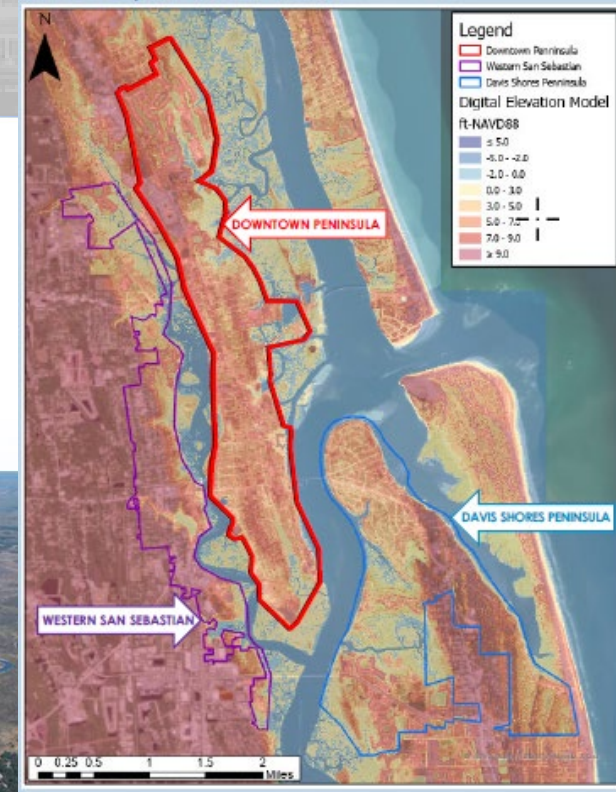


MERGING LESSONS-LEARNED ON SYSTEM RESILIENCE AND APPLYING THOSE TO A NEW GENERATION OF WATER RESOURCES PROJECTS

Jason Engle, P.E.,
Jacksonville
District, USACE

April 17, 2024



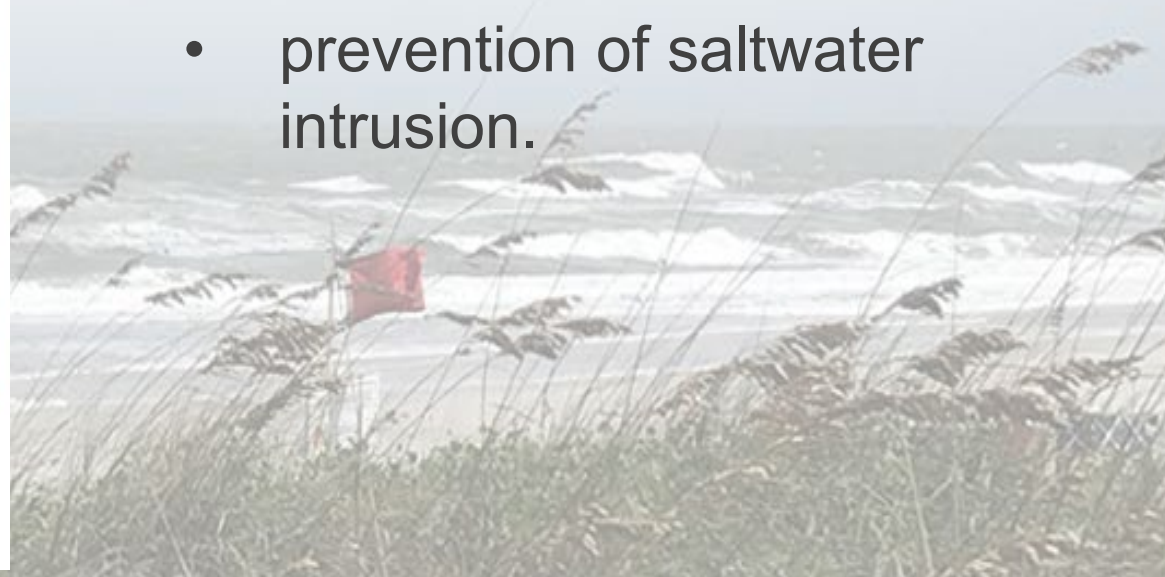
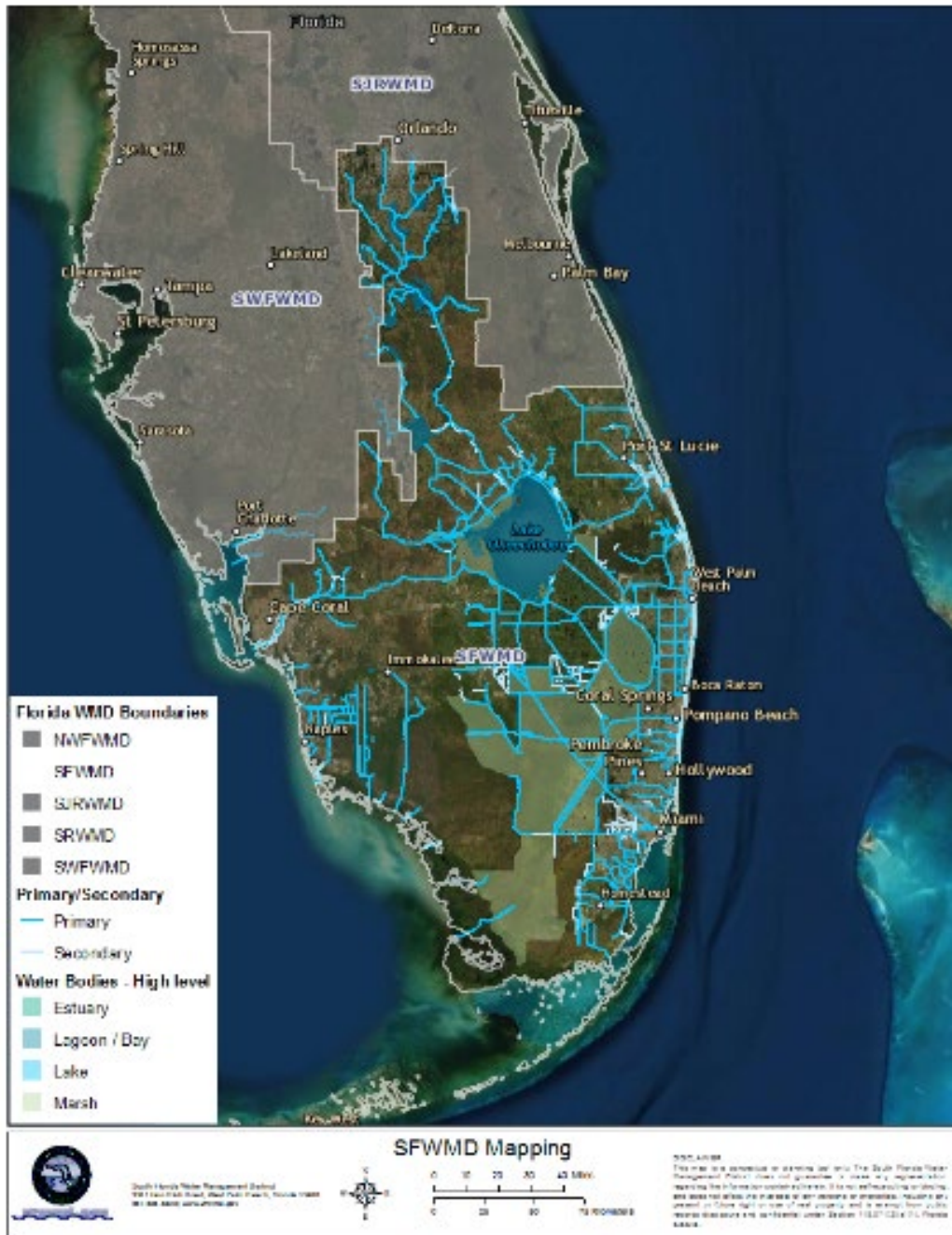
**US Army Corps
of Engineers®**

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The Central and Southern Florida (C&SF) Project Authorized Project Purposes

- water supply
- flood risk management
- preservation of fish and wildlife
- navigation
- recreation
- prevention of saltwater intrusion.



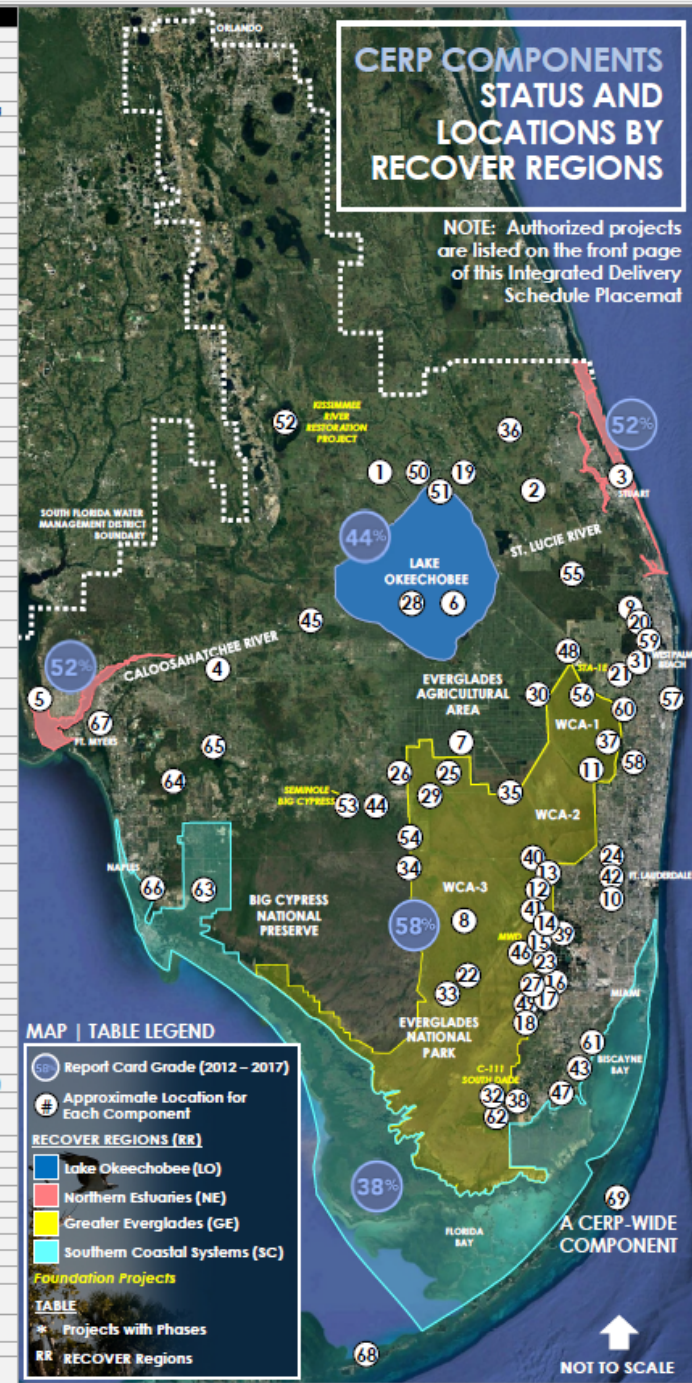


COMPREHENSIVE EVERGLADES RESTORATION PLAN

- Integrated delivery schedule: status of project components
- The 2000 CERP Restudy 'Yellow Book' is the roadmap
- 68+ components that are combined into groups for subsequent detailed studies/design/construction

<https://www.saj.usace.army.mil/Missions/Environmental/Ecosystem-Restoration/>

DE-APR	PLANNING/FEASIBILITY	PENDING	AUTHORIZED / DESIGN / CONSTRUCTION	COMPLETE OR PHASE 1 IMPLEMENTED	RR	YELLOW BOOK NAME AND CODE
10					SC	Change Coastal Wellfield Operations (L)
11					GE	Site 1 Impoundment with ASR* (M)
18					GE	C-4 Structures (I)
19					LO	Taylor Creek/Nubbin Slough Storage and Treatment Area* (W)
38					SC	C-111 Spreader Canal* (WW) - Phase 2 in Planning
42					GE	Lower East Coast Water Conservation (AAA)
48					GE	C-51* and Southern L-8 Reservoir (GGG)
50					LO	Lake Okeechobee Watershed Water Quality Treatment Facilities (OPE)
53					GE	Terminator 2000 Big Cypress Water Conservation Plan (East and West)* (OPE)
56					GE	Acme Basin B (OPE)
57					NE	Lake Worth Lagoon Restoration (OPE)
58					GE	Winsberg Farms Wetlands Restoration (OPE)
64					GE	Southern CREW Project Addition (OPE)
65					GE	Lake Trafford Restoration (OPE)
66					GE	Henderson Creek/Belle Meade Restoration (OPE)
67					GE	Lake Park Restoration (OPE)
68					SC	Florida Keys Tidal Restoration (OPE)
69					ALL	Melaleuca Eradication and Other Exotic Plants (OPE)
2					NE	St. Lucie/C-44 Basin Storage Reservoir (B)
3					NE	Environmental Water Supply Deliveries to St. Lucie Estuary (C)
4					NE	Caloosahatchee Basin Storage Reservoir with ASR* (D)
5					NE	Environmental Water Supply Deliveries to Caloosahatchee Estuary (E)
7					GE	EAA Storage Reservoir (G)
8					GE	Everglades Rain-Driven Operations* (H)
12					GE	Water Conservation Area 3A and 3B Levee Seepage Management (O)
13					GE	Western C-11 Diversion Impoundment and Diversion Canal (Q)
14					GE	C-9 Stormwater Treatment Area/Impoundment (R)
18					GE	L-91N Improvements for Seepage Management (V)
22					GE	Additional S-345 Structures* (AA)
27					GE	Construction of S-356 A and B Structures* (FF)
29					GE	Pump Station G-404 Modification (I)
32					SC	Modification to SDCS in southern portion of L-31N and C-111 (OO)
33					GE	Decompartmentalization of Water Conservation Area 3* (QQ)
36					NE	C-23, C-24, C25 and Northfork and Southfork Basins Storage Reservoirs (UU)
61					SC	Biscayne Bay Coastal Wetlands* (OPE) - Phase 2 in Planning
63					SC GE	Southern Golden Gate Estates Hydrologic Restoration (OPE)
6					LO NE	Lake Okeechobee Regulation Schedule* (F)
15					GE	Central Lake Belt Storage Area (S)
17					GE	Bird Drive Recharge Basin (U)
20					GE	C-17 Backpumping (X)
21					GE	C-51 Backpumping to West Palm Beach Water Catchment Area (Y)
23					GE	Dade Broward Levee/Pennsco Wetlands (BB)
24					GE	Broward County Secondary Canal System (CC)
25					GE	Modified Holy Land Wildlife Management Area Water Management Operations (DD)
26					GE	Modified Rotenberger Wildlife Management Area Water Management Operations (EE)
30					GE	Loxahatchee National Wildlife Refuge Internal Canal Structures (KK)
31					GE	C-51 Regional Groundwater ASR (LL)
37					GE	Palm Beach County Agricultural Reserve Reservoir (VV)
40					GE	Divert WCA2 flows to Central Lake Belt Storage (YY)
41					GE	Divert WCA3 flows to Central Lake Belt Storage Area (ZZ)
45					NE	Caloosahatchee Backpumping with STA (DDD)
46					GE	Flows to Eastern Water Conservation Area (EEE)
51					LO	Lake Okeechobee Tributary Sediment Dredging/Phosphorus Removal (OPE)
52					LO	Lake Itokpoga Regulation Schedule Modification (OPE)
54					GE	Miccosukee Water Management Plan (OPE)
62					SC	Restoration of Pineland & Hardwood Hammocks in C-111 Basin (OPE)
1					LO	North of Lake Okeechobee Storage Reservoir (A)
9					GE	L-8 Project (K)
28					LO	Lake Okeechobee Aquifer Storage and Recovery* (GG)
34					GE	Flow to Central Water Conservation Area 3A (RR)
39					GE	North Lake Belt Storage Area (XX)
43					GE	South Miami Dade County Reuse (BBB)
44					GE	Big Cypress/L-28 Interceptor Modification (CCC)
47					SC	Biscayne Bay Coastal Canals (FFF)
49					SC	West Miami Dade Reuse (HHH)
55					GE	Pal Mar and J.W. Corbett Wildlife Management Area Hydropattem Restoration (OPE)
60					GE	Protect and Enhance Existing Wetlands Systems along Lox (Shoalwater Tract) (OPE)
65					SC	Resolve Miami-Dade Water Supply Deliveries (SS)
59					GE	Palm Beach County Wetlands-based Water Reclamation (OPE)





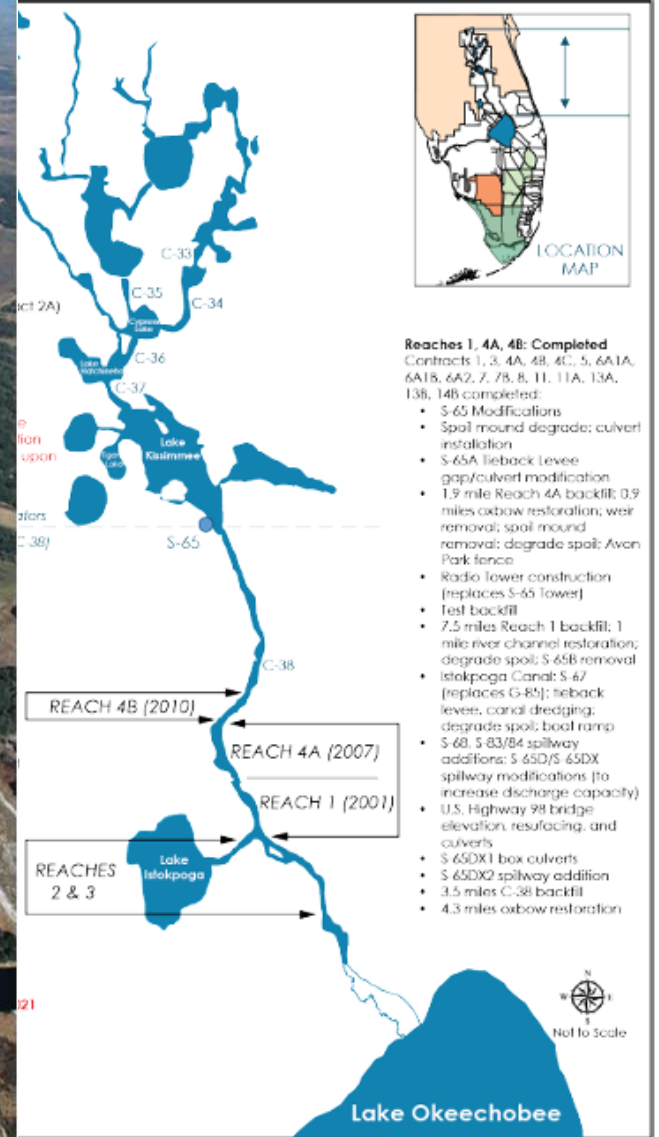
KISSIMMEE RIVER RESTORATION PROJECT



1999



2011





KISSIMMEE RESTORATION PROJECT LESSONS LEARNED



- 102,000 acres of land acquired by State of Florida
- Land acquisition, study, design, construction, and operation have and will continue to require coordination with a very large stakeholder group
- Incremental operations to gain early benefits while gathering data; adaptive management





Lessons Learned from Coastal Storm Risk Management (CSRM) Program St. Johns County Coastal Storm Risk Management 'Version 1.0'



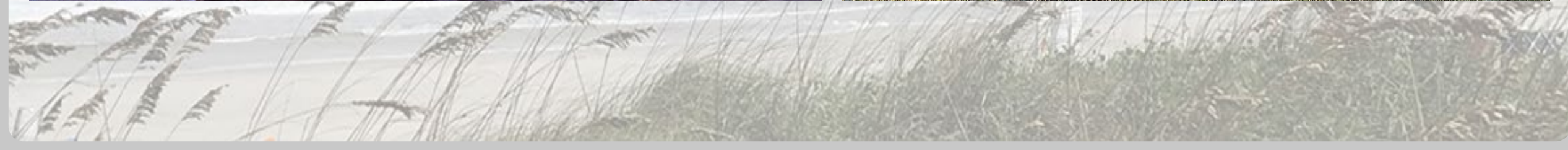


St. Johns County CSRM Today





Duval County, FL 1978 and Current Day





FEDERAL CSRM BEACH PROGRAM KEYS TO SUCCESS



Beach Nourishment

- An original Nature-Based solution
- Environmental value
- Social value
- Regional economic value
- Cost effective

Beach restoration is valuable EVERY DAY, not just during storms

- Enhances national economic development
- Enhances recreation
- Enhances environmental quality
- Enhances local economics
- Enhances climate resilience







LESSONS LEARNED FROM ECOSYSTEM AND COASTAL STORM RISK MANAGEMENT PROGRAMS



- Integrated solutions require regional-scale data, analyses, and master plans
- Large/complex/costly projects are implemented incrementally
 - Opportunity for data collection and adaptive management
 - Show early benefits to retain support
- Strong stakeholder support for natural and nature-based (NNBF) solutions
- NNBF solutions that work with nature mature and become MORE effective through time
- Successful projects have a mix of tangible, 'every day' benefits

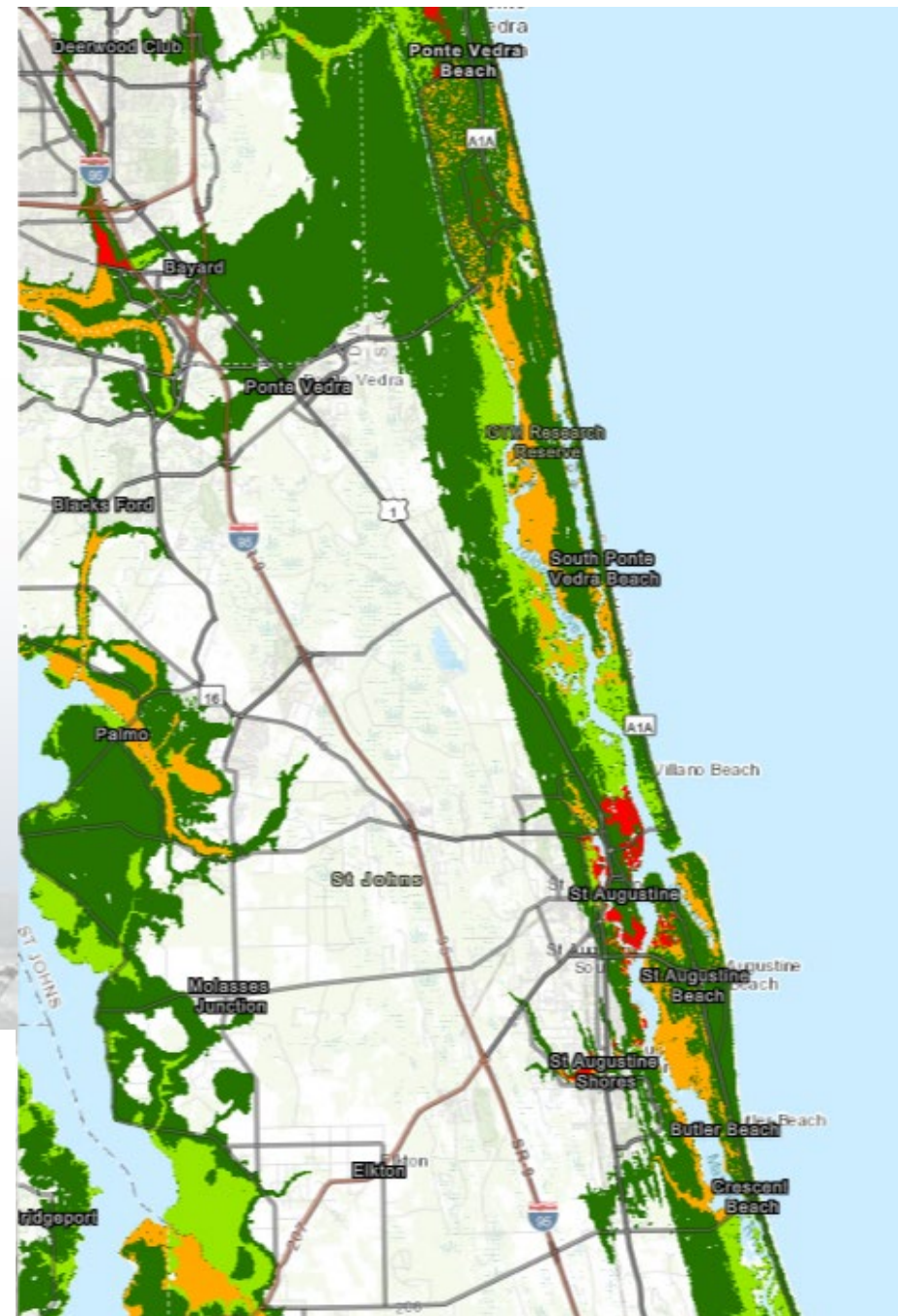


SOUTH ATLANTIC COASTAL STUDY

Significant Risk Across the Southeastern U.S.

- Identified 700+ high risk locations
- 400+ are in peninsular Florida
- Bay/estuarine storm surge inundation is key driver
- Sea level rise will exponentially increase surge in some areas
- Compound flooding (riverine + ocean) a major risk driver
- Follow-on studies/projects needed to address complex risk related to combined inland/coastal flood risk and ecosystem restoration

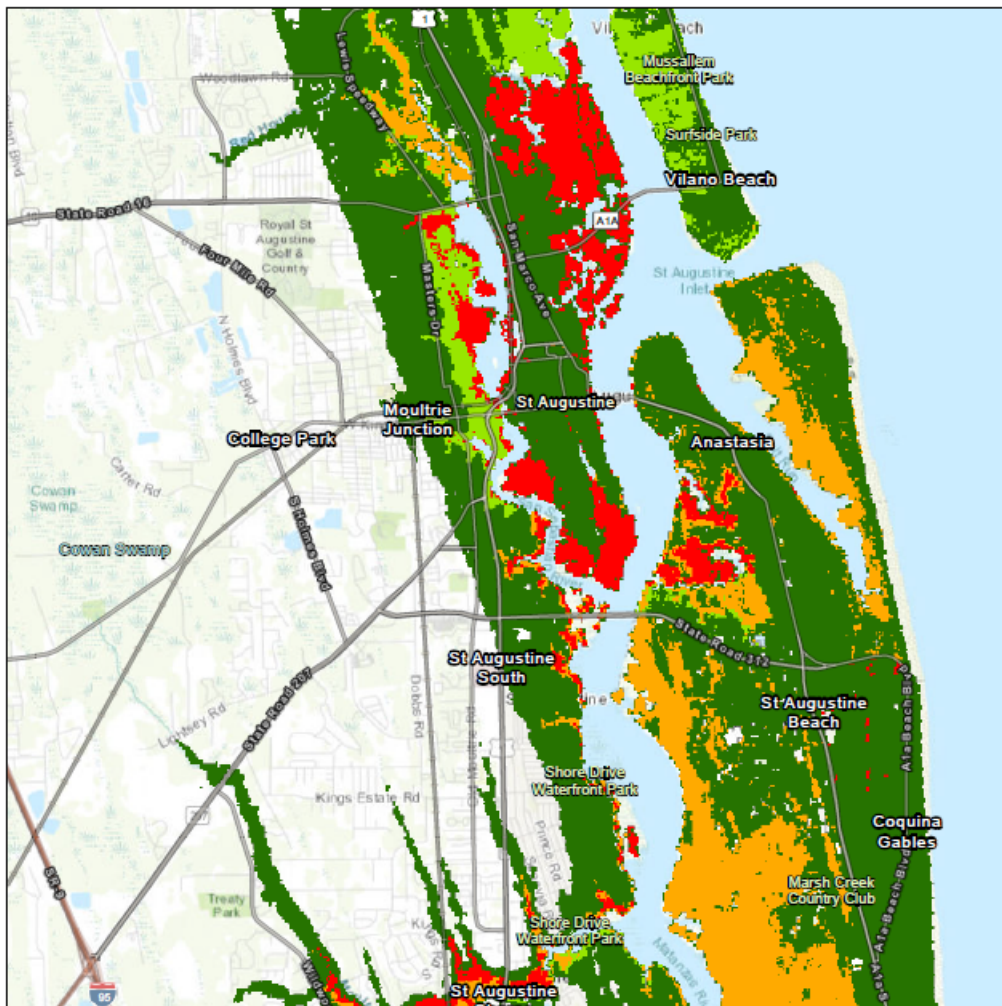
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U.S. ARMY

Risk with Present Day Water Levels

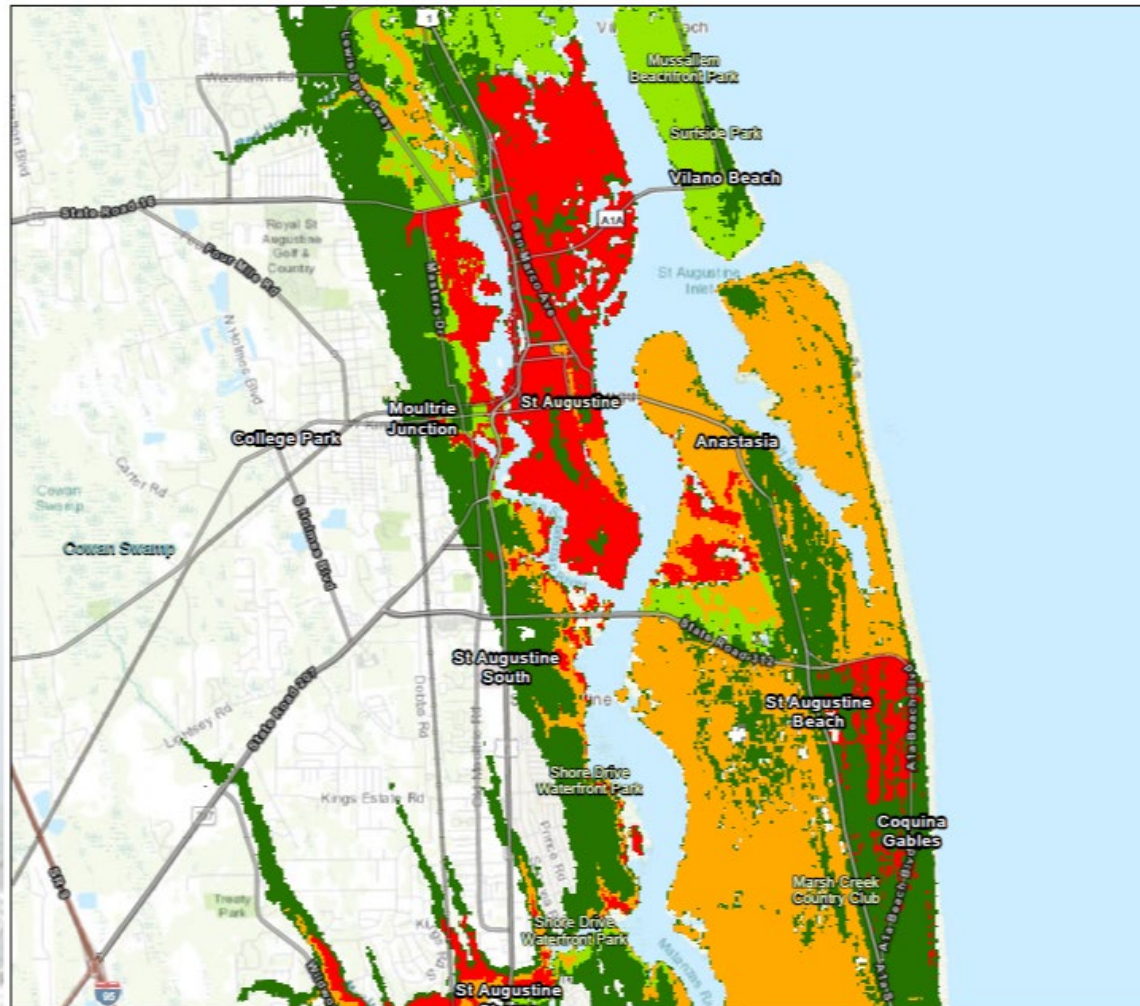


February 1, 2021

Composite Risk Index

- Potential Low Risk
- Potential Medium Risk
- Potential Medium/High Risk
- Potential High Risk

Risk with 3 feet of SLC



February 1, 2021

Composite Risk Plus SLR

- Potential Low Risk
- Potential Medium Risk
- Potential Medium/High Risk
- Potential High Risk

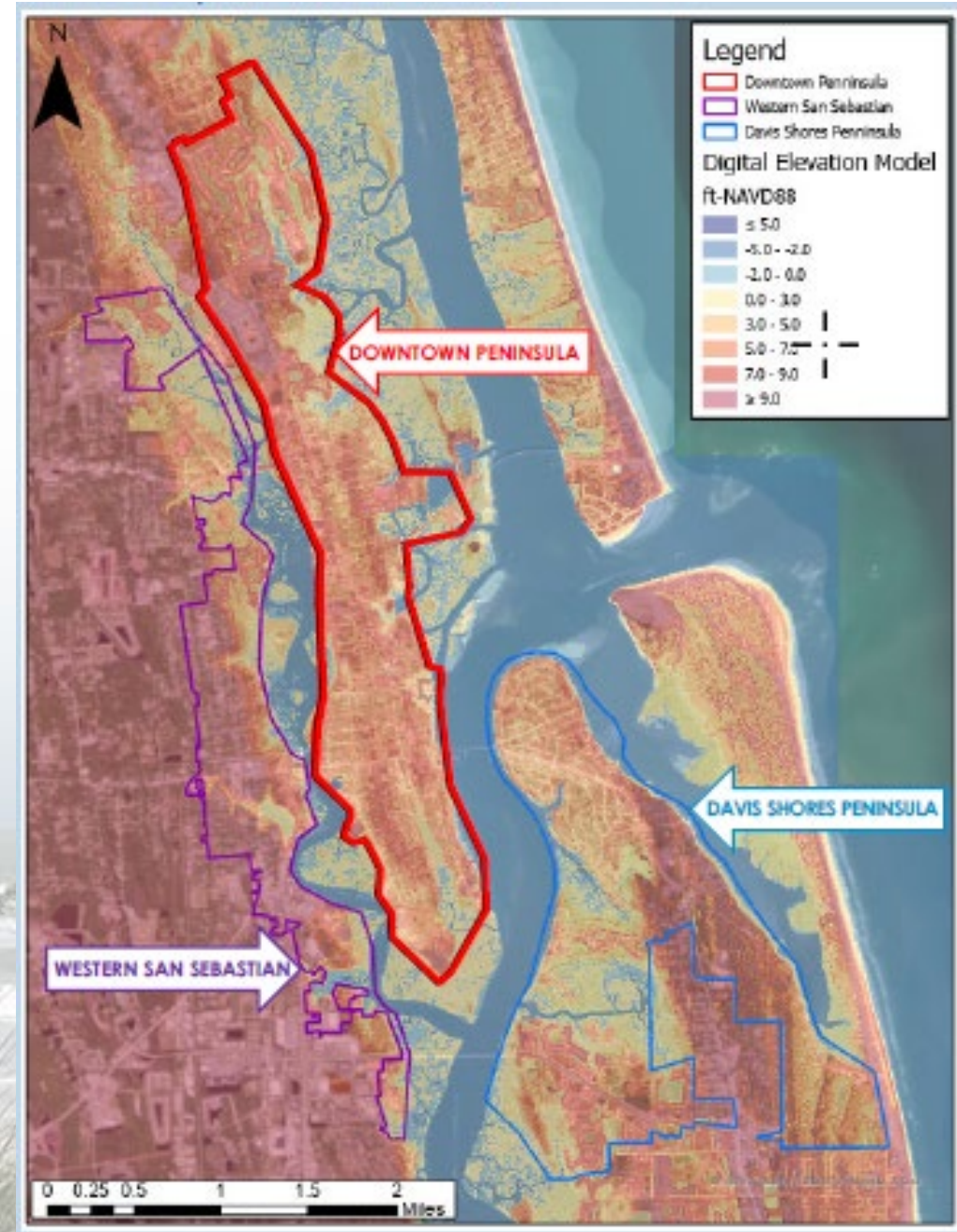


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ST AUGUSTINE, FLORIDA COASTAL STORM RISK MANAGEMENT STUDY

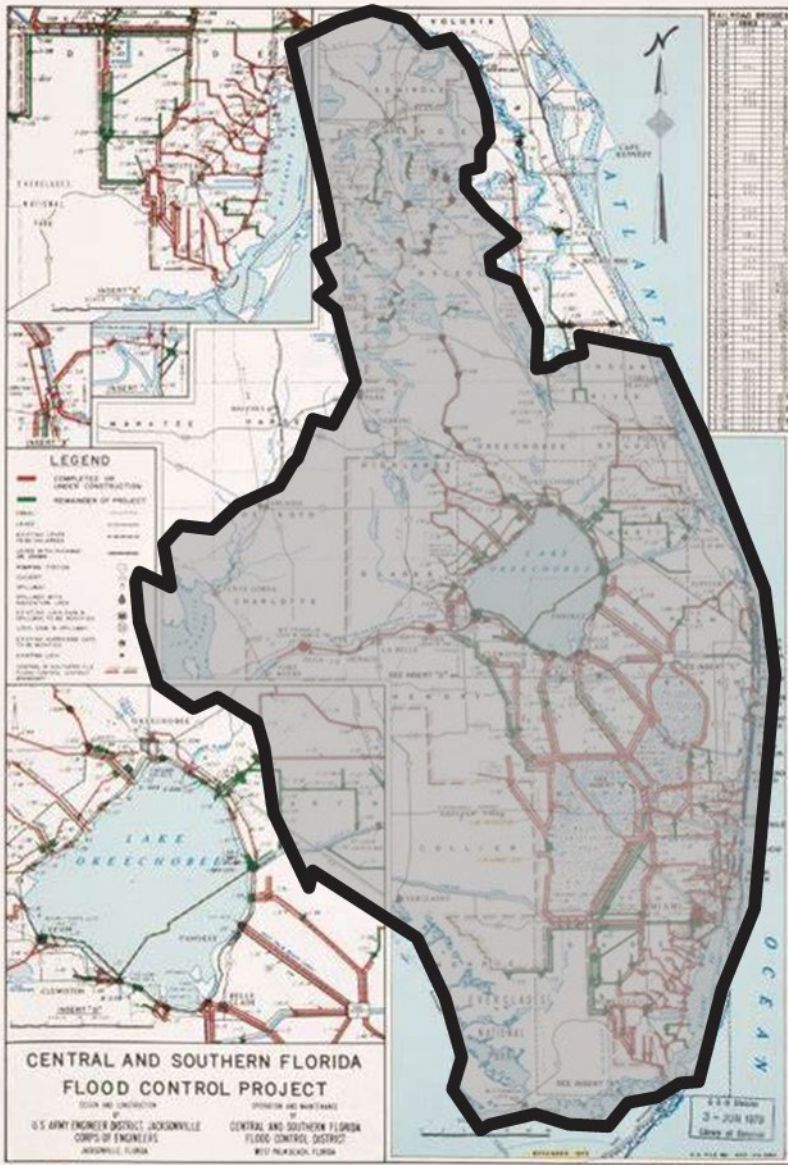
- Strong stakeholder support for natural, nature-based and blended solutions
- Likely to require phased implementation due to high cost and complexity





COMPREHENSIVE CENTRAL AND SOUTHERN FLORIDA STUDY

Overview



Authority –

- Division H Section 8214 of the National Defense Authorization Act for Fiscal Year 2023.

Scope –

- Feasibility study for **resiliency** and **comprehensive improvements** or modifications to existing water resources development projects in the central and southern Florida area
- Purposes of flood risk management, water supply, ecosystem restoration (including preventing saltwater intrusion), recreation, and related purposes.



- Recommend cost-effective structural and nonstructural projects for implementation that provide a **systemwide approach** to solutions

Key themes –

- Increase system-wide community resiliency
- Strategic long-term planning through collaboration with Federal, state, and local entities
- Focus on comprehensive benefits
- Address effects from compound flooding, climate variability, and land use changes
- Incorporate natural and nature-based features to enhance benefits



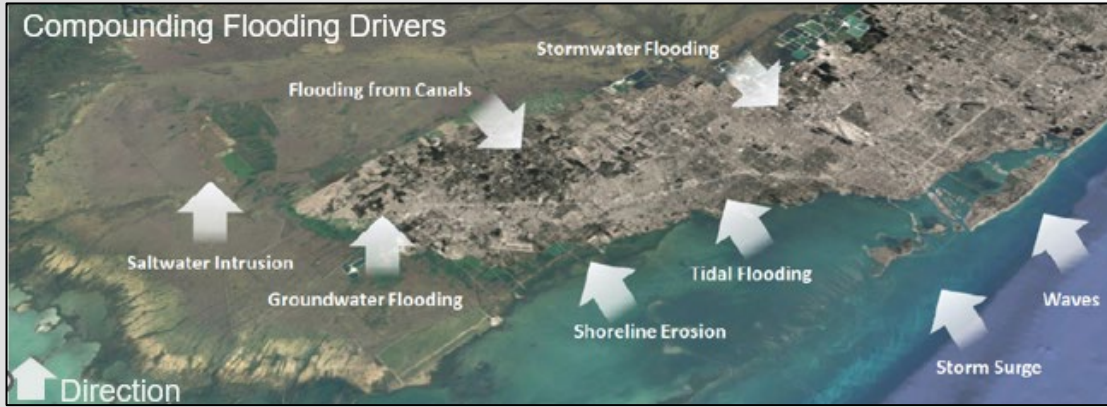
COMPREHENSIVE CENTRAL AND SOUTHERN FLORIDA STUDY



Overview

What is different about the “Comp Study”?

- The way we look at flood risk – compound flooding and comprehensive solutions

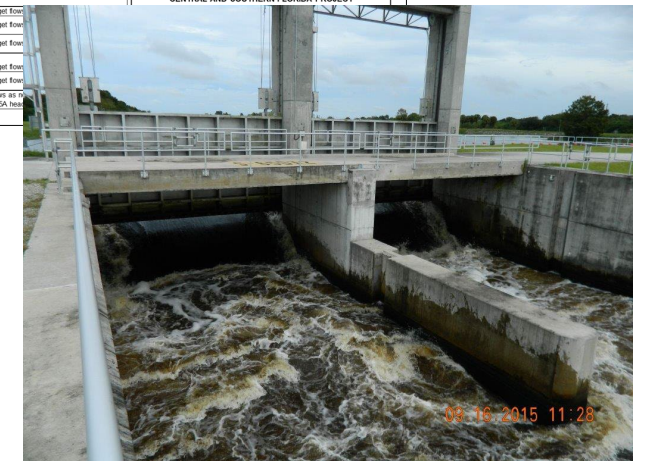
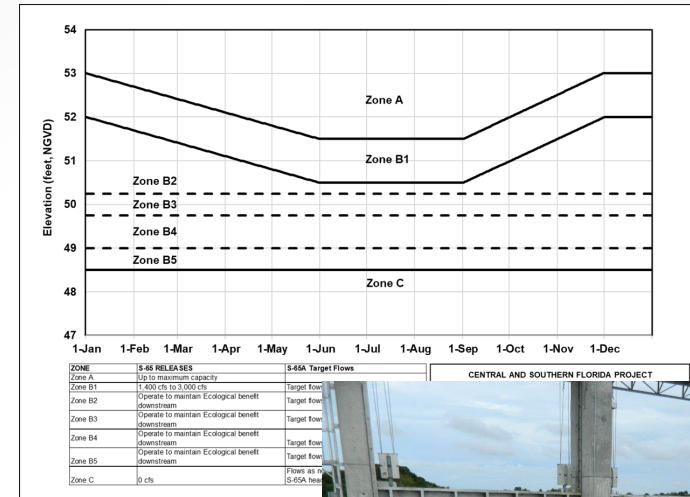


- Comprehensive AUTHORITY allows planning for multipurpose projects



together

- Infrastructure and operations planning together to optimize solutions

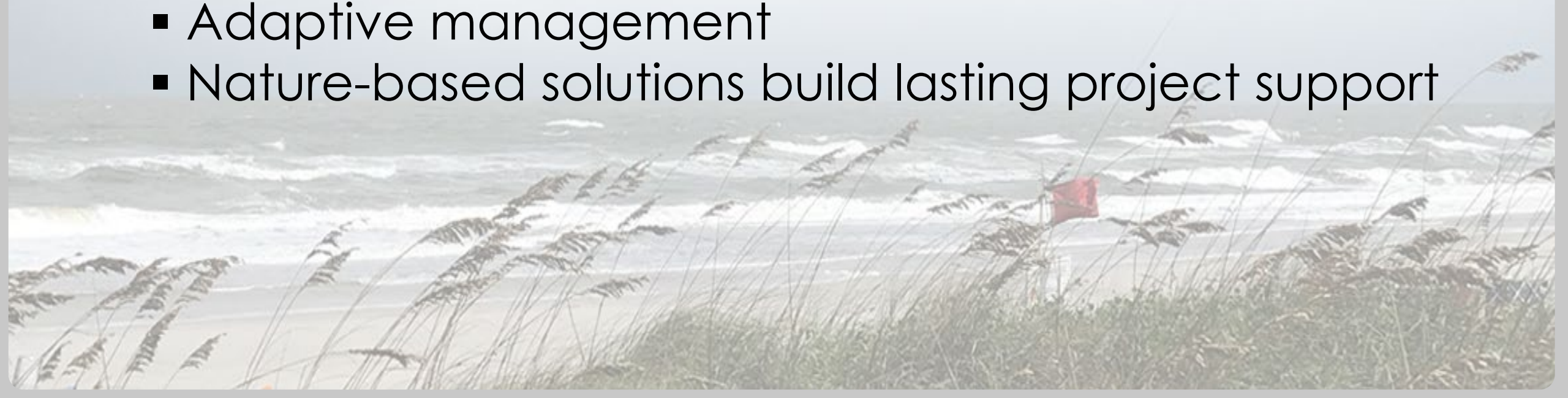




CONCLUSIONS

NEXT GENERATION STUDIES

- A master plan is essential
- Programmatic/systems perspective is essential
- Phased implementation
- Adaptive management
- Nature-based solutions build lasting project support





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