SOUTH ATLANTIC COASTAL STUDY

Creating a shared vision to address coastal vulnerability

Jacksonville Environmental Symposium

September 14th, 2018

Presented by:
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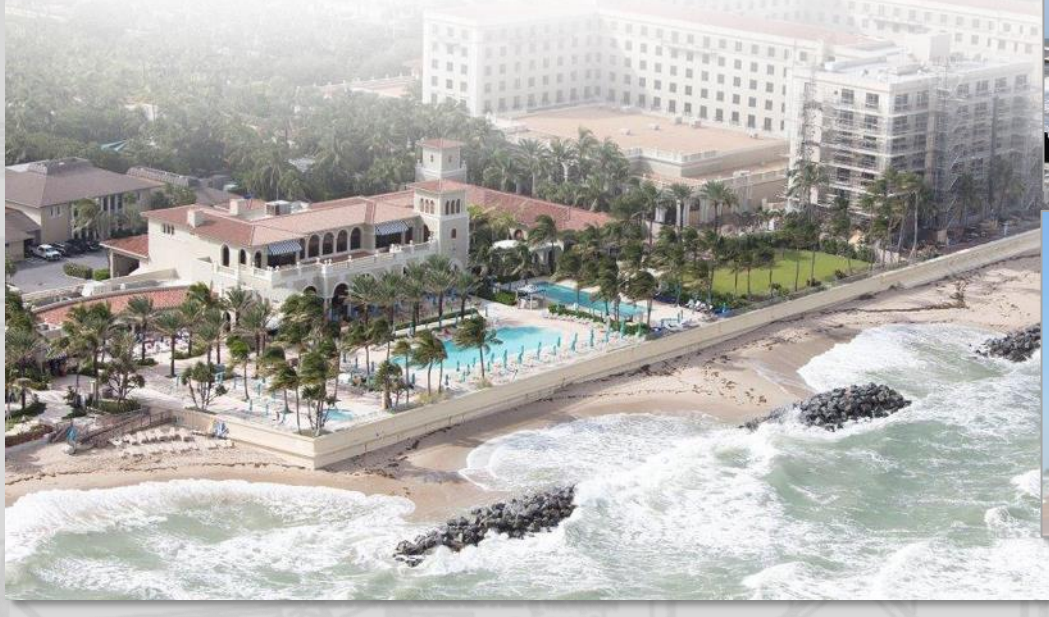
US Army Corps of Engineers
Jacksonville District



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BOTTOM LINE UP FRONT

- Preliminary information
- Background
- Study scope
- Assessing risk
- Increasing resilience with stakeholder involvement

For Coastal Resilience and Sustainability

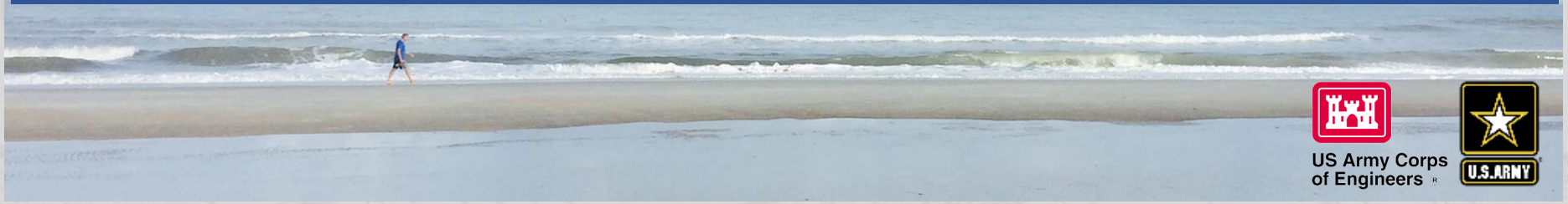

VULNERABILITY ON THE OUTER BANKS


SAVANNAH FLOODING


CHARLESTON FLOODING


BREVARD COUNTY, FLORIDA EROSION

SOUTH ATLANTIC COASTAL STUDY



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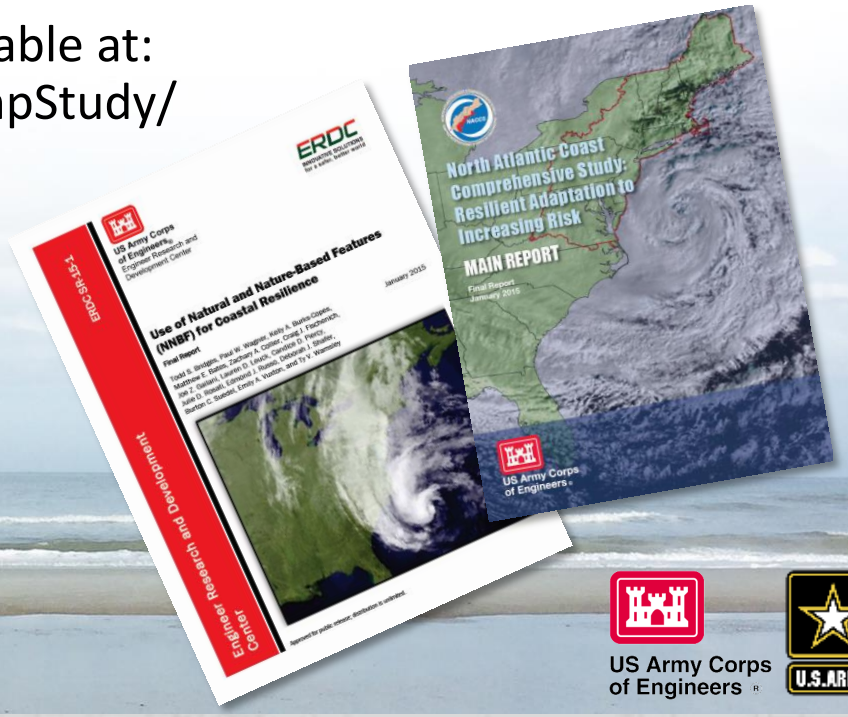
NORTH ATLANTIC COAST COMPREHENSIVE STUDY (NACCS)

- Response to Hurricane Sandy (2012).
  - reduce flood risk to vulnerable coastal populations.
  - promote resilient coastal communities.
- Key findings:
  - Back bay areas are particularly vulnerable.
  - Natural and nature-based features (e.g., wetlands, oyster beds, dunes) should be included in evaluations to address coastal vulnerability.
- Final report (2015), information available at: http://www.nad.usace.army.mil/CompStudy/



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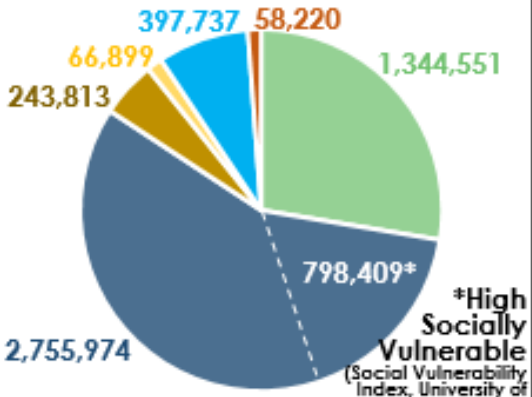
SOUTH ATLANTIC DIVISION – Most Vulnerable in USACE

POPULATION

In Areas < 6' MHHW*
By USACE Coastal Division – Mainland Only



*High Socially Vulnerable (Social Vulnerability Index, University of South Carolina)

$572B PROPERTY VALUES

In Areas < 6' MHHW*
By USACE Coastal Division – Mainland Only

$572 B South Atlantic Division
$389 B North Atlantic Division
$13 B Southwestern Division
$9 B Mississippi Valley Division
$96 B South Pacific Division
$14 B Northwestern Division

Image courtesy of FDEP

ROADWAY

Miles in Areas < 6' MHHW*
By USACE Coastal Division – Mainland Only

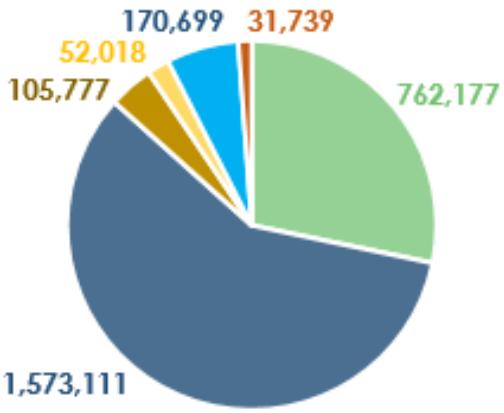
22,484 South Atlantic Division
10,235 North Atlantic Division
1,003 Northwestern Division
4,583 Mississippi Valley Division
2,122 South Pacific Division
2,264 Southwestern Division

2.25M FEDERAL FLOOD INSURANCE POLICIES

2,251,545 South Atlantic Division
805,851 North Atlantic Division
603,631 Southwestern Division
521,781 Mississippi Valley Division
246,461 South Pacific Division
67,198 Northwestern Division
62,837 Pacific Ocean Division

HOMES

In Areas < 6' MHHW*
By USACE Coastal Division – Mainland Only



North Atlantic Division | South Atlantic Division | Mississippi Valley Division | Southwestern Division | South Pacific Division | Northwestern Division | Pacific Ocean Division

Sources: 1. ClimateCentral.org 2. FEMA.gov/reports 3. Coast.NOAA.gov 4. 2035 South Atlantic Division Strategic Assessment

SOUTH ATLANTIC COASTAL STUDY
Ahead of the Storm

- Section 1204 of the Water Resources Development Act of 2016
- Goal: Enhance resilience and sustainability of the tidally influenced coasts in the South Atlantic Division.
  - Evaluate the vulnerability of coastal areas within the South Atlantic Division to increased storm damage as a result of sea level rise.
  - Identify potential solutions to mitigate risks.
  - Develop strategies to address challenges in collaboration with stakeholders.
- Funded by the Bipartisan Budget Act of 2018 (Public Law 115-123).
  - $16-million, 100% Federally funded.
  - Completed within 4-5 years.

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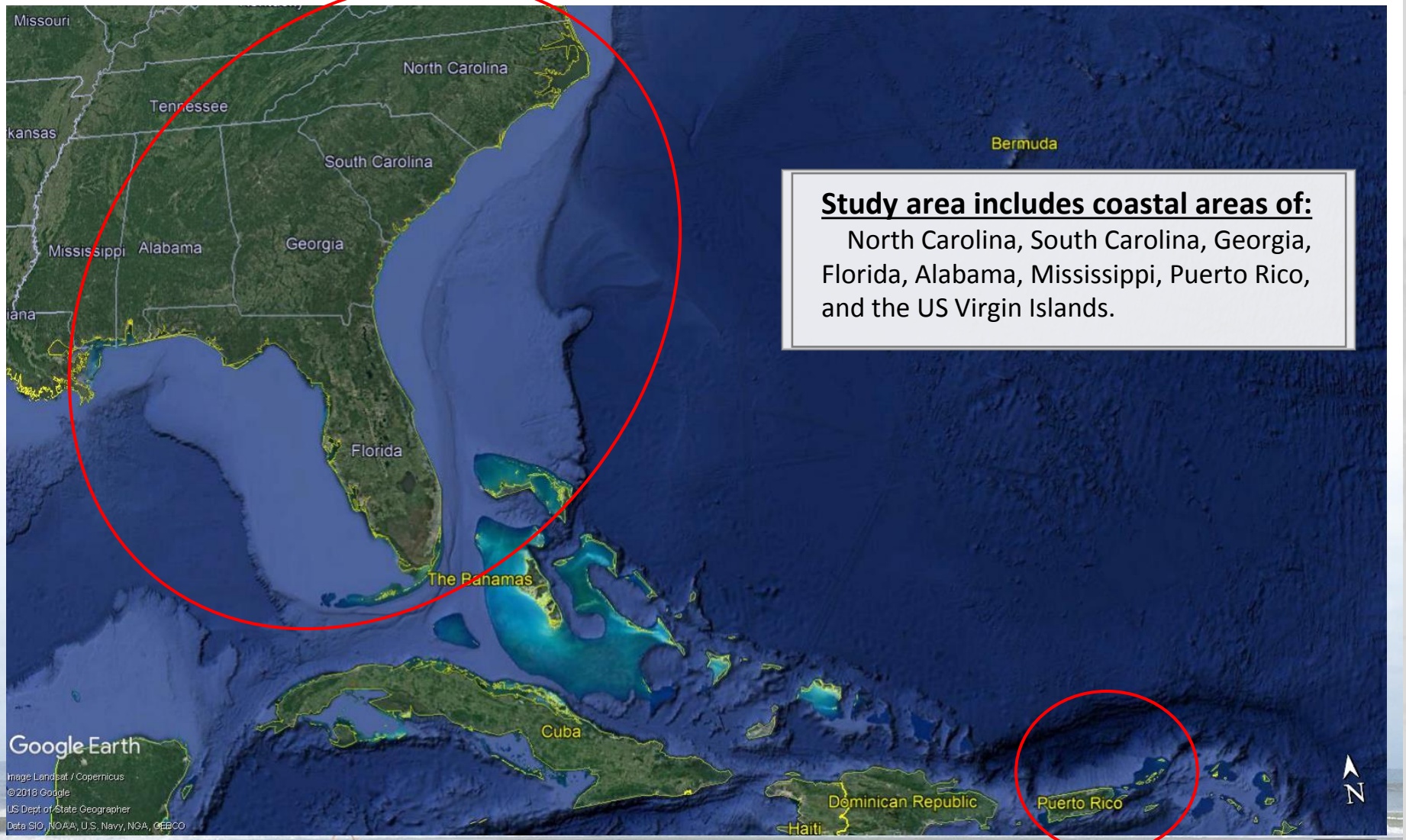
SOUTH ATLANTIC DIVISION



Study area includes coastal areas of:

North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Puerto Rico, and the US Virgin Islands.

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SOUTH ATLANTIC COASTAL STUDY: Framework

STEPS COMPLETED AT A CONCEPTUALS LEVEL BY THE SACS

INITIATE ANALYSIS
- Identify Stakeholders, Partners, and Authorities
- Identify Constraints and Opportunities
- Formulate Goals
- Determine Spatial and Temporal Scale of Analysis

CHARACTERIZE CONDITIONS
- Define Physical and Geomorphic Setting
- Compile Flood Probability Data
- Establish Baseline Conditions and Forecast Future Conditions

ANALYZE RISK AND VULNERABILITY
- Map Inundation and Exposure
- Assess Vulnerability and Resilience
- Determine Areas of High Risk

IDENTIFY POSSIBLE SOLUTIONS
- Assess Full Array of Measures
- Consider Blended Solutions
- Develop Performance Metrics
- Establish Decision Criteria

EVALUATE AND COMPARE SOLUTIONS
- Develop Cost Estimates
- Assess Benefits

Establish stakeholder relationships, coordinate up-front to leverage others' efforts.

Modify "NACCS-consistent" risk assessment for southeast applicability as needed. Identify Focus Areas based on high risk locations and stakeholder input.

Provide useable data & tools to stakeholders. Identify general measures applicable to broad regions and specific solutions for focus areas.

FUTURE ACTIONS

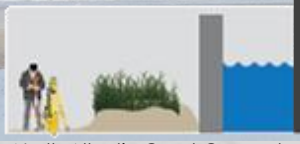
TO BE COMPLETED BY AN APPROPRIATE LOCAL, STATE, OR FEDERAL AGENCY, OR NGO

ADDITIONAL STEPS TO BE COMPLETED IN FUTURE REPLICATIONS OF THE FRAMEWORK AT REFINED SCALES

SELECT PLAN

DEVELOP IMPLEMENTATION PLAN
- Complete Pre-construction Engineering and Design
- Consider Operation and Maintenance Issues
- Establish Adaptation Thresholds

EXECUTE PLAN



MONITOR AND ADAPT
- Measure Performance and Benefit Production
- Assess Resilience
- Adaptively Manage

Post-Coastal Study

Implementation of strategies by Federal and non-Federal efforts at the project specific level.

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RISK ASSESSMENT

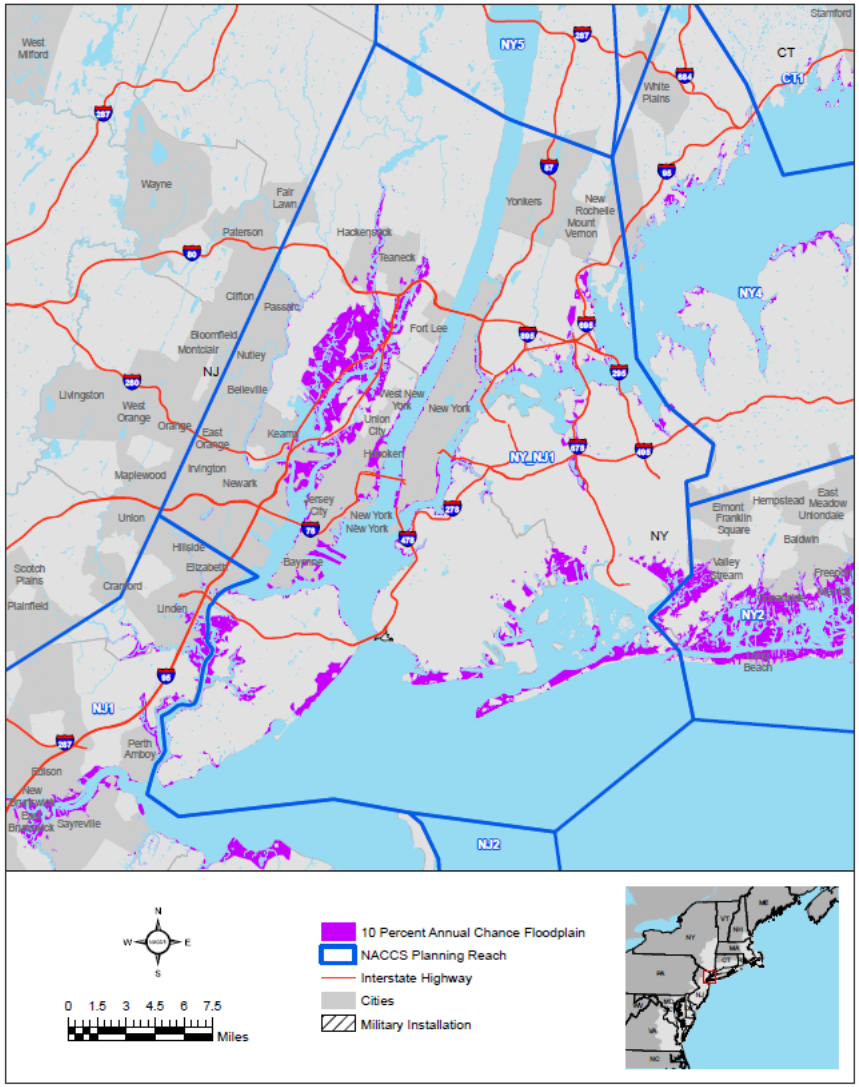

Figure IV-9. Reach NY_NJ1 Very High Impact Area NACCS 10 Percent Floodplain

Three Extreme Water Level Events

1. Category 5 MOM **(extreme event flood)**
2. 1% Annual Chance Flood
3. 10% Annual Chance Flood **(nuisance flood)**

*Sea level rise is included by adding 3 feet to the 1% and 10% events

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RISK ASSESSMENT

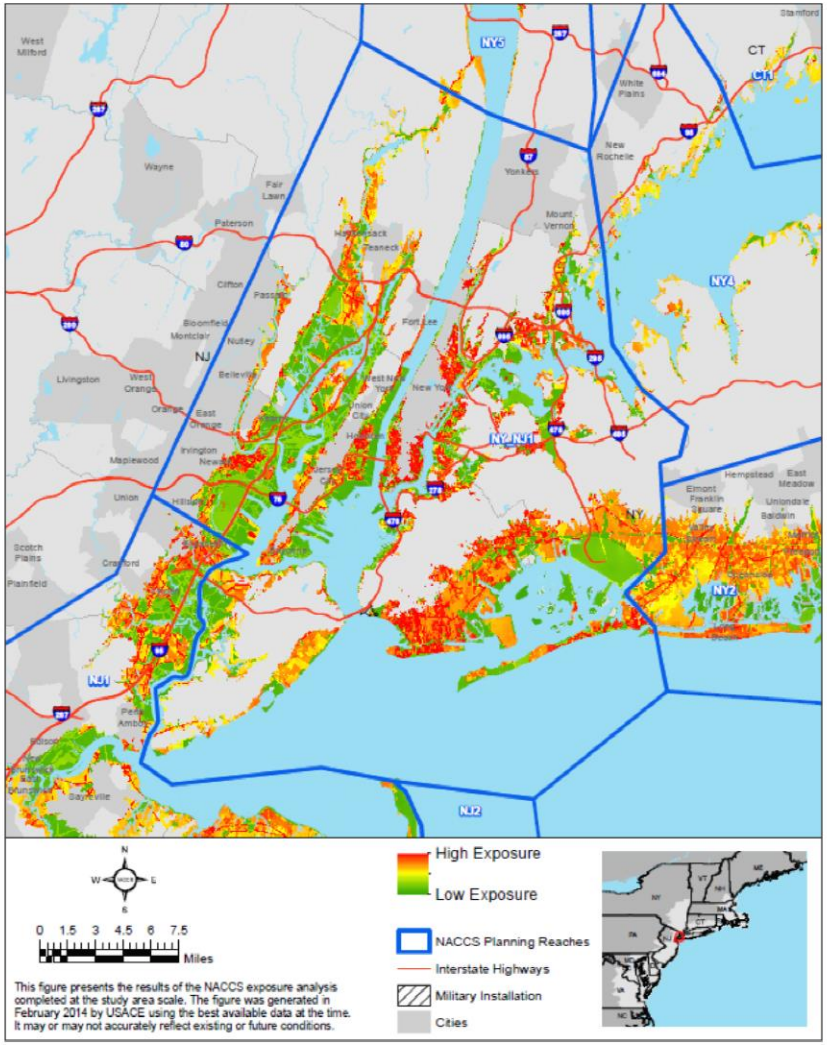

Figure IV-13. Reach NY_NJ1 NACCS Tier 1 Evaluation Composite Exposure Index

Three Exposure Indices

1. Infrastructure and Population
2. Environmental and Cultural Resources
3. Social Vulnerability

Composite Index

= weighted combination of above three indices

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RISK ASSESSMENT

Risk = Composite Exposure Index x Hazard (probability and footprint)

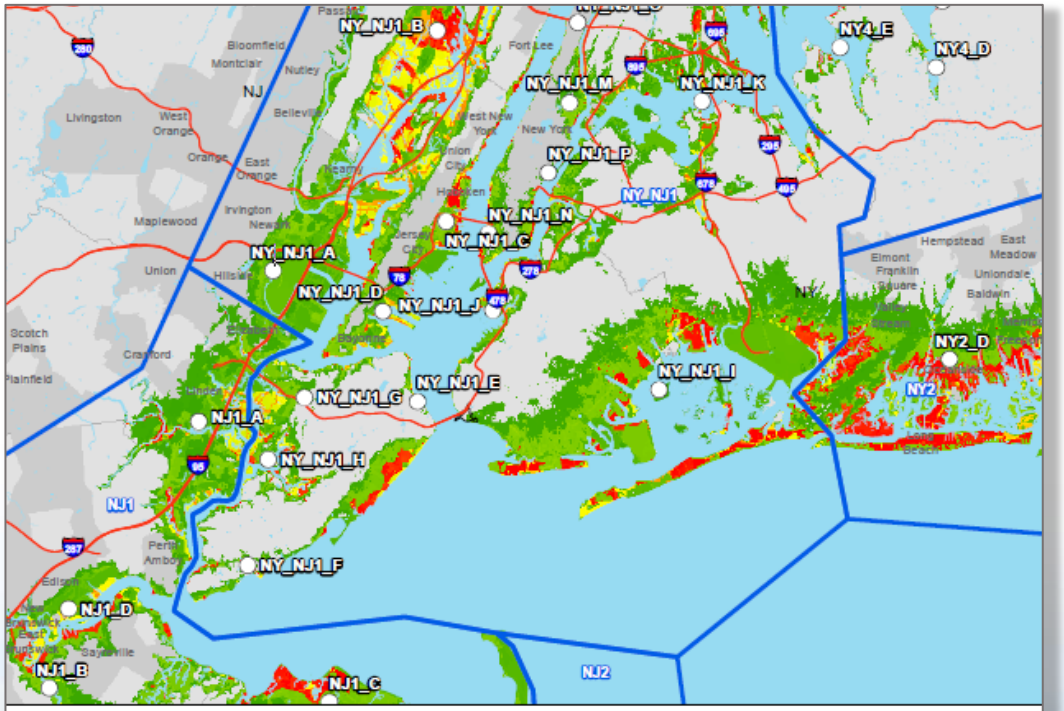

Figure IV-15. Reach NY_NJ1 NACCS Tier 1 Evaluation Risk Areas

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FOLLOWING RISK ASSESSMENT

- Provide useable data and tools to stakeholders.
- Identify measures to address risk.
- Coordinate with stakeholders on Federal and non-Federal actions to address risk throughout the region.

Charleston, SC bay front. September 11, 2017. Photo: Erin Spencer

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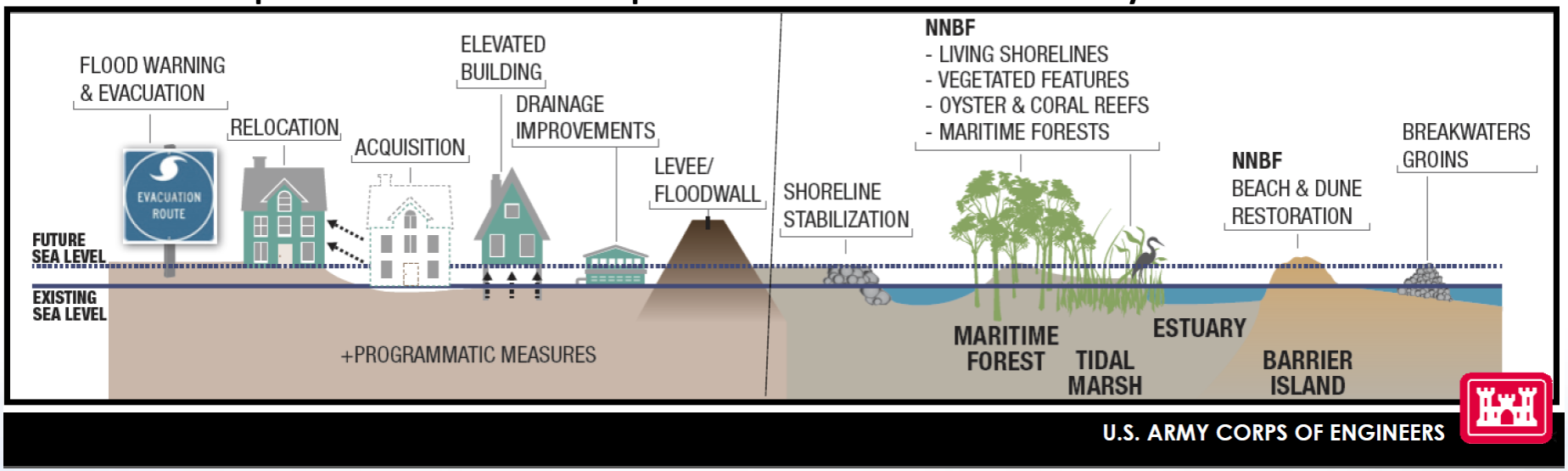
STRATEGIES TO ADDRESS RISK AND IMPROVE RESILIENCE
All Stakeholders Play a Role

Combinations of potential measures to improve resilience and sustainability in the coastal environment.



CAT 5 MOM		1 % Chance Annual Flood		10 % Chance Annual Flood

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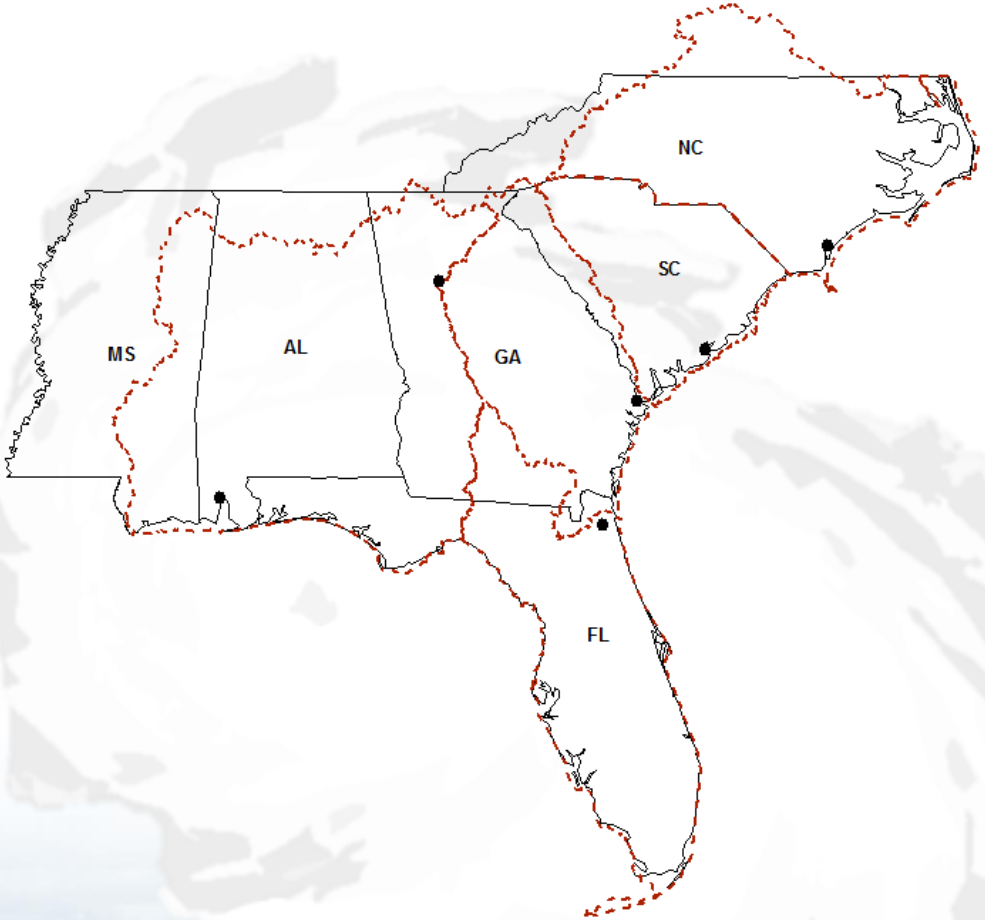
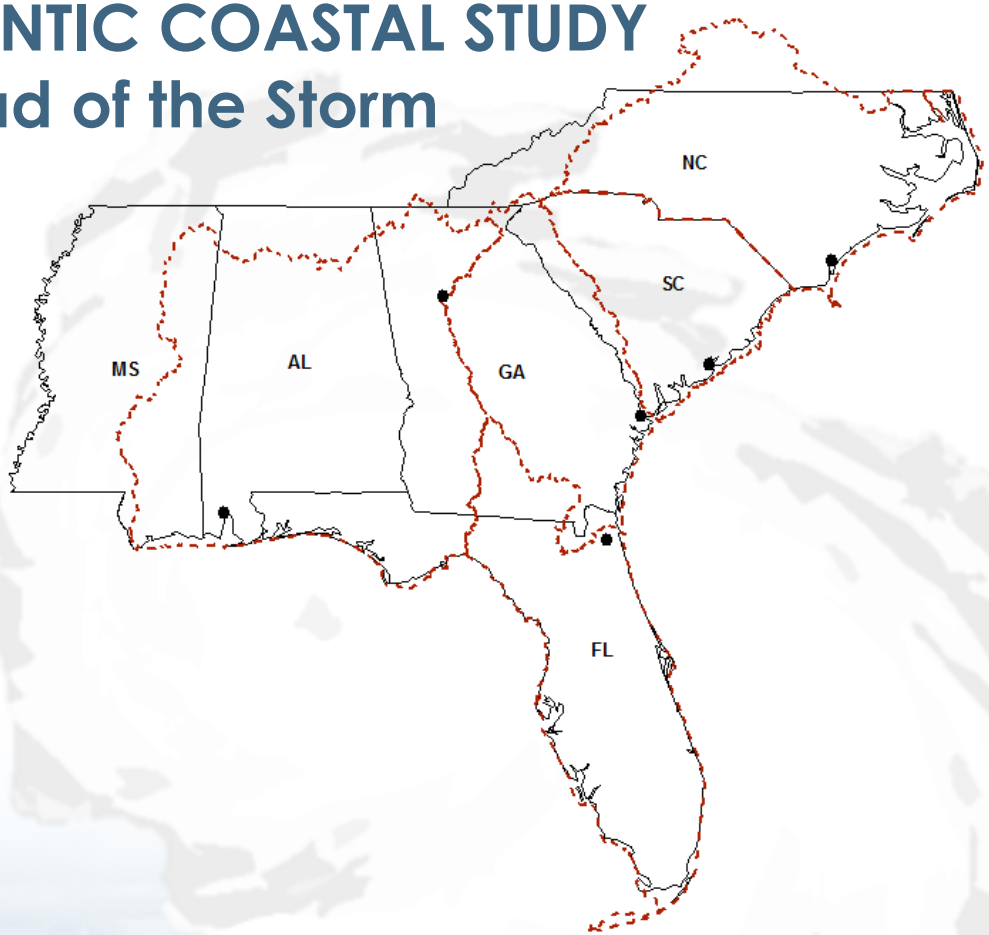
PATH FORWARD

- Stakeholder outreach.
- Risk assessment and revisions, as needed.
- Development of focus areas.
- Coordination on strategies.
- More to come…!



SOUTH ATLANTIC COASTAL STUDY
Ahead of the Storm

QUESTIONS?



Additional Slides

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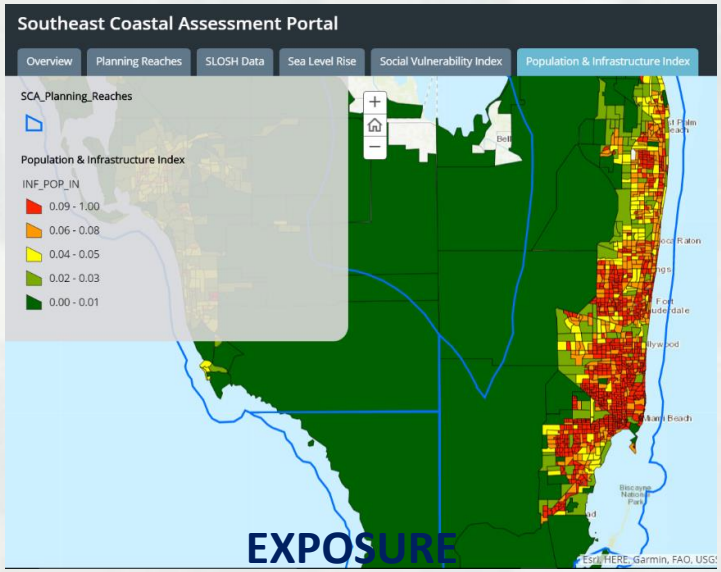
SCA – Risk Assessment



Exposure: Number of assets, people, sensitive environment within the Hazard Footprint

Hazard: Footprint of the Hazard and Probability of the Hazard (Large footprint / Low Probability | Small Footprint / High Probability)

Relative Risk: % chance annual probability that # Assets are flooded to any extent

where Relative Risk:

= Exposure Density X Probability and Area of the Hazard

= # Assets/mi^2*$\mathcal{P}$*mi^2

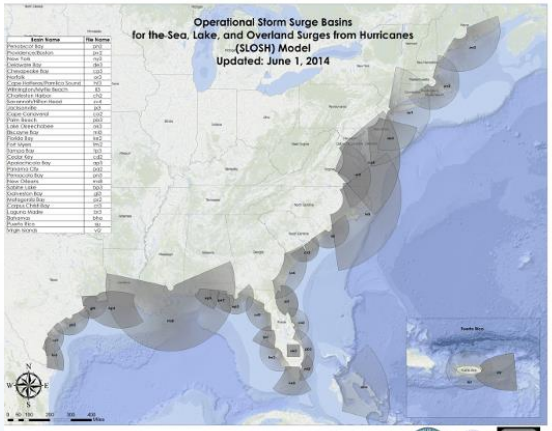
where mi^2 is the aerial extent of the Hazard

Storm Surge

NOAA SLOSH

http://www.nhc.noaa.gov/surge/slosh.php

Category MOM
1
2
3
4
5



SLOSH model coverage

SCA

CAT 5 MOM will represent the most extreme flooding event: maximum storm surge levels caused by extreme hurricane scenarios across the region

NACCS

CAT 4 MOM was used. CAT 5 MOMs are not available north of North Carolina.

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10% Annual Chance Water Level

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10% chance water level will be developed by ERDC. 10% floodplain represents “nuisance” flooding for which natural and nature-based features may be applicable (NNBF).

NACCS

10% level was delineated using stage-frequency analyses completed for NOAA gages across the study area. Multiple % chance events were calculated. Sea Level Rise was not considered (NACCS, Main Report, Pg. 37)

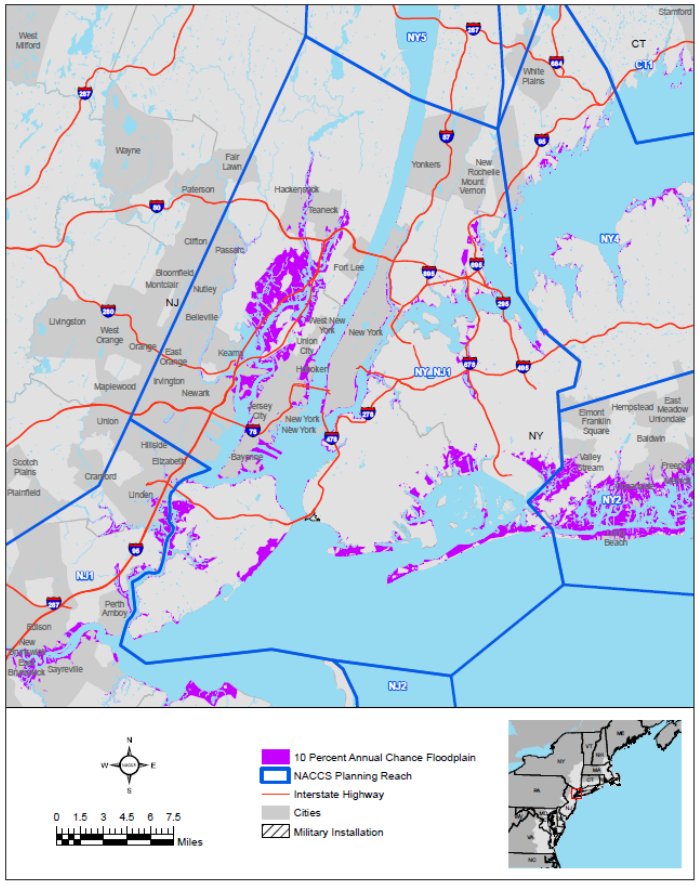

Figure IV-9. Reach NY_NJ1 Very High Impact Area NACCS 10 Percent Floodplain

HAZARD

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1% Annual Chance Water Level + SLR

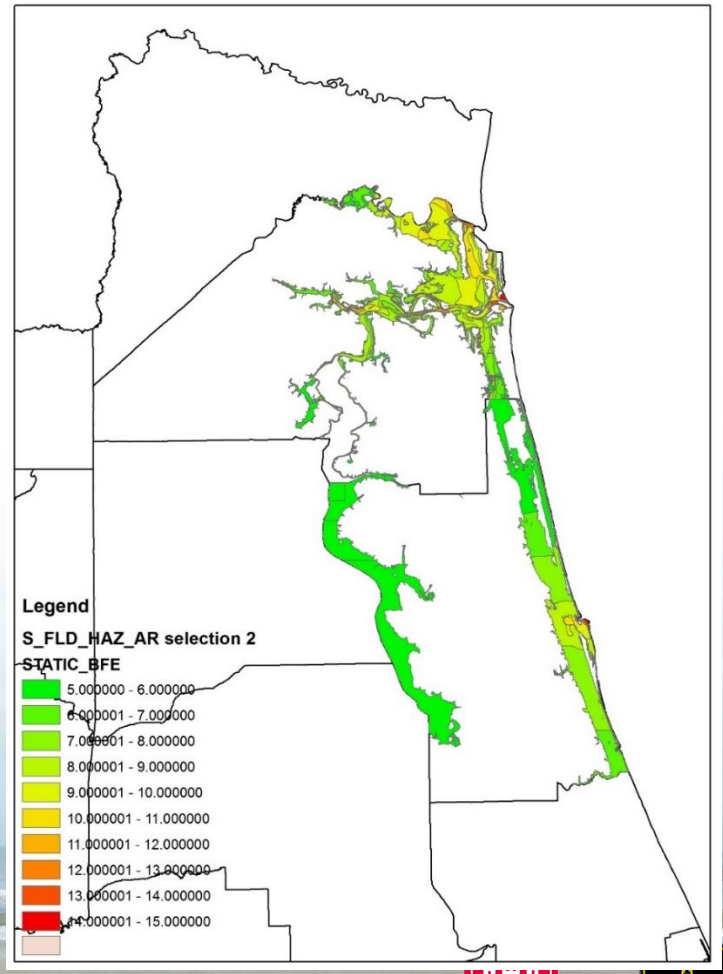
SACS

1% chance water level + Sea Level Rise

NACCS

1% chance water level + 3 feet.
CAT 2 MOM was used instead since FEMA 1% flood mapping was not available throughout the study area.

FEMA FIS / National Flood Hazard Layer



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Population and Infrastructure Density Index

SACS

- 2015 Census data.
- Infrastructure data shown at right.
- Weighting of infrastructure data may differ from NACCS

NACCS

- 2010 Census data.
- Infrastructure data shown at right.

a. Population and Infrastructure Density Index

i. Number of persons within an aerial extent across the study area

b. Number of Infrastructure items in the aerial extent

i. The Homeland Security Infrastructure Program (HSIP) with engineering reconnaissance process described in the Department of the Army Field Manual 3-34. 170 Engineer Reconnaissance (U.S. Army, 2008)

ii. National Structures Inventory - HEC

c. Forecasted Population and Development Density

i. Acquisition of EPA Integrated Climate and Land Use Scenarios (EPA ICLUS)

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Social Vulnerability Index

SACS

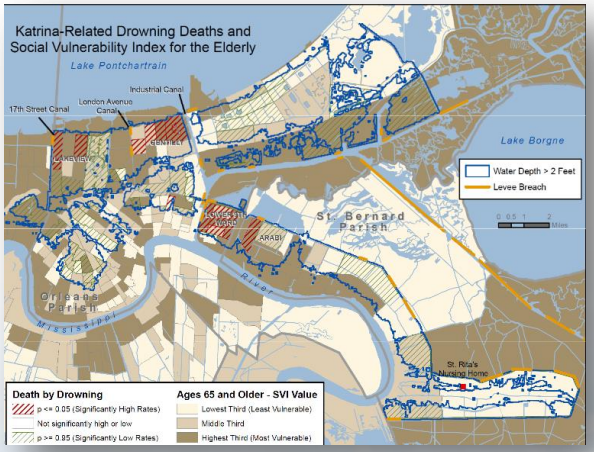
Social Vulnerability Characterization Index

i. CDC (Center for Disease Control and Prevention)

NACCS

- 2010 Census data
- 2011 American Community Survey

CDC Social Vulnerability



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Environmental and Cultural Resources Exposure Index

NACCS used the following data for the Env. and Cultural Exposure Index :

Habitat (as defined by The Nature Conservancy (TNC) and USFWS *(30% weight, NACCS)*

- Seagrass
- Estuarine Emergent Marsh
- Forested Wetland
- Scrub-Shrub Wetland
- Freshwater Emergent Marsh
- Freshwater Forested/Scrub Wetland
- Riverine Wetland
- Rocky Shoreline
- Unconsolidated Shore – Mud, organic, flat
- Unconsolidated Shore – Sand, gravel, cobble
- Sensitive ecosystems and environments
- Endangered/Critical species habitat
- Saltmarsh
- Coral reef
- Freshwater / saltwater interface

Priority Areas (as defined by the Contingency) *(30% weight NACCS)*

- CBRA
- USFWS Protected Areas
- Federal Threatened, Endangered or Protected Species (USFWS)
- Waterbird Nesting Colony, Shorebird Stopover or Special Interest Species (USFWS)
- The Nature Conservancy's regionally significant coastal conservation target areas
- City, County, State and Federal Parks > 10 acres

Cultural Resources *(40% weight, NACCS)*

- Cultural Resource Buffer (1000')
- National Monuments and National Historic Parks
- National Register of Historic Places (NRHP) listed properties

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Composite Exposure Index

SCA

0.8 * Population/Infrastructure Index
+ 0.1 * Social Vulnerability Index
+ 0.1 * Environmental/Cultural Resources Index

Weighting can be revised.

NACCS

0.8 * Population/Infrastructure Index
+ 0.1 * Social Vulnerability Index
+ 0.1 * Environmental/Cultural Resources Index

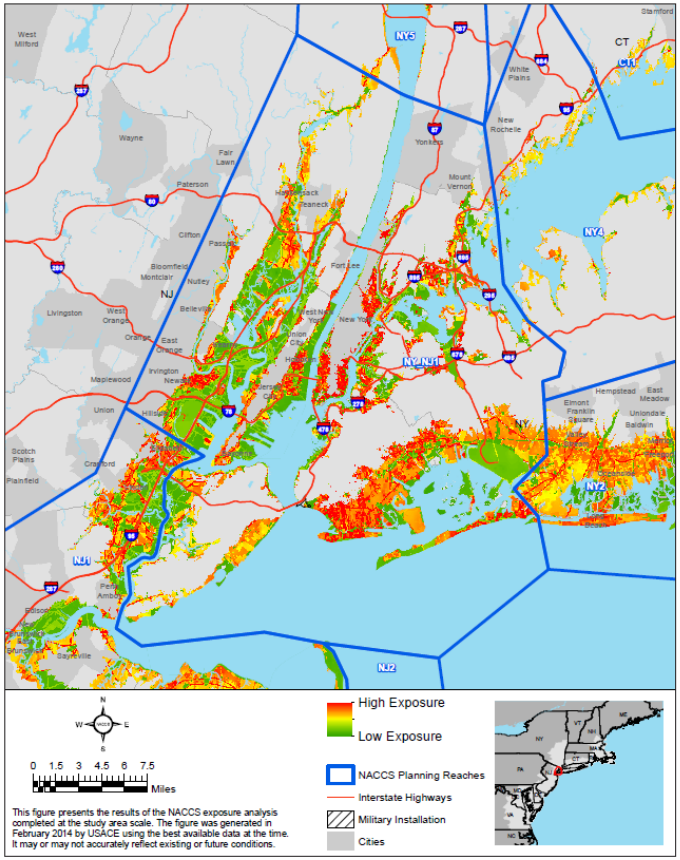

Figure IV-13. Reach NY_NJ1 NACCS Tier 1 Evaluation Composite Exposure Index

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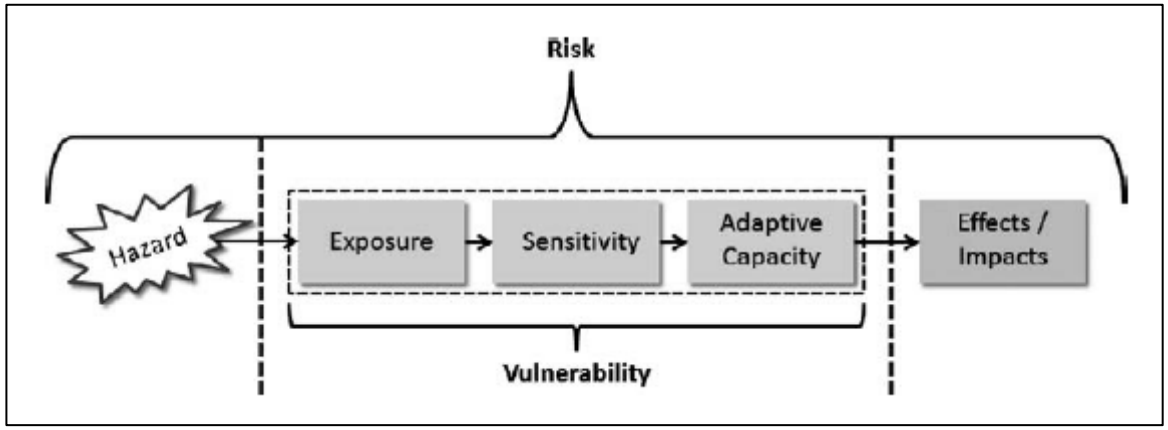
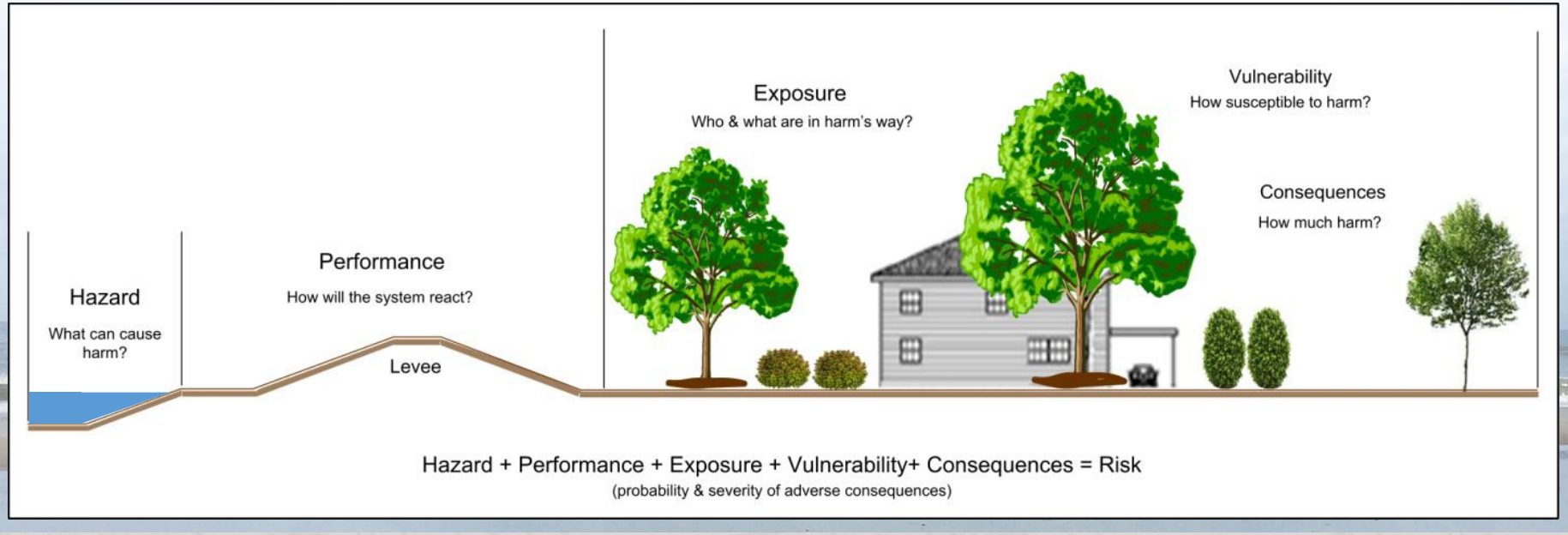
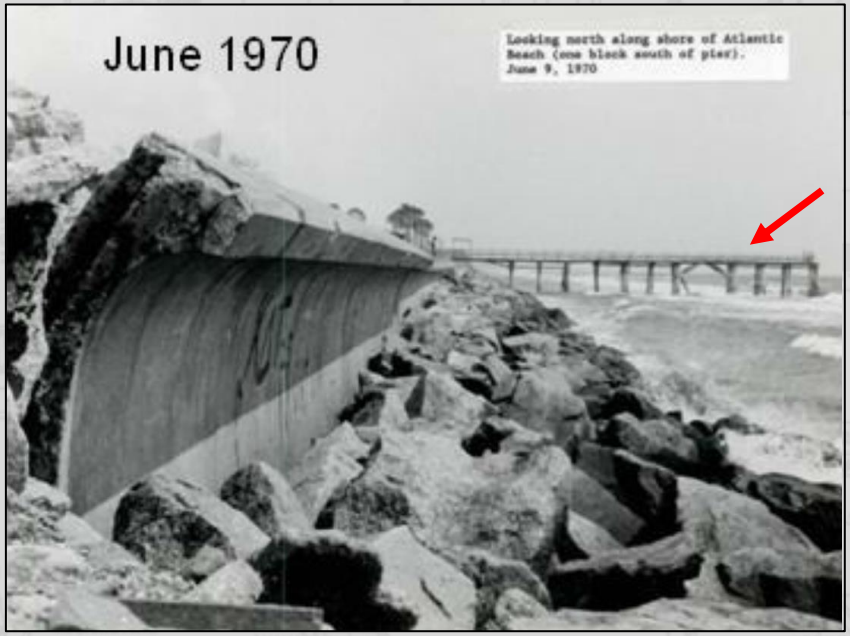
Wamsley *et. al.* (2015)



ER 1105-2-101 (USACE 2017)



Duval County, FL Shore Protection Project (Atlantic Beach segment) – before nourishment



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Duval County, FL Shore Protection Project (Atlantic Beach segment) – after nourishment (1980's)

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Duval County, FL Shore Protection Project (Atlantic Beach segment) – after nourishment

Photo: Olsen Associates, Inc.

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