Final Programmatic Environmental Impact Statement
For the Beneficial Use of Dredge Material Program

Lead Agency:	U.S. Army Corps of Engineers, New Orleans District
Cooperating Agencies:	Louisiana Coastal Protection and Restoration Authority
Location:	Coastal Zone of Ascension, Assumption, Calcasieu, Cameron, Iberia, Jefferson, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, and Vermilion Parishes, Louisiana
Type of statement:	Draft Programmatic Environmental Impact Statement
Abstract:	The Draft Programmatic Environmental Impact Statement (DPEIS) is designed to fulfill the requirements of the National Environmental Policy Act, as well as other laws, regulations, and directives, including but not limited to the Endangered Species Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, 404(r), Executive Order 11988, and Executive Order 11990. The Beneficial Use of Dredge Material (BUDMAT) Program would take greater advantage of existing sediment resources made available by the maintenance dredging of authorized Federal navigation channels to achieve restoration objectives in coastal Louisiana. This report analyzes the problems and opportunities and expresses desired outcomes as planning objectives. Alternatives are then developed to address these objectives. These alternatives include a plan of no action and various combinations of management measures. The economic and environmental impacts of the alternatives are then evaluated and a feasible plan is tentatively selected.
For further information:	Elizabeth L. McCasland Ecological Planning & Restoration Section CEMVN-PM-RS PO Box 60267 New Orleans, LA 70160-0267 (504) 862-2021 (504) 862-2088 (fax) Elizabeth.L.Mccasland@usace.army.mil
EIS filing number and date:	No. 20090397, draft EIS filed November 20, 2009
Comments due date:	Draft – January 4, 2010, Final – 30 days from date of publication in FR

EXECUTIVE SUMMARY (40 CFR 1502.11)

The November 2004 Louisiana Coastal Area Ecosystem Restoration Study (LCA Study) recommended the Beneficial Use of Dredged Material (BUDMAT) Program for programmatic authorization. Subsequently, the U. S. Army Corps of Engineers (USACE) prepared a Programmatic Environmental Impact Statement (PEIS) for the LCA Study and a Record of Decision was signed on November 18, 2005. This report evaluates the potential effects of a broad agency action, the establishment of the 10-year, $100 million BUDMAT Program, and tiers off the LCA Study and its accompanying PEIS. The Water Resources Development Act (WRDA) 2007 (Public Law 110-114) authorized implementation of the BUDMAT Program.

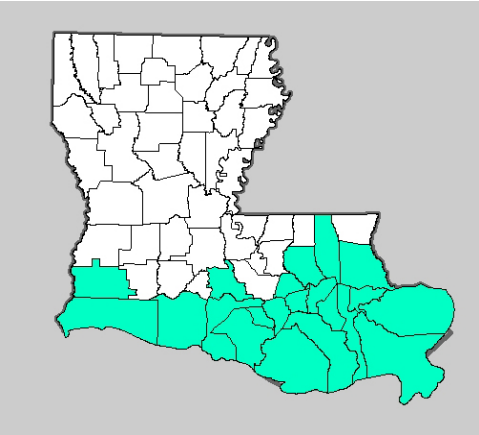


Figure1. The 20 coastal parishes in the BUDMAT Program area

The study area is located in the 20 coastal parishes of southern Louisiana, from Mississippi to Texas (figure 1). The BUDMAT Program would pay the incremental costs to use dredge material above those costs normally incurred in the operation and maintenance of federally maintained navigation channels.

This document details how the BUDMAT Program would be implemented and the potential impacts of using dredge materials for restoration and/or recovery of coastal wetlands. The BUDMAT Program Study is cost shared equally between the USACE – Mississippi Valley Division, New Orleans District (CEMVN) and the Coastal Protection and Restoration Authority of Louisiana (CPRA). Implementation of the program would be cost shared 65 percent Federal and 35 percent from the CPRA.

Purpose and Need for Action and Objectives of Study

Purpose

The purpose of this programmatic report is to present the findings of the study, which was conducted to establish the structure and management architecture of the BUDMAT Program to take greater advantage of existing sediment resources made available by the maintenance activities of authorized Federal navigation channels to achieve restoration objectives in coastal Louisiana.

Need

The U.S. Congress recognizes the need to reduce Louisiana coastal wetland losses. Recent congressional acts include the Coastal Wetlands Planning, Protection, and Restoration Act program (CWPPRA), which provides targeted funds through 2019 for planning and implementing projects that create, protect, restore, and enhance wetlands in coastal Louisiana. Additionally, Section 384 of the Energy Policy Act of 2005 authorized the Coastal Impact Assistance Program (CIAP) to assist coastal producing states and their political subdivisions

(parishes, counties, and boroughs) in mitigating the impacts from Outer Continental Shelf oil and gas production. Louisiana is one of the six coastal states selected to receive funds under the appropriation to implement this program.

Planning Objectives

The objectives of the BUDMAT Program are:

(1) To cost effectively increase the beneficial use of material dredged from federally maintained waterways at a total cost of $100 million over a 10-year period.

(2) To address the critical needs of the LCA Program soliciting, selecting, planning, designing, and constructing individual ecosystem restoration projects that use material dredged from the federally maintained waterways to:

- Restore and create coastal landscape features such as, but not limited to, marshes, ridges, and islands that provide wildlife and fisheries habitat with emphasis on ecological and hydrologic functions that support the coastal Louisiana ecosystem.
- Reduce the loss of existing coastal landscape features such as, but not limited to, marshes, ridges, and islands to help sustain the coastal Louisiana ecosystem.
- Provide protection to Louisiana's coastal infrastructure.

Beneficial use in the context of the BUDMAT Program is limited to habitat restoration to build and restore wildlife habitat with emphasis on ecosystem restoration features that provide hydrologic and/or ecologic functions. Beneficial use under the BUDMAT Program does not include upland disposal or disposal to solely support industrial or commercial activities such as disposal into commercial sand pits. Ecosystem restoration projects implemented under the BUDMAT Program may provide incidental or secondary benefits such as storm damage risk reduction; however, these secondary or indirect benefits will not be assess or considered in the selection of beneficial use projects. As noted previously, funds from the Beneficial Use of Dredged Material Program would be used for disposal activities associated with separate, cost-shared, individual ecosystem restoration beneficial use projects that are above and beyond the disposal activities that are covered under the USACE O&M maintenance dredging Federal Standard. The Federal standard for dredged material disposal is the least costly alternative, consistent with sound engineering practices and meeting applicable Federal environmental statutes.

Planning Constraints

Unlike planning objectives, which represent desired positive changes, planning constraints represent restrictions that should not be violated. The constraints are as follows:

Authorized Federal Navigation Channels – the BUDMAT program operates in conjunction with the maintenance dredging of Federally maintained waterways and therefore excludes dedicated dredging material for specific projects such as finding and mining a sand source for barrier island restoration.

Dredged material transport distances using current techniques – When determining the practical pumping distance cost is the primary limiting factor. Currently hydraulic pipeline

cutterhead dredges have been the primary equipment used for most existing beneficial use projects and this method is cost effective for transporting dredged materials for distances up to several miles. The CEMVN Cost Engineering Section's, opinion discussions with the dredging industry, is that the practical pumping distance using current techniques of installing and removing pipeline on a project-by-project basis and using two booster pumps is approximately 11 miles. If another booster pump is used, a practical maximum pumping distance of 15 miles is likely achievable but would be more costly. Therefore only beneficial use sites that are less than 15 miles from the dredging location shall be considered for nomination under the BUDMAT Program in its initial year. As permanent long distance sediment pipeline projects are constructed or when cost effectiveness for long distance transport techniques improve, the practical maximum transport distance would be increased to cover larger and larger areas of coastal Louisiana for consideration under the BUDMAT Program.

Dredged material that is logistically excluded from beneficial use – Some navigation channels are dredged to cause resuspension of the material via agitation, but some dredged material is not actually removed from the channel. In addition, some reaches of the Mississippi River in the vicinity of the Port of Baton Rouge are dredged and there is little opportunity to use this material beneficially in a cost effective manner.

Dredged material that is unsuitable for land creation and/or barrier island restoration – The sediments from both the lower Atchafalaya River and the Calcasieu River bar channels have high levels of very fine silts and clays, which do not stack very well, and are therefore poor candidates for marsh creation and barrier island restoration. These sediments may be good candidates for marsh nourishment via thin layer placement techniques that are currently being evaluated.

Other limitations include the following:

- Known hazardous, toxic, and radioactive waste (HTRW) sites. The BUDMAT Program would not implement projects at sites with known HTRW concerns.
- Known cultural resource site operations restrictions. The BUDMAT Program would not implement projects at sites with known cultural concerns.
- Threatened and endangered (T&E) species operating restrictions
- Potential conflicts with and impacts on authorized projects. Projects included in the BUDMAT Program must not result in unacceptable impacts to existing authorized projects.

Planning Assumptions

The 2004 LCA Study estimated that approximately 21,000 acres of wetlands could be created through the 10 year $100M BUDMAT Program. This estimate was based on the following assumptions: (1) an average incremental cost of $1 per cubic yard (cy) of dredged material placed beneficially, (2) an estimate of 0.00025 acres of wetlands created per cy of dredged material placed (or using the inverse, 4,000 cy of dredged material are required to create one acre of wetland based on a 2.5 feet total height of dredged material (i.e., a water depth of 1.5 feet plus 1 foot of fill above the water's surface), and (3) a 15 percent planning, engineering, design and real estate cost over the 10 year BUDMAT Program (i.e., the remaining 85 percent or $85M would be available for placing 85,000,000 cy of dredged material beneficially). This equates to approximately $4,000 per acre of wetland created. It should be

noted that the estimate of the potential maximum area of wetland created by the program assumes that all of the program resources would be used for marsh creation projects. However, other restoration features such as barrier island restoration or enhancement would also be considered as candidate projects under the program and the higher cost per unit area of restoration feature would be considered with the understanding that these types of projects provide benefits related to length of shoreline restored or enhanced rather than an area of habitat restored or created.

Alternatives Including the Proposed Action

There are ample opportunities to use dredged material beneficially in coastal Louisiana. Due to limited program funding, guidance was developed for selecting, designing and constructing future site-specific beneficial use projects implemented under the BUDMAT Program.

Alternative Screening Process

An interagency Project Delivery Team (PDT) was assembled to conduct the prerequisite studies and analyses, develop the alternative plans, and report for the BUDMAT Program. The team was composed of staff from the CEMVN, the Coastal Protections and Restoration Authority of Louisiana (CPRA, the non-federal sponsor), the US Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the US Environmental Protection Agency (USEPA), the US Geological Service (USGS), and the Natural Resource Conservation Service (NRCS).

The BUDMAT Plan was identified as the one that best meets the study objectives, is based upon identification of the most critical natural and human ecological needs, and proposes a program that would implement cost effective projects to address those needs. During program implementation, decision documents similar to the planning and design analysis described in the Engineer Regulation 1105-2-100, Planning Guidance Notebook, Appendix F: Continuing Authorities Program, would be developed to the level of detail necessary to justify site-specific beneficial use projects using National Environmental Restoration (NER) analyses and National Economic Development (NED) analyses, if applicable.

Alternatives Considered and Eliminated, or Requiring Further Study

The construction authorization language in WRDA 2007 requires that this program consider the use of sediments from the Illinois River system. These sediments could come from dredging by the State of Illinois or O&M dredging by the USACE Rock Island District, as the WRDA 2007 stipulates consideration of sediment from the Illinois River System, but not which agency is doing the dredging. The State of Illinois has used their dredge material beneficially on various projects within the state. However, the use of these materials beyond the Illinois state boundary presents several issues including the logistics of getting the material from Illinois to Louisiana, getting the material to a project site, and laws regulating the interstate transport of soil.

Final Formulation and Evaluation of Alternative Plans

Several programmatic management and site selection alternative plans were evaluated to implement beneficial use projects in coastal Louisiana. The management and site selection methods under consideration must work within the planning objectives, constraints, and

assumptions. One of the management methods included the no action plan where dredged materials would only be utilized within the Federal Standard for each channel within the existing O&M budget. Dredged materials would be disposed of in an environmentally acceptable manner, which is not necessarily beneficial use. The no action plan is carried forward as the plan all others are compared against in the future.

The customized program alternative developed through the plan formulation process conducted for this study would utilize a proactive, streamlined approach to achieve objectives of the BUDMAT Program. Using an approach that follows the basic procedures described in the 2007 EPA/USACE Beneficial Use Planning Manual, the multi-agency Project Delivery Team (PDT) identified potential selection criteria and evaluated their applicability for screening and selecting beneficial use projects. The PDT determined that an initial screening process was needed to identify potential projects that could be coordinated with O&M dredging, followed by two levels of evaluation criteria: First, a set of screening criteria are used to identify suitable candidate projects for design. The beneficial use projects for which planning and design efforts have been completed are then ranked by a second criteria set to determine which project will be implemented by the BUDMAT program in conjunction with O&M dredging of Federally maintained waterways..

Plan formulation for the customized BUDMAT program included an assessment of existing program structures to determine their ability to carry out the required functions of the BUDMAT Program. Existing program processes that fully or partially address the functional requirements for the BUDMAT program were incorporated into the customized program alternative. A combination of existing program activities for solicitation of projects were incorporated into the customized program alternative for solicitation of projects. The customized program alternative also relies on the project planning and design processes of the Continuing Authorities Program (CAP) Section 204, which provides the appropriate level of planning and design for beneficial use projects implemented under a programmatic authorization.

Identification of the Tentatively Selected Plan

BUDMAT Program Alternative

The BUDMAT Program alternative would utilize a proactive, streamlined approach to achieve the goals of the BUDMAT Program. Under the BUDMAT Program, more dredged material would be disposed beneficially than what is currently achieved within the Federal standard. A range of 3,400 acres to 21,000 acres (5 – 33 square miles) of wetlands could be created over the 10-year, $100M BUDMAT Program. The number of acres created is tied directly to dredge material transport and placement costs. Environmental conditions would improve through the creation and/or restoration of marshes, other wetlands, natural ridges, and barrier shorelines. The economic condition in the area would improve due to long-term improvement in fisheries and wildlife. The negative impacts of deterioration of marshes and wetlands would be reduced through increased land cover, increased habitat, improved water quality, greater surge protection, and reduced saltwater intrusion.

Annual Process for Implementation of the BUDMAT Program

On an annual basis the BUDMAT Program procedures would be used to solicit, screen, and select candidate beneficial use projects for planning and design, and to select construction-ready

projects in conjunction with the scheduled and non-scheduled O&M dredging activities. For the vast majority of beneficial use projects implemented under the BUDMAT Program, the selection process would be greatly simplified by the existence of only one or two alternatives.

Once project design documents have been completed, they would be available for implementing beneficial use projects in conjunction with CEMVN's O&M dredging activities during the upcoming year. It is the intent of the BUDMAT Program to have sufficient project design documents available to utilize all available construction funding per program year.

Monitoring, Operation, and Program Success

The BUDMAT Program is an extension of an existing navigation Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) activity, and as such, the only cost for OMRR&R would be project-specific monitoring as needed to demonstrate project success. If any additional OMRR&R is deemed appropriate for projects constructed under the BUDMAT Program, associated costs for those actions would be the responsibility of the local sponsor.

Management of Plan Implementation

Section 2039 of WRDA 2007 mandates that when conducting a study for a project for ecosystem restoration that the recommended project includes a plan for monitoring the success of the ecosystem restoration. Consistent with WRDA 2007, monitoring shall be a cost-shared project cost for a period of up to a maximum of ten years from completion of construction of a beneficial use project implemented under the BUDMAT Program. Additional monitoring required beyond ten years, if applicable, will be a 100% non-Federal responsibility.

Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) of projects implemented under the BUDMAT Program would be a 100% CPRA responsibility. However, these activities are not typically included in the types of ecosystem restoration projects that would be carried out under the BUDMAT Program. Based on the experience of USACE and the state of Louisiana in implementing beneficial use projects for ecosystem restoration projects in coastal Louisiana under the CAP Section 204 and CWPPRA programs, it has been demonstrated that ongoing benefits are provided by completed projects without ongoing maintenance activities after project construction has been completed.

Affected Environment and Environmental Consequences

Affected Environment

The study area for potentially implementing the BUDMAT Program includes the wetlands, shorelines, and barrier islands of southern Louisiana. With the passage of the Coastal Wetlands Planning, Protection, and Restoration Act (PL 101-646) in 1990, the wetlands of coastal Louisiana were raised to national significance. Since the LCA Study was completed, these coastal areas have been heavily impacted by two severe tropical storm seasons, the 2005 storms, Hurricanes Katrina and Rita and the 2008 storms, Hurricanes Gustav and Ike. Loss of coastal lands has increased due to multiple factors, including the decreased flow of sediments over marshes and swamps, decreased amounts of sediments in the near-shore littoral flow, subsidence, relative sea level change, and direct human activities. Storms have inundated the barrier islands, which no longer get as much sediment material to replenish them. These islands, such as the

Chandeleurs, normally slow the forces of Gulf of Mexico waves in the eastern parts of the state. The Atchafalaya mud stream feeds the western part of the state barrier headlands, but even there, shoreline retreat continues.

As coastal wetlands and swamps decline or change from fresh to more saline, habitats for fish and wildlife species also change, and usually to the detriment of those species. Within the study area, 12 species are currently listed as either Threatened or Endangered. Continued coastal land loss and deterioration of critical coastal habitats, especially barrier shorelines/islands, might impact all threatened and endangered species, which utilize coastal Louisiana.

Habitat types in coastal Louisiana vary across the state, and depend on the soil type. Coastal marshes dominate the Deltaic Plain. In many areas, ridges that were present in the past have declined and have become marsh. Evidence of these ridges can be seen by the dead tree trunks that remain as a silent reminder of the past. In the Chenier Plain (the western part of the state) ancient beachheads create more solid ridges, with marsh or prairie between. The remaining ridges are an important habitat for a variety of wildlife and migratory birds.

Evidence exists that early man has occupied the Gulf coast region continually for approximately 12,000 years. A large portion of Louisiana's coast has suffered gradual subsidence and erosion, with much of the area once occupied by early human settlements now located on the submerged continental shelf. Historic French and Spanish settlements are found throughout the coastal region, with many sunken ships found offshore. Locating significant prehistoric and historic cultural resources is highly probable.

Environmental Consequences

Using dredge materials generated from standard navigational dredging operations would restore beaches, barrier islands, marshes and swamps in coastal Louisiana. The project cost would be beyond the Federal Standard cost for disposal of the dredge materials. The program costs might also include site preparation in anticipation of a dredging event, which could be either a scheduled maintenance dredging cycle or an emergency dredging. In order to reach project beneficial use restoration sites, additional pipelines and lift stations might be required beyond what is normally utilized within the Federal Standard budget. A range of 3,400 acres to 21,000 acres (5-33 square miles) of wetlands could be created over the 10-yr, $100M BUDMAT Program. The number of acres created is tied directly to dredge material transport and placement costs. Current projects utilizing beneficial use of dredge material slightly reduce the severe land loss experienced in coastal Louisiana. Existing marsh restoration projects have restored approximately 265 acres per year of wetlands using O&M funds, and this rate is expected to continue through various funding sources.

Pumping sediment into degraded marshes, which are currently shallow open water areas, would cause temporary disturbances in water quality, and might displace fisheries or animal species. However, the benefits of the barrier islands restoration, back barrier marshes, inland marshes, beachheads, and cheniers would out weigh detrimental issues. Much of the dredge material composition is most suitable for rebuilding or nourishing inland or back barrier marshes. Few routinely dredged channels have sufficient sand needed for rebuilding barrier islands or

beaches. Restoration of the coastal habitats would benefit much of south Louisiana's wildlife and fisheries species, and the livelihoods of the people dependant on them.

Dredging activities could possibly adversely impact previously unknown cultural resources and compromise site integrity. Effects could range from destruction or damage to artifacts to disturbing the chronological sequence of deposition by shifting artifacts. Each project site must be identified in the event that project activities unearth any cultural resources and appropriate mitigation measures must be taken to minimize potential impacts.

While it is not known what impacts the two recent severe hurricane seasons (2005 Hurricanes Katrina and Rita; and 2008 Hurricanes (Gustav and Ike) had on cultural resources, evaluation would continue on a case-by-case basis in accordance with Federal and state laws, regulations and USACE policy when inventories are required. A cultural resource management plan and cultural resource project plan would be developed for specific project sites. National Register of Historic Places listing would be examined for specific BUDMAT project sites as they are developed. Coordination with local Indian tribes and State Historic Preservation Officers would also take place as specific project sites are developed.

Areas of Controversy or Unresolved Issues

The following list is a summary of the major areas of controversy identified throughout the development of the Louisiana Coastal Area Ecosystem Restoration Program and applicable to the BUDMAT Program.

Public concern that litigation from parties negatively impacted by restoration projects will make restoration prohibitively expensive. Concerns about the necessity for sediment and water quality testing for dredging and disposal activities. That conflicts may result when balancing economic interests with coastal restoration, especially when multiple stakeholders share common coastal resources. Concerns with inaction and the perceived lack of urgency with respect to restoration.

Unresolved Issues – Views of the Non-Federal Sponsor

LCA Program Implementation Cost Share

The State of Louisiana is in full support of the LCA Beneficial Use of Dredged Material Program at the current cost share ratio of 65 percent Federal, 35 percent non-Federal, with operations, maintenance, monitoring, repair, replacement, and rehabilitation being 100 percent non-Federal responsibility as required by WRDA 2007. However, the state believes that the alternative cost share scenarios are appropriate and justified and intends to request Congress that the non-Federal share of the total LCA Program implementation be set at 25 percent.

Credit for Non-Federal In-Kind Contributions

Although final implementation guidance has not yet been issued, section 7007 of WRDA 2007 appears to authorize in-kind contribution credit only for work carried out before the date of the partnership agreement. Accordingly, work carried out after the date of a Design Agreement or Project Partnership Agreement is not eligible for credit. The State of Louisiana fully supports the LCA Beneficial Use of Dredged Material Program; however, it disagrees with the USACE implementation guidance related to crediting. The state intends to request from Congress that in-kind contribution credit be allowed for work carried out after the date of a Design Agreement or

Project Partnership Agreement and that in-kind contributions credit be allowed to carry over between LCA Program components (i.e., studies and projects), provided that provision of in-kind contributions, cash, and LERRDs fulfill the total non-Federal obligations. The state believes this view is consistent with the programmatic rules and allowances currently governing implementation of the Comprehensive Everglades Restoration Program. Furthermore, the state intends to request from Congress that in-kind contributions credit be allowed for the incremental funding it provides for beneficial use projects carried out prior to the implementation of the BUDMAT Program and that credit should be allowed commencing on the date of the Chief's Report (January 31, 2005).

Use of Federal Funds for Non-Federal Cost Share

In accordance with Section 7007(b) of WRDA 2007 and to the maximum extent allowable by law, the state will apply funds authorized by Congress under the Energy Policy Act of 2005 (Coastal Impact Assistance Program - CIAP) and the Gulf of Mexico Energy Security Act of 2006 (GOMESA) to meet its non-federal cost share for the BUDMAT Program and its resultant increase in the amount of beneficial use of dredged material performed by CEMVN.

Other Unresolved Environmental Issues

Dredge material disposal activities might adversely affect some oyster leases, permanently removing some from production, especially those involving creation or nourishment of barrier islands and marshes. Leases adjacent to restoration sites may temporarily experience decreased oyster production due to the increase in turbidity associated with disposal activities. Confining disposal of dredged materials in a closed site could greatly reduce impacts to adjacent oyster production areas.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The Louisiana Coastal Area (LCA) Beneficial Use of Dredged Material (BUDMAT) Program was recommended for programmatic authorization in the November 2004 LCA Ecosystem Restoration Study (LCA Study). A Programmatic Environmental Impact Statement (PEIS) was prepared for the LCA Study and a Record of Decision (ROD) was signed on November 18, 2005. This report evaluates the potential effects of a broad agency action, the establishment of the 10-year, $100 million BUDMAT Program, and tiers off the LCA Study and its accompanying PEIS available at the main LCA website, http://www.lca.gov. The Water Resources Development Act (WRDA) 2007 (Public Law 110-114) authorized implementation of the BUDMAT Program.

1.2 PURPOSE

The purpose of this programmatic report is to present the findings of the study which was conducted to establish the structure and management architecture of the BUDMAT Program to take greater advantage of existing sediment resources made available by the maintenance activities of authorized Federal navigation channels to achieve restoration objectives in coastal Louisiana. This report analyzes the problems and opportunities and expresses desired outcomes as planning objectives. Alternatives were then developed to address these objectives. These alternatives include a plan of no action and various combinations of management measures. The economic and environmental impacts of the alternatives are then evaluated and a feasible plan is tentatively selected. The report also presents details on the USACE and the non-federal sponsor participation needed to implement the plan. The report concludes with a recommendation for authorization.

Because the focus of this programmatic study is on the BUDMAT Program and the procedures under which future beneficial use projects would be implemented, it is expected that subsequent National Environmental Policy Act (NEPA) documents would be prepared for site-specific beneficial use projects implemented under the BUDMAT Program. Additionally it is expected that these subsequent NEPA documents would tier off the BUDMAT PEIS and its accompanying ROD.

1.3 NEED

The need to reduce the loss of Louisiana coastal wetlands has been recognized by the U.S. Congress. Recent congressional acts have included the Coastal Wetlands Planning, Protection and Restoration Act program (CWPPRA), which provides for targeted funds through 2019 to be used for planning and implementing projects that create, protect, restore and enhance wetlands in coastal Louisiana. The Coastal Impact Assistance Program (CIAP) was authorized by Section 384 of the Energy Policy Act of 2005, to assist coastal producing states and their political subdivisions (parishes, counties, and boroughs) in mitigating the impacts from Outer Continental

Shelf (OCS) oil and gas production. Louisiana is one of the six coastal states selected to receive funds under this appropriation to implement this program. In November 2007, the U.S. Congress passed the WRDA 2007, which includes provisions to authorize the LCA near-term plan including the programmatic authorization of the BUDMAT Program.

The LCA Study (2004) identified the following critical needs in coastal Louisiana:

Prevent future land loss where predicted to occur

Addressing this need would create and sustain diverse coastal habitats, sustain wildlife and plant diversity, and sustain socio-economic resources. Effective measures to reverse coastal land loss should affect plant communities, in their root zone, in such a way as to promote healthy growth and reproduction, plant succession, or revegetation of denuded surfaces. Increasing nutrients and sediment in the estuarine area would increase the growth of marsh vegetation and slow the rate of land loss. Increased plant growth would result in greater production of organic detritus that is essential for a high rate of fisheries and wildlife production.

Restore or preserve endangered critical geomorphic features

Addressing this need would restore geomorphic features, such as natural levee ridges, lake rims, land bridges, barrier islands, barrier headlands, and chenier ridges. These features are essential to maintaining the integrity of coastal ecosystems because they are an integral part of the overall system and in many instances represent the first line of defense against marine influences and tropical storm events.

Protect vital local, regional, and national socio-economic resources

Addressing this need would reduce the increased risk of damage to cultures, communities, infrastructure, business and industry, and flood protection. Accelerated land loss and ecosystem degradation places over $100 billion of infrastructure at increased risk to damage as a result of storm events. This need could be met by increasing the coastal wetland's capacity to buffer hurricane-induced flooding through wetland creation, wetland sustenance, and retention of barrier island system

1.4 LOCATION

The study area is Louisiana's coastal area from Mississippi to Texas. Louisiana parishes included in the study area include Ascension, Assumption, Calcasieu, Cameron, Iberia, Jefferson, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, and Vermilion (figure 1). The following nine navigation channels represent an initial list of areas (used for cost estimating purposes) with the most significant opportunities for additional beneficial use of dredged material in coastal Louisiana under the LCA

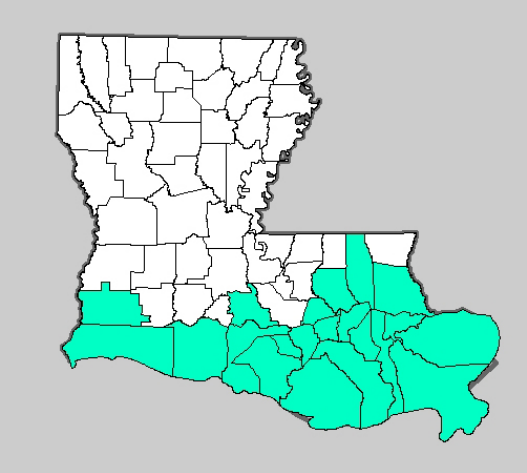


Figure 1. The 20 parishes in the BUDMAT Program area.

Program beyond the USACE Operations and Maintenance (O&M) Program (figure 2)**:**

- Barataria Bay Waterway, LA project;
- Mississippi River Outlets, Venice, LA
- Mississippi River, Baton Rouge to the Gulf of Mexico, LA – Southwest Pass, South Pass, Tiger Pass, and Baptiste Collette
- The Atchafalaya River and Bayous Chene, Boeuf, and Black, LA, project
- Calcasieu River and Pass, LA, project;
- The Houma Navigation Canal, LA
- Bayou Lafourche, LA
- Mermentau River, LA
- Freshwater Bayou, LA

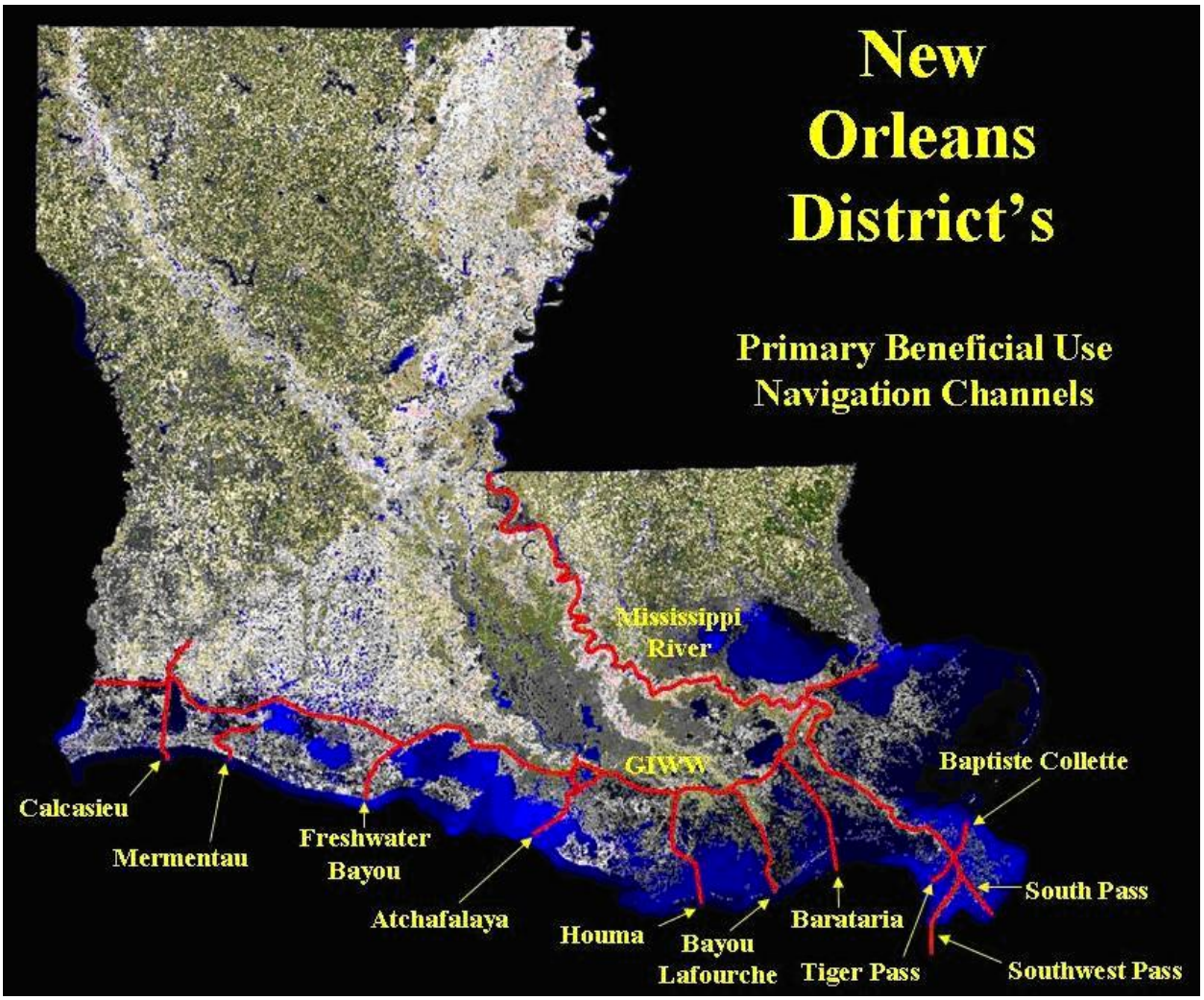


Figure 2. Federally maintained channels in the study area.

1.5 STUDY AUTHORITY

The programmatic study of the BUDMAT Program, as described in the LCA Study, is being conducted under the authority provided to the U.S. Army Corps of Engineers (USACE) through resolutions adopted by the Committees on Public Works of the U.S. Senate and House of Representatives, dated April 19, 1967, and October 19, 1967, respectively. These resolutions requested a review of prior USACE reports to determine the advisability of improvements or modifications to existing improvements in the coastal area of Louisiana in the interest of hurricane protection, prevention of saltwater intrusion, preservation of fish and wildlife, prevention of erosion, and related water resources purposes. These resolutions contain the following language:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act approved June 13, 1902, be, and is hereby requested to review the reports of the Chief of Engineers on the Mermentau River and Tributaries and Gulf Intracoastal Waterway and connecting waters, Louisiana, published as Senate Document Numbered 231, Seventy-ninth Congress, on the Bayou Teche, Teche-Vermilion Waterway and Vermilion River, Louisiana, published as Senate Document Numbered 93, Seventy-seventh Congress, on the Calcasieu River salt water barrier, Louisiana, published as House Document Numbered 582, Eighty-seventh Congress, and on Bayous Terrebonne, Petit Caillou, Grand Caillou, DuLarge, and connecting channels, Louisiana, and the Atchafalaya River, Morgan City to the Gulf of Mexico, published as House Document Numbered 583, Eighty-seventh Congress, and other pertinent reports including that on Bayou Lafourche and Lafourche-Jump Waterway, Louisiana, published as House Document Numbered 112, Eighty-sixth Congress, with a view to determine the advisability of improvements or modifications to existing improvements in the coastal area of Louisiana in the interest of hurricane protection, prevention of saltwater intrusion, preservation of fish and wildlife, prevention of erosion, and related water resource purposes."

Authorization of the Louisiana Coastal Area studies were provided through passage of WRDA 2007 (Public Law 110-114) on November 8, 2007. Within the document, Title VII – Louisiana Coastal Area, Section 7003 states:

> (a) IN GENERAL – The Sectary may carry out a program for ecosystem restoration, Louisiana Coastal Area, Louisiana, substantially in accordance with the report of the Chief of Engineers, dated January 31, 2005.

The report of the Chief of Engineers, dated January 31, 2005, recommends authorization of a beneficial use of dredged material program subject to the approval of a decision document by the Secretary of the Army.

Construction authorization for the BUDMAT Program is provided in WRDA 2007, Title VII, Section 7006, which states:

(d) BENEFICIAL USE OF DREDGED MATERIAL.

(1) IN GENERAL – The Secretary, substantially in accordance with the restoration plan, shall implement in the coastal Louisiana ecosystem a program for the beneficial use of material dredged from federally maintained waterways at a total cost of $100,000,000.

(2) CONSIDERATION – In carrying out the program under paragraph (1), the Secretary shall consider the beneficial use of sediment from the Illinois River System for wetlands restoration in wetlands-depleted watersheds of the coastal Louisiana ecosystem.

1.6 PLANNING OBJECTIVES

The planning objectives of the BUDMAT Program are:

1. To cost effectively increase the beneficial use of material dredged from federally maintained waterways at a total cost of $100 million over a ten year period.
2. To address the critical needs of the LCA Program soliciting, selecting, planning, designing, and constructing individual ecosystem restoration projects that use material dredged from the federally maintained waterways to:
    - Restore and create coastal landscape features such as, but not limited to, marshes, ridges, and islands that provide wildlife and fisheries habitat with emphasis on ecological and hydrologic functions that support the ecosystem of coastal Louisiana.
    - Reduce the loss of existing coastal landscape features such as, but not limited to, marshes, ridges, and islands to help sustain the ecosystem of coastal Louisiana.
    - Provide protection to Louisiana's coastal infrastructure

Funds from the BUDMAT Program would be used in conjunction with disposal activities associated with separate, cost-shared, individual ecosystem restoration beneficial use projects that are above and beyond the disposal activities that are covered under the USACE O&M maintenance dredging Federal standard. The Federal Standard for dredged material disposal is the least costly alternative, consistent with sound engineering practices and meeting applicable Federal environmental statutes. Beneficial use in the context of the BUDMAT Program is limited to habitat restoration to build and restore wildlife habitat with emphasis on ecosystem restoration features that provide hydrologic and/or ecologic functions. Beneficial use under the BUDMAT Program does not include upland disposal or disposal to solely support industrial or commercial activities such as disposal into commercial sand pits. Ecosystem restoration projects implemented under the BUDMAT Program may provide incidental or secondary benefits such as storm damage risk reduction; however, these secondary or indirect benefits will not be assessed or considered in the selection of beneficial use projects.

1.7 PLANNING ASSUMPTIONS

1.7.1 Restoration of Wetlands and the Cost of Dredge Material Placement

The range of potential acres of wetland created under the ten year $100M BUDMAT Program could vary significantly from the conservative average estimate of 3,400 acres up to potentially 21,000 acres as stated in the 2004 LCA Study if beneficial use sites were limited to only the nearby shallow open water areas. This estimate was based on the following assumptions: (1) an average incremental cost of $1 per cubic yard (cy) of dredged material placed beneficially, (2) an estimate of 0.00025 acres of wetlands created per cy of dredged material placed (or using the inverse, 4,000 cy of dredged material are required to create one acre of wetland based on a 2.5 feet total height of dredged material (i.e., a water depth of 1.5 feet plus 1 foot of fill above the water's surface), and (3) a 15 percent planning, engineering, design and real estate cost over the ten year BUDMAT Program (i.e., the remaining 85 percent or $85M would be available for placing 85,000,000 cy of dredged material beneficially). This equates to approximately $4,000 per acre of wetland created. It should be noted that the estimate of the potential maximum area of wetland created by the program assumes that all of the program resources would be used for marsh creation projects. However, other restoration features such as barrier island restoration or enhancement would also be considered as candidate projects under the program and the higher cost per unit area of restoration feature would be considered with the understanding that these types of projects provide benefits related to length o shoreline restored or enhanced rather than an area of habitat restored or created.

Recent 2007 cost estimates of potential beneficial use projects investigated by CEMVN reveal a significantly higher range for incremental cost associated with the beneficial use of dredged material. Incremental costs developed in 2007 range anywhere from just over $1.40 per cy to more than $9 per cy with an average incremental cost of approximately $4 per cy of dredged material placed beneficially. Likewise, cost per acre of wetland created ranged from $12,000/acre to $77,000/acre. Incremental costs are highly dependent upon the quantity of material to be placed; the requirement of retention measures such as dikes (earthen or hard structures such as rock), or geotubes; the length of discharge pipeline required to reach the beneficial use site from the dredge plant; the actual depth of water at each beneficial use site; the location of the dredging and disposal work (i.e., within protected areas versus offshore high energy areas); and the efficiency of the dredging operations. Incremental costs are also highly dependent on the prices of major items such as fuel and steel (required for the discharge pipeline). According to the CEMVN's Cost Engineering Section, fuel costs account for approximately 50 percent of the total dredging costs. Likewise, the estimated acres per cubic yard of dredged material (or inversely, the cubic yard of dredged material required to create one acre of wetland) is also highly dependent on target marsh elevation(s), the physical characteristics of the dredged material which affect both the initial stacking and bulking, as well as the subsequent compaction of the sediments in the beneficial use site, and the geological properties of the beneficial use site affecting the anticipated settlement of the dredged material.

Using the conservative average incremental cost of $4 per cy, the number of acres of wetlands that could be created under the BUDMAT Program would likely be about 3,400 acres over the 10 year program life. This conservative estimate assumes the following: (1) an average incremental cost of $4 per cy of dredged material placed beneficially, (2) an estimate of

0.00016 acres of wetlands created per cy of dredged material placed (or using the inverse, 6,250 cy of dredged material are required to create one acre of wetland based on a 4.0 feet total height of dredged material (i.e., a water depth of 2.5 feet plus 1.5 feet of fill above the water's surface, and (3) a 15 percent planning, engineering, design and real estate cost over the ten year BUDMAT Program (i.e., the remaining 85 percent or $85M would be available for placing 21,250,000 cy of dredged material beneficially based upon an average incremental cost of $4 per cy). This conservative estimate equates to approximately $25,000 per acre of wetlands created.

Currently, the minimum incremental placement cost per cubic yard of material dredged is approximately $1.17 per cubic yard with sediments dredged from Southwest Pass using a hopper dredged pump-out scenario. Even if this low incremental cost could be applied to beneficial use projects coast wide, beneficially using an additional 17 mcy of dredged material per year would require funding of approximately $20 million per year. It is estimated that the BUDMAT Program would be funded at $10 million over a 10-year period. Thus, the estimated funding made available through the BUDMAT Program would be insufficient to beneficially use a large portion of dredged material generated in any given year. In fact, the estimated $10 million per year for ten years, would even be insufficient to beneficially use all of the 14 mcy of sediment dredged each year from the Southwest Pass reach of the Mississippi River.

Incremental costs associated with beneficial use of dredged sediments vary widely depending on the need for retention dikes and pumping distances. The high incremental costs ($9.70 per cubic yard) for the Avoca Lake marsh creation (table 1) can be attributed to both the long pumping distance (approximately 10 miles) and the need for retention dikes. In contrast, the Shell Island Pass marsh creation project, using the identical dredged material, does not require retention dikes and is only 6 miles to 7 miles away. The incremental cost for the Shell Island project is therefore only $4.60 per cubic yard. The cost per acre created for these two projects range from $40,000 per acre to $77,000 per acre. The incremental costs shown for the Calcasieu River beneficial use projects are typical for those utilizing cutterhead dredges and requiring earthen retention dikes. The incremental cost for these projects is approximately $4 per cubic yard with a dollar per acre costs of about $20,000. The low end of incremental costs as shown in table 1 is $1.17 per cubic yard for the Southwest Pass (Miles 6 – 17 Below Head of Passes). If the BUDMAT Program were to focus solely on this beneficial use project, almost the entire annual budget of $10 million per year would be needed. Over 10 years, an estimated 9,200 acres of wetlands could potentially be created using dredged sediments from this reach of the Southwest Pass navigation channel.

Table 1. Summary of Beneficial Use Costs - post Hurricane Katrina

Navigation Channel	Incremental cost per cubic yard	Quantity (cy)	Total Incremental Cost	Acres	Cost per Acre
CALCASIEU RIVER:					
Sabine NWR marsh creation	$3.89	900,000	$3,500,000	200	$17,500
East Cove marsh creation	$3.95	1,900,000	$7,505,000	320	$23,453
Mercantel marsh creation	$4.00	1,400,000	$5,600,000	250	$22,400
HOUMA NAVIGATION CANAL (HNC)					

Navigation Channel	Incremental cost per cubic yard	Quantity (cy)	Total Incremental Cost	Acres	Cost per Acre
HNC Bay – Interior marsh creation*	$2.30	1,000,000	2,300,000	200	$11,500
HNC Bay – Barrier Island back bay marsh creation*	$2.30	600,000	$1,380,000	110	$12,545
HNC Bar – Isle Dernieres back bay marsh creation	$3.40	800,000	$2,720,000	147	$18,545
HNC Bar – Isle Timbalier back bay marsh creation	$8.60	800,000	$6,880,000	147	$49,909
ATCHAFALAYA RIVER					
Horseshoe Bend – Avoca Lake marsh creation	$9.70	1,200,000	$11,640,000	150	$77,600
Horseshoe Bend – Shell Island Pass marsh creation	$4.60	1,200,000	$5,520,000	135	$40,889
MISSISSIPPI RIVER – SOUTHWEST PASS					
Hopper pump-out – entire reach	$1.44	14,000,000	$20,160,000	1547	12,811
Hopper pump-out – Miles 6 -17 only	$1.17	8,190,000	$9,582,300	921	$10,409
**costs do not include required retention dikes*					

1.7.2 Dredging Schedule

The CEMVN has the largest annual navigation channel Operations & Maintenance (O&M) program in the USACE, with an average of 64.0 million cubic yards (mcy) of material dredged annually. Currently, approximately 24 percent of the material dredged under the CEMVN's O&M program is used beneficially within the Federal standard, which represents the least-cost environmentally acceptable disposal alternative. Therefore, on an average annual basis, approximately 15.4 mcy of dredged material is used beneficially under the CEMVN's O&M program. Additional dredged material is used beneficially in the surrounding environment with funding from the CWPPRA Program, the CIAP Program, or the Continuing Authorities Program (CAP) defined by the Water Resources Development Act (WRDA) of 1992, Section 204 for Beneficial Use of Dredged Material. The CEMVN, along with the State of Louisiana as the non-Federal sponsor, has beneficially placed dredged material to create over 19,500 acres (30 square miles) of land between 1976 and 2006. Assuming, that 15 percent of the $100M BUDMAT Program would be used for planning, engineering, and design activities, and real estate acquisition, the remaining $85M could be used to place dredged material beneficially. Table 2 is a summary of the dredging activities for the primary authorized navigation channels in the CEMVN.

Table 2. New Orleans District Primary Navigation Channels

Channel/Reach	Frequency of Dredging (years)	Average Quantity per Event (cubic yards)	Average Annual Quantity (cubic yards)	% Used Beneficially within the Federal Standard
Barataria Bay WW – bar	Every 3 to 4 yrs	640,000	182,857	100
Barataria Bay WW – bay	Every 6 yrs	641,000	106,833	-
Barataria Bay WW – inland	Every 9 yrs	379,800	42,200	-
Miss River – crossings	Annually	14,620,000	14,620,000	0
Miss River – Baptiste Collette	Every 1 to 3 yrs	1,354,800	677,400	100
Miss River – SW Pass *	Annually	15,615,000	15,615,000	6
Miss River – Tiger Pass	Every 1 to 3 yrs	1,941,900	970,950	100
Miss River – South Pass	Every 7 to 8 yrs	5,993,000	799,067	100
Miss River – New Orleans Harbor	Annually	1,131,500	1,131,500	0
Bayou Lafourche – jetty/bar	Every 1 to 2 yrs	637,900	425,267	100
Bayou Lafourche – inland	Every 5 yrs	850,000	170,000	100
Atchafalaya – bar	Annually	9,000,000	9,000,000	20
Atchafalaya – bay	Annually	2,130,000	2,130,000	100
Atchafalaya – Horseshoe Bend	Annually	1,200,000	1,200,000	100
Bayous Chene, Boeuf, & Black	Every 5 to 6 yrs	5,773,000	1,049,636	100
Berwick Bay Harbor	Annually	1,686,000	1,686,000	(varies**)
Houma Nav Canal – inland	Every 8 yrs	725,300	90,663	40
Houma Nav Canal – bay	Every 1 to 2 yrs	1,815,000	1,210,000	44
Houma Nav Canal – bar	Every 1 to 2 yrs	663,000	442,000	0
Freshwater Bayou – Lock to Gulf	Every 2 to 4 yrs	1,057,000	352,333	100
Freshwater Bayou – inland	Every 15 yrs	2,000,000	133,333	-
Mermentau River – bar & inland	Every 1 to 3 yrs	1,264,000	632,000	100
Calcasieu – Mile 5 to 14	Every 2 to 3 yrs	3,615,000	1,446,000	0
Calcasieu – Mile 14 to 24.5	Every 2 to 3 yrs	5,250,000	2100,000	0
Calcasieu – Mile 28 to 36	Every 3 to 8 yrs	1,334,000	242,545	0
Calcasieu – bar	Annually	7,547,000	7,547,000	10
		88,864,200	64,002,585	

(Based on New Orleans District data from years 1996-2007.)

* Includes the periodic mining of the Pass a Loutre hopper dredge disposal area in years 1997, 2004, and 2007.

** Placement into commercial sand pits for beneficial use varies depending on capacity of pits and commercial needs.

1.8 CONSTRAINTS

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions that should not be violated. These constraints are as follows:

1.8.1 Authorized Federal Navigation Channels.

The BUDMAT Program would operate in conjunction with the maintenance dredging of Federally maintained waterways and therefore excludes dedicated dredging material for specific projects such as finding and mining a sand source for barrier island restoration. Another limit of potential beneficial use projects is the fact that maintenance dredging is often restricted to distinct reaches within each authorized navigation channel.

1.8.2 Dredged material transport distances using current techniques.

When determining the practical pumping distance cost is the primary limiting factor. Currently hydraulic pipeline cutterhead dredges have been the primary equipment used for most existing beneficial use projects and this method is cost effective for transporting dredged materials for distances up to several miles. Typically, the pipeline used for transporting beneficial use material is owned by the dredging contractor and the pipeline is placed as needed by the contractor and then removed after the dredging and disposal operations are completed. Other factor affecting cost include pipeline inventory, booster pump inventory, dredge production rates, and sediment characteristics.

The CEMVN's Cost Engineering Section's, in discussions with the dredging industry, opinions that the practical pumping distance using current techniques of installing and removing pipeline on a project by project basis and using two booster pumps is approximately 11 miles. The CEMVN is not aware of past dredging projects in coastal Louisiana, which utilized more than two booster pumps. If another booster pump is used, a practical maximum pumping distance of 15 miles is likely achievable but would be more costly. Figure 3 is a graphical representation of the extent of the BUDMAT Program's initial areas of opportunity delineated by the practical maximum distance of 15 mile of each Federally maintained channel.

Therefore only beneficial use sites that are less than 15 miles from the dredging location shall be considered for nomination under the BUDMAT Program in its initial year. As permanent long distance sediment pipeline projects are constructed or when cost effectiveness for long distance transport techniques improve, the practical maximum transport distance would be increased to cover larger and larger areas of coastal Louisiana for consideration under the BUDMAT Program.

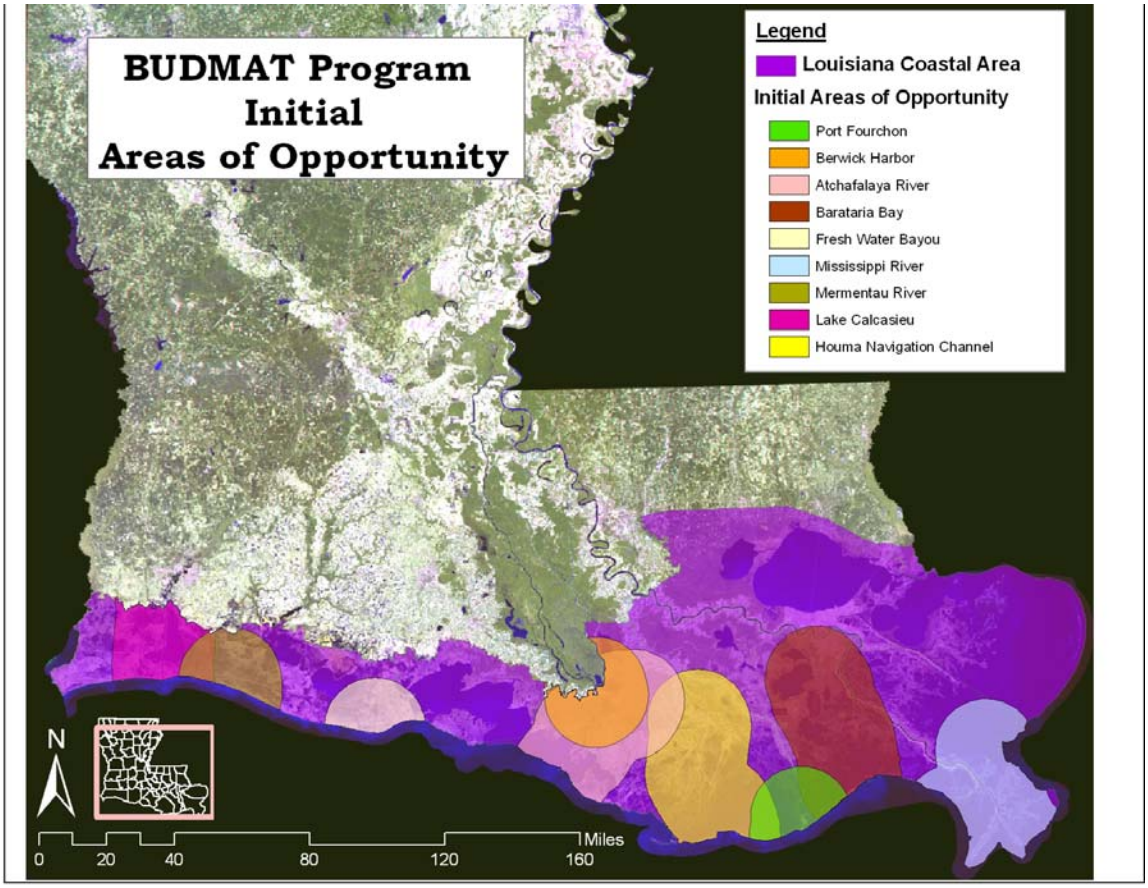


Figure 3. BUDMAT Program Initial Areas of Opportunity

1.8.3 Dredged Material that is Logistically Excluded from Beneficial Use.

Some navigation channels are dredged to cause resuspension of the material via agitation, but the dredged material is not actually removed from the channel. This approach is used in the Mississippi River upstream of the coastal zone and there is little opportunity to use this material beneficially in a cost effective manner. However, future implementation of long distance conveyance of dredge material via pipeline may enable these sediments to be used beneficially.

1.8.4 Dredged Material that is Unsuitable for Land Creation and/or Barrier Island Restoration

The sediments from both the lower Atchafalaya River and the Calcasieu River have high levels of very fine silts and clays ("fluff"), which do not stack very well, and are therefore poor candidates for marsh creation and barrier island restoration. These sediments may be good candidates for marsh nourishment via thin layer placement techniques that are currently being evaluated.

1.8.5 The Federal Standard O&M Dredging

The BUDMAT Program cost for implementing beneficial use projects would be limited to those costs that are beyond the costs of the Federal Standard, which is defined as:

"Federal Standard means the dredged material disposal alternative or alternatives identified by the Corps which represents the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b0(1) evaluation process or ocean dumping criteria. Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" [33CFR335.7].

1.8.7 Other Limitations

Other limitations for beneficial use sites include:

1.8.7.1 Known hazardous, toxic, and radioactive waste (HTRW) sites which are to be avoided

Federal agencies are required to examine and avoid potential problems related to HTRW. In cases where it is not practicable to avoid HTRW, response or remediation actions must be developed and acceptable to the EPA and state regulatory agencies. The BUDMAT Program would not implement projects at sites with known HTRW concerns.

1.8.7.2 Known cultural resource site operations restrictions

Since the passage of the National Historic Preservation Act of 1966, NEPA, and other National laws, Federal agencies are required to identify and consider impacts to historic properties. In cases where the site cannot be avoided, mitigation measures are developed either to retrieve significant data on the cultural resource or to compensate for the impact. The BUDMAT Program would not implement projects at sites with known cultural concerns.

1.8.7.3 Threatened and endangered (T&E) species operating restrictions

Both the U.S. Fish & Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) have jurisdiction over for T&E species. Formal coordination and preparation of necessary documentation such as Biological Assessments, would be initiated with either or both of these agencies on a specific project-by-project basis as required for any project implemented under the BUDMAT Program. These requirements are not anticipated to prevent the consideration or implementation of specific ecosystem restoration projects under the BUDMAT Program; however, certain requirements for avoidance of impacts and protection of critical habitat may be required for planning and implementation of certain projects to ensure protection of T&E species.

1.8.7.4 Potential conflicts with and impacts on authorized projects are to be avoided

Projects included in the BUDMAT Program must not result in unacceptable impacts to existing authorized projects. Potential beneficial use projects that would impact the maintenance and operation of existing authorized projects would be excluded from consideration.

1.8.7.5 Potential conflicts with and impacts on permitted actions are to be avoided, or compensation provided for takings of valid existing rights as identified in the real estate plans for individual projects

Projects included in the BUDMAT Program must not result in unacceptable impacts to existing permitted actions. Potential beneficial use projects that would impact permitted actions would be excluded from consideration unless an agreement could be reached with the permit holder on compensation or relocation.

1.9 PRIOR STUDIES, REPORTS, & EXISTING PROJECTS

Each navigational channel has corresponding environmental documents and they are listed in the annual USACE Dredging Conference reports, available on line at the CEMVN-Navigation web site: http://www.mvn.usace.army.mil/od/navigation.asp. Prior reports that directly pertain to the beneficial use of dredged materials include the following:

1.9.1 Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study (LCA Study)

The purpose of the LCA Study was to:

- Identify the most critical human and natural ecological needs of the coastal area;
- Present and evaluate conceptual alternatives for meeting the most critical needs;
- Identify the kinds of restoration features that could be implemented in the near-term (within 5 years to 10 years) that address the most critical needs, and propose to address these needs through features that provide the highest return in net benefits per dollar of cost;
- Establish priorities among the identified near-term restoration features;
- Describe a process by which the identified priority near-term restoration features could be developed, approved, and implemented;
- Identify the key scientific uncertainties and engineering challenges facing the effort to protect and restore the ecosystem, and propose a strategy for resolving them;
- Identify, assess and, if appropriate, recommend feasibility studies that should be undertaken within the next 5 years to 10 years to fully explore other potentially promising large-scale restoration concepts; and
- Present a strategy for addressing the long-term needs of coastal Louisiana restoration beyond the near-term focus of the Louisiana Coastal Area Ecosystem Restoration Plan (LCA Plan).

The LCA Study resulted in the recommendation of the near-term LCA Plan whose goal is to reduce the current trend of degradation of the coastal ecosystem. The LCA Plan emphasizes the use of restoration strategies by subprovince (figure 4) that: reintroduce historical flows of river water, nutrients, and sediment to coastal wetlands; restore coastal hydrology to minimize saltwater intrusion; and maintain the structural integrity of the coastal ecosystem. Execution of the LCA Plan would make major progress towards achieving and sustaining a coastal ecosystem that can support and protect the environment, economy, and culture of southern Louisiana and

thus contribute to the economy and well-being of the Nation. Benefits to and effects on existing infrastructure, including navigation, hurricane protection, flood control, land transportation works, agricultural lands, and oil and gas production and distribution facilities were strongly considered in the formulation of coastal restoration plans.

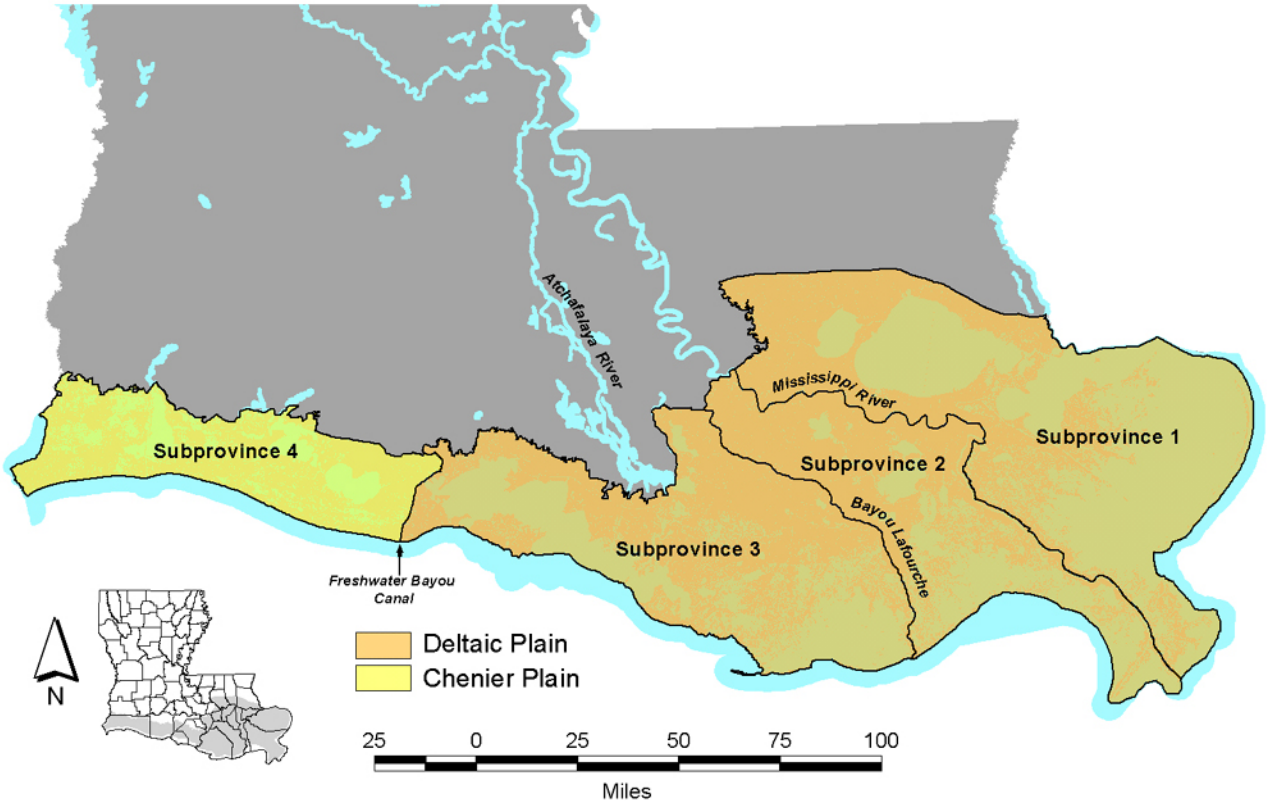


Figure 4. LCA study area and sub-provinces.

The LCA Plan is based upon the extensive experience gained through the on-going CWPPRA implementation effort, best available science and engineering, professional judgment, and other extensive experience in coastal restoration in Louisiana and beyond. The LCA Plan identifies, evaluates, and recommends to decision makers an appropriate, coordinated, and feasible course of action to address the identified critical water resource problems and restoration opportunities in coastal Louisiana. The LCA Study report provides a complete presentation of the study process, results, and findings; indicates compliance with applicable statutes, executive orders, and policies; documents the Federal and non-federal interest; and provides a sound and documented basis for decision makers at all levels to evaluate the request for:

- Specific authorization for implementation of five near-term critical restoration features for which construction can begin within 5 years to 10 years, subject to approval of feasibility-level decision documents by the Secretary of the Army (hereinafter referred to

as “conditional authorization” in the Main Report and accompanying Final Environmental Impact Statement);
- Programmatic Authorization of a Science and Technology Program;
- Programmatic Authorization of Science and Technology Program Demonstration Projects;
- Programmatic Authorization for the Beneficial Use of Dredged Material;
- Programmatic Authorization for Investigations of Modification of Existing Structures;
- Approval of 10 additional near-term critical restoration features and authorization for investigations to prepare necessary feasibility-level reports to be used to present recommendations for potential future Congressional authorizations (hereinafter referred to as “Congressional authorization”); and
- Approval of investigations for assessing six potentially promising large-scale and long-term restoration concepts.

Authorization of the near-term LCA Plan by Title VII of WRDA 2007 has initiated the development of a series of feasibility-level decision documents that would provide detailed project justification, design, and implementation data. These future feasibility-level decision documents would support requests for project construction and would provide the basis for the implementation of the plan documented in this study report.

The authorized LCA Plan includes $100 million in programmatic authority to allow for the extra cost needed for beneficial use of dredged material over a 10-year period. Funds from the BUDMAT Program would be used for disposal activities associated with separate, cost-shared, individual ecosystem restoration beneficial use projects that are above and beyond the disposal activities that are covered under the USACE O&M maintenance dredging Federal Standard. The Federal Standard for dredged material disposal is the least costly alternative, consistent with sound engineering and scientific practices and meeting applicable Federal environmental statutes. Of the $100 million recommended for the BUDMAT Program, approximately 15 percent would be used for planning, engineering, and design activities, and real estate acquisition for beneficial use projects implemented under the BUDMAT Program, and the remaining $85 million would be used for placement of dredged material within the beneficial use disposal sites. The cost breakdown was based on historical averages for similar beneficial use projects carried out by CEMVN under the CWPPRA Program. Contingencies, construction management and monitoring costs were included in the construction costs, while the Planning, Engineering, and Design costs include environmental planning and compliance costs and real estate costs (which were typically significantly less than one percent of the total costs)

The ROD on the LCA Study was signed on November 18, 2005.

1.9.2 Environmental Assessment No. 51, Deposition of Dredged Material within the Developing Atchafalaya River Delta

This Environmental Assessment (EA) covers the disposal of dredged material from the lower Atchafalaya River on the east side of the channel in the developing delta. By doing so, no

additional fresh marsh behind the currently used disposal areas on the west side would be disturbed, and the eroding delta islands on the east side could be rehabilitated.

The Finding of No Significant Impacts (FONSI) was signed on August 28, 1985.

1.9.3 Environmental Assessment No. 62, Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana

This EA was created to address the need to study possible impact by three proposed modified features to the original Deep-Draft dredging project, those being:

- Marsh Creation,
- Interim Saltwater Intrusion Mitigation, and
- Dredged Material Disposal Areas.

The original project, filed with the EPA in July 1982, deepened the 40-foot channel between the Gulf of Mexico and Baton Rouge to 55 feet. The modifications were added as an EA after the EIS was filed with the EPA.

Description of Action

The CEMVN proposed to modify three features of the Mississippi River Ship Channel, Gulf to Baton Rouge, Louisiana (Deep-Draft) Project. The first modification provided for an alternative use of 5 million cubic yards (28 percent of total) of material, which was hydraulically dredged during construction of the 45-foot increment of the Deep-Draft project. This material was proposed to be used as bank stabilization instead of marsh creation. The FONSI attached to the EA, dated April 27, 1997, states that "this modification would result in a 350-acre reduction in the maximum acreages of marsh (18,000 acres or 35,000 acres) expected to be created with the 45-foot-deep or 55-foot-deep channels, respectively, over the 50-year project life."

The second modification provided for the construction of barge mooring facilities at Mississippi River Miles 18.6, 49.7, and 49.0 above Head of Passes adjacent to existing water treatment plants. Approximately 1,300 square feet of river bottom was covered by 280 cubic yards of rock while 18 steel piles were driven into the river bottom during the construction of the mooring facilities. Barges moored at these facilities contained raw water used as an alternate water source during periods when saltwater intrusion, caused by the channel construction, made the river water unsuitable as a water source.

The third modification provided a 230-acre dredged material disposal area at Brant Island, located within the Delta National Wildlife Refuge.

The FONSI was signed on April 21, 1997.

1.9.4 Environmental Assessment No. 77, Marsh Creation, Mississippi River Outlets, Louisiana

This EA covers the proposal to create marsh within a 575-acre disposal site along Baptiste Collette Bayou and a 400-acre site along Tiger Pass. The material would be removed from these navigational channels with a hydraulic dredge during routine maintenance dredging and placed in the sites unconfined.

Description of Action

Because the existing marsh creation disposal areas near the entrance channel are nearing capacity, the CEMVN proposes to designate two additional sites. The Baptiste Collette disposal site consists of a 575-acre area located toward the northwest from the west jetty, and about 500,000 cubic yards of material would be placed in this area annually. The Tiger Pass area would be dredged every 2.5 – 3 years, and about 400,000 cubic yards of material would be placed in a 400-acre site north of the channel during each dredging cycle. The material taken from both channels would be removed with a hydraulic dredge and placed into the unconfined disposal areas to an initial elevation of approximately 5 feet NGVD. After consolidation and compaction, the final design elevation of 1.5 – 2.5 feet NGVD is anticipated.

The FONSI was signed on September 12, 1988.

1.9.5 Environmental Assessment No. 94, Bayou Lafourche Maintenance Dredging, Larose to Leeville, Louisiana

This EA covers the proposal to perform essential maintenance dredging of approximately 4.0 miles of Bayou Lafourche between Yankee Canal (Mile 19.5) and Golden Meadow (Mile 23.4). Dredged material would be utilized to create marsh adjacent to the waterway.

Description of Action

Approximately 200,000 cubic yards of fine-grained sand, silt, and clay would be removed at the first maintenance and every 15 years thereafter. The dredged material would be placed in shallow, open-water areas within previously used or unused confined disposal sites adjacent to the Bayou Lafourche Waterway. In all disposal operations, the dredged material would be placed in a manner conducive to marsh creation. The settled height of the material shall be approximately 1.5 mean sea level. To minimize erosion of the newly created marsh, each disposal site would be filled to the maximum extent possible to reduce erosion induced by wave action.

The FONSI was signed on November 13, 1989.

1.9.6 Environmental Assessment No. 127, Proposed Additional Dredging Material Disposal Areas for Operations and Maintenance of the Houma Navigation Canal, Terrebonne Parish, Louisiana

This EA was created to evaluate the impact of the proposed use of dredged material from the Houma Navigation Canal (HNC) for marsh creation and restoration and barrier island nourishment. The project was a modification to the original Composite Environmental

Statement for Operation and Maintenance Dredging of Four Projects Located South of the Gulf Intracoastal Waterway in Terrebonne Parish, Louisiana, and filed with the EPA in April 1976.

Description of Action

The project proposed using material from routine maintenance dredging of shoaled portions of the HNC from mile 36.6 to -3.9 to replenish or create marshes and nourish Wine Island (a barrier Island in Terrebonne Bay). Approximately 450,000 cubic yards of the 2,650,000 cubic yards dredged in routine maintenance would be used to build or restore up to 245 acres of marshes and beach (on Wine Island) as opposed to continuing the practice of impounding the dredge material in upland disposal. Maintaining existing practices would result in the continued degradation of marshes and barrier islands.

The FONSI was signed on September 14, 1990.

1.9.7 Environmental Assessment No. 127A, Disposition of Dredge Material on Wine Island, Terrebonne Parish, Louisiana

This EA was an addendum to EA 127 to address issues raised by brown pelicans found to be nesting on Wine Island after the initial EA was prepared.

Description of Action

The preferred alternative would use 900,000 cubic yards of dredged material on Wine Island to enhance habitat for black skimmers and terns and to restore beaches and dunes. Areas used by pelicans for nesting would be protected with a temporary earthen dike, to prevent dredged material flowing onto the nesting area. The dredged material would be placed either directly on Wine Island to rebuild scrub/shrub habitat for the birds or 1,000 ft offshore to rebuild dunes and beach. The proposed alternatives, no action and depositing all the dredged material in the offshore location were considered inferior because the former would hasten the destruction of Wine Island and the latter would not benefit tern and black skimmer habitat.

The FONSI was signed on October 11, 2002.

1.9.8 Environmental Assessment No. 155, Calcasieu River and Pass, Marsh Creation, Brown Lake and Sabine National Wildlife Refuge, Cameron and Calcasieu Parishes, Louisiana

This EA analyses potential impacts associated with the placement of dredged material removed between Mile 5 – 21 of the Calcasieu River and Pass to create marsh in shallow open water or deteriorating marsh.

Description of Action

The CEMVN proposes to designate two additional disposal sites for beneficial use of dredged material. These marsh restoration sites, Brown Lake and Sabine National Wildlife Refuge (NWR) encompass approximately 5,400 acres and 1,450 acres, respectively. Dredged material removed from shoaled portions of the Calcasieu River and Pass, Louisiana, project

would be used to restore the marsh in these sites. In 1992, approximately 3,870,000 cubic yards of dredged material would be placed for beneficial uses. Approximately 60 acres of marsh near Brown Lake and approximately 150 acres of marsh within the Sabine NWR would be created by disposal of dredged material.

The FONSI was signed on February 2, 1992.

1.9.9 Environmental Assessment No. 207, West Belle Pass Headland Restoration Project, Lafourche Parish, Louisiana

Description of Action

This EA proposes to deposit sediments dredged from Bayou Lafourche and Belle Pass into canals and shallow bays for the purpose of marsh restoration. At least 184 acres of marsh would be expected to be developed. Several earthen canal closures and low-level earthen dikes would be required to semi-confine the dredge material. The west bank of Bayou Lafourche and Belle Pass would be protected with a rock or concrete rip-rap armor beginning at the west Belle Pass jetty and extending north for 17,000 ft. A rock or concrete rip-rap weir with a passageway for vessels would be built in the Evans Canal near its intersection with Bayou Lafourche. The weir would reduce tidal flows and help stabilize existing and restored marsh.

The FONSI was signed on August 4, 1995.

1.9.10 Environmental Assessment No. 207A, West Belle Pass Headland Restoration Project, Lafourche Parish, Louisiana. Supplemental

Description of Action

This EA modifies the previous EA 207 to include the deletion of dredged material disposal into the eastern Tennessee Gas Pipeline Canal; the addition of an earthen confinement dike, with closures of tidal inlets along the south bank of the Evans Canal; a change in the design of the weir proposed for the Evans Canal; addition of an earthen closure along the bank of Belle Pass; and relocation of an earthen closure from one pipeline canal to another.

The FONSI was signed on July 29, 1997.

1.9.11 Environmental Assessment No. 207B, West Belle Pass Headland Restoration Project, Lafourche Parish, Louisiana

Description of Action

This EA proposes to complete the marsh restoration goals of EA 207 and 207A for the West Belle Pass Headland Restoration Project with additional disposal of maintenance material from Bayou Lafourche and Belle Pass into the West Belle Pass project area. The major features of the original CWPPRA project (EA 207) remain unchanged. Much of the original project was constructed in 1998, including the rock armament along Belle Pass and Bayou Lafourche, the rock weir on Evans Canal, and some of the wetlands creation. To complete the wetlands restoration of this area, CWPPRA has teamed up with the CEMVN's O&M program for Bayou

Lafourche and Belle Pass to initiate a second dredged material placement from these navigation channels into the project area for wetlands creation.

Dredged material would be deposited in the bays and canals of the project area to an elevation between +3.5 – 4.0 ft MLG, so that the settled elevation would be approximately the same as nearby healthy marsh, which occurs between +2.0 – 2.5 ft MLG. CWPPRA funds would be used to reconstruct the dike between Bay Toulouse and Timbalier Bay for dredged material containment while O&M funds would be used to move the dredged material into the project area. The Bay Toulouse dike would be reconstructed of vinyl sheet pile and would be approximately 650 ft long, plus the connection of the closure to the remaining dikes, and would be 6 ft MLG in height. The material originally used for this dike was earthen material from the Bay Toulouse. This material was primarily silty sand, which was unable to withstand the environmental conditions present in the project area during the project's initial construction. Vinyl sheet pile was chosen to replace it as a less marsh-damaging alternative to rock, which would require the construction of floatation canals through the project area. This EA also discusses the plans for continued maintenance and use of this site for future disposal of dredged material from Bayou Lafourche and Belle Pass.

The FONSI was signed on June 25, 2006.

1.9.12 Environmental Assessment No. 268b, Mississippi River, Baton Rouge to the Gulf of Mexico, LA, Designation of Additional Disposal Area, Pass a Loutre, South Pass, Plaquemines Parish, Louisiana

This EA proposes to designate and additional disposal area for the beneficial use of shoal material removed during the sediment mining of the hopper dredge open water disposal area (HDDA) located at the heads of Pass a Loutre and South Pass.

Description of Action

With the proposed action, the material removed during the dredging of the HDDA would be placed in a shallow open water area to expand the existing Pass a Loutre disposal area located primarily in the Delta National Wildlife Refuge (NWR) operated by the U.S. Fish and Wildlife Service (USFWS). The proposed disposal area expansion encompasses a total of approximately 3,300 acres of shallow open water and eroding marsh located north of the Pass a Loutre. Of this total, approximately 2,200 acres is composed of shallow open water that is suitable for marsh development. Material removed from the HDDA would be placed unconfined in shallow open water areas in the proposed disposal area expansion as a series of peninsulas. The maximum initial height of the dredged material would be +7.0 feet MLG over a maximum crown width of about 300 feet. If is anticipated that the final settled elevation of the dredged material would be approximately +4.0 to +5.0 feet MLG along the peninsula crowns. These peninsulas would mimic natural peninsulas that are supportive of both nesting habitat for mottled ducks and neotropical migrants along the crowns and emergent intertidal wetland vegetation along the peninsula slopes and fringes. Gaps would be left between each individual peninsula to allow for the continued movement, flow and intertidal exchange of water.

The FONSI was signed on October 3, 2008.

1.9.13 Environmental Assessment No. 305, Mississippi River Outlets, Vicinity of Venice, LA, Baptiste Collette Maintenance Dredging, Beneficial Use of Dredged Material, Plaquemines Parish, Louisiana

This EA proposes to expand the existing disposal areas for the deposition of dredged material, removed from Baptiste Collette Bayou.

Description of Action

The proposed action would increase the capacity of the existing disposal areas located along the left and right descending banks of Baptiste Collette Bayou in Breton Sound. Approximately 1,722 acres of shallow open water along the left descending bank and 2,878 acres of shallow open water along the right descending bank would be dedicated for the beneficial use of dredged material removed from the Baptist Collette navigation channel during routine maintenance activities. The beneficial use includes wetland development and creation/refurbishment of islands for colonial nesting seabirds. Shoal material in the navigation channel would be dredged and discharged suing a hydraulic cutterhead pipeline dredge. Approximately 400,000 to 1.2 million cubic yards of dredged material, consisting mainly of sandy silt, would be removed annually from the routine maintenance dredging of the navigation channel. Dredged material would be discharged in an unconfined manner to a maximum initial height of approximately +8 ft MLG at the spit sites adjacent to the marsh development and about +3.5 ft MLG at the marsh development sites.

The FONSI was signed on January 25, 2000.

1.9.14 Environmental Assessment No. 309, Port Fourchon, Louisiana, Project, Lafourche Parish, Louisiana

This EA covers the proposal to modify the dredging material disposal plan for construction of the Port Fourchon, Louisiana navigation project. Two sites previously designated for wetland creation would not be used.

Description of Action

Material from the navigation channel would be removed with a hydraulic cutterhead dredge and deposited as slurry into designated disposal areas. The proposed plan includes deposition of material from the upstream end of the navigation channel into an abandoned oil well location canal, locally known as the Phillips Canal, to create wetland habitat. Once the canal is filled to capacity, the remaining material from the navigation channel would be deposited along the Gulf of Mexico shoreline. Both of these disposal areas were designated for dredged material disposal in the Port Fourchon EIS. Maintenance dredging of the channel extension and the rest of the inshore reach of the navigation would be expected about every 5 years. Material dredged during maintenance may be placed in the impoundment, depending on its condition after dredging and disposal activities for port expansion are completed. The Phillips Canal may be used for disposal again during maintenance dredging if the elevation is not sufficient for marsh development after project construction.

The FONSI was signed on November 27, 2000.

1.9.15 Environmental Assessment No. 319, Sabine Refuge Marsh Creation, Cameron Parish, Louisiana

This EA addresses using dredged material from the Calcasieu River and Pass (CRP) in open water areas to reestablish marshes that previously existed in those areas. EA 319 partially amends EA 155 by redesignating the location of deposit areas for dredged materials to new locations so that marsh can be restored in new locations.

Description of Action

The preferred alternative would initially use one million cubic yards of dredged material from routine maintenance of CRP. The dredged material would be placed in an 826-acre section of a designated 3,300-acre target area of the Sabine NWR, resulting in the creation of approximately 125 acres of marsh and nourishment of an additional 300 acres. Negative impacts from the placement (e.g., increased turbidity) would be temporary and outweighed by the benefit of recreating lost marshes. The no action alternative would result in continued loss of wetlands.

The FONSI was signed on December 28, 2000.

1.9.16 Environmental Assessment No. 319A, Sabine Refuge Marsh Creation, Cameron Parish, Louisiana

This EA amends EA 319 by altering the route of the pipeline that would carry the dredged material from the CRP to the target fill area.

Description of Action

Other than changing the route of the pipeline to carry dredge material to the fill site, the action is the same as described by EA 319.

The October 23, 2001, FONSI concluded that the project would have no significant impact upon the human environment.

1.9.17 Environmental Assessment No. 319B, Sabine Refuge Marsh Creation, Cameron Parish, Louisiana

This EA amends EAs 319 and 319A by changing the deposit section within the original 3,300-acre target area and also extending the pipeline route and expanding (from 100 to150 or 200 feet) and making permanent portions of the easement for the pipeline.

Description of Action

Using dredged material from routine maintenance of the CRP, carried by pipeline into four additional target sections of approximately 230 acres each (920 acres total), this EA anticipates restoring marshes that have been lost to open water. Additionally, existing marshes and open

water would be nourished by the restored marshes. The no action alternative would result in continued loss and degradation of the marshes.

The FONSI was signed on July 22, 2004.

1.9.18 Environmental Assessment No. 344, Expansion of Existing Avoca Island Disposal Area, St. Mary Parish, Louisiana

This EA was created to designate a 4,200-acre shallow, open-water disposal area for beneficial use placement within Avoca Island of shoal material removed during routine maintenance dredging of the Atchafalaya River and Bayous Chene, Boeuf, and Black Project.

Description of Action

The CEMVN designated approximately 4,200 acres of shallow, open-water in Avoca Island as a beneficial use disposal site for shoal material removed from the Atchafalaya River and Bayous Chene, Boeuf, and Black during routine maintenance of the project. Dredged material was placed within the open waters of the lake to a height conducive to wetlands development (ranging from bottomland hardwood forest to emergent marsh). These wetlands are hydrologically connected to Bayou Chene. Retention dikes were constructed to allow consolidation of dredged material to wetland elevations, to prevent the flow of dredged material into surrounding areas and to prevent erosion.

The FONSI was signed on March 11, 2002.

1.9.19 Environmental Assessment No. 412, Houma Navigational Canal, Additional Disposal Areas, Between Miles 11.0 and 8.0, Terrebonne Parish, Louisiana

This EA was created to designate two subsided and eroded marsh areas, located approximately between Houma Navigational Canal (HNC) Mile 11.0 and Mile 8.0 on both sides of the channel. These areas would be designated as beneficial use disposal areas for the placemen of material removed during routine maintenance dredging of the HNC.

Description of Action

The CEMVN proposes to designate two subsided and eroded march areas, located approximately between HNC Mile 11.0 and Mile 8.0 on both sides of the channel. These areas would be designated as beneficial use disposal areas for the placement of material removed during routine maintenance dredging of the HNC. Dredged material slurry would be discharged into shallow open water areas of these sites to an initial height not to exceed approximately +3.0 feet (NAVD 88) for wetlands development, with an anticipated target elevation following dewatering and compaction of about +1.5 to +1.0 feet (NAVD 88). Dredged material slurry would be allowed to overflow over existing emergent marsh vegetation, but would not be allowed to exceed a height of about one foot above the existing marsh elevation. Retention dikes and/or closures would be constructed as necessary to prevent the flow of dredged material from re-entering the HNC and adjacent waterways. Such dikes and closures would also serve to protect the disposal areas from wave erosion. All attempts would be made to breach the dikes

between dredging cycles (i.e., within two to three years), or on an as needed basis following the coordination with state and Federal natural resource agencies.

The FONSI was signed on February 3, 2009.

1.9.20 Environmental Assessment No. 435, Sabine Refuge Operations and Maintenance Beneficial Use Marsh Creation Disposal Area, Cameron Parish, Louisiana

This EA was created to designate a failed 4,900-acre freshwater impoundment as an unconfined beneficial use area for four million cubic yards of dredged material from the routine maintenance of the CRP to restore marshes in the unit.

Description of Action

The USACE designated 4,900 acres of shallow open water and eroding marsh as a beneficial use disposal site for dredge material from miles 5 to 14 of the CRP. Approximately four million cubic yards is dredged every two years and had previously been disposed of in upland impoundments. The dredged material would be carried to the fill area via pipeline. Construction of the pipeline would temporarily impact 7.8 acres of shrub/scrub, emergent marsh, and shallow open water. The amount of wetlands created would depend on the funds available for the project. The no action option would result in continued degradation of wetlands.

The FONSI was signed on August 15, 2006.

1.9.21 Environmental Assessment No. 451, Houma Navigational Canal, Additional Disposal Areas, Terrebonne Parish, Louisiana

This EA was prepared to designate four dredge disposal areas, located approximately between Houma Navigational Canal (HNC) Mile 28.0 and Mile 18.0 along the west side of the channel near Theriot, Louisiana in Terrebonne Parish. These areas would be designated as beneficial use disposal areas for the placement of material removed during routine maintenance dredging of the HNC.

Description of Action

The proposed action consists of designating four dredge disposal areas, located approximately between Houma Navigational Canal (HNC) Mile 28.0 and Mile 18.0 along the west side of the channel near Theriot, Louisiana in Terrebonne Parish. These areas would be designated as beneficial use disposal areas for the placement of material removed during routine maintenance dredging of the HNC. Dredged material slurry would be discharged into shallow open water areas of these sites to an initial height not to exceed approximately +3.0 feet for wetlands development, with an anticipated target elevation following dewatering and compaction of approximately +15 feet to +1.0 feet. Dredged material slurry would be allowed to overflow

over existing emergent march vegetation, but would not be allowed to exceed a height of about one foot above the existing marsh elevation, Retention dikes and closures would be constructed as necessary to prevent the flow of dredged material from re-entering the HNC and adjacent waterway. Such dikes and closures would serve to protect the disposal areas from waver erosion. Containment dikes would be breached during the next dredging cycle if they do not naturally degrade.

The FONSI was signed on July 25, 2008.

1.9.22 Environmental Assessment No. 460, Calcasieu River and Pass, Marcantel O&M Beneficial Use Marsh Creation Disposal Area, Cameron Parish, Louisiana

This EA was prepared to evaluate the potential impacts associated with the disposal of dredged material from the routine maintenance of the Calcasieu River and Pass for marsh restoration in a new disposal site referred to as the Marcantel Site Beneficial Use Disposal Area (MS-BUDA).

Description of Action

The proposed action consists of designating an approximately 707 acre area of predominantly shallow open water and eroded marsh for beneficial use of dredged material known as the Marcantel Site beneficial use disposal area (MS-BUDA). The site is located approximately 5.5 miles west of the Calcasieu River and Pass and 1 mile south of the GIWW at river mile 248, Cameron Parish, LA. A hydraulic cutter-head pipeline dredge would remove dredged material from the Calcasieu River and Pass during routine maintenance of the waterway and place the material either confined and/or semi-confined into shallow open water areas within the MS-BUDA for marsh creation. Also included in the project is the construction of a salt-water barrier along the north-northwest rim of Black Lake, which is the south-southeast boundary of MS-BUDA.

The FONSI was signed on February 12, 2008.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

There are many opportunities to use dredged material beneficially in coastal Louisiana. However, there is also limited funding available for the beneficial use of dredged material as the BUDMAT Program funding is $100M over a 10-year period. Therefore, there is a need to develop guidance for selecting, designing and constructing future site-specific beneficial use projects implemented under the BUDMAT Program. This chapter describes the formulation, evaluation, and selection of alternatives for implementation of the BUDMAT Program.

2.1 ALTERNATIVES SCREENING PROCESS

An interagency Project Delivery Team (PDT) was assembled to conduct the prerequisite studies and analyses and develop the alternative plans and report for the BUDMAT Program. The team was composed of staff from the USACE, State of Louisiana (the non-federal sponsor), USFWS, NMFS, USEPA, USGS, and the NRCS.

The most suitable BUDMAT Plan is identified as the one that best meets the study objectives, is based upon identification of the most critical natural and human ecological needs, and proposes a program of highly cost effective features to address those needs. During program implementation, decision documents similar to the planning and design analysis described in the Engineer Regulation 1105-2-100, Planning Guidance Notebook, Appendix F: Continuing Authorities Program, would be developed to the level of detail necessary to justify site-specific beneficial use projects using National Environmental Restoration (NER) analyses and National Economic Development (NED) analyses, if applicable.

2.2 ALTERNATIVES CONSIDERED AND ELIMINATED, OR REQUIRING FURTHER STUDY

The construction authorization language in WRDA 2007 requires that this project consider the use of sediments from the Illinois River system. These sediments could come from dredging by the State of Illinois or O&M dredging by the USACE Rock Island District, as the WRDA 2007 only stipulates “sediment from the Illinois River System” not which agency is doing the dredging. The State of Illinois has used their dredge material beneficially on various projects within the state. However, the use of these materials beyond the Illinois state boundary presents several issues including the logistics of getting the material from Illinois to Louisiana, getting the material to a project site, and laws regulating the interstate transport of soil.

Although the authorization language in WRDA 2007 is brief, the question remains as to how the material would be transported from Illinois to Louisiana and what funding would cover the transportation costs? Currently, there is not sufficient funding in the BUDMAT Program to fund beneficial use of all the material from the O&M dredging of federally maintained waterways within Louisiana. If the BUDMAT program were to absorb the cost of transporting the Illinois

sediments, then even less funding would be available for the actual construction of projects such as marsh restoration, marsh nourishment, barrier island restoration, or ridge restoration.

If outside funding sources were to cover the cost of transport from the dredge site in Illinois to a dock in Louisiana, such as the Port of Baton Rouge or the Port of New Orleans, assuming the material would arrive by barge, the question remains on if the BUDMAT program would then absorb the cost of transport the material from the port to a project site. The material would then have to be removed from the transport vessel, and moved to the restoration site, which would incur an additional cost. If another funding source covered the transport costs of the sediments from the dredge site in Illinois to the restoration site in Louisiana, only then would it become cost effective compared to using Louisiana O&M dredge sediments.

Third, the interstate transport of soil is federally regulated because it can contain diseases and pests such as animal and plant viruses, bacteria, fungi, nematodes, noxious weeds, and the life stages of destructive insects. Soil from all foreign countries and from many states in the U.S. can be moved only if conditions and safeguards prescribed by the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) are met. Federal requirements that allow soil to move through the U.S. state that the soil must be in leak-proof containers that can withstand shipping. Soil must be treated before disposal or further use in the U.S. Two treatments are authorized for soil: (1) Dry heat at 250º F for at least two hours, (2) Steam heat at the same temperature for 30 minutes at 15 pounds of pressure (USDA APHIS circular Q-330.300.1).

For these and other possible reasons, the use of the Illinois River sediments would require additional study and is beyond the scope of this study.

2.3 BUDMAT PROGRAM FUNCTIONAL REQUIREMENTS AND PROGRAM STRUCTURE

At the beginning of the plan formulation process, the Project Delivery Team (PDT) identified the functions that must be carried out under the BUDMAT Program. Once the program functions were identified, plan formulation was carried out to develop and evaluate program alternatives.

2.3.1 BUDMAT Program Functional Requirements

The evaluation of functional requirements for the BUDMAT Program carried out by the PDT determined that the plan formulation process must address the following functional requirements:

- The overall structure of the program must be specified, based on existing program structures or a program structure developed to address the BUDMAT program objectives.
- The annual process for soliciting candidate projects to identify potential BUDMAT projects.
- The annual process for screening which candidate projects will be carried forward for project design. This screening process must provide the methodology for ensuring that the candidate projects that have the greatest potential to provide ecosystem restoration

benefits in a cost effective manner consistent with the objectives of the BUDMAT program are recommended for further site-specific project planning and design, including real estate planning and environmental studies.

- The process for planning and design of projects identified through solicitation and screening must specify the procedures for development and evaluation of project alternatives, including an analysis of the ecologic benefits and cost-effectiveness of the alternatives.
- The annual process for selecting which projects with completed designs will be recommended for construction. This selection process must ensure that only cost effective projects consistent with the objectives of the BUDMAT program are recommended for construction.

2.3.1.1 Development and Evaluation of Program Structure Alternatives

Initial plan formulation was carried out to develop preliminary program structure alternatives for the BUDMAT Program. The PDT identified two basic approaches for development of program structure alternatives: 1) adopt program structures based on existing ecosystem restoration programs for coastal Louisiana, and 2) formulate new program structures to implement the BUDMAT Program. First, the PDT evaluated existing program alternatives to determine whether these alternatives address the objectives and functions of the BUDMAT Program.

2.3.1.2 Preliminary Program Alternatives Based on Existing Programs

2.3.1.2.1 No Action Alternative

With the no action plan, it is assumed that the BUDMAT Program would not be implemented by the Federal Government or by local interests to achieve the planning objectives. The no action alternative plan is the plan to which all other alternative plans are measured.

2.3.1.2.2 CWPPRA Based Alternative

Under this alternative, the processes for identifying, selecting and implementing beneficial use projects would rely on the CWPPRA planning, design and construction procedures. The CWPPRA based alternative includes the weighted scoring of eight criteria to develop one numerical scoring for a given Louisiana restoration project. The eight criteria with their respective weights are: (1) Cost-effectiveness (20 percent), (2) Area of need/high loss area (15 percent), (3) Implementability (15 percent), (4) Certainty of Benefits (10 percent), (5) Sustainability (10 percent), (6) riverine/freshwater input (10 percent), (7) sediment input (10 percent), (8) maintaining or establishing landscape features (10 percent).

2.3.1.2.3 CAP Section 204 Based Alternative

This alternative includes following the guidelines established for Section 204 of the Water Resources Development Act of 1992, as amended, which provides authority to use dredged material from new or existing Federal projects to protect, restore, or create aquatic and

ecologically related habitats, including wetlands. The cost sharing (25 percent non-federal, 75 percent federal) would be applied to the incremental cost above the least cost method of dredged material disposal consistent with engineering and environmental criteria. Work under this authority provides for the use of dredged material from new or existing Federal projects to protect, restore, or create aquatic and ecologically related habitats, including wetlands. In addition to the benefits justifying the costs, the project must not result in environmental degradation. The CAP Section 204 Program has some flexibility in the planning process used to determine the project alternative that will proceed to the design and construction stage.

2.3.1.3 Evaluation of Preliminary Program Structure Alternatives

To be considered for implementation, potential program structure alternatives must meet two requirements:

- The program structure must provide a program focus that meets the objectives of the BUDMAT Program, as described in section 1.6.
- The program structure must provide procedures to carry out the functions of the BUDMAT Program listed in section 2.3.1.

The PDT evaluated the existing program structures using these requirements to identify the components of existing programs that could be adopted or modified for the BUDMAT Program. Making use of existing programs or program elements would allow the program partners to take advantage of previous experience in carrying out similar program functions while reducing the uncertainty and level of effort associated with developing and implementing the BUDMAT Program.

2.3.1.3.1 No Action

The No Action Alternative was found not to provide any contribution towards achieving the objective of the BUDMAT Program. However, the No Action Alternative is carried forward in the study to meet the planning requirements to analyze future without project conditions, and to meet the requirements of the accompanying NEPA document. The No Action Alternative provides a baseline for assessing the outputs and cost effectiveness of other alternatives.

2.3.1.3.2 CWPPRA Based Alternative

The CWPPRA Based Alternative at least partially addresses the objectives of the BUDMAT Program through its demonstrated performance in identifying, selecting, designing and implementing ecosystem restoration projects in coastal Louisiana. However, the PDT determined that the CWPPRA Based Alternative could not be shown to be fully consistent with the objectives of the BUDMAT Program, based on the fact that the program addresses a variety of ecosystem restoration projects, selects projects based on a number of considerations that do not address the opportunity to use dredged material generated by maintenance operations, and its program processes have not been carried out in strict coordination with scheduled and anticipated dredging events that provide material for beneficial use across coastal Louisiana.

2.3.1.3.3 CAP 204 Based Alternative

The CAP Section 204 Program Based Alternative partially addresses the objectives of the BUDMAT Program through its demonstrated performance in selecting, designing and implementing ecosystem restoration projects in coastal Louisiana that make use of the opportunities provided by dredged material from federally maintained waterways. The program structure and processes provide the framework for formulating and evaluating project alternatives, identifying cost-effective and justifiable restoration plans, and completing designs and implementing restoration projects in conjunction with ongoing dredging operations.

2.3.1.3.4 Conclusion

The PDT determined that the existing programs would partially address the objectives of the BUMDAT Program, the team compared the existing programs to the required BUDMAT program functions identified in section 2.3.1. This evaluation determined that the CWPPRA Based alternative partially addresses the requirements for the project solicitation, while the CAP Section 204 based alternative meets the BUDMAT Program requirements for project planning and design. To complete the plan formulation for the program structure, the PDT then developed the Customized Program alternative that incorporates the relevant existing program elements and provides the additional functions needed for program implementation. The Customized Program alternative for the BUDMAT Program structure is described in the following section.

2.3.1.5 Customized Program Alternative

The Customized Program alternative would utilize a proactive, streamlined approach to achieve the objectives of the BUDMAT Program. The approach is adapted from the decision-making process outlined in the EPA/USACE Beneficial Use Planning Manual (EPA, USACE 2007). This alternative will proactively conduct project selection and planning processes to provide completed plans and specifications that can be incorporated into dredging contracts when the O&M maintenance dredging that provides material for the projects is carried out. This approach contributes to the effective implementation of the BUDMAT program, as it ensures beneficial use projects are aligned with the opportunities provided by maintenance dredging operations. This alternative focuses on project selection criteria and design requirements that are applicable to projects that beneficially use dredged material.

2.3.1.6 Comparison of Final Program Structure Alternatives

Based on the evaluation of the initial alternatives in section 2.3.1, two final alternative plans were compared using the four criteria (acceptability, completeness, effectiveness, and efficiency) specified in the USACE Planning Guidance Notebook. These two final alternatives were the no action alternative and the BUDMAT program alternative.

Acceptability is the extent to which the alternative plans are acceptable in terms of applicable law, regulations and public policies. Completeness is the extent to which an alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planning objectives. It is an indication of the degree that the outputs of the plan

are dependent upon the actions of others. Effectiveness is the extent to which an alternative plan contributes to achieving the planning objectives. Efficiency is the extent to which an alternative plan is the most cost effective means of achieving the objectives.

2.3.1.6.1 No Action

As stated previously, the no action plan, assumes that no BUDMAT Program would be implemented by the Federal Government or by local interests to achieve the planning objectives. The no action alternative plan is the plan to which all other alternative plans are measured.

The no action alternative is acceptable in terms of public law and regulation in that it violates neither. However it does not meet the acceptability criterion because it does not address the public policy, previously documented in the LCA Study and further defined in the EPA/USACE Beneficial Use Planning Manual, of the need for increased use of dredged materials for beneficial use. The no-action alternative does not meet the completeness criterion because it does not provide any means to realize the planning objectives of this program; namely to optimize and increase the beneficial use of dredged material from the maintenance of CEMVN's authorized navigation channels. The no-action alternative does not meet the effectiveness criterion because it does not achieve the planning objective of maximizing usage of dredged materials. The no-action alternative does not achieve the objectives of the program. Therefore, the cost effectiveness of this alternative cannot be evaluated.

2.3.1.6.2 Customized Program Alternative Description

The customized program alternative, would utilize a proactive, streamlined approach to achieve the goals of the customized program. The approach includes selective use of proactive design processes, a customized, qualitative site selection methodology, and potential use of pre-construction measures for designs that are already complete.

Under the customized program, more dredged material would be disposed beneficially. A range of 3,400 acres to 21,000 acres of wetlands could be created over the 10-yr, $100 M customized program. Environmental conditions would improve through the creation and/or restoration of marsh and wetlands. The economic condition in the area would improve due to long-term improvement in fisheries and wildlife. The negative impacts of deterioration of marshes and wetlands would be reduced through increased land cover, increased habitat, improved water quality, increased storm surge protection, and reduced saltwater intrusion.

By incorporating CAP Section 204 guidance and the EPA/USACE Beneficial Use Planning Manual, the Customized Program meets the acceptability criterion with respect to regulations. The Customized Program alternative was also developed in coordination with local, state and Federal stakeholders, therefore is acceptable to local, state, and federal stakeholders. The Customized Program is complete in that it is a stand alone program. While the BUDMAT Program is inherently linked to CEMVN's maintenance dredging activities, it is a distinctly separate program with funding to cover the disposal activities for separate, cost-shared, individual beneficial use projects above and beyond the disposal activities that are covered under the USACE O&M dredging Federal standard. By providing only the funding to cover the

disposal activities for separate, cost-shared, individual beneficial use projects above and beyond the disposal activities that are covered under the USACE maintenance dredging Federal standard, the Customized Program is extremely effective for promoting the use of dredged material beneficially. The Customized Program will achieve its objectives by providing the most benefits for the costs incurred to select, plan, design and implement the beneficial use projects. Because the Customized Program adopts the planning and design process for projects established for the CAP Section 204 Program, alternatives for each project will be developed and analyzed to identify the most cost-effective plan for implementation. In addition, the selected plans for each project will be evaluated to ensure that the cost is reasonable, based on costs and benefits provided by similar projects that have also been completed in coastal Louisiana. Because the program must also select among multiple candidate beneficial use projects for planning and design studies, a preliminary evaluation of cost-effectiveness will also be a factor in the screening of candidate projects.

2.3.2 Program Structure Alternative Selection

Based on the comparison evaluation provided above, the Customized Program alternative plan is tentatively selected because it is the only plan that meets all four evaluation criteria: acceptability, completeness, effectiveness, and efficiency.

2.3.2.1 Formulation of the Project Solicitation Process

The BUDMAT Program must provide a process for identifying candidate projects that can be evaluated for the project design and construction phases. As described in section 2.3.1.3, the PDT evaluated existing program alternatives with respect to their capability to solicit potential projects for the BUDMAT Program. Of the existing program alternatives, the CWPPRA Based Alternative was found to partially satisfy the requirements for the BUDMAT Program. In addition to the CWPPRA-based solicitation process, the PDT identified two additional opportunities to solicit candidate projects that could be incorporated into the Customized Program Alternative:

- Solicitation of candidate projects for the BUDMAT Program at meetings of the Coastal Protection and Restoration Authority
- Coordination of project solicitation for the BUDMAT Program with the annual CEMVN Environmental Dredging Conference

Approaches for the project solicitation process must meet the functional requirements presented in the following section:

2.3.2.2 Requirements for the Solicitation Process

The various approaches identified for developing the project solicitation process available to the BUDMAT Program must address the functional requirements identified by the PDT. These requirements include:

- Scheduling Requirements – The amount of time that would be necessary to setup, coordinate and execute the project solicitation process. It was determined that the solicitation process should include input at the annual Environmental Dredging Conference held in May of each year. This provides four months to complete the

screening of nominated projects and to carry out project selection so that design studies and related efforts could be initiated at the start of the next Federal fiscal year.

- Comprehensiveness – This consideration indicates to what extent the approach would address beneficial use projects throughout Louisiana on a coast wide basis. By identifying opportunities for beneficial use across coastal Louisiana, the solicitation process would allow the BUDMAT program to identify the restoration opportunities that provide the most benefits and that are best aligned with the program objectives.

2.3.2.3 Evaluation of Approaches for the Solicitation Process

Based on the requirements for the BUDMAT Program identified during plan formulation for the Customized Program alternative, the approaches for project solicitation were evaluated against each of the implementation considerations.

2.3.2.3.1 Utilize CWPPRA Program

This approach would take advantage of the CWPPRA Task Force meetings currently conducted on a quarterly basis to solicit candidate beneficial use projects for the BUDMAT program. The schedule requirements would be minimal as the CWPPRA program already exists, and project nominees would be presented within that process, including short project nominee fact sheets. The CWPPRA program is coast-wide, thus comprehensive in nature. The solicitation presentations would convey that the BUDMAT Program is focused on upcoming dredging opportunities.

2.3.2.3.2 Utilize CPRA Program

This approach would take advantage of the State of Louisiana's Coastal Protection and Restoration Authority meetings, currently scheduled on a monthly basis, to solicit candidate beneficial use projects for the BUDMAT Program. The schedule requirements would be minimal as project nominees would be presented within the monthly meeting process, including short project nominee fact sheets. The CPRA program is coast-wide, thus comprehensive in nature.

2.3.2.3.3 Utilize Environmental Dredging Conference

This approach would take advantage of the annual Environmental Dredging Conference to solicit candidate beneficial use projects for the BUDMAT program. The schedule requirements would be minimal as the dredging conference meets annually and project nominees would be presented within that process, including short project nominee fact sheets. As the dredging conference is primarily a partnering conference with dredging stakeholders, the nominated projects would likely be based on science or best professional judgment.

2.3.2.4 Minimum Submittal Requirements for Nominated Projects

The project solicitation process could result in a large number of nominated projects. To efficiently evaluate nominated projects, it is necessary to define minimal requirements for

nominating projects, without which project nomination cannot go forward. The minimum requirement for nominating a project is a factsheet with a map showing the proposed beneficial use site placement area. The factsheet should include: proposed project name, proposed location, problem statement, project description with purpose/goals, navigation channel reach to be dredged for beneficial use source material, distance from dredge reach to beneficial use project site, and project sponsor with contact information.

2.3.2.5 Initial Screening of Nominated Projects

Those projects that meet the submittal requirements would then be screened by the Project Evaluation Team (PET) with pass/fail criteria that are meant to ensure that the beneficial use projects meet the minimum goals and objectives, including the authorization and scope of the BUDMAT Program. Initial screening criteria are as follows:

- Proposed beneficial use project is clearly above the federal standard base plan for disposal of dredged material as part of the operations and maintenance of authorized federal navigation channels.
- There is no knowledge of or reason to believe that hazardous, toxic, or radioactive wastes (HTRW) exist at the proposed placement sites of a proposed beneficial use project.
- There are no known or suspected cultural resources at the proposed placement sites of a proposed beneficial use project.
- The navigation channel reach for the source material for a proposed beneficial use project is scheduled to be dredged under the CEMVN O&M program within 3 years.
- The distance from the dredging reach of the navigation channel (or the terminus of an existing permanent long distance sediment pipeline) to the placement site of a proposed beneficial use project is within the maximum practical distance as described in section 1.8.2. As technology improves, this distance is expected to increase.
- A beneficial use project is not being planned or designed that would use the identical sediment generated by the upcoming scheduled maintenance dredging event.

2.3.2.6 Formulation of the Project Screening Process for Design

For the project selection process for design, three aspects must be developed in detail:

- The composition of the team that would carry out the project selection process to recommend specific candidate projects for design,
- The method that would be used to evaluate criteria in the selection of project locations for design, and
- The criteria used to select projects for design, including the conditions used to assign values to each criterion and the procedure used to compare rankings of candidate projects and to select projects to be recommended for design.

2.3.2.7 Method for Assessment of Criteria in Project Screening for Design

In addition to the composition of the team conducting the selection process, the specific method used to evaluate candidate projects with respect to program objectives should be

provided in sufficient detail to guide program implementation. The PDT determined that project screening would be carried out by assigning a categorical value to candidate projects for each project screening criterion. The category ranking of candidate projects for each program objective criterion is compatible with the type and quality of data routinely available for candidate projects.

2.3.2.8 Criteria and Value Assignments for Project Screening for Design

2.3.2.8.1 Development of Screening Criteria

Criteria for screening potential beneficial use projects are included in the project screening process based on two considerations:

- Relevance of each criterion to the objectives of the BUDMAT Program, and
- Ability of the criteria for identifying potential projects that will ultimately provide ecosystem restoration benefits in a cost-effective manner.

The criteria for screening potential projects to be carried forward to the project design process include: protection of critical landscape features, protection of infrastructure, relative cost-effectiveness, synergy with other restoration projects, and implementation complexity.

2.3.2.8.1.1 Protection of Critical Landscape Features

This criterion is adopted directly from the programmatic objectives of the 2004 LCA Study, which provided the basis for the authorization of the BUDMAT Program. Critical landscape features were identified in the 2004 LCA Study as features that contribute to the hydrologic and ecologic functions of coastal Louisiana, including natural geomorphic structures such as barrier islands, distributary ridges, cheniers, land bridges and beach and lake rims. Critical landscape features have been identified in the State's Comprehensive Master Plan for a Sustainable Coast (CPRA 2007). Figure 5 illustrates the preliminary inventory of critical landscape features in coastal Louisiana. These features are essential to maintaining the integrity of coastal ecosystems because they contribute to the stability of diverse habitats throughout the region and in many instances represent the first line of defense against marine influences and tropical storm events.

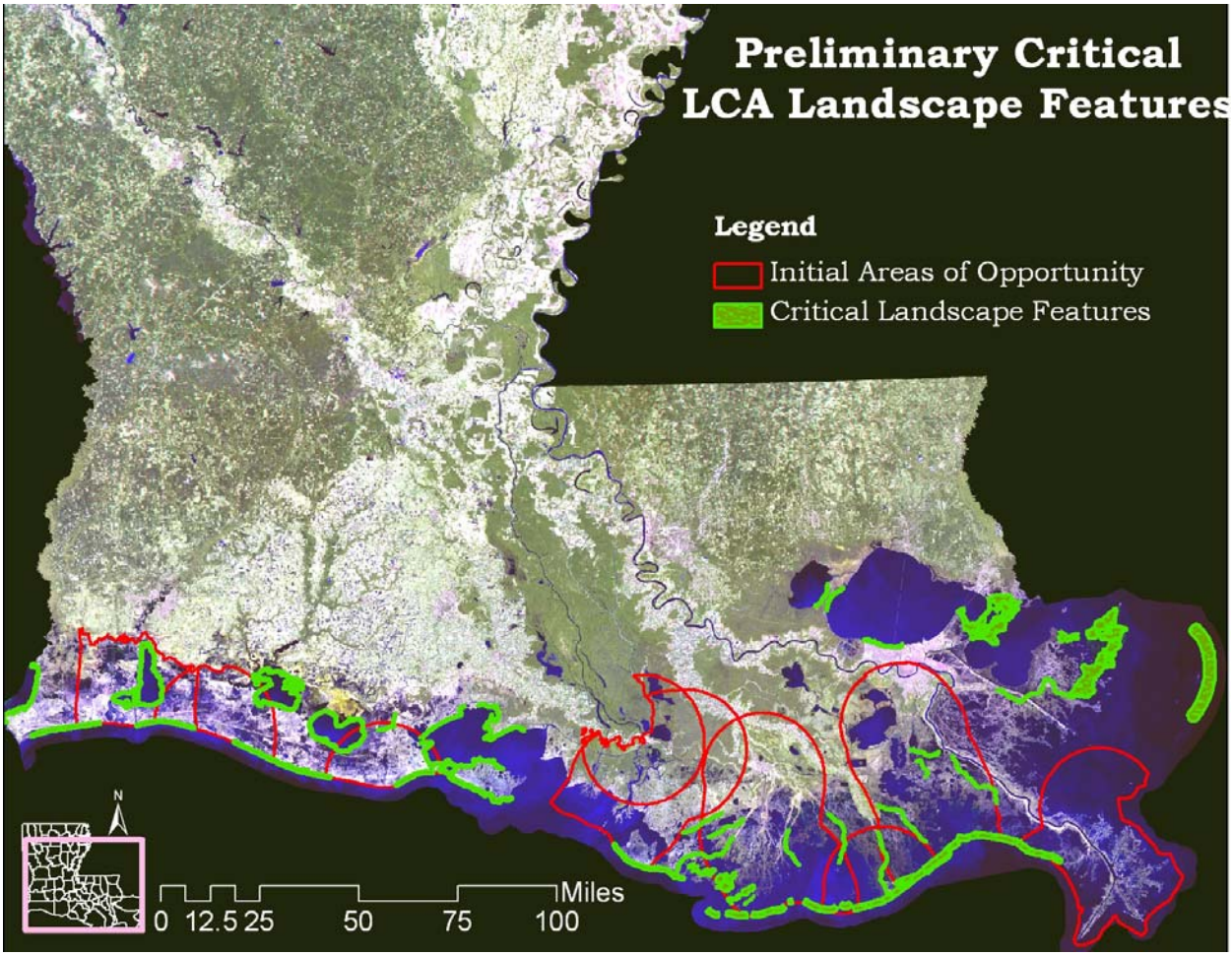


Figure 5. Critical Landscape Features in the Louisiana Coastal Area.

A potential project would be given a high ranking for this criterion where the potential project addresses a degraded or lost segment of a feature that restores their continuity and integrity with respect to surrounding areas where the landscape still retains its form and function. To receive a medium ranking for this criterion, a candidate project must meet one of the following conditions: It must restore a degraded or lost segment of a critical landscape feature that partially contributes to the historic extent of the feature, or it must address shoreline erosion or interior land loss that will threaten the integrity and continuity of the feature within the next 10 years if currently observed loss rates continue over that time period. Potential projects that restore non-continuous portions of critical landscape features or that restore adjacent wetlands along non-continuous segments of these features would be given a ranking of low for this criterion. Restoration or protection of isolated portions of these features do not provide any demonstrated benefit because these projects would not restore the function and continuity of critical landscape features, or would not provide protection from near-term foreseeable land loss that would threaten the features.

2.3.2.8.1.2 Protection of Infrastructure

Similar to protection of critical landscape features, this criterion is adopted directly from programmatic objectives of the 2004 LCA Study. While this objective addresses a number of socioeconomic resources and values, such as communities, economic activities and cultural values, critical infrastructure (figure 6) was determined to be the only component of this objective that can be inventoried and assessed for screening of potential projects in the BUDMAT program. Categorical rankings can be assigned for this criterion based on the information that will typically be available for candidate projects identified from the solicitation process. Protection of infrastructure would reduce the increased risk of damage to cultures, communities, business and industry, and flood protection from erosion and coastal flooding. It is estimated that accelerated land loss and ecosystem degradation places over $100 billion of infrastructure at increased risk due to damage from erosion and coastal flooding.

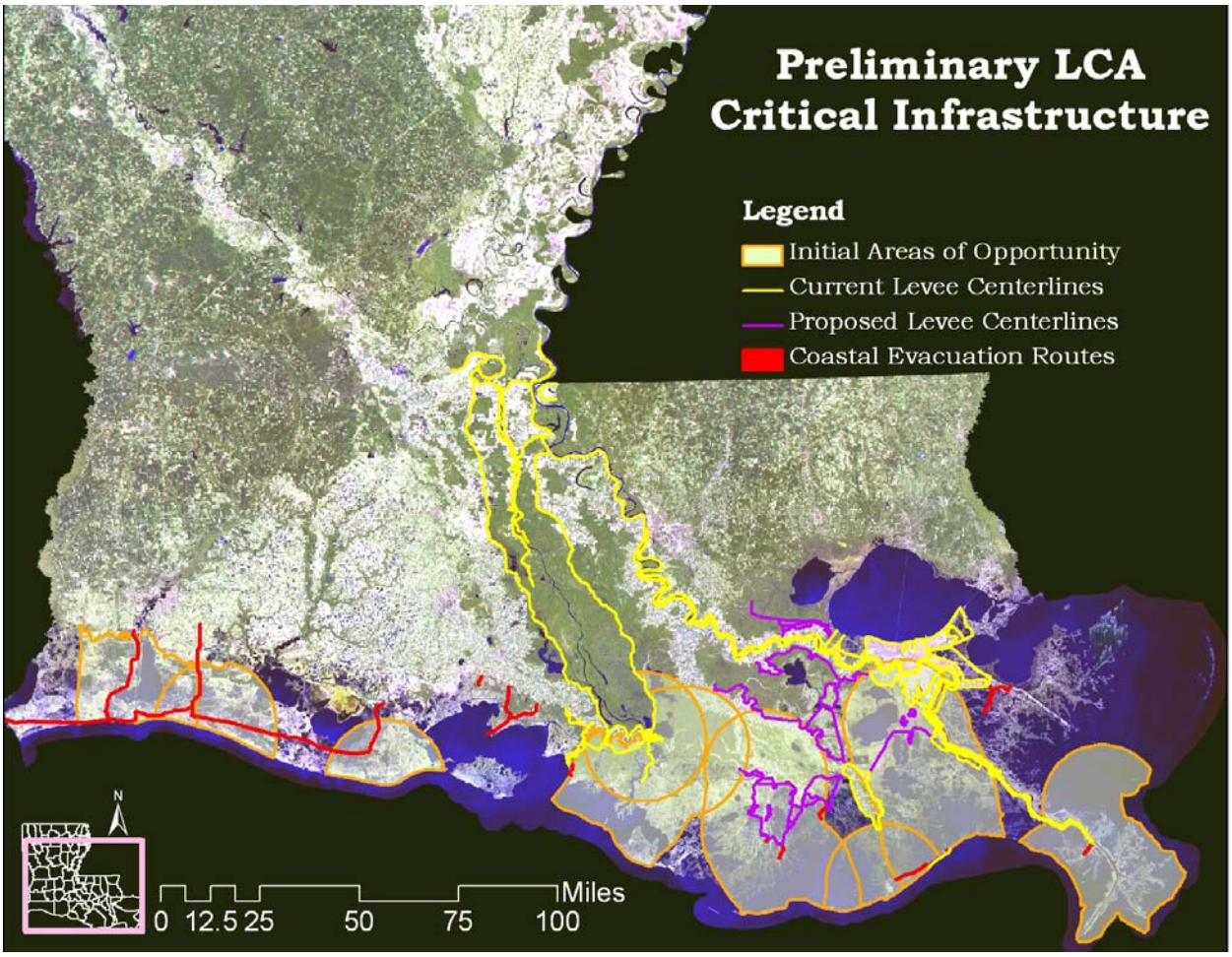


Figure 6. Critical Infrastructure in the Louisiana Coastal Area.

Elements of critical infrastructure include:

- Public facilities including public highways or roads, railroads, and public utilities
- Levees, floodwalls, pump stations, and other flood control and storm damage risk reduction features that serve a public purpose
- Active oil and gas production, transport, and processing facilities that serve a public purpose or aid in the interstate transportation of mineral resources.

A potential project would be given a high ranking for this criterion where the potential project would address a degraded or lost land area that has resulted in open water adjacent to or threatening the stability and use of infrastructure components, such as man-made levees for hurricane and flood damage risk reduction, roads, and communities. To receive a medium ranking for this criterion, a project must address shoreline erosion or interior land loss that would threaten the integrity and use of a component of critical infrastructure within the next 10 years, based on currently observed land loss rates. These restoration efforts would contribute to the protection of critical infrastructure, but do not provide the same degree of restored protection that restoring or replacing land at locations where open water and coastal flooding are already threatening infrastructure, and therefore do not provide as much contribution to the program objective as candidate projects that qualify for a high ranking. Potential projects that do not provide any demonstrated benefit by protecting critical infrastructure would be given a low ranking for this criterion. Beneficial use projects that are not in the vicinity of critical infrastructure where this criterion is considered relevant would also be ranked as low for this criterion.

2.3.2.8.1.3 Relative Cost Effectiveness

Typically, the benefits provided by ecosystem restoration projects are measured as ecologic output, which is expressed as habitat value. These measures of ecological output, such as Average Annual Habitat Units (AAHU) are determined during ecological modeling such as Wetland Value Assessments (WVA), which will not be available for most candidate projects at the time the screening process is carried out. Therefore, for the purpose of screening projects for cost-effectiveness, the size of the project in acres or linear feet will be used. The relative cost-effectiveness criterion is based on the ratio of the preliminary estimated cost to the size of the output for candidate projects being considered for detailed design studies, expressed in dollars per acre of wetland or dollars per linear foot of shoreline.

The historical range of project sizes similar to the projects anticipated in of the BUDMAT program indicate that the most cost-effective third of projects are less than $28,000 per acre for marsh creation/restoration projects and less than $500 per linear feet for shoreline restoration/nourishment projects. Therefore, potential beneficial use projects that fall within these ranges are ranked as high with respect to cost effectiveness. The middle third of projects fall within the range of $28,000 per acre to $103,000 per acre for marsh creation/restoration projects and $500 per linear foot to $1,000 per linear foot for shoreline restoration/ nourishment projects. The lower third of projects are greater than $103,000 per acre for marsh creation/restoration projects and more than $1,000 per linear foot for shoreline restoration/ nourishment projects.

2.3.2.8.1.4 Synergy with Other Restoration Projects

Candidate projects that potentially have synergy with other restoration projects are likely to provide greater long-term benefits to the ecosystem, and benefits are more likely to include secondary effects that extend beyond the footprint of the project features. Candidate projects for design that potentially would enhance benefits provided by other restoration projects or that would be positively affected by the outputs of other projects would be considered higher priorities for being carried forward to the design process. In addition, areas managed as wildlife habitat may also receive benefits from or provide benefits to beneficial use projects, and are considered in the evaluation of synergy for beneficial use projects. Existing or authorized restoration projects within the initial areas of opportunity for beneficial use projects are shown on figure 7, and existing wildlife management areas are shown on figure 8.

Potential projects that would receive benefits from other projects are identified based on their being located within the area of influence of another project. Candidate projects under the BUDMAT program that do not receive benefits from other authorized or constructed projects, or that do not provide benefits to other projects, would be given a ranking of low for this criterion. . If modeling efforts or monitoring results for authorized or constructed projects do not demonstrate benefits that provide synergy, or historical information does not indicate that the restored feature would provide an increase in benefits for either the candidate BUDMAT project or that the other restoration project, then a score of low would be assigned for this criterion.

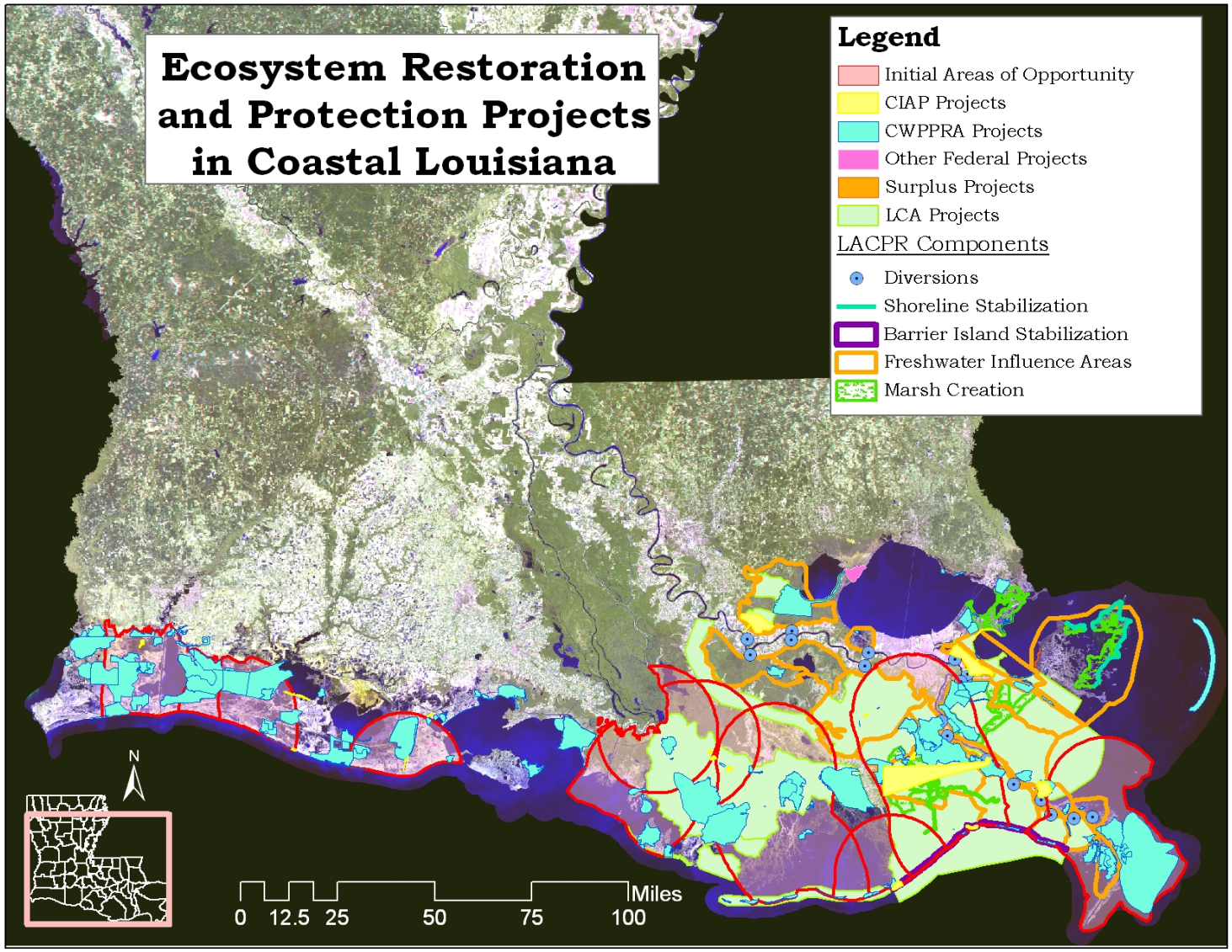


Figure 7. Ecosystem Restoration and Protection Projects in Coastal Louisiana.

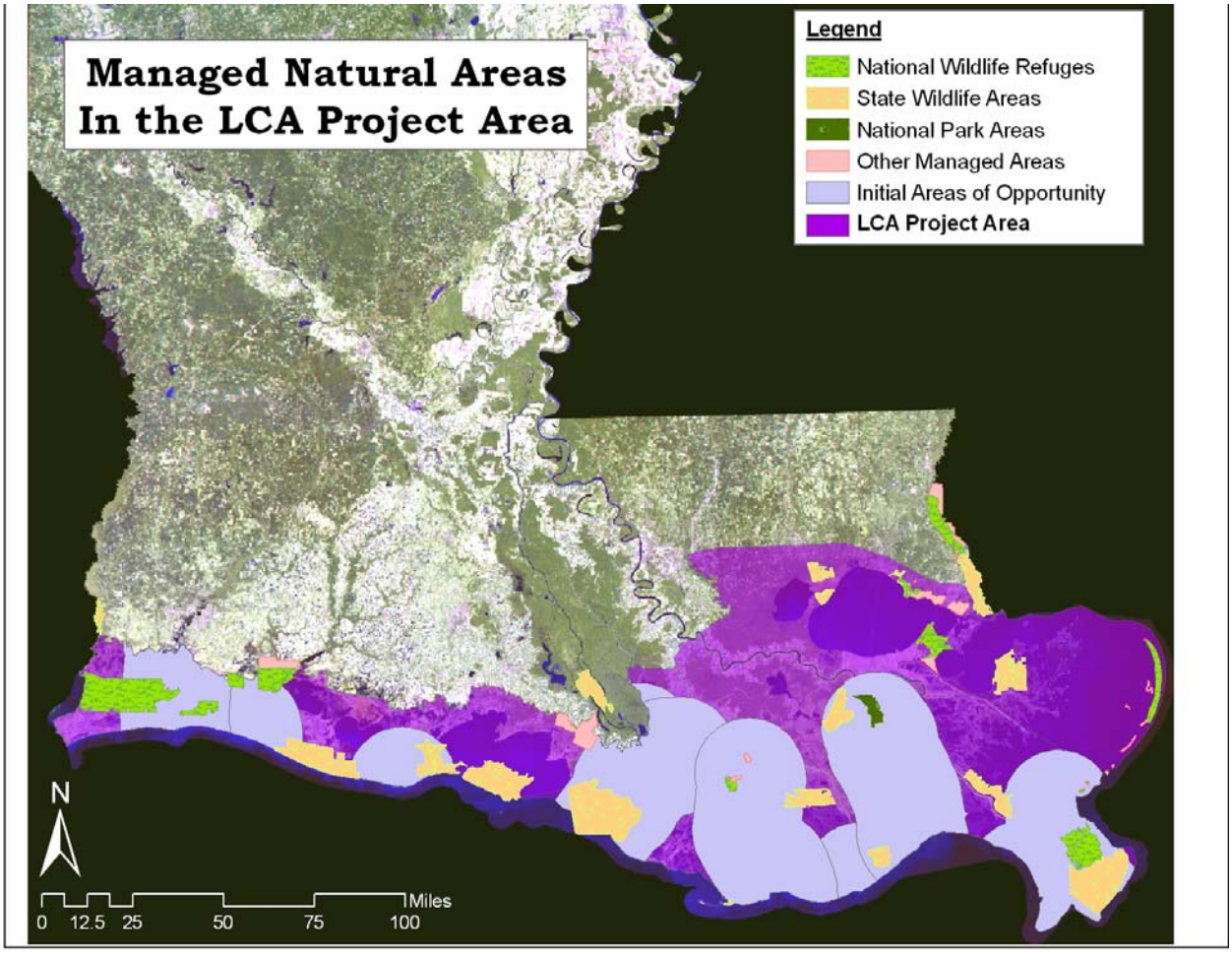


Figure 8. Managed Wildlife Areas in Coastal Louisiana

2.3.2.8.1.5 Implementation Complexity

Candidate projects undergoing the screening process would also be evaluated for the complexity of implementation. Potential issues that indicate more complex project implementation include relocation of infrastructure, complex real estate interests at the project location, major public concerns, or any unique, site-specific issues that would make design and construction of a candidate project more complex and difficult to implement. . Issues that may pose risks for cost growth or schedule delays would also be considered in screening of projects to be carried forward to the design process. Because beneficial use projects must be planned and designed in coordination with upcoming dredging schedules at authorized channels, candidate projects with issues that could not be resolved prior to the associated dredging operation would not be carried forward for design and construction.

Candidate projects with no identified implementation issues would be assigned a value of high for this criterion. Candidate projects with one identified implementation issue would be assigned a value of medium for this criterion. Projects with one implementation issue would present some risk to completion of pre-construction activities prior to the associated dredging event. Potential beneficial use projects with more than one identified implementation issue

would be assigned a value of low for this criterion. Projects with more than one implementation issue would present considerable risks that are difficult to control and would therefore hinder completion of pre-construction activities prior to the associated dredging event. In addition, the more complex setting of the candidate project would not be appropriate for the streamlined design process adopted from the CAP Section 204 program for implementation of straightforward projects.

2.3.2.9 Screening Criteria Totals and Recommendations for Design

For each of the criteria included in the process to select projects for completion of design studies, categorical rankings and definitions have been developed, based on the distribution of these characteristics in projects previously carried out under existing ecosystem restoration programs and the relationship of the ranges of values for each criterion to the candidate projects potential to address the objectives of the BUDMAT program. The rankings for assignment of projects to categorical values for each criterion are presented in table 3.

To complete the process to select projects for design, the PET would assign values to each candidate project for all of the above ranking criteria. For each project, criteria receiving a ranking of high would be assigned a numerical score of 5, those ranked as medium would receive a numerical score of 3, and low values would be given a score of 1. The numerical values would be totaled to identify the top 3 to 4 projects that would be recommended to the PET for completion of the design phase using the CAP Section 204 process. The PET would send this list to the Project Management Team (PMT) for consideration. The documentation provided to support the recommendations would include:

- The list of candidate projects nominated from the solicitation process
- The PET rankings assigned to each candidate project for the screening criteria and the basis for assignment of the rankings
- A summary of the deliberations and selection of projects that were assigned tie scores that were further refined to determine the list of recommended projects for the design process.

Table 3. Categorical Rankings and Basis for Project Selection Criteria

Categorical Rankings and Basis for Project Selection Criteria	
Condition	**Value**
Protection of Critical Landscape Features	
The project restores continuity and function of critical landscape features, OR Restores wetlands that protect the continuity and function of critical landscape features from open water adjacent to the features	High
The project would extend the continuity of critical landscape features along all or part of their former extent OR The project would restore wetlands at locations where continued wetlands loss or shoreline erosion would threaten the continuity of critical landscape features within 10 years, based on current land loss rates.	Medium
The project does not restore or protect critical landscape features from land loss projected to occur within the next 10 years.	Low

Categorical Rankings and Basis for Project Selection Criteria		
Condition		**Value**
Protection of Infrastructure		
The project restores the continuity and function of critical infrastructure, OR Restores wetlands that protect the continuity and function of critical infrastructure from open water adjacent to the features or from non-storm coastal flooding		High
The project would restore wetlands at locations where continued wetlands loss or shoreline erosion would threaten the continuity of critical infrastructure within 10 years, based on current land loss rates.		Medium
The project does not protect critical infrastructure from current or future land losses expected to occur within the next 10 years.		Low
Relative Cost-Effectiveness		
Marsh Creation/Restoration	*Shoreline Restoration/Nourishment*	
Less than $28,000 /net acre	Less than $500 / linear foot	High
$28,000 - $103,000 / net acre	$500 - $1,000 / linear foot	Medium
Greater than $103,000 /net acre	Greater than $1,000 / linear foot	Low
Synergy with Other Restoration Projects		
The project provides certain or known benefits that protects or contributes to the benefits of other restoration projects (e.g. shoreline protection, reduced salinity intrusion, reduced storm surge impacts on other projects) OR The project receives certain or known benefits from other restoration projects (e.g. wetlands receive input or enhanced salinity gradient from a freshwater diversion project)		High
The project does not provide certain or known benefits that protect or contribute to the benefits of other restoration projects AND The project does not receive certain or known benefits from other restoration projects		Low
Implementation Complexity		
The project has no identified issues that would make project implementation more complex (relocations, complex real estate, site-specific issues)		High
The project has one identified issue that would make project implementation more complex (relocations, complex real estate, site-specific issues)		Medium
The project has multiple issues that would make project implementation more complex (relocations, complex real estate, site-specific issues)		Low

2.3.2.10 Formulation of the Project Design Process

The study delivery team recommends that the design process for the BUDMAT Program should follow the guidelines specified for the Continuing Authorities Program (CAP), Beneficial Uses of Dredged Material, Section 204. Section 204 was authorized by the Water Resources Development Act of 1992 and provides the authority for the USACE to restore, protect and create aquatic and wetland habitats in connection with construction or maintenance dredging of authorized navigation projects. Since 1996, Section 204 has successfully been used throughout coastal Louisiana to implement beneficial use projects in conjunction with CEMVN's O&M program.

Various types of beneficial projects such as wetland/marsh creation, chenier ridge restoration, barrier island restoration, beach nourishment, etc., would be implemented under the BUDMAT Program. The amount of site-specific information available for beneficial use sites

varies widely. In some cases, similar nearby beneficial use projects may have been previously constructed and some of the required design parameters such as target elevations and boring logs, may be available. The level of design necessary for beneficial use projects implemented under the BUDMAT Program would also vary with projects ranging from the simple, unconfined hopper dredge pump-out marsh creation projects to the more complex projects such as barrier island restoration. Designs would include the appropriate documentation to justify the methodology of data collection, calculations, and all site-specific design parameters. Therefore, once a beneficial use site has been approved for design, a Project Management Plan (PMP) would be developed and mutually agreed to by CEMVN and CPRA to address the scope of the design tasks, including the non-federal in-kind contributions, required to complete the project design document. Upon design completion, the Federal or non-federal sponsor that was not the design lead, would be allowed to review and comment on the documents before they are finalized. It is anticipated that a typical design effort would be completed in approximately one year.

2.3.2.11 Formulation of the Project Selection Process for Construction

The Customized Program Alternative for BUDMAT must provide a process to select which projects with completed designs would be recommended for construction during the upcoming dredging cycle. The selection process for construction must specify the selection criteria, including the definitions and conditions to rank the projects associated with upcoming dredging operations..

Projects considered for construction for a specific year would be limited to those in proximity to a navigation channels that are schedule to for dredging. In addition, as available construction funding is not unlimited, most likely four or fewer beneficial use projects would be funded each year. For beneficial use projects that have completed the design phase, and have been approved for construction, there may be opportunities to construct project features, such as retention dike or conveyance pipelines, prior to the commencement of the dredging and placement activities. Early construction of some of these features would ensure project readiness and optimization of benefits when the associated dredging cycle is conducted.

Sustainability of project features is an important consideration in evaluating project effectiveness, and this aspect of project performance is reflected in the ranking of projects for cost-effectiveness. Because ecosystem restoration outputs determined through the WVA process are determined over a defined period of analysis and averaged over that time horizon, projects with similar size and scope that provide ecosystem restoration benefits that persist over the period of analysis will rank more highly for cost-effectiveness. Based on this consideration, ranking projects by their cost-effectiveness as determined by using the WVA or other habitat assessment models would also include consideration of sustainability in the selection of project designs for construction. To complete the process to select projects for construction, the PET would rank the projects in order from most to least cost-effective, as expressed as total project cost per ecosystem restoration output, as expressed in AAHUs.

In addition, the PET would give additional consideration to two factors: Uniqueness of restoration opportunity and Availability of construction funds for the planning cycle and project

costs. The PET would then prepare a set of recommended projects to be carried forward for the construction process and would send this list to the PMT for consideration. The documentation provided to support the recommendations would include:

- The PET 's basis for recommending projects for construction, including cost-effectiveness, uniqueness of restoration opportunity and availability of construction funding
- The subset of completed designs for which the source material for beneficial use will be dredged during the upcoming year

2.4 IDENTIFICATION OF THE TENTATIVELY SELECTED PLAN

As described in section 2.3, the plan formulation process resulted in the identification of the customized program alternative as the tentatively selected plan. This section describes the plan implementation, funding and program management requirements for the BUDMAT Program. Final development of the tentatively selected plan would result in a detailed set of implementation procedures that would be used in the BUDMAT Program to identify individual projects for planning, design and construction to fulfill the objectives of the BUDMAT Program. These objectives are to 1) create, restore, and/or nourish coastal wetlands; 2) create or restore coastal landscape features, including barrier islands, chenier ridges and shorelines; 3) provide protection to coastal wetlands or coastal landscape features; and 4) to optimize and increase the beneficial use of dredged material from Federally maintained navigation channels.

2.4.1. BUDMAT Program Management

The BUDMAT Program is only one component of the LCA plan authorized by WRDA 2007. Therefore, the BUDMAT Program would be managed under the larger LCA Plan Management structure as described in the 2004 LCA Study – Main Report, section 4.3 Plan Management. It is also thoroughly discussed in section 4.0 of the accompanying Feasibility report and is incorporated herein by reference.

2.4.2 Annual Process for Implementation of the BUDMAT Program

The following procedures would be used to solicit, screen, and select candidate beneficial use projects for planning and design and to select construction-ready projects in conjunction with that year's O&M scheduled dredging activities. The two selection processes would be carried out concurrently over the life of the BUDMAT Program. The annual process for implementation of the BUDMAT Program is illustrated in figure 9.

2.4.2.1 Solicitation and Initial Screening of Candidate Projects

Project Execution Team (PET) would solicit candidate beneficial use projects from the public, to include local landowners, municipalities, parishes, and State officials, through the public outreach component of the BUDMAT Program and in coordination with the quarterly

meetings of the CWPPRA Task Force, CEMVN's Environmental Dredging Conference held in May of each year, and the CPRA monthly meetings. Candidate projects may include, but would not be limited to, beneficial use projects planned and designed under other coastal restoration programs that are ready to be constructed.

The PET would, on an annual basis, review both the minimum submittal requirements for nominated projects and the initial criteria for screening those nominated projects. The minimum requirements and screening criteria would be revised accordingly to ensure that the beneficial use projects meet the minimum goals and objectives, including authorization and scope, of the BUDMAT Program. The maximum practical transport distance for dredged material, as currently described in section 2.3.3.2, would be reevaluated each year. As permanent long distance sediment pipeline projects are constructed or when cost effectiveness for long distance transport techniques improve, the practical maximum transport distance would be increased to cover increasingly areas of coastal Louisiana for consideration under the BUDMAT Program. In addition, any revisions to Dredged Material Management Plans (DMMPs) that adjust the Federal Standard for dredged material disposal at waterways in coastal Louisiana would be incorporated into the definition of the Federal Standard for determining whether BUDMAT could provide incremental funding for specific beneficial use projects.

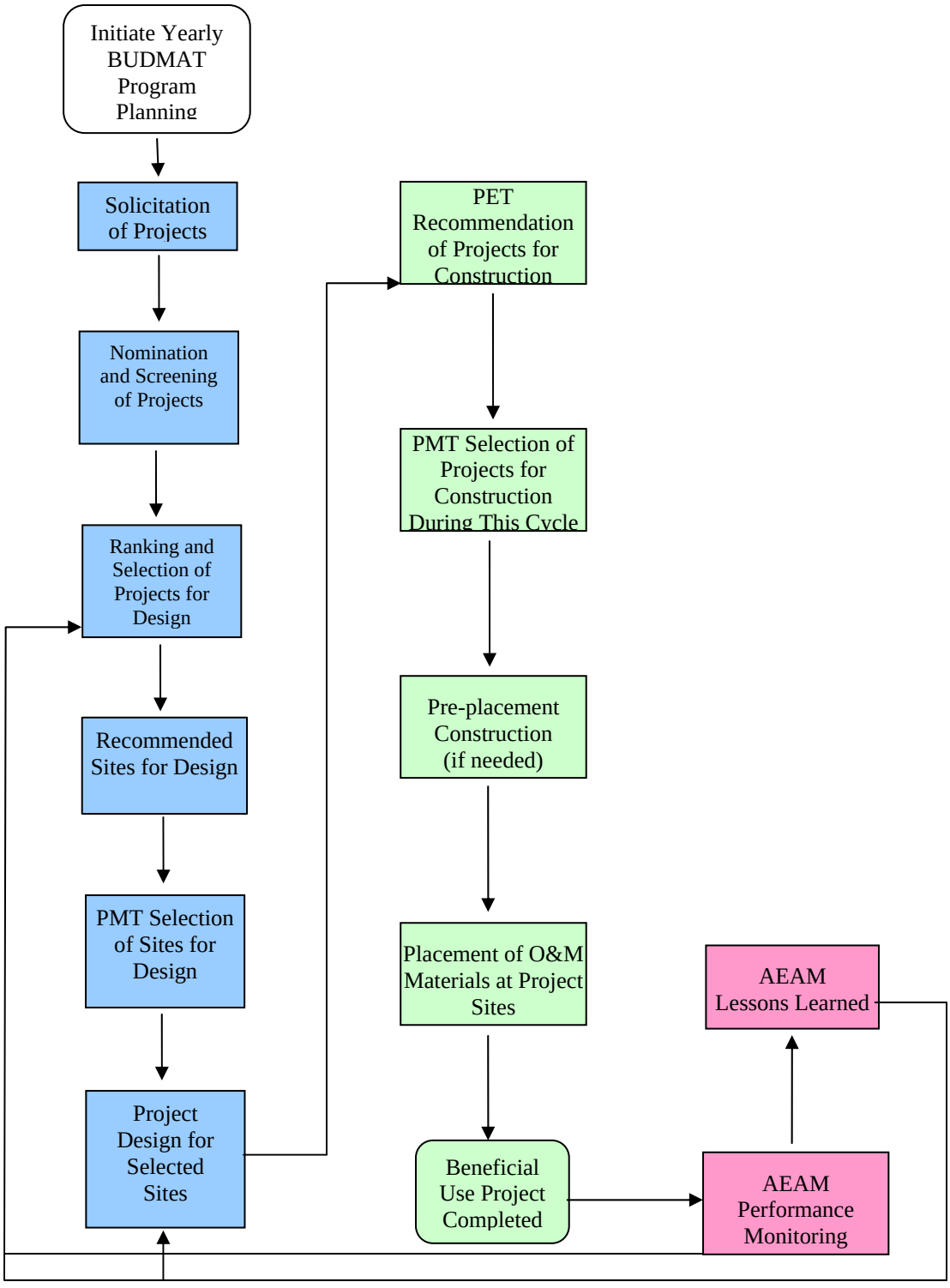


Figure 9. Annual BUDMAT Program Flow Chart

2.4.2.2 Screening of Candidate Projects for Planning and Design

For candidate beneficial use projects that pass through the initial screening process, the PET would, as discussed in section 2.3.5, apply categorical rankings to each project for the following selection criterion:

- Protection of Critical Landscape Features
- Protection of Infrastructure
- Relative Cost-Effectiveness
- Synergy with Other Restoration Projects
- Implementation

Candidate projects planned and designed under other coastal restoration programs that are ready to be constructed would still be required to go through the categorical ranking process for selection for design to ensure they meet the minimum goals and objectives, including authorization and scope, of the BUDMAT Program.

After ranking of the candidate projects, using the screening criteria listed above, the projects would then be assigned numerical scores based on the following value assignments for each criterion's ranking: High = 5, Medium = 3, and Low = 1. The total of the numerical values for each project would then be used to list the candidate projects in order based on the project numerical totals. If multiple projects with identical overall rankings are identified that must be reduced in number to meet the target number of projects to be recommended for design, the PET would evaluate the projects with tie scores using their best professional judgment to identify the projects with similar scores that are to be recommended for design based on the probability that the candidate projects would provide a greater contribution to the program objectives and that have a lower execution risk, based on the information available to the PET. The ranking, evaluation and screening of projects will be considered for all candidate projects throughout coastal Louisiana. Screening and selection of candidate restoration projects will not be performed to identify and fund projects located within each sub-basin or channel reach because the objective of the BUDMAT program is to identify and implement the best-opportunities to use dredged material and to design and construct the most cost-effective projects using the available resources.

The PET would then prepare a set of recommended projects to be carried forward for the design process and would send this list to the PMT for consideration. The documentation provided to support the recommendations would include:

- The list of candidate projects nominated from the solicitation process for consideration
- The PET rankings assigned to each candidate project for the selection criteria and resulting total numerical scores.
- A summary of the deliberations and selection of projects that were assigned tie scores that were further refined to determine the list of recommended projects for the design process.

There is not a minimum score for screening of projects for planning and design. The ranking process was developed to identify the candidate restoration opportunities that best meet the relevant program objectives for coastal ecosystem restoration identified in the LCA study. Any decision not to implement a candidate project will be based on the preliminary screening of

candidate restoration opportunities and the assessment of reasonableness of costs and benefits carried out during the planning process for individual projects.

If delegated approval authority, the PMT would approve projects for further design efforts under the BUDMAT Program. Otherwise the PMT would submit their recommendations to a higher-level authority for review and approval. In order to utilize all of the construction funding available in any given year, the recommendations and approvals of beneficial use projects for design would be made concurrently with the recommendations and approvals of beneficial use projects for construction.

2.4.2.3 Planning and Design Process

The process for planning and designing beneficial use projects implemented under the BUDMAT Program would follow the guidelines specified for the Continuing Authorities Program (CAP), Beneficial Uses of Dredged Material, Section 204. The planning and design process shall include project formulation, analysis, justification, and design of the site-specific beneficial use project. Designs should include the appropriate documentation to justify the methodology of data collection, calculations, and all site-specific design parameters including potential sea-level change.

Once a beneficial use site has been approved for design, a Project Management Plan (PMP) would be developed and mutually agreed to by CEMVN and CPRA to address the scope of the design tasks, including CPRA's in-kind contributions, required to complete the project design document. Upon design completion, the Federal or non-Federal sponsor that was not the design lead, would be allowed to review and comment before the design is finalized. It is anticipated that a typical design effort would be completed in approximately one year.

For the vast majority of beneficial use projects implemented under the BUDMAT Program, the selection process would be greatly simplified by the existence of only one or two alternatives. However, for those projects with multiple or complex alternatives, the process may be accomplished by the cost effectiveness/incremental cost analysis described below.

Selection of the optimal alternative for each project would incorporate National Ecosystem Restoration (NER) analysis as required for ecosystem restoration projects. All Corps water resources projects are evaluated in terms of acceptability, completeness, effectiveness, and efficiency. Ecosystem restoration alternatives are also evaluated on the basis of cost effectiveness and incremental cost analyses (CE/ICA) of the possible restoration alternatives and significance of ecosystem outputs. Outputs (or benefits) are measured by assessing each alternative's contribution to the stock of natural resources. The full array of alternatives can then be displayed by showing each alternative's benefits per dollar of cost.

In the cost effective analysis, the combined weighted ecologic outputs, computed on average annual basis and provided by the ecologic models and benefit assessment protocols would be documented for each project alternative. Typically, the Wetlands Value Assessment (WVA) model would be utilized for assessing the ecologic outputs of projects selected for design and implementation under the BUDMAT Program. However, if recommended by the LCA S&T

Program, other models may be used. The combined weighted outputs and costs for each project alternative would be sorted in terms of increasing output. The project alternatives would then be assessed according to their ability to produce benefits for a given cost level. Graphing cost effective plans results in a theoretical line, or an "efficient frontier". Alternatives that fall above the line are not efficient in that they have higher costs for the same level of ecologic outputs. The cost-effectiveness assessment and identification of the efficient frontier will be followed by an incremental cost analysis.

Incremental cost is the additional cost for each increase in the level of output. In incremental cost analysis, the subset of cost effective plans are examined sequentially (by increasing scale and increment of output) to ascertain which alternatives are most efficient in the production of environmental benefits. The most efficient plans are called "Best Buys" and provide the greatest increase in output for the least increases in cost. That is, they have the lowest incremental costs per unit of output. Graphing of the Best Buy plans is very useful in identifying where significant increases in costs occur as output levels are increased and can assist decision makers in determining the desirable project scale.

While CE/ICA does not dictate what alternative plan to choose, the information from both analyses can inform decision making by progressively proceeding through the available levels of output to ask whether the next level is worth the additional cost.

2.4.2.4 Selection of Projects for Construction

Once project design documents have been completed, they would be available for implementing beneficial use projects in conjunction with CEMVN's O&M dredging activities during the upcoming year. It is the intent of the BUDMAT Program to have sufficient project design documents available to utilize all available construction funding per program year.

For the purpose of selecting projects for construction, there are two types of dredging projects: scheduled, maintenance dredging projects and unscheduled dredging projects. Scheduled maintenance dredging projects can be anticipated based on historical dredging records and the Environmental Dredging Conference held in May of each year. Unscheduled dredging projects, including emergency dredging, are not easily predicted as they typically result from tropical storms or industry sail-outs associated with deep draft or large vessels transporting materials or equipment for oil and gas exploration from inland waterways to the Gulf of Mexico. Dredging as a result of a tropical storm is usually considered an "emergency dredging" event because without this dredging, the channel is unsafe for navigation. As a result, emergency dredging projects usually occur with a sense of urgency. Industry sail-outs are typically scheduled around the normal maintenance dredging cycle. However, sometimes, due to delays in funding or weather delays, unscheduled dredging is needed to allow the vessel to navigate the channel without dragging the bottom of the channel. Beneficial use projects using unscheduled dredging, emergency or not, would need to be considered on a case-by-case basis as the need arises. However, the selection and criteria for determining whether the project should proceed to construction is not necessarily different than that of a routine scheduled dredging event. Therefore, it is not necessary to reserve funds for unscheduled dredging projects since they are to be judged equally with scheduled dredging projects.

To complete the process to select projects for construction, the PET would assign values to each candidate project for all of the above ranking criteria. The projects would then be listed in order based on decreasing number of criteria rankings that were rated as High. If multiple projects with identical overall rankings are identified that must be reduced in number to meet the target number of projects to be recommended for construction, the PET would evaluate the projects with tie scores using their best professional judgment to identify the projects with similar scores that are to be recommended for construction based on the probability that the candidate projects would provide a greater contribution to the program objectives and that have a lower execution risk, based on the information available to the PET. In addition, the PET would give additional consideration to two factors:

- Uniqueness of the restoration opportunity (e.g., if a project construction opportunity is available for a navigation channel reach that is dredged infrequently, a higher priority may be assigned for that project)
- Availability of construction funds for the planning cycle and project costs (e.g. Remaining available construction funds are less than the incremental cost of the next highest ranked project remaining for consideration and where projects with lower rankings could be constructed with the remaining available construction funding)

The PET would then prepare a set of recommended projects to be carried forward for the construction process and would send this list to the PMT for consideration. The documentation provided to support the recommendations would include:

- The subset of completed designs for which the source material for beneficial use would be dredged during the upcoming year
- The PET rankings assigned to each candidate project for the selection criteria based on the cost-effectiveness of projects determined during the planning and design process, as expressed in ecosystem restoration outputs, such as AAHUs divided by the total project cost.
- A summary of the deliberations and selection of projects that were further refined to determine the list of recommended projects for the construction process.

If delegated approval authority, the PMT would approve projects for construction under the BUDMAT Program and the plans and specifications for the beneficial use project would be incorporated into the maintenance dredging contract prior to advertisement. Otherwise the PMT would submit their recommendations to a higher level authority for review and approval. In order to utilize all of the construction funding available in any given year, the recommendations and approvals of beneficial use projects for design would be made concurrently with the recommendations and approvals of beneficial use projects for construction.

Beneficial use projects proposed for unscheduled dredging events, including emergency operations would need to be considered for construction on a case-by-case basis as the need arises. Beneficial use projects with completed designs that would use material from unscheduled dredging events would be ranked using the criteria above, including the two additional factors, and would be compared to the projects already approved for construction for that dredging cycle.

Non-scheduled or emergency-related projects that are ranked more highly would then be recommended to replace the previously selected projects. If the non-scheduled dredging related project ranks higher than a project previously approved for construction the PMT, if delegated approval authority, may decide to construct the project associated with non-scheduled dredging in lieu of a previously approved project or projects.

During the first year of implementation for the BUDMAT Program, there will not be sufficient time available to solicit and screen projects for planning and design, complete the required studies and recommend projects for implementation in association with upcoming dredging events. However, a number of candidate beneficial use projects with complete planning and design studies performed under other programs would be available for implementation during the startup phase of the BUDMAT Program. During this initial startup period, the PET would identify available projects ready for construction that could use material provided by upcoming dredging events. The PET would use the selection for construction process described in this section to recommend projects for construction to the PMT. In subsequent years, projects identified and evaluated through the solicitation and screening processes would be carried forward for planning, design and consideration for construction with subsequent dredging events.

2.4.3 Real Estate

Estates

As previously indicated, design for particular projects will be accomplished through individual project studies. Hence, estates are not proposed at this time. Each decision document prepared will propose the exact estates to be acquired. If due to the nature of the particular project, non-standard estates need to be acquired, approval for those estates will be requested in accordance with the Standard Operating Procedures set forth by Mississippi Valley Division.

Non-Federal Sponsor

The non-federal Sponsor for this programmatic study is the CPRA, acting on behalf of the State of Louisiana. The CPRA will be identified as the non-federal sponsor for the follow-on phase of construction for each of the beneficial use projects implemented under the BUDMAT Program. As the non-federal Sponsor, CPRA must provide all real estate interests required for each project implemented under the BUDMAT Program i.e., all LERRDs. In addition, CPRA would provide all lands, water bodies, and/or water bottoms that are owned, claimed, or controlled by the State, as deemed necessary by the Government in consultation with CPRA. As the non-federal sponsor, CPRA would receive credit for the value of the LERRDs provided for the project.

Federally Owned and State Owned Lands

The plan may affect federally-owned lands. For those project features that are located in federally owned property, the CEMVN would secure right of entry from the other Federal agency.

The plan feature would impact State of Louisiana lands. For those areas that are owned by the State of Louisiana, the State would issue a grant of particular use to the USACE providing right of entry to its property. For planning purposes, it is assumed that the State owns the bed

and bottoms of navigable waterways, including areas of open water. A detailed determination of ownership of the State, including any political subdivisions of the State, would be made by CPRA in conjunction with the relevant state entities including the State Land Office for each particular project implemented under the BUDMAT Program.

Real Estate Costs

Cost estimates would be prepared for each beneficial use project implemented under the BUDMAT Program and would include the estimated value of the LERRDs and incidental costs associated with the acquisition process. The Real Estate appendix presents a plan for acquisition of lands, easements, and rights-of-way necessary for construction of each specific beneficial use project implemented under the proposed 10-year BUDMAT Program.

2.4.4 Funding

The authorization of the BUDMAT Program in the WRDA 2007 grants the USACE the ability to conduct a program in the coastal Louisiana ecosystem that would beneficially use dredged material from federally maintained waterways in an effort to create and restore Louisiana's wetlands. However, appropriation of funds by Congress is necessary for the BUDMAT Program to be implemented. For purposes of this guidance document, it is assumed that the BUDMAT Program would receive $6.5 million annually for 10 years through Congressional appropriations to cover the federal share of the BUDMAT Program costs. Likewise it is assumed that the BUDMAT Program will receive $3.5 million annually for 10 years through the Legislature of the State of Louisiana.

The BUDMAT Program costs are those costs incurred for disposal activities associated with separate, cost-shared, individual ecosystem restoration beneficial use projects that are beyond the ordinary disposal activities that are covered under the USACE O&M dredging and disposal operations in accordance with their established base plan for maintenance dredging activities. The base plan is determined by applying the Federal Standard, which requires disposal or placement activities to be conducted in the least-cost, environmentally acceptable manner based on sound engineering principles.

2.4.4.1 Programmatic Funding

Once funds have been appropriated, they would be allocated to two phases: Project Design and Project Construction. The BUDMAT Program is intended to be weighted toward Project Design in initial years in an effort to have multiple beneficial use sites designed and ready for future dredging projects. The proposed initial budget allocation, by fiscal year, can be found in table 4. The weighting shown in the table would be modified as the BUDMAT Program progresses based on actual costs of design and construction, in consideration of the following objectives:

1. Provide and maintain a sufficient number of beneficial use sites (with completed design documents) to facilitate optimal use of dredged materials from scheduled and unscheduled dredging projects located throughout the study area.

2. Optimize beneficial use of dredged materials beyond the base plan for O&M disposal activities.
3. Maximize the resulting acreage of wetlands, or other coastal landscape features, that are restored, enhanced, or created through the life of the program.

Table 4. Program Funding by Fiscal Year

Program Year	Project Design	Project Construction
PY 1	30%	70%
PY 2	25%	75%
PY 3	20%	80%
PY 4	15%	85%
PY 5-9	10%	90%
PY 10	0%	100%

2.4.4.2 Project Funding

The BUDMAT Program provides funding for: 1) project design documents for disposal activities associated with separate, cost-shared, individual ecosystem restoration beneficial use projects that are above and beyond the disposal activities that are covered under the USACE O&M maintenance dredging Federal standard, and 2) the incremental, additional construction costs required for disposal activities associated with separate, cost-shared, individual ecosystem restoration beneficial use projects that are above and beyond the disposal activities that are covered under the USACE O&M maintenance dredging Federal standard. Project design funding would be utilized for screening and evaluation of potential beneficial use sites; development of environmental documentation in accordance with the National Environmental Policy Act (NEPA); pre-design and design-level site characterization (as required); and development of detailed design documents, including drawings, and specifications for each beneficial use project. Construction costs may include: acquisition of beneficial use site property; potential preparatory work in advance of placement of dredged materials (such as the construction of retention dikes); and the incremental, additional costs for disposal activities associated with separate, cost-shared, individual ecosystem restoration beneficial use projects that are above and beyond the disposal activities that are covered under the USACE O&M maintenance dredging Federal standard.

It is the goal of the BUDMAT Program to use all available funding in the fiscal year for which it was designated. However, in the event some funding is not utilized, it would be carried over to the following year's funding.

2.4.4.3 Cost Sharing

The State of Louisiana, acting through the Coastal Protection and Restoration Authority of Louisiana (CPRA), would be the non-federal sponsor for all beneficial use projects implemented

under the BUDMAT Program. As a component of the LCA Plan, the cost share for this programmatic study and EIS is 50 percent Federal and 50 percent non-federal. The cost share for the planning, design and construction of beneficial use projects implemented under the BUDMAT Program would be 65 percent Federal and 35 percent non-federal. The CPRA must provide all lands, easements, rights-of-way, utility or public facility relocations, and disposal areas (LERRDs) required for site-specific beneficial use projects implemented under the BUDMAT Program. If applicable, Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) of projects implemented under the BUDMAT Program would be a 100% CPRA responsibility.

2.4.5 Public Outreach

Public involvement as required by NEPA regulations would provide the public multiple chances to comment on the BUDMAT Program and site-specific beneficial use projects implemented under the BUDMAT Program. This would include the November 2004 LCA Ecosystem Restoration Program Feasibility Study and PEIS, this BUDMAT Program study and PEIS, and future site-specific beneficial use project design documents, including NEPA documentation and Consistency Determinations. In addition to these opportunities, the BUDMAT project delivery team (PDT) collectively agreed that public involvement should continue throughout the BUDMAT Program. To achieve this, both information only and a comment-based public involvement plan were considered.

A comment-based public involvement plan would be utilized to keep the public informed about the status and location of beneficial use projects implemented under the BUDMAT Program. In addition, this plan would allow the public to comment on the BUDMAT Program and its beneficial use projects. Suggestions for future beneficial use sites and concerns of proposed sites would be solicited and used in determining beneficial use site recommendations.

2.4.6 Monitoring, Operation, and Program Success

Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) of projects implemented under the BUDMAT Program would be a 100 percent CPRA responsibility. The expected benefits of the project features and their changes over the period of analysis considered in project planning and design are described in Section 2.3.2.10.

Section 2039 of WRDA 2007 mandates that when conducting a feasibility study for a project for ecosystem restoration that the recommended project includes a plan for monitoring the success of the ecosystem restoration. The monitoring plan would include a description of the monitoring activities, the criteria for success, and the estimated cost and duration and/or periodicity of the monitoring efforts as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met. Consistent with WRDA 2007, monitoring shall be a cost-shared project cost for a period of ten years from completion of construction of a beneficial use project implemented under the BUDMAT Program. Additional monitoring required beyond ten years, if applicable, will be a 100% non-Federal

In 1994, CEMVN implemented the large-scale Beneficial Use of dredged material Monitoring Program (BUMP) to quantify the amount of new habitat created and to improve dredge disposal placement techniques to maximize beneficial use. Each year, aerial photography is acquired and digital mosaics are produced for each of the beneficial use sites. Geographic Information System (GIS) habitat analysis and field surveys are conducted to generate habitat change maps. From the analysis, coastal change data quantifies the creation of new coastal lands and other habitats. The field program includes ground truthing operations to verify and update the habitat maps and field monitoring to collect information about vegetation, disposal elevations, and placement practices (configurations and containment) to assess best practices for maximizing habitat benefits from the beneficial use of dredged material. Habitat types are broken into simple classes and sub-classes based on the types of vegetation present: water, wetlands (marsh and forested wetlands), and land (beach, bare ground, dune, upland, shrub/scrub, and forest).

Currently, under its existing O&M Program, CEMVN conducts aerial flights to obtain aerial photography for each of its beneficial use placement sites on an annual basis. Since 2000 and due to funding constraints, CEMVN no longer funds the analyses of the aerial photography to produce habitat change maps. Additionally, CEMVN no longer conducts a field program including ground truthing and field surveys. It is anticipated that CEMVN would, at a minimum, continue to acquire the aerial photography on an annual basis under the Federal standard.

The analyses of the aerial photography to produce habitat change maps, in conjunction with the ground-truthing and field monitoring, for site-specific beneficial use projects implemented under the BUDMAT Program would be conducted for selected projects based on the project's uniqueness relating to the uncertainty of achieving ecological benefits, environmental setting, timing of placement, placement elevations and configurations. If a beneficial use project is selected for monitoring, baseline data would be collected within one year of placement of the dredged material. Current guidance for the CAP Program states that monitoring will be limited to five years duration and costs will be limited to 1 percent of the total costs. Therefore, in accordance with Section 2039 of WRDA 2007 guidance and the CAP guidance, the monitoring costs for the BUDMAT Program would be limited to 10 years and 1 percent of the total costs.

Because most of the projects are of limited complexity and low risk, the success monitoring efforts will document basic measures of project outputs, such as acreage of wetland provided, data on vegetation types and abundances, soil quality and function, and basic hydrologic parameters. Under most situations, it is anticipated that the success monitoring data provided on the individual projects would not be used to modify or perform additional construction at completed projects. The success data from individual projects do provide the opportunity to optimize the selection and implementation of subsequent projects under the BUDMAT Program.

2.4.7 Consistency and Coordination between Development and Coastal Restoration and Protection Efforts.

From navigation improvements and hurricane protection to residential and commercial construction, development activities can affect the Louisiana coastal environment. Yet, such activities are critical for a healthy and vibrant economy in coastal Louisiana. The challenge,

therefore, is to ensure that economic development does not undermine the sustainability of wetlands and coastal ecosystems that are also vital to long-term economic health of the region and Nation. The solution is neither a moratorium on growth in the coastal zone, nor "business as usual."

Despite efforts to address this important provision, it is acknowledged by many stakeholders that a more thorough and comprehensive effort is needed to ensure consistency across the coast. It is further recognized that the LCA Plan is the appropriate vehicle for initiating such an effort. In order to move towards such consistency, implementation of the LCA Plan would include:

- "Coastal Consistency" reviews by the LCA Program Execution Team of all CEMVN feasibility reports and significant regulatory actions;
- Early coordination between both the state and CEMVN on all projects in the Coastal Area that have potential impacts upon restoration activities;
- Adherence to the Coastal Zone Management Act Federal Consistency Regulations (15 CFR Part 930 Subpart C---Consistency for Federal Agency Activities, 16 U.S.C. 1451 et seq.)

2.5 SUMMARY COMPARISON OF ALTERNATIVES

The no action alternative assumes that the BUDMAT Program would not be in place, and beneficial use of dredge materials would only take place within the Federal Standard, or with other financial sources such as CWPPRA or CIAP. The opportunity to create or restore up to 21,000 acres of wetlands, barrier islands, barrier headlands or shorelines would be lost. The continued loss of habitat could have a detrimental affect on most coastal fish and wildlife species.

With the BUDMAT Program in place, dredged material from navigation maintenance dredging would only be utilized within the Federal Standard for each channel within the existing O&M Budget. Materials would be disposed of in an environmentally acceptable manner, which is not necessarily beneficially, such as upland disposal sites or in open water. Unfortunately, with the current costs of construction, quality of material dredged from each channel, and the distances from navigation channels, the restoration acreage potential varies widely, from 3,400 acres to 21,000 acres, in the 10-year program.

Table 5 compares the future without project and future with project alternatives. The significant resources are individually described in chapter 3 of this PEIS, and the impacts of the alternatives on each significant resource are detailed in chapter 4. As this is a programmatic EIS, no detailed site impacts are assessed. As specific restoration projects are designed, documentation of the project and impacts would be discussed in future Environmental Assessments or Environmental Impact Statements.

Table 5. Summary Comparison of Alternatives

Significant Resource or Element	Alternative	
	No Action	**BUDMAT Program**
Water Quality	Approximately 265 acres of shallow open water would be converted back to marsh (or 2650 acres in 10 yrs) under current funding methods (O&M, Section 204, CWPPRA).	A range of 3,400 – 21,000 acres of shallow open water would be converted back to marsh over the 10-year project life.
Air Quality	No impacts beyond the *de minimus* would be expected.	No impacts beyond the *de minimus* would be expected.
Noise	Localized and temporary impacts during construction of projects through existing programs	Localized and temporary impacts during construction of new BUDMAT projects, no long-term impacts would be expected.
Soils	Approximately 2,650 (over 10 years) acres of wetland soils would be restored via beneficial use within the Federal standard of O&M dredging..	A range of 3,400 – 21,000 acres of wetland soils would be restored.
Barrier systems: barrier shorelines, headlands, and islands	The long tem degradation of the barrier islands would lead to the coastal wetlands being directly impacted by wave energy from tropical storms.	A small reduction in the rate of loss of barrier island habitat, and a small increase in sustainability. Restoration of barrier islands is a high priority on the Louisiana State Master Plan. Barrier islands protect the LOOP facility (12% of crude oil imports).
Coastal vegetation resources-Wetlands	Long-term significant coast wide net decrease due to continued coastal land losses, including wetlands of national significance such as National Wildlife Refuges and National Parks. Interior land loss rates range from 4 – 19%.	Long-term significant net decrease of all coastal wetland vegetation habitat types (depending on the locations of beneficial use project sites), but with a minor reduction in the rate of loss, particularly with marshes. Potential to restore up to 21,000 acres of wetland habitat.
Wildlife	Continued decline in most coastal Louisiana wildlife species. Loss of migratory habitat for waterfowl and neotropical migrants would affect those populations. Habitat loss would cause impacts to the fur trade.	Most coastal Louisiana wildlife species would benefit.
Fisheries	Would have a net loss in fisheries population size and diversity.	Fisheries would be expected to benefit due to the preservation and restoration of habitat.
Essential Fish Habitat (EFH)	Continued loss and degradation of EFH	Reduction in adverse impacts to some categories of EFH on a local or larger scale.
Threatened and Endangered Species	Continued population decline and loss of critical habitat principally for the piping plovers, sea turtles, and brown pelicans.	Would generally increase and enhance all coastal wetland habitats.
Cultural Resources	Potential loss of resources due to natural and human causes.	Would require project specific cultural resource investigation.

Significant Resource or Element	Alternative	
	No Action	**BUDMAT Program**
Recreation	Potential loss of recreational resource base due to coastal land loss.	Beneficial use of dredged materials above the Federal Standard would result in an even larger amount of wetlands and habitat created then would be allowed under the Federal Standard. More wetlands and habitat would translate into more opportunities for recreational use of the project area.
Aesthetics	Possible loss or diminishment of qualities, which would weaken the significance of Scenic Byways.	Maintaining visually appealing resources systems would further support tourism as one travels Scenic Byways and remote areas of visual interest
Hazardous, Toxic, and Radioactive Waste (HTRW)	Continued growth of human populations, development, industry, and other activities would further increase HTRW areas of concern within coastal area	An HTRW Phase I ISA would be performed on a project-by-project basis. Any HTRW identified would be avoided or removed prior to initiation of construction activities
Socioeconomic and Human Resources	Some industrial employers, petroleum, and seafood would be threatened by coastal land loss and storms, thus causing a loss of associated employment and income. Populations would shift further inland and to urban and suburban areas.	Loss of jobs and income due to coastal erosion and storms may be slightly reduced.
Population	Due to coastal erosion, population would shift further inland and to urban and suburban areas	Impacts would be similar to the no action alternative, but the population shift may be slower
Infrastructure	Infrastructure nearest to the coast would be exposed to more frequent erosion and damage. Infrastructure would have to be relocated, replaced, and repaired.	Some reduction in erosion and damages may occur.
Commercial Fisheries	The fishing industry and its supporting business and activities would experience a decline	Impacts to commercial fisheries would be expected to be slightly lessened
Oyster leases	Gradual loss of production from leases.	Negative impacts to oyster leases would result from placement of dredged material on existing oyster leases. The BUDMAT Program qualifies as a project for which the State is enabled to acquire oyster leases through the State's Oyster Lease Acquisition and Compensation Program.
Oil and Gas	Increased damages to refineries, wells, and other oil and gas producing facilities and equipment. Some relocations would occur due to erosion	Impacts may be slightly lessened

Significant Resource or Element	Alternative	
	No Action	**BUDMAT Program**
Pipelines	Increased damages to pipelines and related equipment. Some relocations would occur due to erosion. Potential for environmental damage and disruptions to the nation's energy supply.	Any increase in protection of these assets would decrease damages.
Navigation	Probable damages to and relocation of port facilities, inland waterways, and traffic	Impacts may be slightly lessened.
Flood Control, Hurricane Protection Levees	Continued erosion of the coast would cause increased flood damages due to storm surge. Some people would choose to relocate	Slight reduction in storm surge damages and possible prevention of people relocating
Agriculture	Continued erosion of the coast would cause increased agricultural flood damages due to storm surges and increased salinity levels	Some prevention in damages to agricultural lands may occur.
Forestry	Continued coastal land loss would reduce forestry opportunities	Project-induced increases in swamp and wetland forests may provide some opportunities for forestry activities
Water Supply	Increased levels of salinity in some of the coastal areas. Potentially businesses could relocate, adversely impacting jobs, income, population, and employment	Impacts would be expected to be negligible.
Environmental Justice	Effects on minority or low-income populations would not be expected to be disproportionately high or adverse compared to the population as a whole	Effects would be expected to be the same as the no action alternative.

CHAPTER 3 AFFECTED ENVIRONMENT

The final Programmatic Environmental Impact Statement for the Louisiana Coastal Area (LCA), Ecosystem Restoration Study (LCA Study) thoroughly covered the coastal systems processes that have shaped ecosystems of southern Louisiana. The beneficial use of dredged materials was one of the restoration opportunities that was authorized as a result of the LCA Study. This section briefly describes the historic and existing conditions with respect to each resource that would be affected with the BUDMAT Program. These resources include: the Physical Environment – water quality, air quality, and noise; the Biological Environment – soils, barrier island systems, coastal vegetation/wetlands, wildlife, fisheries, essential fish habitat, and threatened and endangered species; the Cultural Environment – historic, recreation, and aesthetics; and the Hazardous, Toxic, and Radioactive Waste (HTRW) Environment.

3.1 PHYSICAL ENVIRONMENT

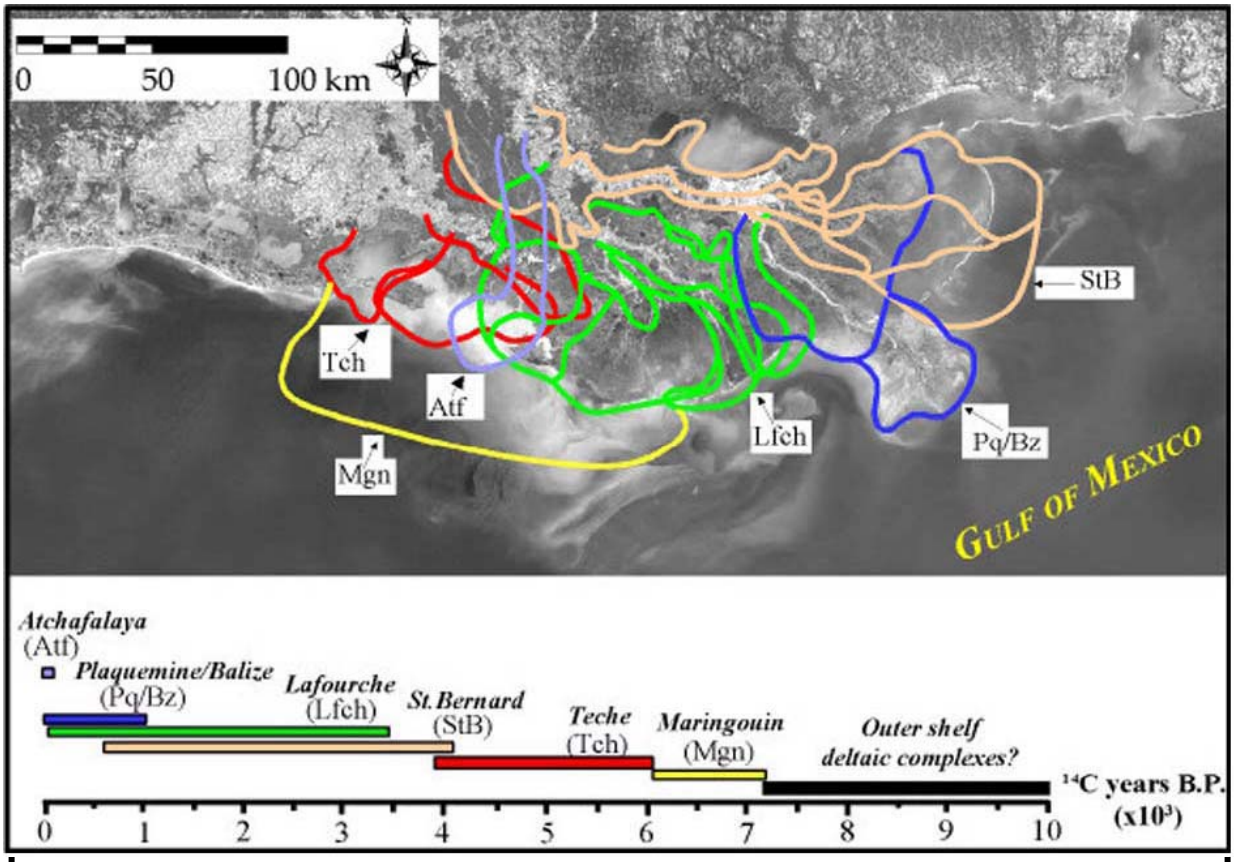
3.1.1 Coastal System Processes

This resource was discussed in the LCA Study (2004) and is incorporated herein by reference.

The geologic development of coastal Louisiana is closely related to shifting Mississippi River courses. The Mississippi River has changed its course several times during the last 7,000 years, leading to the development of the Mississippi River Deltaic and Chenier Plains. The Deltaic Plain is composed of six major delta complexes: two prograding and four degrading (figure 10). As a delta is abandoned, erosion and subsidence are unchecked by sediments (both mineral and suspended organic material), eventually vegetative growth becomes unable to keep up. The outer edges of the deltaic lobes becomes detached from the mainland and either become islands or disappear entirely. Within a delta complex there may be several major distributaries contributing to the development of individual delta lobes. Frazier (1967) was able to subdivide the Mississippi's delta complexes into 16 separate delta lobes. The Atchafalaya and the modern Mississippi Delta complexes are active, and the Teche, Lafourche, and St. Bernard complexes are currently inactive.

In contrast to the Deltaic Plain, the Chenier Plain formed to the west, away from active deltaic growth. When the Mississippi River was in a more westward position, fine silts and clays were transported by westward flowing nearshore currents and deposited as mudflats along the existing shoreline. When Mississippi River deposition ceased or declined, as the river shifted eastward, these mudflats were reworked by marine processes, concentrating the coarser grained sediments and shell material into shore-parallel ridges called “cheniers.” Introduction of new sediments by the next westward shift of the Mississippi River resulted in isolation of these ridges by accretion of mudflats gulfward of the ridges. Numerous cycles of deposition and erosion are responsible for creating the alternating ridges separated by marshlands characteristic of the Chenier Plain. Recognition that the Deltaic and Chenier Plains are formed by an orderly progression of events related to shifting Mississippi River courses led to the identification and characterization of the deltaic cycle. The delta cycle is a dynamic and episodic process

alternating between periods of seaward progradation of deltas (regressive deposition) and the subsequent landward retreat of deltaic headlands as deltas are abandoned, reworked, and submerged by marine waters (transgressive deposition).



By at least 10,000 years B.P. deltaic sequences were being constructed on the upper shelf during times of relative sea-level stability in the overall rising sea level (Boyd et al. 1988). Following sea-level high stand at approximately 4,000 years B.P.,deltaic progradation switched to the east, migrating through distributary switching processes to the west and eventually to the modern Birdfoot Delta (Balize depocenter). Net result of the migrating depocenters is a vertically stacked and offsetsedimentary package of primarily deltaic deposits that have created the extensive fluvial networks and wetlands of Louisiana. Following abandonment of individual delta lobes the deltaic depocenters became submerged and reworked by marine processes. The depocenters then formed transgressive coastlines, barrier island systems, and ultimately submerged sand shoals on the continental shelf.

Figure 10. The Mississippi River Deltaic Plain with locations of major delta complexes (*modified from Frazier 1967*).

3.1.1.1 Land Change by Basin

Within the four LCA Subprovinces (figure 4, section 1.9.1), the coast of Louisiana is further subdivided into hydrological basins (figure 11). Subprovince 1 includes Breton Sound, Pontchartrain Basin, portions of the Pearl hydrologic basin, and the eastern portion of the lower Mississippi River Delta. Subprovince 2 is defined by the hydrologic boundary of the Barataria Basin, which is approximately 2,446 square miles (6,359 square kilometers), and the western portion of the lower Mississippi River Delta. Subprovince 3 consists of the Teche/Vermilion and

Terrebonne Basins, and portions of the Atchafalaya Basin. Subprovince 4 contains the entire Chenier Plain and consists of two major hydrologic basins, the Mermentau Basin and the Calcasieu/Sabine Basin.

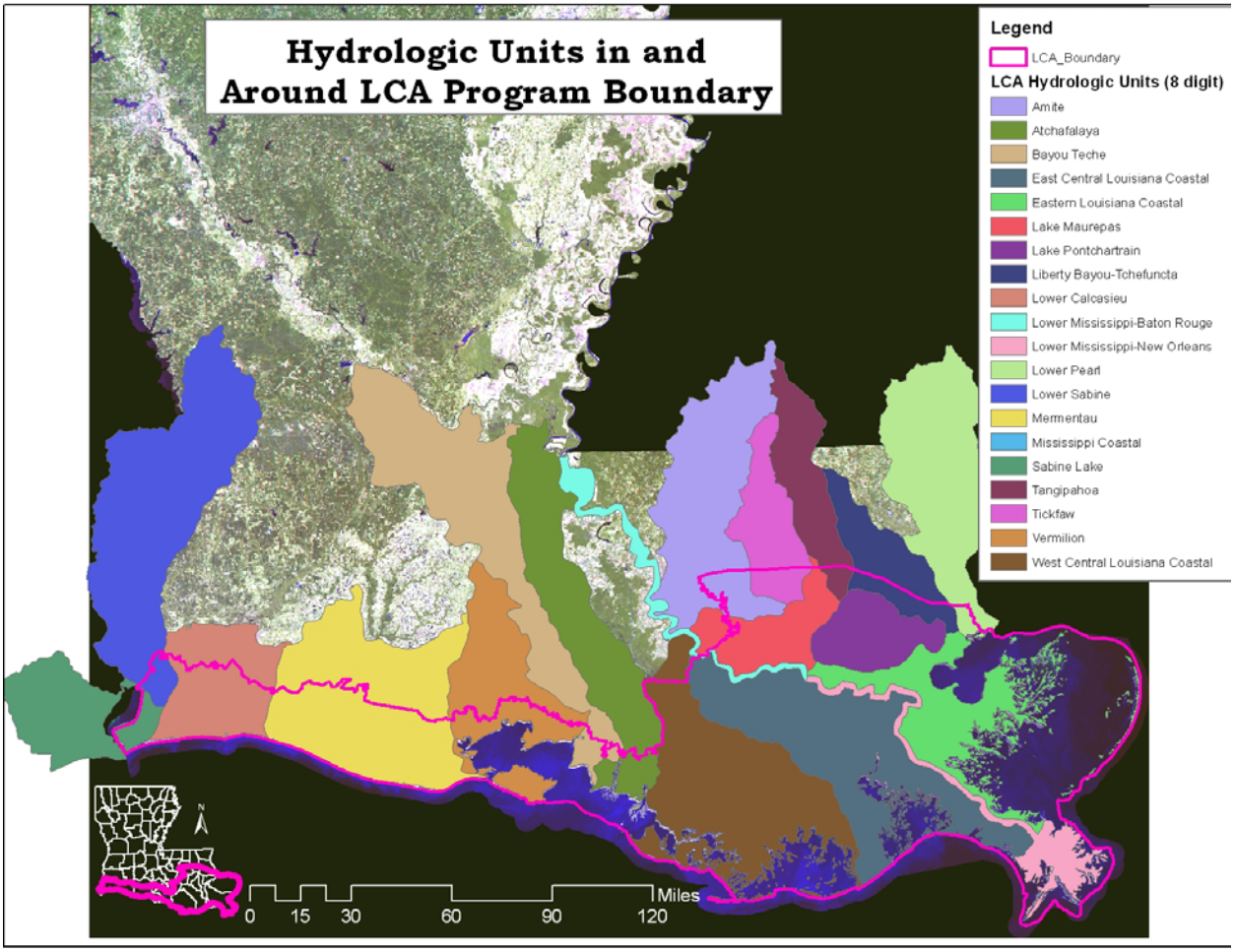


Figure 11. Hydrologic Basins in the LCA Program Boundary

Data from USGS indicates that coast wide the land loss in the years 1985 – 2008 is 4 percent (table 6) (Barras et al 2008, Barras 2009); however the loss rate varies from a 9 percent loss in the Barataria Basin to 4 percent land gain in the Atchafalaya. Recent hurricanes inflicted more damage on the Barataria and Breton Sound Basins than other basins. It is still not known if the marshes will recover or if the land is permanently lost. Hurricanes Ike and Gustav made land fall two weeks apart in September 2008, pushing salt-water storm surges into the Chenier Plain, which was slow to drain off, causing marsh burn. Again, it is not known if the vegetation will recover in the next few years, or if the marshes and plants on the chenier ridges have been killed. The Terrebonne Basin has been loosing marshes at a slightly higher rate, 6 percent, partially due to hurricane damage, and partially due to subsidence, lack of freshwater, or other reasons. A recent study by the Materials Management Service also attributes land loss in coastal Louisiana, especially in the eastern part of the state to the oil and gas industry, and the methods used to lay pipelines from the outer continental shelf inland (Johnston et al. 2009).

Table 6. Land change by hydrologic basin (USGS data[1])

Basin	Area Total (land + water) square miles	Area total acres	Land change 1985-2008 square miles	Land change, acres	Percent Land Change
Calcasieu/Sabine	915	585,689	-31	-19,756	-3%
Mermentau	1,132	724,657	-34	-21,710	-3%
Teche / Vermilion	1,025	655,731	-17	-13,552	-2%
Atchafalaya	428	274,024	+17	10,866	+4%
Terrebonne	1,858	1,188,798	-111	-71,926	-6%
Barataria	1,366	874,513	-123	-78,767	-9%
Mississippi River Delta	631	403,808	-10	-6,670	-2%
Breton Sound	946	605,230	-80	-51,307	-8%
Coastal Total[2]	11,437	7,319,708	459	-293,926	-4%

[1]Barras et al., 2008, and Barras, J.A., 2009

[2]Pontchartrain and Pearl River Basins (3,087 and 49 sq mi respectively) are excluded, as they do not have federally maintained navigation channels.

3.1.1.2 Sea level Change and Relative Subsidence

A number of studies (e.g., Parker 1992) have attempted to determine the global mean sea level trend. Although most coastal regions of the world indicate a mean sea level (MSL), some coastlines show rapidly falling local MSL. This is a consequence of water level gages measuring relative local mean sea level change, which combines the effects of absolute MSL change and any vertical land movement. Various averaging schemes and/or corrections for vertical land motions have been devised, resulting in estimates of global MSL rise ranging from 0.04 inches/year to 0.09 inches/year (1.0 mm/yr to 2.4 mm/yr) (Douglas et al., 2001), which need to be accounted for in attempting to determine local MSL rise for the region (figure 12). The latest research in estimating potential acceleration in global sea level rise can be found in Church and White, 2006.

Relative subsidence and reworking of the abandoned deltaic deposits is occurring throughout the coast of Louisiana. Long-term (>100 years) relative subsidence rates, calculated using radiocarbon dating of buried peat deposits, range from 1.0 feet/century to 4.0 feet/century (3.0 mm/yr to 12.2 mm/yr). Rates are highest near Belle Pass (Mississippi Delta Basin) and the eastern most barrier islands. Rates are generally highest where Holocene sediments are thickest. A primary factor governing land loss along the Louisiana shoreline is relative sea level rise, the rise in sea level relative to the adjacent coastlands.

Relative sea level rise consists of two components (National Research Council, 1987):

- Eustatic sea level change– defined as the global change in oceanic water level relative to a fixed datum (e.g. NAVD88), presently about 1 mm/yr.
- Subsidence– defined as the local change in land elevation relative to the same vertical datum.

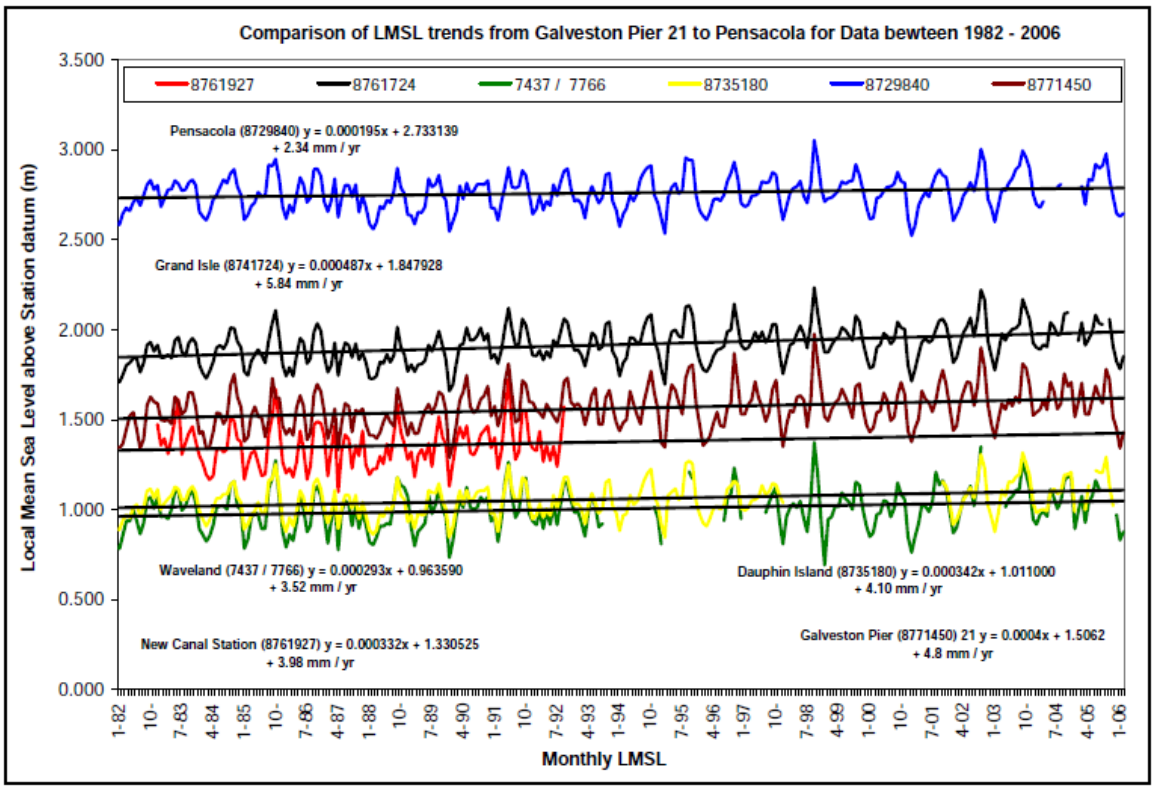


Figure 12. Local mean sea level trends from 1982 to 2006.

Along the Louisiana coast, the land elevation is decreasing due to subsidence while, the MSL elevation is increasing, resulting in significant land loss. Over the 50-year period of analysis (2011 to 2061) the rate of relative sea level rise is increasing and is expected to equal 0.0599 ft (18.3 mm/yr) in 2061. For the purposes of design and analysis, the rate of relative sea level rise is treated as a constant over the 50-year period of analysis, equal to 0.055 feet/year (16.8 mm/yr). Approximately 80 percent of the relative sea-level rise at this location is due to subsidence. Engineering Circular 1165-2-211, "Water Resources Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Works Programs" (July 1, 2009) provides guidance for calculating relative sea level rise in projects under three scenarios: low, medium, and high rates of local sea level change, where "low" is based on the historic rate. The Engineering Circular with the formulas for calculating medium and high rates of change can be found in the appendix of this PEIS.

The average seasonal cycles in monthly local mean sea level can show wide variations depending on the seasonal variations in water temperature, winds, and circulation patterns currents in the nearby coastal ocean. Zervas (2001) presents an analysis of the seasonal variations for the National Water Level Observation Network (NWLON) stations in which he shows that seasonal variations can be a significant factor in determination of sea level trends.

Figure 13 shows a plot of monthly local mean sea levels for Grand Isle. There is a bi-modal variation with secondary high and low in May and July, respectively. Hurricane season, from June through November, coincides with the periods of high monthly local mean sea levels--this generally adds to the elevation of storm surge.

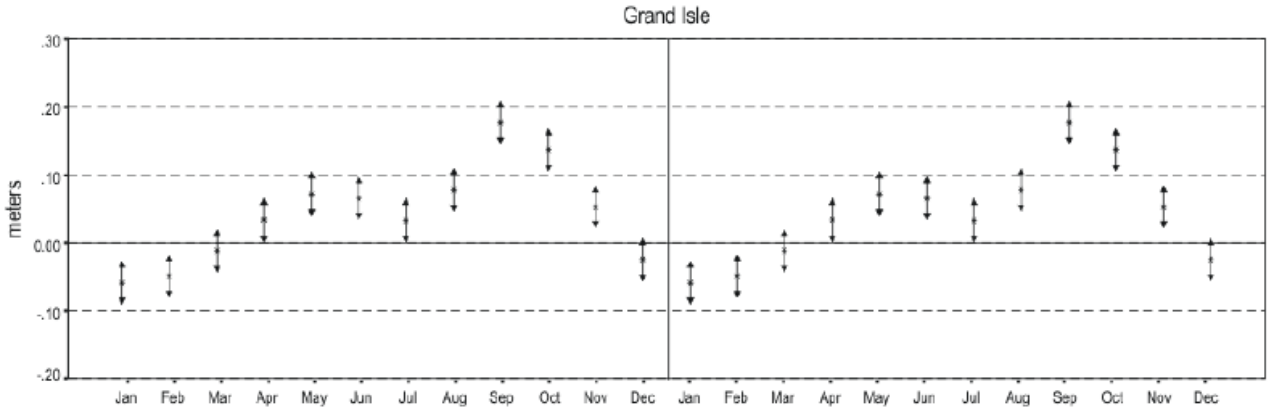


Figure 13. Local sea level at Grand Isle, Louisiana

3.1.2 Water Quality

This resource is institutionally significant because of: the Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968.

Historic and Existing Conditions

This resource was extensively covered in the LCA Study (2004) and is incorporated herein by reference.

After the 2005 hurricane season, with particular attention on the effects of Hurricanes Katrina and Rita, the Louisiana Department of Environmental Quality (LDEQ) expected the following impacts (LDEQ, 2006 Progress Reports for Katrina and Rita):

- Increases in organic loading
- Decreases in dissolved oxygen
- Fish kills
- Increases in fecal coliform
- Increases in salinity and chlorides.

In conjunction with the U.S. Geological Survey (USGS), the EPA, and other state and Federal agencies, LDEQ conducted extensive sampling in order to determine the extent of impacts caused by the hurricanes. According to LDEQ, results of the testing largely agreed with what is commonly expected following hurricane impacts.

The following summary is from the LDEQ 2006 Water Quality Inventory: Integrated Report. The full report is available from the LDEQ office in Baton Rouge or is available on the internet (http://www.deq.la.gov/portal/tabid/2692/Default.aspx).

Hurricane Katrina

"Early in the New Orleans recovery effort it was determined by the state and U.S. Corps of Engineers that it would be necessary to pump the floodwaters covering much of New Orleans into Lake Pontchartrain. This was done by means of existing drainage canals and pump stations as well as by massive pumps imported from around the U.S. and world. To monitor the impact of pumped floodwaters on Lake Pontchartrain, water chemistry analyses, biotoxicity testing, and fish tissue analyses were conducted by LDEQ, USGS, U.S. EPA, and the National Oceanic and Atmospheric Administration (NOAA). These analyses indicated the pumped floodwater had little to no impact on the lake. It was also noted by LDEQ and others that the volume of floodwaters pumped from New Orleans amounted to less than 5 percent of the volume of Lake Pontchartrain. Based on this fact and the testing conducted, it was determined that Lake Pontchartrain remained essentially unchanged following the hurricane and was largely unaffected by the pumping of floodwaters from New Orleans.

Of the 40,963 analytical results (497 sampling events) for organic compounds, only 107 (0.26 percent) were above detection levels. Only two compounds, hexachlorobenzene and bromodichloromethane, each exceeded non-drinking water human health criteria one time on September 19, 2005 and October 3, 2005, respectively. All other detections for organic compounds were below Louisiana water quality criteria. There were no further organic compound detections after 9 November 2005. Only three of 1,984 dissolved metals results exceeded criteria.

Results of LDEQ's testing largely agreed with what is commonly expected following hurricane impacts. In particular, streams north of Lake Pontchartrain suffered significant reductions in dissolved oxygen as a result of the massive amounts of woody, vegetative and structural debris deposited in them by wind and storm surges. This was particularly true at sample points within a few miles of Lake Pontchartrain. Farther inland there was less impact to headwater streams. Dissolved oxygen levels have returned to pre-storm conditions in portions of the north shore area; however, continued testing is being conducted to determine when water quality conditions have returned to pre-Katrina levels. In addition to the dissolved oxygen problems, numerous small and large sewage treatment facilities were either damaged or destroyed during the hurricane. This resulted in releases of partially treated or untreated sewage. Due to the difficulties of rebuilding in these damaged areas, as well as the influx of New Orleans residents moving to the north shore, adequate sewage treatment remains a significant concern for the area.

Marshes to the south and east of New Orleans, while heavily impacted by wind and storm surge, suffered lesser long-term water quality impacts to dissolved oxygen and other parameters. This was because the area is primarily marsh as opposed to forest land, resulting in less debris being dropped into the water. However, the region did suffer from extensive marsh loss as vegetation and bottom sediments were torn up and washed away or redeposited elsewhere. This has resulted in increased saltwater intrusion, further exacerbating the destruction of fresh and brackish marsh plants. Loss of vegetation due to saltwater intrusion may lead to increased coastal wetland loss. In some cases, areas formerly consisting of solid marsh have now become open water. Extensive oil spills from tanks and refineries in St. Bernard and Plaquemine parishes to the south of New Orleans in some cases resulted in additional marsh loss and contamination. Environmental impacts from these oil spills continue to be evaluated by LDEQ and other agencies.

Due to the counter-clockwise winds of Hurricane Katrina, areas to the southwest, west, and northwest of New Orleans received less damage during the hurricane. Limited post-hurricane monitoring in these areas revealed relatively minor, short term water quality impacts due to debris and storm surge.

Hurricane Rita

Hurricane Rita caused widespread destruction, coming ashore near the Texas, Louisiana border. In Louisiana severe impacts extended from the Texas border to Rockefeller Wildlife Refuge and inland as far north as Lake Charles and Interstate 10. Lesser impacts were felt farther north as hurricane and tropical storm force winds continued up into north Louisiana. In New Orleans, approximately 230 miles east of the storm's center, storm driven surge and waves overtopped already weakened levees. These levees had been damaged during hurricane Katrina and were in the process of being repaired by the U.S. Corps of Engineers. Overtopping of the levees caused renewed flooding in portions of the city. The southwest Louisiana coastal communities of Cameron, Creole, Grand Chenier, and Holly Beach were completely destroyed. Debris from these communities, along with uprooted trees and vegetation, were piled by storm surge as much as ten to twenty miles inland in the interior marshes. Debris piles extended along the southern edge of dredged material embankments along the Intracoastal Waterway and other navigation channels. Over-washed coastal chenier ridges, formed by ancient coastal beaches, trapped this saltwater storm surge within freshwater marshes, pastures and rice ponds, killing vegetation. Soils in this area may be contaminated with salt for years to come depending on rainfall in the area. Lake Charles, Louisiana, some 30 miles from the coast, had extensive flooding of low-lying areas of the city caused by a storm surge and heavy rains. Unlike New Orleans, however, the floodwaters were not trapped in the city for a long period of time.

As with Hurricane Katrina, LDEQ began an intensive water quality monitoring program based on its existing ambient water quality monitoring sites in the

region. Monitoring began on October 17, 2006, with samples collected once every two weeks for a minimum of four weeks or two samples. The need for further sampling was based on results found during the first two rounds of sampling. A suite of parameters similar to that used for Hurricane Katrina was used for the sampling effort. Fifty-one sites from the Texas border to Terrebonne Bayou and extending north to just beyond Interstate 10 were evaluated to determine the extent of damage caused by the hurricane.

Fifty four, or 0.32 percent, of the results from 16,800 organic compound analyses (121 sampling events) were found to be above detection levels. The compound 1,2-dichloroethane exceeded Louisiana's human health non-drinking water standard once at both Bayou Verdine and the Intracoastal Waterway near Boone's Corner. Malathion exceeded U.S. EPA freshwater chronic standards for one sample at Sabine Pass. All other detections for organic compounds were below Louisiana water quality criteria. Only one of 816 dissolved metals results exceeded criteria.

As expected, there were some cases of depressed dissolved oxygen due to organic debris having been thrown into area water bodies, particularly in the Mermentau River Basin south of Interstate 10. Some streams in the Vermilion-Teche Basin, farther east from the center of the storm, also experienced reduced dissolved oxygen concentrations, though reductions were not as severe as that found in the Mermentau Basin. Chloride concentrations were significantly higher throughout the impacted area due to the high storm surge. Chloride concentrations in the Vermilion-Teche Basin were also elevated but not as significantly as in the Mermentau region. This reduced impact compared to the Mermentau River Basin results from Vermilion-Teche Basin's location farther east from the center of the storm's path and from its protection from a direct hit by Marsh Island, Vermilion Bay and West Cote Blanche Bay.

Farther to the east, both the Atchafalaya and Terrebonne Basins showed minimal if any impact due to Hurricane Rita. Dissolved oxygen levels were generally at or near pre-storm conditions. Chloride concentrations were elevated in some locations, possibly due to storm surge. However, in addition to the hurricanes there was an ongoing drought in much of Louisiana. Droughts frequently lead to increased chloride concentrations in coastal streams due to reduced freshwater flows with resulting increases in tidal influence along coastal waters.

In general, impacts due to Hurricane Rita, while severe in terms of structural, agricultural, and economic losses, were not unusual or unexpected in terms of water quality. Post-hurricane monitoring in the area was quickly discontinued or replaced by Louisiana's ambient monitoring program described above. As with the ambient samples collected in the Hurricane Katrina impact area, ambient samples taken from sites in the Hurricane Rita impact area will be carefully scrutinized to determine if the site has returned to pre-hurricane conditions."

3.1.3 Air Quality

This resource is institutionally significant because of the Clean Air Act of 1963, as amended (CAA), and the Louisiana Environmental Quality Act of 1983, as amended (LEQA). Air quality is technically significant because of the status of regional ambient air quality in relation to the National Ambient Air Quality Standards (NAAQS). It is publicly significant because of the desire for clean air expressed by virtually all citizens.

Historic and Existing Conditions

The EPA has set national air quality standards for six common pollutants (also referred to as "criteria" pollutants). They include ozone (O_3), particulate matter, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and lead (pB). States are required by the Code of Federal Regulations to report to the EPA annual emissions estimates for point sources (major industrial facilities) emitting greater than, or equal to, 100 tons per year of volatile organic compounds (VOCs), NO_2, SO_2, particulate matter less than 10 microns in size; 1,000 tons per year of CO; or 5 tons per year of Pb. Since O_3 is not an “emission,” but the result of a photochemical reaction, states are required to report emissions of VOCs, which are compounds that lead to the formation of O_3. In accordance with the Clean Air Act, the EPA set National Ambient Air Quality Standard for pollutants considered harmful to public health and the environment. The CAA established two types of national air quality standards. Primary standards set limits to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Generally, addressing potential air quality impacts concerns would be accomplished on a project-by-project basis and in coordination with the LDEQ. As required by LAC 33:III.1405 B, an air quality applicability determination would be made for each specific project. This would include consideration of each separate project item of the proposed action for the category of general conformity, in accordance with the Louisiana General Conformity, State Implementation Plan (LDEQ, SIP 2005).

3.1.4 Noise

Historic and Existing Conditions

Noise, or unwanted sound, may be objectionable in terms of the health or nuisance effects it may have upon humans and the human environment, as well as upon the animals and ecological systems in the natural environment. The Noise Control Act of 1972 declares the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health or welfare. It is the purpose of the act to establish a means for effective coordination of Federal activities in noise control and to provide information to the public regarding the noise emissions.

Noise concerns are directly related to its potential negative effects upon humans and animals, and may range from annoyance to adverse physiological responses, including permanent or temporary loss of hearing, disruption of colonial nesting birds, and other types of disturbance to

humans and animals. Noise is typically associated with human activities and habitations, such as operation of commercial and recreational boats, water vessels, air boats, and other recreational vehicles; operation of machinery and motors; and human residential-related noise (air conditioner, lawn mower, etc.). Generally, noise is a localized phenomenon throughout the BUDMAT Study area.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Soils

These resources are institutionally significant because of the Food Security Act of 1985, as amended; the Farmland Protection Policy Act of 1981; and the Fish and Wildlife Coordination Act of 1958, as amended. These resources are technically significant because of the habitat provided for both open and forest-dwelling wildlife, and the provision or potential for provision of forest products and human and livestock food products. These resources are publicly significant because of their present economic value or potential for future economic value.

Historic and Existing Conditions

Coastal land loss is directly and inextricably linked to the five factors of soil formation. The five main factors that influence the process of soil formation include: climate; formation of the soil material from the parent material; the physical and chemical composition of the original parent material; the kinds of plants and other organisms living in and on the soil; the relief of the land and its effect on runoff and erosion; and the length of time the soil has to form. The effect of any one factor can differ from place to place, but the interaction of all the factors determines the kind of soil that forms. Interaction of the factors results in differences among the soils and has an effect on the type of properties expressed in soils at any given site. This resource was thoroughly covered in the LCA Study (2004), and is incorporated herein by reference.

Properties of Dredged Sediment.

Dredged material is composed predominately of mineral particles ranging in size from coarse sand, to silt, to fine clay and can have extremely mixed mineralogy. The majority of dredged sediments in Louisiana, excluding the far upstream Mississippi River crossings sediments, have a mixed mineralogy consisting primarily of silts and clays and are therefore most suitable for marsh creation and/or chenier ridge restoration. These mixed sediments are not suitable for barrier island restoration and beach berms. The sediments from the lower Atchafalaya and Calcasieu Bar Channel consist of unconsolidated clays, which do not stack well and often remain as individual clay particles (“fluff”) in saline waters. These dredge materials would be most suitable for thin layer placement, such as marsh nourishment. However, the dredged materials from the Mississippi River Delta Head of Passes at Southwest Pass and from the Horseshoe in the Atchafalaya River is predominately sand and is suitable for barrier island restoration and beach berms.

3.2.2 Barrier systems: barrier shorelines, headlands, and islands

These resources are institutionally recognized by the Coastal Barrier Resources Act of 1990 (16 U.S.C. §§3501-3510). Section 3501 of the act describes the Congressional statement of findings that:

- Coastal barriers provide habitats for migratory birds, wildlife, finfish, shellfish, and other aquatic organisms;
- Coastal barriers contain resources of extraordinary scientific, recreational, natural, historic, and ecologic importance;
- Coastal barriers serve as natural storm protective buffers and are generally unsuitable for development because they are vulnerable to hurricane and other storm damage and because natural shoreline recession and the movement of unstable sediments undermine human structures;
- Certain actions and programs of the Federal Government have subsidized and permitted human development on coastal barriers and the result has been the loss of barrier resources, threats to human life, health, and property, and the expenditure of millions of tax dollars each year; and
- A program of coordinated Federal, state, and local governments is critical to the more appropriate use and conservation of coastal barriers.

Historic and Existing Conditions

Louisiana's barrier systems (figure 14) are the first line of defense against the storms and hurricanes that affect coastal Louisiana; they dampen the impacts of waves and surges before they move landward toward more fragile inland estuarine and wetland areas. These were formed as the outer edge of active delta lobes and in time became separated from the mainland, often rolling landward into shallow water behind them. They also protect the inshore oil and gas extraction infrastructure that is not built to withstand the gulf waves. The barrier systems regulate the exchange of higher salinity gulf waters with the lower salinity waters of the interior coastal areas. This is seen in the estuarine gradient of progressively fresher vegetation zones as one travels inland from the saline marshes near the gulf, landward to less saline brackish marshes, intermediate marshes, freshwater marshes, and swamps.

The diversity and abundance of natural resources in Louisiana's barrier systems plays a major role in making this unique area "A Working Coast." This "working coast" is also a rich fishery, recreational, or "sportsman's paradise," and coastal and offshore petroleum production area. In addition to providing critical habitat for threatened and endangered species, such as the piping plover, brown pelican, and sea turtles, Louisiana's barrier systems protect what many consider as critically imperiled human habitat. Barrier Islands are constantly building, eroding, and shifting under the normal actions of wind and waves. Restoration of barrier islands is recommended in the Louisiana State Master Plan (Coastal Protection and Restoration Authority of Louisiana 2007) in the Terrebonne and Barataria Basins because these ecologically important habitats are close enough to marsh and human settlements to diffuse wave energy and storm surge. These areas also provide habitat for migratory birds and threatened and endangered species. The State

Master Plan lists the Chandeleur Islands as a separate case due to their lack of proximity to the mainland for significant storm protection; however, they do represent valuable habitat.

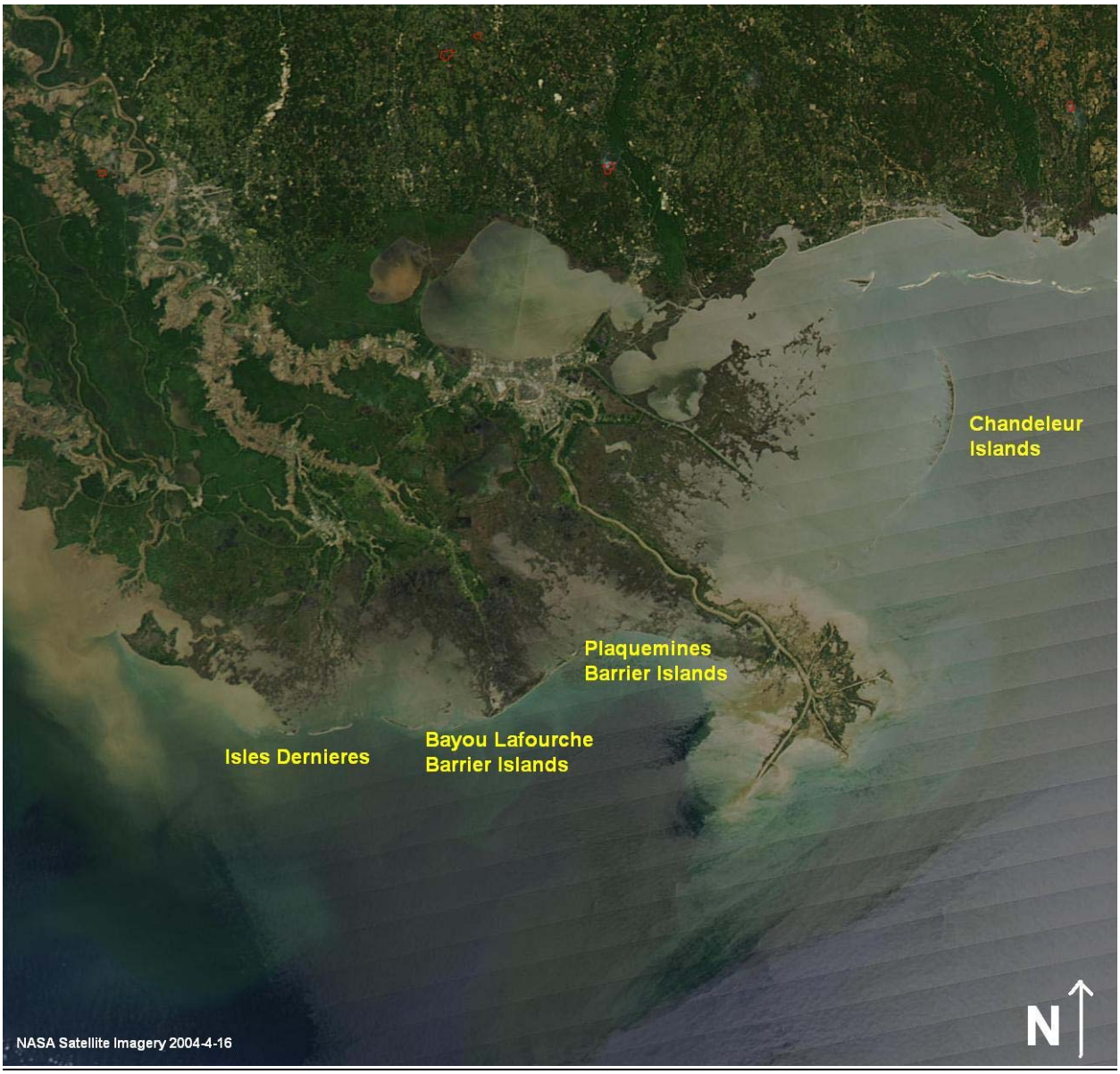


Figure 14. Barrier islands of Louisiana

3.2.2.1 Barrier Islands

Chandeleur Barrier System: At over 46 miles long, the Chandeleur barrier system is the oldest barrier island arc on the Deltaic Plain. These islands enclose Breton Sound and Chandeleur Sound in St. Bernard and Plaquemines Parishes. The Chandeleur Islands are part of the Breton National Wildlife Refuge (NWR), a large portion of which is a designated wilderness

area. The Chandeleur Barrier System includes the following islands: Chandeleur, New Harbor Islands, North Islands, Freemason Islands, Curlew, Errol, Grand Goosier, and Breton Islands.

The Chandeleurs were on the east side of Hurricane Katrina, and in the counterclockwise spin of the storm, received a significant hit, with the eye of the storm passing approximately 50 miles to their east. The storm surge and large waves from Hurricane Katrina submerged the islands, stripped sand from the beaches, and eroded large sections of the marsh. According to preliminary studies by the USGS and the National Aeronautics and Space Administration (NASA), a significant portion of these islands were breached (Barras, 2006; Stone, 2007). Initial observation by survey crews shows tremendous storm impact to the islands, with large scours offshore and numerous breaches to the shoreface (Flocks 2006). It is too soon to tell the long-term effects and recovery.

Plaquemines Barrier System: This approximately 30-mile long barrier system forms the seaward geologic framework for the eastern Barataria Basin and lies about 31 miles northwest of the active Mississippi River Delta. Historic Fort Livingston is situated upon West Grand Terre, the largest island in this system. The Plaquemines barrier system consists of remnant barrier spits and islands defined by either a tidal pass, or the entrance to a bayou. These islands include: Chenier Ronquille, Bay La Mer Gulf Shore, Bay Joe Wise Gulf Shore, Shell Island, Pelican Island, and Dry Cypress Bayou Gulf Area. The 2005 hurricanes did not seem to have a significant impact on the Plaquemines Barrier System as the islands were west of Hurricane Katrina, and far to the east of Hurricane Rita.

Bayou Lafourche Barrier System: The Bayou Lafourche barrier system stretches over 37 miles from Barataria Pass near Grand Isle to Cat Island Pass. This barrier system forms the seaward geologic framework of the western Barataria Basin and the eastern Terrebonne Basin. This barrier system consists of the only commercially developed barrier island in Louisiana, Grand Isle. The 12-mile Caminada-Moreau headland, with some of the highest rates of shoreline loss in coastal Louisiana, is the landfall site of many oil and gas pipelines, including the Louisiana Offshore Oil Port (LOOP) facilities, which handles 12 percent of the US crude oil imports and connects to over 50 percent of the US refinery capacity (www.loopllc.com). The westernmost islands in this barrier system include Timbalier Island and East Timbalier Island. These islands have experienced more lateral morphological change than have any others in Louisiana (Williams et al. 1992). As with the Plaquemines Barrier System, the 2005 hurricanes did not seem to have a significant impact on the Bayou Lafourche Barrier Systems. The storm surges overtopped islands and coastal headlands, but did not wash them away.

Isles Dernieres Barrier System: At over 16 miles long, the Isles Dernieres barrier system forms the seaward geologic framework for the western Terrebonne Basin. In 1853, this barrier system was a continuous shoreline system, except for Wine Island (Williams et al. 1992). Today, this barrier system consists of five main islands: Wine Island, East Island, Trinity Island, Whiskey Island, and Raccoon Island.

East Island suffered severe erosion from the 2005 hurricanes, loosing approximately one third of its land mass, chiefly on the eastern end of the island (Boudreaux-Bodin, ed. 2006). Currently, a CWPPRA project is under construction to repair previous (prior to 2005) storm

damage and reunite the western portion of East Island to Trinity Island by pumping Gulf of Mexico sand into the "New Cut" breach.

3.2.2.2 Chenier Plain and Barrier Shoreline

The Chenier Plain of southwestern Louisiana, with elevations of approximately 6 ft to 20 ft, extends from Sabine Pass, Texas to Southwest Point, Louisiana. A chenier plain consists of multiple shore-parallel, sand-rich ridges that are perched on and physically separated from one another by relatively finer-grained, clay-rich sediments. Oak trees ("cheniers" in French) grew on these ridges and gave the region its name.

Historically, the general mechanism of deposition along the chenier plain was closely related to variations in the amounts of alluvial sediments transported westward by the littoral flow when the Mississippi River oscillated between subdeltas. Chronic erosion in this area is caused by a deficit of sand and sediment in the littoral flow, caused by stabilization of the Mississippi River and regulation of the Atchafalaya River to the east. In addition, the Calcasieu and Mermentau Rivers are not supplying coarse-grained sediment to the area, and the Calcasieu Ship Channel jetties deflect the little material that exists further offshore. Chenier ridge habitat has also been lost due to clearing for development and agriculture.

Coastal communities of southwestern Louisiana were severely impacted by Hurricane Rita, with some communities being totally destroyed. Coastal beaches were over washed by the storm surge and the sands were redeposited further inland. The Holly Beach Sand Management project (CWPPRA CS-31) was completed in 2003 and included breakwater modifications, sand fences, and plantings. The fences created high stable dunes, which to a certain extent, withstood the storm surge. Land analysis by USGS of the project benefit area indicates that the land / water acreage gained after the storm by 85 acres or 0.8 percent. The additional acreage could have come from off-shore sand or from the Holly Beach project's sand nourishment.

3.2.3 Coastal vegetation resources - Wetlands

This resource is institutionally important because of: the Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968. Wetlands are technically important because: they provide necessary habitat for various species of plants, fish, and wildlife; they serve as ground water recharge areas; they provide storage areas for storm and flood waters; they serve as natural water filtration areas; they provide protection from wave action, erosion, and storm damage; and they provide various consumptive and nonconsumptive recreational opportunities. Wetlands are publicly important because of the high value the public places on the functions and values that wetlands provide. Bottomland hardwood forests are technically significant because: they provide necessary habitat for a variety of species of plants, fish, and wildlife; they often provide a variety of wetland functions and values; they are an important source of lumber and other commercial forest products; and they provide various consumptive and nonconsumptive recreational opportunities. Bottomland hardwood forests are publicly significant because of the high priority that the public places on their aesthetic, recreational, and commercial values.

Louisiana's coastal wetlands comprise a variety of environments formed by spatially and temporally varying conditions that continually influence and change the vegetative landscape. The environmental factors and their innumerable combinations that regulate the occurrence and distribution of plant species and associations include, but are not limited to, soil and water salinity, soil type, elevation, hydrology and flooding regime, tidal influence, and climate. Competition, especially from invasive species, herbivory pressure, and man-made disturbance, such as burning or hydrologic modification, are other forces that can impact vegetative species. Each plant species adapts to a definite range of environmental conditions, and those species that are adapted to similar conditions form communities or associations that are best able to grow and successfully compete for a particular site. Wherever the prevailing environmental conditions are similar, analogous communities with comparable species composition and dominance tend to occur. When environmental conditions change, succession can occur where plant species or whole communities are replaced by others more suited to the new conditions (O'Neil 1949; Chabreck 1972a).

Wetlands of national significance include the Barataria – Terrebonne National Estuary which was nominated for participation in the EPA administered National Estuary Program on October 16, 1989. In his nomination letter, the Governor of Louisiana stated, "Louisiana faces a pivotal battle in the Barataria-Terrebonne Estuarine Complex if we are to do our part in winning the national war to stem the net loss of wetlands..." On September 13, 1990, the EPA and the State of Louisiana committed to a cooperative agreement under the National Estuary Program to form the Barataria-Terrebonne National Estuary Program. The program's charter was to develop a coalition of government, private, and commercial interests for the preservation of the Barataria and Terrebonne.

Other wetlands of national interest (figure 15 (same as figure 8)) include those found in 10 National Wildlife Refuges encompassing more than 301,700 acres in coastal Louisiana. They include Sabine, Cameron Prairie, Lacassine, Shell Keys, Bayou Teche, Delta, Breton, Bayou Savage, Big Branch Marsh, and Mandalay NWR. One National Park, the Barataria Preserve unit of Jean Lafitte National Park, protects overt 20,000 acres of swamps, marshes, and ridges just south of the City of New Orleans. The Louisiana Department of Wildlife and Fisheries also operates 17 refuges, preserves and wildlife management areas in coastal Louisiana, comprising more than 572,000 acres. Some of these refuges and wildlife management areas have been increased in size over the years as mitigation for wetland damages from other projects, such as the creation of levees.

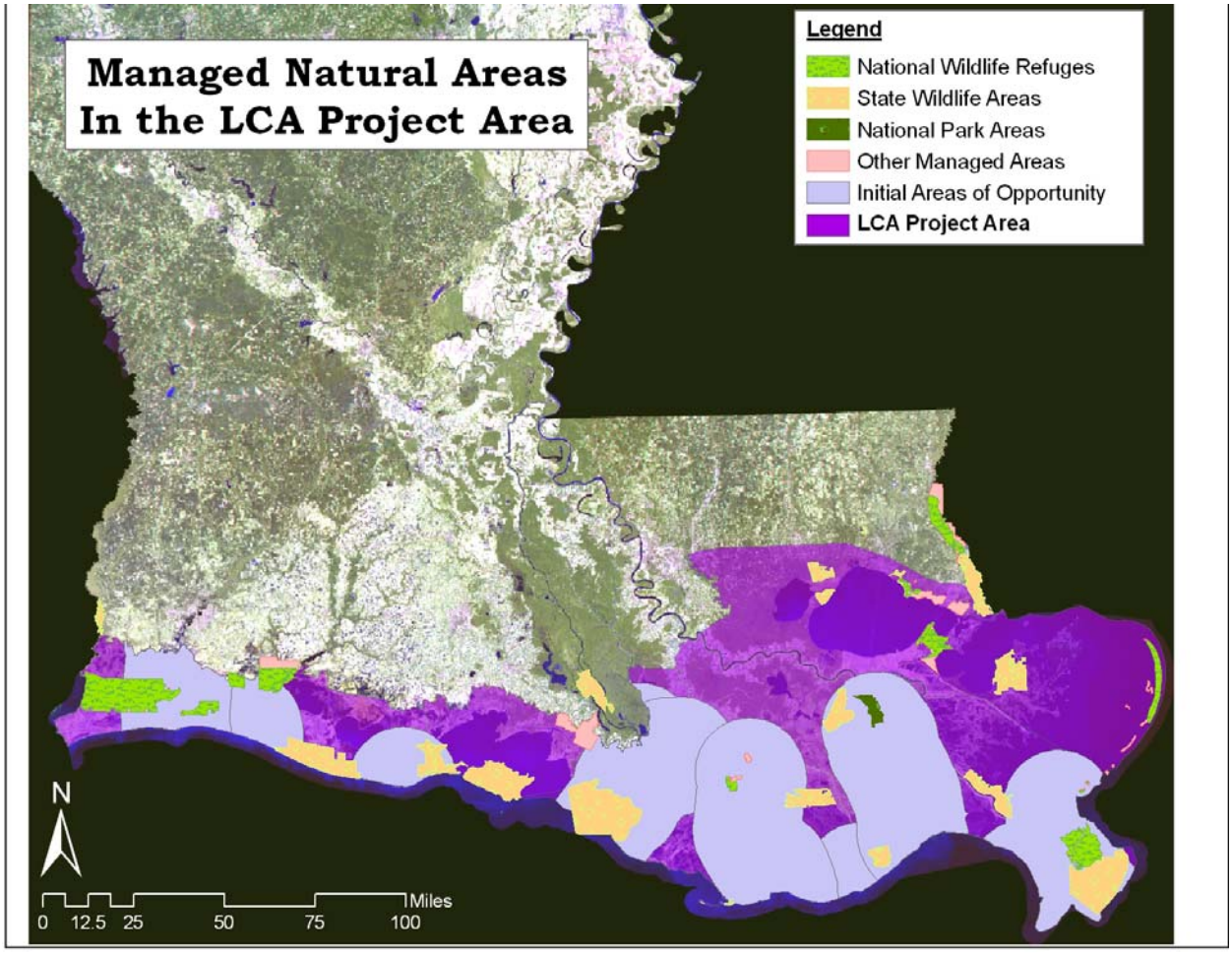


Figure 15. Wetlands of National Interest: refuges, parks, and management areas.

In habitats with restricted variation in conditions, such as those with extreme salinity, species diversity is reduced. Since the source of salinity in coastal Louisiana is the Gulf of Mexico, salinity levels exist along a gradient, which declines as the saltwater moves inland. A zonation of plant species that differ in salinity tolerance exists along that gradient, with the species diversity of those zones increasing from salt to fresh environments (table 7).

Table 7. Salinity ranges for the four coastal wetland types

Wetland Type	Range (ppt)	Mean (ppt)	Typical Range (ppt)
Fresh	0.1 – 6.7	<3.0	0 – 3
Intermediate	0.4 – 9.9	3.3	2 – 5
Brackish	0.4 – 28.1	8.0	4 – 15
Saline	0.6 – 51.9	16.0	12 +

(Source: Chabreck, 1972; Louisiana Coastal Wetlands Conservation and Restoration Task Force; and the Wetlands Conservation and Restoration Authority 1998)
ppt – parts per thousand

Louisiana's coastal vegetative landscape is characterized by a diversity of plant communities that have been previously classified and mapped according to major association or type (Penfound and Hathaway 1938; O'Neil 1949; Chabreck et al. 1968; Chabreck 1970, 1972b; Cowardin et al. 1979; Chabreck and Linscombe 1978, 1988; Visser et al. 1998, 1999, 2000; and Chabreck et al. 2001).

The types and productivity of vegetative communities are greatly influenced by the same factors responsible for coastal land loss. Furthermore, the persistence of a vegetative community is dependent upon its ability to adapt to changing conditions. The loss of wetlands has and continues to impact all vegetative community types from the barrier islands, headlands, and salt marshes at the coastal shore to the interior fresh marshes, swamps, and bottomland forests.

Table 8. Wetland habitat (square miles) by sub-province.

Habitat Classes		Sub-Province 1	Sub-Province 2	Sub-Province 3	Sub-Province 4	Total LCA Area
Fresh Marsh	2001	111	283	534	542	1470
	2005	88	284	545	500	1417
Intermediate Marsh	2001	251	133	302	445	1131
	2005	19	124	267	416	826
Brackish Marsh	2001	282	102	314	215	913
	2005	237	100	298	210	845
Saline Marsh	2001	177	184	177	47	585
	2005	191	197	220	54	662
Swamp/Wetland Forest And other land	2001	553	460	608	6	1627
	2005	467	351	511	0	1329
Total	**2001**	1374	1162	1935	1255	5726
	2005	1002	1056	1841	1180	5079

Source: LCA EIS (2001 data) and USGS (Fall 2005 data).

With the exception of Saline Marsh, all habitat types lost land between 2001 and 2005, as seen in table 8. Some of the saline marsh gain can be attributed to the conversion of fresher marshes to saline due to the inflow of gulf water. Whether these changes are permanent remains to be seen, and is a subject of study for Federal and state institutions. Approximately 650 square miles of coastal land was lost between 2001 and 2005, however, some marshes have started to recover from the devastation of the 2005 hurricanes, only to be hit hard again by Hurricanes Gustav and Ike in September 2008. Imagery and data collected after the 2008 hurricanes was used to calculate the land changes in the 15-mile initial Areas of Opportunity, zones adjacent to the federally maintained navigation channels (table 9). Some of these channels are dredged annually, and some are dredged only every 7-10 years, as discussed in Chapter 1. The highest land loss, 19 percent, is reflected by the Breton Sound portion of the Lower Mississippi River, which was in the direct path of Hurricane Katrina in 2005. Other high land loss areas are adjacent to the Houma Navigation Canal, Port Fourchon, and the Barataria Waterway in the Terrebonne and Barataria Basins.

Table 9. BUDMAT Area of Opportunity

Approximately 15 miles from Federally maintained navigation channels					
Navigation Channel	**Basin**	**Total Area (acres)**	**Acres change 1985 – 2008**	**Change, acres per year 1985-2008**	**% Change**
Calcasieu Ship Channel	Calcasieu	376,826	-13,553	-594	-4%
Mermentau	Mermentau	289,324	-11,596	-508	-4%
Freshwater Bayou	Mermentau Teche / Vermilion	217,075	-14,144	-597	-7%
Berwick Harbor	Atchafalaya	217,244	12,274	518	6%
Atchafalaya	Atchafalaya	547,128	26,319	1110	5%
Houma Navigation Canal	Terrebonne	663,718	-52,528	-2,216	-8%
Port Fourchon	Terrebonne & Barataria	272,353	-27,288	-1151	-10%
Barataria Waterway	Barataria	778,726	-69,020	-2,912	-9%
Lower Mississippi River	Mississippi River Delta and part of Breton Sound	696,625	-130,573	-5,684	-19%
(USGS data: Barras et al 2008 and Barras 2009)					

3.2.3.1 Wetlands – Swamps and Marshes

Wetlands were covered extensively in the LCA Study (2004), and are incorporated herein by reference.

During the 1900s, Louisiana lost approximately 1.2 million acres of its coastal wetlands. Coastwide loss rates peaked at approximately 42 square miles per year during the 1950s and 1960s. Between 1983 and 1990, Louisiana's coastal wetlands were being lost at approximately 24 square miles each year (USACE 2004). The estimated 217 square mile conversion of land to water due to the hurricanes of 2005 will result in a substantially increased loss rate for the time increment encompassing that year (USGS 2006). Additionally, large areas of fresh marsh and low-salinity wetlands have converted to deteriorated brackish and saline marshes, or open water.

The initial estimated loss of wetlands after the 2005 hurricanes by USGS includes the caveat that it does not take into account some marsh recovery, but indications are such that much of the loss may be permanent. Some areas of open water would likely become permanent. Substantial marsh loss, primarily from Hurricane Katrina, occurred east of the Mississippi River in St. Bernard and Plaquemines Parishes. Approximately 39 square miles of marsh around the upper and central portions of Breton Sound were converted to open water by ripping of the marsh or marsh submergence (figures 16 and 17). Other impacts to wetlands after hurricanes include:

- Compressed or folded marsh, where a net decrease in surface area results from marsh being pushed together, somewhat like an accordion closing.
- Marsh balls, which are created by the marsh being piled, rolled, or otherwise deformed to create large mounds (resulting in a decreased surface area)
- Sheer, a rip between marsh surfaces that tears marsh and moves it apart, allowing expanses of water to form.
- Scoured, marsh with vegetation ripped off at the roots, exposing a muddy bottom.
- Inverted or flipped, unbroken marsh mat lifted from its clay base and overturned with roots pointing skywards
- Salt burn, where salt water from the Gulf of Mexico pushed into freshwater areas, killing and damaging salt-sensitive plants.
- Floatant marsh being uprooted and transported further inland by the storm surge, leaving behind open water.
- Deposition of additional sediments from the storm surge.

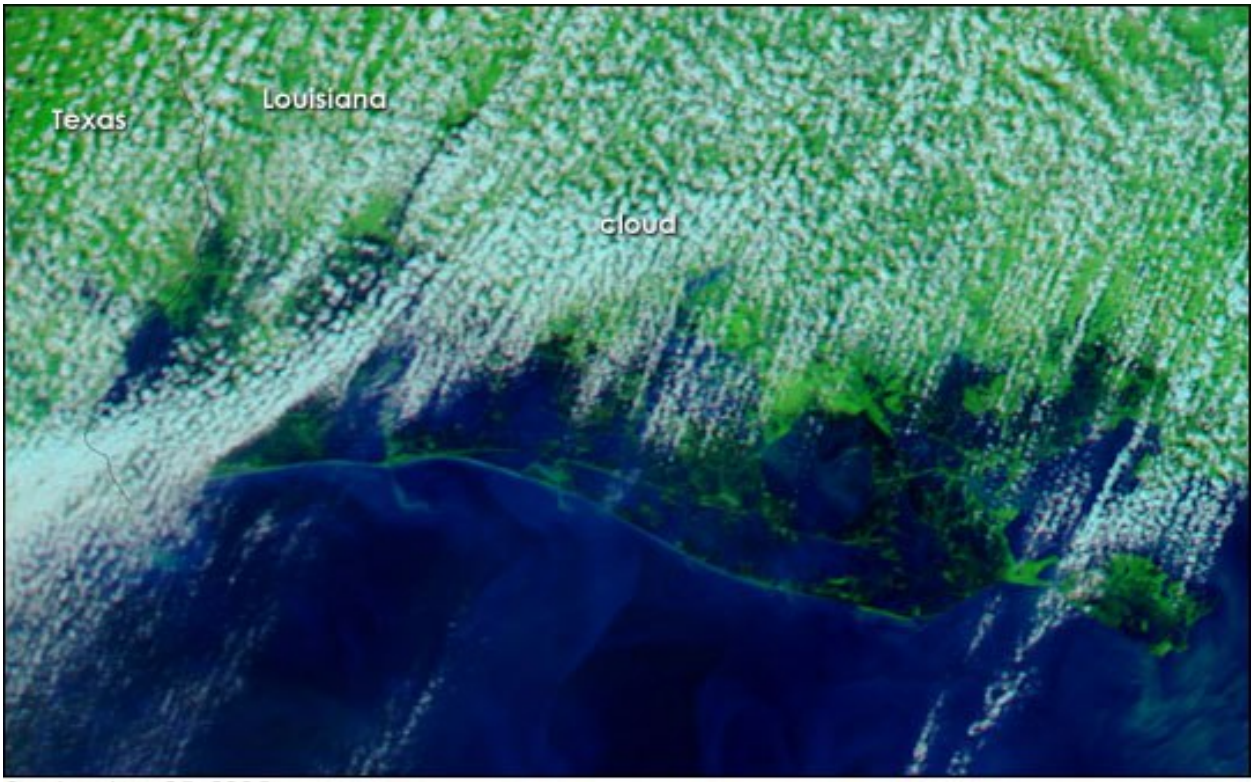
The storm surges from Hurricanes Katrina and Rita (2005) pushed as far inland as 29 miles, damaging freshwater marsh vegetation and overtopping chenier ridges. Storm surges from Hurricanes Gustav and Ike (2008), pushed in approximately 30 miles inland in some areas, affecting central and southwestern Louisiana still recovering from the 2005 hurricanes. Monitoring stations located in the upper Barataria Basin showed that salinity increased from 0.2 parts per thousand (ppt) to over 10 ppt following the passage of Hurricane Katrina (Smith 2006). Areas outside the direct paths of the hurricanes were also affected. A continuous recording station in a freshwater marsh of Terrebonne Parish recorded a peak salinity of 17 ppt following Hurricane Rita and the salinity levels remained above 6 ppt into December 2005 (Steyer 2007). The Terrebonne, Barataria, and Lower Mississippi Basins had the highest land loss rates in the 23 year study period (table 9), ranging from 9 to 19 percent. This reflects subsidence, relative sea level rise, hurricane damage, and damages from oil and gas exploration (Johnson et al 2009). Prolonged flooding of marshes by saltwater was a major problem in southwestern Louisiana, the Calcasieu and Mermentau Basins. Saltwater became trapped by cheniers, flooding the fresh marshes behind them. Louisiana was in an extended drought before the 2005 hurricanes, and the drought continued well into 2006. Therefore, saltwater was not immediately flushed from freshwater systems inundated by gulf waters during the hurricanes (NMFS 2007).

August 9, 2005

September 4, 2005

Figure 16. Flooding impacts after Hurricane Katrina (NASA imagery).

September 21, 2005



September 25, 2005

Figure 17. Flooding impacts after Hurricane Rita (NASA imagery)

3.2.3.2 Cheniers

As stated previously, the Chenier Plain of southwestern Louisiana, with elevations of approximately 6 ft to 20 ft, extends from Sabine Pass, Texas to Southwest Point, Louisiana. A chenier plain consists of multiple shore-parallel, sand-rich ridges that are perched on and physically separated from one another by relatively finer-grained, clay-rich sediments. Oak trees ("cheniers" in French) grew on these ridges and gave the region its name.

The Chenier Plain evolved during the Holocene as numerous cycles of deposition and erosion created alternating ridges separated by marshlands. These processes concentrated the coarse-grained sediments and formed shore-parallel ridges called "cheniers" (Gould and McFarlan 1959; Byrne et al. 1959). Introduction of new sediment by westward shifts of the Mississippi River Delta resulted in the isolation of these ridges by accretion of new material on the existing shoreline. Thus, repeated seaward growth and retreat along the Chenier Plain is a consequence of deltaic deposition farther east as well as the periodic cessation of sediment supply to the Chenier Plain as rivers and streams changed course, abandoning channels and old deltas. Currently, the Atchafalaya River is supplying the Chenier Plain with fine-grained sediments by westward-directed longshore transport.

Figure 18. "Burned" marsh on Cameron Prairie NWR, two years after Hurricane Rita.

The Chenier Plain received a direct hit from Hurricane Rita (2005) that destroyed much of what had been rebuilt after Hurricane Audrey of 1957. Audrey, a Category 4 hurricane, sent 8-foot to 12-foot storm surges penetrating as far inland as 25 miles, destroying the town of Cameron. Almost 50 years later, Cameron was hard hit again by the 10-foot to 15-foot storm surges of Hurricane Rita. These hurricane storm surges pushed saline water far inland, which were trapped behind the Chenier ridges, causing severe stress or killing fresh marshes (figure 18). The effect is often referred to as "burning." Recovery for these effected areas is partially dependant on sufficient rainfall to dilute and wash away the salts. During the recovery phase, these burned marshes are more susceptible to erosion due to the lack of plants to hold the fragile soils in place. Three years later, the Chenier Plain and eastwards into the Terrebonne Basin was inundated by the high tides and storm surges from Hurricanes Gustav and Ike, which came on shore as category 2 storms. Gustav made landfall near Cocodrie, LA in the center of the Terrebonne Basin in early September 2008, and Ike made landfall two weeks later at the north end of Galveston Island, TX , devastating the island, but a storm surge of over 8-10 feet extended across the Calcasieu and Mermentau Basins.

In much of study area, chenier ridge habitat has been lost or dramatically altered due to subsidence or the cutting of canals through ridges. As a result, the dredged material

embankment (locally known as "spoil bank") ridges along canals have become a surrogate for cheniers. In some areas, dredged material embankments provide nearly the only surface available for emergent vegetation. They can support a wide variety of plant species depending on their elevation, age, and proximity to seed sources. These higher wooded areas not only provide necessary resting and refueling areas for neotropical migrants and nesting areas for resident avian species, they also provide refugia for mammals and other species during times of high water. The lower edges of the dredged material embankments usually have a band of smooth cordgrass along the water's edge on the side opposite the canal. The canal side has a higher energy regime and is usually bare along the lower edges. Some of the early colonizers of newer dredged material embankments in the area are seaside goldenrod, marsh-hay cordgrass, salt grass, and seaside heliotrope. The shrubs, marsh elder and groundsel bush, occur on almost all dredged material embankments in the project area and are occasionally intertwined with dodder vine. Older, higher dredged material embankments support well-developed communities with shrub species such as elderberry, yaupon, and wax myrtle. Vines such as marine-vine and blackberry are also found. These older ridges also support the tree species live oak, hackberry, honey locust, and toothache tree.

3.2.4 Wildlife resources: birds, mammals, amphibians, and reptiles

This resource is institutionally significant because of the Fish and Wildlife Coordination Act of 1958, as amended. Wildlife are technically significant because: they are a critical element of many valuable aquatic and terrestrial habitats; they are an indicator of the health of various aquatic and terrestrial habitats; and many species are important commercial resources. Fish and Wildlife resources are publicly significant because of the high priority that the public places on their esthetic, recreational, and commercial value.

The biodiversity characterizing coastal Louisiana is nationally significant. Coastal Louisiana contains an estimated 40 percent of the vegetated estuarine wetlands in the contiguous United States. Louisiana's coastal wetlands provide important habitats for various life cycle phases for over 50 rare, threatened, or endangered species including: piping plover (*Charadrius melodus*), bald eagle (*Haliaeetus leucocephalus*), brown pelican (*Pelicanus occidentalis*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), diamondbacked terrapin (*Malaclemys terrapin*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and Louisiana black bear (*Ursus americanus luteolus*). In the Barataria-Terrebonne estuary alone, one of the most degraded but most productive and diverse estuary complexes of coastal Louisiana, it is estimated that 353 species of birds are known to occur, of which 185 species are annual returning migrants. In total, approximately 735 species of birds, finfish, shellfish, reptiles, amphibians, and mammals spend all or part of their life cycle in the estuary (http://www.btnep.org). The past and continuing loss of coastal wetlands and their associated habitat values are the principle threat to the nationally significant fish and wildlife resources that depend on them.

Historic and Existing Conditions

This resource is thoroughly covered in the LCA Study (2004) and is incorporated herein by reference.

The two sub-provinces hit hardest by the hurricanes of 2005 and 2008, Pontchartrain-Breton-East Mississippi River Delta and the Calcasieu-Mermentau (Sub-provinces 1 and 4 respectively) are still recovering from the storms. Long-term effects to wildlife are still unknown. In the short-term, wildlife were displaced by the storm surge, and may remain displaced as marshes were destroyed or burned by salt-water intrusion. Migratory birds may not find as many trees or shrubs for rest in their north or southbound routes across the Gulf of Mexico.

Louisiana's coastal marshes provide winter habitat for more than 50 percent of the duck population of the Mississippi Flyway. Fresh and intermediate marshes support the greatest concentrations of wintering waterfowl in coastal Louisiana. Those wetlands are vitally important to the mission of Gulf Coast Joint Venture, which was established to help achieve the goals of the North American Waterfowl Management Plan. Louisiana's coastal marshes, swamps, and associated habitats also support many other migratory birds such as rails, gallinules, shorebirds, seabirds, wading birds, and numerous songbirds. One hundred ninety-seven colonies of wading birds and seabirds (representing 215,249 pairs of nesting birds were observed in coastal Louisiana during a 2001 survey (Michot 2003). The cheniers and natural levees forests of coastal Louisiana provide essential stopover habitat to numerous neotropical migratory passerine birds.

Coastal Louisiana has long been a leading fur-producing area in North America. Common furbearers include nutria, mink, muskrat, raccoon, and river otter. Those coastal marshes and swamps also support game animals such as the white-tailed deer and swamp rabbit. The area also supports 1.5 million alligators for which sport and commercial hunting is closely regulated.

3.2.5 Fisheries resources

This resource is institutionally significant because of the Fish and Wildlife Coordination Act of 1958, as amended. Fisheries resources are technically significant because: they are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of various freshwater and marine habitats; and many species are important commercial resources. Fish and Wildlife resources are publicly significant because of the high priority that the public places on their esthetic, recreational, and commercial value.

Historic and Existing Conditions

Louisiana's vast and biologically diverse coastal area serves as an important gulf coast estuarine system, which functions as a nursery, feeding, spawning, and grow out area for many aquatic organisms. Louisiana ports produce a catch comparable to that of the entire Atlantic seaboard, and more than triple that of the remaining Gulf States (NMFS 2001). Four Louisiana ports have ranked among the top 10 in value of commercial fisheries landings throughout the U.S. since 1981 (NMFS 2003). Louisiana's commercial landings have been over one billion lbs/yr for over 20 years, with a value exceeding $400 million in 2000. White shrimp (*Litopenaeus setiferus)*, brown shrimp (*Farfantepenaeus aztecus*), and gulf menhaden (*Brevoortia patronus*) account for the majority of commercial harvest by value.

The term fish, as used in this document, includes a variety of finfish and shellfish. There are several ways to profile this diverse collection of organisms. For the purpose of this PEIS, the general salinity preference of an organism for the freshwater, estuarine, or marine environment is used.

Freshwater species inhabit lakes, rivers, and backwaters where salinities remain low. Lagoons, bayous, and ponds throughout Louisiana provide excellent freshwater habitat for species such as largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis* spp.), various other sunfish species, and catfish (*Ictalurus* sp.).

The majority of the LCA Study area is considered estuarine habitat; therefore, estuarine aquatic organisms are a significant resource within the project area. Estuarine fishery species may be resident (species residing in the estuary throughout their life cycle), such as killifishes (*Cyprinodontidae*), or transient (species that use estuaries during their life cycle), such as gulf menhaden, blue crab (*Callinectes sapidus*), and shrimp.

Marine species are found in offshore waters throughout the gulf coast and generally do not depend on coastal estuaries to complete any part of their life cycle. These species are in some ways dependant on the health and productivity of coastal estuaries, in that their prey often are made up of estuarine dependant species. In addition, some marine species frequently inhabit the lower reaches of estuaries, where productivity is high.

The American oyster (*Crassostrea virginica*) is indigenous to coastal Louisiana, and provides a rich ecological and commercial resource. This organism is unique in that it does not migrate like other estuarine species. Salinity plays a key role in oyster sustainability. Typically, they proliferate in salinities ranging from 5 parts per thousand to 15 parts per thousand. Fresher waters fail to support biological function, and waters that are more saline promote disease and predation.

3.2.6 Essential fish habitat

This resource is institutionally significant because of the Magnuson-Stevens Fishery Conservation and Management Act. Essential Fish Habitat (EFH) is technically significant because, as the Act states, EFH is “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." EFH is publicly significant because of the high value that the public places on the seafood and the recreational and commercial opportunities EFH provides. A summary of EFH requirements for species managed by the Gulf of Mexico Fishery Management Council (GMFMC), and for which EFH has been designated in Louisiana, is in Table 10.

BUDMAT study area include, but are not limited to, estuarine wetlands (e.g., marsh edge, inner marsh, marsh ponds, and tidal creeks); submerged aquatic vegetation; seagrasses; mud, sand, shell, and rock substrates (e.g., oyster reefs and barrier island flats); mangrove wetlands; and estuarine water column. Any activities that may adversely affect EFH should be avoided, minimized, or mitigated to conserve EFH.

Table 10. Summary of the Magnuson-Stevens Fishery Conservation and Management Act

(P.L. 104-297 designation of Essential Fish Habitat for Coastal Louisiana*

Species	Life Stage	EFH
Brown shrimp	Larvae/post larvae	planktonic, sand/shell/soft bottom, submerged
Farfantepenaeus		aquatic vegetation (SAV), emergent marsh, oyster
Aztecus	Juvenile	reef
		SAV emergent marsh, oyster reef
White shrimp	Larvae/post larvae	Planktonic, soft bottom, emergent marsh
Litopenaeus setiferus	Juvenile	SAV, soft bottom; emergent marsh
Red drum	Larvae/post larvae	All estuaries planktonic, SAV, sand/shell/soft
Sciaenops ocellatus		bottom, emergent marsh
	Juvenile	All estuaries SAV, sand/shell/soft/hard bottom, emergent marsh
	Adult	All estuaries SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh
Gulf Stone Crab	Larvae / post larvae	Pelagic, oyster reef, soft bottom
Menippe adina	Juvenile	Sand/shell/soft bottom, oyster reef
King Mackerel	Larvae	Planktonic
Scomberomorus cavalla	Juvenile and adult	Pelagic
Cobia	Larvae	Planktonic
Rachycentron canadum	Juvenile	pelagic
Lane snapper	Larvae	Reefs, SAV
Lutjanus synagris	Juvenile	SAV, mangrove, reefs, sand/shell/soft bottom
Dog snapper	Juvenile	SAV, mangrove, emergent marsh
Lutjanus novemfasciatus		
Bonnethead shark	Juvenile	Inlets, estuaries, coastal waters <25 m
Sphyrna tiburo		
Atlantic sharpnose shark	Juvenile	<40-50m Mississippi Sound and Atchafalaya
Rhizoprionodon terraenovae		Deltas

*Detailed information on Federally managed fisheries and their EFH is provided in the recently updated 2005 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC).

Primary categories of EFH that could be impacted as a result of restoration efforts in the BUDMAT study area include, but are not limited to, estuarine wetlands (e.g. marsh edge, inner marsh, marsh ponds, and tidal creeks); submerged aquatic vegetation; sea grasses; mud, sand, shell, and rock substrates (e.g. oyster reefs and barrier island flats); mangrove wetlands; and estuarine water columns. Any activities that may adversely affect EFH should be avoided, minimized or mitigated to conserve EFH.

Fish and most macro-crustaceans are highly mobile, and they rely on a variety of habitats for different functions (Miller and Dunn 1980). The characteristics of coastal Louisiana waters essential to fish are not static. There are a number of fish species that are Federally managed, with a variety of life stage requirements. The Magnuson-Stevens Act requires a conservative approach to designating EFH. For these reasons, EFH is not confined to isolated locations. All of the estuarine and marine portions of the BUDMAT Program area are considered EFH and are an important consideration in the development of any restoration plan.

Historic and Existing Conditions

As conditions along Louisiana's coast have changed, effects to different categories of EFH have varied. For example, as the marsh has been lost, it has generally been replaced with other categories of EFH, such as submerged aquatic vegetation or mud bottoms. In contrast, in areas where active delta growth is occurring, the opposite may have happened (e.g., mud bottoms have been replaced with marsh). It is important to have a balance between different categories of EFH for the various life stages of Federally managed fishery species in the BUDMAT area. The general trend in the recent past has been one of conversion of highly productive categories of EFH, such as inner marsh and marsh edge, to less productive estuarine water column; and mud, sand, or shell substrates. If this trend continues, it is likely to result in less complex, biologically diverse habitats and unsustainable fishery productivity.

All tidally influenced waters and substrates in coastal Louisiana, including the sub-tidal and tidal vegetation (seagrasses, algae, marshes, and mangroves) are designated as EFH. There are over 8 million acres of marsh and water habitat, of which over 4.4 million acres are surface water. Over half of the waters are between 0–5.9 ft in depth (Perret et al. 1971). Sediments are mud, sand, and silt across the coast (Barrett et al. 1971). Submerged vegetation occurs along the coast, but no acreage figure is available, except for Lake Pontchartrain, where an estimated 20,000 acres existed in the 1990s (Gulf of Mexico Fishery Management Council 1998).

EFH alterations of particular concern are the marsh loss experienced along the Louisiana coast. Land/water interface has been shown to be more important to fishery production than total wetland acreage (Faller 1979; Gosselink 1984; Zimmerman et al. 1984).

3.2.7 Threatened and endangered species

This resource is institutionally significant because of: the Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972; and the Bald and Golden Eagle Protection Act of 1940. Endangered (E) or threatened (T) species are technically significant because the status of such species provides an indication of the overall health of an ecosystem. These species are publicly significant because of the desire of the public to protect them and their habitats.

Within the State of Louisiana, there are 25 animal and 4 plant species (some with critical habitats) under the jurisdiction of the USFWS and/or NMFS (table 11), which are presently classified as threatened or endangered. The brown pelican was only recently delisted (December 17, 2009) where it had been listed as an Endangered Species. The USFWS and NMFS share jurisdictional responsibility for sea turtles and the gulf sturgeon. Of the animals and plants under USFWS and/or NMFS jurisdiction, only 12 animal species are within the study area. Those species outside of the study area are not likely to be affected by the proposed restoration plans

Table 11. Threatened and Endangered Species in Louisiana

Status	Common Name	*Scientific Name*	Note
Mammals			
E	**West Indian manatee**	***Trichechus manatus***	
E	Jaguar	*Panthera onca*	
E	Panther, Florida	*Felis concolor coryi*	
T	**Bear, Louisiana black**	***Ursus americanus luteolus***	
E	Wolf, grey	*Canus lupus*	
E	Whale, finback	*Balaenoptera physalus*	Under jurisdiction of NMFS
E	Whale, humpback	*Megaptera novaeangliae*	Under jurisdiction of NMFS
Birds			
E	Curlew, Eskimo	*Numenius borealis*	
E	**Plover, piping**	***Charadrius melodus***	
*	**Pelican, brown**	***Pelecanus occidentalis***	Removed from the T&E Species List on December 17, 2009. However, Brown Pelicans are still protected under the Migratory Bird Treaty Act of 1918.
E	Vireo, black-capped	*Vireo atricapilla*	
E	Tern, least, interior pop.	*Sterna antillarum*	
E	Woodpecker, red-cockaded	*Picoides borealis*	
*	**Bald Eagle**	***Haliaeetus leucocephalus***	Removed from the T&E Species List on August 8, 2007. However, Bald Eagles are still protected under the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act of 1918.
Fish			
T	**Gulf sturgeon**	***Acipenser oxyrinchus desotoi***	The USFWS and NMFS share jurisdictional responsibilities
E	**Pallid sturgeon**	***Scaphirhynchus albus***	
Reptiles			
T	**Sea turtle, green**	***Chelonia mydas***	The USFWS and NMFS share jurisdictional responsibilities for sea turtles
E	**Sea turtle, Kemp's ridley**	***Lepidochelys kempii***	
E	**Sea turtle, hawksbill**	***Eretmochelys imbricata***	
E	**Sea turtle, leatherback**	***Dermochelys coriacea***	
T	**Sea turtle, loggerhead**	***Caretta caretta***	
T	Turtle, Ringed mapped	*Graptemys oculifera*	
T	Tortoise, gopher	*Gropherus polyphemus*	
E	Frog, Mississippi gopher	*Rana capito sevosa*	
Invertebrates			
T	Heelsplitter, inflated	*Potamilus inflatus*	
E	Mucket, pink (pearlymussel)	*Lampsilis abrupta*	
E	Beetle, American burying	*Nicrophorus americanus*	
Plants			
E	Chaffseed, American	*Schwalbea Americana*	
T	*Geocarpum* (No common name)	*Geocarpum minimum*	
E	Pondberry	*Lindera melissifolia*	
E	Quillwort, Louisiana	*Isoetes louisianensis*	

Species in **bold** are those found within the study area

West Indian manatee

Federally listed as an endangered species, West Indian manatees (*Trichechus manatus*) occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). Manatee occurrences appear to be increasing, and they have been regularly reported in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, and in canals within the adjacent coastal marshes of Louisiana. They have also been occasionally observed elsewhere along the Louisiana Gulf coast. The manatee has declined in numbers due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals.

Louisiana Black Bear

The threatened Louisiana black bear (*Ursus americanus luteolus*) is primarily associated with forested wetlands; however, it utilizes a variety of habitat types, including marsh, dredged material embankments, and upland forests. Within forested wetlands, black bear habitat requirements include soft and hard mast for food, thick vegetation for denning escape cover, vegetated corridors for dispersal, large trees for den sites, and isolated areas for refuge from human disturbance. Prior to 2001, remaining Louisiana black bear populations occurred only in the Tensas River Basin, the Upper Atchafalaya River Basin, and coastal St. Mary and Iberia Parishes. In 2001, the USFWS, in cooperation with the Louisiana Department of Wildlife and Fisheries (LDWF), the Black Bear Conservation Committee, and Louisiana State University, began a multi-year, Louisiana black bear repatriation project. That project has established another subpopulation in Avoyelles and Concordia Parishes, in east-central Louisiana. The primary threats to the species are continued loss of bottomland hardwoods and fragmentation of remaining forested tracts. In addition to habitat loss, human-bear conflicts are a major threat to the conservation and protection of the Louisiana black bear. Human-caused losses include collisions with automobiles, intentional or illegal killing, and removal from the wild, which is necessary when bears that have become habituated to human attractants pose a risk to public health or safety.

Louisiana black bears, particularly pregnant females, normally den from December through April. Preferred den sites include bald cypress and water-tupelo trees with visible cavities, that have a diameter at breast height of 36 inches or greater, and which occur in or along rivers, lakes, streams, bayous, sloughs, or other water bodies. In areas where suitable den trees are uncommon, Louisiana black bears often den in shallow burrows or depressions within areas of dense cover. In order to avoid disturbance of denning bears and possible abandonment of cubs, the USFWS recommends that any work in the project area be prohibited during the denning season. To further protect denning bears, the USFWS (through the final listing rule published on January 7, 1992), has extended legal protection to actual or candidate den trees. As the terms imply, “actual den tree” refers to any tree used by a denning bear during the winter and early spring seasons. Candidate den trees are defined in the final rule as bald cypress (*Taxodium distichum*) and tupelo gum (*Nyssa* sp.) with visible cavities, having a diameter at breast height of 36 inches or greater, and occurring in or along rivers, lakes, streams, bayous, sloughs, or other water bodies. Results of recent research involving Louisiana black bears indicate that they would use virtually any species of tree for a den site if it is large enough and has a cavity, as described above.

Piping Plover

Federally listed as a threatened species, the piping plover (*Charadrius melodus*), as well as its designated critical habitat, occur along the Louisiana coast. Piping plovers winter in Louisiana, and may be present for 8 to 10 months annually. They arrive from the breeding grounds as early as late July and remain until late March or April. Piping plovers feed extensively on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse emergent vegetation; they also require unvegetated or sparsely vegetated areas for roosting. Roosting areas may have debris, detritus, or micro-topographic relief offering refuge to plovers from high winds and cold weather. In most areas, wintering piping plovers are dependent on a mosaic of sites distributed throughout the landscape, because the suitability of a particular site for foraging or roosting is dependant on local weather and tidal conditions. Plovers move among sites as environmental conditions change, and studies have indicated that they generally remain within a 2-mile area. Major threats to this species include the loss and degradation of habitat due to development, disturbance by humans and pets, and predation.

On July 10, 2001, the USFWS designated critical habitat for wintering piping plovers (Federal Register Volume 66, No. 132). Their designated critical habitat identifies specific areas that are essential to the conservation of the species. The primary constituent elements for piping plover wintering habitat are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support those habitat components. Constituent elements are found in geologically dynamic coastal areas that contain intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide. Important components (or primary constituent elements) of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting plovers.

Gulf Sturgeon

The Gulf sturgeon (*Acipenser oxyrhynchus desotoi*), federally listed as a threatened species, is an anadromous fish that occurs in many rivers, streams, and estuarine waters along the northern Gulf coast between the Mississippi River and the Suwanee River, Florida. In Louisiana, Gulf sturgeon have been reported at Rigolets Pass, rivers and lakes of the Lake Pontchartrain basin, and adjacent estuarine areas. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May). Adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. Habitat alterations such as those caused by water control structures that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species.

On March 19, 2003, the USFWS and the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. Portions of the Pearl and Bogue Chitto Rivers, Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne within Louisiana were included in that

designation. The primary constituent elements essential for the conservation of Gulf sturgeon are those habitat components that support feeding, resting, sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes that support those habitat components; those elements should be considered when determining potential project impacts. The primary constituent elements for Gulf sturgeon critical habitat include:

- abundant prey items within riverine habitats for larval and juvenile life stages, and within estuarine and marine habitats for juvenile, sub-adult, and adult life stages;
- riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;
- riverine aggregation areas, also referred to as resting, holding and staging areas, used by adult, sub-adult, and/or juveniles, generally, but not always, located in holes below normal riverbend depths, believed necessary for minimizing energy expenditures during freshwater residency and possibly for osmoregulatory functions;
- a flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of freshwater discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging; and necessary for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larvae staging;
- water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
- sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and
- safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., a river unobstructed by a permanent structure, or a dammed river that still allows for passage).

In that critical habitat designation, responsibility for consultation with specific Federal agencies was also identified for the USFWS and for the NMFS. For estuarine and marine waters in Louisiana, the NMFS is responsible for consultations regarding impacts to the sturgeon and its critical habitat with all Federal agencies, except the Department of Transportation, the Environmental Protection Agency, the U.S. Coast Guard, and the Federal Emergency Management Agency, which consult with the USFWS. Should the proposed project directly or indirectly affect the Gulf sturgeon or its critical habitat in Louisiana, further consultation with the USFWS and NMFS would be necessary.

Pallid Sturgeon

The pallid sturgeon (*Scaphirhynchus albus*) is an endangered fish found in Louisiana, in both the Mississippi and Atchafalaya Rivers (with known concentrations near the Old River Control Structure Complex); it is possibly found in the Red River as well. The pallid sturgeon is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change. Detailed habitat requirements of this fish are not known,

but it is believed to spawn in Louisiana. Habitat loss through river channelization and dams has adversely affected this species throughout its range.

Green Sea Turtle

Federally listed as Threatened, the green sea turtle (*Chelonia mydas*) has a preferred habitat including shallow water bays, estuaries, and shoals containing an abundance of submerged aquatic vegetation. The common name of this species refers to the color of the body fat, not the general coloration of the shell, which is brownish, sometimes shaded with olive. This species is unique among sea turtles in that it is mostly herbivorous. Green turtles were once the most abundant sea turtles, but they are also considered the most palatable and have been heavily exploited for food. Harvest of eggs, females on nests, adults and subadults from foraging areas has been primarily responsible for the decline. This species was once harvested commercially from sea grass beds around the Chandeleur Islands. Erosion of barrier islands and other factors that decrease available sea grass beds, as well as incidental capture has also contributed to the decline.

Kemp's Ridley Sea Turtle

The Kemp's ridley (*Lepidochelys kempii*) is an endangered sea turtle that occurs mainly in the coastal areas of the Gulf of Mexico and northwestern Atlantic Ocean. Juveniles and sub-adults occupy shallow, coastal regions and are commonly associated with crab-laden, sandy or muddy water bottoms. Small turtles are generally found in nearshore areas of the Louisiana coast from May through October. Adults may be abundant near the mouth of the Mississippi River in the spring and summer. Adults and juveniles move offshore to deeper, warmer water during the winter. Between the East Gulf Coast of Texas and the Mississippi River Delta, Kemp's ridleys use nearshore waters, ocean sides of jetties, small boat passageways through jetties, and dredged and nondredged channels. They have been observed within both Sabine and Calcasieu Lakes. Major threats to this species include over-exploitation on their nesting beaches, drowning in fishing nets, and pollution.

Hawksbill Sea Turtle

The hawksbill sea turtle (*Eretmochelys imbricate*) is considered one of the most endangered of the sea turtles. Although this species has been harvested for meat and eggs, historically the primary reason for the decline was the commercial harvest for the shell, which is considered the most beautiful of all sea turtles. Adults frequent warm, shallow water habitats such as bays, shoals, and coral reefs. Female hawksbills return to their natal beaches every 2 years to 3 years to nest at night approximately every 14 days to 16 days during the nesting season. A female hawksbill generally lays 3 to 5 nests per season, which contain an average of 130 eggs. Hawksbill turtles usually nest high up on the beach under or in the beach/dune vegetation on both calm and turbulent beaches. They do not nest in distinct colonies as do most other sea turtles, but nest on pocket beaches, with little or no sand. In Louisiana, this is one of the most infrequently encountered of the sea turtles.

Leatherback Sea Turtle

The federally endangered leatherback sea turtle (*Dermochelys coriacea*) is the largest turtle and the largest living reptile in the world. Leatherbacks are commonly known as pelagic (open ocean) animals, but they also forage in coastal waters. Leatherbacks are the most migratory and

wide ranging of sea turtle species. Its habitat includes open ocean and the deeper waters of the Gulf and coastal bays; coastal beaches and barrier islands for nesting. Females lay several hundred eggs, but only nest every 2 or 3 years. They are not known to nest in Louisiana coastal areas or on the barrier islands. Primary threats include the harvest of eggs for food, accidental capture on fishing long lines and in shrimp trawl gear, and beach erosion of nests. The development of turtle excluder devices (TEDs) on shrimp trawls was with these turtles in mind. TEDs that are large enough to exclude leatherback turtles are now required in shrimp trawl nets.

Loggerhead Sea Turtle

Federally listed as a threatened species, loggerhead sea turtles (*Caretta caretta*) nest within the coastal United States from Louisiana to Virginia, with major nesting concentrations occurring on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida. In Louisiana, loggerheads have been known to nest on the Chandeleur Islands. Nesting and hatching dates for the loggerhead in the northern Gulf of Mexico are from May 1 through November 30. Threats to this species include destruction of nesting habitat and drowning in fishing nets.

Bald Eagle

The project-area forested wetlands may provide nesting habitat for the bald eagle (*Haliaeetus leucocephalus*), which has officially been removed from the List of Endangered and Threatened Species as of August 8, 2007. However, bald eagles are protected under the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act of 1918. The USFWS developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the Bald and Golden Eagle Protection Act. A copy of the NBEM Guidelines is available at: http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf

Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern Parishes. Areas with high numbers of nests include the Lake Verret Basin south to Houma, the marsh/ridge complex south of Houma to Bayou Vista, the north shore of Lake Pontchartrain, and the Lake Salvador area. Eagles also winter, and infrequently nest in mature pine trees near large lakes in central and northern Louisiana. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

Brown Pelican

Brown pelicans (*Pelecanus occidentalis)* were only recently removed ("delisted") from List of Endangered and Threatened Species, December 17, 2009, where they had been Federally listed as an endangered species; however, they are still protected under the Migratory Bird Treaty Act of 1918. They are currently known to nest on Raccoon Point on Isles Dernieres, as well as Queen Bess Island, Plover Island (Baptiste Collette), Wine Island, Rabbit Island in Calcasieu Lake, and islands in the Chandeleur chain. Pelicans change nesting sites as habitat

changes occur; thus, they may also be found nesting on mud lumps at the mouth of South Pass (Mississippi River Delta) and on small islands in St. Bernard Parish. In spring and summer, nests are built in mangrove trees or other shrubby vegetation, although ground nesting may also occur. Brown pelicans feed along the Louisiana coast in shallow estuarine waters, using sand spits and offshore sand bars as rest and roost areas. Major threats to this species include chemical pollutants, colony site erosion, disease, and human disturbance.

Historic and Existing Conditions

From a programmatic standpoint, historic and existing conditions for threatened and endangered species relevant to the BUDMAT Study area principally stem from the alteration, degradation, and loss of habitats; human disturbance and exploitation; and pollution. Louisiana's unabated coastal land loss continues to reduce available coastland resources. This creates increased competition among and between the various threatened and endangered species for scarce coastal resources.

Informal coordination with the USFWS and NMFS was initiated to determine potential impacts of conceptual, programmatic restoration alternatives to threatened and endangered species and their critical habitats. Generally, formal coordination and preparation of any necessary documentation such as Biological Assessments, if necessary, would be initiated with either or both of these agencies on a specific project-by-project basis as required.

3.3 CULTURAL ENVIRONMENT

3.3.1 Historic and cultural resources

This resource is institutionally important because of: the National Historic Preservation Act of 1966, as amended; the Native American Graves Protection and Repatriation Act of 1990; and the Archeological Resources Protection Act of 1979; as well as other statutes. Cultural resources are technically important because of: their association or linkage to past events, to historically important persons, and to design and/or construction values; and for their ability to yield important information about prehistory and history. Cultural resources are publicly important because preservation groups and private individuals support their protection, restoration, enhancement, or recovery.

While it is not known what impacts the 2005 hurricanes (Rita and Katrina) had on cultural resources, they would continue to be evaluated on a case-by-case basis in accordance with Federal and state laws, regulations, and USACE policy when inventories are required. A cultural resource management plan and cultural resource project plan would be developed for specific project sites. National Register of Historic Places listing would be examined for specific BUDMAT project sites as they are developed. Coordination with local Indian tribes and State Historic Preservation Officers would also take place as specific project sites are developed.

Historic and Existing Conditions

The migration of early man into the Gulf of Mexico region is currently accepted to be around 12,000 years before the present (B.P.) (Aten 1983). Sea level curves developed for the northern Gulf of Mexico by Coastal Environments, Inc. (CEI 1982) indicate that sea level at 12,000 years B.P. would have been approximately 45 m (147.6 ft) below present sea level. Therefore, the prehistoric archaeological high-probability zone is a contiguous area between the Federal/state boundary and the 45-m (147.6 ft) bathymetric contour.

Based on their 1977 baseline study, CEI proposed that prehistoric sites analogous to the type of sites frequented by Paleo-Indians on land can be identified on the now-submerged continental shelf. Geomorphic features that have a high probability for associated prehistoric sites include barrier islands and back-barrier embayments, rivers channels and associated floodplains and terraces, and salt-dome features. Recent investigations in Louisiana and Florida indicate that mound building activities by prehistoric inhabitants may have occurred as early as 6,200 years B.P. (Hagg 1992; Russo 1992). Therefore, man-made features, such as mounds, may also exist in the shallow inundated portions of the Outer Continental Shelf (OCS). Remote-sensing surveys performed by the oil and gas industry have been very successful in identifying these types of geographic features that have a high probability for associated prehistoric sites.

Floyd (1995) performed a geoarchaeological analysis of the Ship Shoal area, Block 72 and 87 geohazard survey. Floyd (1995) states that the Shoal Block 88 of the inner continental shelf was above sea level for thousands of years prior to conversion into a marine environment. He continues with an analysis of the subbottom profiles from Blocks 72 and 87, stating they were examined for relict landforms that may have supported prehistoric human groups prior to complete conversion of this region into an offshore environment. Regional geologic information indicates that the post-transgressive, Holocene Age deposits are approximately 110 feet (33.5 m) thick (Bernard 1970). The upper Holocene soil unit covers the Western Wall of the former Mississippi Canyon, which was entrenched during the low sea level cycle. There may have been archaeological sites along the subaerial levees of the Holocene Age deltas (e.g., Teche and LaFourche deltas) that aggraded in this region over the past 6,000 years. Ship Shoal Block 88 falls within the Mineral Management Service (MMS) prehistoric high-probability zone (e.g. 45-m [147.6 ft] bathymetric contour) and is subject to prehistoric archaeological clearance prior to any sea floor disturbance.

The land continues to erode rapidly and with the 2005 Hurricanes (Rita and Katrina) it is not fully known what impacts were had on cultural resources, however, they would continue to be evaluated on a case-by-case basis in accordance with Federal and state laws, regulations and USACE policy when inventories are required. The protection of these lands by some of the ongoing CWPPRA or other restoration projects, such as disposal of borrow material adjacent to archaeological sites, may actually protect these sites in the long-term by stopping or slowing land erosion. Depending on the restoration feature, the proposed actions could help to restore the surrounding wetlands, thus protecting the land and whatever sites that may be located in the area. A cultural resource management plan and cultural resource project plan would continue to be developed. National Register of Historic Places listing would continue for significant sites. Coordination with local Indian tribes and State Historic Preservation Officers would continue.

3.3.2 Recreations resources

This resource is institutionally important because of the Federal Water Project Recreation Act of 1965, as amended, and the Land and Water Conservation Fund Act of 1965, as amended. Recreational resources are technically important because of the high economic value of recreational activities and their contribution to local, state, and national economies. Recreational resources are publicly important because of: the high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana; and the large per-capita number of recreational boat registrations in Louisiana.

Historic and Existing Conditions

This resource is thoroughly covered in the LCA Study (2004) and is incorporated herein by reference. A vast majority of the national and state parks described in the recreation resource section of the LCA Study have reopened two years after Hurricanes Katrina and Rita. Many of these parks sustained extensive damage and lost thousands of dollars while closed for repairs.

Recreational fishing, too, has rebounded over the last two years since the hurricanes' destruction. Information on harvest in Louisiana's recreational fisheries presented below was derived from data collected through the Marine Recreational Fishery Statistics Survey (MRFSS) (Source: NOAA, http://www.st.nmfs.gov/st1/recreational/queries/index.html). Data suggest the fishing activity of private recreational anglers declined significantly following the 2005 hurricane season, but has since increased to pre-storm levels. Additionally, license sales from September through December 2006 were 132 percent above average sales during that period in 2005 and about 6 percent above average sales during that period from 2000–2005. Hurricanes Katrina and Rita also severely impacted Louisiana's recreational fishing facilities and related infrastructure. Only 56 percent of recreational fishing facilities were fully or partially operational in November 2005. However, 81 percent of these facilities were fully or partially operational in April 2007.

3.3.3 Aesthetic resources

This resource's institutional significance is derived from laws and policies that affect visual resources, most notably the National Environmental Policy Act of 1969, the Coastal Barrier Resources Act of 1990, Louisiana's Natural and Scenic River's Act of 1988, and National and Local Scenic Byway Programs. This resource is technically significant because of visual accessibility to unique combinations of geological, botanical, and cultural features that may be an asset to a study area. Public significance is based on expressed public perceptions and professional evaluation.

Historic and Existing Conditions

The 1988 USACE's *Visual Resource Assessment Procedure* (VRAP) was developed for use in the planning process as input to plan formulation, design, and operations. The VRAP is

organized as a process, as if the USACE had a database on the existing visual quality of the LCA and could draw on this to assess the impacts to visual resources caused by civil works projects. As this is not the case, use of the procedure to get a Visual Impact Assessment Value (i.e., the Visual Impact Assessment (VIA) Procedure) requires developing the information leading up to the existing visual quality conditions (i.e., the Management Classification System (MCS)

The limited scope and timeframe for this project is such that indirect sources of public opinion, such as the National and State recognized Scenic Byways and Rivers were recognized as regionally significant viewsheds representative of the LCA. Examples include the Louisiana Scenic Byway, River Road Scenic Byway, San Bernardo Scenic Byway, Lafourche/Terrebonne Scenic Byway, Bayou Teche Scenic Byway, Promised Land Scenic Byway, Jean Lafitte Scenic Byway, and the Creole Nature Trail. Aesthetic values of aquatic areas are derived from the natural characteristics of a particular area. Aesthetic values may include such parameters as the visual distinctiveness of the elements present, which may result from prominence, contrasts due to irregularity of form, line, color, and pattern; the diversity of elements present, including topographic expression; shoreline complexity; landmarks; vegetative pattern diversity; and waterform expression.

The timing of MCS implementation, the level of detail at which visual resource information is collected and analyzed, and the nature of the MCS end products are varied considerably in response to the CEMVN's planning needs. The MCS would be done at the regional level during the detailed planning process of any proposed LCA projects.

3.4 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

Historic and Existing Conditions

There are numerous historic and potential Recognized Environmental Conditions (RECs) in the Louisiana coastal region, mainly resulting from extensive oil and gas exploration and extraction, beginning in the early 20th century and continuing today. Some of these RECs are old disposal pits associated with petroleum operations; others may be the remnants of abandoned equipment and pipelines; yet others may be the remains of accidental oil spills or the accidental release of chemicals used in oil and gas operations. A portion of historic RECs may be due to human habitation in the area (e.g., fishing and hunting camps), or to shipwrecks.

Because of the estimated large number of historic and potential RECs, these cannot be individually addressed in a study drawing conclusions about a large area. They would be discussed in detail in the environmental studies for specific projects in a limited, well-defined area. Addressing existing HTRW sites of concern for proposed LCA Plan projects would require a review of site-specific, as well as project-specific, information and plans. As strategies become more defined, more detailed HTRW analyses would be performed to further evaluate and eliminate potential HTRW problem sites within the LCA Study area. Any HTRW discovered during the Phase I ESA would be avoided, to the maximum extent practicable, to minimize potential direct impacts.

Details of the HTRW situation may be found in "Louisiana Coastal Area (LCA), Louisiana, Ecosystem Restoration Study. November 2004. Volume 2: Final Programmatic Environmental Impact Statement," which is herein incorporated by reference.

3.5 SOCIOECONOMIC AND HUMAN RESOURCES

Beneficial use of dredged material, a technique proven to help build and restore wetlands, would be used in a program to support the efforts of the LCA Ecosystem Restoration Project as reported in the LCA, Louisiana Ecosystem Restoration Study, November 2004 (LCA Study). The primary purpose of the LCA Ecosystem Restoration project is to restore the Louisiana coastal area. The BUDMAT Program would be directed to multiple projects in the LCA study area.

Historic and Existing Conditions

3.5.1 Population

Population in the 20-parish study area increased from 1,556,965 to 2,247,344 from 1960 to 2000, with approximately 50.2 percent of Louisiana's population residing in the coastal area. Population in coastal parishes remained fairly stable as a share of state population over this period. Since Hurricanes Katrina and Rita in August-September, 2005, estimates of the region's population are about eleven percent lower than the pre-Katrina population. The Louisiana Tech University, College of Business, Department of Graduate Studies and Research (2007) estimates that the population of the 20-parish area was 1,953,305 as of July 1, 2007.

3.5.2 Infrastructure

Table 12 is a summary of the infrastructure in the portions of the study area that are considered at risk. All assets are valued in 2003 dollars.

Table 12. Summary of the Valuation of Assets in the BUDMAT Study Area

Asset Category	Value
Oil and Gas Production Facilities	$ 3,207,180,000
Pipeline	$ 12,435,043,000
Highways	$ 5,981,038,000
Railroads	$ 385,770,000
Navigable Waterways	$ 2,576,6411,000
Ports	$ 869,376,000
Industrial and Manufacturing Facilities	$ 30,418,984,000
Transmission Lines	$ 416,844,000
Municipal and Parish Utility Infrastructure	$ 4,333,403,000
Municipal and Parish Private Buildings	$ 42,238,389,000
Agricultural Interests –Lands	$ 159,690,000
Agricultural Interests –Products	$ 163,424,000
Total Asset Value	**$103,185,792,000**
Source: Waldemar S. Nelson & Co., 2003	

3.5.3 Employment and Income

Employment in the study area has varied widely, with several periods of rapid growth and shrinkage as the job base varied. For example, strong growth in the early 1980s was followed by sharp job declines during the mid and late 1980s. This decline was brought about by shrinkage in oil field production and employment, caused by dropping oil prices. The diversification of the southern Louisiana economy increased after the local recession of the late 1980s, as resources were channeled from the oil and gas industry into other areas, including tourism. However, many jobs still depend on the oil and gas industry. For example, much of the construction employment is oil and gas dependent, since a lot of construction activity is done in support of that industry. The leading employers are transportation; oil and gas; seafood; tourism; and the finance, insurance, and real estate sectors.

The highest per capita income parishes in the area prior to Hurricanes Katrina and Rita were consistently those in the New Orleans metropolitan statistical area (MSA), including St. Tammany, Jefferson, and Orleans Parishes. Immediately after Hurricanes Katrina and Rita, the highest rankings changed to East Baton Rouge, Lafayette, and Caddo (including Shreveport) Parishes. After the hurricanes, the per capita personal income of Cameron, Orleans, and St. Bernard Parishes were less than half of that prior to the hurricanes. While many businesses and residences were totally destroyed by the hurricanes and have not yet been restored, many others have returned or have indicated plans for recovery. The most influential industries for the study area economy, and the ones most likely to be impacted by coastal wetland losses, include oil, gas, and pipeline; navigation (transportation); and commercial and recreational fishing and hunting. These industries are covered in the following sections, along with flood control, which is a major issue for study area inhabitants.

3.5.4 Commercial Fisheries

Louisiana's coastal wetlands are the richest estuaries in the country for fisheries production. Commercially and recreationally important species such as brown and white shrimp, blue crabs, eastern oysters, and menhaden are abundant, but these species populations are threatened if land loss continues. Louisiana has historically been an important contributor to the Nation's domestic fish and shellfish production, and is one of the primary contributors to the Nation's food supply for protein. While Louisiana has long been the Nation's largest shrimp and menhaden producer, it has also recently become the leading producer of blue crabs and oysters. As reported by the National Marine Fisheries Service in July of 2007, total landings in Louisiana were 844 million pounds in 2006. The percentage contribution of total landings for the gulf region was 65 percent and for the Nation was 8.9 percent. Dockside revenues for commercial fisheries in coastal Louisiana were over $202 million in 2006. These revenues were the third largest for any state in the contiguous United States, fourth behind Alaska, Massachusetts, and Maine.

The most important species, in terms of Louisiana dockside revenue in 2006, was shrimp. Louisiana landed approximately 144 million pounds of shrimp in 2006, or about 40 percent of United States' total landings. In 2006, the gulf region landed over 80 percent of the total United States' shrimp catch and Louisiana landed about 50 percent of shrimp caught in the gulf. Almost all of the shrimp caught in Louisiana and along the gulf coast have spent an important part of

their life living and growing in the Louisiana coastal marshes. Another important species harvested in the area is menhaden. Menhaden is processed to produce both fishmeal and fish oil. Fishmeal is used as a high protein animal feed. The broiler (chicken) industry is currently the largest user of menhaden meal, followed by the turkey, swine, pet food, and ruminant (cattle/livestock) industries. The Louisiana menhaden fisheries landings were the largest in the Nation, landing twice as much as the next closest state. The percent of dockside value from Louisiana to that of the rest of the Nation was over 50 percent.

In 2006 alone, Louisiana landed more than 50 percent of the Gulf of Mexico and well over 33 percent of the Nation's oyster catch by pounds with 29 percent of the value. Louisiana also has led the United States in eastern oyster production, contributing just under half of the U.S. production. Louisiana also produced about 32 percent of the Nation's blue crabs in 2005. As with eastern oyster production, the trend has been for Louisiana to become the largest producer of blue crabs in the Nation, surpassing other states that were the dominant producers in the 1990s. The dockside value for blue crabs landed in Louisiana in 2006 was more than $32 million of landings of 53.4 million pounds based on preliminary estimates reported by NMFS.

After Hurricanes Katrina and Rita, significant reductions were seen in landings of several marine fisheries during the initial 12 months. During the following 3 months, these fisheries showed significant recovery. However, most of these fisheries had not recovered to levels seen in pre-storm years.

3.5.5 Oyster Leases

Prior to the storms of 2005, Louisiana was the top producer of the eastern oyster (*Crassostrea virginica*) in the United States, averaging approximately 11.4 million pounds (5.1 million kg) per year, with an average value of $25.8 million (NMFS 2007). Because of Hurricanes Katrina and Rita, oyster production suffered damage, but recovered during the following year to landings of 12.8 million pounds in 2007, with a value of $40.1 million.

The fishery has two main sources - privately leased grounds, and public seed grounds. The State of Louisiana owns the water bottoms, and leases out acreage to oyster fishermen. The public grounds are open to harvesting by all licensed fishermen, but are only open during the public season, which runs from September through March. Oysters can be harvested from the private grounds throughout the year. The LDWF and the Louisiana Wildlife and Fisheries Commission manage over 1 million acres (over 405,000 ha) of public grounds. Extensive reefs are located on the east side of the Mississippi River, particularly in Black Bay, Lake Borgne, and the Biloxi Marsh. Special areas in the public grounds are managed as Oyster Seed Reservations, which generally have more strict harvest limitations. These are located in Bay Gardene, Hackberry Bay, Sister Lake, and Bay Junop. Vast areas of public seed grounds are located in Vermilion Bay, East and West Cote Blanche Bays, and a special tonging-only area is located in Calcasieu Lake. These public grounds provide seed oysters (less than 3 inches [7.6 cm]) that can be transplanted to leases to grow up to legal sacking size. The public grounds also provide sack oysters that can be brought directly to market. Prior to 1993, sales from private leases comprised around two thirds of the total oyster production. Beginning in 1993, approximately half of the oysters brought to market in Louisiana now come from public grounds. In recent years, the

market for oysters has been stagnant, which is in part due to illness associated with the consumption of raw oysters. The Louisiana Oyster Task Force has contracted with a marketing firm to try to expand the market for Louisiana oysters, and counteract negative publicity. Approximately 420,000 acres (170,100 ha) are currently under lease in Louisiana, compared to less than 250,000 acres (101,250 ha) during the mid 1970s and early 1980s. The leases have 15-year terms and are leased from the state for $2 per acre per year. Using data from NMFS for the period from 1985 through 2001, the average value of the harvest from private leases is $17,149,464. Dividing this number by the average total acreage leased over this same period gives the annual harvest per acre. Assuming 360,172 acres (145,869 ha), the average acre of oyster lease produces approximately 27 pounds (12.2 kg) of oysters and $48 in gross sales. However, the quality of water bottoms varies widely, with the harder substrates generally providing the better oyster productivity. In a recent bottom side-scan sonar survey of 9,600 acres (3,888 ha) of leases in the Barataria Basin, approximately 6.6 percent of the leased area was found to have a suitable bottom for growing oysters. The remainder of the leased area lacked enough hard bottom to support commercial farming of oysters. It is unknown if this leased area is representative of the entire leased area in the state. Leasing in the Barataria Basin has shown a northward trend over the years, with an increased acreage being leased in the upper estuary as salinities increased. Oysters in high salinity waters are susceptible to infection with *Perkinsus marinus*, or "dermo," a parasitic protozoan. Predation by the oyster drill (*Stramonita haemastoma*) and other predators also causes increased oyster mortality in high salinity water. Leases are presently located as far north as Little Lake, Turtle Bay, Round Lake, and Lake Laurier. Areas east of the Mississippi River and the Barataria Basin dominate oyster production in Louisiana. St. Bernard and Plaquemines Parishes encompass virtually all of the oyster producing areas east of the river, and Plaquemines Parish includes part of the Barataria Basin. From 1988 through 1997, these two parishes accounted for approximately 50 percent of the oysters landed in Louisiana, and approximately 47 percent of landings from private leases in Louisiana. Monitoring data from the existing Caernarvon diversion structure has shown that production of both oysters and menhaden has increased.

The 2005 hurricane season had significant impacts on the Louisiana oyster beds and harvest. Initial reports indicate that about 400 million pounds of in-shell oysters were destroyed by the two storms. That is equivalent to over a year and a half of annual production. NMFS estimates of shucked oysters in 2004 was 13.9 million pounds, declining to 12.1 million in 2005, 11.4 million pounds in 2006, and back up to 12.8 million in 2007.

3.5.6 Oil and Gas

The Louisiana Oil and Gas Association reports that approximately 150,000 jobs in the state were directly related to the development of oil and gas exploration, production, and related services during the early 1980's. Since that time the peak has declined but remains a very important industry to the State and the Nation. The association estimates that in 2007 oil and gas related jobs in Louisiana area bout 82,600. Many more jobs are created by these primary industries (LDNR Non-agriculture employment statistics).

Dependence on imported oil and gas is driven by domestic petroleum production and consumption. Until the 1950s, the United States produced nearly all of the petroleum it needed.

The gap between production and consumption began to widen, so that imported petroleum has become a major component of the U.S. petroleum supply. The U.S. produces less crude oil than it did 20 years ago and from 1993 onward, the U.S. has imported more petroleum than it produced. In 2006, U.S. petroleum net imports reached an annual record level of 13.6 million barrels per day (5.0 billion barrels per year) as reported by the Energy Information Administration (U.S. Department of Energy).

Louisiana plays an important part in the production of crude oil for the Nation. Louisiana's production of crude oil has declined by about 30 percent since 1980, although production in the Louisiana OCS has increased steadily since 1990 and now greatly exceeds the onshore production rate. In 2006, Louisiana produced more than 36 million barrels from wells on land. Louisiana's oil resources come from wells on land, from state waters within three miles of shore, and from Federal waters greater than three miles from shore. Another 393 million barrels were produced in the OCS. The amount of oil produced by Louisiana can be put into perspective by comparing it to what is consumed by the entire Nation. Energy consumption can be divided into five sectors: transportation, industrial, electric power generation, residential, and commercial. From 1980 to 2000, Louisiana crude oil production alone has been greater than what has been consumed nationally in three of these sectors: residential, commercial, and electric power generation. If Louisiana did not produce oil, the U.S. would have to import more oil from the Organization of the Petroleum Exporting Countries (OPEC) than it currently does or develop new sources. In the immediate future, however, any significant decrease in Louisiana production would affect citizens in all states.

Natural gas has been the second largest source of energy for the U.S. The United States had large natural gas reserves until the late 1980s when consumption began to significantly outpace production. Imports rose to make up the difference, nearly all coming by pipeline from Canada. Three states (Texas, Louisiana, and Oklahoma) account for over half of all natural gas produced in the U.S. The amount of natural gas produced by Louisiana can be put into perspective by comparing it to what is consumed by the entire Nation in five economic sectors. From 1980 to 2000, Louisiana's gas production has been greater than what has been consumed in four of the five sectors: transportation, commercial, electric power, and residential sectors. A recent study indicated that Louisiana currently provides over 26 percent of the total natural gas produced in the U.S. From 1980 to 2000, Louisiana has produced more natural gas than what was imported by the Nation. If Louisiana did not produce natural gas at the same level of consumption, the U.S. would have to import gas from other countries than it currently does or develop new sources. Any significant decrease in Louisiana's natural gas production would have a significant impact on the U.S. economy. Based on a study entitled "Economic Impact Assessment Louisiana Coastal Area Comprehensive Coastwide Ecosystem Restoration Study" conducted jointly by the USACE and the Louisiana Department of Natural Resources (LDNR), drilling and production activities in the state amount to a direct economic impact of over $730 million per year.

Indirect impacts equal about $250 million per year. The direct economic impacts create 3,400 jobs with an average wage of $42,330 per year (total annual direct impact wages of $144 million). The indirect impact jobs create another 3,100 jobs at an average wage of $27,300 per year (total annual indirect impact wages of $84 million). All of the oil and gas produced along

Louisiana's coast and wetlands comes from a interdependent network of core and supporting industries. The core businesses, along with their suppliers, contractors, services, and research departments sprung up around each other and formed a huge cluster of businesses linked to each other and to other industries throughout the region. Port Fourchon is the geographic and economic hub of this cluster. Hundreds of offshore drilling rigs in the Gulf of Mexico send oil and gas to the mainland through Port Fourchon. For example, Port Fourchon alone supports a number of businesses ranging from restaurants that provide food and catering to offshore workers, shipbuilders that fabricate drill ships and oil well service vessels, air and water transportation firms, as well as petroleum extraction companies. Most major and independent oil and gas companies operating in the gulf have a presence at Port Fourchon. Damage to infrastructure caused by increased storm surge impacts and associated land losses would threaten the supply base that keeps these offshore facilities operating at peak efficiency and reliability.

The total net collections by the Louisiana Department of Revenue exceeded $9.0 billion in 2007. Since the value of the direct and indirect economic impacts is nearly $1 billion, this means that the oil and gas industry contributes approximately 17 percent of the total revenue collected each year. Since these collections fund all state operations, an impact to the oil and gas industry would have a significant negative impact on the state.

3.5.7 Pipelines

The Louisiana Mid-Continental Oil and Gas Association reporting conditions from 2000 to 2006 indicated that the total assessed value of interstate pipelines alone in Louisiana is over $600 million and the pipeline industry employs 4,855 persons with an annual payroll of $250 million. Louisiana is laced with thousands of pipelines conveying oil, gas, and other liquid and gaseous materials for short and long distances. Included are 25,000 miles of pipe moving natural gas through interstate pipelines; 7,600 miles of pipe carrying natural gas through intrastate pipelines to users within the state's boundaries; 3,450 miles of pipe transporting crude oil and crude oil products; and thousands of miles of flow lines carrying oil and gas from the wellhead to separating facilities. Some of the most prominent sites related to oil and gas interests lie within the state, notably the Henry Hub where the national price of natural gas is set, the Louisiana Offshore Oil Port, and two of the major components of the Nation's Strategic Petroleum Reserve. Louisiana is home to two of the four Strategic Petroleum Reserve storage facilities: West Hackberry in Cameron Parish and Bayou Choctaw in Iberville Parish. The availability of domestic oil production from Louisiana and adjacent OCS adds to the national security.

Of interest to the coastal degradation issue are those pipelines that exist within the coastal areas that are vitally important as a conveyance means to move oil, gas, or chemical products from point of production to refineries, gas plants, and intrastate and interstate pipelines. Many thousands of miles of pipelines can be found in coastal Louisiana ranging from small gathering lines connecting production wells with storage tanks to larger pipelines carrying very large quantities of gas or oil.

Louisiana has 13 major crude oil pipelines, 9 major product pipelines, and 13 Liquefied Petroleum Gas pipelines in the state. Eighteen petroleum refineries distill a combined crude oil capacity of more than 2.7 million barrels per calendar day - the second highest in the Nation after

Texas. Louisiana's oil production affects all states. It provides a significant portion of total U.S. production, and its production is equivalent to a significant portion of total imports and total OPEC imports. Any reduction of Louisiana oil would have obvious adverse effects on all U.S. consumers.

3.5.8 Navigation

Annual U.S. port tonnage statistics consistently rank the Ports of New Orleans, South Louisiana, and Baton Rouge fourth, first, and ninth, respectively. Primary inbound cargos at the Port of Baton Rouge are petroleum and chemicals. Outbound cargos are grain, chemicals, and petroleum products. Primary inbound cargos at the Port of South Louisiana are crude oil and petroleum products, while corn, wheat, and animal feed dominate the port's exports. At the Port of New Orleans, principal inbound cargos consist of steel, crude, and refined petroleum products and outbound cargos include grain, forest products, and steel.

The major waterways in the study area are: The Louisiana portion of the GIWW stretches from the Texas – Louisiana state line in the west to the Louisiana – Mississippi state line in the east. The GIWW Alternate Route operates from Port Allen to Morgan City. This waterway totals 366.4 miles (589.9 km). The GIWW is the lifeline for industries in Louisiana, with both small and large craft using the route to reach channels flowing into the gulf. It is at the Port of New Orleans where the GIWW has its major connection with the interior of the country. There, it joins with the Mississippi River system. Combined, the Mississippi River ports of south Louisiana are rated number one in the Nation in total tonnage and number one in the world in grain exports. When ranked by waterborne tonnage, Louisiana is number one when compared to other states.

Bayou Lafourche is located about 60 miles (96.6 km) upstream from New Orleans near Donaldsonville, Louisiana, and empties into the Gulf of Mexico approximately 100 miles (161 km) west of the Mississippi River Delta. In 1904, a dam was placed across the distributary as a flood protection measure for Donaldsonville. While the dam fulfilled its authorized purpose to help prevent flooding in the city, its construction severed what remained of the hydrologic connection between the Mississippi River and the wetland of Barataria Basin and eastern Terrebonne Basin. Port Fourchon is situated near the mouth of this bayou where the oil and gas industry, and both recreational and commercial fishermen work side by side. The Port of Fourchon serves as a terminal for much of the oil activities in South Louisiana. Supply boats, oil drilling vessels, oil field personnel, repair docks, and labor crews all work out of this area. The Barataria Bay Waterway, which is located in southeast Louisiana, is approximately 41 miles (66 km) from the GIWW to the Gulf of Mexico with a side channel to Grande Isle, Louisiana. Similar to Bayou Lafourche, marine traffic on this waterway primarily services oil company activities in south Louisiana, as well as the commercial fishing industry.

The Calcasieu River and Pass, which is located in southwest Louisiana, is approximately 110 miles (177 km) long beginning at Phillips Bluff, Louisiana and ending at the 42-foot (12.8 m) contour in the Gulf of Mexico. Located on the waterway is the Port of Lake Charles, the 11th largest seaport in the United States, accommodating 4.5 million tons of cargo annually at its public facilities.

The Sabine-Neches Waterway serves the Ports of Port Arthur, Beaumont, and Orange in Jefferson and Orange Counties, Texas. The Sabine-Neches Waterway is attributed with 135 million short tons of freight traffic cargo in 2005. Over 90 percent of this cargo is associated with petroleum and chemical products. This waterway extends from the Gulf of Mexico for 86.8 miles into turning basins at West Port Arthur, Beaumont, and Orange, Texas. The deepest channels, Sabine Pass, Port Arthur Channel and Beaumont Channel are maintained at 40 feet.

The megaports of New Orleans, South Louisiana (comprised of facilities in St. Charles, St. John the Baptist, and St. James Parishes), and Baton Rouge line 172 miles of both banks of the lower Mississippi River. The Port of Lake Charles is located on the Calcasieu River and Pass in southwest Louisiana (table 13).

Table 13. National Ranking of the Ports of South Louisiana, New Orleans, and Baton Rouge

Port	South Louisiana		New Orleans		Baton Rouge	
Year	Total Tonnage	National Ranking	Total Tonnage	National Ranking	Total Tonnage	National Ranking
2005*	212,245,241	1	65,875,811	8	59,293,661	9
2004	224,187,322	1	78,085,209	7	57,082,823	10
2003	198,825,125	1	83,846,626	5	61,264,412	10
2002	216,396,497	1	85,000,428	5	60,582,710	9
2001	212,564,930	1	85,628,353	4	61,415,441	10
(* Hurricane Katrina affected traffic)						
Data from: Waterborne Commerce of the United States (WCUS), Part 5 – National Summaries of Domestic and Foreign Traffic, Table 5-1. 2006 data is not available as of this writing.						

Five additional Federal navigation projects and related waterways have an impact on the LCA Study area. These are the Atchafalaya River and Bayous Chene, Boeuf, and Black; Houma Navigation Canal; and Acadiana Gulf of Mexico Access Channel (Port of Iberia to the gulf); and the Mermentau River. These waterways, along with Bayou Lafourche and Barataria Bay Waterway, have considerable marine activity, but do not carry cargo. The relevant commerce is derived from oil and gas rig fabrication, delivery, and offshore services.

3.5.9 Flood Control: Hurricane Protection Levees

Over one million people currently live within areas protected by existing hurricane protection projects. Numerous communities exist in the study area dominated by the Greater New Orleans metropolitan area. The deltaic area is subject to rainfall, tidal, and hurricane flooding, which results in structural, agricultural, and environmental damages. The relatively flat terrain, and large urbanized areas at or below sea level aggravate flood damages. The study area is very low in elevation, comprised primarily of sea-level marsh, swamp, and open water, with relief provided by the alluvial ridges of the present and abandoned courses and distributaries of the Mississippi River. The elevations vary from as low as –10 feet NGVD in developed areas that have been protected by levees and drained by pumps, to about +25 feet NGVD along the ridges of the Mississippi River. St. Tammany Parish, located on the north shore of Lake

Pontchartrain, has ground elevations of up to +200 feet NGVD. An extensive system of Federal and local levees has been constructed in southern Louisiana to protect against hurricane surge and flooding from the Mississippi River.

The study area contains six existing authorized hurricane protection projects plus three hurricane studies that are in various stages of the study process. The existing authorized projects are Lake Pontchartrain, Louisiana and Vicinity; New Orleans to Venice, Louisiana; West Bank and Vicinity, Louisiana; Larose to Golden Meadow, Louisiana; Morgan City and Vicinity, Louisiana, and Grand Isle and Vicinity, Louisiana. Ongoing studies include Lake Pontchartrain west shore feasibility study; and Donaldsonville to the Gulf reconnaissance study. Morganza to the Gulf feasibility study has been completed. These existing hurricane protection projects would provide protection against storm surge associated with 100-year event storms, but mass evacuations would still be required when hurricanes threaten the area.

In 1998, Hurricane Georges caused great concern in the southeast Louisiana area and forced the evacuation of hundreds of thousands of people. Although this storm did not strike the study area directly, its close passage made many people aware of the potential disastrous impact of a high strength storm. After Hurricane Georges, it was estimated that 300,000 people evacuated. Prior to Hurricane Lili in October 2002, an estimated 400,000 people evacuated the area. For Hurricane Ivan, in September 2004, state and local officials estimate that 600,000 people evacuated. For Hurricane Katrina, the state estimates 1.3 million Louisiana residents evacuated and later during Rita, another 300,000 residents evacuated. All of these evacuations severely stressed the highway systems. There is great potential for catastrophic loss of life due to a major hurricane storm surge.

3.5.10 Agriculture

The 2002 Census of Agriculture estimated agricultural products sold in Louisiana exceeded $1.8 billion. The rich deltaic soil and mild climate are conducive to the production of a wide variety of crops, including sugar cane, rice, and soybeans. According to the 2002 Census of Agriculture, approximately 14 percent of the Nation's rice and 44 percent of the Nation's sugar are produced in Louisiana. Most of this production is in the coastal areas of the state and many of these areas are experiencing either direct land loss or increasing salinities of waters that are used for crop irrigation.

Agricultural production in the study area is dominated by sugar cane in the eastern portion and rice in the western portion. Significant income is also derived from livestock production, primarily cattle and horses. Rice production in the area has traditionally been supported by water obtained from local bayous. These bayous have recently begun to experience higher salinity levels, which is detrimental to crop production. Much of the saltwater intrusion has taken place because of navigation channels and oil and gas canals. In the sugar producing areas, production has been hampered by subsidence resulting in flooding and drainage problems. Even in areas where saltwater intrusion has not occurred, the loss of adjacent wetlands makes croplands more susceptible to storm damages.

3.5.11 Forestry

Much of the initial cut of timber harvested along coastal areas of the state took place by the 1930s although production continues in most parishes. Timber production in Louisiana's forested wetlands is an important renewable resource. As indicated in reports developed by the LSU AgCenter, the forest products industry is the second largest manufacturing employer in Louisiana, employing about 25,000 people with an estimated payroll and income generated by forestry and wood products industry totaling $4.2 billion in 2007, producing earnings of more than $900 million. The harvest and transportation of timber provides jobs for an additional 8,000 people. Bottomland forests in southern Louisiana serve as a source for lumber. The Louisiana Department of Agriculture and Forestry reported that saw timber in the study area exceeded 63 million board feet in 2007, representing about 5.5 percent of the state total. The stumpage value sold was approximately $52.3 million, or about 9.4 percent of the state total.

3.5.12 Water Supply

While coastal Louisiana has abundant sources of freshwater, increases in salinity due to coastal erosion could have serious economic effects in some areas. Of the water used in the LCA Study area in coastal Louisiana, about 97 percent is from surface sources and about 3 percent is from groundwater sources. The Mississippi River and its distributaries are the largest source of surface water, contributing 96 percent of the total surface withdrawals. Other major sources include Bayou Lafourche, the GIWW, Mermentau River, and Bayou Lacassine. Surface water is used for various purposes, including industry (46 percent), power generation (42 percent), public supplies (11 percent), and agriculture (2 percent). Industrial withdrawals are primarily for petroleum refining and chemical manufacturing. Withdrawals for agricultural use are primarily in southwestern Louisiana. Of the three percent of water use in the LCA Study area coming from groundwater supplies, most of this supply was used for chemical manufacturing, sugar refining, and shipbuilding.

3.6 ENVIRONMNTAL JUSTICE

Historic and Existing Conditions

On February 11, 1994, President Clinton issued E.O. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The E.O. requires Federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. As defined by the "Environmental Justice: Guidance Under the NEPA" (CEQ, 1997), "minority" includes persons who identify themselves as Asian or Pacific Islander, Native American or Alaskan Native, black (not of Hispanic origin) or Hispanic. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations are identified using the Census Bureau's statistical poverty threshold, which is based on income and family size. The Census Bureau defines a "poverty area" as a Census tract with 20 percent or more of

its residents below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level.

According to the 2005 U.S. Census, minorities comprise approximately 33 percent of the total population of the 20-parish area, compared with roughly 38 percent statewide. There are 17 percent persons in poverty in the project area, comparable to the 19 percent statewide. Therefore, the project area is not considered a "minority" or "poverty area" as defined previously. The multiple event maintenance dredging projects would be located in an open water site. There are no populated areas within the location of the project site and there are no low-income or minority populations there. Orleans Parish is the only parish in the 20-parish project area that is predominantly minority as shown in table 14.

Table 14. Race and Poverty Demographics

Parish	% White	% Minority	% Below Poverty	Population
Ascension	75.5	24.5	12	97,335
Assumption	66	34	19	23,472
Calcasieu	72	28	17	184,524
Cameron	91	9	13	7,792
Iberia	63	37	21	75,509
Jefferson	61	38	16.5	431,361
Lafourche	81	19	16.5	93,554
Livingston	93	7	13	114,805
Orleans	27	73	27	223,388
Plaquemines	68	32	16	22,512
St. Bernard	81	19	15	15,514
St. Charles	69	31	13	52,761
St. James	49	41	17	21,721
St. John the Baptist	47	43	16	48,537
St. Martin	66	34	20	51,341
St. Mary	61	38	22	51,867
St. Tammany	83	17	11	230,605
Tangipahoa	68	32	22	113,137
Terrebonne	73	27	18	109,348
Vermillion	81	19	19	56,021
Louisiana	**62**	**38**	**19**	**4,287,768**
TOTAL	**67**	**33**	**17**	**2,025,104**

Source: *U.S. Census Bureau*, 2006 county population estimate files. 2004 poverty data, 2005 race data.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter presents the environmental consequences of restoration features of the BUDMAT Program on significant resources.

A comparison of the direct, indirect, and cumulative impacts for restoration opportunities in the BUDMAT Program is presented. Direct impacts are those effects that are caused by the action and occur at the same time and place (section 1508.8(a) of 40 CFR Parts 1500-1508). For example, the beneficial use of dredged material would directly create acres of marsh habitat or barrier island habitat. Indirect impacts are those effects that are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (section 1508.8(b) of 40 CFR Parts 1500-1508). An example of this would be diversions that indirectly result in land building and nourishment. Cumulative impacts are the effects on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-federal) or person undertakes such actions. Cumulative impacts can result from actions that individually are minor, but collectively result in significant actions taking place over time (section 1508.7 40 CFR Parts 1500-1508). For example, the incremental impacts of hydrologic restoration at several localized areas could significantly modify an entire basin's hydrology. The cumulative impact analysis followed the 11-step process described in the 1997 report by the Council of Environmental Quality entitled "Considering Cumulative Effects under the National Environmental Policy Act." This PEIS evaluates and compares the direct, indirect, and cumulative impacts from a qualitative perspective, commensurate with the conceptual level of detail within which these restoration opportunities were developed.

4.1 PHYSICAL ENVIRONMENT

4.1.1 Water Quality

No Action Alternative

Without the proposed actions of the BUDMAT Program, Louisiana would still be affected by activities, natural and man-influenced, that would have both beneficial and detrimental effects to water quality conditions. Some of these activities include: other Federal, state, local, and private restoration efforts such as CWPPRA, USACE ecosystem restoration projects, various NRCS programs (e.g., Coastal Wetlands Restoration Program), and CPRA projects; state and local water quality management programs; national level programs to address hypoxia in the northern Gulf of Mexico; the continued erosion/subsidence of the coast; oil and gas development; industrial, commercial, and residential development; and Federal, state, and municipal navigation and flood-damage reduction projects. The future quality of Louisiana's coastal waters depends on a responsible, watershed approach to managing these activities. The LCA Study (2004) describes a number of present and future activities that would continue to occur without the proposed actions of the LCA Study proposals, including the BUDMAT Program, and would affect surface water quality conditions in coastal Louisiana. Specifically relating to disposal of dredged materials, the following impacts with no action would be expected to occur:

Direct Impacts -

Currently approximately 24 percent of dredged material is disposed of beneficially, mainly building marsh in shallow open water areas and this trend would be expected to continue. The other 76 percent of dredged materials are resuspended in the water column via agitation dredging, disposed in ocean disposal sites, deposited in temporary riverine storage areas (e.g. Head of Passes in the Mississippi River Delta), or removed from the aquatic environment via upland disposal sites.

Indirect Impacts -

Indirect effects of changes to water quality include: nutrient enrichment could possibly lead to increased algae blooms and freshwater tolerant aquatic organisms; increased turbidity could possibly lead to disruption of freshwater and marine organisms; decreased water temperatures; increased dissolved oxygen; freshwater areas would increase thereby providing additional habitats for aquatic organisms; salinities would stabilize or decrease; sediments in the coastal zone would increase, with accompanying minor increases in trace metals associated with bed sediments; and agrichemicals in the water could increase.

Cumulative Impacts -

It is expected that approximately 265 acres per year of shallow open water would be restored to marsh through the O&M dredging material management plan or with the addition of various funding sources available to pay the incremental cost beyond the Federal Standard.

BUDMAT Alternative

As mandated by Section 404(b)(1) of the CWA, the CEMVN is required to demonstrate that the reintroduction of sediments into a proposed study area "will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern." The Section 404 (b)(1) Guidelines (40 CFR 230) are the environmental criteria for evaluating the proposed discharges of dredged or fill material into waters of the United States. Compliance with these guidelines is the controlling factor used by the CEMVN to determine the environmental acceptability of disposal alternatives. The CEMVN must demonstrate through completion of a Section 404 (b)(1) evaluation that any proposed discharge of dredged material is in compliance with the guidelines. To comply with the guidelines, the proposed discharge must satisfy four requirements as follows:

1. Section 230.10 (a) – addresses impacts associated with loss of aquatic site functions and values at the proposed disposal site and requires that the discharge represent the least environmentally damaging, practicable alternative.
2. Section 230.10(b) – requires that the discharge not violate state water quality standards.
3. Section 230.10(c) – requires that the discharge not significantly degrade the aquatic ecosystem.
4. Section 230.10(d) – requires all practicable means be used to minimize adverse environmental impacts.

Section 230.60 of the guidelines provides for an evaluation of the material to be dredged using existing information on the proposed dredging and disposal sites to determine if the

material proposed for discharge requires additional testing. If the conditions for exemption from testing in accordance with Section 236.60 can be met, that is, if review of existing information indicates there is no reason to believe that the proposed dredged material is a carrier of contaminants, no further testing of the dredged material would be performed. If the conditions for exemption from testing in accordance with Section 230.60 cannot be met, that is, if review of existing information indicates there is a reason to believe that the proposed dredged material is a carrier of contaminants, then physical, chemical, and biological evaluations of the dredged material at Section 230.61 would be performed.

Section 230.61 mandates that the CEMVN use an effects based testing protocol to determine the impacts of proposed discharges of dredged or fill material into waters of the U.S. whether the discharge is directly into open water or into an upland confined disposal facility that results in effluent being discharged via a weir back into waters of the U.S. The protocols in the USACE/USEPA technical guidance document, "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual," (USEPA/USACE 1998), also referred to as the "Inland Testing Manual" (ITM), constitute an "effects based" approach that depends on a preponderance of evidence acquired through physical, chemical, and biological assessments as required by Sections 230.60 and 230.61 of the guidelines.

As project sites are developed, an application for a Water Quality Certificate for the particular project would be made, in accordance to the Clean Water Act and Louisiana Title 33. In addition, a Wetlands 404(b)(1) evaluation for each project would be conducted.

Direct Impacts –

Shallow open water areas and associated habitats (e.g. submerged aquatic habitats and adjacent fringe marsh) would be directly impacted. Shallow open water habitats are an abundant resource, and the resource as a whole should not be detrimentally affected by the proposed program. Submerged aquatic habitat is highly valued and provides nursery and foraging habitat for fish and other aquatic life. Turbidity associated with the disposal of dredged materials would increase locally; however, this would be temporary.

Indirect Impacts –

Indirect effects of changes to water quality include: nutrient enrichment could possibly lead to increased algae blooms and freshwater tolerant aquatic organisms; increased turbidity could possibly lead to disruption of freshwater and marine organisms; decreased water temperatures; increased dissolved oxygen; freshwater areas would increase thereby providing additional habitats for aquatic organisms; salinities would stabilize or decrease; sediments in the coastal zone would increase, with accompanying minor increases in trace metals associated with bed sediments; and agrichemicals in the water could increase.

Cumulative Impacts –

A range of 3,400 – 21,000 acres of shallow open water could be restored back to marsh over the 10-year project life. As much as 21,000 acres of shallow open water could be restored back to wetlands depending on project site location and construction costs. The location of future project sites could keep dredge materials from being disposed of in upland sites or lessen the need for ocean disposal.

4.1.2 Air Quality

An air quality determination would be calculated for each project, based upon direct and indirect air emissions. Direct emissions include those resulting directly from construction of the proposed action. Generally, since no other indirect Federal action, such as licensing or subsequent actions would likely be required or related to the restoration construction actions, it is likely that indirect emissions, if they would occur, would be negligible. Therefore, the air applicability determination analysis would be based upon direct emission for estimated construction hours. Typically, however, consideration of total emissions for each work item separately (or even when all work items are summed) generally do not exceed the threshold limit applicable to Volatile Organic Compounds (VOC) for parishes where the most stringent requirement (50 tons per year in serious non-attainment parishes) is in effect. The VOC emissions for any proposed construction projects would be expected to be classified as *de minimus* and no further action would be required.

4.1.3 Noise

No Action

Localized and temporary noise impacts would likely continue to affect animals and the relatively few people in the remote coastal wetland areas. Potential noise impacts concerns may be expected for those workers at oil and gas extraction sites, recreationists, and construction activities. Additional noise impacts would be associated with the villages, towns, and clusters of human habitations. Institutional recognition of noise, such as provided by the regulations for Occupational Noise Exposure (29 CFR Part 1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue.

It is anticipated that, in some instances, noise impacts may be an important issue for their potential effects on wildlife, such as disruption of normal breeding patterns and abandonment of nesting colonies. However, tolerance of unnatural disturbance varies among wildlife. Therefore, these issues shall be addressed by identifying the key species of concern and following feasible administrative and or engineering controls, determining and implementing appropriate buffer zones, and implementing construction "activity windows" (i.e., project construction initiation and completion dates to minimize disturbance to nesting birds).

BUDMAT Alternative

Direct Impacts -

Generally, all restoration opportunities would have only short-term, and minor, direct impacts on noise. Addressing potential noise impacts would be accomplished on a project-by-project basis. Any noise impacts would likely affect relatively few humans other than those employed at or near restoration construction sites due to the typically remote locations of such sites. When employees are subjected to sound exceeding those described under the Occupational Safety and Health Standards, feasible administrative or engineering controls shall be utilized via effective hearing conservation programs. Further, in accordance with these standards, if such controls fail to reduce sound levels within acceptable levels, personal protective equipment shall

be provided and used to reduce sound levels. In some instances, noise impacts may directly impact fish and wildlife species. These organisms would generally avoid the construction area. However, tolerance of unnatural disturbance varies among wildlife. Therefore identifying the key species of concern and following feasible administrative and or engineering controls, determining and implementing appropriate buffer zones, and implementing construction activity windows, shall address these issues.

Indirect Impacts -

It is anticipated that, in some instances, noise impacts could be an important issue for their potential indirect effects on wildlife, such as disruption of normal breeding patterns and abandonment of nesting colonies. However, tolerance of unnatural disturbance varies among wildlife. Therefore, identifying the key species of concern and following feasible administrative and or engineering controls, determining and implementing appropriate buffer zones, and implementing construction activity, would address these issues.

Cumulative Impacts -

The cumulative impacts would principally be related to the potential short-term disruption of fish and wildlife species and similar impacts by other similar Federal, state, local, and private restoration activities as well as other human-induced noise disruptions to these organisms.

4.2 BIOLOGICAL ENVIRONMENT

4.2.1 Soils

No Action

Direct Impacts -

Direct impacts to soil resources would primarily result from those project-related activities that would directly use, remove, or otherwise disturb soil resources. Direct adverse impacts to soil resources would primarily result from activities associated with construction of the various features of each plan.

Indirect Impacts -

Indirect impacts to soil resources would be the increase in land areas and formation of new wetland, chenier ridges, or beaches from restoration construction as well as nourishment of surrounding marshes over time.

Cumulative Impacts -

Currently, approximately 2,650 net acres of wetland soils would be restored through the beneficial use of dredged material within the Federal Standard or with additional funding sources such as CWPPRA, Section 204, or CIAP.

BUDMAT Alternative

Direct Impacts –

The direct impacts would be essentially the same as for the no action alternative, except it would impact larger areas. Approximately 64 million cubic yards of material is dredged annually by maintenance activities and could be used by the BUDMAT Program to achieve restoration objectives. A range of 3,400 acres to 21,000 acres of wetlands could be created over the 10-yr program. The number of acres created is directly tied to dredge material transport and placement costs. The majority of the materials dredged from the navigation channels consists of silts and clays, which is primarily conducive to marsh restoration projects, either interior marshes or marshes on the lee side of the barrier islands. Some channels, such as the Mississippi River have higher sand quantities, which could be utilized for beach nourishment on barrier islands or shorelines. Depending on estimates of sea level change (EC 1165-2-211, found in the EIS Appendix), the acreages and locations of project sites could vary. Those project sites in lower lying areas could require more material for restoration, or may prove unfeasible under the "high relative sea level rise" scenario.

Indirect Impacts -

Indirect impacts to soil resources would primarily result from marsh creation, barrier island, or beach nourishment features which would increase land area and form new soil resources over time.

Cumulative Impacts -

Channel bottom substrates would continue to be temporarily disturbed along with aquatic marine organisms that inhabit those substrates. Sediment that is confined to the channel would be redistributed throughout the estuarine system.

These general direct, indirect, and cumulative impacts would be further developed on a project-by-project basis.

4.2.2 Barrier systems: barrier shorelines, headlands, and islands

No Action

The natural and human-induced land loss processes on these barrier systems would likely continue at the present rates. Marine influences and tropical storm events would be the primary factors affecting land loss of the barrier island systems. As this land loss trend continues, hydrologic connections between the gulf and interior areas would increase and exacerbate land loss and conversion of habitat type within the interior wetland communities.

O&M funded beneficial use sites such as West Belle Pass at Port Fourchon and Freshwater Bayou Canal would continue to be used, allowing some accretion of land. Aerial photographs indicate that the gulf shoreline west of the Freshwater Bayou Canal has prograded as much as 1,300 feet seaward within a mile down drift from the beach nourishment disposal area.

While all the barrier island systems in the study area would continue to experience varying rates of land loss, the greatest occurrence is within the Barataria/Terrebonne shoreline; which is expected to continue.

Direct Impacts -

One of the most valuable services that barrier islands provide is protection of inland areas during storms and hurricanes. Barrier islands and coastal wetlands reduce the magnitude of hurricane storm surges and related flooding. As islands shrink and disappear, they provide mainland areas less protection from storm surge; however, if barrier islands were raised and widened, storm surges experienced inland would decrease (Suhayda 1997). With no action the following resources would continue to diminish: critical habitats for threatened and endangered species such as the piping plover, sea turtles, and brown pelican; essential and diverse habitats for migratory birds and other wildlife; and essential spawning, nursery, nesting, and feeding habitats for commercially and recreationally important species of finfish and shellfish, as well as other aquatic organisms. The continued loss of Louisiana's barrier systems would adversely impact the extraordinary scenic, scientific, recreational, natural, historic, archeological, cultural, and economic importance of these barrier islands.

Indirect Impacts -

The continued loss of these coastal barrier systems would result in the reduction and eventual loss of the natural protective storm buffering of these barrier systems. Without the protective buffer provided by the barrier island systems, interior wetlands would be at an increased risk to severe damage from tropical storm events. Additionally, the continued shoreline recession and the movement of unstable sediments would undermine man-made structures, especially the extensive oil and gas pipelines and structures on this "working coast."

Cumulative Impacts -

The long-term degradation of the barrier islands would lead to the coastal wetlands being directly impacted by wave energy from tropical storms, increasing the land loss rate, leaving coastal cities and towns increasingly vulnerable.

BUDMAT

Direct Impacts -

Direct impacts to barrier systems would primarily result from project-related activities that would immediately and directly create, restore, protect, rehabilitate, alter, or otherwise modify existing barrier systems. With the BUDMAT Program, rebuilding efforts on barrier islands, barrier shorelines, and headlands could lessen the land loss rate but the program limitations would not be able to make up for the all the losses. Some of the critical habitats for threatened and endangered species such as piping plovers, sea turtles, and brown pelicans could be repaired or rebuilt. This would include nursery, nesting, feeding, and loafing habitat for migratory birds and other wildlife, fisheries, commercial and recreationally important species of finfish and shellfish, as well as other aquatic organisms.

Indirect Impacts -

Indirect impacts to barrier systems would primarily result from long-term and far field effects to geomorphologic processes that influence barrier systems and the functions and values of these systems. Restoration of these barrier systems to near historic configurations, would, once again, provide natural storm buffering, limit storm surge heights, and provide protection for the interior wetlands, bays, and estuaries. Placing dredged materials adjacent to the beaches allows the materials to be caught up in the littoral flow, which helps nourish beaches and islands further to the west.

Cumulative Impacts -

The BUDMAT Program would result in a small reduction in the rate of loss of barrier island habitat, and a small increase in sustainability. Additional acreage could be created by nourishing beaches with dredged materials. Some of the dredged materials contain a higher percentage of sands that is ideal for beach nourishment. Access to these materials may require pumping out of Hopper Dredges.

These general direct, indirect, and cumulative impacts would be further developed on a project-by-project basis.

4.2.3 Coastal vegetation resources

4.2.3.1 Wetlands – Swamps and Marshes

No Action

Direct Impacts -

Direct loss of vegetated habitat would continue to occur as plants are physically removed by erosion from marine processes, increased water velocities, and increased herbivory pressures. Changes in environmental conditions that occur quickly or beyond the tolerance limits of plant species to adapt or allow succession, would cause conversion directly to open water. Increased plant detritus would have a short-term increase in fisheries, as a food source, but the long-term effect would be a loss of the resource base. Continued subsidence and other factors that would facilitate increased flooding and saltwater intrusion would cause complete die-off of the more vulnerable plant communities. In particular, large-scale loss of protective land forms, such as elevated ridges and islands, landbridges, and contiguous fringing marshes, that buffer the rare or unique vegetative communities or vulnerable vegetative habitats formed in highly organic conditions, would result in habitat conversion or loss. Increased erosion and water exchange could cause changes in water temperatures and deepening of shallow water areas, and drive turbidity increases that would cause decreases in the presence and productivity of submerged aquatic vegetation.

Table 15. Land change in hydrological basins and potentials for beneficial use of dredged material

	Coastal Total[1]	Calcasieu / Sabine	Mermentau	Teche / Vermilion	Atchafalaya	Terrebonne	Barataria	Mississippi River Delta	Breton Sound
Area total (land + water) *in square miles*	*11,437*	*915*	*1,132*	*1,025*	*428*	*1,858*	*1,366*	*631*	*946*
Area total, in **acres**	**7,319,708**	**585,689**	**724,657**	**655,731**	**274,024**	**1,188,798**	**874,513**	**403,808**	**605,230**
Land change - 1985-2008 [2] *in square miles*	*-459*	*-31*	*-34*	*-17*	***17***	*-111*	*-123*	*-10*	*-80*
Land loss, in **acres**	**-293,926**	**-19,756**	**-21,710**	**-13,552**	**10,866**	**-71,296**	**-78,767**	**-6,670**	**-51,307**
Percentage land change	-4%	-3%	-3%	-2%	**4%**	-6%	-9%	-2%	-8%
FWOP (10 yrs) OPS dredging BU acres created[3]	5,894	0	104	30	1,760	65	437	3,298	200
FWP (10 yrs) BUDMAT potential acres[4]	55,500	11,748			2,251	2,208	255	39,038	
FWP OPS + BUDMAT	61,394	11,748	104	30	5,567	2,273	692	42,336	200

[1] Pontchartrain and Pearl River Basins (3,087 and 49 sq mi respectively) are excluded, as they do not have federally maintained navigation channels.

[2] Land loss (or gain) data from USGS: Barras et al 2008 and Barras 2009.

[3] Currently the Calcasieu Navigation Channel does not use any material beneficially under O&M dredging unless it is funded by outside sources such as CWPPRA, CAP 204, or CIAP.

[4] Based on New Orleans District data from years 1996 through 2007, material not currently used beneficially. **Assumes project construction area has water depth of 1.5 ft.**

Current beneficial use of dredge projects counter to a small extent the severe land loss experienced by coastal Louisiana. Existing marsh restoration projects have restored approximately 265 acres per year of wetlands using O&M funds, and this rate would be expected to continue through various funding sources such as CWPPRA, CAP 204, or CIAP. Land loss by basin is indicated in table 15. Only the Atchafalaya Basin shows a land gain of 4 percent and this can mainly be found in the deltas of the Atchafalaya River and the Wax Lake Outlet. Part of that land gain, approximately 170 acres per year, can be attributed to the delta islands created with O&M dredge material, as satellite imagery does not differentiate between naturally forming land and land created via artificial means. Delta building at the mouths of the Atchafalaya and the Mississippi does not address interior loss which is occurring coast wide.

Indirect Impacts -

The multiple benefits derived from the attributes and functions of wetland vegetation become indirectly impacted by the decline and loss of vegetative habitats. Louisiana plant species and communities vary widely in their abilities to adapt to a variety of environmental conditions. In habitats where variation in conditions becomes restricted, such as those with extreme salinity, water depths, or sediment and nutrient deprivation, species diversity would be severely reduced. Ultimately, species distribution and successional patterns of plant communities would be negatively influenced and only those communities of species that can adapt to severely limited conditions would endure. Sustained environmental stressors causing declines in plant production would also result in biomass deficits. As a result, accumulation of the decomposing organic material that contributes to the structure and vertical accretion of soils would be reduced, carbon sequestration would diminish, and the contribution that serves as the basis of the trophic chain would be curtailed. Deterioration and loss of emergent and submerged plant communities would cause a decline in protection against substrate erosion, water quality improvement, and the contribution of food and physical structure for cover, nesting, and nursery habitat for wildlife and fisheries. Placement of dredged material in degraded wetlands could cause a change in fisheries habitat adjacent to and/or within beneficial use sites from open water to smaller channels and ponds within a marsh. Loss of stabilizing vegetative cover increases the exposure of wetland soils to increased particle detachment, export out of the system, and further loss of elevation.

Cumulative Impacts -

Continued degradation and loss of existing wetland vegetative habitats, in concert with truncation of replenishing processes would accelerate declines in the interdependent processes of plant production and vertical maintenance necessary for persistence of a stable ecosystem. Without action, future wetlands loss would continue. Geographers have predicted a net decrease of 462,760 acres of total wetland vegetative habitat would occur. The predicted net changes in each habitat type is as follows: a decrease of 141,960 acres fresh marsh, an increase of 231,950 acres of intermediate marsh, a decrease of 147,050 acres of brackish marsh, a decrease of 314,620 acres of saline marsh, and a decrease of 91,080 acres of swamp/wetland forest (LCA Study 2004). Intermediate marshes would be expected in increase as fresh marshes and swamps covert to intermediate marsh (more saline) as salt water pushes further inland. Additionally, if investment in the maintenance of existing restoration efforts is discontinued, accelerated loss may also occur in vegetative habitats currently under protection. Since the Louisiana coastal ecosystem contains 40 percent of the Nation's wetlands, and is experiencing 80 percent of the loss (Penland et al. 1990), the potential impacts to other significant resources dependent upon

Louisiana's vegetative habitat and the associated functions and values would be cumulatively severe on a state, Gulf of Mexico regional, and national level.

BUDMAT Alternative

Direct Impacts -

Over the life of the project, the BUDMAT Program would be expected to create a range of 3,400 acres to 21,000 acres, much of which could be marsh. The BUDMAT Program would work synergistically with the Coastal Wetlands Planning, Protection, and Restoration Act of 1990 (PL 101-646). The Act stated that the wetlands of coastal Louisiana were of national importance and worthy of protection and restoration.

Placement of dredged materials in degraded marshes would provide substrate for emergent and/or submergent vegetation, allowing these open water areas to function as marshes. The creation of wetland habitat could reduce localized shoreline erosion rates by reducing wave fetch. Placement of dredged materials in shallow water areas would not prevent or decelerate erosion of all marshes in the future project areas. Because of the composition of the dredged materials, the desired height may not be obtainable in all areas; hence, the placement of dredged materials would result in shallow water / mud flats. Some scrub-shrub habitat could also be created. Both habitats would be utilized by wildlife and fisheries species.

The amount of wetland acreage created or restored, and the longevity of the project is not only dependant on the depth of the fill, but also on relative sea level rise. Under the "low sea level rise" scenario, based on historic sea level changes, dredge material required for wetlands could create more acreage than under the "high" level of sea level rise based on guidance formulas in the USACE Engineering Circular 1165-2-211. Under the "medium" or "high" scenarios, more material, stacked higher would be required for a 50-year project life.

Unfortunately, the 15-mile area of opportunity does not extent very far into the two adjacent basins of high need, Barataria and Breton Sound. Technology will need to improve the efficiency of long distance transport to make better use of this material. In the western part of the state, dredge material from the Calcasieu Ship Channel offers the opportunity to restore lost wetlands, much of that shall open water. The geology of the Chenier Plain is more stable compared to the high subsidence rates of the Deltaic Plain, thus wetlands restored in the Chenier Plain would be expected to be more sustainable. Approximately 11,750 acres could be restored in the Chenier Plain over 10 years (table 15) assuming that the water depths is only 1.5 feet deep, which is true for much of the salt burned marshes from the recent hurricanes.

Indirect Impacts -

The largest economic function of Louisiana's coastal wetlands is the protection of oil, gas, shipping, and transportation infrastructure. Coastal marshes and barrier islands serve as a buffer zone between the open sea and inland areas, protecting infrastructure from waves, wind, tides, and to a certain extent, storm surges. Some of the most prominent sites related to oil and gas interests lie within the state, notably the Henry Hub where the national price of natural gas is set, the Louisiana Offshore Oil Port, and two of the major components of the Nation's Strategic Petroleum Reserve. Louisiana is home to two of the four Strategic Petroleum Reserve storage

facilities: West Hackberry in Cameron Parish and Bayou Choctaw in Iberville Parish. The availability of domestic oil production from Louisiana and adjacent OCS adds to the national security.

Coastal fringe marsh would be nourished by adding nutrients and sediment to the existing marsh. Localized changes of salinity and temperature regimes in adjacent marsh habitats could potentially be affected should restoration of natural geomorphic barriers be implemented as design features.

Cumulative Impacts -

The BUDMAT Program would result in a small reduction in the rate of loss of marshes and forested wetlands, and a small increase in sustainability. With an increase in the marsh to open water ratio, storm surge generated during hurricane and tropical storm events would decrease to a minor degree. The BUDMAT Program is ancillary to the O&M dredging program, and as such, these impacts should be considered. Shoreline erosion along the shipping channels from wake wash would continue to occur with or without the program, unless a specific project includes shoreline protection as a project feature.

4.2.3.2 Cheniers

No Action

Direct Impacts -

Land subsidence and sea level rise would continue erode the cheniers, gradually subsiding to marsh level, with most of the woody vegetation dying. Some shrubs such as marsh elder and groundsel bush would survive the increased salinity and submergence for a time. However, as the open water area increases, submergence, erosion, and salt spray would cause additional plant mortality. Almost 6 percent loss of emergent wetland habitat would be expected in 50 years throughout the Chenier Plain. Increasing saltwater intrusion, particularly in the western half and the extreme eastern boundary of the Chenier Plain, would drive transition of existing vegetated habitats to saltier regimes. Direct land loss through subsidence and increased hydrologic connection would also continue.

Indirect Impacts -

As the chenier ridges are lost, the marshes between the ridges would be fragmented at a faster rate, and more susceptible to salt water intrusion and storm surges. Resting or nesting habitat for avian species would also be detrimentally impacted by the loss of trees that grow on the ridges.

Cumulative Impacts -

Chenier ridges provide storm surge protection for marshes between the ridges and for the people that inhabit them. Losing the ridges would allow Gulf of Mexico waters to intrude farther inland. CWPPRA and CIAP funds have been proposed to restore or rebuild ridges in some areas and this effort would be expected to continue.

BUDMAT Alternative

Direct Impacts -

Due to the fine sediment quality of the majority of the dredged material, most restoration efforts in the Chenier Plain would be marsh restoration in the interior marshes between the Chenier Ridges. With containment, cuts in ridges could be restored, or ridge height could be increased. Care must be taken to not place too much dredged material on top of existing tree roots to avoid damaging or killing mature oaks. Precise calculation of the acres of wetland vegetative habitat that would be directly impacted from the construction or implementation of each plan would be performed when more detailed analysis is conducted for restoration feature-specific studies.

Indirect Impacts -

With all restoration opportunities, loss of cheniers and associated marshes would be expected to continue from natural and human induced factors in some areas, but would be expected to be somewhat offset by the development of vegetated habitat through the use of BUDMAT. Nevertheless, the sediment and nutrient input measures and key structural protection of the restoration opportunities would be expected to reduce the loss of vegetated habitats due to flooding and saltwater intrusion. Separate acreage figures attributed to each type of change for each habitat are not available at this time, but would be determined in future project-specific studies. Vegetative productivity (i.e. production of organic matter) is dependent upon species/community composition and vegetative response as regulated over time by forcing functions such as salinity, inundation, and nutrient availability, among others. Consequently, the effects of the various actions on productivity are considered indirect impacts because changes would occur as vegetation responds over time to the changes in forcing functions.

Cumulative Impacts -

The net change of each vegetative habitat type is not available at this time, but would be determined in future project-specific studies.

4.2.4 Wildlife resources: birds, mammals, amphibians, and reptiles

No Action

Direct Impacts -

The projection of wildlife abundance is based almost exclusively on the predicted conversion of marsh to open water and the gradual sinking and resultant deterioration of forested habitat throughout the study area. Numerous other factors, including water quality, harvesting level, and habitat changes elsewhere in a species' range cannot be predicted and were not considered in these projections. Therefore, the projections presented are to be viewed and used with caution.

Louisiana's coastal wetlands are predicted to continue to experience land loss and habitat change into the future. The effect of such losses and changes would likely result in a decrease in the abundance of wildlife as marshes, forested wetlands, and their associated habitats continue to deteriorate and convert to open water. Populations of resident and migratory birds and other

animals directly dependent on the marshes and swamps would decrease, an impact that would be felt in much of North America, where some of these species spend part of their life cycle.

Indirect Impacts –

Louisiana coastal wetlands provide essential stopover habitat for neotropical migratory birds on their annual migration route. Without places along the way that provide an adequate food supply for the quick replenishment of fat reserves, shelter from predators, and water for rehydration, migratory birds may be negatively affected. Some of the first habitats available after crossing the Gulf include Louisiana's chenier ridges. Of the few remaining ridges, only small patches support forested habitat. As the ridges continue to subside below elevations that can support forests, great number of neotropical migrants would be negatively affected. As Louisiana continues to lose more coastal wetlands, survival of individual migrating birds may be effected, which may effect population size, and over the long term, survival potential for the species as a whole.

Cumulative Impacts -

When combined with CWPPRA and other restoration authorities, beneficial use of dredged material within the Federal Standard would have an impact on wildlife resources, as those programs would work synergistically to improve habitat conditions for wildlife populations across the coast. Continental populations of migratory avian species, such as neotropical songbirds and waterfowl, could improve as critical migratory habitat is restored, protected, and enhanced. Although unlikely to impact populations on a continental scale, game animals, furbearers, reptiles, amphibians, and invasive species (especially the nutria) would also benefit from the cumulative effects of existing restoration programs.

BUDMAT Alternative

Direct Impacts -

Direct adverse (minor to moderate) impacts to wildlife resources would primarily result from construction activities associated with the various features of a beneficial use disposal area such as dredging; temporary stockpiling of soil; dredging of access canals for barges to reach shorelines; and temporary retention dikes to contain dredged material in shallow open water or on low elevation marshes. Wildlife utilizing those associated project areas would be temporarily displaced from the area of disturbance to adjacent habitats. However, these disturbances would be temporary and most species would move to other areas, and return after construction is completed. In some instances, permanent displacement may occur with the construction of permanent project features and with the creation of habitats unsuitable for certain species.

The use of dredged sediment would convert open water habitat to wetlands providing a more diverse habitat. The conversion would increase foraging, breeding, spawning, and cover habitat for a greater variety of fisheries species than would occur with no action, and potentially increase the marsh/water interface. The increased marsh/water interface is a greater benefit than marsh acres alone (Rozas and Minello 2001). Measures should be taken (i.e., creating tidal creeks and ponds) to maximize the fisheries productivity of the created marsh areas. Nutrients and detritus would be added to the food web, providing a benefit to local area fisheries. .

Indirect Impacts -

Important stopover habitat for migratory avian species would be created, restored, and/or protected; in addition, wintering habitat would be created/protected for waterfowl. The invasive nutria would principally benefit from beneficial use and marsh creation. Indirect impacts to wildlife resources would include the creation, restoration, and protection of wetland habitats utilized by those species for nesting, rearing of young, resting, and foraging activities. An increase in wetland acreage (compared to the no action alternative conditions) would provide nesting, brood-rearing, and foraging habitat for resident avian species. Migratory avian species would also benefit from restoration activities as important stopover habitat would be protected for neotropical migrants and wintering habitat would be created/protected for waterfowl. Game mammals and furbearers would also benefit from the increase in wetland types (i.e., swamp, fresh, and intermediate marsh) favored by the majority of those species. Reptiles and amphibians, which prefer fresher wetland types, would also benefit from the projected increase in wetland acres.

Cumulative Impacts -

Historically, before human intervention, populations of birds, mammals, reptiles, and amphibians responded to natural population regulating mechanisms. However, recent historic and existing conditions within the study area (i.e., loss of coastal wetland habitats) have resulted in population declines for wildlife resources and that trend is expected to continue under the Future Without-Project. Over the project life, the BUDMAT Program would result in an increase of wetland acres compared to the no action alternative. When combined with CWPPRA and other restoration authorities, the BUDMAT Program would have an even greater impact on wildlife resources, as those programs would work synergistically to improve habitat conditions for wildlife populations across the coast. Continental populations of migratory avian species, such as neotropical songbirds and waterfowl, could improve as critical migratory habitat is restored, protected, and enhanced. Although unlikely to impact their populations on a continental scale, game animals, furbearers, reptiles, amphibians, and invasive species (especially the nutria) would also benefit from the cumulative effects of the BUDMAT Program as an addition to other restoration programs.

These general direct, indirect, and cumulative impacts would be further developed on a project-by-project basis.

4.2.5 Fisheries resources

No Action

Direct Impacts -

Current O&M beneficial use projects have helped reestablish wetlands, providing valuable foraging habitat and cover for fisheries species that inhabit lakes, bayous, and open water areas. Resurgence of volunteer marsh grasses has created new habitats for the fisheries species currently inhabiting these waterways. Direct impacts to fisheries may result from events such as hypoxia, but would be expected to be smaller in comparison to indirect impacts.

Indirect Impacts -

Indirect impacts to fisheries may result from the expected continuation of land loss and further loss of habitat supportive of estuarine and marine fishery species. In the short-term, land loss and predicted sea level changes would be likely to increase open water habitats available to marine species, except in the active deltas of the Atchafalaya and Mississippi Rivers; and areas otherwise influenced by river flow. In the long-term, as open water replaces wetland habitat and the extent of marsh to water interface begins to decrease; fishery productivity would be likely to decline (Minello et al. 1994; Rozas and Reed 1993). This may already be happening in the Barataria and Terrebonne estuaries.

Other considerations on the impact to fisheries are predator/prey relationships; water quality, salinity, and temperature; harvest rates; wetland development activities (dredge/fill); habitat conversion (e.g., wetland to upland); and access blockages. Habitat suitability, diversity, population size, and harvest rates influence the future condition of fisheries. Habitat suitability for fisheries varies by species, and depends on different water quality and substrate types.

Cumulative Impacts -

Although fisheries productivity has remained high, as Louisiana has experienced tremendous marsh loss, this level of productivity may be unsustainable. As marsh loss occurs, a maximum marsh to water interface (i.e., edge) is reached (Browder et al. 1985). A decline in this interface would follow if marsh loss continues and the overall value of the area as fisheries habitat would decrease (Minello et al. 2003). Because fishery productivity has been related to the extent of the marsh to water interface (Faller 1979; Dow et al. 1985; Zimmerman et al. 1984), it is reasonable to expect fishery productivity to decline as the amount of this interface decreases.

BUDMAT Alternative

Direct Impacts -

The discharge of dredged material and the associated pipelines access corridors would temporarily impact fisheries resources in the immediate disposal area and construction staging areas, because water bottoms would be covered with dredged material. Fish species would vacate the area during placement operations but would return to open water areas after completion of the work. Fisheries access features and structure operation plans would be necessary to facilitate ingress and egress of various fisheries species to created wetlands within the proposed disposal areas. Short-term adverse impacts to fish would occur during the construction phase of these projects because of dredging activities. Floating and temporary portions of pipeline corridors should be re-colonized by fish and wildlife once construction disturbances are complete. Discharge of dredged material and the resulting turbidity plume could indirectly affect phytoplankton productivity in adjacent areas, but the overall effect on primary productivity would be negligible. Depositing dredged materials would expand the marsh/water interface, eventually increasing detrital food materials and slow the conversion of shallow water habitat to deeper water areas by marsh restoration. Short-term impacts would occur to water bottom species such as crabs, clams, amphipods, polychaetes, and snail at the disposal site, but these species should re-colonize once construction is complete. Possible adverse impacts to benthic organisms could occur because of marsh creation, barrier island restoration, and shoreline protection.

Some oyster leases, such as those in the Bay Chaland area could be permanently removed from production by the disposal of dredged materials for creation or nourishment of barrier islands or marshes. Areas adjacent to projects may temporarily experience decreased oyster production due to the increase in turbidity associated with disposal activities. Construction of dikes with a bucket dredge would temporarily increase turbidity adjacent to island sites, but this should not have adverse impacts to oyster production areas. Disposal in a confined site would greatly reduce impacts to adjacent oyster production areas.

Indirect Impacts -

Expected declines in fishery productivity may be reduced through the implementation of this plan, and the long-term sustainability of a productive fishery would be more likely than in the no action alternative conditions. Indirect benefits to fisheries should result from increased productivity, land building, and area of marsh and SAV habitats that are supportive of freshwater, estuarine, and marine fishery species. Subsidence and predicted sea level rise would be less likely to increase open water habitats. Sedimentation impacts from dredged material disposal could cause localized impacts, which could increase the aerial extent of damages to oysters located near marsh creation sites.

Cumulative Impacts -

Restoration efforts in the state (e.g., CWPPRA, the Community based Restoration Program sponsored by the NMFS Restoration Center, various state and local efforts, and others) have aided fisheries habitat and are likely to continue to do so. Economic interest in fisheries, and interest in Louisiana as a fishery resource for the Nation, has increased significantly in the recent past. This increase would be expected to continue and lead to changes in fishing technology, fishing pressure, and fishing regulations, in order to maintain sustainable commercial fisheries. The construction of levees, water control structures, and hurricane protection features, all of which can result in direct loss of habitat, alter water flow, and possibly block fisheries access to habitat, is likely to continue and/or increase, as coastal residents protect themselves and their property from hurricane damage and flooding. With this plan, there should be an overall benefit to fisheries compared to the no action alternative.

These general direct, indirect, and cumulative impacts would be further developed on a project-by-project basis.

4.2.6 Essential fish habitat

No Action

Direct Impacts -

Although previous restoration efforts in the BUDMAT Program study area have helped maintain some categories of EFH, the cumulative impacts of land loss, conversion of habitats, sea level change, increased storm intensity, etc., would be expected to lead to a net decrease in the habitat most supportive of estuarine and marine species. The direct losses of highly productive forms of EFH would lead to losses of shallow habitat, due to the exposed nature of the shallow open water bottoms that are being formed. Shallow waters would be likely to become deep waters, and salinity gradients would be less estuarine, with a sharper distinction

between saline and freshwater habitat, as coastal residents continue their efforts to protect self and property with levees, flood gates, and other water control structures.

Indirect Impacts -

The no action alternative would indirectly impact species that are linked in the food chain to directly affected species. Population reductions in directly affected species, such as brown shrimp and white shrimp, affect species dependent on shrimp for food. As marsh, barrier islands, and other EFH are directly lost, less protection would be available to remaining EFH. These areas would be more susceptible to storm, wind, and wave erosion. A decrease in species population levels would result as populations are stressed by habitat displacement and reduction. With no action, categories of EFH, such as inner marsh and marsh edge, would be converted to less productive forms of EFH (e.g., estuarine water column; and mud, sand, or shell substrates) as wetlands degrade.

Cumulative Impacts -

The effect of human activity, coupled with natural forces, has been substantial to EFH. Water quality degradation, invasive species introductions, storms, and a general reduction in marsh, barrier island, and other habitats contribute to negative impacts on some categories of EFH (e.g., estuarine water column and marsh edge). Water quality degradation, invasive species introductions, storms, and fishing activities contribute to the negative impacts on EFH. Water quality regulations and coastal restoration efforts are believed to minimize some of these negative impacts to EFH. A reduction in suspended sediment load of the Mississippi River and mining of river sediments reduces the net supply available to coastal marshes, and contributes to their loss. Artificial levees confining the river restrict river flow and reduce nourishment to barrier islands and delta building. Coupled with coastal degradation, subsidence, sea level change, shoreline erosion, and saltwater intrusion the no action alternative would substantially decrease the quality of EFH and the ability of the BUDMAT Program area to support Federally managed species.

BUDMAT Alternative

Direct Impacts -

With the BUDMAT Program, fish productivity would not be expected to change dramatically. Within specific project boundaries, the habitat for juvenile life stages would be expected to improve, creating more cover and opportunities to escape. Coastal marshes are largely responsible for the high production of estuarine-dependent species in the north-central Gulf of Mexico. The BUDMAT Program would improve the quality of some categories of EFH in some areas by reestablishing marsh, and protecting existing marsh.

The possible construction of dredged material containment dikes could create adverse conditions for EFH. Temporary increases in the turbidity levels of the waters directly adjacent to the proposed project sites would not be expected to significantly affect EFH needs. Creation of intertidal freshwater, intermediate, brackish and saline marshes would benefit the fishery by adding nutrients and detritus to the existing food web and contribute to the overall productivity of future project sites. Provisions would be made during the O&M process to ensure the earthen

dikes would eventually provide fisheries access to the marsh development sites. Should the earthen dikes fail to degrade by natural processes, gaps would be constructed.

Indirect Impacts -

The BUDMAT Program would improve the quality of some categories of EFH in some areas by reestablishing marsh, and protecting existing marsh. Categories of EFH, such as inner marsh and marsh edge, would not be converted to less productive forms of EFH (e.g., estuarine water column; and mud, sand, or shell substrates) as would be expected with no action. Some restoration features would have some localized adverse impacts to some categories of EFH. However, the BUDMAT Program would maintain most categories of EFH that have been designated for white shrimp, brown shrimp, red drum, and cobia. In addition, categories of EFH that are maintained or improved in quality would be supportive of estuarine-dependent species such as spotted seatrout, gulf menhaden, striped mullet, and blue crab. Some of these species serve as prey for other species managed under the Magnuson-Stevens Act (e.g., mackerels, red drum, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). An increase in SAVs would increase the amount of habitat available for juvenile life stages to escape predation and therefore increase the quality of habitat.

Cumulative Impacts -

Water quality degradation, invasive species introductions, storms, and a general reduction in marsh, barrier island, and other habitats contribute to negative impacts on some categories of EFH (e.g., estuarine water column and marsh edge. The BUDMAT Program may reduce adverse impacts to some categories of EFH on a local or larger scale. By increasing sediment and nutrient input, and reducing shoreline erosion, the BUDMAT Program would likely result in the least loss of coastal marshes in the study area.

These general direct, indirect, and cumulative impacts would be further developed on a project-by-project basis.

4.2.7 Threatened and endangered species

No Action

Generally, continued coastal land loss and deterioration of critical coastal habitats, especially barrier shorelines/islands, is anticipated to impact all threatened and endangered species, which utilize coastal Louisiana. In particular, the brown pelican, piping plover, and all sea turtles would most likely be impacted to the greatest extent, as these species utilize the rapidly deteriorating barrier islands.

Direct Impacts

Continued loss of coastal wetlands would cause habitat loss and a decrease in food supply for several listed species including brown pelicans, piping plovers, loggerhead sea turtles, and Kemp's Ridley sea turtles. The other threatened and endangered species occurring in Louisiana's coastal wetlands and coastal waters are either transient or do not rely as heavily on coastal wetlands for habitat or food sources.

Indirect Impacts

Indirect impacts to threatened and endangered species under the no action alternative would result from the long-term and far field effects of less habitat being restored. Reduced habitat for feeding, resting or wintering grounds could force T&E species to move elsewhere or could increase the stress on the population to such an extent that they could decline.

Cumulative Impacts

With no action, less habitat could be restored, resulting in less area for resting, feeding, and wintering grounds. In the short term, populations of coastal dependant species would be forced to marginal habitats, move elsewhere, or increase density on the resources available. In the long-term, populations could decline to the extent that they become increasingly rare in coastal Louisiana.

BUDMAT Alternative

Direct Impacts -

Direct impacts to threatened and endangered species would be generally confined to actual construction activities of any of the restoration features. For example, direct impacts would include the short-term, unavoidable disruption and displacement of species during construction activities (e.g., the potential incidental takes of sea turtles during dredging and placement operations during barrier system restoration). However, it is unlikely that any of the restoration opportunities would have any significant adverse, direct impacts to any threatened or endangered species. On the contrary, all restoration measures would provide a net increase of coastal wetland habitats used by these species. Specific future BUDMAT projects would be coordinated with the USFWS and NMFS as part of the Section 7 consultation requirements under the Endangered Species Act.

Direct adverse impacts of the BUDMAT Program would be principally confined to actual construction activities of any of the restoration measures.

- Piping Plovers - Critical habitat for wintering populations of the piping plover consists of sandy beaches on barrier islands and shorelines. Construction activities would be timed to avoid impacts as much as possible to wintering or resting birds. These highly mobile birds would likely depart the restoration construction sites and return following restoration of the site. The CEMVN would continue to coordinate with the USFWS regarding procedures and activity windows (time frames best suited for construction to minimize disturbance to species).
- Sea turtles may be found on Louisiana coastal shorelines as well as in various coastal waters. The CEMVN has a long history of dredging and dealing with avoiding adverse impacts to sea turtles during dredging operations. In addition, the CEMVN would maintain close coordination with NMFS to avoid potential impacts to sea turtles during dredging operations for restoration.
- Restoration of brown pelican nesting sites (islands) would be similar as described for piping plover critical habitats. The CEMVN has previously succeeded in restoring brown pelican nesting habitat on Queen Bess Island as part of a joint effort between the CWPPRA and Barataria Bay Waterway, LA channel maintenance dredging operations.

The BUDMAT Program has the potential to create and/or restore foraging and nesting habitat for an array of fish and wildlife, including threatened and endangered species, and subsequently provide an overall benefit to those species compared to the no action alternative conditions.

Louisiana black bear habitat occurs along the coast of Iberia and St. Mary Parishes; however, developing project plans and construction activities that avoid or minimize work in occupied habitat during the black bear denning season would avoid disturbing pregnant females and/or females with cubs. Outside the denning season, bear sightings may still occur when working in occupied habitat, but maintaining clean work sites and providing bear-proof trash receptacles for construction crews could minimize the risk of bear disturbance and conflicts. If sightings do occur, bears are likely to avoid humans, and would only be temporarily displaced by disturbance from construction activities. Habitat loss, if any, should be minimal.

On December 2, 1993, the Service published a proposed rule to designate critical habitat for the Louisiana black bear (58 FR No. 230). The USFWS has determined that physical and biological habitat features (referred to as the primary constituent elements) that support denning, foraging, escape cover, and dispersal are essential to the conservation of the Louisiana black bear. Section 7(a) (4) of the ESA requires Federal agencies to confer informally with the USFWS on any action that is likely to result in destruction or adverse modification of proposed critical habitat.

The West Indian manatee is known to occur periodically in the coastal waters of Louisiana. Contractors would be instructed of the potential presence of West Indian manatees in the area, and West Indian manatee protection language would be included in the plans and specifications for the proposed project in an effort to avoid any impacts to the species.

Spits and offshore sand bars are used as resting and roosting areas by shore birds. Any pelicans foraging or loafing within the proposed action area during construction could easily relocate to other foraging areas in the vicinity. Additionally, potential impacts to nesting brown pelicans could be avoided by conducting activities outside the nesting season. Should the proposed activities occur during the nesting season, those activities could avoid impacting nesting pelicans by remaining outside 2,000 feet of nesting areas.

Potential impacts to piping plovers could be avoided by conducting proposed construction activities outside the wintering season (July to late March or April). If any proposed projects cannot be scheduled to take place outside the wintering season, piping plovers would be able to avoid areas of temporary disturbances as long as there are feeding and/or roosting areas available along the coast. Plovers remaining in the action area during construction would be temporarily displaced to other suitable habitats in the vicinity.

Potential impacts on piping plover critical habitat would be minimal and temporary during projects associated with barrier island enhancement or restoration. Although the proposed action may impact a barrier island designated as critical habitat, only a relatively small amount of habitat would be affected when compared to the amount of critical habitat available. In addition,

most of the proposed barrier island restoration projects may possibly create new potentially suitable habitat (beach) for the piping plover on the Gulf side of the islands and prevent/reduce erosion of existing habitat in the vicinity.

Within Louisiana, the loggerhead sea turtle has only been known to nest on the Chandeleur Islands. Because of storm processes, the Chandeleur Islands may no longer contain high beach and dune surfaces (i.e., beach structure suitable for nesting). Furthermore, recent surveys by USFWS Refuge personnel have found no loggerhead nests in the area. While nesting loggerhead sea turtles have historically used barrier islands, as stated above, occurrences are very rare along the Louisiana coast (one nest was recorded near Port Fourchon, Lafourche Parish in 2007). The restoration of barrier islands may or may not provide suitable nesting habitat, but suitable nesting habitat is nearly nonexistent due to the current degraded state of those islands. The proposed action, therefore, would not negatively affect loggerheads, and may provide some benefit to the species by restoring nesting habitat.

Portions of the Pearl and Bogue Chitto Rivers, Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne within Louisiana are designated critical habitat for the Gulf sturgeon; however, project impacts are not expected to extend into those areas. The USFWS is responsible for consultations in riverine habitats; and the NMFS has consultation responsibility for projects impacting the Gulf sturgeon in marine habitats. In estuarine habitats, consultation responsibility is based on the lead action agency: NMFS is responsible for consultations with the USACE in those habitats. The USACE will consult with both agencies on any proposed project sites to alleviate any issues.

Potential impacts to the pallid sturgeon may occur during dredging activities associated with the BUDMAT Program. There are ways, through timing and use of different types of dredges, to minimize impacts to the pallid sturgeon caused by dredging activities. The Mississippi and Atchafalaya Rivers are large enough to provide an abundance of refuge areas during construction activities; and pallid sturgeon, as well as their prey species, should be able to actively avoid dredging sites.

Migratory Birds

Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in bald cypress trees near fresh to intermediate marshes or open water in the southeastern Parishes. To avoid disturbing nesting bald eagles, the NBEM Guidelines recommend (1) keeping a distance between the activity and the nest (distance buffers), (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and (3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. Generally, site-specific plans and construction activities would be designed to avoid potential impacts to bald eagles throughout the action areas. By adhering to those buffer zones and timing restrictions outlined in the NBEM Guidelines, the impacts to nest trees and breeding behaviors can be avoided.

Some of the proposed dredged material disposal projects could potentially be located in habitats that are commonly inhabited by colonial nesting wading birds and seabirds. Should the project area be used by colonial nesting wading birds and seabirds for roosting, loafing, or feeding, they would be temporarily displaced to other suitable habitats in the vicinity. Generally, site-specific plans and construction activities would be designed to avoid potential impacts to migratory birds throughout the action areas by adhering to buffer zones and timing restrictions.

Indirect Impacts -

Indirect impacts to threatened and endangered species would primarily result from long-term and far field effects of restoration measures. During construction and shortly thereafter, temporary indirect impacts such as turbidity plumes from dredging and disposal activities could hinder site feeders such as pelicans and terns from feeding near project areas. Barrier system restoration would alter the configuration of barrier shorelines, headlands, and islands. However, it is unlikely that any of the restoration opportunities would present significantly adverse indirect impacts to any threatened or endangered species. On the contrary, all restoration measures would likely provide a net increase of coastal wetland habitats used by these species.

Cumulative Impacts -

The BUDMAT Program could enhance, as well as create critical piping plover beach habitat. In addition, piping plovers, brown pelicans, and sea turtles would likely benefit from increases in available coastal wetland habitats, especially barrier shorelines, headlands, and islands. Most other species would not be impacted. Louisiana coast wide ecosystem restoration would help moderate impacts experienced nationwide for these three species in particular. However, these gains would be contrasted with the continued loss of the barrier system (e.g., Chandeleur Islands barrier system) as well as other gulf barrier system habitats. Hence, based upon the potential direct, indirect, and cumulative impacts, implementing the BUDMAT Program would not be likely to adversely affect threatened or endangered species or their critical habitat. Cumulative impacts would be a synergistic result over and above the additive combination of impacts and benefits.

These general direct, indirect, and cumulative impacts would be further developed on a project-by-project basis.

4.3 CULTURAL ENVIRONMENT

4.3.1 Cultural Resources

No Action

Direct Impacts

Under the no action alternative, cultural resources would continue to be in danger due to erosion and subsidence, frequent and more intense storms, saltwater intrusion, and increased wave-activity. Many sites are found along the natural levees of rivers and bayous erosion acceleration occurs with the conversion of marsh to open water and with subsidence, the results of which are the landward encroachment of the gulf.

Prehistoric Resources

Prehistoric resources potentially affected by project implementation may be inorganic (lithic, ceramics, etc.) or organic, and certain such resources may be of importance in the potential dating of archeological sites. It must be acknowledged that the probability of evidence of previous erosion and storm events is a significant factor in determining whether the BUDMAT Program (or other treatment methods, for that matter) could cause a direct effect to prehistoric resources that may have been damaged by erosion and storm impacts in the past.

The effects of erosion, subsidence, and storms on archeological resources are dependent upon the rate of subsidence, pattern of erosion and storm intensity and duration. As much of southern Louisiana consist of marsh lands with saturated soils and high humidity, natural subsidence has occurred at a consistent rate. This also leads to eroded surfaces, especially along river, bayou, and lake embankments as wave action as well as storm surge continue to batter shorelines. Due to natural weather and man made effects storms have become increasing more severe, causing extensive coastal and inland damage to barrier coast lines as well as prehistoric and historic artifacts. The rate of erosion and subsidence is dependent upon factors such as soil type, moisture, and coarseness. For inorganic resources such as lithic tools, stone implements, and ceramics, water, humidity and soil moisture may be expected to cause smoothing of sharp edges on tools as water washes over stone material. Water may also fade or change the chemical composition of painted designs on ceramics, losing valuable native symbols that could later be studied.

As expected, organic resources such as bone, hair, animal and vegetable fibers, and wood are extremely susceptible to water damage and accelerated decomposition, particularly in a humid sub-tropical climate. Even relatively low intensity/duration storms could likely destroy such materials occurring at or below the surface. With continued surface subsidence and erosion, soil stratigraphy of sites would be compromised.

Radiocarbon dating of organic materials (such as charcoal or bone fragments) associated with archeological sites is a common procedure. The destruction of such material would adversely affect the ability to date such sites. In addition, exposure to high humidity and high surface temperatures could cause chemical changes in long buried organic material, which would compromise the ability to accurately radiocarbon date such material.

Historic Resources

Structures built of wood materials, or containing wood materials (such as timber elements of brick structures) are highly susceptible to water damage. Other materials, such as machinery utilized in historic factory operations, are susceptible to corrosion and rusting due to varying pH levels in water and high salt content from coastal storm surges. Organic artifacts associated with historic properties and occurring on the ground surface could be destroyed, while such artifacts beneath the ground surface would likely be protected, depending upon the soil type and moisture.

Indirect Impacts

Other factors influencing site preservation are related to the climate and topography of the area. The climate in this area is influenced by air masses, which result in severe storms during the summer months and sporadic, high energy disturbances during the winter months. The

effects of severe wind and rain are enhanced by the low topography common throughout the area. With the reduction of marsh wetlands, cultural sites would continue to erode into open water and valuable scientific information would be lost.

Cumulative Impacts

Continued loss of marsh land in areas not within the Federal Standard is expected to impact marsh habitat and therefore expose cultural resources to further damage by natural and man made activities as well as possible looting of valuable cultural material. Sites would also continue to be lost to encroaching open water.

BUDMAT Alternative

Direct Impacts

Positive long-term benefits would be realized from the deposition of dredged material into shallow open water areas and onto eroding marsh further protecting cultural resources. The short-term direct impacts from the proposed action would be damage or destruction of archeological resources occurring on the surface and within the root zones of cleared vegetation, resulting in loss of site integrity and associated scientific values. Beneficial use projects nominated under the BUDMAT Program will initially be screened for known cultural resources and projects with known cultural resource concerns will not be implemented.

Prehistoric Resources

Effects relating to use of manual clearing of vegetation would be disturbance of prehistoric archeological resources by displacing surface and subsurface material by pulling, grubbing, or digging plant root systems. Such activity would compromise the scientific value of archeological sites to the degree that such activities disturbed the surrounding soil matrix. Effects would be related to the destruction or damage of artifacts by breaking or chipping and to the scientific value of site context by shifting artifacts and disturbing the chronological sequence of deposition. Not to be neglected is the potential for illegal collection of artifacts by workers. It is noted that in vegetated areas, some level of disturbance to archeological resources would have been expected to occur, due to dislocation by plant growth and animal activity (such as burrowing).

Historic Resources

Direct effects to historic structures and structural remains by manual clearing activities would be minimal, and in some instances could be beneficial, as the growth of vegetation within or adjacent to structural remains tends to accelerate the disintegration process. Effects of manual clearing to artifacts associated with historic sites would be similar to those for prehistoric resources, as noted previously.

Indirect Impacts

No indirect impacts to prehistoric or historic resources have been identified.

Cumulative Impacts

All project actions with the potential to effect cultural resources are subject to the requirements of Section 106 of the National Historic Preservation Act, 36 CFR 800 series.

Because many archaeological sites may have been exposed to erosion, subsidence and storm effects in the past, sites identified during field surveys prior to project implementation would be evaluated to determine whether the sites have been damaged from natural and man made events, and to evaluate the potential effects of proposed project methods on such sites. As such, ground disturbing project methods described under the BUDMAT Program alternative would require site-specific cultural resources evaluation, including examination of records of known sites and an intensive cultural resources inventory (Class III). Mitigation, usually in the form of avoidance, would be necessary if a determination was made that NRHP-eligible properties would be impacted by a proposed action. Should undocumented cultural resource be identified in the course of ground-disturbing activities, the project action would immediately cease until appropriate notification procedures have been accomplished and a decision for proper handling of the resources has been made.

4.3.2 Recreation

No Action

Direct Impacts –

Without implementation of the dredged material placement measure, the existing conditions would persist, including placement of a lesser amount of the available dredged material for marsh restoration as allowed under the Federal Standard. However, a much larger amount of material is not being used while there is continued conversion of existing marsh to open water habitats. Most of the recreational activities that occur in the project area consist of hunting, fishing, wildlife observation, and general enjoyment of the aesthetic marsh environment. Recreational resources in the region that would most likely be affected in the future-without action are those related to loss of wetlands and habitat diversity. Wildlife abundances are directly related to the amount of wetlands present. As high land loss through either erosion or subsidence continues, the wildlife abundances in the project area would decrease. The abundance of migratory birds and other animals directly dependent on the wetlands would also decrease as they moved to more suitable habitat.

With a continued conversion of marsh to open water, much of the estuarine fishery abundances would be expected to decline over time. Lower quality fishery spawning, nursery, and foraging habitat would translate to a decline in sport fishing success in the future. As the usage by game species decline, so would the hunting opportunities. As usage by migratory birds decline, so would the opportunities for viewing.

In general, loss of intertidal, emergent wetlands to shallow, unvegetated open water would result in decrease fishery production and therefore have negative impacts on recreation fishing. Conversion of intertidal marsh and associated submerged aquatic vegetation to large, unvegetated open-water areas would diminish habitat value for all wildlife species. The result is a loss of emergent marsh and diminished capacity of the area to support fish and wildlife populations.

Indirect Impacts –

Marsh wetlands reduce storm surges from tropical systems. An increase in storm surge impacts from a reduction in marsh land can directly affect land loss, which can literally result in loss of boat launches, parking areas, access roads, marinas, and supply shops. The loss of access features, such as boat launches, impacts an individual's ability to recreate in particular areas. The economic loss felt by marinas and other shops may be two-fold. One is potential loss of the actual facility or access to the facility; the other is the change in opportunities.

Cumulative Impacts –

Continued loss of marsh land in areas not within the Federal Standard is expected to impact marsh habitat and therefore produce lower quality fishery spawning. This translates into less recreational opportunity for fishing, hunting, and wildlife viewing. Marsh loss would also create greater chances for storm surges impacting recreation land-based resources.

BUDMAT Alternative

Direct Impacts –

Positive long-term recreation benefits would be realized from the deposition of dredged material into shallow open water areas and onto eroding marsh. Marsh plants consisting of emergent and/or submergent vegetation would become established, complementing the already existing fish and wildlife habitat and increasing future recreational activities in the area. Recreation fishing opportunities could increase due to the increase in fisheries habitat in the project area.

Other direct, short-term impacts to recreational resources would result from the project area being unavailable during construction for recreational activities. During and immediately after construction there would be a decrease in the quality of habitat, and wildlife and fishery species associated with recreational opportunities would be displaced; however, the area would reestablish emergent wetland vegetation. Therefore, these adverse impacts would be temporary and localized. Adverse direct impacts would be offset by the creation of fresh, intermediate, brackish, and/or saline marshes that would contribute to restoring the base of organisms used for recreational activities such as fishing, bird watching and hunting. Following construction, the project area would again be available for recreation activities.

Indirect Impacts –

This alternative would provide additional emergent wetland for recreational use. It would provide more habitat than would be available with the future-without project condition. Because salinity regimes would not markedly change from future-without project conditions, increased recreation activities would come from expansion of new vegetative habitat on newly created areas and the relief from flooding frequency stressors that those areas would afford existing habitats. Creating wetlands and reducing loss rates for the project area may protect nearby recreational infrastructure, such as boat launches and fishing/bird watching piers.

Wildlife-dependent recreation activities may be maintained and possibly increase. Recreation activities dependent upon wetland habitat would be maintained and possibly increase. There would be a temporary decrease in boat traffic accessibility through project areas during

placement of material. Fishing and hunting activities could continue in areas near the project sites.

Cumulative Impacts –

Cumulative impacts would be the synergistic effect with the additive combination of impacts and benefits for overall net acres created by other Federal, state, local, and private restoration efforts including beneficial use of dredged material under the Federal Standard. Beneficial use of dredged material above the Federal Standard would result in an even larger amount of wetlands and habitat created than would be allowed under the Federal Standard. More wetlands and habitat translates into more opportunity for recreational use of the project area.

4.3.3 Aesthetics

No Action

Direct, Indirect, and Cumulative Impacts

Prominent visual changes to the Louisiana coastal area can best be determined by analyzing how lost land and changes in vegetation affects the visual distinctiveness of Louisiana's Scenic Byways. Scenic Byways display various combinations of archeological, cultural, historic, natural, recreational, and scenic qualities that make them regionally significant. Therefore, the loss or diminishment of these qualities weakens the significance of the Scenic Byways. There may also be future developmental actions that cause change in the natural environment along the Scenic Byways. The focus of this analysis is on how visual changes to the Scenic Byways, located in close proximity to the Gulf of Mexico, affect their significance.

Deltaic Plain

Louisiana State Highway 1 is a Louisiana Scenic Byway whose visual distinctiveness is characterized by the contrasting elements found at its southernmost portion. Homogeneous wetlands are viewed amongst meandering landforms, unnaturally straight canals, and the open water of the Gulf of Mexico. Land loss occurring along this Scenic Byway may result in diminished visual complexity, as there is a relatively uniform view of open water along most of State Highway 1.

Chenier Plain

Louisiana State Highway 82 is a National Scenic Byway whose visual distinctiveness is based on the contrasts caused by the diversity of elements present. Views are of homogeneous wetlands intermingling with meandering landforms, water, and linear elevated oak-covered chenier's. Visual changes along this Scenic Byway would be caused by subtle wetland vegetative changes due to saltwater intrusion. These changes in wetland types would, most likely, not diminish the visual complexity surrounding State Highway 82.

BUDMAT Alternative

Direct Impacts

Work associated with the development of each restoration opportunity may directly cause long-term and temporary impacts to the Louisiana Coastal Zone's visual resource base. Direct

impacts to visual resources would primarily result from construction activities associated with the various features of each proposed restoration opportunity. Construction activities may permanently reduce or destroy the visual complexity (as defined in existing Aesthetic Resources conditions) of scenic byways or undetermined visual resources (see existing conditions) that lie within the conceptual footprint of each restoration opportunity.

Construction activity may also be visually distressful as heavy equipment's activity temporarily reduces visual experiences along the scenic byways and other undetermined visual resources. Without more specific project details and more detailed surveys and analysis, it is only possible to give general projections of the direct impacts of certain types of projects. The impacts may vary greatly depending on location, size, and scope of each particular project.

Indirect Impacts

With implementation of the proposed action, work to develop each alternative's plan may indirectly affect the Louisiana coastal zone's visual resource base. Indirect impacts to visual resources would primarily result from the possibility that newly developed-or restored-vegetative habitats would enhance-or develop-visually complex areas alongside scenic byways or undetermined visual resources (see Existing Conditions).

Without more specific project details and more detailed surveys and analysis, it is only possible to give general projections of the indirect impacts of certain types of projects. The impacts may vary greatly depending on location, size, and scope of each particular project.

Cumulative Impacts -

Human population growth, developmental actions, and other human activities have destroyed, enhanced, or preserved visual resources. Overall trends shown by models may be interpreted as reversing some of the damage caused by the previously mentioned human actions and supporting visually complex aesthetic resources healthier than with the no action alternative. Cumulative impacts of maintaining visually appealing resources systems would further support tourism as one travels Louisiana's Scenic Byways and remote areas of visual interest

4.4 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

The discharge of dredged material into waters of the U.S. is regulated under the Clean Water Act (CWA). The Marine Protection and Sanctuaries Act governs the transportation of dredged material to ocean waters for the purpose of disposal. The USACE Engineer Regulation, ER 1165-2-132, "Hazardous, Toxic, and Radioactive Waste (HTRW) for Civil Works Projects" states that dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal or a remedial action) under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or if they are a part of a National Priority List (NPL) site under CERCLA.

No Action

If no action were taken, land loss would be expected to continue, and there would be further erosion along the Louisiana coast. There are a number of known HTRW sites of concern that might be directly impacted through coastal land loss. In addition to these known sites of concern, coastal erosion, and coastal flooding could impact a large number of unidentified HTRW sites of concern. These sites include, but are not limited to, waste disposal facilities; landfills; open pits, ponds or lagoons for waste treatment or associated with oil and gas drilling activities; wastewater treatment facilities; and underground storage tanks. An extensive oil and gas industry along the Louisiana coast has created a large number of potential HTRW problems. Coastal erosion of oil and gas fields and flooding of structures and facilities would likely exacerbate these problems. The exposure of pipelines and loss of protection from coastal erosion for gas processing facilities would likely increase the risk of ruptured pipelines and accidental spills, causing further damage to the environment.

BUDMAT Alternative

Beneficial use projects nominated under the BUDMAT Program will initially be screened for known HTRW sites and projects with known HTRW sites will not be implemented.

Dredged material and sediments beneath the navigable waters proposed for dredging would be evaluated for disposal in waters of the U.S. in accordance with the appropriate guidelines and criteria adopted pursuant to Section 404 of the Clean Water Act and/or for ocean disposal in accordance with Section 103 of the Marine Protection Research and Sanctuaries Act (MPRSA) and supplemented by the USACE Management Strategy for Disposal of Dredged Material: Contaminant Testing and Controls (or its appropriate updated version), as cited in Title 33 Code of Federal Regulations, Section 336.1.

The method for dredged material testing is specified in the Inland Testing Manual [Evaluation of dredged material proposed for discharge in waters of the U.S. – Testing Manual (EPA/USACE, 1998)] or the Ocean Testing Manual [Evaluation of dredged material proposed for ocean disposal – Testing Manual (EPA/USACE, 1991)]. The potential for the presence of contaminants in the dredged material is determined using the protocols in the Inland Testing Manual or the Ocean Testing Manual. The proposed dredging and disposal actions would be evaluated for HTRW as a water quality issue (see section on water quality and 404 (b) (1) permit process).

Based on review of the NPL and CERCLA action sites, and on a site visit to the project area, to be conducted once a project site is identified, the probability of encountering HTRW should be low. The chance of Recognized Environmental Conditions affecting construction could be removed entirely by avoiding the suspect site(s).

Should a Recognized Environmental Condition (REC) be found at anytime during the project that is not addressed through compliance with the Clean Water Act and RCRA exclusion for dredged material (40 CFR 261.4(g)), the CEMVN would take immediate actions to investigate the concern and would coordinate with the appropriate Federal and state authorities to develop an

approved response action. The best response would be for the CEMVN to avoid that area, to the maximum extent practicable.

The USACE is obligated under Engineer Regulation 1165-2-132 to assume responsibility for the reasonable identification and evaluation of all HTRW contamination within the vicinity of the proposed action. ER 1165-2-132 identifies our HTRW policy to avoid the use of project funds for HTRW removal and remediation activities. Costs for necessary special handling or remediation of wastes (e.g., Resource Conservation and Recovery Act (RCRA) regulated), pollutants, and other contaminants not regulated under CERCLA would be treated as project costs if the requirement is the result of a validly promulgated Federal, state, or local regulation.

4.5 SOCIOECONOMIC AND HUMAN RESOURCES

No Action

4.5.1 Population

As inland marshes and barrier islands erode or subside in the Future Without-Project conditions, the resultant threatened population in the coastal communities would be expected to shift to the more northern portions of the coastal parishes. As these populations are dispersed and absorbed into other geographic areas, their heritage and cultural way of life could also be threatened. As discussed in Chapter 3, the population of the 20-parish area increased from 1,556,965 to 2,247,344 from 1960 to 2000, and remains at just over 2,000,000 because of Hurricanes Katrina and Rita in 2005. The Louisiana Tech University, College of Business 2007 report, estimates that the population of the 20-parish area was 1,953,305 as of July 1, 2007. Changes may occur along previous trends, including the level of protection maintained within a particular locality. For example, communities that have experienced the highest storm risk in the past are likely are to experience the highest storm risk in the future, influencing the likelihood of increases or decreases in growth.

It is expected that growth in population would occur with or without the BUDMAT Program in place. The exact location of the population growth and shift would be influenced by many factors including land availability, flood protection, and improvements to the transportation network.

4.5.2 Infrastructure

As previously mentioned, Louisiana's coastal wetlands are the richest estuaries in the country for fisheries production. They are also some of the richest in oil and gas activities. Infrastructure related to these activities as well as navigation, pipelines, agriculture, etc. have a total asset value of approximately $102 billion in 2006 dollars. If no further restoration activities are implemented in coastal Louisiana, these assets, to varying degrees, are at risk. On a local community level, land loss can result in the loss of boat launches, marinas, access roads, supply shops, and local flood protection. Such losses can lead to a community's inability to sustain itself economically as they have to invest more money in infrastructure repairs and relocations.

On a national and international level, the impacts of coastal erosion would be felt in the oil, gas, and pipeline industry. For example, as barrier islands and coastal wetlands continue to erode, open water has scoured away land protecting pipelines. Exposed pipelines are at increased risk of damage and failure. Disruption of flows could affect the Nation's energy supplies and energy security. There is also potential for ecological damage from damage and failure of these facilities.

Navigation infrastructure is already being impacted by coastal erosion. Three areas of the GIWW are experiencing problems. Increased shoaling causes traffic moving on the waterway to slow down which increases the time and cost of moving commodities. It also increases the annual dredging maintenance cost to keep the channel at authorized depths.

4.5.3 Employment and Income

Slow growth in employment is expected to occur as the economy improves without the proposed BUDMAT Program in place. The prospects of income opportunities may decline as well in the rural areas if they experience continued depletion of their natural resources. Without the implementation of the BUDMAT Program, residents and businesses may decide to move further inland to avoid the effects of periodic hurricanes and tropical storms. Economic activity related to wetland resources would also be aversely affected by the depletion of these resources. As the more severely damaged areas of the 2005 hurricanes recover, employment and income would grow.

4.5.4 Commercial Fisheries

Concurrent with projected land loss would be an increase in saltwater intrusion into some of the upper estuaries as barrier islands and marshes degrade. This would result in a shift in the populations of fishes and invertebrates, with more saline-dominated species replacing freshwater species in some areas. The band of intermediate salinity necessary for oyster production would likely narrow significantly, and essential fish habitat for many commercial fishery species would likewise decline, leading to a net loss in fisheries population size and diversity.

Wetland habitat losses would decrease the productivity of Louisiana's coastal fisheries. The seafood industry would likely suffer significant losses in employment as estuaries that are necessary to produce shrimp, oysters, and other valuable species, erode. Job losses would occur in the areas reliant on fishing, harvesting, processing, and shipping of the seafood catch. Thus, changes in existing fisheries habitat caused by wetland loss, saltwater intrusion, and reduced salinity gradients would likely increase the risk of a decline in the supply of nationally distributed seafood products from Louisiana's coast.

The connections between coastal estuaries and offshore populations vary geographically. Approximately 32 percent of the commercial fish landings off the northeastern states depend upon estuaries during some life stage. The dependence figure jumps to 98 percent along the Gulf of Mexico, where marshes support menhaden and shrimp populations. It is estimated that over

75 percent of Louisiana's commercially harvested fish and shellfish populations are dependent on these wetlands during at least some portion of their life cycle. Wetland habitat losses would decrease the productivity of these fisheries. Marsh loss and associated habitat changes may have already affected blue crab populations. Moreover, menhaden depend upon the estuary for a critical stage in their life cycle.

The years 2006 and 2007 have proven to be times of rapid recovery for commercial fisheries from the damages of Hurricanes Katrina and Rita. However, future without project, the seafood industry would likely suffer significant losses in employment as resources, which are necessary to produce shrimp, oysters, and other valuable species (mainly estuaries), begin to erode. Job losses would occur in the areas of fishing, harvesting, processing, and shipping of seafood catch.

4.5.5 Oyster Leases

In the future no action conditions, saltwater intrusion would continue, except in areas where existing freshwater diversion projects are able to reverse that trend. Production from leases would be likely to decline gradually, as areas of suitable salinities move inland and begin to overlap with areas closed due to fecal coliform near sewerage sources in developed areas. At the same time, level or increased production would be likely to occur from leases in bands of intermediate distance from freshwater introduction, where salinities are favorable. Salinities could be stabilized by existing freshwater diversions in two of the most productive basins, the Breton Sound and Barataria Basins. Leases in these basins would be likely to continue at current levels of productivity. As oyster production from leases decline, it would likely result in lower oyster supply, higher oyster prices, and loss of income and jobs in the oyster industry.

4.5.6 Oil and Gas

Most of Louisiana's onshore oil and gas production occurs in the Louisiana coastal ecosystem. This area is at an elevated risk due to the land loss and ecosystem degradation. Loss of wetland, marsh, and barrier islands presents a range of threats to inshore and offshore oil and gas infrastructure. Existing inshore facilities are not designed to withstand excessive wind and wave actions, which would become more commonplace as existing marshes are lost or converted into open bays. In addition, erosion and the subsequent disappearance of barrier islands would allow gulf type swells from tropical storm events to travel farther inland. The combination of these factors would increase the risk to inshore facilities. To address this risk, the oil and gas industry would be faced with the decision to invest in improvements in order to maintain production/transmission or conversely the closure and abandonment of infrastructure.

The offshore oil and gas industry in the coastal zone is an important component in meeting national energy requirements. Coastal land losses have, and would continue to have, a negative effect on the extensive pipeline network located in coastal areas. As the open water areas behind the barrier islands increase in size, the tidal exchange volumes and velocities increase in the tidal passes and channels. This action can lead to the scouring away of sediments atop buried pipelines, exposing the pipelines and increasing the risk of failure or damage due to lack of structural stability, anchor dragging, and boat collisions. Resulting production or transmission

shortfalls may result in disruptions in the availability of crude oil or natural gas to a significant part of the U.S.

The impact to these nationally important resources would be felt in numerous ways depending upon location (i.e., whether onshore or offshore). In the year 2000, onshore production of oil accounted for 16 percent of statewide production and onshore production of natural gas accounted for approximately 26 percent of statewide production. Statewide production includes onshore, Louisiana state waters, and Louisiana Outer Continental Shelf (OCS). Most of this onshore production of oil and gas occurs in the southern part of the state, in areas most at risk due to the degrading coastal landscape. Representatives in the oil and gas industry have indicated that these onshore facilities were not designed to accept wind- and wave-type forces that would be experienced in open bays or worse, gulf-type swells. The owners of these facilities would therefore be faced with the decision of whether to protect these facilities from these types of forces or curtail the production. For the most part, these onshore facilities represent the older production facilities in the state and, absent significant reserves being discovered due to improved exploration techniques, are on the downside of their production. The major oil companies have recognized this trend, and many have already sold off these assets to independent operators who can operate these reserves more profitably since they operate at lower overhead levels. Even with lower cost factors, the expenses incurred in adapting these facilities from a relatively protected marsh-type environment to one where significant wave action would or could occur would probably force some of the operators to shut in that production.

The offshore oil and gas industry is becoming increasingly important to the national energy picture. The impact to this sector would not be to the structures themselves, but to the supply base that keeps them operating at peak efficiency and reliability. There are only a few supply bases serving the deepwater oil and gas industry in the state, with the largest one being Port Fourchon in Lafourche Parish, near the Gulf of Mexico. These bases provide not only the necessary supplies and maintenance services to the offshore platforms, but are also the "jumping-off" spot for the company employees that work on the platforms on rotating schedules. If one of these important bases were severely impacted because of coastal degradation, such as increasing storm surges, the operational cost of this offshore production would go up significantly.

4.5.7 Pipelines

Coastal land losses have, and would continue to have, a significant negative effect on the extensive pipelines traversing coastal areas. These pipelines are used for bringing oil/gas onshore from the numerous production facilities offshore; transporting oil/gas from onshore production facilities; and in some cases, connecting with large pipelines used for interstate transport of oil and gas. Louisiana's pipelines carry oil to refineries located in the gulf coast, midwestern, and eastern seaboard states and natural gas to consumers in most of the states east of the Mississippi River. As the open water areas behind the barrier islands increase in size due to coastal erosion, the tidal exchange volumes and velocities increase in the tidal passes and channels. In many instances, this has led to the scouring away of sediments atop these buried pipelines and in some cases, has undermined them. This action subjects these pipelines to increased risk of damage or failure due to anchor dragging or lack of structural stability. Any

impact to the price of crude oil or natural gas would ripple through the economy, since it is the preferred fuel for area power plants, cogeneration facilities, and a major feedstock for many types of industries. For example, Hurricane Ivan, which occurred in September 2004, and again for Hurricanes Katrina and Rita in August and September 2005 respectively, caused a significant disruption in U.S. oil supplies. Part of oil output in the Gulf of Mexico was shut down due to extensive damage from the hurricane and resultant speculation over the availability of supplies drove up the price of oil to a record highs.

4.5.8 Navigation

A majority of Louisiana's navigable waterways would be adversely impacted without action as marshes and barrier islands that protect waterborne traffic on inland waterways continue to erode. As land adjacent to and connecting these waterways disappears, waterways currently protected would be exposed to wind, weather, and waves found in open bays and the Gulf of Mexico. Additionally, navigation channels that cross open bays may silt in more rapidly or begin to shoal in less predictable ways. The potential impacts to these waterways and the vessels that use them include increased maintenance costs (e.g., dredging), the necessity for higher horsepower vessels to counteract increased currents and wave forces, and increased risk of groundings, collisions or storm damage to vessels and cargo. Moreover, shoaling causes the thousands of tows that traverse this area annually to light load, thereby increasing both the volume of river traffic and the cost of transportation. Due to increased safety concerns, alternate methods of transportation may have to be taken by hazardous commodities now utilizing the GIWW. These impacts would have a corresponding effect on cargo rates, which would affect the local and national economies.

Continued coastal erosion in south Louisiana could also increase the risk of obstruction or closure of the lower Mississippi River Navigation Channel because of siltation or the loss of channel due to hurricane damage. Any closure of the river would result in increased operating costs of the ships waiting to enter or leave port as well as possible higher costs for inventory, additional storage costs, commodity flow restrictions, etc. It is estimated that a 7-day closure of the lower Mississippi River Navigation Channel would result in a loss of approximately $55 million at 2006 prices, and a 14-day closure would result in a loss of approximately $222 million at 2006 price level. These estimates only include increased operating costs of the ships waiting to enter or leave port. Additional costs would likely occur because of value of inventory, additional storage costs, commodity flow restrictions, etc.

All the ports and waterways noted in the previous sections have projected positive annual growth rates over the next 50 years. Estimated growth for cargo moving on the Mississippi River System is about 1 percent annually. This estimate was derived from the growth rates used in the Upper Mississippi River Illinois Waterway Navigation Study. Growth rate estimates for the Louisiana GIWW is 0.78 percent (this is the midlevel estimate from a commodity forecast from the Calcasieu Lock Replacement Study). Average annual growth for the activity associated with the rig fabrication and offshore service industry is 1.67 percent (this estimate comes from a forecast prepared for the Houma Navigation Canal (HNC) Deepening Study). Positive economic impacts associated with the navigation industry would continue over time in the Future Without-

Project conditions. Any environmentally negative impacts to navigation in the study would worsen over time without any projects in place.

4.5.9 Flood Control: Hurricane Protection Levees

The continuing erosion of the Louisiana coastline has increased the potential for flood damages from the surges of hurricanes and tropical storms throughout southern Louisiana. Failure to maintain coastal wetlands would result in a significant level of increases in damages from storm surges that are currently reduced by coastal wetlands. There would also be damages to the levees themselves, which would require increased expenditures to raise, repair, and replace the hurricane protection levees.

While the Lake Pontchartrain and Vicinity, Louisiana and West Bank and Vicinity, Louisiana projects provide significant protection against large hurricanes, they are being upgraded to provide protection against storm surge associated with a 100-year event storm. The remaining hurricane protection projects would also provide that level of protection. In addition, the project area is experiencing high levels of coastal wetlands losses, which is likely increasing the threat from hurricanes. Although coastal restoration projects have been constructed, these have not significantly reversed the current rate of losses. Additional projects have been proposed and are under study to address the coastal land loss problem, but these projects have not moved beyond the study stage at this time. Other conditions that could impact hurricane protection issues are sea level rise and apparent subsidence issues. These issues were not considered in the feasibility studies that resulted in the authorization of some of the existing hurricane protection projects. In future studies, sea level rise must be considered in the planning, design, and construction of any hurricane protective structure.

The near miss of Hurricane Georges in September 1998 heightened local concerns about the level of hurricane protection in the study area. State and local emergency operations managers have stated that evacuation of all of the people at risk is not possible in the short amount of time prior to landfall of a major hurricane. After Hurricane Georges, it was estimated that 300,000 people evacuated. For Hurricane Ivan, September 2004, state and local officials estimate that 600,000 people evacuated. During Hurricane Katrina 1.3 million Louisiana residents evacuated and weeks later for Hurricane Rita, 300,000 residents evacuated. All of these evacuations severely stressed the highway systems. Because much of the area is below sea level, there is great potential for catastrophic loss of life due to a major hurricane storm surge. The American Red Cross does not operate shelters in any parishes south of Lake Pontchartrain due to the fact that they are at risk during a 100-year event storm and greater.

In addition, overtopping of the existing protection areas would flood vast areas of the metropolitan area, as happened during Hurricanes Katrina and Rita. The flooded areas took several weeks to drain. When large areas of the metropolitan area flooded for long periods, extremely high damages to infrastructure, businesses, and homes occurred. In addition, impacts to the Port of New Orleans, New Orleans International Airport, the major facilities owned by the U.S. Navy, and the NASA facility at Michoud were experienced.

4.5.10 Agriculture

The impact to agriculture if no action is taken would be negative and result in an increase of saltwater intrusion, erosion of coast, and increased damages from storms. The loss to agriculture opportunities could cause a decrease in total acreage and yields of crops in the study area.

Salinity levels in water used for crop irrigation are expected to increase and, with continued land loss, the risk of storm damage to agricultural resources would increase. Many crops, such as rice, have a very low tolerance to salinity, and as salinities increase, field production and/or quality decreases. As the coastal landscape erodes and tidal surges force higher salinity waters farther inland, many areas would have to counteract this effect by relocating water intakes to more northerly locations or by installing saltwater barriers to protect their existing intakes. These expenses would undoubtedly be passed on to consumers. Agricultural damages, including losses to crops such as sugar cane, rice, soybeans, pastureland, etc. associated with no action conditions were estimated along the Louisiana coast. This study indicated that continued loss of barrier islands and wetlands would increase the risk of storm damage to agricultural resources. The loss of agricultural productivity associated with reduced amounts of freshwater available for crop irrigation and increased risk of storm damages would result in adverse economic impact to Louisiana and the Nation.

4.5.11 Forestry

There would be a loss of forestry opportunities in the Future Without-Project. By taking no action, the coast of Louisiana would continue to erode, which would lower the potential acreage of forestland. Lower acreage would decrease productivity and decrease yields of timber. There is also a potential for increased damages from storms and saltwater intrusion to forestry.

If there is a decrease in acreage and yields of timber, jobs in the forestry industry could decrease, which could increase the unemployment rates in the study area. In addition, income for forestry landowners would decline if no action were taken. The loss of forestry productivity would result in adverse economic impact to Louisiana and the Nation.

4.5.12 Water Supply

In many coastal areas of southeastern Louisiana, fresh surface water supplies would be limited to the Mississippi River, Atchafalaya River, and many of their distributaries. Because many of these water bodies are controlled by levees and flows are maintained, it is doubtful that they would be affected by loss of surrounding wetlands. In addition, because these water bodies are the major sources of freshwater in southeastern Louisiana, water use would be largely unaffected. However, Bayou Lafourche currently experiences periodic saltwater intrusion, primarily from Company Canal and the GIWW. Salinities in this bayou could increase, limiting freshwater supplies, if the surrounding area became saltier. The economic effects would be felt by industry, agriculture, and the public supply in this area. Because fresh groundwater is very limited or unavailable in most of the LCA Study area, the larger water users in this area, primarily industry and public supply, would have to treat (desalinate) the water for salinity or

find new sources of freshwater. This could affect public water supply, agricultural use, and industrial use in this area, resulting in increased costs for water treatment (desalination). Businesses could be forced to relocate, thereby potentially adversely affecting jobs, income, population, and property values.

In southwestern Louisiana, fresh surface water and groundwater are available in most coastal areas. However, surface water in some areas, such as the Calcasieu Basin, experience periodic saltwater inundation. Much of the water use in these areas is agricultural and farmers use groundwater when surface supplies become salty. If surface water salinities increased in coastal areas because of wetland loss and erosion, it is likely that surface water withdrawals would decrease and withdrawals from groundwater would increase. Fresh groundwater is available in sufficient supplies in most areas of southwestern Louisiana to offset any losses of surface supplies. However, a saltwater-freshwater interface is present in the aquifer system, extending inland from the coast along the base of the aquifer system as a wedge. In coastal areas, freshwater overlies saltwater. Increased withdrawals in coastal areas could cause the interface to move further inland or the interface to rise toward pumping wells. This could affect agricultural use in that area resulting in increased costs for water treatment. Potentially, this agricultural activity could decline, thus adversely affecting the local economy through declines in jobs, income, population, and property values.

4.5.13 Cost Efficiency/Incremental Cost Analysis

Selection of optimal alternative for each project would incorporate National Ecosystem Restoration (NER) analysis as required for ecosystem restoration projects. This analysis compares the outputs or benefits of each alternative with the costs of the alternative. The outputs or benefits are measured by assessing each alternative's contribution to the stock of natural resources. The full array of alternatives can then be displayed by showing each alternative's benefits per dollar of cost. In some projects, the selection process is greatly simplified by the existence of only one or two alternatives. However, in those projects with multiple or complex alternatives, the process is accomplished by cost effectiveness/incremental cost analysis (CE/ICA).

CE/ICA would evaluate each project alternative beneficial use of dredged material projects formulated to restore and preserve coastal habitat and functions. The benefits of the projects would be defined in non-monetary units. Benefits for the study area projects would be evaluated using a qualitative and quantitative metric that assessed each alternative's contribution to the stock of natural resources. Since these feature outputs not readily translatable to dollar terms, traditional monetary benefit-cost analysis could not be performed. Consequently, the use of the CE/ICA method was selected for the comparison of ecologic output benefits versus costs.
In the cost effective analysis, the combined weighted ecologic outputs, provided by the ecologic models and benefit assessment protocols would be documented for each project alternative. The combined weighted outputs and costs for each project alternative would be displayed and ordered by level of benefit. The primary factors of interest are ecological benefit versus cost. The project alternatives would then be assessed according to their ability to produce benefits for a given cost level. The result is a listing of project alternatives that would achieve each benefit level at the lowest cost. A theoretical line, or an "efficient frontier, "would be developed to show

those restoration frameworks with the lowest cost to benefit ratios. Restated, alternative solutions screened in this manner meet these two criteria: (1) no other solution produces the same level of benefit for less cost, and (2) no other framework provides more benefit for the same or less cost.

The cost-effectiveness assessment and identification of the efficient frontier would be followed by an incremental cost analysis. Incremental cost is the additional cost for each increase in the level of output. Changes in incremental costs, combined with other selection criteria discussed, would facilitate a process of evaluating the desirability of implementing the remaining plans in the absence of a strict guideline for determining the best outcome (such as maximizing net benefits), as is done in NED analysis

BUDMAT Alternative

Socioeconomic with-project conditions are expected to be similar to the future without-project conditions, influenced by commercial fisheries, agricultural and forestry production, navigation, the exploration, production, and transport of oil, gas, and other mineral production and related pipelines, economic and public infrastructure, employment and income, population growth, and flood control and hurricane protection. Inland marshes and barrier islands are expected to erode and subside during future with-project conditions as in the case of without-project conditions, including the continued threat of hurricanes impacting the population of coastal communities, shifting activity toward more northern portions of the parishes.

4.6 ENVIRONMENTAL JUSTICE

The EO 12898, Environmental Justice, requires Federal agencies to identify and address, as appropriate, "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The benefits of BUDMAT Program would not be limited to the study area, but would be shared by communities in the LCA due to the restoration objective. The proposed action would not be expected to result in disproportionately high and adverse human health or environmental effects on minority or low-income populations and would benefit populations in the area equally.

4.7 UNAVOIDABLE ADVERSE EFFECTS

The conversion of open water habitat into marsh habitat would have an unavoidable adverse effect on some benthic organisms. Open water habit is not limited in southern Louisiana, and is actually expanding. This trade off in habitat types would be overall beneficial to the complete ecosystem. Oyster reefs could be destroyed directly in the placement of dredged material to create marsh. Existing oyster leases in the placement sites would have to be compensated. The shell cultch could be moved to a new lease site, which would reduce impacts on oyster reefs.

4.8 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

There would be short-term localized and minor impacts to water quality due to runoff and turbidity. There would also be short-term impacts to aquatic resources, EFH, wildlife, and T&E species. Some of the affected species would avoid the area during project construction, while others would be indirectly impacted by turbidity, which could disrupt their feeding. The conversion of open water habitat into marsh habitat would have a long-term positive impact on species that use wetlands. This trade off in habitat types would be overall beneficial to the complete ecosystem, but would also be a trade off in short-term uses for long-term productivity. Air Quality, recreation, and noise, would also have short-term impacts.

4.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

A range of 3,400 – 21,000 acres of shallow open water would be converted to marsh (inland or back barrier island), and/or additional beach head on shorelines (both barrier island and barrier headland) over the 10-year project life. This is an irreversible commitment of benthic resources. The placement of dredged materials is an irretrievable commitment of marsh ecosystem, EFH, and wildlife habitat that could exist if navigation interests were removed. The energy used to construct various beneficial use projects is an irreversible commitment of that resource.

4.10 MITIGATION

As the overall impacts of the BUDMAT Program would be expected to be positive and out-weigh any detrimental impacts, no impacts would be expected that would require compensatory mitigation.

CHAPTER 5 CONSULTATION AND COORDINATION

5.1. PUBLIC INVOLVEMENT

This chapter documents details of the BUDMAT Program study's public involvement and coordination efforts, including a description of the scoping process; public involvement; and the coordination efforts with Federal, state, local agencies and entities, parishes, and other interested parties such as Indian Tribes and Nations.

5.1.1 Scoping Meetings

To announce the start of the feasibility phase, a Notice of Intent to prepare a draft Environmental Impact Statement (EIS) for the Louisiana Coastal Area (LCA) Beneficial Use of Dredged Material Program, Louisiana was published in the Federal Register (Volume 71, Number 126) on June 30, 2006 (http://www.gpoaccess.gov/fr/index.html). The recipients were invited to comment on the results of the earlier completed reconnaissance study and to provide input to the feasibility study, including the scoping of the environmental issues that should be addressed throughout the study. The notice announced public scoping meetings, which were across coastal Louisiana in early September 2006:

Wednesday, September 6, 2006 – Morgan City Auditorium
Thursday, September 7, 2006 – Lake Charles Civic Auditorium
Monday, September 11, 2006 – University of New Orleans, Lindy Boggs Building
Tuesday, September 12, 2006 – Larose Civic Center
Wednesday, September 13, 2006 – Houma Municipal Auditorium

Approximately 93 people attended 1 of the 5 evening meetings with 29 people providing oral comments. Thirty written comments were received during a 35-day comment period. The comments fell into 10 general categories:

- Shorelines
- Reef / Barrier Islands
- Marshes / Wetlands
- Ridges
- Soils / Geology
- Hydrology
- Monitor / Coordinate
- Dredging concerns in general
- Construction
- Miscellaneous / multiple categories

The majority of the comments received expressed concern for restoring barrier islands as one of the higher priorities. Restoration of marshes / coastal wetlands was the topic that received the second most comments. Numerous sites were nominated as potential project sites along the

Calcasieu and Barataria shipping channels. Many of the sites nominated have also been nominated as potential CWPPRA sites. Public concerns expressed during the scoping meetings are summarized in Section 2.2 of the complete scoping report, found in the Environmental Appendix of this PEIS.

Public involvement is a cornerstone of the LCA program beginning with the Coast 2050 planning process in 1998. An intensive public involvement program has been initiated and maintained throughout the BUDMAT Program study to solicit input from affected Federal, state, and local agencies, Indian tribes, and interested private organizations and individuals.

Scoping meeting public notices were mailed to interested parties in August 2006. The recipients were invited to comment on the results of the earlier completed study and to provide input to the feasibility study, including the scoping of the environmental issues that should be addressed throughout the study. The public notice provided three questions as a means of focusing the public's comments and concerns related to the proposed project.

The USACE and the Louisiana Department of Natural Resources (LDNR) hosted the series of five NEPA scoping meetings in September 2006 to solicit public comments as well as to provide information. The meetings, held in Morgan City, Lake Charles, New Orleans, Larose, and Houma, Louisiana, initiated the Programmatic Environmental Impact Statement. The resulting scoping report, available at http://www.lca.gov/budmat.aspx, represents and summarizes the scoping comments expressed at the public scoping meetings, as well as written comments received during the comment period ending October 14, 2006.

The primary goal of public outreach and involvement for the BUDMAT Program is to provide information and gather public input that could impact decisions concerning the project. The LCA Public Outreach and Involvement co-leaders define public outreach as a vehicle for information dissemination and education while public involvement is an open, ongoing, two-way communication, both formal and informal, between agencies and the various publics during the life of a project. The study team desires that the various publics be informed, learn about, and better understand each other's views, the study process, and project details. Public outreach and involvement is critical in developing the partnerships with various publics and stakeholder groups that facilitate project implementation. Stakeholder groups have been identified as landowners, navigation, oil & gas, local governments, fisheries, Native Americans, and Minerals Management Service representatives. The involvement of landowners early in the process is of particular concern as ranking criteria includes landowner agreement. Landowners can also provide valuable suggestions for future beneficial use sites.

The BUDMAT Program would continue to build on previous public outreach and involvement efforts conducted throughout the feasibility phase, while focusing on the specific problems, needs, and opportunities for the program area. The following goals for public outreach and involvement have been identified:

- Educate to increase awareness, understanding, and support at a local, regional, and national level.

- Provide and promote effective intra- and interagency communication and support for the report preparation teams.

- Gather input from diverse groups to assist in identifying problems, opportunities, potential solutions, and impacts of the various alternatives.

- Provide extensive opportunities for public participation throughout the decision-making process, including frank discussions of inevitable trade-offs.

- Develop and implement a feedback process to the public concerning how their input has affected decisions such as alternatives development, analysis, and selection of optimum plans.

- Identify and engage public sectors including stakeholders, public officials, and academia to develop relationships critical to successful execution of the analysis, design, and report preparation phases of the work.

- Provide timely information to the public regarding the team's efforts.

- Establish and/or maintain an active role by project managers in the team's outreach and involvement process.

The BUDMAT program has a web page at the main LCA web site, http://www.lca.gov, which can be used to receive public comments. The public has had and will have input through the LCA Study FS/PEIS, and the BUDMAT FS/PEIS, and BUDMAT Project Partnering Agreement (PPA) with their NEPA coordination and environmental compliance documentation. The required consistency determinations for projects will also provide another opportunity to receive public input. Outreach efforts will utilize existing opportunities such as CWPPRA meetings, Police Jury meetings, and the Breaux Act Newsflash as a means of reaching target audiences.

In addition to the BUDMAT web page, various materials have been and will continue to be used to support public involvement/outreach efforts: publications, PowerPoint presentations, news releases/press kits, as well as exhibits and displays.

A public meeting will be held across coastal Louisiana in the late summer or fall of 2009 to present the findings of the feasibility study and to provide the public an opportunity to express their views on the results and recommendations of the feasibility study.

5.2 INSTITUTIONAL INVOLVEMENT

5.2.1 Study Team

For this study effort, the CPRA is the 50-50 cost-share partner with the CEMVN. They have provided half of their share as in-kind services, such as in project management, contract

management, engineering, real estate support (including access and indemnification for state owned lands), and report preparation. Coordination was achieved through various meetings with the Vertical Team, the Framework Development Team, and the PDT. Functional Team Leaders (FTLs) headed the functional units of research (e.g., Engineering Division, Real Estate Division, Project Management, etc.). Additional meetings and conference calls were arranged as necessary.

During the feasibility study, staff from the CPRA/LDNR participated as members of the study team. They participated directly in the study effort and on the Executive Committee. This involvement has led to support for the implementation of the tentatively selected plan.

5.2.2 Agency Participation

USFWS Coordination Act Recommendations

During the feasibility study, coordination with the U.S. Fish and Wildlife Service (USFWS) was conducted in accordance with the Fish and Wildlife Coordination Act. The USFWS has provided the USACE with a draft Coordination Act Report (September 13, 2007, updated on July 28, 2009, which can be found in it's entirety in the EIS Appendix) that includes their views on the tentatively selected plan. All USFWS recommendations have been given full consideration. The USFWS has coordinated their report with the National Marine Fisheries Service and the Louisiana Department of Wildlife and Fisheries. The following are recommendations of the USFWS:

- Black Bears: On December 2, 1993, the Service published a proposed rule to designate critical habitat for the Louisiana black bear (58 FR No. 230). The Service has determined that physical and biological habitat features (referred to as the primary constituent elements) that support denning, foraging, escape cover, and dispersal are essential to the conservation of the Louisiana black bear. Section 7(a) (4) of the ESA requires Federal agencies to confer informally with the Service on any action that is likely to result in destruction or adverse modification of proposed critical habitat.

- West Indian Manatees: These mammals are known to occur periodically in the coastal waters of Louisiana. Contractors should be instructed of the potential presence of West Indian manatees in the area, and West Indian manatee protection language should be included in the plans and specifications for the proposed project in an effort to avoid any impacts to the species. Those protection measures include the following:
    - All contract personnel associated with the project should be informed of the potential presence of manatees and the need to avoid collisions with manatees, which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.
    - All construction personnel are responsible for observing water-related activities for the presence of manatee(s).
    - Temporary signs should be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., work

area), and at least one sign should be placed where it is visible to the vessel operator.
    - Siltation barriers, if used, should be made of material in which manatees could not become entangled, and should be properly secured and monitored.
    - If a manatee is sighted within 100 yards of the active work zone, special operating conditions should be implemented, including: no operation of moving equipment within 50 feet of a manatee; all vessels shall operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, should be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area on its own accord, special operating conditions are no longer necessary, but careful observations would be resumed.
    - Any manatee sighting should be immediately reported to the U.S. Fish and Wildlife Service (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Natural Heritage Program (225/765-2821).

- Brown pelicans nest on barrier islands and feed in shallow estuarine waters, using sand spits and offshore sand bars as rest and roost areas. Any pelicans foraging or loafing within the proposed action area during construction could easily relocate to other foraging areas in the vicinity. Additionally, potential impacts to nesting brown pelicans could be avoided by conducting activities outside the nesting season. Should the proposed activities occur during the nesting season, those activities could avoid impacting nesting pelicans by remaining outside 2,000 feet of nesting areas.

- Piping Plovers: Potential impacts to piping plovers could be avoided by conducting proposed construction activities outside the wintering season (July to late March or April). If any proposed projects cannot be scheduled to take place outside the wintering season, piping plovers would be able to avoid areas of temporary disturbances as long as there are feeding and/or roosting areas available along the coast. Plovers remaining in the action area during construction would be temporarily displaced to other suitable habitats in the vicinity. Potential impacts on piping plover critical habitat would be minimal and temporary during projects associated with barrier island enhancement or restoration. Although the proposed action may impact a barrier island designated as critical habitat, only a relatively small amount of habitat would be affected when compared to the amount of critical habitat available. In addition, most of the proposed barrier island restoration projects may possibly create new potentially suitable habitat (beach) for the piping plover on the Gulf side of the islands and prevent/reduce erosion of existing habitat in the vicinity.

- Sea Turtles: Within Louisiana, the loggerhead sea turtle has only been known to nest on the Chandeleur Islands. Because of storm processes, the Chandeleur Islands may no longer contain high beach and dune surfaces (i.e., beach structure suitable for nesting). Furthermore, recent surveys by Service NWR personnel have found no loggerhead nests in the area. While nesting loggerhead sea turtles have historically used barrier islands, as stated above, occurrences are very rare along the Louisiana coast (one nest was recorded near Port Fourchon, Lafourche Parish in 2007). The restoration of barrier islands may or may not provide suitable nesting habitat, but suitable nesting habitat is nearly nonexistent

due to the current degraded state of those islands. The proposed action, therefore, would not negatively affect loggerheads, and may provide some benefit to the species by restoring nesting habitat.

Please be advised that the Service is responsible for consultation only when loggerhead and other sea turtles leave the aquatic environment and come onshore to nest. The National Marine Fisheries Service (NMFS) is responsible for aquatic marine threatened or endangered species. Please contact Eric Hawk (727/570-5312) in St. Petersburg, Florida, for information concerning this and other sea turtle species in their aquatic environment.

- Gulf Sturgeon: Portions of the Pearl and Bogue Chitto Rivers, Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne within Louisiana are designated critical habitat for the Gulf sturgeon; however, project impacts are not expected to extend into those areas. The Service is responsible for consultations in riverine habitats; the NMFS has consultation responsibility for projects impacting the Gulf sturgeon in marine habitats. In estuarine habitats, consultation responsibility is based on the lead action agency: NMFS is responsible for consultations with the Corps in those habitats. We, therefore, recommend that you contact Stephania Bolden (727/570-5312) in St. Petersburg, Florida, for concurrence concerning this species should project activities be proposed in marine and estuarine habitats associated with the Gulf sturgeon.

- Pallid Sturgeon: Potential impacts to the pallid sturgeon may occur during dredging activities associated with the BUDMP Study. There are ways, through timing and use of different types of dredges, to minimize impacts to the pallid sturgeon caused by dredging activities. The Mississippi and Atchafalaya Rivers are large enough to provide an abundance of refuge areas during construction activities; and pallid sturgeon, as well as their prey species, should be able to actively avoid dredging sites.

Migratory Birds

- Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in bald cypress trees near fresh to intermediate marshes or open water in the southeastern Parishes. To avoid disturbing nesting bald eagles, the NBEM Guidelines recommend (1) keeping a distance between the activity and the nest (distance buffers), (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and (3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. Please contact this office if you need assistance in determining the appropriate size and configuration of buffers or the timing of activities near a bald eagle nest. For a copy of the NBEM Guidelines, please visit the following website: http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf. Generally, site-specific plans and construction activities could be designed to avoid potential impacts to bald eagles throughout the action areas. By adhering to

those buffer zones and timing restrictions outlined in the NBEM Guidelines, the USACE can avoid impacts to nest trees and breeding behaviors.

- Colonial Nesting Wading Birds: Some of the proposed dredged material disposal projects could potentially be located in habitats that are commonly inhabited by colonial nesting wading birds and seabirds. Should the project area be used by colonial nesting wading birds and seabirds for roosting, loafing, or feeding, they would be temporarily displaced to other suitable habitats in the vicinity. Generally, site-specific plans and construction activities could be designed to avoid potential impacts to migratory birds throughout the action areas by adhering to the following buffer zones and timing restrictions:
    - For colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills, anhingas, and/or cormorants), all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, depending on species present).
    - For colonies containing nesting gulls, terns, and/or black skimmers, all activity occurring within 650 feet of a rookery should be restricted to the non-nesting period (i.e., September 16 through April 1, depending on species present).
    - In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests during the breeding season.
    - All contracts should also contain a statement prohibiting work within the appropriate species-specific distance (referenced previously) of any nesting colonies; unless project-specific discussions with the Service indicate buffer zones may be reduced on a species-specific basis.

From the July 2009 draft Coordination Act Report:

SUMMARY AND SERVICE POSITION

Many details regarding the design, engineering and construction, and associated effects of individual projects are not yet available at the current programmatic level of planning, we, therefore, cannot complete our evaluation of effects on fish and wildlife resources, thus we cannot entirely fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Therefore, extensive additional Service involvement during subsequent detailed planning, engineering, design, and construction of specific project measures, along with more-definitive project information that will be available during those planning phases, will be required so that we can fulfill our responsibilities under that Act.

Given the substantial adverse future impacts to coastal wetlands and their associated fish and wildlife resources that are expected to occur under future without-project conditions, the Service strongly supports authorization and implementation of the BUDMA T Program, as it would improve environmental conditions through the creation and/or restoration of coastal wetland habitats. The negative impacts of deterioration of coastal wetland habitats would be reduced through increased land cover, increased habitat, greater water quality, greater surge protection, and reduced saltwater intrusion.

In support of the BUDMAT Program, the Service also provides the following procedural recommendations for future authorization and implementation of the BUDMAT Program:

1. Modifications to and further development of the BUDMAT Program processes including revisions to the proactive design processes; the screening and evaluation criteria; and the construction process should be coordinated with the natural resource agencies and the project delivery team.

2. Coordination with the State and Federal natural resource agencies should be conducted during the development of project design features and upon design completion as a member of the PET and PMT to ensure that all design features provide the highest quality of fish and wildlife habitat value and comply with statutory obligations.

3. ESA consultation along with the Corps' other statutory obligations (e.g., FWCA, EFH consultation, State coastal zone consistency, NWR special-use permits, etc.) should be incorporated into the proposed Annual BUDMAT Program. We recommend revising the Customized BUDMAT Program process and flowchart accordingly.

4. In accordance with the January 2003 Partnership Agreement for Water Resources and Fish and Wildlife between the Service and the Corps, sufficient continuous funding should be provided to the Service to fulfill our responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act throughout post authorization planning and evaluation for individual beneficial use projects. Accordingly, to ensure that optimum fish and wildlife resource benefits are achieved, the Service will continue to work closely with the Corps and the State of Louisiana throughout the plan implementation process as a member of the PET and PMT. Our findings and recommendations for each of the projects ultimately approved for implementation will be provided in draft and final supplements to this programmatic report under the authority of the Fish and Wildlife Coordination Act. Fulfillment of Section 7 of the ESA of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) responsibilities would also be accomplished at that time.

5. The Corps should coordinate closely with individual refuge managers prior to conducting any work on a National Wildlife Refuge, in conformance with the National Wildlife Refuge System Improvement Act of 1997. Such coordination will be essential to the timely completion of the Service's determination that the proposed work will/will not be compatible with the purposes for which those refuges were established, and to secure any appropriate permits that may be required. Likewise, LCA activities occurring on State-administered Wildlife Management Areas or refuges or National Park Service (NPS) lands should also be fully coordinated with the Louisiana Department of Wildlife and Fisheries or the NPS, respectively.

CEMVN response:

1. Concur. Natural Resource Agencies (USFWS, NMFS, NRCS, LDWF, etc) are considered team members of the Project Delivery Team (PDT). Coordination with the respective agencies would occur during all phases of the planning process.
2. Concur. The BUDMAT Program intends to rely on the expertise of the natural resource agencies to plan and design high quality fish and wildlife habitat as well as comply with statutory obligations.

3. Concur. It is expected that State and Federal agencies would be involved as members of the PDT, thus they would be able to advise of any statutory obligations or conflicts during all phases of the BUTMAT annual process (figure 9, page 47). Furthermore, as a project is selected for design, a NEPA document (Environmental Assessment or Environmental Impact Statement) would be prepared, which includes coordination with State and Federal agencies for statutory permits.
4. The USACE will fulfill its financial requirements under Section 2(b) of the Fish and Wildlife Coordination Act.
5. Concur. Coordination with land management agencies as well as private landowners is essential to the success of the BUDMAT program.

Coordination also occurred with the National Marine Fisheries Service during the feasibility phase. They made the following recommendations:

- To maximize the creation of intertidal wetlands, the CEMVN should limit final elevations of disposal sites. NMFS recommends final elevations for all tidally-influenced disposal sites not exceeding those of naturally occurring, healthy, intertidal marshes in the area. All contract specifications should include provisions to allow the contractor to be directed to wash or grade any dredged material exceeding target elevations prior to demobilization.
- All containment dikes should be designed and constructed to degrade after dewatering of the dredged material to maximize marine fishery access to beneficial use sites. If a containment dike fails to degrade as designed, provisions should be made to breach the dikes during the next dredging cycle for that channel, or within a reasonable period. Statements indicating that all containment dikes would be breached if they do not naturally degrade should be provided in al NEPA documents designating new dredged material beneficial use sites.
- Beneficial use sites should be designed and constructed to maximize their ecological productivity and function. Dredged material used to create marsh elevations should be placed in a manner to avoid creating continuous unbroken tracts of marsh. Sites should be designed such that the maximum amount of marsh edge is created and tidal exchange is provided throughout the sites. Future design and construction of beneficial use sites should incorporate measures to ensure that dredged material is not placed on existing marsh or allowed to block watercourses that have developed within or adjacent to previously used sites. Low cost methods that should be considered for achieving these goals include the placement of hay bales and/or hay rolls within disposal areas to displace dredged material, post-construction breaching of external containment dikes and internal guide dikes, and use of mechanized equipment to construct meandering tidal creeks and shallow ponds prior to or after completion of construction.
- Temporary work areas and discharge pipe rights-of-way should be aligned and designed to minimize impacts to natural and created wetland habitats.

CEMVN response:

Concur. These recommendations will be considered as projects are designed. The National Marine Fisheries Service is considered one the members of the Project Delivery Team,

and their expertise would be relied upon for recommendations of habitat for fisheries species in project design.

5.3 ADDITIONAL REQUIRED COORDINATION

This draft report serves as the document to initiate required coordination. Permits for specific projects will be sought as the projects are developed in the NEPA coordination process for the particular project (table 16).

- Water Quality Certificate
- 404 (b)(1) Wetlands
- Coastal Zone Consistency Permit
- Air Quality Permit
- State Historic Preservation Office (Section 106)

Table 16. Compliance with Environmental Laws, Regulations, and Executive Orders

Law, Regulation or Policy	Status C, PC, or NC	Comments	Full Compliance Expected
Clean Air Act	C	The BUDMAT Program will not be producing any permanent sources of air emissions (Sec. 176)	Full Programmatic compliance after review of the PEIS by LDEQ.
Clean Water Act	C	Project will comply fully with state criteria. Individual construction projects will be evaluated separately for 404(b)(1) and WQ certificates.	Full Programmatic compliance after review of the PEIS by LDEQ.
National Environmental Policy Act of 1969	C	Draft PEIS in being coordinated with the public and agencies. The public comment period was November 20, 2009 – January 5, 2010.	Full compliance upon coordination of the Final PEIS, public outreach activities completed, and signing of the ROD.
Fish and Wildlife Coordination Act of 1958	C	USFWS is an active team participant and have provided information on fish and wildlife elements of this PEIS.	The USFWS CAR is included in the Environmental appendix.
Endangered Species Act of 1973	C	USFWS and NMFS are team participants and have provided information on T&E species.	Full compliance after review of the draft PEIS by the USFWS and NMFS.
Magnuson-Stevens Fishery Management Act	C	An EFH assessment is incorporated in the PEIS at a programmatic level.	Full compliance after review of the draft PEIS by NMFS
Coastal Zone Management Act of 1972	C	This program will be consistent with the Louisiana Coastal Zone Management Program	Full compliance. Coastal Zone Consistency #C20090611 signed on 1/12/1020

Law, Regulation or Policy	Status C, PC, or NC	Comments	Full Compliance Expected
Coastal Barrier Resources Act and Coastal Barrier Improvement Act	C	No specific project sites are identified at this programmatic level, but the potential exists for projects to be constructed on lands protected under these Acts.	Future projects sites will be coordinated with the USFWS, the lead agency.
Marine Mammal Protection Act	C	West Indian Manatee are not likely to be adversely affected by BUDMAT projects.	Full compliance after review of the draft PEIS by the USFWS and NMFS
Marine Protection, Research and Sanctuaries Act	C	Disposal of dredged material must comply with the Act.	Full compliance at a programmatic level on completion of the final PEIS.
Estuary Protection Act of 1968	C	It is anticipated that estuaries would be benefited by this project.	Full compliance at a programmatic level on completion of the final PEIS.
Anadromous Fish Conservation Act	C	Anadromous fish species would not be affected.	Full compliance after review of the PEIS by NMFS.
Migratory Bird Treaty Act and Migratory Bird Conservation Act	C	No migratory birds would be affected by project activities.	Full compliance after review of the draft PEIS by the USFWS
Wild and Scenic Rivers Act of 1968	C	No designated Wild and Scenic River reaches would be affected by project related activities. No foreseeable impacts.	Full Compliance
Federal Water Project Recreation Act	C	The principles of this Act (PL 89-72) have been fulfilled	Full compliance
Submerged Lands Act of 1953	PC	Coordination with LDNR and LDWF has been ongoing	Full compliance after review of the PEIS by LDNR and LDWF.
Rivers and Harbors Act of 1899	C	The proposed project would not obstruct navigable waters of the United States.	Full compliance
National Historic Preservation Act of 1966 and the Archeology and Historic Preservation Act	C	No specific project sites are identified at this programmatic level	Full Programmatic compliance after review of the PEIS by SHPO.
RECRA, CERCLA, Toxic Substances Control Act of 1976	C	BUDMAT Programmatic policy is to avoid HTRW.	Full compliance
Farmland Protection Policy Act of 1981	N/A	No farmlands are likely in potential project sites	Full compliance after review of the PEIS by NRCS
E.O. 11988 Floodplain Management	N/A	This project is not expected to affect floodplains.	N/A
E.O. 11990 Protection of Wetlands	C	The BUDMAT Program is projected to restore from 3,,400 to 21,000 acres of wetlands over the project life.	Full compliance by completion of the final PEIS.
E.O. 12898 Environmental Justice	N/A	No minority or low-income communities would be affected by the BUDMAT Program	N/A

Law, Regulation or Policy	Status C, PC, or NC	Comments	Full Compliance Expected
E.O. 13089 Coral Reef Protection	N/A	The BUDMAT Program would not adversely impact coral reefs or coral reef resources	N/A
E.O. 13112 Invasive Species	C	The BUDMAT Program is not expected to lead to propagation of invasive species	Full compliance

5.4 REPORT RECIPIENTS

The Distribution List is be based on the NEPA Compliance Database maintained by the CEMVN. This database includes Federal, State, and local governments' agencies, as well as elected officials, environmental organizations, media, and other interested parties. A print out of the distribution list is available by request.

5.4.1 Federal

The following Federal agencies were coordinated with during the course of this study:

U.S. Environmental Protection Agency, Region VI
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, National Park Service
U.S. Department of the Interior, Minerals Management Service
U.S. Department of Commerce, National Marine Fisheries Service
U.S. Department of Agriculture, Natural Resources Conservation Service
U.S. Department of Agriculture, Forest Service
U.S. Coast Guard
Gulf of Mexico Program
Advisory Council on Historic Preservation

5.4.2 State

The following state agencies were coordinated with during the course of this study:

Governor's Executive Assistant for Coastal Activities
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources, Coastal Management Division
Louisiana Department of Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality, PER-REGC
Louisiana Department of Environmental Quality, EP-SIP
Louisiana State Historic Preservation Officer
Louisiana Department of Transportation and Development

5.4.3 Parishes

The following parishes were coordinated with during the course of this study:

Ascension	Jefferson	St. Bernard	St. Mary
Assumption	Lafourche	St. Charles	St. Tammany
Calcasieu	Livingston	St. James	Tangipahoa
Cameron	Orleans	St. John the Baptist	Terrebonne
Iberia	Plaquemines	St. Martin	Vermilion

5.4.4 Tribes and Nations

In compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), consultation would be completed on a project-specific basis before decisions are made to carry out project activities that could affect cultural resources. The following Federal and State recognized Indian Tribes would be consulted during the course of this study:

Alabama Coushatta Tribe of Texas
Caddo Nation of Oklahoma
Chickasaw Nation
Chitimacha Tribe of Louisiana
Choctaw Nation of Oklahoma
Coushatta Tribe of Louisiana
Jena Band of the Choctaw Indians
Mississippi Band of Choctaw Indians
Quapaw Tribe of Oklahoma
Seminole Nation of Oklahoma
Seminole Tribe of Florida
Tunica-Biloxi Indians of Louisiana

Additionally, the USACE will coordinate with the Director of the Governor's Office of Indian Affairs and the Inter-Tribal Council of Louisiana, Inc. This document serves as an initial coordination document.

5.5 PUBLIC VIEWS AND RESPONSES

The draft Programmatic EIS was sent out for public review on November 20, 2009. The comment period ended January 5, 2010. Nine comment letters were received both via US Postal Service and through electronic mail. USACE responses to these letters were used to modify the draft PEIS. The letters and responses can be found in the Environmental Appendix B of this report.

5.6 CONSISTENCY OF BUDMAT PROGRAM WITH OTHER EFFORTS

The goal of the BUDMAT Program is to perform habitat restoration in coastal Louisiana. Because a variety of other programs currently exist to perform the same function, the BUDMAT Program must work in close coordination with these other programs not only to avoid duplication of effort, but to provide a synergistic component for the overall coastal Louisiana restoration efforts.

5.6.1 CWPPRA

The majority of CWPPRA projects are not involved with the beneficial use placement of dredge material for habitat restoration. In those project areas where the BUDMAT Program seeks to place dredged materials to restore habitat and the project site lies within, or overlaps a previously constructed CWPPRA project area, or in a not-yet-constructed CWPPRA project area, the BUDMAT Program would only proceed if the CWPPRA project managers provide no objections. For many CWPPRA project sites that lie near Federal navigation channels, the allowance of BUDMAT Program beneficial use of dredged material may provide an enhancement of the CWPPRA project goals. Close coordination with CWPPRA project managers would be a high priority for the BUDMAT Program. These other programs may be able to provide restoration opportunities where the BUDMAT Program cannot.

5.6.2 Regulatory Program

Although BUDMAT Program projects would not require a 404(b)(1) permit from the USACE (the USACE does not issue itself permits), all such projects would be coordinated with the CEMVN Regulatory Branch to ensure that no conflicts over the proposed use of water bottom or eroded marsh habitat would occur. Future BUDMAT Program project sites would be evaluated to comply with 404(b)(1) guidelines.

5.6.3 Hurricane Protection

Because of ongoing wetland loss, communities across coastal Louisiana are increasingly at risk from tropical storms and hurricanes. Currently, there are a number of large-scale hurricane protection projects in the planning stages. While in many cases such further protection is needed, levee projects can result in significant wetland losses if not sited, designed, and operated correctly. These losses can include direct impacts from the placement of the levee and borrow areas; and indirect and secondary effects from modified hydrology and induced development. Such impacts can further reduce the natural storm protection that wetlands provide. Many communities in coastal Louisiana are very much in need of increased hurricane protection. Fortunately, techniques and approaches do exist for avoiding and minimizing wetland impacts when developing hurricane protection projects. In some cases, it may even be possible for hurricane protection levees to complement wetland protection efforts. The challenge, therefore, is to increase structural protection where needed while, at a minimum, not decreasing the natural protection and other important functions and value provided by wetlands. The CEMVN is

studying the following new or expanded hurricane protection and flood protection projects: “West Bank and Vicinity,” “Lake Pontchartrain,” “Morganza to the Gulf of Mexico,” “Donaldsonville to the Gulf of Mexico,” “Mississippi River Levees and Berms,” “Vermilion River Bridges and Culverts,” “Alexandria to the Gulf of Mexico,” and “The Lower Atchafalaya Basin Reevaluation Study.”

5.6.4 Navigation

Efficient and effective navigation in and through coastal Louisiana is critical to the local, state, and National economies. However, the creation, expansion, and ongoing maintenance of navigation channels can and has had significant impacts on wetlands. Such impacts include the direct loss of wetlands from channel excavation, enlargement, and maintenance, and indirect losses from hydrologic modification, salinity intrusion, and increased wake-induced erosion. The continued loss of coastal wetlands can threaten the integrity, safety, and efficiency of existing navigation routes and the communities and industries they serve. The CEMVN is currently studying the deepening of the following existing navigation channels: "Mississippi River Ship Channel;" "Houma Navigation Canal;" "Acadiana-Gulf of Mexico Access Channel;" "Bayous Chene, Boeuf, and Black Navigation Channel;" and "Calcasieu Ship Channel."

The CEMVN uses hopper dredges to maintain only the near-shore channel reaches of Southwest Pass, and the Calcasieu River Navigation Channel. The hopper dredge removes material and places it adjacent to the removal site so it is still in the littoral drift. In the case of Southwest Pass, the dredge removes sediments from the coastal system and disposes it in deeper water offshore sites. This removal of material from the coastal littoral system reduces the sustainability of nearby barrier headlands and adjacent marshes. Navigation projects; however, can offer opportunities to use dredged material beneficially for restoration purposes (e.g., marsh creation).

Upgrading our navigation system is necessary to ensure the vitality of this critical economic asset. Future navigation projects need to be developed to ensure that wetland losses are avoided or minimized as much as possible, while simultaneously maximizing the beneficial use of dredged material for restoration activities. Activities involved in dredging or transporting the dredge material for the BUDMAT Program would not obstruct navigable waters of the United States. The BUDMAT Program is directly tied to the schedule for navigational dredging

5.6.5 Coastal Impact Assistance Program

The Coastal Impact Assistance Program (CIAP) was established by Section 384 of the Energy Policy Act of 2005 to assist producing states and their coastal political subdivisions in mitigating the impacts from Outer Continental Shelf (OCS) oil and gas production. In November 2007, the State of Louisiana’s CIAP plan was approved by the Minerals Management Service. In the CIAP plan, the State identified seven major categories of project types for the expenditure of CIAP funds; among these categories is “Marsh Creation with Dredged Material.” This category includes two basic approaches, creating marsh with sediment removed during maintenance of existing Federal navigation channels, and using material obtained by and

deposited with dredges specifically dedicated to marsh creation. In the case of marsh creation using material from channel maintenance, CIAP funds will share in the incremental cost associated with beneficial use of that material. Currently, the CIAP plan identifies $15 million specifically for beneficial use of material from Federal navigation channels, based on the State's FY 2007 and FY 2008 allocations, along with identical projections of those same allocations for FY 2009 and FY 2010.

5.6.6 Louisiana CPRA

The Integrated Ecosystem Restoration and Hurricane Protection: Louisiana's Comprehensive Master Plan for a Sustainable Coast (Master Plan) was developed to fulfill the mandates of Act 8, which was passed by the Louisiana Legislature in November 2005 and signed into law by Governor Blanco. The act created the Coastal Protection and Restoration Authority of Louisiana (CPRA) and charged it with coordinating the efforts of local, state, and Federal agencies to achieve long-term and comprehensive coastal protection and restoration. In so doing, the CPRA must integrate what had previously been discrete areas of activity: flood control and wetland restoration. Act 8 also requires that the CPRA establish a clear set of priorities for making comprehensive coastal protection a reality in Louisiana. The Master Plan is the principal means for achieving this goal and presents a series of recommended hurricane protection and coastal restoration measures. In each planning unit, the Master Plan identifies marsh restoration using dredged material from both Federal navigation channels and dedicated dredging as a key restoration measure. The Master Plan further identifies beneficial use as a critical strategy for the Chenier Plain as there are no major rivers that can be diverted to create substantial areas of new land.

5.7 UNRESOLVED ISSUES

The following are the areas of concern and unresolved issues identified throughout the development of the Louisiana Coastal Area Ecosystem Restoration Program and applicable to the BUDMAT Program.

5.7.1 Areas of concern voiced by the public

- Public concern that litigation from parties negatively impacted by restoration projects would make restoration prohibitively expensive.
- Concern about the priority of certain restoration projects.
    - Request by Terrebonne and Barataria Basins residents for the immediate restoration of the Barataria-Terrebonne Estuary before other regions of the coastal ecosystem.
    - Public support for the construction of restoration projects in areas that would maximize the benefits to society, culture, and the regional economy.
    - Public concern for the inclusion of additional restoration features for the Chenier Plain in the implemented LCA Plan.

- Concern about the necessity for sediment and water quality testing for dredging and disposal activities.
- Conflicts may result when balancing economic interests with coastal restoration, especially when multiple stakeholders share common coastal resources.
    - Real property rights issues including public access, mineral rights, and the perception that Federal monies would be spent to restore private properties.
    - Concern with impediments to navigation and proposed re-routing of the Mississippi River and the Atchafalaya River Navigation channels.
    - The effect of coastal restoration on flood control projects,
- Concern with inaction and perceived lack of urgency with respect to restoration.
    - Public support for comprehensive, long-term restoration efforts beyond near-term restoration efforts.
    - Public demand for the immediate construction of restoration actions versus requirements for conducting additional study of restoration problems.

5.7.2 Unresolved Issues – Views of the Non-Federal Sponsor

In a letter dated June 3, 2004 that was included as part of the November 2004 Louisiana Coastal Area Ecosystem Restoration Study; the State of Louisiana expressed its intention to share in the costs of implementing the recommendations of that report based on understanding of the current law and administration policy regarding implementation of Federal water resources projects. As included in this Programmatic Study Report for the LCA Beneficial Use of Dredged Material Program, the State of Louisiana continues to voice its support for the LCA Program and specifically the beneficial use of dredged material from federally maintained navigation channels and the recommendations identified in this report..

5.7.2.1 LCA Program Implementation Cost Share

The State of Louisiana is in full support of the LCA Beneficial Use of Dredged Material Program at the current cost share ratio of 65 percent Federal, 35 percent non-Federal, with operations, maintenance, monitoring, repair, replacement, and rehabilitation being 100 percent non-Federal responsibility as required by WRDA 2007. However, the state believes that the alternative cost share scenarios are appropriate and justified and intends to request Congress that the non-Federal share of the total LCA Program implementation be set at 25 percent.

5.7.2.2 Credit for Non-Federal In-Kind Contributions

The State of Louisiana fully supports the LCA Beneficial Use of Dredged Material Program; however, it disagrees with the USACE implementation guidance related to crediting. The state intends to request from Congress that in-kind contribution credit be allowed for work carried out after the date of a Design Agreement or Project Partnership Agreement and that in-kind contributions credit be allowed to carry over between LCA Program components (i.e., studies and projects), provided that provision of in-kind contributions, cash, and LERRDs fulfill the total non-Federal obligations. The state believes this view is consistent with the programmatic rules and allowances currently governing implementation of the Comprehensive Everglades Restoration Program. Furthermore, the state intends to request from Congress that in-kind

contributions credit be allowed for the incremental funding it provides for beneficial use projects carried out prior to the implementation of the BUDMAT Program and that credit should be allowed commencing on the date of the Chief's Report (January 31, 2005).

5.7.2.3 Use of Federal Funds for Non-Federal Cost Share

In accordance with Section 7007(b) of WRDA 2007 and to the maximum extent allowable by law, the state would apply funds authorized by Congress under the Energy Policy Act of 2005 (Coastal Impact Assistance Program - CIAP) and the Gulf of Mexico Energy Security Act of 2006 (GOMESA) in order to enable the USACE to increase the amount of beneficial use of dredged material already performed by CEMVN.

5.7.3 Other Unresolved Issues

As stated in the construction authorization found in WRDA 2007, this project must consider the use of sediments from the Illinois River system. However, the use of these materials beyond the Illinois State boundary presents several issues, including the logistics of getting the material from Illinois to Louisiana, getting the material to a project site, and laws regulating the interstate transport of soil. In order to use sediments from out-of-state sources, a separate environmental document would be required.

Dredge material disposal activities might adversely affect some oyster leases, permanently removing some from production, especially those involving creation or nourishment of barrier islands and marshes. The State of Louisiana developed the Oyster Lease Acquisition and Compensation Program through RS 56: 432:1 to assist coastal restoration and protection projects by removing the obstacle presented by oyster leases. The non-Federal sponsor, CPRA, will utilize this state program to acquire oyster leases in beneficial use project areas, and thus, increase the potential to use dredged material beneficially. Leases adjacent to restoration sites may temporarily experience decreased oyster production due to the increase in turbidity associated with disposal activities. Confining disposal of dredged materials in a closed site could greatly reduce impacts to adjacent oyster production areas.

CHAPTER 6.0 LIST OF PREPARERS AND OTHER

6.1 LIST OF PREPARERS

The individuals listed in the following table were primarily responsible for the preparation of this report.

Table 17. List of Preparers

Name	Affiliation	Discipline	Section
Baumgart-getz, Adam	USGS	Geographer	GIS
Bosenberg, Robert	USACE-PM-OR	Sr. Project Manager	Reviewer
Brown, J. Christopher	USACE-PM-RP	Biologist	HTRW
Coulson, Getrice	USACE-PM-RS	Environmental Resource Specialist	Environmental Justice
Exnicios, Joan M	USACE-PM-R	Branch Chief	Environmental Review
Gatewood, Richard	USACE-PM-RP	Environmental Resources Specialist	HTRW
Hebert, Allen	USACE-PM-AW	Economist	Economics
Hicks, Bill	USACE-PM-OR	Project Manager	Chapters 1 - 2
McCasland, Elizabeth	USACE-PM-RS	Biologist	BUDMAT Environmental Study Manager, Chapters 3 & 4
Owen, Gib	USACE-PM-RS	Biologist, Section Chief	Environmental Reviewer
Padgett, William C.	USGS	Oceanographer	GIS
Perez, Andrew	USACE-PM-RN	Recreation Specialist	Recreation
Radford, Richard	USACE-PM-RN	Landscape Architect	Aesthetics
Richardson, Jerica	USACE-PM-RN	Anthropologist	Cultural Resources
Trehan, Angela	USFWS	Biologist	Wetlands, Wildlife, Fisheries, Threatened & Endangered Species
Wiggins, Elizabeth	USACE-PM-R	Branch Chief	Environmental Reviewer

6.2 STUDY TEAM PARTICIPANTS

The individuals listed in the following table were study team participants.

Table 18. BUDMAT Study Team Participants

Name	Affiliation	Role
Altman, James	OCPR, Land Rights Branch	Real Estate
Balkum, Kyle	LDWF	Agency Liaison
Beall, Andrew	OCPR, Project Management	Project Manager (PM)
Blodgett, Ed	CEMVN-ED-HC	Hydraulics
Boddie, George	OCPR, Engineering & Ops	Engineering
Bonanno, Brian	CEMVN-ED-FD	Geotech
Bosenberg, Bill	CEMVN-PM-C	Senior Project Manager (SPM)
Boyce, Mayely	CEMVN-OC	Attorney
Boyle, Donald	PBS&J	Process Development
Breaux, Cathy	USFWS	Agency Liaison
Breland, Clayton	OCPR, Engineering & Ops	Geology

Name	Affiliation	Role
Britsch, Del	CEMVN-ED-FG	Engineering – Geotech
Broussard, Rick	CEMVN-ED-LW	Engineering – Waterways
Carloss, Mike	LDWF	Agency Liaison - Wildlife
Chatellier, Maury	OCRP, Engineering & Ops	Engineering
Coulson, Getrisc	CWMVN-PM-RS	Environmental Justice
Creef, Ed	CEMVN-OD-T	O & M Dredging
Debose, Greg	CEMVN-ED-SR	Relocations
Deloach, Pam	CEMVN-ED-SP	Engineering
Ducote, Greg	LDNR, CMD	Consistency
Ettinger, John	USEPA	Agency Liaison
Fernandez, Bill	CEMVN-PM-OR	Scheduler
Finley, Heather	LDWF	Agency Liaison – Fisheries
Gatewood, Richard	CEMVN-PM-RP	HTRW
Gillen, Dain	OCRP, Engineering & Ops	Engineering
Glorioso, Daryl	CEMVN-OC	Attorney
Haase, Bren	OCPR, Planning Branch	Planning
Harris, Jeff	LDNR, CMD	Consistency
Hartman, Rick	NMFS	Agency Liaison
Hawes, Sue	CEMVN-PM	Project Management
Hebert, Allan	CEMVN-PM-AW	Economics
Hicks, Bill	CEMVN-PM-OR	Project Manager
Keeler, Barbara	USEPA	Agency Liaison
Khalil, Syed	OCPR, LACES	Science & Technology, Geology
Mallach, Troy	NRCS	Agency Liaison
Marceaux, Michelle	CEMVN-RE-E	Real Estate
Mathies, Linda	CEMVN-OD-T	O & M Dredging
McCasland, Beth	CEMVN-PDR-RS	Environmental Manager – NEPA/EIS
Morgan, Julie	CEMVN-PA	LCA Public Affairs
Mouton, Ed	LDWF	Agency Liaison – Wildlife
O'Cain, Keith	CEMVN-ED-LW	Waterways
Padgett, Clint	USGS	Agency Liaison
Paul, Brit	NRCS	Agency Liaison
Perez, Andrew	CEMVN-PM-RN	Recreation
Petitbon, John	CEMVN-ED-C	Engineering - Costs
Radford, Richard	CEMVN-PM-RN	Aesthetics
Ray, Gary	CEERD-EL-EEW	ERDC, Science & Technology
Richards, Carol Parsons	OCPR, LACES	Science & Technology
Richardson, Jerica	CEMVN-PM-RN	Cultural Resources
Ruiz, Manuel	LDWF	Agency Liaison – Fisheries
Servay, Steve	CEMVN-ED-HM	Water Quality
Steyer, Cindy	NRCS	Agency Liaison
Trahan, Angela	USFWS	Agency Liaison
Turner, Claire Marie	PBS&J	Process Development
Welp, Timothy	CEERD-HN-CD	ERDC, Science & Technology
Wilbanks, Rayford	CEMVD-PD-N	District Support Team
Williams, Chris	OCPR, Project Mngt	Project Manager
Williams, Patrick	NMFS	Agency Liaison

Name	Affiliation	Role
Wray, James	OCPR, Land Rights Branch	Real Estate

6.3 LITERATURE CITED

Aten, L.E. 1983. Indians of the upper Texas coast. Academic Press, New York, NY

Barras, John A. 2006. Land area change in coastal Louisiana after the 2005 hurricanes – a series of three maps. U.S. Geological Survey Open-File Report 06-1274

———. 2009, Land area change and overview of major hurricane impacts in coastal Louisiana, 2004-2008: US Geological Survey Scientific Investigations Map 3080, scale 1:250,000, 6 p pamphlet.

Barras, J.A., Bernier, J.C., and Morton, R.A., 2008, Land area change in coastal Louisiana--A multidecadal perspective (from 1956 to 2006): U.S. Geological Survey Scientific Investigations Map 3019, scale 1:250,000, 14 p. pamphlet.

Barrett, B.B., J.W. Tarver, W.R. Latapie, J.F. Pollard, W.R. Mock, G.B. Adkins, W.J. Gaidry, C.J. White, and J.S. Mathis. 1971. Cooperative Gulf of Mexico estuarine inventory and study, Louisiana. Phase II, Hydrology, and Phase III, Sedimentology. Louisiana Wildlife and Fisheries Commission, New Orleans, Louisiana. 191pp.

Bernard, H.A. 1970. Preliminary report of geology, soil character and soil stability in Louisiana offshore west of the Mississippi Delta. Shell Development Company, Houston, Texas.

Boudreaux-Bodin, G., editor. 2006. Louisiana's wetlands after the storm. Watermarks, No. 30, Louisiana coastal Wetlands Conservation and Restoration Task Force.

Boyd, R., and S. Penland. 1988. Geomorphic model for Mississippi delta evolution. American Association of Petroleum Geologists Bulletin 72(9):1110.

Browder, J.A., H.A. Bartley, and K.S. Davis. 1985. A probabilistic model of the relationship between marshland-water interface and marsh disintegration. *Ecological Modeling* 29:245-260.

Byrne, J. V., D. O. Leroy, and C. M. Riley. 1959. The Chenier Plain and its stratigraphy, southwest Louisiana. *Transactions of the Gulf Coast Association of the Geological Society*. 9: 237-259.

Chabreck, R.H. 1970. Marsh zones and vegetation types in the Louisiana coastal marshes. Unpublished Ph.D. dissertation. Louisiana State University, Baton Rouge, Louisiana. 113 pp.

———. 1972a. Vegetation, water and soil characteristics of Louisiana. Louisiana Agricultural Experiment Station Bulletin. 664 pp.

———. 1972b. Vegetation, water and soil characteristics of the Louisiana coastal region. Louisiana State University and Agricultural and Mechanical College Agricultural Experiment Station. 72pp.

Chabreck, R.H., T. Joanen, and A.W. Palmisano. 1968. Vegetative type map of the Louisiana coastal marshes. Louisiana Wildlife and Fisheries Commission, Louisiana State University, and U.S. Army Corps of Engineers.

Chabreck R.H., and G. Linscombe. 1978. Changes in vegetation types of Louisiana coastal marshes over a ten-year period. Louisiana Academy of Sciences 45: 98–102.

———. 1988. Louisiana coastal marsh vegetative type map. Louisiana Department of Wildlife and Fisheries, New Orleans.

Chabreck, R.H., R.G. Linscombe, S. Hartley, J.B. Johnston, A. Martucci, C. Saltus, and A. Ballard. 2001. Coastal Louisiana marsh vegetative types. U.S. Geological Survey National Wetlands Research Center, Lafayette, Louisiana, report to the Coastal Wetlands Planning, Protection and Restoration Act, and Louisiana Department of Wildlife and Fisheries. 1 CD ROM.

Church, John A. and Neil J. White. 2006. A 20th century acceleration in global sea-level rise, *Geophysical Research Letters*, Vol. 33, L01601, doi10.1029/2005GL024826.

Coastal Environments, Inc (CEI). 1977. Cultural resources evaluation of the Northern Gulf of Mexico continental shelf. Prepared for Interagency Archeological Services, Office of Archeology and Historic Preservation, National Park Service, U.S. Department of the Interior, Baton Rouge, Louisiana.

———. 1982. Sedimentary studies of prehistoric archaeological sites. Prepared for Division of State Plans and Grants, National Park Service, U.S. Department of the Interior, Baton Rouge, Louisiana.

Coastal Protection and Restoration Authority of Louisiana. 2007. Louisiana's comprehensive master plan for a sustainable coast. Baton Rouge, LA www.louisianacoastalplanning.org

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LeRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C.

Douglas, B. C., M. S. Kearney, and S. P. Leatherman. 2001. Sea Level Rise: *History and Consequences, International Geophysics Series*, Vol. 57, Academic Press, 232 pp.

Dow, D.D., W.H. Herke, E.E. Knudsen, B.L. Marotz and E.M. Swenson. 1985. Hydrography on the Grand Bayou, Louisiana, watershed: influence of wetland-water interactions on ecosystem function. *Symposium of Hydrolographic Society of America*. p 52-71.

Faller, K.H. 1979. Shoreline as a controlling factor in commercial shrimp production. National Aeronautics and Space Administration, National Space Technology Laboratories, Bay St. Louis, Mississippi. NASA TM-72-732.

Flocks, J. 2006. Measuring hurricane impact – USGS scientists map the Louisiana coastline. *Soundwaves* 2006-08.

Floyd, R. 1995. Geophysical site survey reports blocks 72 and 87, Ship Shoal Area, offshore Louisiana. Prepared for Mobil Exploration and Production, U.S., by Kinsella, Cook, and Associates, Inc. Prairieville, Louisiana

Frazier, D. E. 1967. Recent deltaic deposits of the Mississippi River, their development and chronology. *Transactions Gulf Coast Association of Geological Societies* 17:287-315.

Gould, H. R. and E. McFarland, Jr. 1959. Geologic history of the Chenier Plain, southwest Louisiana. *Gulf Coast Association of Geological Societies Transactions* 9: 237-270.

Gosselink, J.G. 1984. The ecology of delta marshes of coastal Louisiana community profile (Report to FWS/OBS-84-09). U.S. Fish and Wildlife Service, Washington, D.C.

Gulf of Mexico Fisheries Management Council. 1998. Generic amendment for addressing essential fish habitat requirements in the following fishery management plans of the Gulf of Mexico. Gulf of Mexico Fishery Management Council. Tampa, Florida

Hagg, W.G. 1992. The Monte Santo site, in M.D. Jeter, ed. Southeastern Archaeological Conference: abstracts of the forty-ninth annual meeting. Arkansas Excelsior Hotel, Little Rock, Arkansas.

Johnston, J.B., D.R. Cahoon, and M.K. La Peyre. 2009. Outer continental shelf (OCS)-related pipelines and navigation canals in the Western and Central Gulf of Mexico: Relative impacts on wetland habitats and effectiveness of mitigation. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2009-048. 200 pp.

Louisiana Administrative Code, Title 33. Available from the LDEQ Division of Legal Affairs: http://www.deq.louisiana.gov/portal/tabid/1674/Default.aspx

Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1998. Coast 2050: Toward a sustainable coastal Louisiana. Louisiana Department of Natural Resources. Baton Rouge. Louisiana. 161 pp.

Louisiana Department of Natural Resources, Nonagricultural employment information. http://dnr.louisiana.gov/sec/execdiv/techasmt/facts_figures/tables37.htm

Louisiana Department of Environmental Quality, State Implementation Plan. 2005. Available from the LDEQ Division of Air Quality Assessment, Office of Air Quality Planning: http://www.deq.louisiana.gov/portal/tabid/2381/Default.aspx

Louisiana Department of Water Quality, Hindrichs, A.E. (editor). 2006. Louisiana Water Quality Inventory: Integrated Report, fulfilling requirements of the Federal Clean Water Act, Sections 305(b) and 303(d). Louisiana Department of Environmental Quality, Office of Water Quality Assessment (http://www.deq.la.gov/portal/tabid/2692/Default.aspx). Baton Rouge, LA

Louisiana Oil and Gas Association. http://www.loga.la/oil-gas-statistics.html

Louisiana Tech University. 2007. College of Business, Department of Graduate Studies and Research. Louisiana population estimates, intercensal population estimates. http://www.business.latech.edu/census/population_estimates/07Place-Par-Pub.pdf

Michot, T.C., C.W. Jeske, J.C Mazourek, W.G. Vermillion, and R.S. Kemmerer. 2003. Final draft. Atlas and census of wading birds and seabird nesting colonies in south Louisiana, 2001BTNEP Publication.

Miller, J. M., and M. L. Dunn. 1980. Estuarine perspectives. Proceedings of the Fifth Biennial International Estuarine Research Conference; Jekyll Island, Georgia, October 7-12, 1979. pp 437-448.

Minello, T.J., R.J. Zimmerman, and R. Medina. 1994. The importance of edge for natant macrofauna in a created salt marsh. *Wetlands* 14:184-198.

Minello, T. J., K. W. Able, M. P. Weinstein, and C.G. Hays. 2003 . Salt marshes as nurseries for nekton: testing hypotheses on density, growth and survival through meta-analysis. *Marine Ecology Progress Series* 246:39-59.

National Marine Fisheries Service. 2001. Fisheries of the United States, 2000. National Oceanic and Atmospheric Administration United States Department of Commerce. Silver Spring, Maryland.

———. 2003. Fisheries and Statistics and Economics Division, Silver Springs, Maryland. Personal communication with Dr. William Klein, USACE.

———.. 2007. Report to Congress on the Impact of Hurricanes Katrina, Rita, and Wilma on commercial and recreational fishery habitat of Alabama, Florida, Louisiana, Mississippi, and Texas. U.S. Department of Commerce. Silver Spring, Maryland.

National Research Council. 1987. Responding to Changes in Sea Level: Engineering Implications. National Academy Press: Washington, D.C. http://www.nap.edu/catalog.php?record_id=1006

Nelson, Waldemar S. and Co. 2003. Valuation of Assets in the Louisiana Coastal Area, for the U.S. Army Corps of Engineers, New Orleans District, New Orleans, LA.

O'Neil, T. 1949. The muskrat in the Louisiana coastal marshes. Louisiana Department of Wildlife and Fisheries. New Orleans, Louisiana.

Parker, B. B. 1992. Sea level as an indicator of climate and global change, MTS Journal, 25, 13-24.

Penfound, W.T, and E.S. Hathaway. 1938. Plant communities in the marshlands of southeastern Louisiana. *Ecological Monographs* 8. 56 pp.

Penland, S., H.H. Roberts, S.J. Williams, A.H. Sallenger, Jr., D.R. Cahoon, D.W. Davis, and C.G. Groat. 1990. Coastal land loss in Louisiana. *Gulf Coast Association of Geological Societies Transactions*, vol 40:685-699.

Perrett, W.S., B.B. Barrett, W.R. Latapie, J.F. Pollard, W.R. Mock, G.B. Adkins, W.J. Gaidry, and C.J. White. 1971. Cooperative Gulf of Mexico estuarine inventory and study, Louisiana. Louisiana Wildlife and Fisheries Commission. New Orleans, Louisiana.

Rozas, L.P. and T.J. Minello. 2001. Marsh terracing as a wetland restoration tool for creating fishery habitat. *Wetlands* 21:147-157.

Rozas, L.P., and D.J. Reed. 1993. Nekton use of marsh-surface habitats in Louisiana (USA) deltaic salt marshes undergoing submergence. Mar. Ecol. Prog. Ser. 96:147-157.

Russo, M. 1992. Variations in Late Archaic subsistence and settlement patterning in peninsula Florida. In: Jeter, M.D. ed., Southeastern Archaeological Conference: abstracts of the forty-ninth annual meeting. Arkansas' Excelsior Hotel. Little Rock, Arkansas.

Smith, G. 2006. Natural disasters in the Gulf of Mexico; fisheries, wetlands, and coastal landscapes. Testimony before the Subcommittee on Fisheries and Oceans, Committee on Resources, U.S. House of Representatives, March 21, 2006. http://www.doi.gov/ocl/2006/NaturalDisastersInTheGulfOfMexico.htm.

Steyer, G.D., B.C. Perez, S. Piazza, and G. Suir. 2007. Potential consequences of saltwater intrusion associated with Hurricanes Katrina and Rita. *In* G.S. Farris, G.J. Smith, M.P. Crane, C.R. Demas, L.L. Robbins, and D.L. Lavoie, editors, Science and the storms – the USGS response to the hurricanes of 2005; U.S. Geological Survey Circular 1306.

Stone, G.W., et al. 2007. Winter storm and tropical cyclone impacts on the short-term evolution of beaches and barriers along the northeastern Gulf of Mexico. Coastal Sediments, American Society of Civil Engineers.

Suhayda, J. N. 1997. Modeling impacts of Louisiana barrier islands on wetland hydrology. *Journal of Coastal Research* 13(3):686-693.

USACE. 2004. Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study (LCA Study). New Orleans District, New Orleans, LA

U.S. Department of Energy, Energy Information Administration, U.S. crude oil and petroleum products imports from all countries (thousand barrels per day) http://tonto.eia.doe.gov/dnav/pet/hist/mttimus2a.htm

USGS. 2006. UGSG reports latest land change estimates for Louisiana Coast. October 3, 2006 News Release.

U.S. Government, Code of Federal Regulation, Title 33 - Navigation and Navigable Waters, Chapter 2 - Corps of Engineers, Department of the Army, Department of Defense, Part 335 - Operation and Maintenance of Army Corps of Engineers Civil Works projects involving the discharge of dredged or fill material into waters of the U.S. or Ocean Waters. http://www.gpoaccess.gov/cfr/index.html

USDA, Animal and Plant Health Inspection Service (APHIS). 2008. How to import foreign soil and how to move soil within the United States. Circular Q-330.300.1 (6 pp). Riverdale, Maryland. Available: http://www.aphis.usda.gov/plant_health/permits/organism/soil/

Visser, J.M., R.H. Chabreck, and R.G. Linscombe. 1998. Marsh vegetation types of the Mississippi River Deltaic Plain. Estuaries 21(4B):818-828.

———. 2000 . Marsh vegetation types of the Chenier Plain, Louisiana, USA. *Estuaries* 23(3):318-327.

Visser, J.M., C.E. Sasser, R.H. Chabreck, and R.G. Linscombe. 1999. Long-term vegetation change in Louisiana tidal marshes, 1968-1992. Wetlands 19(1):168-175.

Williams, S.J., S. Penland, and A.H. Sallenger, Jr., editors. 1992. Louisiana barrier island erosion study: Atlas of shoreline changes in Louisiana from 1853 to 1989. Prepared by the U.S. Geological Survey in cooperation with the Louisiana Geological Survey. 103 pp.

Zervas, Chris. 2001. Sea level variations of the United States 1854-1999, NOAA Technical Report NOS CO-OPS. U.S. Department of Commerce, National Ocean Service, Silver Springs, MD. http://www.co-ops.nos.noaa.gov/publications/techrpt36doc.pdf

Zimmerman, R.J., T.J. Minello, and G. Zamora. 1984. Selection of vegetated habitat by brown shrimp, *Penaeus aztecus*, in a Galveston Bay salt marsh. *Fishery Bulletin*, US 82:325-336.

Zimmerman, R.J., T.J. Minello, and L.P. Rozas. 2000. Salt Marsh linkages to productivity of penaeid shrimps and blue crabs in the ecology. Kluwer Academic Publisher, Dorecht, the Netherlands.

6.4 ABBREVIATIONS AND ACRONYMS

AAHU – Average Annual Habitat Units
BBWW – Barataria Bay Waterway
BU – beneficial use
BUDMAT – Beneficial Use of Dredged Materials
CAA – Clean Air Act
CAP – Continuing Authorities Program
CE/ICA – Cost Effectiveness / Incremental Cost Analysis
CEMVN – Corps of Engineers, Mississippi Valley Division, New Orleans District
CERLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFR – Code of Federal Regulations
CIAP – Coastal Impact Assistance Program
CPRA – Coastal Protections and Restoration Authority of Louisiana
CRP – Calcasieu River Pass
CWA – Clean Water Act
CWPPRA – Coastal Wetlands Planning, Protection, and Restoration Act (the Breaux Act)
Cy – cubic yards
EA – Environmental Assessment
EFH – Essential Fish Habitat
EIS – Endangered Species Act
EPA – Environmental Protection Agency
ERDC – Engineering Research & Development Center (USACE)
ESA – Endangered Species Act
FONSI – Finding of No Significant Impacts
FR – Federal Regulation
FS – Feasibility Study
FTL – Functional Team Leader
FY – Fiscal Year
GIWW – Gulf Intracoastal Waterway
GPS – Global Positioning System
Ha- hectares
HARN – High Accuracy Reference Network
HNC – Houma Navigational Canal
HTRW – Hazardous, Toxic, and Radioactive Waste
LAC – Louisiana Administrative Code
LCA – Louisiana Coastal Area
LDEQ – Louisiana Department of Environmental Quality
LDNR – Louisiana Department of Natural Resources
LDWF – Louisiana Department of Wildlife and Fisheries
LERRDS – Lands, Easements, Rights-of-Way, Relocations and Disposal Areas
LEQA – Louisiana Environmental Quality Act
LOOP – Louisiana Offshore Oil Port
MCS – Management Classification System
Mcm – million cubic meters
Mcy – million cubic yards
MLG – Mean Low Gulf
MMS – Materials Management Service (Dept. of Interior)
MPRSA – Marine Protection Research and Sanctuaries Act
MRFSS – Marine Recreational Fishery Statistics Survey
MSA – Metropolitan Statistical Area
NAAQS – National Ambient Air Quality Standards
NASA – National Aeronautics and Space Administration
NAVD 88 – North American Vertical Datum 1988
NBEM – National Bald Eagle Management guidelines
NED – National Economic Development
NEPA – National Environmental Policy Act
NER – National Ecosystem Restoration
NGS – National Geodetic Survey
NGVD – National Geodetic Vertical Datum (of 1929)
NOAA – National Oceanic and Atmospheric Administration
NOD – New Orleans District, USACE
NPL – National Priority List
NRCS – National Resource Conservation Service
NMFS – National Marine Fisheries Service (part of NOAA, also known as NOAA Fisheries)
NWR – National Wildlife Refuge
O & M – Operations and Maintenance
OMRR&R - Operation, Maintenance, Repair, Replacement and Rehabilitation
OCA – Outer continental shelf
PDA – Planning and Design Analysis
PDT – Project Delivery Team
PET – Project Execution Team
PPA – Project Partnering Agreement
Ppt – parts per thousand
RCRA – Resource Conservation and Recovery Act
RM – river mile
ROD – Record of Decision
S & T – Science and Technology
SAV – submerged aquatic vegetation
T&E – Threatened and Endangered Species
USACE – United States Army Corps of Engineers
USACE-MVN – United States Army Corps of Engineers, New Orleans District
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey
VIA – Visual Impact Assessment
WRDA – Water Resources Development Act