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RESTORATION PLAN AND ENVIRONMENTAL ASSESSMENT

FOR THE KERR-MCGEE CHEMICAL CORP. SITE, NAVASSA, NORTH CAROLINA

PHASE I

October 2019

Prepared by Natural Resource Trustees:

National Oceanic and Atmospheric Administration

on behalf of the

U.S. Department of Commerce

The United States Fish and Wildlife Service

on behalf of the

U.S. Department of the Interior

and

North Carolina Department of Environmental Quality

on behalf of the

North Carolina Governor's Office

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Executive Summary

The Department of Commerce, through the National Oceanic and Atmospheric Administration (NOAA), the Department of the Interior (DOI) through the U.S. Fish and Wildlife Service (USFWS), and the State of North Carolina through the North Carolina Department of Environmental Quality (NCDEQ) (Trustees) have prepared this Draft Restoration Plan and Environmental Assessment (Draft RP/EA) to identify, evaluate, and select proposed alternatives to restore injured natural resources, including their supporting ecosystems, and the services they provide in order to compensate the public for the injury to natural resources due to releases of hazardous substances at and from the Kerr-McGee Chemical Corp. Site in Navassa, North Carolina. This Draft RP/EA was prepared jointly by the Trustees in accordance with Section 111(i) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its implementing regulations (43 C.F.R. § 11.93). The Trustees anticipate developing additional Draft RP/EAs, thus this Draft RP/EA is "Phase I" of what is intended to be a multi-phase process to restore natural resources and their services injured as a result of exposure to hazardous substances released at and from the Kerr-McGee Chemical Corp.-Navassa Site.

Public review of the restoration alternatives proposed in this Draft RP/EA is an integral and important part of the restoration planning process and is consistent with applicable state and federal laws and regulations.

The Kerr-McGee Chemical Corp. - Navassa Site (Site) is a former creosote wood-treating facility located in Navassa, Brunswick County, North Carolina. The Site is located on a 300-acre parcel of land and is currently inactive. The Site was established by Gulf States Creosoting Company who began creosote wood treating on the Site in the mid-1930s. Kerr-McGee took ownership of the property in 1965. Site operations ceased in 1974 and Kerr-McGee dismantled the wood-treating facility in 1980. Kerr-McGee transferred the Site to Tronox, Inc. in 2006. Tronox Corporation declared Chapter 11 bankruptcy on January 12, 2009. In 2014, the Trustees recovered $23 million for natural resource restoration planning and implementation.

The Trustees determined that the polycyclic aromatic hydrocarbon (PAH) levels present in the Site sediments were sufficient to cause harm to the organisms living within, upon, or closely associated with those sediments, or otherwise adversely affect the ecological services provided by the habitat. This habitat, which is associated with the bottom of a body of water, is commonly known as benthic habitat, and includes bottom dwelling species such as invertebrates and fish.

As part of the restoration planning process, the Trustees compiled a list of potential restoration alternatives in the Lower Cape Fear River Watershed, and more specifically, in and around Navassa, North Carolina. The Trustees narrowed the list of potential restoration projects to

reflect only those alternatives that meet NRDA regulatory project eligibility requirements (43 C.F.R. § 11.82(d). Projects meeting eligibility requirements were further screened using additional evaluation criteria identified by the Trustees.

The overall objective of the restoration process is to make the environment and public whole for injuries to natural resources and/or services lost due to contamination at the Site. To meet that objective, the benefits of restoration actions must be related, or have an appropriate nexus, to the natural resource injuries and losses. To achieve this fundamental objective, the Trustees are proposing the following alternatives to compensate the public for natural resource injuries:

- Alligator Creek Restoration and Conservation
- Battleship North Carolina—Living Water Restoration
- Carolina Beach State Park Restoration
- Indian Creek Natural Resource Restoration and Conservation
- Lower Black River Conservation
- Lower Cape Fear Bottomlands Conservation
- Merrick Creek Conservation
- Moze Heritage Site Tidal Restoration
- Navassa Stormwater and Riparian Restoration
- Navassa Waterfront Park

These alternatives address the resource injury through restoration or preservation of like habitat; provide ecological benefits in close proximity to Navassa; and are both cost effective and implementable in the short-term. The Trustees believe that these alternatives represent a cost-effective and beneficial means by which to restore or replace the injured natural resources and the services they provided.

The Trustees estimate restoration implementation for these preferred alternatives at approximately $11.35 million, based on current project proposals and budgets. The Trustees will continue restoration in phases until all remaining restoration funds are exhausted. It is anticipated that some projects that were not retained for further analysis in this Draft RP/EA may be considered, and evaluated further, in future restoration phases.

1 Introduction

1.1 *Overview*

The Department of Commerce, through the National Oceanic and Atmospheric Administration (NOAA), the Department of the Interior (DOI) through the U.S. Fish and Wildlife Service (USFWS), and the State of North Carolina through the North Carolina Department of Environmental Quality (NCDEQ) (Trustees) initiated a natural resource damage assessment (NRDA) process under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9601, *et seq*. for the Kerr-McGee Chemical Corporation Site in Navassa, Brunswick County, North Carolina (Site). (Figure 2.1). As part of the NRDA process, the Trustees developed and jointly filed a natural resource damages claim in the Tronox, Inc. bankruptcy proceedings seeking monetary compensation for injuries to the benthic environment (and the natural resources dependent upon the benthic environment such as fish and migratory birds), caused by the release of polycyclic aromatic hydrocarbons (PAHs) at and from the Site. The Trustees' claim was resolved with over $23 million (referred to as "restoration funds") to be used to restore, replace, rehabilitate, or acquire the equivalent of the injured natural resources and the services they provide and related restoration costs.

Pursuant to Section 111(i) of CERCLA, and the CERCLA NRDA regulations (43 C.F.R. § 11.93), the Trustees have prepared this Draft Restoration Plan and Environmental Assessment (Draft RP/EA) to identify, and evaluate proposed alternatives to restore, replace, rehabilitate and/or acquire the equivalent of injured natural resources, including their supporting ecosystems, and the services they provide to compensate the public for natural resources and their services, injured, lost, or destroyed due to releases of hazardous substances in areas at or adjacent to the Site. This Draft RP/EA is the first of a multi-phase process to restore natural resources and their services injured as a result of exposure to hazardous substances released at and from the Kerr-McGee Chemical Corp.-Navassa Site. Thus, this Draft RP/EA also outlines appropriate restoration project categories in preparation for future phases of restoration.

The Trustees intend to prepare future restoration plans supported by National Environmental Policy Act (NEPA) and other environmental compliance analyses as additional projects are identified; or as previously proposed projects become implementable with additional design, development, and/or funding. These future restoration plans and NEPA analyses will be made available for public review and comment, through a multi-year, phased approach until all restoration funds have been expended.

1.2 *Proposed Action and Purpose and Need*

Proposed Action. The Trustees are proposing to implement a suite of restoration projects within the Lower Cape Fear River watershed in North Carolina. Consistent with the CERCLA NRDA

regulations, this Draft RP/EA includes a reasonable range of restoration alternatives and also identifies a non-preferred alternative. Public comments are being sought on this Draft RP/EA and will be considered and addressed in the final RP/EA as appropriate.

Purpose. The purpose of the Proposed Action is to present the "preferred alternative" restoration project or projects that will accomplish the goal of restoring, replacing, rehabilitating, and/or acquiring the equivalent salt marsh and benthic habitat at the locations identified to compensate the public for natural resources, including ecological services, injured, lost or destroyed due to releases of hazardous substances from the Site. The Site consists of a former wood treatment facility adjacent to the Cape Fear and Brunswick Rivers and Sturgeon Creek, which has released hazardous substances into wetland and river habitat in and adjacent to the rivers and creek.

Need. The proposed restoration projects are needed because there were significant injuries to natural resources and services associated with the release of hazardous substances from the Site into the adjacent wetlands and rivers.

1.3 *Natural Resource Trustees and Authorities*

Pursuant to Section 107(f) of CERCLA, as amended, 42 U.S.C. § 9607(f); the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1321(f)(4) and (5), (CWA); Subpart G of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. § § 300.600, 300.605; and other applicable Federal and State laws, designated Federal and State authorities may act on behalf of the public as natural resource Trustee to pursue natural resource damages for injury to, destruction of, or loss of natural resources and their services resulting from the release of hazardous substances to the environment.

This Draft RP/EA was prepared jointly by the Trustees in accordance with Section 111(i) of CERCLA and its implementing regulations (43 C.F.R. § 11.93). Consistent with federal laws, the federal natural resource trustees also evaluated the proposed restoration alternatives for compliance with other applicable laws, as documented in Section 6. NOAA is the lead federal agency.

1.4 *NEPA Compliance*

Actions undertaken by the Trustees to restore natural resources or services under CERCLA and other federal laws are subject to the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321, *et seq.*, and the regulations at 40 C.F.R. Parts 1500 through 1508. NEPA requires agencies proposing federal actions to take a "hard look" at the environmental effects of their proposed actions. NEPA outlines the responsibilities of federal agencies, including environmental documentation. In general, a federal agency contemplating implementation of a major federal action must produce an environmental impact statement (EIS) if the action is expected to have

significant effect on the quality of the human environment. When it is uncertain whether a contemplated action is likely to have significant environmental impacts, the federal agency prepares an environmental assessment (EA) to evaluate the need for an EIS. If the EA demonstrates that the proposed action will not significantly impact the quality of the human environment, the agency issues a Finding of No Significant Impact (FONSI), which satisfies the requirements of NEPA, and no EIS is required.

In accordance with NEPA and its implementing regulations, this Draft RP/EA summarizes the affected environment for the preferred restoration actions and their alternatives, describes the purpose and need for restoration actions, identifies a reasonable range of alternatives, assesses the environmental consequences of the preferred restoration actions and their alternatives, including cumulative impacts, and summarizes the opportunity the Trustees provided for public participation in the decision-making process. This information will be used to make a threshold determination as to whether preparation of an EIS will be required prior to selection of restoration actions.

Actions undertaken by the Trustees to restore natural resources or services under CERCLA and other federal laws must also comply with other applicable laws and regulations, as discussed in Section 6.

1.5 *Public Participation*

The Trustees have prepared this Draft RP/EA to provide the public with information on the nature of the Trustees' natural resource damages claim in the Tronox bankruptcy; the restoration objectives that have guided the Trustees in developing this plan; the restoration alternatives that have been considered; the process used by the Trustees to identify preferred restoration alternatives; and the rationale for their selection. Public review of the restoration alternatives proposed in this Draft RP/EA is an integral and important part of the restoration planning process and is consistent with applicable state and federal laws and regulations, including CERCLA, NEPA, and their implementing regulations.

The restoration alternatives proposed in this Draft RP/EA are being made available for review and comment by the public for a period of 45 days. The Trustees will consider all written comments received during the public comment period prior to approving and adopting a Phase I Final Kerr-McGee Restoration Plan and associated NEPA analysis. Written comments received and the Trustees' responses to those comments, whether in the form of plan revisions or written explanations, will be summarized in the Phase I Final Restoration Plan. Based on the public's comments, or other information, the Trustees may amend the Draft RP/EA if significant changes are made to the type, scope, or impact of the projects.

1.6 *Administrative Record*

The Trustees have maintained records documenting the information considered and actions taken by the Trustees during this restoration planning process, and supporting their decisions in this Draft RP/EA. These records are available for review by interested members of the public. Interested persons can access or view these records at https://www.diver.orr.noaa.gov/web/guest/diver-admin-record?diverWorkspaceSiteId=6102.

2 Overview and history of the site

2.1 *Site Background*

The Site is a former creosote wood-treating facility located in Navassa, Brunswick County, North Carolina, seven miles from Wilmington, North Carolina (Figure 2.1). The Site is located on a 300-acre parcel of land and is currently inactive. The Site is bounded by South Navassa Road to the west, North Navassa Road and Rampage Boat Company to the north, the Brunswick River and marsh to the east, and marsh and Sturgeon Creek to the south. No structures remain on the property, with the last being demolished in November 2017.

The Site was established by Gulf States Creosoting Company who began creosote wood treating on the Site in the mid-1930s. Gulf States Creosoting sold the Site to American Creosoting in 1958. Kerr-McGee took ownership of the property in 1965. Site operations ceased in 1974 and Kerr-McGee dismantled the wood-treating facility in 1980. Kerr-McGee transferred the Site to Tronox, Inc. in 2006. Tronox Corporation filed for Chapter 11 bankruptcy on January 12, 2009.

The former process area of the Site, where pre-cut timber was pressure treated with creosote, comprised 3.5 acres of the overall 300-acre site (Figure 2.2). Two wastewater ponds and five other surface impoundments were utilized during various periods. During the Site dismantling, surface impoundments were either drained or breached and creosote sludge and other waste solids were blended with clean soil, compacted in the bottom of former wastewater ponds and covered with clean soil prior to reseeding. In addition, the former operating portions of the Site were planted with Loblolly pine (*Pinus taeda*) stands during decommissioning, which are now mature. Over 100 contaminants of concern were identified during the site remedial process, including significant PAH contamination in marsh sediments.

Figure 2.1. Location of the Kerr-McGee Chemical Corp. Site in Navassa, North Carolina

Figure 2.2. Detail of the Kerr-McGee Chemical Corp. - Navassa Site (ENSR 2005)

2.2 *Summary of Response Actions*

In 2010, the United States Environmental Protection Agency (EPA) added the Site to the National Priorities List (NPL). The NPL is the list of hazardous waste sites in the United States eligible for long-term remedial action ("clean up") financed under the federal Superfund program. Prior to its listing, the EPA had entered into an Administrative Order on Consent with Kerr-McGee, and then with Tronox, Inc. to conduct a remedial investigation and feasibility study at the Site. Currently, EPA, along with NCDEQ and the Greenfield Environmental Multistate Trust, created through the settlement of the Tronox Bankruptcy, are continuing to conduct site investigations to determine the cleanup necessary at the Site. Generally, the "clean up" actions address risks to human health and the environment from contamination while the focus of NRDA (and this associated Draft RP/EA) is to restore, replace, rehabilitate, and/or acquire the equivalent of natural resources and services lost as a result of the release to "make the public whole". The Trustees have and will continue to coordinate their NRDA activities with the "clean up" actions to be performed by the EPA and NCDEQ. Information on "clean up" activities at the Site can be found at: http://www.epa.gov/region4/superfund/sites/npl/northcarolina/kerrmcgnc.html.

For additional information about the Superfund cleanup, contact the EPA Remedial Project Manager, Erik Spalvins at 404-562-8938, or the EPA Community Involvement Coordinator, LaTonya Spencer at 404-562-8463.

2.3 *Resource Injuries and Service Losses*

For purposes of developing a natural resource damages claim for the Tronox bankruptcy, the Trustees focused their injury determination and quantification on PAH concentrations found in tidal marsh sediments to the south of the Site. PAH describes a defined set of chemicals that are often found together in groups of two or more and are a major contaminant associated with wood-treating. Using readily available data from the Site and literature values, the Trustees determined that the PAH levels present in the Site sediments were sufficient to cause harm to the organisms living within, upon, or closely associated with those sediments, or otherwise adversely affect the ecological services provided by the habitat. This habitat, which is associated with the bottom of a body of water, is commonly known as benthic habitat, and includes bottom dwelling species such as invertebrates and fish. The Trustees determined that benthic invertebrates associated with the marsh at the Site were injured by comparing the sediment concentration of PAHs against sediment quality guidelines (SQG) for assessing effects to benthic invertebrates (MacDonald 1994; Long et al. 1995; Long and MacDonald 1998; Swartz 1999). Benthic invertebrates provide service flows to other resources (e.g., fish, birds, and wildlife) and, therefore, these other resources were also potentially injured as a result of releases at and from the Site. The footprint of sediment contamination in the marsh is approximately 10 acres; total PAH concentrations in marsh sediments are up to three orders of magnitude above published

probable effect levels for benthic macroinvertebrates.

3 CERCLA Restoration Planning Process

3.1 *Restoration Objective*

Restoration of resources injured and services lost due to the release is the goal of the NRDA process. The purpose of the actions proposed in this Draft RP/EA is to restore, rehabilitate, replace, or acquire the equivalent of natural resources that were injured or destroyed as a result of releases of hazardous substances pursuant to the requirements of applicable federal and state laws and regulations.

3.2 *Restoration Scoping*

Restoration alternatives were identified via a variety of approaches. The projects identified reflect a broad survey of the area including those project opportunities in close proximity to the Site as well as others in the broader Lower Cape Fear River Basin. The Trustees 1) reviewed available information on potential projects from reports and existing datasets, 2) consulted with individuals with knowledge of specific projects or restoration opportunities, and 3) solicited public input on potential restoration alternatives through a public process.

In 2009 the Trustees began to review available restoration plans and canvass various agencies, non-governmental organizations, and private groups to identify restoration project concepts that could be applicable to restore injured natural resources and services. This information informed the selection of restoration categories.

In August 2015 (following approval of the settlement agreement by the United States District Court for the Southern District of New York in December 2014, *Tronox Inc. et al., v. Anadarko Petroleum Corp. et al.,* No. 14-cv-5495, Doc 685 (Dec. 5, 2014)), the Trustees released for public comment a Scoping Document for Restoration Planning which included details on the release, natural resource injuries resulting from the release, restoration project categories, and restoration selection criteria. The Trustees also hosted a public meeting in Navassa, North Carolina to present this information, along with a 60-day public review period. The Trustees summarized the feedback received on the Scoping Document (See Restoration Scoping Response Summary (February, 2016). These documents are available as part of the Administrative Record.

For purposes of this Draft RP/EA, the Trustees are using the same criteria for evaluation of restoration alternatives as were used in the Scoping Document. These are described in the next section (3.3). The Scoping Document also identified potential restoration categories to guide the restoration planning process, which are summarized in Section 3.4.

3.3 *Restoration Selection Criteria*

The Trustees are using *eligibility* and *evaluation* criteria to review potential restoration projects. *Eligibility* criteria are specified in the CERCLA NRDA regulations and serve as an initial screening tool to identify restoration alternatives that qualify for Trustee consideration (43 C.F.R. § 11.82(d)). *Evaluation* criteria are defined by the Trustees, specific to the injuries and other considerations at the Site, and are designed to assist the Trustees, and the public, with their evaluation and comparison of the proposed eligible restoration alternatives and the likelihood that the proposed projects will meet the goals of restoring the injured natural resources and services. The Trustees used these criteria, along with identified restoration categories, to identify the subset of proposed restoration alternatives that at this time most closely meet restoration objectives.

Eligibility Criteria

- Link to injured resources - the alternative benefits similar species or habitats as those injured by the release, restoration geographically proximate to where the natural resource injuries and service losses occurred, and projects capable of compensating for benthic injury and providing improvement to species dependent on benthic habitat.
- Cost effectiveness - the cost of the proposed restoration alternative is reasonable in relationship to the injury, and benefits to the injured resources can be quantified; opportunities to share costs with other organizations and/or agencies may be available and are considered. 43 C.F.R. § 11.82(d)(2), (3)
- Likelihood of success - it is likely that a restoration alternative will be successful based on consideration of future operation and maintenance requirements and vulnerability of the alternative to natural or human-induced stresses following implementation. 43 C.F.R. § 11.82(d)(1)
- Measurable results - an alternative delivers tangible and specific resource restoration results that are identifiable and measurable. 43 C.F.R. § 11.82(d)(6), (7)
- Avoid negative impact to natural resources - the restoration alternative promotes other environmental benefits, avoids collateral injury to natural resources as a result of implementation, and is not subject to an independent, prior obligation. 43 C.F.R. § 11.82(d)(5)
- No impact to public health/safety - Projects that would negatively affect public health or safety are not eligible. 43 C.F.R. § 11.82(d)(8)
- Not otherwise required by law - the restoration alternative complies with applicable/relevant Federal, State, and local laws and regulations. 43 C.F.R. § 11.82(d)(9), (10)
- Compatible with clean-up process - action can be successful irrespective of remediation activities and does not adversely affect any ongoing or anticipated remedial actions at the Site. 43 C.F.R. § 11.82(d)(4)

Evaluation Criteria

- Proximity to the site – the restoration alternative is located in the Lower Cape Fear Watershed
- Similar habitat functions and/or ecosystem services benefitted – the restoration alternative promotes benthic productivity, benthic diversity and abundance, fisheries productivity, water quality/nutrient cycling
- More than one resource or service benefitted – the restoration alternative has inter-related natural resource service benefits, provides benefits to multiple resources or services, or provides greater net service benefit or uplift.
- Degree of resource benefit – the restoration alternative has a high magnitude of resource benefits (e.g., large-scale uplift of resource and habitat function and values, long term benefits)
- Conservation significance – the restoration alternative can deliver unique and rare benefits, address a high degree of land use conversion threat, provide protection to adjacent habitats, or are identified as a priority in existing planning efforts. Alternatives are considered more favorably if complementary with other community development plans/goals.
- Advanced-level planning and development – the restoration alternative can be readily implemented (e.g., willing sellers, engineering and design planning underway, permitting and regulatory compliance needs and timing are addressed in the project proposal and/or planning process).
- Leverage – the restoration alternative leverages existing resources and capacity (e.g., partnerships, matching funds and/or in-kind services that could contribute to the project).
- Consistency with existing planning goals - the alternative is compatible with the surrounding land use, other restoration planning efforts, watershed or regional plans, community planning, and ecosystem priorities.

The evaluation of restoration alternatives according to the criteria involves a balancing of interests in order to determine the best way to meet the restoration objective. As noted above, restoration alternatives benefiting multiple resources and services are desirable; accordingly, the trustees considered opportunities to support additional benefits (i.e., recreational access, etc.) that aligned with the overall ecological restoration objectives.

3.4 ***Restoration Categories and Project Concepts***

The Trustees consider the categories listed below as the most appropriate for the purposes of restoring, rehabilitating, replacing or acquiring the equivalent of the natural resources and their services that were injured or lost as a result of the releases of hazardous substances at and from the Site. Projects must create, restore, or enhance:

- Riverine habitat

- Coastal wetlands
- Underwater, intertidal, or shoreline habitat
- Passage for migratory fish

The Trustees will continue to rely on the restoration selection criteria (Section 3.3) to identify preferred restoration alternatives in the restoration categories described above for subsequent restoration planning phases. Additional detail regarding the potential restoration categories is provided in the Restoration Scoping Document.

3.5 *Restoration Alternative Identification and Screening*

The Trustees compiled a list of potential restoration alternatives in the Lower Cape Fear River watershed informed by the restoration scoping process (Section 3.2) and other information about the resources and plans at the Site and surrounding community.

The Trustees then narrowed the list of potential restoration alternatives to reflect those potential alternatives that meet NRDA regulatory criteria (43 C.F.R. § 11.82(d), (Section 3.3). Projects meeting eligibility requirements were further screened using additional evaluation criteria identified by the Trustees (Table 3.1). Trustees scored projects against criteria using a Low-to-High scale. Projects scoring Medium (M) to High (H) for all criteria were considered part of the reasonable range of alternatives for further evaluation in this Draft RP/EA. Projects that scored Low (L) for any evaluation criteria were not retained for further consideration. A summary of the Trustee's restoration project screening process is provided in Table 3.1.

Both the CERCLA NRDA and NEPA regulations require the Trustees to evaluate a "Natural Recovery" or "No Action" restoration alternative. Under this alternative, the Trustees would take no action to restore injured resources and their services or interim losses associated with the evaluated natural resources.

In addition to the No Action alternative, the following alternatives were retained for detailed evaluation in this Draft RP/EA:

- Alligator Creek Restoration and Conservation
- Battleship North Carolina—Living Water Restoration
- Carolina Beach State Park Restoration
- Indian Creek Natural Resource Restoration and Conservation
- Lower Black River Conservation
- Lower Cape Fear Bottomlands Conservation
- Merrick's Creek Conservation
- Moze Heritage Site Tidal Restoration
- Navassa Stormwater and Riparian Restoration
- Navassa Waterfront Park
- Oyster Reefs Establishment in Lower Cape Fear

The Trustees recognize that although some projects proposed may not satisfactorily meet the second tier evaluation criteria at this time, factors such as the degree of advanced planning, cost (and leverage potential), and implementation readiness may change over time. Accordingly, it is anticipated that some projects that were not retained for further analysis in this Draft RP/EA may be considered, and evaluated further, in future restoration planning efforts.

Given that the proposed restoration alternatives identified in this plan would expend less than half of the total funds available for NRDA, the Trustees will continue to approach restoration planning in phases until all remaining restoration funds are expended. Information about proposed projects that satisfy the criteria outlined in Section 3.3 can be suggested and/or submitted to the Trustee Council at any time until all restoration funds have been expended.

Table 3.1. Screening Table for Restoration Alternatives. Preferred alternatives are highlighted.			Restoration Categories				Eligibility Criteria (Y/N)								Evaluation Criteria (H/M/L)								
Restoration Alternative	Retained for Detailed Evaluation (Y/N)	Alternative Proposed By	Riverine Habitat	Coastal Wetlands	Underwater, intertidal,	Migratory Fish Passage	Meets restoration goals and	Delivers benefits cost-effectively	High probability of success	Provides measurable results	Avoids collateral injury to natural resources	Ensures protection of human health and safety	Is not otherwise required	Compatible with the	Proximity to Site	Relationship to injured	Similarity of habitat functions / ecosystem services benefited	Benefits more than one natural resource and/or service	High degree of resource benefit	Conservation significance	Demonstrates advanced level of planning	Leverages existing resources and/or	Complimentary to existing plans / goals
Alligator Creek Restoration	N	CFRW		x	x		Y	Y	N	Y	Y	Y	Y	Y	H	H	H	H	M	H	L	M	H
Alligator Creek Restoration and Conservation Project	**Y**	**Unique Places**		**x**	**x**		**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**H**
Battleship North Carolina Restoration	**Y**	**Battleship, Moffit and Nichol**		**x**	**x**		**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**H**
Benthos and Water Quality Monitoring	N	UNCW	x	x	x		N	Y	Y	Y	Y	Y	Y	Y	Not evaluated; ineligible because alternative does not deliver benthic uplift								
Black River Conservation and Restoration	N	RES		x		x	Y	N	Y	Y	Y	Y	Y	Y	Not evaluated; ineligible due to cost /benefits								
Brunswick Town / Fort Anderson Shoreline Stabilization	N	SEPI	x	x	x		Y	N	N	Y	Y	Y	Y	Y	Not evaluated; ineligible due to cost /benefits and approach not evaluated under similar riverine conditions								
Canetuck Conservation	N	TNC		x			Y	Y	Y	Y	Y	Y	Y	Y	H	M	M	M	M	H	M	L	M
Cape Fear Lock and Dams 2 and 3 fish passage	N	CFRW			x	x	Y	Y	Y	Y	Y	Y	Y	Y	M	M	M	M	H	H	L	H	H
Cape Fear River Marsh	N	RES		x			Y	N	Y	Y	Y	Y	Y	Y	Not evaluated; ineligible because alternative does not deliver benthic uplift								
Carolina Beach State Park	**Y**	**NCCF**		**x**	**x**		**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**M**	**H**	**H**	**H**	**M**	**H**	**H**	**H**
Conservation /Recreation corridor adjacent to Whitehall Plantation	N	NCCLT		x			Y	Y	Y	Y	Y	Y	Y	Y	H	L	M	M	M	M	L	L	M
Eagles Island Conservation	N			x			Y	N	Y	Y	Y	Y	Y	Y	Not evaluated; ineligible due to cost /benefits								
Indian Creek Natural Resource Restoration and Conservation	**Y**	**Town of Navassa, LMG**		**x**	**x**		**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**
Lower Black River Conservation	**Y**	**TNC**		**x**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**M**	**M**	**H**	**M**	**H**	**H**	**M**	**H**
Lower Cape Fear Bottomlands Conservation	**Y**	**NCCLT**		**x**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**H**
Lower Cape Fear Umbrella Mitigation Bank	N	LMG		x		x	Y	Y	Y	Y	Y	Y	N	Y	Not evaluated; mitigation banking project inconsistent with NOAA guidance on "otherwise required"								
Merrick Creek Conservation	**Y**	**TNC**		**x**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**M**	**H**	**M**	**H**	**H**	**H**	**H**
Moze Heritage Site Restoration	**Y**	**Town of Navassa, LMG**		**x**	**x**		**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**H**	**M**	**M**	**H**	**M**	**M**	**H**
Navassa Stormwater and Riparian Restoration	**Y**	**Town of Navassa, LMG**		**x**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**H**
Navassa Waterfront Park	**Y**	**Town of Navassa, LMG**		**x**			**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
North Brunswick Blueway	N	Town of					N	Y	Y	Y	Y	Y	Y	Y	Not evaluated; ineligible because alternative does not deliver benthic uplift								
Oyster Reefs in the Lower Cape Fear	Y	Audubon NC	x		x		Y	Y	Y	Y	Y	Y	Y	Y	H	M	M	H	H	M	M	H	H
Smith Creek	N	RES			x		Y	N	Y	Y	Y	Y	Y	Y	Not evaluated; ineligible due to cost /benefits								
Sturgeon Creek Community Restoration Project	N	Leland, Kimley Horn		x			Y	Y	Y	Y	Y	Y	Y	Y	Not evaluated; withdrawn from consideration								
Water Quality Best Management Practices to Improve Benthic Community	N	NCDA&CS			x		Y	N	Y	Y	Y	Y	Y	Y	H	L	L	M	M	M	L	M	H

4 Evaluation of Restoration Alternatives

In this section, the Trustees evaluate the restoration alternatives using the evaluation criteria described in Section 3.3. Each of the eleven restoration alternatives identified by the Trustees (Section 3.5) is described in more detail in the following section. Figures 4.1 - 4.3 illustrate the locations of each of the proposed alternatives. Tables 4.1 through 4.12 provide a synopsis of how eligibility and evaluation criteria were met for each proposed alternative. Table 4.13 identifies the Trustees' preferred alternative restoration projects that will accomplish the goal of restoring, rehabilitating, replacing and/or acquiring the equivalent of those natural resources, and the services those resources provide.

Details submitted to the Trustees regarding the preferred alternatives, including proposals and other information about the proposed restoration projects, are provided in the Administrative Record:
https://www.diver.orr.noaa.gov/web/guest/diver-admin-record?diverWorkspaceSiteId=6102

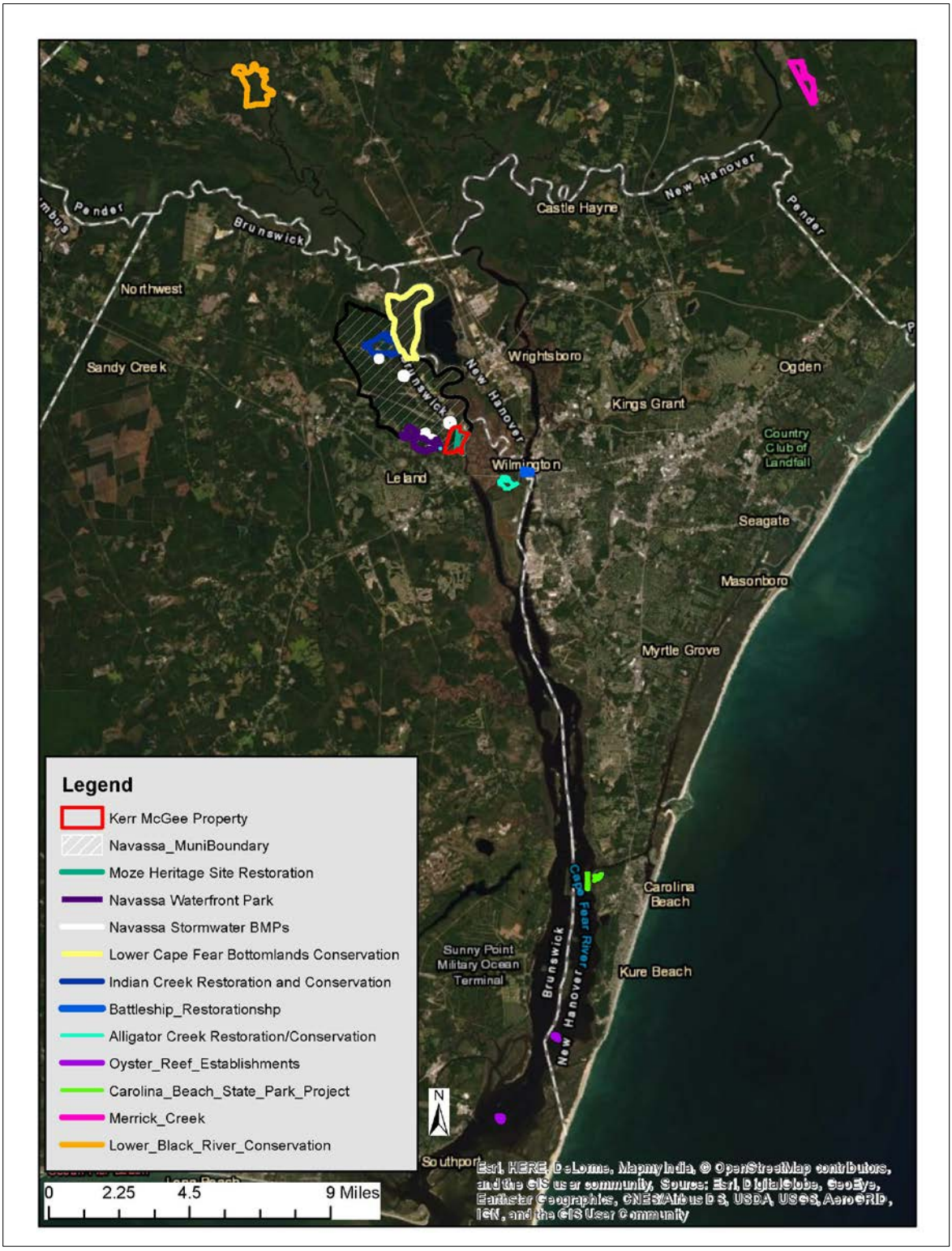

Figure 4.1. Phase I Proposed Restoration Alternative Locations.

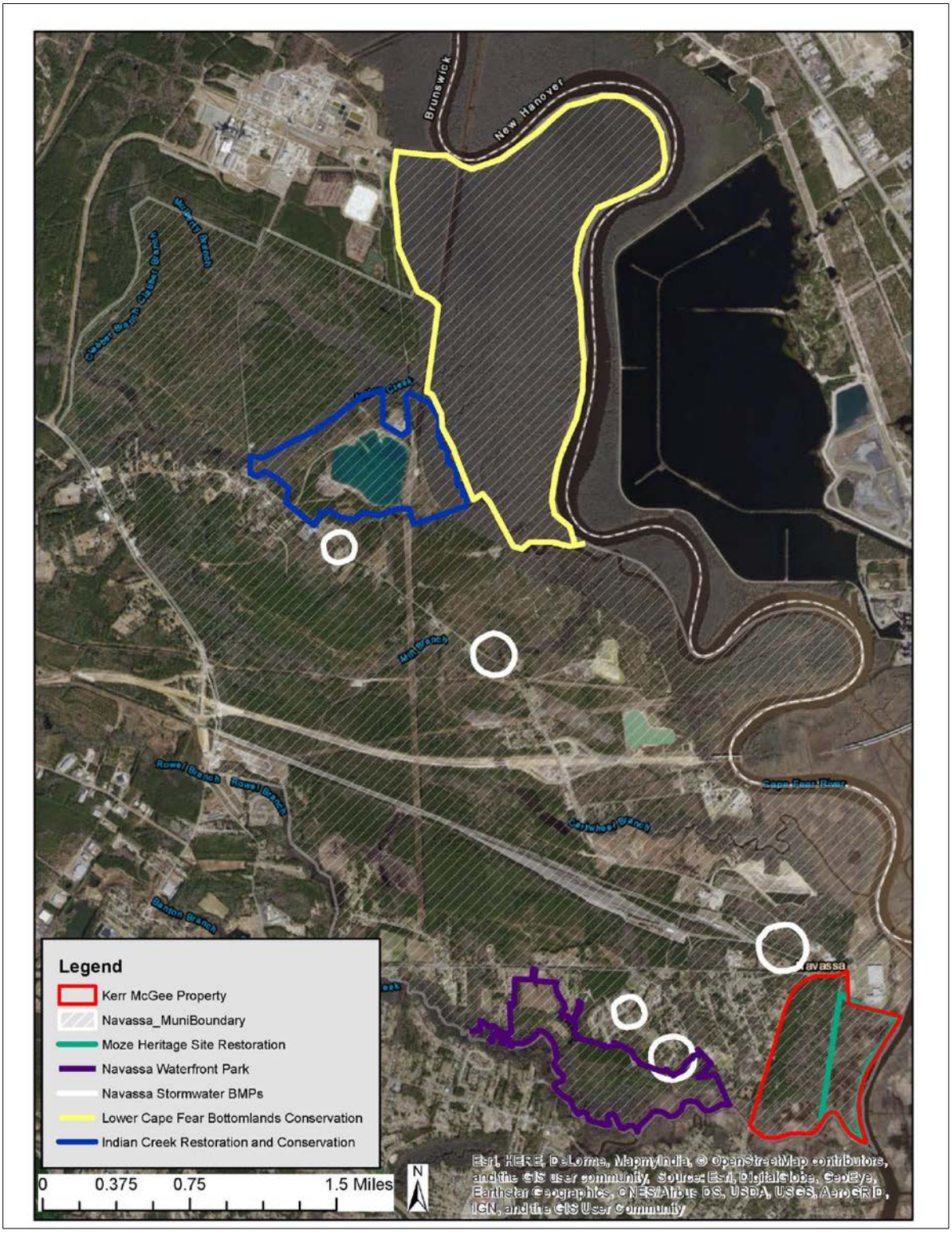

Figure 4.2. Phase 1 Proposed Alternatives located within Navassa Municipal Boundaries.

4.1 *Alternative 1: Alligator Creek Restoration and Conservation (Preferred)*

The proposed restoration project is focused on the restoration of an approximate 3900-ft reach on Alligator Creek and adjacent tidal wetlands (Figure 4.3). Re-establishment of this main channel, and an additional 2000 linear feet (lf) of smaller order creeks, will increase tidal amplitude and restore ecologically significant subtidal and intertidal benthic habitat, as well as Primary Nursery Area. In addition, it will provide ecological uplift to disturbed tidal wetlands currently dominated by the invasive common reed, *Phragmites australis*. Increased tidal exchange resulting from creek restoration will provide for increased refuge and foraging habitat for estuarine-dependent finfish and shellfish while promoting increased primary productivity and detrital export. Diurnal flooding of *Phragmites* stands will reduce its growth and proliferation. In addition, the project will incorporate the restoration and enhancement of tidal riverine wetlands via removal of historic fill material and planting of characteristic hardwood and softwood species (i.e. bald cypress). A berm will also be used to address sea-level rise impacts to the existing sweet gum/cypress wetlands at the site. Native wetland plantings will be used to stabilize restoration design features and provide additional ecological uplift by providing species' preferred habitat.

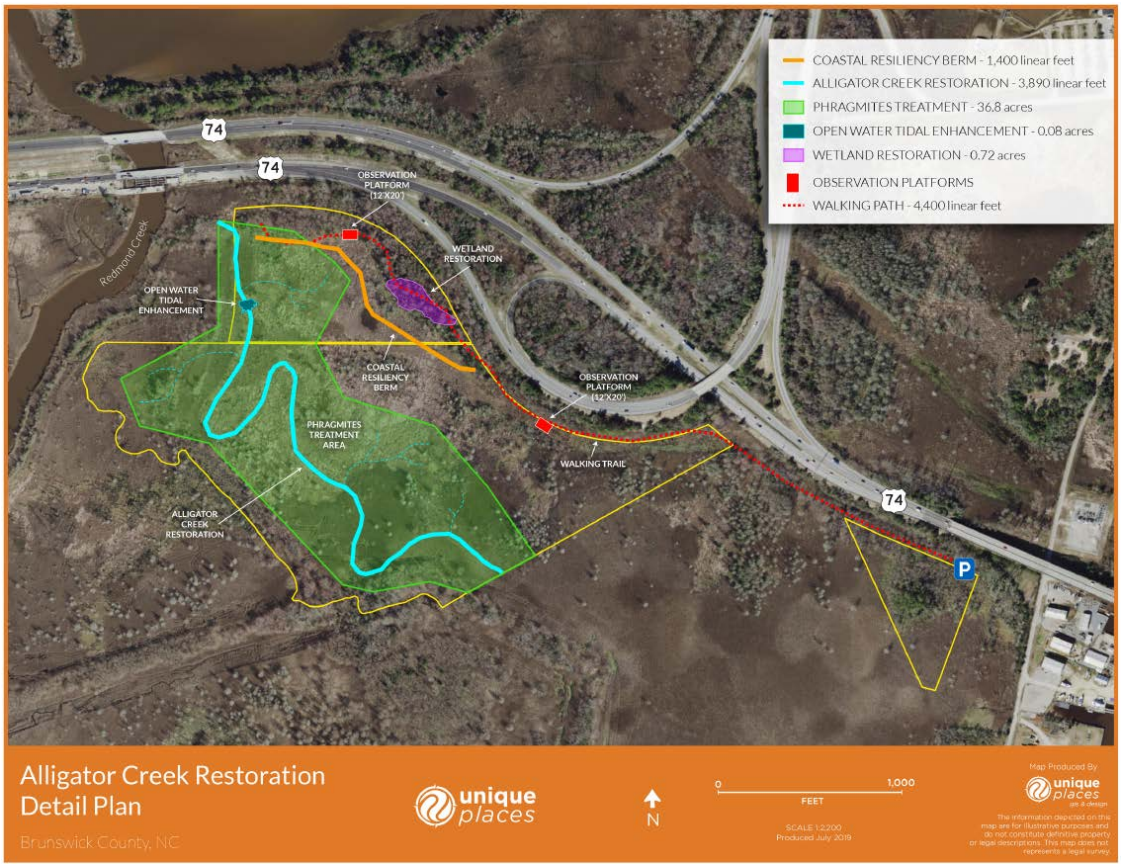

Figure 4.3. Project Footprint for Alligator Creek Restoration and Conservation Project

Restoration design will focus on re-establishment of the pre-existing creek to the extent feasible and will involve gathering and assessing existing conditions (including tidal gauge data, substrate/sediment composition, and elevation data) to assure the resulting tidal prism will be of sufficient size to help maintain channel geometry over the long-term while concurrently avoiding flood risk to adjacent sites. Tidal amplitudes (based upon in-situ tide gauge data and surface marsh elevation data) will be used to model and appropriately size the restored channel. This will ensure that the project will meet the principal design objective (diurnal tidal exchange both within the channel proper and the adjacent marsh surface). The proposed project also identifies a *Phragmites* "treatment" where increased tidal exchange and diurnal flooding to control/restrict *Phragmites* growth, coupled with more novel treatments (e.g., sugar treatment and/or sequential herbicide/mowing treatments) will be implemented. Annual monitoring will be performed for a period of 5 years and will include basic wetland metrics such as hydrology and assessment of *Phragmites* treatments. The proposed alternative also includes site access and interpretation components that support other Brunswick River Blueway routes (existing or proposed) and existing boat and paddle launches, thereby meeting the criteria of providing benefits to multiple resources and services in a cost-effective manner.

The proposed alternative includes hydrologic reconnection, habitat restoration, invasive species removal, and public access components. The estimated project cost of $2,640,750 includes permitting, design/engineering/surveying, construction, monitoring, site access/interpretation, and land acquisition. The land acquisition costs are based on an estimate and an appraisal will be completed prior to acquisition.

Table 4.1. Evaluation of Alligator Creek Restoration and Conservation.

Restoration Criteria	Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)
Meets restoration goals and objectives effectively:	Y; The alternative would secure approximately 80 acres for natural resource enhancement, conservation and tidal restoration. Creates tidal stream in footprint of historic channel and restores coastal wetlands to offset injury.
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Substantial leverage funding.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; Reestablishes tidal stream and restores intertidal and soft bottom shoreline habitat. Evaluation of site changes via long term monitoring is planned. Would provide protection in perpetuity of ~80 acres of priority wetland habitat.
Avoids collateral injury to natural resources:	Y; Poses no long term direct or indirect impacts to injured or other natural resources.

Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Alternative is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Alternative is on Eagles Isl. approximately 2 miles downstream from Site.
Relationship to injured resources:	H; Provides habitat for juvenile finfish and benthic invertebrate communities associated with tidal marsh habitats comparable to those at the Site.
Similarity of habitat functions / ecosystem services benefited:	H; Similar tidal marsh habitat type; the alternative would provide functions such as refuge, foraging, and development for various finfish, avian, and benthic species.
More than one natural resource and/or service:	H; Promotes nutrient uptake, runoff filtration, thermal regulation, bank stability and input for aquatic food webs. Community services include wildlife viewing and environmental education opportunities.
Degree of resource benefit:	H; Substantive and long term ecosystem service flows are anticipated based on the wetland creation and restoration.
Conservation significance:	M; The tidal marsh to be restored/created is within designated Critical Habitat for the Carolina Distinct Population Segment for the Atlantic Sturgeon, a Primary Nursery Area, Essential Fish Habitat, and a Habitat Area of Particular Concern for managed shrimp species.
Advanced level of planning / development:	M; engineering, design, surveying, permitting, and land acquisition yet to be completed; experienced project team; plans for invasive vegetation treatments and detailed survey and monitoring pre and post project.
Leverage:	H; Leveraging funds, partnerships, and services.
Complimentary to existing plans / goals:	H; Conserving/restoring Eagles Island is recognized and supported by many agencies. Restoration of tidal marsh and shoreline habitat for anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.2 *Alternative 2: Battleship North Carolina – Living with Water (Preferred)*

The “Living With Water” alternative proposed near the Battleship North Carolina encompasses the restoration of 800 lf (approximately 1/5 of an acre) of estuarine intertidal shoreline and the creation of approximately 2 acres of intertidal and subtidal estuarine salt marsh habitat (including mud bottom) within a North Carolina Significant Natural Area. The implementation area lies across from downtown Wilmington, North Carolina along the Cape Fear River on Eagles Island, which is comprised of similar habitat types to those present at the Site. The tidal marsh to be

restored/created is within designated Critical Habitat for the Carolina Distinct Population Segment for the Atlantic Sturgeon and within a Primary Nursery Area managed by the North Carolina Division of Marine Fisheries. The alternative will result in the creation of 0.4 acres of new shallow water mud bottom Essential Fish Habitat, also considered a Habitat Area of Particular Concern for managed species including post larvae/juvenile and subadult white shrimp and brown shrimp. The degraded intertidal shoreline proposed to be restored is within the berth of the Battleship and is directly adjacent to the proposed tidal wetland creation area located within the northern third of an existing parking lot subject to routine flooding. Under this alternative, approximately 1.5 acres of impervious surface will be removed to create 2.0 acres of tidal marsh. Regular diurnal tidal flushing would occur within the newly constructed marsh; an area currently covered by a parking lot. The NOAA-Beaufort Laboratory has agreed to serve in a technical advisory capacity and will design a long-term monitoring plan to include evaluation of changes in site elevation, soil characteristics and vegetative community composition over time.

The restored intertidal vegetated shoreline and created tidal marsh will provide habitat for juvenile finfish species such as flounder, red drum, striped bass, American shad, shortnose and Atlantic sturgeon and American eel. Likewise, the benthic invertebrate community associated with tidal marsh habitats at the Kerr-McGee site will be restored or expanded with the completion of this proposed project. It is anticipated that the project will also provide community services including wildlife viewing and environmental education opportunities. .

The frequency and severity of flooding events on this property has dramatically increased over the last three years, causing safety concerns, economic losses and unpredictable conditions on and around the Battleship property. The project design will ensure available space for future migration of tidal marsh habitat and allow for refuge habitat for species from storm and water quality impacts.

The importance of conserving the natural environment of Eagles Island has been highly recognized and supported by many agencies as part of the Eagles Island Coalition Long-Term Management Plan. Additional planning efforts have called for the restoration and protection of critically-important tidal marsh and shoreline habitat for the benefit of anadromous fish and prey species, including the following:

- Critical Habitat Designation for Atlantic sturgeon (NOAA 2016).
- Cape Fear River Basin Action Plan for Migratory Fish (NOAA 2013).
- National Marine Fisheries Service (1998). Recovery Plan for the Shortnose Sturgeon
- The North Carolina Coastal Habitat Protection Plan (CHPP)
- The Cape Fear River Basinwide Water Quality Plan (NCDWQ)

The proposed alternative includes restoration of 800 lf of estuarine intertidal shoreline, creation of 2 acres of tidal marsh, and long-term monitoring. The total estimated project cost for engineering, design, permitting, construction, and monitoring of these components is $1,328,931,

of which $683,931 are requested from the Trustees and $645,000 is proposed from other matching funds.

Table 4.2. Evaluation of Battleship North Carolina—Living with Water.

Alternative #2: Battleship North Carolina Restoration (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Creates and restores coastal wetlands and improves riverine habitat to offset injury.
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Substantial leverage funding.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; creates wetland and restores intertidal and soft bottom shoreline habitat. Evaluation of site changes via long term monitoring is planned.
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Project is on Eagles Island approximately 3 miles from Site.
Relationship to injured resources:	H; Provides habitat for juvenile finfish and benthic invertebrate communities associated with tidal marsh habitats at the Site.
Similarity of habitat functions / ecosystem services benefited:	H; Similar tidal marsh habitat type; the project would provide functions such as refuge, foraging, and development for various finfish, avian, and benthic species.
More than one natural resource and/or service:	H; Promotes nutrient uptake, runoff filtration, thermal regulation, bank stability and input for aquatic food webs. Community services include wildlife viewing and environmental education opportunities.
Degree of resource benefit:	H; Substantive and long term ecosystem service flows are anticipated based on the wetland creation and restoration.
Conservation significance:	M; The tidal marsh to be restored/created is within designated Critical Habitat for the Carolina Distinct Population Segment for the Atlantic Sturgeon, a Primary Nursery Area, Essential Fish Habitat, and a Habitat Area of Particular Concern for managed shrimp species. High level of development pressure.
Advanced level of planning / development:	M; engineering, design and permitting will be completed within 12 months of funding. Pre-project permitting dialog has occurred. The project sponsor owns the project site.
Leverage:	H; Leveraging funds, partnerships, and services.

Complimentary to existing plans / goals:	H; Conserving/restoring Eagles Island is recognized and supported by many agencies. Restoration of tidal marsh and shoreline habitat for anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.3 *Alternative 3: Carolina Beach State Park Restoration (Preferred)*

The Carolina Beach State Park Project alternative consists of two components: 1) benthic and estuarine habitat restoration and 2) tidal marsh restoration (Figure 4.4). The benthic and estuarine habitat restoration component will construct offshore and intertidal and subtidal patch oyster reef habitat, connected by shoreline stabilization structures. The living shoreline design, totaling approximately 5 acres, will stabilize eroding shorelines along the park, and provide fish and benthic habitat. The tidal marsh restoration component will restore tidal hydrology to 13.5 acres of impaired marsh within the park. This will involve removing tidal restrictions, fill removal, and invasive species removal. The habitats restored by the project include salt marsh, tidal marsh, intertidal and shallow subtidal oyster reefs. Additionally, the proposed project will provide protection and enhancement of submerged mudflats, sandy shoals, and the estuarine water column.

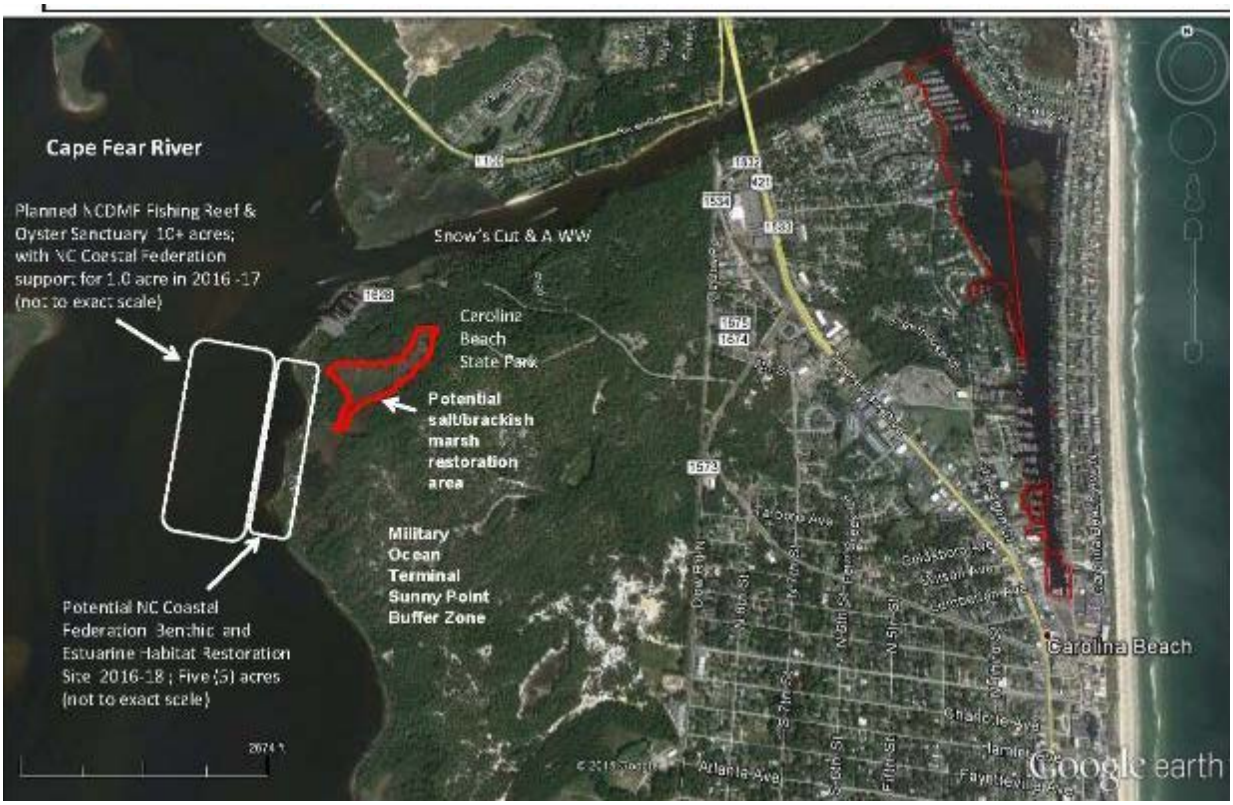

Figure 4.4. Project Footprint for Carolina Beach State Park Project

Benthic and Estuarine Habitat Restoration

This component of the alternative proposes to create benthic and estuarine habitat that will provide spawning, nursery, refuge, and foraging grounds for fish and benthic species in a 5 acre

project area in the lower Cape Fear River adjacent to the park. The stabilization structures will provide storm protection from buffering wave action along coastlines, and create a complex refuge environment for smaller creatures and juvenile organisms, while serving as valuable feeding areas for many larger species of fish, shellfish and birds. The injured resources at the Site, tidal marsh and riverine areas, and the habitats within the proposed project area are also considered Essential Fish Habitat (EFH). The restored habitats' roles as EFH will provide additional benthic uplift. Offshore intertidal and subtidal patch oyster reef will be constructed in patches using shoreline stabilization structures and bagged shell, and separated by submerged and intertidal flats (Figure 4.5). Estuarine shoreline salt marsh and intertidal flats will be created and enhanced through native vegetation plantings and protection from erosion by shoreline stabilization structures.

The estuarine shoreline in the park has experienced significant erosion over the last decade resulting in loss of salt marsh and shallow water benthic habitats.

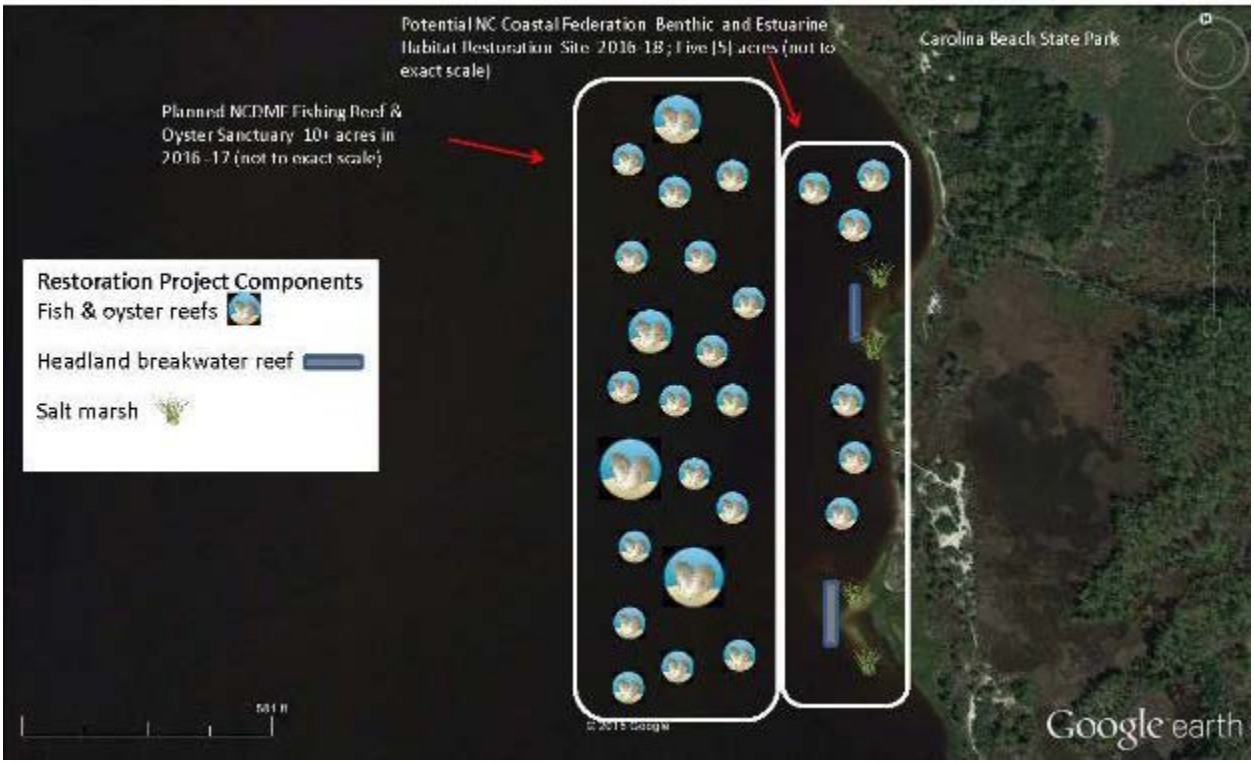

Figure 4.5. Benthic and Estuarine Restoration Design Concept (Carolina Beach)

Tidal Marsh Restoration

The tidal marsh restoration component of the Alterative would return hydrologic and ecological function to 13.5 acres of a highly-degraded marsh within the Carolina Beach State Park. Hydrology is currently inhibited by tidal restrictions along two creeks, and raised elevations due to previous construction activities in that area. The marsh is dominated by the invasive species, *Phragmites*. Two tidal inputs will be widened to increase tidal flow. Natural system elevations will be restored by removing fill. Invasive species will be removed either with burns or an approved herbicide, and area will be replanted with native species (e.g., *Spartina*).

Habitats within the proposed project area are also considered EFH. Federally managed fisheries that will likely utilize this habitat during their life cycles include sturgeon (Atlantic, Short-nosed), shad (American, Hickory), striped bass, red drum, and penaeid shrimp. These species are a food source for additional managed fisheries, and other species of commercial, recreational, or ecological significance, as well as migratory birds. Likewise, the tidal marsh restoration component is expected to improve the quality of habitat used by benthic, pelagic fishery, and migratory bird populations. The proposed alternative is consistent with and supports the following plans:

- The Cape Fear River Basin Action Plan for Migratory Fish
- Cape Fear Arch Conservation Collaboration (CFACC)
- NCDMF Coastal Habitat Protection Plan for Soft Bottom, Shell Bottom, Water Column, and Wetlands
- NCDMF Oyster Fishery Management Plan
- Oyster Restoration and Protection Plan for North Carolina: A Blueprint for Action 2015-2020
- NCDWR Cape Fear River Basin Plan
- NCDMS EEP Watershed Priority Plan for the lower Cape Fear

The total estimated project cost for engineering, design, surveying, permitting, construction, and monitoring of these components is $1,912,383, of which $1,807,383 is requested from the Trustees and $105,000 will be obtained through matching funds.

Table 4.3. Evaluation of Carolina Beach State Park Alternative.

Alternative #3: Carolina Beach State Park (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Creates underwater, intertidal, or shoreline habitat to offset injury.
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Substantial match and leverage funding.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; High degree of uplift to benthic communities and other ecosystem services based on prior results. Includes monitoring effort by UNC IMS, NCDMF and local residents.
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.

Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Project site is located in the Lower Cape Fear Watershed at Carolina Beach State Park, approximately 14 miles from the Site
Relationship to injured resources:	M; focus on benthic and related estuarine habitats provides nexus to the benthic injury quantified at the Site
Similarity of habitat functions / ecosystem services benefited:	H; Augment the hydrologic, biogeochemical and habitat functions provided by the injured habitats at the Site (including water storage, bank stability, nutrient cycling, water quality, and habitat provisions)
More than one natural resource and/or service:	H; Benefits fish, benthos, shellfish, and birds by providing spawning, nursery, refuge and forage habitat. Protects shorelines and promotes water quality.
Degree of resource benefit:	H; Substantive and long term ecosystem service flows are anticipated based on planned creation/enhancement of underwater, intertidal and shoreline habitats.
Conservation significance:	M; Habitats within the project area are considered Essential Fish Habitat.
Advanced level of planning / development:	H; Site analysis and preliminary design; final design and permitting are already complete. Site preparation is complete for tidal marsh restoration component. Project sponsor partner owns the alternative site.
Leverage:	H; Leveraging funds, partnerships, and services.
Complimentary to existing plans / goals:	H; The proposed creation/enhancement of underwater, intertidal and shoreline habitats benefits anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.4 *Alternative 4: Indian Creek Natural Resource Restoration and Conservation Project (Preferred)*

This alternative includes restoration, enhancement, and preservation of several types of habitats endemic to the Lower Cape Fear region along 1.75 miles of Indian Creek, a tributary of the Cape Fear River. The several distinct habitats occurring on the property include tidal blackwater stream, tidal freshwater marsh and tidal freshwater swamp forest (bald cypress-tupelo gum swamp forest). The location for this alternative is on an approximate 310-acre property immediately north of Cedar Hill Road in the community of Navassa, Brunswick County, North

Carolina, approximately 3.3 miles from the Site and centrally located within the town limits of Navassa (Figure 4.1).

Over 142 acres of high-quality tidal freshwater marsh and tidal cypress-gum swamp and 15,050 lf (2.85 miles) of 100 foot buffers along Indian Creek and Molls Branch will be protected in perpetuity along this corridor through a conservation easement. The tidal freshwater habitat is particularly vulnerable due to its limited occurrence and threat of disturbance associated with upland site development. Conservation is important given the intensive development pressures associated with the new I-140 interchange in one of the fastest- growing counties in the state. The site is zoned Residential/ Planned Unit Development (with existing water and sewer capacity) and has a 388-lot preliminary subdivision plat. Restrictive covenants will be recorded for the upland buffers of the property that would prohibit any future land use not consistent with the dedicated uses illustrated in the Conceptual Plan, including public access (Figure 4.6). This corridor extends eastward to the pre-existing Lower Cape Fear Umbrella Mitigation Bank property (where riparian habitats are protected via a conservation easement along Indian Creek and extending the confluence of the Cape Fear River). Consequently, the proposed project would essentially protect nearly all riparian wetlands along development land bordering the shoreline of Indian Creek.

The alternative also includes restoration of tidal freshwater swamp and benthic resources via the removal of an existing road bed along Moll's Branch. Other specific site improvements would include rehabilitation of the existing boat ramp (also known as Halls Landing) and the installation of a small kayak and fishing ramp providing access to Moll's Branch for public use by small, non-motorized watercraft requiring a limited parking area, thereby meeting the criteria to cost-effectively provide benefits to multiple resources and services.

Restoration, enhancement and protection of riverine habitats has been identified as a management goal of both the CHPP and the Cape Fear River Action Plan. The tidal freshwater marsh and tidal cypress-gum swamp fringing this portion of the Cape Fear River and its tributaries are considered of very high significance and are of regional importance for conservation (Cape Fear Arch Conservation Plan, 2015). In addition, the site is located within a Targeted Local Watershed (TLW) of the Cape Fear River Basin.

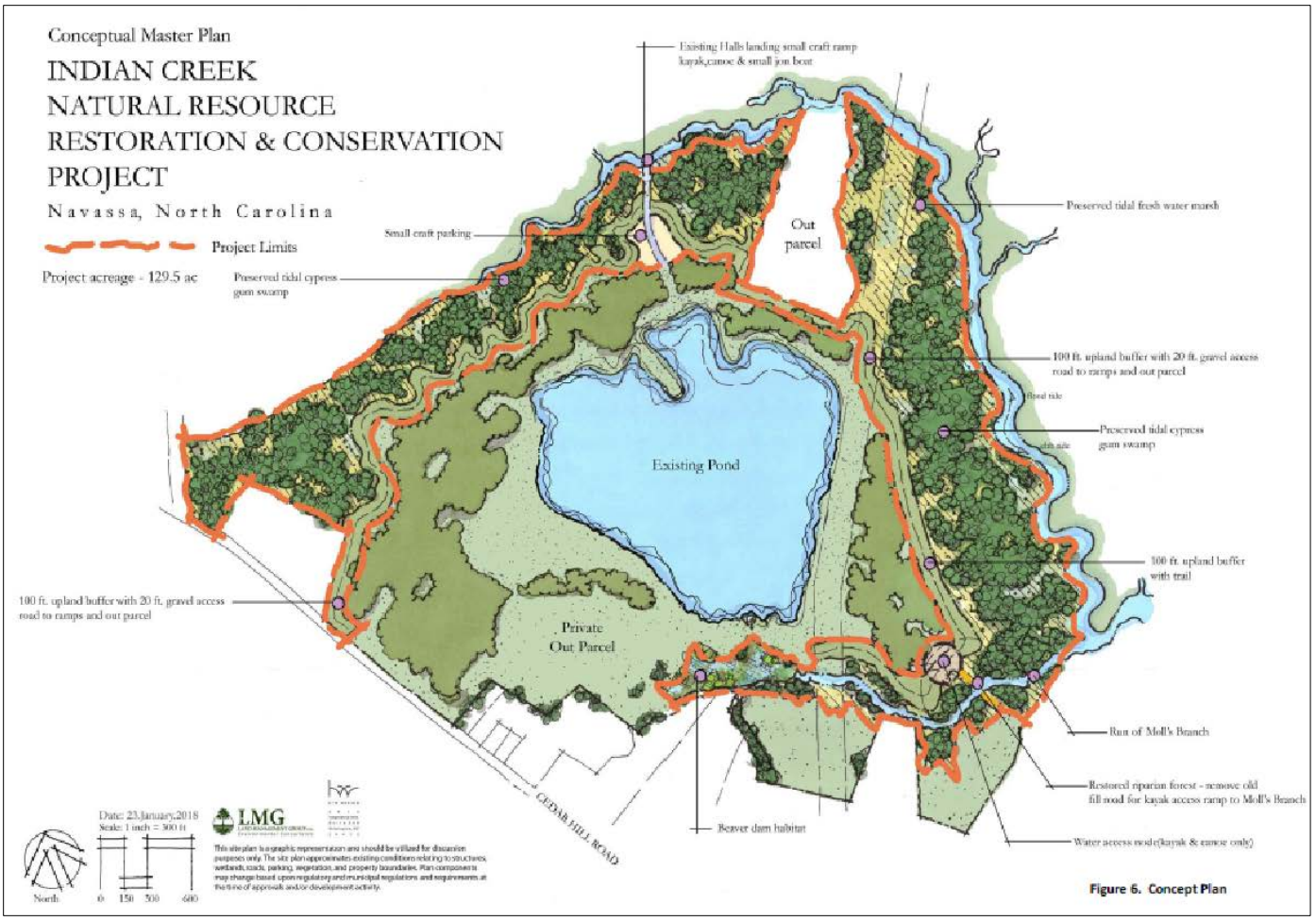

Figure 4.6. Conceptual Plan for Indian Creek Natural Resource Restoration and Conservation Project

The total estimated project cost for land acquisition, surveying/permitting/legal fees, long-term protection, restoration construction, and monitoring is $1,860,000, of which $1,760,000 is requested from the Trustees and up to $100,000 is proposed in matching funds. The land acquisition costs are based on an estimate and an appraisal will be completed prior to acquisition.

Table 4.4. Evaluation of Indian Creek Restoration Alternative.

Alternative #4: Indian Creek Natural Resource Restoration and Conservation (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Includes avoided conversion and restoration within 142 acres of wetlands and 15,050 lf (2.85 miles) of 100 foot buffers along Indian Creek and Molls Branch.
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Reasonable cost/acre estimate for land protection.

High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; Restores wetland habitat and provides perpetual conservation of riparian corridor.
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Project is less than 3.5 miles upstream from the Site and is located within the Navassa town limits.
Relationship to injured resources:	H; Benthic and aquatic resources in the existing tidal freshwater marsh and swamp forest would be protected from the imminent threat of intensive site development.
Similarity of habitat functions / ecosystem services benefited:	H; Like the wetlands at the Site, protection of tidal freshwater wetlands along Indian Creek and Molls Branch will provide nutrient uptake, runoff filtration, thermal regulation, bank stability and input for aquatic food webs. These riparian wetlands will enhance fisheries productivity.
More than one natural resource and/or service:	H; In addition to providing shelter for benthic invertebrates, these riparian wetlands will enhance fisheries productivity. Recreational benefits would also be realized.
Degree of resource benefit:	H; The conversion threat to the proposed project site is high (due to proximity to new interstate and residential zoning onsite); consequently, the degree of benefit associated with avoiding that habitat conversion or development is substantive.
Conservation significance:	H; The project includes the restoration and conservation of natural resources deemed significant to the natural and cultural heritage of the local Navassa community. This habitat is identified as a Significant Natural Heritage Area by the North Carolina Natural Heritage Program and is classified as vulnerable to extinction (due to its limited range of occurrence and threat to degradation). Extreme level of development pressure.
Advanced level of planning / development:	H; The project Sponsor can convey a conservation easement in a timely manner to NCCLT to protect the wetlands on the property and assure compatible site improvements are implemented.
Leverage:	M; Leveraging funds and partnerships.
Complimentary to existing plans / goals:	H; The proposed protection/restoration of tidal freshwater habitat benefits anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.5 *Alternative 5: Lower Black River Conservation (Preferred)*

The proposed Lower Black River Conservation alternative includes conservation of approximately 500 acres of property through fee-simple acquisition and management as part of the Black River Preserve. Restoration funds coupled with committed leveraged funds allow for full acquisition of the 500-acre tract. These lands and waters include tidally influenced swamp forest and wetlands with 5.5 miles of frontage on the Black River (and several old channels) just a few miles upstream of its confluence with the Cape Fear River (Figure 4.7). A portion of the swamp forest was logged about 12 years ago but most, especially near the river, remains intact and contains old-growth bald cypress according to Dr. David Stahle (personal communication) at the University of Arkansas Tree-Ring Lab. Conservation of this site via fee simple acquisition is desirable due to its linkages to other conservation lands and its importance for anadromous fish species and other benthic organisms.

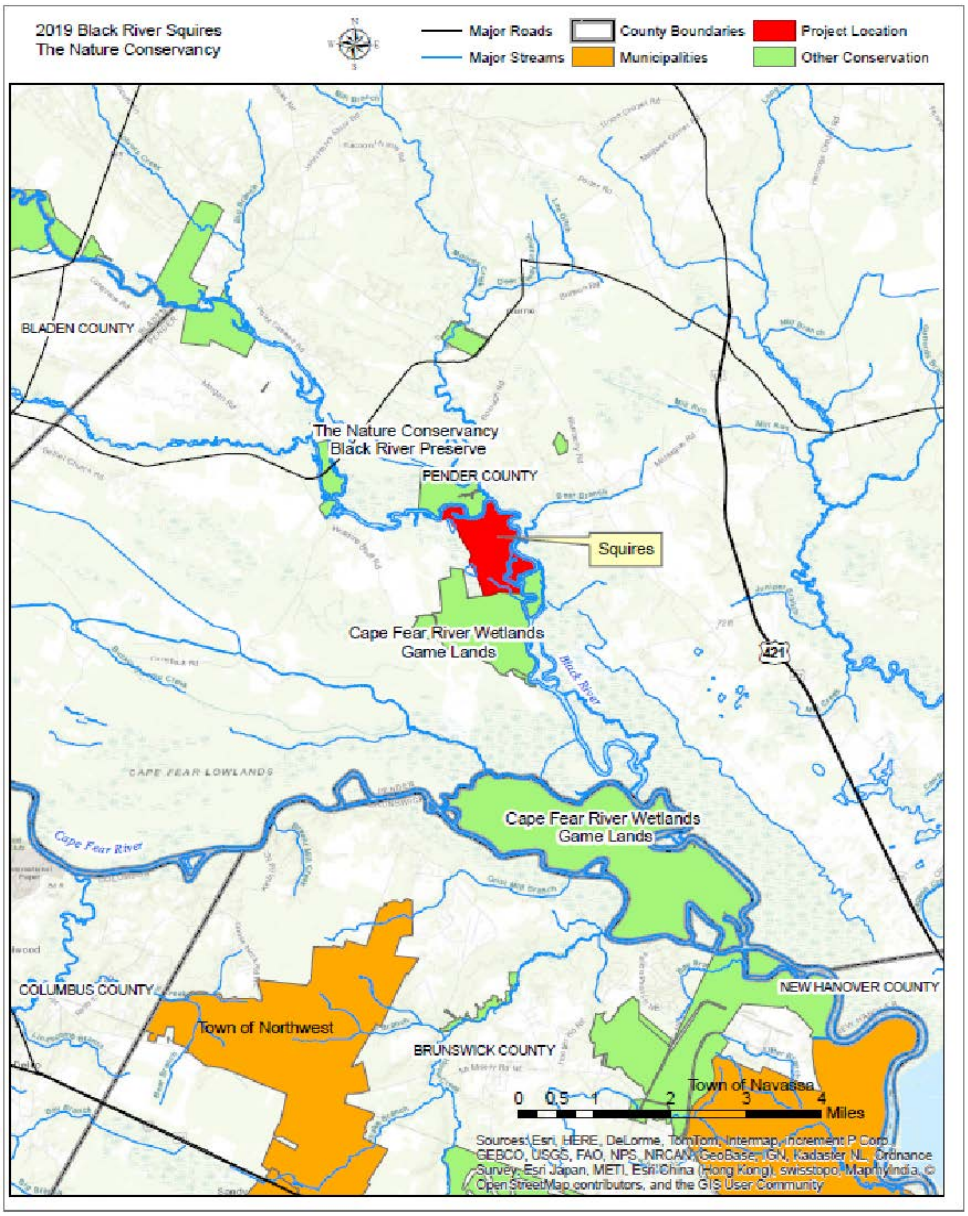

Figure 4.7. Relation of Lower Black River Conservation Alternative to other conservation lands and **recreational opportunities**

Based on the mature forest community, there is an existing threat of habitat conversion due to logging. Accordingly, conservation of these high value wetlands will secure ecosystem services. The project sponsor owns and manages 5,240 acres as the Black River Preserve. The proposed conservation tract is adjacent to part of the Cape Fear River Game Land and across from a tract within the preserve system. Once acquired, this tract would be added to the Black River Preserve.

The mature tidal cypress-gum swamp forest supports a vibrant benthic and finfish community. There is potential for the presence of several significant animals onsite including a waterbird nesting colonies and the Federally threatened Northern Long-eared Bat (*Myotis septentrionalis*) and rare plant species likely present are Green fly orchid (*Epidendrum magnoliae*) and swamp jessamine (*Gelsemium rankinii*). In addition to ecological benefits, it is anticipated that the site will be used recreationally via water access.

The proposed alternative for habitat protection through land acquisition (fee simple purchase) is estimated at $100,000. This amount would be a contribution of approximately 25% towards the total purchase price.

Table 4.5. Evaluation of Lower Black River Conservation Alternative.

Alternative #5: Lower Black River Conservation (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Project would contribute to the protection of 500 acres of tidally influenced swamp forest and wetlands with 5.5 miles of frontage on the Black River (and several old channels) just a few miles upstream of the Cape Fear River confluence
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Reasonable cost/acre estimate for land protection.
High probability of success:	Y; Proven approach, project proponent with prior demonstrated success.
Provides measurable results:	Y; project would contribute to the protection of ~500 acres of tidally influenced swamp forest and wetlands with 5.5 miles of frontage on the Black River. (Fee simple purchase contribution)
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; The project is ~ 12 miles from the Site; just a few miles upstream of the confluence of the Black and Cape Fear Rivers.
Relationship to injured resources:	M; Benthic and aquatic resources dependent upon the integrity of the existing tidal freshwater marsh and swamp forest would be protected. Based on the proximity to the Site and salinity conditions, there is good nexus to the injured benthic community

Similarity of habitat functions / ecosystem services benefited:	M; Like wetlands present at the Site, protection of tidal freshwater wetlands along the lower Black River will provide nutrient uptake, runoff filtration, thermal regulation, bank stability and input for aquatic food webs. These riparian wetlands will enhance fisheries productivity.
More than one natural resource and/or service:	H; The mature tidal cypress-gum swamp forest supports a vibrant benthic and finfish community. Other waterbird nesting colonies, endangered long eared bat, and rare plant occurrences are known in the area. Recreational benefits are also anticipated.
Degree of resource benefit:	M; There is an existing threat of habitat conversion due to logging of the mature forest community onsite, and protection will secure ecosystem services.
Conservation significance:	H; The Black River is designated primary nursery area. Atlantic and shortnose sturgeon, American and hickory shad, blueback herring, alewife and striped bass use the river. The river is designated Outstanding Resource Waters (ORW) and beside the tract is part of the Natural Heritage Program's Exceptionally-ranked Black River Aquatic Habitat. In this lower stretch of the river are 5 rare mussel species tracked by the program. High level of conversion pressure.
Advanced level of planning / development:	H; Project sponsor has a verbal agreement to purchase the property from the existing land owner.
Leverage:	M; Leveraging funds.
Complimentary to existing plans / goals:	H; The proposed protection/restoration of tidal freshwater habitat benefits anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.6 *Alternative 6: Lower Cape Fear Bottomlands Conservation (Preferred)*

The proposed alternative, through land acquisition via fee simple purchase, would conserve over 1,000 acres of relatively pristine riverine habitat along 3.5 miles of the Cape Fear River and almost a mile along Indian Creek, a tributary to the Cape Fear River (Figure 4.1). The mature, forested tidal freshwater wetlands support benthic invertebrates, fish, and birds while allowing for recreational benefits (including future planned use as a gameland and destination for paddlers and small motorized vessels). The conservation tract has been held by the same owner since the 1930's and has not been timbered during this time period. Due to the size of the property and age and type of timber, timbering is a future threat. Development pressures on the property have increased due to the completion of the Wilmington Bypass which will connect Highway 140 in New Hanover County to U.S. 17 in Brunswick County which will be constructed just south of the property. The conservation area is adjacent to, and downstream of, a 1,200-acre conservation easement held by the North Carolina Coastal Land Trust and downstream of the 2,700+acre Roan Island property owned by the North Carolina Wildlife Resources Commission (Figure 4.8).

Benthic and aquatic resources dependent upon the integrity of the existing tidal freshwater marsh and swamp forest would be protected. Tidal freshwater marsh and riverine swamp forests are

important nursery areas for anadromous and resident species of the Cape Fear River. Anadromous species such as American shad, hickory shad, striped bass, alewife, blueback herring, shortnose sturgeon, and Atlantic sturgeon are known to utilize these areas for spawning and larval development. Recreational benefits are anticipated via expanded access as a public gameland and potential ecotourism opportunities in Indian Creek (particularly if implemented in conjunction with alternative 4), which is located directly opposite this parcel on Indian Creek.

The proposed alternative for habitat protection through land acquisition (fee simple purchase) is estimated at $1,500,000. The land acquisition costs included in the budget are based on an estimate and an appraisal would be completed prior to land acquisition.

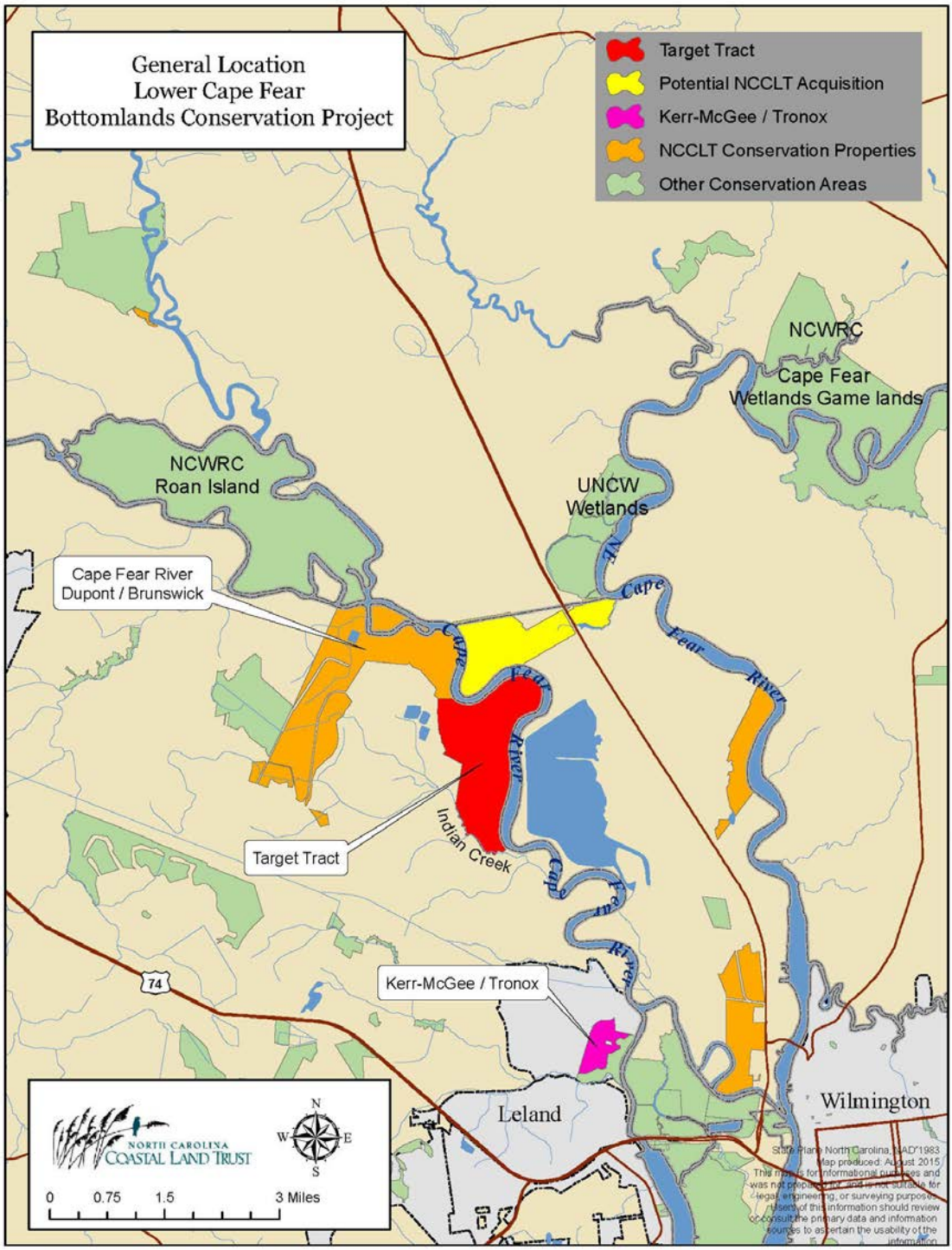

Figure 4.8. Relation of Lower Cape Fear Bottomlands Conservation Alternative to other conservation lands and recreational opportunities

Table 4.6. Evaluation of Cape Fear Bottomland Conservation Alternative.

Alternative #6: Lower Cape Fear Bottomlands Conservation (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Project would conserve over 500 acres of pristine riverine habitat along 3.5 miles of the Cape Fear River and almost a mile along Indian Creek
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Reasonable cost/acre estimate for land protection.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; Provides perpetual conservation of priority riparian habitat. (Fee simple purchase)
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Project is located in Brunswick County an estimated 3-4 air miles or 4-5 river miles north of the Site. Located on opposite bank of Indian Creek to Alt. 4-3.
Relationship to injured resources:	H; Based on the proximity to the Site and salinity conditions, there is good nexus to the injured benthic community.
Similarity of habitat functions / ecosystem services benefited:	H; Like the wetlands at the Site, protection of tidal freshwater wetlands along Indian Creek and the Cape Fear River will provide nutrient uptake, runoff filtration, thermal regulation, bank stability and input for aquatic food webs. These riparian wetlands will enhance fisheries productivity.
More than one natural resource and/or service:	H; Project includes riverine habitat which provides multiple benefits values for aquatic (including sturgeon) and native wildlife species (including a variety of waterfowl, colonial waterbirds, neotropical migratory bird species); thermal regulation, nutrient uptake and runoff and floodwater attenuation.
Degree of resource benefit:	M; The uplift is related to preventing loss of this important wetland community at the confluence of the Cape Fear River and Indian Creek. The conversion (via timbering of this mature bottomland forested wetland) and potential development threats are elevated due to mature timber and recent interstate completion.

Conservation significance:	H; The project contains high value tidal freshwater wetlands of significance adjacent to, and downstream of, a 1,200-acre conservation easement held by the North Carolina Coastal Land Trust and downstream of the 2,700+acre Roan Island property owned by the North Carolina Wildlife Resources Commission. High level of development pressure.
Advanced level of planning / development:	M; Willing seller and planned future management as public game lands (State of North Carolina, Wildlife Resources Commission).
Leverage:	H; Leveraging funds, partnerships, and services.
Complimentary to existing plans / goals:	H; The proposed protection/restoration of tidal freshwater habitat benefits anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.7 *Alternative 7: Merrick Creek Conservation (Preferred)*

The Merrick Creek Conservation alternative proposes to protect approximately 250 acres consisting primarily of tidally influenced swamp forest and 2.5 miles of buffer along Merrick Creek through land acquisition via fee simple purchase. Restoration funds coupled with committed leveraged funds allow for full acquisition of the 250-acre conservation area in Pender County, approximately 4 miles southeast of the town of Rocky Point. The tract is approximately 250 acres along Merrick Creek, one stream-mile upstream from the Northeast Cape Fear River. Merrick Creek flows into Harrisons Creek which then flows into the river 3 miles downstream from the NC 210 bridge. Based on the mature forest community, there is an existing threat of habitat conversion due to logging.

The tract lies within a wildlife conservation corridor identified in The Nature Conservancy's (TNC) Longleaf pine Conservation Plan which maps resilient connections between conservation lands in southeast North Carolina. The tract and several other adjacent tracts form an important block of potential conservation land linking Holly Shelter Game Land and the Onslow Bight region to those in the Bladen Lakes, Brunswick County and beyond. Approximately a mile northeast is TNC's McLean Savanna Preserve and Holly Shelter. Immediately downstream are conservation easements along Harrison Creek and the Northeast Cape Fear River. Protecting plant and animal corridors across the Coastal Plain is essential to the long-term resiliency.

The proposed alternative for habitat protection through land acquisition contribution (fee simple purchase) is estimated at $206,450. This amount would be a contribution of approximately 21% towards the total purchase price; thus meeting the criteria of leveraging funds.

Table 4.7. Evaluation of Merrick Creek Conservation Alternative.

Alternative #7: Merrick Creek Conservation (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Project would contribute to the avoided conversion of ~250 acres and 2.5 miles of buffer along Merrick Creek
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Reasonable cost/acre estimate for land protection.
High probability of success:	Y; Proven approach, project proponent with prior demonstrated success.
Provides measurable results:	Y; Would contribute to the protection in perpetuity of ~250 acres of priority wetland habitat. (Fee simple purchase contribution)
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; The tract is one stream-mile upstream from the confluence of Merrick Creek and the Northeast Cape Fear River and is ~16 miles as the crow flies from the Site.
Relationship to injured resources:	H; Benthic and aquatic resources dependent upon the integrity of the existing tidal freshwater marsh and swamp forest would be protected. Based on the proximity to the Site and salinity conditions, there is good nexus to the injured benthic community.
Similarity of habitat functions / ecosystem services benefited:	M; Like wetlands present at the Site, protection of tidal freshwater wetlands along the lower Black River will provide nutrient uptake, runoff filtration, thermal regulation, bank stability and input for aquatic food webs. These riparian wetlands will enhance fisheries productivity.
More than one natural resource and/or service:	H; Project would connect to a broader landscape of conservation lands and support floodplain resiliency. The mature tidal cypress-gum swamp forest supports a vibrant benthic and finfish community.
Degree of resource benefit:	M; There is an existing threat of habitat conversion due to logging of the mature forest community onsite, and protection will secure ecosystem services. Landowner plans sale in 2020 if not conserved prior to then.

Conservation significance:	H; The proposed conservation tract lies entirely within the Natural Heritage Program's exceptionally significant Northeast Cape Fear Floodplain Natural Area. Several rare plant species found onsite. High level of conversion pressure.
Advanced level of planning / development:	H; The existing landowner is willing to sell the property to the project sponsor at a bargain sale based on the completed appraisal of the site.
Leverage:	H; Leveraging funds, partnerships, and services.
Complimentary to existing plans / goals:	H; The proposed protection/restoration of tidal freshwater habitat benefits anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.8 *Alternative 8: Moze Heritage Site Tidal Restoration (Preferred)*

The proposed alternative is located within the Kerr-McGee Site, currently under the ownership of 1) the Greenfield Environmental Multistate Trust LLC, as Trustee of the Multistate Environmental Response Trust (the Multistate Trust) and 2) the State of North Carolina. Project components include the enhancement of riverine swamp forest along the northeastern portion of the site and the enhancement and preservation of high marsh via the rehabilitation of historic rice field dikes. The alternative would also incorporate permanent walking trails with signage for self-guided tours, as well as the installation of a viewing dock and pier with a kayak launch (Figure 4.9), thereby meeting the criteria of providing benefits to multiple resources and services in a cost-effective manner. Restrictive covenants will be recorded for the upland portion of the property that would prohibit any future land use not consistent with the project design.

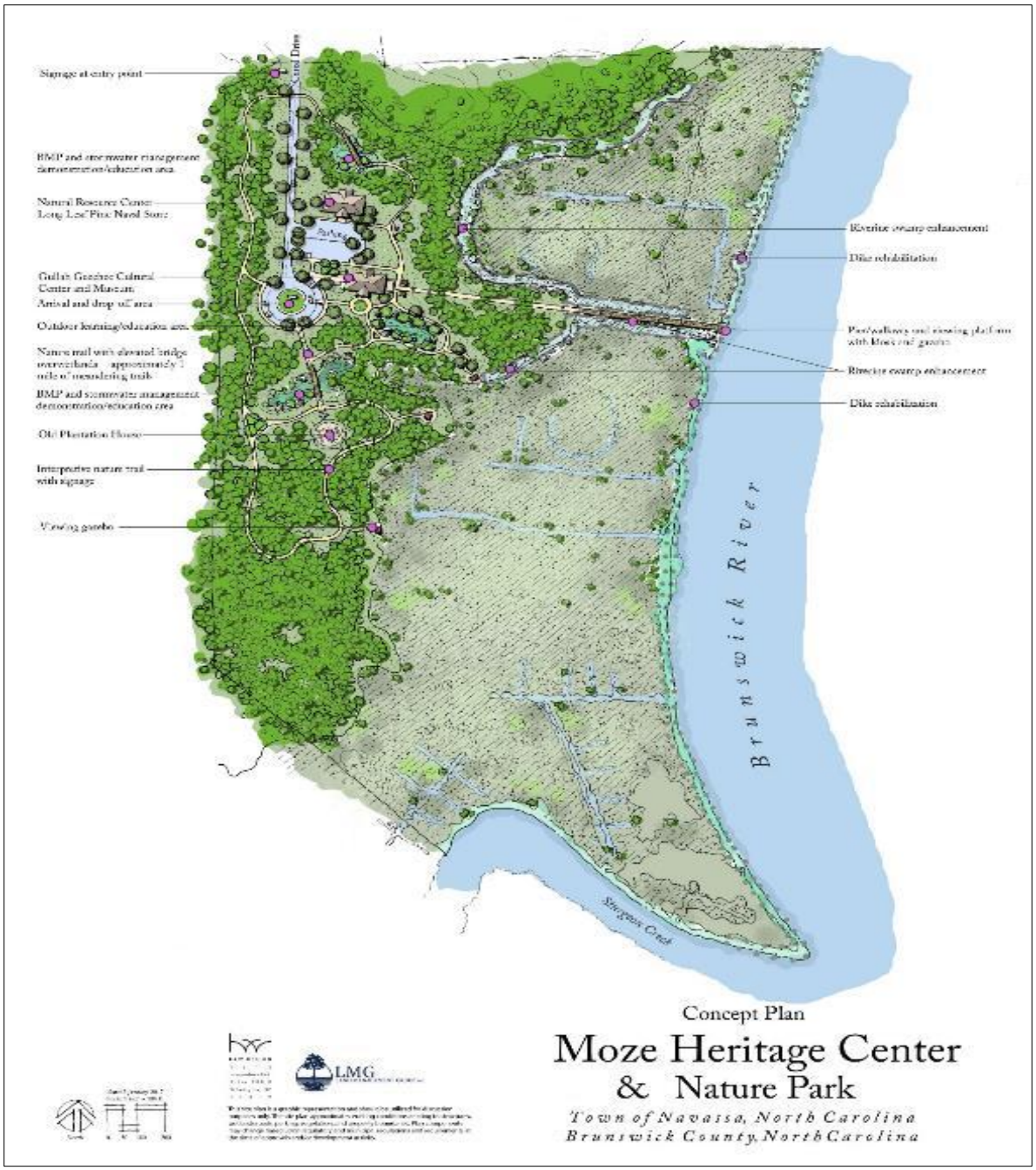

Figure 4.9. Conceptual Design for Moze Heritage Site Tidal Restoration (note that the project features in the upland, including the Heritage Center and museum are not a component of the NRDA alternative)

The alternative provides benefits to multiple habitat types including: tidal blackwater stream; tidal freshwater marsh; tidal freshwater swamp forest (bald cypress-tupelo gum swamp forest); and an intact beaver pond. Cumulatively, the type of habitats to be enhanced and preserved support a suite of rare and endemic species that are regionally significant.

The alternative would include the long-term protection of tidally-influenced, mesohaline marsh and tidal creeks as well as adjacent riverine swamp forest. Restoration of former riverine swamp forest (that historically occupied vast areas along this section of the Brunswick River prior to the deepening of the federal harbor channel) will be achieved by planting of bald cypress (*Taxodium distichum*) and swamp black gum (*Nyssa biflora*) along the fringe of the existing marsh habitat. Restoring characteristic vegetation assemblages provides important water quality benefits for the Brunswick River watershed. Historic rice field dikes would be rehabilitated in this alternative to provide for coastal resiliency to counter the cumulative effects of salt-water intrusion associated with the dredging of the Cape Fear River and with sea-level rise. The rehabilitated dikes will enhance and protect the existing marsh substrate and associated benthic fauna that support recreational and commercially important fisheries while at the same time providing important refuge habitat for species of concern including the black rail (*Laterallus jamaicensis*). The alternative will be an important point of interest along the North Brunswick Blueway (a river trail that extends from Indian Creek in the north to the Brunswick Nature Park in the south), and compliment efforts to connect the region's cultural history with its natural heritage resources.

The proposed alternative includes riverine habitat enhancement, high marsh restoration, habitat protection via easement, and public land and water access components. The estimated project cost of $241,500 includes survey/legal/title fees, staff administration costs, permitting costs, and restoration site improvements including dike rehabilitation, pier construction, and swamp forest enhancement.

Table 4.8. Evaluation of Moze Heritage Site Tidal Restoration Alternative.

Alternative #8: Moze Heritage Site Tidal Restoration (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; The project includes 40 acres for natural resource enhancement, conservation and tidal restoration on the larger 300-acre Site.
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Land protection as in-kind component of project at no cost.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; The project would secure approximately 40 acres for natural resource enhancement, conservation and tidal restoration; Restrictive covenants to assure compatibility of upland development with project design.
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety

Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Onsite.
Relationship to injured resources:	H; Restoration and enhancement in onsite wetlands provide direct nexus to injured resources and services.
Similarity of habitat functions / ecosystem services benefited:	H; Restoration and enhancement in onsite wetlands provide direct benefit to habitat functions and services.
More than one natural resource and/or service:	M; Project components (rehabilitation of the dikes and the planting of bald cypress) would enhance refugia and foraging habitat for resident and migrating fauna and provide greater coastal resiliency. It would also provide recreation opportunities (via hiking, fishing and water access to Sturgeon Creek) while protecting a site of importance to the local community.
Degree of resource benefit:	M; Restoration will provide important water quality and habitat benefits for the Brunswick River watershed and enhance coastal resiliency to counter the cumulative effects of salt-water intrusion.
Conservation significance:	H; This habitat is identified as a Significant Natural Heritage Area is classified as vulnerable to extinction (due to its limited range of occurrence and threat to degradation). The tidal marsh and tidal cypress-gum swamp are considered of regional importance for conservation.
Advanced level of planning / development:	M; The engineering and design of the hydrologic restoration are part of the project scope. The proposed project is highly coordinated between the Town of Navassa, and partners including the NC Coastal Land Trust and the Land Management Group.
Leverage:	M; Leveraging funds, partnerships, and services
Complimentary to existing plans / goals:	H; The proposed protection/restoration of tidal freshwater habitat benefits anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.9 *Alternative 9: Navassa Stormwater and Riparian Restoration (Preferred)*

The Navassa Stormwater and Riparian Restoration alternative includes development of a comprehensive stormwater management plan incorporating both stormwater best management practices (e.g. stormwater wetlands and bio-retention cells), and the conservation and restoration of riparian wetlands and buffers. The Town of Navassa currently does not have a comprehensive stormwater management plan for the retention and treatment of runoff draining to tidal

tributaries of the Lower Cape Fear River. The development of a stormwater management plan will be particularly effective with the increased development pressures within the Town's jurisdictional limits. The proposed alternative seeks to target initial stormwater areas of concern identified by the Town of Navassa. The project locations are located in different catch-basins of local watersheds susceptible to impairment via sediment and nutrient loading. Design and implementation include sites draining into (1) Molls Branch; (2) Indian Creek; (3) Redmon Creek; and (4) Sturgeon Creek. The plans and future construction of these site specific areas will be implemented with the idea of future stormwater design connectivity. As Navassa continues to grow, a fully comprehensive stormwater development plan will be needed, and the proposed alternative will provide a solid foundation for the Navassa community. A November 2015 letter from Mr. Willis, mayor of the Town of Navassa, to the Trustees conveys the importance to the community of stormwater planning and BMP implementation to deal with increasing demands on the Town's drainage system and resultant impacts on local water quality.

The alternative includes two restoration and enhancement areas to improve riparian wetland functions and water quality within downstream receiving waters. One restoration and enhancement area is located downstream of Old Mill Road/Cedar Hill Road and draining into Redmon Creek. Restoration activities would include the removal of historic fill, re-grading of original contours and planting with characteristic riparian hardwood seedlings. In addition, stream enhancement (restoration of floodplain benches and riparian buffer plantings) can be performed along approximately 500 lf of stream reach. The second wetland restoration and enhancement area is located down-gradient of Church Street along riparian wetlands that drain into Sturgeon Creek. Historic fill and debris (e.g. tires and assorted trash) would be removed and replanted with native vegetation.

A significant component of the proposed alternative involves conveyance of conservation easements along tidal riverine wetlands as well as an upland buffer (with a minimum width of 25 ft) from willing landowners to a conservation entity. The alternative would include the preservation of these regionally significant wetlands along the tidally influenced Sturgeon Creek and to link this conservation "blueway" with adjacent properties proposed for preservation (see Alternative 10). Cumulatively (Alternatives 9 and 10), the conservation of the waterfront of these properties would result in nearly 2 river miles of protected blueway just upstream from the Site (beginning less than 700 ft from the Site boundary, see Figure 4.10). The additional conservation areas will also create public pedestrian access to link the Town's multi-use path (from the existing ball fields) to the proposed Navassa Waterfront Park (Alternative 10), thereby meeting the criteria of providing benefits to multiple resources and services in a cost-effective manner.

The proposed alternative includes development of a comprehensive stormwater management plan, implementation of stormwater BMP projects at approximately five sites, conservation and restoration of riparian wetlands and buffers, and stream enhancement components. The estimated project cost of $1,255,000 includes site assessments, survey, engineering and design, site acquisition, permitting, construction, administration, inspection and maintenance costs, and

endowment fees for these project components. The land acquisition costs are based on an estimate and an appraisal will be completed prior to acquisition.

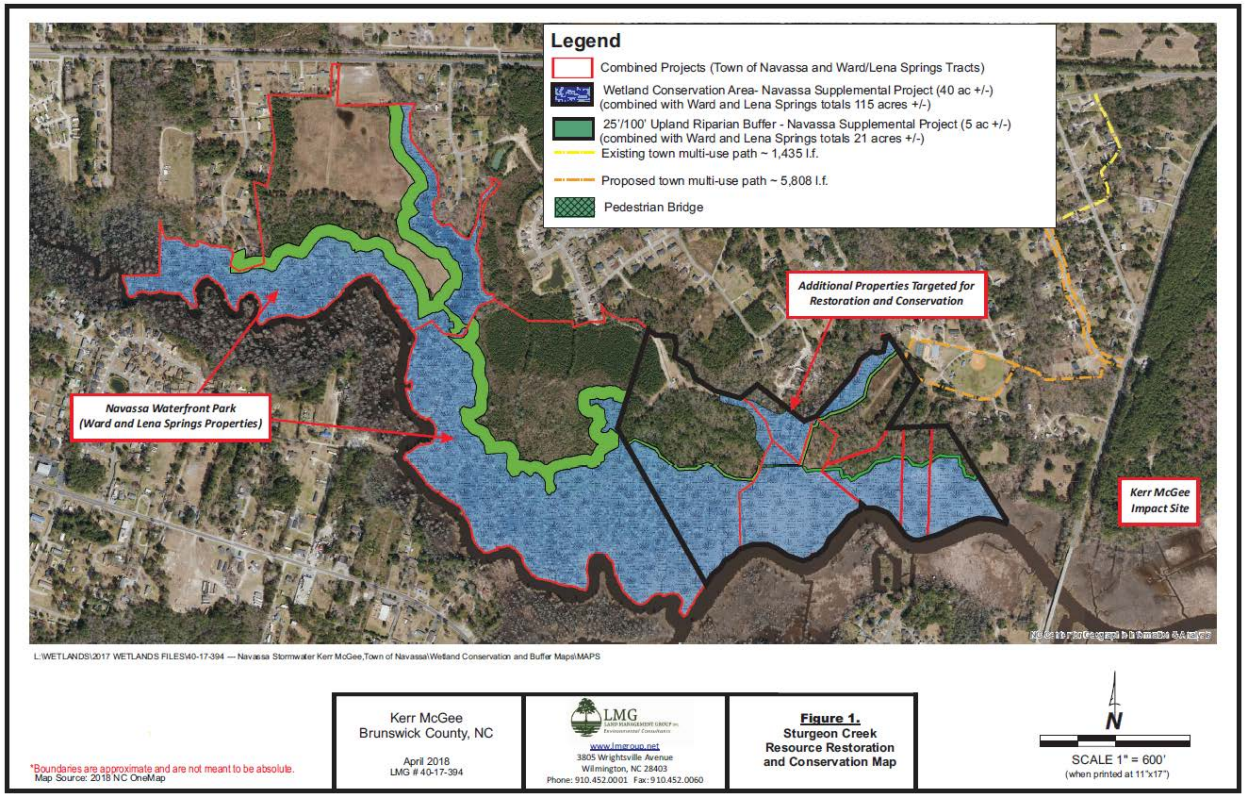

Figure 4.10. Conceptual map for proposed riparian protection and recreational access areas.

Table 4.9. Evaluation of Navassa Stormwater and Riparian Restoration Alternative.

Alternative #9: Navassa Stormwater and Riparian Restoration (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Project would restore wetlands, enhance riverine habitat (via water quality improvement) and avoid conversion of riparian buffer areas in Navassa.
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Reasonable cost/acre estimate for land protection.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; perpetual conservation of riparian zone and immediate upstream area, water quality improvements anticipated to four tidal tributaries to the Cape Fear River.
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.

Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; The proposed project will be implemented in areas just upstream of the Site on Sturgeon Creek and along tributaries to tidal habitats within the Town of Navassa.
Relationship to injured resources:	H; The project will directly benefit down-gradient receiving waters, including Sturgeon Creek, tidal marshes, and the species reliant upon them including benthos, anadromous fish and endangered sturgeon. Species assonated with habitat at the Site are also likely to utilize sites proposed for protection/restoration/enhancement in this project.
Similarity of habitat functions / ecosystem services benefited:	H; Ecosystem services including sediment retention, nutrient absorption and transformation, hydrologic regulation, niche habitat for resident and migratory fauna, and recreational and educational benefits can be achieved that will have a direct benefit to the natural resources and local community of Navassa.
More than one natural resource and/or service:	H; the project provides important riparian buffer functions, but also affords a significant recreational benefit to the local community.
Degree of resource benefit:	H; Increasing development and climate factors make Navassa susceptible to more flooding, water quality impairment, and loss of biodiversity, which will all be addressed in the proposed project.
Conservation significance:	H; The project includes the restoration and conservation of natural resources deemed significant to the natural and cultural heritage of the local Navassa community. High level of development pressure.
Advanced level of planning / development:	M; Site scoping for BMP and restoration/enhancement locations has been completed and conceptual plans for implementation are available. Landowners are willing to convey the necessary conservation easements for wetland and upland buffers and future multiuse public recreational path.
Leverage:	H; Leveraging funds, partnerships, and services
Complimentary to existing plans / goals:	H; The proposed protection/restoration of tidal freshwater habitat benefits anadromous fish and prey species is an identified priority in multiple state and federal plans. Provides recreational connectivity to Alternative 9.

4.10 *Alternative 10: Navassa Waterfront Park (Preferred)*

The proposed alternative consists of two parcels totaling 71 acres located approximately 0.3 miles south of Main Street in Navassa (Brunswick County), North Carolina, and approximately 0.5 miles upstream from the Site. (Figure 4.1). The alternative would secure approximately 50 acres of tidal wetland for preservation through a conservation easement (from landowners to a conservation entity), while the remaining acreage would be used for a community park or public space and access to the bordering waterways. The parcels are bounded by Mill Creek and Sturgeon Creek (tidal freshwater creeks) and adjoining swamp forest wetlands (principally along the southern perimeter of the properties). The alternative contains a unique and ecologically important 7.7-acre freshwater pond ("Ward Pond") with cypress fringe wetland and aquatic vegetation that provides niche habitat for freshwater mollusks, amphibians, and freshwater fish species (including chain pickerel and largemouth bass). The fringe cypress provides roosting habitat for wading birds that utilize adjacent tidal marsh and creeks for feeding and refuge.

The alternative location is immediately south of the Navassa Town Hall and Community Center and thus affords the opportunity for access to lands and waters along Sturgeon and Mill Creeks within walking distance of existing town facilities. There is over 1.5 miles of creek frontage along navigable waters suitable for the recreational use (Figure 4.11).

The proposed alternative would secure 71 acres for natural resource protection, with additional recreational benefit through the installation of a transient boat dock and fishing platform, as well as an integrated pedestrian trail system to include an environmental education and observation area, thereby meeting the criteria of providing benefits to multiple resources and services in a cost-effective manner.

Figure 4.11. Conceptual Design for Navassa Waterfront Park (note that the proposed project components of gazebo and picnic facility are not part of the NRDA alternative)

In addition, the project sponsor will donate a 2-acre upland portion of the property as a waterfront park ("Ward Park"). A restrictive covenant will be recorded for the upland portion of the property that would prohibit any future land use not consistent with the dedicated uses illustrated in Figure 4.11. Matching funds would be provided by the project Sponsor for the implementation of the proposed site improvements (e.g., gazebo and picnic facility). A perpetual conservation easement for the approximate 50 acres of wetlands (including pond) on the property will be conveyed to a third party, non-profit land trust.

Acquisition of adjacent uplands susceptible to imminent threat from residential development will ensure that future habitat loss and degradation is avoided. The alternative would restrict individual pier corridors through the swamp forest and would prevent any future timber harvesting and its associated impacts. The implementation of this alternative will result in direct recreational and community benefits by providing water access to Mill Creek within the Navassa

town limits and within close proximity to existing town facilities. In addition, the property donation and capital improvements from the project sponsor meet the criterion of leveraging funds and cost-effectively providing benefits to multiple resources and services.

The proposed project alternative includes land acquisition, habitat protection via easements, and water and public access components. The estimated project cost of $1,155,352 includes acquisition of conservation easements over wetlands and riparian buffers, survey/legal/permitting fees, endowment fee, recreational site improvements, and monitoring and project management costs. The land acquisition costs are based on an estimate and an appraisal will be completed prior to acquisition.

Table 4.10. Evaluation of Navassa Waterfront Park Alternative.

Alternative #10: Navassa Waterfront Park (Preferred)	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; project avoids conversion of approximately 50 acres of tidal wetland, while the remaining ~210 acres will be developed for recreation (community public space and creek access).
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Reasonable cost/acre estimate for land protection.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; Perpetual conservation of riparian zone and immediate upstream area.
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Located ~ 0.3 miles south of Main Street in Navassa and ~ 0.5 miles upstream from the Site.
Relationship to injured resources:	H; Protected habitats associated with the proposed project lie just upstream of the Site on Sturgeon Creek and along tributaries to tidal habitats within the Town of Navassa.
Similarity of habitat functions / ecosystem services benefited:	Habitat functions and ecosystem service benefits have direct nexus. The tidal marsh community to be restored/enhanced is nearly identical to habitat affected at the Site.
More than one natural resource and/or service:	H; In addition to providing shelter for benthic invertebrates, these riparian wetlands will enhance fisheries productivity. Recreational benefits would also be realized.

Degree of resource benefit:	H; The uplift is related to preventing loss of this important wetland community on Sturgeon and Mill Creeks. The conversion (via buffer clearing and upland residential development) threat is high based on recent interstate completion and residential zoning.
Conservation significance:	H; This habitat is identified as a Significant Natural Heritage Area by the North Carolina Natural Heritage Program and is classified as vulnerable to extinction (due to its limited range of occurrence and threat to degradation). Extreme level of development pressure.
Advanced level of planning / development:	H; The current landowner is willing to implement the project as designed. The project sponsor has developed a concept plan that is compatible with community needs while protecting important tidal wetland habitats.
Leverage:	H; Leveraging funds, partnerships, and services
Complimentary to existing plans / goals:	H; The proposed protection/restoration of tidal freshwater habitat benefits anadromous fish and prey species is an identified priority in multiple state and federal plans. Provides recreational connectivity to Alternative 9.

4.11 *Alternative 11: Oyster Reef Establishment in the Lower Cape Fear River (Non-Preferred)*

The Oyster Reef Establishment in the Lower Cape Fear River alternative proposed to address habitat limitations adjacent to steep-sided dredge spoil islands and marshes in the lower Cape Fear River. These areas provide an opportunity for creation of shallow, intertidal foraging habitat for birds and fish via installation of oyster patch reefs in priority foraging areas for fish and birds in the lower Cape Fear River.

This alternative proposes creation of patch reefs, or low-relief oyster reef clusters in intertidal waters and/or fringing salt marshes along estuarine shorelines with anticipated benefits to include benthic habitat creation, water quality improvement, enhanced forage base for fish and birds, increase biodiversity, and maintenance/protection of shorelines from erosion. The major components of the project include site selection and patch reef design, securing appropriate type and quantity of cultch material, reef construction, and monitoring to determine the success of the restoration. A total of 6 sites are proposed with approximately 1 acre reef creation at each site. Creation of shallow, intertidal invertebrate habitat via patch reef construction can improve water quality, reduce shoreline erosion, improve habitat for fisheries, increase biodiversity, and potentially allow for restoration of marsh or submerged aquatic vegetation, among other benefits.

Ultimately, this alternative is considered non-preferred for the purposes of this Draft RP/EA. The project has been funded separately, and the potential for successful patch reef installation and recruitment of benthic colonization in proximity to dredge spoil islands is being evaluated as

part of an ongoing, but separate, effort. However, there is potential that additional patch reef creation opportunities could be evaluated in future restoration planning phases.

Table 4.11. Evaluation of Non-Preferred Oyster Reef Establishment Alternative.

Alternative #11: Oyster Reefs in the Lower Cape Fear	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	Y; Restores and enhances underwater and intertidal habitat
Delivers benefits cost-effectively:	Y; Cost effective relative to the resource and service losses and expected benefit. Reasonable cost/acre estimate for restoration.
High probability of success:	Y; Proven approach, project team with prior demonstrated success.
Provides measurable results:	Y; Restores intertidal and soft bottom shoreline habitat via reef installation.
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	H; Over 20 miles as the crow flies southeast of the Site in the Lower Cape Fear River.
Relationship to injured resources:	M; Provides habitat for juvenile finfish and benthic invertebrate communities.
Similarity of habitat functions / ecosystem services benefited:	M; The project would provide functions such as refuge, foraging, and development for various finfish, avian, and benthic species.
More than one natural resource and/or service:	H; Promotes nutrient uptake, runoff filtration, thermal regulation, bank stability and input for aquatic food webs.
Degree of resource benefit:	H; Long term ecosystem service flows are anticipated based on the benthic habitat creation and restoration.
Conservation significance:	M; The tidal marsh to be restored/created is within designated Critical Habitat for the Carolina Distinct Population Segment for the Atlantic Sturgeon, a Primary Nursery Area, Essential Fish Habitat, and a Habitat Area of Particular Concern for managed shrimp species.
Advanced level of planning / development:	M; Preliminary design and permitting are underway.
Leverage:	H; Leveraging capacity exists
Complimentary to existing plans / goals:	M; The proposed creation/enhancement of underwater, intertidal and shoreline habitats benefits anadromous fish and prey species is an identified priority in multiple state and federal plans.

4.12 *Alternative 12: No Action*

Under this alternative, the Trustees would take no action to create, restore, or enhance estuarine marsh services. While consideration of the No Action alternative is required by CERCLA and NEPA, this alternative would not meet the requirements and goals of CERCLA and the NRDA process under CERCLA to restore injured natural resources and services. In addition, the restoration funds must be spent on restoration, replacement, rehabilitation, and/or acquisition of the equivalent of injured resources. 42 U.S.C. § 111(i) A No Action alternative does not allow for the spending of the restoration funds in accordance with the Consent Decree.

Table 4.12. Evaluation of No Action Alternative.

Alternative #12: No Action	
Restoration Criteria	**Rationale (Y/N for eligibility criteria; H/M/L for evaluation criteria)**
Meets restoration goals and objectives effectively:	N; Does not offset injuries caused by the Release.
Delivers benefits cost-effectively:	Not applicable.
High probability of success:	N; Interim losses due to release not addressed with equivalent restoration.
Provides measurable results:	Not applicable
Avoids collateral injury to natural resources:	Y; Poses no long term or indirect impacts to injured or other natural resources.
Ensures protection of human health and safety:	Y; Poses no unacceptable risks to public health and safety
Is not otherwise required:	Y; Project is not mandated by other policies, statutory or legal requirements.
Compatible with the remediation process:	Y; Does not impact anticipated or planned remedial actions at the Site.
Proximity to Site:	Not applicable
Relationship to injured resources:	Not applicable
Similarity of habitat functions / ecosystem services benefited:	Not applicable
More than one natural resource and/or service:	Not applicable
Degree of resource benefit:	L; Does not offset injuries caused by the Release.
Conservation significance:	Not applicable
Advanced level of planning / development:	Not applicable
Leverage:	Not applicable
Complimentary to existing plans / goals:	L; Does not address priorities in existing plans

4.13 *Alternatives Proposed for Selection*

The overall objective of the restoration process is to make the environment and public whole for injuries to natural resources and/or service losses resulting from the release. To meet that objective, the benefits of restoration actions must be related, or have an appropriate nexus, to the natural resource injuries and losses. To achieve this fundamental objective, the Trustees are proposing restoration alternatives 1 – 10 to compensate the public for the natural resource injuries. These projects best met all eligibility and screening criteria.

Alternatives 11 and 12 are non-preferred alternatives, and are not proposed for selection. Alternative 11 has been funded outside of the NRDA process. However, there is potential for additional restoration actions related to this alternative to be considered in future restoration planning phases, as the alternative was evaluated and scored highly.

The Trustees estimate restoration implementation for these preferred alternatives at approximately $11.35 million, based on current project proposals and budgets (Table 4.13). Actual costs may differ depending on future contingencies. As described earlier, the Trustees will continue to approach restoration planning and public review in phases until all remaining restoration funds are expended.

Table 4.13. Cost Estimate for Phase I Preferred Restoration Alternatives.

Restoration Alternative		Estimated Cost
1	Alligator Creek Restoration and Conservation	$2,640,750
2	Battleship North Carolina Restoration	$683,931
3	Carolina Beach State Park Restoration	$1,807,383
4	Indian Creek Restoration	$1,760,000
5	Lower Black River Conservation	$100,000
6	Lower Cape Fear Bottomlands Conservation	$1,500,000
7	Merrick Creek Conservation	$206,450
8	Moze Heritage Site Tidal Restoration	$241,500
9	Navassa Stormwater and Riparian Restoration	$1,255,000
10	Navassa Waterfront Park	$1,155,352

Estimated Cost for Phase I Restoration Implementation	**$11,350,366**

5 NEPA Environmental Consequences

This section describes the federal Trustees' NEPA analysis of the environmental consequences arising from the proposed actions. For the proposed actions identified in this Draft RP/EA, the appropriate context for considering potential significance of the actions is local as opposed to national or worldwide.

5.1 *Impact Definitions*

This Draft RP/EA describes and compares the potential impacts of the proposed action and alternatives, including the No Action alternative. This Draft RP/EA analyzes the potential direct, indirect, and cumulative ecological, social, cultural, and economic impacts associated with the alternatives.

The following definitions were generally used to characterize the nature of the various impacts evaluated with this Draft EA.

Short-term or long-term impacts. These characteristics are determined on a case-by-case basis and do not refer to any rigid time period. In general, short-term impacts are those that would occur only with respect to a particular activity or for a finite period. Long-term impacts are those that are more likely to be persistent and chronic.

Direct or indirect impacts. A direct impact is caused by a proposed action and occurs contemporaneously at or near the location of the action. An indirect impact is caused by a proposed action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action. For example, a direct impact of erosion on a stream might include sediment-laden waters in the vicinity of the action, whereas an indirect impact of the same erosion might lead to lack of spawning and result in lowered reproduction rates of indigenous fish downstream.

Minor, moderate, or major impacts. These relative terms are used to characterize the magnitude of an impact. Minor impacts are generally those that might be perceptible but, in their context, are not amenable to measurement because of their relatively minor character. Moderate impacts are those that are more perceptible and, typically, more amenable to quantification or measurement. Major impacts are those that, in their context and due to their intensity (severity), have the potential to meet the thresholds for significance set forth in Council of Environmental Quality (CEQ) NEPA regulations (40 C.F.R. § 1508.27) and, thus, warrant heightened attention and examination for potential means for mitigation to fulfill the requirements of NEPA.

Adverse or beneficial impacts. An adverse impact is one having adverse, unfavorable, or undesirable outcomes on the man-made or natural environment. A beneficial impact is one

having positive outcomes on the man-made or natural environment. A single act might result in adverse impacts on one environmental resource and beneficial impacts on another resource.

Cumulative impacts. CEQ regulations implementing NEPA define cumulative impacts as the "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (40 C.F.R. § 1508.7) Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time within a geographic area.

5.2 *Affected Environment*

This section describes the general environmental setting that may be affected by the restoration alternatives proposed in this Draft RP/EA. It includes information on the physical, biological, and cultural/human use environments at the watershed level, as well as more specific resources that may be affected—either beneficially or adversely—by the preferred alternatives previously described and evaluated in Section 4. The majority of alternatives will be implemented in and around the town of Navassa.

5.2.1 The Physical Environment

The physical environment of the alternatives includes the Lower Cape Fear River Watershed (subbasin 03-06-17) in the coastal plain with slow moving, tannin stained tributary streams and the large Cape Fear River estuary and tidal creeks (NCDWQ 2005). Habitats found in this watershed include, but are not limited to, forested terrestrial, tidal marsh (freshwater and estuarine), freshwater swamp, and riverine. The geologic makeup of the North Carolina coastal region consists of a crystalline basement complex, overlain by a layered wedge of semi-consolidated sedimentary bedrock units. Overlying the sedimentary formations are more recent, unconsolidated sediment deposits. This sedimentary wedge thickens to about 10,000 feet toward the Atlantic coast, and contains the significant aquifers of the northern coastal plain. The area is underlain by intervals of fine sand, intermittent zones of silty to clayey sands, and medium to fine sands. This surficial layer is underlain by a zone of finer grain material (silty sand with silty clay, clayey sand and clay) of 5 to 10 feet thick under the site. Groundwater in the surficial layer throughout Brunswick County is typically encountered 5 to 10 feet below the surface.

Due to industry, development, and agricultural land use in the area, the watershed receives point and non-point source water pollution, but is considered a fairly well-flushed system with a median flushing time of seven days (Ensign et al., 2004).

The area has high air quality, with Wilmington ranked as one of the cleanest cities in the nation in terms of ozone, year-round particle pollution, and short-term particle pollution (State of the Air, 2018).

5.2.2 The Biological Environment

The affected environment includes a variety of habitats supporting fish, shellfish, birds, and other wildlife. Habitats within the affected environment include forested terrestrial, tidal marsh (bordering the south and east uplands), and riverine (Sturgeon Creek and the Brunswick River) areas. The surface water pathway downstream of the site is characterized by riverine and wetland habitats and supports primary nursery areas, spawning, and feeding for fish and shellfish species of sport and commercial importance. Threatened and endangered species may be present in Brunswick and New Hanover counties, and may potentially occur in the project areas (Appendix B).

The tidal freshwater marshes, Sturgeon Creek and the Brunswick River are important habitats for the American eel, American shad, blueback shad, the federally-listed endangered shortnose and Atlantic sturgeon, and striped bass populations. Endangered and threatened sturgeon have been captured, tagged, and tracked in the Cape Fear River Estuary and specifically in the Brunswick River adjacent to the Site (Moser and Ross 1993). The area also includes Habitat of Particular Concern for penaeid shrimp species (brown and white shrimp).

The environment includes essential fish habitat for juvenile finfish including flounder, red drum, striped bass, American and hickory shad, shortnose and Atlantic sturgeon, and American Eel. Additionally, the area exists within the designation of Critical Habitat for the Atlantic Sturgeon and within a Primary Nursery Area managed by NCDMF.

The North Carolina Natural Heritage Program (NCNHP) has identified a number of Significant Natural Heritage Areas in this area, including the Lower Cape Fear River Aquatic Habitat (described as the Cape Fear River from its merger with the Northeast Cape Fear River south to Smith Island), and the Sturgeon Creek Tidal Wetlands. The Lower Cape Fear River provides wildlife habitat for a number of rare animals. The Sturgeon Creek Tidal Wetlands natural area has been identified for the good example of Tidal Freshwater Marsh Cattail Subtype natural community that occurs along Sturgeon Creek and Mill Creek, as well as rare plants that occur in the natural area.

The environment supports herbaceous vegetation including a variety of as salt and intertidal marsh grasses, as well as multiple hardwood species including old growth bald cypress, and tupelo gum. The invasive common reed (*Phragmites australis*) is outcompeting native species in many of the salt and brackish marshes.

5.2.3 Cultural and Historical Resources

The Cape Fear River has played a central role in North Carolina's history, beginning with the Cape Fear Indians who inhabited the area prior to European settlements in the region. The river has been a key transportation route throughout the state's history and was designated an official port of entry in Colonial times. The area later became a profitable location for plantations, bringing in slave labor which included the Gullah Geechee culture. The Gullah Geechee people

were the enslaved workers on rice, indigo and cotton plantations on the South Atlantic coast who mostly originated from West Africa and developed a unique culture from this history. (https://Gullah Geecheecorridor.org/theGullah Geechee/) The Town of Navassa has strong ties to the Gullah Geechee culture, and Wilmington is the northernmost point of the Gullah Geechee Corridor that extends south to Jacksonville, Florida. There is significant interest in preserving and educating the public on this heritage.

This area later proved to be a productive crop land, especially for rice, attracting plantation owners to settle and develop plantations in the mid-late 1730s. Two plantations were located near the Town of Navassa's current location (Willis, 1991). Those two plantations were Sturgeon Creek plantation (landowners from 1737 to 1907) and Bluff Plantation (landowners from 1735 to1800). Bluff Plantation was eventually sold and divided into multiple plantations, thus continuing to use slave labor to farm well after the landowner changes of 1800. In 1869, the Navassa Guano factory began operation on one of the parcels that had originally been part of the Bluff Plantation. The factory operated two business; farming rice and making Guano (a type of fertilizer) to sell to local farmers. Around this time, the railroad was built, which connected Navassa more directly to the rest of the state.

With the discovery of phosphate in South Carolina, the fertilizer industry shifted direction from Guano, resulting in the sale of Navassa Guano to Morris Fertilizer Company in 1917. After several other sales and expansions, Navassa became home to four fertilizer factories. The multiple factories provided jobs, becoming attractive to previously enslaved families as well as new residents. In 1977, Navassa was incorporated as a municipality. Other industrial operations were drawn to this area, including Kerr-McGee Chemical Corp., which operated a wood-treating plant from 1936 to 1980. Due to the creosote used at this facility, the EPA placed the site on the Superfund Program's National Priorities List (NPL) in 2010 because of contaminated groundwater, soil and sediment caused by facility operations.

5.2.4 The Social and Economic Environment

The Town of Navassa is located along the Brunswick and Cape Fear rivers, and covers an area of approximately 14 miles (Figure 2.1). The town's location along the Cape Fear River was another main factor (along with the Navassa Guano Factory and the railroad expansion) that allowed for the area's economic growth.

According to the 2010 Census data, the Town of Navassa's population is between 1,500-2,000 people (1,505 people in 2010). There has been considerable population growth occurring over the last several decades with the annexation of the nearby communities of Phoenix, Old Mill and Cedar Hill in 2001. The broader tri-county area that includes Brunswick, New Hanover and Pender counties is one of the fastest growing areas in the nation, with a projected population growth of 90 percent by 2040 (nhcgov.com). Counties associated with this subbasin are expected to see significant population increases by 2020 (NCDWQ).

According to the 2010 Census, Navassa is a predominantly African American community (63.6 percent) with 21.5 percent of individuals living below poverty level. This is in comparison to Brunswick County, which only has a population of 11.4 percent African American, and New Hanover County, with a 14.8 percent African American population. According to the 2012-2017 American Community Survey estimates, 15.4 percent of households in Navassa earn an income of less than $10,000 as compared to Brunswick County with only 7.2 percent of households earning less than $10,000 per year (which is approximately the same level for the state average).

The Brunswick and Cape Fear rivers support important commercial and recreational fisheries. Anadromous fish, which spend most of their life in salt water, return to freshwater habitats in the Cape Fear River watershed to spawn. Anadromous species that use waters in the assessment area include striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), blueback herring (*Alosa aestivalis*), alewife (*Alosa pseudoharengus*), Atlantic sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) and the shortnose sturgeon (*A. brevirostrum*) (CFRW 2009). All of these fish populations in the Cape Fear River are a small fraction of historical levels. Although current commercial landings are 87 percent lower than estimated peak landings in the early 1800s, migratory fish still help support an estimate $273 billion commercial and recreational fishing industry. To protect the diminished fish populations, state and federal agencies have limited or banned the directed harvest of many of anadromous fish species in the Cape Fear River including sturgeon, striped bass, shad, and river herring (CFRP 2012).

5.3 *Consequence Analysis for Restoration Alternatives*

This section describes the environmental consequences for the relevant affected resources for preferred, non-preferred, and No Action alternatives.

The range of alternatives and associated restoration strategies are listed below (Table 5.1).

Table 5.1. Summary of Restoration Strategies for Evaluated Alternatives.

#	Alternative	Debris Removal	Wetland Restoration and Enhancement	Shellfish Reef Restoration	Shoreline Stabilization	Invasive Species Control	Conservation Easement
1	Alligator Creek		X			X	
2	Battleship Restoration	X	X		X		
3	Carolina Beach Restoration		X	X	X	X	

4	Indian Creek Restoration		X				X
5	Lower Black River Conservation						X
6	Lower Cape Fear Bottomlands Conservation						X
7	Merrick Creek Conservation						X
8	Moze Heritage Site Restoration		X				
9	Navassa Stormwater and Riparian Restoration	X	X		X		X
10	Navassa Waterfront Park						X
11	Oyster Reefs in Lower Cape Fear (*non-preferred*)			X			
12	No Action	--	--	--	--	--	--

5.3.1 Alternative 1: Alligator Creek

The proposed alternative includes 1) approximately 3900 ft of subtidal and intertidal habitat restoration on Alligator Creek, and 2,000ft of creek tributaries, 2) fill material removal, 3) *Phragmites* removal, and 4) site access via trails. Environmental consequences associated with Alternative 1 are summarized below (Table 5.2).

Table 5.2. Impacts of Alligator Creek Restoration and Conservation Alternative.

Environmental Consequences	Alternative 1: Alligator Creek Restoration and Conservation
Physical Resources	
Hydrology and Water Quality	Short-term, direct, minor, adverse impacts to hydrology and water quality would occur during construction due to turbidity. Impacts from earth moving activities would be minimized using best management practices.

	Invasive species removal methods are not expected to have short or long-term, direct or indirect, adverse or beneficial impacts to water quality. Long-term, direct and indirect, beneficial impacts to water quality and hydrology would occur through improved hydrological flow from wetland restoration.
Air Resources	Short-term, direct, minor, adverse impacts to air resources would occur from exhaust emissions during construction. No anticipated long-term beneficial or adverse impacts to air resources.
Sediment/Geology	Short-term, direct, minor adverse impacts to sediments and geology would occur during construction due to moving sediments and substrate. Impacts from earth moving activities would be minimized using best management practices. Long-term, direct, beneficial impacts to sediments and geology would occur from hydrologic reconnection of the tidal creek.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	Short-term, direct, minor, adverse impacts to fish and associated habitats would occur in the immediate vicinity of the project site during construction, due to potential for construction noise and disturbances. No long-term, direct or indirect, adverse impacts to fish and estuarine habitats are anticipated. Wetland restoration would provide long-term, direct and indirect, beneficial impacts to fisheries species by creating new habitats for feeding and shelter for fish and benthic species, including species of recreational and commercial importance including flounder, red drum, and striped bass. Invasive species removal would have long-term, direct, beneficial impacts for fish by improving habitat quality. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	Short-term, direct, minor, adverse impacts to wildlife would occur in the immediate vicinity of the project site during construction, due to potential for construction noise and disturbances. No long-term, direct or indirect adverse impacts would occur due to construction. Habitat restoration would provide long-term, direct and indirect, beneficial impacts by creating new wetland and intertidal habitats for birds and other estuarine wildlife.
Socioeconomics	
Cultural and Historical Resources	There are no known cultural or historical resources that would be negatively impacted during activities in or around the proposed alternative areas. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.

Recreation	No anticipated short- or long-term, direct or indirect, adverse impacts to recreation and tourism because these activities do not currently exist at and around the project site. Long-term, direct and indirect beneficial impacts are anticipated for tourism and recreational use within the project area because proposed actions are expected to improve habitat quality, and provide public access.
Transportation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No anticipated short- or long-term, direct or indirect, adverse impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.2 Alternative 2: Battleship Restoration (Preferred)

The proposed alternative includes 1) removing concrete debris to prepare the living shoreline planting area, 2) stabilizing 800 lf of shoreline using wetland plants, 3) removing 1.5 acres of pavement to excavate 2 acres for restoration, and 4) restoring 2 acres of wetland including shallow tidal creeks. Environmental consequences associated with Alternative 2 are summarized below (Table 5.3).

Table 5.3. Impacts of Battleship North Carolina—Living With Water Alternative.

Environmental Consequences	Alternative 2: Battleship North Carolina—Living With Water
Physical Resources	
Hydrology and Water Quality	Short-term, direct, minor, adverse impacts to hydrology and water quality would occur during construction due to turbidity. Impacts from earth moving activities would be minimized using best management practices. Long-term, direct and indirect, beneficial impacts to water quality and hydrology would occur through erosion control, and shoreline stabilization and protection from wetland restoration and shoreline planting.
Air Resources	Short-term, direct, minor, adverse impacts to air resources would occur from exhaust emissions during construction. There are no anticipated long-term beneficial or adverse impacts to air resources.
Sediment/Geology	Short-term, direct, minor adverse impacts to sediments and geology would occur during construction due to moving sediments and substrate. Impacts from earth moving activities would be minimized using best management practices.

	Long-term, direct, beneficial impacts to sediments and geology would occur from pavement removal in the restoration area, and the creation and restoration of natural habitats.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	Short-term, direct, minor, adverse impacts to fish and benthic communities in the immediate vicinity of the project site would occur during construction, due to potential for construction noise and disturbances. No long-term, direct or indirect adverse impacts would occur due to construction. Wetland restoration and wetland planting would provide long-term, direct and indirect, beneficial impacts by creating new wetland and shoreline habitats for feeding and shelter for fish and other estuarine species including sturgeon species, shad species, penaeid shrimp, and other federally managed species. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	Short-term, direct, minor, adverse impacts to wildlife in the immediate vicinity of the project site during construction would occur, due to potential for construction noise and disturbances. No long-term, direct or indirect adverse impacts would occur due to construction. Wetland restoration and wetland planting would provide long-term, direct and indirect, beneficial impacts by creating new habitats for birds and other resident wildlife.
Socioeconomics	
Cultural and Historical Resources	Long-term, direct, beneficial impacts for the USS North Carolina cultural and historical resource, due to anticipated visitor usage increases in the surrounding area. There are no known cultural or historical resources that would be negatively impacted during activities in or around the proposed project area. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	Short-term, minor, direct and indirect adverse impacts to tourism during construction may occur due to noise disturbances. Long-term, direct beneficial impacts are anticipated for tourism and recreational use would occur with decreased flooding following restoration.
Transportation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No anticipated short- or long-term, direct or indirect, adverse impacts to public health and safety. Minor, beneficial impacts to public health and safety would occur with the reduction of flooding during rain and storm events.

Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.3 Alternative 3: Carolina Beach Restoration (Preferred)

The proposed alternative includes 1) excavating upland adjacent to an impaired marsh to create wetland, 2) stabilizing the shore using living shoreline techniques, 3) restoring shellfish reefs and salt marsh using oyster bags, oyster domes, and salt marsh plugs in a 5-acre footprint, and 4) eradicating invasive species (primarily *Phragmites australis*) in the area to be restored to wetland. Environmental consequences associated with Alternative 3 are summarized below (Table 5.4).

Table 5.4. Impacts of Carolina Beach Restoration Alternative

Environmental Consequences	Alternative 3: Carolina Beach State Park Restoration
Physical Resources	
Hydrology and Water Quality	Short-term, direct, minor, adverse impacts to hydrology and water quality would occur during construction due to turbidity. Impacts from earth moving activities would be minimized using best management practices. Short-term, direct and indirect, minor, adverse impacts to hydrology and water quality would occur during herbicide application for invasive species removal. Long-term, direct and indirect, beneficial impacts to water quality and hydrology would occur through intertidal and shoreline stabilization, improved oyster filtering capacity from restored oyster habitat, as well as improved hydrological flow from wetland restoration.
Air Resources	Short-term, direct, minor, adverse impacts to air resources would occur from exhaust emissions during construction. No anticipated long-term beneficial or adverse impacts to air resources.
Sediment/Geology	Short-term, direct, minor adverse impacts to sediments and geology would occur during construction due to moving sediments and substrate. Impacts from earth moving activities would be minimized using best management practices. Long-term, direct, beneficial impacts to sediments and geology would occur from hydrologic reconnection of the tidal creek, as well as new substrates from oyster reef creation.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	

Fish & Habitats	Short-term, direct, minor, adverse impacts to wildlife would occur in the immediate vicinity of the project site during construction, due to potential for construction noise and disturbances. No long-term, direct or indirect, adverse impacts to fish and estuarine habitats are anticipated. Wetland and oyster habitat restoration would provide long-term, direct and indirect, beneficial impacts to fisheries species by creating new habitats for feeding and shelter for fish and benthic species, including species of recreational and commercial importance including flounder, red drum, and striped bass. Invasive species removal would have long-term, direct, beneficial impacts for fish by improving habitat quality. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	Short-term, direct, minor, adverse impacts to wildlife would occur in the immediate vicinity of the project site during construction, due to potential for construction noise and disturbances. No long-term, direct or indirect adverse impacts would occur due to construction. Habitat restoration would provide long-term, direct and indirect, beneficial impacts by creating new wetland, shoreline, and intertidal habitats for birds and other estuarine wildlife.
Socioeconomics	
Cultural and Historical Resources	There are no known cultural or historical resources that would be negatively impacted during activities in or around the proposed alternative areas. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	Short-term, minor, direct and indirect adverse impacts to tourism during construction may occur due to noise disturbances. Long-term, direct and indirect beneficial impacts are anticipated for tourism and recreational use within the park because proposed actions are expected to improve habitat quality and stability at a popular recreational destination.
Transportation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No anticipated short- or long-term, direct or indirect, adverse impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.4 Alternative 4: Indian Creek Restoration (Preferred)

The proposed alternative includes 1) placing a conservation easement on 142 acres of freshwater marsh and cypress gum swamp on Indian Creek, 2) placing a conservation easement on 100' riparian buffer (2.85 miles), 3) removing the existing road bed along Moll's Branch to restore hydrologic connectivity to a freshwater swamp, and 4) improving water access at existing launch. Environmental consequences associated with Alternative 4 are summarized below (Table 5.5).

Table 5.5. Impacts of Indian Creek Restoration Alternative.

Environmental Consequences	Alternative 4: Indian Creek Restoration
Physical Resources	
Hydrology and Water Quality	Short-term, direct, minor, adverse impacts would occur to hydrology and water quality when removing the road bed at Moll's Branch due to turbidity. Long-term, direct and indirect, beneficial impacts to hydrology and water quality would occur with the hydrologic reconnection. The conservation easement will provide direct, long-term, beneficial impacts to hydrology and water quality by preventing development and other habitat degrading activities.
Air Resources	Short-term, direct, minor, adverse impacts to air resources would occur from exhaust emissions and dust during road bed removal. The conservation easement will provide direct, long-term, beneficial impacts to air resources by protecting habitats and resources.
Sediment/Geology	Short-term, direct, minor adverse impacts to sediments and geology would occur at the road bed site during removal. The conservation easement will provide direct, long-term, beneficial impacts to sediments and geology by protecting and preserving habitats and resources in the project area.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	Short-term, direct, minor adverse impacts to fish and their habitats would occur from earthmoving activities at Moll's Branch. Long-term, minor, direct and indirect, beneficial impacts to fish, aquatic wildlife and vegetation would result from increased aquatic habitat with the removal of the road bed at Moll's Branch. Long-term, direct and indirect, beneficial impacts for fish species (including shad, alewife, herring, and sturgeon) and their habitat would occur as a result of new management of land and water resources, and the prevention of future development. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.

Wildlife & Habitats	Short-term, direct, minor adverse impacts to wildlife and their habitats would occur from earthmoving activities at Moll's Branch. Long-term, minor, direct and indirect, beneficial impacts to aquatic wildlife and vegetation would result from increased aquatic habitat with the removal of the road bed at Moll's Branch. Long-term, direct and indirect, beneficial impacts for aquatic and terrestrial species and habitat would result from new management of land and water resources, and the prevention of future development.
Socioeconomics	
Cultural and Historical Resources	There are no known cultural or historical resources that would be negatively impacted during restoration because the project site avoids significant cultural and historical resources. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	Long-term, direct and indirect, beneficial impacts would occur through the conservation easement, and potential for future recreational activities in areas around the restoration site.
Transportation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to transportation
Public Health and safety	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.5 Alternative 5: Lower Black River Conservation (Preferred)

This alternative proposes to contribute to the acquisition of 499 acres of tidally influenced bald cypress and gum swamp forest habitat through fee simple purchase. The property borders the lower Black River a few miles upstream from its confluence with the Cape Fear River. This is a fee simple acquisition and preservation alternative with no proposed construction. Environmental consequences associated with Alternative 5 are summarized below (Table 5.6).

Table 5.6. Impacts of Lower Black River Conservation Alternative.

Environmental Consequences	Alternative 5: Lower Black River Conservation
Physical Resources	
Hydrology and Water Quality	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to water resources, air resources, or sediment and geology. The conservation easement would result in long-term, direct and indirect, beneficial impacts to physical resources though
Air Resources	
Sediment/Geology	

	prevention of development actions and protection of high-quality habitat.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to fish or wildlife, or their habitats. Long-term minor direct and indirect benefits to fish and wildlife and their habitats are anticipated since the acquired land will be removed from development or conversion pressure, and management can be implemented to control invasive species or complete other activities beneficial to fish and wildlife. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	
Socioeconomics	
Cultural and Historical Resources	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to cultural or historical resources. A letter of concurrence will be requested prior to the release of the Final RP/EA.
Recreation	No short- or long-term, direct or indirect, adverse or beneficial impacts to recreation.
Transportation	No short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No short- or long-term, direct or indirect, adverse or beneficial impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.6 Alternative 6: Lower Cape Fear Bottomlands Conservation (Preferred)

This alternative includes land acquisition to conserve 1,000 acres of mature, forested tidal freshwater forested wetlands along 3.5 miles of the Cape Fear River and approximately 1 mile along Indian Creek. This is a fee simple purchase and preservation alternative with no proposed construction. Environmental consequences associated with Alternative 6 are summarized below (Table 5.7).

Table 5.7. Impacts of Lower Cape Fear Bottomlands Conservation Alternative.

Environmental Consequences	**Alternative 6: Lower Cape Fear Bottomlands Conservation**
Physical Resources	

Hydrology and Water Quality	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to water resources, air resources, or sediment and geology. The conservation easement would result in long-term, direct and indirect, beneficial impacts to physical resources though prevention of development actions and protection of high-quality habitat for fish, birds, and other wildlife.
Air Resources	
Sediment/Geology	
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to fish or wildlife, or their habitats. Long-term minor direct and indirect benefits to fish and wildlife and their habitats are anticipated since the acquired land will be removed from development or conversion pressure, and management can be implemented to control invasive species or complete other activities beneficial to fish and wildlife. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	
Socioeconomics	
Cultural and Historical Resources	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to cultural or historical resources. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	No short- or long-term, direct or indirect, adverse or beneficial impacts to recreation.
Transportation	No short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No short- or long-term, direct or indirect, adverse or beneficial impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.7 Alternative 7: Merrick Creek Conservation (Preferred)

This alternative proposes to contribute to the acquisition and protection of 152 acres of mature tidal cypress gum swamp forest and 40 acres of pine-dominated wetlands. This is a fee simple purchase and preservation alternative with no proposed construction. Environmental consequences associated with Alternative 7 are summarized below (Table 5.8).

Table 5.8. Impacts of Merrick Creek Conservation Alternative.

Environmental Consequences	Alternative 7: Merrick Creek Conservation
Physical Resources	
Hydrology and Water Quality	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to water resources, air resources, or sediment and geology. The conservation easement would result in long-term, direct, beneficial impacts to physical resources though prevention of development actions and protection of high-quality habitat.
Air Resources	
Sediment/Geology	
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to fish or wildlife, or their habitats. Long-term minor direct and indirect benefits to fish and wildlife and their habitats are anticipated since the acquired land will be removed from development or conversion pressure, and management can be implemented to control invasive species or complete other activities beneficial to fish and wildlife.
Wildlife & Habitats	
Socioeconomics	
Cultural and Historical Resources	There are no construction activities associated with this action; therefore, there would be no short- or long-term, minor or major, adverse impacts to cultural or historical resources. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	No short- or long-term, direct or indirect, adverse or beneficial impacts to recreation.
Transportation	No short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No short- or long-term, direct or indirect, adverse or beneficial impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.8 Alternative 8: Moze Heritage Site Tidal Restoration (Preferred)

This alternative includes 1) enhancing riverine swamp forest along the northeast portion of the Site through planting bald cypress and black gum trees, 2) enhancing and preserving high marsh through rehabilitation of historic rice field dikes, 3) protecting habitat via conservation easement, and 4) providing recreational access through kayak launch, dock, and trail system.

The NEPA Analysis is restricted to NRDA-eligible portions of the project (as referenced in Section 4). Environmental consequences associated with Alternative 8 are summarized below (Table 5.9).

Table 5.9. Impacts of Moze Heritage Site Restoration Alternative.

Environmental Consequences	Alternative 8: Moze Heritage Site Tidal Restoration
Physical Resources	
Hydrology and Water Quality	Minor, short-term, direct, adverse impacts to water resources would occur due to proposed earth moving activities associated with the dike activities. Long-term, direct and indirect, beneficial impacts to hydrology and water resources would occur from riparian plantings and the resultant trapping of sediments and decreased erosion.
Air Resources	Short-term, direct, minor, adverse impacts would occur to air resources from exhaust emissions and dust during dike rehabilitation activities. No anticipated long-term beneficial or adverse impacts to air resources are anticipated.
Sediment/Geology	Short-term, direct, adverse impacts to sediment would occur from substrate disruptions during earth moving activities. Long-term, direct, beneficial impacts would occur to sediments due to sediment trapping and reduced erosion from riparian plantings.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	Short-term, direct, minor adverse impacts to fish and habitats would occur from earthmoving disturbances associated with the dike work. Long-term, minor, direct and indirect, beneficial impacts to swamp and estuarine habitat, and the species they support, would occur through the upper marsh and riverine swamp restoration and enhancement activities. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	Short-term, direct, minor adverse impacts to wildlife and their habitats would occur from earthmoving disturbances associated with the dike work. Long-term, minor, direct and indirect, beneficial impacts would occur to swamp and estuarine habitat, and the species they support, through the habitat restoration and enhancement activities.
Socioeconomics	
Cultural and Historical Resources	There are no known cultural or historical resources that would be negatively impacted during restoration because the project site avoids significant cultural and historical resources. A letter of

	concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	Long-term, direct and indirect, beneficial impacts are expected with potential for future recreational and tourism activities in areas around the restoration site.
Transportation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to transportation
Public Health and safety	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.9 Alternative 9: Navassa Stormwater and Riparian Restoration (Preferred)

This alternative includes 1) placing a conservation easement and 25' upland buffer along tidal creeks, 2) restoring riparian wetlands, 3) removing fill associated with an old rail crossing, 4) grading of the streambank contour once the fill is removed, 5) removing tires, trash, and other debris along a tributary to Sturgeon Creek, and 6) riparian planting following debris removal.

The NEPA Analysis is restricted to NRDA-eligible portions of the project (as referenced in Section 4). Environmental consequences associated with Alternative 9 are summarized below (Table 5.10).

Table 5.10. Impacts of Navassa Stormwater and Riparian Restoration Alternative.

Environmental Consequences	Alternative 9: Navassa Stormwater and Riparian Restoration
Physical Resources	
Hydrology and Water Quality	Minor, short-term, direct, adverse impacts to hydrology and water quality would occur due to proposed earth moving activities associated with fill removal, rail removal, and stream bank grading activities. Long-term, direct and indirect, beneficial impacts to hydrology and water resources would occur from restoration activities. Wetland planting would retain sediments and reduce erosion, as well as the potential to reduce water temperatures and improve dissolved oxygen holding potential. The stormwater management actions are expected to improve water quality and hydrology in and around the restoration site.
Air Resources	Minor, short-term, direct, adverse impacts to air resources would occur during construction activities. No anticipated long-term beneficial or adverse impacts to air resources are anticipated.

Sediment/Geology	Minor, short-term, direct, adverse impacts to sediments and geology would occur due to proposed earth moving activities associated with fill removal, rail removal, and stream bank grading. Long-term, direct, beneficial impacts would occur due to sediment trapping and erosion reduction from riparian restoration.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	Short-term, direct, minor adverse impacts to fish and habitats would occur from earthmoving activities associated with rail, fill, and debris removal. Long-term, minor, direct and indirect, beneficial impacts to swamp and estuarine habitat, and the species they support (including sturgeon), would occur through the habitat restoration and enhancement activities. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	Short-term, direct, minor adverse impacts to terrestrial wildlife and habitat would occur from earthmoving activities associated with rail, fill, and debris removal. Long-term, minor, direct and indirect, beneficial impacts would occur to swamp and upland habitat, and the species they support, through the habitat restoration and enhancement activities.
Socioeconomics	
Cultural and Historical Resources	There are no known cultural or historical resources that would be negatively impacted during restoration because the project site avoids significant cultural and historical resources. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	Long-term, direct and indirect, beneficial impacts are expected with potential for future recreational and tourism activities in areas around the restoration site.
Transportation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to transportation
Public Health and safety	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.10 Alternative 10: Navassa Waterfront Park (Preferred)

This alternative includes 1) acquisition and protection of 50 acres of tidal wetland along Mill and Sturgeon Creeks, 2) acquisition of 21 acres of upland property for buffer, and 3) public dock for water access and trail system.

The NEPA Analysis is restricted to NRDA-eligible portions of the project (as referenced in Section 4). Environmental consequences associated with Alternative 10 are summarized below (Table 5.11).

Table 5.11. Impacts of Navassa Waterfront Park Alternative.

Environmental Consequences	Alternative 10: Navassa Waterfront Park
Physical Resources	
Hydrology and Water Quality	There would be short-term, direct, minor, adverse impacts to hydrology and water quality with the construction of the public boat dock and fishing platform due to construction activities and the associated turbidity. The conservation easement would result in long-term, direct and indirect, beneficial impacts to hydrology and water quality though the removal of land conversion pressures, and the protection of high-quality habitat.
Air Resources	There would be short-term, direct, minor, adverse impacts to air resources with the construction of the public boat dock and fishing platform due to construction activities. The conservation easement would result in long-term, direct and indirect, beneficial impacts to air resources though the removal of land conversion pressures, and the protection of high-quality habitat.
Sediment/Geology	There would be short-term, direct, minor, adverse impacts to sediments and geology with the construction of the public boat dock and fishing platform due to construction activities and the associated substrate disruptions. The conservation easement would result in long-term, direct, beneficial impacts to sediments and geology though the removal of land conversion pressures, and the protection of high-quality habitat.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	There would be short-term, direct, minor, adverse impacts to fish and aquatic habitats with the construction of the public boat dock and fishing platform due to construction activities. There may be

	long-term, minor, adverse impacts to some fish species due to the increased access to fishing activities. The conservation easement would result in long-term, direct and indirect, beneficial impacts though prevention of development actions and protection of high-quality habitat for a variety of fish and bird species. The Trustees will initiate ESA and EFH consultations prior to the release of the Final RP/EA.
Wildlife & Habitats	There would be short-term, direct, minor, adverse impacts to wildlife and their habitats with the construction of the public boat dock and fishing platform due to construction activities. The conservation easement would result in long-term, direct and indirect, beneficial impacts though prevention of development actions and protection of high-quality habitat.
Socioeconomics	
Cultural and Historical Resources	There are no known cultural or historical resources that would be negatively impacted during restoration because the project site avoids significant cultural and historical resources. A letter of concurrence as part of NHPA Section 106 consultation with the SHPO will be requested prior to the release of the Final RP/EA.
Recreation	Long-term, direct and indirect, beneficial impacts are expected with potential for future recreational and tourism activities in areas around the restoration site.
Transportation	No short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No short- or long-term, direct or indirect, adverse or beneficial impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.11 Alternative 11: Oyster Reefs in the Lower Cape Fear River (Non-Preferred)

This alternative includes creating 1.36 acres of intertidal oyster reef habitat in the lower Cape Fear River between Snow's Cut and Battery Island, adjacent to dredge spoil islands. Environmental consequences associated with Alternative 11 are summarized below (Table 5.12).

Table 5.12. Impacts of Oyster Reefs in LCFR Alternative.

Environmental Consequences	Alternative 11: Oyster Reefs in the Lower Cape Fear River
Physical Resources	

Hydrology and Water Quality	Short-term, direct, minor, adverse impacts to hydrology and water quality would occur due to turbidity. Long-term, direct and indirect, minor, beneficial impacts to water quality due to improved oyster filtering capacity from restored oyster habitat.
Air Resources	No anticipated short- or long-term, direct or indirect, beneficial or adverse impacts to air resources.
Sediment/Geology	Short-term, direct, minor adverse impacts to sediments and geology would occur during reef creation due to moving sediments and substrate. Long-term, direct, minor, beneficial impacts to sediments and geology would occur from substrates from oyster reef creation.
Climate Change	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to climate change.
Biological Resources	
Fish & Habitats	Short-term, direct, minor, adverse impacts to estuarine species would occur in the immediate vicinity of the project site during reef creation, due to localized disturbances. No long-term, direct or indirect, adverse impacts to fish and estuarine habitats are anticipated. Oyster habitat restoration would provide long-term, direct and indirect, minor beneficial impacts to fisheries species by creating new habitats for feeding and shelter for fish and benthic species.
Wildlife & Habitats	Short-term, direct, minor, adverse impacts to wildlife would occur in the immediate vicinity of the project site due to localized disturbances. No long-term, direct or indirect adverse impacts would occur. Habitat restoration would provide long-term, direct and indirect, minor, beneficial impacts by intertidal habitats for birds and other estuarine wildlife.
Socioeconomics	
Cultural and Historical Resources	There are no known cultural or historical resources that would be negatively impacted during activities in or around the proposed alternative areas.
Recreation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to recreation.
Transportation	No anticipated short- or long-term, direct or indirect, adverse or beneficial impacts to transportation.
Public Health and safety	No anticipated short- or long-term, direct or indirect, adverse impacts to public health and safety.
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.3.12 Restoration Alternative 12: No Action

This alternative would take no action to create, restore, or enhance estuarine marsh services to compensate for the resource losses attributed to the Kerr-McGee Site. Environmental consequences associated with the No Action alternative are summarized below (Table 5.13).

Table 5.13. Impacts of No Action Alternative.

Environmental Consequences	Alternative 12: No Action
Physical Resources	
Hydrology and Water Quality	Project area water, air, and geological/sediment conditions would not be affected since no restoration would occur. Any ecological benefits that may result from preferred alternatives would not occur, and the trajectory of any ecologically degraded areas would remain unchanged.
Air Resources	
Sediment/Geology	
Climate Change	
Biological Resources	
Fish & Habitats	Project area fish, wildlife, vegetation, habitats would not be affected since no restoration would occur.
Wildlife & Habitats	
Socioeconomics	
Cultural and Historical Resources	Project area socio-economic variables would not be affected since no restoration would occur. Potential economic benefits as a result of the enhanced recreational opportunities would not be realized.
Recreation	
Transportation	
Public Health and safety	
Environmental Justice	This alternative does not have the potential to negatively or disproportionately affect minority or low-income populations in the area, including economically, socially, recreationally, or in terms of conditions affecting their health.

5.4 *Cumulative Impacts of Preferred Alternatives*

The preferred alternatives would have no major adverse impacts on habitats, lands, or waterways in the Lower Cape Fear River Watershed, or, more specifically, in and around the Town of Navassa. The alternatives may result in minor, short-term adverse impacts and both short- and long-term beneficial impacts to habitats and the species they support. When considered with other past, present, and reasonably foreseeable future actions within the spatial boundary of the LCFRW, the alternatives are not anticipated to have adverse cumulative impacts. Direct and indirect adverse impacts, as discussed previously, are likely to be short term and will occur primarily during periods of active construction. The preferred alternatives are expected to result in longer-term, beneficial cumulative impacts on the human environment since they, in combination with other current and future activities in the vicinity, may positively impact the area's land use, recreational use, and economic activity through habitat restoration, land preservation, and improved public access and recreational activities at some project sites.

5.5 *Cumulative Impacts of Non-Preferred Alternative*

The non-preferred alternative would have no major adverse impacts on area habitats, lands, or waterways. The alternative may result in minor, adverse impacts during reef creation, but those impacts would be localized and short-term. When considered with other past, present, and reasonably foreseeable future actions within the spatial boundary of the LCFRW, the alternatives are not anticipated to have adverse cumulative impacts, but may result in localized, long-term, beneficial impacts to water quality, and biological resources.

5.6 *Cumulative Impacts of No-Action Alternative*

The No-Action alternative would have long-term, minor adverse effects to physical and biological resources in the Lower Cape Fear River Watershed, since no active restoration would occur; thus, natural resources and services would not return to baseline and interim losses would not be accounted for. Cumulative impacts would be minor, and not at a regional scale.

6 Compliance with Other Key Statutes, Regulations and Policies

As appropriate, the Trustees will comply with applicable statutes, regulations, and policies prior to implementation of any selected restoration alternative. The following is a list of potential statues, regulations, and policies with which the Trustees may need to comply during restoration.

6.1 *Clean Water Act (CWA), 33 U.S.C. § 1251* et seq.

Clean Water Act (CWA), 33 U.S.C. § 1251, et seq., is the principle law governing pollution control and water quality of the nation's waterways. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States. Section 401 of the CWA requires any applicant for a Federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates or would originate. The Trustees will require all necessary permits to be in place prior to all construction activities.

6.2 *Rivers and Harbors Act (RHA), 33 U.S.C. § 401* et seq.

The Rivers and Harbors Act (RHA) regulates development and use of the nation's navigable waterways. Section 10 of the R&HA regulates obstruction or alteration of navigable waters of the United States. The Trustees will require all necessary permits be in place prior to all construction activities.

6.3 *Coastal Zone Management Act (CZMA), 16 U.S.C. § 1451* et seq.*, 15 C.F.R. Part 923*

The goal of the CZMA is to encourage states to preserve, protect, develop, and, where possible, restore and enhance the nation's coastal resources. Under Section 1456 of the CZMA, restoration actions undertaken or authorized by federal agencies within a state's coastal zone are required to comply, to the maximum extent practicable, with the enforceable policies of a state's federally approved Coastal Zone Management Program. The proposed restoration projects are consistent with state policy. The Trustees will initiate CZMA consultation prior to the release of the Phase I Final RP/EA.

6.4 *Fish and Wildlife Coordination Act (FWCA), 16 U.S.C. § 661, et seq.,*

The Fish and Wildlife Coordination Act (FWCA) requires that federal agencies consult with USFWS, NOAA, and state wildlife agencies regarding activities that affect, control, or modify waters of any stream or bodies of water, in order to minimize the adverse impacts of such actions on fish and wildlife resources and habitat utilizing these aquatic environments. This coordination is generally incorporated into compliance processes used to address the requirements of other applicable statutes, such as Section 404 of the CWA. Coordination is taking place by and between NOAA and the USFWS. The restoration actions described herein will have a positive effect on fish and wildlife resources.

6.5 *Endangered Species Act (ESA), 16 U.S.C. § 1531, et seq.,*

The purpose of the ESA is to conserve endangered and threatened species and the ecosystems upon which they depend. The ESA directs all federal agencies to utilize their authorities to further these purposes. Section 7(a)(1) requires federal agencies, in consultation with NMFS and USFWS, to carry out programs for conservation of listed species. Restoration under this program is likely to further the conservation of listed species. Section 7(a)(2) of the ESA requires every federal agency, in consultation with and with the assistance of the Secretaries of the Interior and Commerce, to ensure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Section 9 of the ESA and regulations issued pursuant to Section 4(d) of the ESA prohibit the take of listed species unless exempted by the NMFS or USFWS. To "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect listed species. This prohibition applies to federal and nonfederal parties. An incidental take statement (ITS) is included in formal consultations and exempts an action agency from Section 9 prohibitions as long as the action agency complies with the reasonable and prudent measures and terms and conditions of the ITS. Endangered and threatened species known to occur in and around the Affected Environment are listed in Appendix B. The area's habitats provide general support for any threatened and endangered species migrating through or utilizing these communities, including critical habitat for Atlantic

Sturgeon. Alternatives will have long-term benefits for these habitats through the restoration actions. The general locale where the restoration actions would be sited is not critical habitat for any listed species. The Trustees will initiate ESA consultation prior to the release of the Final RP/EA.

6.6 *Magnuson-Stevens Fishery and Conservation Management Act (MSFCMA), 16 U.S.C. § 1801* et seq.

The MSFCMA as amended in 1996 created a requirement for federal agencies to consult with the NOAA NMFS when their actions or activities may adversely affect habitat identified by federal regional fishery management councils or NMFS as EFH. Rules published by the NOAA Fisheries (50 C.F.R. §§ 600.805 - 600.930) specify that any Federal agency that authorizes, funds or undertakes, or proposes to authorize, fund, or undertake an activity which could adversely affect EFH is subject to the consultation provisions of the above-mentioned act and identifies consultation requirements. The Trustees will initiate EFH consultation prior to the release of the Final RP/EA. The Trustees do not believe that any of the restoration projects set forth in this draft RP/EA will adversely affect EFH.

6.7 *National Historic Preservation Act, 16 U.S.C. § 470 et seq.*

Section 106 of the National Historic Preservation Act mandates federal agencies undergo a review process for all federally-funded and permitted projects that will adversely affect sites listed on, or eligible for listing on, the National Register of Historic Places. Specifically it requires the federal agency to "take into account" the effect a project may have on historic properties. The Trustees do not believe that any of the projects will likely adversely affect eligible historic properties. The Trustees will initiate consultation with the State Historic Preservation Officer (SHPO) prior to the release of the Final RP/EA.

6.8 *Executive Order 12898 (59 Fed. Reg. 7629) - Environmental Justice*

The 1994 Executive Order 12898 requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. In the memorandum to heads of departments and agencies that accompanied executive Order 12898, the President specifically recognized the importance of procedures under NEPA for identifying and addressing environmental justice concerns. The memorandum states that "each federal agency shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by [NEPA]." The memorandum particularly emphasizes the importance of NEPA's public participation process, directing that "each federal agency shall provide opportunities for community input in the NEPA process." Agencies are further directed to "identify potential effects and mitigation measures in consultation with affected communities,

and improve the accessibility of meetings, crucial documents, and notices." The CEQ has oversight of the federal government's compliance with Executive Order 12898 and NEPA. The alternatives proposed for selection encompass a range of activities that will conserve and restore habitats within close proximity to the affected environment and the neighboring Town of Navassa. The alternatives proposed do not create a disproportionately high or adverse effect on any minority or low-income populations. The proposed alternatives may result in downstream economic activity and thus be beneficial to local economies. The level of benefit would vary by specific project site. Additionally, the economic value of high quality tidal marsh and waterways is significant in the coastal stretches of North Carolina, and as natural corridors are established, local communities will benefit from their recreational, commercial, and aesthetic value.

6.9 *Executive Order Number 11514 (35 Fed. Reg. 4247) - Protection and Enhancement of Environmental Quality, as amended by E.O. 11991*

Executive Orders 11514 and 11991 require that federal agencies monitor, evaluate, and control their activities to protect and enhance the quality of the Nation's environment to sustain and enrich human life; inform the public about these activities; share data gathered on existing or potential environmental problems or control methods; and cooperate with other governmental agencies. Releasing the Draft RP/EA for public comment fully addresses the intent of this Executive Order.

6.10 *Executive Order Number 11990 (42 Fed. Reg. 26,961) - Protection of Wetlands*

This Executive Order requires each federal agency to take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for: acquiring, managing, and disposing of federal lands and facilities; providing federally undertaken, financed, or assisted construction and improvements; and conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. The Trustees have concluded that the proposed restoration actions will meet the goals of this Executive Order.

6.11 *Executive Order Number 12962 (60 Fed. Reg. 30,769) - Recreational Fisheries*

This Executive Order requires that federal agencies, to the extent permitted by law and where practicable, and in cooperation with states and tribes, improve the quantity, function, sustainable productivity, and distribution of the Nation's aquatic resources for increased recreational fishing opportunities. The Trustees have concluded that the proposed restoration actions will not result

in adverse effects on recreational fisheries, and some alternatives may increase access to recreational fishing opportunities.

6.12 *Compliance with State and Local Law*

The Natural Resource Trustees will ensure compliance with all applicable state and local laws and other applicable federal laws and regulations relevant to the State of North Carolina. The entity will seek and comply with all necessary permits.

7 Acronym List

CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Contaminants of Potential Concern
CWA	Clean Water Act (or Federal Water Pollution Control Act)
DOI	United States Department of the Interior
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FONSI	Finding of No Significant Impact
IMS	Institute of Marine Sciences
LCFRW	Lower Cape Fear River Watershed
LF	Linear Feet
NCDEQ	North Carolina Department of Environmental Quality
NCDMF	North Carolina Department of Marine Fisheries
NCDWQ	North Carolina Division of Water Quality
NCNHP	North Carolina Natural Heritage Program
NCWRC	North Carolina Wildlife Resources Commission
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRDA	Natural Resource Damage Assessment
PAH	Polycyclic Aromatic Hydrocarbons
RP/EA	Restoration Plan and Environmental Assessment
SQG	Sediment Quality Guidelines
TLW	Targeted Local Watershed
UNC	University of North Carolina
USFWS	United States Fish and Wildlife Service

8 List of Preparers

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9 List of Agencies and Persons Consulted

NC Department of Environmental Quality
NC Division of Marine Fisheries
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Project Sponsors
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Appendix A

Potential Restoration Project Opportunities Identified by the Trustees Prior to Phase I Restoration Planning and Restoration Scoping

Potential restoration projects identified by the Trustees prior to 2015 are listed below. Some elements of these projects have been retained in the current Phase I RP/EA, but with modification based on input from project proponents. Other projects have proceeded in the interim, are no longer viable, or have changed circumstances such that NRDA funds are no longer needed and/or sought.

- Bald Head Island Estuarine Habitat Restoration – opportunity to expand planned estuarine habitat restoration in the 10,000 acre tidal marsh component of the Bald Head Natural Area.
- Bald Head Island Land Conservation – Priority land conservation opportunities that support the integrity of tidal marsh habitat are also available.
- Campbell Island Land Conservation – undeveloped land conservation opportunity on Cape Fear River
- Cape Fear River Fish Passage – design and construction of a rock rapids structure at the Cape Fear River L&D #2.
- Cape Fear River Fisheries Spawning Habitat Restoration – The restoration would expand on existing efforts (assessment of benthic habitat between L&Ds 2 and 3, design of spawning habitat enhancement/restoration) to expand overall restored spawning habitat for priority anadromous fish species.
- Eagles Island Land Conservation (A) – this property on Eagles Island represents a crucial preservation tract (due to threat of conversion to development) with limited potential to restore habitats degraded by former dredge disposal
- Eagles Island Land Conservation (B) – opportunity to protect and restore (via re-contouring of dredge spoil to increase tidal inundation) Eagles Island habitat similar to marsh affected at the Site.
- Indian Creek Land Conservation – opportunity to conserve undeveloped land with conversion threat due to threat future highway construction and development in tidal fresh water wetlands
- Lockwood Folly Restoration – Lockwood Folly River initiatives including riparian buffer protection and oyster reef restoration

- Mallory Creek Land Conservation – opportunity to conserve undeveloped land dominated by marsh habitat encompassing a former dredge disposal site. The marsh habitat is intact and similar to degraded habitat at the Site.
- Northeast Cape Fear River Land Conservation and Restoration – opportunity to conserve undeveloped land. This ecologically significant area is characterized by a riparian wetland communities and upland forested communities. Patch Reef Creation – opportunity to install patch reefs and restore invertebrate habitat in the vicinity of dredge spoil islands and existing marshes by creating shallow intertidal habitat
- *Phragmites* control - Large areas of tidal marsh in the vicinity of the Site are threatened by the spread of the common reed (*Phragmites australis*). *Phragmites* control can be achieved through repeated herbicide application along the marsh margins.
- Smith Creek Watershed Land Conservation and Restoration – opportunity to conserve lands and implement restoration (introduce meander to channelized stream) in the headwaters of a developed watershed.
- Southport Area Land Conservation and Restoration – opportunity to conserve undeveloped land on the Cape Fear River with upland and wetland natural communities including tidal marsh requiring restoration from past logging and mining uses.
- Purchase of credits from Lower Cape Fear Umbrella Mitigation Bank—opportunity to acquire banked credits developed from the restoration of tidal freshwater stream and marsh just upriver from Navassa.

Appendix B

Federal and State Lists of Threatened and Endangered Species

Table B-1. List of federally protected species (mammals, bird, reptiles, clams, fish, snails, and plants) potentially occurring in the counties of Brunswick, Columbus, New Hanover, and Pender, North Carolina. Data from U.S. Fish and Wildlife Service Information, Planning, and Conservation System (http://ecos.fws.gov/ipac) generated on June 13, 2019. Key: E – Federally Endangered, T –Federally Threatened, C - Federal Candidate, CH – Federal Critical Habitat, SAT – Similarity of Appearance

Common Name	Scientific Name	Status	County
West Indian manatee	*Trichechus manatus*	T	Brunswick, New Hanover, Pender
Northern long-eared bat	*Myotis septentrionalis*	T	Columbus, New Hanover, Pender
Piping plover	*Charadrius melodus*	T	Brunswick (CH), New Hanover (CH), Pender (CH)
Red knot	*Calidris canutus rufa*	T	Brunswick, New Hanover, Pender
Red-cockaded woodpecker	*Picoides borealis*	E	Brunswick, Columbus, New Hanover, Pender
Wood stork	*Mycteria americana*	T	Brunswick, Columbus
American alligator	*Alligator mississippiensis*	T (SAT)	Brunswick, Columbus, New Hanover, Pender
Green sea turtle	*Chelonia mydas*	T	Brunswick, New Hanover, Pender
Hawkbill sea turtle	*Eretmochelys imbricata*	E	Brunswick, New Hanover, Pender
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	Brunswick, New Hanover, Pender
Leatherback sea turtle	*Dermochelys coriacea*	E	Brunswick, New Hanover, Pender
Loggerhead sea turtle	*Caretta caretta*	T	Brunswick (CH), New Hanover (CH), Pender (CH)

Atlantic pigtoe	*Fusconaia masoni*	T-proposed	Pender
Waccamaw silverside	*Menidia extensa*	T	Brunswick, Columbus (CH)
Magnificent ramshorn	*Planorbella magnifica*	C	Brunswick, New Hanover
American chaffseed	*Schwalbea americana*	E	Pender
Cooley's meadowrue	*Thalictrum cooleyi*	E	Brunswick, Columbus, New Hanover, Pender
Golden sedge	*Carex lutea*	E	New Hanover, Pender (CH)
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Brunswick, Columbus, New Hanover, Pender
Seabeach amaranth	*Amaranthus pumilus*	T	Brunswick, New Hanover, Pender

Table B-2. List of state-protected animals that may occur in the counties of Brunswick, Columbus, New Hanover, and Pender, North Carolina and in proximity to the proposed projects. List includes both current and historical accounts. Status codes: T = threatened; E = Endangered; SC = Special concern; SR = Significantly rare. Rank codes: S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently secure; S_N = Nonbreeding; S_B = Breeding.

Common Name	Scientific Name	Status/Rank	County
American alligator	*Alligator mississippiensis*	T/S3	Brunswick, New Hanover, Pender
American oystercatcher	*Haematopus palliatus*	SC/S2S3B,S3N	Brunswick, New Hanover
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E/S2	Brunswick, New Hanover
Black-necked stilt	*Himantopus mexicanus*	SR/S1B	Brunswick, New Hanover
Black skimmer	*Rynchops niger*	SC/S2B,S3N	Brunswick, New Hanover

Brown pelican	*Pelecanus occidentalis*	SR/S3B,S4N	Brunswick, New Hanover
Common tern	*Sterna hirundo*	E/S2B	New Hanover
Coppery emerald	*Somatochlora georgiana*	SR/S2	Brunswick, Pender
Dixie zale	*Zale declarans*	SR/S2S3	Brunswick, New Hanover
Eastern big-eared bat	*Corynorhinus rafinesquii macrotis*	SC/S3	New Hanover
Gull-billed tern	*Gelochelidon nilotica*	T/S1S2B	Brunswick, New Hanover
Marbled underwing	*Catocala marmorata*	SR/S1S3	Brunswick, New Hanover
Mottled duskywing	*Erynnis martialis*	SR/S2	Brunswick
Northern long-eared bat	*Myotis septentrionalis*	T/S2	New Hanover
Painted bunting	*Passerina ciris*	SC/S2B	Brunswick, New Hanover, Pender
Pygmy rattlesnake	*Sistrurus miliarius miliarius*	SC/S3	New Hanover
Rare skipper	*Problema bulenta*	SR/S1	Brunswick, New Hanover
Shortnose sturgeon	*Acipenser brevirostrum*	E/S1	Brunswick, Columbus, New Hanover, Pender
Snowy egret	*Egretta thula*	SC/S2S3B,S3N	Brunswick
Tricolored heron	*Egretta tricolor*	SC/S3B,S3N	Brunswick

West Indian manatee	*Trichechus manatus*	T/S1N	Brunswick, New Hanover, Pender

Table B-3. List of state-protected plants that may occur in the counties of Brunswick, Columbus, New Hanover, and Pender, North Carolina and in proximity to the proposed projects. List includes both current and historical accounts. Status codes: T = threatened; E = Endangered; SC = Special concern; SC-V = Special concern – vulnerable; SR = Significantly rare; SR – O = Significantly rare other; SR – P = Significantly rare peripheral; SR – T = Significantly rare throughout. Rank codes: S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently secure

Common Name	Scientific Name	Status/Rank	County
Branched gerardia	*Agalinis virgata*	T/S2	Brunswick, New Hanover, Pender
Brown bogbutton	*Lachnocaulon minus*	T/S2	Pender
Carolina bishopweed	*Ptilimnium ahlesii*	SR-T/S1	Brunswick, New Hanover
Carolina grasswort	*Lilaeopsis carolinensis*	SR-O/S2	Brunswick
Coralbean	*Erythrina herbacea*	E/S2	Brunswick, New Hanover
Cypress knee sedge	*Carex decomposita*	SC/S2	Brunswick
Dissected sneezeweed	*Helenium pinnatifidum*	SR-P/S2	Brunswick, Columbus, New Hanover, Pender
Green fly orchid	*Epidendrum magnoliae*	T/S1S2	Pender
Lace-lip ladies'-tresses	*Spiranthes laciniata*	SC-V/S2	New Hanover
Nerved witch grass	*Dichanthelium neuranthum*	SC-V/S1	Brunswick, New Hanover

Raven's seedbox	*Ludwigia ravenii*	T/S1	Brunswick, Columbus, New Hanover
Riverbank evening primrose	*Oenothera riparia*	SR/S2S3	Brunswick, New Hanover, Pender
Tracy's beaksedge	*Rhynchospora tracyi*	T/S2	Brunswick
Venus flytrap	*Dionaea muscipula*	SC-V/S2	New Hanover
White doll's daisy	*Boltonia asteroides var. glastifolia*	SR/S2	Brunswick