



P.O Box 6965 Metairie, LA. 70009-6965 - SaveOurLake.org

April 2, 2007

To: Jon Porthouse
LA DNR - Integrated Planning Team
Baton Rouge, La.

RE: Comments on the Draft of Integrated Ecosystem Restoration and Hurricane Protection:
Louisiana's Comprehensive Master Plan for a Sustainable Coast

Dear Mr. Porthouse:

Thank you for the opportunity to comment on the State's draft Master Plan. The comments attached represent views of a select science and engineering Assessment Team representing outstanding experience and knowledge. The task of the Assessment Team was to evaluate the State's Master plan in light of the proposed Multiple Lines of Defense Strategy.

We find there are two systemic flaws in the state's Draft Master Plan that if not corrected may undermine both the goals of flood protection and a healthy estuary.

First, there is a need for explicit habitat goals. These are essential to unify the hydrologic design of coastal projects to result in a functioning and sustainable coastline.

Secondly, there should be more aggressive application and integration of natural ridges in the Master Plan. The historical pattern of bayou ridge development and intervening open estuary is Louisiana's own traditional "Smart Growth". Natural ridges are not just "lines of defense", but are also the historic development corridors between the estuarine basins. The importance of the compatibility of natural ridge corridors with estuarine restoration cannot be overstated. Widespread use of "back levees" provide needed protection to communities while isolating the wetland basins for restoration by diversion pulsing. Widespread use of lower "back levees" may very well be adequate for flood protection without massively high outer barrier type levees or flood gates.

The assessment Team will continue their work and review future plans as they develop and also release other technical reports as they develop.

See the attached document for complete comments.

Sincerely,

A handwritten signature in black ink, appearing to read "John A. Soggs". The signature is fluid and cursive, with a large, stylized initial 'J'.

John A. Lopez, Ph.D.

Chair – Multiple Lines of Defense Assessment Team

Director - Coastal Sustainability Program - Lake Pontchartrain Basin Foundation

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CC: Sidney Coffee, Chair, Governor's Office of Coastal Activities

Scott Angelle, Secretary, Louisiana Department of Natural Resources

Johnny Bradberry, Secretary, Louisiana Department of Transportation and Development

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Karen Gautreaux, Deputy Secretary, Department of Environmental Quality

Michael Olivier, Secretary, Louisiana Department of Economic Development

Brad Spicer, Assistant Commissioner, Louisiana Department of Agriculture & Forestry

Jerry Luke Leblanc, Commissioner, Louisiana Division of Administration

King Milling, Chair, Governor's Advisory Commission on Coastal Protection,
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Gerry Spohrer, Executive Director, West Jefferson Levee District

Steve Wilson, President, Pontchartrain Levee District, Levee Region 3 Representative

Windell Curole, General Manager, South Lafourche Levee District, Levee Region 4

Tina Horn, Parish Administrator, Cameron Parish, Non-Levee Parish Representative-
west of the Atchafalaya River

Randy Hanchey LA DNR

Comments on the Draft of Integrated Ecosystem Restoration and Hurricane Protection: Louisiana's Comprehensive Master Plan for a Sustainable Coast

Submitted by the
Multiple Lines of Defense Assessment Team

Sponsored by
Lake Pontchartrain Basin Foundation
Coalition to Restore Coastal Louisiana

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April 2, 2007

Introduction

The Lake Pontchartrain Basin Foundation formally released an influential paper in 2006 titled the "Multiple Lines of Defense Strategy to Sustain Coastal Louisiana" (Lopez, 2006). This coastal planning strategy was presented prior to Hurricane Katrina, but afterward had greater perceived relevance. The acceptance of the Multiple Lines of Defense Strategy (MLODS) has been significant and has been endorsed by the Coalition to Restore Coastal Louisiana and the Louisiana Wildlife Federation. In addition, both the state Department of Natural Resources and US Army Corps of Engineers have officially embraced the strategy.

The grant by the McKnight Foundation is intended to foster development of the Multiple Lines of Defense Strategy and to promote its best application in coastal Louisiana. The Assessment Team is a multi-disciplinary, professional team that was assembled to address these issues. The first task of the Assessment Team was to review the state's draft master plan considering the Multiple Lines of Defense Strategy. This document summarizes the team's current critique of the state plan. A series of Assessment Team work meetings were held in March, but unfortunately, this was not adequate to review all of the Planning Unit recommendations by the April 2 deadline. Detailed comments are provided for Planning Units 1, 2 and 3a. No detailed comments are provided at this time for planning units 3b and 4.

The Assessment Team will continue its deliberations for at least 2007 and other planning documentation will be forthcoming.

Assessment Team Members

John Lopez, Ph.D. (Chair) Coastal Scientist
Joe Suhayda, Ph.D. Engineer (hydrologic modeler)
Alex McCorquodale, Ph.D. PE Engineer (hydrologic modeler)
Subhash Kulkarni, PE Engineer
Martin O'Connell, Ph.D. Biologist (fish)
Mark Hester, Ph.D. Biologist (wetland plants)
Natalie Snider, Wetland Ecologist
Paul Keddy, Ph.D. Wetland plant ecologist
Paul Kemp, Ph.D. Oceanographer
Carlton Dufrechou, AICP Planner Engineer
Bryan Rogers, GIS & Documentation support

General Coast Wide Comments

The Multiple Lines of Defense Strategy proposes that there are two primary considerations needed to sustain coastal Louisiana. First are the eleven types of “Lines of Defense” which reduce storm surge and second are the habitat goals which support sustaining a healthy estuarine coast. The state’s master Plan does include most, if not all, of the eleven types of lines of defense, but it is vague or does not include habitat goals at all. Furthermore, the lines of defense, although present in the master plan, do not represent the optimum alignments for lines of defense. Without habitat goals, it is impossible to properly design levees, gates, and restoration elements that make up the lines of defense in the master plan and determine whether projects can work in concert to achieve surge protection and sustain the coast. (see **Figure 1**)

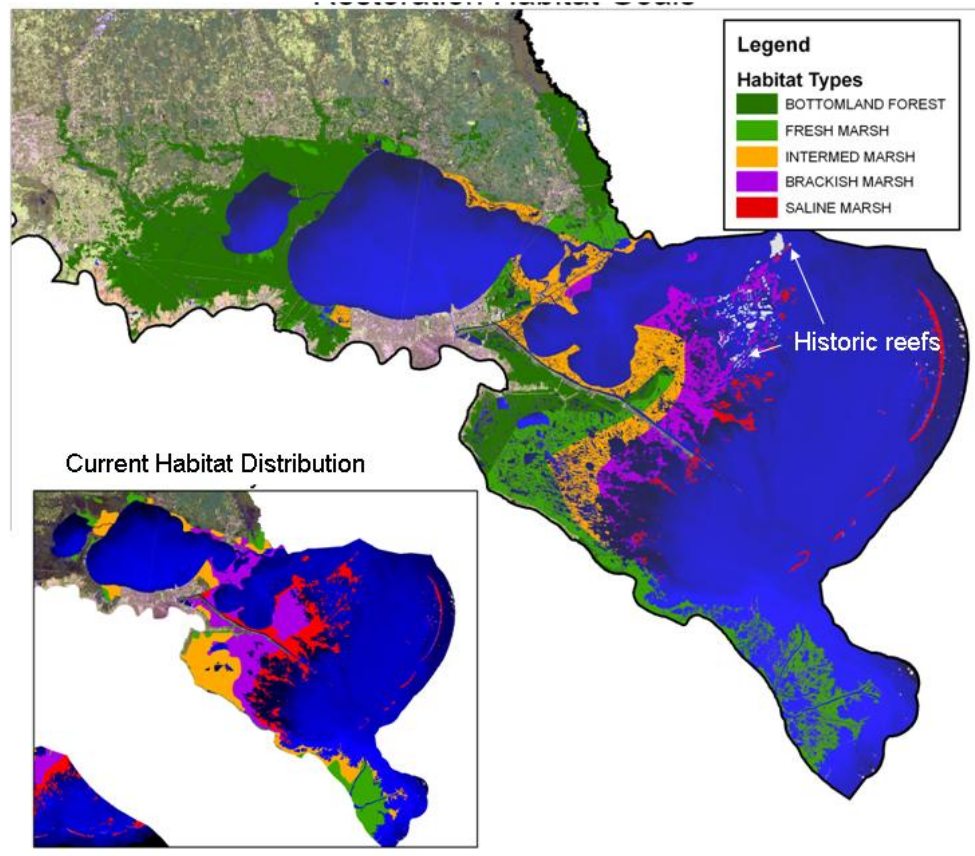


Figure 1: Example of a Wetland Habitat Goal map. Habitat maps will force the integration of hydrologic planning for the array of coastal projects including both coastal restoration and engineered flood protection projects such as levees and flood gates. (Source Lake Pontchartrain Basin Foundation, 2006)

Wetland habitat goals are essential for Louisiana’s coastal planning because:

1. They set a target for a sustainable estuary. Clear and measurable targets are increasingly recognized as a fundamental first step in any planning and restoration program.

2. They integrate the consequences of many separate coastal projects, including levees, flood gates, river diversions, and marsh creation.
3. They forecast the natural resource allocation expected for resource users in areas including fisheries and forestry. This allows the state and commercial stakeholders to properly plan for resource use. For example, crawfishers know where there will likely be crawfish after restoration is completed.
4. They optimize use of funding, including fisheries management programs and coastal restoration programs. The LA Departments of Natural Resources and Wildlife and Fisheries can work much more effectively enhancing shrimp and oyster fisheries.
5. They shift the estuary toward a more riverine influence.

An additional critical element to the Multiple Lines of Defense Strategy is the use of natural ridges as both lines of defense and as residential/commercial corridors. (To be clear: natural ridges have low slopes and are vegetated with indigenous trees whereas levees have steeper slopes and have grass vegetation) The state's master plan does propose restoring natural ridges but does not sufficiently use the natural ridge distribution to guide its levee alignments.

Levee alignments which do not follow natural ridges invariably cut across basins and alter the natural hydrology. Such trans-estuary levee alignments are antithetical to an estuary and will likely confound the best intentions and engineering. Non-ridge levee alignments create grave engineering problems. The soft soil will have higher subsidence rates and, therefore, simultaneously weaken levees, increase costs, and require additional maintenance. Trans-estuary levees will promote the same problems that we are now desperately trying to solve; that is, loss of wetlands.

There are other very strong arguments for levee alignments along ridges (often referred to as "back levees"). One is that better soils will reduce compaction/subsidence and therefore reduce costs. In addition, new levee alignments through wetlands will require expensive mitigation, adding to the cost. With ridge alignments, it is more likely that treated waste water and storm water can be diverted to adjacent wetlands to establish robust marsh and wetland forest buffers directly in front of back levees. ***Finally, the Assessment Team strongly suspects that new levee alignments across the estuary, such as the GIWW alignment in the Barataria Basin, are simply not necessary for storm surge protection.***

USACE modeling in the Preliminary Technical Report reported very high surge levels along the Louisiana coast with possible new levee alignments. Modeled surge against these levees was in excess of 30 feet. This extreme surge elevation is the product of the levee alignment itself and is not representative of the surge to be expected in a broad Louisiana wetland landscape. By instead modeling the existing landscape without a hypothetical new "barrier" levee, modelers find that surge such as in the Barataria Basin is dramatically lower (less than half).

Therefore, considering the natural landscape (ridges & basins) and the character of surge on the Louisiana coast, it is very advantageous for levees to flank natural ridges, i.e. back levees. Wetlands should be outside those levees to buffer surge. Levees can directly protect people and assets on ridges. The surrounding basin and estuary reduce surge heights and reduce surge energy. The more area that our levees envelope, the less area that there is left for surge to be

dispersed or attenuated. Conversely, the smaller the areas behind levees, the more area is available to allow natural hydrology and wetlands to flourish. It is important to appreciate that the GIWW alignment approximately cuts the areal extent of the estuary in half -- and in so doing doubles the height of the surge!

Development Ridge and Estuarine Basin:
The Traditional Louisiana "Smart Growth"

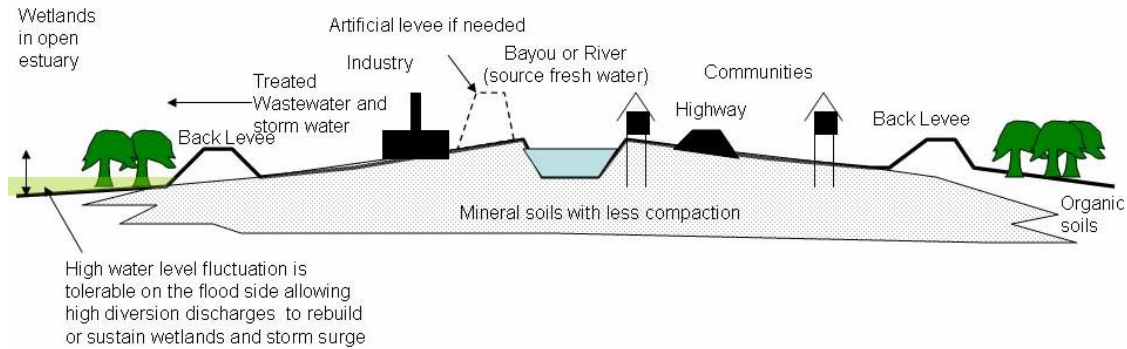


Figure 2: Conceptual profile view of elements of a ridge development corridor and an adjacent estuary. The back levee allows compatibility between the development corridor and an estuarine basin. The estuary on the flood side is subject to storm surge, marine influence and elevated water levels from river diversions. Elevated causeways may connect ridges by crossing the estuarine basin between ridges. Back levees do require management of drainage and will likely require pump stations.

Traditional “back levees” near the outer edges of the natural levees along developed corridors such as the Mississippi River, Bayou Lafourche, Bayou la Loutre, etc. are not just a pre-1900 cultural legacy, they are our own Louisiana style of “Smart growth”, i.e. homes on high ground - wetlands in low ground (see **Figures 2 and 3**). The back levees are not just protecting the ridge-based assets but also allow for management of diversions within the wetlands to prevent (backwater flooding). Another important attribute of back levees along the Mississippi River is that the river is a potential source of sediment to build the levees.

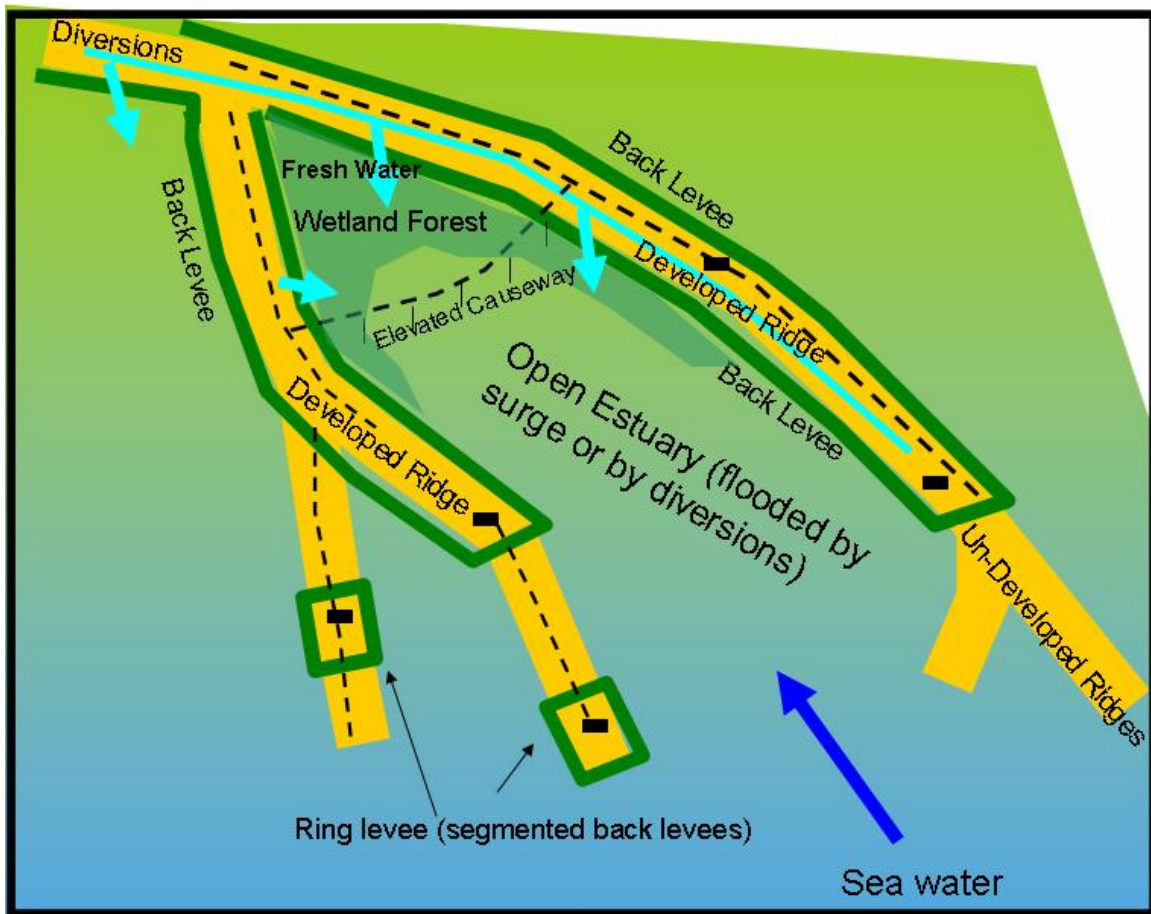


Figure 3: Conceptual plan view of elements of a ridge development corridor and adjacent estuaries. The back levee allows compatibility between the development corridor and an estuarine basin. Ring levees (segmented back levees) may be appropriate in sparsely populated areas or areas in need of direct water access. Trans-estuary levee alignments between ridges are problematic and generally unnecessary.

There is an abundance of scientific documentation of the detrimental effect of impounding wetlands or “structural management” (Sanzone, and McElroy, 1998). These include, at least, reduction in sediment input, reduction of aquatic access for migratory species, alteration of the nutrient budget, increases in subsidence, stranding of salt water leading to salt stress or plant mortality, etc. In Louisiana, there is a legacy of failed reclamation or failed polders such as shown in **Figure 4**. Examples include Delta Farms, The Pen, Guste Island, East New Orleans, Big Mar, Avoca Island, and more.

A particularly disturbing aspect of hydrologic management or reclamation of wetlands in Louisiana is that once the wetlands are brought under management, it seems impossible to hydrologically bring them back into the estuary. Often it is because the land subsides. A casual look at a map of the Louisiana coast reveals many unnaturally “square lakes” which were once wetlands. These historic Louisiana examples are relatively small areas behind levees. The state master plan would include nearly 2000 square miles under hydraulic management west of the river. If flood gates are built on Chef and Rigolets, the total area that would be subject to hydrologic modification would be over 3500 square miles. This area surpasses the entire land loss Louisiana has seen since 1932: 2000 square miles.

Example of wetland loss due to construction of levees and development of “square lakes”



Figure 4: Example of wetland loss due to levee construction around wetlands. Land has subsided due to lack of plant growth creating unnatural “square lakes” along old levee alignments. Note adjacent areas (east and west) without levees are solid wetlands.

Conclusions – Two Systemic Flaws

In general, we see two major systemic flaws in the state’s master plan that are contrary to the best Multiple Lines of Defense Strategy.

1. The lack of habitat goals will allow future design and construction to proceed without a specified target. **Therefore, habitat goals need to be adopted or developed.**
2. Extensive development of back levee protection along developed ridge flanks is far more promising than large outer barrier levees and gates. Back levee alignments will be longer, but in general much lower and have less maintenance. The goal of levee alignments should not be to minimize the length of levee, but to minimize the area enclosed by levees and therefore maximize the long term maintainability of the levees and sustainability of estuarine wetlands. **Therefore, the new outer barrier levee alignments are seriously questioned and alternative ridge/back levee alignments must be included in the state’s master plan.**

Additional Coast Wide Recommendations

Compartmentalization of Municipalities

The concept of flood compartments within dense development areas (major municipalities such as New Orleans) should be evaluated. Compartmentalization enhances flood protection in the event of overtopping or levee failure by internal barriers within a levee system making internal compartments (polders) which may restrict the areal extent of flooding. This is a recommendation of the original Bring New Orleans Back Committee. It is being further developed for New Orleans by the Flood Protection Alliance. Implementation of any such polder plan must assure flood protection equity amongst all residents.

“River Flood Restoration Action Plan”

The Mississippi and Atchafalaya Rivers inevitably have occasional “great floods”. The last great river flood was in 1993 and prior to that in 1973 and 1927. Geological data show that ever larger mega-floods have occurred regularly (Brown and Kennett 1999). The occurrence of these flood events is driven by confluence of high precipitation events in the Mississippi River drainage basin. These events are considered threats for flooding but, in Louisiana, represent rare opportunities to have dramatic restoration of our coastal wetlands because of the volume of sediment-rich water and the abnormal hydraulic head (river stage). The state’s master plan should have a recommendation for the state to develop a “River Flood Restoration Action Plan”. The plan would be an action plan to be implemented in the event of exceptionally high water on the Mississippi or Atchafalaya Rivers. The goal of the action plan is to maximize restoration benefits to the coast during a major flood event by introducing freshwater, sediment and nutrients into the coastal estuaries. Actions might include maximum use of controlled freshwater diversions in which the normal salinity/habitat targets are not used to limit flow. Other examples might be to use flood control structures to additional advantage for restoration, such as installation of gates on the east and west guide levees in the Bonnet Carre Spillway to flood the adjacent marsh in La Branche or Frenier wetlands. Another example would be to allow flooding of impounded areas such as Bayou Sauvage NWR by Mississippi River water via Lake Pontchartrain during a flood protection opening of the Bonnet Carre’ Spillway. The Morganza spillway should be evaluated for restoration advantages in high water. Since the flood river condition will likely create greater maintenance dredging of navigation channels, the action plan could include an emergency beneficial use of dredge material for sites along the Mississippi River.

The use of “pulsing” is well established and has been used with the normal river stages (Day, 1997). Exceptionally high water on the Mississippi River represents a multi-generational opportunity that should be considered within the 100-year planning horizon of the master plan. Since fisheries may experience short-term negative impact, the action plan should include short-term impact assistance for commercial fisheries. Since the flood year can’t be predicted and could occur in just the next 12 months, this is a standing plan of action that should be developed as soon as possible. It is likely that such a plan could be utilized several times within the 100 year time frame and have a dramatic influence toward sustaining the coastal wetlands. Other smaller rivers could also have their individual action plans such as the Pearl, Vermillion, Amite and Sabine Rivers.

Re-evaluation of Artificially Maintained Navigation channels

Between the Mississippi River and the Sabine River, there are at least eight commercial navigation channels that are artificially maintained (dredged). These include Southwest Pass, Empire Waterway, Barataria Waterway, Bayou Lafourche (Fourchon), Lower Atchafalaya River, Freshwater Bayou, Calcasieu Pass and Sabine Pass. The maintenance of the navigational channels with dredging, jetties, etc. often has negative consequences to coastal wetlands such as disruption of sediment transport, salt water intrusion, high salinity events, increased storm surge, etc. An array of channels that link the gulf water with coastal infrastructure has developed over the past century from many economic forces including oil and gas, commercial fishing, etc. In light of the coastal crisis, all of the channels should be re-evaluated for justification and, if justified, to determine what if any changes can be made to maintain navigation while reducing detrimental coastal impacts.

Coastal Risk Education Program

The state's master plan should include a recommendation to develop a very strong public education and awareness campaign to educate the public on coastal risks and risk mitigation. Technical risk terminology such as "1% Level of protection", "100 year level" or "Cat 5" are examples of terms commonly used and misunderstood. The language of coastal risk needs to be established by the state and communicated to the public. Describing risk in familiar terms such as the chance your home would be flooded during your 30-year mortgage is more understandable to the public. Just as important is to communicate what individuals can or should do to minimize their personal exposure to storm events. Non-structural approaches must be ingrained into coastal residents and public officials. The public must understand where the public liability ends and personal liability begins. This can only be one through a common language of discussion.

Non-structural Solutions

The state's master plan should aggressively develop education programs, inducements and financial support for non-structural mitigation of flood threat to homes, businesses and other immobile assets. A statewide ban on building finished residential or office space below sea level should be considered. Construction on grade should be discouraged in all of the coastal zone.

Oyster reefs

The draft CCPMP has little emphasis on restoration of structural oyster reefs. Shellfish, in particular, are recognized to have tremendous benefits throughout the estuary including providing shoreline protection for marshes. Once the hydrology is restored, oyster reefs can be re-built within a few years and provide highly sustainable benefits. The historic reefs of the Biloxi Marsh and Mississippi Sound (circa 1930) are targeted for restoration through the proposed freshwater diversion at Violet and through creation of hard structure for reef growth. Other areas of the coast have even greater potential to help sustain the coastal marshes.

Land Use Planning and Risk Reduction

While the Master Plan emphasizes the importance of land use planning, building codes, and evacuation planning, such as the need to prevent development in wetland areas, foster sustainable coastal forests, and to strictly enforce land use controls, it offers little direction to parish and municipal governments on how to do so. Current state law enables local planning and zoning. However, it is not mandated by the state nor do local governments receive guidance to implement such measures. This is particularly concerning given the Master Plan's attention to new levee projects, such as Morganza to the Gulf, which are expected to cause induced development behind them, resulting in further wetlands destruction and compromising the storm

surge protection wetlands provide, and placing life and property in harm's way. In order to uphold the integrity of the Master Plan, it should be revised to incorporate projects and programs that address these issues. Further, the discussion must include the role of state regulatory permitting agencies, like the Louisiana Department of Natural Resources (LDNR), in protecting wetlands and coastal resources. Specifically, there are opportunities through LDNR's Coastal Use Permitting process that can assist in protecting coastal resources and further support the objectives of the Master Plan; such measures should be clearly stated in the Plan.

Review of Master Plan Objectives

Objective #1: Reduce economic losses from storm based flooding to residential, public, industrial, and commercial infrastructure, making sure assets are protected, at a minimum, from a storm surge that has a 1% chance of occurring in any given year.

Assessment Team Comment: Some key industries not described: Institutions of higher learning, hospitals, medical research.

Objective #2: Promote a sustainable coastal ecosystem by harnessing the processes of the natural system.

Assessment Team Comment: “Promote” is too weak of a word for an essential goal. We propose:

Objective #2 Achieve sustainable wetland habitat goals through integration of flood protection and coastal restoration by optimizing use of natural coastal and estuarine processes.

Objective #3: Provide habitats suitable to support an array of commercial and recreational activities coast-wide.

Assessment Team Comment: No comment

Objective #4: Sustain, to the extent practicable, the unique heritage of coastal Louisiana by protecting historic properties and traditional living cultures and their ties and relationships to the natural environment.

Assessment Team Comment: The Master Plan does not seem to recognize the commercial aspect of tourism including unique coastal communities and ecotourism.

Proposed Objective #5 -

To demonstrate a sustainable coastal society that does not contribute to global warming and sea level rise.

- **Rising sea levels are a great risk to coastal Louisiana, and will override all the short term solutions. Louisiana should demonstrate that it is possible to have a productive but carbon neutral economy.**
- **The master plan will promote development that minimizes production of greenhouse gases through actions including at least: mass transit, solar power, hybrid cars, energy efficient building codes, etc.**
- **The master plan will include use of cypress forests and river diversions for carbon sequestration.**

Proposed Objective #6

Protect human life and health through a comprehensive coastal master plan including structural and non-structural approaches to mitigate risk and emphasize public education of risks. Mitigation of risk should include emergency planning and encouragement of low risk-development of the coast.

Planning Unit 1: East of the Mississippi River

D 1-1. Lake Pontchartrain Barrier Plan: Caernarvon to Pearl River Hurricane Protection

Assessment Team Comment: In discussing the outer barrier features such as levees and gates on the Lake Pontchartrain passes in Planning Unit 2 and the GIWW levee alignment in Planning Unit 2, it is worth contrasting the gross geomorphology and the inherent interaction with approaching storm surge. In Planning Unit 1 the angular geometry between the Mississippi Coastline and the Mississippi River creates a large funnel whose angle is roughly 75° and with an opening 90 miles wide (Venice to Ocean Springs). The compass direction of the funnel center line is just a few degrees south of east. In contrast, Planning Unit 2 has an angular opening (Mississippi River to Bayou Lafourche) of roughly 25° and an opening of 45 miles. The compass direction of the centerline of the funnel is southeast. Since an approaching storm will have its highest wind and surge in the northeast quadrant and pushing the most water from east to west, it seems intuitive that Planning Unit 1 with a larger opening and more funneling effect will inherently have higher risk to extreme surge events compared to Planning Unit 2. If outer barrier features are needed anywhere, it is more likely to be in Sub-Province 1.

It is probably premature for the state to commit to gates and new outer barrier levees. Much more can be gained in the immediate future by repairing and enhancing the flood protection system of the existing levee alignments. Levees on existing alignments should be designed to be overtopped and designed to have very low risk of failure of levees. Complimentary elevations of homes or assets appropriate for the risk/inundation for various assets.

New large barrier type levees or structures will be extremely expensive and are speculative. It may be many years and many hurricane seasons before they would build. Gates on the natural passes may be impossible to design without major changes to the estuary and Lake Pontchartrain. It was noted that 85% of finfish in Lake Pontchartrain migrate to the gulf at some point in their life. Of the 3 alignments proposed, the westernmost alignment is the most acceptable (a) and that the easternmost (open water) is least acceptable (c).

The flood gates at Chef and the Rigolets need to have a proven need and result. Their design and management must be to minimize environmental impacts while providing the needed flood protection. The current CCPMP design suggests a 50% reduction in the pass opening and is of great concern.

In lieu of a new barrier levee plan it was argued that the existing alignment may be adequate with the following: elevating levees and designed for overtopping without failure, Build extensive wetland buffer on the flood side of levees such as Jefferson, St. Bernard and Orleans Parishes, elevating assets within levees to withstand overtopping flooding and lower risk of failure of levees. The state must consider this as an alternative before committing to an outer barrier levee alignment.

D 1-2. Caernarvon to Belair Hurricane Protection

Assessment Team: No Comment

D 1-3. Pointe a la Hache to Phoenix Hurricane Protection

Assessment Team: No Comment

D 1-4. St. Bernard 40 Arpent Levee

Assessment Team Comment: Important redundancy in surge protection for St. Bernard Parish

D 1-5. West Shore of Lake Pontchartrain Hurricane Protection

Assessment Team Comment: Back levee is appropriate but should be located to minimize inclusion of wetlands.

D 1-6. Lake Pontchartrain and Vicinity Hurricane Protection

Assessment Team Comment: Re-evaluation should include the need for a wetland buffer on the lake side of protection levees (as proposed in Jefferson Parish). Consideration should be given to degrade levees around Bayou Sauvage NWR and re-build these wetlands. Degrading the levees would reduce surge in eastern lake Pontchartrain as a hurricane moves inland causing a sloshing effect of the lake toward Slidell. A new levee would be southwest near the Maxtent canal. Also the New Orleans Lakefront Seawall needs to be repaired for protection of the New Orleans' Lakefront levee.

D 1-7. North Shore of Lake Pontchartrain and Lake Maurepas Hurricane Protection

Assessment Team Comment Evaluation is appropriate but ultimately recommendations should maximize use of non-structural means of surge protection. Implementing "smart growth" to concentrate assets and infrastructure as well as minimizing alteration of the hydrology of the flood plain are important steps to be taken now.

D 1-8. Raise/Maintain Evacuation Routes Located Outside the Hurricane Protection Systems

Assessment Team Comment: Complete evacuation routes should be shown on maps within the master plan. Alterations to highways should be considered as threats or potential opportunities to manage the estuary. Evacuation routes are also routes of re-entry after a flood event which are critical to first responders. A guiding principle should be that the flood protection level for an evacuation route within any area should be at least equivalent to the adjacent inland area with a higher level of protection. This is intended to assure evacuees can move from any area to the next level of protection. This would also apply to areas of the coast outside levee systems and therefore provide for complete evacuation for the entire coastal region. All existing evacuation routes should be posted on maps.

D 1-9. Mississippi River Diversion at Hope Canal

Assessment Team Comment: Assessment Team is concerned about the long time before completion. It is currently estimated the design phase alone will not be completed until January 2009. The diversion structure should be 100% overbuilt for potential discharge increase future.

D 1-10. Mississippi River Diversion at Convent/Blind River

Assessment Team Comment: A diversion located at Romeville, LA may be a more suitable location or multiple smaller diversions may be preferable than a single 5000 cfs diversion. Like the diversion at Hope Canal there is great urgency to complete.

D 1-11. Shoreline Stabilization on Maurepas Landbridge

Assessment Team Comment: It is not clear why the state chose these particular reaches of the Maurepas landbridge for protection. The team questioned the suitability and environmental impact of armoring in an area where it may not be needed. Some wave protection may be needed but these structures should be low crested so that they are not destroyed by hurricanes and so that they have minimum environmental damage. Gaps should be designed in to the protection in a similar manner to the structures along the Chenier Shoreline. The team suggested biologic (restoration solutions) to sustain the landbridge such as a westward diversion through wetlands from the Bonnet Carre' spillway, a larger diversion through the Hope canal, and rebuilding the swamp platform with "marsh creation".

D 1-12. St. Tammany Marsh Restoration and Shoreline Protection

Assessment Team Comment: Protection should avoid hard armoring except in areas of very high erosion. The north shore marshes have exceptional diversity and ecologic value and should be protected or restored. Development impact should be minimized. Beneficial use of treated sewage and storm water effluent should be conducted in appropriate wetlands.

D 1-13. Shoreline Protection on South Shore of Lake Pontchartrain

Assessment Team Comment: We are very supportive of wetland buffer. The feasibility of creating a sand beach with groins should be considered to further enhance buffer and recreational value. The Stepped Seawall along LP has been severely damaged by Katrina and Ivan. This is an integral part of the South Shore Hurricane protection in Orleans Parish. It should be repaired as part of the restoration to pre-Katrina protection.

D 1-14. East Orleans Landbridge Shoreline Protection and Ridge Restoration

Assessment Team Comment: We support this proposal .

D 1-15. Close Mississippi River Gulf Outlet (MRGO) at Bayou La Loutre Ridge

Assessment Team Comment: Additional constrictions on the MRGO (in addition to the plug at Bayou la Loutre) should be adopted in the plan to reduce the fetch and energy of surge in front of the St. Bernard levee.

D 1-16. Mississippi River Gulf Outlet (MRGO) Shoreline Stabilization

Assessment Team Comment: The value of this measure should be re-evaluated considering the eminent closure of the MRGO and the elimination of ship wakes.

D 1-17. Central Wetlands Restoration

Assessment Team Comment: The wetland assimilation project should be integrated with the proposed Violet Diversion project.

D 1-18. Marsh Creation at Golden Triangle

Assessment Team Comment: This project is supported but may be contradictory to the potential levee alignments across the Golden Triangle. The potential levee alignments needs to be considered.

D 1-19. Mississippi River Diversion at Violet

Assessment Team Comment: A 50,000 cfs discharge is probably unnecessarily large. The project should be designed to benefit the central wetlands, the Biloxi marsh and Mississippi Sound by maintaining the habitat goals as originally proposed in the 1984 Feasibility study of the Bonnet Carre Diversion Project. Preliminary modeling suggest 10,000 to 15,000 cfs discharge is probably appropriate.

D 1-20. Maintain MRGO – Lake Borgne Landbridge

Assessment Team Comment: Necessary project

D 1-21. Modify Authorization of Caernarvon Diversion

Assessment Team Comment: Recommend operating diversion with max flow in the spring (April May June). Operated to accelerate recovery from Katrina and Rita and increase plant productivity while stabilizing habitats.

D 1-22. Maintain and Restore the Breton Sound Marshes

Assessment Team Comment: Recommendation is vague and does not mention importance as a buffer to the two existing levees in Plaquemines and St. Bernard Parishes

D 1-23. Mississippi River Diversion at White Ditch

Assessment Team Comment: Discharge seems unnecessarily large especially considering the nearby Caernarvon structure is underutilized. The CWPPRA proposed discharge of 500 cfs seems more appropriate.

D 1-24. Maintain and Restore the Biloxi Landbridge and Barrier Reefs

Assessment Team Comment: very supportive

D 1-25. Restore Bayou La Loutre Ridge

Assessment Team Comment: The ecologic value of forested habitat should be emphasized in restoration.

D 1-26. Mississippi River Diversion at Bayou Lamoque

Assessment Team Comment: No Comment

D 1-27. Chandeleur Islands Habitat Management Plan

Assessment Team Comment: Concern that recommendation is weak and does not recognize the unique and important ecologic value of the Chandeleur Islands. Loss of the islands would expose Biloxi marsh to increased wave energy and alter the salinity regime of interior marsh and sounds. Louisiana's 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 part of State waters. These habitats are essential to many valuable fishes and fishery resources including commercial species (e.g., blue crabs), recreational species (e.g., redfish), and federally threatened and endangered species (e.g., various seaturtles). Recent fishery research by the Nekton Research Laboratory at 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 and this may be the only place in the State where nursery habitat for these species occurs. There is also evidence that lemon sharks use the Chandeleur Islands as "pupping grounds". If this is confirmed, it means this area is one of the few places on the planet where this shark species reproduces. Federally-threatened Gulf sturgeon are known to feed in shallow habitats associated with barrier islands and there are known occurrences of sturgeon occurring in the Chandeleur region. Should the Islands not be restored and allowed to disappear, Louisiana will lose those unique and valuable fishery habitats that are formed and protected by the Chandeleur Islands.

Additional Recommendations for Planning Unit 1

The Bonnet Carre Spillway should be evaluated to make modifications in the design and management to include introductions of river water directly into adjacent wetlands for the benefit of local wetlands. This does **not** imply the original Bonnet Carre diversion (1984) which targeted 70-mile distant marsh and sounds and used Lake Pontchartrain as a conveyance should be recommended by the state plan.

Planning Unit 2: Mississippi River to Bayou Lafourche

D 2-1. Donaldsonville to the Gulf Hurricane Protection

Assessment Team Comment: The Donaldsonville to the Gulf (GIWW) Alignment is considered unacceptably contrary to coastal restoration and unnecessary for flood protection. The levee would likely cause large-scale hydrological changes in the basin by impoundment of 1,100 mi² of wetlands. It would restrict flow of fresh water to the south or salt water to the north resulting in alteration of the distribution of sediment and nutrients. The result may be irreversible damage to the Barataria estuary. This alignment would also preclude the natural inland shift of the estuary with rising sea level.

USACE modeling in the Preliminary Technical Report reported very high surge levels along the Louisiana coast with possible new levee alignments. Modeled surge against these levees was in excess of 30 feet. This surge is an artifact of the levee alignment itself and is not representative of surge to be expected in a broad Louisiana wetland landscape. Without a hypothetical new “barrier” levee and modeling instead the existing landscape, modelers find that surge such as in Barataria Basin are dramatically lower (less than half).

The GIWW levee would also be built on top of subsiding organic soils leading to expensive maintenance costs. An alternative alignment of back levees parallel to the natural ridge or natural levees is highly desirable for the reason described previously. Barataria bay is one of the most productive estuaries along the coast, and the GIWW alignment’s cost is greatly enhanced when the loss of economic revenue is considered.

The Assessment Team strongly recommends a back levee alignment (a.k.a. swamp alignment) which would flank the natural levees of the Mississippi River (outside of New Orleans) and Bayou Lafourche in lieu of the GIWW barrier “leaky levee”. This alignment should consider not just surge flood, but also the potential for back water flooding from river diversions such as Davis Pond.

D 2-2. Larose to Golden Meadow Hurricane Protection

Assessment Team Comment: The levee height for this region will not need to be so high if the GIWW levee is not built. The Assessment team proposes that back levees be build along the Bayou Lafouche corridor and the west bank of the Mississippi River. We also recommend ring levees be built to protect other outlying communities. Levee heights would be based off of storm surge modeling for the Barataria basin with a GIWW alignment.

D 2-5. Grand Isle and Vicinity Protection and Shoreline Stabilization

Assessment Team Comment: Dune or barrier island modifications should use and be appropriate for native vegetation and promote the ecology of the barrier island.

D 2-6. Raise/Maintain Evacuation Routes Located Outside the Hurricane Protection Systems

Assessment Team Comment: Modification of roads may allow opportunities to manage the estuary appropriately. It is also recommend that all evacuation routes have the same protection level as adjacent inland (higher) level of flood protection.

D 2-7. Upper Barataria Basin Hydrologic Improvements at Highway 90

Assessment Team Comment: The new Interstate 49 should be elevated appropriately for 0.2% surge height to be used as an evacuation route. Interstate should be constructed with end-on-end construction to minimize the wetland impact. The new interstate creates the opportunity to

remove impoundments along Highway 90. This will be to improve the estuarine hydrology and reduce threats of flood from rain events.

D 2-8. Watershed Management Plan for Upper Barataria Basin

Assessment Team Comment: The need for hydrologic management is greatly reduced or not needed without the GIWW levee alignment.

D 2-9. Move Freshwater to Terrebonne Basin from Barataria Basin via GIWW

Assessment Team Comment: This goal of this recommendation suggests that the GIWW levee is not as “leaky” as proposed by the master plan. Fresh water would be blocked from flowing south to achieve this goal and conflicts with the north to south flow of the estuary as suggested by the “leaky levee”. The GIWW alignment should not be constructed, but this does not preclude the goal of moving water west across Bayou Lafourche through the GIWW.

D 2-11. Mississippi River Diversions at Strategic Locations in Upper Basin

D 2-12. Modify Authorization of Davis Pond Diversion

Assessment Team Comment: Wetland habitat goals that are consistent with the need of flood protection and a sustainable estuary need to be defined for the Barataria Basin to establish long term fisheries and management of diversions. Authorization needs to be consistent with the habitat goals.

D 2-13. Mississippi River Diversion at Myrtle Grove with Dedicated Dredging

Assessment Team Comment: Wetland habitat goals that are consistent with the need of flood protection and a sustainable estuary need to be defined for the Barataria Basin to establish long term fisheries and management of diversions. Authorization needs to be consistent with the habitat goals.

D 2-14. Mississippi River Diversion at West Pointe a la Hache with Dedicated Dredging

Assessment Team Comment: Wetland habitat goals that are consistent with the need of flood protection and a sustainable estuary need to be defined for the Barataria Basin to establish long term fisheries and management of diversions. Authorization needs to be consistent with the habitat goals.

D 2-15. Marsh Creation in Barataria Basin

Assessment Team Comment: This project relies on a healthy (sustainable) estuary to be effective long-term. Marsh creation should be on marsh land bridges that act as a line of defense and may be inherently more sustainable. Wetland habitat goals that are consistent with the need of flood protection and a sustainable estuary need to be defined for the Barataria Basin to establish long term fisheries and management of diversions. Non-riverine sediment sources should be accessed to reduce cost.

D 2-16. Ridge Restoration in Barataria Basin

Assessment Team Comment: The selection of ridges for restoration either are not completely appropriate or are not properly integrated with other restoration /flood protection features. Natural ridges should be re-forested with native ridge vegetation and provide important upland habitat.

D 2-17. Barrier Shoreline Restoration: Barataria Basin

Assessment Team Comment: Barrier islands provide short-term surge reduction but more significantly provide long-term protection of the estuary which is vital for surge reduction and estuarine health. Barrier island restoration is historically designed on an island by island basis. This may be self defeating approach to sustainability. It is imperative that the larger barrier island reaches have a managed sediment budget that includes all of the gulf shoreline elements influencing sediment transport include the islands, jetties, passes, navigation channels etc.

D 2-18. Bankline Protection for Gulf Intracoastal Waterway (GIWW)

D 2-19 West Bank and Vicinity Hurricane Protection Project

Assessment Team Comment: The existing alignment is close to the ideal of protecting areas on or adjacent to natural levees or ridges. The existing levee alignment with additional improvements should be strongly considered as the primary levee alignment for the New Orleans west bank for 0.2% protection levels without the need for an outer barrier levee at the GIWW. With an open and healthy Barataria estuary storm surge will be widely dispersed and lower. The threat of extreme surge events is not as great as the east bank of New Orleans (see earlier discussion). Working with the existing levee alignment will likely result in more rapid enhancement of flood protection while allowing near complete use of the wetland buffer to diminish surge before it encounters this levee alignment. Enhancement of the existing levee alignment and further back levee development will allow for more aggressive use of diversion to restore the estuary.

Additional Recommendations for Planning Unit 2

The master plan indicates a large diversion to be located on the somewhere on the lower delta in the Barataria Basin. A large diversion south of Venice should be designed to deposit sediment near the gulf shoreline to supply sediment to the gulf shoreline eastward to Quatre Bayou Pass by taking advantage of the natural long shore transport northwestward along this reach. For example, channel improvements to Tiger Pass should be evaluated to increase discharge through this pass. Management of the gulf shoreline should include restoration of sediment transport so that losses are minimized by navigational channels, passes and jetties.

Planning Unit 3a: Bayou Lafourche to Bayou de West

D 3a-1. Morganza to the Gulf Hurricane Protection

Assessment Team Comment: It is inappropriate considering the aftermath of Hurricanes Katrina and Rita including the lessons-learned, the federal financial limitations, and the specter of greater storm surge threats that the Morganza to the Gulf project is effectively “grandfathered” into the state's master plan. Those that might think the hurricanes are de facto proof of the need for Morganza to the Gulf misunderstand the lessons the storms provide. In New Orleans, it was an inadequate flood protection system that resulted in the disastrous consequences of Hurricane Katrina. The recent Team Louisiana report issued by the La DOTD makes this abundantly clear. The Morganza to the Gulf was conceived in another time when less surge and more coastal restoration was anticipated. To the contrary restoration has not been adequate and greater storm surge due to more frequent higher category hurricanes is now anticipated. **Figures 5 and 6** dramatically illustrate the proximity of the alignment to the Gulf, the adjacent historic land loss and the calamitous potential of future land loss. Morganza to the Gulf places a regional levee alignment too far south impounding wetlands and reducing the storage for storm surge. The alignment forebodes a new false security for the region that may well lead to future disastrous consequences. The tax payers who might pay for this project and the residents who might chose to live within this levee alignment deserve more than an outdated and ineffective flood protection system design.

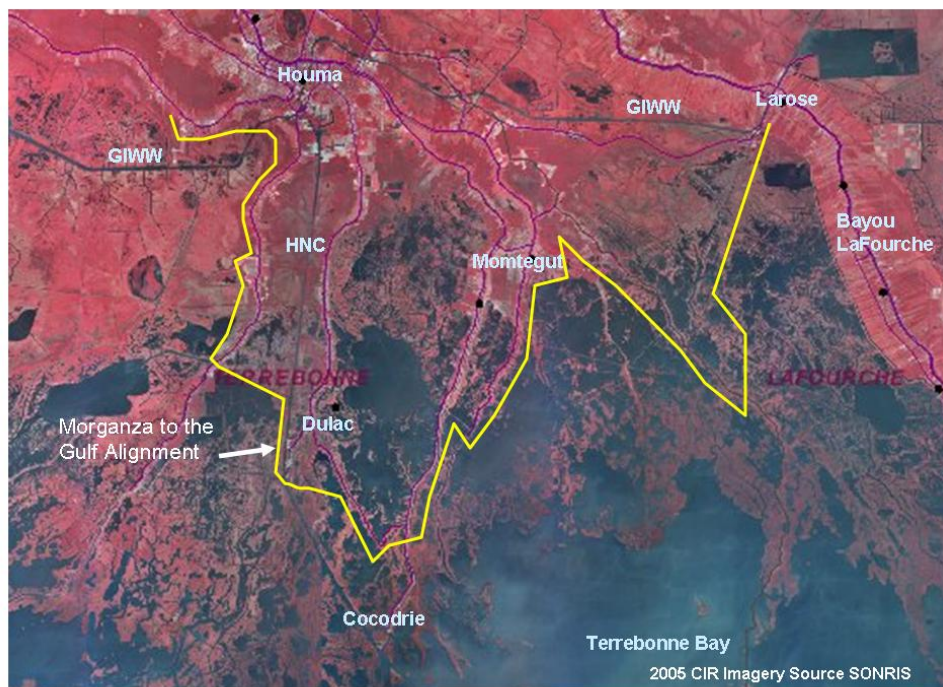
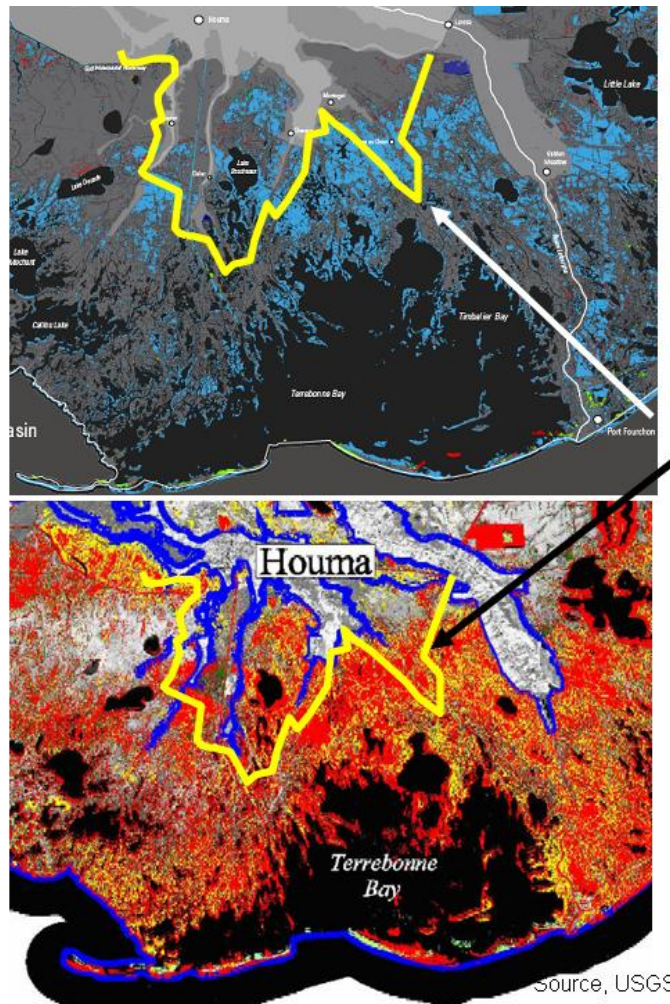


Figure 5: The Morganza to the Gulf Levee alignment on 2005 CIR imagery. Note the thin and fragmented marsh is all that separates the levee from Terrebonne Bay. Also note the inclusion of wetland areas within the alignment.

The Assessment Team recommends an alternative be evaluated using ring levees (segmented back levees) on each of the individual ridges (see Figures 2 and 3). This is consistent with the ridge/ estuary model. This approach in combination with non-structural approaches may actually provide a higher and more reliable flood protection level.



Morganza to the Gulf
proposed alignment

Figure 6: The Morganza to the Gulf Levee alignment on a map of historic land loss in blue (upper) and projected land loss in red (lower) (Source: USGS). Note the massive anticipated land loss south of the levee alignment.

D 3a-3. Morgan City to Gibson Hurricane Protection

Assessment Team Comment: Comments: This alignment should be designed to accommodate the East Atchafalaya Restoration Spillway as proposed below.

D 3a-4. Houma and Vicinity Hurricane Protection

Assessment Team Comment: This flood protection system should be designed to be adequate for 0.2% level of protection without the current design of the Morganza to the Gulf levee.

D 3a-6. Bankline Protection for Houma Navigation Canal (HNC)

Assessment Team Comment: This project provides no Flood Protection benefit and very little or no Coastal Restoration Benefits. It does not serve the master plan objectives of flood protection and coastal restoration.

D 3a-7. Multipurpose Operation of the Houma Navigation Canal (HNC) Lock

D 3a-8. Bankline Protection for GIWW

D 3a-9. Marsh Creation in Terrebonne Basin

Assessment Team Comment: The extent of marsh creation is overly ambitious. It should be more selective and incorporate the East Atchafalaya River Spillway concept. Restoration of oyster reefs around Terrebonne Bay should be included.

D 3a-11. Freshwater Introduction via Blue Hammock Bayou

Assessment Team Comment: Restoration and protection of this feature should be incorporated into the East Atchafalaya River Spillway described below.

D 3a-12. Ridge Restoration in Terrebonne Basin

Assessment Team Comment: Many of the ridges targeted for restoration may not be sustainable unless there is extensive marsh creation in the surrounding areas. This approach seems overly dependent and speculative. A more strategic selection of ridges needs to be made.

D 3a-13. Maintain Landbridge between Caillou Lake and Gulf of Mexico

Assessment Team Comment: This is a critical coastal land bridge and may be considered a line of defense. Restoration and protection of this feature should be incorporated into the East Atchafalaya River Spillway described below.

D 3a-14. Barrier Shoreline Restoration: Terrebonne Basin

Assessment Team Comment: Barrier islands provide short-term surge reduction but more significantly provide long-term protection of the estuary which is vital for surge reduction and estuarine health. Barrier island restoration is historically designed on an island by island basis. This may be self defeating approach to sustainability. It is imperative that the larger barrier island reaches have a managed sediment budget that includes all of the gulf shoreline elements influencing sediment transport include the islands, jetties, passes, navigation channels etc.

D 3a-15. Watershed Management Plan for Upper Terrebonne Basin

Assessment Team Comment: A redesign of the Morganza to the Gulf alignment incorporating isolated ring levees would not create the need for significant water shed management for the Upper Terrebonne Basin.

Additional Recommendations for Planning Unit 3a

The proposal to construct a spillway just upstream of Morgan City should be included as an alternative in the state master plan. A proposal referred to as “East Atchafalaya River Spillway” (EARS) was proposed by Dr. Paul Kemp (Figure 7) in a report to Environmental Defense (Kemp & Hyfield, 2006). This proposal is strongly consistent with the Multiple Lines of Defense approach since it emphasizes restoration into an area that can provide as a surge buffer. The project has great potential for long term sustainability of the Penchant Basin and the eastern areas of the Planning Unit 3 a (west of Terrebonne Bay. In light of the post-Katrina strategy to accelerate and maximize coastal restoration the original proposal should be evaluated to higher discharges than originally proposed. It is conceivable that the best alternative a near complete river diversion through a spillway which captures the majority of discharge through the Atchafalaya Delta.

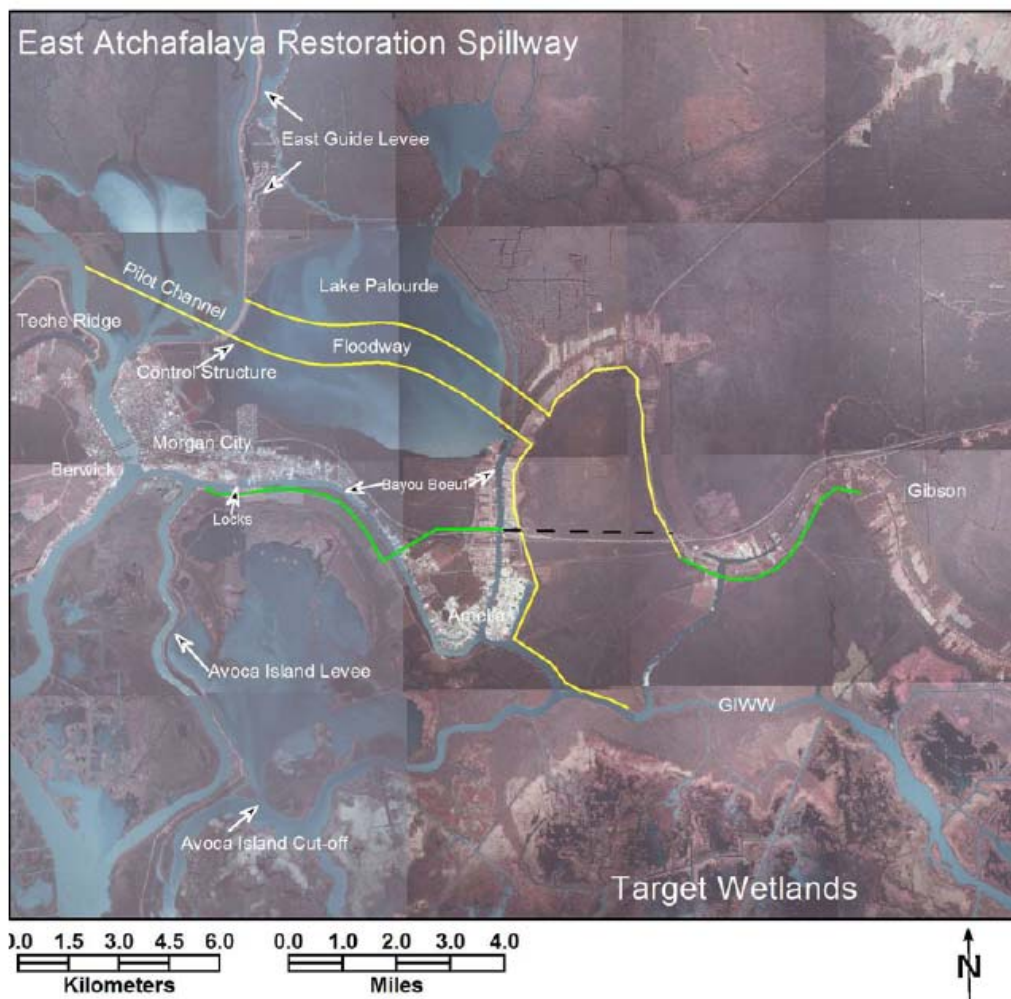


Figure 7: Proposed East Atchafalaya River Spillway that could be used to restore the west side of Planning Unit 3 a (Kemp and Hyfield, 2005)

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