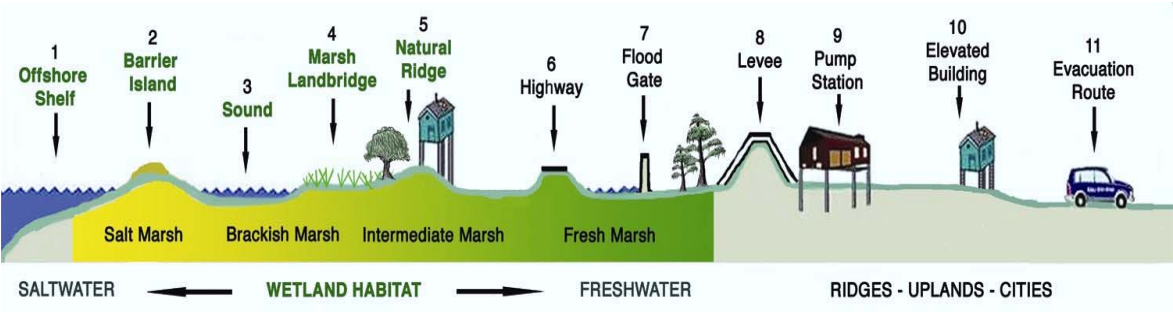


Pontchartrain Coastal Lines of Defense Program



Lake Pontchartrain Basin Foundation
Coastal Sustainability Program

September 2009

LAKE PONTCHARTRAIN BASIN FOUNDATION
SAVE OUR COAST SAVE OUR LAKE
20 YEARS OF SAVING OUR LAKE AND COAST

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Introduction

The Pontchartrain Coastal Lines of Defense Program consists of ten priority project areas within the Pontchartrain Basin. These ten coastal restoration project areas were chosen from the Comprehensive Habitat Management Plan (LPBF, 2006), because of their importance to the regional habitat restoration and because they may provide important flood protection to residents of the Pontchartrain Basin. This approach is consistent with the “Multiple Lines of Defense Strategy” proposed by LPBF (Lopez, 2006, 2009) and subsequently adopted by the US Army Corps of Engineers and the State’s Master Plan.

Under the Multiple Lines of Defense Strategy, coastal sustainability may be achieved with a restoration program utilizing maps which delineate two sets of landscape goals. The first landscape goal targets the critical natural Lines of Defense such as barrier islands and marsh land bridges (**Figure 1**). The second is the target habitat distribution such as fresh, intermediate, brackish and salt marsh (**Figure 2**). In the Pontchartrain Basin, nine Lines of Defense project areas have been identified for

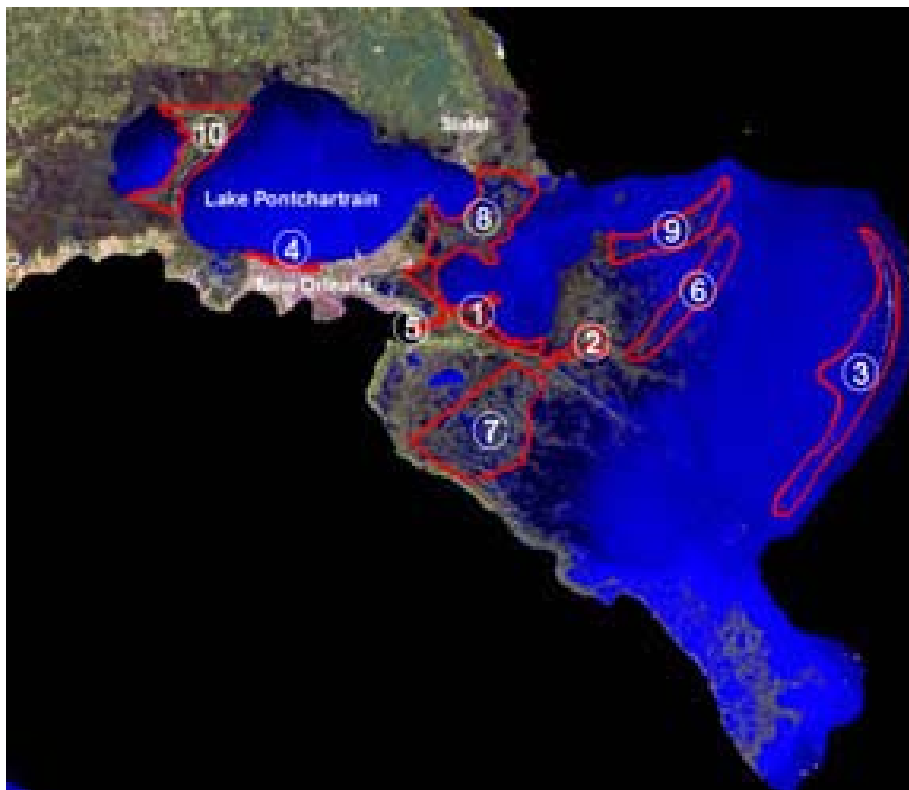


Figure 1: The ten project areas in the Pontchartrain Coastal Lines of Defense Program including nine coastal Lines of Defense and a Mississippi River reintroduction at Violet, LA. These projects restore and sustain the Lines of Defense providing ecological and flood protection benefits.

restoration. These include the Chandeleur Islands, two Biloxi Marsh land bridges, the Bayou la Loutre Ridge, the MRGO/Lake Borgne Land Bridge, the Breton Land Bridge, the East Orleans Land Bridge, a Jefferson Parish wetland buffer, and the Maurepas Land Bridge. All nine of these Lines of Defense are in need of some restoration and define nine project areas. A tenth project area is included to achieve the target habitat goals and help sustain the Lines of Defense in the Pontchartrain Basin. This project is an enlarged diversion located at Violet, La. (**Figure 2**). **Figure 3** illustrates the sub-estuaries which should be targeted for management with diversions within the sub-estuaries. For more information on these diversions see the Comprehensive Habitat Management Plan (LPBF, 2006) and the

Table 1: Pontchartrain Coastal Lines of Defense Program:

Prioritized Projects Utilizing the Multiple Lines of Defense Strategy in the Pontchartrain Basin, i.e. providing dual benefits of habitat restoration and flood protection

1. Maintain the MRGO-Lake Borgne Land Bridge
2. Restore the Bayou la Loutre Ridge (includes constriction of MRGO to GIWW dimensions)
3. Restore the Chandeleur Barrier Islands
4. Construct the Jefferson/Orleans Parish fringe marsh buffer
5. Construct the Violet Reintroduction to maintain target salinity in LA and MS
6. Maintain and restore the Biloxi Marsh Land Bridge and barrier reefs (South)
7. Maintain and restore Breton Land Bridge with Caernarvon and marsh creation
8. Maintain critical marsh shorelines and ridges of the East Orleans Land Bridge
9. Maintain and restore Biloxi Marsh Land Bridge and barrier reefs (North)
10. Maintain and enhance the Maurepas Land Bridge with Maurepas Reintroduction

LPBF considers restoration of all ten of these project areas to be exceptionally significant and beneficial. Funding restoration within these project areas provides the dual benefits of habitat restoration and flood protection. LPBF plans to be opportunistic in achieving Pontchartrain Coastal Lines of Defense Program goals by working with any existing or new authorization that may provide expertise and funding for these projects. Each of the ten project areas may ultimately consist of numerous projects within a single Line of Defense. LPBF suggests that emphasis should be placed on execution of these projects due to the state of urgency to enhance flood protection for Louisiana. Each project summary provides guidance for institutional participation with emphasis on project requirements for effective and expeditious project completion. LPBF welcomes the opportunity to partner with parishes, and state or federal agencies to further develop the Pontchartrain Coastal Lines of Defense Program.

A PowerPoint presentation of this program may be found at saveourlake.org. A more complete restoration context of baseline conditions, historical impacts and recommendations for the projects is contained in the CHMP, which may be also found online.

For more information or other inquiries, please contact the Coastal Sustainability Program Director – John Lopez at 504 421-7348 or johnlopez@pobox.com.

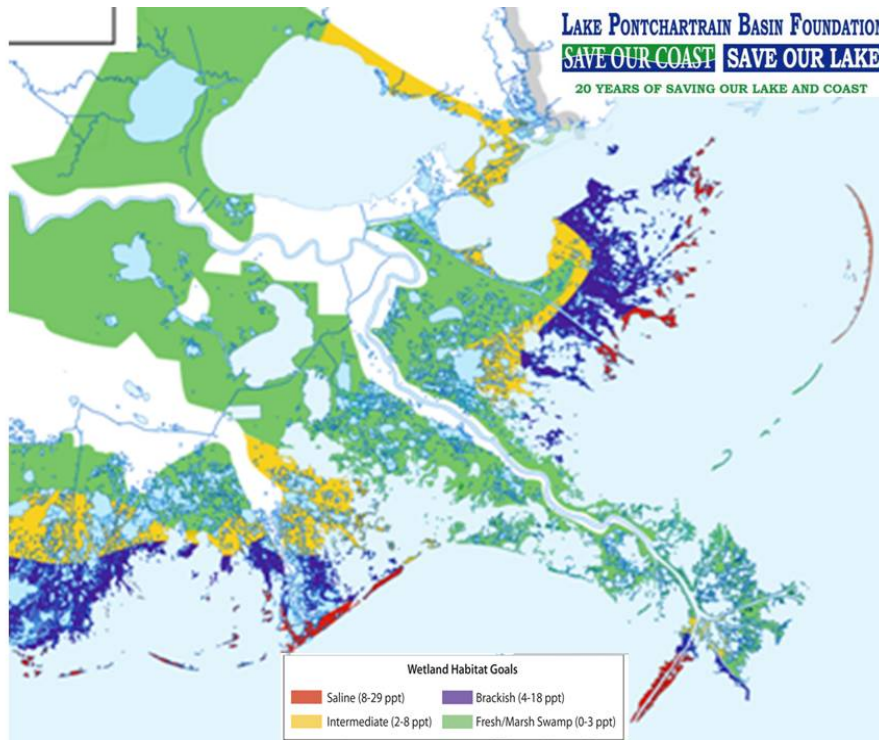


Figure 2: Habitat goals as defined in the Comprehensive Habitat Management plan for the Pontchartrain Basin.

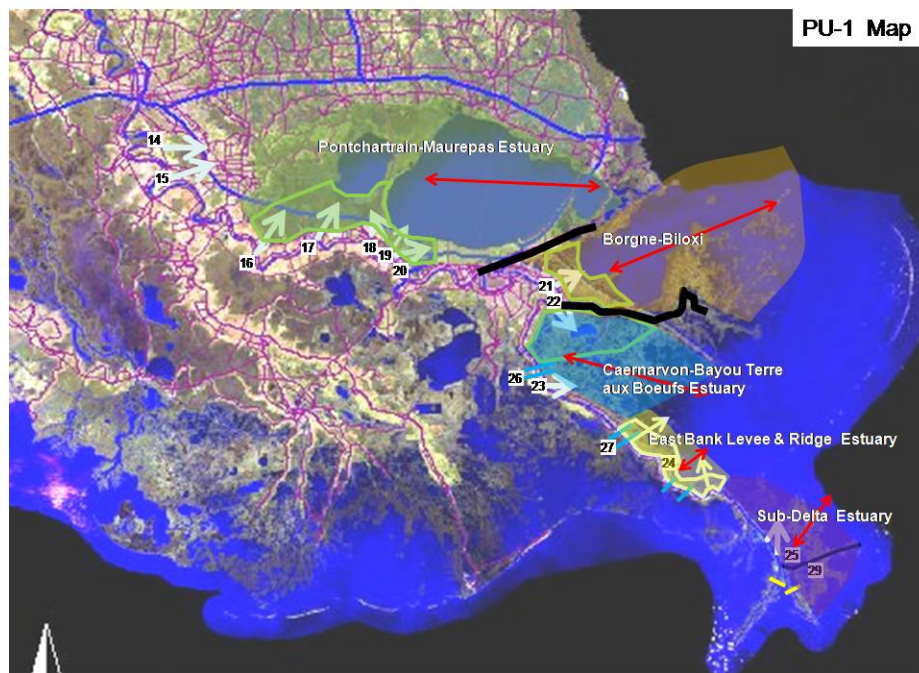


Figure 3: Sub-estuaries of the Pontchartrain Basin. Each of the five sub-estuaries could be managed through multiple Mississippi River reintroductions.

Maintain the MRGO-Lake Borgne Land Bridge

The narrow band of wetlands separating the MRGO channel from Lake Borgne is rapidly eroding on both the channel and lake sides. Since Hurricane Katrina, Lake Borgne is transgressing into the MRGO channel. If Lake Borgne and the MRGO continue to coalesce, the environmental impacts include at

least the following: increase in salinity, disruption of natural littoral transport, expansion of a sediment sink, loss of fringing marsh, increase in the tidal prism, and an increase in hydraulic flushing. This marsh does provide some protection to the levees in St. Bernard Parish. Although not adequate by themselves to protect the levee (as demonstrated by Hurricane Katrina), further loss of the wetlands will increase the need for other measures to protect the levees. The Golden Triangle wetlands are the only natural, direct buffer to surge within the infamous “funnel” between the MRGO and the GIWW. In total, 1,000 acres of marsh creation are recommended to enhance the land bridge.

Figure 4 is a graphic supplied by the USACE, which illustrates the proposed projects for the MRGO-Lake Borgne Land Bridge. These projects will largely address the restoration of the land bridge. The Violet diversion will help sustain the land bridge once the diversion is operational.

Plan Overview Map

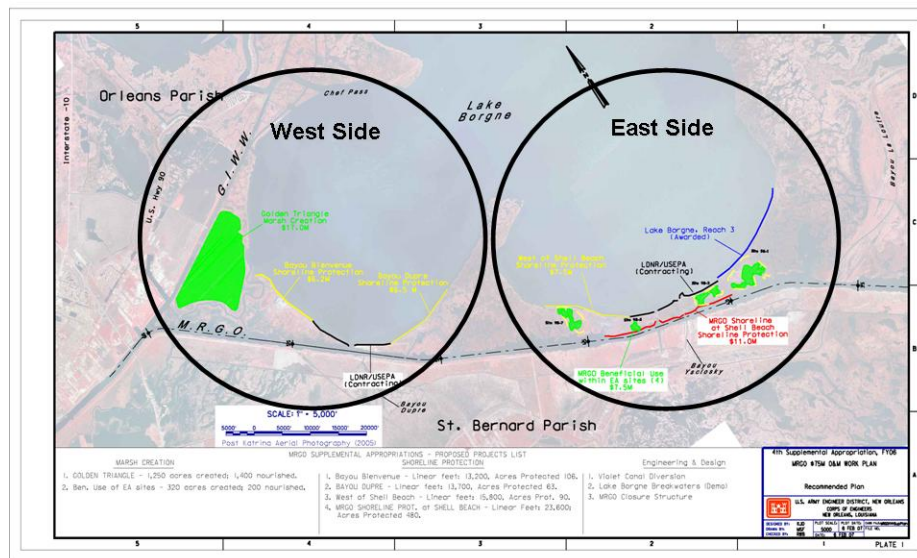


Figure 4: Map of USACE projects on the MRGO--Lake Borgne Land Bridge as funded by the 4th supplemental appropriations approved by Congress in 2006. If completed, this work would substantially address the land bridge rebuilding except for the need for the Violet diversion, which would help sustain this marsh land bridge in the future. (Graphic provided by the USACE).

Restore the Bayou la Loutre Ridge (includes MRGO dam closure)

The Bayou la Loutre Ridge is composed of the natural levees developed along Bayou la Loutre when it was an active distributary of the St. Bernard delta. The resulting natural ridge has subsided and been affected by saltwater intrusion. The ridge forest is nearly lost. The ridge is also breached by the MRGO. Closure of the MRGO at the Bayou la Loutre Ridge was recently completed, and restoration of the ridge will provide a natural Line of Defense and impede surge water movement.

Restoration of the south bank of the Bayou la Loutre Ridge (**Figure 5**) is widely supported and is within the *Louisiana's Comprehensive Master Plan for a Sustainable Coast* and within St. Bernard Parish's coastal plan (CPRA, 2007). Unlike Bayou la Loutre Ridge, nearly all natural ridges in Louisiana have intense development, which impedes restoration of the natural coastal forests. The restored Bayou la Loutre Ridge will provide important habitat for wildlife, including many birds and fur-bearing species.

Bayou la Loutre Ridge Restoration

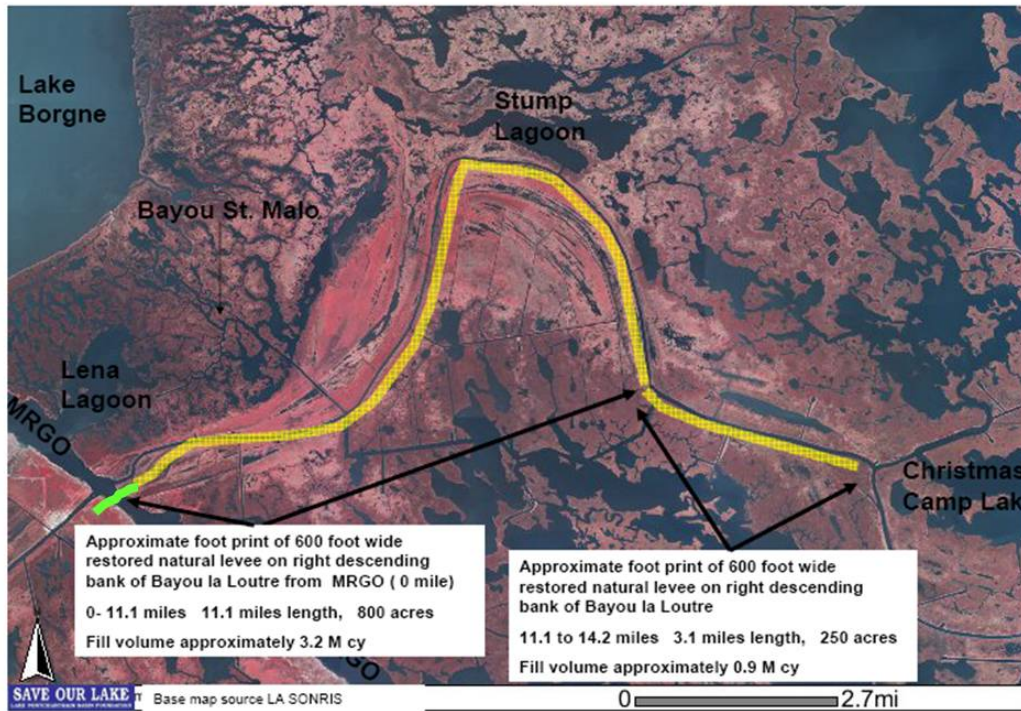


Figure 5: Restoration of the south flank of Bayou la Loutre Ridge. The proposed restoration location (yellow), and the constructed rock dam (plug) of the MRGO channel at the south bank of Bayou la Loutre (green).

Restoration will require placement of sediment to raise the soil elevation of the ridge and reforestation with indigenous trees (primarily live oak). **Figure 6** illustrates a proposed profile to illustrate the desired elevation and reforestation. Restoration of a ridge such as Bayou la Loutre will have technical challenges and some engineering uncertainty. It is estimated that 1,100 acres should be planted over 14 miles of the ridge including approximately 40,000 trees (target 30 trees per acre with 20% mortality). Fill requirement is estimated to be 4 million cubic yards. The type of fill required, how to contain the fill, management of the plant succession, etc. are uncertainties in this recommendation.

The USACE has released a draft final report of a plan to close the MRGO with a rock dam constructed at the south bank of Bayou la Loutre (USACE, 2007), and the dam was constructed from March through June of 2009. The dam elevation should match the elevation of the restored ridge to prevent focusing of surge. The closure of the MRGO as a federal navigation waterway was approved by Congress in Water Resources Development Act (WRDA) language in November 2007, and final legal deauthorization of the reaches below the GIWW occurred on June 5, 2008, when the report was transmitted to Congress (USACE, 2008). This document also directs the USACE to develop a plan for ecologic restoration of the area impacted by the MRGO. Several elements in the PCLOD should be included in the MRGO Feasibility Study report, such as the Bayou la Loutre ridge, the land bridges, diversions, shoreline protection, and marsh creation. .

Bayou la Loutre Ridge Restoration

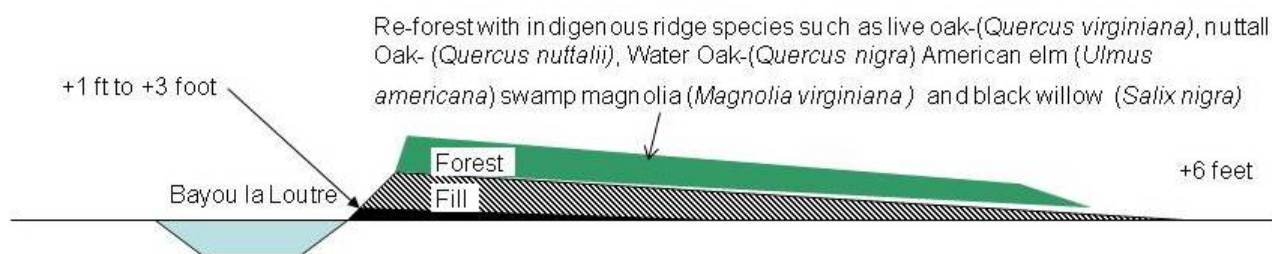


Figure 6: Illustration of restoration of the south flank of the Bayou la Loutre Ridge. As proposed, the restored ridge would have the highest elevation near the bayou at approximately +6 feet with a 100:1 slope toward the marsh. Reforestation would include planting of indigenous species and management of the forest succession (green area).

Restore the Chandeleur Barrier Islands

In the last decade, the Chandeleur Islands have been significantly reduced in areal extent due to several tropical systems including Hurricane Georges and Hurricane Katrina. Hurricane Katrina, in particular, may have caused the loss of as much as 70% of the islands. However, due to a lack of storm impacts and a return to fair-weather wave conditions, some recovery has been observed in 2006, 2007, and 2008 (**Figure 7**). Continued loss of the islands due to future storms would expose Biloxi Marsh to increased wave energy, alter the salinity regime of interior marsh and sounds, and increase the chance for long-period deep-water waves to penetrate deeply into the estuary during a hurricane. Long-period waves were reported to have occurred during Hurricane Katrina and contribute significantly to wave run-up and wave energy.

The Chandeleur Islands contain unique marine habitats that are found nowhere else in the state. While the islands themselves are part of the Breton National Wildlife Refuge and, therefore, under federal jurisdiction, the shallow aquatic habitats and vast meadows of seagrasses on the bayside of the island are “State waters”. These habitats are essential to many valuable fishes and fishery resources including commercial species (e.g., blue crab *Callinectes sapidus*), recreational species (e.g., red drum or “redfish” *Sciaenops ocellatus*), and federally threatened and endangered species (e.g., various sea-turtles). Recent fishery research by the Nekton Research Laboratory at the University of New Orleans (UNO) provides numerous examples of why these habitats need to be preserved for the sake of fishery resources. For example, larval and juvenile groupers have been collected from seagrass beds throughout the summer. This may be the only place in the state where nursery habitat for this species occurs. There is also evidence that lemon sharks (*Negaprion brevirostris*) use the Chandeleur Islands as “pupping grounds.” This means this area is one of the few places in the Gulf of Mexico where this shark species reproduces. Federally-threatened gulf sturgeon (*Acipenser oxyrinchus desotoi*) are known to feed in shallow habitats associated with barrier islands and there are known occurrences of sturgeon occurring in the Chandeleur region. If the islands are not restored and are allowed to disappear, Louisiana will lose unique and valuable fishery habitats that are formed and protected by the Chandeleur Islands.

The USGS has been contracted through US Fish and Wildlife Service (USFWS) to assess the Chandeleur Islands for their potential restoration. It is the recommendation here that restoration should include replenishment of sand and frequent vegetative plantings on the main island chain within the Breton NWR. The USGS report should be released by end of 2009.



Figure 7: Chandeleur Islands recovery in February 2007 shows signs of natural recovery with sand accumulating on the Gulf shoreface adjacent to isolated marsh platform remnants that remained after Hurricane Katrina.

Construct the Jefferson and Orleans Parish fringe marsh buffer

Placement of rip rap and construction of the lakefront seawall directly on the shoreline have reduced the natural ecological benefit of the fringing marsh that once existed along Jefferson and Orleans Parishes' shoreline of Lake Pontchartrain. In Jefferson Parish, rip rap was placed opportunistically from nearby demolition projects, such as an airport runway. Therefore, rock was not appropriately sized for wave conditions. Nearly all of this material was washed away during Hurricane Katrina. During high-water events, the shoreline and base of the levee may be flooded and may be subject to wave erosion. This erosion poses a risk of failure of the levee and additional maintenance costs.

Construction of an offshore breakwater would create a quiet water area for restoration of natural shoreline habitat functions (**Figure 8**). Restoration includes placement of soil fill along the shoreline to create emergent marsh adjacent to the lake's shoreline. Placement of reef balls between the marsh and breakwater would further reduce lateral wave energy and create structures that would be utilized by small fish, crabs, and other indigenous species. The combined impact of the offshore breaker and the wetland habitat would be to reduce wave energy and produce an additional measure of risk reduction for damage to the levee. Rock utilized for the offshore breakwater would be appropriately

sized for the project life. Approximately 2,000 acres of marsh creation are recommended spread across the length of the south shore of Lake Pontchartrain.

Restoration of wetlands in New Orleans in the vicinity of the Lakefront Airport to South Point may have an additional benefit aside from that described above. When a storm moves ashore, west winds reverse the surge flow toward the east. The current armored shoreline accentuates the amplification of surge. Wetlands along this shoreline should absorb some of the surge energy, resulting in reduced sloshing of surge water toward Slidell.

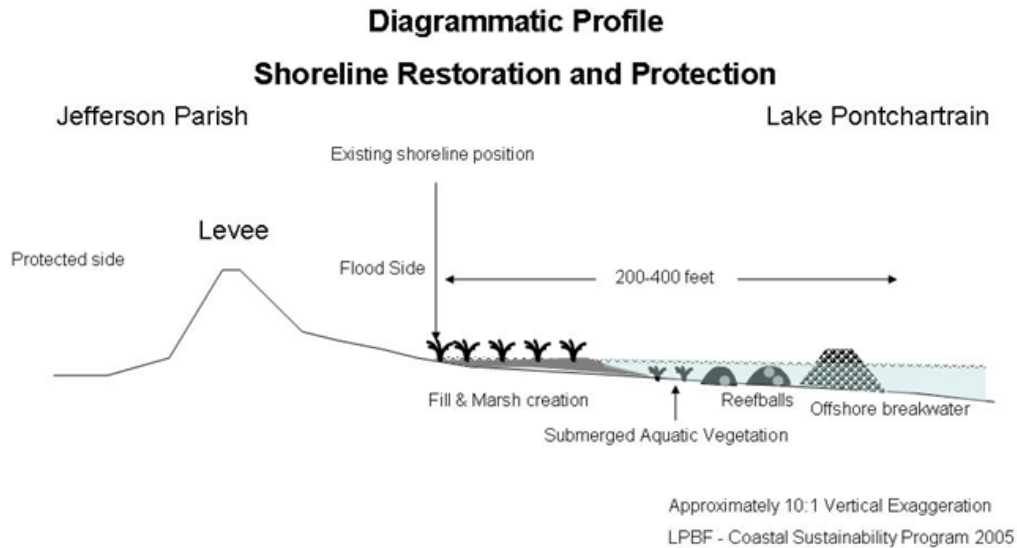


Figure 8: Illustration of restoration and stabilization of the Lake Pontchartrain shoreline - South shore in Jefferson and Orleans Parishes. The proposed width of the wetland buffer and breaker is a minimum and is dependent on the degree of protection allocated to the buffer for the levee.

The LSU School of Architecture has developed some conceptual designs for the integration of marsh restoration, shoreline stabilization, and recreation. These can be seen on line at <http://www.laseagrant.org/pdfs/JeffersonRestoration.pdf>.

Construct the Violet Reintroduction to maintain target salinity in LA and MS

A small siphon currently exists at Violet, Louisiana, but is inadequate (discharge of 200 cfs) to address the needs of the estuary. As discussed previously, the Pontchartrain Basin is a series of sub-estuaries (**Figure 3**) which can be managed by appropriately located and sized river diversions. The Violet Diversion is proposed to manage the Borgne-Biloxi Estuary, including Mississippi Sound (**Figure 9**), which is a large region that can be feasibly managed with the closure of the MRGO at Bayou la Loutre.

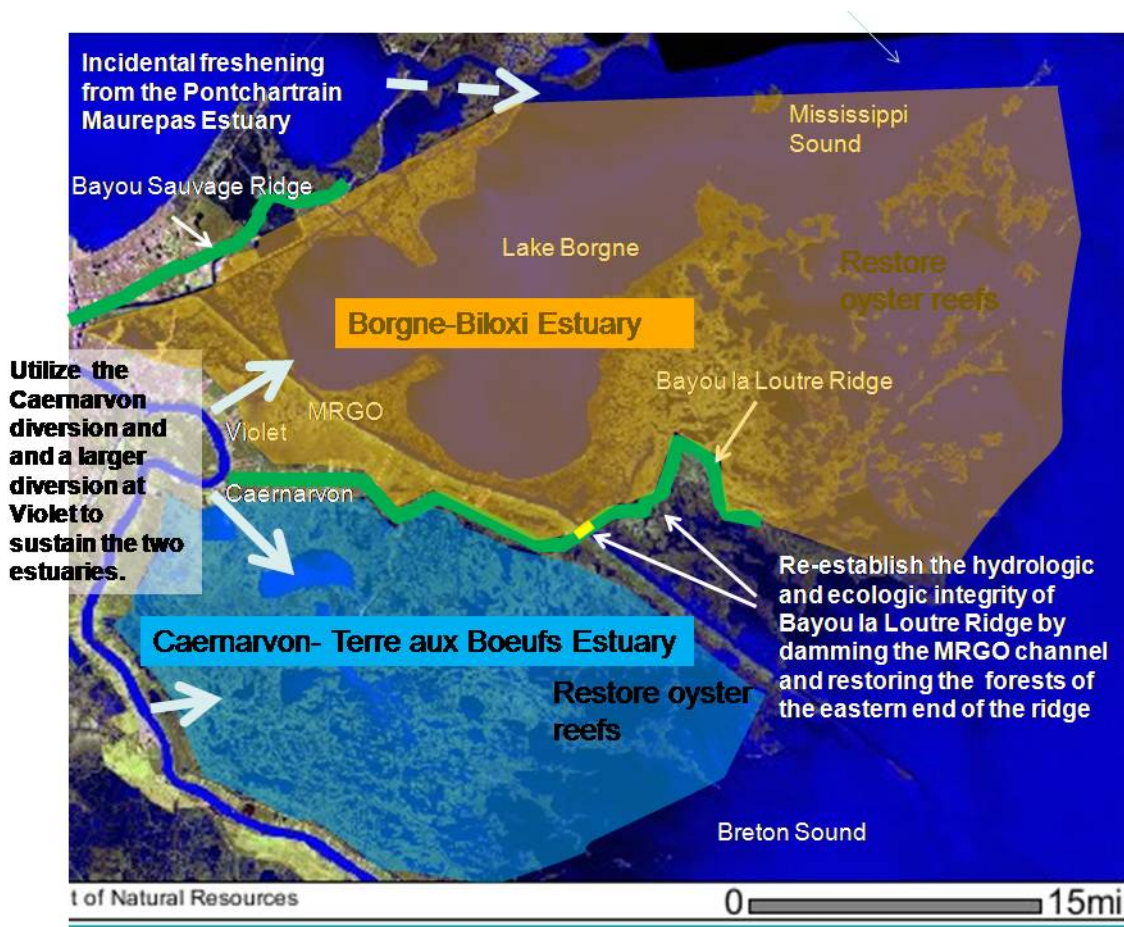


Figure 9: Map of the historic sub-estuaries in the vicinity of the Violet Diversion. With closure of the MRGO, the hydrologic integrity of the Borgne-Biloxi estuary is re-established. Modeling demonstrates a diversion at Violet can be used to manage this estuary.

Hydrologic modeling of the Violet Diversion, assuming that the MRGO is closed, has been conducted by a team of engineers and scientists at the University of New Orleans. Funding was provided by the Pontchartrain Restoration Program. Georgiou et al. (2007) report that 10,000 to 15,000 cfs may be needed to freshen the Biloxi Marsh to brackish salinity with the assumption that the MRGO is closed (**Figure 10**). The model was run for 60 days in a normal rainfall year. It is recommended that a 20,000 cfs diversion be constructed. Long-term modeling indicates that continuous operation of a Violet diversion at high flows could over-freshen Lake Pontchartrain. Salinity control throughout the estuary will require innovative and integrated management of this and other freshwater inputs. UNO has conducted further modeling of multiple diversions into the Pontchartrain Basin. This work demonstrates that a smaller discharge at Violet could be used in tandem with other diversions to reach target salinity; however, it is recommended that the Violet diversion have sufficient capacity alone to reach the sub-estuary for which it is dedicated. The final design should target the larger estuary and habitat goals but also the Central Wetland area between the MRGO levee and the 40-arpent levee in St. Bernard Parish. The Central Wetlands also can be enhanced with beneficial use of treated effluent from the New Orleans Sewage Plant, as proposed by the City of New Orleans.

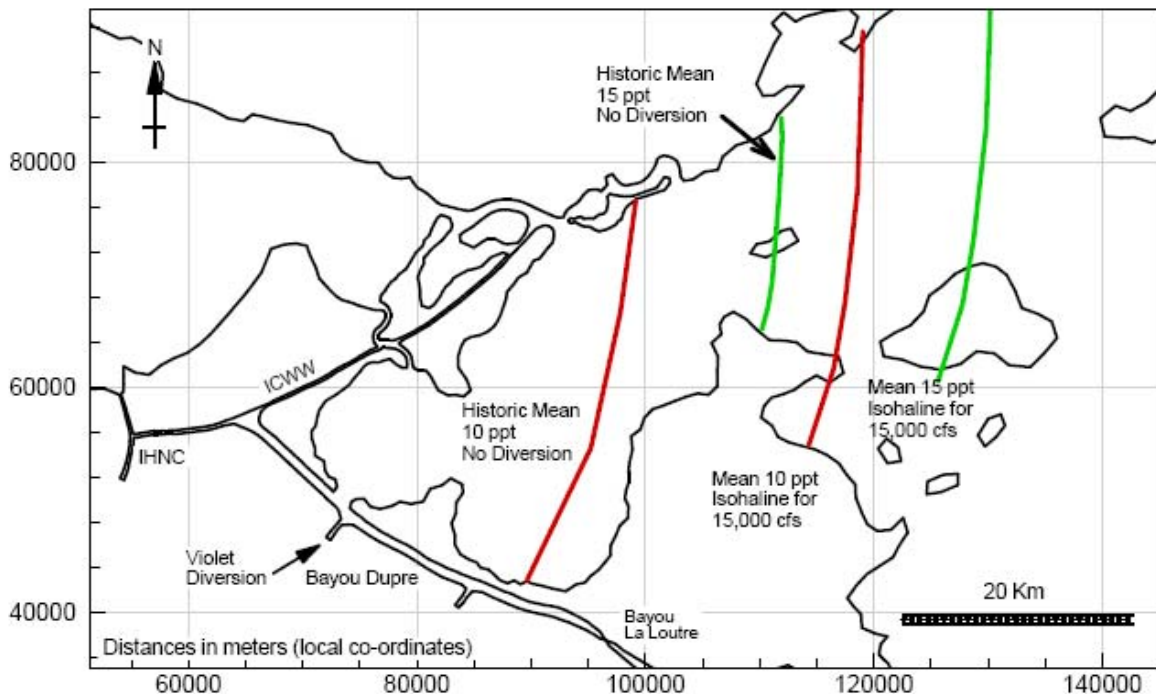


Figure 10: Eastward shift of isohalines from a diversion at Violet, Louisiana, with a constriction of the MRGO at Bayou la Loutre (Georgiou et al., 2007).

Maintain and restore the Breton Land Bridge with the Caernarvon Diversion and marsh creation

This region is an important buffer to the levee alignments of lower St. Bernard and Plaquemines Parishes. Historical wetlands loss rates have been modest until Hurricane Katrina. Due to Hurricanes Katrina and Rita, approximately 40 square miles of emergent marsh were severely damaged or lost (converted to open water) (**Figure 11**; Barras, 2006, 2008). Fortunately, the western side of this area (west of Bayou Terre aux Boeufs) has the beneficial impact of the Caernarvon Diversion. In 2006, the diversion was run at approximately 4,000 cfs through the end of May and seemed to have had a significant benefit to the damaged wetlands. Unfortunately, vegetative response to the 2006 diverted water was limited in areal extent and did not have maximum benefit to the damaged area. Dr. John Day, who has been evaluating this region for many years, is monitoring the recovery. He has preliminarily reported that recovery is occurring rapidly where the marsh platform is still intact.

The Caernarvon Diversion historically discharged less than the design capacity of 8,000 cfs. In large part, this discharge was appropriate to maintain the optimum isohalines of the area around Black Bay. The original Environmental Impact Statement (EIS) limited the discharge to 6,600 cfs but a new Environmental Assessment (EA) allowing discharge at higher levels has been approved by the USACE (USACE, 2008).

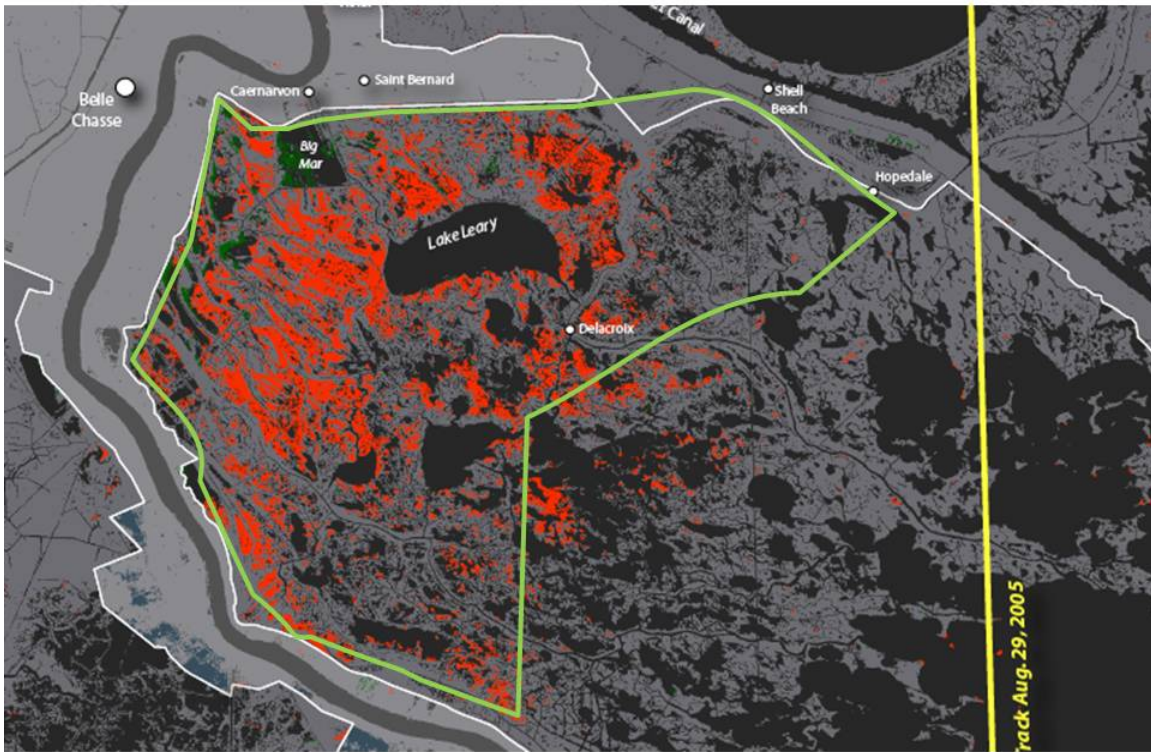


Figure 11: USGS map illustrating apparent wetland loss during the 2005 hurricane season. Green outline is the target area for enhanced restoration utilizing overland flow from the Caernarvon Diversion (Barras, 2006). Approximately 2,500 acres are recommended to be restored with pumping of sediment (marsh creation).

The proposal here is to maximize the areal extent of the benefit of the Caernarvon discharge with overland flow to the area shown in the outline for the Breton-Terre aux Boeufs Basin. These upper reaches of the basin will have established, robust fresh and intermediate habitat that will recover from storm impacts. To achieve this goal will require higher discharge and outfall management to direct water across northeast of Lake Lery and possibly across Bayou Terre aux Boeufs. A CWPPRA project similar to this was selected for Phase I design in PPL17 under CWPPRA and is recommended. Increased discharges should be used to the extent necessary without over-freshening the target oyster habitat in Breton Basin, except possibly during periods of need for accelerated recovery, such as the current situation. In addition, marsh creation should be used to re-build approximately 5,000 acres of critical areas of marsh loss from Hurricanes Katrina or Rita where it is unlikely that natural recovery will occur.

Maintain critical marsh shorelines and ridges of the East Orleans Land Bridge

The East Orleans Land Bridge is critical to maintaining the integrity of Lake Pontchartrain and Mississippi Sound. **Figure 12** illustrates the build-up of surge at the land bridge. The land bridge significantly dampens wave height and surge elevation which must pass across the land bridge from Mississippi Sound or Lake Borgne. All of the communities in the surrounding parishes around Lake Pontchartrain benefit from storm protection from the land bridge. None of the North Shore communities currently have levees and are largely dependent on natural attenuation of surge across the land bridge. The Final Draft LACPR report identifies the land bridge as a critical landscape feature because of its ability to diminish surge (USACE, 2009).

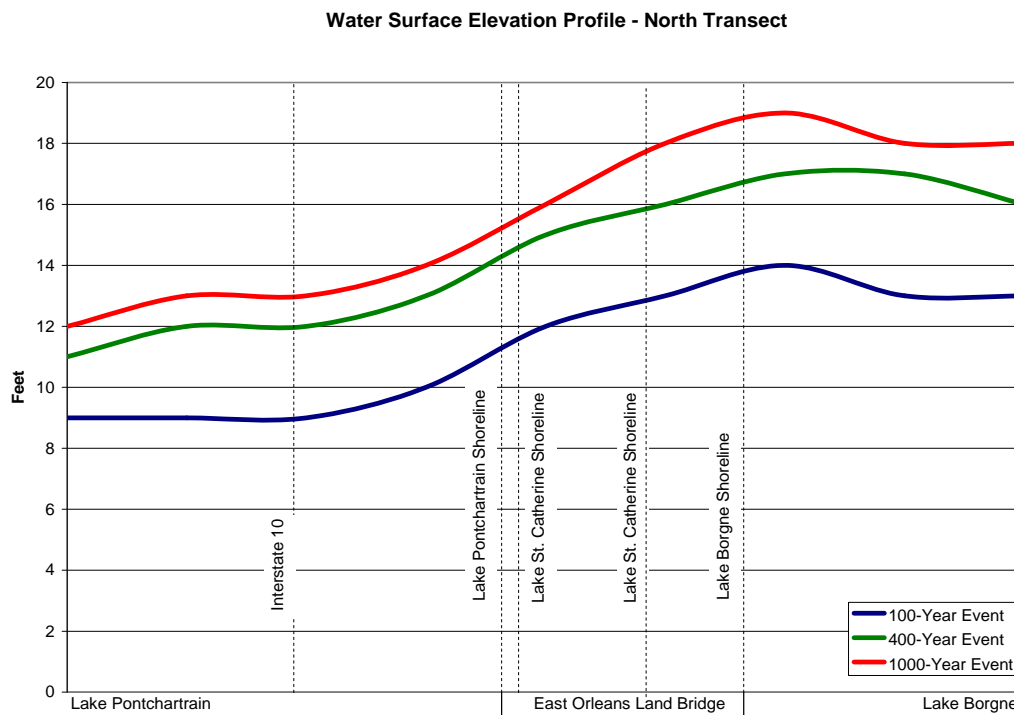


Figure 12: General water surface profile on EOLB. Water surface elevations represent the 2010 Base Conditions from the Draft LACPR Report (USACE, 2008b).

The East Orleans Land Bridge and its two large natural passes are well known as a landscape vital to maintaining the hydrologic exchange between Lake Pontchartrain and the Gulf sounds and lakes (see <http://www.lca.gov/noelb/>). The hydrologic exchange allows movement of aquatic organisms in and out of the estuary while dampening the extreme high water surge developed by hurricanes. The land bridge is complex with other natural features, such as the Pine Island Ridge, Lake St. Catherine, and other smaller tidal passes. It is also an exceptionally important commercial corridor with 2 railroads, 1 interstate highway, evacuation routes, state highways, power lines and pipelines, etc., and is considered the eastern entrance to the Greater New Orleans area and the western entrance to the Mississippi Gulf Coast.

The land bridge has lost approximately 4,000 acres of wetlands since 1956 (USGS land loss data). Hurricane Katrina damaged several critical areas, such as interior marsh loss in the Alligator Bend area and shoreline erosion along the Lake Pontchartrain shoreline. The Habitat Evaluation Team (HET) in the LACPR Draft Technical Report used historical land loss rates from 1978 to 2005 to project future land loss for the next 100 years (USACE, 2008). The base loss without restoration was 8,000 acres for the next 100 years. The recommendation here is to restore 6,000 acres over the next ten years with marsh creation. This restoration combined with other measures, such as shoreline protection, diversions, etc., should sustain the land bridge.

This recommendation is proposed to maintain the East Orleans Land Bridge's functions to regulate the estuary and its natural capacity to dampen storm surge. This includes marsh creation to rebuild marsh areas and stabilization of critical shoreline reaches. The Pine Island Ridge should be evaluated to restore its elevation and the ridge forest.

Recommendations (see also **Figure 13**).

1) South Point Levee Alignment (LPBF and CRCL, 2008)

It is recommended to levee or elevate Interstate 10 near Irish Bayou so that it may be utilized for safe evacuation or re-entry.

2) Highway 90 Elevated Earth Foundation (LPBF and CRCL, 2008)

The proposal is to elevate Highway 90 to a more uniform height of approximately 8 feet above sea level. This will improve the usefulness of the highway for evacuation and make the highway less prone to frequent minor flooding events.

3) Alligator Bend Marsh Restoration and Shoreline Protection PO-34 (CWPPRA)

The goal of this project is to restore critical wetlands destroyed by Hurricane Katrina and to prevent breaching of degraded marshes between the GIWW and Lake Borgne. This will be accomplished through dedicated dredging for marsh creation and vegetation planting for shoreline protection (Lindquist and Martin, 2007). This project is on PPL 16 and was approved for Phase 1, Engineering and Design, and once Phase 1 is completed will compete with other projects for Phase 2 construction funds.

4) Orleans Land Bridge Shoreline Protection and Marsh Creation PO-36 (Energy Bill)

The goal of this project is to protect approximately 1,400 acres of marsh on the East Orleans Land Bridge. This would protect vulnerable Orleans and St. Bernard Parish communities and infrastructure by reducing the rate of shoreline erosion. The project may also include the beneficial use of all excavated material to create about 220 acres of marsh in shallow open water within the project area (CIAP, 2006).

5) Irish Bayou to Chef Menteur Pass Shoreline Protection and Marsh Creation (CWPPRA)

The goals of the project are to stop shoreline erosion and create marsh behind the shoreline in two key areas of loss in order to prevent the lake shore from breaking into the interior marsh ponds. To accomplish this, approximately 20,700 linear feet of rock dike will be constructed along the -2.0 foot contour extending from Point aux Herbes to Chef Menteur Pass. In addition, approximately 46 acres of marsh will be created by hydraulically dredging material from the bottom of Lake Pontchartrain, and placing it into confined marsh creation sites. Approximately 147 acres of marsh would be created/protected over the 20-year project life. This project is recommended as long as breakwaters are placed offshore and similar results might be expected as seen in the original Bayou Chevee Shoreline Protection Project, PO-22 (LPBF, 2006). The project was on the CWPPRA PPL 14 list of candidate projects but was not authorized for Phase 1 funding.

6) Marsh Creation and Shoreline Protection at Brazilier Island

This project would restore marsh in key locations that were impacted by Hurricane Katrina and provide protection against significant shoreline retreat. Marsh creation would be accomplished through dedicated dredging from Lake Pontchartrain.

7) Rigolets Pass Shoreline Protection and Marsh Creation

The goals of this project are to stop shoreline erosion and create marsh behind the shoreline in key areas of loss in order to mitigate further joining of the Rigolets Pass and Lake St. Catherine. This will be accomplished by dedicated dredging for marsh creation and rock armoring for shoreline protection.

8) Big Branch NWR-Pearl River WMA Corridor (LPBF, 2006)

The expansion of the Big Branch Marsh NWR boundary eastward to the Pearl River to make a refuge corridor to the state-managed Pearl River Wildlife Management Area (WMA) would conserve vital wetlands in the project area. Critical areas are the marsh and upland mounds within the marsh north of Highway 433 (Fritchie Marsh), and the marsh and swale topography south of Highway 90 (Weeks Island) abutting the Pearl River WMA (LBPF, 2006).

9) Lake Pontchartrain Sanctuary - Boundary Re-Establishment (LPBF, 2006)

Re-establish guidelines and boundaries in order to better protect species and habitats found in the sanctuary. Specific to the EOLB, the re-establishment of guidelines and boundaries to protect species and habitats found in the sanctuary, should be expanded to the Lake Pontchartrain shoreline of the EOLB and Lake St. Catherine. In addition, commercial trawling (except for live bait) should be prohibited. The goal of the re-establishment of sanctuary boundaries is to protect extensive SAV in the area.

10) Coastal Forest Conservation

Coastal forest tracts that are threatened or have opportunities for restoration or enhanced sustainability should be submitted to the Coastal Forest Conservation Initiative for potential landrights acquisition so that the land may be placed in conservation. Targeted locations may include, but are not limited to, tracts near the Pearl River Wildlife Management Area and large blocks of bottomland forests and forested wetlands west of the Bayou Sauvage National Wildlife Refuge.

11) Coastal Marsh Conservation

Coastal marsh conservation on the EOLB is needed in order to offset the rapid growth of campsites in the area. Although following Katrina, the threat of development may have decreased, the need to put marsh habitat in conservation is a necessity in order to maintain the EOLB as a critical natural line of defense. State and Federal land acquisition programs such as Coastal Estuarine and Land Conservation Program, and other non-profit organizations such as Trust for Public Lands and the Coastal Conservation Fund should be utilized to secure marsh area conservation. Additionally, the creation of wetland mitigation banks similar to the Chef Menteur Mitigation Bank would provide the EOLB an opportunity for marsh creation and the protection of that created marsh. Areas targeted for marsh conservation include, but are not limited to, the Pearl River Island and the area between Catfish Point and Unknown Pass.

12) Highway 90 Cutoff Impoundment (LPBF, 2006)

Create breaching of the old Highway 90 impoundment at the east and south flank by re-routing Highway 90 at the east and south flank, which currently is an open water area with possible low dissolved oxygen. This should increase water exchange and improve water quality. Aquatic access will be re-established. It is possible that the old roadbed could serve as a small nature/bird watching trail.

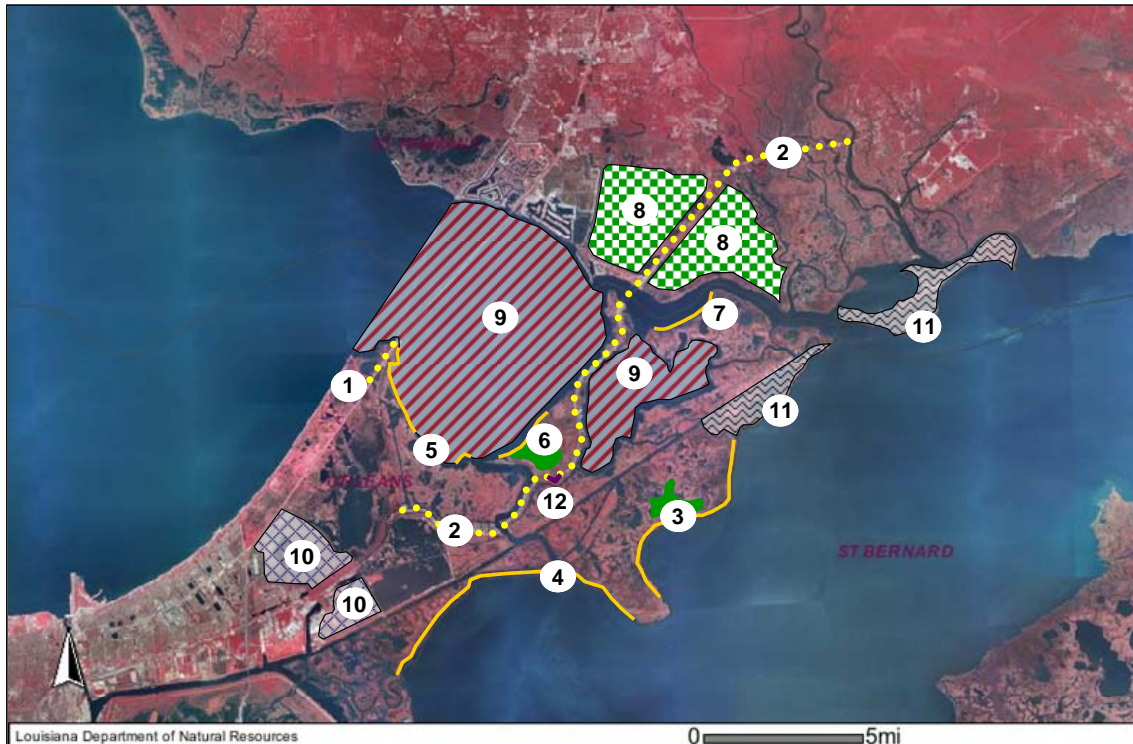


Figure 13: Recommendations for restoration, management, and conservation on the EOLB.

Maintain and restore Biloxi Marsh Land bridges and barrier reefs (North and South)

The Biloxi Marsh Land Bridges compose the outer rim of the Biloxi Marsh. The Biloxi Marsh has been demonstrated to contribute to dampening of storm surge as far east as the MRGO levee. The Biloxi Marsh Land Bridges are critical to maintaining the integrity of marsh platform and the hydrologic integrity of Mississippi and Chandeleur Sounds. The marsh platform significantly dampens wave height and surge elevation that must pass across the land bridges from Chandeleur Sound. The Biloxi Marsh is absolutely vital to protecting the entire eastern flank of Orleans and St. Bernard Parishes from storm surge. The Final Draft LACPR report identifies the Biloxi marsh as a critical landscape feature because of its ability to diminish surge (USACE, 2009).

Maintaining the land bridges will assure that the overall integrity of the Biloxi Marsh is sustained. This region was once highly prolific in oysters and included major oyster barrier reefs. Restoration of the marsh should focus on re-establishment of the historic reefs in Mississippi and Louisiana (**Figure 14**). **Figures 2 and 3** illustrate the targeted habitats and hydrology. Closure of the MRGO facilitates the effectiveness of a freshwater diversion at Violet, Louisiana, to achieve this goal. Reef development should also be supplemented with placement of cultch and structural reef building material. Approximately 3,000 acres of marsh creation are recommended to “patch” the marsh framework on the land bridges. Reef restoration, selective marsh creation and shoreline protection, traditional armoring and the Violet diversion are proposed to sustain the Biloxi Marsh.

The demolition concrete from the I-10 Twin Spans is recommended as a source of shoreline stabilization and reef material. On April 2008, LPBF submitted a proposal to LA DOTD to use the Twin Span concrete for stabilization and reef development on the north flank of the Biloxi Marsh along Mississippi Sound. This area has high rates of erosion with a steep shoreface that should allow access to place material (LPBF, 2008).



Figure 14: Historic oyster reefs of the Biloxi Marsh and Mississippi Sound (black).

Maintain and enhance the Maurepas Land Bridge

The Maurepas Land Bridge is critical to maintaining the integrity of Lakes Pontchartrain and Maurepas. The land bridge significantly dampens wave height and surge elevation which must pass across the land bridge from Lake Pontchartrain. Communities in the surrounding parishes around Lake Maurepas all benefit from storm protection from the land bridge. None of these communities currently have levees and are largely dependent on natural attenuation of surge from Lake Pontchartrain to the Lake Maurepas swamps, including the land bridge. The Final Draft LACPR report identifies the land bridge as a critical landscape feature because of its ability to diminish surge (USACE, 2009).

The wetland forests of the Maurepas Land Bridge have only had slight recovery since being logged in the early 1900s. Lack of freshwater and nutrients, herbivory, and other factors have generally resulted in forests that are highly stressed with a high rate of tree mortality (Keddy et al., 2007). Current conditions will allow very little regeneration if trees are logged or if they die from salt stress. Continued conversion of swamp to marsh or open water will allow more frequent and severe flooding from hurricanes, which threaten nearby communities and the interior swamps.

The land bridge is a transportation corridor including an interstate evacuation route and a railroad.

Proposed Project Features:

- Conserve all coastal wetland forests on the Maurepas Land Bridge.

- Reintroduce Mississippi River water into the Maurepas swamp (maximum design discharge of 3,000 cfs).
- Reintroduce Mississippi River water from the Bonnet Carré Spillway to Frenier (maximum design discharge of 5,000 cfs).
- Create 1000 acres of elevated soils to enhance cypress tree growth on the land bridge.
- Reduce impacts of nutria

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