

REPORT SUMMARY
Neuse River Basin, North Carolina
Ecosystem Restoration Feasibility Study

Feasibility Scoping Meeting	Oct 2007
Alternative Formulation Briefing	29 Mar 2011
AFB Guidance Memorandum	19 Apr 2011
Draft Report Guidance Memorandum	N/A
Division Engineers Transmittal	
Received at CECW- PC	
30-Day S&A Review Start	30 Nov 2011
30-Day S&A Review End:	17 Jan 2012
FEIS Files with EPA	N/A

STUDY INFORMATION

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, North Carolina, 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.

Study Sponsor.

The North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Resources (NCDWR) is the cost-sharing sponsor for this study.

Study Purpose and Scope.

The study investigated the quality of the overall Basin ecosystem and the level of flood risk in the watershed.

The *Draft Integrated Feasibility Report and EA* purpose is to:

- Identify the level of flood risk and potential measures to reduce potential damages;
- Identify and inventory changes to the Neuse River Basin ecosystem over time;

- Identify the key components of the Basin ecosystem that have degraded and lost value in terms of diversity or environmental production or both;
- Develop and evaluate measures to restore lost environmental values throughout the Basin;
- Recommend collaborative and sustainable watershed-based solutions;
- Incorporate Basin stakeholders into an active watershed planning process.

Project Location/Congressional District.

The study area encompasses the Neuse River Basin, the third-largest river basin in North Carolina. The Basin contains a total area of 6,234 square miles and it is one of only four watersheds entirely within the state. The Neuse River originates at the confluence of the Eno and Flat Rivers in north-central North Carolina near the city of Durham (in Person and Orange counties) and flows southeasterly until reaching tidal waters near State Highway 43, upstream of the city of New Bern, North Carolina. At New Bern the river broadens dramatically and changes from a unidirectional freshwater regime to a mixed tidal regime of the Neuse River Estuary. The Neuse River then flows through the estuary and out into Pamlico Sound before reaching the Atlantic Ocean. The Neuse River Basin study area is in the 1st, 2nd, 3rd, 4th, 7th, and 13th Congressional Districts. The four project elements are located entirely within the river basin boundaries.

Prior Reports and Existing Water Projects.

Two studies completed by the State of North Carolina were used extensively to help characterize the Neuse River Basin; The North Carolina Division of Water Quality (NCDWQ) *Neuse River Basin-wide Water Quality Plan* and the *Coastal Habitat Protection Plan* (CHPP).

The *Neuse River Basin-wide Water Quality Plan* summarizes water quality conditions in the Basin and land management activities that are being conducted to improve water quality and habitat conditions throughout the watershed. The *Coastal Habitat Protection Plan* (CHPP) Identified gaps in the protection provided for important fish habitat under other programs. The USACE looked to the goals in the activities and management plans of these reports, as well as others (listed in Appendix C), to establish where the authority for this study could add value to the extensive work already being conducted by others in the Basin.

In addition, relevant USACE historic studies in the watershed were compiled and results/recommendations have been incorporated where applicable.

- Reconnaissance Report, Neuse River Basin, North Carolina. (May 1984)
- Detailed Project Report and Environmental Assessment on Flood Damage Reduction, Adkin Branch, Kinston, NC. (December 1991)
- Detailed Project Report and Environmental Assessment on Flood Damage
- Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the Demolition and Removal of the Pleasant Green Road Dam, on the Eno River, in Orange County, North Carolina. (October 2005)

The Reconnaissance Report, Neuse River Basin, North Carolina. (July 1999) conclusions and recommendations resulted in identifying basin-wide improvements to flood risk management, water quality, environmental restoration, and related purposes. Environmental restoration

opportunities include stream restoration, oyster habitat restoration, and anadromous fish habitat. After the reconnaissance report was completed, there was sufficient support from the non-Federal sponsor to justify this feasibility study.

Other studies/projects/programs relevant to the Neuse Study include:

- Environmental Assessment and Finding of No Significant Impact for the Demolition and Removal of the Rains Mill Dam, on the Little River, in Johnston County, North Carolina. (October 1999)
- USEPA Albemarle-Pamlico National Estuary Program (APNEP)
- Neuse River Basin Wide Water Quality Plan 2009. (State of NC)
- The Kinston Waterfront–Now! (NC State University)
- Neuse River Estuary Modeling and Monitoring Project (University of North Carolina)
- Mapping of Neuse River Estuary (East Carolina University)
- Neuse River Education Team. (East Carolina University)
- The Nature Conservancy oyster restoration efforts in the Basin

Additionally, the North Carolina Oyster Restoration Steering Committee (ORSC). *Oyster Restoration and Protection Plan for North Carolina: A Blueprint for Action* (Draft 2003–2008) identified the Neuse River Estuary as a water body containing sites of high priority for oyster restoration.

Federal Interest.

The Study provided opportunities in the Federal Interest to:

- Provide hydrologic reconnectedness of vitally important bottomland hardwood forests. These wetland systems support a diverse range of floral and faunal communities and provide important flood plain water storage.
- Modify obstructions (dams) to support/restore anadromous fish passage;
- Restore scarce oyster habitat in the Neuse River estuary (it is estimated that >85% of oyster reefs have been lost globally);
- Restore and protect important wetlands, including 240 acres of conservation easement wetlands.

STUDY OBJECTIVES

Problems and Opportunities.

The inventory of existing conditions identified the following ecosystem restoration problems/issues within the study area, and as a result the study focuses on wetlands and stream riparian buffers, anadromous fish habitat, and estuarine resources:

- Impaired biological integrity in the Basin as a result of altered hydrology from urban development and unprotected stream banks,
- Decrease in historical mussel populations attributed to declining water quality in the Neuse River Basin,
- Declines in anadromous fish populations due to the construction of man-made structures that obstruct connection to historic upstream spawning habitat,

- Damaged or eliminated natural riparian buffer resulting from adjacent land use,
- Loss of estuarine emergent wetlands over time in the Neuse River Estuary associated with subsidence and shoreline erosion,
- Declines in eastern oyster (*Crassostrea virginica*) populations as a result of oyster reef habitat depletion in the Neuse River Estuary, associated with historic over harvesting and a reduction in water quality, and
- Impacts of sea level rise on coastal resources.

The following opportunities were developed as means to address those problems in the study area:

- Manage the risk of sea level rise through project design and adaptive management,
- Improve biological integrity,
- Improve habitat for fish and freshwater mussels,
- Improve anadromous fish populations,
- Restore damaged or eliminated natural riparian buffers,
- Restore estuarine emergent wetlands, and
- Increase the quantity and quality of oyster reef habitat.

Planning Objectives.

Over the 50-year period of analysis, throughout the Neuse River Basin, conduct ecosystem restoration to improve biological integrity, hydrologic connectivity, wetland condition, and fish, oyster and mussel populations as measured by increases in functional units.

The following are site specific objectives for each component of the TSP:

Gum Thicket and Cedar Creek. Restore functions within the approximately 60 acres of highly eroded existing estuarine wetland within the Gum Thicket and Cedar Creek sub-estuaries, increasing estuarine wetland function over the 50-year period of analysis.

Kinston East Wetland Complex. Restore functions and improve connectivity between existing tracts of bottomland hardwood forest over the 50-year period of analysis by restoring 14.5 ac of bottomland hardwood forest at the Kinston East Wetland Complex.

Little River Dam near Goldboro. Restore habitat connectivity for 46 miles of the upstream reaches of the Little River, which is currently cut off from its downstream reaches by the Little River Dam.

Neuse River Oyster Growing Area. In the Neuse River Estuary, restore up to 100 acres of oyster reef habitat to address historic and projected habitat losses and protect the restored habitat areas.

Planning Constraints.

The following planning constraints have been identified for this study:

- Geographic limits of the study authority, but including the affected area of the environment;

- Applicable federal laws such as the Endangered Species Act;
- Current limits of knowledge, information, and predictive ability.

ALTERNATIVES

Plan Formulation.

Combinations of site alternatives were compared using cost-effective/incremental cost analysis (CE/ICA). First, CE/ICA was performed on the array of alternatives for each site, and the results were used to select a single alternative from each site for further consideration. Another CE/ICA was then performed on this final array of alternatives. These results, in combination with a comparison of alternatives in Section 6.2 using the four (4) accounts (national economic development, environmental quality, regional economic development, and other social effects), was used to establish the National Ecosystem Restoration plan (NER)

Management Measures and Alternative Plans.

Restoration sites were identified by multi-agency teams, with input from public and interest groups and were screened based on levels of degradation, regional or national significance, and on if it is currently being addressed by other entities. A suite of measures were developed for the screened list of sites. These measures were then screened to those most appropriate to each screened site. The following measures were evaluated and screened:

Adkin Branch. Revegetate banks, Add in-stream woody debris

Gum Thicket/Cedar Creek. At two separate reaches: Gum Thicket and Cedar Creek-Parallel Rock Sill, Marsh (high and Low) planting, Meandering Rock Sill, Oyster Bench

Kinston East Wetland Complex. Remove fill material and create hydrologic connections with surrounding bottomland hardwood forest, Plant vegetation

Ellerbe Creek. Excavate and revegetate banks, create step pools, re-meander channel

Little River Dam. Construct dam gate, construct rock ramp, remove dam

Oyster Growing Areas. Build new deep water reefs, restore existing low output reefs by addition of new cultch, designate existing high output reefs as sanctuaries

Final Array of Alternatives.

The basin-wide best-buy alternatives (final array) include:

Adkin Branch. Add in-stream woody debris, revegetate along 1,150 ft of bank length

Gum Thicket/Cedar Creek. Build a 3,500 foot sill along Gum Thicket reach and 5,200 foot sill along Cedar Creek reach

Kinston East Wetland Complex. Remove fill material from 14.5 acres of former bottomland hardwood forest

Ellerbe Creek. Create in-stream step pools through adding boulders and woody debris

Little River. Build a dam gate structure to restore connectivity

Oyster Growing Areas. Restore 40 acres of sanctuary in Mid-River site and 40 acres in North Shore site

Key Assumptions.

Assumptions made during plan formulation include:

- The future without-project condition is the projection and forecast of what is “most likely” to occur in the study area over the 50-year planning horizon.
- Models used in the EBA have the ability to predict ecosystem changes.
- Fish migration will occur with the reconnection of hydrology at the Little River Dam location.
- Natural recruitment at oyster spat will occur if adequate substrate is provided in the Neuse River estuary.
- 240 acres of conservation easement at Gum Thicket will be protected with the proposed design of the offshore sill.
- Accelerated sea level rise is expected to impact only one part of TSP, which is the Gum Thicket/Cedar Creek site, and would not be significant.
- Erosion rates with the sill in place would be much less than the erosion rate without a sill.

Recommended Plan.

Modification of the Low-head Dam on the Little River: This element would restore habitat connectivity for 46 miles of important spawning habitat for anadromous fish species between the Neuse River estuary and upstream freshwater tributaries. Species that rely on habitat structure from the Neuse River Estuary upstream would be allowed access to the Little River, a tributary to the Neuse River. Forty-six miles of in-stream habitat would be made accessible by reconnection of the Little River to its mainstem, the Neuse River.

Kinston East Wetland Complex: This element would restore approximately 14.5 acres of damaged or eliminated riparian buffer where a former bottomland hardwood forest adjacent to the Neuse River was filled. Restoration of this area would result in a reconnection to the floodplain.

Restoration of the Estuarine Wetlands at Gum Thicket and Cedar Creek: This element would reduce erosion on approximately 59 acres of existing estuarine wetland at the Gum Thicket and Cedar Creek sub-estuaries and create approximately 42 acres of additional estuarine wetland. Stabilizing 3,500 feet of shoreline at Gum Thicket Creek and 5,200 feet of shoreline at Cedar Creek would restore estuarine shoreline and maintain coastal wetland conservation easement, where no development is allowed, that would otherwise be lost to erosion in the future.

Neuse River Estuary Oyster Reef Restoration: This element would restore approximately 10 acres of new oyster reef top, supporting 80 acres of estuarine habitat that would be managed by the state as oyster reef sanctuary, where oyster harvesting would be prohibited.

Systems/Watershed Context.

The Tentatively Selected Plan includes restoration of various habitats throughout the Basin. The following description of plan components begins in the upstream portion of the Neuse River and moves downstream into the Neuse River Estuary. As previously stated, the basin was studied in a holistic manner, and actions implemented throughout the watershed enhance the health of the overall Basin. Success in providing suitable aquatic habitat conditions in the overall watershed would begin by improving conditions for anadromous fish and freshwater mussels by removing obstructions and restoring connectivity to once-unavailable habitat and by providing habitat in

the estuary for species to begin their journey upstream through restoring emergent wetlands and restoring highly-damaged oyster reef habitat.

Environmental Operating Principles.

The *Neuse River Basin Draft Integrated Feasibility Report and EA* was conducted in a manner consistent with the intent of the USACE's Environmental Operating Principles, that is, to ensure its commitment to the environmental quality of the Neuse River Basin in balance with the economy of the region. This integrated feasibility study complies with the Environmental Operating Principles as follows:

A. Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life. Through the careful application of state of the art, appropriate scientific tools and analytical models in combination with site-specific data collection and analysis of significant habitat parameters, sustainable restoration measures and sites have been identified to support targeted restoration outputs over the period of analysis.

B. Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of USACE programs and act accordingly in all appropriate circumstances. This integrated feasibility report/EA uses an approach that considers interrelated environmental impacts on all resources, including socioeconomic resources, interdependently with ecosystem restoration plan formulation and project recommendations.

C. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another. The *Neuse River Basin Integrated Feasibility Report and EA* has been conducted in a multiagency, regional planning context to ensure that land use, residential, and commercial development patterns and economic considerations are incorporated into the development of sustainable and synergistic ecosystem restoration solutions. BMPs or restoration initiatives have been identified in a manner that achieves a balance between human development activities and the natural environment.

Analyses conducted in support of this study did not identify previous USACE projects in the watershed that directly contributed to degradation of ecosystem quality. Existing problems at Federal projects, like nutrient loading into Falls Lake, are being addressed through programs by other agencies. The components of the tentatively selected ecosystem restoration plan have been formulated to ensure that no significant adverse impacts to human health and welfare will result from project implementation.

E. Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work. A cumulative impact analysis has been incorporated into this study to ensure full impact disclosure and adherence to the concept of full integration of plan formulation and environmental compliance. A systems-based approach that considers all elements of the Basin environment was applied to confirm that cumulative effects from project implementation on the environment are beneficial (as the project purpose is ecosystem enhancement and restoration). No cumulative impacts have been identified to non-biological resources in the Basin.

F. Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work. Through effective

coordination between the project delivery team and technical workgroups comprised of a variety of basin stakeholders, a multidisciplinary team has been established to ensure the project recommendations benefit from a range of diverse perspectives and ideas. This integrated knowledge base enhances the performance and sustainability of project features, through incorporation of a greater understanding of the Neuse River Basin and Estuary.

G. Respect the views of individuals and groups interested in USACE activities, listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the nation's problems that also protect and enhance the environment. As indicated above, the *Neuse River Basin Draft Integrated Feasibility Report and EA* has benefitted from incorporating a range of diverse perspectives and regional technical expertise. Interagency collaboration has been fostered through the efforts of technical workgroups and project delivery team meetings held regularly. By implementing a multiagency collaboration and public involvement strategy, a range of technical input was incorporated into the study analyses from multiple disciplines. This approach built trust and positive relationships, supporting innovative “win-win” solutions to identified ecosystem restoration issues.

Peer Review.

A Review Plan was updated in February 2012. Reviews include District Quality Control reviews and Agency Technical Reviews of the Feasibility Scoping, Alternative Formulation, and Final Reports. Additional reviews include cost engineering review and certification, legal review and certification, and model review and approval.

On the basis of the USACE peer-review guidance (EC 1165-2-209), this study does not meet the triggers for an independent external peer review (IEPR) because (1) an EIS is not included, (2) the TSP is not likely to have significant economic, environmental, or social affects to the nation, (3) the study is not likely to have significant interagency interest, (4) the study does not involve significant threat to human life, (5) the study is less than \$45 million in total, (6) the study is not highly controversial, and (7) the study is not based on novel methods, does not present complex challenges for interpretation, does not contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices. A waiver was approved 17 April 2012 for exclusion from IEPR.

EXPECTED PROJECT PERFORMANCE

Project Costs.

Description	(\$1,000's)		
	Cost	Contingency	Total
Lands & Damages – Non Federal	199	50	249
Fish and Wildlife Facilities-Construction Contract	23,926	5,264	29,190
Preconstruction Engineering and Design	2,393	526	2,919
Construction Management	2,426	534	2,960
TOTAL IMPLEMENTATION COST	28,944	6,374	35,318

Equivalent Annual Costs and Benefits.

All costs for this project have been allocated to the purpose of NER.

Neuse River Basin Ecosystem Restoration Project	
Annual Benefits and Costs:	
Investment Costs	
Total Project Construction Costs	\$34,681
Interest during Construction	\$683
Total Investment Costs	\$35,613
Average Annual Costs	
Interest and Amortization of Initial Investment	\$1,661
OMRR&R	\$18
Total Average Annual Costs	\$1,679
Annual Benefits (non-monetary)	241 Functional Units (FU's)

Cost Sharing.

Cost-sharing for construction of this environmental ecosystem restoration project will be 65 percent Federal and 35 percent non-Federal. The Sponsor (State of North Carolina) will provide all lands, easements, relocations, rights-of-way, and disposal or borrow areas (LERRD) required for construction and subsequent maintenance. PED is financed initially 75% Federal and 25% Non-Federal.

Neuse River Basin Ecosystem Restoration Project			
(October 2011 Price Levels - \$1,000))			
Item	Federal Cost	Non-Federal Cost	Total Cost
PED			2,919
LERR&D			249
Construction			32,318
Total	22,957	12,361	35,318

Cost sharing will ultimately be calculated on total implementation cost, not the individual line items.

Project Implementation.

The Non-Federal sponsor for project implementation is the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Resources (NCDWR). The project will be cost. The Corps will be the lead agency for PED and Construction. Project monitoring is scheduled for up to 10 years post construction, until project success can be

determined. Monitoring for structural and biological persistence will occur at the oyster, Kinston, and Gum Ticket/Cedar Creek sites. Structural persistence only will be monitored at the Little River Dam site. Project adaptive management has been proposed for the oyster reef component of the plan only based on uncertainty associated with recruitment of oyster spat to the reefs. Total cost for 10 years of monitoring and adaptive management is estimated to be \$741,000 and \$450,000, respectively.

Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R).

Modifying Low-head Dam on Little River near Goldsboro. Maintenance will be required on the low-head dam to maintain sufficient depth for operation of the water treatment plant intake structure. Floating debris will need to be removed from the proposed water control system installed on the dam (stoplogs) to allow unimpeded operation of the stoplogs. Repair may be required on the proposed stoplogs or access walkway. For purposes of estimating maintenance costs, it is assumed that one third of the water control system and the access walkway would need replacement after 25 years.

Kinston East Wetland Restoration Complex. It is not expected to require any maintenance or repair.

Stabilizing Gum Thicket Creek and Cedar Creek. No long-term operational needs would be required.

Stone Sill – Maintenance may be required if deficiencies are found during Sponsor inspections that would compromise protection of the bank or vegetation. Maintenance would normally involve placement of additional stone or shifting of the existing stone to bring the top of sill up to an acceptable elevation. For the purposes of estimating maintenance costs, it is assumed that 400 linear feet of the stone sill would require an additional layer of 500 pound granite armor stone after 25 years.

Marsh Plantings – In certain conditions, the marsh plantings could become damaged to a point where natural recovery would not take place and shoreline is eroding. In some cases a small amount of earthen fill would be required to provide a substrate for the marsh plantings. For purposes of estimating maintenance costs, it is assumed that 0.2 acres of the marsh planting would require additional fill and plant replacement after 25 years. If Phragmites or other state listed noxious aquatic plants are found within the restoration areas during the vegetation establishment period, chemical control will be conducted as needed to allow appropriate establishment of target vegetation. Herbicides proposed for use would be registered by the U.S. Environmental Protection Agency. Application would be made in accordance with label restrictions by a licensed applicator.

Constructing New Oyster Reef Habitat. Oyster habitat is not expected to require any maintenance or repair.

Key Social and Environmental Factors.

Estuarine ecosystems are important whereby their component wetland and aquatic habitats provide a wealth of human services. Commercial and recreational fisheries that are supported by these habitats drive the local economies of coastal towns via the seafood industry and tourism. Oysters are keystone estuarine species that provide food, habitat and water filtration and are indicators of estuarine health. This habitat attracts fish and provides a fishery for recreation and commercial use. Corps planning and environmental PDT members worked closely with local

fisherman to ensure the selected plan provided benefit to the local fishery and does not negatively impact navigation in the Basin. Additionally, TSP will construct and protect riparian wooded and emergent wetlands and oyster reefs and provide improved passage of anadromous fish. Again, the PDT worked with the local land owners to ensure project could be completed without negative impact to the property owners in the area.

Stakeholder Perspectives and Differences.

Throughout this study, stakeholders, including resource agencies were actively involved in the planning process; some served as members of the PDT and workgroups. The USACE and stakeholders worked together to identify restoration measures that would add value to ongoing projects by other Federal, state, and local agencies and to recommend projects as the tentatively selected plan. No substitutive concerns were made by resource agencies during the plan formulation or review processes.

Environmental Compliance.

As an integrated report, this document meets the technical requirements for USACE feasibility reports and NEPA compliance. This EA is written pursuant to and complies with ER 200-2-2 (33 CFR Part 230): Environmental Quality - Procedures for Implementing the National Environmental Policy Act (NEPA) and 40 CFR Parts 1500 to 1508 the Council on Environmental Quality (CEQ) Regulations for Implementing the National Environmental Policy Act (NEPA).

State and Agency Review.

The Draft Integrated Feasibility Report and EA were made available to an extensive list of local, State and Federal regulatory agencies and the public on November 30, 2011 for a 30-day review and comment period. The Feasibility Report and EA were also placed on the Wilmington District Website.

Comments were received during the 30-day public review period. The comments were used in the preparation of the Final Feasibility Report and preparation of the FONSI. The FONSI documents the environmental considerations.

Certification of Peer and Legal Review.

Agency Technical Review of the Alternatives Formulations Briefing Report was certified June 8, 2009, and a second one on May 3, 2010.

Agency Technical Review of the Engineering Appendix was certified November 10, 2011.

Agency Technical Review of the Final Report was certified on May 30, 2012.

Legal Certification of the Final Report is dated May 25, 2012.

Policy Compliance Review.

A policy review was conducted on the Alternative Formulation Briefings package per PGM dated 19 April 2011.