Site Report: McAllis Point

Original restoration completed in 2010

The McAllis Point restoration project was implemented by the Texas Parks and Wildlife Division and Texas General Land Office with funding from NOAA through the American Recovery and Restoration Act (ARRA). The project involved restoration of 64 acres of intertidal habitat complex through the creation of 50 marsh mounds. Restoration and McAllis Point was completed in 2010

Where, What, Why

Restoration at McAllis Point involved the creation of an estuarine habitat complex to offset significant losses of intertidal wetland and shallow estuarine habitat that this area experienced during the latter half of the last century. Clusters of marsh mounds were created through discharge of hydraulically dredged sandy sediments. The 64 acres of restored habitat complex was strategically placed to protect an additional 42 acres of existing estuarine habitat from further erosion. Similar to other marsh mound projects in the region, the goal of the McAllis Point restoration was ***to maximize marsh edge habitat, and to create shallow protected subtidal areas between mounds to promote seagrass (SAV) growth and associated fishery production***.

Figure 1. Historical loss of marsh extent in the McAllis Point area.

How

At McAllis Point, intertidal habitat was restored by hydraulic dredging of sediments from a nearby borrow area. The dredged sediments were used to create multiple circular mounds that were built to intertidal or slightly higher elevation. Mound placement within the project area involved the creation of two sections of perimeter mounds; one larger section (20 mounds) on northern-most bayward edge of the complex and a smaller section (5 mounds) behind and perpendicular to the outer perimeter and an additional 25 interior mounds. The smaller set of perimeter mounds was situated to defend the landward most portion of the project area against waves from the WNW. Perimeter mounds were built close together and to a higher elevation than interior mounds (1.07 m [3.5 ft] vs 0.67 m [2.2 ft] NAVD88). Perimeter mounds were designed as a sacrificial, softer alternative to traditional wave protection approaches like breakwaters. The eventual erosion of perimeter mounds was intended to serve as an additional source of sediment to sustain the interior mounds. The exterior, intertidal region of all mounds was planted with *Spartina alterniflora* at elevations appropriate for its growth. The interior, higher elevation regions of the mounds were left bare for plants to colonize naturally over time.

Site Physical Characteristics

While winds from the SSE are common in this region, the project site is relatively well-protected from southerly winds due its location on the northern shore of Galveston Island. In contrast, the site is fully exposed to winds from the north, and the strongest winds experienced in this region tend to blow from the NNW. Average values of modeled nearshore wave heights at the project site range from 15 to 25 cm [6-10in], while maximum wave heights reach 54 cm [22in] (Figure 2).

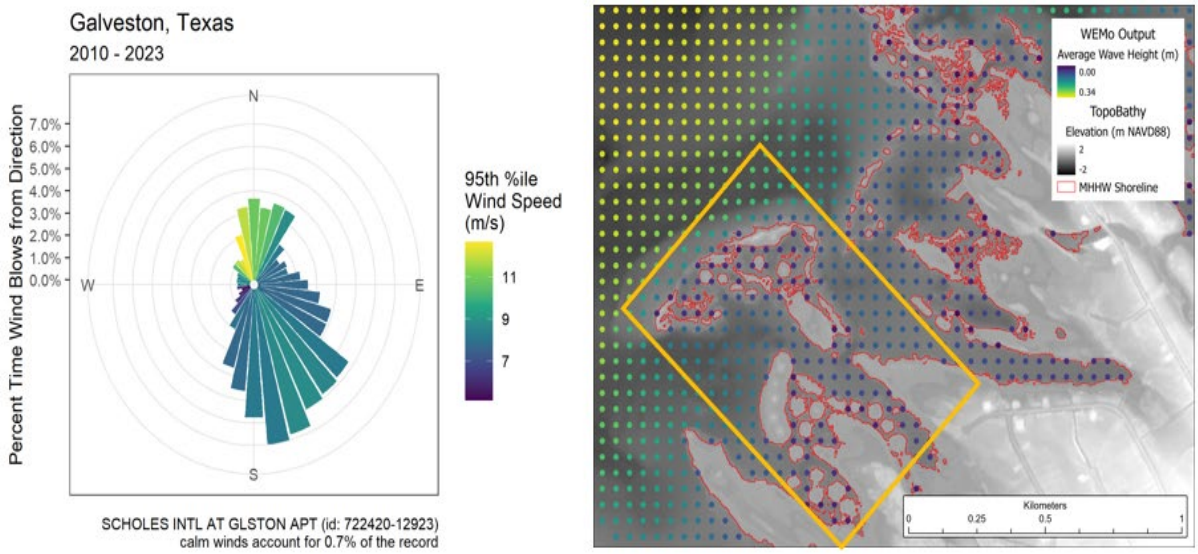

Figure 2. Average measured wind conditions over the project lifespan (left) were used to model wave energy conditions using the Wave Exposure Model (WEMo, right). The yellow rectangle in the right panel outlines the approximate project footprint.

Performance Over Time

Evaluation of changes in shoreline position indicate a 14% decrease in total created mound area (from 37.5 to 32.25 acres) between 2014 and 2022 (Figure 2). The restoration was completed in 2010 and the northernmost section of perimeter mound was already highly eroded by 2014 (the first date with usable imagery). Most of the area lost between 2014 and 2022 was from continued erosion of the northern perimeter. The existing parcels of marsh that were present within the project area prior to restoration appear to be largely unchanged and this is true even for patches of natural marsh that were directly behind the outer line of perimeter mounds (which has since eroded away).

Figure 3. Digitized shorelines from 2014 and 2022 (using imagery from the Natural Agriculture Imagery Program; NAIP). Shoreline position was defined by the outer extent of vegetation on each mound.

Comparison of aerial imagery from 2012 (the year the restoration was completed) and 2022 (Figure 4) shows the conversion of large areas of unvegetated salt flat (a common feature in the high intertidal zone in this region) to tidal marsh, presumably as a result of relative sea level rise.

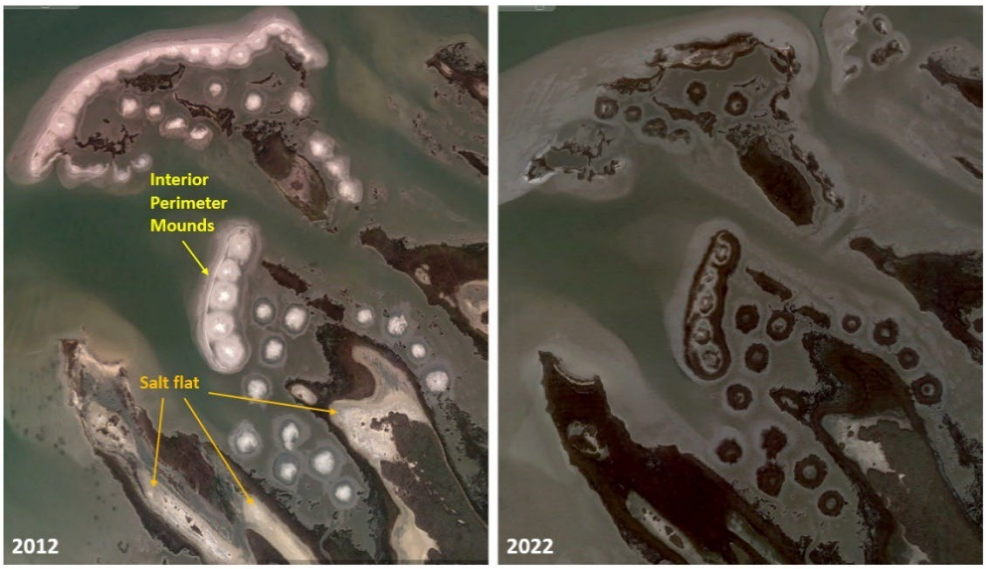

Figure 4. Visual changes in extent of salt flat habitat over time

The interior-most section of perimeter mound (Figure 4) has remained intact and the central, highest regions of those mounds have been colonized by vegetation typical of irregularly flooded elevations (eg. Shoregrass, Camphor Weed, Sea Purslane, Goldenrod, Salt Cedar). As of 2023, the highest points of these perimeter mounds are, on average, 50 cm [20 inches] higher than those of the interior mounds they are protecting. Interior mounds at this site are densely vegetated with *Spartina alterniflora* at elevations < 0.15 m [0.49 ft] NAVD88 and with a dense cover of mixed vegetation (*Spartina alterniflora* and *Batis maritima*) at higher elevations. There is no available as-built survey data or initial monitoring data from this site that would allow for a quantitative comparison of elevation change over time.

Current Habitat Distribution

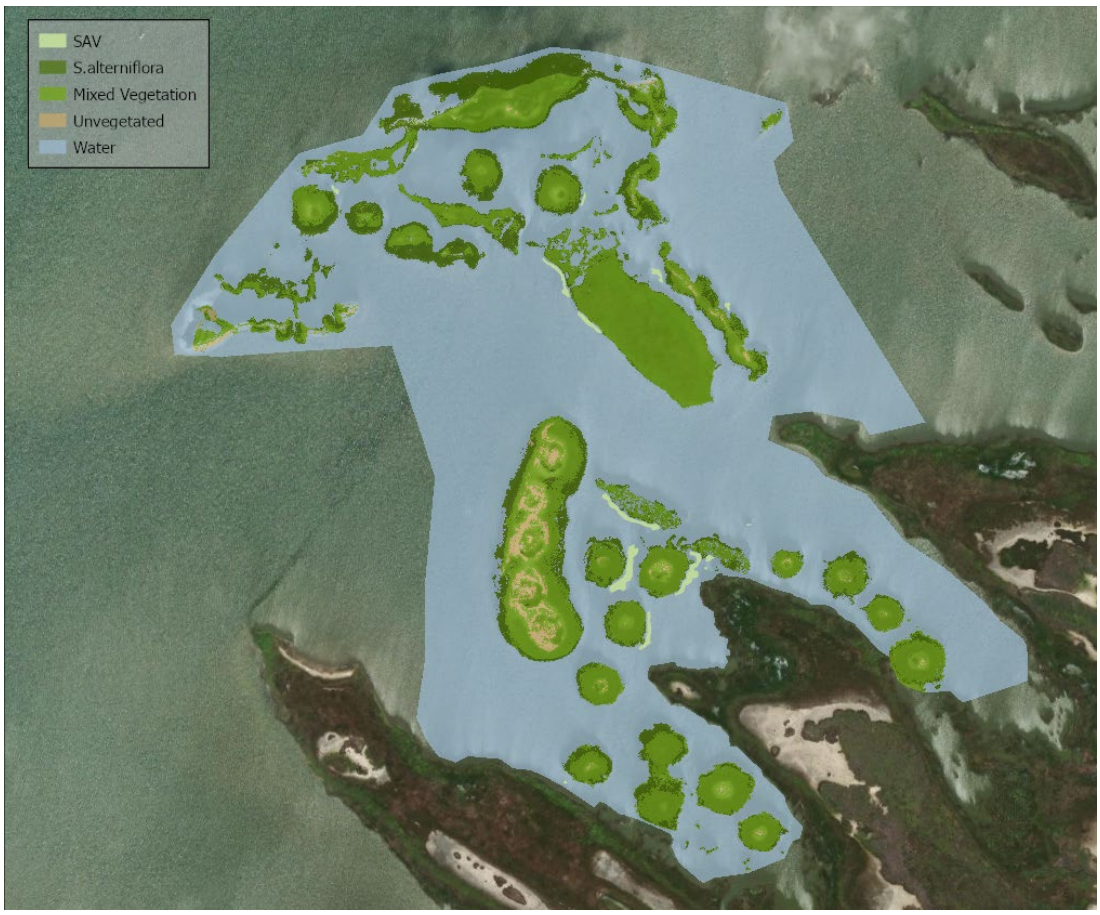

Figure 5. Classified habitat map of project area.

As of 2023, the interior created mounds were densely vegetated and small patches of SAV (presumed to be Halodule wrightii based on positive identification at a nearby site) was present in the lee of several interior mounds. Portions of the higher elevation interior perimeter mounds have remained unvegetated.

Sediments and Carbon Accumulation

The mounds of sandy sediments that were created at McAllis have been transformed over time by the breakdown and decay of plant tissues. As vegetation colonized the mounds, the roots helped to hold the sediment in place making these features increasingly resistant to erosion. As the plants aged, a portion of that root material died and decayed, contributing small fragments to the soil. Over time, this injection of material has led to a soil profile that is increasingly "marsh-like" (i.e., not firm enough to walk on without sinking in). Depth profiles of sediment structure in the created intertidal habitat confirms that sediments that are deeper than the root zone still reflect their initial structure, while sediments < 20 cm deep have become increasingly silty and carbon rich as the site has aged. A back of the envelope carbon calculation based on the average carbon stock in the top 15 cm of sediment and total area of intertidal habitat suggests that this site has accumulated on the order of 89,040 Kg of sediment-associated carbon since construction.

Performance Summary

At McAllis Point, sacrificial perimeter mounds were strategically placed to protect both created marsh mounds and remaining fragments of natural marsh. The outermost band of perimeter has eroded away, leaving the interior mounds and remaining parcels of natural marsh exposed to wave energy. Despite loss of this perimeter, the regions behind them have experienced only minor losses in extent. Perimeter mounds at McAllis Point were built roughly 1 foot higher than interior mounds. The perimeter mounds that are still intact are vegetated with species that don't tolerate regular flooding. These central higher-elevation regions likely play a role in providing both shorebird nesting habitat and high-tide refuge and ultimately, migration space for intertidal marsh as sea levels continue to rise. Overall, the project successfully created more than 30 acres of intertidal and higher habitat that has persisted for 13 years.

Report Credit: Davis, J., LeClaire, A., Bost, M. Walker, Q and Giannelli, R. (2024). Site Report: McAllis. US DOC NOAA NOS National Centers for Coastal Ocean Science (NCCOS). Marsh Mounds.