Project Name: Assessing multi-trophic impacts of microplastic pollutants across macroinvertebrate food webs in Matagorda Bay, Texas

P.I.: Adam Mitchell, Tarleton State University

Contract No: 0046

Reporting Period: 09/01/2025-11/30/2025

Task I: Collect free plastic pollutants found along coastal and wetland environments in Matagorda Bay to develop baseline information on chemical composition and pollution level within microplastic loads.

Status of the task during this reporting period: ☐not started ☒in progress ☐completed

- Describe the major accomplishments for this reporting period
    - *Performed Fourier Transform Infrared Spectroscopy (FTIR) to process samples (water, sediment, vegetation, macroinvertebrate) from Spring 2025 sampling period. All samples have been processed for past sampling periods. Processing of water, sediment, vegetation, and macroinvertebrate samples for Summer and Fall 2025 is ongoing.*
    - *Sampled for water, sediment, vegetation, and macroinvertebrates in Matagorda Bay and adjacent bays (East/West Matagorda, Tres Palacios, Turtle, Vaes, Keller, Cox, Lavaca, and Chocolate) for Summer and Fall 2025.*
    - *Additional graduate student has been hired at University Houston-Clear Lake for ongoing analysis for Task I as part of second phase of research.*
    - *Manuscript for standard protocol for filtering, sorting, and calibrating sediment and saltwater samples for microplastic and nanoplastic assessment submitted to scientific journal for review and has been returned for revisions:*
        - *Al-Mezrakchi, R., D. Adian, N. Al-Ramthan, A. Guzman, A. Mitchell, R. Srinivasan, M.A. Azadah, E.A. Everett, Y. Hamidi, Y. Su, and C. Zhang. In review. Salt-masked micro/nano-plastics: A seasonal study of contaminants in coastal waters of Matagorda Bay using advanced integrated techniques. Environmental Toxicology and Chemistry.*
    - *Graduate student thesis associated with Task I has been developed into manuscript and submitted to scientific journal. One article has been returned for revisions:*
        - *Srinivasan, R. M.A. Azadah, A. Mitchell, C. Mitchell, R. Al-Mezrakchi, G.E. Millsap, E. Everett, E. Fringpong, D. Adrian, and A.S.A. Kodua. In review. Marine microplastic removal using plant-based polymers and machine learning models. ACS-Sustainable Chemistry and Engineering.*
        - *Al-Mezrakchi, R., D. Adrian, N. Al-Ramthan, A. Guzman, A. Mitchell, R. Srinivasan, and M.A. Azadah. In review. Plant-based biopolymer remediation of micro-and-nanoplastics in a Gulf estuary: A multimodal analytical approach. Integrated Environmental Assessment and*

Management.

- List the deliverable(s)/milestone(s) completed during this reporting period
    - *Graduate student thesis associated with Task I and II "Marine microplastics removal using plant-based polymers and machine-learning models" submitted and published to ProQuest for open access publication.*
- Were there any problems or obstacles encountered during this reporting period (e.g., delays, remedial action taken, schedule revision). ☐ Yes ☒No If Yes, please explain:
- Briefly describe plans for the next reporting period.
    - *Will complete analysis of sediment, vegetation, and macroinvertebrates from Matagorda Bay and adjacent bays (East/West Matagorda, Tres Palacios, Turtle, Vaes, Keller, Cox, Lavaca, and Chocolate) for Summer and Fall 2025 for continued calibration and assessment of chemical composition and pollution loads.*
    - *Revise manuscripts submitted to scientific journal, as needed, based on completed work in Task I.*

Task II: Determine the presence, identity, and concentration of toxic or unique chemicals/elements found in plant tissues following the introduction of free plastic pollutants and how these pollutants impact plant growth, development, and nutritional content.

Status of the task during this reporting period: ☐not started ☒in progress ☐completed

- Describe the major accomplishments for this reporting period
    - *Graduate student research associated with Task II (i.e., field sampling and experimental microcosm) is ongoing. Micro and macrophyte tissues obtained from field surveys for Task I. FTIR, SEM, and DSC is ongoing.*
    - *Microphyte and macrophyte taxa undergoing colonization for microcosm experiment prep as part of Task III. Experiment initiated Summer 2025 with anticipated conclusion for Spring 2026.*
- List the deliverable(s)/milestone(s) completed during this reporting period
    - *Graduate student thesis associated with Task I and II "Marine microplastics removal using plant-based polymers and machine-learning models" submitted and published to ProQuest for open access publication.*
- Were there any problems or obstacles encountered during this reporting period (e.g., delays, remedial action taken, schedule revision). ☐ Yes ☒No If Yes, please explain:
- Briefly describe plans for the next reporting period.
    - *We will continue to monitor response of vegetation to microplastic pollutant concentrations in microcosm study for Winter and Spring 2026.*

Task III: Determine the presence, identity, and concentration of toxic or unique chemicals/elements of free plastic pollutants found in macroinvertebrates (herbivores, detritivores, and their predators) and how these pollutants impact macroinvertebrate growth, development, and behavior.

Status of the task during this reporting period: ☐not started ☒in progress ☐completed

- Describe the major accomplishments for this reporting period
    - *Microcosm experiment animal use protocols (AUP) approved at primary institution for macroinvertebrates (e.g., crustaceans, gastropods, insects).*
    - *Macroinvertebrate taxa undergoing colonization for microcosm experiment prep as part of Task III. Experiment initiated Summer 2025 with anticipated conclusion for Spring 2026.*
    - *Graduate student thesis associated with Task III developed into manuscript for submission to scientific journal. Manuscript has been submitted and returned for revisions:*
        - *Everett, E., L. Martin, J. Askew, A. Mitchell, and F. Seemann. Seasonal and trophic dynamics of microplastic bioaccumulation in copepods and jellyfish of Matagorda Bay, Texas. Environmental Toxicity and Chemistry.*
- List the deliverable(s)/milestone(s) completed during this reporting period
    - *Graduate student thesis for Task III "Microplastics as a disturbance to food web dynamics in Texas Gulf Coastal bays" submitted and published to ProQuest for open access publication.*
- Were there any problems or obstacles encountered during this reporting period (e.g., delays, remedial action taken, schedule revision). ☐ Yes ☒No If Yes, please explain:
- Briefly describe plans for the next reporting period.
    - *Submit revisions manuscript for scientific publication associated with assessment of microplastics on Calonoid copepods and cannonball jellyfish in Winter 2026.*
    - *Microcosm associated with crustaceans and insects ongoing; study to continue into Winter and Spring 2026*