US Army Corps
of Engineers
New Orleans District

Louisiana Coastal Area (LCA), Louisiana

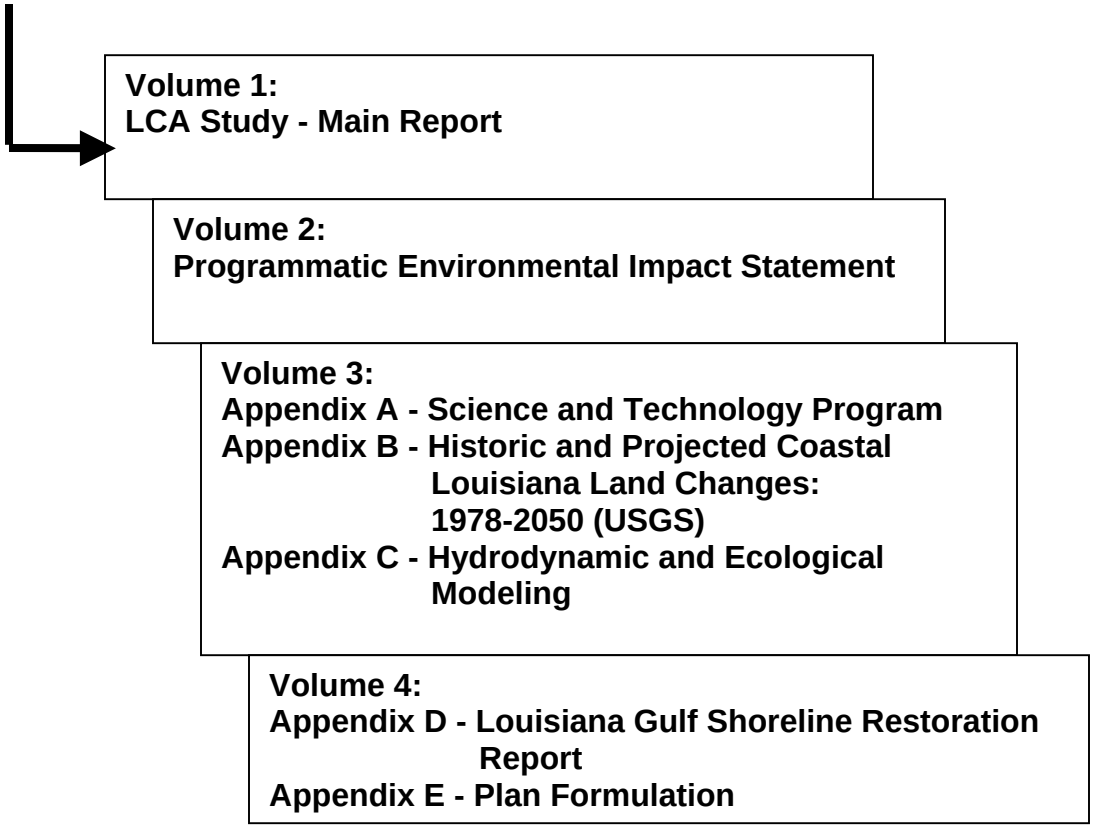
Ecosystem Restoration Study

July 2004

Draft
Volume 1: LCA Study - Main Report

This Report Contains 4 Volumes

You are here



If you have any questions, or require additional information, please contact Mr. Timothy Axtman; Project Manager, U.S. Army Corps of Engineers - New Orleans District; P. O. Box 60267, New Orleans, LA 70160, (540) 862-1921, email: Timothy.J.Axtman@mvn02.usace.army.mil

Cover picture is a Live Oak tree on the eastern shoreline of Lake Salvador. Picture provided by Lane Lefort of the U.S. Army Corps of Engineers - New Orleans District.

LOUISIANA COASTAL AREA (LCA), LOUISIANA

ECOSYSTEM RESTORATION STUDY

EXECUTIVE SUMMARY

Purpose

The loss of Louisiana's coastal wetlands has been ongoing since at least the early 1900s with commensurate deleterious effects on the ecosystem and possible future negative impacts to the economy of the region and the Nation. There have been several separate investigations of the problem and a number of projects constructed over the last 20 to 30 years that provide localized remedies. The Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) Program is an ongoing program comprised of relatively small projects to partially restore the coastal ecosystem. Given the magnitude of Louisiana's coastal land losses and ecosystem degradation, it has become apparent that a systematic approach involving larger projects to restore natural processes working in concert with smaller projects will be required to effectively deal with a physical problem of such large proportions. Restoration strategies presented in the 1998 report entitled "Coast 2050: Toward a Sustainable Coastal Louisiana", which evolved into the Louisiana Coastal Area (LCA) 905(b) reconnaissance report, formed the basis for this broader-scale effort under the Louisiana Coastal Area Ecosystem Restoration Study (LCA Study).

The purpose of the LCA Study is 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 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 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 goal of the LCA Plan is to reverse the current trend of degradation of the coastal ecosystem. The plan maximizes use of restoration strategies that reintroduce historical flows of river water, nutrients, and sediments to coastal wetlands and that maintain the structural integrity

of the coastal ecosystem. Execution of the LCA Plan would make significant 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 considered in the formulation of coastal restoration plans.

The LCA contains one of the largest expanses of coastal wetlands in the contiguous United States, and accounts for 90 percent of the total coastal marsh loss in the Nation. The coastal wetlands, built by the deltaic processes of the Mississippi River, contain an extraordinary diversity of coastal habitats that range from narrow natural levee and beach ridges to expanses of forested swamps and freshwater, intermediate, brackish, and saline marshes. Taken as a whole, the unique habitats, with their hydrological connections to each other, upland areas, the Gulf of Mexico, and migratory routes of birds, fish, and other species, combine to place the coastal wetlands of Louisiana among the Nation's most productive and important natural assets. In human terms, these coastal wetlands have been a center for culturally diverse social development.

Louisiana's coastal wetlands and barrier island systems enhance protection of an internationally significant commercial-industrial complex from the destructive forces of storm-driven waves and tides. This complex of deep-draft ports includes the Port of South Louisiana, which handles more tonnage than any other port in the Nation, and the most active segment of the Nation's Gulf Intracoastal Waterway (GIWW) (Waterborne Commerce Statistics Center (WCSC), 2002). In 2000, Louisiana led the Nation with production of 592 million barrels of oil and condensate (including the outer continental shelf (OCS)), valued at $17 billion, and was second in the Nation in natural gas production with $1.3 billion (excluding OCS and casing head gas) (Louisiana Department of Natural Resources (LDNR), 2003).

Additionally, coastal Louisiana is home to over 2 million people, representing 46 percent of the state's population. When investments in facilities, supporting service activities, and the urban infrastructure are totaled, the capital investment in the Louisiana coastal area adds up to approximately $100 billion. Louisiana produced about $343 million of commercial marine fish landings, which includes all landings except mollusks such as clams, oysters, and scallops (National Marine Fisheries Service (NMFS), 2003). Recent data from the U.S. Fish and Wildlife Service (USFWS) show expenditures on recreational fishing (trips and equipment) in Louisiana to be nearly $695 million for 2001 (USFWS, 2002).

Approximately 70 percent of all waterfowl that migrate through the United States use the Mississippi and Central flyways. With over 5 million birds wintering in Louisiana, the Louisiana coastal wetlands are a critical piece of habitat to these birds, as well as to neotropical migratory songbirds and other avian species who use them as critical stopover habitat. Additionally, coastal Louisiana provides critical nesting habitat for many species of water birds, such as the endangered brown pelican. These economic and habitat values, which are protected and supported by the coastal wetlands of Louisiana, are significant on a National level.

Coastal Louisiana has lost over 1.2 million acres (1,875 mi^2), since the 1930s (Barras et al., 2003; Barras et al., 1994; and Dunbar et al., 1992). As recently as the 1970s, the loss rate for Louisiana's coastal wetlands was as high as 25,200 acres per year (39.4 mi^2/yr). The rate of loss from 1990 to 2000 was about 15,300 acres per year (23.9 mi^2/yr), much of which was due to the residual effects of past human activity (Barras et al., 2003). It was estimated in 2000 that coastal Louisiana would continue to lose land at a rate of approximately 6,600 acres per year (10.3 mi^2/yr) over the next 50 years, resulting in an additional 328,000-acre (513 mi^2/yr) net loss by the year 2050 (Barras et al., 2003). The cumulative effects of human and natural activities in the coastal area have severely degraded the deltaic processes and shifted the coastal area from a condition of net land building to one of net land loss.

While many studies have been conducted to identify the major contributing factors (e.g., Boesch et al., 1994; Turner, 1997; Penland et al., 2000), most studies agree that land loss and the degradation of the coastal ecosystem are the result of both natural and human induced factors, which interact to produce conditions where wetland vegetation can no longer survive and where wetlands are lost. Establishing the relative contribution of natural and human-induced factors is difficult. In many cases, the changes in hydrologic and ecologic processes manifest gradually over decades and in large areas, while other effects occur over single days and impact relatively localized areas. For barrier shorelines, complex interactions among storm events, longshore sediment supply, coastal structures, and inlet dynamics contribute to the erosion and migration of beaches, islands, and cheniers.

The measurable increase in coastal land loss in the mid to late 20th century can be linked to human activities that have fundamentally altered the deltaic processes of the coast and limited their ability to rebuild and sustain it. In the Chenier Plain, human activities have fundamentally altered the hydrology of the area, which has impacted the long-term sustainability of the coastal ecosystems. Because of the magnitude and variety of these human-induced changes, and their interaction with natural landscape processes, all of the factors contributing to coastal land loss and ecosystem degradation must be viewed together to fully understand how Louisiana's coastal ecosystem shifted from the historical condition of net land gain to the current condition of accelerated net land loss.

The past and continued loss of Louisiana's coastal wetlands will significantly affect the ecology, society, and economy of the region and the Nation. The continued decline of the natural ecosystem will result in a decrease in various functions and values associated with wetlands, including corresponding diminished biological productivity and increased risk to critical habitat of Federally-threatened and endangered species. The capacity of the coastal wetlands to buffer storm surges from tropical storm events will diminish, which will increase the risk of significant damage to oil, gas, transportation, water supply and other private and public infrastructure and agriculture lands and urban areas.

Study Area

The study area, which includes the LCA from Mississippi to Texas, is comprised of two wetland-dominated ecosystems, the Deltaic Plain of the Mississippi River and the closely linked Chenier Plain, both of which are influenced by the Mississippi River. For planning purposes, the

study area was divided into four subprovinces, with the Deltaic Plain comprising Subprovinces 1, 2, and 3, and the Chenier Plain comprising Subprovince 4 **(figure ES-1)**.

Today, the Deltaic Plain is a vast wetland area stretching from the eastern border of Louisiana to Freshwater Bayou. It is characterized by several large lakes and bays, natural levee ridges (up to 20 feet above sea level), and bottomland hardwood forests that gradually decrease in elevation to various wetland marshes. The Deltaic Plain contains numerous barrier islands and headlands, such as the Chandeleur Islands, Barataria Basin Barrier Islands, and Terrebonne Basin Barrier Islands. The Chenier Plain extends from the Teche/Vermilion bays to Louisiana's western border with Texas, and is characterized by several large lakes, marshes, cheniers, and coastal beaches.

Within the broadly delineated zones of marsh habitat types, a variety of other wetland habitats (with distinct surface features and vegetative communities) occur in association with the marshes. These include swamp and wetland forests, beach and barrier islands, upland, and other important habitats. There are also unique vegetative communities in the coastal area, such as floating marshes and maritime forests, that contribute to the extensive diversity of the coastal ecosystem and which are essential to the overall stability of the ecosystem.

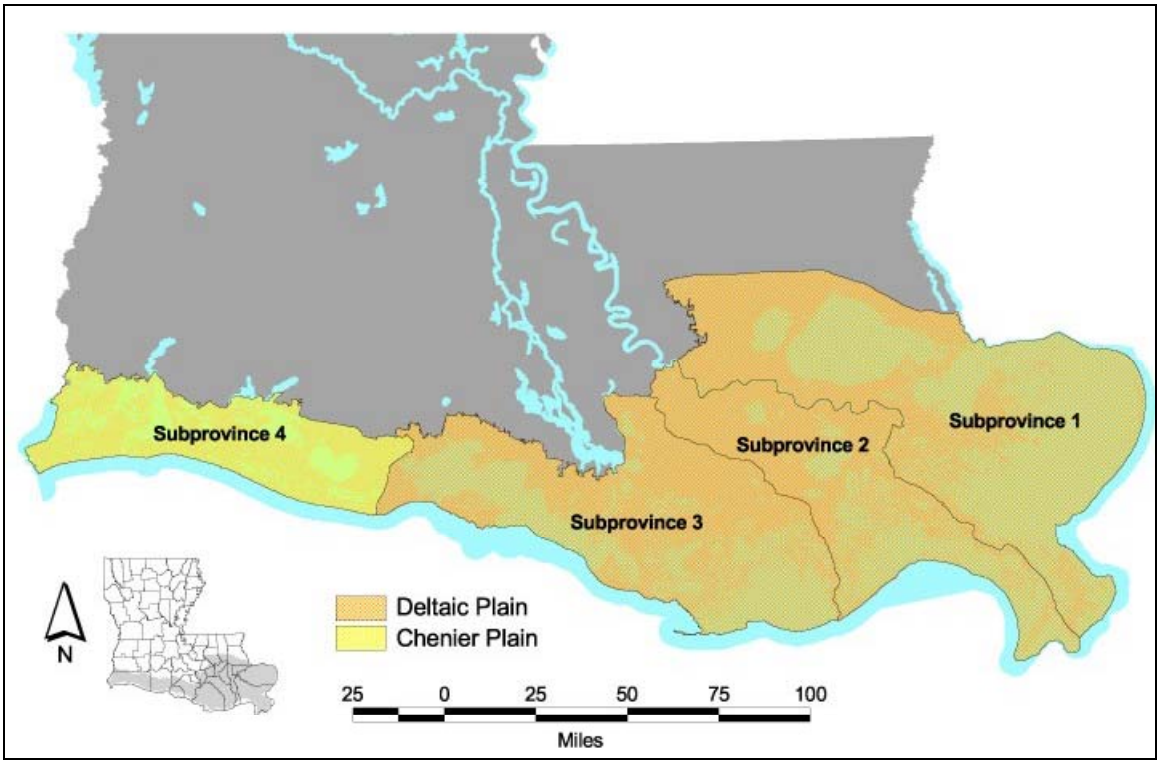


Figure ES-1. LCA Study Area and Subprovinces.

Project Delivery Team (PDT)

An interagency Project Delivery Team (PDT) was assembled to conduct the prerequisite studies and analyses and develop the alternative plans and report for the LCA Study. The team was composed of U.S. Army Corps of Engineers (USACE), State of Louisiana (the non-Federal sponsor), U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, U.S. Geological Survey, and U.S. Department of Agriculture staff. To ensure that development of alternative restoration plans was based upon the best available science and engineering, the USACE and the State of Louisiana also enlisted the aid of over 120 scientists, engineers, and planners from across the Nation to provide advice and guidance, carry out complex modeling efforts, and review results.

Plan Formulation

The LCA Study planning process used by the PDT evolved over two years, ultimately resulting in the selection of a recommended near-term course of action. During this time, the PDT used an iterative decision making process to identify and evaluate the merits of individual restoration features, the effects of combining these features into different coast wide frameworks, and ultimately the ability of these frameworks to address the most critical ecological needs in the Louisiana coastal area. **Table ES-1** highlights the purpose, decision criteria, and results of the major iterations of the plan formulation process.

The most suitable LCA Plan was identified to be one that best meets the study objectives and is based upon identification of the most critical natural and human ecological needs and proposes program of highly cost effective features to address those needs. During program implementation, feasibility-level decision documents would be completed to fully analyze and justify specific features based upon standard planning guidance using NER and National Economic Development (NED) analysis.

Planning Constraints

The development and evaluation of restoration alternatives within coastal Louisiana was constrained by several factors. Foremost among these factors was the fundamental premise that restoration of deltaic processes would be accomplished in part, through reintroductions of riverine flows, but that natural and historical “channel switching” of the Mississippi River would not be allowed to occur. The availability of freshwater, primarily water transported down the Mississippi River, was considered a planning constraint because minimum levels or water flows are required to maintain navigation and flood control, and limit saltwater intrusion. The availability of sediment for restoration efforts was also considered a planning constraint for this study because there is not an unlimited, easily accessible, and low-cost source for restoration efforts.

Another significant category of constraints is the scientific and technological uncertainties inherent in large-scale aquatic ecosystem restoration projects. While many of these were known as the plan formulation process began, others became more evident as the formulation process was completed. A summary of the key scientific uncertainties and

technological challenges as they are currently understood, along with proposed strategies to address these uncertainties and challenges, is presented below.

- **Type 1 - Physical, chemical, geological, and biological baseline condition uncertainties -** This general type of uncertainty is best resolved through continued improvement of tools and networks that would better establish baseline conditions and allow for more detailed and coast wide monitoring and assessment, which in turn would better support program-level, as well as project-level, Adaptive Management;

- **Type 2 - Engineering concepts and operational method uncertainties -** This general type of uncertainty is best resolved through implementation of appropriately scaled demonstration projects and associated monitoring programs to gauge results;

- **Type 3 - Ecological processes, analytical tools, and ecosystem response uncertainties -** This general type of uncertainty is best resolved through refined models that are developed and calibrated for assessment of system responses at appropriate scales; and

- **Type 4 - Socio-economic/political conditions and responses uncertainties -** This general type of uncertainty is best resolved through focused research and application of socioeconomic modeling and assessment methods to better establish socioeconomic linkages that will inform more complete NED/NER analysis.

Table ES-1. Major Iterations of Plan Formulation.

	Iteration We started with:	Purpose Our intent was to:	Criteria We made decisions based on:	Result The iteration ended with:
Phase 1	EOPs and Guiding Principles	Develop Planning Objectives and Planning Scales	• Professional judgment • Extensive CWPPRA experience • Scoping Comments	Planning Objectives Planning Scales
Phase 2	Coast 2050 Plan Section 905(b) Report	Assess broad scale strategies in 2050 Plan to identify Core Strategies for LCA Study effort	• Existing resources available in each of the four Subprovinces	LCA Core Strategies
Phase 3	LCA Core Strategies	Develop restoration features that would support LCA Core Strategies	• Planning Objectives • Creating features that would meet various Planning Scales • Developing features for all LCA Core Strategies	Restoration Features
Phase 4	Restoration Features	Combine Restoration Features into Subprovince Alternative Frameworks	• Need to combine Restoration Features into Alternative Frameworks that achieve different Planning Scales • Need to develop significantly different Restoration Features for all LCA Core Strategies	Subprovince Frameworks
	Subprovince Frameworks	Create, assess, and select Coast wide Restoration Frameworks	• Cost effectiveness (CE) • Incremental Cost Analysis (ICA)	Tentative Final Array of Coast wide Restoration Frameworks
Phase 5	Tentative Final Array of Coast wide Restoration Frameworks	Address completeness of Coast wide Restoration Frameworks in Tentative Final Array	• Public meeting and stakeholder comments • Re-verification of CE/ICA	Final Array
Phase 6	Final Array	Identify highly cost-effective Restoration Features within the Final Array that address most critical ecological needs	• Critical need sorting criteria • Critical need assessment criteria	Plan that Best Meets Objectives (PBMO)

LCA Plan Recommendations

Based upon the best available science and engineering, professional judgment, and extensive experience in coastal restoration in Louisiana and beyond, the LCA Study identifies, evaluates, and recommends to decision makers an appropriate, coordinated, feasible solution to the identified critical water resource problems and opportunities in coastal Louisiana. This 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 the following Tentatively Selected Plan (TSP) components:

- Authorization of programmatic authority for implementation of five near-term critical restoration features for which construction can begin within 5 to 10 years subject to follow-up feasibility-level decision documents;
- Authorization of a Science and Technology Program;
- Authorization of Science and Technology Program Demonstration Projects;
- Programmatic Authority for the Beneficial-Use of Dredged Material;
- Programmatic Authority for Modification to Existing Structures;
- Approval of an implementation plan of ten additional near-term critical restoration features for which a standard authorization process will be followed; and
- Approval of plan for assessing five potentially promising large-scale restoration concepts.

Near-Term Critical Restoration Features for Programmatic Authorization.

The TSP includes five near-term critical restoration features which are recommended for implementation through programmatic authority. Implementation of these five restoration features would be subject to subsequent completion of NED/NER analysis, NEPA compliance, and appropriate feasibility-level decision documentation. These feasibility-level decision documents would be constructed, utilizing current policy and guidelines, to provided a sound basis for decision makers at all levels.

Initial analysis indicates that these features address the most critical ecological needs of the coastal area in locations where delaying action would result in a "loss of opportunity" to achieve restoration and/or much greater restoration costs. All of these features have a basis in cost effectiveness and in their value to significantly address critical natural and human ecological needs. These five critical near-term features present a range of effects essential for success in restoring the Louisiana coast. The benefits provided by these features include the sustainable reintroduction of riverine resources, rebuilding of wetlands in areas at high risk for future loss, the preservation and maintenance of critical coastal geomorphic structure, and perhaps most importantly, the preservation of critical areas within the coastal ecosystem, and the opportunity to begin to identify and evaluate potential long-term solutions. Based on a body of work both preceding and including this study effort, the PDT produced an estimate of average annual costs and benefits for these five features. This information shows that average annual environmental output for this programmatically authorized feature package would be on the order of 22,000 habitat units at an average annualized cost of $2,600 per unit provided.

Restoration features identified for implementation under this component will be forwarded the to the Secretary of the Army for construction approval and subsequent inclusion in the USACE annual budget cycle. The five features are:

- MRGO environmental restoration features
- Small diversion at Hope Canal
- Barataria Basin barrier shoreline restoration (Caminada Headland and Shell Island reaches)
- Small Bayou Lafourche reintroduction
- Medium diversion at Myrtle Grove with dedicated dredging

Science and Technology Program

While the LCA Plan is based upon the best available science and takes advantage of over 20 to 30 years of experience gained from previous Louisiana coastal restoration efforts, such as CWPPRA, there remain scientific and engineering uncertainties associated with some of the proposed LCA restoration efforts (see section 3.1 for a detailed discussion on uncertainties). The USACE and the non-Federal sponsor have developed a Science and Technology Plan (S&T Plan) that provides a strategy, organizational structure, and process to facilitate integration of science and technology into the decision-making processes of the Program Management and the Program Execution Teams. Implementation of this S&T Program would ensure that the best available science and technology are available for use in the planning, design, construction, and operation of TSP components, as well as other coastal restoration projects and programs, such as CWPPRA. There are five primary components in the LCA S&T Program, and each component has a different emphasis and requirement. These components include: (1) Science Information Needs, (2) Data Acquisition and Monitoring, (3) Data and Information Management, (4) Modeling and Adaptive Management, and (5) Research. (Additional information on the S&T Plan is in appendix A, SCIENCE AND TECHNOLOGY PLAN). The S&T Plan is designed to encourage creativity and scientific collaboration in responding to the needs of the restoration program. The objectives of the S&T Plan are to ensure the LCA restoration effort continues to be supported by the best available science and to resolve scientific and engineering uncertainties associated with the ecological processes of the ecosystem and the ecosystem response(s) to restoration projects. One of the applied methods for reducing scientific and engineering uncertainties is the identification, development and implementation of appropriate demonstration projects.

Science and Technology Program Demonstration Projects

The purpose of the recommended LCA S&T Program demonstration projects is to resolve critical areas of scientific, technical, or engineering uncertainty while providing meaningful restoration benefits whenever possible. The types of uncertainty that are best resolved through implementation of appropriately scaled demonstration projects are the "Type 2" uncertainties presented in section 3.1. After design, construction, monitoring, and assessment of individual demonstration projects, the LCA program will leverage "lessons learned" to improve the planning, design, and implementation of other LCA restoration projects.

Demonstration projects may be necessary to address uncertainties not yet known and discovered in the course of individual project implementation or during the course of studies of large-scale and long-term restoration concepts. Nominated demonstration projects would be subject to review and approval of individual project feasibility-level decision documents by the

Secretary of the Army. In addition to standard feasibility-level decision document information, the demonstration project feasibility-level documents would address:

- Major scientific or technological uncertainties to be resolved; and
- A monitoring and assessment plan to ensure that the demonstration project would provide results that contribute to overall LCA program effectiveness.

The five initial candidate demonstration projects were developed by the PDT and recommended for early implementation within the total TSP program funding. For responsiveness to the need for an additional 5 to 20 demonstration projects defined during implementation, the LCA Programmatic Authority for demonstration projects would allow expenditure of approximately $92,700,000 of the total demonstration program. The following five demonstration projects to address critical uncertainties identified during the study effort:

- Marsh restoration and/or creation using saline sediments
- Land bridge restoration using long-distance conveyance of sediments
- Pipeline canal restoration using different methods
- Shoreline erosion prevention using different methods
- Barrier Island restoration using offshore sources of sediments

Programmatic Authority for the Beneficial Use of Dredged Material

The U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District (the District) has the largest annual channel operations and maintenance (O&M) program in the USACE, with an annual average of 70 mcy of material dredged. At this time, approximately 14.5 mcy of this material is used beneficially in the surrounding environment with funding from either the O&M program itself or the Continuing Authorities Program (CAP) defined by the WRDA 1992 Section 204 for beneficial use of dredged material. The TSP effectiveness would be enhanced by a programmatic authority for expanding the beneficial use of dredged material. This program would allow the District to take greater advantage of existing sediment resources made available by maintenance activities to achieve restoration objectives. Annualized, there is reasonable potential to use an additional 30 mcy of material beneficially if funding were made available. (A portion of the average annual material total of 70 mcy is not available for beneficial use because it is resuspended material from upstream maintenance; if taken out of the system upstream, it is not available for downstream beneficial use.) Other limitations within particular areas include threatened and endangered species operating restrictions; cultural resource site operating restrictions; and unfavorable maritime working conditions. Areas with significant opportunity for additional beneficial use of material include:

- The bar channel of the MRGO, LA, project;
- The bay reach of the Barataria Bay Waterway, LA project;
- The [lower] MR&T project, Head of Passes and Southwest Pass;
- The bar channel of the Atchafalaya River and Bayous Chene, Boeuf, and Black, LA, project; and
- The inland reach of the Calcasieu River and Pass, LA, project.

The TSP recommends $100,000,000 in programmatic authority to allow for the additional funding needed for beneficial use of dredged material. Approximately 15 percent of this funding authority would be used for feasibility studies, and the remainder would be used for beneficial placement of dredged material within acquired disposal sites. Past Section 204 projects have demonstrated an incremental cost of $1.00 per CY for beneficial placement. Additionally, these projects have demonstrated approximately 0.00025 acres per CY created. Based on the requested funds and a ten-year period of implementation, it is expected that the LCA beneficial use of dredged material could attain 21,000 acres of newly created wetlands. This recommended beneficial use program represents a significant opportunity to contribute to the attainment of the LCA objectives.

Programmatic authority would allow the application of funds appropriated through LCA for beneficial use of dredged material under the guidelines of the Continuing Authorities Program defined by Section 204 of the Water Resources Development Act (WRDA) of 1992. Approval of individual beneficial use projects would be delegated by the Secretary of the Army and managed by The U.S. Army Corps of Engineers Mississippi Valley Division (the Division) based on the appropriated annual funds. Implementation would proceed with a more detailed analysis of the potential beneficial use disposal sites, a process that would be repeated annually within the O&M "Base Plan" cycle.

Programmatic Authority for Modifications to Existing Structures

Coastal Louisiana is a dynamic environment that requires continual adaptation of restoration plans. With this recognition, opportunities for modifying or rehabilitating existing structures and/or their operation management plans to contribute to the ecosystem restoration objectives may be required in the future. Initiation of studies of restoration opportunities relative to such modifications requires advanced budgeting. Standard budget sequencing may limit responsiveness to recommendations made within the TSP. As a result, the TSP seeks programmatic authority to initiate studies of existing structures using funds within the LCA appropriations, not to exceed $10,000,000.

Near-term Critical Restoration Features Recommended for Standard Process of Implementation

The components of the TSP that are not programmatically authorized would be submitted to Congress for standard authorization in future WRDAs. Based on an analysis of the current plan implementation schedule, the recommended features would have feasibility-level decision documents or Feasibility Reports completed and ready to submit to Congress through FY 2013. Plan implementation would begin with basin-by-basin studies evaluating hydrodynamic and ecological responses of the non-programmatically authorized critical restoration features. The outputs would be evaluated by Cost Effectiveness / Incremental Cost Analysis (CE/ICA) to determine the cost-effective alternatives for implementation. This CE/ICA analysis would support the restoration features feasibility-level decision documents submitted for Congressional authorization.

The TSP recommends 10 additional critical near-term restoration features throughout coastal Louisiana to be implemented through this standard process. Proposed restoration features employ a variety of restoration strategies, such as freshwater and sediment diversions; interior shoreline protection; barrier island and barrier headland protection; and use of dredged material for marsh restoration. The USACE and the non-Federal sponsor concur that each of the identified restoration opportunities could begin construction within the next 10 years. The 10 restoration features recommended for standard implementation in the TSP are:

- Multi-purpose operation of the Houma Canal Lock;
- Terrebonne Basin barrier-shoreline restoration, East Timbalier, Isle Dernieres;
- Maintain land bridge between Caillou Lake and Gulf of Mexico;
- Small diversion at Convent/Blind River;
- Increase Amite River Diversion Canal influence by gapping banks;
- Medium diversion at White's Ditch;
- Stabilize gulf shoreline at Pointe Au Fer Island;
- Convey Atachafalaya River water to northern Terrebonne marshes;
- Re-Authorization of Caernarvon diversion – optimize for marsh creation; and
- Re-Authorization of Davis Pond diversion – optimize for marsh creation.

Large-Scale and Long-Term Concepts Requiring Detailed Study

Several candidate large-scale and long-term concepts for potential incorporation into the TSP were identified during plan formulation. These restoration concepts exhibited significant potential to contribute to achieving restoration objectives in 1) the subprovince within which they would be located, 2) adjacent subprovince(s), and/or 3) substantial portions of Louisiana's coastal ecosystem. Accordingly, the corresponding benefits and costs for these potential plan features should be further analyzed and confirmed to determine how best to incorporate them, if at all, with other plan features. Upon completion of detailed feasibility studies, recommendations for action would be documented in the manner specified for other features not qualifying for programmatic authority and would be subject to the standard review and authorization process for USACE water resources projects.

The TSP recommends the initiation of five feasibility studies of large-scale restoration concepts which, based on scope and/or complexity, will require more time and further study prior to implementation. The large-scale, long-term initiatives identified in the plan include:

- Mississippi River Hydrodynamic Model
  - Mississippi River Delta Management Study
  - Third Delta Study
  - Upper Atchafalaya Basin Study (including evaluation of alternative operational schemes of Old River Control Structure *funded under MR&T*)
- Chenier Plain Freshwater Management and Allocation Reassessment Study
- Acadiana Bay Estuarine Restoration Study

Summary of Tentatively Selected Plan Recommendations

The proposed programmatic authorities will facilitate the implementation of critical restoration features, essential science and technology demonstration projects, increased beneficial use of dredged material, and modification of selected existing projects all to support coastal restoration objectives. The S&T Program will provide for acquisition of data and development of analytic tools to further resolve scientific uncertainties and support program implementation. The remaining recommended plan components would provide the basis for continued restoration within an established framework.

The estimated cost of the TSP components being presented for both programmatic authorization and approval is displayed in **table ES-2**. The total cost of the programmatically authorized components of the TSP is estimated at $1,171,110,000. The total cost of the TSP with the inclusion of conventionally authorized components is $1,961,380,000. Currently, the annual O&M costs are estimated to be $7,172,000. O&M costs are the responsibility of the non-Federal sponsor.

Table ES-2. Cost Estimates for Components of the LCA Tentatively Selected Plan.

(June 2004 Price Levels)

Item			Cost ($)
MRGO environmental restoration features		$	80,000,000
Small diversion at Hope Canal		$	30,025,000
Barataria Basin Barrier shoreline restoration, Caminada Headland, Shell Isl.		$	181,000,000
Small Bayou Lafourche reintroduction		$	90,000,000
Medium diversion at Myrtle Grove w/ possible dedicated dredging		$	146,700,000
	SUBTOTAL	$	527,725,000
Real Estate		$	66,439,000
First cost	SUBTOTAL	$	594,164,000
Feasibility Level Decision Investigations and NEPA Documentation		$	55,609,000
PED		$	37,072,000
Near-term Approval and Implementation Documentation Cost	SUBTOTAL	$	92,681,000
Engineering & Design (E&D) / Supervision & Administration (S&A)		$	99,265,000
Programmatically Authorized TSP Cost		**$**	**786,110,000**
Science & Technology Program Cost (10 year Program)		**$**	**100,000,000**
Demonstration Program Cost (10 year Program)*		**$**	**175,000,000**
Beneficial Use Dredge Material Program*		**$**	**100,000,000**
Modification of Existing Structures		**$**	**10,000,000**
Total Programmatically Authorized TSP Cost		**$**	**1,171,110,000**
Multi-purpose operation of the Houma Navigation Canal Lock [#]		$	-
Terrebonne Basin Barrier shoreline restoration E. Timbalier, Isle Dernieres		$	84,850,000
Maintain Land Bridge between Caillou Lake & Gulf of Mexico		$	41,000,000
Small diversion at Convent / Blind River.		$	28,564,000
Amite River diversion (spoil banks gapping)		$	2,855,000
Medium diversion at White's Ditch		$	35,200,000
Stabilize Gulf Shoreline at Pointe Au Fer Island		$	32,000,000
Convey Atchafalaya River Water to Northern Terrebonne marshes		$	132,200,000
Caernarvon - optimize for marsh creation (project modification)		$	1,800,000
Davis Pond - optimize for marsh creation (project modification)		$	1,800,000
	SUBTOTAL	$	360,269,000
Real Estate		$	208,100,000
First cost	SUBTOTAL	$	568,369,000
Feasibility Level Decision Investigations and NEPA Documentation		$	54,100,000
PED		$	36,067,000
Near-term Approval and Implementation Documentation Cost	SUBTOTAL	$	90,167,000
Engineering & Design (E&D) / Supervision & Administration (S&A)		$	71,734,000
Conventionally Authorized TSP Cost		**$**	**730,270,000**
Mississippi River Hydrodynamic Study		$	10,250,000
Third Delta		$	15,290,000
Upper Atchafalaya Basin Study w/ Mod Operations of Old Riv Control ^		$	-
Chenier Plain Freshwater Management and Allocation Reassessment		$	12,000,000
Mississippi River Delta Management Study		$	15,350,000
Acadiana Bay Estuarine Restoration		$	7,110,000
Large-scale Studies Cost		**$**	**60,000,000**
Total Conventionally Authorized TSP Cost		**$**	**790,270,000**
Total LCA Restoration TSP Cost		**$**	**1,961,380,000**

*Program total costs include any estimated Real Estate costs for these activities

[#] Feature of the Mississippi River and Tributaries, Morganza Louisiana to the Gulf of Mexico Hurricane Protection project recommended in the reports of the Chief of Engineers dated 23 August 2002 and 22 July 2003.

^ Study to be funded under the Mississippi River and Tributaries authority

Areas of Controversy

The following list is a summary of the major areas of controversy. The complete list of areas of controversy can be found in the DPEIS.

1. Divided public support between comprehensive, long-term restoration efforts versus near-term restoration efforts.

Elements of the public expressed concern that the restoration of the LCA must include a long-term, comprehensive approach to significantly reverse the current trend of land loss and ecosystem degradation. While many members of the public acknowledged the need for a "near-term" effort, as embodied by the proposed LCA Plan, the majority viewed such an effort only as the initial step of the overall LCA restoration effort.

2. Widespread public demand for the immediate construction of restoration actions versus requirements for conducting additional study of restoration problems.

Elements of the public expressed concern that the LCA restoration effort will focus on the need for more studies rather than construction, operation and maintenance of restoration projects. In addition, they expressed their belief that immediate action should be taken to address LCA ecosystem degradation issues, and that there are enough existing studies of the problem to warrant and justify that immediate action.

3. Widespread public concern that oyster lease issues will make restoration efforts prohibitively expensive.

Elements of the public expressed concern that restoration efforts, particularly projects that would involve freshwater diversions, would affect existing oyster beds via lowering salinity levels, thereby creating a situation where excessive compensation for potentially affected oyster leases would be necessary. In light of the significant damages awarded to oyster lease holders [settlement is still pending appeal] as a result of prior restoration efforts and implementation of water control structures, the concern was that similar damage awards in response to LCA restoration projects would prevent the implementation of those LCA Plan restoration features that would significantly alter salinity regimes and impact oyster beds (e.g. freshwater diversions and reintroductions). Note: The passage of a state constitutional amendment is intended to hold harmless the state government from future such claims—this amendment has yet to be tested in judicial proceedings.

4. Public concern that diversions will potentially over-freshen receiving basins.

Elements of the public expressed concern that alternations of salinity regimes in the LCA as a result of proposed restoration features would adversely impact commercial and recreational fisheries.

5. Concern with impediments to navigation and proposed re-routing of the Mississippi River and the Atchafalaya River Navigation channels.

Elements of the public expressed concern that proposals to re-route portions of the Mississippi River and the Atchafalaya River Navigation channels could result in delays and restricted access, which could interrupt the transport of goods and commodities into and out of various ports in the LCA.

6. Real property rights issues such as public access, mineral rights, and the public's perception that Federal monies are being spent on restoring private properties.

Elements of the public expressed concern that restoration efforts using public funds (i.e. Federal funds) could result in situations where some or a majority of benefits (e.g. land building) would occur on private lands.

Management of Plan Implementation

Execution of the LCA Plan will require a concerted and collaborative effort between the USACE, the State of Louisiana, and other state and Federal agencies. For this reason, an LCA specific management plan was developed. This plan centers Program Management at the Division level, with Program Execution at the District level. The management plan maximizes concurrent and supporting efforts between the Program Managers, the USACE Washington Headquarters, and the Assistant Secretary of the Army for Civil Works. Program management and execution is conducted in full partnership with the non-Federal sponsor and in collaboration with other Federal and state resource agencies. Collaboration amongst other Federal agencies and the program is ensured through the involvement of a Federal Task Force comprised of members equivalent in authority and responsibility to the Secretary of the Army.

Key to the success of the program is the infusion of the best available science and engineering for the purposes of development and implementation of restoration plans. For this reason a supporting S&T Program and S&T Office is proposed to work hand in hand with the Program Management and Program Execution Teams throughout plan implementation. Since the coastal ecosystem is dynamic and the state of science is evolving, a system of advancing science and, “learn while building” will be instituted. The key to success is the implementation of Adaptive Environmental Assessment and Management (AEAM) principles into the program management.

To protect the public investment and ensure that future public and private actions do not detract from restoration or are leveraged to increase restoration opportunities, a robust and vigorous consistency review will be a responsibility of the Program Execution Team.

LOUISIANA COASTAL AREA (LCA), LOUISIANA

ECOSYSTEM RESTORATION STUDY

MAIN REPORT

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES