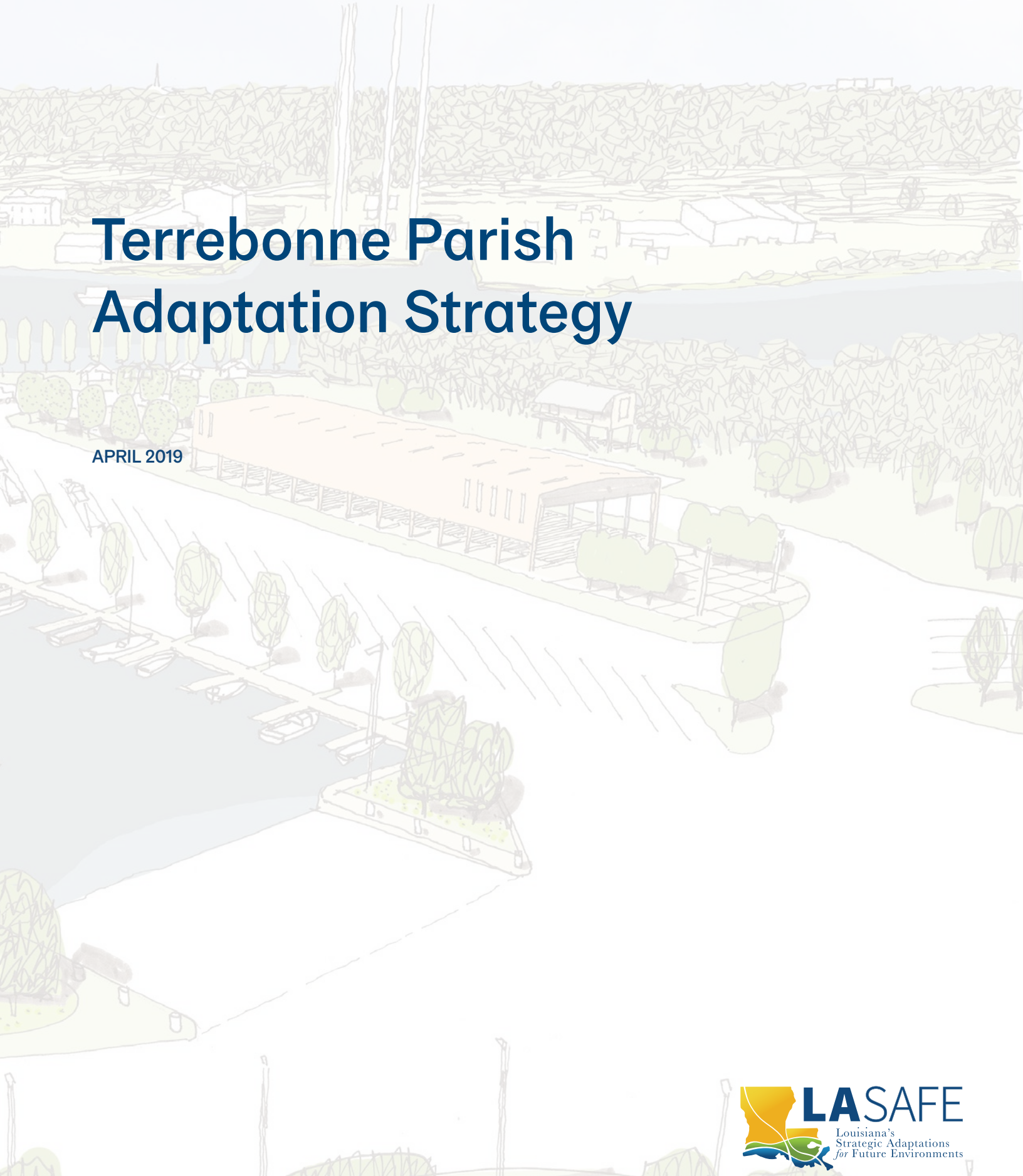
Terrebonne Parish Adaptation Strategy

APRIL 2019



LASAFE
Louisiana's Strategic Adaptations *for* Future Environments

Project Team

Led by the Louisiana Office of Community Development (OCD) and the Foundation for Louisiana (FFL), the multidisciplinary Louisiana's Strategic Adaptations for Future Environments (LA SAFE) team developed strategies in concert with an extensive community engagement campaign to provide an integrated approach in the development of an adaptation strategy for coastal Louisiana.

Funder

U.S. Department of Housing and Urban Development (HUD)

Partners

Louisiana Office of Community Development Disaster Recovery Unit, Lead Partner

Foundation for Louisiana, Partner

Team Members

Center for Planning Excellence, Adaptation Strategy Lead Author, Parish Captain, Outreach and Engagement (St. John the Baptist and Terrebonne Parishes)
Waggonner & Ball, Design Lead, Vision and Adaptation Strategy Development
Concordia, Community Engagement Design Lead, Meeting Results and Analysis, Program and Policy Strategy Development
GCR, Parish Captain, Outreach and Engagement (Jefferson and St. Tammany Parishes)
APTIM, Parish Captain, Outreach and Engagement (Lafourche and Plaquemines Parishes)
Pan American Engineers, Project Management Support Services, Cost Estimating
UNO-CHART, Process Evaluation, Meeting Documentation, Demographic Analysis

Other Partners

Franklin Associates, JCW, NOVAC, Coastal Communities Consulting, Greater New Orleans, Inc., Coalition to Restore Coastal Louisiana, Restore or Retreat, Restore the Mississippi River Delta, National Wildlife Federation, Environmental Defense Fund, Lake Pontchartrain Basin Foundation, Gulf Restoration Network, Bayou Interfaith Shared Community Organizing, Lower 9th Ward Center for Sustainable Engagement & Development, Zion Travelers Cooperative Center

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LA SAFE

Louisiana's Strategic Adaptations *for* Future Environments

LA SAFE MISSION

Working together for community resilience, economic prosperity, and a better quality of life for everyone in Louisiana.

LA SAFE GOALS

1. **To generate parish-wide, community-driven adaptation strategies focused on opportunities for residents and stakeholders to proactively adapt and prepare for anticipated environmental changes over the next 10, 25, and 50 years.**

2. **To implement a catalytic project in each of the six parishes that demonstrates adaptive development practices that conform to current and future flood risks. Furthermore, LA SAFE is intended to identify and support development of resilience-building projects and practices that can serve as models for the entire region.**

3. **To create a statewide adaptation model that enhances long-term sustainability and resilience for all Louisiana parishes.**

LA SAFE is a comprehensive strategy for community **adaptation** and **resilience**, concepts that may have different meanings to different people. For the purposes of this strategy, the following definitions will be used.

Adaptation

the process of modifying behavior to suit changing environmental conditions.

Resilience

the capacity of individuals, communities, and systems to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience.

Executive Summary

The document that follows provides an overview of the LA SAFE program developed in six Louisiana parishes facing increased flood risk associated with environmental changes. It then describes the process and products of the LA SAFE effort in Terrebonne Parish specifically. In addition to a vision for the future of the parish—and the goals, strategies, and actions identified to achieve that vision—these chapters also provide information that describes past, present, and likely future conditions in the parish, as well as an in-depth look at the activities and outputs of the community engagement process that has driven the development and prioritization of recommended adaptation strategies. Additional information on the background, research, analysis, planning process and stakeholder engagement involved in the LA SAFE process can be found in the following chapters, as well as in the **LA SAFE Regional Adaptation Strategy**.

The Terrebonne Parish Adaptation Strategy comprises—

Chapter 1: LA SAFE Program

Provides an overview of the scope of work and adaptation planning objectives designed to support LA SAFE's mission to work together for community resilience, economic prosperity, and a better quality of life for everyone in Louisiana. This chapter includes an in-depth look at the community engagement process that took place over the course of five rounds of meetings conducted in the Terrebonne communities of Houma, Gray, Montegut, and Cocodrie. The resident input collected during this process identified shared concerns and hopes for the future, generated ideas for adaptation strategies, and helped determine priorities to guide planning and investment. Inclusive resident engagement has been and continues to be the driving force of LA SAFE.

Chapter 2: Hazards and Vulnerabilities

Provides detailed descriptions of hazards such as land loss, subsidence, heavy precipitation, and storm surge that contribute to growing flood risk in Terrebonne Parish. Drawing upon Louisiana's Coastal Protection and Restoration Authority (CPRA) storm surge modeling and FEMA floodplain data, this chapter defines characteristics of high-, moderate-, and low-risk flood zones, as well as the impacts of socioeconomic vulnerabilities that amplify risk, such as poverty, aging, rising insurance costs, geographical shifts in population, and a shortage of affordable housing in the parish.

Chapter 3: Existing Conditions

Describes key features of Terrebonne Parish's natural environment and the ways in which topographical features and natural assets have affected early settlement patterns and the subsequent development of housing stock, transportation infrastructure, and economic activity. This chapter also describes the heritage and major cultural traditions and assets found in the parish. To lay groundwork for the vision and strategies detailed in Chapter 4, this chapter summarizes the implications of growing flood risk for the parish's assets in these categories—natural environment, housing, transportation, economy, and culture—as well as describes opportunities for preservation, growth, and investment.

Chapter 4: Vision and Strategies

Presents the vision for high-, moderate- and low-risk zones and strategies for adaptation developed for Terrebonne Parish by residents and community leaders working closely with planning and design experts throughout the LA SAFE engagement process. The strategies address five adaptation goals:

- Manage flooding and subsidence
- Direct growth to low-risk areas
- Improve mobility throughout the parish and region
- Strengthen and diversify local economies
- Protect and promote historic and cultural assets

The strategies presented in this chapter include best practices for stormwater management, inclusive development and revitalization of key corridors in low-risk zones, expansion of transportation choices and implementation of Complete Streets, provision of support for local fisheries, provision of education and job training programs, expansion of access to waterways, and enhancement of community assets for recreational and educational use. Each strategy is supported by actions and steps needed for implementation. Case studies are provided to document demonstrated success of key strategies.

Chapter 5: Realizing the Vision

Describes the six catalytic adaptation projects chosen by residents as priorities to be considered for LA SAFE funding. This chapter also describes the process for developing and evaluating the project proposals. Each project has been designed to demonstrate implementation of adaptation concepts that address the LA SAFE goals established by parish residents, build resilience for the parish, and deliver multiple benefits to the community. The six proposed projects include—

- Bayou La Cache Wetland Park
- Grand Caillou Environmental, Cultural, and Business Center
- Houma Seafood Market and Harbor of Refuge
- Lake Boudreaux Living Mitigation Terraces
- Fishermen and Seafood Cultivation Loan Program
- Buyouts for Permanent Resident Households

Funded Project Descriptions

Buyouts for Permanent Resident Households

The Buyout/Optional Home Owner Assistance for Permanent Resident Households program is a Resilient Housing project that seeks to relocate the relatively few homeowners still living outside of the Morganza to the Gulf Structural Protection System. Areas not protected by the structural protection system are projected to experience very high flood risk. In Terrebonne Parish, most permanent residents living outside of the Morganza to the Gulf Structural Protection System are located on Isle de Jean Charles; the State of Louisiana is in the process of resettling Isle de Jean Charles residents who would like to move to higher, safer ground. The Buyout/Optional Home Owner Assistance for Permanent Resident Households program would provide relocation assistance or deed restrictions that would prohibit the use of the structure as a permanent residence, for the few permanent households located outside of the Morganza to the Gulf Structural Protection System who are not part of the Isle de Jean Charles resettlement program. This program would be reinforced with policies intended to prevent future permanent residential development outside of the Morganza to the Gulf Structural Protection System. Further, the Parish intends to consider adoption of an ordinance that the Parish would not offer National Flood Insurance Program benefits to any new structures outside the Morganza to the Gulf Structural Protection System.

Lake Boudreaux Living Mitigation

The Lake Boudreaux Living Mitigation project is a Resilient Infrastructure and Community Nonstructural Mitigation/Flood Risk Reduction project that will be a model for how certain geographies think through a future with increasing flood risk. This project will operate as one of multiple lines of defense that will work together to protect the people and property of Terrebonne Parish. This project will create over 100,000 linear feet of marsh terraces within the Morganza to the Gulf risk reduction system that will assist in reducing the impacts of storm surge. The terraces also have environmental benefits such as enhancing submerged aquatic vegetation growth, restoring habitats, and trapping suspended sediments generated by wind and wave action.

1 LA SAFE Program

Wetlands in Dulac
One of Terrebonne Parish's natural assets is its coastal saltwater marshes.

Background and Mission

In efforts to plan for a vibrant and sustainable future for our state, addressing growing flood risk will be a primary concern for Louisiana communities. Climate scientists agree that warming temperatures are likely to result in more frequent flooding that occurs with increased intensity. These impacts will be compounded by the effects of human activities that accelerate erosion and subsidence along the coast.

Over the years, Louisiana residents have responded to flood risk in various ways: first, by settling on higher ground along the rivers and bayous, then by building levees, and eventually by restoring wetlands. During the next 50 years, Louisiana is projected to lose more land along its coast than it can rebuild, even if restoration efforts are completed as currently planned.1 As delta land continues to subside and erode, sea level rise is expected to accelerate. With less wetland buffer, the state's coastal regions face increased storm surge and flood risk that will impact families and communities in ways large and small, acute and chronic.

Louisiana communities must develop and implement risk reduction strategies that include mitigation, adaptation, and structural measures. Increasing flood risk is already causing socioeconomic and demographic repercussions. Due to the combined effects of man-made and natural land loss as well as sea level rise, **people are moving from flood-prone areas to higher ground seeking safety. In lower-risk areas to which people are moving, tax bases are growing, but the infrastructure is overburdened.** Communities in areas most at risk are losing population and facing declining median household incomes. These trends are likely to continue as risk increases.

Fifty years from now, high-ground, low-risk areas will be even more scarce. How parishes and municipalities develop this land will influence the region's population capacity, cost of living, economic opportunities, and quality of life. Some of the high-risk areas are where much of the region's economic activity takes place. Planning for the future of these areas where our working coast is located is as important as planning for low-risk areas where populations are expected to grow.

The challenge is greater than coastal restoration. CPRA's projections indicate that land is being lost faster than it can be built.[2] This understanding means that, just as people have done throughout human history, Louisianans must plan to adapt to the changing landscape and environmental conditions.

Hurricane Damage
Levee breach at Wonder Lake during Hurricane Rita.
Photo Credit: FEMA/Greg Henshall

Levee Breach
Wonder Lake levee breach resulting from Hurricane Rita.
Photo Credit: FEMA/Greg Henshall

Building Damage
Downed trees from Hurricane Gustav at H.L. Bourgeois High School.
Photo Credit: FEMA/Jacinta Quesada

Flooding
Flooding in Montegut following Hurricane Rita.
Photo Credit: FEMA/Greg Henshall

An Opportunity for New Solutions

To help address these complex issues in a holistic manner, the National Disaster Resilience Competition (NDRC), sponsored by the U.S. Department of Housing and Urban Development (HUD) and the Rockefeller Foundation, awarded funding for LA SAFE—Louisiana's Strategic Adaptations for Future Environments. The LA SAFE program supported an inclusive public process to identify adaptation strategies and is providing funding for at least one catalytic project in each parish.

The LA SAFE planning process focused on six parishes heavily impacted by Hurricane Isaac in 2012: **Terrebonne, Plaquemines, Lafourche, St. John the Baptist, Jefferson, and St. Tammany**—as well as the region as a whole. Four of the LA SAFE parishes—St. John the Baptist, St. Tammany, Plaquemines, and Jefferson—are eligible to receive investments anywhere in the parish because they meet the HUD's Community Development Block Grant–Disaster Recovery (CDBG–DR) requirements. In Lafourche and Terrebonne Parishes, only certain census tracts meet those requirements. To receive funding, a locale must meet threshold requirements in the three categories of most impacted,

distressed, and unmet recovery needs as a result of a "Qualifying Disaster"—in this case, Hurricane Isaac. Eligible areas in Terrebonne Parish that meet the required threshold include Census Tracts 11, 12.02, 13, and 14.

While ongoing efforts such as the 2017 Coastal Master Plan and the Morganza to the Gulf levee system strive to reduce risk to populations from storm surge flooding via large restoration and protection projects, LA SAFE recognizes that the environmental challenges facing the region cannot be solved by engineering alone. Through policies, programs, and projects, LA SAFE offers a set of community-driven strategies designed to provide a holistic approach to reducing long-term risk and increasing Louisiana's ability to prepare for and recover from disasters and other disruptions.

The adaptation strategies in LA SAFE's regional and parish plans integrate stormwater management, housing and development, transportation, education, economy and jobs, and culture and recreation to provide community benefits that improve quality of life while mitigating flood risk. Through intensive public engagement and technical review processes, the Louisiana Office of Community Development (OCD) has identified at least one catalytic LA SAFE project to receive funding in each parish.

LA SAFE seeks a balance between natural forces and smart growth, where communities learn to adapt to risk by building with nature and living with water.

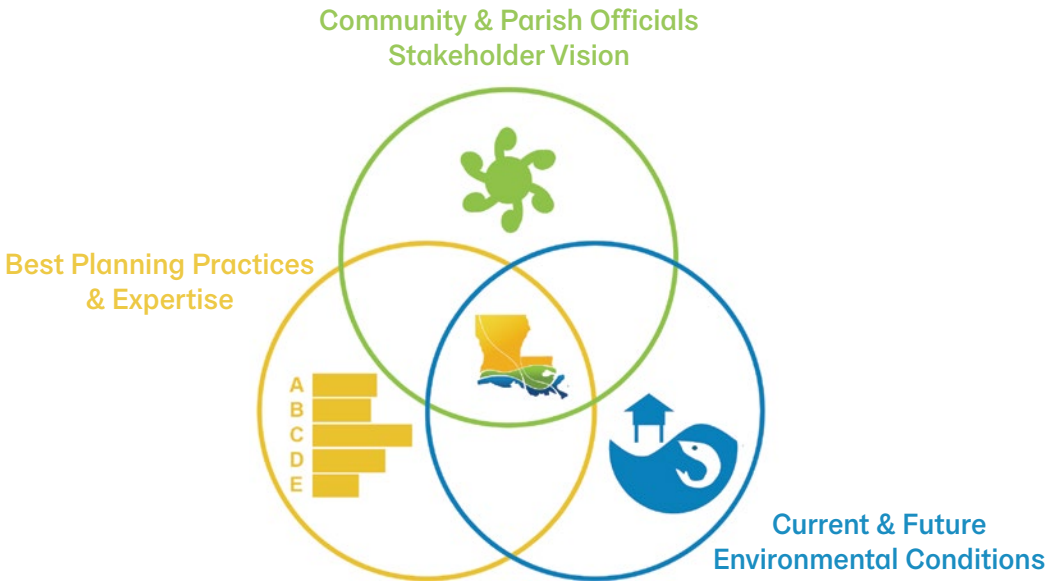
Community-Driven Planning

Community engagement is central to the LA SAFE planning process. **LA SAFE engaged 371 residents and community leaders in Terrebonne Parish over the course of five rounds of meetings.** Meetings were held in Houma, Gray, Montegut, and Cocodrie.

The LA SAFE team worked with these stakeholders to document and evaluate existing conditions in the parish, analyze risk, identify shared goals, and develop a vision for the future. The goals that residents set evolved into policies, programs, and six catalytic projects that address community needs stemming from environmental degradation and increasing flood risk. Specifically, residents established goals and values during the Round 1 meetings, identified areas of opportunity in Round 2 meetings, developed a vision in Round 3 meetings, identified potential projects in Round 4 meetings, and ranked project preferences in Round 5 meetings.

This collaboration was informed from start to finish by the best available data about future environmental conditions, best planning practices, and quality design expertise. The team also worked closely with residents to ensure that the strategies in the plan are closely aligned with the parish's culture and values.

The LA SAFE strategy that follows makes specific recommendations about how Terrebonne Parish might adapt to future conditions. Some of these recommendations come from existing parish plans, some from local stakeholders, and some from the expertise of the team's planners and designers. All have been vetted and prioritized by the parish's residents and community leaders. The recommendations that rose to the top draw from multiple disciplines and provide benefits across categories and risk areas.



Synthesizing Perspectives
Early in the meeting process, LA SAFE presented this framework for decision-making, which seeks the common ground among Community Vision, Current & Future Environmental Conditions, and Best Planning Practices.

Engaging the Community
Left: At Meeting 1, residents comment on sticky notes on changes and challenges they have observed.
Right: A resident at Meeting 5 evaluates one of six catalytic projects.

> **"One thing that stood out was that we need more education for the general public to truly understand the risks to our livelihoods and what it will take to protect our homes, our levees, and our culture."**
>
> **—Terrebonne Parish Resident**

LEAD the Coast

Participants of Foundation for Louisiana's (FFL) LEAD (Leadership, Education, Advocacy, and Development) the Coast program served as table hosts and facilitators during the LA SAFE meetings. As coastal residents themselves, these table hosts had a personal understanding of the issues that impact their fellow community members. The LEAD the Coast Program provided them with additional coastal education and facilitation training. These table hosts helped to connect the LA SAFE project team with issues on the ground throughout the engagement process.

Photo Credit: Foundation for Louisiana

Parish Meeting Activities
At Meeting 1, residents describe the changes they are experiencing.

What Does Change Mean to You?
The first activity, pictured above, asked residents to describe changes and challenges they've seen over the past 50 years. This activity included a map that depicts current and future land loss as well as population shifts that occurred between 2000 and 2010.

Adaptation Goals
The second activity focused on what residents value about Terrebonne Parish and what they see as future goals.

Round 1 Meetings

In the first round of meetings, residents identified challenges, values, and goals that set the course for the rest of the engagement process. To accomplish this, residents participated in two group activities that asked them to describe the changes they have seen, what they value about their community, and what they would like their community to look like in the future.

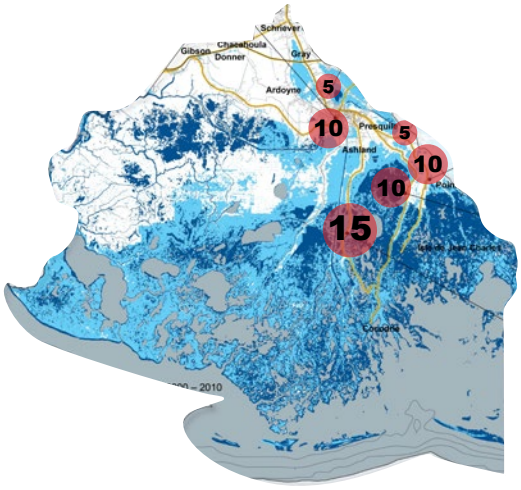
In the first activity, "What Does Change Mean to You?," Terrebonne residents reviewed a map of future flood risk in the parish and described how they have been affected by changes to the environment, economy, and population.

In the second activity, "Adaptation Goals," residents shared their goals and values in categories designated "Community & Culture," "Economy & Jobs," and "Environment & Sustainability." Residents were asked to consider these three categories in the context of the present strengths of the parish and future opportunities. They were asked what they want to preserve in their community and what the future of those things should look like.

Meeting Location Preference

To ensure that the subsequent engagement meetings were held in locations that would be accessible and convenient to the greatest number of people, the residents were asked to suggest towns and potential meeting venues. These are shown to the right on the Activity 1 map. The size and number of the red circles correspond to the number of mentions each town received. Residents advised that Chauvin, Dulac, and Cocodrie be grouped together and Montegut and Pointe-aux-Chenes be grouped together. The Round 2 meeting locations were based on this resident input.

Activity Location Discussion
Residents suggest where Round 2 meetings should be held.



Activity 1 Map
Residents voted on potential Round 2 meeting sites.
Sources: CPRA Land Loss Modeling Data 2017 for a Medium Scenario; For all basemap data see References

"When the Houma navigation canal was cut, it brought saltwater right into our marshes and we immediately started seeing cypress trees dying. You can see it happening everywhere around here."

—Terrebonne Parish Resident, Round 1 Meeting

Round 1 Meeting Outcomes

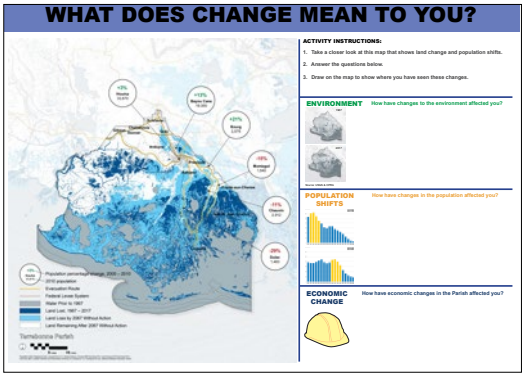
In the first activity, residents described a parish struggling with regular flooding and drainage issues, land loss and erosion, people moving north, loss of businesses and jobs, instability in the seafood industry, and loss of wildlife. Residents also described cultural loss, schools closing, and declining safety due to the shifts stemming from increasing flooding and flood risk. Resident comments were compiled and categorized as challenges.

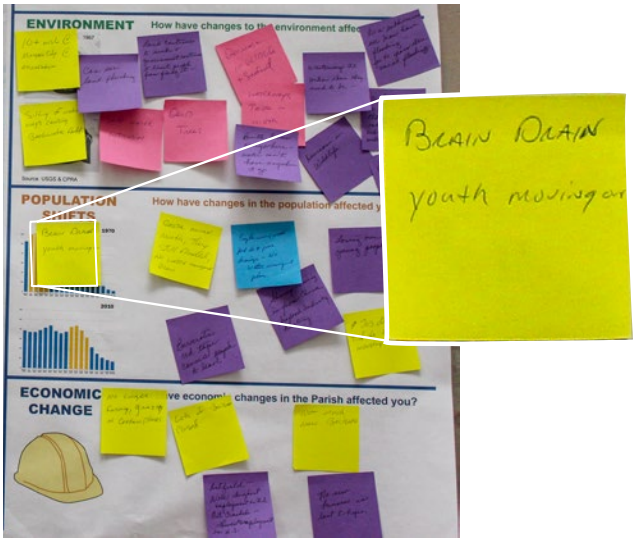
Responses from the second activity described what residents value in the parish and their goals for the future of their community. These were organized as strengths and opportunities, respectively. Among the strengths residents valued were Terrebonne Parish's natural beauty, community traditions, culture, small-town feel, and the quality of life on the bayou.

Among the opportunities most discussed were economic development and diversification, educational improvement, job training, and restoring wetlands. Residents also discussed promoting culture and tourism, expanding recreational youth programs, improving flood prevention and drainage measures, improving transit and evacuation, promoting seafood, and preserving community stability.

"We have a family-supported community. People see that and they come back."

—Terrebonne Parish Resident, Round 1 Meeting





Activity 1: "What Does Change Mean to You?"
Residents described changes and challenges that they've witnessed in the past decades on sticky notes.

Activity 2: "Adaptation Goals"
Residents described what they value in the parish and what their future goals are.

At Meeting 1, **91 residents** wrote **353 responses** to the activity prompts that LA SAFE later organized into challenges, strengths, and opportunities. Resident comments were grouped and evaluated by frequency. The list below summarizes the most-discussed topics at the meeting in order of frequency of mention.

Challenges

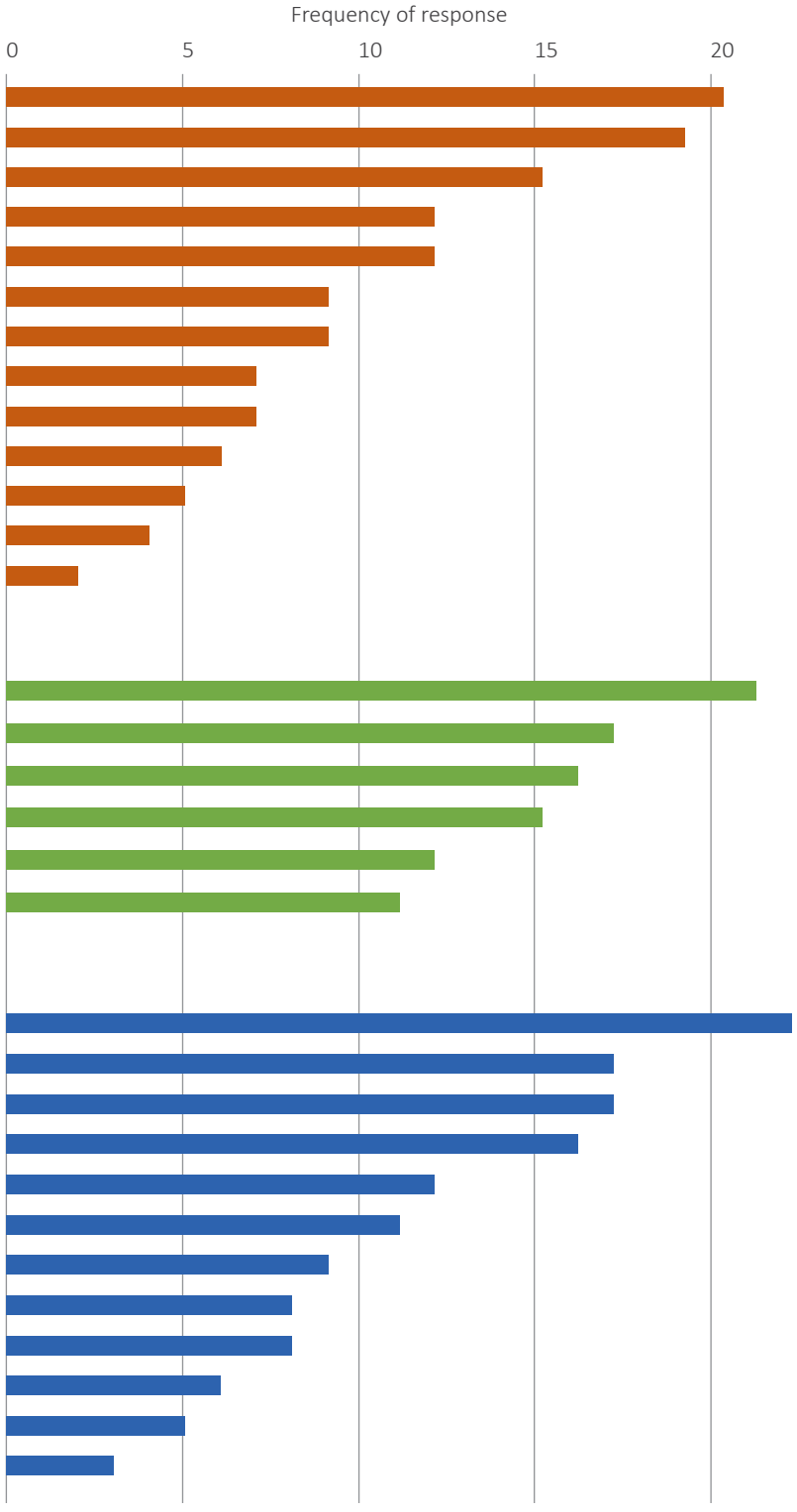
1. Population loss and movement
2. Flooding
3. Loss of business and industry
4. Loss of jobs and income
5. Wildlife movement and death
6. Increasing cost of living
7. Seafood industry instability
8. Schools closing
9. Land loss and erosion
10. Home values declining
11. Cultural loss
12. Declining safety
13. Increased traffic

Strengths

1. Traditions and culture
2. Natural beauty
3. Quality of life
4. Community closeness
5. Fishing and hunting
6. Business and industry

Opportunities

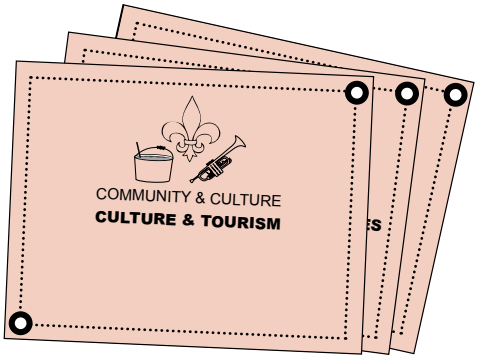
1. Jobs and jobs training
2. Improve education and information sharing
3. Economic development and diversification
4. Coastal protection and restoration
5. Improve regulations and policy
6. Preserve culture and promote tourism
7. Plan and build for future conditions
8. Preserve community stability
9. Recreation and youth programs
10. Promote local seafood
11. Land and water management
12. Transportation



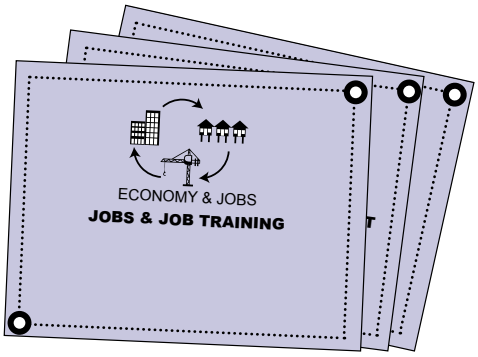
Round 2 Meetings

The second round of LA SAFE meetings in Terrebonne Parish were held in Gray, Montegut, and Cocodrie. Each of these meetings was inclusive of nearby areas and focused on the unique issues particular to these communities.

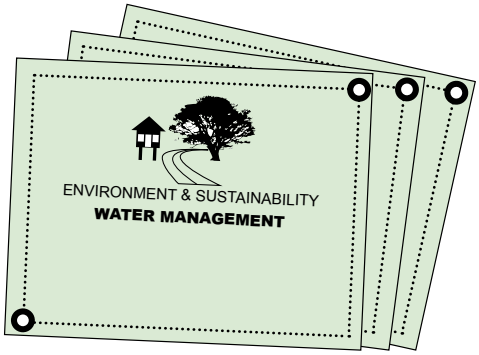
Residents used question cards and maps to describe short-, medium-, and long-term goals for their communities. The question cards reflected the nine major topics that emerged from Meeting 1 across all six parishes. Residents sat in small groups around an elevation map of their community that highlighted future high-ground areas. The top of their table sheet showed land loss and flood risk over time, from 50 years past to 50 years into the future. With these future conditions in mind, residents chose one topic in each of the three categories (see right) that they deemed the most relevant to the future of their community. They were then asked to indicate areas or locations on their map where current issues exist and to propose solutions in the 10-, 25-, and 50-year time frames.



Community & Culture
Culture & Tourism
Youth & Education
Access to Services & Amenities



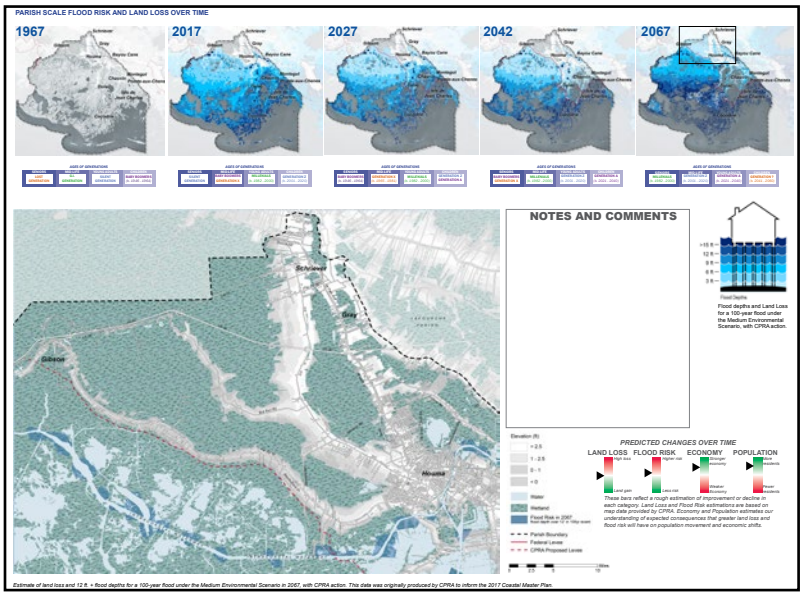
Economy & Jobs
Jobs & Job Training
Local Economic Development
Property Value & Cost of Living



Environment & Sustainability
Water Management
Transportation
Parks & Public Spaces

Table Sheet

Table sheet from the Gray, Gibson, and Schriever meeting.



Round 2

Top: Residents at Round 2 discussing one of the questions. On the right side of the photo, a notetaker captures the conversation.

Left: Residents use their orange marker to show opportunities related to Community and Culture.

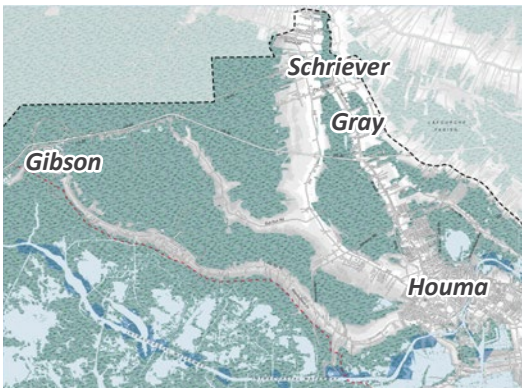
Right: A table sheet on which notes related to Economy & Jobs are written in blue, and Community and Culture are in orange.

"[We need] to design the road so there is a median that holds the water, and then it drains off."

—Terrebonne Parish Resident, Round 2 Meeting

Round 2 Meeting Outcomes

The summaries below describe the most prevalent discussions at each of the three meetings in Round 2. In addition to documenting the conversations, the LA SAFE team collected the notes and comments that residents had written on the maps. Residents in the high-ground areas of the parish recommended economic development and expansion, while residents in higher-risk areas recommended more recreational, cultural, and tourism opportunities.

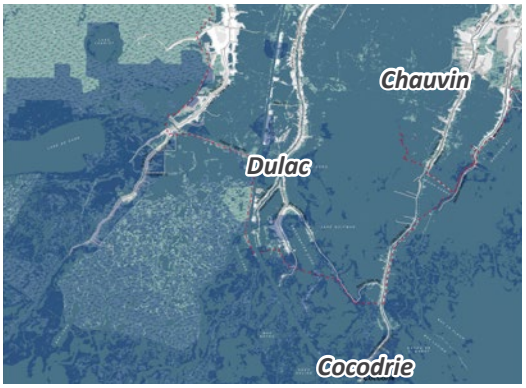


Gray, Gibson, and Schriever

Residents at the Gray meeting envisioned future growth that includes long-term zoning; dense and affordable housing development; walkable neighborhoods; more amenities like groceries, healthcare, and recreation; multimodal transportation; and economic development. Participants recommended promoting local seafood in stores and restaurants and improving the educational pipeline to light manufacturing and coastal restoration jobs. They stressed that stormwater management was the biggest obstacle to achieving this future. Participants cited the need for water retention areas and rain gardens as part of a growth strategy. They proposed new policies to incorporate green infrastructure into subdivision development and called for a regional strategy to regulate stormwater management between parishes.

Montegut and Pointe-aux-Chenes

Residents at the Montegut meeting discussed the relationships among flooding, flood insurance, property values, and the cost of living. They noted that growing risks and rising insurance costs are diminishing property values while driving up the cost of living. Residents recommended many ways to better deal with stormwater, including restoration efforts, levee construction, and drainage maintenance. Many residents asked for more policies and incentives to help them elevate homes, relocate, or lower their flood insurance costs. As some people leave, residents are already observing homes being converted to camps and recreational property. Participants suggested capitalizing on this by adding public boat launches and supporting ecotourism. Residents expressed the need to preserve cultural assets and to teach youth in schools about the Cajun culture and the environment.



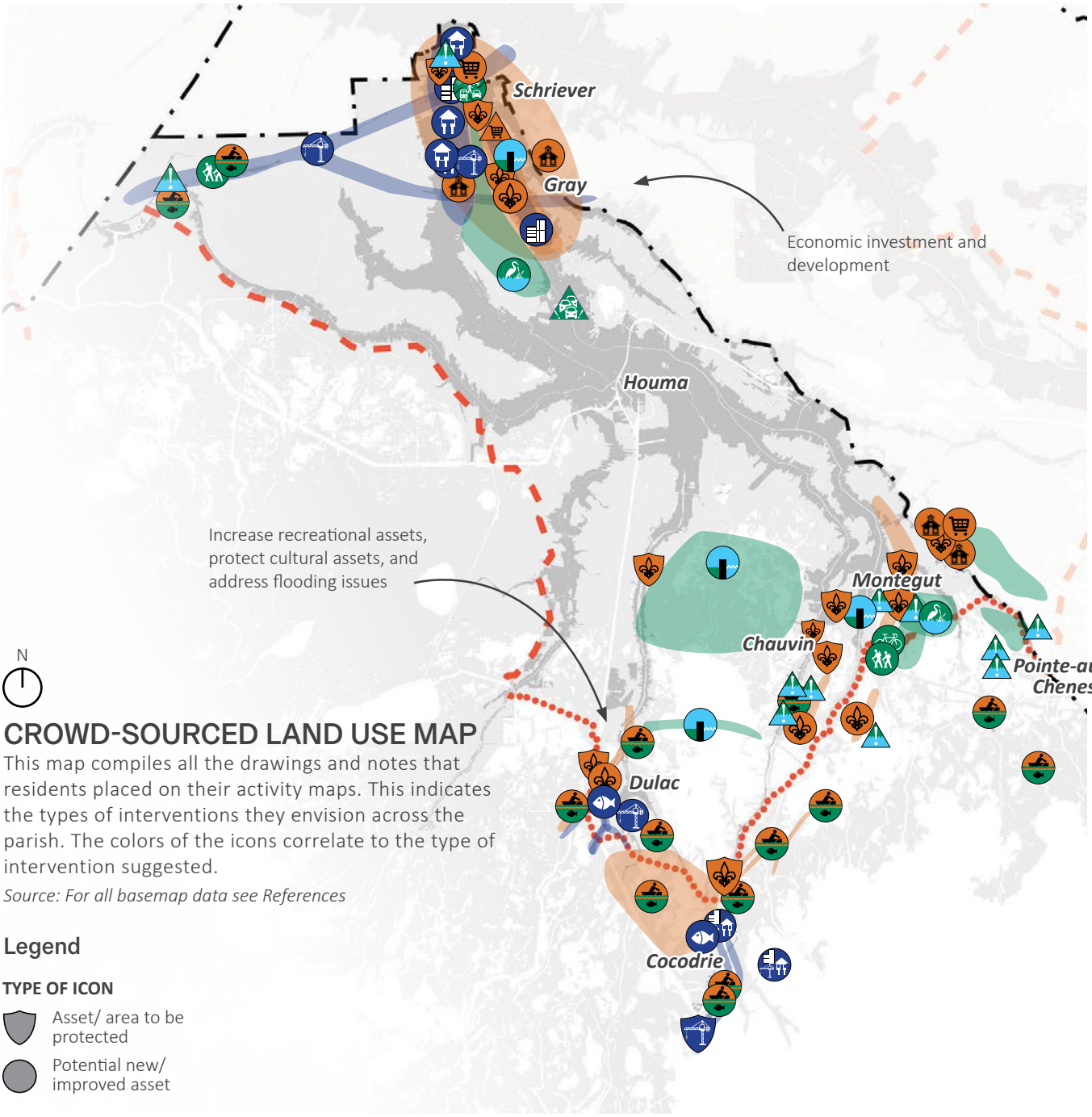
Cocodrie, Chauvin, and Dulac

Residents at the Cocodrie meeting described a future for the area that focused on the oil industry, fishing, camping, and boating. Many residents requested public docks, fishing piers, boardwalks, bike trails, boat rentals, and other water-related amenities. They cited the potential for areas like Dulac to become service hubs to the oil industry. Some residents envisioned a seafood processing center. But in order to realize these opportunities, residents recognize that flood risk must be addressed. Flooding is a chronic issue that many residents combat through home elevation, but the cost of flood and wind insurance is a financial strain. Residents would like to see lower insurance rates, improved pumps and locks, cleaned drains, dredged bayous, floating homes and businesses, and elevated evacuation routes. Some participants advocated for a larger role for Louisiana Universities Marine Consortium (LUMCON) as an educational center and community asset.

Maps of Meeting 2 Locations

Terrebonne Parish Meeting 2 maps show elevation, wetlands, and future land loss to illustrate future areas of high ground.

Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; For all basemap data see References



CROWD-SOURCED LAND USE MAP

This map compiles all the drawings and notes that residents placed on their activity maps. This indicates the types of interventions they envision across the parish. The colors of the icons correlate to the type of intervention suggested.

Source: For all basemap data see References

Legend

TYPE OF ICON

- Asset/ area to be protected
- Potential new/ improved asset

ECONOMY & JOBS

- General Economic Investment
- Industry/Economic Investment
- Housing & Development
- Job Centers
- Seafood Industry

ENVIRONMENT & SUSTAINABILITY

- Parks & Nature Trails
- Bike Trail
- Multimodal Transportation
- Traffic Problem

COMMUNITY & CULTURE

- Cultural Assets
- Schools & Educational Assets
- Groceries & Amenities
- Recreational Fishing & Ecotourism

FLOOD RISK REDUCTION

- Flood Protection
- Rainwater Retention Area/Nature Preserve
- Flooding Problem

Round 3 Meetings

During Round 3, residents completed three activities. The first consisted of a set of polling questions about the strategies LA SAFE should pursue in the parish. Residents responded using clickers, and the results were captured and displayed in real time. For the second activity, residents rated their level of agreement with vision statements for three typological risk levels in the parish. In the third activity, residents responded to program, policy, and project ideas that were based on resident input provided during previous meetings.

The Round 3 meeting was held at the Houma-Terrebonne Civic Center.

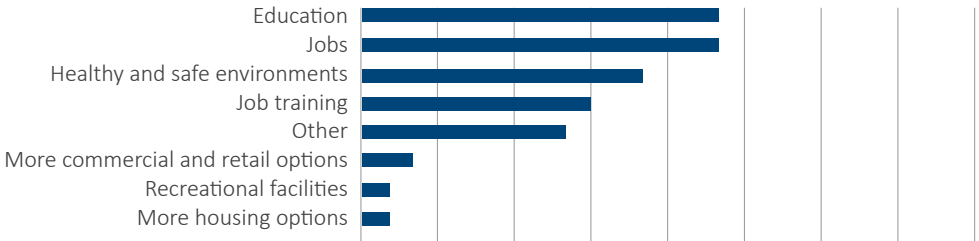
Round 3 Meeting Outcomes

When residents were asked what they believed to be the most important issue for the future of Terrebonne Parish, the majority was split between jobs and education. Nearly 30% of the residents want to see new jobs created around alternative energy. Residents were also asked to rate the importance of improving active transportation facilities like sidewalks, bus routes, and bike lanes within their parish. More than 60% believe it is "very important," and more than 50% believe complete streets need to be the first transportation issue addressed. When asked about stormwater management, more than 40% of residents believe investing in and incentivizing green infrastructure is the most important action the parish should take, followed by investing in pumping and lift stations.

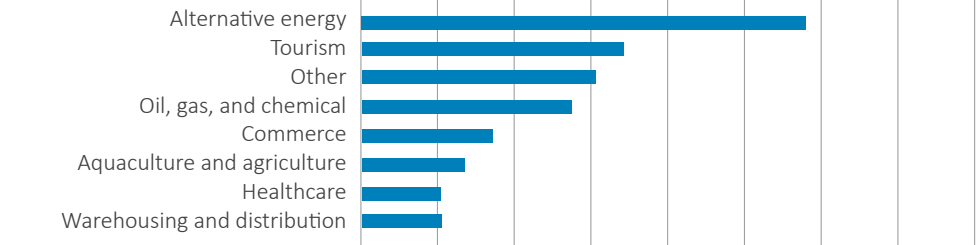
Residents used clickers to respond to instant poll questions.

Activity 1 Responses

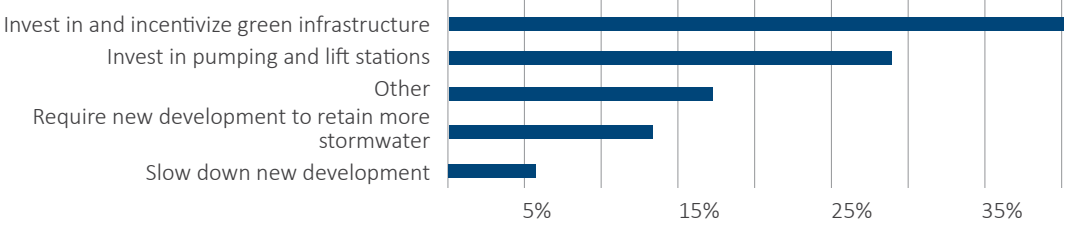
Q6: Which types of job opportunities would you like to see expanded in your parish?



Q7: What is the most important issue for the future of Terrebonne Parish?



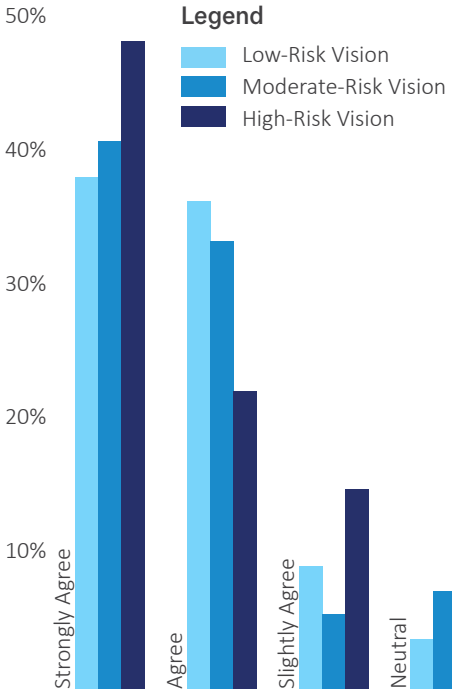
Q8: What is the most important action Terrebonne Parish should take to improve stormwater management?



In the second activity, the LA SAFE team presented a vision for the parish based on resident input received at previous meetings along with data illustrating future flood risk. The vision that the team presented was organized into five planning categories and three risk levels: high-risk, moderate-risk, and low-risk. Residents evaluated the vision for each risk level using their clickers. More than 80% strongly agreed, agreed, or slightly agreed with the vision for each risk level. These vision drawings and the text displayed at the meeting are shown on the right.

More than 80% of Meeting 3 participants agreed with the visions presented at each risk level.

Activity 2 Responses



Visions Presented at Round 3

The images below are the PowerPoint slides and description summaries of the visions that residents responded to using their clickers.

Low-Risk Vision

What we expect over 50 years:
Minimal flood risk
Economic growth
Population increase

Vision
Denser residential and commercial development, increased transportation options, improved stormwater management, and more green space.

Moderate-Risk Vision

What we expect over 50 years:
Land loss in surrounding areas | Moderate local flood risk
Not much change in population

Vision
Protected harbors, clustered elevated housing and amenities, recreational spaces, elevated evacuation routes, and increased transportation options.

High-Risk Vision

What we expect over 50 years:
Land loss | High flood risk | Decline in population

Vision
Expand recreational and ecotourism industries, elevated evacuation routes, and improved infrastructure to support the seafood industry and coastal workers.

Meeting 3 Activity
Residents choose strategies they like and dislike.

Activity 3 focused on the range of projects, programs and policies that LA SAFE could implement. Each table group evaluated 16 – 20 strategies within three of the five planning categories. Residents discussed the strategies shown and used green and red stickers to identify strategies they liked and disliked.

The list to the right shows the highest-rated strategies from each planning category organized within subcategories. Strategies within each subcategory are listed by popularity. Strategies that received scores above average are represented by darker colors and are listed below each subcategory. Less popular strategies are represented in the lighter color and are not individually listed.

The results from this activity illustrate the strategies that most interested Terrebonne Parish meeting participants. After the meeting, the LA SAFE team used these results to begin forming projects, programs, and policies that honor resident preferences.

Top Strategies from Activity Three

The following categories emerged as a result of resident feedback from Meetings 1 and 2 and were introduced as an organizational framework in Meeting 3.

STORMWATER MANAGEMENT

Drainage Improvements

- Cross-parish stormwater management strategy
- Culvert/ditch maintenance
- Improved parish drainage system
- Programs for citizens to assist with canal maintenance and tree planting
- Create a full-time drain maintenance department
- Dredge canals, drains, and culverts

Green Development

- Encourage native planting
- Community gardens and planting programs
- Parks designed to temporarily hold stormwater
- Pervious paving

Green Streets

HOUSING AND DEVELOPMENT

Home Elevation

- Homeowner tax credit for elevating homes
- Policies to encourage resilient, elevated housing development
- Raised and protected neighborhoods

Denser Development

- Increased affordable housing options
- High-density, mixed-use zoning along target corridors

Town Square Development

- Walkable, commercial town center

Community Spaces

- Community gathering and market spaces
- Farmers' and seafood market

Floating homes and businesses

- Houseboats as residences
- Floating services/businesses

Remove Blight

- Program to restore abandoned property to natural condition

TRANSPORTATION

Public and Commercial Transportation
- Expand and coordinate bus transportation
- Improve public transportation across parish lines
- Commuter and regional rail
- Regional bus terminal

Build Infrastructure
- Update and build Bridges
- Complete current roadway construction
- Elevate key transportation and evacuation routes
- Improve street lights on major corridors

Biking and Walking Paths
- Complete Streets

EDUCATION, ECONOMY, AND JOBS

Increase Tourism
- Ecotourism jobs

Create Jobs
- Incentivize essential service providers
- Job opportunities in renewable energy

Support Commercial Fishing
- Local financial assistance and loans for fishers
- Commercial fishing

Job Training
- Coastal restoration construction jobs and training
- Job training programs

Improve Education
- Create parish-specific curriculum in schools

CULTURE AND RECREATION

Youth Activities
- Summer camp restoration programs
- Support culturally focused camps and after school programs
- Hands-on environmental curriculum and field trips

Outdoor Recreation
- Outdoor spaces for large community events

Water-Based Recreation
- Swimming destinations
- Water-based recreation
- Recreational destinations with access to water

Recreational Boat Launches, Boat Docks
- Public boat docks
- Public boat launches

Historic Preservation
- Preserve American Indian sites

"Right now, Terrebonne has very restrictive drainage standards. But our neighbors up the street don't have them, so we get all the water."

—Terrebonne Parish Resident, Round 3 Meeting

Round 4 Meetings

The purpose of the Round 4 meetings was to introduce and collect input on the draft vision statements and example adaptation strategies that were developed based on previous community input. Responses to these materials would then be used to refine the multitude of recommendations from the Round 3 meeting into six final project proposals to be presented in Round 5.

For the Round 4 meetings, the LA SAFE team used different engagement formats— roundtable discussions with parish officials, stakeholders, and business leaders and participation in a local festival. These events provided opportunities for the LA SAFE team to receive feedback on the vision statements and possible adaptation strategies from parish staff, business leaders, residents, and other stakeholders.

Roundtable Discussions

At the roundtable discussions, attendees reviewed and responded to the LA SAFE vision for Terrebonne Parish created through public input as well as different types of adaptation strategies—which includes projects, programs, and policies—that can support community goals and existing plans. Participants reviewed several example strategies, discussing them in small groups. The discussions helped the LA SAFE team ascertain which strategies are supported by the greatest number of stakeholders as well as identify potential hurdles that the strategies could face. The roundtable discussions also allowed the attendees to see how LA SAFE investments could align with existing efforts.

Parish Staff and Stakeholders Roundtable

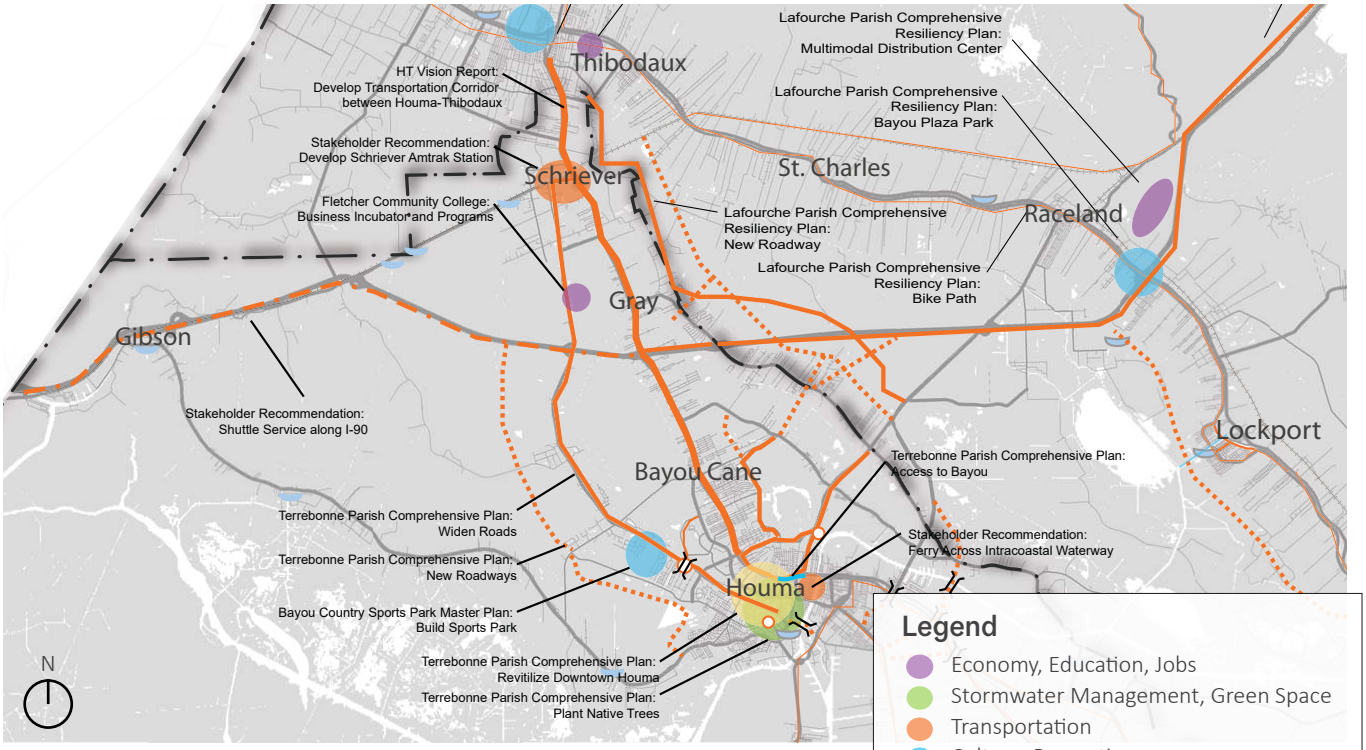
On Thursday, Sept. 29, 2017, the LA SAFE team met with parish government leaders and staff as well as representatives of the Terrebonne Economic Development Authority and the Terrebonne Levee and Conservation District.

Business Roundtable

On Wednesday, Nov. 1, 2017, the LA SAFE team met with stakeholders representing the Houma-Terrebonne Economic Development Authority, the Terrebonne Chamber of Commerce, regional business associations, and local businesses from the seafood, banking, real estate, insurance, oil and gas, and medical industries.

Round 4 Roundtable
Parish officials at the roundtable discussion.

"We need to diversify [the economy] badly! Can't rely on good times when oil and gas is good."
—Rougarou Fest Survey Respondent



EXISTING EFFORTS MAP

The LA SAFE team researched and compiled recommended projects from all of the recent Terrebonne Parish plans. This exercise revealed the existing efforts already underway. LA SAFE can leverage existing projects, avoid duplication, and narrow down the most effective interventions.

Sources: For all basemap data see References

Rougarou Fest Tent

The same project updates that the round table attendees received were shared with community members at the Rougarou Fest on Saturday, Oct. 27, 2017, where LA SAFE hosted an informational tent and surveyed residents for additional input. LA SAFE background information, the LA SAFE vision for Terrebonne Parish, and six example strategies were printed on large posters. Handouts with the same information were also available for attendees. LA SAFE team members were available to answer questions and to help guide people through the information.

Rougarou Fest Tent
LA SAFE tent at Rougarou Fest.

"Providing fishermen with alternate employment options is essential in case of another major oil spill and overfishing."
—Rougarou Fest Survey Respondent

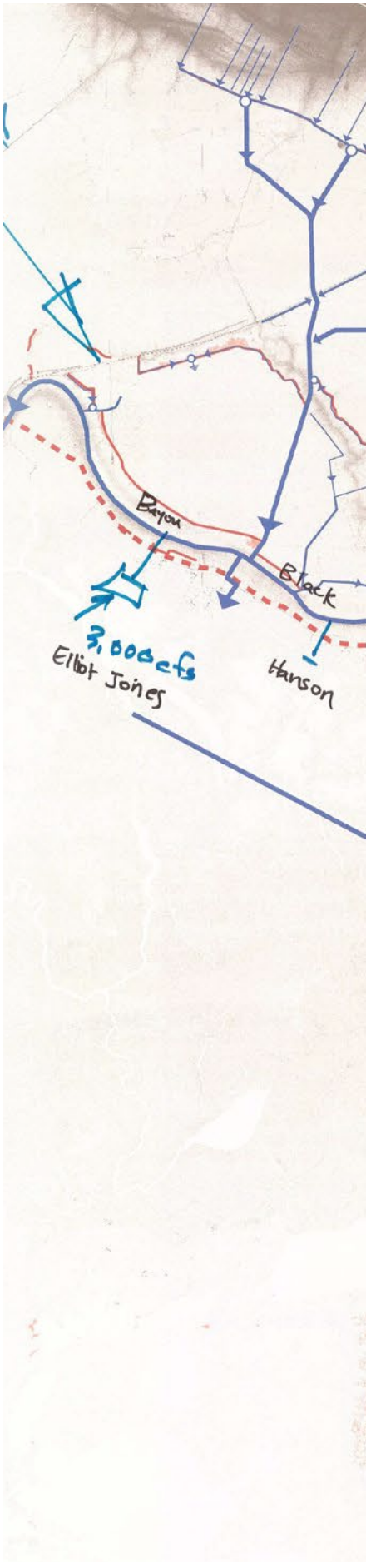
Round 4 Meeting Outcomes

Festival attendees who visited the LA SAFE tent were asked to fill out surveys on the vision and the example strategy ideas. Surveys included questions asking respondents to circle the answer that best matched their opinion on each item on a scale from "Strongly Disagree" to "Strongly Agree," and also included space to write in any comments. Forty-three respondents filled out surveys at the Rougarou Fest; "Support Local Fisheries" was the strategy with the most "Strongly Agree" survey responses at this venue.

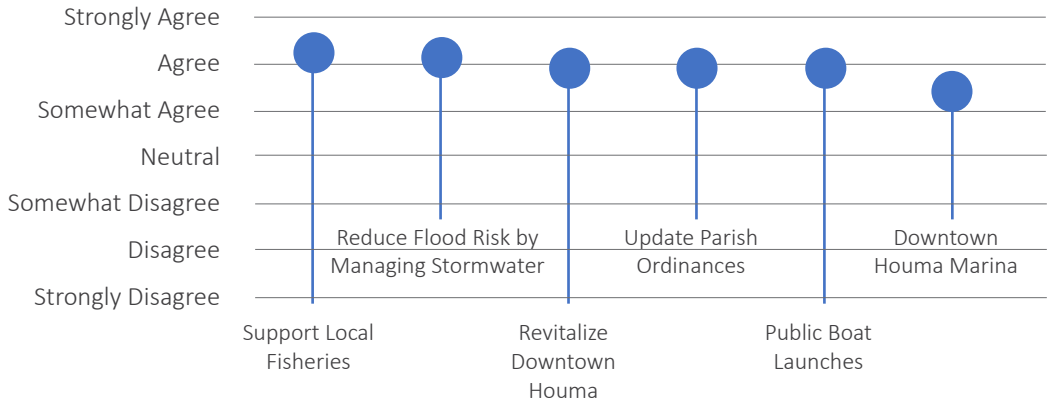
The example strategies for which participants expressed the most support were the stormwater management strategy and public boat launch improvements. The example strategies that attendees identified as having the most opportunity for alignment with current plans were a regional stormwater management strategy, skilled workforce and job training, and continued revitalization of downtown Houma.

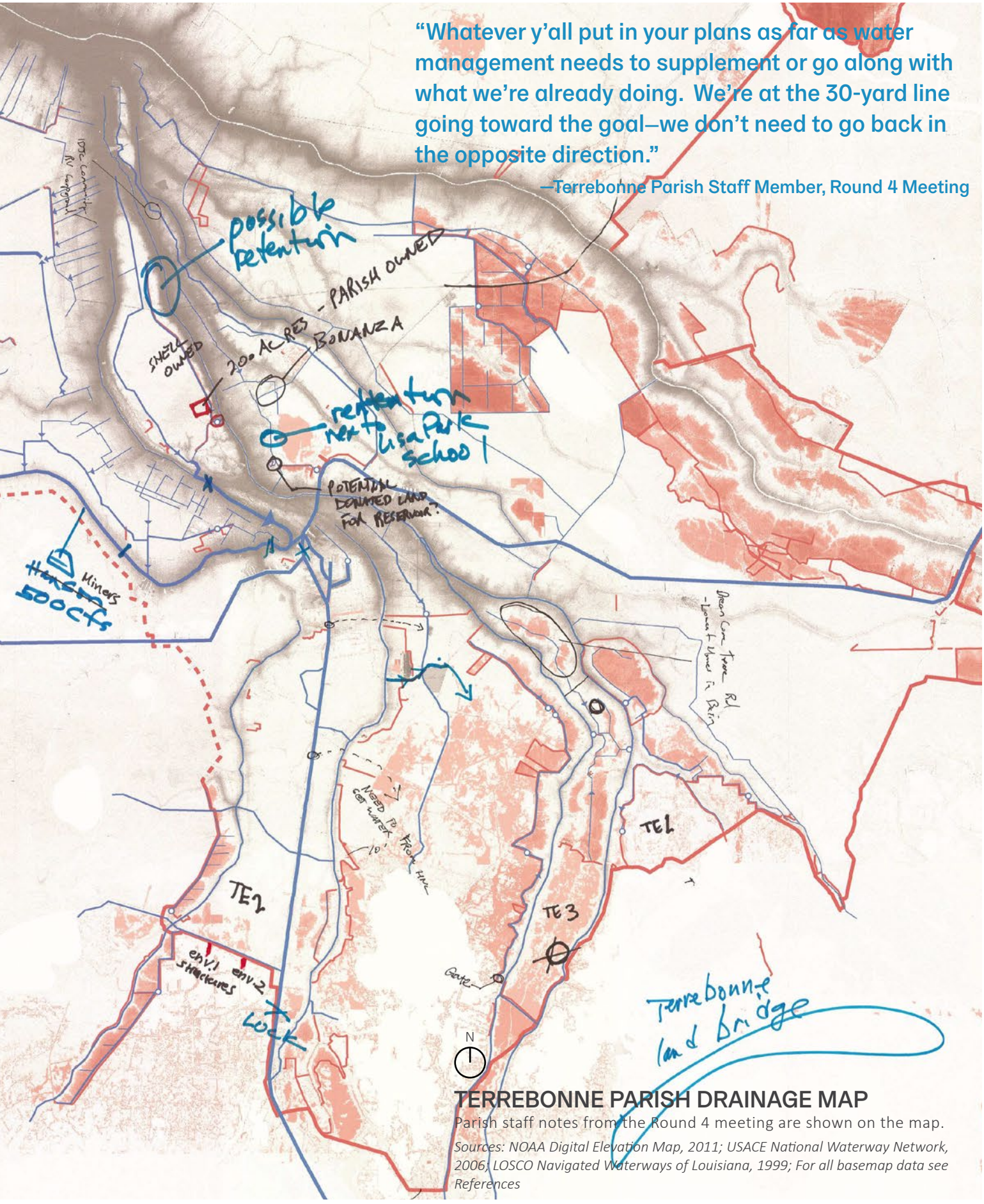
In the roundtable discussions, parish staff and stakeholders identified potential hurdles to the proposed strategies, such as regulations preventing marine fuel sales near downtown Houma and possible competition between a new farmers' and seafood market and existing markets. At the business roundtable, major hurdles identified included a need to expand capacity to manage public boat launches and possible competition between a new farmers' and seafood market and existing markets.

Participants added their knowledge about the drainage systems to a map (right) and identified possible locations for intervention. Participants also discussed how to incentivize different types of development and regional stormwater management that are allowed by current regulations but not being implemented, and making sure that the increased value and safety of elevated homes are taken into account by real estate appraisers.



Average Level of Agreement at the Roundtable Meeting





"Whatever y'all put in your plans as far as water management needs to supplement or go along with what we're already doing. We're at the 30-yard line going toward the goal—we don't need to go back in the opposite direction."

—Terrebonne Parish Staff Member, Round 4 Meeting

TERREBONNE PARISH DRAINAGE MAP

Parish staff notes from the Round 4 meeting are shown on the map.

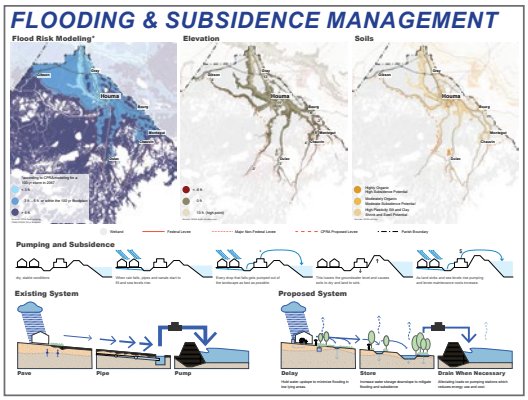
Sources: NOAA Digital Elevation Map, 2011; USACE National Waterway Network, 2006; LOSCO Navigated Waterways of Louisiana, 1999; For all basemap data see References

Round 5 Meetings

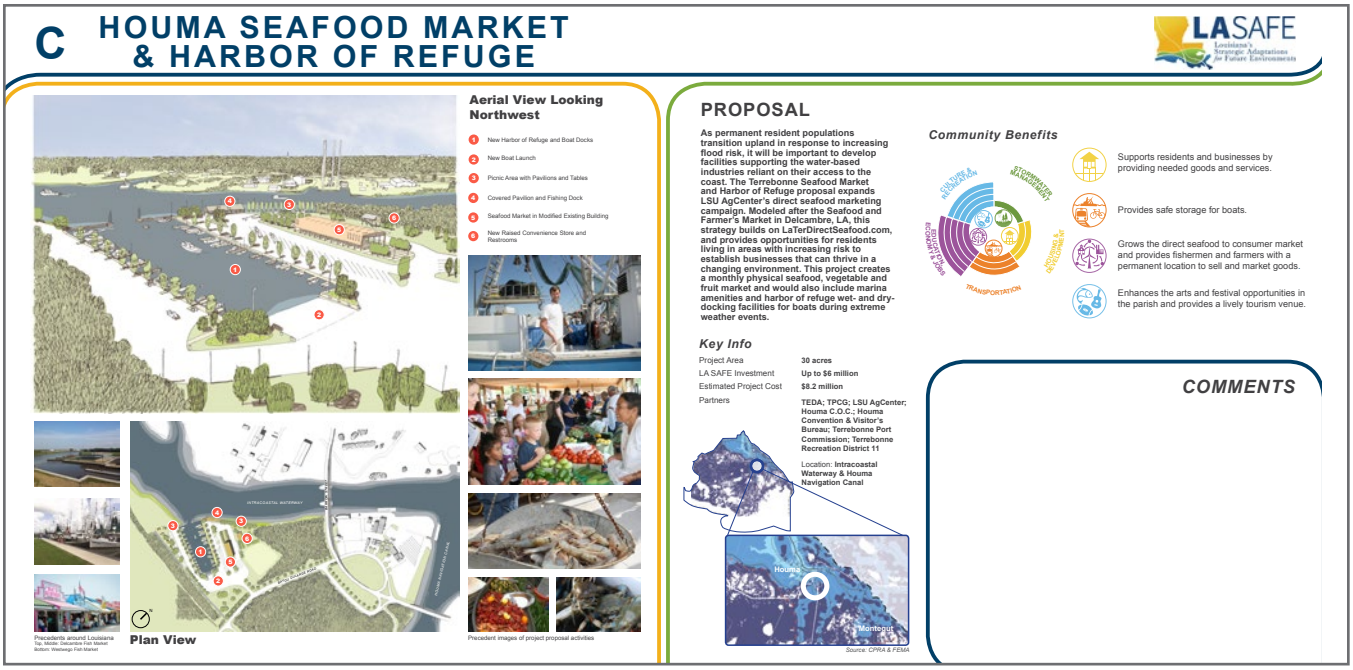
In the final round of Terrebonne Parish meetings, residents gathered on Dec. 6, 2017 at the Houma-Terrebonne Civic Center to evaluate the culmination of planning work that took place during the year. Informational and project boards and a video loop summarized the results from previous meetings, presented flooding and land loss information, and proposed a future vision for the parish that included physical interventions and policy recommendations. An additional meeting for Vietnamese- and Khmer-speaking residents was held on Dec. 20. Residents who speak these languages and live in Jefferson, Lafourche, and Plaquemines Parishes were also invited.

The central purpose of the meeting was for residents to evaluate and rank six catalytic projects that were developed in response to resident input collected during the previous four rounds of meetings. Each project is designed to provide multiple community benefits and support long-term sustainability. The project boards provided detailed descriptions, concept drawings, and example images along with information on the estimated cost, location, area, and potential partners to give residents an idea of what implementation of each project would entail. Terrebonne Parish residents commented on each project and participated in a poll to rank their preferences.

The Round 5 meeting was held at the Houma-Terrebonne Civic Center.



The flooding and subsidence board shown at the meeting. This board was one of 12 informational boards that communicated the process and goals of LA SAFE.

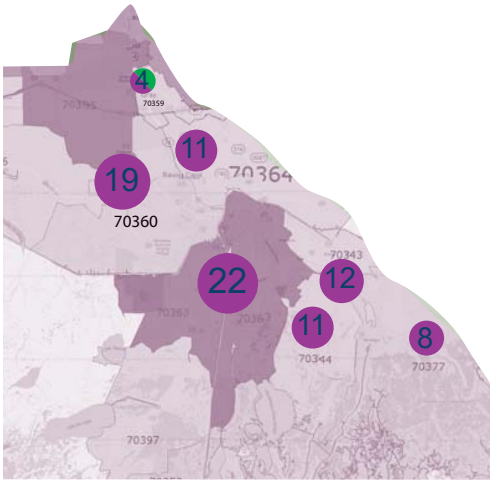


One of the six project boards shown at the meeting. All six projects are described in detail in Chapter 5.

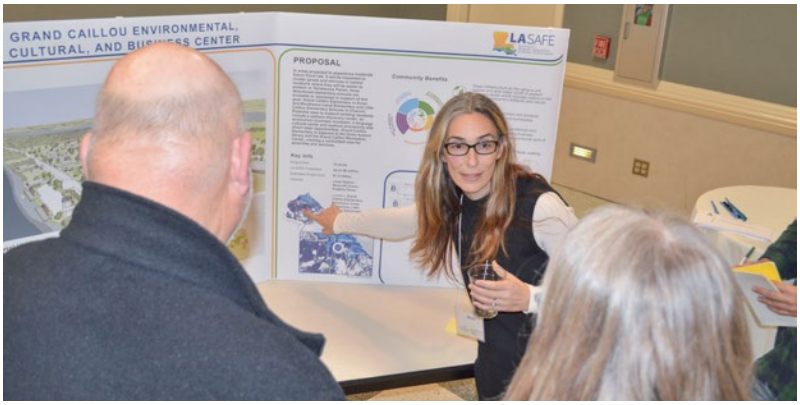
Polling Process

At the meeting, residents were given six tokens: two gold tokens worth two points each, two green tokens worth one point each, and two blue tokens worth no points. Residents were instructed to place one token in each of six tubes that represented the six projects. At the end of the night, paper covers were removed from the tubes, revealing their contents. The color composition of each tube indicated the relative popularity of each of the projects, with gold being most popular and blue least popular. After the reveal, all points were counted. A board at the polling station explained how the public preference polling contributes to the larger selection criteria.

Knowing that some geographic bias was inevitable, LA SAFE also promoted an online version of the poll for three weeks following the Houma meeting. In all, 116 Terrebonne Parish residents from around the parish cast their preferences.

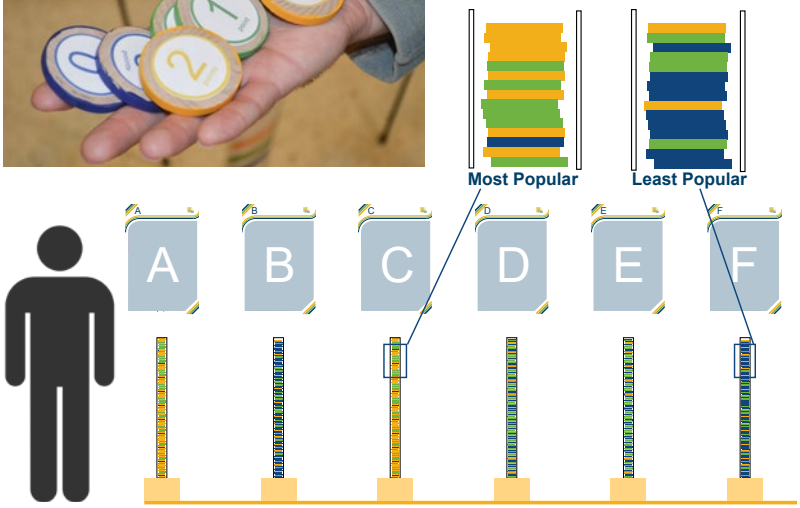


Participation Across the Parish
The map shows the geographic distribution of meeting attendees and online poll participants. The circle size and number correspond to number of participants from each zip code.



An LA SAFE team member describes one of the six catalytic projects.

Preference tokens at the meeting.



LA SAFE team unveils the results at the Houma meeting.

Round 5 Meeting Outcomes

Below is a summary of each of the six catalytic projects meeting participants were invited to review.
See the full project proposals in Chapter 5.

A: BAYOU LA CACHE WETLAND PARK

Terrebonne Parish residents appreciated that this project provides public access to Bayou La Cache, giving them an opportunity to observe and learn about the natural systems of the bayou, while simultaneously allowing for active recreation in the area. There were four suggestions for improvements regarding the cost and safety of the plan.

B: GRAND CAILLOU ENVIRONMENTAL, CULTURAL, AND BUSINESS CENTER

Many stakeholders liked that this project would repurpose existing buildings and includes cultural and educational components. Despite stormwater management components, some residents were concerned about future flooding.

C: HOUMA SEAFOOD MARKET AND HARBOR OF REFUGE

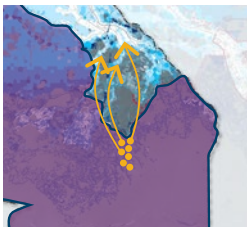
Parish residents liked that this proposal serves multiple functions. It provides opportunities for residents to purchase fresh and healthy food, creates jobs, and boosts tourism in the area. On top of the community appeal, it allows for fishermen to bring their boats to a safe area during storms. There was concern over the location of the harbor; it may be underutilized due to its proximity to the coast.

D: LAKE BOUDREAUX LIVING MITIGATION TERRACES

Stakeholders viewed this proposal as an effective way to combat storm surge and restore marshland in the area. They particularly liked that it could be implemented quickly and have an immediate impact on their community. There were questions surrounding public access and recreation, and ideas like improved access for boating and boardwalks were suggested.

E: FISHER AND SEAFOOD CULTIVATION LOAN PROGRAM

Assistance to local historic industries like crawfish and rice farming and the seafood industry was well-received in this proposal. It allows for Terrebonne Parish farmers and fishers to adapt to changing landscapes and keep up in a shifting economy. There was apprehension that money may be wasted and that the assistance program could be abused by non-commercial fishermen; assuring fairness and flexibility was a main concern.

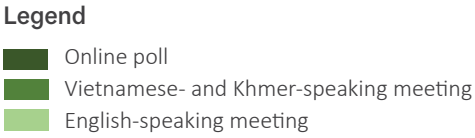


F: BUYOUTS FOR PERMANENT RESIDENT HOUSEHOLDS

Residents liked that the proposal provided an option to take a buyout if and when they decide to move. However, some stakeholders felt that the proposal did not do enough to bolster the communities of southern Louisiana in that it may be too much to ask of people to move away.

Poll Results

The poll results from the meeting, shown below, directly impacted the catalytic project selection process, weighted at 20% in the overall selection score. Terrebonne Parish residents most preferred the Lake Boudreaux Living Mitigation Terraces project, followed by the Bayou La Cache Wetlands Park.



"I love the combination of recreational use, ecological, and educational use."

"It uses an existing building, has [an] educational component, and utilizes recreational area which is really needed in our area."

"I think this is fantastic! Great connection between community, resources, and industry. I have seen this having great positive impact in other coastal cities."

"Is public access allowed? If it's private land, will they be banned from future development or mineral access?"

"Yes! Local people who rely on sustainable natural resource harvest should not face the economic brunt of coastal degradation and commercial exploitation."

"I like this proposal because it allows residents an outlet of hope which many feel they don't have in moving to safer areas. "

—Terrebonne Parish resident comments on the catalytic projects

2 Hazards and Vulnerabilities

Saltwater Intrusion
As saltwater pushes farther into brackish and freshwater marshes, it causes the deterioration of the marsh habitat.

N

RESIDENT OBSERVATIONS

Resident observations from Round 2 of community meetings, held in Gray, Montegut, and Cocodrie in Terrebonne Parish.

Source: For all basemap data see References

Due to its geographic location, Terrebonne Parish is susceptible to the impacts of tropical storms and relative sea level rise. Effects of these two significant hazards include storm surge, heavy precipitation, land loss, sea level rise, and subsidence, all of which are connected and have a collective impact that increases flood risk and coastal erosion in Terrebonne Parish.

Asset

Things such as buildings and infrastructure, natural features, cultural artifacts and traditions, knowledge, social bonds, systems and networks—whether tangible or intangible—that are deemed to be of value to an individual, organization, or community.

Risk

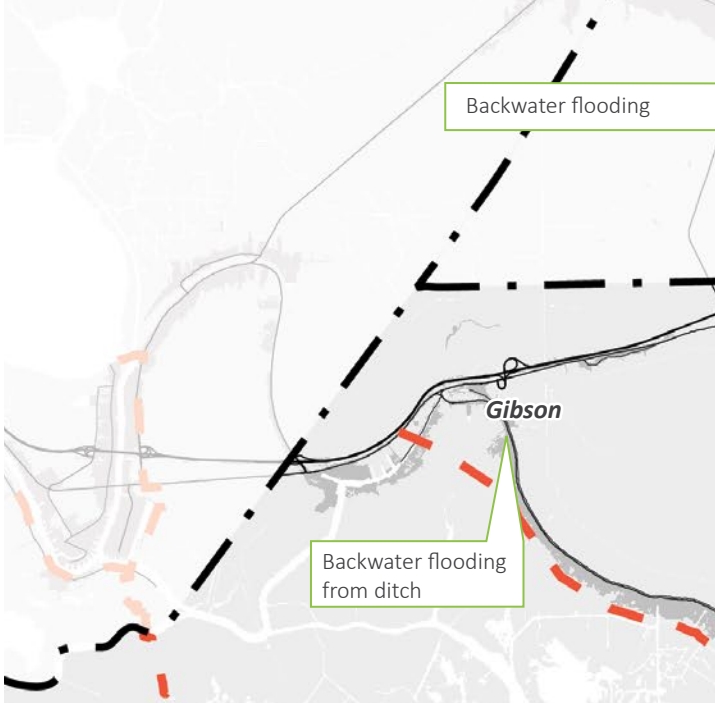
Exposure to the possibility of experiencing negative consequences that may arise when hazards interact with vulnerable people, property, areas, or environments.

Hazard

Any substance, phenomenon, or situation that has the potential to cause disruption or damage to people, their property, their services, and/or their environment.

Vulnerability

Constraints of an economic, social, physical, or geographic nature that increase exposure to risk and/ or reduce the ability to prepare for and cope with the impacts of disasters and disruptions.



Legend

Land

Wetlands

Water

Non-Federal Levee (Morganza to the Gulf)

CPRA Proposed Levee (Morganza to the Gulf)

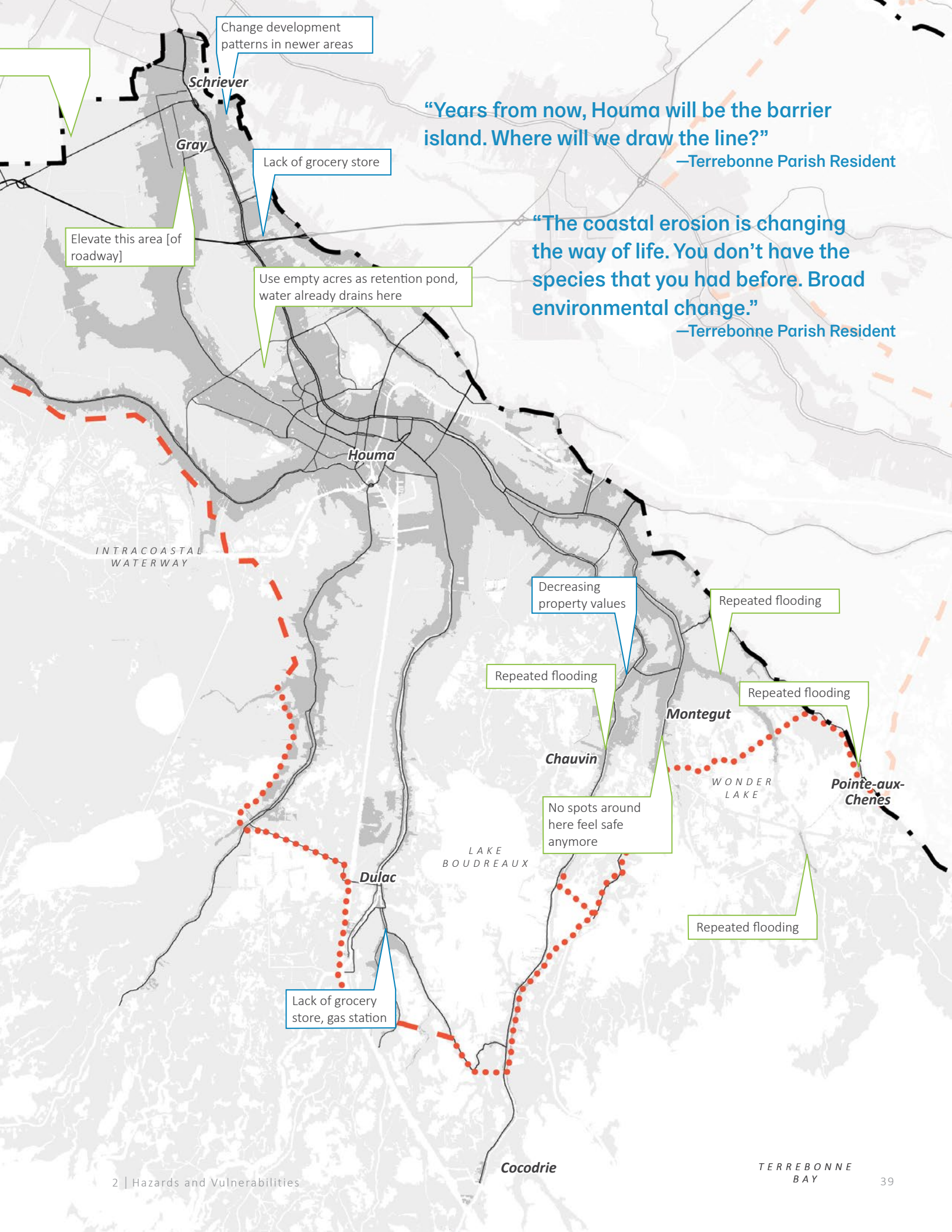
Parish Boundary

Environment & Sustainability

Resident Observation

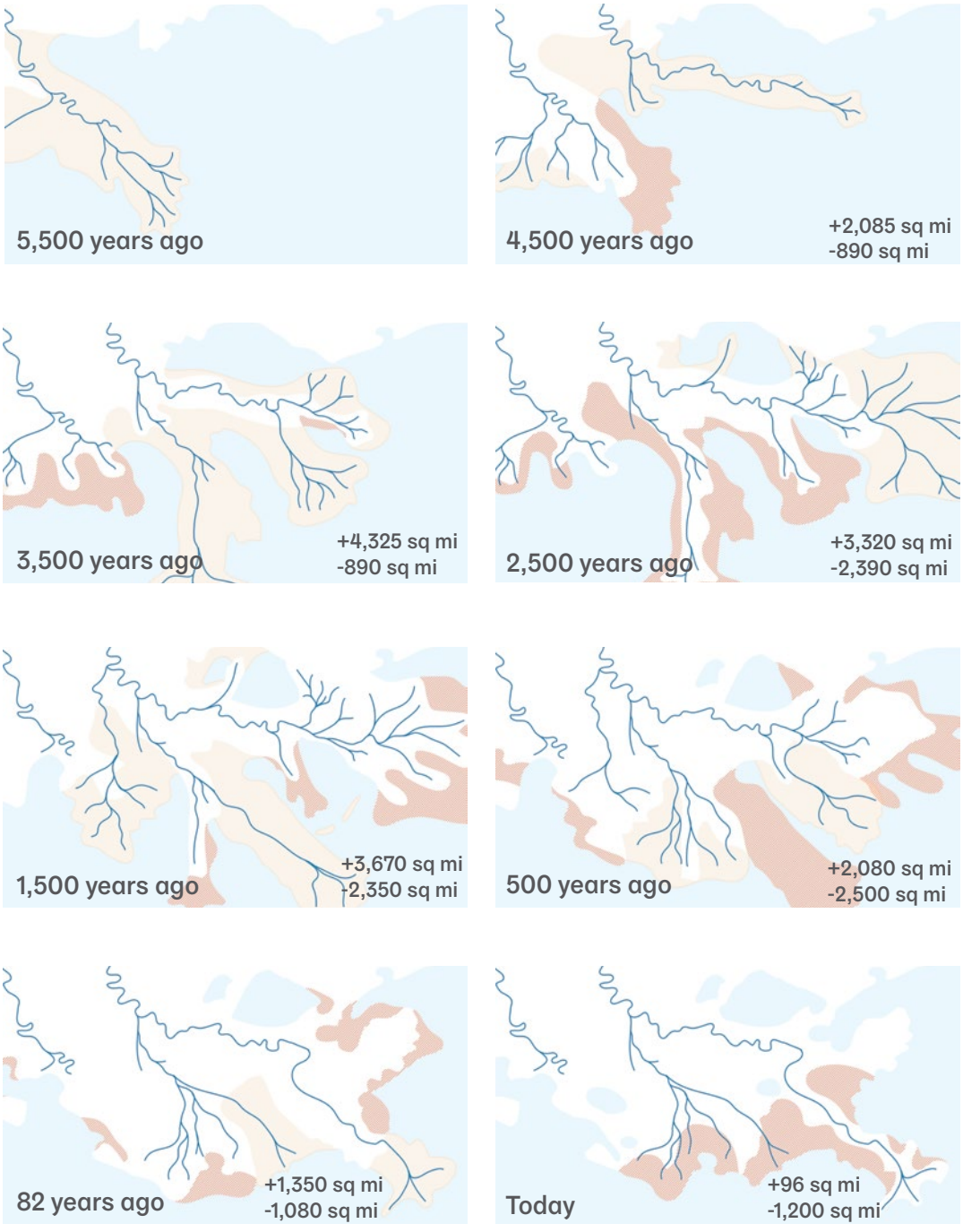
Economy, Community, & Culture

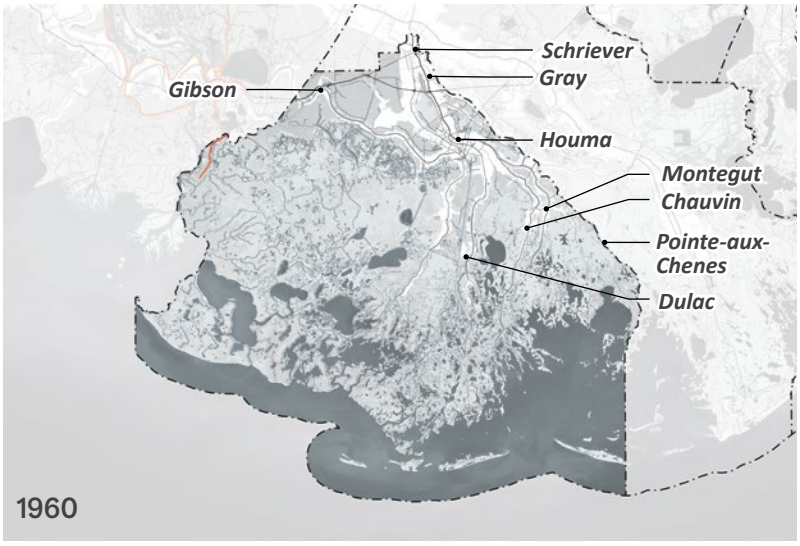
Resident Observation

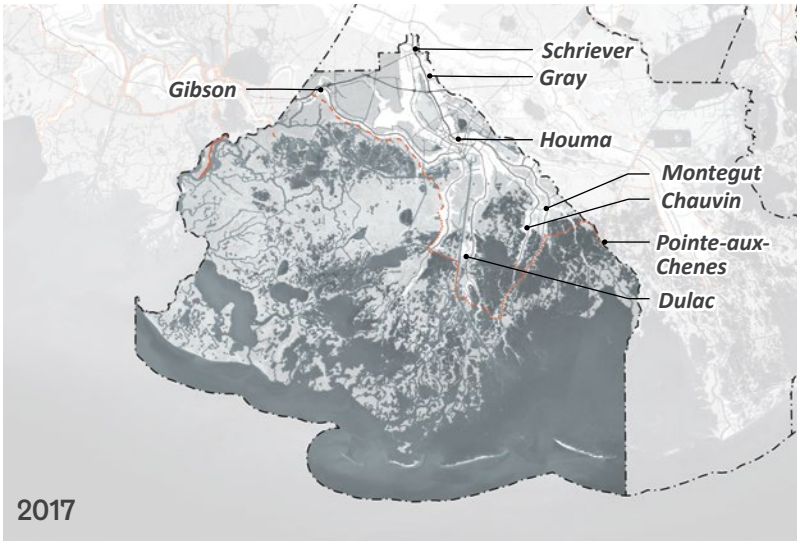

Change development patterns in newer areas
Schriever
Gray
Lack of grocery store
Elevate this area [of roadway]
Use empty acres as retention pond, water already drains here
"Years from now, Houma will be the barrier island. Where will we draw the line?"
—Terrebonne Parish Resident
"The coastal erosion is changing the way of life. You don't have the species that you had before. Broad environmental change."
—Terrebonne Parish Resident
Houma
INTRACOASTAL WATERWAY
Decreasing property values
Repeated flooding
Repeated flooding
Repeated flooding
Montegut
Chauvin
WONDER LAKE
Pointe-aux-Chenes
No spots around here feel safe anymore
LAKE BOUDREAUX
Dulac
Repeated flooding
Lack of grocery store, gas station
Cocodrie
TERREBONNE BAY

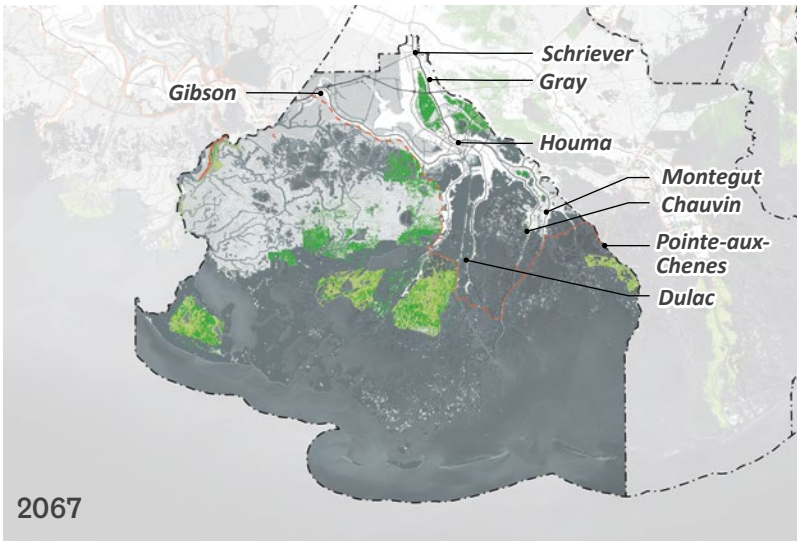
Land Loss

Terrebonne Parish's landmass was built over thousands of years by sediment from the Mississippi River and connecting distributaries. Annual flooding on the parish's five bayous brought sediment that was then deposited throughout the area as waterways overflowed their banks and discharged into marshes and estuaries. This sediment input countered the effects of coastal erosion. However, when levees were constructed along the lower Mississippi River Basin to mitigate river flooding, they choked off the sediment supply to the parish and stopped the natural land-building process.









From 2010 - 2016, Louisiana lost land at a rate equal to a football field every 100 minutes.[3]

In addition to building levees that have contained the sediment supply from the Mississippi River, other human activities have also contributed to subsidence and erosion. Man-made causes of subsidence and erosion include oil and gas extraction, groundwater pumping, and marsh channelization. Extraction and pumping remove fluids and gases from the ground, leaving empty space into which the surrounding soil falls, causing subsidence.[4,5] The creation of navigation channels and canals through marshes has accelerated erosion rates by increasing the area of marsh exposed to wave action and saltwater.

The land in Terrebonne Parish is becoming increasingly fragile due to the absence of new sediment deposits, erosion, subsidence, and the effects of sea level rise, which further erodes land and wetlands.

N

LAND LOSS MAPS

Land change along the Louisiana coast from 50 years ago to today and CPRA's predicted land loss, gained, and maintained under the Medium Environmental Scenario over the next 50 years as an outcome of implementing 2017 Coastal Master Plan projects.

Sources: CPRA Land Loss Modeling Data 2017 for a Medium Scenario; For all basemap data see References

Legend

- Land Lost/Open Water
- Land Maintained
- Land Gained
- Wetlands
- Land
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary

Flood Risk

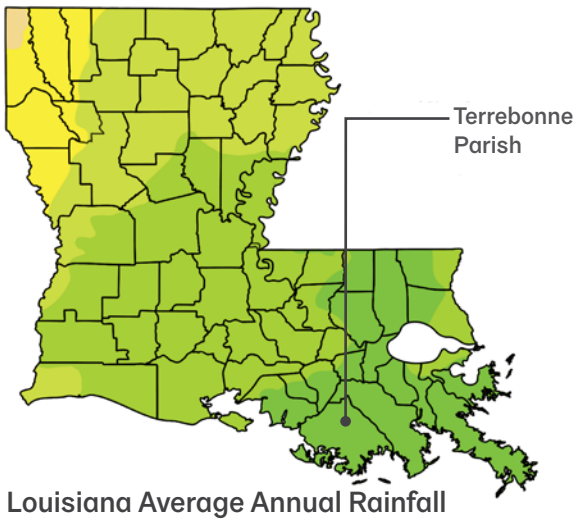
Flood risk is a product of the climate, geography, and socioeconomic profile of Terrebonne Parish, and the threat is pervasive. As a coastal parish in a humid, subtropical climate, Terrebonne Parish is susceptible to tropical storms as well as the storm surge and precipitation they bring, all of which pose significant flood risk. Terrebonne Parish also has high rates of annual precipitation and must manage stormwater to reduce flood risk. Sea level rise, increasing severity and frequency of weather, and subsidence continue to erode land, reshaping Terrebonne Parish's coastline and increasing flood risk in areas previously considered safe from flooding associated with storm surge and precipitation. Poverty, limited access to jobs and training, and an aging population are socioeconomic vulnerabilities that exacerbate the magnitude of threat presented by these risks. Furthermore, though the levee system in Terrebonne Parish provides risk reduction against storm surge, in the absence of additional measures, levees can also alter the water table, which contributes to subsidence. As land sinks within the levee walls, it forms what is essentially a bowl in which precipitation quickly accumulates, exacerbating flood risk from heavy rainfall within the levee system. Flood risks threaten the economies, infrastructure, populations, and the irreplaceable culture of Terrebonen Parish.

"I'll say this, I've been living here for thirty years. When the storms used to come through, we'd get a couple inches, but now it seems that every storm keeps bringing in more and more water."

—Terrebonne Parish Resident

Precipitation

Precipitation in Terrebonne Parish primarily takes the form of rain, though hail has occurred occasionally with severe weather systems. The current precipitation rate for Terrebonne Parish is approximately 65 inches per year.[6] In the future, more intense downpours in shorter time periods are expected to occur more frequently. As a result, flood risk from precipitation is increasing because current stormwater management infrastructure and practices were not designed for these more intense precipitation patterns.



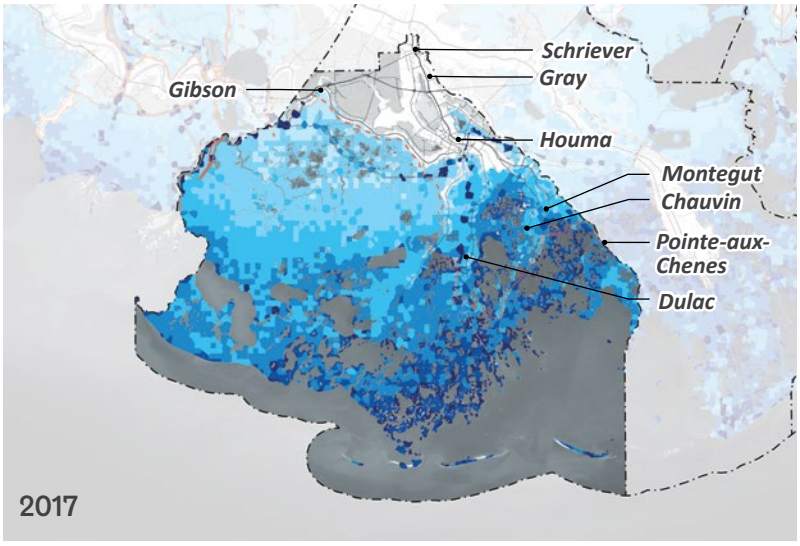
Louisiana Average Annual Rainfall Distribution

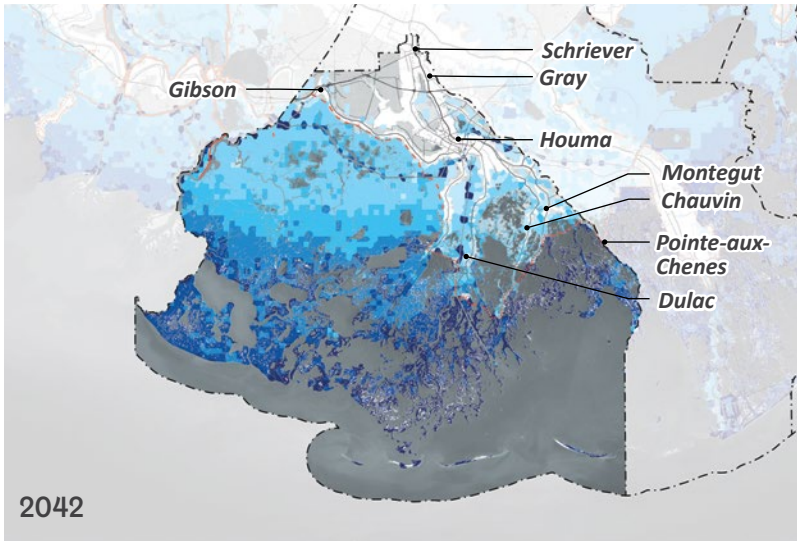
Adapted from: LSU Ag Center, "Precipitation Patterns over the Bayou State"

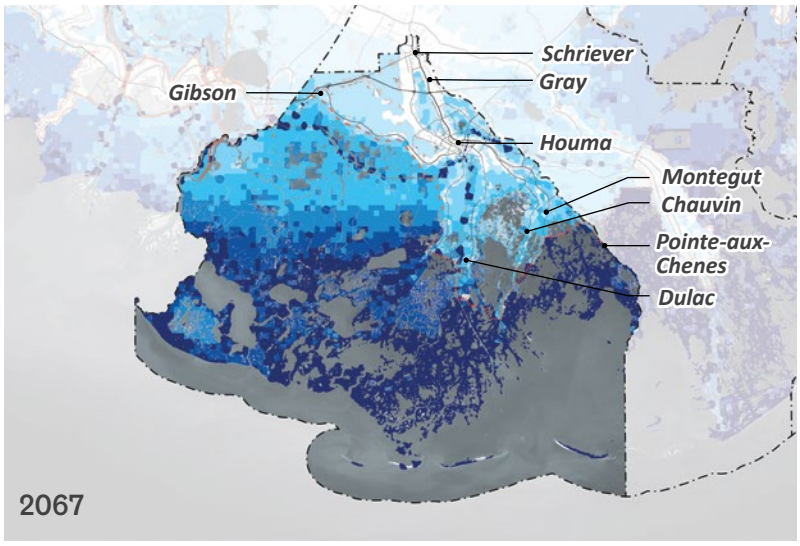
The current precipitation rate for Terrebonne Parish is approximately 65 inches a year.

Storm Surge

Storm surge is an increase in water height caused by strong winds, often associated with a hurricane that produces vertical circulation below the water surface and elevates the water height. When a storm approaches land and encounters shallower water, the water piles up to a greater height. Combined with sea level rise, the impacts of storm surge are felt farther inland, affecting communities that were once protected by surrounding wetlands.







Terrebonne Parish may experience up to $3 billion future economic damages due to storm surge-based flooding.[7]

CPRA's modeling data for a Medium Environmental Scenario is based on a 100-year storm with a 1% probability of forming in a given year.

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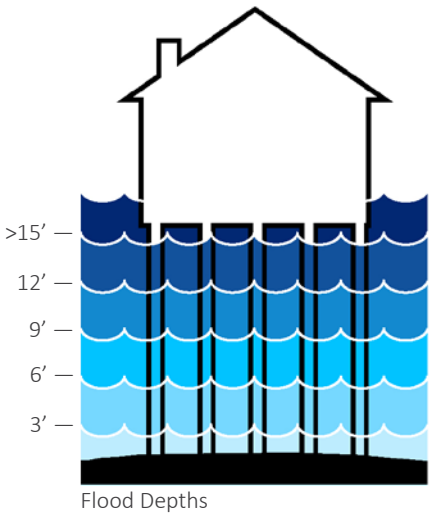
FLOOD RISK MAPS

Flood depths today, 25, and 50 years from now under the Medium Environmental Scenario as an outcome of implementing the 2017 Coastal Master Plan projects.

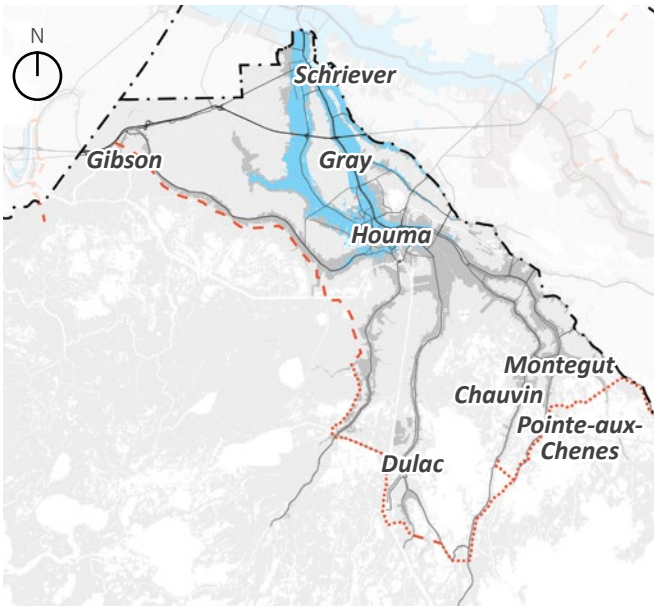
Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; For all basemap data see References

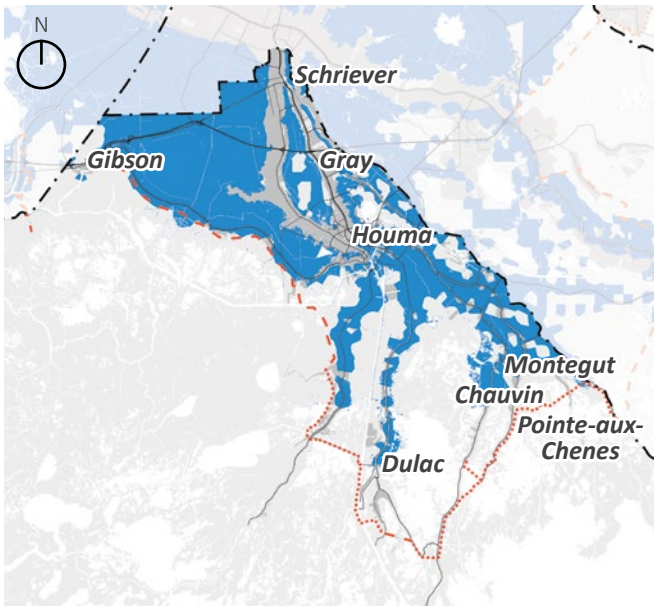
Legend

- Water
- Wetlands
- Land
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary



Flood Depths





Low Risk

Minimal storm surge flood risk projected and outside the current 100-year floodplain

Areas that currently have development opportunities to receive populations and economic activity from more flood-prone areas.

Moderate Risk

>0 – 6' projected storm surge flood depths or within the current 100-year floodplain

Areas conducive to maintaining current population levels and economic trends provided such communities orient future development and mitigation activities in alignment with future flood risk projections.

FLOOD RISK ZONES

Risk scenarios are based on CPRA's 50-year flood depth projections under a Medium Environmental scenario and FEMA's proposed data in the Digital Flood Insurance Rate Maps (DFIRMs) for the National Flood Insurance Program (NFIP).

Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; FEMA Preliminary DFIRM 100-year floodplain data for Terrebonne Parish 2008; For all basemap data see References

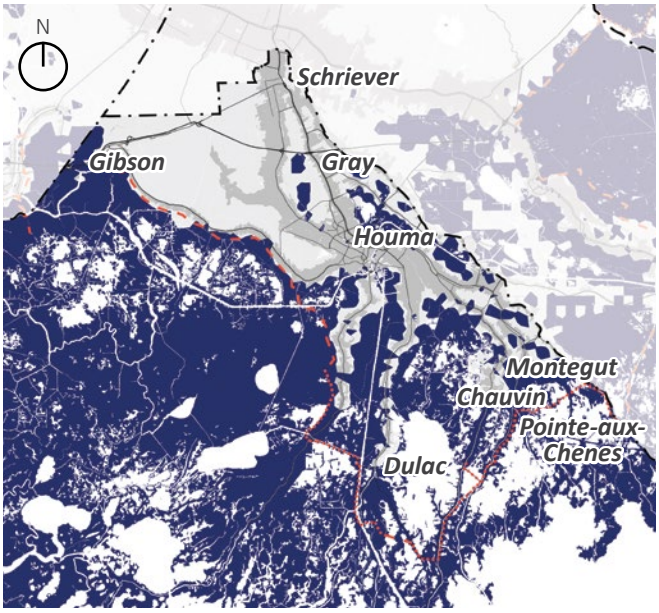
LOW RISK

MODERATE RISK

Houma

Dulac/ Chauvin/ Montegut

Cocodrie



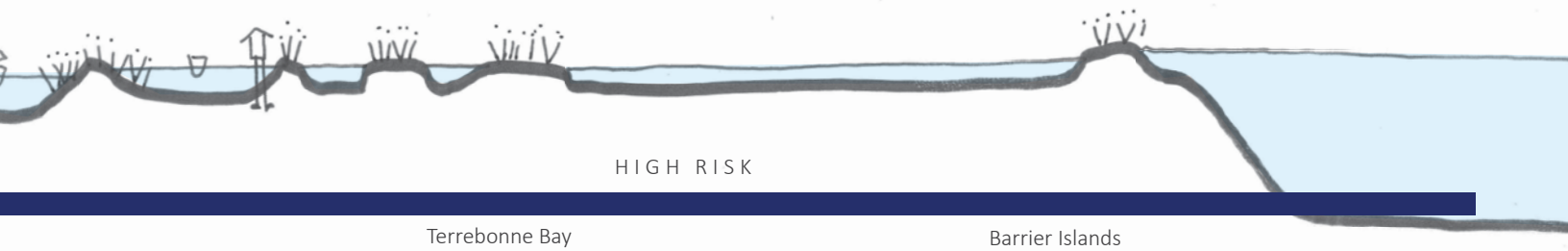
High Risk
>6' projected storm surge flood depths

Areas that can expect to experience population decline and economic losses, up to and including full community-scale resettlement, as environmental conditions deteriorate and repetitive severe flood events take place.

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary

LA SAFE seeks to mitigate the threat of growing flood risk by encouraging smarter development patterns in lower-risk areas.



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COMBINED FLOOD RISK ZONES

Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; FEMA Preliminary DFIRM 100-year floodplain data for Terrebonne Parish 2008; For all basemap data see References

CPRA + NFIP FIRM

STORM SURGE

STORM SURGE + RAINFALL

The map shows 2067 flood risk from storm surge for a medium scenario or a 100-year storm.

Additionally, areas within levees and in a 100-year floodplain are shown as a moderate-risk zone, as these zones flood during heavy rainfall.

Legend

Low Risk
Minimal storm surge flood risk projected and outside the current 100-year floodplain

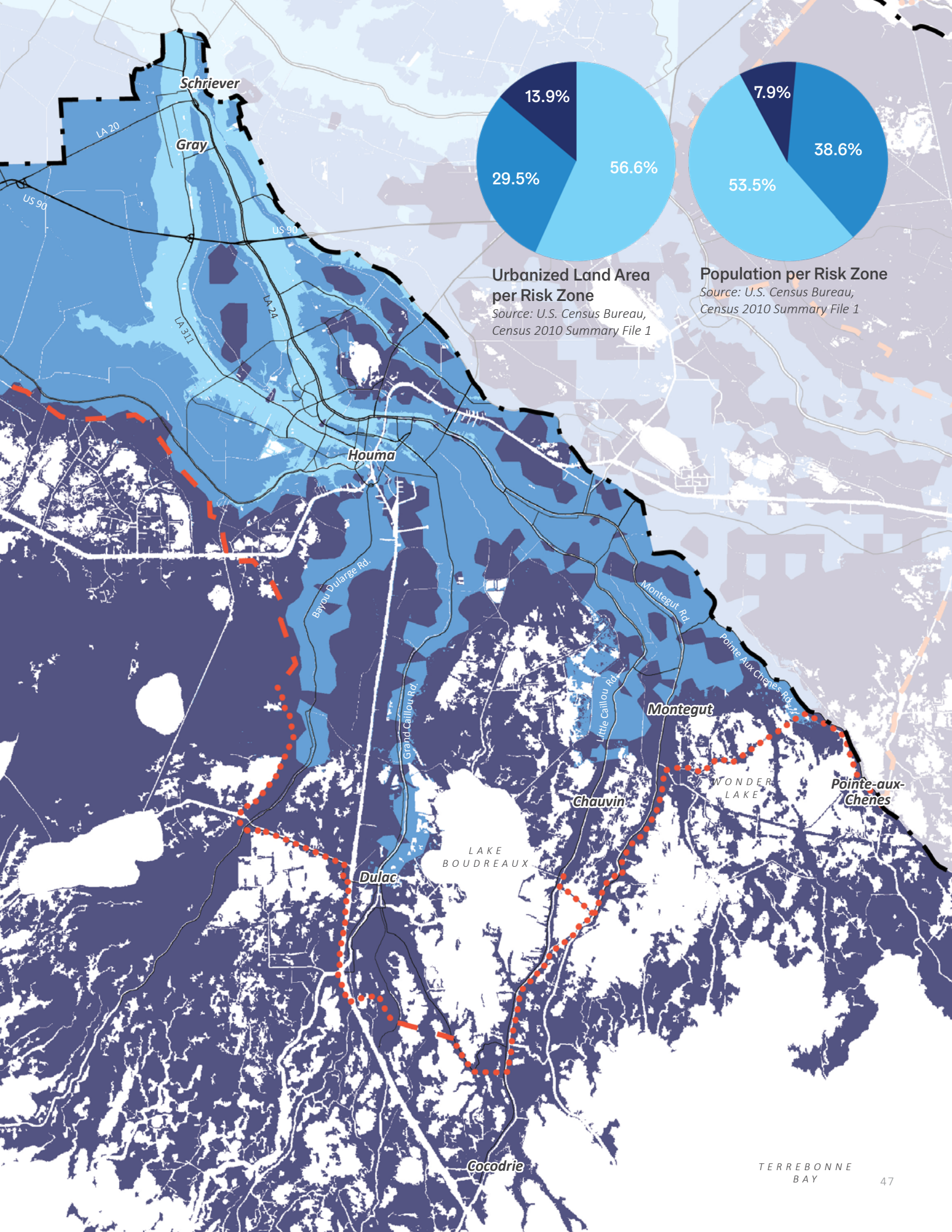
Moderate Risk
>0 – 6' projected storm surge flood depths or within the current 100-year floodplain

High Risk
>6' projected storm surge flood depths

Non-Federal Levee (Morganza to the Gulf)

CPRA Proposed Levee (Morganza to the Gulf)

Parish Boundary


Schriever
Gray
LA 20
US 90
US 90
LA 24
LA 311
Houma
Bayou Dularge Rd.
Grand Caillou Rd.
Little Caillou Rd.
Montegut Rd
Pointe Aux Chenes Rd.
Montegut
Chauvin
WONDER LAKE
Pointe-aux-Chenes
LAKE BOUDREAUX
Dulac
Cocodrie
TERREBONNE BAY
13.9%
29.5%
56.6%
Urbanized Land Area per Risk Zone
Source: U.S. Census Bureau, Census 2010 Summary File 1
7.9%
38.6%
53.5%
Population per Risk Zone
Source: U.S. Census Bureau, Census 2010 Summary File 1

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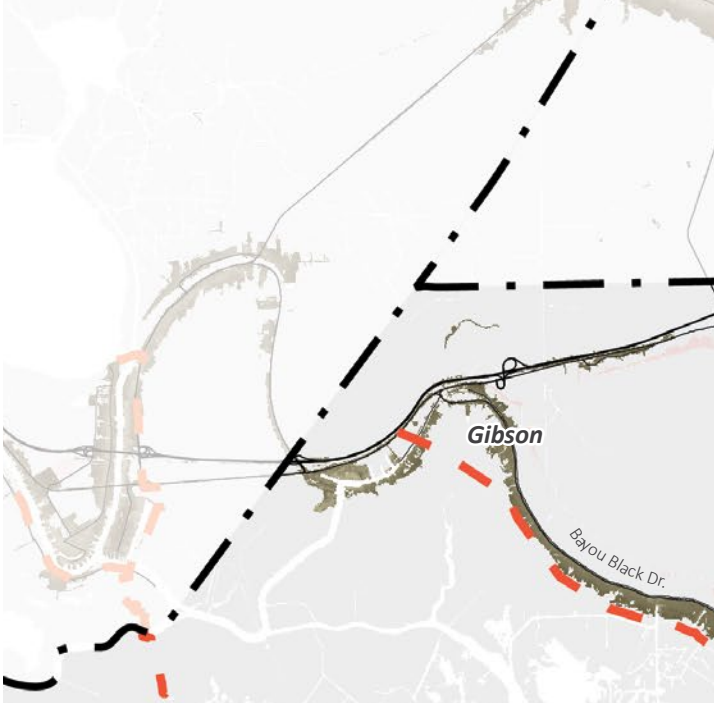
ELEVATION TODAY

Sources: NOAA Digital Elevation Map 2011; For all basemap data see References

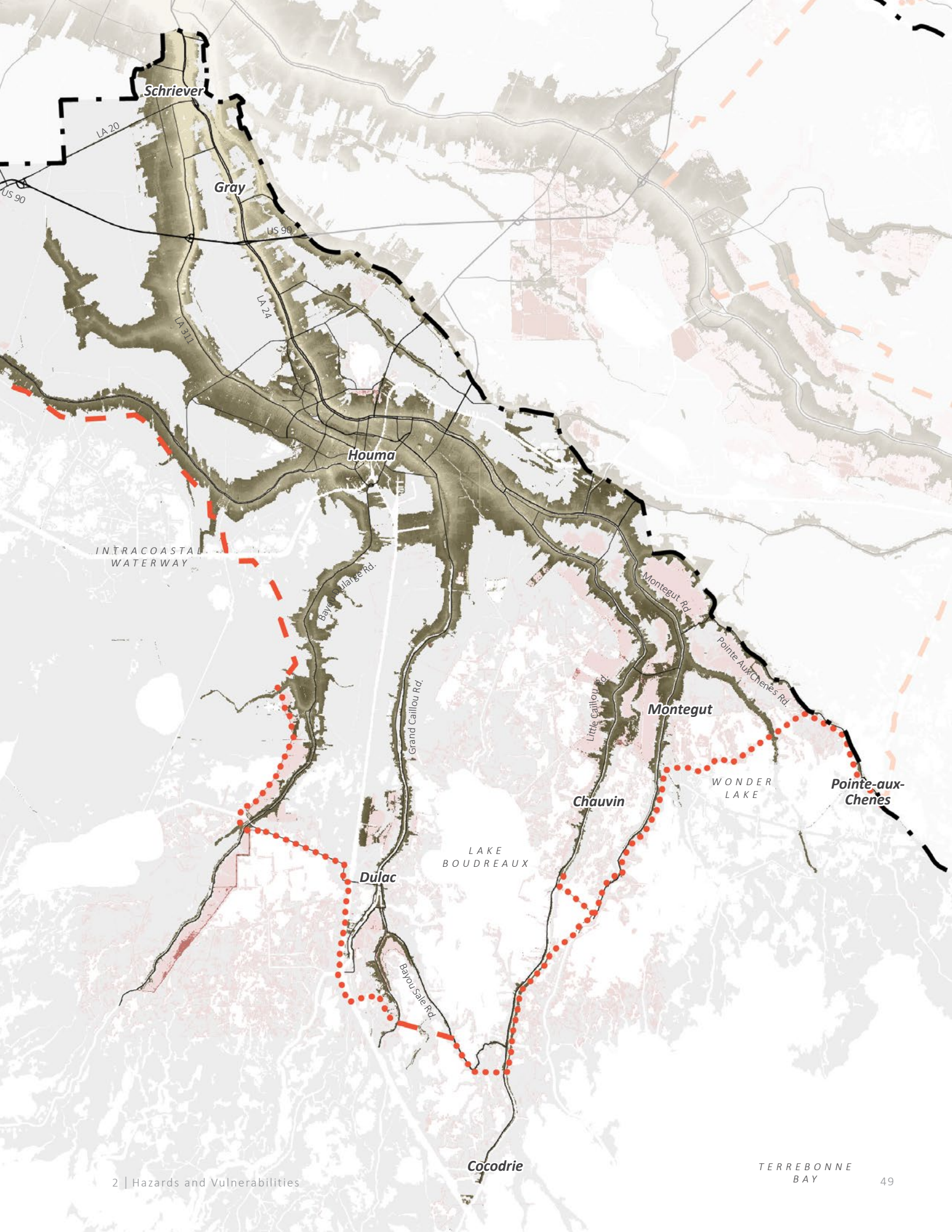
Elevation

About 90% of Terrebonne Parish's land is environmentally sensitive, consisting of wetland and swamp.[8] Many of the parish's communities are located near sea level, some even below. There is limited land available above sea level, with elevation rates higher toward the northern part of the parish. The low elevation of the southern part of the parish is a hazard that cannot be ignored. The higher land elevation in the northern part of the parish and along the ridges is an asset for future growth.



Legend

- > 13'
- 9' to 13'
- 5' to 9'
- 0' Sea Level
- 0' - 1' Wetlands
- 0' to -3'
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary


Schriever
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Gray
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LA 24
LA 311
Houma
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Bayou Dularge Rd.
Grand Caillou Rd.
Montegut Rd.
Pointe Aux Chenes Rd.
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Montegut
Chauvin
WONDER LAKE
Pointe-aux-Chenes
LAKE BOUDREAUX
Dulac
Bayou Sale Rd.
Cocodrie
TERREBONNE BAY

Subsidence

Coastal Subsidence

Like all of the Mississippi River Delta, Terrebonne Parish is subject to subsidence, the settling of sediment that causes land to decrease in elevation—literally to sink. Rising sea levels compound the negative effects of subsidence. The combination of subsidence and sea level rise is referred to as "relative sea level rise," and Terrebonne Parish experiences some of the highest rates of relative sea level rise in the world. Long-term observations estimate the rate of relative sea level rise in Terrebonne Parish to average between 0.61 – 2.01 cm (0.24 – 0.79 inches) annually.[9,10]

Along the Terrebonne Parish coast, the combined effects of these processes—storm surge, sea level rise, saltwater intrusion, and subsidence—expose an ever-increasing area of the parish to erosion as water and wave action reach further inland. As saltwater pushes farther inland, it increases salinity in brackish and freshwater marshes. Saltwater intrusion causes deterioration of the marsh habitat because many species of plants cannot survive increased salinity levels. When marshes are healthy, they provide a protective buffer during storm surge events. But as marsh habitats decline, the vegetation and root structure that prevents erosion disappear, causing the marsh to convert to open water and leaving areas behind the marshes more vulnerable to storm surge flooding.

Shallow Subsidence

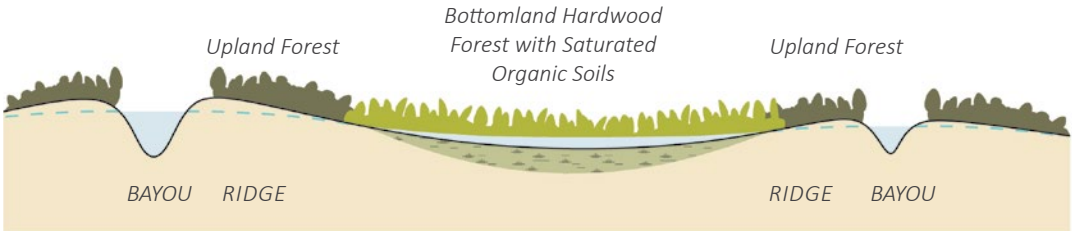
Shallow subsidence is the sinking of the ground that damages our buildings, our streets, and other infrastructure and makes the challenge of pumping stormwater out of the region more difficult. Subsidence is a result of dry soils, largely caused by current drainage practices that pump water out rather than maintaining a consistent water table.

LA SAFE encourages an integrated water management approach that uses both gray and green infrastructure. These facilities reduce flooding by alleviating loads on drainage systems and slowing subsidence by recharging groundwater.

The increased flood risk and infrastructure damage caused by subsidence across the region add millions of public dollars every year in preventable expenses.[11] Subsidence also drastically raises the cost and frequency of repairs to levees, canals, and floodwalls that have been compromised by degradation or lowered elevations.

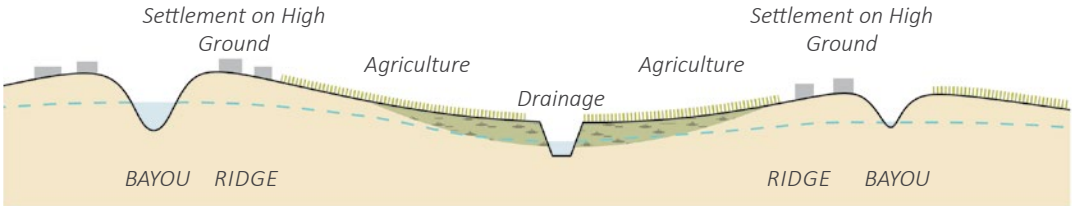
There is an opportunity to address our water risks by expanding water management roles to include subsidence control. Stormwater management best practices hold water in the landscape as long as possible, so that pumping is a last resort. Water storage in ponds, canals, rain gardens, and bioswales maintain groundwater levels higher, allowing organic soils to remain stable.

The graphic below indicates how development patterns over time can lead to land subsidence. Uncontrolled development in low-lying areas with organic soils necessitates pumping practices which, in turn, cause soils that need water to remain stable to dry out and sink.



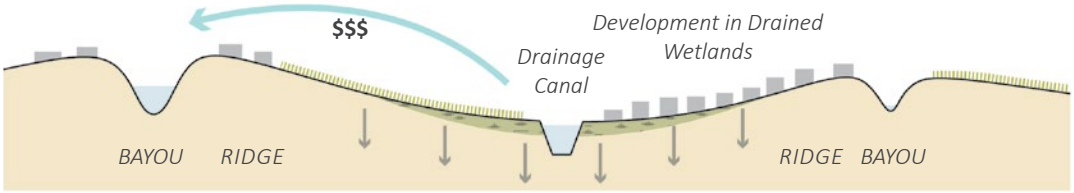
Pre-European Settlement—Natural Condition

Natural waterways form naturally high ridges.



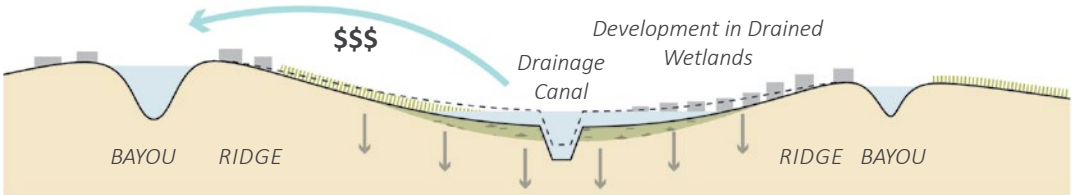
Early Development

Early development was on the highest ground adjacent to natural bayous and waterways.



Current Condition—Drain and Pump

Modern technologies have allowed development in the low-lying wetlands. Water is pumped out lowering the groundwater level and causing soils to dry and land to sink.



Future Subsidence without Action

Limited stormwater capacity in the bayous causes increased flood risk in low-lying areas. As land sinks and sea levels rise, pumping and levee maintenance costs increase further.

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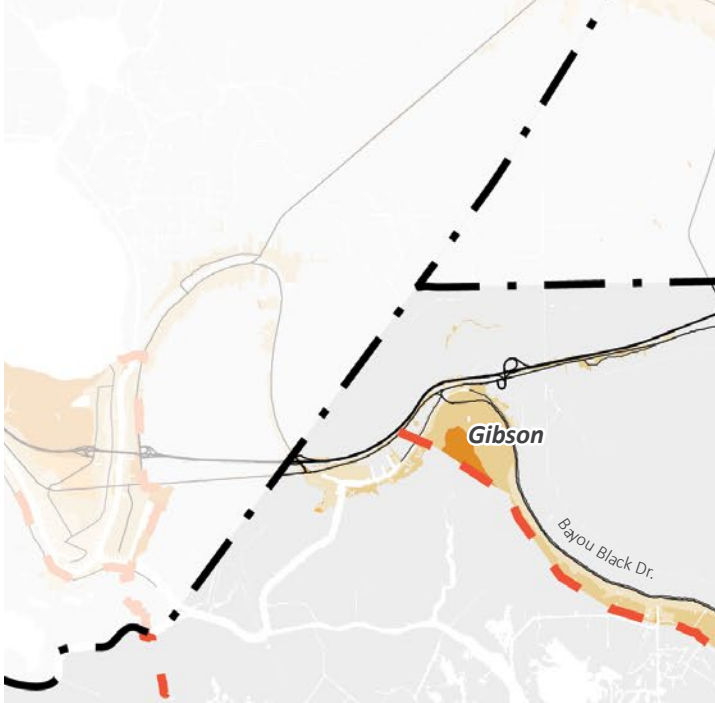
SOIL SUBSIDENCE POTENTIAL

The map shows varying levels of organic soils and their relative subsidence potential. This information can guide land use decisions and help determine risk mitigation standards.

Sources: Web Soil Survey produced by National Cooperative Soil Survey, USDA Natural Resources Conservation Service 2015 – 2016; For all basemap data see References

As organic soils are drained of water, their contents "oxidize," or decompose and shrink. The areas with the highest percentage of organic material in their soils typically have the highest potential for subsidence. Water levels in these areas need to be maintained at higher levels to avoid subsidence-related damage to buildings and infrastructure.

Structural protection worsens subsidence unless internal water detention is prioritized.

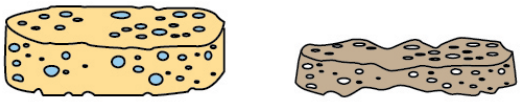


Legend

Highly Organic Soils
High Subsidence Potential

High Plasticity Silt and Clay Soils
Shrink and Swell Potential

Low Plasticity Silt and Clay Soils
Lower Shrink and Swell Potential



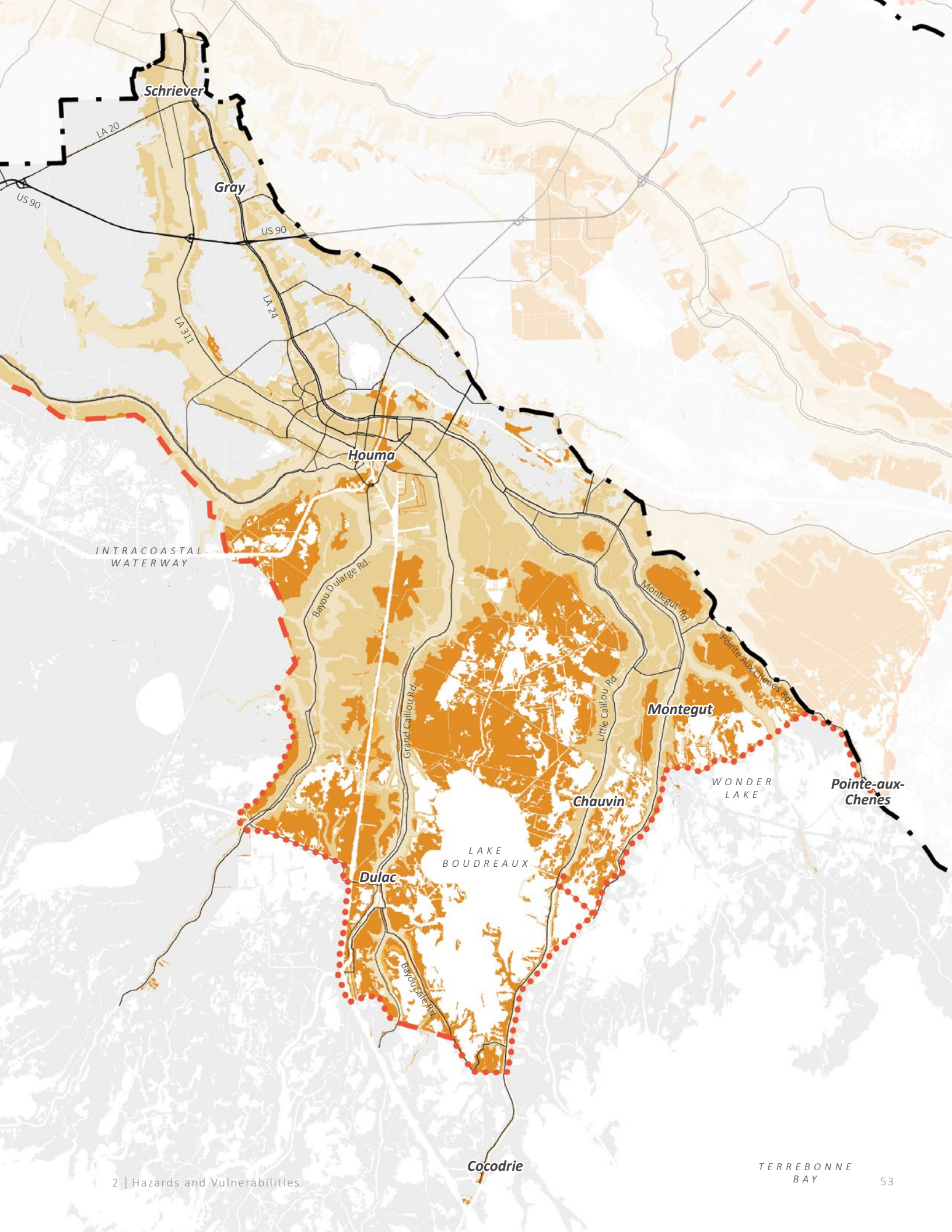
Delta soils are like a sponge. Organic soils are only stable when they are full of water. When they dry out, they shrink.

Wetlands

Non-Federal Levee (Morganza to the Gulf)

CPRA Proposed Levee (Morganza to the Gulf)

Parish Boundary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Bayou Sale Rd.
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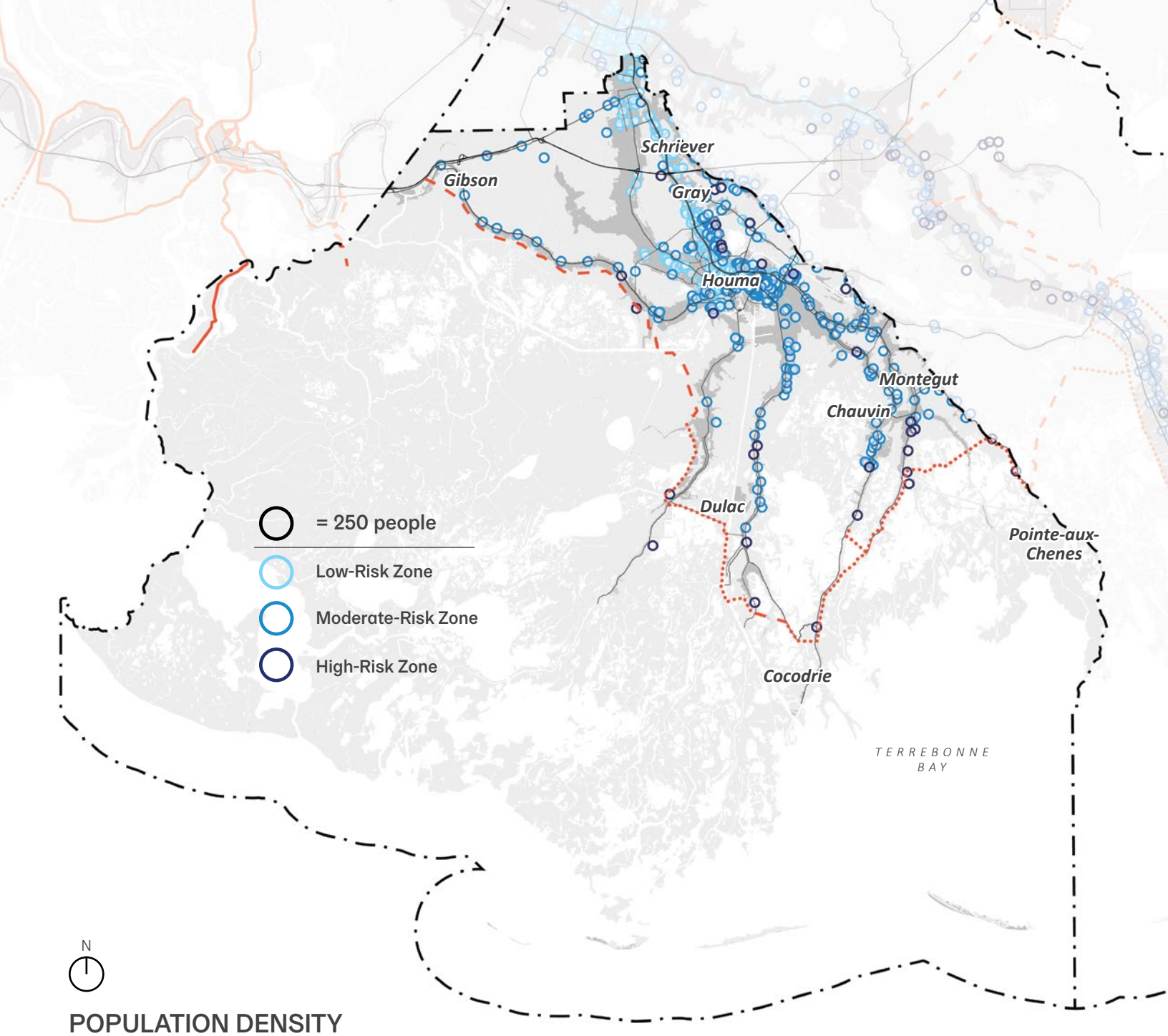


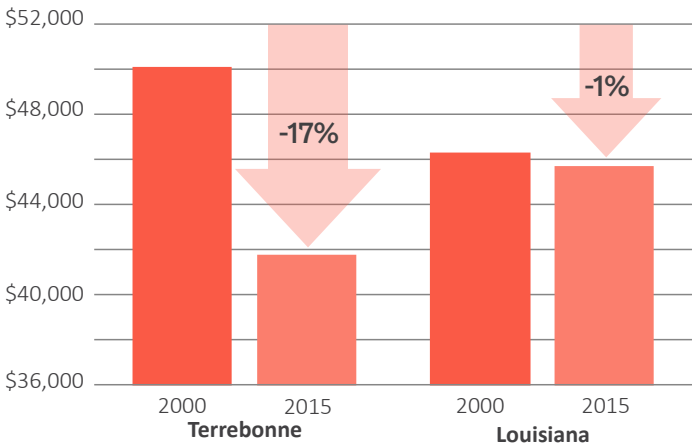
POPULATION DENSITY PER RISK ZONE

The map shows population density in the three risk zones.

Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; FEMA DFIRM 100-year floodplain data for Terrebonne Parish 2008; Data prepared by ESRI, sourced from U.S. Census Bureau, Census 2010 Summary File 1; For all basemap data see References

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary



The graph compares 2000 Inflation Adjusted Median Income and 2015 Median Income.

Social Vulnerability

Vulnerability is more than just exposure to hazards such as storm surge, heavy precipitation, and subsidence. Vulnerability is caused by conditions including poverty, racial or cultural marginalization, geographic isolation, illness, disability, or a variety of other afflictions. These circumstances may impede a person or community's ability to prepare for or cope with a shock or stress. For example, while a storm surge may be the physical cause of damage and harm to a community, a range of economic, cultural, social, and political factors also affect the degree to which an individual or community is negatively impacted by that event. Understanding vulnerability means understanding the amount of damage an event can potentially inflict, as well as understanding the resources and strategies available to the affected population for recovery, preparation, mitigation, and adaptation. In order to effectively plan for and adapt to risks, the types and magnitude of vulnerability must be understood and taken into account.

Income and Poverty

Poverty is a key factor that increases vulnerability to environmental hazards and stresses.[12,13] Lower-income households have fewer resources to dedicate to preparing for and recovering from an adverse event. Their economic livelihoods are also more likely to be disrupted by an environmental shock or stress, as their jobs may offer little protection against employment disruptions. People living in poverty are also more likely to live in high-risk areas with greater degrees of exposure to those risks. They are less likely to be insured against disasters or other adverse events, and they have fewer resources available with which to protect or replace their assets. Often individuals in poverty also do not have adequate access to information about adaptation options. The lack of access to resources presents additional challenges for these families who are often unable to move to new locations, secure new jobs, or to adapt to change in high-risk areas.

Estimates from the U.S. Census Bureau's 2015 American Community Survey show approximately 19.5% of the population in Terrebonne Parish living below the poverty line. This rate is lower than the state of Louisiana (19.8%), but higher than the Gulf Coast region[14] (17.6%) and the United States (15.5%). The percentage of individuals below poverty in Terrebonne Parish has risen 0.4% since the 2000 census. According to the Department of Housing and Urban Development, 26% of Terrebonne Parish households were characterized as "low-income" in 2015.

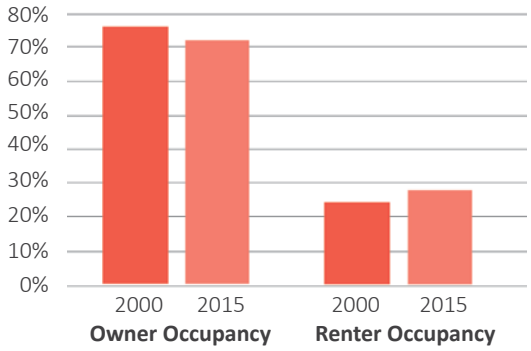
⚠ Implications for Risk

Individuals and families with lower incomes and little or no savings are more vulnerable to any number of flood or disaster-related impacts, including healthcare- or injury-related costs, direct property damage, damages to their vehicles, interruptions to transportation infrastructure or transit services, effects on employers, and interruptions to schools or childcare. Any of these can be "the last straw" that pushes a vulnerable household into economic crisis.

Homeownership and Cost of Housing

In 2015, 72% of non-vacant housing units in Terrebonne Parish were owner-occupied and 28% were renter-occupied,[15] compared to 76% owner occupancy and 24% renter occupancy in 2000.[16] In 2015, the median gross rent in Terrebonne Parish was $860, compared to $788 statewide in Louisiana.[17]

In 2015, approximately 44% of renters in Terrebonne Parish were rent burdened, spending at least 30% of their household income on rent. Over 20% of renters in Terrebonne Parish were severely rent burdened, spending at least 50% of their household income on rent. This is an increase from 2000 when 30% of renters were rent burdened and 17% were severely rent burdened.[18,19] Though homeownership is rising in Terrebonne Parish, those who are renting are increasingly cost-burdened. Whether they own or rent, cost-burdened households have fewer resources to dedicate to preparations and adaptation measures that would make them more resilient to future hazards.



Non-Vacant Housing Occupancy
Sources: U.S. Census Bureau, 2000 Census; U.S. Census Bureau, 2011 – 2015 American Community Survey 5-Year Estimates

Insurance Affordability

Adequate insurance coverage is a critical hedge against the potential cost of disasters, and anyone who owns property in a hazard-prone area should invest in both a home- or property-owner's policy as well as flood insurance. In the wake of a disaster, property that is underinsured or lacks appropriate coverage places greater burdens on the owner's own financial reserves and on public sector disaster recovery efforts.

However, both homeowner's policies and flood insurance are becoming increasingly expensive and therefore increasingly difficult for households and businesses to afford. Within Louisiana, rates increased 67% from 2004 – 2015, and in the coastal zone, the increase was even higher at 85%.[20] Between 2004 and 2015, homeowner's insurance premiums in Terrebonne Parish increased 105%, rising from an average premium of $932 in 2004 to $1,911 in 2015.[21] This represents approximately 3 – 4% of household income for Terrebonne Parish residents.[22] **Rising premiums mean households have fewer resources to devote to efforts to reduce risk or to cover other expenses, resulting in increased vulnerability.**

"My flood insurance is through my mortgage. If I didn't have to have insurance, I wouldn't. No one can afford insurance down here."
—Cocodrie Resident

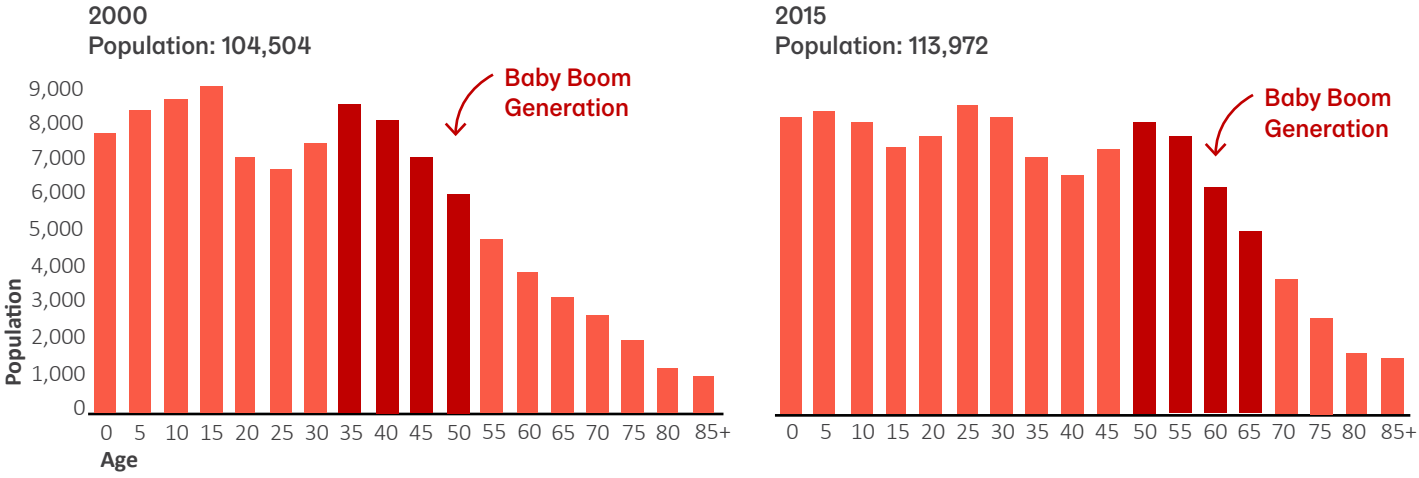
In 2017, the cost of National Flood Insurance Program (NFIP) policies rose an average of 6%.[23] Increases could be much higher but are capped at 18% for any individual policy. Information regarding increases in 2017 flood insurance premiums in Terrebonne Parish was unavailable. While these increases are intended to bring premiums up to actuarial rates that reflect true flood risk, one unintended consequence is that some policyholders are dropping their coverage and fewer homeowners are purchasing new policies. Nationally, there has been a 10% decrease in the number of policies since 2012 when legislative changes were made to the NFIP.[24] As of 2013, the parish had 2,000 repetitive loss and severe repetitive loss properties, half of which were not insured.[25] The rising costs of flood insurance, combined with diminishing property values in high-risk areas, drains residents' net worth and makes relocation financially impossible for many.

Aging Population

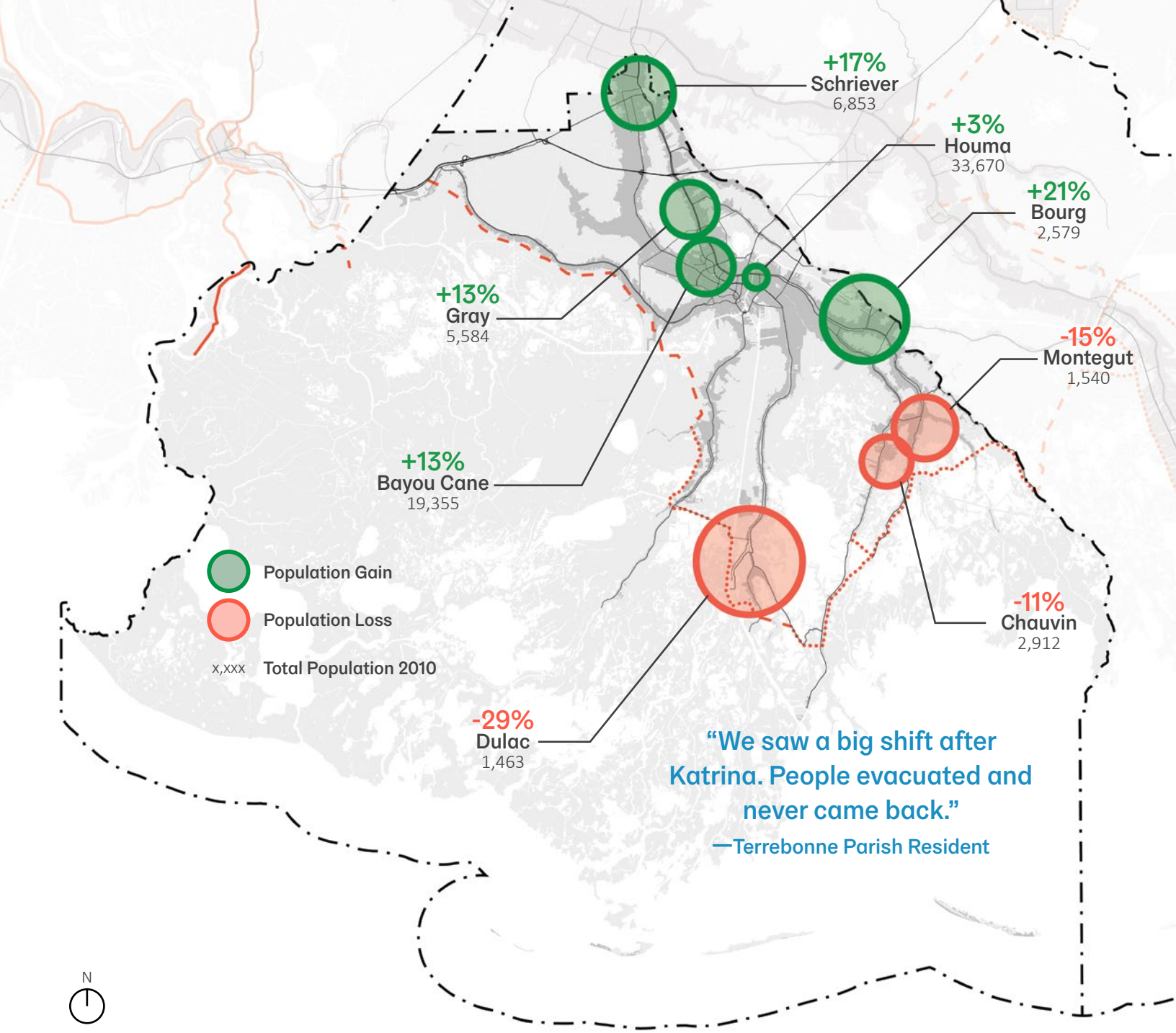
The physical, economic, and social vulnerabilities associated with aging—especially when layered with poverty, lack of insurance, and other factors—pose additional challenges for many older adults attempting to prepare for and recover from disasters, including floods. Since 1980, the median age of Terrebonne Parish's residents has increased by 9.9 years.[26,27]

An aging population has unique needs that must be considered when assessing vulnerability. Older residents are more likely to have mobility issues that make evacuation in the event of a storm more difficult for them. Older residents are also more likely to be on fixed incomes, which can make rising insurance costs and recovery efforts a significant financial burden.

"The pattern has been the last 40 years, the young people leave. As soon as they graduate, they go, they start their families elsewhere."
—Terrebonne Parish Resident



Population by Age, 2000 – 2015
Sources: U.S. Census Bureau, 2000 Census; U.S. Census Bureau, 2011 – 2015 American Community Survey 5-Year Estimates



POPULATION CHANGES 2000 – 2010

Between 2000 and 2010, lower parts of the parish saw declining population while the northern part of the parish saw a population increase.

Source: Data prepared by ESRI, sourced from U.S. Census Bureau, Census 2000 Summary File 1 and Census 2010 Summary File 1; For all basemap data see References

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary

1 in 4 coastal residents have thought about moving

4 in 10 know friends and neighbors who have left

Source: Survey by National Association of Realtors and Center for Planning Excellence, 2013

Population Movement

In 2013, the National Association of Realtors and the Center for Planning Excellence conducted a survey of Louisiana's Coastal Management Zone and found that 25% of coastal residents have thought about moving from their current home, and 40% know friends or neighbors who moved due to persistent challenges associated with living in the coastal areas, including the cost of flood insurance and potential flood damage.[28]

Terrebonne Parish is no exception to this trend. Between 2000 and 2010, the overall parish population increased 7 %; however, the bayou communities of Dulac, Montegut, and Chauvin have experienced population declines of 29%, 15%, and 11%, respectively.[29,30] According to local stakeholders, many residents, weary of repeated storm flooding, simply moved up the bayou to lower risk areas. The communities of Bourg, Schriever, Gray, and Bayou Cane each saw population growth of 21%, 17%, 13%, and 13%, respectively, over the same time period. Houma experienced more modest growth of 3%.[31,32] Overall, the most southern communities are experiencing population decreases, while communities located in the northern parts of the parish, where elevations are higher, are growing. Higher elevations are less susceptible to flood surge risk and relocating to these areas is a way to reduce exposure to risk. However, population shifts such as these create challenges for the communities that are losing population as well as those that are gaining. Population loss makes it more difficult to fund infrastructure and sustain key services such as medical facilities, schools, and emergency services. In receiving communities, rapid population growth may overwhelm the current capacity of infrastructure and services.

"I'm 12 feet elevated. As coastal erosion increases, our property values will decrease—and I'm not even in Cocodrie."

—Terrebonne Parish Resident

⚠ Implications for Risk

It makes sense that individuals, families, and businesses are choosing to relocate in response to the perception or reality of increasing risk in a given location. However, these shifts in population and economic activity can result in economic and social hardships for those who are relocating as well as the communities that they left behind and those to which they moved. The goal of this LA SAFE plan is to consider these movements in a strategic framework that can mitigate rising risks where possible, allowing people to remain in place—or leverage the push and pull forces that lead to population relocation so as to maximize the positive impacts of relocation for all parties.

Property for Sale

3 Existing Conditions

Natural Assets
Water is a driver of both income and recreation for Terrebonne Parish. Bayous also provide habitat for wildlife, including the blue heron pictured here.

Natural Environment

Natural Assets
Above: Wetlands and homes beyond, near Dulac.

Left: Natural assets provide habitats for wildlife.

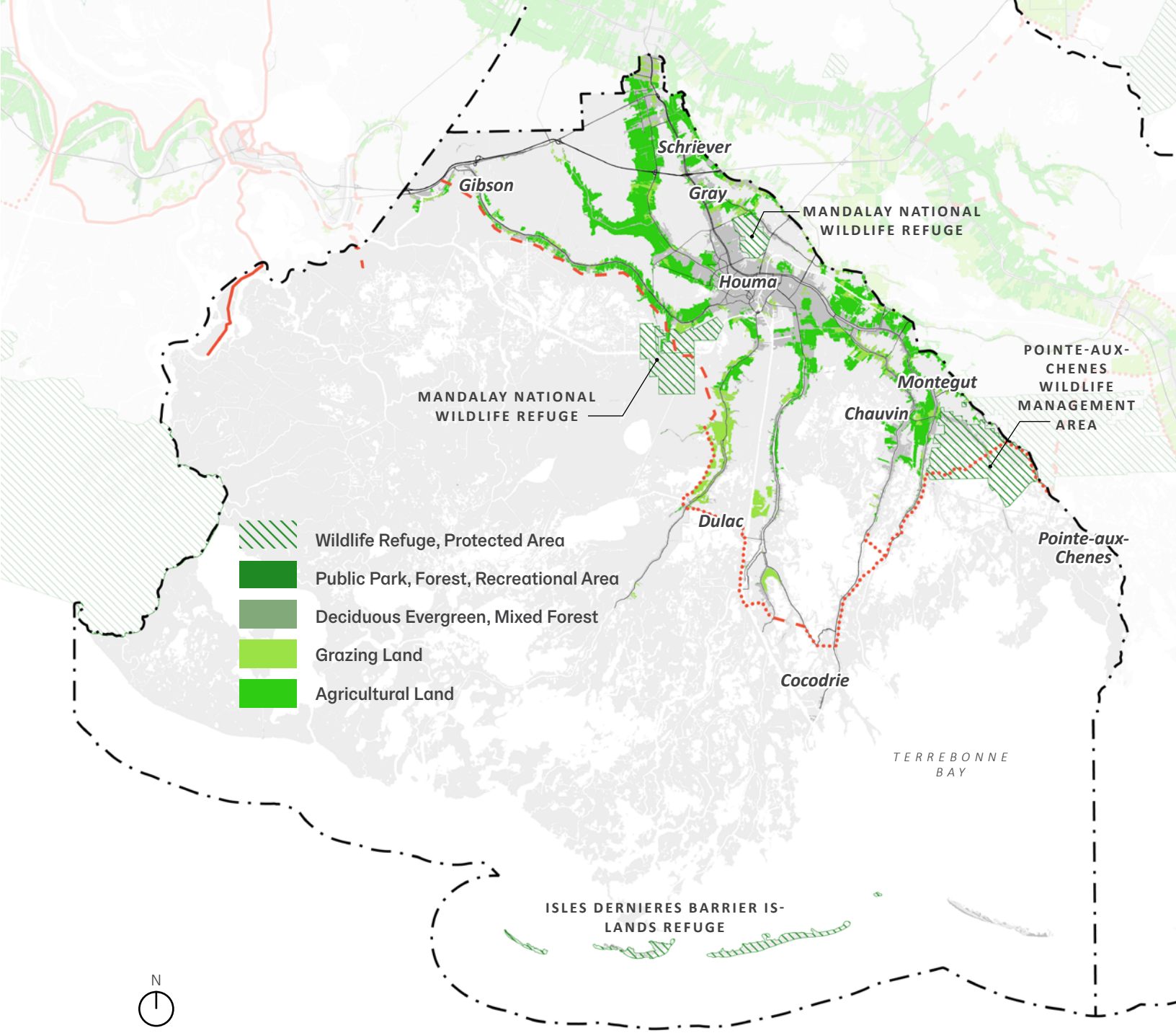
Right: Mandalay National Wildlife Refuge.

"I raised my children [here], and they could ride their bikes anywhere. Now there's only little ditches around big bodies of water."

—Terrebonne Parish Resident

Natural Assets

Terrebonne Parish is located in the heart of the southern Gulf Coast and comprises coastal lands woven with bayous, lakes, waterways, and wetlands. Over 85% of the parish is water and wetlands, with freshwater marshes in the northern areas, brackish marshes farther south, and saltwater marshes near the coast.[33] A network of lakes, bayous, bays, and canals traverse the parish. Most development is found on the high ground along the banks of Bayou Dularge, Bayou Caillou, Bayou La Carpe, Bayou Dulac, Bayou Petit Caillou, Bayou Terrebonne, and Bayou Blue. The extensive bayous, wetlands, and marshes of Terrebonne Parish provide recreational, agriculture/aquaculture, and economic opportunities. However, the low topography and watery landscape of the parish also leave it heavily exposed to floods of all types.



NATURAL ASSETS TODAY

Coastal Louisiana comprises many waterways, parks, forests, and farmland.

Sources: U.S. Census Bureau TIGER/Line 2016; U.S. Fish and Wildlife Service 2001; Louisiana Department of Wildlife and Fisheries 2006; National Land Cover Database created by Multi-Resolution Land Characteristics Consortium 2011; For all basemap data see References

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary

Over 85% of the parish is water and wetlands, with freshwater marshes in the northern areas, brackish marshes farther south, and saltwater marshes near the coast.

Housing and Development

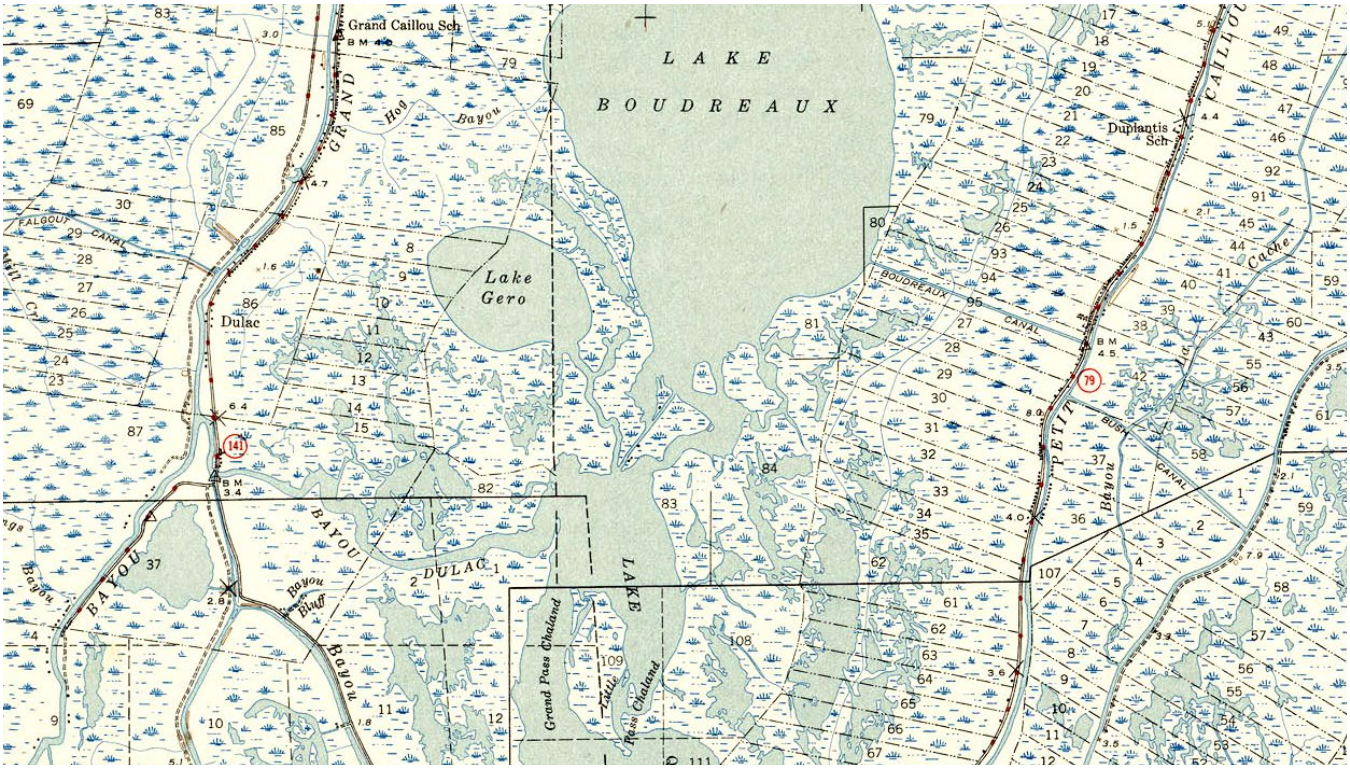
In a planning context, "development" refers to the way in which residential and commercial structures, transportation facilities, stormwater management infrastructure, public amenities, and public services are designed, located, expanded, and spatially organized and networked. Planning and zoning are tools communities can use to help ensure that development results in low-risk, affordable housing stock, efficient transportation systems, access to jobs and services, and economic sustainability while preserving natural and cultural assets and supporting a high quality of life.

Historical Settlement and Development Patterns

The natural landscape has heavily influenced past and current development patterns in Terrebonne Parish. The banks of Bayous Petit Caillou, La Cache, Terrebonne, Black, and Dulac have always been the highest ground and the safest land to settle in Terrebonne Parish. Naturally, earliest settlement by the Houma people gravitated to the higher ground along these bayous. Once land began being divided by European settlers, Native American populations were pushed farther south. Beginning in the 1700s, the French arpent system was used to shape properties on high ground into long, deep parcels with a narrow frontage along navigable rivers that maximized access to both a waterway and cultivable land for the greatest number of landowners. Use of the arpent system created a development pattern of long, narrow parcels along the river, which can still be found in Terrebonne Parish today. Transportation systems were similarly responsive to the environmental context. Water-based transportation connected families and commercial interests across Terrebonne Parish. Later, roads built on the natural ridges along the bayous connected the different settlements across Terrebonne Parish, though traveling by car along the banks of the bayous required people to travel longer distances to reach destinations across a bayou. These roadways have also created access issues, as many property owners can no longer reach the water without crossing multiple lanes of high-speed traffic.

Since the early 20th century, commercial and industrial development have flourished on the banks of the bayous and in the northern part of the parish. The discovery of offshore oil in the 1920s changed the economic landscape dramatically and prompted rapid industrial, commercial, and residential development in the next decades. Terrebonne Parish was established as a strategically-located hub for services related to the oil and gas industry. The parish's economy benefited greatly, and population and infrastructure investments grew significantly around the Houma area.

In Terrebonne Parish, the natural environment heavily influences where residents live and where major revenue sectors locate. This will create challenges in the future, as more of the parish's landscape will change from land to open water, and even less land will be suitable for development.



Dulac, 1944

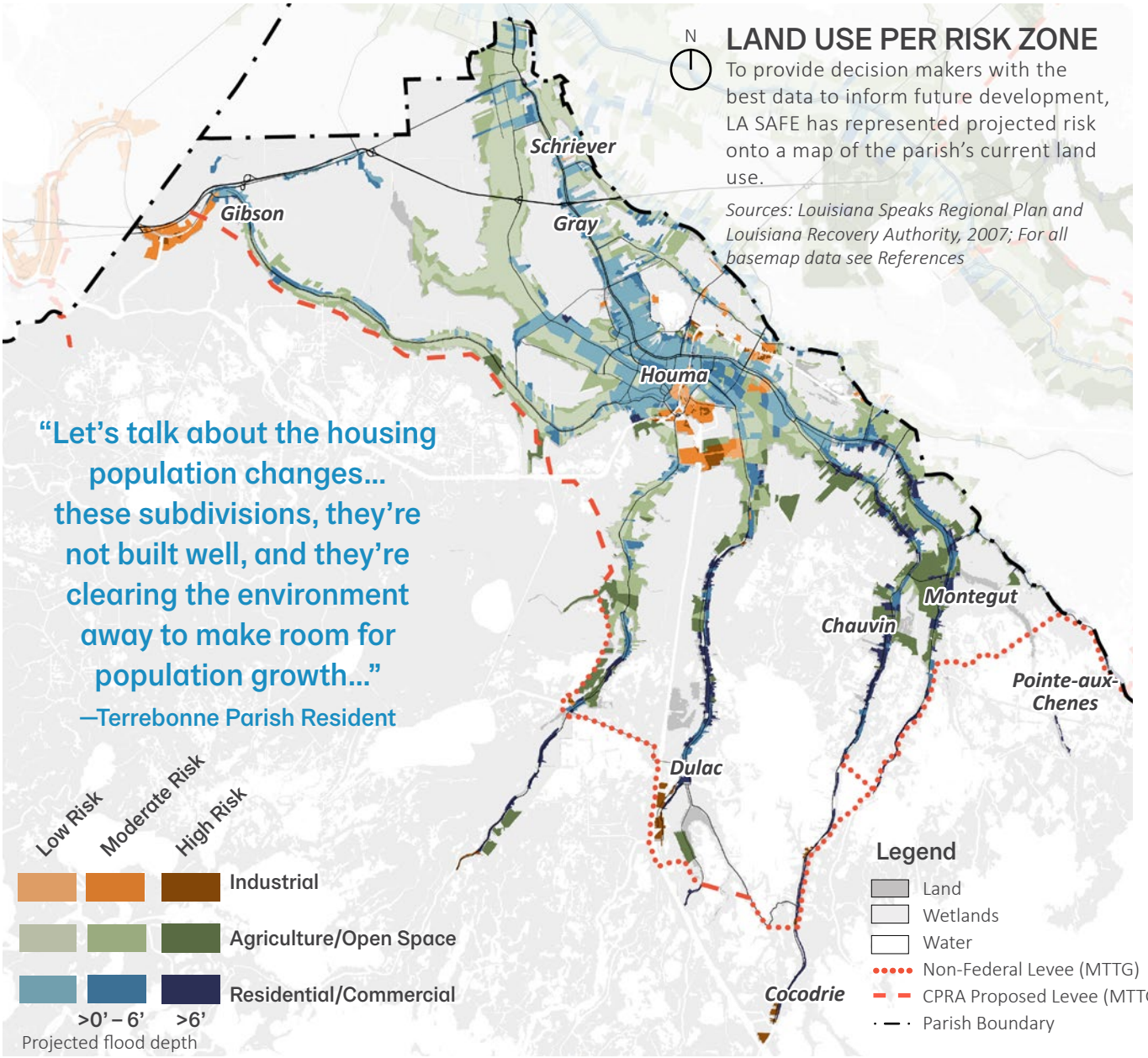
Above: The arpent system along the bayous in Terrebonne Parish allowed everyone access to the bayou.

Map Credit: Perry-Castañeda Library, The University of Texas at Austin, University of Texas Libraries

Houma, 1890

Left: Historically, people settled on the highest ground, the natural ridges adjacent to bayous.

Map Credit: Perry-Castañeda Library, The University of Texas at Austin, University of Texas Libraries



Current Development Patterns

Present-day infrastructure investments continue to be concentrated on higher ground along bayous and in the Houma-Thibodaux area in the northern part of the parish. Industrial development is concentrated around the Houma-Terrebonne Airport, the Houma Navigation Canal, and the Houma-Terrebonne Industrial Park. Existing commercial and office development is concentrated just west of Houma along the LA 3040 and LA 24 corridors toward Thibodaux. The location and proximity of these intermodal assets provides a desirable environment for continued commercial and industrial development.

Terrebonne Parish's area comprises 41% water and 59% land,[34] although land area continues to be converted into water area—most severely in the southern part of the parish and in between the bayous. In those areas already experiencing the impacts of land loss, residents and businesses with the resources to do so have been voluntarily migrating north to reduce their economic losses from

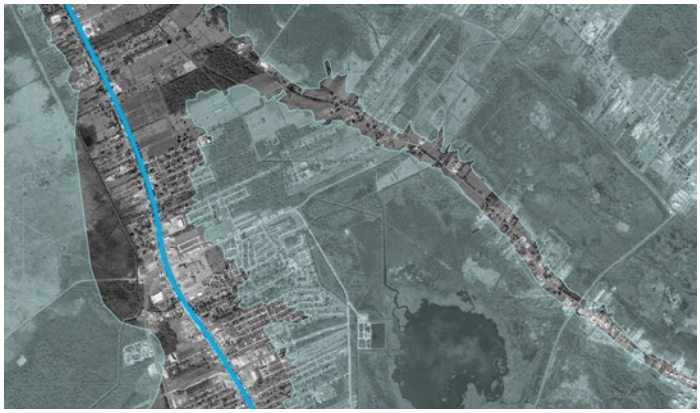
repeated flooding. As a result, populations in communities such as Dulac, Montegut, and Chauvin are shrinking, while populations are growing in places such as Houma, Bourg, Gray, Schriever, and Bayou Cane, which have higher ground and lower flood risk.

Another factor driving the northward migration of southern bayou populations is the location of public assets and amenities. Over the last decade, public assets have been built, or rebuilt, in the northern part of the parish with increasing frequency, prompting residents to move from the southern portions of the parish toward the north where they can more easily access these services and assets. Maintenance of public assets and services in higher-risk areas is increasingly more challenging as flood risks continue to increase, while the pool of those receiving services shrinks.

Some housing units in flood-prone areas of Terrebonne Parish have been built on fill soil, imported from borrow pits, in order to achieve a desired elevation. Though it may protect individual structures, the use of fill accelerates the rate of runoff into surrounding areas and causes scour around the area that was filled, potentially compromising its stability and eroding surrounding land, ultimately increasing flood risk for the surrounding area. However, availability of higher ground is a major constraint for development. This has negative implications for low-income residents who are unlikely to have the resources necessary to move from an area that is losing value and public assets due to growing risk to an area that is gaining value due to lesser risk. These population shifts reinforce historic growth patterns in the parish, where residents are inherently attracted to investing in areas of higher ground. However, availability of higher ground is a major constraint for development.

⚠ Implications for Risk

Development decisions made today about where to locate buildings, roads, homes, and businesses will affect the parish well into the future. The Terrebonne Parish Comprehensive Master Plan calls for future development that generally follows historical development patterns and anticipates that an additional 3,055 acres of land are necessary to accommodate the growth expected by 2030. At the same time, the 2017 Coastal Master Plan anticipates that up to an additional 41% of the parish land will be lost over the next 50 years if no actions are taken to slow down the rate of land loss. In order to maintain enough land to accommodate projected population growth and movement, Terrebonne Parish will need to concentrate assets and encourage greater density in future development.[35,36]



Development Patterns
Historically, buildings were built on the highest ground near the bayou. Arpents, long and thin land parcels, gave each landowner water access and high ground, with the back of the lot sloping down toward the wetlands. When these parcels were subdivided and developed, houses were built in the floodplain.

100-Year Floodplain

Bayou

Source: FEMA Preliminary DFIRM 100-year floodplain data for Terrebonne Parish 2008

Transportation

"[Transportation] needs to be convenient for everyone, affordable and understandable."

—Terrebonne Parish Resident

Local and regional transportation systems support commerce, connect people to activities, jobs and services, and serve as an evacuation network in case of emergency. Terrebonne Parish's transportation infrastructure includes an aircraft runway, bus routes, highways, a growing network of bicycle infrastructure, and canals for water-based transportation.

The Houma-Terrebonne Airport's 6,500-foot runway, capable of handling corporate aircraft, provides for air traffic into and out of the parish. The airport's industrial park is actively marketed as a desirable business environment for economic development. Good Earth Transit provides the parish bus system, which operates five routes throughout the parish, connecting bayou communities, Houma, and Thibodaux. The highway system—LA 24, LA 182, and nearby US 90—provides regional connectivity to adjacent communities and New Orleans as well as multiple evacuation routes. There is a growing emphasis at the parish level on bike facilities and "complete streets" that accommodate multiple modes of travel, encourage active lifestyles, attract new residents, and improve quality of life. Additionally, the Gulf Intracoastal Waterway and Houma Navigational Canal provide waterway access for commerce and trade.

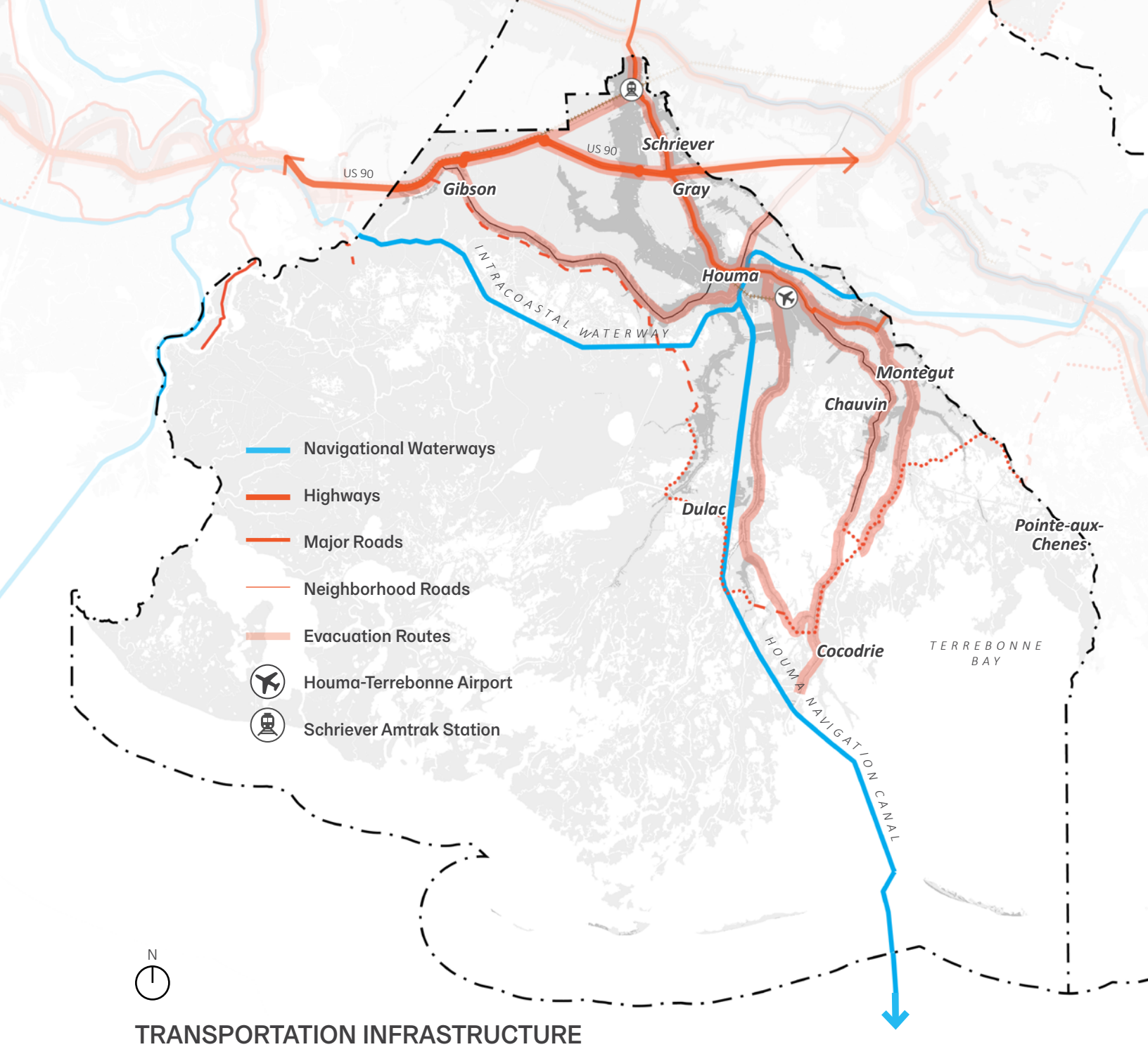
Houma Intracoastal Waterway Tunnel
Important transportation infrastructure can be impacted by floods, such as the Houma Intracoastal Waterway Tunnel.

Passenger Transit
The Amtrak Schriever station provides passenger transit connection to Lafayette and New Orleans. *Photo Credit: Terrebonne Parish Consolidated Government*

⚠ Implications for Risk

Transportation infrastructure may be impacted by floods in two main ways: short-term submersion and long-term damage from water, scour, or salt. Short- or long-term loss of transportation infrastructure can have serious impacts on everything from evacuation and repopulation, disaster recovery and logistics, and economic health—both sector-specific and broad-based. Mitigation (elevation, floodproofing, and relocation) can dramatically reduce vulnerabilities of transportation infrastructure. Roads can also exacerbate flood conditions by cutting off natural drainage channels, causing water to pool. In many cases, properly designed transportation infrastructure can double as mitigation in itself, providing retention and detention facilities, drainage, or spillway capacity. Roads can also exacerbate flood conditions by cutting off natural drainage channels, causing water to pool.

Flooded Streets
Photo Credit: FEMA/Patsy Lynch



TRANSPORTATION INFRASTRUCTURE

The map shows the parish's major transportation infrastructure, including roadways, navigation canals, the airport, and Amtrak station. Evacuation routes are highlighted.

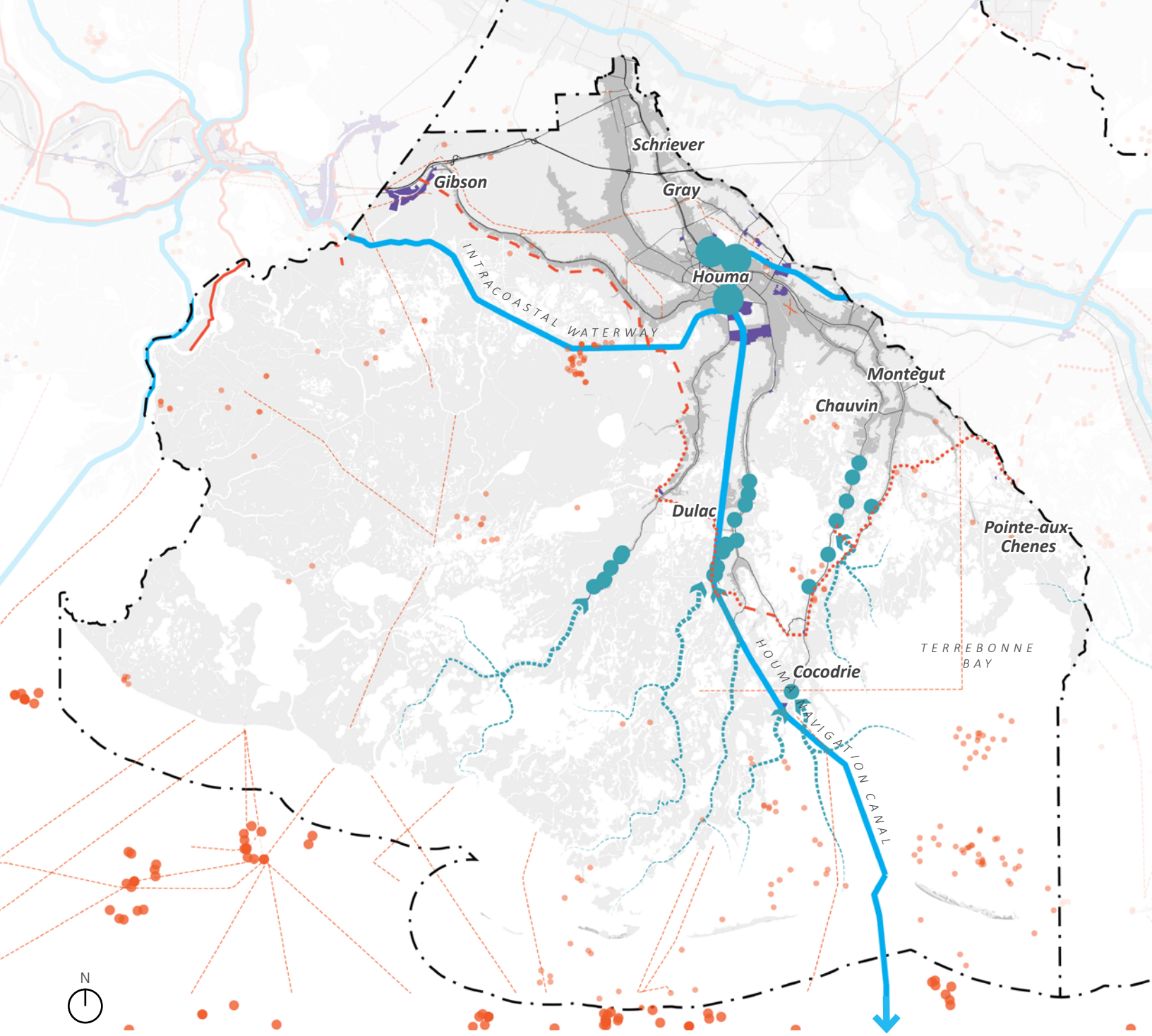
Sources: Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS) and National Transportation Atlas Databases (NTAD) 2006; OpenStreetMap 2017; For all basemap data see References

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary

"The way the town has sprawled, we don't have a way to get from where we live to where we need to be."

—Terrebonne Parish Resident



ECONOMIC DRIVERS

The landscape of southeastern coastal Louisiana provides a number of economic drivers—such as oil and gas, navigation, and seafood industries.

Sources: RITA/BTS and NTAD 2006; USGS National Wetlands Research Center 1999; Louisiana Department of Natural Resources, Office of Conservation 2007; U.S. Department of the Interior, Minerals Management Service 2006; Louisiana Speaks Regional Plan and Louisiana Recovery Authority 2007; For all basemap data see References

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary
- Industrial Areas
- Offshore Oil & Gas Platforms
- Active Oil & Gas Well
- Pipelines
- Seafood Processing Center
- Seafood Distribution Center
- Navigational Waterways

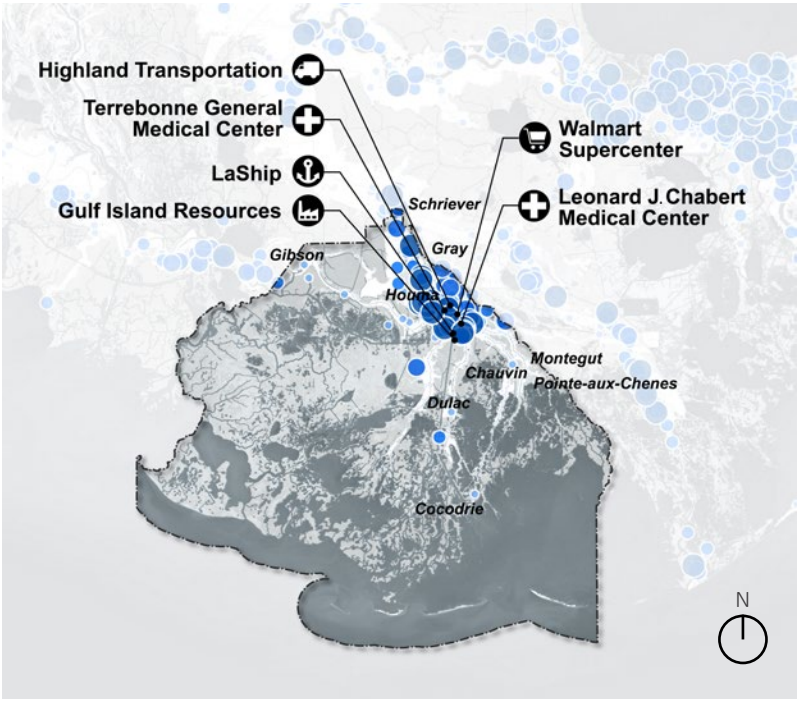
Economy

Prior to the tremendous growth of the oil and gas industry that occurred from the 1920s up until the 1970s, Terrebonne Parish's economy relied heavily on agriculture and the seafood industry. Terrebonne Parish residents farmed on plantations; harvested, processed and distributed seafood; traded fur; cultivated sugarcane; and logged forests. Although the oil and gas industry is now valued by residents as a primary revenue-generator for the parish, the food manufacturing sector—especially seafood—and the navigation sector are also major employers that Terrebonne can hone to a competitive advantage and leverage for growth. In addition to these industries, the Terrebonne Parish Economic Development Authority is focusing diversification efforts on growing and attracting jobs in medical services, coastal restoration, aviation, food manufacturing and professional services such as engineering, accounting and law.

Terrebonne Parish stakeholders identified manufacturing, energy production, and the seafood industry as areas that offer potential growth and diversification opportunities. The LA SAFE process included outreach to these industries, and the LA SAFE plans take the current and future needs of these industries into careful consideration. Common concerns that emerged include workforce development, career readiness and awareness, land-use policy, and flood risk. LA SAFE strategies presented in the regional and parish plans reflect the need to sustain core employers while also diversifying economic assets.

⚠ Implications for Risk

The facilities and infrastructure that support these industries are exposed to flood hazards the same as any other component of the built environment. When such facilities or assets are damaged or shut down by hazard events, they have "ripple effects" on the surrounding community. These effects may take the form of hazardous material releases (airborne or waterborne), supply-chain interruptions, or economic disruptions that drag on household economies and resiliency. Over the longer term, significant impacts to key business sectors can also drive down tax revenues and thus undermine the fiscal stability of the parish, generate lawsuits and insurance claims that can adversely affect business confidence, and diminish the parish's ability to retain and attract employers.



JOB CENTERS

The majority of the parish's job centers are located on high ground. While the economy is largely based on oil and gas, growing employers include medical, transport, and shipbuilding.

Sources: U.S. Census Bureau, Center for Economic Studies, 2014; Infogroup published under U.S. Department of Labor guidance; For all basemap data see References

Legend

Job per Census Block Group

- 0 - 50
- 50 -100
- 100 - 200
- 200 - 500
- 500 - 1000

- Water
- Wetlands
- Parish Boundary

Energy

The oil and gas industry is a primary economic driver in the parish.

Photo Credit: Edibobb/Wikimedia Commons/Public Domain

Navigation

Intersection of the Intracoastal Waterway and Bayou Terrebonne in Houma.

Seafood Industry

Historically a major economic driver, the seafood manufacturing industry remains a major employer in Terrebonne Parish.

Energy

The oil and gas industry grew tremendously through the middle part of the 20th century, becoming the top industry in Houma by the 1970s. Despite the oil bust in the 1980s, the oil and gas industry is the largest source of revenue for Terrebonne Parish today and is expected to remain a major employer and economic driver into the future.[37]

However, the parish's oil and gas workforce has declined recently as a result of operations shifting into deeper waters and the oil and gas market downturn. This skilled workforce is available to be retrained and transitioned to other emerging industries. Existing and future post-secondary vocational training and on-the-job training programs provided by nearby universities, colleges, and technical schools will be essential to the successful transition of these workers.

"Some key industries—we used to have healthy industries related to oil, but the water levels in combination with oil prices have lead to all of them leaving, shutting down."

—Cocodrie Resident

⚠ Implications for Risk

Industrial assets may be vulnerable to direct damage from flooding, with the potential to cause hazardous material releases as well as other physical damage. Terrebonne Parish needs to ensure that the infrastructure supporting the oil and gas industry is protected from and adapted to hazards both to sustain the industry's important contributions to the local economy and to protect residents and the environment from the potentially hazardous effects of a failure or breakdown.

Navigation

Terrebonne Parish has strong maritime industries such as navigation, shipbuilding, fabrication, and repairs. Strategically located at the intersection of the Gulf Intracoastal Waterway and the Houma Navigational Canal, Terrebonne Parish has direct access to the Gulf of Mexico and the global market that supports these navigation services.

⚠ Implications for Risk

Navigational assets may be vulnerable to direct damage from flooding. Depending on the cargo, this may include the potential for hazardous material release. Damage to port, transfer, or storage facilities may also create supply-chain interruptions locally and beyond. In some extreme cases, navigational channels may be compromised, requiring expensive dredging to repair. Finally, lasting damage to navigational assets—whether onshore facilities or boats—can result locally in loss of wages and wealth, insurance impacts, forgone taxes, and other negative economic ripple effects.

Seafood Industry

The seafood industry in Terrebonne Parish provides more than an occupation; for many, fishing and shrimping is a lifestyle and livelihood passed down through generations. Seafood from Terrebonne Parish supplies and supports the region's rich culinary traditions and contributes to the regional economy as a major export. The parish's shrimping and fishing industry was robust in the 1970s with operations dotting lower Terrebonne Parish. Regrettably, this industry is now much reduced, with just a few shrimping facilities remaining in operation. Despite the decline, however, the parish still produces over 20% of Louisiana's seafood.[38]

⚠ Implications for Risk

Commercial fishing assets, including facilities for port, transfer, storage, and refrigeration, vehicles and boats, and wetlands and marshes are vulnerable to direct damage from flooding. Saltwater intrusion and habitat loss can devastate species of fish and crustaceans the seafood industry depends on. Damage to port, transfer, or storage facilities may create supply-chain interruptions locally and beyond. Finally, lasting damage to navigational assets—whether onshore facilities or boats—can result locally in loss of wages and wealth, insurance impacts, forgone taxes, and other negative economic ripple effects.

Case Study: Delcambre Direct

The Delcambre Direct Seafood program revitalized Delcambre's shrimping industry in 2010. Developed by the Town of Delcambre in partnership with LSU Agricultural Center and Louisiana Sea Grant, the program helped connect fishermen directly to consumers and drive new customers to the local fishing industry along Louisiana's Gulf Coast.

Recently launched programs such as Louisiana Direct Seafood are continuing work to promote the local fishing industry. LaTer (Lafourche-Terrebonne) Direct Seafood, which is modeled after Delcambre Direct, enables fishermen in Terrebonne Parish to market their catch directly to the public. This initiative allows consumers to buy seafood off the boat, providing direct access to Terrebonne Parish's internationally known oysters and all varieties of seafood available from local fisherman. The fishermen benefit from an improved ability to sell their catch to consumers at a fair price, while customers get better access to fresh seafood.

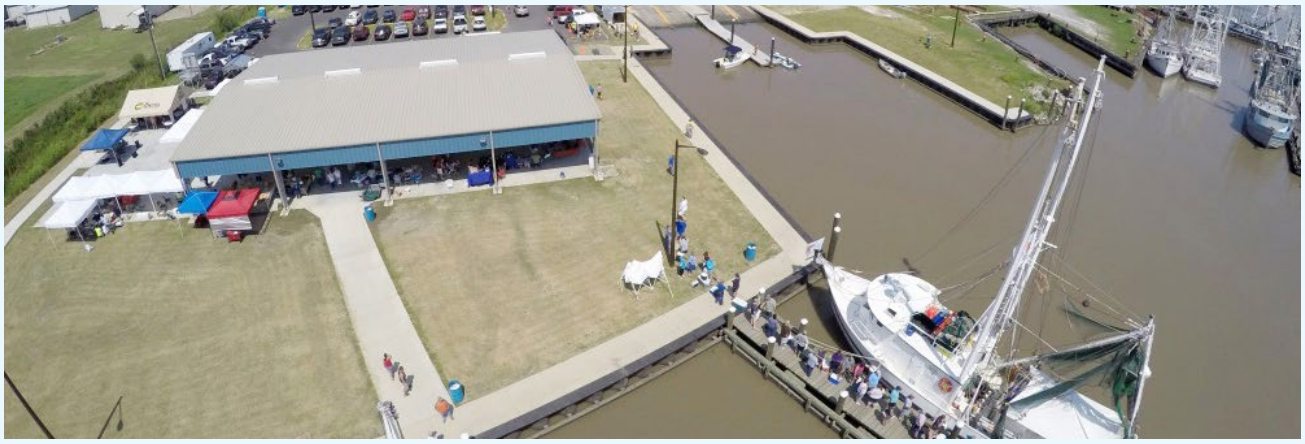


Photo Credit: Delcambre Market Blog, Delcambre Seafood & Farmers Market

Agriculture

According to the USDA's 2012 Census of Agriculture, the parish's top crops are sugarcane and hay. The Economic Enhancement Strategy for Terrebonne Parish notes soybean and rice farming as other important crops. However, food manufacturing only comprised approximately 250 jobs in the parish in 2016. To better capitalize on the parish's agricultural assets, food manufacturing must be expanded to maximize the economic benefits of crop production in the parish.

Agriculture
Sugarcane is one of the parish's top crops.

⚠ Implications for Risk

Agricultural assets—including buildings, vehicles, seed stocks, livestock, silage, and fields—may be vulnerable to direct damage from flooding. In particular, saltwater intrusion from surge or backwater flooding can devastate crops. Additionally, transportation, transfer, and storage facilities may be impacted by floods. Lasting damage to any of these can result in ripple effects through related sectors of the economy as well as loss of wages and other negative economic impacts.

Recreation and Tourism

Terrebonne Parish is the embodiment of the"Sportsman's Paradise," for which Louisiana is known. The parish's wildlife areas, recreational facilities, parks, bayous, and marshes provide abundant opportunities for hiking, biking, boating, recreational fishing, kayaking, hunting, birding, and ecotourism.

Sport fishing in particular is a well-established industry and passion for many in Terrebonne Parish. Fishing camps and fishing charters take advantage of the parish's wetland and coastal locations, affording access to both freshwater and saltwater fishing. Opportunities to hunt duck and other waterfowl abound throughout the parish. The Mandalay National Wildlife Refuge preserves over 4,000 acres of freshwater marsh, providing a home to many species of migratory birds. The Mandalay Refuge offers visitors excellent opportunities for birding and viewing wildlife in its natural habitat.

Expanding Industries
Natural assets provide recreation for locals and visitors to Terrebonne Parish.

⚠ Implications for Risk

Sport fishing and other recreational assets may be vulnerable to direct damage from flooding, similar to commercial fishing. Vulnerabilities include onshore assets (port and support facilities as well as private camps), the boats themselves, and other related tourist infrastructure such as lodging, restaurants, and retail. Damage to any of these can disrupt recreational activities, which can in turn drag down local income and wealth. Moreover, because recreational and tourist spending is highly elastic, difficult economic straits or challenging local conditions can sharply reduce demand for such activities.

Economic Decline and Disruption

Changes on the coast have increased Terrebonne Parish's economic vulnerability. Even with the full implementation of the 2017 Coastal Master Plan, CPRA estimates damages of $1 billion per year over the next 50 years.[39] A portion of this damage will be to the parish's infrastructure. The largest industries—oil and gas, fisheries, and shipbuilding—all depend on parish infrastructure for access to the Gulf. Terrebonne Parish produces 20% of the state's seafood,[40] but even small storms can require the closing of parish floodgates, leaving fishers unable to get their catch to market. Large storms also impact smaller but growing industries such as recreation and tourism by impacting infrastructure, demolishing docks and ice houses, and damaging boats.

Trade-Offs of Economic Activity

The effects of industrial infrastructure and navigational canals have assisted in degrading Louisiana's shoreline including valuable stretches of coastline and marshland in Terrebonne Parish. As a result, vegetation and wildlife habitats were damaged and destroyed, and long-term impacts such as an accelerated rate of land loss, depletion of mangrove forests, and destruction of barrier islands and wildlife habitats are expected. Due to the parish's dependence on these habitats and their wildlife, Terrebonne Parish's economy was and will continue to be negatively impacted by natural and man-made disasters.

Impacts
Cleanup along the shoreline after the Deepwater Horizon oil spill in 2010.

"Our kids are passionate about living here and being involved in contributing to the parish's future."
—Terrebonne Parish Resident

⚠ Implications for Risk

The developed areas of Terrebonne Parish face flood risk from precipitation events. Nearly all residential and commercial developments in Terrebonne are on the ridges that parallel the five bayous in the parish. While these ridges represent the lowest flood risk areas in the parish, they make up less than 6% of the land area. Subsidence and sea level rise also affect these areas, contributing to nuisance flooding and reducing the effectiveness of drainage systems. In short, nearly all land in the parish is susceptible to flood risk of some kind.

Economic Opportunities
Top Left: Terrebonne General Medical Center in Houma.
Photo Credit: Google Maps Street View

Bottom Left: Fletcher Technical Community College.
Photo Credit: Houma-Terrebonne Chamber of Commerce

Right: Ecotourism in coastal wetlands.

Economic Opportunities

Meeting participants recognized that Terrebonne Parish must continue to diversify its economy to reduce its heavy dependence on finite natural resources and to increase economic resilience from natural disasters. In addition to building on existing industries, tourism, healthcare, and coastal restoration are three emerging industries that show promise for gaining a stronghold in Terrebonne Parish.

For instance, Terrebonne General Medical Center is an asset that can be built upon to create additional employment and economic activity in the healthcare industry. Of the 6,800 people employed in the healthcare sector, approximately 25% work at the Terrebonne General Medical Center.[41] Increases in the parish's aging population will further expand the need for nursing care and other health services.

A local knowledge base relating to coastal restoration has grown out of the long-standing presence of the oil and gas industry and is bolstered by programs at Fletcher Technical Community College, Nicholls State University, and support from federal, state, and local governments. The parish has developed a plan for coastal restoration that outlines a number of initiatives that could result in both construction and technical jobs in this industry for years to come.

For communities down the bayou, sport fishing is increasingly a great economic opportunity, with people from around the world visiting fishing camps, hiring charter boats, and dining at local seafood restaurants. Ecotourism—tourism that capitalizes on the natural beauty and resources of an environment—is an industry that can provide economic viability for those areas with high flood risks.

Cocodrie Welcome Sign.
Photo Credit: Terrebonne Parish Consolidated Government

Festivals and music are important cultural assets.

The parish's natural landscape influences its culture and heritage.

Parish Assets

During the community engagement process, parish residents identified the natural beauty, small-town feel, love for quality of life, and life on the bayou as the parish's cultural strengths.

Heritage and Culture

Terrebonne Parish residents value their heritage and culture and appreciate the traditions that developed over time as generations built their lives and families amidst the local landscape and waterways. Despite disasters and other disruptions, Terrebonne Parish communities seek to prioritize historic and cultural resources, embrace the local ways of living with water, celebrate the social and cultural character of different neighborhoods, and cultivate a special sense of place.

The name Terrebonne means "good earth." Terrebonne Parish's culture has been heavily influenced by its people's appreciation for and dependence upon the natural environment, which has sustained inhabitants for centuries. The indigenous Houma tribes were among the first to make Terrebonne their home. Fleeing conflict, they settled on the high ground along bayous throughout the mid-to-late 1700s, until an influx of early European settlers pushed the American Indian populations south into the marsh and coastal areas. Acadians were also drawn to the area for its relative seclusion and fertile environment. The confluence of these diverse populations and their strong connection to the land created a unique culture that typifies life along the bayou in Terrebonne.

Hospitality, fun-loving natures, culinary traditions, and an emotional connection to the land are alive and well along the bayous today. Cajun food and music along with festivals, parades, swamps, fishing rodeos, and cultural events such as the Houma Mardi Gras, Cajun Christmas Parade, the Rougarou Festival, and the Voice of the Wetlands Festival give Terrebonne Parish its unique and endearing character, drawing tourists from around the state, nation, and globe. This powerful cultural presence is a valuable asset that helps drive the economy and sustain a strong sense of place.

"This is the only place in the world where Cajun culture exists, and it's leaving more and more. The further north you go, the worse it gets."

—Terrebonne Parish Resident

4 Vision and Strategies

50-Year Vision

Louisiana's Bayou Country

Characterized by its numerous Gulf Coast bayou communities, Terrebonne Parish draws residents and visitors alike to its diverse environment, wildlife, and Cajun culture. As these assets are faced with increasing risk, LA SAFE envisions a future where, parallel to the ongoing and planned coastal protection and restoration efforts, investments are prioritized on higher ground. Blue/green corridors and parkways store excess water in the landscape and sustainable industries diversify the economy. In coastal high-risk areas, the challenge of rising water is turned into an opportunity for new cultural and ecological destinations with support for the fishing industry, enhanced connectivity, and improved evacuation routes.

Smart Growth and Integrated Water Management

Anticipating continued population movement to low-risk areas, Terrebonne Parish directs growth to higher ground north of the Intracoastal Waterway and utilizes natural systems for stormwater management.

- More focused, mixed-use development patterns and town centers between Houma and Thibodaux spur economic development and promote public health through walkable, bikeable neighborhoods.
- Environmental assets and natural buffers are preserved and protected, and new development is restricted in the floodplains.
- Blue/green networks of engineered landscapes delay and store stormwater, reducing flooding and drainage-induced subsidence while providing amenities with multiple benefits to the community.
- Water conveyance across ridges is minimized and water is held in the basins and as close to the source as possible.
- Green infrastructure is incorporated in all new development and redevelopment projects.
- Smart retrofits use permeable materials to replace impervious surfaces.
- Sustainable industries diversify the economy and provide opportunities for waterway redevelopment.

Investment Prioritization

South of the Intracoastal Waterway, bayou communities prioritize new investments on higher ground and stable soils.

- Communities in moderate-risk areas along the bayous consolidate services and amenities around hubs on higher ground, with agriculture and floodplain management in between.
- Structures are elevated on piers.
- Environmental assets and natural buffers are preserved and protected, and new development in the floodplains is restricted.
- Wetland terraces provide additional risk reduction from storm surge.

Cultural and Ecological Destination

High-risk areas, both inside and outside the Morganza to the Gulf levee, turn challenges into new opportunities.

- Cultural and ecological assets are preserved.
- Structures are elevated on piers.
- Support for the fishing industry and new incentives for aquaculture, elevated camps, and ecotourism bring new revenue to the parish.
- Connectivity of services and safe evacuation routes are maintained and improved to promote a new water-based economy.

50-YEAR TERREBONNE PARISH VISION

The Terrebonne Parish vision includes designing new growth corridors and centers, protecting public assets, establishing resilient neighborhoods, enhancing economic engines, and adapting to rising waters.

Legend

- Existing Transportation Routes
- CPRA Proposed Levee
- Pump Station/Control Structure
- High Ground
- Low Ground (High Flood Risk)
- Salt/Brackish Water

Toolkit of Interventions

Hardscape Retrofits and Build Sustainable Industries

Water Storage in Unused Land and Stormwater Retrofits

Ecological Restoration and Limited Floodplain Development

Consolidated Services and Amenities on Higher Ground

Low Risk

Minimal storm surge flood risk projected and outside the current 100-year floodplain

Design New Growth Corridors and Urban Centers

Low-risk areas have development opportunities to receive populations and economic activity from more flood-prone environments.

Moderate Risk

>0 – 6' projected storm surge flood depths or within the current 100-year floodplain

Protect Assets and Establish Resilient Neighborhoods

Areas conducive to maintaining current population levels and economic trends provided such communities orient future development and mitigation activities in alignment with future flood risk projections.

High Risk

>6' projected storm surge flood depths

Enhance Economic Engines and Adapt to Rising Waters

Areas that can expect to experience population decline and economic losses, up to and including full community-scale resettlement, as environmental conditions deteriorate and repetitive severe flood events take place.

Image Credit: Terrebonne Parish Consolidated Government

50-Year Vision by Risk Level

Dealing with flood hazards and managing risk have always been part of life in Terrebonne Parish, and a great deal of work has been done in recent years to help the parish and the region continue to thrive amidst a changing environment and risk profile. The 2017 Coastal Master Plan, along with Terrebonne Parish's Hazard Mitigation Plan and Drainage Master Plan, are guiding investments in structural and nonstructural projects designed to address land loss and coastal erosion, which is essential to the future of Louisiana's coastal communities.

LA SAFE has created an opportunity to build upon these plans and ongoing investments by putting community members and stakeholders at the forefront of the planning process. The LA SAFE team worked with them to develop a shared vision for the future of their parish and region; set priorities to inform a holistic approach to achieving resilience; and vet local, parish-wide, and regional solutions. This process enabled residents and local stakeholders to take on greater ownership of the strategies needed for their communities to successfully mitigate flood risk and adapt to future hazards. The following recommendations are the result of that community-driven process.

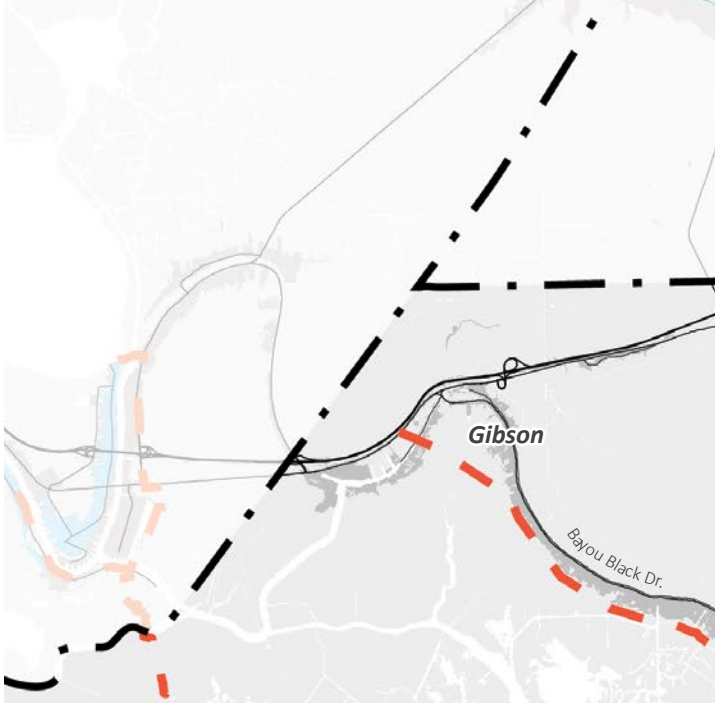
LA SAFE promotes new growth corridors and urban centers in low-risk areas, protects assets and establishes resilient neighborhoods in areas of moderate risk, and enhances economic engines and adapts to rising waters in high-risk areas.

N

LOW-RISK ZONE

Risk scenarios are based on CPRA's 50-year flood depth projections under a Medium Environmental scenario and FEMA's proposed DFIRM floodplain data.

Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; FEMA Preliminary DFIRM 100-year floodplain data for Terrebonne Parish 2008; For all basemap data see References



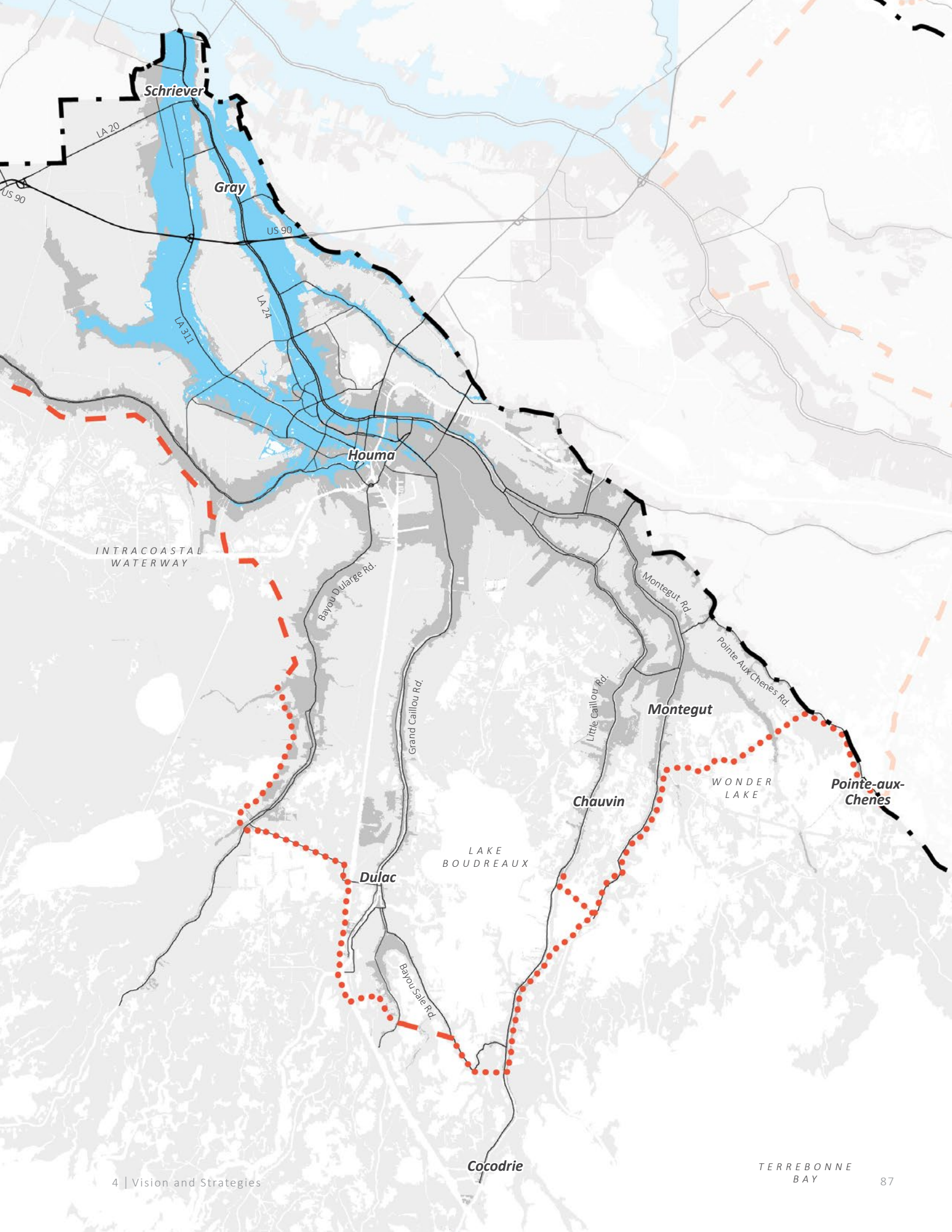
Low Risk

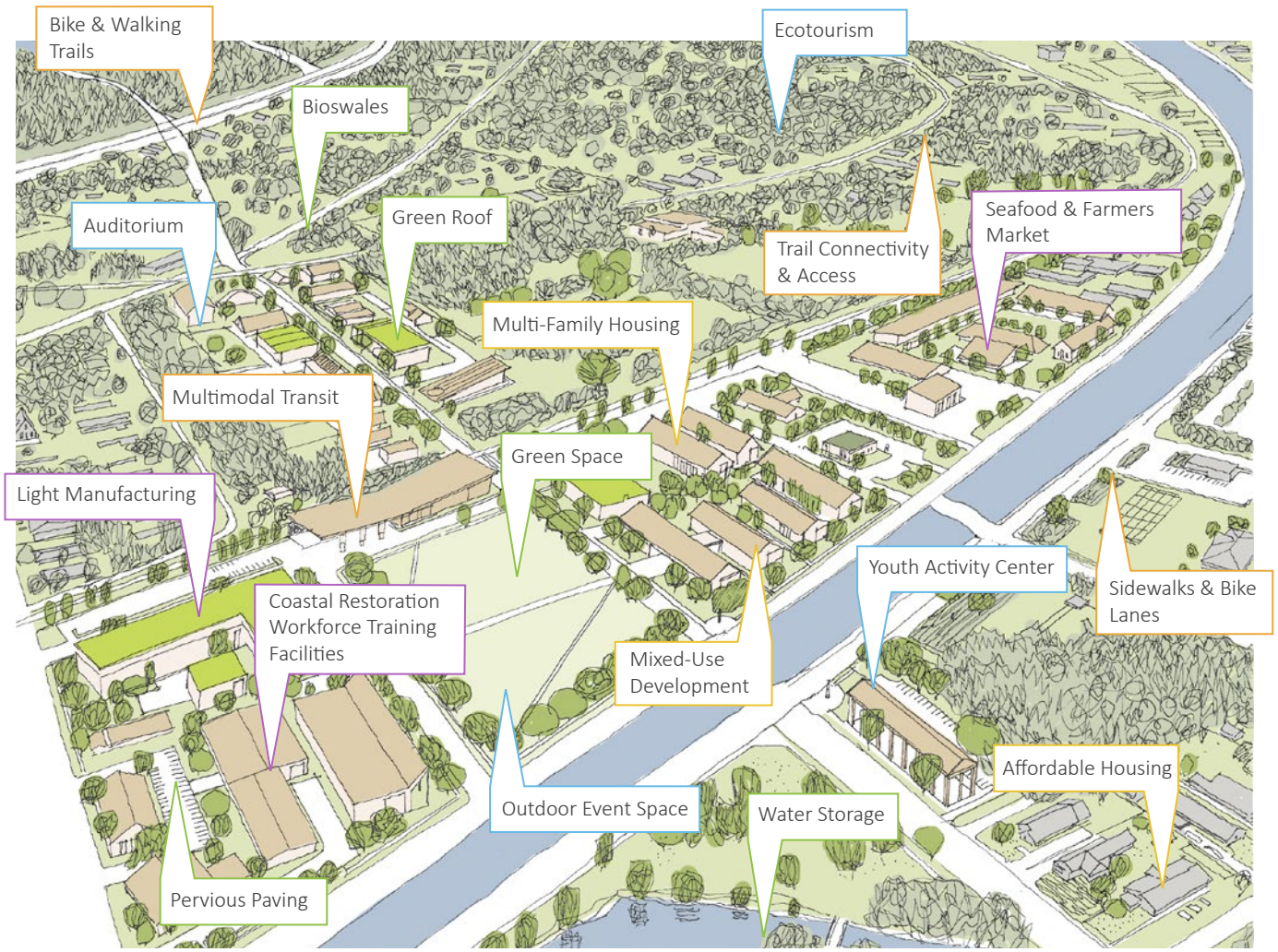
Minimal storm surge flood risk projected and outside the current 100-year floodplain

Current characteristics of these areas include suburban-type single-family residential and commercial development with infill opportunities, some public transportation options, and traditional stormwater management facilities. Primarily located on and along the natural ridges, the area is growing geographically toward the north, converting agricultural land into subdivisions. Currently, there is minimal flood risk from storm surge in this area, although heavy downpours have been flooding streets.

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary


Schriever
LA 20
US 90
Gray
US 90
LA 24
LA 311
Houma
INTRACOASTAL WATERWAY
Bayou Dularge Rd.
Grand Caillou Rd.
Little Caillou Rd.
Montegut Rd.
Pointe Aux Chenes Rd.
Montegut
WONDER LAKE
Pointe-aux-Chenes
Chauvin
LAKE BOUDREAUX
Dulac
Bayou Sale Rd.
Cocodrie
TERREBONNE BAY



Perspective View of 50-Year Vision
The low-risk vision presents a future with denser, walkable town centers, increased transportation options including sidewalks and bicycle lanes, and improved stormwater management.

Legend

- Water Management
- Education, Economy, and Jobs
- Housing and Development
- Culture and Recreation
- Transportation

50-Year Vision for Low-Risk Areas: Design New Growth Corridors and Urban Centers

Lower-risk areas are projected to have economic growth, population increases, and minimal flood risk. The low-risk area vision is characterized by—

- Denser residential and commercial development
- Increased transportation options
- Improved stormwater and subsidence management
- Green public spaces

When surveyed in Meeting 3, 83% of Terrebonne Parish participants agreed with this vision for the future of low-risk areas.

Houma-Thibodaux Growth Corridor

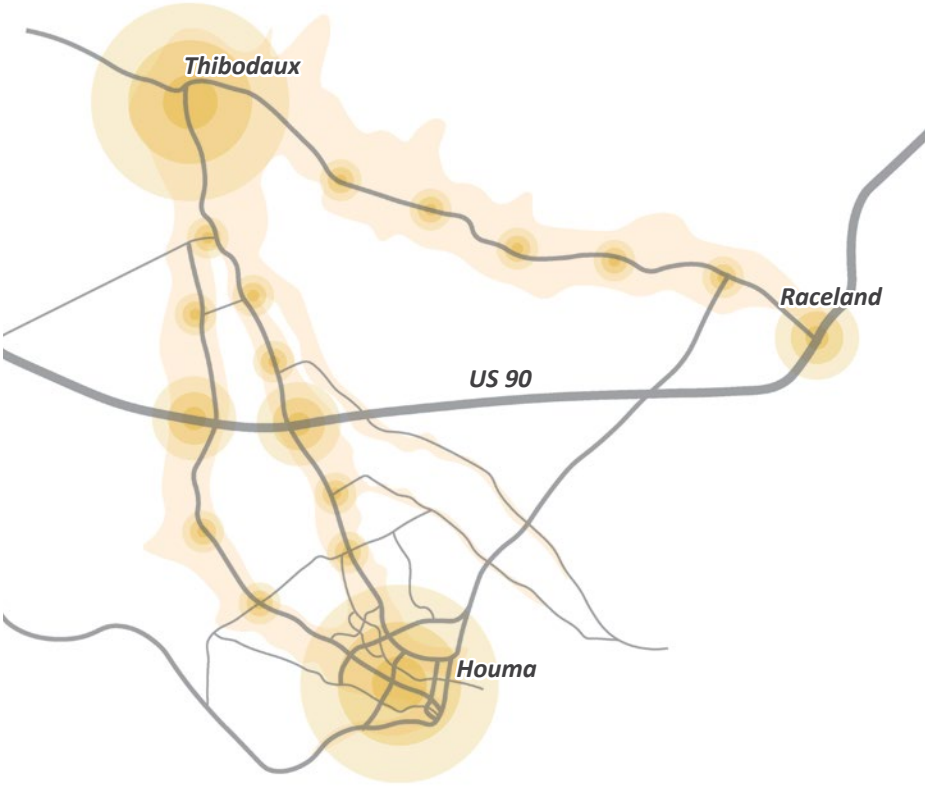
A series of walkable town centers between the cities of Thibodaux and Houma can attract residents from within the parish and elsewhere, spurring economic development.

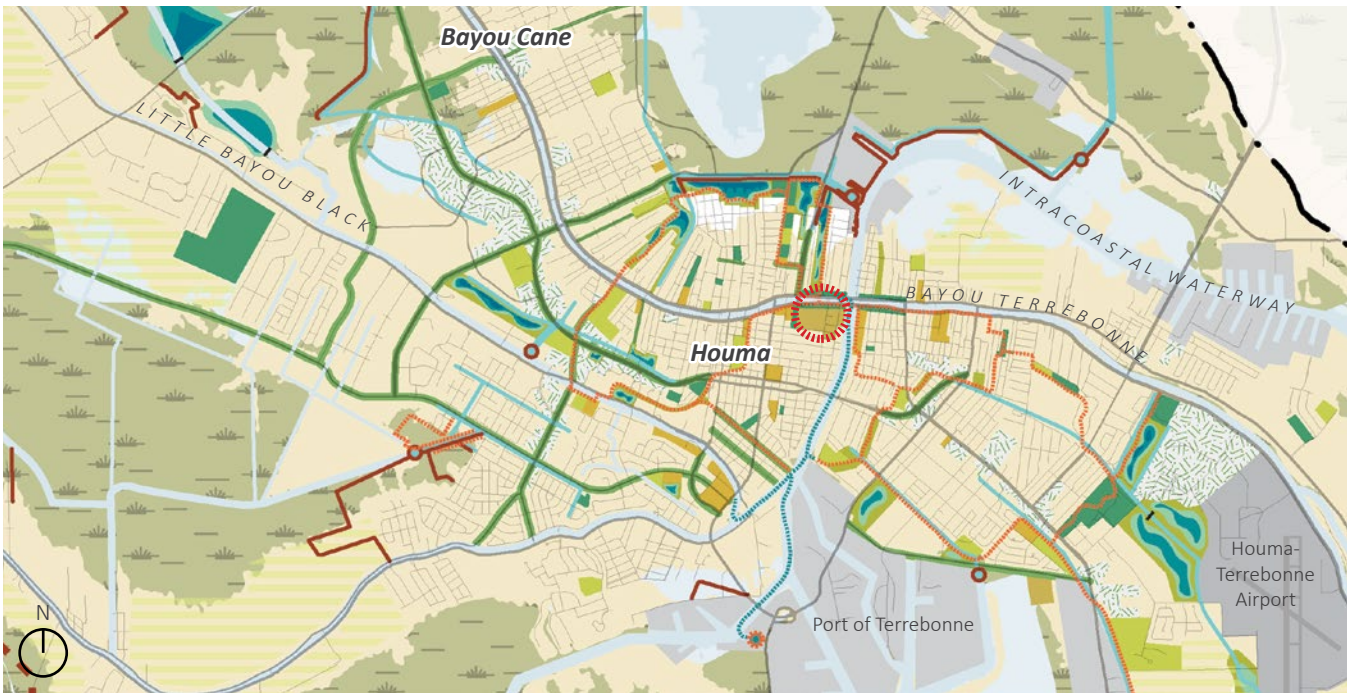
Denser Mixed-Use Communities Around Development Nodes

US 90 intersections located on higher ground have potential for future growth and economic development.

Revitalization of Downtown Houma

Improving access to Bayou Terrebonne in Houma can improve connections, activate the bayou's edge, and spur adaptive reuse and infill at key gateways into downtown.





Plan View of 50-Year Vision, Houma Area

Sources: For all basemap data see References

Legend

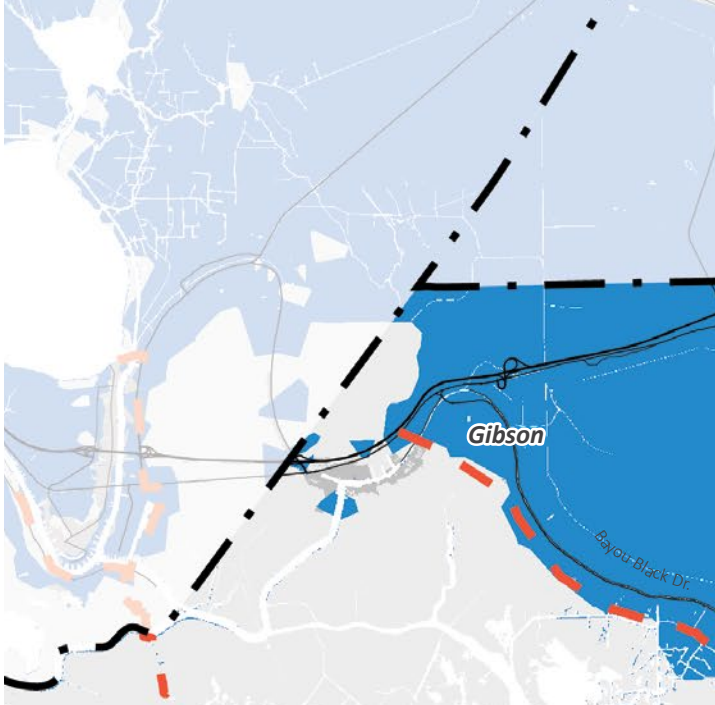
- Stormwater storage
- Pervious paving and green infrastructure in commercial zones
- Complete green streets
- Existing levees and pumps
- Downtown Houma revitalization
- Pedestrian network to link services and amenities
- Harbor of Refuge and boat launch
- Existing park
- Existing school
- Existing civic institution

N

MODERATE-RISK ZONE

Risk scenarios are based on CPRA's 50-year flood depth projections under a Medium Environmental scenario and FEMA's proposed DFIRM floodplain data.

Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; FEMA Preliminary DFIRM 100-year floodplain data for Terrebonne Parish 2008; For all basemap data see References



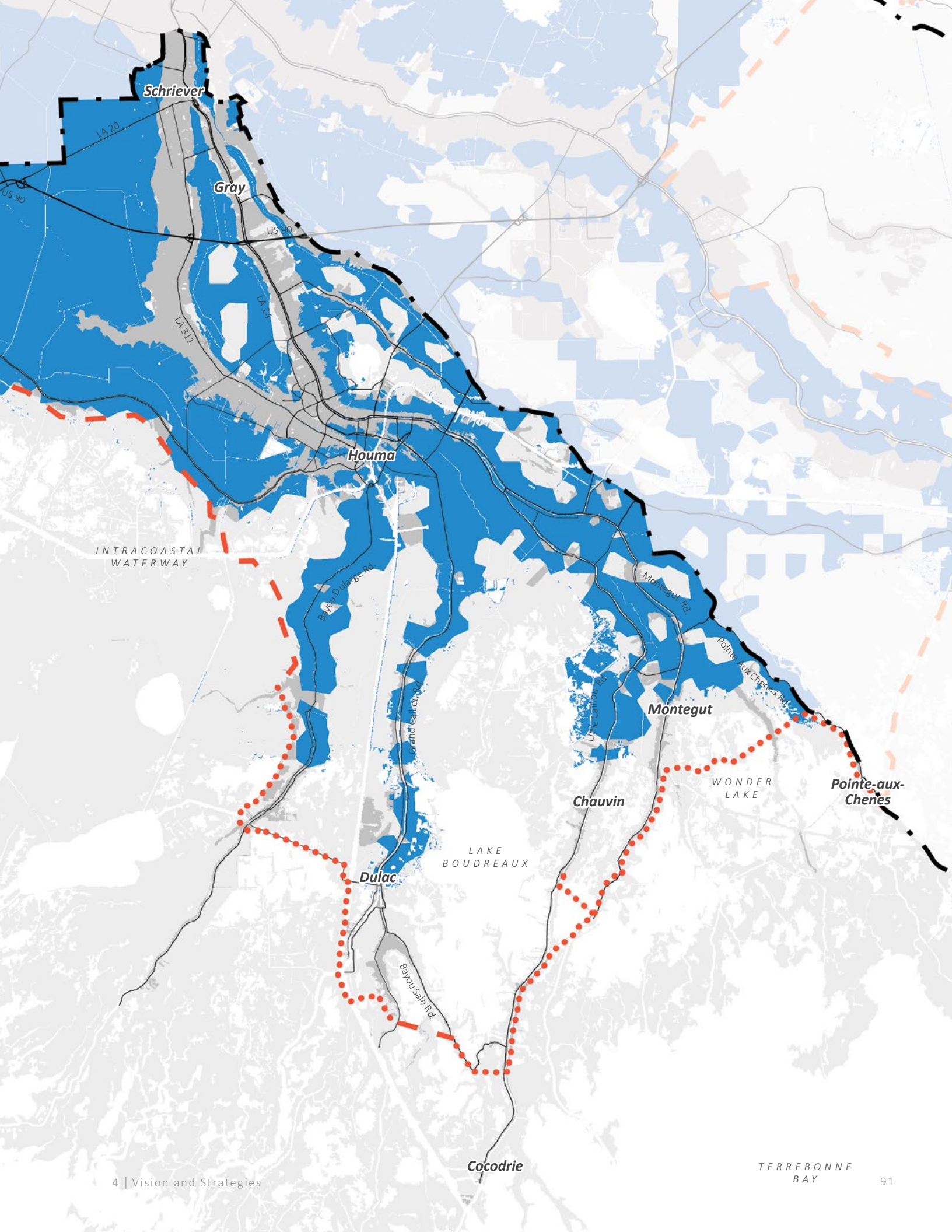
Moderate Risk

>0 – 6' projected storm surge flood depths or within the current 100-year floodplain

At this time, the area is primarily agricultural and undeveloped land with isolated, concentrated development in the southern parts. In areas farther south, recreational and commercial fishing communities like Chauvin and Montegut are currently at the highest flood risk. Protection and restoration projects are currently underway to decrease storm surge flood risks of up to 15 feet.

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary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WONDER LAKE
Pointe-aux-Chenes
Chauvin
LAKE BOUDREAUX
Dulac
Bayou Sale Rd
Cocodrie
TERREBONNE BAY

50-Year Vision for Moderate-Risk Areas: Protect Assets and Establish Resilient Neighborhoods

Moderate-risk areas are projected to have land loss in surrounding areas, moderate local flood risk, and minimal change in population. The moderate-risk area vision is characterized by—

- Protected harbors
- Clustered elevated housing and amenities
- Recreational spaces
- Elevated evacuation routes
- Increased transportation options

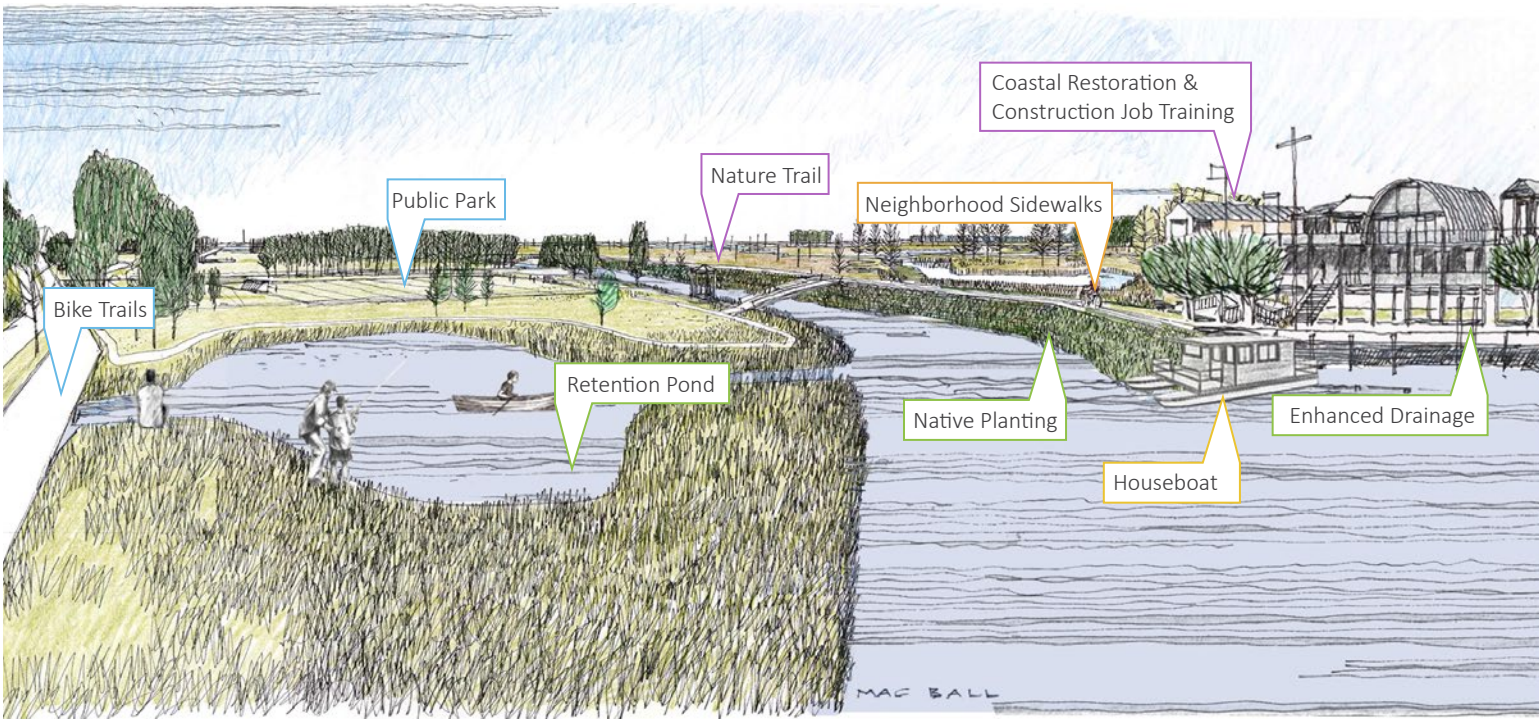
When surveyed in Meeting 3, 80% of Terrebonne Parish participants agreed with this vision for the future of moderate-risk areas.

Legend

- Water Management
- Education, Economy, and Jobs
- Housing and Development
- Culture and Recreation
- Transportation

Perspective View of 50-Year Vision

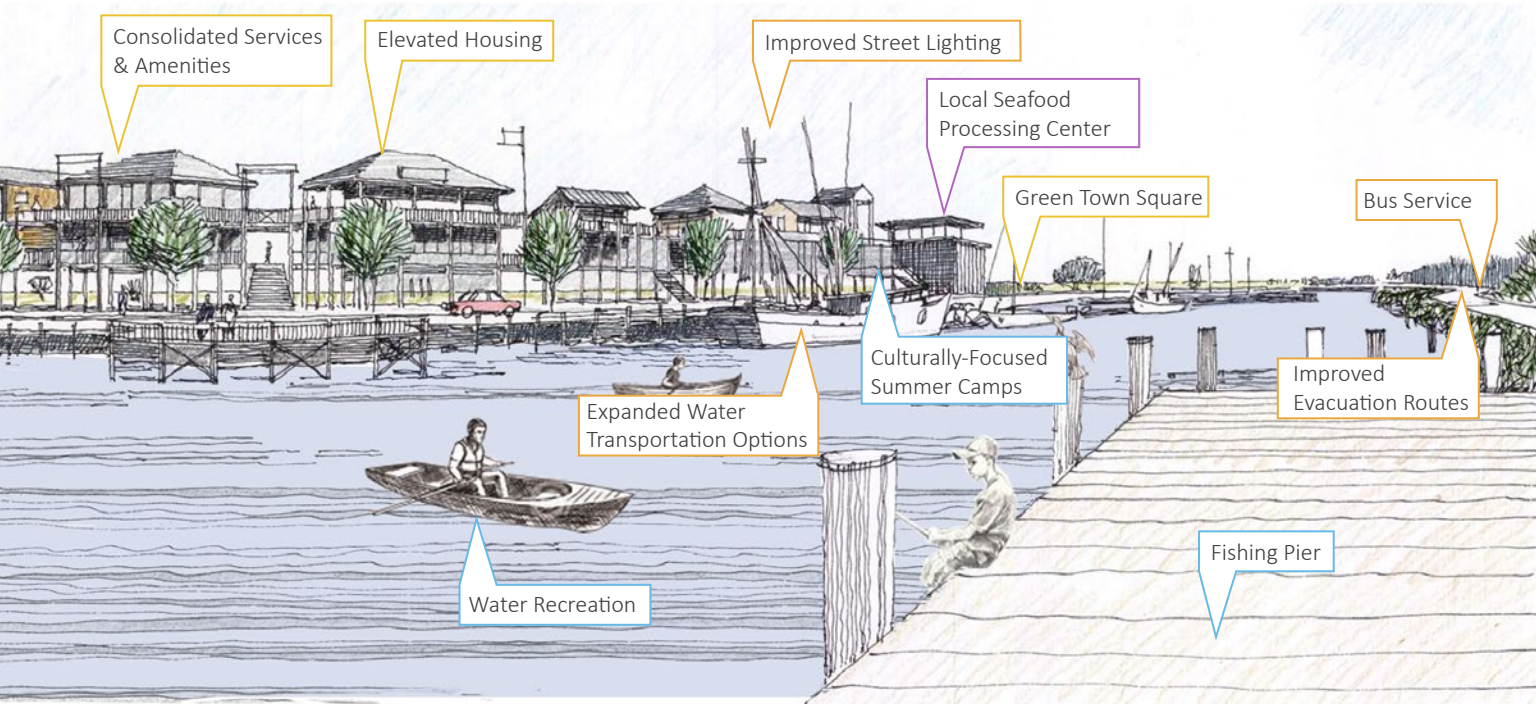
The moderate-risk vision presents a future with clustered elevated housing, integrated stormwater management, and access to recreation.



Plan View of 50-Year Vision

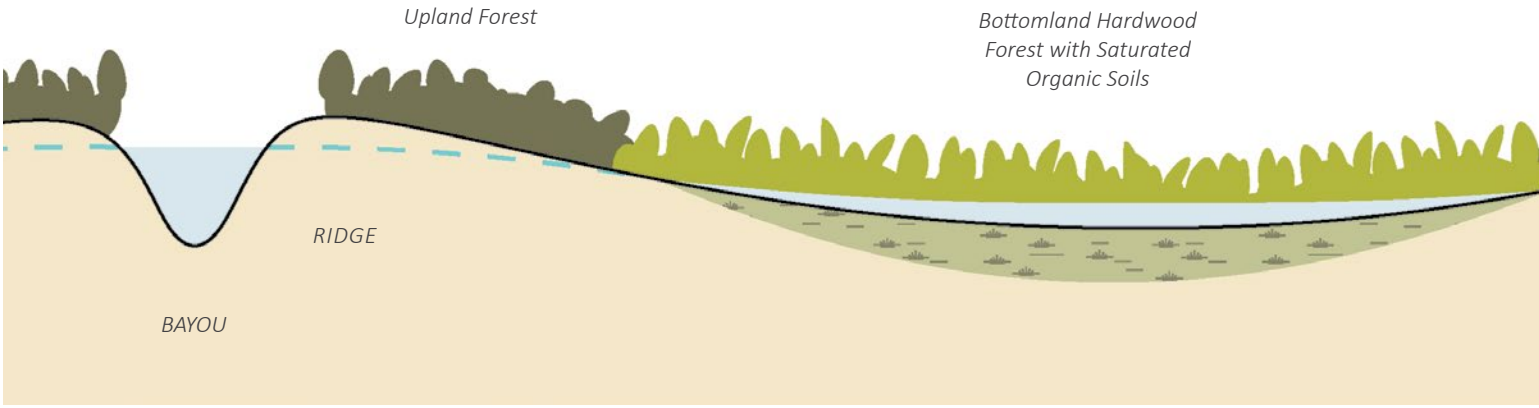
The 50-year vision includes preserving and restoring ecosystems and communities inside the levees.

Sources: For all basemap data see References

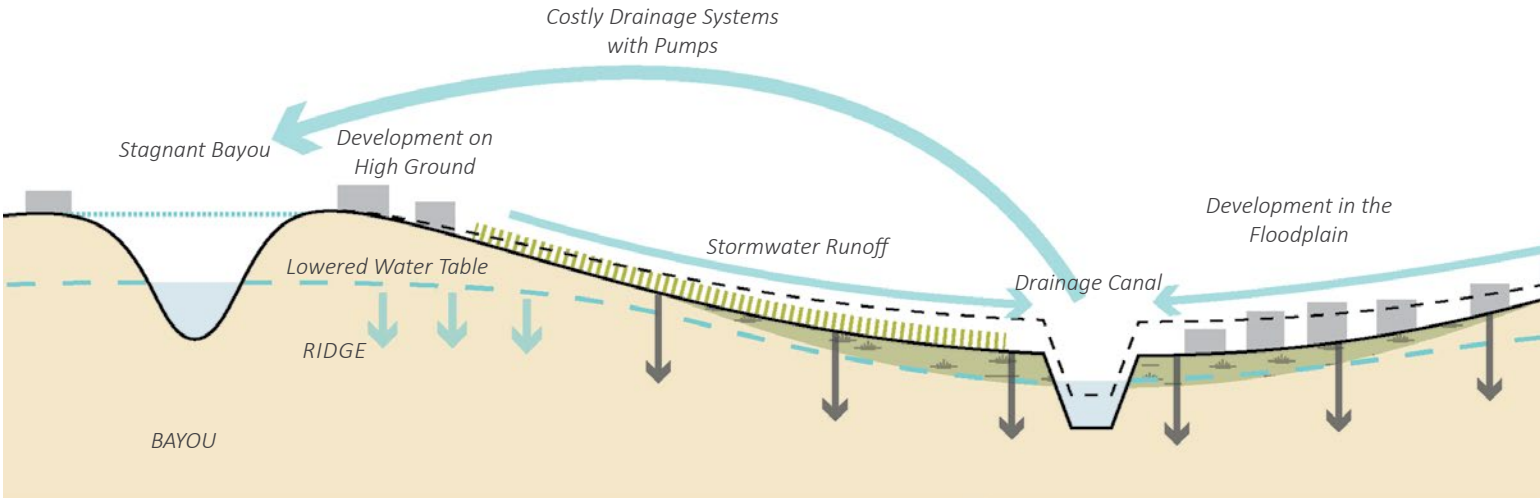


Section and Plan Diagrams

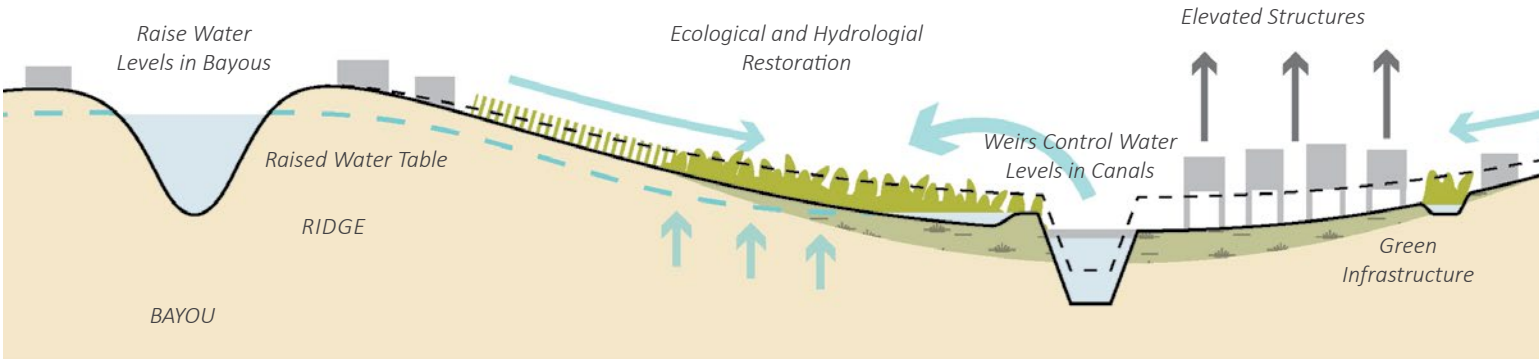
The diagrams below show pre-develop condition, current condition, and a future vision for Terrebonne Parish's bayou communities.



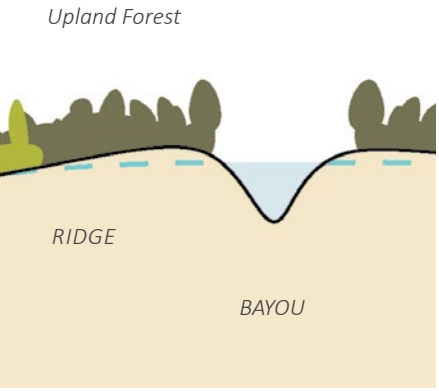
Section Diagram

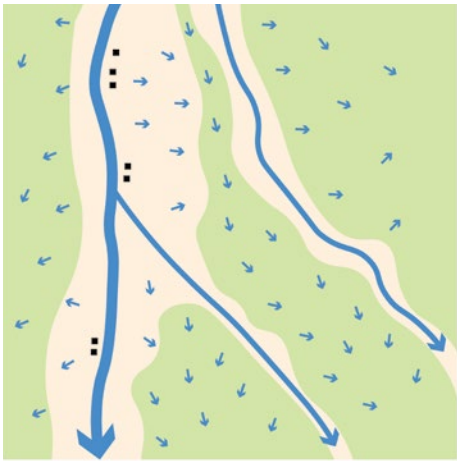


Section Diagram



Section Diagram

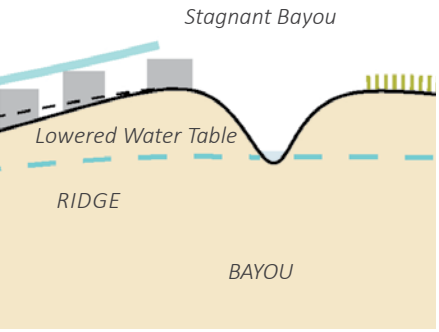


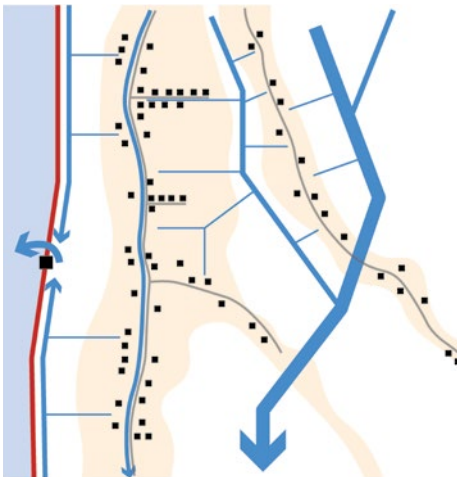


Plan Diagram

Pre-European Settlement: Natural Condition

Bayous distribute river water and sediment to form ridges. Swamps in the basins are adapted to flood.

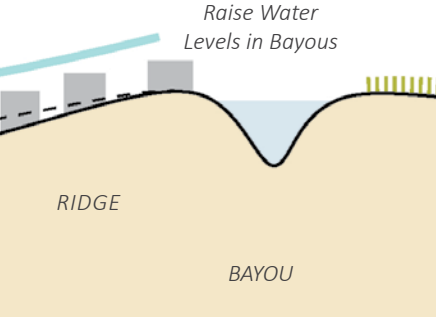


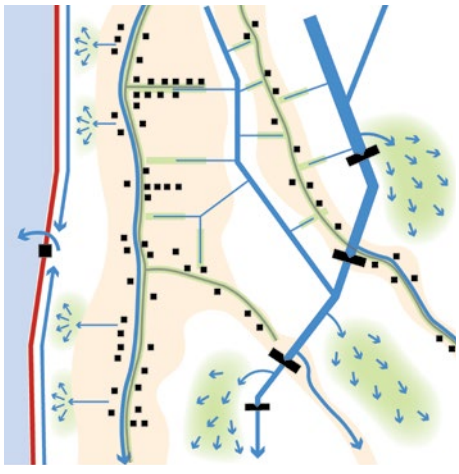


Plan Diagram

Current Condition: Drain and Pump

Canals, pumps, and levees drain the basins. The lowered water table enables agriculture and development but also induces subsidence.





Plan Diagram

50-Year Vision: Slow, Store, Drain if Necessary

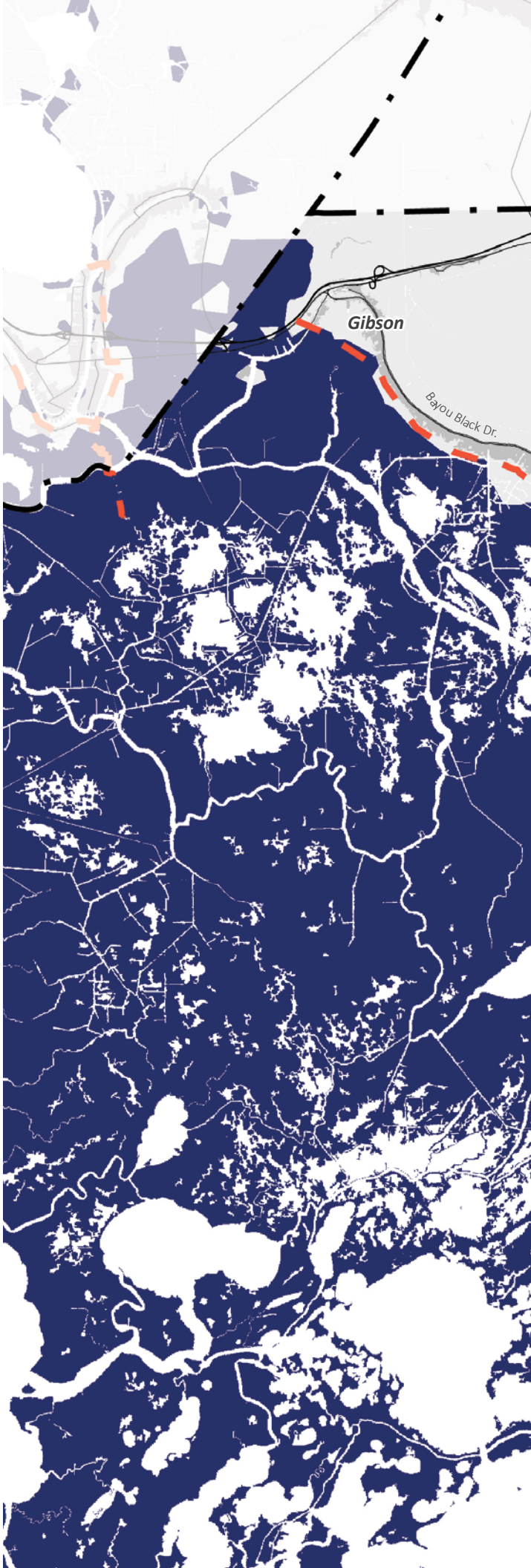
The natural hydrology is emulated with green infrastructure. The raised water table mitigates subsidence and elevated structures reduce risk.

N

HIGH-RISK ZONE

Risk scenarios are based on CPRA's 50-year flood depth projections under a Medium Environmental scenario and FEMA's proposed DFIRM floodplain data.

Sources: CPRA Flood Risk Medium Scenario Modeling Data 2017; FEMA Preliminary DFIRM 100-year floodplain data for Terrebonne Parish 2008; For all basemap data see References

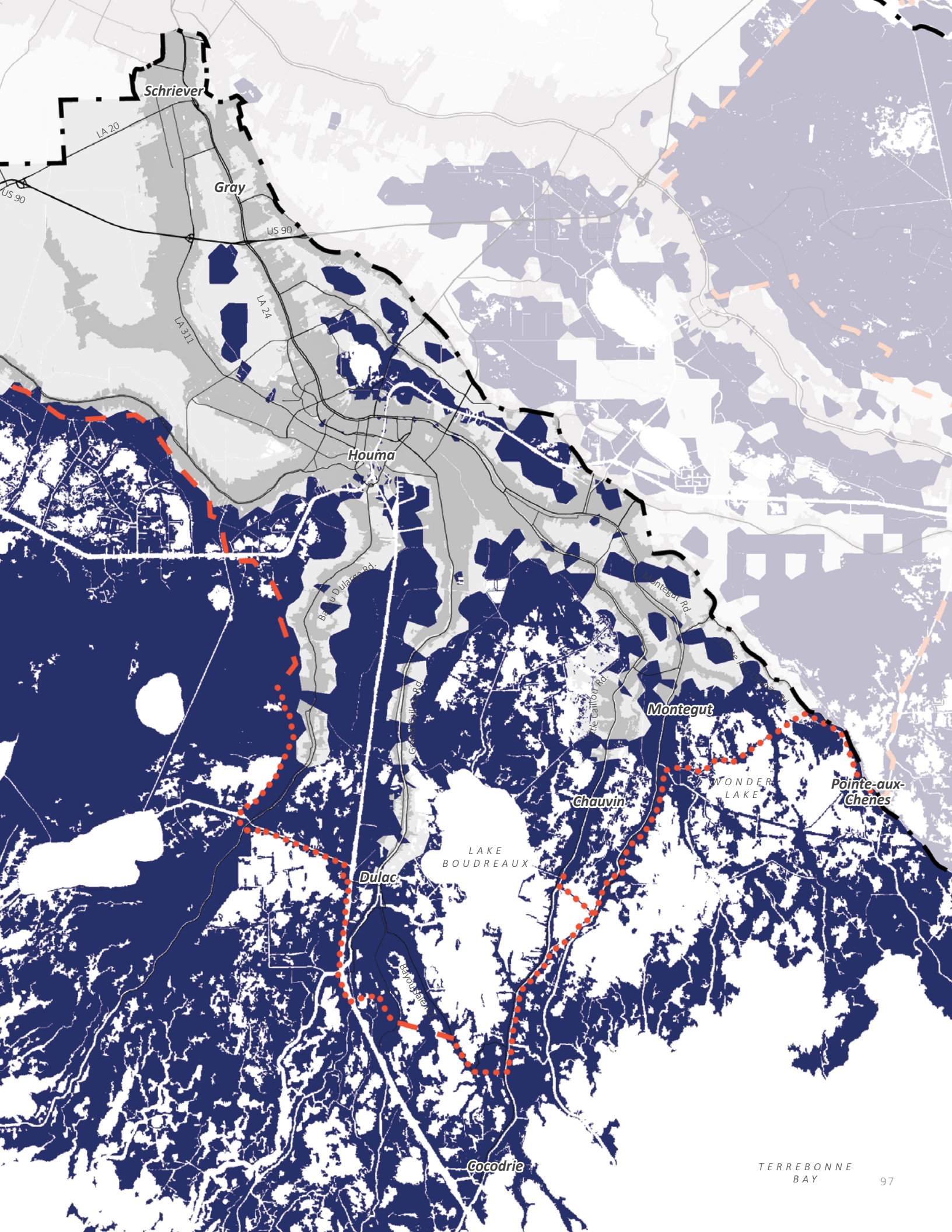


High Risk
>6' projected storm surge flood depths

Most of these ares currently experience a high level of flood risk. As seas continue to rise and the Louisiana coastline continues to be negatively impacted, these areas will experience unsustainable levels of flood risk. Land loss and coastal erosion are evident, and parish and state investments toward infrastructure improvements have significantly slowed. In many areas, new or substantially improved homes are required to elevate 12 feet or higher due to FEMA, state, or local regulations. These residents are primarily working in the oil and gas and seafood industries or ancillary support industries. Many homes have transitioned to seasonal fishing camps, and fewer people live there permanently. Commercial development has effectively ceased.

Legend

- Land
- Wetlands
- Water
- Non-Federal Levee (Morganza to the Gulf)
- CPRA Proposed Levee (Morganza to the Gulf)
- Parish Boundary


Schriever
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Houma
Bayou Dularge Rd
Montegut Rd
Montegut
Chauvin
WONDER LAKE
Pointe-aux-Chenes
LAKE BOUDREAUX
Dulac
Bayou Dularge
Cocodrie
TERREBONNE BAY

50-Year Vision for High-Risk Areas: Enhance Economic Engines and Adapt to Rising Waters

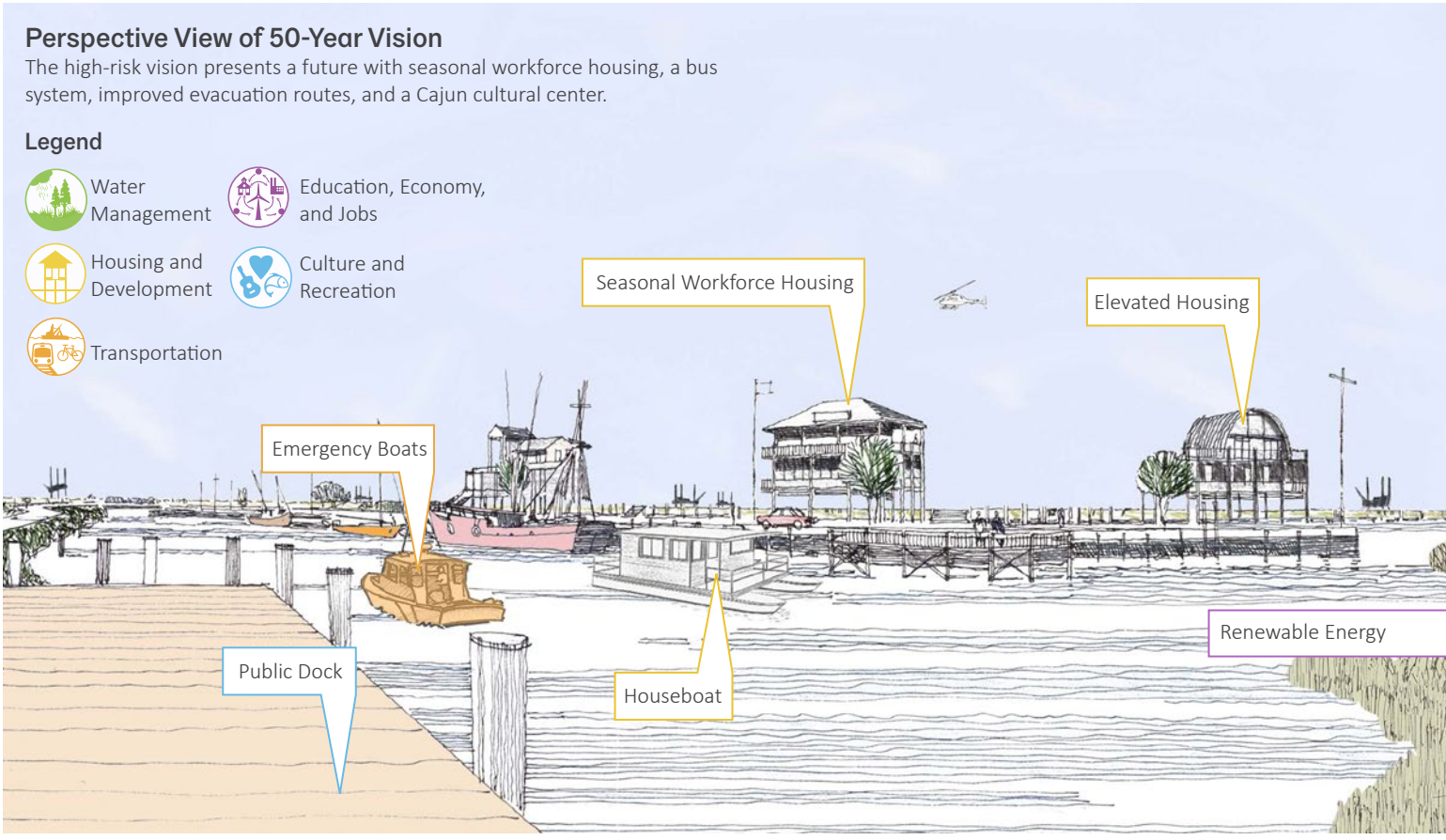
High-risk areas are projected to have land loss, high flood risk, and a decline in population. The high-risk area vision is characterized by—

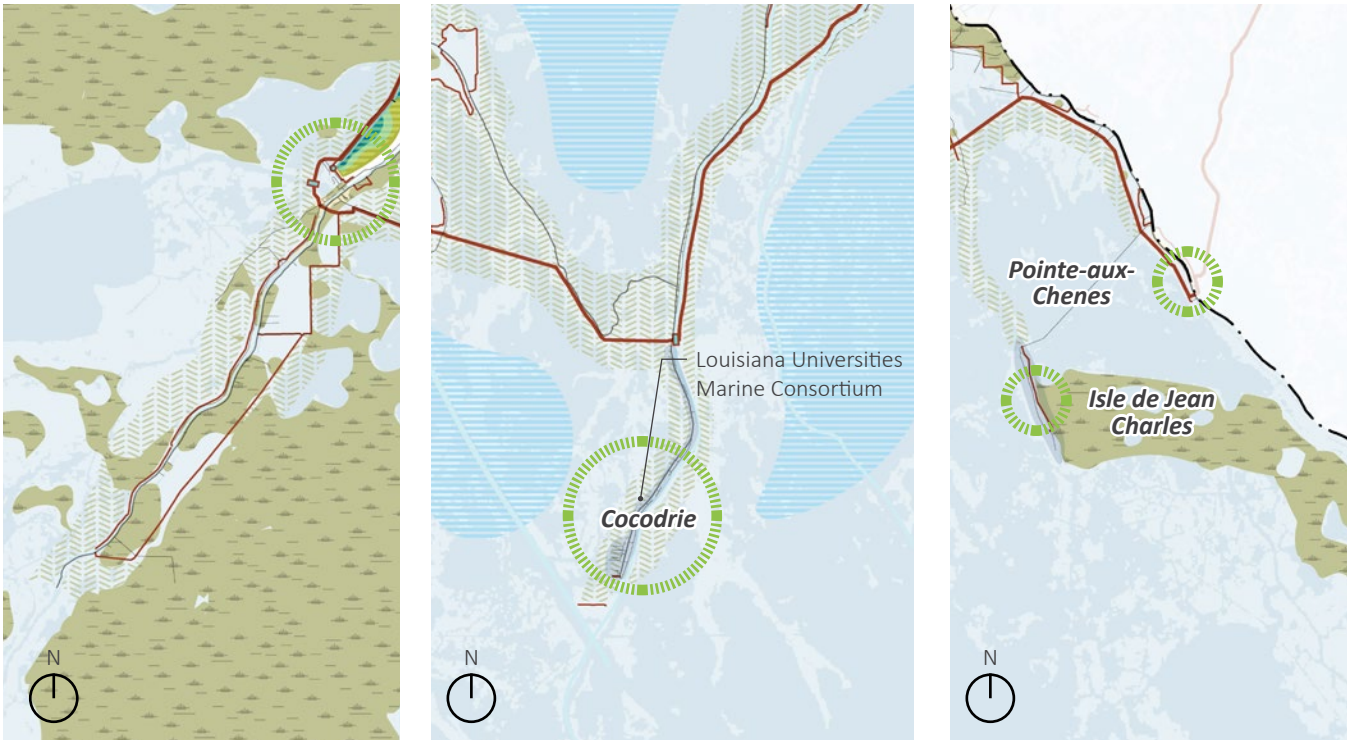
- Expanded recreation and ecotourism industries, and improved access to nature
- Elevated evacuation routes
- Improved infrastructure to support the seafood industry and coastal workers
- Promotion of new industries such as aquaculture, coastal restoration, renewable energy, and workplace development in these sectors
- No permanent primary residences outside the levee system

When surveyed in Meeting 3, 86% of Terrebonne Parish participants agreed with this vision for the future of high-risk areas.

Perspective View of 50-Year Vision

The high-risk vision presents a future with seasonal workforce housing, a bus system, improved evacuation routes, and a Cajun cultural center.





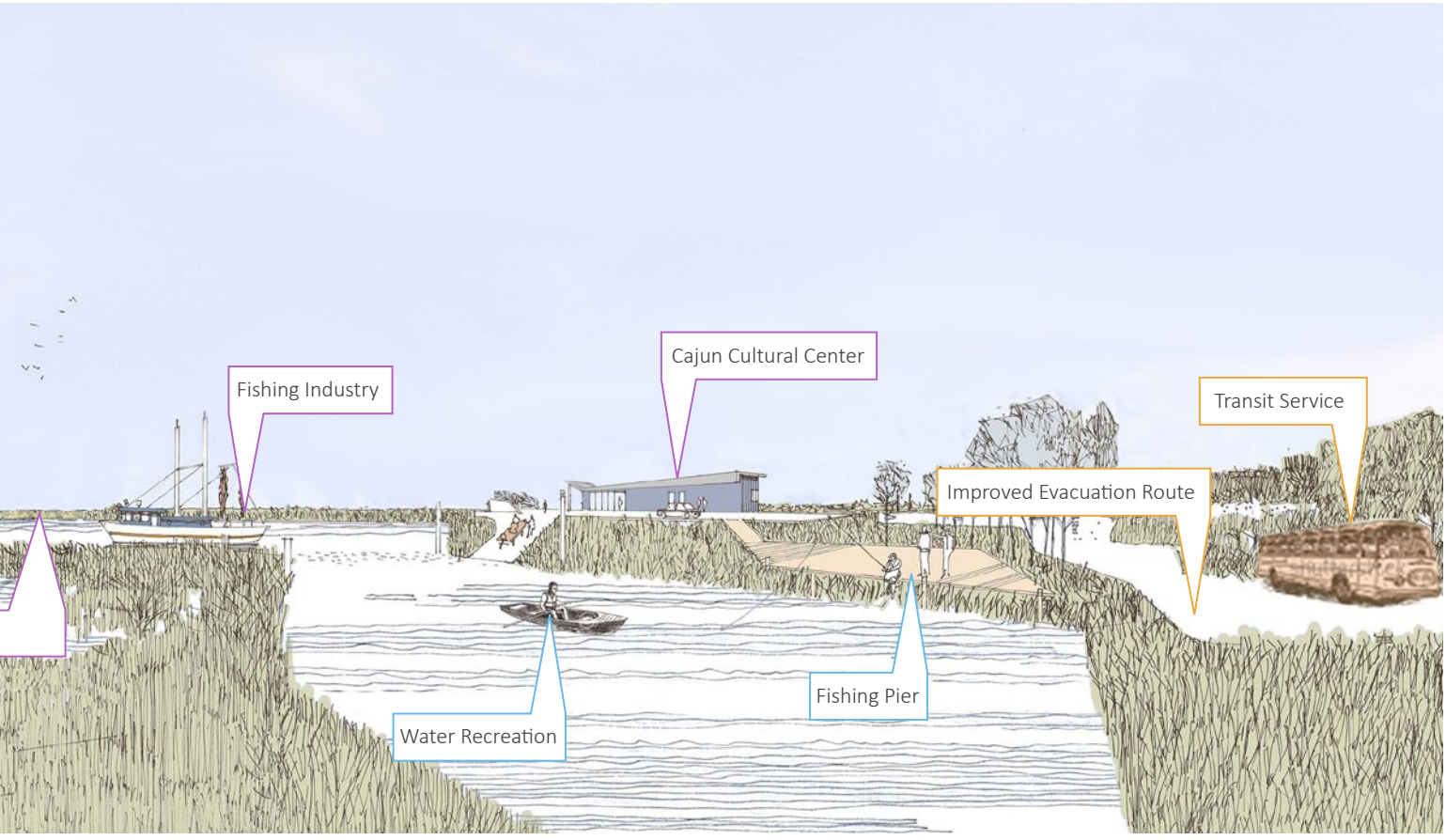
Plan View of 50-Year Vision

The 50-year vision includes expanded recreation and tourism industries in areas outside of the Morganza to the Gulf levee system.

Sources: For all basemap data see References

Legend

- Water Literacy Education Center, Ecotourism & Water Recreational Center, Cultural Center
- Water Storage
- Wetlands
- Aquaculture



Adaptation Goals and Strategies

This section includes background on each goal followed by a description of the strategy and specific actions needed to implement the strategy. Through the LA SAFE engagement process, parish residents, leaders, and stakeholders provided input to create these goals.

Goal 1: Manage Flooding and Subsidence

Implement water management strategies that are based on natural systems and address all scales, which include regional, parish, and community programs as well as initiatives targeted to individual property owners.

Strategy 1: Retain and detain stormwater
Strategy 2: Reduce impervious surfaces
Strategy 3: Review and update stormwater policies and programs
Strategy 4: Reduce the impact of storm surge

Goal 2: Direct Growth to Low-Risk Areas

Create safe, inclusive, and vibrant communities with amenities that attract and retain residents of all ages.

Strategy 1: Encourage housing and commercial development on higher ground
Strategy 2: Continue revitalization of downtown Houma
Strategy 3: Plan for a Houma-Thibodaux growth corridor

Goal 3: Improve Mobility Throughout the Parish and Region

Support a resilient transportation system that includes multiple modes of transportation and promotes the creation of walkable communities.

Strategy 1: Expand and diversify transportation options between the coast and areas of higher ground
Strategy 2: Adopt and implement a complete streets program

Goal 4: Strengthen and Diversify Local Economies

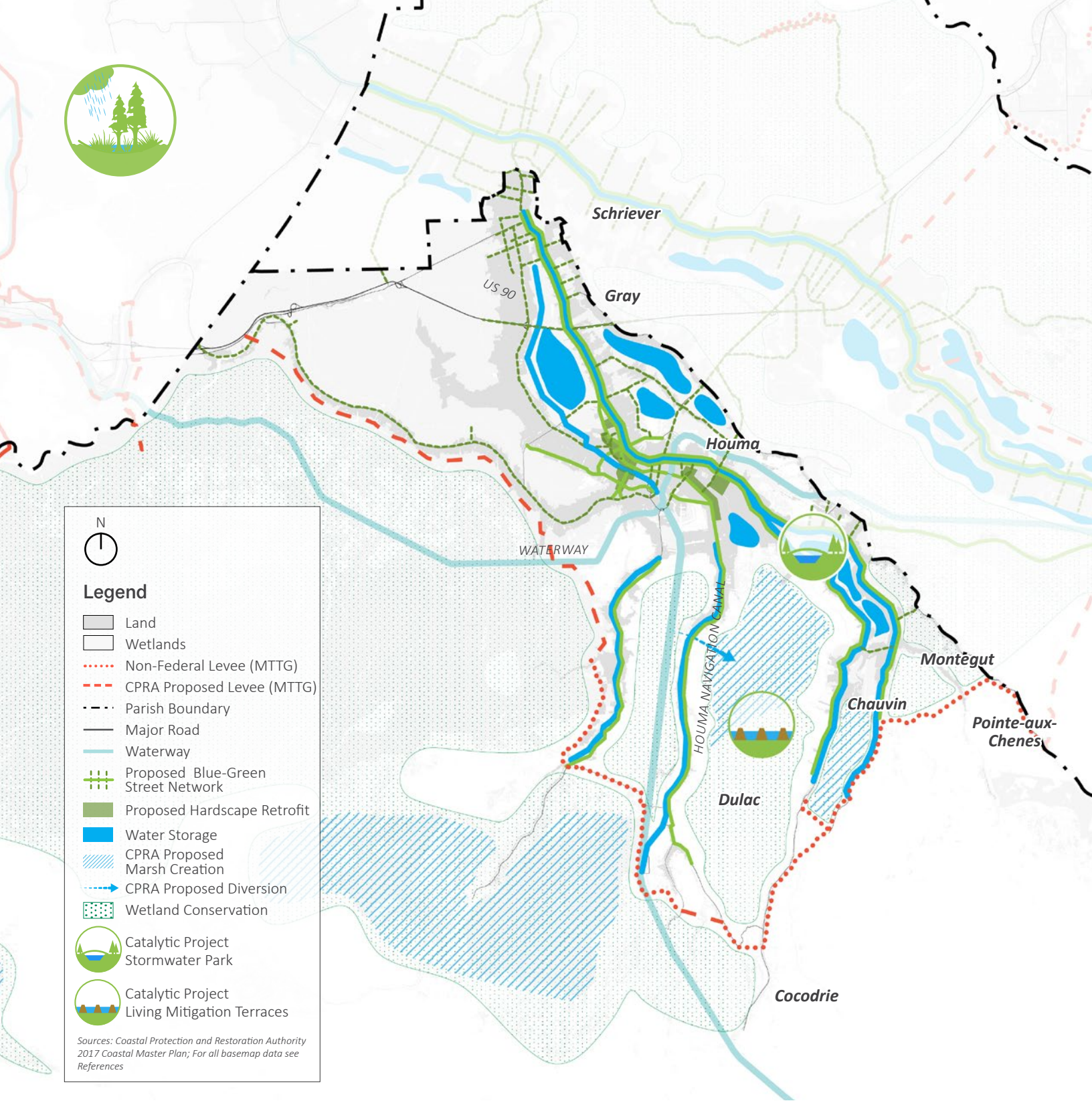
Integrate risk and adaptation practices into all levels of government and educational systems. Build a robust economy that diversifies the parish's economic base, supports residents' entrepreneurial spirit, and trains and retrains parish workers in emerging industries.

Strategy 1: Support local fisheries
Strategy 2: Expand public access to parish waterways
Strategy 3: Enhance job training and education
Strategy 4: Provide business incubation and adaptation assistance

Goal 5: Retain Local Culture and Enhance Recreation Opportunities

Retain the parish's culture and values—arts, music, food and the value of the land and water—as residents migrate to northern parts of the parish. Incorporate diverse recreation opportunities—from fishing, birdwatching, and kayaking in higher-risk areas of the parish to more traditional parks and open spaces in the low-risk areas of the parish—to promote a healthy environment that allows residents to experience the parish's natural beauty.

Strategy 1: Ensure public and community assets provide recreational and educational opportunities
Strategy 2: Enhance public access to Terrebonne Parish's waterways for recreational purposes



In Terrebonne Parish, like other parishes and communities across the state and nation, stormwater management best practices need to complement and support resilient development and redevelopment. Many green infrastructure site-design practices can reduce the cost of infrastructure while maintaining or even increasing the value of the property.

GOAL 1 Manage Flooding and Subsidence

Strategy 1 Retain and detain stormwater

Action A: Promote the use of shared detention areas to adjacent property owners.

Action B: Identify and use retention areas throughout the parish.

Action C: Expand the parish's "Adopt-a-Ditch (or Bayou)" or "Maintain the Drain" program.

Action D: Minimize water conveyance across ridges; hold water in the basins by enforcing a strong retention standard for stormwater.

Action E: Establish a groundwater management unit of the parish to monitor water tables and provide standards limiting impacts of subsidence.

Strategy 2 Reduce impervious surfaces

Action A: Incorporate green infrastructure into development designs and drainage updates.

Action B: Incorporate green streets infrastructure and water management into road design.

Action C: Discourage elevated fill and incentivize pier-and-beam foundations for structures.

Strategy 3 Review and update stormwater policies and programs

Action A: Conduct an audit of all parish plans, regulations, and policies relevant to stormwater regulation and amend development codes to achieve consistency with stormwater management best practices.

Action B: Develop a stormwater management plan.

Action C: Continue to develop and update stormwater utilities that create fee-based services to help pay for green infrastructure flood risk reduction projects.

Action D: Provide incentives for private developers to handle stormwater on site.

Strategy 4 Reduce the impact of storm surge

Action A: Sufficiently elevate structures in moderate- and high-risk areas.

Action B: Conserve and restore wetlands.

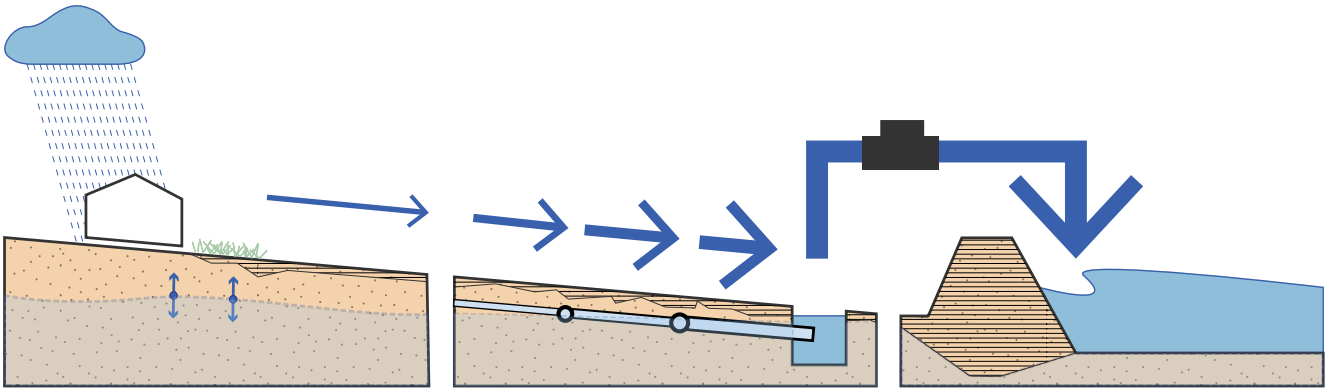
Wetland Park
Wetland parks divert and temporarily store water during heavy rain events, provide for natural habitat recovery, and offer a public space for education and recreation.

Strategy 1: Retain and detain stormwater

Terrebonne Parish has an opportunity to manage stormwater by promoting existing ordinances to share detention ponds; increasing retention areas throughout the parish; reducing stormwater runoff; and promoting maintenance of drainage systems to residents and businesses.

To ease demand on Terrebonne Parish's pump system during storm events, the parish should identify additional areas to retain water. This measure will serve to reduce economic damage from flooding, decrease downstream erosion and improve the quality of water flowing into adjacent bayous. Retention areas strategically located throughout the parish would have the most impact and should be located near development to receive runoff routed from the development site. Potential retention areas include undeveloped wetlands or undeveloped land throughout the parish to which stormwater is intentionally directed from developed areas. Similarly, existing detention requirements could be leveraged with other or smaller property owners to locally manage stormwater.

Existing System

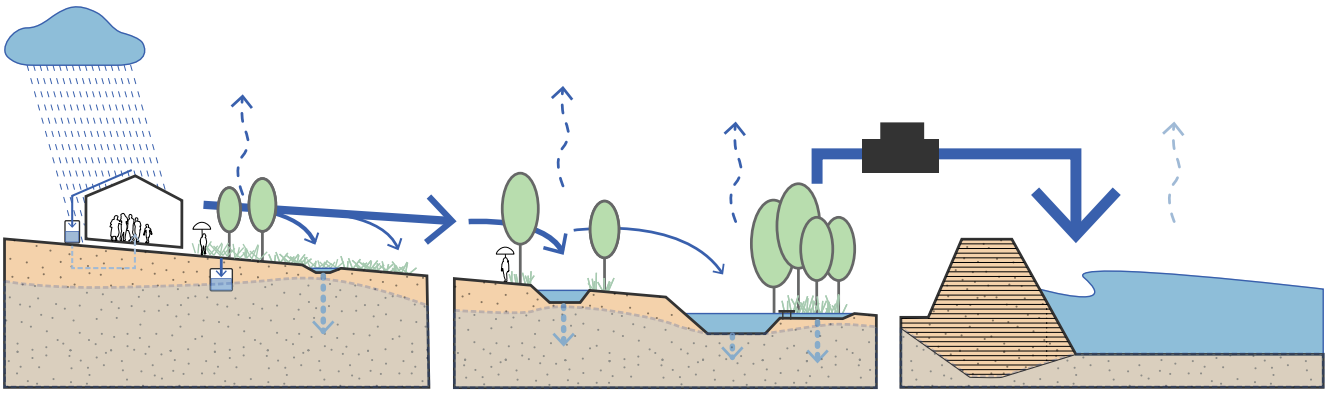


Pave

Pipe

Pump

Proposed System: Delay and Store Runoff



Delay
Hold water upslope to minimize flooding in low-lying areas.

Store
Increase water storage downslope to mitigate flooding and subsidence.

Drain When Necessary
Alleviate loads on pumping stations, which reduces energy use and cost.

Retain

the holding of stormwater permanently in basins, ponds, and cisterns. Retention basins allow stormwater to infiltrate the ground and for the collected stormwater to be repurposed for other uses such as irrigation.

Detain

the holding of stormwater temporarily in a swale, detention basin, or other features. Detention reduces peak discharge by allowing the slower and more controlled release of runoff and does not allow for the permanent pooling of water.

Water Storage
Detention areas can be landscaped and become shared assets by adjacent properties.

Action A: Promote the use of shared detention areas to adjacent property owners.

When a site larger than one acre is developed, the applicable stormwater detention volume could be increased to allow adjacent development to channel stormwater runoff into this closed system. The parish should work with developers and adjacent property owners to identify opportunities to leverage detention areas to serve larger developed areas. In addition, commonly-held detention areas need to be inspected regularly to ensure that channels into the detention and retention areas are clear of debris.

Steps needed:

- Allow shared detention areas in development codes.
- Identify potential sites for shared detention areas, including new development sites near existing development sites or near sites currently being planned for development.
- Identify a fee structure, including any incentives for installation of green infrastructure.
- Work with the development community and Louisiana Home Builders Association to educate them on the benefits of shared detention areas and promote their use.
- Update the Storm Drainage Design Manual to include guidelines for shared detention areas.
- Outline maintenance standards and responsibilities to ensure proper functioning of detention areas.

Action B: Identify and use retention areas throughout the parish.

To reduce the demand on forced drainage during storm events, the parish should continue to identify strategically-located undeveloped areas that can serve as retention areas for stormwater. When not needed for retaining stormwater, the retention areas could also be sites for publicly accessible culture- and nature-based education and recreation. For example, the proposed Bayou La Cache Wetland Park transforms an existing borrow pit site into a park that slows down the flow of stormwater and provides multiple ecosystem benefits, including stormwater management, water cleansing, and recovery of native habitats, as well as creating a public space for education and recreation.

Steps needed:

- Map high flood risk areas (on a parcel level), undeveloped and natural areas, and local hydrology and drainage patterns.
- Identify focus areas where undeveloped and natural areas can be used by developed areas to temporarily store runoff.
- Ensure that the stormwater management area remains undeveloped and continues its retention function.
- Update Storm Drainage Design Manual to ensure that stormwater quality and quantity are appropriate for the receiving ecosystem.

Wetland Park

Wetland parks can hold vast quantities of stormwater during heavy rains while providing valuable open space and recreational amenities.

Bayous
Maintaining bayous and other waterways is important to ensure adequate drainage capacity.

Action C: Expand the parish's "Adopt-A-Ditch (or Bayou)" or "Maintain the Drain" program.

Similar to the "Adopt-a-Bayou" program, which was established by the Legislature in 2007 (RS 30:2548), Terrebonne Parish—in partnership with neighborhood associations, nonprofits, academic institutions, and others—should expand their existing programs for the removal of litter and other obstructive features that may hinder local stormwater conveyance. This program could also target private properties or neighborhood associations to maintain nearby culverts, inlets, outlets, and other drainage infrastructure and further increase awareness and public participation in stormwater management.

Steps needed:

- Identify areas of greatest need for maintenance to ensure stormwater management conveyance.
- Identify and reach out to potential partners such as property owners, homeowner associations, businesses, and nonprofits to begin the engagement process.
- Develop program material, including what can and cannot be done by the adopting entity, when it should be done, and how it should be done. Include the intended outcomes and benefits of the program.
- Raise awareness of the program through marketing and recognition of the entities involved.

Action D: Minimize water conveyance across ridges; hold water in the basins by enforcing a strong retention standard for stormwater.

To reduce costs of pumping water over ridges and the associated impacts to the water table, the parish should build on their current regulations to increase incentives to retain stormwater in place.

Steps needed:

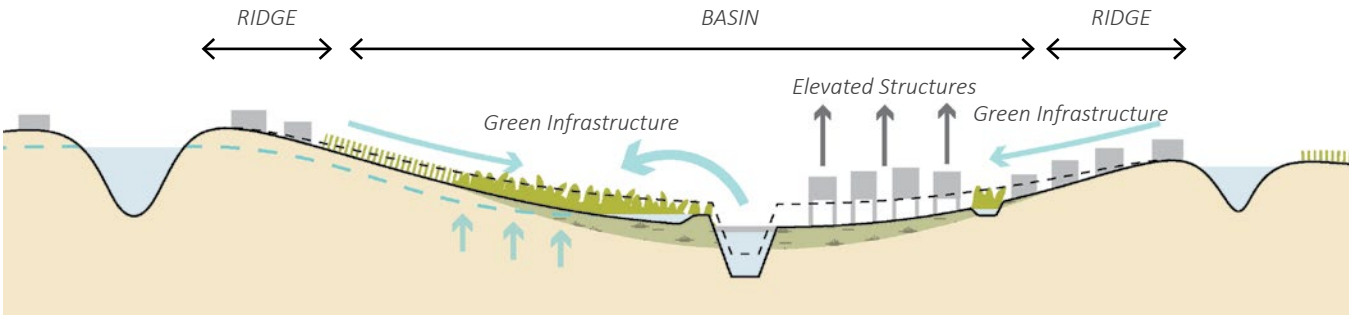
- Enforce stormwater management requirements to minimize the volume of runoff discharged from developed sites.
- Review stormwater fee structure to ensure that incentives result in desired stormwater retention.
- Implement and enforce non-compliance fees.
- Apply fees toward building and maintaining green infrastructure that benefits the same community where the fee is collected.
- Create “water credits” to encourage developers to exceed stormwater management requirements.
- Establish a Stormwater Management Authority to manage fees and “water credits” and a Stormwater Advisory Committee to review stormwater management projects and advise on fee allocations.

Action E: Establish a groundwater management unit of the parish to monitor water tables and provide standards limiting impacts of subsidence.

Monitoring water tables and activities that draw down the water tables will allow the parish to create standards limiting impacts and raising the water table where possible in subsidence prone soils.

Steps needed:

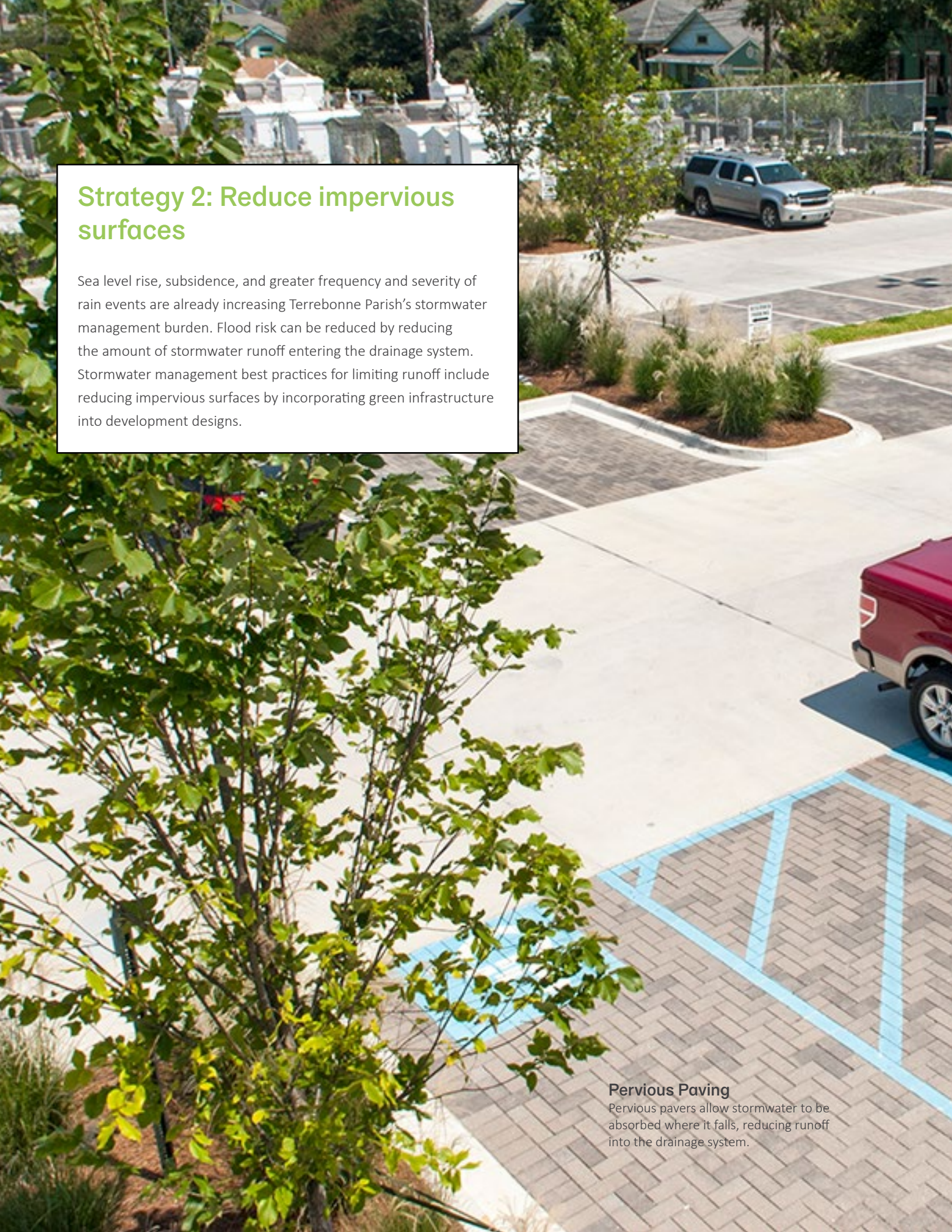
- Employ green infrastructure practices to mitigate flooding, combat subsidence, and comply with MS4 requirements.
- Install a groundwater monitoring network and employ real-time controls to manage surface water levels for subsidence control.
- Monitor and record stormwater and groundwater quantity and quality, as well as land subsidence, to ensure objectives are being met.
- Establish close collaboration with other local and state entities that manage groundwater within the perimeter defense system.



50-Year Vision—Slow, Store, Drain if Necessary
The natural hydrology is emulated with green infrastructure. The raised water table mitigates subsidence and elevated structures reduce risk.

Strategy 2: Reduce impervious surfaces

Sea level rise, subsidence, and greater frequency and severity of rain events are already increasing Terrebonne Parish's stormwater management burden. Flood risk can be reduced by reducing the amount of stormwater runoff entering the drainage system. Stormwater management best practices for limiting runoff include reducing impervious surfaces by incorporating green infrastructure into development designs.



Pervious Paving
Pervious pavers allow stormwater to be absorbed where it falls, reducing runoff into the drainage system.

Action A: Incorporate green infrastructure into development designs and drainage updates.

To reduce the demand on the drainage system, the parish should consider requiring the incorporation of green infrastructure into all development as a means to handle stormwater runoff and control erosion.

Steps needed:

- Include a list of best practices to reduce impervious hard surfaces in the Stormwater Pollution Prevention Plan for all phases of development.
- Update ordinances to require property owners (including those below one acre) to manage stormwater onsite and reduce runoff from their property.
- Update ordinances to reduce parking requirements; establish a maximum impervious surface for developments. *[Currently at 70% hard surfaces; drainage design prepared by a professional engineer approved by the TPCG Engineering Division, Design by Public Works Director. Or 10,000 square feet in existing subdivision prior to 1994.]*
- Provide incentives/rewards for voluntary reduction of impervious surfaces.
- Encourage the use of pervious material where practicable.
- Update ordinances to increase erosion controls during and after site development.
- Require integration of green infrastructure techniques into site design.
- Develop a stormwater impact fee to incentivize the use of green infrastructure.
- Work with neighborhood associations and other stakeholders to promote use of green infrastructure.

Action B: Incorporate green streets infrastructure and water management into road design.

Green streets improve water quality and help reduce runoff into the stormwater system through integration of stormwater treatment techniques that use natural filtration processes and landscaping into street design. Terrebonne Parish should review its right-of-way, drainage patterns, and green infrastructure opportunities and incorporate green street concepts into the parish's roadway conceptual planning, design, engineering, and development process.

Steps needed:

- Review right-of-way, drainage patterns, and green infrastructure opportunities.
- Incorporate green street concepts into the parish's roadway conceptual planning, design, engineering, and development process.
- Incorporate green street infrastructure into right-of-way acquisition and roadway design decisions.
- Coordinate across departments to leverage ongoing capital improvements to include green infrastructure that will improve water quality, improve drainage, and control erosion.
- Prepare operation-and-maintenance plans.

Green Streets

Stormwater is directed into curbside bioswales through curb cuts to reduce street flooding and infiltrate soils.

Action C: Discourage elevated fill and incentivize pier-and-beam foundations for structures.

Reducing the amount of fill used to meet elevation requirements will reduce flood risk. Any slope of fill increases runoff velocity, which can lead to soil erosion, scouring, stormwater quality impairments, and alterations in local hydrology and the hydrology of borrow pits. To prevent future unintended consequences from the use of fill, the parish should work with home builders and realtor associations to identify and implement development best practices and incentivize use of the least amount of fill or no fill to meet elevation requirements.

Steps needed:

- Work with the Louisiana Home Builders Association, the Louisiana Realtors, and other stakeholders to identify barriers and opportunities to discourage elevating homes on fill.
- Work with state agencies and local departments to document benefits and trade-offs of limiting the fill option.
- Work with the Louisiana Assessors' Association to discuss how elevations are assessed and the potential differences among types of elevations.
- Review local code of ordinances for opportunities to further encourage pier-and-beam construction that properly accommodates water flow during flood events and discourage slab-and-grade and fill.
- Provide property owners with clear and current information regarding best practices and options for elevating homes and businesses. FEMA, the LSU AgCenter, and the American Society of Civil Engineers have numerous publications available that provide useful technical information.
- Combine wind fortification and weatherization programs with home elevations to account for multiple risk factors.
- Require elevation via pier-and-beam construction in order to be eligible to receive parish and state resources for elevation modifications.

Elevated Structures

Structures elevated with pier-and-beam construction allow the water to flow underneath without harming the structure or neighboring structures.

Photo Credit: Google Maps Street View

Strategy 3: Review and update stormwater policies and programs

Terrebonne Parish's Code of Ordinances, programs, and policies should support the implementation of stormwater management best practices, support the preservation and conservation of open space and wetlands, provide guidance for desired development, and reduce—or at least not increase—the burden on the parish administration to address flood risk now and in the future.

Space for Water
Existing parks and open spaces, vacant lots, and underutilized right-of-ways provide opportunities for safely storing water and enhancing the urban landscape.

Action A: Conduct an audit of all parish plans, regulations, and policies relevant to stormwater regulation and amend development codes to achieve consistency with stormwater management best practices.

To ensure all aspects of the Code of Ordinances are consistently supportive of stormwater management best practices, Terrebonne Parish should conduct an audit of the entire code, address any unintended consequences of current codes, and remove barriers to as well as encourage use of stormwater management best practices.

Steps needed:

- Meet with parish departments to identify how stormwater management relates to their work and mission, including any needs or barriers staff have observed, how the code is implemented "on the ground," and any unintended consequences.
- Conduct an audit of the entire code and remove barriers to and encourage use of stormwater management best practices, and address any undesirable unintended consequences of current codes.
- Review results of the code audit with parish departments and the development community.
- Develop code amendments, as identified in the code audit, using best practices to address conflicts and needed updates.
- Develop a mechanism to ensure that agencies and departments collaborate on implementing the revised codes and provide input/ sign-off in the permitting process.
- Prepare and adopt amendments to city codes as needed.

"The increase of population will increase the threat of stormwater. More people, means more concrete, means more drainage problems."

—Terrebonne Parish Resident

Action B: Develop a stormwater management plan.

To address watershed-related flood risk throughout the parish, develop or update the parish stormwater management plan and partner with regional organizations and other parishes to prepare a regional stormwater management plan to serve as a guiding document for water management decisions. The plans should address floodplain management within the watershed, provide short- and long-term goals for managing water quantity and quality, and provide guidance on how to protect the watershed and its inhabitants.

Steps needed:

- Develop or update the comprehensive parish stormwater management plan.
- Work with regional planning associations to develop a watershed-based stormwater management plan and policies that apply across jurisdictional lines, especially those upstream of the parish.
- Assess current and planned programs and projects to ensure consistency with the 2017 Master Plan.
- Develop strategies to consider current and future flood risk in prioritizing allocation of resources.

Example of a Regional Framework: Greater New Orleans Urban Water Plan

Though every region will have unique needs and priorities, The Greater New Orleans Urban Water Plan provides one example of a regional framework designed to guide resilient and sustainable development at multiple scales. The plan works in tandem with the existing levee system and Louisiana's 2012 Coastal Master Plan, while also shifting the paradigm from conventional water management toward a sustainable, resilient system that values water as an asset.
See full reports here: http://livingwithwater.com/
Image Credit: Greater New Orleans Urban Water Plan, Waggonner & Ball

Policy Example: City of New Orleans Comprehensive Zoning Ordinance (CZO)
The Greater New Orleans Foundation Headquarters, built to comply with the new CZO, features a courtyard with multiple water management systems including rain gardens, underground cisterns, permeable paving, native plantings, and a permeable asphalt parking lot.
Photo Credit: Waggonner & Ball, Photo by Alise O'Brien

Action C: Continue to develop and update stormwater utilities that create fee-based services to help pay for green infrastructure flood risk reduction projects.

The impacts of population growth—more development, fewer pervious surfaces, and more polluted runoff—are causing stormwater management programs to become increasingly expensive. To offset these costs and leverage infrastructure projects, local jurisdictions can develop a stormwater fee that supports stormwater management projects and practices that reduce flood risk. As capital improvements are made, the stormwater fee can also provide funding for incorporating green infrastructure features into other projects.

Steps needed:

- Require that all publicly funded capital projects capture and store at least 1.25 inches of rainfall in the first hour of a rain event.
- Encourage the use of captured stormwater for graywater use and establish safety guidelines for use of graywater.
- Continue to design new and retro-fitted recreation areas with ample drainage and storage space, and use those recreation areas as a secondary tier of defense against neighborhood flooding.
- Develop a five-year benchmark for "Greened Acres" and offer competitive grant programs for the development of green infrastructure projects on private property.

"We need a regional approach to work with upstream parishes so we can deal with drainage better."

—Terrebonne Parish Resident

Action D: Provide incentives for private developers to handle stormwater on site.

Handling stormwater on site reduces the amount of runoff entering the drainage system. The parish should develop incentive programs to encourage property owners to implement site-level features such as a rain barrels, rain gardens, bioswales, and replace impervious surfaces like concrete with pervious materials such as gravel or permeable pavers. Incentives in the form of tax credits, stormwater fee discounts, and rebates can be used to offset the costs of implementation and reward measures taken to increase the amount of stormwater that can be handled on site.

Steps needed:

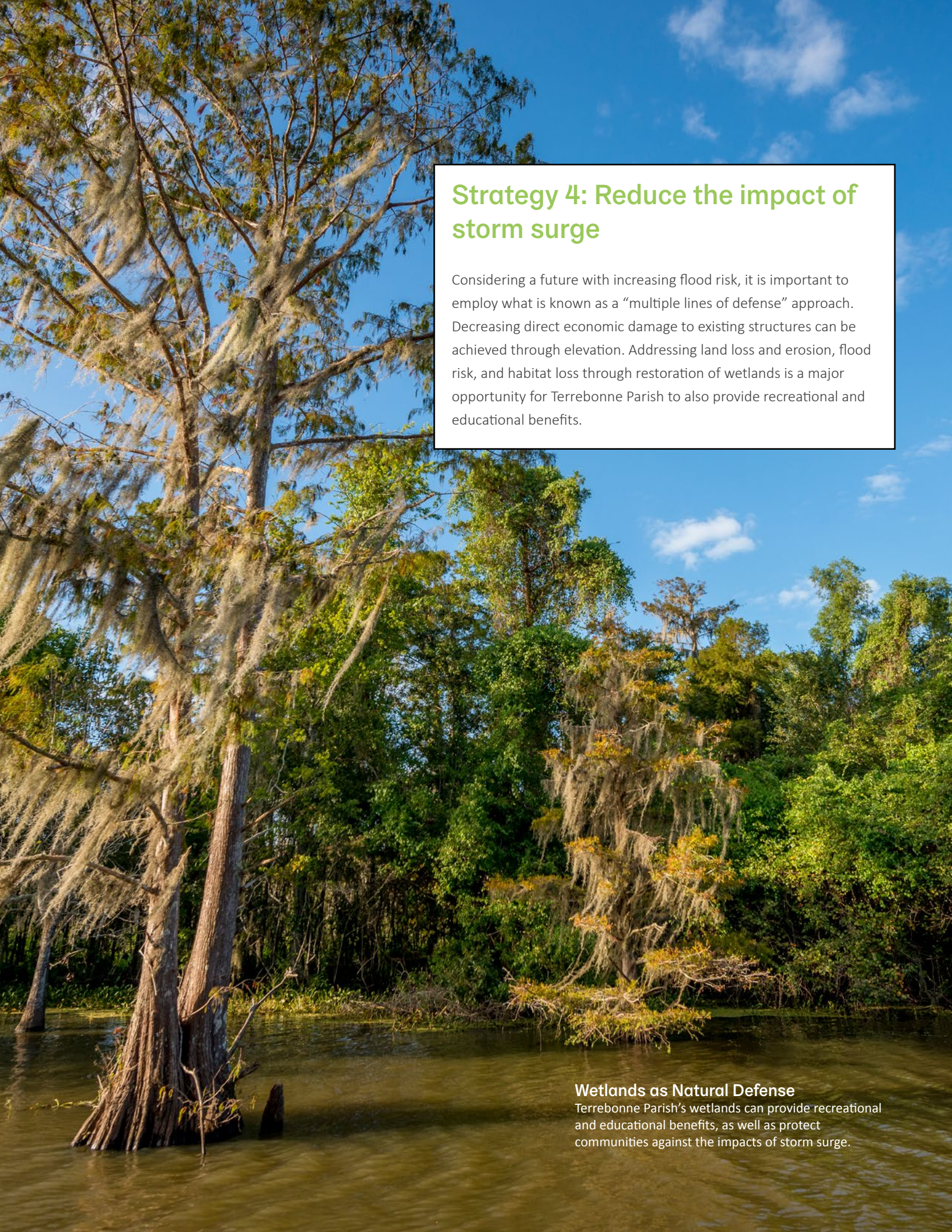
- Incentivize investment in stormwater best practices on private property through grant and low-interest loan programs, tax rebates, and stormwater fees.
- Provide outreach, education, and technical assistance to the public, planners, contractors, and local governments on best management practices for stormwater management, green infrastructure, and the current status of local stormwater management systems.

Economic Incentives

The Front Yard Initiative is an incentive program of The Urban Conservancy to encourage the removal of excessive paving. The program reimburses eligible homeowners per square foot of paving removed, up to 500 square feet.
Image Credits: Front Yard Initiative

Strategy 4: Reduce the impact of storm surge

Considering a future with increasing flood risk, it is important to employ what is known as a "multiple lines of defense" approach. Decreasing direct economic damage to existing structures can be achieved through elevation. Addressing land loss and erosion, flood risk, and habitat loss through restoration of wetlands is a major opportunity for Terrebonne Parish to also provide recreational and educational benefits.



Wetlands as Natural Defense
Terrebonne Parish's wetlands can provide recreational and educational benefits, as well as protect communities against the impacts of storm surge.

Action A: Sufficiently elevate structures in moderate- and high-risk areas.

Storm surge can cause significant economic damage to infrastructure and residential and commercial structures. As these structures are built and redeveloped, they should be elevated to a height that ensures minimal damage from storm surge.

Steps needed:

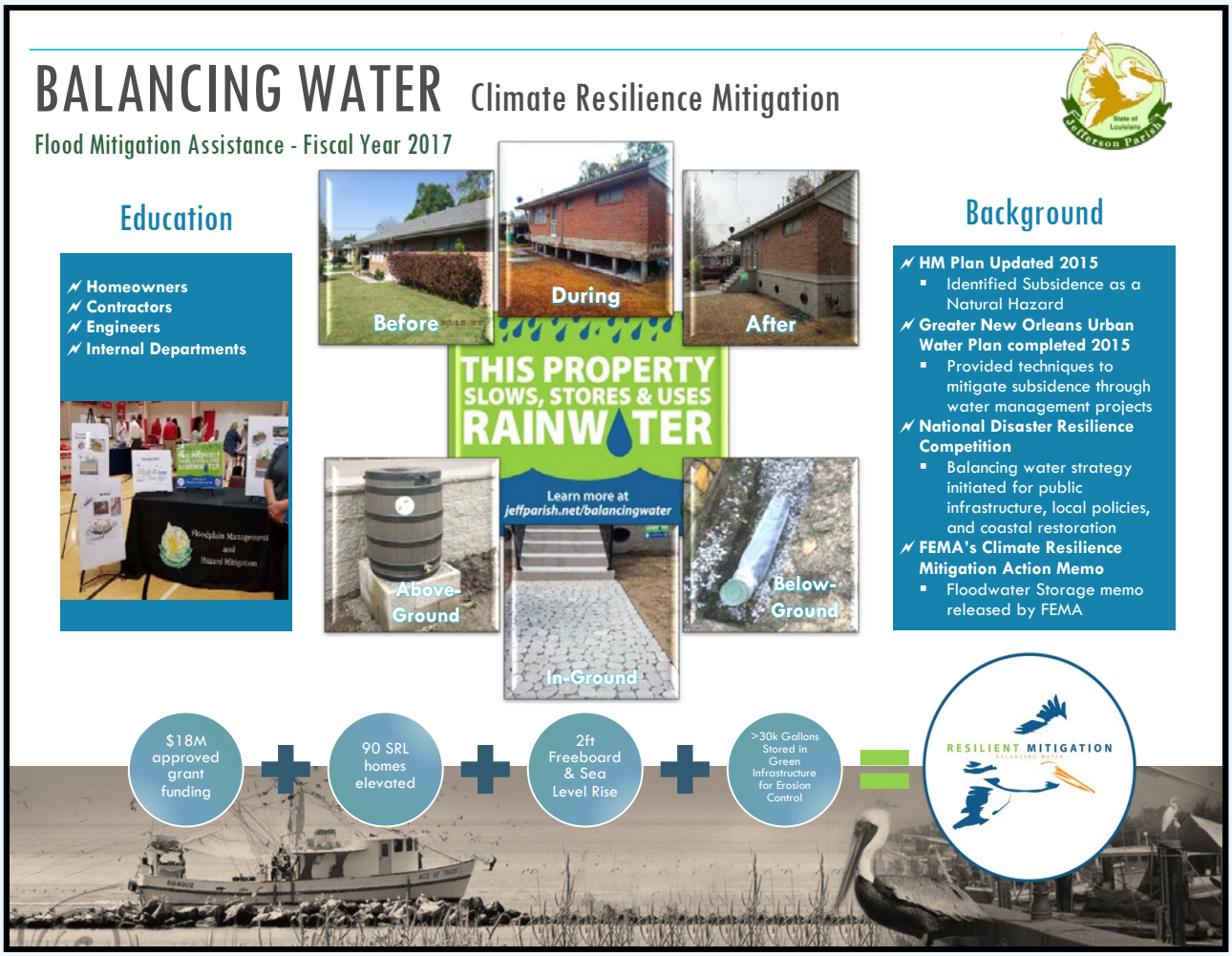
- Review state flood risk disclosure requirements and update requirements that flood risk is disclosed during property transactions and that these requirements are enforced.
- Adopt a two-foot freeboard standard.
- Identify professionals and funding for the parish to develop their own flood map to show updated flood risk that takes into account parish-level flood-risk mitigation measures that have been taken and other features not reflected in the FEMA maps.

Action B: Conserve and restore wetlands.

Natural habitats such as wetlands and forests have been shown to attenuate storm surge. In addition to the levee protection system, the parish can further reduce storm surge impacts by restoring and creating marshlands inside the levee. This will serve to advance implementation of the Multiple Lines Of Defense Strategy[42] the state has incorporated into its coastal protection and restoration effort. An example of restoring and creating marshlands is the proposed Lake Boudreaux Living Mitigation Terraces project to create over 300 acres of terraces and marshlands within the Morganza to the Gulf protection system. This project will assist in reducing the impacts of storm surge for residents and businesses as well as protecting Terrebonne Parish's infrastructure. The terraces have environmental benefits such as enhancing submerged aquatic vegetation growth, restoring habitats, and trapping suspended sediments generated by wind and wave action.

Steps needed:

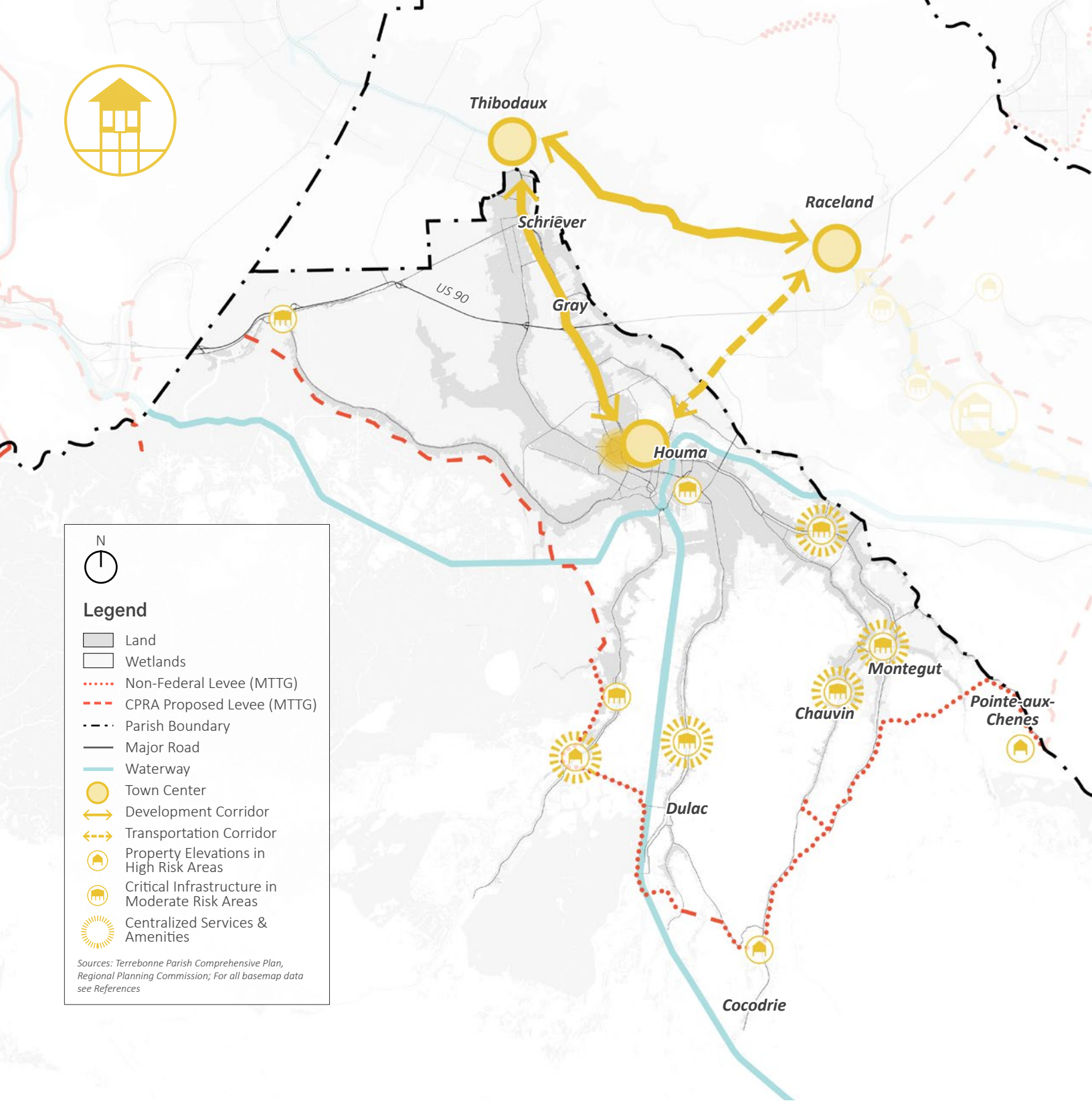
- Coordinate with USACE and CPRA to leverage ongoing protection and restoration efforts.
- Identify target areas and prioritize restoration projects that will provide the most benefit to ecosystems and communities over the long term.
- Continue to seek funding for full implementation of the entire 300 acres of living mitigation terraces.



Above: Jefferson Parish is implementing the Balancing Water Program.
Image Credit: Jefferson Parish, Department of Floodplain Management & Hazard Mitigation

Case Study: Jefferson Parish, LA

Jefferson Parish, through FEMA's Flood Mitigation Assistance Program, is elevating residential structures that have flooded using pier-and-beam foundations rather than fill. This nationally-competitive grant program provides funds annually for flood hazard mitigation projects and plan development, prioritizing repetitive flood claims, severe repetitive loss, and NFIP properties. In addition to elevating structures, this program also funds soil stabilization, erosion control, and hydrological restoration projects, which can be implemented using green infrastructure. Using these funds, Jefferson Parish is elevating numerous flooded properties and also installing green infrastructure features that assist with stormwater quality, erosion control, and aquifer storage. In addition, Jefferson Parish is reaching out to and educating residents on the importance of managing stormwater on site through its Balancing Water Program, funded through the National Disaster Resilience Competition (NDRC).



To be competitive economically, quality of life and quality of place are increasingly important. This is particularly true as the parish works to attract and retain a young and diverse labor force. Careful planning and strategic investment can serve to reinforce a desirable development pattern, fully leverage the area's assets, and create a more memorable and livable place. This can be achieved by continuing revitalization of downtown Houma and investment in the Houma-Thibodaux corridor.

GOAL 2 Direct Growth to Low-Risk Areas

Strategy 1 Encourage housing and commercial development on higher ground

Action A: Prepare areas of higher ground for increased concentrations of development.
Action B: Develop a housing incentive program to encourage development on higher ground.
Action C: Consider repurposing unused properties.

Strategy 2 Continued revitalization of downtown Houma

Action A: Develop a comprehensive Open Space Plan.
Action B: Improve streetscape and public realm amenities within downtown.
Action C: Create more opportunities for street life and active uses.
Action D: Build upon existing wayfinding and public art programs to incorporate art and culture into the district's signage and public places.

Strategy 3 Plan for a Houma-Thibodaux growth corridor

Action A: Develop a corridor plan along LA 24 and US 90.
Action B: Study development potential at US 90 nodes.
Action C: Evaluate and improve corridor transportation infrastructure.

Strategy 1: Encourage housing and commercial development on higher ground

As coastal and down-bayou areas experience increased flood risk, communities on high ground will continue to be growth centers. This growth should be directed in such a manner as to increase livability, maintain the area's unique character, and improve the parish's economic position.

Downtown Houma
Houma and areas on high ground north of Houma are ideal for new and infill residential and commercial development.

Action A: Prepare areas of higher ground for increased concentrations of development.

To accommodate parish residents who wish to move away from areas of increased flood risk in the southern part of the parish and to maximize economic opportunities, the northern part of the parish, including the Houma-Thibodaux corridor, should increase available housing stock and provide opportunities for commercial investments. Applying best practices for local water management, transportation, and site and building design, Terrebonne Parish has an opportunity to provide a high quality of life reflective of the culture and traditions of its residents.

Steps needed:

- Update ordinances to allow for higher density and mixed-use developments; incorporate requirements for minimum building elevation and on-site stormwater management.
- As part of the corridor planning process, evaluate zoning practices to ensure that growth can be accommodated and is appropriately placed.
- Consider and evaluate incentives for locating residential and commercial development on higher ground.
- Together with property owners, residents, and developers, create building design guidelines to ensure that building typology fits within the desired context and character of the community.
- Ensure that housing and commercial development coordinates with and integrates transportation and stormwater management practices.
- Require bonding of new commercial developments in high-risk areas to ensure demolition at the end of their useful life, or upon long-term vacancy.

Terrabella: Covington, LA

Located in Covington, LA, Terrabella is a dense, walkable, mixed-use development. The model uses smart-growth techniques, providing opportunities for more sustainable growth.
Photo Credits: Google Earth Street View

"I think the most important is the building codes, and to follow certain building codes that work for you as a person...but unless people start to be proactive about all this, then nothing's gonna change."

—Terrebonne Parish Resident

Action B: Develop a housing incentive program to encourage development on higher ground.

People who want or need to move to areas of higher ground often do not have the resources to relocate and purchase homes in new communities. Stressed with living in a high-risk area with degraded property values, they may have limited funds for moving, closing costs, and down payments. A housing relocation fund could be established for three to five years to assist people moving from the highest risk areas, or areas with repetitive losses, to areas of higher ground. One-time grants for moving costs, down payments, or closing costs would provide an incentive and the assistance needed to move away from high-risk areas.

Steps needed:

- Initiate funding programs through public funding and nonprofits to pay closing costs, partial down payments, moving costs, and other related expenses.
- Identify additional sources of funding or develop a partial repayment program to maintain this fund over the long term.
- Expand existing housing repair and maintenance programs to rehab and redevelop substandard housing, focusing on low-risk areas.
- Provide pre- and post-purchase housing education and counseling programs.
- Implement policies intended to prevent future permanent resident development in these areas.

Action C: Consider repurposing unused properties.

To encourage and concentrate development and redevelopment in existing communities, abandoned buildings should be repurposed to meet the needs of the community. Terrebonne Parish and other entities should work with property owners, residents, and others to identify opportunities for redevelopment and develop policies or incentives that encourage adaptive reuse of existing buildings.

In Terrebonne Parish, three abandoned elementary schools are available to repurpose in support of this goal: Grand Caillou Elementary in Dulac, and Boudreaux Canal Elementary and Little Caillou Elementary School in Chauvin. Potential uses to support existing residents include a wetland discovery center, an ecotourism business incubator, a cultural language center, and a seafood processing facility with direct retail opportunities. Grand Caillou Elementary is adjacent to the Dulac branch library and the Grand Caillou Recreation Center, creating a centralized area for amenities and services.

Steps needed:

- Identify the commercial and public infrastructure needs of the community.
- Inventory abandoned public and private buildings, such as schools, post offices, big box stores, and others.
- Work with property owners, residents, and others to identify opportunities for redevelopment.
- Develop policies or incentives that encourage adaptive reuse of existing buildings.

Potential for Revitalization

Grand Caillou Elementary School could be redeveloped to provide an educational and recreational amenity.

Strategy 2: Continued revitalization of downtown Houma

Downtown Houma functions as Terrebonne Parish's civic, commercial, and social center. The parish has made strides in recent years to improve the area through initiatives such as the construction of the Bayou Walk and activities hosted by the Downtown Houma Development Corporation. There is an acknowledged need to take better advantage of Bayou Terrebonne to create a unique downtown experience and unlock even greater potential to grow and revitalize the historic core.

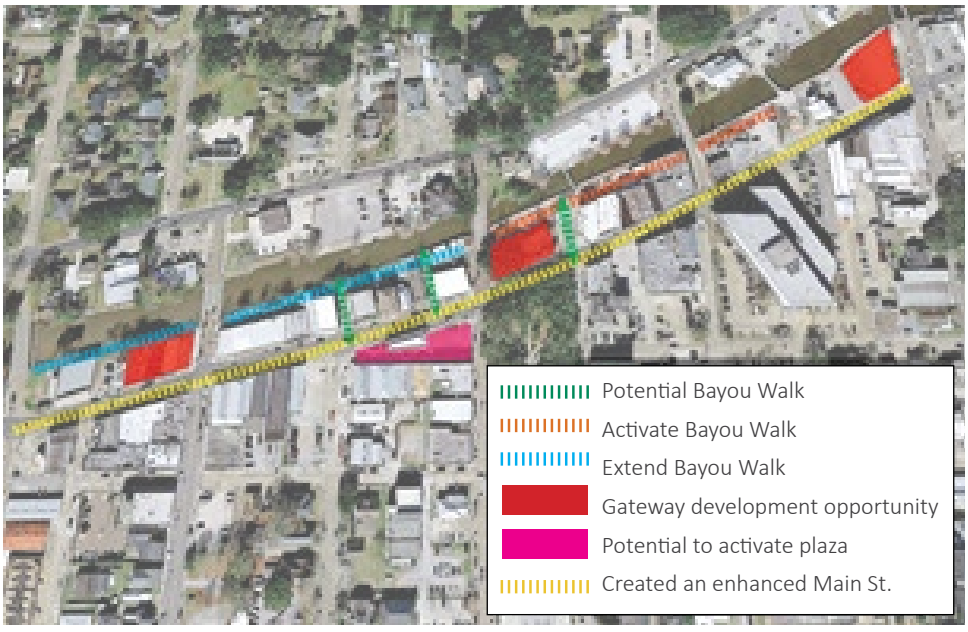
Downtown Houma
Photo Credit: DRW Planning Studio

Action A: Develop a comprehensive Open Space Plan.

Extend and improve the Bayou Walk, activate both sides of Bayou Terrebonne, strengthen linkages between downtown and the bayou, and provide dispersed pocket parks and plazas.

Steps needed:

- Inventory existing open space assets within downtown and identify strategic opportunities for new open space.
- Develop guidelines for open space development based upon a hierarchy of open space amenities, such as plazas, parks, pocket parks, and passive open space.
- Work with Downtown Houma Development Corporation to identify programming opportunities for open space to encourage and attract visitors and provide activities for downtown residents and business owners.
- Develop and fund maintenance program for downtown open space, including coordinating volunteer efforts.
- Create a capital improvement program for downtown open space that identifies funding needs and priorities for open space developments well as coordinate it with other downtown capital investments and developments.
- Identify and invest in a pilot project to catalyze investment.



Bayou Terrebonne Revitalization

The map illustrates the recommendation to strengthen downtown's edge along the bayou to create a more connected experience with Bayou Terrebonne through improved connections, an activated edge, sensitive adaptive reuse, and infill at key gateways into downtown.

Activate the Streetscape

Potential active plaza with outdoor seating, shade, and plantings. Belanger St. could be configured as a flexible space that provides parking and seating on most days and an extension of the plaza during events.

Activate the Bayou

Encourage the revitalization of buildings along the bayou and provide an active frontage of cafes and shops with direct access to Bayou Walk.

"By 2030, Downtown Houma will have become a desirable, safe, and secure, mixed-use destination, attracting visitors, workers, and shoppers to its diverse venue of businesses and shops—many of which have been established to capitalize on and promote local culture and heritage—supporting a variety of commercial and residential developments in a well-maintained, attractively landscaped, less congested, pedestrian-friendly environment."

—Downtown Houma Vision Statement, Vision 2030

Action B: Improve streetscape and public realm amenities within downtown.

Accommodate bike and pedestrian traffic, plant native trees to provide shade, and develop a palette of street furnishings and other elements that celebrate the culture of Terrebonne Parish.

Steps needed:

- Inventory and categorize downtown street types and desired amenities.
- Develop guidelines that outline a palette of street furnishings, plant materials, surface treatments, and lighting for each street type.
- Evaluate existing zoning regulations to eliminate potential conflicts with desired improvements and require public realm upgrades as part of the redevelopment process.
- Develop an implementation plan and capital improvement program to prioritize and guide investment in public realm improvements.
- Develop and fund a maintenance program for public realm amenities.
- Identify and invest in a pilot project to catalyze investment.

Downtown Houma

Left: Bayou Terrebonne.
Right: Downtown Houma.

Active Streetscapes
In addition to festivals and special events, the streetscape can promote active uses through pop-up and mobile amenities and uses.

Action C: Create more opportunities for street life and active uses.

Encourage active, innovative uses along Bayou Terrebonne and other frontages—which may involve temporary occupation of underutilized or vacant lots and structures—for pop-up retail venues and services, such as mobile cafes, food trucks, libraries, or markets. Main Street can be enlivened by increasing shopping and restaurant options and encouraging outdoor seating where feasible.

Steps needed:

- Review existing zoning regulations, and amend requirements if necessary, to accommodate active uses on ground floors. Establish design standards that support pedestrian activity both along the street and along the bayou, while maintaining the historic integrity of buildings.
- Encourage and coordinate pop-up activities to temporarily occupy vacant storefronts as part of festivals and events.
- Ensure that regulations allow and encourage sidewalk cafes along the street and bayou.
- Investigate historic tax credits for improving historic structures and restoring facades as well as other economic incentives to rehabilitate and occupy buildings in a way that contributes to the pedestrian experience of downtown.
- Identify and invest in a pilot project to catalyze investment.

Action D: Build upon existing wayfinding and public art programs to incorporate art and culture into the district signage and public places.

The downtown target area should be defined to prepare a comprehensive downtown implementation plan that addresses open space, and public realm amenities as well as identifies incentives to attract development and funding sources. Within the target area, pilot implementation projects can catalyze investments.

Steps needed:

- Identify boundaries of downtown target area.
- Use the Comprehensive Plan 2030 as a foundation from which establish goals, objectives, and guiding principles.
- Prepare a comprehensive downtown implementation plan addressing open space, public realm amenities, incentives to attract development, and funding sources.
- Continue existing wayfinding program and use temporary signage and banners to promote events and activities downtown.
- Identify and invest in a pilot project to catalyze investment.

Street Signage and Wayfinding

Well-designed lighting, signage, and street furniture enhance safety, wayfinding, and neighborhood identity.

Aerial View
Aerial view of Gray in northern Terrebonne Parish.
Photo Credit: CSRS

Strategy 3: Plan for a Houma-Thibodaux growth corridor

The emerging growth corridor between Thibodaux and Houma is a regional asset with ample undeveloped land that can be more fully leveraged through strategic investments in housing, commercial development, and transportation infrastructure. Directing and concentrating growth in this way would allow these communities to benefit from proximity to one another by sharing amenities and raising the quality of life for all in the corridor. Focusing on investments at key intersections with US 90, as well as updates to the Schriever Amtrak station, will further contribute to the economic vitality of the corridor through improved access and varied transportation options.

Action A: Develop a corridor plan along LA 24 and US 90.

Thoughtful planning can help create a series of walkable villages between the population centers of Thibodaux and Houma that can attract residents from the southern part of the parish and elsewhere and spur economic development. Taking a holistic approach to the corridor will allow for guidance of growth to appropriate locations and coordination of key investments and improvements.

Steps needed:

- Conduct a buildable lands analysis and determine growth capacity within the Houma-Thibodaux corridor.
- Determine desired land use and development patterns to reinforce a series of villages around potential development nodes.
- Develop market projections and evaluate various growth scenarios.
- Evaluate transportation systems and other infrastructure needed to support growth.
- Develop a prioritized capital improvement program to ensure that growth needs can be met.

Action B: Study development potential at US 90 nodes.

In Terrebonne Parish, US 90 intersects LA 20, LA 311, LA 24, and LA 316. These intersections are located on higher ground and have tremendous potential for future growth and economic development. Specifically, the US 90/LA 24 intersection, located between Bayous Cane and Gray, should be further studied for additional housing and commercial development opportunities.

Steps needed:

- Prepare a small area plan to identify potential land uses, needed infrastructure improvements and incentives to attract development.
- Conduct a buildable lands analysis and determine growth capacity.
- Determine desired land use and development patterns to establish a development node with a variety of housing types and a commercial activity center.
- Develop market projections and evaluate various growth scenarios.
- Evaluate transportation systems and other infrastructure to support needed growth.
- Develop a prioritized capital improvement program to ensure that growth needs can be met.

Action C: Evaluate and improve corridor transportation infrastructure.

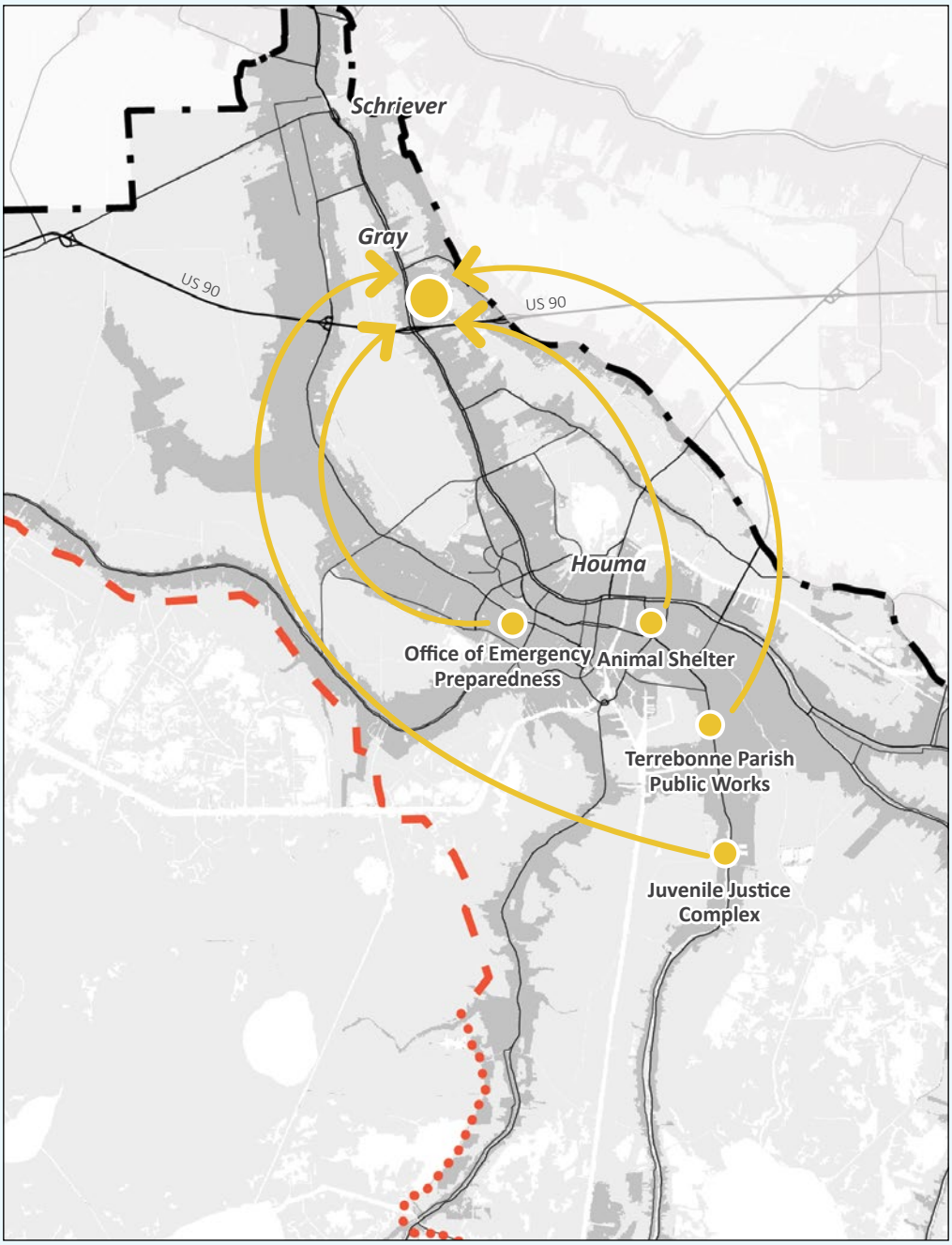
Development in the Houma-Thibodaux corridor will change transportation demands in the northern reaches of Terrebonne Parish. To meet those demands, the parish must work with partners and external stakeholders such as South Central Planning and Development Commission and Lafourche Parish. Solutions to improve mobility in the corridor require interlocal cooperation and include implementing a complete streets program, providing multimodal access and connectivity along and across Bayou Terrebonne, and coordinating transit opportunities.

Steps needed:

- Ensure that all regional transportation modeling reflects anticipated and desired growth in the corridor.
- Update the transportation needs inventory to reflect improvements needed to accommodate growth.
- Coordinate policies at the parish level regarding complete streets and other guidance for transportation infrastructure investment and improvements to ensure consistency and eliminate conflicts.
- Evaluate and coordinate transit options, building off of the South Central Transportation Plan.

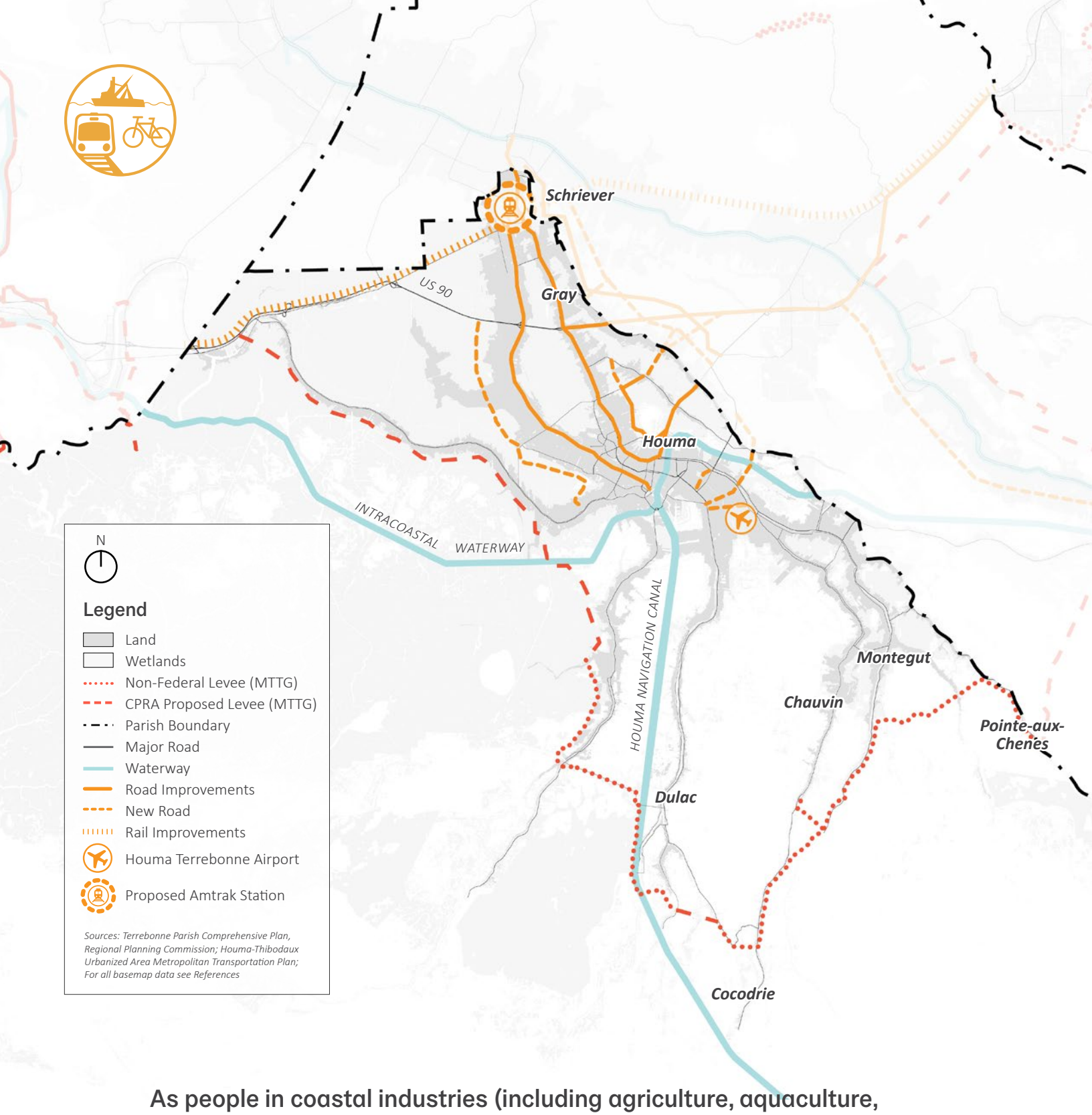
Airline Highway

Example from St. John the Baptist Parish illustrating a Complete Street with green infrastructure and shared pedestrian and bicycle paths.
Map Insert Credit: St. John the Baptist Parish



Case Study: Terrebonne Parish, LA

Terrebonne Parish has begun investing in the northern part of the parish on higher ground to reduce flood risk to critical assets. A portion of the public works division, the animal shelter, and the Office of Emergency Preparedness are now located north of US 90 as well as the Juvenile Justice Complex which relocated from Ashland to north Terrebonne Parish. A new safe room will be built on the new campus, along with various infrastructure investments.



As people in coastal industries (including agriculture, aquaculture, oil and gas support, boating, boat building, and maintenance) are forced to move north to higher land, they will have longer commute distances to their work on the coast. Travel times and costs to work will increase, causing additional stress on residents' financial stability. Alternative ways to get to work along the coast will be needed to sustain the coastal economy and the livelihood of people who live off of the land and water.

GOAL 3 Improve Mobility Throughout the Parish and Region

Strategy 1 Expand and diversify transportation options between the coast and areas of higher ground

Action A: Augment the South Central Transportation study to review transportation options between the coast and northern parish areas and to diversify parish transportation options.

Action B: Provide regional transportation between Terrebonne Parish and surrounding parishes.

Action C: Increase walking and biking opportunities by implementing the South Central Planning and Development Commission's regional bicycle and pedestrian master plan.

Action D: Plan for safe and efficient evacuation routes when planning and designing new roadways, as applicable.

Strategy 2 Adopt and implement a Complete Streets program

Action A: Design and construct roadways and intersections to enable safe access for all users.

Action B: Incorporate stormwater management into roadway design.

Action C: Set appropriate design standards for rural and urban areas.

Action D: Evaluate capital improvements and coordinate design.

Strategy 1: Expand and diversify transportation options between the coast and areas of higher ground

To adapt to this change in lifestyle and travel demands, Terrebonne Parish coastal workers and fishermen will have to find new options that make the trip economically viable and safe as travel in the southern part of the parish becomes more risky.

Multiple Modes of Transportation
Transportation options could include expanded bus networks, water transportation, and expanded pedestrian and bicyclist options.
Image Credit: National Disaster Resilience Competition for the City of New Orleans, Waggonner & Ball

Action A: Augment the South Central Transportation study to review transportation options between the coast and northern parish areas and to diversify parish transportation options.

As investments in public infrastructure in the southern part of the parish decline, support of alternative modes of transportation should be considered, such as ensuring that the bayous are navigable for smaller boats that may be used to reach commercial fishing boats.

Steps needed:

- Investigate option to use Bayou Terrebonne for transportation. Consider using the navigable portions of Bayou Terrebonne for short-distance traffic circulation such as a water taxi or ferry and connect it to the Intracoastal Waterway.
- Develop the bayous as assets for transportation, amenities, and recreation.
- Explore water taxis as a transportation option.
- Explore floating services, medical facilities, schools, and groceries to serve people in coastal areas.
- Prioritize transportation projects that promote multimodal transportation, access to public and commercial facilities, and provide environmental and economic benefits.
- Use the CPRA Master Plan's 50-year projections to identify key transportation and evacuation routes vulnerable to current or future flooding and prioritize their retrofit in the State Transportation Plan.

Action B: Provide regional transportation between Terrebonne Parish and surrounding parishes.

Explore a shuttle, or enhanced public transportation, to run along US 90 and LA 24, connecting out-of-parish workers to jobs and parish residents to neighboring parishes. This would work especially well if growth and development are initially focused around the intersection with US 90.

Steps needed:

- Expand and improve bus service with routes connecting major employment hubs in coordination with Good Earth Transit, SCPDC, and Lafourche Parish.
- Increase cross-parish transportation options by connecting communities through water taxis on navigable bayous and canals.
- Provide shuttle service along US 90 to connect Lafourche, Terrebonne, and St. Mary Parishes.

Southdown Trail
The Southdown Bike Trail is Houma's first shared bicycle and vehicle trail. The photo above shows a shared bicycle and vehicle lane with street markings and signage on Valhi Blvd.

South Central Regional Bicycle and Pedestrian Plan
Image Credit: South Central Planning and Development Commission

Action C: Increase walking and biking opportunities by implementing the South Central Planning and Development Commission's regional bicycle and pedestrian master plan.

Terrebonne Parish should complete the currently planned multi-use trail network and work to plan and implement an expanded, parish-wide system with both on-and off-road segments. This system should emphasize connecting neighborhoods to public spaces and amenities as well as to other parts of the region.

Steps needed:

- Complete the currently planned multi-use trail network and work to plan and implement an expanded, parish-wide system with both on- and off-road segments.
- Emphasize connecting neighborhoods to public spaces and amenities, as well as to other parts of the region.
- Add bike lanes along LA 24 between Houma and Thibodaux.

Action D: Plan for safe and efficient evacuation routes when planning and designing new roadways, as applicable.

Terrebonne Parish's transportation plan should push for major road improvements to include building roads on pilings to preserve existing hydrology and evacuation routes.

Steps needed:

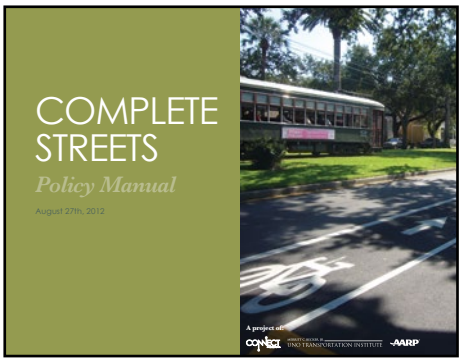
- Coordinate with DOTD to identify upgrades and new infrastructure that is needed.
- Require DOTD to model the impacts of new transportation projects on hydrological processes.
- Request that all DOTD projects include flood risk mitigation and cause minimal impact on surrounding areas.

Strategy 2: Adopt and implement a Complete Streets program

In recent years, there has been a cultural shift toward building streets that better balance various types of travel modes and provide safe accommodation for cars, bikes, and pedestrians. This "Complete Streets" approach to street design has a number of benefits that increase overall quality of life and quality of place, including improved safety for all users, regardless of age, ability, or mode of transportation; reduced traffic congestion; accelerated economic growth; improved public health; decreased burden on other infrastructure when stormwater management best practices are integrated into street design; and environmental improvements such as improved air quality due to reduced congestion and improved water quality due to better stormwater management practices.

Green Streets
Green street design incorporates stormwater treatment techniques and landscaping.

Action A: Design and construct roadways and intersections to enable safe access for all users.



Complete Streets Manual

See full report here:
https://www.cpex.org/complete-streets-manual/

Regardless of age, ability, or mode of transportation, streets must be safe for everyone. In many cases, this requires retrofitting existing streets to better accommodate users of modes other than cars. This changing approach to street design and construction must be guided by an overarching policy that defines priorities and outlines appropriate techniques to achieve them—for instance using traffic calming techniques to reduce speeds in areas of high pedestrian activity to improve safety; defining streetscape elements in a manner that provides federally compliant ADA access; and designing intersections to minimize conflicts between pedestrians, cyclists, vehicles, and transit to improve multimodal safety.

Steps needed:

- Using models of existing complete streets manuals, customize a Complete Streets manual for Terrebonne Parish that provides street crossing best practices, technical details relating to street design, and information regarding where and how to apply these techniques throughout the parish.
- Evaluate the parish's current guidance and manuals relating to street and intersection design for criteria to improve safety and comfort for pedestrians and bicyclists and ensure ADA accessibility; amend as necessary.

Action B: Incorporate stormwater management into roadway design.

Green streets are street right-of-ways that use stormwater management techniques that filter stormwater to reduce pollutants and reduce the quantity of water conveyed into the storm sewer system in lieu of conventional stormwater management. Incorporating stormwater management facilities throughout street right-of-ways should be part of an integrated strategy to deal with stormwater runoff throughout Terrebonne Parish and help reduce the burden on structural flood control devices.

Steps needed:

- Evaluate current guidance and manuals relating to paving and drainage for barriers to implementing green streets.
- Update codes to reflect goals for implementing green streets and stormwater management, including green infrastructure.

Context of South Louisiana
Development patterns vary depending on context.
Image Credit: Louisiana Speaks Pattern Book

Action C: Set appropriate design standards for rural and urban areas.

Terrebonne Parish contains a variety of different types of places, from urban areas in downtown Houma to more rural locations among the bayou communities. Respecting this varied character throughout the parish requires a tailored approach to designing roadways that is consistent with the character of a place while also addressing safety, connectivity, and convenience for everyone using the road. A palette of design standards that reflects the rich array of contexts will assist in developing street designs that better respond to and connect with the surrounding context. Design standards must also provide solutions to address differing priorities that must be addressed when there is limited right-of-way available.

Steps needed:

- Prepare corridor plans for areas targeted for Complete Streets to establish design priorities for capital projects.
- Create design standards for the range of street types identified in the area plan that are consistent with guidance provided in an adopted complete streets manual.

Action D: Evaluate capital improvements and coordinate design.

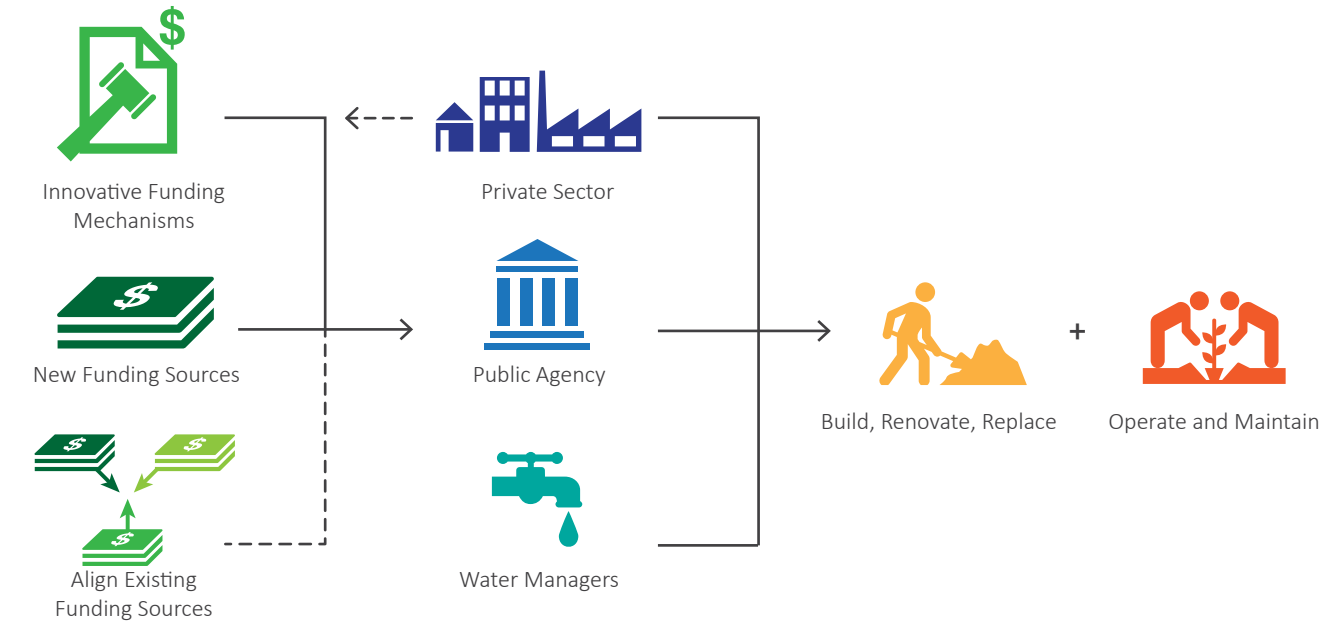
A number of subsurface utilities must be coordinated with one another as well as with above ground amenities in order to avoid conflicts. The amount of right-of-way available can often determine how easy or complex this task will be. Coordination must occur at the early stages of a project, beginning with project selection, to ensure that needs can be met, design can be coordinated, and construction can take place efficiently. This level of coordination requires a clearly articulated process that defines roles and responsibilities of everyone involved in street design and construction.

Steps needed:

- Create a coordinated capital improvement program for all department and utility projects to leverage infrastructure investments and minimize conflicting projects.
- Outline a design process that requires all departments to work together to select projects, evaluate design alternatives, and coordinate throughout the construction and project delivery process.
- Coordinate with all utility providers during project selection, design, and construction of street projects.

Financing Diagram

The diagram shows how various funding sources can be leveraged to execute new projects.
Image Credit: Edited from Greater New Orleans Urban Water Plan

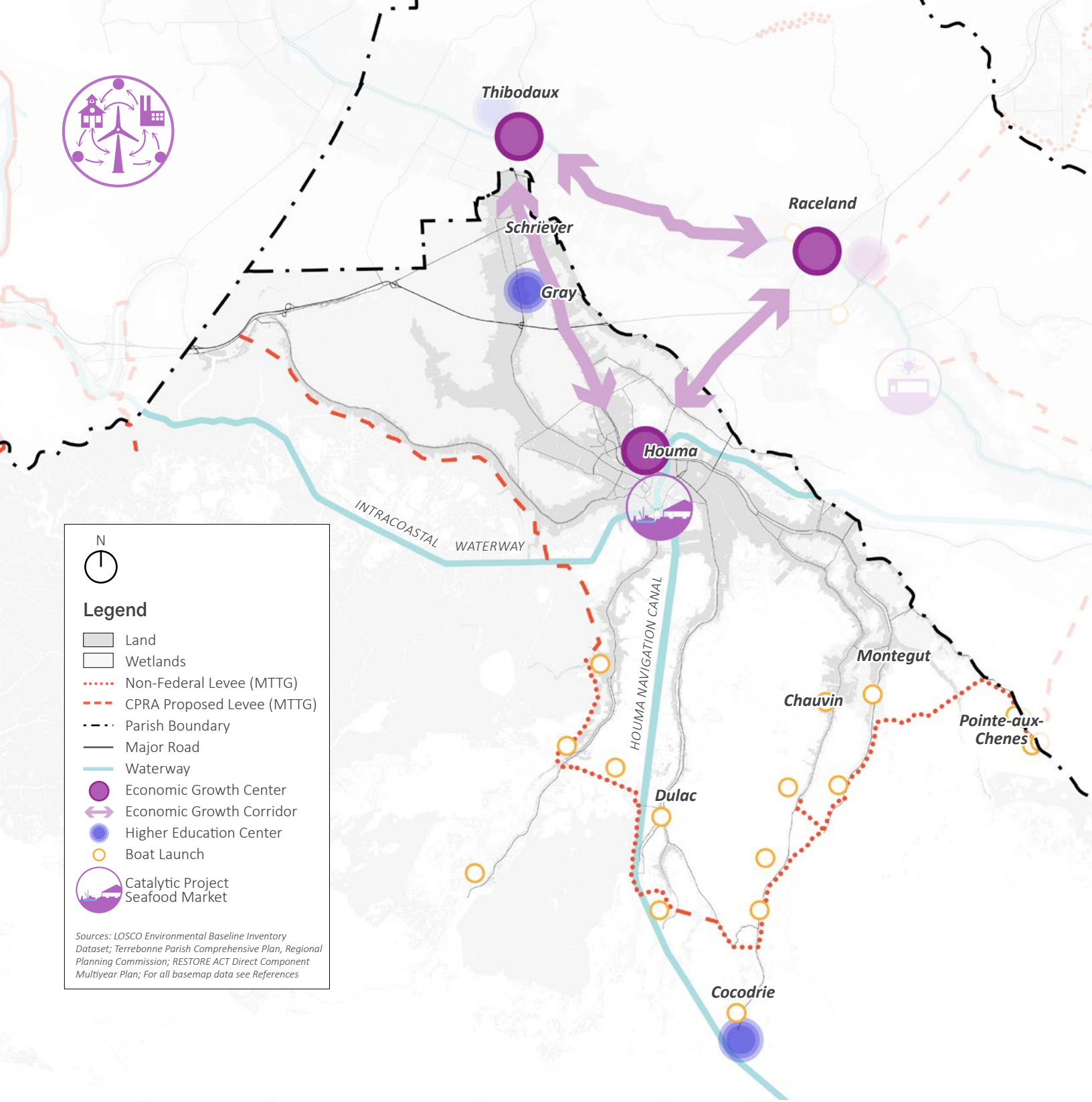


Grant Ave. biorention cells, curb cuts, and ADA-compliant sidewalk upgrades.
Photo Credit: Google Maps Street View

Flower Avenue Green Street Project.
Image Credit: City of Takoma Park

Case Study: City of Takoma Park, MD

Through private and public funds, the City of Takoma Park is transforming a heavily-used road with little runoff management into a street that has reduced the runoff of polluted water into the nearby creek system while promoting safe pedestrian, bicycle, and vehicular use. The one-mile section will feature stormwater curb extension, bioretention cells, and bioretention swales to address stormwater management needs. The retrofit also includes wider, ADA-compliant sidewalks.


Thibodaux
Raceland
Schriever
Gray
Houma
INTRACOASTAL WATERWAY
HOUMA NAVIGATION CANAL
Montegut
Chauvin
Pointe-aux-Chenes
Dulac
Cocodrie
N
Legend
Land
Wetlands
Non-Federal Levee (MTTG)
CPRA Proposed Levee (MTTG)
Parish Boundary
Major Road
Waterway
Economic Growth Center
Economic Growth Corridor
Higher Education Center
Boat Launch
Catalytic Project
Seafood Market
Sources: LOSCO Environmental Baseline Inventory Dataset; Terrebonne Parish Comprehensive Plan, Regional Planning Commission; RESTORE ACT Direct Component Multiyear Plan; For all basemap data see References

GOAL 4 Strengthen and Diversify Local Economies

Strategy 1 Support local fisheries

Action A: Connect producers with consumers.

Action B: Provide and upgrade facilities to help commercial fishermen adapt to change.

Strategy 2 Expand public access to parish waterways

Action A: Enhance the Downtown Houma Marina.

Action B: Upgrade public boat launches and boating facilities.

Action C: Increase availability of harbor of refuge sites.

Strategy 3 Enhance job training and education

Action A: Enhance demand-driven training programs for growing Terrebonne Parish industries with educational partners.

Action B: Maximize Fletcher Water Management/Coastal Restoration and Protection Institute as a workforce generator.

Action C: Create apprenticeship, paid internship programs, and “earn-and-learn” programs for high school and college students and expand skills training in coastal careers.

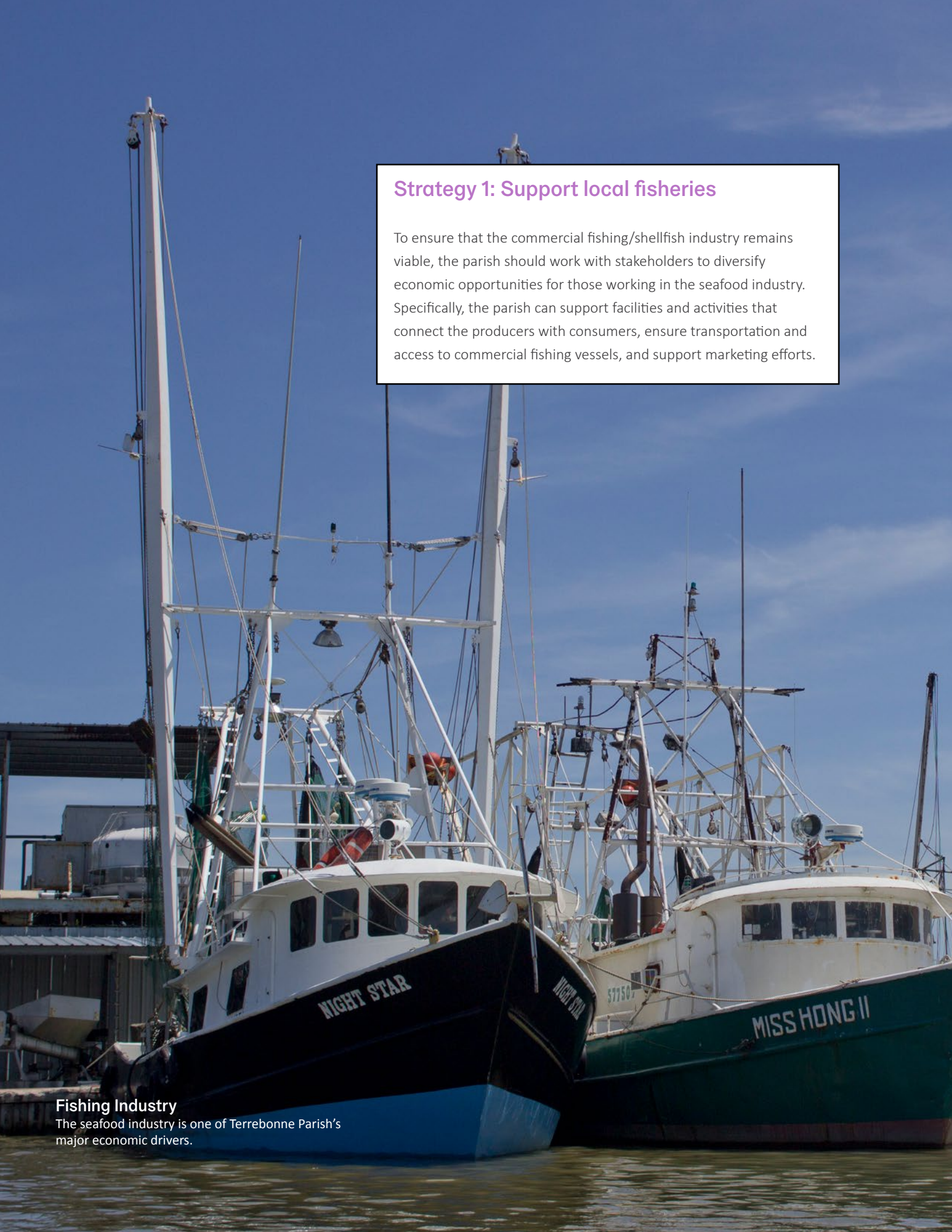
Strategy 4 Provide business incubation and adaptation assistance

Action A: Create a business incubation center.

Action B: Provide adaptation services for businesses confronting environmental changes.

Strategy 1: Support local fisheries

To ensure that the commercial fishing/shellfish industry remains viable, the parish should work with stakeholders to diversify economic opportunities for those working in the seafood industry. Specifically, the parish can support facilities and activities that connect the producers with consumers, ensure transportation and access to commercial fishing vessels, and support marketing efforts.



Fishing Industry
The seafood industry is one of Terrebonne Parish's major economic drivers.

Action A: Connect producers with consumers.

Building on the success of the Louisiana Direct Seafood Program, fishers should work with the LSU AgCenter and Louisiana Sea Grant to explore how to expand the LaTer Direct Seafood Program—which currently serves individual consumers—can target regional grocery stores and restaurants to buy from local fishers. New and updated marinas should be designed to accommodate fish and seafood markets and commercial kitchens that enable fishers to add value to seafood and fish catches and sell their products directly. The proposed Houma Seafood Market and Harbor of Refuge project creates a monthly seafood, vegetable, and fruit market. The project would also include marina amenities and harbor of refuge wet- and dry-docking facilities for boats during extreme weather events.

Steps needed:

- Implement a broad and vigorous marketing campaign.
- Expand the program's reach beyond individual consumers, targeting regional grocery stores and restaurants to buy from local fishermen.
- Coordinate with new/updated marinas so that they are designed to accommodate fish and seafood markets and commercial kitchens that enable fishers to add value to seafood and fish catches and sell their products directly.

Image Credit: Louisiana Seafood Direct

Seafood Market

LaTer Direct Seafood can market seafood directly to consumers as well as local grocery stores and restaurants.
Photo Credit: St. Tammany Parish Flickr

Action B: Provide and upgrade facilities to help commercial fishermen adapt to change.

As commercial fishermen and their families have to move north to live in safer communities that provide the education, goods, and services they need, they will also need new types of support facilities in the southern areas where their jobs remain. They will need secure spaces to store supplies and gear, boat storage and safe harbor areas, and bathing and shower facilities to use prior to traveling northward to their homes.

Steps needed:

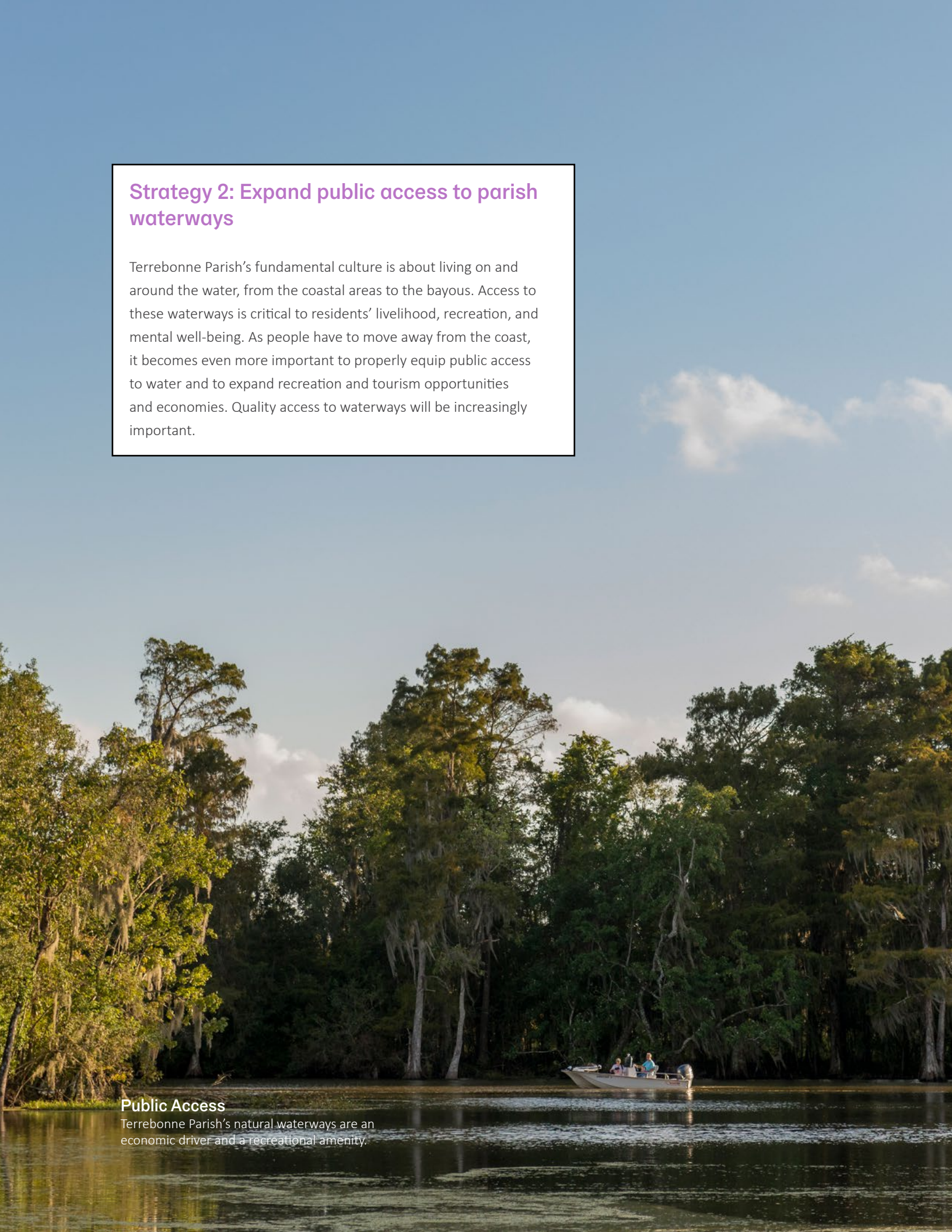
- Provide parking and gear storage spaces for fishermen to use near their boat storage areas.
- Provide groceries, ice houses, and processing plants.
- Provide resources, such as insurance, marketing assistance, and business plans, to help fishermen expand into ecotourism during non-fishing seasons.
- Establish public spaces to store traps and other gear.
- Understand how changing environmental conditions and proposed coastal restoration projects will affect Louisiana fisheries and work with affected fisheries to provide alternative opportunities or support.
- Assist the fishing industry with technical assistance and flexible loan programs that help improve product quality, reputation, and distribution to local markets.
- Promote Louisiana's seafood industry with targeted advertising campaigns and events.
- Provide research and technical assistance for adopting sustainable fisheries and aquaculture practices in Louisiana.

Harbor of Refuge

In addition to providing a harbor of refuge for vessels to shelter in place during disaster events, these facilities can provide marina amenities, wet- and dry-docking facilities, bathing and shower facilities, and supply storage.

Strategy 2: Expand public access to parish waterways

Terrebonne Parish's fundamental culture is about living on and around the water, from the coastal areas to the bayous. Access to these waterways is critical to residents' livelihood, recreation, and mental well-being. As people have to move away from the coast, it becomes even more important to properly equip public access to water and to expand recreation and tourism opportunities and economies. Quality access to waterways will be increasingly important.



Public Access
Terrebonne Parish's natural waterways are an economic driver and a recreational amenity.

Action A: Enhance the Downtown Houma Marina.

The downtown marina has the potential to expand its services to include dry boat storage, refreshments, bait, boat cleaning and maintenance service, showers and personal services, and call-ahead concierge services. Leveraging its downtown location and proximity to shops, restaurants, and numerous other sites of interest for tourists, the downtown marina can also expand its services to attract charter boats and small commercial passenger vessels.

Steps needed:

- Research local examples of enhanced marinas.
- Prepare a plan that specifies upgrades to the marina and improvements to the surrounding area in order to create a welcoming environment that attracts people and investment.
- Provide safe boating storage.
- Create a branding strategy for the marina.

Houma Marina

The Houma Marina features boat docking, a playground, and a recreational pathway. The marina could be expanded to accommodate more amenities and facilities.

Action B: Upgrade public boat launches and boating facilities.

The majority of boat launches in Terrebonne Parish have either shell or concrete ramps and limited parking. An update to these ramps should include—where appropriate—RV support, shelter, bathroom facilities, commercial kitchens, and fish cleaning stations. This would support economic diversification opportunities consistent with the parish's culture and identity. In strategic locations, existing boat launches could be expanded to provide mooring and boat storage facilities. The design of the upgrades should fit within the character of the area and minimize disturbance to the natural environment and hydrology. In addition, the upgrades should incorporate green infrastructure and renewable energy to meet stormwater management goals and utility needs.

Steps needed:

- Provide services to residents and attract tourists by upgrading boat launches, enhancing the downtown marina, and encouraging development of supportive facilities and activities.
- Work with the Boat Launch Advisory Committee to inventory existing facilities and services as well as to assess quality and maintenance needs.
- Identify improvements needed to existing facilities.
- Identify areas in the parish that need boat launches and supporting facilities.

Action C: Increase availability of harbor of refuge sites.

Terrebonne Parish should consider increasing the number of harbors of refuge to ensure that boats will be protected from storms and that adjacent properties are protected from boats during storms.

Steps needed:

- Identify locations in the parish to develop harbors of refuge for public use.
- Create a harbor of refuge specifically for commercial fishing vessels. Include boat docks, a picnic pavilion, and seafood market.
- Coordinate with property owners to acquire or rent long-term property to establish safe harbor areas.
- Identify funding partners, including parish, DOTD, industry, and nonprofits.

Skilled Jobs
Skilled job training and education can prepare Terrebonne Parish's residents for new and expanding industries.
Image Credit: Coalition to Restore Louisiana

Strategy 3: Enhance job training and education

While the oil and gas industry has been a longstanding employer and backbone of the Terrebonne Parish economy, recent downturns in demand and production have led to a surplus of highly trained workers. Under these conditions, circumstances are ripe for leveraging a rich tradition of skilled craft training and the current pool of underemployed and unemployed workers to diversify the Terrebonne Parish economy.

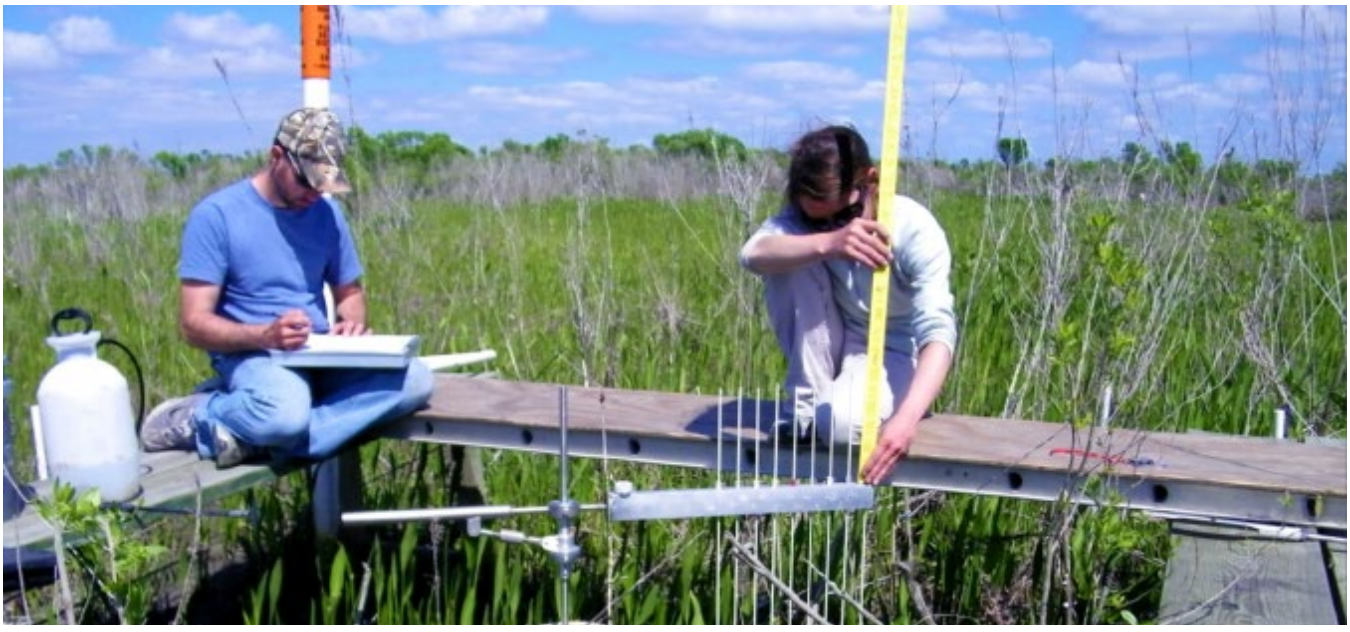
Action A: Enhance demand-driven training programs for growing Terrebonne Parish industries with educational partners.

Fletcher Technical Community College has a long tradition of industry-based training, and Jump Start pathways in high schools extend pipelines to younger talent. Through programs like these, Terrebonne Parish an continue training skilled labor for its traditional maritime and energy jobs as well as create pathways to opportunities in emerging fields such as aircraft operations, coastal restoration, and renewable energy. Programming and curriculums at high schools, two-year colleges, and four-year universities must be guided by industry needs and shaped to directly meet their current and long term hiring needs.

Action B: Maximize Fletcher Water Management/Coastal Restoration and Protection Institute as a workforce generator.

Recognizing the job growth in water management and coastal restoration in Southeast Louisiana, Fletcher Technical Community College is emerging as a leader in forward-thinking programming designed to build the workforce necessary to accommodate this growth. To that end, Fletcher must be supported in its efforts to connect with the coastal restoration industry and government agencies to grow first-class programming in this area.

Coastal Restoration Job Training
Terrebonne Parish can become a leader in job training in water management and coastal restoration fields.
Photo Credit: CPRA Applied Research Program



Action C: Create apprenticeship, paid internship programs, and "earn-and-learn" programs for high school and college students and expand skills training in coastal careers.

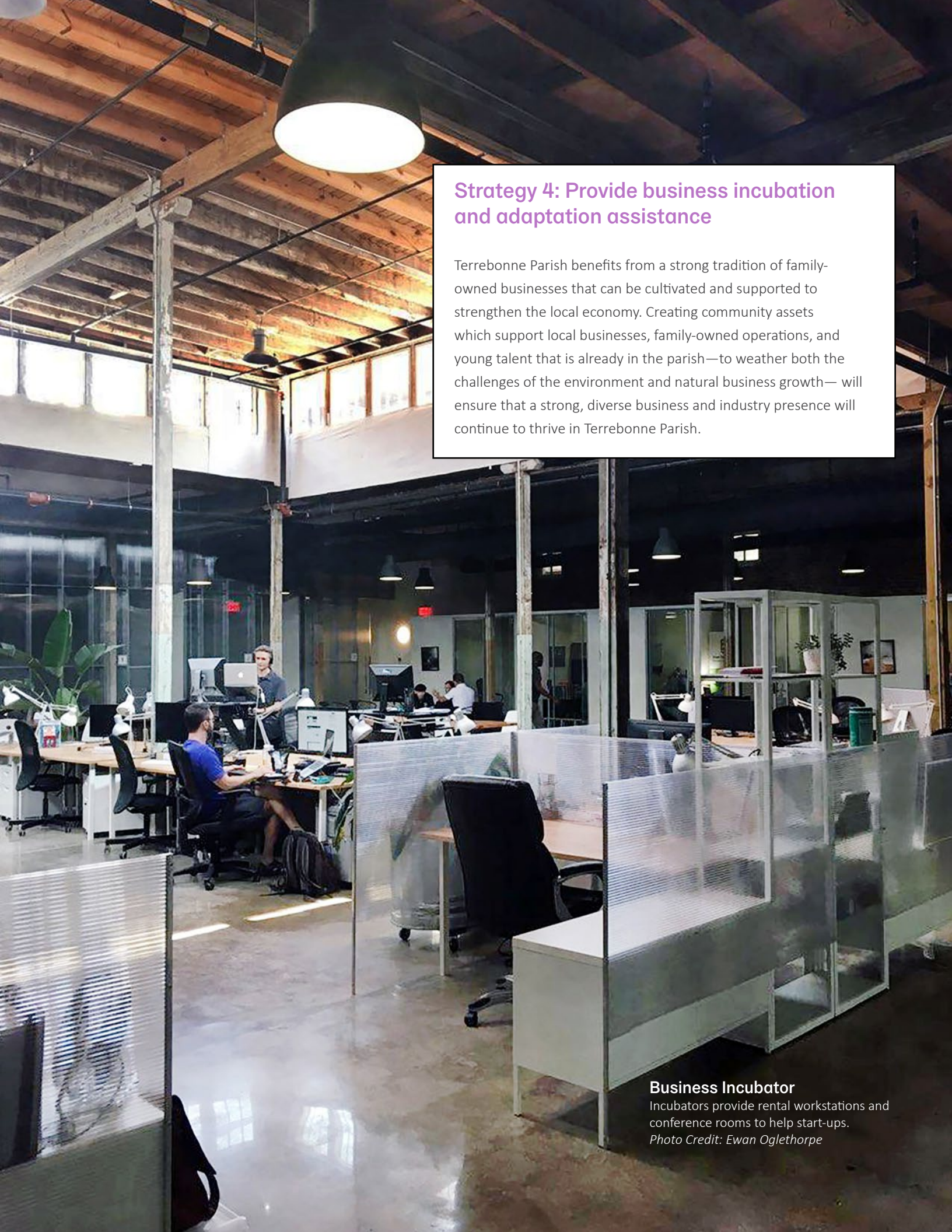
Community colleges across Southeast Louisiana often offer internships to provide students with on-the-job training, entry into the local workforce, and means to sustain themselves through completion of their programs. Many industries cite the need for this kind of experience in addition to Jump Start credentials to demonstrate an entry-level candidate's job readiness. To augment existing programs and provide greater financial stability for students seeking career preparation, apprenticeship and paid-internship programs should be facilitated between schools and industry partners.

Steps needed:

- Develop real-time research and data that accurately reflects job growth, wage levels, and skills needed for industry drivers. This information must be updated regularly to reflect incoming economic development projects and market shifts and made easily accessible to educators at all levels.
- Create systems for demand-driven employer engagement with educational providers. Two-year schools and high schools must have direct and ready access to employers in order to provide workforce-ready graduates.
- Facilitate apprenticeships and/or paid internship programs between industry and education partners. Apprenticeship programs often require facilitation between employers and high schools or higher education institutions. For high school students, issues of transportation, insurance, and liability are common barriers to overcome. In the case of two-year colleges or other higher education providers, trainings must typically be customized for the employer's needs, and schedules must be arranged to accommodate a work/study balance. In order to streamline these processes and ensure success, appointed facilitators of such programs must be in place.
- Develop a coastal specialization certification pathway open to students seeking either Jump Start or TOPS diplomas.
- Enhance coordination between K-12 education, community colleges, four-year universities, and industry to ensure students are receiving the training that meets the needs of local employers.
- Support an eventual transition to an apprenticeship-based model for training new employees in coastal careers.
- Use a combination of regulations, financial incentives, technical assistance, outreach, and education to build Louisiana's expertise in coastal and stormwater management.
- Offer retraining programs in coastal careers.
- Market and promote Louisiana expertise in the fields of coastal restoration, adaptation, and water management.

Strategy 4: Provide business incubation and adaptation assistance

Terrebonne Parish benefits from a strong tradition of family-owned businesses that can be cultivated and supported to strengthen the local economy. Creating community assets which support local businesses, family-owned operations, and young talent that is already in the parish—to weather both the challenges of the environment and natural business growth— will ensure that a strong, diverse business and industry presence will continue to thrive in Terrebonne Parish.



Business Incubator
Incubators provide rental workstations and conference rooms to help start-ups.
Photo Credit: Ewan Oglethorpe

Action A: Create a business incubation center.

While a key component of economic development is business attraction, business retention efforts are equally critical. Ensuring that there are resources to help new businesses come online, help existing businesses innovate and explore research and development opportunities, and help all businesses weather the challenges of major market downturns is necessary to maximize the economic prosperity of Terrebonne Parish.

Action B: Provide adaptation services for businesses confronting environmental changes.

Working with businesses to create adaptation strategies and provide adaptation services is beyond the typical role of many small business incubators, but that is an innovative and leading approach Terrebonne Parish could adopt to support its business community. Providing loans and technical assistance, which are tailored to meet the needs of the local fishing and agricultural communities, can assist in adapting existing farms to changing environmental conditions as well as sustaining the Louisiana seafood economy.

Steps needed:

- Create a board and identify incubator sponsors.
- Develop a business plan for the incubator.
- Enlist the support of local businesses.
- Develop a governance structure.
- Identify partners.

Business Incubator

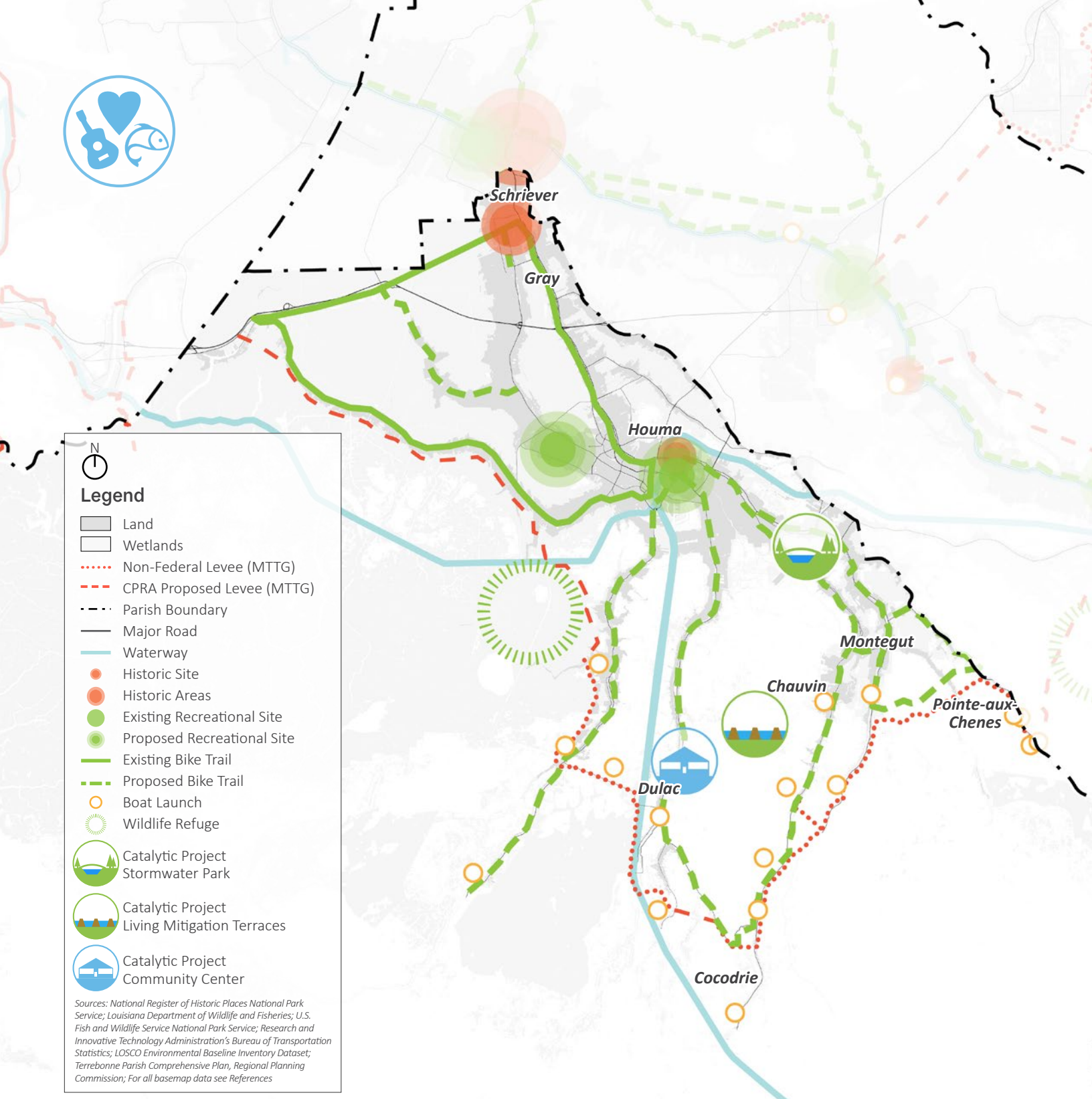
Incubators can offer training programs for starting new businesses as well as offer space and amenities for small business owners. *Photo Credit: The Blue House*

Above: AJ & Sheron Fabre Market. *Photo Credit: Town of Jean Lafitte/Paul Christiansen*

Left: Jules Nunez Seafood Pavilion. *Photo Credit: Town of Jean Lafitte/Paul Christiansen*

Case Study: Jean Lafitte Fisheries Market

In 2017, the Town of Jean Lafitte opened a seafood pavilion and market to host special events and serve as a monthly vending outlet for local commercial fishers, artists, and craft retailers. The Jules Nunez Seafood Pavilion and AJ & Sheron Fabre Market is a large, covered venue featuring a 60-foot counter with beer and soda taps, ice machines and refrigerators, and a stage for live bands for special events. To underline and preserve the local identity, the venue is decorated with reproductions of signs from local retailers of a century ago, including the Bridge Side Inn, the Isadore Fisher General Store, and Victor Kerner's Grocery, which was run by Mayor Tim Kerner's great-grandfather. The attached deck is partially built over the waterway and seats up to 175 people. Two smaller pavilions provide space for up to eight commercial fishers to sell their catch directly.



Many of these recommendations and actions answer residents' desires to support, enjoy, and capitalize on local arts, music, and food and maintain their strong connections to the land, water, and natural environment. By developing and expanding opportunities for recreational fishing, bird watching, and kayaking in higher-risk areas of the parish and providing traditional parks and open spaces in the low-risk areas, residents and visitors alike can experience the parish's natural beauty.

GOAL 5 Retain local culture and enhance recreation opportunities

Strategy 1 Ensure public and community assets provide recreational and educational opportunities

Action A: Incorporate trails, observation decks, and boardwalks into landscape designs.

Action B: Design stormwater management facilities on vacant and abandoned lots and public lands as recreational assets.

Action C: Provide kayak/canoe/pirogue rental and launch opportunities.

Action D: Provide educational signage at key locations to learn about the culture and natural assets of the area.

Action E: Develop a cultural center highlighting local culture and economies.

Action F: Preserve and support Louisiana culture and historical sites.

Strategy 2 Enhance public access to Terrebonne Parish's waterways for recreation

Action A: Increase the number of public boat launches and docks.

Action B: Develop facilities and services around water-based recreation.

Strategy 1: Ensure public and community assets provide recreational and educational opportunities

The proposed projects, such as the Grand Caillou Recreation Center, the Bayou La Cache Wetland Park, and the Living Mitigation Terraces, present numerous recreational and educational opportunities for visitors. Platforms, trails, boardwalks and outdoor classrooms should all connect to each other and contain proper informational and wayfinding signage. Many of the stormwater management elements on these sites also offer opportunities for recreation, such as bird watching, walking, kayaking, and nature exploration.

Recreational Amenities
Amenities, such as boardwalks, can provide educational and recreational opportunities.

Action A: Incorporate trails, observation decks, and boardwalks into landscape designs.

The proposed project will restore and enhance habitats that support birds, wildlife, and vegetation native to Terrebonne Parish. By incorporating connected trails and boardwalks, these areas will become accessible to visitors for birding, exploring the parish's wetlands, and learning about the habitats that have contributed to Terrebonne Parish's rich recreational culture.

Steps needed:

- Identify strategic access points for trails and boardwalks.
- Identify connectors, trailhead locations and destinations for trails, such as public facilities.
- Work with Audubon Louisiana-National Audubon Society, Louisiana Department of Wildlife and Fisheries, Terrebonne Parish Recreation Districts, and Terrebonne Levee and Conservation District to ensure trails and observation decks provide recreational opportunities and support restoration and rehabilitation efforts of the area.

Access to Nature

Boardwalks and pathways allow recreational access to nature and wildlife viewing.

Action B: Design stormwater management facilities on vacant and abandoned lots and public lands as recreational assets.

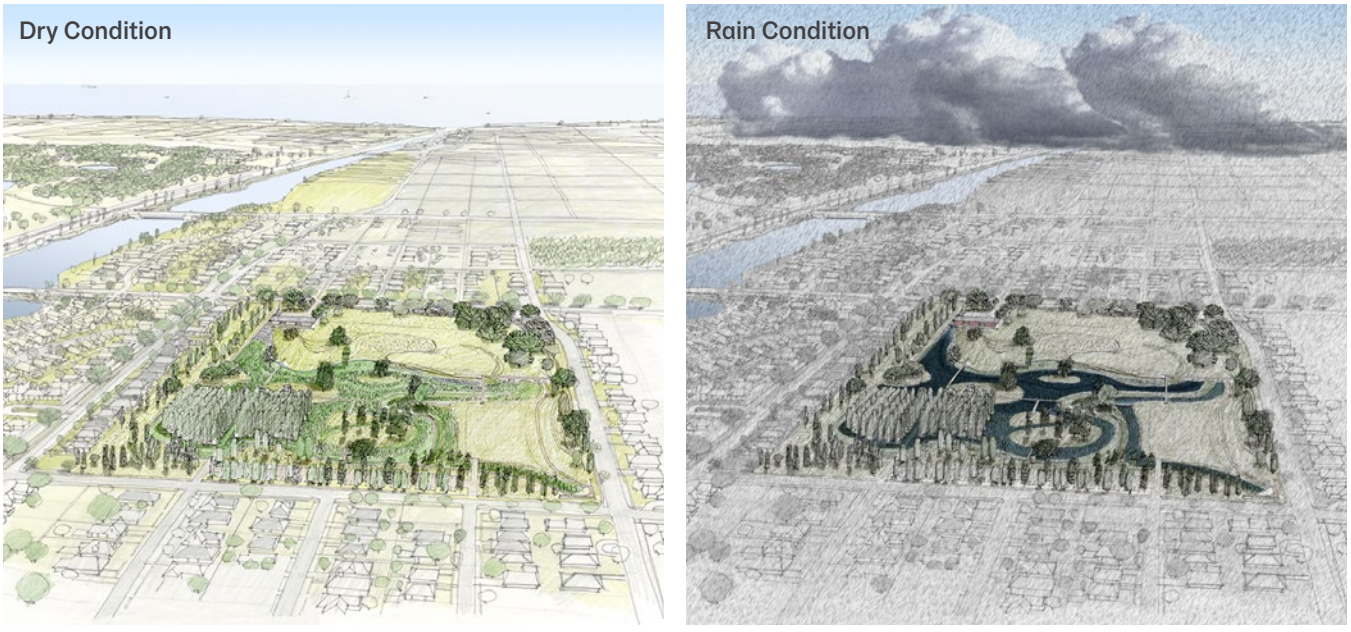
Reduce flooding by using vacant and abandoned lots as well as public lands, such as right-of-ways, for stormwater management and recreational facilities. Terrebonne Parish should develop a program to turn this abandoned land into water features and landscaped areas with swales, water gardens, permeable paths and sidewalks, and other amenities. This enables properties to be recreational and open community assets while also holding floodwaters when needed.

Steps needed:

- Review existing Terrebonne Parish regulations for neighborhood retention areas.
- Research best practices, using New Orleans and other cities that are creating multi-use retention facilities as sources.
- Update ordinances to require private properties that provide retention areas to design and build them as recreational or open space areas.
- Identify property and funding for potential multi-use facilities.
- Work with Terrebonne Parish Recreation Districts to create multi-use retention areas.

Space for Water

The Mirabeau Water Garden, currently in design for the City of New Orleans, is a 25-acre empty lot that will become a model of sustainable water management in the region by reducing flooding and limiting subsidence in the neighborhood. The public park will also become a destination for recreation and environmental education.
Image Credit: Waggonner & Ball



Boat Launch and Rental Facilities
Boat launch and rental facilities allow residents and visitors access to parish waterways.
Photo Credit: St. Tammany Parish Flickr

Action C: Provide kayak/ canoe/pirogue rental and launch facilities.

Pirogues—the small wooden boats made from a single tree trunk—have traditionally transported the people in and around Terrebonne Parish across marshes and swamps. A rental station and launch area for these small boats at the Bayou La Cache Wetland Park will encourage their recreational use and sustain this traditional way of "getting around" while residents and visitors enjoy the natural beauty of the area.

Steps needed:

- Identify a strategic location, or several, to add a rental station and launch area.
- Work with Audubon Louisiana-National Audubon Society, Louisiana Department of Wildlife and Fisheries, Terrebonne Parish Recreation Districts, and Terrebonne Levee and Conservation District to identify routes and water-based destinations to maximize recreational aspects.
- Work with business community and/or Terrebonne Parish Recreational District to develop a rental facility and launch.

Signage
Signage at the Woodlands Conservancy provides information to visitors about this cypress tree.

Action D: Provide educational signage at key locations to learn about the culture and natural assets of the area.

Building on the recreational opportunities that provide access to the Bayou La Cache Wetland Park, educational opportunities should be developed and installed. Signs, maps, and brochures can convey important natural and cultural facts to visitors and engage them more deeply in the experience of the park.

Steps needed:

- Identify the key elements to feature on signage and brochures. Include facts about the natural environment and its habitats; species of birds and other wildlife and vegetation common in the area; the stormwater management function of the site; information about the pirogues and their uses and users; and other relevant information.
- Work with Louisiana Department of Culture, Recreation and Tourism, Terrebonne Parish Recreation Districts, Barataria-Terrebonne National Estuary Program, and other stakeholders to develop the content and maps for trail and boat users.
- Place signage at key locations.
- Promote use of trails and key educational sites through geocaching and outdoor classroom activities.

Action E: Develop a cultural center highlighting local culture and economies.

A Terrebonne Parish cultural center will feature the culture, history and economy of the parish, including sugarcane cultivation practices, traditional practices of water management (featuring a retired pump from the area), and other unique cultural practices and artifacts of various Terrebonne communities, past and present. A cultural center should connect to the boardwalk and trails of the area.

Steps needed:

- Identify funding partners to support a cultural center initiative.
- Identify a strategic location for the cultural center.
- Identify revenue stream for construction, maintenance, and operations of the center.
- Work with the necessary stakeholders to determine the focus of the cultural center.

Museum and Wetland Trace

The Lafitte's Barataria Museum in Jean Lafitte, LA features exhibits on local wildlife and economies as well as an outdoor wetland trace nature trail.
Photo Credits: Town of Jean Lafitte

Action F: Preserve and support Louisiana culture and historical sites.

An aggressive state, regional, and local cultural and historic marketing campaign will attract tourists and visitors to Terrebonne Parish to experience the parish's many assets.

Steps needed:

- Use apps, augmented reality, and other new technologies to help visitors discover Louisiana's culture and history.
- Participate in a state-sponsored "stay-cation" marketing campaign aimed at Louisiana residents to promote local tourism.
- Promote use of the state's Percent for Art program to include all capital expenditures from public funds and allow the program to fund cultural assets such as space for music, festivals, or traditional cooking, in addition to visual arts.
- Co-locate cultural events and programs near existing transportation corridors and community centers to make them more accessible to a wider range of people.

Historical Sites

Terrebonne Parish can expand on its historical sites, town centers, and parks to attract tourists and visitors.

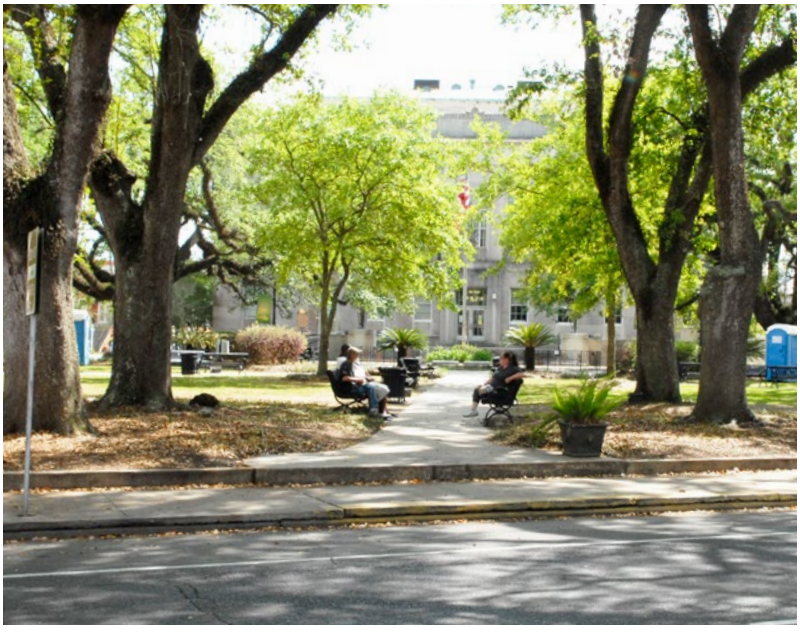


Photo Credit: Groundspeak, Inc.

Strategy 2: Enhance public access to Terrebonne Parish's waterways for recreation

Terrebonne Parish residents strongly value their proximity to water and the many recreational opportunities it provides. From bird watching to fishing to water sports, access to the water is ingrained in the culture of this parish. To ensure that this way of life is preserved and to provide access to Terrebonne Parish's waterways, additional boat launches, facilities, and services should be considered.

Waterways
Terrebonne Parish's many waterways are a cultural and recreational amenity for residents and visitors.

Action A: Increase the number of public boat launches and docks.

Terrebonne Parish currently has 11 public boat launches. Additional boat launches at strategic locations will increase access to water-based recreation opportunities. The location and design of the new docks and launches should fit within the character of the area and minimize disturbance to the natural environment and hydrology. Green infrastructure and renewable energy to meet stormwater management goals and utility needs should be part of the design.

Steps needed:

- Work with the Boat Launch Advisory Committee to identify areas in the parish that need boat launches and supporting facilities.
- Work with property owners to purchase or lease properties suitable for launching boats.

Action B: Develop facilities and services around water-based recreation.

As the parish implements new boat launches, RV support, shelters, bathroom facilities, and fish cleaning stations should be considered as well. Services around the boat launches, along with boat rental facilities, would support economic diversification opportunities consistent with the parish's culture and identity.

Steps needed:

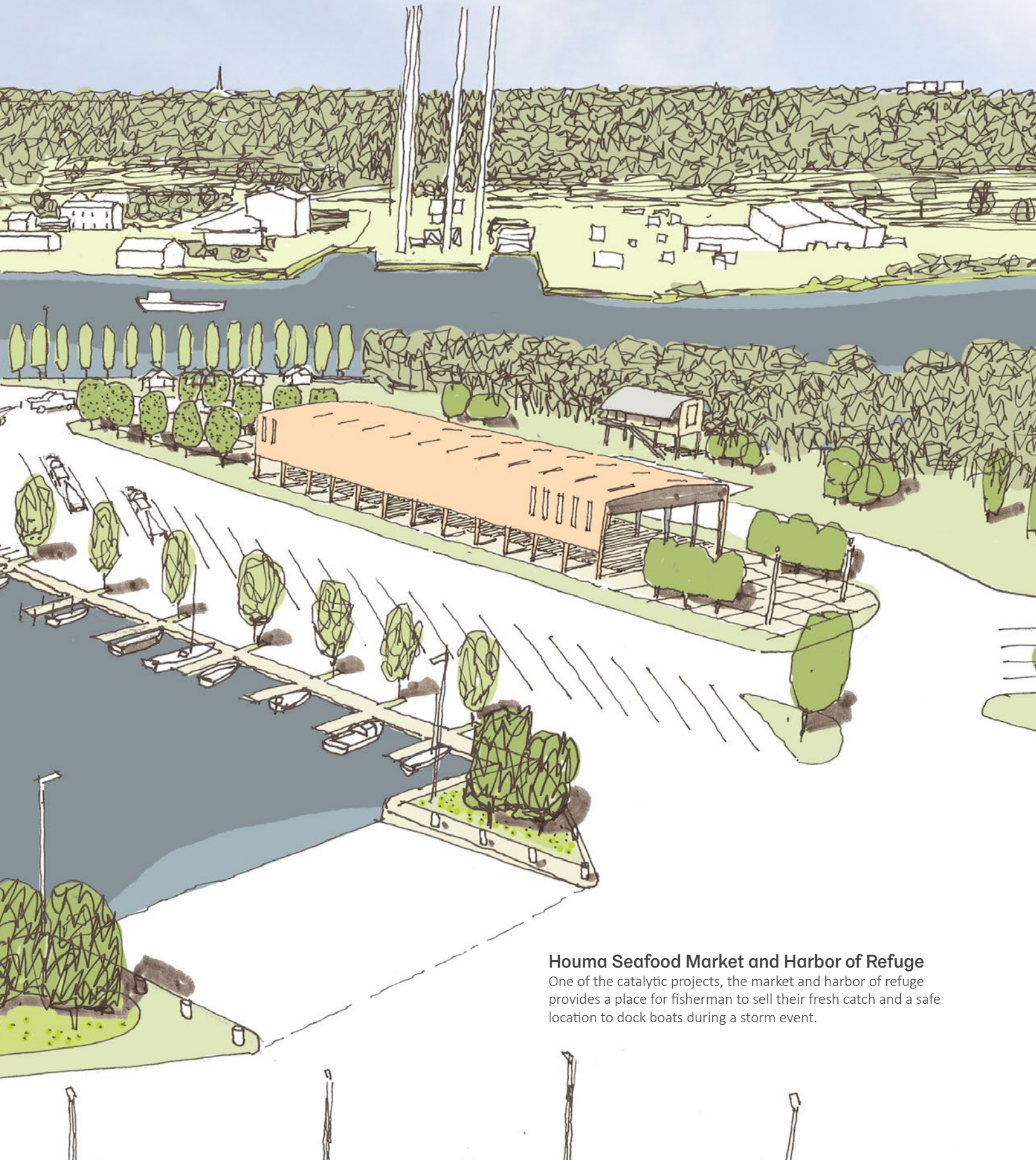
- Provide services to residents and attract tourists by encouraging development of supportive facilities and activities around existing and new boat launches.
- Promote areas outside structural protection systems as a sportsman's paradise, including tax incentives for recreational businesses operating in these areas.
- Partner with nonprofits or philanthropic organizations to expand access to outdoor recreational opportunities for Louisiana youth.
- Work with nonprofit and philanthropic partners to expand weekend or summer camp opportunities for coastal education and combined culture and history camps.

Case Study: Wally Pontiff Jr. Playground, Metairie, LA

Wally Pontiff Jr. Playground, located in the Old Metairie section of Jefferson Parish, is a high-performance landscape that maintains the appearance of a traditional suburban park. In addition to providing significant stormwater retention, it offers recreational opportunities for local residents including ball fields and a gymnasium. Pontiff Playground flooded after Hurricane Katrina and subsequent levee failures, damaging facilities and necessitating near total reconstruction.

The most striking strategy of the reconstruction of Pontiff Playground is a three-foot tall earthen berm, which was constructed around the perimeter of the park, creating a 40-acre stormwater retention area that is designed to retain water for up to a day before being siphoned into the 17th Street and Suburban Canals. The bermed area accommodates approximately 6.9 million cubic feet (52 million gallons) of stormwater. This is sufficient to drain six inches of standing water from a surrounding area totaling 180 acres, with the goal of mitigating a 10-year rain event (9.4 inches in a 24-hour period) During heavy rainfall, the playground can be intentionally flooded to help alleviate the burden on surrounding drainage systems. The berm, additional drainage modifications, and required pumps were financed by the Jefferson Parish Drainage Department for approximately $6 million. Enhancing the pre-Katrina park infrastructure with a cost-effective and high-capacity integrated landscape water management system has reduced risk of flooding in Old Metairie, dual-purposed public land, and has created a popular destination that improves the quality of life for Jefferson Parish residents.

5 Realizing the Vision



Houma Seafood Market and Harbor of Refuge
One of the catalytic projects, the market and harbor of refuge provides a place for fisherman to sell their fresh catch and a safe location to dock boats during a storm event.

Planning to Action

Residents constantly think about the risks associated with living in St. John the Baptist Parish and how they can live harmoniously with the water around them. Throughout the LA SAFE initiative, residents and stakeholders discussed their needs and possible solutions for adapting to future changes to their environment and risk profiles. The top strategies for each adaptation goal are described in Chapter 4: Vision and Strategies.

Based on resident and stakeholder input, the Louisiana Office of Community Development identified six catalytic projects that implement numerous adaptation strategies. Ideas gathered from meeting participants in Rounds 1 through 4 contributed to each project's development. Residents and stakeholders reviewed the resulting six strategies and provided feedback on their preferences, which were factored into funding decisions. LA SAFE identified one or two projects in each parish to provide funding assistance.

Strategy Evaluation Criteria

Evaluation of catalytic projects eligible for LA SAFE funding is based on the following criteria—

1. Public Preference
The results of the preference polling at the fifth round of meetings paired with the responses from an online survey, which allowed residents to indicate their preferences if they were unable to attend a Round 5 meeting.

2. Leverage Funds
The level of matching funds from other sources available to implement the project.

3. LMI Benefit
Projects that predominantly benefit a low-to-moderate income population.

4. Public Benefit (Quantitative)
The level of benefit to the public that can be measured. For example, the number of units created in a housing proposal or the amount of water stored in a stormwater management proposal.

5. Public Benefit (Qualitative)
The degree to which the project addresses future flood risk in a unique way and/or improves quality of life for residents.

6. CRS Score
Awarded to projects that gain points in FEMA's Community Rating System (CRS), which lowers flood insurance rates.

The table on the opposite page summarizes the six catalytic projects considered for LA SAFE funding and how they address the parish's goals. Detailed descriptions of each of the six projects follow the table.

Project Benefits Table

Catalytic Projects	LA SAFE Goals				
	 Water Management	 Housing and Development	 Transportation	 Education, Economy, and Jobs	 Culture and Recreation
Bayou La Cache Wetland Park	Diverts water from the bayou into detention ponds, allows for groundwater recharge, and alleviates loads on the drainage system.	Potential to reduce flooding affecting development down the bayou.		Includes observation and education platform and open classroom.	Provides green space, walking paths, and habitat.
Grand Caillou Environmental, Cultural, and Business Center	Green infrastructure on the campus will capture and slow water runoff. A wetland discovery center will educate visitors on the value of Terrebonne Parish's wetlands and natural systems.	Provides training, services and products needed by residents and businesses.		Incubators assist business start-ups and retrain residents in emerging business opportunities. Supports entrepreneurial spirit of residents.	Provides green space, sports fields, walking paths, and wildlife habitat.
Houma Seafood Market and Harbor of Refuge		Supports residents and businesses by providing needed goods and services.	Provides safe storage for boats.	Grows the direct seafood to consumer market and provides fishermen and farmers a permanent location to sell and market goods.	Enhances the arts and festival opportunities in the parish and provides a lively tourism venue.
Lake Boudreaux Living Mitigation Terraces	The terraces produce marshlands and reduce storm surge, wave fetch, and turbidity. The project also traps suspended sediments generated by wind and wave action.	Protects residences and businesses from storm surge.	Protects roadways and infrastructure from storm surge.	Provides educational examples of the value of wetlands and marshlands and habitat diversity.	Enhances submerged aquatic vegetation growth; providing resting and nesting habitat for avian life and the American alligator to support birding and tourism industries.
Fishermen and Seafood Cultivation Loan Program	Transitioning from dry farming to seafood crop (rice and crawfish) provides stormwater retention benefits to the region.		Loans can be used to improve commercial fishing boats.	Enhanced product quality can provide higher incomes for fishermen and farmers.	Loans could be used by boat owners to expand into charter or tour businesses.
Buyouts for Permanent Resident Households	Vacated properties may be converted for stormwater retention or wave attenuation purposes.	Relocated residents will enjoy closer access to goods and services.		Residents who choose to relocate will be provided with funds to resettle in a safer area.	Vacated properties may be converted to recreational camps, facilitating an economic transition to natural uses.

Bayou La Cache Wetland Park

A major challenge identified by stakeholders in Terrebonne Parish is flooding due to poor drainage and stormwater management, especially in the southern part of the parish. At the same time, the parish's natural beauty is an asset with many possibilities. Opportunities identified by residents include building to live with water, improving land and water management, and promoting the parish's natural beauty through restoration efforts, education, and access to these assets.

Areas subject to moderate and high future flood risk must consider stormwater management features in addition to current and planned structural protection systems. The Bayou La Cache Wetland Park proposal transforms an existing borrow pit site into a beautiful public park with educational and recreational programming. The park will provide multiple ecosystem services, including stormwater management, water cleansing, and native habitat recovery.

The Bayou La Cache Wetland Park in the Smith Ridge forced-drainage system diverts and temporarily stores water during heavy rain events while providing access from Aragon Road to amenities such as bird and wildlife viewing and walking paths. Increasing the bayou's capacity by using weirs and shutoff valves to divert water into existing ponds reduces flood risk down the bayou.

"It's an amazing proposal. I'd love to be able to use and enjoy what is in my backyard."

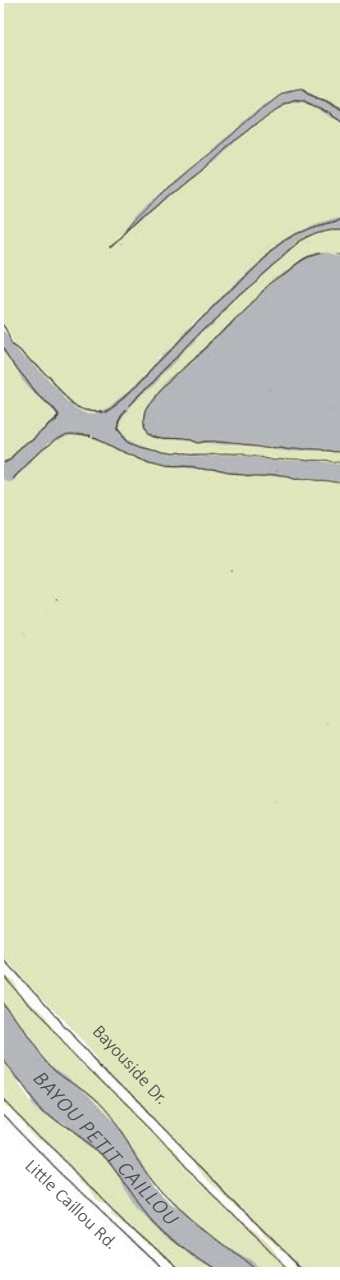
—Terrebonne Resident Comment

Statistics	
Project Area	100 acres
Location	Bayou La Cache
Estimated Project Cost	$5.4 million
Potential Partners	Terrebonne Levee & Conservation District; Terrebonne Parish; Louisiana Department of Wildlife & Fisheries

Photo Credits: Matthias Süßen Wiki

Plan View

The level of water in Bayou La Cache is raised by a weir to a higher elevation, discharging into an existing borrow pit. A collection of new weirs between the existing borrow pit controls their water level. Using gravity, water cascades downward and returns to the bayou allowing still water to move. Concurrently and during drought spells, modern wind mills, connected to Archimedes screw pumps, elevate drainage water to the level-controlled borrow pits.



1. Weir to divert water to retention ponds
2. Terraced retention pond filled with native plants and boardwalks
3. Observation deck, pavilion, open-air classroom, and water literacy pavilion
4. Wind-driven Archimedes screw pumps
5. Existing sugarcane fields
6. Future cultural center with focus on sugar cultivation and water literacy

Photo Credit: Payton Chung\Flickr\CC by SA 2.0

imedia Commons CC BY-SA 3.0

Photo Credits: Jamie\Wikimedia Commons\CC by SA 2.0

Above Left, Above Middle, Above Right: Precedent image of terraced wetlands, boardwalks, and overlooks
Photo Credit: Turenscape Landscape Architecture

Above: Precedent image of Archimedes

The Grand Caillou Environmental, Cultural, and Business Center

Land loss and erosion, lack of development and services, and residents moving north have been major contributors to school closings and loss of businesses in the southern part of Terrebonne Parish. Despite these challenges, a sense of community closeness and preservation of traditions and culture are strengths upon which residents of Terrebonne Parish wish build.

In areas projected to experience moderate future flood risk, it will be important to cluster goods and services in central locations where they will be easier to access and protect. In Terrebonne Parish, three abandoned elementary schools are available to repurpose in support of this goal: in Dulac, Grand Caillou Elementary, and in Chauvin, Boudreaux Canal Elementary and Little Caillou Elementary.

The Grand Caillou Environmental, Cultural, and Business Center project will redevelop and reprogram an unused school site to provide multiple community uses and stormwater management benefits. Potential uses to support existing residents include a wetland discovery center, an ecotourism business incubator, a cultural language center, and a seafood processing plant with direct retail opportunities. This project also includes retention ponds and enhanced open space amenities. Grand Caillou Elementary is adjacent to the Dulac branch library and the Grand Caillou Recreation Center, creating a centralized area for amenities and services.

By concentrating redevelopment and repurposing abandoned buildings, communities and their cultures and traditions will continue to thrive while providing residents with needed services and jobs.

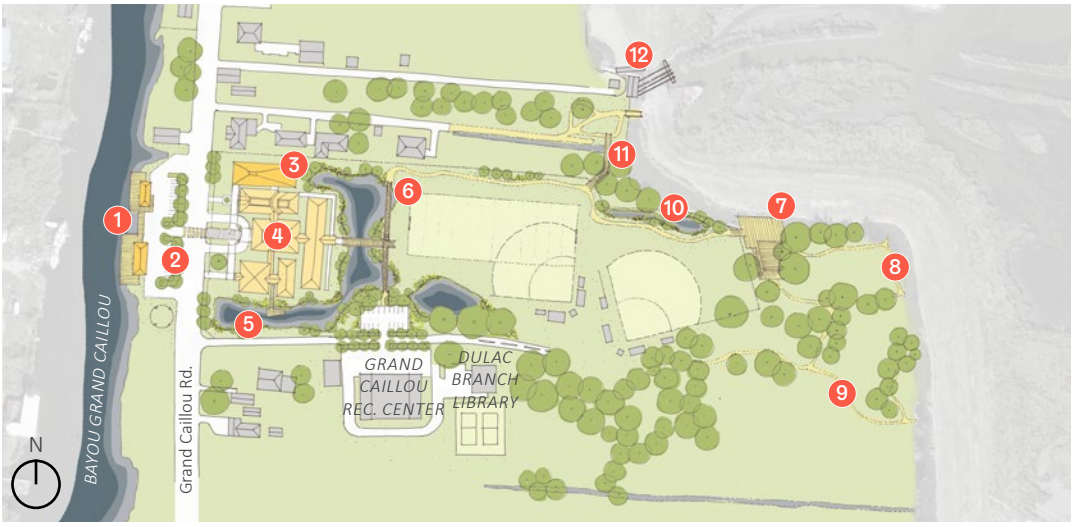
Statistics

Project Area	15 acres
Location	Grand Caillou Elementary, Boudreaux Canal Elementary, Little Caillou Elementary
LA SAFE Investment	Up to $6 million
Estimated Project Cost	$7.3 million
Potential Partners	Terrebonne Levee & Conservation District; nonprofit grants; property owner

Aerial View Looking North

1. New waterfront gazebos for seafood retail with boat docks
2. Parking lot with permeable pavers
3. New roof on existing commercial kitchen to be used for seafood processing
4. Existing buildings- renovation for new uses
5. Retention ponds
6. Boardwalk and educational discovery trail

7. New observation and educational platform (Open Classroom)
8. Educational signage (Ex. “At this point, you are 4 1/2 feet below sea level”)
9. New trails in forested wetland
10. Retention pond/bioswale
11. New boardwalk to connecting existing trails
12. Existing pump station- Future upgrades can include signage and windows for educational purposes



Plan View

Houma Seafood Market and Harbor of Refuge

Due to its strategic location near the Gulf of Mexico, Terrebonne Parish's seafood production is a significant contributor to the state's seafood industry. However, currently Terrebonne seafood is sold primarily wholesale to restaurants and other retailers and is not readily available to individual consumers. Connecting Terrebonne seafood providers directly to a consumer market is key to growing this local industry. Terrebonne Parish's seafood industry must also be resilient to the impacts of seasonal storms and storm surge that can damage assets such as boats, vessels, and other equipment, jeopardizing the entire industry.

To ensure continuity and diversification of Terrebonne Parish's seafood industry, stakeholders in Terrebonne Parish proposed the Houma Seafood Market and Harbor of Refuge. The proposal calls for creation of a marina and safe harbor facility that includes a venue in which to host a monthly seafood, vegetable, and fruit market. It will give fishermen and farmers a central location from which to sell products, provide consumers an established retail venue, and showcase local products to a broader market. In addition, the Houma Seafood Market and Harbor of Refuge would include marina amenities and wet-and dry- docking facilities for boats during extreme weather events.

The Houma Seafood Market and Harbor of Refuge proposal builds upon the seafood direct marketing campaign developed by the LSU AgCenter. Modeled after the Seafood and Farmers Market in Delcambre, LA, this strategy also complements LaTerDirectSeafood.com and provides opportunities for residents living in areas with increasing risk to establish businesses that can thrive in a changing environment.

Statistics	
Project Area	30 acres
Location	Intracoastal Waterway and Houma Navigation Canal
LA SAFE Investment	Up to $6 million
Estimated Project Cost	$8.2 million
Potential Partners	TEDA; TPCG; LSU AgCenter; Houma C.O.C.; Houma Area Convention & Visitor's Bureau; Terrebonne Port Commission; Terrebonne ParishRecreation District 11

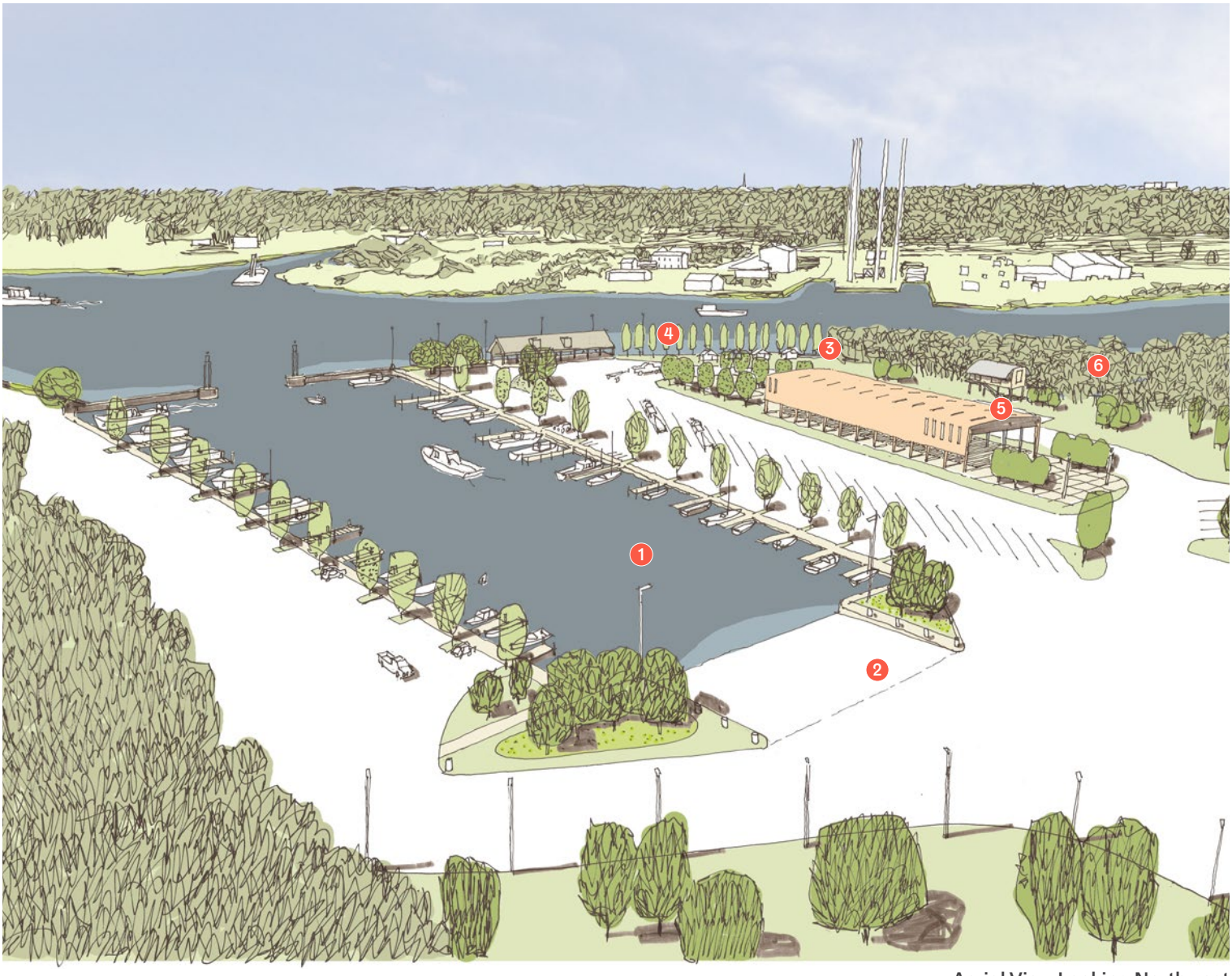
Precedent image of fresh catch to sell at seafood and farmers market.
Photo Credit: dbking\Flickr\CC by 2.0

Precedent image of seafood and farmers market.
Photo Credit: St. Tammany Parish Flickr

Precedent image of Westwego fish market.

1. New harbor of refuge and boat docks
2. New boat launch
3. Picnic area with pavilions and tables
4. Covered pavilion and fishing dock
5. Seafood market in modified existing building
6. New raised convenience store and restrooms

Plan View



Aerial View Looking Northwest

Lake Boudreaux Living Mitigation Terraces

Considering a future with increasing flood risk, it is important to employ what is known as a "multiple lines of defense" approach. Addressing land loss and erosion, flood risk, and habitat loss through restoration of wetlands is a major opportunity for Terrebonne Parish to also provide recreational and educational benefits. Originally developed through a partnership among Terrebonne Parish Consolidated Government, U.S. Army Corps of Engineers, Coastal Protection and Restoration Authority, the LSU AgCenter, and Louisiana Sea Grant, the Living Mitigation Project was identified as the most suitable approach to reduce flood risk and habitat loss in the parish. Incorporating an educational and recreational aspect into this project would further support goals and objectives prioritized by Terrebonne Parish residents.

The Lake Boudreaux Living Mitigation Terraces will create over 300 acres of terraces and marshlands within the Morganza to the Gulf hurricane protection system that will assist in reducing the impacts of storm surge for residents and businesses and help protect Terrebonne Parish's infrastructure. The terraces also have environmental benefits such as enhancing submerged aquatic vegetation growth, restoring habitats, and trapping suspended sediments generated by wind and wave action.

Aerial View
Vegetated terraces create marshland and reduce storm surge impact.
Image Credit: Original image courtesy of LSU Coastal Sustainability Studio, edits by LA SAFE team

Statistics

Project Area	1,235 acres/300 acres of created marsh
Location	North of Lake Boudreaux
LA SAFE Investment	Approximately $2 million
Estimated Project Cost	$10 million
Potential Partners	Terrebonne Levee & Conservation District; Terrebonne Parish; Property Owner; nonprofit grants; industry representatives

Project site is located within the wetland area circled in red.
Image Credit: Terrebonne Parish Consolidated Government

Photo Credit: Mr. Bill Lang\Wikimedia Commons\CC BY-SA 3.0

Precedent images of coastal restoration, wetlands as habitat, and area for recreational activities.

Photo Credit: Florida Fish And Wildlife Commission\Flickr\CC by Sa 2.0.

Fisher and Seafood Cultivation Loan Program

A major challenge identified by Terrebonne Parish residents is the increased instability of the seafood industry, due in large part to loss of habitat. Although there is a strong desire and need to diversify the parish's economy, many of those impacted by the changes in the seafood industry require support and assistance to do so.

The Fishermen and Seafood Cultivation Loan Program will provide technical assistance and loans of up to $50,000 to residents in the fishing or agriculture industries who do not have access to traditional lines of credit. Fishermen may use these loans to improve or repair boats and equipment, diversify into charter service or tourism, implement recognized best practices, or invest in product quality-enhancement equipment. Likewise, farmers in low-lying areas that require expensive water management to maintain expected crop yields may qualify for loans and technical assistance to convert dry agriculture operations to more sustainable land uses. Loans would be low interest, and borrowers may be eligible for flexible repayment options based on seasonal income.

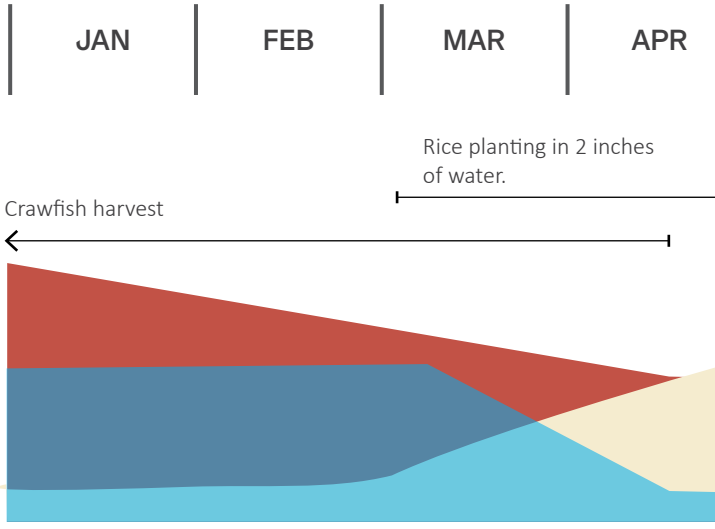
Fisher Loans

Implementing a program such as Supporting Louisiana Seafood is a goal that was expressed by LA SAFE participants across the coast. Fishermen struggle with changing ecosystems, increasing risk to their equipment, and cheap imported competition. They often need boat repairs and upgrades prior to the fishing season and the income it provides. Due to the seasonal nature of the industry, conventional loans do not always meet their needs. This program would provide low-interest loans with a flexible repayment schedule that matches the fishing season. By supporting fishermen, this program also supports the Louisiana seafood industry as a whole, a cornerstone of Louisiana economy and culture.

Statistics	
Location	All eligible census tracts in Terrebonne Parish
LA SAFE Investment	Up to $3 million
Estimated Project Cost	$3 million
Potential Partners	Community Development Financial Institution; credit union or nonprofit

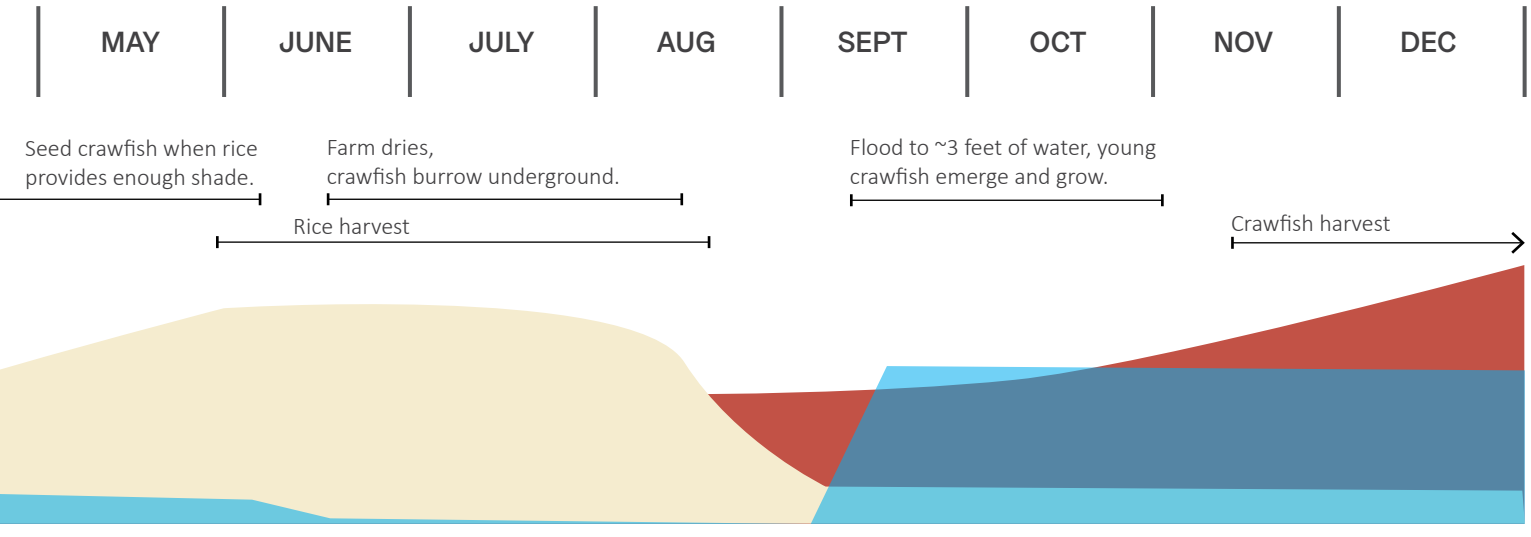
Yearly Flooding and Harvests
This is an abstracted calendar showing the pattern of rice and crawfish harvests and the level of water during different times of the year.
Photo Credit: USDA\Flickr\CC by SA 2.0

Upgrading equipment such as freezers allows fishermen to enhance product quality, and save on gas by taking longer trips.



Agriculture Transition Loans and Technical Assistance

Changing coastal conditions will likely lead to different future habitats. Farmers seeking assistance to convert their operations to crops suited to a wet environment can benefit from this program. For example, dry wheat and sugarcane farms in increasingly wet regions could convert to combined rice and crawfish farms, providing income and stormwater management.



Buyouts for Permanent Resident Households

Coastal erosion is a severe issue that Terrebonne Parish has been experiencing for decades, and many projects exist today to address the increased storm surge flood risk. The Morganza to the Gulf hurricane protection system is intended to provide protection to the parish's many communities; however, some residents will not reap the benefits of the levees. Areas not protected by the planned levee system that are projected to experience high degrees of flood risk are not suitable for permanent housing. To prevent economic losses from flooding, the only option for property owners living outside the levee system is to move entirely out of the high-risk flood area.

In Terrebonne Parish, most permanent residents living in these areas are located on Isle de Jean Charles. The state of Louisiana is in the process of resettling these residents to higher, safer ground. The Buyouts for Permanent Resident Households program will provide assistance for the owners of the additional seven permanent residences outside the Morganza to the Gulf to relocate to a safer location. The program, combined with the resettlement of Isle de Jean Charles, would create a precedent in which all permanent residents in Terrebonne Parish would be located to a safer location inside of the Morganza to the Gulf. This program would be supported by policy implementations intended to prevent future permanent resident development in these areas.

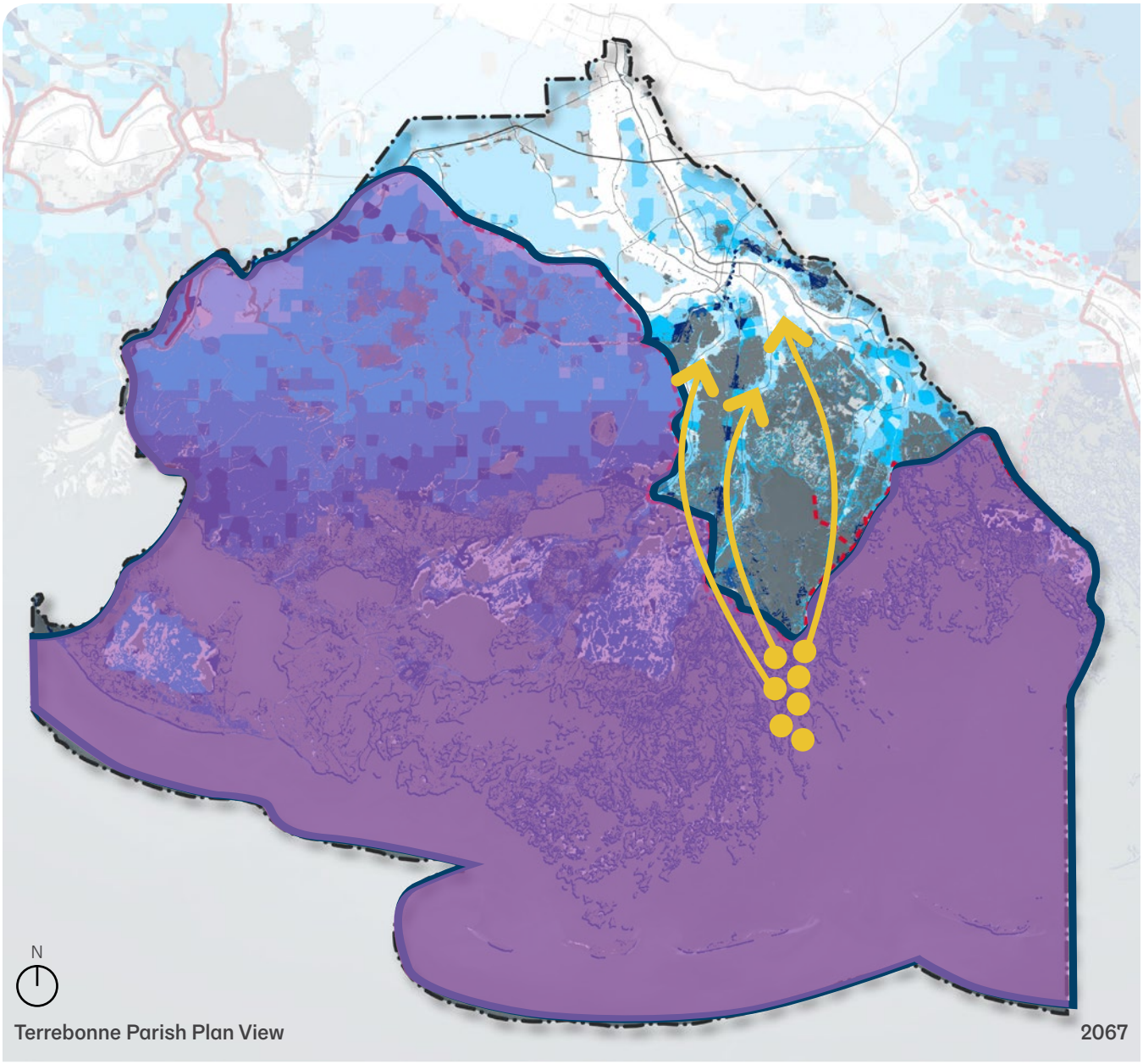
> **"My property value is nil. Been trying to sell my house for two years and no one wants it."**
>
> **—Montegut Resident**

Statistics

Number of Households	7
Location	Eligible area outside the Morganza to the Gulf
Estimated Project Cost	Up to $2 million $250,000 cap per household $250,000 for administration
Potential Partners	Terrebonne Parish

Economic and Recreational Opportunities

Even as residents leave land outside of protection systems, these areas can still serve a variety of economic and recreational purposes.



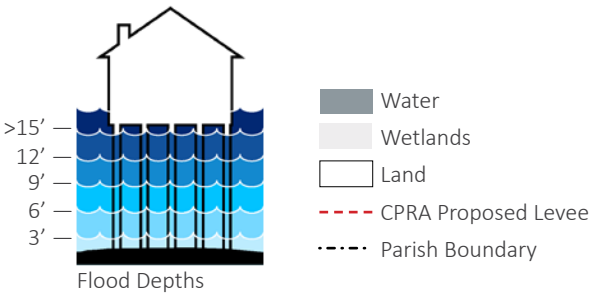
Buyout program for permanent residents outside of Morganza to the Gulf

Residents who accept the voluntary buyout will receive funds to relocate to higher ground within Terrebonne Parish.

Legend

- Area outside of the Morganza to the Gulf hurricane protection system
- Permanent resident households
- Voluntary relocation inside the Morganza to the Gulf hurricane protection system

Map Underlay: Flood depths 50 years from now under the Medium Environmental Scenario as an outcome of implementing the 2017 Coastal Master Plan projects. *Source: CPRA Flood Risk Medium Scenario Modeling Data 2017; For all basemap data see References*



Implementation Plan

During the Round 5 meetings, residents evaluated and marked their preferences among six catalytic project proposals. The six proposals reflect the vision and input gathered throughout the engagement process and targeted opportunities that Terrebonne Parish residents identified throughout the LA SAFE process.

Following the Round 5 meetings, a selection committee whose membership includes officials from the Louisiana Office of Community Development reviewed each of the projects and used a point system to rank their potential for funding and implementation, taking into account public preference, leveraged funds available, LMI benefit, public benefit (quantitative and qualitative), and CRS score.

The projects selected via this process for Terrebonne Parish, **Buyouts for Permanent Resident Households** and **Lake Boudreaux Living Mitigation Terraces**, are described below.

Buyouts for Permanent Resident Households

The Buyouts for Permanent Resident Households program is a Resilient Housing project that seeks to relocate the relatively few homeowners still living outside of the Morganza to the Gulf structural protection system. Areas not protected by the structural protection system are projected to experience very high flood risk. In Terrebonne Parish, most permanent residents living outside of the Morganza to the Gulf are located on Isle de Jean Charles. The State of Louisiana is in the process of resettling Isle de Jean Charles residents who would like to move to higher, safer ground. The Buyouts for Permanent Resident Households program would provide relocation assistance for the approximately seven permanent households outside of Morganza who are not part of the Isle de Jean Charles resettlement program. This program would be reinforced with policies intended to prevent future permanent residential development outside of the Morganza alignment.

The Buyouts for Permanent Resident Households program emanated from Terrebonne Parish Government officials in consultation with local officials in down-bayou locales, including those areas outside of current and planned structural protection systems. Additionally, through LA SAFE's outreach and engagement efforts, citizen participants highlighted the following actions which would support a strategic buyout program:

- Create a system for conservation easements.
- Implement regulations restricting certain forms of development in high risk areas.
- Reduce economic and social risk.
- Account for decreasing home values in high risk environments that precludes many current residents from selling and moving to higher ground.
- Decrease availability of government services down bayou, so people move to higher ground where services are more readily available.
- Account for populations moving upland because of increasing insurance rates.

More than 80% of citizen participants agreed with a future vision for high-risk environments that included fewer permanent resident households and more seasonal and workforce housing.

Lake Boudreaux Living Mitigation Terraces

The Lake Boudreaux Living Mitigation project is a Resilient Infrastructure and Community Nonstructural Mitigation/Flood Risk Reduction project that will be a model for how certain geographies think through a future with increasing flood risk. This project will operate as one of multiple lines of defense that will work together to protect the people and property of Terrebonne Parish. This project will create over 300 acres of terraces and marshland within the Morganza to the Gulf risk reduction system and will assist in reducing the impacts of storm surge. The terraces also have environmental benefits such as enhancing submerged aquatic vegetation growth, restoring habitats, and trapping suspended sediments generated by wind and wave action.

During the first round of LA SAFE meetings, the project team hosted stakeholders of Terrebonne Parish at the Houma Terrebonne Civic Center in Houma, Louisiana. At this meeting, attendees pointed out Terrebonne Parish's many strengths, including the fact that it is a sportsman's paradise with an abundance of natural beauty. To be more specific, approximately 40 data points relate directly either to the parish as a sportsman's paradise or to the parish's natural beauty. Additionally, attendees mentioned flooding, land loss, and a need for environmental restoration as significant challenges to the parish over 55 times. The Lake Boudreaux project presents an opportunity to synthesize all of these challenges and opportunities into a single project that provides multiple public benefits. This project was designed in partnership with parish staff and has support from parish leadership. As a small-scale restoration and protection project that doubles as a public amenity, the Lake Boudreaux Living Mitigation project aligns closely with the public's vision for this region of Terrebonne Parish and directly addresses the opportunities and challenges residents identified throughout the LA SAFE engagement process. The project ranked first out of the six projects presented in the fifth and final round of meetings in Terrebonne parish.

It is anticipated that funding for these projects will become available mid-2018 and project completion is anticipated by September 2022.

Priority Implementation Table

The Terrebonne Parish Adaptation Strategy has been specifically outlined in previous sections of this document. Implementing the vision will require an effective partnership among private businesses and stakeholders; federal, state and local public entities; nonprofits; and members of the community. This Implementation Table provides a road map for the parish and other stakeholders to follow that prioritizes those relationships based on a series of action items over the near term (1 to 10 years), medium term (11 to 25 years), and long term (over 25 years). Based on the issues identified by the extensive public input and on the concepts forwarded in this strategy, action items have been organized into the following key goals:

Goal 1: Manage Flooding and Subsidence
Goal 2: Direct Growth to Low-Risk Areas
Goal 3: Improve Mobility Throughout the Parish and Region
Goal 4: Strengthen and Diversify Local Economies
Goal 5: Retain Local Culture and Enhance Recreation Opportunities

Strategy	Action	Risk Zone	Timeline
Stormwater Management			
Retain and detain stormwater	Promote the use of shared detention areas to adjacent property owners.	Low Moderate	Near Term (1 – 10 years)
	Identify and use retention areas throughout the parish.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Expand the parish's "Adopt-a-Ditch (or Bayou)" or "Maintain the Drain" program.	Low Moderate High	Near Term (1 – 10 years)
	Minimize water conveyance across ridges; hold water in the basins by enforcing a strong retention standard for stormwater.	Moderate High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Establish a groundwater management unit of the parish to monitor water tables and provide standards for limiting impacts of subsidence.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
Reduce impervious surfaces	Incorporate green infrastructure into development designs and drainage updates.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Incorporate green streets infrastructure and water management into road design.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Discourage elevated fill and incentivize pier-and-beam foundations for structures.	Low Moderate High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
Review and update stormwater policies and programs	Conduct an audit of all parish plans, regulations, and policies relevant to stormwater regulation and amend development codes to achieve consistency with stormwater management best practices.	Low Moderate High	Near Term (1 – 10 years)
	Develop a stormwater management plan.	Low Moderate High	Near Term (1 – 10 years)
	Continue to develop and update stormwater utilities that create fee-based services to help pay for green infrastructure flood risk reduction projects.		Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Provide incentives for private developers to handle stormwater on site.	Low Moderate	Near Term (1 – 10 years)

Strategy	Action	Risk Zone	Timeline
Stormwater Management			
Reduce the impact of storm surge	Sufficiently elevate structures in moderate- and high-risk areas.	Moderate High	Ongoing (0 – 50 years)
	Conserve and restore wetlands.	High	Ongoing (0 – 50 years)
Housing and Development			
Encourage housing and commercial development on higher ground	Prepare areas of higher ground for increased concentrations of development.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Develop a housing incentive program to encourage development on higher ground.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Consider repurposing unused properties.	Low Moderate High	Ongoing (0 – 50 years)
Continued revitalization of downtown Houma	Develop a comprehensive Open Space Plan.	Low Moderate High	Near Term (1 – 10 years)
	Improve streetscape and public realm amenities within downtown.	Low	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Create more opportunities for street life and active uses.	Low	Ongoing (0 – 50 years)
	Build upon existing wayfinding and public art programs to incorporate art and culture into the district's signage and public spaces.	Low Moderate	Near Term (1 – 10 years)
Plan for a Houma-Thibodaux growth corridor	Develop a corridor plan along LA 24 and US 90.	Low	Near Term (1 – 10 years)
	Study development potential at US 90 nodes.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Evaluate and improve corridor transportation infrastructure.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years) Long Term (26 – 50 years)

Strategy	Action	Risk Zone	Timeline
Transportation			
Expand and diversify transportation options between the coast and areas of higher ground	Augment the South Central Transportation study to review transportation options between the coast and northern parish areas and to diversify parish transportation options.	Low Moderate High	Medium Term (11 – 25 years)
	Provide regional transportation between Terrebonne Parish and surrounding parishes.	Low Moderate High	Near Term (1 – 10 years)
	Increase walking and biking opportunities by implementing the South Central Planning and Development Commission's regional bicycle and pedestrian master plan.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Plan for safe and efficient evacuation routes when planning and designing new roadways, as applicable.	Low Moderate High	Ongoing (0 – 50 years)
Adopt and implement a Complete Streets Program	Design and construct roadways and intersections to enable safe access for all users.	Low Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years) Long Term (26 – 50 years)
	Incorporate stormwater management into roadway design.	Low Moderate High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Set appropriate design standards for rural and urban areas.	Low Moderate High	Near Term (1 – 10 years)
	Evaluate capital improvements and coordinate design.	Low Moderate High	Ongoing (0 – 50 years)

Strategy	Action	Risk Zone	Timeline
Education, Economy, and Jobs			
Support local fisheries	Connect producers with consumers.	High	Near Term (1 – 10 years)
	Provide and upgrade facilities to help commercial fishermen adapt to change.	High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
Expand public access to parish waterways	Enhance the Downtown Houma Marina.	Low	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Upgrade public boat launches and boating facilities.	Moderate High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Increase the availability of harbor of refuge sites.	High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
Enhance job training and education	Enhance demand-driven training programs for growing Terrebonne Parish industries with educational partners.	Low Moderate	Near Term (1 – 10 years)
	Maximize Fletcher Water Management/Coastal Restoration and Protection Institute as a workforce generator.	High	Medium Term (11 – 25 years)
	Create apprenticeship, paid internship programs, and "earn-and-learn" programs for high school and college students to expand skills training in coastal careers.	Low Moderate High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
Provide business incubation and adaptation assistance	Create a business incubation center.	Low	Near Term (1 – 10 years)
	Provide adaptation services for businesses confronting environmental changes.	High	Near Term (1 – 10 years) Medium Term (11 – 25 years)

Strategy	Action	Risk Zone	Timeline
Culture and Recreation			
Ensure public and community assets provide recreational and educational opportunities	Incorporate trails, observation decks, and boardwalks into landscape design.	Low Moderate High	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Design stormwater management facilities on vacant and abandoned lots and public lands as recreational assets.	Low Moderate High	Near Term (1 – 10 years)
	Provide kayak/canoe/pirogue rental and launch facilities.	Low Moderate High	Near Term (1 – 10 years)
	Provide educational signage at key locations to learn about the culture and natural assets of the area.	Low Moderate High	Near Term (1 – 10 years)
	Develop a cultural center highlighting local culture and economies.	Moderate	Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Preserve and support Louisiana culture and historical sites.	Low Moderate High	Near Term (1 – 10 years)
Enhance public access to Terrebonne Parish's waterways for recreation	Increase the number of public boat launches and docks.		Near Term (1 – 10 years) Medium Term (11 – 25 years)
	Develop facilities and services around water-based recreation.		Near Term (1 – 10 years) Medium Term (11 – 25 years)

Catalytic Project Implementation
On April 20, 2018, Governor John Bel Edwards announced the 10 projects across six parishes selected for development.

"We believe LA SAFE represents a crucial step forward in cementing Louisiana's place on the cutting edge in resilience-building activities. Although our Coastal Master Plan is the country's preeminent effort to reduce future land loss and coastal flood risk, LA SAFE has taken the next step in illuminating a path forward for how our communities develop future housing, economic, social, and transportation needs to withstand future disasters and adapt to environmental changes over time. In an age of heightened risk, now is the time to start addressing the needs of our communities."

—Governor John Bel Edwards

Call to Action

Terrebonne Parish has a lively culture and robust maritime economy based on the fishing and oil and gas industries. Due to its proximity to the Gulf of Mexico, Terrebonne Parish has always lived with the risk of flooding. Responding to annual storm threats is a way of life, and dealing with these challenges has brought the community closer together. This has made Terrebonne Parish's leaders and residents experts at weathering storms and bouncing back from hurricanes, damaging winds, and other natural events. However, these hazards have lately been exacerbated by both natural and manmade disasters, including climate change and subsidence. The result is that wetlands along Terrebonne Parish's coast are transforming into open water at an alarming rate, bringing the Gulf of Mexico closer than ever and making the parish more vulnerable to storm and tidal surge. Outdated stormwater management is contributing to this flood risk, as drainage capacities are now easily overwhelmed by simple downpours. The threat of flooding has intensified the need for timely flood risk reduction measures and adaptation strategies—not only to secure a bright and viable future but also to preserve the parish's history, culture, and very existence.

To date, Terrebonne Parish has planned and implemented numerous flood protection and wetland restoration projects. However, as flood risk continues to increase locally and globally, different strategies are needed to ensure Terrebonne Parish will adapt to an ever changing environment.

Through funding from the National Disaster Resilience Competition, LA SAFE was conceived to address flood hazards in Terrebonne Parish and five other parishes and to provide adaptation strategies that will strengthen each parish's approach to flood resilience. Throughout this plan's development, residents, stakeholders, and experts took into account the existing and potential threats facing the parish. They considered the complex aspects of flood hazards such as historical occurrence, causes, and exacerbating factors. Risks include overland, riverine, and backwater flooding as well as storm surge, shoreline erosion, relative sea level rise, and climate change. The Adaptation Strategy is built on the parish's planning, regulatory, and emergency management capabilities, which are very strong but severely limited in resources.

Through the LA SAFE process, Terrebonne Parish residents and stakeholders developed a variety of strategies that will enable their communities to chart a new path in known territory—one that will allow the rich and deeply-rooted traditions to persevere, economies to diversify, and communities to make informed and wise development decisions. The adaptation strategies identified and prioritized through this project aim to propel Terrebonne Parish toward a future where flood risk is mitigated by—

- ensuring that no one is left behind in the highest risk areas;
- building on existing assets and repurposing buildings to accommodate a smaller, more concentrated community footprint that will be easier to protect from flood risk;
- providing economic opportunities and safe properties for those in the moderate-risk areas; and
- using natural functions of our wetlands and bayous to manage water.

The adaptation strategies were developed by the people of Terrebonne Parish for the people of Terrebonne Parish. Implementation of the strategies through deep involvement of the parish's leadership and residents will continue to improve Terrebonne Parish's ability to reduce impacts from hazards and bounce back after natural and man-made disasters, allowing residents to live in the rich cultural and natural environment that residents love to call home.

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Unless otherwise noted, all photos and drawings were produced by the LA SAFE project team.

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