E C O L O G I C A L R E V I E W

New Cut Dune/Marsh Restoration
CWPPRA Priority Project List 9
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ECOLOGICAL REVIEW
New Cut Dune/Marsh Restoration

I. Goal Statement

The primary goal of this proposed project is to close New Cut, an inlet that formed between East Island and Trinity Island during Hurricane Carmen in 1974, and restore approximately 239 acres of open water to sustainable beach, dune, barrier flat, and marsh habitat (figure 1). It is anticipated that in addition to restoring critical barrier island habitat and providing storm protection, the closure of New Cut will also benefit adjacent beaches along East Island and Trinity Island by restoring the littoral drift system along the eastern Isle Dernieres.

II. Strategy Statement

The designated strategy for achieving the above stated goals comprises several project features that will be implemented during construction. These features include:

- an hydraulic fill of approximately 1.5 million cubic yards of sediment dredged from a shoal complex in Wine Island Pass (figure 1). The constructed project will create a gulf side beach, a dune platform, a barrier flat, and a bay side marsh platform that will support sustainable barrier habitats and provide storm protection.
- sand fencing constructed along the dune platform and gulf side beach that will capture eolianites (wind blown material) and promote dune development.
- vegetation plantings along the dune platform, gulf side beach (in the vicinity of the sand fencing), barrier flat, and marsh platform to restore sustainable barrier island plant communities, foster the establishment of a primary dune system, and stabilize the fill surface.

III. Strategy-Goal Relationship

The direct creation of a gulf side beach, dune platform, barrier flat, and marsh platform, using sediments dredged from Wine Island Pass, will (1) close New Cut; (2) provide a stable platform composed of both intertidal and supratidal habitats for various barrier island plant species; (3) provide additional storm protection to the back-barrier bay and mainland marshes by preventing the transmission of wave energy through the pass; and (4) restore the littoral drift system along the eastern Isles Dernieres by reducing the potential for longshore transported sediments to be flushed through the inlet and removed from the littoral system.

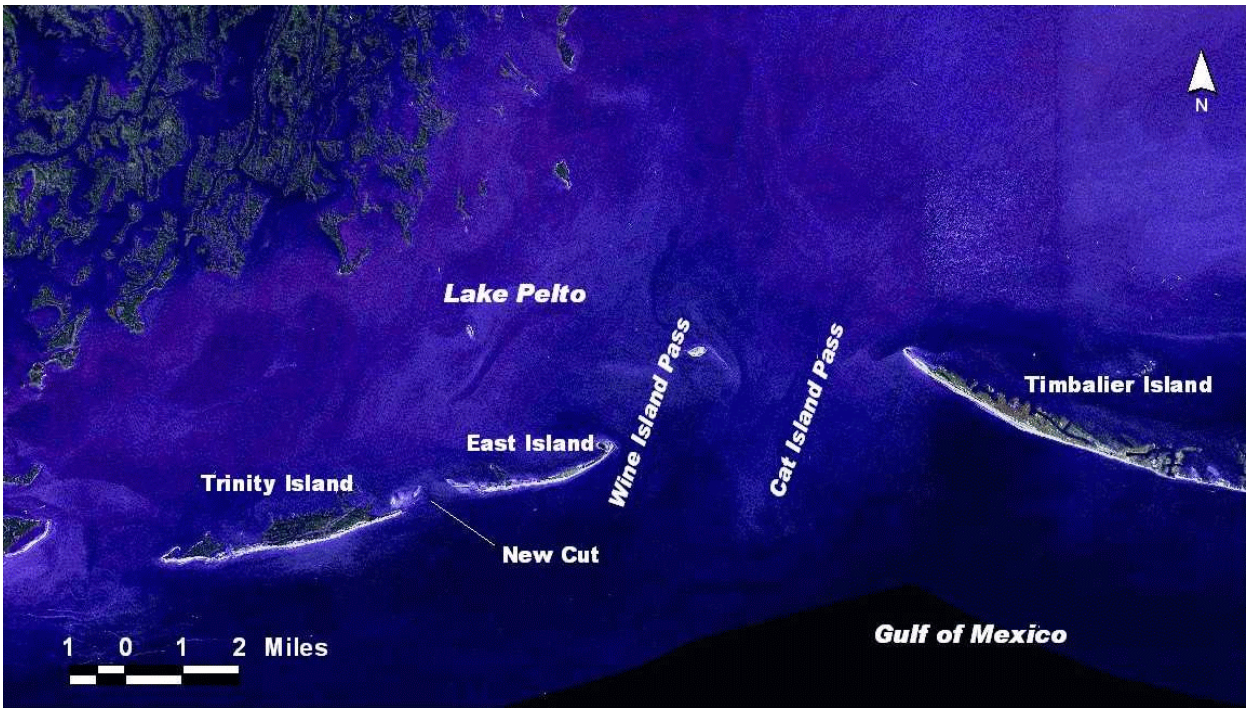

Figure 1. Location of the New Cut Dune/Marsh Restoration (TE-37) project along the eastern Isles Dernieres.

IV. Project Feature Evaluation

Borrow Site

A comprehensive, state-of-the-art, geophysical investigation was undertaken to locate and delineate potential borrow sites comprised predominantly of sand-sized material for the creation of the gulf side beach, dune platform, barrier flat, and marsh platform. Since the success of the project relies heavily on both the quality and quantity of the borrow material identified, the engineering-scale geophysical investigation undertaken was both warranted and fundamental to the success of the project. Identification of high-quality, borrow material is critical to the feasibility and success of any barrier island restoration project that has a gulf side beach-fill component because beach fills tend to perform better when grain size characteristics of the borrow material are equal to or slightly coarser than the native beach material (Krumbein 1957; James 1974; 1975; Dean 1974; USACE 1984; National Research Council 1995). The borrow site at Wine Island Pass identified in the feasibility phase (Phase 1) of this project delineated more than two million cubic yards of accessible, high-quality material that is nearly identical in grain size to the native material (0.13 mm). The collection of additional geophysical data is still underway to ground-truth the hydro-acoustical record, which indicated additional suitable material at the borrow site. Assuming a cut-to-fill ratio of 1.5 to 1, which is a conservative estimate given the preliminary results of the geophysical data collected to date, the project will require approximately 2.2 million cubic yards of cut material to be constructed.

Fill Section

A typical section of the New Cut restoration project is approximately 1,640 ft in length and comprises four distinct geomorphologic zones. Each geomorphological zone will provide habitats for various barrier island flora and fauna and provide storm protection to Lake Pelto during some point in the life of the project.

- The Gulf side Beach will extend 340 ft seaward from the toe of the dune platform to an earthen containment dike and will have an elevation of +4 ft (NAVD 1988). Additional material will be placed seaward of the containment dike and function as a sacrificial berm during post-construction beach and shoreface equilibration. Assuming a background erosion rate of 35 ft per year (McBride et al. 1991) and a rate double the background erosion rate during the first two years following construction (National Research Council 1995), the gulf side beach should transgress to the toe of the dune platform by year 9. This erosion rate estimate may be low, however, given the performance of other beach fills around the U.S. (National Research Council 1995). If the gulf side beach fill performs according to estimates, the proposed project width should be sufficient to maintain an effective barrier between Lake Pelto and the Gulf of Mexico during the 20-year project life.
- The primary function of the Dune Platform is to provide storm protection to Lake Pelto during hurricanes. An elevation of +8 ft (NAVD 1988) is probably high given the typical profile of the Isle Dernieres and La Fourche barrier systems, nevertheless, since the dune platform along barrier island restoration projects on East and Trinity

Islands were constructed to +8 ft (NAVD 1988), constructing a lower dune at New Cut may make this area more susceptible to breaching during a large storm that generates surges sufficient to overtop a lower dune platform. The results of numerical modeling indicate that the +8 ft (NAVD 1988) dune platform would be overtopped during a storm surge of +10 ft (Category 2 Hurricane) but complete overwash would not occur.

- The Barrier Flat extends approximately 340 ft bayward of the toe of the dune platform at an elevation of +4 ft (NAVD 1988). This zone provides a more stable, supratidal habitat than the gulf side beach because it is protected by the dune platform from salt spray and washovers during low-magnitude storms. In addition, the barrier flat provides an elevated platform for sediments to be deposited onto during overwash events. The elevation and width of this platform are probably sufficient to account for post-construction adjustment, including sediment compaction and eolian deflation.
- The back-barrier Marsh Platform extends 400 ft bayward from the barrier flat and slopes down from +4 ft to +2 ft (NAVD 1988). Given the proposed project design and accounting for post-construction adjustment, this zone will probably not become intertidal shortly after construction. Therefore, it is unlikely that a sustainable intertidal marsh habitat will be established across a majority of this zone within the first several years after construction.

Sand Fencing

The proposed project design establishes sand fencing along the dune platform and the gulf side beach. The purpose of the sand fencing along the dune platform is to capture eolianites in transport and reduce the quantity of fill material from being transported off the island into the adjacent Gulf of Mexico and Lake Pelto. Restoration projects on East and Trinity Islands have indicated the important role sand fencing plays in barrier island restoration projects, particularly if the fencing is constructed immediately following hydraulic dredging and before the winter cold front season. Dune development will also provide additional storm protection during hurricanes. The objective of constructing sand fencing along the gulf side beach, in the vicinity of the dune platform, is to establish a primary foredune system that will episodically nourish the beach and longshore bar during storms and provide additional protection to the island. The continual sediment exchange between the beach and dune is an important natural process for maintaining both morphological stability and ecological diversity (Carter, 1988).

Vegetation Plantings

The planting of vegetation proposed for this project is a critical feature with respect to project success from both a geomorphological and ecological perspective. During the first several months following construction, only vegetation that colonizes naturally will be available to provide protection to the fill surface from eolian processes. Sand fencing will play a critical role in reducing fill losses in the short-term but over several years as planted vegetation colonizes and creates a protective canopy, eolian deflation will be reduced dramatically and confined to open areas like the beach and overwash fans. *Panicum amarum*

(bitter panicum) was planted successfully on East, Trinity, and Whiskey Islands along dunes and *Spartina patens* (marshhay cordgrass) to a lesser degree. There is some indication that the *Spartina patens* survived better at higher elevations where soil salinity was lower, however no data exist to support this hypothesis. Establishment of a sustainable intertidal marsh habitat along the marsh platform may be difficult to achieve given the proposed design elevation.

V. Assessment of Goal Attainability

Closing the pass at New Cut using sediments dredged from Wine Island Pass is an attainable goal given the available geophysical data. Restoring sustainable beach, dune and marsh habitats is also attainable if the presently proposed design is implemented with one alteration: redesign the marsh platform to +2 ft (NAVD 1988) for the entire 400 ft section. This change would create an intertidal area that could support intertidal plant species immediately after construction. The present proposed design would render a majority of the marsh platform supratidal, even after post-construction adjustment (compaction and eolian deflation), and this area would most likely be unable to sustain marsh/intertidal habitat.

The success of the New Cut project relies heavily on both the quality and quantity of the borrow material. The quantity of high-quality dredge material available in Wine Island Pass will govern beach fill performance and ultimately project longevity. Phase 1 feasibility has made every attempt to employ state-of-the-art techniques and technology to locate and delineate local borrow areas that contain high-quality material. The acquisition of high-resolution, hydro-acoustical data at an engineering scale has further enhanced our ability to delineate the borrow area and increased our confidence level with regard to the actual quality of the borrow material. Ascertaining the final cone-penetrometer profiles and deep cores will provide important data needed to ground-truth the hydro-acoustic data and finalize the engineering plans.

ï **Recommendation:**

The New Cut Dune/Marsh Restoration (TE-37) project should be approved pending 1) the acquisition of the remaining geophysical data (penetrometer profiles and long cores); and 2) redesign of the 400 ft section of marsh platform to +2 ft (NAVD 1988). This project may also be a good candidate for an experimental planting of *Uniola paniculata* (sea oats) along the gulf side primary foredune system. Project monitoring should concentrate data collection efforts on quantifying initial post-construction adjustment during the first five years following construction, including rates of eolian deflation, beach fill performance, and equilibration of the lower shoreface.

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