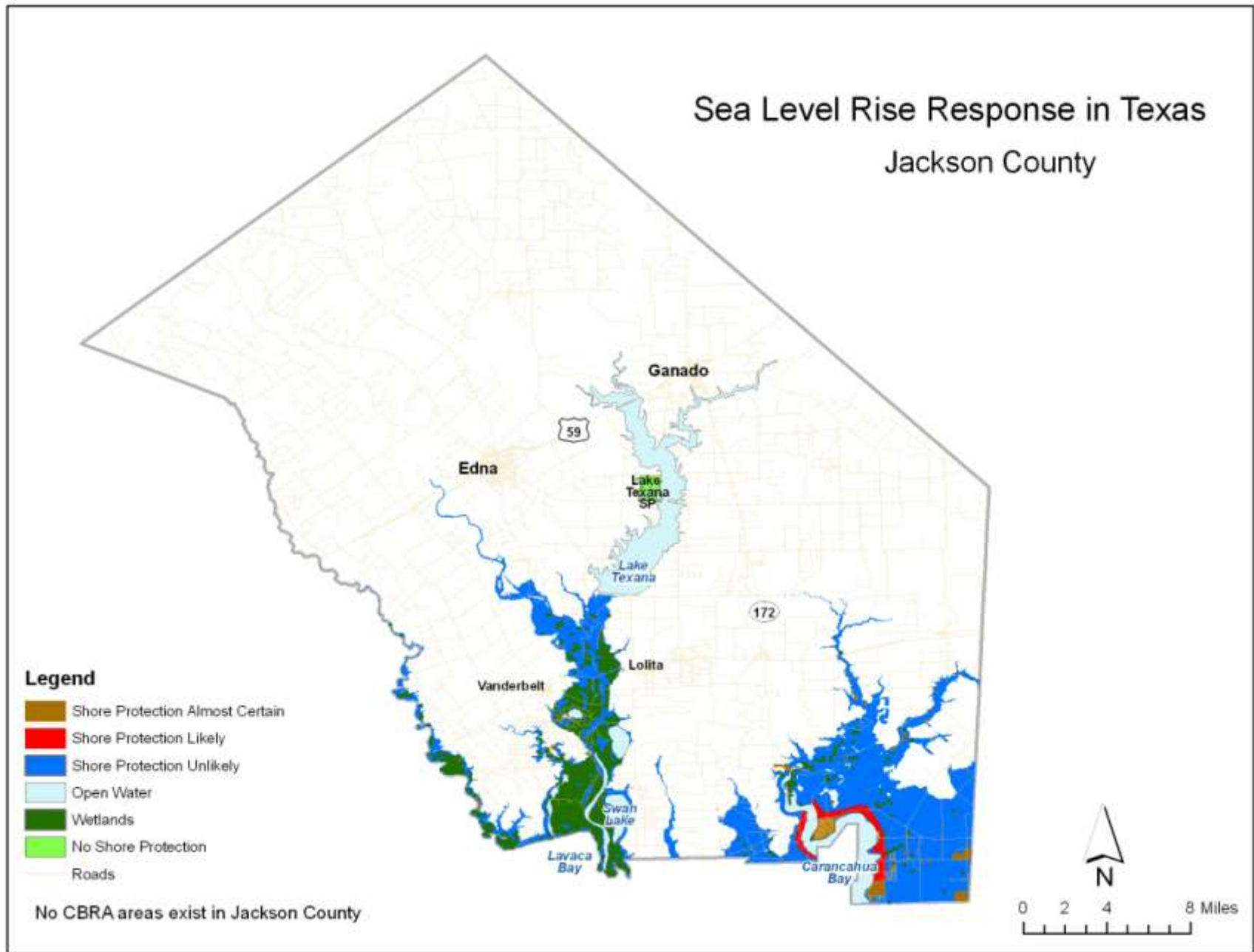


Figure 11. Sea Level Rise Response in Jackson County

CALHOUN COUNTY

Calhoun County is unique in that the mainland area is sandwiched between two major bays: San Antonio to the southwest and Matagorda to the northeast. The major developed areas are currently near the Bay cities of Port Lavaca, Seadrift, Point Comfort, and Port O'Conner. The majority of the inland area consists of agricultural land with emergent wetlands predominant along the coast of Espiritu Santo Bay, which separates the mainland from Matagorda Island. Emergent and woody wetlands line the large floodplain where the San Antonio and Guadeloupe Rivers merge at Greens Lake.

Calhoun County has been a relative backwater for growth on the Texas coast (Figure 12). Our informants believe Calhoun County is poised for significant new growth. Prominent properties, such as the Powderhorn Ranch, have changed hands once or twice in the past few years, indicating the beginnings of some land speculation. Several new waterfront developments are being advertised near Sea Drift and Port O'Connor, as well as near Port Lavaca and Point Comfort. Calhoun County is in an attractive location, and if overall population trends continue as forecast in Texas, then there is good reason to believe Calhoun County could be a likely center for beachfront communities.

Virtually all of Matagorda Island is contained within Matagorda Island State Park, and all of it is covered by CBRA, and thus unlikely to see development anytime soon.

Sea Level Rise Response in Texas

Calhoun County

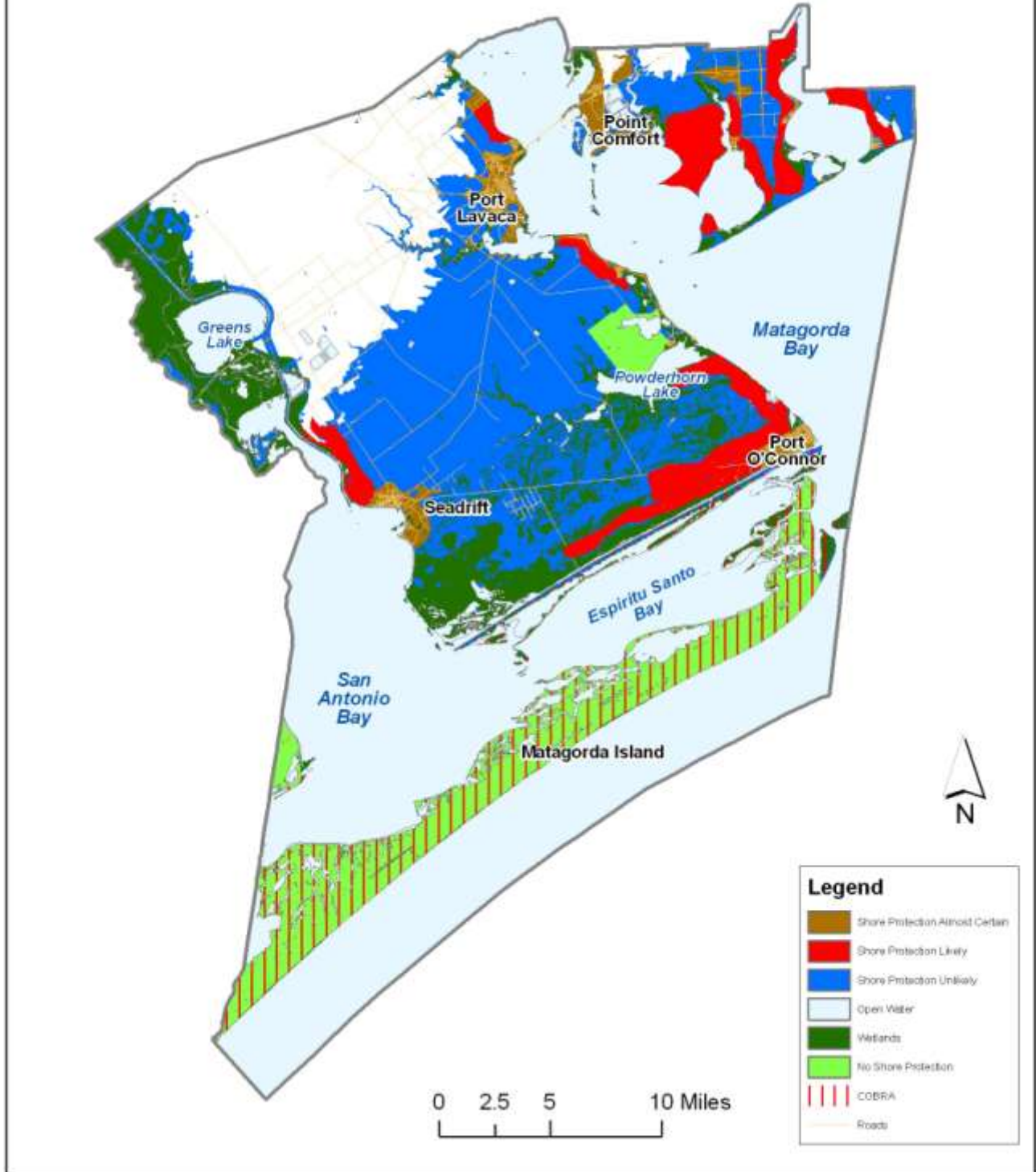


Figure 12. Sea Level Rise Response in Calhoun County

REFUGIO COUNTY

Refugio County is not directly on the Gulf of Mexico. However, it borders Copano Bay to the southwest and San Antonio Bay to the northeast. The City of Refugio, outside our study area, is largest city in the county. Only a few small communities are located within the study area. They include Bayside on the west side of Copano Bay and Austwell on the west side of San Antonio Bay. Several large oil fields exist in the northern sections of the County. In the southern areas, agricultural crops and shrub lands are the major types of land use.

Very little development pressure is occurring in Refugio County (Figure 13). Much of the county is occupied by very large landholdings associated with the O'Connor and Welder families. These families apparently have little interest in developing resort or other properties. Bayside is the only community in this county on Copano Bay.

Bayside already occupies most of the developable land in the study area in Refugio County on the west side of Copano Bay. The community could be redeveloped, and would appear to be in a good location for redevelopment into a resort community in the future, but little would change with respect to the lines on the map associated with this project. The rest of Copano Bay in this county is either lined with estuarine wetlands and/or part of the large estates mentioned above.

Potential new development could occur around Austwell on Haynes Bay, a subset of San Antonio Bay on the east side of the County. Austwell did not figure in any of our informants reports on growing areas. We surmised that at least some growth would be likely around Austwell in the next several decades, given its location.

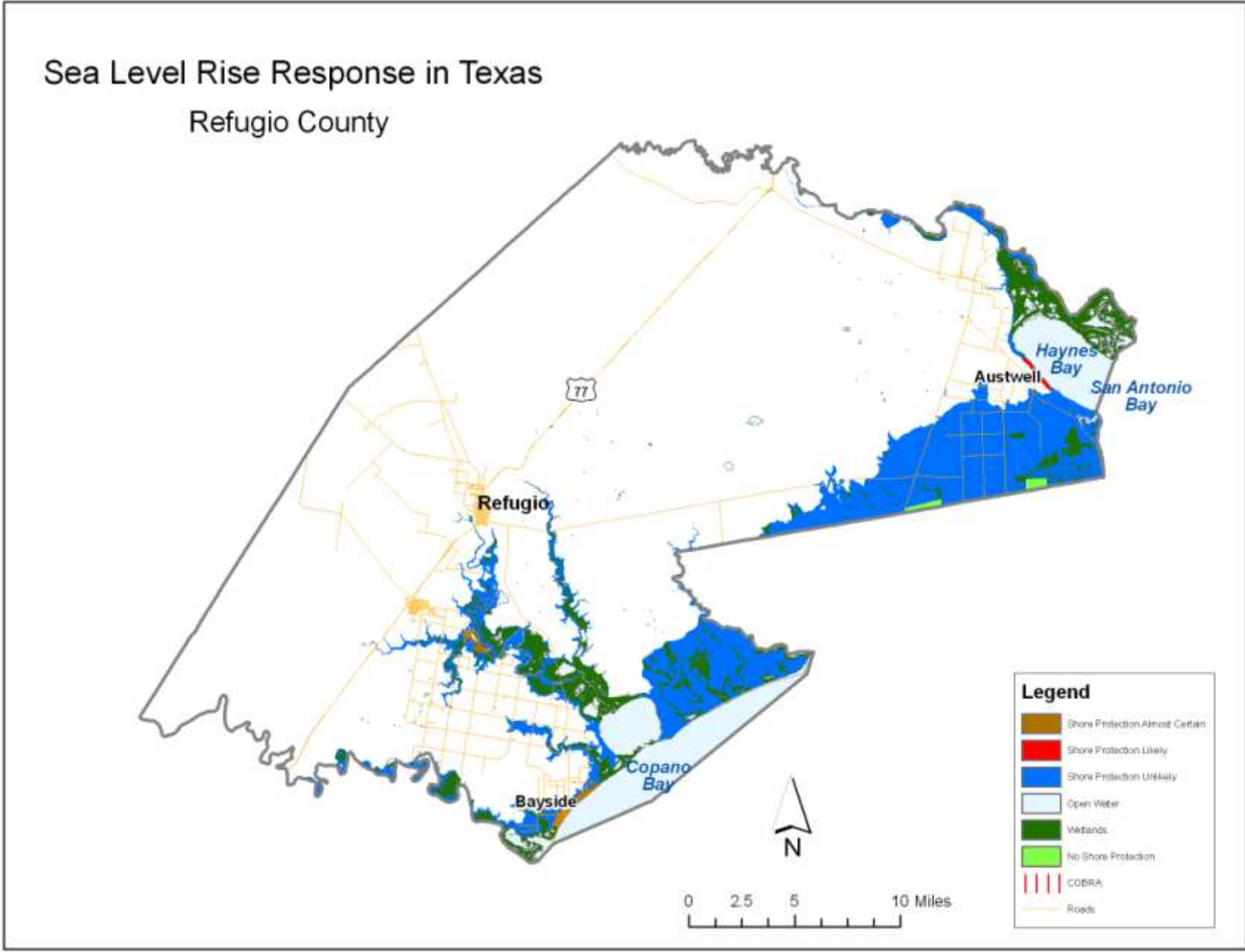


Figure 13. Sea Level Rise Response in Refugio County

ARANSAS COUNTY

Aransas County is a small county almost completely bordered by water and largely developed. Aransas Bay separates San Jose Barrier Island from the Mainland, and San Antonio Bay extends the County's eastern border with Copano Bay to the Northwest (this not clear!). Rockport and Fulton are the largest incorporated cities in the county, with extensive unincorporated development lining Aransas Bay on Live Oak Peninsula. The northeastern section of the County is protected from development by the Aransas National Wildlife Refuge. Deciduous forests are abundant within the Refuge. A few estuarine wetlands still line the northern banks of St. Charles Bay south of the refuge and the Bay side of San Jose Island. Relatively little agricultural land still exists in Aransas County.

Rockport is growing rapidly. Current trends indicate that little open space will be left on Live Oak Peninsula. Lamar Peninsula to the north is also undergoing rapid development. The proximity to water and a world-class wildlife refuge (Aransas NWR) are major draws for retirees and others. We conservatively forecast only about the southern half of Lamar Peninsula becoming developed. All of Blackjack Peninsula is protected from development in the Aransas NWR.

San Jose Island has an abundance of undeveloped, non-wetland shoreline protected by CBRA that would otherwise be prime land for development, given its proximity to Rockport. There are no road or ferry connections to San Jose Island at present. No development is foreseen on this island under current conditions.

Some additional new development is likely along the west side of Port Bay and the southwest side of Copano Bay.

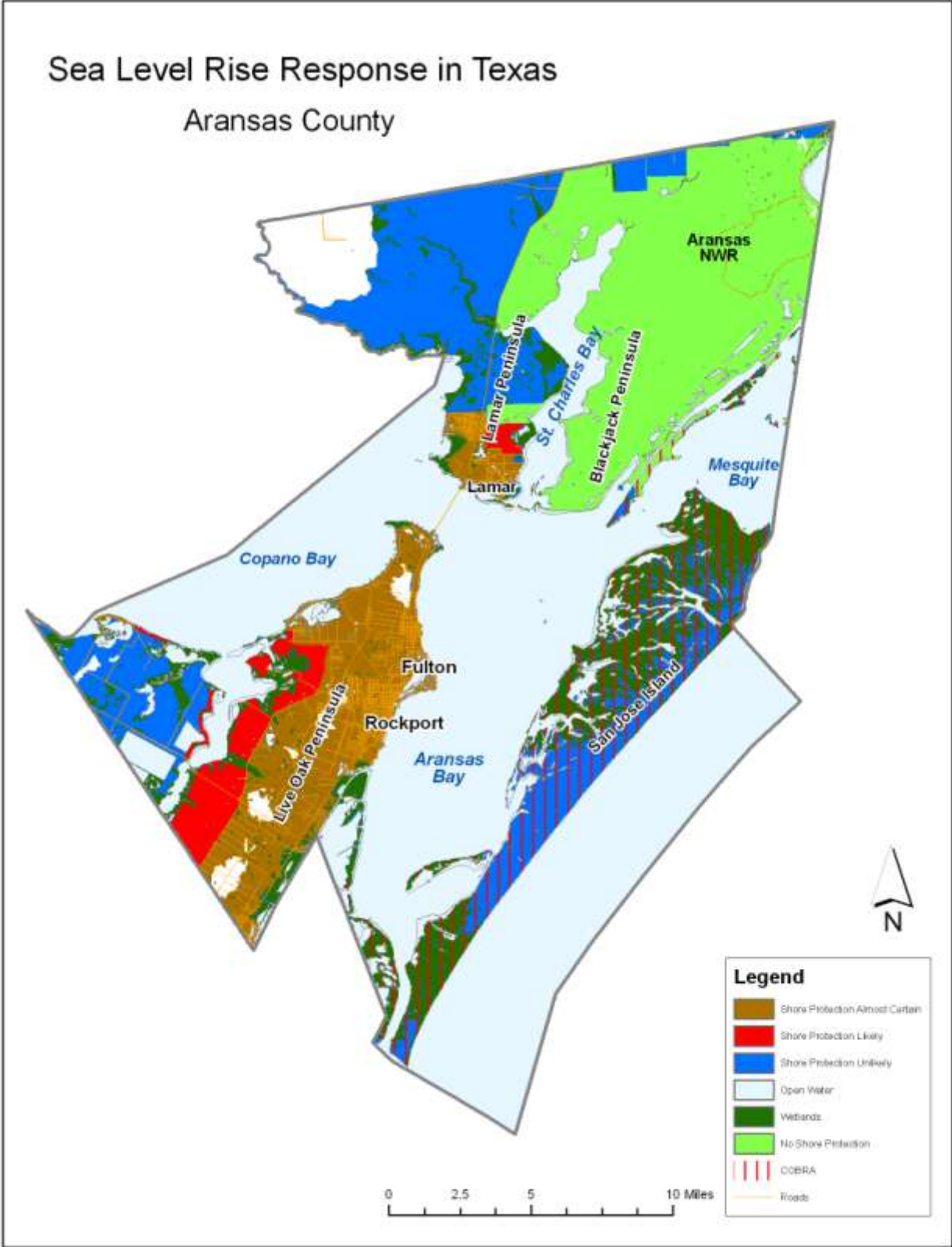


Figure 14. Sea Level Rise Response in Aransas County

SAN PATRICIO COUNTY

San Patricio County lies between Corpus Christi Bay to the southwest, the Aransas River to the north, and Redfish Bay to the southeast just off the Texas Coast. Much of the county is covered with agricultural crops. The majority of development resides along the bays and coastal areas. Only a small portion of this county is within the project study area. The Nueces River, which drains into Corpus Christi, has an extensive floodplain which contains a significant amount of wetlands within the project elevation study area. Wetlands also extend along the Aransas River floodplain along the northern border of the county. Almost all of the area along Redfish Bay has been converted to development.

All of the developable shoreline in San Patricio County appears to be at least moderately developed and therefore all in the Shoreline Protection Almost Certain Category. East and west of Portland, not much more than the shoreline itself is developed, and mainly only a single line or two of beach homes. Little development exists to the east of Portland, but our informants believe beach homes are imminent in this area.

Most of the new development will be along the sandy ridge of land that extends from Ingleside up into the Live Oak Peninsula and Rockport. Some of the expansion associated with "greater" Rockport-Ingleside will likely spill over into San Patricio County.

Sea Level Rise Response in Texas

San Patricio County

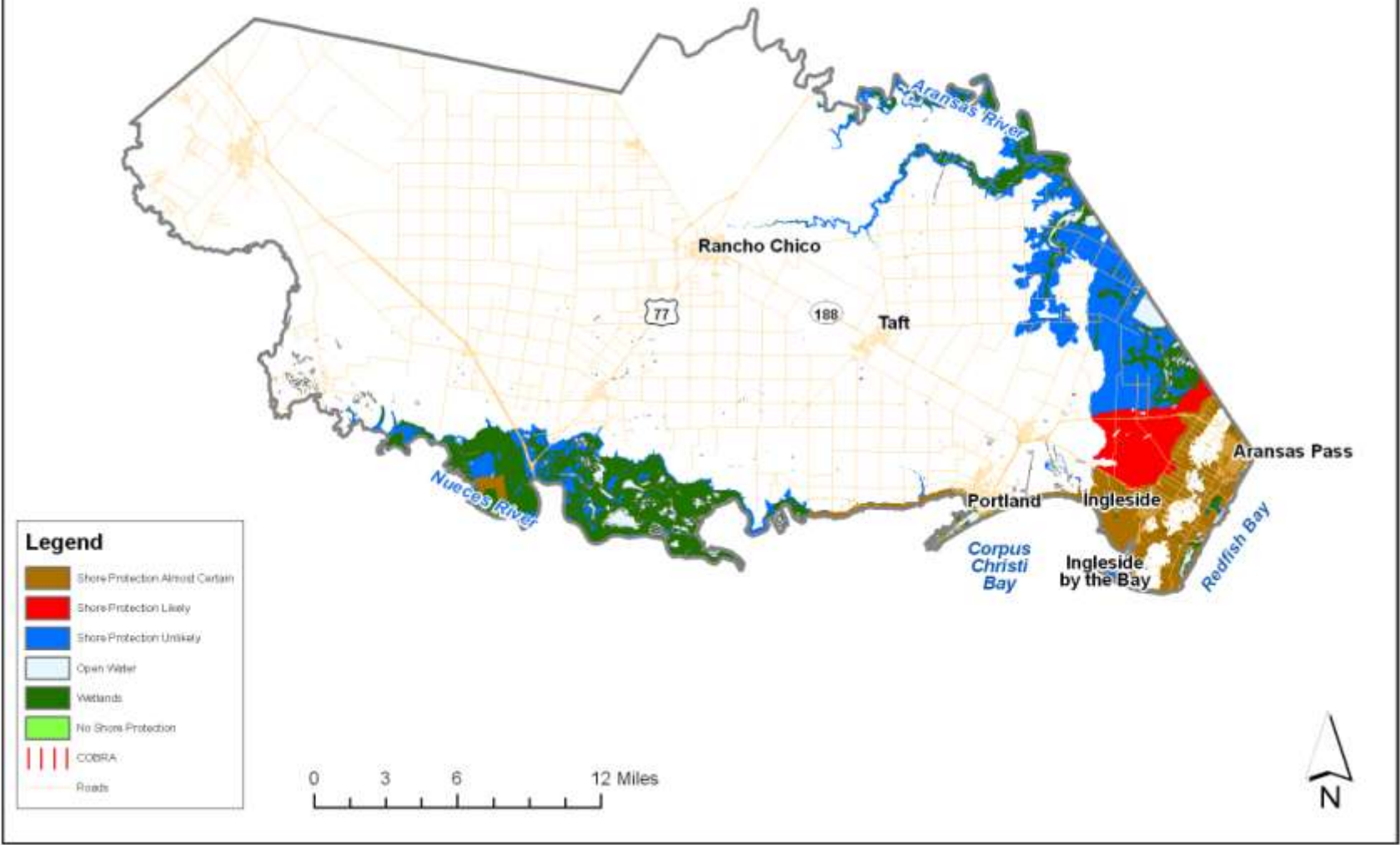


Figure 15. Sea Level Rise Response in San Patricio County

NUECES COUNTY

Nueces County is situated along the Texas Coast between San Patricio and Aransas Counties to the north, separated by Corpus Christi Bay and the Nueces River, and Kleberg County to the south. Much of Nueces County is still in agricultural use. However, dense development extends far inland along the coast of Corpus Christi Bay. Robstown and Corpus Christi are the two major cities located in Nueces County. The few wetland areas that remain in this county are located in the Mustang Island State Park, just on either side of the Park and in the upper reaches of the Nueces River floodplain.

Almost all of the Nueces County shoreline is in the Protection Almost Certain category, in other words, almost completely developed (Figure 16).

There is an upland area of potentially developable land just south of Mustang Island State Park that is currently undeveloped (blue). This strip of land is covered by the Coastal Resources Barrier Act, and we are assuming that no development will occur on this land as long as other insurable coastal properties are available. Given the proximity to Corpus Christi, it is inconceivable that every square inch of developable, insurable land will not be developed within the next 20-30 years.

There is only a small amount of acquirable land within the study area south of Oso Creek. King Ranch owns the majority of the land east of Chapman Road and south of Oso Creek and extending to Laguna Madre, which limits future development to the south-east along Laguna Madre.

Sea Level Rise Response in Texas

Nueces County

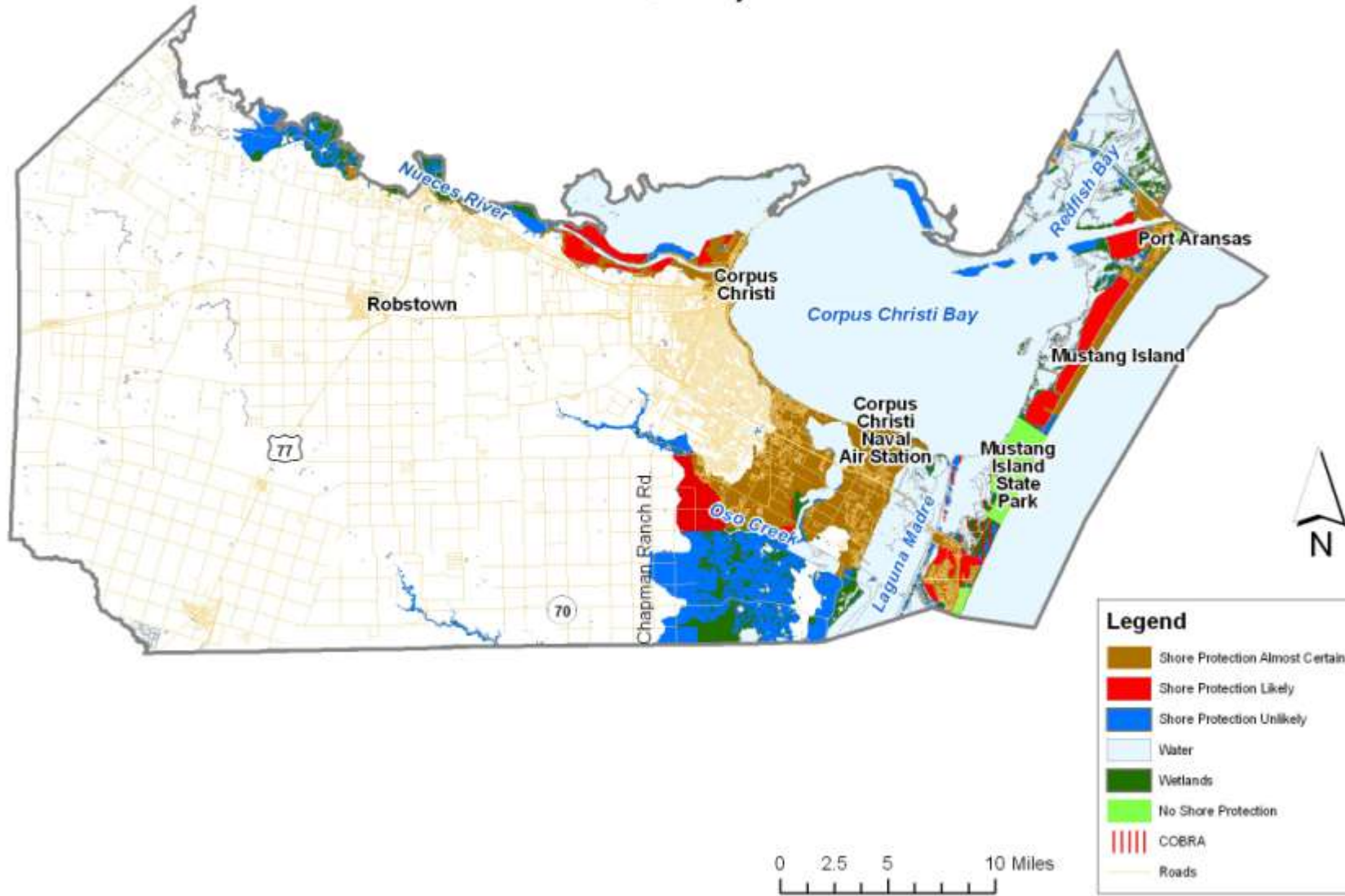


Figure 16. Sea Level Rise Response in Nueces County

KLEBERG COUNTY

Kingsville is the major population center of Kleberg County. The towns of Riviera and Loyola Beach lie along the northern coast of Cayo Del Grullo, a subbay of Baffin Bay, in the southern portions of the county. Los Olmos Creek separates Kenedy from Kleberg County to the South. Kleberg County has a large shallow lake, Laguna Largo, in the north east part of the County. The Laguna Largo area appears as wetlands on the 2005 aerial Landsat images. It is unclear whether this area should be termed a lake or wetland based on recent observations. According to the National Wetland Inventory data, the northern section of the lake contains submerged vegetation and the southern portion is categorized as palustrine marsh. The Laguna Madre stretches though Cameron, Willacy, Kenedy and Kleberg counties until it reaches Corpus Christi Bay to the north in Nueces County. All of Kleberg's portion of North Padre Island is protected by CBRA.

Kleberg County is dominated by large ranches, particularly in the 20-ft elevation zone. There is no indication that any of the ranch owners wish to sell or develop their land.

There is a small area of private holdings, not in the large ranches, on the waterfront between Riviera and Loyola. No one has indicated an expectation for significant growth in this area, but given the proximity to Corpus Christi and Kingsville, it is hard to believe that some additional waterfront development would not take place in this area, however small.

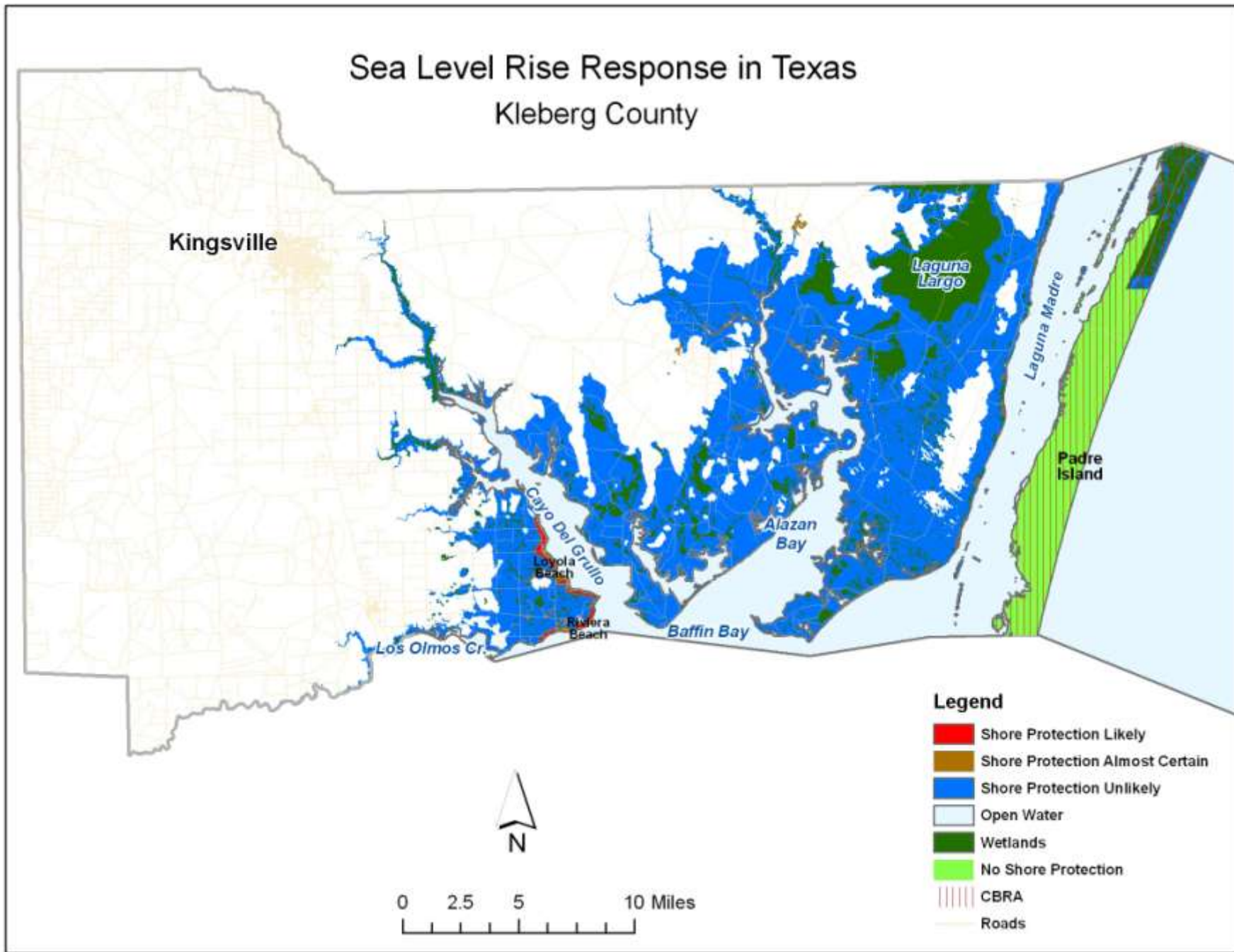


Figure 17. Sea Level Rise Response in Kleberg County

KENEDY COUNTY

This county is predominately undeveloped. In the northwest section of the county, there are small areas of mixed forest. The remaining areas to the west are mainly grassland and shrublands with scattered agriculture and pastures. Estuarine wetlands are predominate in the coastal areas. The Norias Division of King Ranch is located in the southeast section of the county. The section of North Padre Island in Kenedy County is completely covered by CBRA. Baffin Bay separates Kenedy and Kleberg Counties.

Kenedy County has three small towns along US Highway 77: Rudolph, Armstrong and Sarita.

Only 400 people or so live in Kenedy County today. No growth is expected for the next 40-50 years, and the State Demographer in fact predicts a loss of about 50 people by 2040. The entire county is in holdings of either the King, Kenedy, or Armstrong ranches. None of the owners have evinced the slightest motion towards development, and our informants assure us no change is envisioned for the foreseeable future.

Windfarms are being considered for some of the Kenedy Ranch lands near the coast, but this is a very controversial project, with both of the other ranches fighting this project. Windfarms consist of widely spaced pads for windmills, not the kind of development that would impede sea level transgression.

Sea Level Rise Response in Texas Kenedy County

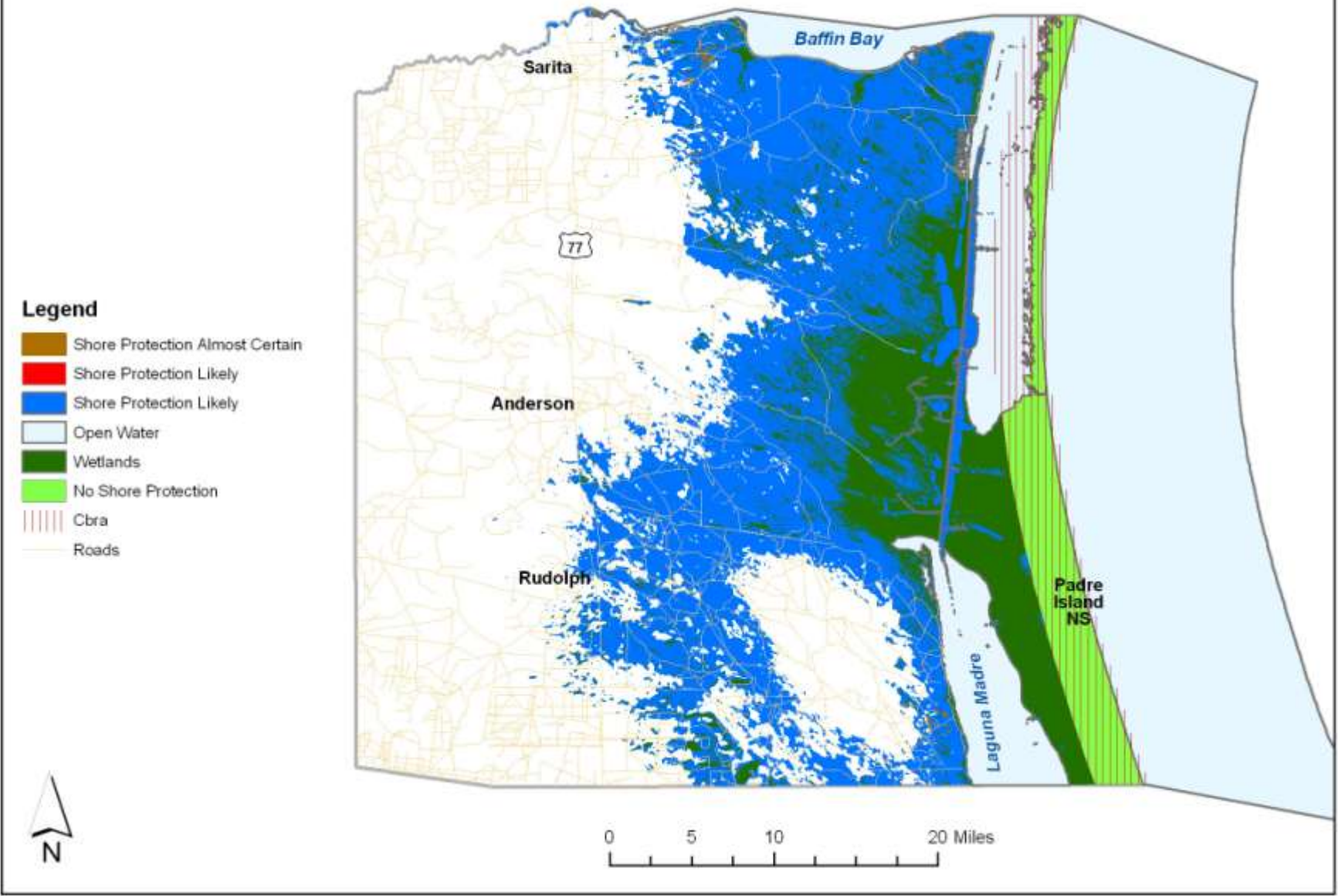


Figure 18. Sea Level Rise Response in Kenedy County

WILLACY COUNTY

The majority of Willacy County is undeveloped with the exception of Raymondville located in the west-central area of the county, and Port Mansfield located in the northeast part of the county adjacent to Laguna Madre to the east. Agricultural land, mixed forest and grasslands make the majority of the county. The entire stretch of North Padre Island in Willacy County is protected by CBRA. Scattered wetlands lace the mainland shore of Laguna Madre.

Little growth is expected for Willacy County. In the study area, only Port Mansfield is expected to grow a little. Growth is blocked to the north of Port Mansfield by the King Ranch and to the south by a large complex of wetlands.

Sea Level Rise Response in Texas

Willacy County

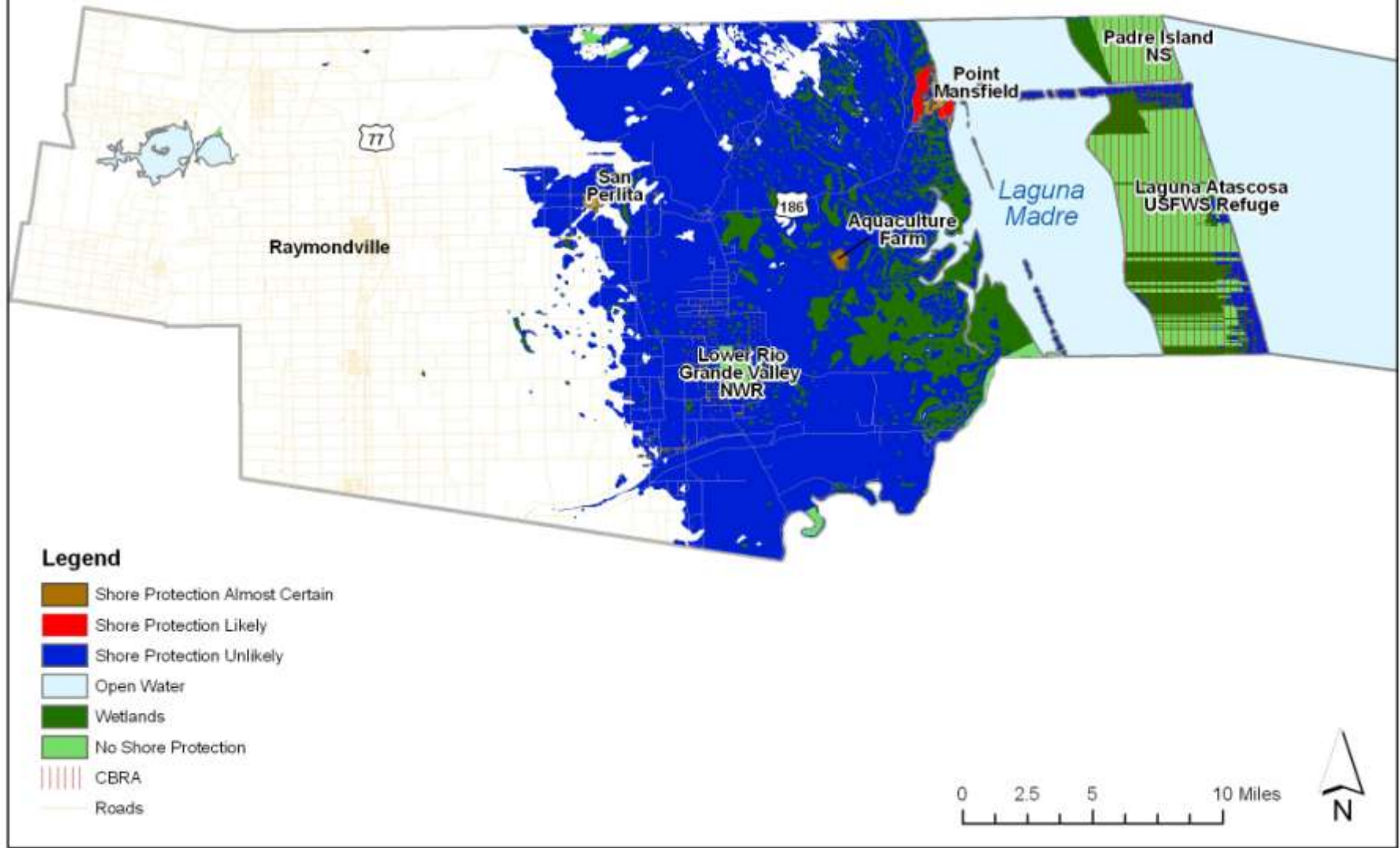


Figure 19. Sea Level Rise Response in Willacy County

CAMERON COUNTY

Cameron County borders Mexico to the south where the Rio Grande separates Texas from Mexico. It is highly developed in the southern and western sections, with Brownsville and Harlingen being the population centers. The Laguna Atascosa Wildlife Refuge encompasses a large section of land north of Port Isabel on the mainland side of Laguna Madre. The southern coastal areas below Port Isabel are designated CBRA areas with little historical development. The northern coastal area of South Padre Island in Cameron County is completely covered with CBRA. Wetlands are common on the Bay shoreline on the mainland side. Land use in the undeveloped portions of the county is agricultural crops and grasslands with spotted deciduous forest.

Cameron County is projected by the Texas State Demographer to be the 3rd fastest growing coastal county in Texas in terms of both percentage and total population. Brownsville will be the center of this growth, and much of that growth will occur under 20ft amsl.

The barrier island off of Cameron County is largely protected by CBRA, but the unprotected part will be developed as soon as sewer and electricity is extended from the city of South Padre Island (area shown in red).

Much of the Cameron County mainland fronting the Laguna Madre is sheltered from development by a vast complex of wetlands and protected areas. The main axis of growth will extend north out of Brownsville, towards Arroyo City. How far north is anyone's guess, but based on our informants, we have placed it more than two-thirds of the way to the northern border of the county. Our informants did not think that much growth would occur from Harlingen to the east into the study area.

It would seem likely that some growth would occur along the Brownsville – Pt. Isabel highway bordering the Brownsville Ship Channel. This is an important corridor that would be protected from SLR under almost any scenario.

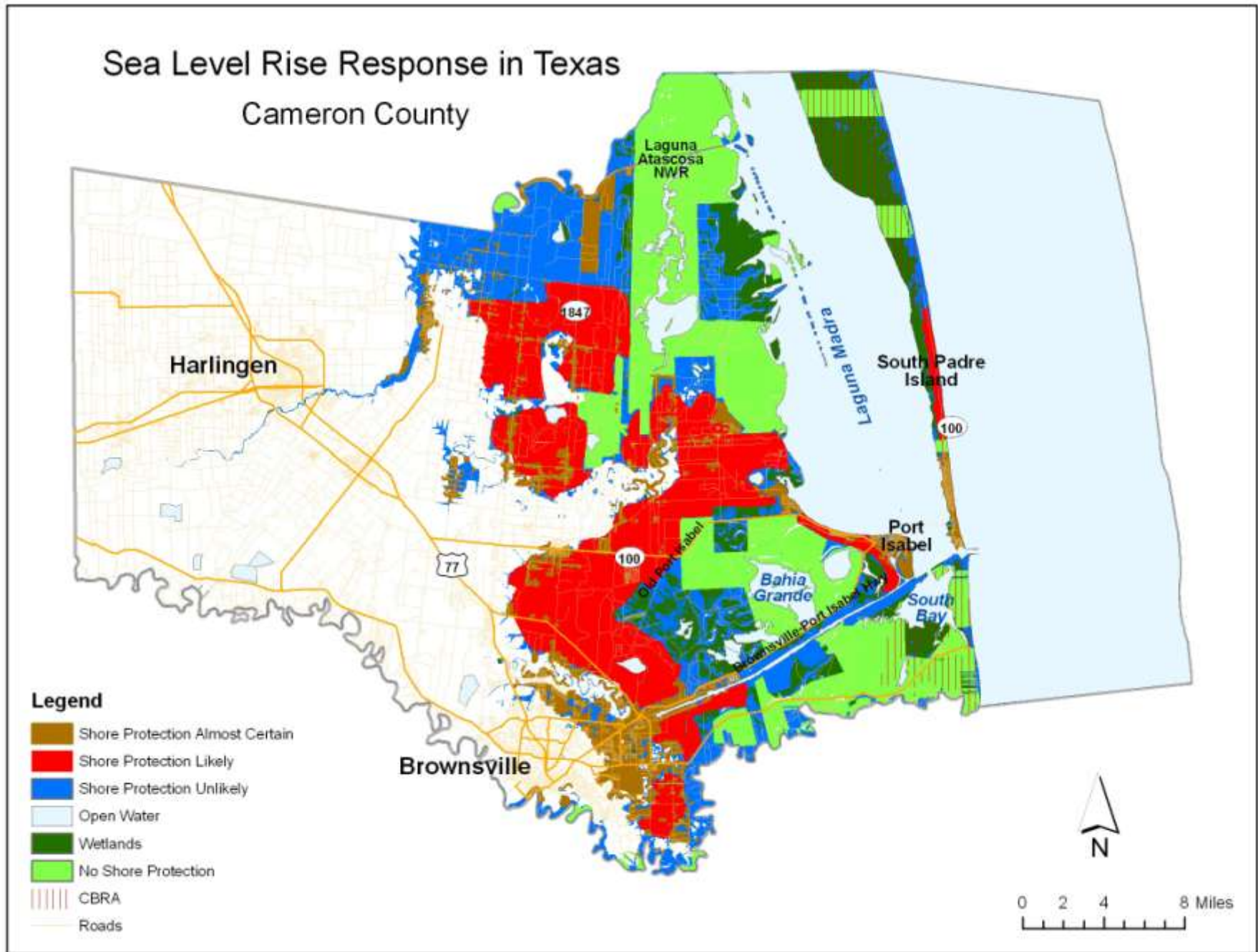


Figure 20. Sea Level Rise Response in Cameron County

Table 4. Informants

County	Person	Position
Aransas	Tom Niksala	Director, Corpus Christi Metropolitan Planning; Chief planner for transportation in Coastal Bend Region
Brazoria	Dmitry Messen	Chief Demographer, Houston-Galveston Area Council
Calhoun	Danny Long	Golden Crescent Regional Planning Commission
Calhoun	Arlene Marshall	Director, Calhoun County Economic Development Corporation
Cameron	Gilbert Salinas	Director of Marketing and Communications, Brownsville
Cameron	Ian Monroe	realtor, Alta Monroe Realty, South Padre Island
Cameron	Nita Jo Graves	Realtor
Chambers	Dmitry Messen	Chief Demographer, Houston-Galveston Area Council
Galveston	Dmitry Messen	Chief Demographer, Houston-Galveston Area Council
Harris	Dmitry Messen	Chief Demographer, Houston-Galveston Area Council
Jackson/Calhoun	Danny Long	Economic Development Coordinator, Golden Crescent Regional Council
Jefferson	Bob Dickinson	Director, Transportation/ Environmental Resources Division, SETRPC
Jefferson	Dawn Martinez	Public Information Planner, Southeast Texas Regional Planning Council
Jefferson	Jeff Brannick	Special Assistant to the County Judge (economic development issues)
Jefferson	Jim Rich	President, Greater Beaumont Chamber of Commerce
Kleberg/Kenedy	Dick Messenbarger	Exec Director Kleberg CDC edc@kingsville.org
Kleberg/Kenedy	Richard Bullock	Dir of Planning, Coastal Bend COG

Matagorda	Carol Allen	realtor, Matagorda Real Estate, 979-863-7888
Matagorda	Owen Bludeau	Matagorda Co Economic Development
Nueces	John Buckner	Executive Director, Coastal Bend Council of Governments
Nueces	Tom Niksala	Director, Corpus Christi Metropolitan Planning; Chief planner for transportation in Coastal Bend Region
Orange	Michael Cedars	Orange County Appraisal District
Orange	Bobby Fillyaw	Orange County Economic Development Director
Refugio	Tom Niksala	Director, Corpus Christi Metropolitan Planning; Chief planner for transportation in Coastal Bend Region
San Patricio	Tom Niksala	Director, Corpus Christi Metropolitan Planning; Chief planner for transportation in Coastal Bend Region
Willacy	Agustin Lopez	Willacy County Appraisal District

APPENDIX A: GEO-SPATIAL PROCESSING

GEO-SPATIAL PROCESSING

The Sea Level Rise Response (SLRR) draft maps (printed and digital versions) were created using Geographical Information Systems (GIS) tools (ESRI ArcGis 9.2). The analysis part of the project was implemented through a process using Spatial Analyst that used vector and raster datasets as input (See Table 2).

Table 2. Summary of GIS data applied in study

Data Name	Application in Study	Source/Year Published
<i>Digital Elevation Models (DEM)</i>	Used to find lands with elevation below or equal to 6.096 m (20 ft) above sea-level	United States Geological Survey (USGS) National Elevation Dataset (NED) - 1997
<i>Developed Areas</i>	Developed (i.e., residential, commercial, industrial) and undeveloped lands within study area.	Digitized on-screen from NAIP DOQQ 2004 Aerial Photos
<i>Roads</i>	Used to map lands to be protected along a roadway corridor.	US Census 2000 Tiger Files
<i>Water and Shoreline</i>	Used to map lands inside 1,000 ft buffer from the shoreline in areas with high elevation change inside this corridor (greater than 20 feet)	National Oceanic and Atmospheric Organization (NOAA), Coastal Services Center website
<i>Water Bodies</i>	Used to exclude lands from the analysis	National Oceanic and Atmospheric Organization (NOAA), Coastal Services Center website
<i>National Wetlands Inventory</i>	Used to identify tidal and nontidal wetlands for the entire study area.	National Wetland Inventory (NWI) website (1992)
<i>Conservation Lands</i>	State and federal lands, public parks, others	Texas General Land Office website. County Parks and other public areas were on-screen digitized using other sources, such as Google and Yahoo Maps
<i>Future development areas</i>	Used to project future developed areas likely to be protected from SLR	Digitized from local expert input .
<i>Study area</i>	Defines landward boundary of study area by identifying lands that are higher than 20 feet in elevation or within 1,000 feet of mean high water based on tidal wetlands data.	Contract to EPA/2005-2006
Note: DATA SOURCES section gives additional detail on each data source.		

Project Study Area

In order to represent the areas that would mostly likely be affected by sea level rise, a mask for the study area was created. Two main components for the study area mask include:

- Elevation: Less or equal to 20 feet (6.096 m)
- Shoreline Buffer: Less or equal to 1000 feet. The buffer was used to complement the first criterion (elevation) in shoreline areas with high elevation values where otherwise only a very small strip would be shown.

An elevation raster layer was created using the digital elevation models downloaded from the National Elevation Dataset. A shoreline buffer of 1000 feet or less inland was derived from a vector shoreline shapefile for Texas downloaded from NOAA (http://www.csc.noaa.gov/shoreline/data_central.html). Once the mask was complete and the study area was defined (see figure 2), all other layers were masked to the study area to exclude unwanted information outside the project boundaries.

The Maps

The following process was used to derive thematic maps with probable shoreline protection areas, based on existing and predicted land use/land cover changes. The "Existing Development" layer was completely digitized on screen from 2004 Aerial Photos and contains the land use category: "*Existing Development*". Within the "*Existing Development*" layer we included "*infill*" and "*imminent development*" areas. "Infill" and "imminent development" areas are places that the informants were almost certain would be developed in the near future or be protected based on the proximity to development. For example, a planned subdivision would be considered "imminent development" even though construction had not yet begun. The final SLRR legend shows only one category of "brown" development or *Protection Almost Certain*, but the infill and imminent development areas are preserved within the GIS layers. Finally, based on expert input from local experts in each area, a new layer named "*New Areas*" that includes "Predicted Future Development" was on-screen digitized and included on the maps (for more information on the mapping and data layers, please see the metadata appendix).

Comprehensive County Sea Level Rise Response Maps with the following legend were produced:

Shore Protection Almost Certain (Dark Brown)

Shore Protection Likely (Red)

- Shore Protection Unlikely (Dark Blue)
- Open Water (Light Blue)
- Wetlands (Dark Green)
- No Shore Protection (Light Green)

Note: GIS layers are not necessarily in this order

Map Layouts (Hard-Copy and Digital Maps)

To produce final versions of Sea Level Rise Response (SLRR) Maps (digital and Hard-copy maps), the following vector layers were added to an ArcMap document:

- a) County Boundaries
- b) Roads (US Census 2000 - TIGER files)
- c) Water Bodies (US Census 2000 - TIGER files - NOAA)
- d) CBRA flood zones (Federal Emergency Management Agency - FEMA)

Input Data

To derive the final datasets, 6 input datasets were used.

Input datasets – vector:

<i>Water.shp</i>	(Water Bodies)
<i>Wetlands.shp</i>	(Wetland Areas)
<i>Conserv.shp</i>	(Conservation Lands)
<i>ExistDev.shp</i>	(Existing Development)
<i>Roads.shp</i>	(Roads and Streets)
<i>New</i>	(New Development)

Pre-Processing steps

1. Clip water features to each county study area to produce **Water.shp** vector dataset.
2. Clip wetlands features to each county study area to produce **Wetlands.shp** vector dataset. Filter dataset to Include Estuarine, Palustrine and Riverine wetlands. Exclude "Farmed", "Dike/Impounded" and "Spoil" categories.

3. Clip conservation features to each county study area to produce **Conserv.shp**. Create **ExistDev.shp** (existing development) feature class by digitizing urban and other outstanding developed areas directly from high-resolution 2004 Aerial photos (on-screen digitizing).
4. Create **Roads.shp** by clipping the Tiger Roads feature class to the county study area.
5. Create **New.shp** feature class by digitizing changes to existing land-cover values as suggested by local experts during field and on-line conferences.

Certain GIS layers were overlaid on top of others in order to demonstrate an accurate perception of the projected Sea Level Rise Response within each county. For example, once a wetland is developed it would no longer exist. Therefore, we placed current and future development on top of existing wetlands. Since it is important to demonstrate the current conservation areas, they were placed on top of the 20 foot elevation mask. Below is the order in which the layers are placed within the GIS projects from top to bottom.

1. Roads
2. CBRA areas
3. Open water
4. Conservation – No Shore Protection
5. Existing Development – Shore Protection Almost Certain
6. New Development - Shore Protection Likely
7. Wetlands
8. Study Area – Shore Protection Unlikely

DATA SOURCES

Digital Elevation Models (DEM)

Downloaded from the United States Geological Survey (USGS) National Elevation Dataset (NED) website <http://ned.usgs.gov>

Water and Shoreline

Downloaded from the National Oceanic and Atmospheric Organization (NOAA) website <http://www.csc.noaa.gov/shoreline/data.html>

Water Bodies (NOAA)

<http://www.csc.noaa.gov/shoreline/data.html>

Wetlands (National Wetland Inventory NWI)

<http://wetlandsfws.er.usgs.gov/NWI/download.html>

Conservation Lands (state and federal lands, public parks, others)

Downloaded from Texas General Land Office. County Parks and other public areas were digitized on-screen using other sources, like Google Maps

<http://www.glo.state.tx.us/gisdata/gisdata.html>

Developed Areas (Digitized on-screen from NAIP DOQQ 2004 Aerial Photos

)
<http://www.tnris.state.tx.us/digital.htm>

Roads (US Census 2000 Tiger Files)

http://arcdata.esri.com/data/tiger2000/tiger_download.cfm

New Development (Digitized from local expert's input outlines drawn on PDF version of GIS maps

APPENDIX B: METADATA

Metadata as Exported from ArcGIS

1. SLRR EXISTING DEVELOPMENT FOR TEXAS COASTAL COUNTIES

Metadata:

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Entity and Attribute Information
- Distribution Information
- Metadata Reference Information

Identification_Information:

Citation:

Citation_Information:

Originator: Heather Biggs, John Jacob and Ricardo Lopez

Publication_Date: January 2008

Title: SLRR Existing Development for Texas Coastal States

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Publication_Information:

Publication_Place: TCWP

Publisher: TCWP

Other_Citation_Details:

The TCWP worked on this project from January 2007 to December 2007

Online_Linkage:

\\GIS-HB\C\$\Projects_HB\SLR_Jeff\Data\ExistingDev\ExistingDev.shp

Description:

Abstract:

This GIS layer was prepared under a contract to Industrial Economics, Inc., in consultation with Jim Titus of the EPA to be published in a report to demonstrate the response to sea level rise within the next 30 years. We defined the study area to encompass all areas equal or less than 20 feet in elevation and within 1000 feet or less of the Texas Coast shoreline. This layer represents development up to the year 2005.

Purpose:

The purpose of constructing this layer was to prepare a set of maps showing anticipated local response to sea level rise in 17 Texas Coastal Counties: Jefferson, Orange, Chambers, Galveston, Harris, Brazoria, Matagorda, Jackson, Calhoun,

Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. This report is part of a national effort on the part of the Environmental Protection Agency to begin a national assessment of the impacts of sea level rise and to begin to encourage long-term thinking and planning for sea level rise by local officials. Existing development layers were created for all Texas Coastal Counties within the study area of ≤ 20 feet in elevation and ≤ 1000 feet from the coastal shoreline. A "New Development" (or projected development) layer was also created to demonstrate forecast growth between now and 2040.

Supplemental_Information:

The Texas A&M Texas Coastal Watershed Program created multiple GIS layers in order to fulfill the objective mentioned in the Purpose section of this metadata.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: publication date

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -94.361788

East_Bounding_Coordinate: -93.854883

North_Bounding_Coordinate: 30.182652

South_Bounding_Coordinate: 29.695511

Keywords:

Theme:

Theme_Keyword_Thesaurus: Global Warming

Theme_Keyword: Sea Level Rise

Place:

Place_Keyword_Thesaurus: Texas

Place_Keyword: Texas Coast

Stratum:

Stratum_Keyword_Thesaurus: Coastal Habitat

Stratum_Keyword: Wetlands

Temporal:

Temporal_Keyword: Sea Level Rise

Access_Constraints: None

Use_Constraints:

The Texas Coastal Watershed Program must be given credit for the use of this product.

Point_of_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program
Contact_Person: Heather Biggs/Ricardo Lopez
Contact_Position: Geo-information Specialist
Contact_Voice_Telephone: 281-218-6128
Contact_Electronic_Mail_Address: biggsh@tamu.edu
Hours_of_Service: 8-5 M-F
Data_Set_Credit: Texas A&M Texas Coastal Watershed Program
Security_Information:
Security_Classification: Unclassified
Native_Data_Set_Environment:
Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 2; ESRI ArcCatalog 9.2.1.1332
Cross_Reference:
Citation_Information:
Originator: John Jacob, Heather Biggs, Ricardo Lopez
Publication_Date: Unknown
Publication_Time: Unknown
Title:
Anticipated Local Response to Sea Level Rise Along the Texas Coast
Edition: 1
Geospatial_Data_Presentation_Form: map
Other_Citation_Details:
This GIS layer was created as part of a report to the EPA regarding the Reponse to Sea Level Rise.
Online_Linkage: www.urban-nature.com

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

The delineation of the development was created at a scale of 1:1000-1:5000 depending on the amount of development within an area. This layer was designed to give a general visual of the developed areas within each county at the county, not community, level.

Logical_Consistency_Report:

This layer is consistant with land use data on a county by county basis.

Completeness_Report:

The development polygons were created using 2004-2005 county mosaic images. The data created is only accurate up to 2005. Any development after 2005 was not necessarily incorporated within this layer. It was attempted to include all Imminent developement based on local expert knowledge.

Lineage:

Source_Information:

Source_Scale_Denominator:

Most areas were delineated at a 1:1000 - 1:5000 scale from 2004-2005 aerials

Type_of_Source_Media: Imagery acquired from Landsat

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 2004-2005

Process_Step:

Process_Description:

In order to derive the existing development layer for this project the TCWP reviewed aerial imagery from 2004-2005. Development was digitized on-screen from aerial county mosaics purchased from Landsat. There was no attempt to distinguish between low and high development.

Process_Date: May 2007 to December 2007

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Heather Biggs

Contact_Organization: TCWP

Contact_Position: Geo-information Specialist

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 m-f

Contact_Instructions: The final report will be posted at www.urban-nature.org

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 237

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 15

Transverse_Mercator:

Scale_Factor_at_Central_Meridian: 0.999600

Longitude_of_Central_Meridian: -93.000000

Latitude_of_Projection_Origin: 0.000000

False_Easting: 500000.000000

False_Northing: 0.000000

Planar_Coordinate_Information:

Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000000
Ordinate_Resolution: 0.000000
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: ExistingDev

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain:

Sequential unique whole numbers that are automatically generated.

Beginning_Date_of_Attribute_Values: September 2007

Ending_Date_of_Attribute_Values: October 2007

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: Id

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program

Contact_Person: Heather Biggs

Contact_Position: Geo-information Specialist/Extension Associate

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 m-f

Resource_Description: Downloadable Data

Distribution_Liability:

The Texas Coastal Watershed Program makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. Also, this organization makes no warranty, either express or implied, regarding the condition of the product or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these files have been processed successfully on computers at this organization, no warranty is made by this organization regarding the use of these data on any other system, nor does the fact of distribution constitute or imply such a warranty (Copied from HGAC metadata, 2007).

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.132

Digital_Transfer_Option:

Offline_Option:

Offline_Media: CD-ROM

Ordering_Instructions: Contact the Texas Coastal Watershed Program

Turnaround: 5 days

Custom_Order_Process:

If you would like to obtain this layer, please contact Heather Biggs at the Texas Coastal Watershed Program.

Technical_Prerequisites: none

Metadata_Reference_Information:

Metadata_Date: 20071219

Metadata_Review_Date: 20071213

Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program

Contact_Person: Heather Biggs

Contact_Position: Geo-information Specialist

Contact_Address:

Address_Type: mailing and physical address

Address: 17000 El Camino Real, Ste 301

City: Houston

State_or_Province: Texas

Postal_Code: 77058

Country: USA

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998

Metadata_Time_Convention: local time

Metadata_Access_Constraints: None

Metadata_Use_Constraints: Credit should be given to the TCWP for developing this metadata

Metadata_Security_Information:

Metadata_Security_Classification: Unclassified

Metadata_Extensions:

Online_Linkage: <<http://www.esri.com/metadata/esriprof80.html>>

Profile_Name: ESRI Metadata Profile

Generated by [mp](#) version 2.8.6 on Wed Dec 19 10:02:57 2007

2. SLRR NEW DEVELOPMENT FOR TEXAS COASTAL COUNTIES 2007-2040

Metadata:

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Entity and Attribute Information
- Distribution Information
- Metadata Reference Information

Identification_Information:

Citation:

Citation_Information:

Originator: Heather Biggs, John Jacob and Ricardo Lopez

Publication_Date: January 2008

Title: SLRR New Development for Texas Coastal States 2007-2040

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Publication_Information:

Publication_Place: TCWP

Publisher: TCWP

Other_Citation_Details: The TCWP created this layer from January 2007 to December 2007

Online_Linkage:

\\GIS-HB\C\$\Projects_HB\SLR_Jeff\Data\ExistingDev\ExistingDev.shp

Larger_Work_Citation:

Citation_Information:

Originator: The Texas Coastal Watershed Program

Publication_Date: Unpublished Material

Title:

Anticipated Local Reponse to Sea Level Rise along the Texas Coast: a First Approximation

Geospatial_Data_Presentation_Form: document

Online_Linkage: www.urban-nature.org

Description:

Abstract:

This GIS layer was prepared under a contract to Industrial Economics, Inc., in consultation with Jim Titus of the EPA to be published in a report to demonstrate the response to sea level rise within the next 30 years. We defined the study area

to encompass all areas equal or less than 20 feet in elevation and within 1000 feet or less of the Texas Coast shoreline. This layer represents forecast development based on information gathered from local experts.

Purpose:

The purpose of constructing this layer was to prepare a set of maps showing anticipated local response to sea level rise in 17 Texas Coastal Counties: Jefferson, Orange, Chambers, Galveston, Harris, Brazoria, Matagorda, Jackson, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. This report is part of a national effort on the part of the Environmental Protection Agency to begin a national assessment of the impacts of sea level rise and to begin to encourage long-term thinking and planning for sea level rise by local officials. A "New Development" (or projected development) layer was created to demonstrate forecast growth between now and 2040. Existing development layers were also created for all Texas Coastal Counties within the scope of this project.

Supplemental_Information:

The Texas A&M Texas Coastal Watershed Program created multiple GIS layers in order to fulfill the objective mentioned in the Purpose section of this metadata.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: publication date

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -94.350543

East_Bounding_Coordinate: -93.858227

North_Bounding_Coordinate: 30.066932

South_Bounding_Coordinate: 29.735139

Keywords:

Theme:

Theme_Keyword_Thesaurus: Global Warming

Theme_Keyword: Sea Level Rise

Place:

Place_Keyword_Thesaurus: Texas

Place_Keyword: Texas Coast

Stratum:

Stratum_Keyword_Thesaurus: Coastal Habitat

Stratum_Keyword: Projected Population

Temporal:

Temporal_Keyword: 2007

Access_Constraints: None

Use_Constraints:

The Texas Coastal Watershed Program must be given credit for the use of this product. These data were created for only areas within our study area: ≤ 20 feet in elevation and ≤ 1000 feet from the coast shoreline.

Point_of_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program

Contact_Person: Heather Biggs/Ricardo Lopez

Contact_Position: Geo-information Specialist

Contact_Address:

Address_Type: mailing and physical address

Address: 17000 El Camino Real, ste 301

City: Houston

State_or_Province: Texas

Postal_Code: 77058

Country: USA

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 M-F

Browse_Graphic:

Browse_Graphic_File_Type: JPEG

Data_Set_Credit: Texas A&M Texas Coastal Watershed Program

Security_Information:

Security_Classification: Unclassified

Native_Data_Set_Environment:

Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 2; ESRI ArcCatalog 9.2.1.1332

Cross_Reference:

Citation_Information:

Originator: John Jacob, Heather Biggs, Ricardo Lopez

Publication_Date: Unknown

Publication_Time: Unknown

Title:

Anticipated Local Response to Sea Level Rise Along the Texas Coast

Edition: 1

Geospatial_Data_Presentation_Form: map

Other_Citation_Details:

This GIS layer was created as part of a report to the EPA regarding the Reponse to Sea Level Rise.

Online_Linkage: www.urban-nature.com

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

This layer is strictly based on the opinions of local city and county experts and the Office of the Texas State Demographer. The TCWP makes no attempts to conclude this data is actual.

Logical_Consistency_Report:

This layer was created based on the knowledge from local experts within each Texas coastal county pertaining to future growth of the population within our study area (≤ 20 feet; ≤ 1000 from shoreline).

Completeness_Report:

This is just a first approximation of the areas that will likely be protected against sea level rise within the next 20 to 30 years along the Texas Coast. The TCWP assumes that governments will make reasonable efforts to protect coastal developed areas.

Positional_Accuracy:

Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report:

The TCWP contacted several representatives within each county to acquire knowledge of areas of potential growth within the study area. These data are strictly hypothetical scenarios for areas of future development based on best professional knowledge from local experts.

Vertical_Positional_Accuracy:

Vertical_Positional_Accuracy_Report: No vertical attributes exist within this data set.

Lineage:

Source_Information:

Type_of_Source_Media:

Personal communications with local experts and the Texas Office of the State Demographer

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 2004-2005

Source_Contribution:

We would like to thank all the county informants that participated in gathering of information regarding future development within the study area. For a list of informants please see the report documented in this metadata: Anticipated Local REponse to Sea Level Rise along the Texas Coast: A First Approximation. This report is available online at www.urban-nature.org.

Process_Step:

Process_Description:

In order to derive the new development layer for this project the TCWP reviewed projected population forecast data for each county as well as requested expert opinions for local, county and state planners and developers. The TCWP developed an "Existing development" layer, which allowed us to exclude current and

imminent development from this layer. County maps (pdfs) were provided to the local population experts in which they manually delineated areas of potential growth within the project study area within their county of expertise.

Process_Date: May 2007 to December 2007

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Heather Biggs

Contact_Organization: TCWP

Contact_Position: Geo-information Specialist

Contact_Address:

Address_Type: mailing and physical address

Address: 17000 El Camino Real

City: Houston

State_or_Province: Texas

Postal_Code: 77058

Country: USA

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 m-f

Contact_Instructions: The final report will be posted at www.urban-nature.org

Process_Step:

Process_Description: Metadata imported.

Source_Used_Citation_Abbreviation:

C:\DOCUME~1\Ricardo\LOCALS~1\Temp\xml44.tmp

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 8

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic:

Latitude_Resolution: 0.000000

Longitude_Resolution: 0.000000

Geographic_Coordinate_Units: Decimal degrees

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Semi-major_Axis: 6378137.000000

Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: New_Devel

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain:

Sequential unique whole numbers that are automatically generated.

Beginning_Date_of_Attribute_Values: September 2007

Ending_Date_of_Attribute_Values: October 2007

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: Id

Overview_Description:

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program

Contact_Person: Heather Biggs

Contact_Position: Geo-information Specialist/Extension Associate

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 m-f

Resource_Description: Downloadable Data

Distribution_Liability:

The Texas Coastal Watershed Program makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. Also, this organization makes no warranty, either express or implied, regarding the condition of the product or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these files have been processed successfully on computers at this organization, no warranty is made by this organization regarding the use of these data on any other system, nor does the

fact of distribution constitute or imply such a warranty (Copied from HGAC metadata, 2007).

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.132

Digital_Transfer_Option:

Offline_Option:

Offline_Media: CD-ROM

Ordering_Instructions: Contact the Texas Coastal Watershed Program

Turnaround: 5 days

Custom_Order_Process:

If you would like to obtain this layer, please contact Heather Biggs at the Texas Coastal Watershed Program.

Technical_Prerequisites: none

Metadata_Reference_Information:

Metadata_Date: 20071219

Metadata_Review_Date: 20071213

Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program

Contact_Person: Heather Biggs

Contact_Position: Geo-information Specialist

Contact_Address:

Address_Type: mailing and physical address

Address: 17000 El Camino Real, Ste 301

City: Houston

State_or_Province: Texas

Postal_Code: 77058

Country: USA

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 m-f

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998

Metadata_Time_Convention: local time

Metadata_Access_Constraints: None

Metadata_Use_Constraints: Credit should be given to the TCWP for developing this metadata

Metadata_Security_Information:

Metadata_Security_Classification: Unclassified

Metadata_Extensions:

Online_Linkage: <<http://www.esri.com/metadata/esriprof80.html>>

Profile_Name: ESRI Metadata Profile

Metadata_Extensions:

Online_Linkage: <<http://www.esri.com/metadata/esriprof80.html>>

Profile_Name: ESRI Metadata Profile

Generated by [mp](#) version 2.8.6 on Wed Dec 19 10:12:58 2007

3. SLRR STUDY AREA

Metadata:

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Entity and Attribute Information
- Distribution Information
- Metadata Reference Information

Identification_Information:

Citation:

Citation_Information:

Originator: Heather Biggs, John Jacob and Ricardo Lopez

Publication_Date: January 2008

Title: SLRR Study Area

Edition: 1

Geospatial_Data_Presentation_Form: raster digital data

Publication_Information:

Publication_Place: TCWP

Publisher: TCWP

Other_Citation_Details:

The TCWP worked on this project from January 2007 to December 2007. The study area is defined as ≤ 20 feet in elevation and ≤ 1000 feet from the Texas Coastal Shoreline.

Online_Linkage: \\GIS-

HB\C\$\Projects_HB\SLR_Jeff\Data\rst_output\msk20_1000b

Description:

Abstract:

This GIS layer was prepared under a contract to Industrial Economics, Inc., in consultation with Jim Titus of the EPA to be published in a report to demonstrate the response to sea level rise within the next 30 years. This layer was used as our study area for this project. We defined the study area to encompass all areas equal or less than 20 feet in elevation and within 1000 feet or less of the Texas Gulf of Mexico shoreline.

Purpose:

The purpose of constructing this layer was to prepare a set of maps showing anticipated local response to sea level rise in 17 Texas Coastal Counties: Jefferson, Orange, Chambers, Galveston, Harris, Brazoria, Matagorda, Jackson, Calhoun,

Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. This report is part of a national effort on the part of the Environmental Protection Agency to begin a national assessment of the impacts of sea level rise and to begin to encourage long-term thinking and planning for sea level rise by local officials. This dataset enabled TCWP to mask the additional project layers to our study area (≤ 20 feet elevation at at least 1000 feet from the NOAA shoreline).

Supplemental_Information:

The Texas A&M Texas Coastal Watershed Program created multiply GIS layers in order to fulfill the objective mentioned in the Purpose section of this metadata.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: publication date

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -94.446554

East_Bounding_Coordinate: -93.793067

North_Bounding_Coordinate: 30.191786

South_Bounding_Coordinate: 29.404812

Keywords:

Theme:

Theme_Keyword_Thesaurus: Global Warming

Theme_Keyword: Sea Level Rise

Place:

Place_Keyword_Thesaurus: Texas

Place_Keyword: Texas Coast

Stratum:

Stratum_Keyword_Thesaurus: Coastal Habitat

Stratum_Keyword: Coastal Region

Temporal:

Temporal_Keyword: Sea Level Rise

Access_Constraints: None

Use_Constraints:

The Texas Coastal Watershed Program must be given credit for the use of this product.

Point_of_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program

Contact_Person: Heather Biggs/Ricardo Lopez

Contact_Position: Geo-information Specialist
Contact_Voice_Telephone: 281-218-6128
Contact_Electronic_Mail_Address: biggsh@tamu.edu
Hours_of_Service: 8-5 M-F
Data_Set_Credit: Texas A&M Texas Coastal Watershed Program
Security_Information:
Security_Classification: Unclassified
Native_Data_Set_Environment:
Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 2; ESRI ArcCatalog 9.2.1.1332
Cross_Reference:
Citation_Information:
Originator: John Jacob, Heather Biggs, Ricardo Lopez
Publication_Date: Unknown
Publication_Time: Unknown
Title:
Anticipated Local Response to Sea Level Rise Along the Texas Coast
Edition: 1
Geospatial_Data_Presentation_Form: map
Other_Citation_Details:
This GIS layer was created as part of a report to the EPA regarding the Reponse to Sea Level Rise.
Online_Linkage: www.urban-nature.com

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

The reaster dataset is only as accurate as the National Elevation Dataset and the NOAA shoreline layer, which were used as input to create this layer. Since the layers were reclassified, no elevation data remains within this layer. If you would like the unclassified DEM for a particular state, please contact the TCWP or download the data from the USGS NED (<http://ned.usgs.gov/>).

Quantitative_Attribute_Accuracy_Assessment:

Attribute_Accuracy_Value: 1

Attribute_Accuracy_Explanation:

The value of 1 equals all elevations ≤ 20 feet in elevation and at a minium of 1000 feet from the shoreline. For example: if an area 900 feet from the shoreline was above 20 feet in elevation it was included in the mask.

Logical_Consistency_Report:

This layer is elevation data on a county by county basis. This metadata represents all the mask layers created for all the Texas Coastal Counties. However, different projections were used for certain sections of the state depending on the local representative projection. For Example: Harris, Chambers and Galveston County masks were created in Texas South Central State Plane (feet 4202) due to having

two UTM zones within one county. The lower sections of the state were created in UTM Zone 14. To acquire individual metadata for each state please contact the TCWP.

Completeness_Report: Complete

Positional_Accuracy:

Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report:

See National Elevation Dataset Raster DEMs and NOAA Coastal Services Center Shoreline vector files

Vertical_Positional_Accuracy:

Vertical_Positional_Accuracy_Report:

The TCWP derived this layer based on the elevation value from the NED DEMs. Raster calculator was used to query all elevations ≤ 20 feet. The dataset was then reclassified so that 0 = all elevations > 20 feet and 1 = all elevations less than or equal to 20 feet.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Title: USGS National Elevation Dataset

Source_Scale_Denominator:

The TCWP downloaded the NED for each county. Some counties had multiply downloads due to the size of the particular county and file size.

Type_of_Source_Media: Downloaded via internet

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 2007

Source_Currentness_Reference: ground condition

Source_Citation_Abbreviation: USGS NED

Source_Contribution: <http://ned.usgs.gov/>

Process_Step:

Process_Description:

In order to derive the mask or study area, TCWP downloaded multiply DEMs from the National Elevation Dataset (NED) for each county. The DEMs were then merged using Spatial Analyst Tools to construct one elevation layer. Next TCWP used the NOAA shoreline layer for the Texas Coast and created a 1000 foot buffer. Each dataset was then reclassified. Raster Calculator was then used to "add" the two datasets together creating one raster dataset that included all elevations equal or less than 20 feet in elevation and extended inland at least 1000 feet from the shoreline. Regardless of the distance from the shoreline, all elevations less than or equal to 20 feet were included in the mask.

Process_Date: May 2007 to December 2007

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Heather Biggs

Contact_Organization: TCWP

Contact_Position: Geo-information Specialist

Contact_Address:

Address_Type: mailing and physical address

Address: 17000 El Camino Real; Ste 301

City: Houston

State_or_Province: Texas

Postal_Code: 77058

Country: USA

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 m-f

Contact_Instructions: The final report will be posted at www.urban-nature.org

Process_Step:

Process_Description: Metadata imported.

Source_Used_Citation_Abbreviation:

C:\DOCUME~1\Ricardo\LOCALS~1\Temp\xml14F.tmp

Cloud_Cover: NA

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference: NED

Direct_Spatial_Reference_Method: Raster

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 237

Raster_Object_Information:

Raster_Object_Type: Grid Cell

Row_Count: 3006

Column_Count: 2163

Vertical_Count: 1

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 15

Transverse_Mercator:

Scale_Factor_at_Central_Meridian: 0.999600

Longitude_of_Central_Meridian: -93.000000
Latitude_of_Projection_Origin: 0.000000
False_Easting: 500000.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: row and column
Coordinate_Representation:
Abscissa_Resolution: 28.813637
Ordinate_Resolution: 28.813637
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:

Detailed_Description:
Entity_Type:
Entity_Type_Label: msk20_1000b.vat
Attribute:
Attribute_Label: Rowid
Attribute_Definition: Internal feature number.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: VALUE
Attribute:
Attribute_Label: COUNT

Distribution_Information:

Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Texas Coastal Watershed Program
Contact_Person: Heather Biggs
Contact_Position: Geo-information Specialist/Extension Associate
Contact_Address:
Address_Type: mailing and physical address
Address: 17000 El Camino Real; Ste 301
City: Houston
State_or_Province: Texas

Postal_Code: 77058

Country: USA

Contact_Voice_Telephone: 281-218-6128

Contact_Electronic_Mail_Address: biggsh@tamu.edu

Hours_of_Service: 8-5 m-f

Resource_Description:

All elevations along the Texas Coastal Counties of 20 feet or less.

Distribution_Liability:

The Texas Coastal Watershed Program makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. Also, this organization makes no warranty, either express or implied, regarding the condition of the product or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these files have been processed successfully on computers at this organization, no warranty is made by this organization regarding the use of these data on any other system, nor does the fact of distribution constitute or imply such a warranty (Copied from HGAC metadata, 2007).

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

File-Decompression_Technique: no compression applied

Transfer_Size: 0.150

Digital_Transfer_Option:

Offline_Option:

Offline_Media: CD-ROM

Fees: No Fees

Ordering_Instructions: Contact the Texas Coastal Watershed Program

Turnaround: 5 days

Custom_Order_Process:

If you would like to obtain this layer, please contact Heather Biggs at the Texas Coastal Watershed Program.

Technical_Prerequisites: none

Metadata_Reference_Information:

Metadata_Date: 20071219

Metadata_Review_Date: 20071213

Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: Texas Coastal Watershed Program

Contact_Person: Heather Biggs

Contact_Position: Geo-information Specialist

Contact_Address:

Address_Type: mailing and physical address

Address: 17000 El Camino Real, Ste 301
City: Houston
State_or_Province: Texas
Postal_Code: 77058
Country: USA
Contact_Voice_Telephone: 281-218-6128
Contact_Electronic_Mail_Address: biggsh@tamu.edu
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: None
Metadata_Use_Constraints: Credit should be given to the TCWP for developing this metadata
Metadata_Security_Information:
Metadata_Security_Classification: Unclassified
Metadata_Extensions:
Online_Linkage: <<http://www.esri.com/metadata/esriprof80.html>>
Profile_Name: ESRI Metadata Profile

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