



TEXAS COASTAL RESILIENCY MASTER PLAN OVERVIEW

MARCH 2019

George P. Bush, Commissioner, Texas General Land Office

The Texas General Land Office (GLO) is pleased to present the 2019 Texas Coastal Resiliency Master Plan (Resiliency Plan) – the second installment of a statewide plan to protect and promote a vibrant and resilient Texas coast that supports and sustains a strong economy and healthy environment for all who live, work, play or otherwise benefit from the natural resources and infrastructure along the Texas coast.

The Texas coast is an integrated network of built infrastructure and natural environments that should be considered in partnership to understand and achieve coastal resiliency. The state's natural coastal environments contribute resources and invaluable ecosystem services – such as cultural and recreational benefits, seafood, flood prevention and habitat productivity – that bolster business development, improve quality of life, and attract people to Texas. The coast's built environments provide the support services, transportation and infrastructure systems that allow industries, communities and businesses to flourish up and down the coast.

While Texas is full of diverse landscapes and city settings, there is no doubt the value of its coast is unmatched. Supported by its vast expanse of port enterprises and the energy industry's exploration and production endeavors, the Texas coast is both the main trade hub for the rest of the state and the leading energy producer for the nation.¹ In recent years, Texas ports provided \$368 billion in economic value to the state – roughly 23 percent of the total state gross domestic product – and handled 23 percent of all U.S. port tonnage annually.^{2,3,4} In total, the Texas coastal region accounts for roughly 24 percent of the state's population, 23.5 percent of the state's businesses, 26 percent of the state's workforce, and brings in 29 percent of the state's total annual average wages.^{2,5} The rest of the state's residents and visitors also rely on the coast for the goods and services, recreation and quality of life that a strong and resilient coast provides.

The coastal region is susceptible to the extreme impacts from natural disasters as well as the impacts from long-term environmental, social and economic pressures that can have dire consequences. This Resiliency Plan identifies eight priority Issues of Concern that encompass risks and threats to the viability of coastal communities, habitats and industries:

- Altered, Degraded or Lost Habitat
- Gulf Beach Erosion and Dune Degradation
- Bay Shoreline Erosion
- Existing and Future Coastal Storm Surge Damage
- Coastal Flood Damage
- Impact on Water Quality and Quantity
- Impact on Coastal Resources
- Abandoned or Derelict Vessels, Structures and Debris



Photo Credit: Texas General Land Office

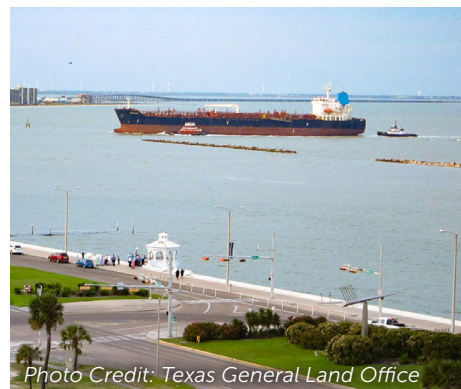


Photo Credit: Texas General Land Office



Photo Credit: Texas General Land Office



Photo Credit: Texas General Land Office

To bring about long-term resiliency along the entire Texas coast, the Resiliency Plan lists recommended Tier 1 projects that mitigate, collectively and individually, the identified Issues of Concern. The Tier 1 projects address the majority of high priority needs identified by data gathering and modeling completed by the GLO Planning Team. The 2019 Texas Coastal Resiliency Master Plan recommends 123 Tier 1 projects for a cumulative Resiliency Plan cost of \$5.4 billion. The 123 projects have been thoroughly reviewed and vetted by a Technical Advisory Committee and the GLO.

Coastal resiliency does not stop at project implementation. It can only be achieved as the result of continual learning and improvement among all those who actively work to enhance the coast. Together, monitoring and adaptive management will help the GLO identify the highest performing projects, design more effective future project solutions, and collect desperately needed long-term data to improve coastal science, engineering and planning for the next generation of coastal management.

A resilient coast is the responsibility of all Texans. The Texas Coastal Resiliency Master Plan provides a strategic pathway to restore, enhance and protect the coast. The GLO looks forward to working together to ensure a strong coast for a strong Texas.

THE TEXAS COAST The Critical Connection



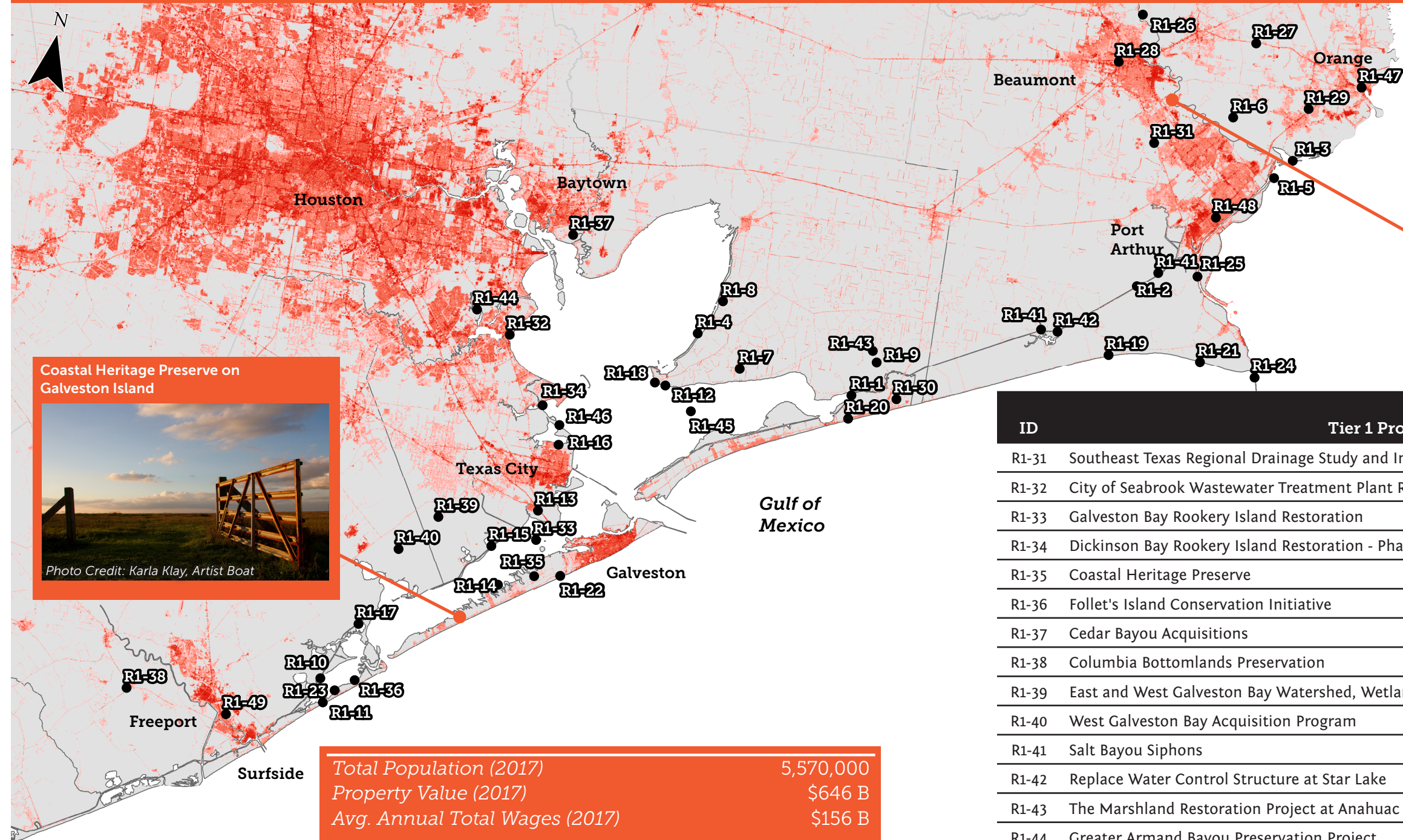
REGION 1 TIER 1 PROJECTS

49 Projects \$4.9B+

ID	Tier 1 Project	Estimated Project Cost
R1-1	Anahuac National Wildlife Refuge Living Shoreline	\$60,900,000
R1-2	Willow Lake Shoreline Stabilization	\$6,600,000
R1-3	Old River Cove Restoration	\$15,200,000
R1-4	Gordy Marsh Restoration & Shoreline Protection	\$4,500,000 ^(PF)
R1-5	Sabine-Neches Waterway Dredge Placement Island Habitat Restoration	\$3,700,000
R1-6	Bessie Heights Wetland Restoration	\$13,500,000 ^(PF)
R1-7	Moody National Wildlife Refuge Conservation and Restoration	\$10,000,000 *
R1-8	Double Bayou Habitat Preservation	\$5,000,000 *
R1-9	Chambers County Wetland Restoration	\$25,000,000 *
R1-10	Brazoria National Wildlife Refuge GIWW Shoreline Protection	\$21,800,000
R1-11	Follet's Island Wetland Restoration	\$36,600,000
R1-12	Candy Abshier Wildlife Management Area Shoreline Protection and Marsh Restoration	\$1,700,000 ^(PF)
R1-13	O'Quinn IH-45 Causeway Intertidal Marsh Restoration	\$4,300,000
R1-14	Galveston Island State Park Wetland Restoration & Shoreline Protection - Phase 3	\$5,700,000
R1-15	Green's Lake Shoreline Protection & Wetland Restoration - Phase 2	\$4,200,000 ^(PF)
R1-16	Dollar Bay Wetland Creation, Restoration and Acquisition	\$5,100,000 ^(PF)
R1-17	Oyster Lake - West Bay Breach Protection - Phase 3	\$4,600,000 ^(PF)
R1-18	East Bay Living Shorelines and Wetland Restoration	\$8,900,000
R1-19	McFaddin National Wildlife Refuge Shoreline Restoration	\$183,100,000 **
R1-20	Bolivar Peninsula Beach & Dune Restoration	\$81,200,000 ^(PF) **
R1-21	Texas Point Beach Nourishment Project	\$36,100,000
R1-22	Galveston Island West of Seawall to 8 Mile Road Beach Nourishment	\$10,500,000
R1-23	Follet's Island Nourishment and Erosion Control	\$106,400,000 **
R1-24	Sabine Pass Jetty Repair	\$105,000,000
R1-25	Sabine-Neches Channel Shoreline Protection	\$10,200,000
R1-26	Southeast Texas Regional Water Supply Study and Improvements	\$1,000,000
R1-27	Interstate 10 Drainage Improvements at Cow Bayou	\$5,000,000
R1-28	Southeast Texas Regional Wastewater Treatment Improvements	\$500,000
R1-29	Improve State Highway 73 at Bridge City	\$2,800,000
R1-30	Elevate State Highway 87 and Widen State Highway 124 to Improve Evacuation Capabilities	\$21,900,000

*Maximum amount **Up to \$20M per phase of work ^(PF)Partially Funded

Region 1 Project Recommendations



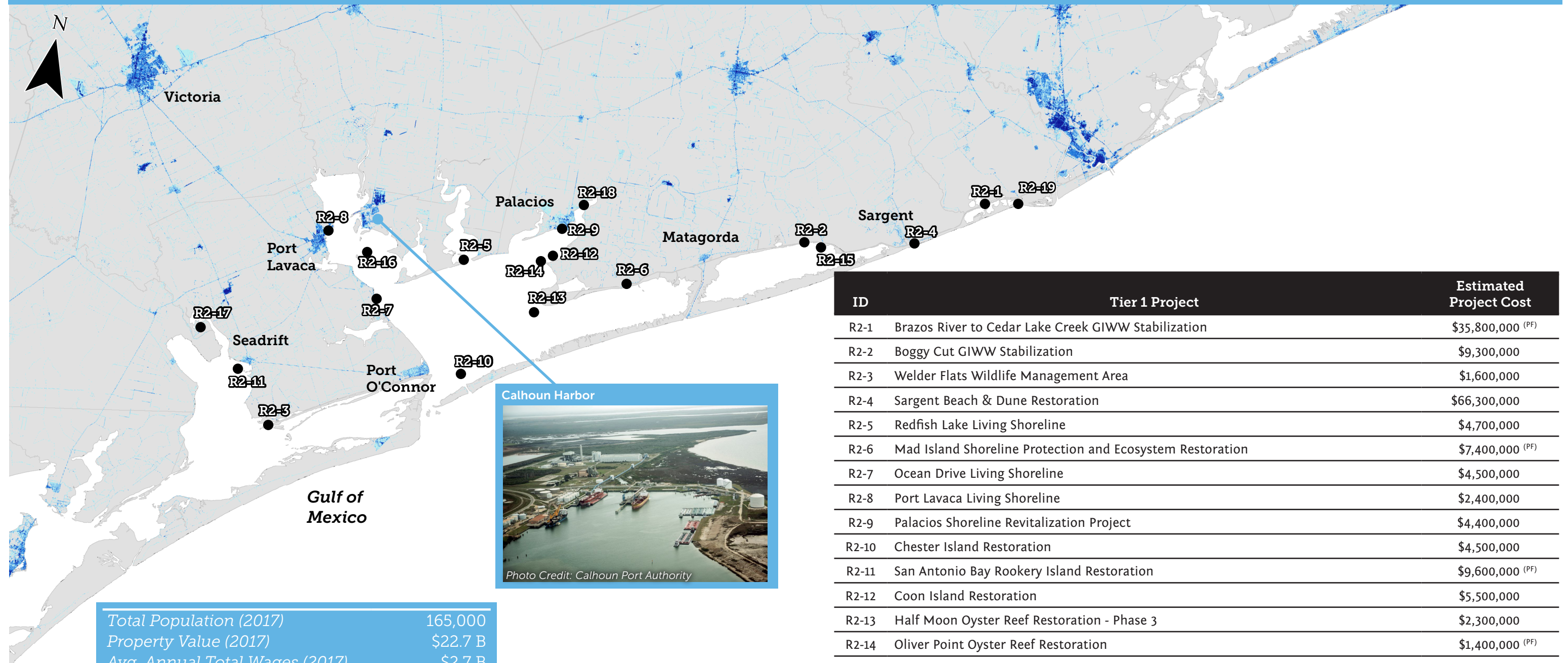
Total Population (2017)	5,570,000
Property Value (2017)	\$646 B
Avg. Annual Total Wages (2017)	\$156 B
Counties	Brazoria, Chambers, Galveston, Harris, Jefferson, Orange
Political Districts	TX House #19, 21-25, 29, 128-129, 134, 142-145, 147-148 TX Senate #3-4, 6, 11, 13, 15, 17 U.S. Congress #2, 7, 14, 18, 22, 29, 36

ID	Tier 1 Project	Estimated Project Cost
R1-31	Southeast Texas Regional Drainage Study and Improvements	\$1,000,000
R1-32	City of Seabrook Wastewater Treatment Plant Relocation	\$34,100,000
R1-33	Galveston Bay Rookery Island Restoration	\$37,500,000
R1-34	Dickinson Bay Rookery Island Restoration - Phase 2	\$3,200,000
R1-35	Coastal Heritage Preserve	\$28,200,000 (PF)
R1-36	Follet's Island Conservation Initiative	\$7,600,000
R1-37	Cedar Bayou Acquisitions	\$10,000,000 *
R1-38	Columbia Bottomlands Preservation	\$18,800,000 (PF)
R1-39	East and West Galveston Bay Watershed, Wetland and Habitat Conservation	\$15,600,000 (PF)
R1-40	West Galveston Bay Acquisition Program	\$25,000,000 *
R1-41	Salt Bayou Siphons	\$4,500,000
R1-42	Replace Water Control Structure at Star Lake	\$2,100,000
R1-43	The Marshland Restoration Project at Anahuac National Wildlife Refuge	\$7,500,000 *
R1-44	Greater Armand Bayou Preservation Project	\$10,000,000 *
R1-45	Galveston Bay Oyster Reef Planning & Restoration	\$2,500,000 (PF)
R1-46	Texas City Levee Erosion Control and Marsh and Oyster Reef Restoration	\$2,800,000
R1-47	Orange County Hurricane Flood Protection Levee	\$2,363,600,000 (PF)
R1-48	Port Arthur Hurricane Flood Protection Levee	\$881,900,000 (PF)
R1-49	Freeport Hurricane Flood Protection Levee	\$711,800,000 (PF)

*Maximum amount **Up to \$20M per phase of work (PF)Partially Funded

REGION 2

TIER 1 PROJECTS
19 Projects \$163M+



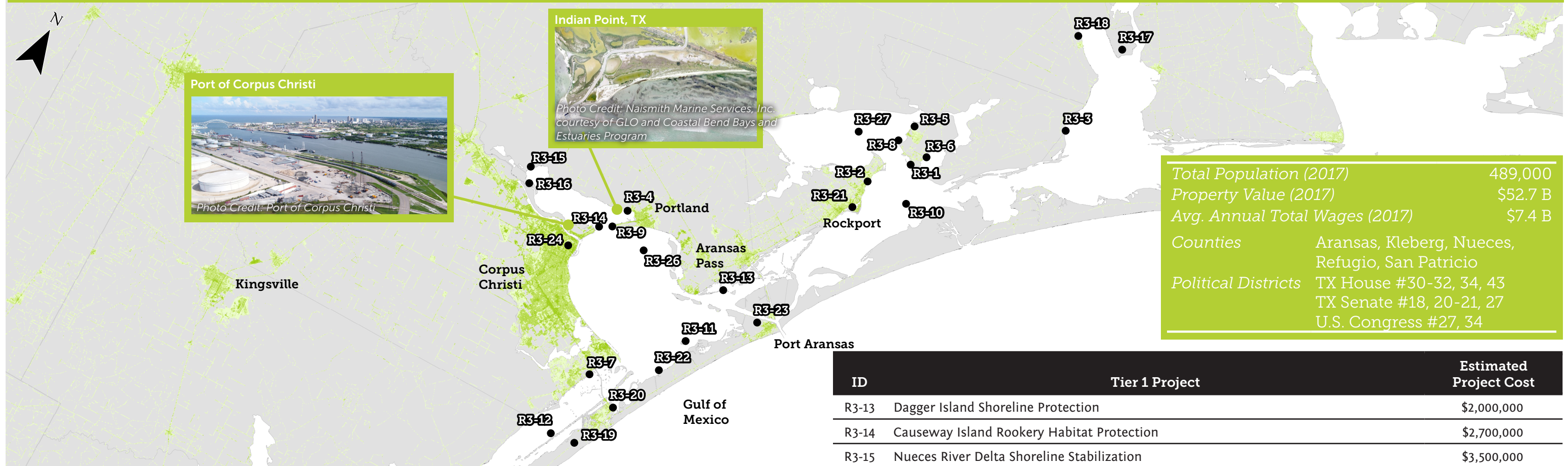
Total Population (2017)	165,000
Property Value (2017)	\$22.7 B
Avg. Annual Total Wages (2017)	\$2.7 B
Counties	Calhoun, Jackson, Matagorda, Victoria
Political Districts	TX House #25, 30, 85 TX Senate #17, 18 U.S. Congress #14, 27

ID	Tier 1 Project	Estimated Project Cost
R2-1	Brazos River to Cedar Lake Creek GIWW Stabilization	\$35,800,000 ^(PF)
R2-2	Boggy Cut GIWW Stabilization	\$9,300,000
R2-3	Welder Flats Wildlife Management Area	\$1,600,000
R2-4	Sargent Beach & Dune Restoration	\$66,300,000
R2-5	Redfish Lake Living Shoreline	\$4,700,000
R2-6	Mad Island Shoreline Protection and Ecosystem Restoration	\$7,400,000 ^(PF)
R2-7	Ocean Drive Living Shoreline	\$4,500,000
R2-8	Port Lavaca Living Shoreline	\$2,400,000
R2-9	Palacios Shoreline Revitalization Project	\$4,400,000
R2-10	Chester Island Restoration	\$4,500,000
R2-11	San Antonio Bay Rookery Island Restoration	\$9,600,000 ^(PF)
R2-12	Coon Island Restoration	\$5,500,000
R2-13	Half Moon Oyster Reef Restoration - Phase 3	\$2,300,000
R2-14	Oliver Point Oyster Reef Restoration	\$1,400,000 ^(PF)
R2-15	Chinquapin Oyster Reef Restoration	\$1,400,000
R2-16	Lavaca Bay Oyster Reef Restoration	\$1,300,000
R2-17	San Antonio Bay Hydrologic Regional Watershed Plan	\$250,000
R2-18	Matagorda Bay Regional Inflow Study	\$250,000 ^(PF)
R2-19	Brazos River and San Bernard River Restoration Strategy and Management Plan	\$325,000 ^(PF)

^(PF)Partially Funded

REGION 3

TIER 1 PROJECTS
27 Projects \$92M+



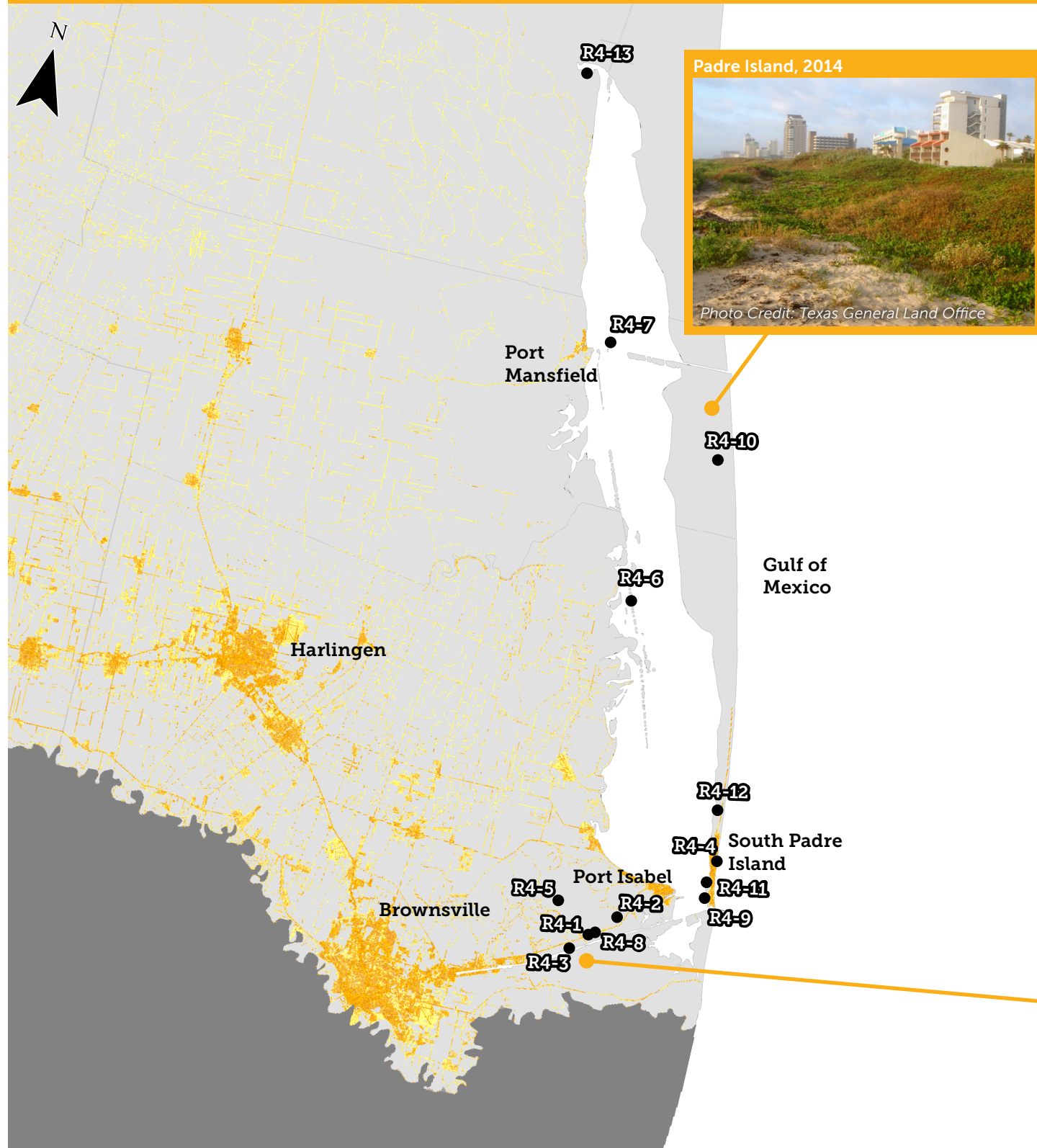
ID	Tier 1 Project	Estimated Project Cost
R3-1	Goose Island State Park Habitat Restoration and Protection	\$1,400,000
R3-2	Fulton Beach Road Protection	\$3,200,000
R3-3	Aransas National Wildlife Refuge Dagger Point Shoreline Preservation	\$2,600,000 ^(PF)
R3-4	Portland Living Shoreline	\$3,000,000
R3-5	Shell Point Ranch Wetlands Protection	\$5,000,000
R3-6	Lamar Beach Road Protection	\$3,500,000
R3-7	Flour Bluff Living Shoreline	\$3,400,000
R3-8	Newcomb's Point Shoreline Stabilization	\$2,700,000
R3-9	Indian Point Marsh Area Living Shoreline	\$2,800,000
R3-10	Long Reef and Deadman Island Shoreline Stabilization and Habitat Protection	\$3,400,000
R3-11	Shamrock Island Restoration – Phase 2	\$3,000,000 ^(PF)
R3-12	Tern Island and Triangle Tree Island Rookery Habitat Protection	\$3,600,000

ID	Tier 1 Project	Estimated Project Cost
R3-13	Dagger Island Shoreline Protection	\$2,000,000
R3-14	Causeway Island Rookery Habitat Protection	\$2,700,000
R3-15	Nueces River Delta Shoreline Stabilization	\$3,500,000
R3-16	Nueces County Hydrologic Restoration Study	\$200,000 ^(PF)
R3-17	Guadalupe Delta Estuary Restoration	\$3,900,000
R3-18	Guadalupe River and Delta Wildlife Management Area Acquisition	\$3,000,000
R3-19	Coastal Bend Gulf Barrier Island Conservation	\$500,000
R3-20	Packery Channel Nature Park Habitat Restoration - Phase 2	\$2,500,000
R3-21	Little Bay Restoration Initiative	\$14,400,000
R3-22	Restore Barrier Island Bayside Wetlands on Mustang Island	\$8,400,000
R3-23	Port Aransas Nature Preserve Stabilization and Restoration	\$4,400,000 ^(PF)
R3-24	Corpus Christi Bay Wastewater, Stormwater Quality and Pollution Management Improvements	\$1,000,000
R3-25	Baffin Bay Watershed Monitoring and Management Plan	\$2,500,000
R3-26	Corpus Christi & Nueces Bays Oyster Reef Restoration	\$700,000
R3-27	Copano Bay Oyster Reef Restoration	\$5,300,000

^(PF)Partially Funded

REGION 4

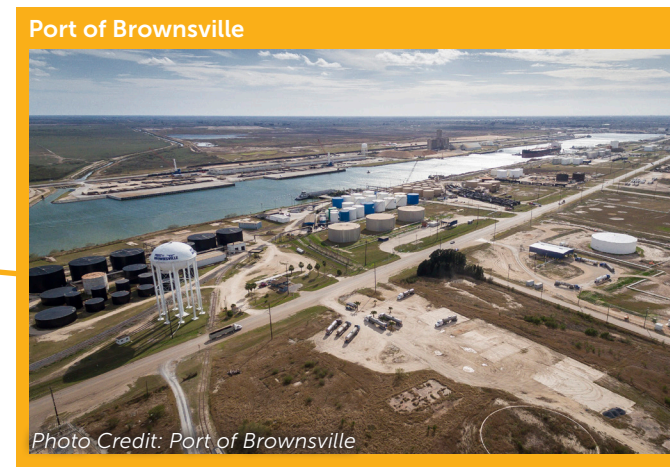
TIER 1 PROJECTS
13 Projects \$145M+



ID	Tier 1 Project	Estimated Project Cost
R4-1	Bahia Grande Hydrologic Restoration	\$5,300,000
R4-2	Paso Corvinas Wetlands & Hydrologic Restorations	\$2,700,000 ^(PF)
R4-3	Development of the Lower Laguna Madre and Brownsville Ship Channel Watershed Protection Plan	\$600,000 ^(PF)
R4-4	South Padre Island Beach and Dune Management and Restoration	\$74,100,000 ^{**}
R4-5	Bird and Heron Islands Restoration	\$7,100,000 ^(PF)
R4-6	Restore Laguna Madre Rookery Islands	\$12,100,000
R4-7	Mansfield Rookery Island Shoreline Protection	\$3,800,000
R4-8	Bahia Grande Living Shoreline	\$5,400,000
R4-9	Restore Barrier Island Bayside Wetlands on South Padre Island	\$5,500,000
R4-10	South Padre Island Coastal Beach Protection	\$25,000,000 ^{*(PF)}
R4-11	City of South Padre Island Living Shoreline	\$2,600,000
R4-12	South Padre Island Park Development	\$1,100,000
R4-13	Laguna Madre Relative Sea Level Rise Monitoring and Adaptive Management	\$500,000

*Maximum Amount **Up to \$20M per Phase of Work ^(PF)Partially Funded

Total Population (2017)	443,000
Property Value (2017)	\$22.9 B
Avg. Annual Total Wages (2017)	\$3.2 B
Counties	Cameron, Kenedy, Willacy
Political Districts	TX House #31, 35, 37, 38 TX Senate #27 U.S. Congress #34



COASTWIDE TIER 1 PROJECTS

19 Projects \$19M+

ID	Tier 1 Project	Estimated Annual Project Cost
R0-1	Texas Coastal Resiliency Master Plan	\$2,500,000
R0-2	Dune Management and Access Plan	\$1,000,000
R0-3	Texas Seagrass Restoration	\$2,000,000*
R0-4	Derelict Structure and Vessel Removal	\$3,000,000
R0-5	Abandoned and Derelict Petroleum Production Structure Removal Program	\$5,000,000
R0-6	Evacuation Route Study for Coastal Resilience	\$250,000*
R0-7	State Flood Assessment and Flood Risk Management	\$600,000
R0-8	Texas Coastal Nonpoint Source Pollution Program	\$500,000
R0-9	Sediment Management Plan	\$1,000,000
R0-10	Beach Monitoring and Maintenance Program	\$1,000,000
R0-11	Subsidence Study and Monitoring	\$500,000
R0-12	Longshore Transport Modeling	\$1,000,000
R0-13	Long-Term Hydrologic Monitoring Program	\$500,000
R0-14	Development of Optimal Coastwide Bathymetric and Topographic Models	\$250,000
R0-15	Data Collection to Support Continual Updates to the National Wetlands Inventory Dataset	\$50,000

*Initial Cost

References

1. U.S. Energy Information Administration. 2018. Texas State Energy Profile. Available at: <https://www.eia.gov/state/print.php?sid=TX> (accessed Feb 14, 2019)
2. Port Authority Advisory Committee. 2019. Texas Ports Mission Plan: Investment Strategy - 86th Legislature. Texas Department of Transportation Maritime Division. Available at: <http://ftp.dot.state.tx.us/pub/txdot-info/tpp/giww/mission-plan-86.pdf> (accessed Feb 14, 2019)
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5. Bureau of Labor Statistics. 2017. Quarterly Census of Employment and Wages. U.S. Department of Labor. Available at: https://data.bls.gov/cew/apps/table_maker/v4/table_maker.htm#type=1&year=2017&qtr=A&own=5&ind=10&supp=0 (accessed Feb 14, 2019)