

Avian Bioacoustic Assessment Across Armand Bayou Nature Center

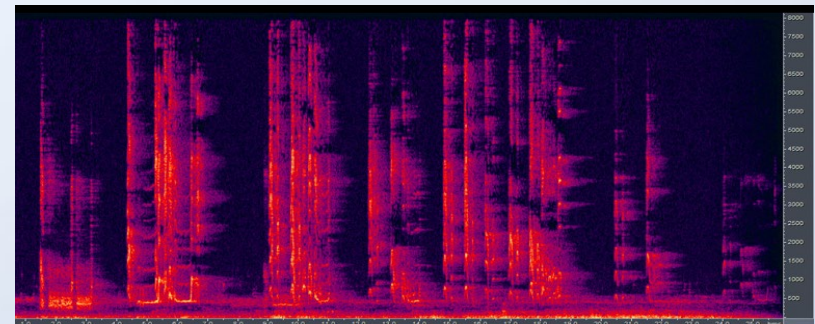
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Bioacoustic Assessments

- Passive acoustic monitoring uses recorders with programmed intervals
- The recordings are processed using bioacoustics software and AI to identify species.
- These findings can then be combined metrics, such as ABC's BirdsPlus Index, to compare the birdlife found against regional expectations.
- The long-term data provided by bioacoustic surveys can reveal patterns in species activity, seasonal changes, and responses to environmental factors, as well as tracking habitat recovery.

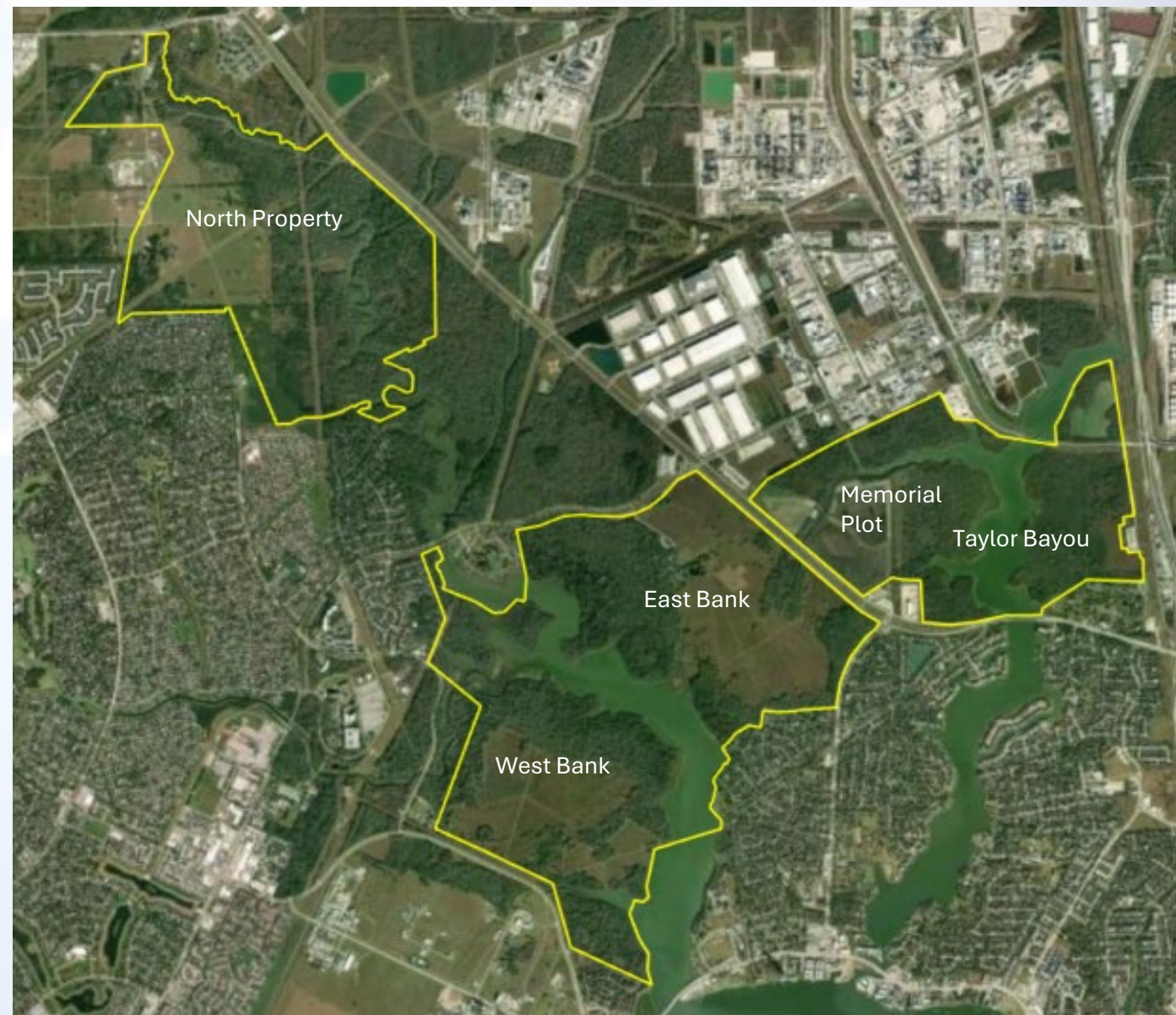


ABNC Properties

Armand Bayou Nature Center has recently acquired several new properties and begun restoration activities. These properties have been under differing uses and will be restored with different techniques.

ABNC contains 3 habitat types (prairie, riparian forest and marshland).

ABNC is also surrounded by dense habitation.



ABNC and ABC

- We are seeking \$78,312.50 across 24 months to establish a bioacoustic monitoring system in coordination with the American Bird Conservancy.
- ABC will provide 50 audio recording units distributed across both legacy sanctuary lands and the new parcels, targeting core habitats, prairie restoration areas and urban transition zones. This project targets native wildlife species, including federal and state listed SGCNs, and evaluates ecological health across coastal tallgrass prairie, riparian forest, and fresh/saltwater marsh habitats.
- Time is critical. Capturing biocoustic records early in the restoration process on the newly acquired properties will allow ABNC to capture unrepeatable baseline ecological data before active prairie restoration and surrounding urban development progress further.
- This project delivers actionable baseline assessments of the urban-wilderness interface and will quantify how multi-year coastal tallgrass prairie restoration influences avian community structure across grassland, riparian forest, and coastal marsh habitats, while evaluating key shifts in avian biodiversity along a gradient from restored preserve lands to adjacent urban corridors.

GALVESTON BAY ESTUARY PROGRAM · FISCAL 2028 PROJECT PROPOSAL

Eastern Black Rail Genomics and Acoustic Density Assessment

in the Galveston Bay Watershed

Dr. Chris Butler

Butler Avian Ecology Lab · Texas A&M University

chris.butler@tamu.edu · 405-215-5806

Genomics partner: U.S. Geological Survey, Western Ecological Research Center

\$248,936

requested, FY28–FY30

Primary: M&R

Secondary: NRU

Scalable

phased by component



Black Rail banded at the Texas mid-Coast NWR by the PI

One of the last strongholds — and two blind spots

2020

Listed Threatened under the Endangered Species Act; Threatened in Texas and an SGCN in the Texas Conservation Action Plan

~130

vocalizing Black Rails detected on the Texas mid-Coast NWR Complex during 2021–2022 surveys

Zero

population-genetic studies exist for Eastern Black Rails

1 No genetic baseline

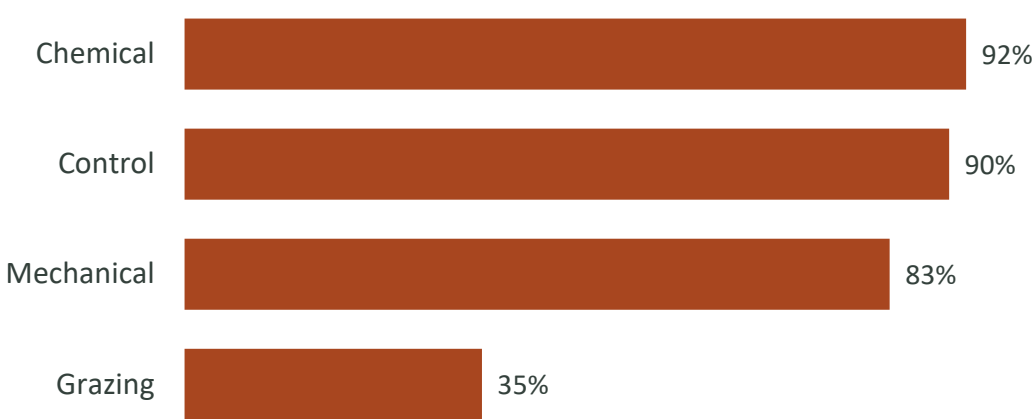
Black Rails are rarely captured, so almost no genetic data exist for the eastern subspecies and none for Galveston Bay. Managers have no measure of gene flow, effective population size, or adaptive potential against which to judge future change.

2 No way to count them

Standard recording units confirm a Black Rail is present but cannot tell one calling bird from five. Without density estimates, managers cannot evaluate how populations actually respond to marsh management.

Occupancy told us where. It cannot tell us how many.

Occupancy by woody-vegetation management, Texas Gulf Coast



Model-estimated occupancy (ψ) across 51 ARU sites, 2024–2026. Only chemical vs. grazing differed significantly ($p = 0.023$); confidence intervals on every estimate are wide. Markwood 2026, M.S. thesis — GBEP-supported.

- **Occupancy is already near its ceiling**
Watershed-wide occupancy is estimated at 88%. A marsh holding one calling male and a marsh holding ten score the same. Presence/absence conveys limited information.
- **The management signal needs resolution**
Grazed sites were concentrated at a single property and the effect estimate is imprecise. Density is what would allow managers to distinguish high-quality habitat from suboptimal habitat.

ARU sites surveyed	Black Rail detections	Occupancy estimate	Per-visit detection	Delivered to GBEP
51	132	$\psi = 0.88$	$p = 0.26$	M.S. thesis, 2026

Two components, one coordinated field program

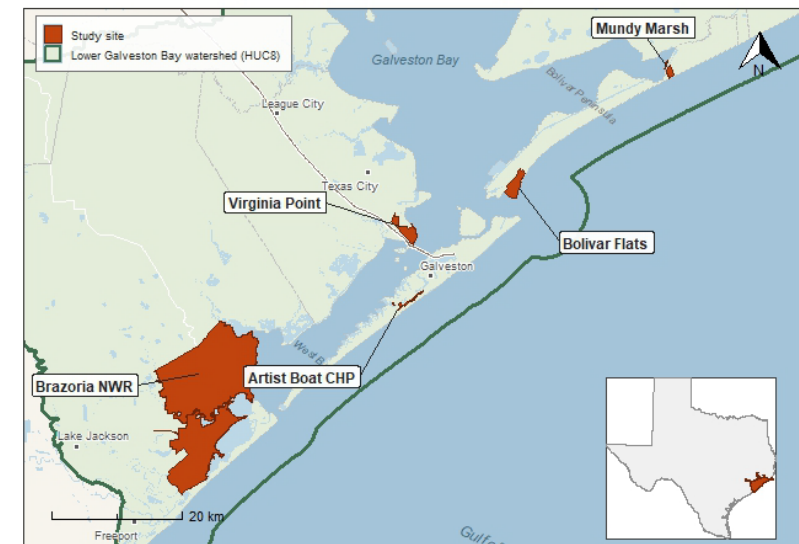
1 Population genomics — with USGS

Capture rails at night, band, and take a ~20 µl blood sample; SNPs generated by high-throughput sequencing at the USGS San Diego genetics lab. Four questions: (1) subspecies phylogeny, (2) population structure and gene flow, (3) effective population size, and (4) local adaptation. Feather $\delta^2\text{H}$ screening confirms sampled birds are Gulf residents.

2 Acoustic density — proof of concept

A spatially coordinated grid of AudioMoth units, already owned and contributed in-kind. Synchronized recordings, BirdNET identification, and acoustic localization separate individual calling birds; call-rate correction keeps density from tracking vocal activity instead of bird numbers.

Eastern Black Rail study sites, Lower Galveston Bay watershed



Watershed boundary: USGS Watershed Boundary Dataset (HUC8 12040202-12040205). Hydrography, roads, places and county boundaries: US Census Bureau TIGER/Line 2023. Protected area boundaries: USGS Protected Areas Database (PAD-US). Projection: NAD83 / Texas South Central (EPSG 32039).

Five high-marsh sites • ~55,900 acres of conserved habitat

All five managed by federal or NGO partners with whom the PI has established access.

What GBEP funding buys

● **Two M&R priorities**

Assessment, exposure and response to stressors, for a Species of Greatest Conservation Need; and meaningful, effective monitoring that extends work GBEP has already funded. Plan actions RES-1, ACS-1 and ACS-2.

● **Science, not infrastructure**

\$26,093 in secured USGS in-kind analyst time; the ARU array is already owned; capture and site access follow up on existing USFWS, NOAA RESTORE, CBBEP and NPS awards.

● **The right genomics partner**

USGS Western Ecological Research Center scientists published the Black Rail reference genome and led rail genomics in California and Colorado.

● **Transferable, and shared**

A tested acoustic density protocol any partner can redeploy, plus genomic results, a final report and a peer-reviewed paper. All data to USFWS and TPWD, plus a public USGS data release.

FY 2028	FY 2029	FY 2030	Total requested	With leverage
\$65,844	\$141,921	\$41,171	\$248,936	\$275,029



Mapping Green Sea Turtle Foraging Using Galveston Bay Estuary System Isoscapes

JUSTIN JENKINS

CHRISTOPHER D. MARSHALL, PHD



GULFCENTER
FOR SEATURTLE
RESEARCH

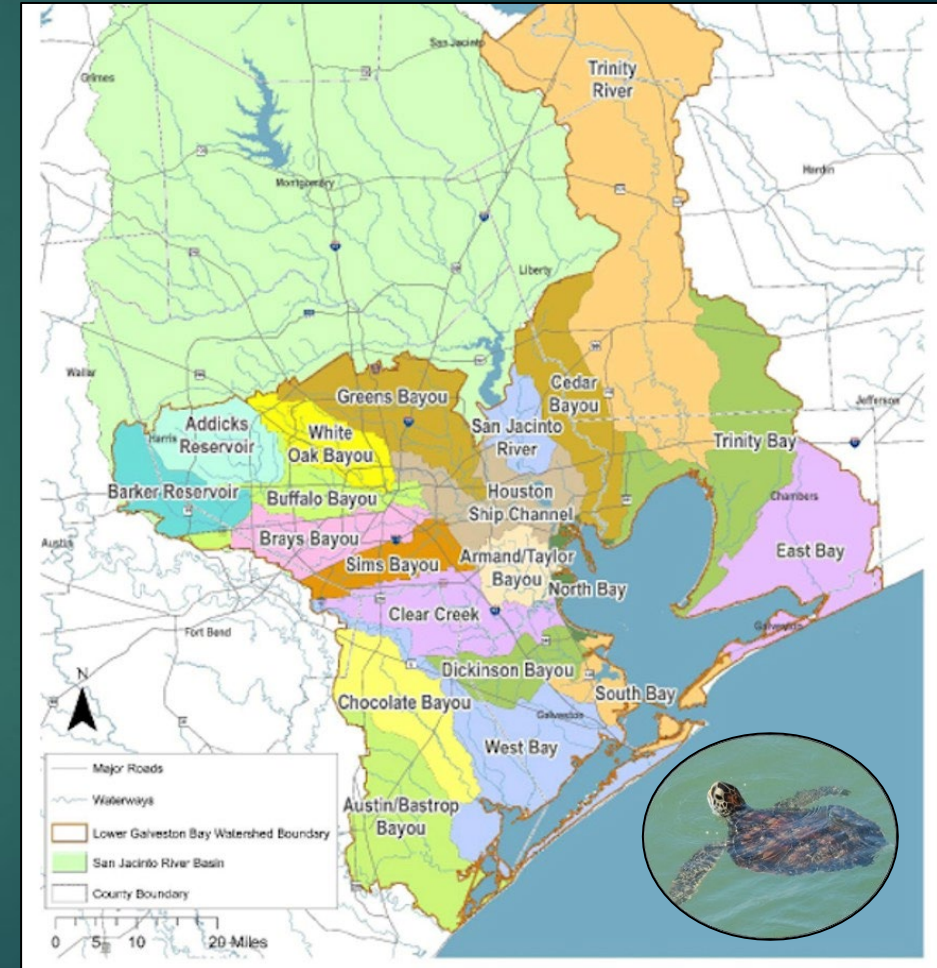


TEXAS A&M
UNIVERSITY

GALVESTON CAMPUS®

Why This Study?

- ▶ **Movement Data Raises New Questions**
 - ▶ GBEP funded tracking has revealed greens utilizing rocky habitats, but not what they are eating or foraging hotspots
- ▶ **Novel Foraging Opportunities from Restoration**
 - ▶ Restoration efforts have created new rocky habitats that may be shaping greens foraging habits that have not been studied.
- ▶ **Previously Limiting Diet Methods**
 - ▶ Most diet studies done of greens along the Texas coast have been visual inspection which miss soft-bodied easily digested prey and can't reveal long-term diet history



Proposal Objectives

► Objective 1

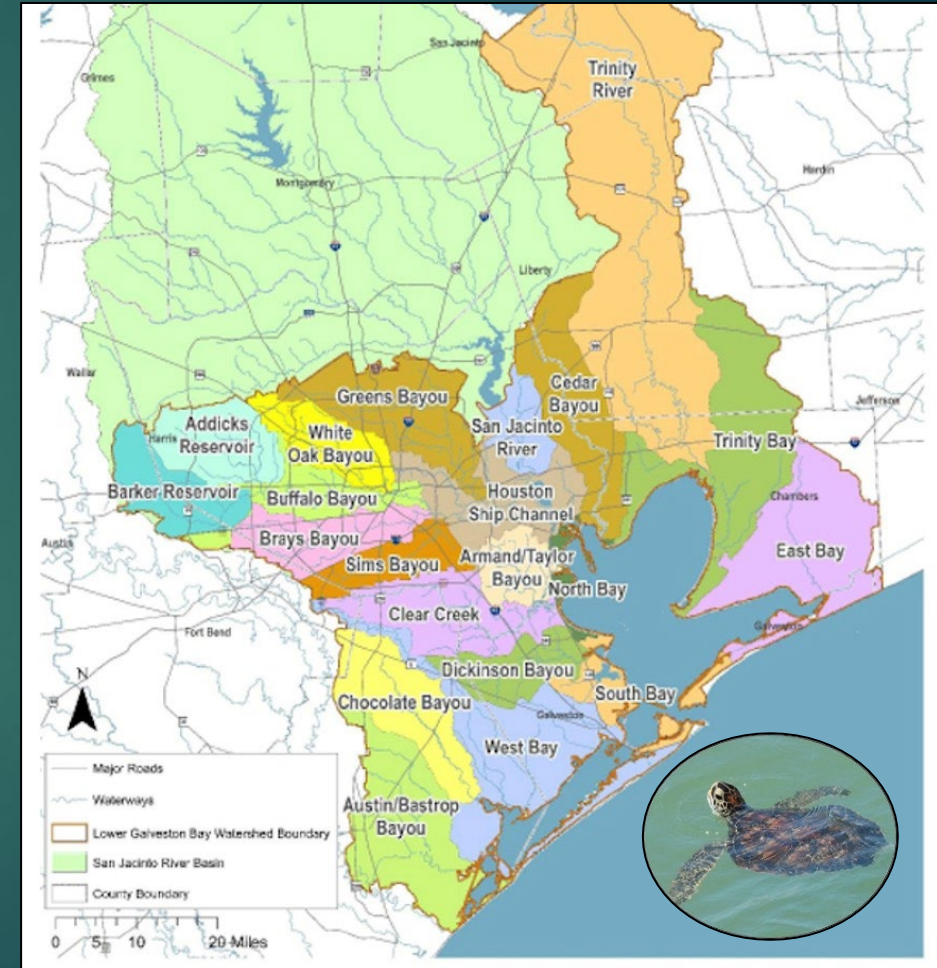
- Characterize the biodiversity and distribution of new and existing hard, rocky habitats used by juvenile greens

► Objective 2

- Map foraging hotspots and habitat use patterns using a high-resolution isoscape paired with Bayesian MixSIAR models

► Objective 3

- Deliver an estuary-wide framework of habitat maps, isotope baselines and dietary data to guide conservation and restoration decisions



FY2028 Plan Priority Area Actions

- ▶ **Plan Priority 2: Protect and sustain Living Resources**

- ▶ **SC-1:** Projects that sustain and restore native species populations

- ▶ **Plan Priority 4: Inform Science-Based Decision Making**

- ▶ **RES-1:** Develop new and support existing efforts to conduct biological stressor monitoring and research
- ▶ **RES-2:** Develop new and support existing efforts to conduct geochemical stressor monitoring and research
- ▶ **RES-3:** Develop new and support existing efforts to conduct physical stressor monitoring and research
- ▶ **ACS-1:** Support tracking the status and trends of environmental and stressor indicators of Galveston Bay by ecosystem health
- ▶ **ACS-2:** Expand the dissemination of easy-to-access Galveston Bay Monitoring and research

- ▶ **Subcommittees**

- ▶ Natural Resource Uses
- ▶ Monitoring & Research



Community video from San Leon

Building a Baseline for Sandy Beach Ecosystem Health

Monitoring the ecological effects of
beach nourishment and contaminant
exposure in Galveston Bay

Dr. Guilherme Corte
Dr. David Hala



SANDY BEACHES: WHERE PEOPLE ENCOUNTER THE OCEAN



RECREATION
& TOURISM



COASTAL
PROTECTION



BIODIVERSITY



ENVIRONMENT FEATURES

Beaches: The Overlooked Engine of the American Economy

This country's best conservation investment is hidden in plain sight



FISHERIES



WATER
FILTRATION



BIODIVERSITY

Give Beach Ecosystems Their Day in the Sun

THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE FOURTH ASSESSMENT REPORT (1) LARGELY overlooked the impacts of climate change on marine ecosystems (2). In their Review ("The impact of climate change on the world's marine ecosystems," 18 June, p. 1523), O. Hoegh-Guldberg and J. F. Bruno redress this gap by synthesizing recent literature. In so doing, they made the disparities in research among ocean systems apparent. Specifically, there are no studies of climate change impacts to sandy beach ecosystems. Rather than any oversight by Hoegh-Guldberg and Bruno or previous authors (3), we believe that the omission of beaches from this and other assessments of anthropogenic impacts reflects a relative lack of appreciation of beaches as ecosystems.

This paucity of beach studies (4, 5) is alarming, not only because beaches comprise ~70% of open-ocean coasts and have high socioeconomic and ecosystem value, but also because their position at the land-sea margin renders them highly vulnerable to climate change (5, 6). Beaches are at risk of significant habitat loss and ecological impacts from warming, acidification, and erosion caused by sea-level rise and increased storms. Where landward retreat of beaches is restricted by development or topography, beach habitat may disappear. When engineering interventions seek to mitigate beach erosion, negative ecological consequences may be severe but are only beginning to be understood (6, 7). The inadequacy of information on ecological impacts of climate change on this vulnerable and challenged coastal ecosystem must be addressed.



Science

Climate Change

Beaches

Nature

News Article ⓘ

Half of World's Beaches 'Will Disappear by End of the Century'

PUBLISHED

NOV 19, 2025 AT 11:02 AM EST

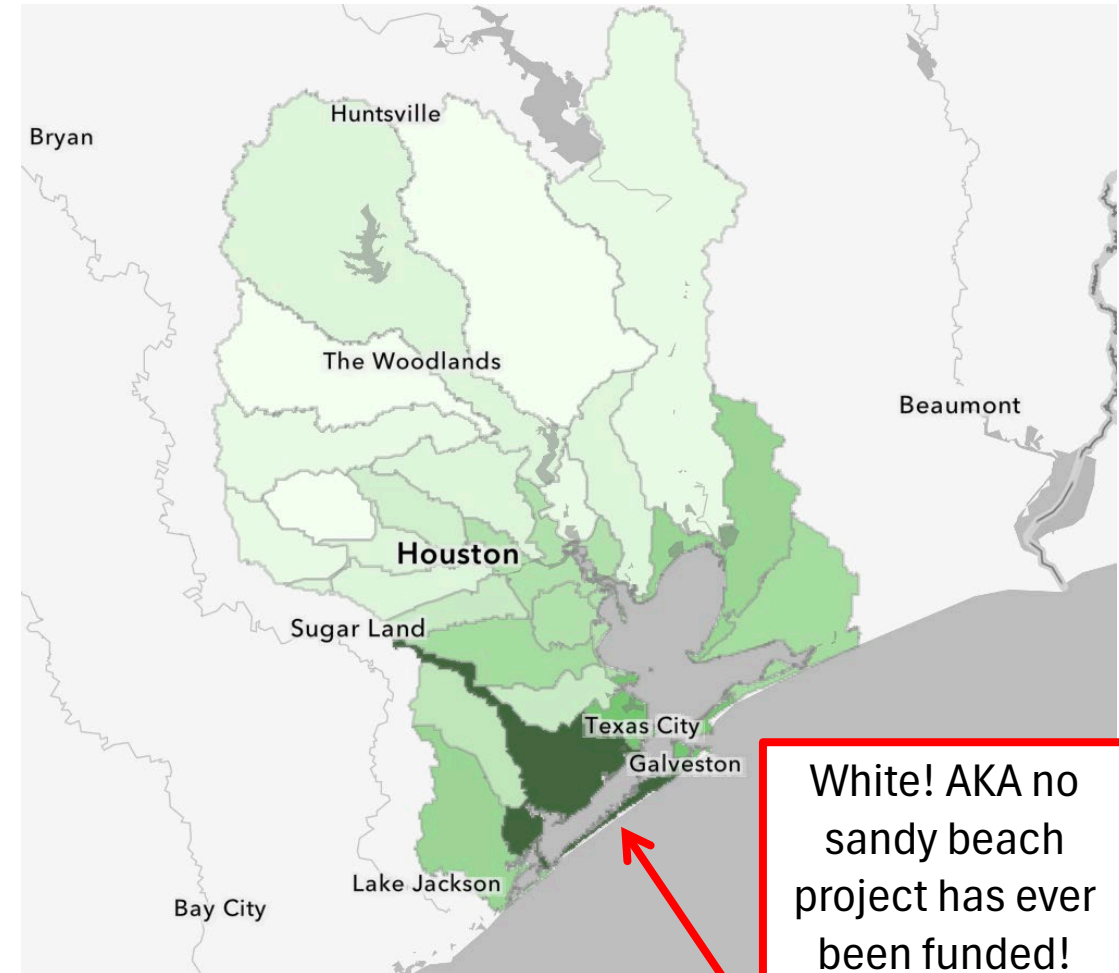
Coastal Erosion



The average coastal erosion rate for the 367 miles of Texas coast is 4.1 feet per year

[Home](#) > [Coastal](#) > [Protecting the Coast](#) > Coastal Erosion

www.glo.texas.gov/coastal/protecting-coast/coastal-erosion



GBEP-Funded Projects by Watershed

GBEP Watershed boundaries colored by number of funded projects directly impacting each catchment area.

darker
= more projects

lighter
= fewer projects

White! AKA no sandy beach project has ever been funded!

THREE OBJECTIVES:

- (1) document biodiversity and ecological condition across Galveston-area sandy beaches;
- (2) establish a baseline of contaminant exposure in representative beach organisms;
- (3) evaluate ecological responses and recovery following beach nourishment.

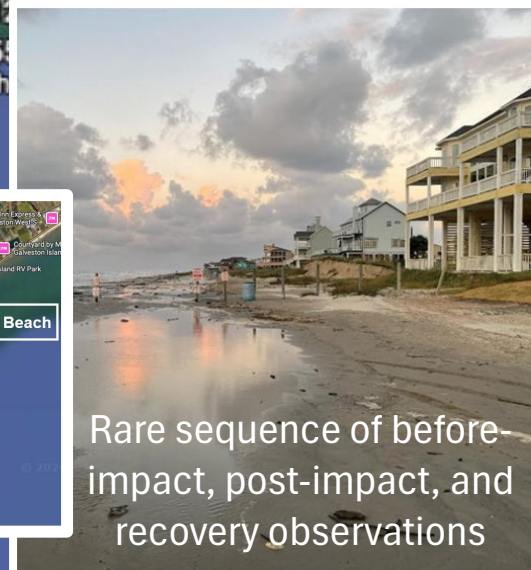
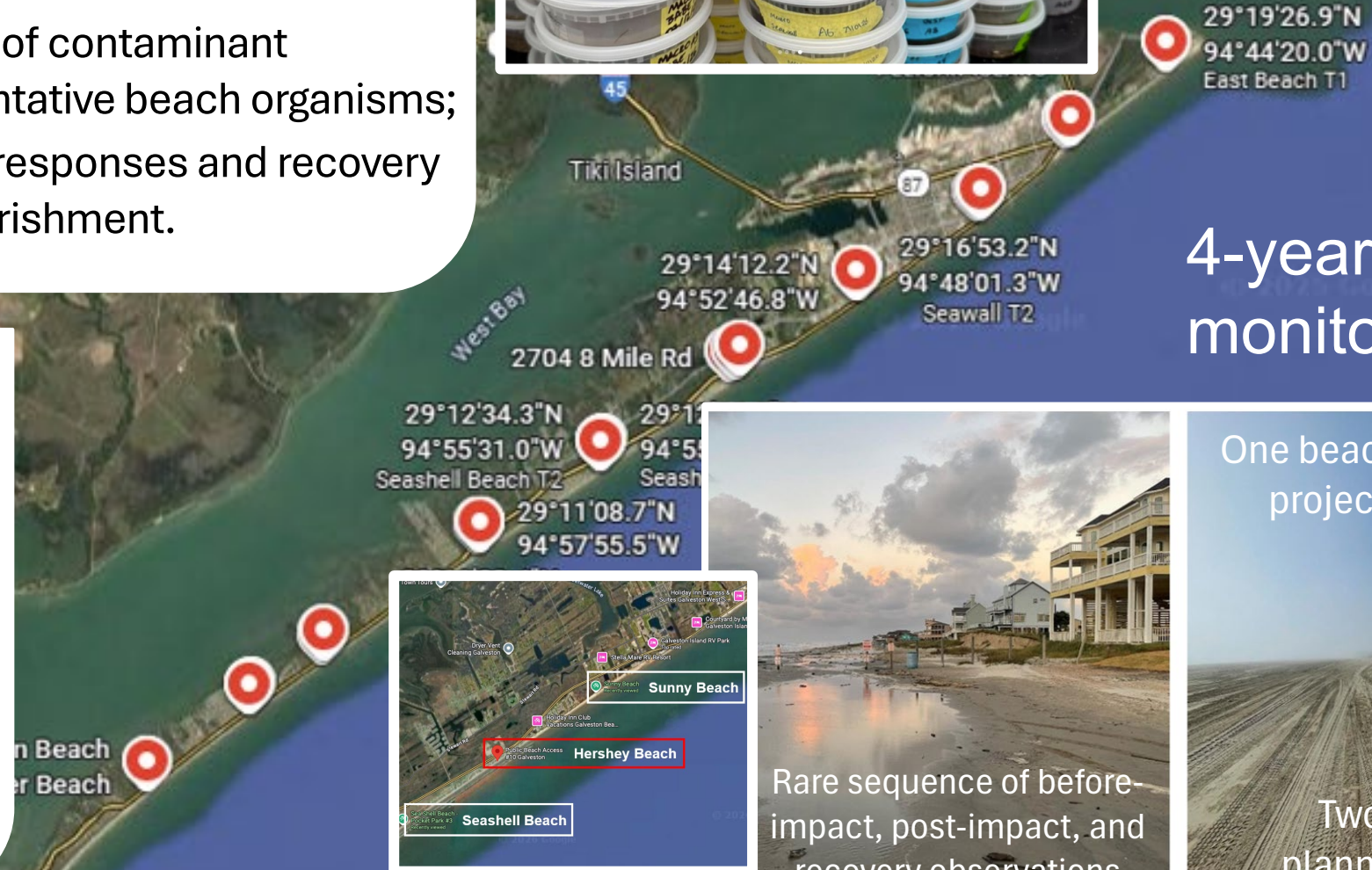
- 11** beaches sampled in 2025 and 2026
-  dunes to underwater
 -  biodiversity surveys
 -  eDNA assessments
 -  population monitoring
 -  54 contaminants



>3000 samples being analyzed (2025-26)
+4000 samples will be collected (2027-28)



4-year monitoring



Rare sequence of before-impact, post-impact, and recovery observations



One beach nourishment project completed

Two projects planned for 2027

One design links biodiversity, impacts, and monitoring

01 Biodiversity and condition

Dune to shallow-subtidal surveys combine community sampling, key species populations, environmental data, and eDNA.

02 Contaminant exposure

Resident organisms are analyzed for 54 polycyclic aromatic compounds and 26 PCBs, including EPA-priority and dioxin-like compounds.

03 Nourishment response

Impact and control beaches reveal ecological change, recovery trajectories, and the environmental drivers of restoration performance.

MANAGEMENT RETURN

- Identify vulnerable beaches, species, and elevated contaminant exposure
- Evaluate ecological recovery and improve nourishment design and monitoring
- Benchmark future spills, storms, harmful algal blooms, and pollution events
- Deliver maps, datasets, technical guidance, and accessible public summaries

REQUEST: 145,229 (scalable)

- Supplies to process samples already collected and planned for 2027–2028 (*leveraging ~\$100,000 in molecular analyses already funded*)
- Support for 2 PhD students

READY NOW: samples collected | workflows established | field network active

SUBCOMMITTEE PRIORITIES

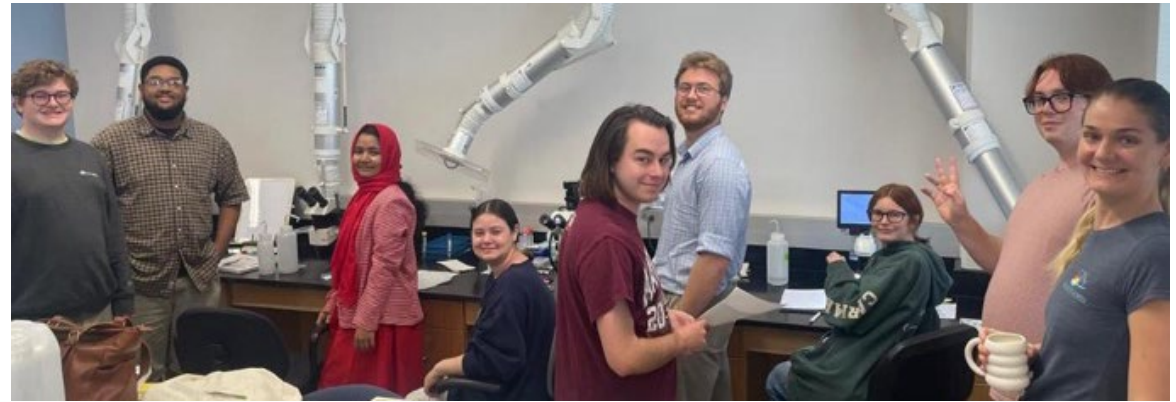
GULF COAST

Massive restoration project closes popular Gulf Coast beach for months

M&R: Baseline assessments for large-scale, man-made changes to Galveston Bay at an adequate timeline and spatial range to provide useful information



M&R: Assessment, exposure, and response to stressors, including environmental parameters and legacy contaminants



NRU: Enhancement of restoration and conservation efforts

Evaluate post-nourishment ecological recovery and improve future project design and management.

WSQ: Implementation and/or evaluation of best management practices that address point and nonpoint source pollution.

Assess how beach biodiversity responds to physical and chemical stressors

PPE: Conservation and environmental workforce development

Provide hands-on training in coastal monitoring, molecular ecology, contaminant assessment, and science communication.

A Coast of Thorns and Roses: Autonomous Detection and Treatment of Invasive Macartney Rose in the Coastal Prairies of the Lower Galveston Bay Watershed



Texas A&M University at Galveston
Nova Morales, nova.morales65@tamu.edu



Macartney Rose Is a Growing Threat to Coastal Prairie



- **Displaces native prairie** - forms dense, impenetrable thickets
- **Reduces biodiversity** – degrades habitat quality
- **Undermines restoration** – rapidly recolonizes managed sites
- **Threatens coastal resilience** – alters vegetation & ecosystem function
- **Challenges management** – large landscapes, limited resources

The challenge isn't simply treating Macartney rose—it's finding and prioritizing it efficiently across large, complex landscapes

Drone + AI Approach to Invasive Species Management

Map / Image collection



AI-assisted ID



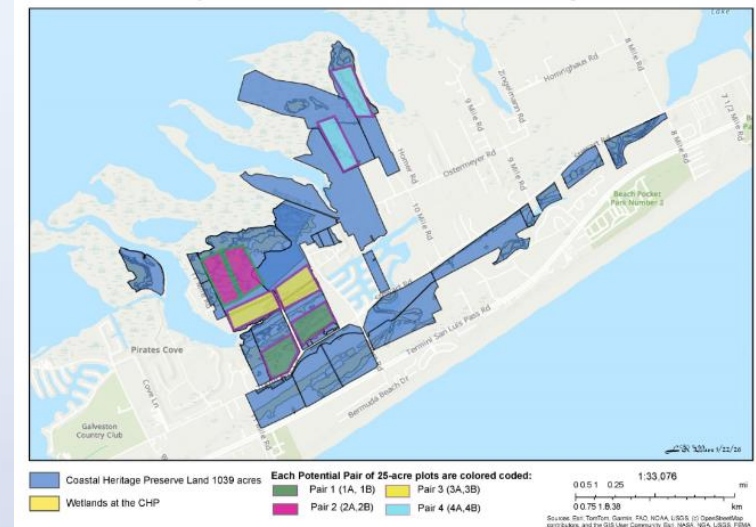
Targeted Treatment & Evaluation



GPS points for Macartney Rose cluster locations



Macartney Rose Trials at Artist Boat's Coastal Heritage Preserve



Technology enhances—not replaces—traditional invasive species management.

From One Project to a Scalable Management Framework

Ecological Impact	Management Impact	Scalability
1. Earlier detection of invasive populations	1. More efficient use of limited resources	1. Transferable to other coastal prairie sites
2. More targeted treatment	2. Prioritized treatment areas	2. Adaptable to other invasive species
3. Protection of native coastal prairie	3. Repeatable monitoring framework & Best Management Practices Manual (BMP)	3. Standardized mapping + decision-support framework
4. Improved restoration outcomes	4. Reduced unnecessary treatment	4. Created a model for technology-assisted restoration (AI script)

Deliverable: A practical, scalable framework for drone- and AI-assisted invasive species detection and management.



UHCL University of Houston
Clear Lake



Post-Restoration Terrapin Nesting Habitat Surveys at Galveston Island State Park

Lead-PI: Mandi Gordon; gordon@uhcl.edu

Co-PI: Danielle DeChellis; dechellis@uhcl.edu

Project Partners:

Savannah Horton, Texas Parks and Wildlife Department

Matthew Abernathy, UHCC Texas Institute for Coastal Prairie Research and Education

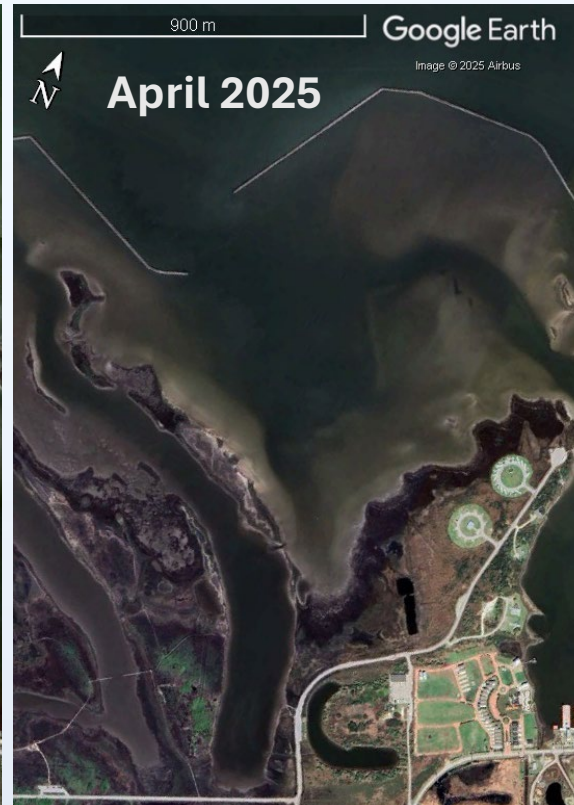
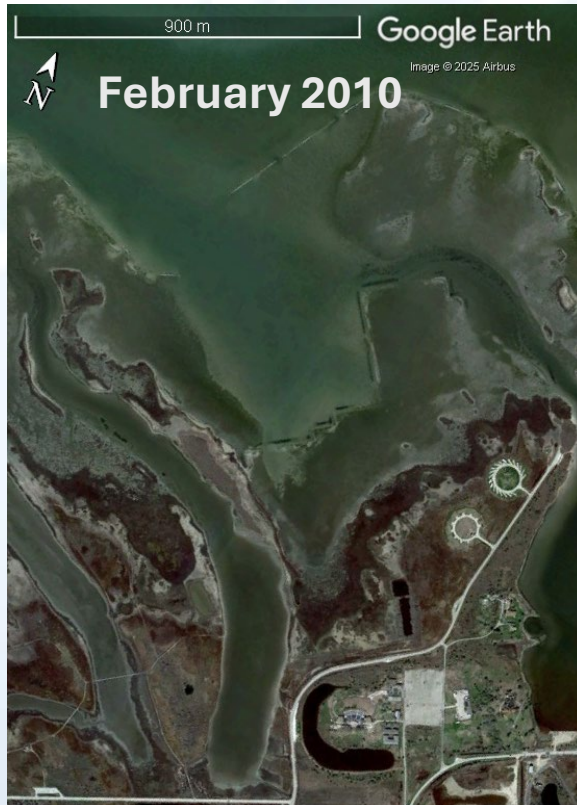
Project Background

- Species of greatest conservation need (TPWD 2025)
- Paucity of information related to nesting habitat and locations in Galveston Bay
- Observations of terrapin at GISP but nesting unknown
- Range of potential nesting habitat types in Galveston Island State Park (GISP)
- Planned restoration at GISP may improve available nesting habitat(s)



Project Background

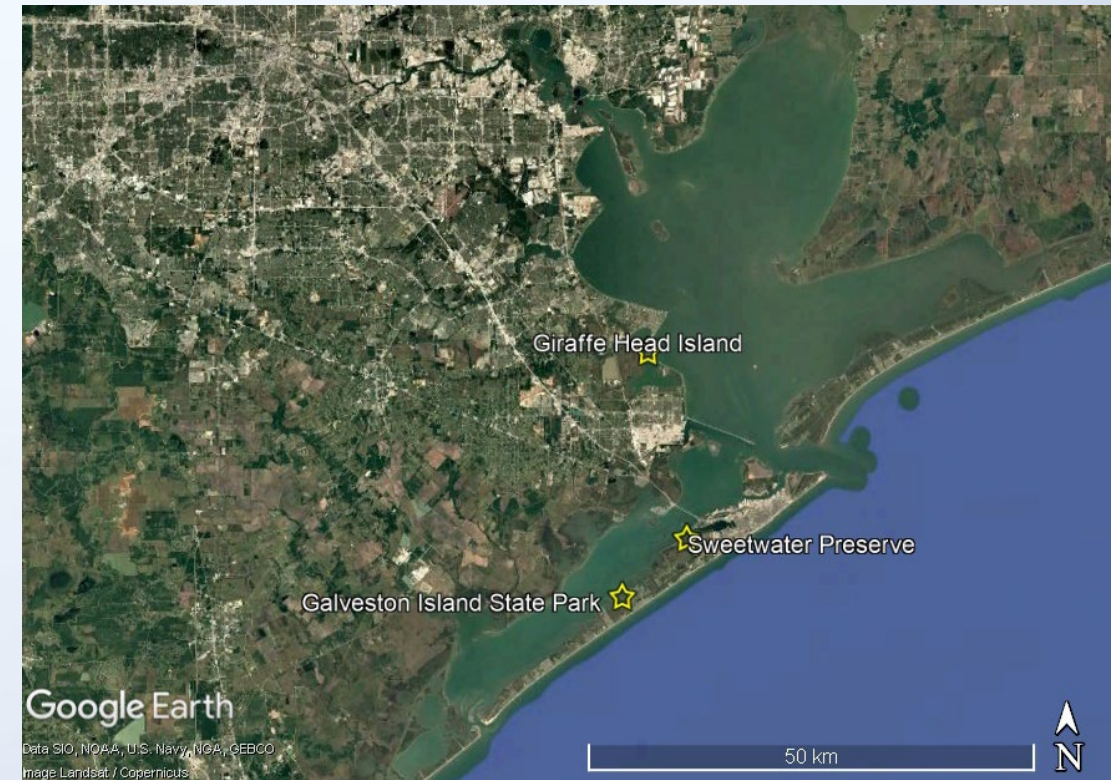
- Current GBEP-funded study:
*Shoreline Restoration at Galveston Island State Park and
Prairie/Wetland Creation at UH Coastal Center*



Project Urgency and Timeline

- Restoration and nesting survey project timeline:
 - Late 2026: Design finalization and initial planning
 - Early 2027: Ground-breaking and start of shoreline restoration
 - **Late 2027: Project completion; contract start for nesting surveys**
 - Early 2028: Nesting surveys in restored areas and other parts of GISP
 - Early 2029: Second round of nesting surveys

- Other restoration projects anticipated in next 10 years



Project Budget and Priorities Met

- Leverage:
 - FY26-28 GISP Restoration: \$250,000
 - FY27-31 USFWS Surveys: \$48,000
 - Proposed GOAA Surveys: \$40,000
- Total Project Costs = \$392,608
(28% requested)
- Galveston Bay Plan Priorities:
 - HC-2 and HC-3
 - SC-1
 - RES-3 and RES-8
- NRU and M&R FY28 Priorities

Cost Category	FY28 Total	FY29 Total	Project Total
Salary	\$ 40,730	\$ 41,169	\$ 81,899
Fringe	\$ 9,182	\$ 9,340	\$ 18,522
Equipment	\$ -	\$ -	\$ -
Travel	\$ -	\$ 1,300	\$ 1,300
Supplies (M&O)	\$ 784	\$ 524	\$ 1,308
Contractual	\$ -	\$ -	\$ -
Other	\$ 5,888	\$ 6,188	\$ 12,077
Sub-total	\$ 56,585	\$ 58,521	\$ 115,106
IDC (16%)	\$ 8,414	\$ 8,723	\$ 17,137
Total	\$ 64,998	\$ 67,245	\$ 132,243