Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA)

The 2012 Evaluation Report to the U.S. Congress on the Effectiveness of Coastal Wetlands Planning, Protection and Restoration Act Projects

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CWPPRA Mission Statement

Louisiana currently faces an unprecedented collapse of its entire coastal ecosystem and the vital economic activity and unique culture that it supports.

After 20 years, the Task Force continues to fulfill its role under CWPPRA by implementing a science and engineering-based program that extensively engages the public and serves as the Nation's model for effective and efficient coastal restoration. In order to secure the future of Louisiana's coast, the Task Force and stakeholders must share a common vision, one that aligns with State and national priorities.

Documentation

This report is submitted by the Louisiana Coastal Wetlands Conservation and Restoration Task Force in accordance with the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), Title III of Public Law 101-646. This report fulfills the CWPPRA mandate, which requires a report to the U.S. Congress every 3 years on the effectiveness of Louisiana's coastal wetland restoration projects.

CWPPRA Task Force Member Agencies

- U.S. Army Corps of Engineers (represented by the New Orleans District): contact 504–862–2204 or at http://www.mvn.usace.army.mil/pd/cwppra_mission.htm.
- U.S. Department of the Interior (represented by the U.S. Fish and Wildlife Service): contact 337–291–3100 or at http://www.fws.gov/coastal/CoastalGrants/; www.fws.gov/lafayette.
- U.S. Department of Agriculture (represented by the Natural Resources Conservation Service): contact 318–473–7751 or at http://www.la.nrcs.usda.gov/programs/cwppra/index.html.
- U.S. Department of Commerce (represented by the National Oceanic and Atmospheric Administration National Marine Fisheries Service): contact 225–389–0508 or at http://habitat.noaa.gov/restoration/index.html.
- U.S. Environmental Protection Agency (represented by the Water Quality Protection Division of EPA Region 6): contact 214–665–7275 or at http://www.epa.gov/region06/6wq/at/cwppra.htm.
- Louisiana's Governor's Office (represented by the Coastal Protection and Restoration Authority chairman): contact 225–342–3968 or at http://www.coastal.la.gov/.

Web sites

LaCoast, the official CWPPRA Web site, has a complete project listing and technical documents at http://lacoast.gov. The CWPPRA program is administered through the U.S. Army Corps of Engineers. The CWPPRA organizational chart, standard operating procedures, annual Priority Project List (PPL) reports, and administrative proceedings documentation are publicly available on the New Orleans District Web site at http://www.mvn.usace.army.mil/pd/cwppra_mission.htm.

Acknowledgments

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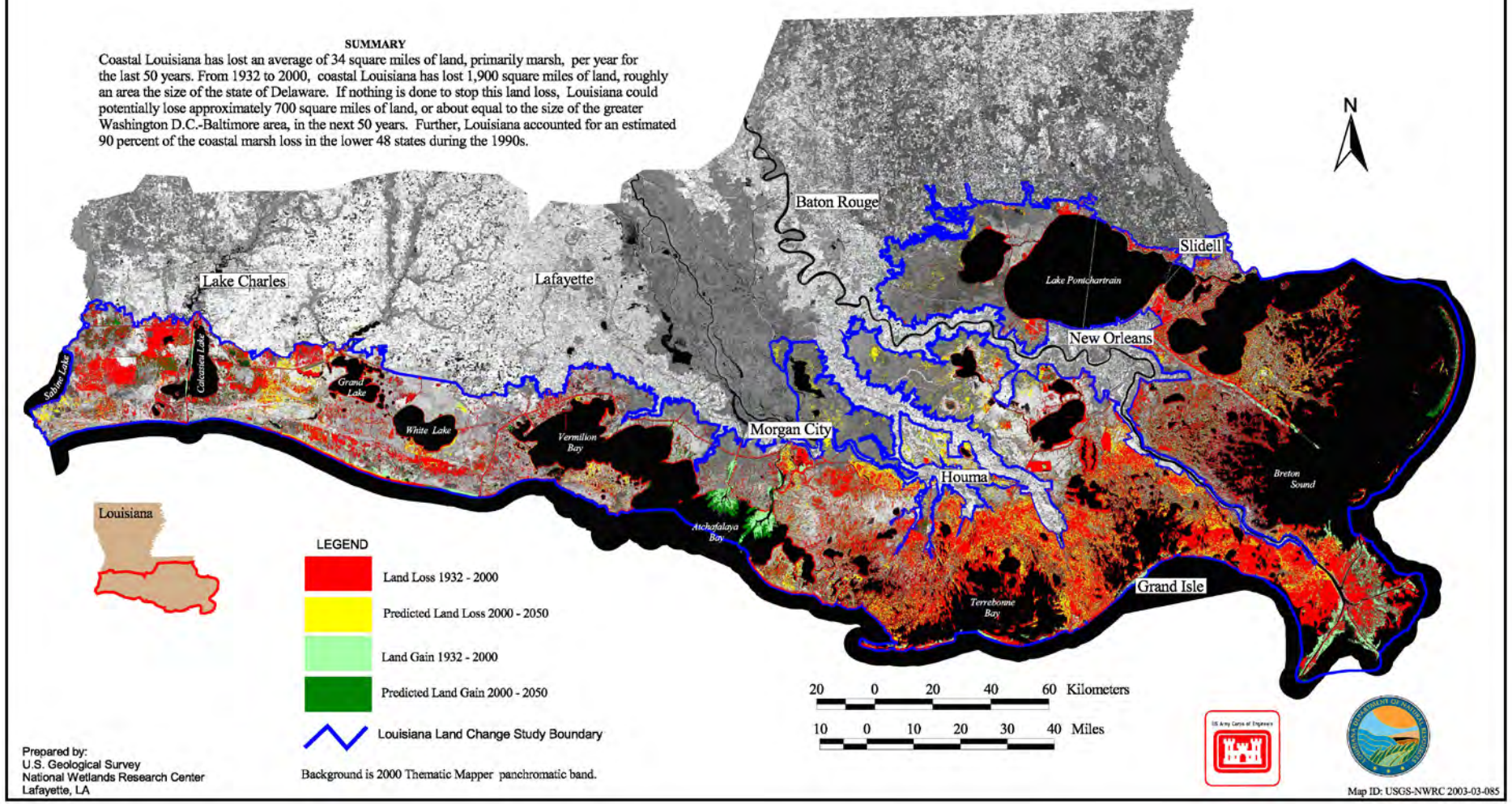
100+ Years of Land Change for Coastal Louisiana



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Executive Summary:

The 2012 Evaluation Report to the U.S. Congress on the Effectiveness of Coastal Wetlands Planning, Protection and Restoration Act Projects

Louisiana wetlands host a diverse and vibrant ecosystem that serves as a vital environmental, economic, and cultural asset for the United States. Wetlands act as a buffer against hurricanes and storms. They also store excess floodwater during high rainfall (much like a sponge). Wetlands replenish aquifers, and they purify water by filtering out pollutants and absorbing nutrients.

Approximately 30 percent of coastal marshes and 45 percent of all intertidal coastal marshes of the lower 48 States are located in Louisiana. Unfortunately, this fragile environment is disappearing at an alarming rate. Louisiana has lost up to 40 square miles of marsh per year for several decades—that's 80 percent of the Nation's annual coastal wetland loss. To date, coastal Louisiana has lost a land area equal to the size of the State of Delaware. A USGS report (Barras and others, 2008) estimates the 1983 to 2008 Louisiana coastal average land loss rate at 16.4 square miles per year. This loss rate would equal an acre of wetland loss every 50 minutes. If the current rate of loss is not slowed by the year 2040, an additional 294,000 acres of wetlands will disappear. Louisiana has already lost more than 1,883 square miles (1.2 million acres) of land in the last 80 years with a potential 1,756 square miles (1.1 million acres) at risk in the next 50 years if nothing is done.

Wetlands provide habitat for a variety of wildlife. Louisiana coastal wetlands are the breeding grounds and nurseries for thousands of species of aquatic life, land animals, and birds of all kinds—including our national bird, the bald eagle. It is estimated that over five million waterfowl migrate to coastal Louisiana each year.

Our national economy also benefits from Louisiana's coastal wetlands. Economic activity in Louisiana includes oil and gas production, shipping commerce, commercial fisheries, oyster production, and fur harvesting. This accounts for over 55,000 jobs and billions of dollars in revenues. Additionally, wetlands are wonderful recreational resources and are part of Louisiana's growing ecotourism business.

The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) has been essential to advancing the cause of coastal restoration in Louisiana. Nevertheless, it has long been recognized that at current funding levels CWPPRA alone is not sufficient to address Louisiana's coastal crisis. The Water Resources Development Act of 2007 established the Louisiana Coastal Area (LCA) program to address restoration needs that were not included within the scope of CWPPRA. The 2012 Louisiana Comprehensive Master Plan for a Sustainable Coast (Master Plan) also addresses restoration and protection needs beyond the authorization of CWPPRA.

In the wake of the BP Deepwater Horizon oil spill, the Federal government joined with the five Gulf States to form the Gulf Coast Ecosystem Restoration Task Force (GCERTF). The resulting Gulf of Mexico Regional Ecosystem Restoration Strategy charts a path for a sustainable Gulf of Mexico. The subsequent enactment of the RESTORE Act in July 2012 establishes a structure and funding mechanism which could complement CWPPRA and further enhance coastal restoration in Louisiana and the other Gulf States. With the emergence of these complementary programs and policies, CWPPRA is well poised to continue its role as a highly collaborative and expeditious program for implementing targeted coastal restoration projects. Additionally, CWPPRA has the experience necessary for success with broader and more ambitious restoration efforts. Given limited CWPPRA funding, the project selection process generates more construction-ready projects than the program can afford to build. Although Congress in 2004 reauthorized CWPPRA through 2019, the program is expected to reach its capacity to fund new projects within the next few years.

If fully funded, CWPPRA could complement the aforementioned programs by quickly developing and implementing projects in high priority areas while more comprehensive and complex coastal

restoration measures are being developed. Thus, CWPPRA helps "hold the line" in critical parts of the landscape, pending implementation of more systemic and large-scale solutions. CWPPRA serves as a model for interagency collaboration and decisionmaking. The interagency decisionmaking and public involvement processes established by CWPPRA could be utilized by other restoration programs. Moreover, the CWPPRA program could serve as a vehicle for advancing the GCERTF Strategy and (or) for administering restoration funds from sources such as the BP Deepwater Horizon oil spill.

CWPPRA has and will continue to be the primary source of practical experience, learning, and agency expertise regarding coastal restoration in Louisiana. In addition to its ecosystem benefits, CWPPRA has provided "hands-on" experience with the practical challenges of bringing restoration projects from concept to reality. CWPPRA has been a training academy in which staff and management from Federal and State agencies have gained invaluable experience in administering a coastal restoration program and implementing a range of different types of projects. Much of the expertise needed to effectively implement the GCERTF Strategy, the 2012 Master Plan, and (or) other restoration efforts in Louisiana comes directly or indirectly from CWPPRA. Thus, whether in its current form or an expanded role, CWPPRA can be a cornerstone for the effort to restore sustainability to coastal Louisiana; however, without reauthorization by Congress, this would not be possible.

The path to a more sustainable gulf is not easy, but bold action is essential if we wish to secure for future generations the vast ecological and economic benefits that coastal Louisiana provides to the Nation. Now more than ever, we need to collaboratively cooperate at all levels of government and with every interested stakeholder as one Louisiana community. The time to act is now.

The CWPPRA Task Force authorized 13 new projects between 2010 (Priority Project List [PPL] 19) and 2012 (PPL 21) for Phase 1—Engineering and Design, which if constructed would result in an estimated net benefit of approximately 6,440 acres of wetlands. During this period, the Task Force also authorized Phase 2—Construction of 10 projects that are expected to result in an estimated net benefit of approximately 2,858 acres of wetlands. These 10 proposed construction projects include four marsh creation projects, one barrier headland project, two shoreline protection projects, one freshwater diversion project, and two vegetative planting projects. The Louisiana coast is separated into four ecologic regions that cover nine hydrologic basins. Besides the four ecologic regions, a coastwide category is also considered for the purpose of project planning. Below is the list of the projects that were authorized to begin Phase 2—Construction during this reporting period (2010–12).

Region 2 (Breton Sound, Barataria, and Mississippi River Delta hydrologic basins): Barataria Basin Landbridge (BA-27c[4]) Phase 3, Construction Unit 8; Bayou Dupont Ridge Creation and Marsh Restoration (BA-48); Grand Liard Marsh and Ridge Restoration (BA-68); and South Lake Lery Shoreline and Marsh Restoration (BS-16). These projects will have a combined net benefit of approximately 1,072 acres of wetlands.

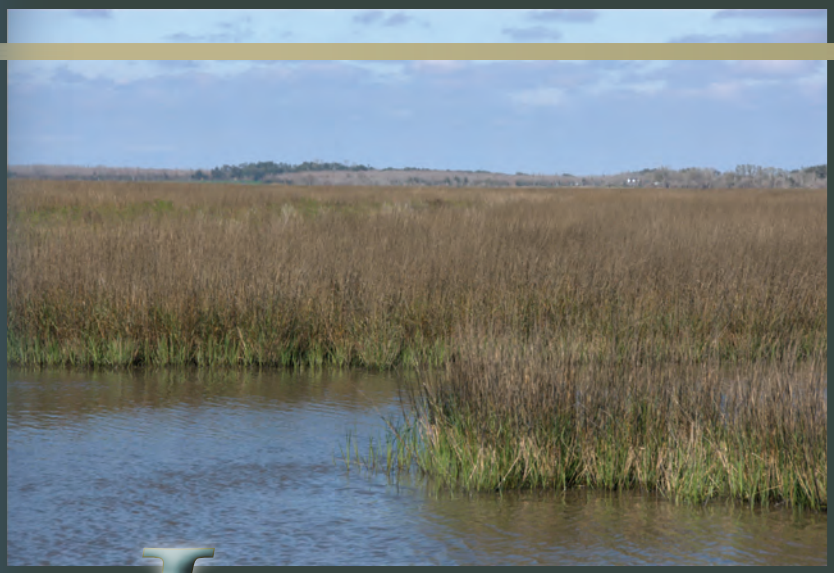
Region 3 (Atchafalaya, Terrebonne, and Teche/Vermilion hydrologic basins): West Belle Pass Barrier Headland Restoration (TE-52), North Lake Boudreaux Basin Freshwater Introduction (TE-32a), and Gulf Intracoastal Waterway Bank Restoration of Critical Areas (TE-43), with a combined net benefit of approximately 636 acres of wetlands.

Region 4 (Calcasieu/Sabine and Mermentau hydrologic basins): Cameron Creole Freshwater Introduction, Construction Unit 1 (CS-49[CU1]) and Sabine Refuge Marsh Creation Cycles 4 and 5 (CS-28), with a combined net benefit of approximately 371 acres of wetlands.

Coastwide: Coastwide Vegetative Planting Project (LA-39) will have a net benefit of approximately 779 acres of wetlands.

Although projects are authorized and constructed individually, they often work synergistically with one another. For example, the barrier island projects are collectively rebuilding Louisiana's first line of defense that can extend ecosystem benefits beyond just the sum of their individual projects. This type of synergy is also seen within the Barataria Basin, where constructed projects are working together to restore the structural integrity of a critical landform that is undergoing high land loss rates. These projects are demonstrating how small- to mid-scale projects are working collectively to generate large-scale results.

Most of the CWPPRA projects are located within one of the four specific regions. During the 2010–12 period, the Task Force authorized four projects in Region 2, three in Region 3, two in Region 4, and a comprehensive coastwide vegetative planting project. A map that illustrates these coastal regions with PPL 1–20 is at http://www.lacoast.gov/maps/allregions_ppl1-20(web).pdf.



Introduction

The traditional image of Louisiana's wetlands depicts a grassy expanse of vegetation with trawling shrimp boats and sea birds dotting the horizon. The image is accurate, but its serenity can be misleading. Louisiana's coastal zone contains approximately 30 percent of coastal marshes and 45 percent of all intertidal coastal marshes in the lower 48 States, but it is suffering 80 percent of the entire Nation's annual coastal wetland loss. Since the 1930s, coastal Louisiana has lost more than 1,883 square miles, an area more than 25 times larger than Washington, D.C. In 2008, Barras and others estimated the average annual Louisiana coastal land loss rate to be 16.4 square miles. Although the causes are a combination of complex human-induced and natural factors, this rate of loss is largely attributable to channelization of the Mississippi River for flood protection, natural subsidence, petroleum exploration and navigation channels, storms, and pressures from human-related land uses. As a result, the wetlands are rapidly converting to open water.

Congress recognized the ongoing severe coastal wetland losses in Louisiana and the increasing impacts on locally, regionally, and nationally important resources when it established the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) in 1990 (Public Law 101–646, Title III). Over the last two decades, it has been clearly established and well documented that there is an imminent need to restore and protect Louisiana's coastal wetlands in order to sustain the ecological and economic health of the Louisiana coastal zone. Louisiana's wetlands provide a variety of benefits that serve the Nation across an array of economic sectors. Because of this, the coastal wetland loss crisis in Louisiana is considered a matter of national concern.

The Gulf of Mexico is a natural resource of vital importance which provides immeasurable benefits and services to citizens throughout the United States. The Gulf Coast has been and continues to be subject to a number of ongoing environmental challenges that have attracted significant attention from State and Federal natural resource managers and conservation interests.[1] These challenges were further compounded in 2010 by the Deepwater Horizon oil spill, which released more than 4.9 million barrels of oil into the Gulf affecting thousands of miles of shoreline, bayous, and bays. Coastal Louisiana received and continues to receive the majority of the ecological impacts from the spill. Efforts to assess natural resource injuries resulting from the spill are ongoing and will continue until the full extent of damages is determined, restoration plans are designed and implemented, and the environment and public are made whole for injuries to natural resources and services resulting from the Deepwater Horizon oil spill. Some CWPPRA project areas near the oil spill received oiling, and natural resource trustee agencies are continuing to analyze BP oil spill effects on CWPPRA project sites and other coastal habitats in Louisiana. Ongoing issues include the following:

[1]This paragraph and the subsequent bulleted items were taken from information included in a report published in September 2010 titled *America's Gulf Coast: A Long Term Recovery Plan After the Deepwater Horizon Spill*.

- The loss of coastal wetlands, barrier islands, and other habitats of the Mississippi River Delta. While an issue in every Gulf State, the loss of coastal habitat is most dramatic in Louisiana. Since the 1930s, the coast of Louisiana has lost more than 1,883 square miles of wetlands (an area roughly the size of Delaware). This loss is due to a combination of both natural and human factors including storms, subsidence, dredging of navigation channels and oil and gas canals, and disruption of the natural deltaic processes of the Mississippi River. Climate change (particularly sea-level rise) threatens to accelerate the loss of these habitats.

- Erosion of barrier islands and barrier shorelines. The continued erosion of the coastal barrier island and barrier shorelines system undermines storm protection for coastal communities, threatens the beaches that support the local tourism economy, and affects numerous species that rely on these barrier islands for habitat.

- Loss and degradation of estuarine habitat. Estuaries of the Louisiana's coast—such as Breton Sound, Barataria Bay, and others—provide nursery habitat for most of the fishery resources and support a nationally important oyster industry. These estuaries are impacted by a variety of stressors, including pollution, coastal development, energy development, erosion, hydrologic alteration, and changes in freshwater inflow.

- Imperiled fisheries. Several major commercially and recreationally important fish species are currently experiencing pressures from overfishing or have been overfished. In some cases, these conditions have persisted for many years. Additionally, contaminants such as methyl-mercury in fish, and red tide organisms and human pathogens in shellfish, reduce fishery values and endanger human health.

- Hypoxia (low oxygen) in the Gulf of Mexico. Hypoxia occurs when the concentration of dissolved oxygen in the water column decreases to a level that reduces the quality of habitat, resulting in death of aquatics or their migration away from the hypoxic zone. The northern Gulf of Mexico adjacent to the Mississippi River is the site of the largest hypoxic zone in the United States and the second largest hypoxic zone worldwide. This Gulf of Mexico "Dead Zone" is caused by input of excess nutrient pollution to the gulf—most of which comes from upstream through Mississippi River drainage. Freshwater and sediment diversions from the Mississippi and Atchafalaya Rivers may help reduce the hypoxic zone off Louisiana's coast.

- Climate change. Our changing climate is already altering, perhaps irreversibly, the physical, chemical, and biological characteristics of our oceans, coasts and adjacent watersheds. Increasing air and water temperatures, changing precipitation patterns, rising sea level, and ocean acidification will increasingly confound efforts to restore or sustain the Louisiana coastal ecosystem. Plausible sea-level rise may be from 0.39 to 2.1 feet (0.12 to 0.65 meter) in the next 50 years, or 0.78 to 4.2 feet (0.24 to 1.28 meters) in the next 100 years (LA CPRA, 2012).

- Vulnerability of communities. Loss of coastal habitats may also increase the vulnerability of communities that lie further inland with respect to flooding from storm surge and heavy rain. The presence of barrier islands have been shown to reduce wave heights by 0.98 to 2.28 feet (1 to 2 meters), and coastal wetlands can reduce wave heights by an additional 0.98 to 3.28 feet (0.3 to 1 meter). Without these coastal habitats, coastal communities are increasingly vulnerable to storms. This vulnerability is likely going to intensify in coming years, as storm events are predicted to become more frequent and intense.

As part of CWPPRA, Congress established and directed the Louisiana Coastal Wetlands Conservation and Restoration Task Force (hereafter referred to as the "Task Force" or "CWPPRA Task Force") to prepare, annually update, and implement a list of coastal wetland restoration projects in Louisiana to provide for the long-term conservation of wetlands and dependent fish and wildlife populations. In addition, Congress directed the Task Force to provide a scientific evaluation every 3 years on the effectiveness of the projects as required by Section 303 (b) (7) of CWPPRA. The purpose of this report is to meet this requirement. The following sections summarize projects selected for implementation since 2009 and demonstrate the effectiveness of the program to date and the relevancy of CWPPRA to address land loss in Louisiana's coastal wetlands.

CWPPRA Overview

CWPPRA was initially authorized by Congress in 1990. Three additional authorizations have extended the program until the year 2019. This act provides approximately 80 to 90 million in Federal dollars per year to partially restore coastal wetlands. The Fiscal Year 2012 funding amount was $79.2 million. Total Federal funding since 1990 has been $1.2 billion.

The Sport Fish Restoration and Boating Safety Trust Fund (Trust Fund) is the funding source supported by excise taxes on fishing equipment, small engine, and motorboat fuel taxes. This Trust Fund contributes 18.5 percent of its annual revenues to CWPPRA appropriations and that amount is divided as follows:

- 70 percent Louisiana CWPPRA program
- 15 percent Coastal Wetland Conservation Grants
- 15 percent North American Wetlands Conservation Act (to coastal States only)

Funding for Louisiana CWPPRA projects is cost shared: a split of 85 percent Federal and 15 percent State of Louisiana. Congress has postponed renewing the Sport Fish Restoration and Boating Safety Trust Fund, and the fund is currently extended until March 27, 2013, by Congressional continuing resolution.

Five Federal agencies work with the State of Louisiana in planning and implementing projects for coastal wetlands restoration. The federal agencies are: Department of the Army—U.S. Army Corps of Engineers (USACE), U.S. Department of Interior—Fish and Wildlife Service (FWS), U.S. Department of Agriculture—Natural Resources Conservation Services (NRCS), U.S. Department of Commerce—National Oceanic and Atmospheric Administration—National Marine Fisheries Service (NOAA-NMFS), and the U.S. Environmental Protection Agency (EPA)—Region 6.

CWPPRA operates on an annual cycle to identify and select projects for engineering and design through what is called the Priority Project List (PPL). The PPL planning process starts with project concepts that are developed by Federal, State, and local government representatives and public stakeholders. All proposed projects have a designated Federal and local sponsor (Louisiana Coastal Protection and Restoration Authority [CPRA]). After initial planning meetings, the five Federal agencies, the State, and local parishes select the top 20 projects for consideration. The CWPPRA Technical Committee then votes to recommend 10 of those 20 projects as candidate projects for detailed evaluation of costs and benefits. At the end of the annual PPL planning cycle, the Task Force typically approves four of these candidate projects for detailed engineering and design.

Upon completion of engineering and design, projects are selected through a Technical Committee and Task Force voting process, and the number of projects recommended to be funded is based upon availability of construction funds. Projects compete annually for limited construction funds.

Organization chart for the Louisiana Coastal Wetlands Conservation and Restoration Task Force.

Louisiana Coastal Restoration Techniques

The techniques used in various projects depend on the problems being addressed and other site-specific factors, including project area landscape, substrate, wave climate, habitat type, and proximity to sediment and freshwater resources, major waterways, and open water.

Most projects employ one or more of the following restoration techniques:

Barrier Island Restoration

Barrier island restoration projects are designed to protect and restore the features unique to Louisiana's barrier island chains. This type of project may incorporate a variety of restoration techniques, such as the placement of dredged material to increase island height and width, the placement of structures to protect the island from erosive forces, and the placement of sand-trapping fences, used in conjunction with vegetative plantings to build and stabilize sand dunes.

Marsh Creation

Marsh creation uses dredged material to restore marsh or nourish existing marsh. The dredged material is placed in a deteriorated wetland at specific elevations so that desired marsh plants will colonize and grow to form new marsh. For projects that are long distances from available sediment sources, the dredging technique involves the use of booster pumps to transport sediment greater distances.

Freshwater and Sediment Diversions

Freshwater diversions use gates or siphons to regulate the flow of water. Freshwater is channeled from a nearby river or water body into surrounding wetlands. This infusion of water, sediment, and nutrients helps slow saltwater intrusion, slows the loss of marsh, and promotes the growth of new marsh. Sediment diversions promote the creation of new marsh in shallow open-water areas. A gap (called "crevasse") is cut into a river levee, allowing river water and sediment to flow into nearby wetlands to mimic natural wetland-building processes. The above picture exhibits a crevasse and receiving area of the Delta Wide Crevasses CWPPRA project taken during the 2009 annual inspection.

Shoreline Protection

Shoreline protection projects involve various techniques designed to decrease or halt shoreline erosion. Some techniques, such as rock berms or revetments, are applied directly to the eroding shoreline. Other techniques, such as segmented breakwaters and wave-damping fences, are placed in the adjacent open water in order to decrease a wave's energy before it hits the shoreline and to promote the buildup of sediment.

Hydrologic Restoration

Hydrologic restoration projects involve restoring natural drainage patterns in an attempt to address problems associated with artificially altered hydrology. On a larger scale, this technique may involve locks or gates on major navigation channels; on a smaller scale, it may involve blocking canals or cutting gaps in levee banks that were created by canal dredging. Other hydrologic restoration techniques maximize the benefits of freshwater diversions to ensure that water and sediment reach needed areas. These techniques can involve regulating water levels and direction of water flow to increase the dispersion and retention time of freshwater, nutrients, and sediment in the marsh.

Sediment and Nutrient Trapping

Sediment and nutrient trapping projects create new land and protect nearby marshes by means of structures that are designed to slow water flow and promote the buildup of sediment. For example, shallow bay terraces involve dredging sediment from a shallow bay and constructing low ridges in patterns that enclose open water areas to slow waterflow and help trap sediment to rebuild and protect marsh.

Vegetative Planting

Vegetative planting projects are used both alone and in conjunction with shoreline protection, barrier island restoration, marsh creation, and sediment and nutrient trapping restoration techniques. This technique involves the use of flood-tolerant native marsh plants that will hold sediments together and stabilize the soil with their roots as they become established in a new area.

On average, a CWPPRA project can go from concept to construction in 3 to 5 years. This ability is largely a result of the congressional authority that has been delegated to the Task Force to both authorize and fund restoration projects without having to seek additional authorization, which could delay projects for many more years. Moreover, the project selection process quickly culls projects that have the highest construction feasibility and public support, which ultimately streamlines project implementation. Additionally, the interagency model of CWPPRA provides for multiple agencies to have a divide and conquer approach, which distributes the project load and can lead to faster construction.

Given the limited funding for CWPPRA, the project selection process also generates more construction-ready projects than the program can afford to build. This is compounded by the fact that, although Congress in 2004 reauthorized CWPPRA through 2019, the program is expected to reach its capacity to authorize new projects within the next few years. This is due to the current commitment of future funding needed to construct existing authorized projects and to fund operations and maintenance of all constructed projects. The backlog of construction-ready projects developed through the CWPPRA program has provided opportunities to transfer some projects to other funding authorities for rapid implementation. The synergy thus created between authorities stretches restoration dollars, reduces redundancy, and implements projects faster since CWPPRA has already designed, prioritized, and publicly vetted all of its projects.

Notwithstanding the significant ecologic, economic, and political changes that have occurred in south Louisiana since Hurricanes Katrina and Rita (2005) and Gustav and Ike (2008), and more recently the BP Deepwater Horizon oil spill (2010), CWPPRA has continued to stay the course and effectively serve as the largest coastal wetlands restoration program in the State's history in terms of total projects constructed and environmental benefits accomplished. The present-day relevance of CWPPRA lies in its unique ability to construct near-term, small- to mid-scale projects that meet local immediate restoration needs and its ability to work seamlessly with other authorities to implement ecosystem-level restoration. Projects constructed through CWPPRA are either complementary to projects being planned through other authorities or addressing land loss in critical areas that have no other resources for restoration.

CWPPRA Project Planning and Implementation

In 1990, the U.S. Congress enacted CWPPRA in response to the growing awareness of Louisiana's land loss crisis. CWPPRA was the first Federal, statutorily mandated program with a stable source of funds dedicated exclusively to the short- and long-term restoration of the coastal wetlands of Louisiana. Between 1990 and 2012, 106 restoration projects have been constructed or are currently under construction. Additionally, there are 50 projects undergoing engineering and design (Phase 1). These projects include diversions of freshwater and sediments to improve marsh vegetation; dredged material placement for marsh creation; shoreline protection; sediment and nutrient trapping; hydrologic restoration through outfall, marsh, and delta management; and vegetative planting on barrier islands.

The Task Force authorizes projects to be implemented under CWPPRA by using a systematic approach that starts with an annual planning cycle to select new projects. All projects undergo detailed engineering and design before they get final approval to proceed to construction and long-term operations, maintenance, and monitoring.

The Task Force authorized 13 new projects between 2010 (PPL 19) and 2012 (PPL21) for Phase 1—Engineering and Design, which if constructed would result in an estimated net benefit of approximately 6,440 acres of wetlands. These 13 new projects included Lost Lake Marsh Creation and Hydrologic Restoration (TE-72), Freshwater Bayou Marsh Creation (ME-31), LaBranche East Marsh Creation (PO-75), Cheniere Ronquille Barrier Island Restoration (BA-76), Bayou Bonfuca Marsh Creation (PO-104), Cameron-Creole Watershed Grand Bayou Marsh Creation (CS-54), Coastwide Planting (LA-39), Kelso Bayou Marsh Creation and Hydrologic Restoration (CS-53), Terrebonne Bay Marsh Creation-Nourishment (TE-83), Oyster Bayou Marsh Restoration (CS-59), LaBranche Central Marsh Creation (PO-133), Northwest Turtle Bay Marsh Creation (BA-125), and Cole's Bayou Marsh Restoration (TV-63) (table 1).

In this 2010–12 period, the Task Force also authorized 10 projects for Phase 2—Construction that are expected to result in an estimated net benefit of approximately 2,858 acres of wetlands (table 2). These 10 proposed construction projects include four marsh creation projects, one barrier headland project, two

Table 1. CWPPRA Projects authorized from 2010 to 2012 (PPL 19–PPL 21) for Phase 1—Engineering and Design.

Project number	Project Priority List (PPL)	Project name	Date authorized	Total net acres (reestablished and protected)	Region
TE-72	19	Lost Lake Marsh Creation & Hydrologic Restoration	20-Jan-10	749	3
ME-31	19	Freshwater Bayou Marsh Creation	20-Jan-10	279	4
PO-75	19	LaBranche East Marsh Creation	20-Jan-10	715	1
BA-76	19	Cheniere Ronquille Barrier Island Restoration	20-Jan-10	308	2
PO-104	20	Bayou Bonfouca Marsh Creation	19-Jan-11	424	1
CS-54	20	Cameron-Creole Watershed Grand Bayou Marsh Creation	19-Jan-11	534	4
LA-39	20	Coastwide Vegetative Planting	19-Jan-11	779	Coastwide
CS-53	20	Kelso Bayou Marsh Creation	19-Jan-11	274	4
TE-83	20	Terrebonne Bay Marsh Creation-Nourishment	19-Jan-11	353	3
CS-59	21	Oyster Bayou Marsh Restoration	19-Jan-12	489	4
PO-133	21	LaBranche Central Marsh Creation	19-Jan-12	731	1
BA-125	21	Northwest Turtle Bay Marsh Creation	19-Jan-12	407	2
TV-63	21	Cole's Bayou Marsh Restoration	19-Jan-12	398	3
		Total = 13 Projects	Total Net Acres =	6,440	

shoreline protection projects, one freshwater diversion project, and two vegetative planting projects. The Louisiana coast is separated into four ecologic regions along with a coastwide category for the purpose of project planning. These ecoregions are Region 1 (Pontchartrain Basin), Region 2 (Breton Sound, Mississippi River, and Barataria Basins), Region 3 (Terrebonne, Atchafalaya and Teche/Vermilion Basins), and Region 4 (Mermentau and Calcasieu-Sabine Basins). Below is the list of the projects that were authorized to begin Phase 2—Construction during this reporting period (2010–12).

Region 2: Barataria Basin Landbridge (BA-27c[4]) Phase 3, Construction Unit 8; Bayou Dupont Ridge Creation and Marsh Restoration (BA-48); Grand Liard Marsh & Ridge Restoration (BA-68); and South Lake Lery Shoreline and Marsh Restoration (BS-16), which will have a combined net benefit of approximately 1,072 acres of wetlands.

Region 3: West Belle Pass Barrier Headland Restoration (TE-52), North Lake Boudreaux Basin Freshwater Introduction (TE-32a), and Gulf Intracoastal Waterway Bank Restoration of Critical Areas (TE-43), which will have a net benefit of approximately 636 acres of wetlands.

Region 4: Cameron-Creole Freshwater Introduction, Construction Unit 1 (CS-49[CU1]) and Sabine Refuge Marsh Creation Cycles 4 and 5 (CS-28), which will have a combined net benefit of approximately 371 acres of wetlands.

Coastwide: Coastwide Planting Project (LA-39) will have a net benefit of approximately 779 acres of wetlands.

In general, projects are authorized and constructed individually, but they often work synergistically with one another. For example, the barrier island projects are collectively rebuilding Louisiana's first line of defense that can extend ecosystem benefits beyond just the sum of their individual projects. This type of synergy is also seen within the Barataria Basin, where constructed projects are working together to restore the structural integrity of a critical landform that is undergoing high land loss rates. These projects are demonstrating how small- to mid-scale projects are working collectively to generate large-scale results.

Most of the CWPPRA projects are located within one of the four specific regions. During the 2010-12 period, the Task Force authorized four projects in Region 2, three in Region 3, two in Region 4, and a comprehensive coastwide vegetative planting project. A map that illustrates these coastal regions with PPL 1-20 is located in the Web site http://www.lacoast.gov/maps/allregions_ppl1-20(web).pdf.

The following two (BA-27c and BA-48) projects represent examples of shoreline protection and marsh restoration through CWPPRA. Tables 1 and 2 exhibit all 23 projects (13 in Phase 1 and 10 in Phase 2) authorized during this 2010–12 reporting period.

Barataria Basin Landbridge Shoreline Protection Project Phase 3 (BA-27c[4]) Construction Unit 8

- http://lacoast.gov/reports/gpfs/BA-27c.pdf
- Approved Date: 2000
- Project Area: 589 acres
- Approved Funds: $16.6 million
- Total Est. Costs: $20.5 million
- Net Benefit after 20 Years: 107 acres
- Status: Completed
- Project Type: Shoreline Protection
- PPL#: 9
- Sponsoring Agency: NRCS
- Restoration Strategy**:** The project's objective is to reduce or eliminate shoreline erosion along 14,811feet of shoreline along the west bank of Bayou Perot and north shore of Little Lake. To reach this goal, a rock revetment was constructed, incorporating four openings to allow the exchange of water, nutrients, and organisms. With the available funding, the project will be maintained for the full 20-year project life, with the effects lasting beyond.

Bayou Dupont Ridge Creation and Marsh Restoration (BA-48)

- http://lacoast.gov/reports/gpfs/BA-48.pdf
- Approved Date: 2007
- Project Area: 309 acres
- Approved Funds: $37.9 million
- Total Est. Costs: $38.5 million
- Net Benefit after 20 Years: 186 acres
- Status: Engineering and Design
- Project Type: Marsh Creation
- PPL#: 17
- Sponsoring Agency: NMFS
- Restoration Strategy: Project goals include (1) creating and nourishing approximately 300 acres of marsh through pipeline sediment delivery from the Mississippi River and (2) creating a ridge along a portion of the southwestern shoreline of Bayou Dupont. Sediment from the river will be hydraulically pumped to the project site to construct both the marsh and ridge features. The ridge is being designed to mimic the configuration of other natural ridges within the watershed. The ridge will include a constructed elevation conducive for the growth of native vegetation such as live oak, hackberry, and Yaupon. The ridge will help redefine the limits of Bayou Dupont and reestablish the natural bank that once flanked the bayou and protected adjacent marshes.

Table 2. CWPPRA projects authorized from 2010 to 2012 (PPL 19–PPL 21) for Phase 2—Construction.

Project number	Project Priority List (PPL)	Project name	Date authorized	Total net acres (reestablished and protected)	Region
CS-49	18	Cameron-Creole Fresh Water Introduction—Construction Unit 1	20-Jan-10	40	4
BA-27c(4)	9	Barataria Basin Landbridge, Phase 3—Construction Unit 8	20-Jan-10	107	2
TE-52	16	West Belle Pass Barrier Headland Restoration	20-Jan-10	305	3
TE-43	10	GIWW Bank Restoration of Critical Areas in Terrebonne	20-Jan-10	65	3
BA-48	17	Bayou Dupont Marsh & Ridge Creation	19-Jan-11	186	2
CS-28	8	Sabine Refuge Marsh Creation, Cycles 4 and 5	19-Jan-11	331	4
TE-32a	6	North Lake Boudreaux Basin Freshwater Introduction & Hydrologic Management	19-Jan-11	266	3
BS-16	17	South Lake Lery Shoreline and Marsh Restoration	19-Jan-12	409	2
BA-68	18	Grand Liard Marsh & Ridge Restoration	19-Jan-12	370	2
LA-39	20	Coastwide Vegetative Plantings	19-Jan-12	779	Coastwide
		Total = 10 Projects	Total Net Acres =	2,858	

Coastwide Reference Monitoring System (CRMS)

Need for a Comprehensive Monitoring System

To evaluate project-specific effectiveness and inform future project designs, most CWPPRA projects are regularly monitored. At the coastwide level, resource managers must also assess cumulative project effects as they work towards achieving a sustainable coast. In 2003, CPRA and the U.S. Geological Survey (USGS) received approval from the CWPPRA Task Force to implement the Coastwide Reference Monitoring System (CRMS) as a mechanism to monitor and evaluate the effectiveness of CWPPRA restoration and protection efforts at the project, region, and coastwide scales. The CRMS network is currently funded through CWPPRA and provides data for a variety of user groups, including resource managers, academics, landowners, and decisionmakers.

Approach and Design of the CRMS

Prior to CRMS, CWPPRA projects and unmanaged reference areas were monitored in a paired design to assess project effects. Although this approach worked well initially, finding appropriate paired reference sites became increasingly difficult, and significant challenges began to surface when scaling up to assess the entire coastal zone. Additionally, the introduction of large scale restoration efforts reemphasized the need for a coastwide monitoring approach.

The CRMS approach gathers information from a suite of sites that encompass a range of ecological conditions across the coast. Resource managers can compare the trajectories of changing conditions within both CRMS reference sites and CWPPRA project sites to better understand the performance of their projects. The CRMS design not only allows for monitoring and evaluating project-specific effectiveness but also supports large-scale evaluation of the cumulative effects of all CWPPRA projects throughout the coastal ecosystems of Louisiana.

The CRMS network covers the entire Louisiana coast and comprises 391 sites. Peer reviewed standard operating procedures for data collection and data quality assurance guarantee consistency of CRMS data across habitat types. The CRMS network monitors swamp, fresh, intermediate, brackish, and saline marsh habitats. Monitoring parameters include salinity, water level, emergent and forested vegetation, surface elevation and vertical accretion, soil characteristics, and land-to-water ratios. Data collection intervals range from hourly for hydrologic data to every 5 years for landscape assessments of land-to-water ratios. Site construction and data collection began in 2005, with the entire network operational by 2008. The active CRMS sites generate large amounts of data which, in turn, are used by the CRMS program to develop assessment tools and products for project evaluation, model improvement, scientific research, and adaptive management.

The CRMS Web Site

To efficiently deliver the large number and diverse sets of data-driven products developed by the CRMS program, a Web site (http://lacoast.gov/crms) was designed as the "one-stop shop" for CRMS informational products, assessment tools, and data. Through a data-sharing partnership with the Louisiana CPRA, all raw ecological data are available for download from the official CPRA online database (http://coastal.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=92) and may be categorized by project name, CRMS site, or station number.

Louisiana coastal habitats monitored through CRMS are expansive and dynamic, thus warranting a public interface which exposes the data and information products in a spatial context. The CRMS web mapping interface allows for visualizations from site to landscape scales and a suite of information products developed for multi-scale analyses and assessments. The user-friendly interface allows for viewing information on specific sampling sites, including photos and data summaries, along with a mechanism for data

downloads of derived analytical datasets, single- or multi-site graphics, and report carding (fig. 1).

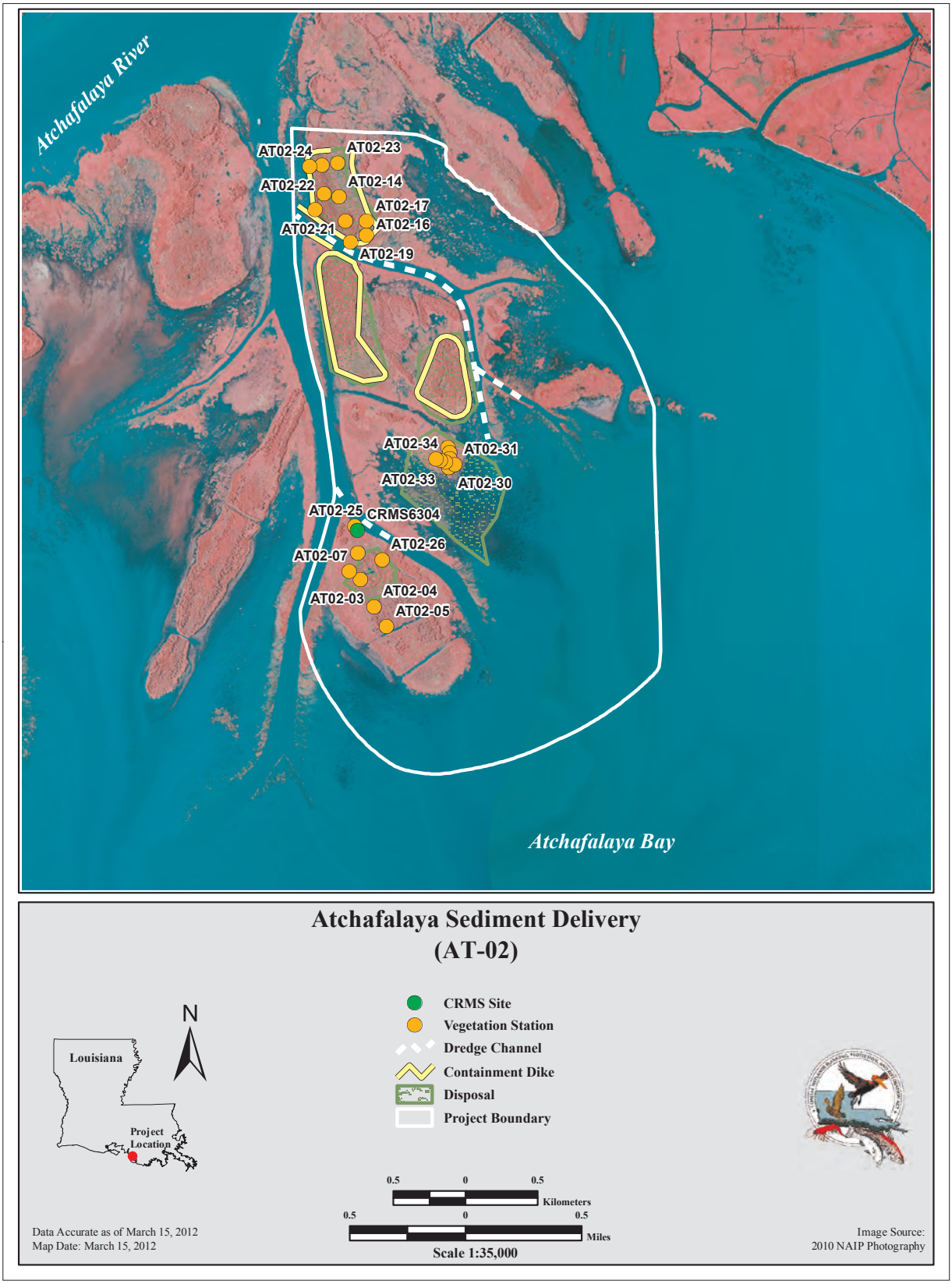
The CRMS report card uses data-derived ecological indices to assess trajectories of change for CRMS sites relative to other sites within the same marsh type, hydrologic basin, and CWPPRA project. Four primary indices are used in the report cards: hydrologic, floristic quality, submergence vulnerability, and landscape. Several of the project summaries which appear in the next section of this report use a hydrologic index (HI) for project evaluation. The HI was developed by using 4 years of baseline CRMS data and evaluates how salinity and percentage of time flooded may influence vegetation productivity. The HI and other CRMS report card features allow CWPPRA project managers to evaluate and visualize how specific projects are faring through time.

Given the substantial monetary investments in restoration and protection by the CWPPRA program, CRMS provides a robust monitoring system that enables multiple temporal and spatial scale evaluations for a variety of user groups.

To ascertain the science behind the CRMS monitoring data, and the overall effectiveness of CWPPRA restoration program, the following six CWPPRA projects have been chosen to be further evaluated:

- AT-02 Atchafalaya Sediment Delivery (PPL2)
- TE-24 Isles Dernieres Restoration Trinity Island (PPL 2)
- TV-04 Cote Blanche Hydrologic Restoration (PPL 3)
- MR-09 Delta Wide Crevasses (PPL 6)
- CS-28 Sabine Refuge Marsh Creation Cycles 1, 2, and 3 (PPL 8)
- BA-37 Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake (PPL 11)

Figure 1. CRMS Web site visualizations of the Cote Blanche Hydrologic Restoration (TV-04) project area, project information summary, and project report card.



The Atchafalaya Sediment Delivery (AT-02) project area in relation to the eastern lobe of the Atchafalaya Delta.

Project Description and Goals

The Atchafalaya River serves as one of the major outlets for the Mississippi River flood plain. Unlike the mouth of the Mississippi River (the "birdsfoot delta"), which lies at the edge of the continental shelf, the mouth of the Atchafalaya lies well within the outlines of the continental shelf. Sediment deposited at the mouth of the Atchafalaya River, thus, has significant delta-building potential. The creation of the Atchafalaya Delta in 1952 was followed by two decades of rapid growth. In the late 1970s, growth of the delta slowed, and shoaling began in channels that formerly fed sediment to the delta's edges. The objective of the Atchafalaya Sediment Delivery project is to enhance growth of the eastern delta by restoring through dredging two arteries for sediment delivery (Natal Channel and Castille Pass; fig. 2). Since its construction in 1997, this project has had three specific goals: (1) create approximately 230 acres of delta by using dredged material; (2) increase, or at least maintain, the historical growth rate of the delta as it was measured in 1956; and (3) increase the distributary potential of Natal Channel and Castille Pass.

Project Assessment

Analysis of high-resolution photography shows that restoration of Natal Channel and Castille Pass successfully created 249 acres of emergent marshland and mudflats, exceeding the project goal of 230 acres. In addition to delta created through the use of dredged material, the Atchafalaya Sediment Delivery project area experienced natural delta growth through both conversion of shallow submerged flat to emergent marshland and addition to existing pre-project delta. Submerged delta was also created through conversion of open water to shallow submerged flat.

Since project completion, 16 acres/year have converted from shallow submerged flat to emergent marshland and mudflats (brown areas in fig. 2). The area just north of Natal Channel is particularly impressive, as here a large region that was formerly mudflats and submerged aquatic vegetation has converted to freshwater marsh. The existing pre-project delta has grown at a rate of 4 acres/year (green areas in fig. 2), most of which has occurred on the eastern bank of the East Pass Channel. Vegetative species colonizing this newly developed land (particularly arrowhead and coco yam) are indicative of delta marsh. The total delta growth rate of 20 acres/year far exceeds the historical rate of 9 acres/year, thereby realizing project goal 2. In addition, the flood event of 2011, the largest since 1973 (the only previous time the Morganza Spillway was opened), is expected to have resulted in substantial additional growth.

As seen in figure 2, the distributary potential of Natal Channel and Castille Pass has been increased, thereby fulfilling goal 3. Lastly, 12 acres/year have converted from open water to shallow submerged flat (blue areas in fig. 2). The most noteworthy area is the mid-channel bar forming on the eastern edge of the delta at the East Fork of Natal Channel. This bar suggests that flow has been restored to this area and natural delta building processes are contributing to growth on the eastern delta edge.

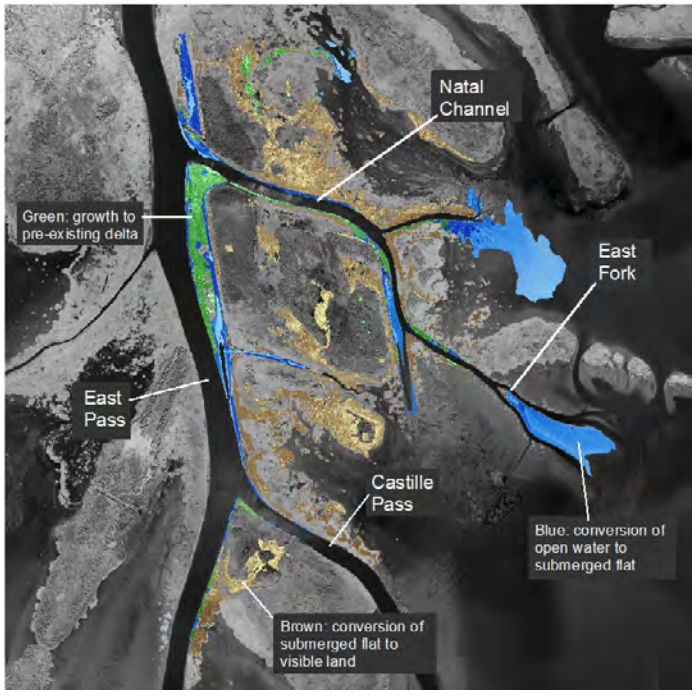
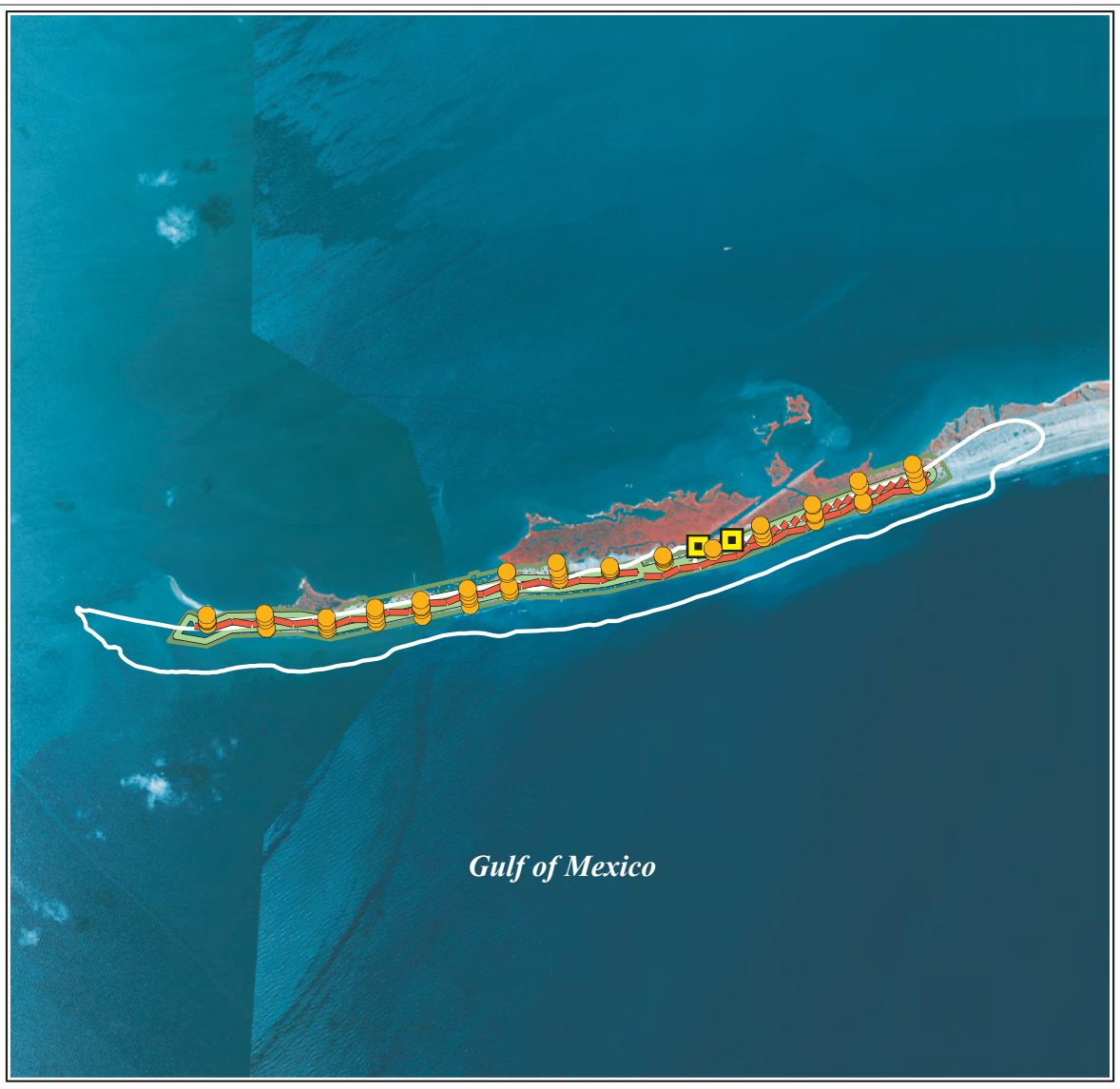


Figure 2. Areas where post-construction delta growth has occurred (identified from photography obtained in 2008). Green represents growth to existing pre-construction delta. Brown represents conversion of shallow submerged flat to emergent marshland. Blue represents conversion of open water to shallow submerged flat.



Isle Dernieres Restoration Trinity Island
(TE-24)

Vegetation Station
Bulkhead
Sediment Fences
Plantings
Disposal/Fill
Project Boundary

0.5 0 0.5
Kilometers
0.5 0 0.5
Miles
Scale 1:50,000

Data Accurate as of March 15, 2012
Map Date: March 15, 2012

Image Source:
2010 NAIP Photography

The Isles Derniers Restoration Trinity Island (TE-24) project area boundary and features.

Project Description and Goals

Rapid land loss in the Isles Dernieres barrier island chain is a consequence of a complex interaction among global sea-level rise, subsidence, wave and storm processes, inadequate sediment supply, and significant anthropogenic disturbances. Currently, the Isles Dernieres island chain is exhibiting some of the highest rates of erosion of any coastal region in the world. The specific goals of the Isles Dernieres Restoration Trinity Island (TE-24) project are (1) to increase the height and width of Trinity Island and close breaches by using dredged sediments and (2) to reduce loss of sediment through vegetative plantings, thus increasing the island's stability.

Project Assessment

Results indicate that the TE-24 project has been successful in increasing elevation and volume of sediment in the project area and maintaining sediment through vegetative plantings and sand fencing, despite setbacks induced by storm- and major hurricane-related damage since construction.

Completion of the TE-24 restoration project in 1999 increased island acreage by 45 acres. The 2002 habitat analysis from the Barrier Island Comprehensive Monitoring Program (BICM), funded by CPRA, showed that Trinity Island consisted of 663 acres. Hurricanes Katrina and Rita reduced the 2004 pre-storm acreage from 651 acres to 581 acres. Consequently, the 2005 acreage is 6 percent below the pre-project land area reported in 1996.

Interpretation of elevation data gathered post-construction shows that the TE-24 project fill area has retained more sediment than other projects constructed in the Isles Dernieres barrier island chain. Initial post-construction data collection efforts indicated that the average elevation of the project area increased by 6 feet. Eight years post-construction, the mean elevation remains 3 feet higher than average pre-construction elevations. Furthermore, no breaches have formed as of 2011 in the project area, and the only noticeable land loss has been because of erosion of approximately 1,500 feet at the western end of the island.

Shoreline change analysis was performed along Trinity Island as well as the entire Louisiana coastal shoreline through the BICM program. Post-construction shoreline change rates show that Trinity Island has eroded in the short term (1996–2005) an average of 41 feet/year. This is a slight increase from the historical erosion rate (from the 1890s to 2005) of 37 feet/year but is a much lower increase in the short-term erosion rate compared to other areas of the coast. The Isle Dernieres is experiencing lower and stable erosion in the short-term period since 1996, as shown in figure 3, which could likely be a direct result of sediment additions from barrier island projects such as the TE-24 project.

BICM habitat mapping data indicate that the restoration efforts have increased the size of the island and created vegetated habitats consistent with project goals. Initial post-project analysis (2002) showed that there was a 97 percent increase in bare land habitat following construction. By 2004, however, there was an 89 acre reduction in the bare land classification, whereas the barrier vegetation class increased by 118 acres. Hurricanes Katrina and Rita caused major disturbance, and areas that were classified as bare land and barrier vegetation in 2004 have been mostly converted to beach and bare land habitats.

It has been predicted that the Isles Dernieres of 1988 would disappear by 2017; however, the CWPPRA barrier island projects have increased the life span of this barrier island chain by approximately 16 years, with the island persisting until the year 2033 if current trends continue (fig. 3).

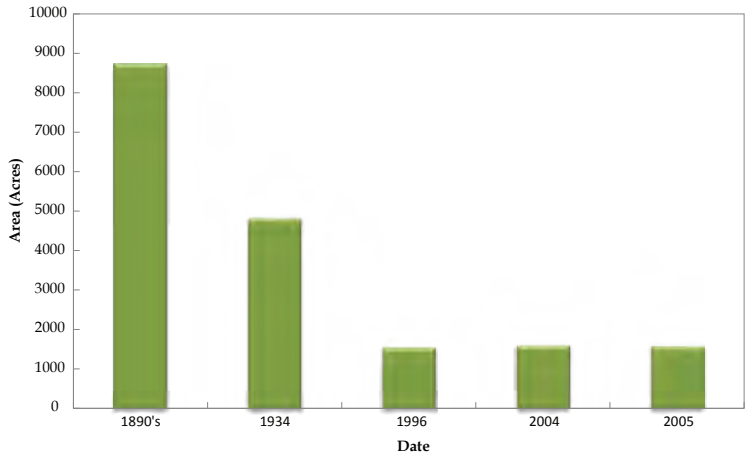
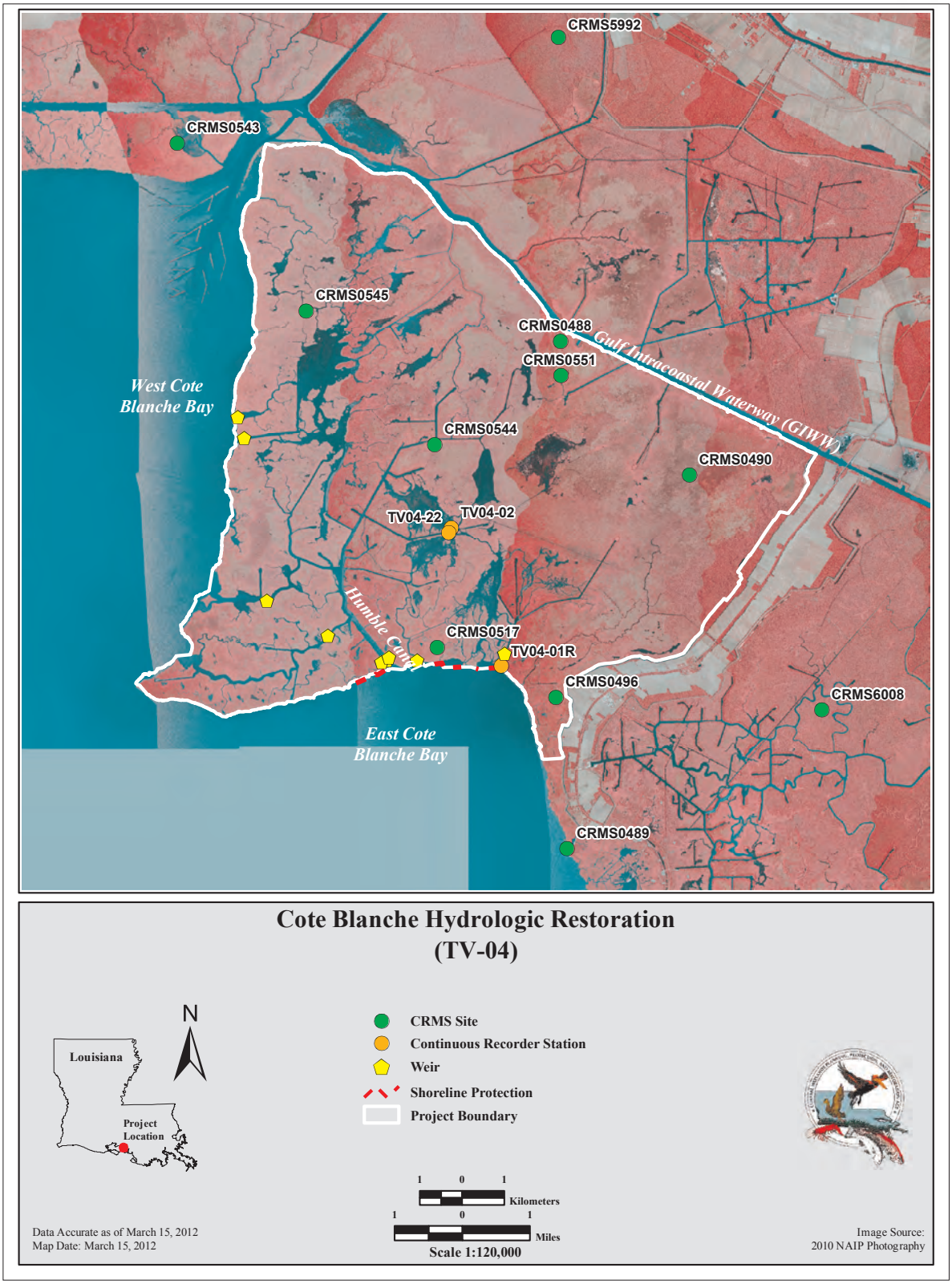


Figure 3. Barrier Island Comprehensive Monitoring Program (BICM) land area change analysis for the Isles Dernieres indicating reduced land change post CWPPRA project implementation.



Cote Blanche Hydrologic Restoration (TV-04) project area boundary and features.

Project Description and Goals

The installation and unrestricted enlargement of numerous oilfield access canals since the mid-1930s has increased water exchange between the Cote Blanche Bays of the Teche/Vermilion (TV) Basin and vulnerable, organic interior marsh. Marsh degradation has been evident in aerial photography since 1952 as the increased water exchange easily eroded fragile soils in the interior marshes. In order to fulfill the main goal of reducing marsh loss by reducing water exchange, the Cote Blanche Hydrologic Restoration (TV-04) project installed seven boat-bay weirs across openings of three oil-field access canals and four enlarged bayous in 1999 to reduce and maintain channel cross-sections while maintaining access to oilfield infrastructure (fig. 4). In addition, to reduce shoreline erosion at select reaches of the TV-04 shoreline along East Cote Blanche Bay, foreshore structures were installed (PVC sheet pile wall in 1999 and rock dike in 2007).

Project Assessment

The TV-04 project has been successful. The low-level weirs across the large pipeline canal openings have reduced water exchange, and the land-loss rate has decreased as the marsh interior has been allowed to recuperate following storm surge disturbances. Following installation of the weirs in 1999, water-level ranges relative to East Cote Blanche Bay (TV04-01R) were reduced by 12.5 percent in the project area (TV-02/22) from 1999 to 2004, which included impacts from Hurricane Lili in 2002. After a breach in the project area shoreline was repaired and two additional weirs were installed in 2007, water-level ranges were reduced by 20 percent in the project area (CRMS station CRMS0544) from 2007 to 2010, which included impacts from Hurricane Gustav in 2008. The CRMS hydrologic index (HI) shows that the TV-04 project area, as monitored by CRMS sites, provides good hydrologic conditions for plant production potential based on flood duration and salinity thresholds and has maintained higher HI scores than non-CWPPRA project (reference) sites among fresh and intermediate marsh sites in the TV Basin. Coastwide, the TV-04 sites ranks within the top 50 percent of all CRMS sites (fig. 5).

The project's shoreline protection measures have significantly reduced erosion relative to unprotected shorelines along East Cote Blanche Bay. The reach that was protected by the PVC wall, constructed in 1999, actually gained shoreline until a string of hurricanes began in 2002. The rock dike greatly reduced shoreline loss after construction in 2007, as compared to previous time intervals when the shoreline had been unprotected (fig. 6).

The TV-04 project area's historical (1957–1990) land-loss rate based on aerial photography was 0.24 percent per year (Britsch and Kemp, 1990), which is similar to the TV Basin's historical land-loss rate (adapted from Couvillion and others, 2011). After project construction, land loss decreased in the project area and, conversely, increased in the TV Basin. Much of the marsh loss in the TV Basin has been attributed to exacerbation of hurricane impacts (Barras, 2009), which the project features in the TV-04 project area, in contrast, have buffered.

Figure 4. Low-level weir with boat bay (80 feet wide and 8 feet deep) at opening of Humble Canal (400 feet wide and 20 feet deep) reduces water exchange between East Cote Blanche Bay (West Cote Blanche Bay is in the background) and marshes between the Cote Blanche Bays. Note the wide and straight access canal.

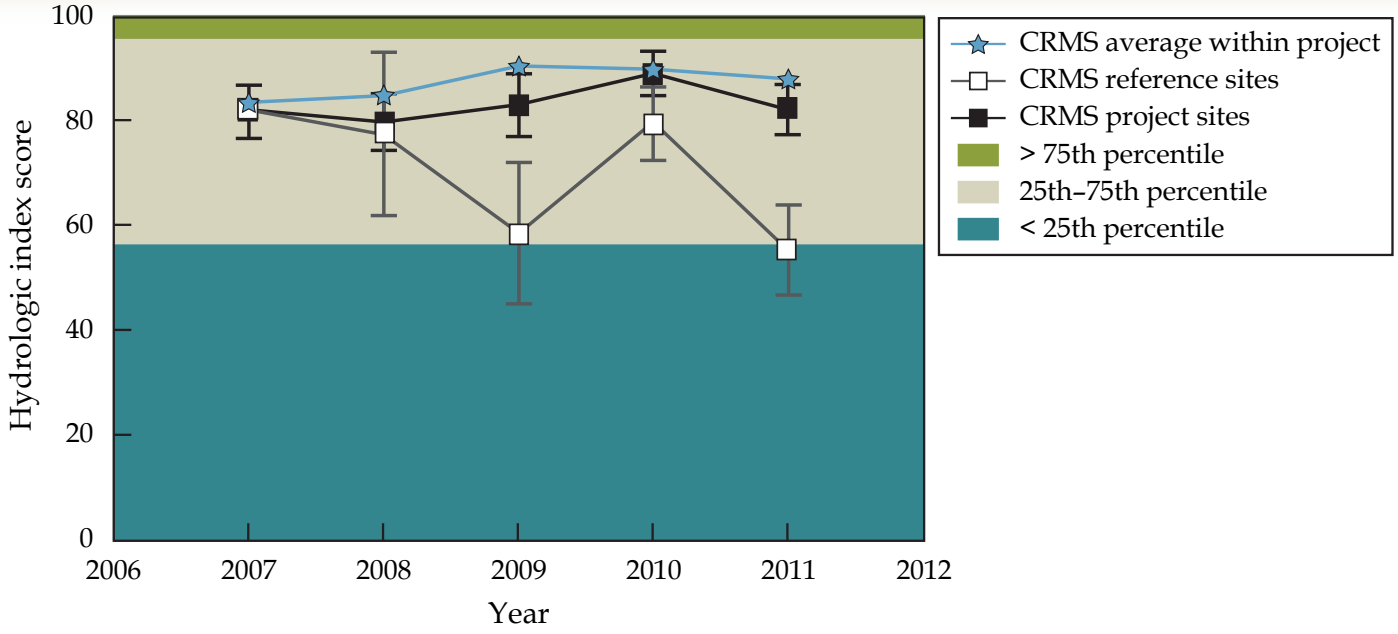


Figure 5. Hydrologic Index scores of Coastwide Reference Monitoring System (CRMS) sites (mean ± 1 standard error [SE]) within TV-04 (blue star, n=7) are shown over time relative to all other CRMS sites (within Coastal Wetlands Planning, Protection and Restoration Act [CWPPRA] projects and references for CWPPRA projects) in fresh and intermediate vegetation types within the Teche/Vermilion Basin. The green, tan, and blue background represents the distribution of all coastwide CRMS sites from 2006 to 2010.

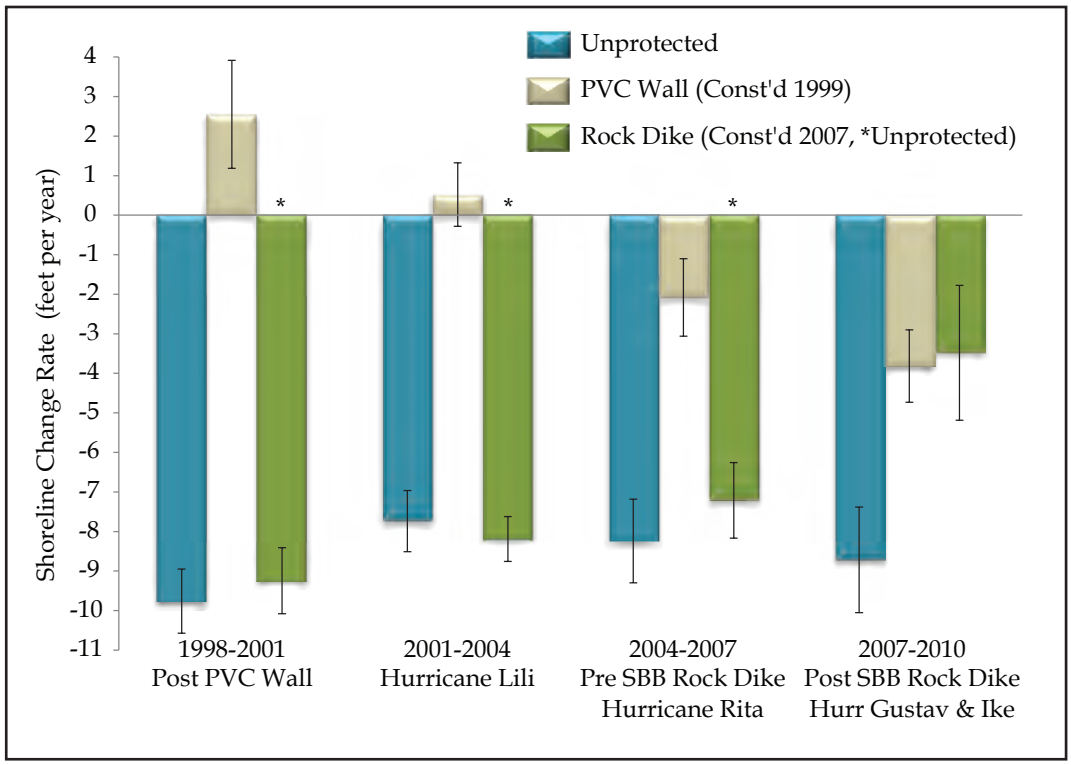
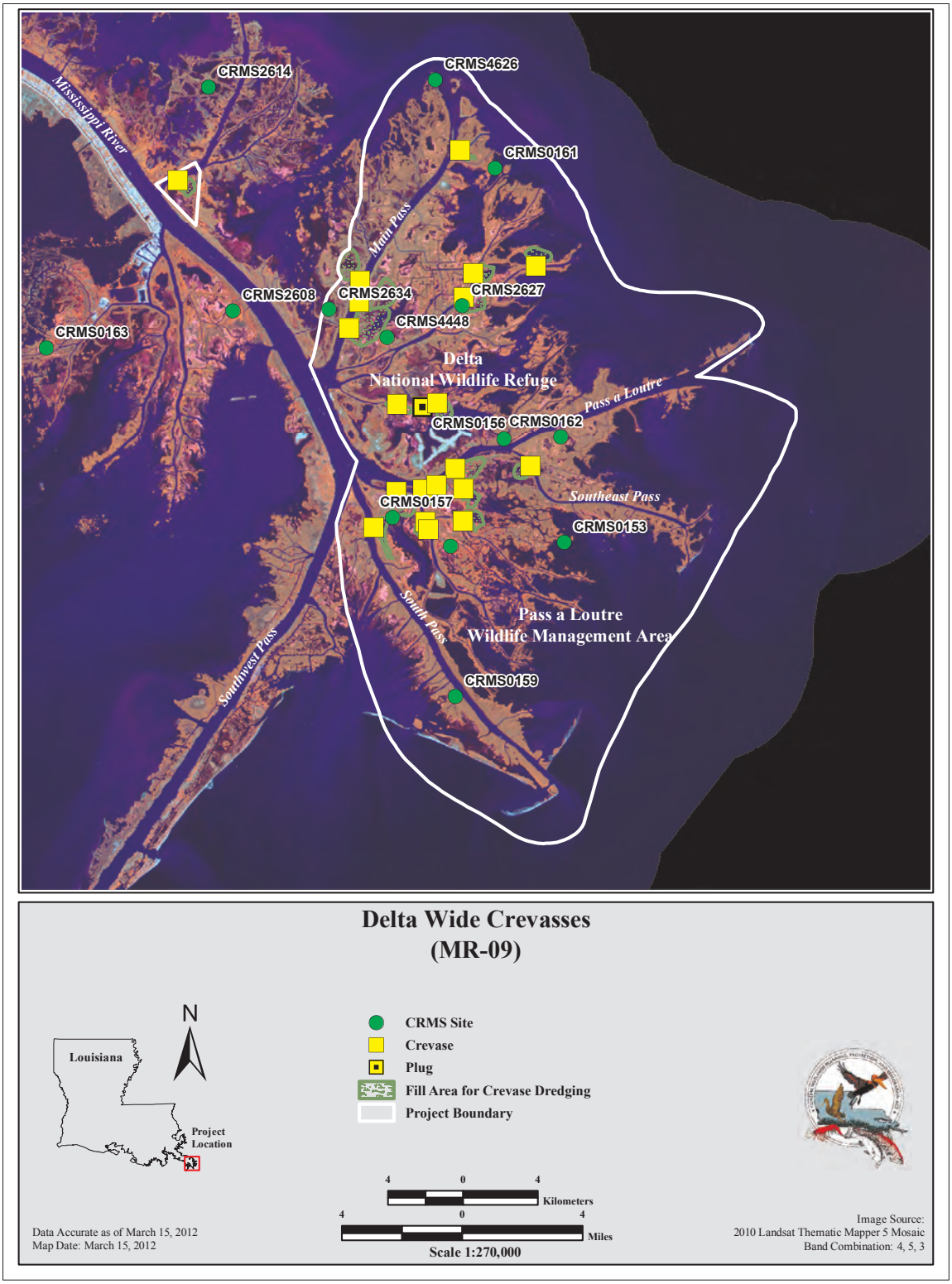


Figure 6. Shoreline change rates for 3-year intervals from protected and unprotected shoreline reaches along East Cote Blanche Bay (negative values are loss; positive values are gain). The PVC wall was constructed in 1999, and the rock dike was constructed in 2007.



Delta Wide Crevasses (MR-09) location and project features.

Project Description and Goals

Rapid wetland deterioration that has occurred in the Mississippi River Delta Basin is likely due to a combination of anthropogenic factors such as levee and canal construction and natural processes such as subsidence. Sediment carried in water that passes through newly created crevasses quickly settles out of the water column and accumulates in receiving areas, eventually forming new land, which serves as a foundation for colonization by marsh vegetation. The MR-09 project is a series of small, uncontrolled crevasses (sediment diversions) located in the southeastern portion of the Mississippi River Delta on Delta National Wildlife Refuge and Pass a Loutre Wildlife Management Area. The project, completed in phases (Phase 1 in 1999 and Phase 2 in 2005), involved the creation of new crevasses (fig. 7), maintenance of existing crevasses, and the plugging of an existing crevasse to enhance flow downstream. The following goals were established to evaluate project effectiveness: (1) increase or maintain the land to open-water ratios, (2) increase the mean elevation, and (3) increase the mean percent cover of emergent fresh and intermediate marsh type vegetation.

Project Assessment

The MR-09 project has been successful in increasing land to open-water ratios and sediment elevation in the project area. Land-water analysis conducted on post-construction aerial photography indicates a land gain of 59.4 percent (499 acres) across all crevasse receiving areas within the MR-09 project from construction to 2007, with an average gain of 23 acres per crevasse. In fact, 21 of 22 crevasses in the MR-09 project area have shown an increase in land to water ratios. Land-water analysis at CRMS2627, a monitoring station that is directly influenced by an MR-09 crevasse, showed a gain of 6 percent (15 acres) between 2005 and 2008.

Analysis of elevation survey data in 12 of the MR-09 crevasse receiving areas shows a positive trend in elevation for 11 of the 12 crevasses since construction. Much of the elevation gain occurred in the years immediately following crevasse construction. There has been a mean elevation gain of 0.91 foot in the crevasse receiving areas from construction to 2008.

Project specific vegetation surveys show that the percent cover of species such as bulltongue, broadleaf arrowhead, elephant ear, and Olney's bullrush, which dominated the 1999 and 2002 surveys, decreased in the 2007 survey (fig. 8). Meanwhile, percent cover of other typical Louisiana deltaic marsh species such as common reed, hairypod cowpea, and cattail has increased from 1999 to 2007. Mean percent cover at Crevasse 20, a crevasse that was newly created in 1999, went from 0 percent in 1999 to 82 percent in 2007. The Crevasse 20 vegetation surveys were dominated by species such as bulltongue, broadleaf arrowhead, and cattail, which are early colonizing species expected on newly formed land.

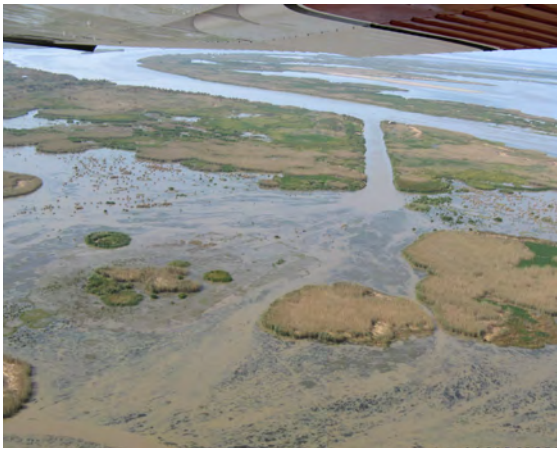


Figure 7. View of one of the MR-09 crevasses (center) during the November 2009 annual inspection. The crevasse was constructed off of Pass a Loutre at a width of over 150 feet and allows sediment to travel through and settle out into the receiving area.

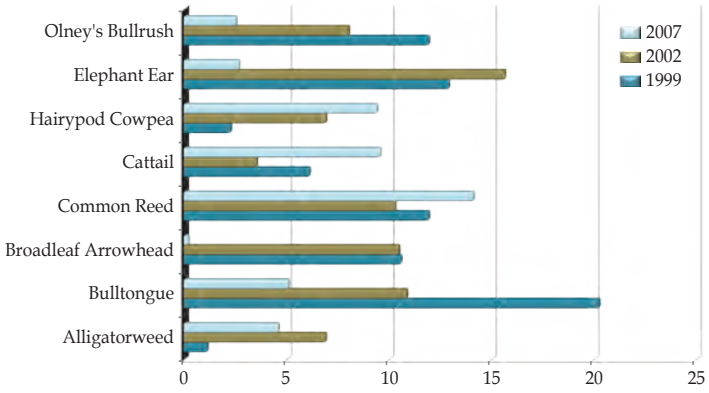
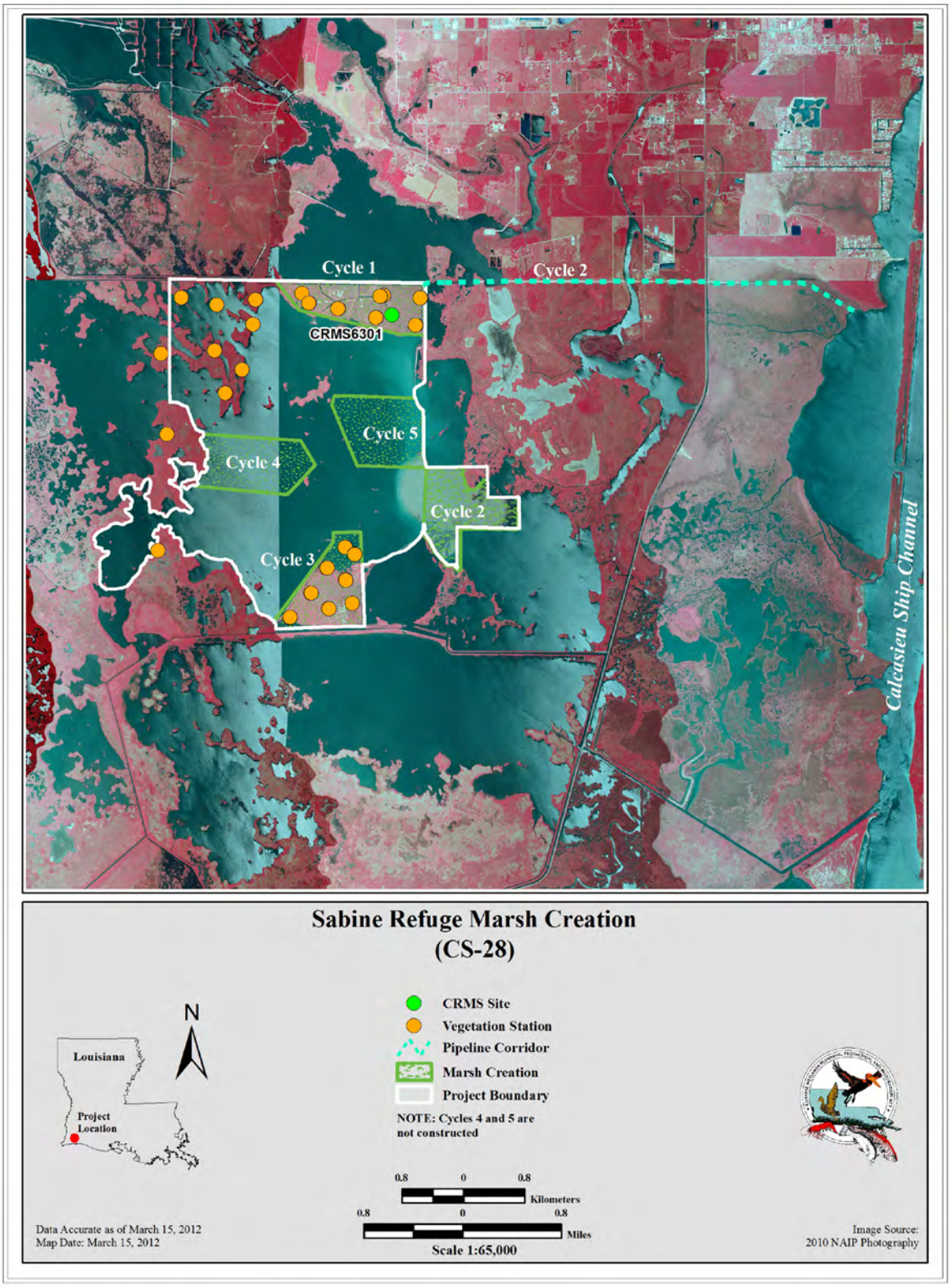


Figure 8. Mean percent cover of selected species across all 4-square-meter plots within the Delta Wide Crevasses (MR-09) project area during August 1999 (n=46 plots), August 2002 (n=49 plots), and August 2007 (n=50 plots). Vegetation was sampled by using the Braun-Blanquet method.



Sabine Refuge Marsh Creation (CS-28) Project area showing areas of dredged material placement for Cycles 1-5. In this 2010 imagery, Cycles 1, 2, and 3 were constructed.

Project Description and Goals

The Sabine Refuge Marsh Creation (CS-28) project area suffered extensive land loss caused by hurricanes and canal building in the 1950s, 1960s, and 1970s and by saltwater intrusion through the Calcasieu Ship Channel and the Gulf Intracoastal Waterway. Dredged material from the Calcasieu Ship Channel has been placed into three of five planned marsh creation cycles in the Brown Lake area in the northeast corner of Sabine National Wildlife Refuge. A permanent pipeline for transferring dredged material to the area has been constructed to take advantage of the Army Corps of Engineers Maintenance Dredging for the Calcasieu Ship Channel. The project cycles are designed to create marsh, prevent saltwater intrusion, reduce wave energy, and nourish the existing marsh in the project area.

Project Assessment

The three dredged cycles constructed to date have created at least 550 acres of emergent marsh and mudflat (table 3). Most of the Cycle 1 area quickly converted from bare mudflat to vegetated emergent marsh within the first few years and then slowly continued to convert from water to land where elevations allowed (fig. 9). The project is achieving its goals of creating land in each cycle.

Emergent vegetation coverage in all cycles has increased over time (fig. 10). Hurricane Rita impacted vegetation in Cycle 1 in 2005, but the area recovered quickly. Hurricane Rita came during a drought when water levels were very low, and the salty storm surge was absorbed by the soil. The impact of Hurricane Ike in 2008 was negligible, most likely because of higher water levels prior to the storm. Hurricane Ike came in on the tails of the flooding rains from Hurricane Gustav, so the surface was already flooded, and the storm surge was not absorbed.

Each of the cycles has a small delta formation element where the containment dikes are gapped to allow dredged material to flow out, create additional mudflat, and nourish existing marsh. By 2009, an additional 47 acres of land had been created outside the dredged material Cycles 1 and 3, some of it directly adjacent to Cycle 1 and some of it in the previously existing marsh. A permanent pipeline is in place, and Cycles 4 and 5 will be constructed via this pipeline. Cycles 4 and 5 are planned to be 230 acres each, have a potential for additional land gain from levee gapping, and should extend the collective benefit of the project to the existing marsh. A total of 331 acres is predicted to remain after 20 years.

Figure 9. Northeast corner of Cycle 1 of the Sabine Refuge Marsh Creation (CS-28) project, October 2008. Densely vegetated area is the dredge cell, and clumps of vegetation are on the delta formation area. The area recovered quickly from Hurricane Rita and continued to fill in areas that did not become immediately vegetated after project construction in 2001. By 2009, the area was 86 percent vegetated.

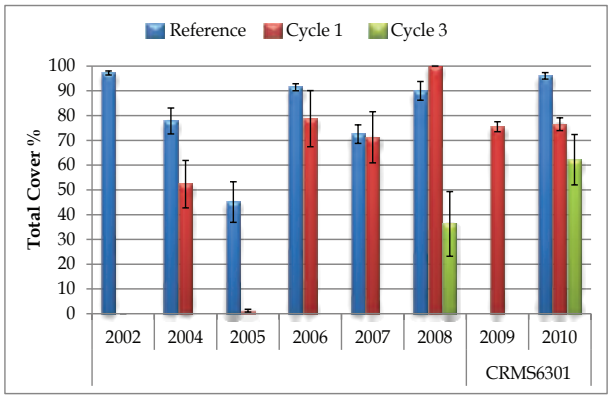


Figure 10. Vegetative cover in Cycles 1 and 3 of Sabine Refuge Marsh Creation (CS-28) project over time. Note the impact of and recovery from Hurricane Rita in 2005. Coastwide Reference Monitoring System (CRMS) site replaced project specific monitoring in Cycle 1 in 2009.

Table 3. Dredge cycle construction dates and acreages from U.S. Geological Survey aerial photography analyses conducted in 2002 and 2009.

Dredge cycle	Year constructed	Acres 2002	Acres 2009	Total acres cycle
Cycle 1	2001	139 (mudflat)	171 (marsh)	200
Cycle 2	2010		approx. 150 + 100 outside cell (mudflat)[1]	230
Cycle 3	2007		133 (mudflat)	230

[1]State only. No monitoring.

Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake (BA-37)

CRMS Site
Shoreline Protection
Marsh Creation
Project Boundary

0.45 0 0.45
Kilometers
0.5 0 0.5
Miles

Scale 1:40,000

Data Accurate as of March 15, 2012
Map Date: March 15, 2012

Image Source:
2010 NAIP Photography

The Little Lake Shoreline Protection/Dedicated Dredging near Round Lake (BA-37) project area boundary and features.

Project Description and Goals

There was very little marsh degradation in the Bayou L'Ours Basin until the advent of canal dredging for pipeline construction and oil field access in the 1940s. During the 1950s and 1960s, several deep access canals were allowed to breach the Bayou L'Ours ridge, creating large gaps in the ridge, which significantly altered the hydrology in the semi-enclosed basin. These canals decreased the marsh surface elevations of the highly organic marsh mats and introduced saltwater into a fresh and intermediate marsh environment. Land loss data indicate that the Bayou L'Ours Basin decreased by 6,085 acres during the period from 1945 to 1989. The Little Lake Shoreline Protection/Dedicated Dredging near Round Lake (BA-37) project was built to enhance a 1,374-acre portion of the Bayou L'Ours Basin. The goals of this project are to enhance 336 acres, to protect and restore 713 acres of intermediate or brackish marshes, and to reduce the rate of marsh edge erosion along the Little and Round Lake shorelines over the 20-year project life. To attain these goals, a marsh creation and nourishment area and a foreshore rock dike were constructed.

Project Assessment

The BA-37 project is currently achieving its goals. The constructions of a 920-acre marsh creation and nourishment area and a 25,976-foot foreshore rock dike have enhanced and protected wetlands in the Bayou L'Ours basin (fig. 11).

Five years after construction, the BA-37 marsh creation and nourishment area seems to have created sustainable intermediate and brackish marsh habitats. The initial elevation of the constructed marsh was 2.36 feet North American Vertical Datum of 1988 (NAVD 88). Comparing the measured mean elevation changes to estimated values derived from consolidation curves reveals that the marsh creation area is settling and subsiding at a predicted rate established during project design, thereby suggesting sustainability of the area. The CRMS-6303 site vegetation data (fig. 12) confirm that the marsh creation area is intermediate and brackish marsh, thus supporting the assumption that the marsh creation and nourishment goals are being attained (fig. 12). Preliminary pre- and post-construction shoreline position data indicate that the foreshore rock dike has reduced shoreline erosion rates in the BA-37 project area. Shoreline erosion rates were calculated for the marsh creation area and the lake rim area (project shoreline outside the marsh creation area) independently. Pre-construction data reveal that the BA-37 shoreline was transgressing at an alarming rate (fig. 13). It is apparent from the shoreline erosion data that the 2005 hurricane season significantly altered and reshaped the project area shoreline. The passage in quick succession of Hurricane Cindy (July 2005), Hurricane Katrina (August 2005), and Hurricane Rita (September 2005) in proximity to the project area probably eroded large sections of shoreline. The initial (2007–8) post-construction shoreline analysis suggests that the lake rim shoreline continued to erode at the pre-2005 rate while the marsh creation area shoreline erosion rate was substantially reduced (fig. 13). Later shoreline analysis (2008–10) shows considerable reductions in the lake rim erosion rates, thereby suggesting that the high post-construction shoreline erosion rate in the lake rim area was probably caused by Hurricane Gustav in 2008. Moreover, it appears that hurricanes, not cold fronts or wind generated waves, are the dominant force reshaping these shorelines.

Figure 11. Aerial view of a typical segment of the Little Lake Shoreline Protection/Dedicated Dredging near Round Lake (BA-37) project. The structure bordering the marsh creation and nourishment area is the foreshore rock dike. Note the sizable acreage of open water areas in the background.

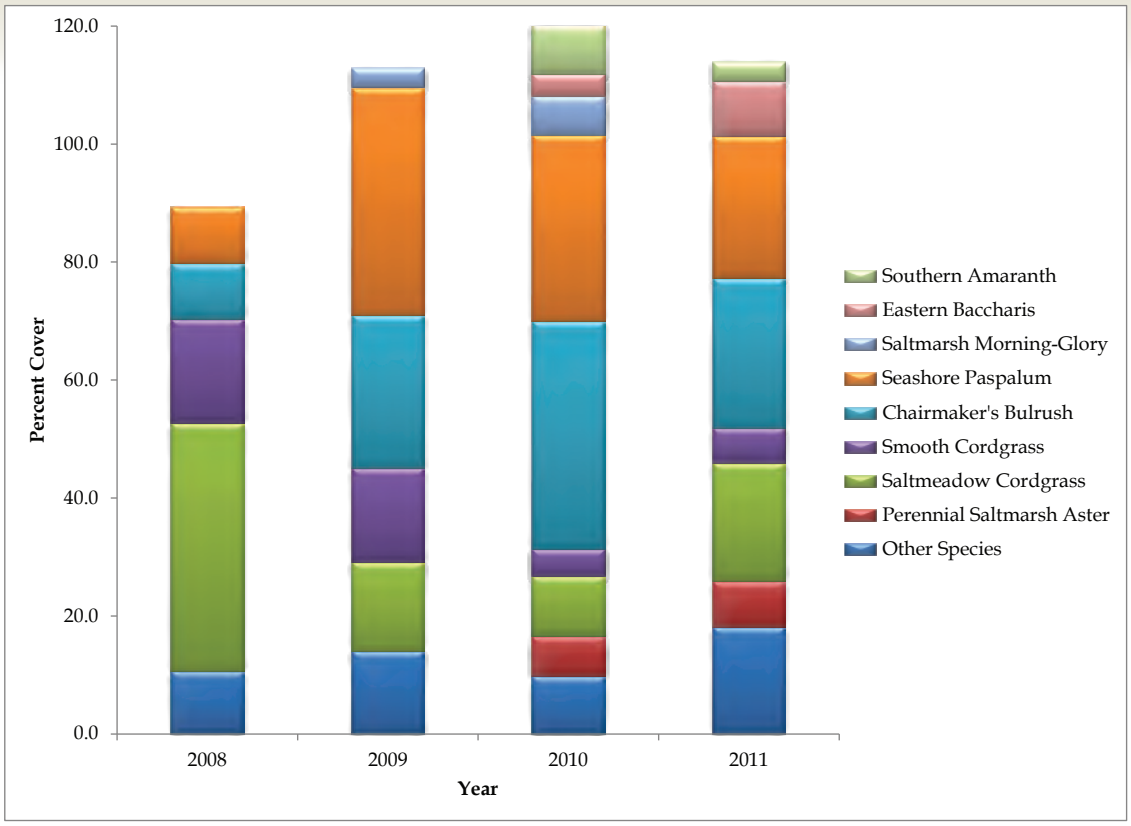


Figure 12. Annual mean cover of the dominant vegetation species populating the CRMS-6303 site inside the Little Lake Shoreline Protection/Dedicated Dredging near Round Lake (BA-37) marsh creation area from 2008 to 2011.

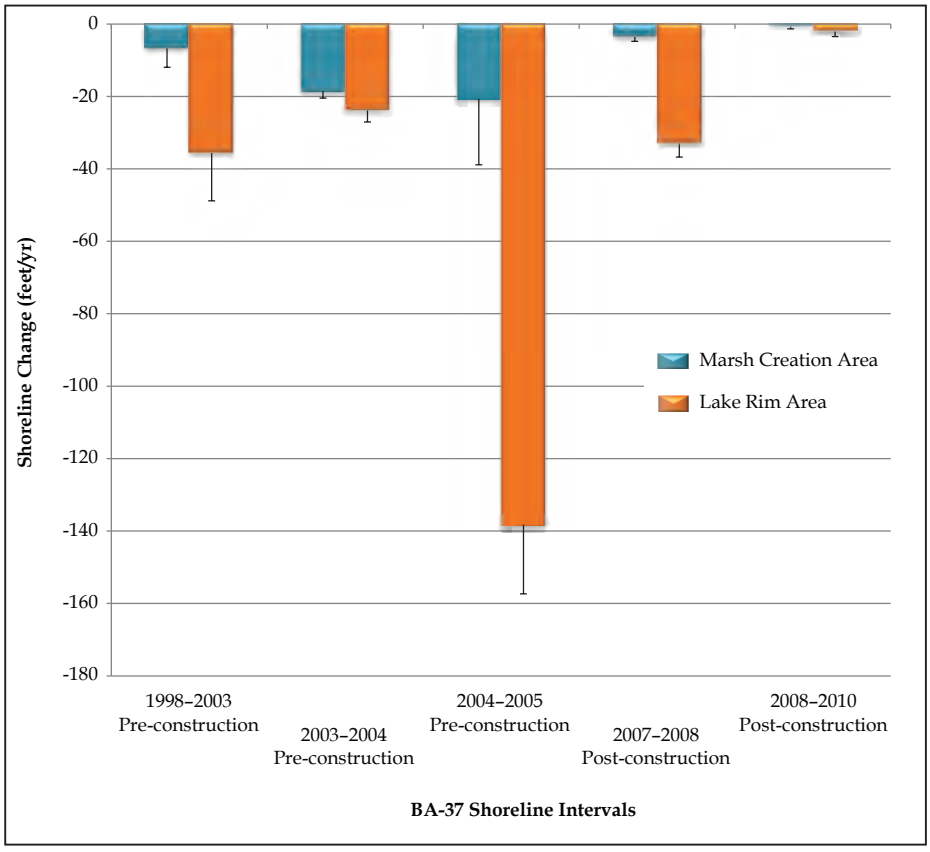


Figure 13. Pre-construction (1998–2005) and post-construction (2007–10) shoreline change at the Little Lake Shoreline Protection/Dedicated Dredging near Round Lake (BA-37) project. Note the considerable erosion induced during the 2005 hurricane season.

Current CWPPRA Program Developments

Louisiana State 2012 Coastal Protection and Restoration Master Plan

The 2012 Louisiana Comprehensive Master Plan for a Sustainable Coast (Master Plan) was unanimously approved by the State Legislature on May 22, 2012. The Master Plan charts Louisiana's coastal restoration and protection course for the next 50 years. The Master Plan includes many large Mississippi River sediment diversions (up to 250,000 cubic feet per second) and large marsh creation projects (over 20,000 acres). The Master Plan was developed in coordination with a Master Plan Framework Development Team (FDT) that consisted of Federal, State, and local agencies, stakeholders, and non-governmental organization (NGO) representatives. The Task Force, at its June 5, 2012, meeting, modified the Fiscal Year (FY) 2013 Priority Project List (PPL 23) process by requiring that CWPPRA projects nominated be consistent with the Master Plan.

CWPPRA Projects Reaching Their 20-Year Life

Current CWPPRA standard operating procedures (SOP) provide for a 20-year life for all projects, after which time the project would be closed and all funding would end. This was done because it was recognized that the amount of funding received would not allow the program to maintain projects indefinitely. CWPPRA does not require a 20-year project life span; however, the current standard operating procedures provide for 20-year project life spans. Two of the 97 constructed projects will reach their 20-year lives in 2014, two in 2015, and four in 2016. Project completion reports and closeout provisions may need to be implemented for projects ending at 20 years. CWPPRA Task Force member agencies are currently reviewing their projects nearing their 20-year lives to provide recommendations for closeout or continuance. The Task Force will be developing a 20-year project life policy in the near future regarding procedural steps for project closeout or continuance.

Sport Fish Restoration and Boating Safety Trust Fund

The Louisiana CWPPRA program currently receives approximately 13 percent (70 percent of 18.5 percent) of annual revenues from the Sport Fish Restoration and Boating Safety Trust Fund (Trust Fund), currently $79 million (FY 2012). The remaining 30 percent of CWPPRA appropriations is divided evenly between the Fish and Wildlife Service Coastal Wetlands Conservation Grant Program and the North American Wetlands Conservation Act (NAWCA). The Trust Fund was part of the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) that was enacted August 10, 2005, which authorized Federal surface transportation and other programs for the 5-year period of 2005 to 2009. The Trust Fund expired in October 2009 but has been currently extended until March 27, 2013, by Congressional continuing resolution.

Coastal Wetlands Planning, Protection and Restoration Act Reauthorization

CWPPRA is currently authorized to 2019. It was reauthorized in 2004 from 2009 to 2019 through amendment to the Dingell-Johnson Sport Fish Restoration Act (16 U.S.C. 777c[a]). Reauthorization will be necessary to continue the program beyond 2019.

Conclusion

The Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) has been actively reclaiming wetlands and helping to turn the tide on land loss for more than 22 years. Projects that have rebuilt the barrier islands and interior marshes and have repaired hydrology have all left a lasting mark on the coastal landscape. A foundation has been laid with the inception of CWPPRA, on which subsequent restoration initiatives have been built. Several comprehensive restoration plans have capitalized upon CWPPRA's public planning process and so have been generated and widely accepted because of the encouragement of public involvement and interagency cooperation. Government planning documents and various ongoing feasibility studies have often resulted from CWPPRA generated project concepts. Additionally, some projects that have been designed through CWPPRA have been adopted and constructed through other authorities. This type of synergy between funding vehicles is not redundant but rather is efficient in pursuing project implementation. In addition to authorizing 192 projects, the CWPPRA program remains uniquely committed to the understanding and championing of restoration science. Together with a rich brain trust of local academia, program scientists collect and analyze data from CWPPRA projects to evaluate their environmental benefits. This helps guide managers to develop projects by using the most cutting edge science to support successful restoration. CWPPRA is meeting an otherwise unfilled niche by building near-term projects in acute, and often highly strategic, areas of need. This continues to be CWPPRA's greatest asset and contribution to turning the tide on Louisiana land loss.

References

Barras, J.A., 2009, Land area change and overview of major hurricane impacts in coastal Louisiana, 2004–08: U.S. Geological Survey Scientific Investigations Map 3080, scale 1:250,000, 6 p.

Barras, J.A., J.C. Bernier, and R.A. Morton, 2008, Land area change in coastal Louisiana—A multidecadal perspective (from 1956 to 2006): U.S. Geological Survey Scientific Investigations Map 3019, scale 1:250,000, 14 p. (Also available at http://pubs.usgs.gov/sim/3019/.)

Barras, J., S. Beville, D. Britsch, S. Hartley, S. Hawes, J. Johnston, P. Kemp, Q. Kinler, A. Martucci, J. Porthouse, D. Reed, K. Roy, S. Sapkota, and J. Suhayda, 2003, Historical and projected coastal Louisiana land changes—1978–2050: U.S. Geological Survey Open File Report 03–334, 39 p.

Britsch, L.D., and E.B. Kemp, 1990, Land loss rates—Mississippi River Deltaic Plain: Vicksburg, Miss., Technical Report GL-90-2, U.S. Army Engineer Waterways Experiment Station, 25 p.

Couvillion, B.R., J.A. Barras, G.D. Steyer, W. Sleavin, M. Fisher, H. Beck, N. Trahan, B. Griffin, and D. Heckman, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. (Also available at http://pubs.usgs.gov/sim/3164/downloads/SIM3164_Pamphlet.pdf.)

LA CPRA, 2012, Louisiana Comprehensive Master Plan for a Sustainable Coast: Baton Rouge, La., Louisiana Coastal Protection and Restoration Authority, 190 p.

Abbreviations

- BICM – Barrier Island Comprehensive Monitoring Program
- CPRA - Coastal Protection and Restoration Authority representing the State of Louisiana - Office of the Governor–Coastal Activities
- CWPPRA – Coastal Wetlands Planning, Protection and Restoration Act
- CRMS – Coastwide Reference Monitoring System
- EPA - U.S. Environmental Protection Agency
- FDT – (Master Plan) Framework Development Team
- GCERTF - Gulf Coast Ecosystem Restoration Task Force
- LCA – Louisiana Coastal Area
- NAWCA - North American Wetlands Conservation Act
- NGO – Non-governmental Organization
- NMFS - National Marine Fisheries Service
- NOAA – National Oceanic and Atmospheric Administration
- NRCS - Natural Resources Conservation Service
- OC – (Public) Outreach Committee
- PPL – Priority Project List
- SOP – Standard Operating Procedures
- USACE - U.S. Army Corps of Engineers
- USFWS - U.S. Fish and Wildlife Service
- USGS – U.S. Geological Survey

Appendix 1. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Project Types

The Task Force has implemented various restoration techniques to protect and restore coastal wetlands in Louisiana. The types of techniques used in various CWPPRA projects depend on the problems being addressed and other site-specific factors, including project area landscape, substrate, wave climate, habitat type, and proximity to sediment and freshwater resources, major waterways, and open waters. Most CWPPRA projects employ one or more of the following restoration techniques:

- ***Freshwater Reintroduction -*** Freshwater is channeled from a nearby river or water body into surrounding wetlands. This infusion of water, sediment, and nutrients helps slow saltwater intrusion, slows the loss of marsh, and creates a limited amount of new marsh.
- ***Outfall Management -*** A variety of techniques are used to regulate the flow of freshwater reintroduction to ensure that water and sediment reach needed areas. These techniques maximize the benefits of freshwater reintroduction.
- ***Sediment Diversion -*** A crevasse is cut into a river levee, allowing river water, nutrients, and sediment to flow into nearby wetlands to mimic natural land-building processes.
- ***Dredged Material/Marsh Creation -*** Dredged sediment is placed at specified elevations in shallow open water and deteriorating marsh to encourage plant recolonization.
- ***Shoreline Protection -*** Eroding shorelines are protected by buttressing the land with rock berms, concrete, or plantings or by diffusing wave energy in front of the shore by using breakwaters and (or) fences.
- ***Sediment and Nutrient Trapping -*** Brush fences or low land ridges (terraces) are built to slow waterflow and promote sediment accumulation.
- ***Hydrologic Restoration -*** Natural drainage patterns are restored as much as possible by installing water control structures, by blocking dredged canals, and (or) by cutting gaps in levees.
- ***Marsh Management -*** The water level and salinity in a contained marsh area are controlled by levees and gates or weirs to promote the regrowth of desired vegetation and reestablish historical wildlife habitat.
- ***Barrier Island Restoration -*** Several methods are used to stabilize and protect islands, including shoring up dunes with fences and vegetative plantings, rebuilding islands with dredged material, and using breakwaters to protect islands from waves.
- ***Vegetative Planting -*** Site-appropriate marsh plants are established in project areas to reduce erosion, stabilize the soil, and accelerate wildlife habitat development.
- ***Terracing -*** Terracing is the construction of low ridges, usually in patterns, in shallow open water areas. The ridges slow waterflow and help trap sediment to rebuild marsh.
- ***Long-Distance Conveyance of Dredged Material -*** This technique is similar to other marsh creation techniques except different techniques are utilized to transport sediment greater distances, often by using booster pumps.
- ***Invasive Species Control Program -*** A control program pays licensed trappers/hunters to harvest invasive species, such as nutria, that damage the marsh.
- ***Delta Management -*** Wetland creation on active deltas can be enhanced by altering flow patterns, thus promoting land accretion.

Appendix 2. Complete List of Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Projects Authorized Since 1990

The following Web site provides a complete list of authorized projects under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) since its implementation in 1990: http://www.lacoast.gov/new/Projects/List.aspx.

Appendix 3. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Educational Videos

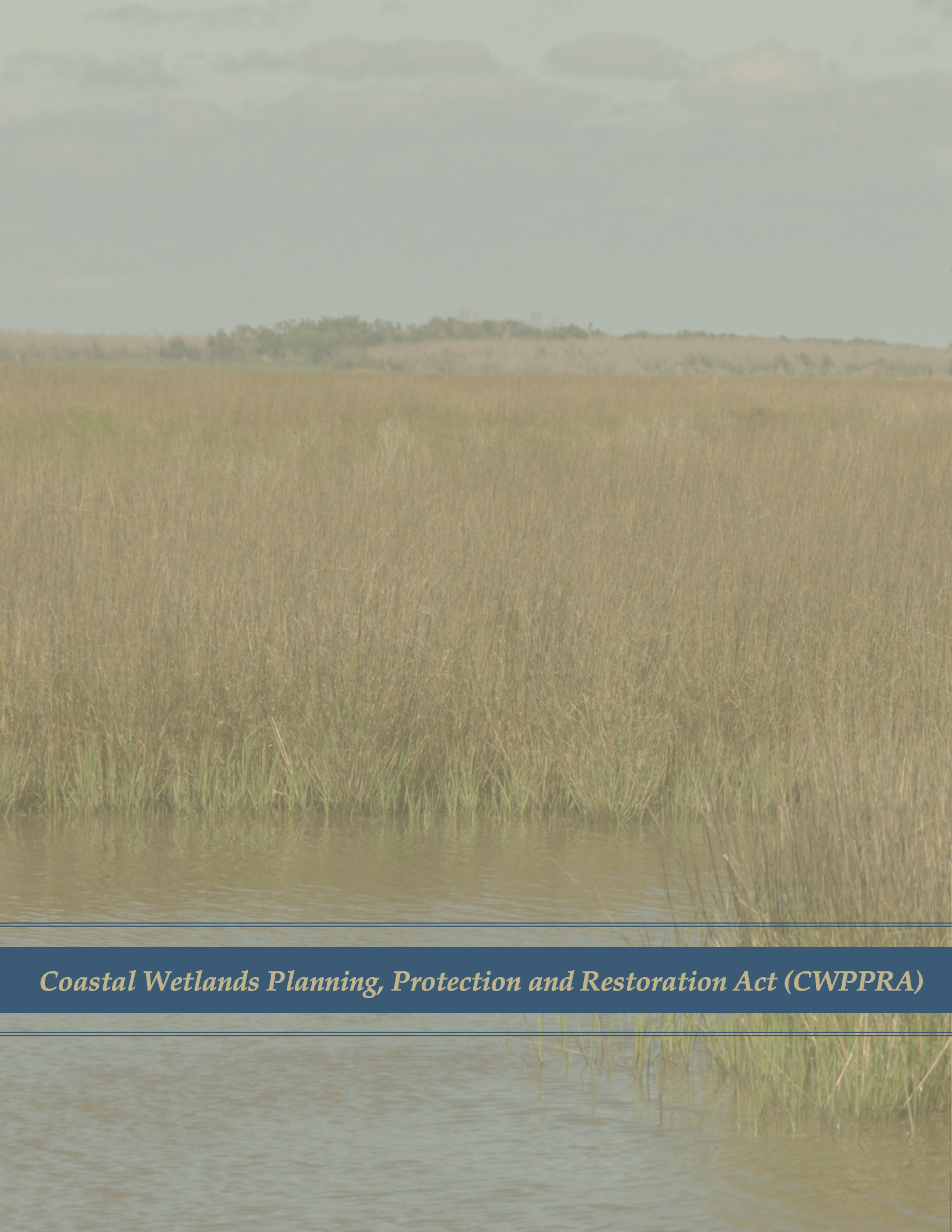
The Public Outreach Committee (OC) is composed of members from the participating Federal agencies, the State of Louisiana, other coastal programs, and non-profit organizations. But only the core group members representing the CWPPRA entities are eligible to vote on budget matters. The committee is currently responsible for

- formulating information strategies and public and formal education initiatives,
- maintaining a Web site of complex technical and educational materials,
- developing audio-visual presentations,
- organizing exhibits,
- disseminating publications and news releases, and
- conducting special events such as project dedications and groundbreakings.

The outreach coordinator manages the educational program, which provides information and materials for classroom use throughout the State. The Chairman and coordinator for outreach serve on local and regional planning efforts and act as the liaisons between the public, parish governments, and the various federal agencies involved in CWPPRA. To address the need for immediate action of wetland loss and educating the public, the CWPPRA's Public Outreach Committee, in collaboration with our Federal, State, Local and private

stakeholders have developed various Outreach Videos (listed below). All the listed videos and their short descriptions can be found at http://www.lacoast.gov/new/Pubs/videos.aspx.

- Returning Marshlands to Magnificent Life—Learn about hydrologic restoration techniques that CWPPRA uses to protect coastal Louisiana.
- CWPPRA - Rebuilding Coastal Louisiana - What is CWPPRA?—Learn about saving coastal Louisiana through the Coastal Wetlands Planning Protection and Restoration Act.
- Marsh Creation - Step by Step—Learn about CWPPRA's efforts to save Marsh Island in south central coastal Louisiana.
- Meet the CWPPRA Task Force—Learn about Louisiana's coastal restoration efforts through CWPPRA. As CWPPRA celebrates its 20th anniversary, Task Force members explain why restoration is essential to Louisiana.
- Louisiana Coastal Land Loss Simulation Video 1932-2010—This USGS-NWRC video captures Louisiana Coastal Land Loss issues via animation.
- Coastal Louisiana: Impacts of Hurricanes on Salt Marsh and Mangrove Wetlands—This video describes research conducted by Dr. Karen McKee, USGS Research Ecologist, and her university partners, Dr. Irv Mendelssohn (Louisiana State University) and Dr. Mark Hester (University of Louisiana at Lafayette). They are studying the effects of hurricanes on marsh and mangrove wetlands in the Mississippi River Delta.
- Effects of Sea-Level Rise on Coastal Wetlands in the Mississippi Delta—This video describes research being conducted by Dr. Karen McKee, USGS Research Ecologist, and her university partner, Dr. Julia Cherry. Their goal is to better understand the effects of sea-level rise and other global change factors on coastal wetlands in the Mississippi River Delta.
- The Floating Marshes of Louisiana: A Unique Ecosystem—In the Mississippi River Delta Plain, there are large expanses of floating marsh, which are the focus of this video. This unique ecosystem is dominated by a variety of grasses and forbs, which can create a buoyant mat that floats on a layer of water. How these marshes form and some of their unique features are described.
- What Lies Beneath: Using Mangrove Peat to Study Ancient Coastal Environments and Sea-Level Rise—This video describes how scientists study past changes in sea level and coastal environments by analyzing mangrove peat. Mangrove islands located off the coast of Belize are underlain by deep deposits of peat (organic soil), which retain a record of past sea level, vegetation, and climate. By studying past changes in sea level and how intertidal ecosystems, such as mangroves, have responded to these changes, we can better predict what will happen in the future as sea levels increase.



Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA)