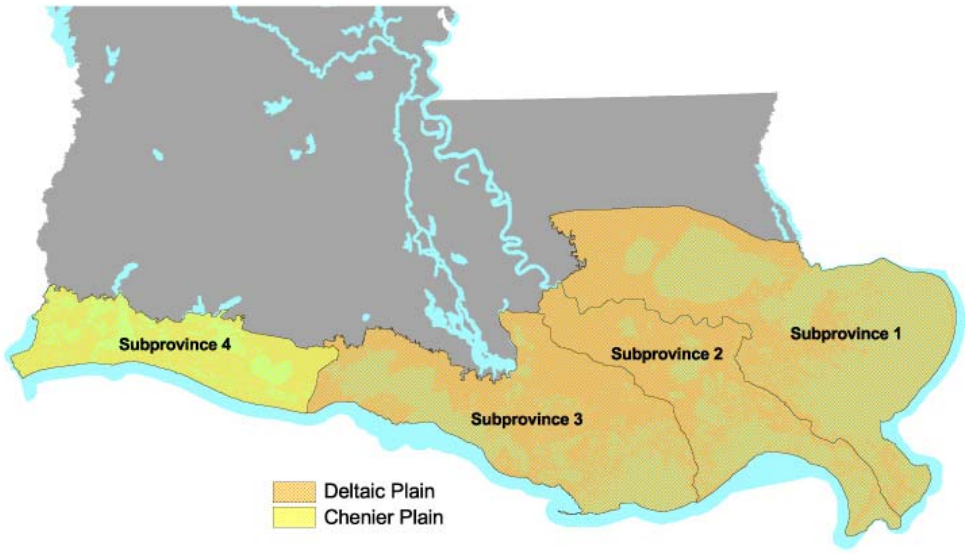
Overview of the Louisiana Coastal Area (LCA) Ecosystem Restoration Study

Tentatively Selected Plan



Public Meetings - July and August 2004

Chalmette, LA – July 27
Cameron, LA – July 28
Beaumont, TX – July 29
Larose, LA – August 3
New Iberia, LA – August 4
Mandeville, LA – August 5
Alexandria, LA – August 9
Bay St. Louis, MS – August 10
Memphis, TN – August 12

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Seven Components of the Tentatively Selected Plan (TSP)

I. Initial Near-Term Critical Restoration Features*
   1. Mississippi River Gulf Outlet Canal (MRGO)
   2. Small diversion at Hope Canal
   3. Barataria Basin barrier shoreline restoration
   4. Small Bayou Lafourche reintroduction
   5. Medium diversion with dedicated dredging at Myrtle Grove

II. Other Near Term Critical Restoration Features**
   6. Multi-purpose operation of the Houma Navigation Canal Lock
   7. Terrebonne Basin barrier shoreline restoration, E. Timbalier, Isle Dernieres
   8. Maintain land bridge between Caillou Lake and Gulf of Mexico
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   10. Increase Amite River Diversion Canal influence by gapping banks
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   12. Stabilize Gulf shoreline at Pointe Au Fer Island
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III. Beneficial Use of Dredged Material*

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V. Science & Technology Program Demonstration Projects*
   - 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

VI. Science & Technology Program*

VII. Studies on Long-Term, Large Scale Restoration Concepts**
   - Mississippi River Delta Management Study
   - Third Delta Study
   - Upper Atchafalaya Study including alternative operational schemes for the Old River Control Structure
   - Chenier Plain Freshwater Management and Allocation Reassessment Study
   - Acadiana Bay Estuarine Restoration Study

* *Programmatic Authorization* - A process by which a project or project feature is authorized subject to completion of the necessary decision documents, such as a feasibility-level decision document for construction. The project/feature can be approved by the Secretary of the Army and implemented subject to availability of funds.

** *Standard Authorization* - A process by which the necessary decision documents are developed for the Secretary of the Army for submission to the Administration. The Administration, in turn, submits the document to Congress for authorization of project/features. Project features can be implemented subject to availability of funds.

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I. Overview

The LCA contains one of the largest expanses of coastal wetlands in the continental 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 recognized and appreciated worldwide.

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, built in concert with smaller projects, will be required to effectively deal with the problem. 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).

A combination of human and natural factors has contributed to land loss as evidenced by the sinking of the Leeville Cemetery in Leeville, La.

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.

The goal of the LCA Study 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 Study 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.

In an effort to guide plan formulation, two tiers of planning objectives and sorting and critical needs criteria were established. Concepts and features considered in the study, including freshwater diversions, sediment diversions, dedicated dredging/marsh creation, and barrier island protection, may effectively accomplish these planning objectives and address the critical needs of the LCA.

<u>Hydrogeomorphic Objectives</u>:

1. Establish dynamic salinity gradients that reflect natural cycles of freshwater availability and marine forcing (fluctuation related to normal daily and seasonal tidal action or exchange).
2. Increase sediment input from sources outside estuarine basins, and manage existing sediment resources within estuarine basins, to sustain and rejuvenate existing wetlands and rebuild marsh substrate.
3. Maintain or establish natural landscape features and hydrologic processes that are critical to sustainable ecosystem structure and function.

Ecosystem Objectives:

1. Sustain productive and diverse fish and wildlife habitats.
2. Reduce nutrient delivery to the Continental shelf by routing Mississippi River waters through estuarine basins while minimizing potential adverse effects

Sorting Criteria

1. Engineering and design complete and construction started within 5 to 10 years.
2. Based upon sufficient science and engineering understanding of processes.
3. Implementation is independent; does not require another restoration feature to be implemented first.

Critical Needs Criteria

1. Prevents future land loss where predicted to occur.
2. (Sustainability) Restores fundamentally impaired (or mimics) deltaic function through river reintroductions.
3. (Sustainability) Restores or preserves endangered critical geomorphic structure.
4. Protects vital socio-economic resources.

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II. Components of the Tentatively Selected Plan (TSP)

Initial Near-Term Critical Restoration Features

It is recommended that Congress programmatically authorize implementation of five near-term critical restoration features, subject to review and approval of feasibility-level decision documents by the Secretary of the Army (**figure 1**). These feasibility-level decision documents will be developed for each of the initial restoration features and will document planning; engineering and design; real estate analyses; and supplemental requirements under the National Environmental Policy Act (NEPA). The combined total cost of the five near-term restoration features is approximately $786 million. Construction costs for the individual near-term restoration features include:

> ***Programmatic Authorization*** - A process by which a project or project feature is authorized subject to completion of the necessary decision documents, such as a feasibility-level decision document for construction. The project/feature can be approved by the Secretary of the Army and implemented subject to availability of funds.

- *Mississippi River Gulf Outlet Canal (MRGO)($80 million)*
- *Small diversion at Hope Canal ($30 million)*
- *Barataria Basin barrier shoreline restoration ($181 million)*
- *Small Bayou Lafourche reintroduction ($90 million)*
- *Medium diversion with dedicated dredging at Myrtle Grove ($147 million)*

Other Near-Term Critical Restoration Features

The ten near-term critical restoration features (**figure 2**) that are to be submitted to Congress for standard authorization in future Water Resources Development Acts (WRDAs) include:

> ***Standard Authorization*** - A process by which the necessary decision documents are developed for the Secretary of the Army for submission to the Administration. The Administration, in turn, submits the document to Congress for authorization of project/features. Project features can be implemented subject to availability of funds.

- *Multi-purpose operation of the Houma Navigation Canal Lock ($0)*
- *Terrebonne Basin barrier shoreline restoration, E. Timbalier, Isle Dernieres ($85 million)*
- *Maintain land bridge between Caillou Lake and Gulf of Mexico ($41 million)*
- *Small diversion at Convent/Blind River ($29 million)*
- *Increase Amite River Diversion Canal influence by gapping banks ($3 million)*
- *Medium diversion at White's Ditch ($35 million)*
- *Stabilize Gulf shoreline at Pointe Au Fer Island (32 million)*
- *Convey Atchafalaya River water to northern Terrebonne marshes ($132 million)*
- *Re-authorization of Caernarvon Diversion – optimize for marsh creation ($2 million)*
- *Re-authorization of Davis Pond – optimize for marsh creation ($2 million0*

Beneficial Use of Dredged Material

The beneficial use of dredged material is one restoration tool to create new and restore existing wetlands in the coastal area.

The U.S. Army Corps of Engineers (USACE) - Mississippi Valley Division, New Orleans District (District) has the largest annual channel Operation & Maintenance (O&M) program in the USACE, with an annual average of 70 million cubic yards (mcy) of material dredged. Currently, approximately 14.5 mcy of this material is beneficially used 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 existing O&M program and the CAP Section 204, which provides $15 million in annual funding for beneficial use projects throughout USACE, do not provide the resources for the District to take full advantage of the available sediment resources. Each year, there is reasonable potential to beneficially use an additional 30 mcy of dredged material if funding were made available. The TSP recommends $100 million in programmatic authority to allow for the extra cost needed for beneficial use of dredged material (**figure 3**).

Authority to Initiate Studies of Modifications to Existing Water Control 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 LCA 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 authorities to initiate studies of existing structures utilizing funds within the LCA appropriations, not to exceed $10 million (**figure 4**).

Science & Technology Program Demonstration Projects

The purpose of LCA S&T Program demonstration projects is to resolve critical areas of scientific, technical, or engineering uncertainty while providing meaningful restoration benefits whenever possible. After design, construction, monitoring, and assessment of individual demonstration projects, the LCA program will leverage the lessons learned to improve the planning, design, and implementation of other LCA restoration projects. Demonstration projects under the S&T Program would be funded as an authorized item at a total amount not to exceed

$175 million. The five initial candidate demonstration projects have an estimated total project cost of $82.3 million. Responding to the need for an additional 5 to 20 demonstrations projects to be defined during implementation, the LCA Programmatic Authority for demonstration projects would include an additional $92.7 million. Demonstration projects recommended in the TSP include:

- *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*

Science & Technology Program

The TSP includes a recommendation for programmatic authorization for a 10-year Science and Technology (S&T) Program, which would be funded as an authorized item at a total amount not to exceed $100 million. The LCA S&T Program would provide a strategy, organizational structure, and process to facilitate integration of science and technology into decision-making processes. 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 features, as well as other coastal restoration projects and programs, such as CWPPRA. A major component of the S&T Program would be programmatically authorized demonstration projects.

Feasibility Studies for the Continued Development of Long-Term and Large Scale Restoration Concepts

During plan formulation, the Project Delivery Team (PDT) identified several long-term and large-scale restoration concepts for potential incorporation into the TSP. These restoration concepts exhibited significant potential to help achieve 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.

Recommended studies on long-term, large-scale restoration concepts include:

- *Mississippi River Delta Management Study*
- *Third Delta Study*
- *Upper Atchafalaya Basin Study including evaluation of alternative operational schemes of Old River Control Structure*
- *Chenier Plain Freshwater Management and Allocation Reassessment Study*
- *Acadiana Bay Estuarine Restoration Study*

A critical first step of the Mississippi River Delta Management, Third Delta, and Upper Atchafalaya Basin Studies would be the development of a Mississippi River hydrodynamic model because the restoration concepts for all three studies involve and rely on the same resource, the Mississippi River.

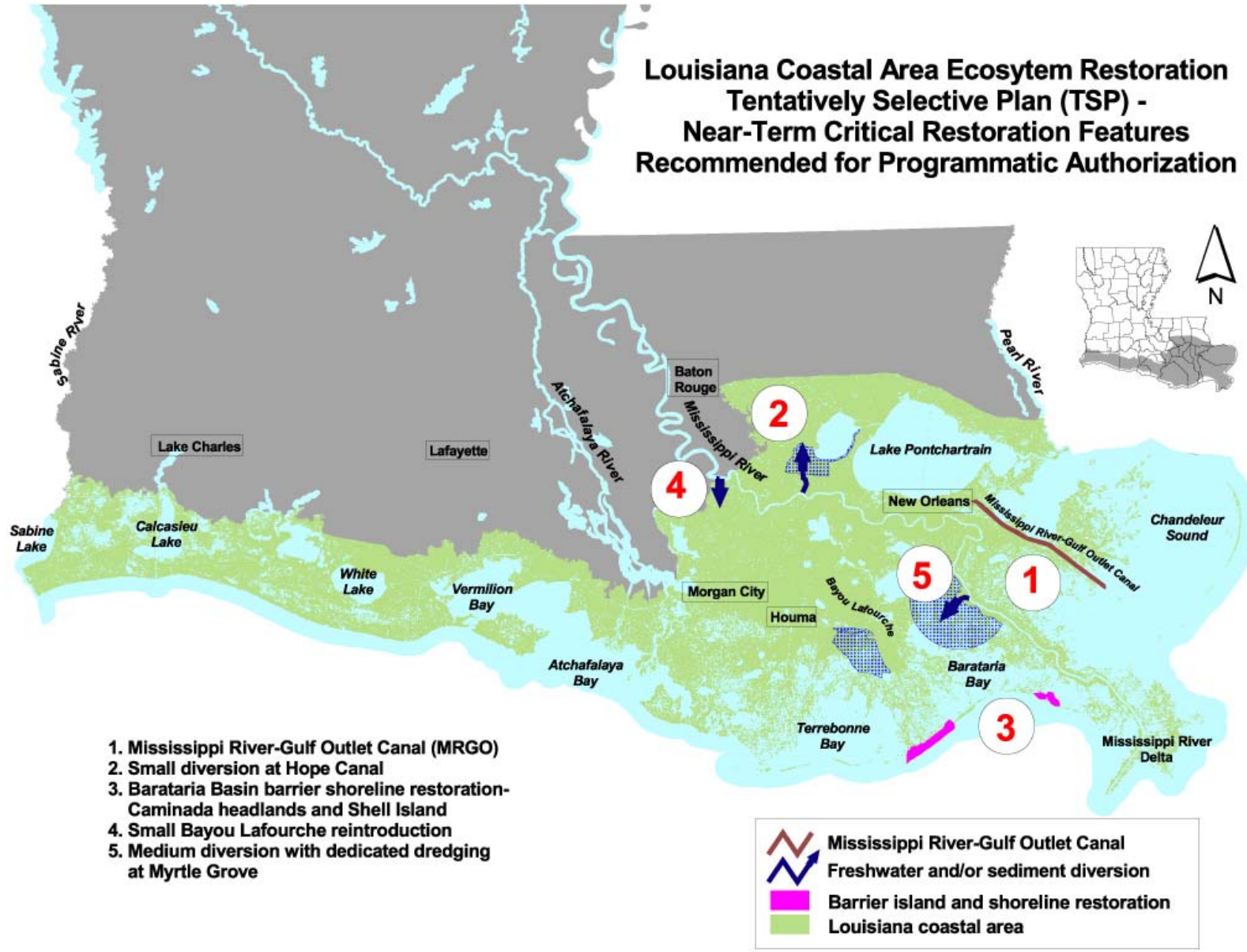

Figure 1. Initial Near-Term Critical Restoration Features

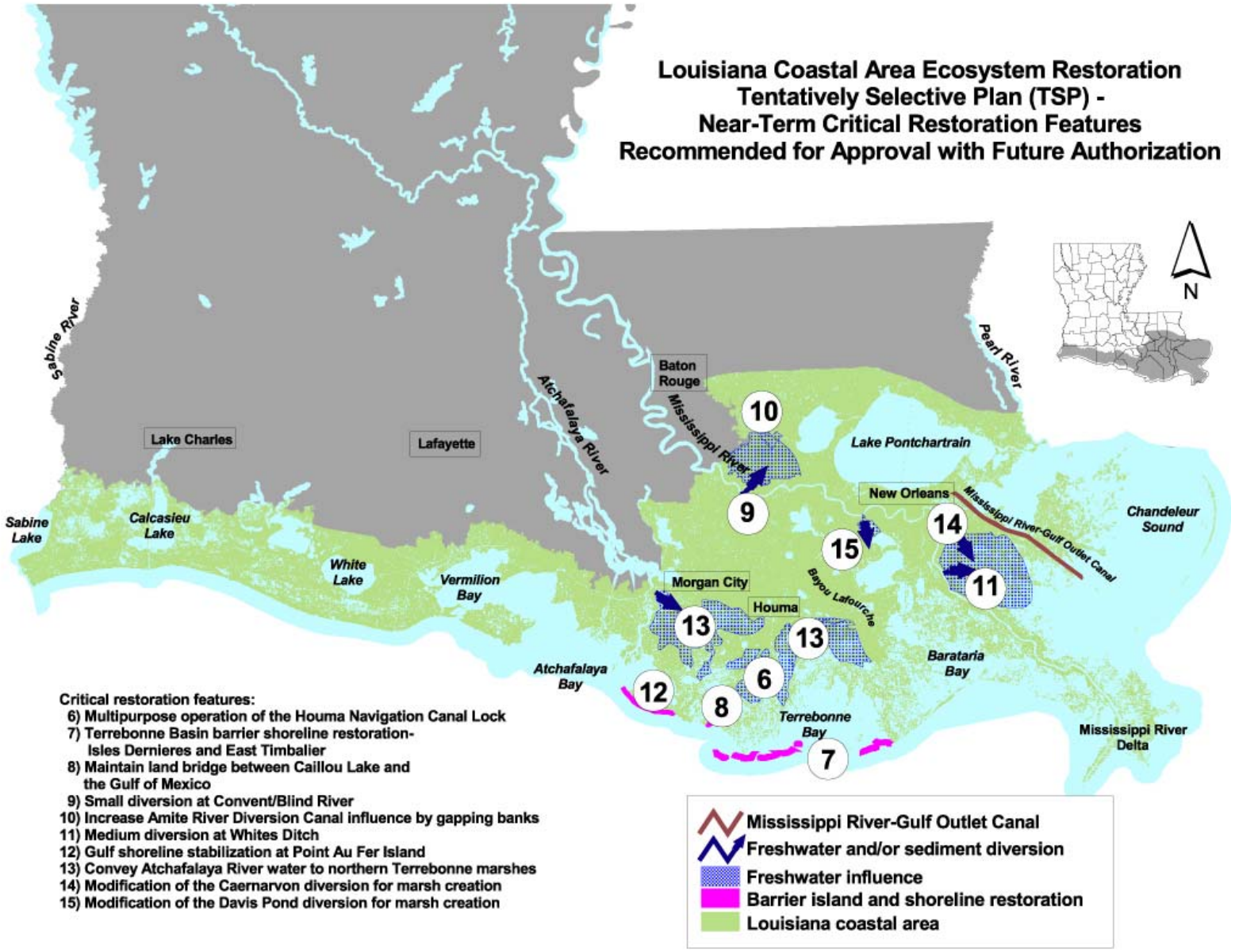

Figure 2. Other Near-Term Critical Restoration Features

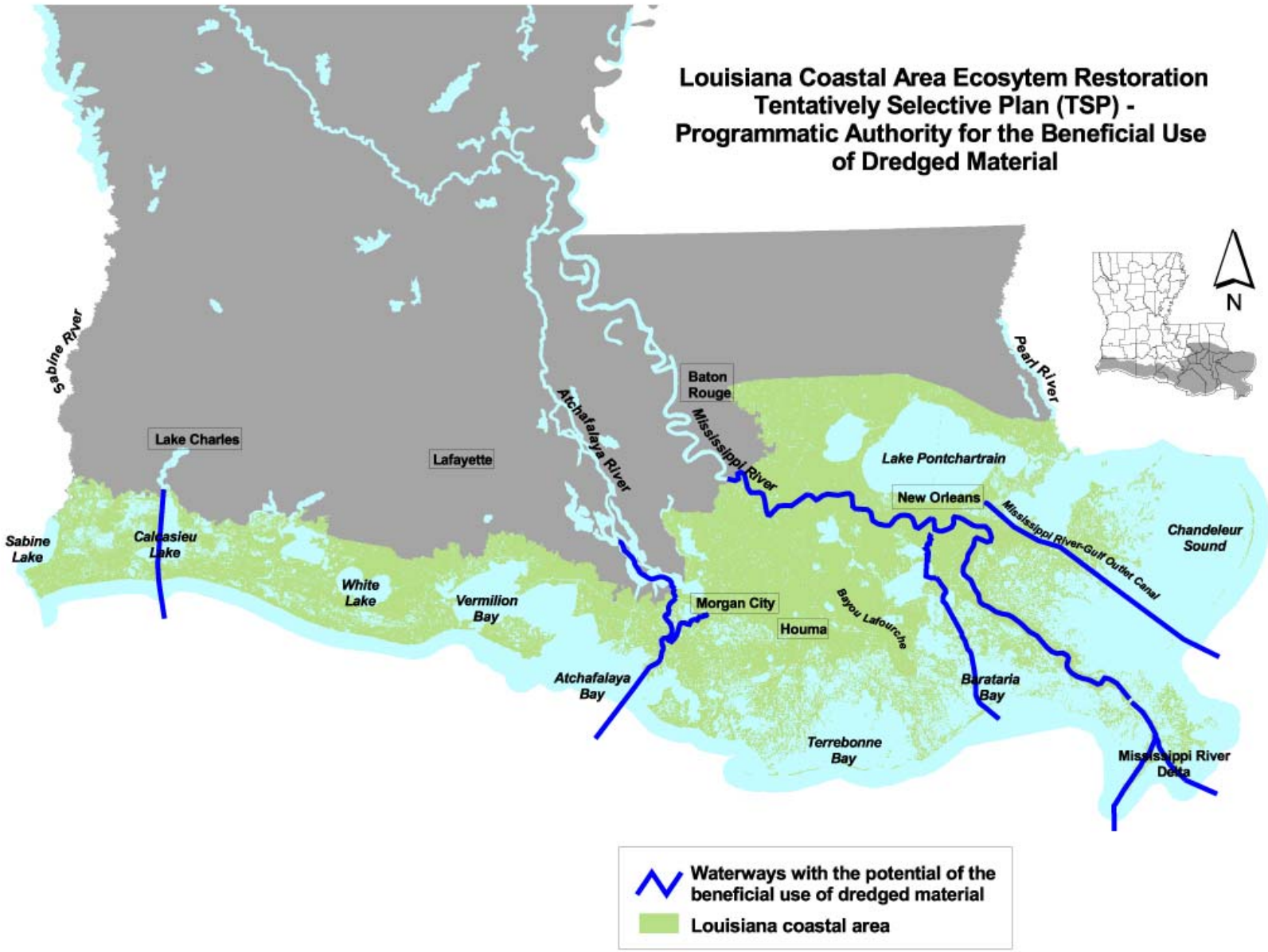

Figure 3. Potential Sources for Beneficial Use of Dredged Materials

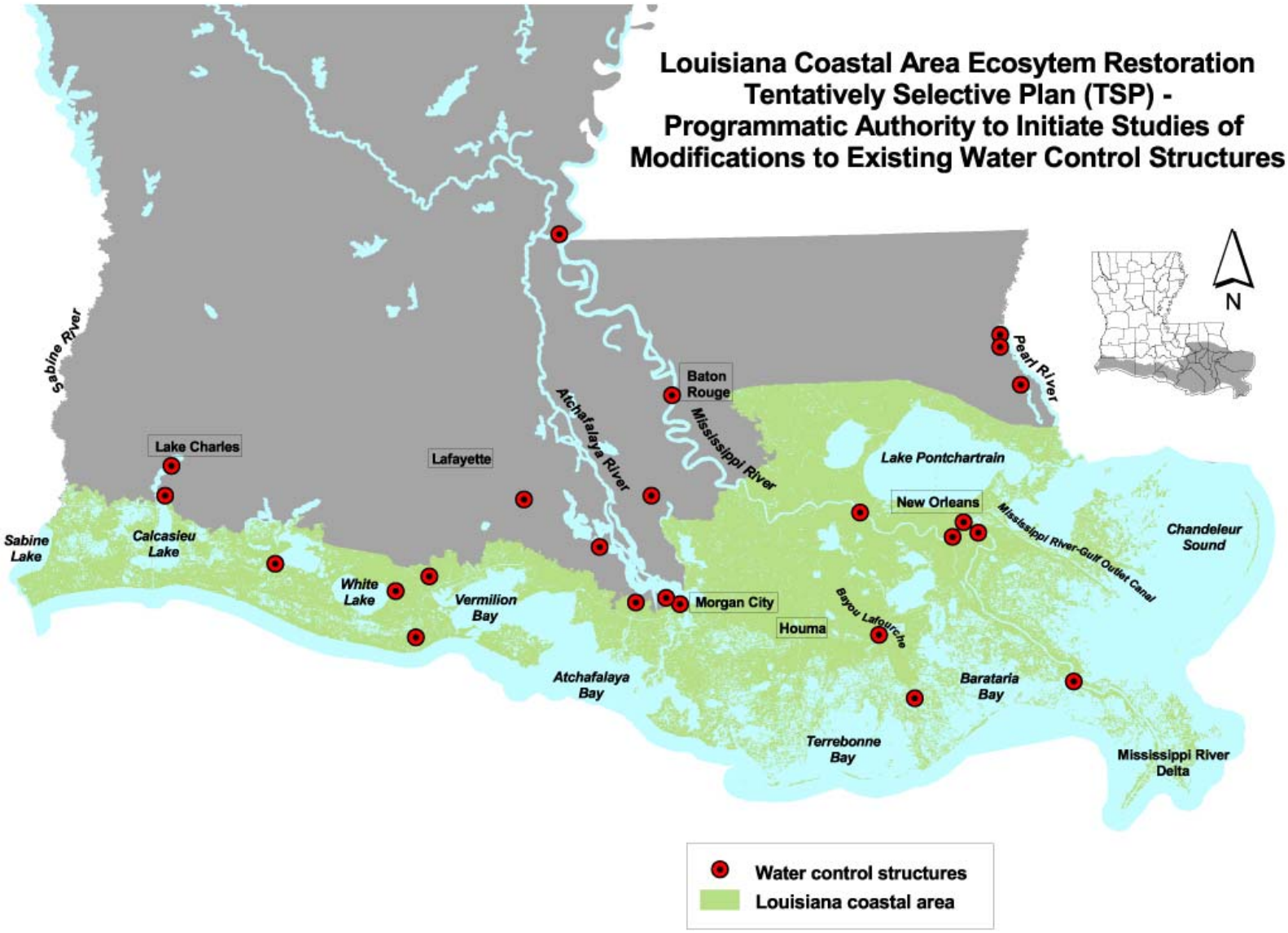

Figure 4. Existing Water Control Structures That Could Potentially Be Modified for Louisiana Coastal Area Restoration Efforts

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III. Subprovince 1

Near-Term Critical Restoration Features

Mississippi River Gulf Outlet Canal

In response to public concerns, adverse environmental effects, and national economic development considerations, an ongoing study is re-evaluating the viability of operation and maintenance of the Mississippi River Gulf Outlet Canal (MRGO). Since the construction of this authorized navigation channel, saltwater intrusion and boat wake erosion have degraded large expanses of freshwater marshes and accelerated habitat switching from freshwater marshes to brackish and intermediate marshes in the Biloxi marshes, the Central Wetlands, and the Golden Triangle wetlands. This critical restoration feature proposes to construct rock breakwaters along the entire north bank of the MRGO and along important segments of the southern shoreline of Lake Borgne that may breach in the near future.

Unprotected, fragile wetlands along the MRGO are susceptible to erosion from ship wakes

Small diversion at Hope Canal (CWPPRA Maurepas diversion)

This restoration feature involves a small diversion from the Mississippi River through a new control structure at Hope Canal. The objective is to introduce sediments and nutrients into Maurepas Swamp south of Lake Maurepas. The introduction of additional freshwater via the diversion would facilitate organic deposition, improve biological productivity, and prevent further deterioration of the swamp. Initial Engineering and Design (E&D) and NEPA compliance has been initiated under CWPPRA.

Small Diversion at Convent/Blind River

This restoration feature involves a small diversion from the Mississippi River into Blind River through a new control structure. The objective of this feature is to introduce sediments and nutrients into the southeast portion of Maurepas Swamp. This feature is intended to operate in conjunction with the Hope Canal diversion to facilitate organic deposition in the swamp, improve biological productivity, and prevent further swamp deterioration.

Increase Amite River Diversion Canal Influence by Gapping Banks

This restoration feature involves the construction of gaps in the existing dredged material banks of the Amite River Diversion Canal. The objective of this feature is to allow floodwaters through the gaps and introduce additional nutrients and sediment into western Maurepas Swamp. The exchange of flow would occur during flood events on the river and from the runoff of

localized rainfall events. This feature would provide nutrients and sediment to facilitate organic deposition in the swamp, improve biological productivity, and prevent further swamp deterioration.

Re-authorization of Caernarvon Diversion – Optimize for Marsh Creation

The Caernarvon diversion structure, constructed on the Mississippi River in 1992 near the Breton Sound marshes, has a maximum operating capacity of 8,000 cubic feet per second (cfs). The structure has been operated as a salinity management feature, with freshwater introductions ranging between 1,000 cfs to 6,000 cfs, but in general averaging something less than half of the structure's capacity. The primary purpose of the existing Caernarvon project has been to maintain salinity gradients in the central portion of Breton Sound. This operation, in effect, partially restored the historic functions of marsh nourishment (e.g., freshwater inflow, providing nutrients and sediment to the marsh, and countering the effects of subsidence). The proposed restoration feature would seek an authorization change of the Caernarvon project purpose to include wetland creation and restoration, thereby altering the project's operational plan. This would allow an increase in the freshwater introduction rate, perhaps 5,000 cfs on average, to accommodate the wetland building function of the system. The introduction of additional freshwater would facilitate organic and sediment deposition, improve biological productivity, and prevent further deterioration of the marshes. This feature is located in the vicinity of a historic crevasse.

Medium Diversion at White's Ditch

This restoration feature provides for a medium diversion from the Mississippi River into the central River aux Chenes area using a controlled structure in the vicinity of White's Ditch. The objective of the feature is to provide additional freshwater, nutrients, and fine sediments to the area between the Mississippi River and River aux Chenes ridges. This area is currently isolated from the beneficial effects of the Caernarvon freshwater diversion. The introduction of additional freshwater would facilitate organic sediment deposition, improve biological productivity, and prevent further deterioration of the marshes. This feature is located in the vicinity of a historic crevasse.

Studies on Long-Term, Large Scale Restoration Concepts

Mississippi River Delta Management Study

This restoration concept requires detailed investigations to address the maximization of river resources, such as excess freshwater and sediments, for wetland restoration. The objective of this concept is to greatly increase the deposition of Mississippi River sediments on the shallow continental shelf, while ensuring navigation interests. Sediment, nutrients, and freshwater would be re-directed to restore the quality and sustainability of the Mississippi River Deltaic Plain, its coastal wetland complex, and the Gulf of Mexico. The study would investigate potential modifications to existing navigation channel alignments and maintenance procedures and requirements.

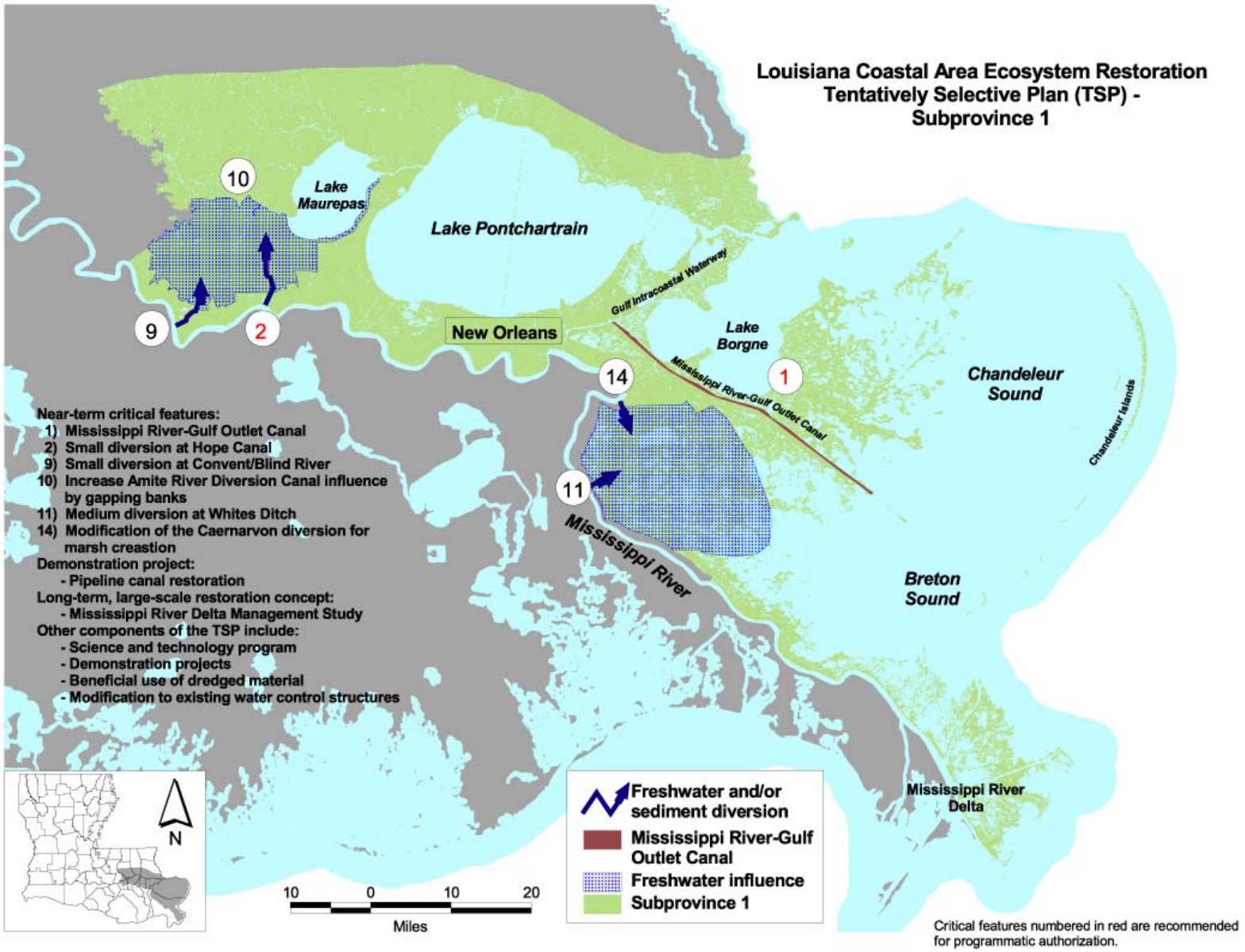


Figure 5. Restoration Components of the Tentatively Selected Plan in Subprovince 1

IV. Subprovince 2

Near-Term Critical Restoration Features

Barataria Basin Barrier Shoreline Restoration

This restoration feature involves mining offshore sediment sources to reestablish sustainable barrier islands. The feature is based on designs developed in the LCA Barataria Barrier Island Restoration Study (an earlier coastal interim report) and assumes a 3,000-foot wide island footprint. The critical areas include the Caminada-Moreau Headland (an area between Belle Pass and Caminada Pass) and Shell Island (a barrier island in the Plaquemines barrier island system). These barrier shoreline segments are critical components of the Barataria shoreline. The Caminada-Moreau Headland protects the highest concentration of near-gulf oil and gas infrastructure in the coastal zone. This reach of the Barataria shoreline also supports the only land-based access to the barrier shoreline in the Deltaic Plain. The Shell Island segment has been nearly lost, and failure to take restorative action could result in the loss of any future options for restoration. Loss of the Shell Island segment would result in permanent modification of the tidal hydrology of the Barataria Basin. The Shell Island segment is the only remaining natural barrier between the Gulf and lower Plaquemines Parish.

Small Bayou Lafourche Reintroduction

This restoration feature would reintroduce flow from the Mississippi River into Bayou Lafourche. The pumped flow would be continuous and would increase riverine influence in the wetlands between Bayous Lafourche and Terrebonne, south of the GIWW. Several alternatives are being considered which would provide year-round flow into the bayou, including gated culverts and a pump/siphon station at Donaldsonville, and initial E&D has been initiated under CWPPRA. Additional features that would be required, regardless of the type of diversion structure built, include modification of existing infrastructure, bank stabilization, dredging, and channel improvements.

Medium Diversion with Dedicated Dredging at Myrtle Grove

This restoration feature involves a medium diversion from the Mississippi River near Myrtle Grove through a new control structure. The diversion would provide additional sediment and nutrients to highly degraded fresh to brackish wetlands in shallow open water areas. Reintroduction would ensure the long-term sustainability of these marshes by increasing plant productivity, thereby preventing future loss. The introduction of sediment to this area would also promote the infilling of shallow open water areas both through deposition and marsh expansion. Dedicated dredging of sediment mined from the Mississippi River would complement this feature. This feature is located in the vicinity of a historic crevasse. Work has been initiated on engineering and design and NEPA compliance under CWPPRA.

Re-authorization of Davis Pond – Optimize for Marsh Creation

The Davis Pond diversion structure, constructed in 2002 in upper Barataria Basin, has a maximum operating capacity of 10,600 cfs. The structure has been operated as a salinity management feature, with freshwater introductions from the Mississippi River ranging from 1,000 cfs up to 5,000 cfs averaging, to this point in time, considerably less than half of the structure's capacity. The primary purpose of the existing Davis Pond project has been to maintain salinity gradients in the central portion of Barataria Basin. This operation, in effect, partially restored the historic functions of marsh nourishment (e.g., freshwater inflow, providing nutrients and sediment to the marsh, and countering the effects of subsidence). This restoration feature would seek an authorization change of the Davis Pond project purpose to include wetland creation and restoration, thereby altering the project's operational plan. This would allow an increase in the freshwater introduction rate, perhaps 5,000 cfs on average, to accommodate the wetland building function of the system. The introduction of additional freshwater would facilitate organic and sediment deposition, improve biological productivity, and prevent further deterioration of the marshes. This feature is located in the vicinity of a historic crevasse.

Originally built as a freshwater diversion, Davis Pond, located in Luling LA, would be modified under the LCA Plan to include wetland creation and restoration

Demonstration Projects

Marsh Restoration and/or Creation Using Saline Sediments

This demonstration project would address the uncertainty involved in selecting sources of material for marsh creation, restoration of maritime forests, and restoration of freshwater cheniers. There is uncertainty regarding the effectiveness of using saline mineral soils to support freshwater habitats. Uncertainties regarding the time required for soil to leach out salts and increase organic matter content so soils are suitable for the establishment of freshwater vegetation needs to be resolved prior to using this technique on a large scale.

This demonstration project would be located in the southwestern Barataria Basin, just north of Port Fourchon, in the "Chenier Unit" of the partially completed Barataria Basin Marsh Creation Study. This project would be constructed in four 200-acre cells, each one constructed using different methods of placement to include spray dredge and unconfined/semi-confined traditional hydraulic techniques at varying depths.

Project monitoring would determine plant mortality and landform stability occurring within the different cells. Monitoring would also evaluate impacts related to the acquisition of borrow material and its effect on the local ecosystem. Approximate design and construction costs for this demonstration project would total $12 million.

Pipeline Canal Restoration Using Different Methods

This demonstration project would address uncertainties involved in the restoration of pipeline canals. Pipeline canals have been cut throughout the coastal marshes and have resulted in fragmentation and accelerated erosion of many of the marshes. There has been considerable uncertainty and debate about the most effective approach to restoring existing and future pipeline canals. There are also uncertainties about the viability of restoration efforts and the timing of restoration. Different approaches to restoration should be examined and monitored including: 1) backfill with small hydraulic dredge; 2) cross dikes to construct cells and improvements on effluent discharge location; 3) mechanical backfill; 4) gaps in the spoil bank to restore natural hydrology; and 5) test plugs as stand alone features to reduce erosion within the canal. If backfill is used, impacts related to the acquisition of borrow material and its effect on the local ecosystem must be addressed.

This demonstration project would be constructed in the Barataria and Terrebonne basins, with planned closure of twenty different canal sections via the five different methods described above. Approximate design and construction costs for this demonstration project would be $20 million within each test section at approximately $1 million.

Studies on Long-Term, Large Scale Restoration Concepts

Mississippi River Delta Management Study

The Mississippi River Management Study is the same as the one described for Subprovince 1 on page 18.

Third Delta Study

This feature provides for a large diversion from the Mississippi River through a new control structure in the vicinity of Donaldsonville. This feature provides for an approximately 240,000 cfs diversion at maximum river stage. Flows would be diverted into a newly constructed conveyance channel (parallel to Bayou Lafourche) extending approximately 55 miles from the initial point of diversion to the eventual point of discharge. Diverted flow would be divided equally at a point north of the GIWW to enable the creation of a deltaic wetlands complex in the Barataria and Terrebonne Basins. A possible alternative configuration could involve a 120,000 cfs diversion, at maximum river stage, into the Barataria Basin only. Enrichment of this diversion would also be considered and assumes use of 30-inch dredge at capacity for three months yielding 6,293,000 yd^3 each year. The study requires significant investigations of flood control, drainage, and navigation impacts, in addition to environmental and design efforts.

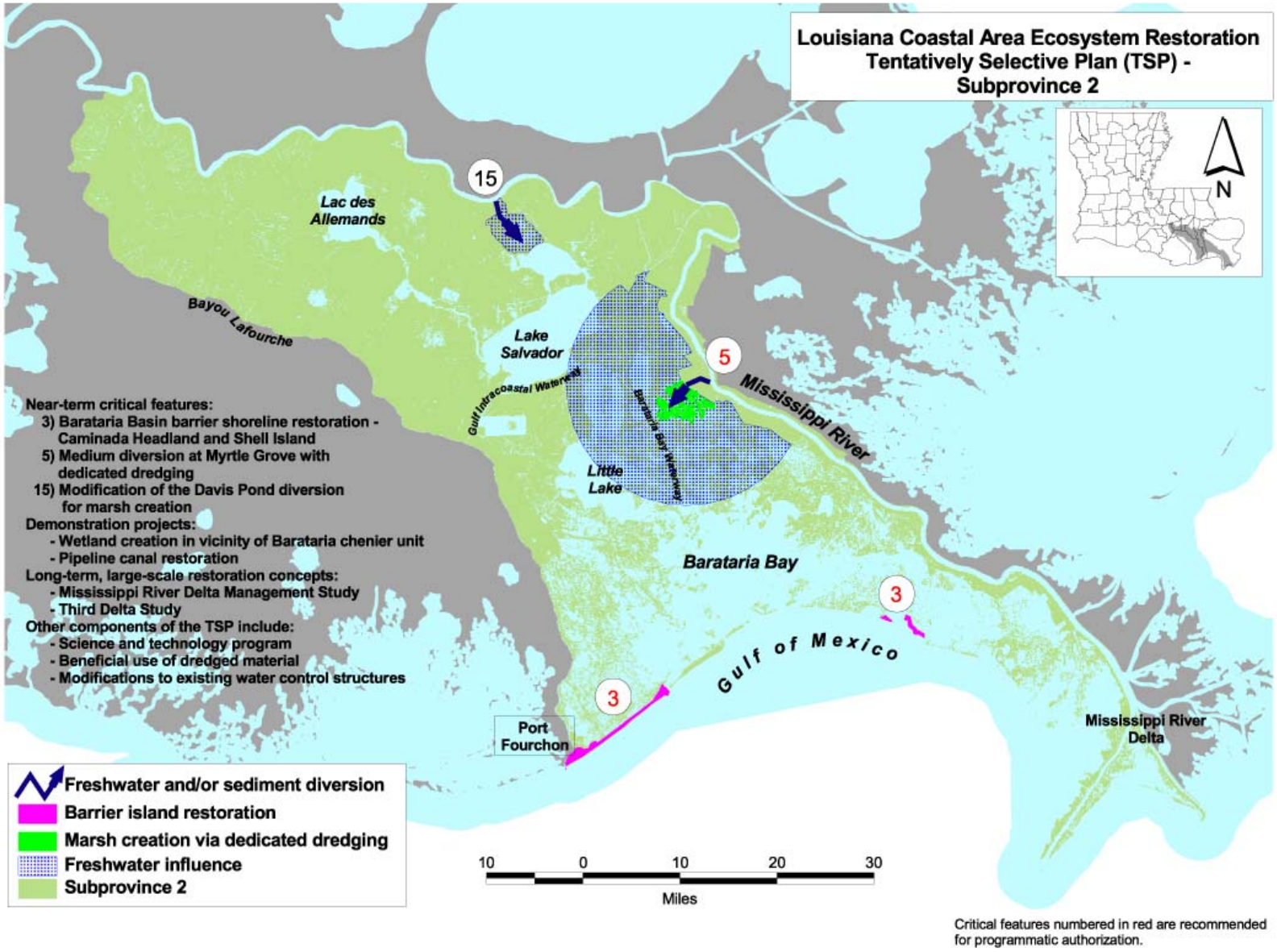


Figure 6. Restoration Components of the Tentatively Selected Plan in Subprovince 2

V. Subprovince 3

Near-Term Critical Restoration Features

Multi-purpose Operation of the Houma Navigation Canal Lock

This restoration feature involves the multi-purpose operation of the proposed Houma Navigation Canal (HNC) Lock, located at the southern end of the HNC. The Morganza to the Gulf Hurricane Protection Study includes construction of the lock, but does not include the multi-purpose operation of the lock. The objective of this feature is to make more efficient use of Atchafalaya River waters and sediment flow, as well as maintain salinity regimes favorable for area wetlands. The proposed structure would be operated to restrict saltwater intrusion and distribute freshwater and sediments during times of high Atchafalaya River flow. The current project is designed to limit saltwater intrusion, but with a minor modification, it would provide additional benefits to the wetlands by increasing retention time of Atchafalaya River water in the Terrebonne Basin wetlands. An increased retention period would provide additional time for sediment and nutrients to nourish the wetlands, thus benefiting the forested wetlands, and fresh, intermediate, and brackish marshes adjacent to the lock and canal; the Lake Boudreaux wetlands to the north; the Lake Mechant wetlands to the west; and the Grand Bayou wetlands to the east.

Terrebonne Basin Barrier-Shoreline Restoration, E. Timbalier, Isle Dernieres

This feature would restore the Timbalier and Isles Dernieres barrier island chains by reducing the number of breaches, increase the widths, or footprints, of the Isles Dernieres (East Island, Trinity Island, and Whiskey Island) and East Timbalier Island, and restoring dune crests to those conditions that were present prior to Hurricane Andrew in 1992.

Maintain Land Bridge Between Caillou Lake and Gulf of Mexico

This restoration feature would maintain the land bridge between the Gulf of Mexico and Caillou Lake by placing shore protection in Grand Bayou du Large to minimize saltwater intrusion. This feature would involve rock armoring or marsh creation to plug/fill broken marsh areas on the west bank of lower Grand Bayou du Large, thereby preventing a new channel from breaching the bayou bank and allowing a new hydrologic connection with Caillou Lake. Some gulf shore armoring would be needed to protect the area from erosion on the gulf shoreline. Gulf shoreline armoring might be required where shoreline retreat and loss of shoreline oyster reefs has allowed increased water exchange between the gulf and the interior water bodies (between Bay Junop and Caillou Lake). Some gaps in the barrier between these two water bodies would be closed to restore historic hydrologic connections. By reducing marine influences in these interior areas, this feature would allow increased freshwater influence from Four League Bay to benefit marshes in the surrounding areas.

Small Bayou Lafourche Reintroduction

This restoration feature is the same as the one described for Subprovince 2 on page 20.

Convey Atchafalaya River Water to Northern Terrebonne Marshes

This restoration feature would enhance existing Atchafalaya River influence to central (Lake Boudreaux) and eastern (Grand Bayou) Terrebonne marshes via the Gulf Intracoastal Waterway (GIWW) by introducing flow into the Grand Bayou basin by enlarging the connecting channel (Bayou L'Eau Bleu) to capture as much of the surplus flow (max. 2,000 to 4,000 cfs) that would otherwise leave the Terrebonne Basin. Several alternatives would be evaluated through hydrologic models; however in all cases, gated control structures would be installed to prevent increased saltwater intrusion during the late summer and fall when riverine influence is typically low. Some alternatives may include auxiliary freshwater distribution structures. This feature also includes repairing banks along the GIWW and enlarging constrictions in the GIWW.

Stabilize Gulf Shoreline at Pointe Au Fer Island

This feature provides for stabilizing of the gulf shoreline of Point Au Fer Island. The objective is to prevent direct hydrologic connections from forming between the gulf and interior water bodies as the barrier island erodes. In addition to gulf shoreline protection, this feature would prevent the fresher bay side water circulation patterns from being influenced directly by the gulf, thus protecting high quality estuarine habitats from converting to marine habitat.

Demonstration Projects

Land Bridge Restoration Using Long-Distance Conveyance of Sediments

This demonstration project, through long distance conveyance of sediments via pipeline, would address the uncertainty involved in land bridge restoration. Concerns about the cost effectiveness of using conventional dredging techniques to transport large quantities of sediments long distances from sediment sources must be addressed. While conventional dredging equipment typically requires large pipelines for transport of sediments over shorter distances (~ 1 to 4 miles), there are uncertainties about how the material can be effectively transported efficiently over longer distances (~5 miles and beyond) and properly distributed. Variability in the sections of the land bridge would facilitate monitoring to determine optimal final grade vs. design grade, dewatering periods, and potential water quality effects of transported materials. Tests should also be conducted to apply a two-tiered approach whereby large pipeline systems are used to convey high volumes of material but smaller dredges could be used to then disperse the material into final locations.

This demonstration project would be located along the degrading land bridge between Bayous Dularge and Grand Caillou in the lower Terrebonne Basin. Approximate design and construction costs for this demonstration project would be $10.3 million.

Pipeline Canal Restoration Using Different Methods

This demonstration project is the same as the one described for Subprovince 2 on page 22.

Barrier Island Restoration Using Offshore Sources of Sediments

This demonstration project would address uncertainties involved in restoration of barrier islands with offshore sources of sand. Focused research and restoration projects already completed in the Louisiana's coastal area have contributed to an understanding about the most effective and sustainable island geometry design. However, several issues remain regarding the potential sources of the large quantities of sediment required to re-establish or restore coastal barrier islands. Several sand sources have already been identified, such as Ship Shoal and the Lower Mississippi River. Issues related to Ship Shoal are the quantity of available material and the cost-effectiveness of using this source relative to other sources. Sand sources must be quantified and different transport mechanisms tested to determine a cost-effective approach. The demonstration project test sections would also vary in the types of sediment (percentage of sand/silt/clay) used for barrier islands and back barrier marsh creation. Monitoring would focus on vegetation growth and island stability.

This demonstration project would be constructed along sections of the Terrebonne barrier islands. Approximate design and construction cost for this demonstration project would be $20 million.

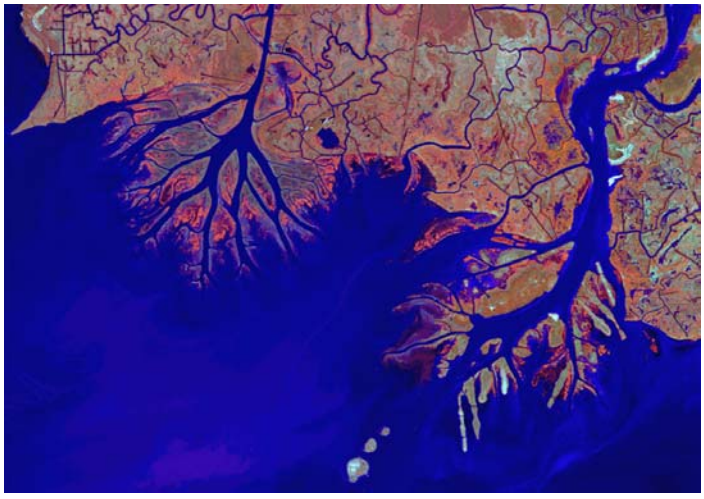
Studies on Long-Term, Large Scale Restoration Concepts

Third Delta Study

The Third Delta Study is the same as the one described for Subprovince 2 on page 22.

Upper Atchafalaya Basin Study Including Evaluation of Alternative Operational Schemes of Old River Control Structure

This feature would evaluate alternative Old River Control Structure (ORCS) operational schemes with a goal of increasing the sediment load transported by the Atchafalaya River for the purpose of benefiting coastal wetlands. The ORCS regulates the total water flows from the Red and Mississippi Rivers at the latitude of Old River, passing 30 percent of the flows down the Atchafalaya River and 70 percent down the Mississippi River on a yearly basis. Detailed studies of this feature would determine: impacts (beneficial and adverse) to the interior of the Atchafalaya Basin; the degree to which flow and sediment redistributions would be required; and the increased costs of maintaining the flood control, navigation, and environmental features long the Lower Mississippi, Red, and Atchafalaya Rivers.



Acadiana Bay Estuarine Restoration Study

Maximizing sediment delivery through the Old River Control Structure has the potential to sustain land building in the Lower Atchafalaya River Delta

The oyster shell reefs that composed the historic Point Chevreuil Reef were removed by shell dredging for the past several decades to gather aggregate for industrial and construction purposes. With the loss of the reef, Acadiana Bay has been subjected to extreme fluctuations in salinity resulting from the rapid draw down of the bay during winter frontal passages. Loss of the reef has also allowed for the filling of the lower portion of the bay with fine sediments as the Wax Lake Outlet Delta progrades gulfward. This restoration feature provides for rebuilding the historic Point Chevreuil Reef toward Marsh Island, and rehabilitating the Bayou Sale natural levee between Point Chevreuil and the gulf. The natural levee would be rebuilt in the forms of a shallow sub-aqueous platform, small islands, and small reefs. This feature was designed to help restore historic hydrologic conditions in the Teche/Vermilion Basin and prevent over-freshening of Acadiana Bay.

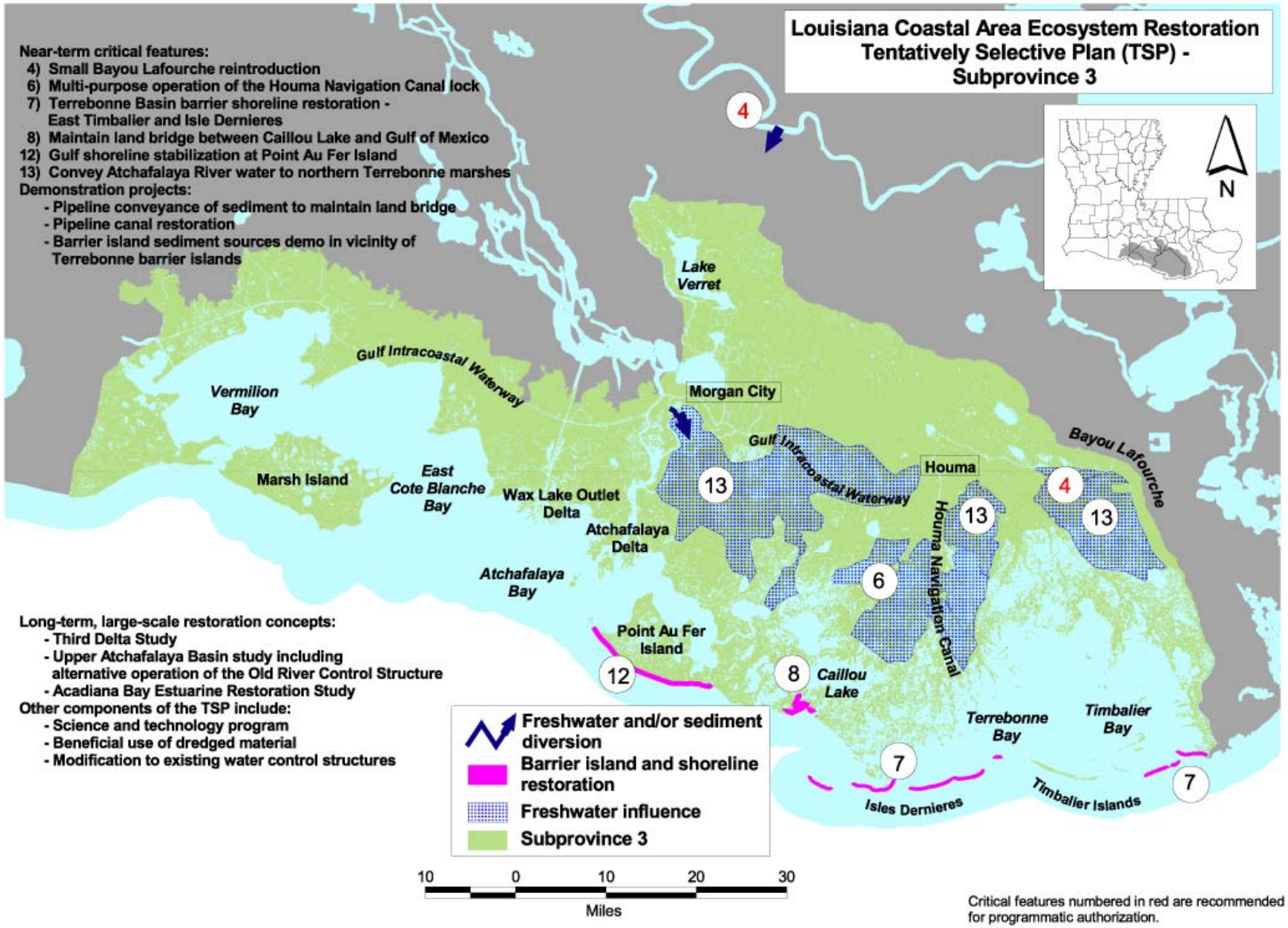


Figure 7. Restoration Components of the Tentatively Selected Plan in Subprovince 3

VI. Subprovince 4

The PDT determined through the application of critical needs criteria that the most critical ecological needs of the LCA were located in the Deltaic Plain. However, several components of the TSP are applicable in Subprovince 4, including the S&T Program demonstration projects, studies on long-term, large scale restoration concepts, and beneficial use of dredged material. While the Calcasieu Ship Channel Beneficial Use restoration feature was not carried through to the TSP, the beneficial use of dredged material program is intended to identify and act upon restoration opportunities such as the Calcasieu Ship Channel. The TSP does not contain near-term critical restoration features for implementation in the Subprovince 4.

Demonstration Projects

Shoreline Erosion Prevention Using Different Methods

This demonstration project would address uncertainties involved in restoration of eroding shorelines throughout the coastal area. Erosion along open bays and channels has lead to wetland losses across the coast. Different approaches to impede future erosion would be examined and monitored for long-term effectiveness and sustainability. Project monitoring would include comparative evaluations of settlement occurring within the various erosion protection/foreshore protection features.

This demonstration project would be implemented through construction and monitoring of a variety of erosion protection/foreshore protection features in a variety of foundation conditions. This demonstration project would be constructed along fifteen different one-mile stretches of the rapidly eroding Rockefeller Refuge shoreline in the Chenier Plain.

Approximate design and construction costs for this demonstration project would be $20 million. Depending on the protective measure used, reconnaissance level estimates indicate that costs for one-mile test sections will vary between .75 to $1.5 million.

Studies on Long-Term, Large Scale Restoration Concepts

Chenier Plain Freshwater Management and Allocation Reassessment Study

This restoration opportunity involves detailed investigations of water allocation needs and trade-off analyses in the eastern Chenier Plain, including the Teche/Vermilion Basin, to provide for wetland restoration and to support continued agriculture and navigation activities in the region. A series of navigation and salinity control structures are currently authorized and operated in the eastern portion of the Chenier Plain. These structures maintain a freshwater source for agricultural applications and prevent saltwater intrusion in the area. Tidal stages have predominantly exceeded water levels within the managed area therefore hindering drainage and creating a ponding issue for the fresh and intermediate marshes in the area. In addition, the natural ridges that define this area continue to be impacted by erosion, further threatening the ability for continued management and sustainability of the interior marshes. The study would address water management and allocation issues including salinity control, drainage, and fisheries accessibility.

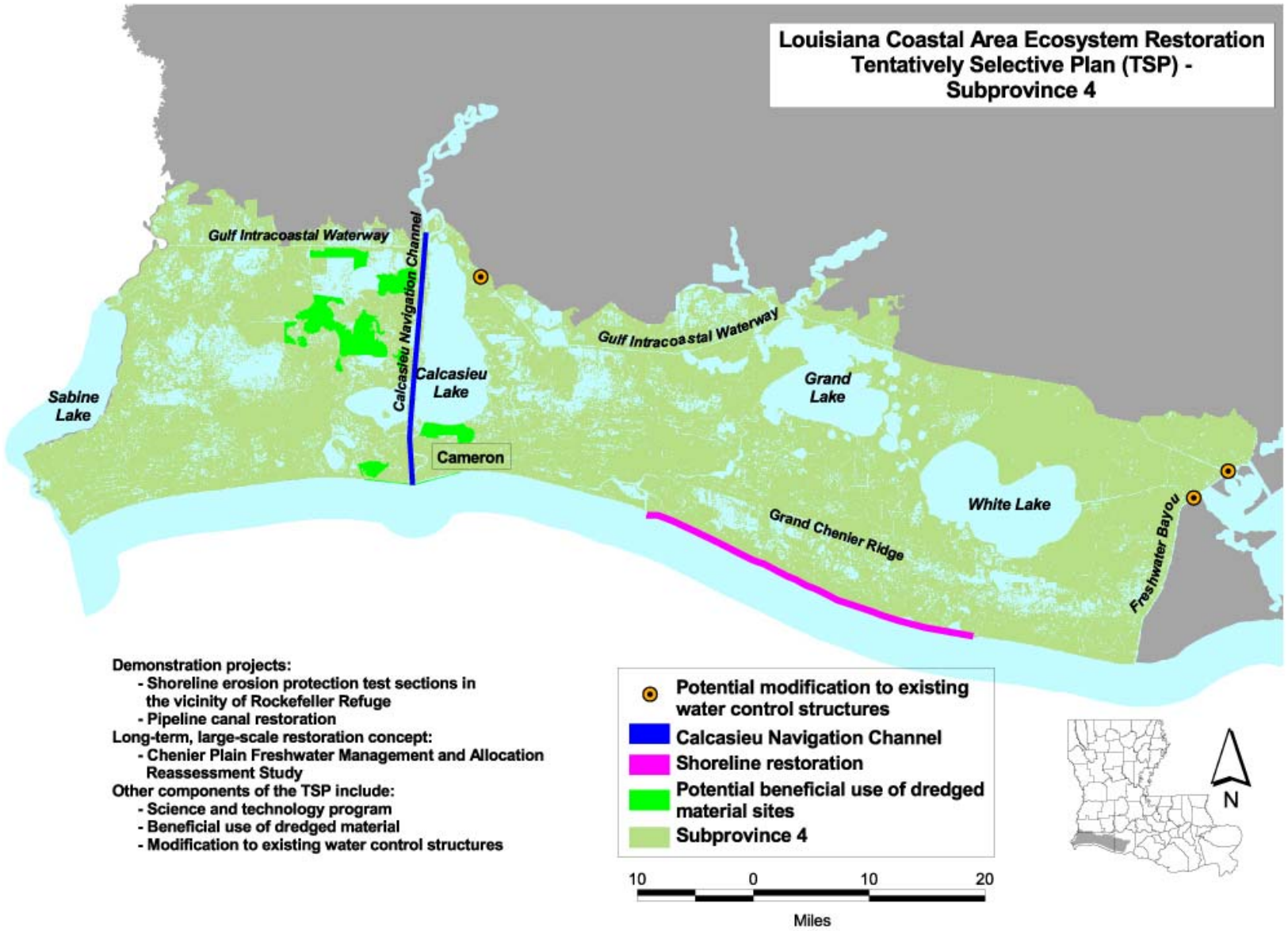


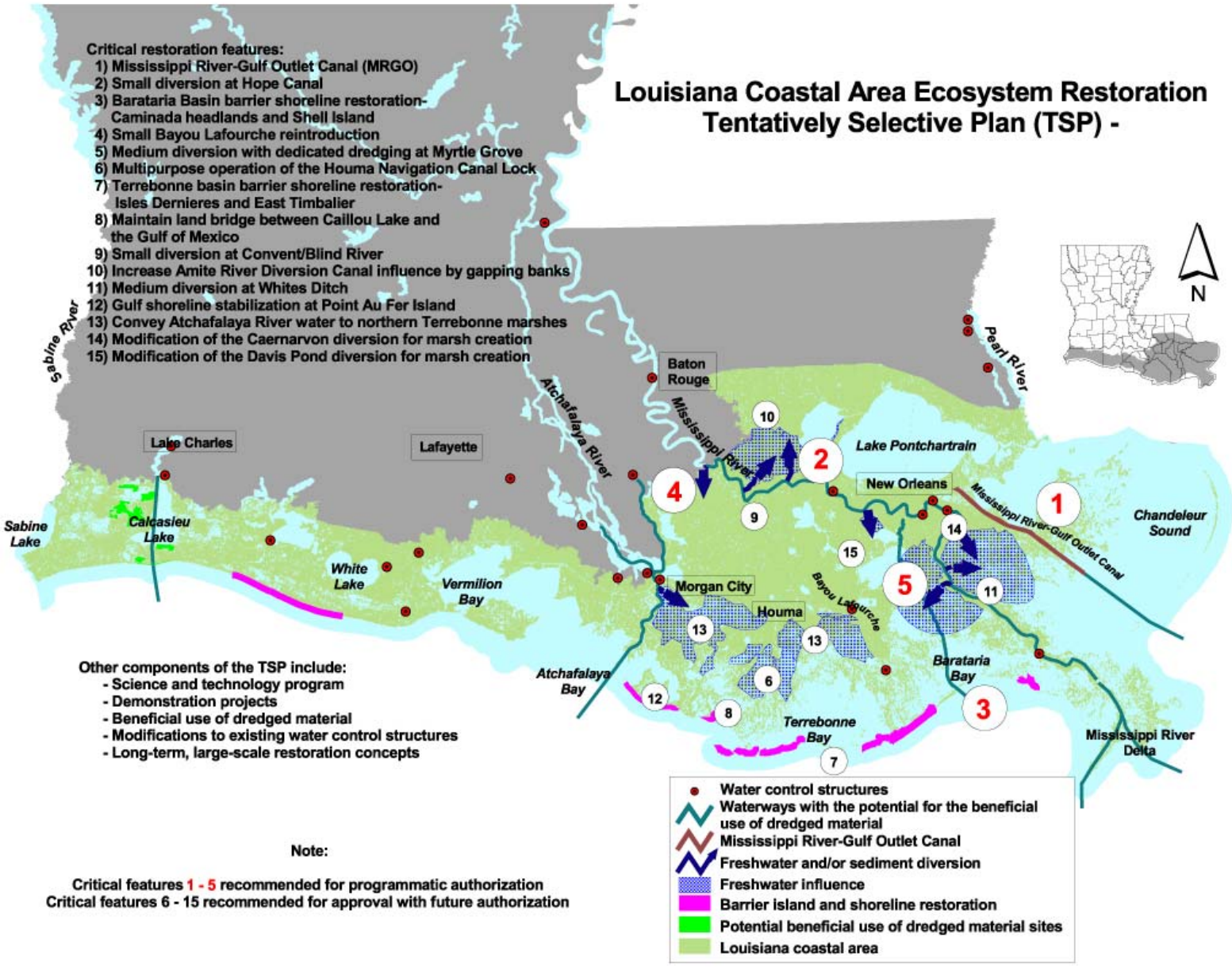
Figure 8. Restoration Components of the Tentatively Selected Plan in Subprovince 4

Summary

The Tentatively Selected Plan addresses the most immediate and critical needs of the ecosystem and directs attention to many areas where the prevention of wetland loss is critical to coastal restoration and is essential to achieve a sustainable coastal ecosystem. A sustainable ecosystem will support nationally significant living resources, provide a sustainable and diverse array of fish and wildlife habitats, reduce nitrogen delivery to offshore Gulf waters, and provide infrastructure protection and a sustainable resource base necessary to support National Ecosystem Restoration goals. This continued ecosystem stability is a key to the viability of future restoration actions.

The recommended actions of the TSP are primarily founded on the introduction of Mississippi River water and sediments, the beneficial use of dredged material, and the maintenance and restoration of critical geomorphic structures, such as barrier islands. The reintroduction of Mississippi River water provides significant improvements in hydrologic connectivity and sediment material exchange within the Deltaic Plain. The beneficial use of dredged material will help create and maintain wetlands habitats in both the Deltaic and Chenier Plains. The conservation and restoration of barrier islands, shorelines, and land bridges across the coast ensures that these critical geomorphic structures will continue to protect the integrity of the coastal ecosystem.

Restoration features in the TSP that improve hydrologic connectivity in the Deltaic Plain will result in habitat changes in portions of the coast. For most plant and wildlife species, suitable habitat levels are expected to remain the same or slightly change from current levels. Based on earlier ecological model analysis, certain saline species are anticipated to experience a decline in habitat levels or be displaced. At the same time, it is expected that many freshwater-associated species should see an increase in levels of suitable habitat. Even with the anticipated changes in cumulative habitat suitability, overall diversity is expected to remain high and similar to current conditions, consistent with the study's ecosystem objective. These habitat trade-offs are consistent with the reintroduction of deltaic land building processes.


Louisiana Coastal Area Ecosystem Restoration
Tentatively Selective Plan (TSP) -
Critical restoration features:
1) Mississippi River-Gulf Outlet Canal (MRGO)
2) Small diversion at Hope Canal
3) Barataria Basin barrier shoreline restoration-
Caminada headlands and Shell Island
4) Small Bayou Lafourche reintroduction
5) Medium diversion with dedicated dredging at Myrtle Grove
6) Multipurpose operation of the Houma Navigation Canal Lock
7) Terrebonne basin barrier shoreline restoration-
Isles Dernieres and East Timbalier
8) Maintain land bridge between Caillou Lake and
the Gulf of Mexico
9) Small diversion at Convent/Blind River
10) Increase Amite River Diversion Canal influence by gapping banks
11) Medium diversion at Whites Ditch
12) Gulf shoreline stabilization at Point Au Fer Island
13) Convey Atchafalaya River water to northern Terrebonne marshes
14) Modification of the Caernarvon diversion for marsh creation
15) Modification of the Davis Pond diversion for marsh creation
Sabine River
Baton Rouge
Pearl River
Atchafalaya River
Mississippi River
Lake Charles
Lafayette
Lake Pontchartrain
New Orleans
Mississippi River-Gulf Outlet Canal
Chandeleur Sound
Sabine Lake
Calcasieu Lake
White Lake
Vermilion Bay
Morgan City
Houma
Bayou Lafourche
Barataria Bay
Atchafalaya Bay
Terrebonne Bay
Mississippi River Delta
N
Other components of the TSP include:
- Science and technology program
- Demonstration projects
- Beneficial use of dredged material
- Modifications to existing water control structures
- Long-term, large-scale restoration concepts
Note:
Critical features 1 - 5 recommended for programmatic authorization
Critical features 6 - 15 recommended for approval with future authorization
Water control structures
Waterways with the potential for the beneficial use of dredged material
Mississippi River-Gulf Outlet Canal
Freshwater and/or sediment diversion
Freshwater influence
Barrier island and shoreline restoration
Potential beneficial use of dredged material sites
Louisiana coastal area