



Matagorda Bay Mitigation Trust (MBMT)
Quarterly Progress Report (QPR): FY24, Quarter 2 (Dec. 2023 – Feb. 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)
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This QPR describes the FY24 Quarter 2 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 Q2 Progress: Data compilation has begun. As of this QPR, data compilation is ongoing and will be continued through the fiscal year.

TASK STATUS: Ongoing

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

FY24 Q2 Progress: As historical data are compiled (see Task 1.1), survey locations will be identified. Preliminary locations will be surveyed as part of a pilot study in FY24 Q3.

TASK STATUS: Ongoing

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

FY24 Q2 Progress: Co-PI M. Mokrech is currently certified by the FAA. 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 Q2 Progress: Task has not been started. As survey locations are identified, access permissions will be coordinated with landowners and/or managers.

TASK STATUS: Pending

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

FY24 Q2 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 Q2 Progress: Data compilation is ongoing and will be continued through the fiscal year.

TASK STATUS: Ongoing

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 Q2 Progress: Literature review on sea-level rise scenarios and sediment supply has started.

TASK STATUS: Ongoing

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

FY24 Q2 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 Q2 Progress: Desktop reconnaissance has been started to identify sites for micro-level monitoring and modeling. A field trip to these sites will be organized in FY24 Q3. We are currently exploring options for sediment corers to be used for evaluating vertical accretion rates in 1-foot of substrate samples from the selected sites.

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 Q2 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 Q2 Progress: Spatial data are being compiled to aid in survey location selection. As of this QPR, three locations in Matagorda Bay have been identified for pilot surveys during FY24 Q3. These sites represent a range of anthropogenic influences and point/non-point source inflows for potential microplastic accumulation/deposition. A full list of survey locations will be identified 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 Q2 Progress: Task has not been started. As survey locations are identified, access permissions will be coordinated with landowners and/or managers.

TASK STATUS: Pending

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

FY24 Q2 Progress: Current UHCL project personnel have reviewed available Nurdle Patrol protocols and have been trained in survey methods. As new project personnel are on-boarded, they will be trained on an as needed basis.

A standardized sediment sampling protocol was developed in Galveston Bay for collection and processing methods. These protocols will be implemented as part of a pilot study in Matagorda Bay during FY24 Q3.

TASK STATUS: Ongoing

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

FY24 Q2 Progress: Task has not been started.

TASK STATUS: Pending

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

FY24 Q2 Progress: Protocols for shoreline sediment sample processing have been developed and are currently being refined. Current project personnel are involved in this process and as new project personnel are on-boarded, they will be trained as needed. Samples collected during training events in Galveston Bay will be used to further refine lab processing techniques. Final sediment sample collection and processing protocols will be implemented during a pilot study in FY24 Q3.

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 Q2 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 Q2 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. Annual permit reports and project-specific amendments were submitted this quarter. Updated permits and protocols are anticipated for approval in FY24 Q3.

TASK STATUS: Ongoing

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

FY24 Q2 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 will be conducted to identify areas of highest likelihood (e.g., “hotspots”) of terrapin presence. As of this QPR, historic occurrence data for use in species distribution models are in the final stages of cleaning and organizing while environmental and habitat co-variates are being identified. The spatial distribution model(s) is(are) planned to be completed during FY24 Q3 or Q4.

TASK STATUS: Ongoing

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

FY24 Q2 Progress: Current project personnel were trained in standardized terrapin survey protocols in Galveston Bay during October and November of FY24 Q1 and February of FY24 Q2. Additional training sessions are planned for FY24 Q3 and as new project personnel are on-boarded, they will be trained as needed.

To date, 30 terrapin have been captured during training sessions in Galveston Bay. Using these individuals, project personnel were trained in tissue (blood)

sample collection, morphometric data collection, permitted animal handling techniques, and general project logistics. Additionally, modified crab trap techniques were refined in the context of the current study. These standardized protocols will be implemented as part of a pilot study during FY24 Q3.

TASK STATUS: Ongoing

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

FY24 Q2 Progress: Task has not been started. Surveillance flights may be implemented during FY24 Q3, pending FAA remote sensing pilot certification(s) (see Task 1.3) and TPWD AWM permitting (see Task 4.1).

TASK STATUS: Pending

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 Q2 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 will be procured in FY24 Q3.

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 Q2 Progress: Standardized blood collection, handling, and processing techniques have been established. Processing equipment was procured this quarter and project personnel have received training. 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 blood or tissue samples have been collected for analysis in this study, though samples are planned for collection as part of a pilot study during FY24 Q3.

TASK STATUS: Ongoing

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

FY24 Q2 Progress: Task has not been started. Project personnel are coordinating with vendors to procure updated portable sonographic technology. A demonstrative training session was conducted for current personnel this quarter. Additional personnel will be trained as needed.

TASK STATUS: Pending

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 Q2 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 Q2 Progress: Project personnel began conversations with high school teachers about current projects their students are involved in in FY24 Q1. These contacts have been maintained through FY24 Q2 and will be expanded in future quarters.

TASK STATUS: Ongoing

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

FY24 Q2 Progress: Task has not been started.

TASK STATUS: Pending

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 Q2 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 Q2 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 Q2 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.