Water Quality Improvement Through Inexpensive Nature Based Solutions

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1. **Background:** The Mississippi Sound's beaches and have historically struggled with water quality issues since their creation in the mid-1900's. Currently, storm water on the coastal beaches in Mississippi is managed through a series of more than 200 outfalls which extend from the seawall to the tidal zone. These anthropogenic beaches are a large economic driver for the State and important to the communities and visitors. We propose an approach that can be greatly enhance the beaches making them more aesthetic, provide increased water quality, and create storm protection by implementing a nature-based solution. Previous efforts with similar goals were attempted within an outfall challenge by the State in which new designs were created to improve water quality through the structures themselves. These designs where overly complex with unrealistic construction and maintenance costs. We propose taking a bottom-up approach in which marsh grasses are re-introduced in specific designs adjacent and on the periphery of the existing outfall structures. This strategy will provide beneficial services such as nutrient uptake, sediment stability, wave energy reduction and more. The beaches remain intact and undisturbed, but the outfalls are made more aesthetic and functional toward water quality. More natural looking beaches with increased water quality and reduced beach closures will be a tremendous economic benefit for the Coastal cities, counties and the State.
2. **Project Approach:** Initiate three pilot study sites in which specific marsh grass buffer designs are implemented in the current permitted footprint of the outfalls (Figure 1). These marsh grass buffers will be monitored and modeled to measure nutrient reduction capabilities during small and large rain events. Once nutrient reduction capabilities are measured and understood, it can be modeled by replicating to multiple outfalls determining the full benefits and costs of a large-scale outfall conversion program. Construction costs are estimated to be a fraction of previous infrastructure design ideas and maintenance costs are also anticipated to be minimal. We intend to have all costs identified as per outfall cost as determined by the pilot study. This will allow managers to scale up as determined by need and function of the counties.

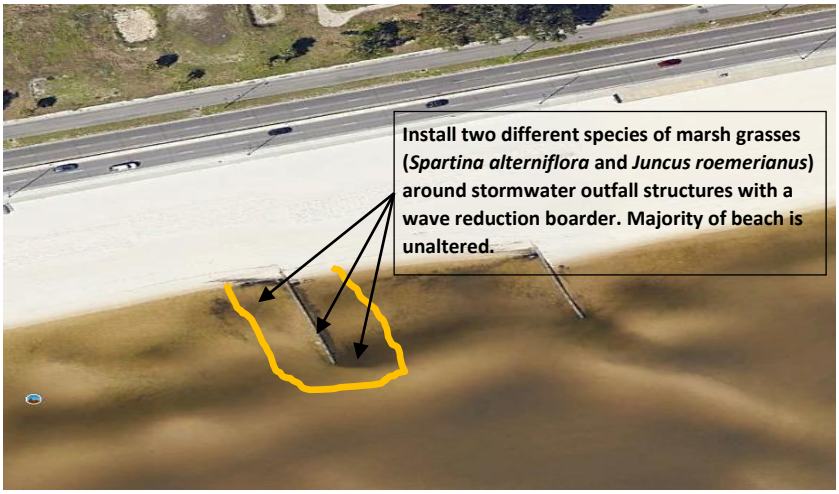

Figure 1: Harrison County outfall site example with design approach

   A. **Risk level and Potential Issues:** Risk level is considered low because of low installation cost and utilizing existing permits. In higher wave energy areas (SE facing beaches), there may need to be hardened structures installed to protect the marsh grasses adjacent to the outfalls from erosion. These hardened structures are most likely not to pose any issues as the outfalls are currently present in these areas creating avoidance by beachgoers.
   B. **Monitoring and Scaling Up:** Once the pilot project is completed with monitoring and modeling results, cost estimates and water quality impacts will be understood for coastal and municipal managers to utilize.
   C. **Personnel:** MSU administrator and accounting support staff, MSU scientists, field technicians, and sub-contractors for buffer designs and installations.
   D. **Funding structure:** Two-year grant totaling $491,309 which will include three pilot study sites, water quality model outputs and cost analyses (full proposal and budget can be provided upon request). Price per outfall conversion is estimated to be much less as no water quality modeling or monitoring is required after pilot is complete.