2029

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

ALL PROJECT TYPES BOOKLET

State of Louisiana

Louisiana's Coastal Master Plan

Louisiana's Coastal Master Plan strives to ensure that the collective effects of project investments reduce storm surge-based flood risk to communities, provide habitat for commercial and recreational activities, and reinforce infrastructure critical to the working coast. This is part of a larger, ongoing effort led by the Coastal Protection and Restoration Authority (CPRA) to strategically adapt Louisiana's coast to better face continued coastal changes into the future.

Louisiana's rich culture, ecosystems, and natural resources are severely threatened by ongoing land loss and flood risk. Over the past century, the state has experienced massive changes to its landscape and the environment that already pose significant challenges to the lives and livelihoods of many Louisianans.

Coastal wetlands define the landscape of coastal Louisiana. For thousands of years, they have existed here in the space between open water and more solid land. They are deeply tied to the unique history and cultural heritage of southern Louisiana and fundamental to our way of life. Generations of people have lived in and near Louisiana's coastal wetlands, often depending on them for their livelihoods. In addition to providing jobs, coastal wetlands offer unequaled opportunity for recreation. Our coast is beloved as a Sportsman's Paradise because coastal wetlands provide critical habitat to support robust commercial and recreational fisheries. Coastal wetlands support other important industries and their infrastructure as well, including navigation, ports, and oil and gas. Coastal wetlands also provide security by buffering storms, so as land is lost, coastal communities become increasingly vulnerable.

Once approved by the Louisiana Legislature, this plan sets the vision for the state's coastal activities. It defines the state's strategic priorities for investment in the design, implementation, and operation of large-scale restoration and risk reduction projects.

While the master plan provides a roadmap for restoration and planning activities in coastal Louisiana, a coalition of support and partners is required to advance this work, carry it through implementation, and thus create a dynamic and productive ecosystem, a vibrant coastal economy, and enduring cultural traditions.

The Coastal Master Plan is a living document that is now updated every six years. This ensures that the latest science, data, and interested and affected parties' considerations are incorporated to continuously improve the master plan's impact and make the case for additional funding.

CPRA is currently operating under the 2023 Coastal Master Plan while beginning the work to develop the 2029 Coastal Master Plan which will be submitted for legislative approval in 2029.

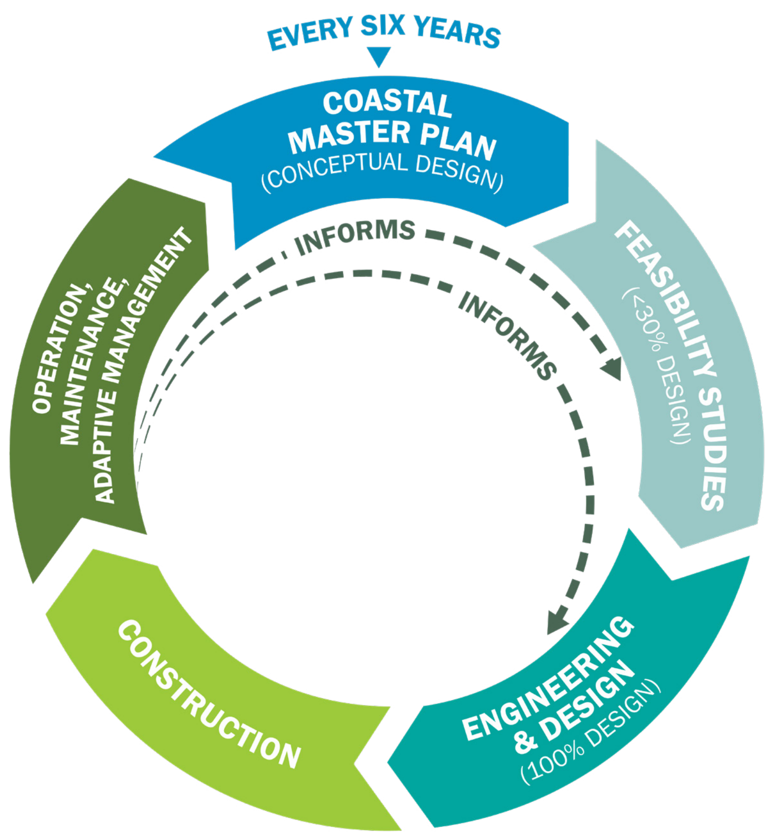


Figure: Louisiana's six-year Coastal Master Plan process.

How is the plan developed?

Developing the master plan is a multi-step process that combines community input, expert guidance, and advanced modeling to identify the most effective projects to protect and restore coastal Louisiana.

Project ideas are solicited from the public to address key coastal challenges. Projects from previous master plans that are not yet funded are also reconsidered. After screening, candidate projects are modeled to understand their benefits compared to a 50-year Future Without Action.

A suite of models predicts how the coastal landscape and associated flood risks may change over the next 50 years under different future scenarios.

The model results show how candidate restoration and risk reduction projects could change the coastal landscape and their potential impacts on expected flood damages.

Model outputs provide the basis for analyzing and selecting the final projects. Advisory groups made up of a broad network of coastal experts, residents, landowners, scientists, community leaders, local officials and other interested parties are asked to provide insight and guidance throughout the plan development process. This results in a plan where projects selected not only reduce risk and land loss, but working together helps us sustain and grow coastal Louisiana's culture, economy, and natural resources.

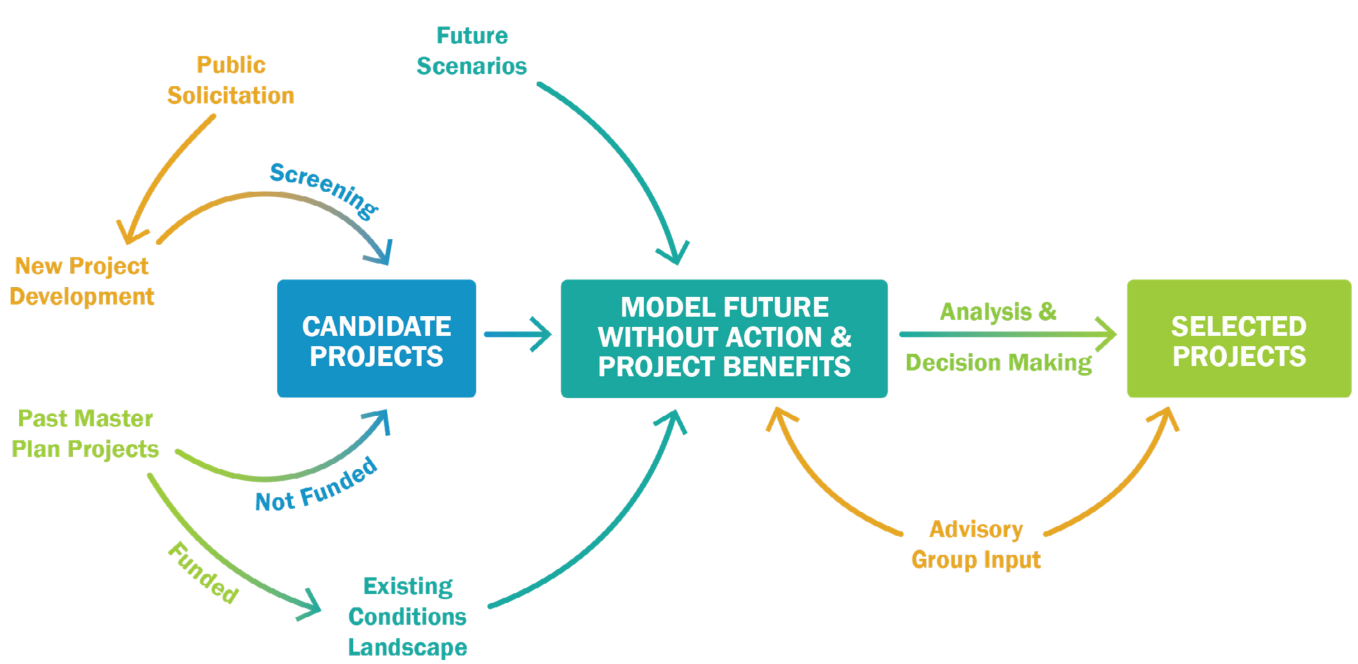


Figure: The 2029 Coastal Master Plan development process.

Goals & Objectives

Louisiana's Coastal Master Plan includes several different types of projects that help achieve the goals and objectives of the master plan.

The master plan identifies robust projects that meet the two primary goals of the plan, to reduce storm surge-based flood risk and land loss across the coast both today and into the future.

For the Coastal Master Plan, the two primary project selection metrics for the first goal are expected annual damages reduced in dollars and structures compared to projected damage without the projects.

The primary project selection metric for the second goal is land area benefit, specifically how much land area a project creates and maintains over 50 years compared to the projected landscape without the project.

In addition, beyond the primary goals of the plan, the selected projects together support the plan's five objectives.

GOAL 1: STORM SURGE RISK REDUCTION

GOAL 2: LAND LOSS REDUCTION

Master Plan Objectives

FLOOD PROTECTION

Reduce & protect from flood-related economic damages

NATURAL PROCESSES

Promote & harness the natural processes of the land

COASTAL HABITATS

Provide coastal habitats

CULTURAL RESOURCES

Sustain Louisiana's unique cultural heritage

WORKING COAST

Promote a viable working coast

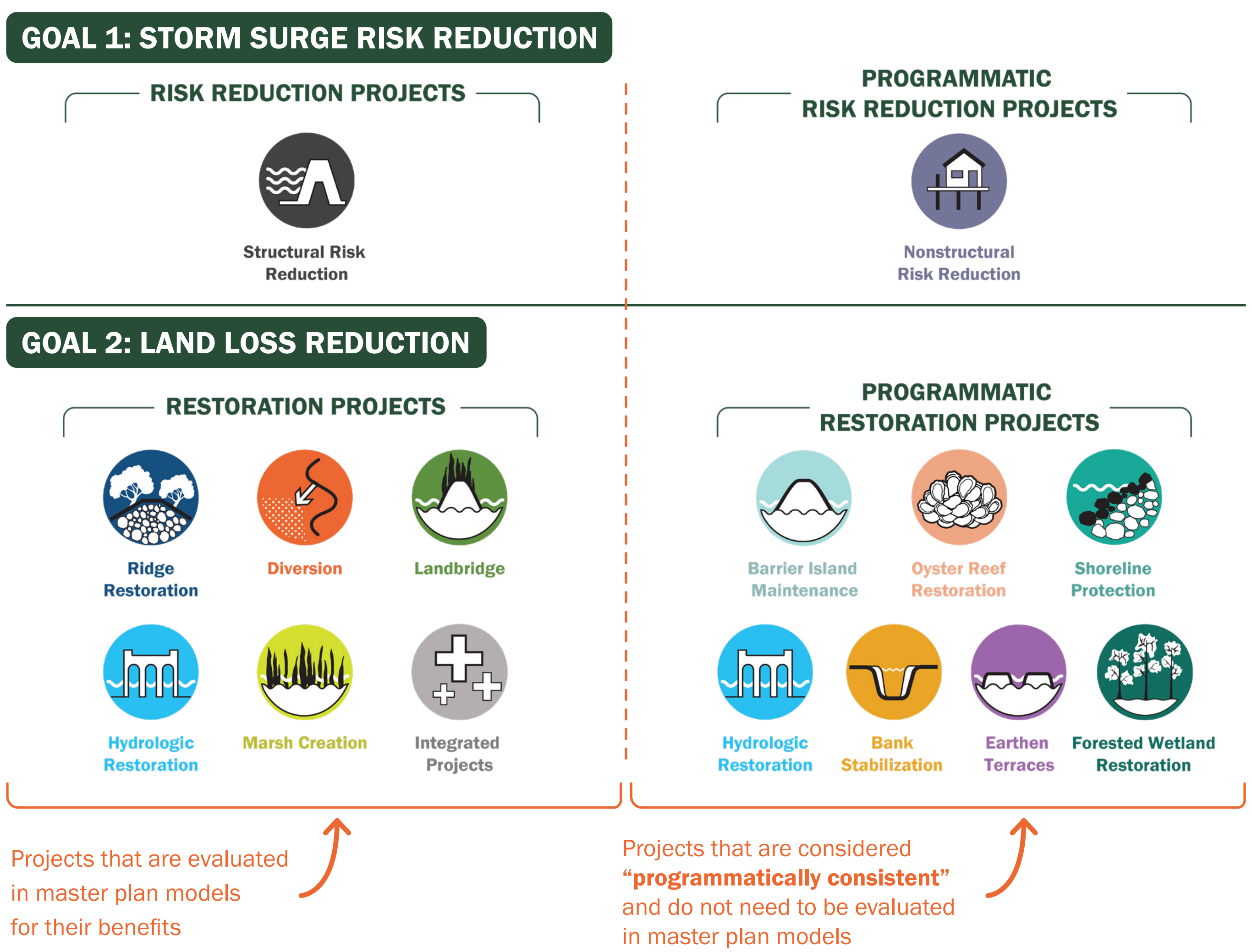
A suite of projects

Louisiana relies on a variety of approaches to confront our coastal challenges. A full suite of project types —from marsh creation projects and hydrologic restorations, to floodwalls and levees—are included in the master plan.

The master plan identifies robust projects that meet the two primary goals. Risk Reduction projects–whether floodwalls, floodgates and levees, or strategies to floodproof or elevate houses–are meant to reduce the risk of damage Louisianans face from storm surge-based flooding. On the other hand, restoration projects–like marsh creation, diversion, or hydrologic restoration, among others–use varied approaches to create and sustain land.

Projects are included in the plan in two different ways:

- Project types that are individually evaluated and selected for the plan.
- Programmatically consistent project types that are not evaluated or listed individually but can still be consistent with the master plan. Most of these project types are smaller-scale, designed to address site-specific issues, and typically provide highly localized benefits, or they are selected through other programs. If you're looking to implement a project in this category, the master plan already supports this, even if projects of these types are not listed individually!



How to use this booklet

This booklet serves as a reference to better understand the suite of projects supported by Louisiana's 2029 Coastal Master Plan. It outlines the various project types that may be proposed to address ongoing coastal challenges. It also provides information on programmatically consistent project types that do not need to be proposed for the master plan, but are an important part of our comprehensive approach to reducing flood risk and land loss.

In the following sections you will find:

Project Type Considerations
A side-by-side comparison of all project types, listing the functions they serve and how each contributes to the Master Plan's two primary goals of reducing coastal flood risk from storm surge and limiting land loss. The matrix also outlines the hazards each project type addresses, relative ratings, and local suitability considerations.

Project Type Summaries
A detailed overview of each individual project type, presented on separate spreads. Each includes a representative image or section drawing, examples of common benefits, specific hazards addressed, and the role the project plays in advancing coastal resilience.

The following sections are intended to support community members, planners, and others to identify local needs and understand how different project types contribute to long-term risk reduction and restoration efforts.

HOW TO READ THE PROJECT TYPE CONSIDERATIONS MATRIX

Functions: The project functions listed in this matrix show how different master plan project types directly achieve the plan goals of reducing 1) land loss and 2) storm surge-based flood risk.

Co-benefits: Selecting master plan restoration projects primarily based on acres of land benefitted over 50 years serves as a proxy for seeking a healthy, productive, diverse coastal estuarine system that supports (and is supported by) all five coastal master plan objectives. Similarly, selecting storm surge-based flood risk reduction projects based on dollars or structural equivalent damages reduced with project vs. without also serves as a proxy for a slew of benefits representing well-functioning, productive coastal communities. This section of the table lists just a few of the many co-benefits we can achieve when we address land loss and storm surge-based flood risk.

Hazards addressed: Different master plan project types directly address the challenges that result from different common hazards that exacerbate land loss and flood risk challenges in coastal Louisiana. Some examples of these hazards and the project types that help address the issues they create are listed in this matrix.

Relative ratings: When considering which project type(s) to select to address the specific coastal challenge you have identified, it can be helpful to see how each type generally compares to others in terms of cost and sustainability of benefits. For example, a marsh creation project is typically designed to provide benefits for two or three decades before subsidence and erosion have significantly reduced its function, whereas a hydrologic restoration project that continues to reduce salinity in an area for many decades yields relatively more sustainable benefits.

Local suitability: This section of the matrix lists general rules of thumb and guidelines about the location-specific conditions that can increase or decrease the likelihood of successful construction and operation of each project type.

Project Type Considerations

● Always

○ Sometimes

This matrix does not contain rigid rules and does not reflect the full range of characteristics of each project type, but it is a useful starting point for new project idea developers.

FUNCTIONS	PROJECT EFFECTS EVALUATED THROUGH MODELING						PROGRAMMATICALLY CONSISTENT PROJECT TYPES							
	Structural Risk Reduction (Page 13)	Marsh Creation (Page 15)	Hydrologic Restoration (Large) (Page 17)	Diversion (Page 19)	Landbridge (Page 21)	Ridge Restoration (Page 23)	Nonstructural Risk Reduction (Page 27)	Barrier Island Maintenance (Page 29)	Oyster Reef Restoration (Page 31)	Shoreline Protection (Page 33)	Bank Stabilization (Page 35)	Earthen Terrace (Page 37)	Hydrologic Restoration (Small) (Page 39)	Forested Wetland Restoration (Page 41)
GOAL 1: Reduce Coastal Risk From Storm Surge														
Block or dampen storm surge	●	○			○	○		○	○	○				
Floodproof or raise structures & infrastructure							○							
Move away from risk							○							
GOAL 2: Reduce Land Loss														
Increase elevation with sediment input														
Use dredged sediment beneficially		●			●	●		●						●
Connect to tidal or riverine sediment inputs			○	●									○	●
Increase suspended sediment trapping/ accumulation efficiency		○			○	○			○	○		○		●
Promote conditions for vegetation and organic accretion														
Improve hydrology (e.g., appropriate water levels and salinities)		○	●	●	○	○		○					●	●
Maintain diversity of vegetative communities coastwide		●	●	●	●	●		●	○	○	○	●	●	●
Reduce erosion														
Reduce encroachment of waterways into vegetated wetlands					○					○	●			
Reduce wind and wave driven erosion on barrier islands								●		○				
Reduce wave driven erosion in wetlands		○			●	○			●	●	●	●		

● Always
○ Sometimes

This matrix does not contain rigid rules and does not reflect the full range of characteristics of each project type, but it is a useful starting point for new project idea developers.

		PROJECT EFFECTS EVALUATED THROUGH MODELING						PROGRAMMATICALLY CONSISTENT PROJECT TYPES							
		Structural Risk Reduction (Page 13)	Marsh Creation (Page 15)	Hydrologic Restoration (Large) (Page 17)	Diversion (Page 19)	Landbridge (Page 21)	Ridge Restoration (Page 23)	Nonstructural Risk Reduction (Page 27)	Barrier Island Maintenance (Page 29)	Oyster Reef Restoration (Page 31)	Shoreline Protection (Page 33)	Bank Stabilization (Page 35)	Earthen Terrace (Page 37)	Hydrologic Restoration (Small) (Page 39)	Forested Wetland Restoration (Page 41)
HAZARDS ADDRESSED	Storm surge-based flooding	●						●							
	Erosion					●	●		●	●	●	●	●		
	Subsidence		●		●	●	●		●				●		
	Sea level rise		●		●		●						●	○	
	Lack of sediment input		●	●	●	●								●	○
	Unsuitable wetland water levels and inundation durations		●	○	○	●			●			○		○	○
	Saltwater intrusion		○	●	●	●	○							●	
	Impounded wetlands			●										●	
	Habitat degradation and loss		●	●	●	●	●		●	●	●	●	●	●	●
	Reduced ecosystem diversity		●	●	●	●	●		●	●	●	●	●	●	●
RELATIVE RATINGS	Average cost in MP23	1.1 B	380 M	57 M	530 M	720 M	14 M								
	Range of project costs in MP23	310 M - 3.9 B	33 M - 1.5 B	16 M - 130 M	120 M - 790 M	460 M - 1.0 B	1.9 M - 26 M								
	Sustainability of typical project benefits	Long	Medium	Medium to Long	Long	Medium	Medium	Long	Medium	Medium	Short to Medium	Short to Medium	Medium	Medium	Medium to Long
LOCAL SUITABILITY	Water depth of 3 feet or less		●		●	●	○			○	○		○		
	Soils that can support significant additional weight		●			●	●			●	●	●	●		
	Reasonable access to source of suitable sediment		●			●	●		●						
	Proximity to river/freshwater source			○	●										
	Complements other project types in high wave energy environments					●				●	●	●	●		

Project types

Structural Risk Reduction

RISK REDUCTION PROJECT

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

HAZARDS ADDRESSED

Storm Surge Flooding

FUNCTIONS

- Block or dampen storm surge

COMMON COMPONENTS

- Earthen levee
- Flood gate
- Flood wall
- Ties in to flood protection system

RELATIVE RATINGS

Sustainability of benefits.................................Long

Average MP23 cost — $1.1 B

Range of MP23 cost — $310 M – $3.9 B

CO-BENEFITS

- Flood protection

● Always ○ Sometimes

B. CONCRETE T-WALL CONSTRUCTION

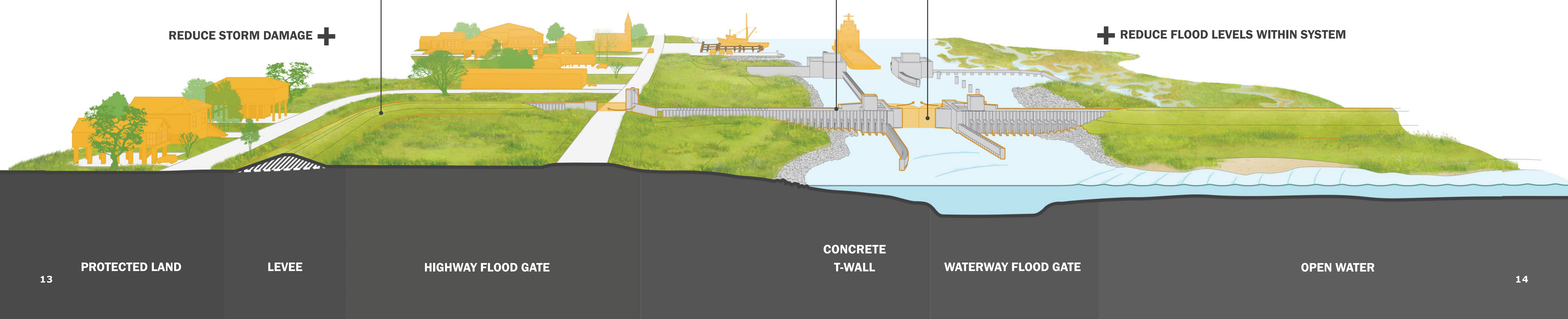
Install concrete barriers and metal sheetpiles in combination with earthen levees to create a fortified system that protects surrounding communities from storm surge.

A. EARTHEN LEVEE CONSTRUCTION

Use earthen fill to construct a levee for increased storm surge protection for surrounding communities.

C. FLOOD GATE CONSTRUCTION

Install floodgates at critical navigation channels to allow for continued usage of waterways while still allowing flood barrier protection during climatic events.

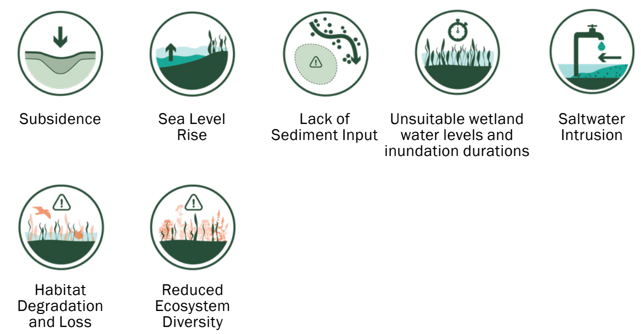


Marsh Creation

RESTORATION PROJECT

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

HAZARDS ADDRESSED



FUNCTIONS

- ○ Block or dampen storm surge
- ● Use dredged sediment beneficially
- ○ Increase suspended sediment trapping/ accumulation efficiency
- ○ Improve hydrology
- ● Maintain diversity of vegetative communities coastwide
- ○ Reduce wave driven erosion in wetlands

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ● Support commercial and recreational fisheries
- ● Provide habitat for migratory species
- ○ Support waterfowl
- ○ Reduce economic losses from storm surge-based flooding
- ○ Provide habitat for endangered species and species of greatest conservation need

RELATIVE RATINGS

Sustainability of benefits.............................Medium

Average MP23 cost — $380 M

Range of MP23 cost — $33 M to $1.5 B

LOCAL SUITABILITY

- ● Water depth of 3 feet or less
- ● Soils that can support significant additional weight
- ● Reasonable access to source of suitable sediment

COMMON COMPONENTS

- ● Earthen containment dike
- ● Dredged sediment transport and placement
- ○ Vegetative planting
- ○ Shoreface armoring
- ● Backbarrier marsh
- ○ Canal backfilling
- ○ Breakwaters (made of rip-rap, shell, organic materials)

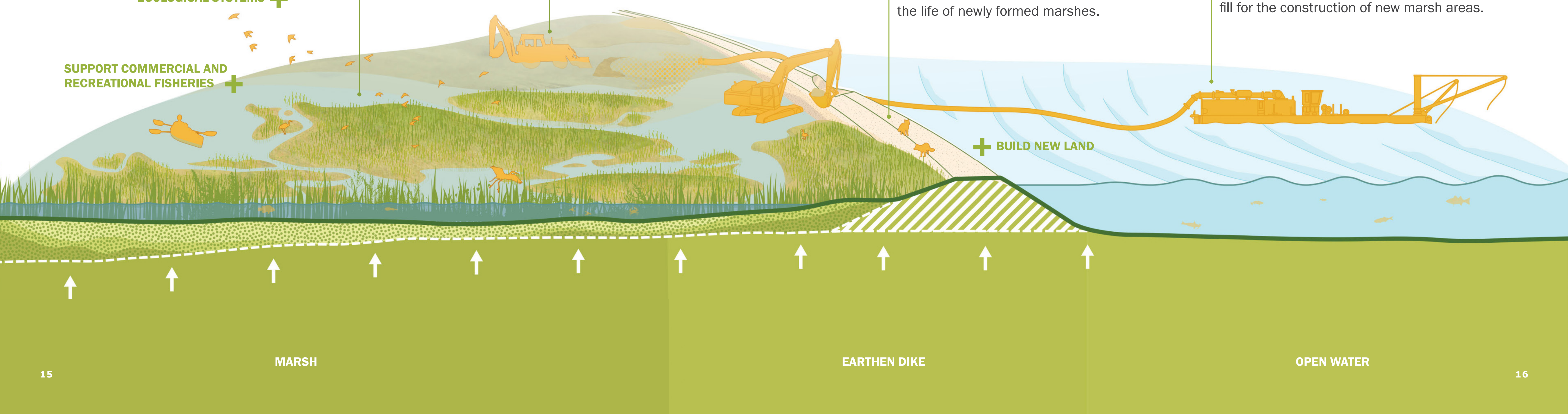
● Always ○ Sometimes

D. MARSH CREATION
Plant grass plugs on newly developed marsh land. These will eventually grow into thriving wetland ecosystems.

C. SEDIMENT PLACEMENT
Use pumped sediment to create elevated landmasses to support biodiverse marsh development.

B. EARTHEN CONTAINMENT DIKE
Create an earthen containment dike using locally dredged material to help diffuse wave energy and prolong the life of newly formed marshes.

A. SEDIMENT DREDGING
Use dredging to harvest sediment to provide fill for the construction of new marsh areas.

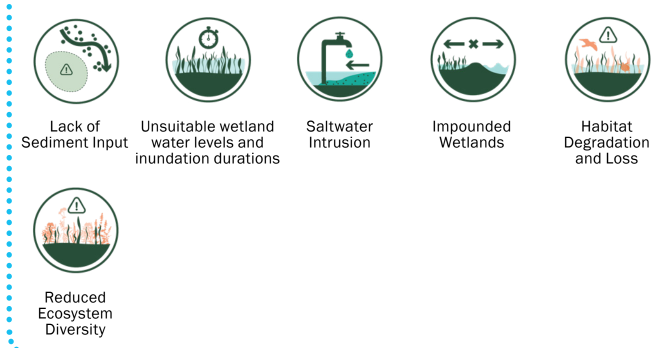


Hydrologic Restoration - Large

RESTORATION PROJECT

These projects use techniques to ensure water movement across the landscape supports a healthy ecosystem at a basin or sub-basin scale.

HAZARDS ADDRESSED



FUNCTIONS

- ○ Connect to tidal or riverine sediment inputs
- ● Improve hydrology
- ● Maintain diversity of vegetative communities coastwide

COMMON COMPONENTS

- ○ Ties in to flood protection system
- ● Channel dredging
- ● Water control structure (medium to large)

LOCAL SUITABILITY

- ○ Proximity to river/freshwater source

RELATIVE RATINGS

Sustainability of benefits................Medium to Long

Average MP23 cost — $57 M

Range of MP23 cost — $16 M – $130 M

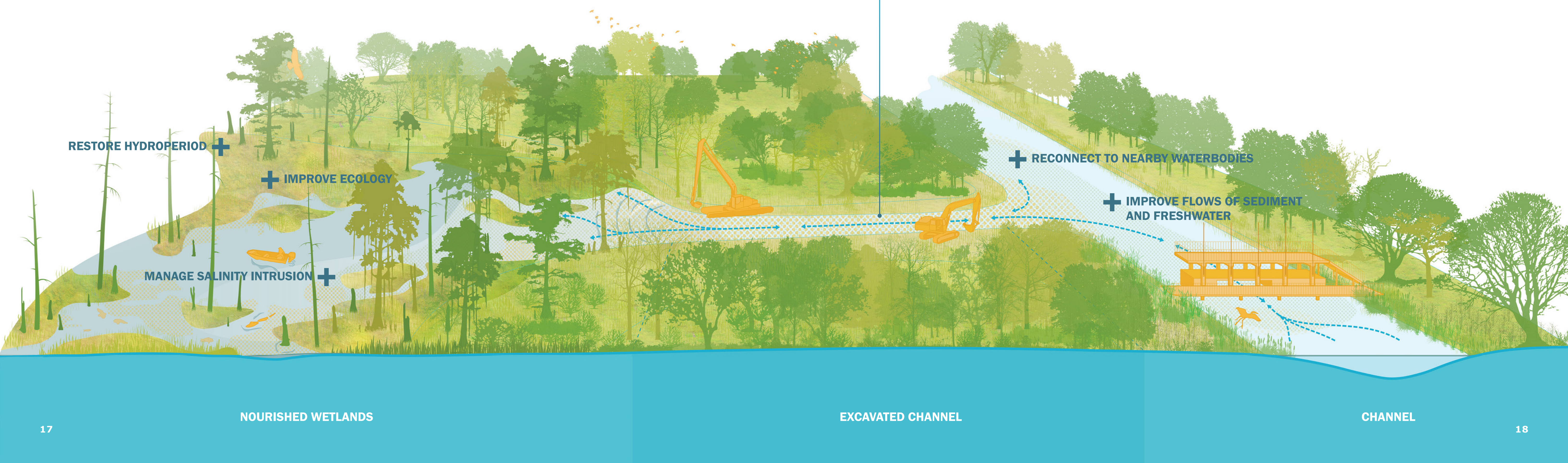
CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ○ Support waterfowl
- ● Provide sustainable benefits by enhancing natural processes
- ○ Provide habitat for endangered species and species of greatest conservation need

● Always ○ Sometimes

A. CHANNEL DREDGING

Remove features that obstruct historic flows between wetlands, bayous and rivers. Restoring hydrologic connectivity changes water levels and salinities to improve the health of degraded wetlands.



Diversion

RESTORATION PROJECT

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

HAZARDS ADDRESSED

- Subsidence
- Sea Level Rise
- Lack of Sediment Input
- Unsuitable wetland water levels and inundation durations
- Saltwater Intrusion
- Habitat Degradation and Loss
- Reduced Ecosystem Diversity

FUNCTIONS

- ● Connect to tidal or riverine sediment inputs
- ● Improve hydrology
- ● Maintain diversity of vegetative communities coastwide

COMMON COMPONENTS

- ○ Earthen levee
- ○ Ties in to flood protection system
- ● Channel dredging
- ○ Water control structure, culvert, plug (small)

LOCAL SUITABILITY

- ● Water depth of 3 feet or less
- ● Proximity to river/freshwater source

RELATIVE RATINGS

Sustainability of benefits..................................Long

Average MP23 cost: $530 M

Range of MP23 cost: $120 M – $790 M

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ○ Maintain waterways
- ○ Support waterfowl
- ● Provide sustainable benefits by enhancing natural processes
- ○ Provide habitat for endangered species and species of greatest conservation need

● Always ○ Sometimes

C. DEPOSIT SEDIMENT

Deposit sediment from the diversion to help restore and create new marsh lands.

B. CREATE CONVEYANCE CHANNEL

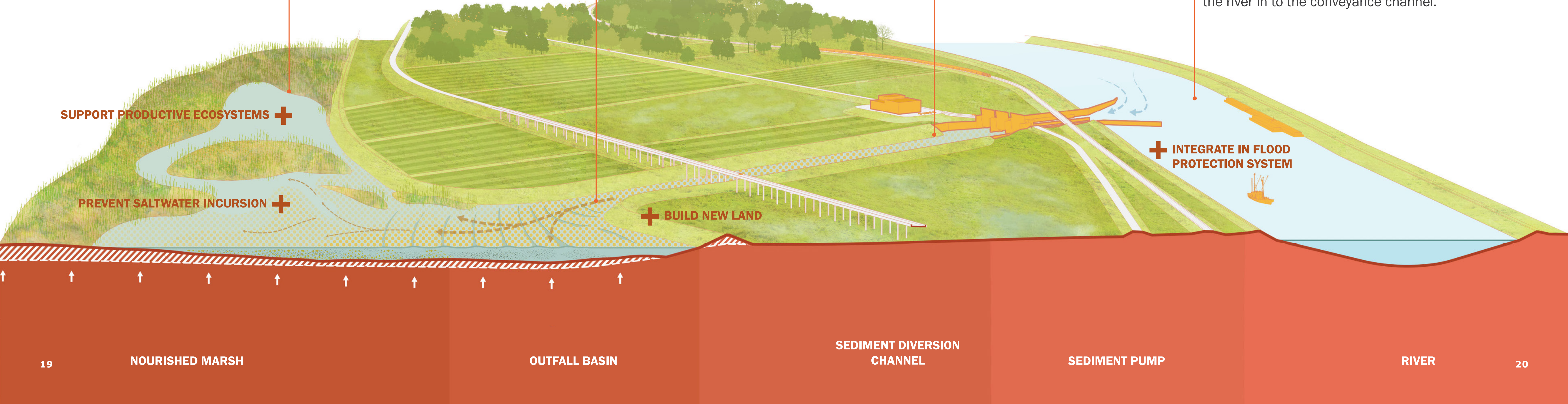
Direct sediment and fresh water through the newly developed conveyance channel connecting the river source to the outfall area.

D. NOURISH EXISTING WETLANDS

Re-nourish existing wetlands through the infusion of nutrients carried by newly deposited sediment and fresh water.

A. REDIRECT FRESH WATER AND SEDIMENT

Using the intake structure, flood gates, or pumps, divert sediment and fresh water from the river in to the conveyance channel.



Landbridge

RESTORATION PROJECT

Landbridges are linear tracts of constructed marshes oriented across coastal basins which provide important habitat and help attenuates waves. They include additional features to plug or constrain channels which help restore basin hydrology.

HAZARDS ADDRESSED

- Erosion
- Subsidence
- Lack of Sediment Input
- Unsuitable wetland water levels and inundation durations
- Saltwater Intrusion
- Habitat Degradation and Loss
- Reduced Ecosystem Diversity

FUNCTIONS

- ○ Block or dampen storm surge
- ● Use dredged sediment beneficially
- ○ Increase suspended sediment trapping/ accumulation efficiency
- ○ Improve hydrology
- ● Maintain diversity of vegetative communities coastwide
- ○ Reduce encroachment of waterways into vegetated wetlands
- ● Reduce wave driven erosion in wetlands

COMMON COMPONENTS

- ○ Earthen containment dike
- ● Dredged sediment transport and placement
- ○ Vegetative planting
- ● Shoreface armoring
- ○ Canal backfilling
- ○ Breakwaters

RELATIVE RATINGS

Sustainability of benefits..............................Medium

Average MP23 cost — $720 M

Range of MP23 cost — $460 M – $1 B

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ● Maintain waterways
- ● Support commercial and recreational fisheries
- ● Provide habitat for migratory species
- ○ Support waterfow
- ○ Reduce economic losses from storm surge-based flooding
- ○ Provide habitat for endangered species and species of greatest conservation need

LOCAL SUITABILITY

- ● Water depth of 3 feet or less
- ● Soils that can support significant additional weight
- ● Reasonable access to source of suitable sediment

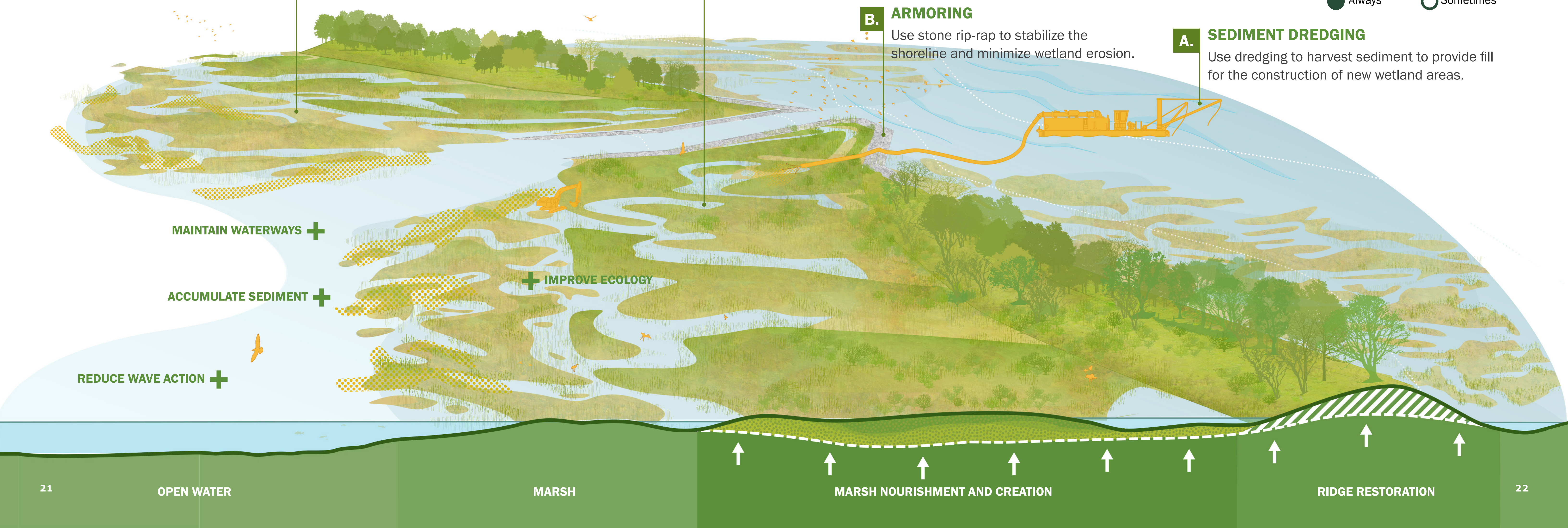
● Always ○ Sometimes

D. MARSH CREATION
See Marsh Creation project type for more information.

C. SEDIMENT DEPOSITION
Use sediment material pumped from sediment sources to create an elevated landmass to support biodiverse marsh development.

B. ARMORING
Use stone rip-rap to stabilize the shoreline and minimize wetland erosion.

A. SEDIMENT DREDGING
Use dredging to harvest sediment to provide fill for the construction of new wetland areas.



Ridge Restoration

RESTORATION PROJECT

Restoration of historic coastal ridges can reduce land loss in adjacent areas when the ridge reduces saltwater intrusion into areas with freshwater inputs. Restored ridges also serve as high points during storm events, providing refuge for animals and potentially dampening storm surge. In practice, restoring historic ridges may need to be permitted as part of an integrated project paired with marsh creation to offset any potential wetland impacts.

HAZARDS ADDRESSED

- Erosion
- Subsidence
- Sea Level Rise
- Saltwater Intrusion
- Habitat Degradation and Loss
- Reduced Ecosystem Diversity

FUNCTIONS

- ○ Block or dampen storm surge
- ● Use dredged sediment beneficially
- ○ Increase suspended sediment trapping/accumulation efficiency
- ○ Improve hydrology
- ● Maintain diversity of vegetative communities coastwide
- ○ Reduce wave driven erosion in wetlands

LOCAL SUITABILITY

- ○ Water depth of 3 feet or less
- ● Soils that can support significant additional weight
- ● Reasonable access to source of suitable sediment
- ● Complements other project types in high wave energy environments

RELATIVE RATINGS

Sustainability of benefits..............................Medium

Average MP23 cost: $14 M

Range of MP23 cost: $1.9 M – $26 M

COMMON COMPONENTS

- ○ Earthen containment dike
- ● Dredged sediment transport and placement
- ○ Local sediment dredging and placement
- ● Vegetative planting

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ● Maintain waterways
- ● Provide habitat for migratory species
- ○ Reduce economic losses from storm surge-based flooding
- ○ Provide habitat for endangered species and species of greatest conservation need

● Always ○ Sometimes

C. VEGETATIVE PLANTING

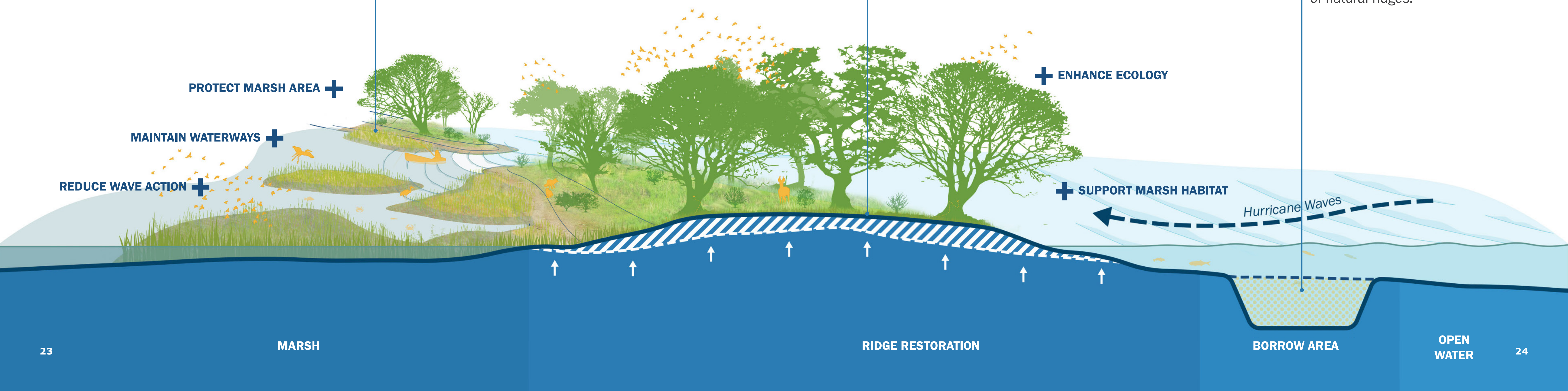
Plant native species to enhance ecological systems. The trees located on top of the ridge also mitigate hurricane winds and provide critical habitat for many of Louisiana's endangered species.

B. NATURAL RIDGE ELEVATION AND ENHANCEMENT

Elevate ridges to create habitat corridors and protect adjacent wetlands by diffusing wave energy.

A. SEDIMENT DREDGING

Use dredging to harvest sediment for the elevation of natural ridges.

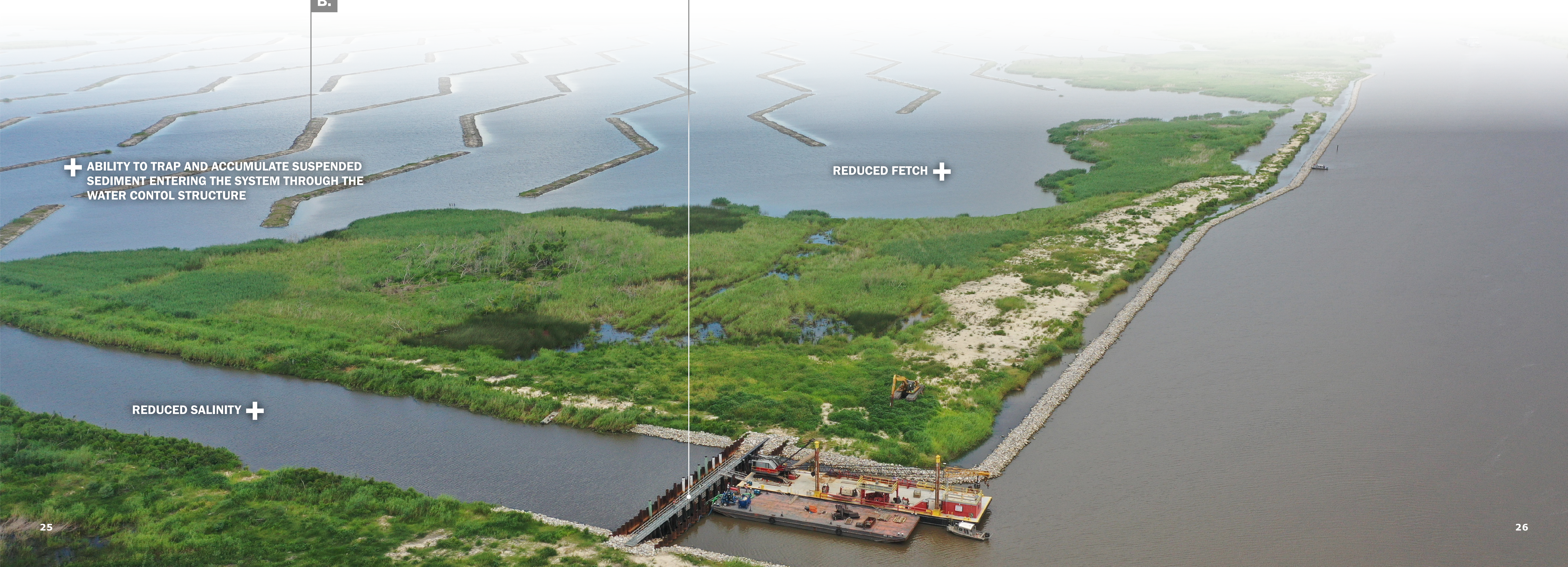


Integrated Projects

RESTORATION PROJECT

Integrated Projects combine features from multiple project types into one integrated concept. Integrated projects consist of a primary project feature that is coupled with any other project type(s). The project types must work synergistically towards the project goals. Integrated projects can potentially provide multiple functions and extend the beneficial lifespan of projects.

The dominant project feature must be one of the following types: structural risk reduction, marsh creation, medium- or large-scale hydrologic restoration, ridge restoration, landbridge, or diversion.



Nonstructural Risk Reduction

PROGRAMMATIC RISK REDUCTION PROJECT

Nonstructural Risk Reduction measures are entirely voluntary and are undertaken in close collaboration with local residents and property owners. For master planning purposes, the approach varies with the depth of storm surge-based flooding expected from the 1% annual exceedance probability event. Commercial structures subject to 1-3 feet of flooding can be floodproofed, while residential structures may be elevated if predicted flooding is between 3 and 14 feet or recommended for voluntary acquisition if predicted flood depths are higher.

HAZARDS ADDRESSED

Storm Surge Flooding

FUNCTIONS

- ○ Floodproof or raise structures & infrastructure
- ○ Move away from risk

COMMON COMPONENTS

- ● Elevated buildings and infrastructure
- ● Relocation outside of risk zone/voluntary acquisition
- ● Floodproofed buildings and infrastructure
- ● Earthen containment dike
- ● Dredged sediment transport and placement
- ● Vegetative planting

RELATIVE RATINGS

Sustainability of benefits.................................Long

CO-BENEFITS

- ● Reduce economic losses from storm surge-based flooding

● Always ○ Sometimes

A. RECOMMENDED FOR FLOODPROOFING

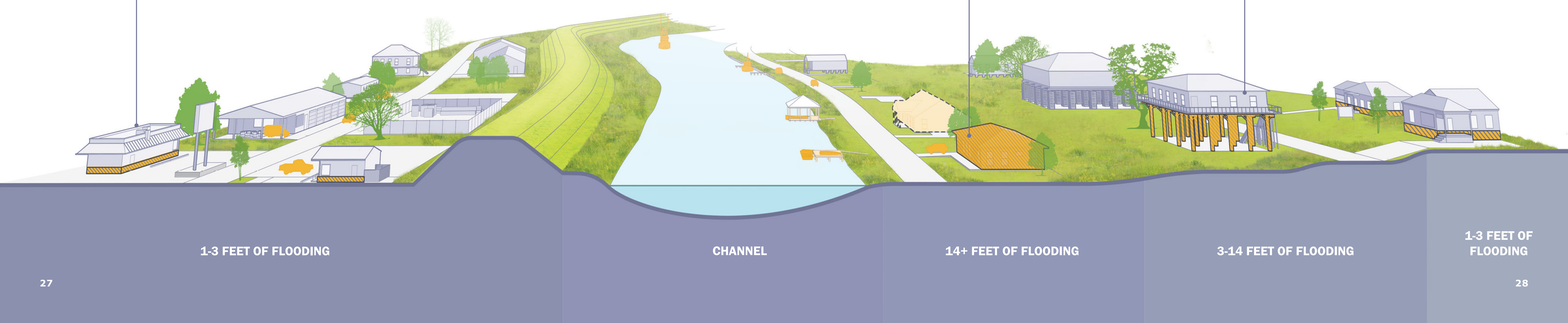
Floodproofing measures are recommended for commercial structures that are projected to experience 1-3 feet of flooding for a 1% annual exceedance probability event.

C. RECOMMENDED FOR VOLUNTARY ACQUISITION

For residential properties that are projected to experience greater than 14 feet of storm surge-based flooding for a 1% annual exceedance probability event, voluntary acquisition is a recommended risk reduction strategy.

B. RECOMMENDED FOR ELEVATION

Residential properties that are projected to experience 3-14 feet of flooding for a 1% annual exceedance probability event are recommended for elevation.

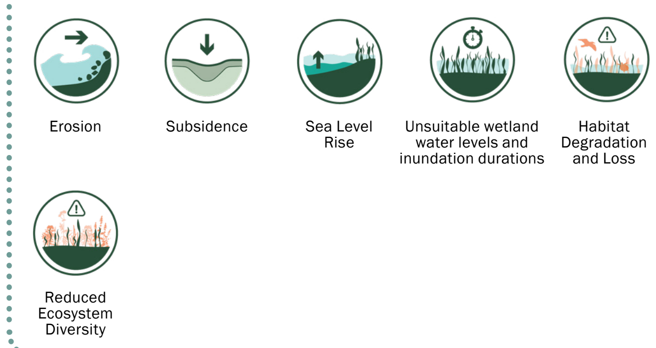


Barrier Island Maintenance

PROGRAMMATIC RESTORATION PROJECT

Barrier Island Maintenance projects use dredged sediment to rebuild and strengthen the beaches, dunes, and backbarrier marshes of degrading barrier islands, often in response to damage from storms. These projects aim to increase the elevation and footprint of the islands while allowing natural processes to nourish beaches over time. This work enhances natural storm surge attenuation and maintains or improves critical wildlife habitat.

HAZARDS ADDRESSED



FUNCTIONS

- ○ Block or dampen storm surge
- ● Use dredged sediment beneficially
- ○ Improve hydrology
- ● Maintain diversity of vegetative communities coastwide
- ● Reduce wind and wave driven erosion on barrier islands

COMMON COMPONENTS

- ○ Earthen containment dike
- ● Dredged sediment transport and placement
- ● Vegetative planting
- ● Beach and dune habitat
- ● Backbarrier marsh

RELATIVE RATINGS

Sustainability of benefits............................Medium

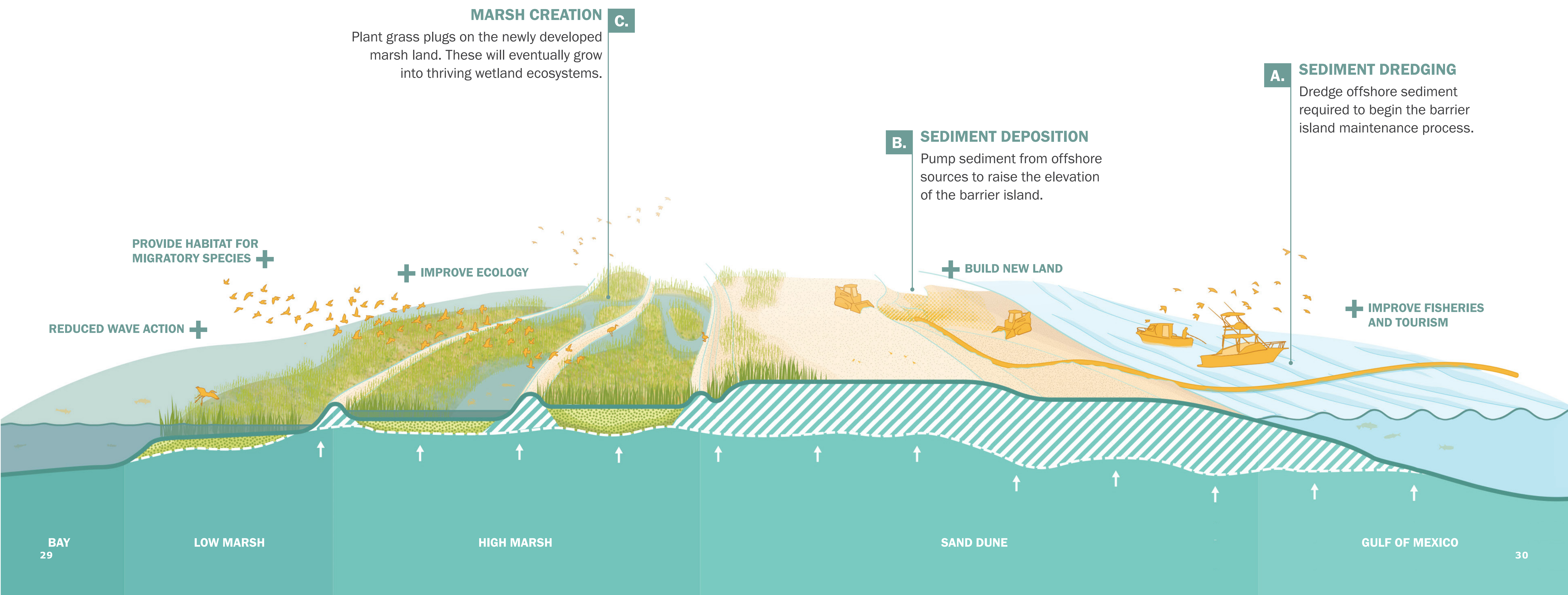
LOCAL SUITABILITY

- ● Reasonable access to source of suitable sediment

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ● Support commercial and recreational fisheries
- ● Provide habitat for migratory species
- ○ Reduce economic losses from storm surge-based flooding
- ○ Provide habitat for endangered species and species of greatest conservation need

● Always ○ Sometimes



Oyster Reef Restoration

PROGRAMMATIC RESTORATION PROJECT

Oyster Reef Restoration projects use natural materials, concrete, or other hard substrates to create habitat conducive to oysters, while also reducing wave driven erosion along nearby wetland shorelines. Design considerations include ensuring habitat suitability for oysters is expected to continue into the future, offsetting reef placement from shorelines to maintain natural edge habitat, and accounting for sea level rise and subsidence in design life planning.

HAZARDS ADDRESSED

- Erosion
- Habitat degradation and loss
- Reduced ecosystem diversity

FUNCTIONS

Block or dampen storm surge	Sometimes
Increase suspended sediment trapping/ accumulation efficiency	Sometimes
Maintain diversity of vegetative communities coastwide	Sometimes
Reduce wave driven marsh edge erosion in wetlands	Always

LOCAL SUITABILITY

Water depth of 3 feet or less	Sometimes
Soils that can support significant additional weight	Always
Complements other project types in high wave energy environments	Always

RELATIVE RATINGS

Sustainability of benefits............................Medium

COMMON COMPONENTS

Breakwaters	Always

CO-BENEFITS

Restore habitats and enhance ecological systems	Always
Support commercial and recreational fisheries	Always
Provide sustainable benefits by enhancing natural processes	Sometimes
Reduce economic losses from storm surge-based flooding	Sometimes

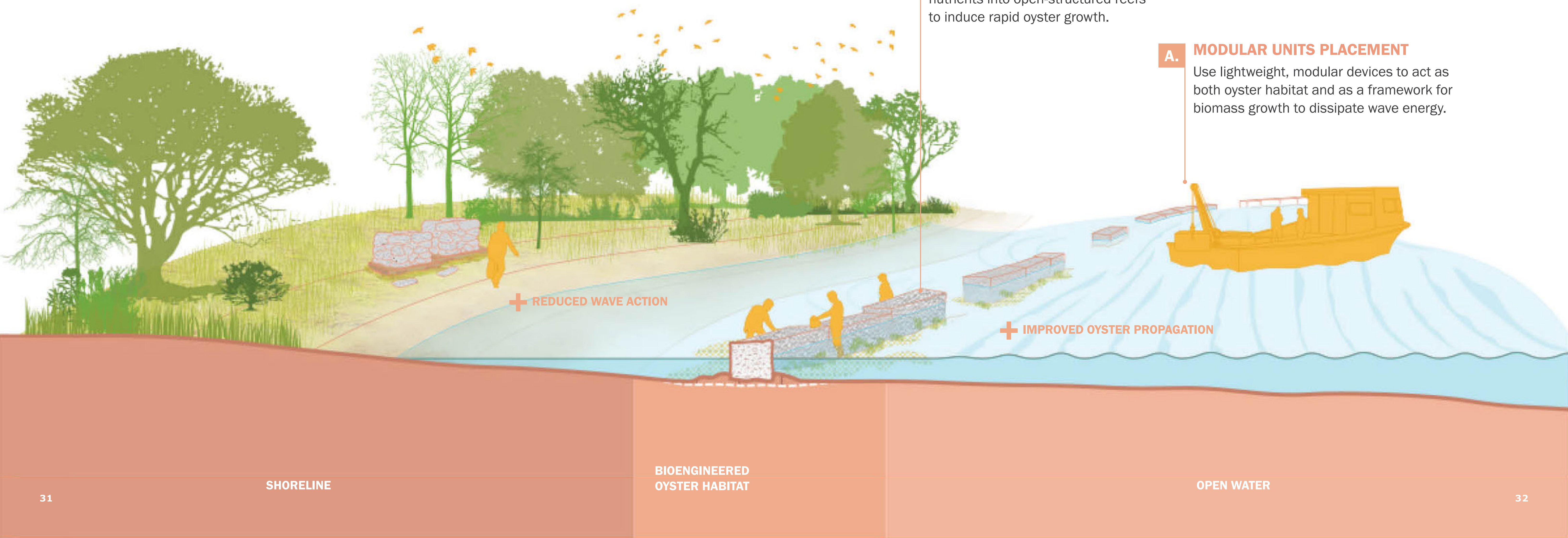
Always · Sometimes

B. OYSTER SPAT DEPOSITION

Deposit oyster spat and enhanced nutrients into open-structured reefs to induce rapid oyster growth.

A. MODULAR UNITS PLACEMENT

Use lightweight, modular devices to act as both oyster habitat and as a framework for biomass growth to dissipate wave energy.

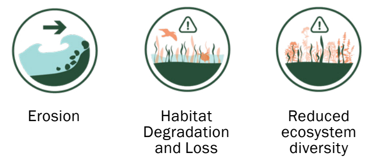


Shoreline Protection

PROGRAMMATIC RESTORATION PROJECT

Shoreline Protection involves hard structures or living shorelines designed to absorb and/or reflect wave energy before it reaches a wetland area or beach, thus reducing erosion. They can also trap sand and sediment. Breakwaters are typical shoreline protection features used in coastal Louisiana. Placement of living shorelines needs to account for future change and ensure that suitable conditions to support the living elements will continue. Additional design considerations include effects on longshore sediment transport, avoiding undesirable induced erosion, allowing gaps for fish passage, ensuring substrates can support material loads, and accounting for sea level rise and subsidence during the life of the project.

HAZARDS ADDRESSED



FUNCTIONS

- ○ Block or dampen storm surge
- ○ Increase suspended sediment trapping/ accumulation efficiency
- ○ Maintain diversity of vegetative communities coastwide
- ○ Reduce encroachment of waterways into vegetated wetlands
- ○ Reduce wind and wave driven erosion on barrier islands
- ● Reduce wave driven erosion in wetlands

COMMON COMPONENTS

- ● Shoreface armoring
- ● Breakwaters

RELATIVE RATINGS

Sustainability of benefits...............Short to Medium

LOCAL SUITABILITY

- ○ Water depth of 3 feet or less
- ● Soils that can support significant additional weight
- ● Complements other project types in high wave energy environments

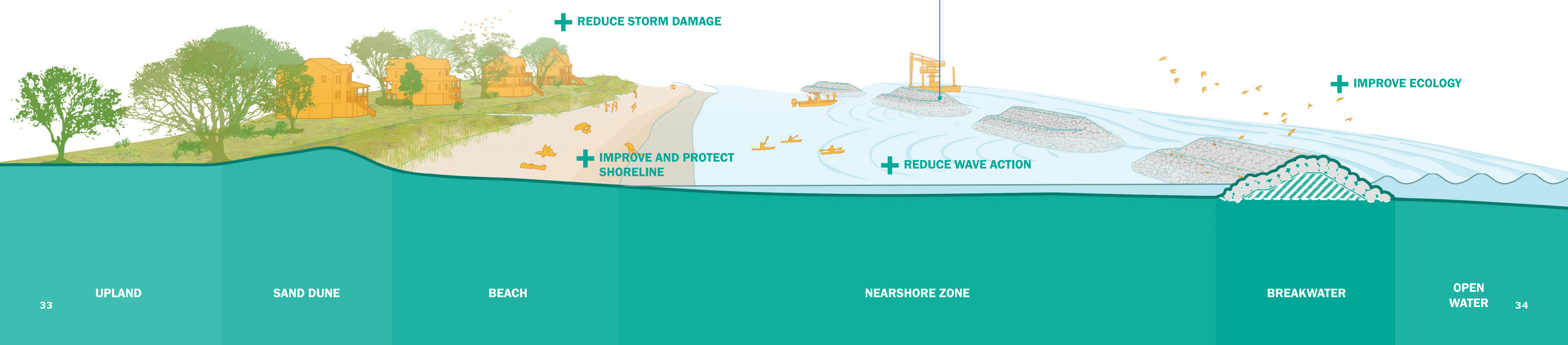
CO-BENEFITS

- ○ Restore habitats and enhance ecological systems
- ○ Maintain waterways
- ● Support commercial and recreational fisheries
- ○ Reduce economic losses from storm surge-based flooding

● Always ○ Sometimes

A. BREAKWATER CONSTRUCTION

Create a series of segmented stone breakwaters to attenuate wave action along adjacent shorelines.

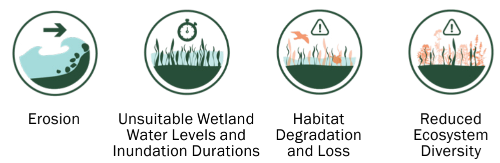


Bank Stabilization

PROGRAMMATIC RESTORATION PROJECT

Bank Stabilization involves the use of dredged material or armoring (e.g., with rip-rap) to fortify a channel or stream bank to halt or prevent erosion-driven bankline retreat. Stabilization features are applied directly to the face, and sometimes top, of the bank. Design considerations include ensuring increased elevations support wetland and/or bottomland hardwood vegetation, maintaining hydrologic exchange within channels, and stability in the face of extreme water levels and wave conditions.

HAZARDS ADDRESSED



FUNCTIONS

- ○ Maintain diversity of vegetative communities coastwide
- ● Reduce encroachment of waterways into vegetated wetlands
- ● Reduce wave driven marsh edge erosion in wetlands

COMMON COMPONENTS

- ● Shoreface armoring
- ○ Ties in to flood protection system
- ○ Breakwaters

RELATIVE RATINGS

Sustainability of benefits...............Short to Medium

LOCAL SUITABILITY

- ● Soils that can support significant additional weight
- ● Complements other project types in high wave energy environments

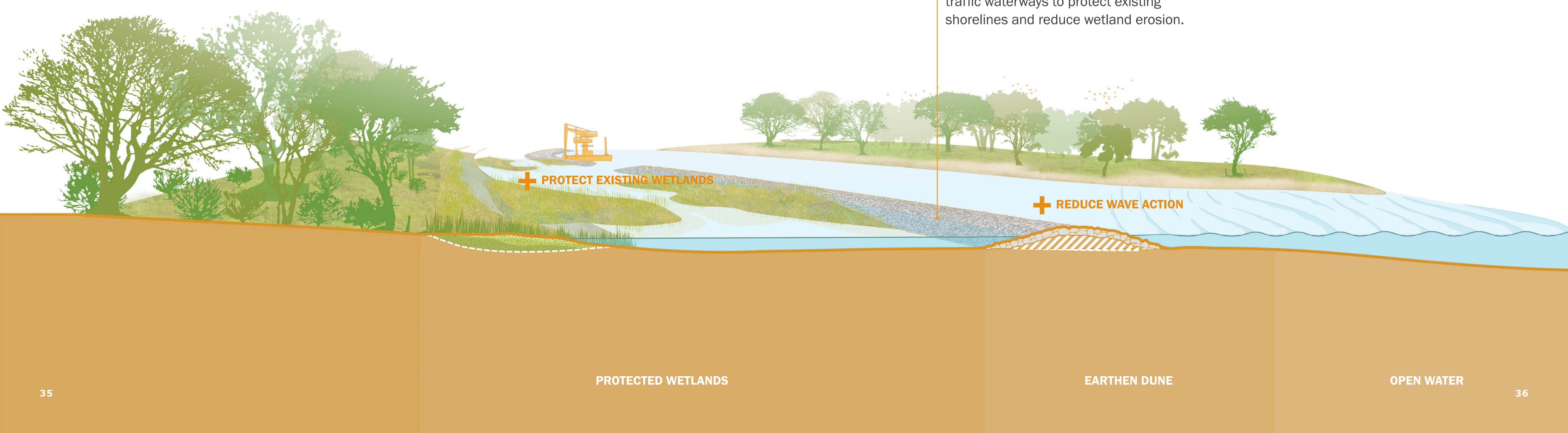
CO-BENEFITS

- ● Maintain waterways

● Always ○ Sometimes

A. EARTHEN LEVEE CONSTRUCTION

Use earthen fill and articulated concrete blocks to construct a levee along high traffic waterways to protect existing shorelines and reduce wetland erosion.

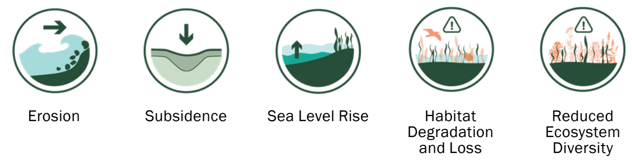


Earthen Terraces

PROGRAMMATIC RESTORATION PROJECT

Earthen Terraces are constructed in shallow open water using in-situ dredge material. They are designed to reduce fetch, and thus wave driven erosion along nearby shorelines. When sufficient suspended sediment is present in the water, terraces can also promote sediment trapping and accumulation. In areas suitable for submerged aquatic vegetation establishment, they support waterfowl and other wildlife habitat. Design considerations include the local availability of competent soil conditions for construction, and exposure to wind-wave erosion in large open water bodies.

HAZARDS ADDRESSED



FUNCTIONS

- ○ Increase suspended sediment trapping/ accumulation efficiency
- ● Maintain diversity of vegetative communities coastwide
- ● Reduce wave driven erosion in wetlands

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ○ Support commercial and recreational fisheries
- ○ Provide habitat for migratory species
- ○ Support waterfowl
- ○ Provide habitat for endangered species and species of greatest conservation need

RELATIVE RATINGS

Sustainability of benefits............................Medium

LOCAL SUITABILITY

- ○ Water depth of 3 feet or less
- ● Soils that can support significant additional weight
- ● Complements other project types in high wave energy environments

COMMON COMPONENTS

- ● Local sediment dredging and placement
- ○ Vegetative planting
- ○ Shoreface armoring

● Always ○ Sometimes

Hydrologic Restoration - Small

PROGRAMMATIC RESTORATION PROJECT

Small-Scale Hydrologic Restoration projects focus on restoring more localized hydrologic patterns (e.g., utilizing plugs and control structures, canal backfilling, channel cleanout). Design considerations include ingress and egress of estuarine nekton, maintaining passage for vessels through natural waterways, and the need to allow for drainage of the area following extreme inundation from heavy precipitation and/or storm surge events.

HAZARDS ADDRESSED

- Sea Level Rise
- Lack of Sediment Input
- Unsuitable wetland water levels and inundation durations
- Saltwater intrusion
- Impounded Wetlands
- Habitat Degradation and Loss
- Reduced Ecosystem Diversity

FUNCTIONS

- ○ Connect to tidal or riverine sediment inputs
- ● Improve hydrology
- ● Maintain diversity of vegetative communities coastwide

COMMON COMPONENTS

- ○ Ties in to flood protection system
- ○ Channel dredging
- ● Water control structure, culvert and/or plug
- ● Canal backfilling
- ● Channel cleanout

RELATIVE RATINGS

Sustainability of benefits............................Medium

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ● Maintain waterways
- ● Provide sustainable benefits by enhancing natural processes
- ○ Provide habitat for endangered species and species of greatest conservation need

● Always ○ Sometimes

Forested Wetland Restoration

PROGRAMMATIC RESTORATION PROJECT

Forested Wetland Restoration projects aim to increase the extent and/or quality of coastal swamps or bottomland hardwood forests through a combination of introducing new sediment to increase elevation and reduce inundation, hydrologic features that improve drainage or otherwise reduce water level, and planting trees to restore canopy cover and help prevent conversion to marsh.

HAZARDS ADDRESSED

- Lack of Sediment Input
- Unsuitable Wetland Water Levels and Inundation Durations
- Habitat Degradation and Loss
- Reduced Ecosystem Diversity

FUNCTIONS

- ● Use dredged sediment beneficially
- ● Connect to tidal or riverine sediment inputs
- ● Increase suspended sediment trapping/ accumulation efficiency
- ● Improve hydrology
- ● Maintain diversity of vegetative communities coastwide

CO-BENEFITS

- ● Restore habitats and enhance ecological systems
- ● Support commercial and recreational fisheries
- ● Provide habitat for migratory species
- ○ Provide habitat for endangered species and species of greatest conservation need

RELATIVE RATINGS

Sustainability of benefits................Medium to Long

COMMON COMPONENTS

- ○ Dredged sediment transport and placement
- ○ Vegetative planting
- ○ Ties in to flood protection system
- ○ Channel dredging
- ○ Water control structure
- ○ Water control structure, culvert and/or plug
- ○ Channel cleanout

● Always ○ Sometimes

C. TREE PLANTING

Planting trees in degraded swamps increases canopy cover and helps prevent conversion of swamp to marsh or open water.

B. HYDROLOGIC ADJUSTMENT

Increase hydrologic connectivity (e.g., by gapping spoil banks, constructing or opening channels) to reduce flooding and allowing the swamp to drain, increasing productivity and tree germination. Increased connectivity can also introduce vital sediments and nutrients into swamps.

A. SEDIMENT ADDITION

Deliver new sediment to the swamp (e.g., through spray dredging or other thin layer placement) to increase elevation relative to water levels, improving conditions for tree productivity and germination.

COASTAL PROTECTION AND RESTORATION AUTHORITY OF LOUISIANA
coastal.la.gov