

Adaptacja do zmian klimatu - zagadnienia ogólne.

Wykład 2



Adaptacja - „proces dostosowania się do aktualnego lub oczekiwanego klimatu i jego skutków”.

*Łagodzenie skutków - redukcja czynników,
które powodują zmiany klimatyczne np.
poprzez redukcje gazów cieplarnianych –
dzięki zwiększeniu ilości zieleni w miastach.*

Odporność - "zdolność systemów społecznych, gospodarczych i środowiskowych do radzenia sobie ze zdarzeniami, zakłóceniami. W wyniku impulsu mają zdolność do reagowania i reorganizacji w taki sposób aby zachować podstawę systemu. Mają zdolność adaptacji, uczenia się i transformacji".

















CXC

STREET
CITY

RE
EN



NBS

Według definicji IUCN są to „działania mające na celu ochronę, zrównoważone zarządzanie i przywracanie naturalnych lub zmodyfikowanych ekosystemów, które skutecznie i adaptacyjnie rozwiązują problemy społeczne, zapewniając jednocześnie dobrostan człowieka i korzyści dla różnorodności biologicznej”

- Z kolei według Komisji Europejskiej są to *„działania inspirowane naturą, wspierane przez nią lub z niej kopiowane, które mają na celu pomóc społeczeństwom w rozwiązywaniu różnorodnych wyzwań środowiskowych, społecznych i ekonomicznych w zrównoważony sposób”*

zrównoważona urbanizacja

Make Freshkills Park Your Park



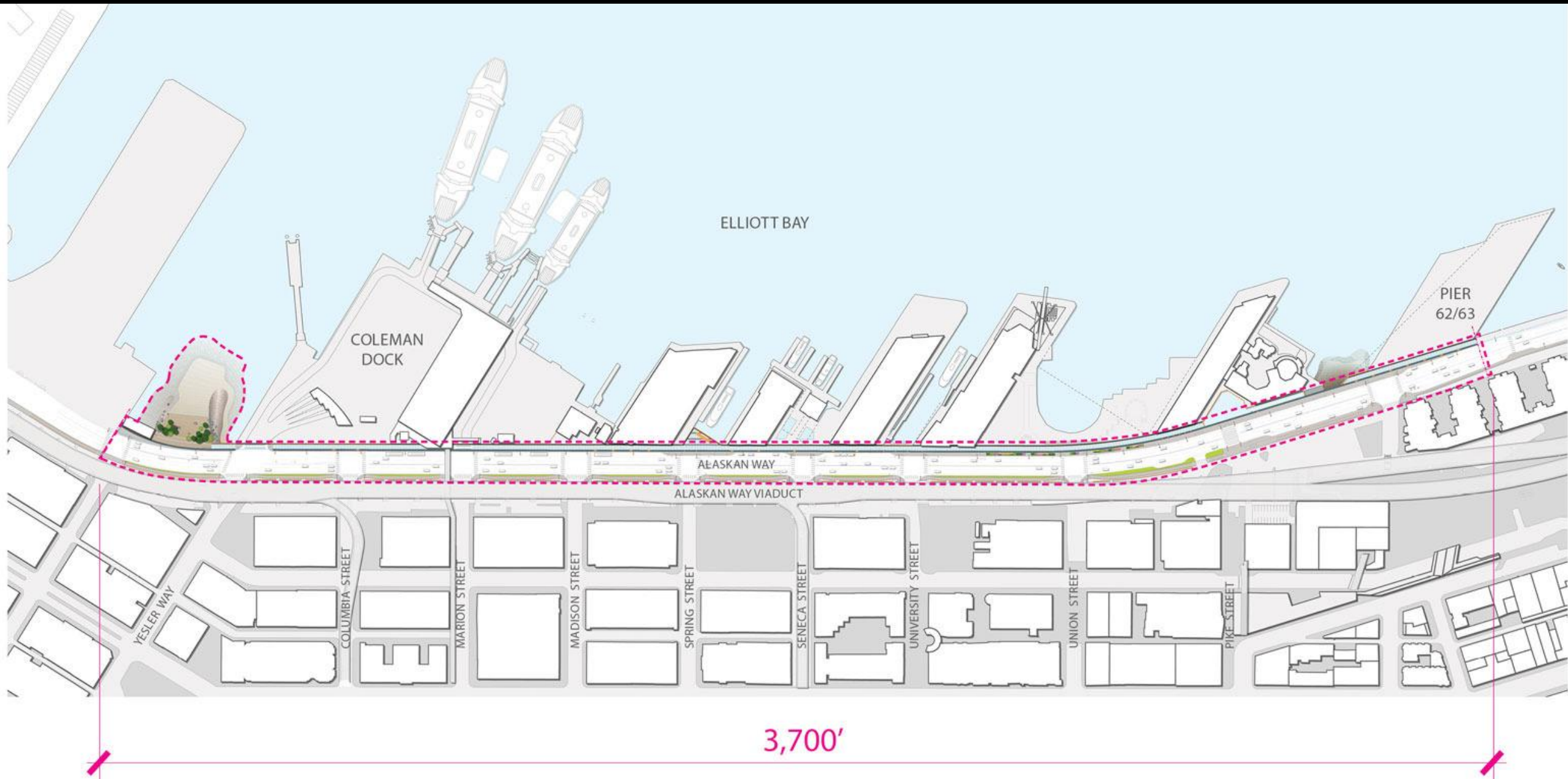
https://www.youtube.com/watch?v=TFm_EynqyYk

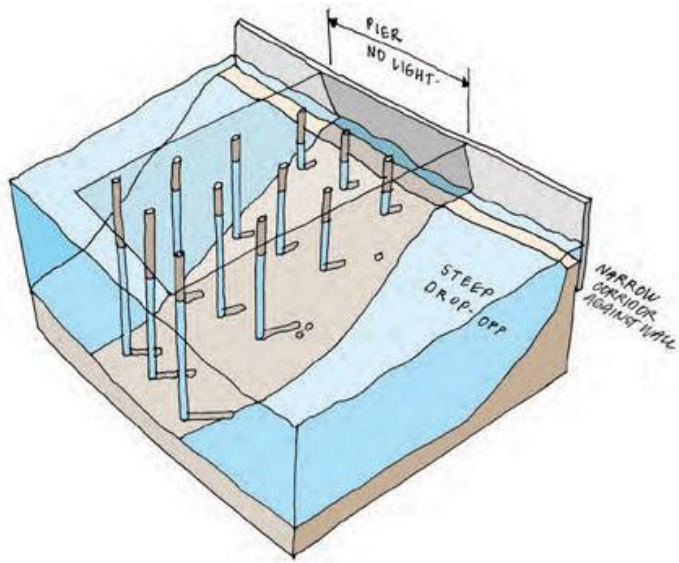


4:18 / 4:43

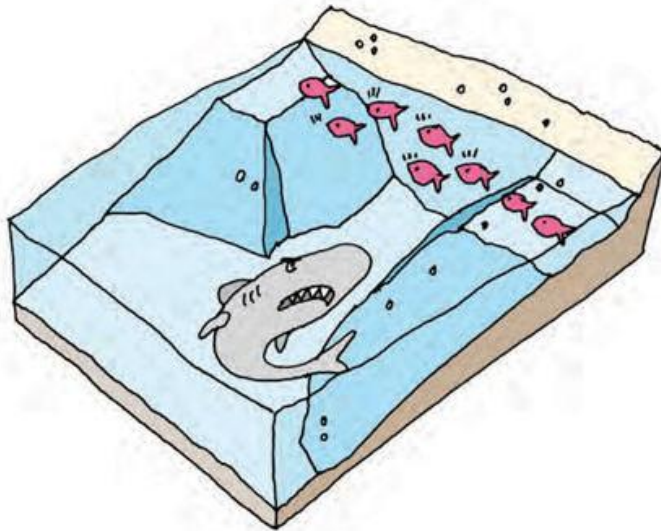


odbudowa zdegradowanych ekosystemów

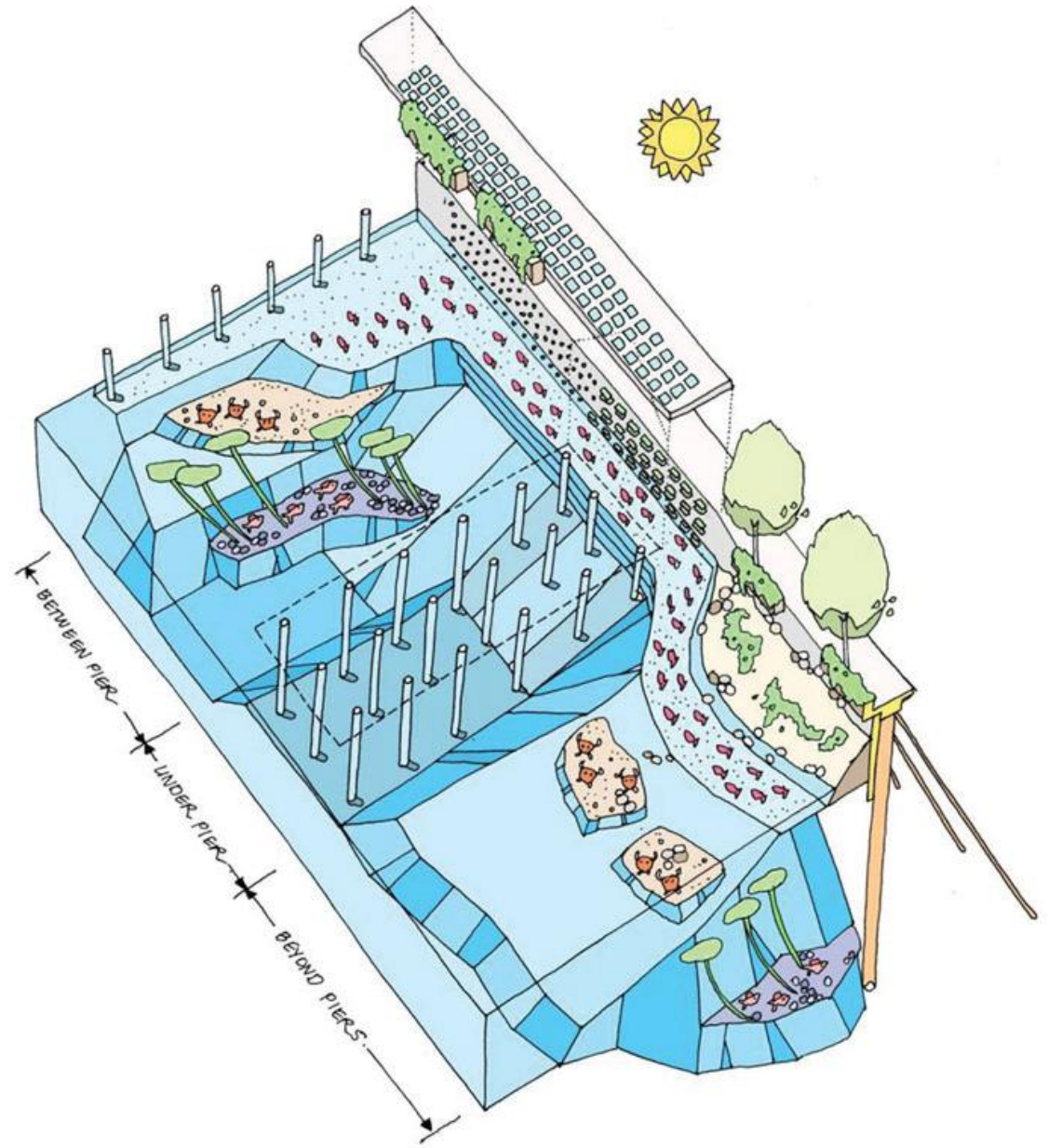




NO LIGHT... NO PLANT LIFE, NO FOOD



DEEP SHORELINE = OPPORTUNITIES FOR PREDATORS



IDEAL HABITAT/PIER CONFIGURATION WITH INTEGRATED SALMON MIGRATION CORRIDOR

LIGHT
PENETRATING
SURFACE



PERMEABLE
PROMENADE



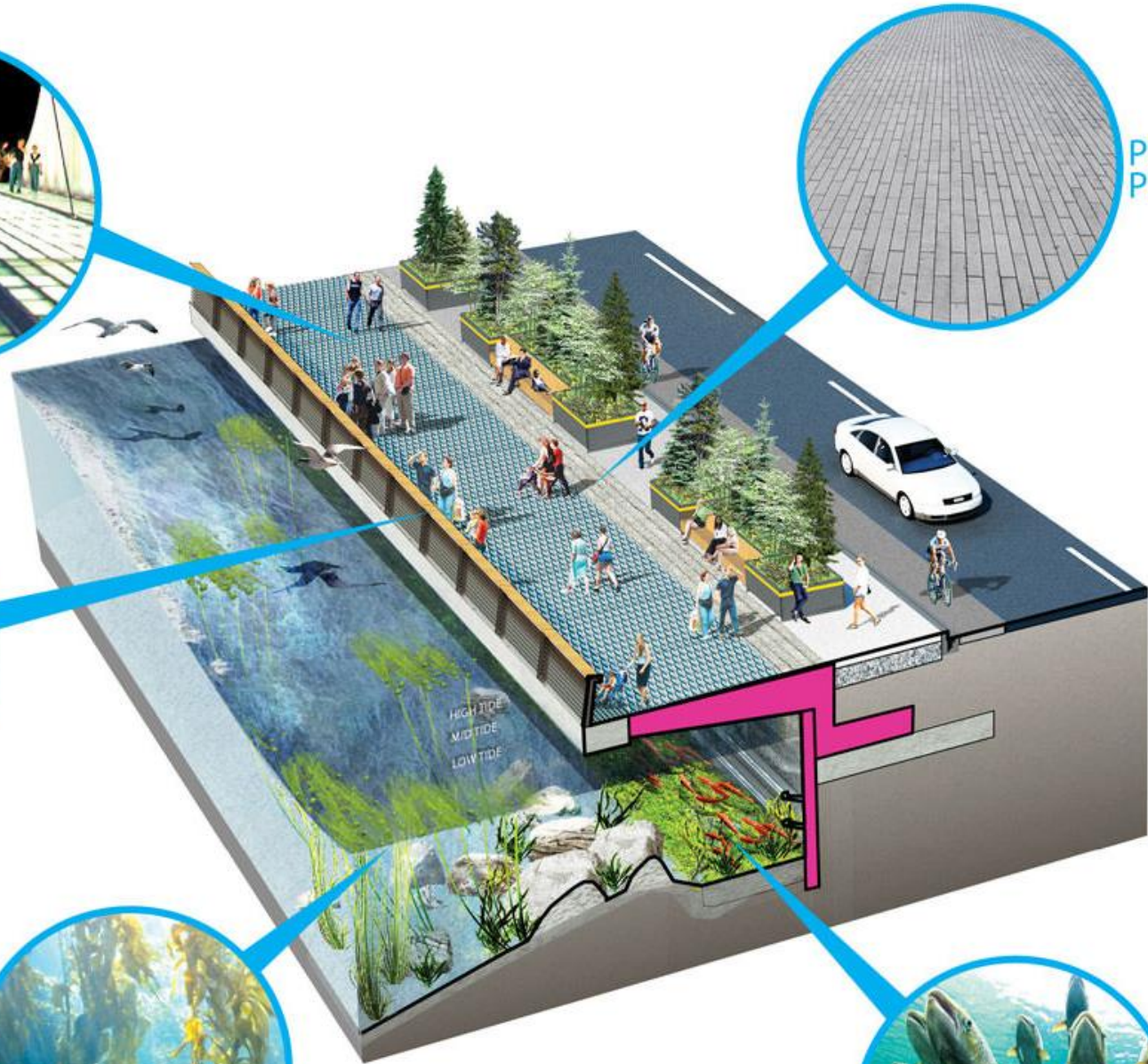
SOLAR LIT
RAILING

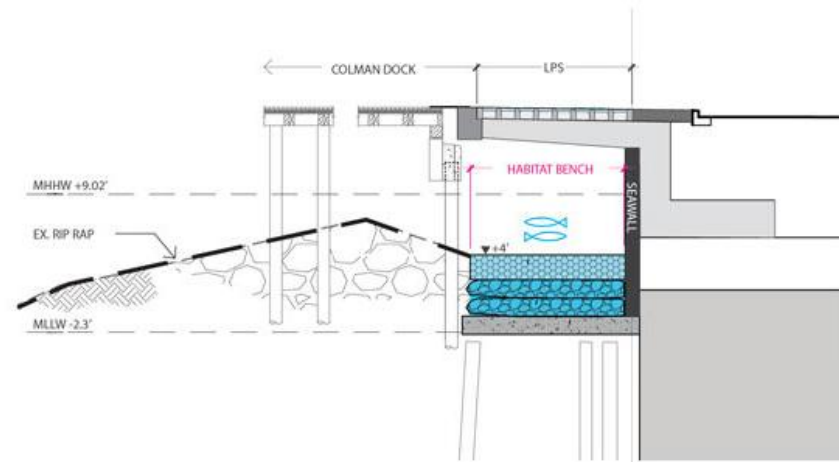


RESTORED
KELP
FOREST

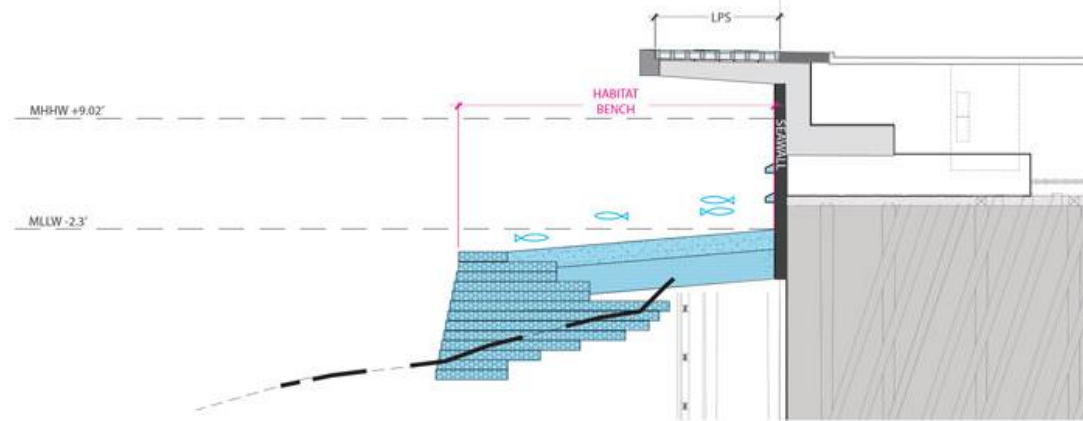


JUVENILE
SALMON
MIGRATION
CORRIDOR

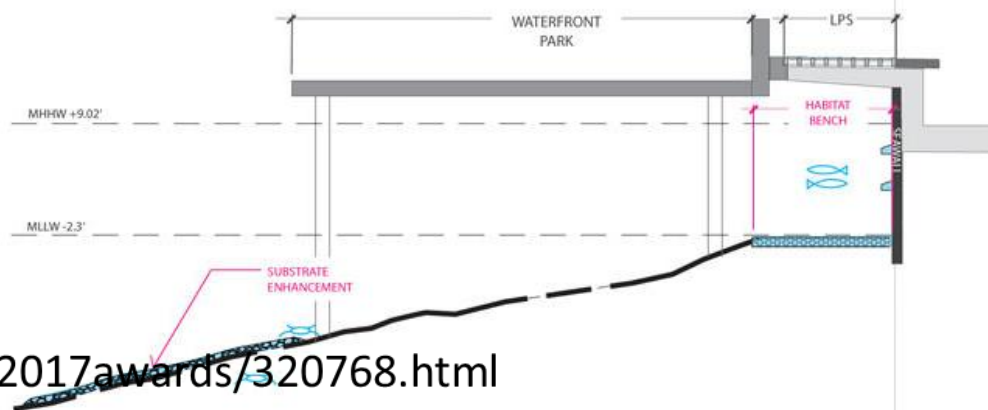




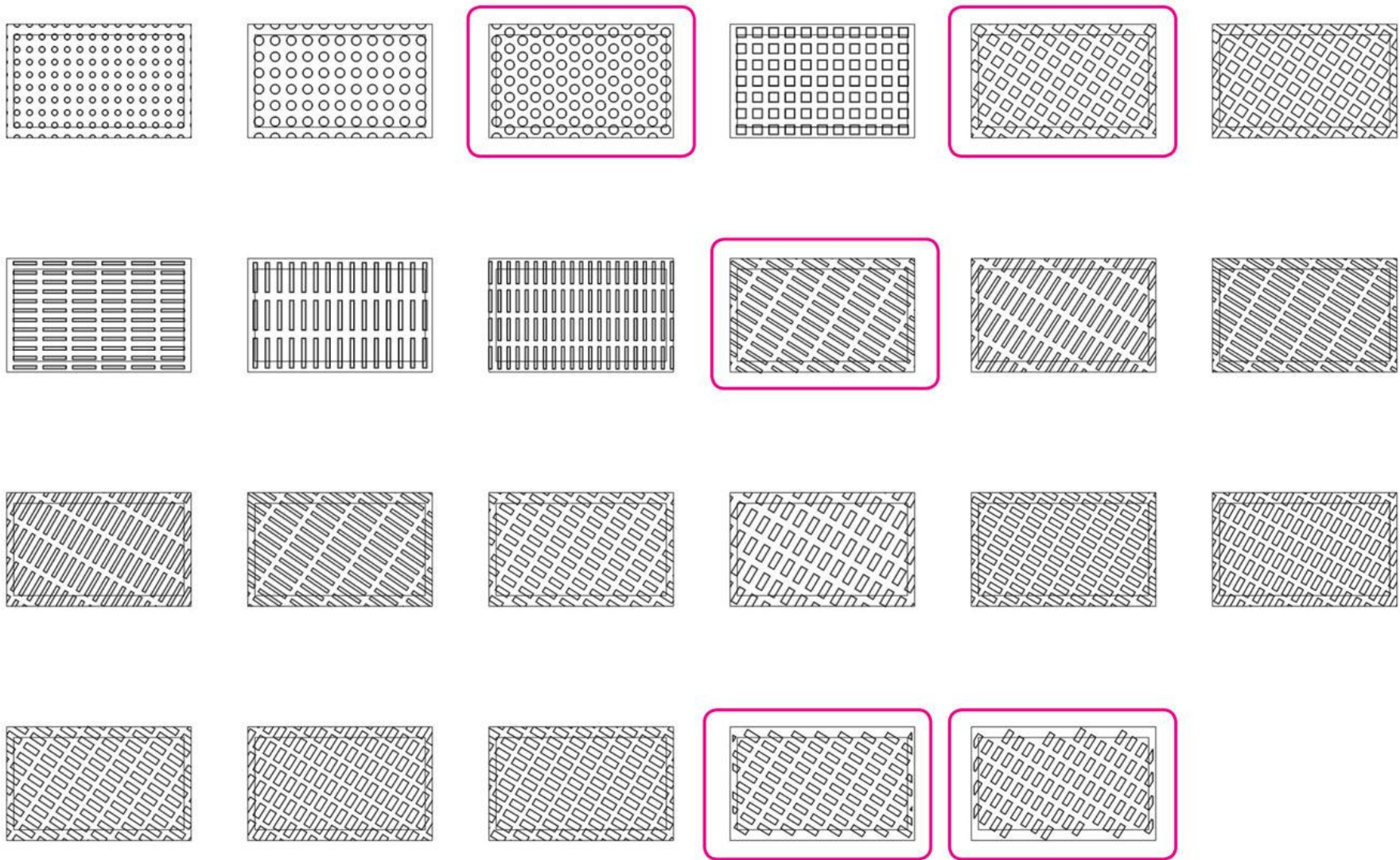
HABITAT CORRIDOR - AREA 2
(COLMAN DOCK)



HABITAT CORRIDOR - AREA 4
(BETWEEN PIER 54 & 55)



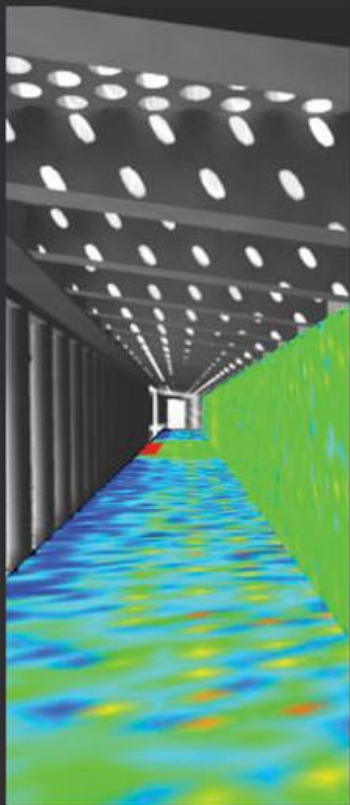
HABITAT CORRIDOR - AREA 7
(WATERFRONT PARK)



LIGHT PENETRATING SURFACE PANEL ANALYSES



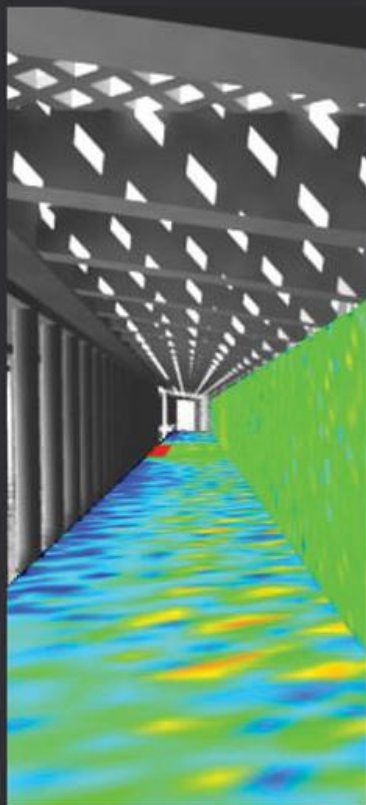
8" DIAM. CIRCLE



193
FOOTCANDLES



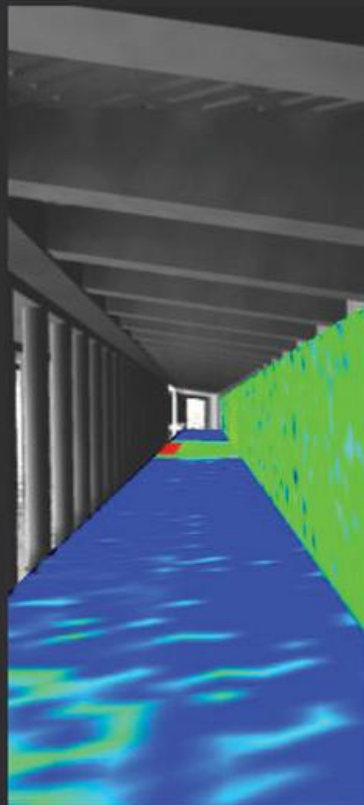
8" X 8" SQUARE



185
FOOTCANDLES



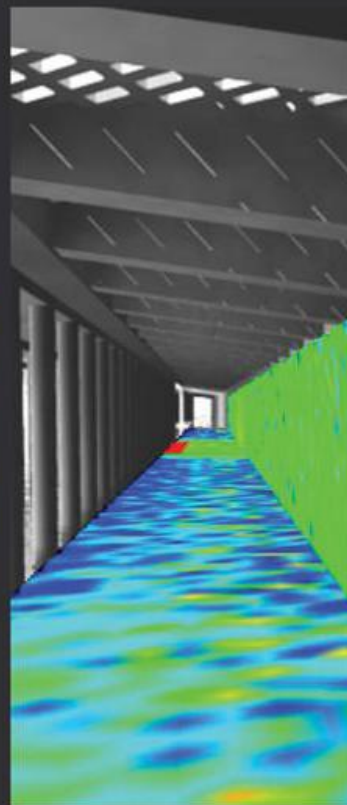
3" X 20" RECTANGLE



0
FOOTCANDLES



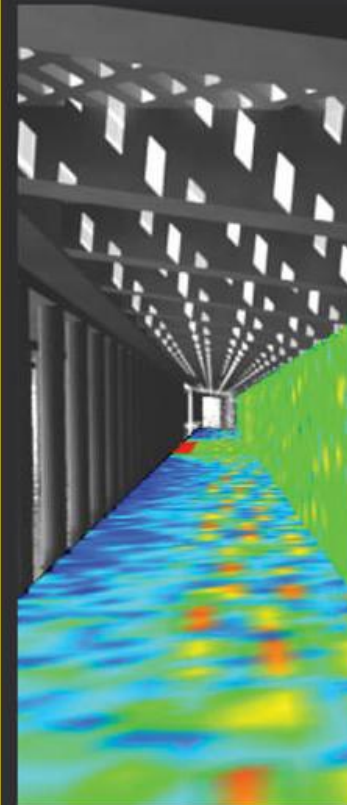
5" X 12" RECTANGLE



60
FOOTCANDLES



12" X 5" RECTANGLE



219
FOOTCANDLES







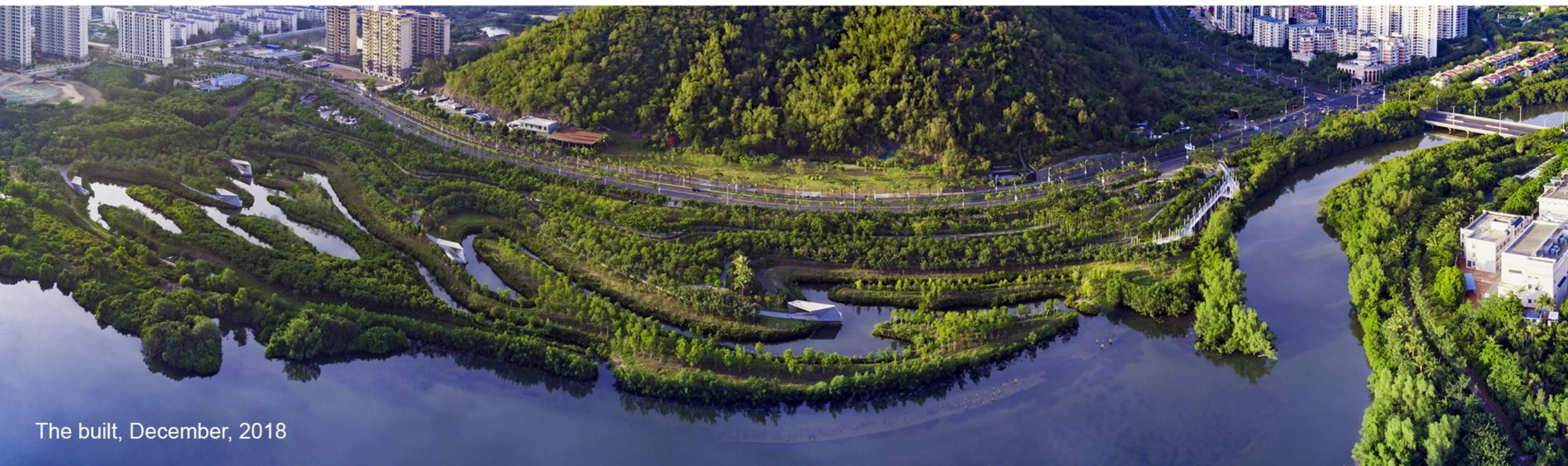
łagodzenie i ulepszanie zarządzanie ryzykiem i odporność



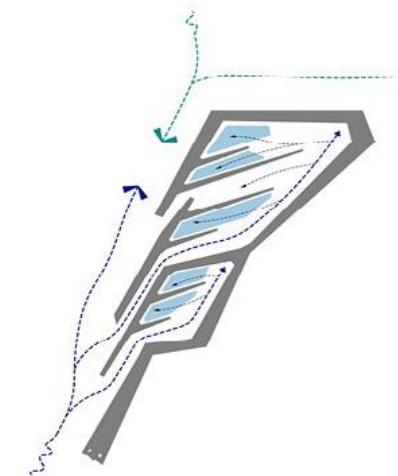
The preexisting site, April, 2016 (Google earth)



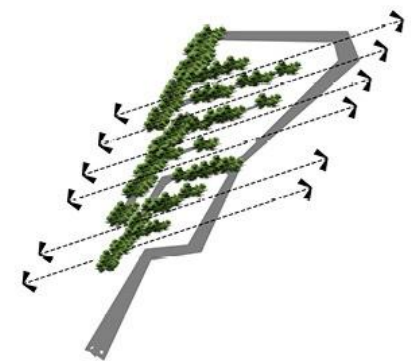
The process of construction, April 2017



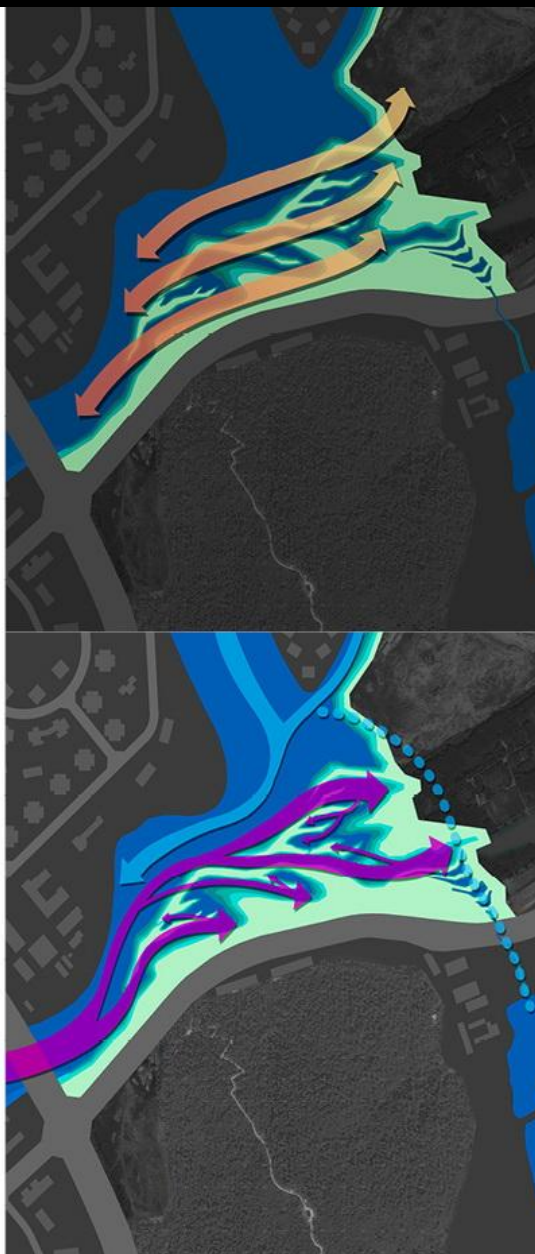
The built, December, 2018



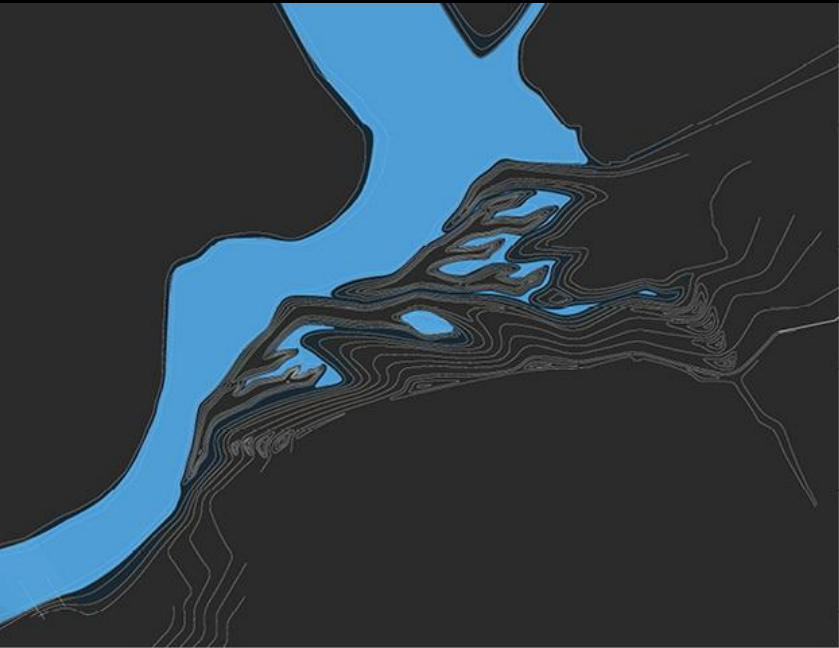
To induct ocean tides and avoid destructive fresh water storm



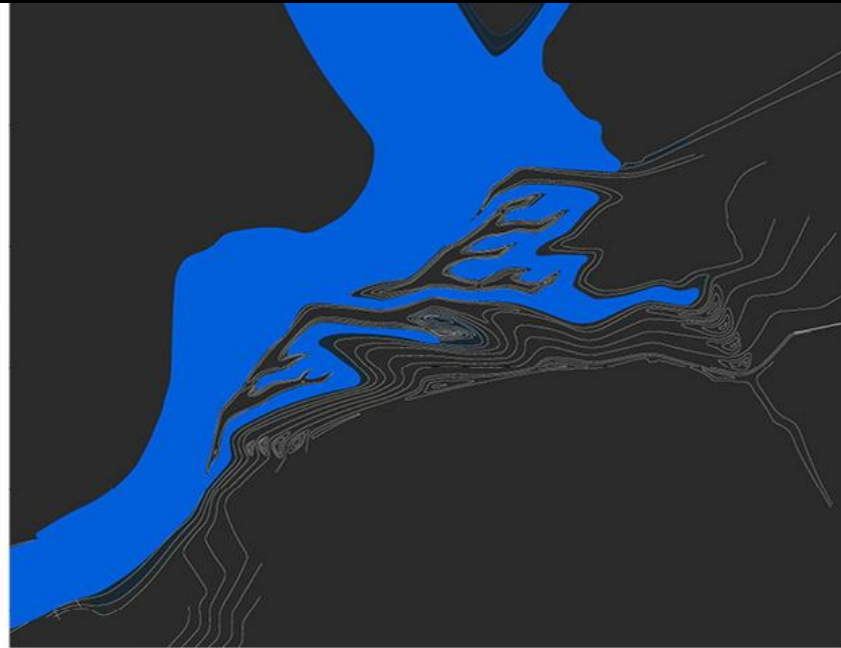
To avoid tropical destructive storm from the sea



1. Main Entrance
2. Sky Walk
3. Terraces
4. Bioswale
5. Resting Place
6. Pavilion
7. Main Path Connected to Urban Greenways
8. Sanya River
9. Urban Artery Road
10. Pedestrian Path



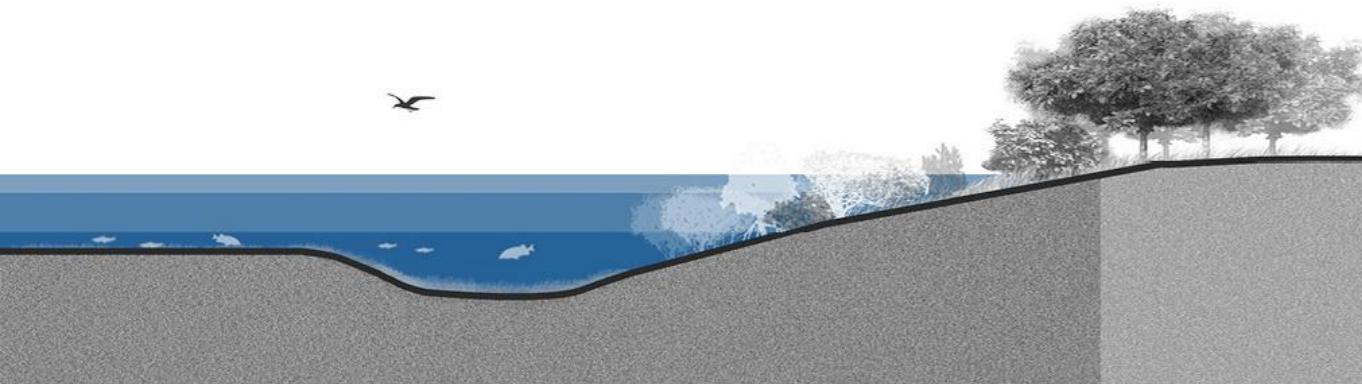
Low tide



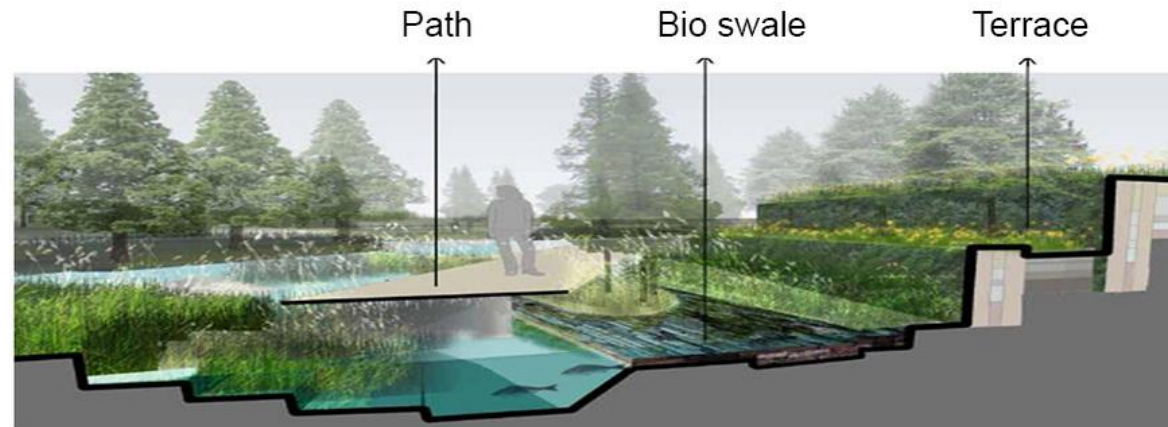
High tide



Ecotones with diverse aquatic settings

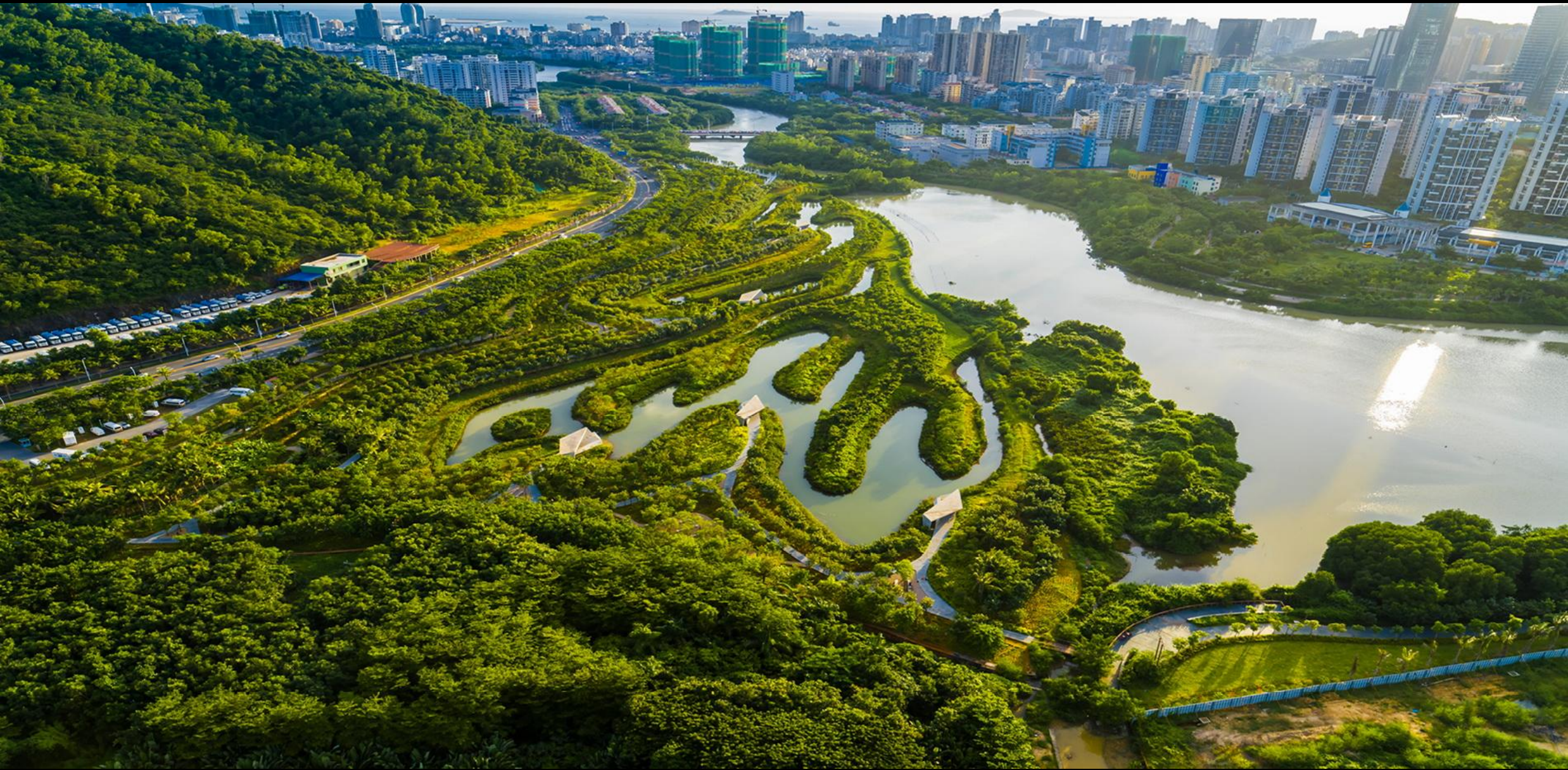


Ecotones with diverse aquatic settings



Bio swales and vegetated terraces to filtrate polluted urban runoffs









Adaptacja do zmian klimatu

BEFORE: Extensive Flooding

02 July 2011: > 150mm
RAIN fell in 2 HOURS.

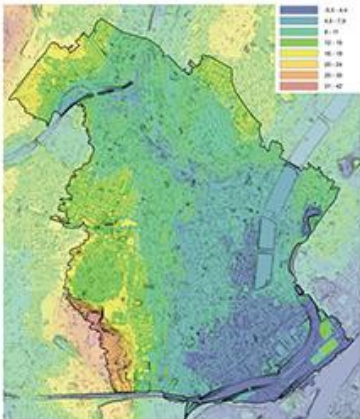
CLOUDBURST

hits Copenhagen

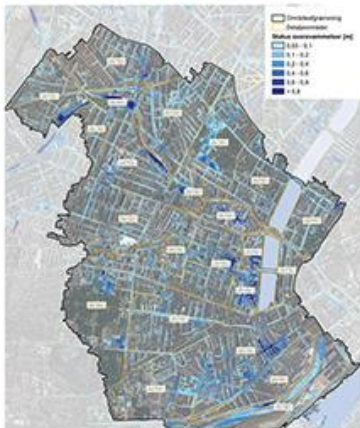




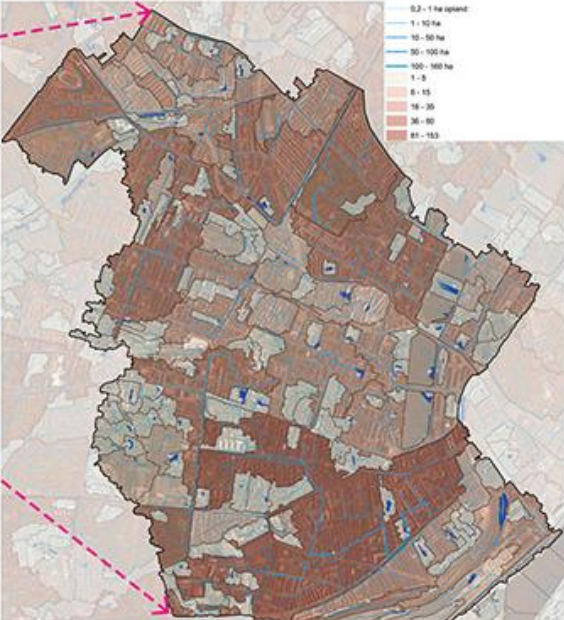
Lådegås-Aen Catchment



Digital Terrain Model - Slope



Sub-Catchments and Risk Attributed to Flooding Potential



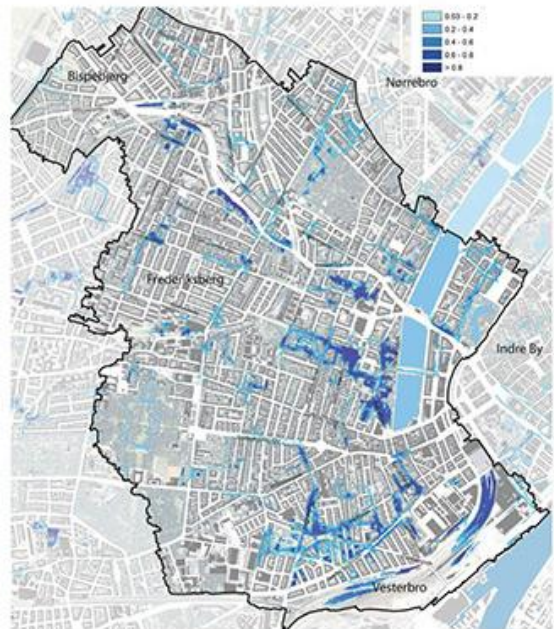
Watershed Catchments, Sub-Catchments



Risk-Analysis in proximity to the lake within the Frederiksberg



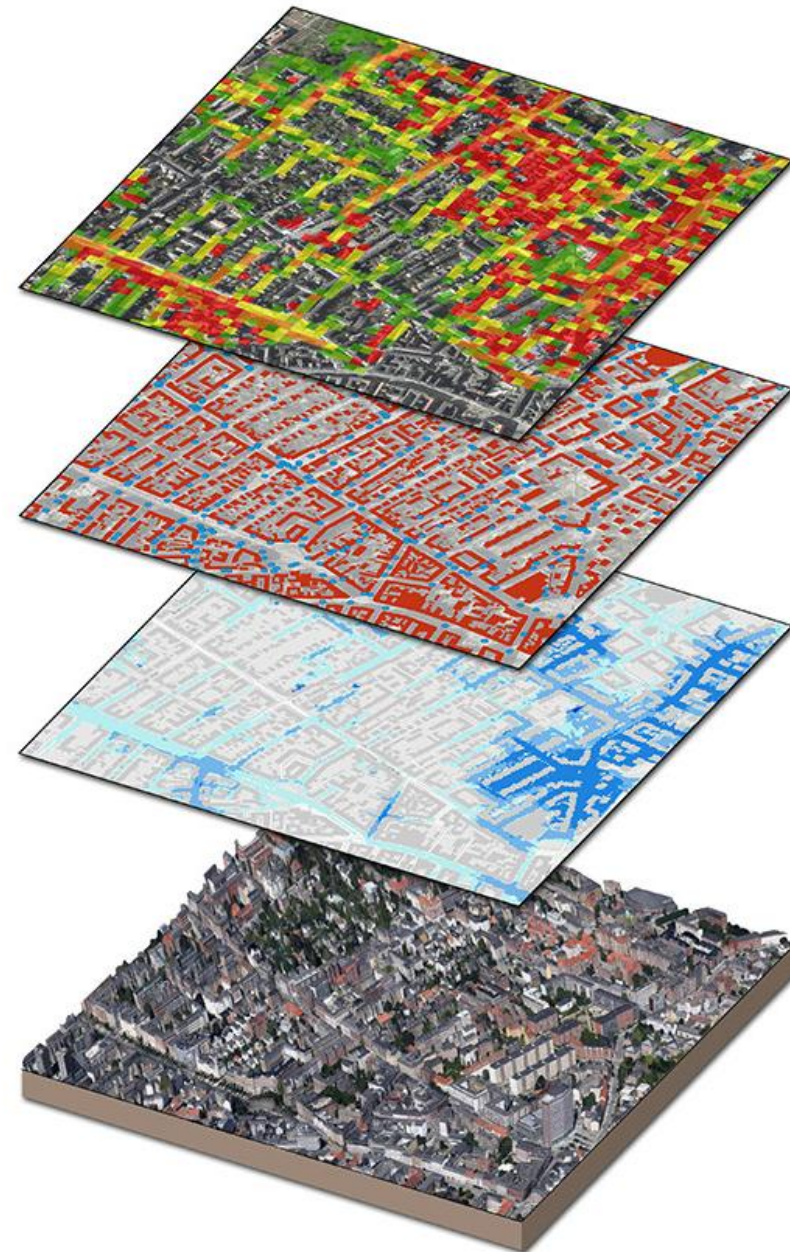
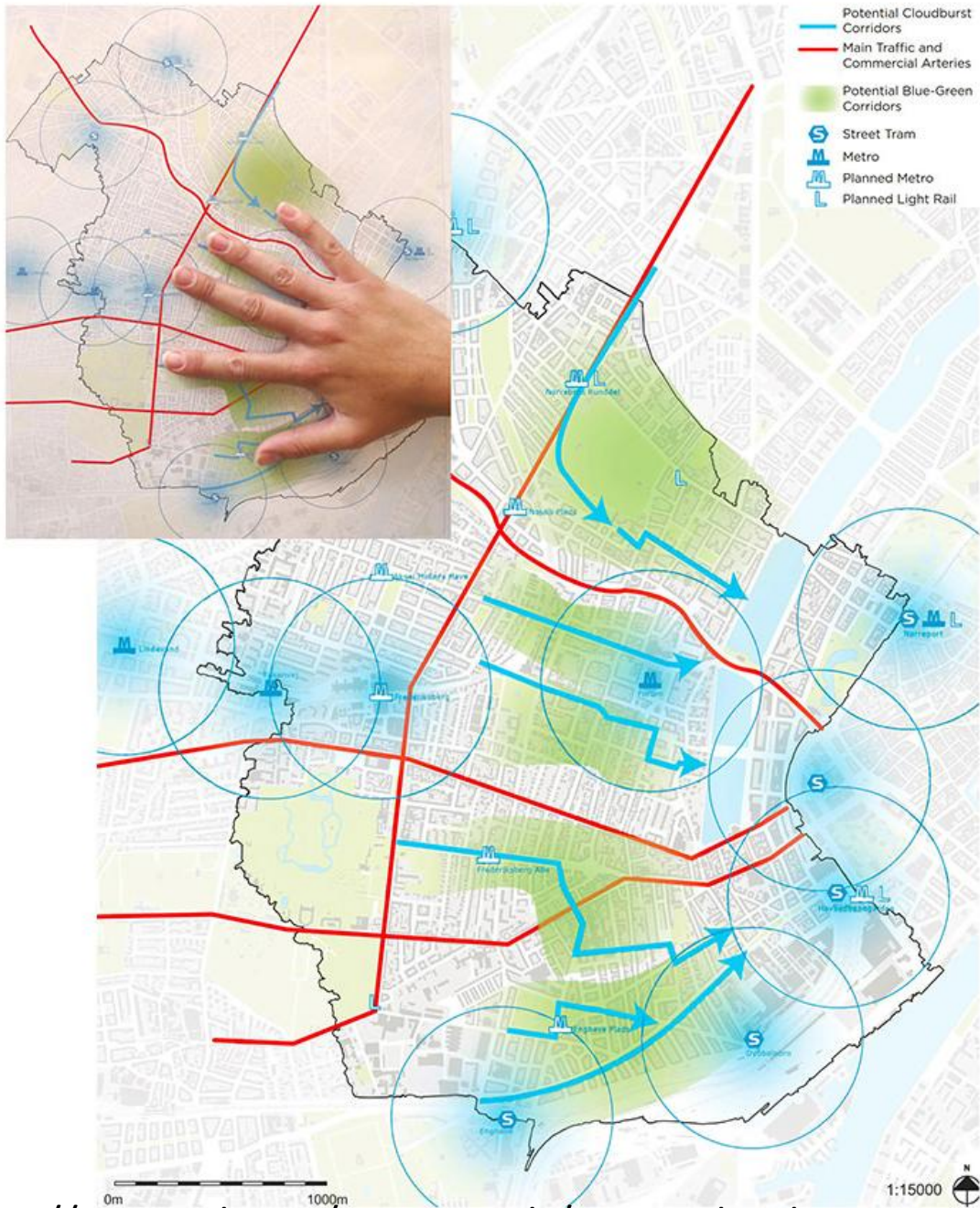
Social Corridors and Mobility Network



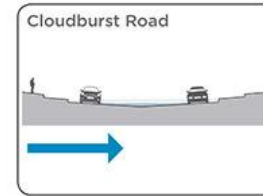
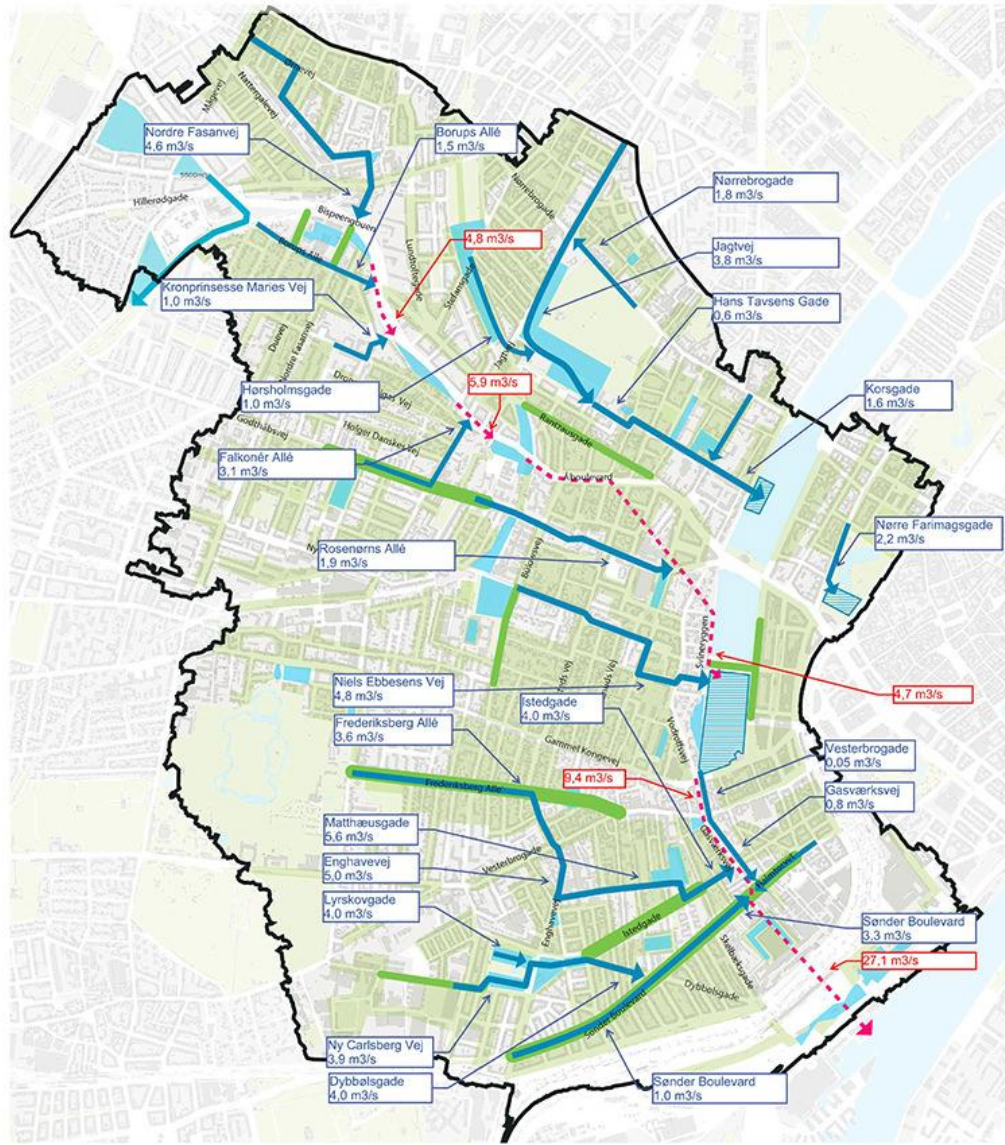
Catchment Water Routes



Collaborative Planning Workshops with Community

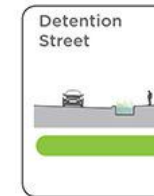


Detailed site analysis reveals the complex existing situations; identifying areas most at risk to flooding shows the potential sites as catalyst pilot projects (Frederiksberg District shown in isometric visualisation above)



Cloudburst Road

Cloudburst roads are used to channel and direct cloudburst water. These streets can be formed with a unique V-shaped profile and raised kerbs to ensure water will flow in the middle of the road, away from the buildings - contrary to standard engineering practice. Channels and swales can be established along road edges so that water runs in urban rivers or green strips. Cloudburst roads may also be combined with Cloudburst piping below the surface to create tool synergies.



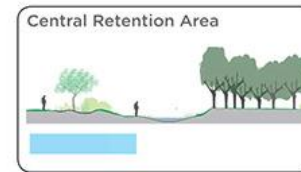
Detention Street

Detention streets are streets that are typically located slightly upstream of vulnerable low-points. In these streets there should be a detention volume established to handle stormwater before reaching the more vulnerable points downstream.



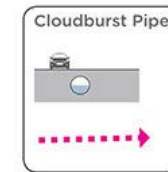
Green Street

Green streets are proposed as upstream connections to all Cloudburst roads. The green streets should be established with a combination of small-scale channels and stormwater planters or permeable paving. Stormwater should be collected, delayed and then channeled towards the Cloudburst roads.



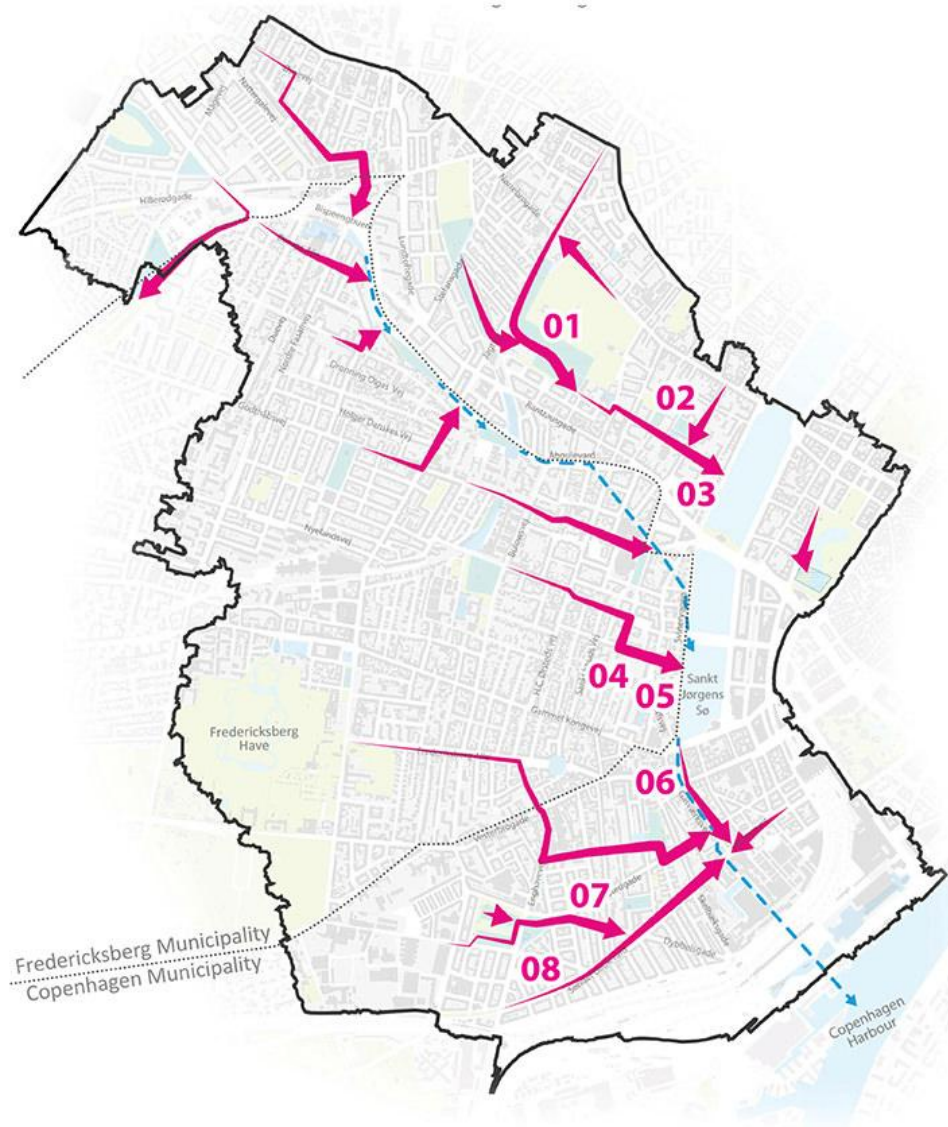
Central Retention Area

Central retention areas are proposed in the squares and parks where it is possible to delay stormwater, so that Cloudburst roads can be established in smaller dimensions. The central retention elements can be, for example, open depressions in the parkland or lowered seating areas. Alternatively, they can be established as underground storage such as soak-away crates or rain gardens. Central retention elements will typically be placed in connection with adjacent Cloudburst roads.



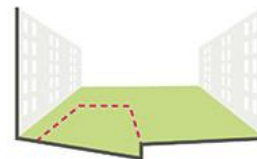
Cloudburst Pipe

A Cloudburst pipe handles rainwater in the same way as Cloudburst roads. This is placed just below street level to ensure connection to other surface solutions. This solution is used if there is no useable space for aboveground solutions.

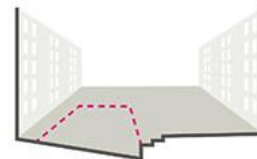


CLOUDBURST TOOLBOX

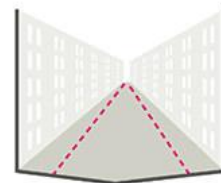
01 Park



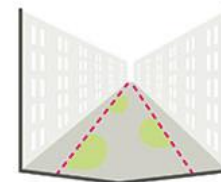
02 Plaza



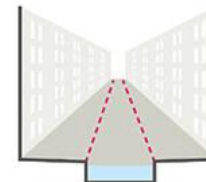
03 Street



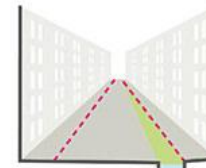
04 Green Street



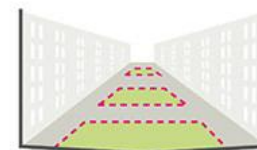
05 Urban Canal



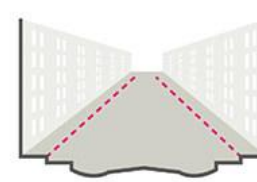
06 Urban Creek

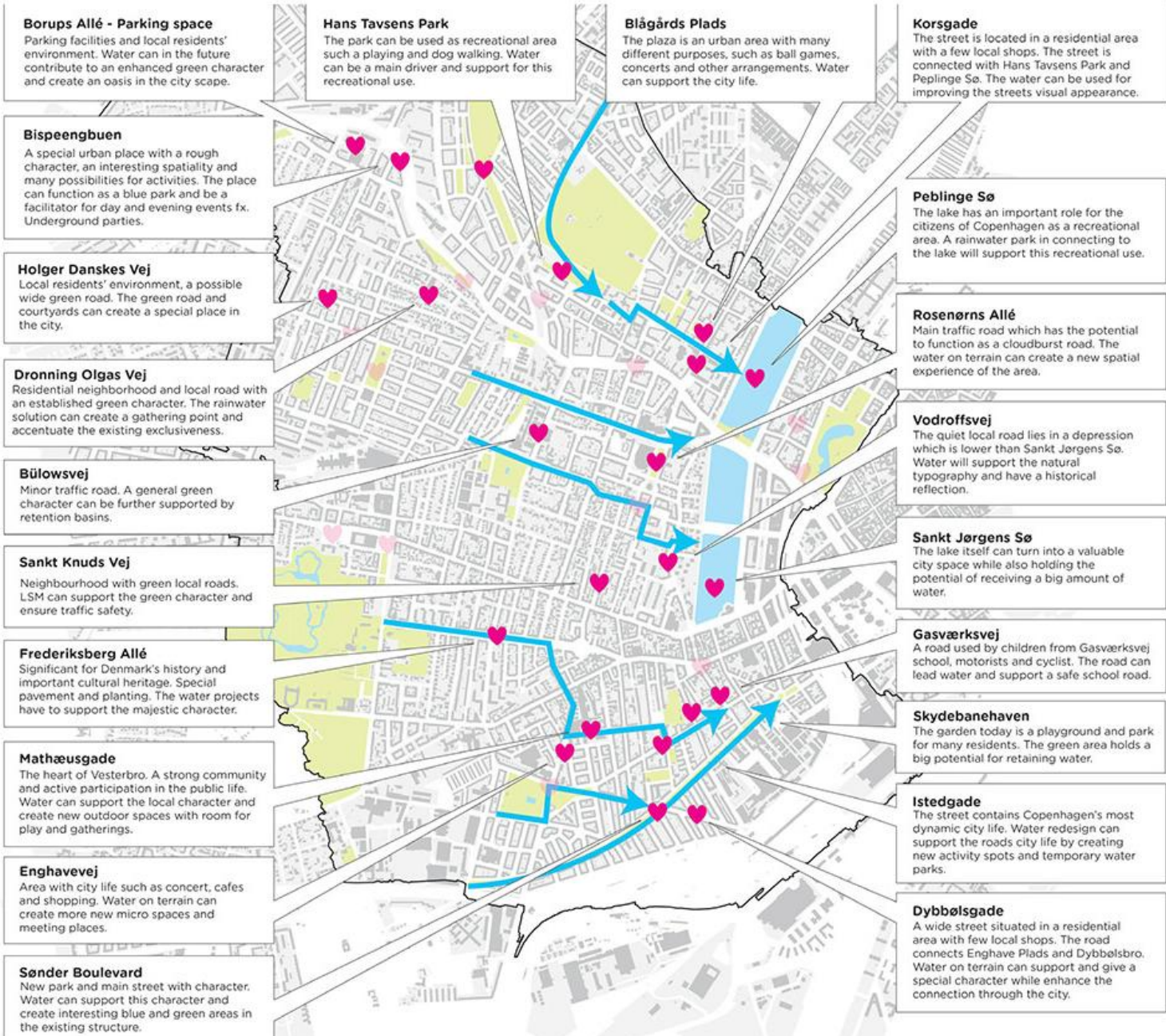


07 Retention Boulevard



08 Boulevard

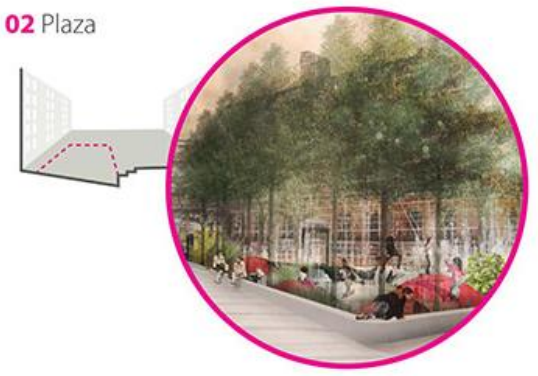




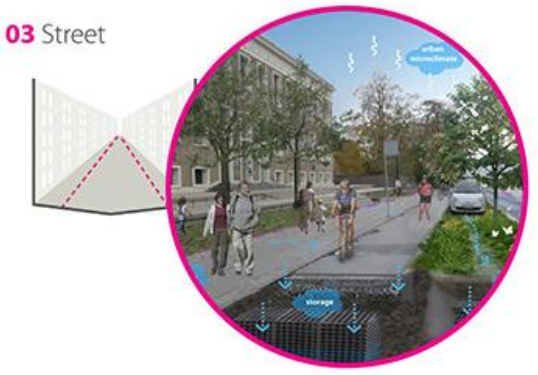
01 Park



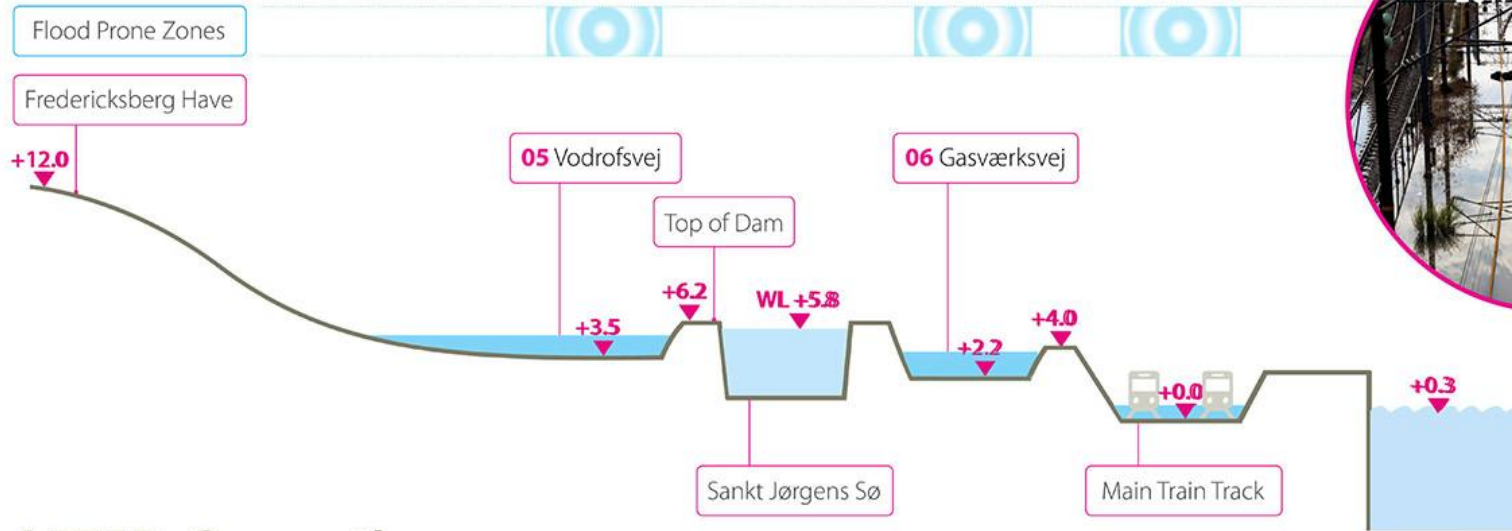
02 Plaza



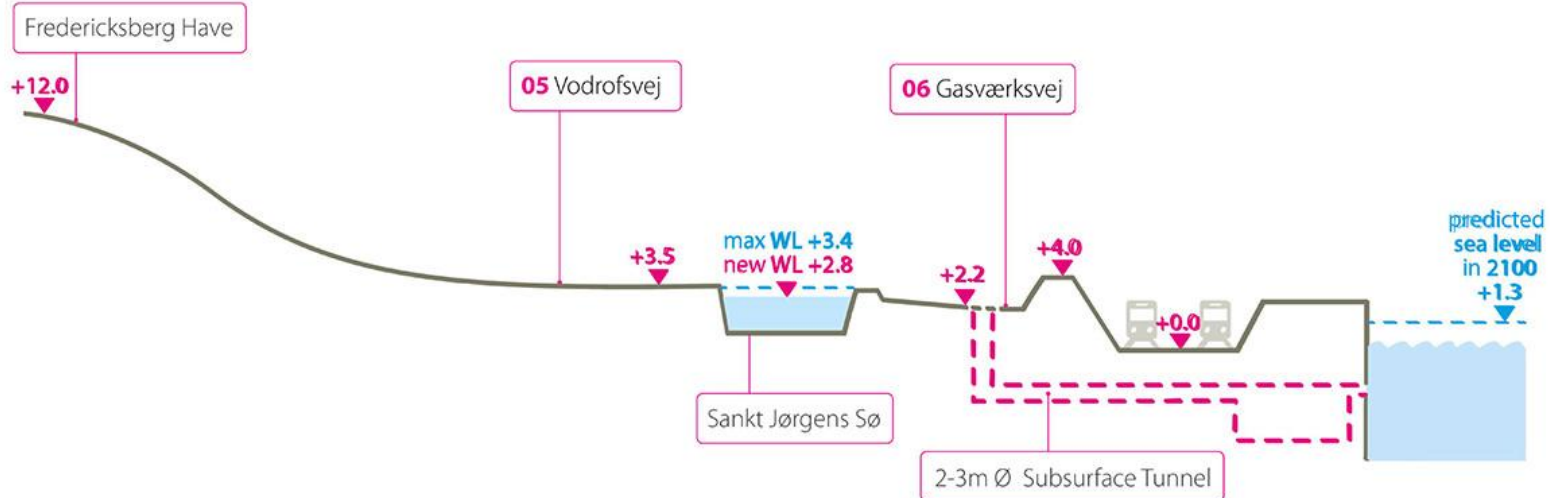
03 Street



BEFORE: Barriers

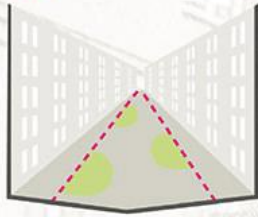


AFTER: Connections



Transformation to a Blue-Green City

04 Green Street



2,5 m

3,5 m

(16 m)

4,0 m

3,5 m



walk

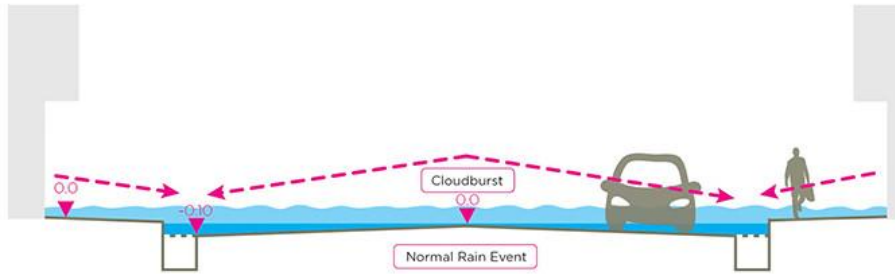
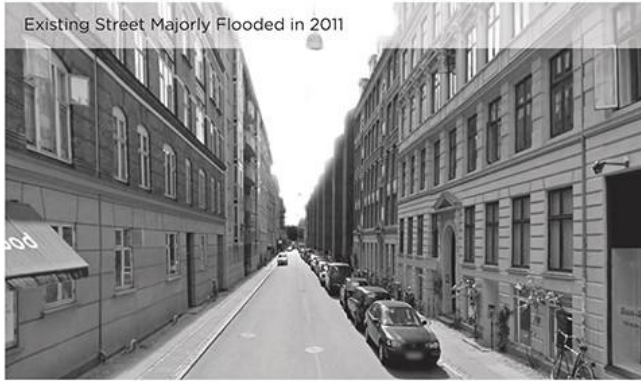
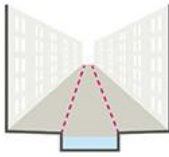
planter | urban activation

cycle - 2 way | drive - 1 way

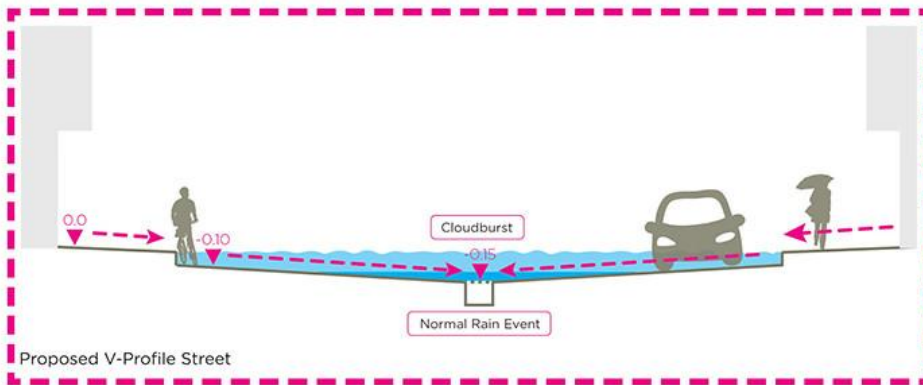
urban activation | planters

walk

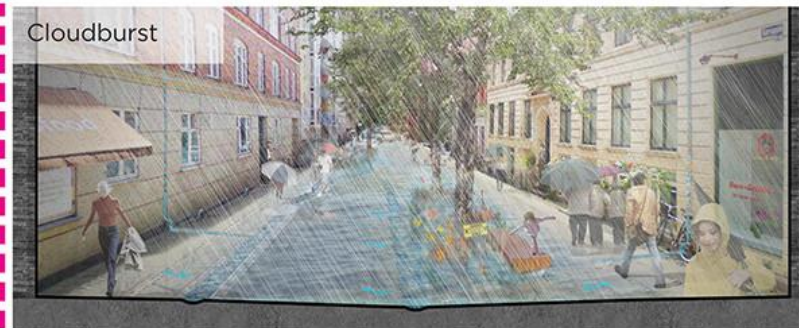
05 Urban Canal



Conventional: Existing Crowned Street

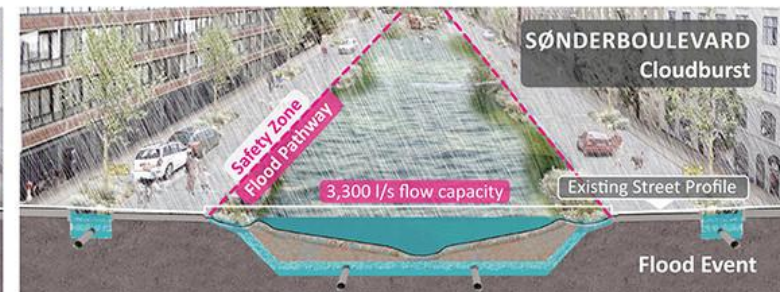


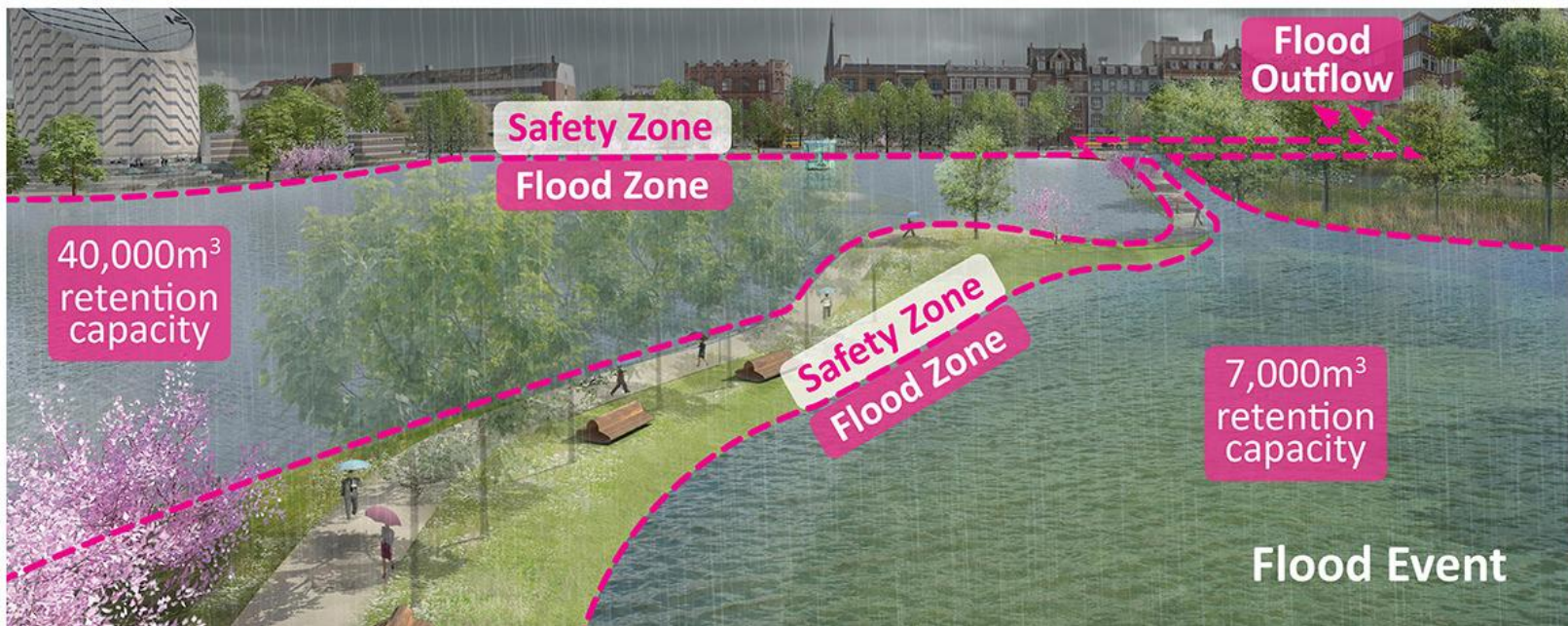
Proposed V-Profile Street

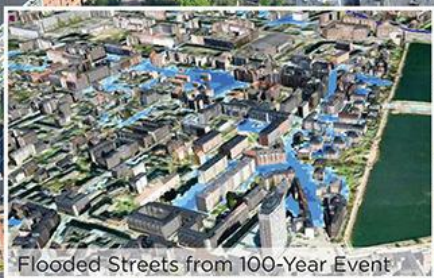




Rain Event Handled within Multi-Functional Tools including Urban Creek, Retention Boulevard, and Boulevard







Flooded Streets from 100-Year Event

 **\$200 MILLION
SAVED**
Cloudburst solution combines Blue-Green techniques with reduced pipe sizing to both save money and create multi-functional space synergies.

  **10%** real estate value increase
Green areas increase adjacent real estate value between 10-15%, or 1% for every 1 hectare of space within walkable proximity (Trust for Public Land, 2009).

  **3.3x** more active
Residents in green neighborhoods are three times more likely to be physically active compared to non-green neighborhoods (Forestry Commission).

A New 'Old' Destination
The lake becomes a multi-functional park space with recreation, fitness, and heritage amenities that capitalize space use, simultaneously mitigate Cloudbursts and normal rain events, and beckons residents and guests to engage with the active waterfront edge.



Existing Parking Lot Transformed



Change of Thinking

The cost of doing nothing creates losses of \$60 million a year (City of Copenhagen). Let's create robust solutions that add value and mitigate Cloudbursts.

Parks are proven to increase property value 10-15% (Source: Trust for Public Land).

NBS stosujemy w celu:

- a) Implementacja NBS w działaniach związanych z rewitalizacją.
- b) Wykorzystywanie rozwiązań NBS w kreowaniu dobrostanu człowieka w miastach.
- c) Ochrona wybrzeży
- d) Zarządzanie działami wodnymi.
- e) NBS jako element zrównoważonego gospodarowania energią w miastach.
- f) NBS jako element zabezpieczający ekosystemy.
- g) Rozwiązania oparte na przyrodzie jako narzędzie sekwencji dwutlenku węgla z przyrody.

(EbA) – wykorzystanie usług ekosystemowych w adaptacji do zmian klimatu. Przy tych działaniach wykorzystuje się potencjał lokalnych społeczności. W ten zakres wchodzi również działania związane z edukacją.

HOME PLACE

A Conversation Guide for the Princeville Community, Rebuilding After Hurricane Matthew.

HOME PLACE

A Conversation Guide for the Kinston Community, Rebuilding After Hurricane Matthew.

HOME PLACE

A Conversation Guide for the Windsor Community, Rebuilding After Hurricane Matthew.

HOME PLACE

A Conversation Guide for the Seven Springs Community, Rebuilding After Hurricane Matthew.

HOME PLACE

A Conversation Guide for the Lumberton Community, Rebuilding After Hurricane Matthew.

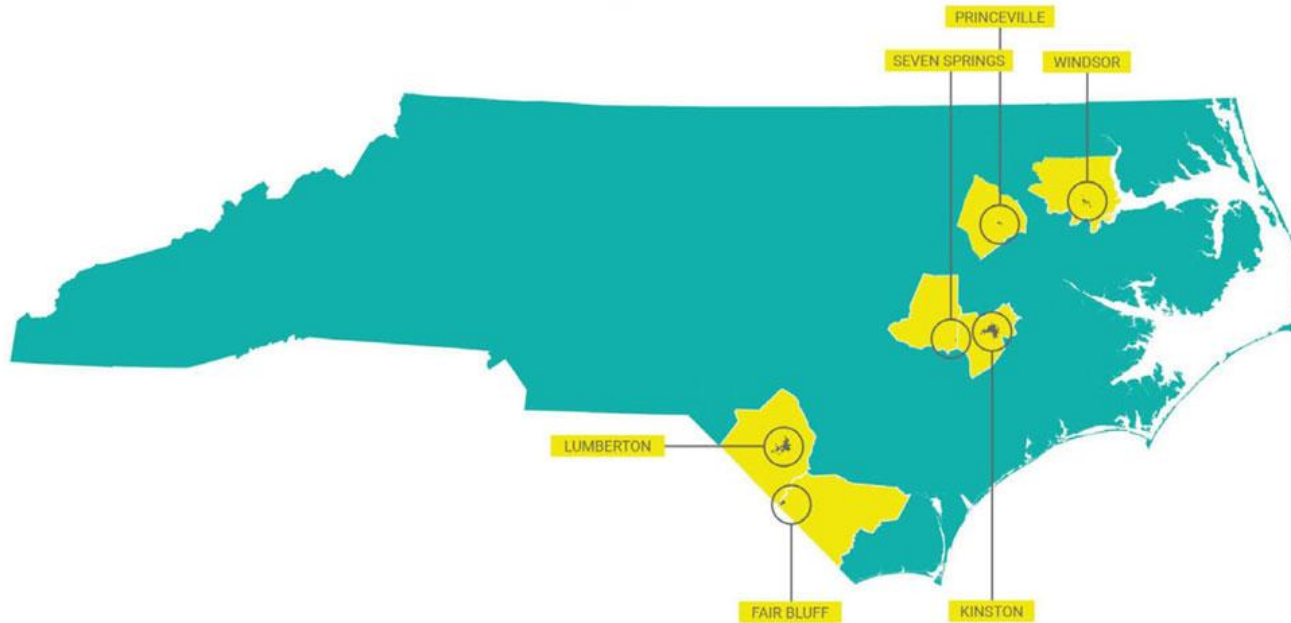
HOME PLACE

A Conversation Guide for the Fair Bluff Community, Rebuilding After Hurricane Matthew.

THE SIX COMMUNITIES

This guide is one of six that were developed for communities affected by flooding after Hurricane Matthew: **Fair Bluff, Kinston, Lumberton, Princeville, Seven Springs, and Windsor.**

These communities span eastern North Carolina, from the gently rolling hills of the state's southernmost coastal plains, to the sluggish rivers, backwaters, and hardwood forests of the riverine floodplains. The region's estuarine system—its rivers, sounds, and seas—shaped the earliest histories of its inhabitants. The rivers continue to act as arteries, connecting geographically distant, rural towns by way of a common heritage.



11 _ HOMEPLACE _ COMMUNITY CONVERSATION GUIDE

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02_FLOODING IN FAIR BLUFF	
03_RECOVERY OPTIONS	

HOMEPLACE + RESILIENCE: THE ROLE OF DESIGN

This guide seeks to help Fair Bluff and other eastern North Carolina communities build resilience through a place-based design and planning approach that reflects local people and traditions. The ultimate goal is the creation of physical spaces that promote individual and community health and wellbeing, history and heritage, and overall quality of life.

Design is the means by which these goals are translated into on-the-ground results and new lived realities for residents of Fair Bluff. This guide provides a series of concrete strategies and templates for the construction of high-quality structures and landscapes that set the stage for community-driven regeneration and placemaking.

The following principles are applied throughout this guide, to designs at the house, yard, street, community, and regional scales.



ACCESSIBILITY: All places should serve the needs of all people, regardless of age or ability.



CURB APPEAL: Designs should vary and should reflect the distinctive and longstanding aesthetic traditions of eastern North Carolina communities.



AFFORDABILITY: Designs should provide high-quality construction and materials at a price that is affordable for eastern North Carolina residents, in the short and long term.



EFFICIENCY: Designs should make use of materials and methods that ensure the short- and long-term efficiency and sustainability of structures and landscapes.



FLEXIBILITY: Designs should be varied and flexible to meet the current and future needs of residents and communities.

11 _ HOMEPLACE _ COMMUNITY CONVERSATION GUIDE

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COMMUNITY SNAPSHOT

The six HMDRRI communities are the focus of state and federal rebuilding efforts in eastern North Carolina. This moment offers a critical opportunity to rebuild in ways that increase resilience and provide new economic opportunities.



FAIR BLUFF
Pre-Matthew population of 859, and approximately 108 homes damaged by flooding.



KINSTON
Pre-Matthew population of 21,540, and approximately 303 homes damaged by flooding.



LUMBERTON
Pre-Matthew population of 21,721, and approximately 400 homes damaged by flooding.



PRINCEVILLE
Pre-Matthew population of 2,188, and approximately 450 homes damaged by flooding.



SEVEN SPRINGS
Pre-Matthew population of 76, and 47 homes damaged by flooding.



WINDSOR
Pre-Matthew population of 3,802, and approximately 60 homes damaged by flooding.

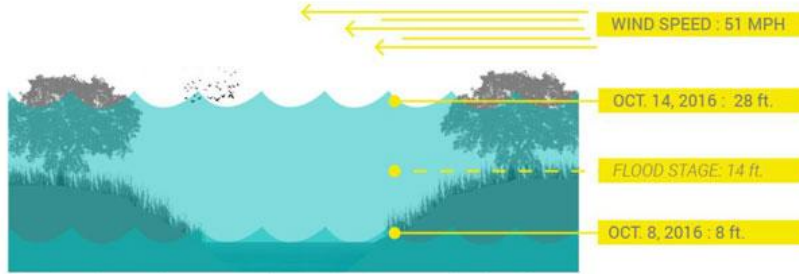
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KINSTON EFFECTS OF MATTHEW



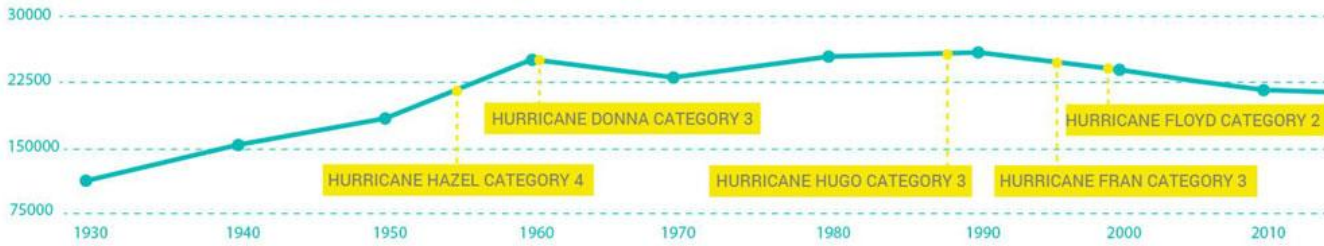
Kinston is situated on the Neuse River and has a population of 21,540. Kinston is 18.4 square miles in area and is located in Lenoir County.



The above diagram demonstrates the changing river gauge height at the 'Neuse River at Kinston' station, as observed by the USGS in October 2016.



This diagram shows the shifts in Kinston's population over time, along with the timing of some of the most destructive hurricanes to hit North Carolina.



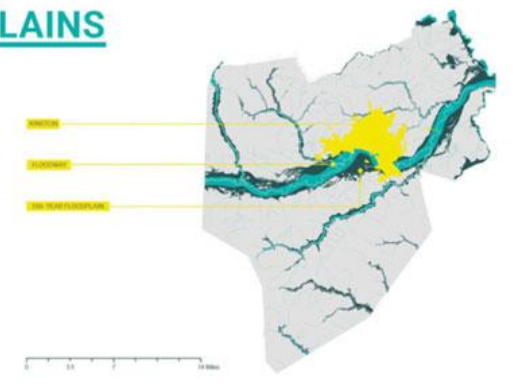
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LENOIR COUNTY FLOODPLAINS

Lenoir County is crisscrossed by waterways that make some communities more susceptible to flooding than others. Below is a map that shows floodway and floodplain determinations for the county. These areas are defined by a Flood Insurance Study, conducted for the federal National Flood Insurance Program (NFIP), overseen by FEMA.



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KINSTON FLOODPLAINS

Large portions of Kinston are located within the 100-year floodplain. This map demonstrates the extent to which Kinston's houses, yards, streets, and communities are vulnerable to major flood events.



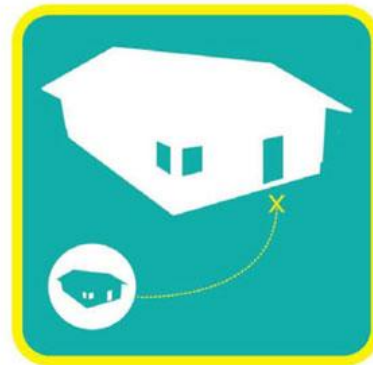
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I WANT (OR WAS APPROVED) TO...

Relocation and elevation are two of the most common forms of FEMA- and state-funded hazard-mitigation and risk-reduction techniques. The choice to relocate or elevate can be one of the most important and stressful decisions faced by homeowners in flood-prone areas. This guide will walk you through your options.



RELOCATE

In this scenario, the local government uses FEMA and state funds to purchase the home, demolish it, and turn the land into open space in perpetuity. Homeowners receive pre-disaster fair market value for their homes, and they move elsewhere.

[GO TO PAGE 24](#)



ELEVATE

Before or after a disaster, homeowners can choose to have their current house elevated in place to meet the latest hazard safety standards. Safety standards and elevation options are explained in the following pages.

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I WANT TO RELOCATE

Where can I move?

For many property owners, the best solution might be to move to a site outside of the floodplain and to build new from the ground up. This is the primary solution for those who elect to participate in the buyout program, and it reduces the risk that your house will flood.

Part of the HMORRI team's relocation strategy is to identify areas outside of the floodplain but within town boundaries where those pursuing a buyout may move. This would reduce flood risk while maintaining Lumberton's tax base.

What can I afford?

The cost of a house depends on many factors, including location, size, quality of materials and construction, complexity of details, site constraints, utility requirements, systems requirements, development and permitting fees, and general market and economic conditions. Housing affordability counseling can help those seeking to purchase a new home.

FIVE HOUSING TYPES



What will my house look like?

The five house types in this guide are designed to fit comfortably into existing neighborhoods in Lumberton or to form new cohesive, attractive neighborhoods. The styles, forms, materials, and details are contemporary, but they reference historical precedents from eastern North Carolina.

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I WANT TO ELEVATE

What can I afford?

The cost of elevating a house depends on many factors, including location, size, quality of materials and construction, complexity of details, site constraints, utility requirements, systems requirements, development and permitting fees, and general market and economic conditions. The following pages will help you consider your options.

What are my elevation options?

The first step in elevating a house is to consult all relevant codes and regulations. There are three basic strategies for constructing an elevated house: lifting on piers, mounding sitework, and building a tall foundation. All three strategies are explained in this section.

When considering sitework—to include elevating structures on fill material—it is imperative that the work is carried out in compliance with the Local Flood Damage Prevention Ordinance. This might require, for example, obtaining a "no-vice certification" before work may begin.

ELEVATION OPTIONS



ELEVATED HOUSING TYPES



What will my house look like?

The three elevated house types in the guide are designed to fit comfortably into existing neighborhoods in Prineville. The styles, forms, materials, and details are contemporary, but they reference historical precedents from eastern North Carolina.

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BOGUE: TYPE 1

The Bogue plan features three bedrooms, a porch on the street side, and a porch off the dining room. Adjacent to the bedroom zone is a den/workspace with room for a desk and shelving. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Master bedroom
- 6 Bedroom
- 7 Driveway
- 8 Den/workspace
- 9 Ramp

DETAILS

1500 SQ. FT
 3 BEDROOMS
 2 BATHROOMS
 FRONT + BACK PORCH

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PAMLICO: TYPE 1

The Pamlico is a two-bedroom, two-bathroom house. One side of the house contains an open kitchen, dining, and living space. The other side contains bedrooms, bathrooms, and a full laundry closet. A generous front porch wraps the corner of the house to provide covered outdoor space and exterior storage space. This house is designed to be built with or without accessibility features, such as wheelchair ramps, depending on the needs of the residents.



- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Bedroom
- 6 Master bedroom
- 7 Driveway
- 8 Ramp

DETAILS
 1500 SQ. FT
 2 BEDROOMS
 2 BATHROOMS
 PORCH

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PAMLICO: ELEVATED

The Pamlico is a two-bedroom, two-bathroom house. One side of the house contains an open kitchen, dining, and living space. The other side contains bedrooms, bathrooms, and a full laundry closet. A generous front porch wraps the corner of the house. Elevating the house above flood levels allows for covered parking and increased yard size.



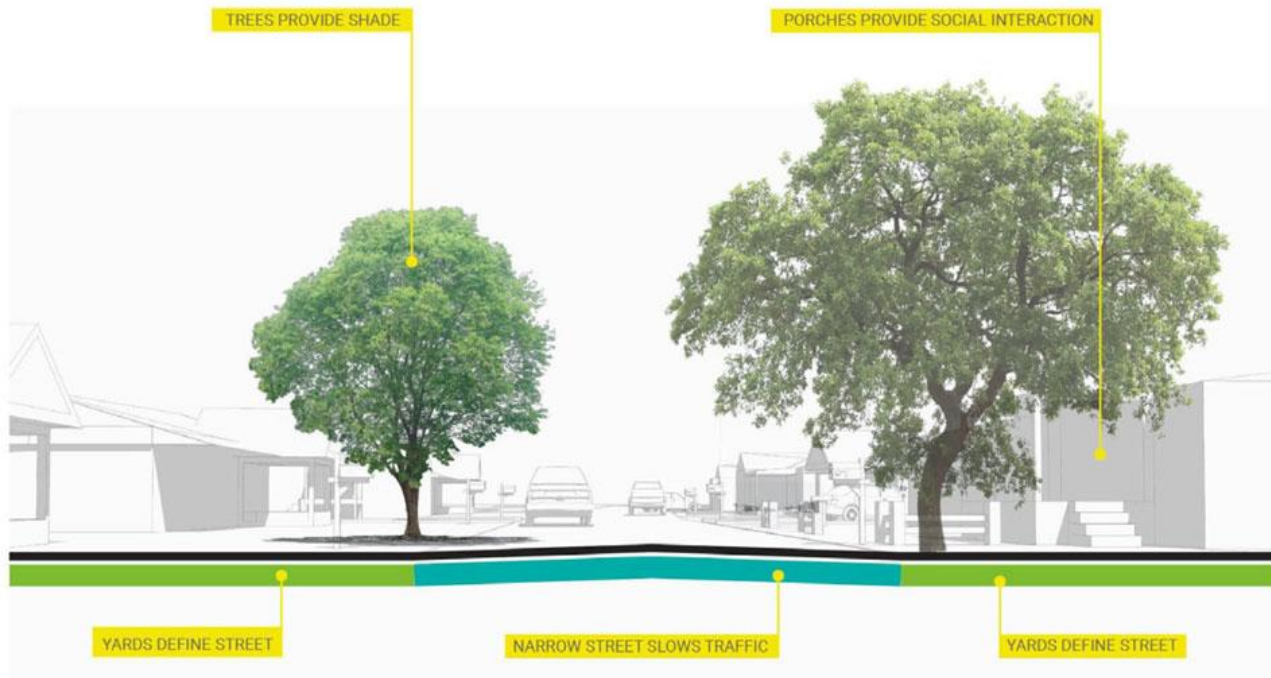
- 1 Porch
- 2 Living
- 3 Dining
- 4 Kitchen
- 5 Bedroom
- 6 Master bedroom
- 7 Covered parking

DETAILS
 1500 SQ. FT
 2 BEDROOMS
 2 BATHROOMS
 PORCH

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WALKABLE STREETS

Many streets in areas affected by flooding are two lanes and narrow by contemporary standards. However, research suggests that narrow streets have many benefits to neighborhoods—including promoting slower automobile travel speeds, encouraging walking, and promoting stronger neighborhood character.

Pre-World War II street design favored connected networks with walkable block sizes and shapes. Traffic volumes in many affected areas are relatively low and still favor walking, especially if measures are taken to improve pedestrian safety and comfort. These might include improved wayfinding and signage, crosswalks, maintenance of streets and sidewalks for pedestrian safety, and the preservation or planting of shade trees for protection from the sun.



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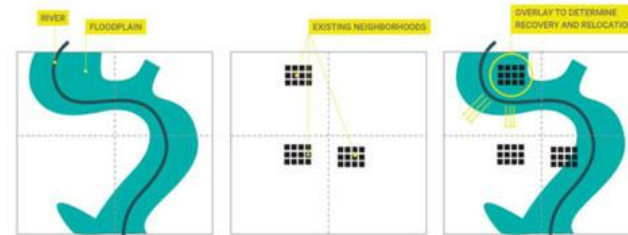
LANDSCAPE ANALYSIS

THE USE OF MAPS

One set of forces is environmental and associated with floodplains, the places that face highest flood risk. Another set of forces is social and associated with neighborhoods, and with the landscape patterns that define the homeplaces of residents. These include streets, yards, porches, stoops, and other elements of landscape that support community life.

The landscape is influenced by many different forces. Maps can help identify these forces.

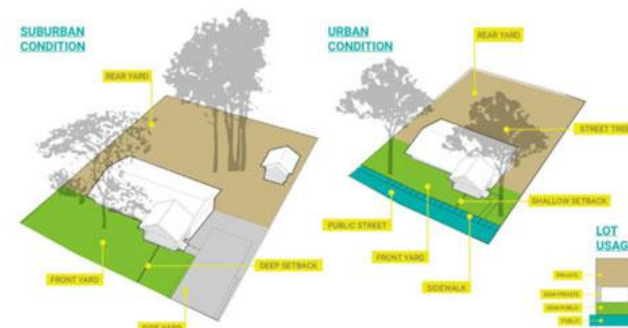
Mapping and overlaying these forces can provide a window into the qualities of the landscape that helped people lead their lives in floodplain areas. It is important to consider these patterns—combined with the findings of the HMDRRRI Land Suitability Analysis—when regenerating floodplain areas for those who choose to stay and to reinvest in place. Mapping can also identify the landscape qualities of neighborhoods outside the floodplain, to consider and respond to when relocating and building new homes in existing neighborhoods.



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YARDS AND SETBACKS

Yards are the most direct ways that houses connect to their streets and neighborhoods. Setbacks—the policies that control how close together houses can be to one another and the street—define yards. The overall pattern of yards contributes to the image and quality of a neighborhood. Yards are often the settings of informal activities that connect people to their neighbors. To promote social cohesion

and strong communities, noting and responding to local patterns of yards and setbacks should be an area of design and planning focus.



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BRINGING IT ALL TOGETHER

Although there are many different elements that make up community character, communities are the result of incremental decisions made by people committed to making their neighborhood a better place. This guide outlines different aspects of the landscape and broad decision-making tools that can affect community form. But observing the community reveals the cumulative decisions made

over time that make the values of homeowners present in the environment. There need to be places where planting, outdoor seating, carpools, and other components can be put together in the unique styles of each homeowner. When people take pride in their homes and invest in them to suit their preferences and community values, it indicates the success of a resilience strategy.

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PORCHES AND STOOPS—CONNECTING NEIGHBORS

Porches and stoops historically have played a significant role in connecting houses to their streets and neighborhoods. Before air conditioning, they served as outdoor rooms where residents could get relief from the heat and also engage with their neighbors.

Today, porches and stoops continue to offer a vital bridge between the private life of the home and the public life of the street. They prevent isolation, fostering regular interaction with neighbors and building a sense of community.



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ACTIVATING PUBLIC SPACE

If residents choose to stay in areas affected by flooding, they choose to either elevate their existing home or build a new elevated home. Most previous neighborhood patterns in floodplain areas did not include elevated structures, and the qualities of the landscape that historically enabled social interaction were at the ground level. These included the streets, the yards, the porches and stoops, and other elements that promoted "eyes on the street." There is an

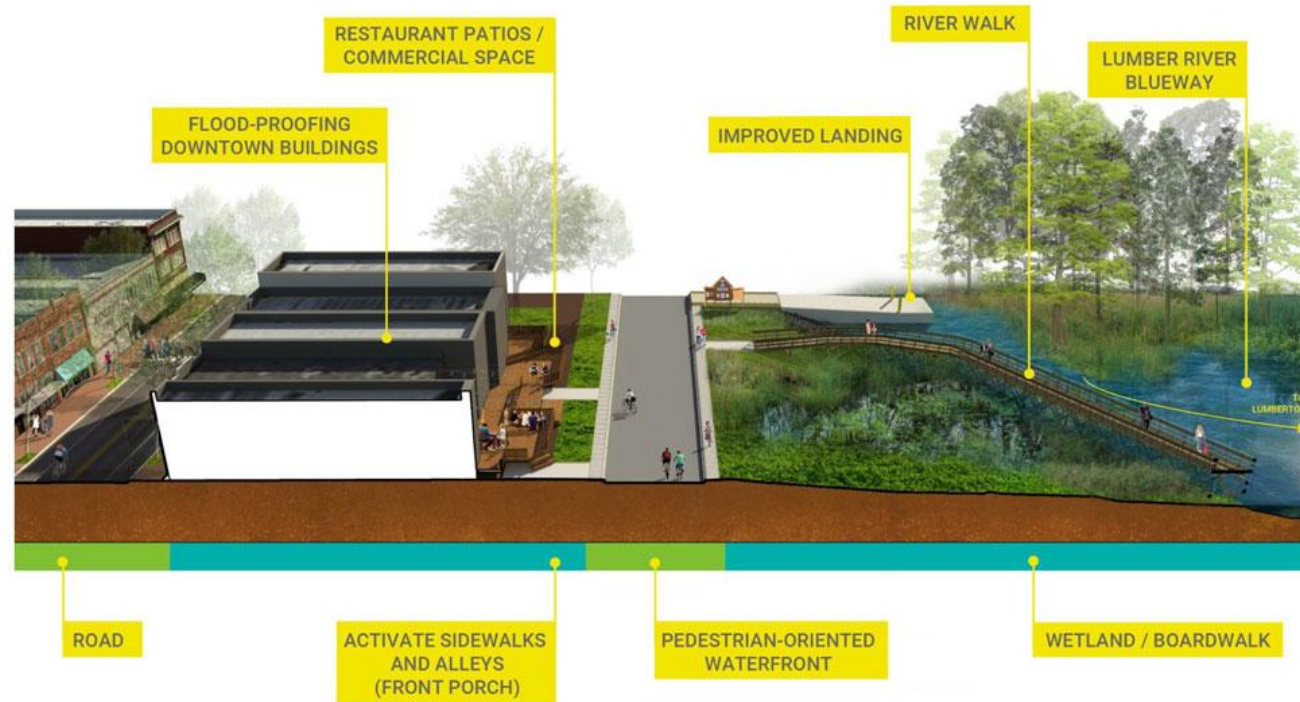
opportunity to address the potential impact of elevation on social life in the neighborhood. Activating space beneath the structure allows for weather-protected uses such as shaded seating, children's play, outdoor eating, and other activities that can simulate the life that was once on a porch or stoop. Keeping elevated structures close enough to the street to allow people to engage neighbors from porches and balconies can also support neighborhood life.



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CONNECTING FAIR BLUFF TO THE RIVER

This cross section illustrates the need and opportunity to create stronger connections between the downtown and the Lumber River, which can occur through modifications to the existing roadway and by creating public space along the backside of downtown buildings.

FAIR BLUFF GREENSPACE

The conceptual greenspace framework proposed for Fair Bluff is based on the assumption that, while potential buyouts may result in a large number of vacated residential properties in and around downtown, the downtown commercial area itself will remain where it is. The greenspace framework is intended to help address and resolve the long-term sustainability of Fair Bluff and to aid in the growth and development of the community so that it can become more resilient to future river flooding.



- LEGEND**
- FAIR BLUFF
 - ROADS
 - BUILDING FOOTPRINTS
 - MATTHEW FLOOD AREA
 - 100-YEAR FLOODPLAIN
 - 500-YEAR FLOODPLAIN
 - LUMBER RIVER
 - BOAT ACCESS

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GREENSPACE CONCEPT
 The Fair Bluff greenspace system should include an expanded trails network that takes advantage of the town's location on the Lumber River. The system should include trails, sidewalks, and bikeways that extend throughout the community. Additional greenspace east of the downtown, the result of voluntary buyouts, will allow future expanded public space to support festivals and community events.



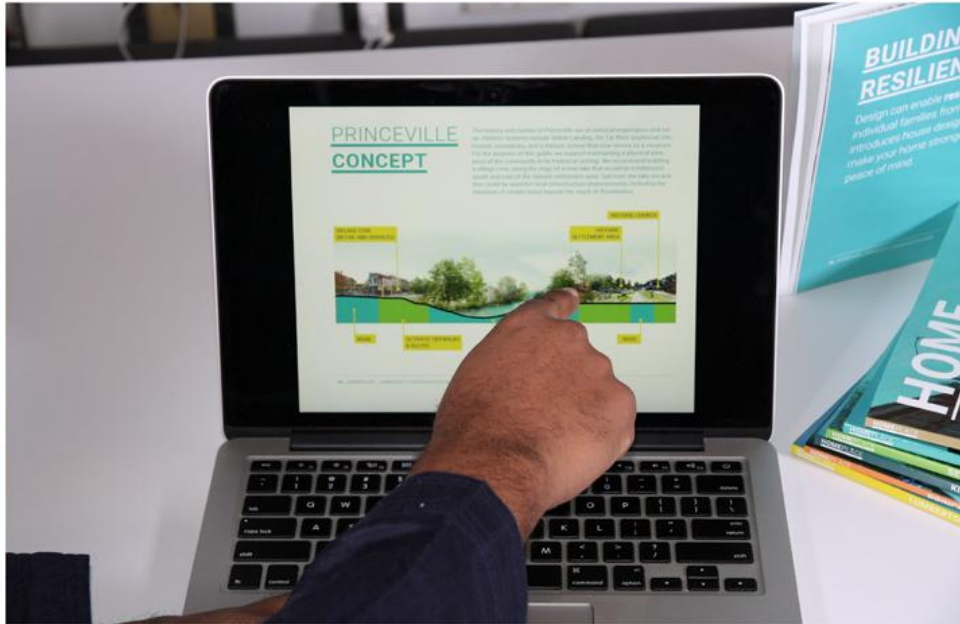
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LUMBER RIVER BLUEWAY
 This map illustrates a possible blueway trail between Lumberton and Fair Bluff. The trail can promote canoe and kayak travel, with stops at the Lumber River Campground, Lumber River State Park, Sandy Ridge, and Osbow Station. To promote this blueway, outfitters should be located on both Lumberton and Fair Bluff to service paddler users.

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(EbM) – działania mające na celu wypracowanie globalnych, długoterminowych korzyści wpływających na łagodzenie zmian klimatycznych. Takie rozwiązania stosowane są poza terenami miast. Przywracanie całych ekosystemów np. lasów.

STORM + SAND + SEA + STRAND

BARRIER ISLAND RESILIENCY PLANNING
FOR GALVESTON ISLAND STATE PARK



09.14.2008



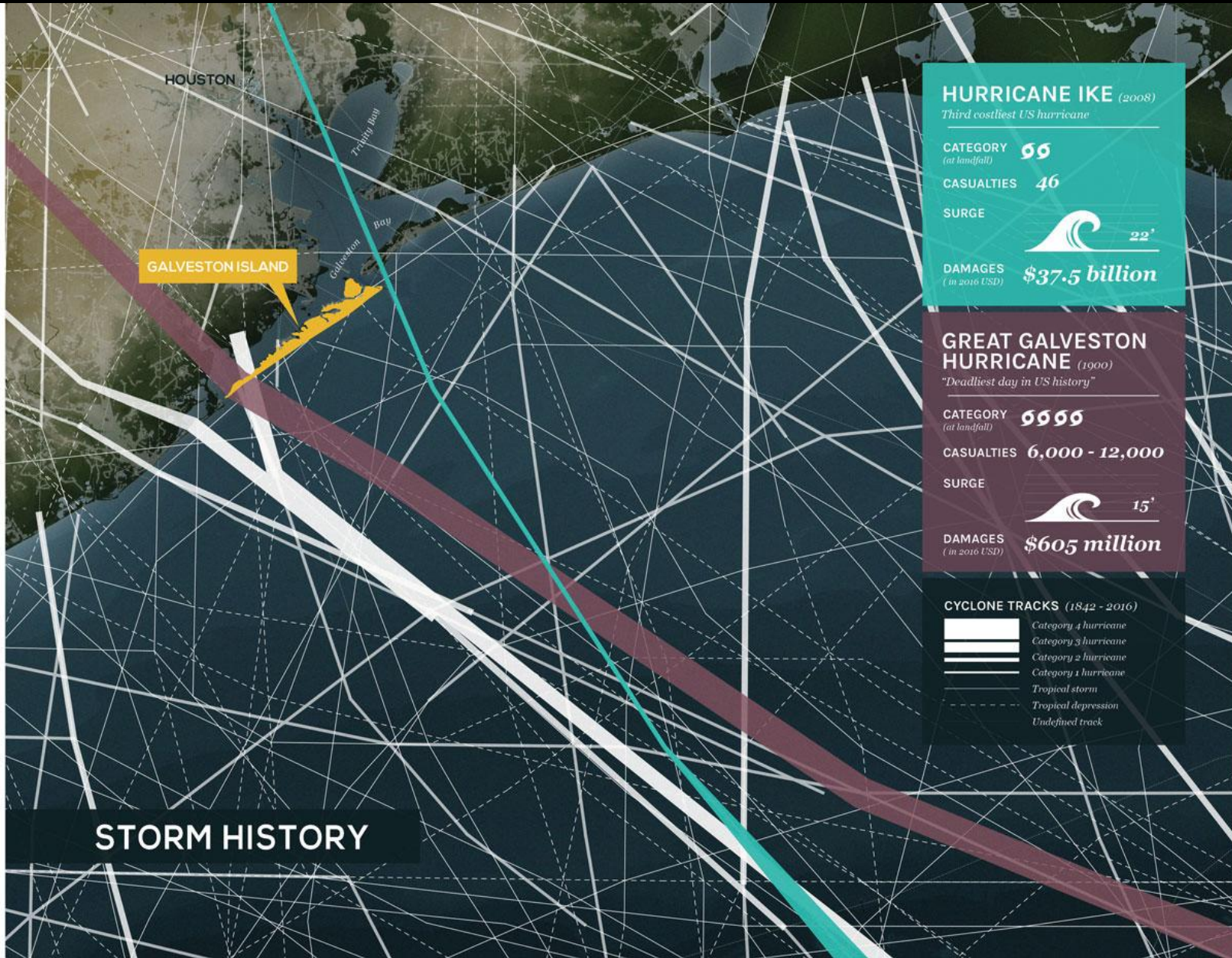
09.10.2008

AS TEXAS' LARGEST ESTUARY, GALVESTON BAY'S WATERSHED IS HOME TO THE **4TH AND 9TH LARGEST CITIES** IN THE UNITED STATES: **HOUSTON AND DALLAS.**

32 MILES OF GULF COAST BEACHES

300+ SPECIES OF BIRDS





STORM HISTORY



SEA LEVEL RISE



SUBSIDENCE



HURRICANES



EROSION



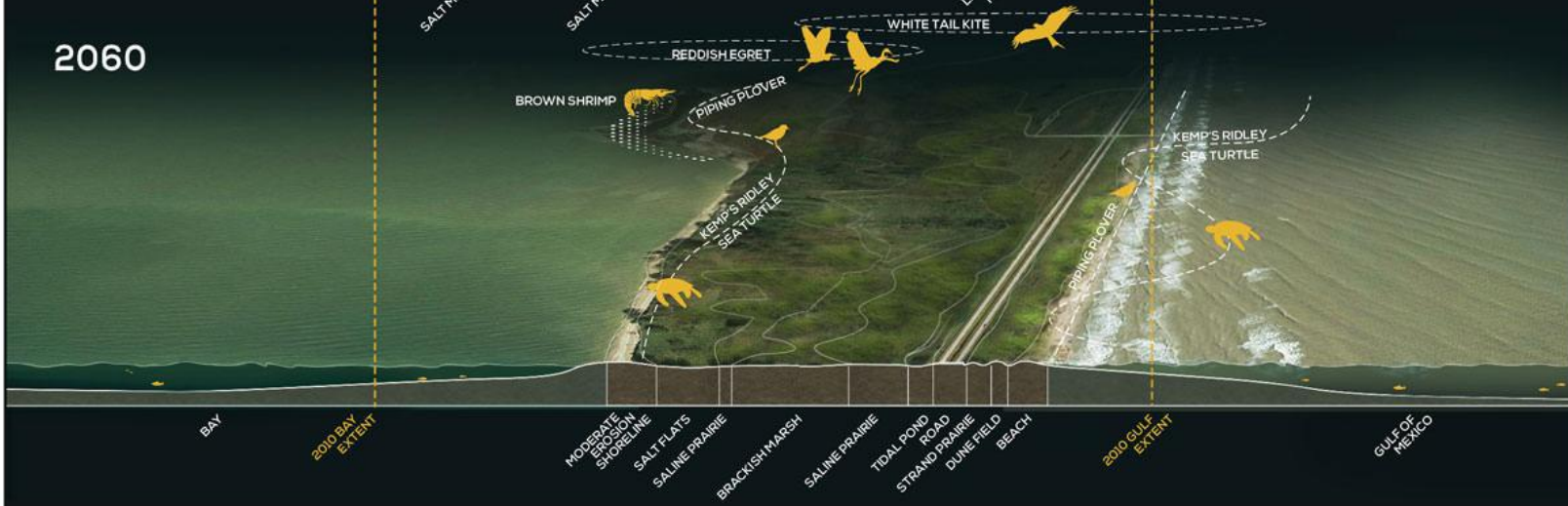
22% LAND LOSS
OVER 50 YEARS

SHIFTING ECOLOGY

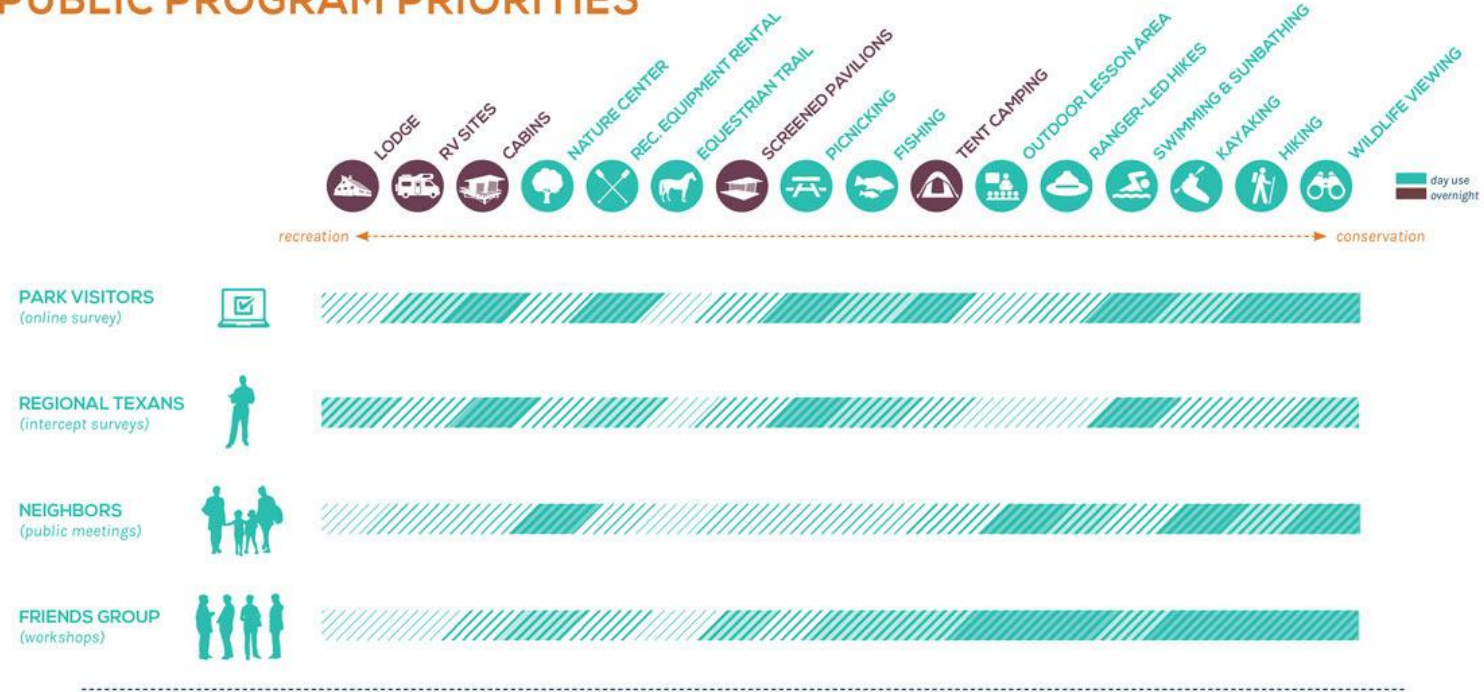
2010



2060



PUBLIC PROGRAM PRIORITIES



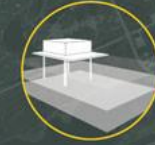
PLANNING AGENCY PRIORITIES



RESPONSIVE INTERVENTIONS



AGGREGATION
CONSOLIDATE STRUCTURES TO EDGES FOR CONTIGUOUS HABITAT



ACCOMMODATION
ANTICIPATE SHIFTING WATERS WITH VERTICAL FLEXIBILITY



ANTICIPATION
ANTICIPATE HORIZONTAL SHIFTS IN ECOLOGY AND LAND MASS



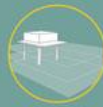
ELEVATION TIED TO FUNCTION
EXPERIENCE PROGRAMS AT A VARIETY OF ELEVATIONS



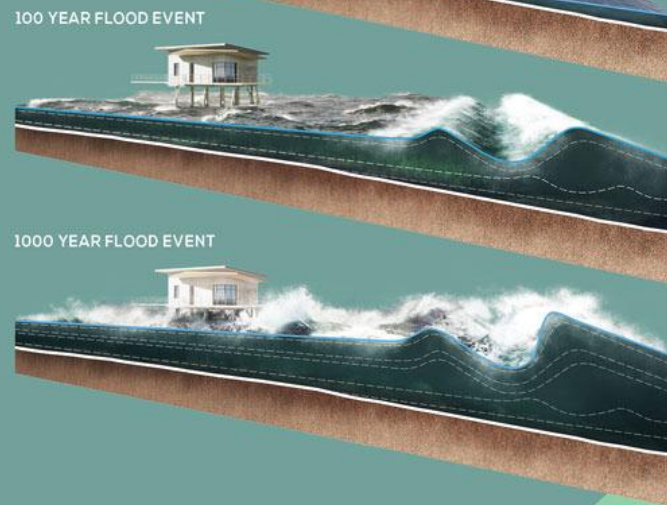
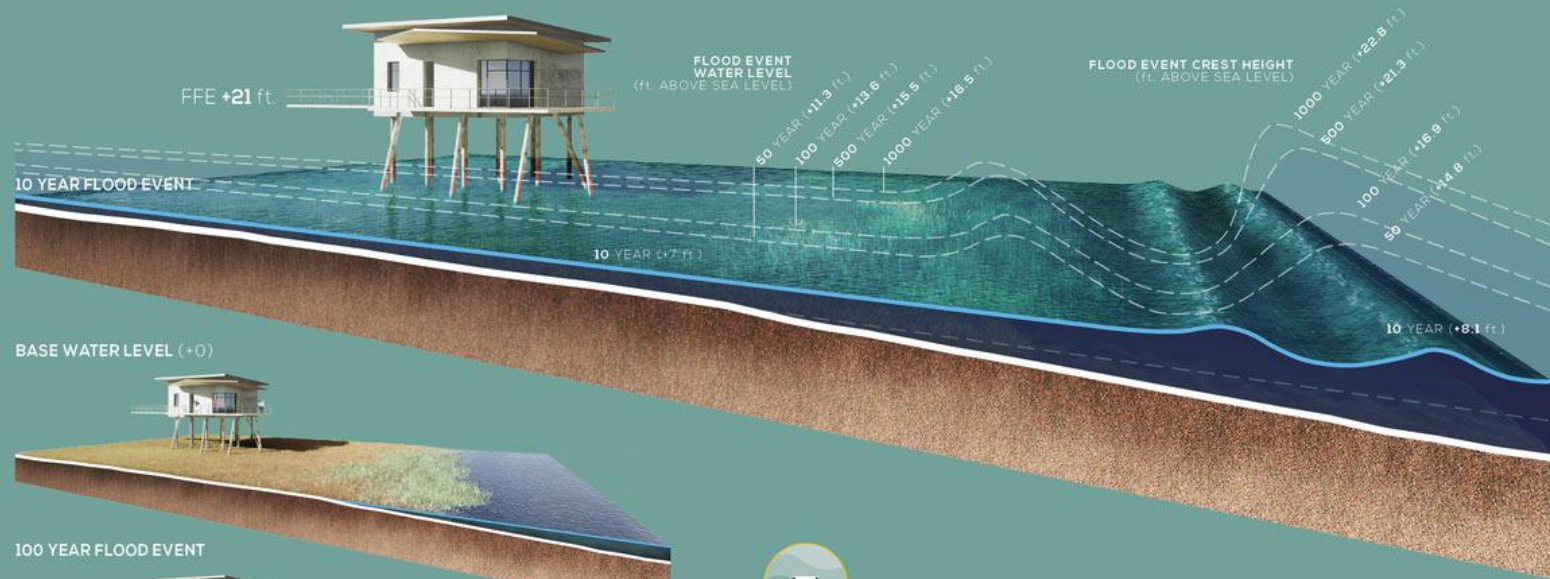
NIMBLE INFRASTRUCTURE
MITIGATE DEVELOPMENT PRESSURE AND LIKELY FUTURE STORM EVENTS THROUGH DUNE RESTORATIONS AND MIGRATION MEASURES



LAUNCH POINTS
CONSERVE A SUBTLE LANDSCAPE WITH A SINGULAR INTERPRETIVE ORIENTATION



ACCOMMODATION



PIPING PLOVER HABITAT (2010)



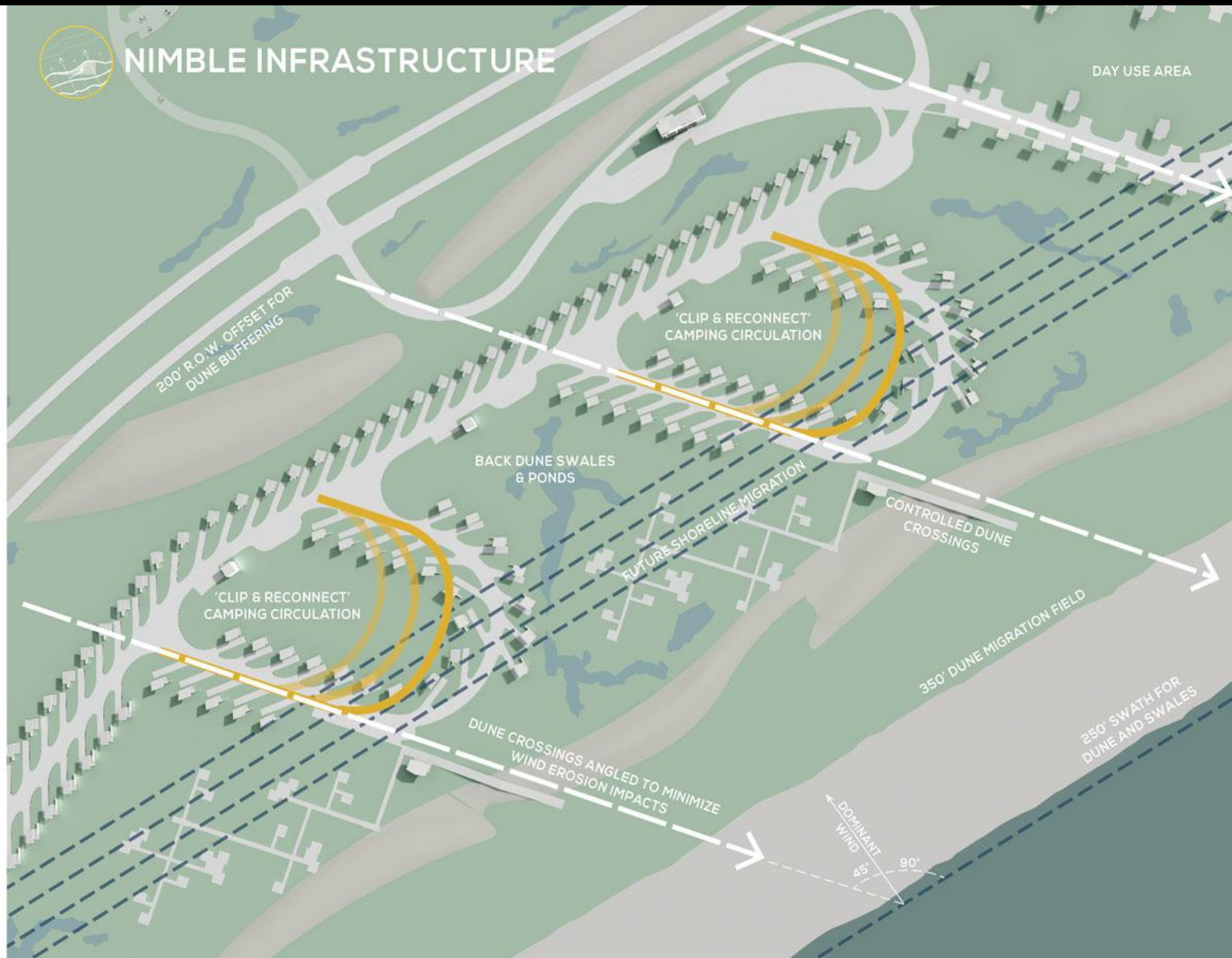


ELEVATION TIED TO FUNCTION





NIMBLE INFRASTRUCTURE

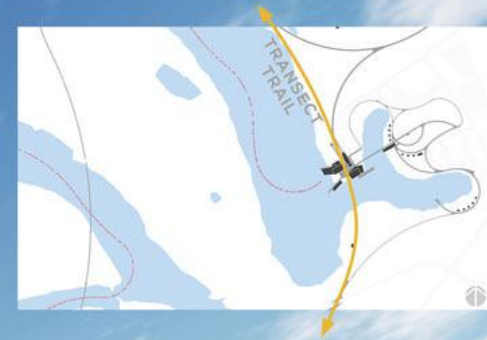




BARRIER ISLAND DISCOVERY CENTER

2010

AS THE ORIGIN OF VISITOR EXPERIENCES,
THE CENTER STRADDLES THE TRANSITION
OF LAND AND WATER





BARRIER ISLAND DISCOVERY CENTER

2060

THROUGH HABITAT SHIFT AND RISING SEAS, STRUCTURES ENDURE AND ACCOMMODATE THE EVOLUTION OF THE BARRIER ISLAND ENVIRONMENT



CAS - zrozumienie kluczowych mechanizmów i cech ekologicznych, które wspierają zdolność ekosystemów do adaptacji do zmian.



EUROPEAN SETTLEMENT

MAJOR U.S. SEAPORT

RISING URBAN POPULATION

URBAN RENEWAL

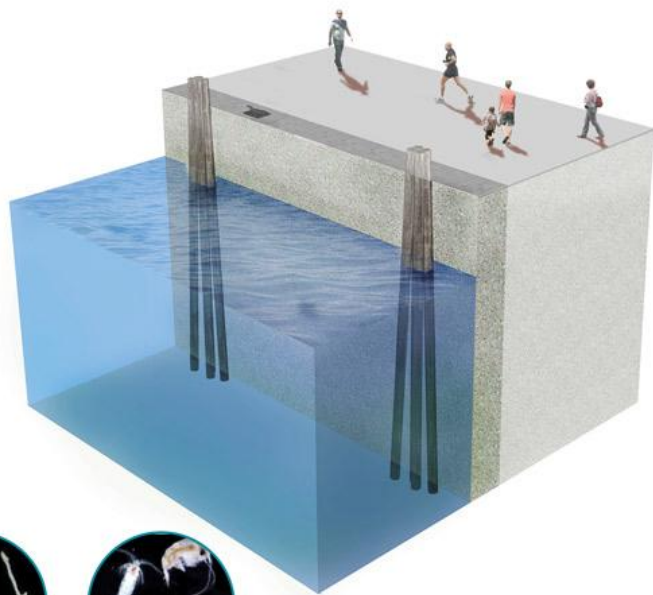
18TH CENTURY

19TH CENTURY

EARLY – MID 20TH CENTURY

LATE 20TH CENTURY

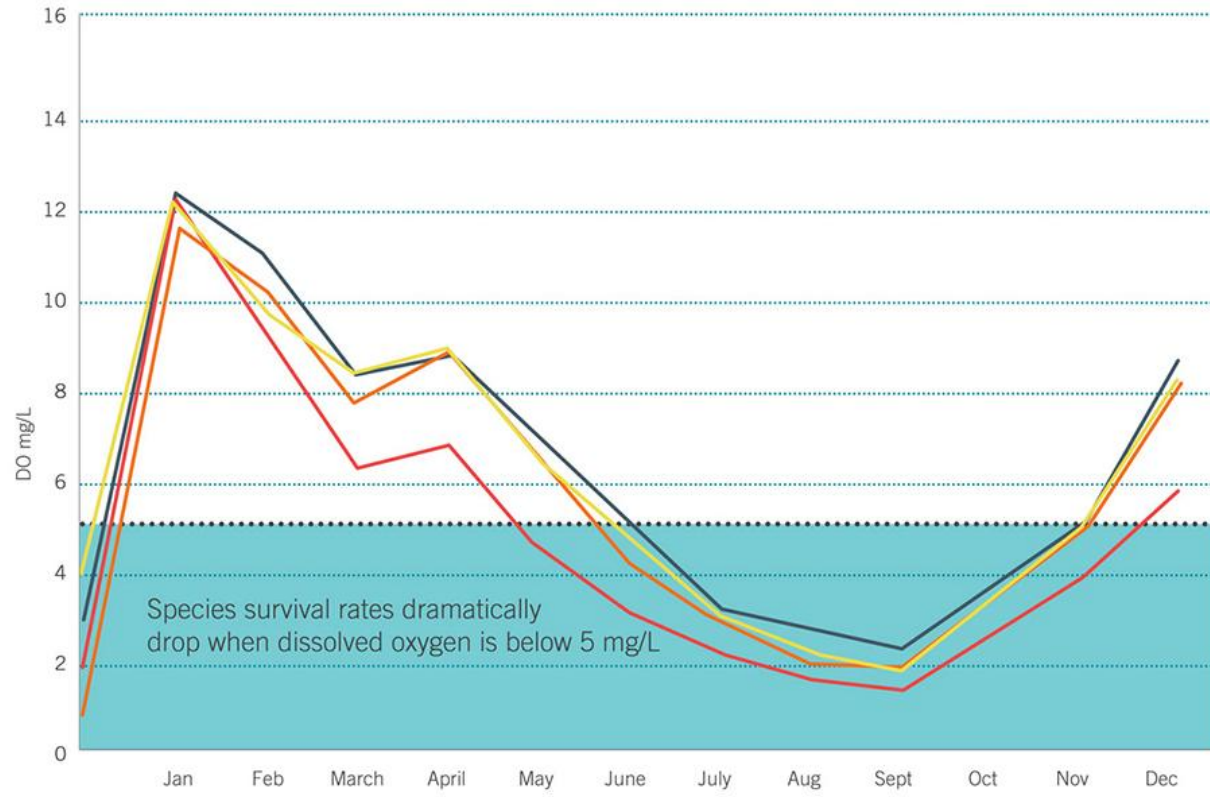




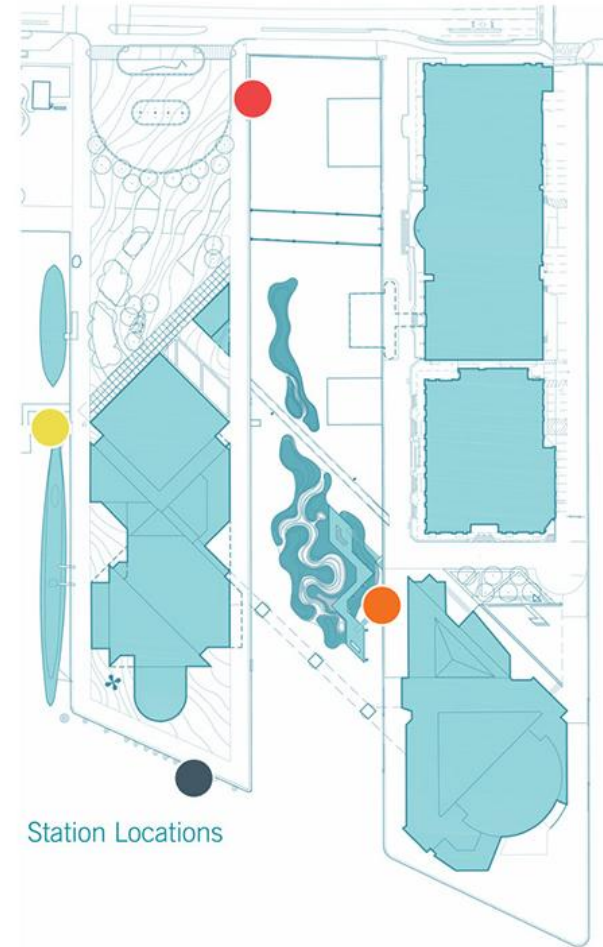
Existing Condition



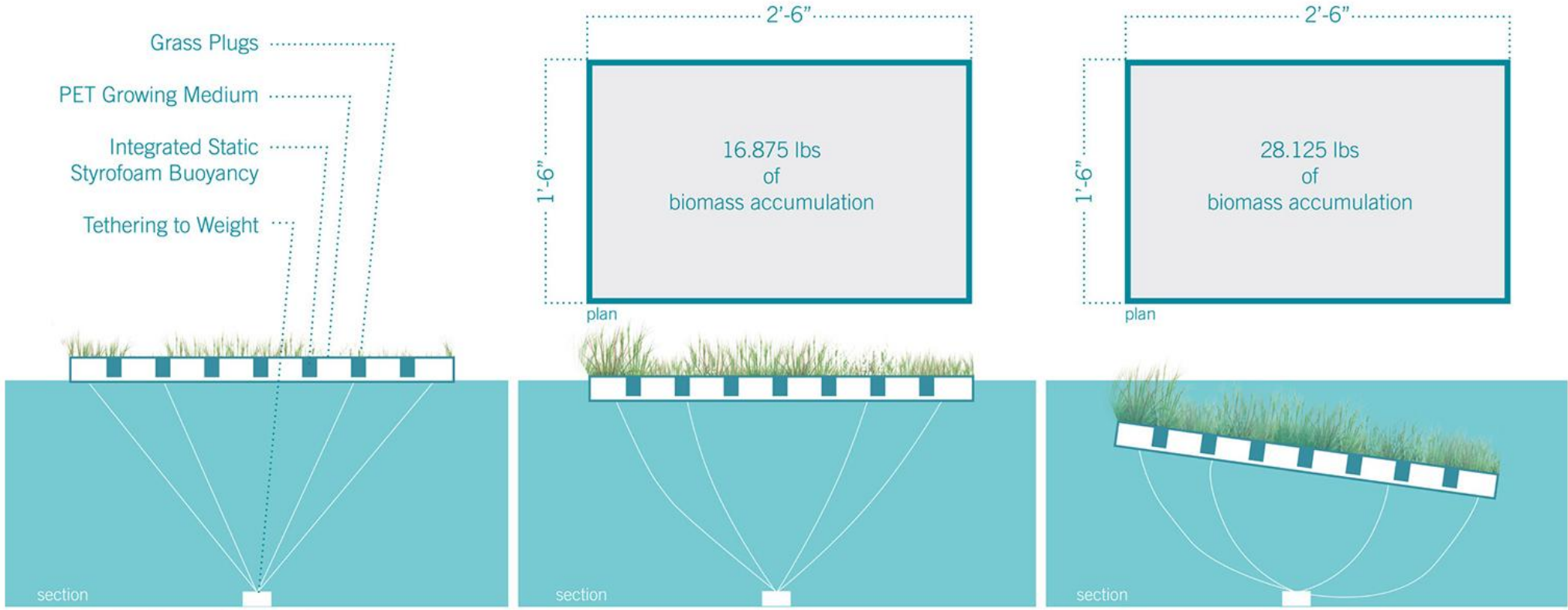
Desired Condition



Average Dissolved Oxygen (mg/L) by Station



Station Locations

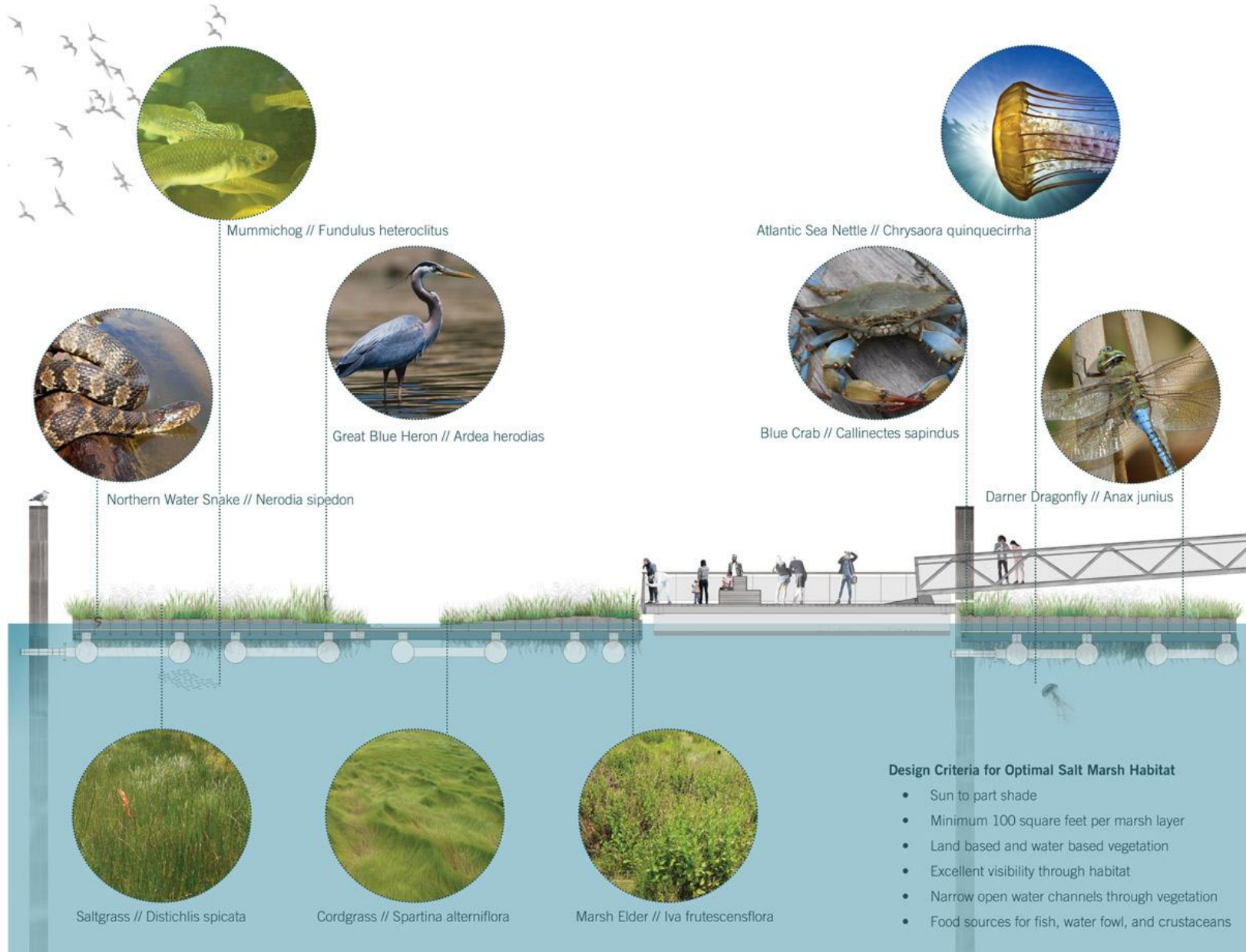


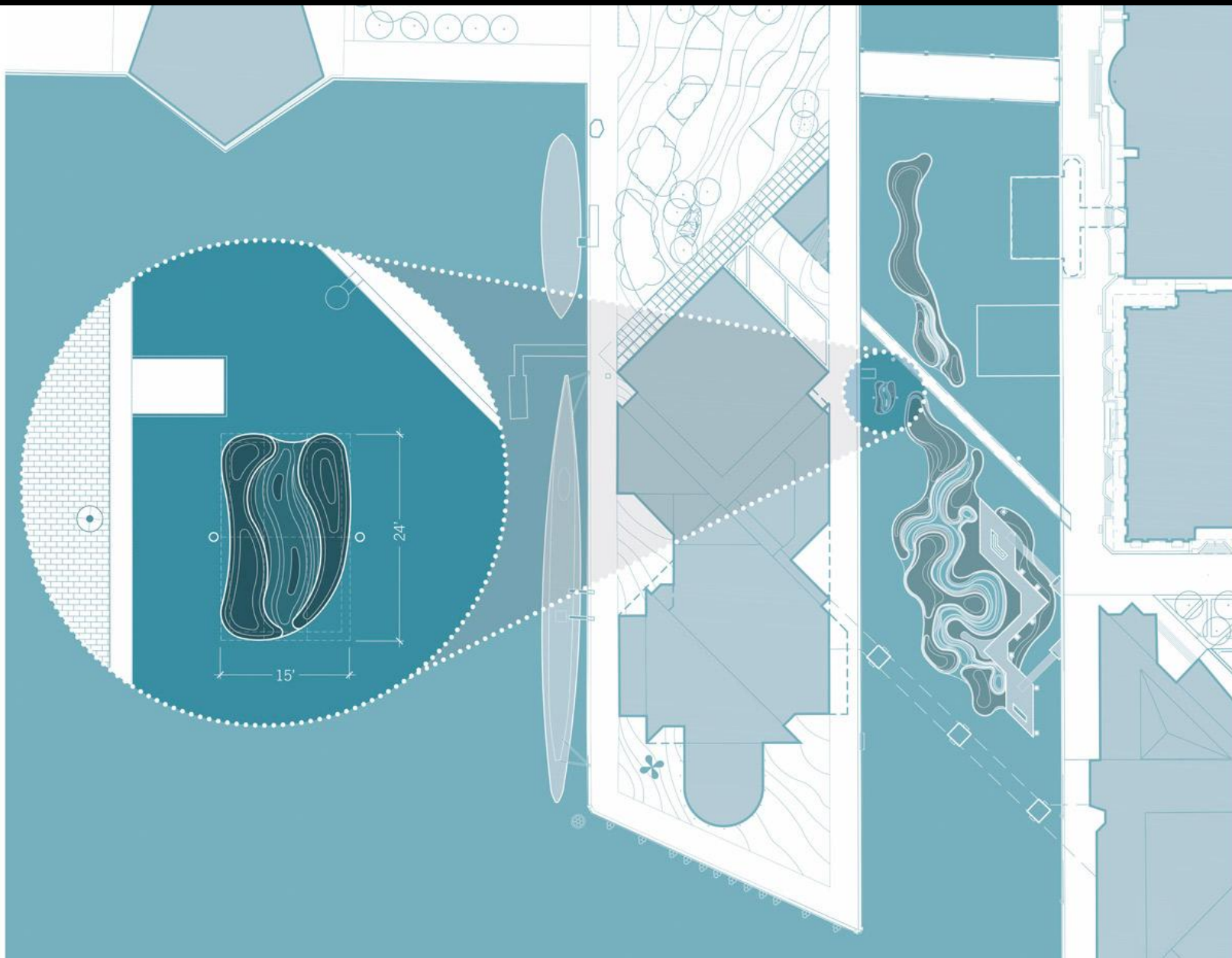
Traditional Floating Wetland at Installation

Traditional Floating Wetland at Year 3

Traditional Floating Wetland at Year 5







shallow submerged
low marsh
-6" to -1"



Spartina alterniflora,
Scirpus americanus

non-submerged
low marsh
1" to 5"



Spartina patens,
Distichlis spicata,
Solidago sempervivens,
Hibiscus moscheutos,
Scirpus robustus

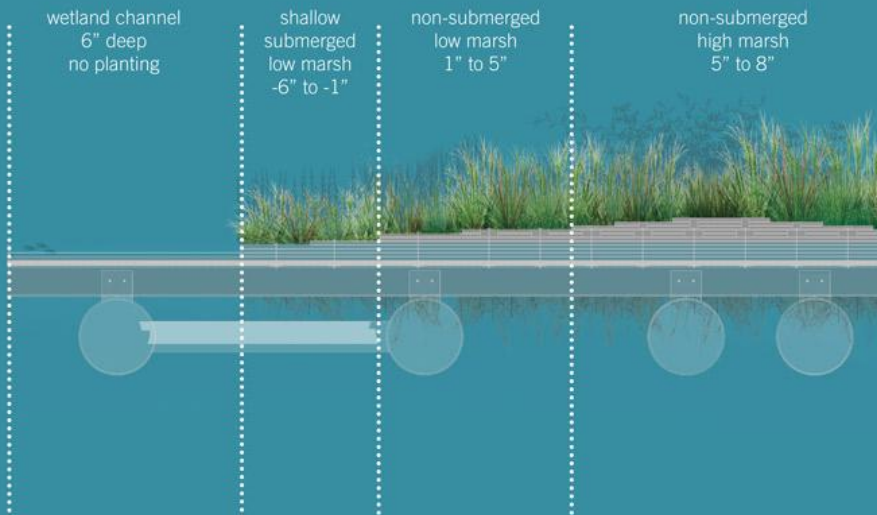
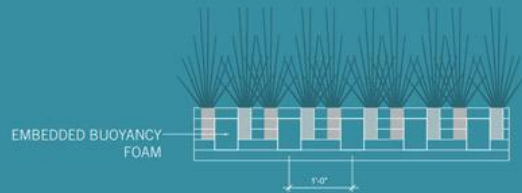
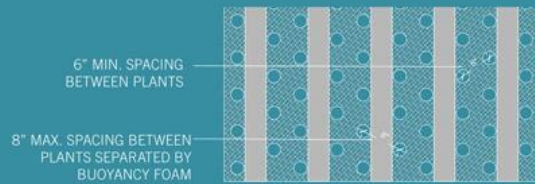
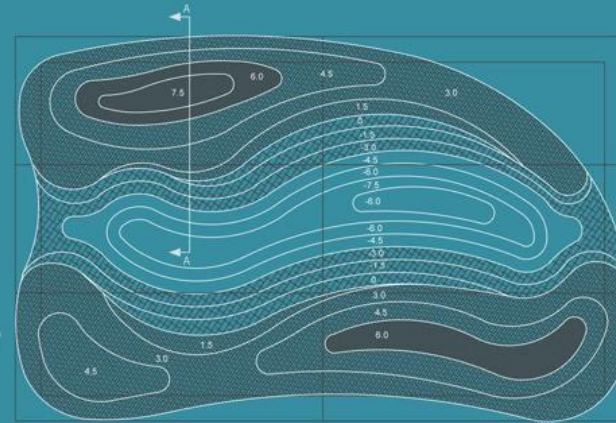
non-submerged
high marsh
5" to 8"

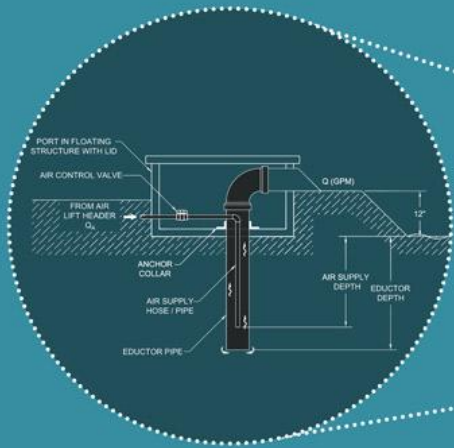


Baccharis halimifolia,
Amorpha fruticosa,
Iva fruticosa,
Ilex glabra,
Itea virginica

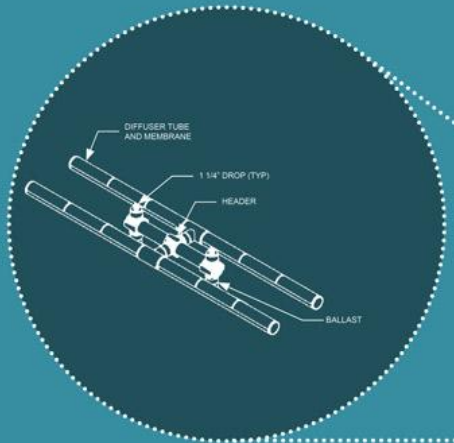
PLANTING LEGEND

	SHALLOW SUBMERGED LOW MARSH (1'-4'-6")
	NON-SUBMERGED LOW MARSH (1"-5")
	HIGH MARSH (5"-8")

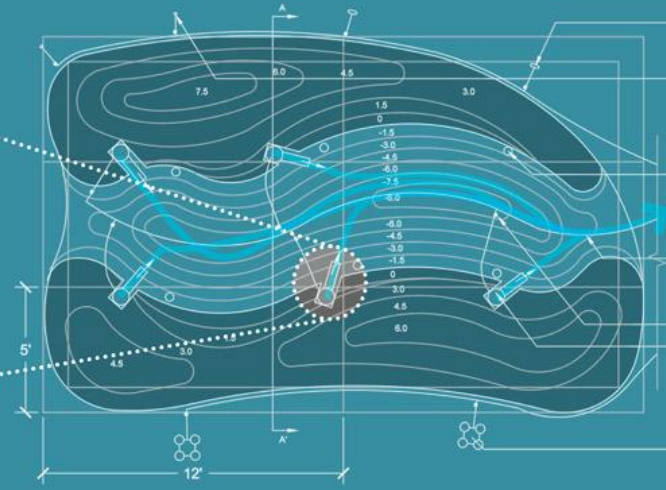




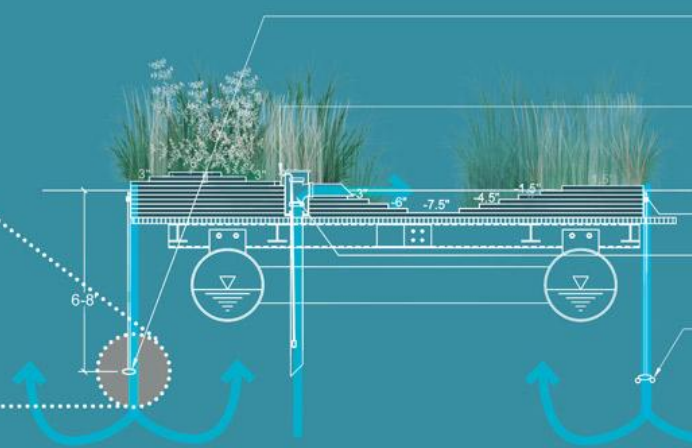
Airlift Pump



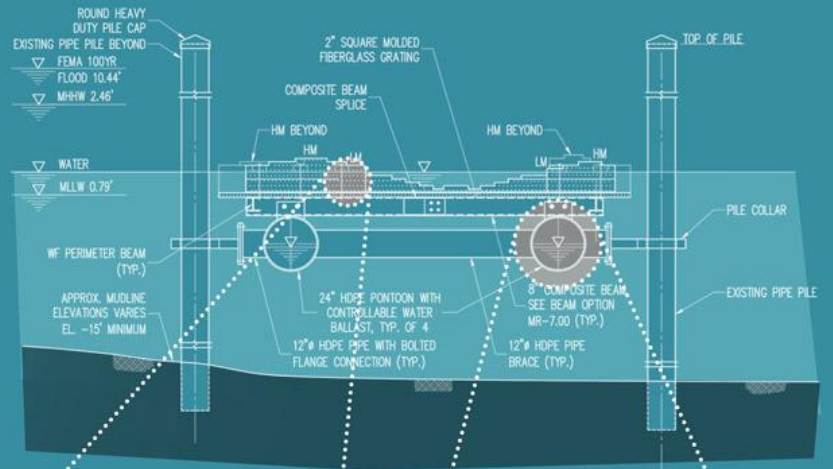
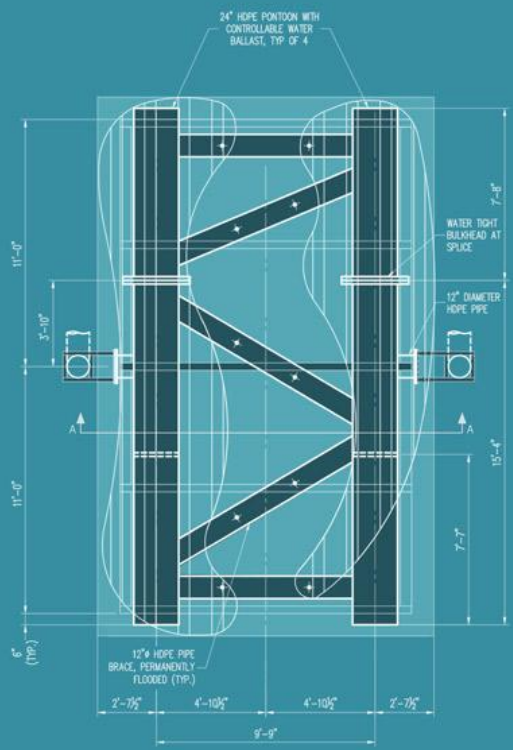
Perimeter Diffuser



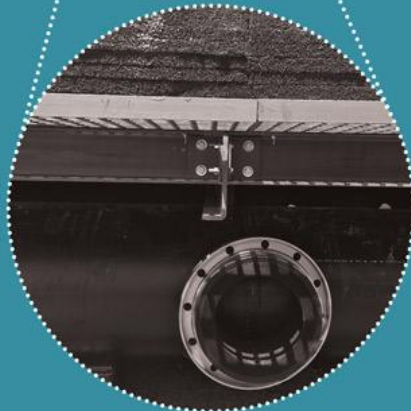
- SUSPENDED DIFFUSER, MEMBRANE AIR DIFFUSER,
- SUSPENDED DIFFUSER, AIRSTONES, HANG DOWN ALONG THE PERIMETER OF THE WETLAND MEDIA.
- AERATOR PORTALS TO WATER BELOW. LOCATIONS TO BE COORDINATED TO AVOID SUPPORT STRUCTURE.
- MAIN AIR LEADER SUPPLY LINE TEED OFF ALONG LENGTH
- SHUT OFF VALVES
- AIRLIFT PUMP LOCATIONS. 8" PLASTIC BASIN WITH EXTENDED 4" PIPE. LOCATIONS TO BE COORDINATED TO AVOID SUPPORT STRUCTURE.
- SUSPENDED DIFFUSERS,



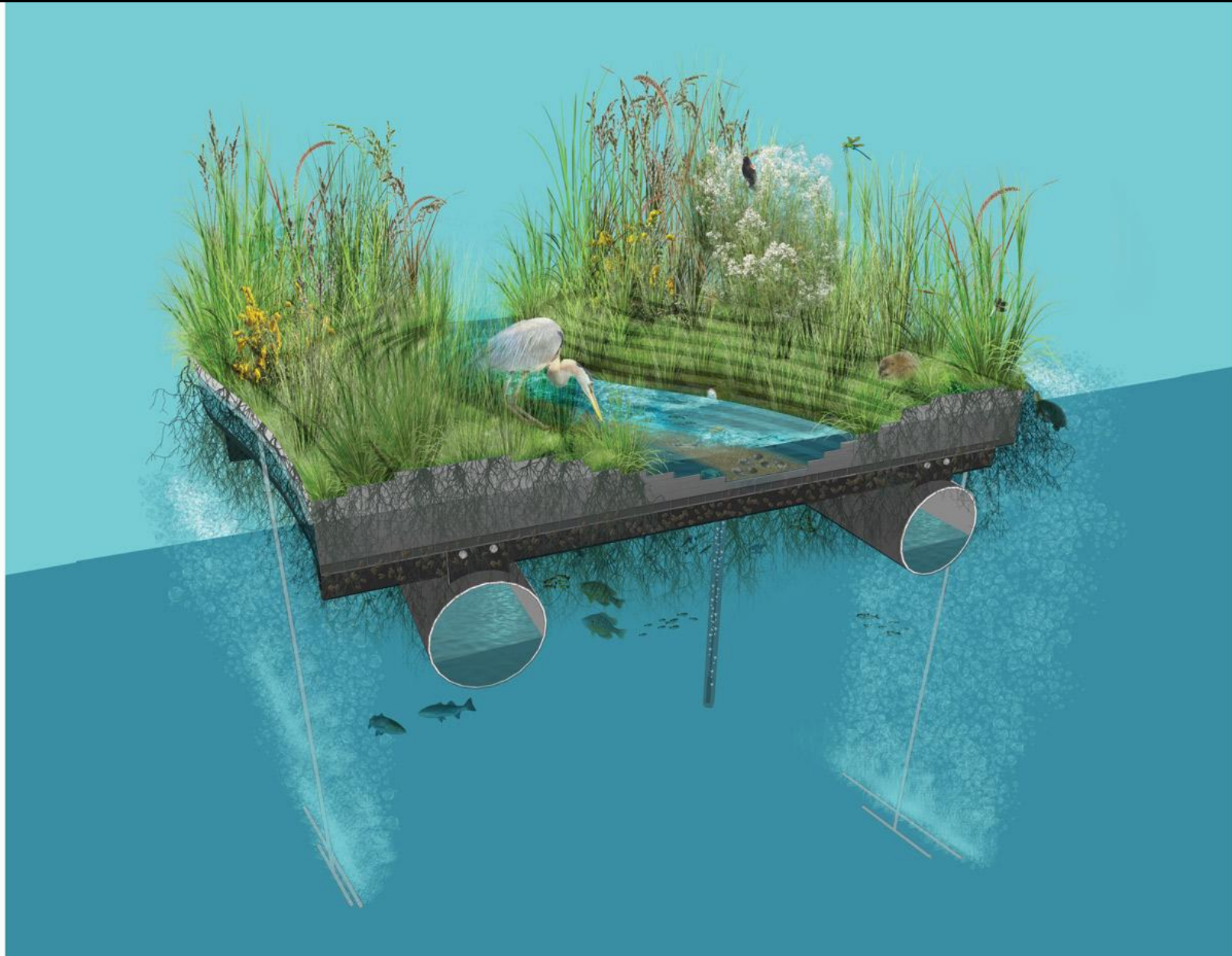
- SUSPENDED DIFFUSER ALONG PERIMETER, MEMBRANE AIR DIFFUSER
- MAIN AIR LEADER SUPPLY LINE TEED OFF ALONG LENGTH AND RUNS DOWN THE CENTER.
- SHUT OFF VALVES
- AIRLIFT PUMP LOCATIONS. 8" PLASTIC BASIN WITH EXTENDED 4" PIPE.
- SUSPENDED DIFFUSERS ALONG THE PERIMETER



PET Growing Medium



Prototype Structure





ABOVE



AROUND



IN



ON



UNDER

Fishes

- Rainwater Fish // *Lucania parva*
- Mummichog // *Fundulus heteroclitus*
- Atlantic Silverside // *Menidia menidia*
- Striped Killifish // *Fundulus magalis*

Crustaceans

- Grass Shrimp // *Palaemonetes pugio*
- Blue Crab // *Callinectes sapidus*
- Mud Crab // *Rhithropanopeus harrisi*
- Dark False Mussels // *Mytilopsis leucophaeta*
- White Barnacle // *Balanus subalbidus*

Birds

- Mallard Ducks // *Anas platyrhynchos*
- American Coot // *Fulica americana*
- Black-Crowned Night Heron // *Nycticorax nycticorax*

Jellies

- Sea Nettle // *Chrysaora chesapeakei*
- Pink Comb Jelly // *Beroe ovata*
- Sea Walnut // *Mnemiopsis leidyi*



Limited Species Before Intervention

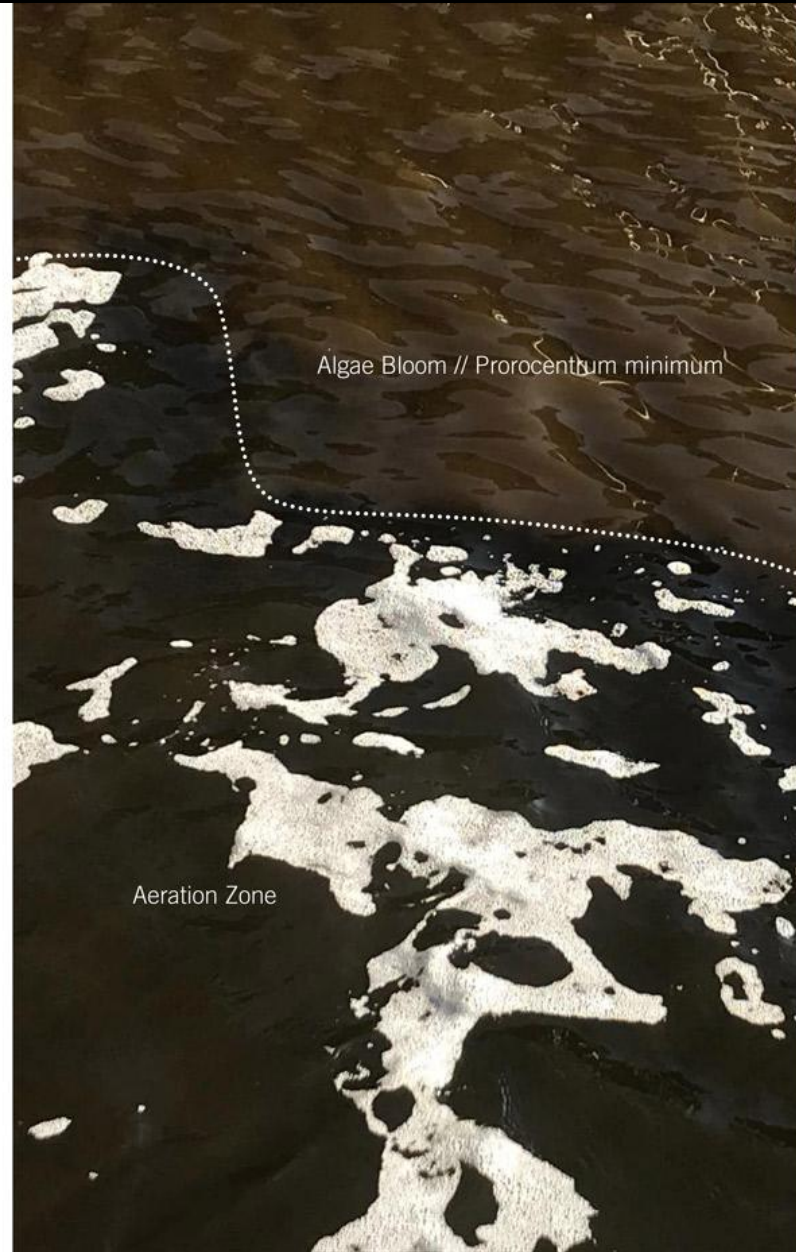


Increased Biodiversity After Intervention



Recorded Biofilms

- colonial ciliates
- hydroids
- flatworms
- stentor
- amphipod
- whip mudworm
- lacy crust bryozoan
- anemone
- clam worm
- tube bryozoan
- dusky sea slug
- hydra
- copepod
- dark false mussel
- white barnacle



Eco-DRR - zminimalizowanie skutków zdarzeń niebezpiecznych poprzez odpowiednie przygotowanie ludności – nie muszą być związane ze zmianami klimatycznymi.

Podjęcie Eco-DRR można wdrożyć we wszystkich skalach. Przykłady obejmują odtworzenie dużych mokradeł w celu ochrony przed powodzią oraz wykorzystanie obszarów chronionych w celu zmniejszenia ryzyka katastrof na obszarach przybrzeżnych.



















