Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA)

The 2015 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 continues to face an unprecedented collapse of its entire coastal ecosystem and the vital economic activity and unique culture that it supports.

Over the past 25 years, the Louisiana Coastal Wetlands Conservation and Restoration Task Force (Task Force) has fulfilled its role under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) by implementing a science- and engineering-based program that extensively engages stakeholders and 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 Task Force in accordance with 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.

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/missions/environmental/cwppra.aspx.
- 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/lafayette; http://www.fws.gov/coastal/CoastalGrants/.
- U.S. Department of Agriculture (represented by the Natural Resources Conservation Service): contact 318–473–7751 or at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/la/programs/easements/acep/?cid=nrcs141p2_015685.
- 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 Mississippi Valley New Orleans District Web site at http://www.mvn.usace.army.mil/missions/environmental/cwppra.aspx.

Acknowledgments

The Louisiana CWPPRA Task Force wishes to thank Governor of Louisiana Bobby Jindal, the Louisiana Legislature, the Federal Louisiana Delegation, and the U.S. Congress for their support of this crucial program.

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

US Army Corps of Engineers
New Orleans District

NOAA
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

U.S. Fish & Wildlife Service

State of Louisiana
Union Justice Confidence

United States Environmental Protection Agency

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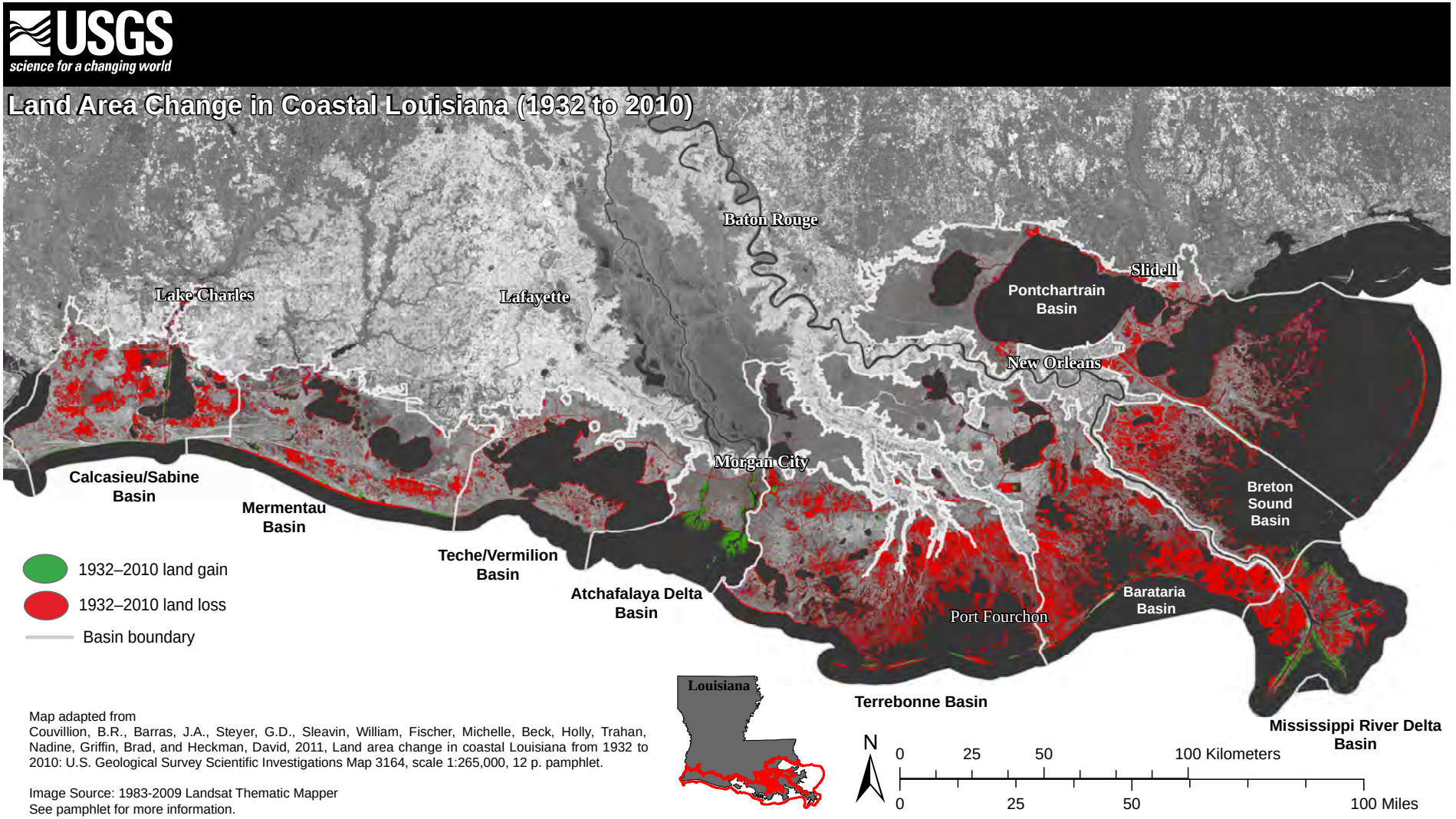


Map adapted from
Couvillion, B.R., Barras, J.A., Steyer, G.D., Sleavin, William, Fischer, Michelle, Beck, Holly, Trahan, Nadine, Griffin, Brad, and Heckman, David, 2011, Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet.

Image Source: 1983-2009 Landsat Thematic Mapper
See pamphlet for more information.

Executive Summary:

The 2015 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. Wetlands replenish aquifers, and they purify water by filtering out pollutants and absorbing nutrients.

Approximately 37 percent of all coastal marshes of the lower 48 States are located in Louisiana (Couvillion and others, 2011; NOAA, 2006). Unfortunately, this fragile environment is disappearing at an alarming rate. Between 1996 and 2010, Louisiana underwent more coastal wetland loss than all other States in the lower 48 combined (NOAA, 2010). A USGS report (Couvillion and others, 2011) estimates the 1984 to 2010 Louisiana coastal average land loss rate at approximately 16.6 square miles per year. Louisiana's average coastal land loss rate equates to the disappearance of an area equivalent to a football field every hour. Louisiana has already lost more than 1,883 square miles (1.2 million acres) of land over the last 80 years, an area equal to the size of the State of Delaware. Modeled projections show that, without increased restoration efforts, an additional 811 square miles (519,000 acres) to 1,739 square miles (1.1 million acres) may be at risk of loss by the year 2060 (Couvillion and others, 2013).

Wetlands provide habitat for a variety of wildlife. Louisiana coastal wetlands are the breeding grounds and nurseries for thousands of species of aquatic and terrestrial life, as well as many species of birds including our Nation's symbol, the bald eagle. It is estimated that more than five million waterfowl migrate to coastal Louisiana each year. Because of the abundant wildlife and wetlands to hunt and fish, Louisiana is referred to as the "*Sportsman's Paradise*." Today many of these wetlands are being lost.

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). Since its inception, CWPPRA has constructed, or funded for construction, projects to protect and restore more than 88,000 net acres (138 square miles)

Louisiana Coastal Wetland Loss Facts

- **LA lost more coastal wetlands than all other lower 48 States combined**
- **LA loses 1 football field of land per hour**
- **LA lost more than 1,883 square miles (1.2 million acres)—equal to size of Delaware**
- **LA may lose 0.5 to 1.1 million acres in next 50 years**

of Louisiana's coastal wetlands in its first 25 years (1990 to 2015). The purpose of this report is to fulfill the requirement by Congress for the Task Force to provide a scientific evaluation every 3 years on the effectiveness of the projects (Section 303 (b) (7) of CWPPRA). These restored wetlands and associated open-water habitats provide foraging, escape cover, nesting, breeding, and nursery habitat for a myriad of coastal fish and wildlife, including threatened and endangered, at-risk, and rare species, as well as commercially and recreationally valuable species. Additionally, a variety of freshwater and estuarine-dependent fish and shellfish are residents of Louisiana's coastal wetlands.

Our national economy also benefits from Louisiana's coastal wetlands. Economic activity in Louisiana's coastal zone includes oil and gas production, shipping commerce, commercial fisheries, oyster production, and fur harvesting. This activity accounts for more than 450,000 jobs and billions of dollars in revenues (CPRA, 2011; Batker and others, 2012). Additionally, wetlands are wonderful recreational resources and are part of Louisiana's growing ecotourism business.

CWPPRA has been essential to advancing the cause of coastal restoration in Louisiana. Nevertheless, it has long been recognized that no single restoration program alone is sufficient to address Louisiana's coastal crisis.

The Water Resources Development Act of 2007 established the Louisiana Coastal Area (LCA) program to address some restoration needs that were not included within the scope of CWPPRA. Currently, the LCA consists of 15 near-term projects, 3 programs, and 1 long-term study. The 2012 Louisiana Comprehensive Master Plan for a Sustainable Coast (Master Plan [CPRA, 2012]) also addresses restoration and protection needs beyond the authorization of CWPPRA.

In the wake of the BP Deepwater Horizon (DWH) oil spill, a number of complementary efforts have begun to restore Gulf of Mexico ecosystems. In July 2012, the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) established the Gulf Coast Ecosystem Restoration Council. The enactment of the RESTORE Act established a structure and funding mechanism to complement CWPPRA and further enhance coastal restoration in Louisiana and the other Gulf Coast States. With 25 years of on-the-ground experience, 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. The CWPPRA project development and selection process generates more construction-ready projects than the program can afford to build. These "shovel-ready" projects are available to other programs for expedited implementation. Some CWPPRA projects (e.g., Chenier Ronquille Barrier Island Restoration, Scofield Island Restoration, and Lake Hermitage Marsh Creation) have already been targeted for implementation or expansion with DWH-related funds. Although Congress in 2004 reauthorized CWPPRA through 2019, the CWPPRA program is expected to reach its capacity for funding new projects before then.

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-

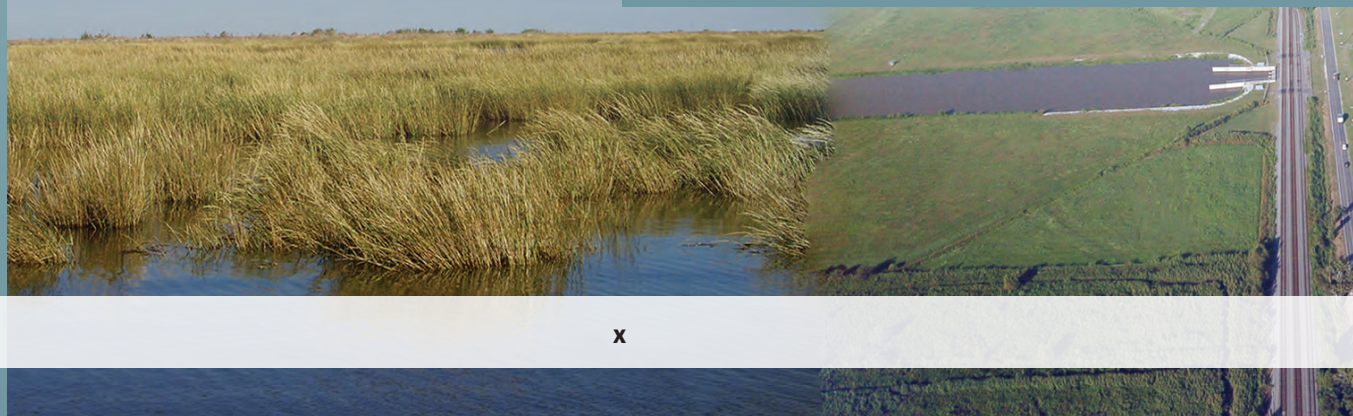
scale solutions. CWPPRA serves as a model for interagency collaboration and decision making. The interagency decision making and public involvement processes established by CWPPRA could be utilized by other restoration programs. Moreover, the CWPPRA program could serve as a vehicle for advancing the Gulf Coast Ecosystem Restoration Council strategy and (or) for administering restoration funds from other sources.

CWPPRA has been and will continue to be the primary source of practical experience, learning, and agency expertise regarding coastal restoration in Louisiana. The monitoring data collected through the CWPPRA program since the 1990s are used to select, prioritize, and design nearly all coastal restoration. Since 2007, the Coastwide Reference Monitoring System (CRMS), funded by CWPPRA and the State of Louisiana, has been used to evaluate project effectiveness and has provided critical baseline ecological data to inform coastal restoration and disaster response. CWPPRA monitoring programs provide vital information to evaluate not only the CWPPRA program but also other restoration programs.

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"

CWPPRA's Programmatic Benefits

- **Proven Track Record of Project Construction**–Over 25 years, 200 approved projects benefiting more than 1,344 square miles (860,000 acres); 101 constructed (20 under construction).
- **Responsive**–CWPPRA projects are constructed in 3 to 5 years.
- **Interagency Approach**–Cost-effective projects developed by an experienced interagency team (5 Federal, 2 State agencies).
- **Community Involvement**–Local governments and citizens contribute to project nomination and development.
- **Predictable Funding**–Federal Sport Fish & Boating Safety Trust Fund funding to 2015 through fishing equipment taxes and small engine fuel taxes.
- **Fiscally Responsible**–CWPPRA projects are cost effective.
- **Science Based**–CWPPRA's monitoring program (Coastwide Referencing Monitoring System - CRMS). Demonstration projects "field-test" restoration techniques for future restoration project success.
- **Complementary**–CWPPRA projects complement other large-scale restoration efforts (i.e., Coastal Impact Assistance Program, State Master Plan, BP DWH Oil Spill Early Restoration and the RESTORE Act).



from which Federal and State personnel 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 other Gulf Coast restoration efforts comes directly or indirectly from CWPPRA. Thus, whether in its current form or in an expanded role, CWPPRA can be a cornerstone for the effort to restore sustainability to coastal Louisiana; however, without reauthorization by Congress, this will not be possible.

The CWPPRA Task Force authorized 12 new projects between 2013 and 2015 (Priority Project Lists [PPLs] 22–24) for Phase 1—Engineering and Design. If constructed, those projects would result in a benefit of approximately 3,813 net acres of wetlands. During the same period, the Task Force also authorized Phase 2—Construction of five projects that are expected to result in an estimated net benefit of approximately 2,309 acres of wetlands. These approved construction projects are all marsh creation projects, including one with hydrologic restoration features.

The Louisiana coast is separated into four ecologic regions that cover nine hydrologic basins. Projects that were authorized to begin Phase 1—Engineering and Design during this reporting period (2013–2015) are highlighted on the following page. From 2013 to 2015, the Task Force authorized two projects in Region 1, four in Region 2, three in Region 3, and three in Region 4. A map illustrating Louisiana's coastal regions with CWPPRA projects from 1990 to 2015 (PPL 1–24) can be found at *http://lacoast.gov/maps/allregions_ppl1-24_2015-03_lowres_web.pdf.*

Although projects are authorized and constructed individually, the ones that work synergistically are often given greater consideration for selection. For example, CWPPRA barrier island restoration projects are collectively rebuilding Louisiana's first line of defense that can extend ecosystem benefits beyond 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 the Barataria Basin Landbridge, a critical platform 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.

After the historic Hurricanes Katrina and Rita in 2005, other restoration programs were developed. Although coastal land loss and hurricane threats continue, some future restoration will be provided by DWH funding. Contingent upon continued authorization and appropriation, the CWPPRA Task Force will continue to fulfill its role 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.

PROJECTS APPROVED FOR PHASE I ENGINEERING AND DESIGN 2013–15

Region 1 (Pontchartrain Basin)

- **New Orleans Landbridge Shoreline Stabilization and Marsh Creation**
- **Shell Beach South Marsh Creation**

Total benefit - 511 net acres

Region 2 (Breton, Barataria, and Mississippi River Delta Basins)

- **Bayou Dupont Sediment Delivery Marsh Creation**
- **Terracing and Marsh Creation South of Big Mar**
- **Caminada Headlands Back Barrier Marsh Creation**
- **Bayou Grande Cheniere Marsh and Ridge Restoration**

Total benefit - 1,131 net acres

Region 3 (Atchafalaya, Terrebonne, and Teche/Vermilion Basins)

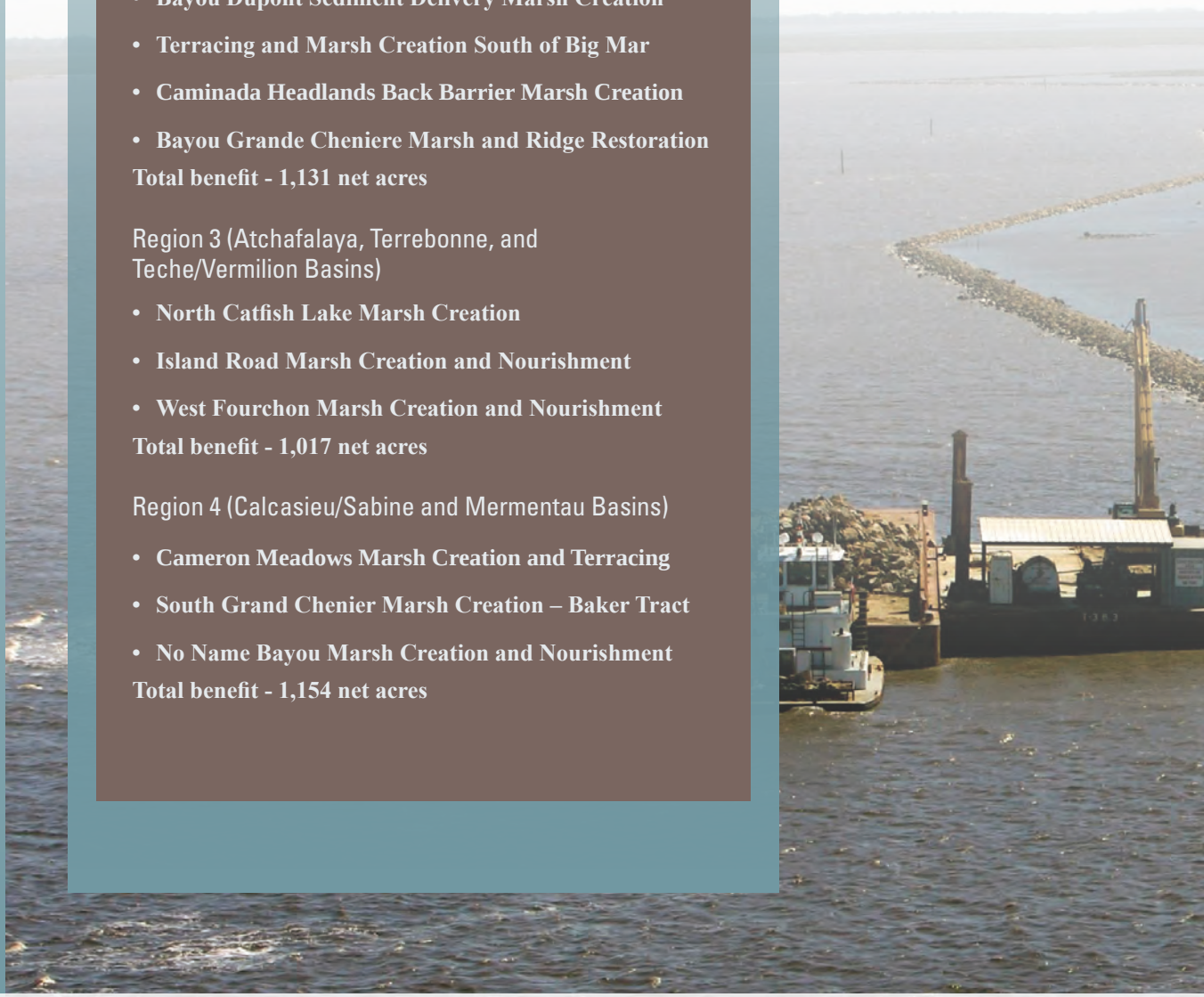
- **North Catfish Lake Marsh Creation**
- **Island Road Marsh Creation and Nourishment**
- **West Fourchon Marsh Creation and Nourishment**

Total benefit - 1,017 net acres

Region 4 (Calcasieu/Sabine and Mermentau Basins)

- **Cameron Meadows Marsh Creation and Terracing**
- **South Grand Chenier Marsh Creation – Baker Tract**
- **No Name Bayou Marsh Creation and Nourishment**

Total benefit - 1,154 net acres



1. CWPPRA will continue to design and construct coastal restoration projects in coordination with other Louisiana coastal restoration programs guided by public input.

2. CWPPRA will continue to be an "incubator" of projects for other programs to construct, if CWPPRA lacks construction funding.

3. The CWPPRA Task Force stands ready to increase its coastal restoration effort to reestablishing a sustainable coastal Louisiana ecosystem with additional funding.

4. CWPPRA will continue designing and constructing demonstration restoration projects to test innovative ideas and construction techniques to be used in larger projects.

5. CWPPRA will continue to provide the appropriate level of project monitoring. The CRMS and project-specific monitoring programs increase the body of scientific data to evaluate the effectiveness of constructed projects and inform how we plan and design future restoration projects.

Habitats Restored by CWPPRA Have Helped Endangered Species Recover

Bald eagle removed from endangered species list August 2007

Brown pelican removed from endangered species list November 2009

Louisiana black bear proposed for delisting May 2015

Wetlands Provide Activities for People

Louisiana is home to **20 State parks** and **24 national wildlife refuges**.

There are **400 species of birds** that visit Louisiana each year that provide birding and hunting activities for people.

3,000 miles of shoreline provide fishing opportunities.

Waterways near the Louisiana coast accommodate **boating**, **swamp tours**, and other **water activities**.

Introduction

The traditional image of Louisiana's wetlands depicts a grassy expanse of vegetation with shrimp boats and sea birds dotting the horizon. Louisiana's coastal zone contains approximately 37 percent of all coastal marshes and 45 percent of all intertidal coastal marshes in the lower 48 States, but annually Louisiana is losing 80 percent of the entire Nation's coastal wetlands. Since the 1930s, coastal Louisiana has lost more than 1,883 square miles (1.2 million acres), an area more than 25 times larger than Washington, D.C. Couvillion and others (2011) estimated the average annual Louisiana coastal land loss rate from 1985 to 2010 to be approximately 16.6 square miles. Louisiana's coastal 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). Since its inception, CWPPRA has protected and restored almost 90,000 acres (138 square miles) of Louisiana's coastal wetlands in its first 25 years (1990 to 2015).

Over the last three decades, it has been clearly established 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 these benefits, 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 that 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 (Gulf Coast Ecosystem Restoration Task Force, 2010). These challenges were further compounded in 2010 by the Deepwater Horizon (DWH) oil spill, which released more than 4.9 million barrels (270 million gallons) of oil into the gulf, affecting thousands of miles of shoreline, bayous, and bays (NOAA, 2015; Achenbach and Fahrenthold, 2010). Coastal Louisiana received the majority of the ecological impacts from that 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 DWH oil spill. Even when the impacts of the oil spill are addressed, the work to save these vital coastal wetlands will not end. Ongoing issues include the following:

- ***The loss of coastal wetlands, barrier islands, and other habitats of the Mississippi River Delta and Chenier Plain—***This loss is due to a combination of both naturally occurring and human-induced factors including storms (annual and tropical), subsidence (land sinking), construction of navigation and oil and gas channels, and leveeing of the Mississippi River for flood protection. 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 shoreline system undermines storm protection for coastal communities, threatens the beaches that support the local tourism economy, and affects numerous threatened, endangered, and rare species that rely on these barrier islands for habitat.

- ***Loss and degradation of estuarine habitat—*** Estuaries of Louisiana's coast (such as Breton Sound, Barataria Bay, and many 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, water flow (hydrologic) alteration, and reductions in freshwater inflow.

- ***Imperiled fisheries—***Several major commercially and recreationally important fish species are currently experiencing overfishing pressures or have been overfished. Additionally, contaminants such as methyl-mercury in fish, 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 dissolved oxygen concentration in the water column decreases to a level that results in the death of fish and shellfish and (or) in 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 (8.5 million acres) and the second largest hypoxic zone worldwide. This Gulf of Mexico "Dead Zone" is caused by input of excess nutrient pollution to the gulf from the Mississippi River. Freshwater and sediment diversions from the Mississippi and Atchafalaya Rivers may help reduce the hypoxic zone off Louisiana's coast by channeling nutrient-rich waters into coastal wetlands, where the nutrients will be used by marsh and aquatic vegetation.

- ***Climate change—***Our changing climate is already altering 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 complicate efforts to restore or sustain the Louisiana coastal ecosystem. Plausible sea-level rise may be between 0.78 and 4.2 feet (0.24 to 1.28 meters) in the next 100 years (CPRA, 2012).

- ***Vulnerability of communities—***Loss of coastal habitats may also increase the vulnerability of communities that lie farther inland from flooding caused by storm surges and heavy rain. Barrier islands and coastal wetlands have the potential to reduce storm surge, but this reduction is dependent on landscape and storm characteristics (Suhayda, 1977; Wamsley and others, 2009). Without these coastal habitats, coastal communities are increasingly vulnerable to storms. This vulnerability will likely 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 (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 2013 and demonstrate the effectiveness and the relevancy of CWPPRA to address land loss in Louisiana's coastal wetlands.

What Is Hypoxia?

Hypoxia is the lack of oxygen in the water column. In the Gulf of Mexico's Texas-Louisiana Shelf, hypoxia is defined as seasonally low oxygen levels (less than 2 milligrams/liter).

- **What Causes Hypoxia?**

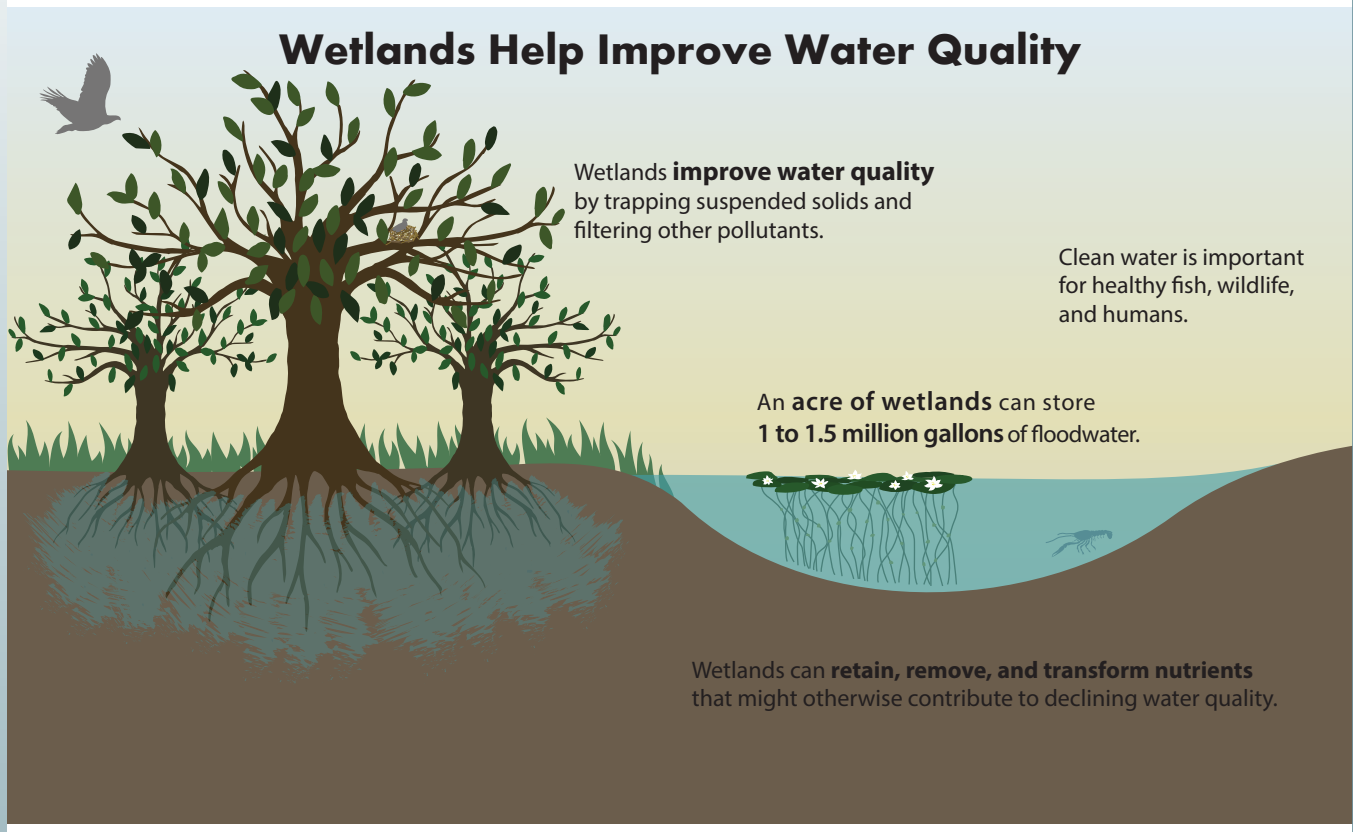
  Hypoxic zone results from excessive nutrients, primarily nitrogen, carried to the gulf by the Mississippi and Atchafalaya Rivers.

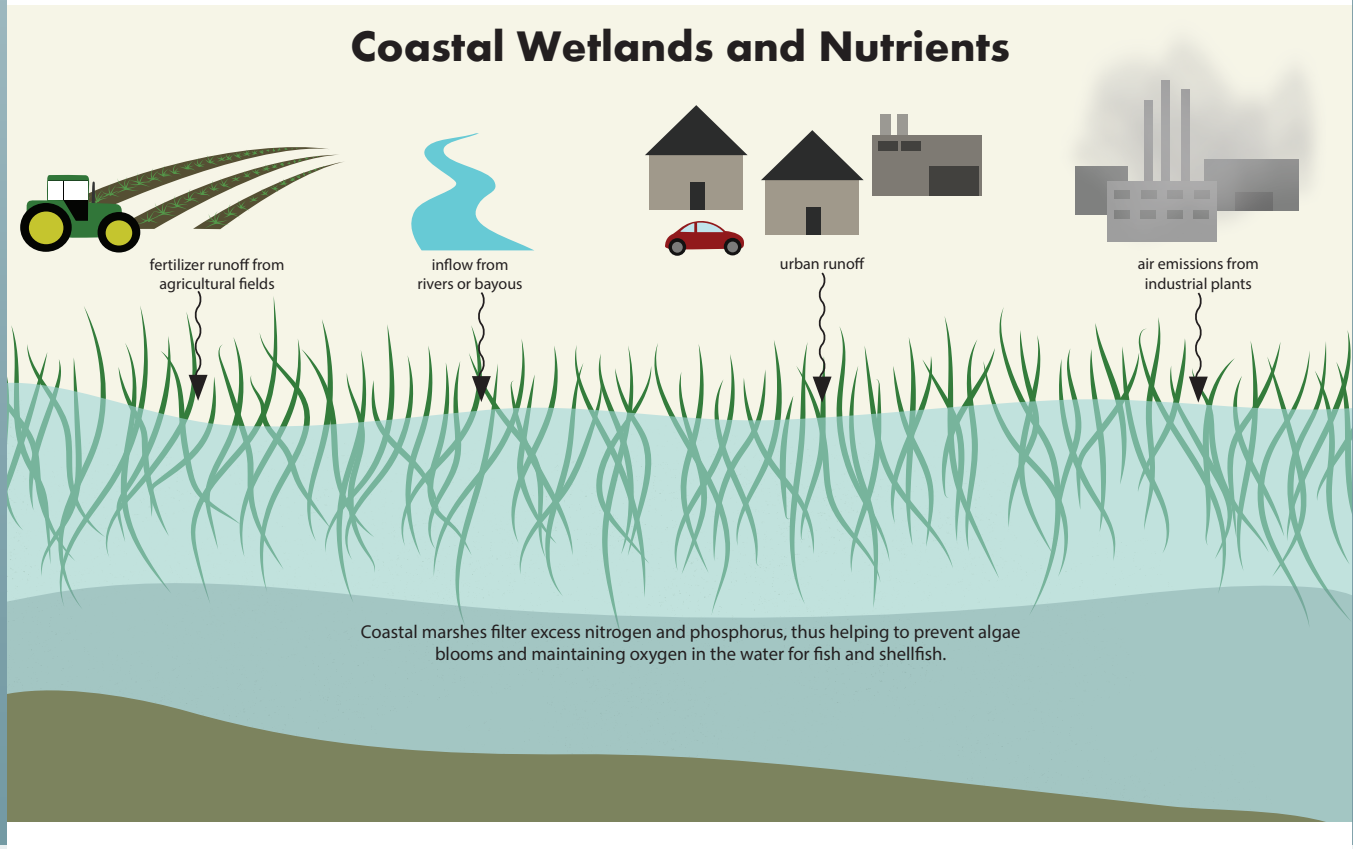
- **How Large Is the Hypoxic Zone?**

  Hypoxic zone covers a 5-year running average of 5,454 square miles in the northern gulf.

- **How Does Hypoxia Affect Fish and Wildlife?**

  Due to an overabundance of nutrients, excessive algal growth (eutrophication) can result. Excessive demand for oxygen results in a decrease of dissolved oxygen in the bottom water and a corresponding loss of aquatic habitat in the water column and benthic layer. Mobile organisms leave the hypoxic zone; those that cannot leave die or are weakened.


Wetlands Help Improve Water Quality
Wetlands improve water quality by trapping suspended solids and filtering other pollutants.
Clean water is important for healthy fish, wildlife, and humans.
An acre of wetlands can store 1 to 1.5 million gallons of floodwater.
Wetlands can retain, remove, and transform nutrients that might otherwise contribute to declining water quality.


Coastal Wetlands and Nutrients
fertilizer runoff from agricultural fields
inflow from rivers or bayous
urban runoff
air emissions from industrial plants
Coastal marshes filter excess nitrogen and phosphorus, thus helping to prevent algae blooms and maintaining oxygen in the water for fish and shellfish.

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 70 to 90 million in Federal dollars per year to restore coastal wetlands. Fiscal year 2015 funding decreased 7.3 percent because of sequestration. The fiscal year 2015 funding amount was $78.6 million. Total Federal funding since 1990 has been $1.6 billion.

The Sport Fish Restoration and Boating Safety Trust Fund (Trust Fund) is CWPPRA's funding source supported by excise taxes on fishing equipment and small engine and motorboat fuel taxes. Funding for Louisiana CWPPRA projects is cost shared: a split of 85 percent Federal and 15 percent State of Louisiana. Congress is currently considering Trust Fund reauthorization. The Trust Fund contributes 18.5 percent of its annual revenues to CWPPRA appropriations; that amount is divided as follows:

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

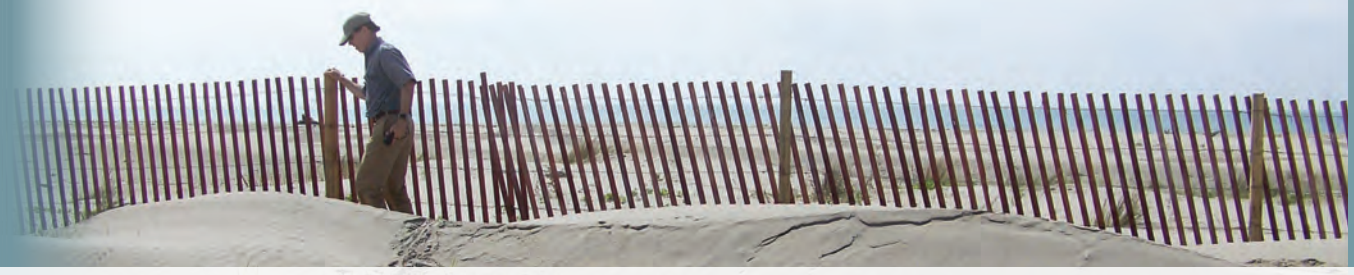
Five Federal agencies work with the State of Louisiana in planning and implementing CWPPRA restoration projects. The Federal agencies are Department of the Army—Army Corps of Engineers (USACE), Department of the Interior—U.S. Fish and Wildlife Service (USFWS), Department of Agriculture—Natural Resources Conservation Service (NRCS), 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 annually identifies and selects projects for engineering and design through the Priority Project List (PPL) process. Project concepts 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 22 projects for preliminary evaluation; the CWPPRA Technical Committee (the committee that advises the Task Force) then selects 10 projects for more detailed evaluation. After this review, the Task Force typically approves four projects for detailed Phase 1—Engineering and Design.

Upon completion of Phase 1—Engineering and Design, projects are selected for Phase 2—Construction funding by the Task Force; the number of projects recommended to be funded for Phase 2—Construction is based upon the annual availability of construction funds.

CWPPRA as a Project Incubator for Other Restoration Programs

To capitalize on alternative funding streams, some projects conceptualized and designed by the CWPPRA program may be transferred to other restoration programs if CWPPRA lacks sufficient funding for construction. Examples of projects designed by CWPPRA that have been transferred to other programs include the Grand Lake Shoreline Protection (ME-21) project (transferred to the Coastal Impact Assistance Program [CIAP]) and the Chenier Ronquille Barrier Island Restoration (BA-76) project (transferred to Phase III of the DWH Early Restoration Plan).



Grand Lake Shoreline Protection (ME-21) Project

CWPPRA designed the Grand Lake Shoreline Protection (ME-21) project (fig. 1), but funds were not immediately available for construction. The project consists of a 38,700-linear-foot segmented rock breakwater along the southern Grand Lake shoreline and a 5,700-foot breakwater at Tebo Point, La. CWPPRA transferred the 38,700-foot rock dike segment feature to the State, which constructed that portion with CIAP program funds. CWPPRA will construct the remaining 5,700-foot rock dike at Tebo Point and maintain the entire project. Dredged material from access canal dredging was placed between the rock and shoreline restoring marsh. Shoreline loss (11 to 32 feet per year) would be prevented, and marsh would be restored to benefit 495 acres of fresh and intermediate marsh.

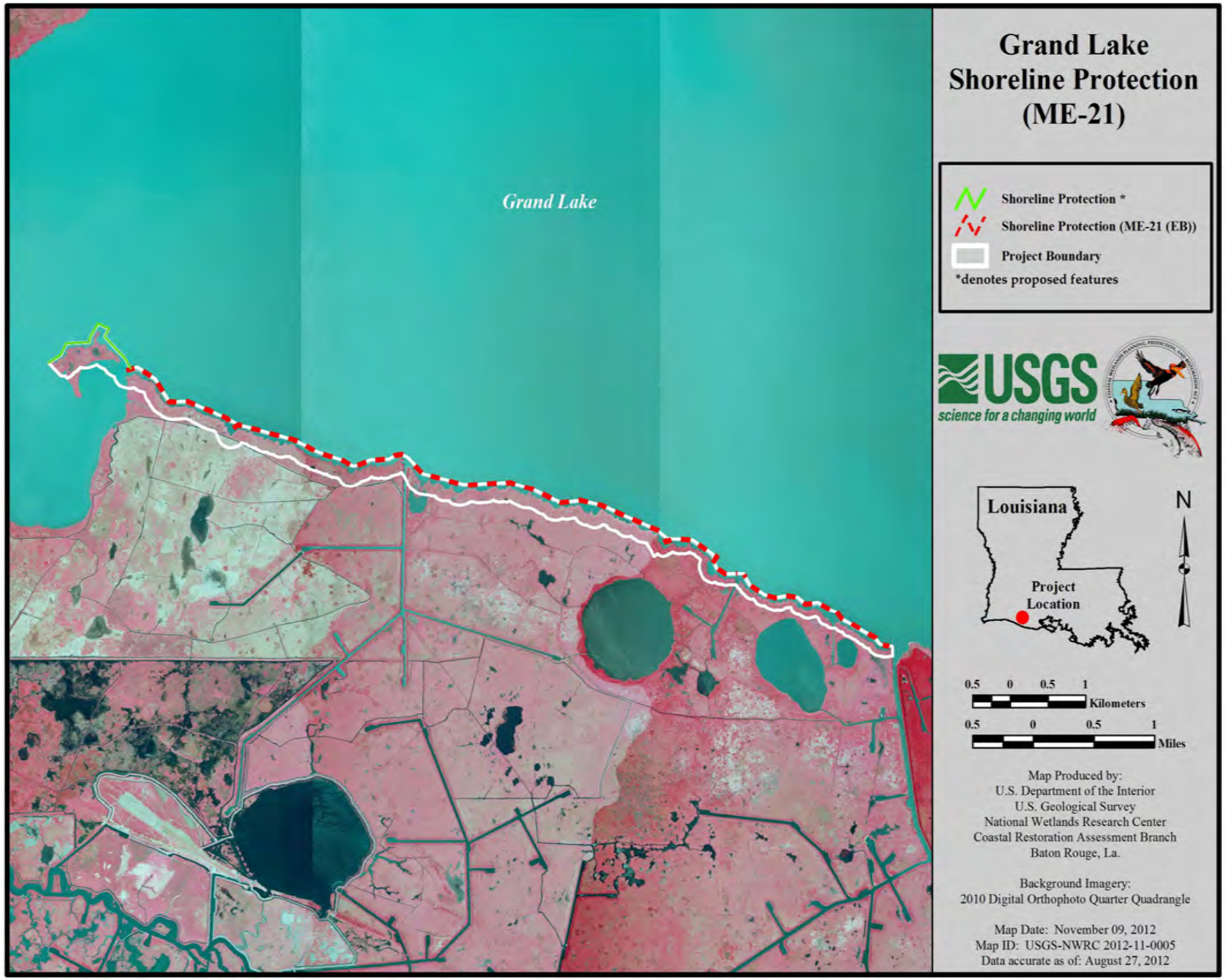


Figure 1. Grand Lake Shoreline Protection (ME-21) project features.

Chenier Ronquille Barrier Island Restoration (BA-76) Project

CWPPRA transferred the fully designed Chenier Ronquille Barrier Island Restoration (BA-76) project (fig. 2) to Phase III of the DWH Early Restoration Plan in 2015 as a "shovel-ready" project ideally situated to address injuries caused by the DWH spill. This project could restore and revegetate approximately 127 acres of beach/dune fill and approximately 259 acres of marsh creation/nourishment (total 386 acres).

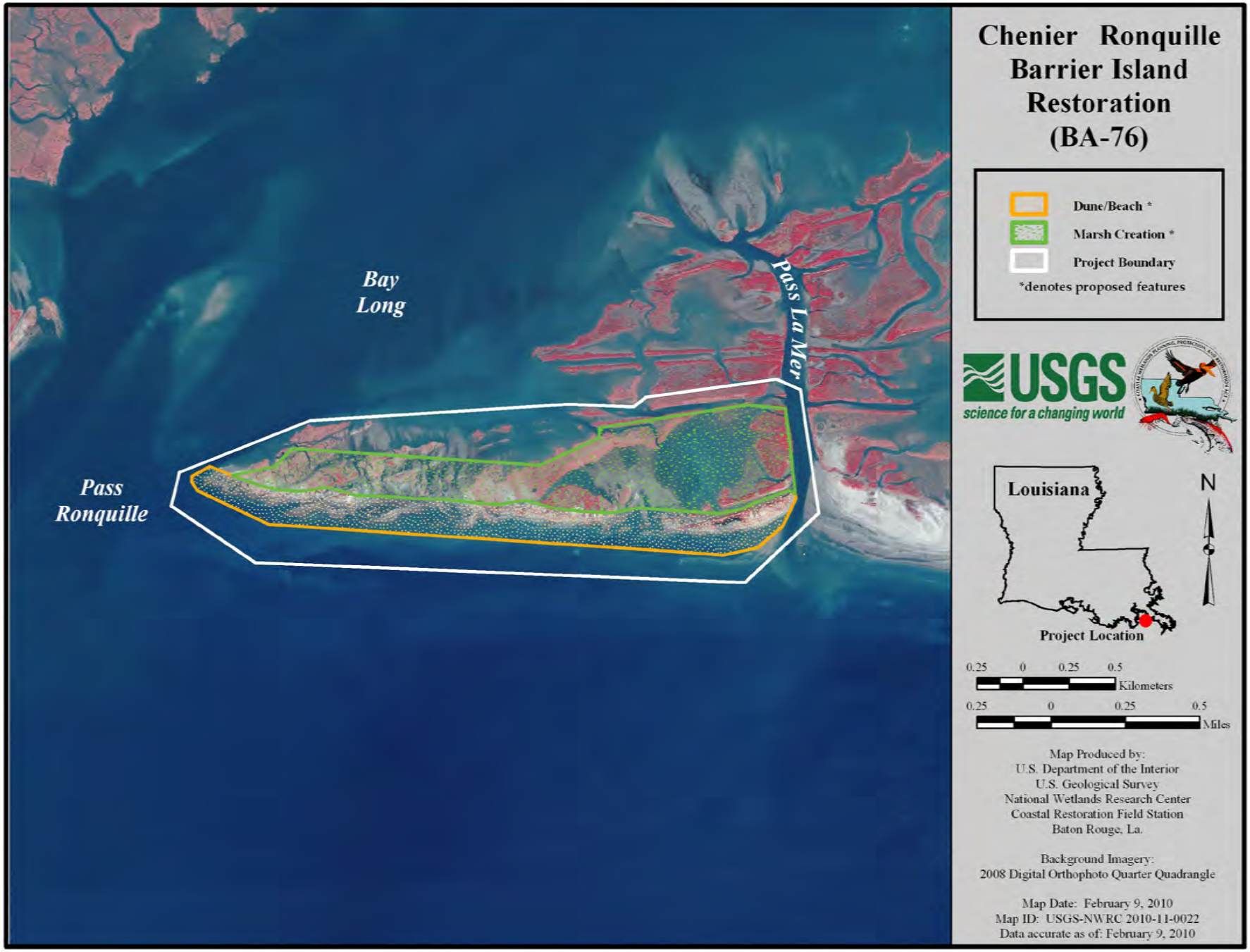


Figure 2. Chenier Ronquille Barrier Island Restoration (BA-76) project features.

CWPPRA Project Expansions and Partnerships

Projects constructed under CWPPRA may be expanded through the use of CWPPRA or other funding sources. These efforts result in expanded benefits and reduced costs to all parties by utilizing already in-place project infrastructure. Examples of expanded CWPPRA projects include Lake Hermitage Marsh Creation (BA-42) project (expanded by Phase I of the DWH Early Restoration Plan and by surplus project funds). The Bayou Dupont Marsh and Ridge Creation (BA-48) project is being constructed ***in partnership*** with Louisiana's Long Distance Sediment Pipeline Project.

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 the sum of their individual projects. This type of synergy is also seen within the Barataria Basin, where constructed projects work together to restore the structural integrity of the critical Barataria Basin Landbridge landform (which is undergoing high land loss), as well as protect strategic marshes south of New Orleans (fig. 3). These projects are demonstrating how small- to mid-scale projects are working collectively to generate large-scale results.

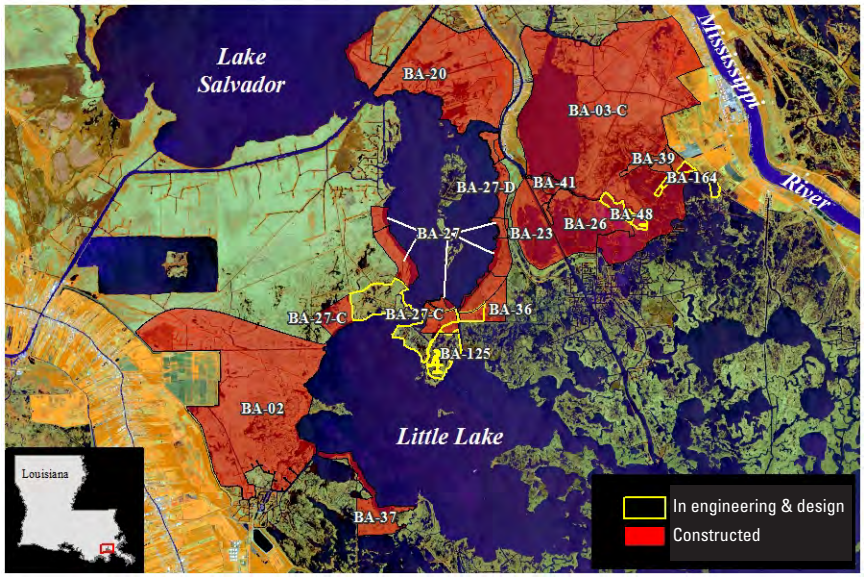


Figure 3. Barataria Basin Landbridge projects work synergistically to restore a larger area.

How CWPPRA Fits Into the Current Coastal Louisiana Restoration Landscape

Louisiana's coastal restoration landscape is very different from that in 2006. After the historic Hurricanes Katrina and Rita in 2005, other restoration programs such as the CIAP, Louisiana Coastal Area (LCA), and Louisiana Coastal Protection and Restoration (LaCPR) programs were being developed and implemented (fig. 4). These programs have either ended, had programmatic challenges that prevented them from being fully developed, or lacked sufficient funding to continue significant restoration efforts; nevertheless, CWPPRA has remained a consistent and indispensable source of restoration funding.

DWH coastal restoration funding programs include DWH Natural Resource Damage Assessment (NRDA), National Fish and Wildlife Foundation (NFWF) Gulf Environmental Benefit Fund, and the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act).

Other current non-CWPPRA coastal restoration programs in Louisiana include the Gulf of Mexico Energy Security Act (GOMESA) of 2006, the CIAP, and State-only restoration. The comprehensive LaCPR program was

superseded by the joint Federal-State LCA program. Currently, the LCA consists of 15 near-term projects, 3 programs, and 1 long-term study. Since other Louisiana coastal restoration programs exist, the Task Force approved the following CWPPRA roles in working with those programs for the protection and restoration of Louisiana's coast:

1. As the only joint Federal-State restoration program with a regular recurring funding stream, CWPPRA will continue to design and construct coastal restoration projects in coordination with other Louisiana coastal restoration programs. CWPPRA will examine the near-term plans of other programs and channel projects to areas of need, consistent with the current State Master Plan (CPRA, 2012).
2. CWPPRA will continue to be an "incubator" of projects to be transferred to other coastal restoration programs for construction. Some CWPPRA projects have been transferred to other programs, and some of the 22 projects currently in Phase 1—Engineering and Design are candidates for future transfer if not constructed by CWPPRA.
3. The Task Force stands ready and has a vision to increase its coastal restoration contribution to reestablishing a sustainable coastal Louisiana ecosystem with increased funding resources. CWPPRA has 25 years of restoration experience in designing and constructing more than 100 coastal restoration projects approved by a multiagency Task Force.
4. CWPPRA will continue to evaluate innovative technologies and techniques and test their applicability in coastal Louisiana by designing and constructing demonstration restoration projects.
5. CWPPRA will continue to provide the appropriate level of project monitoring. The Coastwide Reference Monitoring System (CRMS) and project-specific monitoring programs increase the body of scientific data, allow us to evaluate constructed projects, and inform how we plan and design future restoration projects.

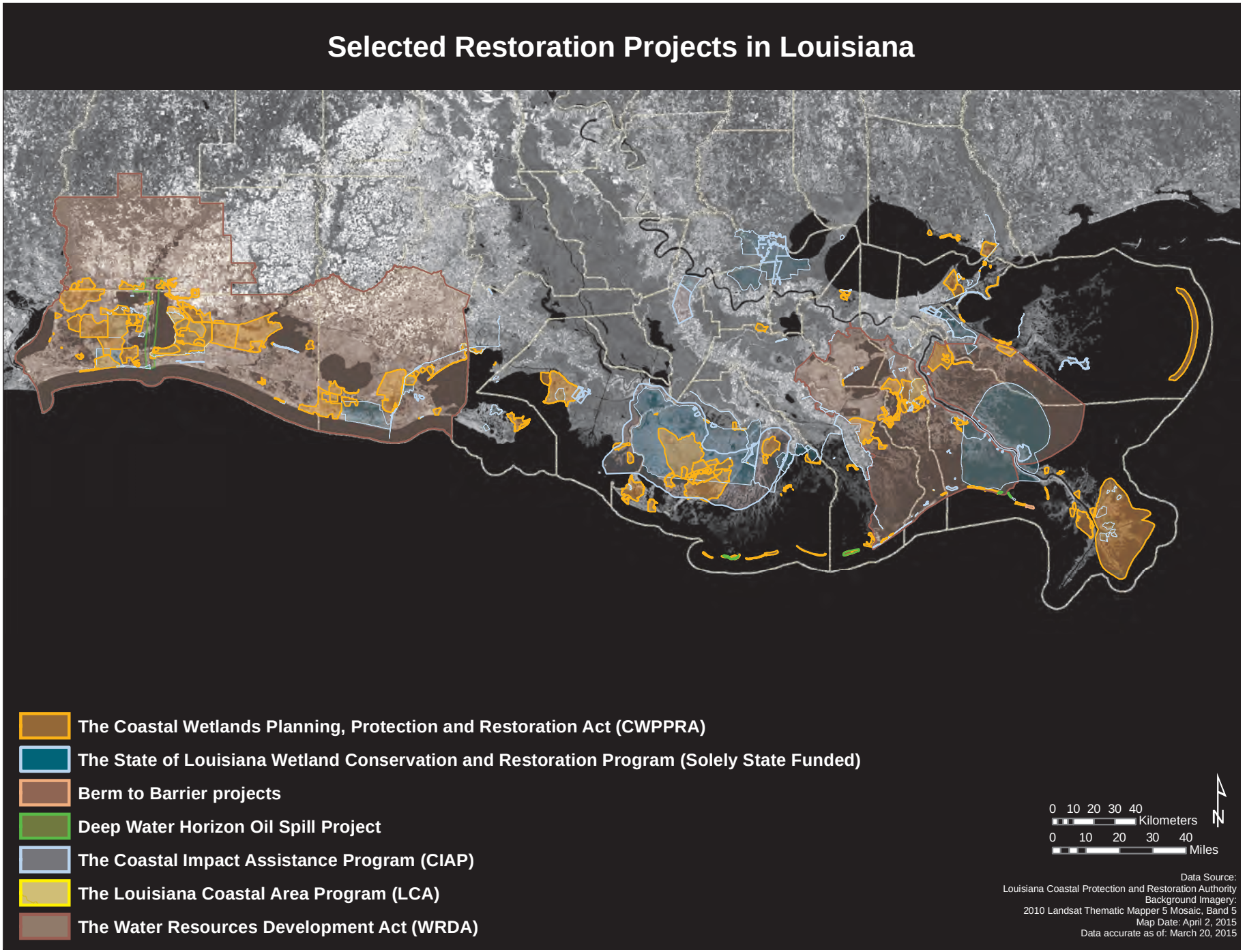


Figure 4. Louisiana coastal restoration program projects.

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 [CPRA, 2012]) 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 each). 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 nongovernmental organization (NGO) representatives. The Task Force, at its June 5, 2012, meeting, modified the PPL process by requiring that future CWPPRA projects nominated be consistent with the Master Plan. The State and FDT are currently developing the 2017 Louisiana Comprehensive Master Plan, which will be completed in spring 2017.

CWPPRA Projects Reaching Their 20-Year Lives

Current CWPPRA standard operating procedures provide for a 20-year life for all projects, after which time the project would be closed and all funding would end. This was decided because it was recognized that the amount of funding received would not allow the program to maintain projects indefinitely. Two of the 101 constructed projects will reach their 20-year lives in 2015, one in 2016, and six in 2017. The Task Force is currently reviewing projects nearing their 20-year lives to provide recommendations for closeout or continuance. The four possible future path scenarios established by the Task Force for projects reaching their 20-year lives are (1) close out, (2) close out and remove features, (3) transfer the project to another entity, or (4) extend the project life with or without operations and maintenance.

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 Trust Fund, currently $78.6 million (fiscal year 2015). 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 that has been continued by Congress to 2015.

CWPPRA Reauthorization

CWPPRA is currently authorized until 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.

RESTORE Act

In July 2012, in response to the DWH oil spill and other environmental challenges in the Gulf Coast region, Congress passed the RESTORE Act, which (1) establishes the Gulf Coast Restoration Trust Fund (Gulf Coast Trust Fund), (2) outlines a Gulf Coast Trust Fund use structure, and (3) establishes the Gulf Coast Ecosystem Restoration Council (Council). Figure 5 depicts the Gulf Coast Trust Fund's funding allocations (Gulf Coast Ecosystem Restoration Council, 2014).

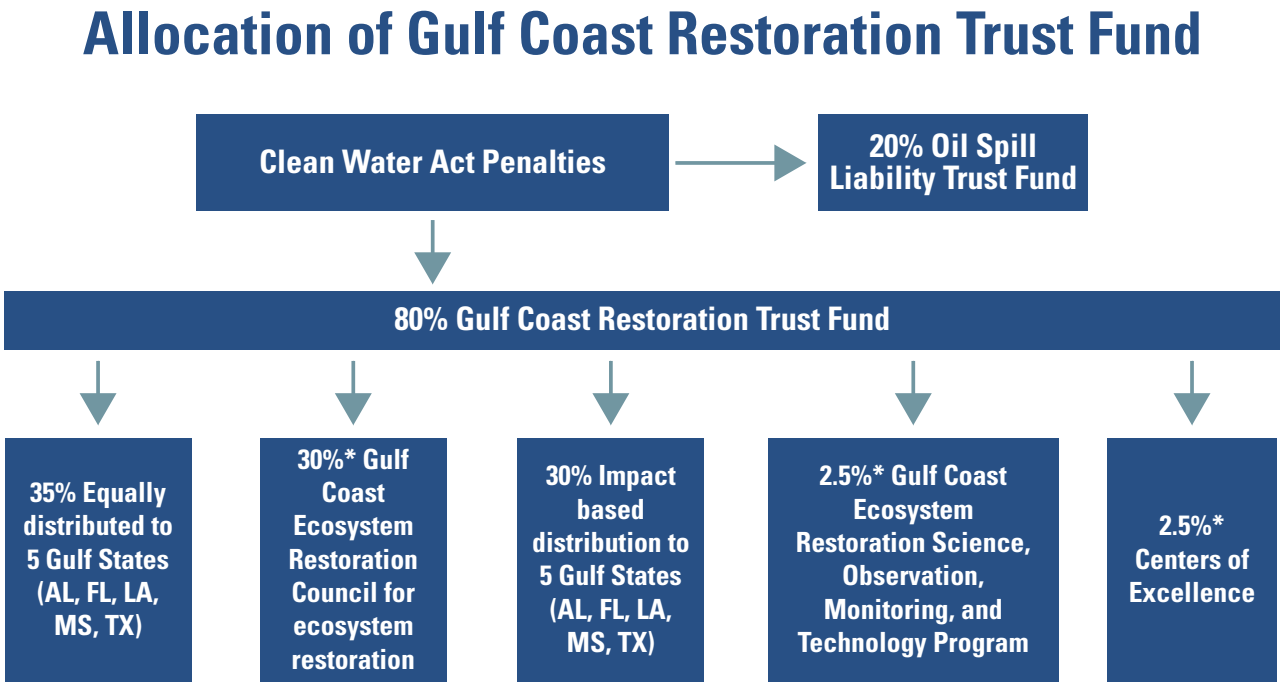


Figure 5. Allocation of Gulf Coast Restoration Trust Fund. (Source: http://www.restorethegulf.gov/sites/default/files/About%20the%20Council%20Fact%20Sheet%20Oct%202014_1.pdf.)

CWPPRA's Benefits to Fish and Wildlife

CWPPRA has protected and restored approximately 88,400 acres of Louisiana's vanishing coastal wetlands in its first 25 years. Those restored swamps, marshes, and barrier islands/headlands and associated open-water habitats provide foraging, nesting, breeding, wintering, escape cover, and nursery habitat for a myriad of coastal fish and wildlife, including threatened and endangered, at-risk, and rare species, as well as commercially and recreationally valuable species and State and national fish and wildlife trust resources.

Louisiana's coastal wetlands provide habitat for hundreds of species of birds, mammals, and reptiles and a variety of freshwater and estuarine-dependent fish and shellfish. Habitats restored through CWPPRA have aided in the delisting of our national symbol, the bald eagle, and the Louisiana State bird, the brown pelican, from the endangered species list. These coastal wetlands contain some of the most biologically diverse wildlife habitats in the Nation. Located at the termini of the Mississippi and Central Flyways, south Louisiana provides annual wintering habitat for more than 5 million waterfowl and habitat for Neotropical migrant birds. Table 1 lists some of the threatened and endangered and at-risk/rare species found in the Louisiana's coastal zone.

Louisiana's protected and restored coastal wetlands also provide habitat that benefits dabbling and diving ducks, geese, other migratory and resident birds, and mammals, reptiles, and amphibians (table 2).

Most of the economically important saltwater fishes and crustaceans harvested in Louisiana spawn offshore, and then the larvae and juveniles forage in highly productive estuarine areas in or adjacent to restored marshes that provide nursery habitat by accessing the estuaries during incoming tides. Those estuarine-dependent smaller and juvenile fisheries species (e.g., red drum, spotted sea trout, and Atlantic croaker) contribute to the estuarine food web by serving as prey for predators and highly migratory species (e.g., billfishes and sharks) (table 3).

Louisiana's coastal wetlands provide habitat for the commercial trapping of the American alligator and furbearers (e.g., muskrat, mink, and otter) and natural areas for tourist activities such as bird watching, boating, swimming, and hiking.

CWPPRA Projects Benefit Fish and Wildlife Habitat

- **25,900 acres - fresh marsh/swamp**
- **21,700 acres - intermediate marsh**
- **19,000 acres - brackish/saline marsh**
- **6,200 acres - barrier islands/headlands**
- **15,700 acres - combined coastal habitats**

Table 1. Threatened, endangered, and rare species of the Louisiana coastal zone.

Coastal habitat	Threatened/endangered species	Rare species
Barrier islands/barrier headlands	piping plover, red knot, Kemp's ridley sea turtle, loggerhead sea turtle	*, **snowy plover, Wilson's plover, reddish egret, and gull billed tern *American oystercatcher, Caspian tern, sooty tern, and brown pelican **black skimmer, long-billed curlew, Hudsonian godwit, western sandpiper, stilt sandpiper, buff-breasted sandpiper, and short-billed dowitcher
Brackish or saline marshes	Louisiana eyed silkmoth (petitioned for listing)	*diamondback terrapin **seaside sparrow saltmarsh topminnow (NOAA/FWS species of concern)
Fresh-intermediate marshes - swamps		*bald eagle **wood stork, little blue heron, mottled duck
Coastal marshes	black rail (petitioned for listing)	*Peregrine falcon, sand hill crane, glossy ibis **king rail
Coastal bays/rivers	West Indian manatee	osprey
	Atlantic sturgeon (Lake Pontchartrain - Breton Sound)	*American swallow-tailed kite

*Louisiana Department of Wildlife and Fisheries (2015).

**U.S. Fish and Wildlife Service, Gulf Coast Joint Venture (2012). "The Gulf Coast Joint Venture (GCJV) is a bird habitat conservation partnership that spans the coastal portions of Alabama, Mississippi, Louisiana, and Texas. The GCJV mission is to advance conservation of important bird habitats through biological planning, implementation of habitat conservation activities, and evaluating the planning and implementation process through monitoring and research" (U.S. Fish and Wildlife Service, 2012).

Saving Wetlands Helps Threatened and Endangered Species

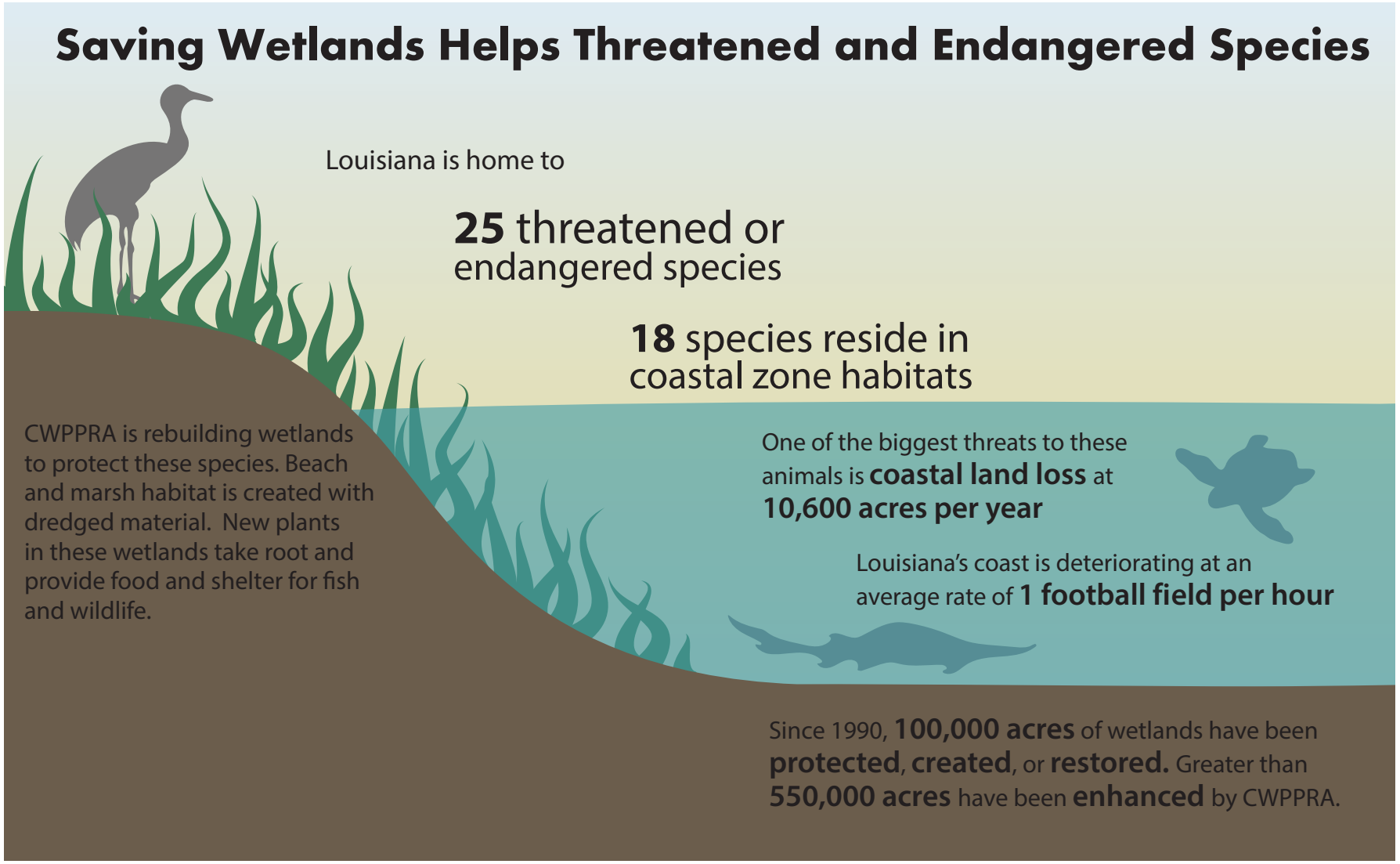


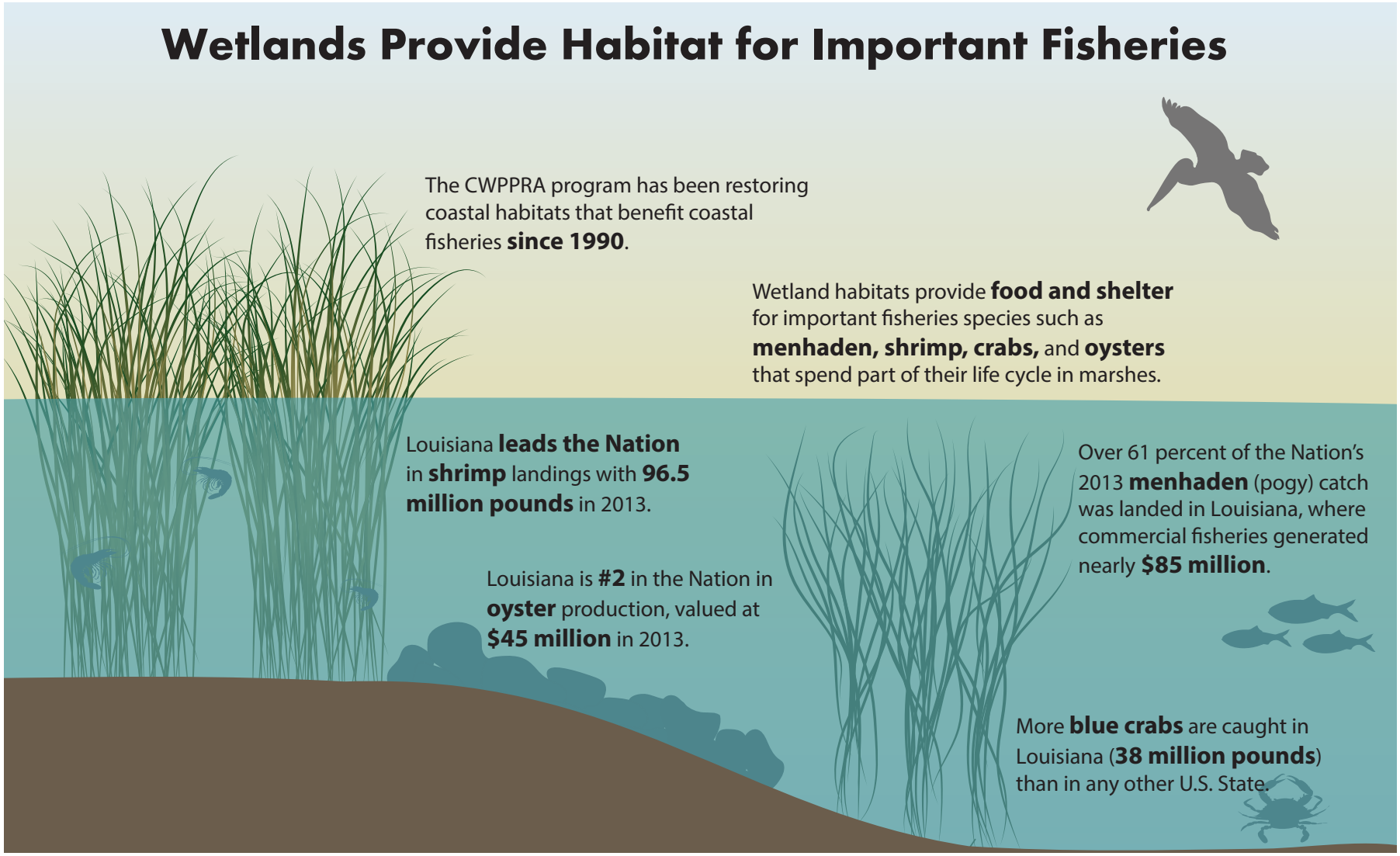
Table 2. Louisiana waterfowl, other migratory and resident birds, and mammals, reptiles, and amphibians benefited by CWPPRA projects.

Dabbling ducks	Diving ducks	Geese	Other migratory and resident birds	Mammals, reptiles, and amphibians
mallard, mottled duck, gadwall, American widgeon, pintail, northern shoveler, green-winged teal, and blue-winged teal	lesser scaup, ring-necked duck, and several merganser species	white-fronted geese, Canada geese, and snow geese	brown and white pelicans cormorants and anhingas Herons: great blue heron, little blue heron, bitterns, green-backed heron, yellow-crowned night heron, black-crowned night heron, great egret, snowy egret, glossy ibis, white-faced ibis, and white ibis Others: American coots, rails, gallinules, shorebirds, terns, boat-tailed grackle, red-winged blackbird, eastern kingbird, northern harrier, belted kingfisher, and songbirds	Mammals: Louisiana black bear, nutria, muskrat, mink, river otter, raccoon, swamp rabbit, coyote, and white-tailed deer Reptiles: American alligator, western cottonmouth, red-eared turtle, common snapping turtle, and soft-shell turtle Amphibians: tree frogs, bullfrog, pig frog, leopard frogs, and salamanders

Table 3. Commercially and recreationally important fisheries species benefited by CWPPRA projects.

Freshwater fisheries	Commercially important fisheries	Recreationally important estuarine species
largemouth bass, crappie, bluegill, gar, blue catfish, and shad crawfish and river and grass shrimp	Gulf menhaden, striped mullet, catfishes, gars, and freshwater drum brown and white shrimp, blue crab, Gulf stone crab, and the American oyster	spotted sea trout, white trout, red drum, black drum, Atlantic croaker, spot, southern flounder, snappers, mackerel, groupers, and sharks

Wetlands Provide Habitat for Important Fisheries



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:

Coastal Restoration Techniques


Freshwater Reintroduction


Marsh Creation Using Dredged Material


Hydrologic Restoration


Vegetative Planting


River Diversion via Siphons


Shoreline Protection


Marsh Management


Diversions


Discharge Pipe for Marsh Creation


Sediment & Nutrient Trapping/Terracing


Barrier Island Restoration

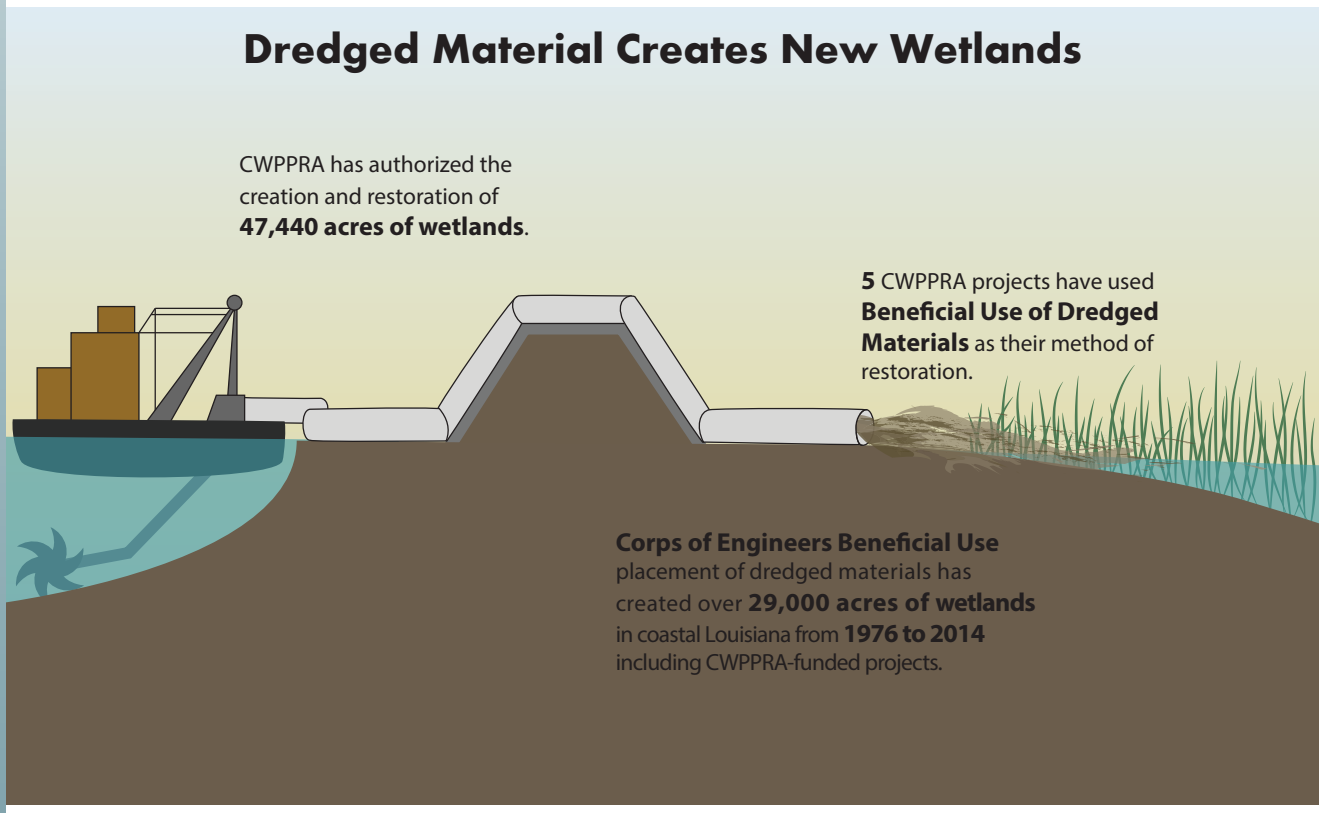

Ridge Restoration

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 from dedicated dredging (via hydraulic dredge) from bays, rivers, or the gulf to restore or nourish existing marsh. The dredged material slurry 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. The technique also includes "marsh nourishment," in which dredged material is placed over existing deteriorated marsh. The technique referred to as "beneficial use of dredged material" uses maintenance-dredged material from navigation channels "beneficially" to restore wetlands.



Freshwater and Sediment Diversions

Freshwater diversions use water control structures, 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 and its associated sediment and nutrients helps slow saltwater intrusion, slows or reverses the loss of marsh, and promotes the growth of new marsh. For sediment diversions, a gap (called a "crevasse") is cut into a river levee, allowing river water and sediment to flow into nearby wetlands to mimic the river's natural wetland-building processes. Sediment diversions promote the creation of new marsh in shallow open-water areas.

Shoreline Protection

Shoreline protection projects involve various techniques designed to decrease or halt shoreline erosion. Some techniques, such as foreshore rock dikes or revetments, are applied adjacent to or directly on the eroding shoreline. Other techniques, such as segmented rock breakwaters and wave-damping fences, are placed in the adjacent open water in order to decrease wave 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 salinity or water levels. On a larger scale, this technique may involve locks or gates on major navigation channels; on a smaller scale, it may involve blocking canals, cutting gaps in spoil banks that were created by canal dredging, or installing water control structures to control water levels and salinities. 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.


NEXT 250 FEET
CLOSED
TO ALL
ACTIVITIES
EXCEPT BOAT
PASSAGE

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 with gaps in shallow open-water areas to slow water flow and help trap sediment to rebuild and protect marsh.

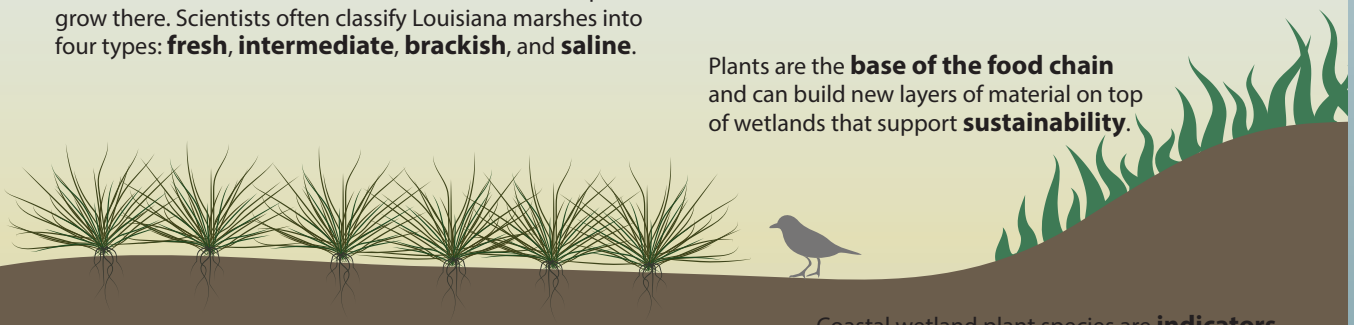
Vegetative Planting

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

Native Plants Create Healthy Wetlands

The amount of salt water in an area influences which plants grow there. Scientists often classify Louisiana marshes into four types: **fresh**, **intermediate**, **brackish**, and **saline**.

Plants are the **base of the food chain** and can build new layers of material on top of wetlands that support **sustainability**.



Site-appropriate plants are established to **reduce erosion**, **stabilize the soil**, and **accelerate wildlife habitat development**.

Coastal wetland plant species are **indicators** of soil and hydrologic conditions.

Wetland vegetation **reduces erosion** primarily by damping and absorbing wave and current energy and by binding and stabilizing the soil with roots.

CWPPRA Project Selection Process

On average, a CWPPRA project can go from concept to construction in 3 to 5 years. This ability is a result of the congressional authority delegated to the Task Force to both authorize and fund restoration projects without having to seek additional authorization, which would delay project construction for many years. As a result, the project selection process quickly selects projects that have the highest construction feasibility and public support, thereby streamlining project implementation. The interagency CWPPRA model enables multiple agencies to distribute the project load, leading to faster and more efficient construction.

Given CWPPRA's limited funding, the project selection process also generates more construction-ready projects than the program can afford to build. The Task Force adopted the Cash Flow funding program in 1998 that involves a two-step funding process: Phase 1—Engineering and Design and Phase 2—Construction. Projects must thus compete for funding twice. There are currently 22 projects in Phase 1—Engineering and Design. Although Congress, in 2004, reauthorized CWPPRA through 2019, the program will reach its capacity to authorize new projects within the next few years without reauthorization. This lack of capacity is due to the current commitment of future funding needed to construct existing authorized projects and to fund operations, maintenance, and monitoring for most constructed projects. The backlog of construction-ready CWPPRA projects 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. CWPPRA, therefore, becomes an "incubator" for some projects transferred to other programs.

Significant ecologic, economic, and political changes have occurred in south Louisiana since Hurricanes Katrina and Rita (2005) and Gustav and Ike (2008), the DWH oil spill (2010), and more recently Hurricane Isaac (2012). Despite those changes, 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 either complement projects being planned through other authorities or address 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 2015, 121 restoration projects have been constructed or are under construction in the CWPPRA program. Additionally, there are 22 projects currently undergoing engineering and design (Phase 1). These projects include diversions of freshwater and sediment to improve marsh vegetation; dredged material placement for marsh and ridge restoration; shoreline protection; sediment and nutrient trapping; hydrologic restoration through outfall, marsh, and delta management; and vegetative plantings.

The Task Force authorizes projects 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 12 new projects between 2013 (PPL 22) and 2015 (PPL 24) for Phase 1—Engineering and Design, which if constructed could result in an estimated net benefit of approximately 3,813 acres of wetlands (table 4).

In this 2013–2015 period, the Task Force also authorized five projects for Phase 2—Construction that are expected to result in an estimated net benefit of approximately 2,309 acres of wetlands (table 5). These five authorized construction projects are all marsh creation projects, one with a hydrologic restoration feature.

During project planning, projects are placed in one of the four ecologic regions or in a coastwide category if the project affects multiple ecoregions. 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). Tables 4 and 5 exhibit all 17 projects (12 in Phase 1 and 5 in Phase 2) authorized during this 2013–2015 reporting period. A map that illustrates these coastal regions with PPL 1–24 projects can be found at http://lacoast.gov/maps/allregions_ppl1-24_2015-03_lowres_web.pdf.

Table 4. CWPPRA projects authorized from 2013 to 2015 (PPL 22–PPL 24) for Phase 1—Engineering and Design.

Name	Project number	Project priority list (PPL)	Date authorized	Total net acres (reestablished and protected)	Marsh benefited	Ecologic region
Bayou Dupont Sediment Delivery Marsh Creation No. 3	BA-164	22	24-Jan-13	383	Brackish	2
Terracing & Marsh Creation South of Big Mar	BS-24	22	24-Jan-13	303	Fresh to intermediate	2
North Catfish Lake Marsh Creation	TE-112	22	24-Jan-13	401	Brackish	3
Cameron Meadows Marsh Creation and Terracing	CS-66	22	24-Jan-13	264	Brackish to Intermediate	4
Caminada Headlands Back Barrier Marsh Creation	BA-171	23	16-Jan-14	181	Saline	2
Bayou Grande Cheniere Marsh and Ridge Restoration	BA-173	23	16-Jan-14	264	Brackish	2
South Grand Chenier Marsh Creation—Baker Tract	ME-32	23	16-Jan-14	393	Brackish	4
Island Road Marsh Creation and Nourishment	TE-117	23	16-Jan-14	312	Brackish	3
New Orleans Landbridge Shoreline Stabilization and Marsh Creation	PO-169	24	22-Jan-15	167	Brackish	1
Shell Beach South Marsh Creation	PO-168	24	22-Jan-15	344	Brackish	1
West Fourchon Marsh Creation and Nourishment	TE-134	24	22-Jan-15	304	Saline	3
No Name Bayou Marsh Creation and Nourishment	CS-78	24	22-Jan-15	497	Saline	4
Total = 12 projects			**Total Net Acres = 3,813**			

Table 5. CWPPRA projects authorized from 2013 to 2015 (PPL 22–PPL 24) for Phase 2—Construction.

Name	Project number	Project priority list (PPL)	Date authorized	Total net acres (reestablished and protected)	Marsh benefited	Ecologic region
Bayou Bonfouca Marsh Creation	PO-104	20	24-Jan-13	478	Brackish	1
Lost Lake Marsh Creation and Hydrologic Restoration	TE-72	19	24-Jan-13	452	Brackish and Intermediate	3
South Grand Chenier Marsh Creation	ME-20	11	16-Jan-14	414	Brackish and Intermediate	4
Cameron Creole Watershed Grand Bayou Marsh Creation	CS-54	20	22-Jan-15	476	Saline	4
Oyster Bayou Marsh Restoration	CS-59	21	22-Jan-15	489	Saline	4
Total = 5 projects			**Total Net Acres = 2,309**			

Examples of Recently Constructed Significant and Strategic Projects

The following three projects represent examples of significant and strategic marsh restoration through CWPPRA.

Lake Hermitage Marsh Creation (BA-42) Project

URL: http://lacoast.gov/reports/gpfs/BA-42.pdf

Restoration Strategy: The original project goal was to restore 549 acres, but additional CWPPRA funding allowed the Lake Hermitage project to construct the West Pointe a la Hache Marsh Creation (BA-47) project—an additional 246 acres for a total of 795 acres to be restored through the CWPPRA program. An additional 104 acres was created by DWH Early Restoration Natural Resource Damage Assessment (NRDA) program funding, and another 111 acres of marsh creation was constructed by State-only funds, bringing the total area restored to 1,007 acres (fig. 6). The marsh creation and 6,300-linear-feet of Lake Hermitage shoreline restoration were accomplished by using material dredged from a Mississippi River borrow area. The project is a good example of a multiprogram partnership among CWPPRA, DWH NRDA, and the State of Louisiana.

- **Approved Date: 2006**
- **Project Area: 1,846 acres (1,634 acres CWPPRA), 212 acres (State and NRDA DWH Early Restoration)**
- **Approved Funds: $38 million (CWPPRA only)**
- **Total Est. Costs: $50.3 million ($38 million CWPPRA plus $12.3 million State and NRDA)**
- **Net Benefit after 20 Years: 831 acres**
- **Status: Completed**
- **Project Type: Marsh Creation**
- **PPL#: 15**
- **Sponsors: USFWS and CPRA**

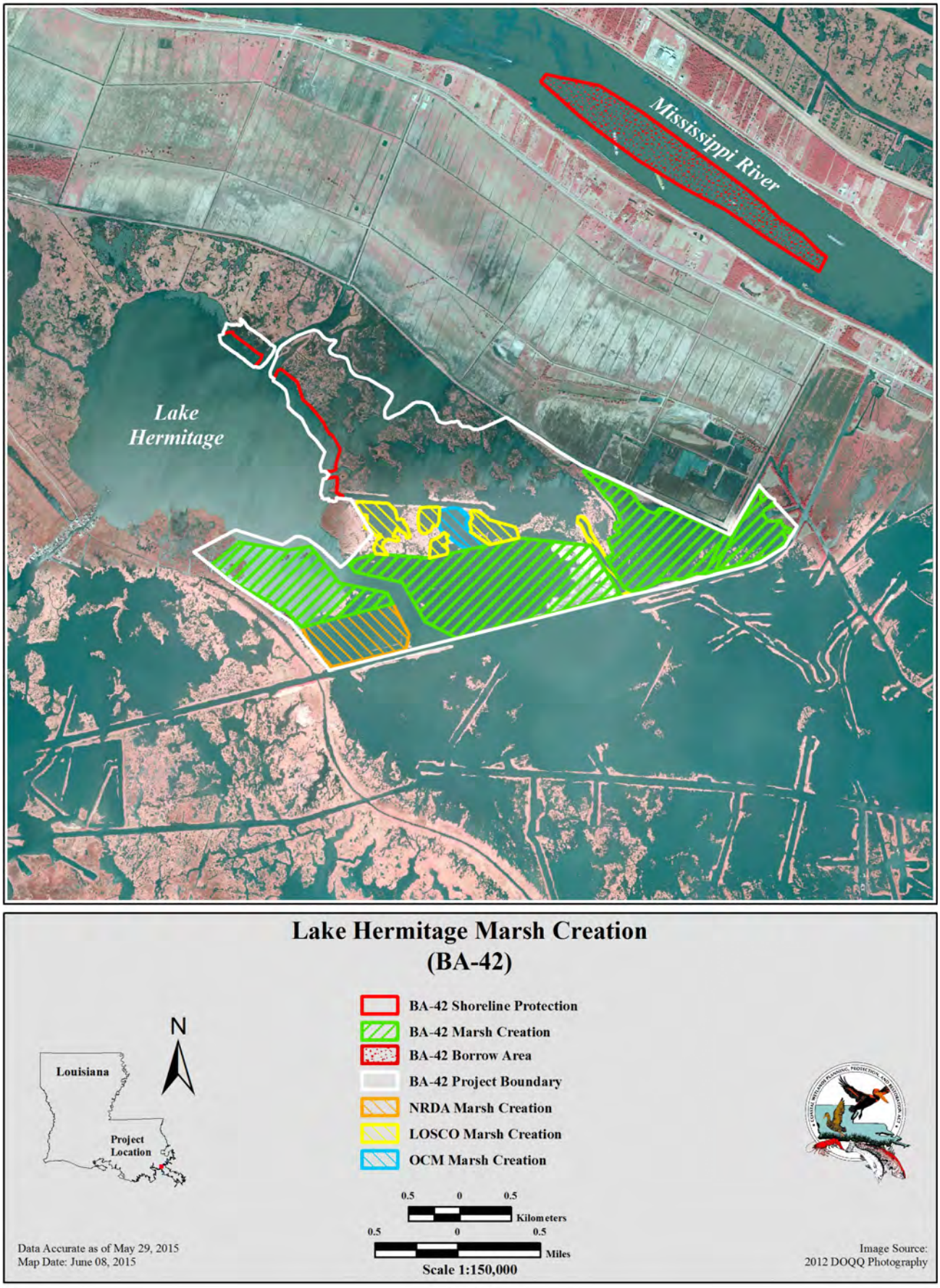


Figure 6. Lake Hermitage Marsh Creation (BA-42) project map.

Sabine Refuge Marsh Creation Cycles 4 and 5 (CS-28-4-5) Project

URL: http://lacoast.gov/reports/gpfs/CS-28-4-5.pdf

Restoration Strategy: The revised project (fig. 7) restored an estimated 1,000 acres of brackish marsh on Sabine National Wildlife Refuge north of Brown Lake and in Unit 1A south of Hackberry, La. The original project goal was to restore approximately 462 acres of marsh in Cycles 4 and 5 (north of Brown Lake) through the beneficial use of dredged material from USACE Calcasieu Ship Channel maintenance dredging. An additional 412 acres of marsh creation was constructed in Sabine National Wildlife Refuge Unit 1A with funds from the Port of Lake Charles and surplus CWPPRA project funds, restoring a total of 874 acres. Another 200 or more acres of marsh are expected to develop on project-constructed mud flats that have formed adjacent to the marsh creation cells by sediment flowing over retention dikes, resulting in more than 1,000 acres restored. Sediment from the ship channel was hydraulically pumped to the project site through the CWPPRA-funded permanent pipeline south of Hackberry to construct the marsh features in four cells.

- **Approved Date: 2011**
- **Project Area: 1,000 acres**
- **Approved Funds: $10.3 million**
- **Total Est. Costs: $10.3 million**
- **Net Benefit after 20 Years: 1,016 acres**
- **Status: Completed**
- **Project Type: Marsh Creation (using Calcasieu Ship Channel maintenance dredged material)**
- **PPL#: 8**
- **Sponsors: USFWS, USACE, CPRA**

West Belle Pass Barrier Headland Restoration (TE-52) Project

URL: http://lacoast.gov/reports/gpfs/TE-52.pdf

Restoration Strategy: The project restored an estimated 183 acres of beach and dune and another 227 acres of back barrier marsh (total 410 acres) with dredged material from the Gulf of Mexico (fig. 8). The headland was undergoing shoreline erosion rates of more than 100 feet per year. This project helped reestablish the West Belle Pass headland by rebuilding a large portion of the beach, dune, and back barrier marsh. Approximately 10,000 feet of beach and dune was restored by using 2.8 million cubic yards of dredged sand, and 227 acres of marsh habitat was rebuilt by using 1.4 million cubic yards of dredged material. This project protects both West Belle Pass and Port Fourchon from erosion. Port Fourchon is an important oil and gas port for servicing Gulf of Mexico exploration and production rigs and platforms.

- **Approved Date: 2009**
- **Project Area: 410 acres**
- **Approved Funds: $41.5 million**
- **Total Est. Costs: $42.2 million**
- **Net Benefit after 20 Years: 305 acres**
- **Status: Completed**
- **Project Type: Barrier Headland Restoration**
- **PPL#: 16**
- **Sponsors: NMFS-CPRA**

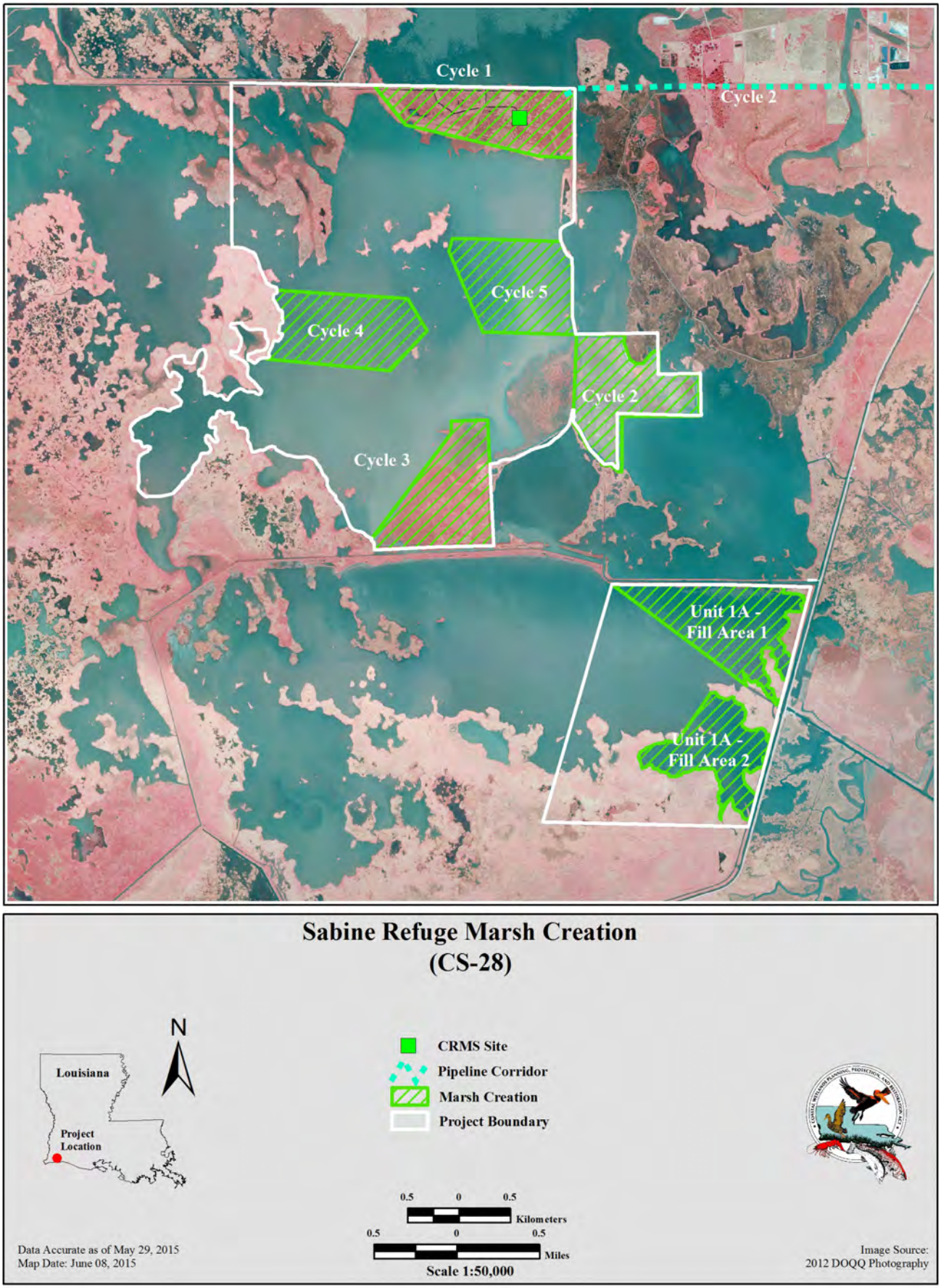


Figure 7. Sabine Refuge Marsh Creation (CS-28) cycles 1 through 5 project map. Note cycles 4 and 5 (CS-28-4-5).

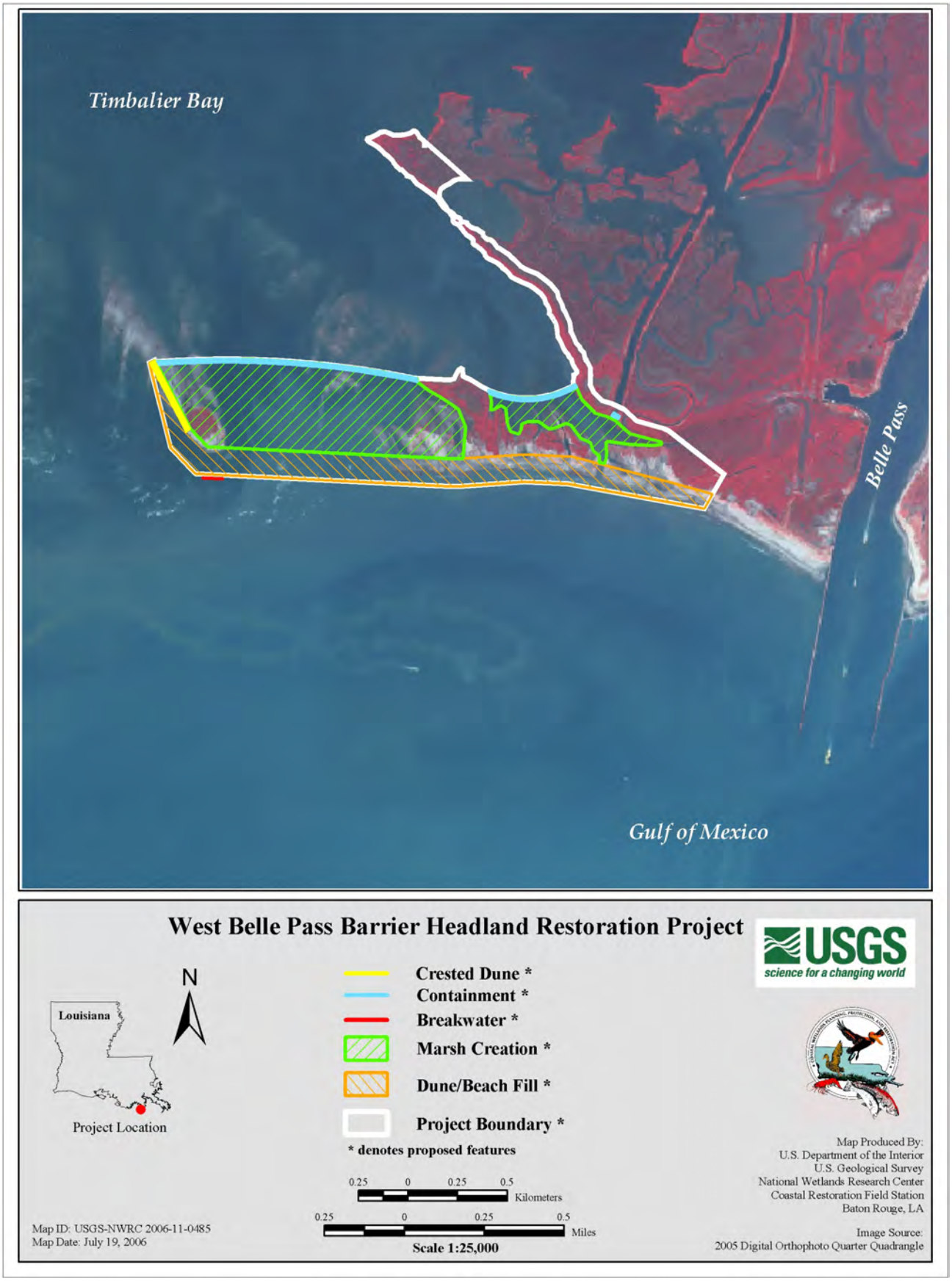


Figure 8. West Belle Pass Barrier Headland Restoration (TE-52) project map.

Evaluating the CWPPRA Program with Monitoring Data

CWPPRA legislation contained two monitoring mandates: to evaluate the effectiveness of individual restoration projects and to evaluate the effectiveness of the restoration program. From 1990 to 2003, CWPPRA projects and nearby reference areas were monitored to assess project effects versus reference conditions. Although this approach worked well initially, finding appropriate paired project and reference sites became increasingly difficult. Additionally, the introduction of large-scale restoration efforts reemphasized the need for a coastwide monitoring approach. The current CWPPRA monitoring program consists of project-specific and coastwide monitoring.

Coastwide Reference Monitoring System (CRMS)

In 2003, the CPRA and the U.S. Geological Survey (USGS) received approval from the CWPPRA Task Force to implement CRMS as a mechanism to monitor and evaluate the effectiveness of CWPPRA efforts at the project, basin, regional, and coastwide scales. The CRMS network is currently funded through CWPPRA with additional funding provided by the State of Louisiana in excess of their standard 15% matching funds required by law. CRMS provides data for a variety of user groups, including resource managers, academics, landowners, and decision makers. Project-specific monitoring is continued outside of CRMS at a smaller, project-level scale.

Approach and Design of CRMS

The CRMS approach gathers information from a suite of 391 sites that encompass a range of ecological conditions throughout the coastal area. 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 and response to disturbance. 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.

Peer-reviewed standard operating procedures for data collection and data quality assurance guarantee consistency of CRMS data across habitat types. The CRMS network monitors all coastal habitats except barrier islands, which are monitored on a project-specific basis. CRMS 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 3 years for landscape assessments of land-to-water ratios. Site construction and data collection began in 2005, with the entire network operational by 2007. 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 and development, 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 CPRA, all raw ecological data are available for download from the official CPRA online database, the Coastal Information Management System (CIMS) (http://cims.coastal.louisiana.gov), and may be categorized by project name, CRMS site, or station number.

The CRMS Web site mapping interface allows the user to visualize changes in the Louisiana coastal zone from the small CRMS site scale, to the larger CWPPRA project scale, basin, and regional scales. This user-friendly interface allows for easy viewing of information including photographs and data summaries, along with the ability to download data or request graphics for each data type collected, and includes a report card.

The CRMS report card uses data-derived ecological indices to determine the direction of change in the landscape, both positive and negative, for CRMS sites compared to other sites within the same marsh type (from fresh to salt marsh). Four primary indices are used in the report cards: hydrologic (water level and salinity), floristic quality (vegetation), submergence vulnerability (elevation change), and landscape (land loss). The CRMS report card features allow CWPPRA project managers to determine if specific projects are meeting their goals and how they respond to environmental and man-made disturbance. Given the substantial monetary investments in restoration and protection by the CWPPRA program, CRMS provides a robust monitoring system that enables multiple scale evaluations for a variety of user groups.

Evaluation Summaries of Selected CWPPRA Projects

To ascertain the science behind the CRMS monitoring data and the overall effectiveness of the restoration program, scientific evaluations of the following six CWPPRA projects (table 6) were chosen to be presented in this report.

Table 6. A few selected and monitored CWPPRA projects highlighted in this report.

Name	Project number	Federal sponsor	Project type	Location	Construction date
East Mud Lake Marsh Management	CS-20	NRCS	Marsh Management	Calcasieu Lake	1996
Bioengineered Oyster Reef Demonstration	LA-08	NMFS	Shoreline Protection, Oyster Reef	Rockefeller Refuge	2012
East Marsh Island Marsh Creation	TV-21	NRCS - EPA	Marsh Creation	Vermilion Bay	2010
North Lake Mechant Landbridge Restoration	TE-44	USFWS	Marsh Creation and Shoreline Protection	Lake Mechant	2008
Bayou LaBranche Wetland Creation	PO-17	USACE	Marsh Creation	Lake Pontchartrain	1994
Bayou Dupont Marsh Creation	BA-39	EPA	Marsh Creation	Barataria Bay	2009

East Mud Lake Marsh Management (CS-20) Project (CWPPRA PPL 2)

Project Description and Goals

The East Mud Lake Marsh Management (CS-20) project, completed in June 1996, is designed to reduce fluctuations in salinity and water level while providing adequate water flow from adjacent marshes to create a water regime conducive to the establishment and persistence of marsh vegetation in a 7,207-acre project area north of Holly Beach, La. The Calcasieu Ship Channel allows large volumes of high-salinity water to infiltrate marshes in the Calcasieu/Sabine Basin. The combination of increased salinity and high water-level fluctuations in the project area stressed the vegetation and led to interior marsh ponding and loss of sediment. The NRCS and CPRA are the Federal and State sponsors for this project, respectively. Project features included 18 water-control structures and repairs to 40,600 feet of levee and 5,000 linear feet of Mud Lake shoreline.

Two conservation treatment units (CTUs) were established. CTU 1 contains Mud Lake and is managed passively; CTU 2 is a large marsh area, northeast of Mud Lake, actively managed to encourage shallow open-water areas to convert to emergent vegetation (fig. 9). Managed drawdowns of water levels were conducted in CTU 2 for the first 2 years of the project life to promote vegetation expansion in open water areas of broken marsh and along shorelines (fig. 10). The goal of the project is to reduce wetland degradation by stabilizing hydrologic conditions to reduce vegetative stress caused by increased salinities and water levels. The objectives are to increase vegetative growth along shorelines and shallow open-water areas to decrease the rate of marsh loss, reduce water-level and salinity fluctuations to within acceptable target ranges for the establishment of brackish vegetation, increase soil accretion in CTU 2, and maintain fisheries abundance.

Project Assessment

The East Mud Lake (CS-20) project has been effective at decreasing the rate of marsh loss. Land loss rates decreased substantially after construction in CTU 2, decreasing from having the highest rate of land loss (-1.0% per year) among project and reference areas to being the only area to gain land through 10 years after construction (+0.2% per year), which included marsh loss from Hurricane Rita in 2005. The CS-20 project has been effective at increasing emergent vegetation in shallow open-water areas in CTU 2 (fig. 11). Dominant plant species composition changed over time to more salt-tolerant plants, especially in the project areas, from the brackish marshhay cordgrass (fig. 12) and three-corner bulrush to the more saline seashore saltgrass and leafy three-square bulrush.

The East Mud Lake project has been sustaining its hydrologic objective of reducing high water-level fluctuations and maintaining salinity within acceptable target ranges for brackish marsh relative to reference areas. This water-level control has led to more consistent conditions for vegetative growth and surface accretion. The hydrologic modifications did not negatively affect fisheries, as the project achieved its objective to maintain fisheries abundance. Resident fishes (e.g., red drum) and crustaceans (e.g., grass shrimp) were generally more abundant in the project area, and transient fishes (e.g., speckled trout, Gulf menhaden, bay anchovy) and crustaceans (e.g., white shrimp, brown shrimp, blue crab) were generally more abundant in the reference area prior to and 5 years after project construction.

Accretion (soil elevation increase) in CTU 2 has increased since the beginning of the project, thereby achieving the project's surface elevation objective. The protected water conditions within the project area allow sediment to settle on the marsh surface rather than being exported by the strong outgoing tides. Thus, surface elevation increase in CTU 2 has outpaced relative sea-level rise (RSLR), whereas surface elevation change in Reference Area 2 (REF 2) is less than RSLR.

The project has achieved the main goal of preventing wetland degradation by reducing vegetative stress, thereby improving the abundance of emergent and submerged vegetation. This improvement has been achieved through water

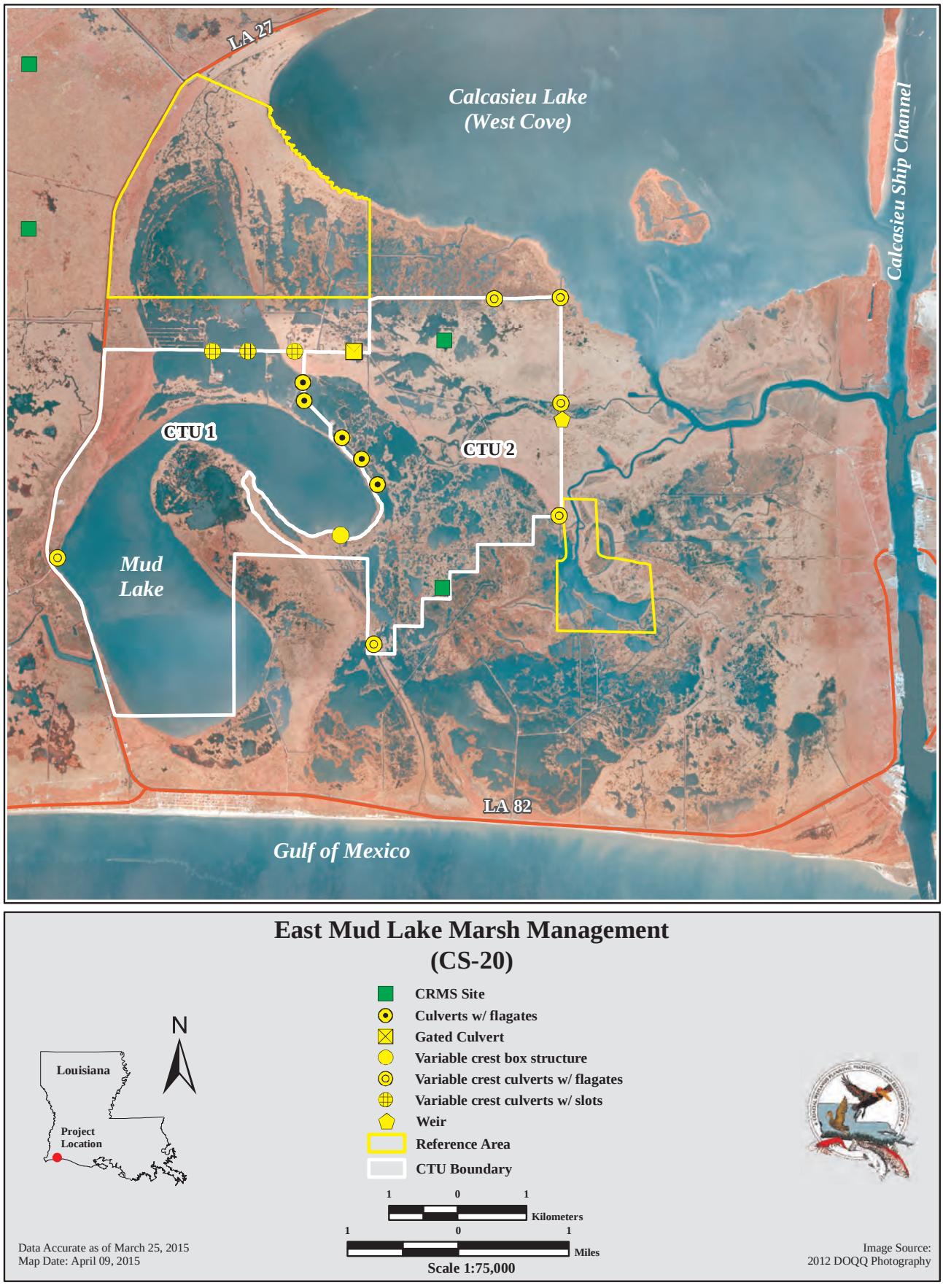


Figure 9. Map of the East Mud Lake Marsh Management (CS-20) project, completed in June 1996.

management structures to reduce water levels and salinities and through adaptive management to allow for the flushing of water after major climatic events such as droughts and storm surges when salinities greater than acceptable levels occur outside of the project area. Large ecological changes over time are driven by climatic conditions (droughts, flooding, hurricanes) occurring on a regional scale; during "calmer times" between regional-scale events, differences among project and reference areas are more distinctive, as the project areas typically have more moderate (less fluctuations) water levels and lower salinity, thereby providing conditions that reduce vegetative stress.

The East Mud Lake project restores and protects habitat for rare and at-risk species (e.g., glossy ibis, black rail, Louisiana eyed silkmoth, and diamondback terrapin) and Gulf Coast Joint Venture priority species (seaside sparrow and king rail), as well as wading birds and other marsh birds. The project also provides habitat for muskrat, raccoon, coyote, white-tailed deer, and the American alligator.

Figure 10. Structure No. 5 in the northwest corner of CTU 2 provides managed hydrologic connectivity between the East Mud Lake Marsh Management (CS-20) project area and Calcasieu Lake (background), which is connected to the higher salinities and water-level fluctuations of the Gulf of Mexico via the Calcasieu Ship Channel. This view is looking at the interior "marsh side" stop log header that controls water levels within the managed area.

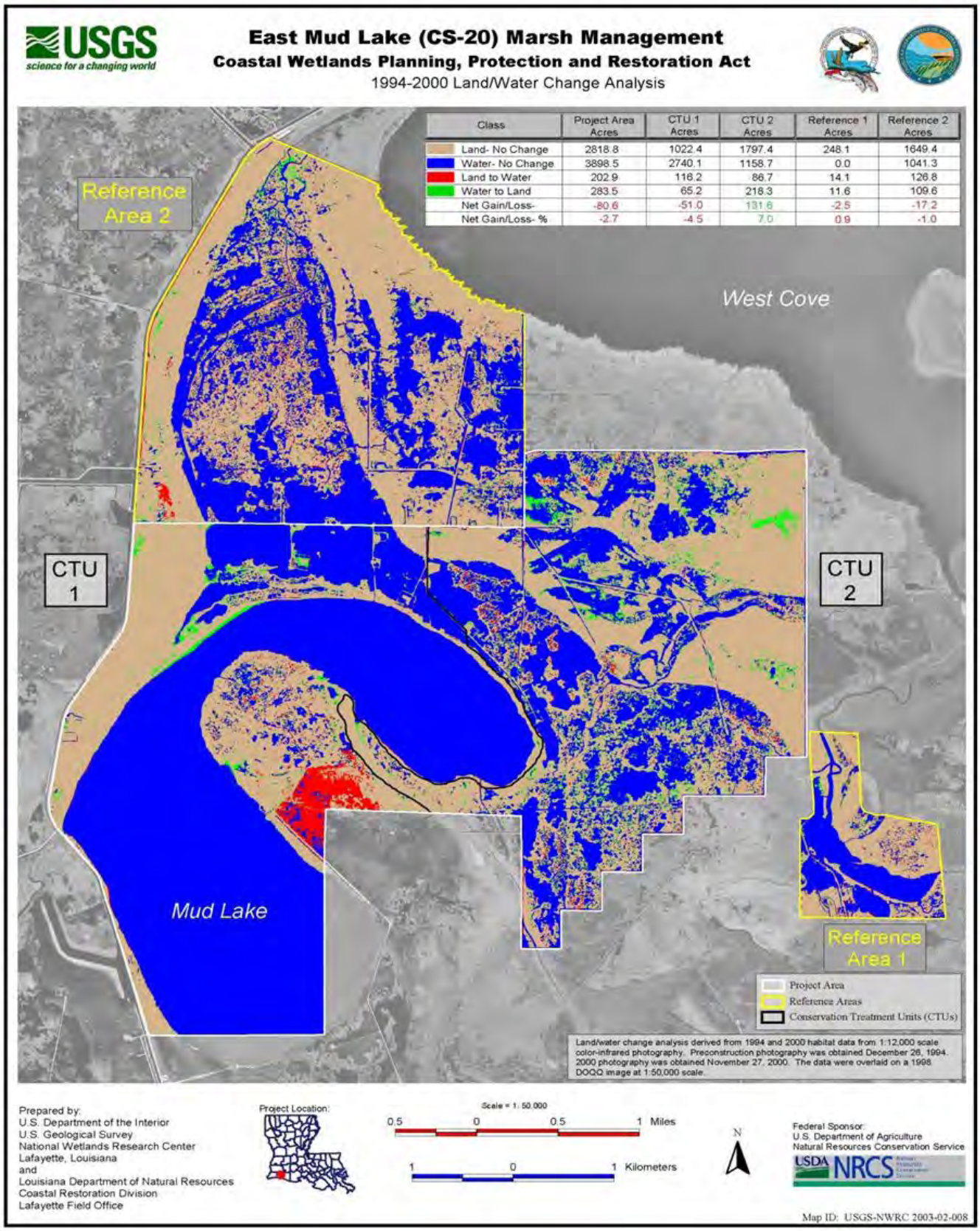


Figure 11. Land-water change analysis for East Mud Lake Marsh Management (CS-20) project from 1994 to 2000. Note marsh gains (green) within broken marsh and along larger ponds in CTU 2. The large swath of marsh loss (red) in CTU 1 was caused by a marsh fire that mostly recovered by 2006.

Figure 12. Photograph depicting healthy marshhay cordgrass marsh and a CRMS vegetative sampling site in the East Mud Lake Marsh Management (CS-20) project area.

Bioengineered Oyster Reef Demonstration (LA-08) Project (CWPPRA PPL 17)

Project Description and Goals

The Bioengineered Oyster Reef Demonstration (LA-08) project, federally sponsored by the NOAA-NMFS, is testing the Oysterbreak™ system patented by Oyster Restoration Advancement Technologies, LLC, as an alternative to rock breakwaters to prevent shoreline erosion. Weak soils along the Louisiana coastline are a prominent problem as the Gulf of Mexico and bays erode marshes. The 17-mile-long Rockefeller Wildlife Refuge shoreline (fig. 13) undergoes among the highest rate of erosion, 40 feet per year, along the northern Gulf of Mexico. The diminished shell hash beach is reworked by waves and rolled onto the marsh where it smothers and kills the vegetation, which then easily erodes into the gulf when the shell hash is rolled back by each successive winter storm. Subsequently, the water bottoms along the shoreline are old marsh platforms classified as very soft clay with a weight-bearing capacity too weak to hold the weight of rock used in traditional breakwaters.

Oysterbreak, an artificial reef composed of interlocking concrete rings designed to break waves and provide habitat for oyster colonization, is less dense than traditional rock breakwaters. Two 215-foot-long by 40-foot-wide Oysterbreak reefs separated by a 130-foot-wide gap were installed at the Rockefeller Wildlife Refuge southwest shoreline near St. Josephs Harbor Canal in February 2012 (fig. 14*A*). The project goal is to reduce shoreline erosion, and its objectives are to (1) reduce wave energy reaching the shoreline by 50% during average conditions and (2) provide habitat for oyster colonization (fig. 14*B*). Each reef is composed of a different type of concrete to assess oyster colonization preference. Standard weight concrete, used for Oysterbreak–East, is being compared to OysterKrete©, a darker, more porous concrete designed to enhance oyster colonization, used for Oysterbreak–West.

Project Assessment

Oyster settlement on the Oysterbreak structures was negligible a year and a half after construction. The designed elevation of the reefs was intended to match the average Gulf of Mexico sea level in this area; however, Oysterbreak–East was constructed 0.4 foot higher than Oysterbreak–West because of

natural gulf water bottom variability. Differences between the Oysterbreak reefs for shoreline change and wave attenuation are attributable to the elevation differences, as Oysterbreak–West is submerged 33% more often than is Oysterbreak–East, as determined by water levels measured at a nearby CRMS site (2012–2013).

The shoreline erosion rate along the entire Oysterbreak protected area was 69% less than along the unprotected reference area through 1.5 years after construction. Within the Oysterbreak area, land formed behind the Oysterbreak reefs, while erosion continued around the ends and between the reef structures (fig. 15).

Wave transmission was monitored behind each Oysterbreak reef and along the reference area 6 months after construction. The objective of reducing wave heights reaching the shoreline by 50% was met by both Oysterbreak reefs. Waves were reduced 66% by Oysterbreak–West, 72% by Oysterbreak–East, and 36% as they approached the reference/unprotected shore due to its natural slope.

Both Oysterbreak reefs are providing habitat for oyster colonization. Twenty months after construction, oysters are growing at a healthy rate (fig. 16). At the demonstration project midpoint, no significant differences in oyster productivity have been observed between the standard weight concrete and OysterKrete Oysterbreak reefs.

The Bioengineered Oyster Reef Demonstration project protects the gulf shoreline to benefit the threatened piping plover and red knot, at-risk species (diamondback terrapin, snowy plover, Wilson's plover, and brown pelican), and Gulf Coast Joint Venture priority species (seaside sparrow, glossy ibis, and king rail). The project benefits shoreline and marsh habitat for other wading birds, shorebirds, and important higher salinity estuarine fisheries species (e.g., spotted sea trout, red drum, and Gulf menhaden), as well as blue crab and the American oyster.

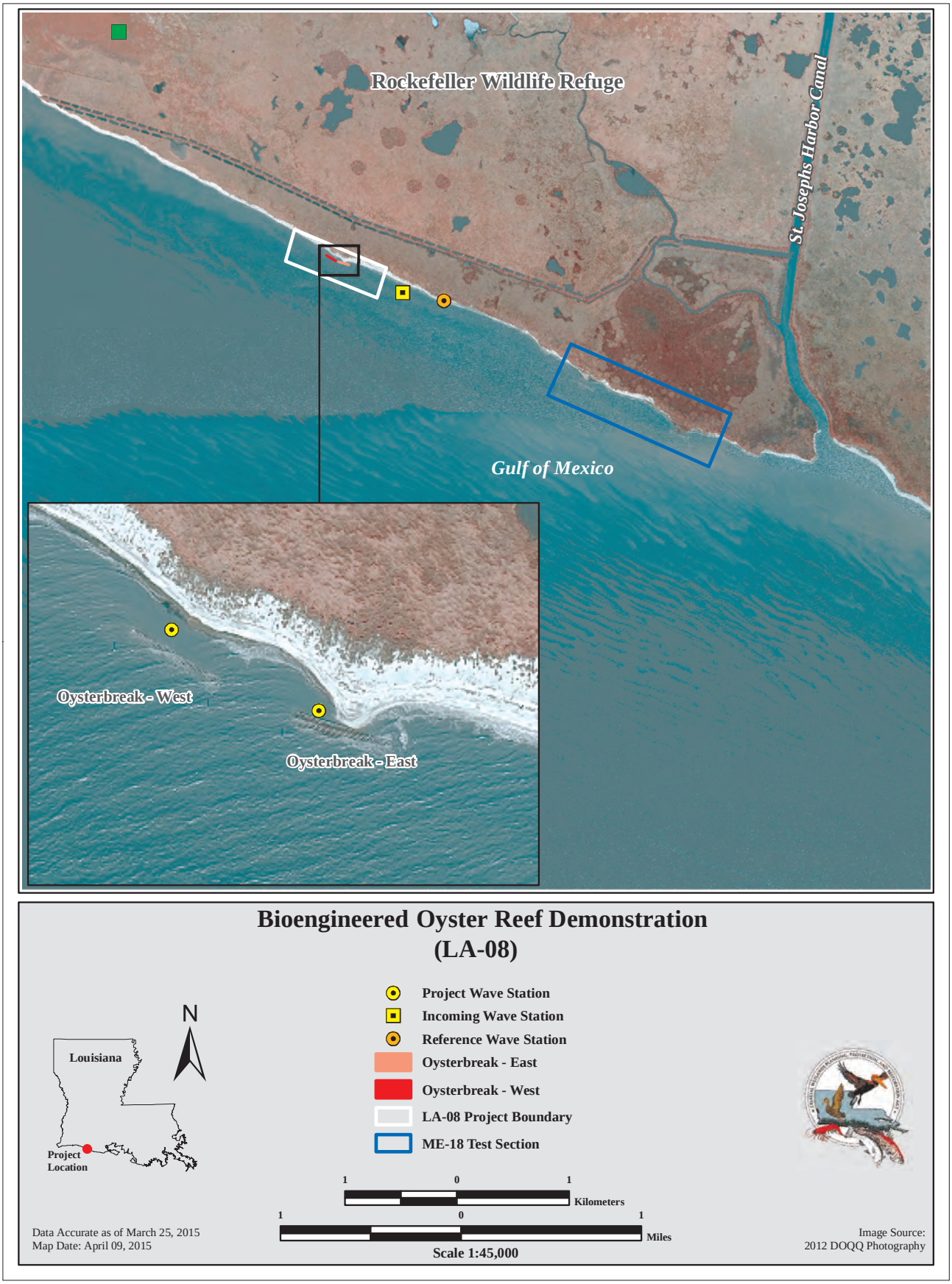
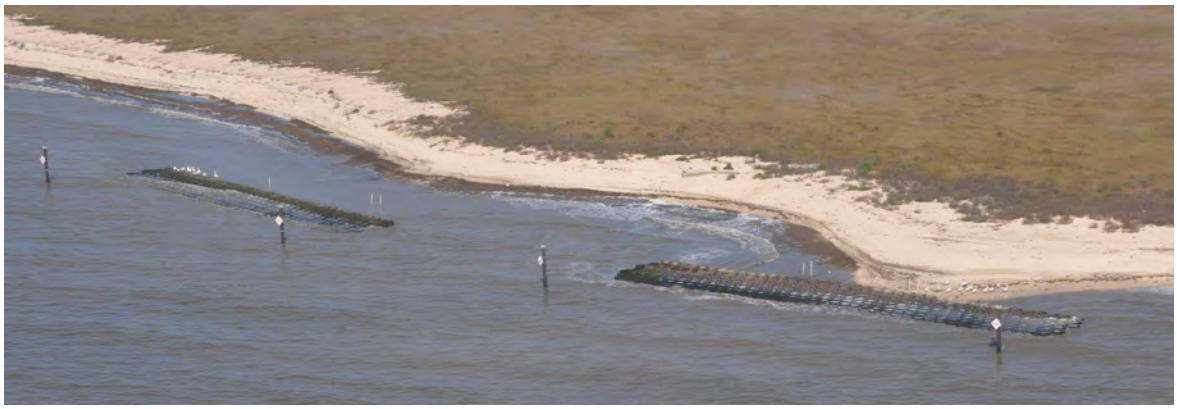


Figure 13. Bioengineered Oyster Reef Demonstration (LA-08) project map.

A



B

Figure 14. *A*, Oblique aerial photograph taken during low water about a year after construction of the Oysterbreak reefs at the Bioengineered Oyster Reef Demonstration (LA-08) project. Note the elevation difference (based on water inundation) between Oysterbreak–West composed of OysterKrete (lower) and Oysterbreak–East composed of standard weight concrete (taller). Also, note the new land that formed behind Oysterbreak–East after construction. *B*, Stacked, interlocking rings shown from behind Oysterbreak–East; note the waves crashing on the front of the reef and the calm water behind the reef.

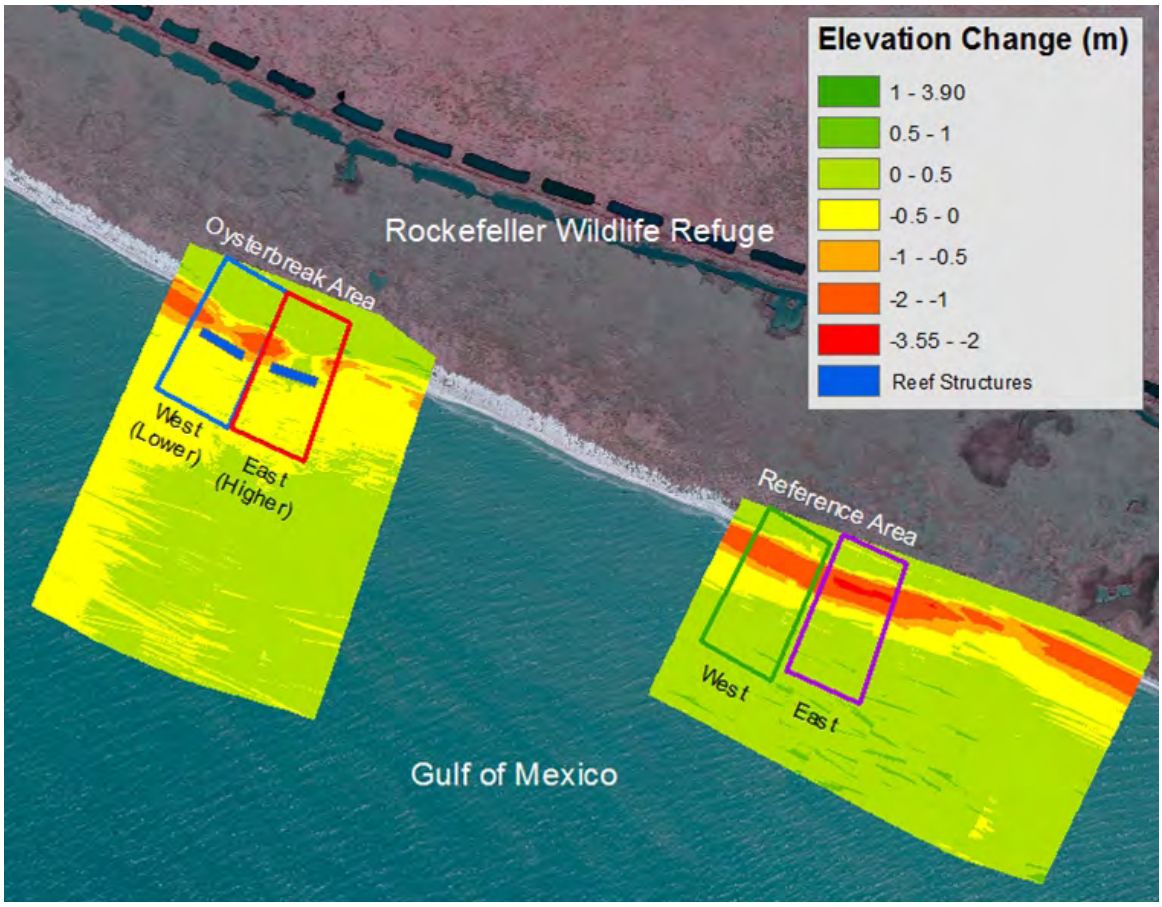


Figure 15. Soil elevation changes in the Oysterbreak and reference areas of the Bioengineered Oyster Reef Demonstration (LA-08) project from October 2011 to July 2013. Note the loss along the reference shoreline and behind the ends of and between the Oysterbreak reefs.

Figure 16. Colonization of oysters on east end of Oysterbreak–East 20 months (1.7 years) after construction.

East Marsh Island Marsh Creation (TV-21) Project (CWPPRA PPL 14)

Project Description and Goals

In December 2010, the East Marsh Island Marsh Creation (TV-21) project, sponsored by the NRCS, EPA, and CPRA, was constructed to fill 1,159 acres of shallow open water with material dredged from the adjacent East Cote Blanche Bay. Located in southeast Iberia Parish on the eastern end of the Marsh Island Wildlife Refuge, the project area (fig. 17) was historically relatively stable with a low land loss rate of -0.29% per year. Hurricane Lili (2002) caused these marshes to destabilize through erosion, which progresses by removing the marsh substrate. The marsh was restored by filling the shallow open water of previously eroded marsh areas with new sediment. The project objectives were to (1) create approximately 362 acres of emergent marsh in contained shallow open water and mud flats, (2) create/nourish an additional 797 acres of brackish marsh with unconfined dredged sediment, and (3) reduce the loss rate of new and existing marsh in the project area by 50%.

Project Assessment

Analysis of high-resolution 2012 aerial photography shows that the project has successfully met its marsh creation and nourishment goals. Before the project was constructed, <1% of the project area was classified as land. One year after project construction, 85% to 90% of the project area was classified as land (fig. 18). Surveys conducted 1 year after construction indicated that the marsh is settling as expected and is near the target elevation for healthy brackish marshes of +1.7 feet (referenced to the North American Vertical Datum of 1988 [NAVD 88]).

Coverage of emergent vegetation has increased over time in both the containment and nourishment areas (fig. 19). Heavy nutria herbivory damage caused a drastic decline in vegetative cover in 2012, especially in the nourishment areas (fig. 20). Analysis of vegetation data collected from CRMS reference sites on Marsh Island confirmed that nutria were prolific across Marsh Island in 2012, causing widespread damage. A combination of nutria control by the Louisiana Department of Wildlife and Fisheries and a harsh winter, which impacted nutria populations, probably contributed to vegetative recovery.

Project area vegetation dominated by marshhay cordgrass and Olney's three square bulrush recovered quickly by the following year and has increased in coverage since that time.

Shoreline protection on the eastern edge of the project was implemented to prevent erosion from the Gulf of Mexico. Additionally, the containment dikes were gapped in several locations to allow natural tidal exchange and thereby increase vegetative cover after construction.

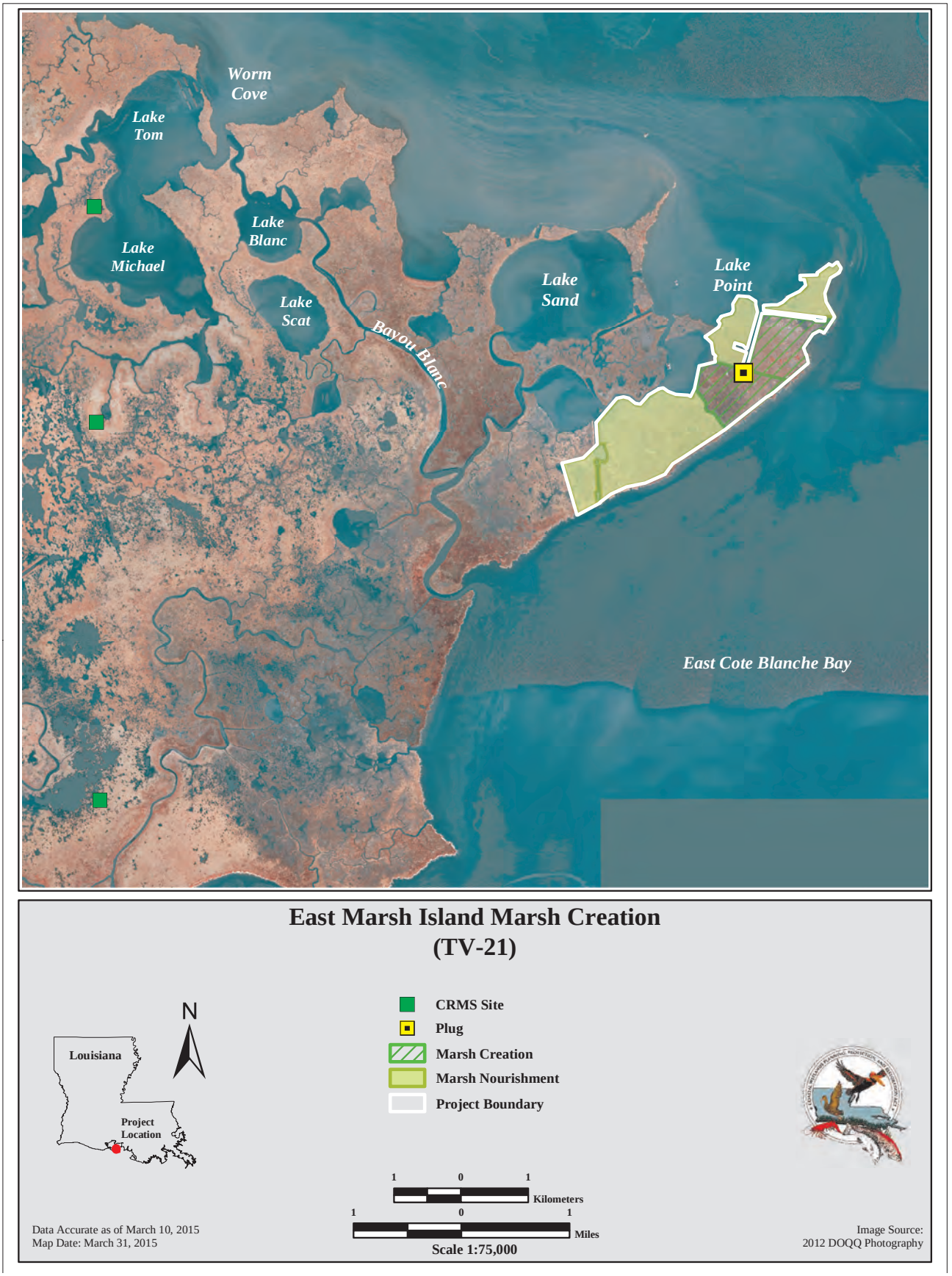


Figure 17. Map of the East Marsh Island Marsh Creation (TV-21) project, constructed in December 2010.

Figure 18. Aerial view of the eastern half of the East Marsh Island Marsh Creation (TV-21) project, June 2011. The areas in the foreground are the containment area portions of the project in which dredged material was contained by earthen retention dikes.

Figure 19. View of healthy marshhay cordgrass and chairmaker's bulrush thriving within the nourishment area of the East Marsh Island Marsh Creation (TV-21) project in September 2013.

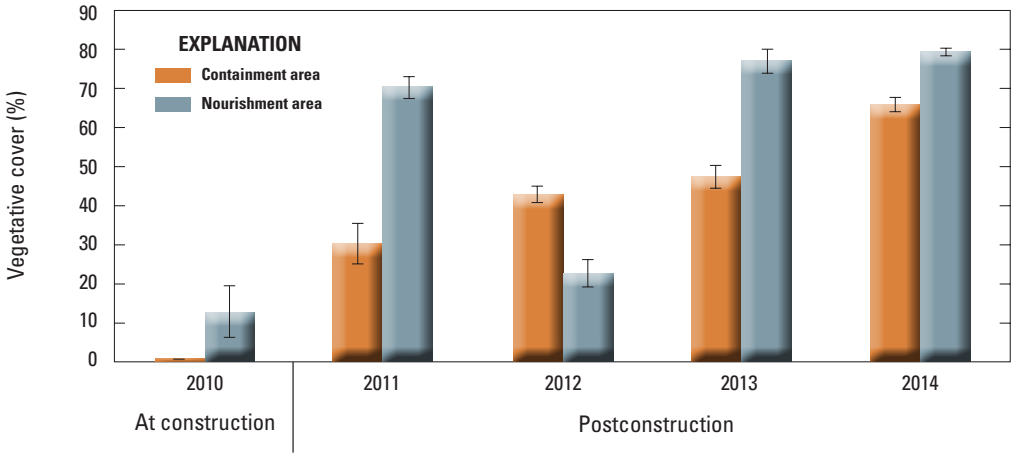


Figure 20. Vegetative cover of the East Marsh Island Marsh Creation (TV-21) project. Note the impact of and recovery from nutria herbivory damage in 2012.

North Lake Mechant Landbridge Restoration (TE-44) Project (CWPPRA PPL 10)

Project Description and Goals

The North Lake Mechant Landbridge Restoration (TE-44) project, completed in 2009, is located in Terrebonne Parish approximately 15 miles southwest of Theriot, La. (fig. 21). The project, sponsored by the USFWS and CPRA, is intended to protect and restore the North Lake Mechant Landbridge and Small Bayou La Pointe Ridge, which have been threatened by continued shoreline erosion from Lakes Mechant and Pagie and by subsidence of interior marshes. These marshes, which undergo high subsidence rates estimated at 0.25–0.42 inches per year, form a critical landbridge barrier separating the fresh and intermediate marshes north of Bayou De Cade from the brackish waters and tidally dominated Lake Mechant system to the south (fig. 22). The project goals are to create 790 acres of intertidal marsh habitat in shallow open water suitable for intermediate marsh, nourish 40 acres of existing marsh, and maintain intermediate interior marsh vegetation for the project life. Project features include several earthen, rock, and sheet pile plugs; 1 sheet pile weir; 1 rock-armored earthen dike; 11 dredged material fill areas; and vegetative plantings of smooth cordgrass (fig. 21).

Project Assessment

The North Lake Mechant Landbridge Restoration (TE-44) project nourished more than 40 acres of existing marsh and exceeded its acreage goal with the creation of 850 acres within and surrounding the project's boundaries (fig. 22). The goal to maintain intermediate marsh vegetation in the interior marsh has not yet been met. Although vegetative cover has increased from a broken natural marsh prior to construction to a solid created marsh postconstruction (fig. 23), the dominant species are seashore saltgrass (fig. 24) and smooth cordgrass, which are saline (salt) marsh species. This may be due to the higher salinity of the Lake Mechant dredged soil or the expansion of the planted salt-tolerant marsh vegetation. The project area is in a transitional zone where freshwater influences from the north may affect the vegetation along the project landbridge over time. The degree of influence can vary from year to year depending on environmental conditions. Reference Area 1 lost 7 acres (-13.5%) and Reference Area 2 gained 6 acres (+1.9%) from 2002 to 2012, whereas the project areas gained 890 acres of land (+64%) during that same time period (figs. 22 and 23).

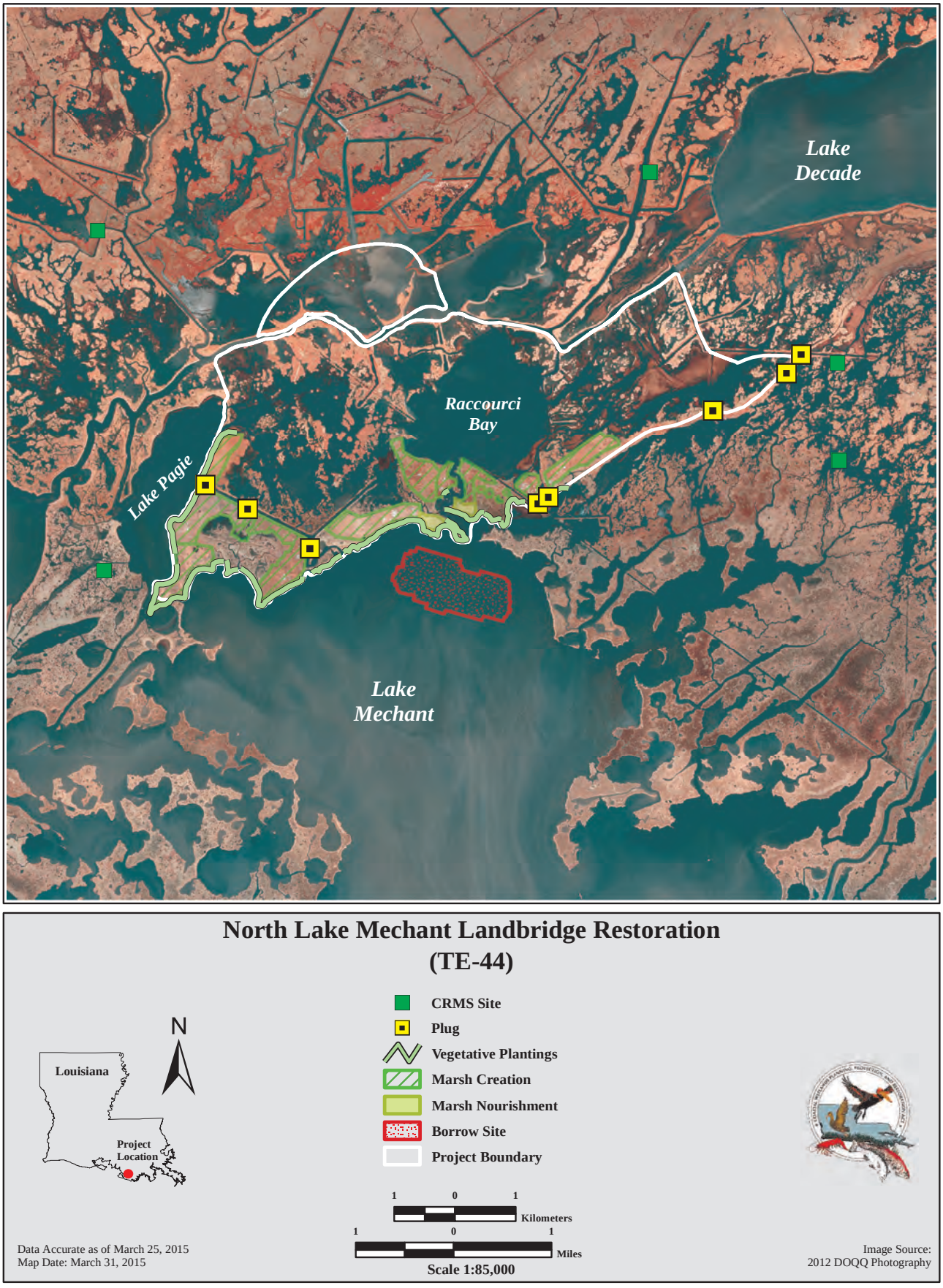


Figure 21. Map of the North Lake Mechant Landbridge Restoration (TE-44) project, completed in 2009.

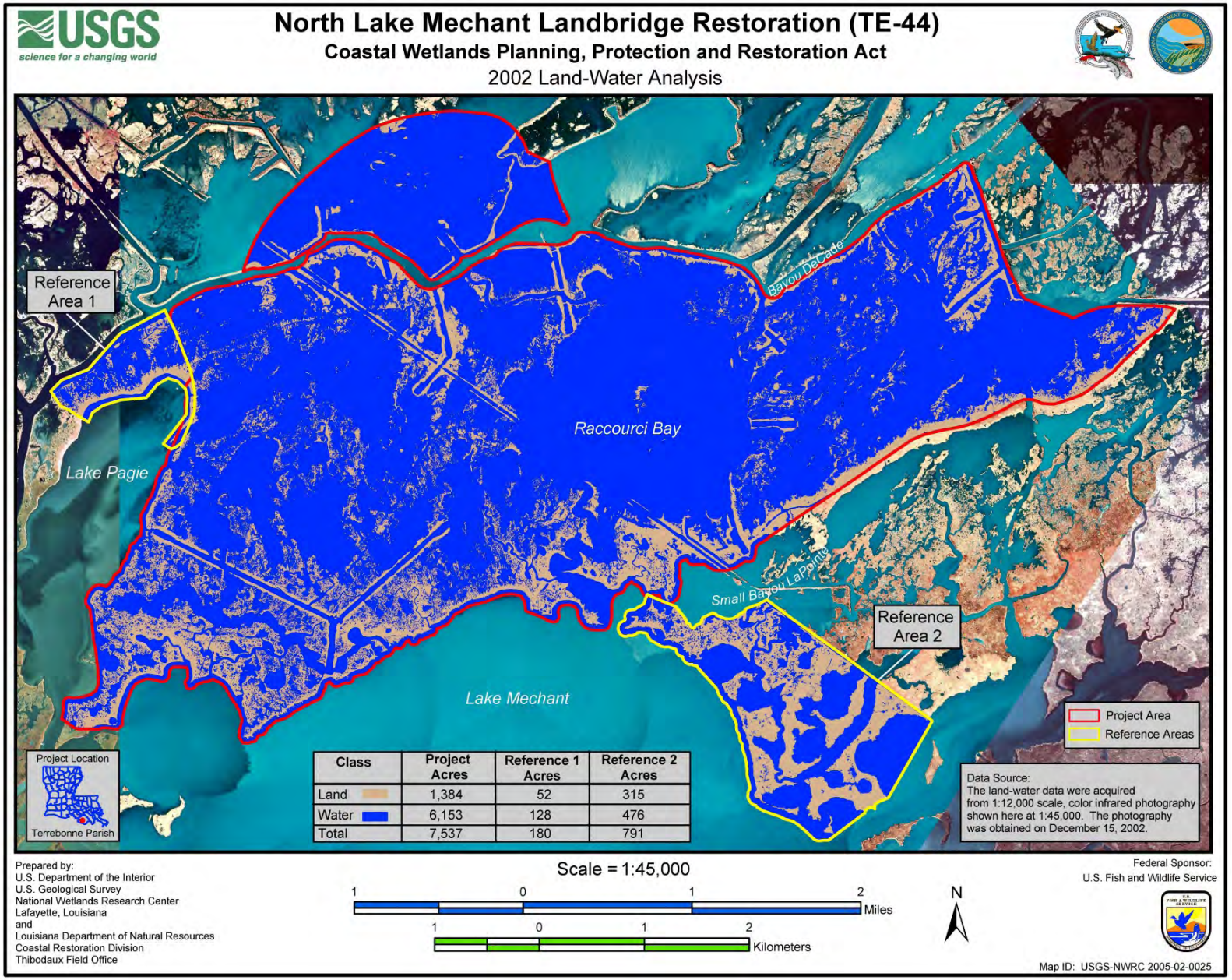


Figure 22. Land-water classification for the North Lake Mechant Landbridge Restoration (TE-44) project area in 2002, prior to construction of project features.

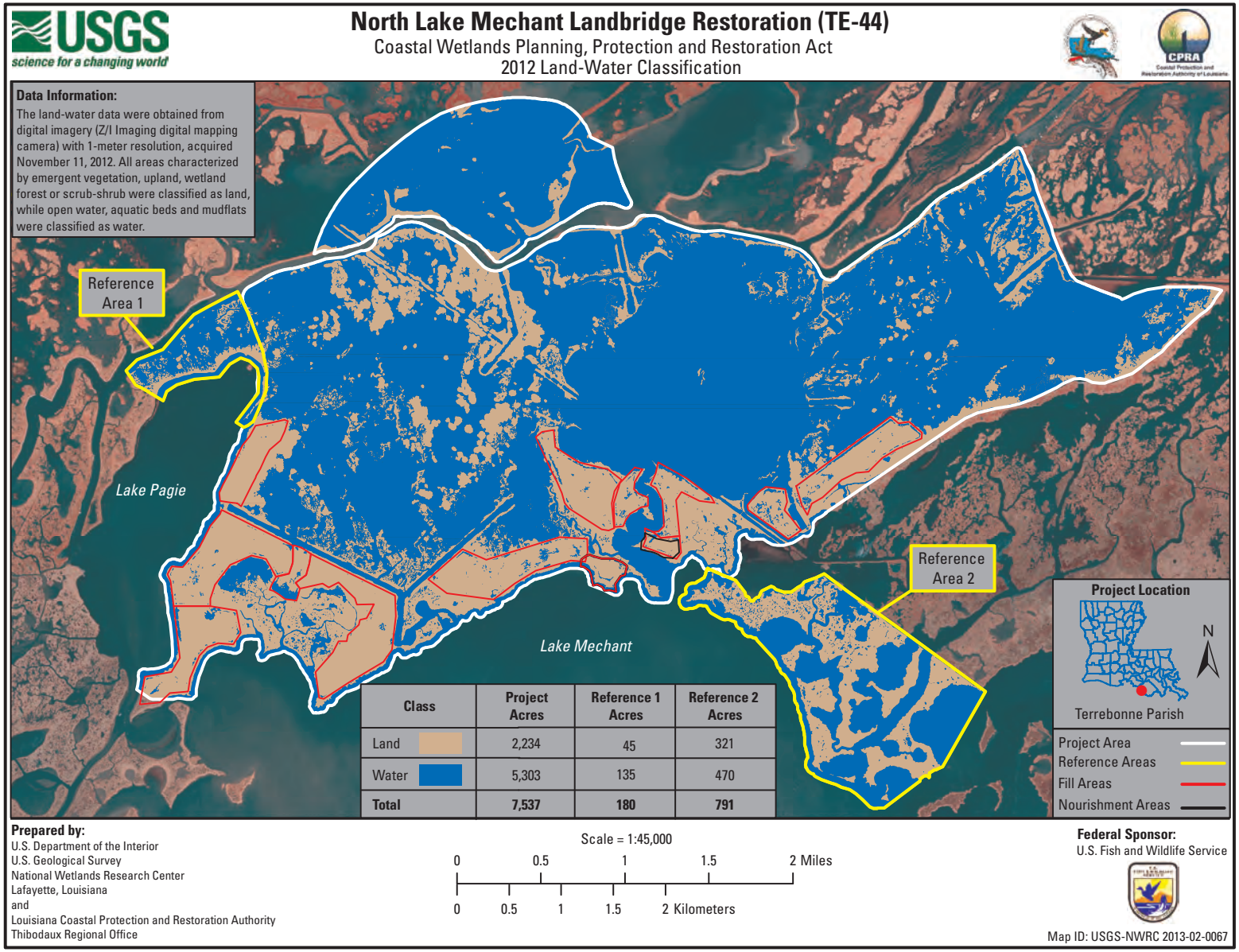


Figure 23. Land-water classification for the North Lake Mechant Landbridge Restoration (TE-44) project area in 2012. The marsh fill area outlined in red resulted in 850 acres of land gain, and the nourishment areas outlined in black resulted in 40 acres of land gain.

Figure 24. Vegetation in the North Lake Mechant Landbridge Restoration (TE-44) project fill area showing healthy stands of seashore saltgrass, marshhay cordgrass, common reed, and goldenrod growing on the restored marsh.

Bayou La Branche Wetland Creation (PO-17) Project (CWPPRA PPL 1)

Project Description and Goals

The Bayou La Branche Wetland Creation (PO-17) project is a 436-acre marsh creation project that is located in St. Charles Parish, immediately south of Lake Pontchartrain (fig. 25). Federally sponsored by the USACE, it was the first restoration project constructed through CWPPRA in 1994 and was the first project to complete its 20-year monitoring lifespan in 2014. The marsh was created by using sediment that was hydraulically dredged from Lake Pontchartrain and pumped to the site via pipeline. The CWPPRA program recognized a need for this project because of the degradation of the Bayou La Branche wetlands, which has resulted from hydrologic alteration due to farming, Interstate 10, railroad construction, hurricanes, subsidence, saltwater intrusion, and shoreline erosion. The purpose of this project was to create marsh habitat in an area that had largely converted from marsh to open water and had become increasingly susceptible to shoreline breaching, increased wave energy, and higher salinity inflow from the lake. The goals of the project were to (1) create 305 acres of habitat in shallow water conducive to the natural establishment of emergent wetland vegetation and (2) increase the ratio of marsh to open water in the project area to a minimum of 70% emergent marsh to 30% open water 5 years following project completion.

Project Assessment

The Bayou La Branche Wetland Creation project has demonstrated that using dredged sediment to create marsh is an effective restoration strategy that can provide benefit beyond the 20-year CWPPRA project lifespan (fig. 26). Prior to construction, the project area contained 81 acres of land and 355 acres of water, while the reference area immediately east of the project area contained 12 acres of land and 504 acres of water (fig. 27). Postconstruction analysis of the project area has revealed that the amount of land created has not only been sustained over years but also has increased from 356 acres in 1997 to 408 acres in 2012 (fig. 27), while the reference area has shown no significant change in the ratio of land to water over time. The land area increased by 327 acres, which is five times the amount of marsh present prior to project construction in 1994.

The goal of achieving a minimum of 70% emergent marsh was surpassed by 2012; however, it took longer than 5 years to attain. Habitat analysis conducted in 1997 indicated that only 51% of the project area was emergent marsh, while 29% was scrub-shrub habitat.

During construction, sediment discharge was concentrated in the northern project area because of concerns over compromising the foundation of Interstate 10. This sediment discharge resulted in a higher localized elevation in the north that fostered the early development of scrub-shrub habitat. As the sediment settled and the land received greater inundation, much of this habitat transitioned to marsh. By 2012, emergent marsh had increased to 82%, while scrub-shrub habitat had declined to 10% (fig. 28). The dominant marsh species in the project area since 2004 have been smooth cordgrass, saltmeadow cordgrass, and sturdy bulrush.

As of 2013, the created marsh had settled to a mean elevation of 1.2 feet NAVD 88, with the highest elevation still in the north and the lowest elevation in the central project area. This elevation is similar to the average marsh elevation of 1.3 feet NAVD 88 that was surveyed in natural marsh surrounding the project area.

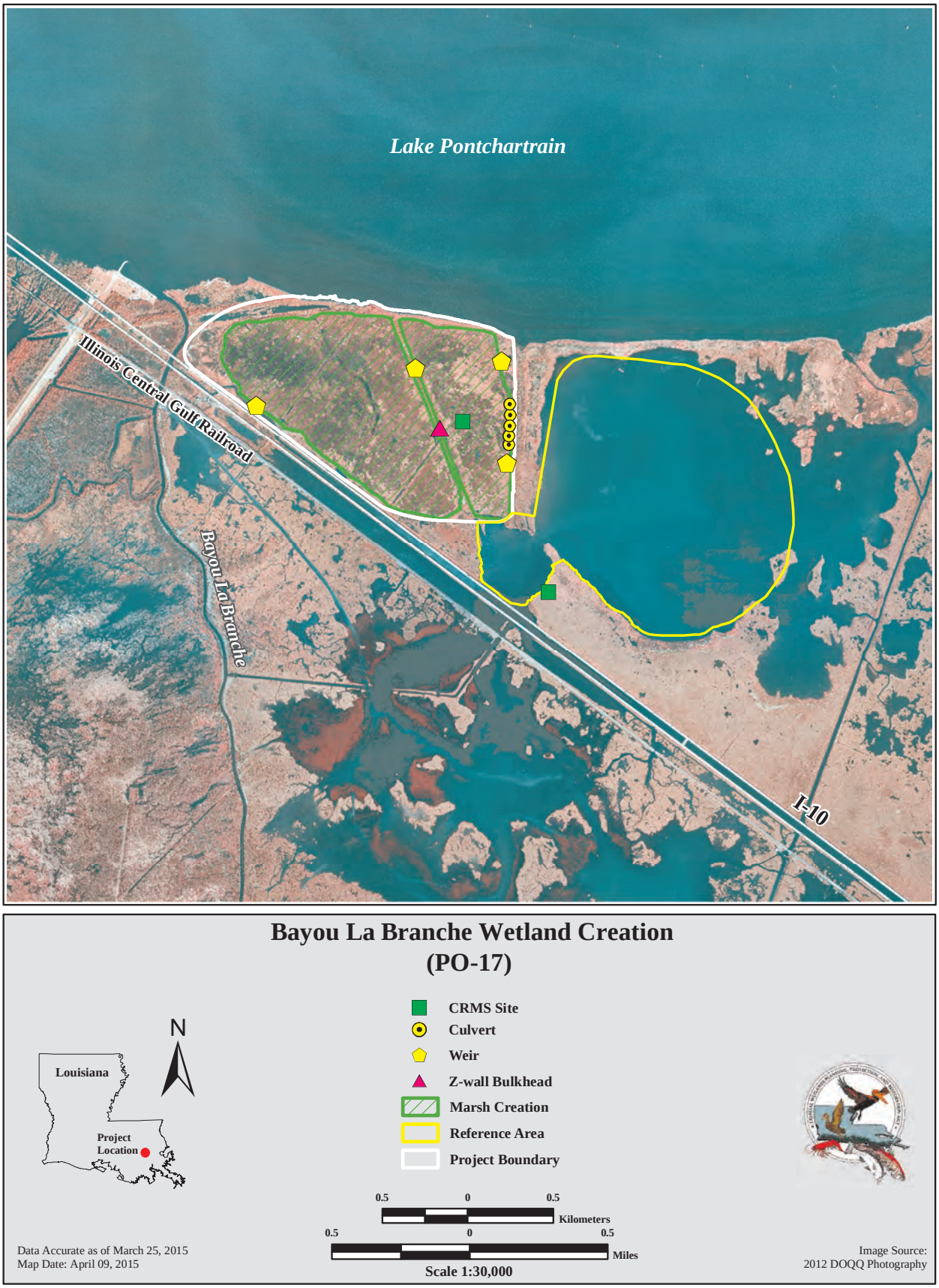


Figure 25. Map of Bayou La Branche Wetland Creation (PO-17) project. This was CWPPRA's first restoration project constructed in 1994.

Figure 26. The Bayou La Branche Wetland Creation (PO-17) project area (2013) continues to support vigorous marsh vegetation more than 20 years after project construction.

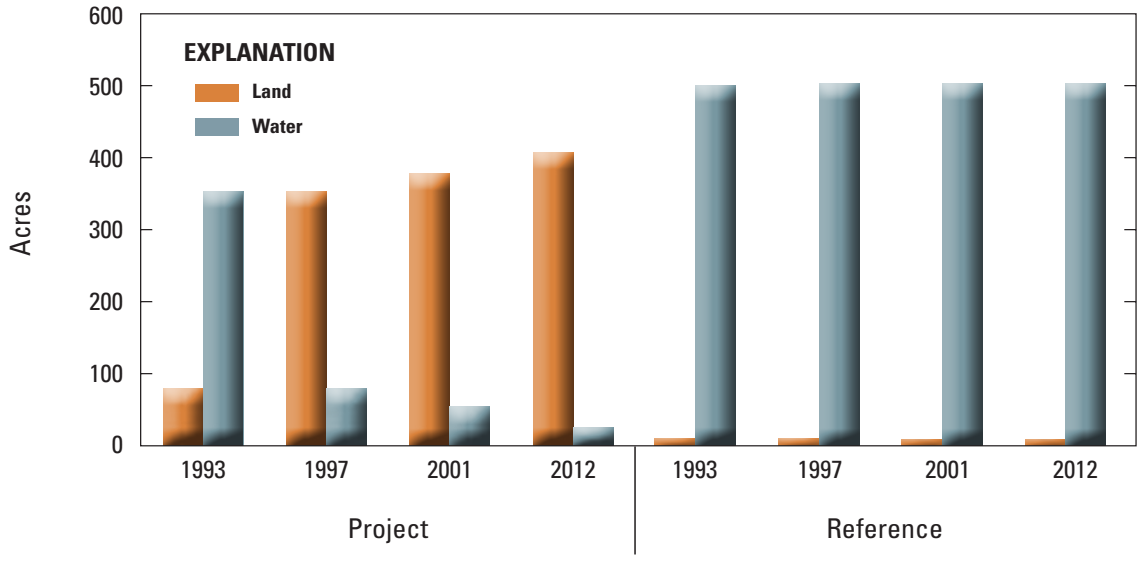


Figure 27. Land-water classification of the Bayou La Branche Wetland Creation (PO-17) project and reference areas. The 1993 aerial photography was taken prior to project construction in 1994.

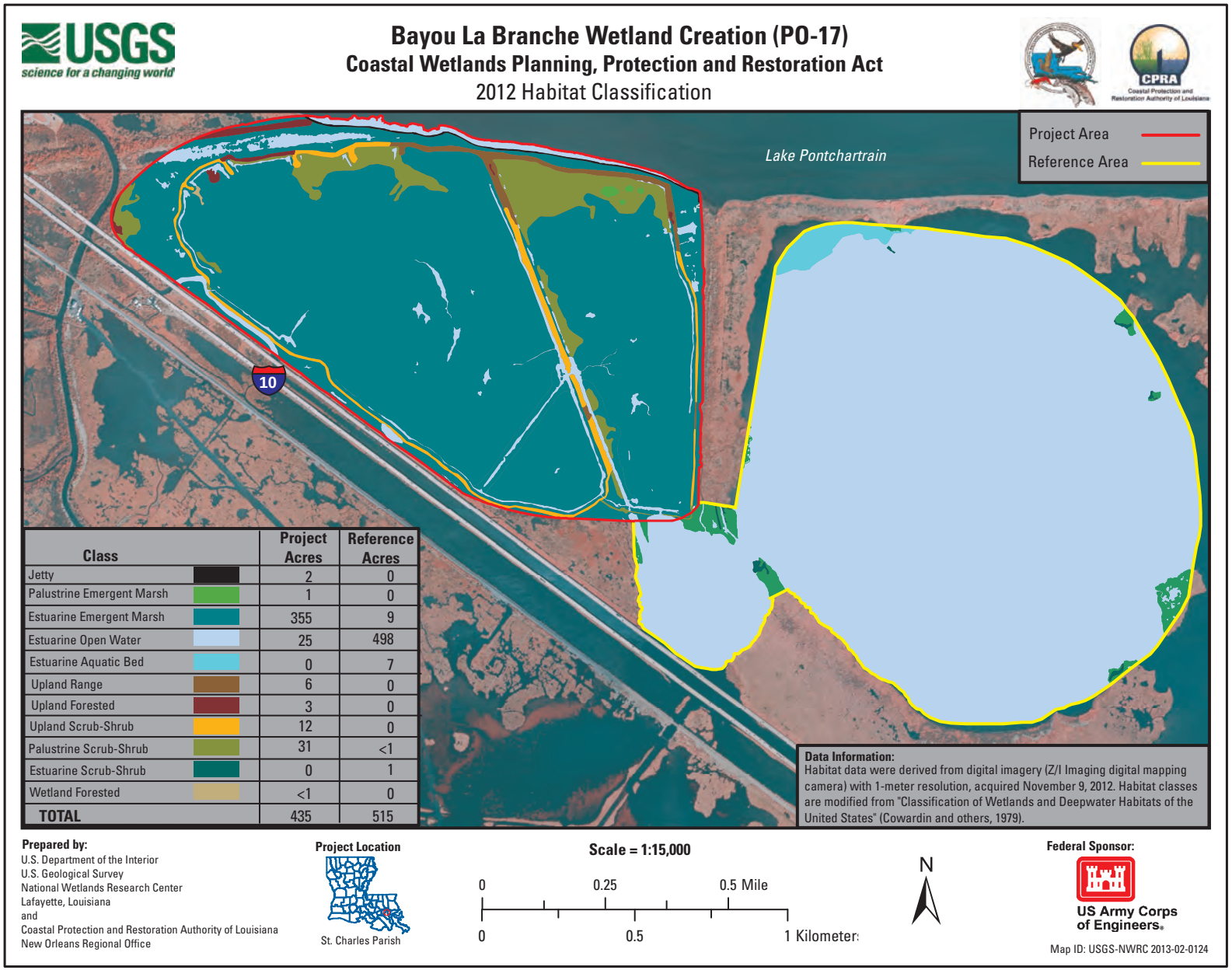


Figure 28. Habitat classification of the Bayou La Branche Wetland Creation (PO-17) project and reference areas using 2012 CRMS aerial photography. By 2012, the project area had transitioned to primarily marsh, with some scrub-shrub habitat remaining at higher elevations in the north and on spoil banks.

Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) Project (CWPPRA PPL 12)

Project Description and Goals

The Mississippi River Sediment Delivery System−Bayou Dupont (BA-39) project, completed in May 2010, was the first CWPPRA restoration project that used sediment hydraulically dredged from the Mississippi River and delivered through pipeline to restore marsh (figs. 29 and 30). The EPA and CPRA are the project's Federal and State sponsors, respectively. The BA-39 project area is located within an eroding and subsiding section of the Barataria Basin Landbridge on the west bank of the Mississippi River (fig. 29) near the town of Myrtle Grove, La. Marsh and ridge habitat in this region has been hydrologically altered by the dredging of oil and gas canals and leveeing of the Mississippi River, which disconnected the area from riverine freshwater and sediment input. Construction of the Naomi Siphon in 1992 restored some flow of river water into the Barataria Basin and, as a result, has helped to moderate saltwater intrusion in the project area. The goals of the Bayou Dupont (BA-39) project are to restore/create 372 acres and nourish 99 acres of emergent marsh in an area that had converted to primarily open water (fig. 30).

Project Assessment

The first postconstruction land-water analysis was completed in 2012 by using CRMS aerial photography. Of the 495 acres included in the analysis, 458 acres (93%) was classified as marsh and 37 acres (7%) as water (fig. 31). The water areas are largely due to ponding at lower elevations, primarily in Marsh Creation Area 2. Although not intended as part of the project design, these ponds provide waterfowl habitat.

Vegetation surveys indicate that the project area has increased in mean total marsh cover from 42% in 2010 to 71% in 2014, with seashore paspalum, herb of grace, cattails, and saltgrass all being abundant species. Saltmeadow (marshhay) cordgrass is the dominant species in the adjacent natural marsh. Target marsh elevation (1.3 feet NAVD 88 at year 10) was based on the average elevation of saltmeadow (marshhay) cordgrass marsh in the area. This species has expanded in the project area in both cover and range, increasing from less than 1% cover in 2010 to 8% cover in 2014 (fig. 32) and expanding from occurrence at 3% of stations in 2010 to 37% in 2014.

Firsthand observations and data collected from vegetation and elevation surveys indicate that more than 50% of the project area is at an elevation that is supporting or can support marsh habitat. Elevation survey data collected during October 2011–January 2012 indicated that approximately 48% of the project area had settled to an elevation between 1.5 and 2.0 feet NAVD 88. About 27% of the project area, however, was still at a higher elevation between 2.0 and 2.5 feet NAVD 88. The Mississippi River Sediment Delivery System−Bayou Dupont project is only 5 years old. As the project area continues to settle and approach the targeted elevation of 1.3 feet NAVD 88, it is expected that water exchange will increase and the marsh will continue to transition towards a stable, productive, robust marsh community that more closely resembles the local natural marsh, containing tidal creeks, ponds, and healthy marsh.

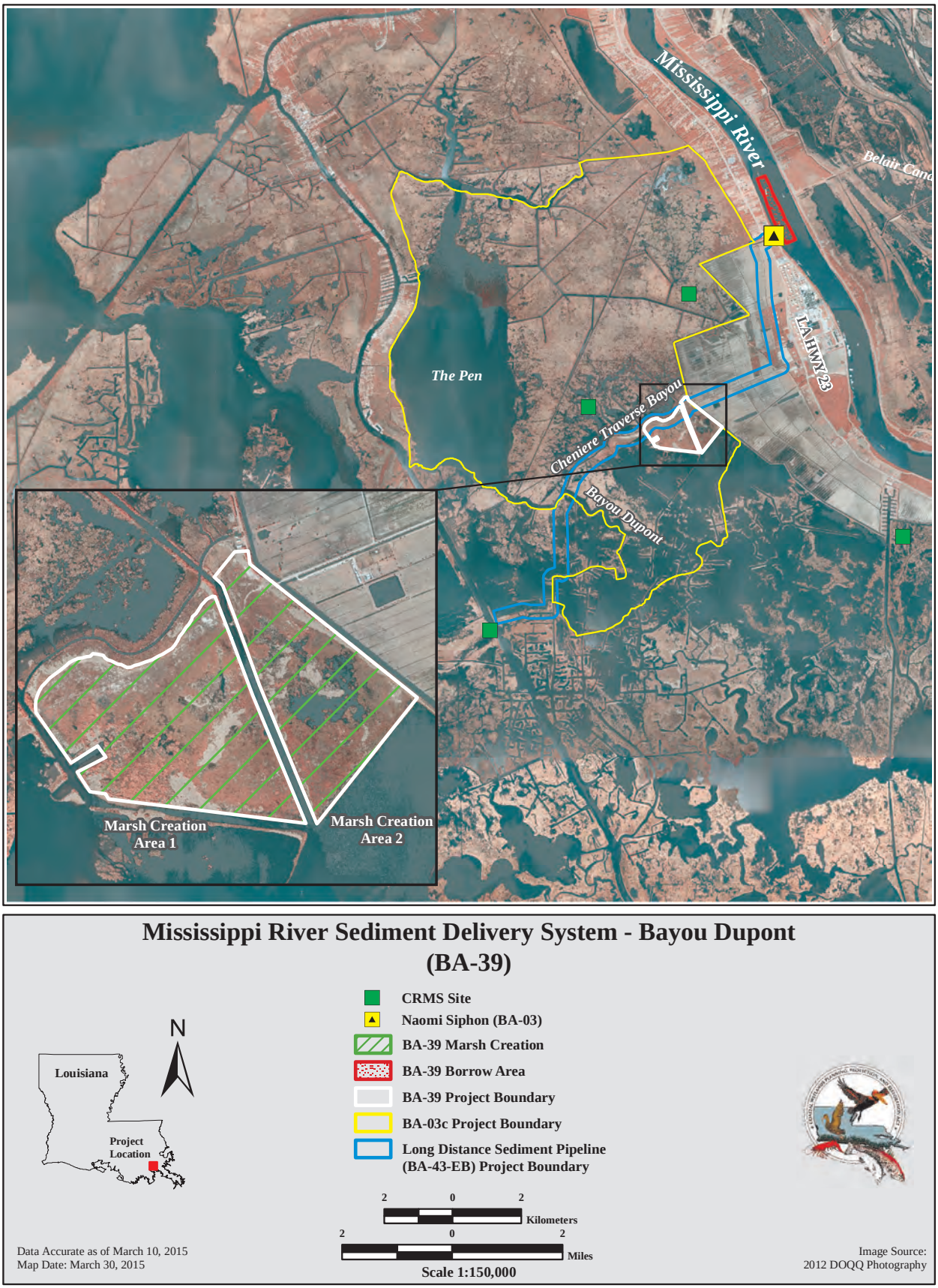


Figure 29. Project map of the Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) project, completed in May 2010. This was the first CWPPRA restoration project that used sediment hydraulically dredged from the Mississippi River.

Figure 30. The Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) project area in 2013, looking west from the Plaquemines Parish flood protection levee, 3 years postconstruction.

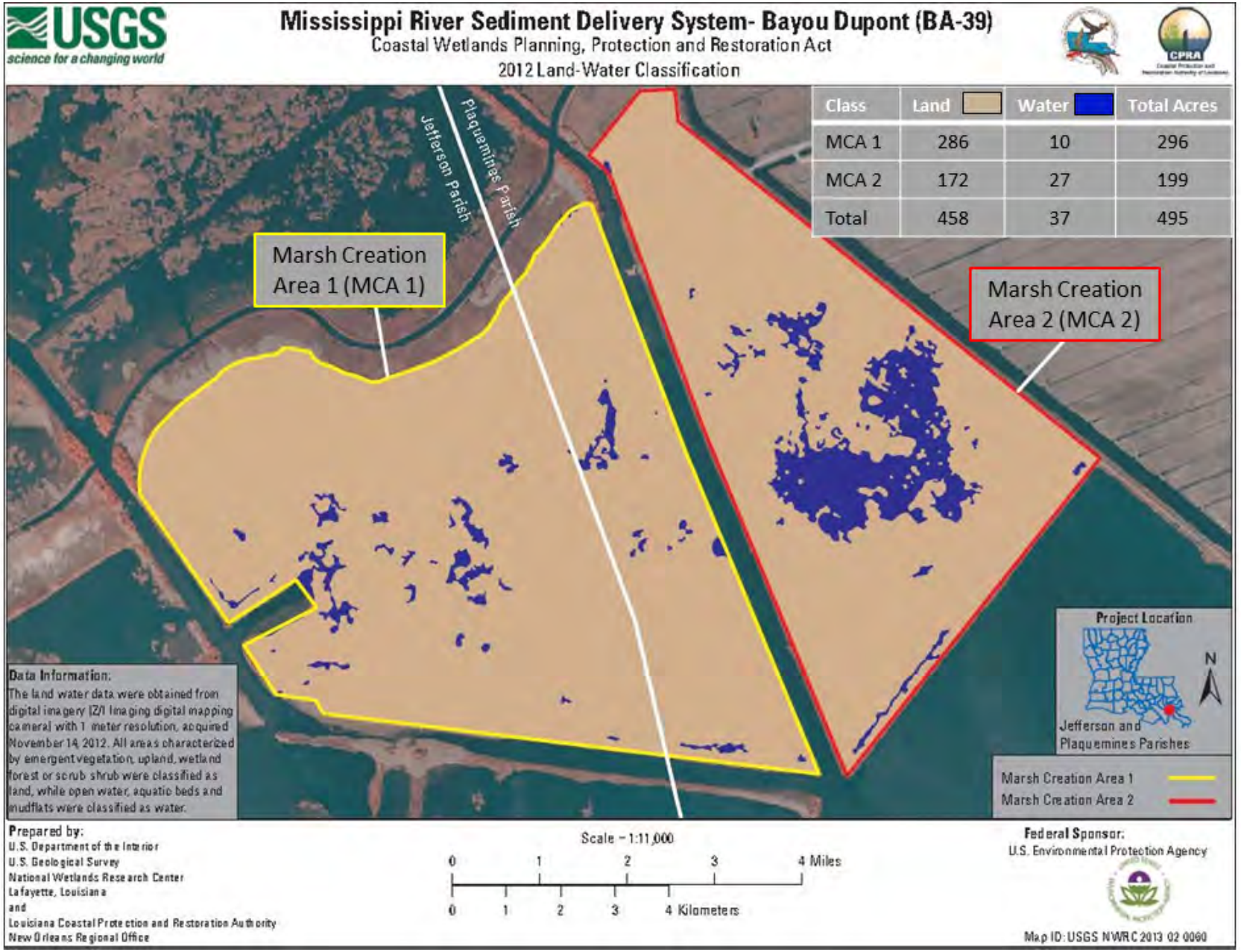


Figure 31. Land-water classification of the Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) project area. The 2012 CRMS aerial photography shows 458 acres of land within an area that contained primarily open water before project construction.

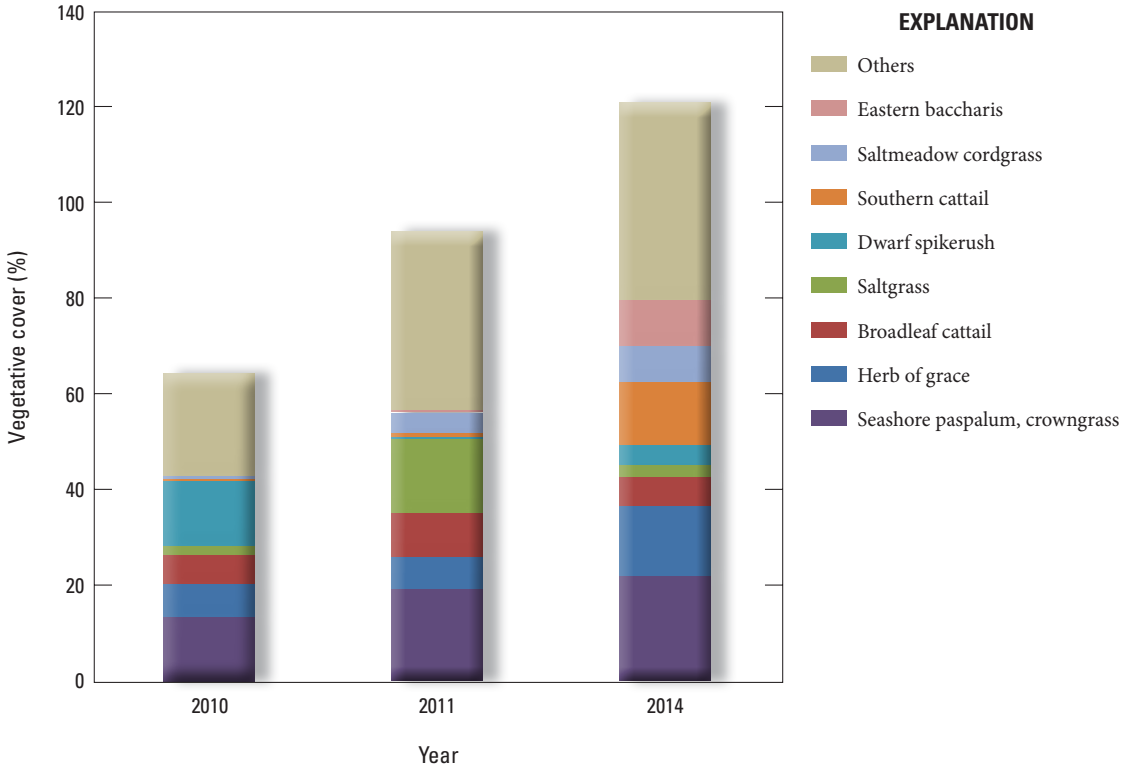


Figure 32. Annual mean cover (%) for each species of vegetation surveyed at Mississippi River Sediment Delivery System–Bayou Dupont (BA-39) project stations. While total cover is based on 100%, the sum of each species' cover can be greater than 100% because of overlap.

Fish and Wildlife Benefits of Selected CWPPRA Projects

The East Marsh Island, North Lake Mechant, Bayou LaBranche, and Bayou Dupont projects protect and restore brackish marshes, which provide fish and wildlife habitat for rare and at-risk species, Gulf Coast Joint Venture priority species, wading birds, and other marsh birds. They also provide habitat for mammals and the American alligator. Estuarine fisheries benefiting from those restored brackish marsh habitats include important recreational (e.g., spotted sea trout, red drum, and Atlantic croaker) and commercial (e.g., Gulf menhaden and brown and white shrimp) species.

Conclusion

The CWPPRA program has been actively rebuilding wetlands and helping to turn the tide on land loss for 25 years. Projects that have restored barrier islands, interior marshes, and swamps have all left a noticeable mark on the coastal landscape. A foundation has been laid with the implementation of CWPPRA, upon which subsequent restoration initiatives have been built. Several comprehensive restoration plans have capitalized upon CWPPRA's public planning process, benefiting from the generation and wide acceptance of such plans through practice of a public involvement policy and interagency cooperation. Various government planning documents and feasibility studies have often capitalized on CWPPRA-generated project concepts. Some projects that have been designed through CWPPRA have been adopted and constructed through other authorities. This type of synergy between funding vehicles is efficient and expedites project implementation. CWPPRA has constructed, or funded for construction, 121 of 200 authorized projects that are protecting and restoring more than 88,000 acres of coastal wetlands and ultimately benefiting 860,000 acres over a 25-year period. The CWPPRA program remains uniquely committed to the understanding and promotion of restoration science. CWPPRA is responsive in constructing projects relatively quickly, within 3 to 5 years. CWPPRA builds cost-effective projects developed by an experienced interagency team of coastal scientists and engineers along with local government and citizen contribution to project nomination and development. CWPPRA has predictable funding through the Trust Fund.

The CWPPRA program is science-based on the CRMS and project-specific monitoring program. Together with a rich brain trust of local academia, program scientists collect and analyze data from CWPPRA projects to evaluate their environmental benefits and gauge project success. This scientific analysis helps guide managers to develop projects by using the cutting edge science to support successful restoration.

CWPPRA constructs lower cost demonstration projects that "field-test" restoration techniques for future application in restoration projects. CWPPRA projects complement other large-scale restoration efforts (e.g., CIAP, Master Plan, DWH Early Restoration Plan, and the RESTORE Act).

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.

CWPPRA's Programmatic Benefits

- **Proven Track Record of Project Construction–** Over 25 years, 200 approved projects benefiting more than 1,344 square miles (860,000 acres); 101 constructed (20 under construction).
- **Responsive–**CWPPRA projects constructed in 3 to 5 years.
- **Interagency Approach–C**ost-effective projects developed by an experienced interagency team (5 Federal, 2 State agencies).
- **Community Involvement–**Local governments and citizens contribute to project nomination and development.
- **Predictable Funding–**Federal Sport Fish & Boating Safety Trust Fund funding to 2015 through fishing equipment and small engine fuel taxes.
- **Fiscally Responsible–**CWPPRA projects are cost effective.
- **Science Based–**CWPPRA's monitoring program (CRMS). Demonstration projects "field-test" restoration techniques for future restoration project success.
- **Complementary–**CWPPRA projects complement other large-scale restoration efforts (i.e., LCA, CIAP, State Master Plan, BP DWH Oil Spill Early Restoration, and the RESTORE Act).

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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
GCERC (Council)	Gulf Coast Ecosystem Restoration Council
LCA	Louisiana Coastal Area
NAVD 88	North American Vertical Datum of 1988
NAWCA	North American Wetlands Conservation Act
NGO	Nongovernmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWRC	(USGS) National Wetlands Research Center
PPL	Priority Project List
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Appendixes

Appendix 1. 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 2. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Educational Videos

The CWPPRA Public Outreach Committee is composed of members from the participating Federal agencies, the State of Louisiana, other coastal programs, and nonprofit organizations. 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 audiovisual presentations,
- organizing exhibits,
- disseminating publications and news releases, and
- conducting special events such as project dedications.

The outreach coordinator manages the educational program by providing information and materials for classroom and other use throughout the State. The chairman and outreach coordinator 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 Public Outreach Committee, in collaboration with Federal, State, local, and private stakeholders, has developed various outreach videos (http://www.lacoast.gov/new/Pubs/videos.aspx).

- Returning Marshlands to Magnificent Life - Hydrologic restoration techniques.
- CWPPRA - Rebuilding Coastal Louisiana - What is the Coastal Wetlands Planning, Protection and Restoration Act?
- Marsh Creation - Step by Step - CWPPRA's efforts to save Marsh Island.
- Meet the CWPPRA Task Force - Task Force members explain why restoration is essential to Louisiana.
- Louisiana Coastal Land Loss Simulation 1932 through 2010 - This USGS-NWRC video captures Louisiana coastal land loss issues via animation.
- Coastal Louisiana: Impacts of Hurricanes on Salt Marsh and Mangrove Wetlands.
- Effects of Sea-Level Rise on Coastal Wetlands in the Mississippi Delta - The effects of sea-level rise and other global change factors on coastal wetlands in the delta.
- The Floating Marshes of Louisiana: A Unique Ecosystem - Mississippi River Delta Plain floating marshes.
- What Lies Beneath: Using Mangrove Peat To Study Ancient Coastal Environments and Sea-Level Rise.

Appendix 3. Louisiana Coastal Threatened and Endangered Species, Fisheries, and Common Marsh Plants

Coastal Louisiana Threatened and Endangered Species

West Indian Manatee
Trichechus manatus
Endangered
River, Estuary, Ocean

Red-Cockaded Woodpecker
Picoides borealis
Endangered
Pine habitats adjacent to wetlands, primarily in St. Tammany Parish

Leatherback Sea Turtle
Dermochelys coriacea
Endangered
Ocean, Beach

Hawksbill Sea Turtle
Eretmochelys imbricata
Endangered
Ocean, Beach

Kemp's Ridley Sea Turtle
Lepidochelys kempii
Endangered
Ocean, Beach

Pallid Sturgeon
Scaphirhynchus albus
Endangered
River

Louisiana Quillwort
Isoetes louisianensis
Endangered
Adjacent to wetlands, River

Louisiana Black Bear
Ursus americanus luteolus
Threatened
Bottomland hardwood, primarily in St. Mary & Iberia Parishes

Red Knot
Calidris canutus rufa
Threatened
Beach

Piping Plover
Charadrius melodus
Threatened
Beach

Loggerhead Sea Turtle
Caretta caretta
Threatened
Ocean, Beach

Green Sea Turtle
Chelonia mydas
Threatened
Ocean, Beach

Ringed Map Turtle
Graptemys oculifera
Threatened
River

Atlantic Sturgeon
Acipenser oxyrhynchus desotoi
Threatened
River, Ocean

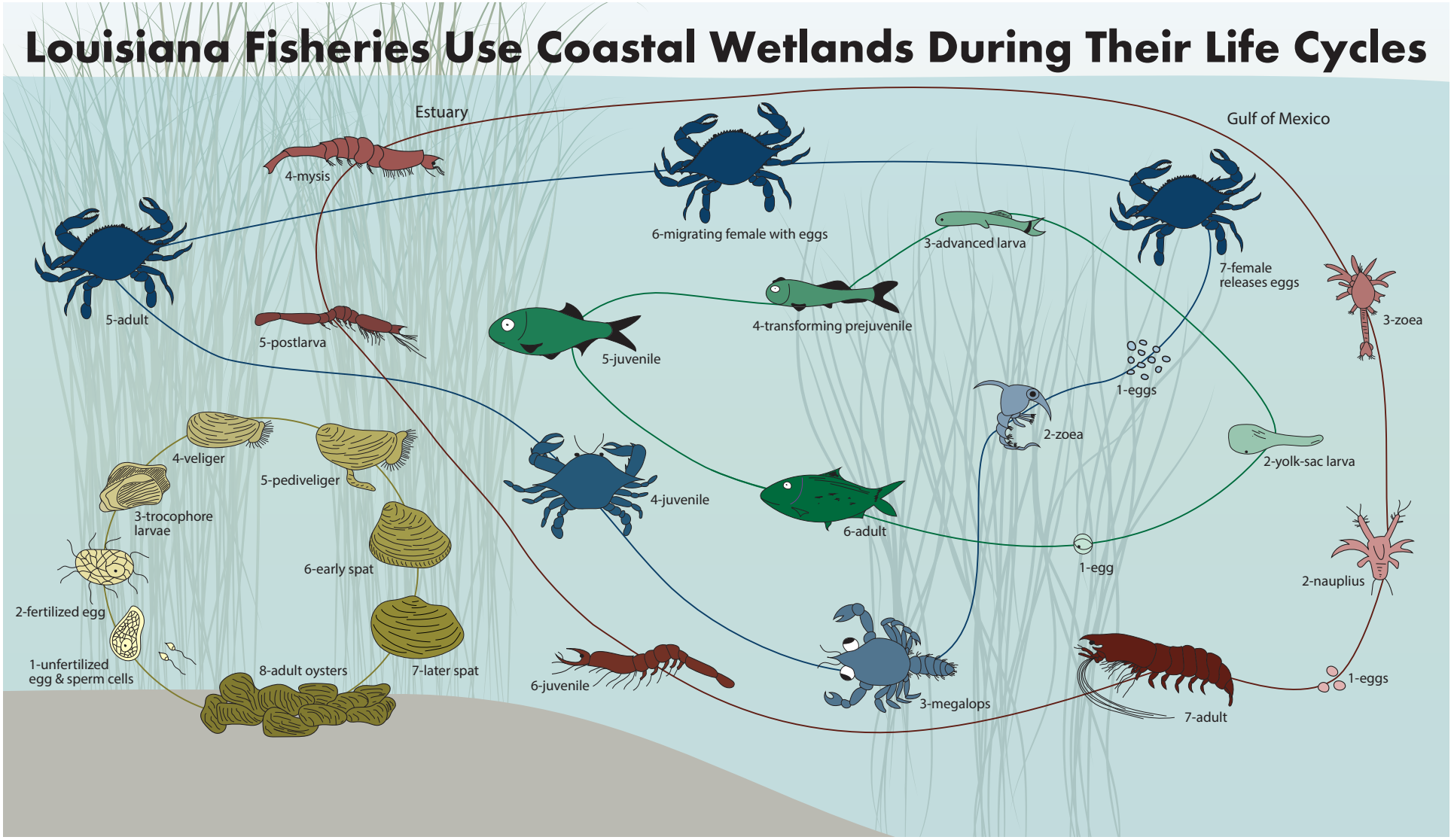
Alabama Heelsplitter Mussel
Potamilus inflatus
Threatened
River

Sprague's Pipit
Anthus spragueii
Candidate
Uplands adjacent to wetlands

Dusky Gopher Frog
Rana sevosa
No longer in Louisiana
Habitat Critical
Uplands within pine habitats

Whooping Crane
Grus americana
Nonessential Experimental Population
White Lake Conservation Area and adjacent marshes

Louisiana Fisheries Use Coastal Wetlands During Their Life Cycles



Common Marsh Plants of Louisiana

Black Mangrove
Avicennia germinans
Saline

Black Needlerush
Juncus roemerianus
Brackish

Broadleaf Cattail
Typha latifolia
Fresh, Intermediate

Bulltongue
Sagittaria lancifolia
Fresh, Intermediate

California Bulrush
Schoenopletus californicus
Fresh, Intermediate

Giant Cutgrass
Zizaniopsis miliacea
Fresh

Groundsel Tree
Baccharis halimifolia
Fresh, Brackish

Gulf Cordgrass
Spartina spartinae
Brackish, Saline

Inland Saltgrass
Distichlis spicata
Brackish, Saline

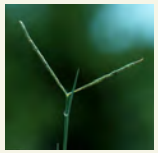
Maidencane (Paille Fine)
Panicum hemitomon
Fresh

Marshhay Cordgrass
Spartina patens
Intermediate, Brackish

Pickerelweed
Pontederia cordata
Fresh

Rattlebox (Poisonbean)
Sesbania drummondii
Fresh

Roseau
Phragmites communis
Fresh, Brackish



Seashore Paspalum
Panicum vaginatum
Fresh, Brackish

Seaside Goldenrod
Solidago sempervirens
Edges of saltmarsh

Smooth Cordgrass
Spartina alterniflora
Saline

Wooly Rosemallow
Hibiscus lasiocarpos
Fresh, Intermediate

Photographs courtesy of Larry Allain

Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA)

The 2015 Evaluation Report to the U.S. Congress