Coast 2050

Revised Strategies

January 10, 2001

Coast 2050
Briefing Package Contents

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Revised Coastwide Common Strategies

The coastwide common strategies were ubiquitous to practically every mapping unit, so they are simply defined one time, with the understanding that they would be implemented as appropriate. They are explicitly recommended for some mapping units where there is deemed to be a compelling and immediate need for such a strategy (Appendices C-F).

Beneficial Use of Dredged Material from Maintenance Operations to Create, Restore, or Protect Wetlands

Five components are recognized: (1) inventory unused material, (2) assess suitability of material for beneficial use (e.g., grain size, contaminants), (3) identify sites to benefit from unused material, (4) address the Federal standard for beneficial use, and (5) secure funding to utilize unused material if beneficial use is more costly than the Federal standard. Some aspects of this beneficial use are programmatic in nature in that they do not result in project development and construction. The beneficial use strategies listed in the regional and mapping unit tables refer to the physical act of creating, restoring, or protecting wetlands with dredged material rather than the programmatic aspects discussed later in this document (Chapter 8).

Dedicated Dredging, to Create, Restore, or Protect Wetlands

Wetland habitat creation, restoration or protection using dredging technology is a viable strategy across the coastal zone to build land where traditional marsh building processes do not occur, or are infeasible. This strategy differs from beneficial use of maintenance dredged material in that maintenance dredged material from navigation channels or other permitted activities is not the intended sediment source. As a strategy, the primary purpose of dedicated dredging is the utilization of dredged material to create, restore or protect coastal wetlands.

Herbivory Control

Nutria, and occasionally muskrat, populations can become so high in certain areas of Louisiana's coast that they actually destroy marsh, resulting in its conversion to open water. This strategy is aimed at reducing the severe levels of marsh destruction by increasing trapping incentives, developing better markets for nutria, etc.

Stabilization of the Width and Depth of Major Navigation Channels and Other Water bodies at their Point of Intersection

The loss of wetlands resulting from the direct effects of bank erosion along Louisiana's nine major navigation channels in the coastal zone is estimated to be in excess of 35,000 acres. The need for stabilization in critical areas has been noted in all four Coast 2050 regions. One of the primary concerns is that these channel cross-sections tend to increase over time, as well as the size of the opening at the intersection of adjoining water bodies. This can result in several negative hydrologically-induced impacts, including increased tidal energy and saltwater in wetlands not adapted to these conditions.

Maintenance of Gulf, Bay and Lake Shoreline Integrity

This strategy includes an array of shoreline protection technologies in locations where excessive erosion of gulf**,** bay and lake rims would expose interior marshes to increased rates of erosion or severe hydrologic change. The strategy is not intended to armor all shorelines or to prevent normal shoreline retreat and rollover.

Management of Pump and Gravity-flow Outfall for Wetland Benefits

As the number of pumps increases throughout the coast, so do the opportunities to benefit wetlands while improving the quality of the discharged water. Water quality improvement usually involves introducing the discharge into wetlands, rather than directly into waterways, in a controlled fashion for filtering.

Vegetative Planting

Planting projects have been used for over a decade in Louisiana with a high degree of success. Vegetative plantings can stabilize banks and reestablish wetlands in some areas. Added benefits include increased overall plant productivity in the area and creation of prime habitat for wildlife and fish.

Maintain, Protect, or Restore Ridge Functions

Coastal ridges resulting from abandoned shorelines or natural levees are a critical structural component of our estuaries. The protection, repair or maintenance of these to protect or improve the hydrology of the coast is recommended at numerous locations.

Terracing

Terracing, accompanied by vegetative planting, is an effective means of marsh habitat creation in areas with soils of suitable mineral content. Functions and values of terraces include nursery habitat, fetch reduction, and sediment trapping in addition to promoting conditions conducive to growth of submerged aquatic vegetation.

Off-shore and Riverine Sand and Sediment Resources

Investigate new technologies for using offshore and riverine sand and sediment sources for restoration purposes.

Diversions and Riverine Discharge

Riverine discharge should be evaluated and measures taken to reduce this loss of sediment from near-shore coastal processes. River diversions must be utilized where appropriate in order to introduce sediment, nutrients, and fresh water into our coastal estuaries.

Management of Diversion Outfall for Wetland Benefits

Diversion outfall should be managed to optimize freshwater, sediment and nutrient input to marshes and/or swamps. This strategy would include utilizing fresh water from rivers in a manner to benefit wetland habitats by managing the outfall area. Riverine discharges could be introduced directly into wetlands rather than directly into waterways in a manner that would allow for sediments to be deposited in order to build marshes and/or swamps while also improving water quality.

Revised Coastwide Programmatic Recommendations

Coordinate mitigation with restoration plan objectives and priorities

During the permitting process, when compensatory mitigation for unavoidable impacts to coastal resources is being negotiated, regulatory authorities should, if within statutory limits, make certain that mitigation plans are consistent with restoration plan objectives. Compensatory mitigation projects have far-reaching potential for wetland creation, enhancement, and protection efforts in the coastal zone, and this strategy is designed to capture this potential.

Provide appropriate relocation costs and adequate flood control for impacts related to wetland restoration projects

This strategy is to ensure that wetland restoration projects include, at the outset, provisions to adequately mitigate for potential damages that may be incurred as a result of that project. Flooding impacts, both primary and secondary, from wetland restoration projects should be anticipated in the design phases of those projects. Projects should include specific, detailed provisions to address those impacts. For example, if a river diversion is likely to result in flooding, avoidance of damages or compensation for property damages should be included as a cost of the project. If appropriate, oyster lease issues should be addressed in accordance with Louisiana's laws and regulations (R.S. 56:432.1 et seq., and LAC 43:I§850-858).

Expedite permitting of coastal restoration projects

Despite efforts to streamline permitting of regulated activities in jurisdictional wetlands, securing the necessary authorizations can be time-consuming, even for those projects that are considered beneficial. Development of additional Federal and State general permits or perhaps special exemptions would reduce permitting time and allow beneficial projects to be implemented in a timely manner.

Impose and enforce wake limits in areas where bank erosion caused by wakes is severe

This strategy is designed to reduce boat wakes, thereby decreasing wave energy and reducing erosion on shorelines and banks. The strategy is to work with enforcement agents and post speed limits on portions of waterways most susceptible to erosion.

Implement best management practices to improve wetlands and associated aquatic habitats and address other water quality issues

This strategy would entail the coordination with other State and Federal agencies such as Department of Environmental Quality, Department of Transportation and Development, Natural Resources Conservation Service, Soil and Water Conservation Commission, Louisiana Department of Wildlife and Fisheries and U.S. Environmental Protection Agency to implement

best management techniques for such practices as forestry, agriculture, marinas, urban development, and hydrologic modification.

Improve land rights acquisition procedures

This strategy involves working with landowners to secure rights to build restoration projects or to increase acreage of wetland habitats through donations, Federal and State incentive programs, easements, etc.

Increase wetlands though incentive-based programs

Marsh and swamp acreage could be increased by converting unused agriculture fields, pastures, and grazing areas to their original wetland habitats through such efforts as the Wetland Reserve Program, which is administered by the Natural Resources Conservation Service.

Identify funding sources that match the scale needed to adequately address the coastal land loss problems in Louisiana

This strategy involves determining additional levels of funding required to adequately offset Louisiana's coastal land loss and to implement appropriate actions to secure such funds.

Prevent the negative effects of shell dredging

Shell dredging should be administered in such a way that environmental damages, including but not limited to wetland effects, are avoided or mitigated.

Mitigate water hyacinth problems to reduce marsh erosion

Water hyacinth is an exotic plant that, under optimal growth conditions, can form floating mats of vegetation that can weigh many tons. When these huge rafts are blown or carried by currents against or onto a bank of emergent wetland vegetation, severe damage and ensuing erosion may be sustained. In instances where water hyacinth may be an important factor in erosion rates, steps should be taken to prevent associated problems from occurring.

Minimize losses due to permitted activities

Evaluate the net loss of wetlands due to permitted activities in view of avoidance, minimization and mitigation efforts and develop recommendations to address deficiencies.

Develop and support a comprehensive barrier shoreline/island initiative to expedite appropriate actions such as mitigation of damages and restoration of these critical areas.

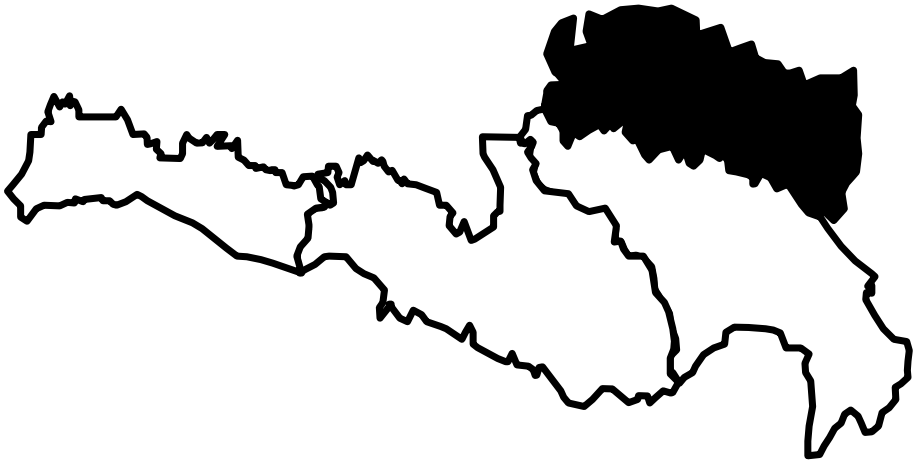
Barrier shorelines, headlands, and barrier islands are important for a number of reasons. Therefore, consideration should be given to the formation of an initiative that focuses on problems, potential solutions, and other issues related to these areas.

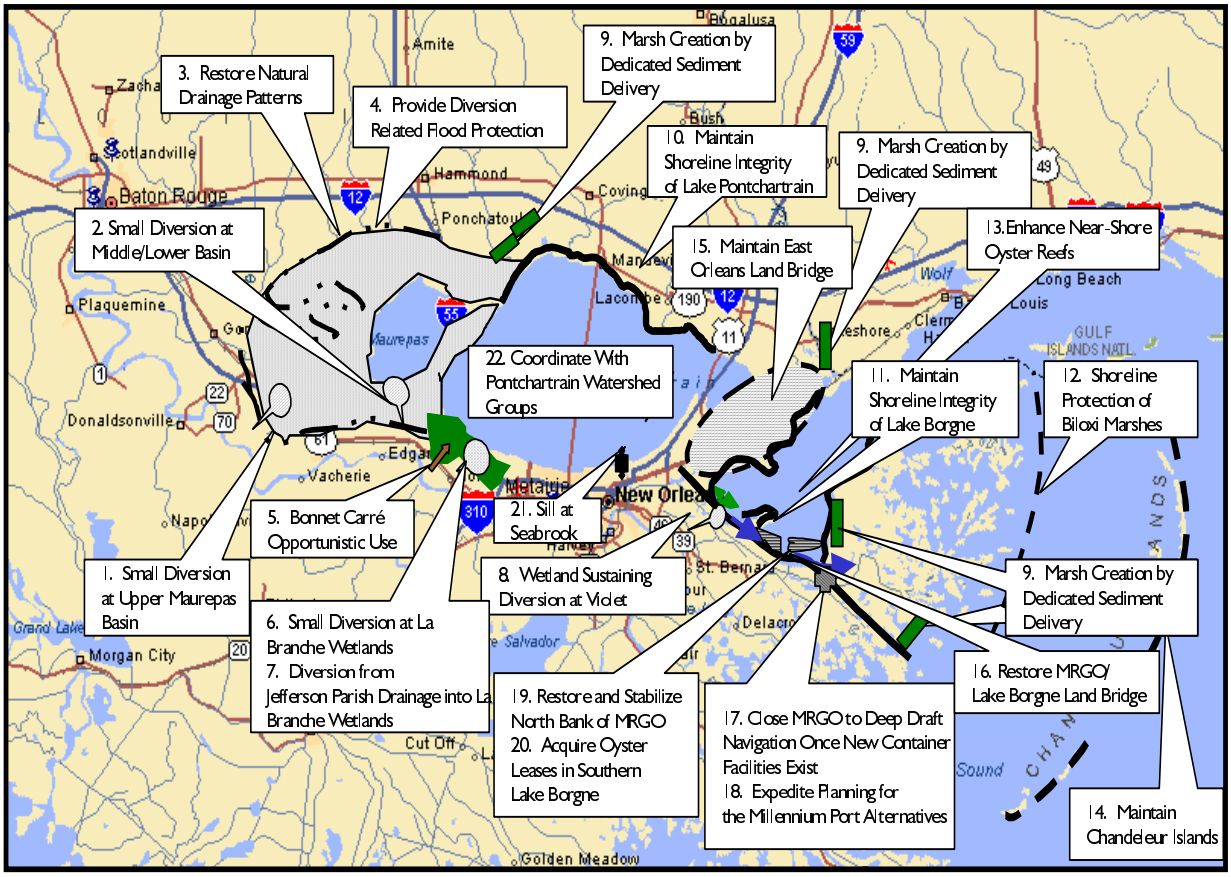
Provide for better coordination among agencies regarding coastal issues

Many coastal issues are interrelated, while an agency that is primarily responsible for implementing a particular program is usually focused on a subset of these overall issues. For this reason, it is recommended that steps be taken to provide for better communication and coordination among the State Wetlands Authority and the Breaux Act Task Force agencies, as appropriate, in order to better facilitate initiatives of common interest that affect coastal resources and user groups.

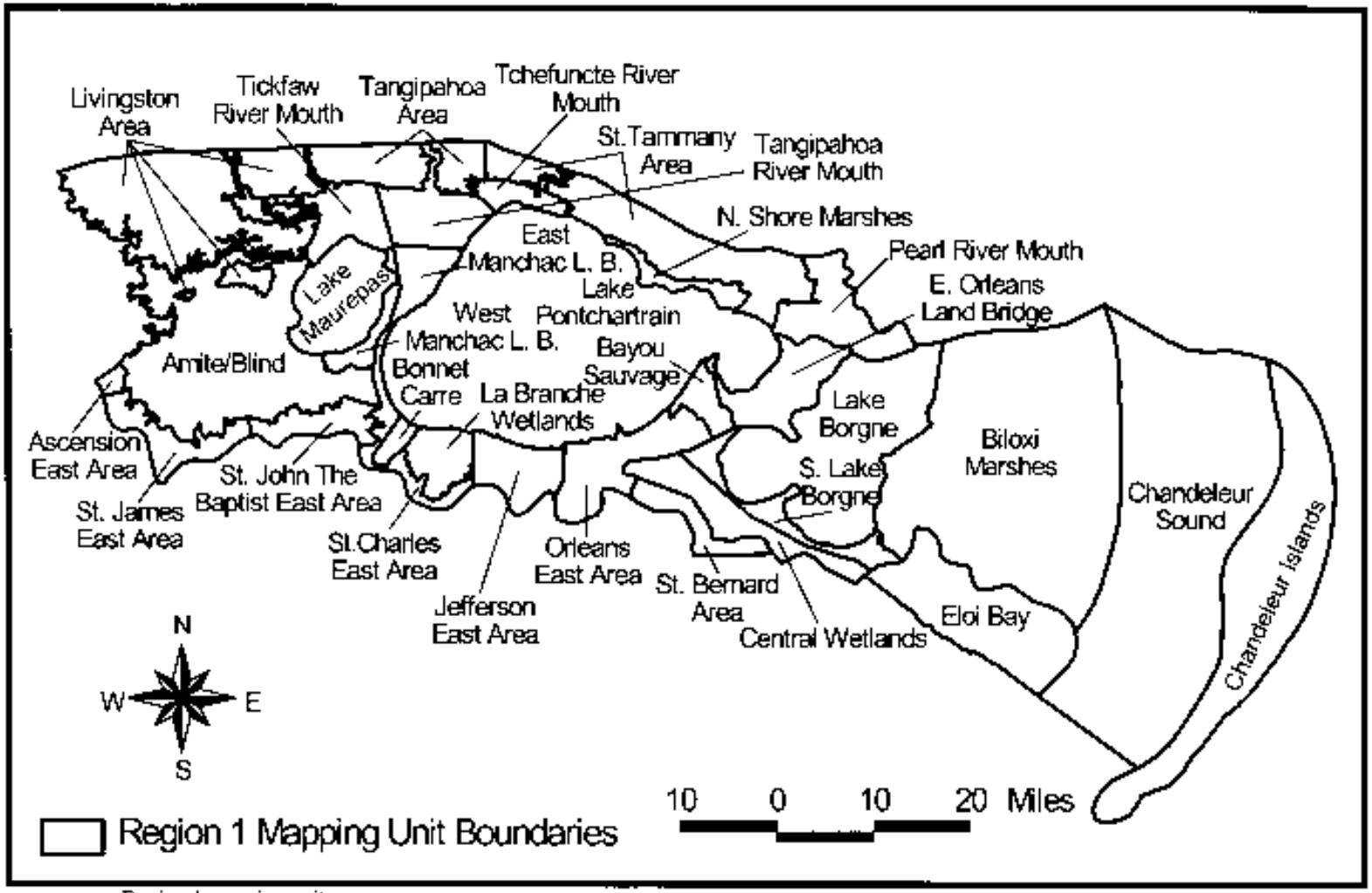
Region 1:

The Pontchartrain Basin





Coast 2050 Region 1 regional ecosystem strategies.



Region 1 mapping units.

Region 1
Revised Regional Ecosystem Strategies

Restore Swamps

1. Small Mississippi River diversion at Upper Maurepas Basin, with outfall management. The swamps in the Upper Basin are dying because they are stagnant, subsiding, flooding, and lacking sediment and nutrients. A diversion of no greater than 2,000 cubic feet per second (cfs) in the upper Maurepas Basin with outfall management (restoring natural drainage patterns by gapping spoil banks, plugging canals, and maintaining culverts) is proposed (Fig.7-2). This strategy is intended to preserve these swamps by reducing flooding and providing them with nutrients.

2. Small Mississippi River diversion at middle/lower basin, with outfall management. A diversion of no greater than 2,000 cfs in the vicinity of the Reserve Relief Canal with outfall management is expected to preserve minor acreage in these swamps by reducing flooding and providing them with nutrients.

3. Restore natural drainage patterns. In areas of the Upper Basin where diversions are not built, natural drainage patterns would be restored by gapping spoil banks, plugging canals, and maintaining culverts. For instance, if the culverts under U.S. Highway 51 were properly maintained, the swamps to the west would be less stressed by ponded water. This strategy is projected to preserve minor amounts of swamp.

4. Provide diversion-related flood protection where needed. Additional flood protection and drainage would be provided to any developed areas in the Upper Basin that would be threatened by diversion-related flooding. Low levees would be provided at the wetland/nonwetland interface with pumped drainage. This strategy is necessary before any of the diversions can be built, and its benefits to wetlands will be indirect.

Restore/Sustain Marshes

5. A small diversion, starting with less than or equal to 4,000 cfs. (unless monitoring dictates otherwise from the Mississippi River through the Bonnet Carré Spillway by opportunistically removing pins from the water control structure. The wetlands along the south shore of Lake Pontchartrain have a low loss rate, probably because the water diverted through the Bonnet Carré Spillway for flood control provides sediment and nutrients. Authorization would be sought for removing pins from the Bonnet Carré Flood Control Structure when the Mississippi River is high. The diverted water would provide additional nutrients and sediment to the wetlands adjoining Lake Pontchartrain. By removing pins early in the year, the fresh water and nutrients would be diverted to the lake before the warm temperatures could cause large algal blooms. Some of the additional water would be moved to the west, perhaps along the Old Hammond

Highway borrow pit, to reach the Manchac wetlands. This strategy is expected to prevent the loss of a moderate amount of wetlands.

6. *Small diversion of Mississippi River into La Branche wetlands*. A small diversion from the Mississippi River could be made into the southern La Branche marshes. The diversion is likely to prevent the loss of a moderate amount of wetlands.

7. Small diversion of Jefferson Parish drainage into La Branche Wetlands. Drainage water would be pumped into the swamps or marshes wherever feasible. Pumping water from the Jefferson Parish drainage canal is proposed to get additional fresh water and nutrients into the La Branche Wetlands. This strategy is expected to preserve a minor amount of wetlands.

8. Wetland sustaining diversion from the Mississippi River near Violet once the MRGO is closed to deep draft navigation. A 2,000 to 5,000 cfs diversion from the Mississippi River through the Violet Canal to sustain the Central Wetlands and Biloxi Marshes would be built. Such a diversion could not be effective until the MRGO is closed to deep draft navigation. This strategy is estimated to preserve moderate amounts of the marshes in the Central Wetlands and adjacent to Lake Borgne. These marshes provide significant hurricane buffering for the New Orleans metropolitan area.

9. Dedicated delivery of sediment for marsh building. Material could be pumped from adjacent lakes or rivers to create marsh in several units (including, but not limited to, Tchefuncte, North Shore Marshes, Tangipahoa, and Pearl River Marshes, Eloi Bay and Biloxi Marshes). This strategy is projected to create a moderate amount of marsh.

Protect Bay and Lake Shorelines

10. Maintain shoreline integrity of Lake Pontchartrain to protect regional ecosystem values. Maintaining the shoreline integrity of Lake Pontchartrain needs to be addressed in order to protect nearshore habitats, values, and functions. Lake shoreline protection could be in the form of structural means (wave busters, gobi mats, rip-rap, etc.) or non-structural means (vegetative rolls or mats, vegetative plantings, etc.). This strategy is expected to preserve a minor amount of marsh. This strategy is not intended to armor all shorelines or to prevent normal shoreline retreat and rollover.

11. Maintain shoreline integrity of Lake Borgne. Maintaining the shoreline integrity of Lake Borgne needs to be addressed. Lake shoreline protection could be achieved by structural means (wave busters, gobi mats, rip-rap, etc.) or non-structural means (vegetative rolls or mats, vegetative plantings, etc.). This strategy is projected to preserve a minor amount of marsh.

12. *Protect the outer shoreline of Biloxi Marshes*. Shoreline protection of the Biloxi Marshes is necessary because 18% of the area will be lost by the year 2050 if nothing is done. Lake shoreline protection could be achieved by structural means (wave busters, gobi mats, rip-rap, etc.) or non-structural means (vegetative rolls or mats, vegetative plantings, etc.). Shoreline protection of the most seriously eroding areas is projected to preserve a moderate amount of marsh.

13. In unleased, near-shore areas, develop oyster reefs and preclude oystering in these areas.

Adjacent to eroding shorelines and provided that salinities are appropriate, develop oyster reefs in order to reduce shoreline erosion and to improve water quality in the area. These reefs could also provide spat for near-by leases.

Restore and Maintain Barrier Islands

14. Maintain Chandeleur Islands and investigate enhancing restoration by requesting special exemption from wilderness area restrictions from Congress. The Chandeleur Islands provide unique habitat in the basin: beaches, dunes, marshes, mudflats, and beds of submerged aquatic vegetation (SAV). The islands are fairly stable, but they breach regularly and are moving north and west. The islands were seriously damaged by Hurricane Georges in 1998. Portions of the Chandeleurs are protected with a wilderness designation that prevents any repair. Coordination with the U.S. Fish and Wildlife Service should occur and a request for a special exemption from Congress to allow island maintenance should be sought. Islands would be restored with material from offshore or from the maintenance of the MRGO. This strategy would maintain the 1990 acreage on the islands.

Maintain Critical Landforms

15. Maintain Eastern Orleans Land Bridge by marsh creation and shoreline protection. This land bridge protects the wetlands surrounding Lake Pontchartrain from higher salinity and higher energy waters. It is a fairly stable landform at the present time. If it appears that the land bridge is at risk, major efforts would be made to stabilize it. Marsh would be created and shoreline protected by dedicated dredging or beneficial use. Vegetative plantings could also be used. SAV beds would be restored. This strategy is estimated to preserve moderate amounts of marsh.

16. Restore and maintain landbridge between MRGO and Lake Borgne with created marshes and shoreline protection. The landbridge between the MRGO and Lake Borgne and between Bayou Bienvenue and Lena Lagoon is in danger of breaching because of an erosion rate of 15 ft. per year on the Lake Borgne side. This strategy could be implemented by various projects. Oyster leases in the two southern lobes of Lake Borgne (at Bayous Dupre and Yscloskey) could be purchased and marsh created in these lobes by beneficial use of dredged material. Rock dikes could contain the created marsh. The
marsh could be maintained with maintenance material. This would create and preserve major amounts of marsh.

On a smaller scale, the cross section of the breaches between MRGO and Lake Borgne could be constricted with created marshes surrounded by rock shore protection. This would reduce the salinity in Lake Borgne and the Biloxi marshes. This strategy would improve the area slightly for oysters but have no mappable wetland benefits.

Special Concerns and Opportunities

17. Close MRGO to deep draft navigation when adequate container facilities exist on the river. The MRGO is perceived as a major problem in the Pontchartrain Basin. Wake erosion causes a

15-foot per year loss along 37 miles of the north bank. When the MRGO was completed in the 1960's, salinity increased in the basin, causing massive environmental damage. Currently, the MRGO is the only access to container facilities on the Inner Harbor Navigation Canal. However, only 2-3 large ships per day use the waterway. Some container facilities have just been built on the Mississippi River in the New Orleans area, but they are generally fully booked.

Once there are adequate container facilities elsewhere, the MRGO would be closed to deep draft navigation. A closure could be achieved that would allow the passage of shallow-draft navigation but reduce salinities coming up the MRGO. In addition, the possibility of restoring the ridges at Bayous Bienvenue, Dupre, and Yscloskey should be studied. The strategy of actually closing the channel to deep draft shipping is expected to preserve minor amounts of marsh.

18. Expedite planning for Millennium Port alternatives and coordinate such planning with Coast 2050 objectives. The Millennium Port, a new deep draft port under consideration for construction would allow closure of the MRGO to large vessels. Planning for the Millennium Port should start immediately and should be closely coordinated with all other Coast 2050 objectives; in particular, the three strategic objectives (Coast 2050 Plan, page 2) of sustaining coastal ecosystems, restoring the highest practicable acreage of productive and diverse wetlands, and attainment of multiple use benefits.

19. Restore and stabilize the entire north bank of the MRGO. The U.S. Army Corps of Engineers (USACE) has placed some rock along the north bank of the MRGO under various authorities. Authorization and funding for more rock along the north bank would be sought. In addition, dredged material would continue to be used beneficially behind the rock. This strategy is projected to prevent the loss of a moderate amount of marsh.

20. Construct a sill at Seabrook. During most summers, a large area of Lake Pontchartrain has very little dissolved oxygen at the bottom. This anoxic area is caused by salinity stratification due to the MRGO. This anoxic condition could be solved by constructing a sill at Seabrook. This strategy would improve fisheries in Lake Pontchartrain.

Mapping Unit Strategies: Region 1	
	(No recommended revisions)**
AMITE/BLIND	
1	**Maintain Shoreline Integrity**
	e.g. Along Lake Maurepas
2	**Vegetative Plantings**
	e.g. Cypress plantings
LAKE MAUREPAS	
3	**Vegetative Plantings**
	e.g. Restore beds of submerged aquatic vegetation
TICKFAW RIVER MOUTH	
4	**Shoreline Stabilization**
	e.g. Shoreline stabilization along Lake Maurepas
5	**Vegetative Plantings**
	e.g. Cypress plantings
6	**Dedicated Dredging**
	e.g. Dedicated dredging from Lake Maurepas
MANCHAC LAND BRIDGE WEST	
7	**Shoreline Stabilization**
	e.g. Shoreline stabilization along Lake Maurepas
8	**Dedicated Dredging**
	e.g. Dedicated dredging from Lake Maurepas
9	**Vegetative Plantings**
	e.g. Cypress plantings
10	**Restore Hydrology**
	e.g. Improve hydrological exchange
MANCHAC LAND BRIDGE EAST	
11	**Shoreline Stabilization**
	e.g. Along Lake Maurepas
12	**Vegetative Plantings**
	e.g. Cypress plantings
13	**Dedicated Dredging**
	e.g. From Lake Pontchartrain
14	**Restore Hydrology**
	e.g. Improve hydrological exchange
TANGIPAHOA RIVER MOUTH	
15	**Beneficial Use of Dredged Material**
	e.g. Beneficial use from mouth bar dredging
16	**Shoreline Stabilization**
	e.g. Around Tangipahoa River mouth
TCHEFUNCTE RIVER MOUTH	
17	**Shoreline Stabilization**
	e.g. Around Tchefuncte River mouth
18	**Beneficial Use of Dredged Material**
	e.g. Beneficial use from mouth bar dredging
LA BRANCHE WETLANDS	
19	**Shoreline Stabilization**
	e.g. Along Lake Pontchartrain

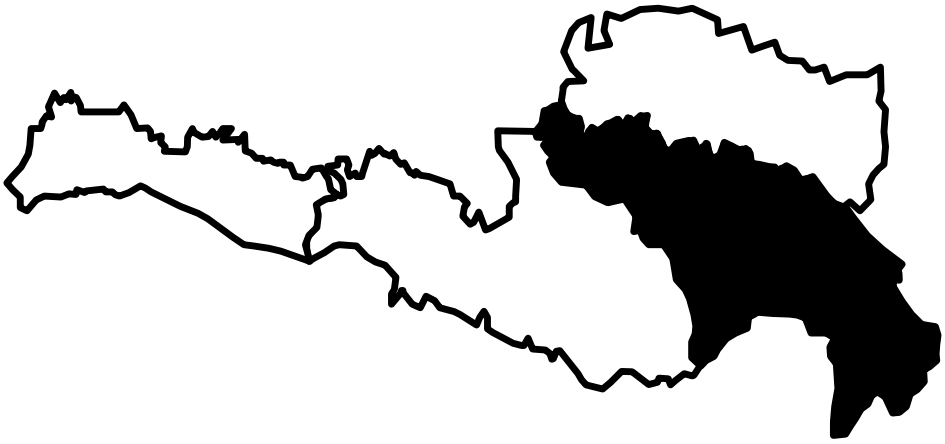
20	**Dedicated Dredging**
	e.g. Dedicated dredging from Lake Pontchartrain
21	**Vegetative Plantings**
	e.g. Cypress/marsh plantings
22	**Hydrologic Management**
	e.g. Improve hydrology of impounded areas
23	**Terracing and Marsh Creation**
LAKE PONTCHARTRAIN	
24	**Dedicated Dredging**
	e.g. Create marsh in Lake Pontchartrain adjacent to the south shore with dedicated dredging
25	**Vegetative Plantings**
	e.g. Restore submerged aquatic vegetation beds and stabilize lake rim marshes and beaches
26	**Maintain Shoreline Integrity**
	e.g. Create wave breaks and fisheries habitat with rubble
NORTH SHORE MARSHES	
27	**Maintain Shoreline Integrity**
28	**Vegetative Plantings**
29	**Restore Hydrology**
	e.g. Re-establish natural drainage patterns
30	**Terracing**
PEARL RIVER MOUTH	
31	**Beneficial Use of Dredged Material**
	e.g. Beneficial use of Pearl River dredged material
32	**Maintain Shoreline Integrity**
33	**Vegetative Plantings**
34	**Terracing**
EAST ORLEANS LAND BRIDGE	
35	**Dedicated Dredging**
	e.g. Dedicated dredging from Lakes Pontchartrain & Borgne
36	**Maintain Shoreline Integrity**
	e.g. Along Lakes Pontchartrain & Borgne
37	**Vegetative Plantings**
	e.g. Restore submerged aquatic vegetation beds
BAYOU SAUVAGE	
38	**Continue the CWPPRA Pump Project and Evaluate the Possible Need for Pump Outfall Management**
39	**Vegetative Plantings**
40	**Hydrologic Management; Re-establish Connection to the Lakes**
CENTRAL WETLANDS	
41	**Beneficial Use of Dredged Material**
42	**Vegetative Plantings**
SOUTH LAKE BORGNE	
43	**Maintain Shoreline Integrity**
	e.g. Protection along the Lake Borgne shoreline
44	**Dedicated Dredging**
	e.g. Dedicated dredging from Lake Borgne
45	**Beneficial Use of Dredged Material**
	e.g. Beneficial use of MRGO dredged material
46	**Hydrologic Restoration**

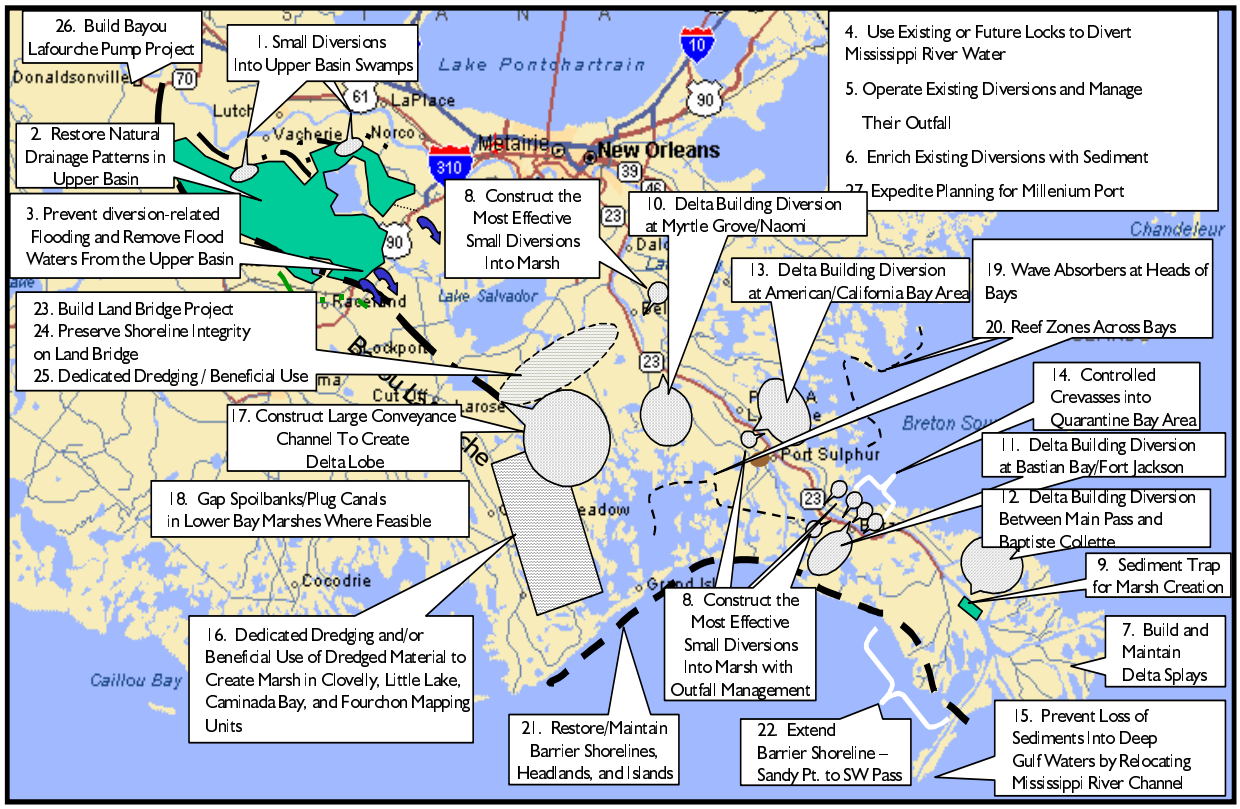
BILOXI MARSHES	
47	**Maintain Shoreline Integrity**
	e.g. Develop reef zones/enhance near-shore oyster reefs
48	**Vegetative Plantings**
49	**Dedicated Dredging**
	e.g. Dedicated dredging from Lake Borgne
50	**Beneficial Use of Dredged Material**
	e.g. Beneficial use of MRGO dredged material
51	**Hydrologic Restoration**
	e.g. Gap spoil banks
ELOI BAY	
52	**Beneficial Use of Dredged Material**
	e.g. Beneficial use of MRGO dredged material
53	**Dedicated Dredging**
54	**Vegetative Plantings**
55	**Hydrologic restoration**
	e.g. Gap spoil banks
56	**Restore Fringing Marsh Islands**
CHANDELEUR ISLANDS	
57	**Vegetative Plantings**
	e.g. Restore submerged aquatic vegetation beds

Revised Region 1 Programmatic Recommendations	
LAKE PONTCHARTRAIN	
1	**Water quality improvement**
	e.g., Improve Jefferson/Orleans sewer discharge and efficiency of north shore water treatment
	e.g., Evaluate the need to continue moratorium on drilling
	e.g., Manage removal of fill material
	e.g., Continue ban on shell dredging
2	**Coordinate between Pontchartrain Basin Partnership Act and Lake Pontchartrain Basin Watershed Plan**
NORTH SHORE MARSHES	
3	**Coordinate proposed flood control measures with Coast 2050 plan**
PEARL RIVER MOUTH	
4	**Restrict West Pearl River dredging**
LAKE MAUREPAS	
5	**Nominate as National Estuarine Research Reserve (NOAA)**
MANCHAC LAND BRIDGE WEST	
6	**Nominate as National Estuarine Research Reserve (NOAA)**
MANCHAC LAND BRIDGE EAST	
7	**Extend Joyce and Manchac Wildlife Management Areas**
TCHEFUNCTE RIVER MOUTH	
8	**Reduce draining and development of marshes**
LaBRANCHE WETLANDS	
9	**Consider adding to Bayou Sauvage National Wildlife Refuge**
SOUTH LAKE BORGNE	
10	**Limit draft of MRGO vessels to 36 ft (authorized channel depth)**
LAKE BORGNE	
11	**Enhance near-shore oyster reefs/no-oystering zone near-shore**
BILOXI MARSHES	
12	**Enhance near-shore oyster reefs/no-oystering zone near shore**
ELOI BAY	
13	**Enhance near-shore oyster reefs/no-oystering zone near shore**

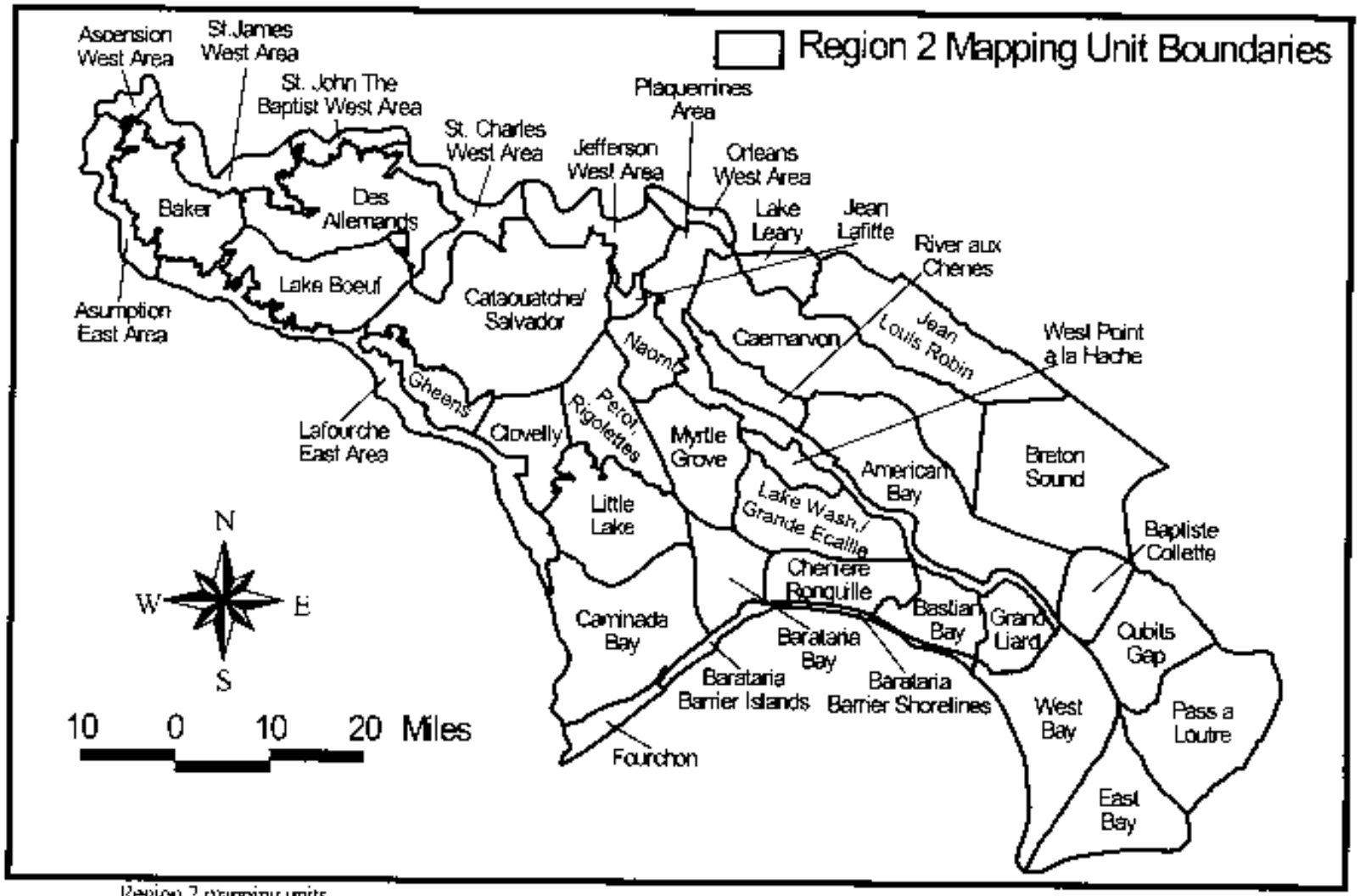
Region 2:

The Barataria, Breton Sound, and Mississippi River Basins





Coast 2050 Region 2 regional ecosystem strategies.



Region 2 mapping units.

Region 2
Revised Regional Ecosystem Strategies

Restore Swamps

1. Construct small diversions into upper basin swamps with outfall management. A possible strategy to preserve the stressed upper basin swamps is to construct several small sediment-rich diversions from the Mississippi River. The outfall of the diversions should be managed to spread the water across the swamp, keep the water moving and prevent ponding. The nutrients and small amounts of sediment brought in by the river should slightly increase productivity and vertical accretion in the swamps. This strategy is projected to preserve a minor amount of swamp habitat.

2. Restore natural drainage patterns in upper basin swamps. Another strategy consists of restoring natural drainage by gapping spoil banks and plugging canals where these actions would not cause adverse effects. It would be implemented in swamps where it is not possible to provide freshwater diversions. It would be less effective in preventing swamp loss than the previous strategy, which brought in fresh water.

3. Prevent diversion-related flooding and remove diverted waters from the upper basin. To add water to the swamps, flood protection must be provided for developed areas, and drainage improvements must be made so the water can exit the upper basin. Local forced drainage should be provided at the wetland/non-wetland interface so the swamps are separated from the developed regions. Environmentally sound pumping plans should be developed so storm water is filtered through the swamps. U.S. Highway 90 should be raised with sufficient flap-gated culverts installed so that rainfall and the additional river water could drain south by gravity.

Restore and Sustain Marshes

4. Use existing or future locks to divert Mississippi River water. The existing locks on the Mississippi River (Algiers, and Empire) could be used to divert as much water as possible. At the present time, the USACE is releasing freshwater through the Algiers Lock whenever the stage is low on the marsh side. The existing Harvey Lock cannot be used for small diversions, but when a replacement lock is needed for navigation, it should be designed so that small diversions would be feasible. Implementation of this strategy is projected to preserve a minor amount of marsh by 2050.

5. Operate existing diversions and manage their *outfall.* All existing diversions should be operated whenever feasible. The siphons at Naomi and West Point a la Hache already have Breaux Act outfall management plans. These 20-year plans could be continued through 2050. The authorized Breaux Act outfall management plan at Caernarvon should be implemented. A plan should be developed for the Davis Pond diversion. This strategy is estimated to moderately reduce marsh loss by 2050.

6. Enrich existing diversions with sediment. This enrichment is difficult to engineer at the siphons because extra sediment could cause clogging. This concept should be pursued at Davis

Pond and Caernarvon. Additional sediment is expected to preserve a minor amount of marsh by 2050.

7. Continue building and maintaining delta splays. The Mississippi River is creating marsh naturally on the east bank south of Bohemia and in the Birdsfoot Delta. The natural delta on the east bank should be maintained. The Breaux Act program of building and maintaining delta splays in the Birdsfoot Delta should be continued through 2050. This strategy is projected to create a moderate amount of new land.

8. Construct small diversions into marsh with outfall management. A possible strategy to preserve marshes is several small diversions from the Mississippi River, with outfall management. The following small diversions should be planned and built Upper Oak River, Amoretta, east and west of Empire, and others. Small diversions are projected to prevent a moderate amount of marsh loss by 2050.

9. Construct a sediment trap in the Mississippi River south of Venice, and utilize the material to create mash and/or restore barrier islands . A sediment trap in the Mississippi River south of Venice would reduce dredging in Southwest Pass. The trapped material that would normally be hopper dredged and ocean dumped could be removed by a dustpan dredge and used to create marsh or restore barrier islands. Significant amounts of marsh are projected to be created in the Birdsfoot Delta by this strategy.

10. Construct delta-building diversion in Myrtle Grove/Naomi area (about 15,000 cfs).
A delta-building diversion from the Mississippi River should be built in the vicinity of Myrtle Grove or Naomi. Such a diversion is estimated to have significant benefits by creating land and preventing significant amounts of marsh loss in the central basin by 2050.

11. Construct delta-building diversion in Bastion Bay /Fort Jackson area (about 15,000 cfs). A delta-building diversion of about 15,000-cfs could be built in the Bastion Bay/ Fort Jackson area. This strategy must address oyster lease issues. This strategy would partially fill the borrow pit left from the construction of the New Orleans to Venice Hurricane Protection levee. Local interested parties are concerned that this pit is increasing marsh loss and causing increased salinities in the developed area. This strategy is estimated to create land and prevent significant amounts of marsh loss.

12. Construct delta-building diversion between Main Pass and Baptiste Collette Bayou (about 50,000 cfs). A very large diversion in the Birdsfoot Delta between Main Pass and Baptiste Collette Bayou is projected to create a significant amount of land and reduce future marsh loss.

13. Construct a delta-building diversion into the American Bay/ California Bay area (20,000 to 100,000 cfs). This strategy is projected to create a moderate amount of land with a small diversion and a significant amount with the large diversion. This strategy must address the oyster lease issue.

14. Construct delta-building diversion through controlled crevasses into the Quarantine Bay area. This strategy consists of breaching the natural levee between Bayou Lamoque and Fort St. Phillip to allow about 40,000 cfs to enter Quarantine Bay. Most of the sediment would be kept in Quarantine Bay by a low levee from California Point to Sable Island. This diversion is projected to create a significant amount of marsh and reduce marsh loss in the vicinity. This strategy should not significantly impact oysters.

15. Prevent the loss of bedload into deep gulf waters off the Continental Shelf by relocating the Mississippi River Navigation Channel. One of the most significant ecological problems in coastal Louisiana is the loss of major amounts of Mississippi River sediments, including the bedload, into deep gulf waters. This strategy would dissociate riverine processes and navigation and thus allow the Mississippi River sediments to build and nourish marshes. Navigation would be handled by a new channel exiting to the east or west (but not north of Venice) with at least a double set of locks. The strategy is expected to create a significant amount of land in the long term.

16. Dedicated dredging and/or beneficial use of dredged material to create marsh in the Clovelly, Little Lake, Caminada Bay, and Fourchon mapping units. The marshes adjacent to the southern end of Bayou Lafourche are deteriorating rapidly and are far from any riverine sediment. Material dredged from such sites as Bayou Lafourche, or Little Lake or pumped from offshore could be used in the deteriorating marsh/pond complex to create of marsh in the above mentioned mapping units. The marshes east of Louisiana Highway 1 south of Leeville are nearly gone. This strategy would protect portions of vulnerable Louisiana Highway 1 with a band of marsh. This strategy is projected to result in creating a moderate amount of marsh by 2050.

17. Construct large conveyance channel to create a delta lobe in Little Lake and Caminada Bay mapping units. The extremely high marsh losses in the Little Lake and Caminada Bay mapping units are indicative of a collapsed wetland system. High subsidence rates, inadequate sediment supply, altered hydrology and shoreline erosion are largely responsible for this condition. Potentially, the most effective alternative for rebuilding this wetland system entails initiating a new subdelta building process in the area (Gagliano and Van Beek 1993 and 1998; Gagliano 1994 and 1998). The subdelta could be accomplished by building a large conveyance channel that would leave the Mississippi River south and east of Donaldsonville and parallel the developed Bayou Lafourche ridge. One branch of the channel would cross the bayou north of the Gulf Intracoastal Waterway (GIWW) and build a delta in the Bully Camp area of Region 3. The other branch would stay on the east side of the bayou and nourish marshes and build a delta in the Little Lake and Caminada Bay mapping units. Small diversions could be built into wetlands in the northern portion of the basin.
After consolidation, material dredged from the channel might provide a base for a new Highway 1. Any possible navigation functions shall not impede or interfere with the land-building capacity of the diversion. This strategy is anticipated to create significant amounts of marsh in the Little Lake and Caminada Bay mapping units, reduce marsh loss over the entire western portion of the Barataria Basin, and help preserve swamp in the upper basin.

18. Gap spoil banks and plug canals in lower bay marshes. Where determined to be appropriate and feasible, spoil banks would be gapped and canals plugged to maximize sediment deposition in marshes adjacent to the bays in the lower portions of Breton and Barataria Basins. This strategy is estimated to prevent a minor amount of loss.

Protect Bay/Lake Shorelines

19. Construct wave absorbers at the heads of bays. Low breakwaters would be built at the heads of bays to protect fringing marshes in Barataria Bay and across the southern rim of the Lake Washington/Grand Ecaille unit. This strategy would preserve a moderate amount of marsh.

20. Construct reef zones across bays. Reef zones would be constructed across bays. This strategy has no mappable marsh benefits but would enhance estuarine fisheries habitat.

Restore/Maintain Barrier Headlands, Islands and Shorelines

21. Extend and maintain barrier headlands, islands, and shorelines, The Fourchon headland, barrier islands and barrier shoreline of Region 2 are among the most rapidly disappearing habitats in the region. These areas would be restored to a condition suitable for maintaining the integrity of the estuarine system. This strategy would create moderate amounts of marsh and beach habitat by 2050. Additional unmappable benefits would be gained by protecting, restoring, or creating wooded areas critical for Neotropical migrants.

22. Extend and maintain barrier shoreline from Sandy Point to Southwest Pass. The Plaquemines Parish Council has requested that the barrier shoreline be extended from Sandy Point to Southwest Pass. Material from sediment trap (see Strategy 9) could possibly be used to build such a shoreline. This strategy would create moderate amounts of marsh and beach habitat by 2050.

Maintain Critical Landforms on the Central Basin Land Bridge
(south shore of Lake Salvador and Perot/Rigolettes, Clovelly,
Little Lake, Naomi and Myrtle Grove mapping units)

23. Build entire CWPPRA Barataria Basin Land Bridge Shoreline Protection project. The unit shorelines of bayous Perot and Rigolettes and the north shore of Little Lake must be kept intact to protect the marshes further north. This project should be built and then maintained through 2050. This would preserve a moderate amount of marsh by 2050.

24. Preserve bay and lake shoreline integrity on the land bridge. The southern shores of Little Lake and Lake Salvador are in danger of breaching into interior marsh or the GIWW. These shorelines and any others whose loss threatens the integrity of the land bridge should be stabilized. This strategy would prevent the loss of a moderate amount of marsh.

25. Dedicated dredging and/or beneficial use of dredged material to create marsh on the land bridge. This strategy consists of dedicated dredging or beneficial use to create marsh in areas

such as north of the Bayou L'Ours ridge, east of Dupre Cut, or other open water areas to help stabilize the land bridge.

26. Build the Bayou Lafourche Siphon and Pump project. The possibility of a small pumped diversion down Bayou Lafourche is being studied. The waters could be directed into the Clovelly area to help preserve land bridge marshes.

Special Problems

27. *Expedite planning for Millennium Port alternatives and coordinate such planning with Coast 2050 objectives and strategies.* The Millennium Port, a new deep draft port under consideration for construction, would allow the closure of the MRGO to large vessels. Planning for the Millennium Port should start immediately, and should be closely coordinated with all other Coast 2050 objectives and strategies; in particular the three strategic objectives (Coast 2050 Plan, page 2) of sustaining coastal ecosystems, restoring the highest practicable acreage of productive and diverse wetlands, and attainment of multiple use benefits.

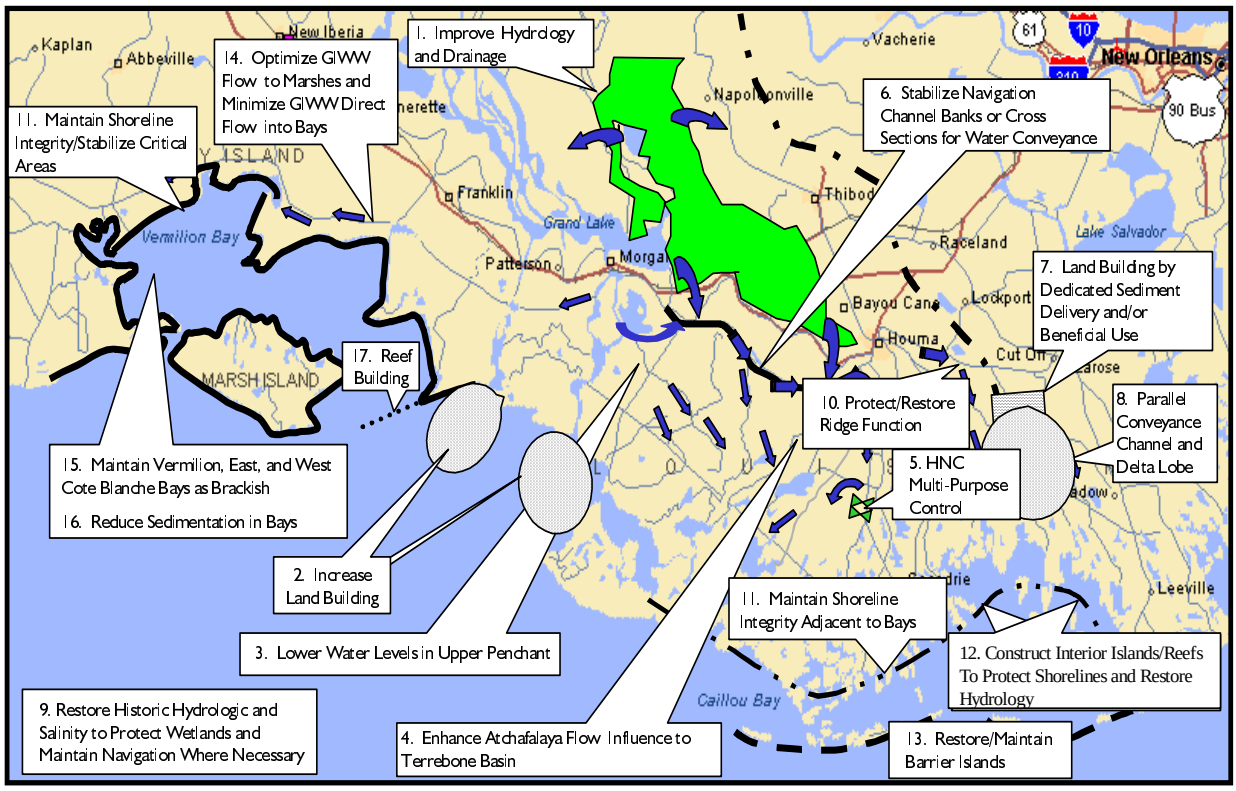
Region 2 mapping unit strategies.	
	**** No recommended revisions**
BAKER	
1	**Herbivory Control**
CATAOUATCHE/SALVADOR	
2	**Maintain Shoreline Integrity**
	e.g., Maintain bay/lake shoreline integrity
	e.g., Stabilize banks of GIWW
3	**Herbivory Control**
DES ALLEMANDS	
4	**Herbivory Control**
JEAN LAFITTE	
5	**Restore Hydrology**
NAOMI	
6	**Herbivory Control**
PEROT/RIGOLETTES	
7	**Herbivory Control**
GHEENS	
8	**Management of Pump Outfall for Wetland Benefits**
CLOVELLY	
9	**Use of Dredged Material**
	e.g., Beneficial use of BBWW material
LITTLE LAKE	
10	**Management of Pump Outfall for Wetland Benefits**
	e.g., Relocate hurricane protection pumps to put water into marsh
11	**Use of Dredged Material**
	e.g., Beneficial use of BBWW material
12	**Maintain Ridge Function**
	e.g., Prevent breaching of Bayou L'Ours ridge
MYRTLE GROVE	
13	**Restore Ridge Function of Bayou Barataria**
	e.g., Restore Barataria ridge
14	**Restore Hydrology**
CHENIERE RONQUILLE	
15	**Restore Ridge Function**
	e.g., Restore oak ridges behind barrier shoreline
BARATARIA BAY	
16	**Use of Dredged Material**
	e.g., Dredge material from offshore to build marsh
	e.g., Beneficial use of BBWW material
CAMINADA BAY	
17	**Maintain Shoreline Integrity**
	e.g., Vegetative plantings of mangroves or marsh
	e.g., Stabilize banks of BBWW and SW La. Canal
18	**Management of Pump Outfall for Wetland Benefits**
	e.g., Relocate hurricane protection pumps to put water into marsh

Region 2 mapping unit strategies (Cont.).	
BARATARIA BARRIER ISLANDS	
19	**Beneficial Use of Dredged Material**
	e.g., Dredging offshore to build barrier island back marshes
	e.g., Beneficial use of BBWW to build islands
20	**Restore Ridge Function**
	e.g., Restore oak ridges behind barrier islands
BARATARIA BARRIER SHORELINES	
21	**Beneficial Use of Dredged Material**
22	**Restore Ridge Function**
	e.g., Restore oak ridges behind barrier islands
23	**Restore Barrier Islands**
	e.g., Build movable wave absorbers; Remove Empire jetties; Sand bypass at Empire jetties
LAKE WASHINGTON/GRAND ECAILLE	
24	**Restore Hydrology**
	e.g., Fill hurricane protection levee borrow canal as opportunities arise to make marsh
BAPTISTE COLLETTE	
25	**Beneficial Use of Dredged Material**
26	**Dedicated Dredging to Create Marsh**
CUBIT'S GAP	
27	**Beneficial Use of Dredged Material**
PASS A LOUTRE	
28	**Beneficial Use of Dredged Material**
29	**Dedicated Dredging to Create Marsh**
30	**Restore Hydrology**
	e.g., Limit depth of South Pass; encourage flow out Pass a Loutre
EAST BAY	
31	**Beneficial Use of Dredged Material**
	e.g., Create marsh to protect SW Pass marsh
32	**Dedicated Dredging to Create Marsh**
33	**Establish Reef Zone**
WEST BAY	
34	**Introduction of Mississippi River Water and Sediment/Outfall Management**
	e.g., Enrich Grand Pass with sediment dredged from river
35	**Beneficial Use of Dredged Material**
GRAND LIARD	
36	**Restore Hydrology**
	e.g., Fill hurricane protection borrow canal as opportunities arise to make marsh
37	**Study the Borrow Canal Saline Intrusion Issue**
BASTIAN BAY	
38	**Restore Hydrology**
	e.g., Fill hurricane protection borrow canal as opportunities arise to make marsh
39	**Beneficial Use of Dredged Material**
CAERNARVON	
40	**Evaluate Diversion of Greater than 4,000 cfs from Caernarvon; Monitor Existing Diversion and Evaluate to Derive Maximum Benefits**

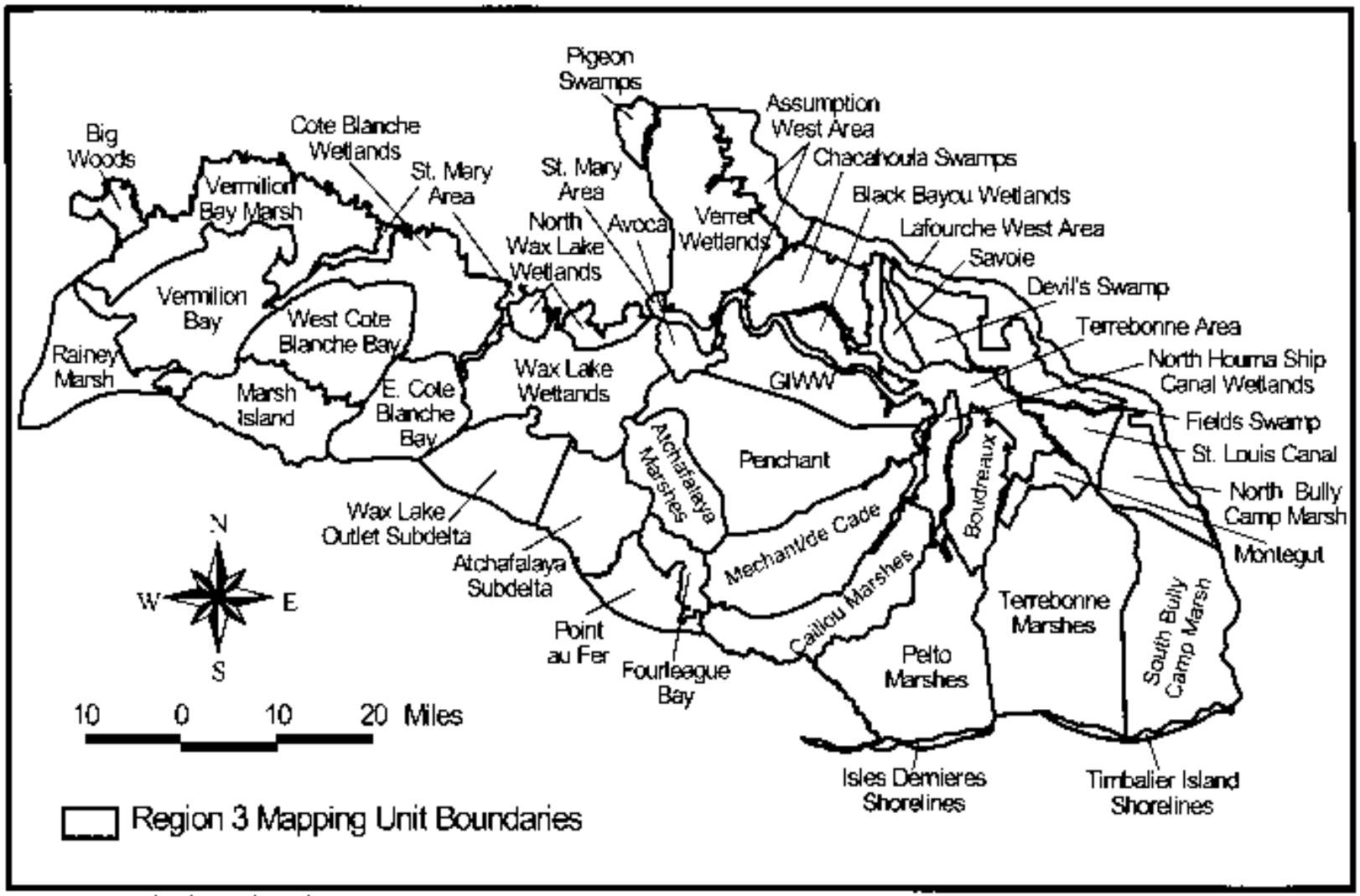
Region 2 programmatic recommendations.	
	**** No recommended revisions**
BAKER	
1	**Allow for selective harvesting of replanted trees in mitigation banks**
DES ALLEMANDS	
2	**Allow for selective harvesting of replanted trees in mitigation banks**
FOURCHON	
3	**Restore barrier islands**
	e.g., Restrict sand mining on islands
CAMINADA BAY	
4	**Use alternative sources of sediment such as red mud, compost, etc.**
LAKE WASHINGTON/GRAND ECAILLE	
5	**Study the borrow canal salinity intrusion issue**
BASTIAN BAY	
6	**Study the borrow canal salinity intrusion issue**

Region 3:

The Terrebonne, Atchafalaya, and Teche/Vermilion Basins



Coast 2050 Region 3 regional ecosystem strategies.



Region 3 mapping units.

Region 3
Revised Regional Ecosystem Strategies

Restore Swamps

1. *Improve hydrology and drainage in the Verret Subbasin.* Implementation of a flood protection feature from the USACE Lower Atchafalaya River Reevaluation Study would alleviate the problems associated with chronic and excessive backwater flooding that is largely due to Atchafalaya River influence. This feature, known as the "Barrier Plan," would block water exchange from south to north at U.S. Highway 90 between Morgan City and Houma. Pumps would be installed to remove excess water from the Verret Subbasin. The effect of this action on floating marshes in the Penchant Subbasin is uncertain at this time, but the water should be distributed so as not to impact these wetlands. Additional measures, such as introducing supplemental water from the Atchafalaya River or the Mississippi River to the Verret Subbasin during drought conditions to address water quality needs, would be considered. Implementation of this strategy would benefit about 200,000 acres of forested wetlands and prevent most future swamp loss. The strategy would protect the affected communities, industries, and agricultural lands from flooding.

Restore and Sustain Marshes

2. *Increase deltaic land building where feasible.* This strategy entails implementing a delta management plan in Atchafalaya Bay to maximize land building. One feature would be to separate navigation from the delta development zone, thereby allowing more efficient delta growth and reduced navigation channel maintenance. Another element of the strategy would be to train a delta lobe to extend toward Four League Bay to protect nearby mainland marshes from storm surges and to increase the amount of sediment available for transit into the marshes from storms. The Atachafalaya Bay plan would attempt to contain land building sediments in Atchafalaya Bay rather than filling bays to the west. The Atchafalaya Bay plan would maintain the processes that preserve the mainland wetlands in the Atchafalaya outlets area. Other areas where land building is feasible should be investigated. This strategy is anticipated to create substantial amounts of marsh by 2050.

3. *Lower water levels in upper Penchant marshes.* Wetland stress in the upper Penchant Subbasin is associated with excessive flooding from the Atchafalaya River and the Verret Subbasin. Modifying water flow patterns to distribute the fresh water to other wetland areas, especially the lower Penchant marshes, would relieve the excessive flooding. Reducing water levels would reduce wetland losses in upper Penchant.

4. *Enhance Atchafalaya River influence to Terrebonne Basin marshes, excluding upper Penchant marshes (project area -Minors Canal/ Bayou Dularge to Bayou Laforuche).* Tidal marshes adjacent to Four League Bay are strongly influenced by Atchafalaya River flows. These marshes are generally healthy whereas marshes farther east receive less Atchafalaya influence and are experiencing higher rates of loss. This strategy would implement measures to distribute more Atchafalaya flow to the tidal marshes in the vicinity of Lake Mechant and Caillou Lake. This

strategy would expand the zone of beneficial influence by modifying water flow patterns to distribute Atchafalaya flow farther east and to adjust the north to south drainage in the area's watersheds as necessary to maximize wetland benefits. Wetland losses are expected to be reduced by the increased flow of fresh water and nutrients.

5. *Establish multipurpose hydrologic control of any navigation canals.* A lock or gate on the Houma Navigation Canal is a feature in the ongoing Morganza-to-the-Gulf Study that could aid in accomplishing the strategy for enhancing central Terrebonne marshes. The lock and connecting levees could allow more efficient use of Atchafalaya River water and sediment flow, aid in maintaining salinity regimes favorable to area wetlands, and provide hurricane protection to residents of Terrebonne Parish. More fresh water and less salt water north of the lock are anticipated to reduce wetland losses.

6. *Stabilize banks and/or cross-sections of any navigation channels for water conveyance and/or for restoring hydrology of adjacent marshes.* The Avoca Cutoff Channel, Bayou Chene, the Gulf Intracoastal Waterway (between the Atchafalaya River and Bayou Lafourche), and the Houma Navigation Canal would function as major conveyance channels for Atchafalaya flow distribution. Some of the banks have deteriorated. To perform a conveyance function, the deteriorated channel banks would need to be rebuilt and stabilized. This strategy acts synergistically with Strategies 3 through 5 above and is requisite for strategy 4. Taken together, strategies 3 through 6 are anticipated to preserve a substantial amount of marsh through 2050. This strategy would also allow for restoration to authorized widths and depths of navigation channels in order to restore existing hydrologic patterns affecting adjacent marshes.

7. *Maintain or direct Atchafalaya River water or other freshwater sources and sediment through the Gulf Intracoastal Waterway or other water sources.* Presently marshes in the Teche-Vermilion Basin seem to be deriving benefit from the flow the Atchafalaya River water and sediment through the Gulf Intracoastal Waterway. The purpose of the strategy is to both discourage any curtailment of such flow through the GIWW while also allowing for re-direction of Atchafalaya River and other freshwater source flows through any conveyance channels deemed feasible.

8. *Dedicated delivery and/or beneficial use of sediment for marsh building by any feasible means.* This strategy could be used to rebuild wetlands on a small scale at sites across the region 3. Sediment should be used where appropriate for marsh building. When normal maintenance operations are occuring, this sediment shall be used where appropriate for marsh creation.

9. *Build land in upper Timbalier Subbasin by sediment diversion from the Mississippi River via a conveyance channel.* The extremely high land loss in the Timbalier Subbasin is indicative of a collapsed wetland system. High subsidence rates, inadequate sediment supply, altered hydrology, and increased tidal exchange rates are largely responsible for this condition.

Potentially, the most effective alternative for rebuilding this wetland system may be to initiate a new subdelta building process in the area (Gagliano and Van Beek 1993; Gagliano 1994, 1998;

Gagliano and Van Beek 1998). This subdelta could be accomplished by diverting flows from the Mississippi River, south and east of Donaldsonville, through a large conveyance channel parallel to the developed Bayou Lafourche ridge. One A branch of the channel, carrying about half of the water, would cross Bayou Lafourche below Thibodaux and end in the Bully Camp area. The other branch would stay on the east side of the bayou and nourish marshes and would build a delta in the Little Lake and Caminada Bay mapping units. Any possible navigation functions shall not impede or interfere with the land building capacity of the channel. This strategy is anticipated to create significant amounts of land and reduce marsh loss in the Bully Camp and Terrebonne marshes.

10. *Restore historic hydrologic conditions of major tidal exchange points or prevent adverse tidal exchange points between Gulf/lake, lake/marsh, bay/marsh, gulf/bay and marsh/navigation channel locations.* This strategy could be used to restore vast acres of marshes to their natural or historic salinity regimes as occurred before 1949. Both natural and man-made impacts could be ameliorated through construction of projects designed to reduce saltwater intrusion, increase freshwater input, reduce wind/wave erosion, manage hydrology, and contain man-made channels within prescribed dimensions. This strategy would also allow for projects to be constructed which would restore natural drainage patterns. Impacts to navigation interests would be required to be considered during the project development phase. For example, this strategy could reduce cross-sections of Southwest Pass in a manner acceptable to navigation, in order to restore historic, hydrologic and salinity conditions in order to protect wetlands and restore tidal prism.

11. *Protect, restore, and maintain ridge function.* Chenieres or other coastal ridges are critical structural components within the Region 3 wetlands. Many of the mapping units within the region have singled out ridge function establishment and protection as a high priority. The numerous locations at which the repair or maintenance of these critical land forms can be performed warranted including this strategy wherever feasible or practical.

Protect Bay and Lake and Gulf Shorelines

12. *Maintain shoreline integrity and stabilize critical areas of Vermilion, East and West Cote Blanche, Atchafalaya, Caillou, Terrebonne, and Timbalier Bay systems including the gulf shoreline.* Interior wetlands would benefit from measures that would absorb erosive wave energies and would aid in maintaining favorable hydrological conditions. This strategy is anticipated to preserve a moderate amount of marsh.

13. *Construct interior islands and/or reefs to protect bay/lake shorelines and/or for restore ing hydrology.* This strategy is designed to construct offshore reefs or islands utilizing oyster shells, clam shells, limestone, or other suitable materials in order to reduce wave fetch and thus minimize shoreline erosion in bays and open lakes. These structures would also enhance estuarine fisheries habitat.

Restore Barrier Islands and Gulf Shorelines

14. *Restore and maintain the barrier islands and gulf shoreline such as Isles Dernieres, Timbalier barrier island chains, Marsh Island, Point au Fer and Cheniere Au Tigre (including*

back barrier beaches). The Timbalier and Isles Dernieres barrier island chains have severely eroded. Marsh Island has lost almost 10,000 acres since 1932, with much of the loss occurring along its shorelines. The shoreline along Cheniere Au Tigre in the Vermilion Bay Marsh mapping unit is retreating at a rate of 30 ft. per year. This strategy would restore the island chains and gulf shorelines to a condition suitable for maintaining the integrity of the estuarine system. The Barrier Shoreline Feasibility Study has evaluated alternative restoration measures, costs, and benefits of restoring the island chains. This strategy is anticipated to create moderate amounts of marsh and barrier beaches. Marsh Island and the Cheniere Au Tigre shoreline west of Southwest Pass would also benefit from shoreline protection projects.

Special Concerns and Opportunities: Resolve Vermilion-Cote Blanche Bays Salinity and Turbidity

The Teche-Vermilion Basin is strongly influenced by the Atchafalaya River. River flow is transported westward into the basin by the Gulf Intracoastal Waterway, by exchange between Atchafalaya Bay and East Cote Blanche Bay, and by a diversion from the Atchafalaya into Bayou Teche and the Vermilion River. While this influence benefits wetlands and satisfies some agricultural irrigation needs, there are concerns about its adverse effects on navigation and estuarine fisheries. Managing the river's influence to sustain the basin's wetlands is a general strategy. Several measures that address aspects of this strategy are being evaluated in the USACE Lower Atchafalaya River Reevaluation Study. The following specific strategies include other measures that address basin needs.

15. *Optimize Gulf Intracoastal Waterway flows into marshes and minimize direct flow into bays.* With this strategy, Gulf Intracoastal Waterway flows would be routed through wetland areas before draining into the bays. Sediments and nutrients would be retained in the wetlands, and bay water temperatures would be increased. This strategy is anticipated to preserve a moderate amount of marsh.

16. *Maintain Vermilion, East and West Cote Blanche Bays as brackish.* While this strategy could be viewed as an objective, the sensitivity surrounding this issue required the statement be made a strategy. No specific measures have been identified to implement this strategy. The main expectation is to achieve the objective when planning other measures in the region that could affect bay salinities. Benefits for this strategy have not been estimated.

17. *Reduce sedimentation in bays.* Measures identified to implement Strategies 2, 15, and 18 (increase deltaic land building where feasible, optimizing Gulf Intracoastal Waterway flows into marshes and minimizing direct flow into bays, and creating an artificial reef complex) would aid in accomplishing this strategy. Other measures to reduce Atchafalaya River influence to these

bays are being evaluated in the USACE Lower Atchafalaya River Reevaluation Study. Benefits for this strategy have not been estimated.

18. *Create an artificial reef complex including one extending from Point Chevreuil southward.* An artificial reef would be constructed along the alignment of the natural reef that was mined earlier this century. Expectations are that the reef would restore some semblance of the former

hydrology in East Cote Blanche Bay and adjacent wetlands. The reef would also enhance fisheries through reduction of turbidity and bay infilling. This strategy has no measurable marsh benefits.

Revised Region 3 mapping unit strategies.	
SOUTH BULLY CAMP MARSH	
1	**Protect Bay/Lake Shorelines**
	e.g., Reef zone, breakwaters, oyster reefs, use oyster shells from shucking plants
2	**Establish/Protect Ridge Function**
3	**Beneficial Use of Dredged Material**
NORTH BULLY CAMP MARSH	
4	**Establish/Protect Ridge Function**
5	**Protect Bay/Lake Shorelines**
6	**Beneficial Use of Dredged Material**
7	**Hurricane and Flood Protection**
	e.g., Maintain an apron of marshes outside the levees where possible
ST. LOUIS CANAL	
8	**Establish/Protect Ridge Function**
9	**Stabilize Banks**
MONTEGUT	
10	**Establish/Protect Ridge Function**
11	**Beneficial Use of Dredged Material**
12	**Beneficial Use of Pump Outfall**
TERREBONNE MARSHES	
13	**Establish/Protect Ridge Function**
14	**Stabilize Banks (Bayou Terrebonne)**
15	**Protect Bay/Lake Shorelines**
16	**Beneficial Use of Dredged Material**
TIMBALIER ISLAND SHORELINES	
17	**Protect Bay/Gulf Shorelines**
18	**Beneficial Use of Dredged Material (Fill Abandoned Canals)**
BOUDREAUX	
19	**Establish/Protect Ridge Function**
20	**Beneficial Use of Dredged Material**
21	**Protect Bay/Lake Shorelines**
PELTO MARSHES	
22	**Stabilize Banks (Houma Navigation Canal)**
23	**Protect Bay/Lake Shorelines**
24	**Beneficial Use of Dredged Material**
FIELDS SWAMP	
25	**Stabilize Banks**
26	**Beneficial Use of Dredged Material**
27	**Beneficial Use of Pump Outfall**

Table 4-4. Region 3 mapping unit strategies (Cont.).	
DEVIL'S SWAMP	
28	**Stabilize Banks (GIWW)**
NHSC WETLANDS	
29	**Stabilize Banks**
30	**Beneficial Use of Dredged Material**
CAILLOU MARSHES	
31	**Establish/Protect Ridge Function**
32	**Beneficial Use of Dredged Material**
ISLES DERNIERES SHORELINES	
33	**Protect Bay/Gulf Shorelines**
34	**Beneficial Use of Dredged Material (Fill Abandoned Canals)**
VERRET WETLANDS	
35	**Beneficial Use of Pump Outfall (Minimize Impact to Penchant Flotant Marshes)**
CHACAHOULA SWAMPS	
36	**Stabilize Banks**
BLACK BAYOU WETLANDS	
37	**Stabilize Banks**
AVOCA	
38	**Establish/Protect Ridge Function**
39	**Stabilize Banks**
40	**Beneficial Use of Dredged Material**
GIWW	
41	**Stabilize Banks (Buffer on Channel Side)**
42	**Beneficial Use of Dredged Material**
PENCHANT	
43	**Establish/Protect Ridge Function**
44	**Stabilize Banks**
45	**Protect Bay/Lake Shorelines**
46	**Beneficial Use of Dredged Material**
MECHANT/DE CADE	
47	**Establish/Protect Ridge Function**
48	**Stabilize Banks**
49	**Protect Bay/Lake Shorelines**
50	**Beneficial Use of Dredged Material**
ATCHAFALAYA MARSHES	
51	**Stabilize Banks**
52	**Protect Bay/Lake Shorelines**
	e.g., Train a lobe of the Atchafalaya Delta towards Four League Bay
53	**Beneficial Use of Dredged Material**
POINT AU FER	
54	**Beneficial Use of Dredged Material**
55	**Protect Bay/Lake/Gulf Shorelines**
	e.g., Train a lobe of the Atchafalaya Delta towards Four League Bay

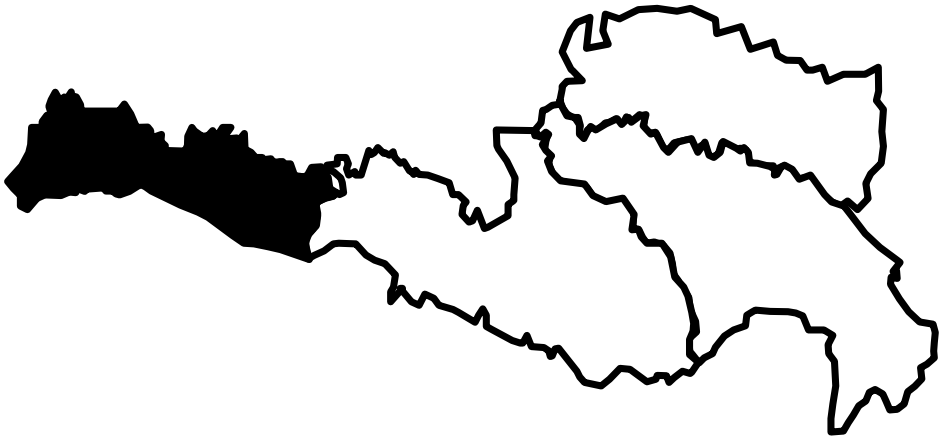
Table 4-4. Region 3 mapping unit strategies (Cont.).	
ATCHAFALAYA SUBDELTA	
56	**Protect Bay/Lake/Gulf Shorelines**
	e.g., Train a lobe of the Atchafalaya Delta toward Four League Bay
57	**Beneficial Use of Dredged Material**
NORTH WAX LAKE WETLANDS	
58	**Stabilize Banks**
WAX LAKE WETLANDS	
59	**Stabilize Banks**
60	**Protect Bay/Lake Shorelines**
61	**Beneficial Use of Dredged Material**
62	**Maintain Distributaries**
	e.g., Hog Bayou
WAX LAKE OUTLET SUBDELTA	
63	**Protect Bay/Lake Shorelines**
	e.g., Keep Wax Lake Outlet open
MARSH ISLAND	
64	**Protect Bay/Lake/Gulf Shorelines**
	e.g., Establish artificial reefs
65	**Beneficial Use of Dredged Material**
66	**Stabilize Banks of Navigation Canals to restore hydrology of area marshes**
RAINEY MARSH	
67	**Establish/Protect Ridge Function**
	e.g., Cheniers
68	**Stabilize Banks of Navigation Canals to restore hydrology of area marshes**
69	**Protect Bay/Lake/Gulf Shorelines**
	e.g., Protect and restore Southwest Pass shoreline
	e.g., Stabilize critical reaches of Chenier au Tigre and bays
	e.g., Establish artificial reefs
70	**Restore hydrology of area marshes**
71	**Beneficial and Dedicated Use of Dredged Material**
BIG WOODS	
72	**Establish/Protect Ridge Function**
EAST COTE BLANCHE BAY	
73	**Protect Bay/Lake Shorelines**
74	**Beneficial Use of Dredged Material**
75	**Maintain the Jaws Terracing Project Through the Year 2050**

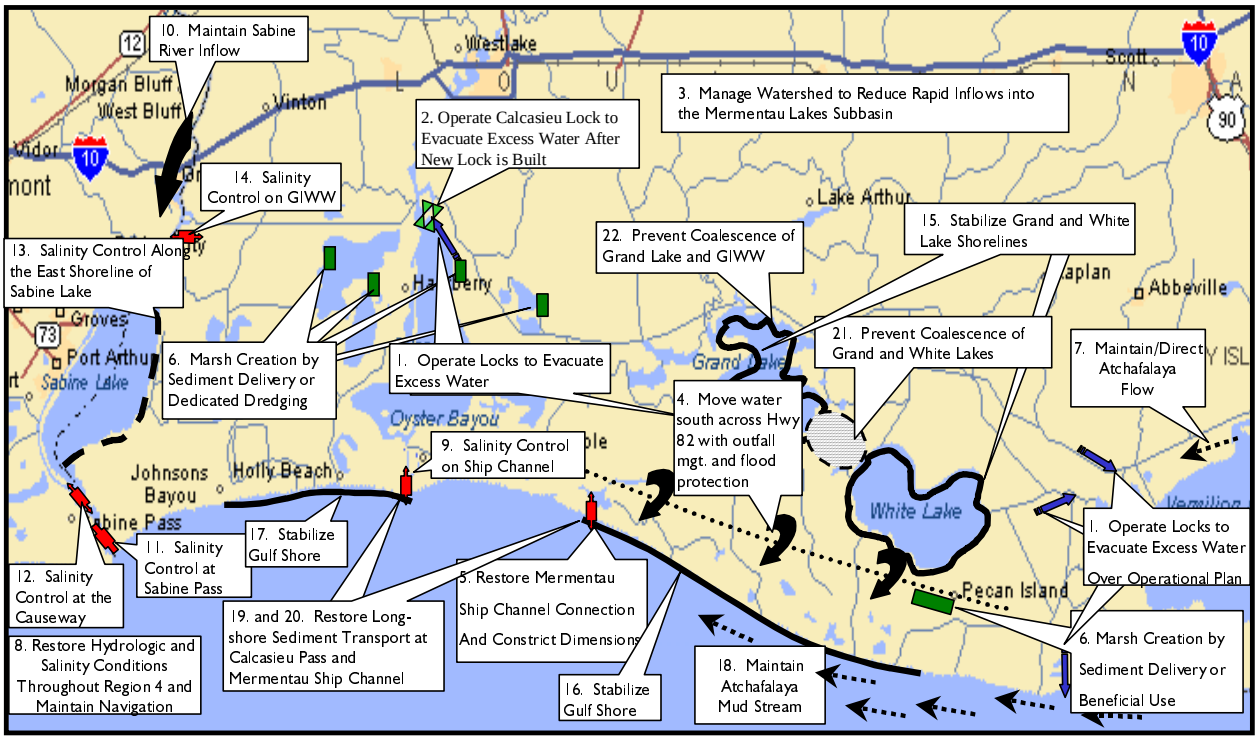
Table 4-4. Region 3 mapping unit strategies (Cont.).	
WEST COTE BLANCHE BAY	
76	**Protect Bay/Lake Shorelines**
77	**Beneficial Use of Dredged Material**
COTE BLANCHE WETLANDS	
78	**Establish/Protect Ridge Function**
79	**Stabilize Banks**
	e.g., Rebuild south banks of GIWW
80	**Protect Bay/Lake Shorelines**
81	**Beneficial Use of Dredged Material**
VERMILION BAY MARSH	
82	**Establish/Protect Ridge Function**
83	**Stabilize Banks of Navigation Channels and Canals**
	e.g., Rebuild south banks of GIWW
84	**Protect Bay/Lake Shorelines**
	e.g., Rebuild south bank of the GIWW at Weeks Bay to prevent breach
85	**Beneficial Use of Dredged Material**
	e.g., Place dredged material along GIWW for additional hurricane protection
VERMILION BAY	
86	**Protect Bay/Lake Shorelines**
	e.g., Narrow the gap of the head of Little Vermilion Bay
	e.g., Stabilize critical areas of Little Vermilion Bay and Weeks Bay
87	**Beneficial Use of Dredged Material**

Revised Region 3 programmatic recommendations.	
COAST-WIDE	
1	**Prevent the negative effects of shell dredging in all regions**
2	**Conduct additional studies on the influence of river water, leveraging existing studies already underway and expanding the measurement criteria**
3	**Exotic or introduced aquatic species control - to prevent marsh erosion coastwide**
4	**Develop and support a comprehensive Barrier Shoreline/Island restoration/mitigation initiative, not limited to wetland issues**
RESTORE/SUSTAIN WETLANDS--REGIONAL STRATEGIES	
5	**Establish multi-purpose control of HNC or other navigation channels (FW and sediment distribution, salinity control, hurricane protection, and navigation)**
6	**Establish statewide plan for management of surface water and groundwater supplies**
ST. LOUIS CANAL	
7	**Flood protection**
DEVIL'S SWAMP	
8	**Maintain levees**
9	**Water quality improvement**
BIG WOODS	
10	**Protect ground water between Perry/Big Woods (recharge area) from saltwater intrusion**
TIMBALIER ISLAND SHORELINES	
11	**Eliminate any new dredging of canals on the islands**
12	**Directional drilling to prevent new development footprints on the land**
13	**Oilfield companies - help to restore island**
FIELD'S SWAMP	
14	**Wake limit control**
ISLES DERNIERES SHORELINES	
15	**Directional drilling to prevent new development footprints on the islands**
16	**Eliminate any new dredging of canals on the islands**
17	**Oilfield companies - help to restore islands**
NORTH HOUMA SHIP CANAL WETLANDS	
18	**Amend Falgout Canal Project water management plan**
19	**Flood protection for both sides of channel**
20	**Wake limit control established and enforced**
MECHANT/DE CADE	
21	**Water quality/wastewater management**

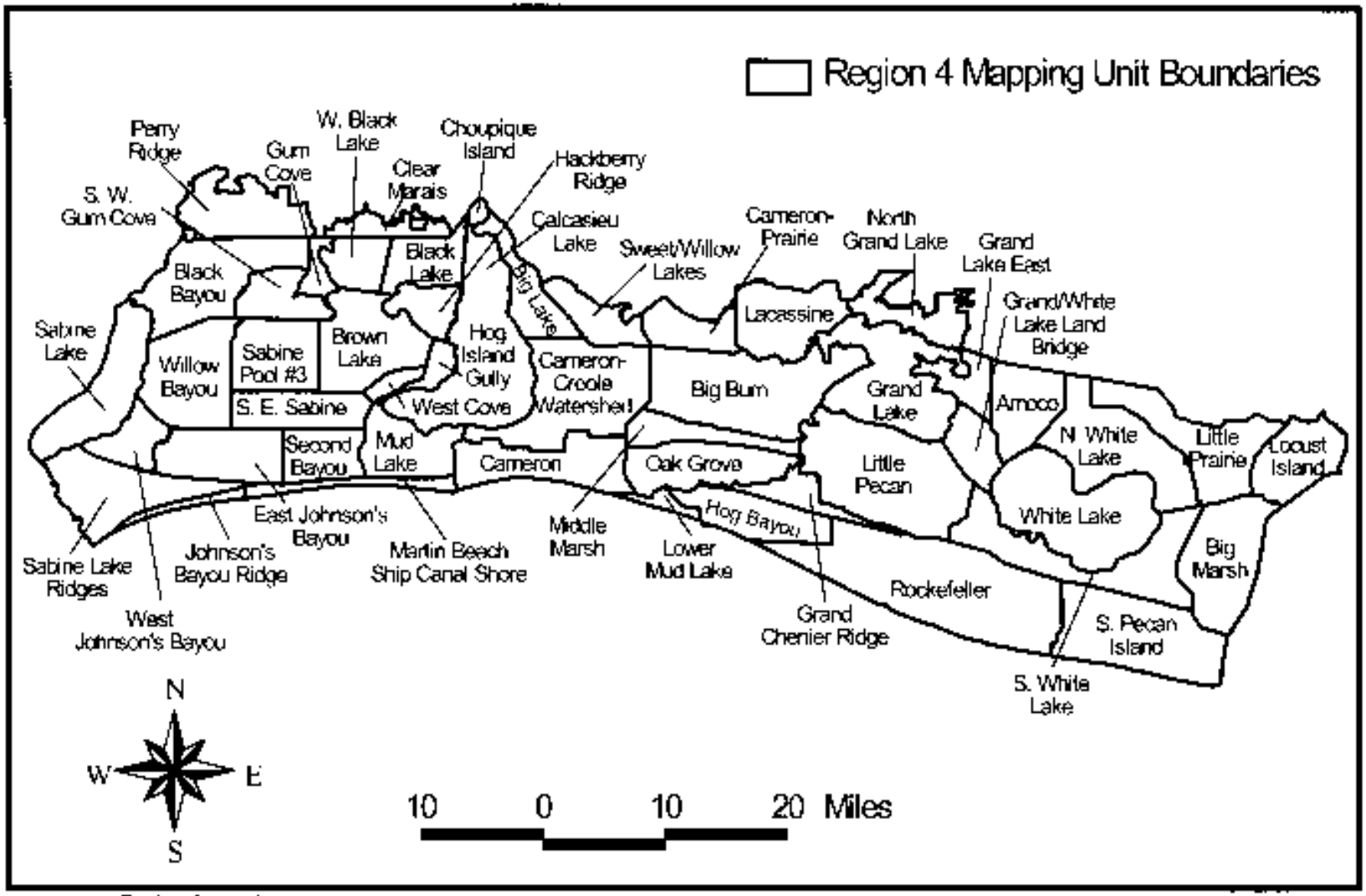
Region 4:

The Mermentau and Calcasieu/Sabine Basins





Coast 2050 Region 4 regional ecosystem strategies.



Region 4 mapping units.

Region 4
Revised Regional Ecosystem Strategies

Because of the socioeconomic demands and opportunities which exist in this region, it is not realistic to return to "natural" conditions by taking actions such as restoring Calcasieu Pass or Sabine Pass to their pre-1900 conditions, filling in the Gulf Intracoastal Waterway, or filling in the myriad of smaller canals. In a manner which accommodates, better uses, and improves existing infrastructure, the goals of the regional strategies for Region 4 are: (1) to eliminate adverse hydrologic conditions, including elevated water levels and extreme salinity spikes, and (2) to reestablish or maintain the integrity of major natural landforms.

Restore and Sustain Wetlands

1. Operate locks to evacuate excess water over that water level specified by the USACE structure the operational plan from the Mermentau Lakes Subbasin. By lowering water levels in a timely manner, inundation-related plant stresses could be relieved and lake shoreline erosion could be reduced. In recent years, this strategy has been partially implemented with some success. Continued and additional benefits could be derived by consistently operating structures 24 hours per day at all five control points (Calcasieu Lock, Leland Bowman Lock, Schooner Bayou Control Structure, Catfish Point Control Structure, and Freshwater Bayou Lock). Operation should strive to reduce the duration of marsh inundation during and after periods of high rainfall, achieve water elevations which are conducive to marsh vigor and health inside the lock system, and allow free outflow of water when inside water levels exceed target water levels and a drainage differential exists. This strategy is expected to preserve a moderate amount of marsh by 2050.

2. Operate existing Calcasieu Lock specifically to evacuate excess water, after timely building of a new lock on a parallel channel specifically for navigation and follow implementation of new lock structure and coordinate with the USACE to implement the lock. The Calcasieu Lock site is thought to be the best of the existing sites for the evacuation of excess water. The new lock would allow water evacuation and navigation to function independently and without conflict. The goal of this strategy is that it be included in the overall operational schedule of all the locks in an effort to evacuate excess water from the area to evacuate excess fresh water westward through the Calcasieu Lock. This strategy is anticipated to preserve a moderate amount of marsh by 2050 by lowering water levels.

3. Manage watershed to reduce rapid inflows into the Mermentau Lakes Subbasin. Drainage improvements in the Mermentau River watershed allow water, particularly during and after high rainfall events, to reach the Lakes Subbasin very quickly, causing elevated water levels. Without impeding drainage from existing developed or agricultural lands, this strategy would slow the flow of water, perhaps through incentive programs, catch basins, or stream restoration. This strategy is expected to preserve a moderate amount of marsh by 2050.

4. Move water from Lakes Subbasin across Highway 82 with including outfall management and flood protection where needed. This strategy is two-fold: to evacuate excess water from the Lakes Subbasin, and to provide freshwater to the Chenier Subbasin. Water could be moved from the north with a series of gravity drainage structures and/or pumps along Highway 82. A prerequisite for such structures or pumps would be to improve drainage south of Highway 82, perhaps establishing a flow-through system. Outfall management of the excess water north and south of Hwy. 82 (or from anywhere within the subbasin) would should be included in any project proposals if needed. This strategy is anticipated to preserve a major amount of marsh by 2050.

5. Restore the connection of the original Mermentau River to the Gulf of Mexico and constrict the width and depth of the Mermentau Ship Channel to its authorized dimensions. The purpose of this strategy is also two-fold: to allow better drainage of wetlands located along the lower 5 to 7 miles of the original Mermentau River, and to reduce the intrusion of salt water up the Mermentau Ship Channel. This strategy is anticipated to preserve a minor amount of marsh by 2050.

6. Use dedicated dredging or beneficial use of sediment for wetland creation or protection. This strategy consists of dredging material from channels or lakes to create marsh in rapidly eroding units such as Lacassine, Cameron Creole Watershed, Sweet and Willow Lakes, Big, Brown, and Black Lakes, and South Pecan Island. It would also include beneficial use of sediment from maintenance dredging activities on lakes, channels, or other water bodies. This strategy is projected to create a moderate amount of marsh.

7. Maintain or direct Atchafalaya River water or other freshwater sources and sediment inflow through the Gulf Intracoastal Waterway or other water channels routes sources. Presently, marshes in the Mermentau Basin seem to be deriving benefit from the flow of Atchafalaya River water and sediment through the Gulf Intracoastal Waterway. The purpose of this strategy is to both discourage any curtailment of such flow through the Gulf Intracoastal Waterway while also allowing for re-direction of Atchafalaya River and other freshwater source flows to Region 4 through any conveyance channels deemed feasible.

8. Restore historic hydrologic and salinity conditions throughout Region 4 to protect wetlands from hydrologic modification and maintain navigation where necessary at major tidal exchange points specifically at Gulf to lake and lake to marsh interchanges. This strategy is designed to transform existing wetland habitats, impacted by adverse hydrologic activities, to historic conditions. Much of the historic land loss in Region 4 occurred from 1956-1983 and was due to altered hydrology, flooding, and wind/wave erosion. Salinities have increased throughout the region due to the construction of numerous canals and navigation channels. Hydrologic patterns and overland sheet flow have been altered and/or restricted due to construction of levees and placement of numerous water control drainage structures. This strategy is expected to preserve a moderate amount of marsh by 2050.

9. Restore wetland hydrology to previously drained wetlands by modifying pumps and/or water control structure regimes. This would be accomplished through voluntary agreements with private landowners. Region 4 contains thousands of acres of former wetlands that have been leveed and drained for agricultural purposes. The hydrology of many of these areas can be modified to return them to wetlands with the landowner's consent. Landowner incentives would be provided to allow these drained former wetlands to be restored to functional coastal wetlands. The Coastal Wetland Reserve Program and the State Conservation Plan currently have some funding for these types of activities, but this restoration activity can also be included in CWPPRA funding.

Salinity Control in the Calcasieu Basin

10. Control adverse salinity and tidal amplitude control of in the Calcasieu Ship Channel between the Gulf of Mexico and Calcasieu Lake at levels sufficient to protect and restore existing wetlands. Both salinity and tidal amplitude control and water level control could be established by installing a gate, lock, or other saltwater barrier in Calcasieu Pass. The primary goal of this strategy is to reduce peak salinities and reduce any excessive tidal influences whenever they occur in the Calcasieu estuary. During nonpeak salinities, navigation would be unaffected. Should such control be established, perhaps the need for maintenance and/or intensive operation of lakeside control structures could be reduced in the future. This strategy is expected to preserve a major amount of marsh by 2050. Navigation interests would be considered for any projects recommended or constructed. It should be noted that the goal of this strategy is not to eliminate tidal flow within the Calcasieu Lake estuary but to mitigate adverse impacts caused by excessive salinities and tidal amplitudes.

Salinity Control of the Sabine Basin[*]

11. Maintain Sabine River inflow at levels sufficient to restore and protect maintain wetlands. The primary focus of this strategy is to discourage implementation of the Texas Water Development Board (TWDB) plans that reduce inflows to Sabine Lake. This would involve via proactive participation, including projection of future conditions, education regarding adverse effects, direct opposition to TWDB plans TWDB if appropriate, and development of measures to mitigate any adverse plans. The strategy would preserve a moderate amount of marsh by 2050. It would also allow for projects to utilize fresh water from the Sabine River to maintain, protect, restore, or create wetlands.

12. Salinity and tidal amplitude control at Sabine Pass sufficient to restore and protect wetlands while maintaining navigation. Salinity control and regulation of tidal amplitude could be established by installing a gate, lock, or other saltwater barrier in Sabine Pass. The primary goals of this strategy are to reduce peak salinities and reduce excessive impacts from tidal movements whenever and wherever they occurring at Sabine Pass.

*These strategies apply whether the TTWP is implemented or not, but are an absolute must if the TTWP is implemented.

During nonpeak salinities, navigation would be unaffected. Navigation interests would be considered for any projects recommended or constructed. This strategy is expected to preserve a substantial amount of marsh by 2050 by reducing salinities.

13. Salinity reduction of Sabine Lake at the Causeway. Salinity reduction could be accomplished by a sill type structure that would allow small to medium boat navigation. Large boat navigation (barges, ships, etc.) through the Sabine-Neches Waterway would be unaffected. This strategy is anticipated to preserve a moderate amount of marsh by 2050.

14. Salinity control on the east shoreline of Sabine Lake and Sabine Pass. The primary goal of this strategy is to reduce the flow penetration of peak salinities into the interior marshes. This strategy is anticipated expected to preserve a major amount of marsh by 2050.

15. Salinity Control in the Gulf Intracoastal Waterway east of Sabine River. The primary goal of this strategy is to reduce the flow of high salinity water eastward from Sabine River, through the Gulf Intracoastal Waterway, and into the interior marshes. This strategy is anticipated to preserve a moderate amount of marsh by 2050.

Protect Bay and Lake Shorelines

16. Stabilize Grand Lake and White Lake shorelines. These two very large lakes are experiencing significant shoreline erosion. In many areas the historic shoreline rim is completely lost, exposing interior organic soil marshes to high wave energy. Shoreline stabilization should address the ongoing direct loss as well as increasing rates of loss for interior marshes which otherwise would be exposed to wave energy. This strategy is expected to preserve a major amount of marsh by 2050.

Restore and Maintain Barrier Islands and Shorelines

17. Stabilize Gulf of Mexico shoreline in the vicinity of Rockefeller Refuge from the old Mermentau River to Dewitt Canal. With a shoreline retreat rate of 35 feet per year, shoreline stabilization is necessary to address the direct loss of wetlands. This strategy is anticipated to preserve a major amount of marsh.

18. Stabilize Gulf of Mexico shoreline from Calcasieu Pass to Johnson's Bayou. In addition to the long-term threat to interior wetlands posed by potential shoreline breaches and saltwater intrusion, there is an immediate threat to sections of Highway 82 which would be addressed with this strategy of holding the shoreline in its current position. This strategy is expected to preserve a moderate amount of marsh by 2050.

19. Maintain Atchafalaya River mudstream in along the Gulf of Mexico Region 4 shoreline. Presently, certain reaches of the Gulf Mexico shoreline in Region 4 are prograding because of the Atchafalaya River mudstream (*see* Fig. 3-5b). The purpose of this strategy is to discourage any curtailment of such a stream in the Gulf of Mexico.

20. Restore long-shore sediment flow across the mouth of Calcasieu Pass. Jetties installed for reducing sedimentation within the Calcasieu Ship Channel have interrupted long-shore sediment transport along the Gulf of Mexico shoreline. Sediment bypass mechanisms would help reduce shoreline retreat west of the Calcasieu Ship Channel, and could be implemented as part of Strategy 16 above. This strategy is anticipated to preserve a minor amount of marsh by 2050.

21. Restore long-shore sediment flow across the mouth of Mermentau Ship Channel. Jetties installed for the purpose of reducing sedimentation within the Mermentau Ship Channel have interrupted long-shore sediment transport along the Gulf of Mexico shoreline. Sediment bypass mechanisms would help reduce shoreline retreat west of the Mermentau Ship Channel. This strategy is likely to preserve a minor amount of marsh by 2050.

Maintain Critical Landforms

22. Prevent the coalescence of Grand and White Lakes. Individually, Grand Lake and White Lake are presently very large and are experiencing significant shoreline erosion. If allowed to coalesce, the fetch and probably erosion rates will increase tremendously. Additionally, if the lakes coalesce, water circulation patterns throughout the Lakes Subbasin will likely be altered and wind-induced water stacking will likely exacerbate marsh inundation, leading to increased interior marsh loss. One possible solution is the construction of a sill at the old GIWW. This strategy is expected to preserve a major amount of marsh by 2050.

23. Prevent the coalescence of Grand Lake and the Gulf Intracoastal Waterway. If Grand Lake and the Gulf Intracoastal Waterway are allowed to coalesce, the north bank of the waterway will be exposed to the fetch of Grand Lake and water circulation patterns throughout the Lakes Subbasin will likely be altered. This strategy is anticipated to preserve a minor amount of marsh by 2050.

Revised Region 4 mapping unit strategies.	
MERMENTAU BASIN	
AMOCO	
1	**Protect Shorelines**
	e.g., Bank stabilization along the GIWW where necessary
	e.g., Maintain integrity along White Lake shoreline (possibly using fly ash)
BIG BURN	
2	**Improve Hydrology**
	e.g., Hydrologic restoration at Humble Canal and the GIWW
	e.g., Freshwater introduction from the GIWW into Big Burn
3	**Protect Shorelines**
	e.g., Bank stabilization along the GIWW where necessary
4	**Terracing/Vegetative Plantings**
BIG MARSH	
5	**Improve Hydrology**
	e.g., Maintain the CWPPRA Freshwater Bayou (ME-04) hydrologic restoration and bank protection project
CAMERON PRAIRIE	
6	**Protect Shorelines**
	e.g., Bank stabilization along the GIWW where necessary
GRAND CHENIER RIDGE	
7	**Maintain Ridge Function**
	e.g., Maintain Grand Chenier Ridge
GRAND LAKE	
8	**Protect Shorelines**
	e.g., Bank stabilization along the GIWW where necessary
9	**Manage as a Low Salinity, Fresh to Intermediate Ecosystem**
	e.g., Protect the freshwater supply to rice/crawfish farms and fresh marshes from saltwater intrusion
10	**Protect Wetland Diversity**
GRAND LAKE EAST	
11	**Protect Shorelines**
	e.g., Bank stabilization along the GIWW where necessary
	e.g., Shore stabilization in Umbrella Bay
12	**Terracing/Vegetative Plantings**
	e.g., Vegetative plantings in Mallard Bay
	e.g., Build terraces at Bird Island between Mallard Bay and Grand Lake
GRAND/WHITE LAKE LAND BRIDGE	
13	**Dedicated Dredging**
	e.g., Dedicated dredging from Grand and/or White lakes to the land bridge
14	**Improve Hydrology**
	e.g., Structures/hydrologic management at the Old GIWW
15	**Terracing/Vegetative Plantings**
	e.g., Terracing and associated plantings
16	**Protect Shorelines**

Table 4-4. Region 4 mapping unit strategies (Cont.).	
HOG BAYOU	
17	**Improve Hydrology**
	e.g., Move sediment-rich water from Mermentau River into Hog Bayou
	e.g., Moderate salinities (3 alternatives): (a) Freshwater & sediment introduction from north to south of Hwy. 82 from the Lakes Subbasin; (b) Move fresh water and sediment from the Mermentau River into Hog Bayou; (c) Possible salinity control structure in Hog Bayou
	e.g., Insure ingress/egress of marine organisms
LACASSINE	
18	**Beneficial Use of Dredged Material**
	e.g., Beneficial use of dredged material along the GIWW
19	**Protect Shorelines**
	e.g., Bank stabilization along the GIWW where necessary
	e.g., Maintain Lacassine Bayou shoreline
LITTLE PECAN	
20	**Freshwater Introduction**
	e.g., Divert fresh water from Grand Lake to Little Pecan Bayou to reduce saltwater intrusion
	e.g., Move water from the Superior Canal to the Little Pecan Bayou area to the west
	e.g., Insure ingress/egress of marine organisms
21	**Improve Hydrology**
	e.g., Moderate salinities (3 alternatives): (a) bring fresh water from the Superior Canal; (b) divert freshwater from Grand Lake; or (c) saltwater barrier in Little Pecan Bayou
	e.g., Hydrologic restoration in the North Little Pecan Bayou area (e.g., XME-46)
	e.g., Insure ingress/egress of marine organisms
22	**Protect Shorelines**
	e.g., Vegetative plantings on Little Pecan Lake shore
	e.g., Maintain and restore Little Pecan Lake shorelines
LITTLE PRAIRIE	
23	**Beneficial Use of Dredged Material**
	e.g., For protection from saltwater intrusion during storms
	e.g., Prevent locks from being bypassed during storms
24	**Freshwater Introduction**
	e.g., Maintain freshwater inflows from the GIWW and Vermilion River to the west
	e.g., Maintain freshwater inflow through the marshes
LOCUST ISLAND	
25	**Beneficial Use of Dredged Material**
	e.g., Protection from saltwater intrusion during storms
	e.g., Prevent locks from being bypassed during storms
	e.g., Prevent erosion from tidal fluctuations
26	**Freshwater Introduction**
	e.g., Maintain freshwater and sediment inflow from the Vermilion River through the GIWW and Freshwater Bayou Canal to protect fresh marshes south of the GIWW
	e.g., Maintain freshwater inflow through the marshes
27	**Protect Shorelines**
	e.g., Rebuild west bank along Freshwater Bayou Canal and the south bank of GIWW

Table 4-4. Region 4 mapping unit strategies (Cont.).	
LOWER MUD LAKE	
28	**Beneficial Use of Dredged Material**
	e.g., Beneficial use of Mermentau River spoil for Gulf of Mexico shore protection
29	**Maintain Ridge Function**
	e.g., Maintain the Hackberry Ridge function
30	**Shoreline Stabilization**
	e.g., Stabilize Gulf of Mexico shoreline
MIDDLE MARSH	
31	**Herbivory Control**
32	**Improve Hydrology**
	e.g., Improve drainage to relieve impoundment
NORTH GRAND LAKE	
33	**Protect Shorelines**
	e.g., Bank stabilization of the GIWW
	e.g., Vegetative plantings for shoreline stabilization
34	**Improve Hydrology**
	e.g., Restrict the Mermentau River at its confluence with Grand Lake and the GIWW
NORTH WHITE LAKE	
35	**Protect Shorelines**
	e.g., Bank stabilization on the GIWW
	e.g., Vegetative plantings where feasible
	e.g., Pump historic beach sand and/or sediment to restore the current White Lake north shore
	e.g., Hard shoreline stabilization
OAK GROVE	
36	**Maintain Ridge Function**
	e.g., Maintain Grand Chenier function
ROCKEFELLER	
37	**Protect Shorelines**
	e.g., Preserve and stabilize the gulf shoreline
	e.g., Protect interior shorelines with terracing
38	**Improve Hydrology**
	e.g., Maintain and improve current hydrology
SOUTH PECAN ISLAND	
39	**Dedicated Dredging**
	e.g., Dredge fill in open water areas with either White Lake or gulf spoil
40	**Shoreline Protection to Prevent Coalescence of White Lake and the Gulf**
	e.g., Maintain integrity of Gulf of Mexico shoreline where needed
41	**Terracing/ Vegetative Plantings**
	e.g., Terracing and plantings along northern boundary of unit
SOUTH WHITE LAKE	
42	**Protect Shorelines**
	e.g., Pump historic sand beach and/or sediment to restore the current White Lake south shore
	e.g., Hard shoreline stabilization
CALCASIEU/ SABINE BASIN	
BIG LAKE	
43	**Beneficial Use of Dredged Material**
	e.g., Pump dredged material from the GIWW and Calcasieu Ship Channel to shallow open water areas

Table 4-4. Region 4 mapping unit strategies (Cont.).	
44	**Improve Hydrology**
	e.g., Hydrologic restoration south of Big Lake (CS-10) to complete perimeter control along the eastern shoreline of Calcasieu Lake
BLACK BAYOU	
45	**Beneficial Use of Dredged Material**
	e.g., Pump dredged material from the Sabine River
46	**Freshwater Introduction**
	e.g., Freshwater inflows from Sabine River to include a siphon from the Sabine Canal and the Vinton Drainage Ditch into Black Bayou
47	**Improve Hydrology**
	e.g., Hydrologic restoration through the NRCS watershed project and maintenance of the CWPPRA Black Bayou project through 2050
BLACK LAKE	
48	**Beneficial Use of Dredged Material**
	e.g., Pump dredged material from the GIWW and the Calcasieu Ship Channel
49	**Improve Hydrology**
	e.g., Install a saltwater barrier at the Alkali Ditch
	e.g., Maintain Brown's Lake project (CS-09)
	e.g., Maintain existing hydrologic restoration projects
	e.g., Close structure under Shell Western Road near Black Lake Mgt. Area
	e.g., Hydrologic restoration at Kelso Bayou near the Calcasieu Ship Channel
50	**Shoreline Stabilization**
	e.g., Re-establishment of Black Lake shoreline boundaries
51	**Terracing/Vegetative Plantings**
BROWN LAKE	
52	**Beneficial Use of Dredged Material**
53	**Improve Hydrology**
	e.g., Implement the North Line Canal structure
	e.g., Maintain Sabine NWR hydrologic restoration control structures through 2050
54	**Terracing/Vegetative Plantings**
CALCASIEU LAKE	
55	**Beneficial Use of Dredged Material**
	e.g., Maintain and enhance islands (i.e., Rabbit Island)
56	**Protect Shorelines**
	e.g., Continuous armored bank along ship channel; Decrease height of ship channel spoil to near marsh level lakeward of channel and fortify channel shoreline
CAMERON	
57	**Improve Hydrology**
	e.g., Maintain existing wetland management plan at Rutherford Beach
58	**Maintain Drainage Infrastructure**
	e.g., Maintain drainage infrastructure within the Cameron fastland
59	**Maintain Ridge Function**
60	**Terracing/Vegetative Plantings**
	e.g., Terracing may be feasible in eastern portion of unit

Table 4-4. Region 4 mapping unit strategies (Cont.).	
CAMERON-CREOLE WATERSHED	
61	**Beneficial Use of Dredged Material**
	e.g., Beneficial use of dredged material from the GIWW
62	**Terracing/Vegetative Plantings**
	e.g., Vegetative plantings, terraces, submerged aquatic vegetation plantings
CHOUPIQUE ISLAND	
63	**Beneficial Use of Dredged Material**
	e.g., Pump dredged material from the GIWW and the Calcasieu River
64	**Maintain Perched Marshes**
CLEAR MARAIS	
65	**Improve Hydrology**
	e.g., Address hydrologic problems between Choupique Bayou & Brannon's Ditch
66	**Shoreline Stabilization**
	e.g., Maintain and extend Clear Marais shoreline stabilization project
EAST JOHNSON'S BAYOU	
67	**Herbivory Control**
68	**Improve Hydrology**
	e.g., Restore hydrologic barriers in Deep Bayou
	e.g., Hydrologic restoration in Burton-Sutton Canal
HACKBERRY RIDGE	
69	**Improve Hydrology**
	e.g., Maintain the Rycade Canal structure
70	**Shoreline Stabilization**
	e.g., Reduce erosion along the west bank of ship channel
HOG ISLAND GULLY	
71	**Beneficial Use of Dredged Material**
	e.g., Stabilize the marsh east of Hwy. 27 to protect the highway
	e.g., Pump dredged material to rebuild marsh
72	**Terracing/Vegetative Plantings**
	e.g., Maintain and expand terracing in shallow water areas of the unit east of Hwy. 27
JOHNSON'S BAYOU RIDGE	
73	**Maintain Ridge Function**
	e.g., Maintain chenier ridge natural habitat (for Neotropical migrant birds)
74	**Shoreline Stabilization**
	e.g., Sacrificial (feeder) berm just west of Constance Beach breakwaters
MUD LAKE	
75	**Beneficial Use of Dredged Material**
	e.g., Pump dredged material from Calcasieu Ship Channel to restore marsh
76	**Improve Hydrology**
	e.g., Manage hydrology outside of East Mud Lake project area (Oyster Bayou project)
77	**Protect Shorelines**
	e.g., Shoreline protection along Sabine Refuge boundary

Table 4-4. Region 4 mapping unit strategies (Cont.).	
PERRY RIDGE	
78	**Beneficial Use of Dredged Material**
	e.g., Pump material from the GIWW and Sabine River to restore marsh
79	**Shoreline Stabilization**
	e.g., Stabilize the northern GIWW bank from Perry Ridge to the Sabine River
SABINE LAKE	
80	**Beneficial Use of Dredged Material**
	e.g., Maintain Sabine Island
SABINE LAKE RIDGES	
81	**Beneficial Use of Dredged Material**
	e.g., Pump material from Sabine Ship Channel to restore marsh
82	**Improve Hydrology**
	e.g., Restore hydrologic barriers by plugging canals
	e.g., Hydrologic restoration at Lighthouse Bayou (maintain fisheries access)
83	**Protect Shorelines**
	e.g., Protect Sabine Lake shoreline and gulf coast east of Sabine jetty
SABINE POOL #3	
84	**Improve Hydrology**
	e.g., Marsh management to lower water levels
	e.g., Structures in North and South (Central) Canals to restore hydrology
85	**Improve Water Quality**
	e.g., Reduce turbidity in unit with wave breaks
86	**Terracing/Vegetative Plantings**
	e.g., Wave break levees (terracing in open water in southeast)
SECOND BAYOU	
87	**Herbivory Control**
88	**Improve Hydrology**
	e.g., Restore natural hydrology by improving water flow in the unit
SOUTHEAST SABINE	
89	**Improve Hydrology**
	e.g., Hydrologic restoration structures in Central Canal
	e.g., Hydrologic restoration in the Burton-Sutton Canal
SECOND BAYOU	
90	**Terracing/Vegetative Plantings**
SOUTHWEST GUM COVE	
91	**Improve Hydrology**
	e.g., Hydrologic restoration at the Northline Canal & Bancroft Canal
	e.g., Implement and maintain the NRCS and CWPPRA Black Bayou (XCS-48) projects
	e.g., Maintain north levee of Northline Canal to maintain the hydrology of Starks Canal
SWEET/WILLOW LAKES	
92	**Beneficial use of Dredged Material**
93	**Improve Hydrology**
	e.g., Restore the west bank of the Unical Canal
	e.g., Place levee (or breakwater fence or Christmas tree fence) west of salt burn
94	**Protect Shorelines**
	e.g., Stabilize remainder of GIWW to Gibbstown Bridge
95	**Terracing/Vegetative Plantings**

Table 4-4. Region 4 mapping unit strategies (Cont.).	
WEST BLACK LAKE	
96	**Beneficial Use of Dredged Material**
97	**Protect Shorelines**
	e.g., Erosion control along GIWW where needed
	e.g., Erosion control along West Black Lake shoreline
98	**Terracing/Vegetative Plantings**
WEST COVE	
99	**Vegetative Plantings**
	e.g., Plantings in the NE region of unit
WEST JOHNSON'S BAYOU	
100	**Beneficial Use of Dredged Material**
	e.g., Pump material from the Sabine-Neches Ship Channel to restore marsh
101	**Improve Hydrology**
	e.g., Hydrologic restoration by plugging canals
102	**Protect Shorelines**
	e.g., Sabine Lake shoreline protection
WILLOW BAYOU	
103	**Beneficial Use of Dredged Material**
	e.g., Dredge-filling/beneficial use of Sabine-Neches Ship Channel material
104	**Improve Hydrology**
	e.g., Maintain freshwater inflows from the Sabine River
	e.g., Manage Gray's Canal similar to the Cameron-Creole Watershed
	e.g., Contingency plan for the Texas Water Development Board Plan
	e.g., Hydrologic restoration in the Burton-Sutton Canal
	e.g., Restore hydrology by plugging Willow Bayou Canal & Gray's Ditch
105	**Protect Shorelines**
	e.g., Sabine Lake shoreline protection
106	**Terracing/Vegetative Plantings**

Revised Region 4 programmatic recommendations.	
Restore/Sustain Wetlands - REGIONAL STRATEGY	
1	**Provide source of freshwater to upper Mermentau Basin during drought e.g. channel water from Atchafalaya across a 10mi stretch of St. Landry Parish**
2	**The Calcasieu Locks project should be funded 100% - Target date 2004 - Feasibility phase**
GRAND CHENIER RIDGE AND OTHER CHENIERE RIDGES	
3	**Restrict sand dredging**
WHITE LAKE	
4	**Allow for limited estuarine organism access**
	e.g., Allow for limited estuarine access into the lake at the Schooner Bayou, Leland-Bowman, and Catfish locks
5	**Maintain lake as a low salinity fresh to intermediate ecosystem**
	e.g., Protect the rice/crawfish farms and fresh marshes from saltwater intrusion, as well as protect wetland diversity
	e.g., Maintain the surrounding marshes as fresh to intermediate
6	**Maintain lake's subbasin target water level**
	e.g., Achieve the 2 ft MLG water level targets in the Lakes Subbasin. At 4 ft MLG go to an emergency drainage program at structures and locks
7	**Monitor fisheries access at the locks**
LITTLE PRAIRIE	
8	**Navigation safety**
	e.g., Straighten the "wiggles" in the GIWW for navigation safety, wildlife, and fisheries
GRAND LAKE	
9	**Maintain lake as a low salinity, fresh to intermediate ecosystem**
	e.g., Protect the rice/crawfish farms and fresh marshes from saltwater intrusion, as well as protect wetland diversity
	e.g., Maintain the surrounding marshes as fresh to intermediate
10	**Maintain lake's subbasin target water level**
	e.g., Achieve the 2 ft MLG water level targets in the Lakes subbasin. At 3 ft MLG go to an emergency drainage program at structures and locks
11	**Allow for limited estuarine organism access**
	e.g., Allow for limited estuarine access into Grand Lake at Catfish Lock
12	**Monitor fisheries access at the locks**
BLACK BAYOU	
13	**Contingency plan for the Texas Water Development Board Plan (research and develop)**
CALCASIEU LAKE	
14	**Allow for estuarine organism access to surrounding marshes**
	e.g., Allow for estuarine fisheries access to adjacent lake marshes with existing and future control structures

Table 4-5. Region 4 programmatic recommendations (Cont.).	
PERRY RIDGE	
15	**Restore hydrology**
	e.g., Contingency plan for the Texas Water Development Board Plan (research and develop)
	e.g., Maintain Toledo Bend/Sabine Lake freshwater inflows
SABINE LAKE	
16	**Increase water quality**
	e.g., Reduce pollution by best management practices
17	**Contingency plan for the adverse impacts of the Texas Water Development Board Plan (research and develop)**
SABINE LAKE RIDGE	
18	**Restore/maintain hydrology**
	e.g., Contingency plan for the Texas Water Development Board Plan (research and develop)
	e.g., Maintain Toledo Bend/Sabine Lake freshwater inflows
SOUTHEAST SABINE	
19	**Contingency plan for the Texas Water Development Board Plan (research and develop)**
SOUTHWEST GUM COVE	
20	**Restore hydrology**
	e.g., Contingency plan for the Texas Water Development Board Plan (research and develop)
	e.g., Maintain Toledo Bend/Sabine Lake freshwater inflows
WILLOW BAYOU	
21	**Restore hydrology**
	e.g., Maintain Toledo Bend/Sabine Lake freshwater inflows
22	**Contingency plan for the adverse impacts of the Texas Water Development Board Plan (research and develop)**
JOHNSON'S BAYOU RIDGE	
23	**Maintain ridge function**
	e.g., Maintain chenier ridge natural habitat (for Neotropical migrant birds) through policy and study formulation.
WEST JOHNSON'S BAYOU	
24	**Maintain Toledo Bend/Sabine Lake freshwater inflows**
25	**Contingency plan for the adverse impacts of the Texas Water Development Board Plan (research and develop)**

Table 4-5. Region 4 programmatic recommendations (Cont.).	
WHITE LAKE	
26	**Allow for limited estuarine organism access**
	e.g., Allow for limited estuarine organism access into the lake at the Schooner Bayou, Leland-Bowman, and Catfish locks
	e.g., Monitor fisheries access at the locks
27	**Manage lake as a low salinity fresh to intermediate ecosystem**
	e.g., Protect the rice/crawfish farms and fresh marshes from saltwater intrusion, as well as protect wetland diversity
	e.g., Maintain the surrounding marshes as fresh to intermediate
EAST JOHNSON'S BAYOU	
28	**Address bullwhip mortality**
29	**Contingency plan for the adverse impacts of the Texas Water Development Board Plan (research and develop)**
SECOND BAYOU	
30	**Address bullwhip mortality**