Matagorda Bay Mitigation Trust 2023-2024 Funding Cycle

Title: **Evaluating Ecological and Human Health Risk of PFAS in Matagorda Bay**

Contract #067

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Y2 Q4 February 2026 Progress Report

Y2 Q4 Update:

During this reporting period, we continued advancing Phase 1 through ongoing PFAS tissue method refinement while finalizing logistical and experimental preparations for Phase 2 oyster exposure studies. A formal planning meeting was conducted with hatchery collaborators at the Texas A&M AgriLife Mariculture facility to coordinate spawning schedules, water preparation protocols, broodstock sourcing, and life-stage–specific sampling timepoints. Exposure experiments are scheduled to begin this Spring 2026 pending seasonal spawning of ripe eastern oysters. In parallel, we completed preparatory water chemistry analyses for exposure stock water designed to mimic Matagorda Bay conditions and finalized the PFAS mixture composition and concentration framework for Phase 2 exposures. Phase 3 remains contingent upon the generation of tissue body-burden and toxicity endpoint data from Phases 1 and 2.

Phase 1:

Phase 1 efforts this quarter focused on continued refinement of PFAS extraction methods for eastern oyster (*Crassostrea virginica*) tissues, with particular emphasis on adapting and expanding EPA Method 1633 for complex oyster matrices. While earlier efforts were based on elements of EPA Method 537.1, we are now transitioning fully to Method 1633 to enable quantification of a broader suite of PFAS compounds relevant to Matagorda Bay.

Method development continues to address challenges associated with high organic content and heterogeneous lipid composition in oyster tissues. Recent progress has narrowed the required tissue mass necessary to achieve consistent detection limits while maintaining acceptable recovery efficiencies across target analytes. Optimization trials have focused on balancing extraction efficiency with matrix cleanup, including refinement of homogenization procedures, solvent systems, and acid digestion strength prior to SPE cleanup.

Preliminary method iterations have shown improved reproducibility and more consistent recoveries across PFOS, PFNA, PFOA, PFHxS, and PFDA, though troubleshooting is ongoing to ensure robust quantification across all compounds included under the expanded 1633 framework. These refinements are critical to generating defensible PFAS body-burden data for both wild-collected and experimentally exposed oysters.

In coordination with hatchery partners, plans are also underway to collect additional wild oysters from Keller Bay (within the Matagorda Bay system) during broodstock collection this spring. These oysters may serve dual purposes: (1) supporting Phase 2 exposure experiments and (2) providing additional tissue samples for Phase 1 PFAS burden analysis in wild oysters.

Phase 2:

Phase 2 activities this quarter focused on finalizing experimental logistics and exposure design in coordination with hatchery collaborators.

Hatchery Coordination and Experimental Scheduling
A planning meeting was held with hatchery staff to coordinate spawning timelines, broodstock collection, water preparation procedures, and experimental room allocation. Spring spawning is anticipated in mid-April, contingent upon optimal water quality conditions and availability of reproductively ripe oysters.

Wild oysters will be collected from Keller Bay for spawning and potential broodstock use. Water samples will be collected concurrently during broodstock collection to support PFAS characterization of source waters. UTMSI will provide pre-cleaned water sampling bottles and tissue collection materials to minimize potential PFAS contamination.

Larval rearing experiments will be conducted in a separate dedicated room to minimize cross-contamination risks. Exposure water will consist of filtered seawater sourced from Laguna Madre, diluted with dechlorinated municipal water (treated with sodium thiosulfate) to achieve a target salinity of approximately 30 ppt. Water will be prepared several days in advance of exposures to allow for stabilization and preliminary chemistry confirmation.

All experimental materials introduced into exposure systems will be controlled by UTMSI personnel to minimize background PFAS contamination.

Exposure Design and PFAS Mixture Preparation
We have finalized the PFAS exposure mixture and concentration framework for Spring 2026 experiments. Exposures will utilize a five-compound mixture (PFOS, PFNA, PFOA, PFHxS, and PFDA) in a 1:1:1:1:1 ratio, selected based on environmental relevance to Matagorda Bay detections. The total target PFAS concentration for experimental exposures will be 50 ppb.

Stock solutions have been prepared and preliminary water chemistry verification has been conducted to confirm mixture stability and target concentrations in prepared exposure water. These preparatory analyses represent a key milestone toward initiating experimental exposures.

Gamete and Embryo Exposures
Based on hatchery recommendations and developmental observations, sampling timepoints have been refined to improve detection of biologically meaningful endpoints. Gamete exposures will be followed by fertilization assays, with developmental assessments conducted at:

- ~2 hours post-fertilization (early cleavage assessment)
- 24 hours (D-stage larval normality and hatching success)
- 48 hours (continued larval development and morphology)

The previously considered 8-hour timepoint was removed following discussion with hatchery staff, as developmental transitions are more clearly distinguishable either earlier (~2 hr) or at later D-stage assessments.

Larvae will be filtered using PFAS-free sieves constructed according to hatchery guidance, allowing quantification of normal D-larvae and developmental abnormality rates.

Juvenile Oyster Planning
Planning also continued for the juvenile exposure phase. Wild-spawned oysters are expected to be grown initially in the hatchery to approximately 3 mm before being deployed to a research site within Matagorda Bay or Corpus Christi Bay to promote natural growth. Once oysters reach approximately 1–2 inches in shell length (anticipated mid-summer), they will be returned to the hatchery for controlled exposure trials.

Juvenile exposures will assess survival, shell growth, and PFAS bioaccumulation. Current experimental density targets (approximately eight oysters per five gallons) are designed to minimize density-related stress and promote growth. Standard exposure duration remains 96 hours, though extended exposure scenarios may require partial water renewal depending on water quality conditions.

Water samples will be collected at both deployment and recollection to characterize PFAS background concentrations.

Phase 3:
Phase 3 ecological and human health risk assessments remain dependent upon quantitative outputs from Phases 1 and 2. Model inputs will ultimately include:

- PFAS concentrations in wild and experimentally exposed oyster tissues
- Bioaccumulation factors
- Matagorda Bay water PFAS concentrations
- Life-stage–specific toxicity endpoints

Current efforts continue to ensure that analytical outputs (Phase 1) and exposure designs (Phase 2) align directly with the data needs required for quantitative risk modeling.

Next Steps:

- Initiate Spring 2026 gamete and embryo PFAS exposure experiments upon hatchery spawning
- Continue refinement and validation of oyster tissue PFAS extraction under EPA Method 1633
- Collect wild broodstock oysters and associated water samples from Keller Bay
- Begin larval rearing and developmental endpoint assessments
- Prepare for juvenile oyster growth and subsequent exposure trials