



Matagorda Bay Mitigation Trust (MBMT)

Quarterly Progress Report (QPR): FY24, Quarter 3 (March – May 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 3 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).

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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 Q3 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 Q3 Progress: As historical data are compiled (see Task 1.1), survey locations will be identified. Preliminary locations may be surveyed in FY24 Q4 or FY25 Q1.

TASK STATUS: Ongoing

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

FY24 Q3 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 Q3 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 Q3 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 Q3 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

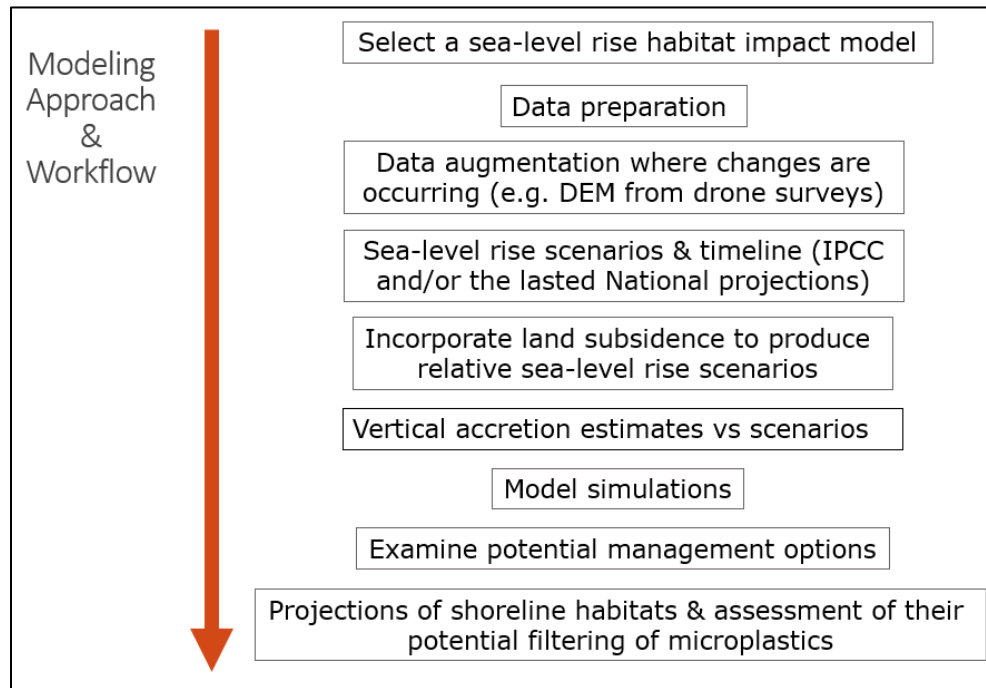


Figure 1 Initial plans for spatial modeling approach and workflow. Note: the modeling steps included are subject to modifications and rearrangement in sequence, as needed.

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 Q3 Progress: A modeling approach based on augmenting existing datasets to improve the quality of the modeling data has been adopted. In addition, a model comparison is underway to identify the best model for investigating the impacts of sea-level rise on coastal saltmarshes in Matagorda and San Antonio Bay.

TASK STATUS: Ongoing

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

FY24 Q3 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 Q3 Progress: A field trip to Matagorda Bay was organized, which helped the initial identification of the locations of sediment sampling.

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 Q3 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 Q3 Progress: Pilot study sampling was conducted in March 2024 at three spatially distinct areas within Matagorda Bay. These sites represent a range of anthropogenic influences and point/non-point source inflows for potential microplastic accumulation/deposition. Nurdle patrols were conducted concurrently with sediment sampling at all three locations with no nurdles detected at any site. 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 Q3 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 prior to field sampling.

TASK STATUS: Pending

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

FY24 Q3 Progress: Pilot study sampling was conducted in March 2024 at three spatially distinct areas within Matagorda Bay. Nurdle patrols were conducted concurrently with sediment sampling at all three locations with no nurdles detected at any site.

TASK STATUS: Ongoing

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

FY24 Q3 Progress: Pilot study sampling was conducted in March 2024 at three spatially distinct areas within Matagorda Bay. Nurdle patrols were conducted concurrently with sediment sampling at all three locations with no nurdles detected at any site. Data for these surveys have been submitted to nurdlepatrol.org.

TASK STATUS: Pending

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

FY24 Q3 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. During pilot study sampling conducted in March 2024 at three spatially distinct areas within Matagorda Bay, 54 sediment cores were collected from

randomly selected shoreline and in-marsh plot locations. These samples are being used to refine laboratory sample processing procedures and additional processing supplies were procured this quarter.

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 Q3 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 Q3 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. Updated permits and protocols were approved in this quarter.

TASK STATUS: Ongoing

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

FY24 Q3 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 and retrieved from open-access databases. The species distribution model(s) is(are) planned to be completed during FY24 Q4.

TASK STATUS: Ongoing

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

FY24 Q3 Progress: Current project personnel were trained in standardized terrapin survey protocols in Galveston Bay during FY24 Q1-Q3 and in on-campus training session in FY24 Q3. To date, 30 terrapin have been captured during training sessions in Galveston Bay and tissue samples from Red-eared Slider Turtles (*Trachemys scripta elegans*) are being used for laboratory procedure

refinement. Using individuals captured during these training surveys, 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 were implemented as part of a pilot study in March 2024 and will be used throughout the project duration.

TASK STATUS: Ongoing

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

FY24 Q3 Progress: Task has not been started. Surveillance flights may be implemented during FY24 Q4, 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 Q3 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 Q4.

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 Q3 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 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.

TASK STATUS: Ongoing

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

FY24 Q3 Progress: Updated portable ultrasound devices were acquired this quarter and project personnel are being trained in operation of the new technology. As part of a pilot study on the UHCL campus, project personnel tested the new ultrasound unit using Red-eared Slider Turtles and were able to successfully observe reproductive structures. This new unit will be used for the duration of the project period.

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 Q3 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 Q3 Progress: Project personnel met with non-formal Environmental Education providers in the area. A review of education modules already available has begun and will continue 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 Q3 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 Q3 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 Q3 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 Q3 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.