2013 WEDA Environmental Excellence Award
Deer Island Restoration Project
U.S. Army Corps of Engineers, Mobile District

Award Category: Navigation Dredging

Project Summary:
Deer Island is a 3.5-mile long spindle-shaped island located just off the coast of Biloxi, Mississippi (Figure 1). The island is owned by the State of Mississippi and is part of the Mississippi Department of Marine Resources (MDMR) Coastal Preserves Program. One of the aims of the MDMR program is to preserve and restore Mississippi's coastal ecosystems to perpetuate their natural characteristics, features, ecological integrity, social, economic, and aesthetic values for future benefit. As one of the most important properties in the Coastal Preserves Program, the restoration of Deer Island has received considerable interest. The Deer Island Restoration Project is part of an on-going, multiple-project, joint effort by the U.S. Army Corps of Engineers (USACE) Mobile District, the MDMR, and local environmental groups to restore Deer Island to its 1850's footprint.

Though much of Deer Island endured through catastrophic storm events over the last century including Hurricanes Camille, Ivan, and Katrina, the storms destroyed forested areas, significantly eroded the sandy shoreline, and left elevations too low to support marsh vegetation. The primary objective of the Deer Island Restoration Project was the restoration of marsh along the Mississippi coast for environmental benefit. Through creative thinking, innovative design concepts, and collaborative partnering, the USACE, MDMR, and local stakeholders, also identified several other objectives for the project. Together, the project team and stakeholders developed a plan that would deliver economic and social benefits as well.

The Deer Island Restoration Project included the filling of the west end breach, the restoration of the southern shoreline, and strategic vegetation plantings (Figure 2). Approximately 1.95 million cubic yards of hydraulically-dredged material from a nearby borrow site were utilized to fill the west end breach and restore the southern shoreline. Over 300,000 plants were planted on the island and, currently, another 325,000 plants are being planted. Importantly, the project included the construction of a 1 million cubic yard capacity lagoon specifically designed for the beneficial use placement of fine-grained dredged material from Federally-authorized navigation channels. 170,000 cubic yards of dredged material were placed in the lagoon in October 2011. The principles and practices used for the Deer Island Restoration Project provide significant environmental benefits for the region, as well as protection for the City of Biloxi from storm events, recreation opportunities for people, and hard-to-come-by economically feasible and environmentally acceptable beneficial use opportunities for dredged material. The project is a credit to the USACE Mobile District, the MDMR, and the stakeholders whose efforts yielded such diverse and important benefits.

Project Delivery Team Members:

US Army Corps of Engineers, Mobile District	Dr. Susan Rees, Program Manager, WEDA Member, Current	
	Jennifer Jacobson, Environmental Mike Malsom, Environmental	Thomas Smith, Project Manager
	Justin McDonald, Construction Manager	Nathan Lovelace, Beneficial Use (BU) Manager
MS Department of Marine Resources	Jamie Miller, Director	
	Jeff Clark, Project Manager	George Ramseur, BU Manager
Contractors	Mike Hooks Incorporated, Dredging, WEDA Member (Ashley Kearns), Current	
	Fish Tec Incorporated, Geotubes	
	RCG-Quality Enterprises USA Joint Venture, Vegetation	
	Tropical World Construction, Landscaping & Irrigation, Vegetation	

Nominating Entity:

- USACE, Mobile District (Point of Contact: Dr. Susan Rees)

Project Description/Criteria:

Environmental Benefits –

- What are the environmental benefits?

The Deer Island Restoration Project (Figure 3), through the repair of the west end breach and restoration of the southern shoreline, and plantings created approximately 215 acres of new habitat for terrestrial and aquatic species. The restored portions of the island provide large colonies of least terns and black skimmers with a significant increase in nesting and foraging habitat. The restoration of the island also provides for the protection of valuable foraging and nesting habitat on the interior of the island for bald eagles and osprey. After nearly two decades without a reported sea turtle nesting event on any beach in the State of Mississippi, a loggerhead sea turtle (Federally-listed as 'threatened' under the Endangered Species Act) nesting occurred on a restored portion of Deer Island. The nesting is one of very few noted few to have occurred in 2012 along the Mississippi coast, is particularly notable due to the recentness of the restoration, and gives credit to the decision of the USACE to utilize a "soft" approach to the island's shoreline restoration (Figure 4). Current efforts include the planting of the southern shoreline which will increase the diversity of the habitat on Deer Island for the benefit of multiple species, and increase the resiliency of the island against multiple erosion-inducing forces.

In addition, the Deer Island Restoration Project created approximately 1 million cubic yards of dredged material beneficial use capacity. The restoration design included the creation of a "lagoon" in the area located between the northern limit of the post-project southern shoreline and southern limit of the pre-project southern shoreline. Due to pervasive concerns by resource agencies regarding water quality impacts from the discharge of fine-grained sediments, the project was specifically designed and constructed to include a spur dike and sand underwater weir to minimize impacts from the placement of fine-grained dredged material (Figure 3). In October 2011, the lagoon was utilized for the beneficial placement of approximately 170,000 cubic yards of fine-grained maintenance material from the Federally-authorized Biloxi Lateral Navigation Channel. The placement of fine-grained dredge material in the lagoon will create valuable marsh habitat as well as provide a more resilient shoreline for future storm events. The remaining capacity of the lagoon provides an environmentally beneficial and economically feasible opportunity for additional placements of material from future maintenance

dredging operations. The strategy of the plantings along the southern shoreline includes the injection of native plant species into the boundary of the lagoon area with the expectation that they will, through natural reproduction, stabilize the areas that will be filled in future dredging operations.

- What unique environmental challenges were addressed?

The beneficial placement or disposal of fine grained sediments is an environmental challenge for the USACE's Navigation Program and Mississippi's navigation and environmental health stakeholders, due to concerns regarding the potential impacts associated with turbidity and sediment migration during discharge. To address these challenges, the Deer Island Restoration Project Delivery Team (PDT) utilized out-of-the-box thinking to incorporate the development of a beneficial placement area into the design of the project while still achieving the goal of the restoring the island to its 1850's configuration. Instead of building the shoreline outward from, and adjacent to, the existing shoreline, the shoreline was constructed in a manner that left a long gap (i.e. the lagoon) resulting in a peninsula-like sub-aerial feature with an open-water area that is connected with the Mississippi Sound (Figure 5). This open water area, approximately 100 acres in size and 19,000 ft. in length, created an ideal beneficial use site for fine-grained material due to its proximity to the Biloxi Lateral and East Access Navigation Channels and its long, slender configuration. Because of its configuration, dredge material can be easily contained during placement without the use of traditional containment features such as large dikes and weir boxes. Instead, more cost-effective features that require minimal effort to construct, such as small spur dikes, natural weirs, and turbidity curtains, can be utilized. These features also allow the site to have continual connectivity with the Mississippi Sound which facilitates the development of tidal channels and natural sediment segregation with minimal environmental impact as well as providing access to larval and juvenile forms of commercially and recreationally important species of shellfish and finfish.

<u>Innovation</u> –

- How does this project show leadership and take steps beyond "traditional" environmental protection efforts?

Exceptional leadership was provided during all phases of this project to ensure community participation/ownership and alignment of engineering and environmental concepts to produce project successes beyond the traditional environmental benefits derived from restoration projects. In addition to traditional environmental benefits such as habitat for sea turtles and various shorebird species, the project was designed and constructed to provide economic benefits through (1) the creation of beneficial use areas for cost-effective dredge material placement and (2) the reduction of wave energy and associated damages along the mainland coast of Biloxi, MS in Harrison County. The project also provides numerous social benefits via increased recreational opportunities for beach-goers, fisherman, and bird watchers due to its close proximity to the mainland coast.

- Did the project "break new ground" in addressing the environmental challenges?

Two main environmental challenges to beneficial use are 1) concern over potential adverse effects from increases in turbidity during dredging and placement, and 2) trading one type environment (open water) for another (wetland or island habitat). Both of these challenges were addressed in this project through development of strong partnerships with stakeholders and innovative engineering and design. The USACE Mobile District "broke new ground" by designing a project whose primary purpose was aquatic ecosystem restoration in such a way that it simultaneously became a future beneficial use site.

- What methods, technologies, or approaches (including partnerships) were used?

Critical to the success of this project were the collaborative partnerships developed early in the project among the Federal and State regulatory agencies, elected officials, non-governmental organizations, and the general public, thus developing a sense of ownership among all the partners. Consideration for the diverse needs of the community, i.e. habitat, water quality, safety, recreation, and the economy, formed the basis for the conceptual design. For example, the closure of the west end breach would provide for reduced risk from storm damage to the mainland, reduction in operations and maintenance dredging costs, and for areas suitable for recreation by residents and visitors who lack the opportunities to visit the more distant barrier islands. Through our collaborative approach with stakeholders, we were able to overcome the environmental and resource use challenges traditionally faced in this area.

Additionally, by practicing adaptive management we were able to respond easily to problems and opportunities that arose during the construction process to ensure success and enhance the overall value of the project. For example, a mud-wave developed along the northern shoreline during the filling of the breach area. This posed a safety problem for visitors accessing the island. We were able to immediately shift vegetation planting activities to that area to create a buffer that would discourage use of the area as a landing point.

- What sustainable approaches were applied?

On several past occasions, efforts were undertaken by various entities to fill the west end breach with dredged material and concrete rubble. These efforts were not successful and the west end of Deer Island continued to breach. To ensure a sustainable breach closure for the Deer Island Restoration Project, the PDT 1) engineered the placement of two very large, buried geotubes in the breach template, and 2) ensured that the appropriate grain size for the fill material was obtained from a cost-effective adjacent site. The engineering methods used, in conjunction with the local sourcing of materials, resulted in cost efficiencies that allowed the financial resources for an intensive planting effort. In addition, approximately 300,000 native grasses, forbs, herbs, vines, trees, and shrubs were planted on the restored west end breach to facilitate natural dune creation and stabilize the island (Figure 6). An effort to plant approximately 325,000 grasses along the southern shoreline is currently under construction to stabilize the beach and the marsh areas that will be created through the beneficial use of dredged material. On the whole, the simultaneous restoration of the island for environmental benefit and the creation of the lagoon as capacity for the beneficial use of dredged material represent a sustainable approach for attaining maximum benefits with limited resources.

Economic Benefits –

- Explain implementation of cost-effective methods, procedures, or practices in terms of environmental protection efforts. Were there project efficiencies? Were there any specific cost-saving components of the project?

The major project efficiencies were the achievement of multiple benefits through what was primarily intended to be an environmental restoration effort. The collaborative practices and cost-effective approaches to materials resourcing and project design and construction allowed the Deer Island Restoration Project to address all of the issues critical to the Mississippi coast. The major cost-saving component of construction of the project was obtaining the initial fill required for the breach closure and the southern shoreline restoration from an area near to the project site. This greatly reduced the initial construction cost but also resulted in the creation of a prime fishing area adjacent to the created recreation area. The project's inclusion of the beneficial use lagoon set the stage for near- and long-term cost efficiencies for the Corps' navigation program at Biloxi (Figure 7).

- How does the project contribute to the economy?

Dredge material from both the Biloxi Lateral and East Access Navigation Channels are eligible to be placed in the approximate 100-acre southern lagoon, which enables the Government-contracted pipeline dredges to avoid the costly reduced pay status associated with adverse weather conditions and available depths in the traditional open water placement areas. Prior to the creation of the lagoon placement site, pipeline dredges were required to use only the permitted open water placement sites located in the adjacent shallow water near the channel. Often times, the dredge is placed on a reduced pay status due to the spill barge's inability to handle rougher sea conditions. Having a placement area in the southern lagoon avoids the need to use the spill barge, which allows the dredge to continue pumping and ultimately increases efficiency and reduces costs to the taxpayer.

The Deer Island Restoration Project also contributes to the economy by providing a recreational opportunity for resident and visitors who lack the ability or resources to visit the more distant barrier islands and other coastal areas. This opportunity results in additional revenue for local businesses and offers cost-savings for those that would otherwise travel farther for such an experience. In 2012, a festival was held on Deer Island that attracted several thousand people to the newly restored island.

Transferability –

- Are the project characteristics and lessons learned transferable and can they be used by others addressing similar environmental issues?

Firstly, the importance of fostering communication and collaboration among all the interests early in the planning process is definitely transferable. Rather than the Deer Island Restoration Project being a USACE project with a local sponsor, it became a locally sponsored and supported project with USACE backing. The cooperative approach used, combined with the success of the innovatively designed project, is expected to garner future support for additional efforts to create dredged material placement areas in conjunction with environmental restoration efforts.

Secondly, the 2011 Deer Island lagoon dredged material placement demonstrated the ability to pump fine-grained channel maintenance material into a semi-confined placement site without the use of traditional containment dikes and weir boxes. The use of a spur dike, underwater weir, and turbidity curtain allowed the site to continually experience daily tidal exchanges immediately after placement of dredge material, which helped to create natural tidal ditches and sediment segregation. The soft-engineering and semi-confined approach can be transferred along other coastal areas where traditional fine-grained sediment containment areas are not desired, but where there is a need to nourish existing marshes or develop areas that have potential to support additional habitats.

Outreach and Education –

- What education and/or outreach activities were undertaken?

The Deer Island Restoration project was used as the model for an educational workshop at the Girls Engaged in Math and Science (GEMS) 2013 Conference at the University of South Alabama in March 2013. An overview of the project's features and benefits were presented to the girls at the initiation of the workshop and was followed by hands-on activities to provide a better understanding of how combining engineering and environmental concepts are integral to development of a successful project. Activities such as plant identification, performing grain size analyses of different types of sediment, and creating sea turtle tracks were used to enhance the learning experience. Faculty of the Department of Landscape Architecture at Mississippi State University have been utilizing the restored area as outdoor laboratories

for their students. This has increased the diversity and abundance of vegetation on the island leading to increased stability. The successes of this project were also presented at the following forums: the Western Dredging Association and Texas A&M University annual conference in June 2012, the World Association for Waterborne Transport Infrastructure (PIANC) Dredging 2012 conference in October 2012, the annual meeting of the USACE's Engineering With Nature and Regional Sediment Management Program in November 2012, and to the PIANC Environmental Commission membership in February 2013. The Deer Island Restoration Project is also highlighted on the USACE Engineering With Nature website (http://el.erdc.usace.army.mil/ewn/ or www.engineeringwithnature.org). A critical feature of our public outreach success was mediated by nature when a loggerhead sea turtle choose to nest on the southern shore of the west end breach. This event, along with the emergence of hatchlings, was captured in the newspaper and on local TV and highlighted the importance of habitat restoration and species conservation efforts.

- What mechanisms were used to involve the broad array of stakeholders?

Relationships and communications are the best tools to involve stakeholders. For this project, we drew on our relationships with local leaders to spread the good word about the project. The team also used all means of communication especially the media to enhance transfer of the story. The close proximity of Deer Island to the mainland beaches and marinas made this extremely convenient as ever-present and curious onlookers facilitated the communication process.

Other –

- What about this project makes it deserving of the WEDA Environmental Excellence Award?

The Deer Island Restoration Project is an environmental restoration project that considered the needs of the area and helped to foster the MDMR vision for a resilient coast including consideration of the people, the economy, the environment, and the vast heritage of the coast. The project has provided for the creation of over 200 acres of restored habitat that benefits several life history stages of migratory and resident avian species and provides nursery habitat for several fish species while simultaneously providing recreational opportunities for people. The project utilized local resources, and a "soft engineering" approach, through sunken geotubes and an intensive native planting effort, to increase the resiliency of the restored island. Importantly, the project has provided critical capacity for the placement of fine-grained dredged sediments from the Biloxi Lateral and East Access Navigation Channels for beneficial use. The Deer Island Restoration Project serves as a positive example of what can be achieved through the application of these concepts and practices. The future use of dredged material as a resource for environmental improvements, by the USACE and others, will be aided by the innovative design and construction approach taken by the USACE Mobile District and the satisfaction of the project stakeholders with the project outcomes.

Figure 1 – Deer Island Restoration Project Location

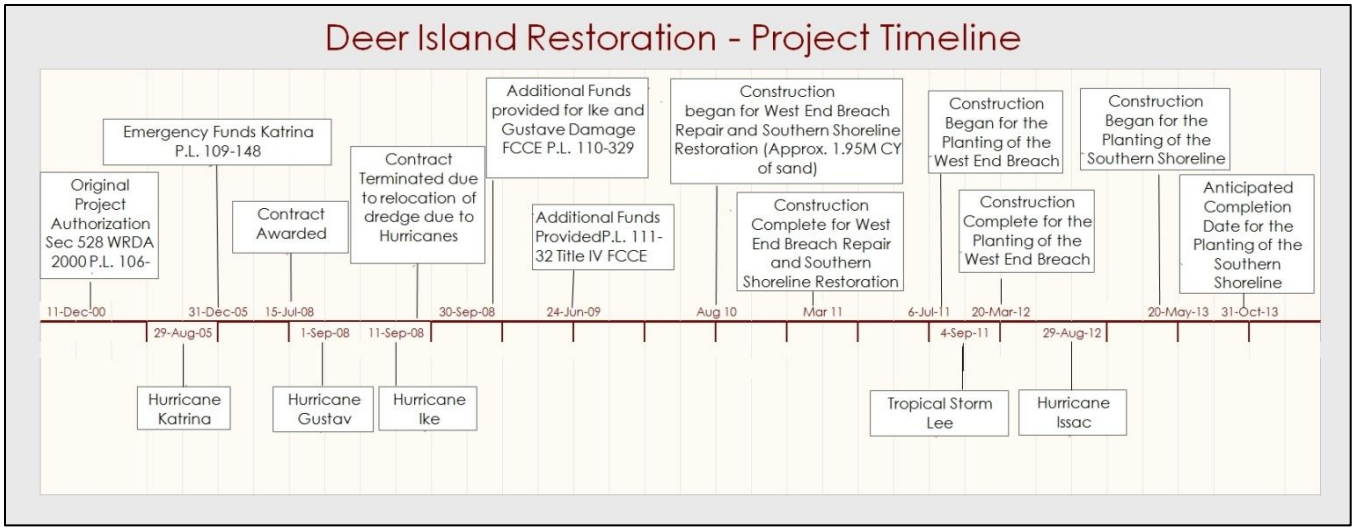

Figure 2 – Deer Island Restoration Project Timeline

Figure 3 – Deer Island Project Overview

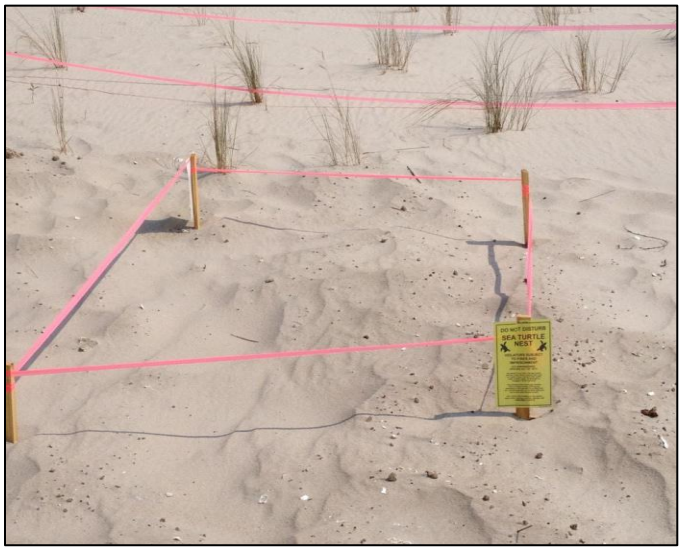

Figure 4 – Loggerhead Sea Turtle Nest

Figure 5 – View of Deer Island from the East

Figure 6 – Vegetation Planted on Deer Island

Figure 7 – Federally Authorized Navigation Channels near Deer Island