



Matagorda Bay Mitigation Trust (MBMT)
Quarterly Progress Report (QPR): FY24, Quarter 4 (June – August 2024)

TITLE OF MBMT CONTRACT No. 033:

Microplastic Distribution and Impacts to Diamond-backed Terrapin, Highlighting Public Education and Future Effects of Sea-Level Rise

Performing Party University of Houston-Clear Lake (UHCL)
Funding Agency Matagorda Bay Mitigation Trust (MBMT)
Contract No. MBMT 033
Contract Amount \$499,999.01
Effective Date September 01, 2023
Expiration Date August 31, 2026

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Recommended citation: Gordon, M., Mokrech, M., Reistle, W., McDermid, R., Hammerbach, G., DeChellis, D., Thurman, L. 2024. Microplastic Distribution and Impacts to Diamond-backed Terrapin, Highlighting Public Education and Future Effects of Sea-Level Rise – Quarterly Progress Report FY24, Quarter 4. University of Houston-Clear Lake, Environmental Institute of Houston, Houston, Texas, USA. EIH Report #25-001. 8 pp.

This QPR describes the FY24 Quarter 4 portion of the MBMT Project undertaken by UHCL under Contract No. 033 between the MBMT and UHCL. Questions about this project or QPR should be directed to Mandi Gordon (gordon@uhcl.edu).

Objective 1: Compile historic and current spatial data related to dispersion and accumulation of microplastic contaminants within Matagorda and San Antonio Bays.

Task 1.1: Compile historic spatial data for use in projection models (see Objective 2 for model description).

FY24 Q4 Progress: Data compilation has begun. As of this QPR, data compilation is ongoing and will be continued through the next fiscal year.

TASK STATUS: Ongoing

Task 1.2: Identify locations for field surveys focused on topographic and bathymetric data collection.

FY24 Q4 Progress: Historical data compilation has begun, and survey locations will be finalized in FY25.

TASK STATUS: Ongoing

Task 1.3: Procure Federal Aviation Administration (FAA) remote pilot certificates for new project personnel.

FY24 Q4 Progress: Co-PI M. Mokrech is currently FAA Part 107 certified. Other current UHCL project personnel have begun the training and certification process for FAA remote pilot certificates. As new project personnel are on-boarded, they will be trained as needed.

TASK STATUS: Ongoing

Task 1.4: Obtain access permissions for field surveys focused on topographic and bathymetric data collection.

FY24 Q4 Progress: Initial survey locations have been identified. These locations are subject to changes if needed. As survey locations are finalized, access permissions will be coordinated with landowners and/or managers, as needed.

TASK STATUS: Ongoing

Task 1.5: Conduct field surveys in select areas to compile current topographic and bathymetric data.

FY24 Q4 Progress: Task has not been started.

TASK STATUS: Pending

Objective 2: Investigate the implications of sea-level rise on coastal habitats and evaluate its effect on current and future roles of shoreline habitats in filtering microplastic contaminants.

Task 2.1: Incorporate historic and current spatial data into dispersion and habitat projection models.

FY24 Q4 Progress: Data compilation is ongoing and will be continued through the fiscal year. An initial modeling workflow has been developed as shown in Figure 1 and will be refined as additional data sources are identified.

TASK STATUS: Ongoing

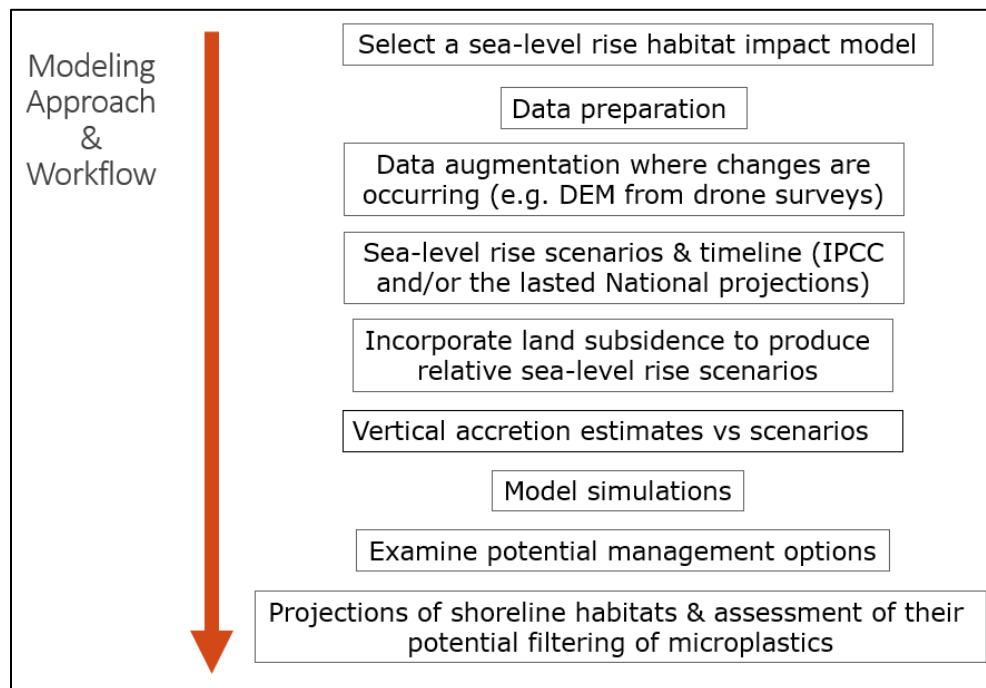


Figure 1 Initial plans for spatial modeling approach and workflow. Note: the modeling steps included are subject to modifications and rearrangement in sequence, as needed.

Task 2.2: Perform models incorporating accommodation space, sediment supply, and rate of relative sea-level rise to simulate wetland losses over time and quantify future habitat changes and distributions.

FY24 Q4 Progress: A modeling approach based on augmenting existing datasets to improve the quality of the modeling data has been adopted to investigate the impacts of sea-level rise on coastal saltmarshes in Matagorda Bay and San Antonio Bay. Data preparation and model setting has begun and will continue through FY25.

TASK STATUS: Ongoing

Task 2.3: Examine use of adaptation options that aim to minimize habitat losses under future conditions.

FY24 Q4 Progress: Task has not been started.

TASK STATUS: Pending

Task 2.4: Use current data to conduct micro-level modeling at selected sites and evaluate potential for shoreline habitats in filtering microplastic contaminants.

FY24 Q4 Progress: Cores were collected in Matagorda Bay in August 2024 to preliminarily examine sediment composition at depths greater than 5-cm. Development of standardized protocols for collecting non-surface level sediment cores in high and low marsh is ongoing and will be finalized in FY25. Non-surface level sediment cores will be taken in FY25 to evaluate microplastic contamination at different depths for micro-level modeling.

TASK STATUS: Ongoing

Task 2.5: Generate a publicly accessible web application to document historic, current, and projected microplastic dispersion within Matagorda and San Antonio Bays.

FY24 Q4 Progress: Task has not been started.

TASK STATUS: Pending

Objective 3: Expand Nurdle Patrol survey methods to areas otherwise inaccessible to the public within Matagorda and San Antonio Bays and apply newly developed standardized protocols for microplastic shoreline sediment sampling.

Task 3.1: Identify locations for field surveys focused on shoreline sediment sampling.

FY24 Q4 Progress: Our initial round of sampling efforts was conducted in August 2024 at two of the sites sampled during the March 2024 pilot study (specifically sites where terrapin activity has been historically documented). Additional survey locations will be finalized in FY25 concurrent with Tasks from Objectives 1 and 4.

TASK STATUS: Ongoing

Task 3.2: Obtain access permissions for field surveys focused on shoreline sediment sampling.

FY24 Q4 Progress: To date, survey areas are all publicly accessible and access permissions have not been required. As access permissions are needed, they will be obtained.

TASK STATUS: Pending

Task 3.3: Conduct expanded Nurdle Patrol surveys and standardized shoreline sampling protocols.

FY24 Q4 Progress: Our initial round of sampling efforts was conducted in August 2024 at two of the sites sampled during the March 2024 pilot study (specifically sites where terrapin activity has been historically documented). Final sediment collection protocols were tested and applied during this initial round of sampling. Nurdle Patrols were conducted concurrently with sediment sampling and resulted in no detections of nurdles.

TASK STATUS: Ongoing

Task 3.4: Submit all nurdle observations directly to the Nurdle Patrol global database.

FY24 Q4 Progress: As of this QPR, the two site-specific nurdle patrol surveys from the August 2024 sampling have been submitted to nurdlepatrol.org, though these surveys resulted in no detections of nurdles.

An opportunistic survey at a local beach in August 2024 resulted in 23 nurdles being found by project personnel. The results of this and other subsequent opportunistic surveys will be submitted to nurdlepatrol.org in FY25 Q1.

TASK STATUS: Ongoing

Task 3.5: Analyze shoreline sediment samples for presence of microplastic particles of varying sizes and types.

FY24 Q4 Progress: As of this QPR, final sediment collection protocols have been implemented at two sites, but laboratory processing protocols are still being refined. March

2024 pilot study samples are being used to refine laboratory methods and additional literature compilation was completed in FY24 Q3. Thirty-six sediment cores were collected during initial sampling events in August 2024 and will be processed in FY25 Q1 once laboratory protocols have been finalized.

TASK STATUS: Ongoing

Objective 4: Evaluate the relationship between dispersion, habitat use, and bioaccumulation of microplastic contaminants in a sentinel wildlife species, the Diamondbacked Terrapin (herein referred to as “terrapin”, *Malaclemys terrapin littoralis*).

Task 4.1: Obtain an updated Texas Parks and Wildlife (TPWD) Aerial Wildlife Monitoring (AWM) Permit.

FY24 Q4 Progress: Task has not been started. As project personnel become certified for FAA remote piloting (see Task 1.3), survey locations are identified, and survey dates are scheduled, TPWD AWM permit(s) will be obtained for field surveys.

TASK STATUS: Pending

Task 4.2: Update existing TPWD Scientific Permit for Research (SPR) and current Institutional Animal Care and Usage Committee (IACUC) Protocols.

FY24 Q4 Progress: UHCL currently holds a TPWD SPR permit for wildlife surveys coast-wide in Texas and an approved IACUC protocol for handling and collecting samples from aquatic turtles in Texas. These documents require annual review and will be maintained throughout the project duration.

TASK STATUS: Ongoing

Task 4.3: Identify locations for field surveys focused on terrapin detection and capture.

FY24 Q4 Progress: Two locations in Matagorda Bay have been identified for field surveys based on previous surveys conducted by Guillen et al. (2015). Project personnel have partnered and are coordinating with researchers from other universities and state agencies to identify other known population locations in the Matagorda Bay complex. These institutions have other ongoing research projects focused on terrapin and surveys will be coordinated to not disrupt ongoing studies.

To select additional survey locations, species distribution models are being developed to identify areas of highest likelihood (e.g., “hotspots”) of terrapin presence. As of this QPR, historic terrapin occurrence data for use in species distribution models are in the final stages of cleaning, organizing, and duplication removal, with over 800 occurrences compiled to date. Environmental and habitat co-variables have been identified and are being retrieved from open-access databases and formatted in ArcGIS Pro for input. Preliminary test runs of the models have been performed using subsets of available data; more robust models will be developed in FY25 Q1. The final species distribution model will be used to guide selection of additional field survey locations for the remainder of the study

TASK STATUS: Ongoing

Task 4.4: Conduct field surveys to capture terrapin for assessment of microplastic contaminant bioaccumulation.

FY24 Q4 Progress: To date, 30 terrapin have been captured during training sessions in Galveston Bay in FY24 and tissue samples from on-campus Red-eared Slider Turtles (*Trachemys scripta elegans*) captured in May 2024 are being used for laboratory procedure refinement. The two sites sampled as part of initial field surveys in August 2024 were selected due to historic observation of terrapin at these locations. All standardized field protocols were implemented during these initial surveys, including: surficial sediment samples collection, trapping efforts for terrapin captures, and walking transect surveys. No terrapin were observed or captured as part of these efforts.

TASK STATUS: Ongoing

Task 4.5: When conditions allow, conduct surveillance drone flights to pinpoint location(s) of terrapin.

FY24 Q4 Progress: Due to state and federal bans of UHCL-owned drone equipment and software, this task has been cancelled. In the event that state- or federally-approved equipment are obtained during the study duration, this task may be re-evaluated in FY25 or FY26.

TASK STATUS: CANCELLED

Task 4.6: Hold captured terrapin overnight (up to 24-hours) in individual containers to collect stomach and/or fecal contents for evaluation of “ingested” microplastic contaminants.

FY24 Q4 Progress: Fecal sample collection protocols are being refined based on a previous study by Alleman and Guillen (2017). As of this QPR, no terrapin have been held overnight for fecal sample collection and updated permits are pending. Supplies for sample collection and processing have been procured.

After discussions with veterinarians from the Houston Zoo, we have decided not to collect stomach contents from live terrapin as this procedure would require anesthesia, is invasive, and has the potential for harm to the animal (J. Flanagan, Chief Veterinarian, Houston Zoo, personal communication). Protocols for obtaining stomach contents from dead terrapin through necropsy are being developed. As of this QPR, no stomach content samples have been collected.

TASK STATUS: Ongoing

Task 4.7: Collect blood and/or tissue samples to perform traditional blood panel “health” analyses to elucidate patterns in changes of health indices resulting from increased particle ingestion.

FY24 Q4 Progress: Standardized blood collection, handling, and processing techniques have been established and current project personnel have received training. A pilot study using Red-eared Slider Turtles (*Trachemys scripta elegans*) was conducted on the UHCL campus in May 2024 to develop sample processing procedures for blood tissue analyses. Project personnel are continuing to coordinate with internal and external laboratories to identify the most efficient and effective way to analyze samples. As of this QPR, no terrapin have been captured and no blood samples have been collected in Matagorda or San Antonio Bays.

TASK STATUS: Ongoing

Task 4.8: Examine reproductive structures (follicles and eggs) in female terrapin using a portable ultrasound.

FY24 Q4 Progress: Updated portable ultrasound devices were acquired in FY24 and project personnel have been trained in operation of the new technology. Protocols were updated in reference to the use of the new unit. As of this QPR, no additional exams have been administered to terrapin in Matagorda or San Antonio Bays.

TASK STATUS: Ongoing

Task 4.9: Analyze results of blood and/or tissue collection, health indices, and reproductive data for correlations between microplastic bioaccumulation and/or habitat accumulation.

FY24 Q4 Progress: Task has not been started.

TASK STATUS: Pending

Objective 5: Provide educational opportunities for residents of areas in and around Matagorda and San Antonio Bays to raise awareness of microplastic contaminants and their potential impacts to shoreline habitats.

Task 5.1: Coordinate with local educators to identify areas of interest for education and/or outreach programs.

FY24 Q4 Progress: Project personnel have met with non-formal Environmental Education providers in the Matagorda Bay area. A review of currently available education modules has begun and will continue in future quarters. In FY25 Q1, we will be discussing with the Matagorda Bay Foundation on how we can partner with them for the development of “virtual field trips”.

TASK STATUS: Ongoing

Task 5.2: Develop a program outline for environmental education targeted to communities around Matagorda and San Antonio Bays.

FY24 Q4 Progress: The review of currently available educational modules has been completed, and a gap has been identified in readily available “virtual field trip” options. In FY25 Q1, we will be creating a storyboard for the first “virtual field trip” on the topic of “Modelling the extent and impact of sea level rise”, concurrent with data being compiled for Tasks 1 and 2.

TASK STATUS: Ongoing

Task 5.3: Generate easily incorporated modules on topical areas of interest which utilize data collected (see Objectives 1-4) to make learning exciting and relevant.

FY24 Q4 Progress: Task has not been started

TASK STATUS: Pending

Task 5.4: Host up to four environmental education workshops for students, teachers, and other interested groups in communities around Matagorda and San Antonio Bays.

FY24 Q4 Progress: Task has not been started

TASK STATUS: Pending

Task 5.5: Partner with the UHCL Pre-Service Educator program to develop a workshop aimed at exposing future educators outside of the Matagorda and San Antonio Bay systems to ongoing environmental topics of interest.

FY24 Q4 Progress: Task has not been started

TASK STATUS: Pending

Literature Cited

Alleman, B.J., Guillen, G.J. 2017. Prey availability and diet analysis of Texas Diamond-backed Terrapin (*Malaclemys terrapin littoralis*). *Chelonian Conservation and Biology*. 16(1):52–61.

Guillen, G., Moss, A., Oakley, J., Mokrech, M., George, R., Alleman, B., Bush, D. 2015. Population survey of the Texas Diamondback Terrapin in San Antonio Bay, Matagorda Bay, and Sabine Lake. Environmental Institute of Houston, University of Houston-Clear Lake. EIH Report #15-001. 194 pp.