PENINSULA, ISLAND,ISLAND, PARKWAY

Designing with change in Mobile Bay

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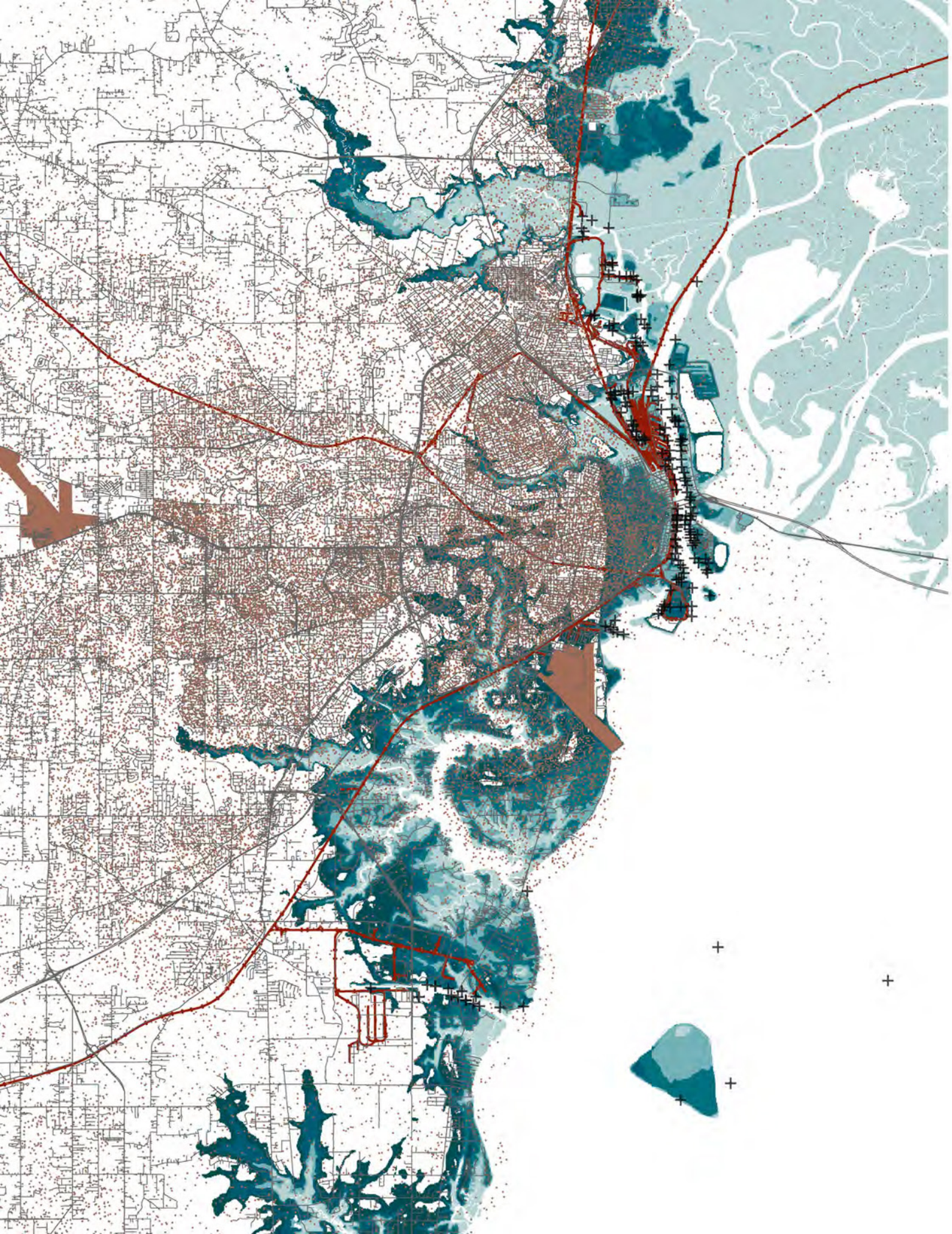


ATLAS

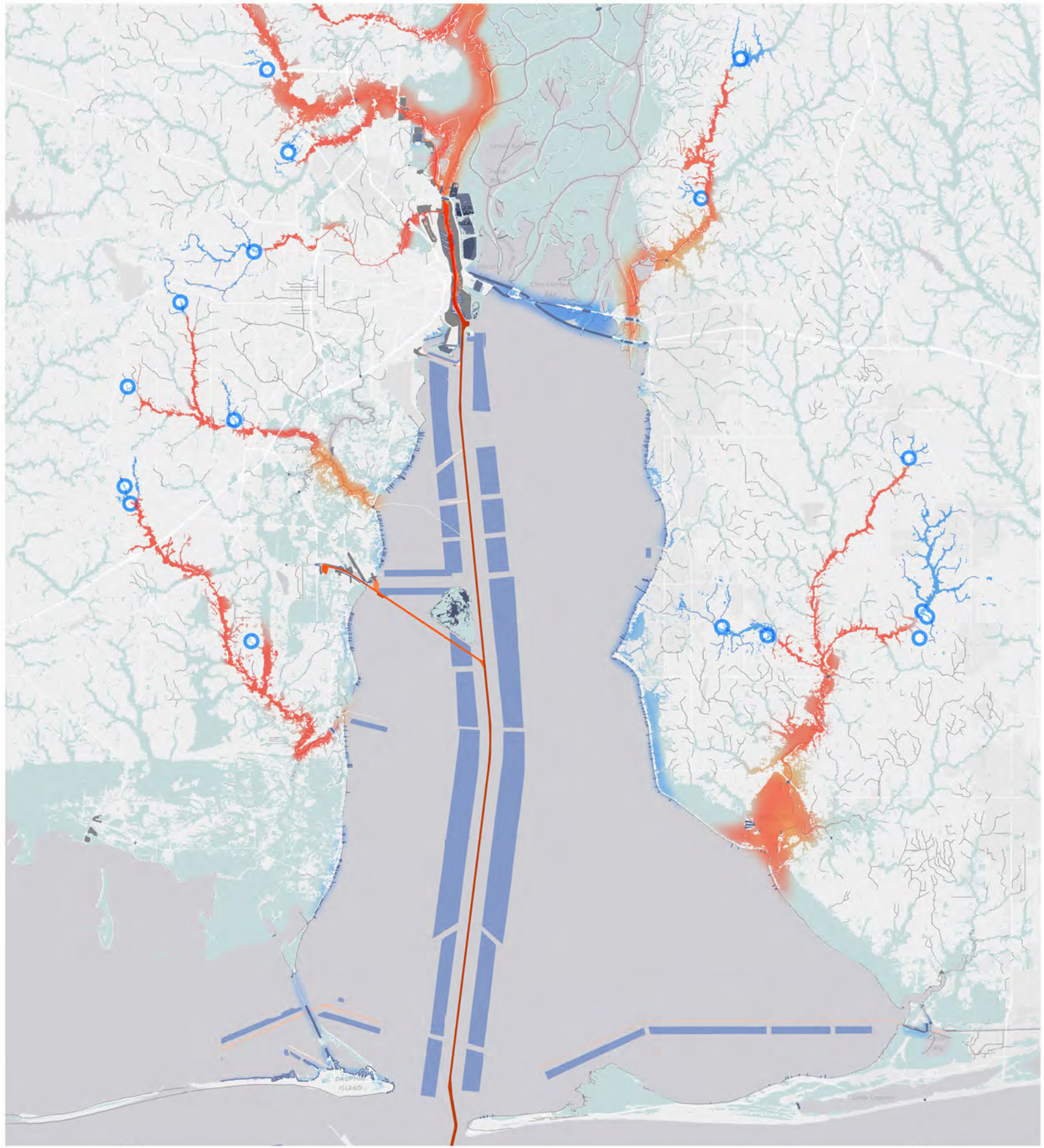
Observing and learning process through a larger context is critical to understand a site. Particularly, in coastal areas like Mobile Bay, large scale mapping helps to articulate both historical and current issues in the trajectory of time and space. It also makes people to understand the complexity of the issues coastal regions are facing. In the section of ATLAS, multiple mapping strategies have been used to understand Mobile Bay from the aspects of coastal infrastructure, habitat change, storm surge, and sea level rise. Through this mapping study, we are able to unpack Mobile Bay's geological, ecological, social, and cultural characteristics from the bay and state scales, which is conducive to the future exploration of challenges and potentials embodied in this unique coastal landscape.

DAMS TRANSFORMED THE BASIN

The construction of dams has impact on the aquatic species. It affects fish migration patterns, because dams prevent fish from moving upstream/downstream for spawning and breeding.

Legend

- Dams
- American Eel habitat
- Gulf sturgeon habitat
- Previous habitat
- Alabama shad habitat
- Causeway location

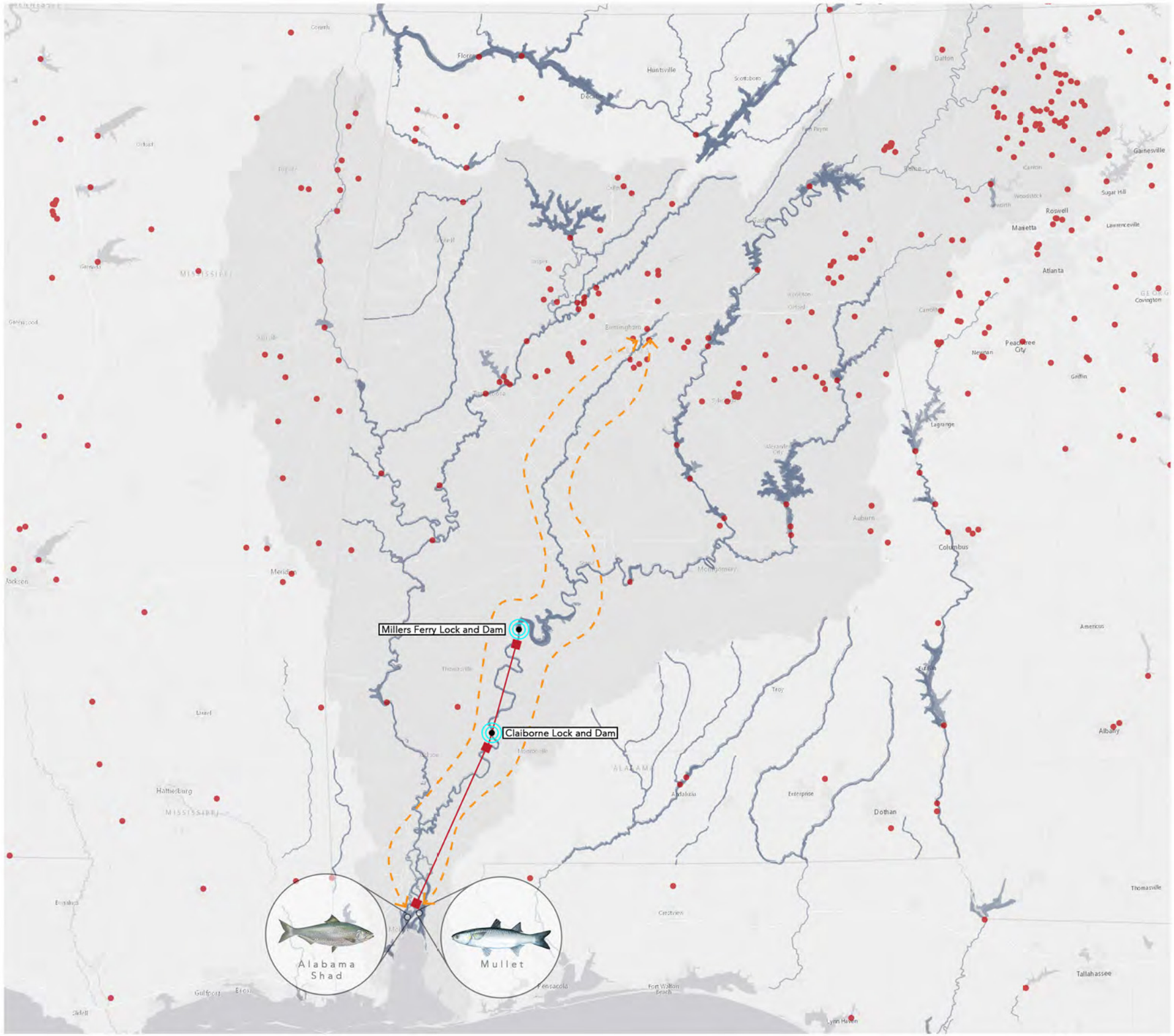


DAMS SHIFTED SEDIMENT MOVEMENT

To improve navigation channels to enter and leave ports efficiently, quickly, and safely, massive sediment operations are conducted in Mobile Bay. Dredging disposal area and dams have changed the ecological and geological condition of Mobile Bay. Sediment are blocked behind dams which reduce the sediment supply for downstream area.

Legend

- Dams
- Areas losing sediments
- Areas gaining sediments
- Wetland

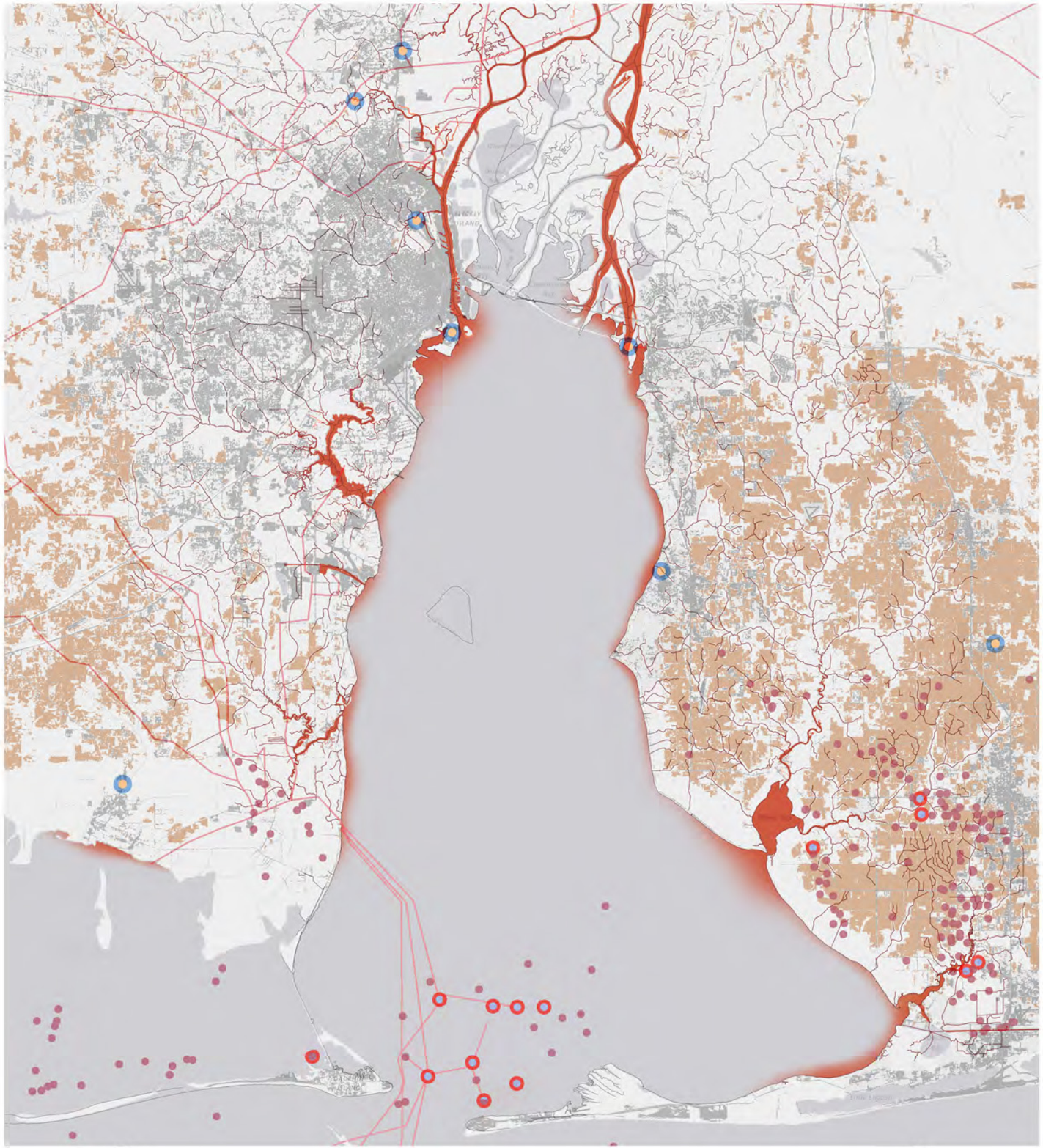


DAMS AFFECTED FISH HABITAT

The Alabama Shad and Mullet are one example of the dam infrastructure affecting migration habits. Both of these species of fish once migrated from Mobile Bay all the way up the Alabama and Cahaba River to Birmingham; over a 300 mile long trip! After the construction of the Claiborne and Millers Lock and Dam in the late 1960s' and early 1970's, their trip has been cut. As a result, the fish has to find new migration route to spawn and breed.

Legend

- Dams
- Migration before 1969
- Migration after 1969
- Rivers/steams
- Mobile bay watershed

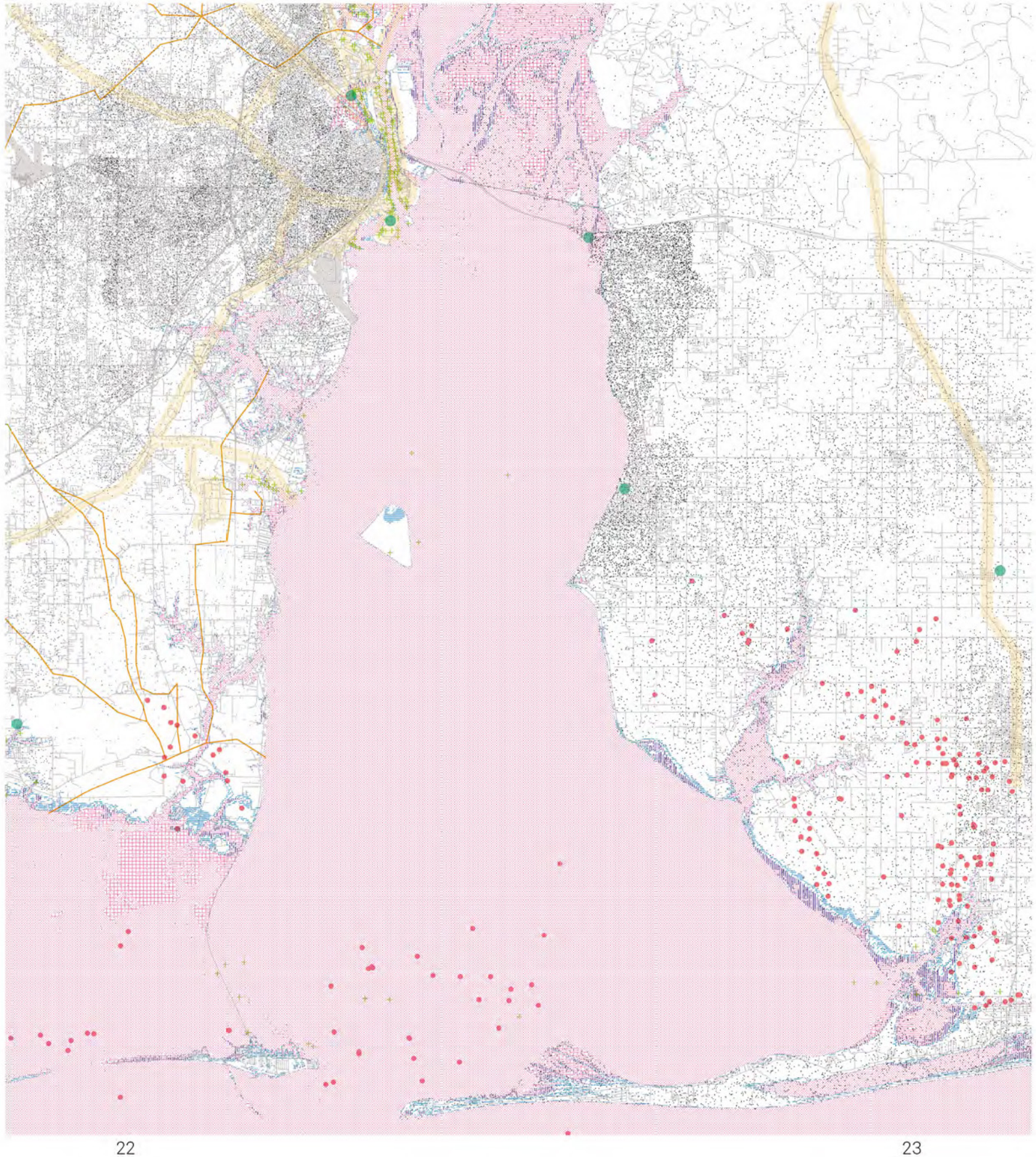


GAS WELLS AND URBANIZATION CAUSED POLLUTION

Port facilities such as active and inactive coastal gas wells post threat to water quality and habitat protection at Mobile Bay. Impervious paving and agriculture operations at developed areas are also likely to cause runoff pollution, which eventually affect the water resources of watershed and Mobile Bay.

Legend

- Active gas wells
- Inactive gas wells
- Water treatment plant
- Agricultural land

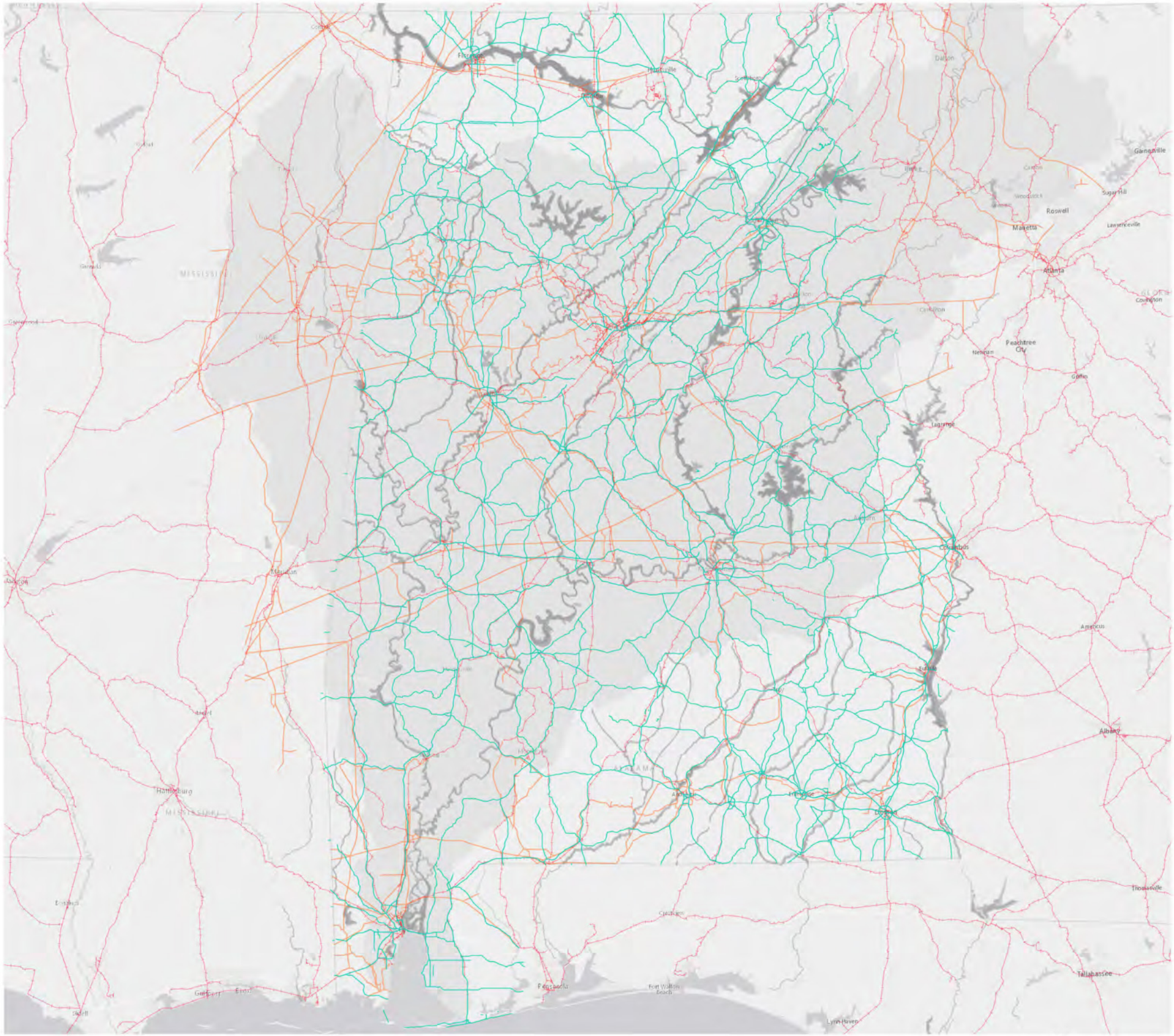


INFRASTRUCTURE AND SEA LEVEL RISE

Sea level rise has a long term impact on coastal cities and their infrastructure. As water takes up land, it pushes people to rethink and reshape the city infrastructure to better react to this change, which make coastal communities cohabit with the changing sea level.

Legend

- Ports
- Population density
- Railroads
- Road network
- Waste water treatment plant
- Oil pipelines
- Oil wells
- 1feet sea level rise
- 1-3 feet sea level rise
- 4 feet sea level rise
- 5 feet sea level rise
- 6 feet sea level rise

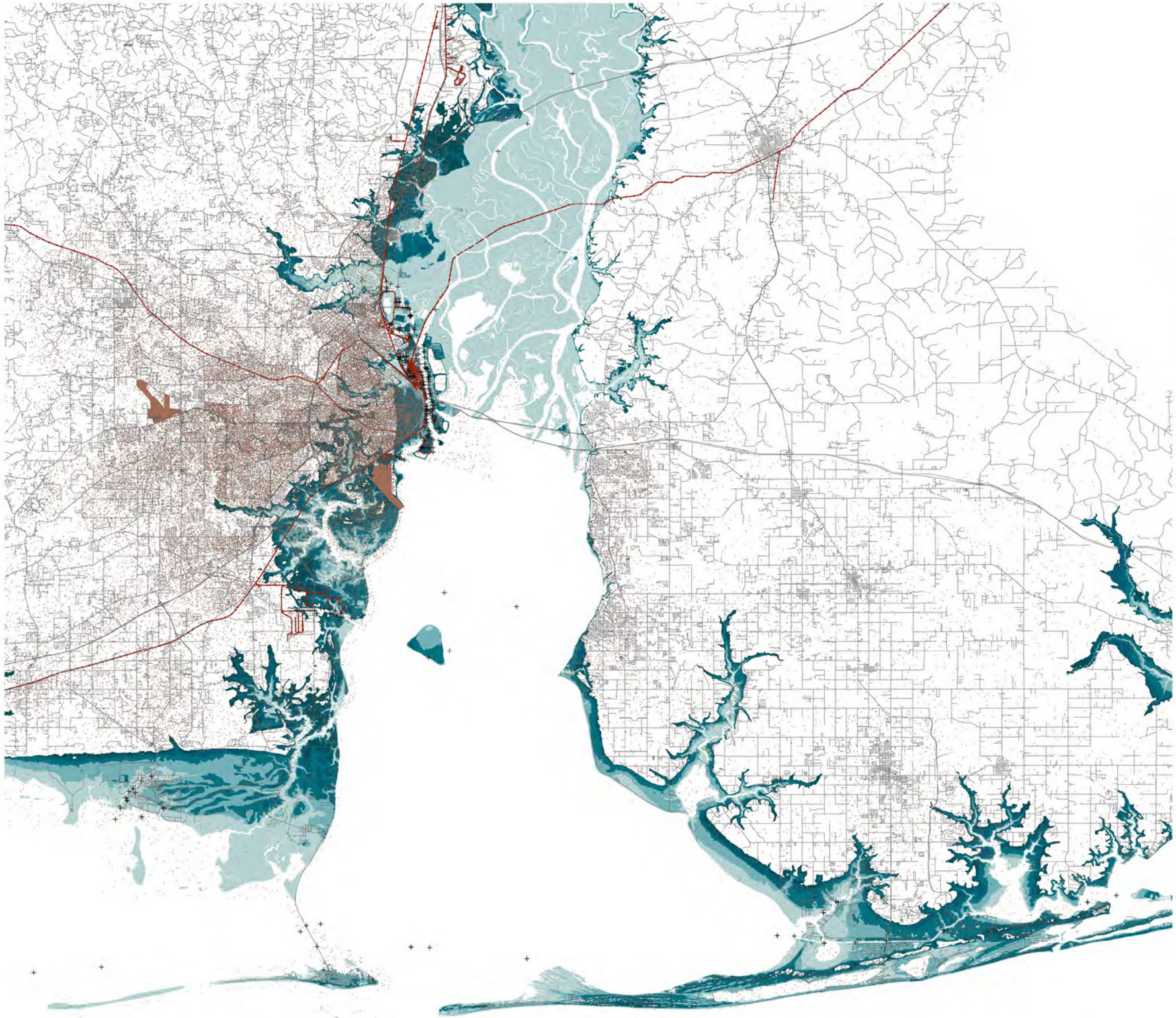


INFRASTRUCTURE RESHAPED THE LANDSCAPE

As urbanization increases, massive infrastructure development has reshaped the nature of land in the State of Alabama. The railroads, interstates, and pipelines cut through the rivers, lakes, streams and other types of water bodies.

Legend

- Mobile bay watershed
- Major roadways
- Gas pipelines
- Railways
- Rivers/streams

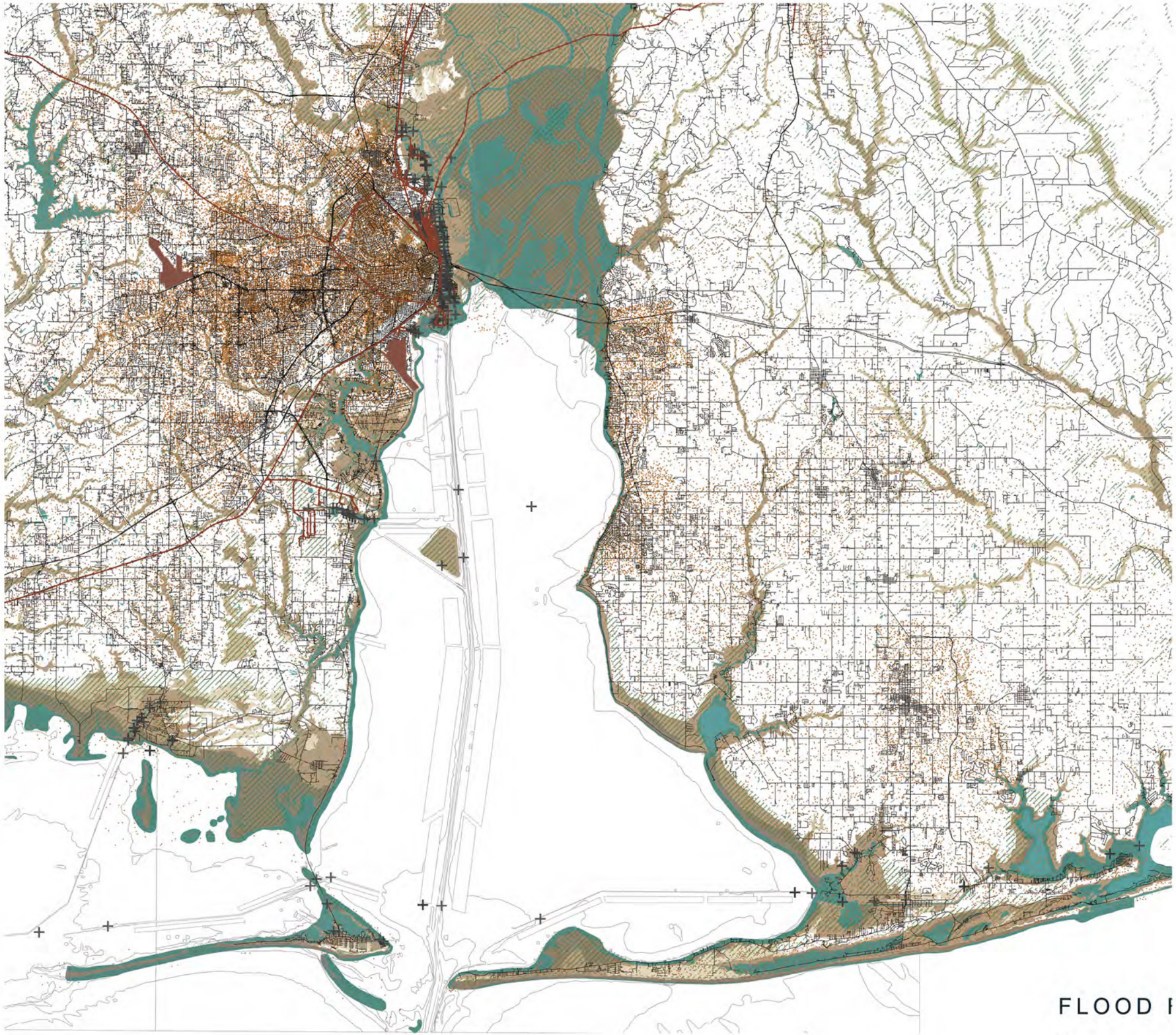


STORM SURGE AFFECTED COASTAL HABITAT

Storm surge has significant impacts on the existing infrastructure and population of Mobile Bay. It decreases the land value of coastal communities and destroys natural habitat.

Legend

- Ports
- Railways
- Roadways
- Category 5
- Category 4
- Category 3
- Category 2
- Category 1
- Airports
- Population density



FLOOD RISK

Flooding is a significant risk in coastal areas like Mobile Bay. It affects city infrastructure. Flooding also has negative impacts on human and non-human habitat. It causes damage to urban area such as coastal communities, agricultural land, and natural habitat.

Legend

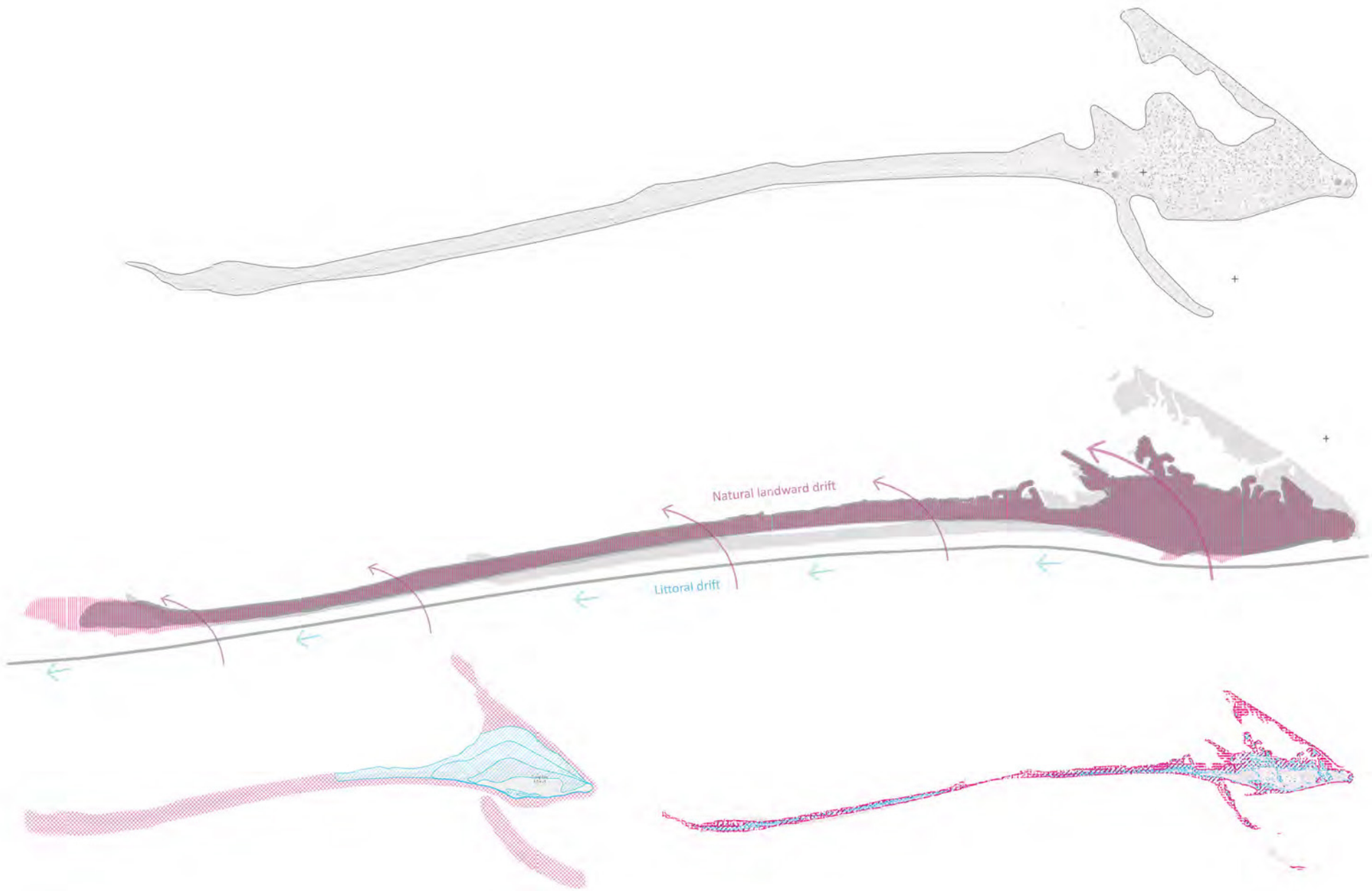
- (A)
- (AE)
- (VE)
- (2%)
- (X)

HABITAT CHANGE

Due to urbanization, habitat change in Mobile Delta is significant. People have used some natural habitats to facilitate city development, which may pose a threat to biodiversity and coastal resilience. This is because natural habitats such as wetlands, prairies , and forests are the natural buffers to mitigate the natural disaster. At the same time, these natural areas also accommodate various ecological services that maintain the overall ecosystem.

Legend

- Wetland to forest
- Crop/grass land to forest
- Aquatic bed to forest
- Urban land to forest
- Forest to wetland
- Crop/grass land to wetland
- Aquatic bed to wetland
- Urban land to wetland
- Forest to crop/grass land
- Wetland to crop/grass land
- Aquatic bed to crop/grass land
- Urban land to crop/grass land
- Aquatic bed to forest
- Aquatic bed to wetland
- Aquatic bed to crop/grass land
- Aquatic bed to urban land
- Urban land to forest
- Urban land to wetland
- Urban land to crop/grass land
- Urban land to Aquatic bed



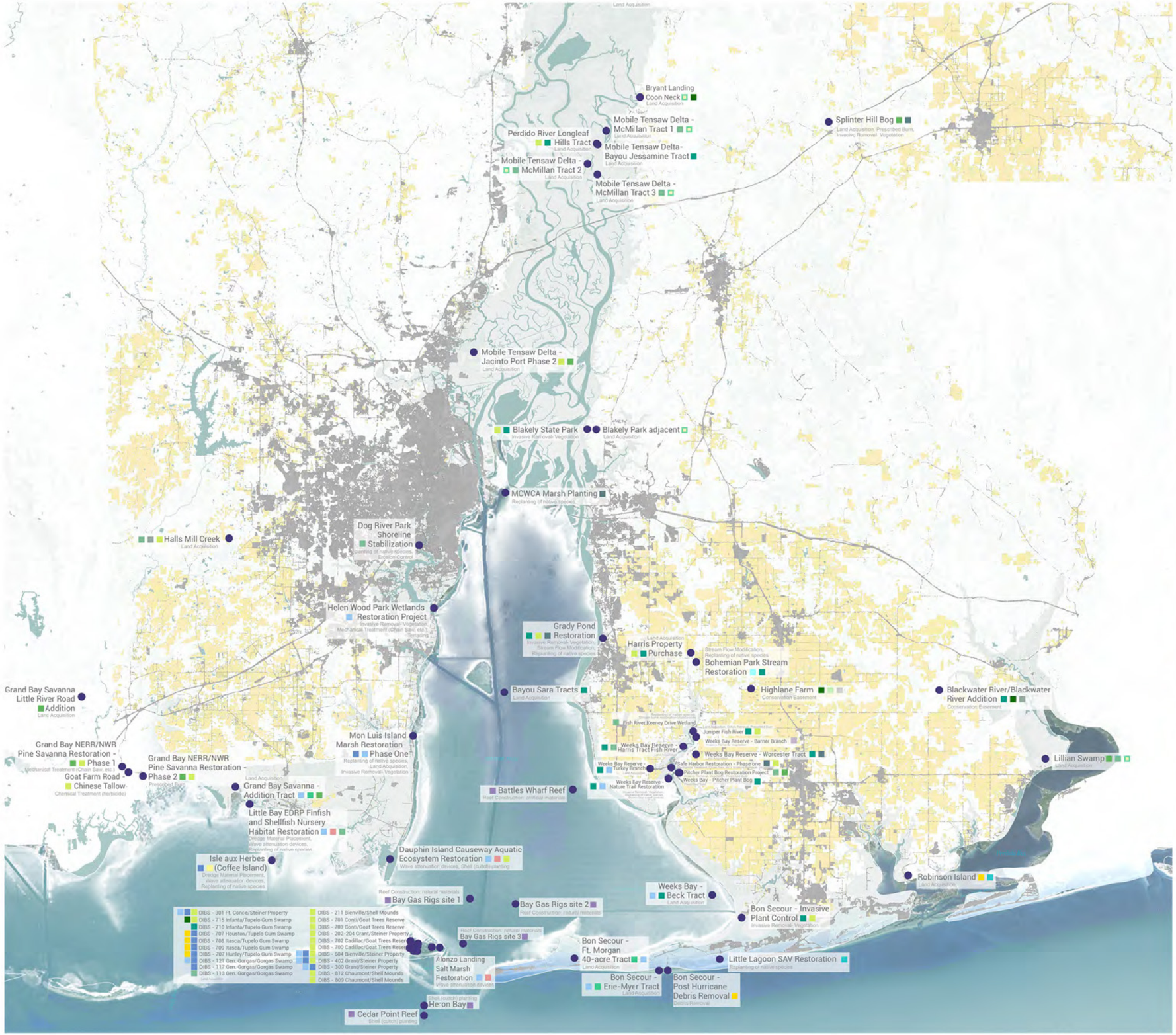
BARRIER ISLAND VULNERABILITY

Dauphin Island is a barrier island at the Gulf of Mexico, and it is an example of barrier island habitat being converted to developed area. This conversion shows that our current development pattern —developing the most sensitive, rapidly changing, and low-lying areas—is intensifying the vulnerability of people and infrastructure to sea level rise.

Legend

- Schools
- Historical sites
- Tornado locations
- 2001
- 1978-1981
- 1918-1957
- 1849-1867
- Coastal flooding
- 1% annual change

1ft 4ft 6ft



HABITAT RESTORATION

Recently people have implemented a wide variety of habitat restoration projects in Mobile Delta, helping maintain the ecological service and biodiversity.

Legend

- Forest/Woodland
- Upland forest
- Pine savanna
- Maritime forest
- Bottomland Hardwood
- Upland open space
- Field/Meadow
- Forested wetland
- Wetland
- Riparian
- Freshwater marsh
- Tidal wetland
- Salt marsh
- Submerged aquatic vegetation
- Hard bottom
- Soft bottom
- Instream
- Barrier island
- Dune
- Oyster reef

NOW

DOUBLE LANE TWO WAY ROADS

2' Sea Level Rise

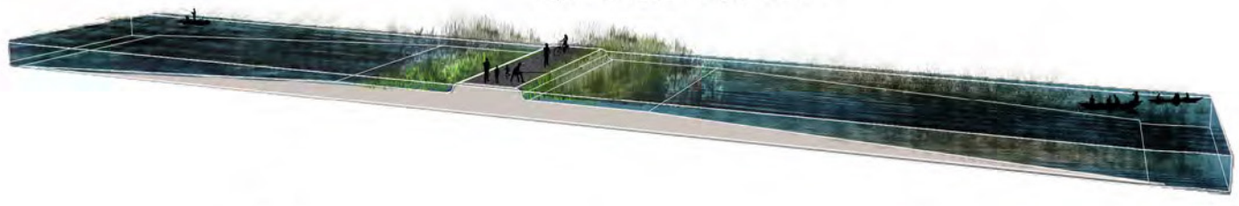
SINGLE LANE ROADS + HIGH
MARSH ROOMS

4' Sea Level Rise

MARSH MIGRATION + NON
MOTORIZED PATHWAYS

6' Sea Level Rise

RAISED PATH + INCREASED
AQUATIC VEGETATION HABITAT

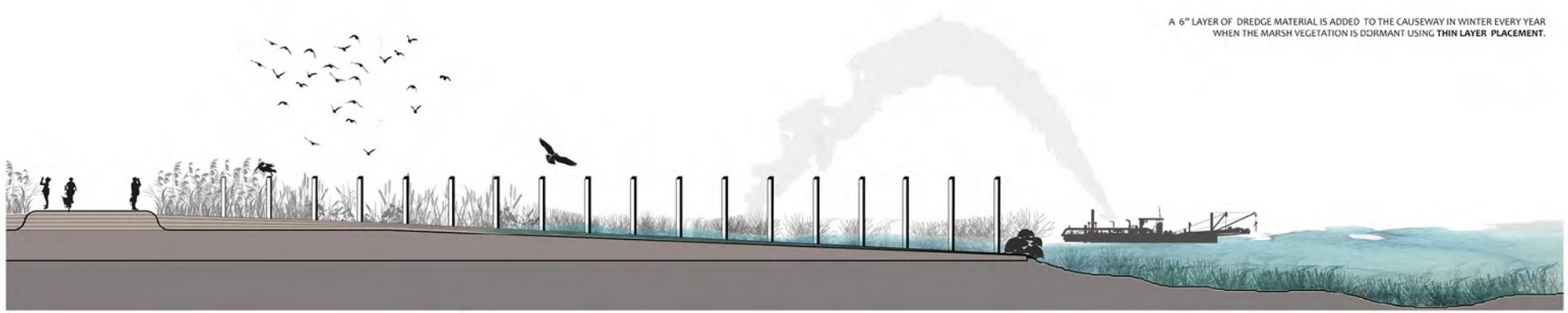


DESIGN FOR CHANGE

The bay is an extremely dynamic space, affected directly by natural processes and disturbances such as tides, wind, sediment movement, hurricanes, sea level rise, and storm surge. While some of these affect the bay daily, the effects of others might take months or years. Designing adaptable yet robust spaces that accommodate change is crucial managing a resilient future for all inhabitants of the bay.

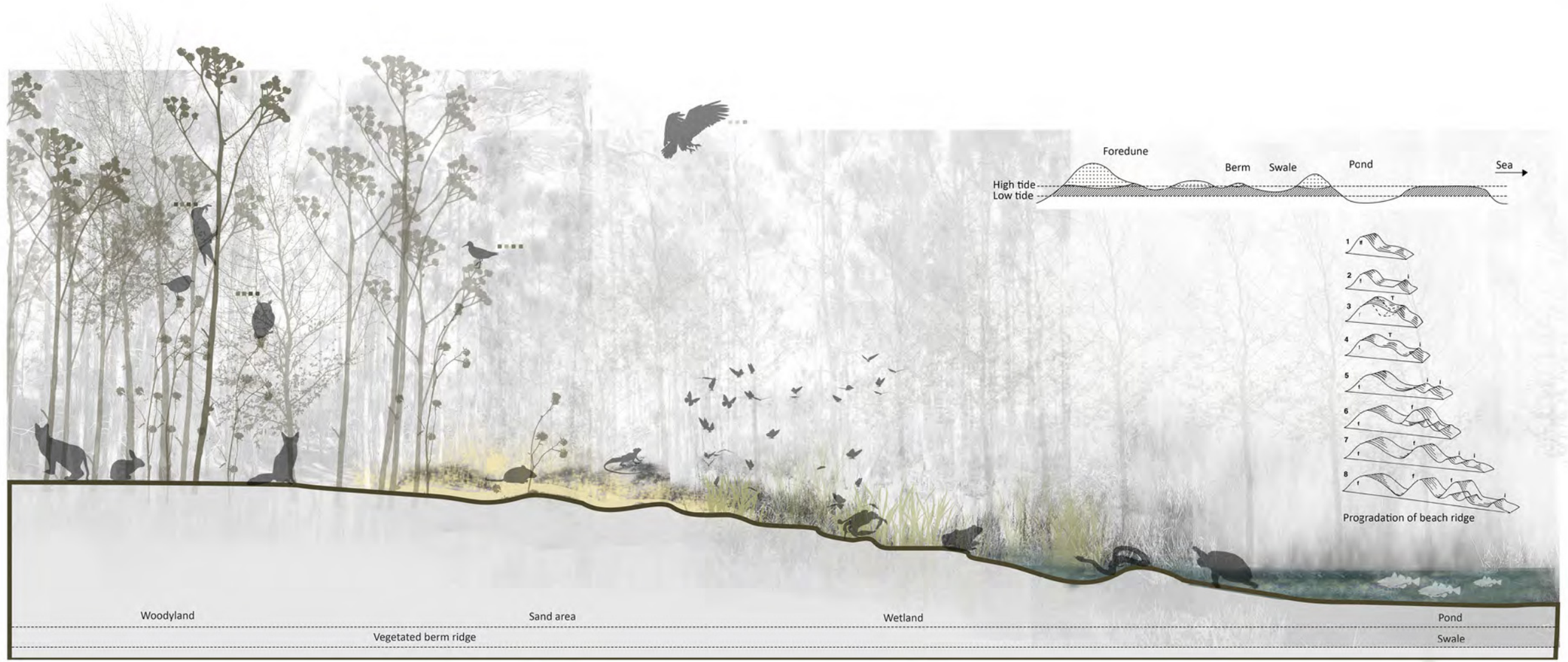
FACILITATE

Designs should facilitate significant ecological and cultural processes occurring within the bay. Facilitation of such processes, encourages individual interactions thereby befitting the bay at the level of community, and ecosystem. Processes like spawning, migration, nesting, feeding, dredging, fishing, bird-watching, and kayaking, drive the economy and ecology of the bay. This image from this project represents how ecological and cultural processes can and should occur simultaneously.

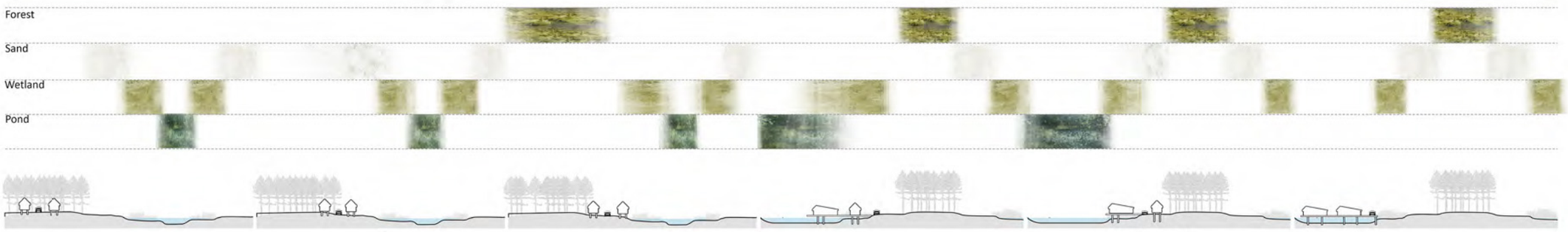


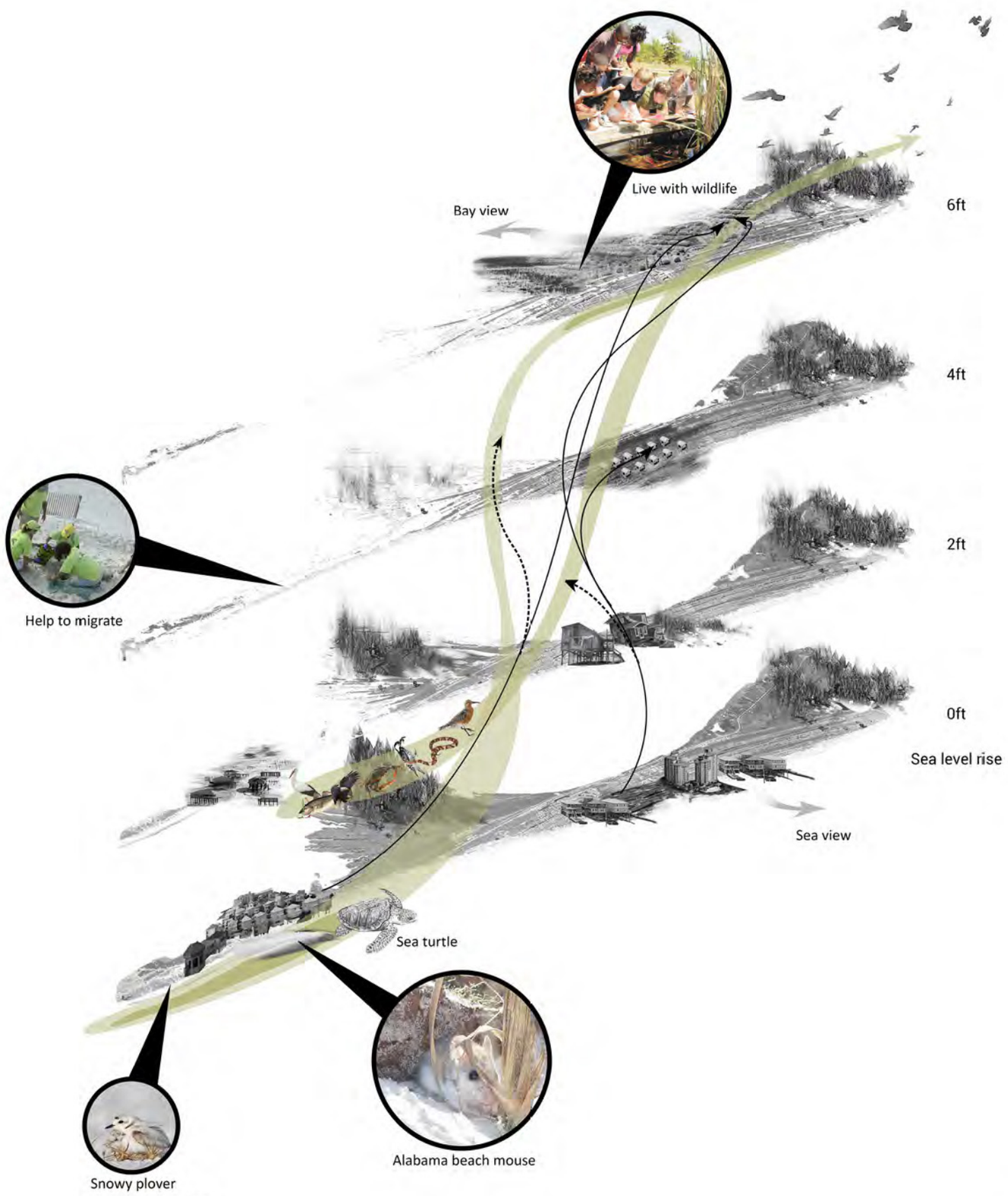
SHARE

Designed landscapes should be multi-faceted places built to amalgamate. This designed fusion should not only unite human and non-human species but also blur the divide between processes such as natural and industrial. Share refers to not just who and what will be experiencing the place but also the interactions of inhabitants and visitors.



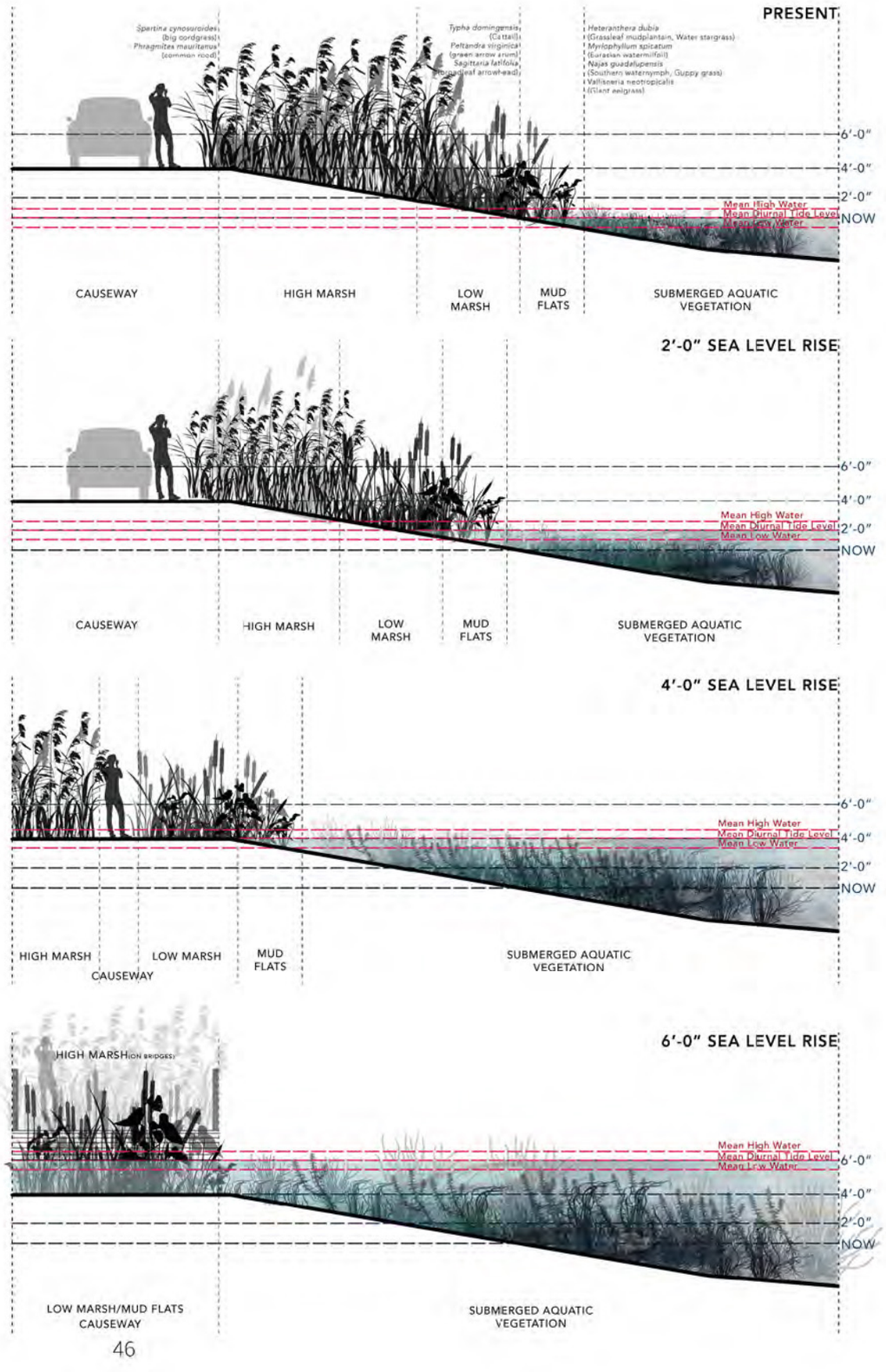
Progradation of beach ridge





MIGRATE

Designed landscapes should facilitate the movement of humans and non-human species at a diversity of spatial and temporal scales. This ranges from how they enter and exit, how they interact with moments and spaces within. A successful designed landscape should have interaction between the site and its diverse inhabitants.

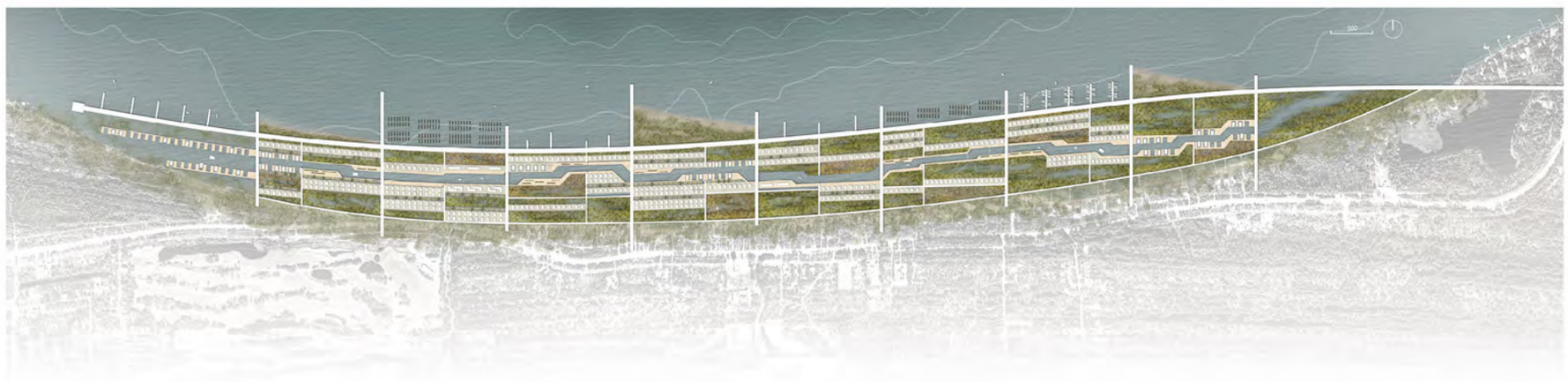


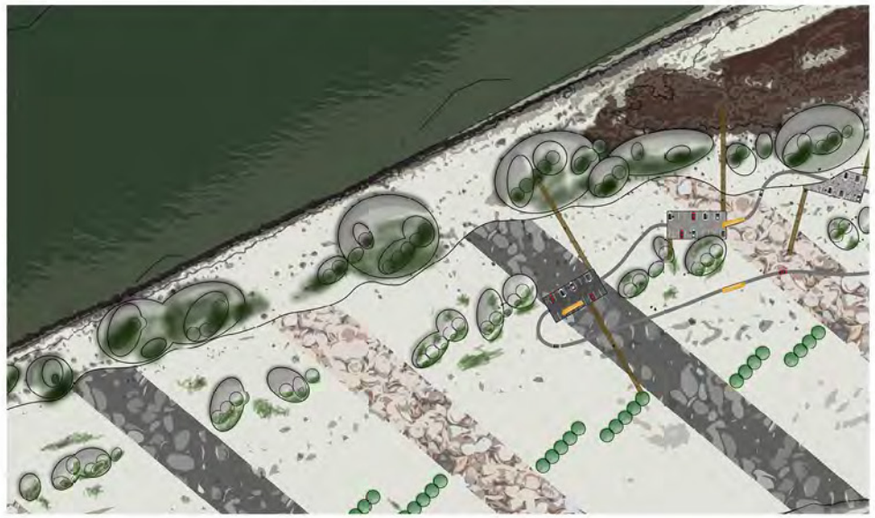
RECYCLE

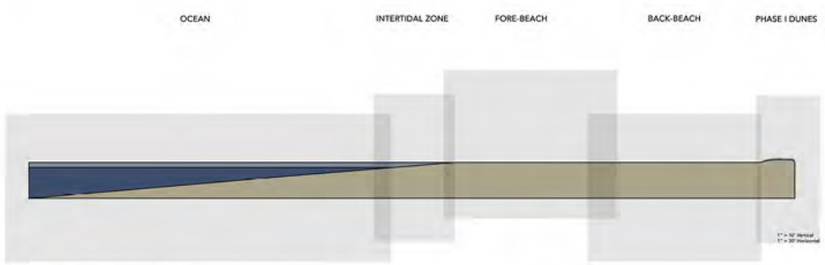
The infrastructure of coastal regions accommodates cities daily operations and urgent protection from natural disasters. In this Mobile Bay project, a conventional infrastructure is re-purposed to respond to the future sea level rise and unpredictable natural disturbances. The combination of landscape intervention and existing infrastructure provides more opportunity for Mobile dwellers to experience their daily recreation or aesthetic needs brought by this multi-functional infrastructure.

ACTIVATE

An open, participatory design process can create better communities and a healthier environment. Public involvement will help identify the issues important to the larger community and develop the most appropriate planning, design, and management solutions. Members of the public should be encouraged to participate and experience the designed space. Projects like these should have a lasting positive effect on both its inhabitants and the environment its settled in.







PHASE I DUNE PLANTINGS
Dune Initiator

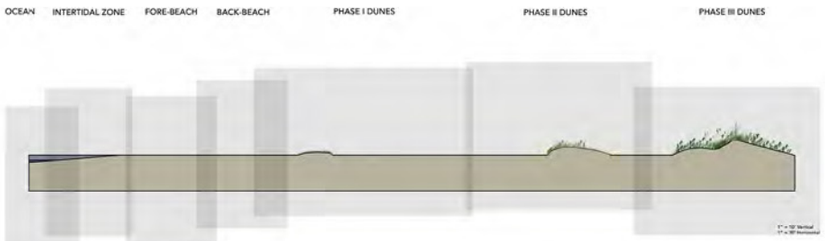
- *Sesuvium portulacastrum*
Sea Purslane

PHASE I DUNE PLANTINGS
Dune Initiator

- *Sesuvium portulacastrum*
Sea Purslane

PHASE II DUNE PLANTINGS
Dune Builder

- *Uniola paniculata*
Sea Oats



PHASE I DUNE PLANTINGS
Dune Initiator

- *Sesuvium portulacastrum*
Sea Purslane

PHASE II DUNE PLANTINGS
Dune Builder

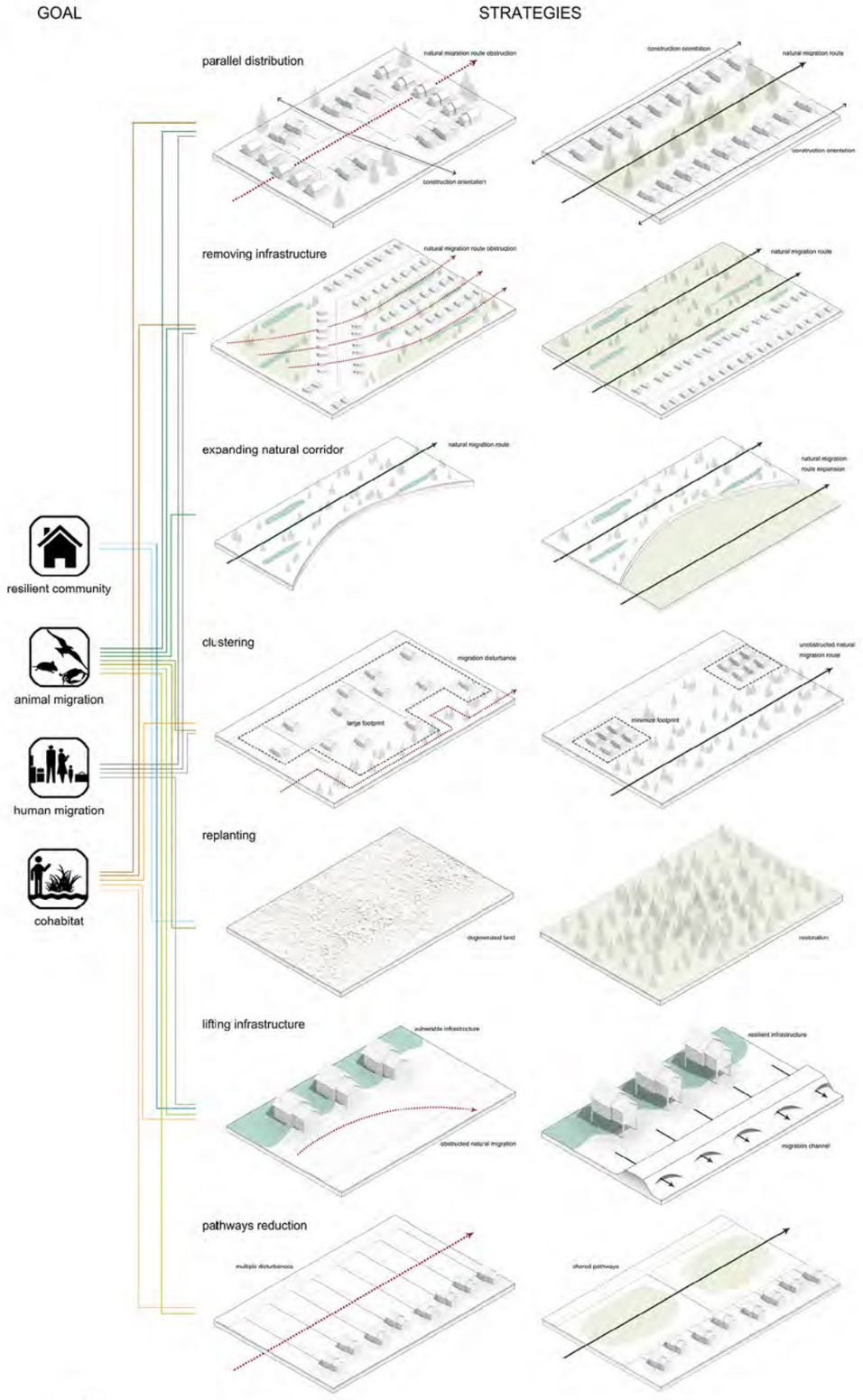
- *Uniola paniculata*
Sea Oats

PHASE III DUNE PLANTINGS
Dune Stabilizer

- *Ceratiola ericoides*
Florida Rosemary

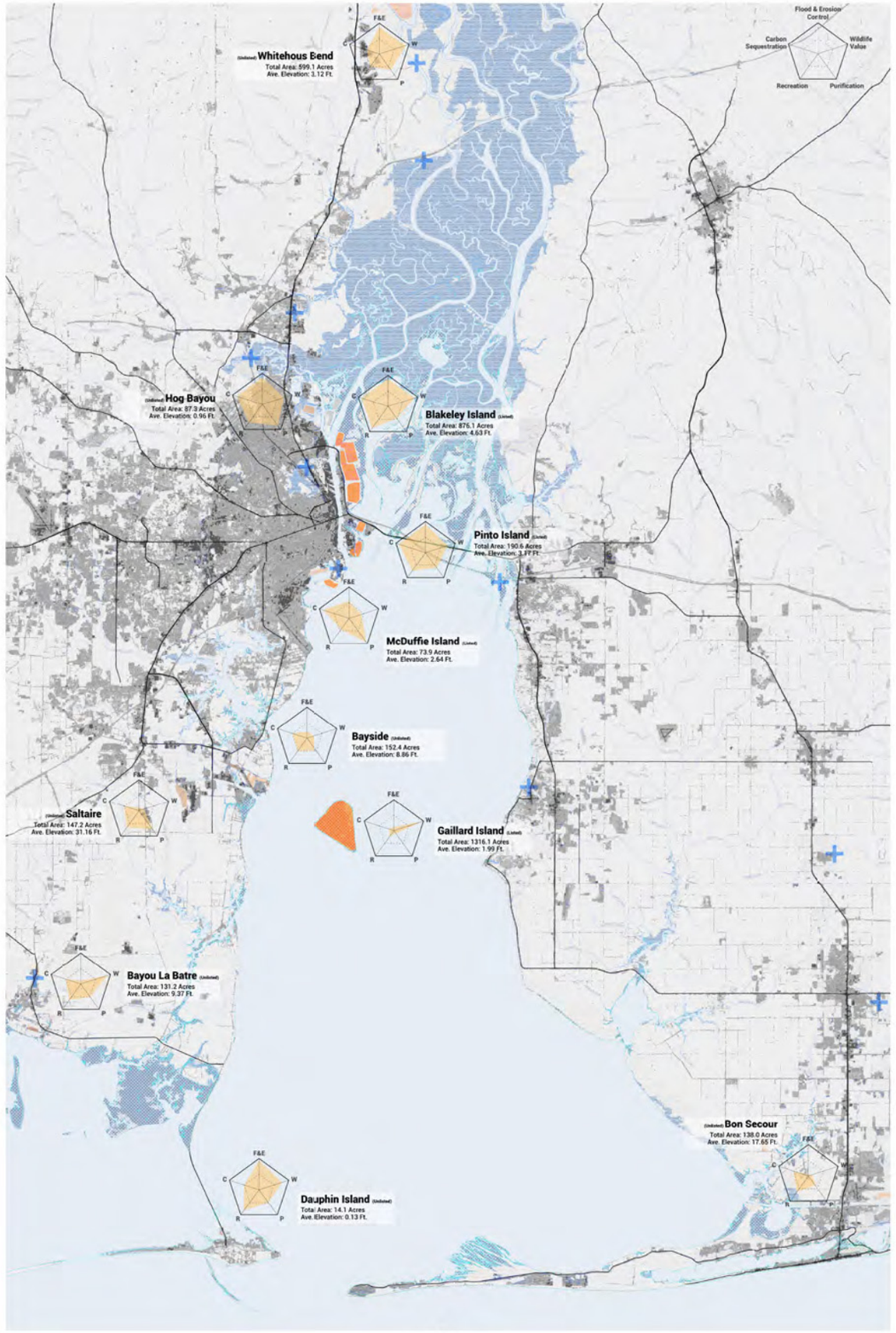
EDUCATE

Designed landscapes should incorporate an educational facet that all people can benefit from. From unearthing todays concealed issues to expounding upon the trending ones, the site should shine a light on these issues to increase coverage of this information far and wide. This project aims to educate not only the surrounding community, but school children on field trips as well. The goal is to incorporate these groups of people by the use of hands-on dune construction and earth moving.



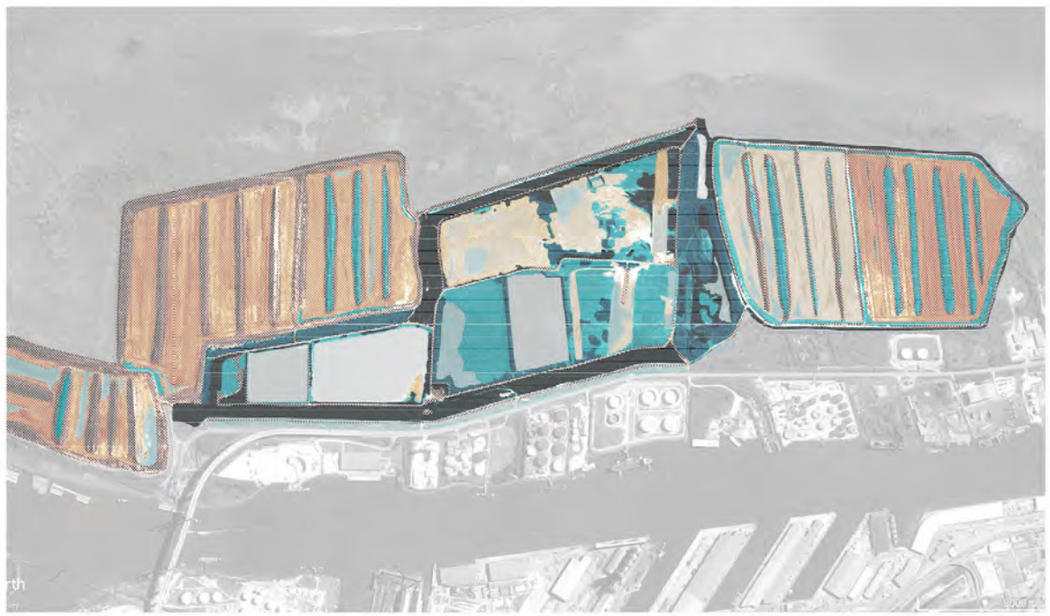
PROTOTYPE

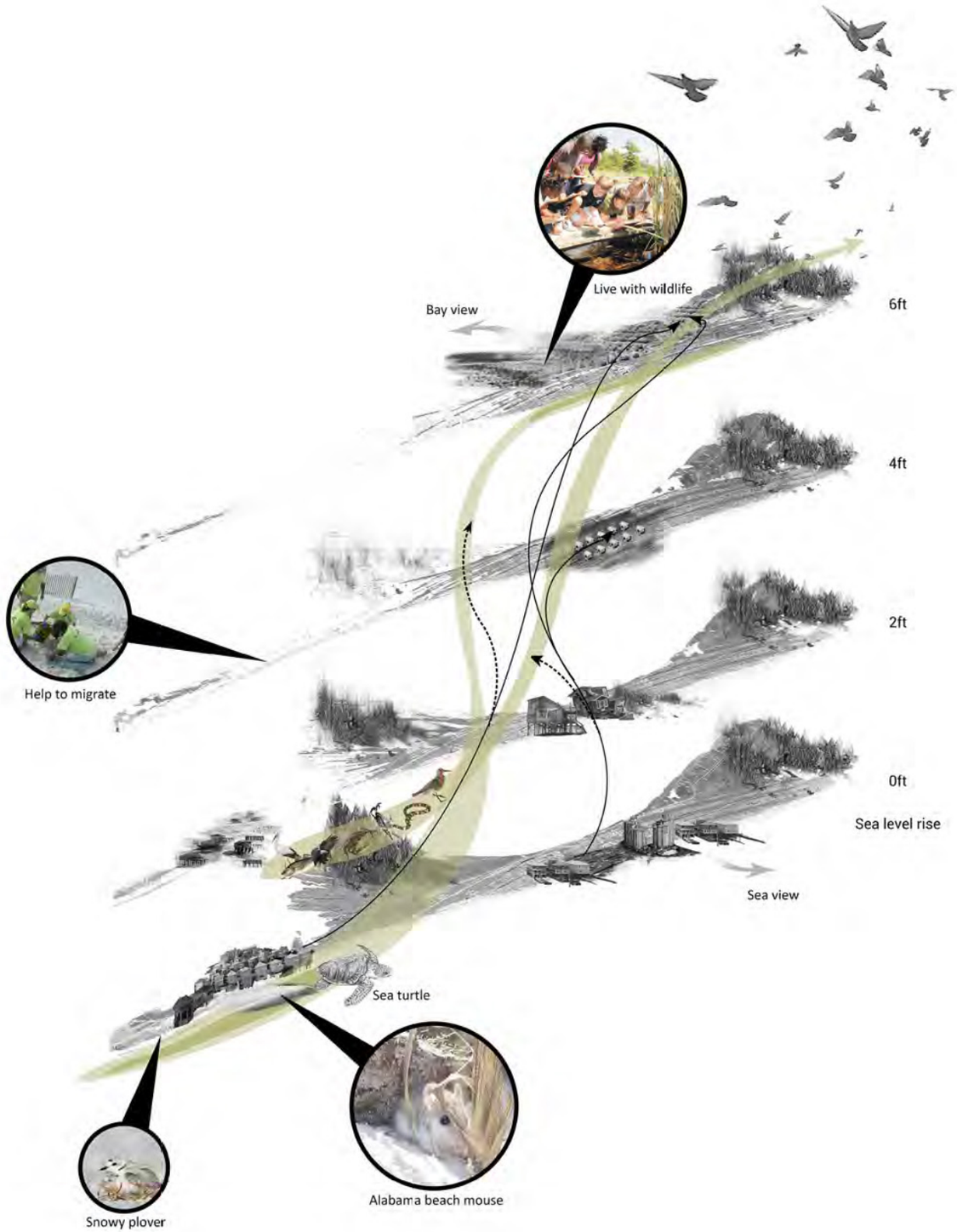
Although this work is focused on Mobile Bay, some of the problems, such as sea level rise, marsh loss, and surge events are shared among the coastal areas all around the world. By exploring the prototypical design of the different types of landscape, we believe we can generate more valuable solutions for wider application and replication. From this perspective, our design proposals considered local particularities as well as the universality of coastal typology to ensure they have the potential to be applied to other coastal areas sharing the similar condition. The design proposal is exploring the different possibility in dredged material management areas and the sand engine design which helps the process of beach nourishment can be good examples of this principle.



DESIGN ACROSS SCALES

Landscape design is human expression superimposed in the material world. One central success in landscape architecture is the ability to consider how society shapes the physical landscape across multiple scales; regional, city, local, and site. Landscape architects work in a wide range of diverse practices which requires the ability to think across scales and systems to identify opportunities. The ideation across scales enables the design to create places that link systems, strengthen organizations, build communities, and elevate the human spirit.



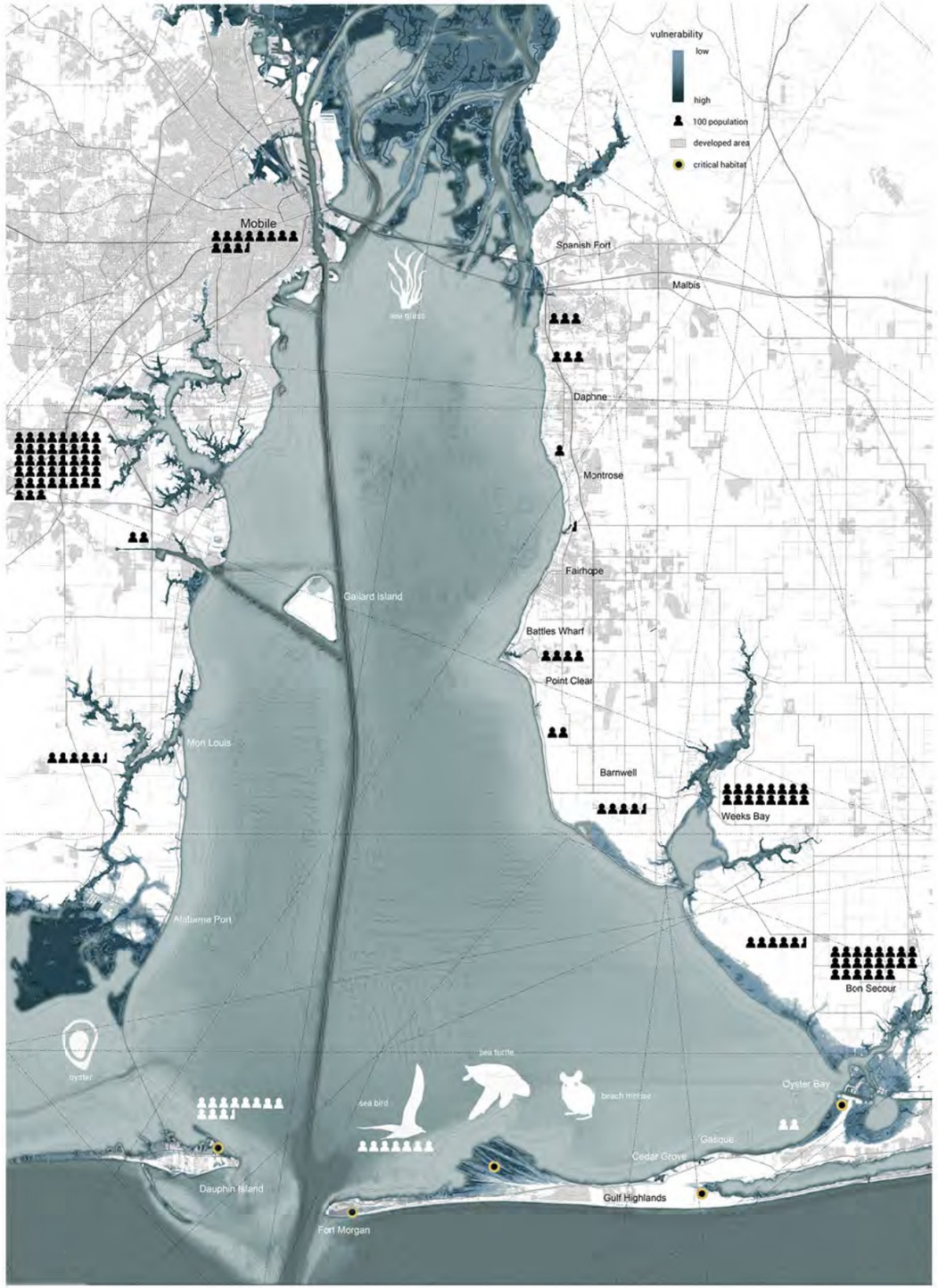


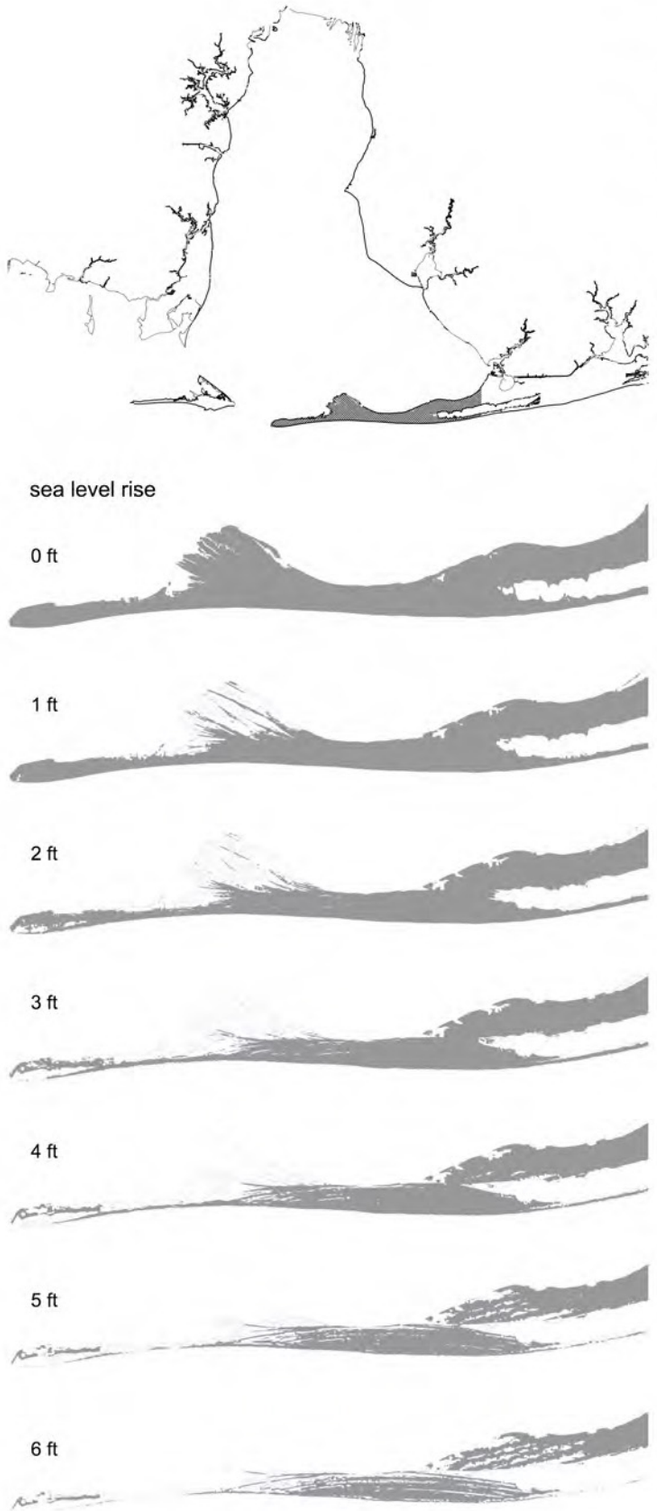
FORT MORGAN PENINSULA

Rui Wang
Yuanyuan Gao

The design focuses on coastal resilience issues that the state of Alabama is facing. This project takes Fort Morgan Peninsula as an example, uses design as a methodology, and engages complex and messy situations to help build better futures for coastal areas. Although the design is grounded in Alabama, the work does not stop at the state line, we believe that coastal resilient issues resonate with communities across the scutheast, and beyond.

This design adapts to the sea level rise problem from the perspective of human and natural migration. The designing of human dwelling places help animals' migration and achieve coastal resilience.





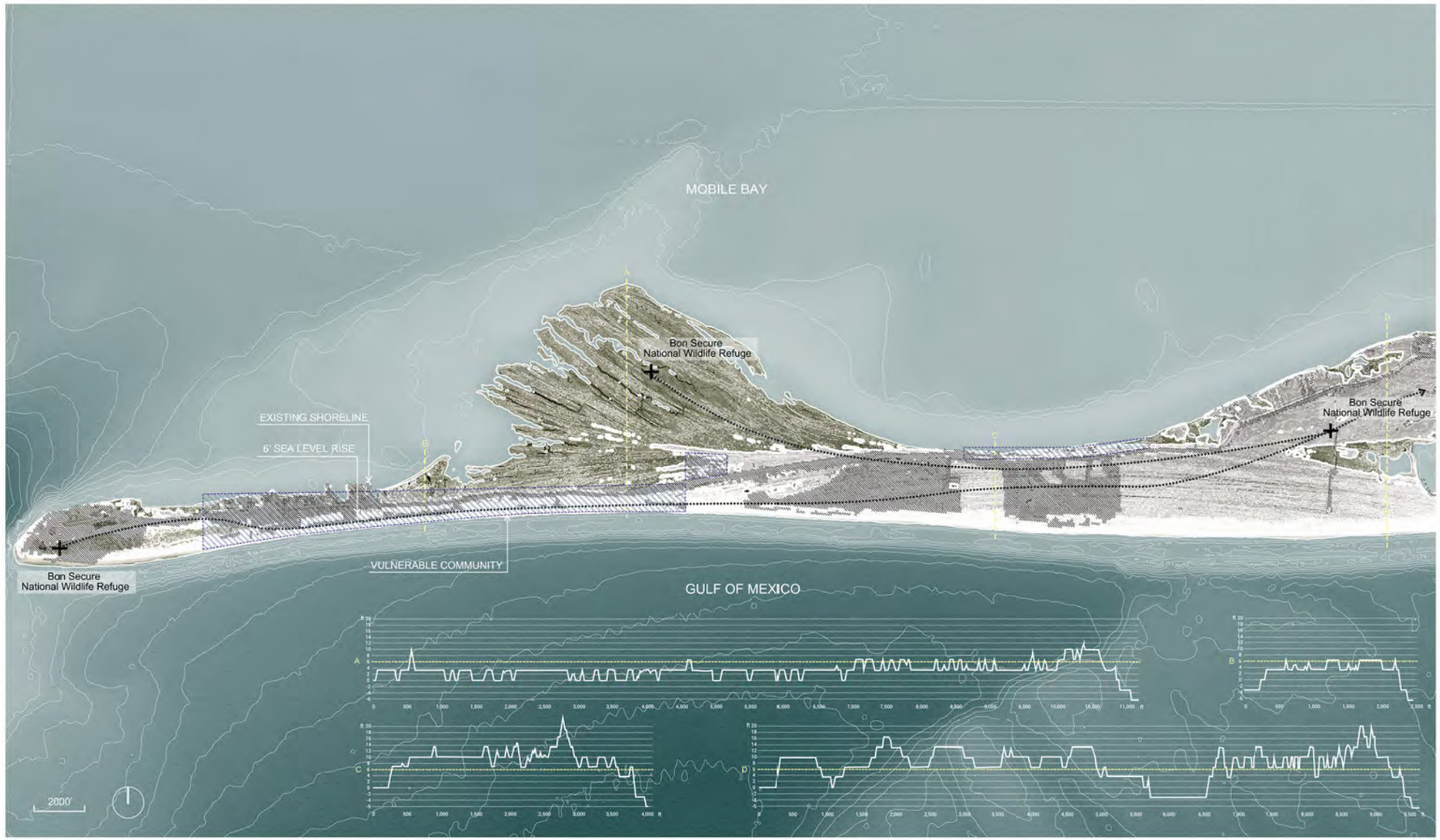
SEA LEVEL RISE

The impacts of climate change are dramatic and everywhere, but nowhere are they more visible than in our dynamic relationship with the coastline. One of the most affected areas are the peninsulas.

It is projected that sea levels will rise two feet by mid-century and six feet by 2100. The rising sea level will transform the landscape of coastal areas and decrease the land of the peninsula. We are talking about the time scale of hundreds of years, but we have to work on a shorter scale of several years to decades. The proposal frames the project work in a timeline that can happen within a reasonable period but also impacts the next hundreds of years.

LEFT

Vulnerable developed areas and wildlife in Mobile Bay.

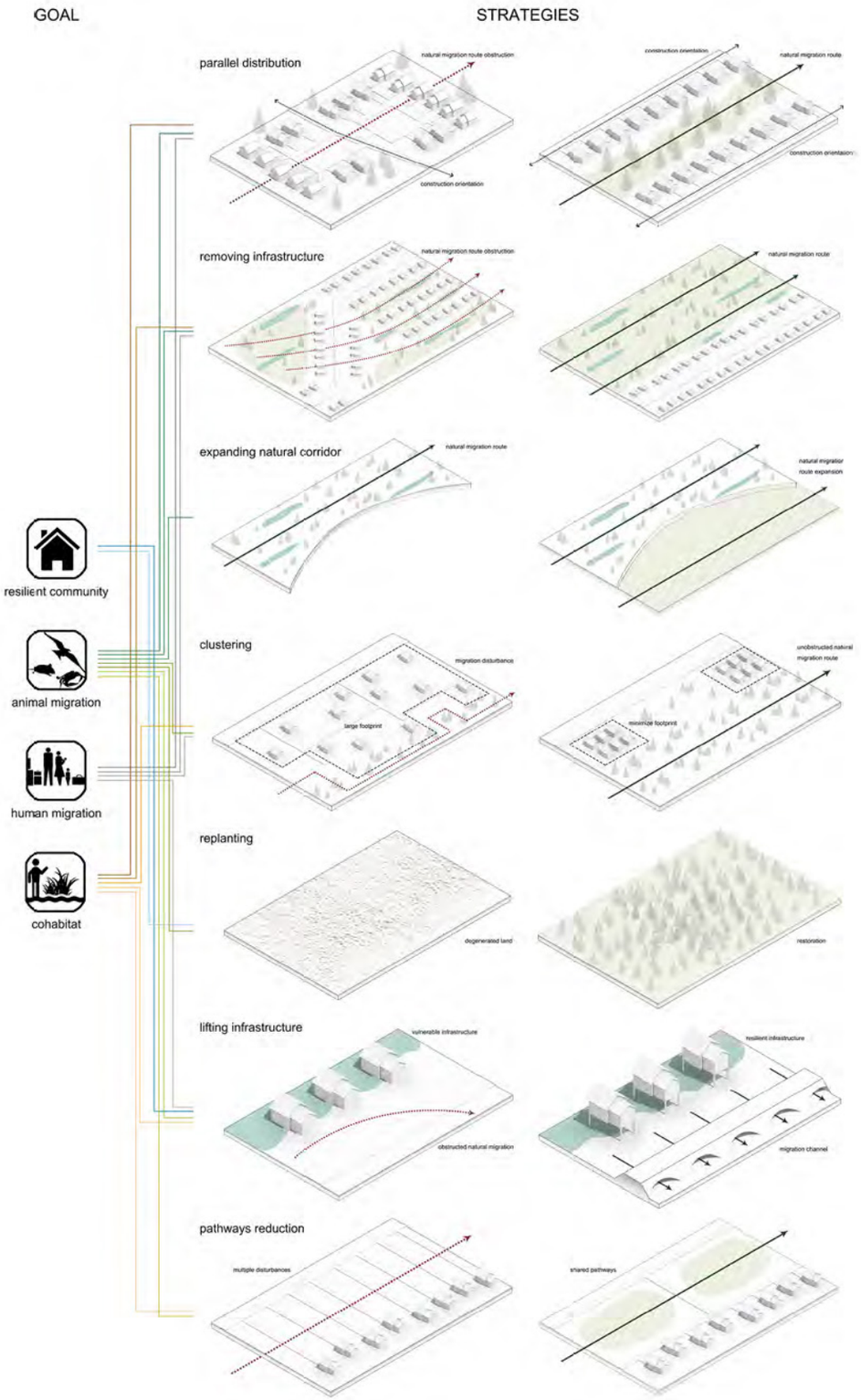


FORT MORGAN PENINSULA

Bon Secour National Wildlife Refuge is home to a variety of wildl fe. Many of these animals are threatened by losing habitat because of sea level rise. The refuge encompasses some of Alabama's last remaining undisturbed coastal barrier habitat, including beach dunes and rolling pine-oak woodlands.

There are endangered species in this region. The Alabama beach mouse that can be found in coastal dune ecosystems is one example. Thriving beach mouse populations are an indicator of healthy dune ecosystems which help protect coastal habitats, especially during hurricanes.

Habitats on the peninsula have been cut into fragments because of human development (communities, recreational facilities, roads, etc.). When sea levels rise, wildlife lose their habitats and have to migrate inland. These developed areas can be constraints on their migration routes.

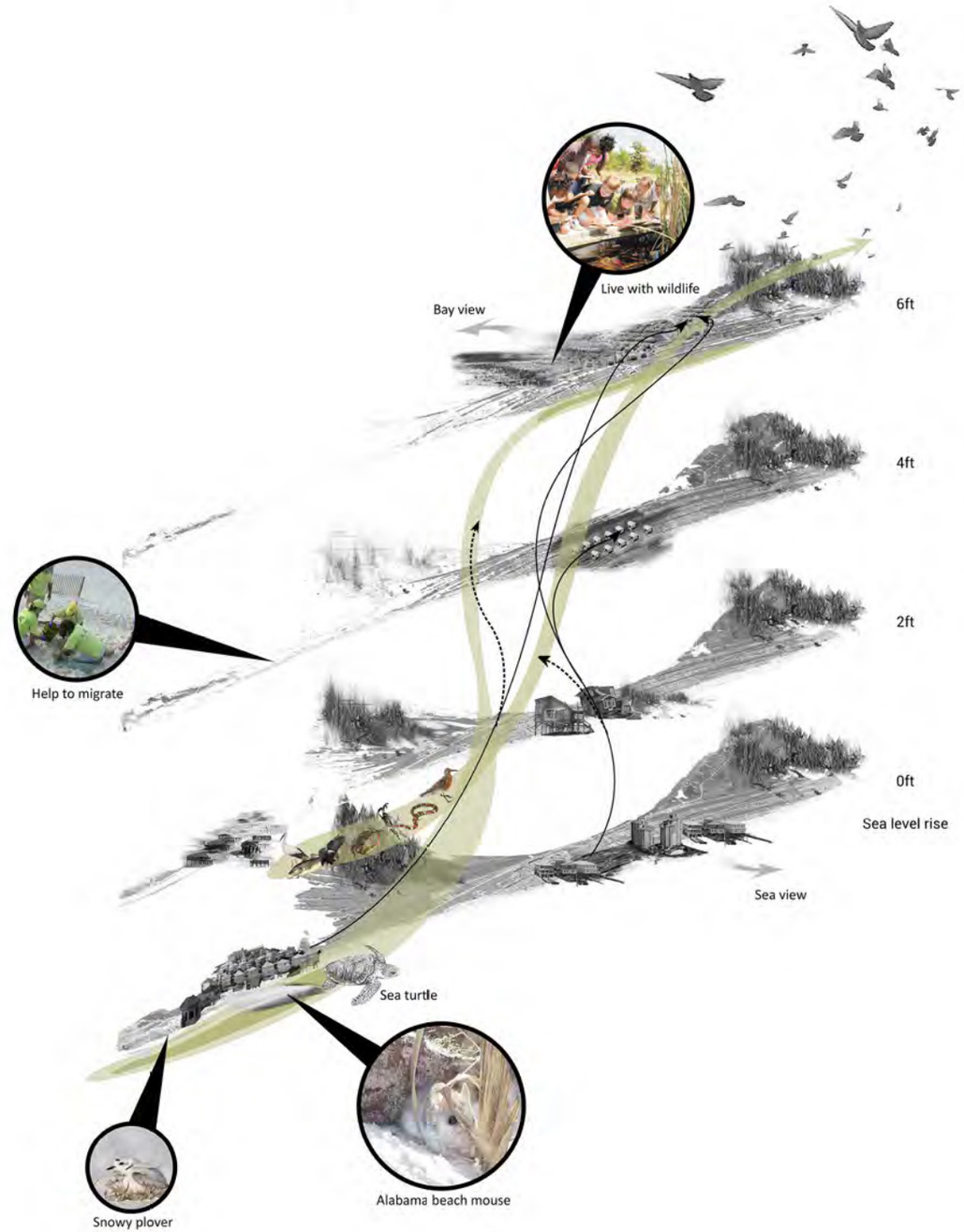


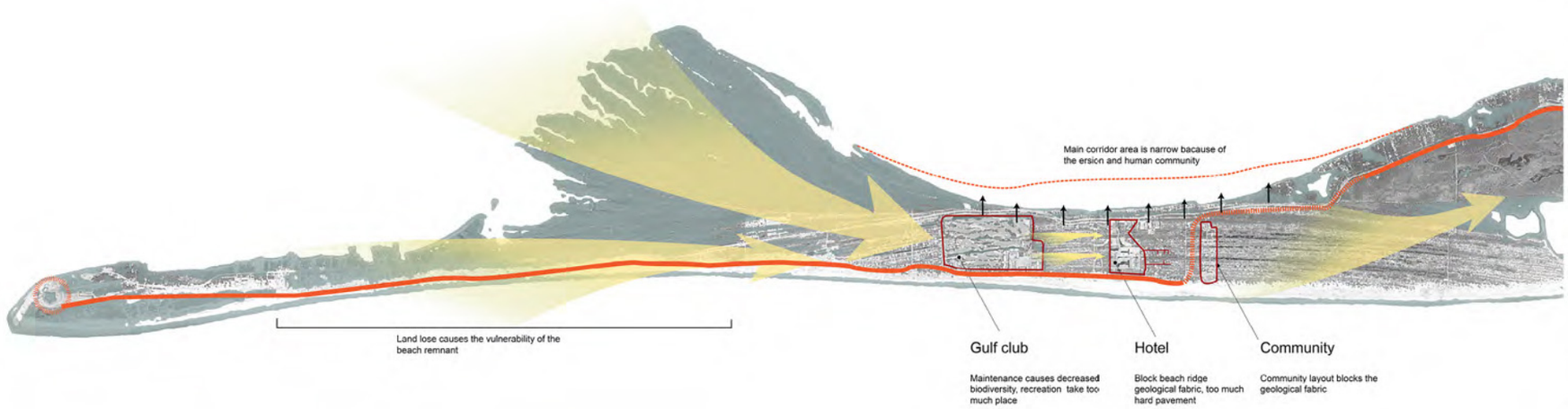
MIGRATION CONCEPT

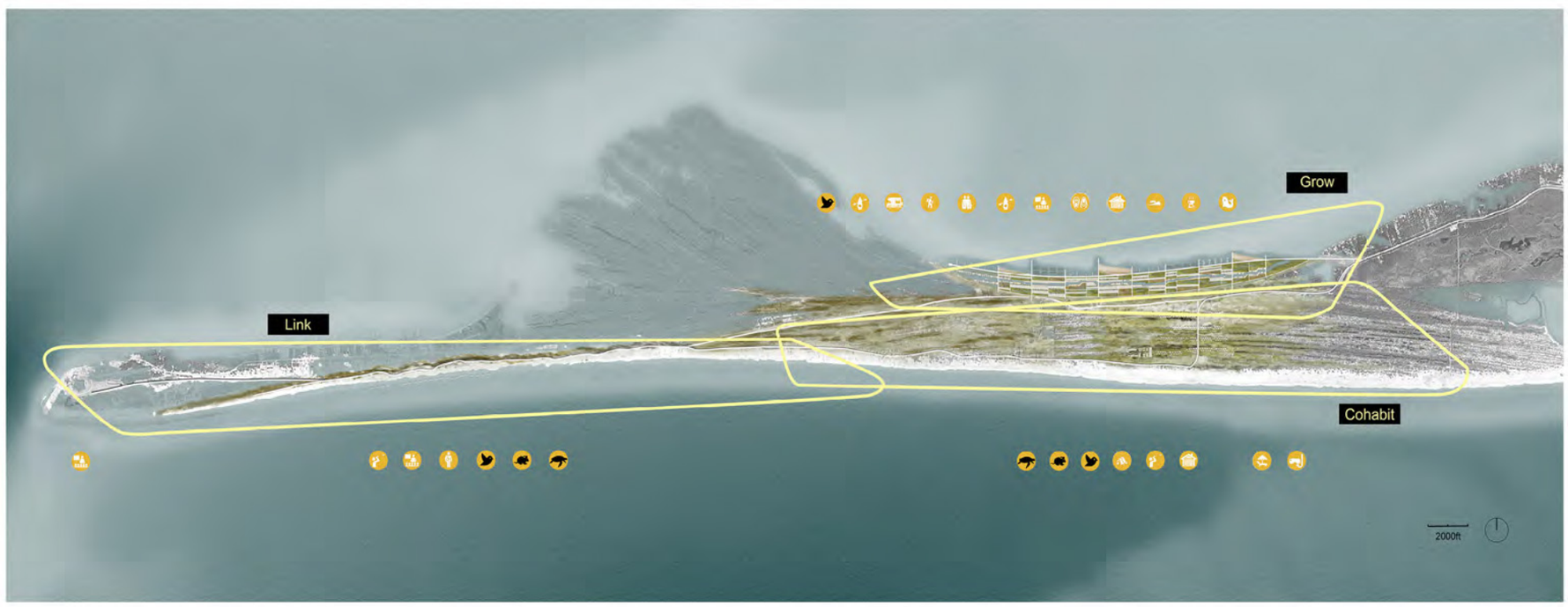
The typical community can adapt to become more helpful to migration, improving both peoples' experiences at a site scale and natural migration at a regional scale.

LEFT
Goals corresponding strategies in different situations.

RIGHT
People and wildlife migration.







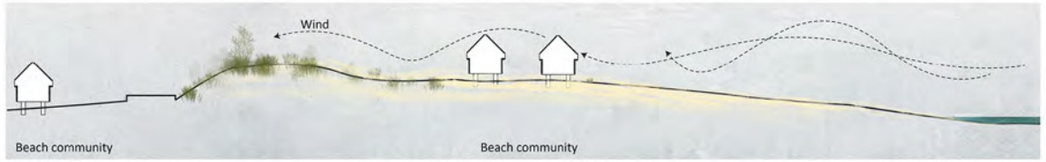
CONSTRAINTS AND PHASES

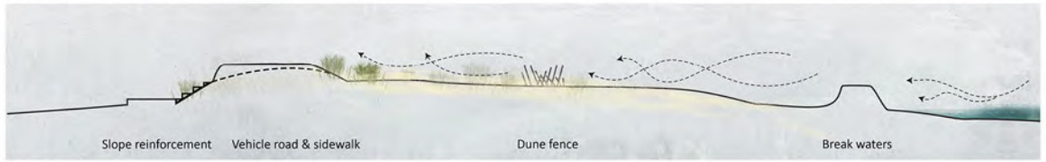
New experiences will emerge on the island. Static development patterns transform into a dynamic migratory system, offering new experiences for residents, students, and visitors.

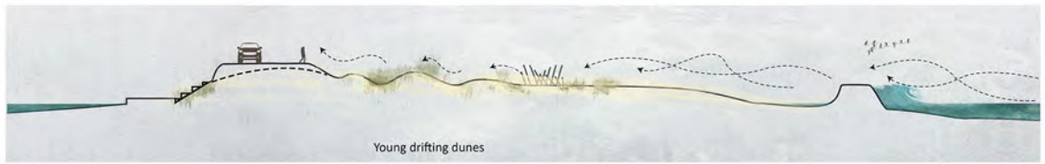
The design has three core components. The first is link, which helps to reserve the critical beach habitat. The second is cohabit, makes people capable of living with wildlife. The third is grow, which strengthens the migratory corridor. These three phases are based on the time frame of sea level rise and vulnerability of land, from what people can achieve now to future development on the peninsula.

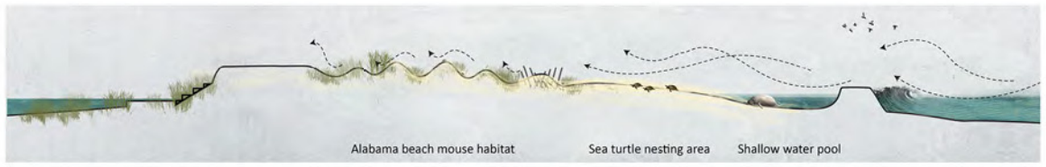
ABOVE
Main constraints for the migration

BELOW
Three phases and new experiences







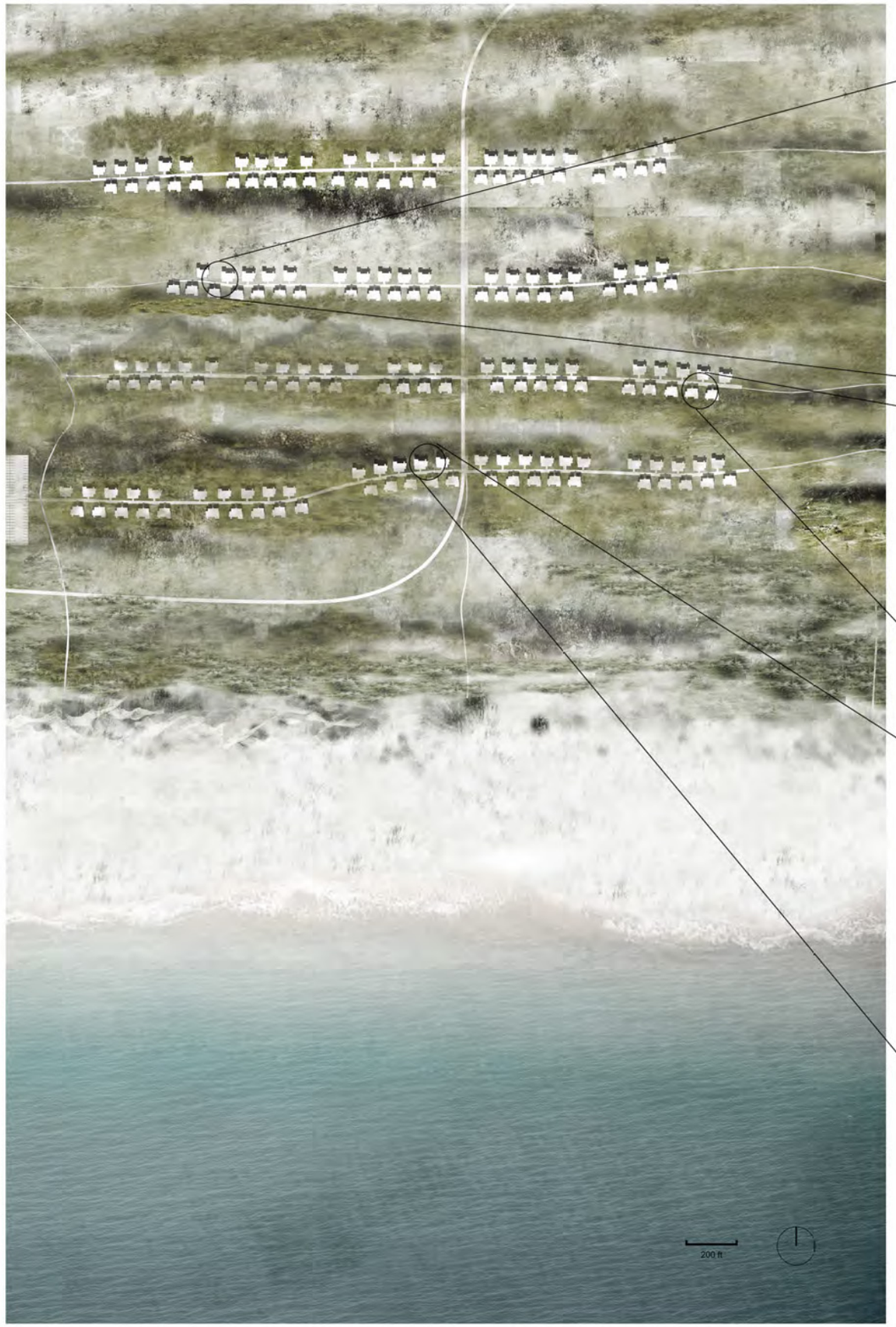


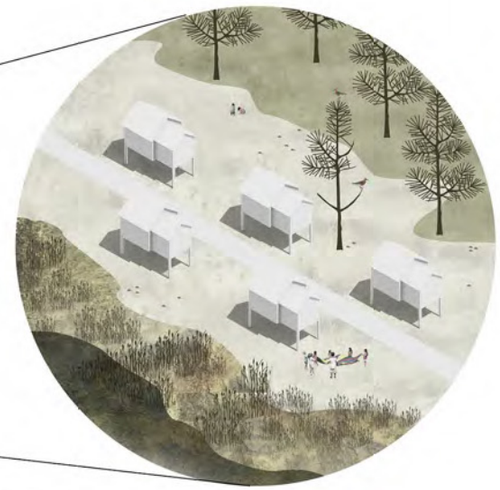
LINK

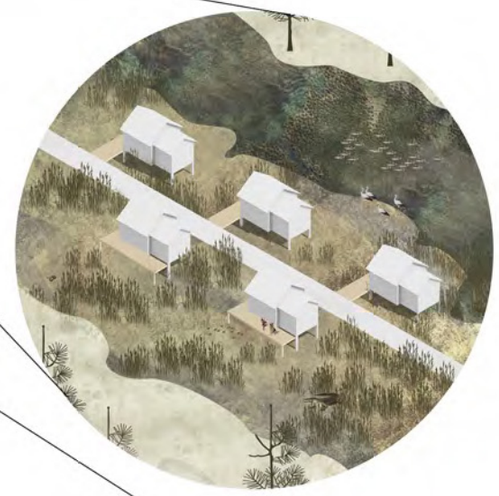
Education is important. People need to know about migration. The link proposes to host tours and wildlife watching along the beach in collaboration with students, volunteers, and educators. The aim is to build on the idea that engagement and persuasion plays a role in the design process.

CREATING BEACH RIDGES

Corridor and habitat for wildlife and provide volunteer and education opportunities along the beach





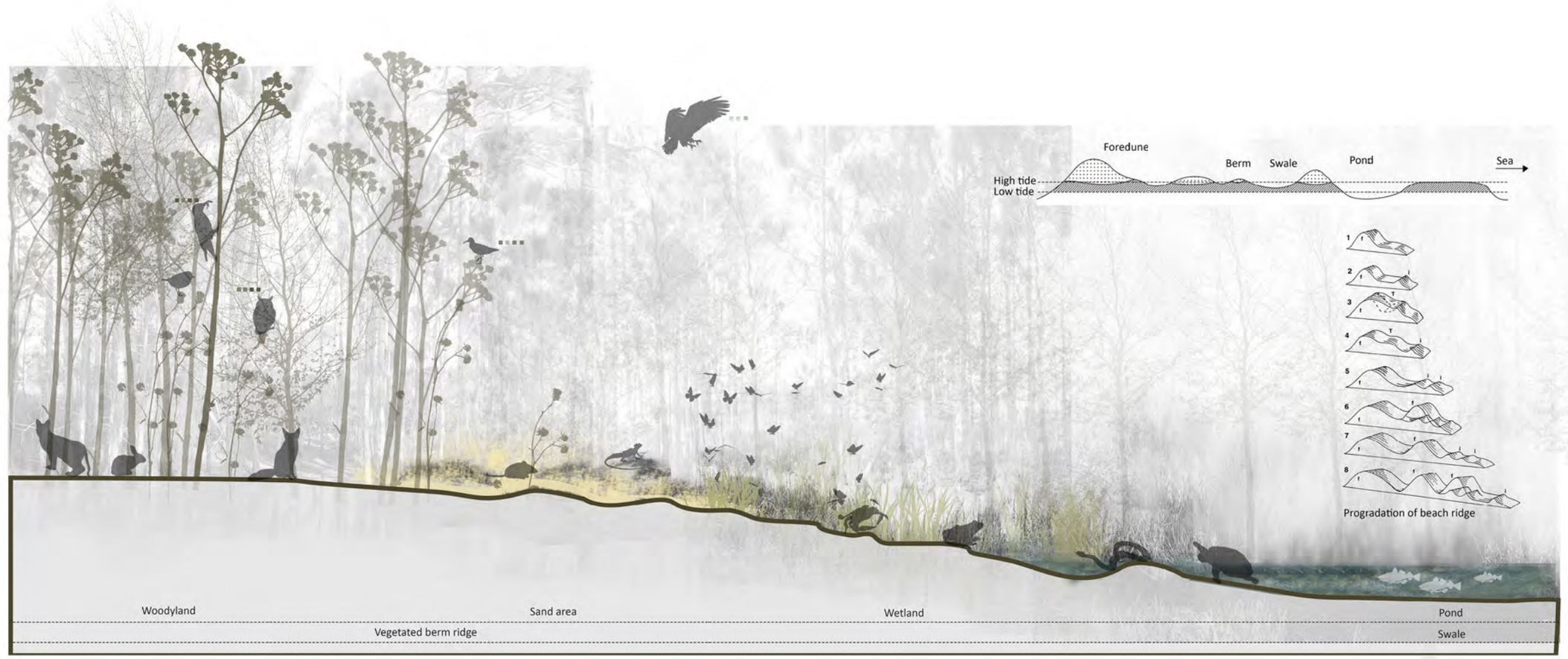


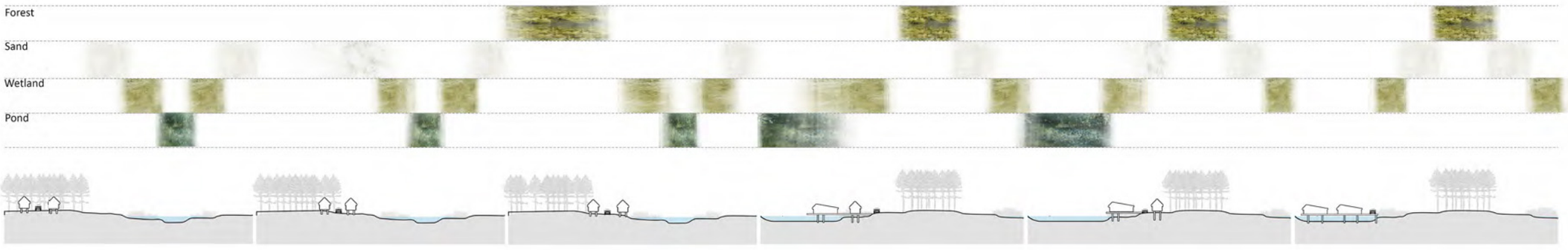
SHARE

Beach ridges are a major geomorphic feature of the peninsula. A beach ridge is a wave-swept or wave-deposited ridge running parallel to a shoreline. A decline in water level (or an uplift of land) can isolate a beach ridge from the body of water that created it. Three major habitats are distributed as linear shape along the beach ridges - beach, marsh, and forest.

The typical communities are organized cut through the beach ridges, which blocks the natural migration routes. The design proposes to reorganize these communities, make the construction orientation respond to the shape of beach ridges, and encourage natural migration routes. Under these circumstances, animals will less be disturbed by human dwellings, which can achieve the goal of cohabitation.

FOLLOWING SPREAD
Community arrangement with different beach ridges features.

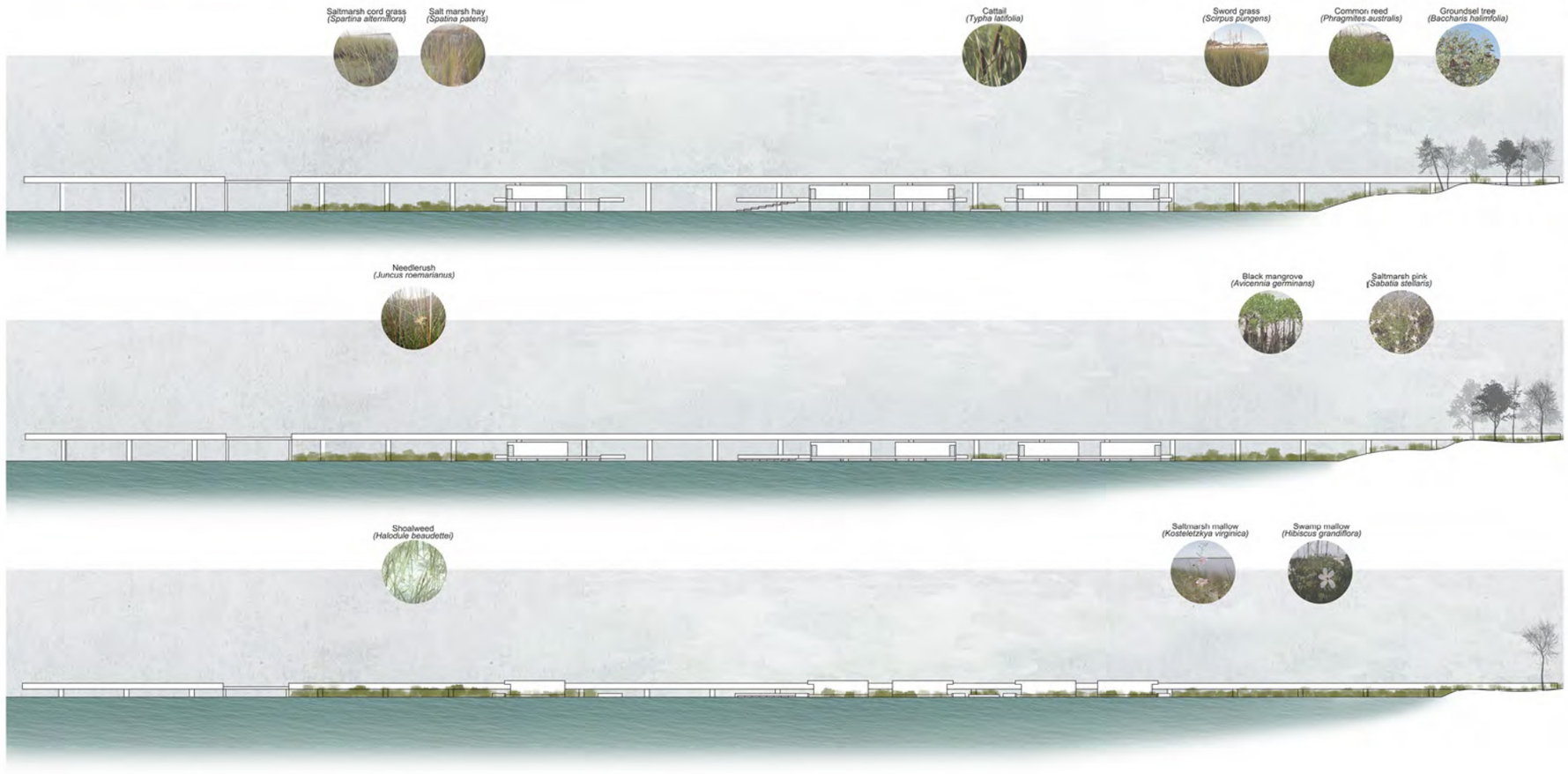

Foredune
Berm
Swale
Pond
Sea
High tide
Low tide
1
2
3
4
5
6
7
8
Progradation of beach ridge
Woodyland
Sand area
Wetland
Pond
Vegetated berm ridge
Swale

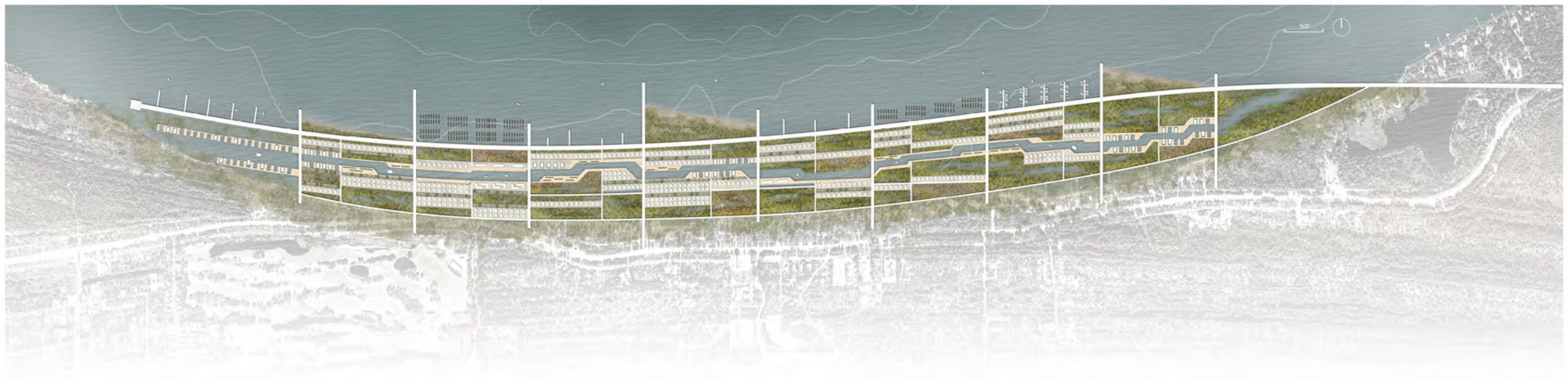

Forest
Sand
Wetland
Pond

COMMUNITY ON THE BEACH RIDGE
This community is parallel to the linear beach

COMMUNITY NEAR THE MARSH
This community is parallel to the linear marsh

COMMUNITY IN THE FOREST
This community is parallel to the linear forest





GROW

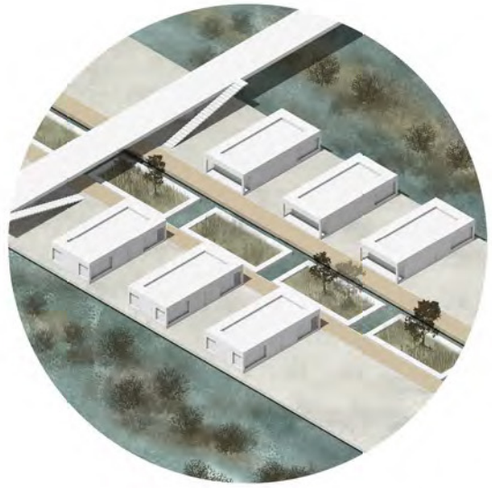
To deal with future potential threats from climate change, it is necessary to change the way that people are dwelling. The future community will float on the sea, which can deal with sea level rise and expand the natural corridor. It will supplement the land people and wildlife lost. People who lost their home can have a choice to move to the new community. The community provides a new and safer way people living near the shore.

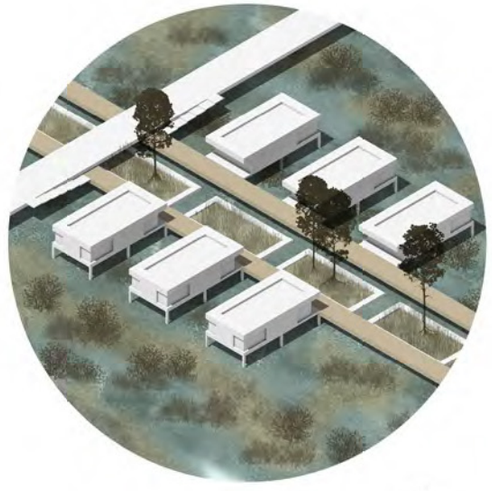
LEFT

Community responds to sea level rise.

BELOW

Plan of floating community.





ADAPTABLE COMMUNITY

Functionally speaking, the floating community provide dwelling space and natural habitat. Constructionally speaking, the floating house and green board can be adaptable to sea level rise. Instead of giving up homes before being submerged by sea water, the active structure of the community can rise and fall with the sea level, and thus preserve peoples' homes.

TOP ROW
0' sea level rise

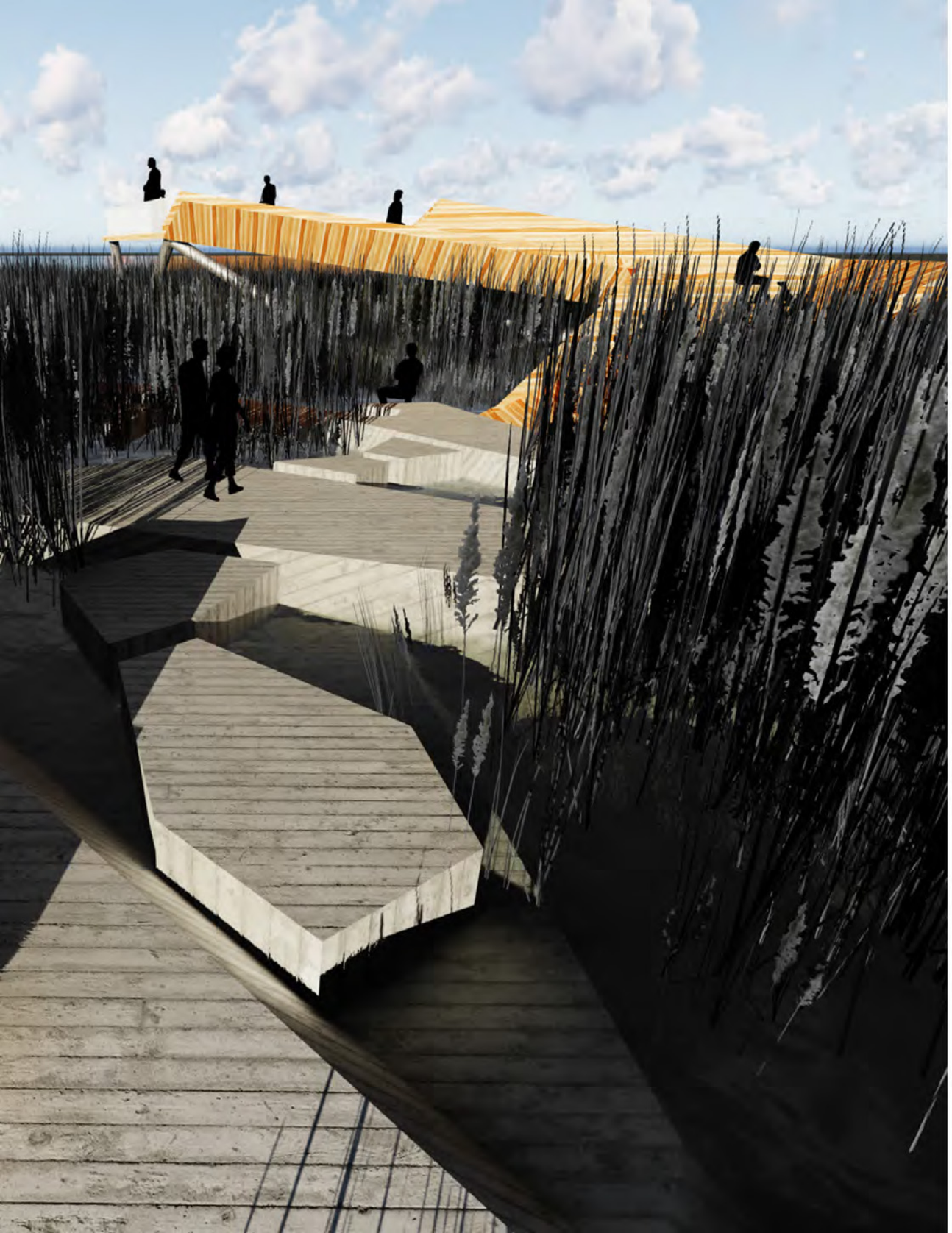
MIDDLE ROW
6' sea level rise

BOTTOM ROW
6'+ sea level rise

COMMUNITY
Bridge leads people to the sea

OYSTER FARM
Oyster production and education

MARSH
Provide habitat and prevent shoreline erosion



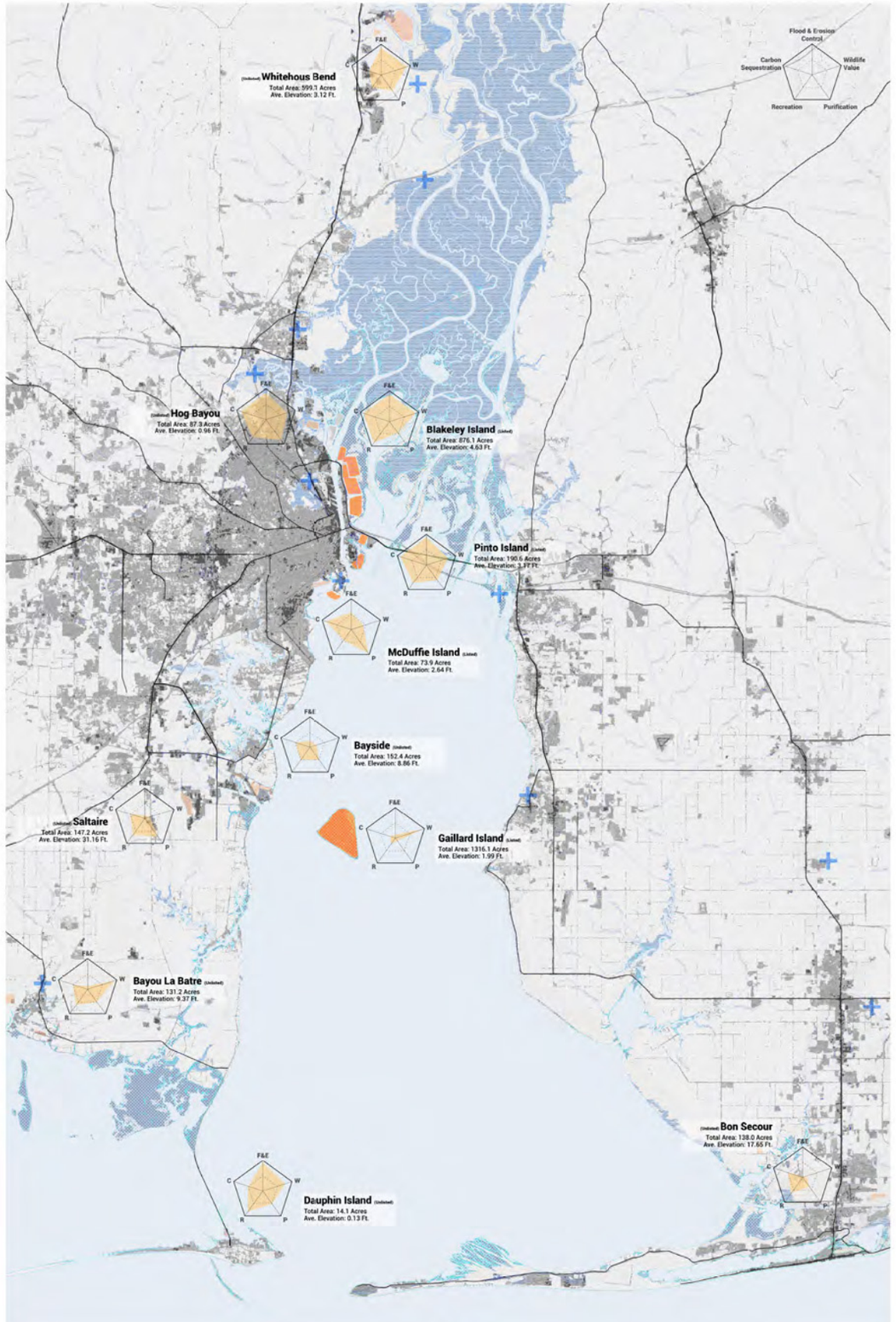
BLAKELEY ISLAND

Yuzhou Jin

As significant port, Mobile has a considerable amount of navigational dredging each year. As one of the products of the process of dredging, dredged material management areas (DMMAs) are taking more and more land. DMMAs are used to retain dredged material solids while permitting the carrier water to be released from the area. It is a tract of land is surrounded by dikes to form a confined surface area, and the dredged channel sediments are then pumped into this area hydraulically.

The project is inspired by the fact that some DMMAs spontaneously became habitats for migratory birds. This process shows the great potential of DMMAs to be transformed from pure industrial focus to multifunctional space.

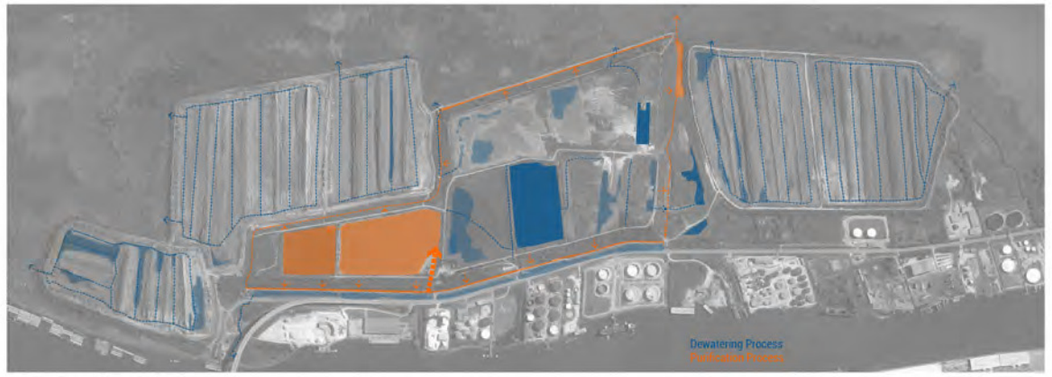
The selected site is on Blakeley Island, with about 942 acres in area. The main concept is to merge ecological, recreational, and industrial value altogether, and create a prototypical design that can be applied to other similar DMMAs.



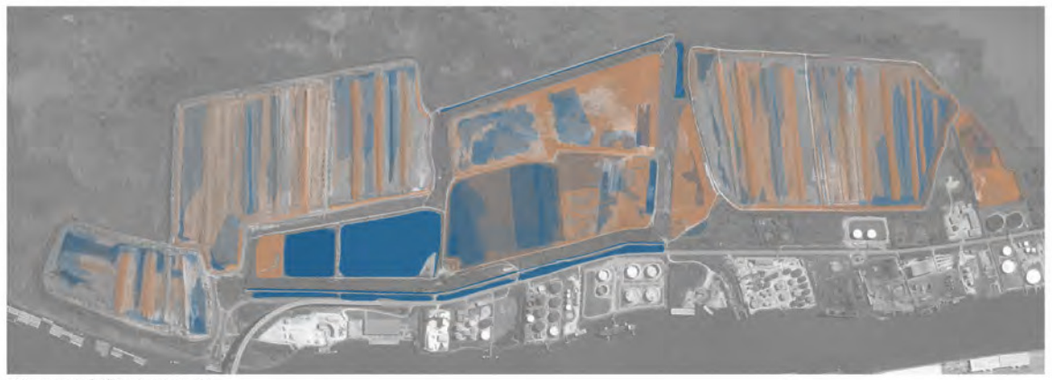
DMMA POTENTIAL ANALYSIS

This regional scale analysis shows various potentials including flood control, wildlife habitat, water purification, recreation, and carbon sequestration of different DMMAs in the bay.

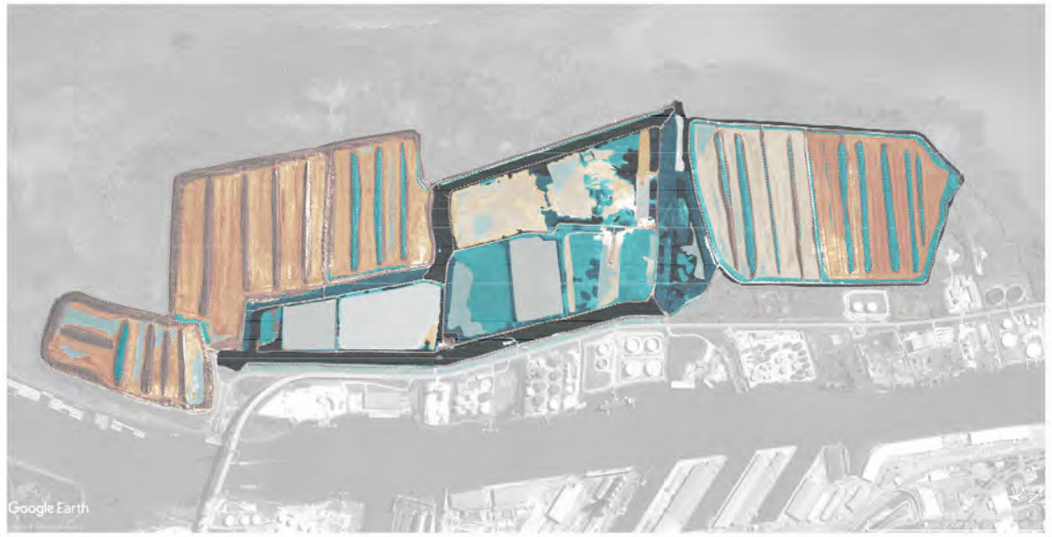
This study provides the basis for the subsequent site selection.



Water cycle analysis



Changeability analysis



Current land pattern type

SITE ANALYSIS

Water cycle analysis shows the circulation of dewatering process for dredged material, as well as the purification process for industrial waste treatment.

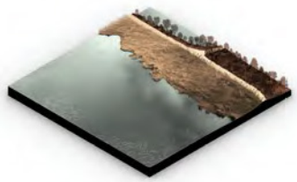
Changeability analysis overlaps the historical sediment and water pattern.

Current land pattern type illustrates all kinds of landscape patterns that currently existing on Blakeley Island.

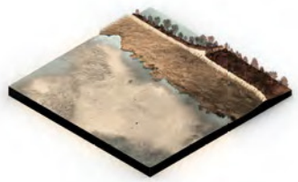
With 40 years of accumulation, the site gradually transformed from the beginning of simple DMMAs to multifunctional landscape medium. In addition to stockpiling dredged material, the site now has a certain ecological value and the potential for recreational activities.

PROTOTYPE I

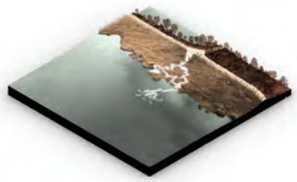
This design attempts to combine bird watching, bird migration, and dewatering processes.



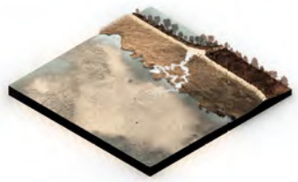
During dewatering



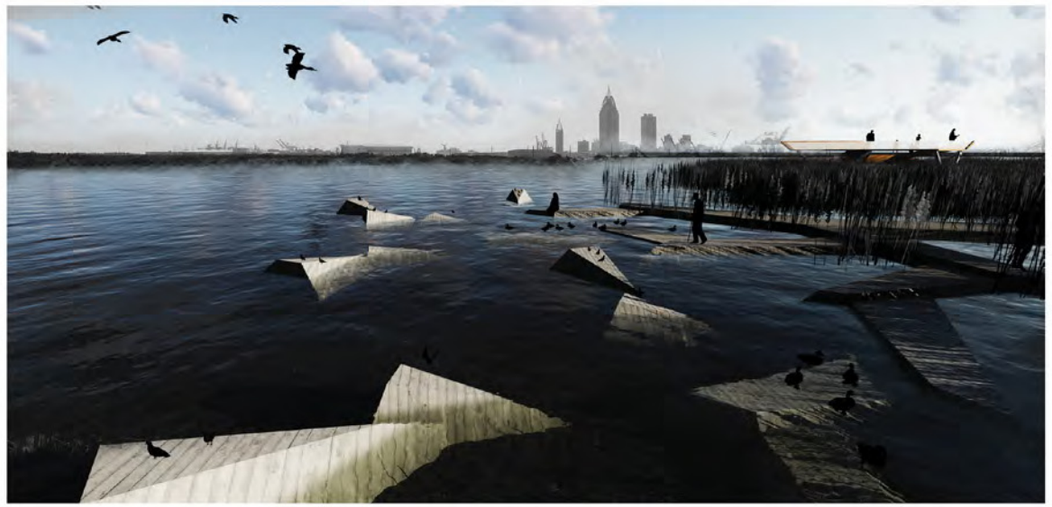
After dewatering

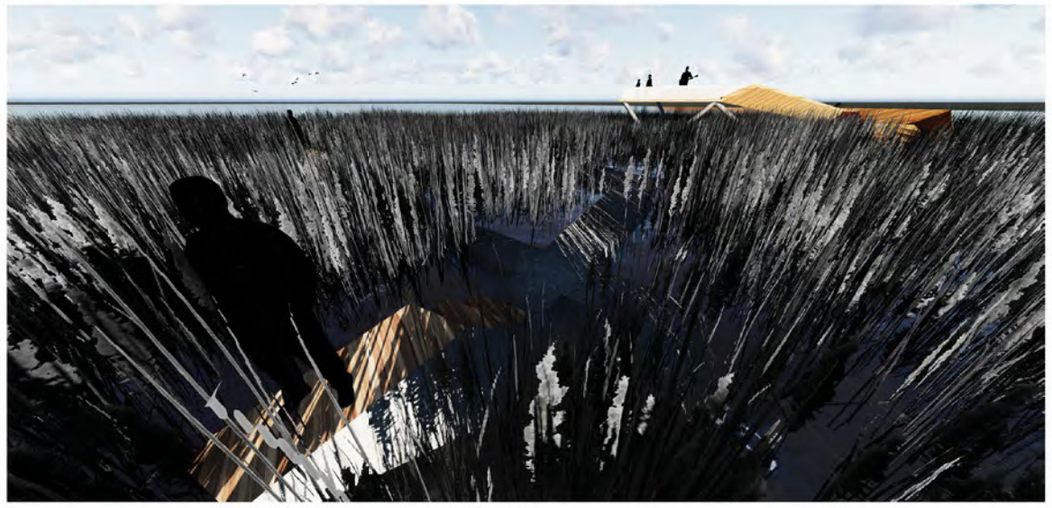


Access during dewatering



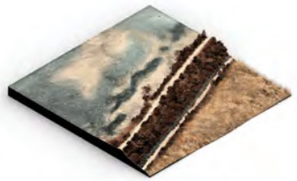
Access after dewatering





PROTOTYPE II

This design attempts to amplify the feeling of vastness of the DMMA and the surrounding wetlands.



After dewatering

During dewatering

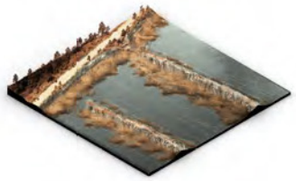
Access after dewatering

Access during dewatering

PROTOTYPE III

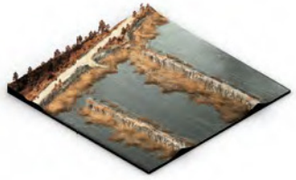
This design attempts to use a movable bridge structure to help the visitor access to the DMMA's unique space at any time.

After dewatering

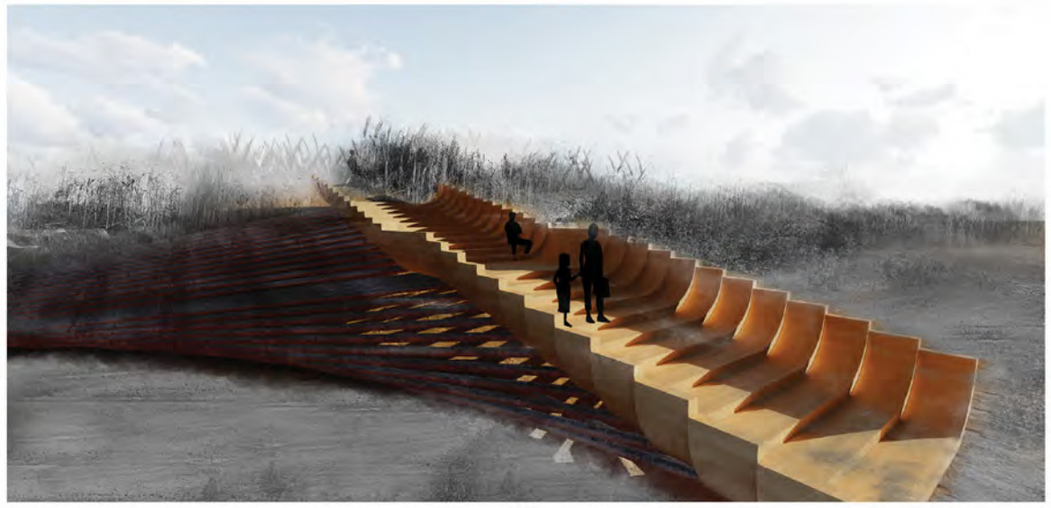


During dewatering

Access after dewatering



Access during dewatering



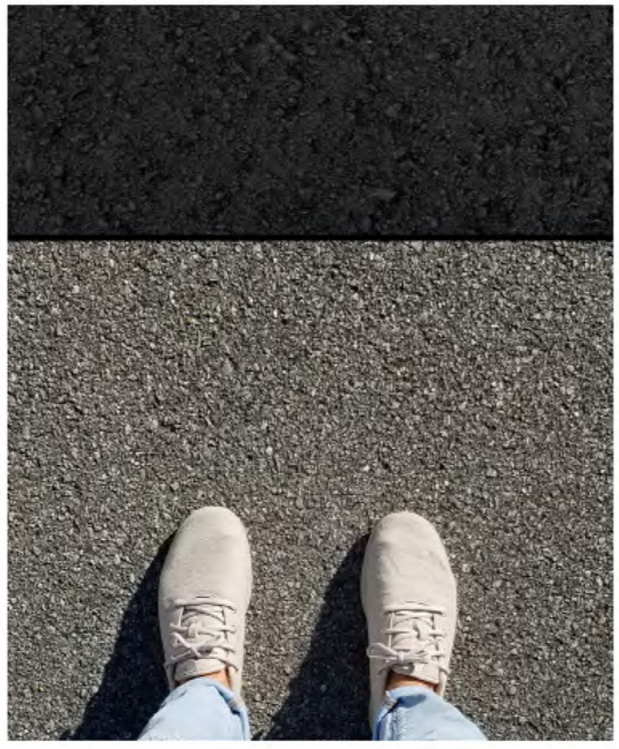
DAUPHIN ISLAND

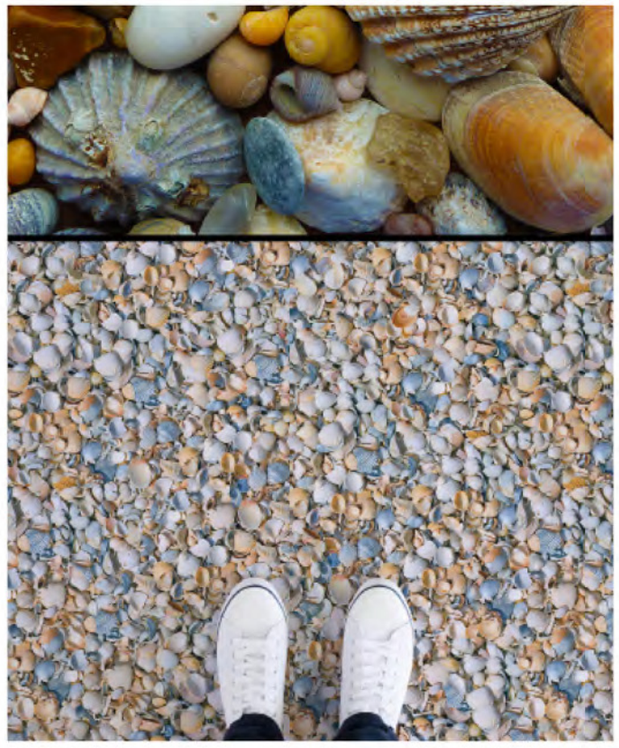
Alexander Channell

This project investigated Dauphin Island and its job as a barrier island to protect Mobile Bay. The island has shifted slightly over the years, but the real problem has been hurricanes, especially Hurricane Katrina. Hurricane Katrina blew a major hole in the island significantly weakening its ability to protect Mobile Bay. This project aims to educate and involve the community as well as strengthen Dauphin Island for long term protection against natural disasters and natural erosion.

BARRIER ISLAND

Dauphin Island has undergone a lot of change in recent years. Besides its usual movement due to erosion and littoral drift, there have been a number of strong hurricanes. Hurricane Katrina affected Dauphin Island more than any other recent one. Hurricane Katrina actually broke the island in two. This significantly affected Mobile Bay, the bay that Dauphin Island is supposed to be protecting. A man-made stone wall was made to reconnect the two parts of the island and capture sediment to insure the island performs as it should.



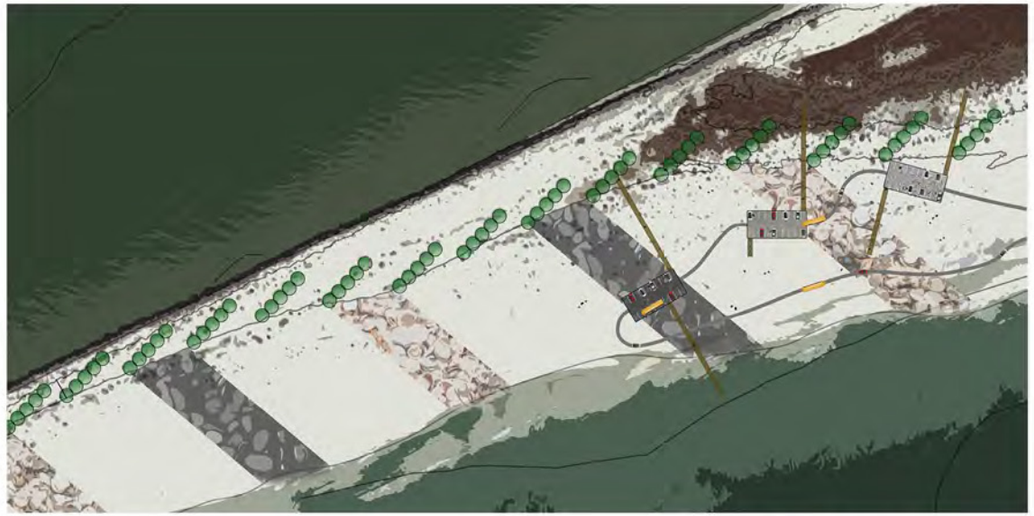


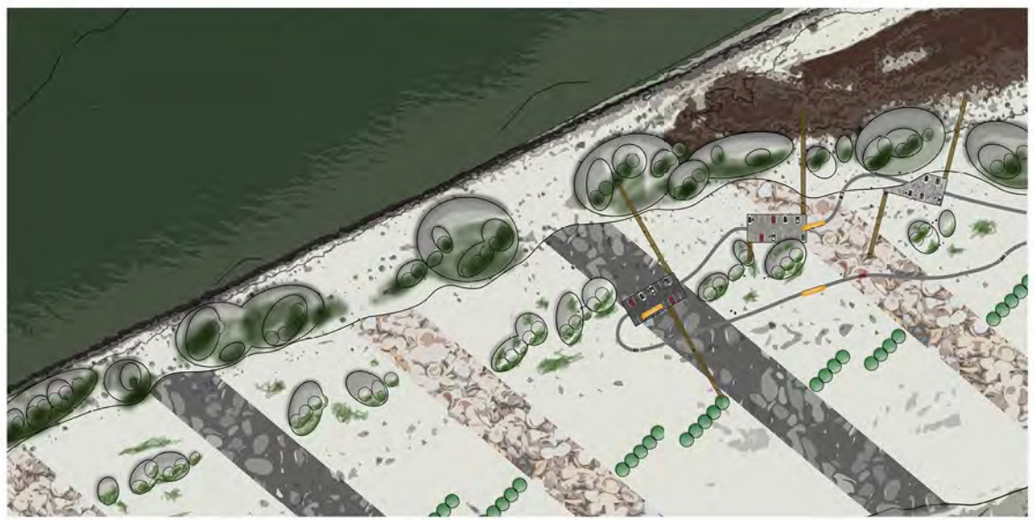
TEXTURE

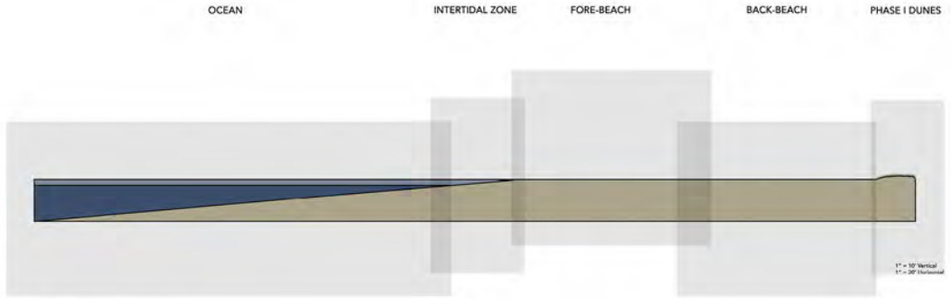
This design seeks to impose contrasting textures to heighten the experience of the person on this site. These textures are not just experiential, they play an important role in the accretion of sediment for the island to maintain integrity through future storms of magnitude.

SEDIMENT ACCRETION

This design seeks to use materials in accordance with wind, tidal, and solar orientations in order to capture sediment. Certain materials imposed on the landscape will either accelerate or decelerate the movement of sediment across the ground plane. Other materials are meant to capture the sediment so it can accumulate. This space will change over time, giving a dynamic experience for those who come to visit, and especially for those who played a role in its implementation. The implementation will occur as frequently as the island accumulates, giving multiple generations the opportunity to implement as well as experience this space at different phases.



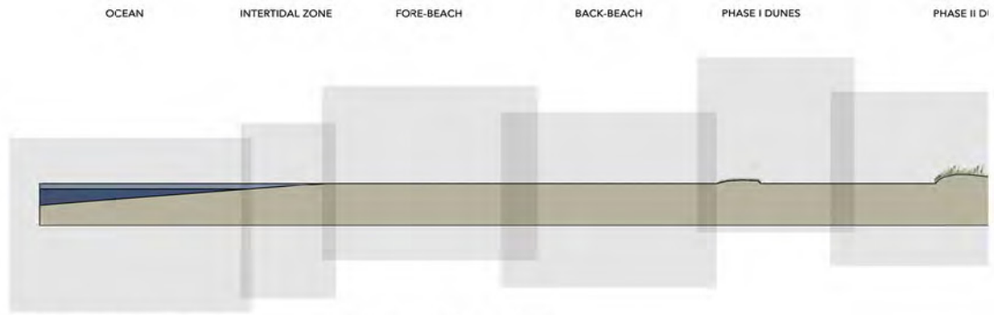




PHASE I DUNE PLANTINGS

Dune Initiator

- *Sesuvium portulacastrum*
Sea Purslane



PHASE I DUNE PLANTINGS

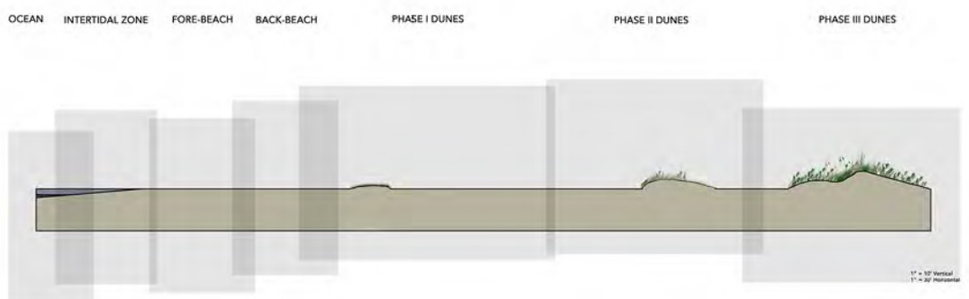
Dune Initiator

- *Sesuvium portulacastrum*
Sea Purslane

PHASE II DUNE PLANTINGS

Dune Builder

- *Uniola paniculata*
Sea Oats



PHASE I DUNE PLANTINGS

Dune Initiator

- *Sesuvium portulacastrum*
Sea Purslane

PHASE II DUNE PLANTINGS

Dune Builder

- *Uniola paniculata*
Sea Oats

PHASE III DUNE PLANTINGS

Dune Stabilizer

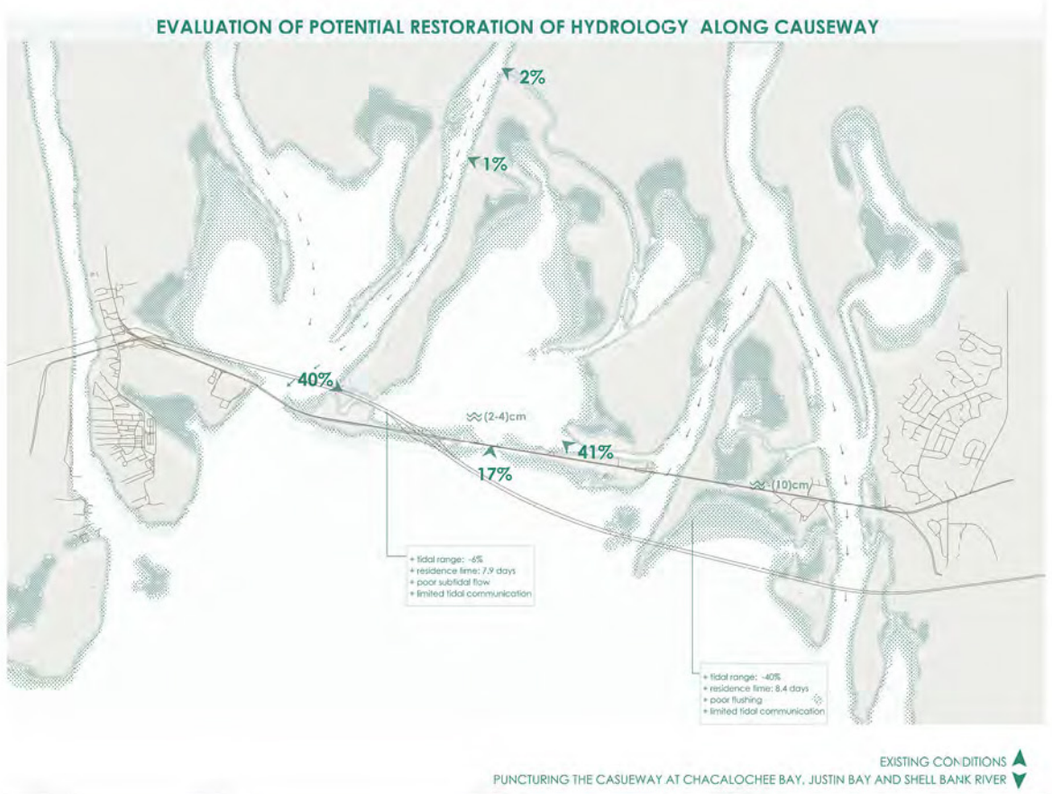
- *Ceratiola ericoides*
Florida Rosemary

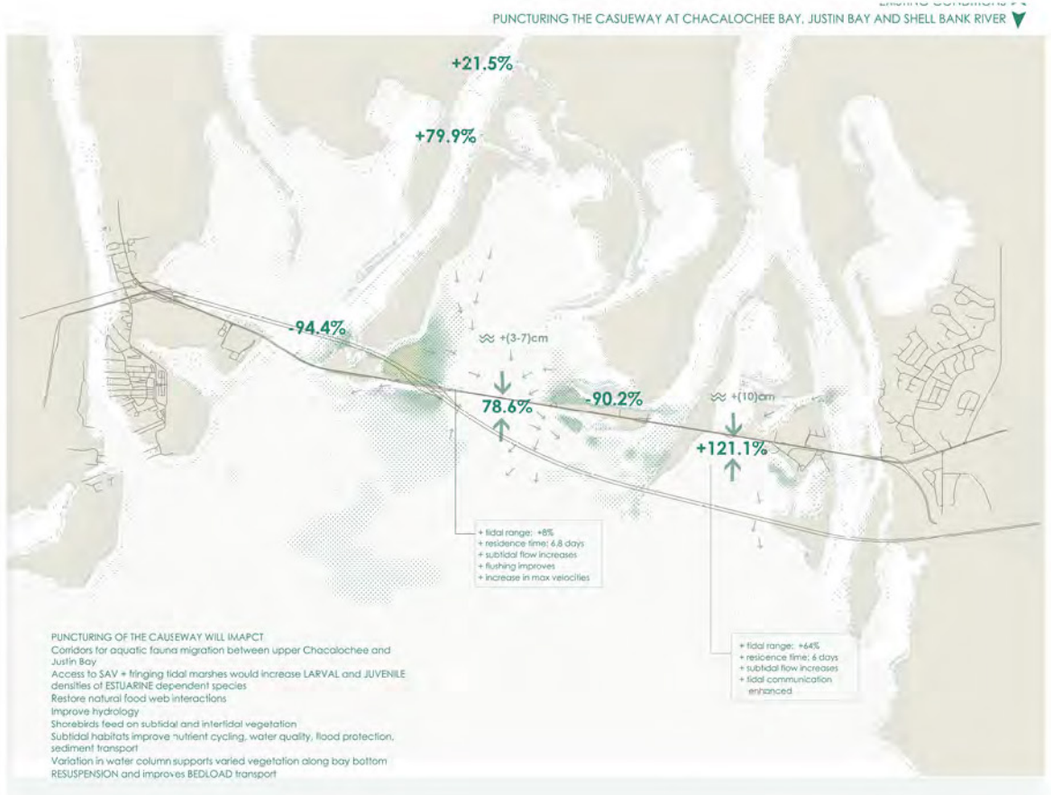
BATTLESHIP PARKWAY

Jaspuneet Kaur

Radhika Shenoy

Battleship Parkway, commonly referred to as the "Causeway", is a 7-mile long causeway that carries US 90 and US 98 eastbound across Mobile Bay from the Bankhead Tunnel on Blakeley Island in Mobile, Alabama to Spanish Fort, Alabama. Constructed in 1926, this busy piece of infrastructure connects Mobile County to Baldwin County across the Bay. At the time the Causeway was constructed, filling the marsh areas was preferred over the construction of an elevated roadway due to technological and funding limitaticns. Large areas of open water/marsh habitat were filled with dredged material in certain locations in order to provide a base for the roadway. As a result, the constructed land impeded flow between areas north and south of the Causeway and interrupted natural processes of the delta system and estuary. This has created a barrier between the Delta and Mobile Bay with the exception of four narrow channel openings currently existing in the Causeway. While some species depend on Battleship Parkway for nesting and feedings, it acts as a barrier to several others. This proposal aims at restoring some of the hydrological and sediment cycles in the bay by implementing certain design strategies on and throughout the causeway. It also uses the Causeway to help educate its visitors/users about the dynamic forces like Sea Level rise, and habitat loss that effect the Bay.





HYDROLOGY OF THE MOBILE BAY

Coastal Alabama has a dynamic hydrological system. The north end of Mobile Bay, where the Mobile and Tensaw rivers flow into the bay is a good example of this complexity. The mixing of brackish water from the south bay and freshwater from the Mobile-Tensaw River Delta, along with a combination of forces like wind, tides, sea level rise, hurricanes make the Mobile Bay an ever-changing, complex ecosystem. The Bay also has an average shallow depth of 10 feet thereby creating varied micro-climate required to support the diverse flora and fauna found in the Bay.

EXISTING HYDROLOGY

The Alabama Department of Conservation and Natural Resource's (ADCNR), Investigation of Restoration of Hydrology on Mobile Bay Causeway focuses on three conceptual Causeway restoration locations as indicated on the maps above. These locations include Choccolatta Bay, Justins Bay, and Shellbank River. Creating openings in these spots have been studied to have significantly improved the hydrology of the bay.

THE CAUSEWAY - HABITAT

Mobile Bay's coastal communities will be substantially affected with the predicted sea level rise which are in the range of 18-59 cm for the next 80 years. The vulnerability of social, ecological and infrastructural entities along the coast is further increased by storm surges and precipitation. Mobile Bay has a broad range of transportation modes, including highways, airports, transit, marine ports and oil and gas pipelines. One such example of low-lying coastal infrastructure that is vulnerable is the Battleship Parkway, a causeway that connects Mobile County to Baldwin County.

CAUSEWAY AS HABITAT

(Following page)

Alabama Red Bellied Cooters, Gulf Sturgeon, Alabama Shad, Piping Plover are only a few out of the many species that will be at risk when the sea level rises. Presence of submerged aquatic vegetation (SAV) – macrophytes along the causeway make it the preferred habitat for most species.

gulf sturgeon
[acipenser oxyrinchus desotoi]

gulf sturgeon
[acipenser oxyrinchus desotoi]

alabama red-bellied turtle
[pseudemys alabamaensis]

why does gulf sturgeon matter

Acipenser means sturgeon
Oxyrinchus means sharp snout
Desotoi honors Hernando de Soto

The Gulf sturgeon traces its ancestry back 200 million years
appearance: not much has changed **[dinosaur age]**

decline

overfishing, throughout most of the 20th century
construction of water control structures, such as dams and "sills", mostly after 1950, exacerbated habitat loss
dredging
groundwater extraction
irrigation
flow alterations
poor water quality
contaminants, from industrial sources

Anadromous fish

characterstics
lifecycle, habits, and needs

weight:
up to 200 pounds (90 kg)

length:
4-8 feet (1-2.5 m)

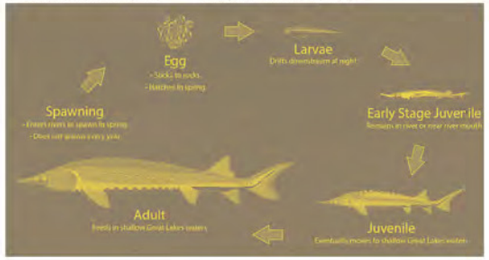
appearance:
color, special features
primitive fish
characterized by bony plates, or "scutes," and a hard, extended snout

lifespan:
20-25 years on average, but can live up to 60 years

diet:
brachiopods, mollusks, worms, and crustaceans

Gulf sturgeon have no teeth
They are bottom feeders and will skim the muddy bottom for food

Habitat Use:
they migrate into rivers to spawn in the spring



habitat
nest

From November through January individuals reside in estuaries and near shores, where they feed on amphipods, isopods, midges, crabs, and shrimp.

February.
Upstream spawning runs usually begin

After spawning, adults retreat to deeper pools and remain there until August or September, when they return downstream.

When these fishes are in fresh water, feeding apparently ceases.

Spawning sites vary from river to river, but members of a single population probably return to the same general spawning area

Gulf sturgeon are bottom feeders, and eat primarily macroinvertebrates, including brachiopods, mollusks, worms, and crustaceans.

All foraging occurs in brackish or marine waters of the Gulf of Mexico and its estuaries; sturgeon do not forage in riverine habitat.

Gulf sturgeon migrate into rivers to spawn in the spring; spawning occurs in areas of clean substrate comprised of rock and rubble.

Their eggs are sticky, sink to the bottom, and adhere in clumps to snags, outcroppings, or other clean

why does the red cooter matter

was named the Alabama **state reptile** by the Alabama Legislature in 1990
brought to the Southeast by enslaved peoples from the West African nation of Mali

destruction of the beds of submerged aquatic vegetation

pollution and development reduce the quality and quantity of habitat

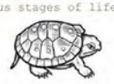
constructing bulkheads and riprap along bayous

range
is **restricted** to the Mobile-Tensaw River Delta in Mobile and Baldwin counties adjacent to Mobile Bay
exclusively in the Mobile-Tensaw Delta
rarely found north of Interstate 65

major rivers and tributaries of the Mobile Bay, Bayou La Batre, Fowl, Dog, Fish, Magnolia and Bon Secour rivers.

ecosystem services
food source at various stages of life

raccoons and fish crows

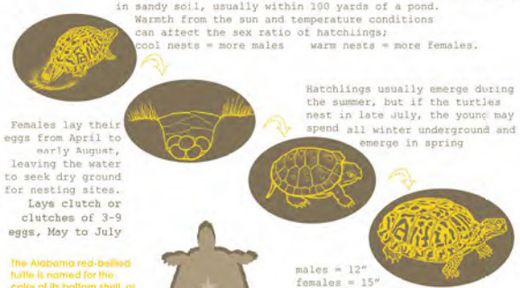


large fish, shore birds, snakes,

alligators

characterstics
lifecycle, habits, and needs

In late spring and early summer, females select nesting sites in sandy soil, usually within 100 yards of a pond.
Warmth from the sun and temperature conditions can affect the sex ratio of hatchlings;
cool nests = more males warm nests = more females.



Females lay their eggs from April to early August, leaving the water to seek dry ground for nesting sites.
Lays clutch or clutches of 3-9 eggs, May to July

Hatchlings usually emerge during the summer, but if the turtles nest in late July, the young may spend all winter underground and emerge in spring

The Alabama red-bellied turtle is named for the color of its bottom shell, or plastron, which can range from pale yellow to dark red but is most often orange to light red. The upper shell, or carapace, may be greenish to dark brown or black with red, orange, or yellow markings along the sides.

males = 12"
females = 15"
mating does occur in shallow water in the fall or spring
life span = 50 years
FEEDING HABITS: Herbaceous feeding on submergent aquatic macrophytes, such as hydrilla, brushy pondweed, eel-grass, arrowhead, and mud plantain.

habitat
nest

HABIT = invest a lot of energy serial lounging
HABITAT = the requirement for copious basking spots is a vital territory trademark for the species. Have dense beds of aquatic vegetation for basking.

River mouth/tidal river
Terrestrial Habitat: Sand/dune

Special Habitat Factors:
Benthic,
Burrowing in or using soil,
Fallen log/debris

Habitat Comments:
Most abundant in quiet backwaters of upper Mobile Bay in areas with dense submerged vegetation= **macrophytes**

in water generally 1-2 m deep; also in river channels; occurs only as a straggler in brackish water and salt marsh areas of lower Mobile Bay .

habitat prerequisites
amphibian vegetation for sustaining

sandy or loamy soils for nesting

delicate substrates at an adequate profundity for hibernation.

THE CAUSEWAY - TRANSPORTATION

The causeway is an active mode of transportation and recreation for people residing in Baldwin and Mobile counties and also a critical habitat for several species of plants, fish, animals, amphibians, reptiles and migratory birds. It is a piece of infrastructure that is valuable from both a cultural and ecological perspective.

- DEMOLISHED BUILDING
- VOLLEYBALL COURT
- PARKING
- FISHING
- WAR MEMORIAL
- FAST FOOD
- WILDLIFE CONSERVATION
- BOATING DOCK
- MUSIC
- SEAFOOD RESTAURANT
- RADIO TOWER
- AUTO REPAIR
- BAR
- HIKING
- STATE PARK
- INSTITUTION
- CAMPING

THE PROPOSAL

Our proposal looks at a series of strategies, that will educate people and change with the dynamics of the bay. While revealing sea level rise is one goal of the project, another is to conserve the species that depend on the causeway. These strategies include both designs that stretch across the entire length of the causeway and design strategies that may be repeated at intervals through out the causeway. This proposal aims to leverage the position of the causeway to educate people about complex problems ensued by global environmental changes. By facilitating the causeway for potential changes, it will act as a gauge that can measure changes in the sea level. Designing the causeway as a host for recreational activities like fishing, kayaking,bird-watching, and walking trail sets up conditions for public to engage. This association with infrastructure will make the intricate issues of sea level rise, flooding, as well as migration, spawning, and nesting of species in the bay tangible to the community.

NOW

2' SEA LEVEL RISE

4' SEA LEVEL RISE

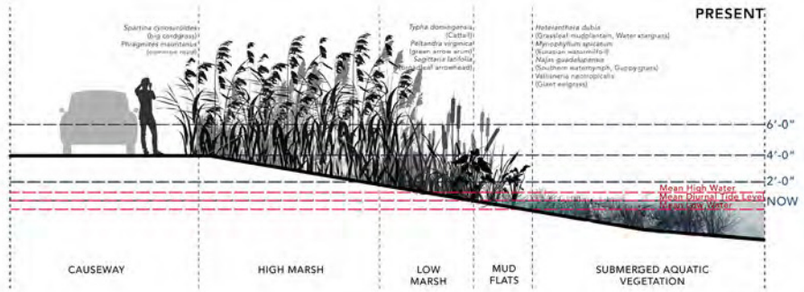
6' SEA LEVEL RISE

ACROSS THE ENTIRE LENGTH OF THE CAUSEWAY

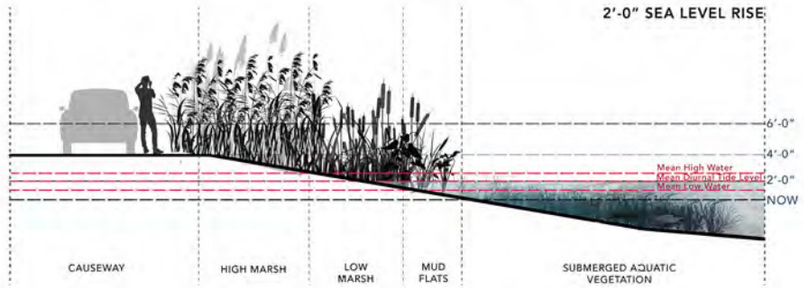
SEA LEVEL RISE ALONG THE CAUSEWAY

The diagrams suggest adaptive strategies that can be used to aid the transition of a transportation corridor into recreational infrastructure. This is achieved by the gradual narrowing of road widths with time so as to increase recreational and habitat value of the causeway.

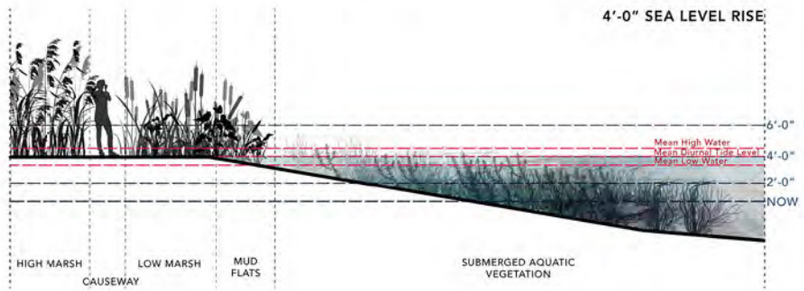
PRESENT



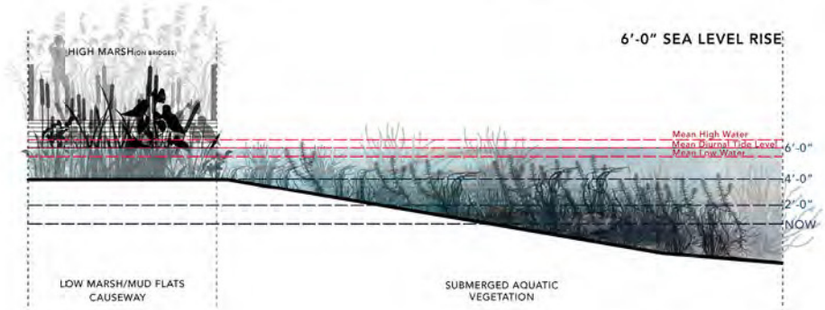
2'-0" SEA LEVEL RISE



4'-0" SEA LEVEL RISE



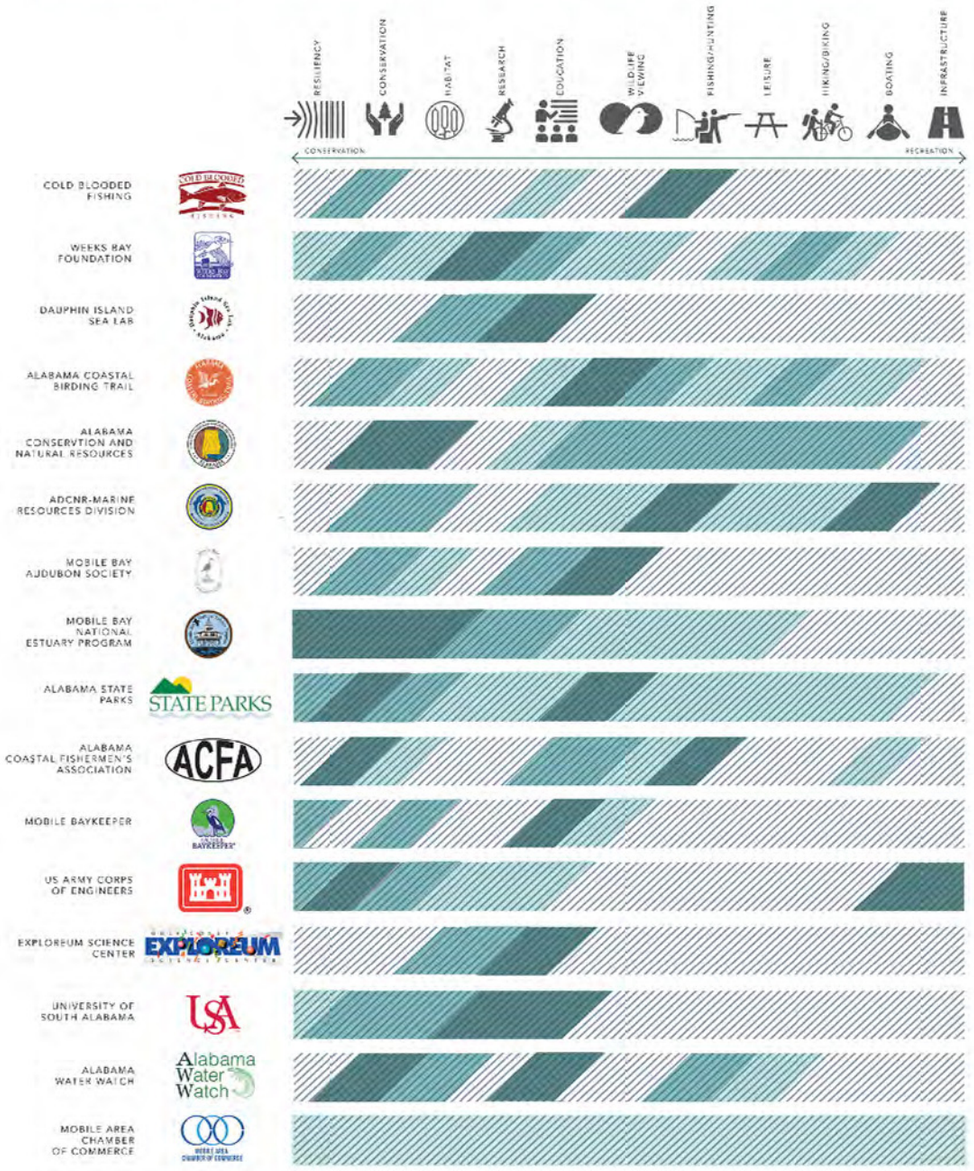
6'-0" SEA LEVEL RISE



MARSH MIGRATION

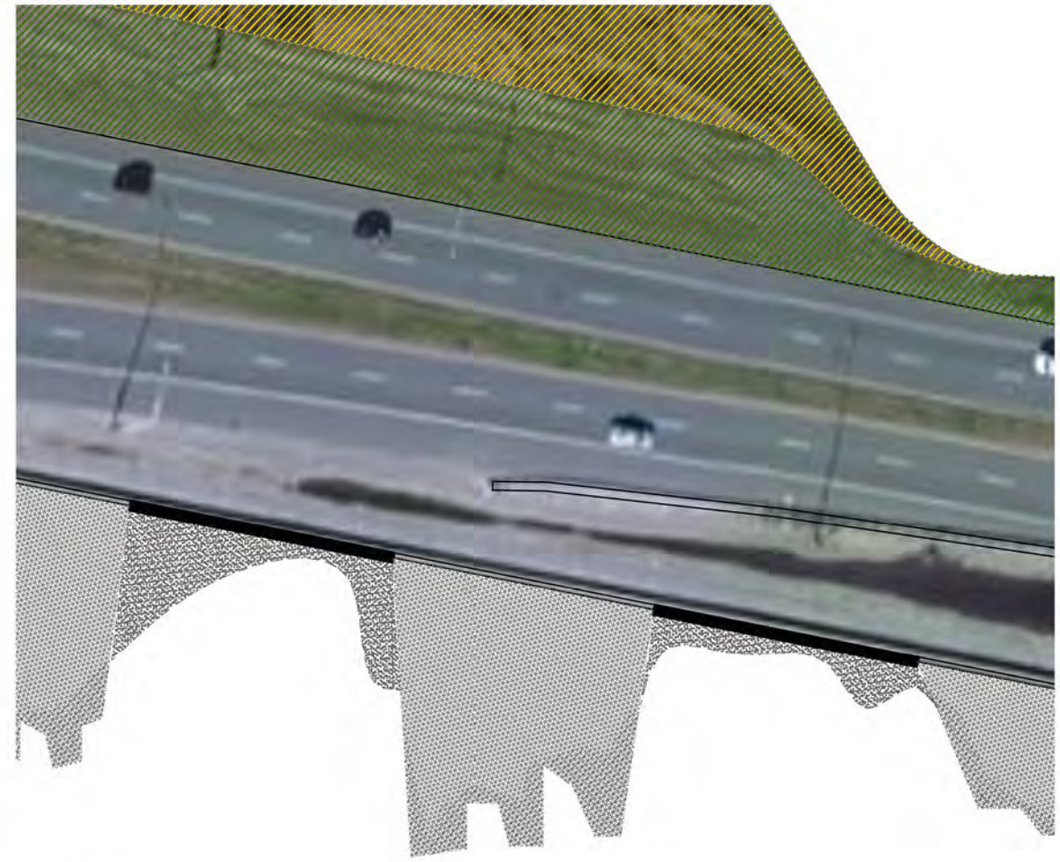
As sea-level rises the composition of the marshes changes too. For marshes to survive, additional land area needs to be provided so that they can migrate and adapt to this change. Bridges and widening of the causeways are strategies that help with marsh migration

POTENTIAL FRIENDS OF THE LIVING CAUSEWAY



EDUCATION AND ENGAGEMENT

Potential organizations that can be involved in making the causeway an engaging experience. Education plays a huge role in designing for change in the Mobile bay.

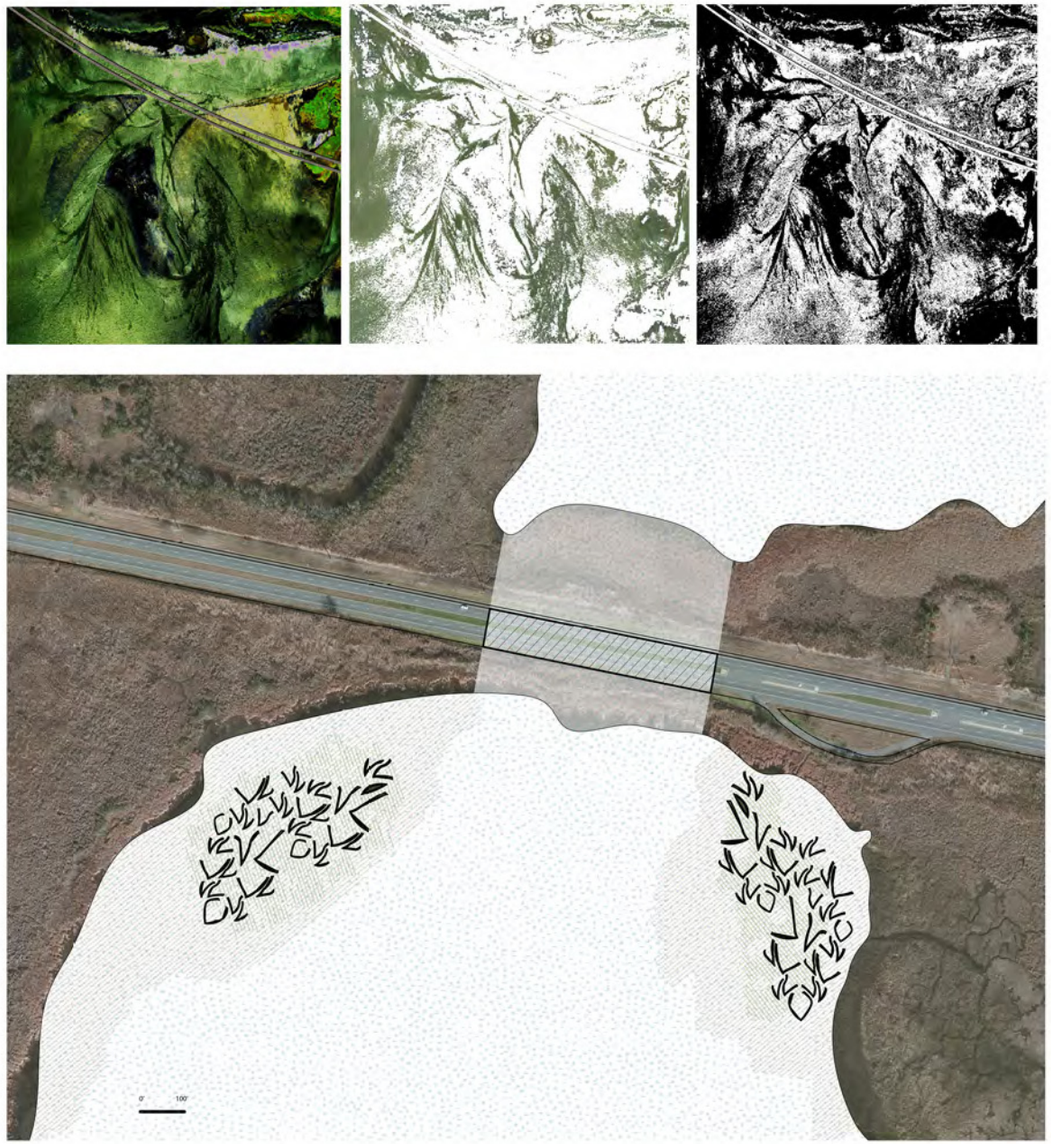


PROTOTYPES THAT ARE REPLICATED AT INTERVALS ALONG THE CAUSEWAY

This proposal also analyzes the change in peoples perception of the causeway over time. Designs like the proposed marsh rooms, breaking bulkheads, guano stakes and baffles are relatable to the human scale and help people perceive large changes in the bay in smaller scales of spaces.

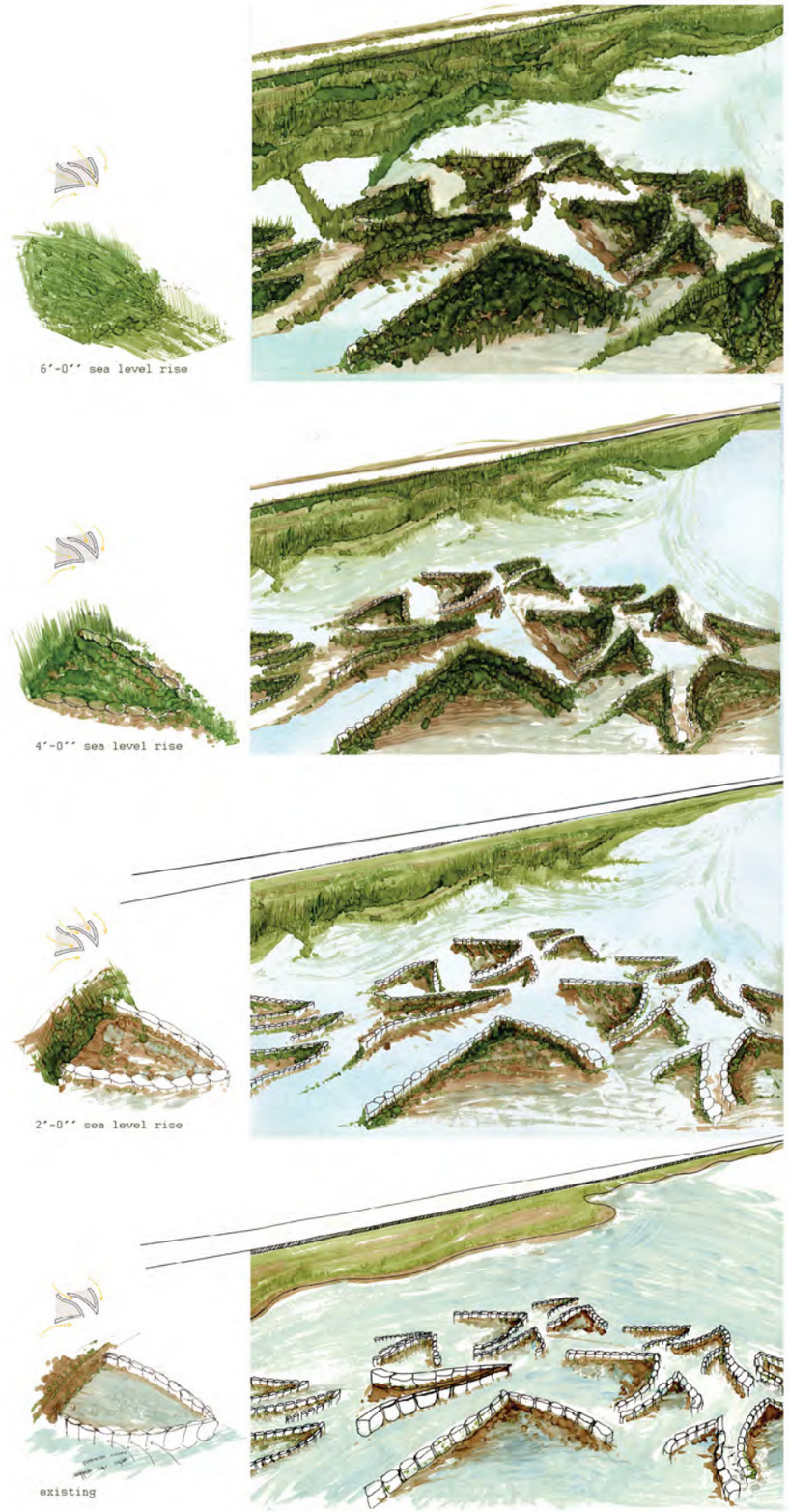
BREAKING BULKHEADS

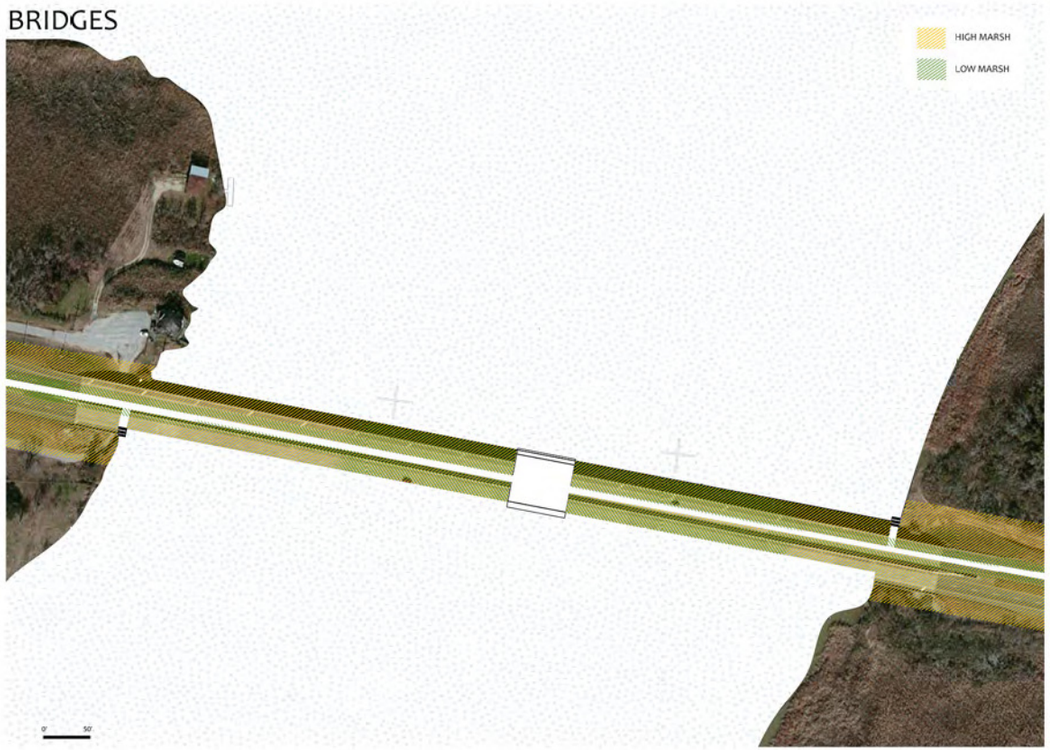
The edges of the causeway are currently lined with rip-rap and bulkhead. Converting some of these hard edges to softer edges as a widening strategy can increase marsh migration habitat as sea-level rises. These spaces are also designed to be recreational hot spots and a place where people can begin to interact more with the bay.



BAFFLES

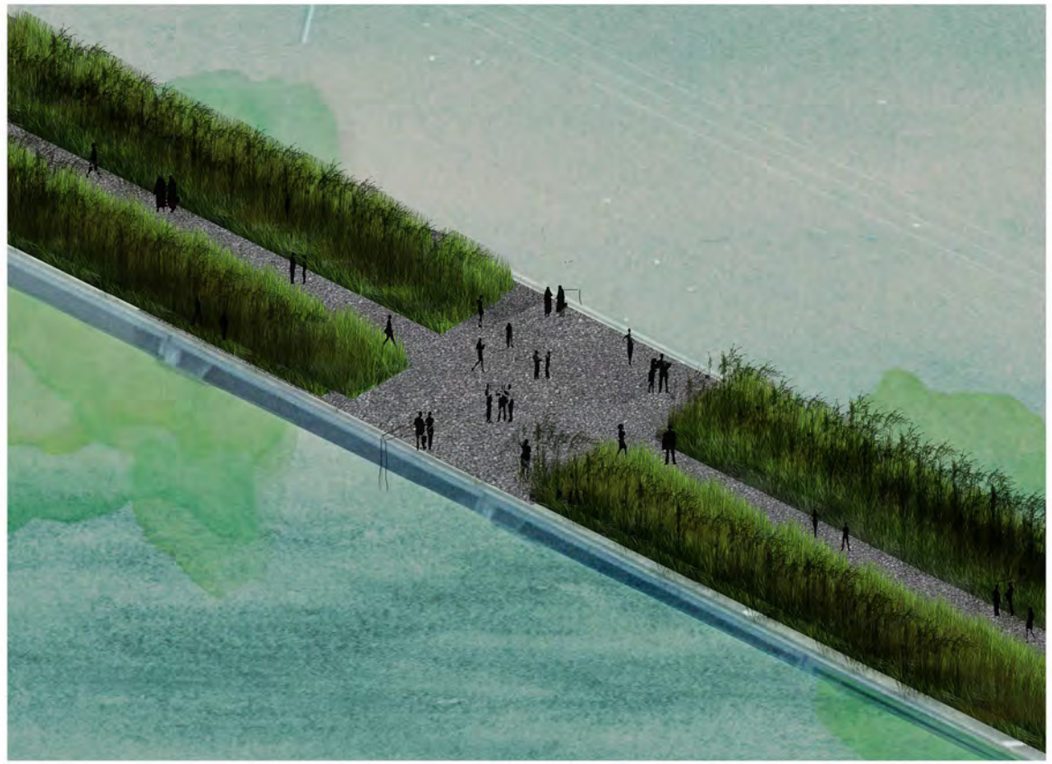
The baffles are designed and constructed by carefully analyzing the accretion patterns in the bay so that they begin to trap sediment thereby setting up a condition that can potentially offset the loss of SAV when the sea level rises.





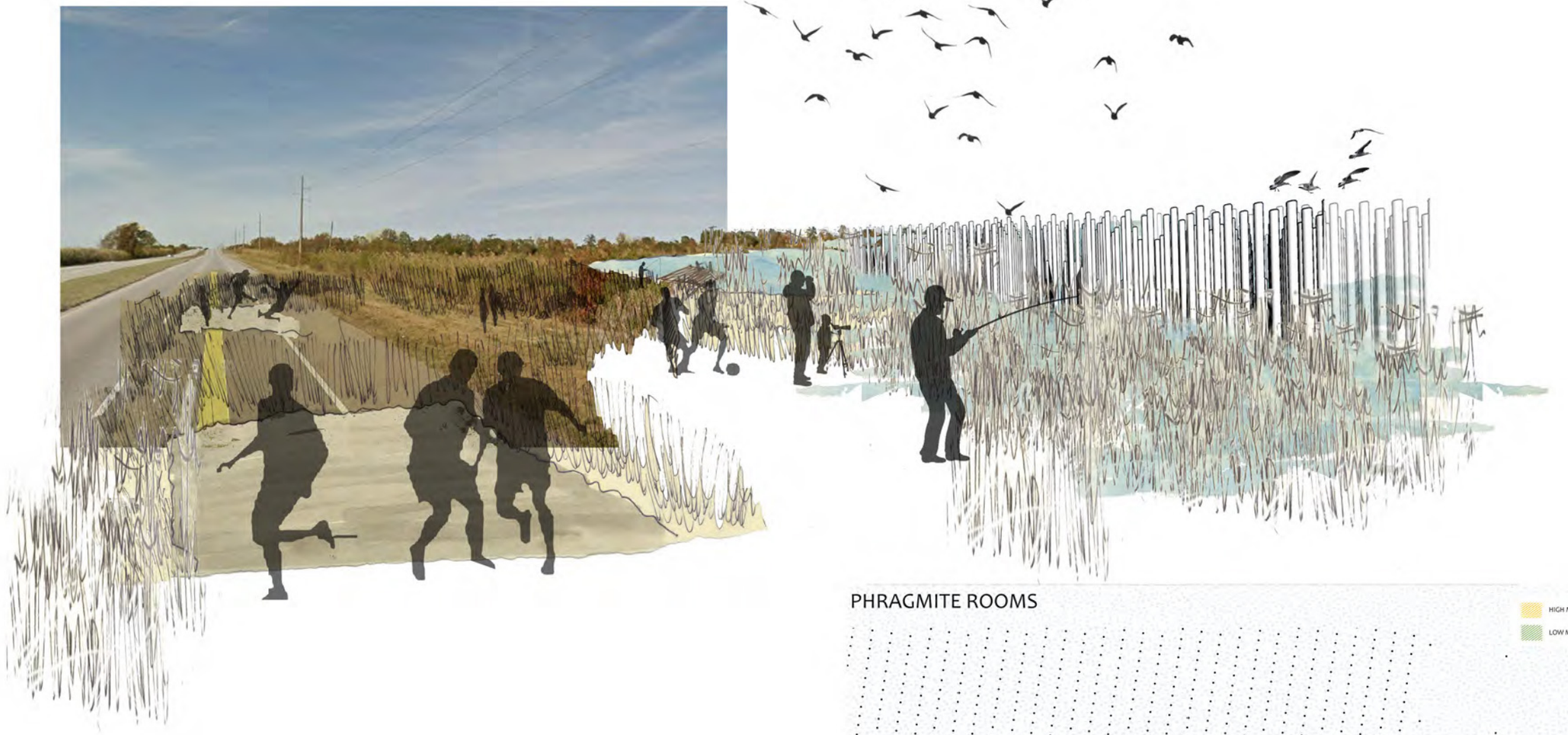
BRIDGES

With sea level reaching a height of 6'0" and when most of the causeway is submerged , bridges will be the places where marshes migrate.



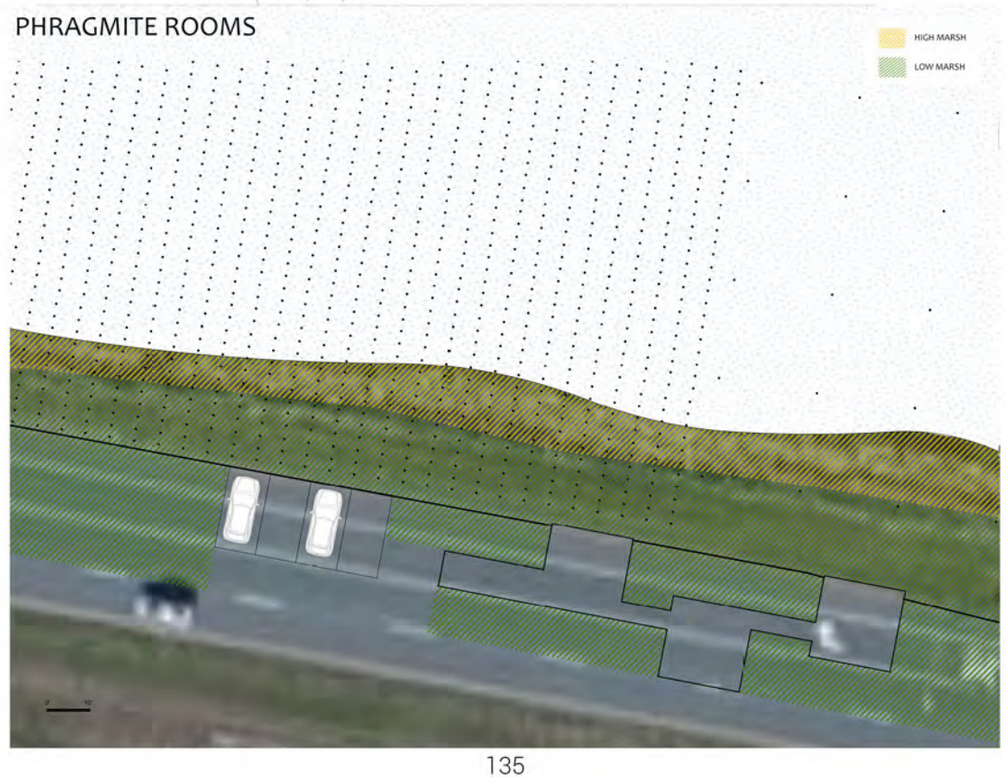
BRIDGES FOR MIGRATION

This perspective illustrates how some of the asphalt on the bridge can be maintained to create pockets of recreation amidst the migrating marsh habitat. This infrastructure is no more used for transportation, however it has other values. It is now used for habitat and recreation.

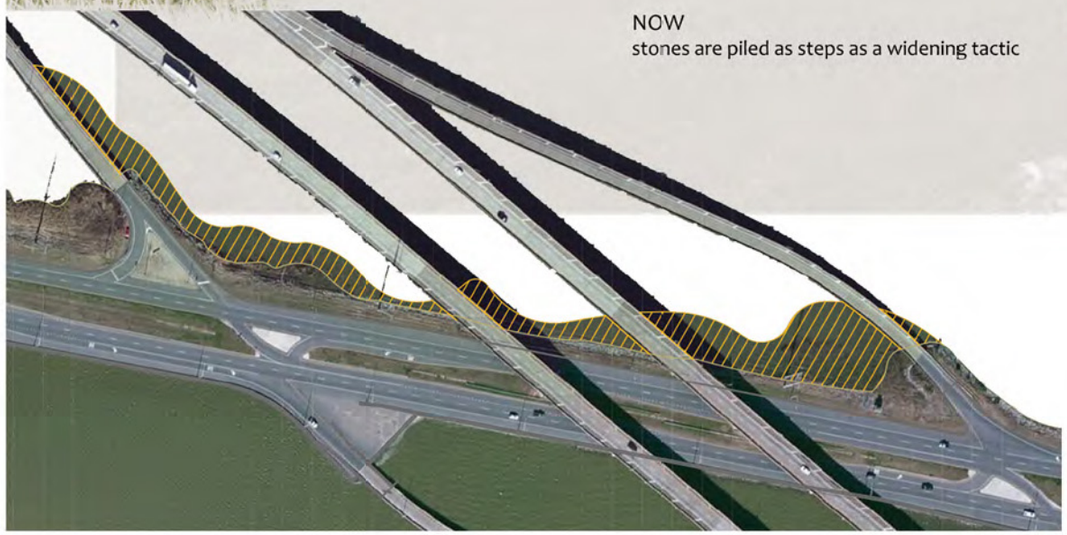


PHRAGMITE ROOMS

Asphalt on the roadways onf the causeway are removed in parts to create rooms in which Phragmites can grow in. These rooms are designed to be comfortable for the human scale and are also designed to provide views of other strategies implemented on the causeway like the guano stakes.



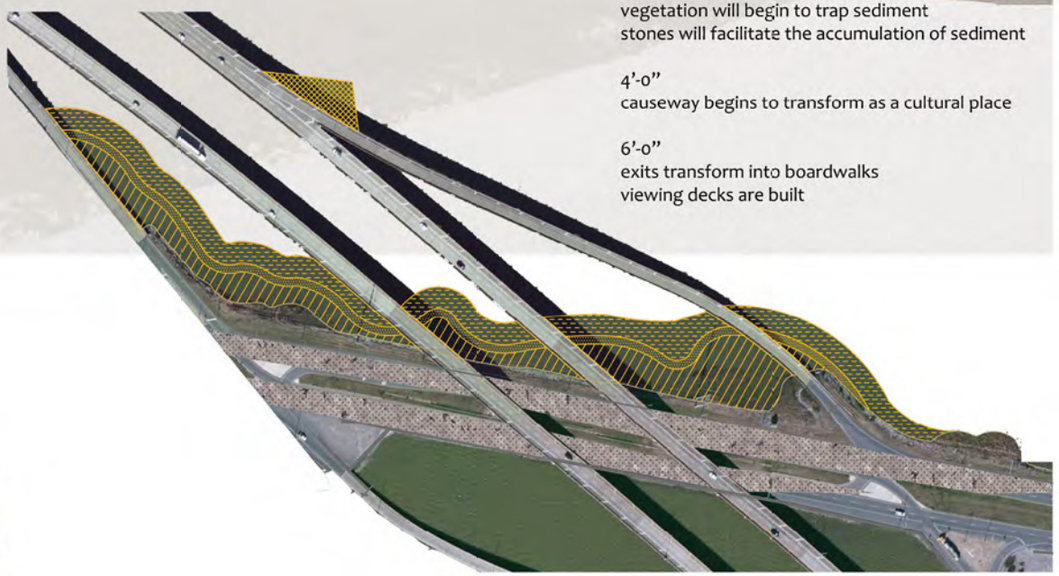
NOW
stones are piled as steps as a widening tactic

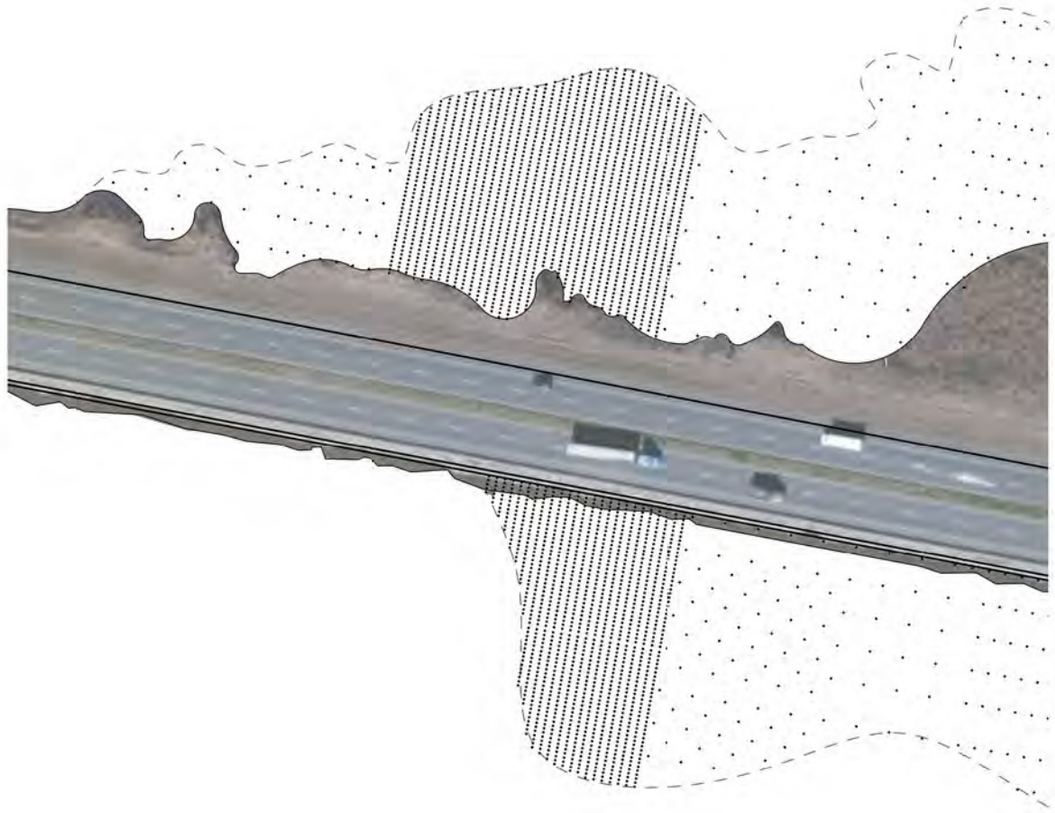


2'-0"
vegetation will begin to trap sediment
stones will facilitate the accumulation of sediment

4'-0"
causeway begins to transform as a cultural place

6'-0"
exits transform into boardwalks
viewing decks are built

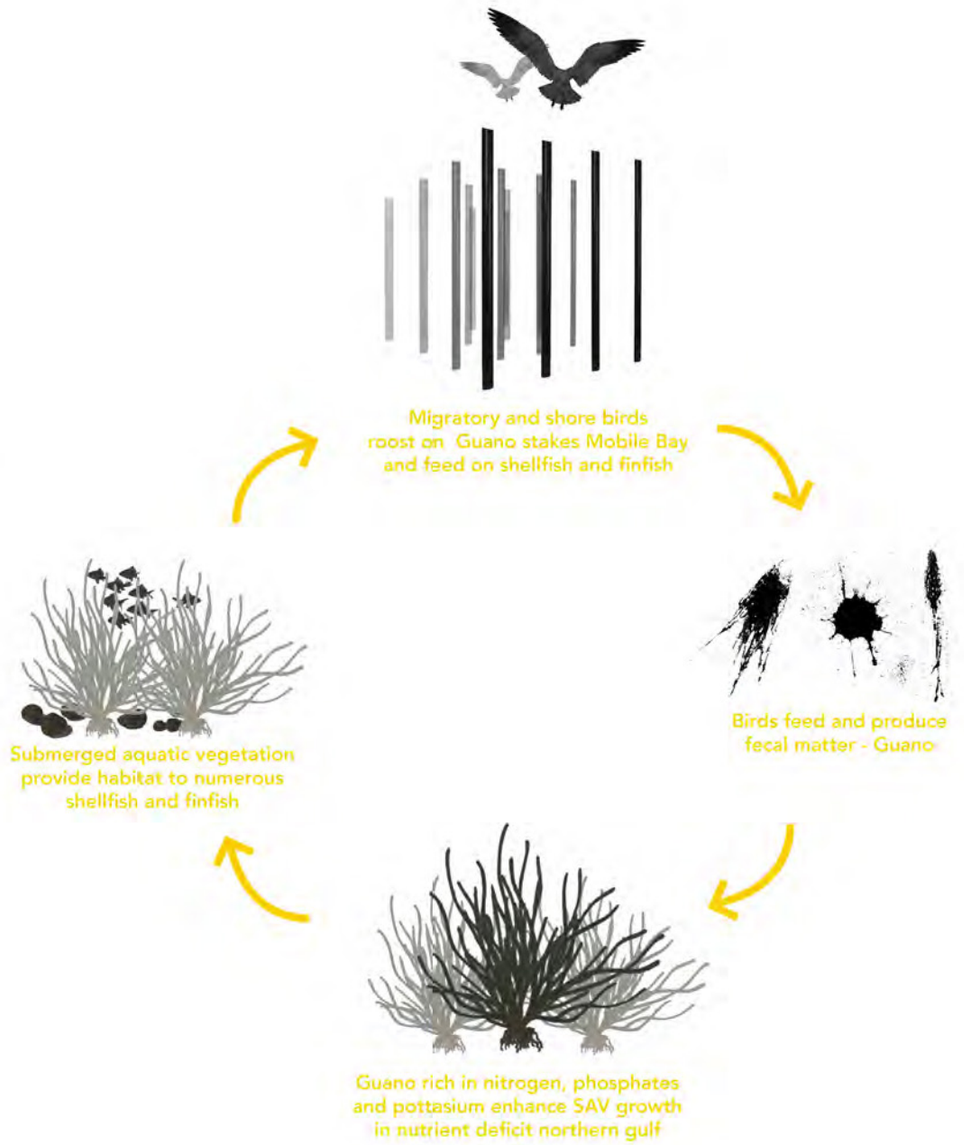




0' 50'

GUANO STAKES TO PROMOTE SAV GROWTH

This strategy makes use of fecal matter from sea birds called guano to promote growth of submerged aquatic vegetation. Guano stakes will be placed in varying grids along the causeway to enhance spatial experience of kayakers and bird watchers.



GUANO STAKES - RECREATION

Apart from being beneficial for submerged aquatic vegetation, Guano stakes also support a wide range of recreational activities like kayaking, photography and bird watching.

ACKNOWLEDGMENT

This book is the result of a semester-long investigation of Mobile Bay. This project would not have been possible without the kind help and support of many individuals and organizations. On behalf of the Auburn University Master of Landscape Architecture Program, we would like to thank those who have lent a helping hand throughout the design process.

Renee Collini at the Dauphin Island Sea Lab, Paul Lamars from the National Estuary Program, Susan Rees and Justin MacDonald from the US Army Corps of Engineers Mobile District, and Jamie Bullock from Mobile Baykeeper were all kind enough to arrange discussions for us that helped us better understand the state of the bay and on-going resilience efforts there.

We would also like to thank our professor's Rob Holmes and David Hill for the guidance, encouragement and advice they provided us throughout the semester.