



# The Charleston Water Plan

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A Foundational Strategy for Managing Flood Risks and  
Embracing Water's Place in the City's Future

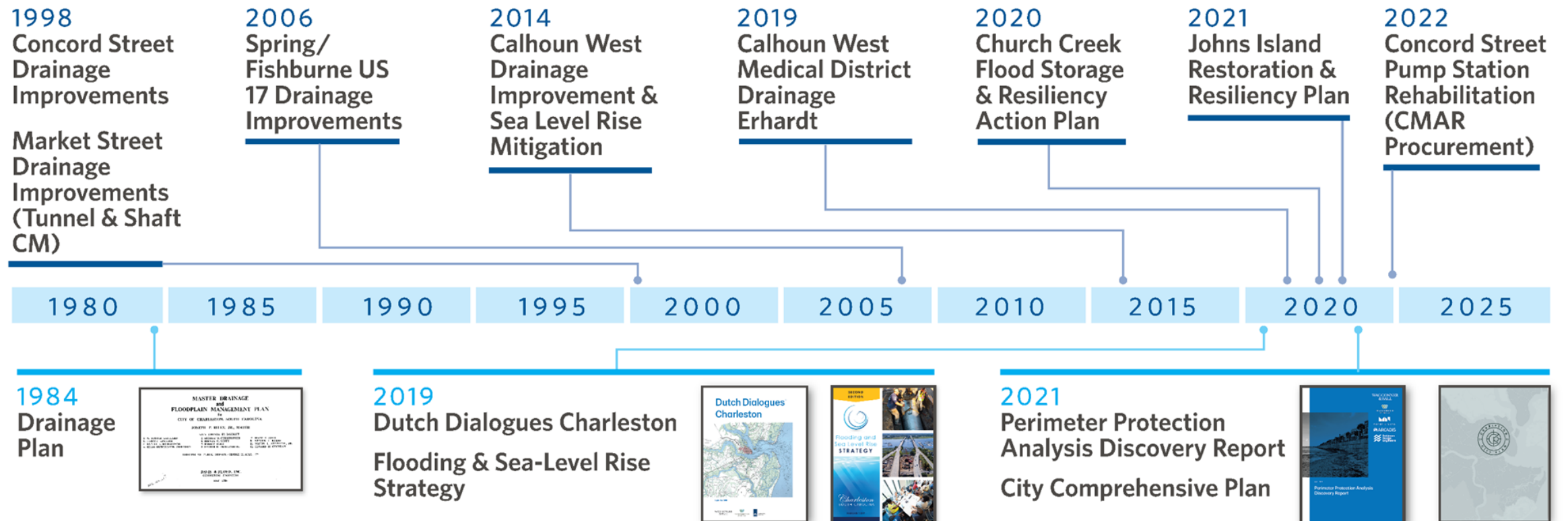
NCBIWA 27<sup>th</sup> Annual Conference  
November 19, 2024  
Jared Bramblett, PE  
Moffatt & Nichol



The Charleston Water Plan outlines **strategies & projects** to manage **future flood risks**, ensuring the City's **long-term** resilience and sustainability through **proactive & inclusive** measures.

# How We Got Here

## Continuity of approach to water & integration with past plans



# Project Timeline

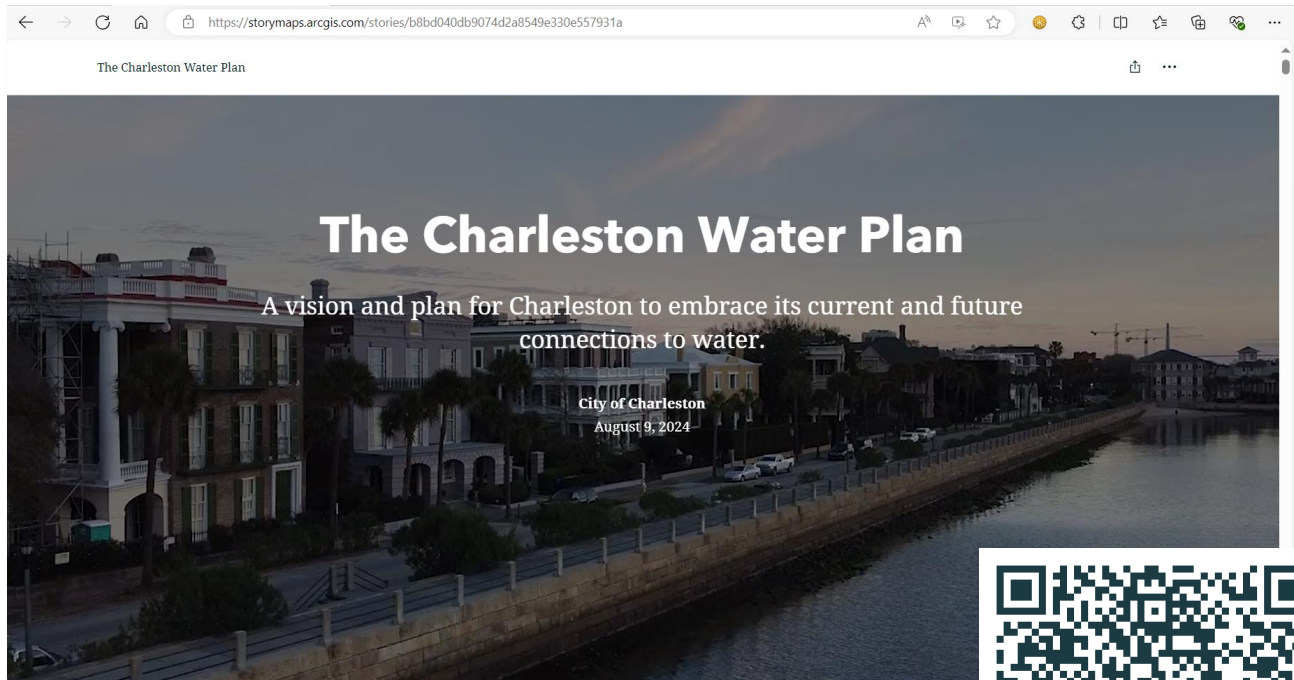


-  City & Stakeholder Collaboration
-  Public Workshops



# Water Plan Format

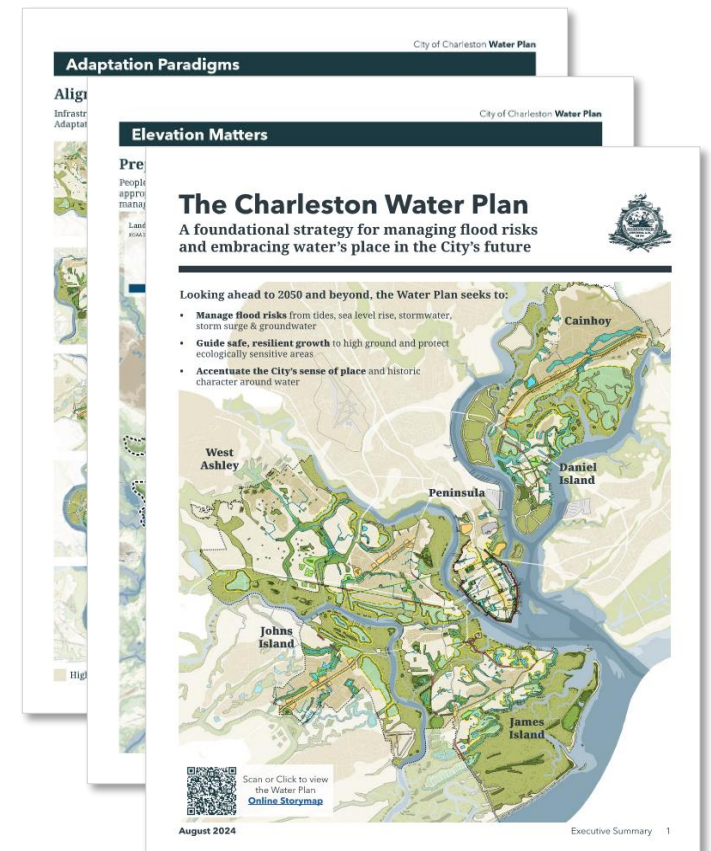
## Online Storymap



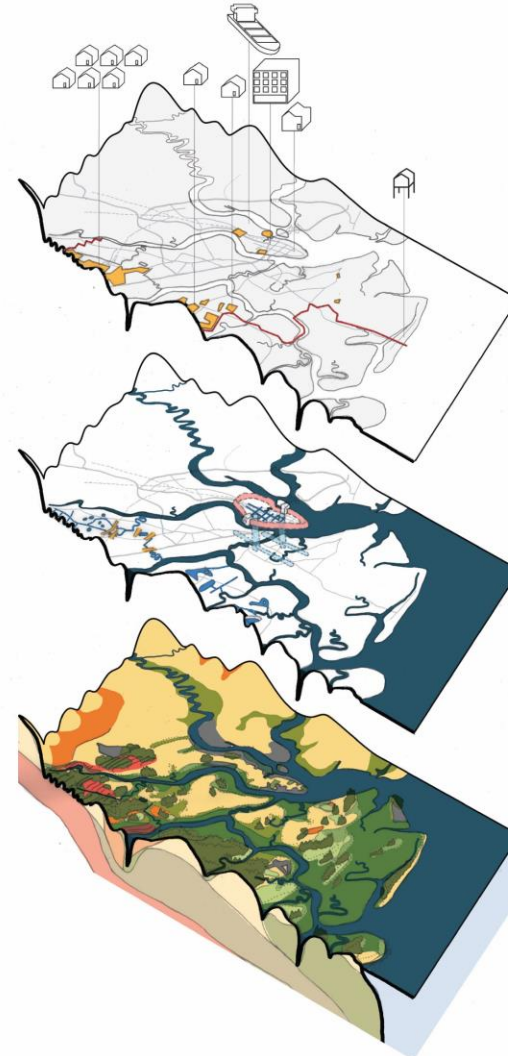
Visit [charleston-sc.gov](https://charleston-sc.gov) or scan the QR code:



## Summary Document



# Layered Approach



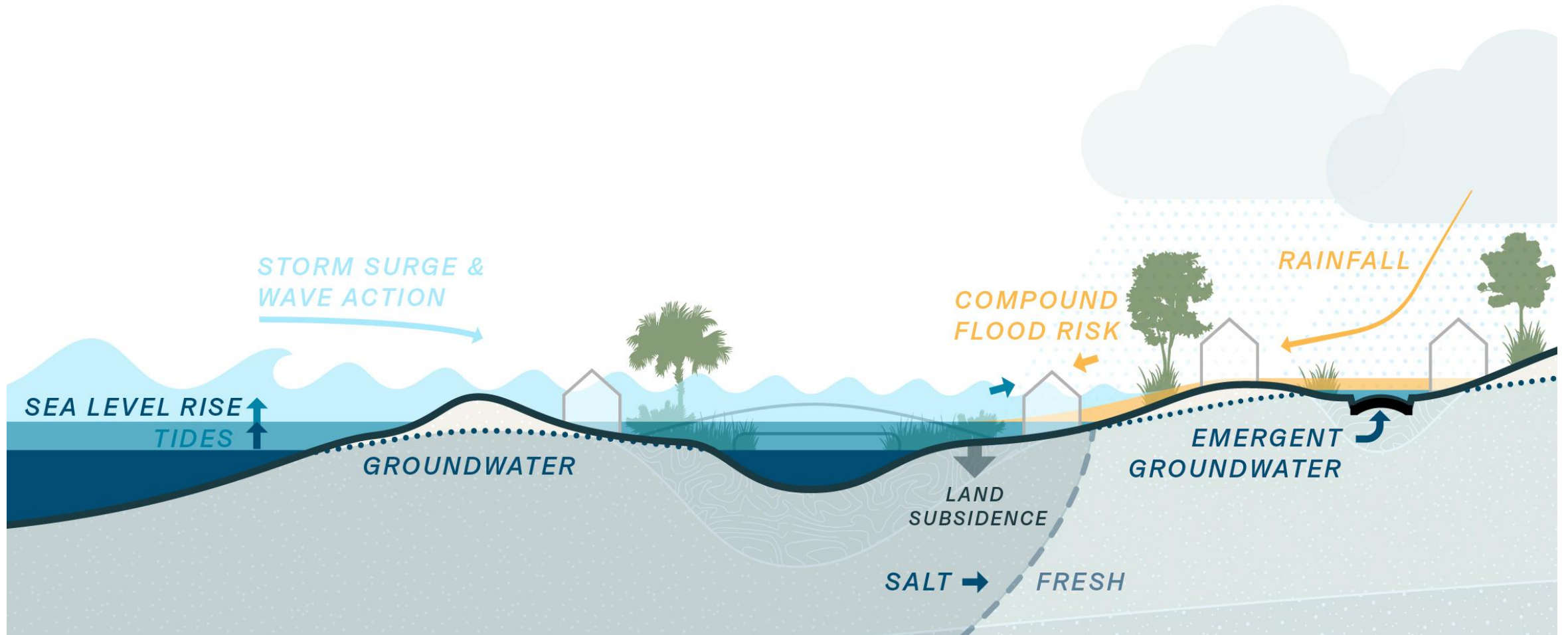
**Communities**

**Infrastructure**

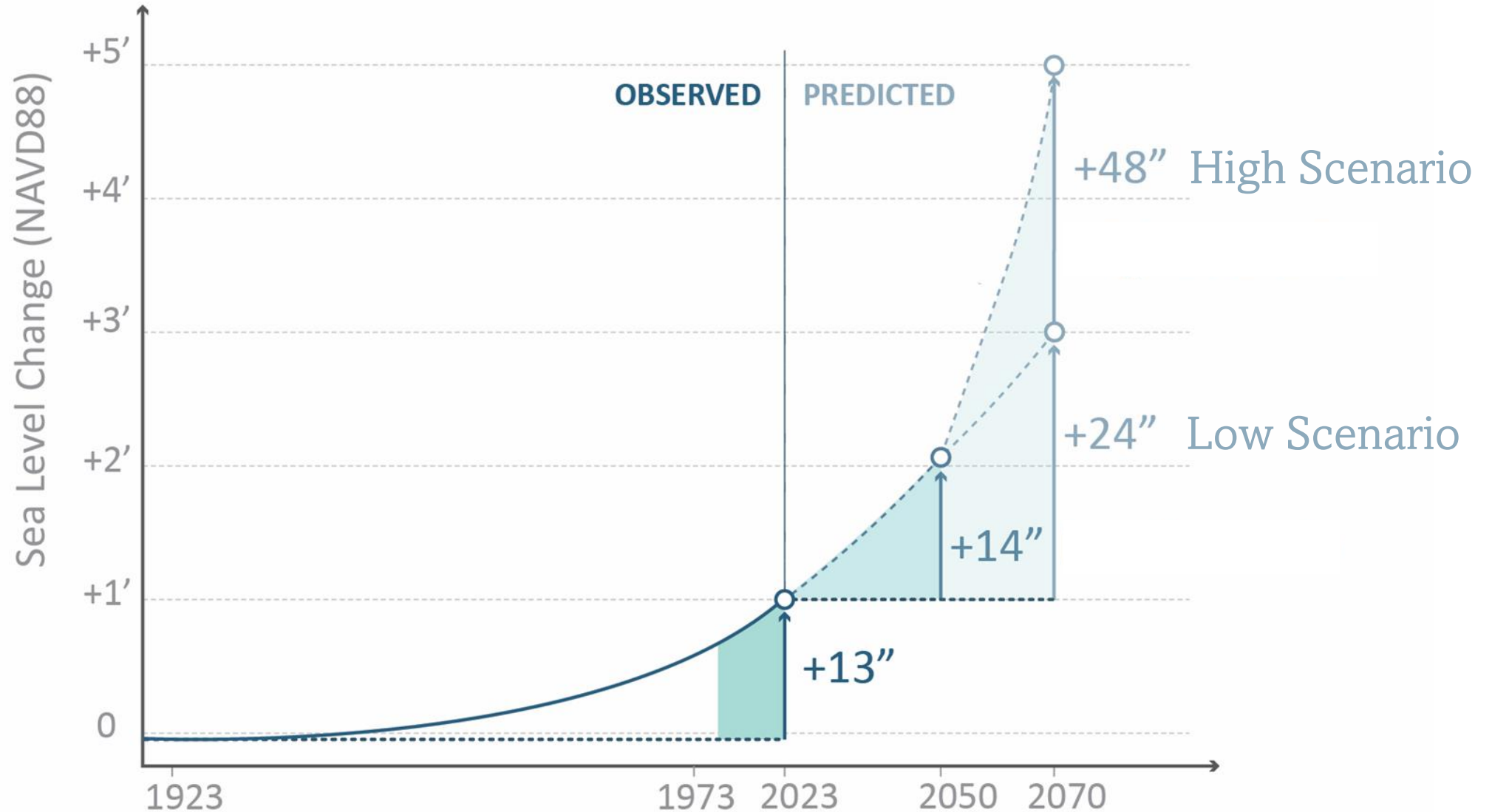
**Land & Water**



# Forces of Water

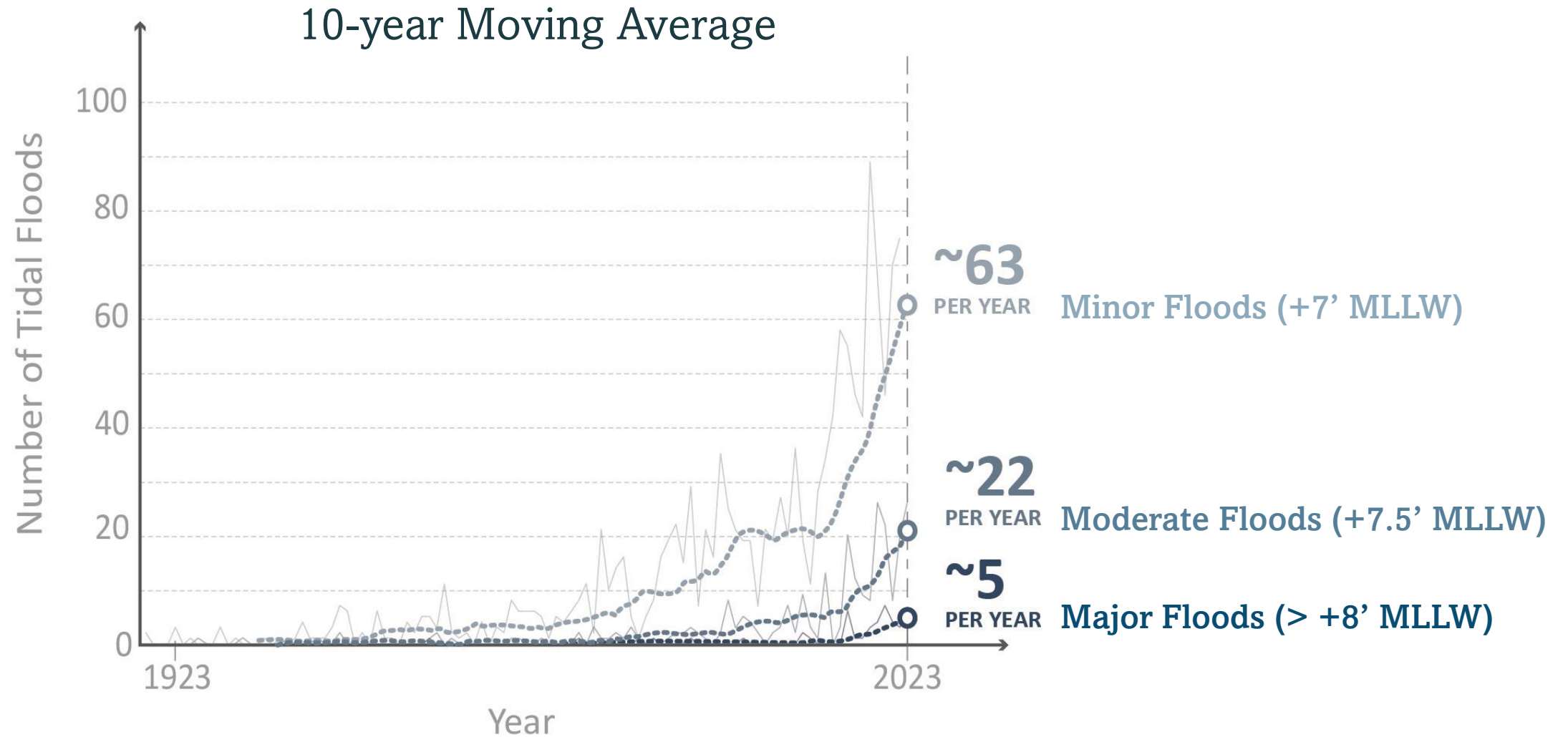


# Sea Level Rise Trends

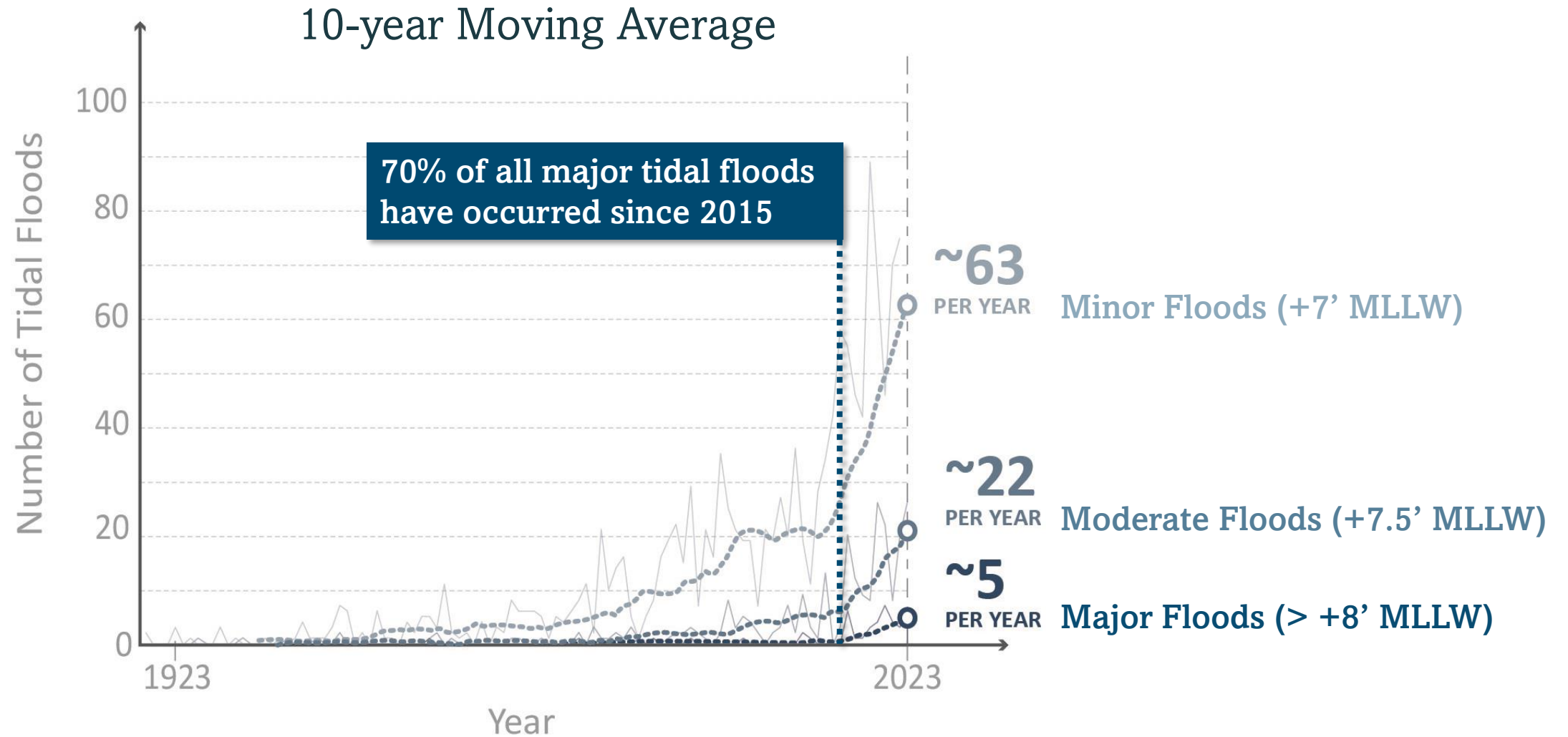




# Tidal Flooding



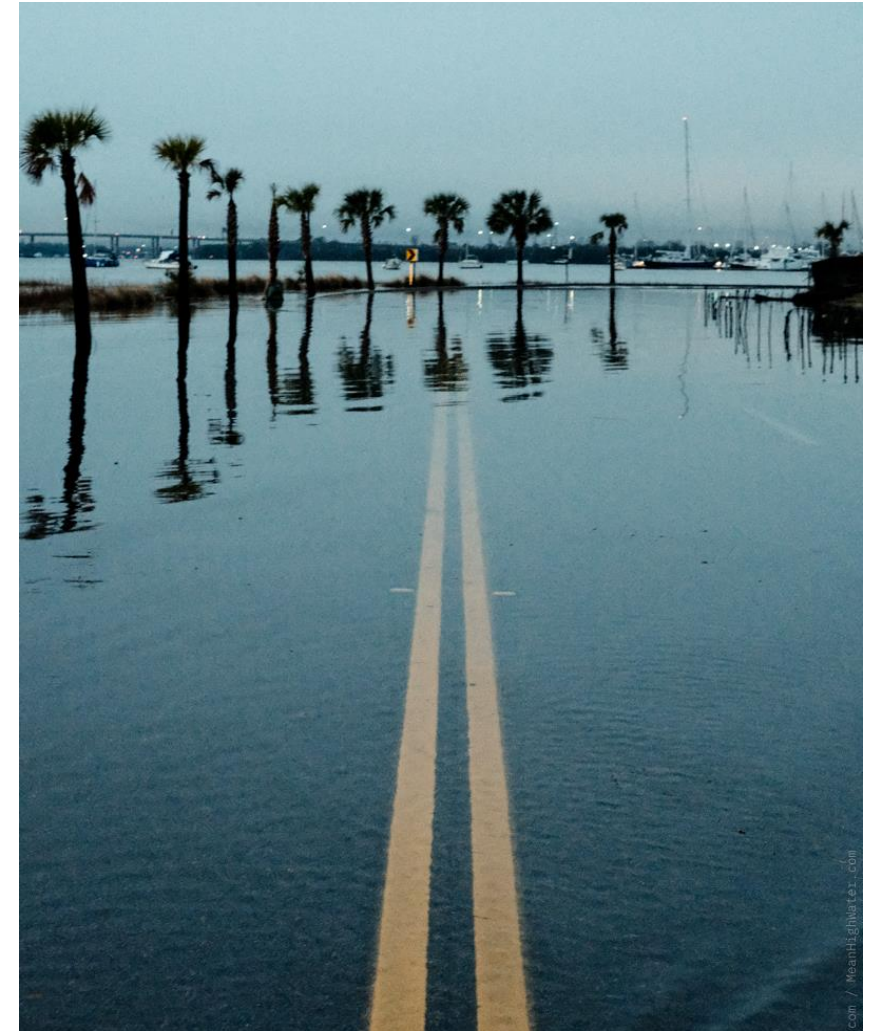
# Tidal Flooding



# High Water, More Often

## Storm Surge & Significant Tides

12.55' MLLW	Sept. 22, 1989 (Hugo)
10.23'	Aug. 11, 1940
9.92'	<b>Sept. 11, 2017 (Irma)</b>
9.86'	<b>Dec. 17, 2023</b>
9.29'	Oct. 8, 2016
9.23'	<b>Aug. 30, 2023 (Idalia)</b>
8.81'	Jan. 1, 1987
8.76'	Nov. 24, 2018
8.69'	Oct. 27, 2015
8.64'	May 28, 1934





# Stormwater Basis of Design

## City Design Storms

**7.8" in 24hrs**  
(25-year Storm)

**10.2" in 24hrs**  
(100-year Storm)

Source: NOAA Atlas 14



President Street

# Events Exceed Standards



**10.2” in 24hrs**  
(100-year Storm)

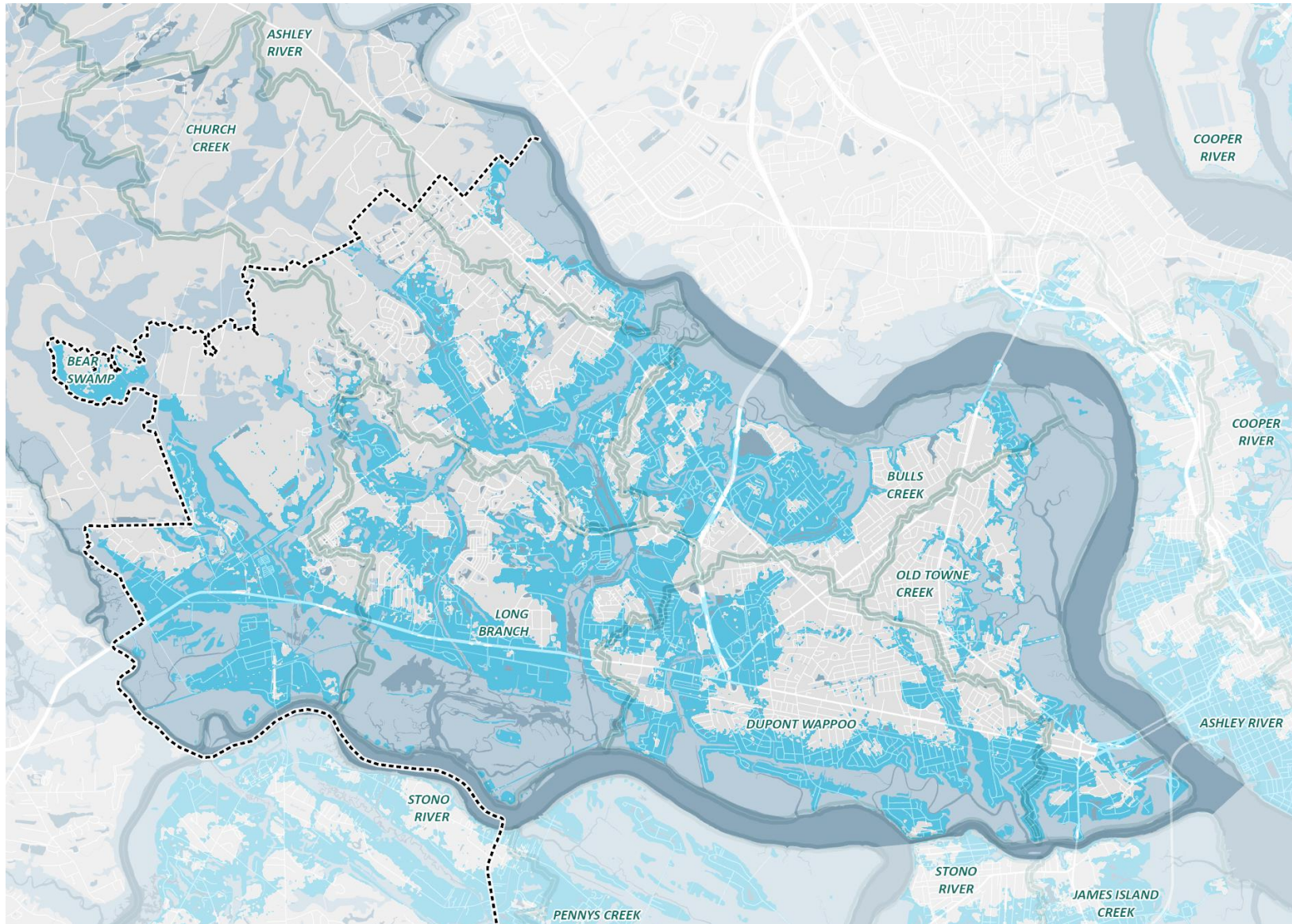
Source: NOAA Atlas 14

## Significant 24-hr Rainfall Events



13.70”	<b>Oct. 3-4, 2015 (Mt. Pleasant)</b>
12.56”	Sept. 21, 1945
11.50”	Sept. 29, 1959 (KCHS)
<b>10.94”</b>	<b>June 8, 2013</b>
10.72”	June 11, 1997 (KCHS)
10.54”	July 6, 1963
10.42”	Aug. 11, 1940
10.65”	Aug. 29, 1985



# West Ashley Storm Surge



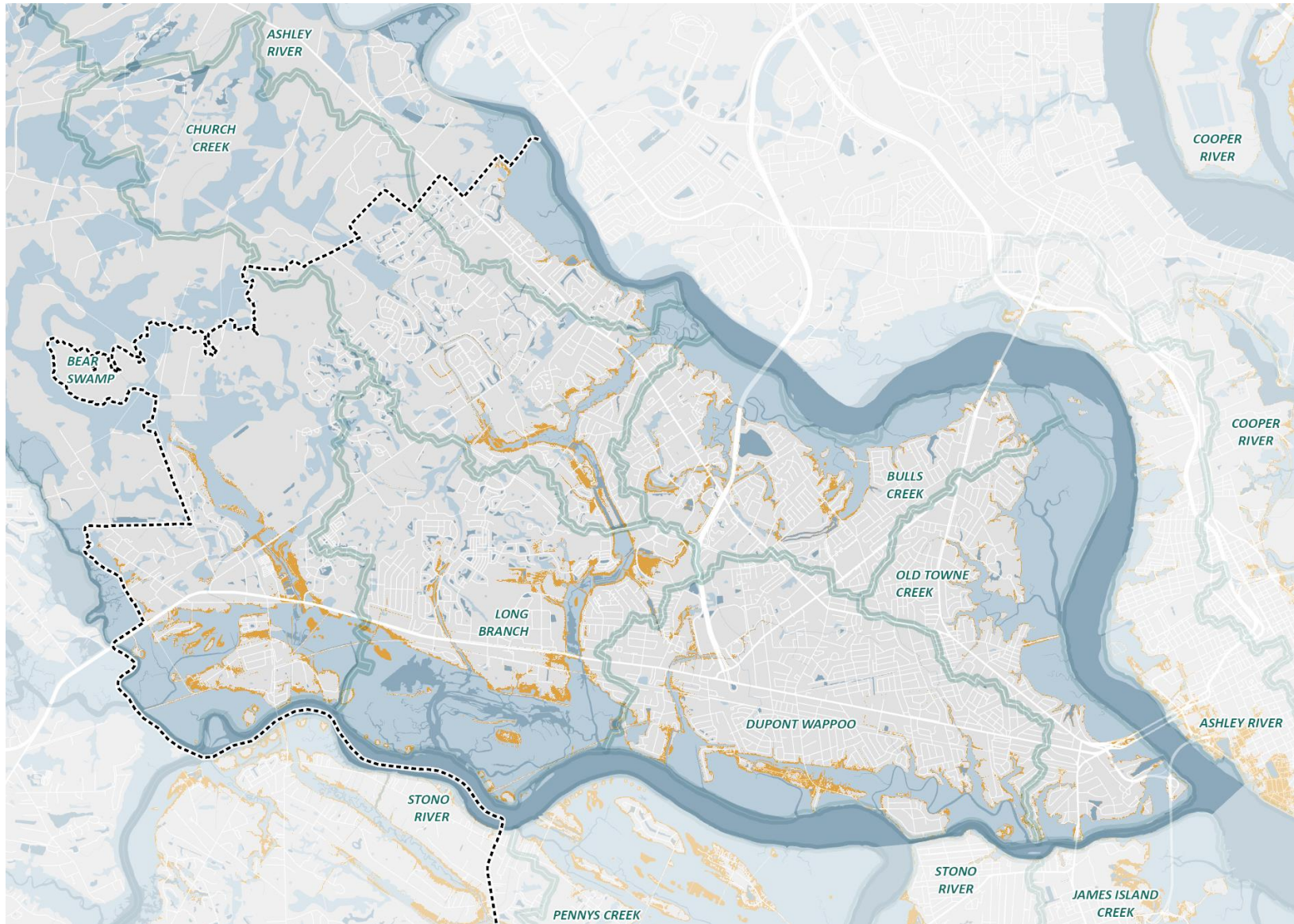
## 50-yr Storm Surge

-  Storm Surge 50-yr (2% AEP)
-  Drainage Basin

Source: City of Charleston



# West Ashley Major Tide Today



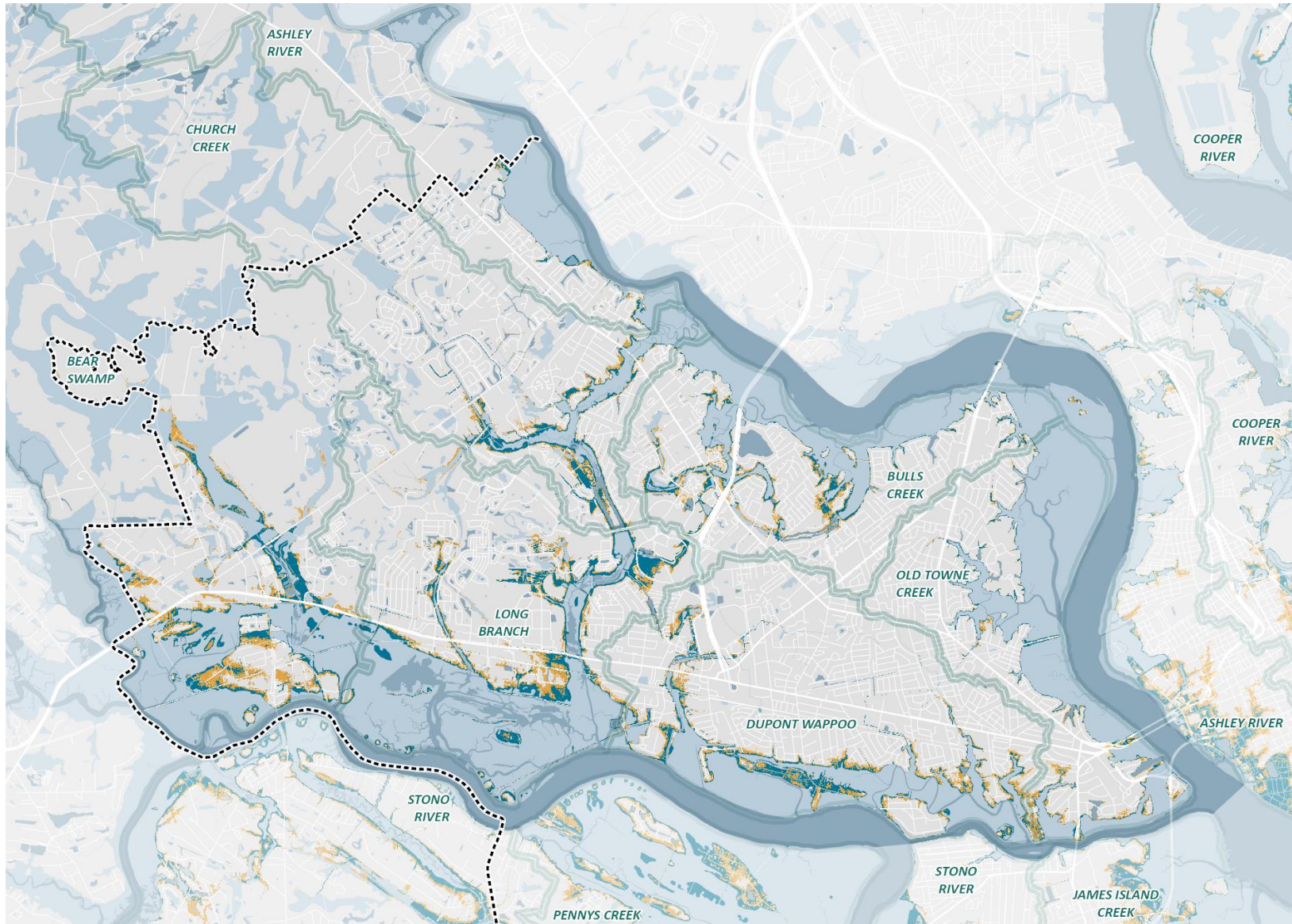
## Major Tidal Flood Risk Today

-  +8' MLLW Tide
-  Drainage Basin

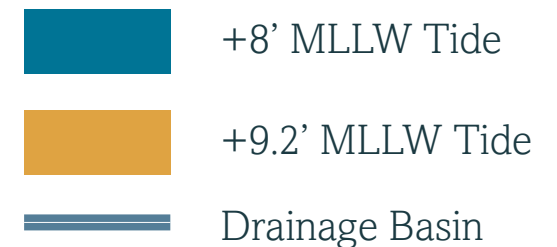
Source: City of Charleston, Water Plan analysis



# West Ashley Major Tide +14" SLR (2050)



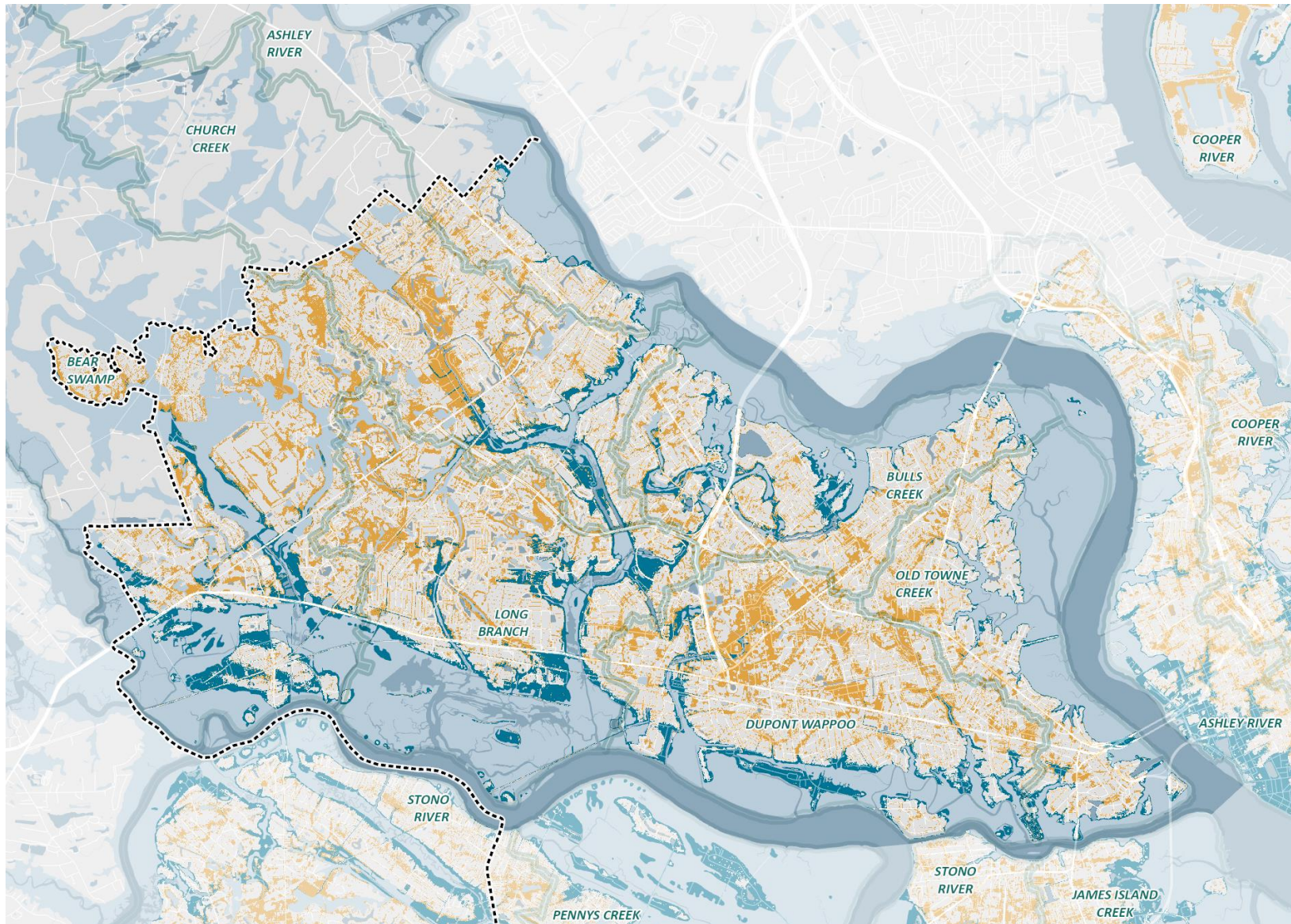
## Major Tidal Flood +14" SLR






Source: City of Charleston, Water Plan analysis



# West Ashley Compound Flood +14" SLR



**Compound Flood Potential +14" SLR**  
100yr Rainfall Event

-  +9.2' MLLW Tide
-  Area of Flood Potential
-  Drainage Basin

Source: NOAA Atlas 14, Water Plan analysis

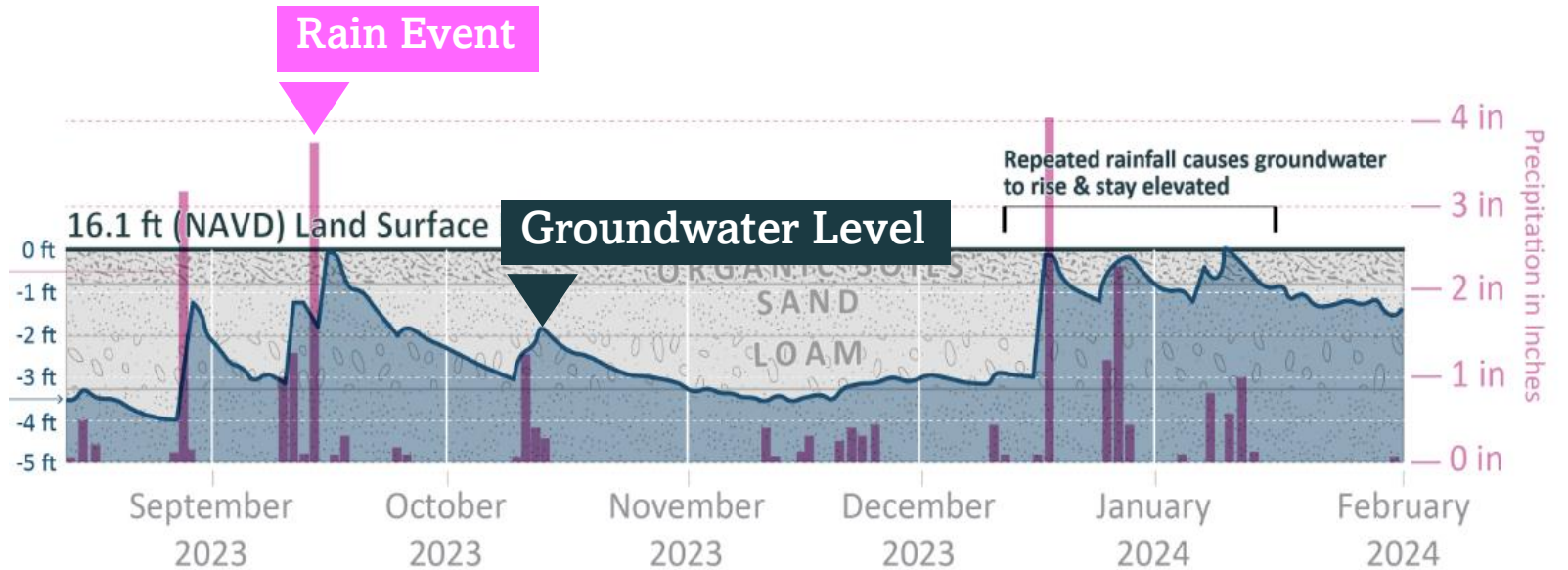


# Rising Groundwater

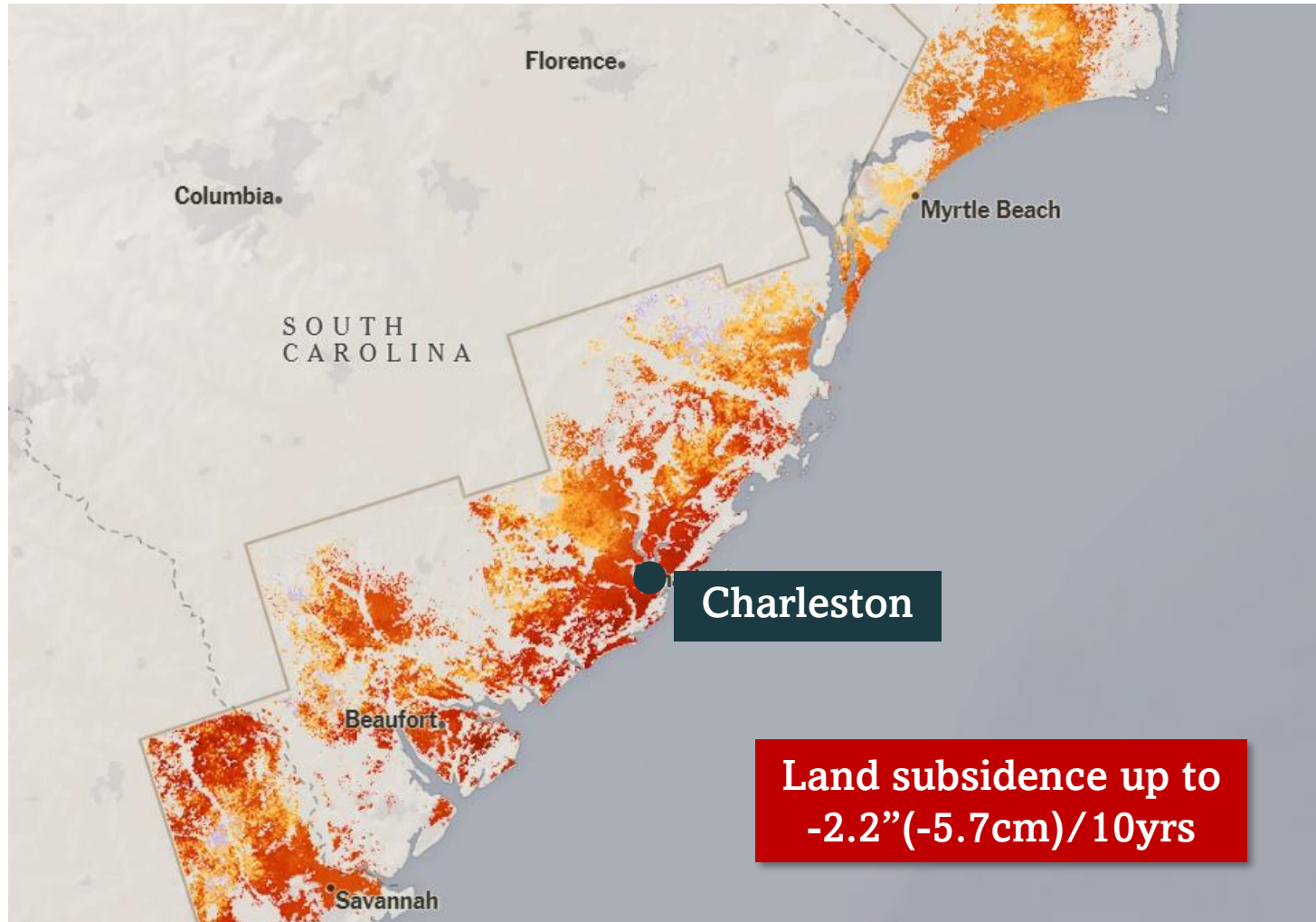


Shallow monitoring well installation  
April 2023

## Johns Island Shallow Groundwater Well Data



# Sinking Land



## Subsidence Processes:

### Shallow

Desaturation, stormwater pumping, land development

### Deep

Aquifer depletion, industrial extraction



# Elevation Matters.

Value High Ground & Raise Structures





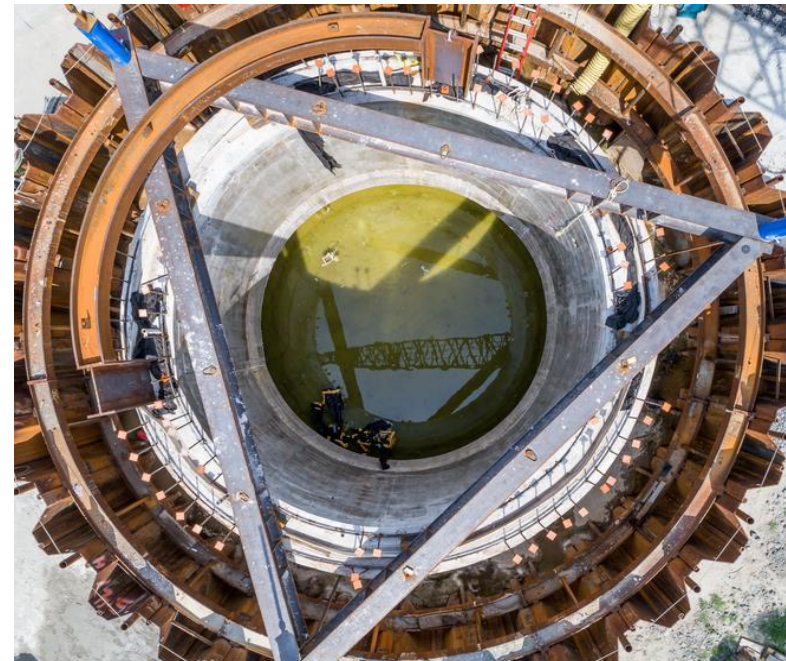
# Make Space for Water.

Connect Low Ground where Water Wants to Be



# Act Now, Adapt over Time.

Benefits must Justify Costs, but Costs come before Benefits

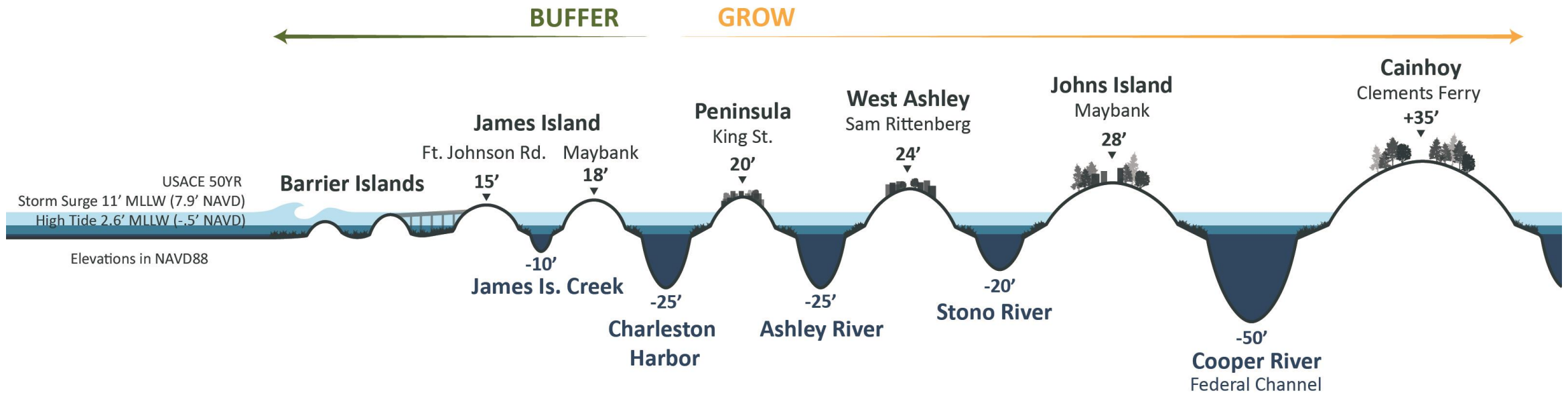




# Principles & Key Recommendations



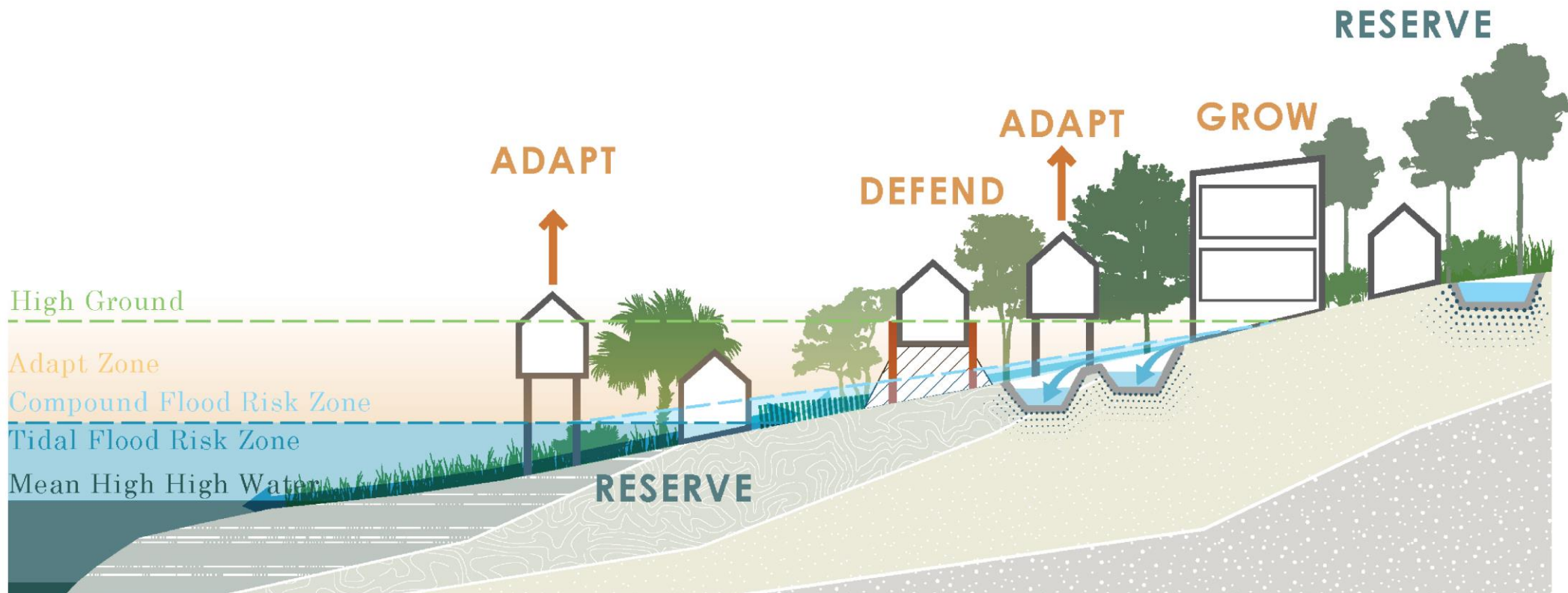
## Safety First: Protect & Connect



# Principles & Key Recommendations

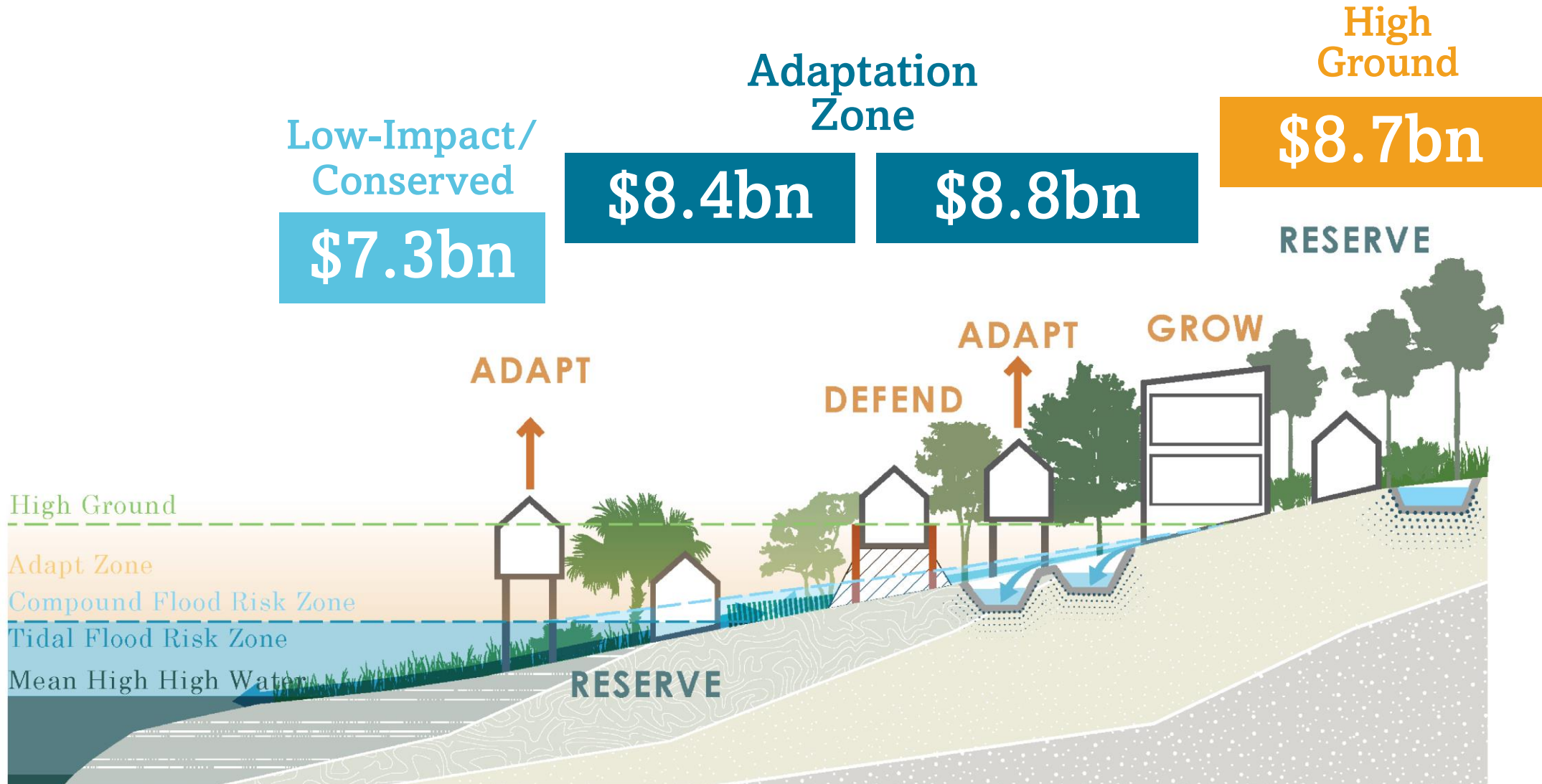


## Safety First: Protect & Connect





# Taxable Property Value by Elevation



# Principles & Key Recommendations

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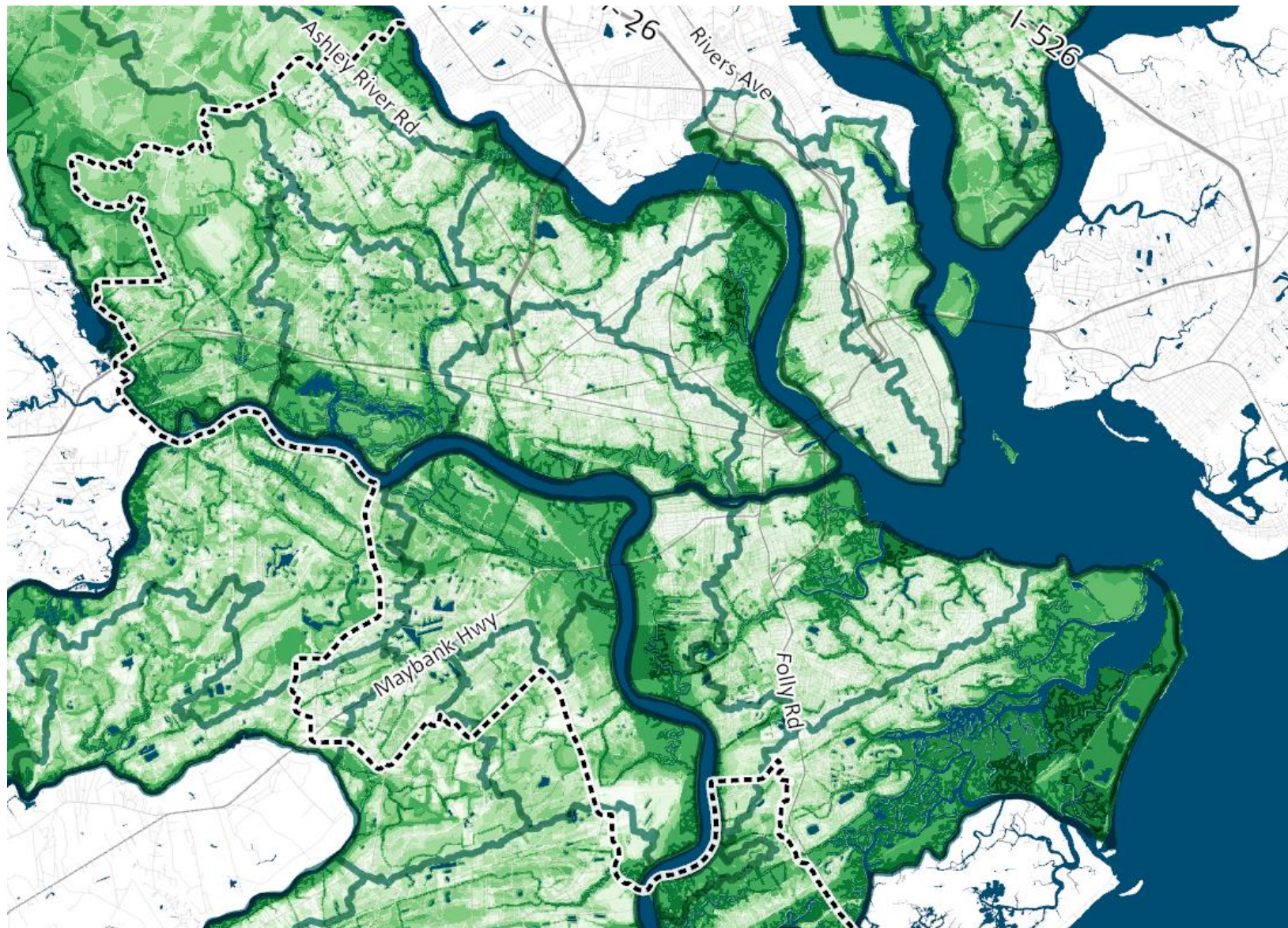
Safety First: Protect & Connect



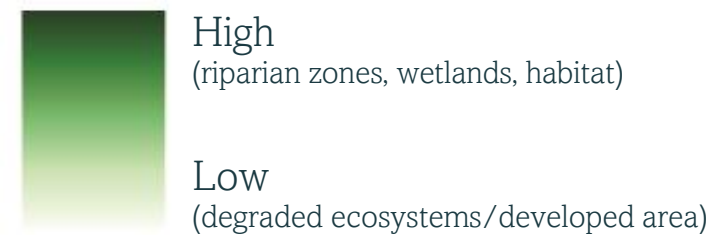
**Work from the Ground Up:** Build with Nature



# Natural Systems



## Natural Value



Source: City of Charleston/Water Plan analysis

# Principles & Key Recommendations

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Safety First: Protect & Connect



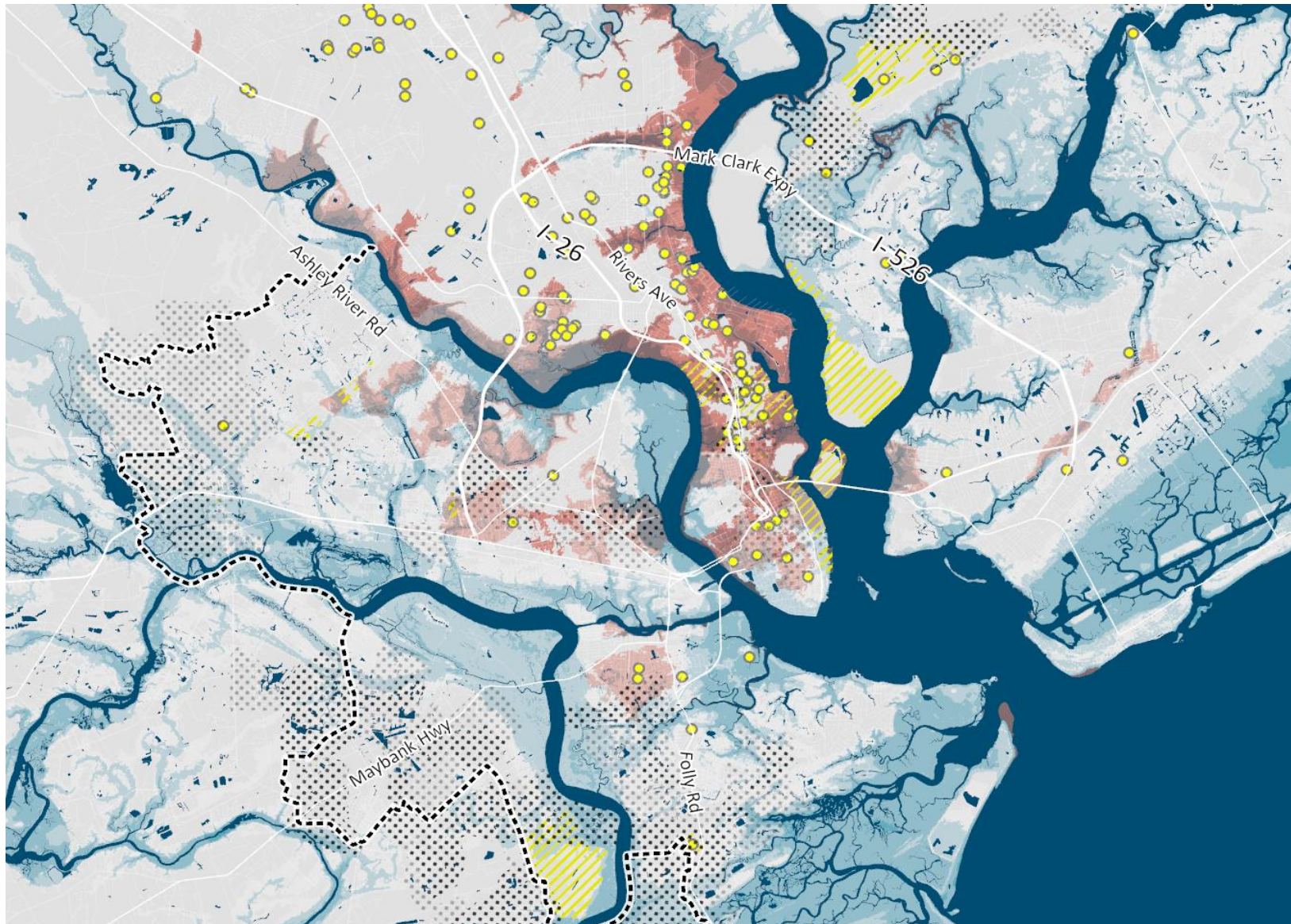
Work from the Ground Up: Build with Nature



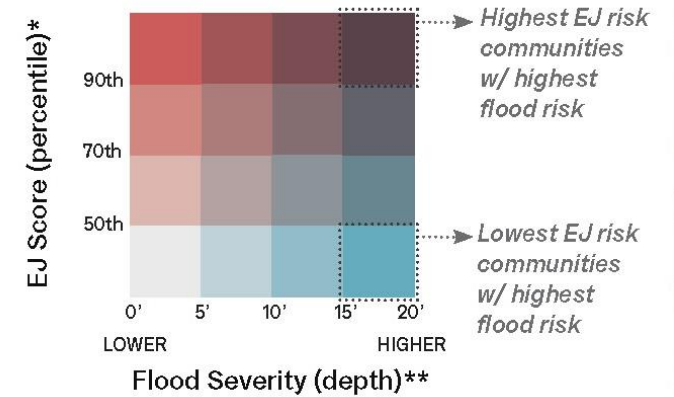
**Change for Good: Provide Resources & Access**



# Environmental Justice



EJ and 500 YR Floodplain



EPA cleanup sites



Industrial zones



Settlement Communities

# Principles & Key Recommendations

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Safety First: Protect & Connect



Work from the Ground Up: Build with Nature



Change for Good: Provide Resources & Access



**Work Together: Coordinate & Communicate**



# Principles & Key Recommendations

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Safety First: Protect & Connect



Work from the Ground Up: Build with Nature



Change for Good: Provide Resources & Access



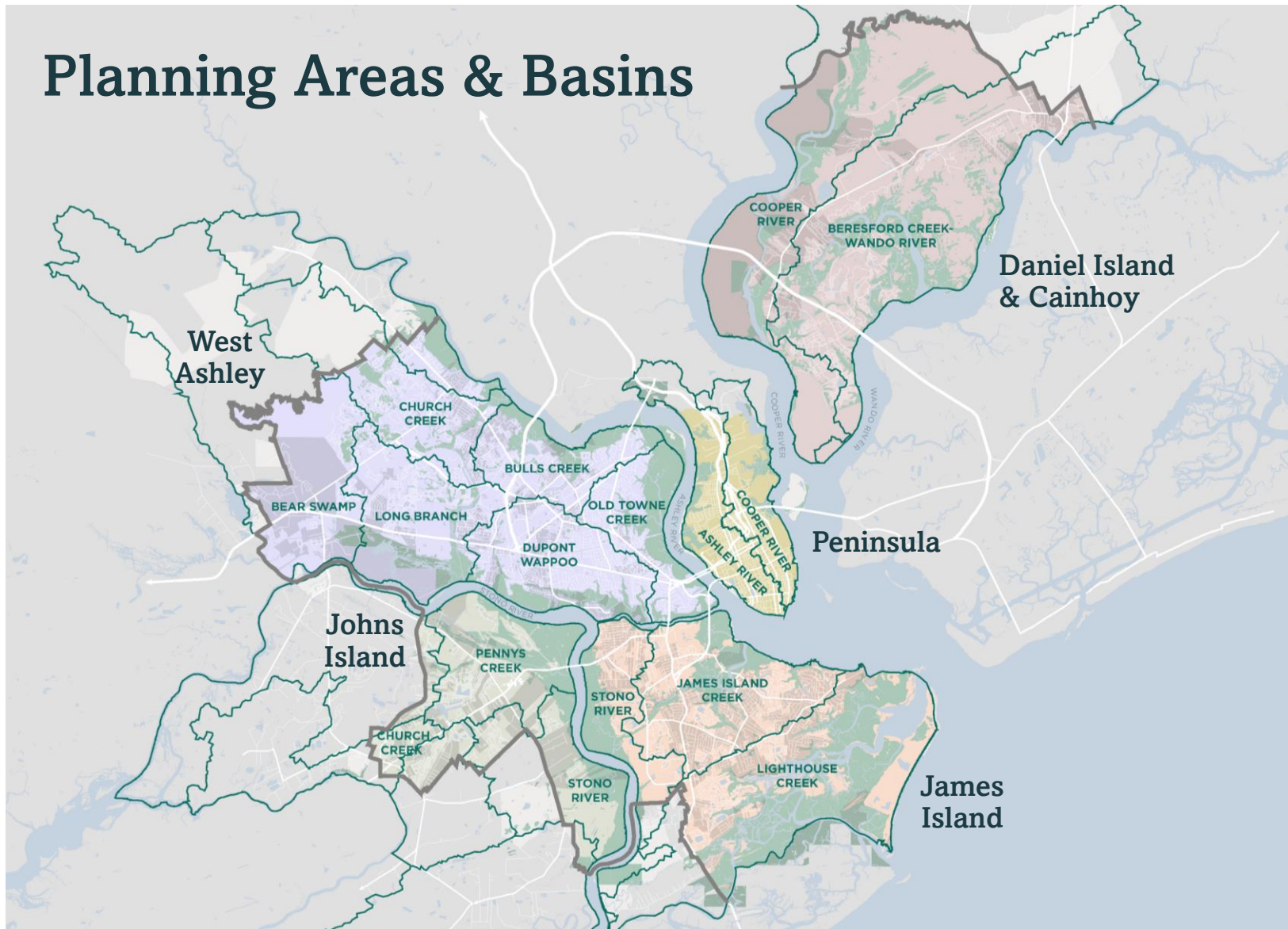
Work Together: Coordinate & Communicate




**Build Value: Invest & Adapt**

# Integrating Scales

## Planning Areas & Basins



-  BASIN
-  MARSH
-  URBAN GROWTH BOUNDARY
-  DANIEL ISLAND AND CAINHOY
-  JAMES ISLAND
-  JOHNS ISLAND
-  PENINSULA
-  WEST ASHLEY
-  OUTSIDE URBAN GROWTH BOUNDARY

*\*LIGHTER COLORS ARE WITHIN CITY OF CHARLESTON, DARKER COLORS ARE OUTSIDE*



## Feature Projects (8)

“More-than-the-sum-of-their-parts”  
high-impact & incremental.

### Rough Order-of-Magnitude Cost Estimates

\$	<\$10 million
\$\$	\$10-25 million
\$\$\$	\$25-50 million
\$\$\$\$	\$50-100 million
\$\$\$\$\$	>\$100 million

## Prototypical Projects (100+)

Identified from conceptual modeling  
for areas of potential flooding.

-  (Re)development Opportunities
-  Critical Connections
-  Green Infrastructure
-  Stormwater Storage / Parks
-  Drainage Improvements
-  Defend / Elevate
-  Reserve (incl. marsh migration & terracing)
-  Community Adaptation Areas



# Charleston 2050

City of Charleston  
Water Plan



West Ashley

Johns Island

James Island

Peninsula

Cainhoy &  
Daniel Island





# Next Steps

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Act Now, Adapt Over Time



## How to use the Water Plan:

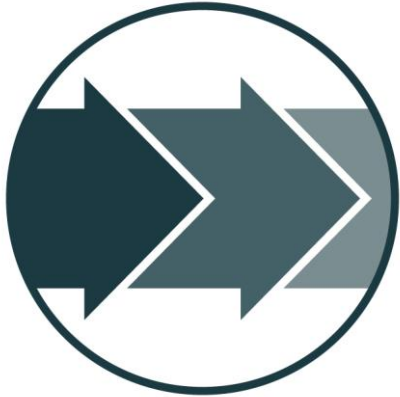
- To **benchmark success** to date
- As a **screening tool** to align goals & project criteria
- As the basis for **resilient CIPs** (Capital Improvement Program & Projects)
- To inform **policy guidelines** & regulations
- To support **funding strategies** (federal & state)
- To guide long-term **operations & maintenance**





## How to use the Water Plan:

- As **inspiration & motivation** for achievable adaptation
- For **understanding & education** about water risks and opportunities
- To inform individual & collective **actions & advocacy**
- As a starting point for **Community Adaptation Planning** (per basin)



- **Track Progress** & assign responsibilities
  - comprehensive City projects & initiatives per basin
  - Adaptive Management program
- Proceed with **Partnerships**
- **Collect & Monitor** data
  - City-wide stormwater modeling
  - Water data collection & monitoring (tide, groundwater, rainfall)
- **Advance Projects** through scoping, design & engineering

# Look back, look ahead.

Imagine the future we want to create

