GREATER POINT COMFORT TX AREA LIVING SHORELINE FEASIBILITY STUDY

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Earlier this year, BCarbon received a grant from Formosa Plastics to examine the potential for coastal living shoreline/blue carbon projects in the vicinity of Point Comfort, Texas. This report sets forth the results of this work.

Please note: *in this grant, Formosa assessed the feasibility of regionally targeted living shoreline projects, but this report does not constitute in any way a commitment to construct such projects.*

Introduction

As sea levels rise, existing coastal wetlands and the aquatic habitats they provide for fish and marine life will be destroyed unless steps are taken soon to address this threat. In the most recent report of the Intergovernmental Panel on Climate Change, IPCC noted that "adaptation options that are feasible and effective today will become constrained and less effective with increasing global warming". The option to protect coastal wetlands and maintain their ability to sequester carbon dioxide is one of those options that will not be available in the future as the wetlands begin to be lost.

One way to protect these wetlands is to develop innovative and creative options such as the coastal living shoreline blue carbon credit protocol developed by BCarbon. This protocol allows for the issuance of carbon credits based both upon (1) the protection of carbon stored in the marsh that would be released as the marsh erodes and (2) on a yearly basis for the continued sequestration based upon a healthy, protected marsh. In this way, carbon credits can provide a pathway for protecting the fisheries and marsh habitat of the Texas coast.

In this study, BCarbon has identified 25 potential marsh protection/carbon credit generation projects within 30 miles of the greater Point Comfort area. The concept behind this study is that carbon offsets are a key part of industry toolkits to achieve net zero carbon emissions in the future. Manufacturing facilities and plants are in the process of developing long-term carbon abatement plans, and

nature-based carbon offsets can and should be a part of a comprehensive program that includes internal steps to avoid and minimize carbon emissions. By focusing upon nature- based carbon credit projects near their facilities, mid-coast plants and manufacturers can make a major contribution to the long-term viability of the Lavaca, Matagorda and San Antonio Bay fisheries and also assist endangered and threatened species such as the Whooping crane and Black rail. In this way, a carbon abatement strategy can also become a community and ecological enhancement strategy, creating enormous value for participating companies far beyond "net zero" goals.

BCarbon's Living Shoreline Carbon Credit Protocol

Living shorelines provide an excellent mechanism to combat erosion and act as a sediment trap to allow coastal wetlands a better chance of surviving the impact of sea level rise. The modern living shoreline concept was first applied to erosion control projects in the Chesapeake Bay and has since expanded to coastal regions throughout the U.S. and elsewhere. A variety of natural or biodegradable materials such as stone, sand, oyster shells, prefabricated structures and/or coir logs are typically used, generally in conjunction with planting of native species such as Spartina alterniflora – Smooth (or Saltmarsh) cordgrass.

Living shorelines come in many different configurations, but the fundamental difference between a living shoreline and a traditional protective bulkhead or other "hard" infrastructure is that the latter abruptly severs the ecological connection between the original shoreline and the water (and often requires significant maintenance over the life of the structure), whereas living shorelines maintain that connection, allowing wildlife easy access from water to land, encouraging much more wildlife in crucial habitats along the water's edge. Living shorelines also become part of the shoreline landscape, rarely if ever requiring any post-construction maintenance.

Visit this link to the Texas General Land Office guidance document about living shorelines for further information and context:
https://www.glo.texas.gov/livingshorelines/documents/guide-to-living-shorelines- in-texas.pdf

Evidence from existing projects indicates that properly constructed, living shorelines can:

- stop the erosion of the toe of the wetlands, thereby preventing the potential loss of large amounts of carbon stored in wetland soils;
- protect landward portions of the wetlands that would otherwise erode in future decades from wave energy as the shoreline continues to recede;
- support the regeneration of wetlands and habitat creation, depending on the surrounding environment and structural design. Plants in protected shorelines can provide additional stability by trapping sediments which would otherwise be exported and oxidized in adjacent estuarine waters, resulting in a vertical increase ("accretion") of the wetland (Figure 1).

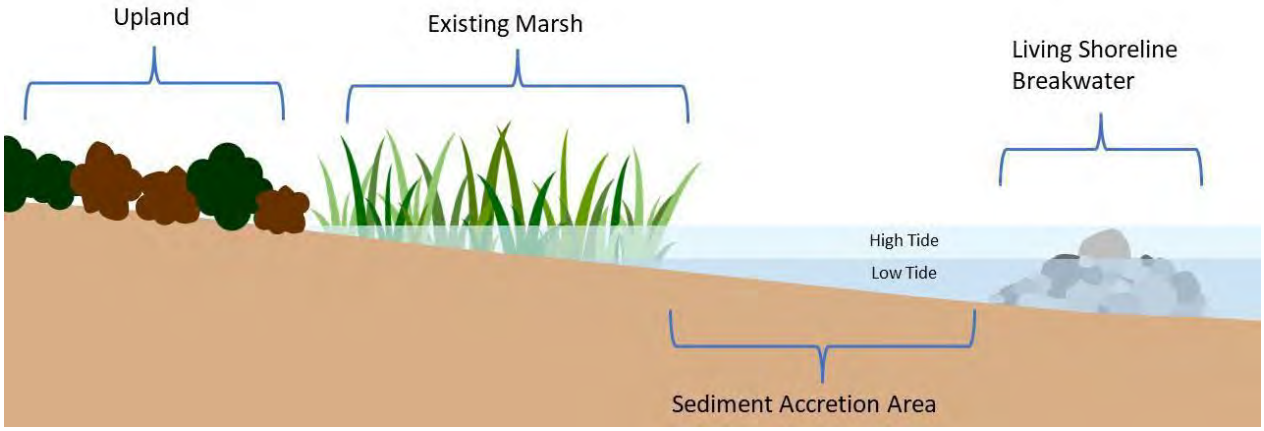


FIGURE 1. Diagrammatic representation of living shoreline

Under BCarbon's methodology, the impact of sea level rise is quantified using the Sea Level Affecting Marshes Model (SLAMM) developed by the Harte Research Institute (HRI) and AECOM for the Texas General Land Office 2023 Texas Coastal Resiliency Coastal Master Plan. Once the loss area is determined, the amount of carbon stored in that area is calculated using a database developed for BCarbon by Dr. Rusty Feagin of Texas A&M University. This database builds off of earlier research funded by the National Aeronautics and Space Administration (NASA) and draws from two key data streams: the continuously updating U.S. Fish and Wildlife Service National Wetlands Inventory (NWI), and decades of soil sampling by Natural Resources Conservation Service (NRCS), the Soil Survey Geographic Database (SSURGO) and others.

A BCarbon-certified living shoreline project is designed to protect the marsh's

stored carbon and also to allow annual carbon credits to be issued based upon the drawdown of carbon dioxide within the protected marsh area.

Living Shorelines and Potential (Co)Benefits

The purpose of the grant-funded BCarbon study was to determine the availability and feasibility of prospective wetland protection projects within a thirty mile radius of the Point Comfort area in the Texas mid-coast. In addition to potentially providing carbon credits to offset the carbon footprint of area facilities, these projects would be "local," meaning that both employees and citizens of the region could benefit from this marsh protection, as the continued health of the marsh protects the wetland nursery function that is so essential to recreational fishing on the Texas coast. Moreover, living shorelines would work to protect the habitat of wetland-dependent avian species, including the threatened Black rail and endangered Whooping crane, promoting ecotourism via birding in the area. Emergent breakwater structures, especially those involving oyster colonization, could also add foraging and roosting habitat for shorebirds like American oystercatchers and a wide variety of terns, sandpipers, and plovers.

As an example of the area's importance to birds and birders, there are four prestigious Audubon Christmas Bird Count (CBC) circles within the study area, three of which typically rank within the top four counts in Texas in terms of observed species. One of those counts, Mad Island, generally leads the nation. Partly in reaction to this abundance, bird festivals are popping up all along the Texas coast; in 2023 the 7th annual Matagorda Bay Birdfest was held in Palacios, within the project study area.

These types of events are significant contributors to the local economies of the coast. Copano Bay (in neighboring Aransas / Refugio Counties) is an instructive example of the economic impacts of not only birding, but also fishing. Rockport Fulton estimates 70,000+ visitors per year to the Aransas National Wildlife Refuge, with a local annual economic impact of $5-7 million annually, including private tours. As for fishing impacts, the Rockport Fulton Chamber of Commerce estimates that, conservatively, the fishing guide industry alone generates $13,500,000 annually (Rockport Fulton Chamber of Commerce, USFWS). By protecting and enhancing wetland habitats,

including those on private lands with willing landowners, additional co-benefits from a corporate carbon footprint reduction strategy can strengthen local economies.

Beyond the specific local benefits of wetland protection, it is also important to note that conserving Texas's wetlands has economic impacts coastwide. A study by Dr. David Batker found that an acre of wetlands on the Texas coast generated ecological service values of approximately $70,000 per acre per year.

Wetlands are the nurseries of the bay and the Gulf of Mexico. They have an important role in the life cycle of White and Brown shrimp, Blue crab and Southern flounder as well as many other species. In a study of the coastal fishery literature by the Texas Coastal Exchange, it was found that Texas coastal wetlands support an average of 68,000 Brown shrimp and 67,000 White shrimp per acre, along with almost 50,000 Blue crabs per acre.

The Proposed Projects

To investigate the availability of wetland protection projects proximate to Point Comfort, BCarbon created a map divided into four distinct areas – five-, ten-, twenty-, and thirty-mile radii around the city. As shown below in Figure 2, there are a total of 25 different potential projects that were identified within this area. 3 projects are within five miles, 12 within ten miles, 17 within 20 miles and 25 within 30 miles. These coastal projects stretch roughly from the Guadalupe Delta to the Mad Island Marsh complex in Matagorda Bay.

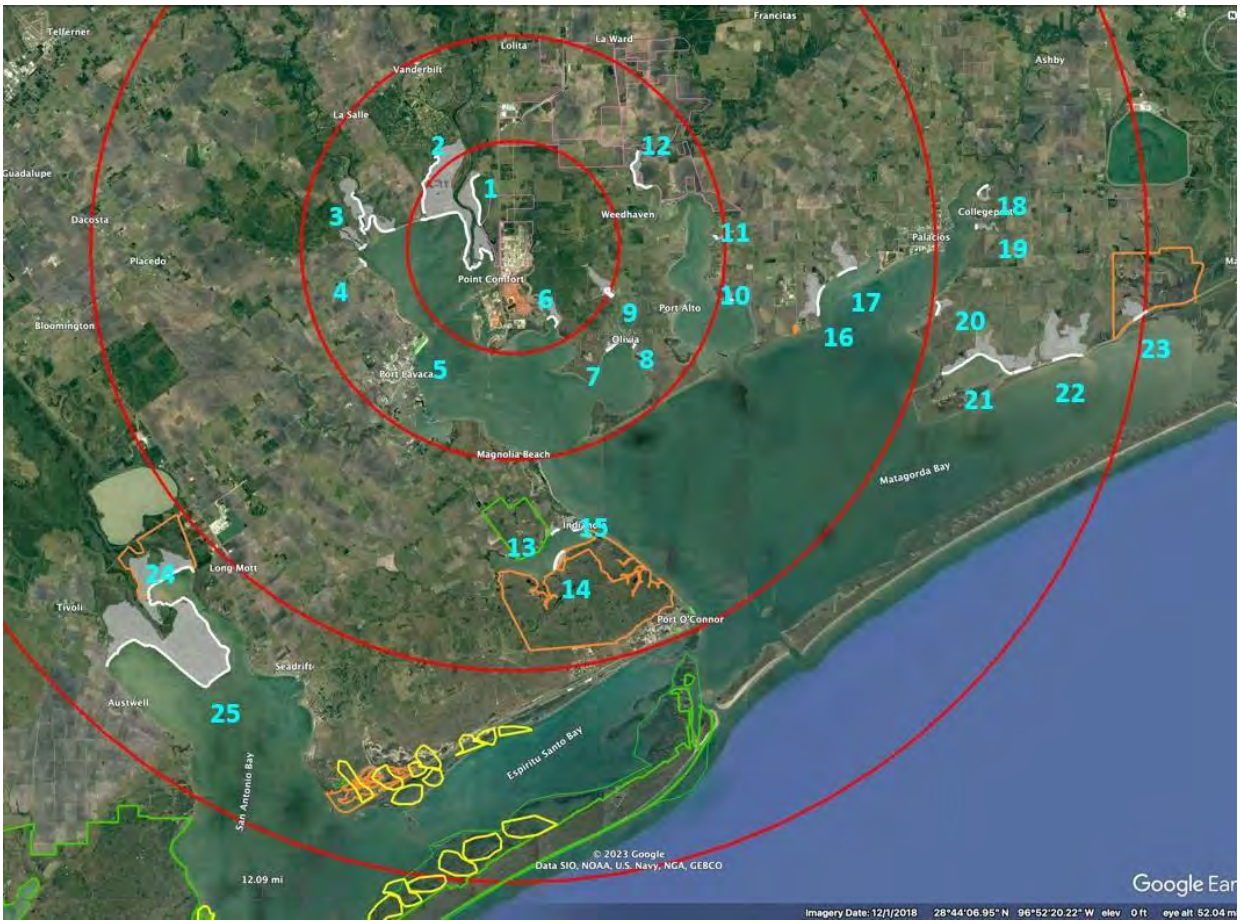


FIGURE 2.

A very general description of each site's location, miles of living shoreline required to be constructed, and acres protected is shown in Table 1. Together, these projects represent 59 miles of living shoreline and the protection of roughly 23,500 acres of wetlands.

Table 1

1-2 Lavaca River Delta and Swan Lake ~13 miles, 4400 AC
3 Garcitas & Placedo Creeks, Lavaca Bay ~5.75 miles, 1600 AC
4 Six Mile Creek, Lavaca Bay ~.6 Mile, 170 AC
5 Port Lavaca Bird Sanctuary ~.9 Mile, 68 AC
6 Cox Creek ~1 Mile, 450 AC
7 North Keller Bay ~.9 Mile, 80 AC
8 Olivia, Keller Bay ~.7 Mile, 60 AC
9 Keller Creek ~1.75 Miles, 440 AC

10 **Carancahua Bay Inlet** ~.35 Mile, 110 AC
11 **Five-Mile Draw, Vaes Bay** ~.3 Mile, 130 AC
12 **Carancahua Creek** ~2.6 Miles, 260 AC
13 **Powderhorn Lake North Shore** ~1 Mile, 130 AC
14 **Powderhorn Lake South Shore** ~1.1 Miles, 160 AC
15 **Powderhorn Bayou Indianola** ~1 Mile, 190 AC
16 **Turtle Bay West** ~1.5 Miles, 520 AC
17 **Turtle Bay East** ~1 Mile, 565 AC
18 **Collegeport North, Tres Palacios Bay** ~.75 Mile, 140 AC
19 **Collegeport South (Pelican Slough), Tres Palacios Bay** ~.25 Mile, 190 AC
20 **Coon Island Bay, Tres Palacios** ~.75 Mile, 170 AC
21 **Oyster Lake North Shore** ~4.7 Miles, 1500 AC
22 **Mad Island Marsh West** ~1.5 Miles, 2100 AC
23 **Mad Island Marsh East, Mad Island WMA** ~.8 Mile, 430 AC
24 **Guadalupe Delta WMA, Mission Lake** ~3 Miles, 1890 AC
25 **Guadalupe Delta** ~14 Miles, 7800 AC

The next step in this process is the assessment of the number of carbon credits available within the various project areas. This is determined by overlaying the project area determined by SLAMM modeling upon the carbon content map prepared by Dr. Feagin. The overall results are shown in Figure 2 and Table 2. (Note that for the purposes of this regional study, the carbon content in a given wetland protection area is approximated, but its precise value can be readily calculated for any given project, utilizing ArcGIS tools being developed by BCarbon.)

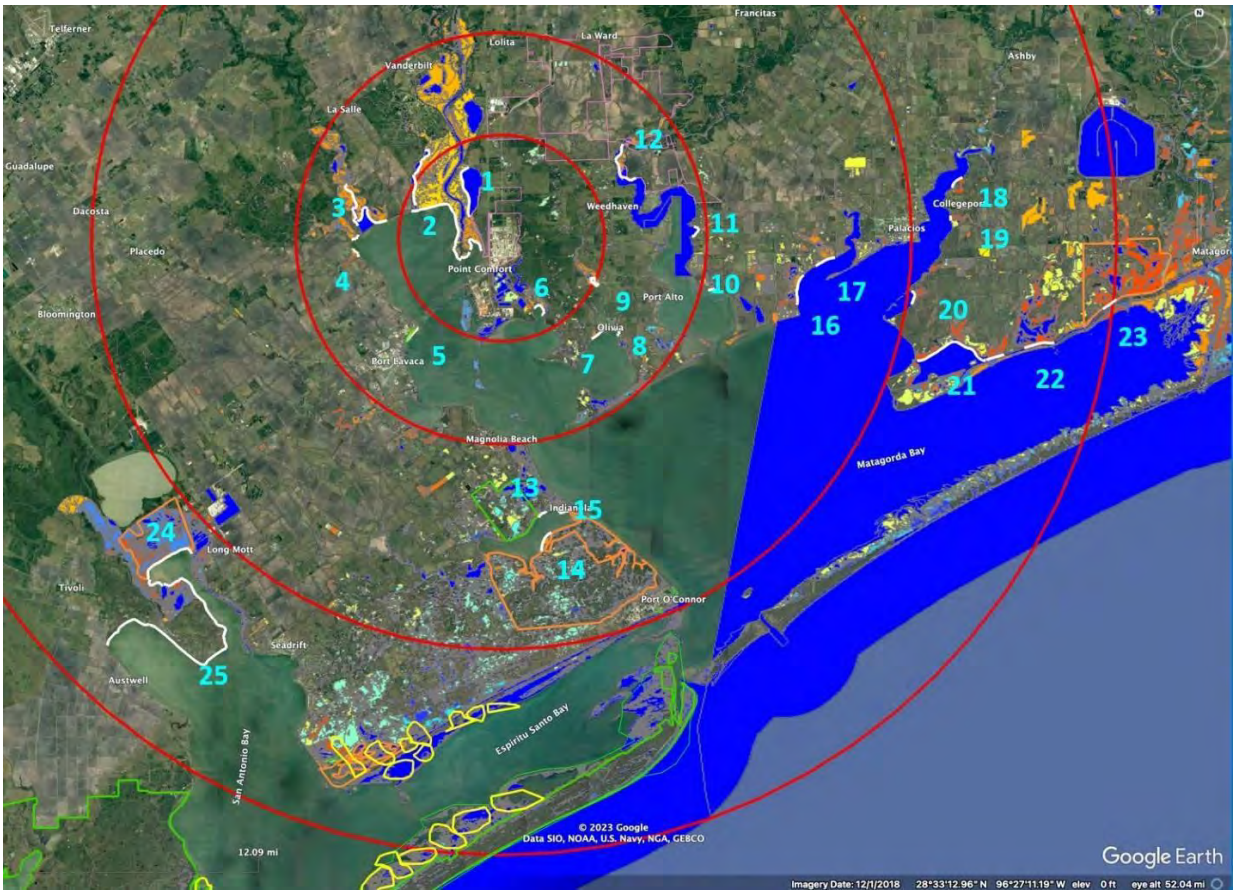


FIGURE 3.

Table 2

1-2 Lavaca Delta & Swan Lake ~770,000 tons - $39
3 Garcitas & Placedo Creeks, Lavaca Bay ~378,000 tons - $29
4 Six-Mile Creek, Lavaca Bay ~47,000 tons - $32
5 Port Lavaca Bird Sanctuary ~15,570 tons - $60
6 Cox Creek ~58,000 tons - $35
7 North Keller Bay ~16,000 tons - $100
8 Olivia, Keller Bay ~14,000 tons - $125
9 Keller Creek ~120,000 tons - $15
10 Carancahua Bay Inlet~27,500 tons - $32
11 Five-Mile Draw, Vaes Bay ~30,000 tons - $20
12 Carancahua Creek ~50,000 tons - $59
13 Powderhorn Lake North Shore ~16,000 tons - $63

14 **Powderhorn Lake South Shore** ~26,200 tons** - $42
15 **Powderhorn Bayou Indianola** ~39,000 tons - $26
16 **Turtle Bay West** ~119,000 tons - $20
17 **Turtle Bay East** ~119,000 tons - $13
18 **Collegeport North, Tres Palacios Bay** ~49,000 tons - $18
19 **Collegeport South (Pelican Slough), Tres Palacios Bay** ~67,000 tons - $6
20 **Coon Island Bay, Tres Palacios** ~48,000 tons - $20
21 **Oyster Lake North Shore** ~355,000 tons - $28
22 **Mad Island Marsh West** ~420,000 tons - $7
23 **Mad Island Marsh East, Mad Island WMA** ~155,000 tons - $13
24 **Guadalupe Delta WMA, Mission Lake** ~400,000 tons - $15
25 **Guadalupe Delta** ~1,300,000 tons - $23

***Marsh Platform Restoration Project, requires SOC field evaluation (typical)*

This analysis lays out the basic costs and paybacks for the various projects and suggests several different methods for considering these projects. For example, projects could be evaluated on the cost of carbon credits produced, which would suggest certain projects over others. If generating a volume of carbon credits at lowest possible cost was a goal, then one could screen out all projects producing less than 100,000 tons and see what emerged. Alternatively, one could utilize proximity as a factor in making that decision.

However, another basis for making this analysis is suggested by Figure 3 which shows the relationship of the various study projects to likely expansion areas for Whooping cranes as set out by the International Crane Foundation. Here, future crane habitat can be seen in proximity to eleven of the proposed wetland projects sites. Crane territorial expansion may be a co-benefit of interest for those credit buyers that are also concerned about impacts to Whooping cranes from other projects' activities either on the Texas coast or in the cranes' flyway.

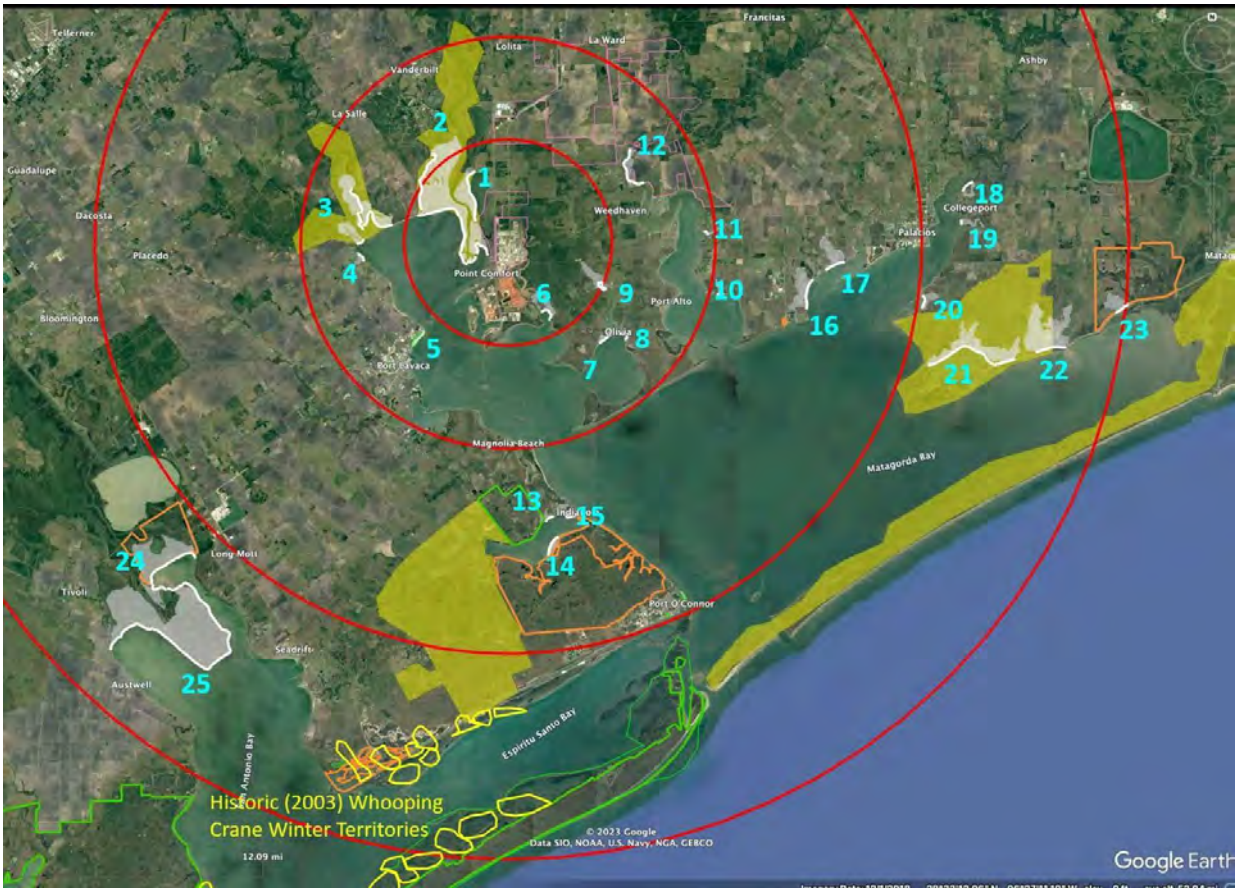


FIGURE 4. Future Whooping crane habitat shown relative to potential wetland protection projects.

In the appendices that follow, a more detailed analysis of each of the sites is shown. To illustrate the full process through which the analysis was produced, the Garcitas & Placedo Creeks site (Project #3) is set out in detail. Other project sites are then shown in summary fashion.

Conclusion

Living shoreline projects provide a unique opportunity to protect coastal resources in addition to serving as a foundation for a more sustainable and resilient coastal economy. They are also an ultimate win/win in terms of carbon abatement strategy. Once a company has avoided and minimized emissions from within the plant complex, alternative sources of carbon footprint reduction will be needed for the company to reach 2030 and 2050 goals related to carbon abatement and working toward net zero carbon emissions.

The living shorelines would not only help interested companies reach their carbon abatement goals, but would also protect their properties as well as those of its neighbors, provide job opportunities and income, and, in a few cases, enhance community parks for local municipalities and residents. It is hoped that this analysis will guide mid-coast plants, refineries, and others in the determination of the reasonableness of pursuing blue carbon credits in a way that incorporates "local" value from a fisheries and endangered species standpoint.

As stated previously, the IPCC has warned that conservation and climate resilience options exist today that might not be available in the next decade. The protection of Texas's coastal wetlands via living shoreline construction is a prime example of such time-sensitive action.

Today, the opportunity exists to protect our coastal wetlands and communities, conserve our valued fisheries, and enhance the habitats of critical avian species. In a decade, this opportunity, and all its environmental, economic, and social benefits, may no longer exist.

APPENDICES:

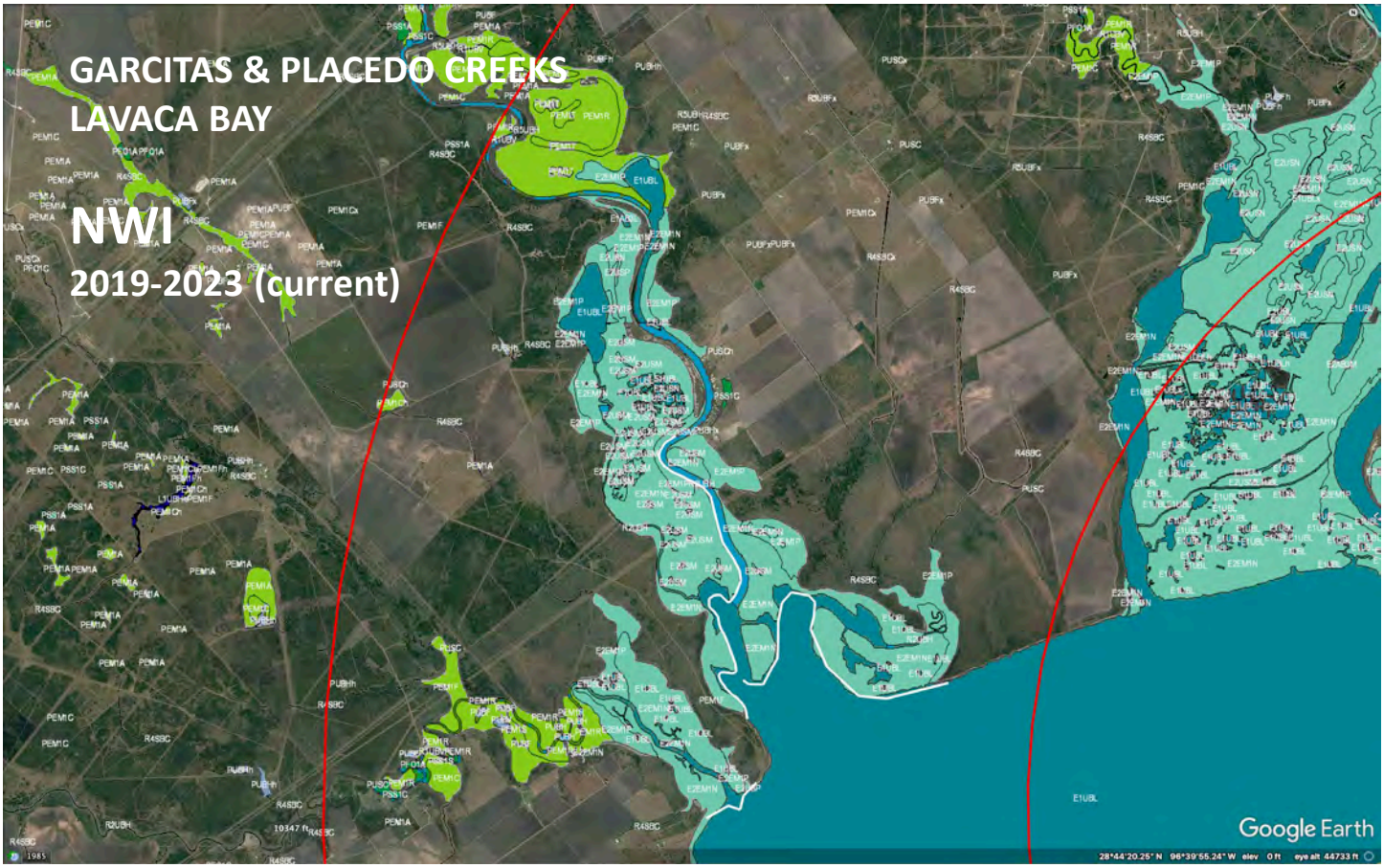
A: Garcitas & Placedo Creeks Case Study

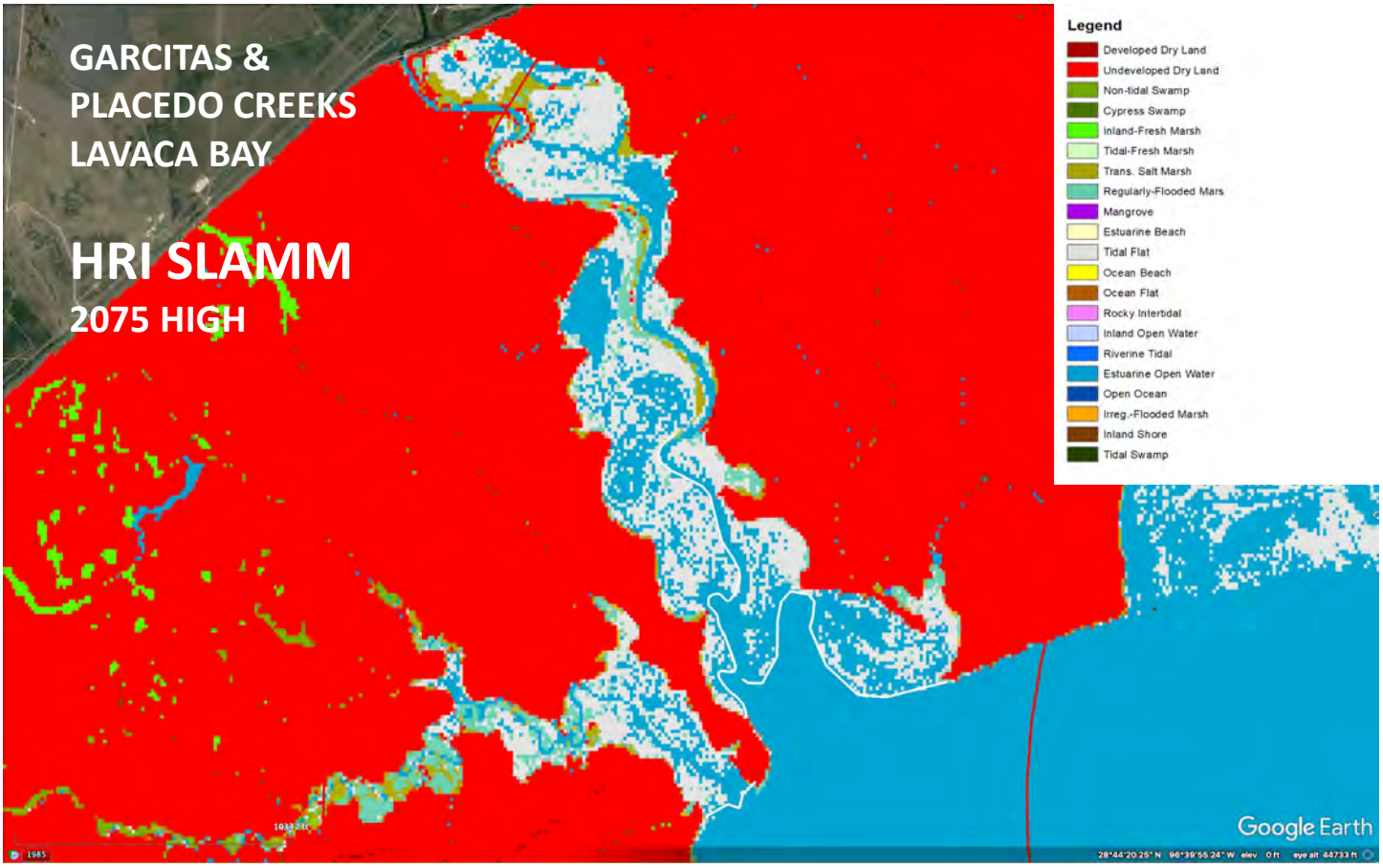
B: User Guide & Legends

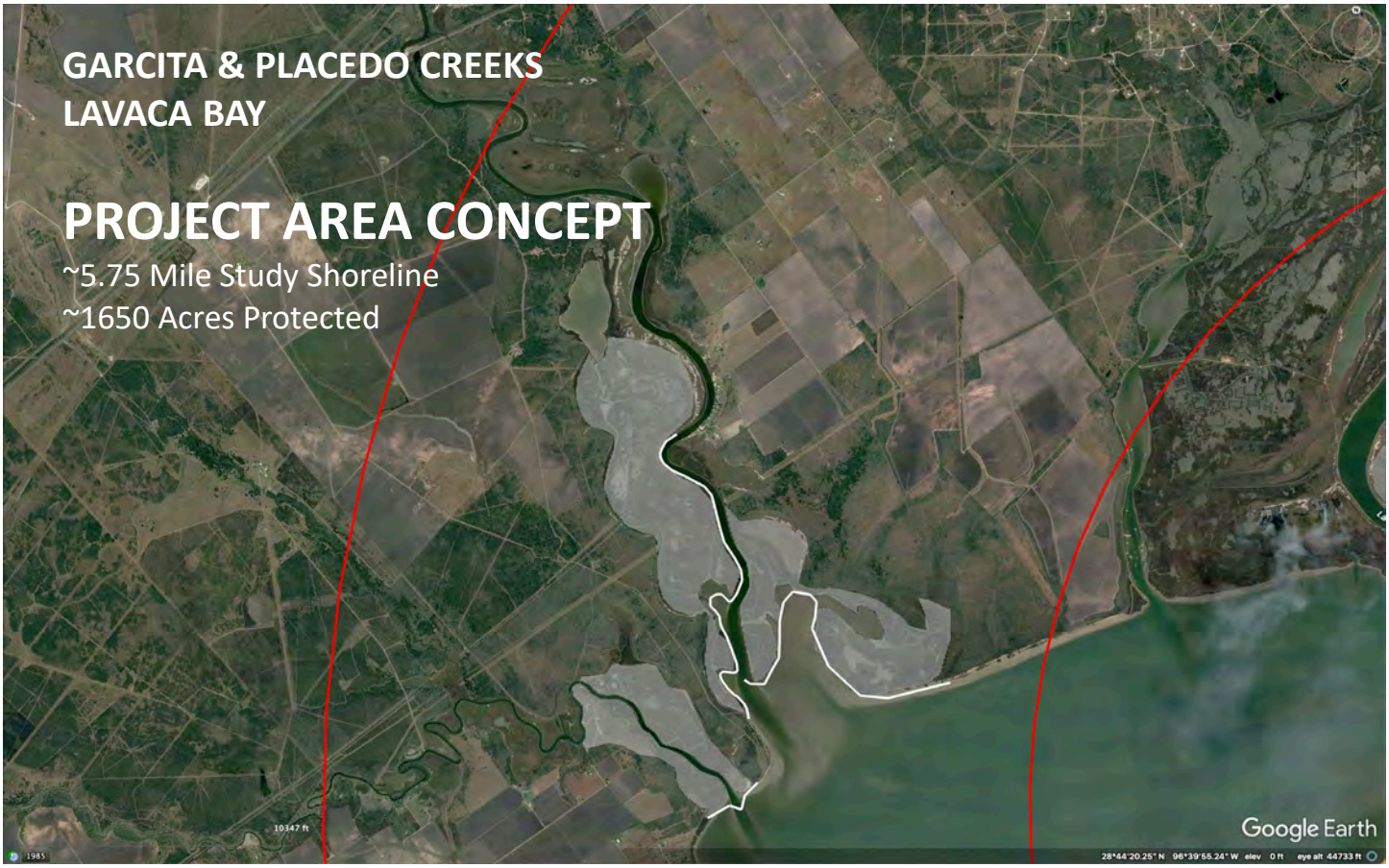
C: Project Descriptions (Cut Sheets) 1-25

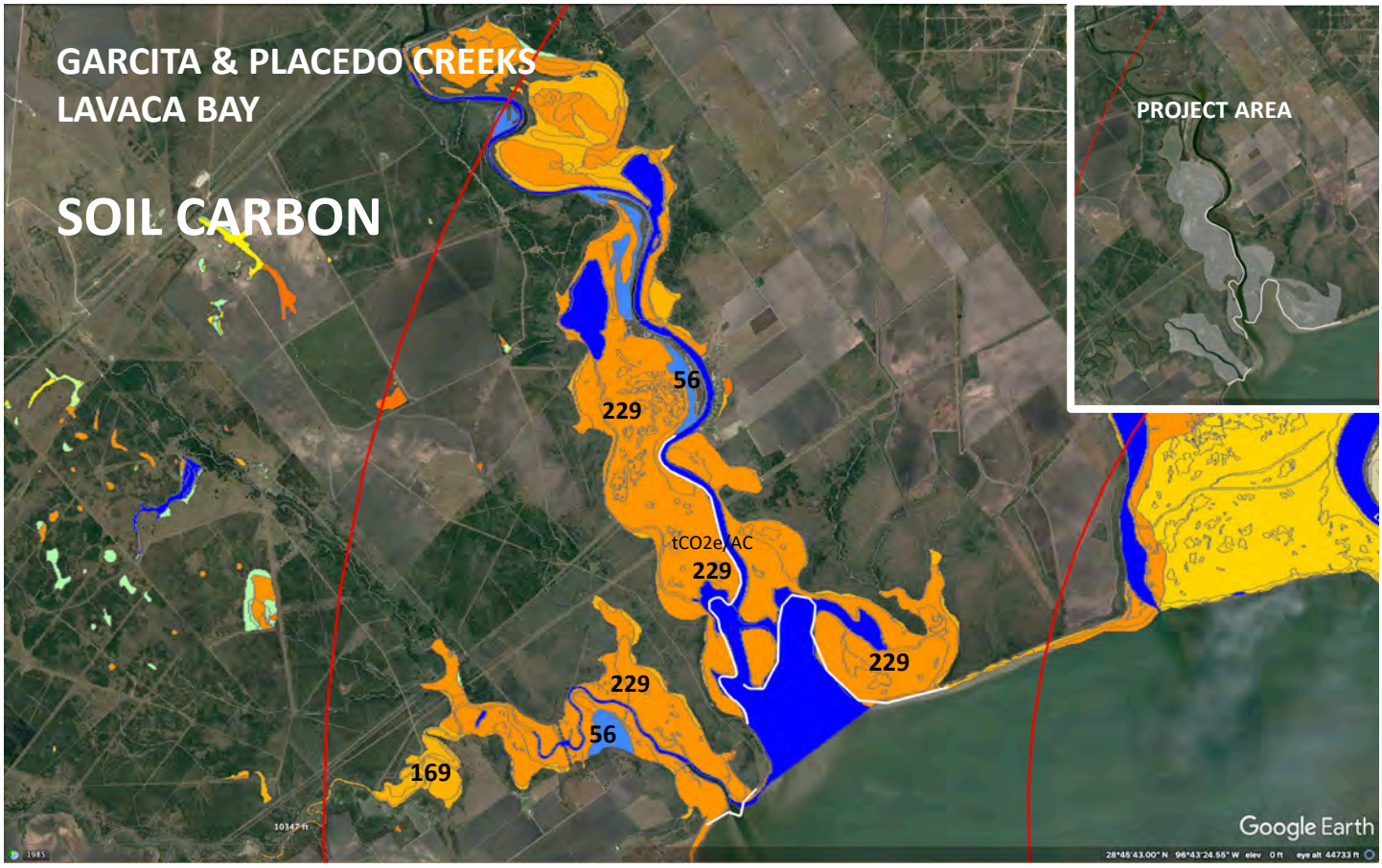
D: Large-scale Regional Plans

A - GARCITAS & PLACEDO CREEKS CASE STUDY






GARCITA & PLACEDO CREEKS
LAVACA BAY
PROJECT AREA CONCEPT
~5.75 Mile Study Shoreline
~1650 Acres Protected
Google Earth


GARCITA & PLACEDO CREEKS
LAVACA BAY
SOIL CARBON
PROJECT AREA
56
229
tCO2e/AC
229
229
229
56
169
Google Earth

B – STYLE GUIDE & LEGENDS

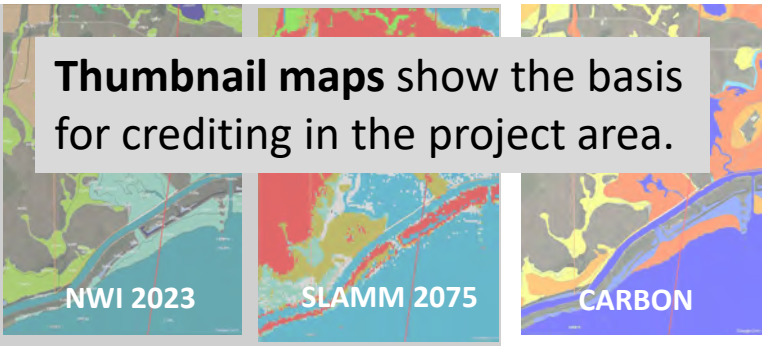
project

PROJECT NAME

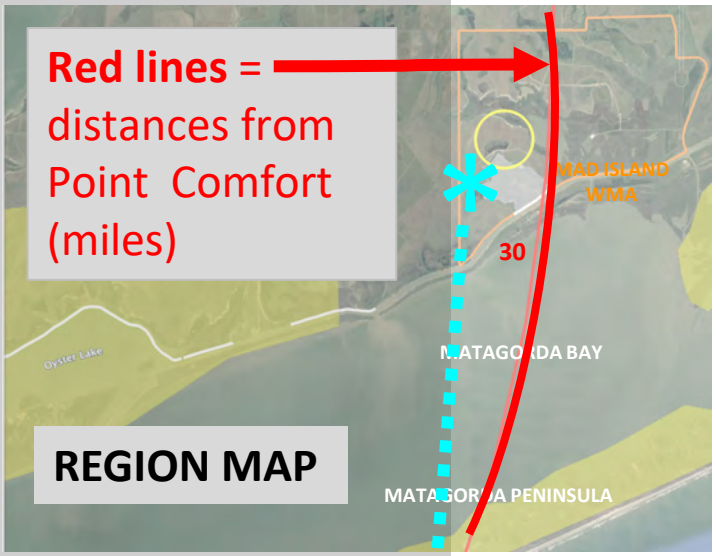
SHORELINES:
Miles of shoreline, cost per mile + total

SOIL CARBON:
Total acreage,
soil carbon per acre + total

CARBON DEVELOPMENT COST (tCO2e):
Cost per carbon credit to "break even" on project

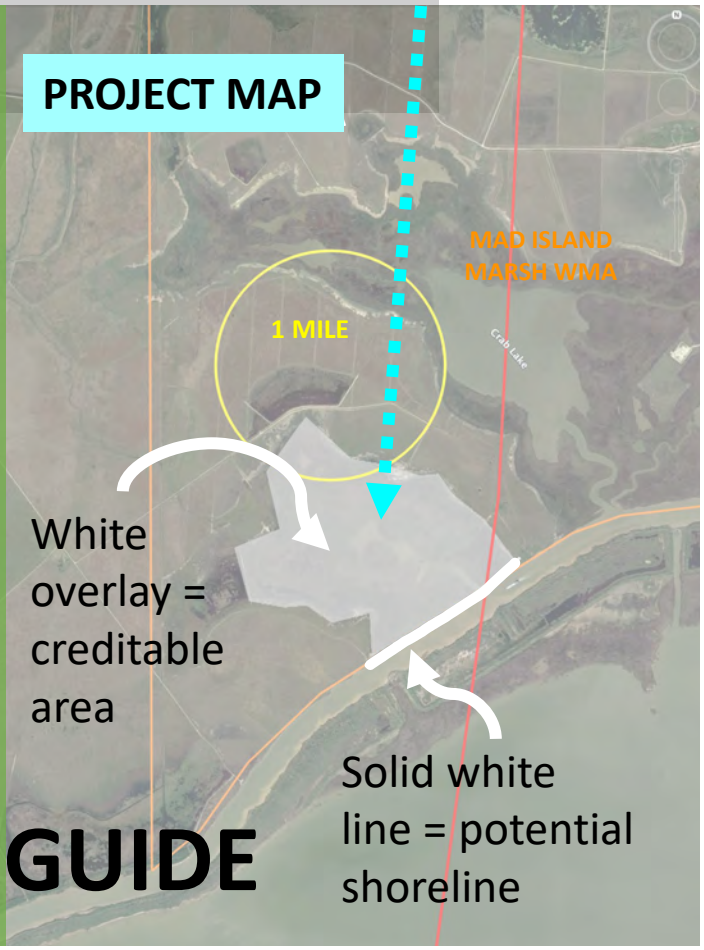


Thumbnail maps show the basis for crediting in the project area.



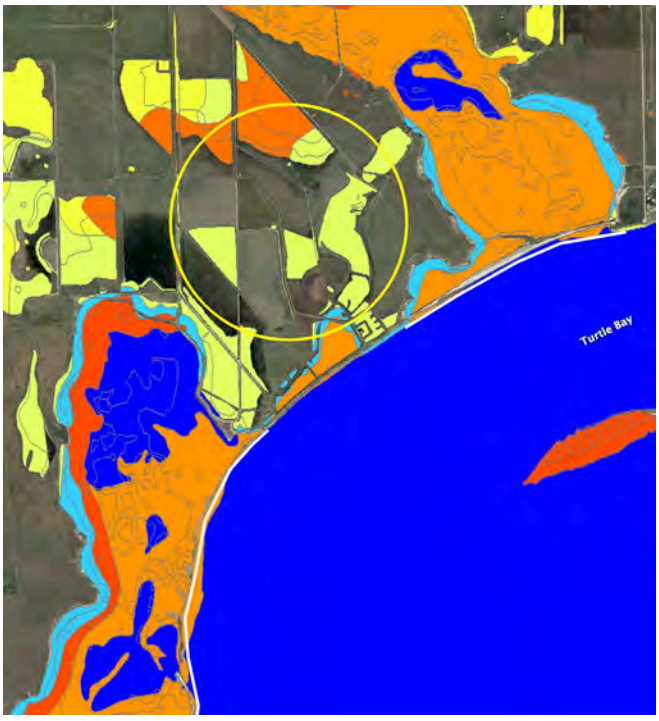
CO-BENEFITS / PROJECT BIODIVERSITY:

- Description of site attributes and surroundings that add additional "stacked benefit" value to resultant credits
- Examples: endangered species presence, cultural importance, proximity to Point Comfort, birding opportunities, parks etc.



CUT SHEET STYLE GUIDE

BLUE CARBON DATABASE



Sliding color scale

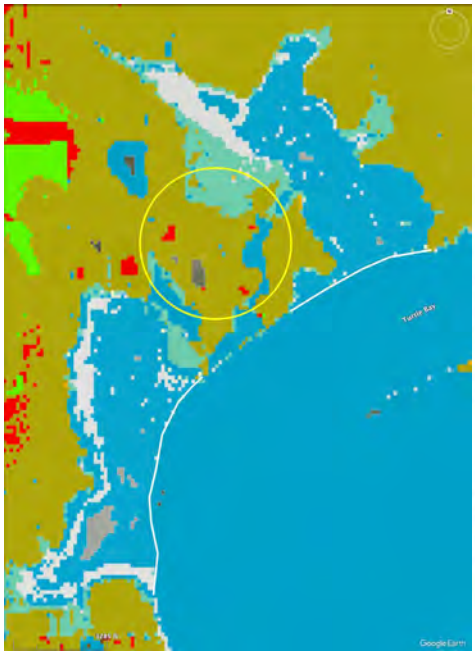
Lowest carbon value

Highest carbon value

No data* / zero carbon value

** Blue areas within a marsh should not be automatically treated as "zero carbon" areas. Rather, they are areas where no field sampling has occurred, which may in fact have high carbon values.*

SLAMM



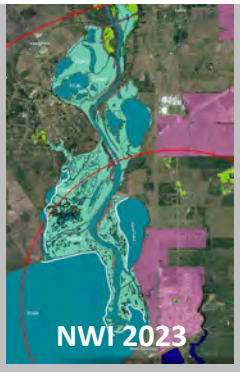
- Developed Dry Land
- Undeveloped Dry Land
- Non-tidal Swamp
- Cypress Swamp
- Inland-Fresh Marsh
- Tidal-Fresh Marsh
- Trans. Salt Marsh
- Regularly-Flooded Marsh
- Mangrove
- Estuarine Beach
- Tidal Flat
- Ocean Beach
- Ocean Flat
- Rocky Intertidal
- Inland Open Water
- Riverine Tidal
- Estuarine Open Water
- Open Ocean
- Irreg.-Flooded Marsh
- Inland Shore
- Tidal Swamp

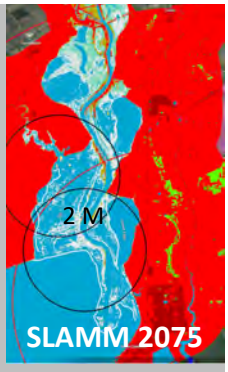
LEGENDS

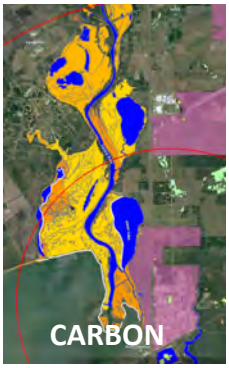
C - PROJECT DESCRIPTIONS

1-2

LAVACA RIVER DELTA & SWAN LAKE



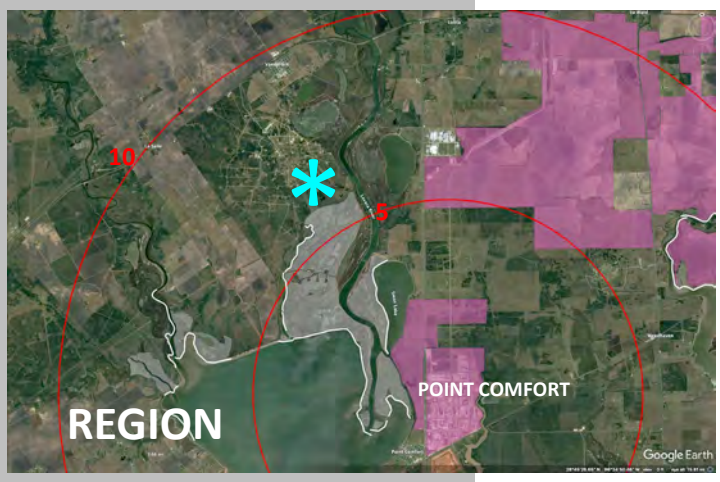




SHORELINES:
~13 miles shorelines, conceptual
~$2.25 million/mile average
~$30 million project

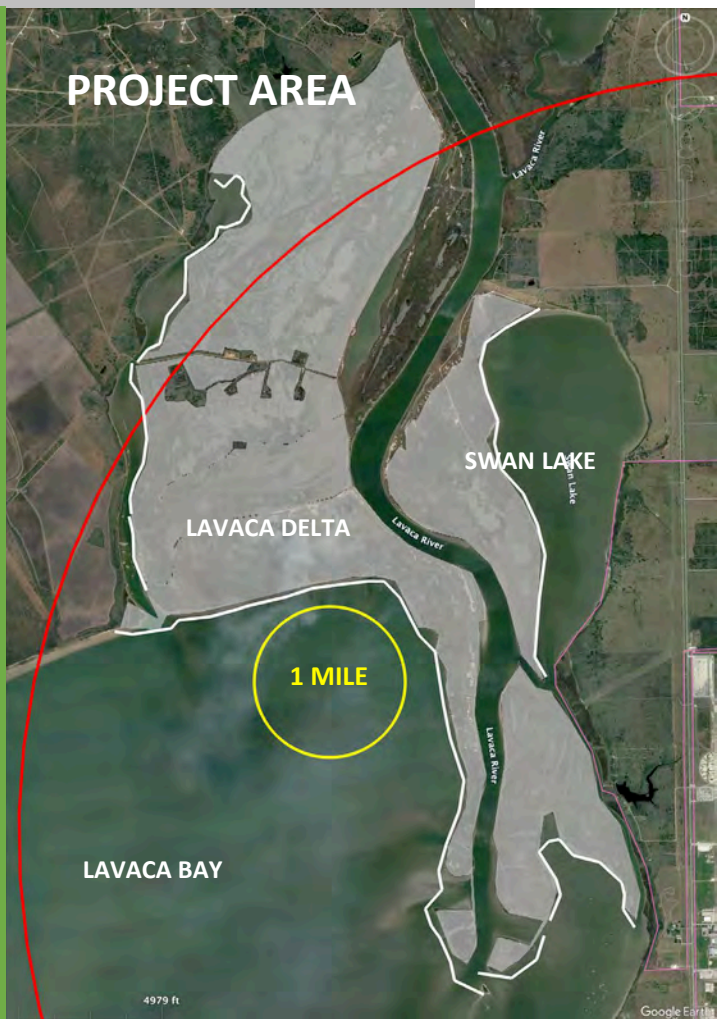
SOIL CARBON:
~4400 AC
~151-229 tCO2e/AC – 175 t average
~770,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$39/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- Directly adjacent to Point Comfort.
- Part of one of top 4 Audubon Texas Christmas Bird Counts (CBC).
- Whooping Crane potential: ~25 miles to Welder Flats (TPWD) and Matagorda Island, 30+ miles to Aransas NWR.
- Lavaca River watershed is an International Crane Foundation (ICF) ICF Priority Site for winter Whooping Crane expansion, as the historic Texas flock begins to disperse into new territories, coastwide.



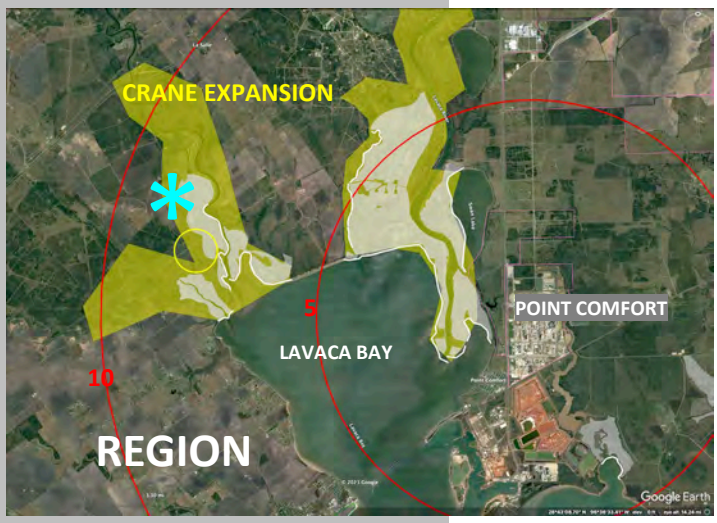
3

GARCITAS & PLACEDO CREEKS - LAVACA BAY

SHORELINES:
~5.75 miles shorelines, conceptual
~$2 million/mile projected
~$11.5 million project

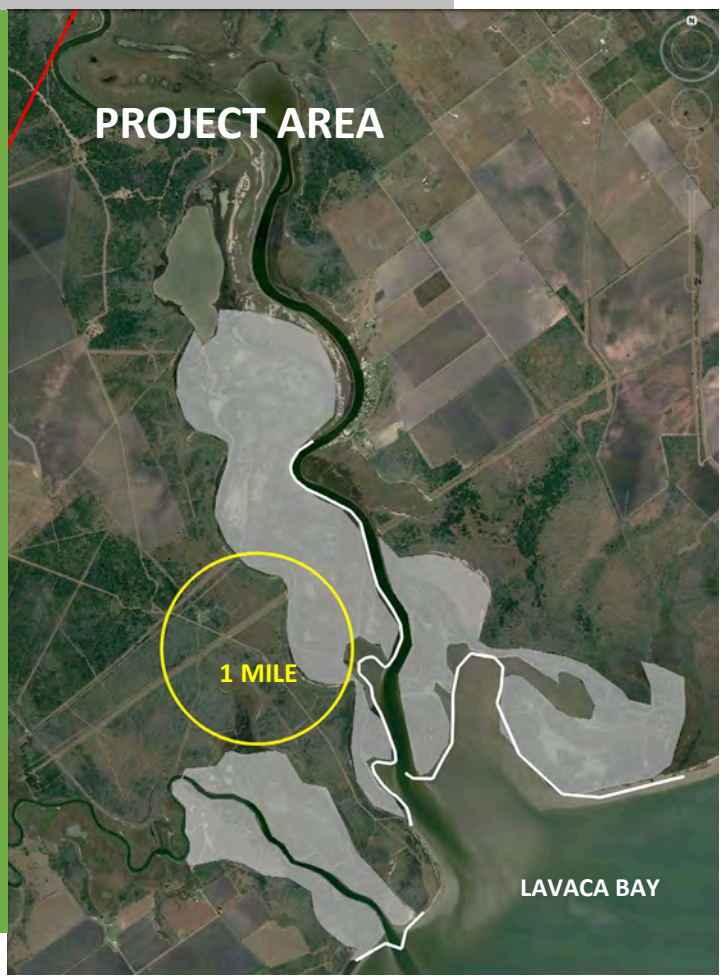
SOIL CARBON:
~1650 AC Project Area
~229 tCO2e/AC average
~378,000 tons stored

CARBON DEVELOPMENT COST (tCO2e):
~$29/ton



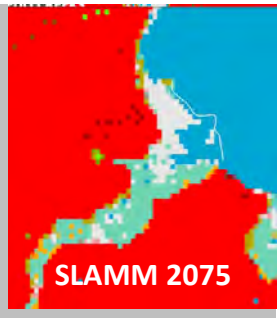
CO-BENEFITS / PROJECT BIODIVERSITY:

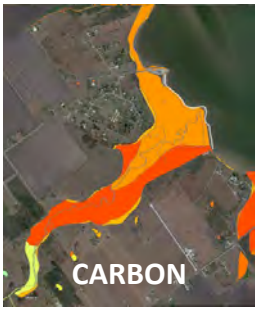
- Within 2 miles of Point Comfort.
- Whooping Crane potential: ~23 miles to Welder Flats (TPWD) and Matagorda Island, ~30 miles to Aransas NWR.
- International Crane Foundation (ICF) Priority Site for winter Whooping Crane expansion, as the historic Texas flock begins to disperse into new territories, coastwide. See Region map.



4

SIX-MILE CREEK - LAVACA BAY





SHORELINES:
~.6 mile shorelines, conceptual
~$2.50 million/mile projected
~$1.5 million project

SOIL CARBON:
NOTE: Primarily fresh marsh (NWI)
~170 AC
~275 tCO2e/AC average
~47,000 tons stored

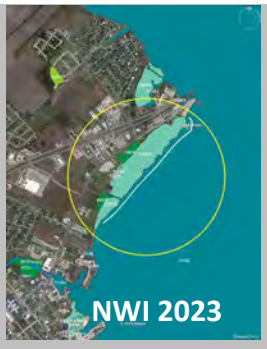
CARBON DEVELOPMENT COST (tCO2e):
~$32/ton

CO-BENEFITS / PROJECT BIODIVERSITY:

- Within 10 miles of Point Comfort.
- Adjacent 6-Mile Park is Great Texas Coastal Birding Trail Site, Central Coast CTC 030A.
- Whooping Crane potential: ~25 miles to Welder Flats (TPWD) and Matagorda Island, 30+ miles to Aransas NWR. Immediately adjacent to ICF Priority Site for winter Whoopers.
- Restoration potential - historic brackish marsh fringe, now eroded, but sediment and marsh platform visible in modern aerial, carbon noted.
- See also Garcitas / Placedo Creeks Project immediately northward , Lavaca Bay.

5

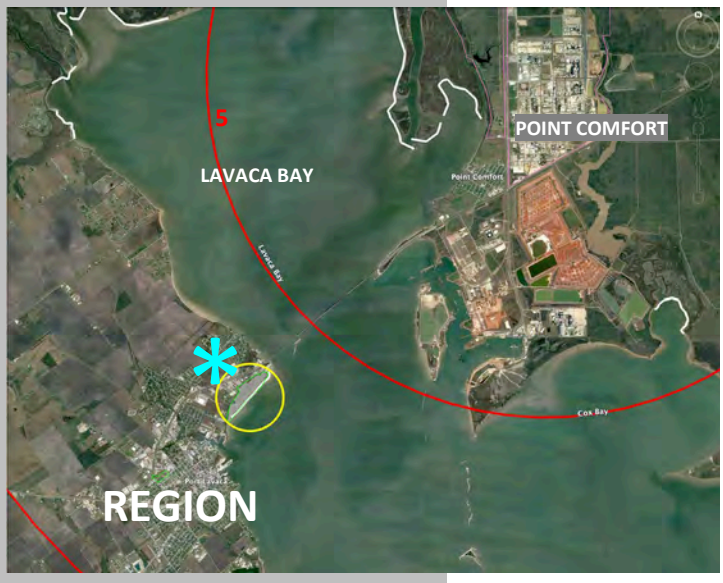
PORT LAVACA BIRD SANCTUARY



SHORELINES:
~.9 mile shoreline, conceptual
~$1 million/mile projected
~$900,000 - $1 million project

SOIL CARBON:
~68 AC
~186-229 tCO2e/AC typical, 229t average
~15,570 tons stored

CARBON DEVELOPMENT COST (tCO2e):
~$60/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- Directly across from Point Comfort at base of Lavaca Bay bridge into Port Lavaca. Highly visible project, used as park, including Formosa Wetlands Walkway & Alcoa Birding Tower – high community benefits.
- Great Texas Coastal Birding Trail Site, Central Coast CTC 030.

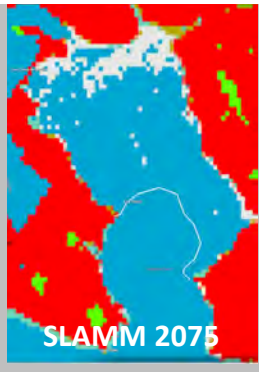
6

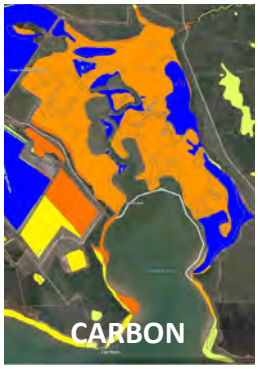
COX CREEK

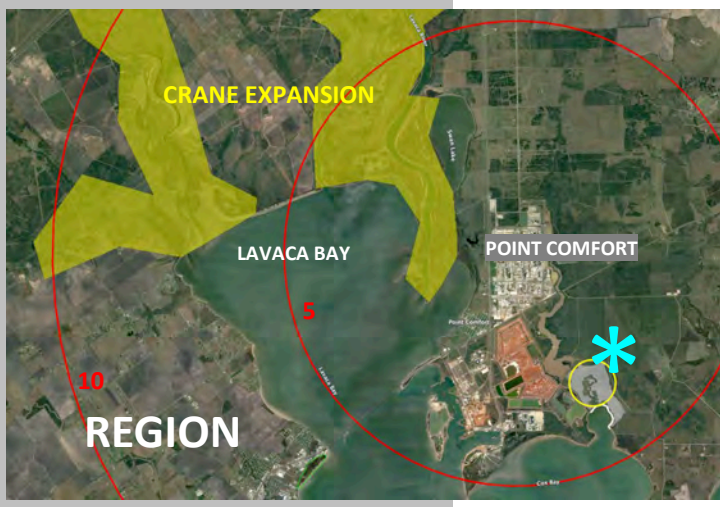
SHORELINES:
~1 mile shoreline, conceptual
~$2 million/mile projected
~$2 million project

SOIL CARBON:
~450 AC
~118-264 tCO2e/AC typical, 129t average
~58,000 tons stored

CARBON DEVELOPMENT COST (tCO2e):
~$35/ton

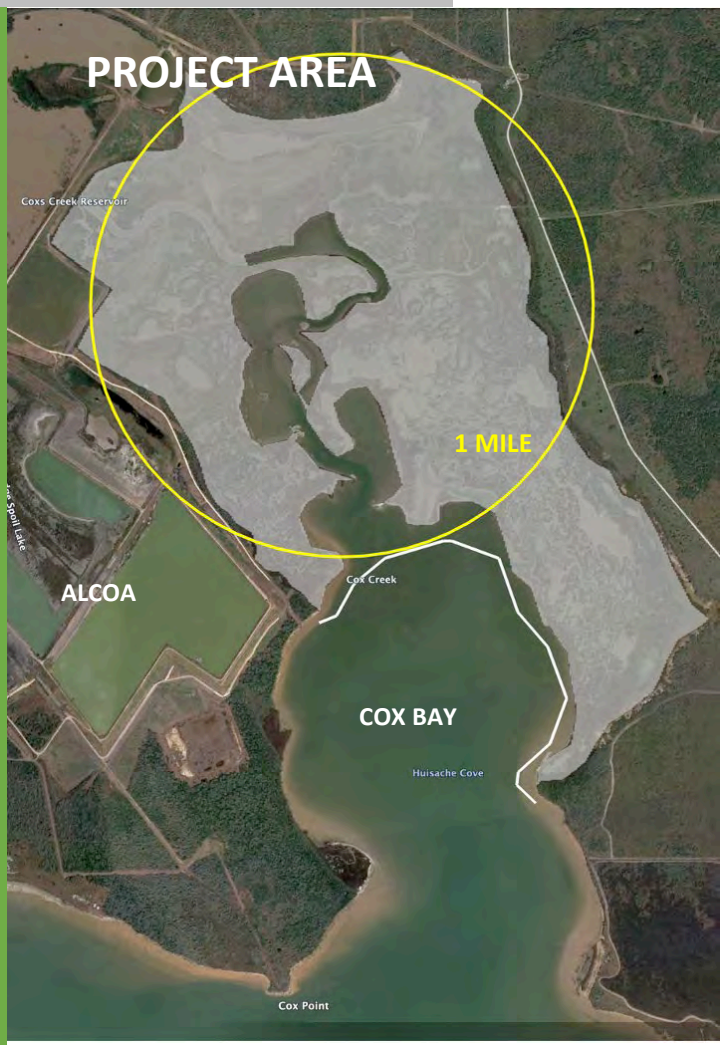






CO-BENEFITS / PROJECT BIODIVERSITY:

- Within 2 miles of Point Comfort.
- Part of one of top 4 Audubon Texas Christmas Bird Counts - Jackson/Calhoun County.
- Whooping Crane potential: ~23 miles to Welder Flats (TPWD) and Matagorda Island, ~30 miles to Aransas NWR
- Within 5 miles of Lavaca River watershed, an International Crane Foundation TCPI/ICF priority site for winter Whooping Crane expansion, as the historic Texas flock begins to disperse into new territories, coastwide. See Region map.



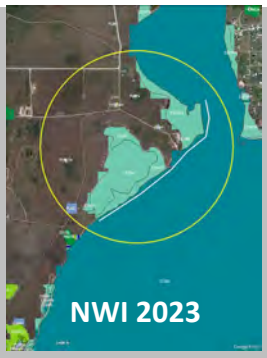
7

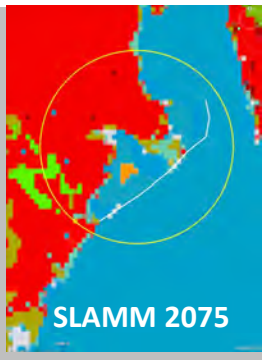
NORTH KELLER BAY

SHORELINES:
~.9 mile shoreline, conceptual
~$1.75 million/mile average
~$1.6 million project

SOIL CARBON:
~80 AC
~98-229 tCO2e/AC typical, 200t average
~16,000 tCO2e/AC stored

CARBON DEVELOPMENT COST (tCO2e):
~$100/ton



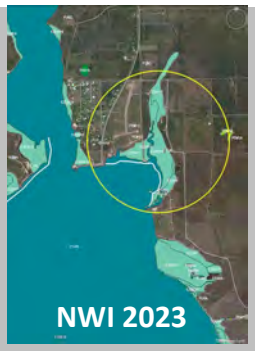


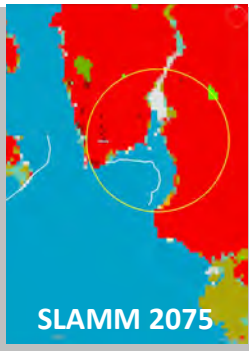
CO-BENEFITS / PROJECT BIODIVERSITY:

- North Keller Bay, and its companion project at Olivia are within 6 miles of Point Comfort. Part of one of top 4 Audubon Texas Christmas Bird Counts.
- Keller Bay, overall, is a priority site in the 2023 GLO Texas Coastal Resiliency Master Plan and the recent USACE/GLO Texas Coastal Study (GIWW). This BCarbon concept shoreline is one of a trio in the northern watershed portion of Keller Bay. See also Keller Creek #9 and Olivia #9.
- North Keller Bay is 7 miles from the Lavaca Delta, identified as an ICF priority site for winter Whooping Crane expansion. It is roughly 10 miles from the Powderhorn Lake unit of the Aransas NWR, with associated crane expansion territory.

8

OLIVIA
KELLER BAY





SHORELINES:
~.7 mile shoreline, conceptual
~$2.5 million/mile average
~$1.75 million project

SOIL CARBON:
~60 AC
~229- 353 tCO2e/AC typical, 229t average
~14,000 tCO2e/AC stored

CARBON DEVELOPMENT COST (tCO2e):
~$125/ton

CO-BENEFITS / PROJECT BIODIVERSITY:

- Olivia & North Keller Bay are within 6 miles of Point Comfort. Audubon CBC count circle.
- Keller Bay, overall, is a priority site in the 2023 GLO Texas Coastal Resiliency Master Plan and the 2021 USACE/GLO Coastal Texas Study (GIWW). This BCarbon concept shoreline project is one of a trio in the northern watershed portion of Keller Bay. See also Keller Creek #9.
- Olivia is 7 miles from the Lavaca Delta, an ICF priority site for winter Whooping Crane expansion. It is roughly 10 miles from the Powderhorn Lake unit of the Aransas NWR.
- Great TX Coastal Birding Trail Site, Central Coast CTC 016.

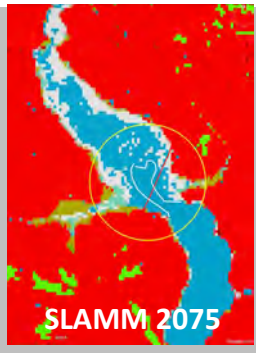
9

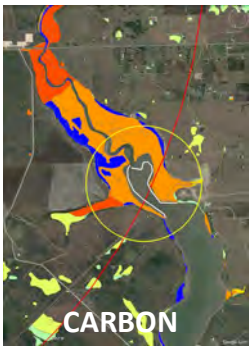
KELLER CREEK

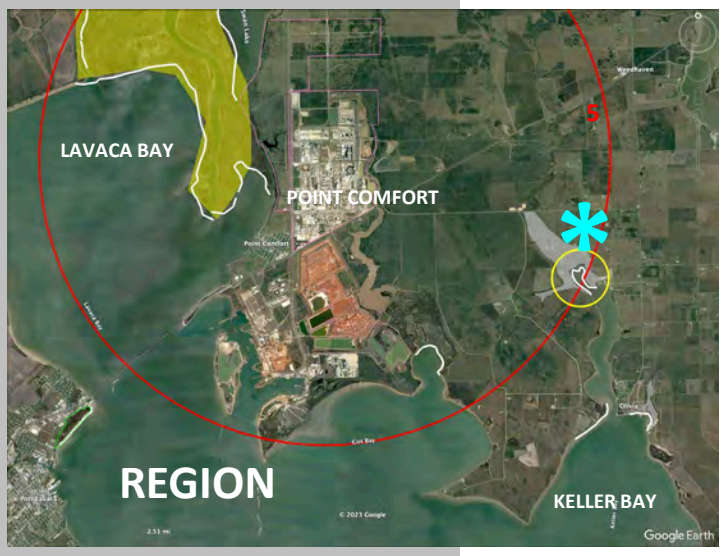
SHORELINES:
~1.4 miles shoreline, conceptual
~$1.25 million/mile average
~$1.75 million project

SOIL CARBON:
~440 AC
~229-353 tCO2e/AC typical, 270t average
~119,000 tCO2e/AC stored

CARBON DEVELOPMENT COST (tCO2e):
~$15/ton

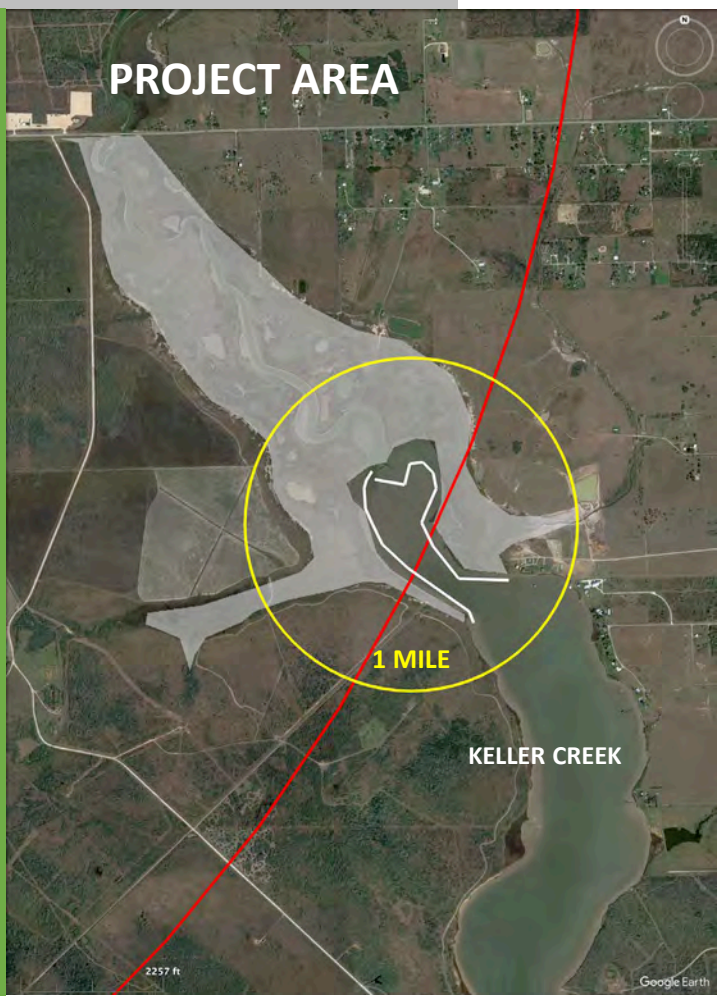






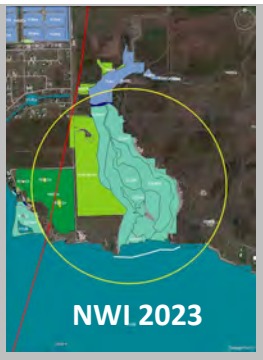
CO-BENEFITS / PROJECT BIODIVERSITY:

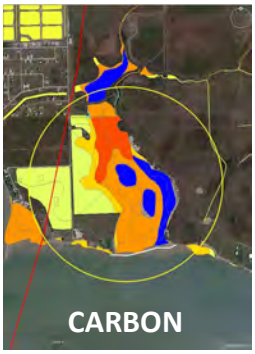
- Keller Creek is within 6 miles of Point Comfort. Part of one of top 4 Audubon Texas Christmas Bird Counts (CBC).
- Keller Bay, overall, is a priority site in the 2023 GLO Texas Coastal Resiliency Master Plan and the 2021 USACE/GLO Coastal Texas Study (GIWW). This BCarbon concept shoreline project is one of a trio in the N. watershed portion of Keller Bay.
- Keller Creek is 6 miles from the Lavaca Delta, an ICF priority site for winter Whooping Crane expansion. It is roughly 11 miles from the Powderhorn Lake unit of the Aransas NWR , with associated high-value crane expansion territory. (See Powderhorn Lake projects.)



10

CARANCAHUA BAY INLET





SHORELINES:
~.35 mile shoreline, conceptual
~$2.5 million/mile average
~$875,000 project

SOIL CARBON:
~110 AC
~229-275 tCO2e/AC typical, 250t average
~27,500 tCO2e/AC stored

CARBON DEVELOPMENT COST (tCO2e):
~$32/ton

CO-BENEFITS / PROJECT BIODIVERSITY:

- The two projects in Carancahua and Carancahua/Vaes Bays are within 6 miles of Point Comfort.
- Carancahua Bay Inlet, on the east side of Carancahua Bay, is 8.5 miles from the Oyster Lake complex, and 14 miles from Matagorda Peninsula directly south across Matagorda Bay - both ICF priority sites for winter Whooping Crane expansion.
- Carbon noted @ eroding but still-visible marsh shoreline platform. Good restoration potential inside breakwaters.

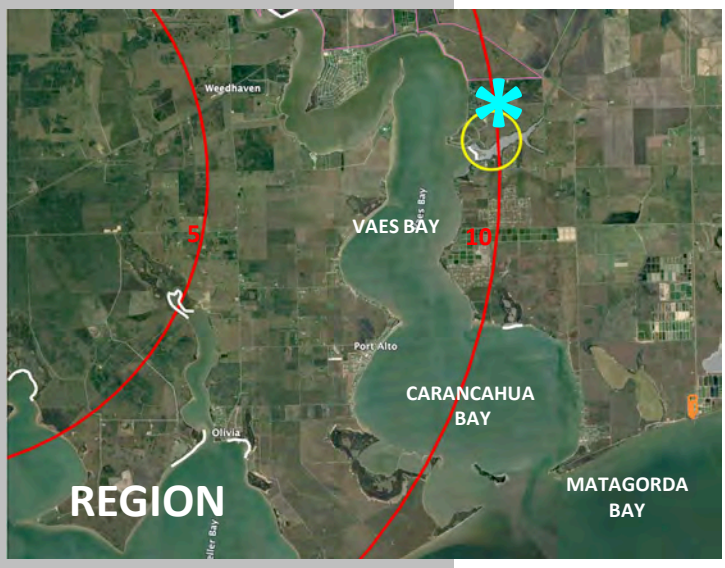
11

FIVE-MILE DRAW – VAES BAY

SHORELINES:
~.3 mile shoreline, conceptual
~$2 million/mile average
~$600,000 project

SOIL CARBON:
~130 AC
~229 tCO2e/AC typical
~30,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$20/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- The two projects in Carancahua and Carancahua/Vaes Bays are within 6 miles of Point Comfort.
- Part of one of top 4 Audubon Texas Christmas Bird Counts (CBC).
- Five-Mile Draw, on the east side of Carancahua Bay, is 10 miles across Matagorda Bay from the Oyster Lake complex, an ICF priority sites for winter Whooping Crane expansion.
- Carbon noted @ eroding but still-visible marsh shoreline platform. Good restoration potential inside breakwaters.

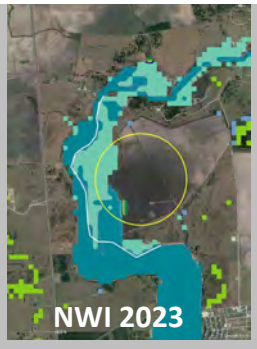
12

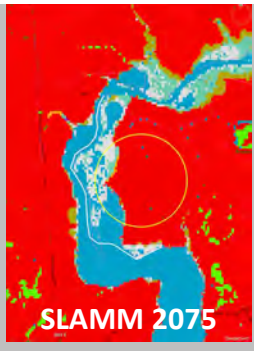
CARANCAHUA CREEK

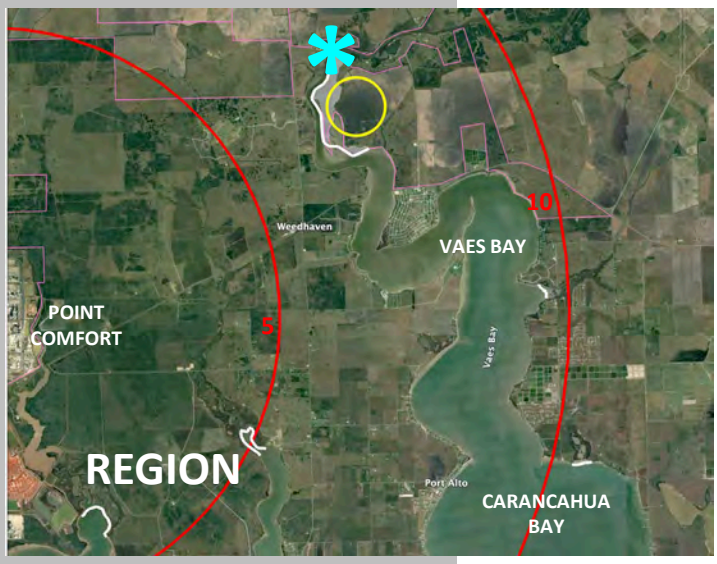
SHORELINES:
~2.6 miles shoreline, conceptual
~$1.25 million/mile average
~$3.25 million project

SOIL CARBON:
~257 AC
~169-229 tCO2e/AC typical, 214t average
~55,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$59/ton

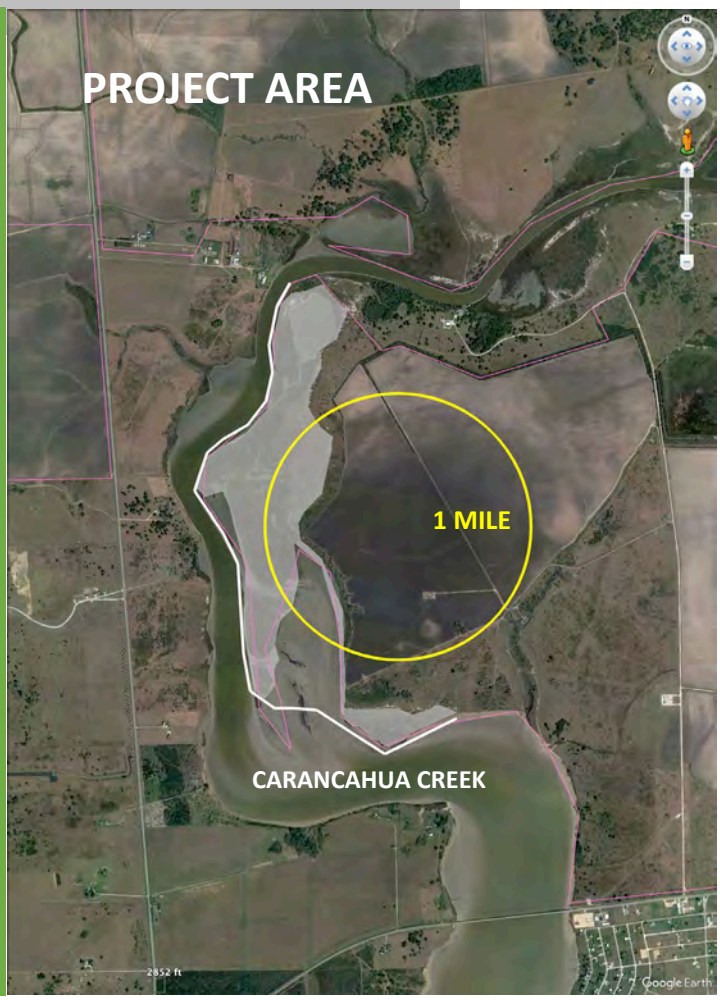






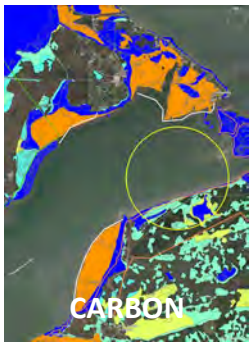
CO-BENEFITS / PROJECT BIODIVERSITY:

- Project is 7.5 miles from Point Comfort, protecting wetlands along Carancahua Creek, which nourishes Carancahua Bay.
- Part of one of top 4 Audubon Texas Christmas Bird Counts (CBC).
- This is the furthest-inland project proposed by BCarbon in the study. While the project within 8 miles of the Lavaca Delta crane expansion site, its potential value to Whooping cranes lies in protecting wetland habitat along the upper reaches of an important crane bay, encouraging up-watershed / inland crane expansion.



13

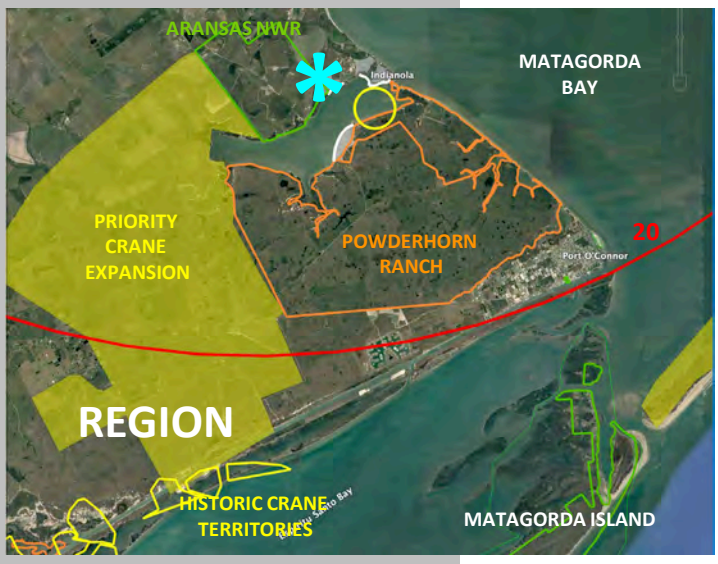
POWDERHORN LAKE NORTH SHORE



SHORELINES:
~1 mile shoreline, conceptual
~$1 million/mile average
~$1 million project

SOIL CARBON:
~130 AC
~2-91-229 tCO2e/AC typical, 123t average
~16,000 tCO2e stored

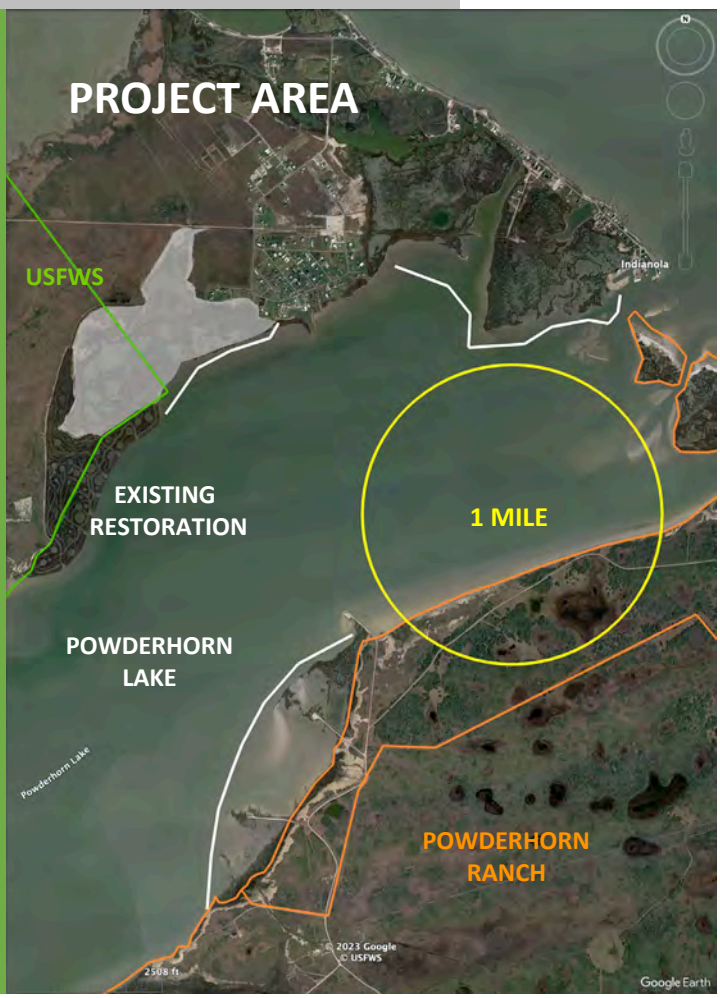
CARBON DEVELOPMENT COST (tCO2e):
~$63/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

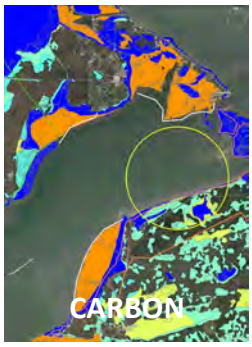
- The proposed trio of Powderhorn Lake projects are ~13 miles from Pt. Comfort.
- These three projects are within a mile of the USFWS Aransas NWR Powderhorn Lake unit and TPWD Powderhorn Ranch, including associated ICF Priority Crane expansion areas of great significance.

North Shore project directly abuts Aransas NWR & complements a 2007 wetland restoration in the southeast corner of the Refuge which already has shoreline protection.



14

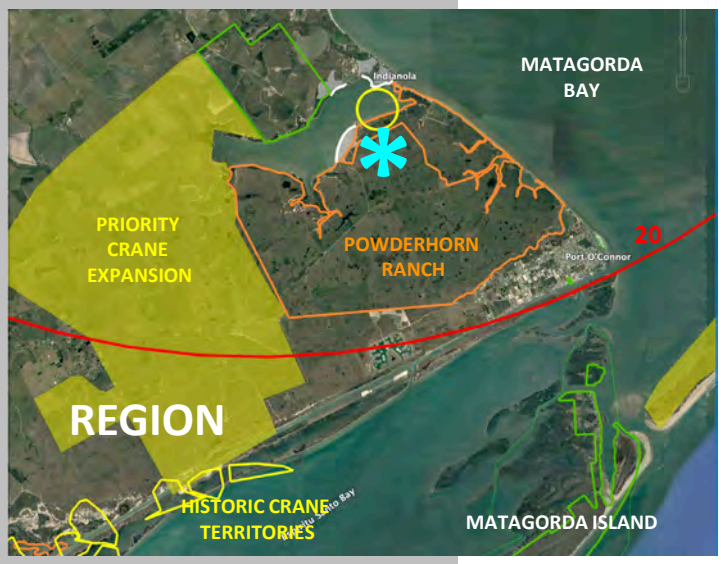
POWDERHORN LAKE SOUTH SHORE



SHORELINES:
~1.1 miles shoreline, conceptual
~$1 million/mile average
~$1.1 million project

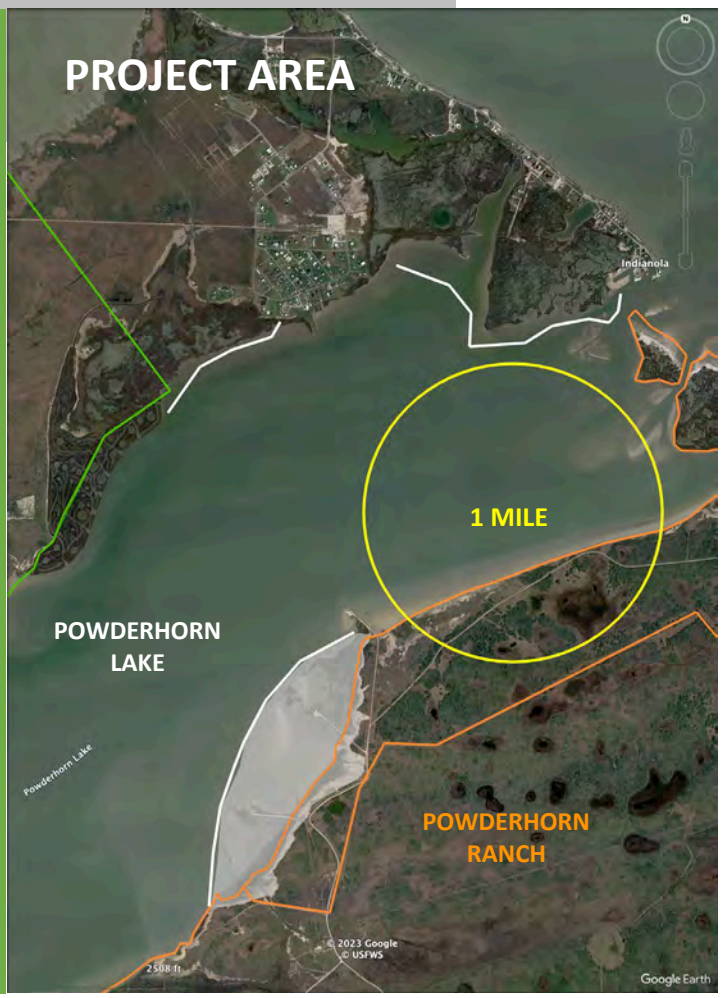
SOIL CARBON:
~160 AC
~2-91-229 tCO2e/AC typical, 164t average
~26,200 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$42/ton



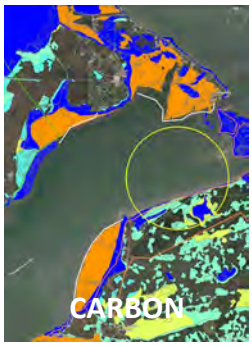
CO-BENEFITS / PROJECT BIODIVERSITY:

- The proposed trio of Powderhorn Lake projects are ~13 miles from Pt. Comfort.
- These three projects are within a mile of Aransas NWR Powderhorn Lake unit and TPWD Powderhorn Ranch, including associated ICF Priority Crane expansion.
- South Shore project is unique for BCarbon, as it is primarily a restoration opportunity rather than a brackish marsh protection effort. This is a high value project for TPWD alongside the old Powderhorn oil field. BCarbon has been advised that the original marsh platform is largely intact, carbon is noted, and protection would enable ongoing restoration by the State.



15

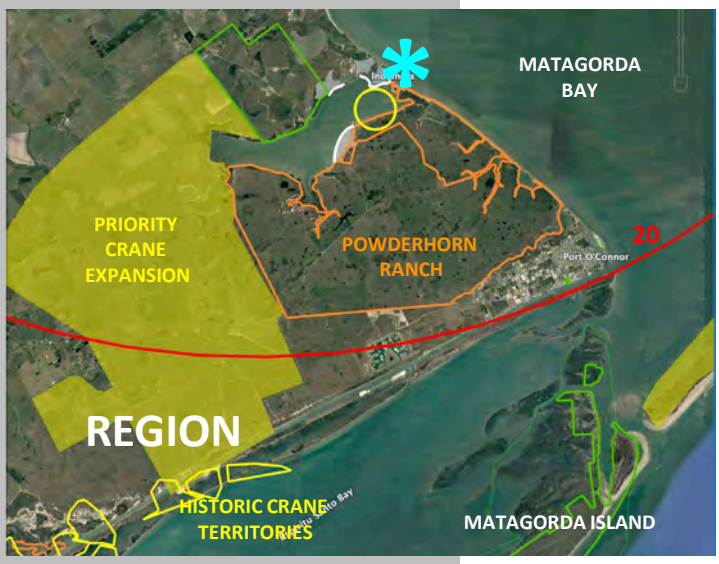
POWDERHORN BAYOU INDIANOLA



SHORELINES:
~1 mile shoreline, conceptual
~$1 million/mile average
~$1 million project

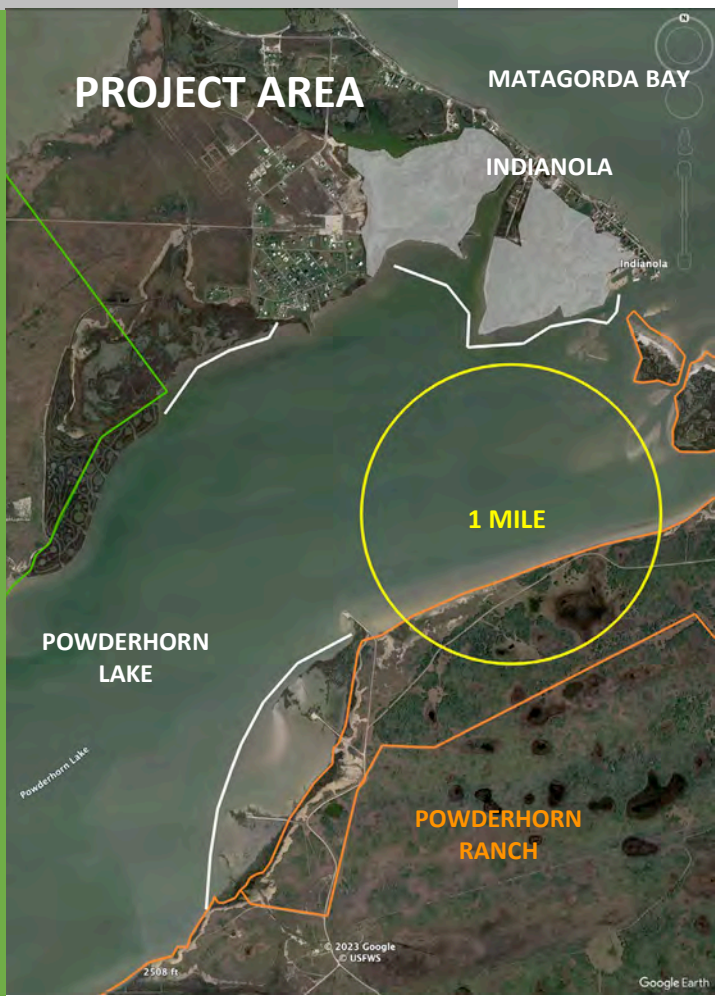
SOIL CARBON:
~171 AC
~229 tCO2e/AC typical
~39,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$26/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- The proposed trio of Powderhorn Lake projects are ~13 miles from Pt. Comfort.
- These three projects are within a mile of Aransas NWR Powderhorn Lake unit and TPWD Powderhorn Ranch, including associated ICF Priority Crane expansion.
- Indianola project would protect and enhance the north shore wetlands sheltering the original Bayou inlet connecting Powderhorn Lake and Matagorda Bay, complementing more traditional TPWD, GLO and USACE protection initiatives underway on the open Matagorda Bay shoreline. High community benefits in historic upland ridge community of Indianola.



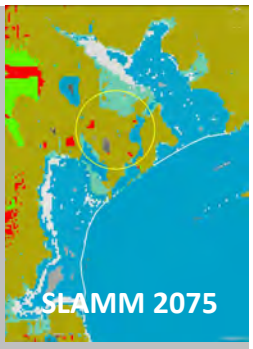
16

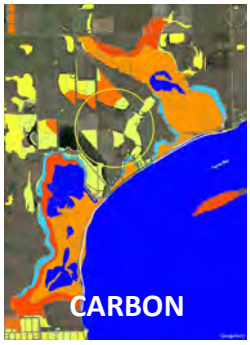
TURTLE BAY WEST

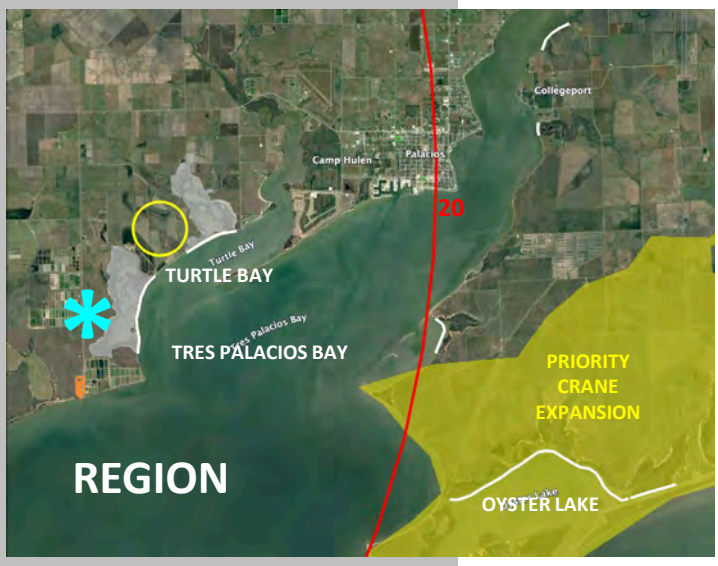
SHORELINES:
~1.5 mile shoreline, conceptual
~$1.5 million/mile average
~$2.25 million project

SOIL CARBON:
~520 AC
~229 tCO2e/AC typical
~119,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$20/ton

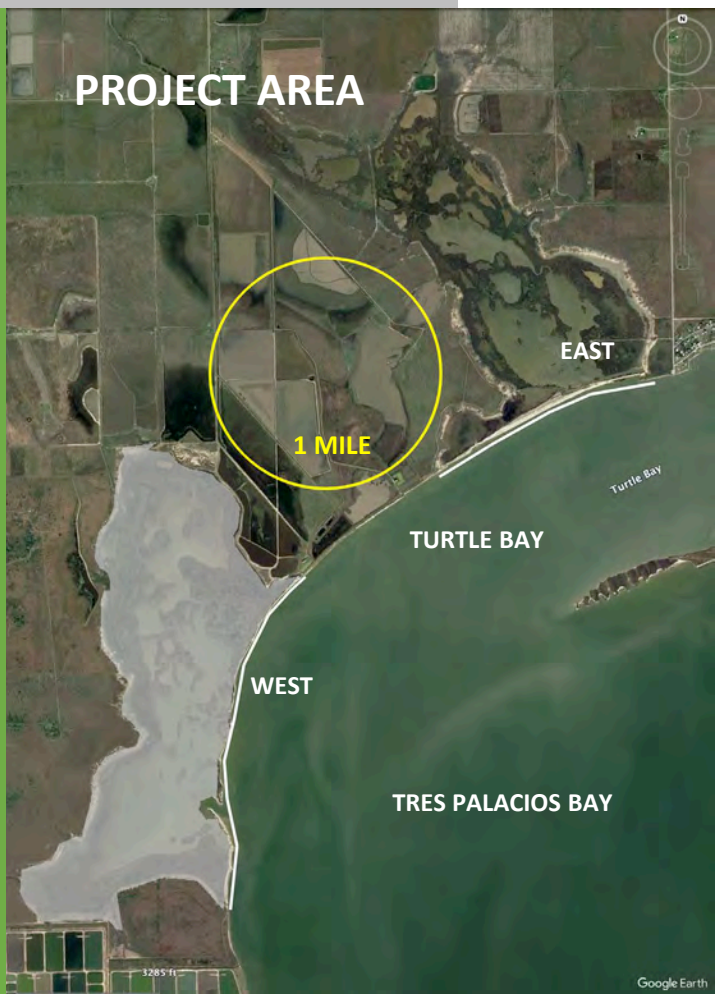






CO-BENEFITS / PROJECT BIODIVERSITY:

- The proposed companion projects along Turtle Bay are ~14 miles from Point Comfort.
- The Turtle Bay projects are less than 5 miles across Tres Palacios Bay from the Oyster Lake complex, an ICF crane expansion priority site. Turtle Bay is 11 miles from Matagorda Bay Peninsula.



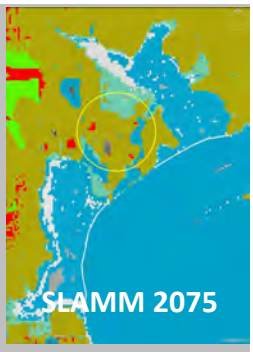
17

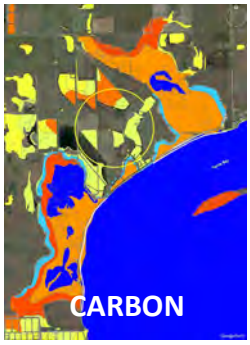
TURTLE BAY EAST

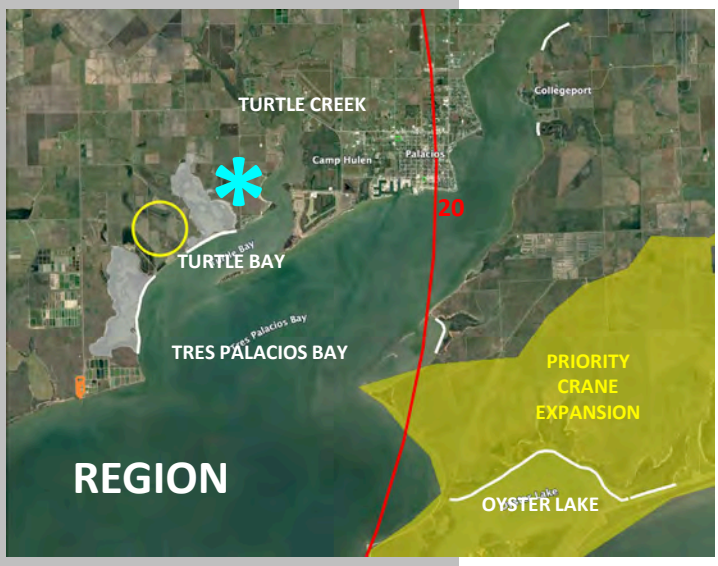
SHORELINES:
~1 mile shoreline, conceptual
~$2.5 million/mile average
~$2.5 million project

SOIL CARBON:
~565 AC
~74-353 tCO2e/AC typical, 229t average
~119,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$13/ton



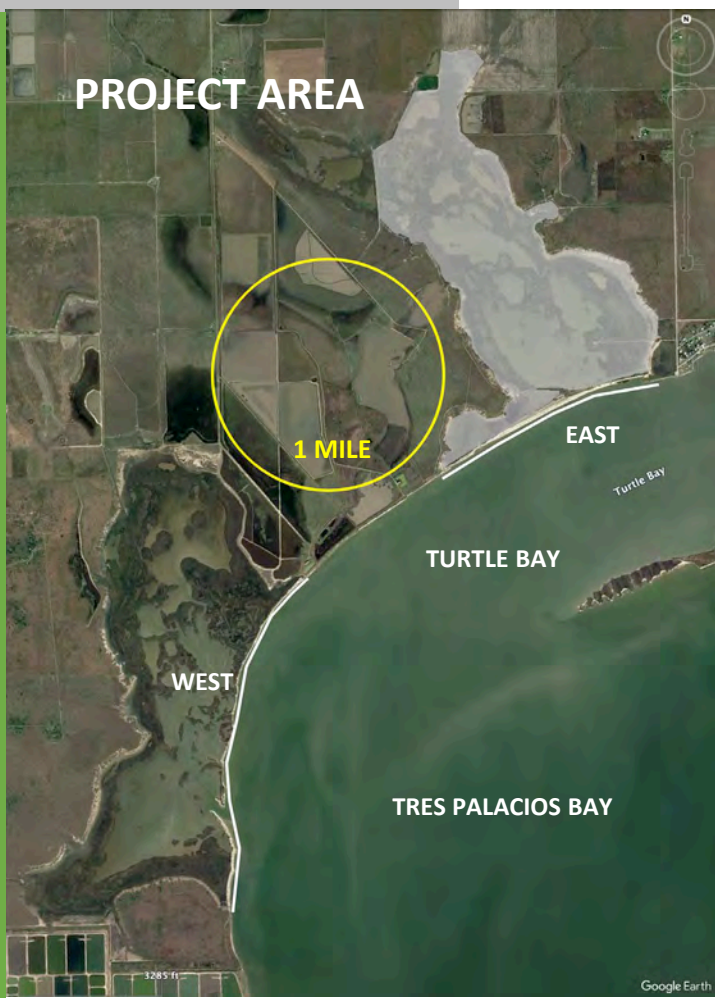




CO-BENEFITS / PROJECT BIODIVERSITY:

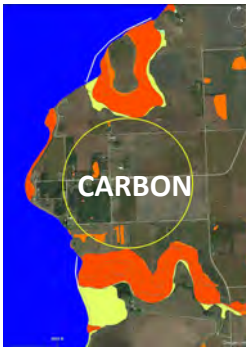
- The proposed companion projects along Turtle Bay are ~14 miles from Point Comfort.
- Turtle Bay projects are less than 5 miles across Palacios Bay from the Oyster Lake complex, an ICF crane expansion priority site. Turtle Bay is 11 miles from Matagorda Bay Peninsula.

Turtle Bay East could be complemented by additional restoration consideration at the mouth of Turtle Creek ~2 miles inland.



18

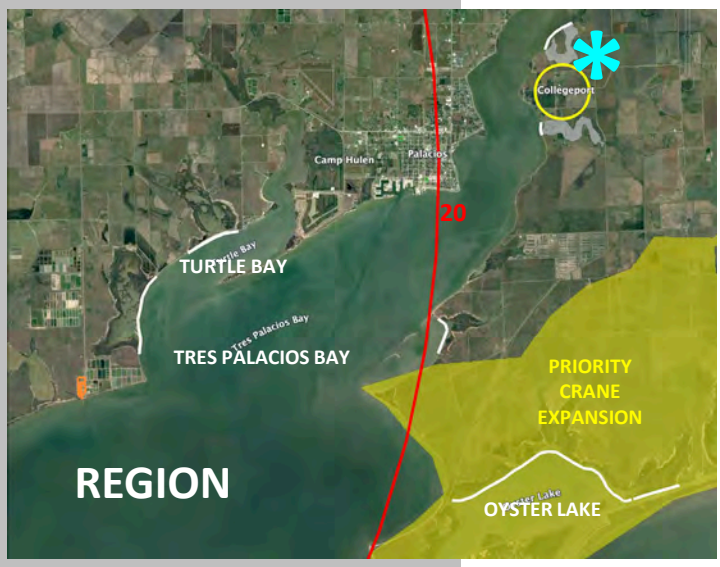
COLLEGEPORT NORTH - TRES PALACIOS BAY



SHORELINES:
~.75 mile shoreline, conceptual
~$1.25 million/mile average
~$900,000 project

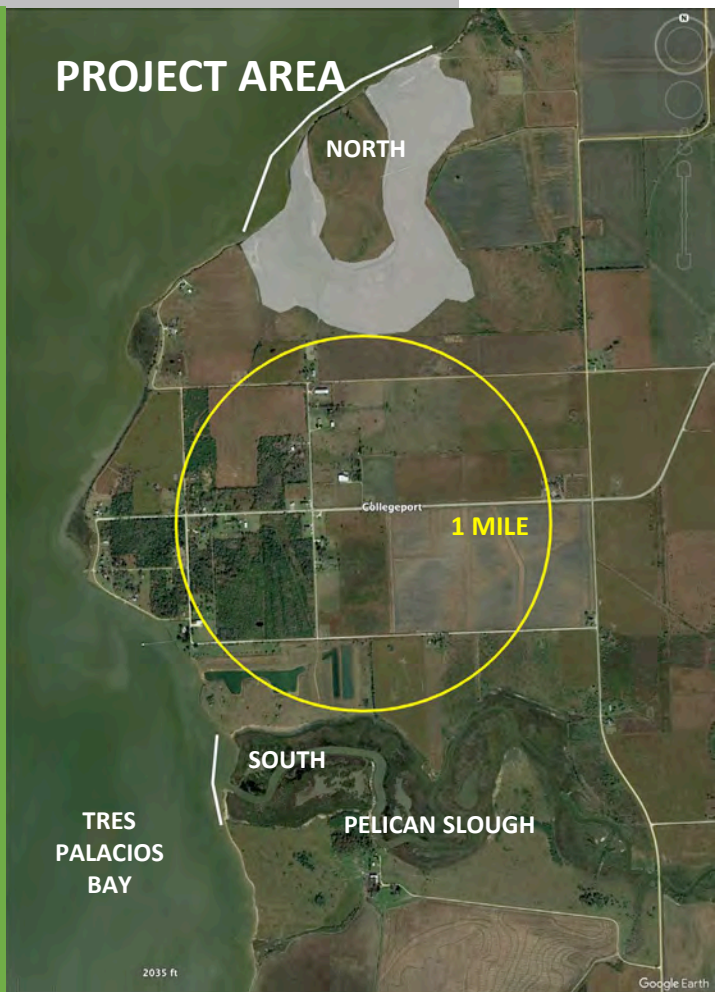
SOIL CARBON:
~140 AC
~353 tCO2e/AC typical
~49,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$18/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- The proposed Collegeport North and South (Pelican Slough) companion projects along the inland reaches of Tres Palacios are upward of 20 miles from Point Comfort.
- However, these projects are directly inland (~3-4 miles) of priority Whooping Crane expansion habitat at the Oyster Lake complex, and, like Carancahua Creek to the west, likely provide hop-skip habitats for cranes working their way inland, in this case into the large easterly Tres Palacios River watershed, Matagorda County.



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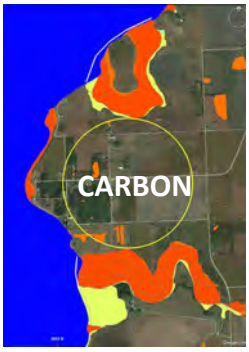
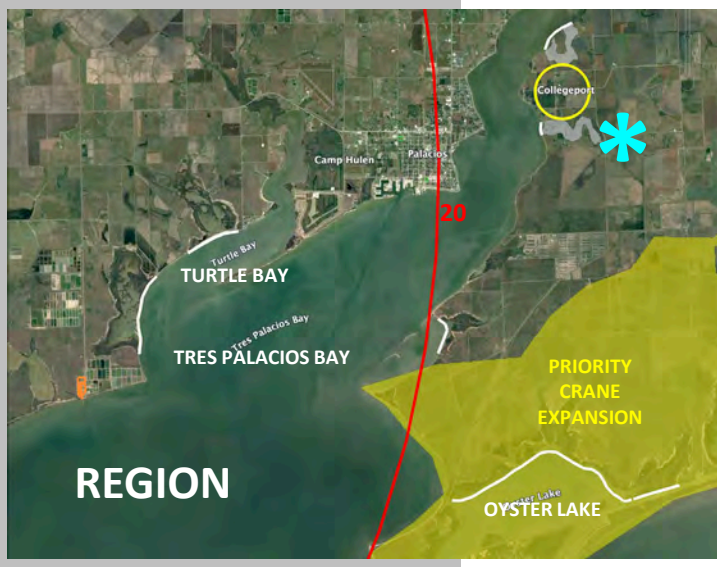
COLLEGEPORT SOUTH TRES PALACIOS BAY



SHORELINES:
~.25 mile shoreline, conceptual
~$1.25 million/mile average
~$.4 million project

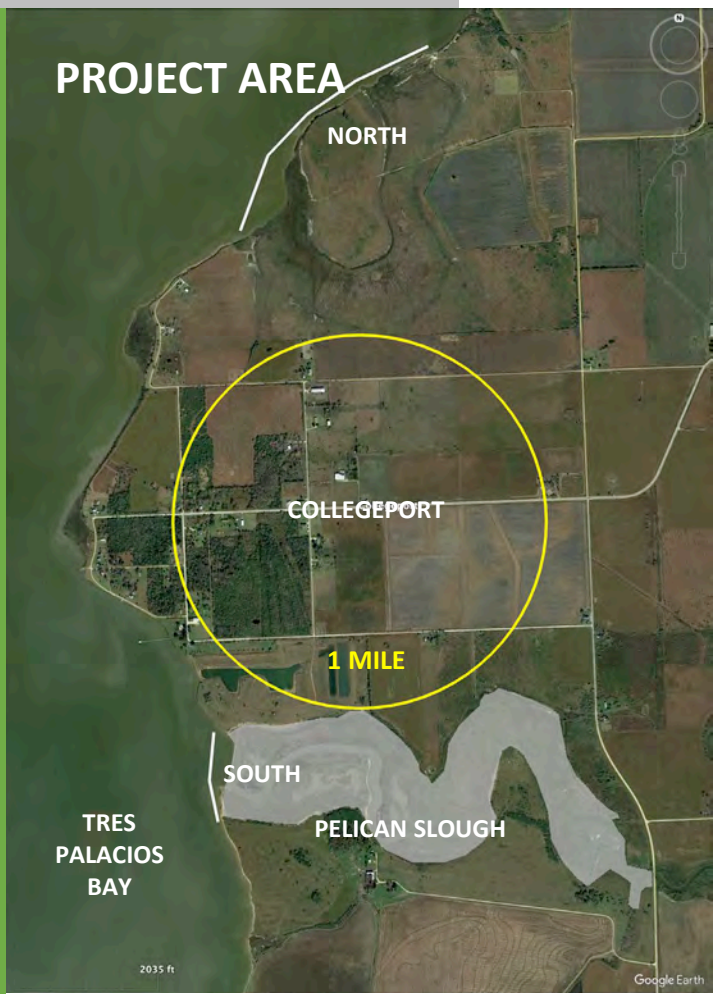
SOIL CARBON:
~190 AC
~353 tCO2e/AC typical
~67,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$6/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- The proposed Collegeport North and South companion projects along the inland reaches of Tres Palacios are upward of 20 miles from Point Comfort.
- However, they are directly inland (~3-4 miles) of priority ICF Whooping Crane expansion habitat at the Oyster Lake complex, and, like Carancahua Creek to the west, likely provide hop-skip habitats for cranes working their way inland, in this case into the large easterly Tres Palacios River watershed, Matagorda County.



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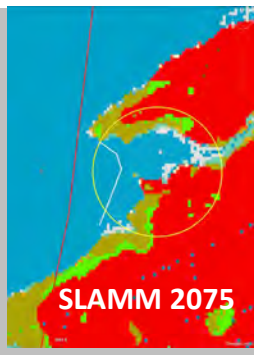
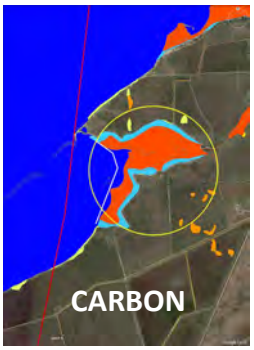
COON ISLAND BAY
TRES PALACIOS

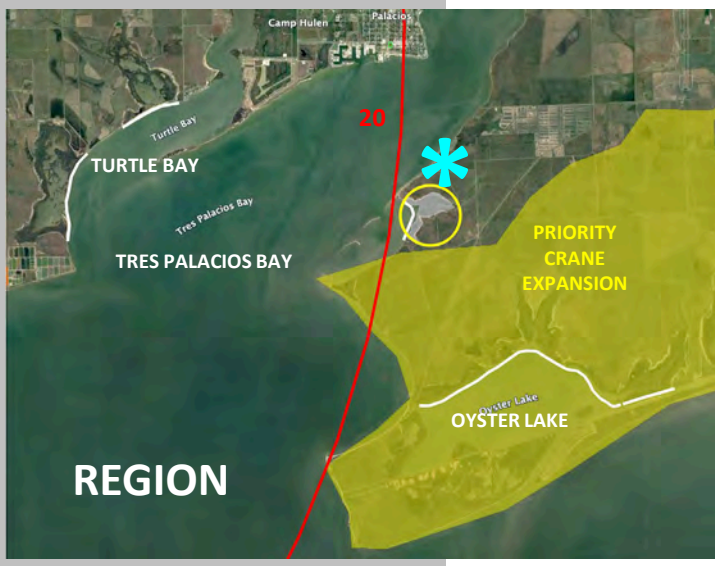




SHORELINES:
~.75 mile shoreline, conceptual
~$1.25 million/mile average
~$1 million project

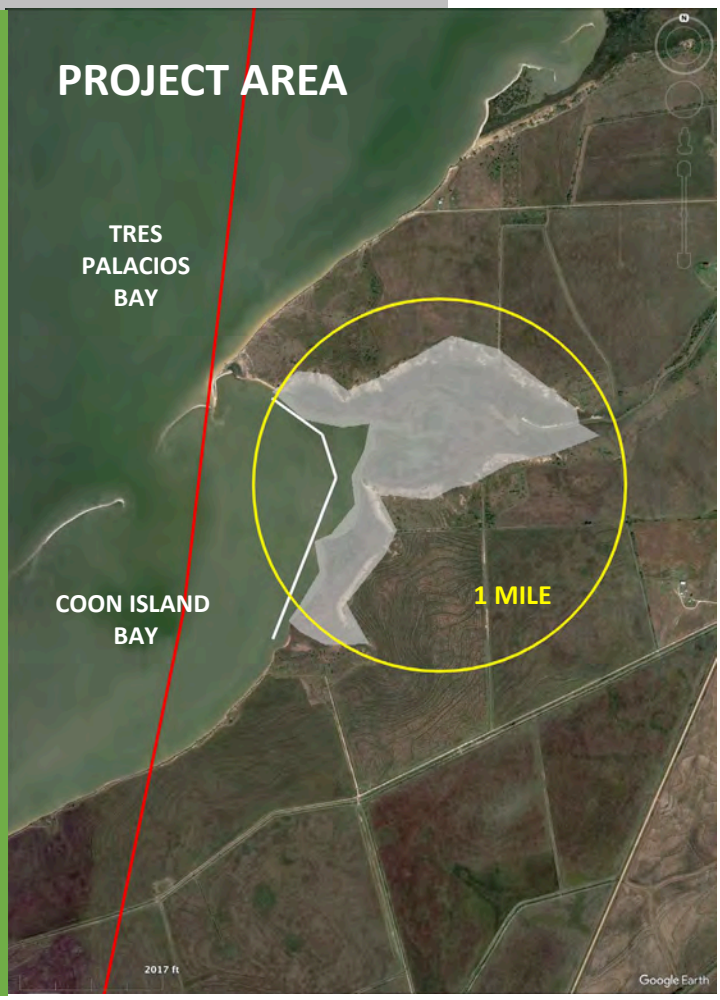
SOIL CARBON:
~170 AC
~74-353 tCO2e/AC typical, 283t average
~48,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$21/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- The Coon Island Bay project is 20 miles from Point Comfort.
- However, it is directly adjacent to priority Whooping Crane expansion habitat at the Oyster Lake complex.
- The proposed project protects the remaining eastern wetland of Coon Island Bay inside historic Coon Island Reef. This small bay is a well-known wade-fishing location with a famous fall flounder run. It and the associated reef complex could be potential future restoration opportunities.



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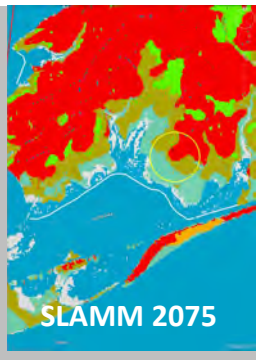
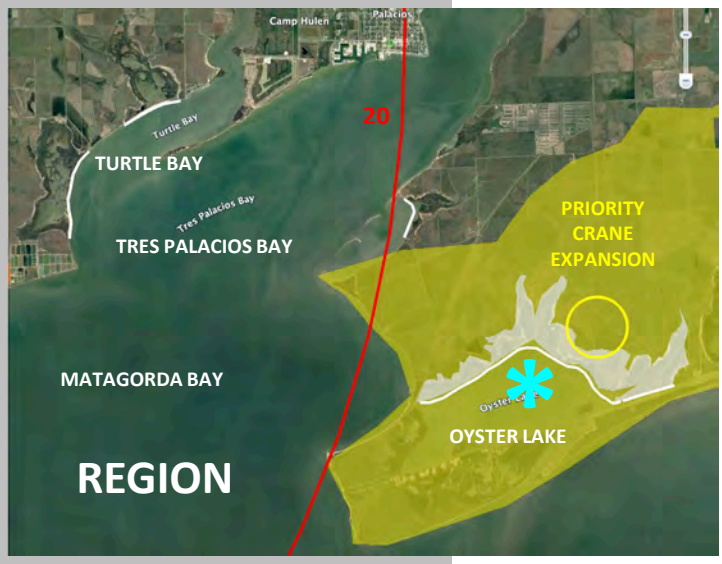
OYSTER LAKE NORTH SHORE



SHORELINES:
~4.7 miles shoreline, conceptual
~$2 million/mile average, partial GIWW
~$10 million project (phase-able)

SOIL CARBON:
~1500 AC
~74-353 tCO2e/AC typical, 236t average
~355,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$28/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- Oyster Lake is 20+ miles from Point Comfort in Matagorda County. The eastern portion of the project involves shore protection along the the GIWW. (See Mad Island Marsh projects.)
- The site is an integral part of the large ICF Priority Crane Expansion area for Matagorda Bay.
- Oyster Lake Park is a site on the Great Texas Coastal Birding Trail, CTC 008.
- Oyster Lake is one of the most popular protected kayak fishing spots in West Matagorda Bay.

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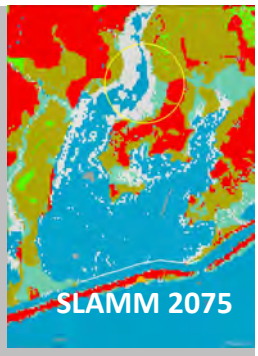
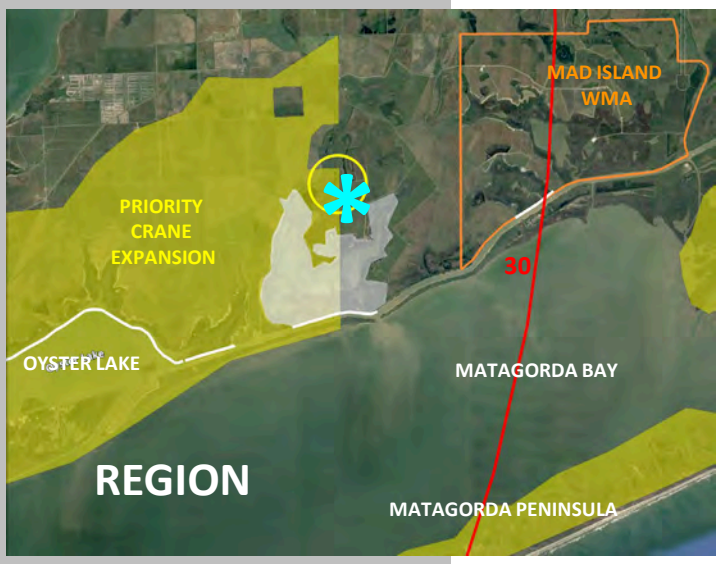
MAD ISLAND MARSH WEST



SHORELINES:
~1.5 mile shoreline, conceptual
~$2.5 million/mile average, GIWW
~$3.75 million project

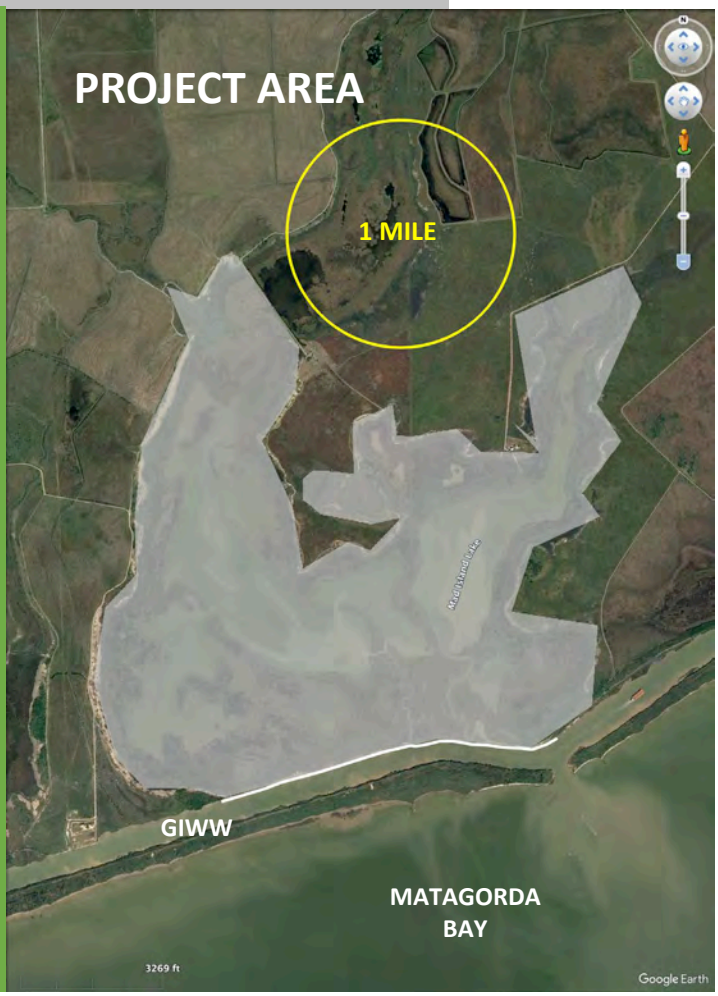
SOIL CARBON:
~2100 AC
~50-353 tCO2e/AC typical, 200t average
~420,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$9/ton



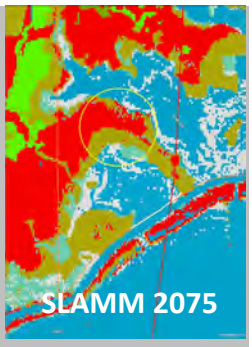
CO-BENEFITS / PROJECT BIODIVERSITY:

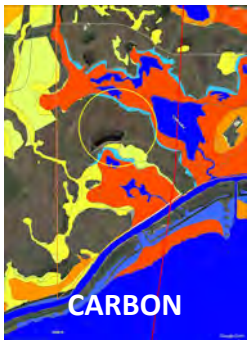
- Companion Mad Island Marsh shoreline projects West and East (TPWD WMA) along the Matagorda Bay GIWW are 25-30 miles east of Point Comfort.
- Mad Island Marsh West is on private land, of which about half is included in the ICF Priority Crane Expansion area around Oyster Lake.
- These eastern inland sites along Matagorda Bay include the richest stored soil carbon deposits within the project study area.
- Audubon Christmas Bird Count for Mad Island Marsh area typically leads the nation count, averaging 220-230 species.



23

MAD ISLAND MARSH EAST (TPWD WMA)

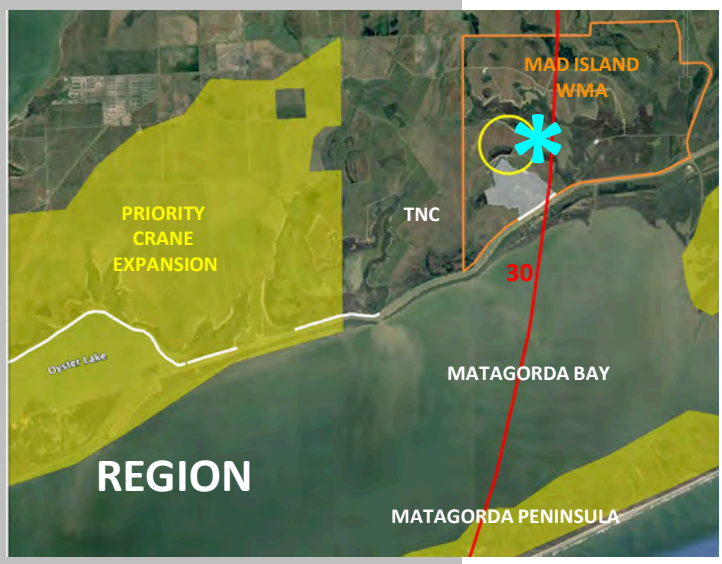




SHORELINES:
~.8 mile shoreline, conceptual
~$2.5 million/mile average
~$2 million project

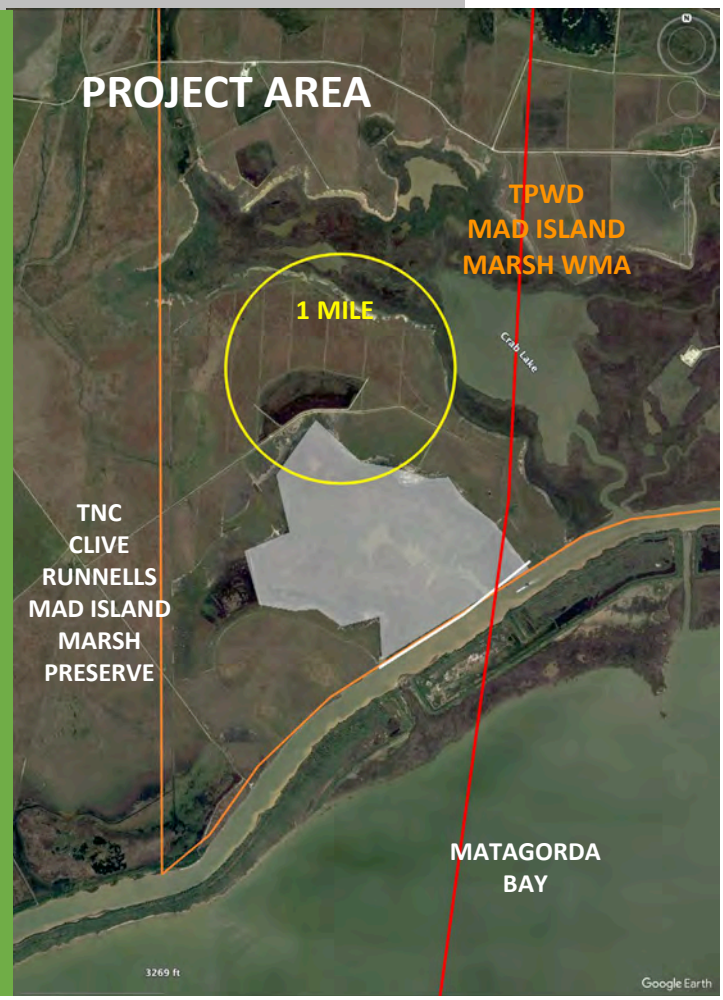
SOIL CARBON:
~430 AC
~361 tCO2e/AC typical
~155,000 tCO2e stored

CARBON DEVELOPMENT COST (tCO2e):
~$13/ton



CO-BENEFITS / PROJECT BIODIVERSITY:

- Companion Mad Island Marsh shoreline projects West and East (TPWD WMA) along the Matagorda Bay GIWW are 25-30 miles east of Point Comfort.
- Project is 3 miles from ICF Priority Crane Expansion sites. Nature Conservancy (TNC) land bounds TPWD WMA to west.
- These eastern inland sites along Matagorda Bay include the the richest soil carbon deposits within the project study area.
- TX Coastal Birding Trail CTC 007. Audubon Christmas Bird Count for Mad Island Marsh area typically leads the nation count, averaging 220-230 species.



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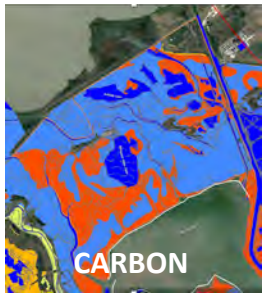
GUADALUPE DELTA WMA / MISSION LAKE



SHORELINES:
~3 miles shorelines, conceptual
~$2.0 million/mile projected
~$6 million project

SOIL CARBON:
~1890 AC
~56-351 tCO2e/AC stored ~209t avg
~400,000 tons stored

CARBON DEVELOPMENT COST (tCO2e):
~$15/ton

CO-BENEFITS / PROJECT BIODIVERSITY:

- Within 25 miles of Point Comfort.
- Whooping Crane potential: ~10 miles to Welder Flats (TPWD), Matagorda Island and Aransas NWR.
- TPWD owned Guadalupe Mission Lake WMA, mostly freshwater wetlands.
- Part of Audubon Christmas Bird Count (CBC) Guadalupe area - 2022 species 192, Texas rank #3.
- Great Texas Coastal Birding Trail Site Central Coast CTC 036.

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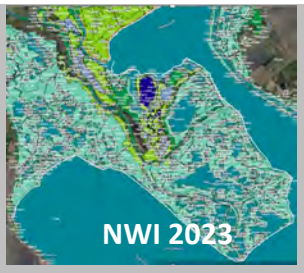
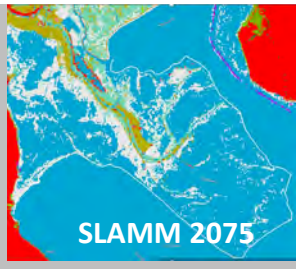
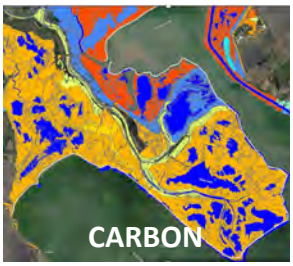
GUADALUPE DELTA







SHORELINES:
~14 miles shorelines, conceptual
~$2.25 million/mile projected
~$31 million project

SOIL CARBON:
~7800 AC
~123-361 tCO2e/AC stored ~170t average
~1.3 million tons stored

CARBON DEVELOPMENT COST (tCO2e):
~$23/ton

CO-BENEFITS / PROJECT BIODIVERSITY:

- Combine with Guadalupe Delta WMA / Mission Lake project.
- Within 25 miles of Point Comfort.
- Whooping Crane potential: ~10 miles to Welder Flats (TPWD), Matagorda Island and Aransas NWR.
- Ed Rachal Foundation , Corpus Christi, land ownership in project area.

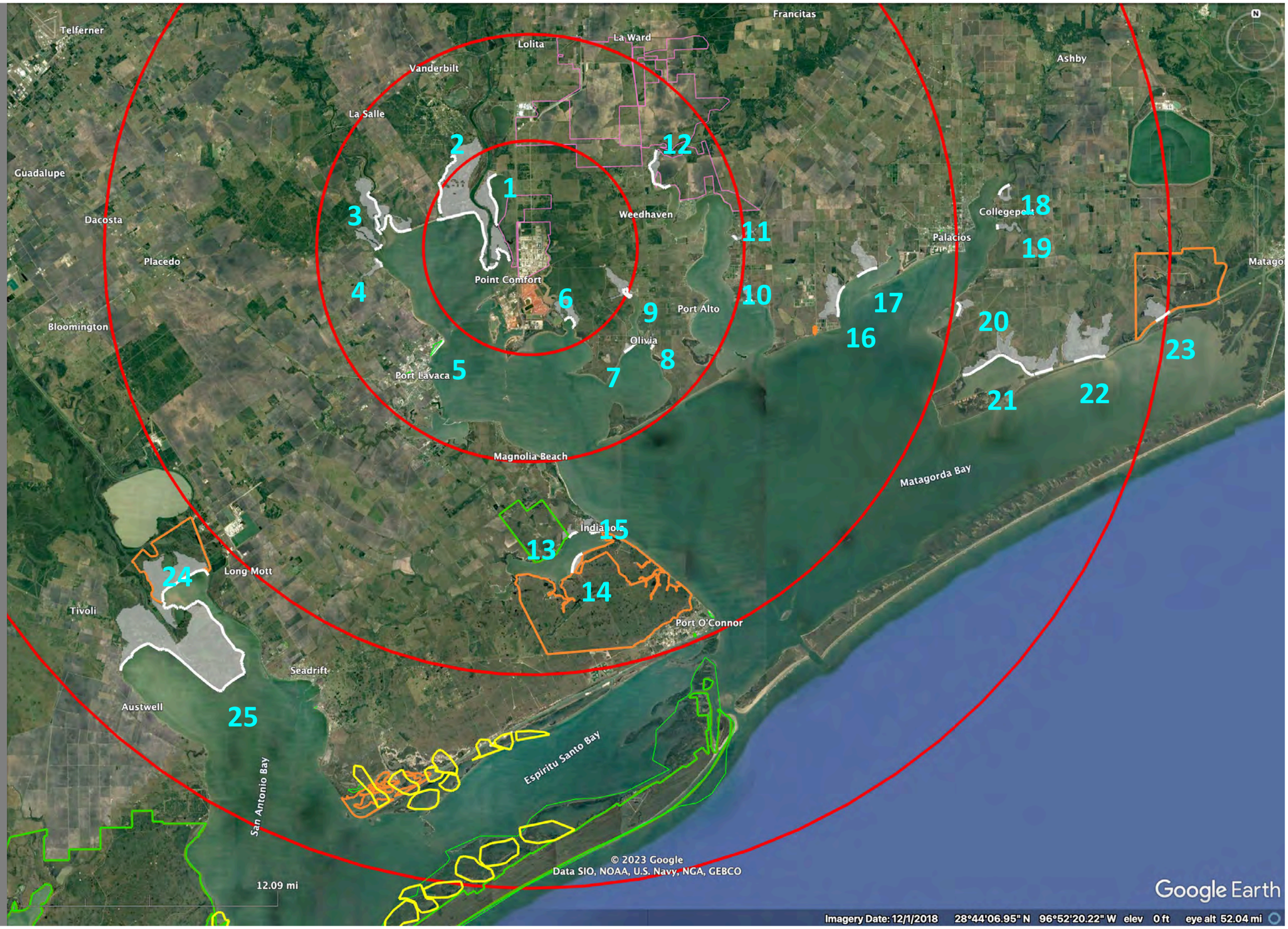
D - LARGE-SCALE REGIONAL PLANS

SITE LEGEND:

1-2 Lavaca Delta & Swan Lake ~13 miles, 4400 AC
3 Garcitas & Placedo Creeks ~5.75 miles, 1600 AC
4 Six-Mile Creek Lavaca Bay ~.6 Mile, 170 AC
5 Port Lavaca Bird Sanctuary ~.9 Mile, 68 AC
6 Cox Creek ~1 Mile, 450 AC
7 North Keller Bay ~.9 Mile, 80 AC
8 Olivia - Keller Bay~.7 Mile, 60 AC*
9 Keller Creek ~1.75 Miles, 440 AC
10 Carancahua Bay ~.35 Mile, 110 AC
11 Five-Mile Draw - Vaes Bay ~.3 Mile, 130 AC
12 Carancahua Creek ~2.6 Miles, 260 AC
13 Powderhorn Lake North Shore ~1 Mile, 130 AC
14 Powderhorn Lake South ~1.1 Miles, 160 AC
15 Powderhorn Bayou Indianola ~1 Mile, 190 AC
16 Turtle Bay West ~1.5 Miles, 520 AC
17 Turtle Bay East ~1 Mile, 565 AC
18 Collegeport N. Tres Palacios ~.75 Mile, 140 AC
19 Collegeport S. Tres Palacios~.25 Mile, 190 AC
20 Coon Island Bay Tres Palacios ~.75 Mile, 170 AC
21 Oyster Lake North Shore ~4.7 Miles, 1500 AC
22 Mad Island Marsh West ~1.5 Miles, 2100 AC
23 Mad Island Marsh East ~.8 Mile, 430 AC
24 Guadalupe Delta Mission Lake ~3 Miles, 1890 AC
25 Guadalupe Delta ~14 Miles, 7800 AC

PROJECTS SUMMARY:

~59.2 Miles Shorelines
~23,500 AC Wetland Protection

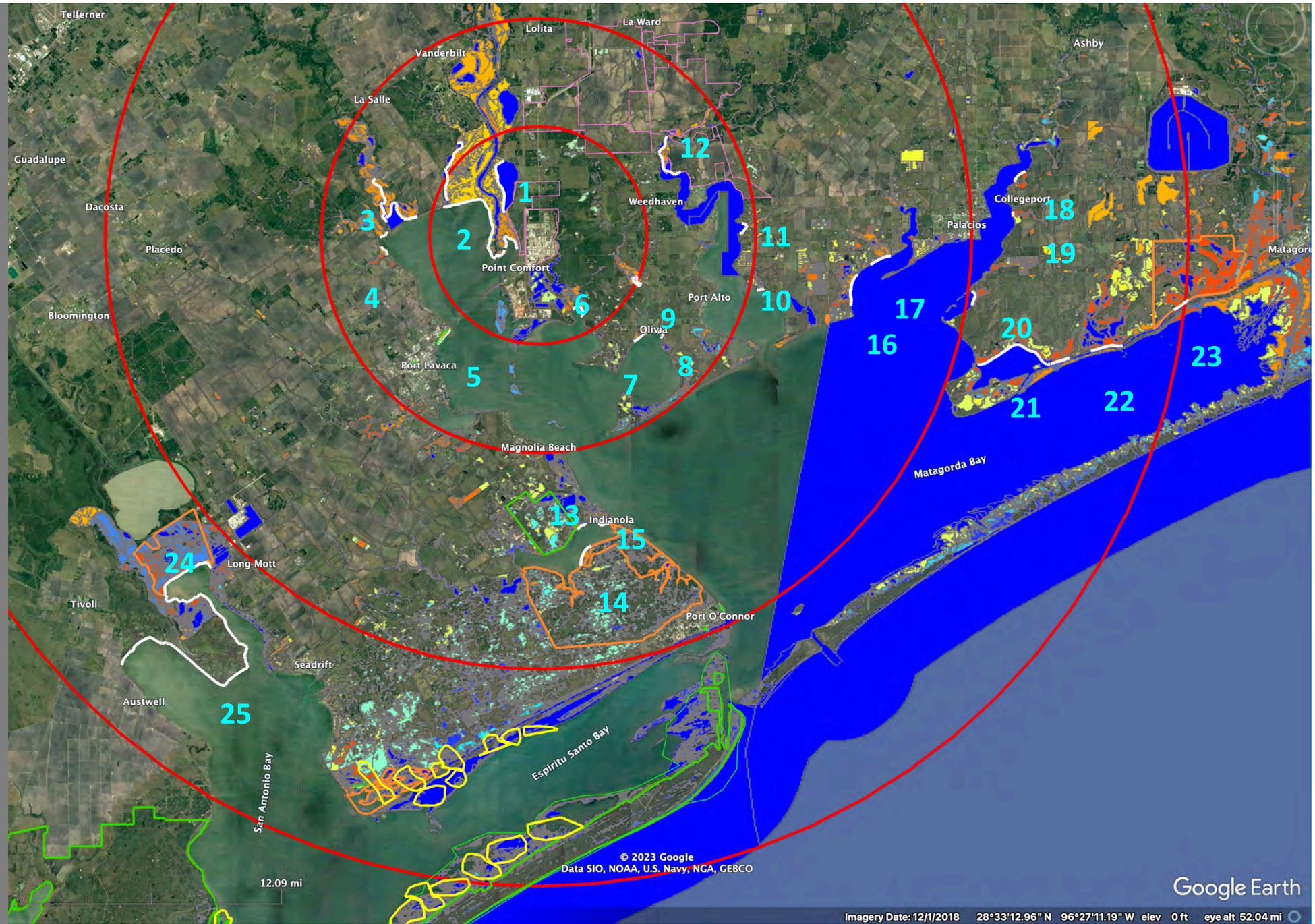


SOIL CARBON:

Stored tCO2e - Est. Develop Cost/ton

1-2 Lavaca Delta & Swan Lake ~770,000 tons - $39
3 Garcitas & Placedo Creeks ~378,000 tons - $29
4 Six-Mile Creek Lavaca Bay ~47,000 tons - $32
5 Port Lavaca Bird Sanctuary ~15,570 tons - $60
6 Cox Creek ~58,000 tons - $35
7 North Keller Bay ~16,000 tons - $100
8 Olivia - Keller Bay ~14,000 tons - $125
9 Keller Creek ~120,000 tons - $15
10 Carancahua Bay ~27,500 tons - $32
11 FIve-Mile Draw - Vaes Bay ~30,000 tons - $20
12 Carancahua Creek ~50,000 tons - $59
13 Powderhorn Lake N. Shore ~16,000 tons - $63
14 Powderhorn Lake South ~26,200 tons** - $42
15 Powderhorn Bayou Indianola ~39,000 tons - $26
16 Turtle Bay West ~119,000 tons - $20
17 Turtle Bay East ~119,000 tons - $13
18 Collegeport North Palacios ~49,000 tons - $18
19 Collegeport South Palacios~67,000 tons - $6
20 Coon Island Bay Tres Palacios ~48,000 tons - $20
21 Oyster Lake Northshore ~355,000 tons - $28
22 Mad Island Marsh West ~420,000 tons - $7
23 Mad Island Marsh East ~155,000 tons - $13
24 Guadalupe Mission Lake ~400,000 tons - $15
25 Guadalupe Delta ~1,300,000 tons - $23

***Marsh Platform Restoration Project, requires SOC field evaluation (typical)*



WHOOPING CRANES:

Yellow wash indicates regions identified by the International Crane Foundation as being high priority areas for Whooping Crane expansion onto private lands. 7 study sites are within or immediately adjacent to such areas. 10 sites are within 5 miles; the remaining 8 sites are within 10 miles.

1-2 Lavaca Delta & Swan Lake 0-1 mile
3 Garcitas & Placedo Creeks 0-1 mile
4 Six-MileMile Creek Lavaca Bay 0-1 mile
5 Port Lavaca Bird Sanctuary <5 miles
6 Cox Creek <5 miles
7 North Keller Bay <10 miles
8 Olivia - Keller Bay <10 miles
9 Keller Creek <10 miles
10 Carancahua Bay <10 miles
11 5-Mile Draw / Vaes Bay <10 miles
12 Carancahua Creek <10 miles
13 Powderhorn Lake North Shore <5 miles
14 Powderhorn Lake South Shore <5 miles
15 Powderhorn Bayou Indianola <5 miles
16 Turtle Bay West <5 miles
17 Turtle Bay East <5 miles
18 Collegeport N. Tres Palacios <5 miles
19 Collegeport S. Tres Palacios <5 miles
20 Coon Island Bay Tres Palacios 0-1 mile
21 Oyster Lake North Shore 0-1 mile
22 Mad Island Marsh West 0-1 mile
23 Mad Island Marsh East <5 miles
24 Guadalupe Delta Mission Lake <10 miles
25 Guadalupe Delta <10 miles