Mobile Bay National Estuary Program
Fowl River Watershed Restoration Meeting
April 23, 2019

Purpose:
A Fowl River Watershed Management Plan (WMP) was completed in 2016. One of the priorities identified in the Plan is the preservation of spits and marshes along the river.

The Mobile Bay National Estuary Program held a public meeting to share results from a year-long Fowl River Marsh Health and Recovery Study.

The purpose of this study was to identify factors causing the degradation of marsh-covered spits in the transitional zone between fresh and brackish waters of Fowl River. Study results are intended to inform future habitat restoration efforts in Fowl River.

Goals:
Characterize the status and health of the wetlands in the transitional zone of Fowl River.

Understand the causes of wetland decline observed in many areas of the River.

Inform best-practice engineering designs for wetland restoration and protection.

Meeting Takeaways:
- Investigators were unable to discount any hypothesized mechanisms, or "smoking guns" underlying marsh degradation.
- Fowl River spits and marshes are being affected by multiple stressors: lack of sediment to replenish marshes and stay ahead of sea level rise and subsidence; more frequent flooding and salt intrusion on the marshes; increased erosion from high-frequency, low-amplitude boat wakes; and elevated nutrient concentrations.
- Any proposed restoration will need to consider trends and identified sources of stress.
- MBNEP will continue to engage stakeholders before restoration or engineering and design activities commence.

Minutes:
As the meeting got underway, Roberta Swann welcomed attendees and acknowledged representatives from Goodwyn Mills and Cawood (who prepared the Fowl River WMP) and Mobile County. Before discussing the Fowl River Marsh Study, Tina Sanchez and Eddie Kerr of Mobile County provided a brief update on the Salt Aire Shoreline Restoration project and the County's acquisition of Memories Fish Camp. Memories public access will include Master Plan development with stakeholder input throughout that process.

Next, Ms. Swann recounted the Mobile Bay National Estuary Program's (MBNEP) role in the Fowl River Watershed and how this marsh study and other projects in the watershed implement management measures and strategies recommended in both the Fowl River WMP and MBNEP's Comprehensive Conservation & Management Plan. The Fowl River Marsh Study examined vegetation, sediment, and hydrology characteristics from the mouth of Fowl River upstream to the bridge on Fowl River Rd., with a focus on marshes and spits in the transitional zone of Fowl River (Region 2). A strength of this study is that each component (vegetation, sediment, hydrology) is integrated, meaning investigation of each component will benefit from information collected for the other two.

Funding to undertake this comprehensive assessment of marsh health, including the four priority spits identified in the WMP, was awarded to the MBNEP by the National Fish and Wildlife Foundation (NFWF) Gulf Environmental Benefit Fund. Before funding restoration measures, NFWF expressed the importance of first understanding the factors underlying loss of habitat in Region 2 marshes before proceeding with engineering and design or habitat restoration projects.

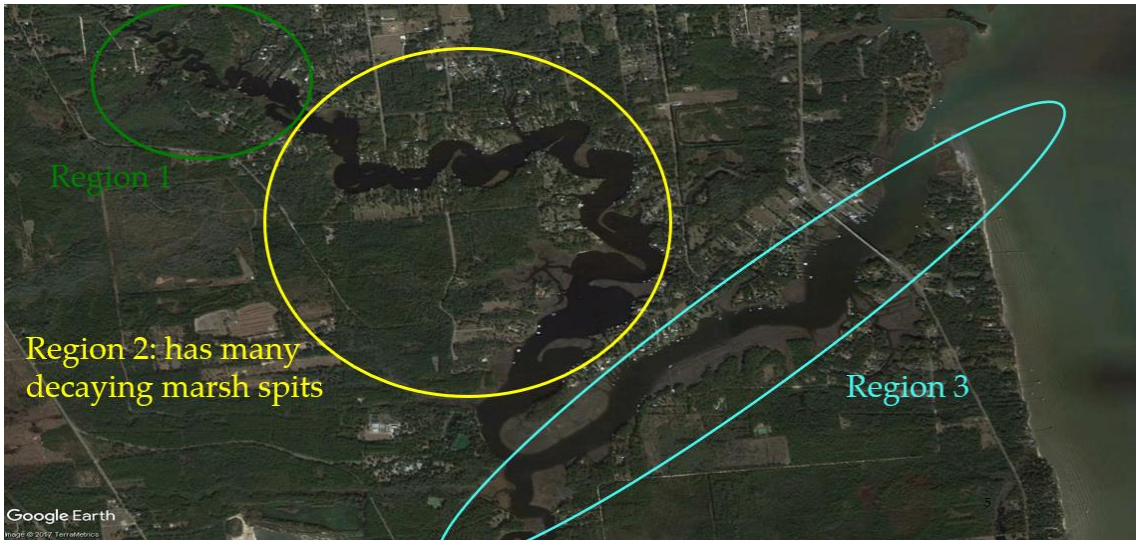


TABLE 8.2: PRIORITY COASTAL PROJECTS					
Priority (Zone)	Location Name	Length (ft)/ Area (acres)	Est. Cost	Brief Description	Location Diagram
1 (I)	Lightcap	1800 / 1.7	$2.1M	Proposed salt marsh enhancement and protection would include structural stabilization, fill, and appropriate vegetation.	
2 (I)	Tapia	2800 / 4.2	$3.2M	Proposed salt marsh enhancement and protection would include structural stabilization, fill, and appropriate vegetation.	
3 (I)	Strout	1300 / 0.8	$1.5M	Proposed spit and salt marsh enhancement and protection would include structural stabilization, fill, and appropriate vegetation.	
4 (I)	Closing Hole	1700 / 3.2	$2.0M	Proposed spit and salt marsh enhancement and protection would include structural stabilization, fill, and appropriate vegetation.	

Representatives from the Marsh Study Team were introduced:
Dr. Alex Beebe, USA (present); Dr. Ruth Carmichael, DISL; Dr. Just Cebrian, DISL; Mr. Marlon Cook, Cook Hydrogeology LLC; Dr. Brian Dzwonkowski, DISL; Mr. Joshua Goff, DISL; Dr. John Lehrter, DISL (present); Dr. Stephanie Smallegan, USA (present); Mr. Tim Thibaut, Barry Vittor and Associates (present); Dr. Bret Webb, USA. Members of the Marsh Study Team also participate on the MBNEP's Science Advisory Committee. The purpose of the Science Advisory Committee is to provide MBNEP guidance and scientific understanding of issues and recommend necessary monitoring and research activities to inform the status and trends of coastal Alabama's estuarine environment and ecosystem restoration and protection measures. Marsh study activities and methods were vetted by the SAC, which comprises a diverse body of subject matter experts.

To begin, Mr. Tim Thibaut provided specific examples of failing or lost marsh habitat in Fowl River. Analysis of comparative aerial photographs from 1938, 1974, and 2013 in the WMP and 1940, 2002, and 2017 provided by Barry Vittor and Associates demonstrate shoreline loss in Fowl River. The Marsh Study Team hypothesized three mechanisms (acting separately or in conjunction) that could be responsible for the observed decline.

Three hypothesized mechanisms:

- Sea level rise: Increased inundation and salinity
- Sediment starvation
- Boat wakes and wave energy

To investigate these mechanisms, the study selected three integrated components for investigation:

- Vegetation: Composition, health, and extent
- Sediments: Insufficient sediment loads to sustain marsh habitat
- Hydrology: salt intrusion, flooding, nutrient concentration, and wave energy

Presenters at the April 23 meeting were grouped according to the study components. Mr. Thibaut

presented the Vegetation component, describing ***vegetative composition, porewater salinity, and elevation characteristics of tidal marshes along Fowl River, Alabama.***

<u>Vegetation component questions:</u>

1) What is the general marsh health status across the three study Regions?
2) What are the factors that influence the health of marshes in the transitional zone where fresh and brackish waters mix?

Vegetation component activities - vegetation surveys were performed at 10 sites across the three Regions.

- Plant species diversity, distribution, and % cover
- Marsh elevation
- Marsh porewater salinity
- Hydrogeomorphic modeling
- Floristic Quality Index

<u>Conclusions:</u> Elevation transects revealed the spits are relatively flat. With continued sea level rise, they will be permanently inundated with water. Boat wakes and erosion are likely exacerbating the inundation stress. The diversity, distribution, and coverage of plants species has changed. When the spits were surveyed decades ago, they were forested with more woody, more upland vegetation; surveys conducted during this study reveal those habitats are now mostly covered with emergent marsh species.

Introducing the Sediment component, Dr. Alex Beebe presented ***Fowl River and Marsh Sediment Dynamics.*** While Mobile Bay is characterized as a drowned river valley, Fowl River represents a *drowning* river valley. This is common in riverine systems where meanders in the upper reaches transition to a broad open basin downstream, before transitioning again near the mouth to a tidal inlet. Examples of similar river systems are common globally where sea level rise increases, forcing water up river. In the case of Fowl River, geologically, the future of the spits comes down to delivery of sediments to offset and sea level rise – like balancing a checking account. Marsh elevation is controlled by two things: accretion (paycheck/revenue) and increases in sea level (expenditures). If your paycheck/revenue does not exceed your expenses over time, your account (relative elevation of spits) will decrease as represented in the following equation:

$$\Delta Marsh\ Elevation\ = Net\ Accretion - \Delta Sea\ Level$$

Sediment component activities:

- Sediment loading and transport assessment
- Channel profiles and channel bed sediment characterization
- Sediment cores collected from spits and river channel
    - Calculated accretion/erosion rate
    - Organic carbon concentration
    - Stable isotope analysis to determine increased human activity
    - Depositional profiles

Sediment team questions and conclusions:

1) What is the current sediment supply, fate, and transport in Fowl River?
    - *Very little river sediment is available to accrete on the Region 2 spits.*

2) How do the current sediment conditions compare to the past?
    - *Same sediment type but composition of stable isotopes reflects increased human activity in the 20th Century.*

3) What is the accretion/erosion rates for the marsh?
    - *Accretion (paycheck/revenue) is not keeping pace with sea level rise (expenditures).*

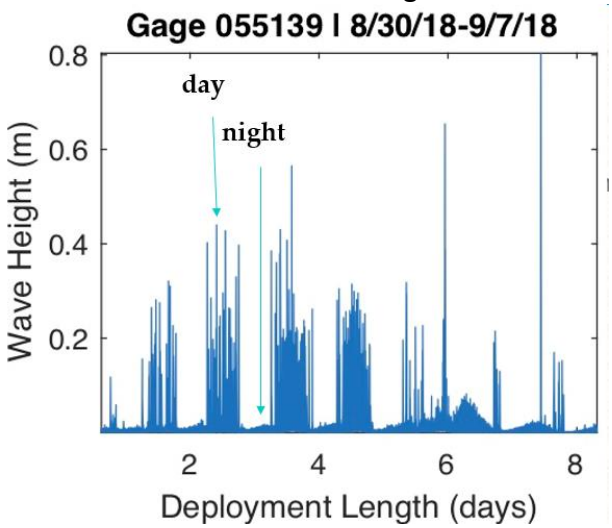
Dr. Stephanie Smallegan led off the Hydrology component with results from the analysis of ***Boat Wakes in Fowl River. (Hydrology)***

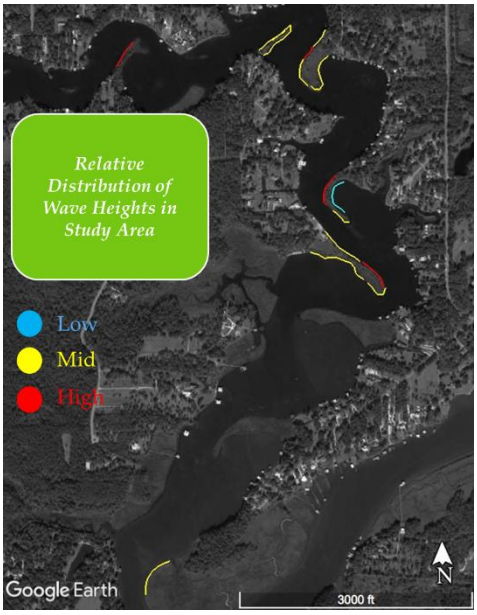
Boat wake component activities:

- 10 high frequency wave gauges were deployed between May 24 and October 3, 2018
    - Some gauges were deployed permanently at representative stations while others were rotated at strategic spit locations.

Boat wake study objectives:

- Measure tides and waves
- Evaluate wave conditions
- Describe wave frequency
- Inform restoration design



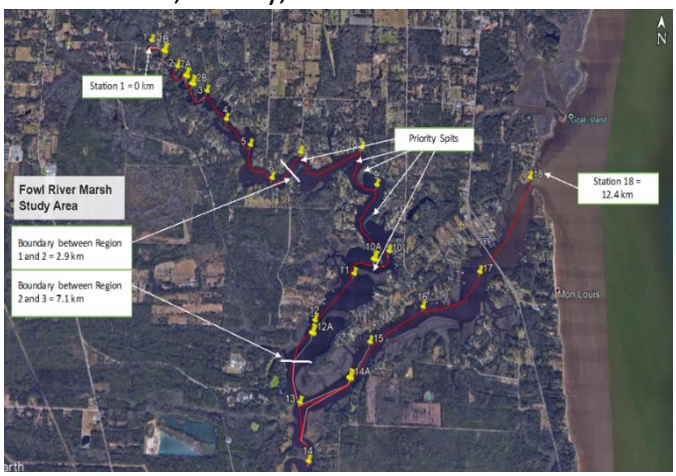


Conclusions: Data from the boat wake study suggests all significant wave energy is generated by boats (rather than winds). Data clearly showed all wave energy is during daylight hours with little to no wind chop. Wave frequency, rather than wave height, is the primary stressor. Persistent wave frequency exceeded marsh grass (*Spartina alterniflora*) tolerance limits most of the time. All sites exceeded frequency tolerance thresholds by at least 20%, while some sites exceeded tolerance 80% of the time. Wakes are likely contributing to additional marsh inundation and erosion to the edges. Regardless of other contributing stressor impacts, reducing the energy of boat wakes will be a critical component of any restoration design.

Dr. John Lehrter, also addressing the Hydrology component, shared **Sea *Level, Salinity, Suspended Sediments, and Nutrients.***

Hydrology team questions:

1) How are changing marsh spits related to sea level rise, salinity, and nutrients?
2) Can we diagnose causes for loss of spit shoreline?
3) How best to plan for restoration considering environmental change?



Hydrology component activities:

- Continuous water quality sampling and measurements from April to October 2018
- Porewater well (depth and salinity)
- Monthly water quality surveys at 18 stations from January to October 2018.
    - Developed vertical profiles (salinity, temperature, depth, and dissolved oxygen)
    - Eight discrete water sampling stations to collect suspended sediments, nutrients, organic matter, and Chlorophyll a (surface and bottom)

Conclusions: The hydrology team concluded that marsh flooding is a persistent issue, with marshes submerged throughout the study period. Salinity in the marshes is related to increasing salinity trends observed in the river. Suspended sediment data indicated low inputs come from the watershed but instead are mainly from Mobile Bay. Persistently-low oxygen (hypoxic) conditions were frequently found on the bottom of the river. Low oxygen conditions, while naturally occurring, can be intensified by excessive nutrients entering the system. Analysis of nutrient data suggests Fowl River is a eutrophic (nutrient-rich) system. However, additional investigation would be needed to determine the significance of the relationship to marsh degradation in Fowl River.

Following Dr. Lehrter's presentation the floor was opened for questions and discussion. Attendees were informed that MBENP currently has funding in place for Fowl River restoration engineering and design, this process will include a feasibility study to examine multiple restoration scenarios. It is critical that any restoration scenarios involve stakeholder input, improve ecosystem function and do not pose unintended consequences to the integrity of Fowl River. MBNEP will continue to involve the community and subject matter experts before proceeding with any restoration activities.

Questions:

- Is there a wave tolerance frequency curve for *Juncus roemerianus* (black needlerush)? Needlerush is much more prevalent in Fowl River than *Spartina alterniflora.*
- Are no-wake zones an option? How will that impact towing sports on the river? Could activity zones for tow sports be established?
- Will the community continue to be involved?
- Will funding for all four spits or a single spit be available?