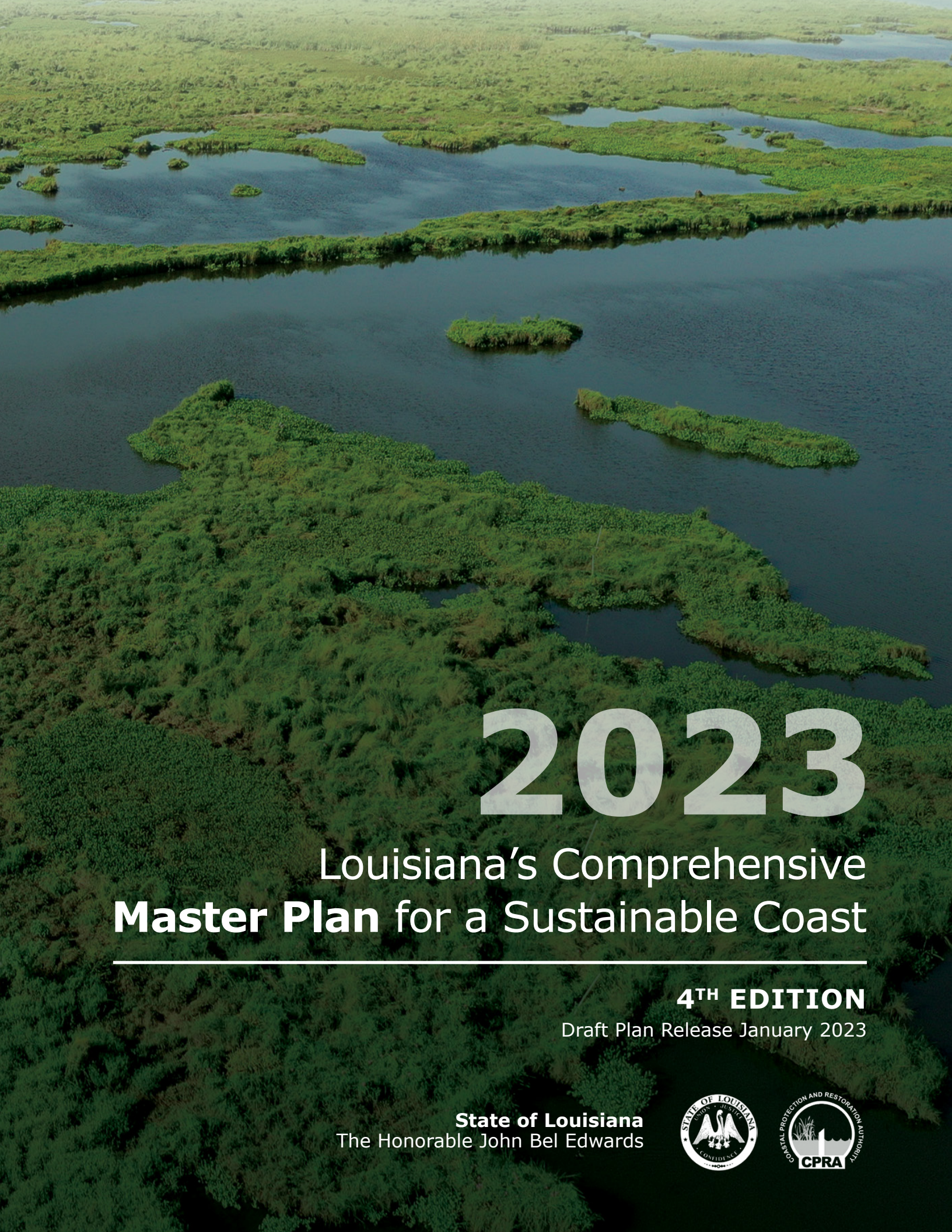

2023

Louisiana's Comprehensive **Master Plan** for a Sustainable Coast

4TH EDITION

Draft Plan Release January 2023

State of Louisiana
The Honorable John Bel Edwards

committed to **our coast**

COASTAL PROTECTION AND RESTORATION AUTHORITY OF LOUISIANA

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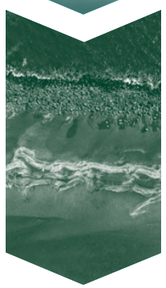

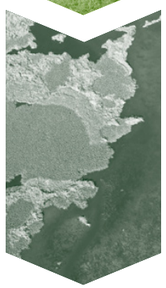

CHAPTER 1

INTRODUCTION

Louisiana's 2023 Coastal Master Plan updates the state's living plan to preserve our rich history, culture, ecosystems, and natural resources that are threatened by ongoing land loss and flood risk. By building on past progress, evaluating our current situation, and preparing to adapt for the future, the master plan works to protect our treasured resources and reduce land loss and flood risk.

Image: CPRA Staff in Lake Saint Catherine, 2021 (CPRA)

COMMITTED TO OUR COAST

PURPOSE AND OPPORTUNITY

Fifty years from now, Louisiana's coast will look very different. The state continues its commitment to implement restoration and risk reduction projects that will result in a vibrant and more sustainable coast for residents and visitors to enjoy. We recognize the challenges of natural and human-made change to the coastal environment and are proactively working to address them through this updated master plan. The implementation of large-scale projects represents a commitment to the people of Louisiana, to our cultural heritage, and to maintaining a viable working coast.

When thinking about the future, people in coastal Louisiana have many questions. What might the future coast look like? How will hurricanes impact coastal communities in the future? Will future generations get a chance to enjoy the communities, landscapes, and natural resources of our coast? Through a rigorous evaluation effort, the 2023 Coastal Master Plan provides insight into these questions. The master plan presents projections of the future coastal landscape and how factors like climate change and land use decisions may impact where and how coastal communities can thrive. But it does not stop there – master plan analyses provide a vision for a better, more productive future for our coast by proposing a robust suite of restoration and risk reduction projects to benefit every region.

The 2023 Coastal Master Plan and appendices provide information about land loss, storm surge-based flood risk, and associated challenges facing south Louisiana, explanations of how the plan was developed, and in-depth discussion of proposed projects to address those challenges. Taken together, the many parts of the master plan provide ideas for a better future and offer ways to enhance the connection between our coast and all who depend on it.

The 2023 Coastal Master Plan is the fourth such plan developed by the State of Louisiana to articulate a clear statement of priorities to achieve comprehensive coastal restoration and risk reduction goals. The Louisiana Coastal Protection and Restoration Authority (CPRA) is tasked with updating the master plan every six years. Once approved by the Louisiana Legislature, this plan becomes the guiding document for the state's coastal activities and provides a clear path forward for billions of dollars of investment in the design, implementation, and operation of large-scale restoration and risk reduction solutions.

CPRA was formed following the devastating hurricanes of 2005. The first Louisiana Coastal Master Plan was released in 2007. It has since been updated in 2012, 2017, and now 2023. The 2012 plan represented a significant advancement in the plan framework, utilizing predictive models to prioritize investments, which were built upon in the 2017 plan. The 2023 plan has again built on that framework while improving evaluation tools, incorporating the best available science, and adapting the process to better utilize local knowledge.

Much has changed over the last 18 years since CPRA was formed. Additional hurricanes have ravaged our coast. We experienced the Deepwater Horizon Oil Spill – one of the worst environmental disasters in the history of our country. New funding sources became available, and CPRA and its partners developed, designed, and constructed the state's largest and most ambitious restoration and risk reduction projects.

Image: White Lake Wetlands Conservation Area, 2021 (Louisiana Sea Grant College Program)

There is uncertainty in what the future holds, but work to date demonstrates that the state is invested in the future of our coast. This plan is the blueprint for where we go from here: the goal is a sustainable coast where people can continue to live, work, and enjoy the things that make coastal Louisiana economically, ecologically, and culturally unique and valuable.

Building this resilient coast is a much larger endeavor than the projects CPRA implements. It is dependent on the decisions of individual citizens, communities, local governments, and businesses, as well as fellow state and federal agencies. In addition to prioritizing restoration and risk reduction projects, the 2023 Coastal Master Plan illustrates how the coast will change in terms of landscape, natural resources, and future hurricane risk. It also illustrates how people and communities may experience that change so they can make informed decisions.

LOUISIANA'S BOUNTIFUL COAST

With a population of more than two million people, coastal Louisiana is home to a rich diversity of people, communities, and cultural traditions. It is also home to a variety of industries, ecosystems, and natural resources which feed and nourish its people and the nation's economy. Louisianans have a deep and abiding love for their coast, and their rich cultural heritage is closely connected to the land and water. This connection between the land, water, and people is as diverse and productive as the people themselves. Louisianans include members of multi-generational fishing families that dock in Plaquemines Parish; duck hunters setting out at dawn amongst the freshwater marshes in Cameron Parish; Indigenous peoples whose traditions and histories inform their daily lives on the coast; and new residents who have begun to experience and appreciate the natural beauty and bounty of our coast. For each of these residents, and the millions of visitors to the state each year, maintaining a healthy and productive coast is of critical importance.

STRATEGIC PLANNING

THE ROLE OF THE 2023 COASTAL MASTER PLAN

Previous master plans have set an ambitious path to respond to the loss of our coastal land and threats from storm surge-based flooding. The 2023 Coastal Master Plan continues the state's mission by identifying a long-term program of project planning, design, construction, monitoring, and operations and maintenance, as well as adaptive management of the coastal program and landscape.

Louisiana's coastal program is guided by an ongoing master planning process that allows for progress to be made in advancing projects before the funding to build them is available. By laying out a vision for which projects the state prioritizes for investment, the master plan fosters efficient and effective progress such that when funds become available from any source, action can be taken quickly to implement projects. The plan is sufficiently specific about what needs to be done and where to provide a foundation for action. It provides a level of confidence about where funds will go and what outcomes are expected, while not being overly prescriptive on project details so their designs can be tailored to on-the-ground conditions when the time is right. This process bridges the gap between the current conditions in coastal Louisiana and future changes, while providing a path forward to support the lives, livelihoods, and culture of our coastal citizens and communities.

A SIX-YEAR UPDATE CYCLE

Every master plan cycle begins by reviewing feedback on the previous master plan process and incorporating recommended improvements. Additionally, collaboration among CPRA staff, advisory groups, expert partners and contractors, and dialogue with stakeholders across coastal Louisiana is a major component of the plan development process. Goals are identified, timelines are determined, tasks are outlined, and appropriate technical partners are engaged to undertake the work of updating the plan. We work with experts to translate up-to-date data and scientific information into a modeling framework that addresses the physical and ecological dynamics of the coastal landscape and changes in predicted damages from storm surge-based flooding.

In parallel, advisory groups are established and a broad network of coastal experts, landowners, scientists, community leaders, local officials and stakeholders are asked to provide insight and guidance during the development process. By doing this, we identify challenges, understand what Louisianans value, and develop projects that address the coastal crisis. Advisory group members provide input on topics ranging from technical updates and scientific understanding to regional and local priorities and effective communication strategies.

An extensive model improvement effort was one of the first steps in the development process of the 2023 Coastal Master Plan, the results of which are detailed in the following section. These models were used to predict changes in the landscape and storm surge damages over a 50-year period and identify future challenges across the coast.

PROJECT SELECTION PROCESS

Louisiana residents are facing enormous changes. Because people are making decisions about their families, their jobs, and their futures, they need the opportunity to provide input and feedback on plans for the future of the coast. A list of candidate projects was developed to address future land loss and storm surge-based flood damages. Project concepts were solicited from the public and members of advisory groups to address key coastal concerns. Projects included in previous master plans that have not yet been implemented were also added to the list. All of these candidate projects were then modeled, and model outputs were used to evaluate project performance in reducing land loss, reducing storm surge-based flood risk, and other impacts on important coastal metrics (such as navigation, habitats, and support of resource-based industries and workers).

We modeled 50 years of a future with each project and compared that to the predictions without the project in place to understand the project's impacts (positive or negative). We then used a computer-based decision support software system, called the Planning Tool, to identify groups of robust projects that are predicted to have beneficial impacts under a variety of future conditions. More information on the Planning Tool can be found in Chapter 4 - Evaluate.

Throughout the project selection process, members of the public and advisory groups were kept informed and regularly asked to provide feedback and guidance. As each step of the process was completed, methods and outputs were documented, and modeling results underwent a quality assurance protocol to ensure decisions were made based on accurate and reliable data. Information was communicated to advisory groups, stakeholders, local and state officials, and other interested parties at several points during plan development, followed by an extensive outreach effort that presented the plan to Louisianans. Ultimately, the 2023 Coastal Master Plan is presented to the CPRA Board and the Louisiana Legislature for consideration and, upon approval, becomes the official guidance for the state's coastal program. This process, along with feasibility studies and engineering and design work, allows the state to be more responsive to funding as it is identified by having projects on hand that have already been evaluated and are well developed. This leads to project implementation that is both efficient and effective.

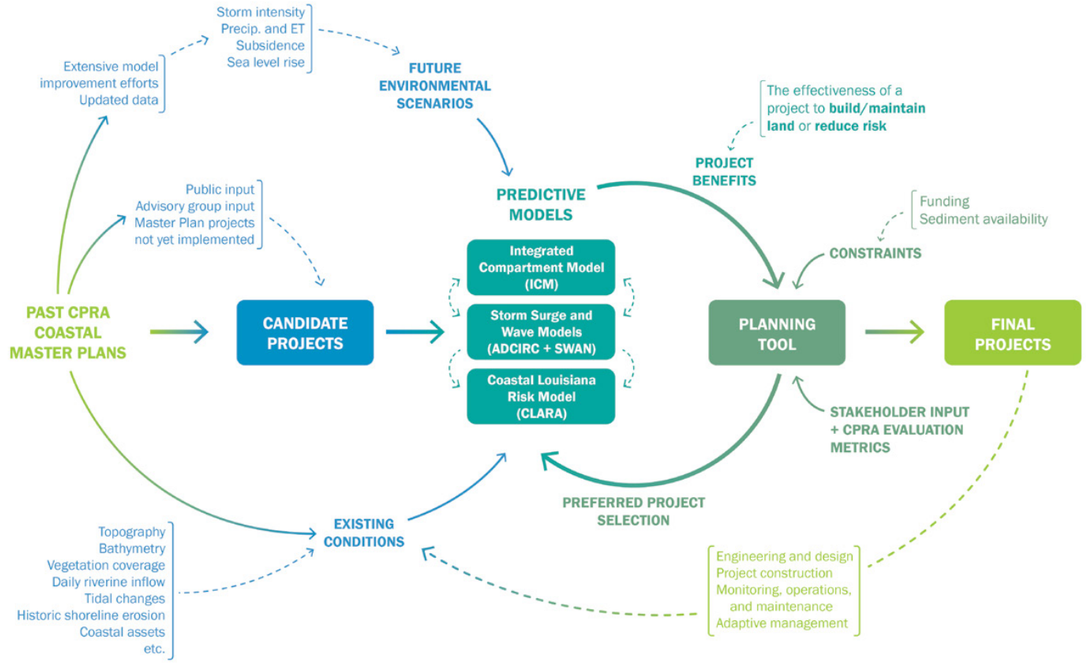

Figure 1.1: The 2023 Coastal Master Plan development process.

A PLAN TO ACHIEVE

GOALS, OBJECTIVES AND PRINCIPLES

The master plan serves as a guide for the state to prioritize restoration and risk reduction efforts. This is accomplished by identifying robust projects that meet the goals of the plan by reducing land loss and limiting storm surge-based flood risk across the coast both today and into the future. However, those are not the only concerns of coastal Louisiana residents and the master plan has been developed with people in mind. To better meet the needs of Louisianans, the master plan refines the vision of our future coast by identifying objectives and principles. Here, we present objectives and principles which have been identified to help support the master plan's goals and provide clarity about what Louisianans value. Together, these goals, objectives, and principles reflect years of coastal planning experience and serve as guidelines for developing and implementing a comprehensive 2023 Coastal Master Plan.

PLAN GOALS

LAND LOSS REDUCTION

Candidate projects are evaluated based upon how much land they create and maintain over 50 years, as compared to the projected landscape without the projects.

STORM SURGE RISK REDUCTION

Candidate projects are evaluated based on how well they reduce expected annual damage in dollars and in terms of structure damages, from storm surge-based flooding as compared to the projected risk without the projects.

PLAN OBJECTIVES

FLOOD PROTECTION

Reduce economic losses from storm surge-based flooding to residential, public, industrial, and commercial infrastructure.

NATURAL RESOURCES

Promote a sustainable coastal ecosystem by harnessing the natural processes of the system.

COASTAL HABITATS

Provide habitats suitable to support an array of commercial and recreational activities coastwide.

CULTURAL HERITAGE

Sustain the unique cultural heritage of coastal Louisiana by protecting historic properties and traditional living cultures and their ties and relationships to the natural environment.

WORKING COAST

Promote a viable working coast to support regionally and nationally important businesses and industries.

PRINCIPLES

Urgent Need to Take Action. In order to have the best future outcomes, we must plan, design, and implement projects now to address increasing land loss and storm surge-based flood risk in the future.

A Systems Approach with Near- and Long-Term Solutions. The master plan was developed using a systems approach to risk reduction and restoration, whereby a robust suite of projects was selected for the plan. Projects are evaluated and selected using a planning horizon of 50 years but spread over two implementation periods for near- and long-term impact.

Clear Expectations. We cannot recreate the coast of the 20th century or even retain the coast of today. Instead, we must plan to help shape a new landscape that will continue to support viable natural and human communities into the future.

Acknowledging Residual Risk. Risk reduction measures and restored coastal habitats cannot eliminate all storm surge-based flooding risks. Some degree of residual risk is inevitable.

Collective Responsibility. CPRA, through the master plan and with its partners, develops the common vision for our coast. Achieving a sustainable coast, however, is a collective endeavor that requires stakeholder input and feedback, and coordinated action from our state, federal, and local government partners, and various other stakeholders including non-governmental organizations, business, industry, and academic and research institutions.

Providing for Transitions. Louisiana's coastal crisis has and is displacing people, infrastructure, businesses, and entire communities. Sensitivity and fairness must be shown to those whose homes, lands, livelihoods, and ways of life may be affected by master plan projects or by continued land loss and flooding.

Participatory Process. The master plan was developed with the participation of the many diverse interests that live, work, play, and own property in coastal Louisiana, along with national interests that have a stake in coastal Louisiana's landscape.

Accounting for Uncertainties. Planning for the next 50 years means acknowledging a certain level of financial, environmental, and scientific uncertainty. We do know, however, that land loss and increased flood risk will continue, and the risk of doing nothing is far greater than the risk of acting with incomplete knowledge.

Adapting to Changing Circumstances. The master plan is updated every six years with model and process improvements, including the integration of newly available data, to respond to changing economic, social, environmental, and climatic conditions in Louisiana's dynamic coastal communities.

Efficient Use of Resources. The master plan was developed in a way that acknowledges the need for efficient use of resources, such as funding and sediment. The plan's analysis seeks to capitalize on synergies among projects, resolve overlaps and conflicts, and promote sound management of resources.

Sediment for Restoration. At present, limited supplies of, or access to, renewable sediment resources constrain the restoration efforts we can undertake. We consider natural processes and dredging options to meet our needs.

Regulatory Effects. Revisions to some laws and regulations may be needed to help the state's coastal program better achieve its goals, and cooperation is needed from local, state, and federal partners.

Role of Private Landowners, Business, and Industry. Close working relationships with private landowners are essential. Since Louisiana is also a working coast, partnerships with businesses and industries are also important for the success of the coastal program.

LEADING UP TO 2023

A TIMELINE OF PROGRESS

The information shown here represents just some of the notable events and key achievements of Louisiana's coastal program since 2005. Project implementation metrics are also presented to track accomplishments over time.

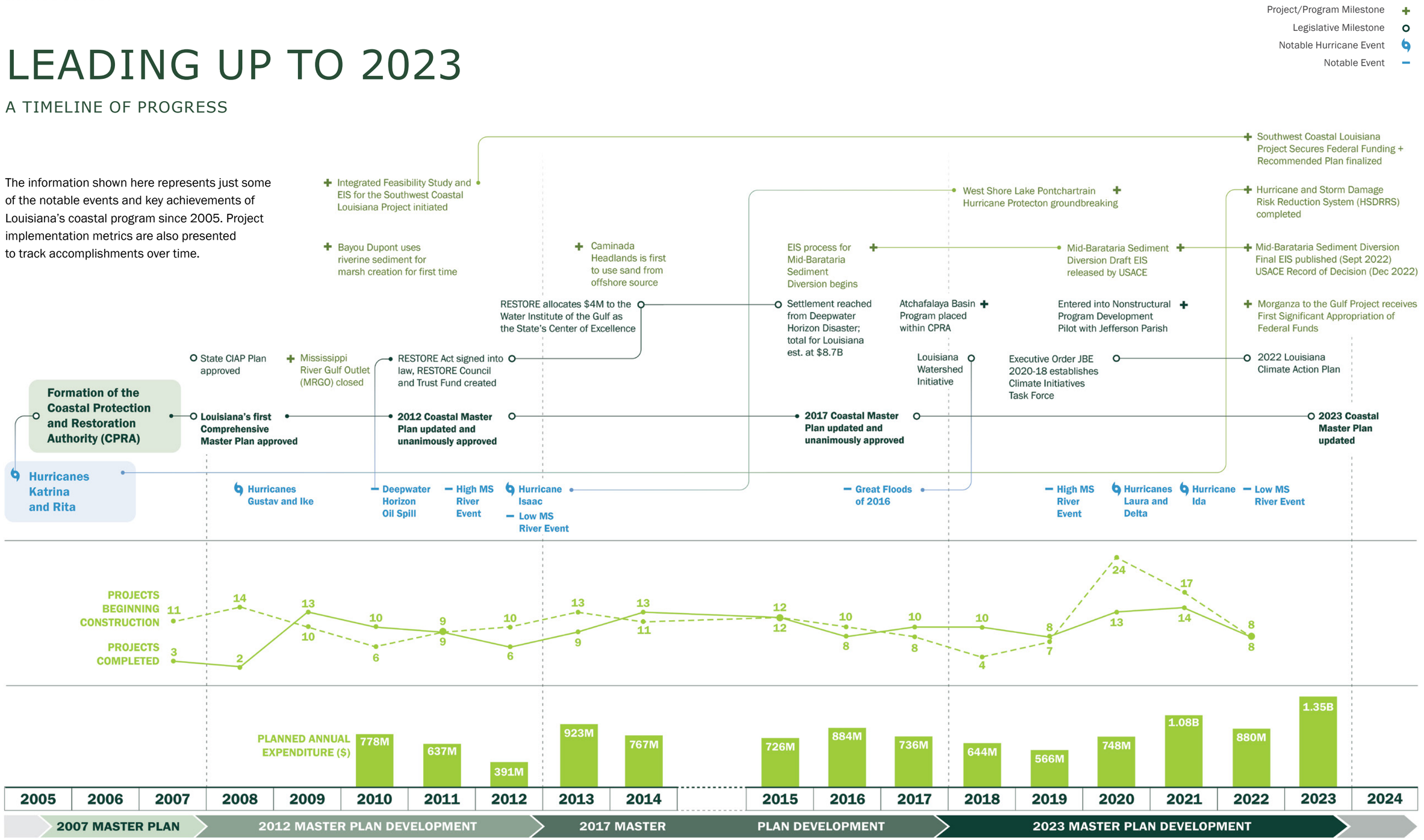

Figure 1.2: Timeline of master plan efforts leading up to 2023 and other notable events.

PROGRESS ON THE GROUND

LOUISIANA'S COASTAL PROGRAM IN ACTION

CPRA is an implementation agency – we do not just plan projects, we build them. For decades, the state and our partners have moved projects forward from conception to construction. Since 2007, CPRA and its partners have secured $21.4 billion in pursuit of coastal restoration and risk reduction efforts. Over that time, CPRA has completed more than 140 projects to benefit coastal Louisiana. Since 2007, these efforts have totaled:

- 55,807 acres benefited (87.2 sq mi)
- 193,000,000 cubic yards of sediment placed
- 369 miles of improved levees
- 71.6 miles of restored barrier islands

CPRA is committed to mobilizing dollars quickly and efficiently through the master plan process and to leveraging advanced science and technology and the dedication of people working to implement the master plan.

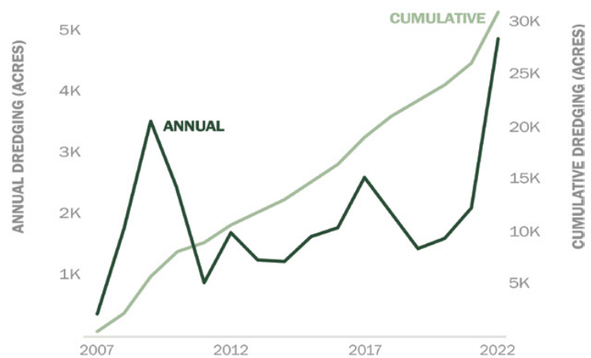

Figure 1.3: Acres created by dredging per year.

Structural Risk Reduction
Ridge Restoration
Marsh Creation
Diversion
Hydrologic Restoration
Oyster Reef Restoration
Shoreline Protection
Barrier Island Maintenance
Other CPRA Master Plan Projects
CPRA Coastal Program Projects

Map 1.1: Implemented Projects as of January 2023.

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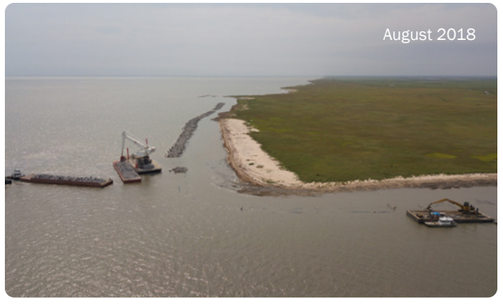
0 5 10 20
MILES

ROCKEFELLER SHORELINE PROJECTS

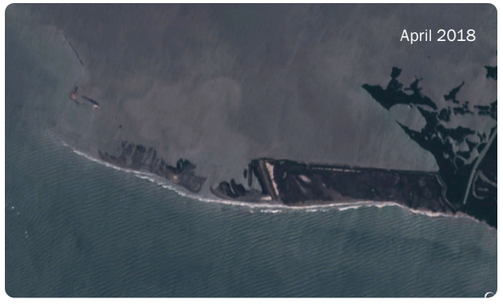
The Rockefeller Shoreline projects, three in all, together represent over five miles of foreshore breakwaters. They protect reaches of the Gulf shoreline that have been eroding at some of the highest rates in Louisiana.

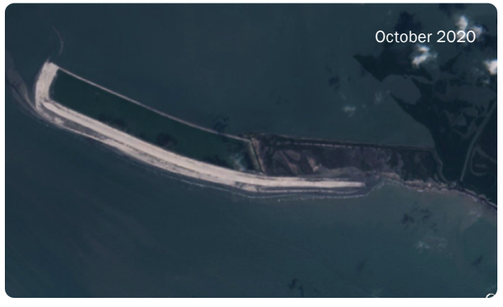
Due to soft substrates this project involved the development of novel techniques for the placement of breakwaters, including testing of different approaches. Lighweight aggregate in the core of the breakwaters reduces their weight, while providing the necessary structure to reduce wave erosion.



TERREBONNE BASIN BARRIER ISLAND RESTORATION

The Terrebonne Basin Barrier Island and Beach Nourishment project includes the engineering, design, and construction of approximately 1,100 acres of beach, dune, and marsh habitat within the Terrebonne Basin barrier shoreline system. It uses dredged material from Ship Shoal, and includes restoration of beach, dune and marsh habitat on West Belle Headland, Timbalier Island, and Trinity Island.





GREATER NEW ORLEANS HURRICANE RISK REDUCTION

The Hurricane and Storm Risk Reduction System (HSDRRS) project includes the construction and improvement of 133 miles of perimeter risk reduction features, such as levees, floodwalls, floodgates, and pump stations to reduce risk for an event with a 1% annual exceedance probability. It also includes about 70 miles of interior risk reduction features such as large-scale pump stations. It is among the most advanced storm surge risk reduction systems in the world.

SPANISH PASS RIDGE AND MARSH CREATION

The Barataria Basin Ridge and Marsh Creation Project, Spanish Pass Increment project involves dredging sediment from the Mississippi River to restore 132 acres of earthen ridge and 1,538 acres of marsh along Spanish Pass in Plaquemines Parish, a natural historic river distributary west of Venice, Louisiana.

THIS UPDATE OF THE MASTER PLAN

The master plan serves as a long-term, comprehensive guide to restoration and risk reduction investments by the State of Louisiana and is undertaken in parallel with other efforts to address more acute challenges in the coastal zone. In the past six years, several events and initiatives have influenced the conversations and actions around issues of environmental and community change across the coast.

SINCE THE 2017 COASTAL MASTER PLAN

CPRA has remained hard at work since the adoption of the 2017 Coastal Master Plan to address challenges across the coast. Thousands of Louisiana residents were negatively affected and/or displaced as a result of Hurricanes Laura and Delta in 2020, and Ida in 2021 among others, and state and federal assistance related to these events is ongoing. The Louisiana Office of Community Development's resettlement of Isle de Jean Charles has begun to see the first residents move to their new homes near Schriever, Louisiana. The Chitimacha Tribe of the Central Coast was awarded $5 million as part of the U.S. Bureau of Indian Affairs' greatly expanded efforts to assist tribes severely affected by climate-related environmental threats.

The U.S. Army Corps of Engineers (USACE) issued their final environmental impact statement (EIS) on the Mid-Barataria Sediment Diversion. The HSDRRS was completed and handed off to the state and levee boards. The West Shore Lake Pontchartrain Risk Reduction project was funded and construction has started. In addition, Governor John Bel Edwards' administration appointed Louisiana's first Chief Resilience Officer and encourages state agencies to incorporate long-term coastal change projections into their planning and operations. Governor Edwards also established the Climate Initiatives Task Force, which released a plan to guide the state's pursuit of carbon neutrality by 2050. In 2018, in response to the statewide flood events of 2016, the state launched the Louisiana Watershed Initiative, a watershed-based approach to reducing flood risk in Louisiana. It is designed to coordinate and align various state and federal programs, and coordinate policies and decision-making among local jurisdictions within a watershed.

WHAT'S NEW IN 2023

Building on the capabilities and advancements of previous plans, the 2023 Coastal Master Plan includes efforts to improve project development and evaluation; incorporate the best available science to refine tools and analyses; collaborate with federal, state, and local governments, academia, and non-governmental organization partners; and effectively engage stakeholders.

Following two public solicitations for new project ideas, CPRA worked with Regional Workgroups (RWs) to refine project concepts and identify areas of need that were not represented among the initial proposals. Ultimately, 131 candidate projects were evaluated. Projects were developed with a focus on addressing regional-scale challenges and integrating restoration techniques to amplify benefits. A new robust project selection process was used to identify projects that perform well under a range of possible future conditions to address climate and other uncertainties in the decision-making process. Improvements to predictive models include updates to inputs and assumptions, such as the vegetative response to stressors and covariance of environmental scenario values along potential climate change pathways. Risk modeling now incorporates updated and higher resolution coastal assets data, population change, and community demographics information. The development of new risk metrics allows us to better understand and illustrate who is currently most vulnerable to flood risk and how different communities may experience future flood risk. Nonstructural risk reduction strategies are considered coastwide to better support funding and implementation opportunities provided by multiple agencies and programs.

To facilitate effective communication of the results, the 2023 Coastal Master Plan includes expanded analyses that are accessible through the Master Plan Data Viewer. These improvements work together to create a plan that is both realistic and practical, links risk reduction and restoration projects, and focuses on a message of transition and adaptation for coastal Louisiana residents.

Image: Pass A Loutre, 2020 (CPRA)

FOCUS ON THE COAST

The 2023 Coastal Master Plan presents a vision for the coast and illustrates the benefits of continued investment and implementation of projects.

- The plan relies on a variety of restoration project types that harness natural processes and use available dredge material to create and maintain land over time.
- The plan looks to both structural and nonstructural risk reduction projects to provide storm surge-based flood risk reduction to communities across the coast and provides information on the residual risk faced over the next 50 years.
- The plan provides tremendous economic development opportunities for Louisiana and its citizens. Our investment in coastal research has spurred the growth of this and related fields. For example, learning to live with water is central to our wetland restoration and flood risk reduction strategies.
- The ecosystem benefits provided by the plan will support commercial and recreational fisheries and wildlife across the coast and provide additional benefits to our communities.
- The plan provides a blueprint for action that is consistent with and supportive of other efforts at the local, state, and federal level and provides information to support the work of other agencies.

CHAPTER 2

UNDERSTAND

To understand how best to restore and protect Louisiana's coast, we must recognize its value as a natural, economic, and cultural resource. The state has a rich history of connection between its landscape and communities as well as decades of scientific studies on land loss and storm impacts. Bringing this knowledge together means better planning for the future of our coast.

Image: Grand Isle, 2016 (CPRA)

A PART OF THE SOLUTION

PLANNING AND COOPERATION

Coastal resilience is more than restoration and protection. State agencies, parishes, municipalities, levee districts, federal partners, businesses, and individuals must work together in support of a comprehensive approach to enhance the resiliency of our communities, livelihoods, culture, and coastal environment.

The 2023 Coastal Master Plan serves as the guiding document for the state's investments in coastal restoration and risk reduction. While updating each master plan is complex and takes six years to complete, plan development is only one part of the work CPRA undertakes.

The master plan process develops and evaluates project concepts that have regionally significant impacts over decades, projects that complement local and parish-level efforts, and those that help respond to specific events, like hurricanes or oil spills. The master plan allows the state to be prepared when restoration or risk reduction funding becomes available by evaluating project concepts and advancing promising ideas.

After funds are identified and incorporated into CPRA's Integrated Ecosystem Restoration & Hurricane Protection in Coastal Louisiana: Fiscal Year Annual Plan (annual plan), projects can efficiently move forward. They are analyzed further in the feasibility process through which CPRA, the state, and our partners refine our understanding of how a project is expected to perform and what it will take in terms of funding, timelines, permitting, etc. to construct and operate.

From there, projects can move forward to engineering and design.

Once funded and permitted, projects that have been fully designed and evaluated can move into construction. Depending on the project type and size, this can take several years, and hundreds of local jobs may be created during the construction phase.

Following construction, CPRA or its partners are responsible for project operation, maintenance, and monitoring. This improves project outcomes and provides data and information necessary to inform future planning efforts and adaptively manage the state's coast with respect to ongoing challenges.

CPRA is both a planning and an implementation agency, which ensures consistency between the master plan and CPRA's other charges.

EXPANDED COORDINATION

In addition to the work of CPRA, the State of Louisiana leverages local government initiatives, the efforts of other state agencies, federal studies and funding, and the work of non-profit and community-based organizations to expand the reach of our coastal program.

Through state and local partnerships, large-scale risk reduction projects, such as the Morganza to the Gulf project, have been pursued incrementally. Information sharing among state agencies has led to assessment of vulnerabilities, identification of adaptation actions, and pursuit of measures to make our coastal communities more resilient.

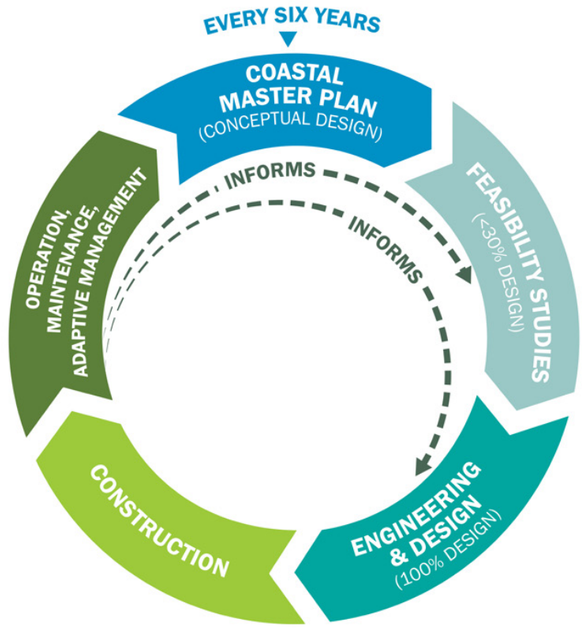


Figure 2.1: Six-year cycle to update the master plan.

This is the result of the Governor's Adaptive Governance Initiative (AGI) in which CPRA supports state agencies in their required efforts to consider environmental change projections from the master plan in their long-term planning and decision-making.

In addition to state and local partners, CPRA also works directly with USACE to monitor and maintain levees and coordinates with the Federal Emergency Management Agency (FEMA) and other federal partners during and in the aftermath of damaging storms.

The state's pursuit of these endeavors is anchored in a commitment to the people and places that make up coastal Louisiana. While restoration and risk reduction planning is essential for managing the coast and providing consistent, long-term investment in our communities and ecosystems, it cannot meet every need.

Resilience and the future of coastal Louisiana rely on identifying goals, cultivating a shared vision, and continuing to adapt to changing conditions. The state, through updates to the master plan and each of the efforts above, supports Louisianans in understanding how the coast will change in the future and how to prepare accordingly.

>>> CPRA has an important role in shaping the future of coastal Louisiana through the development of the 2023 Coastal Master Plan, implementation of projects and programs, and cooperation with partners. Learn more in **Chapter 7: Beyond the Master Plan**.

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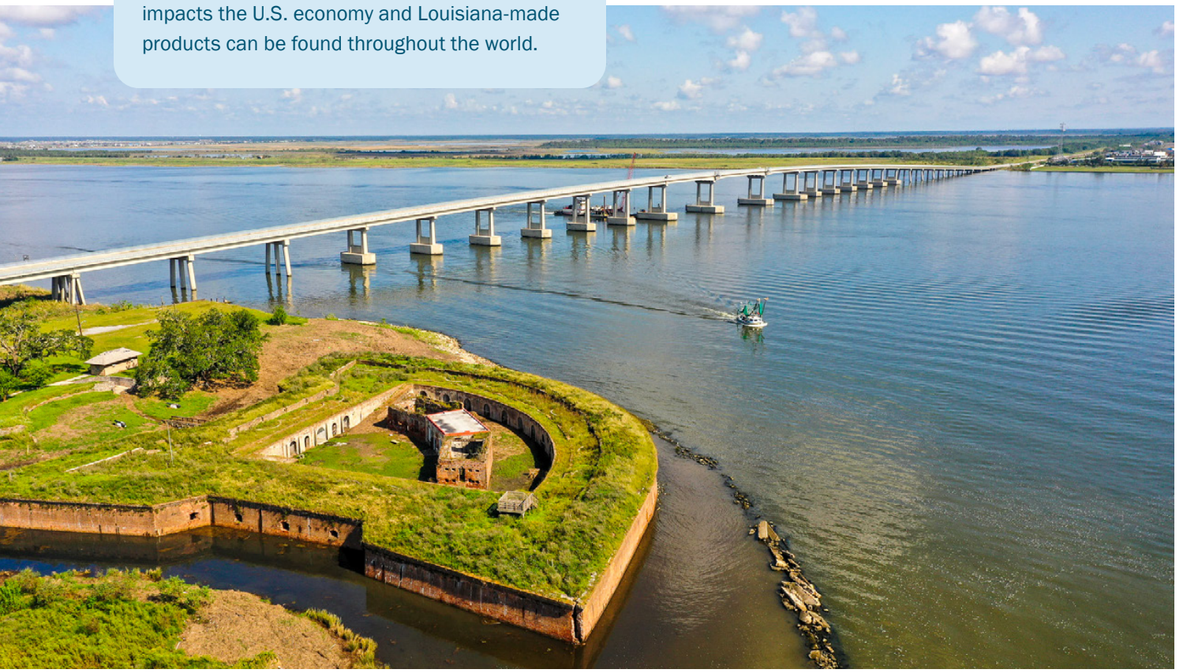
THE VALUE OF OUR COAST

A trip to coastal Louisiana makes clear the valuable resource that it is. It boasts extensive reaches of coastal wetlands that are filled with Spanish moss-draped cypress trees and miles of coastal marshes. Alligators float on the water's surface, bridging the world of the fish swimming below to that of the birds flying above. This landscape supports a thriving ecosystem and is home to a diverse group of people and their rich cultures. They make their living on the Louisiana coast -fishing, hunting, and working in industry. Louisiana's working coast impacts the U.S. economy and Louisiana-made products can be found throughout the world.

Image: Atchafalaya Basin, 2018 (Louisiana Sea Grant College Program)

Image: Fort Pike, 2021 (CPRA)



The landscape is for more than just making a living. Recreational fishing, hunting, birding, and boating in coastal Louisiana are unparalleled. Locals and people from all around the world come to enjoy the beautiful and bountiful landscape.

Image: Pelicans on Queen Bess Island, 2020 (CPRA)

These experiences, skills, and enjoyments have been passed down for generations. The 2023 Coastal Master Plan is critical to a vibrant future coast for generations to come.

Image: Pointe-aux-Chênes, 2020 (CPRA)

A HISTORY OF CHANGE

DYNAMIC LANDSCAPES AND COMMUNITIES

The landscapes and communities of Louisiana have changed immensely over time – from the early Indigenous settlements to our present-day rural and urban populations and industries – and will continue to do so in the future.

Much of the land that makes up coastal Louisiana was formed from sediment that washed down the Mississippi River and was distributed over thousands of years as the river changed course and left behind enormous deltas with vast areas of coastal wetlands. As one delta was built and others degraded, the diversity of the ecosystems—from swamps to salt marshes to barrier islands—emerged. To the west, sediments moved along the coast as the Mississippi changed course, and periodic deposition and erosion led to chenier ridges across the wetland plain.

These underlying formations created a vast complex of wetlands interspersed with protected lakes and bayous that provided essential navigable waterways during pre-colonial and post-industrial periods. The fertile lands, made of rich sediments from overflowing rivers and bayous, first made this region desirable to early native and settler populations.

Louisiana's population, culture, and economy have evolved over centuries. The original inhabitants of this land were the Indigenous peoples that lived in the area for thousands of years before the arrival of Spanish and French settlers in the 16th and 17th centuries. The population expanded and diversified with the arrival of thousands of enslaved people transported from West and Central African nations. The 18th century saw the arrival of Acadians from present day Nova Scotia who, when they were expelled by the British, chose to settle in Louisiana. Descendants of these groups, including the geographically unique Creole population, have continued to make their home in Louisiana alongside more recently arrived residents, including members of Louisiana's large Vietnamese and Latin American communities.

During and after World War II, Louisiana's significant economic development was due to the petrochemical industry and increasingly involved inshore and offshore oil and natural gas drilling in the Gulf of Mexico. This energy development completely transformed the state's economy and its landscape. As the oil industry expanded, thousands of miles of canals were cut through Louisiana's coastal wetlands and marsh, unintentionally contributing to and exacerbating wetland loss. Chemical production, leveraging the state's readily available hydrocarbons, sulfur, salt, and water resources, boomed between 1947 and 1957 when the first big move to offshore petroleum production was made. After the war, the rise of economic markets led to rapid industrialization in Louisiana inducing oil refineries, petrochemical plants, foundries, food production, fishing, timber, transportation equipment, and electronic equipment. Today, chemical, petroleum, and coal products remain Louisiana's leading industrial sectors, providing approximately 30% of all industrial activity in the state. These industries are located predominantly along the Mississippi River between Baton Rouge and New Orleans, and near Lake Charles, where they are served by deep water navigation channels.

While petrochemical production is still important, the agricultural foundation of rural Louisiana remains strong. Louisiana farmers produce commodities, such as sugarcane, soybeans, rice, feed grains, cotton, strawberries, hay, and pecans. Louisiana is also the nation's second largest seafood supplier and the seafood industry is a major employer across the coast. From shrimp to oysters and crabs to crawfish, Louisiana seafood remains an iconic product for the state.

Image: Map of the Alluvial Region of the Louisiana Coastal Plain, 1861 (Library of Congress)

Many of these coastal industries and businesses rely on workers living in coastal communities that have become increasingly impacted by damage from hurricanes in recent decades. Repeated flooding, frequent and unpredictable evacuations, and challenges with obtaining affordable insurance are all factors that have contributed to many residents' decisions to move inland. The residents of south Louisiana have always moved with the changing coast and will continue to do so as they weather these challenges. Long-term, gradual changes to the coastal landscape and increased flooding risks, along with the more acute impacts of hurricanes such as Katrina, Rita, Ike, Gustav, Laura, Delta, and Ida have led some coastal residents to move north. While it is true that south Louisianans are moving as they always have, doing so today is a different proposition than it was 100 or even 50 years ago. As a result, people are moving to areas that might not be ready for them. Increases in traffic, needs for road improvements, and a lack of affordable housing are all problems that expanding communities and their new arrivals face. Understanding the challenges that come with a changing coast is important so individuals and communities can plan and adapt. The 2023 Coastal Master Plan presents a detailed picture of what the future may hold and a plan for transition through continued investment in coastal restoration and risk reduction projects.

ENVIRONMENTAL AND CLIMATE CHANGE

Unfortunately, over the past century, the State of Louisiana has experienced changes to its landscape and the environment that pose significant challenges to the lives and livelihoods of many Louisianans. Since 1932, more than 2,000 square miles of Louisiana's coast, and the benefits they provide, have been lost. Both natural processes – such as hurricanes, erosion, subsidence, sea level rise – and human-made challenges – like the cutting of canals, oil spills, and building levees on the Mississippi River – impact coastal wetlands and barrier islands and undermine their ability to replenish naturally.

These issues are exacerbated by the impacts of climate change, which contributes to increasing rates of sea level rise and more intense hurricanes. Climate change will increase flooding in coastal communities, as tides get higher and roads flood more frequently. Drainage becomes more difficult as water levels rise, flooding fields and yards and causing excessive inundation of previously vibrant wetlands. The remaining wetlands and communities of coastal Louisiana are especially vulnerable, and additional land loss and increased flooding risk are inevitable over the coming decades.

PREPARING FOR THE FUTURE

Change is inevitable for Louisiana's coast. The state's landscape will look different in 50 years regardless of the environmental conditions we face. It is important that we prepare for the future in order to protect our resources. Although the future is uncertain, predictions of climate change are constantly improving and can provide significant insight for how we should adapt to oncoming change. The master plan looks at a range of potential future environmental conditions to best be prepared for what the future brings. The plan looks forward to the next 50 years in order to identify a path forward considering the resources we have. This allows us to make timely progress toward the future and be proactive. As the plan is implemented, we evaluate at every step and are able to adapt to the way the future unfolds.

Image: Ghost Forest in Pointe-aux-Chênes, 2018 (Louisiana Sea Grant College Program)

Image: Drainage Relief Outlet in Cameron Parish Post Hurricane Delta, 2020 (CPRA)

Image: Hurricane Laura Damage in Cameron Parish, 2020 (Louisiana Sea Grant College Program)

Image: Hurricane Laura Damage in Cameron Parish, 2020 (Louisiana Sea Grant College Program)

Image: Bridge Repair Post Hurricane Ida, Lafitte, 2021 (CPRA)

PEOPLE IN THE PROCESS

STAKEHOLDER INPUT

The 2023 Coastal Master Plan was developed through years of discussion, engagement, and input from the people of Louisiana.

From the very first master plan, interaction with a broad array of local stakeholders, communities, and technical experts has been crucial to defining the goals of the state's coastal program and developing solutions to address land loss and storm surge-based flooding.

Engagement with the master plan process takes many forms. In 2018, several advisory groups were established to bring experts from across the state into the plan and project development process. The insights and participation of our Coastal Advisory Team (CAT), five Regional Workgroups (RW), and Community Engagement Workgroup (CEW) helped to focus efforts on meaningful advancements, refine project concepts to address critical regional issues, and understand the hopes and concerns of individuals and communities coastwide. One result of this was the development of new project concepts by local experts with on-the-ground experience and knowledge of conditions.

Throughout plan development, CPRA staff had conversations with a variety of groups and individuals, including fishers, students, landowners, business and industry representatives, non-governmental organizations, parish officials, elected leaders, and tribal leaders. Discussions focused on the future of our coast and actions we can take now to achieve a more resilient future. These conversations occurred in a diverse array of settings, including classrooms, civic centers, ports, council chambers, banquet rooms, and boat launches. The figure to the right provides a summary of these efforts for the 2023 Coastal Master Plan.

59 Briefings (Community groups, civic and non-profit organizations, etc.)

20 Coastal Advisory Team meetings

7 Community Engagement Workshops

28 Regional Workgroup meetings

19 Predictive Models Technical Advisory Committee meetings

23 Conferences

8 CPRA Board meetings

4 Workshops

14 Informal public meetings

1 Governor's Advisory Commission on Coastal Protection, Restoration and Conservation

12 Master Plan Data Viewer demonstrations

195 Engagement touch points

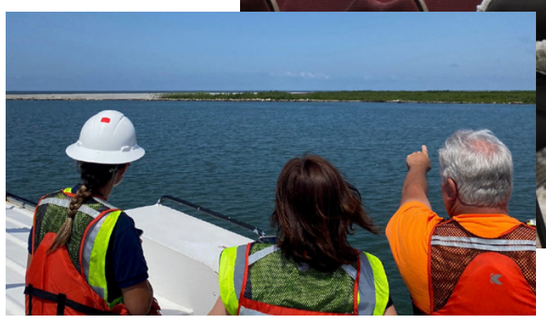
More than **200** hours of engagement

118 Technical Partners

from **31** Institutions / Organizations

113 Advisory Group members

from **85** Organizations



Images: Engagement Efforts (CPRA)

THE ROLE OF SCIENCE

USING WHAT WE KNOW

While we do not know exactly how the coast will change in coming decades, the fact is that the coast will certainly be different than it is today, just as it is different now than in the past. The master plan's intent is not to halt or reverse that change, but rather to use advanced tools to anticipate a range of possible future outcomes. These predictions provide a basis for a plan that moves toward more desirable and sustainable outcomes for Louisiana residents, businesses, and our natural coastal resources.

To ensure the 2023 Coastal Master Plan is built on the best possible scientific foundation, the State of Louisiana brought together local, national, and international experts to refine data, improve predictive models, and design comparative analyses. Through this process and by building on experience from previous master plans, we believe that the 2023 Coastal Master Plan is the most advanced coastal plan of its kind anywhere in the world.

PREDICTIVE MODELS

The master plan uses an array of predictive models that consider landscape change, storm surge and waves, and flood-related damages to coastal Louisiana structures and assets to understand what the future holds under a range of environmental conditions. These models are also used to evaluate the potential benefits of restoration and risk reduction projects and identify projects that best reduce land loss and storm surge-based flood damages through the 50-year planning time frame. CPRA partnered with multiple entities to use the most advanced and highest performing computer systems upon which these models were run.

THE LANDSCAPE MODEL (ICM)

The landscape of coastal Louisiana is represented using the Integrated Compartment Model (ICM), which predicts coastal hydrology, wetland morphology, vegetation dynamics, and the suitability of habitats to support an array of fish and wildlife. The ICM builds on the version used for the 2017 Coastal Master Plan, but recent improvements include refined resolution in key areas and the incorporation of additional processes.

The State of Louisiana's Coastwide Reference Monitoring System (CRMS) is a large network of more than 300 wetland-based observation stations that, since 2006, have collected data about wetland elevation, water levels, salinity, vegetation, and land change. In the 2023 Coastal Master Plan, data from CRMS stations has been used to refine how wetland vegetation in the ICM responds to changes in salinity and inundation stress. CRMS data, along with data and information from other CPRA-funded studies, were also used to improve the evaluation of subsidence (i.e., sinking of the ground) across the coast.

Future environmental change is an important driver of the predictive models used to inform master plan development and decision-making. During plan development, the most recent available global climate model outputs were leveraged to develop environmental scenarios that link climate-related variables, such as sea level rise rates and temperature changes, to represent plausible future conditions.

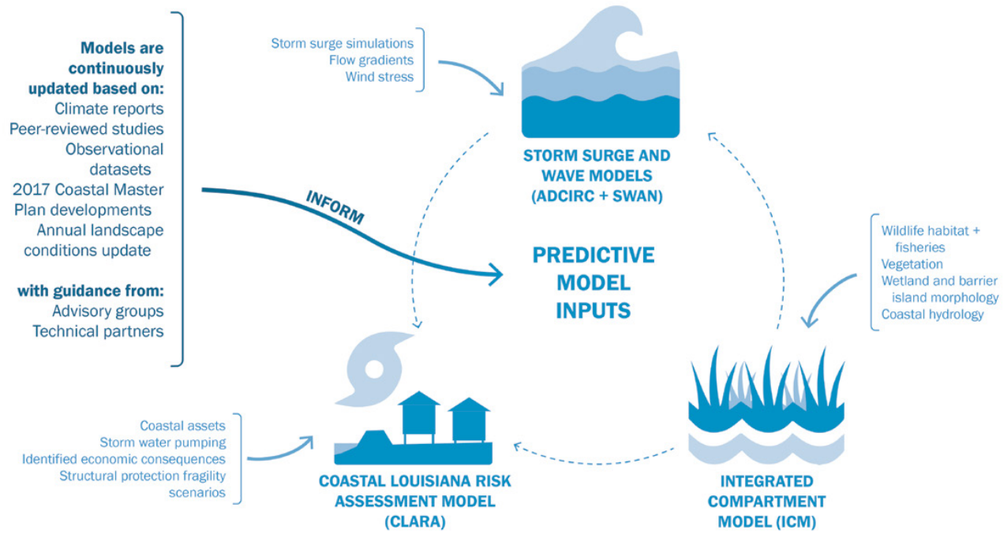


Figure 2.2: Predictive Model Inputs.

STORM SURGE AND WAVE MODELS (ADCIRC+SWAN)

Risk to coastal communities from hurricanes and other tropical events will continue into the future. These storm surge-producing events are modeled through the use of storm surge and wave models (ADCIRC+SWAN) that provide water level inputs to the risk assessment model.

Synthetic storms with varying characteristics, such as wind speed and central pressure, are modeled to test the impacts of a range of plausible events.

Working with the USACE Engineer Research and Development Center (ERDC), an updated set of storms, incorporating more extreme and less intense storms than were previously available, was used to model hurricanes and tropical storms and evaluate associated storm surge and wave levels across the coast.

COASTAL LOUISIANA RISK ASSESSMENT MODEL (CLARA)

The CLARA model is designed to estimate flood depths and direct economic damages from hurricanes and other tropical events. CLARA is used to estimate risk under a range of assumptions about future environmental and economic conditions and with different combinations of structural and nonstructural risk reduction projects on the landscape. The CLARA framework considers uncertainty related to future storms and their associated storm surge and wave levels, as well as the physical landscape.

Multiple detailed asset inventories were combined to characterize residential, commercial, industrial, and public structures across the coast to improve economic damage estimates. Additionally, through work with scholars at Purdue University, artificial intelligence was utilized to produce more accurate first floor elevation data (which informs damage estimates) than in any previous plan.

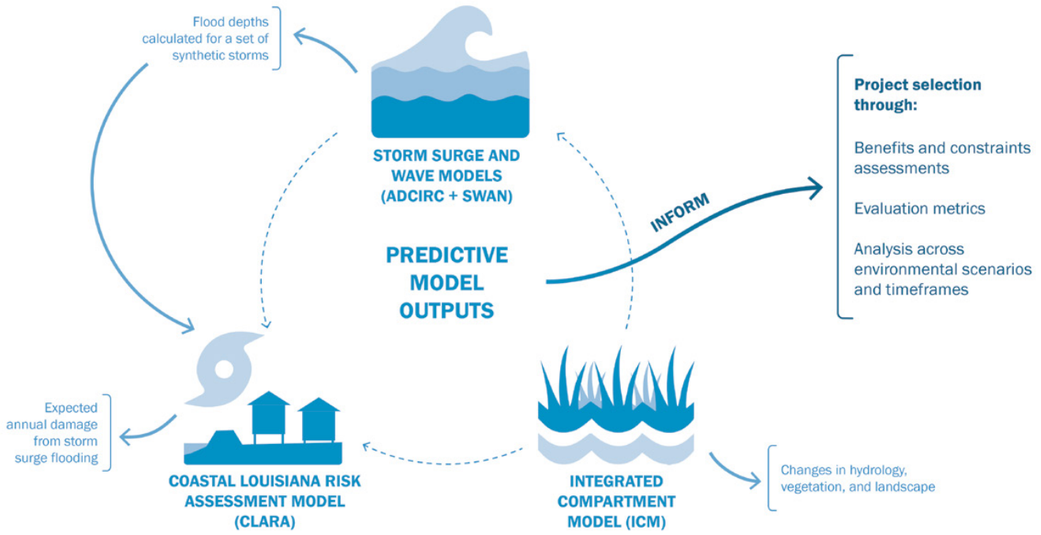


Figure 2.3: Predictive Model Outputs.

An economic measure of damages, known as expected annual damage in dollars (EADD), is an annualized estimate of storm surge damage. EADD includes damage to structures, their contents, and other direct losses incurred during the recovery period after a storm event, such as lost wages, costs associated with evacuation and temporary displacement, and other considerations. Another metric, expected annual structural damage (EASD) is an annualized estimate of structural damage. EASD is reported in 'structure equivalents' and represents an aggregate risk to structures, with damage to each structure expressed as a proportion of its replacement cost. It is important to consider the proportional flood damages that are represented by EASD so that the project selection process will not be more heavily weighted toward reducing damages in affluent communities at the expense of communities with lower property values. The incorporation of EASD in the 2023 Coastal Master Plan was an important step in providing an equitable and balanced risk reduction project portfolio.

>>> WANT TO KNOW MORE?

The following appendices provide additional information on model improvements, inputs, and other aspects of the predictive models used in developing the 2023 Coastal Master Plan.

- **Appendix C: Predictive Modeling Summary Document** provides an overview of all the predictive models and their uses in the 2023 Coastal Master Plan development process.
- **Appendix D: Landscape Modeling (ICM)** provides an overview of the ICM landscape model and how it functions, as well as details on improvements to individual model components.
- **Appendix E: Risk Modeling** provides an overview of two risk-related models focused on storm surge and waves (ADCIRC+SWAN), and risk assessment (CLARA).

FREQUENTLY ASKED QUESTIONS

Why is the master plan important to Louisianans? The master plan provides a way for Louisiana leaders, residents and businesses to understand what may happen in the future to their neighborhood, their favorite fishing areas, and how much flooding may occur in future storms. This allows them to prepare for, rather than react to, the changing coast. By knowing which projects are planned and how they can improve future conditions, individuals and communities can support these efforts, inform others, and work with local, state, and federal officials to expedite project implementation.

How can I get involved in the master plan process? By reading the plan you are already engaged! The CPRA Board meets monthly to share updates on progress and allow individuals time for public comments. You can also sign up for master plan updates (email us at masterplan@la.gov) and follow our social media to stay informed of recent advancements and upcoming events. Providing your thoughts and comments about coastal change and how it impacts you, gives the state important context for when and where action is needed.

If new data is incorporated into the master plan models and it changes the results from the last plan, does that mean that the previous models were wrong? How do we know this plan is right? The master plan models are neither right nor wrong. They are not being used to produce a single forecast of what will happen in coastal Louisiana. Rather, they tell us how our assumptions about the future may play out given our current understanding of the coastal system and key drivers of change like sea level rise and more intense storm events.

In this plan, restoration and risk reduction projects were selected based on their performance across multiple future conditions, which means they should provide benefits no matter how conditions change.

Coastal Louisiana has changed throughout history – why do we need a whole plan to deal with future changes? Coastal Louisiana is a very dynamic system and, over time, people have changed how they live to adjust to those changes, sometimes moving across the coast seasonally to harvest wildlife or catch shrimp. However, the way we currently live and work in coastal Louisiana means most of us move houses or jobs relatively infrequently and have strong ties to our local communities. Those communities are one of the great strengths of coastal Louisiana. This plan aims to allow that lifestyle to continue in as many places as possible and ensure that Louisianans can continue working in coast-dependent industries like ports, energy, and commercial fishing that are not only part of our unique cultural heritage but are also critical to state, regional, and national economies.

>>> HAVE MORE QUESTIONS?

Visit us online at coastal.la.gov or contact us directly at masterplan@la.gov.

CHAPTER 3

PREDICT

To predict potential future changes to coastal Louisiana over the next 50 years, we use predictive models to get an idea of how the landscape and storm surge-based flood damages might change with and without projects. Using an environmental scenario approach enables project performance to be tested against a range of future uncertainties.

Image: Louisiana Center for River Studies, Baton Rouge, 2019 (SCAPE)

PLANNING WITH MODELS

USING PREDICTIVE MODELING TO MAKE INFORMED DECISIONS

Since the 2007 Coastal Master Plan, the state has clearly articulated goals and objectives around reducing land loss, reducing storm surge-based flood risk, and realizing a future coast that supports how Louisianans live, work, and play. Each subsequent master plan used the most up-to-date information to predict how the coast may look in the future due to climate change and other environmental changes.

A combination of observations and scientific projections indicate that rising sea level, more intense hurricanes, and other environmental stressors will have major impacts on coastal systems, but exactly when, where, and how remains uncertain. In the face of this uncertainty, knowing how to adapt to a range of potential futures and achieve the goals of the state's coastal program requires the use of predictive models to inform decision-making.

Predictive models can be used to understand potential future conditions and to test the impact of different strategies in meeting our goals. For example, the ICM was specifically developed to support the master plan process. It represents the landscape of coastal Louisiana and the physical and ecological processes, and feedbacks that drive coastal change. This model uses established and newly developed understandings of coastal dynamics to predict change on the landscape. The interaction between storms, waves, and the landscape are represented in two other models, ADCIRC and SWAN, which predict changes in storm surge flooding. These predictive models, when supplied with boundary conditions and inputs, produce outputs that reflect the complexity of coastal processes and how they change over time.

Boundary conditions are external inputs to the models that vary over time, such as water levels, river flows, or wind speeds. They are based on historical conditions or predictions of future conditions. Data about elevation, water levels, vegetation, and other aspects of the landscape serve as a starting point, or initial conditions, for the 50-year predictions of landscape change in the ICM. The storm surge and risk assessment models are also informed by the boundary conditions imposed on the ICM as well as information about existing assets and infrastructure across the coast.

The future is uncertain with regard to climate-related environmental conditions and, therefore, assumptions about how climate will change must be made to make landscape- and storm damage-related predictions. We know that sea level rise and subsidence, along with precipitation, temperature, tributary flows, and hurricane intensity are key environmental drivers that influence our coastal landscape. We also know that there is uncertainty in how these variables may change over time. To make informed decisions, the master plan employs a scenario approach to define a range of plausible future environmental conditions.

SCENARIOS AND DRIVERS

For the 2023 Coastal Master Plan, we defined two scenarios, referred to as the "lower" and "higher" scenarios, to drive change within the ICM and ADCIRC + SWAN for use in project selection. Analyses from the 2017 Coastal Master Plan showed that two variables, subsidence and sea level rise, had the greatest impact on model outputs; therefore, development of scenarios for this plan began with choosing values for these two model inputs. Sea level rise rates were selected based on climate change modeling from external sources such as the National Oceanic and Atmospheric Administration (NOAA) sea level guidance and the Intergovernmental Panel on Climate Change (IPCC). Subsidence rates were determined through analysis of shallow and deep subsidence rates derived from CRMS and global positioning system (GPS) elevation data, with a greater rate of shallow subsidence applied in the higher scenario than in the lower. Overall, the lower scenario represents more moderate future conditions, while the higher scenario represents more severe conditions with greater sea level rise and shallow subsidence, leading to increased land loss and flood depths compared to the lower scenario.

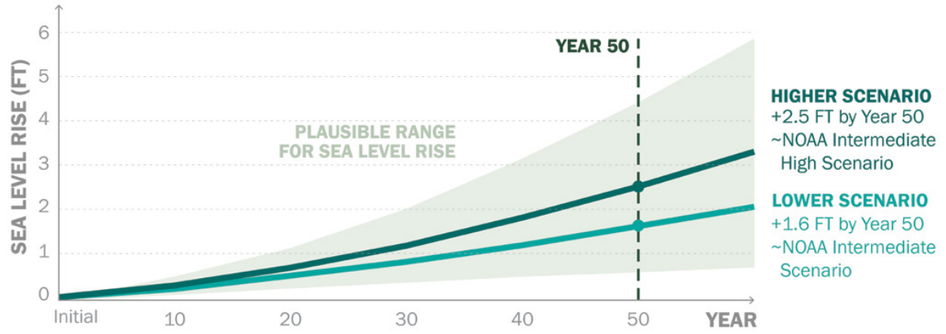


Figure 3.1: Sea Level Rise Curves for Project Selection and Range of Plausible Curves.

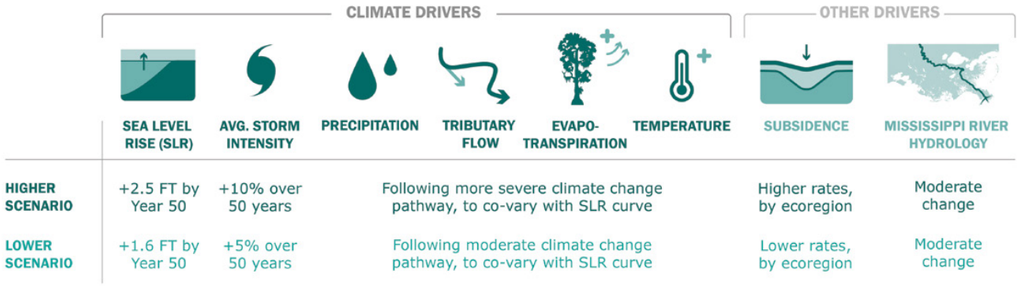


Figure 3.2: Climate and other drivers for the Higher and Lower Scenarios.

Once sea level rates were selected for the two scenarios, values for the other scenario variables were derived from related global climate model outputs. When considered together, the model outputs of the two scenarios delineate a range of possible future landscapes and damage profiles that can be used to inform decision-making. While the use of this scenario approach does not make the future more certain, it does provide a better understanding of what may come and, thereby, increases confidence in the master plan being well-suited for whatever the future holds. Additional scenario values are used in the prediction of storm surge-based flood damage in CLARA. The analysis does not necessarily assume that all storm surge protection levees hold when storm flooding occurs. Rather, CLARA uses two fragility (i.e., infrastructure performance) scenarios: 1) a no fragility scenario, where levees hold, and 2) a fragility scenario that uses assumptions developed by USACE in post-Katrina studies. Similarly, whether interior drainage pumps continue to operate during a storm to remove rainfall from poldered areas is also dependent on a variety of unpredictable factors. Therefore, CLARA uses three pumping scenarios: 1) drainage pumps are fully operational, 2) pumps operate at 50% capacity, or 3) no pumping.

>>> Additional details on scenario values can be found in **Appendix B Attachment B2**.

THE CURRENT OUTLOOK

THE FUTURE DEPENDS ON THE PAST

When modeling the possible futures of coastal Louisiana, outcomes are significantly impacted by the chosen starting point. As part of the master plan development process, the starting landscape was updated from the one used in the 2017 Coastal Master Plan. This landscape update reflected changes in surface elevation, land/water distribution, and vegetation cover and was adjusted to include new restoration or levee projects that were recently constructed.

It is important that the initial landscape conditions used in the modeling represent the on the ground conditions as much as possible so that there is confidence that model outputs reasonably reflect landscape responses to candidate restoration and risk reduction projects.

FUTURE WITHOUT CURRENTLY FUNDED PROJECTS (FWOCFP)

As part of the 2023 Coastal Master Plan development, the ICM was run for 50 years under a condition referred to as "Future Without Currently Funded Projects (FWOCFP)." For these model runs, the only restoration or risk reduction projects modeled on the landscape are those that have already been constructed. Some of these projects are included in the existing conditions coastwide digital elevation model (DEM), which captures the location and elevation of these features along with the rest of the landscape features.

The characteristics of other projects or features that were constructed after data were collected for the DEM were imposed on the model based on engineering design documents, conversations with local landowners, institutions like levee boards, and others who have knowledge of their community and these features.

These model runs serve to demonstrate the possible future of coastal Louisiana if all future planned restoration and risk reduction efforts were halted and the coastal program only continued to operate existing projects. Given that funding for future projects is not guaranteed and that unforeseen circumstances could complicate the process of implementing projects that are already funded, comparing these model runs to those with projects that have funding but are not yet constructed can provide insight into the long-term effects of ongoing investments in the coastal program.

The 2023 Coastal Master Plan, however, does not assume this FWOCFP landscape to be the starting point. The next section provides additional detail about what is included in the master plan's starting landscape or "Future Without Action (FWOA)."

FUTURE WITHOUT ACTION (FWOA)

The FWOA condition in the 2023 Coastal Master Plan serves as the baseline for predicting changes to the landscape and storm surge-based risk into the future. The initial landscape represented in the ICM and passed to the ADCIRC + SWAN and CLARA models reflects a snapshot in time while the coastal program continues its activities. Thus, a decision must be made about how to include the effects of ongoing work in the modeling.

To start, completed projects and existing landscape features are included. Then, additional projects and features are included based upon expectations around progress in implementing those projects. This includes projects that have undergone significant advancements in engineering and design, those that have availability of funding for construction, and those for which construction permits are currently being obtained.

Image: Operations at West Belle Pass after Hurricane Ida, 2021 (CPRA)

Some of the projects included in FWOA are very large and are expected to have significant impacts on the future landscape following implementation. Of particular note are several projects that were included in the 2017 Coastal Master Plan and have been successful in advancing toward construction since that time.

For the first time, two large-scale sediment diversions off of the Mississippi River—the Mid-Barataria and Mid-Breton Sediment Diversions—are included in FWOA. These projects, when implemented, will divert sediment and water from the river when flows are favorable to transport sediment and deliver it to the Barataria and Breton basins, respectively. The two mid-basin sediment diversions are anticipated to reconnect the adjacent basins to the Mississippi River as a source of sediment to nourish and maintain existing wetlands and to create coastal wetlands over time, in much the same way as southeast Louisiana was originally built by the Mississippi River before levee construction (see Chapter 2 for more details about the history of coastal Louisiana's landscape).

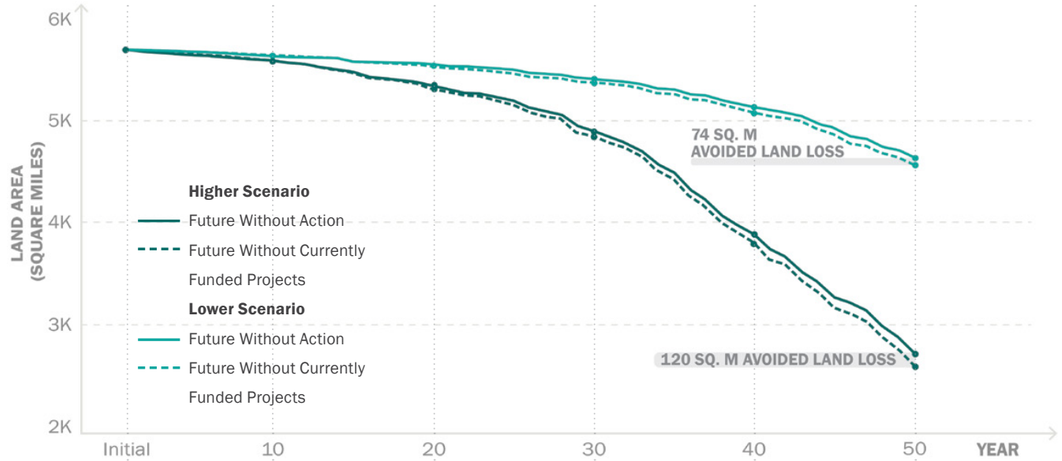
Analysis from the 2017 Coastal Master Plan and subsequent engineering and design studies suggests that the Mid-Barataria Sediment Diversion has the potential to build 21 square miles of new land over a 50-year period. In September 2022, USACE issued the final EIS for this project. Federal and state permits and permissions for construction are under review as of December 2022. The Mid-Breton Sediment Diversion project is currently in advanced stages of design, and it is anticipated that initial construction could commence upon permit approval.

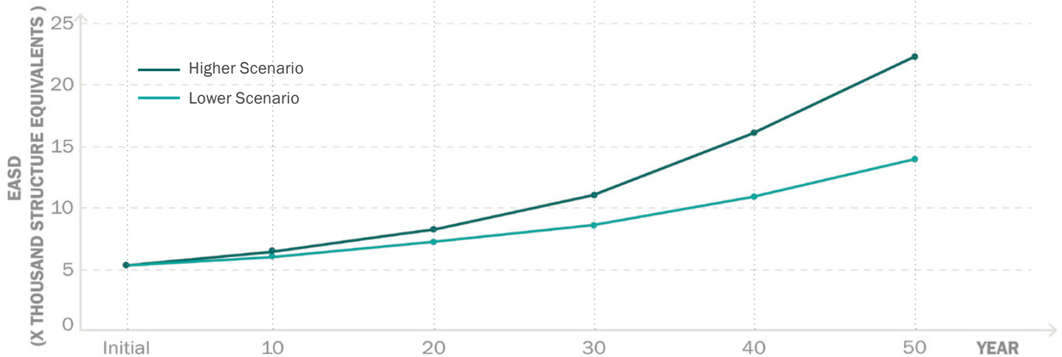
The impact of these projects on the landscape can be seen in output maps for FWOA model runs (see maps 3.1-3.4) showing creation of 58 square miles of land that helps to strengthen wetlands in both basins. It is important to note that because these projects are in FWOA their benefits are not attributed to the 2023 Coastal Master Plan. Those benefits, however, are a keystone of Louisiana's coastal program and are the result of targeted, significant investment in large-scale restoration projects.

Another project that is assumed to be on the landscape in FWOA is the River Reintroduction Into Maurepas Swamp. This project includes a gated diversion structure in Reserve, Louisiana, and a conveyance channel crossing Highway 61 and Interstate 10 to allow a maximum of 2,000 cubic feet per second (cfs) of water from the Mississippi River to restore natural swamp hydrology and reduce salinity levels in the Maurepas Basin. Design of the River Reintroduction Into Maurepas Swamp project is nearly complete and construction is expected to begin in 2023, in coordination with the West Shore Lake Pontchartrain levee project.

Even with these projects assumed to be on the ground, the FWOA landscape realizes significant land loss and increases to storm surge-based flood depths over the 50-year model prediction. Under the lower scenario, 1,100 square miles of land are lost in 50 years; an equivalent amount of loss occurs by year 34 under the higher scenario, with up to 3,000 square miles in 50 years under those more severe environmental conditions.

This land loss impacts not only the landscape configuration and ecology but also results in changes to storm surge and waves and, thus, flood-related damages. Without additional project implementation, flood damages could increase by up to $19 billion annually, with 17,000 additional structures damaged due to significant increases in flood depths. These possible futures without action reveal the challenges that the 2023 Coastal Master Plan was developed to address.





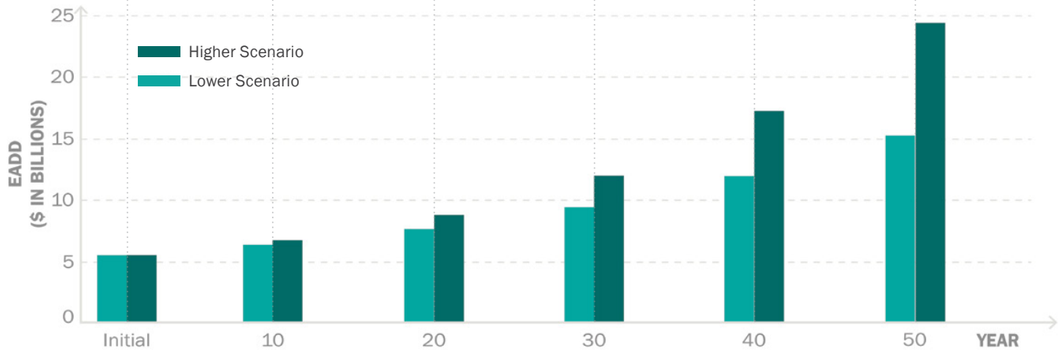


Figure 3.3: Land Area over 50 years, FWA and FWOCFP, Higher and Lower Scenario.

Figure 3.4: Expected Annual Structural Damage (EASD) over 50 years, Future Without Action, Higher and Lower Scenario.

Figure 3.5: Expected Annual Damage in Dollars (EADD) over 50 years, Future Without Action, Higher and Lower Scenario.

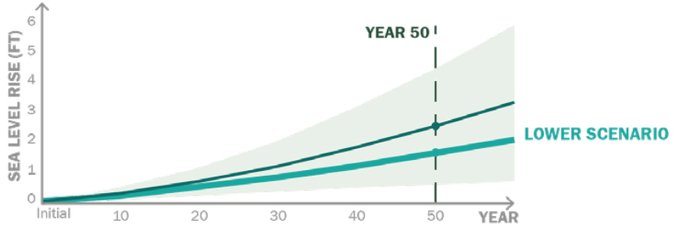
Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/

LAND CHANGE

FUTURE WITHOUT ACTION | LOWER SCENARIO | YEAR 50

Because Louisiana's coast is a dynamic system that will continue to be impacted by a changing climate, environmental conditions 50 years in the future will be different from those experienced today. It is important to develop a FWOA landscape to define the scale of the land loss challenge in coming decades and to serve as a baseline with which the projects in the master plan can be compared to determine their potential benefit.

Land change projections for the master plan's lower environmental scenario, one of two scenarios used for project selection, are shown above. Under this environmental scenario, coastal Louisiana would experience moderate climate change impacts, including sea level rise of 1.6 ft over 50 years. Without the 2023 Coastal Master Plan projects, the lower scenario ICM outputs predict 1,100 square miles of land lost in that same time period. Much of the projected loss is concentrated in lower basins and on marsh edges.



Land Gained
Land Lost

Map 3.1: Land Change, Future Without Action, Lower Scenario, Year 50.

N
0 5 10 20
MILES

Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/

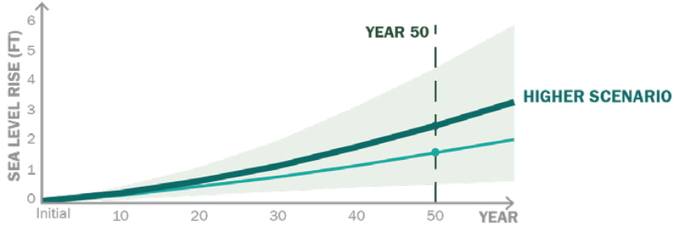
LAND CHANGE

FUTURE WITHOUT ACTION | HIGHER SCENARIO | YEAR 50

Planning under uncertainty requires considering multiple possible future environmental scenarios to understand the range of possible outcomes that the master plan may need to address. Land change projections for the master plan's higher environmental scenario after 50 years are shown above. Under this possible environmental scenario, coastal Louisiana would experience severe climate change impacts, including sea level rise of up to 2.5 ft over the next 50 years. Without the projects selected for the 2023 Coastal Master Plan, the higher scenario ICM outputs predict extensive land loss of 3,000 square miles over that same time period, with every region of the coast affected.

It is important to note that the higher environmental scenario represents a harsher future condition when compared to the lower scenario.

Due to uncertainty around future climate conditions, both scenarios are used in the development of the 2023 Coastal Master Plan to represent a range of future landscapes and to select robust projects that can provide benefits for the coast for whatever future conditions transpire.



Land Gained
Land Lost

Map 3.2: Land Change, Future Without Action, Higher Scenario, Year 50.

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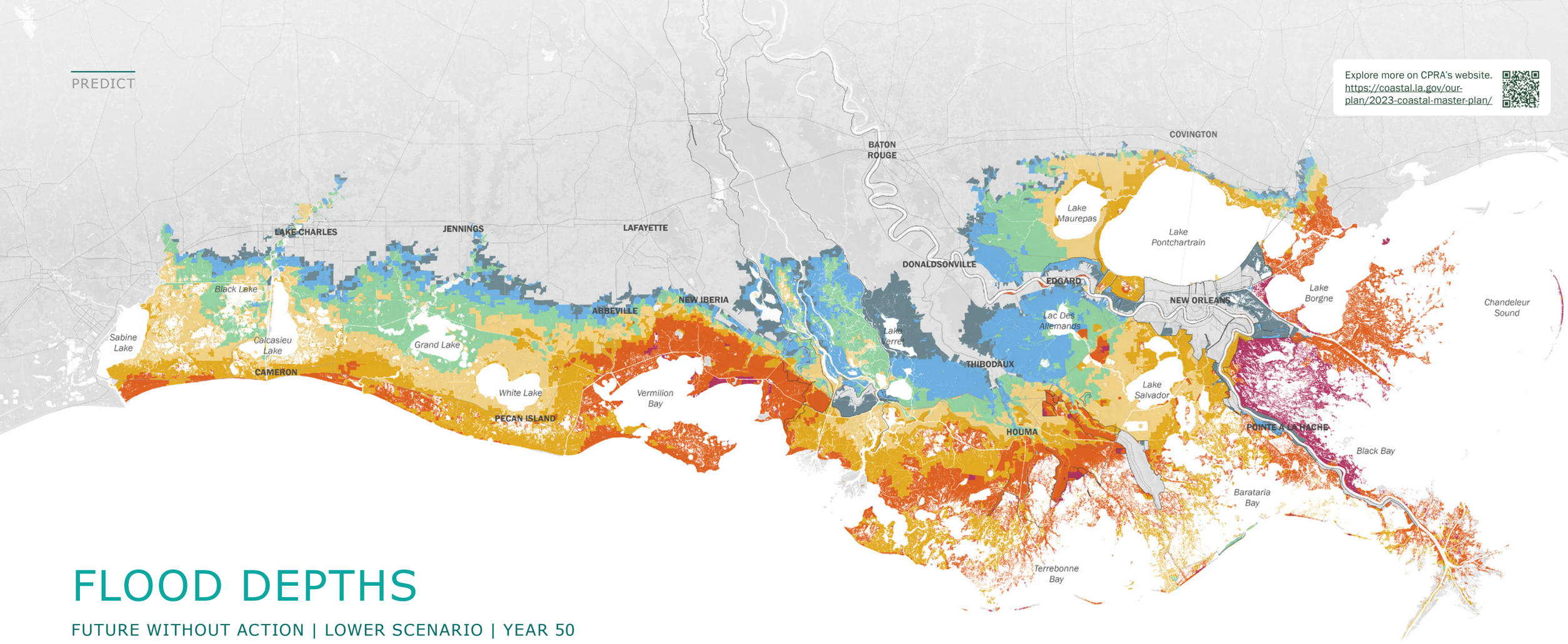
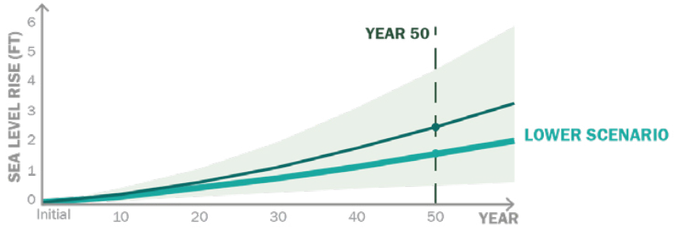
Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/



FLOOD DEPTHS

FUTURE WITHOUT ACTION | LOWER SCENARIO | YEAR 50

Storm surge-based flood depths are projected to increase in the future as more intense storms interact with higher sea levels, lower land, and with the continued degradation of coastal wetlands that can act as natural defenses. Under the lower environmental scenario, an additional 1.6 ft of sea level rise is expected over the next 50 years, adding height to already damaging storm surge levels. As a result of climate change, hurricanes are assumed to increase in intensity by 5% over the same period, exacerbating the risk posed by storm surge. Lower scenario projections of storm surge-based flood depths at locations across the coast with a flood depth of 1% Annual Exceedance Probability (AEP) are displayed above. That means that every year there is a 1% chance that these flood depths will be met or exceeded. These projections are for a future without the structural risk reduction projects selected for the 2023 Coastal Master Plan and show significant risk of flooding in communities across the coast.



1 to <4 feet
4 to <7 feet
7 to <10 feet
10 to <13 feet
13 to <16 feet
16 to <21 feet
21+ feet

Map 3.3: Flood Depths,
1% Annual Exceedance Probability,
Future Without Action, Lower Scenario, Year 50.

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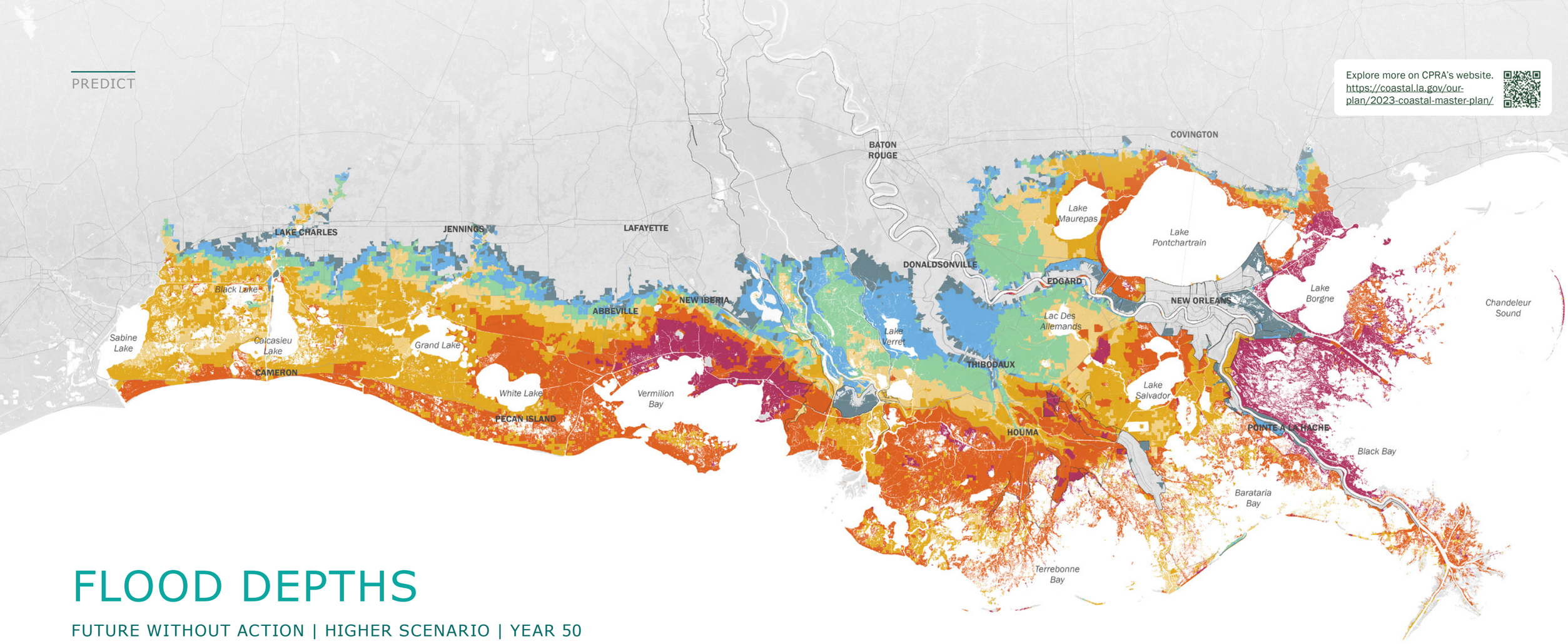
MILES

Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/



FLOOD DEPTHS

FUTURE WITHOUT ACTION | HIGHER SCENARIO | YEAR 50

Higher scenario projections of storm surge-based flood depths at locations across the coast with a flood depth of a 1% AEP are illustrated above. When compared to the lower scenario, it is clear that more severe climate change impacts—such as sea level rise of up to 2.5 ft, higher subsidence, and increased storm intensity of up to 10% in 50 years—have a significant impact on the potential depth of storm surge-based flooding. The northward migration of the storm surge-impact and the expansion of areas projected to experience the largest storm surge heights (more than 21 ft in some areas) can be seen under the higher scenario without the implementation of 2023 Coastal Master Plan projects.

Again, it is important to note that the higher environmental scenario represents a harsher future condition when compared to the lower scenario. Due to uncertainty around future climate conditions, both are used in the development of the 2023 Coastal Master Plan to represent a range of future landscapes and to plan robust projects that can provide benefits for the coast under any plausible future condition.

>>> Go to **Chapter 5: Take Action** to read about how CPRA addresses these anticipated challenges through protection and restoration projects.

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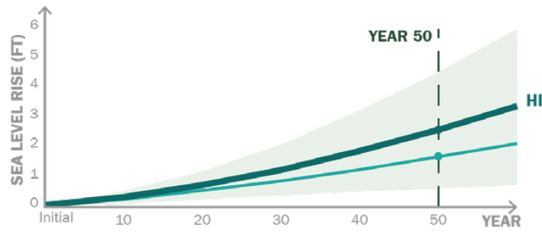

1 to <4 feet
4 to <7 feet
7 to <10 feet
10 to <13 feet
13 to <16 feet
16 to <21 feet
21+ feet

Map 3.4: Flood Depths,
1% Annual Exceedance Probability,
Future Without Action, Higher Scenario, Year 50.

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MILES

BY THE NUMBERS

A FUTURE WITHOUT THE 2023 COASTAL MASTER PLAN

Figure 3.6: By the Numbers, Future Without Action.

FREQUENTLY ASKED QUESTIONS

Two different maps are shown for land change – how do I know which one is right? The maps are based on different assumptions about the future, so neither is right nor wrong. Rather, they show us where land could be lost, where it could be built, and how much change could occur. If an area of land is lost – or built – in both maps, then we are more certain that type of change is going to occur. Both maps make assumptions about future climate and river conditions as well as how projects and structures, such as locks, are operated. If these assumptions do not play out exactly as predicted, the coastal map could be different from those presented.

I've always heard about flooding from a "100 year storm", but the master plan doesn't use this term - why? What is used instead? The master plan does not focus on recurrence intervals (e.g., 100-year storm), as those descriptions are based on long-term averages. As Louisianans have experienced, we can have a 100-year storm two years in a row. Instead, the maps show flood depths that have an AEP of 1%—that means every year there is a 1% chance that these flood depths will be met or exceeded. The depths and probabilities are calculated using flood depths associated with a set of storms that statistically reflect historical storm characteristics and the probability of those storms occurring in coastal Louisiana.

The land change maps show my community at risk of significant land loss through the model period – how should I use this information? The change shown in some areas is dramatic and is clearly concerning. Remember, however, that FWOA is used as a baseline to select restoration and risk reduction projects. Compare these maps with those shown later to see what difference the master plan can make in your area. You can use that information to advocate for construction of projects in the plan or to work with officials on other projects that could be included in future master plans to alleviate the loss and mitigate risk.

>>> HAVE MORE QUESTIONS?
Visit us online at coastal.la.gov or contact us directly at masterplan@la.gov.

CHAPTER 4

EVALUATE

To evaluate the potential impact of restoration and risk reduction projects on future outcomes, we solicit and model candidate project concepts. Project performance is evaluated in the Planning Tool, alongside considerations such as cost and available sediment, resulting in a prioritized list of projects for state investment.

Image: Rockefeller Shoreline, 2020 (CPRA)

PROJECT SELECTION

SETTING PARAMETERS FOR PLANNING

Selecting projects for inclusion in the master plan is a complex endeavor, because the process needs to be guided by real-world considerations, such as funding, resource constraints, and environmental change. Additional considerations regarding how projects may interact and the impact of the full plan on different aspects of the coast are also necessary. In the end, the projects included in the master plan represent a suite of solutions to address a variety of coastal issues Louisianans face now and into the future.

DECISION DRIVERS

As discussed in Chapter 2, the projects evaluated in the master plan process are compared based upon their performance with regard to two decision drivers: land area built and maintained and reduction of flood risk. While many of the projects included in the 2023 Coastal Master Plan have additional important benefits (e.g., supporting habitat and ecosystems, maintaining salinity gradients, supporting resource-based industry, etc.), the evaluation process is based upon project performance with regard to the two decision drivers.

Land Loss Reduction

Storm Surge Risk Reduction

PLANNING HORIZON

When planning, it is important to define the planning horizon—how far in the future will projects continue to yield results? In the master plan process, a 50-year planning horizon has been selected for a variety of reasons. Assessing project benefits over several decades allows long-term effects to be considered as well as near-term outcomes, and over 50 years the plan provides benefits for multiple generations.

Additionally, with the uncertainty inherent in the master plan process regarding both funding and climate change, a 50-year planning horizon is considered to be as far into the future as we can reasonably project those considerations with an acceptable level of confidence. The further into the future projections are made, the less certain we are about them.

Finally, 50 years is thought to be a sufficiently long planning horizon to be separated from political cycles at local, state, and federal levels and instead encourage “big picture” thinking and decision-making.

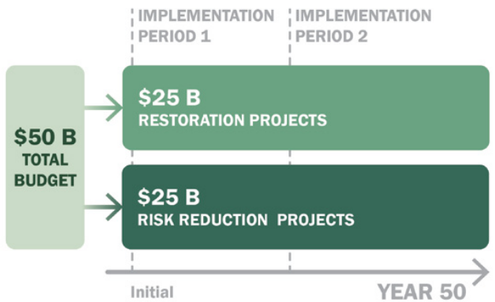


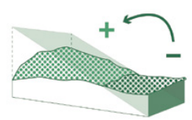
Image: Caminada Headland, 2016 (CPRA)

CONSTRAINTS

The 2023 Coastal Master Plan was developed using two fundamental constraints. First, a $50 billion overall budget for a 50-year period was selected with the funds divided evenly between restoration projects and risk reduction measures. This represents an aspirational but potentially achievable level of investment. While the State of Louisiana has budgeted more than $1 billion annually for the coastal program in recent years (as documented in the CPRA Fiscal Year 2023 Annual Plan), that level of funding has not been secured for the full 50 years considered in the master plan. Because funding for the coastal program is not guaranteed, the master plan is also divided into two implementation periods (IP1 [Years 1-20] and IP2 [Years 21-50]), with the most beneficial projects identified for near-term construction in the first 20 years of the plan with a budget of $25 billion. Because reducing land loss and storm surge-based flood risk are both decision drivers, the plan divides the full $50 billion budget equally between restoration and risk reduction efforts. More information on funding and implementation periods can be found in Chapter 5.

The second constraint considered is sediment availability. Restoring, creating, or maintaining wetlands requires sediment. The master plan recommends marsh creation projects that require a source of sediment to create wetlands. For the 2023 Coastal Master Plan, the sediment needed for marsh creation and landbridges is calculated and matched against how much sediment is available in potential borrow areas. This constraint, due to the variable cost of accessing different sediment sources and transporting material to project sites, also impacts project costs and, thus, which projects can be selected under the budget constraints discussed above.

Funding



Sediment Availability

PROJECT TYPES

ONE COAST, MANY SOLUTIONS

To address coastal land loss and storm surge-based flood risk, 131 candidate projects (113 restoration and 18 structural risk reduction projects) were considered for selection in the 2023 Coastal Master Plan. These are in addition to programmatic projects that address locally important issues and concerns.

A LONG-TERM, COASTWIDE PLAN FOR RESTORATION AND RISK REDUCTION

The projects included in the master plan are based on proven concepts and are shown to provide benefit over the 50-year planning horizon. The $50 billion planning budget accommodates a variety of project types that are consistent with the goals and objectives of the 2023 Coastal Master Plan.

FOCUS ON ADDRESSING REGIONAL CONCERNS

Not every part of the coast will change in the same way due to climate change and other local factors; therefore, some project types are better-suited to address the issues in a specific location than in others. Projects need to address the concerns experienced both today and into the future.

>>> For more information, see **Appendix A: Project Definition** and **Appendix H: Model Outputs** to learn more about the design and the performance of projects, respectively.

SUPPORTS MASTER PLAN OBJECTIVES

Beyond their individual benefits, the suite of master plan projects should collectively support master plan objectives (see Chapter 1 for more details). This is tracked through a series of additional metrics that consider whether the master plan as a whole supports the lives, livelihoods, and cultures of coastal Louisianans. See the following pages for more information on the project types considered in the master plan analyses as well as examples of programmatic project types.

RISK REDUCTION PROJECTS

Structural Risk Reduction

One effective means to address storm surge-based flood risk in coastal Louisiana is through the implementation of structural risk reduction projects. This project type encompasses new and improved levees, flood gates, storm surge barriers, and other structural elements that reduce flooding.

Nonstructural Risk Reduction

Risk reduction can also be successfully achieved through nonstructural mitigation measures. For the 2023 Coastal Master Plan, nonstructural projects, including elevating residences, commercial floodproofing, and voluntary acquisition, are considered to be applicable across all coastal communities. More information on implementing nonstructural projects can be found in Chapter 5.

RESTORATION PROJECTS

Restoration project types utilize varied approaches to restore, create, and sustain land. Standalone projects were considered for selection alongside integrated projects, which combine features from multiple project types into one integrated concept. In the end, a suite of restoration projects is planned and operated together to maximize their effectiveness and benefits over time, and surpass the benefits of any single project or project type.

Ridge Restoration

Marsh Creation

Landbridge

Diversion

Hydrologic Restoration

Integrated Projects

PROGRAMMATIC RESTORATION PROJECTS

CPRA implements several project types that are not individually identified in the master plan. These projects are often smaller scale, designed to address site-specific issues, and typically provide highly localized benefits. One example includes repairing barrier island breaches caused by hurricane impacts. While these types of projects are not explicitly listed in the plan, they remain consistent with the master plan goals.

Barrier Island Maintenance

Oyster Reef Restoration

Shoreline Protection

Bank Stabilization

Programmatic Restoration

Structural Risk Reduction

Structural Risk Reduction projects protect people and property with earthen levees, concrete T-walls, floodgates, and other structural components. They reduce the risk of storm surge flooding and damage within the protected area.

Image: Plaquemines Levee (CPRA)

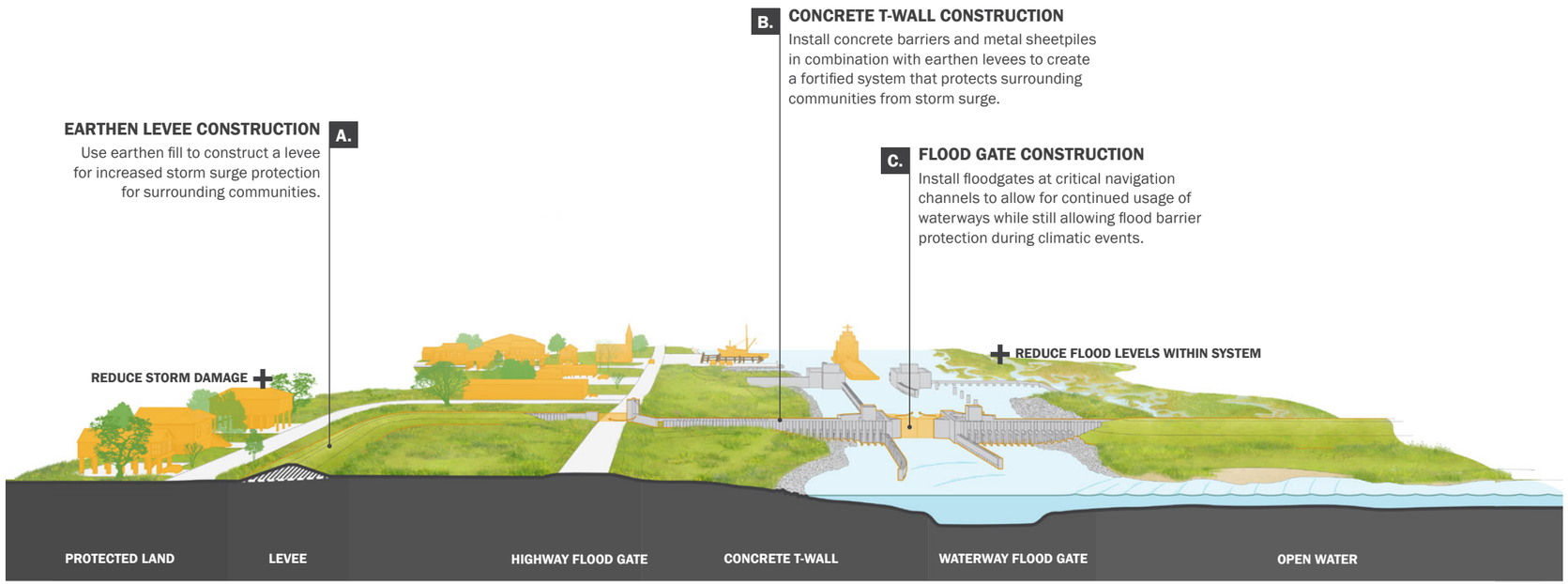


Figure 4.1: Structural Risk Reduction Project Type Visualization.

PROGRAMMATIC

Nonstructural Risk Reduction

Nonstructural Risk Reduction measures include the floodproofing, elevation, or acquisition of at-risk properties depending on projected flood depths. Nonstructural Risk Reduction measures are entirely voluntary and are undertaken in close collaboration with local stakeholders.

Image: Elevated Houses on Grand Isle (Lindsey Janies)

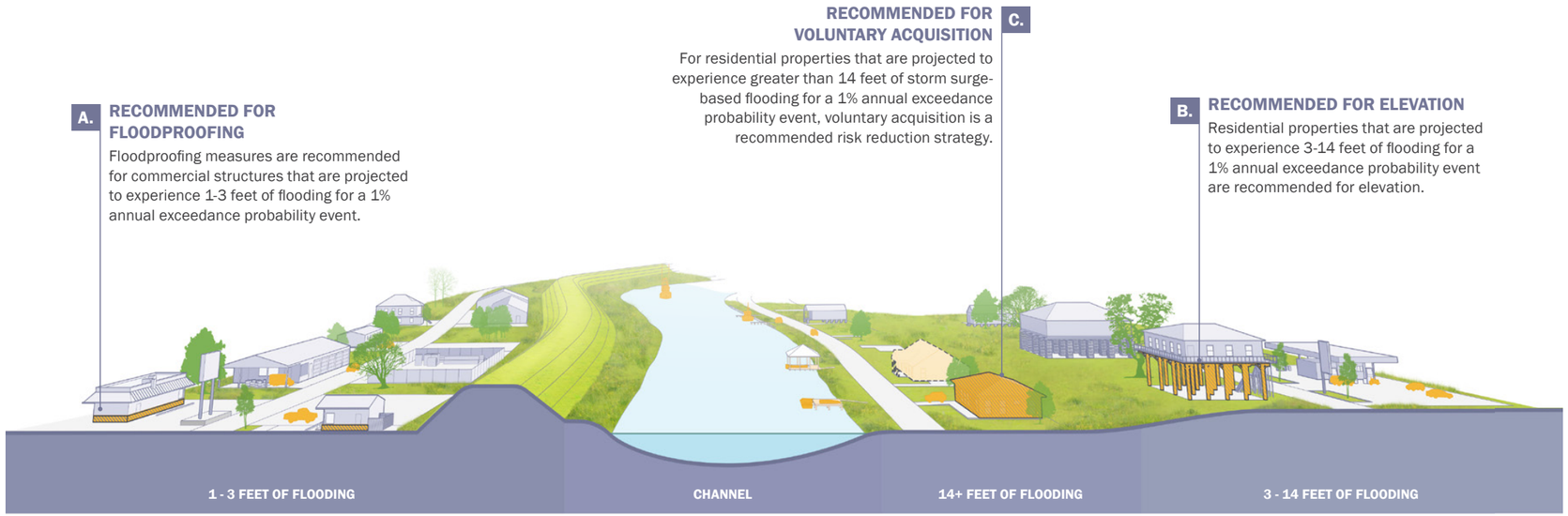


Figure 4.2: Nonstructural Risk Reduction Project Type Visualization.

Ridge Restoration

Ridge Restoration projects re-establish historic coastal ridges and forested maritime habitat through sediment placement and new plantings. Restored ridges are high points during storm events, providing refuge for animals and potentially reducing storm surge.

Image: Barataria Basin Ridge And Marsh Creation Spanish Pass Increment (CPRA)

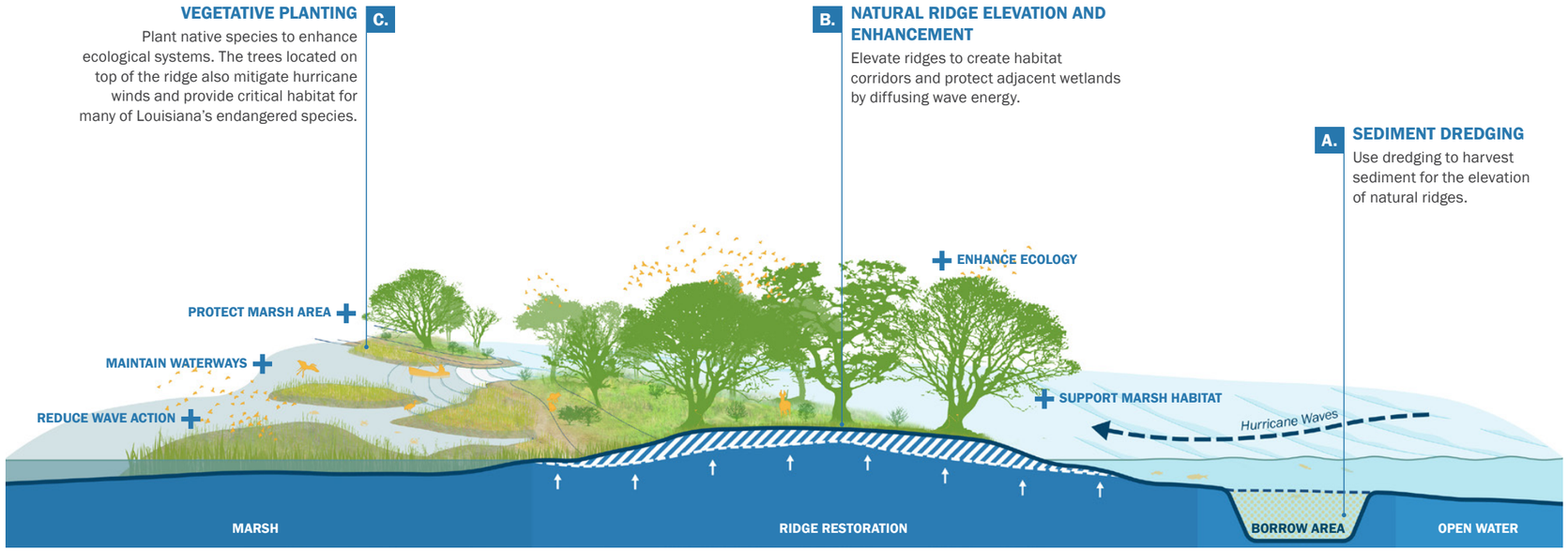


Figure 4.3: Ridge Restoration Project Type Visualization.

Marsh Creation

Marsh Creation projects restore landscape and ecosystem processes, enhance habitat, and provide additional storm surge attenuation. Wetlands are created through placement of dredged material and plantings in shallow open water or areas with deteriorated marsh.

Image: Lake Borgne Marsh Creation (CPRA)

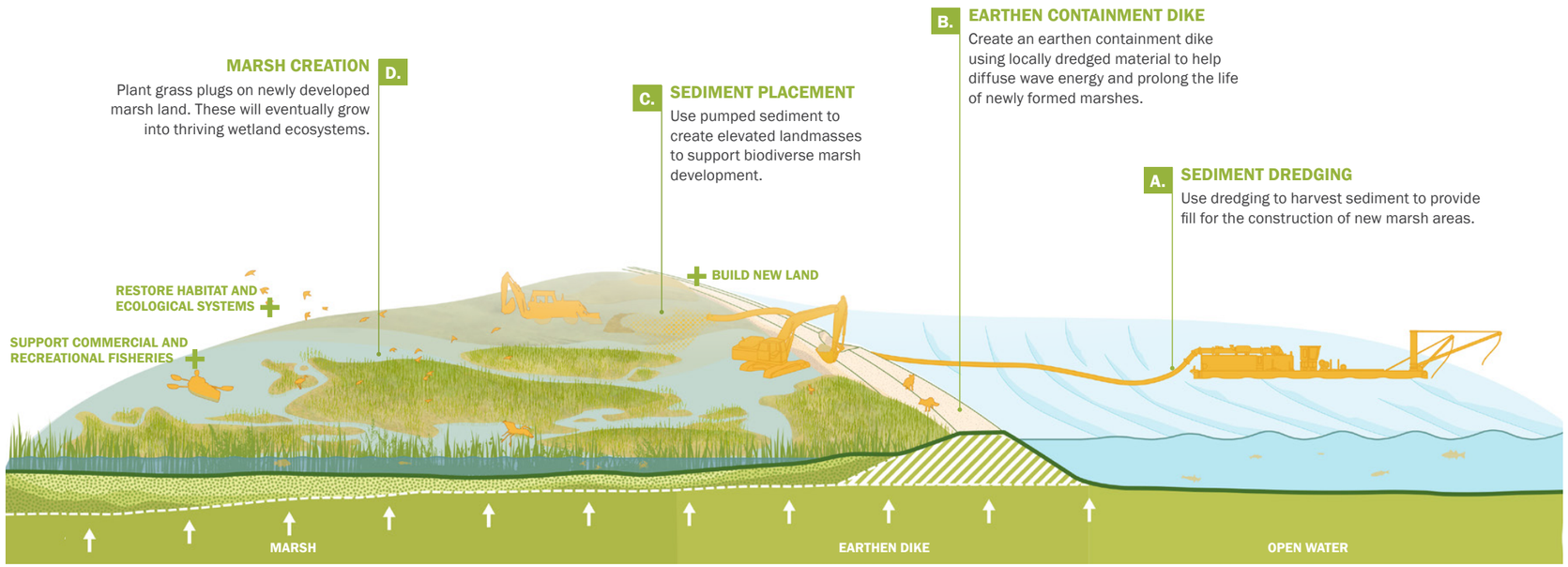


Figure 4.4: Marsh Creation Project Type Visualization.

Landbridge

Landbridges are linear tracts of constructed marshes oriented across coastal basins. Landbridges create habitat, attenuate waves, control the dispersal of sediment, and mitigate saltwater intrusion. They include reinforced channels to allow continued water exchange and navigation.

Image: Project Construction (Lindsey Janies)

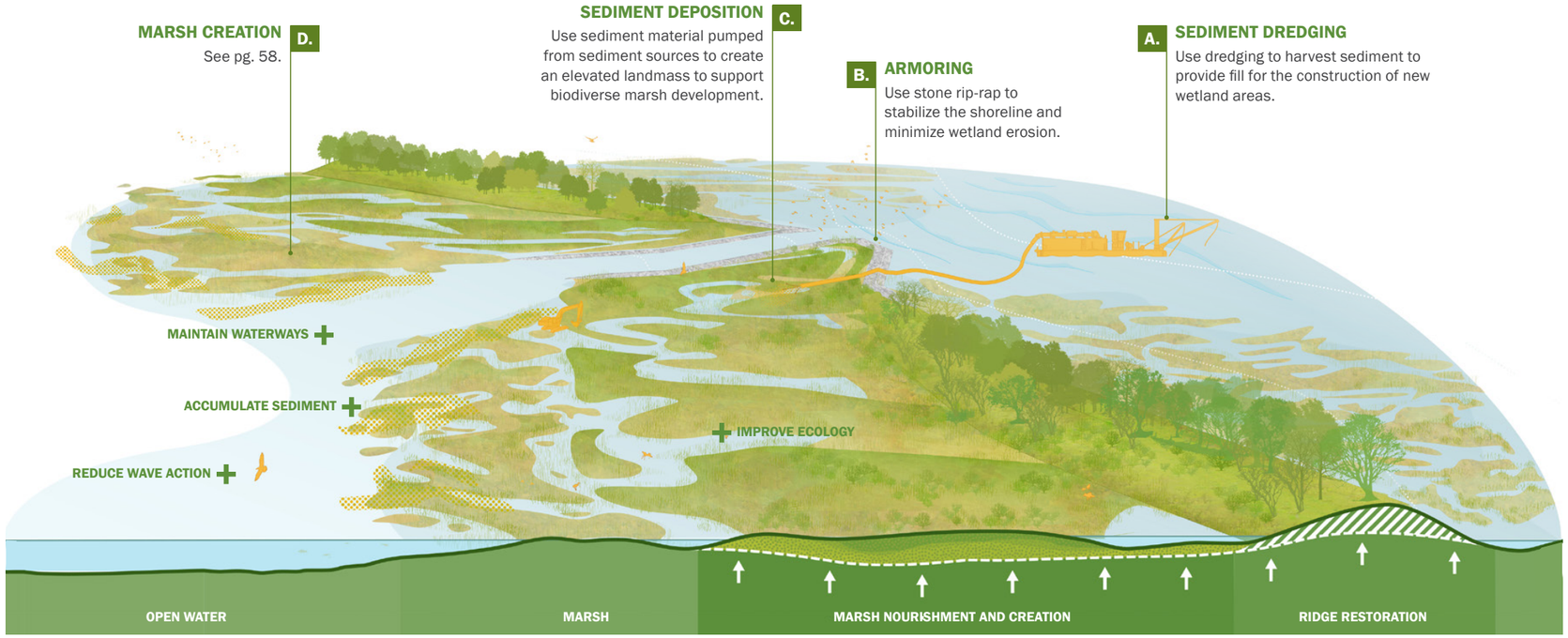


Figure 4.5: Landbridge Project Type Visualization.

Diversion

Diversions convey freshwater and sediment from rivers into adjacent wetland basins. These projects restore historic deltaic processes, build new land, nourish existing wetlands, and prevent saltwater incursion into the estuary.

Image: Caernarvon Freshwater Diversion (CPRA)

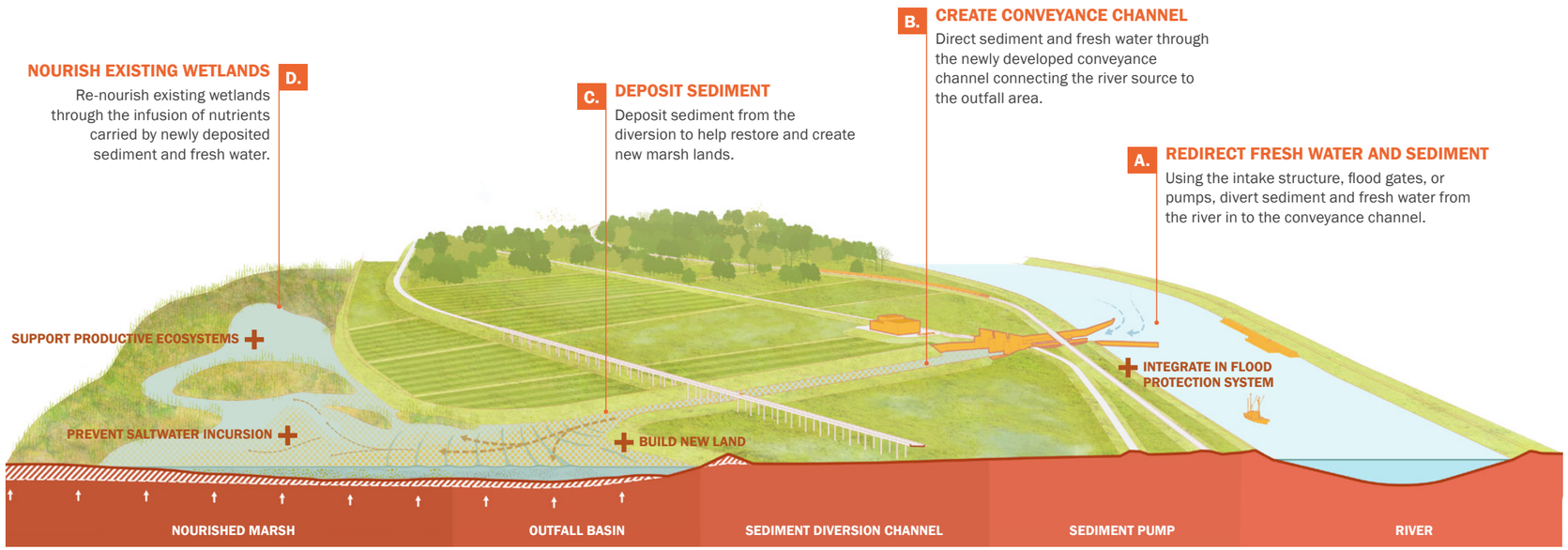


Figure 4.6: Diversion Project Type Visualization.

Hydrologic Restoration

Hydrologic Restoration projects evaluated for the plan seek to improve hydrology at the basin and sub-basin scale. Small-scale hydrologic restoration focusing on restoring more localized hydrologic patterns (e.g., utilizing plugs and control structures, canal backfilling, channel cleanout) are considered programmatically consistent with the master plan.

Image: Cameron-Creole Maintenance Structure (CPRA)

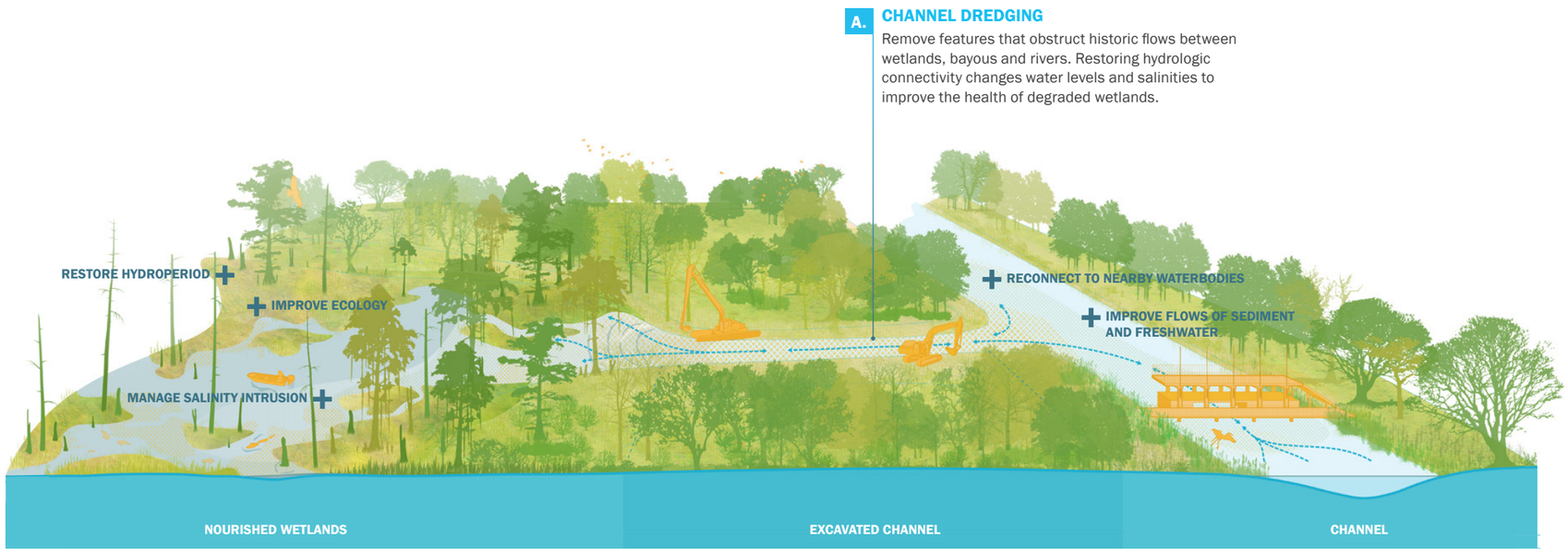


Figure 4.7: Hydrologic Restoration Project Type Visualization.

PROGRAMMATIC

Barrier Island Maintenance

Barrier Island Maintenance projects use dredged sediment to rebuild and strengthen the beaches, dunes, and backbarrier marshes of degrading barrier islands. These projects enhance natural storm surge attenuation and maintain or improve critical wildlife habitat.

Image: Timbalier Island (CPRA)

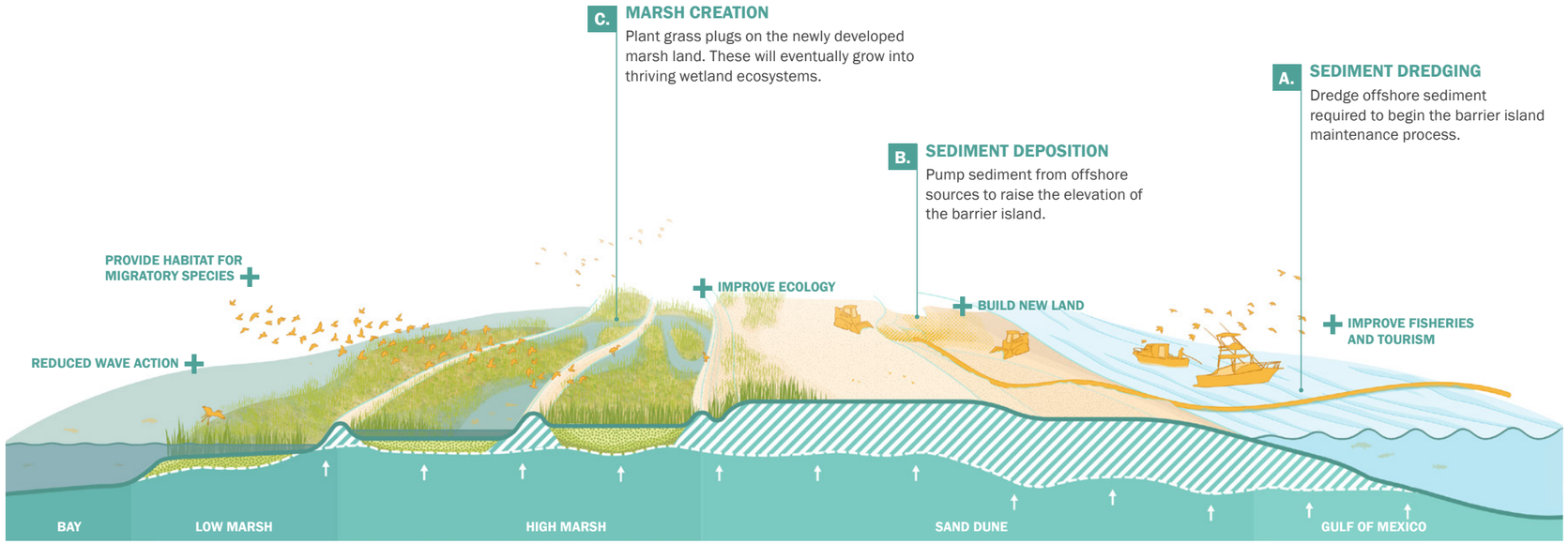


Figure 4.8: Barrier Island Maintenance Project Type Visualization.

PROGRAMMATIC

Programmatic Restoration

A comprehensive approach to coastal restoration requires the use of a variety of techniques to restore ecosystems and improve future outcomes for the coast. In addition to the project types described on the previous pages, a wide variety of additional project types are considered effective and consistent with the master plan. For example, smaller scale programmatic project types like shoreline protection, plantings, and small-scale hydrologic restoration may be pursued through programs in which they can be evaluated on a case-by-case basis, like the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), RESTORE Parish Matching, and the Restoration Partnership Fund.

Image: Vegetative Planting at Elmer's Island (CPRA)

Image: Rockefeller Shoreline Protection (CPRA)

Image: Grand Isle Oyster Hatchery (Louisiana Sea Grant College Program)

Image: Living Shoreline Demonstration Project, St Bernard Parish (CPRA)

Image: Living Shoreline Demonstration Project, St Bernard Parish (CPRA)

Image: Vegetative Planting in St. Bernard Parish (Louisiana Sea Grant College Program)

EVALUATE PERFORMANCE

A PLANNING TOOL FOR DECISION-MAKING

After project effects are evaluated with predictive models, projects are selected for inclusion in the plan using the Planning Tool. This tool helps the state formulate a robust, long-term plan objectively and transparently.

The Planning Tool is a computer-based decision support system, composed of a database of predictive model results, an optimization model to define collections of projects based on decision drivers and constraints, and an interactive visualization package to support deliberations between different groups of projects (or alternatives).

The models predict how the coastal landscape and associated flood risks may change over the next 50 years under different environmental scenarios, and how different restoration and risk reduction projects could change the coastal landscape and flood damages 50 years into the future.

The Planning Tool uses the model outputs to develop groups of projects to implement in IP1 and IP2 that best achieve the state's goals, subject to budget and sediment constraints. There is no correct alternative, and the Planning Tool is designed to formulate many alternatives and summarize the key differences among them. The Planning Tool is part of a deliberation-with-analysis approach to support the state's complex planning challenge.

Although the Planning Tool has been used to support the master planning process since 2012, several improvements were made for this plan to address limitations of previous analyses.

ROBUST PROJECT SELECTION

In previous master plans, projects were selected based on a single environmental scenario. The Planning Tool was updated to use a robust selection process in the 2023 Coastal Master Plan that considers both scenarios. This process first identifies high-confidence projects by formulating alternatives for each of the two scenarios – called "optimal" alternatives. Projects common to both optimal alternatives are referred to as high-confidence projects (see figure 4.9).

The Planning Tool then iteratively increases the budgets for each optimal alternative until a set of high-confidence projects are defined that expend that original amount of funding. This process was applied for both IP1 and IP2 for restoration project selection. For structural risk reduction, fewer candidate projects were considered, and the same set of projects was chosen for each scenario for IP1.

A NEW APPROACH TO NONSTRUCTURAL PROJECTS

Risk reduction projects can be either structural or nonstructural. Previous master plans selected specific projects in both categories. For the 2023 Coastal Master Plan, the state recognizes that nonstructural damage mitigation is often carried out at the local scale through a number of different state and federal programs, and that its effectiveness is highly dependent on local participation that may not be well characterized in the predictive models. With this in mind, nonstructural projects are considered programmatically consistent. This means that the plan does not identify individual communities as 'selected' or not selected. However we do define and evaluate nonstructural projects for each community as a way to help prioritize structural risk reduction projects and identify how much of the total budget could cost-effectively be invested in nonstructural. In IP1, nonstructural projects were identified, defined by 1% AEP flood depths at initial conditions and a 75% participation rate, and their benefits compared to those of structural protection projects by community.

The Planning Tool used these to support the selection of structural risk reduction projects in two ways. First, for a single community, the Planning Tool could select only the structural or the nonstructural project, not both. Second, a structural project for a given community must perform favorably against all potential nonstructural projects, anywhere on the coast. In other words, if any nonstructural project was higher-performing than a given structural project, the structural project would be lower priority in the Planning Tool selection process.

In IP2, the flood depths used to define nonstructural projects were adjusted to account for future conditions, then the participation rate was adjusted based on the selection of projects in IP1. For both IP1 and IP2, the Planning Tool identified the best set of projects – from both structural and nonstructural options – to reduce storm surge-based flood damages.

BENEFITS OVER TIME

As the coastal landscape changes over time and sea level rise increases, the benefits of restoration and risk reduction projects change over the 50-year period of analysis. In previous master plans, specific points in time were averaged to characterize project benefits: 20 and 50 years for restoration projects and 25 and 50 years for risk reduction projects. While the objective was to ensure that both nearer- and longer-term benefits were considered, the approach penalized projects with benefits that rapidly declined in the last few years or those with higher benefits that were delayed in time. For the 2023 Coastal Master Plan, the state's goals are represented by equally weighting annual damage reduction and annual land building across all 50 years of the plan period. For risk reduction projects, EASD (a term that captures how many structures are impacted by flooding and to what degree) is equally weighted with EADD to better reflect equity in damage reduction investments.

PROJECT INTERACTIONS

Another important modification to the project selection process is the addition of an intermediate modeling step in which restoration projects selected for IP1 are assumed to be on the future landscape for the basis of evaluating the remaining projects for IP2. Once restoration projects are identified for IP1, they are assumed to be on the landscape and therefore included when the predictive models are run to evaluate the effects of the remaining candidate projects.

This approach assumes that remaining candidate projects are only eligible to be selected for IP2, and the new project evaluations are used to determine which remaining projects to select.

METRICS

In addition to the decision drivers and constraints used in the Planning Tool, we developed metrics based on model outputs and used community characteristics, such as demographic information and major industries, to better understand how the changing coast and the projects being evaluated impact different communities and resources.

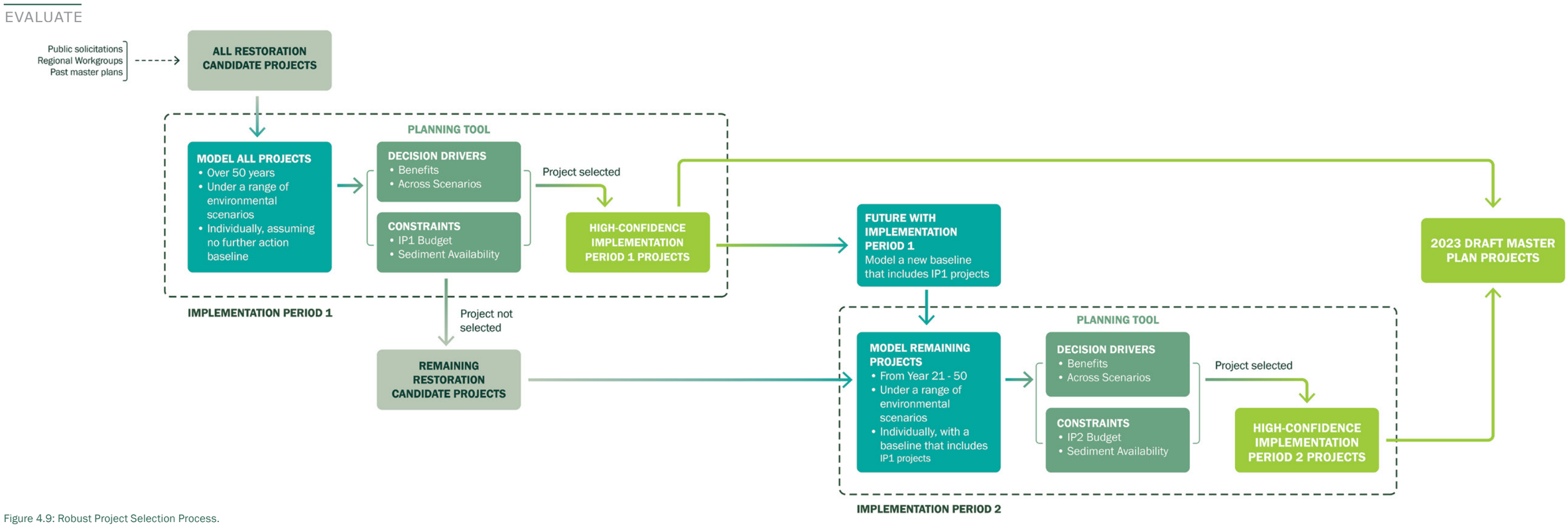


Figure 4.9: Robust Project Selection Process.

Ecosystem metrics help us consider the ability of projects to create or maintain suitable habitat for various species. Community metrics combine ecosystem outputs and risk outputs to help us characterize how certain communities, like those associated with traditional fishing or agriculture, may be impacted.

Demographic data helps us understand how structural risk reduction projects impact more vulnerable communities. During the project selection process, these can be used as a check on the Planning Tool optimization to make sure we are directly addressing questions of equity and resilience and not selecting suites of projects that disproportionately impact certain communities.

SEDIMENT BORROW SOURCES

Sediment is an important resource for some types of restoration projects, and cost-effective sources in coastal Louisiana are limited. In previous master plans, each project requiring sediment was associated with a specific borrow area and sediment availability was a constraint. For the 2023 Coastal Master Plan, the Planning Tool was configured to allow an individual project or project element to borrow from more than one source, if cost efficient to do so. Thus, sediment availability is now a factor in the cost of a project and is reflected in the budget constraint, rather than being a separate constraint. For the 2023 analysis, 41 individual sediment sources were defined. For sources that are not within the Mississippi River channel, a single amount of sediment was specified that can be drawn upon until exhausted. For Mississippi River-based sources, sediment is considered renewable. These sources were assigned a 10-year renewable fill volume available at any time in those 10 years.

PROJECT SELECTION

Based on this approach, the Planning Tool uses the outputs from the predictive models summarized by 25 geographic areas (or ecoregions) for restoration outcomes and 374 communities for damage reduction outcomes. Each project that is selected for implementation begins accruing engineering and design costs in the first year of IP1. Construction costs are incurred immediately following engineering and design, and operation and maintenance continues through the end of the 50-year planning horizon. For both restoration and risk reduction projects, the procedure first selects projects to implement in IP1. The Planning Tool assumes that these projects are implemented beginning in the first year and that cost (and sediment requirements for restoration projects) for the first 20 years of each project must be met by IP1 funding and sediment sources. For some projects, construction costs and sediment requirements extend beyond the first 20 years. In this case, the Planning Tool ensures that sufficient budget and sediment are available in IP2. When projects are selected for IP2, the requirements for the projects selected in IP1 must be satisfied first. The Planning Tool next selects projects to implement in IP2. Any project not selected in IP1 is a candidate for selection. These projects are assumed to begin engineering and design in the first year of IP2 and accrue costs from that year forward. The Planning Tool again ensures that all funding and sediment requirements are met.

Throughout this process, the visualization component of the Planning Tool was used to compare different alternatives and consider the coastwide distribution of projects and their benefits, while considering varying budgets.

COMMUNICATING THE PLAN

REACHING STAKEHOLDERS

The 2023 Coastal Master Plan identifies the projects our state should implement and provides important information about how that translates to land created or maintained. The plan also provides details about which communities will be most vulnerable to flooding in future years and how structural and nonstructural risk reduction projects can address that risk. We cannot predict exactly how our coast will change, but based on what we know today, the projects in this plan will allow us to build land in crucial areas and reduce current and future storm surge-based flood risk. Because this information is critical to individuals and communities, a key part of the master plan development process is communicating the possible future landscape and projects that can mitigate land loss and reduce storm surge-based flood risk. Conversations with stakeholders and advisory groups take place throughout the master plan update cycle, and emphasis is placed on producing materials and tools to facilitate that communication.

As the 2023 Coastal Master Plan is drafted, work begins on communicating the project list and what the plan delivers. This includes posting a digital version of the master plan document on the CPRA website along with technical appendices and attachments that document the development process and provide details on models, outputs, and other topics. These resources are hosted on the website alongside outreach resources, such as technical webinars and corresponding presentation slides.

The Master Plan Data Viewer was updated, and a Guided Tour feature will help first-time users understand the nature of the coastal crisis and what implementation of this plan would accomplish. An Explore feature allows users to dive deeper into data from across the coast, including maps of the FWOA coast and the effects of the 2023 Coastal Master Plan. New features of the data viewer include a map export function to facilitate easy printing of master plan-related maps and expanded data download capabilities to ensure master plan-generated data is available for researchers and interested audiences.

Print materials were also developed to supplement technical documentation and presentations at outreach meetings. Five different types of fact sheets were developed to provide quick overviews of key master plan information. These fact sheets provide data at levels ranging from the individual project to regional overviews.

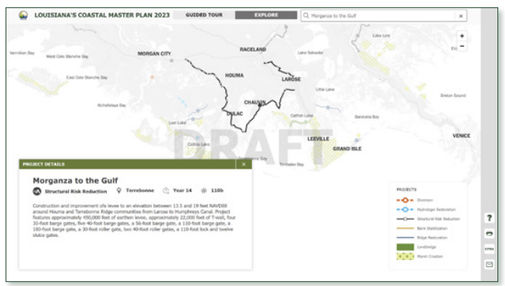


Figure 4.10: Project information in the Data Viewer desktop view.

Figure 4.11: Land change data in the Data Viewer desktop view.

FREQUENTLY ASKED QUESTIONS

Which type of project is best at restoring the coast? Different project types perform best in different circumstances. Projects that restore hydrology or increase delivery of freshwater and sediment may perform well where saltwater intrusion and a lack of sediment contributes to land loss. Marsh creation projects do well in fragmented marsh areas; this is accomplished by filling shallow water areas and elevating the marsh surface. In some cases, integrated projects are needed to address multiple issues.

Why does CPRA use the Planning Tool to select restoration projects? If funding were the only constraint, ranking projects based on cost-effectiveness might be a reasonable approach to project selection. However, we recognize that sources of sediment near project sites are limited. The Planning Tool allows both funding and sediment to be considered simultaneously, allowing CPRA to choose robust project sets. It also enables the evaluation of how the master plan may benefit or impact other things that are important to Louisianans, such as habitat creation, navigation, and the working coast.

What are expected annual damages? Our analysis considers storms of different intensity and tracks, and their expected probability of occurring in any one year. The flood depths resulting from those storms change over time as the coast degrades and sea level rise increases water levels. Rather than selecting a single probability of flooding or a single time period, the Planning Tool combines the total damage from all possible flood events considered and the likelihood of each event occurring, or expected annual damages. The change in expected annual damage due to a project being built is used to summarize the benefits of projects over time, considering different types of storms that could occur. This damage is reported both in dollars and based on reductions in the number of structures damaged and the degree of damage experienced.

Why are different implementation periods used? The state recognizes that we need to address the coastal crisis as soon as possible and that we need to build projects that will continue to provide benefits to future generations, but that the funds we need will not all be available right away. Therefore, the state wants to identify the best performing projects for implementation. Projects are evaluated over the entire 50 years, and those that perform best in terms of maintaining/building land or reducing expected annual damage, based on a set amount of funding, are assigned to IP1. The remaining projects are evaluated on their benefits over the last 30 years (i.e., IP2) of the 50-year planning horizon. Using two implementation periods ensures the master plan is making reasonable assumptions about project funding streams while maximizing the timing and benefits the projects provide.

HAVE MORE QUESTIONS?
Visit us online at coastal.la.gov or contact us directly at masterplan@la.gov.

CHAPTER 5

TAKE ACTION

To take action toward addressing the challenges of a changing coast, a suite of 73 restoration and risk reduction projects was identified. When fully implemented, the 2023 Coastal Master Plan will provide a myriad of benefits for coastal communities and ecosystems, including reducing hundreds of square miles of land loss and reducing expected annual damage from storm surge-based flooding by billions of dollars.

Image: Construction of Barataria Basin Ridge and Marsh Creation - Spanish Pass Increment, 2021 (CPRA)

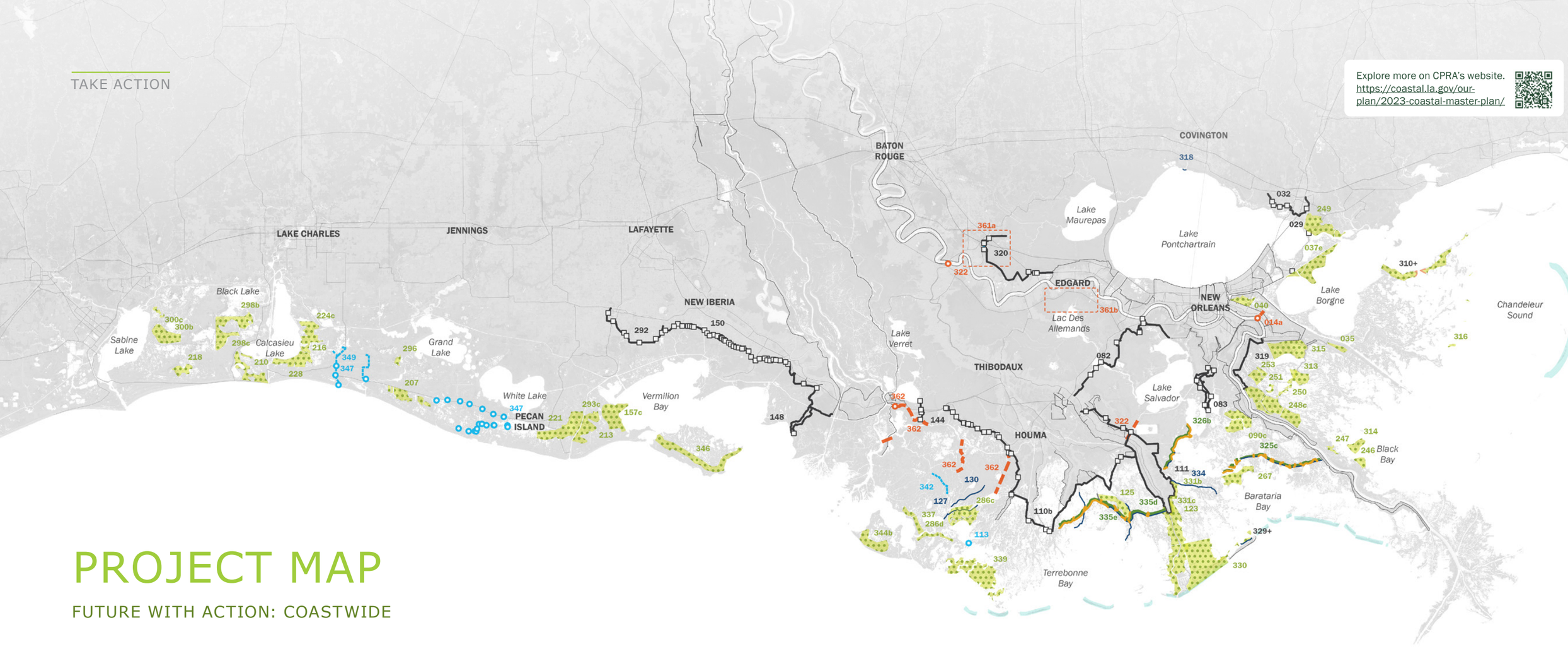
Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/

PROJECT MAP

FUTURE WITH ACTION: COASTWIDE

The 2023 Coastal Master Plan identifies projects designed to restore, create, and maintain land; reduce flood risk to citizens and communities; and sustain habitats that support a variety of recreational and commercial activities. The restoration and risk reduction projects selected perform well with respect to future conditions and reflect a comprehensive, long-term focus and continued commitment to balancing the diverse objectives of the master plan. In addition to these specific projects, $2.5 billion is allocated to programmatic restoration efforts, including barrier island maintenance and repair, small-scale hydrologic restoration, and local strategies, such as bank stabilization and oyster reef restoration. Additionally, $11.2 billion is allocated to nonstructural risk reduction activities across the coast.

Beyond the projects, the master plan acknowledges that the coastal area is dynamic, and additional adaptation will be required to continue living, working, and playing in coastal Louisiana. The plan alone is not sufficient to respond to all of the challenges the future may bring, but it can be a catalyst for coordinating local, state, and federal efforts to help address our coastal land loss crisis and threats from storm surge-based flooding and in pursuing the greenhouse gas reductions that are necessary to avoid the most severe impacts of climate change.



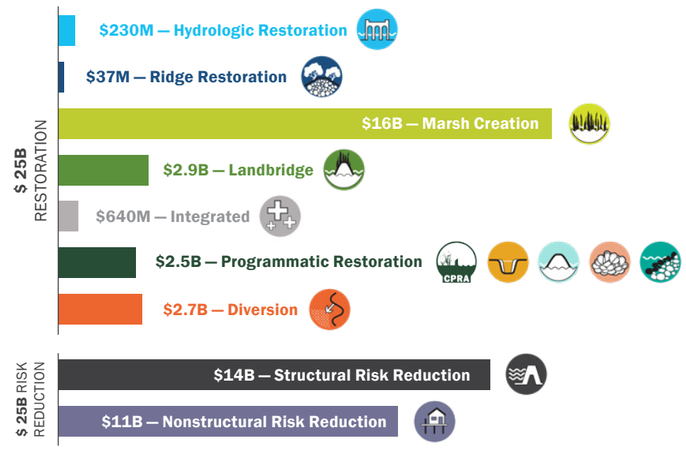
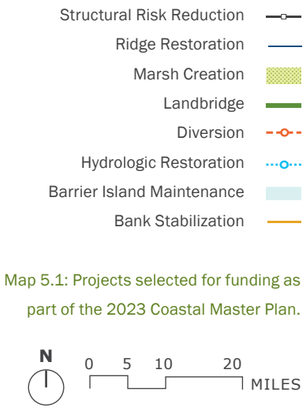


Figure 5.1: Funding by Project Type in USD.



Map 5.1: Projects selected for funding as part of the 2023 Coastal Master Plan.

CHENIER PLAIN

See page 96 for regional project map and project descriptions.

PROJECT TYPE	ID#	PROJECT NAME	IP	COST
Hydrologic Restoration	347	**Mermentau Basin Hydrologic Restoration**	1	$ 130M
	349	**Cameron-Creole to the Gulf Hydrologic Restoration**	1	$ 59M
Marsh Creation	207	**South Grand Chenier Marsh Creation**	1	$ 390M
	210	**Mud Lake Marsh Creation**	1	$ 330M
	216	**Southeast Calcasieu Lake Marsh Creation**	2	$ 450M
	218	**Cameron Meadows Marsh Creation**	1	$ 150M
	221	**East Pecan Island Marsh Creation**	1	$ 650M
	224c	**East Calcasieu Lake Marsh Creation**	1	$ 340M
	228	**Calcasieu Ship Channel Marsh Creation**	1	$ 83M
	293c	**Freshwater Bayou North Marsh Creation**	1	$ 150M
	296	**Little Chenier Marsh Creation**	2	$ 51M
	298b	**West Brown Lake Marsh Creation - North**	2	$ 410M
	298c	**West Brown Lake Marsh Creation - South**	1	$ 240M
	300b	**West Sabine Refuge Marsh Creation**	2	$ 640M
	300c	**West Sabine Refuge Marsh Creation - Central**	1	$ 130M

CENTRAL COAST

See page 108 for regional project map and project descriptions.

PROJECT TYPE	ID#	PROJECT NAME	IP	COST
Marsh Creation	157c	**East Rainey Marsh Creation**	1	$ 350M
	213	**West Rainey Marsh Creation**	1	$ 400M
	344b	**Central Coast Marsh Creation - Point Au Fer**	1	$ 270M
	346	**Marsh Island Barrier Marsh Creation**	1	$ 710M
Structural Risk Reduction	148	**Franklin and Vicinity**	2	$ 310M
	150	**Iberia/St. Mary Upland Levee**	1	$ 1.7B
	292	**Abbeville and Vicinity**	2	$ 610M

TERREBONNE

See page 120 for regional project map and project descriptions.

PROJECT TYPE	ID#	PROJECT NAME	IP	COST
Hydrologic Restoration	113	**Central Terrebonne Hydrologic Restoration**	1	$ 16M
	342	**Western Terrebonne Hydrologic Restoration**	1	$ 22M
Landbridge	335d	**Eastern Terrebonne Landbridge - East**	1	$ 460M
	335e	**Eastern Terrebonne Landbridge - West and Central**	2	$ 1.0B
Marsh Creation	123	**Belle Pass-Golden Meadow Marsh Creation**	1	$ 1.2B
	125	**North Terrebonne Bay Marsh Creation**	1	$ 210M
	286c	**North Lake Mechant Marsh Creation - East**	1	$ 250M
	286d	**North Lake Mechant Marsh Creation - West**	2	$ 230M
	337	**Fourleague Bay - Blue Hammock Bayou Marsh Creation**	1	$ 370M
	339	**West Terrebonne Marsh Creation Project**	1	$ 1.5B
Ridge Restoration	127	**Bayou Decade Ridge Restoration**	1	$ 13M
	130	**Mauvais Bois Ridge Restoration**	1	$ 13M
Diversion	362	**Atchafalaya Diversions**	1	$ 790M
Structural Risk Reduction	110b	**Morganza to the Gulf**	1	$ 3.9B
	111	**Larose to Golden Meadow**	2	$ 500M
	144	**Amelia Levee Improvements**	2	$ 840M

BARATARIA

See page 132 for regional project map and project descriptions.

PROJECT TYPE	ID#	PROJECT NAME	IP	COST
Integrated Project	329	**Caminada Bay Marsh Creation and Fifi Island Ridge**	1	$ 78M
Landbridge	325c	**Lower Barataria Landbridge - East**	2	$ 840M
	326b	**Mid-Barataria Landbridge - West**	2	$ 520M
Marsh Creation	090c	**Large-Scale Barataria Marsh Creation**	2	$ 560M
	267	**North Barataria Bay Marsh Creation**	2	$ 220M
	330	**East Bayou Lafourche Marsh Creation**	1	$ 1.3B
	331b	**Southeast Golden Meadow Marsh Creation - North & South**	2	$ 270M
	331c	**Southeast Golden Meadow Marsh Creation - Central**	1	$ 100M
Ridge Restoration	334	**Bayou L'Ours Ridge Restoration**	1	$ 9.5M
Diversion	322	**Freshwater Delivery to Western Barataria**	2	$ 120M
	361b	**Upper Basin Diversion Program - Barataria**	1	$ 750M
Structural Risk Reduction	082	**Upper Barataria Risk Reduction**	1	$ 510M
	083	**Lafitte Ring Levee**	2	$ 1.4B

PONTCHARTRAIN / BRETON

See page 144 for regional project map and project descriptions.

PROJECT TYPE	ID#	PROJECT NAME	IP	COST
Integrated Project	310	**Three Mile Pass Marsh Creation and Hydrologic Restoration**	2	$ 560M
Marsh Creation	035	**Hopedale Marsh Creation**	2	$ 160M
	037e	**New Orleans East Marsh Creation**	2	$ 1.1B
	040	**Central Wetlands Marsh Creation**	1	$ 49M
	246	**Sunrise Point Marsh Creation**	1	$ 47M
	247	**Uhlan Bay Marsh Creation**	1	$ 33M
	248c	**Pointe a la Hache and Carlisle Marsh Creation**	1	$ 860M
	249	**Fritchie North Marsh Creation**	1	$ 110M
	250	**Oak River to Delacroix Marsh Creation**	1	$ 170M
	251	**Spanish Lake Marsh Creation**	2	$ 61M
	253	**Tiger Ridge/Maple Knoll Marsh Creation**	1	$ 150M
	313	**West Delacroix Marsh Creation**	1	$ 390M
	314	**Belle Pass Island Marsh Creation**	1	$ 99M
	315	**North and East Lake Lery Marsh Creation Project**	2	$ 890M
	316	**Chandeleur Sound Island Restoration Projects**	2	$ 57M
Ridge Restoration	318	**Tchefuncte River Restoration**	1	$ 1.9M
Diversion	014a	**Central Wetlands Diversion**	2	$ 270M
	361a	**Upper Basin Diversion Program - Pontchartrain**	1	$ 750M
Structural Risk Reduction	029	**Lake Pontchartrain Barrier**	1	$ 2.4B
	032	**Slidell Ring Levees**	1	$ 420M
	319	**Braithwaite to White Ditch**	1	$ 440M
	320	**St James-Ascension Parishes Storm Surge Protection**	2	$ 730M

Figure 5.2: 2023 Coastal Master Plan Project List

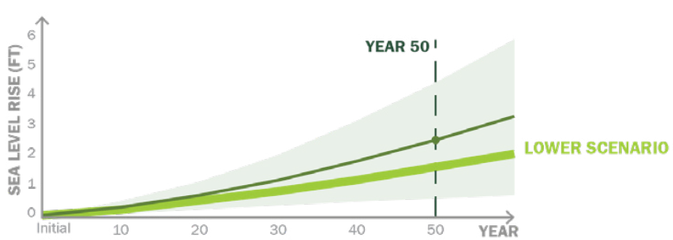
Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/

LAND CHANGE

FUTURE WITH ACTION | LOWER SCENARIO | YEAR 50

Even with full implementation of the 2023 Coastal Master Plan, the future landscape of coastal Louisiana will be different from today. In comparison to a future without the 61 restoration and 12 risk reduction projects, the plan provides a significant amount of land created or maintained into the future that would otherwise be converted to open water. It is expected that under the master plan's lower environmental scenario, the projects in this plan will create and maintain approximately 314 square miles of land over 50 years, as shown in the map above. Marsh creation projects in the Breton and Barataria basins contribute substantial areas of additional land, especially in the lower Bayou Lafourche corridor between the Larose to Golden Meadow levee system and Port Fourchon.

Marsh creation projects in western Terrebonne, on Marsh Island, and near Freshwater Bayou also bolster the land area in the lower estuaries. Landbridges in Barataria and eastern Terrebonne work synergistically with marsh creation projects to maintain land across the mid-basins. This is especially the case in eastern Terrebonne where there is extensive land loss. In the Chenier Plain, loss is reduced where marsh creation and hydrologic restoration projects sustain land that would otherwise be lost.



Land Gained
Land Maintained
Land Lost

Map 5.2: Land Change, Future With Action, Lower Scenario, Year 50.

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MILES

Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/

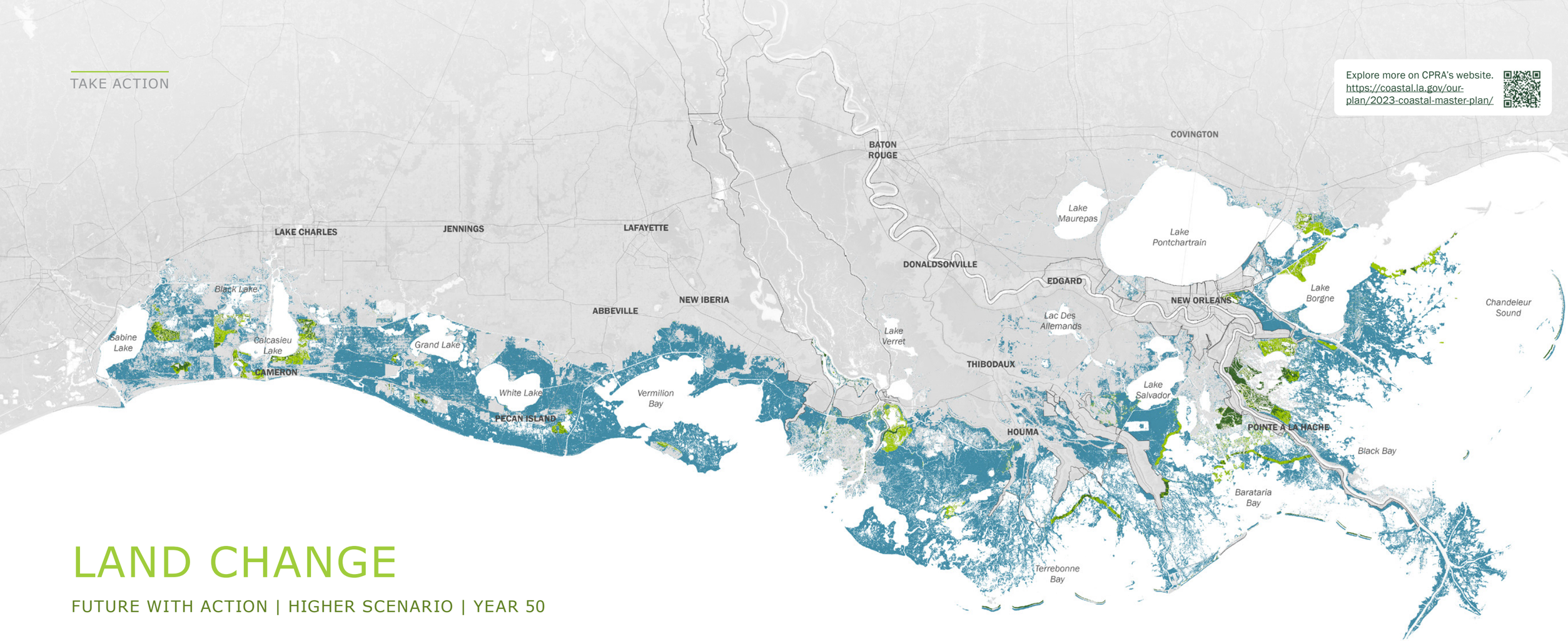
LAND CHANGE

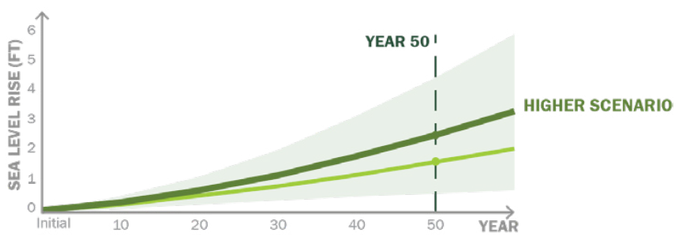
FUTURE WITH ACTION | HIGHER SCENARIO | YEAR 50

The master plan uses an environmental scenario approach to project a range of possible outcomes and applies that information to the planning process. When 2023 Coastal Master Plan projects are implemented under the higher scenario, they build or maintain 233 square miles of land over the 50-year period. While significantly more land loss is projected under the higher scenario compared to the lower, the robust suite of projects selected still has large benefits. Due to higher sea level rise and subsidence in this scenario, individual project effects are much clearer in some areas of the coast. The effects of marsh creation projects and marsh creation components of integrated projects are clear in the Lake Borgne area and in the Breton Basin. In these areas, many of the marsh creation projects perform well until the later years; so, despite land being lost by year 50 in many areas, the projects yield substantial benefits throughout much of the 50 years. Landbridges in Barataria and eastern Terrebonne provide continuous land through 50 years. Further west, where subsidence rates are lower, marsh creation in the Calcasieu and Sabine basins provide large areas of continuous wetlands south of the Gulf Intracoastal Waterway (GIWW).

>>> Go to **Chapter 6: Regional Approach** for more info on regional benefits of the master plan projects.

P 95





Land Gained
Land Maintained
Land Lost

Map 5.3: Land Change, Future With Action, Higher Scenario, Year 50.

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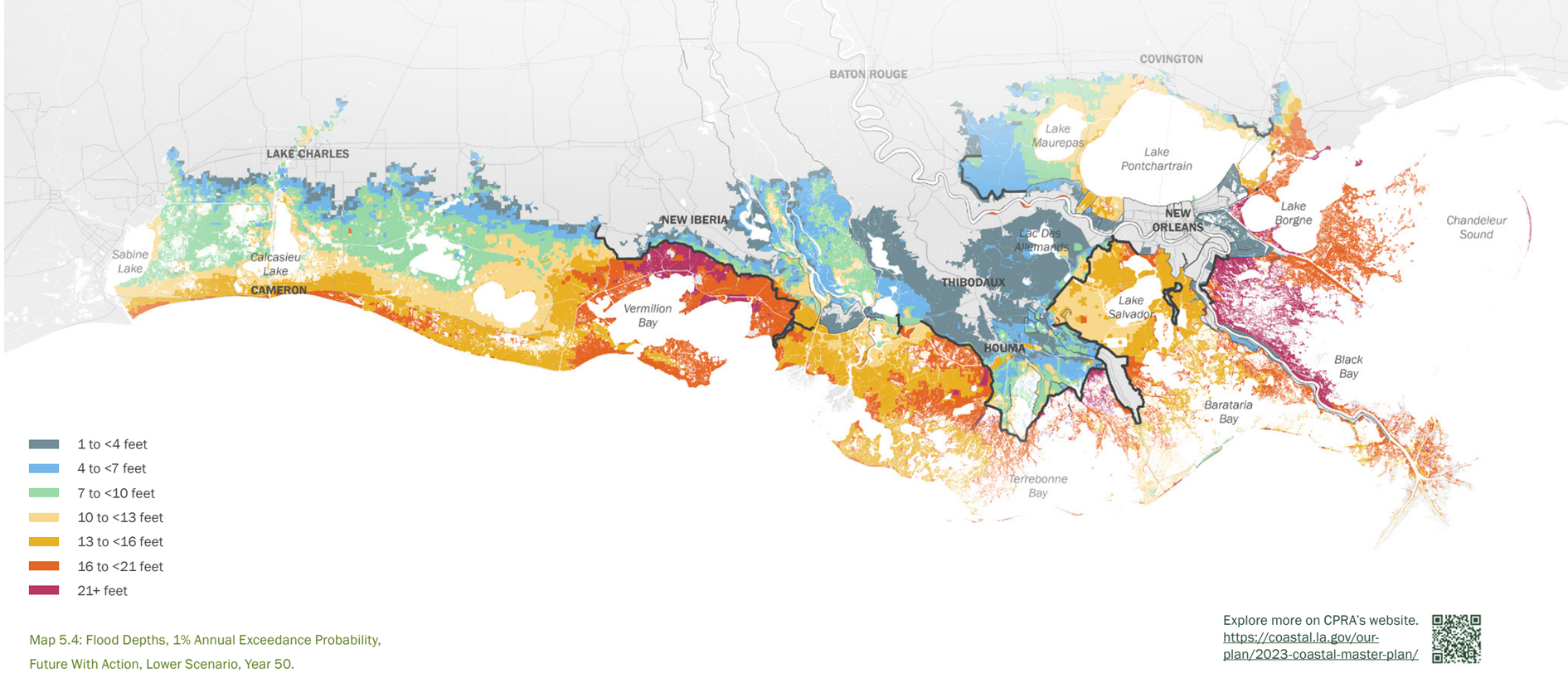
FLOOD DEPTHS

FUTURE WITH ACTION
LOWER SCENARIO | YEAR 50

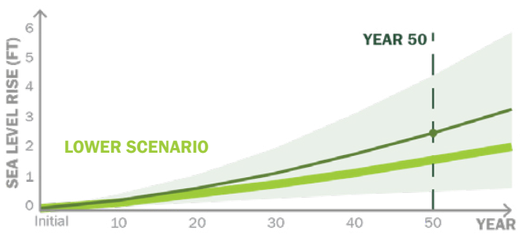
Structural risk reduction measures are expected to reduce flood damage by $7.7 billion in EADD under the lower environmental scenario. Lower scenario projections of flood depths with a 1% AEP are shown to the right. Even with plan implementation, residual flood risk exists.

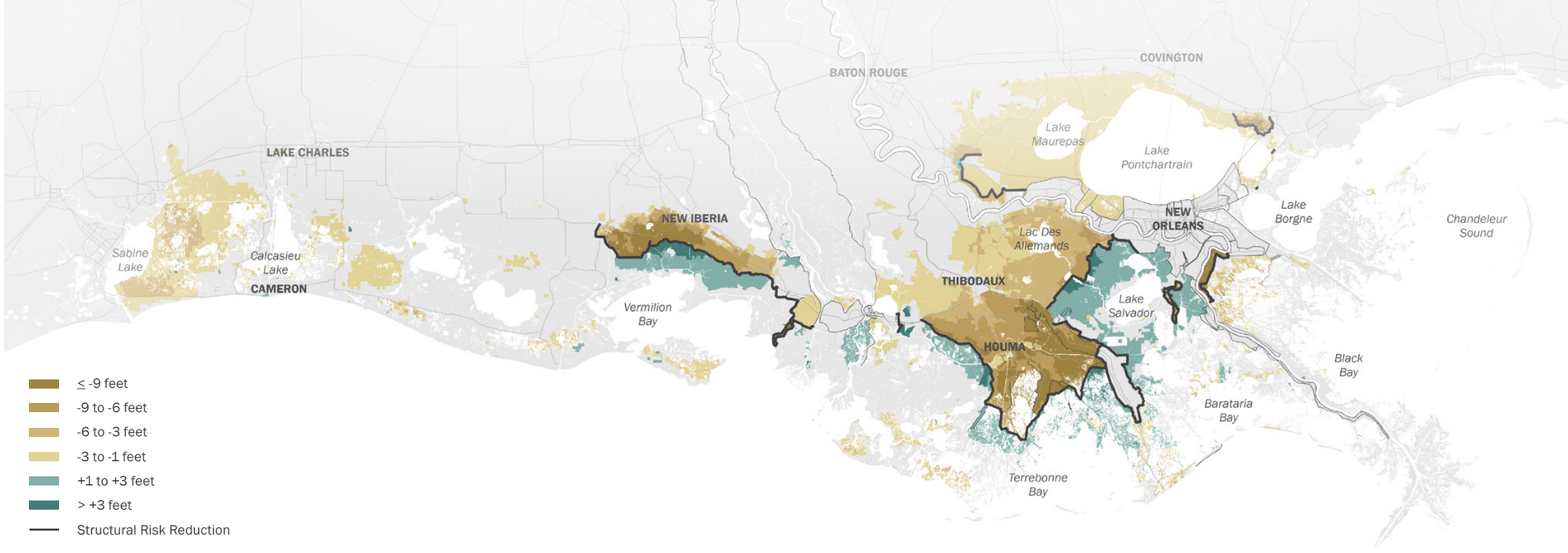
Many communities will benefit from structural risk reduction projects, including new levees and improving some existing structures to withstand greater storm surge. To provide risk reduction to coastal communities outside of current and proposed levee systems, $11.2 billion of the master plan budget is recommended to support nonstructural risk reduction measures, such as elevations, floodproofing, and voluntary acquisition.



Map 5.4: Flood Depths, 1% Annual Exceedance Probability, Future With Action, Lower Scenario, Year 50.

Explore more on CPRA's website. https://coastal.la.gov/our-plan/2023-coastal-master-plan/





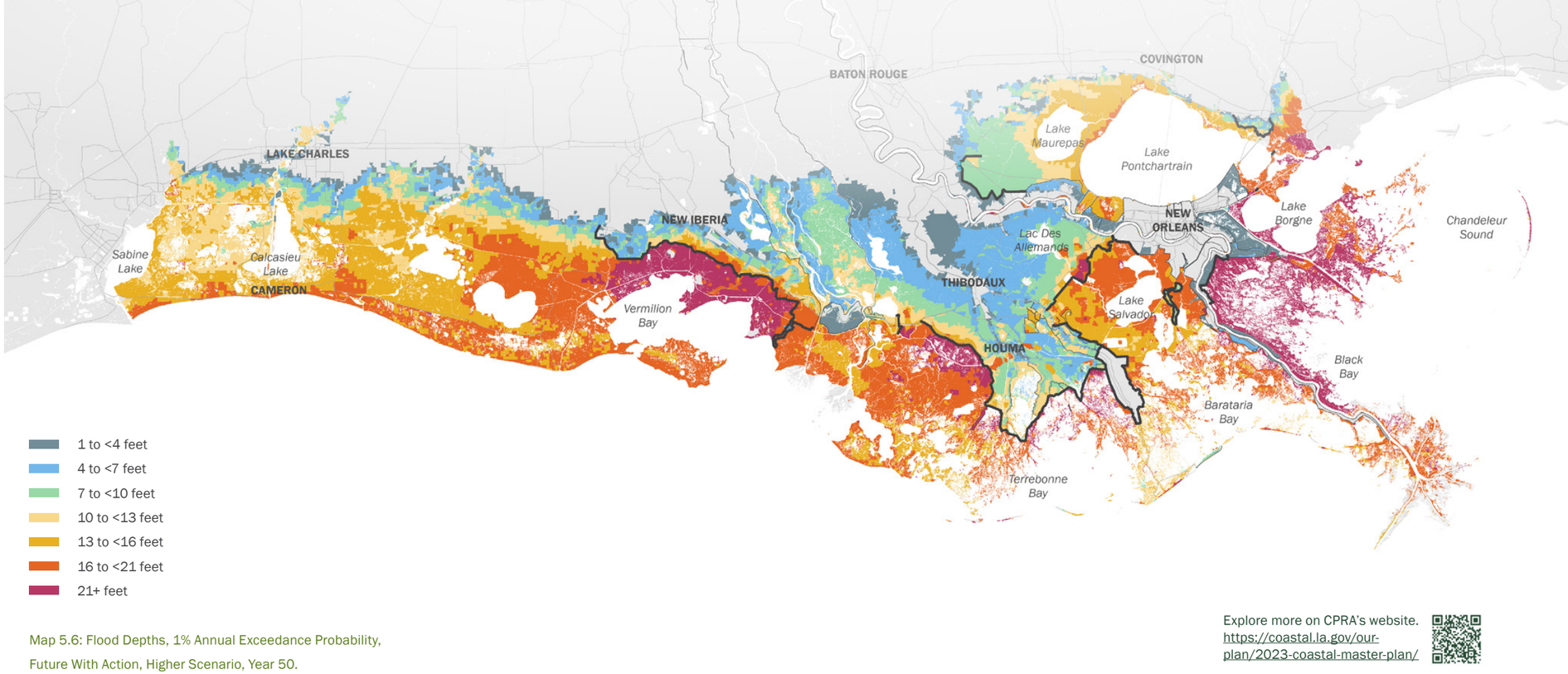
Map 5.5: Flood Depths Difference between FWA and FWOA, 1% Annual Exceedance Probability, Lower Scenario, Year 50.

FLOOD DEPTHS

FUTURE WITH ACTION
HIGHER SCENARIO | YEAR 50

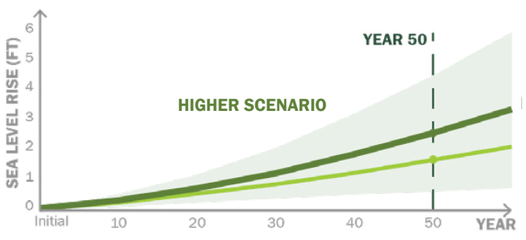
With the higher environmental scenario, storm surge-based flood depths are expected to increase and extend northward, putting additional communities at risk over 50 years. The 2023 Coastal Master Plan includes $13.8 billion in structural risk reduction measures expected to reduce flood damage by $11 billion in EADD under the higher scenario. Higher scenario projections of flood depths with a storm event of 1% AEP are shown above. Even with plan implementation, residual flood risk exists.

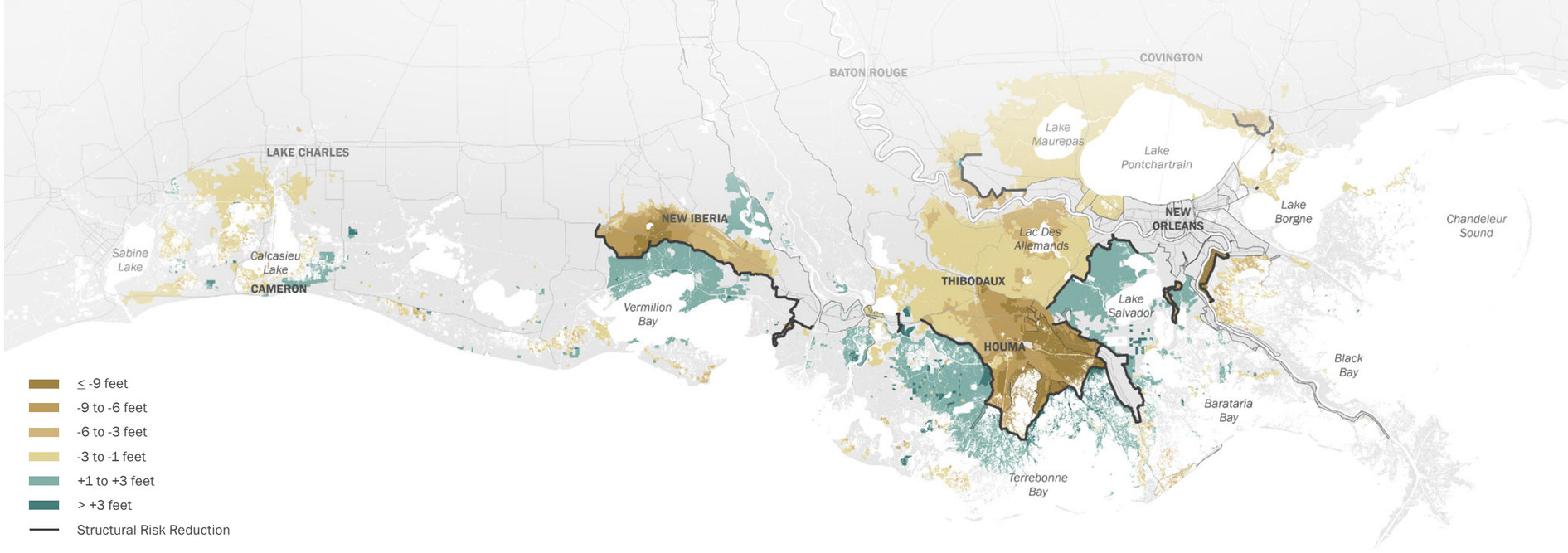
If the higher scenario is realized, elevating homes in some areas may no longer be suitable; in these instances, voluntary acquisition may become the most viable approach.



Map 5.6: Flood Depths, 1% Annual Exceedance Probability, Future With Action, Higher Scenario, Year 50.

Explore more on CPRA's website. https://coastal.la.gov/our-plan/2023-coastal-master-plan/





Map 5.7: Flood Depths Difference between FWA and FWOA, 1% Annual Exceedance Probability, Higher Scenario, Year 50.

BENEFITS OVER TIME

IMPACTS OF THE PLAN

Even with the 2023 Coastal Master Plan fully implemented, coastal Louisiana's landscape is going to look different 50 years into the future. While the coast as we know it today will continue to change into the future, the master plan delivers significant and essential benefits in terms of the land area that is maintained and/or gained. The projects selected help maintain a diversity of ecosystems and bolster key landscape features.

Under the lower scenario 314 square miles of land is built or maintained that would have otherwise been lost by Year 50. In fact, we project net positive land change for the first 20 years. Under the higher scenario 233 square miles of land is built or maintained at Year 50 compared to a future without action. We see a maximum benefit of 395 square miles of additional land at year 40 under this higher scenario, however the benefits of many of the early projects diminish in the final decade as they can no longer keep pace with subsidence and accelerated rates of sea level rise.

The plan identifies $13.8 billion in structural risk reduction. By year 50, these projects will reduce expected annual damage by $7.7 billion (EADD) under the lower scenarios and $10.7 billion (EADD) under the higher scenario compared to a future without action. The plan also allocates $11.2 billion in nonstructural measures which could further reduce expected annual damage by $3.0 billion (EADD) and $3.8 billion (EADD) under the lower and higher scenarios, respectively.

Fully implementing the plan could reduce EADD by up to 70% under the lower scenario and 60% under the higher scenario compared to a future without action. The risk reduction, as measured in EASD, shows similar effects reducing coastwide risk by up to 78% under the lower scenario and 65% under the higher scenario. This level of investment could mean that in 50 years, under the lower environmental scenario, Louisiana has less flood risk from hurricanes and tropical storms than we do today.

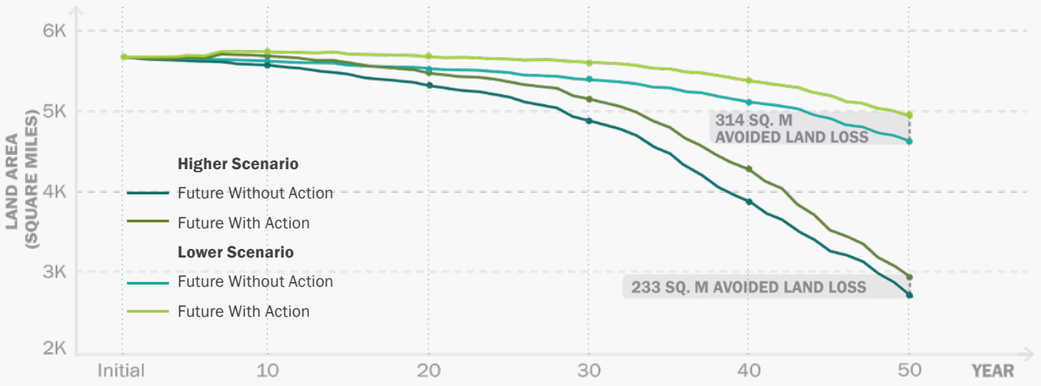
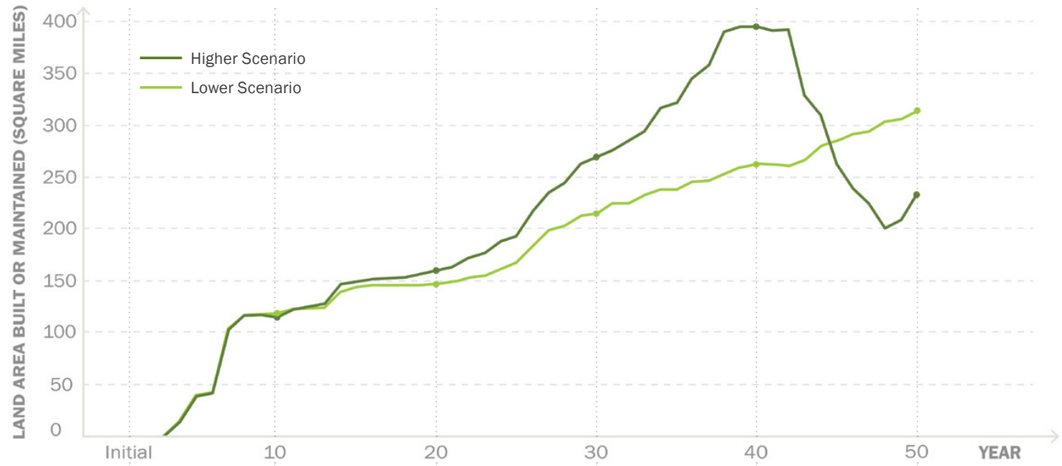
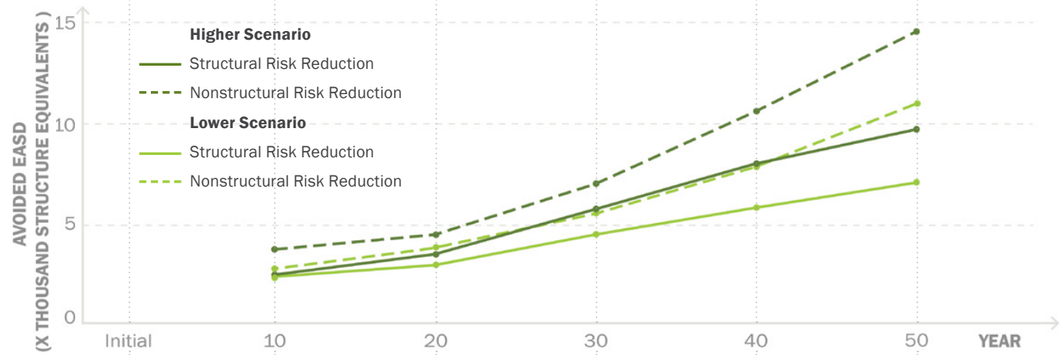


Figure 5.3: Land Area over 50 years, Future With and Without Action, Higher and Lower Scenario.





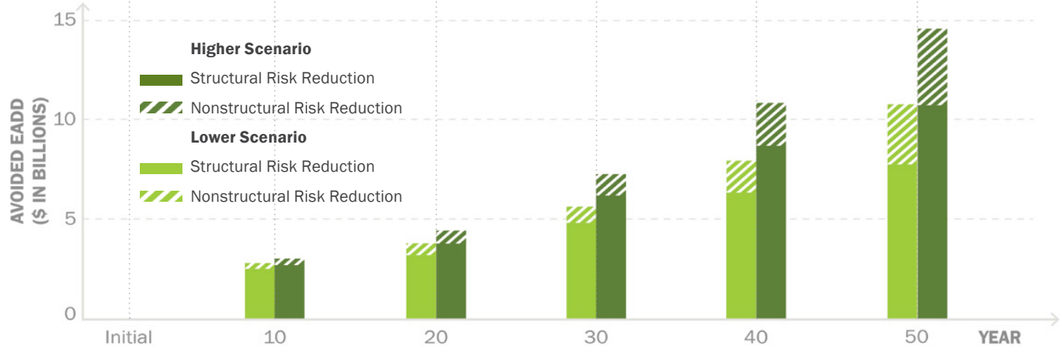


Figure 5.4: Land Area Built or Maintained over 50 years, Future With Action, Higher and Lower Scenario.

Figure 5.5: Avoided Expected Annual Structural Damage (EASD), over 50 years, Future With Action, Higher and Lower Scenario.

Figure 5.6: Avoided Expected Annual Damage in Dollars (EADD), over 50 years, Future With Action, Higher and Lower Scenario.

FUNDING & IMPLEMENTATION

A major consideration of the master planning process is to identify the funding necessary to advance a project from a master plan project concept through feasibility, engineering and design, and into construction and operation. In other words, what do we need to fund the implementation of the 2023 Coastal Master Plan?

CPRA's annual plan identifies available funding for a 3-year period and the programs and projects that the funding will support. The annual plan is also used to track the progress of CPRA projects in different phases of implementation. The implementation plan and funding projections presented in the annual plan represent a snapshot in time based on available funding sources. The state actively explores new sources of funding to ensure that the coastal program maintains its momentum.

2021 marked a monumental federal investment in coastal Louisiana that will benefit residents across the coast as $2.6 billion in funding was allocated to Louisiana to support hurricane risk reduction projects. Through the Extending Government Funding and Delivering Emergency Assistance Act (Supplemental Disaster Relief) and the Infrastructure Investment and Jobs Act (IIJA), USACE dedicated funding to several of CPRA's projects.

Louisiana will continue to use funding associated with the Deepwater Horizon Oil Spill settlement, including funds administered under the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act), National Fish and Wildlife Foundation (NFWF), and the Oil Pollution Act (Natural Resource Damage Assessment [NRDA]). Other important sources of funding include the Gulf of Mexico Energy and Security Act (GOMESA), Water Resource Development Act (WRDA), Coastal Protection and Restoration (CPR) Trust Fund, Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), State Capital Outlay funds, disaster-based funding, and grants to support implementation.

Congress provided more than $2B for coastal and other flood risk reduction projects in LA to the USACE, including the following:

- $783 million for New Orleans to Venice Hurricane Protection
- $453 million for West Shore Lake Pontchartrain
- $163 million for Atchafalaya Basin
- $128 million for Comite River Diversion
- $94.3 million for Southeast Louisiana
- $8 million for Upper Barataria Basin
- $3.8 million for Grand Isle and Vicinity
- $3.5 million for Bayou Segnette Waterway
- $3 million for Tangipahoa Parish

Congress provided more than $643M in IIJA funded to the USACE for 21 coastal and water management projects, including the following:

- $379 million for Morganza to the Gulf
- $125 million for Southwest Coastal
- $52.9 million for Atchafalaya Basin
- $23.2 million for the Gulf Intracoastal Waterway

In 2022, CPRA, parishes and NGOs have recieved more than $30 million in competitive grant awards for ecosystem restoration projects in Louisiana funded through DRSA and IIJA.

The RESTORE Act, signed into law on July 6, 2012, created the Gulf Coast Ecosystem Restoration Council (RESTORE Council). The Council's Gulf Coast Restoration Trust Fund (RESTORE Trust Fund) receives 80% of the Deepwater Horizon Oil Spill Clean Water Act civil penalties for purposes of restoring the long-term health of the natural ecosystems and economy of the Gulf Coast region. These funds are distributed over 15 years, ending on April 4, 2031. Louisiana's share will total more than $841 million, including $29 million for the Louisiana RESTORE Act Center of Excellence.

Under its approved RESTORE Plan, the state committed to funding two projects (Calcasieu-Sabine Large-Scale Marsh and Hydrologic Restoration project and the Houma Navigation Canal Lock Complex) and two programs (Adaptive Management Program and Parish Matching Fund Program) for a total of approximately $811.9 million, including contingency funds of approximately $26.4 million.

CPRA also has the opportunity to submit projects for funding under the Council-Selected Restoration Component. To date, funding has been received to support work on five projects totaling $182 million.

The NFWF Gulf Environmental Benefit Fund (GEBF) was established in early 2013 as an outcome of plea agreements for the Deepwater Horizon Oil Spill. $2.54 billion is directed to NFWF over a 5-year period to support projects that remedy harm to natural resources that were affected by the spill. In Louisiana, the funds must be allocated solely to barrier island restoration projects and river diversion projects along the Mississippi and Atchafalaya Rivers. GEBF will receive $1.27 billion over a 5-year period for project expenditures in Louisiana. To date, NFWF has awarded more than $465 million from GEBF for 12 projects in Louisiana.

NRDA will provide $5 billion in settlement funds used for Deepwater Horizon Oil Spill restoration activities. This funding stream is overseen by the Louisiana Trustee Implementation Group (LA TIG), who approves restoration and implementation plans that utilize these funds. These funds are distributed annually over 15 years, ending on April 4, 2031.

GOMESA allows for federal revenues derived from offshore energy production to be shared with the Land and Water Conservation Fund, the four Gulf producing states, and their coastal political subdivisions. In Louisiana, funds have been constitutionally dedicated to the CPR Trust Fund and are used primarily to fund hurricane risk reduction projects. The state receives its GOMESA payment each spring based on revenues generated during the prior federal fiscal year.

Louisiana's CPR Trust Fund is largely supported by mineral revenues and severance taxes on energy production on state lands. The CPR Trust Fund provides funding for the coastal program's ongoing operating expenses and for continued efforts in coastal restoration and risk reduction.

WRDA authorized the Southwest Coastal Louisiana project to provide nonstructural risk reduction to communities in this region and has also funded feasibility and planning for several flood risk reduction projects that could lead to further federal funding.

CWPPRA was originally authorized in 1990 and has since been reauthorized several times. Through the CWPPRA Program, CPRA works with five federal agencies—U.S. Environmental Protection Agency, NOAA National Marine Fisheries Service, National Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service (FWS), and USACE—to develop coastal wetlands restoration projects.

Capital Outlay generated by the Louisiana Legislature grants cash and non-cash lines of credit for state and non-state projects. CPRA anticipates receiving $10 million per year over the next three years in Capital Outlay funding to supplement implementation of 12 projects.

Future disaster-based funding will be applied toward efforts, such as nonstructural mitigation, that remediate damage from the precipitating event. CPRA will coordinate closely with other agencies to direct applicable future disaster funds toward implementation of nonstructural solutions identified in the 2023 Coastal Master Plan.

Grants from businesses, industry, large corporations, and national philanthropic organizations are also a potential future funding source for projects.

IMPLEMENTING NONSTRUCTURAL RISK REDUCTION PROJECTS

Nonstructural risk reduction projects are unique in the master plan process in that they are typically smaller scaled projects – from floodproofing individual businesses to elevating multiple homes along a single road or even the voluntary acquisition of several residential properties in a neighborhood or community with particularly high flood risk. The nature of these projects, which require active participation of individuals and communities, means that pre-selecting a location for a particular project is exceedingly difficult.

Additionally, because nonstructural projects are effective against many types of flooding (such as heavy rainfall and nuisance flooding events) and not just the storm surge-based flooding that is considered in the master plan, they could potentially be funded by sources that do not typically provide funding for coastal projects. Nonstructural projects are also unique in that CPRA does not traditionally implement these project types. One exception is the USACE Southwest Coastal Louisiana project. In October 2022, the project secured $296 million, mostly from the IIJA. To date, more than 3,900 structures have been preliminarily identified as eligible for either elevation or floodproofing measures. USACE is currently working with CPRA to execute a Project Partnership Agreement before proceeding to elevate homes that have been cleared for construction.

State agencies, such as the Office of Community Development (OCD) and the Governor's Office of Homeland Security and Preparedness (GOHSEP), are experienced in working with federal partners, such as the Department of Housing and Urban Development (HUD) and FEMA, to marshal funding and manage nonstructural project implementation. These agencies also have a role in the disbursement of federal funds made available for recovery following hurricanes and other natural disasters.

Despite the unique realities of implementing nonstructural risk reduction projects, they are considered an integral part of the 2023 Coastal Master Plan. $11.2 billion of the $25 billion risk reduction budget in the plan is allocated to pursuing nonstructural measures across both implementation periods, reflecting their near- and long-term effectiveness.

>>> Go to **Chapter 4: Evaluate** for more information on nonstructural risk reduction project types recommended for different flood depth projections.

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Image: Elevated Homes along Bayou Decade, 2021 (CPRA)

BY THE NUMBERS

THE IMPACT OF THE 2023 COASTAL MASTER PLAN

Figure 5.7: The 2023 Coastal Master Plan By the Numbers.

FREQUENTLY ASKED QUESTIONS

What if we don't have the funding to build all the projects in the master plan? The master plan is developed to provide a list that has more projects than the state currently has funding to implement. Funding for restoration and risk reduction projects comes from various sources and is often required to be used for certain project types or to meet particular goals. Because of this, the plan identifies a variety of worthy projects in anticipation of future funding opportunities. Additionally, the master plan is not an all-or-nothing undertaking. Each project is evaluated and selected based on its individual benefits before being modeled as part of the full master plan. This means that all investments toward project implementation, no matter the number or location, will provide benefits in terms of reducing land loss and/or flood risk.

Why is there still damage from storms if so much is spent on risk reduction projects? The project selection for risk reduction projects was based on maximizing the amount of flood risk reduction that could be attained across a wide range of storm surge events in coastal Louisiana. The structural risk reduction projects are designed to provide protection up to a given design event, often the 1% AEP flood depths. However, some storms and extreme events produce greater flood depths than these design elevations, possibly resulting in overtopping of levees and floodwalls. This means there will be some residual risk of damage from large events. It is simply not possible to protect every community from every possible eventuality.

What about areas where no 2023 Coastal Master Plan projects have been selected? It is important to remember that the master plan is part of a much broader coastal program for Louisiana and that restoration and risk reduction efforts have been underway for decades. As the fourth edition of the master plan, the projects selected are in addition to projects already funded and/or implemented and, therefore, included in our baseline FWOA landscape. Areas without selected projects may already have solutions in place or may be less vulnerable to coastal change than those with projects in this plan.

>>> HAVE MORE QUESTIONS?
Visit us online at coastal.la.gov or contact us directly at masterplan@la.gov.

CHAPTER 6

REGIONAL APPROACH

A regional approach to understand challenges, predict potential change, and evaluate project impacts helps to ensure that the valuable communities that define coastal Louisiana are at the forefront of the planning process. This section includes analyses and vignettes that go beyond project selection to present a fuller picture of how each region experiences the coast now and into the future.

Image: Rockefeller Wildlife Refuge, 2020 (CPRA)

CHENIER PLAIN

The Chenier Plain spans from the Texas border to Pecan Island, Louisiana. The region includes the City of Lake Charles, White Lake Wetlands Conservation Area, and Rockefeller Wildlife Refuge. “Chêne” is French for “oak.” The Chenier Plain is named for wooded ridges that parallel the coastline. Rich in wildlife and interspersed with a series of lakes, it is popular with hunters and fishers. The region is known for being an energy, industrial, and transportation hub.

Figure 6.1: Aerial View of the Chenier Plain Region with the 2023 Coastal Master Plan projects.

ABOUT THE CHENIER PLAIN

AN INTRODUCTION

The Chenier Plain is located in southwest Louisiana and includes all or part of four parishes: Calcasieu, Cameron, Jefferson Davis, and Vermilion. Residents and visitors to the Chenier Plain enjoy the beauty and productivity of the region's vast marsh ecosystems. Known for its abundance of wildlife and the beauty of its marshlands and beaches, southwest Louisiana is a place where fishing and hunting enthusiasts thrive.

Southwest Louisiana is also a vital contributor to Louisiana's working coast. The main center of commercial and residential development is in the Lake Charles-Sulphur area, and the primary economic base of the region includes the chemical and refining industries and oil and liquefied natural gas (LNG) production. These industries rely on the Calcasieu Ship Channel, a 68-mi long, deep-draft commercial waterway that connects Lake Charles to the Gulf. This channel also connects to the GIWW, which provides for east-west shallow draft navigation. Hackberry, south of Lake Charles, is home to a storage site for the Strategic Petroleum Reserve, a system of underground salt caverns that can hold up to 220.4 million barrels of oil.

Restoring the coastal landscape and reducing storm surge-based flood risk for communities in the Chenier Plain helps to support the local workforce. Agricultural communities of Creole and Johnson's Bayou are important, and cattle ranchers and other residents have voiced concerns about the impacts of increased salinity, flooding, and land area change to their livelihoods. The 2023 Coastal Master Plan proposes a number of projects to restore habitats and support the region's continued productivity and economic viability.

The Chenier Plain's hydrology is highly managed. It includes major water control structures like locks and flap-gated culverts, and countless smaller ditches, culverts, and plugs. The master plan evaluated and selected large-scale hydrologic restoration projects to improve drainage at the basin scale. At a more local scale, cleaning ditches and drainage canals or installing culverts can have a significant impact on wetland productivity. The need for such projects is often changing, as storms can alter the landscape, creating new connections for water to flow or filling existing drainage paths. These types of local solutions often rely on the expertise of landowners, land managers, and local coastal zone managers and are, therefore, considered programmatically consistent with the master plan. More information about programmatic project types can be found in Chapter 4.

This region includes the Mermentau Basin, which is bordered on the west by Highway 27, on the south by Highway 82, and on the east by Freshwater Bayou. The major drainage outlet from the basin is via the Mermentau River where drainage is controlled by the Catfish Point Water Control Structure, which was designed to reduce saltwater intrusion to Grand Lake from the Mermentau River. High water levels in the Gulf often limit gravity drainage through this and other smaller structures, resulting in prolonged inundation of the region's intermediate to saline marshes. The Cameron Creole Watershed and large parts of the Calcasieu-Sabine Basin are extensively managed to control water levels. This area is important for wildlife and waterfowl and includes the White Lake Wetlands Conservation Area; the Rockefeller Wildlife Refuge; and the Lacassine, Cameron Prairie, and Sabine National Wildlife Refuges. The North American Waterfowl Management Plan states that the Chenier Plain supports up to six million overwintering waterfowl, making it one of North America's most important waterfowl habitats.

Image: Rabbit Island on Calcasieu Lake (CPRA)

This region has suffered greatly from hurricane impacts over the last two decades. In 2005, Hurricane Rita made landfall in Johnson Bayou with an 18 ft storm surge that flooded or destroyed most of the structures in Cameron, Holly Beach, Hackberry, Creole, Johnson Bayou, Grand Chenier, and Pecan Island. Three years later, Hurricane Ike brought a 22 ft storm surge that flooded many of these same communities. In August 2020, Hurricane Laura brought catastrophic flooding to many parts of Cameron Parish, including flood depths greater than 12 ft around the communities of Creole and Grand Chenier, and devastating winds throughout the Chenier Plain, including Lake Charles. Recovery efforts were delayed and damages were experienced again by Hurricane Delta that arrived just a month later. Today, many residents in the region are still struggling to recover.

The Southwest Coastal Louisiana Study is the first federally authorized feasibility-level study with the dual purpose of addressing hurricane and storm damage risk reduction (National Economic Development [NED] Plan) and restoring the coastal ecosystem (National Ecosystem Restoration [NER] Plan). The project was authorized by Congress in 2016 and has since seen federal funding allocated for the NED Plan to provide nonstructural hurricane and storm damage risk reduction measures through residential structure elevation and floodproofing of commercial structures. $296 million was appropriated through the 2022 IIJA and is projected to elevate over 500 homes and floodproof businesses and warehouses.

The NER Plan is not yet federally funded; however, several of these projects have been constructed through other funding sources and several are included in the master plan. Should NER receive federal funding, it would be a tremendous opportunity to implement additional restoration projects in this region.

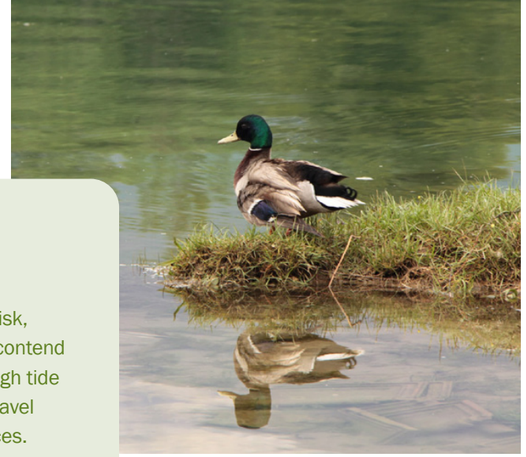


Image: Chenier Plain Waterfowl (Unsplash)

HIGH TIDE FLOODING IN CAMERON PARISH

In addition to storm surge-based flood risk, Louisiana's coastal communities often contend with localized flooding, also known as high tide flooding which can impede day-to-day travel and activity as well as emergency services. The low-lying areas in and around Cameron can expect to experience increased frequency and severity of this localized flooding over the next 50 years, as shown in Figure 6.2 below. Cameron Parish's population tends to be situated along the coast atop remnant chenier ridges. Water is removed from those areas through forced drainage. Expected sea level rise will impede gravity drainage while exacerbating the frequency and extent of high tide flooding events. Currently, areas near the Cameron Ferry West Landing, the low point on the Highway 27 hurricane evacuation route, almost never experience high tide flooding. In 25 years, these areas may experience high tide flood events during half of the year. In 50 years, these areas may experience high tide flooding year-round.

	YEAR 1	YEAR 25	YEAR 50
Ferry West Landing	~Never	Up to 28	32 - 49
Cameron Evacuation Link, LA-27	~Never	Up to 22	27 - 49

Figure 6.2: Number of weeks per year that HTF in Cameron Parish may occur at least once.

Image: Crabbing at Rockefeller Wildlife Refuge (Louisiana Sea Grant College Program)

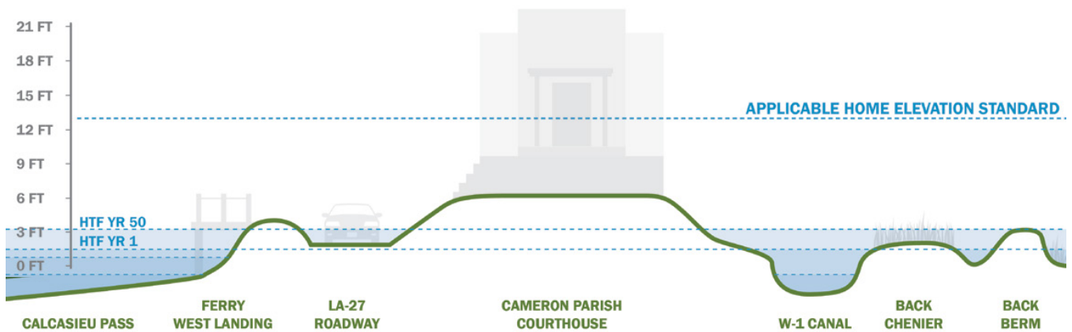
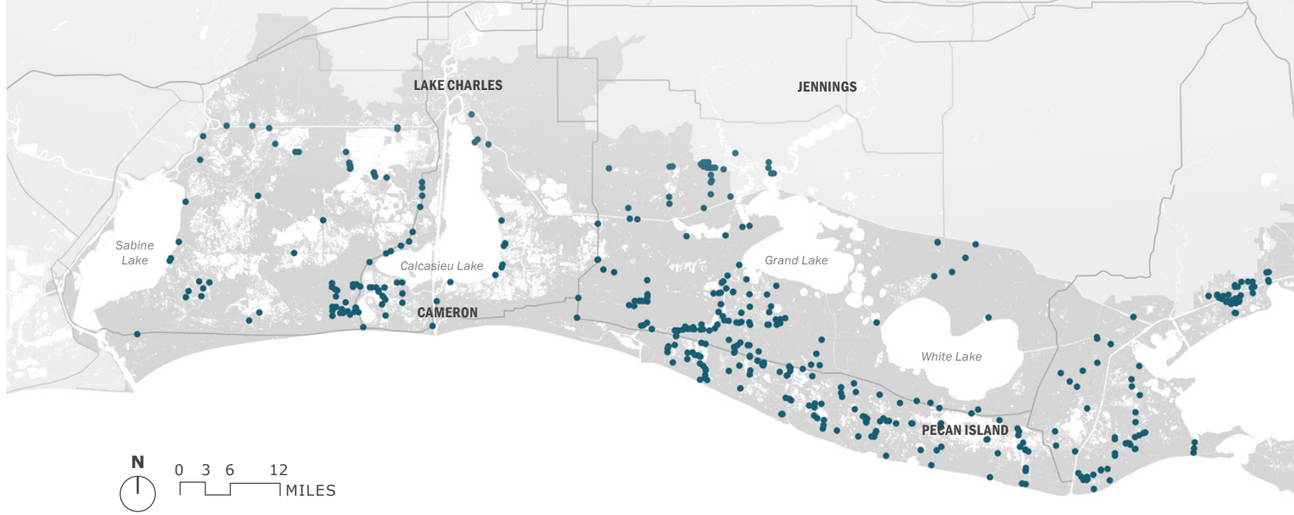


Figure 6.3: Representative High Tide Flooding (HTF) for Cameron Parish Elevations at Year 1 and 50 in the Lower Scenario.



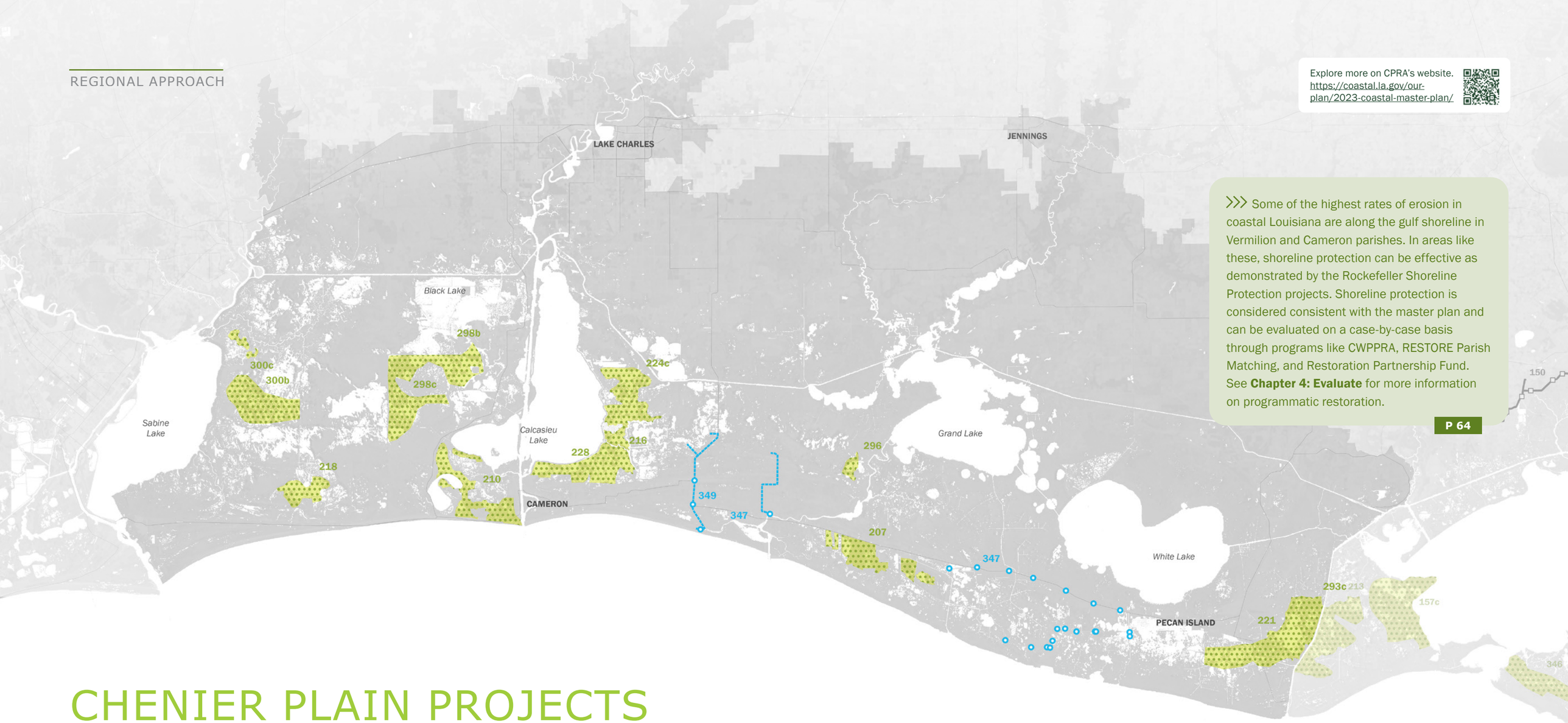
Map 6.1: Existing Hydraulic Control Structures Identified in Chenier Plain.

Image: Cameron-Creole Maintenance Structure (CPRA)

DRAINAGE CONCERNS

Over the last century, the hydrology of the Chenier Plain has been altered dramatically through a combination of navigation channels, canals, and drainage or water control features. Major historic changes to water flow in this region resulted from dredging the Calcasieu and Sabine-Neches Ship Channels to the Gulf as well as efforts that connected the ship channels by dredging the GIWW along the northern portion of the region. Smaller, more localized changes to oilfield canals, construction of salinity and water-level control structures and levees, and impoundment of large areas of the marsh for wildlife management have also impacted the area's hydrology. At the current sea level, opportunities for drainage from the managed marsh ecosystem into coastal lakes are already highly limited—all but the tidally connected marshes are flooded too deeply and for too long to continue to support healthy marsh vegetation. With continued sea level rise in the future, drainage is expected to become more challenging in the region. The hydrologic restoration projects selected for this region in the 2023 Coastal Master Plan address flooding and drainage while maintaining salinity control. More information about these issues can be found in McGinnis, T. et al., 2019. 2019 Basin Summary Report for the Calcasieu-Sabine Basin. CPRA.

Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/



CHENIER PLAIN PROJECTS

REGIONAL 2023 PROJECTS MAP

For the 2023 Coastal Master Plan, 15 projects were selected in the Chenier Plain region, including several marsh creation projects spread across the region. Through the help of the Chenier Plain Regional Workgroup, the locations of these marsh creation projects were chosen to address current and future land loss concerns, such as strengthening the shoreline of Calcasieu Lake and other important regional water bodies. Large-scale hydrologic restoration projects were also selected for the region. These projects were designed, with input from our advisory groups, to provide improved drainage in both the upper Mermentau Basin and the Cameron-Creole Watershed.

>>> Some of the highest rates of erosion in coastal Louisiana are along the gulf shoreline in Vermilion and Cameron parishes. In areas like these, shoreline protection can be effective as demonstrated by the Rockefeller Shoreline Protection projects. Shoreline protection is considered consistent with the master plan and can be evaluated on a case-by-case basis through programs like CWPPRA, RESTORE Parish Matching, and Restoration Partnership Fund. See **Chapter 4: Evaluate** for more information on programmatic restoration.

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Marsh Creation
Hydrologic Restoration

Map 6.2: Chenier Plain 2023 Coastal Master Plan Projects.

N 0 2 4 8 MILES

ID#	PROJECT NAME	DESCRIPTION	IP	COST
347	**Mermentau Basin Hydrologic Restoration**	A series of hydrologic features designed to facilitate drainage from the upper Mermentau Basin south to the Gulf of Mexico. Kings Bayou: Channel dredging and cleanout in Little Chenier Canal and Kings Bayou as well as improving three road crossings and increasing capacity at the Kings Bayou Control Structures with 15 60-inch flap gated culverts to increase drainage to the Mermentau River. Rockefeller: 105 60-inch flap gated culverts under Highway 82 and 120 60-inch flap gated culverts on the south and west boundaries of the Rockefeller management area to move water south across Highway 82.	1	$ 130M
349	**Cameron-Creole to the Gulf Hydrologic Restoration**	Hydrologic restoration increasing the capacity for drainage from the Cameron-Creole Watershed to the Gulf of Mexico through Creole Canal. Dredging and cleanout of Creole Canal; increasing cross-section at two road crossings; construction of a receiving pond in the western end of the Mermentau River; installing a 750 cfs pump station from the receiving pond to the Gulf to maintain the receiving pond stage at mean low water.	1	$ 59M
207	**South Grand Chenier Marsh Creation**	Creation of marsh within a footprint of approximately 6,900 acres south of Highway 82 near Grand Chenier to create new wetland habitat and restore degraded marsh.	1	$ 390M
210	**Mud Lake Marsh Creation**	Creation of marsh within a footprint of approximately 8,100 acres at Mud Lake south of West Cove Calcasieu Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 330M
216	**Southeast Calcasieu Lake Marsh Creation**	Creation of marsh within a footprint of approximately 9,200 acres southeast of Calcasieu Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 450M
218	**Cameron Meadows Marsh Creation**	Creation of marsh within a footprint of approximately 3,700 acres at Cameron Meadows north of Johnsons Bayou to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 150M
221	**East Pecan Island Marsh Creation**	Creation of marsh within a footprint of approximately 12,000 acres of the eastern portion of marsh between Pecan Island and the west bank of the Freshwater Bayou Canal to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 650M
224c	**East Calcasieu Lake Marsh Creation**	Creation of marsh in the western portion of marsh in the eastern Cameron-Creole watershed to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 340M
228	**Calcasieu Ship Channel Marsh Creation**	Creation of marsh within a footprint of approximately 3,200 acres south of Calcasieu Lake near Cameron to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 83M
293c	**Freshwater Bayou North Marsh Creation**	Creation of marsh in the northern portion in Vermilion Parish west of Freshwater Bayou to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 150M
296	**Little Chenier Marsh Creation**	Creation of marsh within a footprint of approximately 1,100 acres in Cameron Parish south of Grand Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 51M
298b	**West Brown Lake Marsh Creation - North**	Creation of marsh in the eastern portion of marsh in Cameron Parish south of Black Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 410M
298c	**West Brown Lake Marsh Creation - South**	Creation of marsh in the eastern portion of marsh in Cameron Parish south of Black Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 240M
300b	**West Sabine Refuge Marsh Creation**	Creation of marsh in the western portion of marsh in Cameron Parish east of Sabine Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 640M
300c	**West Sabine Refuge Marsh Creation - Central**	Creation of marsh in the western portion of marsh in Cameron Parish east of Sabine Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 130M

Figure 6.4: Chenier Plain Project List.

Image: Cameron Meadows (CPRA)

HYDROLOGIC RESTORATION PROJECTS

The Chenier Plain Regional Workgroup proposed several candidate projects to address persistent marsh flooding and lack of drainage. The Mermentau Basin Hydrologic Restoration and Cameron-Creole to the Gulf Hydrologic Restoration projects were selected for inclusion in IP1 of the 2023 Coastal Master Plan.

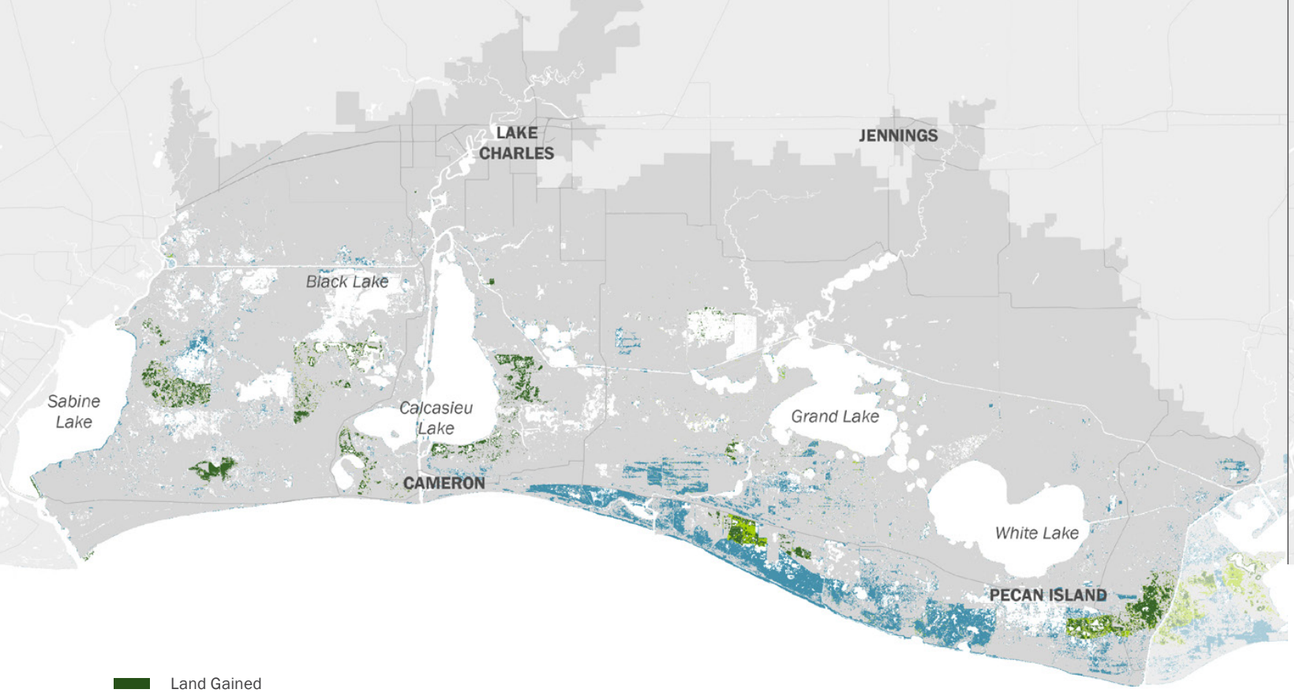
The Mermentau project moves water, by way of gravity drainage, southward across Highway 82 into the tidally connected canals throughout the Rockefeller National Wildlife Refuge, and the Cameron-Creole project reduces water levels by maintaining constant (via downstream pumps) mean low tide levels in the Creole Canal, allowing the Cameron-Creole system to efficiently gravity drain to the canal at all times. Combined, these projects relieve pressure on the Mermentau River allowing for more efficient drainage through existing waterways. This results in reduced water levels throughout the southern Mermentau and Cameron-Creole watersheds and healthier, more sustainable marshes in this area, as compared to FWOA.

These two hydrologic restoration projects will work in conjunction with the Calcasieu-Sabine Large-Scale Marsh and Hydrologic Restoration project currently being engineered and designed by CPRA to alleviate chronic inundation of marsh areas to the east of Calcasieu Lake.

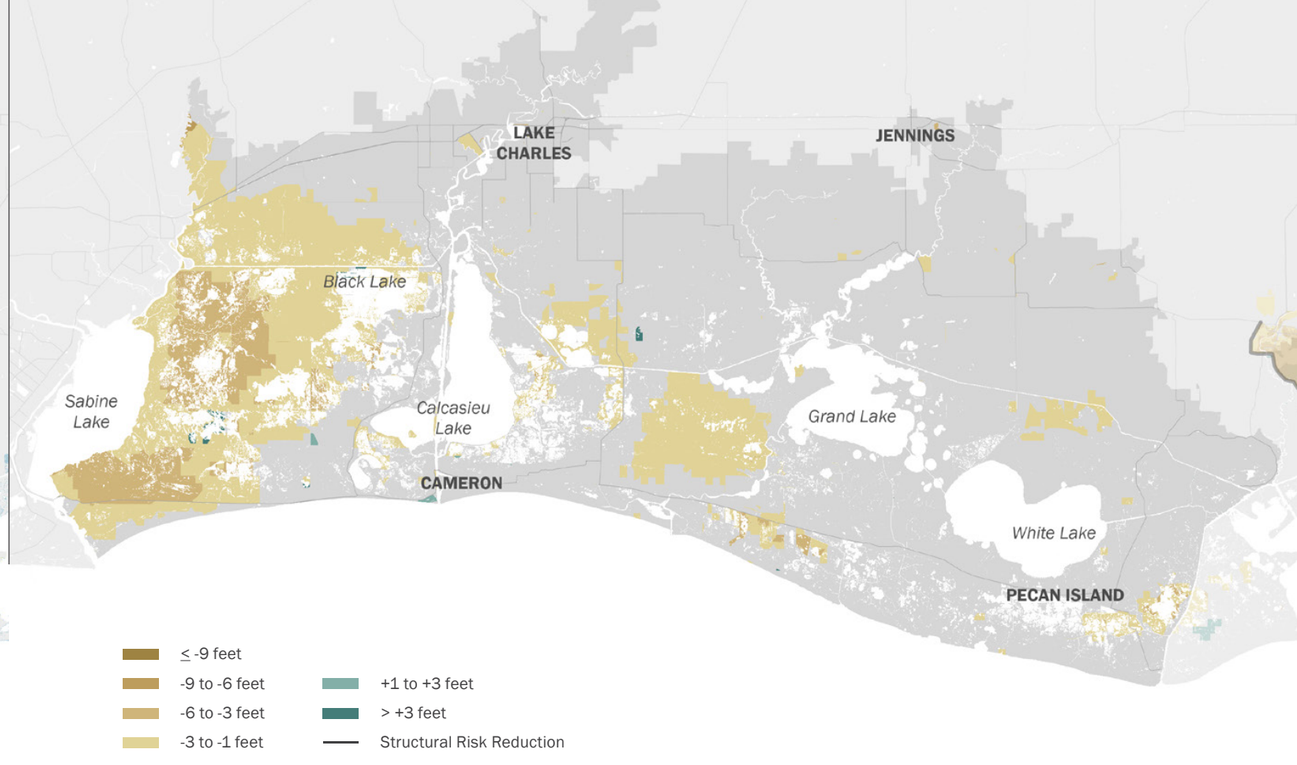
REDUCING RISK

The areas of the Chenier Plain most exposed to storm surge are also the most rural, which leaves few cost-effective options for structural protection. Elevating homes and floodproofing businesses have been the standard for building in low-lying coastal communities for decades, yet there is still need and opportunity. CPRA is working with USACE to implement these critical projects through the Southwest Coastal project.

Restoring and maintaining the wetlands and ridges between the Gulf and the more populated areas has been a key concern from some communities further north. The restoration projects proposed in the master plan are projected to reduce EADD in Lake Charles by as much as 18% in 50 years.



Map 6.3: Chenier Plain, Land Change, Future With Action, Lower Scenario, Year 50.



Map 6.4: Chenier Plain, Flood Depths Difference, Future With Action, Lower Scenario, Year 50.

REGIONAL BENEFITS

With action, we build and maintain 23,000 acres of land in the lower environmental scenario and 35,000 acres in the higher scenario. Restoration in the region is focused on large-scale marsh creation and ensuring adequate drainage of wetlands in the Mermentau Basin. In the lower environmental scenario, the projects are successful in maintaining much of the land area and extensive intermediate marshes. Under the higher scenario, there is extensive land loss in the Mermentau Basin after 50 years and some increase in salinity, but the restoration projects are successful in maintaining extensive marsh both east and west of Calcasieu Lake. The hydrologic restoration projects and existing management projects help maintain intermediate marsh, although there has been an increase in conversion to salt marsh in the last decade.

There were no structural risk reduction projects proposed in the Chenier Plain. The selected restoration projects do have an impact in attenuating storm surge and reducing risk. With the restoration projects on the landscape, the models show an 18% reduction in risk in Lake Charles, Sulphur, and surrounding areas in 50 years under the lower scenario. There is, of course, significant residual risk across the Chenier Plain, which illustrates the need for nonstructural risk reduction projects.

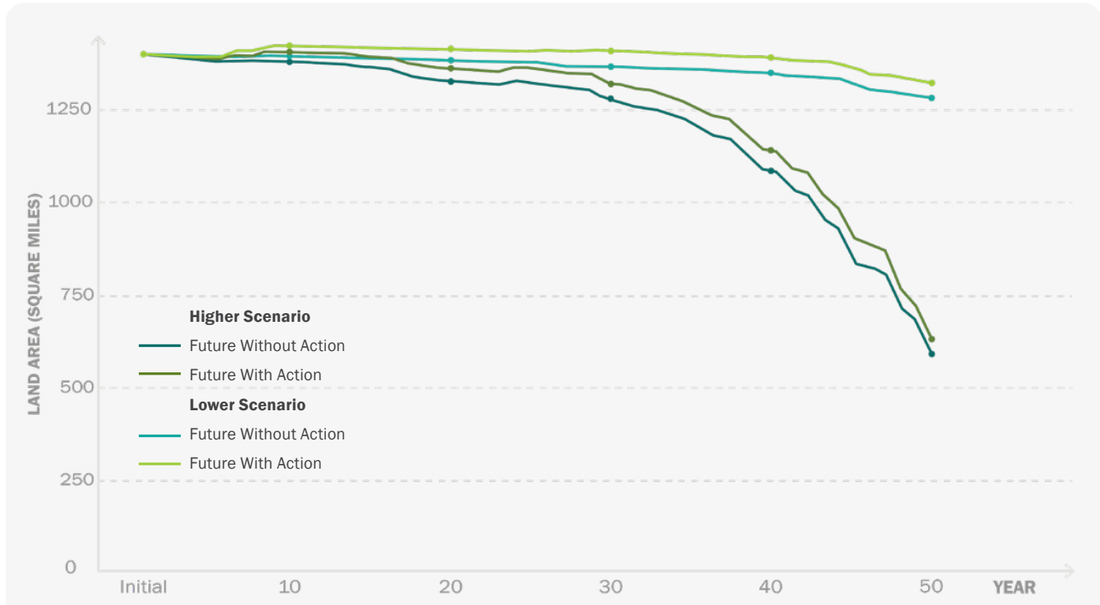


Figure 6.5: Chenier Plain Land Area over 50 years, Future With and Without Action, Higher and Lower Scenario.

CENTRAL COAST

The Central Coast includes the areas around the Atchafalaya River Delta, spanning from Freshwater Bayou to the eastern banks of the Atchafalaya River, including Abbeville and salt domes like Avery and Weeks Island. The region features a series of connected bays that lead to the Gulf. Notable features include Marsh Island and the Atchafalaya River and Wax Lake deltas. Hunting and fishing are popular in the area due to the productive marsh ecosystem.

Figure 6.6: Aerial View of the Central Coast Region with the 2023 Coastal Master Plan projects.

ABOUT THE CENTRAL COAST

AN INTRODUCTION

The Central Coast region is a unique part of coastal Louisiana. It is between the Mississippi Delta Plain and the Chenier Plain. The shallow coastal bays in the area are influenced directly by freshwater and sediment from the Atchafalaya River.

The region extends from the Atchafalaya Floodway levee and Fourleague Bay to the east, to Freshwater Bayou to the west. The region continues inland to the lower reaches of the Atchafalaya Floodway, the communities along Bayou Teche, the outskirts of Lafayette, and agricultural land west of Abbeville. It includes parts of Iberia, Lafayette, St. Martin, St. Mary, and Vermilion parishes.

The region is traversed by the GIWW. Important ports include the Port of Morgan City, Port of Iberia, and the Port of West St. Mary, which utilize local waterways and their proximity to the GIWW and the Gulf. While most communities are located away from the coastline, Intracoastal City is a hub for the local shrimp and pogie fleets on the GIWW near Vermilion Bay, and Cypremort Point is a popular recreational fishing area.

The Central Coast of Louisiana is the "Gateway to the Atchafalaya Basin," and the landscape is shaped by the Atchafalaya River, which branches off the Mississippi River and carries up to 30% of its flow below the Old River Control Structure west of Simmesport.

The Central Coast is one area of the state that is building land through active growth of the Atchafalaya River and the Wax Lake deltas, supporting a growing research economy around the study of natural and constructed river diversions.

The Chitimacha Tribe of Louisiana is the only tribe in Louisiana to still occupy a portion of their original homeland, which once encompassed the entire Atchafalaya Basin, lands westward toward Lafayette, southward to the Gulf, and eastward to the New Orleans area. The Chitimacha Tribe maintains a reservation adjacent to Charenton, in St. Mary Parish and was recently awarded $5 million by the U.S. Bureau of Indian Affairs targeted at reducing the community's risk of flooding from two fronts: the coast, about 10 miles to the south, and the Atchafalaya River, immediately to the north.

The Central Coast region is widely recognized for its fresh seafood, bountiful agriculture and cattle herds, beautiful and useful waterways, and rich cultural traditions. It is precisely these qualities that support a thriving cultural and eco-tourism industry in the region. Sometimes called "The Most Cajun Place on Earth," the people and places of the Central Coast are a key component of the rich cultural heritage in the state.

This region's economy is benefited by the natural resources of the area – residents from communities like Charenton, Delcambre, Gibson, Morgan City, and Patterson contribute to fishing and shrimping activities, and Intracoastal City consistently ranks among the top six seafood ports in the country. Energy production and agriculture are also important to the region with residents of communities like Abbeville, Franklin, Erath, Gueydan, and Lydia contributing to those sectors.

The 2023 Coastal Master Plan proposes a number of projects to restore ecosystem function and reduce storm surge-based flood risk to communities within the Central Coast region. Agriculture is a key industry in the region with Vermilion, Iberia, Lafayette, and St. Mary parishes among the top producing parishes for sugarcane in the state. Four of Louisiana's 11 operating raw sugar factories are located in the region in communities along Bayou Teche. Vermilion is also historically among the top producing parishes for rice. The region's agriculture is, in many areas, impacted by subsidence and sea level rise, which make draining agricultural impoundments more difficult. This is expected to be more of a challenge with accelerating rates of sea level rise in the future.

Numerous storm events, including Hurricanes Laura and Delta (2020), Barry (2019), Lee (2011), Ike (2008), Gustav (2008), Rita (2005), Lili (2002), Bertha (2002), Allison (2001), and Andrew (1992), affected the region and resulted in economic damages, loss of property, loss of life, and repeated mandatory evacuation costs. USACE recently completed the South Central Coast Louisiana Study to develop solutions to storm surge-based flooding. The study identified nonstructural measures, including voluntary floodproofing or elevation of 2,240 structures located within the 25-year storm surge floodplain.

Image: Vermilion Bay (Louisiana Sea Grant College Program)

Because of the proximity to the Gulf and the influence of the Atchafalaya River, the ecosystems in this region are diverse and include freshwater swamps and saline marshes. The region includes the Atchafalaya Delta Wildlife Management Area, the Marsh Island and Rainey State Wildlife Refuges, the Bayou Teche National Wildlife Refuge, and the National Audubon Society's 26,000 acre Paul J Rainey Wildlife Sanctuary.

>>> The Atchafalaya Basin is the largest contiguous bottomland hardwood forest in North America and is the largest overflow alluvial hardwood swamp in the United States. The Atchafalaya River Delta is an area of active coastal land building and serves as a living laboratory where monitoring and research activities inform how conservation and restoration can be successfully implemented throughout coastal Louisiana. For more information on CPRA's Atchafalaya Basin Program see **Chapter 7**.

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HIGH TIDE FLOODING IN DELCAMBRE

In addition to storm surge-based flood risk, Louisiana's coastal communities often contend with localized flooding, also known as high tide flooding which can impede day-to-day travel and activity as well as emergency services The low-lying areas around Delcambre, especially those in unprotected areas can expect to experience increased frequency and severity of this localized flooding over the next 50 years, as shown in Figure 6.7. Although elevations and levee heights vary in the area, the average road elevation in the Delcambre area is only about half a foot above sea level. Areas of Delcambre are predicted to experience high tide flooding effects more than half of the year in the next 25 years and during almost every week of the year in the next 50 years. Similar low-lying areas, especially along Delcambre Canal, can expect to experience similar frequencies of flooding.

	YEAR 1	YEAR 25	YEAR 50
Bayou Carlin Cove	~Never	Up to 24	49 - 52
E Main St and S President St Low Area	Up to 4	30 - 50	49 - 52

Figure 6.7: Number of weeks per year that HTF in Delcambre may occur at least once.

Image: Delcambre Shrimp Festival (Louisiana Sea Grant College Program)

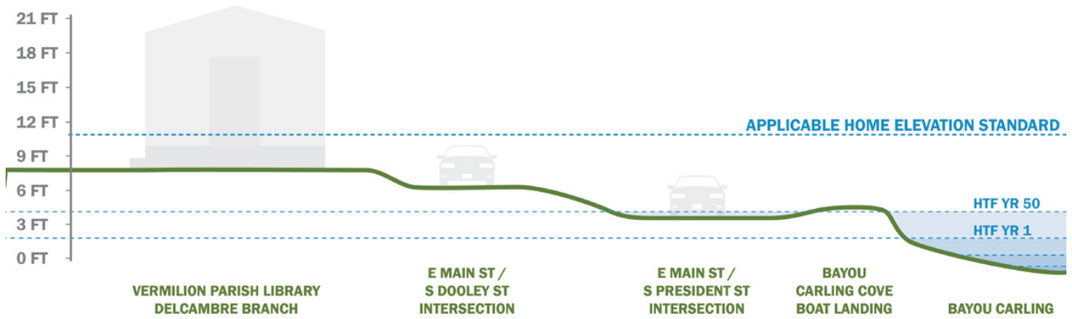
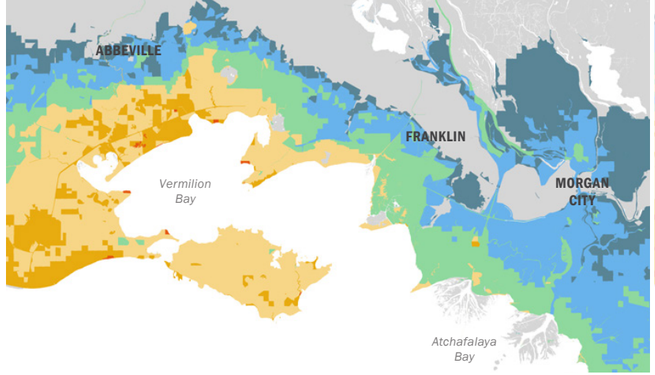
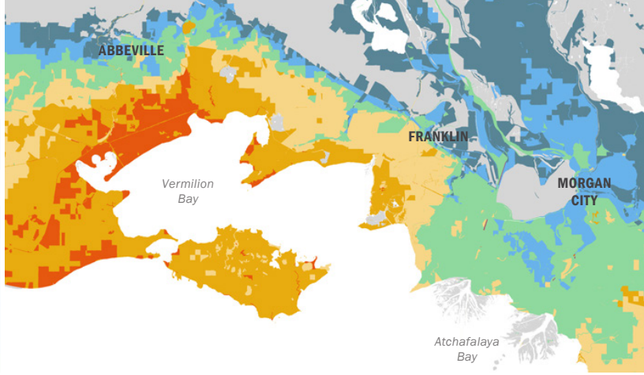


Figure 6.8: Representative High Tide Flooding (HTF) Elevations for Delcambre at Year 1 and 50 in the Lower Scenario.



Map 6.5: Hypothetical Hurricane Rita Impacts on Initial Conditions Landscape, Lower Scenario.



Map 6.6: Hypothetical Hurricane Rita Impacts on a Future Landscape, Future Without Action, Lower Scenario, Year 50.

1 to <4 feet
4 to <7 feet
7 to <10 feet
10 to <13 feet
13 to <16 feet
16 to <21 feet

N
0 3.5 7
MILES

HURRICANE RITA

Hurricane Rita made landfall near the Louisiana/Texas border on September 24, 2005, less than one month after Hurricane Katrina. Hurricane Rita brought with it up to 15 ft of storm surge throughout southwest Louisiana, and severely damaged several coastal communities and tens of thousands of acres of coastal wetlands.

Storm surge in the Central Coast was measured at about 12 ft with much of Vermilion, Iberia, and St. Mary parishes south of Highway 14 and U.S. 90 inundated. We predict that in 50 years, without further restoration and protection efforts, an additional 2-5 ft of storm surge and nearly three times as much economic damage (in 2020 dollars) would be experienced in the communities of Franklin and Delcambre and surrounding agricultural areas south of Highway 14 and U.S. 90 for a storm similar to Hurricane Rita.

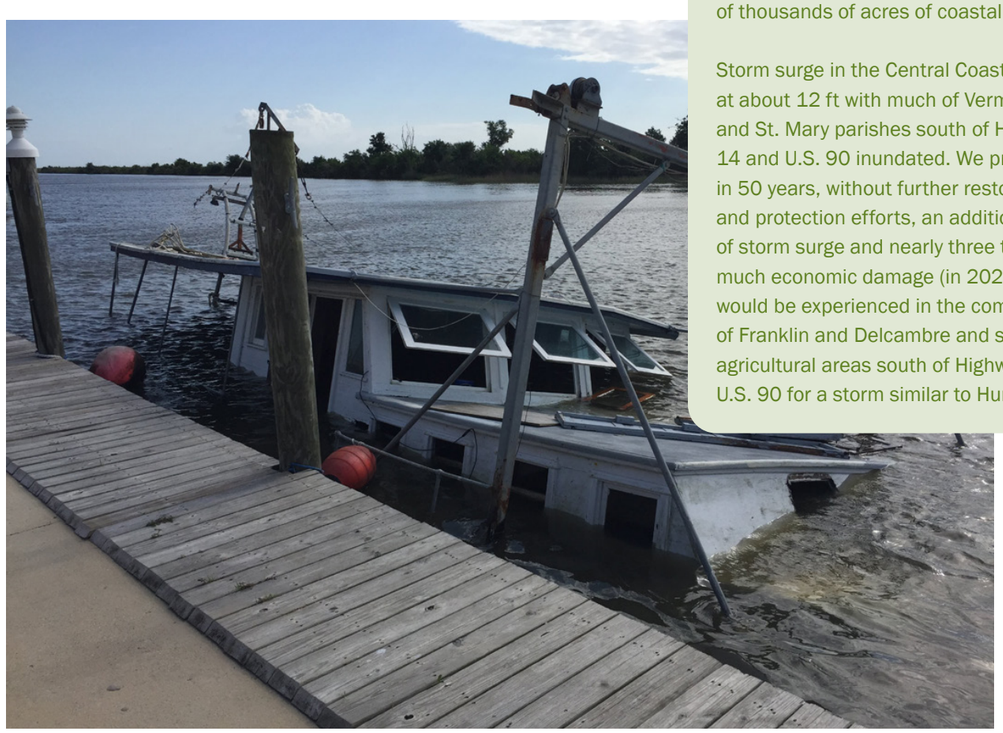


Image: Hurricane Damage (CPRA)

Shoreline protection is considered consistent with the master plan and can be evaluated on a case-by-case basis through programs like CWPPRA, RESTORE Parish Matching, and Restoration Partnership Fund. Shoreline protection is, of course, most effective in areas with acutely high erosion rates, like. the north side of Marsh Island, or when applied to maintain critical landscape features, such as Southwest Point. See **Chapter 4: Evaluate** for more information on programmatic restoration.

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The Atchafalaya Basin is deeply tied to the Central Coast and western Terrebonne coastal basins; however, it is a distinctive river swamp system with unique goals and solutions for restoration and enhancement. The Atchafalaya Basin Program, which is administered by CPRA, has been established to help meet these specific challenges. See **Chapter 7: Beyond the Master Plan** for more.

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Explore more on CPRA's website. https://coastal.la.gov/our-plan/2023-coastal-master-plan/

Map 6.7: Central Coast 2023 Coastal Master Plan Projects.

CENTRAL COAST PROJECTS

REGIONAL 2023 PROJECTS MAP

For the 2023 Coastal Master Plan, 7 projects were selected for the Central Coast region. These projects include several large-scale marsh creation projects from West Rainey Marsh and across Marsh Island to Point Au Fer. With the help of our Central Coast Regional Workgroup, several originally submitted project concepts were revised to avoid overlap and to focus on regional priorities, such as maintaining regionally important landforms. Structural risk reduction projects were also selected for the region that, in conjunction with nonstructural risk reduction measures, would reduce risk and damages from storm surge-based flooding in communities across the Central Coast.

ID#	PROJECT NAME	DESCRIPTION	IP	COST
157c	**East Rainey Marsh Creation**	Creation of marsh in the northern portion of marsh in the eastern portion of Rainey Marsh to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 350M
213	**West Rainey Marsh Creation**	Creation of marsh within a footprint of approximately 10,000 acres at Rainey Marsh near the southeast bank of the Freshwater Bayou Canal to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 400M
344b	**Central Coast Marsh Creation - Point Au Fer**	Creation of marsh within a footprint of approximately 8,200 acres on Point Au Fer Island to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 270M
346	**Marsh Island Barrier Marsh Creation**	Creation of marsh within a footprint of approximately 16,000 acres on Marsh Island to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 710M
148	**Franklin and Vicinity**	Improvements of a levee to an elevation between 12 and 18 feet NAVD88 from the Wax Lake Outlet to the Charenton Canal as well as the Bayou Sale polder. Project features approximately 210,000 feet of earthen levee, approximately 4,800 feet of T-wall, a 30-foot roller gate and two sluice gates.	2	$ 310M
150	**Iberia/St. Mary Upland Levee**	Construction of a levee to an elevation between 15.5 to 20 feet NAVD88 in Iberia and St. Mary parishes between the Delcambre Canal and the Charenton Canal. Project features approximately 150,000 feet of earthen levee, approximately 15,000 feet of T-wall, five 30-foot barge gates, three 110-foot barge gates, four 40-foot roller gates, 27 sluice gates and seven pump stations.	1	$ 1.7B
292	**Abbeville and Vicinity**	Construction of a levee to an elevation between 15.5 and 20 feet NAVD88 in the area south of Delcambre, Erath, and Abbeville roughly following Highway 330. Project features approximately 100,000 feet of earthen levee, approximately 2,800 feet of T-wall, two 56-foot barge gates, two 20-foot stop log gates, two 30-foot stop log gates, and a sluice gate.	2	$ 610M

Figure 6.9: Central Coast Project List

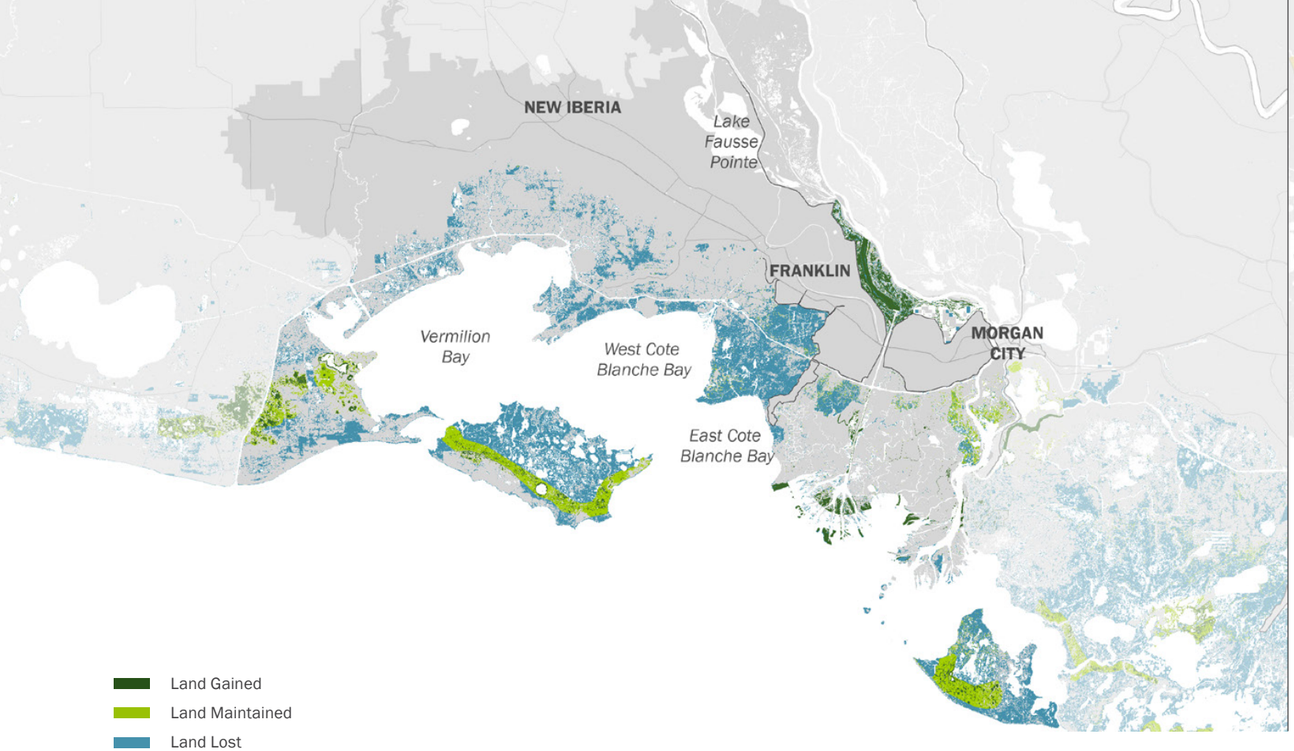
IBERIA/ST. MARY UPLAND LEVEE

This project was selected in IP1 of the 2023 Coastal Master Plan and provides storm surge-based risk reduction for the community of New Iberia as well as areas further south, such as Jeanerette, Lydia, and the Port of Iberia. Much of the risk reduction provided by this project is realized in the later years of our model projections as sea level rise, subsidence, and continued land loss over the 50-year period are expected to lead to increased flood risk in areas north of U.S. 90, especially in New Iberia. A similar levee project was among several evaluated in USACE's South Central Coast Louisiana Study, which ultimately targeted nonstructural projects as the preferred alternative. CPRA will partner with USACE to implement the nonstructural risk reduction measures identified, as it is the most practical path to help these communities adapt to flood risk in the near-term.

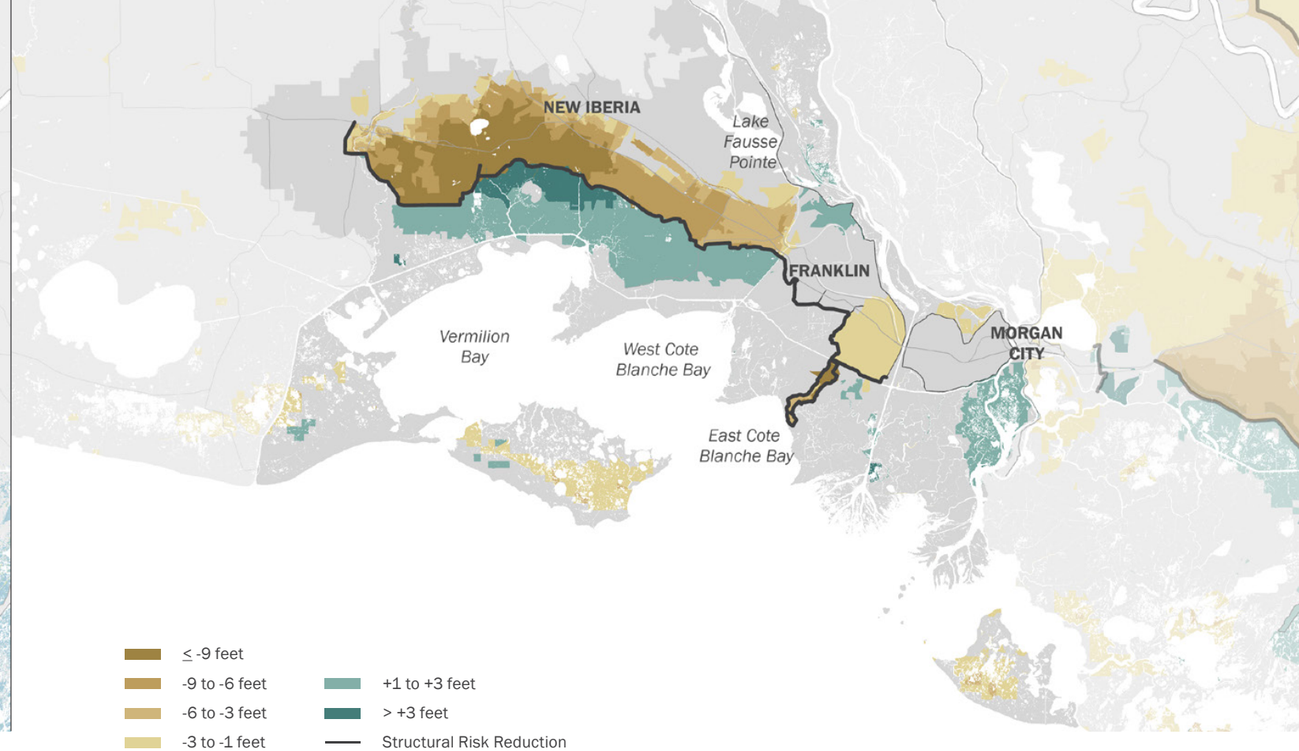
MARSH CREATION PROJECTS

Starting in 2018, CPRA established Regional Workgroups to consider regional issues and to help develop new project concepts and refine past project ideas. Regional Workgroups members were asked to consider how to restore lost areas, take into account projections of land change and hydrologic conditions, and identify the key landscape features to maintain and protect. Workgroup members continually emphasized the importance of maintaining Marsh Island and Point Au Fer as barriers between the Gulf and the region's population centers, recommending that we refine past master plan projects in the area to focus on east-west alignments. Both projects were evaluated and ultimately selected for the plan.

Image: Atchafalaya Basin (Louisiana Sea Grant College Program)



Map 6.8: Central Coast, Land Change, Future With Action, Lower Scenario, Year 50.



Map 6.9: Central Coast, Flood Depths Difference, Future With Action, Lower Scenario, Year 50.

REGIONAL PROJECT BENEFITS

With action, we build and maintain 29,000 acres of land in the lower environmental scenario and 1,400 acres in the higher scenario. Restoration is focused on maintaining a 'barrier' of marsh between the open bays and Gulf with marsh creation east of Freshwater Bayou, on Marsh Island, and on Point au Fer. These projects are successful over the next 50 years under the lower environmental scenario but some land loss occurs on Marsh Island and to the north of East Cote Blanche Bay. There is also some land gain in the Atchafalaya and Wax Lake deltas over the first three decades. The marsh creation 'barrier' is also successful in the higher environmental scenario, but the marshes degrade by year 50 and land loss increases markedly in the last decade. Freshwater flows from the Atchafalaya River keep the eastern part of the region fresh, while to the west there is dramatic decrease in intermediate marsh in the last two decades.

Three structural risk reduction projects were selected in the Central Coast region that together span from Abbeville to the Wax Lake Outlet Channel. These projects are predicted to reduce future surge-based flood risk in the region by 65%. These projects provide between $1 - $1.6 billion reduction in EADD in 50 years. Over half of that risk reduction is seen in the communities of Abbeville, Franklin, and New Iberia, which are projected to see dramatic increases in surge-based flood risk over the next 50 years without these projects.

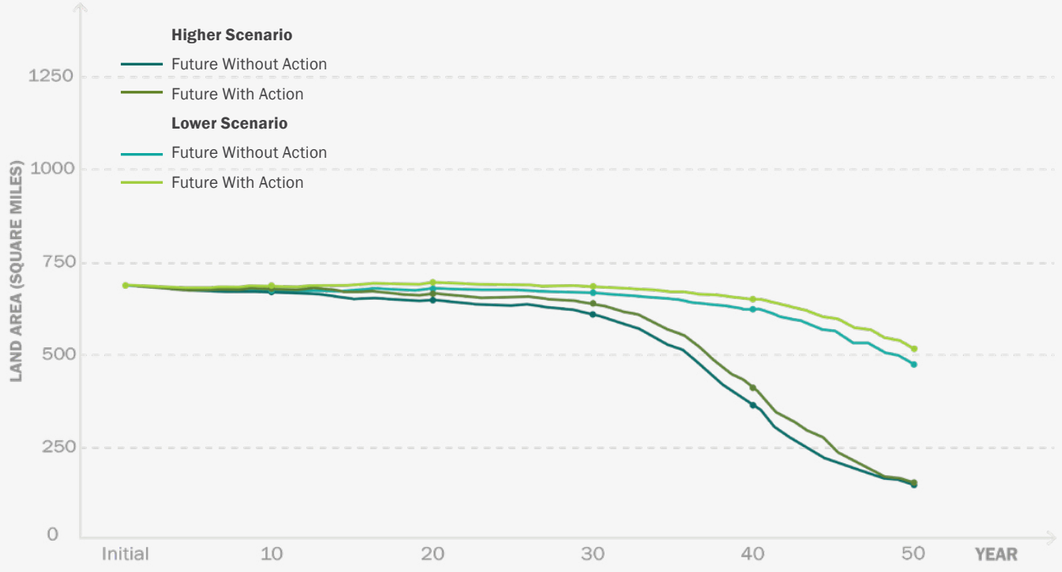


Figure 6.10: Central Coast Land Area over 50 years, Future With and Without Action, Higher and Lower Scenario.

TERREBONNE

The Terrebonne region spans from Morgan City to Highway 1, including the communities of Houma and Dulac. The name derives from the French words “terre” and “bonne,” which together mean “good earth.” The region is filled with an interconnected web of bayous after which many of its small towns are named. The region has a series of barrier islands across the Terrebonne and Timbalier bays, including Timbalier Island and the Isles Dernieres Barrier Islands Refuge.

Figure 6.11: Aerial View of the Terrebonne Region with the 2023 Coastal Master Plan projects.

ABOUT TERREBONNE

AN INTRODUCTION

The Terrebonne region extends from the Verret Basin in the north to the Isles Dernieres and Timbalier Islands that border the Gulf.

It extends from Bayou Lafourche in the east to the Atchafalaya Basin floodway, Fourleague Bay, and Oyster Bayou on the west. The region includes parts of seven parishes: Assumption, Ascension, Iberville, Lafourche, St. Martin, St. Mary, and Terrebonne. Residential and commercial development can be found along the Atchafalaya River, in Morgan City, and in Houma and surrounding communities on Bayou Terrebonne. Most communities are on higher land adjacent to natural bayous, such as Bayou Blue and Bayou Black.

The ecosystem includes extensive bottomland hardwood and swamp forests in the Verret Basin and floating marshes in the Penchant Basin. While there is a fresh-to-saline gradient across the region, salt and brackish marshes are more prevalent in eastern Terrebonne. The region includes the Elm Hall Wildlife Management Area in the Verret Basin and Pointe-aux-Chenes Wildlife Management Area in eastern Terrebonne, as well as the Isles Dernieres Barrier Islands Refuge and the Mandalay National Wildlife Refuge.

The Verret and Penchant basins receive freshwater from the Atchafalaya River. Areas east of the Bayou Terrebonne Ridge receive freshwater primarily from rainfall and from Atchafalaya River inflow to the GIWW via the Houma Navigation Canal (HNC) and Grand Bayou Canal. Land loss was extensive during the 20th century in part due to ongoing deltaic subsidence, saltwater intrusion along the HNC and other canals, historic oil and gas activity, and natural deterioration of barrier islands.

This region is often described as being “defined by water” and is known for its endless bayous and blackwater swamps. Although beautiful, this region’s geography and history of flooding and coastal land loss is challenging for residents. Thousands of residents of the Terrebonne region live in communities outside of levee protection systems. Land loss and rising sea levels continually threaten residents, including the residences and landscapes of cultural importance to the members of several Indigenous groups that call communities like Point-aux-Chenes, Isle de Jean Charles, and Dulac home.

Resource-based industries are prevalent in the Terrebonne region’s economy, with the energy industry and seafood production as primary sources of revenue. Residents of communities like Houma, Chauvin, Cocodrie, and Dulac contribute to the region’s productivity with the area accounting for over 20% of Louisiana’s seafood production.

Commercial and industrial activities in the region include extensive agriculture (e.g., sugarcane, soybeans, and pasture lands), ship building and fabrication, and support for the offshore energy industry. Major population centers, such as Morgan City, Houma, and Thibodaux, provide services, such as healthcare and retail, to surrounding communities. Many of the outlying communities are important hubs for commercial fishing, including shrimp, oysters, and crabs. For example, in 2020, almost 34% of total statewide shrimp landings were from the Terrebonne Basin. In 2018, almost 26% of commercial fishers who landed shrimp in Louisiana lived in Terrebonne Parish. The region also has important public and private oyster-growing areas, including Lake Chien and Sister Lake.

Image: Timbalier Island (CPRA)

The Terrebonne region is home to several groups of Indigenous peoples, including members of the Chitimacha Tribe. The Grand Caillou/Dulac Band of Biloxi-Chitimacha-Choctaw tribal peoples have been living in their ancestral traditional village of Grand Caillou/Dulac for centuries, living by trapping, fishing, hunting, and farming. Their ancestors were primarily of the historic Biloxi, Chitimacha, and Choctaw but also Atakapas and Acolapissa Tribes. To the east, the Pointe-au-Chien Indian Tribal Community is located in lower Pointe-aux-Chenes, a traditional village of their ancestors, the Chitimacha. The Pointe-au-Chien Indians also descend from the Biloxi, Acolapissa, and Atakapas Tribes. Terrebonne is also home to members of the United Houma Nation, a state-recognized tribe. Tribal members reside within a six-parish area along the southeastern coast of Louisiana. These peoples have strong cultural ties to the wetlands that are impacted by land loss, changing habitats, and erosion of key cultural sites, such as burial grounds.

Terrebonne residents and businesses have a long history of living with hurricanes and associated storm surge-based flooding. In recent decades Hurricanes Andrew (1992), Lili (2002), Rita (2005), Gustav and Ike (2008), and Ida (2021) have all caused extensive flooding.

Following Hurricane Juan in 1985, concerted efforts began to reduce the risk of flooding for bayou communities and the Houma area. The Morganza to the Gulf project, originally authorized in WRDA of 2007, consists of a 98 mi hurricane risk reduction system of grass-covered earthen levees between U.S. 90 near Gibson to the west and Highway 1 near Lockport to the east.

HIGH TIDE FLOODING IN DULAC

In addition to storm surge-based flood risk, Louisiana's coastal communities often contend with localized flooding, also known as high tide flooding which can impede day-to-day travel and activity as well as emergency services. Communities are experiencing these issues today, and their residents have informal impact thresholds—areas they know to flood regularly—such as the Dulac Community Center's parking lot, which signals the threat of flooding. While the construction of the Morganza to the Gulf project has the potential to mitigate some high tide flooding, communities will still potentially be affected when the floodgates are open, allowing tidal ingress. The combined effects of sea level rise and coastal land loss will exacerbate the magnitude, frequency, and extent of these issues. As sea level rises and the geography of the coast changes, Dulac should continue to experience similar seasonal tidal variation as it does now. However, the extent and magnitude of tidal ingress will continue to increase due to these changes.

	YEAR 1	YEAR 25	YEAR 50
Dulac Community Center	Up to 31	49 - 52	49 - 52
Shrimpers Row Rd / Bayou Guillaume Rd	Up to 14	49 - 52	49 - 52

Figure 6.12: Number of weeks per year that HTF in Dulac may occur at least once.

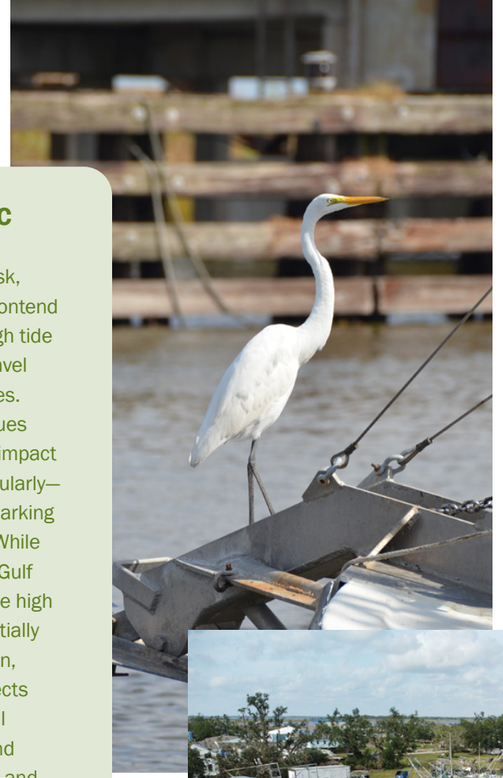


Image: Egret in Dulac (Louisiana Sea Grant College Program)

Image: Shrimpers Row, Dulac (Louisiana Sea Grant College Program)

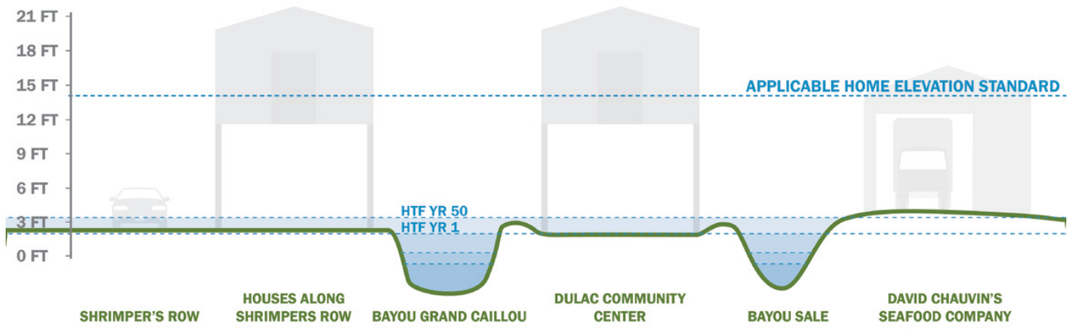


Figure 6.13: Representative High Tide Flooding (HTF) Elevations for Dulac at Year 1 and 50 in the Lower Scenario.

Image: Gulf Intracoastal Waterway (CPRA)

OPPORTUNITIES TO USE FRESHWATER

Flows to the east from the Atchafalaya River through the GIWW are an important source of freshwater to the marshes of the eastern and central Terrebonne region. Freshwater flows south through openings, such as Bayou Copesaw, Minors Canal, the HNC, Bayou Terrebonne and, further to the east, Grand Bayou Canal. This water flow helps to maintain the estuarine gradient from fresh to salt across the southern part of the region. Several projects have been proposed to increase these flows from the GIWW into the marshes to the south, including the Increase Atchafalaya Flow to Terrebonne project, which seeks to increase the flow to the east by moving water around the lock in Morgan City. There have also been several project proposals to increase flow into Grand Bayou Canal near Larose – one of which is currently being engineered with funding from Lafourche Parish and CPRA's Parish Matching Program.

Opportunities may increase in the future as more water will be pumped from the Mississippi River into Bayou Lafourche, further freshening the GIWW between Houma and Larose. In addition, the expected construction of the HNC Lock and Floodgate complex will allow additional flexibility to manage freshwater flows through the HNC. Several projects selected in the 2023 Coastal Master Plan in the Terrebonne region will utilize freshwater from the GIWW to maintain the estuarine salinity gradient in the face of ongoing sea level rise and subsidence. These include the Eastern Terrebonne Landbridge; Central Terrebonne Hydrologic Restoration, which seeks to limit saltwater intrusion from the south; and the Bayou Decade and Mauvais Bois Ridge projects, which can limit exchanges from saline areas into the upper parts of the Penchant Basin.

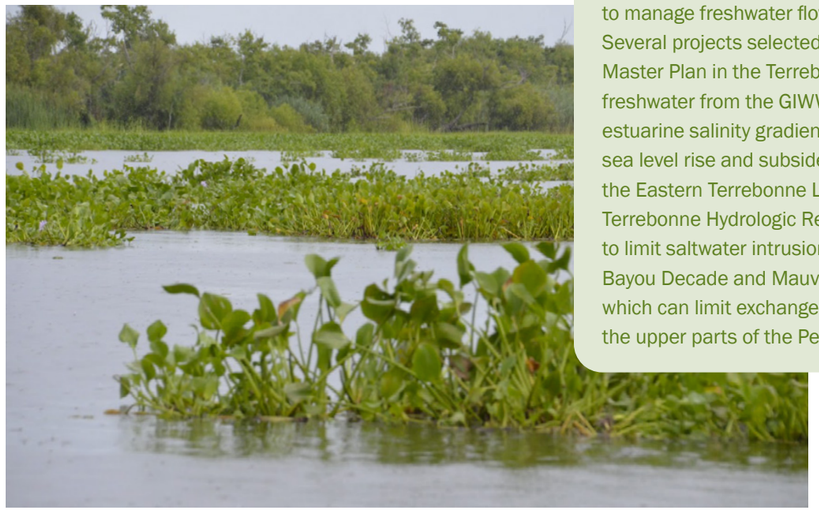


Image: Terrebonne Wetlands (CPRA)

Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/

>>> The Terrebonne barrier island system is a critical part of the landscape. It provides a variety of ecosystem services, such as habitat, storm-surge buffering, and plays a role in maintaining marine and estuarine gradients in eastern Terrebonne. Louisiana recently invested over $160M in constructing the Terrebonne Basin Barrier Island and Beach Nourishment project (TE-0143) which includes approximately 1,100 acres of beach, dune, and marsh habitat and plans to continue to invest in rebuilding these features. See **Chapter 4: Evaluate** for more information on barrier island programs.

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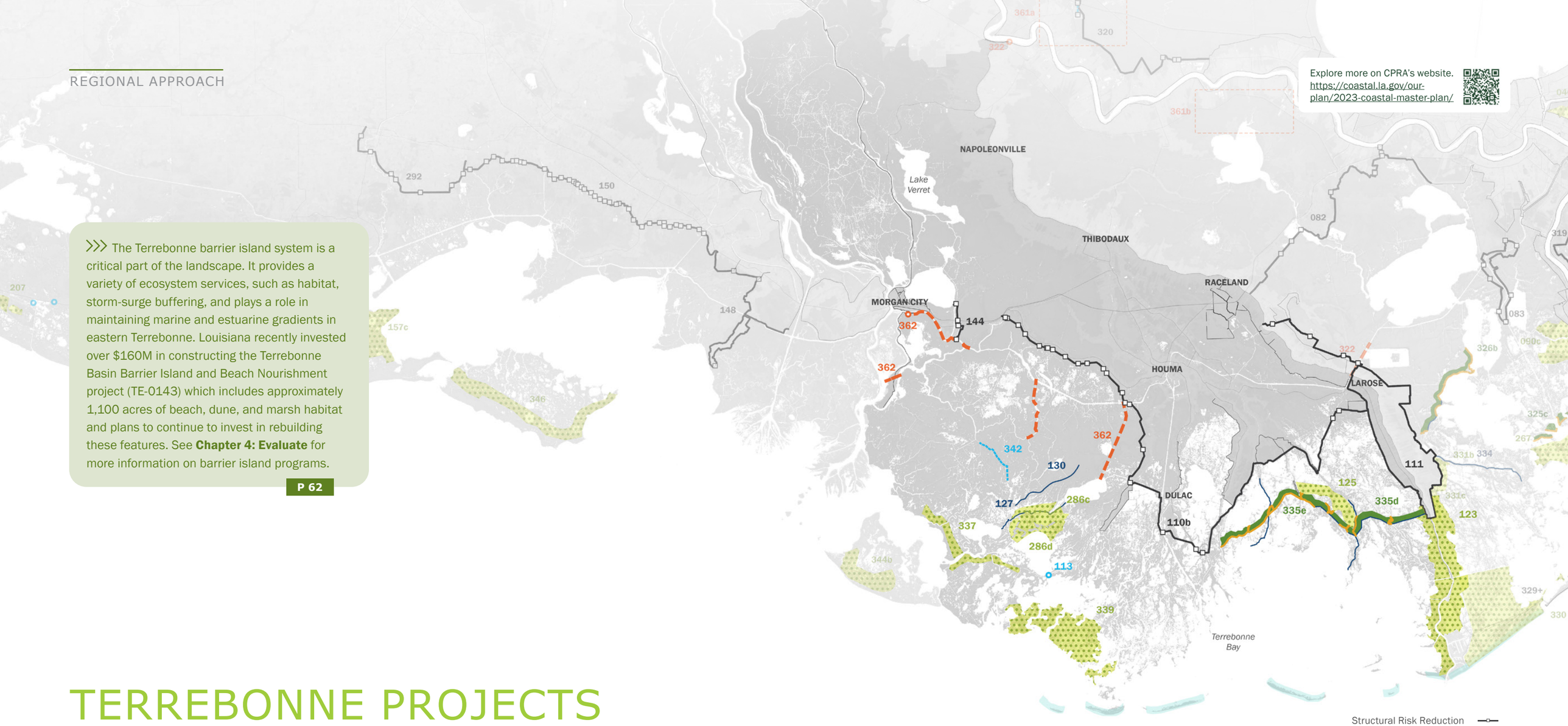
TERREBONNE PROJECTS

REGIONAL 2023 PROJECTS MAP

For the 2023 Coastal Master Plan, 16 projects were selected for the Terrebonne region. These projects include a variety of restoration measures, such as marsh creation, riverine diversions, ridge restoration, and the cross-basin Eastern Terrebonne Landbridge project. The Central Terrebonne Hydrologic Restoration project was selected to prevent saltwater intrusion from Caillou Lake into Lake Mechant and support the ecosystems and habitat in the area. Several structural risk reduction projects were selected to reduce the impact of storm surge-based flooding to coastal communities across the region, such as Houma, Dulac, Larose, and Amelia. These projects, along with nonstructural risk reduction measures, can help reduce risk to residents and communities in the Terrebonne region.



Structural Risk Reduction
Ridge Restoration
Marsh Creation
Landbridge
Diversion
Hydrologic Restoration
Barrier Island Maintenance
Bank Stabilization

Map 6.10: Terrebonne 2023 Coastal Master Plan Projects.

N
0 2 4 8 MILES

ID#	PROJECT NAME	DESCRIPTION	IP	COST
113	**Central Terrebonne Hydrologic Restoration**	Construction of a rock plug in Grand Pass with a 150- foot by 15-foot navigable section to prevent saltwater intrusion from Caillou Lake into Lake Mechant.	1	$ 16M
342	**Western Terrebonne Hydrologic Restoration**	Hydrologic restoration to reconnect freshwater flows from Bayou Penchant to southern Terrebonne marshes by re-establishing flow through Bayou Carencro. Dredging portions of Carencro Bayou and installing a weir at Superior Canal to increase flow to the southeast through Bayou Carencro. Cleanout canal and install one-way culverts south of Bayou Carencro to allow freshwater further south.	1	$ 22M
335d	**Eastern Terrebonne Landbridge - East**	Creation of marsh including filling areas deeper than 2.5 feet, from Bayou Pointe-aux-Chênes to the south Lafourche Levee near Catfish Lake. 30,000 feet of shoreline revetment to limit erosion in exposed areas and channel armoring to maintain channels at current dimensions at Bayou Pointe-aux-Chênes and Bayou Blue to reduce the tidal prism and to create new wetland habitat, restore degraded marsh, and reduce wave erosion. Restoration of approximately 44,000 feet of Bayou Pointe-aux-Chênes Ridge.	1	$ 460M
335e	**Eastern Terrebonne Landbridge - West and Central**	Creation of marsh including filling areas deeper than 2.5 feet, from Bayou Terrebonne to Bayou Pointe-aux-Chênes to reduce the tidal prism and to create new wetland habitat, restore degraded marsh, and reduce wave erosion. 130,000 feet of shoreline revetment to limit erosion in exposed areas and channel armoring to maintain channels at current dimensions to reduce the tidal prism and to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 1.0B
123	**Belle Pass-Golden Meadow Marsh Creation**	Creation of marsh within a footprint of approximately 29,000 acres of northeast portion of marsh from Belle Pass to Golden Meadow to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 1.2B
125	**North Terrebonne Bay Marsh Creation**	Creation of marsh within a footprint of approximately 6,200 acres south of Montegut between Bayou St. Jean Charles and Bayou Pointe-aux-Chênes to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 210M
286c	**North Lake Mechant Marsh Creation - East**	Creation of marsh in Terrebonne Parish between Lake Decade and Lake Mechant to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 250M
286d	**North Lake Mechant Marsh Creation - West**	Creation of marsh in Terrebonne Parish between Lake Decade and Lake Mechant to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 230M
337	**Fourleague Bay - Blue Hammock Bayou Marsh Creation**	Creation of marsh within a footprint of approximately 6,900 acres along the northeast rim of Fourleague Bay and east along Blue Hammock Bayou to Bayou Dularge to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 370M
339	**West Terrebonne Marsh Creation Project**	Creation of marsh within a footprint of approximately 22,000 acres in between Caillou Lake and Caillou Bay in western Terrebonne to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 1.5B
127	**Bayou Decade Ridge Restoration**	Restoration of approximately 43,000 feet of historic ridge along Bayou Decade to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation.	1	$ 13M
130	**Mauvais Bois Ridge Restoration**	Restoration of approximately 43,000 feet of historic ridge at Mauvais Bois to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation.	1	$ 13M
362	**Atchafalaya Diversions**	Two separate projects diverting water and sediment from the Atchafalaya River into the Penchant Basin and areas east were evaluated for the plan—Atchafalaya River Diversion (108) and Increase Atchafalaya Flow to Terrebonne (139b). Both provided similar benefits to the region but in combination would induce excessive flooding. The Increase Atchafalaya Flow to Terrebonne project is currently being engineered by CPRA (TE-110). CPRA will finalize engineering and pursue construction of the TE-110 project with the Atchafalaya River Diversion (108) project as a potential alternative.	1	$ 790M
110b	**Morganza to the Gulf**	Construction and improvement of a levee to an elevation between 13.5 and 19 feet NAVD88 around Houma and Terrebonne Ridge communities from Larose to Humphreys Canal. Project features approximately 450,000 feet of earthen levee, approximately 22,000 feet of T-wall, four 30-foot barge gates, five 40-foot barge gates, a 56-foot barge gate, a 110-foot barge gate, a 180-foot barge gate, a 30-foot roller gate, two 40-foot roller gates, a 110-foot lock, and 12 sluice gates.	1	$ 3.9B
111	**Larose to Golden Meadow**	Improvements to a levee to an elevation between 12 and 21 feet NAVD88 within the Larose to Golden Meadow levee system. Project features approximately 250,000 feet of earthen levee and approximately 7,100 feet of T-wall.	2	$ 500M
144	**Amelia Levee Improvements**	Construction of a levee to an elevation of 18 feet NAVD88 along the GIWW between Lake Palourde and the Bayou Boeuf Lock near Amelia. Project features approximately 14,000 feet of earthen levee, approximately 15,000 feet of 8-foot T-wall, a 110-foot barge gate, a 150-foot barge gate, three 40-foot swing gates, a 40-foot roller gate and four vertical lift gates.	2	$ 840M

Figure 6.14: Terrebonne Project List.

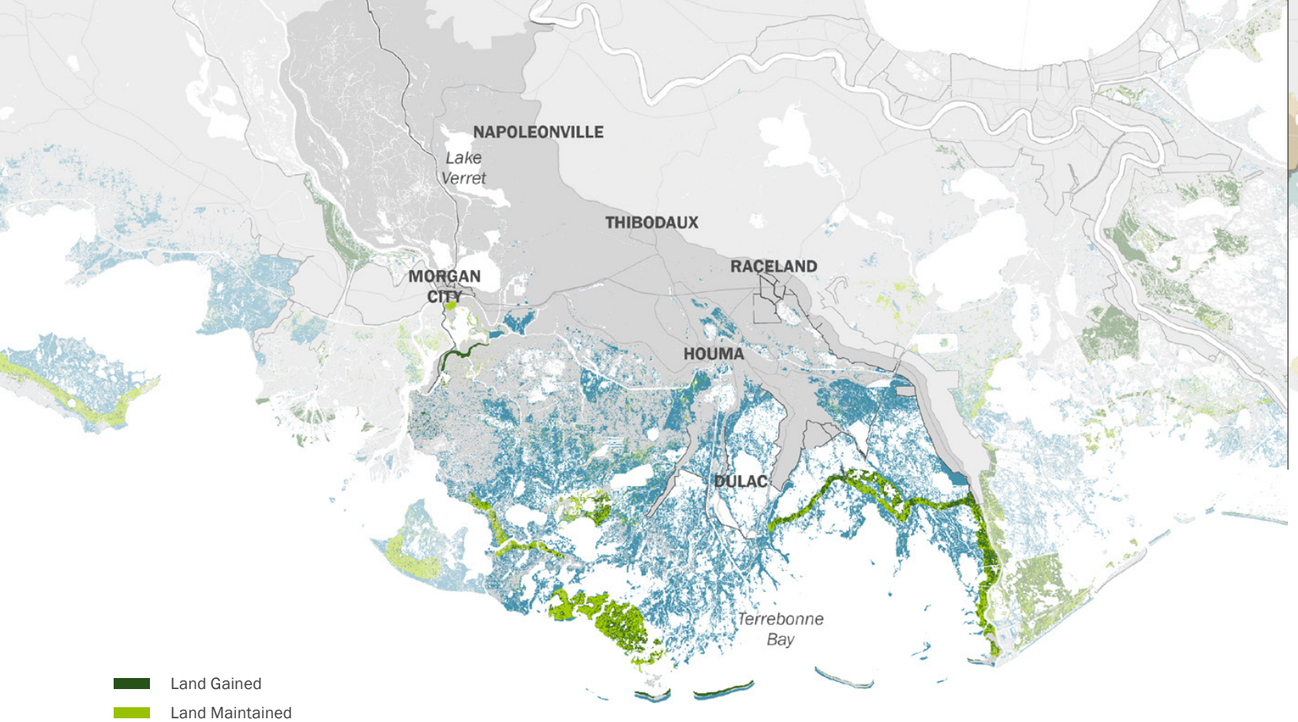
Image: West Belle Barrier Island Maintenance (CPRA)

EASTERN TERREBONNE LANDBRIDGE

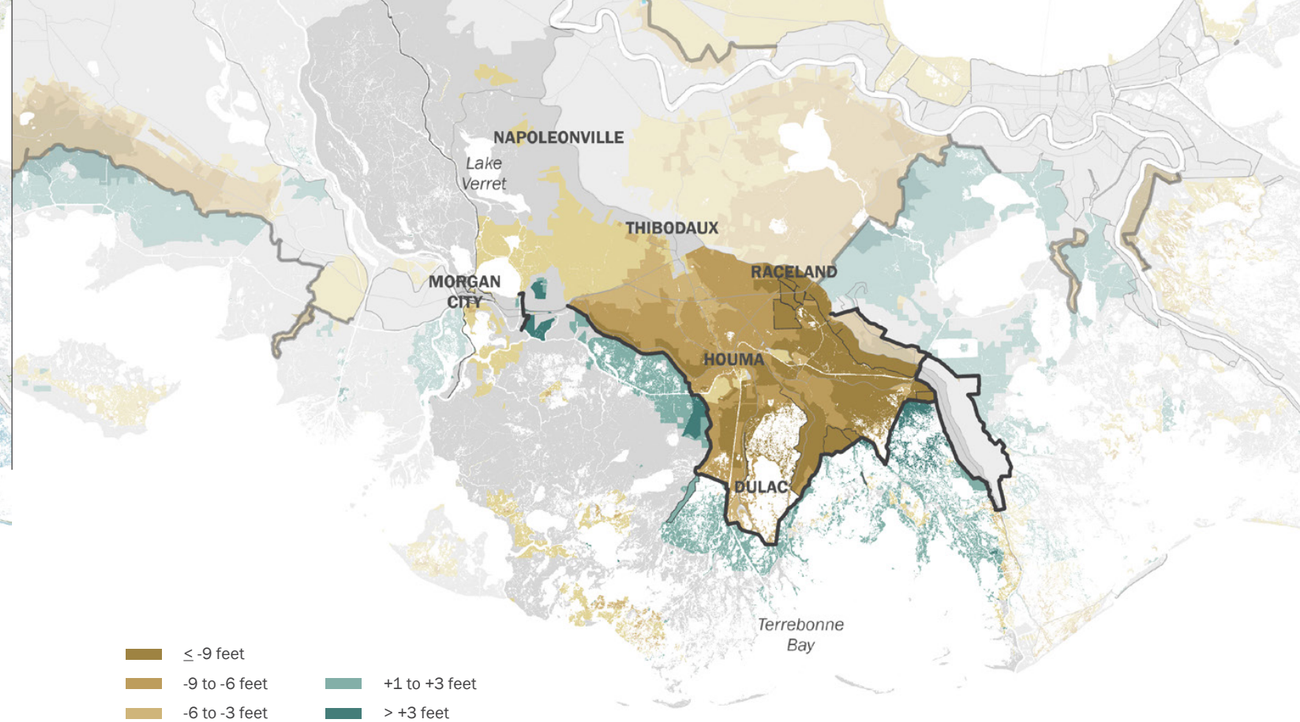
A newly selected project for the 2023 Coastal Master Plan, the Eastern Terrebonne Landbridge project extends across the eastern Terrebonne marshes and is planned to be built in phases over both implementation periods. In IP1, the eastern component from Bayou Lafourche to Bayou Pointe-aux-Chênes would be built, and in IP2, the western and central components from Bayou Pointe-aux-Chênes to Bayou Terrebonne would be built. The project will essentially fill all of the open water within the landbridge footprint with only a few bayous remaining open. This will limit water movement from Terrebonne Bay to the interior marshes, reducing salinity levels and land loss in some areas.

MORGANZA TO THE GULF

The Morganza to the Gulf project involves the construction and improvement of a levee around Houma and Terrebonne Ridge communities from Larose to Humphreys Canal. It is selected in IP1 in the 2023 Coastal Master Plan as it provides extensive benefits. For example, this project will reduce EADD in Houma by more than $1.5 billion and reduce damage equivalent to more than 1,500 structures in 50 years. Federal funding has only recently been provided, and progress on the system has been spearheaded by the Terrebonne Levee and Conservation District and CPRA using local and state funds. By building to USACE standards, the locally built portions of the system are seen as a contribution to the federal project. This approach can provide a model for moving ahead with a project while awaiting federal authorization and funding.



Map 6.11: Terrebonne, Land Change, Future With Action, Lower Scenario, Year 50.



Map 6.12: Terrebonne, Flood Depths Difference, Future With Action, Lower Scenario, Year 50.

REGIONAL PROJECT BENEFITS

With action, we build and maintain 58,000 acres of land in the lower environmental scenario and 17,000 acres in the higher scenario. Restoration is focused on maintaining key cross-basin landforms, including ridges, and the Eastern Terrebonne Landbridge provides both continuous marsh and some modulation of tidal flows. The Atchafalaya Diversion also brings freshwater into the Penchant Basin. In the lower scenario, these projects slow the rate of land loss and increase diverse marsh types. Relatively high subsidence and increased sea level rise in the higher scenario result in dramatic loss of wetlands in the next 50 years, much of which occurs in the last two decades of the 50-year projections. Fresh marshes, including flotant, persist in the Penchant Basin where the Atchafalaya Diversion is successful in maintaining a more gradual estuarine gradient than to the east of the region.

Three structural risk reduction projects were selected in the Terrebonne region including the Larose to Golden Meadow system, which spans the Terrebonne and Barataria regions. In total, the projects reduce future storm surge-based flood risk in the region by 63% in 50 years under the lower scenario. These projects provide a $3.7 billion reduction in EADD in 50 years under the lower scenario and a $5.2 billion reduction in EADD in 50 years under the higher scenario. Even with the implementation of these structural risk reduction projects, significant residual risk both outside and inside of the levee systems remains.

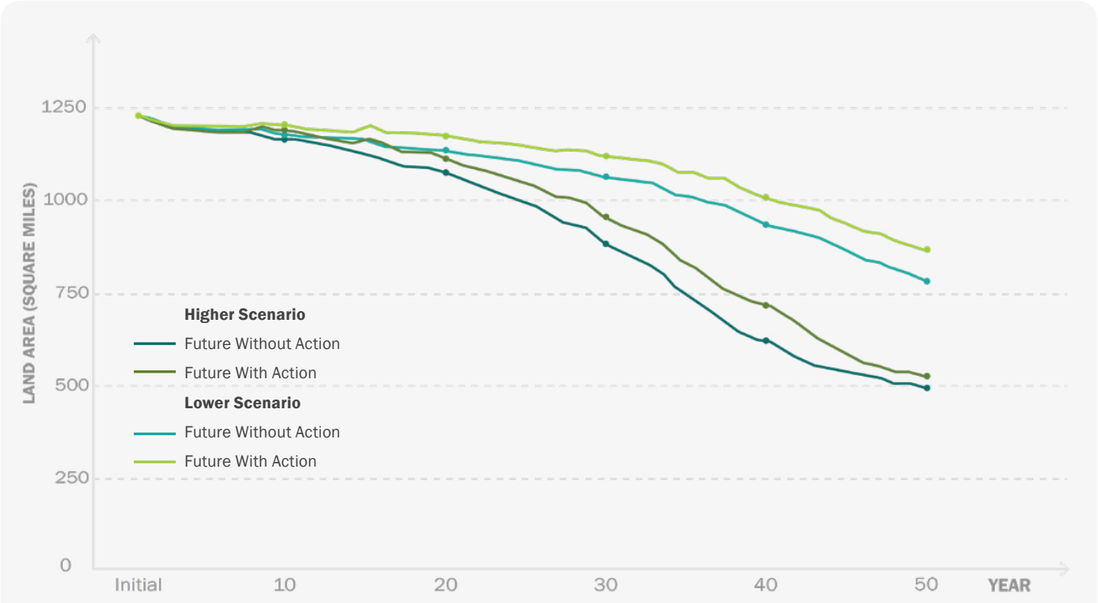


Figure 6.15: Terrebonne Land Area over 50 years, Future With and Without Action, Higher and Lower Scenario.

BARATARIA

Barataria lies on the west bank of the Mississippi River, reaching to Port Fourchon and includes the west bank of New Orleans and popular fishing destinations of Lafitte and Venice. Barataria Basin is separated from the Gulf by a string of barrier islands that includes Grand Isle. Known for its fishing communities, the region includes a variety of waterways including the Jean Lafitte National Historical Park and Preserve and the Salvador/Timken Wildlife Management Area.

Figure 6.16: Aerial View of the Barataria Region with the 2023 Coastal Master Plan projects.

ABOUT BARATARIA

AN INTRODUCTION

Barataria region is located between the Mississippi River and Bayou Lafourche. It includes portions of nine parishes: Assumption, Ascension, St. James, Lafourche, St. John the Baptist, St. Charles, Jefferson, Plaquemines, and Orleans.

Extensive residential and commercial development can be found along the Mississippi River and Bayou Lafourche, as well as in the mid-basin along U.S. 90, and on the west bank of Orleans and Jefferson parishes. These include the communities of Des Allemands, Paradis, Luling, and Boutte. The communities of Lafitte, Barataria, Crown Point, and Grand Isle are more isolated and have strong ties to the ecology and natural resources of the basin.

The ecosystem is characterized by extensive swamps in the upper basin and floating marshes near Lac des Allemands and Lake Salvador. Fresh marshes grade into intermediate, brackish, and salt marshes closer to the Gulf. Several remnant natural ridges are in the area, including Bayou L'Ours. The lower part of the basin is rimmed with barrier islands, separated by wide, and sometimes deep, inlets. The region includes Lake Boeuf and Salvador/Timken Wildlife Management Areas, the Elmer's Island Wildlife Refuge, and the Barataria Unit of Jean Lafitte National Historical Park and Preserve.

Barataria region includes vibrant communities along the Mississippi River and extends south to the Gulf with one of the nation's most productive estuaries. The waters and wetlands of Barataria Basin support tremendous commercial and recreational fishing opportunities, and waterfowl hunting opportunities here have long been recognized as some of the best in the nation. In 2020, about 20% of total statewide shrimp landings were from the Barataria Basin. In that same year, the basin was responsible for nearly 44% of the statewide landings of oysters from private leases. Changing environmental conditions are challenging these and other industries, with impacts on oyster, shrimp, and other important resources. The region has experienced rapid growth and business development over the past several decades, especially in areas such as St. Charles and Jefferson parishes, and also boasts a rich cultural heritage associated with the many Indigenous communities of the area.

As in many parts of the coast, natural resources and navigable waterways provide opportunities for economic growth and activity. Refineries, petrochemical plants, and granaries were built on former sugarcane fields and employ residents from across the region. Home to the Port of South Louisiana, the largest port by tonnage of cargo handled in the western hemisphere, and Port Fourchon, the Barataria region is instrumental in the transportation and transfer of goods between ships, barges, and trucks for distribution throughout the United States. Recent storm impacts have challenged several communities in the region, and recovery from flood and wind damage caused by Hurricane Ida is still underway in places like Grand Isle, Lafitte, and Ironton.

Basin hydrology has been extensively altered since European settlement. Levees built along the Mississippi River during the 19th century limited overbank flow during floods, and the basin was essentially isolated from the Mississippi River following the flood in 1927. Bayou Lafourche was cut off from the river in 1905, further limiting riverine inputs of sediment and freshwater to this region. Additional hydrologic changes to facilitate navigation included dredging the GIWW (1930's), Empire to the Gulf Waterway (1950), Segnette Waterway (1957), Barataria Waterway (1963), and Tiger Pass Waterway (1978). Along the Gulf, shoreline jetties were first constructed at Belle Pass in 1939, and jetties at Grand Isle on the Barataria Pass and the Empire Waterway were later added.

Image: Waterfowl on Grand Isle (Louisiana Sea Grant College Program)

Repeated storm impacts result in overwash, erosion, breaching, and fragmentation of barrier islands and also cause major damages to communities and commercial or industrial assets in the basin, threatening lives and livelihoods. Storms of note include Hurricane Betsy in 1965 and, more recently, Katrina (2005), Gustav and Ike (2008), Isaac (2012), and Ida (2021).

Since the 1990s, more than 60 restoration projects have been constructed in the Barataria Basin by local, state, and federal agencies; parishes; non-governmental organizations; and private companies. This represents more projects and more expenditures for restoration than in any other basin. Some of these projects were built to support navigation or reduce flood risk. Examples include the Naomi Freshwater Diversion (1992), the West Pointe a la Hache Freshwater Diversion (1992), and the Davis Pond Freshwater Diversion (2002). Others addressed barrier island or headland erosion and fragmentation, including the massive Caminada Headland Beach and Dune Restoration that placed approximately 5.4 million tons of sediment transported from Ship Shoal onto the shoreline, and the Spanish Pass Increment of the Barataria Basin Ridge and Marsh Creation project that used sediment dredged from the Mississippi River. Further, the Mid-Barataria Sediment Diversion, a first-of-its-kind restoration project currently undergoing environmental review, has the capability to create and sustain thousands of acres of wetlands in the region.

HURRICANE IDA

Hurricane Ida made landfall at Port Fourchon on August 29, 2021 as a strong Category 4 storm and caused immense wind and flood damage. Storm surge of up to 14 ft and sustained 140 mph winds caused the destruction of homes, businesses, and tens of thousands of acres of coastal wetlands. The storm was the greatest test of the completed HSDRRS system to date with storm surge impacts stretching from Jefferson Parish to St. Bernard Parish. Outside of the HSDRRS system, communities like Leeville, Lafitte, Grand Isle, Ironton, and many more suffered devastating storm surge impacts. Some of these communities will see future risk reduction through ongoing projects, such as the New Orleans to Venice project or the Lafitte Tidal Protection project. In south Lafourche, storm surge came within a few feet of overtopping the levees, but the communities of Larose, Cut Off, Galliano, and Golden Meadow were spared catastrophic flooding. To illustrate how land loss, sea level rise, and subsidence may lead to greater future flooding and damages, we modeled Hurricane Ida on both the existing and a future landscape, for both FWOA and with the full implementation of the 2023 Coastal Master Plan. The results for the area near Bayou Gauche show an additional 3-4 ft of storm surge in Lafitte and an additional 2-4 ft of storm surge in the river parish communities, like Luling, Boutte, and Vacherie for FWOA under the lower scenario. Areas near the Larose to Golden Meadow system would see an additional 3-5 ft of storm surge that would overtop the existing levee and cause extensive flooding and an estimated $1.6 billion in damage. The Larose to Golden Meadow project (111) would prevent overtopping within the polder.

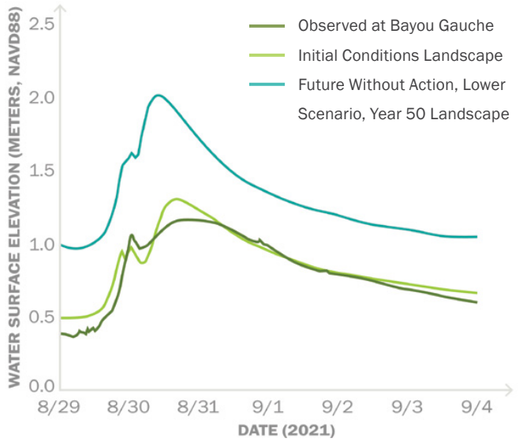
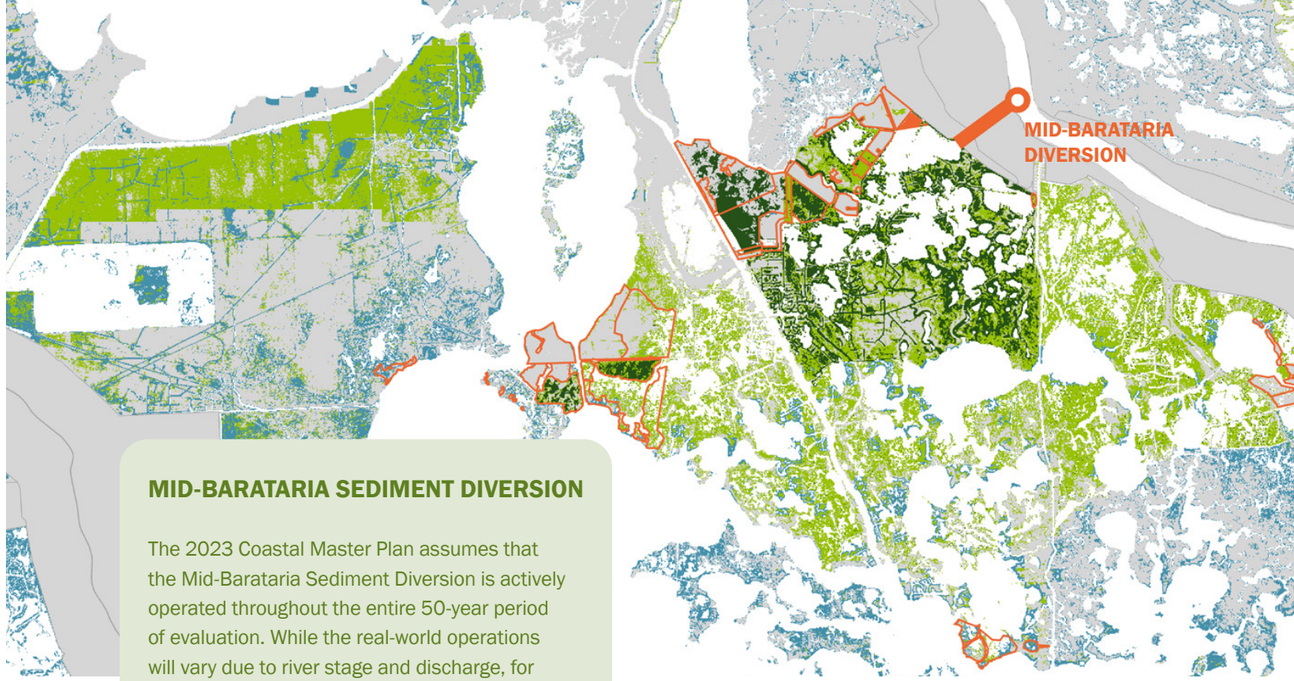


Figure 6.17: Hurricane Ida Storm Surge Simulations

Image: Lafitte, Post Hurricane Ida (CPRA)



Map 6.13: Mid-Barataria, Land Change between FWOA and FWOCFP, Year 50, Lower Scenario

MID-BARATARIA SEDIMENT DIVERSION

The 2023 Coastal Master Plan assumes that the Mid-Barataria Sediment Diversion is actively operated throughout the entire 50-year period of evaluation. While the real-world operations will vary due to river stage and discharge, for modeling purposes, a single operational rule was followed for ICM simulations. When comparing FWOA against a FWOCFP, where the diversion is not active, one can see a large area of newly built wetlands in the immediate outfall of the diversion where river sediments deposit in open water bodies, eventually becoming land after approximately 20 years of operation. In addition to the newly built subaerial land, large portions of existing wetlands throughout the middle portions of Barataria Basin (i.e., areas northwest of Little Lake) are maintained into the future, whereas they are projected to be lost if the diversion were not active. The land is maintained due to a combination of suspended sediments nourishing the wetlands and increased organic matter accretion rates in these areas. It is important to keep in mind the sensitivity of these results to the exact operations of the diversion. Slight changes to the operational rules will impact the balance between sediment and freshwater delivery and inundation, which is one of many reasons why adaptively managing the operations will be critical to the long-term success of the project.

Image: Coastal Marsh (Lindsey Janies)

Explore more on CPRA's website.
https://coastal.la.gov/our-plan/2023-coastal-master-plan/

>>> The Barataria barrier island system is a critical part of the landscape. It provides a variety of ecosystem services, such as habitat, storm-surge buffering, and plays a role in maintaining marine and estuarine gradients. Louisiana has invested hundreds of millions of dollars over the past two decades restoring its barrier islands and shorelines and plans to continue to invest in rebuilding these features. See **Chapter 4: Evaluate** for more information on barrier island programs.

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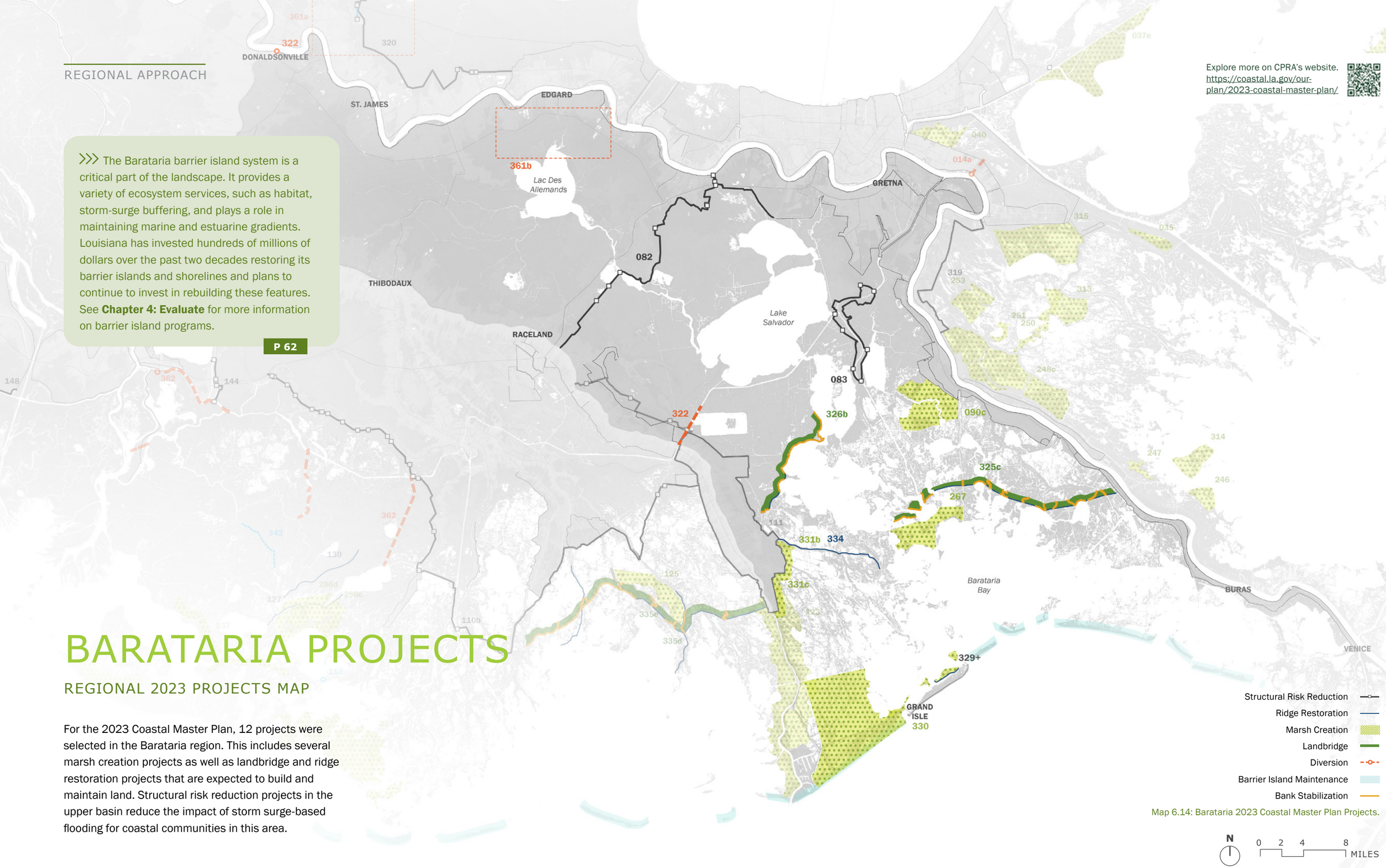
BARATARIA PROJECTS

REGIONAL 2023 PROJECTS MAP

For the 2023 Coastal Master Plan, 12 projects were selected in the Barataria region. This includes several marsh creation projects as well as landbridge and ridge restoration projects that are expected to build and maintain land. Structural risk reduction projects in the upper basin reduce the impact of storm surge-based flooding for coastal communities in this area.



Structural Risk Reduction
Ridge Restoration
Marsh Creation
Landbridge
Diversion
Barrier Island Maintenance
Bank Stabilization

Map 6.14: Barataria 2023 Coastal Master Plan Projects.

N
0 2 4 8 MILES

ID#	PROJECT NAME	DESCRIPTION	IP	COST
329	**Caminada Bay Marsh Creation and Fifi Island Ridge**	Creation of marsh within a footprint of approximately 1,600 acres in Caminada Bay to create new wetland habitat, restore degraded marsh, and reduce wave erosion and approximately 14,000 feet of shoreline protection along Fifi Island to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation.	1	$ 78M
325c	**Lower Barataria Landbridge - East**	Creation of marsh within a footprint of approximately 6,900 acres including filling areas deeper than 2.5 feet, from Bayou Dogris to Port Sulphur. 130,000 feet of shoreline revetment to limit erosion in exposed areas and channel armoring to maintain channels at current dimensions at Wilkinson Canal, Wilkinson Bayou, Bay Chene Fleur, multiple channels north of Bay Batiste, Two Sisters Bayou, Socola Canal, and Grand Bayou to reduce the tidal prism and to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 840M
326b	**Mid-Barataria Landbridge - West**	Creation of marsh within a footprint of approximately 3,800 acres including filling areas deeper than 2.5 feet, from Galliano to Bayou Perot. 63,000 feet of shoreline revetment to limit erosion in exposed areas and channel armoring to maintain channels at two canals in the Clovelly Oil Field to reduce the tidal prism and to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 520M
090c	**Large-Scale Barataria Marsh Creation**	Creation of marsh within a footprint of approximately 15,000 acre in western portion of Large-Scale Barataria Marsh Creation project to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 560M
267	**North Barataria Bay Marsh Creation**	Creation of marsh within a footprint of approximately 7,200 acres on western portion of Barataria Bay shoreline to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 220M
330	**East Bayou Lafourche Marsh Creation**	Creation of marsh within a footprint of approximately 33,000 acres east of Bayou Lafourche and along the Caminada Headland to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 1.3B
331b	**Southeast Golden Meadow Marsh Creation - North and South**	Creation of marsh including filling areas deeper than 2.5 feet along the along portions of the South Lafourche levee alignment to create new wetland habitat and reduce wave energy on the levee system.	2	$ 270M
331c	**Southeast Golden Meadow Marsh Creation - Central**	Creation of marsh including filling areas deeper than 2.5 feet along the along portions of the South Lafourche levee alignment to create new wetland habitat and reduce wave energy on the levee system.	1	$ 100M
334	**Bayou L'Ours Ridge Restoration**	Restoration of approximately 54,000 feet of historic ridge along Bayou L'Ours to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation.	1	$ 9.5M
322	**Freshwater Delivery to Western Barataria**	Increase pump capacity from Mississippi River to Bayou Lafourche by 500 cfs. Dredge GIWW east of Larose to -20 feet to reduce salinity in western Barataria.	2	$ 120M
361b	**Upper Basin Diversion Program - Barataria**	Multiple freshwater and sediment diversions into the swamps of the Western Pontchartrain and Upper Barataria basins were modeled for inclusion in the plan. These projects showed complex interactions with other diversions assumed to be operating on the landscape. This program will evaluate how diversions into the upper basins could be operated in conjunction with currently planned diversions to maintain swamps and coastal marshes, sustain estuarine gradients, and aid in Mississippi River flood control. These studies will lead to the construction of one or more diversion features into Barataria or Maurepas basins.	1	$ 750M
082	**Upper Barataria Risk Reduction**	Construction and improvement of a levee to an elevation between 10.5 and 15 feet NAVD88 along Highway 90 between the West Bank and Larose. Project includes approximately 200,000 feet of earthen levee, approximately 4,100 feet of T-wall, a 250-foot barge gate, two 40-foot roller gates, six sluice gates, and pump station improvements.	1	$ 510M
083	**Lafitte Ring Levee**	Construction of a levee to an elevation of 16 feet NAVD88 around Lafitte. Project features include approximately 120,000 feet of earthen levee, approximately 30,000 feet of T-wall, two 30-foot barge gates, a 56-foot barge gate, three 150-foot barge gates, and a 40-foot roller gate.	2	$ 1.4B

Figure 6.18: Barataria Project List.

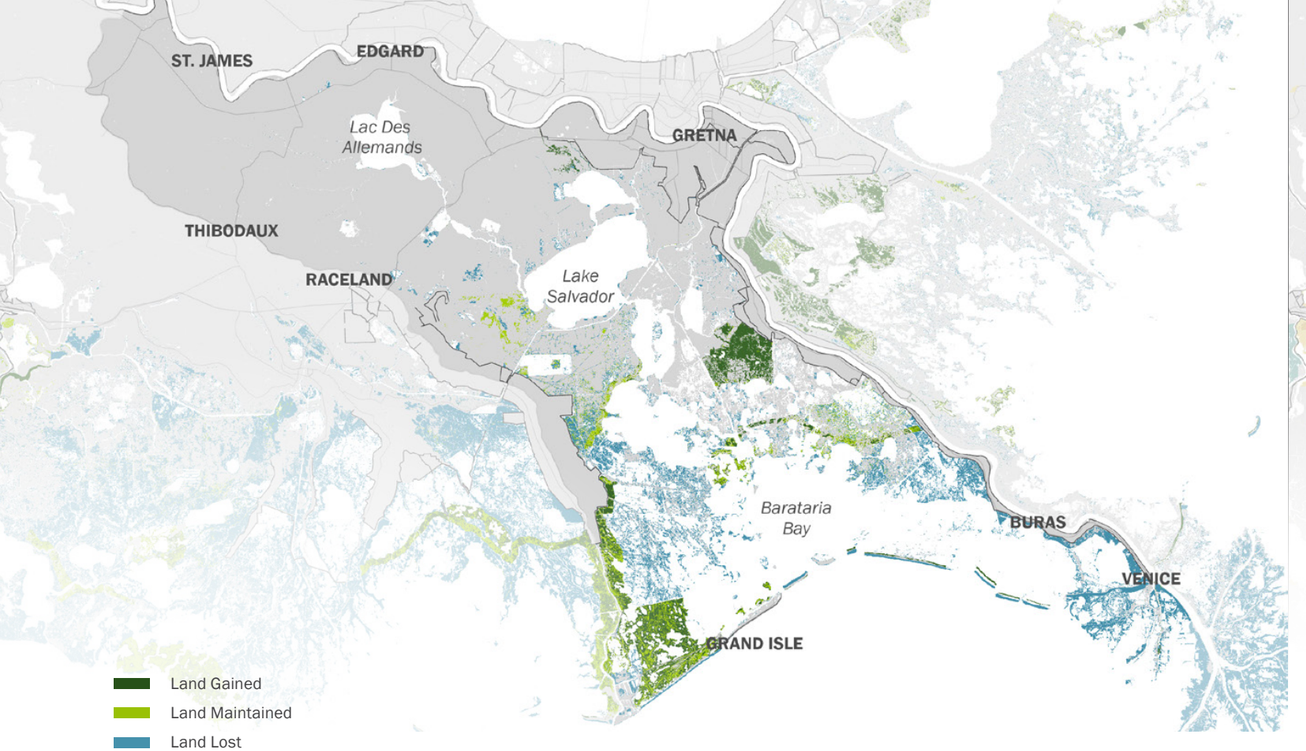
Image: Large Scale Barataria Marsh Creation, 2022 (CPRA)

UPPER BASIN DIVERSION PROGRAM

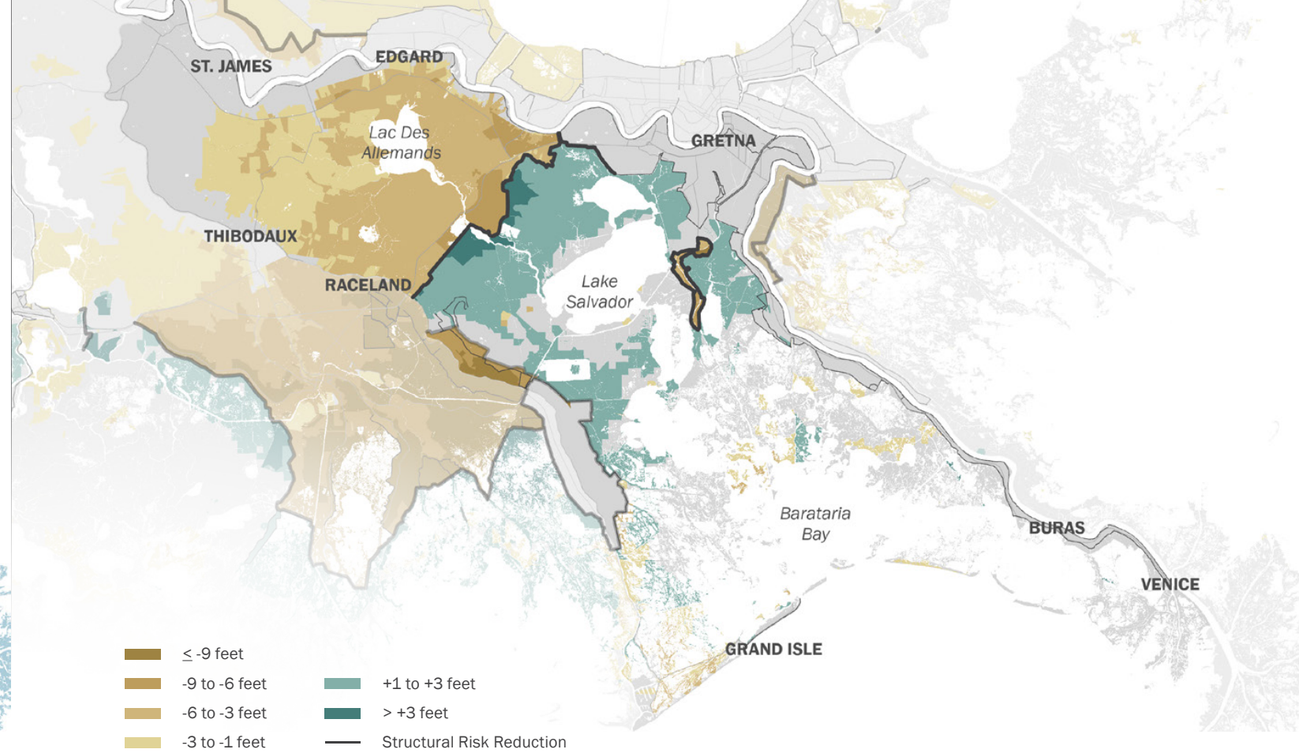
Modeling for the 2023 Coastal Master Plan made the assumption that the Mid-Barataria Sediment Diversion, Mid-Breton Sediment Diversion, and the River Reintroduction into Maurepas Swamp project would be implemented in the early years of the 50-year period, in addition to the existing freshwater diversions already constructed. As a result of the interactions of multiple diversions operating in a single basin, many of the additional diversion projects that had been effective as individual projects in building or maintaining land in the 2017 Coastal Master Plan showed mixed landscape results. The combined effects of the additional diversion projects and those already assumed to be operational resulted in excessive water levels in the basin. These results highlight the need for basin wide management of diversions. Additional evaluations suggest that upper basin diversions could play an important role in maintaining swamps and coastal marshes, estuarine gradients, and in Mississippi River flood control. CPRA is proposing to further evaluate these projects and support USACE in their Lower Mississippi River Comprehensive Management Study to identify suitable locations for the construction of additional diversions. By continuing to evaluate a systems approach to operating multiple diversions, we can further maximize utilization of sediment, freshwater, and nutrient resources of the Mississippi River to protect and restore a larger footprint of the coastal ecosystem.

UPPER BARATARIA RISK REDUCTION

This project includes construction and improvement of a levee to an elevation between 10.5 and 15 ft along U.S. 90 between the West Bank and Larose, with a barge gate on Bayou des Allemands. Under the lower scenario, in 50 years, the project reduces flood depths by more than 5 ft in the Paradis, Luling, and Boutte areas of St. Charles Parish for the 1% AEP, and results in localized increases in flooding south of the levee. The result is a reduction in EADD of more than $37 billion, which increases to more than $42 billion in the higher scenario. When implemented as part of the plan, the project reduced structure-equivalent damages in Chackbay by 47% in the lower scenario and 41% in the higher scenario, with reduction of 79% and 54%, respectively, in Luling-Boutte, and 82% and 18% in Paradis.



Map 6.15: Barataria, Land Change, Future With Action, Lower Scenario, Year 50.



Map 6.16: Barataria, Flood Depths Difference, Future With Action, Lower Scenario, Year 50.

REGIONAL PROJECT BENEFITS

With action, we build and maintain 53,000 acres of land in the lower environmental scenario and 31,000 acres in the higher scenario. Restoration includes cross-basin landbridges, central basin marsh creation areas, restored ridges, and ensuring wetlands are more robust between the Larose to Golden Meadow levee and the Gulf. Many of these projects work in concert with the Mid-Barataria Sediment Diversion, included in FWOA, to maintain extensive marsh areas in the lower scenario. In the higher scenario, increased sea level rise and higher rates of subsidence result in higher land loss. There is extensive loss in the southeast portion of the region and on the western side, south of the GIWW, especially in 30-50 years. However, there is little change in the upper basin and extensive areas of swamp, flotant, fresh and intermediate marshes remain.

Three structural risk reduction projects were selected in the Barataria region, including the Larose to Golden Meadow system which spans the Terrebonne and Barataria regions. In total, these projects reduce future surge-based flood risk in the region by 64% in 50 years under the lower scenario. These projects provide a $2.0 billion reduction in EADD in 50 years.

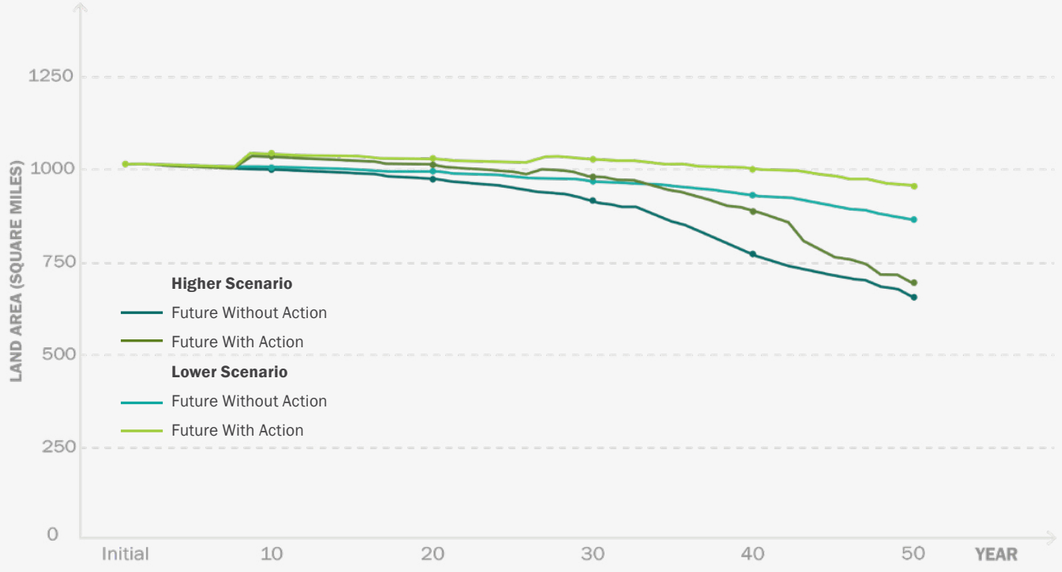


Figure 6.19: Barataria Land Area over 50 years, Future With and Without Action, Higher and Lower Scenario.

PONTCHARTRAIN / BRETON

The Pontchartrain/Breton region reaches from the east bank of the Mississippi River to the Mississippi border and includes New Orleans, Mandeville, and Slidell. The region also includes Lakes Pontchartrain and Borgne as well as the Bird's Foot Delta of the Mississippi River. The region is surrounded by the Breton and Chandeleur sounds, which are separated from the Gulf by a string of barrier islands, including the Chandeleur Islands, part of the Breton National Wildlife Refuge.

Figure 6.20: Aerial View of the Pontchartrain/Breton Region with the 2023 Coastal Master Plan projects.

ABOUT PONTCHARTRAIN / BRETON

The Pontchartrain/Breton region is bordered on the south by the Mississippi River levee and the river itself below East Point a la Hache, and includes the Bird's Foot Delta.

It encompasses Breton Island, the Chandeleur Islands, and the lower part of the Pearl River floodplain. The northern boundary is set by the extent of future storm surge-based flooding. It includes all or part of East Baton Rouge, Livingston, Tangipahoa, St. Tammany, Orleans, St. Bernard, Plaquemines, Jefferson, St. John the Baptist, St. James, and Assumption parishes. The region includes major population centers, such as New Orleans, Metairie, Slidell, Covington, and Gonzales. Major industries include ports, petrochemical industries, and agriculture, including extensive sugarcane along the Mississippi River corridor.

The Pontchartrain/Breton region is home to population centers like New Orleans, the North Shore communities, and smaller towns along the lowermost Mississippi River. This region boasts a diversity of residents with significant Black, Creole, Indigenous, Southeast Asian, and Latin American populations in the area. New Orleans is a popular tourist destination with distinct French and Spanish Creole architecture, cross-cultural and multilingual heritage, and a large annual Mardi Gras celebration. Just outside the city, it is clear why this region is considered a paradise for fishing, hunting, and bird watching – St. Bernard Parish has several stops on the America's Wetlands Birding Trail, and St. Tammany Parish includes recreational assets like the Tammany Trace and North Shore Fontainebleau State Park.

Several of these communities have levees and other structures to protect them from storm surge-based flooding. Following Hurricane Katrina in 2005, HSDRRS was built to reduce flood risk in Orleans, Jefferson, St. Bernard, Plaquemines and parts of St. Charles parishes; much of the area on the East Bank; and other areas in this region. USACE strengthened the levees, floodwalls, gated structures, and pump stations along the 133 mi Greater New Orleans perimeter system and improved approximately 70 mi of interior risk reduction structures. Few other communities in the region, or the state, have this level of structural protection. Master plan modeling suggests that, with prescribed maintenance, including authorized lifts, the system continues to provide a 1% AEP level of risk reduction over the next 50 years even under the higher environmental scenario. In 2021, construction began on the West Shore Lake Pontchartrain Hurricane Protection project. Once complete, the structure will provide 100-year storm surge flood protection to 60,000 Louisianans in St. Charles, St. James, and St. John the Baptist parishes. The $760 million project will span 18.5 mi.

In recent years, many communities from East Baton Rouge Parish to Slidell have experienced substantial growth. In these areas, communities are developing in previously undeveloped lowland and flood prone areas. As these areas are developed, risk of damage due to storm surge-based flooding rises substantially. As CPRA and its partners work to mitigate this risk, it is imperative that local authorities support smart growth and development by enacting appropriate policies, ordinances, and rules. Requiring building design to utilize freeboard and build above the base flood elevation and limiting unfettered development in flood-prone areas now can pay dividends later by eliminating unnecessary damages and the need to retrofit structural or nonstructural strategies. Only proper land use planning and appropriate building practices will allow Louisiana to keep up with the changing landscape of risk.

Image: Delacroix, Louisiana (CPRA)

The ecosystems in this region are very diverse. Managed lands include Joyce Wildlife Management Area, St. Tammany Wildlife Refuge, the Big Branch Marsh, Bayou Sauvage, Delta and Breton National Wildlife Refuges. To the east, the Breton Wildlife Refuge provides important wintering habitat for the federally threatened piping plover. The Chandeleur Islands are the only place in Louisiana where true seagrasses are found. At the other end of the region, the Maurepas Swamp includes more than 100,000 acres of cypress tupelo swamp, bottomland hardwood forest, and fresh and intermediate marshes. Between these is a productive estuary, including Lake Pontchartrain, Lake Borgne, Breton Sound, and Chandeleur Sound and includes extensive areas of marsh on the Orleans Landbridge and Biloxi Marsh. These areas support vibrant recreational and commercial fisheries. For example, in 2020, the region accounted for 37% of the statewide crab landings.

The wetlands of the Pontchartrain/Breton region have been degrading like the rest of the coast. A number of innovative restoration projects have already been implemented. For example, the Caernarvon Freshwater Diversion was constructed in 1991. It was designed to manage salinity levels in the Breton Sound area to be suitable for oysters in the public seed grounds. It has since shown that it can build and sustain land and is now operated to better support ecosystem restoration. The West Bay Sediment Diversion, completed in 2003, is an uncontrolled diversion of Mississippi River freshwater and sediments on the west bank above Head of Passes in the Bird's Foot Delta. The success of these projects supports the currently planned diversion projects in the region, including the River Reintroduction to Maurepas Swamp and the Mid-Breton Sediment Diversion.

Image: Post Hurricane Isaac (CPRA)

HURRICANE ISAAC

Hurricane Isaac first made landfall at Southwest Pass before returning to water and making a second landfall at Port Fourchon on August 29, 2012. The slow-moving storm made landfall as a Category 1 hurricane with maximum sustained winds of 80 mph. Storm surge from Hurricane Isaac reached 11 ft at Shell Beach and 6-8 ft in the surrounding areas of southeast Louisiana. Inundation over ground level reached 17 ft in parts of Plaquemines Parish and overtopped levees in Braithwaite. Its unusual track and speed produced flooding and damage to Terrebonne, Barataria, Breton, and Pontchartrain basins. North Shore communities of Mandeville, Slidell, and Eden Isles saw significant impacts as well as areas of Livingston and Tangipahoa parishes. Using ADCIRC, Hurricane Isaac was modeled on the existing landscape and on the landscape 50 years from now under the lower environmental scenario to illustrate how land loss, sea level rise, and subsidence lead to greater flooding and damage without further action. The results show an additional 2-3 ft of storm surge in communities like Lafitte, Delecroix, Mandeville, and Maurepas. Hurricane Isaac would have produced three times as much economic damage (measured in 2020 dollars) across southeast Louisiana if it occurred 50 years in the future with no additional restoration or risk reduction measures in place. Much of the increase in damage is concentrated in St. Tammany Parish, particularly in Slidell, which illustrates the importance of the Slidell Ring Levee.

Image: Mississippi River Port (CPRA)

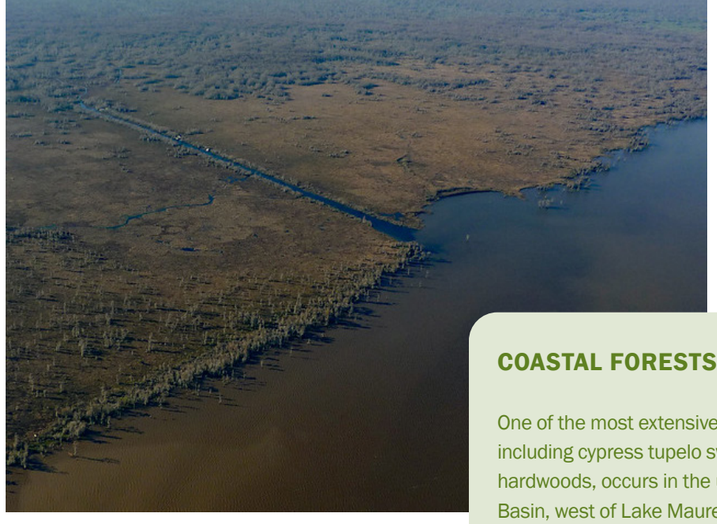


Image: Maurepas Swamp (CPRA)

COASTAL FORESTS

One of the most extensive areas of coastal forest, including cypress tupelo swamp and bottomland hardwoods, occurs in the upper Pontchartrain Basin, west of Lake Maurepas. During storms, forested areas can mitigate storm damage as the forest canopy reduces the effects of the wind on the water surface, and the trees slow water movement. The presence of forests can result in piling up of surge within the forested areas and in areas closer to the Gulf. Predictive modeling showed that if coastal forests were replaced with herbaceous marshes, storm surge can penetrate further inland leading to a greater extent of flooding. Communities, such as Ponchatoula and Hammond, may experience more frequent flooding. In addition, some storms could result in deeper flooding in areas presently inland of extensive coastal forests, such as Sorrento. The surge attenuation provided by coastal forests can provide significant economic benefits, especially in communities like Gonzales, Prairieville, Livingston, Ponchatoula, Springfield, and Tangipahoa. Projects, such as River Reintroduction to Maurepas Swamp, could indirectly reduce storm surge-based flood risk by sustaining coastal forests.

Image: Lake Maurepas (Louisiana Sea Grant College Program)

Explore more on CPRA's website. https://coastal.la.gov/our-plan/2023-coastal-master-plan/

>>> Shoreline protection is most effective in areas with acutely high erosion rates (e.g., Point Aux Marchettes on the eastern shore of Lake Borgne) and is considered consistent with the master plan and can be evaluated on a case-by-case basis. See **Chapter 4: Evaluate** for more information on programmatic restoration.

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>>> The Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration plan has identified projects to restore and protect areas that had been impacted by the MRGO prior to its closure in 2009. The Ecosystem Restoration plan was completed in 2012 and, if funded, would be a tremendous opportunity for restoration.

PONTCHARTRAIN / BRETON

REGIONAL 2023 PROJECTS MAP

For the 2023 Coastal Master Plan, 22 projects were selected for the region. These projects include several marsh creation projects and other project types intended to maintain important landscape features and functions, such as a broad estuarine gradient. Structural risk reduction projects were selected that benefit several communities on the east bank of the Mississippi River as well as communities on the North Shore, which are expected to face significantly increased storm surge flood risk into the future.

Structural Risk Reduction
Ridge Restoration
Marsh Creation
Diversion
Barrier Island Maintenance

Map 6.17: Pontchartrain/Breton 2023 Coastal Master Plan Projects

N 0 2 4 8 MILES

ID#	PROJECT NAME	DESCRIPTION	IP	COST
310	**Three Mile Pass Marsh Creation and Hydrologic Restoration**	Creation of marsh within a footprint of approximately 11,000 acres including a 660 acre footprint filling areas deeper than 2.5 feet to create new wetland habitat and restore degraded marsh in Malheureaux Point and Grand Pass. 20,000 feet of oyster reef creation along the created marsh in Three Mile Bay to reduce hydrologic connectivity between Mississippi and the interior of the Biloxi Marsh Complex.	2	$ 560M
035	**Hopedale Marsh Creation**	Creation of marsh within a footprint of approximately 1,900 acres in northern Breton Sound in the vicinity of Hopedale to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 160M
037e	**New Orleans East Marsh Creation**	Creation of marsh within a footprint of approximately 29,000 acres in a portion of the New Orleans East Landbridge Marsh Creation project to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 1.1B
040	**Central Wetlands Marsh Creation**	Creation of marsh within a footprint of approximately 3,800 acres in Central Wetlands near Bayou Bienvenue to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 49M
246	**Sunrise Point Marsh Creation**	Creation of marsh within a footprint of approximately 2,200 acres on east bank of Plaquemines Parish around Auguste Bay to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 47M
247	**Uhlan Bay Marsh Creation**	Creation of marsh within a footprint of approximately 960 acres on east bank of Plaquemines Parish around Uhlan Bay to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 33M
248c	**Pointe a la Hache and Carlisle Marsh Creation**	Creation of marsh along the east side of the Mississippi River from White Ditch to Bohemia to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 860M
249	**Fritchie North Marsh Creation**	Creation of marsh within a footprint of approximately 4,400 acres in St. Tammany Parish along the eastern Lake Pontchartrain shoreline to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 110M
250	**Oak River to Delacroix Marsh Creation**	Creation of marsh within a footprint of approximately 2,400 acres in Plaquemines Parish between Grand Lake and Lake Lery to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 170M
251	**Spanish Lake Marsh Creation**	Creation of marsh within a footprint of approximately 840 acres in Plaquemines Parish along the eastern shore of Spanish Lake to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 61M
253	**Tiger Ridge/Maple Knoll Marsh Creation**	Creation of marsh within a footprint of approximately 4,700 acres in Plaquemines Parish near Tiger Ridge to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 150M
313	**West Delacroix Marsh Creation**	Creation of marsh within a footprint of approximately 5,100 acres south and west of Delacroix Island to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 390M
314	**Belle Pass Island Marsh Creation**	Creation of marsh within a footprint of approximately 3,800 acres on Belle Pass Island near Bohemia to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	1	$ 99M
315	**North and East Lake Lery Marsh Creation Project**	Creation of marsh within a footprint of approximately 14,000 acres in north and east Lake Lery to create new wetland habitat, restore degraded marsh, and reduce wave erosion.	2	$ 890M
316	**Chandeleur Sound Island Restoration Projects**	Creation of marsh within a footprint of approximately 940 acres in the eastern Biloxi Marsh Complex to create new wetland habitat, restore degraded marsh, and reduce wave erosion on Comfort Island, Mitchell Island, Martin Island, and Brush Island.	2	$ 57M
318	**Tchefuncte River Restoration**	Restoration of approximately 3,600 feet of historic ridge at the mouth of the Tchefuncte River to provide coastal upland habitat, restore natural hydrology, and provide wave and storm surge attenuation.	1	$ 1.9M
014a	**Central Wetlands Diversion**	Diversion into Central Wetlands near Violet to provide sediment for emergent marsh creation and freshwater to sustain existing wetlands, 5,000 cfs capacity (modeled at a constant flow of 5,000 cfs, independent of the Mississippi River flow).	2	$ 270M
361a	**Upper Basin Diversion Program - Pontchartrain**	Multiple freshwater and sediment diversions into the swamps of the Western Pontchartrain and Upper Barataria basins were modeled for inclusion in the plan. These projects showed complex interactions with other diversions assumed to be operating on the landscape. This program will evaluate how diversions into the upper basins could be operated in conjunction with currently planned diversions to maintain swamps and coastal marshes, sustain estuarine gradients, and aid in Mississippi River flood control. These studies will lead to the construction of one or more diversion features into Barataria or Maurepas basins.	1	$ 750M
029	**Lake Pontchartrain Barrier**	Construction of closure gates and weirs to an elevation of 2 feet NAVD88 across the passes at Chef Menteur and the Rigolets for storm surge risk reduction within the Lake Pontchartrain Basin.	1	$ 2.4B
032	**Slidell Ring Levees**	Construction and improvement of a levee to an elevation between 13 to 17 feet NAVD88 around the City of Slidell. Project features approximately 76,000 feet of earthen levee, approximately 11,000 feet of T-wall, a 30-foot barge gate, a 180-foot barge gate, a 220-foot barge gate, a 20-foot stop log gate, and a 30-foot stop log gate.	1	$ 420M
319	**Braithwaite to White Ditch**	Improvements of a levee to an elevation of 15 feet NAVD88 between Braithwaite and White Ditch. Project features approximately 94,000 feet of earthen levee and approximately 280 feet of T-wall.	1	$ 440M
320	**St James-Ascension Parishes Storm Surge Protection**	Construction of a levee to an elevation of 16 feet NAVD88 protecting areas between Geismer and Gramercy. Project features approximately 140,000 feet of earthen levee, approximately 6,800 feet of T-wall, a 40-foot roller gate, two 40-foot roller gates, four sluice gates, a one-way culvert for the Panama Canal Connector, and four pump stations.	2	$ 730M

Figure 6.21: Pontchartrain/Breton Project List.

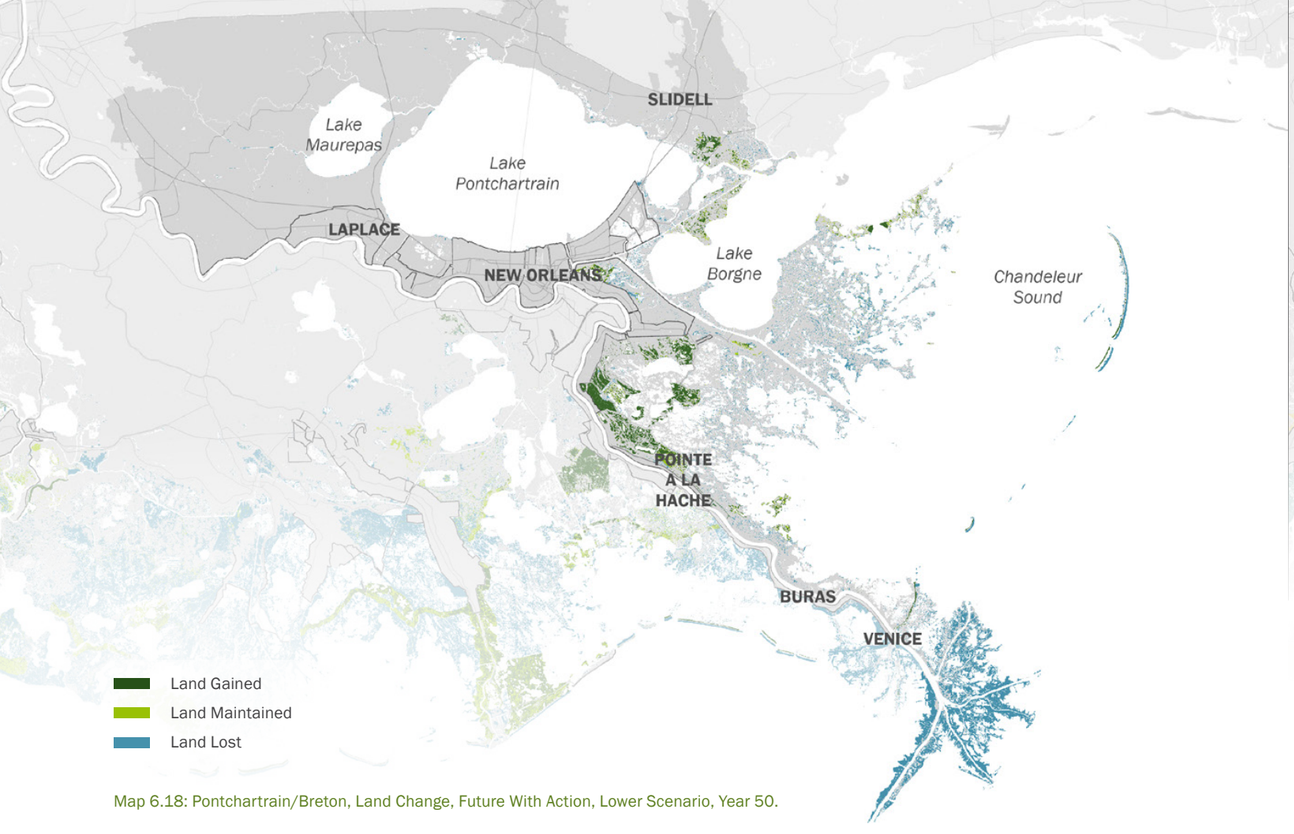
Image: New Orleans Landbridge Construction, 2020 (CPRA)

NORTH SHORE STRUCTURAL RISK REDUCTION

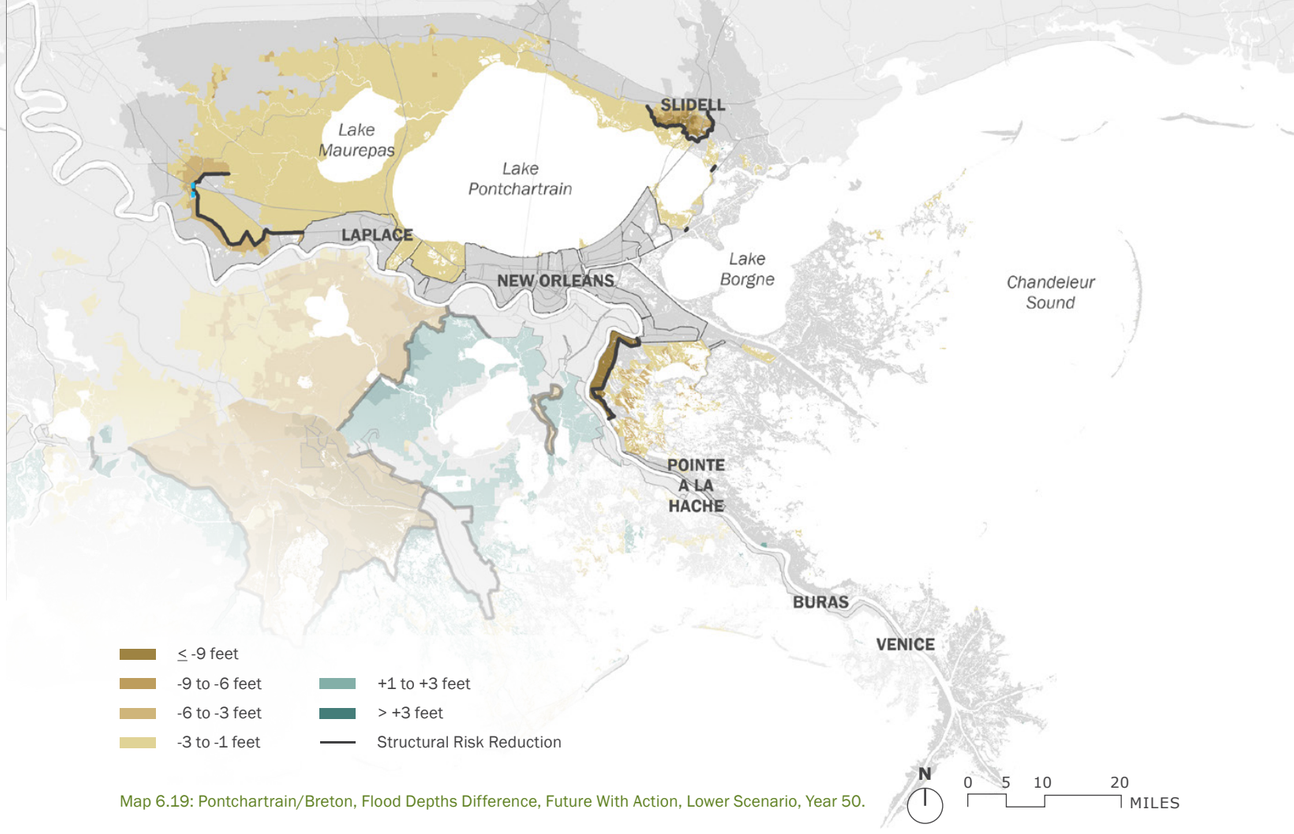
The communities of Slidell, Eden Isles, and Pearl River collectively have among the highest risk from storm surge-based flooding in coastal Louisiana – an estimated $845 million EADD under current conditions, which is expected to triple over the next 50 years under the lower environmental scenario. The Slidell Ring Levee project reduces roughly 35% of the risk in these communities. Fully addressing this risk will require both structural and nonstructural mitigation measures. The Slidell Ring Levee project includes the construction or improvement of nearly 17 mi of levees and floodwalls around Slidell. The levee alignment is based on USACE's St. Tammany Parish Feasibility Study Tentatively Selected Plan (TSP). USACE's TSP included a significant nonstructural component. As this project progresses, CPRA, USACE, and St. Tammany Parish will look for opportunities to further reduce risk for communities like Eden Isles that sit outside of the current structural protection alignment.

MARSH CREATION PROJECTS

Several large-scale marsh creation projects were selected in the area of Breton Sound just east of the Mississippi River, including West Delacroix Marsh Creation and Pointe a la Hache and Carlisle Marsh Creation. These projects plan to use sediment dredged from the Mississippi River. The proximity to the Mississippi River as a source of sediment makes these more cost-effective than similar projects without nearby borrow areas. As these projects move into feasibility and design, there may be additional opportunities to coordinate construction of multiple projects and utilize pipeline corridors.



Map 6.18: Pontchartrain/Breton, Land Change, Future With Action, Lower Scenario, Year 50.



Map 6.19: Pontchartrain/Breton, Flood Depths Difference, Future With Action, Lower Scenario, Year 50.

REGIONAL PROJECT BENEFITS

With action, we build and maintain 37,000 acres of land in the lower environmental scenario and 65,000 acres in the higher scenario. Restoration includes extensive marsh creation in the Breton Basin and east of Lake Pontchartrain, as well as a small diversion into the Central Wetlands. The Mid-Breton Sediment Diversion is included in FWOA. In the lower scenario, these projects result in a major increase in land area in the next 50 years. Despite implementation of the plan, land loss continues in the Bird's Foot Delta. In the higher scenario, most of the projects are locally effective in maintaining land over 50 years, although there is extensive loss in the Biloxi marshes and around Lake Borgne. In both scenarios, the swamps and fresh and intermediate marshes around Lake Pontchartrain and in the upper Pontchartrain Basin remain intact, in part due to the influence of the River Reintroduction to Maurepas project, which is in FWOA.

Four structural risk reduction projects were selected in the Pontchartrain/Breton region. In aggregate, they reduce future surge-based flood risk in the region by 35%. These projects provide a $1.6 billion reduction in EADD in 50 years under the lower scenario and a $2.5 billion reduction in EADD in 50 years under the higher scenario. Even with the implementation of these structural risk reduction projects, significant residual risk remains, especially on the North Shore. Our analysis shows a significant need and opportunity for nonstructural risk reduction in these communities.

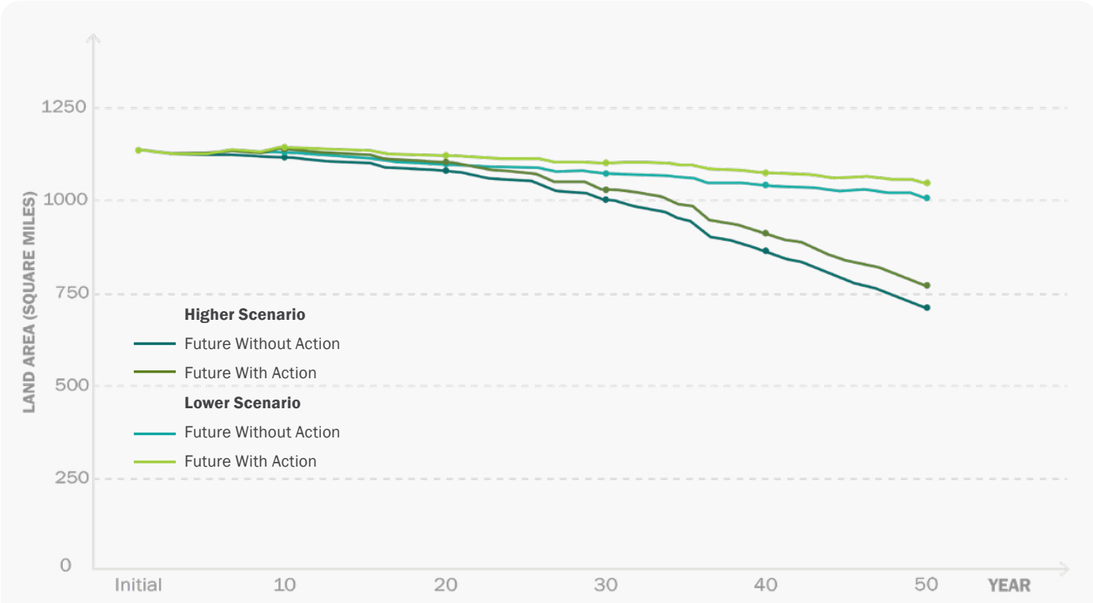


Figure 6.22: Pontchartrain/Breton Land Area over 50 years, Future With and Without Action, Higher and Lower Scenario.

CHAPTER 7

BEYOND THE MASTER PLAN

In addition to the 2023 Coastal Master Plan, the state of Louisiana is involved in several programs and initiatives intended to benefit coastal landscapes and residents. More information about some of those can be found in this section.

Image: Mississippi River Delta, 2020 (CPRA)

BEYOND THE MASTER PLAN

PROGRAMS AND INITIATIVES

This chapter outlines projects, programs, and initiatives that are adjacent to the master plan and are actively shaping the future of coastal Louisiana's communities and landscape.

In support of these efforts, data and information generated through the master plan process are available to all stakeholders, from the general public to government program managers, and academics. While some are led by CPRA, others are led by CPRA's state and federal agency counterparts whose directives focus on topics related to coastal restoration and protection. Several example efforts highlighted in this chapter are briefly described below.

Most directly tied to the master plan is the 2023 Master Plan Data Viewer. The data viewer complements the master plan by providing access to data and information developed as part of this most recent planning process. This interactive tool displays projected flood risk and land change data that helps viewers visualize what change might look like over time in their communities and across the coast. The data viewer also provides detailed information about recommended protection and restoration projects.

Each six-year master plan update cycle is an adaptive management exercise and includes evaluating and redefining the problem, revisiting overarching goals and objectives, developing and refining system models, identifying uncertainties, formulating the plan, monitoring actions, and assessing the system. The science that underpins the master plan is continually being advanced and through the master plan process our team evaluates recent analysis and incorporates new research into the process. Field investigations undertaken by CPRA and our partners are incorporated as well as to refine our understanding of coastal processes. This approach maximizes the success of the coastal protection and restoration program by iteratively incorporating new information into each step of the planning and decision-making process.

In addition to updating and implementing the master plan, CPRA is also responsible for administering several programs tied to specific regions of the coast. Examples of these programs include the Atchafalaya Basin Program (ABP), the Lowermost Mississippi River Management Program (LMRMP), and the Barrier Island System Management Program (BISM).

The ABP was established to develop and implement a comprehensive plan to address the priority issues affecting the Atchafalaya Basin Floodway System. Implementation of the program occurs through an annual planning process.

Of key importance to the nation, Louisiana, and to CPRA is another river – the Mississippi River. The LMRMP is a $9.3 million effort that aims to move toward a more holistic approach for water and sediment management that supports the long-term sustainability of the Lowermost Mississippi River.

Barrier islands are another critical component of the coastal landscape for which CPRA is responsible. BISM is a holistic, system wide approach to island management that guides when and where to focus restoration resources (funding and sediment) to maintain barrier island integrity (as defined in the master plan).

Although CPRA is solely responsible for developing and implementing many coastal projects, programs, and initiatives, CPRA's leadership and staff understand the importance of collaborating with and leveraging the efforts of other state and federal partners across the coast. Collective efforts forged through both long-standing and more recent collaborations yield synergistic results. Example collaborative efforts include the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) program, the Southwest Coastal Louisiana Study, and the Louisiana Watershed Initiative (LWI).

The purpose of the CWPPRA program is to identify, prepare, and fund construction of restoration projects throughout coastal Louisiana as well as to promote research and implement wetland preservation. This program has a long history of implementing restoration and monitoring across the coast. The Chairman of the CPRA Board sits on the CWPPRA task force.

The Southwest Coastal Louisiana Study was completed in 2016 by USACE with CPRA as the local sponsor; it recommended both risk reduction and ecosystem restoration measures across Calcasieu, Cameron, and Vermilion parishes. Through the Infrastructure Investment and Jobs Act of 2022 and Fiscal Year 22 Community Projects Funding, $296 million has been secured for implementation of voluntary nonstructural risk reduction measures recommended by the study.

Although CPRA primarily focuses on coastal restoration and protection, the agency participates in important initiatives that extend beyond the coastal area. One example is LWI. CPRA serves as one of five state agencies on the Council on Watershed Management, which administers LWI. LWI represents a new watershed-based approach to floodplain management in Louisiana and seeks to reduce flood risk and improve floodplain management across the state, including through maximizing the natural and beneficial functions of the floodplain.

One of the programs that LWI is implementing through the Office of Community Development, is a voluntary buyout program. This program was created to provide assistance to willing landowners in flood prone areas. While not limited to the coastal zone, this program provides benefits, primarily to low to moderate income residents, to help move residents out of harm's way and relocate to higher and drier ground.

In addition to efforts in which CPRA is directly involved, other critical efforts are being carried out which affect coastal Louisiana communities. For example, the Climate Initiatives Task Force was established by Executive Order in 2020 to develop strategies and actions to address the causes of climate change, identify strategies to improve resilience, and develop policies to reduce greenhouse gas (GHG) emissions to put Louisiana's efforts in line with the goals of the Paris Climate Agreement. The Louisiana Climate Action Plan was approved in 2022 and contains strategies and actions to reduce GHG emissions across the state's economy. Restoring and conserving coastal wetlands is one of 28 strategies outlined in the plan.

Another example initiative with direct impacts to Louisiana's citizens is the Federal Emergency Management Agency (FEMA) Risk Rating 2.0. Through this effort, FEMA is updating the National Flood Insurance Program's risk rating methodology through the implementation of a new pricing methodology. The methodology leverages industry best practices and cutting-edge technology to enable FEMA to deliver rates that are actuarially sound, equitable, easier to understand and better reflect a property's flood risk.

2023 MASTER PLAN DATA VIEWER

For the 2017 plan, CPRA made public access to information a priority and worked to develop a new tool, the Master Plan Data Viewer, to serve as a complement to the plan document.

This interactive tool increases the accessibility of complex model output information and enables coastal Louisiana residents to see how the landscape and their flood risk from storms may change over time 50 years into the future.

Similarly, the 2023 Master Plan Data Viewer is an interactive online companion to the 2023 plan and includes land change, vegetation type, flood depth, damage, and 2023 Coastal Master Plan project information. The land change and vegetation type data can be explored by decade, by environmental scenario, for both with and without the master plan in place. Flood depth and damage information can be explored in the same way, with the added layers of seeing how the coast changes when the type of storm (annual exceedance probability) varies and how projected damage is quantified over time either in dollars or by structures.

Not only has the viewer been updated with the 2023 plan information, which includes the most up to date scientific information at a higher resolution, but the viewer's style and functionality has also been improved. While the viewer's goal is to make the master plan data accessible to residents, the viewer holds a wealth of information also used by community planners, businesses, parish officials, other state agencies, and academia. Many of the changes made were a result of feedback received directly from all of these stakeholders.

One significant improvement to the user experience is that the landing screen now has the option to take a guided tour that explains why there is a need for a master plan and illustrates the viewer's features and the types of information available. This new guided tour option allows us to share important context and background on the viewer's data to improve coastal Louisiana residents' understanding and usability of the information, and in turn increases their flood risk awareness and provides them with important information needed to prepare and plan for their futures.

Other important updates to highlight are the ability to access and easily use the 2023 Master Plan Data Viewer on mobile phones and tablets, literally putting the data within arm's reach. This has proved to be invaluable in sharing information and discussion both with and among community members. In addition, the viewer's search bar functionality has expanded beyond entering addresses so you can now search for keywords, such as part of a project name. Additional features include new zoom and highlighting functions whereby clicking on a project name zooms to that location, and clicking on a project type highlights them across the coast.

Explore the 2023 Master Plan Data Viewer and send any questions or feedback to masterplan@la.gov.

Explore more on CPRA's website: https://coastal.la.gov/our-plan/2023-coastal-master-plan/

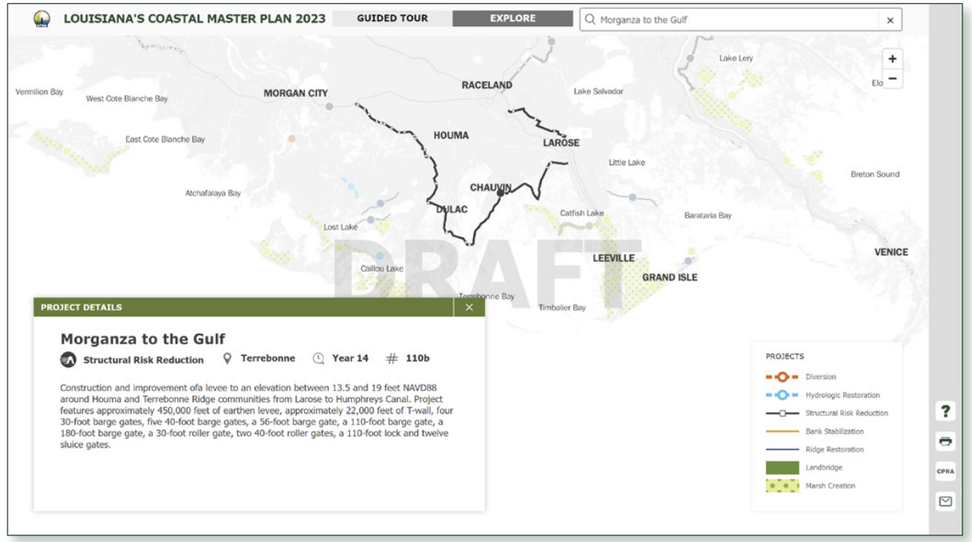


Figure 7.1: Desktop view of the Master Plan Data Viewer showing project information.

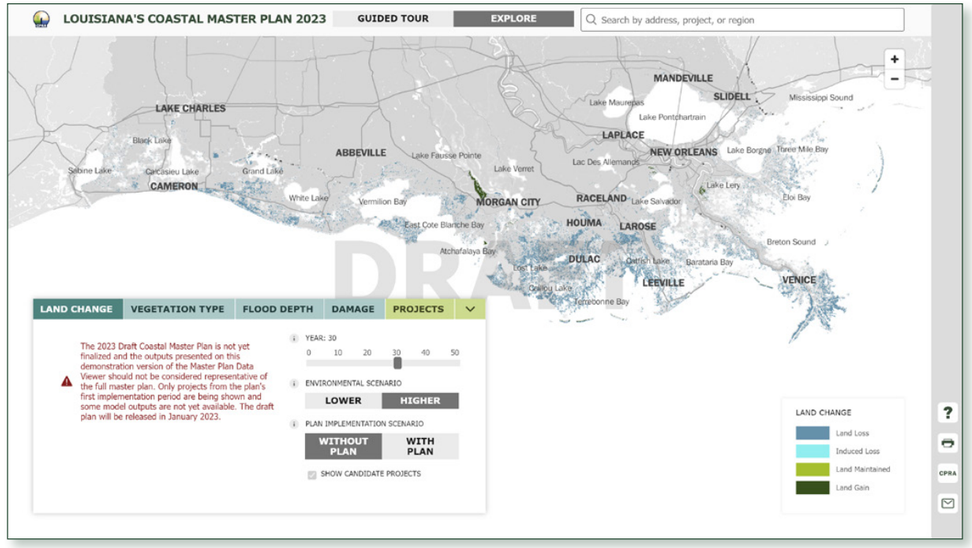


Figure 7.2: Desktop View of the Master Plan Data Viewer showing coastwide land change data.

CPRA ADAPTIVE MANAGEMENT PLAN

Adaptive management is a structured, iterative process of incorporating new information and knowledge to improve decision-making over time.

Louisiana's dynamic coastal environment naturally lends itself to adaptive management, given the shifting baselines associated with ongoing landscape change and, consequently, the difficulty in predicting the future effects of protection and restoration actions. Continued land change, sea level rise, and subsidence as well as the periodic impact of tropical storms and hurricanes mean there is rarely, if ever, a high degree of certainty about how the effects of a project or an entire program will unfold over time. In addition, coastal environments are uniquely challenged due to the interdependence and delicate balance of managing water, land, ecological, and economic systems and the future uncertainties associated with the magnitude and rate of climate change impacts. Changes in coastal populations, economic growth, and human ties to natural resources will continue to affect managers' ability to both protect communities and sustain ecosystems. Sustaining such a complex system in which natural, human, and socio-economic systems are highly integrated is inherently difficult. To meet this challenge, adaptive management, within the context of the six-year cycle for updating the master plan, provides a process for making better decisions over time. This is done through active learning and enables adjustments in planning and program implementation as new information becomes available.

Adaptive management encourages an integrated and flexible approach to managing coastal resources while considering risks and uncertainty. It reduces the uncertainty associated with complex decision-making through a step-by-step process of gathering data and evaluating conditions at regular intervals and adjusting management actions based on what has been learned. In this way, adaptive management is a structured approach to gathering information and using it to gain new knowledge, reduce uncertainties, and improve management decisions to meet the goals and objectives of the master plan.

The goal of CPRA's adaptive management plan is to maximize the success of the coastal protection and restoration program by iteratively incorporating new information into each step of the planning and decision-making process. This approach balances the urgent need for action and the inherent uncertainty involved in large-scale coastal planning by ensuring new information is utilized in all aspects of the planning process. CPRA applies adaptive management to both project and program scale management. Adaptive management is employed at the project level to identify, design, and evaluate project effects over time. At the programmatic scale, adaptive management is incorporated into the master plan process, by applying what we have learned regarding changes in coastal conditions and previous project performance to develop, evaluate, and recommend a set of high-performing projects for implementation. This process is repeated every six years and is based on the best available science and data at that time.

Activities that occur during CPRA's six-year master plan cycle include: engaging stakeholders, evaluating and redefining the problem, revisiting goals and objectives, developing and refining system models, identifying uncertainties, formulating the plan, implementing the plan, monitoring actions, and assessing the system.

Throughout all phases of adaptive management, effective stakeholder engagement is essential for achieving a common understanding, reaching consensus, and reducing conflicts. Stakeholder engagement not only involves disseminating information to improve understanding among those impacted by management actions, but also provides an opportunity to receive new data, information, and creative solutions for addressing the goals and objectives.

At the start of each six-year planning cycle, CPRA, with input from stakeholders, reevaluates and redefines the primary problems it seeks to address with the master plan. Following this, master plan goals and objectives are reviewed to determine whether revisions are necessary.

A model improvement plan is developed at the beginning of each planning cycle. Model improvements are generally prioritized based on the degree to which predictions of processes and variables most critical to plan formulation can be advanced. Uncertainties are identified to understand model limitations, the degree of confidence in different model components, and to target future research that can improve these models in the future.

Plan formulation provides the strategy for meeting the master plan goals and objectives and results in the development of a flexible and robust project list, additional programs, and information that can be used to support other coastal planning activities. Plan formulation methods continue to evolve as the program is implemented and new ways to synthesize information are developed to evaluate individual projects and groups of projects.

Monitoring, such as project-specific monitoring or systematic monitoring, provides the data necessary for system models to be set up, calibrated, and validated before they are used to predict the potential performance of projects. While the assessment activity is designed to assess programmatic performance and resolve uncertainties to increase understanding and modeling capability, it can also be used to evaluate landscape conditions and/or identify the need to change course.

As CPRA's coastal program continues to grow, the master plan process continues to incorporate adaptive management, despite the complexity of the problem at hand. In essence, new information and lessons learned over each six-year cycle are integrated into the process and are used to develop an updated master plan. These updates are themselves considered adaptive management.

ADAPTIVE GOVERNANCE INITIATIVE

The impacts of Louisiana's coastal crisis extend beyond the immediate effects of land loss or hurricane storm damage and demand interventions outside the scope of hurricane protection and coastal restoration projects.

The impacts of coastal change on local communities present significant challenges to stage agencies charged with the continued management of state-owned assets and the provision of services to coastal residents and communities. Recognizing the wide-ranging impacts associated with our changing coast, Governor Edwards signed Executive Order 2020-19 on Coastal Resilience in August of 2020.

Executive Order 2020-19 begins the process of building a broader, cross-government approach to resilience by appointing an inaugural Chief Resilience Officer for the state and charging each executive agency with appointing a resilience coordinator to be the agency's point person for advancing responses to the demands of a changing coast. These resilience coordinators are tasked with conducting vulnerability assessments to identify the ways their agencies are impacted by coastal change both now and in the future. They are also responsible for developing adaptation actions that address their agencies' most significant vulnerabilities.

Although each agency in the Executive Branch has a distinct mission and its own expertise, resources, and responsibilities, they are all impacted and tested by the monumental changes occurring across Louisiana's coast.

Each of these agencies also has a role to play in building a more resilient coast. Coastal resilience spans several spheres of state government — it includes a robust built environment, a sustainable natural environment, a strong economy, and health and opportunity for all coastal residents.

The Adaptive Governance Initiative (AGI) asks agencies to consider their role in proactively planning for coastal resilience and ensuring that they can continue to meet their mission in the face of increasing coastal change. Such a multi-sector, holistic approach to the coastal crisis is necessary to support coastal residents and business in the face of rapid change.

The crisis on the coast is punctuated by singular disasters like hurricanes, but it also brings chronic stressors for the people, communities, natural resources, and economies of Louisiana as water levels rise and land degrades. These chronic issues often manifest in higher management costs, increased workloads, and extended periods of emergency operations within state agencies. Through the AGI each agency is identifying ways to adapt to these changes while also elevating the challenges and needs that are common across several agencies.

Together, agencies are helping to build a more resilient state by supporting more comprehensive and adaptable programs and assets that meet the changing needs of our coastal populations.

Louisiana's master plan offers a foundation for the agencies' work by providing analysis and insights into how the coast will change over time, including which areas may face increasing environmental risk and which may have more time to adapt. Equipped with this critical information, agencies across government can better plan their investments in assets and adjust their programs to serve the people of Louisiana and carry out their missions more effectively and efficiently today and in the future.

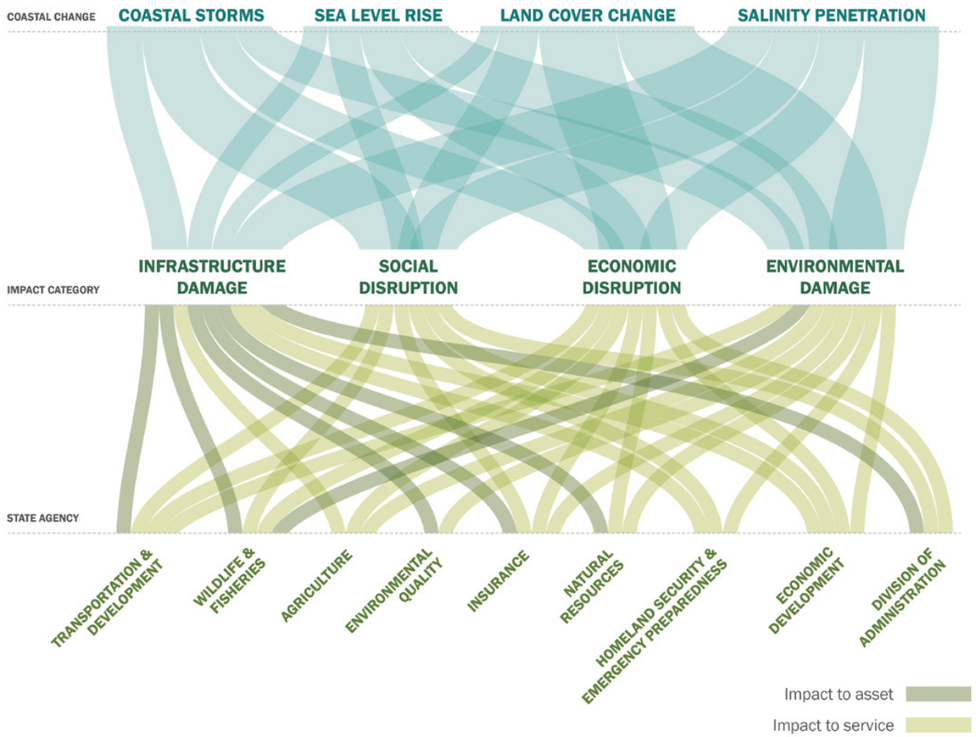


Figure 7.3: Cascading impacts of coastal change to a selection of state agencies

The AGI is a joint effort of the Office of the Governor and the Center for Planning Excellence (CPEX) and is being implemented with support from the Walton Family Foundation, the Kresge Foundation, Foundation for Louisiana, Greater New Orleans Foundation, and CPRA.

"...Whereas the full breadth of tools, expertise, and missions of Louisiana's various state agencies must be brought to bear to more fully and more directly address the economic and social implications of Louisiana's degrading coast; and whereas this multi-agency approach will ensure the best outcomes for the people of Louisiana and better position the state to partner with the parishes and municipalities most at risk from coastal change..."

- Governor John Bel Edwards
Executive Order JBE 2020-19

ATCHAFALAYA BASIN PROGRAM

The Atchafalaya Basin is the nation's largest river swamp, containing almost one million acres of America's most significant bottomland hardwoods, swamps, bayous, and backwater lakes. The basin begins near Simmesport, LA, and stretches 140 miles southward to the Gulf of Mexico. Currently, the Atchafalaya Basin is bound by ridges formed by levee building along active and abandoned courses of the Mississippi River and serves as a critical relief valve for extreme flood events on the Mississippi River.

Authorized in 1928 by the Flood Control Act, the Atchafalaya Basin Floodway System serves as a system of public works within the lower Mississippi Valley, providing flood risk management and a stable, efficient navigation channel using levees and floodwalls, floodways, channel improvements and stabilization. Over time, however, modifications to the natural flow regime of the Atchafalaya River and its swamp have caused sedimentation and water quality issues in the basin. Poor water quality is the result of poor connectivity of waterways in the basin, leaving many areas stagnant and with low dissolved oxygen that, in turn, promotes an overabundance of invasive, aquatic plants, such as water hyacinth and hydrilla. These pervasive issues threaten the ecosystem, navigation, flood control, and the communities that rely on the basin's natural and cultural resources.

The Atchafalaya Basin Program (ABP) was established to develop, implement, and manage a comprehensive state master plan for the Atchafalaya Basin Floodway System. ABP is part of CPRA's overall annual planning process. The primary goal of ABP is to improve water quality and improve access to the basin through the implementation of hydrologic restoration projects. Through the implementation of these projects, the program ensures that the ongoing work aligns with the state's coastal priorities.

Although ABP is administered by CPRA, many entities provide recommendations and guidance such as the Atchafalaya River Basin Restoration and Enhancement Task Force (ARBRE). ARBRE is made up of stakeholders that include state and local leaders, academics, private citizens, and state agency representatives. ARBRE is chaired and staffed by the Governor's Office of Coastal Activities (GOCA). ARBRE was created to identify major concerns and develop strategies and recommendations to the CPRA Board.

This Task Force works to elevate critical issues facing the Atchafalaya Basin, identify and build support for new and recurring sources of funding, identify shared goals and values for restoration and enhancement of the basin, and serve as a proactive means to build consensus and advise ABP on matters relating to the implementation of the Atchafalaya Basin Floodway System. Once ARBRE was established, its primary mission was to study the Atchafalaya Basin and develop an initial report on findings for the CPRA Board. The recommendations included the following:

- Enhance outreach that highlights the importance of the Atchafalaya Basin locally
- Urge and request Congress to fully fund construction of finalized USACE studies relevant to the management of the Atchafalaya Basin as well as fund authorized studies
- Urge USACE to approach management of the Atchafalaya Basin holistically, designating ecological restoration as a primary component along with flood control and navigation
- Request the CPRA Board evaluate inclusion of the remainder of the Atchafalaya Basin within the Louisiana Coastal Zone
- Restore the north/south sheet flow within the basin
- Restore and conserve deep water habitats within the basin
- Examine ways to better manage sediment within the Atchafalaya Basin
- Examine the current hydrology of the Atchafalaya Basin, including management of the Old River Control Complex and the Atchafalaya Basin channel outlets
- Update the state's Atchafalaya Basin Master Plan to include current conditions and challenges as determined by the ARBRE Task Force
- Recommend the CPRA Board and CPRA enhance public engagement concerning the management of the Atchafalaya Basin
- Recommend the ARBRE Task Force be used to discuss and inform potential management actions within the Atchafalaya Basin
- Explore opportunities for significant recurring funding for ABP

These recommendations inform CPRA on the implementation of future projects. CPRA considers projects for funding on an annual basis. All projects submitted through CPRA's ABP solicitation process are screened on a variety of metrics, including master plan consistency, geographic areas with issues of water quality, sedimentation, public access, and nonduplication of submissions previously turned down. CPRA, as the non-federal sponsor for USACE Floodway Projects, provides the mechanisms to match federal dollars used in the mitigation of the Atchafalaya Basin Floodway System.

Image: Atchafalaya Swamp, 2018 (Louisiana Sea Grant College Program)

CLIMATE INITIATIVES TASK FORCE

In August 2020, Governor John Bel Edwards signed an Executive Order to create the Louisiana Climate Initiatives Task Force in response to the 2018 Intergovernmental Panel on Climate Change (IPCC) Special Report on greenhouse gas (GHG) emissions reduction pathways. The Task Force was established to develop strategies and actions to address the causes of climate change, identify strategies to improve resilience, and develop policies to reduce GHG emissions in an effort to help avoid the worst impacts of climate change as well as put Louisiana's efforts in line with the goals of the Paris Climate Agreement.

The Louisiana Climate Initiative Task Force (Task Force) is a 2-year initiative to support the state achieving net zero GHG emissions by 2050. In order to achieve net zero emissions, the Task Force has set the following emission reduction goals:

- By 2025, reduce net GHG emissions by 26-28% of 2005 levels
- By 2030, reduce net GHG emissions by 40-50% of 2005 levels
- By 2050, reduce GHG emissions to net zero

More than 140 experts participated as members of the Task Force, its committees, or its advisory groups and engaged across nearly 50 public meetings held since November 2020. The Task Force includes scientists, state administrators, academics, oil industry representatives, and environmental advocates. The Task Force is supported by volunteers from diverse backgrounds organized into six sector committees, representing different sectors of the state's economy and four advisory groups focused on equity, science, legal, and financial considerations. The 23-member body set priorities for the overall planning process as well as an approved set of recommendations for the Climate Action Plan. The Task Force is chaired and staffed by the Governor's Office of Coastal Activities (GOCA). Under leadership of the Governor's Executive Assistant for Coastal Activities, GOCA serves as the staff and managers of the Task Force, advisory groups, and sector committees in coordination with advisory and committee chairs.

Louisiana is among the most vulnerable states in the United States to the impacts of climate change. The state's hot and humid climate and location at the mouth of the Mississippi River and the edge of the Gulf of Mexico carry environmental challenges that have direct and indirect impacts on local communities. Throughout the state, whole communities are being displaced. Louisiana is home to people, critical industries, cultural resources, and tourism economies. The coastal plain and low-lying regions of the southeast are extremely vulnerable to climate change impacts. Flood frequencies, extreme rainfall events, and sea level rise affect property values and the viability of infrastructure. Extreme heat and changing seasonal climates are projected to have impacts on exposure-linked health and economic vulnerabilities in agricultural, timber, and manufacturing sectors.

The Louisiana Climate Action Plan contains 28 strategies and 84 specific actions to reduce GHG emissions across the state's economy. The report provides details from activities across the economy about where Louisiana's GHG emissions originate, where they are naturally absorbed from the atmosphere, and direction about how to approach GHG emissions reductions in a focused way. The planning process for developing the Final Climate Report was developed through the Structured Decision Making (SDM) approach, which integrates science and policy to break down complex decisions and identify solutions that achieve the desired ends.

With the technical support of the Louisiana State University (LSU), the LSU Center for Energy Studies (CES) conducted an update to Louisiana's GHG inventory using the United States Environmental Protection Agency's (USEPA's) State Inventory Tool (SIT) methodology to ensure consistency with the methodology used to prepare the state's previous inventory. A Science Advisory Group provided oversight and direction to guide the GHG inventory update process, including two rounds of comments. The inventory estimates and assesses the state's GHG emissions from all major sources, activity types, economic sectors, and pollutant types and provides an important updated snapshot in time of Louisiana's GHG baseline. Overall, the findings of this inventory suggest that industrial decarbonization is critical to achieve future GHG emission goals in Louisiana.

A presentation of draft findings was shared with the Task Force in its July 2021 meeting. The plan recommends strategies (high-level approaches) and actions (practical and implementable policy steps) to reduce GHG emissions to net zero by 2050 and avert the worst impacts of climate change.

The recommendations span eight sections and include the following:

- Clean energy transition
- Industrial decarbonization
- Actively managed methane emissions
- Transportation, development, and the built environment
- Natural and working lands and wetlands
- An inclusive, low-carbon economy
- Collaboration and partnership to ensure successful implementation
- Accountability and adaptability to ensure lasting success
- The plan also includes three priority policy pillars:
- Renewable electricity generation
- Industrial electrification
- Industrial fuel switching to low- and no-carbon hydrogen.

The plan also offers strategies and actions that can improve health outcomes and the quality of life of Louisiana residents immediately. These actions include reducing the amount of fossil fuel combustion in the production of electricity and manufactured goods and from buildings and transportation while helping to slow the warming of the atmosphere that causes other climate impacts that harm health, safety, and quality of life.

The Climate Action Plan was approved on January 31, 2022, and the final plan, Louisiana's Climate Action Plan was sent to the Governor for his consideration on February 1, 2022. The Task Force met again in

March 2022 to move forward with the plan's implementation. As the state's first effort to address the root causes of climate change, the Climate Action Plan also contains a detailed description of the science of climate change and details how a warmer planet is impacting Louisiana people, environment, and economy with increasing severity and frequency.

SOUTHWEST COASTAL LOUISIANA

The people, economy, environment, and cultural heritage of Southwest Coastal Louisiana are at risk from damages caused by hurricane storm surge-based flooding. The area's flat, low elevation, proximity to the Gulf of Mexico, subsiding lands, and rising seas, are all contributing factors that cause coastal flooding, shoreline erosion, saltwater intrusion, and loss of wetland and Chenier habitats.

The Southwest Coastal Louisiana Study is the first federally authorized feasibility level study with the dual purpose of addressing hurricane and storm damage risk reduction and restoring the coastal ecosystem of southwest Louisiana. The study focuses on 4,700 sq mi in the Calcasieu, Cameron, and Vermilion parishes. In 2016, the study established the Southwest Coastal Louisiana Final Integrated Feasibility Report and Environmental Impact Statement (2016 Feasibility Report).

After the study was completed in 2016, Congress authorized the Southwest Coastal Louisiana Hurricane and Storm Surge Damage Risk Reduction and Ecosystem Restoration Project in the Water Infrastructure Improvements for the Nation Act of 2016 (WIIN Act of 2016). This project will decrease damages related to storm surge-based flooding by implementing risk reduction strategies, such as floodproofing, structural elevation, and localized storm surge risk reduction measures (berms). Implementation of the project will benefit social and economic factors related to housing, tax revenue and property values, and community cohesion. Participation in this project is completely voluntary. Benefits that structure owners may experience as a result of the project may include reduced storm damages for little-to-no out of pocket expenses and increased community resilience.

Construction funding was added to the 2022 Infrastructure Investment and Jobs Act in the amount of $120 million. The funds are only available for the storm damage risk reduction features of the project. Additional USACE guidance is forthcoming once the funds are made available. The $296 million investment is projected to elevate over 500 structures.

USACE will work closely with the CPRA Board, who will serve as the non-federal sponsor, to execute a Project Partnership Agreement. Once the agreement is in place, USACE will solicit and award a Design/ Build Construction Contract to prepare individual plans. Once agreed to by the homeowner, the CPRA Board and USACE will issue a notice to proceed to elevate the structure to the projected Year 2075 100-year base flood elevation. Homeowners will be required to sign a floodproofing agreement stating that they cannot use the space below the first floor for living space along with other terms.

To date, 27 structures have been approved for construction and elevation — 10 in Calcasieu Parish and 17 in Vermilion Parish. USACE prioritized the structures by their first floor elevation and the low to moderate income area status. Approximately 150 voluntary applications have been received for inclusion in the project from the targeted list of homeowners, and elevation of the first structures is expected in early 2023.

BARRIER ISLAND SYSTEM MANAGEMENT

Coastal Louisiana's barrier island systems are an important component of the Mississippi River Delta Plain, providing a variety of ecosystem services, such as habitat, storm-surge buffering, and maintenance of marine and estuarine gradients. For decades, there have been efforts to restore and protect these rapidly degrading barrier islands. In 2021, CPRA developed the Barrier Island System Management (BISM) program with facilitation by the Water Institute of the Gulf. BISM is a holistic, system-wide approach to barrier island management that guides when and where to focus restoration resources to maintain barrier island integrity, while minimizing overall system maintenance costs and reducing project implementation times.

Two databases were created to support the BISM program. The BISM Database of Databases is an inventory of data relevant to barrier island restoration decisions. The BISM Stakeholder Concern Inventory details decision-makers and stakeholders interests relevant to barrier island restoration, including potential funding entities and regulatory authorities.

Louisiana has also developed the Barrier Island Restoration Tradeoff Analysis (BIRTA) toolkit to support quantitative analysis of restoration project consequences, identify future sediment and funding needs, and provide input into the design of monitoring programs. Because the model is probabilistic and driven directly by available data, it can identify the largest uncertainties and most critical gaps in barrier island restoration prioritization.

There are several additional steps that can be taken to advance the programmatic objectives of BISM, including:

- Expansion of Louisiana Sediment Availability and Allocation Program (LASAAP) for broader use in Regional Sediment Management (RSM) and linkage with the BISM BIRTA toolkit
- Coordination of BISM and BICM as part of an adaptive management approach to barrier island and headland restoration and monitoring
- Enhance linkages of BISM with the master plan
- Working Group to streamline project permitting

COASTAL WETLANDS PLANNING, PROTECTION, AND RESTORATION ACT

The Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) was established in 1990 through federal legislation to identify, prepare, and fund construction of coastal wetland restoration projects throughout Louisiana. While restoration is a major part of the initiative, CWPPRA also aims to promote research and implement wetland preservation. Since its foundation, Louisiana has benefited from the continued efforts of CWPPRA in overseeing and implementing roughly 210 coastal restoration or protection projects.

The CWPPRA Program is managed by the CWPPRA Task Force comprised of representatives of the Louisiana's Governor's Office of Coastal Activities as well as five federal agencies, including USACE, NOAA, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Services, and the U.S. Environmental Protection Agency. The Task Force plans and implements projects that create, protect, restore, and enhance wetlands throughout coastal Louisiana.

Because CWPPRA projects are partially funded by the state, all CWPPRA projects are required to be consistent with the master plan. Input and public participation are essential parts of project design, planning, and selection each year. The selection process consists of four regional planning teams accepting projects nominated by the public, with a coastwide planning team selecting up to 20 engineering and design projects and six demonstration (planning) projects from the nominated list. Ten candidate projects and three demonstration projects are selected for more detailed assessments. Work groups review and evaluate project costs, need, feasibility, and the overall benefit. The CWPPRA Technical Committee conducts public hearings to release findings and receive comments about the candidate projects. The Technical Committee recommends up to four of the 10 candidate projects for the CWPPRA Task Force to select projects to receive funding.

CWPPRA project funding is allocated through an annual funding stream, with a mix of federal and state funds. Federal funding comes through the Sport Fish Restoration and Boating Trust Fund, which is funded by taxes on marine fuel, boater registrations, and fishing equipment. There is an 85% federal, 15% state cost share, with roughly $5 million allocated for planning, $3 to $4 million allocated for engineering and design project, and project-dependent funding for construction and post completion monitoring/maintenance. Funded projects provide for the long-term conservation of wetlands and dependent fish and wildlife populations with cost-effective plans for creating, restoring, protecting, or enhancing coastal wetlands.

Considered the backbone for restoration throughout the state, CWPPRA has an entire suite of projects identified for restorative habitat. Administered by USACE, typical projects undertaken through CWPPRA include marsh creation, shoreline protection, hydrologic restoration, beneficial use of dredged material, terracing, sediment trapping, vegetative planting, barrier island restoration, and bank stabilization. Funded projects provide for the long-term conservation of wetlands and dependent fish and wildlife populations by creating, restoring, protecting, or enhancing coastal wetlands.

LOWERMOST MISSISSIPPI RIVER MANAGEMENT PROGRAM

The Lowermost Mississippi River Management Program (LMRMP) aims to move toward a more holistic approach for water and sediment management that supports the long-term sustainability of the Lowermost Mississippi River (LMR), defined for purposes of the program as the Mississippi River and its outlets in southern Louisiana below, and inclusive of, the Old River Control Structure.

LMRMP effort was launched in 2018 and will conclude in fall 2023 and is supported primarily by a $9.3 million award to CPRA from the Gulf Coast Ecosystem Restoration Council-funded Component of the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States (RESTORE) Act. CPRA also leveraged external funding from the National Wildlife Federation. It builds upon the Louisiana Coastal Area Mississippi River Hydrodynamic and Delta Management Study previously conducted by USACE and CPRA and serves to further develop the science needed to adequately inform decision-makers on future LMR management.

LMRMP is structured to strengthen partnerships, improve/develop science and technical tools, and help advance holistic water and sediment management that yield practical benefits across all interests. CPRA objectives for managing LMR include:

- Support the long-term sustainability of the coast and reduce land loss to the extent possible,
- Maintain and enhance channels that support use of the LMR for navigation,
- Enhance the health of ecosystems associated with the LMR,
- Mitigate threats to communities and infrastructure posed by river flooding, and
- Support holistic management of LMR water and sediment resources to maximize benefits across all missions.

LMR's response to previous and ongoing management, sea level rise, subsidence, and watershed-scale precipitation trends related to climate change will continue to test our knowledge and management capabilities. Data and decision support tools are needed to evaluate existing river conditions and approaches for future management strategies.

Specific tasks include synthesizing existing and newly collected data, conducting numerical and physical modeling, performing economic analyses, investigating existing river management, identifying and evaluating high-level "what if" river management strategies and future environmental scenarios, and coordinating with other programs and initiatives such as the Mississippi River Mid-Basin Sediment Diversion Program.

Efforts associated with LMRMP will result in greater understanding of river hydrodynamics and flow, sediment transport and dredging, and landscape condition and change, and will support progression toward holistic management of Mississippi River sediment and water resources. More information on the program and individual tasks, links to task overviews, team members, and deliverables, can be found at https://cims.coastal.la.gov/outreach/Projects/LMRMP. All deliverables associated with LMRMP will be made available through CPRA's Coastal Information Management System (CIMS), and river-focused datasets will be made available on the RESTORE-funded Mississippi River Data Portal (https://cims.coastal.la.gov/river/).

LOUISIANA WATERSHED INITIATIVE

In 2016, historic flooding throughout Louisiana exposed deficiencies in the state's approach to floodplain management at all levels of government, prompting a reassessment of how Louisiana prepares for increasing flood events. An early investigation into innovative solutions identified regional watershed-based floodplain management as a means to systemically address water management and avoid interventions that may unintentionally increase runoff or subsequent flooding on adjacent communities, whether upstream or downstream.

In 2018, Gov. John Bel Edwards issued Executive Order JBE18-16 to create the Council on Watershed Management (Council) to reform the state's approach to flood risk mitigation. The Council is composed of five state agencies — the Office of Community Development (OCD), the CPRA, the Department of Transportation and Development (DOTD), the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP), and the Department of Wildlife and Fisheries (DWF). These agencies are working together to provide funding, technical support, data, and resources for flood risk reduction across the state. The Council administers the Louisiana Watershed Initiative (LWI) — a new watershed-based approach to floodplain management in Louisiana. LWI's mission is to reduce flood risk and improve floodplain management across the state, including through maximizing the natural and beneficial functions of the floodplain. The state agencies composing LWI are actively implementing this mission through a holistic approach that includes:

- Improving the way residents and governments understand, address, and respond to flood risk
- Organizing a structure for making decisions and improvements on a regional scale
- Developing the modeling, planning, and data tools needed to inform and support effective watershed-based decisions and projects

In August 2019, the Council agreed to use eight watershed regions as a starting point to coordinate efforts among parishes and distribute project funds.

Following the launch of LWI, the U.S. Department of Housing and Development (HUD) allocated approximately $1.2 billion to Louisiana in Community Development Block Grant Mitigation (CDBG-MIT) funding for the purpose of mitigating current and future flood risk, providing an unprecedented opportunity to enhance and expedite LWI efforts. Guided by a federally approved Action Plan, LWI is utilizing these funds to support statewide planning, watershed modeling, data collection, and flood mitigation projects that reduce flood risk across the state. In administering this grant, the state and its various jurisdictions and political subdivisions are coordinating expenditures and activities throughout LWI to improvement statewide floodplain management.

More information on LWI, including its various programs — many of which are ongoing and supported by the CDBG-MIT funding stream —can be found at https://watershed.la.gov/.

RISK RATING 2.0

From October 2021 through April 2022, FEMA began implementation of Risk Rating 2.0. Through this program, FEMA is updating the National Flood Insurance Program's (NFIP's) risk rating methodology that leverages industry best practices and cutting-edge technology to deliver rates that are actuarily sound, equitable, easier to understand and better reflect a property's flood risk.

FEMA has a statutory responsibility to clearly communicate flood risk. Before 2021, the flood insurance rating methodology had not been updated since the 1970s. Risk Rating 2.0 allows FEMA to calculate premiums more equitably across all policyholders based on the value of their home and individual property's flood risk.

Over the last 50 years, FEMA has collected $60 billion in NFIP premiums but has paid $96 billion in costs (including losses, operating expenses, and interest). Taxpayers and policyholders are adversely impacted when the program does not generate the revenue needed to pay claims. Risk Rating 2.0 will help put the NFIP on solid financial footing by creating a more stable program that is accountable to taxpayers

All NFIP policyholders have been subject to premium increases every year; however, under Risk Rating 2.0, rate increases will not continue indefinitely. FEMA recognizes that under the new pricing plan each policyholder will be affected differently based on their property's individual flood risk. Some premiums will go up, some will go down, and some will stay about the same. Under Risk Rating 2.0, roughly two-thirds of policyholders with older pre-Flood Insurance Rate Map (FIRM) homes will see their premiums decrease. For policyholders whose premiums will be going up, their policies will be transitioned using the existing statutory limits on increases imposed by Congress. In general, that means that the annual increases will be capped at 18%, only increasing until the full risk rate has been reached. Additionally, FEMA will allow existing policyholders to transfer their current discount with the sale of their property.

FEMA launched the program in two phases. Phase 1, launched on October 1, 2021, stipulated that new policies were subject to the new rating methodology. Also beginning in Phase 1, existing policyholders eligible for renewal were able to begin taking advantage of immediate decreases in their premiums. Phase 2, launched on April 1, 2022, stipulated that all remaining policies renewing on or after that date were subject to the new rating methodology.

FEMA continually updates Congress and other key industry partners, state agencies, private sector and organizations to ensure a clear view and understanding of the implementation process of Risk Rating 2.0. Working with the Write Your Own companies, FEMA communicates with policyholders to understand what these changes will mean to them. Risk Rating 2.0 allows FEMA to provide individuals and communities with information to make more informed decisions on purchasing flood insurance, initiating, and informing appropriate mitigation options to help lower flood insurance rates.

committed to **our coast**

Image: Vermilion Bay, 2021 (CPRA)

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FIGURES & MAPS

FIGURES

MAPS

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