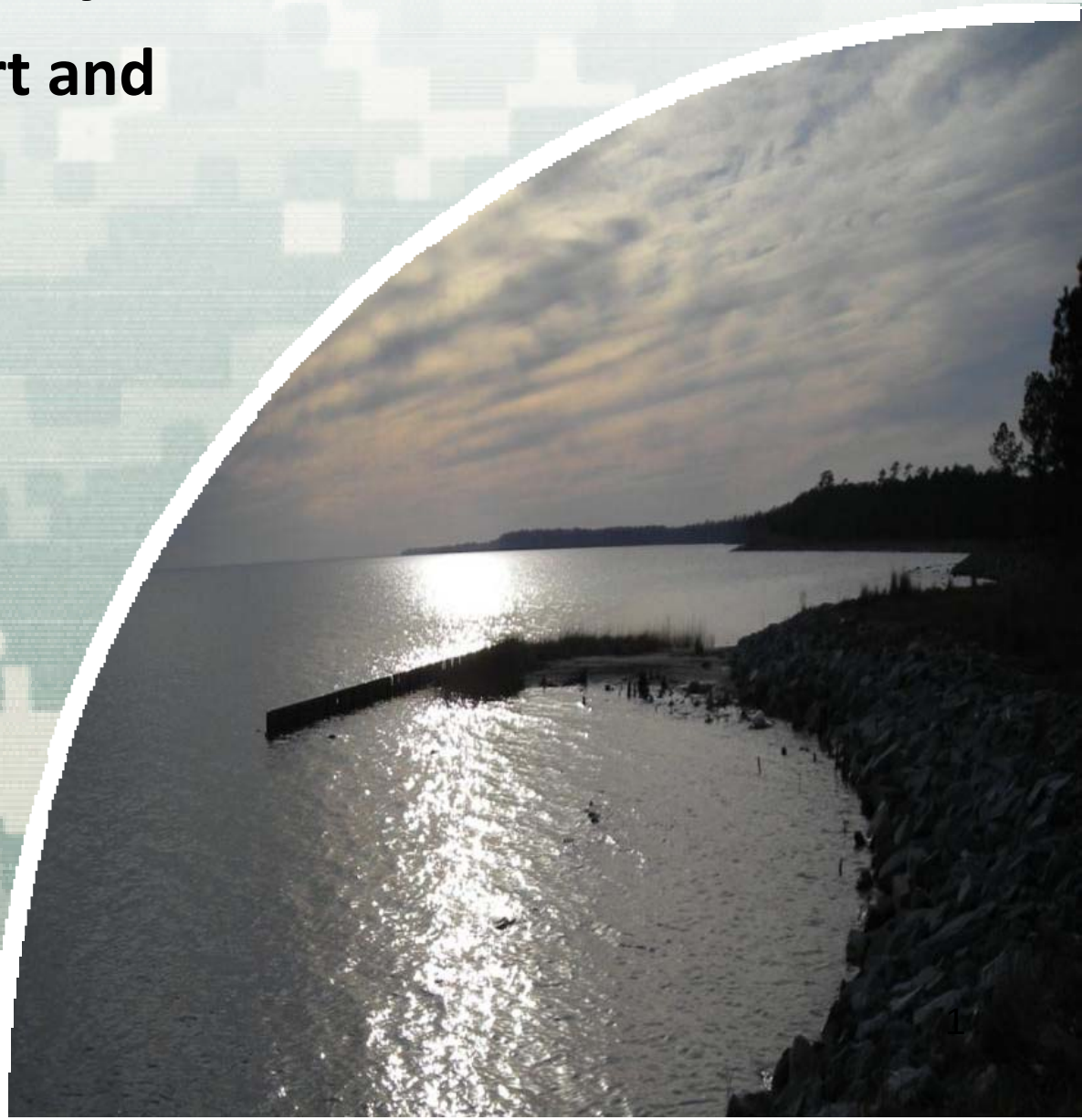
Presentation to the

CIVIL WORKS REVIEW BOARD

Neuse River Basin, North Carolina

Integrated Feasibility Report and Environmental Assessment



by

COL Steven A. Baker

District Commander

Wilmington District

5 October 2012

US Army Corps of Engineers

BUILDING STRONG®

In Cooperation With

The State of North Carolina

Through the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Resources (DWR)

Purpose of Civil Works Review Board (CWRB) Briefing

- Provide an overview of Neuse River Basin, North Carolina Ecosystem Restoration Feasibility Study and Environmental Assessment
- Answer questions and address comments
- Obtain Civil Works Review Board (CWRB) approval to release Final Report for State and Agency review

District Presentation Outline

- Overview of Feasibility Study
  - Study Authority & Purpose
  - Study Area Map & Description
  - Neuse River Basin Significance
  - Problems and Opportunities
  - Plan Formulation
- Recommended Plan
  - Restoration Features
  - Sea Level Rise
  - Risk Management
  - Monitoring and Adaptive Management
  - Cost Share
- Environmental Compliance
- Public Involvement
- Technical Reviews
- Study Summary
- Recommendation

Bottom Line Up Front

- Report outlines four water resource/ecosystem restoration features:
  - Little River Dam Modification
  - Kinston East Wetland Complex
  - Gum Thicket and Cedar Creek
  - Neuse River Estuary Oyster Reef Habitat Restoration
- Total Project First Cost: $36,659,000
  - Fully funded to midpoint of construction: $38,156,000
  - Overall Cost Share (Federal / non-Federal Sponsor): 65% / 35%
- Report is integrated with the Environmental Assessment

Study Authority

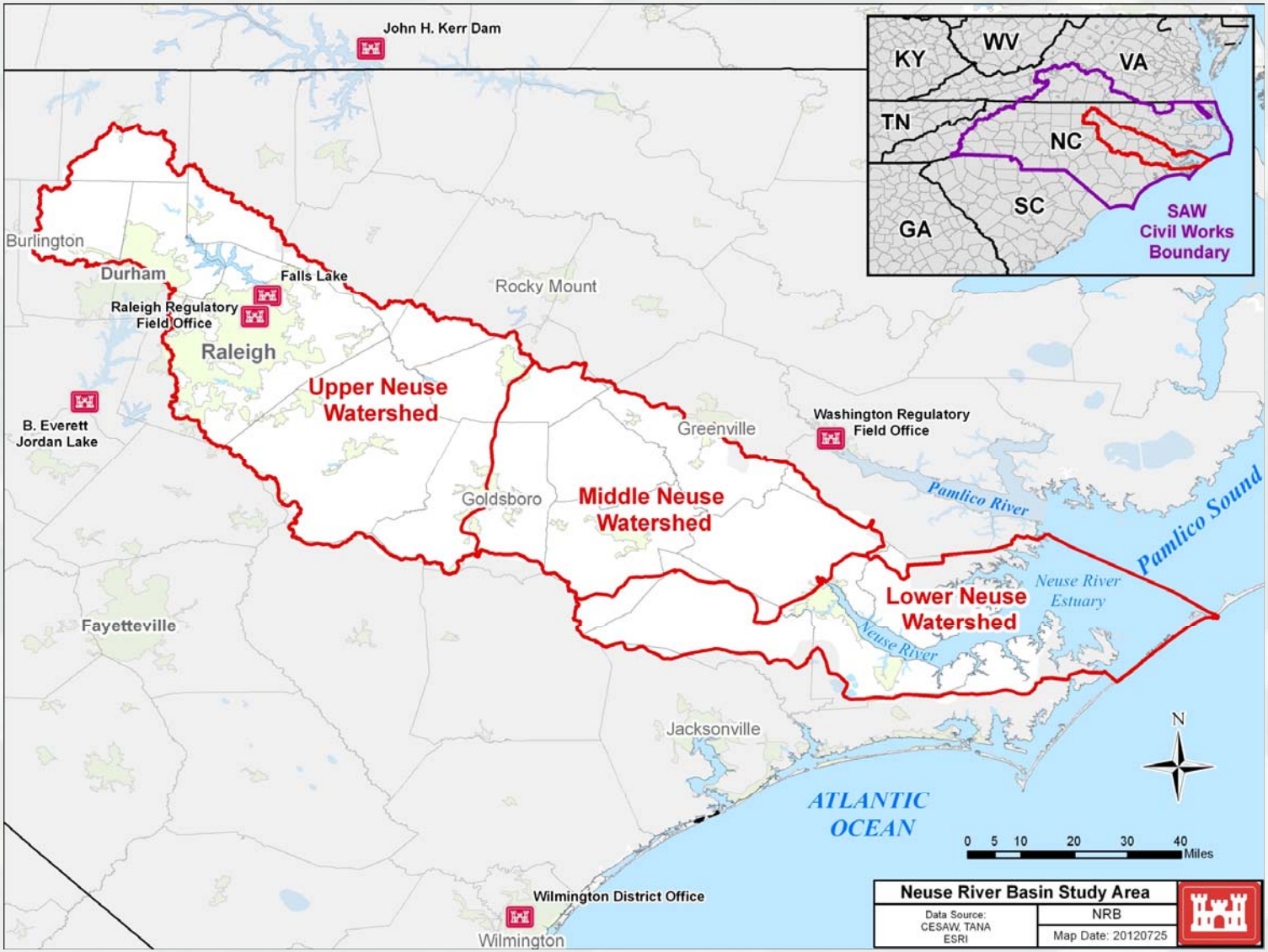
July 23, 1997. Resolved by the Committee *on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is requested to review the report of the Chief of Engineers on the Neuse River Basin, NC, published as House Document 175, 89th Congress, 1st Session, and other pertinent reports to determine whether modifications of the recommendations contained therein are advisable at the present time in the interest of flood control (flood risk management), environmental protection and restoration, and related purposes.*

Neuse River Basin Study Purpose

Study investigates the overall quality of the Basin ecosystem and the level of flood risk in the watershed

- Identify flood risks and potential reduction measures
- Identify and inventory changes to ecosystem
- Identify the key components of the ecosystem that have decreased in diversity and/or production
- Develop and evaluate measures to restore lost environmental function values
- Recommend collaborative and sustainable watershed-based solutions
- Incorporate stakeholders into planning process

Neuse River Basin Study Area



Area = 6,234 square miles

- 3,497 miles freshwater streams
- 21 miles Atlantic Ocean coastline

Contains:

- 18 counties (including 74 municipalities)
- 19 reservoirs (including Falls Lake)

Neuse River Basin Significance

Dwarf wedgemussel

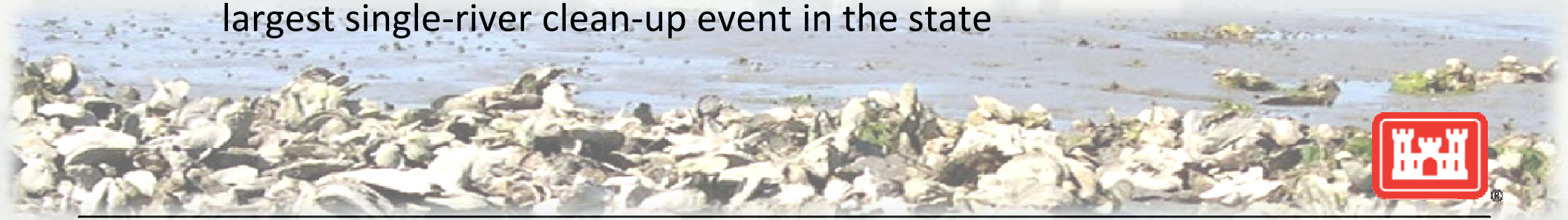
Atlantic sturgeon

Tar spinymussel

- Home to:
  - ► 17 species of rare freshwater mussels and a rare snail species
    - Includes **Dwarf wedgemussel** and **Tar spinymussel**
  - ► Anadromous Fish
    - Includes striped bass, hickory shad, American shad, alewife, blueback herring, **shortnose sturgeon**, **Atlantic sturgeon**
  - ► 95 species of freshwater fish, representing 27 families
  - ► 7 other federally listed endangered species
  - ► 7 Essential Fish Habitats (EFH)
  - ► 12 Significant Natural Heritage Areas

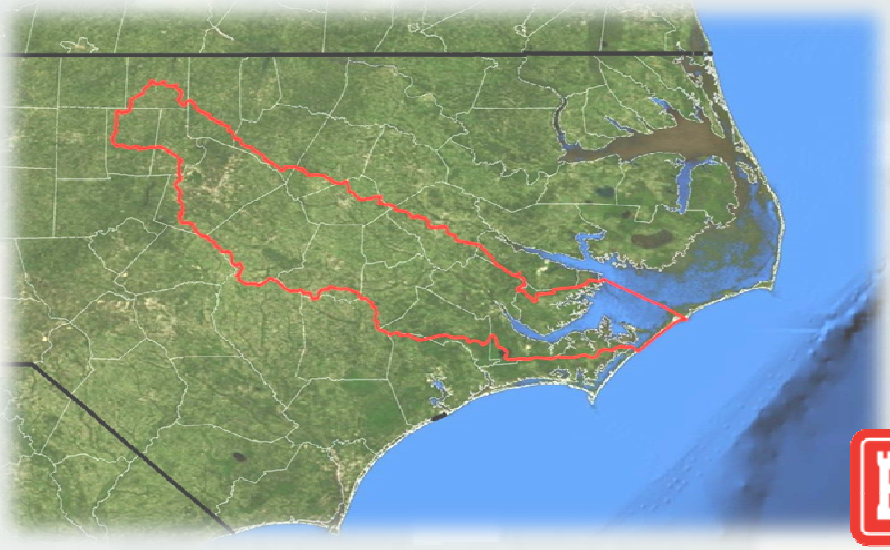
Neuse River Basin Significance (cont.)

- Technical Recognition (cont.)
  - Feeds Albemarle-Pamlico Sound
    - One of the nation's largest and most productive estuaries
    - Nursery for 90% of the commercial seafood species caught in North Carolina
- Institutional Recognition
  - Designated as a priority watershed by U.S. Environmental Protection Agency (EPA)
  - Designated as one of the most threatened rivers in North America by American Rivers
- Public Recognition
  - Water supply for municipal and industrial use
    - Contains roughly one-sixth of the state's population
  - Neuse River Foundation's Neuse River Spring Clean-up has become the largest single-river clean-up event in the state



Problems and Opportunities

- Identified through scoping process
- USACE PDT consisted of interdisciplinary team members from:
  - Wilmington District,
  - Savannah District, and
  - NCDENR
- Comments and concerns organized into four workgroups:
  - Wetlands, Streams, and Riparian Buffer Restoration
  - Anadromous Fish Habitat Restoration
  - Estuarine Resources
  - Flood Risk Management



In Coordination With…

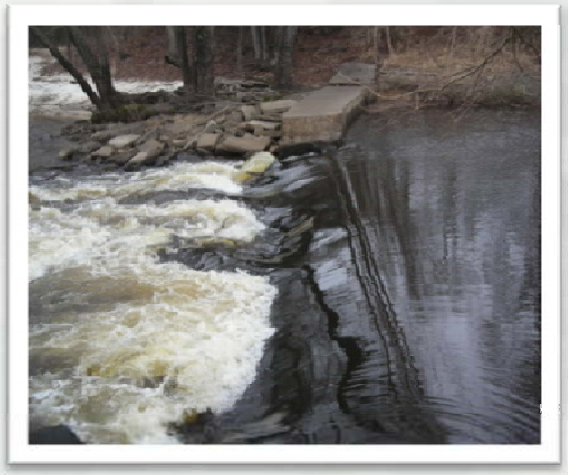
- Workgroups consisted of USACE PDT members and various stakeholders in the region, including:
  - State of North Carolina
  - U.S. Environmental Protection Agency (USEPA)
  - U.S. Fish & Wildlife Service (USFWS)
  - National Marine Fisheries Service (NMFS)
  - Natural Resources Conservation Service (NRCS)
  - American Rivers
  - Conservation Trust for North Carolina
  - Wilson, Wake, Pitt, & Greene Counties
  - Neuse Riverkeeper Foundation
  - NC Oyster Restoration Steering Committee
  - NC Ecosystem Enhancement Program
  - NC State University
  - Cities of Goldsboro, Kinston, Durham, & Raleigh
  - The Nature Conservancy

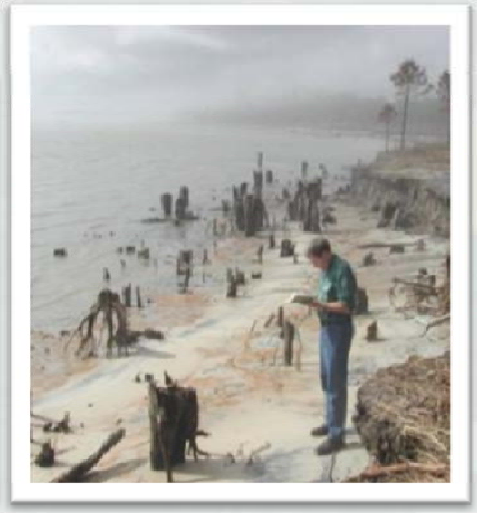
Flood Risk Management Analysis and Findings

- PDT did not identify any USACE interest in Flood Risk Reduction at this time
- Independent of the Neuse River Basin Study:
  - North Carolina Division of Emergency Management (NCDEM) and the Federal Emergency Management Agency (FEMA) acquired over 1,000 residential structures through a voluntary buy-out program
  - NCDEM has aggressive programs for flood-prone areas, including:
    - Floodplain mapping
    - Emergency preparedness and response
    - Risk communication

Ecological Problems

- Declines in eastern oyster populations
- Loss of estuarine emergent wetlands
- Damaged or eliminated natural riparian buffer
- Impaired biological integrity (embedded aquatic habitat/ sediment impairment/ turbidity/ streambank erosion)
- Declines in anadromous fish populations
- Decrease in historical mussel populations



Future Without-Project Conditions

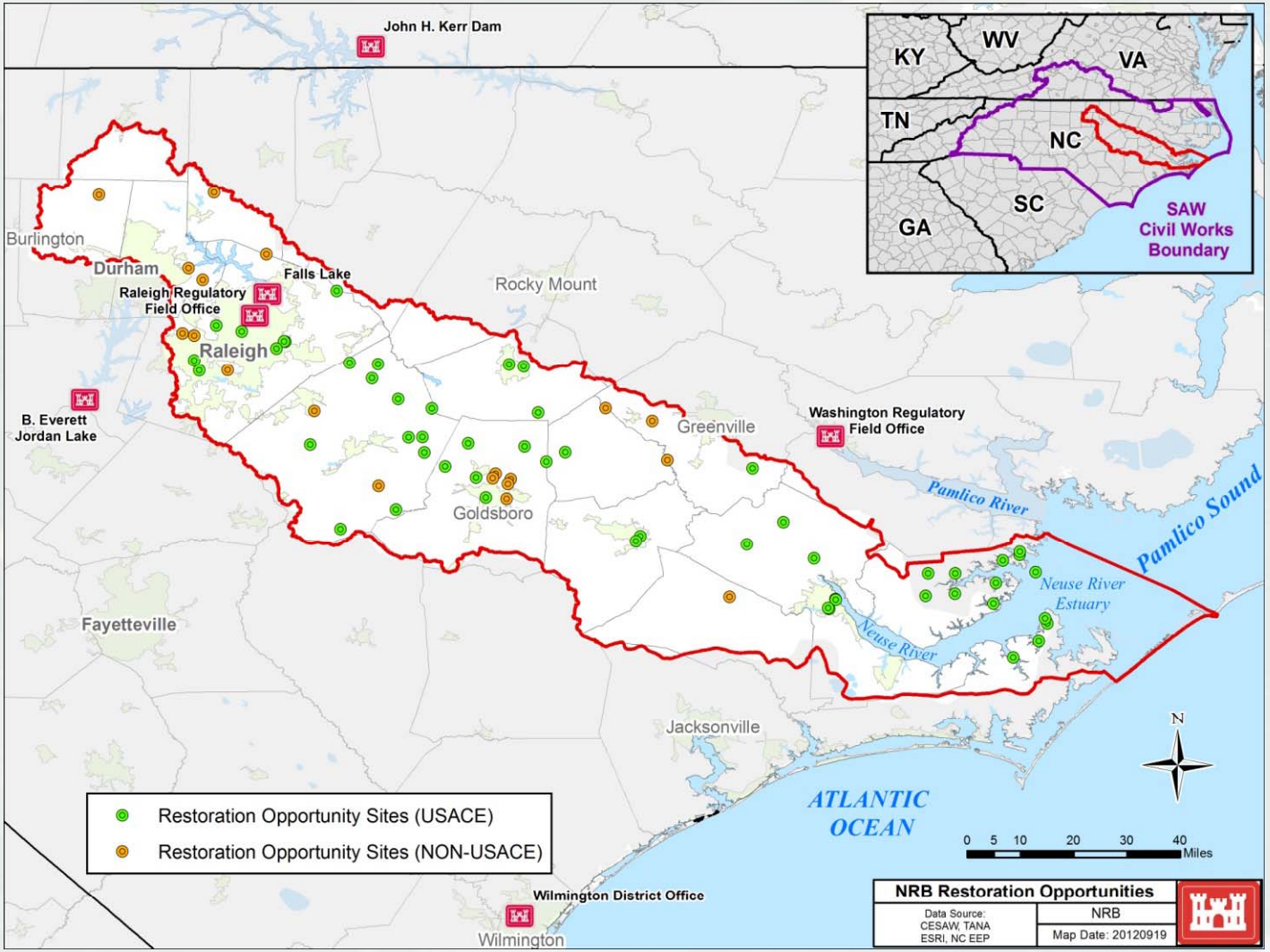
Erosion

Stream Degradation

- Continued fragmentation of wetland habitat
- Limited habitat connectivity for aquatic species moving upstream *(Little River)*
- Continued erosion rates of 9 ft/yr and 2 ft/yr *(Gum Thicket and Cedar Creek, respectively)*
- Loss of cultural resources, emergent marsh, and habitat protected by conservation easement *(Gum Thicket and Cedar Creek)*
- Reestablishment of displaced oyster reefs would NOT occur *(Neuse Estuary)*

Plan Formulation

Initial Array	72 Initial opportunities (sites) identified

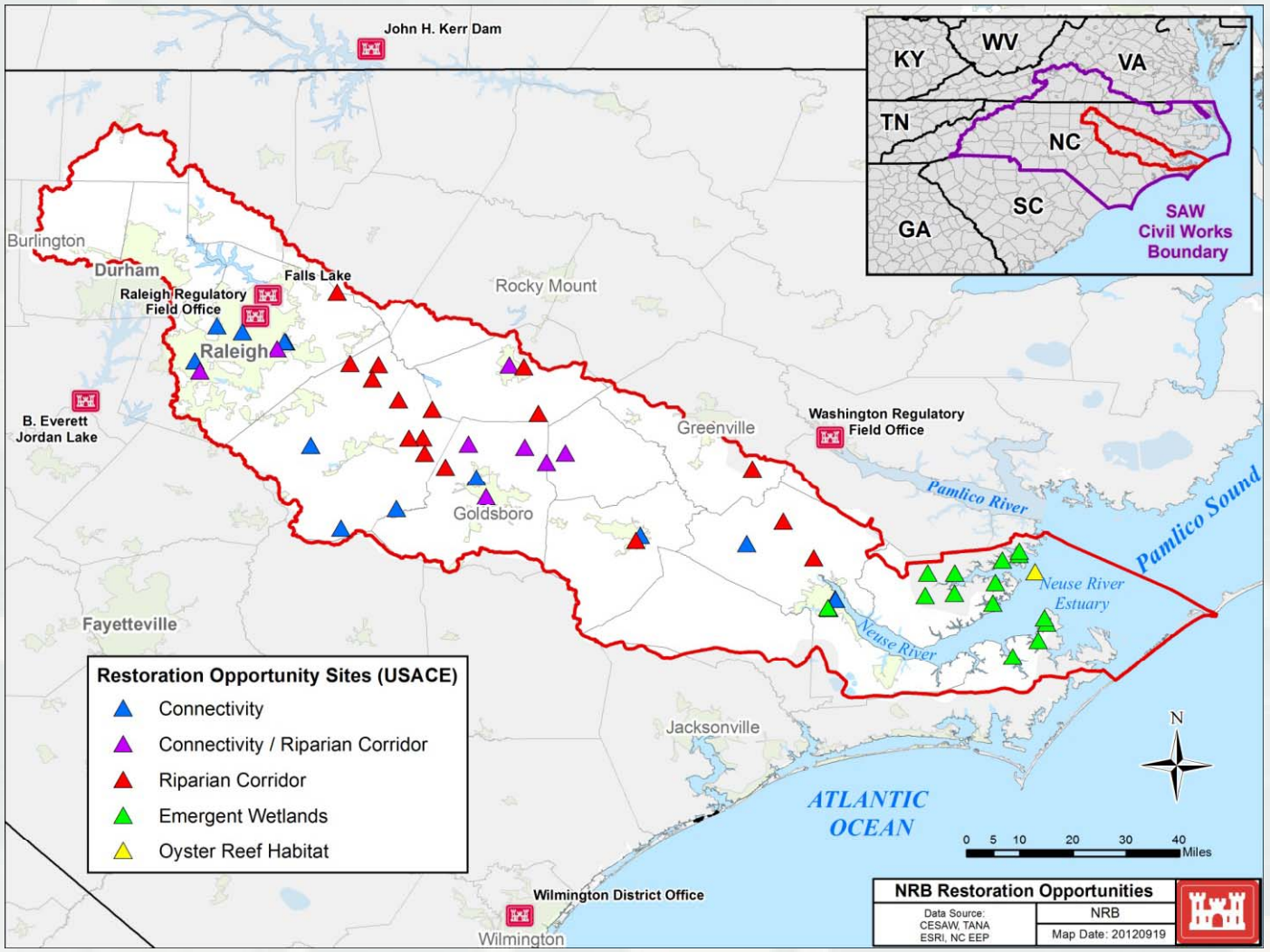


Plan Formulation

Initial Array	72 Initial opportunities (sites) identified
Filter for Key Objectives	Filter initial array for sites that: ✓ Improve connectivity and functions ✓ Restore estuarine emergent wetlands ✓ Restore damaged riparian corridor ✓ Restore ecosystems supporting traditional oyster reef habitat
Filtered Array	53 Opportunities (sites) warranted further evaluation

Ecosystem Restoration Opportunities

- 53 Sites Identified
- Opportunities to:
  - Improve connectivity and function
  - Restore damaged riparian corridor
  - Restore estuarine emergent wetlands
  - Restore ecosystems supporting traditional oyster reef habitat



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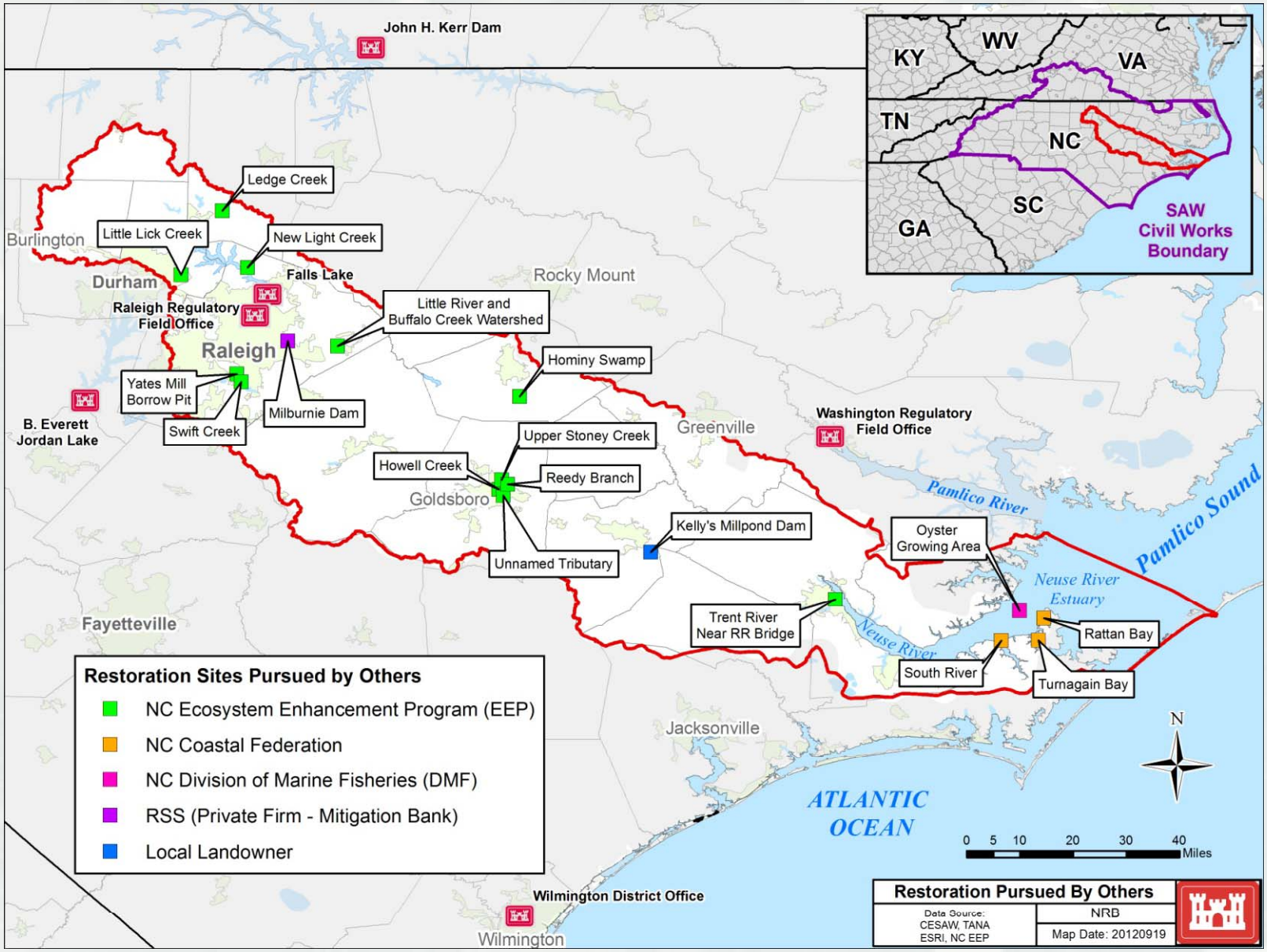
Filtered Array	53 Opportunities (sites) warranted further evaluation
Screen	Qualitatively screen filtered array based on: • Potential to contribute towards addressing identified problems • Site constraints • Site status

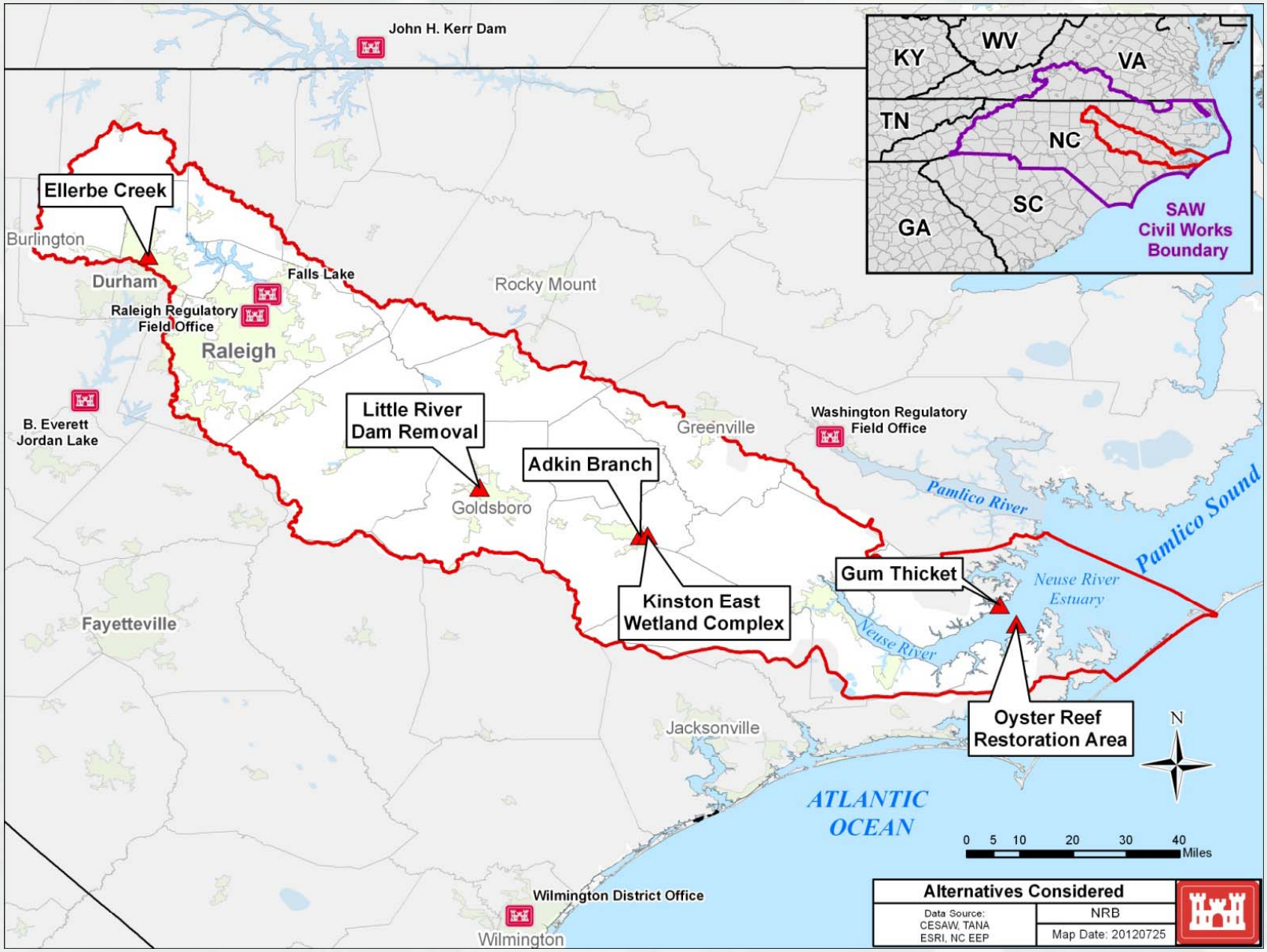
Opportunities Pursued by Others



Plan Formulation

Initial Array	72 Initial opportunities (sites) identified
Filter for Key Objectives	Filter initial array for sites that: ✓ Improve connectivity and functions ✓ Restore estuarine emergent wetlands ✓ Restore damaged riparian corridor ✓ Restore ecosystems supporting traditional oyster reef habitat
Filtered Array	53 Opportunities (sites) warranted further evaluation
Screen	Qualitatively screen filtered array based on: • Potential to contribute towards addressing identified problems • Site constraints • Site status
Final Array	6 sites, including a large portion of the Neuse River estuary, remained after screening

Final Array – Alternatives Considered



Plan Evaluation

Environmental Benefits Assessment (EBA)	Conducted on 6 sites
Cost-Effectiveness/ Incremental Cost Analysis (CE/ICA)	• Performed on all the alternatives at each of the 6 sites • Single preferred alternative selected at each site

Alternatives Considered

Within **Ellerbe Creek** Restoration Opportunity Area

- Opportunities Identified:
  - Improve biological integrity
  - Restore damaged or eliminated natural riparian buffers
- Alternatives Evaluated:
  - No Action
  - Excavate and re-vegetate stream banks
  - Create step pools
  - Restore natural stream meander wavelength through reach
- Alternative(s) Selected:
  - Create step pools

Alternatives Considered (cont.)

Within **Little River Dam** Restoration Opportunity Area

- Opportunities Identified:
  - Increase fish passage efficiency
- Alternatives Evaluated:
  - No Action
  - Construct dam gate
  - Construct rock ramp
  - Remove dam
- Alternative(s) Selected:
  - Construct dam gate

Alternatives Considered (cont.)

Within **Kinston East Wetland** Restoration Opportunity Area

- Opportunities Identified:
  - Restore damaged or eliminated natural riparian buffers along the Neuse River
- Alternatives Evaluated:
  - No Action
  - Remove fill material and restore hydrologic connections
  - Vegetation plantings
- Alternative(s) Selected:
  - Remove fill material and restore hydrologic connections

Alternatives Considered (cont.)

Within **Adkin Branch** Restoration Opportunity Area

- Opportunities Identified:
  - Improve biological integrity
  - Restore damaged or eliminated natural riparian buffers
- Alternatives Evaluated:
  - No Action
  - Revegetate both banks on the upper ~200 ft of the stream reach
  - Revegetate the degraded left bank on the lower ~950 ft of the stream reach
  - Place large woody debris within the channel to restore degraded in-stream habitat in about 30% of the channel throughout the stream reach
- Alternative(s) Selected:
  - Combination of bank revegetation at the upper 200 ft of both banks and lower 950 ft of the left bank with the addition of in-stream woody debris

Alternatives Considered (cont.)

Within **Gum Thicket/Cedar Creek** Restoration Opportunity Area

- Opportunities Identified:
  - Restore eroded emergent wetlands
  - Improve biological integrity
  - Increase the quantity and quality of degraded oyster reef habitat
- Alternatives Evaluated:
  - No Action
  - Parallel rock sill Gum Thicket
  - Parallel rock sill Cedar Creek
  - Meandering rock sill Gum Thicket
  - Meandering rock sill Cedar Creek
  - High and low Marsh Planting
- Alternative(s) Selected:
  - Construct parallel rock sill and marsh plantings at both Gum Thicket and Cedar creeks

Alternatives Considered (cont.)

Within **Neuse River Oyster** Restoration Opportunity Area

- Opportunities Identified:
  - Increase the quantity and quality of oyster reef habitat
- Alternatives Evaluated:
  - No Action
  - Restore deep water reefs
    - 20 acres
    - 30 acres
    - 40 acres
  - Restore existing low output reefs by addition of new cultch
    - 20 acres
    - 30 acres
    - 40 acres
  - Designate existing high output reefs as sanctuaries
    - 14 acres
    - 24 acres
    - 34 acres
- Alternative(s) Selected:
  - Create 40 sanctuary acres at the Mid-River area and 40 sanctuary acres at the North Shore area

Plan Evaluation

Environmental Benefits Assessment (EBA)	Conducted on 6 sites
Cost-Effectiveness/ Incremental Cost Analysis (CE/ICA)	• Performed on all the alternatives at each of the 6 sites • Single preferred alternative selected at each site • Second analysis on all combinations of those site plans to select the Basin-wide National Ecosystem Restoration (NER) Plan

Elimination of Ellerbe Creek & Adkin Branch Restoration Sites

- Cost: $130,000
- Will not provide significant contribution to the achievement of National Ecosystem Restoration Goals
- Recommendation:
  - Minimal size and costs of restoration at these sites could be addressed at the local level

Plan Evaluation

Environmental Benefits Assessment (EBA)	Conducted on 6 sites
Cost-Effectiveness/ Incremental Cost Analysis (CE/ICA)	• Performed on all the alternatives at each of the 6 sites • Single preferred alternative selected at each site • Second analysis on all combinations of those site plans to select the Basin-wide National Ecosystem Restoration (NER) Plan
Comparison of Final Array	• Demonstrated the positive and negative effects of various plans • Compared using ✓ System of Accounts *(National Economic Development [NED], Environmental Quality [EQ], Regional Economic Development [RED], Other Social Effects [OSE])* ✓ Planning opportunities ✓ Formulation criteria *(Completeness, Effectiveness, Efficiency, and Acceptability)*

Recommended Plan

85.7 acres

Total area of wetlands restored

509.2 acres

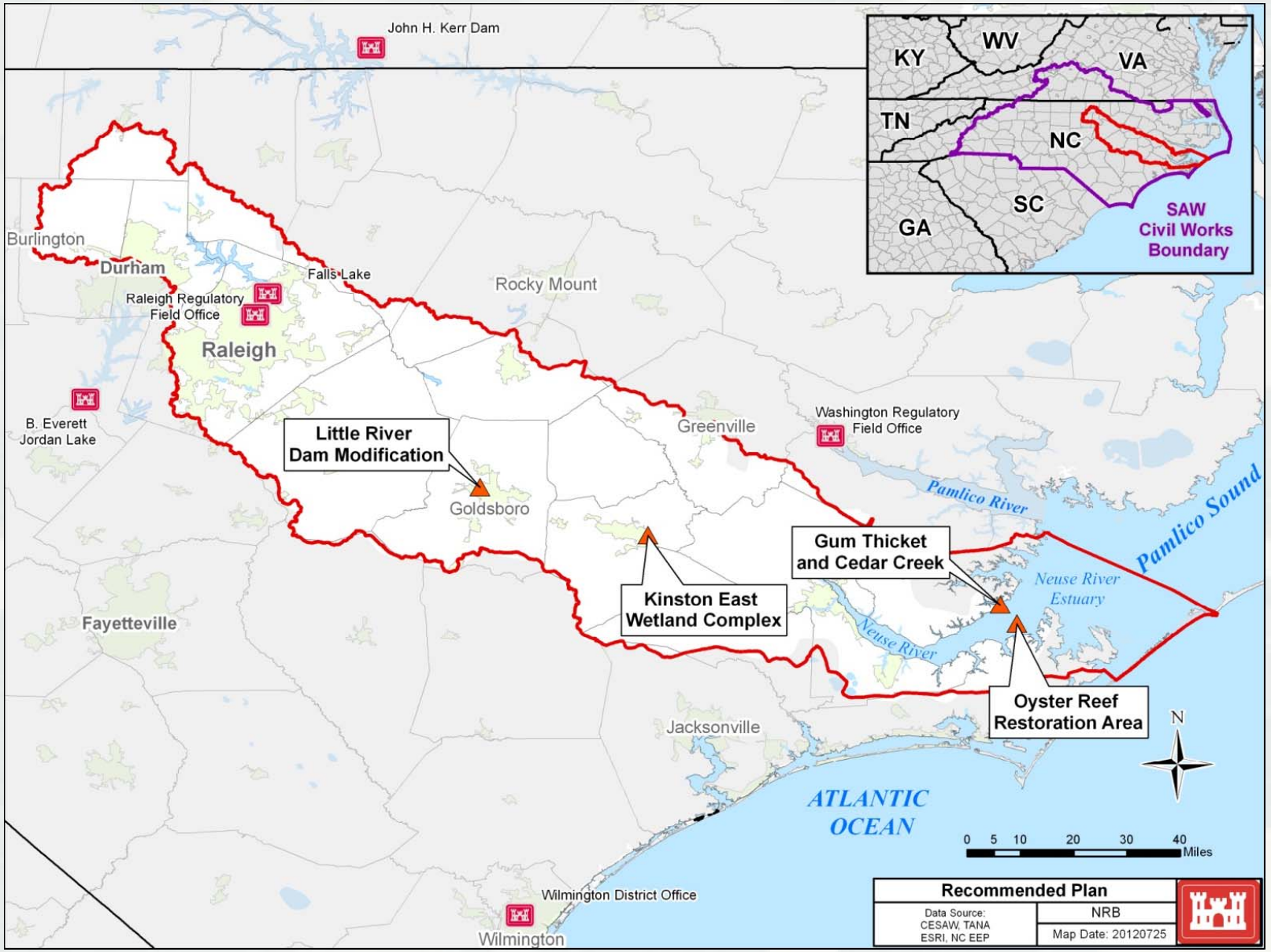
Total area of stream restored

80 acres

Total oyster service area

10.4 acres

Total area of constructed reef top



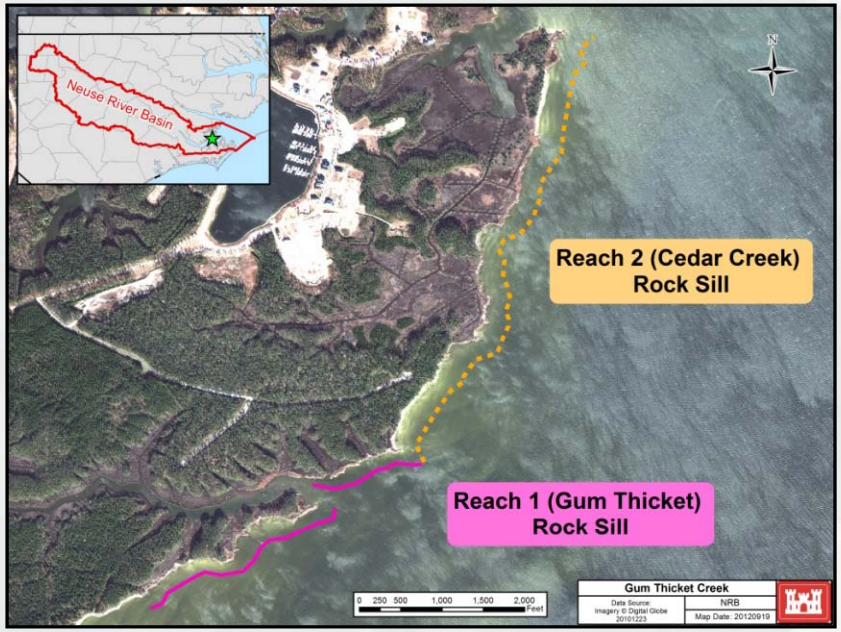
Little River Dam near Goldsboro

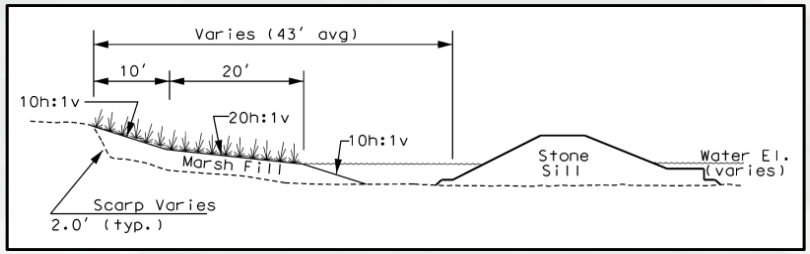
- Cost: $538,000
- Scope
  - Modify low-head dam
  - Remove 20-ft section of the existing 100-ft-wide, 4-ft-high concrete dam
  - Install a discharge control structure in the 20-ft opening
- Benefits
  - 46 mi of spawning habitat for anadromous fish species connected
    - Supports the US Anadromous Fish Conservation Act
  - Provides improved habitat for rare mussels
- Considerations
  - Gate would remain open during the anadromous fish migration season (~Jan to May)
  - City would close the gate during low-flow conditions (~Jul to Sep) to ensure sufficient water from secondary water intake structure

Kinston East Wetland Complex

- Cost: $3,960,000
- Scope
  - Restore 14.5 acres bottomland hardwood wetlands by re-establishing appropriate elevation and vegetation
- Benefits
  - Contributes to Federal wetland policy goals of “no net loss”
  - Improves connectivity between existing tracts of bottomland hardwood forest
- Considerations
  - Previously filled 14.5 acre site now consists of 4.3 acres of open grassed area, 1.2 acres of an excavated pond, and 9.0 acres of loblolly pine and sweetgum
  - Restoration site is bordered by mature bottomland hardwood wetlands within the Neuse River floodplain

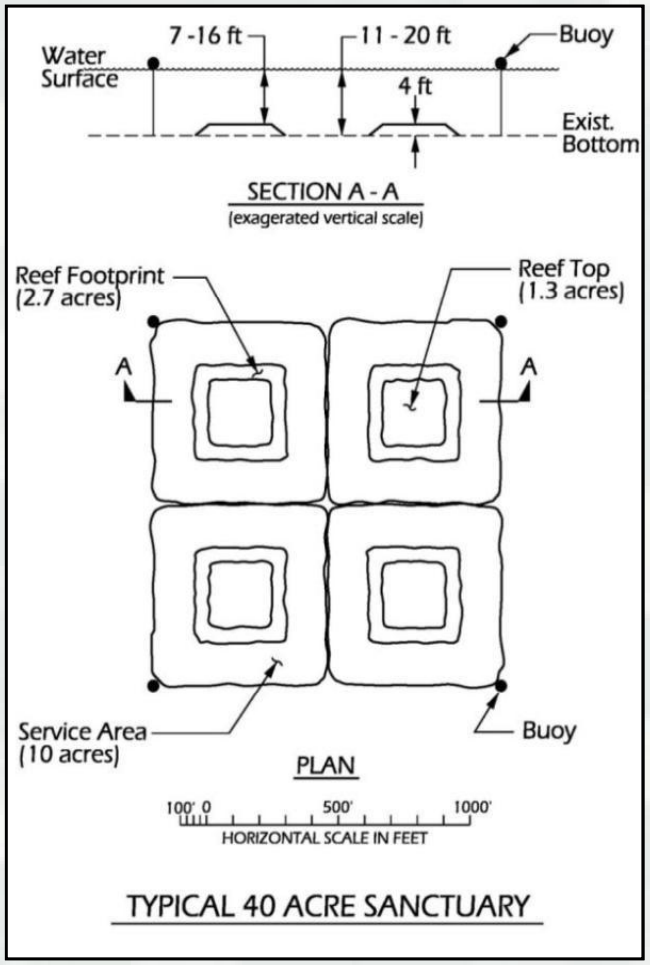
Gum Thicket and Cedar Creek





- Cost: $14,202,000
- Scope
  - Construct meandering rock sills approximately 3,500 ft long at Gum Thicket Creek and 5,200 ft long at Cedar Creek
- Benefits
  - Reduce turbidity within the water column
  - Preserve five known cultural resource sites (shell middens)
  - Stabilize wetland shoreline to prevent erosion of existing 60 acres, and create up to an additional 6 acres of estuarine wetlands
- Considerations
  - Openings every 100 ft to facilitate movement of water, nekton, and plankton
  - Sills made of limestone and granite rock

Neuse River Estuary Oyster Reef Habitat



- Cost: $11,438,000
- Scope
  - Construct 80-acres of oyster reef sanctuary area (4 reefs at 2 locations)
- Benefits
  - Provides keystone habitat for fish and other estuarine organisms (EFH)
  - Improve water quality through increased natural filtration
  - Helps to achieve goal set by the NC Oyster Restoration Steering Committee for restoration of 100 acres of oyster reef habitat
  - Contributes to the primary purpose of the Estuary Restoration Act of 2000 to promote the restoration of estuary habitat
- Considerations
  - Will be managed as a state oyster reef sanctuary

Incorporation of Lessons Learned

- Sill and Marsh Construction
  - Design based on successful project from Festival Park, NC (NC & USACE project)
  - Similar construction at Harker's Island for National Park Service Project
  - Wind-driven tide systems require plants of larger size for marsh establishment (Festival Park, NC)
- Oyster Reef Design
  - Historic low relief oyster reef failures due to low dissolved oxygen along bottom (NC Division of Marine Fisheries project) required a modified design to mimic natural high relief elevations

Sea Level Rise (SLR)

- SLR effects evaluated in accordance with EC 1165-2-212:

Low	• 0.42 ft in 50-years • Historical rate of SLR from nearby Beaufort NC tide gauge
Intermediate	• 0.85 ft in 50-years • National Research Council curve 1
High	• 2.2 ft in 50-years • National Research Council curve 3

- Future without project condition
  - Shoreline erosion expected to accelerate in proportion to the rate of SLR
- Potential impact only at the Gum Thicket/Cedar Creek site
  - Stone sill/marsh design height based on historic rate of SLR
  - Under *Low* and *Intermediate* scenarios would remain functional
  - Under *High* scenario would remain functional for the first 25-years but would gradually reduce thereafter

Risk Management

- Project is “low risk”
  - No components of the plan are burdened by significant risk or uncertainty
- Considerations Include:
  - System Effects
    - Dynamic Ecosystem
    - Extreme Weather Events
    - Sea Level Rise
  - Cost and Benefit Analysis
    - Timing and availability of funds
    - Environmental Benefits Analysis
    - Used simplified assumptions

Risk Management (cont.)

- Measures to reduce risk and uncertainty include:
  - Expanding on and referencing successful similar work
  - Refining further investigation of oyster restoration sites in areas that contained existing sustainable reefs
  - Modeling water quality to select restoration areas with optimal conditions for oysters
  - Using plant species common to the area from local sources

Monitoring and Adaptive Management

- **Monitoring** proposed to address project objectives and confirm project effectiveness at four project sites

Monitoring Component	First Cost (Oct 2013) 10 years ($1,000s)
Oyster Reef Restoration	$ 118.0
Kinston East Wetland Complex	$ 41.0
Gum Thicket and Cedar Creek	$ 147.0
Little River Dam Removal	$ 6.0
10 year total monitoring cost	**$ 312.0**

- **Adaptive management** may be required to address oyster spat recruitment only

Adaptive Management	First Cost (Oct 2013) 10 years ($1,000s)
Oyster Reef Restoration	**$ 354.0**

Neuse River Basin Cost Summary
($1,000s)

Item	Estimated Cost (Oct 2011)	First Cost (Oct 2013)	Fully Funded (Jan 2016)
PED	$ 2,919	$ 3,111	$ 3,143
Construction Management			
Construction Management	$ 2,335	$ 2,487	$ 2,721
Monitoring and Adaptive Management	$ 625	$ 666	$ 729
Lands & Damages	$ 249	$ 257	$ 258
Fish and Wildlife Facilities			
Little River Dam near Goldsboro	$ 521	$ 538	$ 559
Kinston East Wetland Complex	$ 3,836	$ 3,960	$ 4,113
Gum Thicket and Cedar Creek	$ 13,755	$ 14,202	$ 14,752
Oyster Restoration	$ 11,078	$ 11,438	$ 11,881
Total Project Cost	**$ 35,318**	**$ 36,659**	**$ 38,156**

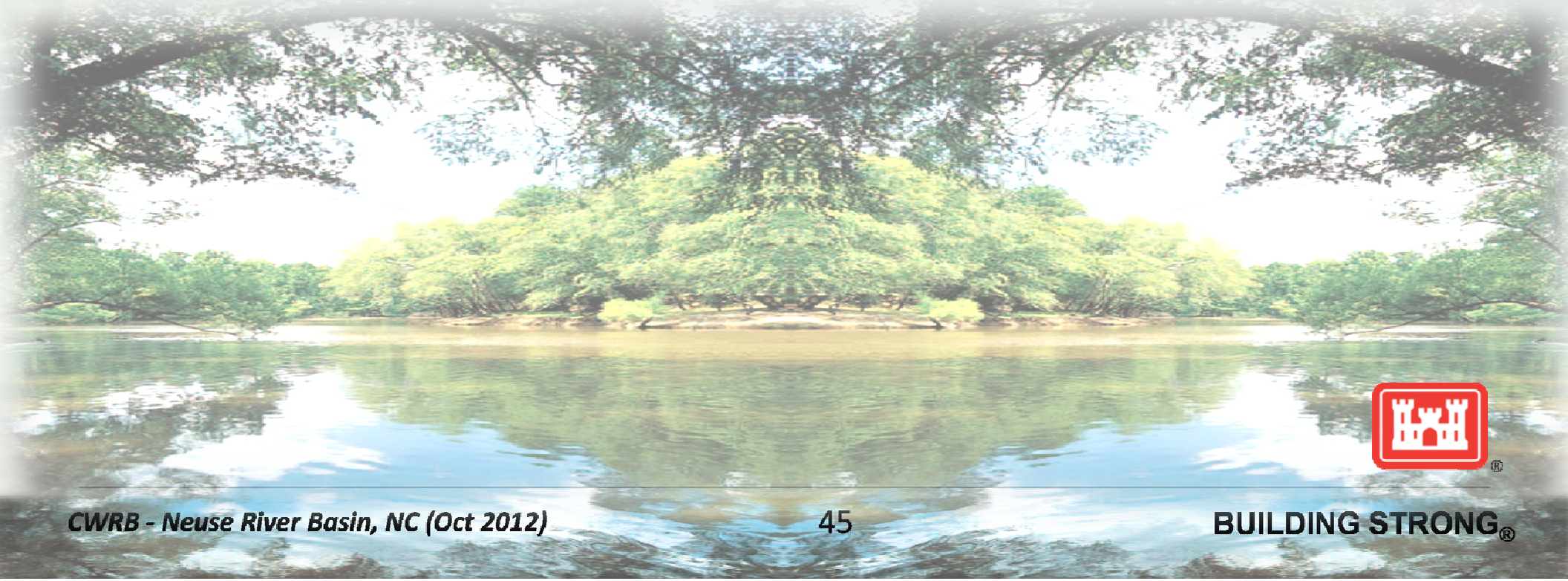
Neuse River Basin – Cost Sharing
(October 2013 Price Level)

Item	Federal Cost ($1,000s)	Non-Federal Cost ($1,000s)	Total ($1,000s)
PED*	$ 2,158.5	$ 952.5	$ 3,111.0
Construction Management			
Construction Management	$ 1,616.5	$ 870.5	$ 2,487.0
Monitoring and Adaptive Management	$ 432.9	$ 233.1	$ 666.0
Lands & Damages	$ 23.6	$ 233.4	$ 257.0
Fish and Wildlife Facilities			
Little River Dam near Goldsboro	$ 349.7	$ 188.3	$ 538.0
Kinston East Wetland Complex	$ 2,574.0	$ 1,386.0	$ 3,960.0
Gum Thicket and Cedar Creek	$ 9,231.0	$ 4,971.0	$ 14,202.0
Oyster Restoration	$ 7,434.7	$ 4,003.3	$ 11,438.0
Total Project Cost	**$ 23,820.9**	**$ 12,838.1**	**$ 36,659.0**
OMRR&R	-	$ 390.0	$ 390.0

- Overall Cost Share (Federal / non-Federal Sponsor): 65% / 35%
  * Initial PED Cost Share (Federal / non-Federal): 75% / 25%

Environmental Compliance

- Environmental Assessment Prepared
- Public Review: November 2011 - January 2012
- FONSI will be signed upon confirmation from Headquarters USACE
- No Significant Environmental Compliance Issues



Public Involvement

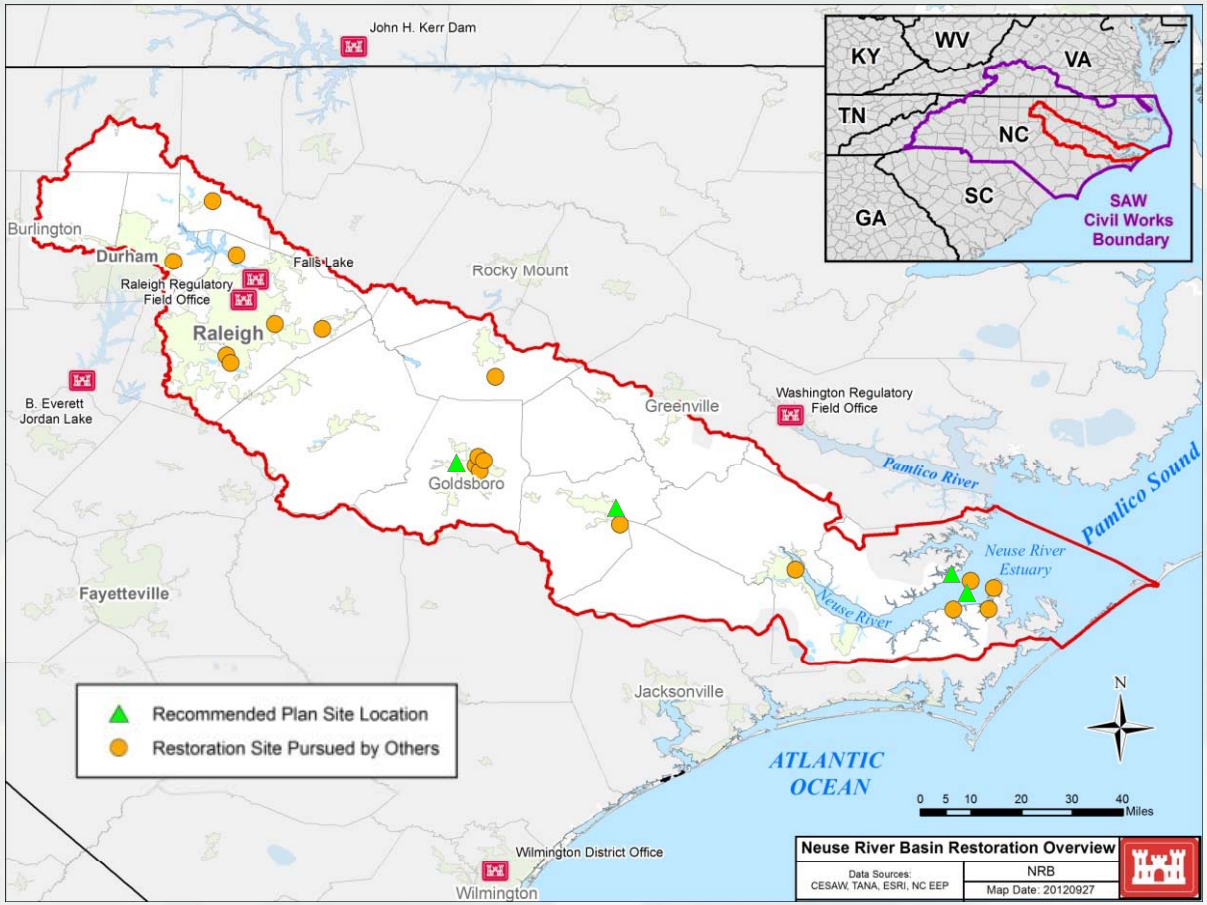
- Public Scoping – March 1999 and April 2006
- Agency coordination
  - Essential Fish Habitat coordination with the National Marine Fisheries Services
  - Cultural resources coordination with the State Historic Preservation Officer
  - Section 401 Water Quality Certification with the NC Division of Water Quality
  - Consistency with the Coastal Zone Management Act
  - Fish and Wildlife Coordination Act
- Public and Agency Review of Draft Report
- No significant concerns

Technical Reviews

- Agency Technical Review
  - Review managed by ECO-PCX, Baltimore District led effort
  - All ATR Comments Resolved
  - Certification completed August 2012
  - Cost DX Certification received November 2011
- Independent External Peer Review
  - Exclusion from IEPR Granted May 2012
- Model Review and Approval for Use
  - The following models were approved for use by the HQ Model Certification Team:
    - North Carolina Wetland Assessment Method (NC WAM)
    - North Carolina Stream Habitat Evaluation Method (NC SHEM)
    - USFWS Habitat Evaluation Procedure (HEP) for oysters

Neuse River Basin Study Summary

- The proposed plan fills in critical gaps to restore lost environmental function to one of the most endangered rivers in the country
- Restoration of key resources provides significant ecosystem benefits throughout the Neuse River Basin
- Federal investment is in line with other restoration projects of similar scope and output



Recommendation

Civil Works Review Board approve release of the Neuse River Basin Integrated Feasibility Report and Environmental Assessment for State and Agency Review.