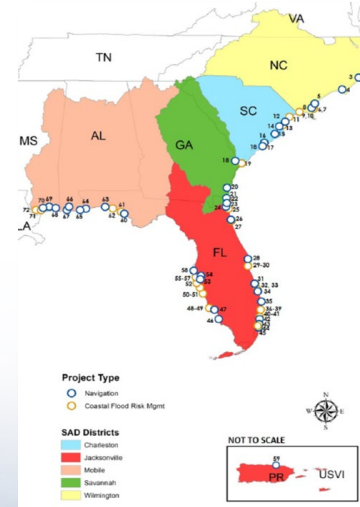


# THE MEETING OF TWO MISSIONS: HOW CLIMATE CHANGE IS BRINGING THE USACE COASTAL STORM RISK MANAGEMENT AND ECOSYSTEM RESTORATION PROGRAMS TOGETHER



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February 4, 2021



US Army Corps of Engineers®

*"The views, opinions and findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."*



# BOTTOM LINE UP FRONT



## CSRM PROGRAM LESSONS LEARNED

- Historical transition of erosion/flood risk measures
- Beach nourishment benefits beyond erosion/flood risk management
- Sea level change impacts on project benefits
- Systems approach

## SACS

- Exposing present and future coastal risk across entire coastal system
- Producing key technical products for studies and projects
- Identifying opportunities: Regional Sediment Management, Natural and Nature-Based alternatives, collaboration across local/state/federal with common risk context

## CERP LESSONS LEARNED

- Systems approach
- Implementation of large/complex projects

## LESSON CROSS-OVER

- Both Programs: Expanded system perspective--coastal, estuarine, inland
- CSRM: Sea level change driving large/complex back-bay projects
- Flood risk from combination of SLC, rainfall/hydrology and coastal storms
- CERP BBSEER: CERP project with sea level change challenges



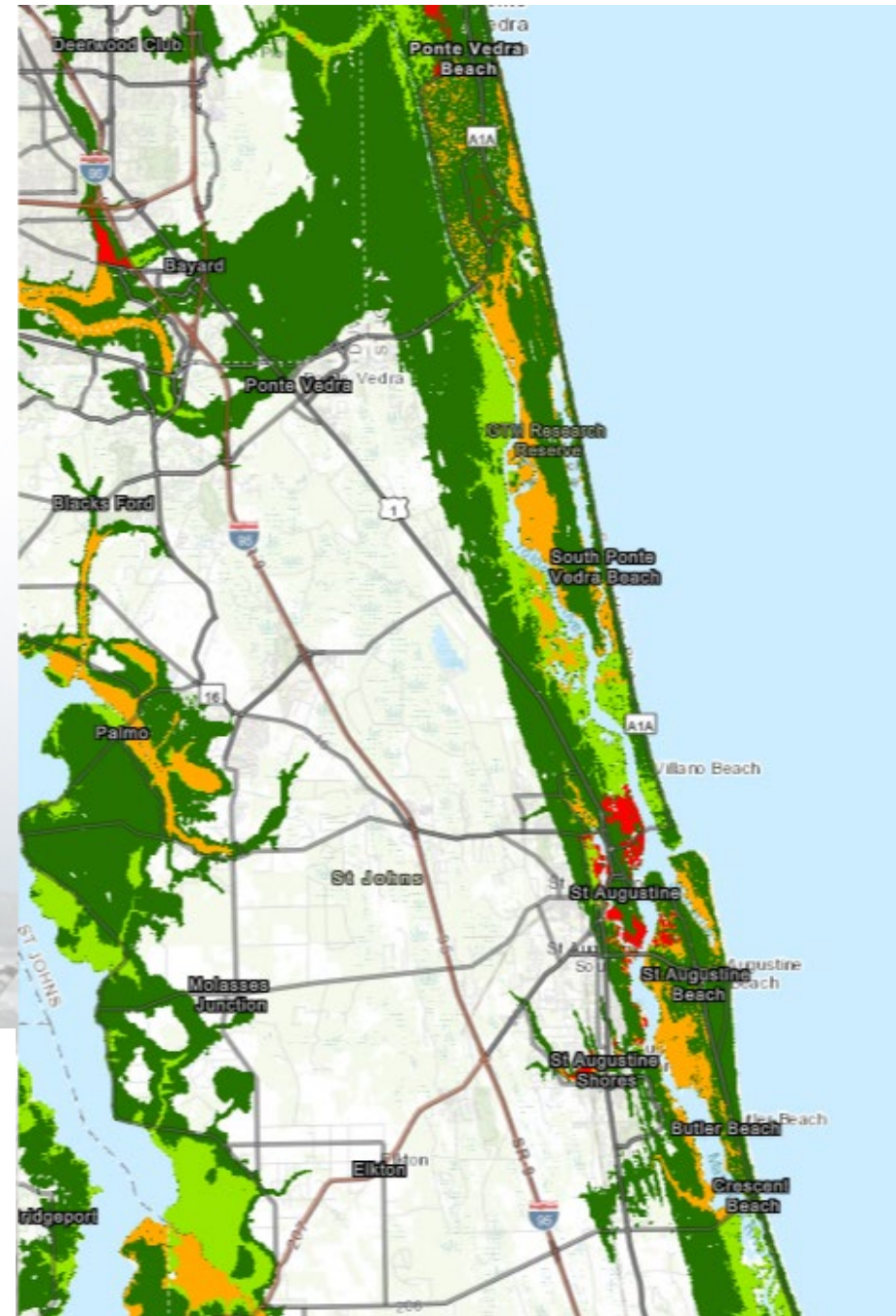


# SOUTH ATLANTIC COASTAL STUDY

## Significant Risk Across the Southeastern U.S.

- Tier 1 & 2 identified 700+ high risk locations
- 400+ are in peninsular Florida
- Back bay storm surge inundation is key driver.
- Sea level rise will exponentially increase surge in some areas: San Juan vicinity, St. John, St. Croix, Northeast Florida.
- Further understanding/application of compound flooding impact is needed
- Significant need for follow-on efforts to address complex risk related to combined inland/coastal flood risk and ecosystem restoration

<https://www.sad.usace.army.mil/SACS/>







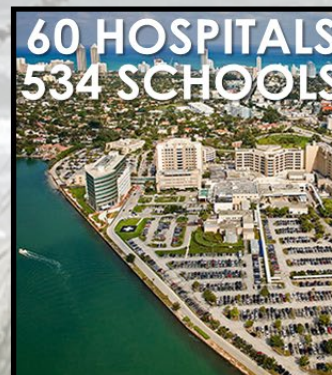
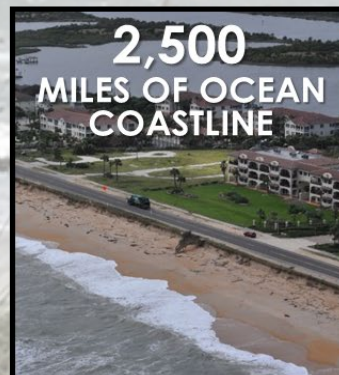
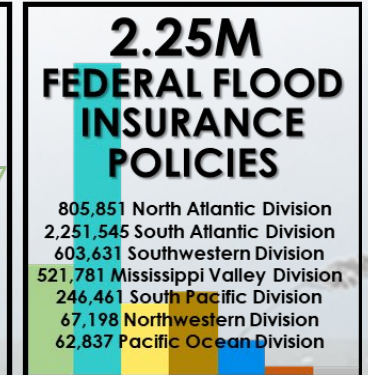
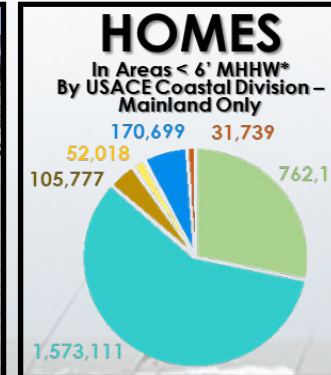
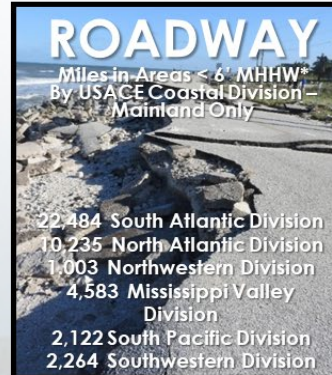
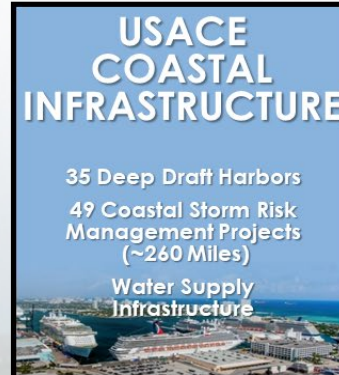
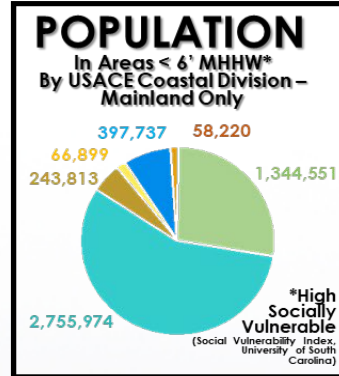
# SOUTH ATLANTIC REGION COASTAL RISK (SACS)



## SACS Products

- Storm data (Coastal Hazard System), Sediment availability and needs (SAND)
- Regional sediment management opportunities (RSM Optimization)
- Coastal storm risk alternatives and their costs (Measures and Costs Library)
- Ecosystem/environmental resource data and vulnerability (Planning Aid Report)

<https://www.sad.usace.army.mil/SACS/>

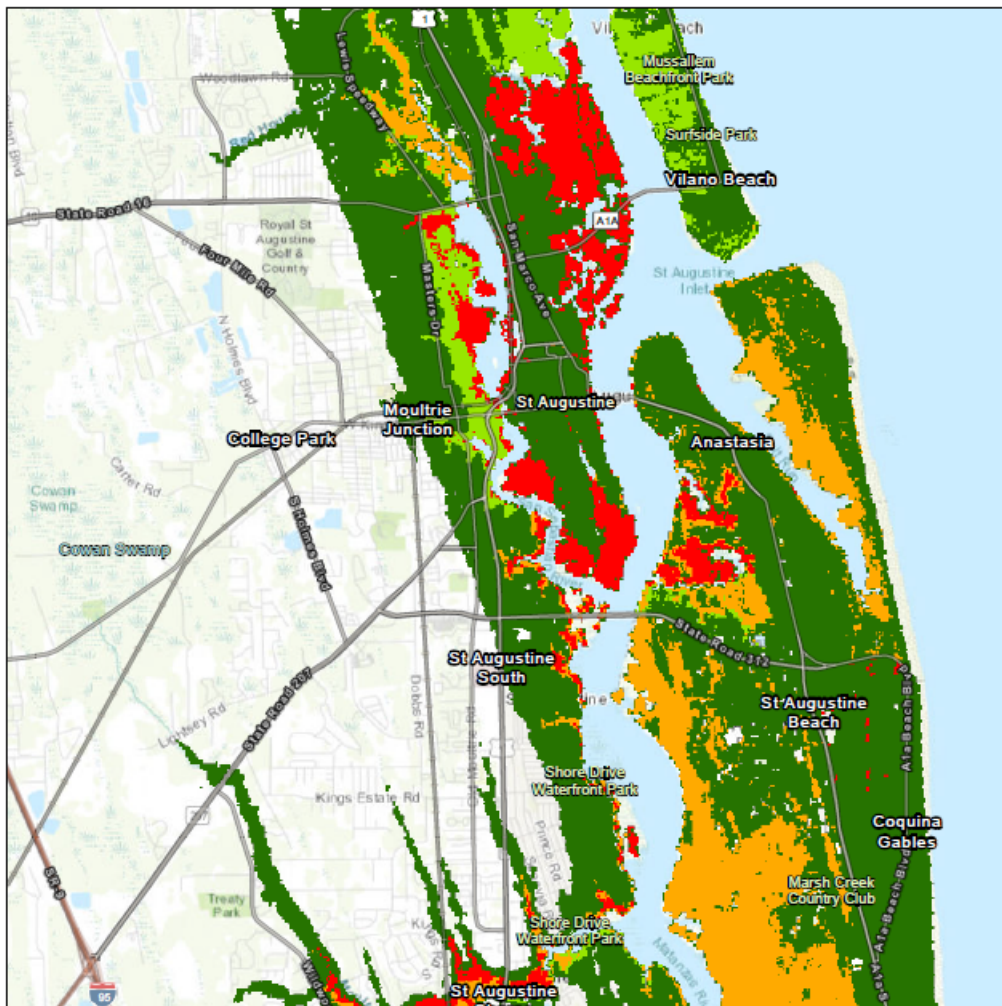






U.S. ARMY

# Risk with Present Day Water Levels



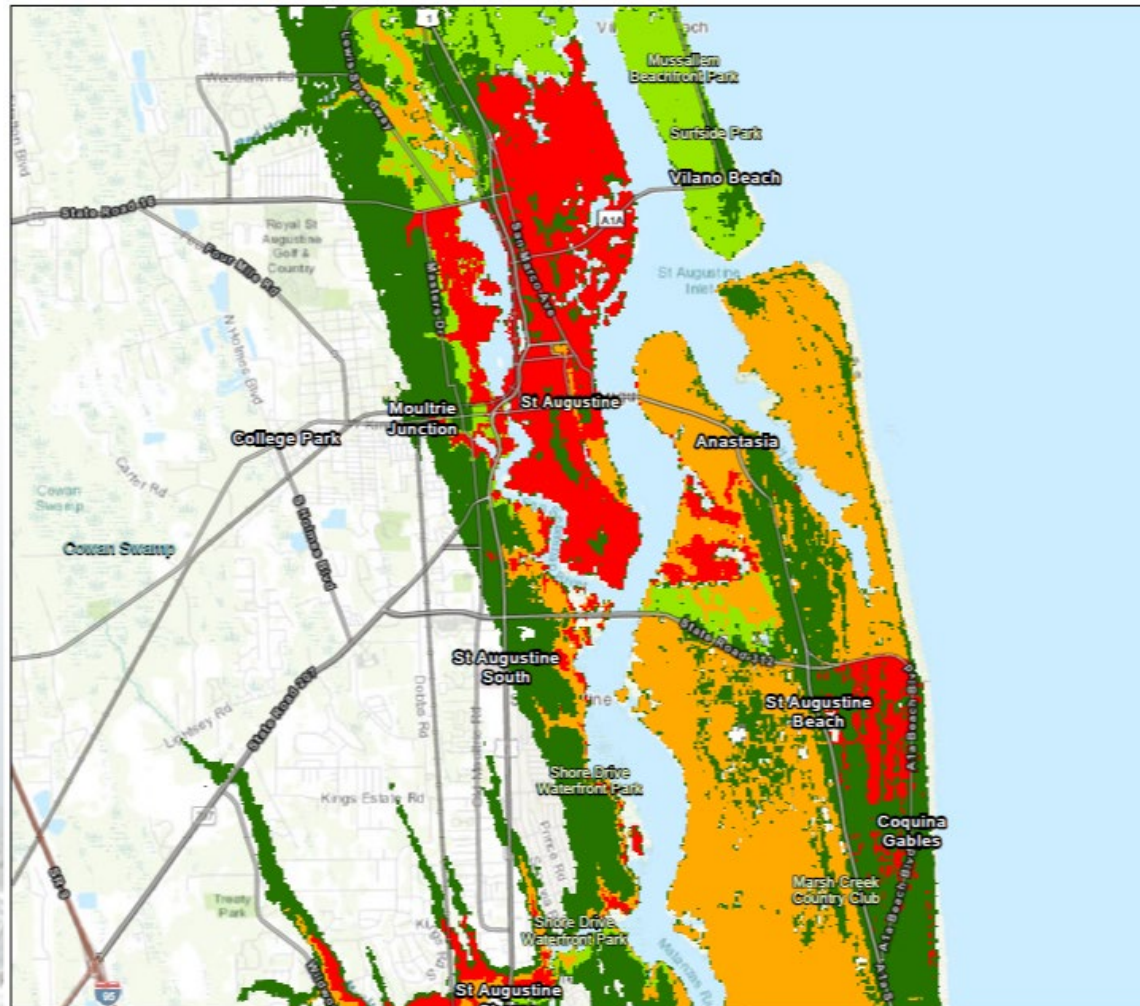
February 1, 2021

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

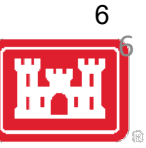
- Potential Low Risk
- Potential Medium Risk
- Potential Medium/High Risk
- Potential High Risk

<https://www.sad.usace.army.mil/SACS/>





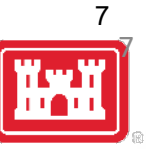
# St. Johns County Coastal Storm Risk Management, Version 1.0



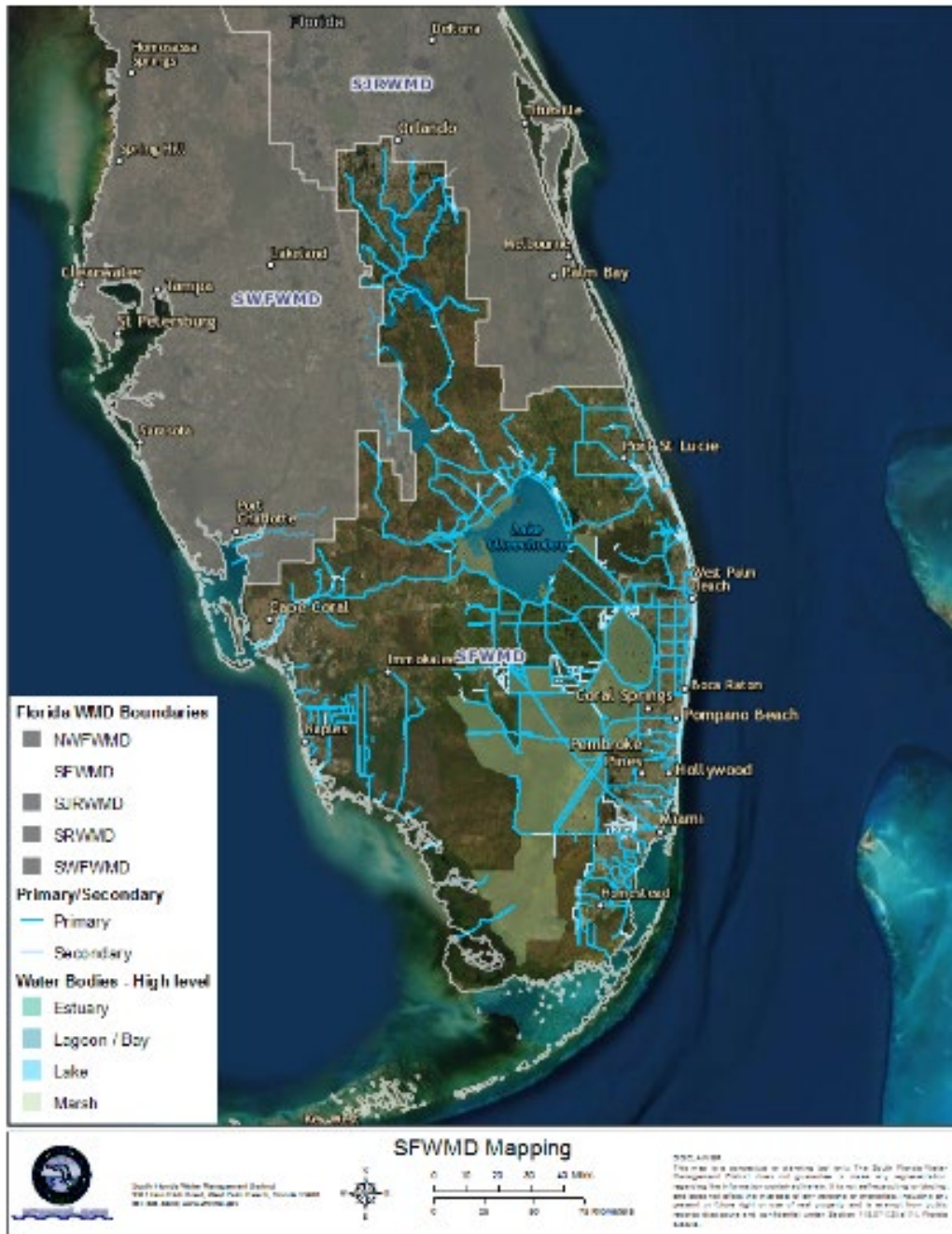




# St. Johns County CSRM Versions 2.0 and 3.5







## The Central and Southern Florida (C&SF) Project

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





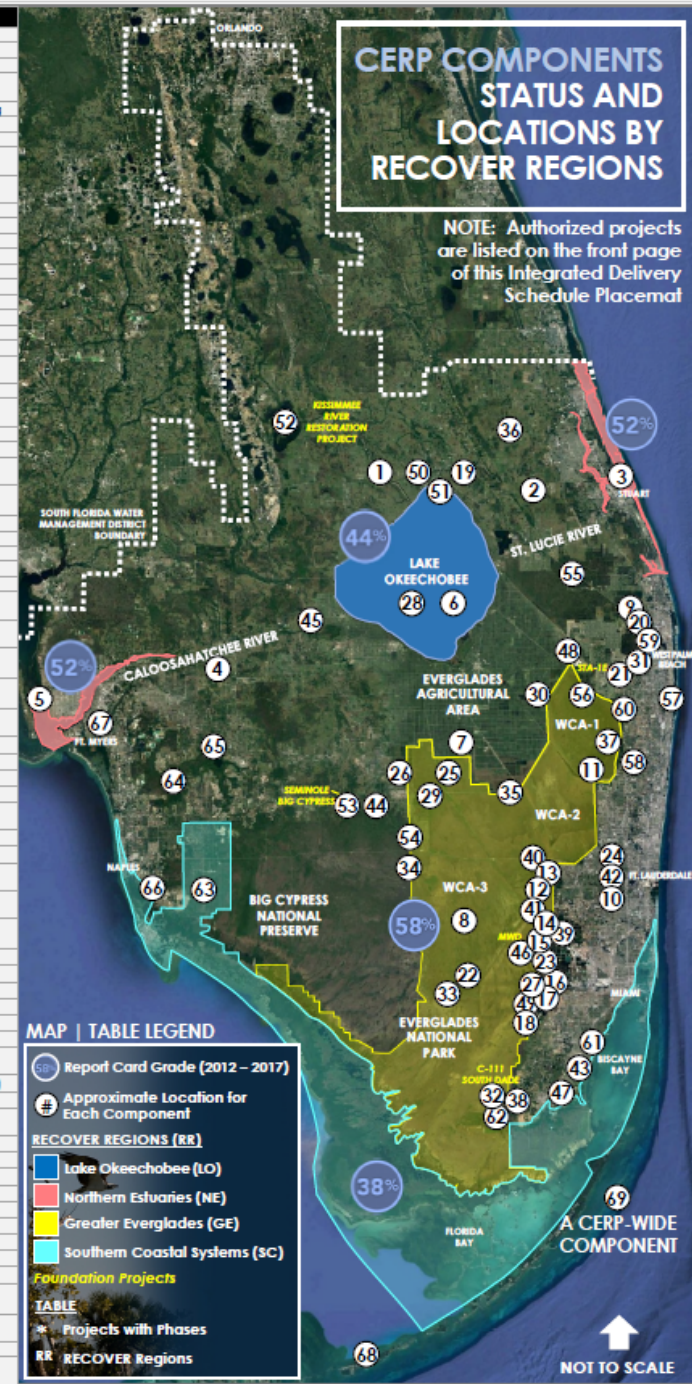


# COMPREHENSIVE EVERGLADES RESTORATION PLAN

- Integrated delivery schedule: status of project components
- The 2000 CERP Restudy 'Yellow Book' is the roadmap
- 68+ components

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

| PHASE | 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    | Seminole Tribe Big Cypress Water Conservation Plan (East and West) (OPE)         |
| 56    | GE    | Acme Basin (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)                   |
| 19    | 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 Lakebell 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 Rottenberger 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 Bell Storage (YY)                              |
| 41    | GE    | Divert WCA3 flows to Central Lake Bell 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 Bell 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 Hydropattern Restoration (OPE) |
| 60    | GE    | Protect and Enhance Existing Wetlands Systems along Lox (Shazulla Tract) (OPE)   |
| 65    | SC    | Re-route Miami-Dade Water Supply Deliveries (SS)                                 |
| 30    | SC    | Palm Beach County Wetlands-based Water Reclamation (OPE)                         |
| 59    | GE    |                                                                                  |







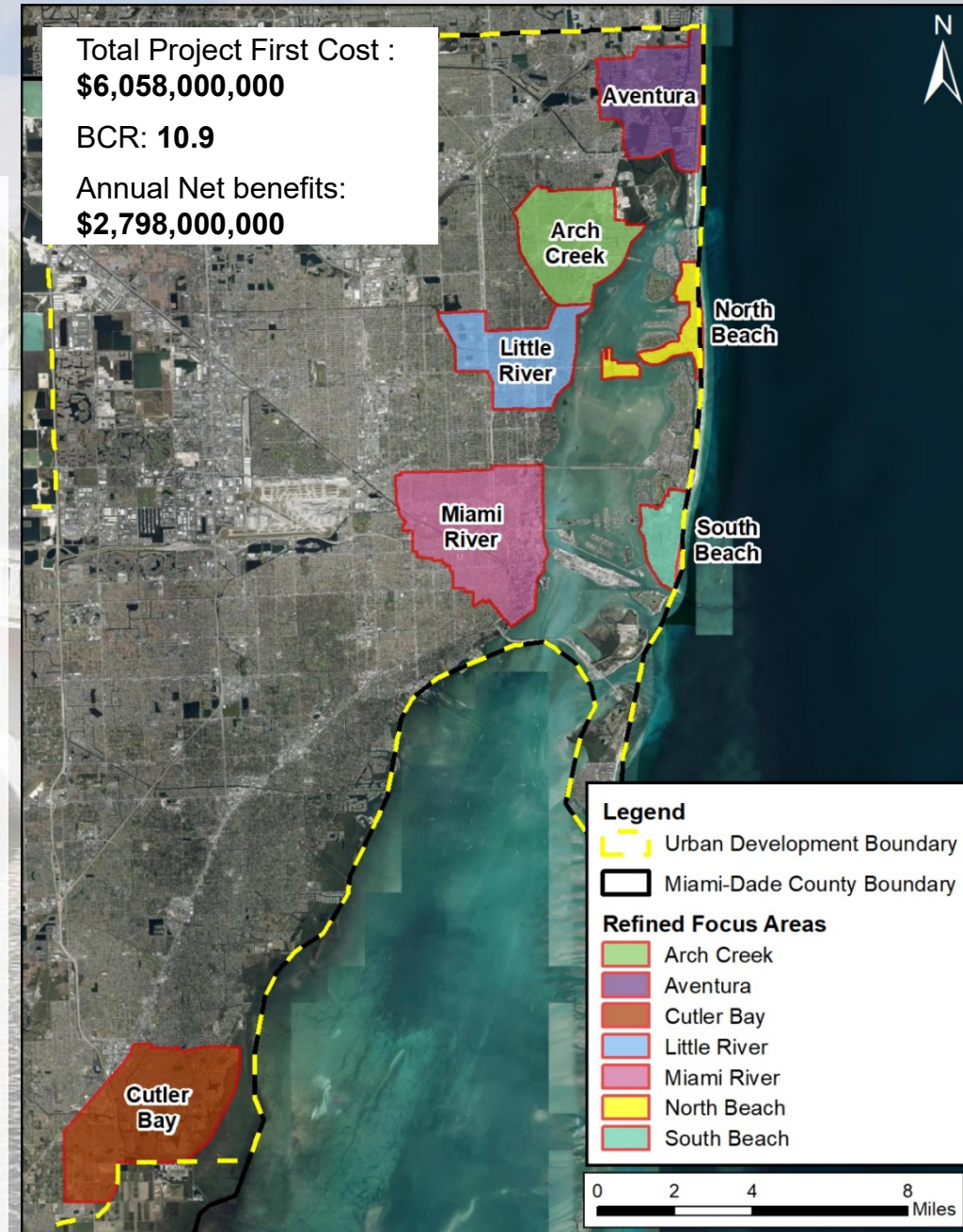
US Army Corps of Engineers

# MIAMI DADE COASTAL STORM RISK MANAGEMENT STUDY

## Recommended Plan:

- Floodproofing approximately 200 x critical infrastructure facilities
- 7 x high risk focus areas featuring structural, nonstructural and/or NNBFs.
- Structural measures:
  - Surge barriers, floodwalls, and pump stations at Biscayne Canal, Little River, Miami River, Coral Gables Way, and S22 (Snapper Creek Canal).
  - Potential storm surge risk reduction to 220,000 structures.
- Nonstructural measures:
  - Elevating residential buildings: 5,800
  - Floodproofing non-residential buildings: 4,600
- NNBFs were identified through coordination with local stakeholders, State agencies, and Federal agencies.

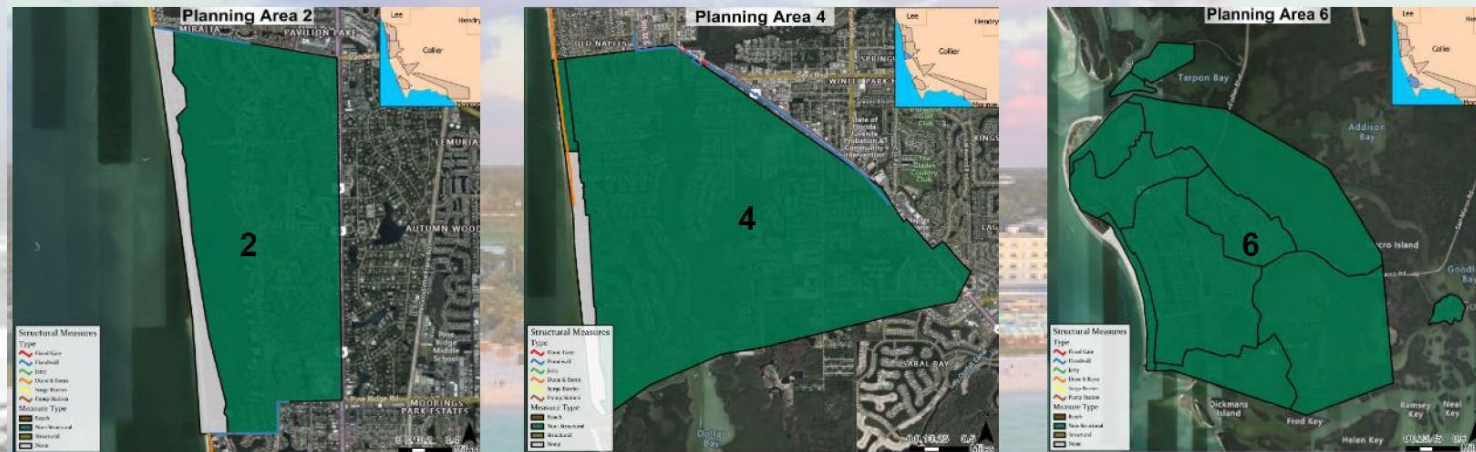
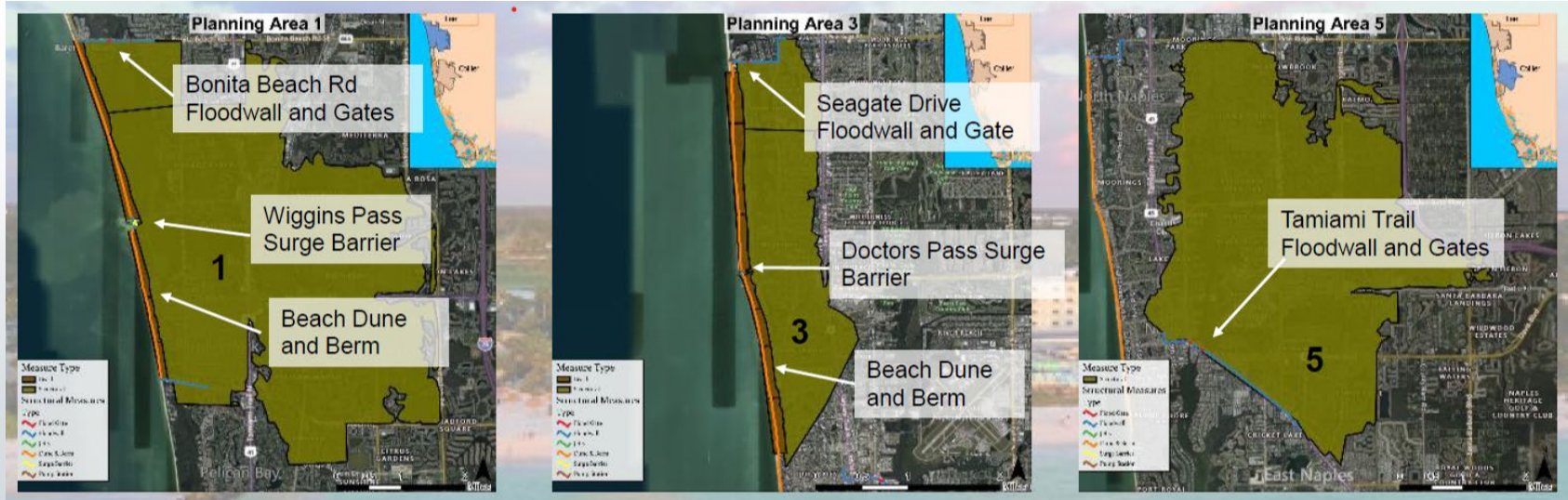
<https://www.saj.usace.army.mil/MiamiDadeBackBayCSRMFfeasibilityStudy/>







# COLLIER COUNTY COASTAL STORM RISK MANAGEMENT STUDY



## Recommended Plan Alternative 4: Combination of Structural, Nonstructural, Beach, and Critical Infrastructure

**Total Project First Cost: \$2,351,000,000**  
**Total Nourishment Cost**  
**7 cycles: \$540,000,000**  
 (FY21 price level)

### Cost Sharing

- ❑ Initial Construction: 65% Federal (\$1.5B) / 35% non-Federal (\$823M)
- ❑ Continuing Renourishments: 50% Federal (\$270M) / 50% non-Federal (\$270M)

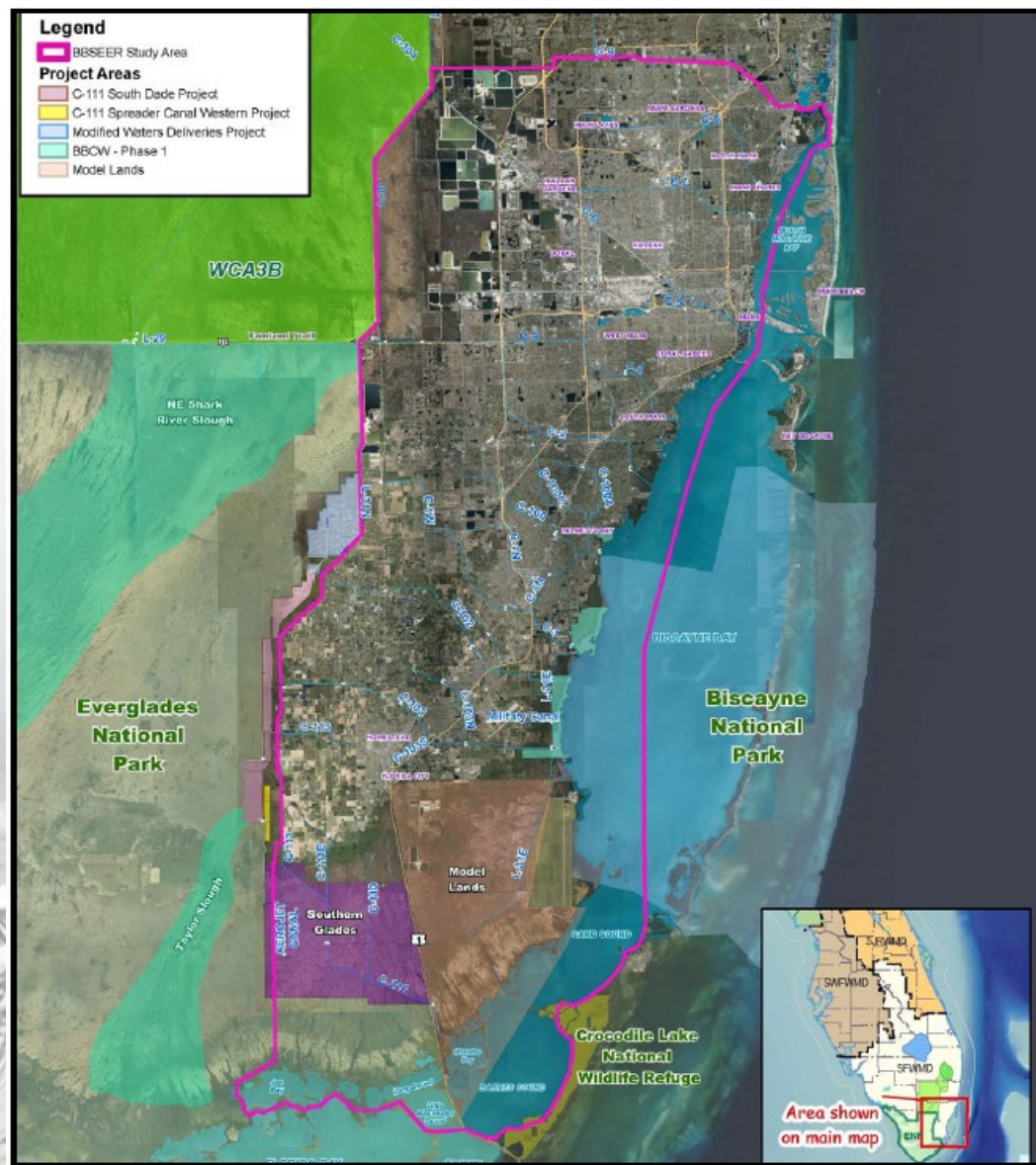
**Average Annual Benefit: \$145M**  
**Average Annual Cost: \$115M**  
**BCR @ 2.5% discount rate: 1.3**

<https://www.saj.usace.army.mil/CollierCountyCSRMEasibilityStudy/>





# BISCAYNE BAY AND SOUTHEASTERN EVERGLADES ECOSYSTEM RESTORATION PROJECT (BBSEER)







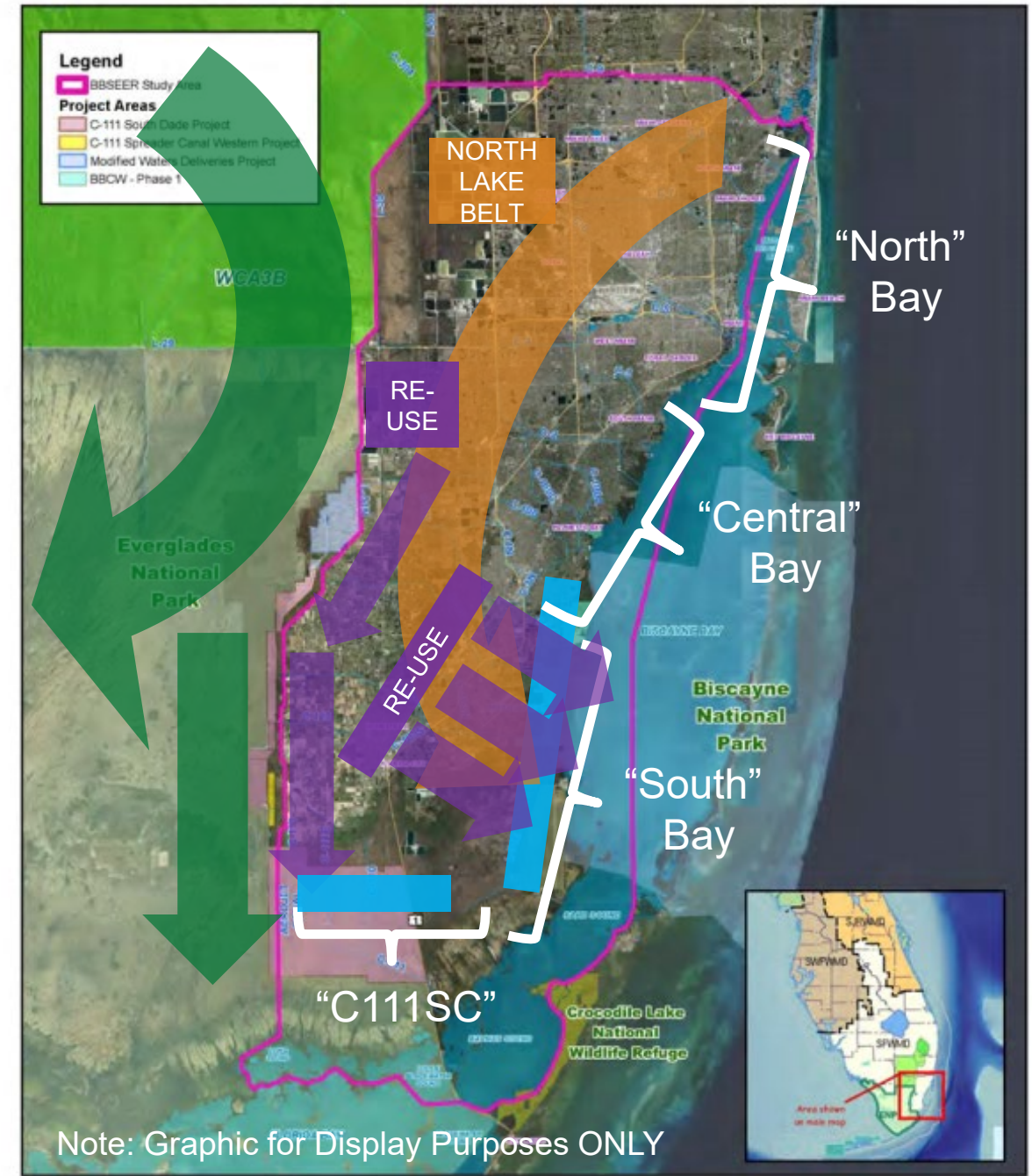
**Keep Everglades Water in the Everglades**

**Improve Coastal Wetlands and Nearshore / Sheet Flows**

**Store Water and Move from North to South Bay**

**Supplement Regional Water Budget with REUSE**

<https://usace.contentdm.oclc.org/utils/getfile/collection/p16021/coll11/id/4899>











# CONCLUSIONS

## CSRM PROGRAM LESSONS LEARNED

- Historical transition of erosion/flood risk measures
- Beach nourishment benefits beyond erosion/flood risk management
- Sea level change impacts on project benefits
- Systems approach

## SACS

- Exposing present and future coastal risk across entire coastal system
- Producing key technical products for studies and projects
- Identifying opportunities: RSM, NNBF, collaboration

## CERP LESSONS LEARNED

- Systems approach
- Implementation of large/complex projects

## LESSON CROSS-OVER

- Both Programs: Expanded system perspective--coastal, estuarine, inland
- CSRM: Sea level change driving large/complex back-bay projects
- Flood risk from combination of SLC, rainfall/hydrology and coastal storms
- CERP BBSEER: CERP project with sea level change challenges





**THANK YOU**

**JASON.A.ENGLE@USACE.ARMY.MIL**