DRAFT LAND PROTECTION PLAN AND ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED EXPANSION OF ROANOKE RIVER NATIONAL WILDLIFE REFUGE

Bertie, Washington, Martin, Halifax, and Northampton Counties, North Carolina

U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region
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Executive Summary

In accordance with U.S. Fish and Wildlife Service (Service) policy and the National Environmental Policy Act, a draft Land Protection Plan and Environmental Assessment have been prepared analyzing the effects and describing the strategy of establishing a 287,090-acre Conservation Partnership Area along the Roanoke River from Weldon to the Albemarle Sound, with authority to acquire up to 50,000 acres in fee title and 100,000 acres in conservation easements and conservation partnerships as part of Roanoke River National Wildlife Refuge (NWR). Acquisitions will fall within Bertie, Washington, Martin, Halifax and Northampton Counties, North Carolina. The plan outlines the options and methods used to provide the minimum interests necessary to preserve and protect the area's fish, wildlife, and plant resources.

The Roanoke River riparian corridor is the largest, most intact, and least disturbed bottomland forest ecosystem remaining in the Mid-Atlantic Region. This expansion supports the restoration and protection of a contiguous, forested riparian corridor approximately 137 miles long, extending from Weldon to the Albemarle Sound. In addition, the expansion supports many of the goals of the North Carolina Wildlife Action Plan which calls for an increase of riparian buffers and connectivity of habitats through acquisition and easements specifically for brownwater, bottomland hardwood systems.

Within this riparian corridor, referred to as a Conservation Partnership Area (CPA), Service trust species, including American black ducks *(Anas rubripes*), swallow-tailed kite *(Elanoides fortificatus*), bald eagles *(Haliaeetus leucocephalus*), neotropical migratory birds, wild turkey *(Meleagris gallopavo*), and herons *(*Ardeidae sp.), would be managed for long-term species survival. Aquatic species, including American eel *(Anguilla rostrata*), American shad *(Alosa sapidissima*), blueback herring *(Alosa aestivalis*), and striped bass *(Morone saxatilis*), would benefit from habitat and water quality protection.

Between January 23 and January 26, 2017, the planning team held a public meeting in each of the counties impacted by this expansion: Bertie, Washington, Martin, Halifax and Northampton. A 30-day public review and comment period was held subsequent to the meetings to solicit input on issues and areas of concern to consider in the draft Land Protection Plan and Environmental Assessment.

The Service developed and analyzed four alternatives, with each alternative taking into consideration lands already protected: Alternative A (No Action or status quo); Alternative B, a 287,090-acre CPA with 50,000 acres in fee-title ownership and up to 100,000 acres in conservation easements; Alternative C, a 195,119-acre CPA with 50,000 acres in fee-title ownership and up to 100,000 acres in conservation easements; and Alternative D, a 205,391-acre CPA with 50,000 acres in fee-title ownership and up to 100,000 acres in conservation easements. The Service has selected Alternative B as the Proposed Action. Under this alternative, up to 50,000 acres of land would be obtained through fee-title acquisition and up to

100,000 acres through conservation easements to become a part of the Roanoke River NWR. The Service's approach for this project was to delineate a CPA within which it would work with interested landowners and other conservation partners to help protect the aquatic resources and bottomland hardwood forests of the watershed. The Service believes this alternative best serves the purpose and need as well as the stated goals and objectives, vision, and purposes of the refuge.

With the expansion of Roanoke River NWR, the Service would be able to support more effectively and facilitate management and protection of the wildlife and habitats within the lower Roanoke River watershed. Bottomland hardwood forests would be more protected from fragmentation, and connectivity between existing conservation lands would be enhanced. The water resources of the river watershed would be maintained or improved. Opportunities for wildlife-dependent recreational activities would be increased. Further, any cultural resources found within the refuge would be afforded protection by the Service.

LAND PROTECTION PLAN

I. INTRODUCTION AND PURPOSE

This Land Protection Plan (LPP) outlines how the U.S. Fish and Wildlife Service (Service) will protect and manage the most extensive bottomland hardwood forest on the East Coast and associated habitats through a landscape-scale conservation initiative, focusing on the fragile habitats found in the North Carolina Coastal Plain, as part of the Roanoke River National Wildlife Refuge (NWR, refuge; U.S. Fish and Wildlife Service [USFWS] 2005). The refuge currently encompasses 21,313 acres (Figure 1) and has an acquisition boundary of 33,000 acres. Through this expansion, the Service would establish a Conservation Partnership Area (CPA), approximately 287,090 acres in size (Figure 2), within which the Service and our state, local, private, and fellow federal partners would work together toward a common vision for conservation with 50,000 acres in Service fee-title ownership and up to 100,000 acres in conservation easements.

Management goals include improvement of water quality in the region, restoration of more natural flow and flood regimes along the Roanoke River, and conservation and overall creation of a functional landscape on the Albemarle-Pamlico (AP) peninsula. Within this riparian corridor, Service trust species, including American black ducks (*Anas rubripes*), swallow-tailed kite (*Elanoides fortificatus*), bald eagles (*Haliaeetus leucocephalus*), neotropical migratory birds, wild turkey (*Meleagris gallopavo*), and herons (Ardeidae sp.), will be managed for long-term species survival. Aquatic species, including American eel (*Anguilla rostrata*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), and striped bass (*Morone saxatilis*), would benefit from habitat and water quality protection.

A. PROJECT DESCRIPTION

This refuge expansion represents a landscape-scale conservation initiative, focusing on the fragile habitats found in the North Carolina Coastal Plain, with Roanoke River NWR as a nucleus for land protection. The refuge covers a total of 21,313 acres (Figure 1) and has an acquisition boundary of 33,000 acres. The area of interest, referred to as the full CPA, for this proposed project is the greater AP Peninsula and the Roanoke River floodplain (Figure 2). This expansion focuses on the effective flood plain of the river, represented by the 35,000 cubic feet per second (cfs) release stage from the dam at Roanoke Rapids. This flow rate is the highest flow release from the John H. Kerr Dam and Reservoir authorized and implemented since its construction in 1953.

In pursuit of these goals, we propose the establishment of a CPA approximately 287,090 acres in size (Figure 3), within which the Service and our state, local, private, and fellow federal partners would work together toward a common vision. The proposed CPA would include the current 33,000-acre acquisition boundary of Roanoke River NWR (Figure 1) and an additional 260,853 acres. The CPA would encompass the 100-year floodplain of the Roanoke River from Albemarle Sound to Weldon and connect Roanoke River NWR and Pocosin Lakes NWR. We

propose to acquire permanent less-than-fee-title interest in up to 100,000 acres within the CPA (through conservation easements and/or other means) and fee-title interest in up to 50,000 acres, the maximum fee-title-interest area, to be included within the boundary of Roanoke River NWR and in addition to the remaining 11,687 acres authorized for acquisition under the current acquisition boundary.

B. REFUGE PURPOSE(S)

Roanoke River NWR was established on August 9, 1989, to protect and conserve migratory birds and other wildlife resources through the protection of wetlands, in accordance with the following laws:

> "the conservation of wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions" (Emergency Wetlands Resources Act of 1986, 16 U.S.C. § 3901(b), 100 Stat. 3583));
>
> "for the use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (Migratory Bird Conservation Act of 1929, 16 U.S.C. § 664);
>
> "for the development, advancement, management, conservation, and protection of fish and wildlife resources" (Fish and Wildlife Act of 1956, 16 U.S.C. § 742f (b) (1)).

More specifically, the primary reason for acquisition and inclusion of the area into the National Wildlife Refuge System (Refuge System) was to conserve wintering habitat for mallards (*Anas platyrhynchos*), American black ducks, and wood ducks (*Aix sponsa*), as well as breeding habitat for wood ducks (USFWS, Southeast Region, Approval Memorandum 1988). The approval memorandum identified the following three objectives for which the area would be managed: (1) To conserve an area that has traditional high use for wintering waterfowl; (2) to provide additional waterfowl habitat through refuge management; and (3) to establish a waterfowl sanctuary. The Roanoke River NWR Comprehensive Conservation Plan, Final Environmental Impact Statement, and Record of Decision (CCP/FEIS/ROD) were completed in 2005 which developed a vision, goals, objectives, and strategies to guide refuge management based on the establishing purposes.

The vision for the Roanoke River NWR is:

> "Roanoke River National Wildlife Refuge will protect, enhance, and manage high-quality habitat for a diversity of abundance of migratory birds, fish, and other wildlife. Through new and existing partnerships, the refuge will foster and practice sound conservation in land management and river flow management to assure the physical and biological integrity of the Roanoke River floodplain.

> Roanoke River NWR will provide compatible wildlife-dependent public use opportunities, including recreation and environmental education and interpretation. The refuge will provide increased opportunities to learn about the ecological and cultural importance of the Roanoke River floodplain. The refuge will become a national destination, and activities will contribute to the local economy" (Roanoke River NWR CCP, USFWS 2005).

Refuge Goals

The Roanoke River NWR CCP has established a number of goals to guide management of the refuge (USFWS 2005), including:

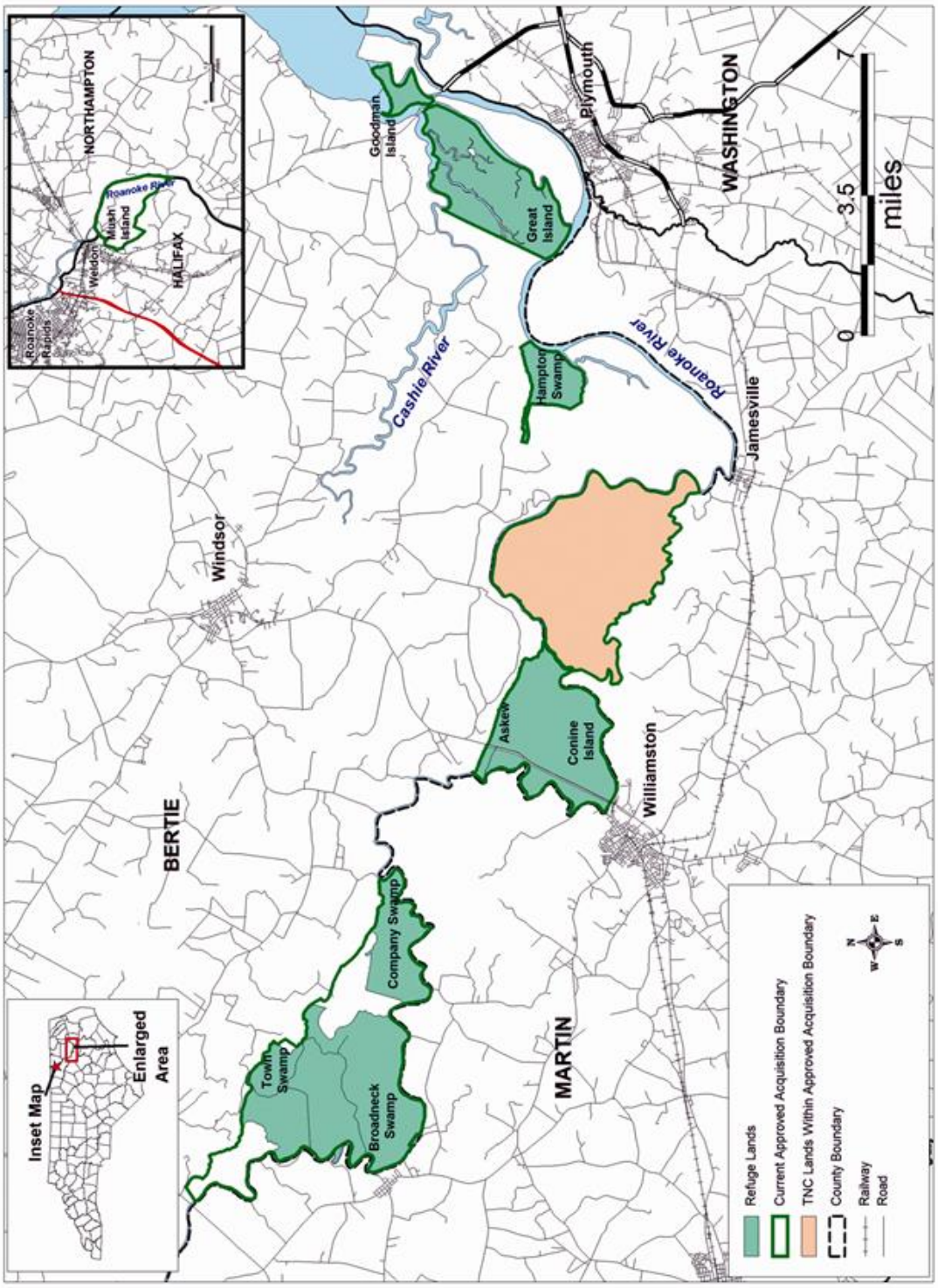
> Goal 1. Protect, maintain, and enhance healthy and viable populations of indigenous migratory birds, wildlife, fish, and plants, including federal and state threatened and endangered species.
>
> Goal 2. Restore, maintain, and enhance the health and biodiversity of bottomland forested wetland habitats to ensure optimum ecological productivity.
>
> Goal 3. Provide the public with safe, quality, wildlife-dependent recreational and educational opportunities that focus on the wildlife and habitats of the refuge and the Refuge System. Continue to participate in local efforts to sustain economic health through nature-based tourism.
>
> Goal 4. Protect refuge resources by limiting the adverse impacts of human activities and development.

In addition, the following subgoals were set forth in the Roanoke River NWR Habitat Management Plan (USFWS 2013).

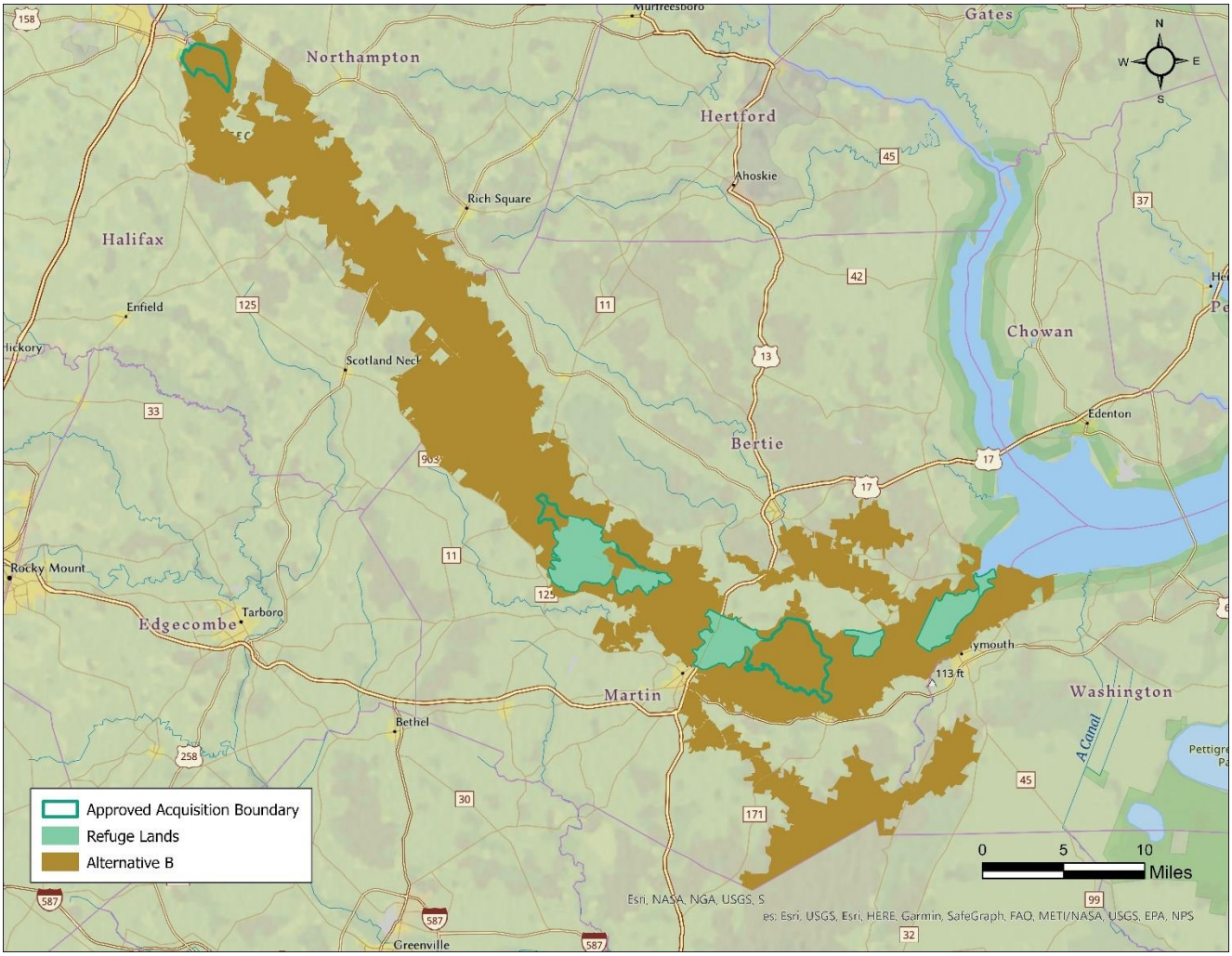
> Subgoal 1. Bottomland Hardwood Goal covers Coastal Plain levee forests (brownwater subtype) and Coastal Plain bottomland hardwoods (brownwater subtype). Provide a sustainable and diverse bottomland hardwood forest community having the structural characteristics necessary to support a rich diversity of migratory birds and resident wildlife in an effort to maintain the ecological integrity of North Carolina's Coastal Plain region.
>
> Subgoal 2. Cypress/Tupelo Swamp covers cypress-gum swamp (blackwater subtype), cypress-gum swamp (brownwater subtype). Enhance and protect healthy, functional, cypress/tupelo swamp habitat to maintain it as a natural community that fosters the ecological integrity of North Carolina's Coastal Plain region.
>
> Subgoal 3. Hydrologically Disconnected Floodplain Forest covers mesic mixed hardwood forests (Coastal Plain subtype). Restore and enhance to create a mosaic that

reflects the habitat requirements for a mixed, uneven-aged deciduous hardwood forest having the structural characteristics necessary to support a rich diversity of migratory birds and resident wildlife in an effort to maintain the ecological integrity of North Carolina's Coastal Plain region.

LPP Figure 1. Roanoke River NWR lands and current approved acquisition boundary



LPP Figure 2. Full Roanoke River National Wildlife Refuge Conservation Partnership Area (Alternative B)



II. RESOURCES

A. RESOURCES TO BE PROTECTED

The Roanoke River, in northeastern North Carolina, flows through an extensive floodplain of national significance. This forested wetland area is considered to be the largest intact, and least disturbed, bottomland forest ecosystem remaining in the Mid-Atlantic Region (North Carolina Natural Heritage Program 1988). The active floodplain of the Roanoke River below Roanoke Rapids Dam encompasses about 150,000 acres (235 square miles) and meanders 137 miles before it reaches the Albemarle Sound. Some of the best remaining known examples of brownwater river floodplain ecological communities are present in this system. Important habitat types in the conservation partnership area consist of upland hardwoods, alluvial forested wetlands, and in-stream habitats.

An important aspect of this proposed expansion is connecting Roanoke River NWR lands with other protected areas nearby, including Pocosin Lakes NWR, State of North Carolina Lower and Upper Roanoke River Gamelands, and areas under management by The Nature Conservancy (TNC). The CPA would connect the Roanoke River floodplain to Pocosin Lakes NWR, creating a corridor that would provide emigration routes for plant and wildlife species. The placement of this corridor is influenced by several factors. The first factor is the need to connect two large conservation areas, Roanoke River NWR and Pocosin Lakes NWR. The second factor is the need to design a corridor that does not overlap current municipalities and encompasses as much forested land as possible. The third factor is an attempt to accommodate the habitat needs of a variety of animals, from the very small space required by many insects and amphibians to larger territories required by mammals, like black bears (*Ursus americanus*), that may use areas as big as 50 square miles or more.

Habitat and Wildlife Resources

Habitat

The refuge lies within the Coastal Plain reach of the Roanoke River watershed, a largely rural area that has a long history of agriculture, forestry, hunting, and fishing. The Roanoke River is a fifth order brownwater alluvial stream that originates in the Blue Ridge Mountains of western Virginia, passes through the Piedmont and Coastal Plain Geological Provinces, and eventually empties into the Albemarle Sound. Rice and Peet (1997) studied the vegetation patterns of the lower Roanoke River and recognized eight alluvial forest and three swamp forest vegetation types, consistent with units in the U.S. National Vegetation Classification (U.S. Federal Geographic Data Committee 2008, Jennings et al. 2009). The distributions of these vegetation types are strongly correlated with geomorphic position (levee, alluvial flats, low ridge, high ridge, back-swamp) and soil fertility. In addition to extensive mature bottomland hardwood and swamp forests, other natural features found within the CPA are beaver ponds, blackwater streams and oxbow lakes. Together, these habitats support a rich array of diverse and abundant fish and wildlife species. For detailed information on fish and wildlife resources found in the lower Roanoke River, refer to the refuge CCP and the Affected Environment and

Environmental Consequences - Natural Resources Section in the Environmental Assessment (EA; USFWS 2005, USFWS 2022).

Within the proposed corridor to connect Pocosin Lakes NWR to the riparian corridor of the Roanoke River, residential and agricultural development, forestry practices, and water management have resulted in the alteration of what was once a continuous forested floodplain. Fragmentation has created a system less equipped to support wildlife species dependent on large, forested tracts of land and less prepared for the gradual changes and buffering service needed to deal with sea level rise and population growth in the future. This conservation strategy is designed to conserve and maximize the benefits of what remains.

Wildlife

The area's variety of habitats supports a range of wildlife, including various amphibians and reptiles, that tend to stay in localized areas to wide-ranging species, such as black bear. Numerous species of birds, both resident and migratory, utilize the area's habitats for foraging, resting, and nesting. Common mammal species include white-tailed deer (*Odocoileus virginianus*), raccoons *(Procyon lotor)*, opossums (*Didelphis virginiana*), various rodents, and bats. The watershed provides habitat for a number of resident and migratory fish species. A more detailed description of wildlife found within the CPA can be found in the Terrestrial Wildlife and Aquatic Species section under Affected Environment and Environmental Trends – Natural Resources in the EA (USFWS 2022).

B. THREATS

Several large-scale issues pose threats to the Roanoke River riparian ecosystem: surface hydrology alterations, forest fragmentation, and sea level rise. Two of these threats, surface hydrology alterations and sea level rise resulting from climate change, involve all-encompassing processes that impact every aspect of the system.

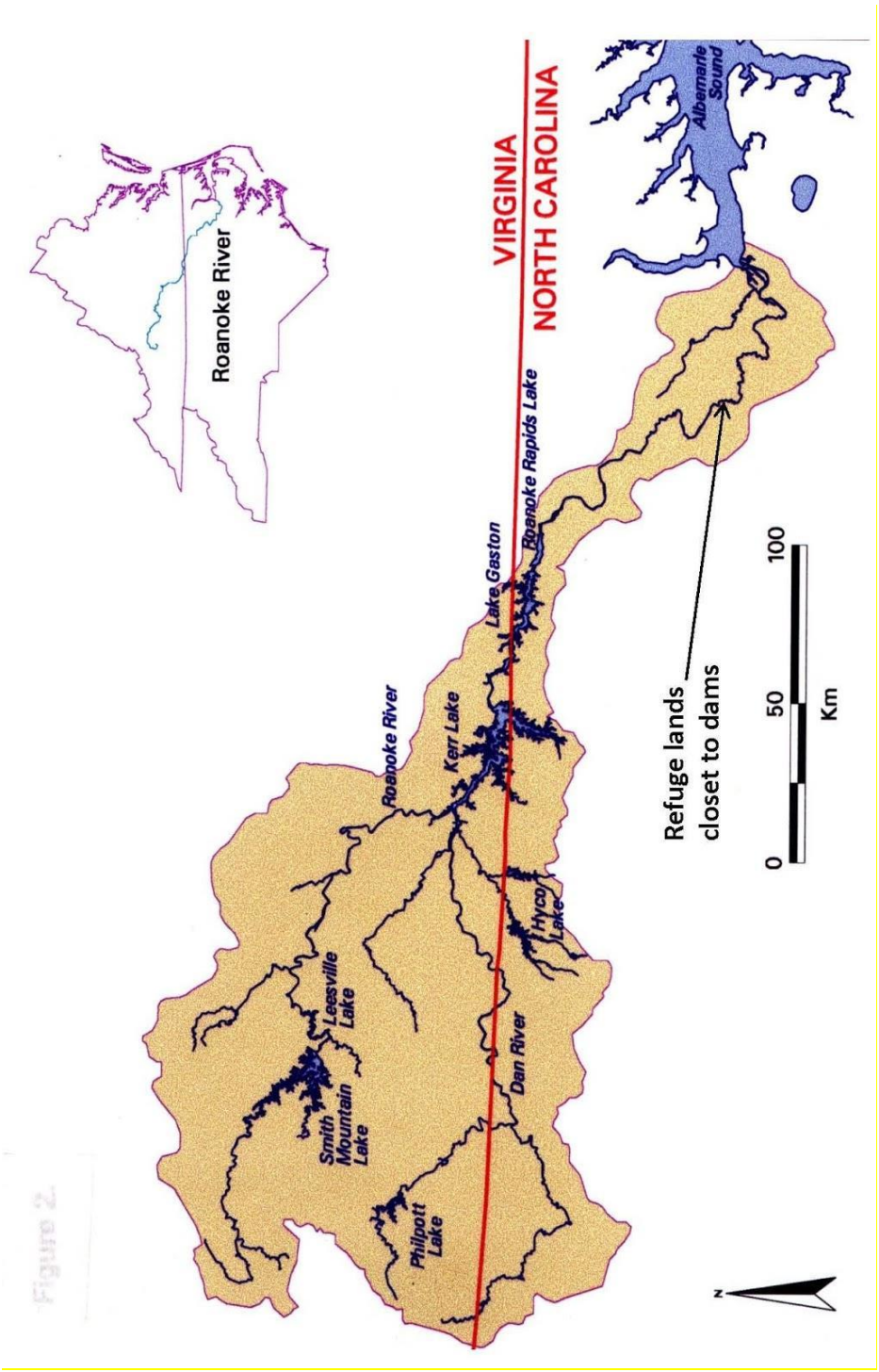
Surface Hydrology

Three dams in the upper reach of the Roanoke River Basin directly affect the flows on the River's Coastal Plain hydrology. From downstream to upstream, they are the Roanoke Rapids, Gaston, and John H. Kerr Dams (Figure 3). The Roanoke Rapids and Gaston Dams are owned and operated by Dominion Power and are licensed by the Federal Energy Regulatory Commission to produce hydropower. The John H. Kerr Dam is operated by the U.S. Army Corps of Engineers (USACE) and functions to generate electricity and to control flooding below it.

From 1954 to 2016, the USACE's flood control project at the John H. Kerr Dam was managed to reduce the magnitude of short-duration floods, resulting in longer, less extensive floods. The flood control project changed the timing and magnitude of flows. As a result, some areas that would flood under natural conditions no longer flood, and others that would naturally be flooded for a short time now remain under water for extended periods. This, in turn, adversely affects the plant and animal species that occupy the floodplain, reduces water quality of the

river, impacts fish spawning in the river and floodplain, and increases erosion of the riverbanks.

After years of research to demonstrate that releases from the USACE's John H. Kerr Dam were causing a decline in the integrity of the downstream ecosystem, a major collaborative effort with multiple stakeholders celebrated a milestone achievement in 2016 with the adoption of a Quasi-Run-of-River flow regime. The new flow releases will more closely mimic the natural hydrograph by allowing higher releases more frequently, based on the weekly inflows into the reservoir. This improvement in hydrology will improve vegetative diversity and distribution in over 150,000 acres of bottomland hardwood floodplain forest. Although the changes to the flood operations have improved the downstream ecosystem, the Coastal Plain reach is still being deprived of the major scouring floods. These scouring floods are necessary to keep the guts and creeks cleansed of debris; to expose soil on the forest floor to promote tree regeneration; and to create river and floodplain features (e.g., levees, ridges, and point bars). The river is still constrained and is by no means a free-flowing river, but the change to flood control operations through the Quasi-Run-of-River flow regime is a significant step in the right direction.



LPP Figure 3: Map of Roanoke River Basin with the locations of the three dams: John H. Kerr Dam (U.S. Army Corps of Engineers), Gaston Dam, and Roanoke Rapids Dam (Dominion Energy) indicated along with proximity to Roanoke River NWR lands.

Climate Change

Climate change is already having visible impacts in the United States and its coastal waters--reduced sea ice in the Arctic, longer summer droughts, reduced availability of water, rapidly retreating glaciers, earlier springs resulting in certain plants and animals moving further north, fish arriving earlier on the spawning grounds and departing sooner, and changes in salinity and the distribution of algae and fish in oceans, lakes, and streams. In North Carolina, the greatest concern will be sea level rise, increase in temperatures, and changes in precipitation patterns. Climate change is a real threat to the natural communities that we know today. The challenge of the Service and its conservation partners is to plan for how these natural communities will change and to ensure that sufficient habitat is available for species moving to new locations to find more favorable habitat conditions.

Sea Level Rise

Sea level rise is primarily caused by two factors related to global warming: the added water from melting land ice and the expansion of sea water as it warms. All signs indicate that sea level rise is accelerating. A study by the University of Pennsylvania has found the rate of sea level rise along the Atlantic coast of the United States to be greater now than it has been at any other point in the past two millennia (Kemp et al. 2011). Conservative estimates from the Intergovernmental Panel on Climate Change (IPCC) indicate that coastal North Carolina has over one million acres of land below one meter of elevation—making North Carolina the third largest low-lying region in the U.S., after Louisiana and Florida (IPCC 2007).

The North Carolina Coastal Resources Commission Science Panel predicts a sea level rise for North Carolina from a minimum of 0.5 meters to a maximum of 1.4 meters by 2100 (North Carolina Department of Environment and Natural Resources 2010). Ongoing human emissions affect sea level rise estimates. Sea level rise by 2100 in Wilmington, North Carolina is projected to be between 24 and 94cm under a reduced emissions scenario (RCP2.6) and between 42 and 132cm under a high emissions scenario (RCP8.5; Kopp et al. 2015, Bhattachan et al. 2018). One meter of sea level rise would convert hundreds of thousands of acres of conservation lands in eastern North Carolina to open water or marsh habitats, losing habitat for terrestrial species. In addition to large areas of the Albemarle-Pamlico Peninsula, much of the lower Roanoke River floodplain up to Jamesville may be inundated, along with significant areas in Bertie County in the vicinity of Williamston. If the influence of the Outer Banks is lost, the Roanoke River may be further influenced by higher lunar tides and increases in salinity. This would have profound implications for aquatic and terrestrial resources in the lower Roanoke River. It is estimated that 7,800 acres of current refuge lands will be affected by sea level rise. Maps of predicted inundation at 1.0 meters of sea level rise on the Albemarle-Pamlico Peninsula and along the lower and middle reaches of the Roanoke River can be found in the EA (USFWS 2022).

Increased Temperatures

Increased temperatures may also cause shifts in the geographic distribution of species in places where temperature increases exceed a species' physiological tolerances. Species at the southern limits of their range in northeastern North Carolina may die out or move north. At the same time, species more typical to the southern latitudes will likely move into North Carolina as the summers become longer and warmer to the south. Species such as wood stork, white ibis, and roseate spoonbills may become a common occurrence along the Roanoke River as winters become milder, especially as sea level rise brings wetter, marsh-like conditions. In addition, those species of reptiles and amphibians currently common to more southern states may work their way to North Carolina, displacing current native species; local species may be lost as they shift north in response to climate change. It is expected that there will be significant shifts in ecosystem type, dynamics, and structure.

Changes in Precipitation Patterns

Climate change is expected to increase extremes of precipitation, leading to more severe rainfall events and droughts. These changes can harm wildlife and habitats that cannot tolerate these extremes. In North Carolina, rainfall maxima are expected to increase in intensity and frequency, especially in association with tropical cyclones (Paerl et al. 2019). This increased precipitation could translate to more frequent and prolonged flood events being released from the USACE's John H. Kerr flood control project (Lin et al. 2021), further changing the hydrologic regime in the floodplain from the historic pattern of short, high-intensity flood events. Populations of wildlife and plants that are not tolerant of long periods of inundation will decline and may be outcompeted or replaced by more hydrologically tolerant species. This is expected to cause a major shift in ecosystem dynamics and structure.

Forest Fragmentation

Across the southeastern United States, forest fragmentation is primarily the result of residential and agricultural development. As is the case for many southeastern rivers and streams, the Roanoke River no longer has an uninterrupted riparian corridor. Lands around the river have been cleared, drained, and filled for use as farm fields, residential and commercial development, and forestry. The result is a fragmented matrix of forests, farms, timber farms, and housing. Habitat fragmentation also occurs due to large scale clearcuts (greater than 100 acres) of mature forestlands. New advancements in the logging industry have made it easier and more economically feasible for landowners to cut forest tracts that normally would not have been cut in the past, including many bottomland hardwood tracts along the Roanoke River. While some commercial timber harvesting can be conducted in a sustainable, managed way, large-scale clearcuts completely remove large areas of habitat that can take more than fifty years to regrow.

Fragmentation influences all forest-dwelling species, especially those that require large unfragmented acreages and forest interior species. Avian species that are affected include Swainson's warbler *(Limnothlypis swainsonii)*, prothonotary warbler *(Protonotaria citrea)*, swallow-tailed kite, wood thrush *(Hylocichla mustelina),* and the state Special Concern cerulean warbler (*Setophaga cerulea*). The loss of connectivity between the remaining forested tracts hinders the movement of wildlife and reduces the functional value of remaining smaller forest tracts. The lost connections also result in a loss of gene flow, further endangering the viability of native species populations. Restoring the connections to allow gene flow and re-establish travel corridors is particularly important for some wide-ranging species, such as the black bear. Fragmentation also increases the amount of artificial edge, increasing the risk of many interior forest dwelling bird species to brood parasitism of the brown-headed cowbird (*Molothrus ater*).

C. RELATIONSHIP OF PROJECT TO LANDSCAPE CONSERVATION GOALS AND OBJECTIVES

The expanded Roanoke River NWR and CPA is designed in the spirit of America's Great Outdoors Initiative. It represents a long-standing partnership with the State of North Carolina, TNC, and other federal agencies to develop a landscape-scale conservation strategy, of which this expansion is a part. The CPA builds wildlife corridors and establishes long-term connectivity between the habitats of the Coastal Plain. In addition, this initiative draws attention to the impacts of climate change, also a focus of America's Great Outdoors, and more specifically to the Service's Climate Change Strategic Plan.

The Climate Change Strategic Plan challenges us to be a leader in national and international efforts to address climate change through coordination, collaboration, scientific excellence, and professionalism. This new conservation strategy is designed to encourage partnerships and collaboration to affect change greater than the staff of a single refuge could do. The Service brings scientific expertise to each partnership through staff biologists, South Atlantic Landscape Conservation Cooperative (SALCC) staff, and staff from Ecological Services, Fisheries and Migratory Bird Programs.

With the release of President Biden's Executive Order 13990 and the 2021 report, Conserving and Restoring America the Beautiful, there's a new emphasis across the United States on collaborating locally with partners to conserve and restore the lands, waters and wildlife that support and sustain the nation. The Southeast Conservation Adaptation Strategy (SECAS) plan, embodies this initiative by collaborating with state and private conservation stakeholders to collectively come together to create a conservation landscape of the future for the southeastern United States and Caribbean. The Southeast Conservation Blueprint is the primary product of the SECAS. The Blueprint identifies priority areas based on a suite of natural and cultural resource indicators representing terrestrial, freshwater, and marine ecosystems. The Blueprint prioritizes 78% of the Roanoke River NWR and CPA as a regionally important area for a connected network of lands and waters. A large percentage (68%) of the

expanded Roanoke River NWR and CPA falls within a key hub and corridor for connectivity in the Blueprint contributing to numerous intact habitat cores. The Roanoke CPA scores above average 34%, on resilient terrestrial sites suggesting continued support of species diversity and ecosystem function in the face of climate change predictions (SCAS 2023).

The South Atlantic Coastal Plain (Figure 8) serves as primary migration habitat for migratory songbirds returning from Central and South America. Maintenance and stabilization of the area's forested wetland patches are important goals of cooperative private-state-federal partnerships under the North American Waterfowl Management Plan, Partners in Flight, the Atlantic Coast Joint Venture (ACJV), and the Roanoke River Joint Venture. The Partners in Flight Bird Conservation Plan for the South Atlantic Coastal Plain has habitat objectives for landbird species protection and management of forested wetland sites including habitat patches in the following quantities and sizes: 10 patches over 100,000 acres; 15 patches over 20,000 acres; 7 patches over 10,000 acres; and 30 patches over 6,000 acres. These objectives were recommended to meet the habitat needs of swallow-tailed kite, cerulean warbler, Wayne's black-throated green warbler (*Dendroica virens waynei*), and Swainson's warbler, all of which occur on Roanoke River NWR and the proposed CPA (Hunter et al. 2001).

The North American Waterfowl Management Plan of 1986 brought together international teams of biologists from private and government organizations from Canada and the United States to address long-term conservation of waterfowl populations. To implement the goals of the North American Waterfowl Management Plan, Joint Venture partnerships were formed to restore waterfowl populations to the levels of the early 1970s, by enhancing, restoring, and protecting about 6 million acres of priority wetland habitats from the Gulf of Mexico to the Canadian Arctic. The Roanoke River NWR falls within the ACJV, which spans from Maine to Florida, including Puerto Rico. This ACJV has designated the Roanoke River system as its primary American black duck focus area for habitat conservation.

The Roanoke River NWR is designated as a globally important bird area (Audubon's Important Bird Areas Program). The Roanoke River Bottomlands Important Bird Area is 149,328 acres in size. This vast area begins near the small community of Weldon and continues downriver more than 100 miles to Albemarle Sound, and the proposed CPA includes this Important Bird Area.

The National Fish Habitat Action Plan (Association of Fish and Wildlife Agencies 2006) focuses on protecting, restoring, and enhancing the nation's fish and aquatic communities through partnerships that foster fish habitat conservation and improve the quality of life for the American people. Under the plan, Fish Habitat Partnerships have been established on a regional basis and focus on the plan's mission, objectives, and goals. Two such partnerships, the Southeast Aquatic Resources Partnership and the Atlantic Coastal Fish Habitat Partnership, overlay the refuge and are potential sources of funding for on-the-ground restoration focused on aquatic habitat.

Maintenance and sustainability of the diadromous fishery resources which use the Roanoke

River as a migratory pathway, as a spawning area, and as nursery habitat is the goal of the Atlantic States Marine Fisheries Commission (ASMFC), which regulates those species when they are in state waters. When the species are in Atlantic Ocean waters, they are under the regulatory authority of the federal Fishery Management Councils (New England, Mid-Atlantic, and South Atlantic) and the National Marine Fisheries Service. Service participation in these regulatory institutions is the responsibility of the Service's Fisheries Program. The ASMFC has prepared Fishery Management Plans for most of the diadromous species using refuge waters, and the New England and Mid-Atlantic councils are currently considering amendments which would affect the bycatch of the two river herring species in the ocean. The ASMFC Fishery Management Plans establish the management targets and thresholds for each species, in some cases on a watershed basis (e.g., for American shad and river herring, see ASMFC 2009, 2010).

D. PARTNERSHIP EFFORTS/RELATED RESOURCES

An overview of related resources within the CPA, including landscape conservation goals and objectives as well as partner efforts, is outlined below. The refuge would enhance the contribution of many of these, including the SALCC; the North Carolina Wildlife Action Plan; Wetlands Reserve Program of the Natural Resources Conservation Service, U.S. Department of Agriculture (USDA); Southeast Conservation Adaptation Strategy, nongovernmental conservation lands; and international, national, and regional conservation plans and initiatives. Several of these are listed below.

International

- Partners in Flight, North American Landbird Conservation Plan (Rich et al. 2004)
- The North American Waterfowl Management Plan

National

- America's Great Outdoors Initiative (2011)
- Forest Stewardship Program (USDA 2011a)
- Partners for Fish and Wildlife (USFWS 2012)
- Wetlands Reserve Program of the Natural Resources Conservation Service of USDA (2011b)
- North American Waterbird Conservation Plan

Important Bird Areas – National Audubon Society

Regional

- The South Atlantic Migratory Bird Initiative Implementation Plan
- SALCC
- Threatened and Endangered Species Recovery Plans
- SECAS

State

- North Carolina Wildlife Action Plan (North Carolina Wildlife Resources Commission 2005, 2015)

In this landscape, the Service works with several federal, state and nongovernment key partners, including but not limited to: North Carolina Wildlife Resources Commission, North Carolina Chapter of The Nature Conservancy, U.S. Geological Survey, USACE, North Carolina Department of Environmental Quality, Dominion Power, National Marine Fisheries Service, North Carolina Division of Marine Fisheries, North Carolina Wildlife Federation, Roanoke River Basin Association, and multiple universities.

III. LAND PROTECTION STRATEGY

A. ACTION AND OBJECTIVES

The nucleus of this project is Roanoke River NWR, which is in Bertie County, North Carolina. Within the 287,090-acre proposed CPA, centered on Roanoke River NWR, the Service would have the ability to work with willing landowners and partners on conservation programs and agreements. Within the CPA, the Service would be authorized to acquire up to 100,000 acres of less-than-fee-title interest and 50,000 acres of fee-title-interest from willing landowners.

Though the river follows its historic channel, upstream dams manage water flows. The nearest dam to the refuge is located 70 miles upstream at Roanoke Rapids. River levels and flow rates are managed primarily for energy production and, on a less-frequent basis, for flood control. The result is a flood regime that does not accurately mimic the scale and timing of historic floods. The proposed CPA is based on a water release value of 35,000 cfs, which is the highest flow rate implemented to this date (since construction of John H. Kerr Dam and Reservoir in 1953) and which captures the bottomland hardwood forests, swamps, and marshes that need to be conserved. The CPA represented in Figure 3 encompasses all areas between the river and the 35,000 cfs demarcation line and those parcels of land intersected by that line.

Refuge managers and planners, in determining the proposed CPA along the river, employed a suite of criteria. Those criteria are as follows:

- All land from Weldon, starting at the northern extent of the current acquisition boundary at Mush Island, and within the 35,000 cfs flood level of the river extending to the Albemarle Sound would be included.
- When a tract of land is intersected by the 35,000 cfs level and the entire tract does not fall below the 35,000 cfs level, the entire tract would be included.
- When a tract of land is intersected by a major road or highway, only the area on the river side of the thoroughfare would be included, even if there is only one owner for the tract.
- When an entire tract does not fall within the 35,000 cfs level and has points of road egress that do not require crossing proposed project, it would be excluded.
- When a tract is not within the 35,000 cfs level but is entirely surrounded by areas that are and has no egress other than through potential refuge lands, it would be included.
- No tracts along the Cashie River upstream of the Bertie Game Lands would be included.
- Larger tracts of land that are currently forested or are being managed for timber along the Cashie River corridor and the corridor towards Pocosin Lakes NWR will be included.
- Include tracts between the 35,000 cfs and Sweetwater Creek tributary to the extent of Sweetwater Creek.
- Where the 35,000 cfs flood extent ends on the Roanoke River, an effort will be made to avoid as many tracts with residential and municipal development as possible within the

corridor towards Pocosin Lakes NWR while maintaining a corridor width of no less than 0.75 miles.

For planning purposes, a "tract" refers to property recognized as one unit on county tax records. A single tract may have one owner or multiple owners.

The total proposed CPA is approximately 287,090 acres. Within the CPA are approximately 93,000 acres that are currently under conservation, including the 21,313 acres within the Roanoke River NWR (Figure 1).

Maximum Fee-Title Interest

The Service proposes a maximum fee-title interest in approximately 50,000 acres acquired in properties from willing landowners only. Landowners within the area would be under no obligation to sell their properties to the Service. Lands acquired by the Service from willing landowners would be included within the boundary of the Roanoke River NWR and managed as part of the refuge under the current CCP (USFWS 2005). Any proposal to expand beyond the authorized 50,000 acres would require an additional separate planning effort by the Service, including public involvement, in accordance with applicable laws and policies.

Public uses that would likely occur on newly acquired properties are hunting, fishing, environmental education and interpretation, wildlife observation and photography, research, hiking, horseback riding, bicycling, boating, and kayaking, following appropriate use and compatibility determination processing. Other potential public uses and activities supporting these uses could also be considered, depending on the specifics of a particular property acquired. Existing uses of the current Roanoke River NWR would continue to occur under existing appropriate use findings and compatibility determinations in accordance with the refuge's CCP. The refuge was established as part of a Joint Venture with the State of North Carolina and, therefore, all refuge lands are incorporated into the Commission's Permit Hunt Program. All future lands that the Service will purchase in fee-title would likewise be incorporated into this program.

For properties that the Service would own in fee-title, habitat restoration and management would provide threatened, endangered, and resident wildlife with suitable habitat. Where appropriate, prescribed fire would be used to remove excess vegetation and restore native plant communities. Invasive species would be controlled through manual, mechanical, and chemical means. Cultural and historical resources would be protected, and interpretive programs and materials would allow the public to better understand and appreciate these important resources.

Less-than-Fee-Title Acquisition

The Service would limit acquisition of less-than-fee-title interests to only 100,000 acres of the total proposed CPA. Participation by landowners in the proposed easements and agreements would be voluntary.

Landowners within an approved CPA would be under no obligation to sell interest in their properties to the Service. If less-than-fee-title interests in lands within the proposed CPA were to be acquired, they would reflect the vision, purposes, and goals of the overall project, and would be subject to the terms and conditions of whatever easement, agreements, and/or other tool(s) used for less-than-fee-title acquisition. Less-than-fee-title acquisitions (e.g., conservation easements) would be acquired in perpetuity.

These less-than-fee-title interests would provide important opportunities for conservation, while at the same time maintaining private ownership rights and responsibilities. Landowners in the proposed CPA may voluntarily choose to participate, and participating lands would remain in private ownership. Private landowners who elected to participate would continue to control activities on their lands in accordance with the easement or agreement they negotiated. Once 100,000 acres were acquired in less-than-fee-title interest, any proposal to expand beyond the authorized 100,000 acres would require an additional separate planning effort by the Service, including public involvement, in accordance with applicable laws and policies.

B. LAND PROTECTION PRIORITIES

The Service's Proposed Action (Alternative B) would result in the acquisition of up to an additional 50,000 acres in fee-title and 100,000 acres in conservation easements or agreements of wildlife habitat as an expansion of Roanoke River NWR. The Service believes these are the minimum interests necessary to preserve and protect the fish and wildlife resources in the proposed area.

Property will be prioritized for acquisition using the following criteria:

- biological significance;
- existing and potential threats;
- significance of the area to refuge management and administration; and
- existing commitments to purchase or protect land.

The proposed CPA was delineated after engaging numerous stakeholders in the area and considering a variety of conservation and public benefits. The considerations included but were not limited to key wildlife species and habitats, habitat diversity, landscape resiliency, public recreation potential, flooding frequency and duration, water quality, infrastructure development within and outside the CPA, community expansion and economics, past establishment proposals, current data and trends, working lands, potential for working partnerships, wildlife corridor opportunities, existing land conservation projects, industry, etc. The CPA strives for wildlife habitat conservation and restoration for the benefit of wildlife and people. A variety of landowners within the proposed acquisition boundary exist including state agencies, non-profit organizations, trusts, corporations and private individuals. A priority system of land acquisition is described below. Actual method and timing of acquisition are dependent on willing sellers and agency funding. Flexibility is important in order to take advantage of opportunities and maximize conservation efforts.

PRIORITY GROUP I

The most important resources within this proposal are those parcels of land upstream of the Highway 17 bridge at Williamston that touch the Roanoke River and are composed of bottomland hardwood habitat types or are adjacent to other lands in conservation status (Figure 4). The lands upstream of the Williamston bridge have been selected as priority I because they are projected to remain relatively free of impacts from sea level rise. Lands adjacent to the river and composed of bottomland forest types are critical habitats for a large variety of wildlife and form the core of the migration corridor strategy that we are trying to promote with this land protection plan.

PRIORITY GROUP II

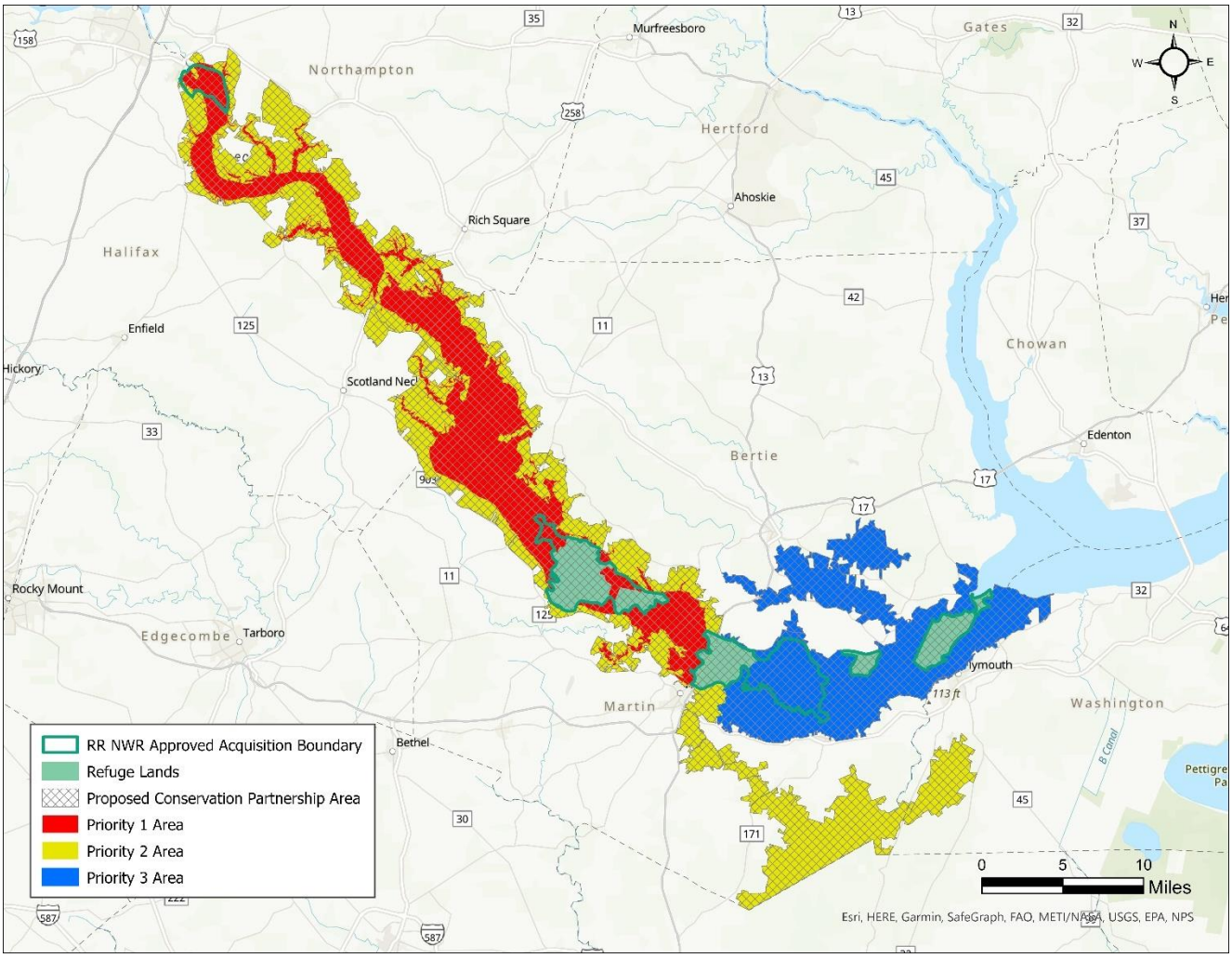
This group represents land parcels that are upstream of the Highway 17 bridge at Williamston and do not actually touch the river or are within the corridor connecting to Pocosin Lakes NWR (Figure 4). Priority will be given to lands that are adjacent to areas already in conservation status. Lands that form the corridor connecting this project to Pocosin Lakes NWR are important to create connected pathway of habitat for species to migrate away from rising sea levels. Lands in this section may be in agricultural or silvicultural status but are outside of human population centers. Parcels in this group that are located upstream of the Williamston bridge will be prioritized for; bottomland hardwood forest types, other forest types, proximity to lands already in conservation status, all other lands. While not in the highest priority group, these lands are important to the conservation strategy because they provide habitat that is not routinely flooded and maintain the width of the corridor such that it suits the needs of the greatest variety of wildlife.

PRIORITY GROUP III

This group represents parcels of lands that are downstream of the highway 17 bridge at Williamston and adjacent to the Roanoke River and adjacent to the Cashie River between the

town of Windsor and the Roanoke River (Figure 4). All of the lands in this group will be significantly impacted by sea level rise. We expect these habitats to change to open marsh or marsh-like habitats with varying salinity levels. We anticipate that open marsh and marsh-like habitats will not be in short supply as sea levels rise all along the NC coast, therefore these areas are of lowest priority."

LPP Figure 4. Map showing lands prioritized by location and significance to wildlife.



C. LAND PROTECTION OPTIONS

The Service acquires lands and interests in lands, such as easements, and management rights in lands through leases or cooperative agreements consistent with legislation or other congressional guidelines and executive orders for the conservation of fish and wildlife and to provide wildlife-dependent public use for recreational and educational purposes. These lands include national wildlife refuges, national fish hatcheries, research stations, and other areas.

We will use the following options to implement this LPP.

Option 1: Management or land protection by others
Option 2: Less-than-fee acquisition by the Service
Option 3: Fee acquisition by the Service

When land is needed to achieve fish and wildlife conservation objectives, the Service seeks to acquire the minimum interest necessary to meet those objectives and acquire it only from willing sellers. Our proposal includes a combination of options 1, 2, and 3, above. We believe this approach offers a cost-effective way of providing the minimal level of protection needed to accomplish refuge objectives while also attempting to meet the needs of local landowners.

OPTION 1. MANAGEMENT OR LAND PROTECTION BY OTHERS

A great deal of land within the project area is already owned by our partners or managed by our partners through conservation easements and ownership. It should also be emphasized that the protection of this area represents a large landscape-scale wildlife and habitat corridor which, in combination with other Service initiatives, represents the Service's response to climate change and sea level rise for eastern North Carolina. This proposed project would serve as an important keystone in this conservation effort. The following partners both manage and own property in, or ecologically associated, with the project area:

TNC has a long history of working with the Service to protect wildlife habitat. They own in fee title several tracts of land which total approximately 30,000 acres of bottomland hardwood habitat adjacent to the Roanoke River. As a stakeholder, TNC was a vital partner in the conservation community's effort to change the USACE water management plan for the J. H. Kerr Dam to benefit downstream ecosystems.

The North Carolina Wildlife Resources Commission owns approximately 53,000 acres within the project area that they manage as state game lands. The Roanoke River NWR was established as part of a Joint Venture with the State of North Carolina and, therefore, all refuge lands are incorporated into the Commission's Permit Hunt Program. All future lands that the Service will purchase in fee-title would likewise be incorporated into this program.

OPTION 2. LESS-THAN-FEE ACQUISITION BY THE SERVICE

Under option 2, we would protect and manage land by purchasing only a partial interest, typically in the form of a conservation easement. This option leaves the parcel in private ownership while allowing Service control over the land use in a way that enables us to meet our goals for the parcel or that provides adequate protection for important adjoining parcels and habitats. The structure of such easements would provide permanent protection of existing wildlife habitats while also allowing habitat management or improvements and access to sensitive habitats, such as for endangered species or migratory birds. We would determine, on a case-by-case basis, and negotiate with each landowner the extent of the rights we would be interested in buying. The extent of the negotiated rights may vary, depending on the configuration and location of the parcel, the current extent of development, the nature of wildlife activities in the immediate vicinity, the needs of the landowner, and other considerations.

In general, any less-than-fee acquisition will maintain the land in its current configuration with no further subdivision. Easements are a property right and typically are perpetual. If a landowner later sells the property, the easement continues as part of the title. Properties subject to easements generally remain on the tax rolls, although the change in market value may reduce the assessment. The Service does not pay refuge revenue sharing on easement rights. Where we identify conservation easements, we would be interested primarily in purchasing development and some wildlife management rights. Easements are best when:

- only minimal management of the resource is needed, but there is a desire to ensure the continuation of current, undeveloped uses and to prevent fragmentation over the long-term and in places where the management objective is to allow vegetative succession;
- a landowner is interested in maintaining ownership of the land, does not want it to be further developed, and would like to realize the benefits of selling development rights;
- current land use regulations limit the potential for adverse management practices;
- the protection strategy calls for the creation and maintenance of a watershed protection area that can be accommodated with passive management; and/or
- only a portion of the parcel contains lands of interest to the Service.

The determination of value for purchasing a conservation easement involves an appraisal of the rights to be purchased based on recent market conditions and structure in the area. The LPP Methods section further describes the conditions and structure of easements.

OPTION 3. FEE ACQUISITION BY THE SERVICE

Under Option 3, we would acquire parcels in fee title from willing sellers, thereby purchasing all rights of ownership. This option provides us the most flexibility in managing priority lands and ensuring the protection in perpetuity of nationally significant trust resources.

Management of Service lands is guided by the mission of the Service and the purpose(s) for which a refuge is established. These goals may require active management techniques such as controlling invasive species, mowing, timber management, prescribed burning, planting, and managing for the six priority public uses. We only propose fee acquisition when adequate land protection is not assured under other ownerships, active land management is required, or we determine the current landowner would be unwilling to sell a partial interest like a conservation easement.

In some cases, it may become appropriate to convert a previously acquired conservation easement to fee acquisition, such as when an owner is interested in selling the remainder of interest in the land on which we have acquired an easement. We will evaluate that need on a case-by-case basis.

D. LAND PROTECTION METHODS

We may use several methods of acquiring either full or partial interest in parcels identified for Service land protection: (1) purchase (e.g., complete title or a partial interest, like a conservation easement), (2) leases and cooperative agreements, (3) donations, and (4) exchanges.

PURCHASE

The method we ultimately use to protect a given tract depends partly on the landowner's wishes; however, for most of the tracts in the boundary, it is expected that the method will be fee title or easement purchase.

Fee Title Purchase

A fee title interest is normally acquired when (1) the area's fish and wildlife resources require permanent protection not otherwise assured, (2) land is needed for visitor use development, (3) a pending land use could adversely impact the area's resources, or (4) it is the most practical and economical way to assemble small tracts into a manageable unit.

Fee title acquisition conveys all ownership rights to the federal government and provides the best assurance of permanent resource protection. A fee title interest may be acquired by donation, exchange, transfer, or purchase (as availability of funding allows).

Easement Purchase

Easement purchase refers to the purchase of limited rights (less than fee) from an interested landowner. The landowner would retain ownership of the land but would sell certain rights identified and agreed upon by both parties. The objectives and conditions of our proposed conservation easements would recognize lands for their importance to wildlife habitat or outdoor recreational activities and any other qualities that recommend them for addition to the Refuge System. Land uses that are normally restricted under the terms of a conservation easement include:

- development rights (agricultural, residential, etc.);
- alteration of the area's natural topography;
- uses adversely affecting the area's floral and faunal communities;
- excessive public access and use; and
- alteration of the natural water regime.

LEASES AND COOPERATIVE AGREEMENTS
Potentially, the Service can protect and manage habitat through leases and cooperative agreements. Management control on privately owned lands could be obtained by entering into long-term renewable leases or cooperative agreements with the landowners. Short-term leases can be used to protect or manage habitat until more secure land protection can be negotiated.

DONATION
We encourage donations in fee title or conservation easement in the approved areas.

EXCHANGE
We have the authority to exchange land in Service ownership for other land that has greater habitat or wildlife value. Inherent in this concept is the requirement to get dollar-for-dollar value with, occasionally, an equalization payment. Exchanges are attractive because they usually do not increase federal land holdings or require purchase funds; however, they also may be very labor-intensive and take a long time to complete.

E. SERVICE LAND ACQUISITION POLICY

Once a land protection (refuge acquisition) boundary has been approved, we contact landowners within the boundary to determine whether any are interested in selling. If a landowner expresses an interest and gives us permission, a real estate appraiser will appraise the property to determine its market value. Once an appraisal has been approved, we can present an offer for the landowner's consideration.

Appraisals conducted by Service or contract appraisers must meet federal as well as professional appraisal standards. In all fee title acquisition cases, the Service is required by federal law to offer 100 percent of the property's appraised market value, which is typically based on comparable sales of similar types of properties.

We based the proposed boundary expansion on the biological importance of key habitats. The expansion of this boundary gives the Service the approval to negotiate with landowners that may be interested or may become interested in selling their land in the future. With this internal approval in place, the Service can react more quickly as important lands become available. Our long-established policy is to work with willing sellers as funds become available, and we continue to operate under that policy. Lands within this boundary do not become part of the refuge unless their owners willingly sell or donate them to the Service.

F. FUNDING

The most likely sources of appropriated dollars for the purpose of land acquisition are the Land and Water Conservation Fund (LWCF) and the Migratory Bird Conservation Fund (MBCF). The primary source of income to the LWCF is fees paid by companies drilling offshore for oil and gas, as well as oil and gas lease revenues from federal lands. Additional sources of LWCF income include the sale of surplus federal real estate and taxes on motorboat fuel. The primary source of income to the MBCF is revenue from the sale of Migratory Bird Hunting and Conservation Stamps, commonly known as Duck Stamps. Additional major sources of MBCF income include appropriations from the Wetlands Loan Act of 1961, import duties collected on arms and ammunition, and receipts from the sale of refuge admission permits. In its effort to meet the goals of this refuge, the Service will seek appropriations from the LWCF and the MBCF for fee-title acquisition and conservation easements.

The cost-per-acre values used in Table 1 and the estimations below are based on data derived from recent land sales information provided by the Tax Assessment Offices for the five counties spanning the project area, as well as data obtained from a non-profit organization working to conserve land within these counties.

LPP Table 1. Fee Simple and Conservation Easement Land Sales Data by County.

County	Current Countywide Average Fee-Per-Acre Values	Conservation Easement Per-Acre Examples	Fee-Per-Acre Examples
Bertie	Not Available	Land and Timber: $1,260	Mixed Upland Timber, Cropland, Floodplain: $2,000-3,500 Land and Timber: $1,600
Halifax	Cropland: $2,600 Woodland (Timber not valued): $1,040	Not Available	Mixed Upland Timber, Cropland, Floodplain: $2,000-3,500
Martin	Cropland: $3,800 Woodland (Timber not valued): $950-1,800	Not Available	Mixed Upland Timber, Cropland, Floodplain: $2,000-3,500
Northampton	Cropland: $3,000 Woodland (Timber not valued): $950	Land and Timber: $1,600	Mixed Upland Timber, Cropland, Floodplain: $2,000-3,500
Washington	Not Available	Land and Timber: $535	Land and Timber: $850

At this point in time, the Service is unable to predict where and when refuge lands would be acquired within the proposed CPA. Because the cost of acquisition varies widely depending on the characteristics of the tract and the method of acquisition, it is impossible to pre-determine the precise cost of acquisition and easements on all 150,000 acres. The total estimated cost to acquire 50,000 acres in fee title and 100,000 acres in conservation easements ranges from $225,000,000 to $375,000,000, based on fee title costs of $2000-3000 per acre and conservation easement costs of $1250-1750 per acre. These per-acre estimates can be considered an *average* per-acre-cost of all size tracts and various land uses; both of these factors can greatly affect value. This provides the Service with a high/low range of value for acquisition of the entire acreage. The range in value is affected by the following factors:

- The various land uses within the CPA, with the vast majority currently forested. There are approximately 51,210 acres in agricultural use and 203,924 acres categorized as forested.
- The various percentages of the counties' per-acre values represented in the overall CPA acreage.
- Tract size within the CPA ranges from less than 1 acre to 11,960 acres. Per-acre estimates were generated based on countywide averages as well as specific recent sale examples of various sized tracts encompassing floodplain habitats.
- Limited data for conservation easement values are available.

It is important to note that these costs are only provided as an *approximation based on current market value*. Donations, the ratio of fee title to conservation easement purchases, and land value fluctuations over time are among the factors that would likely influence the costs associated with completion of the refuge.

IV. Coordination

Methods of outreach to private landowners, state and federal elected officials, other state and federal natural resource agencies, nongovernmental conservation organizations, and the general public included direct mailings, e-mails, digital media (a link on the Roanoke River NWR website), and press releases to local media.

For public scoping, the Service held five open houses from 6:00-8:00 pm on each evening of the week of January 23-27, 2017. The meeting locations for each county were as follows: TJ Recreation Center, Roanoke Rapids, North Carolina (Halifax County) on January 23, 2017; Martin County Extension Office, Williamston, North Carolina (Martin County) on January 24, 2017; Windsor Community Building, Windsor, North Carolina (Bertie County) on January 25, 2017; Northampton Recreation Center, Jackson, North Carolina (Northampton County) on January 26, 2017; and Washington County Extension Office, Plymouth, North Carolina (Washington County) on January 27, 2017.

Each two-hour open house provided the public with an opportunity to interact individually with Service experts in fish and wildlife management, recreational opportunities, real estate, aquatic biology, private land stewardship, and refuge planning. The open house meetings were announced in advance through a press release, as well as in letters and e-mails sent to CPA landowners, state and local elected officials, and other state and federal natural resource agencies. A total of approximately 108 people attended the meetings over the 5 days: 19 in Halifax, 35 in Martin, 36 in Bertie, 10 in Northampton, and 8 in Washington. The purpose of public scoping was to seek input regarding the expansion of Roanoke River NWR and to identify the issues that needed to be addressed in the planning process. The public scoping period was from January 1 through March 3, 2017. The issues and comments identified during the scoping process helped guide revisions of this LPP and EA.

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Section B. Environmental Assessment

Roanoke River National Wildlife Refuge Proposed Land Protection Plan

November 2023

Prepared by

Roanoke River National Wildlife Refuge
Bertie, Washington, Martin, Halifax, and Northampton Counties, North Carolina

Environmental Assessment for Roanoke River National Wildlife Refuge Proposed Expansion Plan

Date: November 2023

Introduction

This Draft Environmental Assessment (EA) is being prepared to evaluate the effects associated with the proposed action and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (43 CFR 46; 516 DM 8) and U.S. Fish and Wildlife Service (550 FW 3) regulations and policies. The NEPA requires examination of the effects of proposed actions on the natural and human environment.

The scope of this environmental assessment is limited to the proposed acquisition of lands for the expansion of the Roanoke River National Wildlife Refuge (refuge or NWR) which was established in 1988 (USFWS 1988). The purpose of Roanoke River NWR as reflected in the refuge's authorizing legislation, is to protect and conserve migratory birds, and other wildlife resources through the protection of wetlands, in accordance with the following laws:

"...the conservation of wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..." (16 U.S.C., Sec. 3901(b), 100 Stat. 3583) (Emergency Wetlands Resources Act of 1986);

"...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." (16 U.S.C. Sec. 664) (Migratory Bird Conservation Act of 1929);

"...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." (6 U.S.C. Sec 742f(a)4); and

"...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services..." (16 U.S.C. Sec. 742f(b)1) (Fish and Wildlife Act of 1956).

The EA is not intended to cover the development and/or implementation of detailed, specific programs for the administration and management of those lands. The appendices are provided as general information for the public in its review of the environmental assessment. If the refuge is expanded and the needed lands or interests in lands are acquired, the Service will modify the refuge's existing management plans to incorporate the new lands and resources under its control. At that time, these modified refuge management plans will be reviewed in accordance with the Departmental requirements of the NEPA.

National wildlife refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual. The mission of the NWRS, as outlined by the National Wildlife Refuge System Administration Act (NWRSAA), as amended by the National Wildlife Refuge System Improvement Act (16 U.S.C. 668dd et seq.), is:

"... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans"

Additionally, the NWRSAA mandates the Secretary of the Interior in administering the NWRS (16 U.S.C. 668dd(a)(4)) to

- provide for the conservation of fish, wildlife, and plants, and their habitats within the NWRS;
- ensure that the biological integrity, diversity, and environmental health of the NWRS are maintained for the benefit of present and future generations of Americans;
- ensure that the mission of the NWRS described at 16 U.S.C. 668dd(a)(2) and the purposes of each refuge are carried out;
- ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the states in which the units of the NWRS are located;
- assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the NWRS and the purposes of each refuge;
- recognize compatible wildlife-dependent recreational uses as the priority general public uses of the NWRS through which the American public can develop an appreciation for fish and wildlife; and

- ensure that opportunities are provided within the NWRS for compatible wildlife-dependent recreational uses; and monitor the status and trends of fish, wildlife, and plants in each refuge.

PROPOSED ACTION

The U.S. Fish and Wildlife Service (Service) is proposing to protect and manage up to an additional 150,000 acres in Bertie, Washington, Martin, Northampton and Halifax Counties in North Carolina, through the expansion of the Roanoke River National Wildlife Refuge (NWR, refuge) in accordance with the refuge's Comprehensive Conservation Plan (CCP; U.S. Fish and Wildlife Service 2005). In accordance with Service policy and the NEPA, a draft Land Protection Plan (LPP) has been prepared describing the strategy of establishing a 287,090-acre Conservation Partnership Area (CPA) along the Roanoke River from Weldon to the Albemarle Sound, with authority to acquire up to 50,000 acres in fee title and 100,000 acres in conservation easements and conservation partnerships as part of Roanoke River NWR. Acquisitions would fall within Bertie, Washington, Martin, Halifax and Northampton Counties, North Carolina. The plan outlines the options and methods used to provide the minimum interests necessary to preserve and protect the area's fish, wildlife, and plant resources.

A proposed action may evolve during the NEPA process as the agency refines its proposal and gathers feedback from the public, tribes, and other agencies. Therefore, the final proposed action may be different from the original. The proposed action will be finalized at the conclusion of the public comment period for the EA.

BACKGROUND

The Roanoke River NWR, along with 10 other national wildlife refuges, is part of a larger landscape recognized by the Service as the Roanoke-Tar-Neuse-Cape Fear Ecosystem and classified as Ecosystem Unit #34. In the early 1990's, a partnership among federal, state and nongovernmental land managers in northeastern North Carolina, informally referred to as the Land Protection Team, formed to work collaboratively to conserve the natural resources of this ecosystem. An early result of those efforts was a Preliminary Project Proposal for the Proposed Expansion of Eastern North Carolina Refuges (USFWS 1994). Approved in 1994, the proposal recommended expansion of 7 of the 11 refuges in the ecosystem to form a connected system of conservation areas linked by corridors, which would provide continuous forested habitat for many Service trust species. This proposal builds upon that earlier work with specific focus on the expansion of Roanoke River NWR to create habitat corridor linkages.

Expansion of Roanoke River NWR would support the restoration and protection of a contiguous forested riparian corridor approximately 130 miles long extending from the Weldon area to the Albemarle Sound. In addition to providing continuous forested habitat, the additional protected lands would afford water quality benefits by providing a significant and necessary buffer preventing runoff of nonpoint source pollutants and

sediments from entering the river channel. Because the river supports diverse and significantly large populations of migratory fish, improving water quality and clarity is critical to ensuring the welfare of the river's fishery and the wildlife species that depend on a healthy fishery.

The bottomland forest associated with the Roanoke stretches nearly five miles wide in places and is considered the largest, most intact and least disturbed bottomland forest ecosystem in the mid-Atlantic (North Carolina Natural Heritage Program 1988). Two hundred fourteen bird species have been recorded for this site, 88 of which are known to breed, making this site one of the most diverse in the Coastal Plain. Thirty-five species of Neotropical migrants breed within the site. Several colonies of wading birds are present, including the Conine Island colony, North Carolina's largest inland colony of wading birds. The site supports a significant diversity and abundance of Neotropical migrant songbirds, as well as a large number of breeding wood ducks. The site holds a significant diversity and abundance of species associated with bottomland hardwood forests.

The North Carolina Wildlife Resources Commission (NCWRC) Wildlife Action Plan (2005) and The Nature Conservancy (TNC) recognize the floodplain forest along the Roanoke River as the best and largest example of this type of habitat still in existence along the Atlantic Coast. However, pressures threaten to significantly reduce the bottomland hardwood forest landscape. Factors that are driving the need to expand the Roanoke River NWR include regional growth and subsequent water supply demands; water flow control and resultant impacts to habitats; habitat fragmentation; and sea level rise and its potential negative effects on plant and animal communities.

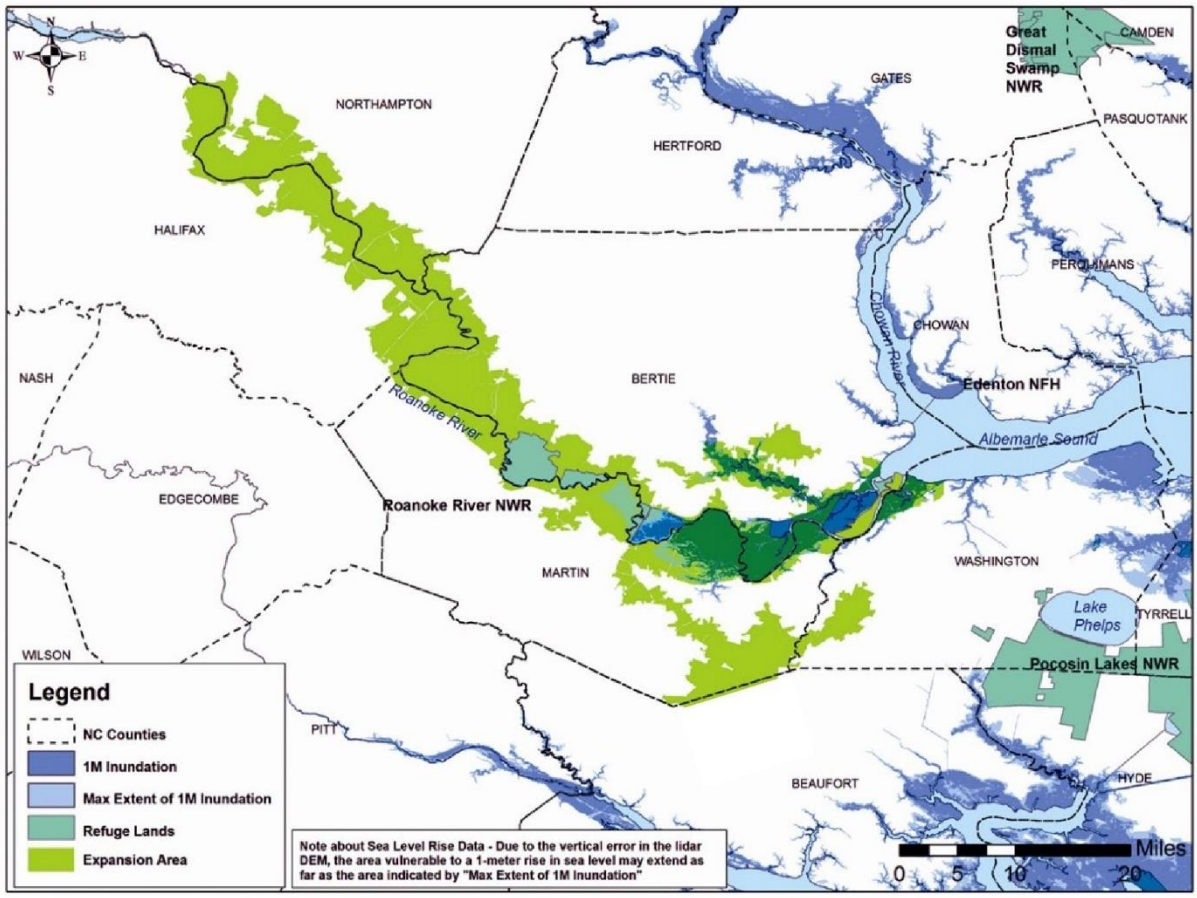
PURPOSE AND NEED FOR THE ACTION

The purpose of this proposed action is to protect and manage up to an additional 150,000 acres in Bertie, Washington, Martin, Northampton and Halifax Counties in North Carolina, through the expansion of the Roanoke River National Wildlife Refuge (NWR, refuge) in accordance with the refuge's CCP (USFWS 2005).

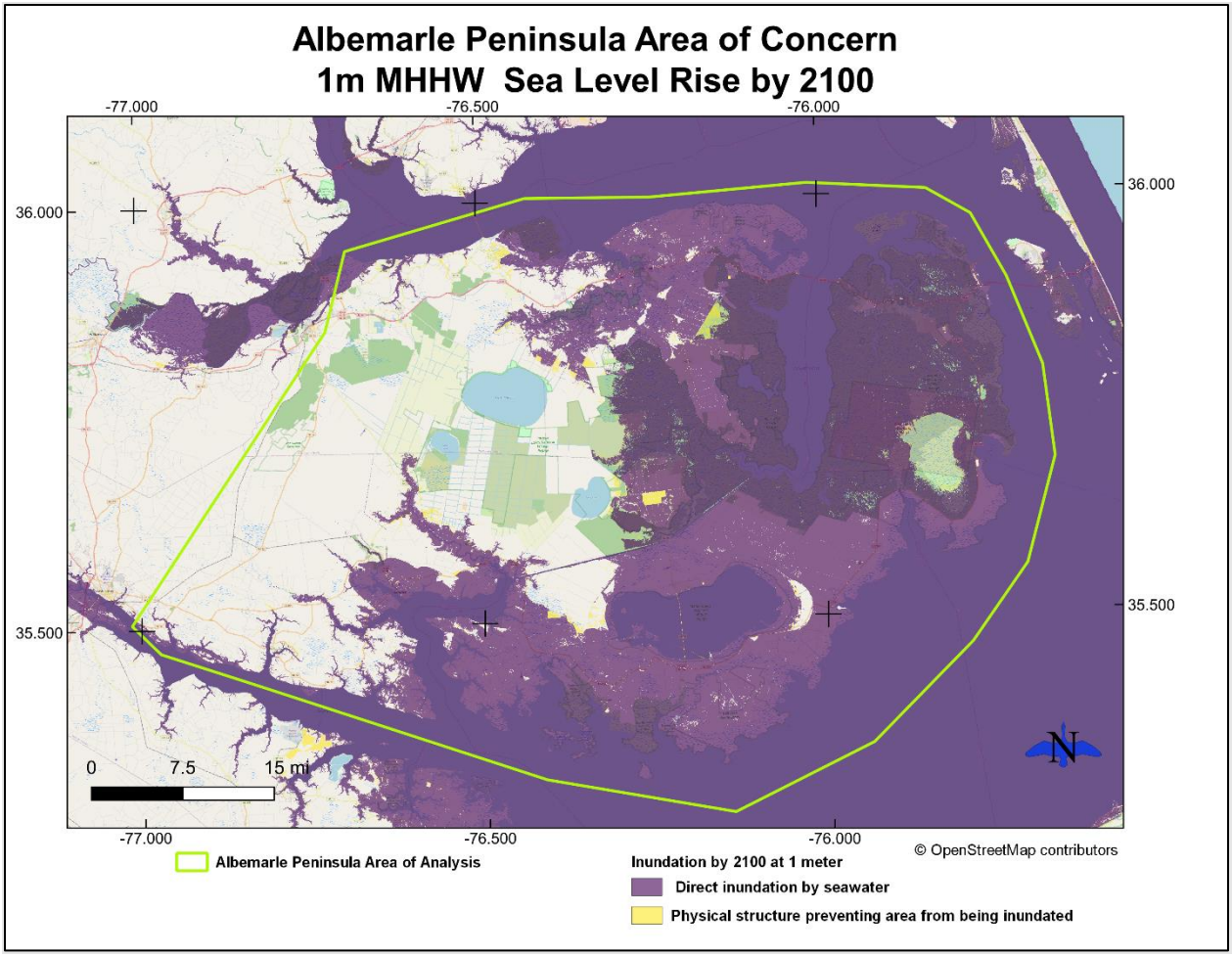
Residential and agricultural development, forestry practices, and water management have resulted in the alteration of what was once a continuous forested floodplain along the Roanoke River. Fragmentation has brought about a system less equipped in the present to support wildlife species dependent on large, forested tracts of land and less prepared for the effects of future sea level rise. A key concept of the 1994 Preliminary Project Proposal was ecosystem management through the creation of a network of core areas focused on existing wildlife refuges and connected by corridors (USFWS 1994).

Sea level rise factors significantly into the need for this proposal. The impacts of sea level rise on terrestrial habitats of northeastern North Carolina have become increasingly evident. Sea level rise by 2100 in Wilmington, North Carolina is projected to be between 24 and 94cm under a reduced emissions scenario (RCP2.6) and between 42 and 132cm

under a high emissions scenario (RCP8.5; Kopp et al. 2015, Bhattachan et al. 2018). The North Carolina Sea-Level Rise Assessment Report projects a 1-meter rise in sea level along the North Carolina Coast by 2100 (North Carolina Department of Environment and Natural Resources 2010). This would result in inundation of some existing refuge lands and approximately 741,151 acres to the east of Roanoke River NWR (Figures 1 and 2). These lands would most likely convert to either open water or marsh habitats. Of proximate concern is loss of habitat for terrestrial dwelling trust species, including waterfowl, migratory bird species, and the red-cockaded woodpecker (*Picoides borealis*).



EA Figure 1. Projected 1-meter sea level rise (expected by 2100) in the Roanoke River Basin, including boundaries of current refuge (pale blue) and the proposed CPA (green). Sea level rise data from the North Carolina Coastal Resources Commission's Science Panel on Coastal Hazards, 2010.



EA Figure 2. Projected 1-meter sea level rise (expected by 2100) on the Albemarle Peninsula in eastern North Carolina (Newcomb 2021).

The need of the proposed action is to meet the Service's priorities and mandates as outlined by the NWRSAA to "plan and direct the continued growth of the System in a manner that is best designed to accomplish the mission of the System, to contribute to the conservation of the ecosystems of the United States, to complement efforts of States and other Federal agencies to conserve fish and wildlife and their habitats, and to increase support for the System and participation from conservation partners and the public" (16 U.S.C. 668dd(a)(4)(C)).

Connecting Roanoke River NWR lands with other protected areas nearby including Pocosin Lakes NWR, State of North Carolina Lower and Upper Roanoke River Gamelands, and areas under management by TNC is an important aspect of this proposed expansion. The area proposed for inclusion connects the Roanoke River floodplain to the proposed expansion area of the Pocosin Lakes NWR to create a corridor that would

provide emigration routes for plant and wildlife species, facilitating movement between protected landscapes and along the topographical gradient. Placement of this corridor is dictated by several factors. First is the need to connect two large conservation areas, Roanoke River NWR and Pocosin Lakes NWR. Second is the need to design a corridor that does not intersect with current municipalities and encompasses as much forested land as possible. Third is an attempt to accommodate the home range of a variety of animals from the very small home range of many insects and amphibians to the large home ranges of large mammals like black bears (*Ursus americanus*), who may range as far as 50 miles or more. The design of this corridor incorporates all the home range needs of priority wildlife species.

Alternatives

Alternative A – No Action Alternative

Under Alternative A, the No Action Alternative, the Service would not expand the existing acquisition boundary for Roanoke River NWR and no additional lands would be available for inclusion in the refuge either through fee-title ownership, conservation easement, or cooperative agreement. No change from the current authorized acquisition boundary would be made. Roanoke River NWR currently has 21,313 acres within its 33,000-acre acquisition boundary. Land within the acquisition boundary is authorized for purchase in fee-title, conservation easement or cooperative agreement.

Refuge staff would continue to protect, maintain, restore, and enhance 21,313 acres of refuge lands for resident wildlife, waterfowl, migratory nongame birds, and threatened and endangered species according to the CCP (USFWS 2005). Refuge management would continue to focus on providing migratory and breeding habitat for neotropical migratory songbirds, production habitat for wood ducks, and supporting the habitat conservation goals of the North American Waterfowl Management Plan. In addition, the refuge would continue to contribute to other national, regional, and state goals to protect and restore neotropical breeding bird, wood duck, wintering American black duck and other waterfowl, colonial nesting birds, and anadromous fish populations, and continue to conduct survey and monitoring efforts for birds, invertebrates, reptiles, and amphibians.

The refuge would continue to actively manage forest stands to provide a diverse complex of habitats. The current public use program of the refuge would continue, supporting the six priority public uses of hunting, fishing, hiking, wildlife photography, environmental education and environmental interpretation.

The refuge would continue to pursue acquisition of lands from willing sellers within the current acquisition boundary. Lands acquired as part of the refuge would be available for compatible public wildlife-dependent recreation and environmental education opportunities in the times and locations that do not interfere with the purpose of the refuge.

The refuge would continue to work to promote conservation in the area through other means such as outreach, partnerships with landowners, hunt clubs and the Natural Resources Conservation Service through conservation easements, cooperative agreements, and federal programs such as the Wetlands Reserve Program.

Cultural resources would be protected first by the comprehensive inventory of the refuge and through consultations with state and federal authorities prior to any construction and management actions.

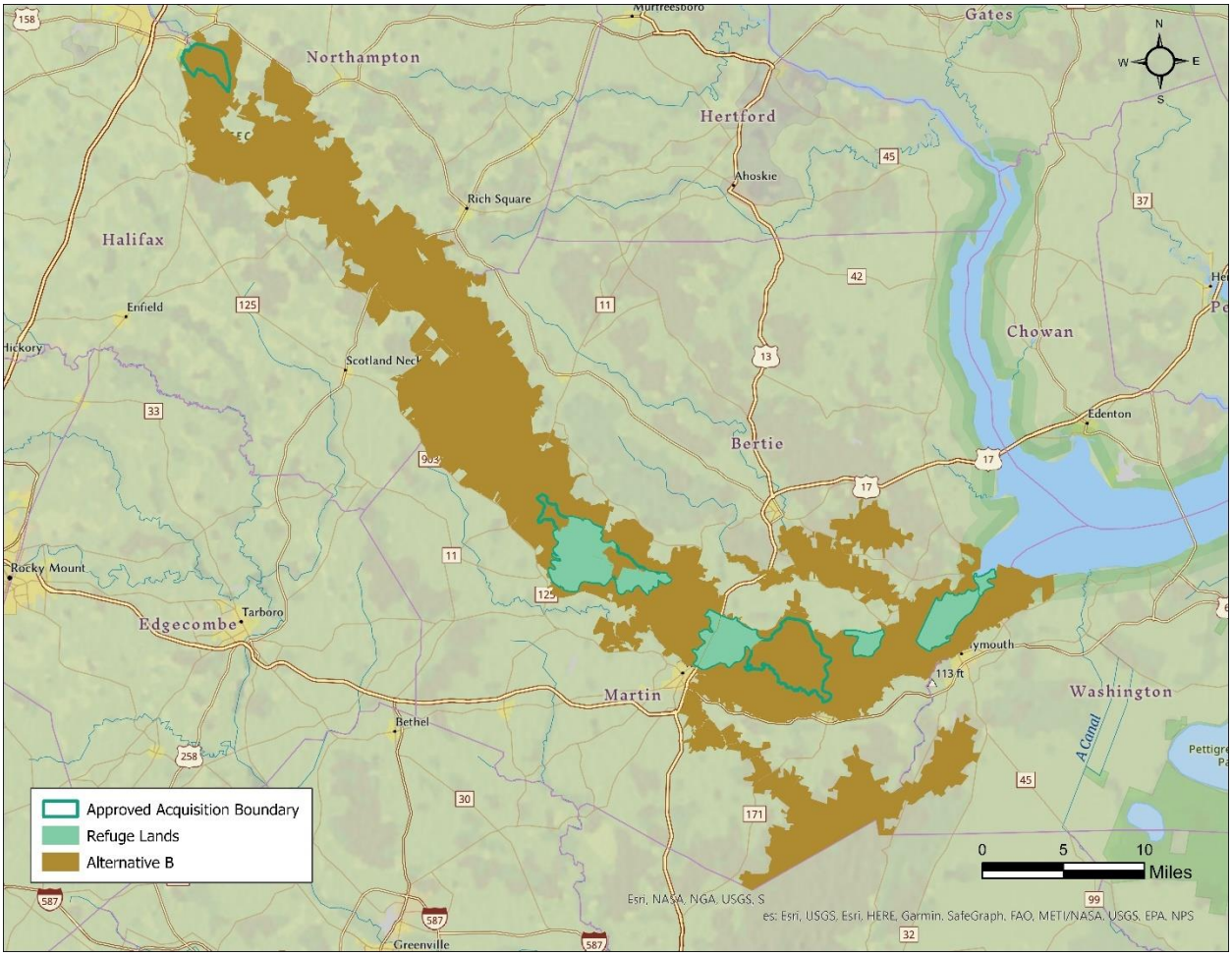
The refuge would continue to be managed to current Service standards to ensure the safety of employees, staff and the visiting public. Refuge funding is dependent upon a variety of factors, including Congressional appropriations, Southeast Region budget priorities and allocations, grants and collaborations, and actual refuge needs. Under this alternative, the Service's Southeast Regional Office would evaluate the need for staff and funding based on management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff or funding when justified.

ALTERNATIVE B – ESTABLISH FULL CONSERVATION PARTNERSHIP AREA – (PROPOSED ACTION ALTERNATIVE)

Under Alternative B, the Proposed Action Alternative, the Land Protection Plan would be approved and the Roanoke River NWR acquisition boundary would be expanded to 287,090 acres to create a Conservation Partnership Area (CPA) in which the Service could add up to 50,000 acres in fee-title and 100,000 acres in conservation easements to Roanoke River NWR, in addition to the remaining 11,687 acres authorized under the current acquisition boundary.

Within the CPA, the Service would work with state, local, private, and fellow federal partners toward a common vision for conservation of the bottomland hardwood habitats of the Roanoke River. The proposed CPA would include the current 33,000-acre acquisition boundary of Roanoke River NWR and an additional 260,853 acres (Figure 3). The proposed CPA would approximate the 100-year floodplain of the Roanoke River from Albemarle Sound to Weldon, provide additional protection to the Cashie River lands south of Windsor, and create a corridor from Roanoke River NWR toward Pocosin Lakes NWR. A full description of the Alternative is described in the draft Land Protection Plan (Section A).

EA Figure 3. Map of the proposed CPA under Alternative B, including all tracts in the 35,000 cfs boundary of the Roanoke River, tracts along the Cashie River, and the corridor towards Pocosin Lakes NWR.



The criteria followed for the design of Alternative B are:

- All land below the dam at Weldon, starting at the northern extent of the current acquisition boundary at Mush Island, and within the 35,000 cubic feet per second (cfs) flood level of the river extending to the Albemarle Sound.
- When a tract of land is intersected by the 35,000 cfs level and the entire tract does not fall below the 35,000 cfs level, the entire tract would be included.
- When a tract of land is intersected by a major road or highway, only the area on the river side of the thoroughfare would be included, even if there is only one owner for the tract.

- When an entire tract does not fall within the 35,000 cfs level and has points of road egress that do not require crossing proposed project, it would be excluded.

- When a tract is not within the 35,000 cfs level, but is entirely surrounded by areas that are and has no egress other than through potential refuge lands, it would be included.

- No tracts along the Cashie River upstream of the Bertie Game Lands would be included.

- Larger tracts of land that are currently forested or are being managed for timber along Cashie River corridor and the corridor towards Pocosin Lakes NWR will be included.

- Include tracts between the 35,000 cfs and Sweetwater Creek tributary to the extent of Sweetwater Creek.
- Where the 35,000 cfs flood extent ends on the Roanoke River an effort will be made to avoid as many tracts with residential and municipal development as possible within the corridor towards Pocosin Lakes NWR while maintaining a corridor width of no less than 0.75 miles.

This alternative would fully satisfy the Purpose and Need by advancing the 5 goals for the refuge listed in the CCP (USFWS 2005), as follows:

Goal 1. Protect, maintain, and enhance healthy and viable populations of indigenous migratory birds, wildlife, fish, and plants, including federal and state threatened and endangered species.

Within this riparian corridor, or CPA, Service trust species including American black ducks (*Anas rubripes*), swallow-tailed kite (*Elanoides fortificatus*), bald eagles (*Haliaeetus leucocephalus*), neotropical migratory birds, wild turkey (*Meleagris gallopavo*), and herons (Ardeidae sp.) would be managed for long-term species survival, particularly in the face of sea level rise.

The CPA would help connect the Roanoke River floodplain to Pocosin Lakes NWR, creating a corridor that would provide emigration routes for plant and wildlife species threatened by sea level rise. The corridor would serve as a crucial link from those conservation lands predicted to be directly threatened by sea level rise to the network of conservation lands found in the Roanoke River system. It would serve as a refuge for plant and wildlife resources as their habitats are lost and they are pushed westward from the pressures of sea level rise. The corridor is designed in a way that maximizes forestland cover and minimizes impacts to current agricultural and residential land uses. The habitat needs of those species moving westward, including breeding and migratory

passerine birds and large mammals such as the black bear, are incorporated into the design of the corridor.

Goal 2. Restore, maintain, and enhance the health and biodiversity of forested wetland habitats to ensure improved ecological productivity.

Refuge expansion under Alternative B would support the restoration and protection of a contiguous forested riparian corridor approximately 137 miles long, extending from Weldon to the Albemarle Sound. In addition to providing continuous forested habitat, the additional protected lands would afford water quality benefits, by providing a significant and necessary buffer preventing runoff of non-point source pollutants and sediments from entering the river channel. Because the river supports diverse and significantly large populations of migratory fish, improving water quality and clarity is critical to protecting the river's fishery and the wildlife species that depend on a healthy fishery.

Though the river follows its historic channel, upstream dams manage water flows. The nearest dam to the refuge is located 70 miles upstream at Roanoke Rapids. River levels and flow rates are managed for multiple stakeholders with the primary focus on power production and flood control. The result is a flood regime that does not accurately mimic the scale and timing of historic floods and has a direct influence on the bottomland hardwood forests, swamps, and marshes that need to be conserved. The proposed CPA is based on a water release value of 35,000 cfs, which is the highest flow release authorized and implemented to this date since construction of John H. Kerr Dam and Reservoir in 1953.

Goal 3. Provide the public with safe, quality wildlife-dependent recreational and educational opportunities that focus on the wildlife and habitats of the refuge and the Refuge System. Continue to participate in local efforts to achieve a sustainable level of economic activity, including nature-based tourism.

Opportunities for wildlife-dependent recreational and educational opportunities would expand under Alternative B. Public uses that would likely occur on the expanded Roanoke River NWR fee title lands include hunting, fishing, environmental education and interpretation, wildlife observation and photography, research, hiking, horseback riding, bicycling, boating, and kayaking, following appropriate use and compatibility determination processing. Other potential public uses and activities supporting these uses would also be considered, depending on the specifics of a particular property acquired. Existing uses of the current Roanoke River NWR would continue to occur under existing appropriate use findings and compatibility determinations in accordance with the refuge's CCP.

Goal 4. Protect refuge resources by limiting the adverse impacts of human activities and development.

Threats to the bottomland hardwood forest landscape are almost certain to increase from the impacts of human encroachment, especially as the landscape eastward changes due to sea level rise and as overall human population numbers increase. Impacts to water quality and human development of land will increase, threatening the resources needed by the fish and wildlife resources in the area. This is one concern driving the need to reframe the conservation strategy in order to ensure that fish and wildlife resources and the integrity of their habitats can sustain viable populations during their westward retreat.

The recent establishment of the South Atlantic Landscape Conservation Cooperative (SALCC) by the Service signals a broader and more inclusive strategy of resource protection that recognizes the limitations of a single agency or entity and seeks to build partnerships and collaboration in order to conserve ecosystem functions. The proposed creation of the CPA creates a platform or focus for establishing partnerships across this landscape in order to protect and restore the functions of the Roanoke River within the greater Albemarle-Pamlico peninsula region.

Residential and agricultural development, forestry practices, and water management have resulted in the alteration of what was once a continuous forested floodplain. Fragmentation has created a system less equipped to support wildlife species dependent on large, forested tracts of land and less prepared for the gradual changes and buffering service needed to deal with sea level rise in the future. This conservation strategy is designed to conserve and maximize the benefits of what remains.

Goal 5. Acquire and manage adequate funding, human resources, facilities, equipment, and infrastructure to accomplish the other refuge goals.

Refuge funding is dependent upon a variety of factors, including Congressional appropriations, Southeast Region budget priorities and allocations, grants and collaborations, and actual refuge needs. Under this alternative, the Service's Southeast Regional Office would evaluate the need for additional full-time staff based on management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff when justified.

This alternative fulfills the Service's mandate under the NWRSAA. The Service has determined that the 287,090-acre CPA with 50,000-acres in fee-title and 100,000-acres in conservation easements and cooperative agreements (Alternative B) is compatible with the purposes of Roanoke River NWR and the mission of the NWRS.

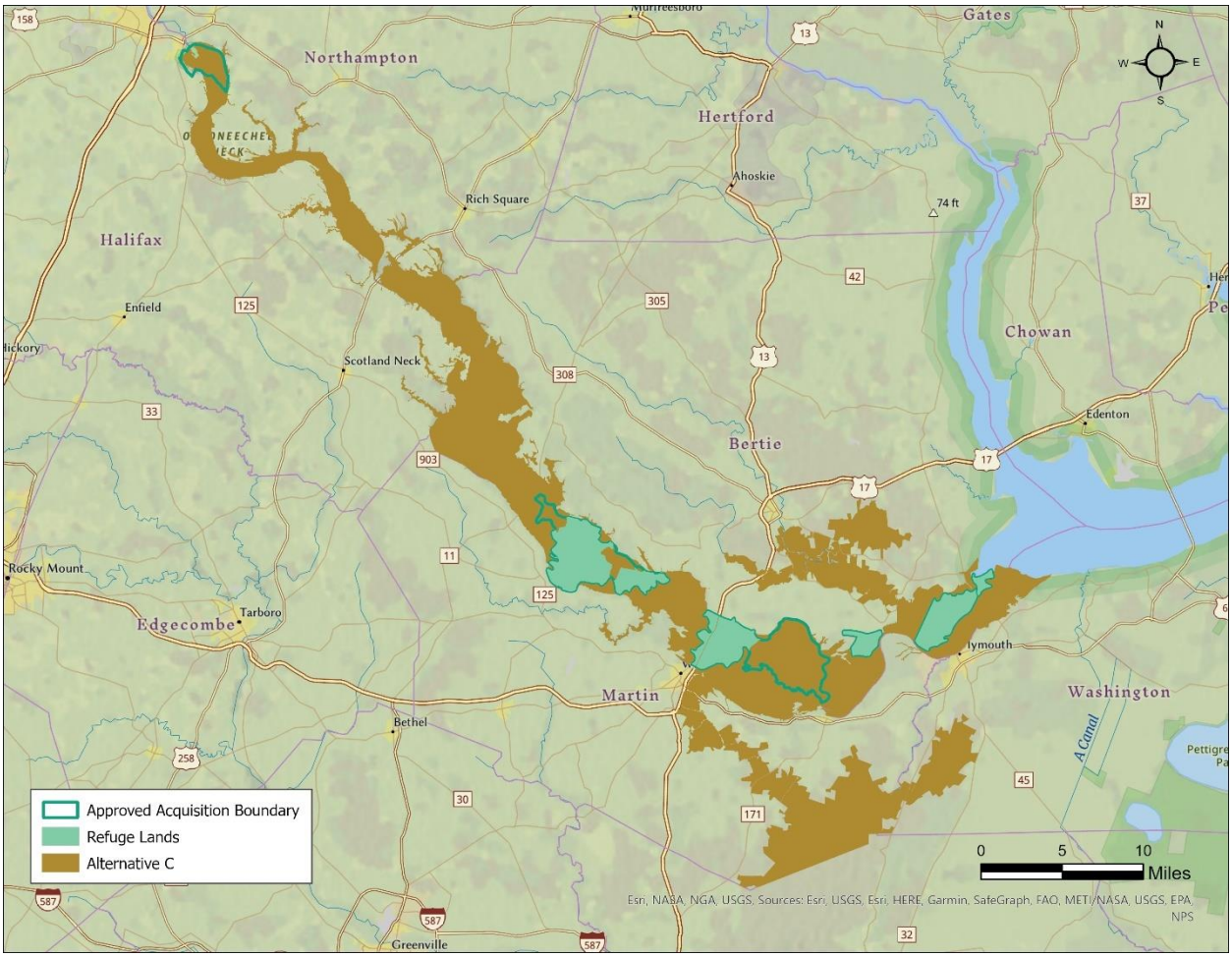
ALTERNATIVE C – 35,000 CFS CORE RIVER AREA, CASHIE RIVER, AND WILDLIFE CORRIDOR CPA

Alternative C would incorporate into the CPA only those lands that fall below the 35,000 cfs line along the Roanoke River from Weldon to the Albemarle Sound, plus the lands that extend up the Cashie River to Windsor and along Sweetwater Creek south, continuing as a corridor to Pocosin Lakes NWR (Figure 4). The significant distinction between this alternative and the proposed alternative (Alternative B) is that no lands outside of the 35,000 cfs line would be included. In the proposed alternative, where tracts are crossed by this line, the entire tract would be included within the CPA. Under this alternative, the Roanoke River NWR acquisition boundary would be expanded to 195,119 acres to create a Conservation Partnership Area (CPA) in which the Service could add up to 50,000 acres in fee-title and 100,000 acres in conservation easements to Roanoke River NWR in addition to the remaining 11,687 acres authorized under the current acquisition boundary. This alternative would exclude some farmland from the CPA; however, it would also preclude a landowner from selling an entire tract to the Service if that tract were divided by the 35,000 cfs line.

The criteria followed for the design of Alternative C are:

- All land from Weldon, starting at the northern extent of the current acquisition boundary at Mush Island, and within the 35,000 cubic feet per second (cfs) flood level of the river extending to the Albemarle Sound.
- No tracts along the Cashie River upstream of the Bertie Game Lands would be included.
- Larger tracts of land that are currently forested or are being managed for timber along Cashie River corridor and the Pocosin Lakes NWR corridor will be included.
- Include tracts between the 35,000 cfs and Sweetwater Creek tributary to the extent of Sweetwater Creek.
- Where the 35,000 cfs flood extent ends on the Roanoke River an effort will be made to avoid as many tracts with residential and municipal development as possible within the corridor towards Pocosin Lakes NWR while maintaining a corridor width of no less than 0.75 miles.

EA Figure 4. Map of the proposed CPA under Alternative C, including only lands within the 35,000 cfs boundary, as well as lands along the Cashie River and the corridor to Pocosin Lakes NWR.



Alternative C would have many of the benefits of the proposed Alternative B but is restrictive in land acquisition rules. Willing sellers can only sell the land that falls within the 35,000 cfs footprint, not their entire tract. Breaking up a tract may be a disincentive for a landowner to sell, with the Service potentially missing out on the opportunity to protect quality wildlife habitat.

This alternative would support many of the goals of Roanoke River, as described below:

Goal 1. Protect, maintain, and enhance healthy and viable populations of indigenous migratory birds, wildlife, fish, and plants, including federal and state threatened and endangered species.

This alternative fulfills this goal similarly to Alternative B, except that those forestlands that fall above the 35,000 cfs footprint would not be eligible for protection through acquisition, easement, or cooperative agreement that could support service trust species.

Goal 2. Restore, maintain, and enhance the health and biodiversity of forested wetland habitats to ensure improved ecological productivity.

This alternative fulfills this goal similarly to Alternative B, except that all forestlands that fall above the 35,000 cfs footprint would not be eligible for conservation through acquisition, easement, or cooperative agreement, making restoration or enhancement of low value acreage for wildlife more difficult to accomplish.

Goal 3. Provide the public with safe, quality, wildlife-dependent recreational and educational opportunities that focus on the wildlife and habitats of the refuge and the Refuge System. Continue to participate in local efforts to achieve a sustainable level of economic activity, including nature-based tourism.

This alternative fulfills this goal similarly to Alternative B, except that all forestlands that fall above the 35,000 cfs footprint would not be eligible for Service acquisition and used to provide wildlife-dependent recreational and educational opportunities to the public.

Goal 4. Protect refuge resources by limiting the adverse impacts of human activities and development.

This alternative fulfills this goal similarly to Alternative B, except that those lands on a tract that are outside the 35,000 cfs footprint would not be protected and subjected to human encroachment activities such as unsustainable forestry practices and development.

Goal 5. Acquire and manage adequate funding, human resources, facilities, equipment, and infrastructure to accomplish the other refuge goals.

Refuge funding is dependent upon a variety of factors, including Congressional appropriations, Southeast Region budget priorities and allocations, grants and collaborations, and actual refuge needs. Under this alternative, the Service's Southeast Regional Office would evaluate the need for additional full-time staff based on

management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff when justified.

This alternative would fulfill the Service's mandate under the NWRSAA, but to a lesser degree than Alternative B. While the majority of the area in the CPA would be the same as in Alternative B, the exclusion of tracts crossed by the 35,000 cfs would reduce the potential land that could be conserved and managed in accordance with these goals.

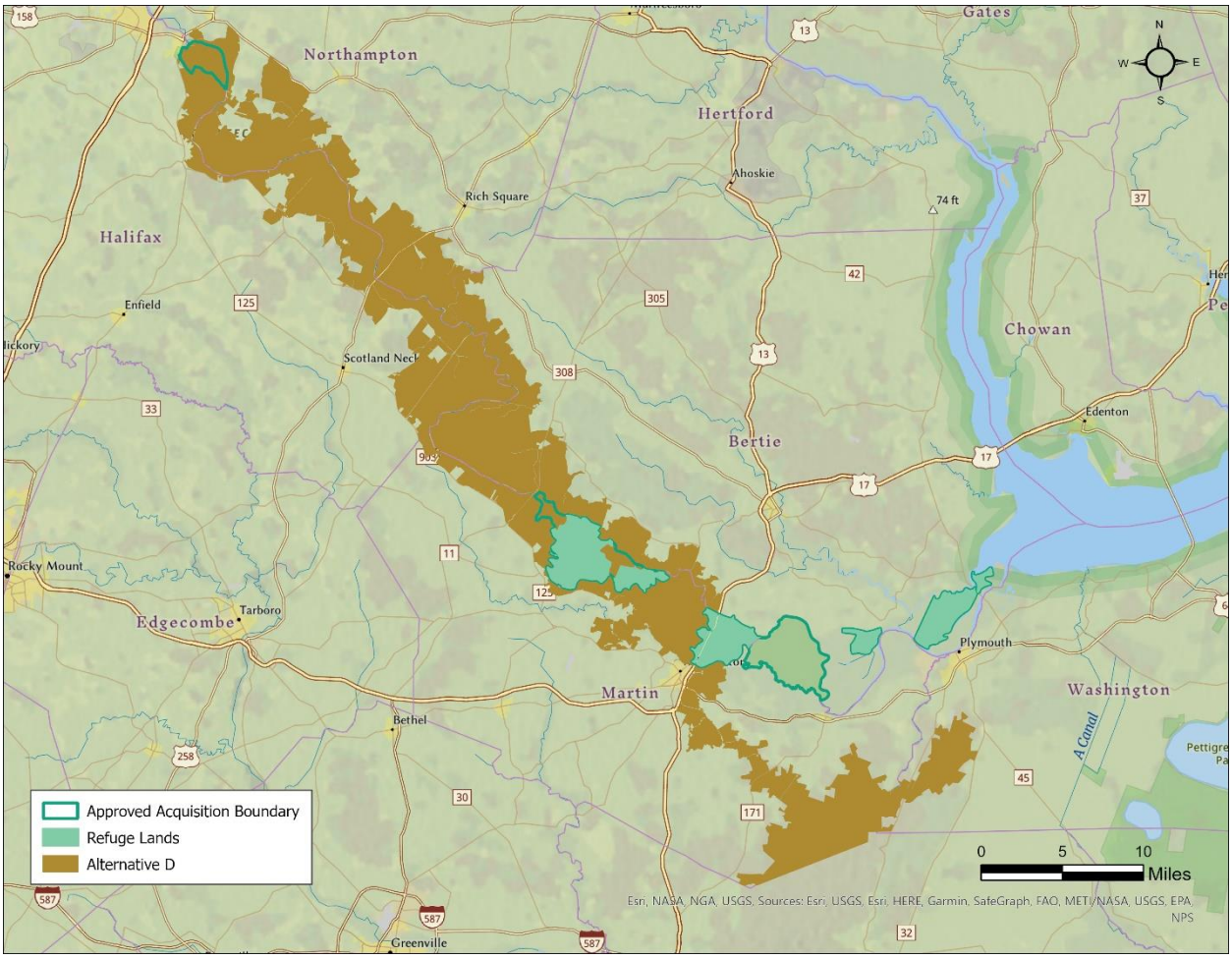
ALTERNATIVE D – NORTHERN REACHES AND WILDLIFE CORRIDOR CPA

Alternative D focuses the expansion on the northern reach of the Roanoke River from Williamston north to Weldon and incorporates a wildlife corridor extending south toward Pocosin Lakes NWR (Figure 5). This alternative design focuses more significantly on the projected impacts due to sea-level rise.

As noted earlier, the impacts of sea level rise on terrestrial habitats in northeastern North Carolina have become increasingly evident. It is projected that approximately 741,151 acres to the east of the Roanoke River NWR will convert to either open water or marsh habitats (Figure 2). Of proximate concern is loss of habitat for terrestrial dwelling trust species, including waterfowl and migratory bird species.

Alternative D takes a longer view of conservation and sets the stage for conservation in 50 to 100 years when sea level has risen. The priority is placed on the upper reaches of the Roanoke River within North Carolina that will remain riverine in the future but also are important to conservation in the present. In addition, the corridor along Sweetwater Creek south towards Pocosin Lakes NWR to the Washington County line provides a path of migration for those animals retreating along with habitat as sea level rises. Under this alternative, the Roanoke River NWR acquisition boundary would be expanded to 205,391 acres to create a Conservation Partnership Area (CPA) in which the Service could add up to 50,000 acres in fee-title and 100,000 acres in conservation easements to Roanoke River NWR in addition to the remaining 11,687 acres authorized under the current acquisition boundary.

EA Figure 5. Map of the proposed CPA under Alternative D, including tracts within the 35,000 cfs floodplain of the Roanoke River above Highway 17 and tracts along the corridor to Pocosin Lakes NWR.



The criteria followed for the design of Alternative D are:

- All land from Weldon, starting at the northern extent of the current acquisition boundary at Mush Island, and within the 35,000 cfs flood level of the river.

- When a tract of land is intersected by the 35,000 cfs level and the entire tract does not fall below the 35,000 cfs level, the entire tract would be included.

- When a tract of land is intersected by a major road or highway, only the area on the river side of the thoroughfare would be included, even if there is only one owner for the tract.

- When an entire tract does not fall within the 35,000 cfs level and has points of road egress that do not require crossing proposed project, it would be excluded.

- When a tract is not within the 35,000 cfs level but is entirely surrounded by areas that are and has no egress other than through potential refuge lands, it would be included.

- No lands will be included along the Cashie River.

- No lands will be included downstream of the HWY 17 bridge at Williamston.

- Include tracts between the 35,000 cfs and Sweetwater Creek tributary to the extent of Sweetwater Creek.
- Larger tracts of land that are currently forested or are being managed for timber along the Pocosin Lakes NWR corridor will be included.
- Where the 35,000 cfs flood extent ends on the Roanoke River an effort will be made to avoid as many tracts with residential and municipal development as possible within the corridor towards Pocosin Lakes NWR while maintaining a corridor width of no less than 0.75 miles.

This alternative would support many of the goals of Roanoke River NWR, as described below:

Goal 1. Protect, maintain, and enhance healthy and viable populations of indigenous migratory birds, wildlife, fish, and plants, including federal and state threatened and endangered species.

This alternative fulfills this goal similarly to Alternative B, except that those areas most prone to the effects of sea level rise would not be included within the acquisition boundary. This would leave out those areas not under current conservation protection along the Cashie River and below Williamston on the Roanoke River, significantly reducing the area that could be protected to support Service trust species.

Goal 2. Restore, maintain, and enhance the health and biodiversity of forested wetland habitats to ensure improved ecological productivity.

This alternative fulfills this goal similarly to Alternative B, except that those areas most prone to the effects of sea level rise would not be included within the acquisition boundary. Unprotected areas along the Cashie River and below Williamston on the Roanoke River would be vulnerable to unsustainable forest cutting practices that may impact forested wetlands and other natural habitats.

Goal 3. Provide the public with safe, quality wildlife-dependent recreational and educational opportunities that focus on the wildlife and habitats of the refuge and the Refuge System. Continue to participate in local efforts to achieve a sustainable level of economic activity, including nature-based tourism.

This alternative fulfills this goal similarly to Alternative B, except that the exclusion of those forestlands that fall below Williamston and along the Cashie River from potential acquisition would restrict potential opportunities for public wildlife-dependent recreational and educational opportunities in the future.

Goal 4. Protect refuge resources by limiting the adverse impacts of human activities and development.

This alternative fulfills this goal similarly to Alternative B, except that those areas most prone to the effects of sea level rise would not be included within the acquisition boundary. This would leave those areas not under current conservation protection along the Cashie River and below Williamston on the Roanoke River, including lands and waters adjacent to the refuge and used by refuge wildlife, potentially vulnerable to unsustainable forest clearing and low-level development.

Goal 5. Acquire and manage adequate funding, human resources, facilities, equipment, and infrastructure to accomplish the other refuge goals.

Refuge funding is dependent upon a variety of factors, including Congressional appropriations, Southeast Region budget priorities and allocations, grants and collaborations, and actual refuge needs. Under this alternative, the Service's Southeast Regional Office would evaluate the need for additional full-time staff based on management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff when justified.

This alternative would fulfill the Service's mandate under the NWRSAA to a lesser degree than Alternative B. While the majority of the area in the CPA would be the same as in Alternative B, the exclusion of tracts along the Cashie River and below Williamston would reduce the potential land that could be conserved and managed in accordance with these goals.

Affected Environment and Environmental Consequences

This section is organized by affected resource categories and for each affected resource discusses both (1) the existing environmental and socioeconomic baseline in the action area for each resource and (2) the effects and impacts of the proposed action and any alternatives on each resource. The effects and impacts of the proposed action considered here are changes to the human environment, whether adverse or beneficial, that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives. This EA includes the written analyses of the environmental consequences on a resource only when the impacts on that resource could be more than negligible and therefore considered an "affected resource." Any resources that will not be more than negligibly impacted by the action have been dismissed from further analyses.

The refuge consists of approximately 21,313 acres in Bertie County, North Carolina, and is primarily bottomland hardwood forests. The proposed action is located in the Roanoke River Basin (see maps of the proposed CPA under different alternatives at Figures 3-5).

For more information regarding the general characteristics of the refuge's environment, please see section II of the Refuge's CCP (USFWS 2005), which can be found here: https://ecos.fws.gov/ServCat/Reference/Profile/1515

The following resource does not exist within the project area: Wilderness.

Natural Resources

Terrestrial Wildlife and Aquatic Species

Affected Environment

Description of Affected Environment for the Affected Resource

Migratory and Nesting Waterfowl

The Roanoke River floodplain expansion area provides habitat for a significant portion of the three most commonly harvested duck species in North Carolina. Migratory mallards (*Anas platyrhynchos*), American black ducks, and migratory wood ducks (*Aix sponsa*) use the bottomland hardwoods and cypress-gum swamps primarily in the fall and winter months. Resident wood ducks use the floodplain habitat in late-winter and spring to nest in cavities in the standing timber along the river, blackwater streams, swamps, sloughs, and beaver ponds. The refuge is part of a conservation initiative that began in the late 1980's within the lower Roanoke River Basin. Several thousands of acres of public and private conservation lands are being targeted in this initiative to provide habitat to the wintering and migratory waterfowl that use this part of the landscape within the Atlantic Flyway.

Migratory and Nesting Landbirds

The Roanoke River floodplain is a rich ecosystem that supports a diverse array of wildlife. More than 214 species of birds have been observed, of which 35 are nesting neotropical migratory birds and 55 are other nesting resident species (USFWS 2005). Part of the Atlantic Flyway, the floodplain is used by many species of ducks, wading birds, shorebirds, raptors, and neotropical migratory birds, and provides important habitat for those species as well as bald eagles.

One of the largest natural populations of wild turkey in North Carolina is found in the bottomland hardwood habitat along the Roanoke River and within the expansion area. The ancient ridges and terraces provide food and cover for densities exceeding 15 turkeys per-square-mile in some areas.

Large tracts of contiguous forest are required to support populations of many migratory landbird species. Each species requires a different set of habitat components to meet life history needs. Several species of migratory landbirds found on the refuge have been undergoing long-term declines in continental populations due in part to the loss of bottomland hardwood forest habitat throughout the southeast. The Service strives to maintain a diverse landscape that provides sufficient suitable habitat to sustain populations of priority landbird species in the lower Roanoke River Basin. Refer to Table 2 in Appendix D for a list of the priority species found in the lower Roanoke River Basin and the referenced plan that identifies them as a priority.

Waterbirds

Wading birds find suitable habitats within the Roanoke River basin for feeding, nesting, and resting. The largest inland rookery in North Carolina is located on the Conine Island tract of the refuge. The rookery is estimated to be approximately 40 acres in size; anhinga (*Anhinga anhinga*), great blue heron (*Ardea herodias*), and great egret (*Ardea alba*) can be found nesting there. There are an unknown number of smaller rookeries that occur throughout the swamp forests. Yellow-crowned night-heron (*Nyctanassa violacea*), great blue heron and great egret rookeries are known to occur. The killdeer is the only shorebird species found nesting within the full proposed CPA; however, during migration, the refuge and surrounding lands are used as resting and refueling areas for species such as spotted sandpipers (*Actitis macularius*), American bittern (*Botaurus lentiginosus*) and greater yellowlegs (*Tringa melanoleuca*).

Herpetofauna

Herpetofaunal inventories performed in the lower Roanoke since 1996 have shown a diverse array of both reptiles and amphibian species. As of 2013, a total of 56 species have been identified. The 32 reptile species include eight turtles, six lizards, and eighteen snakes. Of these, the timber rattlesnake (*Crotalus horridus*) is listed as a North Carolina

Special Concern Species. The 24 amphibian species include eight salamanders, four toads, and twelve frogs.

The location of the lower Roanoke basin represents an important geographic transition zone for reptiles and amphibians, encompassing the northern range termini of many southeastern species as well as southern termini for certain northeastern species (Conant and Collins 1991, Palmer and Braswell 1995).

Reptiles and amphibians are abundant and functionally important in bottomland communities and are significant components of their ecosystem. Many species of herpetofauna are wide-ranging and may serve as indicator species in evaluating environmental health of an ecosystem (USFWS 2005). Objective 7 in the refuge CCP is to "Protect and conserve populations of amphibians and reptiles" (USFWS 2005).

Resident Mammals

The bottomland hardwood forests in the lands proposed for inclusion in the CPA and associated habitats support high populations of indigenous mammals. Many of the indigenous species are important game animals, such as gray squirrels (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*) and marsh rabbits (*Sylvilagus palustris*), white-tailed deer (*Odocoileus virginianus*), raccoons (*Procyon lotor*), and bobcat (*Felis rufus*). Other species receive less interest from the general public, such as small and medium-sized mammals, yet are critical to the environmental health and biodiversity of the refuge and the lower Roanoke River ecosystem. Other mammals found in the area include mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), groundhog (*Marmota monax*), American beaver (*Castor canadensis*), nutria (*Myocastor coypus*) and opossum (*Didelphis virginiana)*. The NCWRC classifies the Roanoke River floodplain as high-density white-tailed deer habitat, with densities reaching as high as 24.3 animals per square kilometer in some areas.

In recent years black bears have become more abundant year-round within the CPA. Most of the bears are concentrated in the lower reaches of the river and the proposed corridor that connects to Pocosin Lakes NWR. Bears are attracted to the Roanoke floodplain area due to the abundance of food and presence of large old trees that are suitable for winter denning sites.

A compilation of wildlife species of concern in the five counties that encompass the full proposed CPA is found in Table 1 in Appendix D.

Fishery Resources

The Roanoke River supports a significantly large migratory fish population in eastern North America, as well as a wide variety of resident fishes and other aquatic life. During the spring, the river serves as a "superhighway," providing migratory anadromous fish

species access to their spawning grounds. Some of these species stay within the river's mainstem to carry out their spawning activities, e.g., American shad (*Alosa sapidissima*), Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus)*, and striped bass (*Morone saxatilis*), while others, such as alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*), collectively known as river herring, and hickory shad (*Alosa mediocris*), are known to use floodplain habitat for spawning and/or nursery areas during spring floods (Peters et al. 1998). The American eel (*Anguilla rostrata*) is a catadromous species, migrating upriver as juveniles and using the entire riverine ecosystem as nursery and juvenile habitat for 10-12 years. When sexually mature, eels migrate from the river to spawning grounds in the Sargasso Sea. Sea lampreys (*Petromyzon marinus*), which are native to the Roanoke River Basin, also use the main stem river as a migratory pathway to upstream spawning areas.

Maintenance and sustainability of the diadromous fishery resources which use the Roanoke River as a migratory pathway, as a spawning area, and as nursery habitat is the goal of the Atlantic States Marine Fisheries Commission (ASMFC), which regulates those species when they are in state waters. When the species are in Atlantic Ocean waters, they are under the regulatory authority of the federal Fishery Management Councils (New England, Mid-Atlantic and South Atlantic) and/or the National Marine Fisheries Service. Service participation in these regulatory institutions is the responsibility of the Service's Fisheries Program. The ASMFC has prepared Fishery Management Plans for most of the diadromous species within the ASMFC. Fishery Management Plans establish the management targets and thresholds for each species, in some cases on a watershed basis (e.g., for American shad and river herring, see ASMFC 2009, 2010).

The creeks, guts, sloughs, and swamps within the floodplain system support a great diversity of resident fish, including largemouth bass (*Micropterus salmoides*), white crappie (*Pomoxis annularis*), redear sunfish (*Lepomis microlophus*), bluegill (*Lepomis macrochirus*), channel catfish (*Ictalurus punctatus*), yellow bullhead (*Ictalurus natalis*), and white catfish (*Ameiurus catus*). Nongame fish such as carp (*Cyprinus spp.*), longnose gar (*Lepisosteus osseus*), gizzard shad (*Dorosoma cepedianum*), bowfin (*Amia calva*), red fin pickerel (*Esox americanus*), and creek chub sucker (*Erimyzon oblongus*) are just some of the species also found utilizing floodplain habitat.

Description of Environmental Trends and Planned Actions

Wildlife and Fisheries Population Trends

Nationally, the majority of migratory bird populations have experienced steep declines since 1970 (Rosenberg et al. 2019). Populations of species breeding in eastern forests have declined by 17% (Rosenberg et al. 2019). Waterfowl have been an exception to the decline: while the 2019 Waterfowl Population Status report estimated fewer ducks in

North America than in 2018, the 2019 estimate of 38.9 million ducks is still higher than the 64-year long-term average of 35.4 million ducks (USFWS 2019). Populations of other groups of organisms, including amphibians and reptiles, freshwater fishes, bats, and insects, have also experienced significant long-term declines in North Carolina and the US in general (NCWRC 2015). Some game mammals, such as black bear and white-tailed deer (*Odocoileus virginianus*), have increased their populations in North Carolina in recent decades (NCWRC 2015).

American eel numbers have been declining at an alarming rate due to overfishing and pollution. Another cause of declines is dams, blocking eels from accessing large portions of available habitat on almost all river systems eels reside in. Eels had been blocked from all habitats above the Roanoke Rapids Dam until 2010, when eelways became operational (Jenkins and Burkhead 1994; Dominion Generation, unpublished data). During 2010 and 2011, over 600,000 American eels migrated up the Roanoke River, through the refuge, to the base of the dam, where they were captured and transported over the dam. Migratory sea lamprey are also blocked by dams. The status of the sea lamprey population is currently unknown, although it is likely reduced from historic levels due to dams blocking access to historic spawning habitats (Jenkins and Burkhead 1994).

Surface Hydrology

Surface hydrology is the driver of bottomland systems. Over thousands of years, seasonal flooding patterns that were relatively short in duration and varied in magnitude created the floodplain that is present today. The fish and wildlife species that inhabit the bottomland system evolved with the variable hydrology. Flooding from the river created the floodplain features found and dictates where plant and animal species are found. The hydrology within the proposed full CPA is directly impacted by discharges from upstream dams, primarily the U.S. Army Corps of Engineers John H. Kerr flood control project. The resultant flow regime does not mimic the hydrology the fish and wildlife resources evolved with. Long duration flood events during the growing season impact ground nesting and foraging landbirds by degrading the quality of habitat, making it inaccessible or undesirable. Herpetofauna that cannot tolerate long duration flooding are pushed to higher ground, limiting available habitat.

Development and Forest Fragmentation

Forest loss in the Lower Roanoke River Basin has accelerated over the last ten years, particularly in floodplains (Zeng 2022). Between 2011 to 2020, an average of 68 km^2 were lost each year, representing 1% of the total basin land area lost each year (Zeng 2022). While some deforested areas may be left to naturally regenerate, other forested areas may be converted into plantation forests, agriculture, or developed lands. Forest loss is expected to have negative impacts on populations of forest-dependent wildlife species through disturbance and habitat loss.

Climate Change

Climate change refers to the increasing changes in the measures of climate over a long period of time – including precipitation, temperature, and wind patterns. Climate change

is expected to have large impacts on wildlife in coastal North Carolina. Direct impacts of increased temperature due to a warming climate could include changes to timing of life history events, changes to reproduction and growth, and distorted sex ratios in some reptiles (Walther et al. 2002, McCallum et al. 2009). Habitat shifts will have even greater impacts to wildlife, as described in the Habitat and Vegetation section below. Species distributions may shift, contingent on the availability of suitable habitats that may be changing with conditions; if species or their habitats are not able to move with changing conditions, populations may decline or go extinct (Davis et al. 1998). As communities move, species may come into contact that did not previously interact, resulting in novel associations (Root et al. 2003, Walther et al. 2002). The precise impacts of climate change are expected to be highly local and species-specific, and there is limited information available for most organisms. While some species may benefit from changes, many, particularly already threatened species, are expected to experience negative impacts. For example, changes in climate patterns could decrease breeding habitat for ducks; mismatches between food availability and predator abundance could increase mortality; and more frequent extreme events could increase stochastic mortality (Sorenson et al. 1998, Koons et al. 2014). On the other hand, some species may benefit from changes such as increased food resources, new habitat created by shifting precipitation regimes, and changes in species interactions such as competition and predation (Koons et al. 2014).

Sea Level Rise

Sea level rise is expected to convert wetlands and swamp woods to open water and increase the salinity of the river system, particularly closer to Albemarle Sound. This habitat conversion may have initial positive effects on salt-tolerant aquatic organisms; however, anadromous species such as river herring may suffer from increased migration distances to reach low-salinity water (Weaver 2009). More sensitive freshwater species may simply decline in response to changing conditions. Terrestrial species would be negatively affected by habitat loss and conversion.

As discussed above, by 2100, more than 741,151 acres on the Albemarle Peninsula to the east of the proposed CPA are expected to become inundated due to sea level rise. This will greatly impact wildlife populations to the east of Roanoke River NWR. Some organisms may be able to move in response to rising water levels and changing habitats. This may result in an influx of new individuals to the study region; however, if the area is unable to support higher wildlife populations, local wildlife populations would remain the same and regional wildlife populations would experience a large decrease in the long term.

Impacts on Affected Natural Resources

Alternative A

Beneficial - Under the No Action alternative, there would be no benefits to native fish or wildlife populations, with the possible exception of those species that can tolerate or thrive in pine plantations and in residential, agricultural, or otherwise altered terrestrial environments. Examples of such species include white-tailed deer, coyotes (*Canis latrans*), raccoons, gray squirrels, blue jays (*Cyanocitta cristata*), and northern mockingbirds (*Mimus polyglottos*).

Adverse - As native and natural habitats continue to decline in quality and spatial extent within the Roanoke River Basin, and as habitat patches become more fragmented, the animal species that use these habitats would decline in numbers or fitness. The No Action alternative would exacerbate this decline for some of the area's fauna. The species most susceptible are those that are tied to relatively undisturbed, intact, native forests. Specifically, forest interior birds would likely continue to decline as large swaths of native forests are clear-cut. These clear-cut forests take at least 30-40 years to regenerate to suitable habitat for forest interior birds. With suitable habitat already limited, some of the more vulnerable species may not be able to sustain viable populations within the region. If large scale clear-cutting operations continue, populations of some vulnerable wildlife species will not be able to persist.

Nuisance species that prefer forest edges would increase. For example, increases in brown-headed cowbirds (*Molothrus ater*) would result in increased brood parasitism, with negative consequences to native songbird populations. In addition, with frequent disturbance, non-native, invasive species would be able to gain a greater foothold in the region, reducing the biodiversity of the floodplain ecosystem and decreasing available resources for wildlife.

If the projected levels of sea level rise on the North Carolina coast occur, wildlife on the Albemarle Peninsula will gradually move westward as the habitat they once used is no longer suitable to provide species life requisites. The No Action alternative would not ensure that a suitable migratory corridor and habitat would be available for these "wildlife refugees," potentially resulting in a reduction of wildlife numbers and diversity in eastern North Carolina.

In addition, without sufficient land under protective status, adequate buffers along the river and forested swamplands would be lacking. This would lead to an increased potential for nonpoint source pollution degrading aquatic habitats. Aquatic diversity would likely decline, which may also have negative effects on other wildlife that depend on aquatic life.

Given the trend of habitat degradation and loss of forested wetlands throughout the Southeast, the adverse effects of Alternative A, the No Action alternative, are expected to be major.

Alternative B

Beneficial -The proposed alternative, Full CPA, would protect the majority of the floodplain forest habitat within the lower Roanoke River Basin for use by the area's fauna. Species that would gain the most benefit from this alternative are those that require relatively undisturbed, intact, native forests. Forest interior breeding birds would especially benefit, since native forest habitat would be protected, and sustainable forest management practices would be employed to prevent fragmentation of forest habitats. In addition, the numerous migratory birds that use the forests and other habitats as a stopover location during their spring and fall migrations or that spend their winters in the region would have more stable habitats to rely on into the future. Suitable habitat would also be available for the wide variety of game species found throughout the region, such as wild turkey, white-tailed deer, gray squirrels, and rabbits, providing hunting and wildlife observation opportunities for the local and visiting public.

Adequate riparian buffers would reduce the amount of runoff, protecting water quality for aquatic species. Runoff from agricultural operations into wetlands has been identified as a major stressor to aquatic life. Suspended sediments contribute the largest volume of contaminants to aquatic habitats (Cooper 1993). When buffers along stream corridors are not present, the effects of pollutants on aquatic life are accelerated. The presence of buffers would help protect aquatic organisms that serve important roles in the food chain and in turn conserve the integrity and diversity of the floodplain forest ecosystem. In addition, adequate buffers of protected land along the river and forested swamplands would provide terrestrial wildlife refugia during high water flood events.

If the projected levels of sea level rise on the North Carolina coast occur, wildlife on the Albemarle Peninsula will gradually move westward as the habitat they once used is no longer present. Alternative B would ensure that a suitable migratory corridor and habitat would be available for these "wildlife refugees" to help conserve the wildlife diversity in eastern North Carolina.

Given the trend of habitat degradation and loss of forested wetlands throughout the southeast, the Full CPA alternative is expected to have a major positive effect in conserving the fish and wildlife species that use the lower Roanoke River Basin.

Adverse – Overall, under Alternative B, the Full CPA alternative, no adverse impacts to wildlife are expected.

Alternative C

Beneficial - This alternative would protect the portion of the lower Roanoke River floodplain forest habitat that actively floods during the maximum allowable releases from Roanoke Rapids Dam, 35,000 cfs, which would benefit those wildlife species found within the active flood zone. In general, impacts would be expected to be similar to Alternative B: Alternative C would benefit many species, especially forest interior species; would provide a wildlife corridor for "wildlife refugees" from farther east in the Albemarle

Peninsula; and would provide some buffers along the Roanoke and Cashie River corridors to benefit aquatic wildlife.

Given the trend of habitat degradation and loss of forested wetlands throughout the Southeast, this alternative is expected to have a moderate effect in conserving the fish and wildlife species that use the lower Roanoke River Basin.

Adverse – Unlike Alternative B, the more restricted footprint of Alternative C would have an increased risk of nonpoint source pollution runoff into floodplain habitat where buffers within the 35,000 cfs footprint are insufficient. This would lead to an increased potential for nonpoint source pollution to enter floodplain habitats with potential adverse effects to floodplain aquatic wildlife, including salamanders, frogs and fish. Overall, under this alternative, minimal adverse impacts to wildlife are expected.

Alternative D

Beneficial- This alternative would protect a significant portion of the floodplain forest habitat within the lower Roanoke River Basin located above Williamston for use by the area's fauna. Overall, the impacts would be expected to be similar to those of Alternative B: Alternative D would benefit many species, especially forest interior species; would provide a wildlife corridor for "wildlife refugees" from farther east in the Albemarle Peninsula; and would provide adequate buffers along the river upstream of Williamston to benefit aquatic wildlife. Given the trend of habitat degradation and loss of forested wetlands throughout the Southeast, this alternative is expected to have a large positive effect in conserving the fish and wildlife species that use the lower Roanoke River Basin.

Adverse- This alternative offers no further protection of habitat below Williamston along the Roanoke River and on the reach of the Cashie River below Windsor. There are several acres of conservation lands already set aside in these areas for wildlife. The threat of the unprotected lands being lost to development is very low due to the hydric soils and hydrology of the area. These areas are predicted to be significantly impacted by sea level rise in the next several decades, reducing the long-term value of conservation lands in those areas. Given these facts, not protecting lands on the Cashie River and below Williamston on the Roanoke River is expected to have a moderate adverse effect on wildlife in those areas.

THREATENED AND ENDANGERED SPECIES, AND OTHER SPECIAL STATUS SPECIES

Affected Environment

Description of Affected Environment for the Affected Resource

Threatened and Endangered

The lands proposed for inclusion in the CPA in Alternatives B, C, and D include lands in five counties (Bertie, Washington, Halifax, Martin, and Northampton). These five counties provide habitat for 19 threatened, endangered, and candidate species (Table 1). Of these species, only four occur on the refuge and/or potentially have habitat in the lands proposed for inclusion in the CPA. Northern long-eared bats have been detected on refuge bat surveys and mist-netting. Red-cockaded woodpeckers are not on the refuge, but potential acquisitions in the expanded CPA could include suitable longleaf pine or pond pine pocosin habitats. Monarch butterflies have been documented on the refuge; while the refuge's hardwood swamps do not provide much pollinator habitat, potential acquisitions in the expanded CPA could include suitable habitat or could be restored with pollinator food sources. Red wolves in eastern North Carolina use a wide variety of habitats; however, besides Washington County, the lands proposed for inclusion in the CPA are outside of the defined Red Wolf Non-Essential Experimental Population Area. No red wolves are released outside of the Non-Essential Experimental Population Area, and there are no plans to release red wolves on Roanoke River NWR.

The Roanoke River itself provides habitat for 2 federally endangered aquatic species; the Atlantic sturgeon and shortnose sturgeon (*Acipenser brevirostrum*). Atlantic sturgeon spawning in the river was confirmed in fall of 2012. The federally endangered shortnose sturgeon (*Acipenser brevirostrum*) also historically resided in the area. The last shortnose sturgeon sighting was in 1998 in Western Albemarle Sound (Armstrong 1999, Armstrong and Hightower 2002).

In North Carolina, northern long-eared bats forage in a wide variety of forested and wooded habitats and roost in a variety of living and dead trees throughout the year (Jordan 2020). The northern long-eared bat was listed as threatened under the Endangered Species Act on April 2, 2015 due to declines caused by white-nose syndrome (WNS) and the continued spread of this disease. The fungus *Pseudogymnoascus destructans,* known to cause WNS in hibernating bats, has decimated bat populations of several species in the eastern United States and Canada. As white-nose syndrome continues to spread, it will likely cause significant mortality (declines up to 99% have been recorded at many hibernation sites in the Midwest and Northeast; Frick et al. 2010, Kurta and Smith 2020). The eastern North Carolina, South Carolina, and Virginia populations of northern long-eared bat do not hibernate in large groups. Test results for WNS on those bats captured within the proposed CPA and other parts of eastern North Carolina have all come back negative for the fungus, giving hope that eastern North Carolina may serve as a hold-out for the survival of this species. These populations may be important refugia as populations across the country continue to decline (Jordan 2020). While WNS is the primary cause of the northern long-eared bat's decline, other sources of

mortality can compound the broader population decline. In eastern North Carolina, threats to the species include loss of forested habitat, including destruction of roosts and maternity colonies; wind energy-related mortality; and climate change (USFWS 2022).

EA Table 1. Table of federally endangered and threatened species in the five counties of the study area, generated from USFWS Information for Planning and Consultation (IPaC) database.

Species	Status	Occurrence
Northern Long-Eared Bat (*Myotis septentrionalis*)	Endangered	Present on refuge
Red Wolf (*Canis rufus*)	Experimental Population	Not present on refuge or in proposed expansion area
West Indian Manatee (*Trichechus manatus*)	Threatened	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Rufa Red Knot (*Calidris canutus rufa*)	Threatened	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Red-cockaded Woodpecker (*Picoides borealis*)	Endangered	Not present on refuge; suitable habitat in lands proposed for inclusion in the CPA
American Alligator (*Alligator mississippiensis*)	Similarity of Appearance	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Green Sea Turtle (*Chelonia mydas*)	Threatened	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	Endangered	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Neuse River Waterdog (*Necturus lewisi*)	Threatened	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Carolina Madtom (*Noturus furiosus*)	Endangered	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Atlantic Pigtoe (*Fusconaia masoni*)	Threatened	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA

Species	Status	Occurrence
Dwarf Wedgemussel (*Alasmidonta heterodon*)	Endangered	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Tar River Spinymussel (*Elliptio steinstansana*)	Endangered	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Yellow Lance (*Elliptio lanceolata*)	Threatened	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Monarch Butterfly (*Danaus plexippus*)	Candidate	Present on refuge, with limited suitable habitat; additional tracts could provide additional habitat Potential for habitat/acquisition
Rough-leaved Loosestrife (*Lysimachia asperulaefolia*)	Endangered	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Sensitive Joint-vetch (*Aeschynomene virginica*)	Threatened	Not present on refuge and no suitable habitat in lands proposed for inclusion in the CPA
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)	Endangered	Roanoke River designated as critical habitat; no habitat on refuge lands or in lands proposed for inclusion in the CPA
Shortnose Sturgeon (*Acipenser brevirostrum*)	Endangered	Occurs in Roanoke River; no habitat on refuge lands or in lands proposed for inclusion in the CPA

Special Concern and Other Special Status Species

In addition to the federally recognized species, there are dozens of species found within the region that have the status of endangered, threatened, special concern, significantly rare or are on a watch list at the state level. For a list of these species, see Appendix D.

Two other bat species that are federal species of concern occur within the lands proposed for inclusion in the CPA, Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) and the southeastern myotis (*Myotis austroriparius*). In the bottomland wetlands, both species prefer hollow bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), ash (*Fraxinus* spp.), and cottonwood (*Populus deltoides*) trees as roost sites. Loss of appropriate roosting trees is one reason for the decline of both these species.

The cerulean warbler (*Setophaga cerulean*) is a species of concern due to a precipitous decline in its population numbers since the 1960s. The primary reason for this alarming decline is due to loss of habitat on both its nesting and wintering grounds. This Neotropical migrant resides at mid-level elevations in the Andes Mountains during the winter; much of this land is being cleared for coffee plantations. On its breeding grounds,

it requires large tracts of hardwood forests with tall, large-diameter trees and diverse vertical structure in the forest canopy. Gaps in the forest canopy or small forest openings also appear to be important for the species. A population still exists along the lower Roanoke River corridor. The current status of the population is not currently known; however, a recent survey of the lower Roanoke River carried out in 2011 indicated numbers have declined from those detected during a similar survey in 2001 (Carpenter and Richter 2011).

The aquatic species located within the CPA that have been identified as species of special concern are: Alewife and Blueback Herring (collectively known as River Herring), striped bass, American eel, and Chowanoke crayfish (*Orconectes virginiensis)*.

There is currently a harvest moratorium on River Herring (Alewife and Blueback Herring) in North Carolina and several other mid-Atlantic states. These species have been in decline for many years. An Atlantic coastwide stock assessment update for river herring was completed by the Atlantic States Marine Fisheries Commission in August 2017, with data through 2015. Results indicate that river herring populations remain depleted and at or near historic lows on a coastwide basis. In North Carolina, the fishery is considered overfished with recruitment overfishing, despite the moratorium. The reasons for the declines are complex and include historic overfishing in rivers, altered hydrology, bycatch in oceanic fisheries, physical barriers to floodplain spawning habitat, and water quality degradation (ASMFC 2021, NCWAP 2020).

In a recent report to congress (Appelman et al. 2021), the Albemarle-Roanoke striped bass population has been identified as a stock that is overfished, with overfishing still occurring. The Roanoke River population has had several years of poor reproductive success due to high discharges during the spawning season. The high flow events created suboptimal spawning and nursery habitat and also caused eggs and fry to reach the Albemarle Sound too fast, resulting in low survivorship. With the challenges of reproductive success and overfishing pressures, the NCWRC significantly reduced the creel limit in 2022 to help maximize reproductive output and success of the striped bass.

Declines in American eel numbers have been occurring for several decades. The primary reason for this species' decline is habitat loss, pollution and overharvest of young glass eels (ASMFC 2018). More information on the American eel can be found in the Fisheries Resources section and the provided citation.

The Chowanoke crayfish is found only in the Chowan and lower Roanoke River basins in Virginia and North Carolina. This species has been assessed by the IUCN as "Data Deficient." Data-Deficient species have no available abundance data and no species-specific threats reported, so it is not possible to make a more comprehensive conservation assessment (Adams, Schuster, and Taylor 2010). Chowanoke crayfish is under review for potential federal listing under the Endangered Species Act due to lack of population status information and the narrow range of this species.

The Roanoke River has records of the state endangered green floater (*Lasmigona subviridis*) in Halifax and Northampton Counties. This mussel species is currently undergoing review for potential federal listing under the Endangered Species Act. The green floater requires large rivers with sand, silt, cobble or gravel bottoms. The status of the species within the area proposed for inclusion in the CPA is unknown.

Bald eagles are protected under the Bald and Golden Eagle Protection Act. They regularly occur on the refuge and have nested on the refuge in the past. Bald eagles regularly use the lands proposed for inclusion in the CPA for nesting and foraging.

Description of Environmental Trends and Planned Actions

The lands proposed for inclusion in the CPA have had relatively low rates of urbanization; however, anthropogenic disturbance and development have still affected threatened, endangered, and special status species in the area. Many tracts of forest along the river have been clear-cut, destroying remaining tracts of old-growth bottomland forests and causing declines in old-growth bottomland forest-dependent wildlife, such as cerulean warblers. The loss of mature bottomland forests also impacts availability of nurse and roost trees necessary for northern long-eared bats and southeastern myotis to remain in the region. Forest clearing can also impact bald eagles, which require large trees for nesting. While eagle nests themselves are protected, regular cutting of forest stands may prevent trees from growing large enough to support eagle nests, reducing available nesting habitat.

Forest clearing, agricultural activities, and other human development can also negatively affect water quality, impacting rare mussels, crayfish, and sturgeon. In addition, physical barriers such as dams and culverts prevent species from using the full extent of the habitat present within the CPA. Barriers particularly affect anadromous fish that use the floodplain for spawning, nursery and foraging habitat, such as river herring, American eel and striped bass.

As climate change and associated sea-level rise affect eastern North Carolina, terrestrial upland species will find habitats converted to marsh and then open water, potentially resulting in large-scale loss of habitat. Species occupying habitats tied to particular hydroperiods, such as bottomland swamps, will likely be affected first as sea-level rise raises average water levels and increases extent and duration of flooding in low-lying areas. This could amplify the loss of mature bottomland forests required by northern long-eared bats, southeastern myotis, and cerulean warblers.

Impacts on Affected Resource

Alternative A

Beneficial - Under the No Action alternative, there would be no benefits to the species listed in Table 1 that occur in the CPA. If sufficient habitat is not protected, their continued presence within the region is uncertain.

Adverse - The potential for endangered, threatened, and other special status species to be negatively impacted by the No Action alternative is high. Without the proposed CPA, it would be difficult to maintain large contiguous tracts of mature floodplain forest and adequate buffers along the river's mainstem, essential to protecting water quality for listed aquatic species. The scale and intensity of the threats (e.g., habitat loss, changes in water resources) are believed to be significant enough that without a larger, more comprehensive effort to protect large tracts of deciduous forests and riparian areas, several of the mentioned species would likely continue to decline or possibly become extirpated. Under this alternative, impacts to endangered, threatened, and other special status species are expected to be major.

Alternative B

Beneficial - Endangered, threatened, and other special status species would all benefit from the proposed alternative, Full CPA. Intra-Service Section 7 consultation with the Raleigh Ecological Field Office has determined that the proposed alternative may affect but is not likely to adversely affect the listed species found within the CPA. See Appendix B. A long-term forest management plan would ensure large, contiguous tracts of forestland are available to sustain populations of the southeastern myotis, northern long-eared, Rafinesque's big-eared bats, and cerulean warbler. Preservation of upland areas would provide a retreat from rising sea levels for many species.

Buffers would protect water quality around the swamp forests and the river's mainstem from stormwater runoff and limit sediment and contaminants from entering the river. Preserving water quality would benefit habitat for the federally endangered Atlantic and shortnose sturgeons and the federally threatened Atlantic pigtoe mussel.

Habitat for aquatic species would likely not be directly acquired by the refuge through land acquisition. Rare mussels, sturgeon, and crayfish would occur in state-controlled waters such as the Roanoke River, and thus would not be under the jurisdiction of Roanoke River. However, acquisition of nearby terrestrial habitats may have a positive effect on threatened and endangered species due to benefits to water quality (see Water Quality, below). In addition, increased conservation efforts in the region may help facilitate efforts to remove physical barriers to floodplain habitat for special status species. Under this alternative, these positive effects on endangered, listed, and other special status species are expected to be major.

Adverse - No adverse impacts to special status species are expected under this alternative.

Alternative C

Beneficial- Under this alternative, threatened, endangered, and other special status species would benefit from many of the same effects as under Alternative B. Because this alternative does not extend beyond the 35,000 cfs line, it would result in a narrower vegetative buffer along the active floodplain forest. This narrower buffer would likely not directly affect any special status species in the immediate future; however, without the buffer, special status species would not have habitat to retreat towards with rising sea levels, and aquatic species may suffer from nonpoint source pollution and runoff. Under this alternative, the positive effects on endangered, threatened and other special status species are expected to be major.

Adverse- No adverse impacts to special status species are expected under this alternative.

Alternative D

Benefits- Under this alternative, threatened, endangered, and other special status species would benefit from many of the same effects as under Alternative B. Upstream of Williamston, buffers would protect water quality around the swamp forests and the river's mainstem from stormwater runoff and limit sediment and contaminants from entering the river. Preserving water quality would protect habitat for rare sturgeon, crayfish, and mussels. These buffers would also provide habitat for species retreating from the effects of sea level rise.

This alternative offers no further protection of wildlife habitat below Williamston along the Roanoke River and on the reach of the Cashie River below Windsor. There are a number of acres of conservation lands already set aside in these areas for wildlife. The threat of the unprotected lands being lost to development is also very low due to the hydric soils and hydrology of the area. As a result, special status species would likely not be significantly affected by the lack of further protection of downstream wildlife habitat.

Under this alternative, these positive effects on endangered, threatened, and other special status species are expected to be major.

Adverse- No adverse impacts to special status species are expected under this alternative.

HABITAT AND VEGETATION (INCLUDING VEGETATION OF SPECIAL MANAGEMENT CONCERN)

Affected Environment

Description of Affected Environment for the Affected Resource

The largest habitat components of the lands proposed for inclusion in the CPA include agricultural property, vegetative communities in succession, tupelo-cypress habitat, pine,

and successional pine (USFWS 2005; Table 2). Agricultural development is a significant interest in the area, with over 51,000 acres in agricultural use within the Alternative B CPA boundary. Emphasis would be placed on obtaining natural vegetative communities and avoiding agricultural and urban land cover types.

The variety of vegetative communities demonstrates the sensitivity of the natural communities to variations in elevation, hydrology, and disturbance history. Few areas in the proposed CPA are classified as a natural climax community, showing a relatively high level of disturbance (USFWS 2005). This further emphasizes the need for promoting large contiguous tracts of forested land cover.

Atlantic white cedar communities make up only a small portion of the expansion area, 151 acres. However, the rarity of this habitat makes it a very important component of the CPA. Atlantic white cedar is a fire-dependent habitat. In the absence of fire, it succeeds to pine forest or cypress-gum swamp (Schafale and Weakley 1990). Fire suppression practices in recent years have had a detrimental effect on this habitat.

The proposed CPA provides a landscape matrix of natural habitats comprised of forest, giant river cane, early successional habitats, and grassland. Across the bottomland hardwood forest landscape, a variety of tree species are adapted to specific zones defined by factors such as soil composition, elevation, and hydroperiod. Slight differences in these factors can change the overlying plant communities. As a result, bottomland hardwood forests contain a great variety of trees, shrubs, and vines often growing close together, with large variation in height, branch pattern, fruit, foliage thickness, and shade tolerance. Food resources, such as soft and hard mast, are produced by different plants at different times of the year, and flooding cycles stimulate invertebrate abundance and diversity.

EA Table 2. Acres and percent cover of landcover types for each alternative. Landcover data from the National Landcover Database (NLCD). Total acreages may not match the area of each alternative due to rounding and treatment of boundary cells.

Landcover Class	Alt. B Acreage	Alt. C Acreage	Alt. D Acreage	Alt. B Percent	Alt. C Percent	Alt. D Percent
Open Water	2,039	7,895	1,317	0.7%	4.1%	0.6%
Developed, Open Space	3,442	1,941	2,899	1.2%	1.0%	1.4%
Developed, Low Intensity	649	283	409	0.2%	0.2%	0.2%
Developed, Medium Intensity	358	74	139	0.1%	< 0.1%	0.1%
Developed High Intensity	174	12	32	0.1%	<0.1%	< 0.1%

Landcover Class	Alt. B Acreage	Alt. C Acreage	Alt. D Acreage	Alt. B Percent	Alt. C Percent	Alt. D Percent
Barren Land (Rock/Sand/Clay)	42	7	10	< 0.1%	< 0.1%	< 0.1%
Deciduous Forest	3,998	1,602	3,884	1.4%	0.8%	1.9%
Evergreen Forest	40,194	25,923	34,523	14.3%	13.3%	16.8%
Mixed Forest	3,984	1,332	3,480	1.4%	0.7%	1.7%
Shrub/Scrub	6,739	4,985	5,972	2.4%	2.6%	2.9%
Grassland/Herbaceous	6,550	5,250	5,524	2.3%	2.7%	2.7%
Pasture/Hay	191	94	162	0.1%	< 0.1%	0.1%
Cultivated Crops	51,210	14,878	45,046	18.2%	7.6%	22.0%
Woody Wetlands	155,748	125,729	96,662	55.3%	64.5%	47.1%
Emergent Herbaceous Wetlands	6,353	4,998	5,206	2.3%	2.6%	2.5%
Forest (Deciduous, Evergreen, Mixed, and Woody Wetland Forests)	203,924	154,586	138,549	72%	79.3%	67%
Total	281,674	195,003	205,267	100%	100%	100%

Description of Environmental Trends and Planned Actions

Several invasive pests and diseases are expected to negatively affect vegetation on the refuge in coming years. The emerald ash borer *(Agrilus planipennis)* is spreading south and east across North Carolina and causes very high mortality in several species of related trees, including green ash (*Fraxinus pennsylvanica*; North Carolina Forest Service 2017). Laurel wilt disease has spread north into southern North Carolina as far as Onslow County (North Carolina Forest Service 2020). The disease is caused by a fungus (*Raffaelea lauricola*) that is carried by the redbay ambrosia beetle (*Xyleborus glabratus*). Laurel wilt disease targets plants in the laurel family (Lauraceae) and could reduce populations of spicebush (*Lindera benzoin*) found on the refuge. There are currently limited control options available for these pests.

There is no definitive information on how exactly changes in climate will impact vegetation; many effects of climate change, including rising sea levels, increased

frequency of storms, higher temperature extremes, earlier warm temperatures, and others can have different impacts on vegetation, many over short timescales (Williams et al. 2002, Svenning and Sandel 2013).

In the southeast, continued warming is expected through all seasons, especially summer, and at an increasing rate through the end of the century (US Global Change Research Program 2009). Average temperatures may rise by 4.5-9 degrees F by the 2080s and the number of days with extremely high maximum temperatures will likely increase even more drastically. As a consequence of these heat changes, evapotranspiration rates and drought frequency, duration, and intensity, will likely continue to increase (US Global Change Research Program 2009). The increase in summer temperatures may overall increase plant productivity; however, it may cause a shift in species composition, as some species are less able to tolerate the warmer temperatures (Troch et al. 2009).

Warmer temperatures, more intense or frequent storms, and shifts in precipitation patterns may lead to increased frequency of disturbances such as droughts, tornadoes, and hurricanes (EPA 2017; Overpeck et al. 1990). Changes in precipitation patterns could cause increased precipitation within the Roanoke River Basin, translating to more frequent and prolonged flood events being released from the USACE's John H. Kerr flood control project. The continued changes in flood patterns will place more stress on forest communities within the CPA that are unable to tolerate prolonged flooding. Wilder et. al. 2011 found that forest communities subjected to prolonged flood events are succumbing and transitioning to forest types that can tolerate longer flood events. Sea level rise due to global climate change is predicted to flood low-lying areas, changing soil hydroperiods and pushing habitats to progressively more flood-tolerant species compositions (Conner and Brody 1989).

Impacts on Affected Resource

Alternative A

Beneficial - The Service currently cannot predict the likelihood of other conservation and/or protection efforts in the region. Given this, it is expected that the No Action alternative would have no benefit to habitat.

Adverse - Under the No Action Alternative, existing native habitats would likely be converted to pine plantations, agricultural fields, residential development, or clear-cut, with regrowth likely to consist of non-native and weedy native species. The remaining larger tracts of floodplain forest would become smaller and increasingly fragmented, decreasing the diversity and quality of habitat and vegetation. Approximately 72 percent of the lands proposed for inclusion in the full CPA consist of forestland. Current commercial timber markets are incentivizing private landowners to clear-cut large swaths of their land, fragmenting the forested landscape at an alarming rate. Ecologically healthy forest habitats that are not protected would become increasingly fragmented, with negative consequences for many habitats and both terrestrial and aquatic plants.

Given the trend of habitat degradation and loss of forested wetlands throughout the Southeast, the adverse impacts of the No Action alternative are expected to be major.

Invasive Species

Adverse - Many exotic species often thrive in habitats that have been converted from their native, natural state (Beyers 2002). Increased human disturbance increases the opportunities for exotic species to spread. The opportunity for other possible land uses and land management practices that are expected to occur under the No Action alternative could allow for the continued proliferation of numerous exotic species, furthering the disruption of the native ecosystems. As exotic species gain a greater foothold in the region, they will reduce biodiversity of the floodplain ecosystem and decrease land values from both silvicultural and recreational perspectives. Native trees that are high in value on the commercial timber markets will have trouble competing with noxious exotics such as Chinese privet (*Ligustrum sinense)*, mimosa (*Albizia julibrissin*), chinaberry (*Melia azedarach)*, and princess tree (*Paulownia tomentosa),* all of which are present within the lands proposed for inclusion in the CPA. These exotic species can successfully outcompete the more valuable native timber species by either preventing the regeneration of native species or by hindering their growth once established. It is difficult to quantify the overall impacts of exotics under this alternative. It is unclear what future land management practices will be carried out on unprotected lands and what control measures of exotics, if any, would likely occur on unprotected lands. However, based on the current limited control of exotics in the region, it is expected that the adverse effects of invasive species under the No Action alternative would be major.

Alternative B

Beneficial - The proposed alternative, Full CPA, would protect the majority of the floodplain forest habitat within the lower Roanoke River Basin. The proposed CPA is an extension of the habitat types found within the current refuge boundary, with the exception of urban and agricultural lands. Within the CPA, emphasis would be placed on obtaining natural vegetative communities and avoiding agricultural and urban land cover types. This alternative would include upland tracts that would provide temporary refuge for wildlife during high flood events. The upland areas would also form vegetated buffers that would aid in protecting the water quality of forest swamplands and the river from storm water runoff (Sweeney et. al. 2004, Qi et al. 2009).

The floodplain of the Lower Roanoke River contains some of the finest examples of brownwater forest ecosystems in the state (LeGrand and Hall 2014). These bottomland hardwood and swamp forest communities would be offered protection at a larger and more comprehensive scale than the No Action alternative, ensuring adequate protection of the aquatic and riparian habitats. Most importantly, forestlands would be managed and, if needed for management, harvested in a responsible way that would ensure continued availability of large contiguous tracts of forest.

This alternative offers protection of habitat below Williamston along the Roanoke River and on the reach of the Cashie River below Windsor. In addition, a corridor connecting those areas east of the Roanoke River Basin to the Roanoke River just below Williamston is also part of this alternative. If the projected levels of sea level rise on the North Carolina coast occur, habitat types on the Albemarle Peninsula will gradually move westward, following the Pocosin Lakes Corridor as the hydrology and soil conditions change. This alternative would benefit plant populations with limited dispersal capabilities by increasing contiguity of conservation lands and ensure habitats could continue to exist.

Alternative B, the Full CPA alternative, is expected to have a major positive effect in protecting the forest communities and aquatic habitats found within the Lower Roanoke River Basin.

Adverse - No adverse impacts are expected to habitat under this alternative. This alternative is expected to have a major positive effect in protecting the forest communities and aquatic habitats found within the Lower Roanoke River Basin.

Invasive Species

Beneficial - The Service anticipates that the spread of exotic invasive species (particularly plants) would be reduced under the proposed alternative, Full CPA. In those lands where the Service has conservation easements and cooperative agreements, Service staff would work with landowners to identify non-native species and develop a control plan. On Service-owned lands, control measures would be carried out with the goal of eradication of the target non-native species. Overall, the expected benefit would be major.

Adverse - No adverse impacts related to invasive species are expected under this alternative.

Alternative C

Beneficial – This alternative would have many of the same benefits as Alternative B. This alternative would concentrate on protecting those lands that fall within the part of the floodplain that is still active (35,000 cfs footprint). However, forestlands adjacent to the active floodplain may be subject to clearing, removing vegetative buffers that would aid in capturing sediment and protecting water quality of forest swamplands and the river proper from storm runoff. Like Alternative B, emphasis would be placed on obtaining natural vegetative communities and avoiding agricultural and urban land cover types.

If the projected levels of sea level rise on the North Carolina coast occur, habitats of the Albemarle Peninsula will gradually move westward, following the Pocosin Lakes Corridor as the hydrology and soil conditions change. This alternative would ensure that suitable conserved land would exist to facilitate habitat transition in the face of sea level rise

Adverse - No adverse impacts are expected to habitat under this alternative.

Invasive Species

Beneficial- The Service anticipates that the spread of exotic invasive species (primarily nonnative plants) would be reduced under the 35,000 cfs Core River Area, Cashie River, and Wildlife Corridor alternative. However, a buffer around some of the forested wetlands would be lacking in this alternative, since only the footprint of the 35,000 cfs floodplain is included. The potential exists for invasive species to dominate upland sites and encroach into the active floodplain. Because both the Cashie River and Pocosin Lakes Corridor are included in this alternative, these lands would be protected from the types of disturbances that tend to promote encroachment of invasive species. The overall benefit to habitat under this alternative would be moderate.

Adverse- No adverse impacts related to invasive species are expected under this alternative.

Overall, this alternative is expected to have a moderate positive effect in protecting the forest communities and aquatic habitats found within the Lower Roanoke River Basin.

Alternative D

Beneficial- This alternative would protect floodplain forest habitat within the lower Roanoke River Basin at a larger and more comprehensive scale than under the No Action Alternative. Under this alternative, forestlands would be managed and harvested in a responsible way that would ensure large contiguous tracts of forest are available to support a diversity of forest and vegetation types. Like Alternatives B and C, emphasis would be placed on obtaining natural vegetative communities and avoiding agricultural and urban land cover types.

In those areas upstream of Williamston, this alternative would also include upland lands. These upland areas would provide temporary refuge for wildlife during high flood events. The upland areas would also form vegetated buffers that would aid in protecting the water quality of forest swamplands and the river proper from storm water runoff (Sweeney et. al. 2004, Qi et al. 2009).

A corridor connecting those areas east of the Roanoke River Basin to the Roanoke River just below Williamston is also part of this alternative. If the projected levels of sea level rise on the North Carolina coast occur, habitat types on the Albemarle Peninsula will gradually move westward, following the Pocosin Lakes Corridor as the hydrology and soil conditions change. This alternative would ensure that habitats could continue to exist and would benefit plant populations with limited dispersal capabilities by increasing contiguity of conservation lands.

The Above Highway 17 and Wildlife Corridor alternative would be expected to have a moderate positive effect in protecting the forest communities and aquatic habitats found within the Lower Roanoke River Basin.

Adverse- This alternative offers no further protection of habitat below Williamston along the Roanoke River and on the reach of the Cashie River below Windsor. There are a number of acres of conservation lands already set aside in these areas. In addition, the threat of the unprotected lands being lost to development is very low due to the hydric soils and hydrology of the area. These areas are predicted to be significantly impacted by sea level rise in the next several decades, reducing the long-term value of conservation lands in those areas. Given these facts, not protecting lands on the Cashie River and below Williamston on the Roanoke River is expected to have a moderate adverse effect on habitat and vegetation in those areas.

Invasive Species

Beneficial- The Service anticipates that the spread of exotic invasive species (primarily nonnative plants) would be reduced under the Above Highway 17 and Wildlife Corridor alternative, Alternative D. The forested wetlands along the Roanoke River upstream of Williamston, including some upland lands, and the corridor to the refuges to the east would be included in the CPA. However, the lands along the Cashie River and Roanoke River below Williamston would not receive any additional protection, leaving them vulnerable to land management practices that promote the encroachment of invasive species. Overall, the beneficial impacts of this alternative relating to invasive species control would be moderate to major.

Adverse- No adverse impacts related to invasive species are expected under this alternative.

GEOLOGY AND SOILS

Affected Environment

Description of Affected Environment for the Affected Resource

The Roanoke-Albemarle system can be divided into three distinctive parts: the upper Roanoke River, above the Roanoke Rapids Dam; the lower Roanoke River, below the Roanoke Rapids Dam to approximately 5 miles northeast of Plymouth; and the Albemarle Sound estuarine system.

Hydrology is the driving force in bottomland systems. Annual floods over the centuries have overtopped the riverbanks, dropping suspended sediments from upriver to form the levees and ridges of the floodplain. The coarse, heavier sediments fall out closest to the river, forming the natural levees immediately adjacent to the river channel, while the finer, lighter sediments (silts and clays) gradually settle in the slack water areas ponded behind the levees. These sediments are supplemented each year by humus from abundant leaf litter decay, resulting in deep, rich soils. The presence of the three dams upstream has reduced the amount of sediment deposition in recent years.

Soils on Roanoke River NWR are predominantly of the Wehadkee and Chewacla series, which are nearly level, poorly drained (high water table 6 to 12 inches below the surface)

to somewhat poorly drained (high water table 12 to 18 inches below the surface), and have a loamy surface layer and subsoil (US Department of Agriculture Soil Conservation Service 1985).

The proposed CPAs in Alternatives B and C include lands along the Cashie River. The Cashie River is classified as a blackwater river. These types of rivers are non-alluvial in nature, so no floodplain features are formed like they are with brownwater rivers like the Roanoke. Soils of the Cashie River floodplain located within the CPA are predominantly Dorovan mucky peat. Soils in the corridor area between the Roanoke River and Pocosin Lakes are predominantly loams. Pantego and Betherera loams make up approximately 35% of this soil texture, and various fine sandy loams, such as Rains, Lynchbury and Portsmouth, make up about 40%.

For a detailed description of the geology and soils of the region, see Section II of the refuge's CCP (USFWS 2005).

Description of Environmental Trends and Planned Actions

Changes to hydrologic flow regimes caused by the three upstream dams and impoundments on the Roanoke River affect the geology along the lower Roanoke River. The flow regime is managed to reduce peaks and extend flooding duration, causing lower elevation areas to flood for longer and higher elevations to flood rarely or not at all compared to historic flow regimens. These changes increase sediment deposition in the lower half of the river, increase overall rates of bank erosion, and shift the highest rates of erosion from upper reaches to middle reaches (Hupp et al. 2009, Hupp et al. 2015).

Sea level rise due to global climate change is predicted to flood low-lying areas, increasing soil hydroperiods (Conner and Brody 1989).

Deforestation in the lower Roanoke River basin has increased since 2010, particularly on downstream banks (Zeng 2022). Deforestation can increase rates of erosion, depending on the land use and implementation of sediment control practices (Fitzpatrick and Knox 2000, Anderson and Lockaby 2011, Fraser et al. 2012).

The Service is unaware of any other environmental trends or planned actions affecting geology and soils.

Impacts on Affected Resource

Alternative A

Under this alternative, the refuge would be unable to conserve lands outside of the existing approved acquisition boundary. Ongoing development would continue throughout the region, including ground-disturbing activities such as agriculture, clearcut timber harvesting, and construction of impervious surfaces, which increase erosion rates. This would result in a moderate negative impact to the geology and soils of the region.

Alternative B
Under this alternative, the refuge would conserve up to 150,000 additional acres in the Roanoke River floodplain and adjoining corridor through fee-title acquisition, easements, and cooperative agreements. Conserving land as native vegetation with limited agricultural or other ground-disturbing activities would reduce erosion and help capture soils from nearby eroding lands. In addition, maintaining river buffers would help further protect soils from erosion. This would result in a moderate positive impact to the geology and soils of the region.

Alternative C
Under this alternative, the impacts would be the same as Alternative B, but to a lesser extent due to the more limited footprint available for conservation and the more limited area available for buffers against erosion. This would result in a slight positive impact to the geology and soils of the region.

Alternative D
Under this alternative, the impacts would be the same as Alternative B, but to a lesser extent due to the more limited footprint available for conservation. This would result in a slight positive impact to the geology and soils of the region.

AIR QUALITY

Affected Environment

Description of Affected Environment for the Affected Resource

Air quality standards set by the North Carolina Department of Environment and Natural Resources state that: "No source of air pollution shall cause any listed ambient air quality standard (Section 0.0400) to be exceeded or contribute to a violation of any listed ambient air quality standard (Section 0.0400) except as allowed by Rules 0.0531 or 0.532 [0.401©, NCAC, Title 15A, Subchapter 2D – Air Pollution control Requirements" (North Carolina Department of Environment and Natural Resources)].

Subchapter 2D lists ambient air quality standards for sulfur oxides (measured as sulfur dioxide), total suspended particulates, carbon monoxide, ozone, hydrocarbons, nitrogen dioxide, lead, and particulate matter. Section 0.508 enumerates control of particulates from pulp and paper mills. Section 0.0520 (7) indicates that fires purposely set to forest lands for forest management practices acceptable to the North Carolina Division of Forestry and the Environmental Management Commission are permissible if not prohibited by ordinances and regulation so of governmental entities having jurisdiction. The regulation also includes a disclaimer that addresses certain potential liabilities of burning, even though permissible.

Pulp and paper mills on each end of the lower Roanoke River may have a negative impact on air quality. There are two paper pulp mills below the dams at Roanoke Rapids Dam.

Air quality in the region has been generally good. Over the last ten years (2011-2021), the overall Air Quality Index at the Jamesville monitor in Martin County, NC has registered as

"Unhealthy for Sensitive Groups" or higher only four times, all before 2016 (US EPA 2022).

Description of Environmental Trends and Planned Actions

Warmer air due to climate change can increase the formation of ground-level ozone, contributing to hazardous smog and poor air quality (US EPA 2017).

The Service is unaware of any other environmental trends or planned actions related to air quality and the proposed action.

Impacts on Affected Resource

Alternative A

Beneficial - Positive effects on air quality are not expected under the No Action alternative.

Adverse - Under this alternative, unprotected lands that are currently in a natural state would continue to be converted to commercial forests and agriculture. Air quality declines tend to be correlated to increasing urbanization, increases in air pollution from point sources, and reductions in vegetated areas (Song et al. 2008). Trees have been shown to reduce the concentration of ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter (PM10 and PM2.5), primarily through direct uptake and adhesion to stems and leaves (Escobedo et al. 2007). Some tree species naturally produce volatile organic compounds (VOCs) that can convert to ozone under certain atmospheric conditions, such as high temperatures and stagnant air (Chameides et al. 1988). However, because vegetated areas also remove ozone and other air pollutants from the atmosphere, air quality tends to decline as areas become increasingly developed and forests are lost (Song et al. 2008). Air quality in North Carolina has remained relatively good, even as the population has increased in other regions of the state. Although increased logging in eastern North Carolina should not be overlooked, adverse impacts to air quality under the No Action alternative are expected to be slight.

Alternative B

Beneficial - With the expansion of conservation areas, protected lands would provide increased tree canopy and other vegetative cover, important in removing ozone and other air pollutants from the atmosphere. Sources of air pollution resulting from potential urbanization, agricultural operations, industry, etc., would be reduced. A moderate positive effect on air quality is anticipated as a result of Alternative B, the Full CPA alternative.

Adverse - There are no negative consequences to air quality associated with the implementation of the Full CPA alternative.

Alternative C

Beneficial - Although on a smaller scale than Alternative B, the Full CPA alternative, this expansion of the conservation lands would also ensure stable tree canopy and other vegetative cover that is important in removing ozone and other air pollutants from the atmosphere. Sources of air pollution resulting from potential urbanization, agricultural operations, industry, etc., would be reduced. A slightly positive effect on air quality is anticipated as a result of Alternative C, the 35,000 cfs Core River Area, Cashie River, and Wildlife Corridor alternative.

Adverse - There are no negative consequences to air quality associated with Alternative C.

Alternative D

Beneficial - Although on a smaller scale than Alternative B, this expansion of conservation lands would also provide increased tree canopy and other vegetative cover, important in removing ozone and other air pollutants from the atmosphere. Sources of air pollution resulting from potential urbanization, agricultural operations, industry, etc., would be reduced. A slightly positive effect on air quality is anticipated as a result of Alternative D, the Above Highway 17 and Wildlife Corridor alternative.

Adverse- There are no negative consequences to air quality associated with Alternative D.

WATER QUALITY

Affected Environment

Description of Affected Environment for the Affected Resource

There are 12 National Pollution Discharge Elimination System (NPDES) permitted sites on the Roanoke River between the Roanoke Rapids Dam and Plymouth. The sites vary from small, domestic sewage treatment systems to pulp/paper mills. Eight involve domestic sewage systems for cities and towns, the largest being Roanoke Rapids. Some of the largest NPDES permitted sites are Domtar Paper Company, Roanoke Rapids Sewage Discharge/Roanoke Rapids Wastewater Treatment Plant, Weldon Wastewater Treatment Plant, Hamilton Wastewater Treatment Plant, Williamston Wastewater Treatment Plant, and Plymouth Wastewater Treatment Plant. The largest NPDES permitted site on the Cashie River is the Town of Windsor's Wastewater Treatment Plant.

The North Carolina Division of Water Quality has identified three impaired streams on the Roanoke River below the Roanoke Rapids Dam: Quankey Creek, impaired for biological integrity; Welch Creek, impaired for dioxin and low pH; the reach of the Roanoke River below Jamesville, which is impaired for low dissolved oxygen; and the reach of the Roanoke River from Plymouth to the mouth, which is impaired for dioxin (NCDWQ 2012).

Surface waters in North Carolina are classified based on designated uses (e.g., swimming, fishing, drinking water supply), which determine what protections are given to those waters. The designated use carries with them an associated set of water quality standards to protect those uses. Surface water classifications are one tool that state and federal agencies use to manage and protect all streams, rivers, lakes, and other surface waters in North Carolina. Classifications and their associated protection rules may be designed to protect water quality, fish and wildlife, or other special characteristics. Class C waters are those which are designated for the propagation and survival of aquatic life, fishing, wildlife, secondary recreation, and agriculture. Class WS IV waters are protected as water supplies, which are generally in moderately to high developed watersheds. In Class WS IV waters, point source discharges of treated wastewater are still permitted, but pursuant to governing rules. Swamp Waters are waters which have low velocities and other natural characteristics which are different from adjacent streams.

The Surface Water Classifications for the mainstem lower Roanoke River below Weldon are as follows: Class C from Weldon to Coniotte Creek; Class WS-IV CA from 1 mile downstream of Coniotte Creek to approximately 0.3 miles upstream of US 13/US 17 or approximately 0.5 miles upstream of the Martin County Regional Water and Sewer Authority's intake, due to the Town of Williamston and Martin County Water District #1's withdrawal of water from the Roanoke River for consumption; Class C downstream of the water intake point to the town of Jamesville (located at River Mile 18); and Swamp from River Mile 18 to the mouth.

Description of Environmental Trends

Accelerated forest loss and conversion in the Roanoke River Basin can directly affect water quality. In undeveloped areas, the natural physical, chemical, and biological processes interact to recycle most of the materials found in stormwater runoff. However, as natural vegetated lands are clear-cut and converted to pine plantations, residential, agricultural fields and other such uses, the natural processes are disrupted, reducing the efficiency of water detoxification (Qi et al. 2009). Materials such as leaves, animal wastes, oil, greases, heavy metals, fertilizers, pesticides, and other materials are washed off by rainfall and are carried by stormwater to rivers, wetlands, lakes, and bays.

Impacts of Alternatives on Affected Resource

Alternative A

Beneficial - Under the No Action alternative, benefits to water quality are not anticipated in the region.

Adverse - Under this alternative, water quality is expected to generally be adversely affected in the region. Vegetated buffers along the Roanoke and Cashie Rivers and their associated floodplain forests would be limited, causing pollutants from upland activities to enter these aquatic habitats (Sweeney et. al. 2004, Klapproth and Johnson 2009). Runoff into the waterways accumulates concentrations of sediment, nutrients, heavy metals, petroleum hydrocarbons, coliform bacteria and viruses and degrades aquatic habitats. One of the leading sources of water impairment to rivers and aquatic habitats in the United States is runoff from agricultural activities, especially through increases in the amount of suspended sediments (Cooper 1993, US EPA 2009).

Additionally, the use of herbicides and fertilizers on pine plantations and in agricultural fields can cause further water quality degradation during heavy rainfall events. Contaminated water containing herbicides and fertilizers that flows directly into floodplain swamp forests and rivers may adversely affect developmental stages of migratory and residential fish species, reptiles, and amphibians (Rohr and McCoy 2010). Most commercial forestry operations clear-cut forests, which exposes the soil to erosion. According to the North Carolina Forest Service, sediment is the most frequent water quality concern associated with forestry operations (NCFS 2021). Many factors influence rates of sediment loss and erosion. If best management practices are not followed and adverse conditions occur, large amounts of sediment could wash into local waterways.

Overall, the region's water quality is likely to continue to be adversely affected by expanding urban land use, commercial logging, and agricultural operations. Although increased management efforts by state agencies and nongovernmental partners would help reduce water quality degradation, it is expected that the clearing of forests would continue to cause declines in water quality across the region. Relative to the size of the region, under the No Action alternative, this impact is expected to be moderate rather than major, due to the number of acres of swamp forests already protected.

Alternative B

Beneficial - This alternative is expected to result in benefits to water quality within the proposed CPA. A protective vegetative buffer along 125 miles along the Roanoke River and 24 miles along the Cashie River would minimize runoff and protect water quality of the rivers and the floodplain forest from nonpoint sources of pollution. Vegetated buffers can significantly reduce the effect of nonpoint source pollution into the rivers and swamplands by capturing and filtering the contaminants before they enter the aquatic system (Daniels and Gilliam 1996, Chesapeake Bay Foundation n.d., New Jersey Dept. of Environmental Protection and Dept. of Agriculture 1994, Sweeney et al. 2004, Castelle and Johnson 2000). Conservation lands, such as the refuge, tend to improve water quality downstream as intact vegetated areas reduce runoff and sedimentation, while also

absorbing some nitrogen and phosphorus. Vegetated buffers bordering forested wetlands and rivers have been shown to help protect the area's water resources (Castelle and Johnson 2000, Klapproth and Johnson 2009 and Burgess 2004). Forests, for instance, can absorb and slowly release water, providing a flow of water that sustains smaller creeks and guts, even during some droughts. Conversely, during periods of extreme rainfall, forested land cover helps prevent sedimentation and limit flash flood events especially on the river's tributaries. Forestry operations on protected lands would be conducted in such a way as to minimize runoff into waterways using best management practices.

The positive impacts to water quality are expected to be major under the proposed alternative, Full CPA.

Adverse – Under Alternative B, the Full CPA alternative, no significant adverse impacts to water quality are expected. Use of approved herbicides for controlling nonnative plants could cause some of these chemicals to leach into the groundwater or make their way into surface waters. Adherence to product usage guidelines and Service requirements would keep any of these adverse effects to water quality to a minimum.

Alternative C

Beneficial - This alternative is expected to result in benefits to water quality within the CPA. A protective vegetative buffer along 125 miles of the Roanoke River and 24 miles of the Cashie River would be created, protecting the waters of the rivers' mainstem. Since this alternative includes only the active part of the floodplain, the vegetative buffer protecting water quality within the swamp forests would be reduced, potentially allowing more chemical and sediment runoff into these areas from neighboring agricultural and forestry operations. However, a large enough vegetated buffer along both the Cashie and Roanoke Rivers would still be achieved to reduce runoff and protect water quality of the rivers from nonpoint sources of pollution. Conservation lands, such as the refuge, tend to improve water quality downstream as intact vegetated areas reduce runoff and sedimentation, while also absorbing some nitrogen and phosphorus. Forestry operations on protected lands would be conducted in such a way as to minimize runoff into waterways using best management practices. The overall impacts to water quality are expected to be moderate under Alternative C.

Adverse - Under this alternative, no significant adverse impacts to water quality are expected. Use of approved herbicides for controlling nonnative plants could cause some of these chemicals to leach into the groundwater or make their way into surface waters. Adherence to product usage guidelines and Service requirements would keep any of these adverse effects to water quality to a minimum.

Alternative D

Beneficial- This alternative is expected to result in benefits to water quality within the CPA. A protective vegetative buffer along approximately 116 miles of the Roanoke River, including the entire area above Williamston. This buffer would minimize runoff and protect water quality of the river and the floodplain forest from nonpoint sources of pollution. Forestry operations on protected lands would be conducted in such a way as to minimize runoff into waterways using best management practices. The positive impacts to water quality are expected to be moderate to major under this alternative.

Adverse- Under this alternative, adverse impacts to water quality would be slight. The CPA would not include a 20-mile stretch of the Cashie River and approximately 26 miles of the Roanoke River from Williamston to the mouth. Because close to half the lands downstream of Williamston are already under some type of conservation protection, some buffers are already present along this stretch of river. In addition, due to the nature of the swamp habitat in much of this area, human activities in these areas are not as prevalent as upstream areas. However, agricultural and forestry operations do still occur, so the potential for chemical and sediment runoff into the rivers and swamp forests would still exist.

Use of approved herbicides for controlling nonnative plants on conserved lands could cause some of these chemicals to leach into the groundwater or make their way into surface waters. Adherence to product usage guidelines and Service requirements would keep any of these adverse effects to water quality at a minimum.

FLOODPLAINS

Affected Environment

Description of Affected Environment for the Affected Resource

A series of dams approximately 70 miles upstream of the Broadneck tract on the Roanoke River have a significant effect on the River's Coastal Plain hydrology. From downstream to upstream, these dams are the Roanoke Rapids, Gaston, and John H. Kerr Dams. Both Roanoke Rapids and Gaston Dams are owned and operated by Dominion Power Company, a private, for-profit utility. The John H. Kerr Dam is a U.S. Army Corps of Engineers (USACE) Flood Control Project with power generation capacity. The USACE's flood control project became operational in 1953; the Roanoke Rapids Dam became operational in 1955; and the Gaston Dam became operational in 1963. These three dams, all constructed in the Piedmont Province of the Roanoke River Basin, have markedly altered the hydrologic characteristics of the lower portion of the river by reducing the frequency of low- and high-flows and increasing the frequency and duration of moderate flows.

Water is the driving force in creating and maintaining the ecological integrity of bottomland forest communities. Floodplain and riverine ecosystems evolved in response to the hydrologic patterns of the watershed. When these flows are significantly altered, the reduced range of natural variance and extremes reduces the diversity and integrity of the bottomland ecosystem.

Executive Order 11988 mandates federal agencies to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve natural and beneficial values served by floodplains. The proposed action would occur in the floodplain of the Roanoke and Cashie Rivers.

Description of Environmental Trends and Planned Actions

Sea level rise is expected to increase the rate of flooding in low-lying areas and cause flooding in previously upland areas (Conner and Brody 1989). Areas previously outside the floodplain boundary may become part of the floodplain, and flood maps may need to be re-drawn to accurately reflect the changing risk.

Impacts on Affected Resource

Alternative A

Under this alternative, the refuge would not be able to acquire lands in the floodplain outside of the existing acquisition boundary. These lands would remain available for non-compatible development. Federal executive orders involving the protection of wetlands and floodplains only apply to federal agencies. They do not apply to habitat alterations by non-federal entities, which receive no federal funds. The natural and beneficial values served by floodplains would likely become degraded over time with continued development and activities in the flood zone.

Alternative B

Under this alternative, native floodplain habitats would be preserved and degraded areas in the floodplain would be restored. Conservation of floodplains would ensure that ecosystem services of floodplains continue, including reducing speed and volume of flood waters by maintaining adequate river buffers, diminishing the extent of flooding, and reducing impacts on human infrastructure and developed areas. Forests, for instance, can absorb and slowly release water, providing a flow of water that sustains smaller creeks and guts, even during some droughts. Conversely, during periods of extreme rainfall, forested land cover helps prevent sedimentation and limit flash flood events especially on the river's tributaries. This alternative would have a moderate beneficial effect on floodplains.

Alternative C

The same impacts as Alternative B would be expected under this alternative.

Alternative D
The same impacts as Alternative B would be expected under this alternative; however, the lower reaches of the Roanoke and Cashie Rivers would not be included in the proposed CPA. As a result, those stretches of floodplain habitats would remain unprotected and vulnerable to non-compatible development.

VISITOR USE AND EXPERIENCE

Affected Environment

Description of Affected Environment for the Affected Resource

Hunting and fishing are the primary wildlife-dependent recreational activities on the refuge. In addition, the refuge is used for wildlife observation and photography, boating, interpretation, and environmental education. In 2020, the refuge estimated 160 waterfowl hunting visits, 20 upland game hunting visits, and 3,800 big game hunting visits. Access to most of the refuge is by boat only; two tracts can be accessed from U.S. Highway 13/17 via one gravel and several grassy trails. Although the refuge does not have jurisdiction over any suitable fishing waters, anglers are allowed to fish in the Roanoke River from the banks on the refuge.

Across the study area, most of the land is in private ownership. Many natural areas are privately-owned and are owned by or leased out to hunt clubs.

There are several public boat ramps on the Roanoke River that provide access for recreation and fishing. Striped bass fishing is a particularly significant recreational activity in the lower reaches of the river.

Description of Environmental Trends and Planned Actions

Visitation to Bertie County has remained approximately the same in recent years; visitors to the county spent an estimated $12.39 million in 2020, compared to $12.66 million in 2016 (Visit North Carolina 2020). Visits to the refuge have been steady or slightly increasing; the refuge had an estimated 6,120 visitors in 2020, compared to 6,000 estimated visitors in 2015 (USFWS 2021).

The Service is unaware of any other planned actions that would impact visitor use and experience.

Impacts on Affected Resource

Alternative A

Beneficial – The no action alternative would continue with current levels of public use. The Refuge currently offers opportunities for the "Big Six" priority public uses: hunting, fishing, wildlife observation, photography, environmental education, and interpretation.

Adverse – Under this alternative, the refuge would only have the potential to increase public land access and opportunities within the existing refuge acquisition boundary.

There would be a moderate negative impact on visitor use and experience under this alternative relative to the other alternatives.

Alternative B

Under this alternative, the refuge would have authority to acquire up to 50,000 acres in fee-title ownership and up to 100,000 acres in easements. The refuge would be able to evaluate expanding public access on fee-title land, providing additional recreational opportunities in an area with limited public land ownership and recreation opportunities. On up to 100,000 acres in conservation easements or cooperative agreements, land access would continue to be determined by the private landowner.

Hunting opportunities on the refuge are subject to the rules and regulations of the NCWRC Special Permit Hunt program. On fee-title land acquired by the Service, these rules may limit hunting activity relative to the previous private ownership and management. However, it is also possible the Service may acquire properties with limited or no prior hunting, resulting in an increase in hunting opportunities in the area. Landowners who opt to place a conservation easement on their property would retain all hunting rights and would not fall under the regulations of the NCWRC Special Permit Hunting Opportunities.

Currently, the refuge does not have a fishing plan due to a lack of waters for fishing on the refuge. If property is acquired with refuge-owned waters, a fishing plan may need to be developed.

Wildlife observation and photography, and environmental education and interpretation programs would also be developed in appropriate newly acquired locations. Other uses that are determined appropriate and compatible would also be considered and evaluated.

Alternative C

The impacts for this alternative would be similar to those of Alternative B, but to a lesser extent due to the more limited footprint included within the proposed CPA. An additional adverse effect would be that the refuge would not be able to consider acquiring portions of tracts above the 35,000 cfs line, potentially limiting public access to new refuge tracts.

Alternative D

The impacts for this alternative would be the same as for Alternative B, but to a more limited extent. The refuge would not be able to acquire land along the Roanoke River below Williamston or along the Cashie River, limiting expansion of public access and recreational activities in those areas.

CULTURAL RESOURCES

Affected Environment

Description of Affected Environment for the Affected Resource

Roanoke River served Native American and later historic populations as a major transportation corridor. Its rich fisheries yielded herring, sturgeon, Roanoke and largemouth bass, white catfish, bull chub, silver redhorse which were heavily exploited by both Native American, Euro-Americans, and African-Americans (VanDerwarker 2001; Whyte 2008). The bottomland forests and rich agricultural soils fostered the development of Native American and later historic communities and towns, such as Plymouth, Hamilton, Weldon, Halifax, and Woodville. The later historic communities often fronted the river and later centered around the 19th century railroads. Roanoke Rapids, located at the edge of the proposed expansion, was established in the 1890s. Its textile mills continue as a major economic driver for the Halifax County.

Other economic pursuits, such as large and small-scale farmsteads and commercial logging have left their traces on the landscape. These traces include standing houses; farmyards; and abandoned logging railroads.

Region 4's Office of the Regional Archaeologist (ORA) has begun collecting information about historic properties recorded throughout the proposed expansion corridor. At least two county-wide historic architectural surveys have been conducted; one for Bertie County (Blokker 2010); the other for Northampton County (Spanbauer 2010). A preliminary review of the North Carolina Division of Cultural Resources' HPOWEB yielded information on National Register-listed historic districts; residential, commercial, governmental, and religious buildings; and historic areas on the Division's "Study List." Table 3 provides a brief list of the type of the built environment scattered across this area.

EA Table 3. National-Register Listed Historic Districts and Properties.

Study List
Charlie Henry Pate Farm
Palmyra Historic District
Tillery Resettlement District
Spring Green Community Historic District
Historic District
Conoho Historic District
Halifax Historic District
Hamilton Historic District
Plymouth Historic District
Roanoke Rapids Historic District
Woodville Historic District
Farm/Plantation Complexes/Houses
Pinewood [Browne House]

The Hermitage [Tillery House] (Plantation)
Woodstock
Garner Farm
Tillery-Fries House
Hickory Hill [Price-Everett House]
Sherrod House
W. W. Griffin Farm
Mowfield (Plantation)
Churches
St. Mark's Episcopal Church
Spring Green Primitive Baptist Church & Cemetery
Skewarkey Primitive Baptist Church & Cemetery
Garysburg United Methodist Church & Cemetery
Schools
Allen Grove School [Rosenwald School]
Williamston Colored School [Rosenwald School]
Gaston School
Other
Roanoke Canal
Halifax County Home & TB Hospital

Three pre-contact archaeological sites are known to be located in or near the proposed expansion areas. These include the National Register-listed Rhodes Site (31BR90), the Gaston Site (31HX7), and the Jordan's Landing Site (31BR7). ORA staff plans to visit the North Carolina Office of the State Archaeology to conduct research in the archaeological site files.

Description of Environmental Trends and Planned Actions

Population growth, increased urbanization, and changing land use patterns projected for the region may adversely affect a number of cultural and historic properties. These impacts are expected to be moderate. Sea level rise and climate change may lead to flooding and severe storms that damage or destroy cultural and historic sites at a more frequent rate.

Impacts on Affected Resource

Section 106 of the National Historic Preservation Act of 1966, as amended, and Section 14 of the Archaeological Resources Protection Act require the Service to evaluate the effects of any of its actions on cultural resources [e.g., historic, architectural and archaeological)

that are listed or eligible for listing in the National Register of Historic Places (NRHP)]. In accordance with these regulations, the Service has initiated the review of this proposal with the Service's Regional Archaeologist and the State Historic Preservation Office.

Alternative A

Beneficial - No positive impacts on archaeological and historical resources are expected under the No Action alternative.

Adverse - The No Action alternative could have a negative effect on the protection of historical and archaeological resources in the region. Without additional protection, cultural resources, whether listed or not, tend to be vulnerable to development, disturbance, take, and vandalism.

Without the expansion of conservation lands, fewer lands would be managed by the Service and its partners, which are mandated to protect cultural resources.

Landowners and developers have no similar legal responsibilities, unless one of their activities requires a federal permit (i.e., an Army Corps of Engineers 404 Permit, or a Service Incidental Take Permit) or state permit. If permits are required, landowners or developers would have to comply with either Section 106 of the National Historic Preservation Act or state regulations regarding cultural resources prior to the issuance of any permit. In these cases, archaeological and historical investigations, if deemed necessary by the federal agency, the state agencies, and the tribes, would be limited to the project area in question. The activity could proceed provided that the landowner or developer has taken steps to avoid, minimize, or mitigate adverse impacts to historic properties identified within the specific project area. A number of landowners in the region possess a strong conservation ethic. Their efforts to protect and conserve important habitats on their holdings are often beneficial for cultural resource sites.

However, because of population growth, increased urbanization, and changing land use patterns projected for the region, cultural and historic properties would likely be adversely impacted under the No Action alternative. These impacts are expected to be moderate.

Alternative B

Beneficial - Beneficial impacts to cultural resources are anticipated from the implementation of Alternative B, the Full CPA alternative. The expansion would help increase the preservation of any archaeological and historic sites on otherwise unprotected lands within the lands in the proposed CPA. The Service, like other federal agencies, has several legally mandated responsibilities that include the development of a cultural resource management plan; compliance with the Section 106 of the National Historic Preservation Act prior to any undertaking that possesses the potential to impact historic properties; an archaeological inventory of its lands and subsequent National Register of Historic Places eligibility testing; and research-directed testing or excavation, site protection, and interpretation. Critical to these efforts are the North Carolina State

Historic Preservation Office, several Native American tribes, and many other interested parties, such as nearby universities, adjacent landowners, and state resource agencies. The Service would, when possible, partner with these groups to facilitate archaeological and ecological investigations, protection, and interpretation of sites deemed to have cultural and religious significance for the tribes. Protection of historic properties would be enhanced by incorporating concepts of site stewardship and ownership, where appropriate, into public use materials and interpretive panels. This effort would be further enhanced by providing advanced archaeological resource protection training to refuge law enforcement personnel. The Service expects that the overall benefits to cultural resources would be moderate under this alternative.

Adverse - No negative impacts to cultural resources are anticipated under Alternative B. The Service believes that the proposed acquisition of lands will have no adverse effect on any known or yet-to-be identified NRHP-eligible cultural resources. However, in the future, if the Service plans or permits any actions that might affect historic properties, it would carry out appropriate site identifications, evaluations, and protection measures as specified in the regulations and in Service directives and manuals.

Alternative C

Beneficial- Moderate beneficial impacts to cultural resources are anticipated from the implementation of Alternative C, the 35,000 cfs Core River Area, Cashie River, and Pocosin Lakes Corridor alternative. The expansion would help increase the preservation of any archaeological and historic sites on otherwise unprotected lands in the region. The impacts under this alternative are expected to be the same as under Alternative B, but to a more limited extent due to the more limited footprint of Alternative C.

Adverse- No negative impacts to cultural resources are anticipated under Alternative C. The Service believes that the proposed acquisition of lands would have no adverse effect on any known or yet-to-be identified NRHP-eligible cultural resources. However, in the future, if the Service plans or permits any actions that might affect eligible cultural resources, it would carry out appropriate site identifications, evaluations, and protection measures as specified in the regulations and in Service directives and manuals.

Alternative D

Beneficial - Beneficial impacts to cultural resources are anticipated from the implementation of Alternative D, the Above Highway 17 and Wildlife Corridor alternative. The expansion would help increase the preservation of any archaeological and historic sites on otherwise unprotected lands in the region. The impacts under this alternative are expected to be the same as under Alternative B, but would occur in a more limited area due to the more limited footprint of the proposed CPA.

Adverse - No negative impacts to cultural resources are anticipated under Alternative D. The Service believes that the proposed acquisition of lands would have no adverse effect on any known or yet-to-be identified NRHP-eligible cultural resources. However, in the future, if the Service plans or permits any actions that might affect eligible cultural resources, it would carry out appropriate site identifications, evaluations, and protection measures as specified in the regulations and in Service directives and manuals.

REFUGE MANAGEMENT AND OPERATIONS

LAND USE ON THE REFUGE

Affected Environment

Description of Affected Environment for the Affected Resource

The refuge currently has approximately 15 miles of roads, primarily old logging roads maintained as grassy trails. There is one designated graveled hiking trail, the Charles Kuralt Trail.

Description of Environmental Trends and Planned Actions

Wherever possible, the Service has removed culverts on the refuge and replaced them with low-water crossings to improve fish passage and hydrologic connectivity. The refuge will continue to explore possibilities for future projects to remove unnecessary infrastructure and improve refuge habitats.

The Service is unaware of any other environmental trends or planned actions relevant to this proposed action and refuge land use.

Impacts on Affected Resource

Alternative A

Under this alternative, existing refuge land use would continue as needed to meet refuge management objectives.

Alternative B

Under this Alternative, on up to 50,000 acres of fee-title lands, existing roads and infrastructure would be evaluated for refuge needs and access. If in alignment with refuge purpose and needs, infrastructure would continue to be maintained. If deemed unnecessary for achieving the purpose and needs of the refuge, infrastructure would be unmaintained or removed.

On up to 100,000 acres of conservation easements and cooperative agreements, infrastructure would continue to be the responsibility of the landowner. The Service is

open to working with landowners of conservation easements and cooperative agreements to develop and implement management plans to improve habitat for wildlife.

Alternative C
Impacts would be the same as under Alternative B.

Alternative D
Impacts would be the same as under Alternative B.

ADMINISTRATION

Affected Environment

Description of Affected Environment for the Affected Resource

Refuge staff currently consists of a refuge manager, a wildlife biologist, and an office administrator. Refuge funding is dependent upon a variety of factors, including Congressional appropriations, Southeast Region budget priorities and allocations, grants and collaborations, and actual refuge needs.

Description of Environmental Trends and Planned Actions

The Service is unaware of any environmental trends or planned actions relating to administration and this proposed action.

Impacts on Affected Resource

Alternative A
Under this alternative, there would be no change in refuge administration.

Alternative B
Initially, staff implementing the proposed alternative would likely consist of existing refuge staff. In the long-term, the Service's Southeast Regional Office would evaluate the need for additional full-time staff based on management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff when justified. Other staff such as foresters, maintenance workers, law enforcement personnel, and private lands biologists could be phased in over time as need and funding permitted. The ability to fill staff positions would depend on availability of funds and regional priorities. In the future, if resources are available, additional visitor services support may be evaluated.

Since this CPA is only proposed and is not yet approved, no funding has been identified to support land acquisition, boundary posting, and management activities on new parcels and easements. Any funding for the proposed expansion would be dependent upon a variety of factors, including Southeast Region budget priorities and allocations.

Alternative C
Same impacts as under Alternative B.

Alternative D
Same impacts as under Alternative B.

SOCIOECONOMICS

LOCAL AND REGIONAL ECONOMIES

Affected Environment

Description of Affected Environment for the Affected Resource

Roanoke River NWR is located in Bertie County, North Carolina. The area proposed for inclusion in the CPA under Alternatives B, C, and D also covers portions of Martin, Washington, Halifax, and Northampton Counties. The median household income for these five counties ranges from $35,502 in Halifax County, NC to $40,090 in Martin County, all below the national average of $62,843 (U.S. Department of Commerce 2020; Table 4). The three industry sectors with the most jobs in these counties are government, health care and social assistance, and retail trade. Arts, entertainment, recreation, accommodation, and food services make up approximately 7.3% of total employment in these counties (U.S. Department of Commerce 2020). Relative to the United States overall, the five counties have a greater share of government and non-services jobs and a greater share of non-labor income as percent of personal income.

EA Table 4. Median household income (in 2019 dollars) and percentage of families in poverty for Martin, Bertie, Halifax, Northampton, and Washington Counties, as well as the United States overall (U.S. Department of Commerce 2020).

	Martin	Bertie	Halifax	Northampton	Washington	United States
Median Household Income	$40,090	$35,527	$35,502	$37,146	$35,979	$62,843
Percentage of families in poverty	13.8%	17.1%	20.9%	17.0%	16.4%	9.5%

Refuge Revenue Sharing and Local Tax Revenues

The Refuge Revenue Sharing Act of June 15, 1935 (16 U.S.C. 715s) offsets the loss of local tax revenues from federal land ownership through payments to local taxing authorities. The refuge provides annual payments to taxing authorities, based on the acreage and value of refuge lands located within its jurisdiction. Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources, and from congressional appropriations, which are intended to make up the difference between the net receipts from the Refuge Revenue Sharing Fund and the total amount due to local taxing authorities. The exact amount of the annual payment depends on the Congressional appropriation, which in recent years have tended to be less than the amount to fully fund the authorized level of payments. In 2021, USFWS paid Bertie County $57,392 and paid Washington County $16,479 (U.S. Department of Commerce 2020). Table 5 lists the Refuge Revenue Sharing Payments to Bertie County between 2007-2015.

The Refuge Revenue Sharing payments are based on one of three different formulas, whichever results in the highest payment to the local taxing authority. The payments are based on three-quarters of 1 percent of the appraised fair market value (or the purchase price of a property until the property is reappraised). The Service reappraises the value of refuge lands every five years, and the appraisals are based on the land's highest and best use. Refuge Revenue Sharing payments typically benefit local communities in areas where wetlands and formerly farmland-assessed properties make up a larger component of the landscape. On these types of lands, full entitlements Refuge Revenue Sharing payments sometimes exceed the real estate tax; in other cases, Refuge Revenue Sharing payments may be less than the local real estate tax.

EA Table 5. Refuge Revenue Sharing Payments to Bertie County, 2007-2015.

Year	Acres	Assessment	Payment	% of Maximum Authorized Level
2007	21,062	$13,337,000	$41,669	41.66%
2008	21,062	$13,337,000	$32,329	32.32%
2009	21,062	$16,470,000	$37,515	30.37%
2010	21,062	$16,470,000	$26,433	21.40%

Year	Acres	Assessment	Payment	% of Maximum Authorized Level
2011	20,562	$16,470,000	$28,326	22.93%
2012	20,562	$16,470,000	$26,617	21.55%
2013	20,562	$27,750,000	$52,632	25.29%
2014	20,562	$27,750,000	$49,262	23.67%
2015	20,562	$27,750,000	$51,794	24.88%
2016	20,562	$27,750,000	$58,734	28.50%
2017	20,562	$27,750,000	$58,734	23.40%
2018	20,562	$27,750,000	$54,763	26.60%
2019	20,562	$27,750,000	$47,480	23.20%
2020	20,562	$27,750,000	$44,622	21.90%

Economics of Wildlife-dependent Recreation

Wildlife-dependent recreation and ecotourism have economic significance in the region. Annual hunt seasons draw many deer and turkey hunters to eastern North Carolina, both North Carolina residents and, to a lesser extent, non-residents of the state (Southwick Associates 2008).

A National Survey of Fishing, Hunting, and Wildlife-Associated Recreation is performed every five years. The 2016 overview states that "Wildlife recreation is not only an important leisure pastime, but it is also a catalyst for economic activity. Hunters, anglers, and wildlife watchers spent $156.3 billion on wildlife-related recreation in 2016. This spending contributed to local economies throughout the country, which improved

employment, raised economic output, and generated tax revenue" (US Department of the Interior et al. 2016). The 2016 report of the National Survey estimates $1.7 billion spent in North Carolina from fishing-related activities; $1.27 billion spent in North Carolina on hunting-related activities; and $987 million spent in North Carolina on wildlife-watching activities (US Department of the Interior et al. 2016).

The Roanoke River fishery is also a source of recreational spending. Historically, the striped bass fishery lured anglers during the annual spring run. A 1999 survey estimated that revenue of $918,000 may have been realized by local businesses over three months due to the striped bass recreational fishery (Schuhmann 1999). In addition, creel surveys estimated that total expenditures for all anglers amounted to $2.5 million during the 12-month period ending in June 2006 (McCargo et al. 2007). During the 64-day harvest period in spring 2015, estimated angler trip expenditures contributed $1.7 million to the local economy (Dockendorf et al. 2016). In recent years, the striped bass fishery has steeply declined due to overfishing and changing river flows (NCWRC 2022). Harvest periods have been greatly shortened: the 2022 harvest season was open for only four days, with strict limits on quantity and size limits. However, the fishery remained open for catch-and-release fishing throughout the spring. While recent economic surveys have not been conducted, most of the income generated during the recreational striped bass season is from catch-and-release anglers who are not local to the region.

The Roanoke River Partners (RRP) canoe trail with camping platforms is another example of the successful promotion of ecotourism in the area. The 2016 NC Growth study "Ecotourism in the Roanoke River Region: Impacts and Opportunity" showed that the Roanoke River Partners operations return over $550,000 to the regional economy each year. For every dollar spent as a result of the Paddle Trail, $1.64 is generated in the regional economy (Fryberger et. al. 2016).

Description of Environmental Trends and Planned Actions

Both population and employment in the five counties have been declining (U.S. Department of Commerce 2020). Between 2000 and 2020, employment in the five counties fell 14.3%, even while the United States overall experienced 15.4% increase in employment. The average earnings per job in the five counties shrank slightly, with a 2.0% decrease; over the same time period, the United States overall experienced a 15.4% increase in average earnings. Since 1976, unemployment has fluctuated between a low of 4% in 1989 to a high of 14% in 1983. The three industry sectors that added the most jobs between 2001 and 2020 are administrative and waste services, transportation and warehousing, and real estate and rental and leasing.

Climate change is predicted to have negative socioeconomic effects over the long term. Increased rainfall may exacerbate flooding; more frequent storms could cause significant damage to infrastructure and increase insurance rates and deductibles; and more severe droughts could cause crop failures and reduce livestock productivity (U.S. EPA 2017).

The Service is unaware of any other trends or planned actions affecting local and regional economies related to land protection activities.

Impacts on Affected Resource

Alternative A

Local Tax Revenues

Beneficial/Adverse - Under the No Action alternative, effects on local tax revenues could be either beneficial or adverse. The revenues in the area would continue to be influenced by various market forces, population trends, and other factors.

Economics of Wildlife-dependent Recreation

Beneficial – Currently, there are limited public recreation opportunities in the region. It is common for private lands in the region to be leased to individuals or hunt clubs. Therefore, it is likely that economic benefits associated with wildlife-dependent recreation would not be significantly increased under the No Action alternative.

Adverse - Without additional conservation through a CPA, few new lands that offer wildlife-dependent activities to the public are likely to be established in the region in the foreseeable future.

Lands under conservation protection status can contribute to the region's economy through visitors' expenditures at area hotels, restaurants, and stores. In the absence of new public lands in the area, the associated new economic and tax opportunities of wildlife-dependent recreation would not be realized.

Nearby Property Values

Beneficial - Economic benefits of conservation land to nearby property values would not be expanded under the No Action alternative.

Adverse - Without the CPA, there would be no protection from potentially negative development and uses that could decrease assessed property values (e.g., municipal infrastructure such as waste treatment/disposal sites, industrial development, apartment buildings, strip malls, logging clear cuts). It is expected there would be a slight to moderate adverse effect under the No Action alternative.

Ecosystem Services

Ecosystem services are defined as the services a functioning ecosystem provides that directly benefit humans. Examples include water detoxification, floodwater storage, nutrient cycling, biomass production, pest control, critical pollination services, carbon storage, wildlife habitat, recreational opportunities, and scenic beauty.

Beneficial – Under Alternative A, the "No Action" alternative, the supporting services provided by a functioning floodplain system would be unchanged.

Adverse - Under Alternative A, the overall impact to ecosystem services would be slight. There would be no increased benefits to local communities associated with ecosystem services, and no additional cost savings to local communities would result. Any significant degradation on unprotected lands would potentially negatively impact the ecological services already being provided. However, future actions on unprotected lands are unpredictable, so the net impact in the future is unclear and best assessed as slight.

Commercial Forestry
Under Alternative A, conserved lands in the region would not be expected to expand.

Beneficial - From a socioeconomic standpoint, the impact to the commercial forest industry or those involved in logging land for income would be unchanged under the No Action alternative. Loggers would be able to conduct their practices unchanged, following the regulations set forth by the NC State Forest Service.

Adverse - From a socioeconomic standpoint, commercial forestry would not be negatively impacted under the No Action alternative. However, if sustainable forestry practices are not used, the amount and quality of timber available for harvest in the region would most likely decrease.

Commercial Agriculture
Under Alternative A, the number of current acres of agricultural lands would be unchanged.

Beneficial – Under Alternative A, farmers would continue to conduct their practices unchanged.

Adverse - From a socioeconomic standpoint, commercial agriculture would not be negatively impacted under the No Action alternative.

Alternative B

Local Tax Revenues
Beneficial/Adverse - Under Alternative B, the effects on local tax revenues depend on several factors, as described below.

In areas that are rapidly urbanizing and where land-values are rising, Refuge Revenue Sharing payments may be less than local tax rates. However, it is expected that these losses may be offset by cost-savings to communities. Refuges can reduce costs to local communities because they require minimal infrastructure. Maintaining a system of open spaces, such a refuge, is one important way to control the operating costs of local governments. Land conservation is often less expensive for a local government than a

suburban-style residential development. In general, refuges and other open spaces place little demand on the infrastructure of a municipality and should be considered in assessing the financial impact on the municipality. Conserving open space has the long-term benefit of avoiding future costs. Increasingly, communities and counties are finding that single-family residential tax rate tables do not cover the costs of municipal services, community infrastructure, and local schools. Furthermore, these costs continue into the future, generally increasing over time. Even including the initial cost of acquisition, open space is less costly to taxpayers over both the short and long term than development of the same parcel, while the major public costs to conserve natural areas are finite (East Amwell Agricultural Advisory Board 1994; Mendham Township Committee 1994; Pinelands Commission 1994; Burlington County Board of Chosen Freeholders 1996; Madsen et al. 2004).

Currently, refuge parcels are all located in Bertie County. Between 2007-2020, the percentage of revenue sharing with Bertie County varied depending on the property value of the refuge (Table 5).

As noted earlier, a maximum of 50,000 acres could be acquired in fee title by the Service under Alternatives B, C, and D. In reality, the Service expects many parcels would not be acquired and would remain in private ownership. The Service may purchase an easement on many parcels, in which case property taxes would remain the responsibility of the landowner.

It is difficult to determine what the overall effects would be on local tax revenues. In the 2010-2020 ten-year time period, the 5-county area experienced negative growth, with an overall population decrease of 14% (U.S Census Bureau 2020). These trends could change over time. At this point in time, the Service is unable to predict where and when refuge lands would be acquired within the proposed CPA.

Economics of Wildlife-dependent Recreation

Beneficial - The Service expects the expansion of conservation lands under Alternative B, the Full CPA alternative, to have a major positive economic effect from wildlife-dependent recreation.

Lands under conservation protection status can contribute to the region's economy in several ways. First, a segment of the visiting public would spend its money at area hotels and restaurants. Second, visitors would locally buy some equipment and supplies associated with public uses such as hunting, fishing, and wildlife-watching/photography. According to the USFWS Report "Banking on Nature 2006," recreational spending on refuges generated nearly $185.3 million in tax revenue at the local, county, state and federal level. About 87% of refuge visitors travel from outside the local area. Notably, the Southeast Region had the most visitors in fiscal year 2006 at 9.4 million, and spending in the region supported the highest number of jobs at 7,381 (Carver and Caudill 2007). Under this alternative, the refuge would have the broadest possible area to acquire land

on which to establish additional public recreational opportunities, drawing more visitors and increasing economic gains.

Beneficial/Adverse – Depending on the hunting opportunities previously allowed on fee-title land acquired by the Service relative to refuge hunting opportunities, overall hunting in the region may increase or decrease. Landowners who opt to place a conservation easement on their property would retain all hunting and access rights. The Service expects this effect under Alternative B, the Full CPA alternative, to be slight.

Nearby Property Values

Beneficial - Owning a home near a national wildlife refuge and other conservation lands likely increases the home value and helps support the surrounding community's tax base (Taylor et al. 2012). According to this study, conducted for the Service by economic researchers at North Carolina State University, homes located within half a mile of a refuge and within 8 miles of an urban center were found to have higher home values. Although the region is rural in nature, some benefits of this alternative include the assurance that the land is protected from potentially negative development or use on nearby lands that may cause a decrease in assessed property values (e.g., municipal infrastructure such as waste treatment/disposal sites, apartment buildings, strip malls, logging clear cuts). It is expected there would be a moderate beneficial effect under the Full CPA alternative.

Adverse - No adverse effects are anticipated to nearby property values with Alternative B.

Ecosystem Services

Beneficial - Under Alternative B, local communities could receive the fullest extent of benefits from an array of potential "ecosystem services" (McConnell and Walls 2005). Ecosystem services are the cost savings provided by functioning natural systems. These include all the functions performed by nature that provide benefits to humans, such as reductions in stormwater runoff, flood prevention, reductions in air pollution, and reduced costs of government services.

The careful management and conservation of a floodplain system can provide additional economic benefits by capitalizing on such services to reduce the costs of corresponding man-made infrastructure and services. Moore et. al. 2011 found that forested riparian systems provide a greater benefit in ecosystem services than upland forested areas. They quantified the value of six non-timber ecosystem services (water quality and quantity; soil formation and stability; pollination; habitat; and aesthetic, cultural and passive uses) from approximately 22 million acres of private forests in Georgia and found that the forests provided over $37.6 billion in ecosystem services per year. Per-acre values ranged from $264 to $13,442, with higher values for forested wetlands or riparian forests in urban areas. Other studies have been conducted to quantify the financial benefits that open spaces provide to local communities. For example, a 2010 study found

that Long Island's parks and open space provided quantifiable economic benefits worth over $2.74 billion a year (The Trust for Public Land 2010). The Long Island analysis included agricultural lands and found them to have a combined estimated worth of $288 million annually, slightly more than 10 percent of the total cost benefit.

Nationwide, these cost savings are substantial. Within the contiguous 48 states, the total value of ecosystem services provided by National Wildlife Refuge System lands was estimated at over $32 billion annually (Ingraham and Foster 2008). The analysis estimated that forests were worth about $1,000 per acre for ecosystem services alone.

Cost savings associated with flood prevention and mitigation provided by wetlands and other open spaces are among the most important of all ecosystem services. For example, a study by American Forests (2008) determined that the forested open space in Mecklenburg County, North Carolina provides 935 million cubic feet of stormwater retention capacity. The group estimated that replacing this capacity with man-made infrastructure would cost approximately $1.9 billion. Another study, conducted by the Minnesota Department of Natural Resources, showed that it would cost approximately $370 to replace each acre-foot of flood storage capacity naturally provided by a wetland with artificial flood controls (Floodplain Management Association 1994).

Under Alternative B, the Full CPA alternative, the beneficial socioeconomic effects of ecosystem services are expected to be major.

Adverse - No adverse socioeconomic effects of ecosystem services are anticipated under this alternative.

Commercial Forestry

Beneficial- From a socioeconomic standpoint, there could be some long-term benefits to the commercial forestry industry under this alternative. For those landowners opting to place a conservation easement on their forest lands, the Service's Partnership Program would provide technical biological and forestry expertise and potentially matching funds to implement sustainable forestry practices that also benefit wildlife. Sustainable forestry practices stimulate local economies and the forestry industry while ensuring a continued supply of forest products into the future. A moderate benefit is expected to be achieved under Alternative B.

Adverse- Timber harvests on easement, conservation partnership, or Service lands would follow sustainable management practices. These practices generate less revenue in the short term than clear-cutting. Under Alternative B, the Full CPA alternative, impacts to commercial forestry could be moderate.

Commercial Agriculture

Under Alternative B, the number of acres of agricultural land currently in the region has the potential to change. The Service would prioritize conservation of forested lands.

However, the Service may acquire agricultural lands within the CPA if such lands support refuge purposes. The Service only acquires lands from willing sellers. Given the high value of agricultural lands in the area, it is expected that only limited acreages of agricultural land would be offered for conservation protection.

In addition, the landowner would have the option of placing just the forested parcel of their property under conservation protection, either via easement or fee title. The farmland would remain under ownership of the landowner, reducing the impacts to commercial agriculture.

Adverse - While the Service would not prioritize agricultural lands for conservation, lands acquired in fee-title or easement would be permanently prohibited from commercial agriculture in the future. This could limit the potential acreage available for farming in the area.

Depending on the percentage of willing sellers or participants that respond positively to this proposal, the impact to farming could be moderate under Alternative B, the Full CPA alternative.

Alternative C

Local Tax Revenues

Beneficial/Adverse - The effects of Alternative C on local tax revenues depend on several factors. This alternative would have many of the same effects as Alternative B, but in a smaller area due to the smaller extent of area available for protection.

Economics of Wildlife-dependent Recreation

Beneficial - The Service expects the expansion of conservation lands under Alternative C, the 35,000 cfs Core River Area, Cashie River, and Wildlife Corridor Alternative, to have a moderate positive economic effect, similar to Alternative B. However, due to the more limited scope of the proposed CPA in Alternative C, these effects would likely be less than in Alternative B.

Adverse - The adverse effects of this alternative are expected to be similar to those of Alternative B. The Service expects this effect under Alternative C to be slight.

Nearby Property Values

Beneficial- As described above in Alternative B, owning a home near a national wildlife refuge and other conservation lands would likely increase the home value and help support the surrounding community's tax base (Taylor et al. 2012). It is expected there would be a moderately beneficial effect on nearby property values under Alternative C, the 35,000 cfs Core River Area, Cashie River, and Wildlife Corridor alternative.

Adverse- No adverse effects are anticipated to nearby property values under Alternative C.

Ecosystem Services

Beneficial- Under Alternative C, the overall benefits would be moderate. With the active floodplain under conservation protection, the floodplain forest ecosystem would be able to provide a partial array of potential "ecosystem services" outlined in Alternative B, the Full CPA Alternative. The full extent of ecosystem services may not be achieved in this alternative due to a reduction in potential vegetative buffers around the active floodplain forest.

Adverse- No adverse effects to ecosystem services are anticipated under this alternative.

Commercial Forestry

Beneficial - From a socioeconomic standpoint, there could be some long-term benefits to the commercial forestry industry under this alternative. For those landowners opting to place a conservation easement on their forest lands, the Service's Partnership Program would provide technical biological and forestry expertise and potentially matching funds to implement sustainable forest practices that would also benefit wildlife. Sustainable forestry practices stimulate local economies and the forestry industry while ensuring a continued supply of forest products into the future. A moderate benefit is expected to be achieved under Alternative C.

Adverse - From a socioeconomic standpoint, sustainable forestry would generate less revenue in the short term relative to the quick return of revenues generated from clear-cutting. Under Alternative C, impacts to commercial forestry could be moderate.

Commercial Agriculture

Under Alternative C, the number of acres of agricultural land in the region may change. The impacts would be expected to be similar to those of Alternative B. Under Alternative C, only lands falling below the 35,000 cfs line would be included in the CPA. If a tract were bisected by the line, only the lands below the line would be eligible for conservation through easement or fee-title acquisition. As a result, less agricultural land would be included in the CPA relative to Alternative B (Table 2).

Within the CPA, the Service would prioritize conservation of forested lands. However, the Service may acquire agricultural lands within the CPA if such lands support refuge purposes. The Service only acquires lands from willing sellers. Given the high value of agricultural lands in the area, it is expected that only limited acreages of agricultural land would be offered for conservation protection.

Because the majority of the area being targeted for conservation is forestland, the impact to farming would be slight under Alternative C.

Alternative D

Local Tax Revenues

Beneficial/Adverse - The effects of Alternative D on local tax revenues depend on several factors. This alternative would have many of the same effects as Alternative B, but in a smaller area due to the smaller extent of area available for protection.

Economics of Wildlife-dependent Recreation

Beneficial- Under Alternative D, many of the same effects as Alternative B would be expected. Acquisition of up to 50,000 acres in fee-title lands would increase public recreational opportunities in the region. The Service expects the expansion of conservation lands under Alternative D, the Above Highway 17 and Wildlife Corridor alternative, to have a moderate positive economic effect.

Adverse - The adverse effects of this alternative are expected to be similar to those of Alternative B. Depending on the prior history of lands acquired as fee-title, hunting opportunities may be restricted (by stricter refuge regulations on lands previously hunted) or expanded (by opening public access on lands with no or limited hunting before). The Service expects this effect under Alternative D to be slight.

Nearby Property Values

Beneficial – As described above under Alternative B, owning a home near a national wildlife refuge and other conservation lands would likely increase the home value and help support the surrounding community's tax base (Taylor et al. 2012).

It is expected there would be a slight to moderately beneficial effect under Alternative D.

Adverse - No adverse effects are anticipated to nearby property values with Alternative D.

Ecosystem Services

Beneficial- Under Alternative D, Above Highway 17 and Wildlife Corridor, the overall benefits would be moderate and similar to those of Alternative B. Local communities in the area upstream of Williamston would receive the fullest extent of benefits from an array of potential "ecosystem services" from land protection in that area. While the CPA would not include areas below Williamston and along the Cashie River, there are already a number of acres of conservation lands set aside in those areas. These areas would also experience some of the ecosystem services described in Alternative B, but to a lesser extent.

Adverse- No adverse effects are anticipated under this alternative.

Commercial Forestry

Beneficial - The beneficial effects of Alternative D would be similar to those of Alternative B, although the area downstream of Williamston and the Cashie River would not experience those benefits. A moderate benefit is expected to be achieved under Alternative D.

Adverse - Under Alternative D, only sustainable timber harvests could be carried out on easement and fee-title lands. Sustainable timber harvests would generate less revenue in the short term relative to the quick return of revenues generated from clear-cutting. Impacts to commercial forestry under Alternative D would be moderate and similar to those of Alternative B.

Commercial Agriculture

Under Alternative D, the number of acres of agricultural land in the region may change. The impacts would be expected to be similar to those of Alternative B. Unlike Alternative B, areas downstream of Williamston and the Cashie River basin would not be a part of the CPA, so agricultural lands in those geographies would not be affected. As a result, potential impacts to commercial agriculture under Alternative D would occur in a slightly more limited area than under Alternative B (Table 2).

Within the CPA, the Service would prioritize conservation of forested lands. However, the Service may acquire agricultural lands within the CPA if such lands support refuge purposes. The Service only acquires lands from willing sellers. Given the high value of agricultural lands in the area, it is expected that only limited acreages of agricultural land would be offered for conservation protection.

Depending on the level of interest and the number of willing sellers, the impact to farming could be minor to moderate under Alternative D.

ENVIRONMENTAL JUSTICE

Affected Environment

Description of Affected Environment for the Affected Resource

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

Median Household Income in each of the five counties is well below the national median of $62,843, ranging from $35,502 in Halifax County to $40,090 in Martin County (Table 4).

The percentage of families in poverty in each of the five counties is above the national average of 9.5%, ranging from 13.8% in Martin County to 20.9% in Halifax County.

Bertie, Halifax, Northampton, and Washington Counties all have minority populations greater than 50% of the total; the minority population of Martin County is slightly under 50%, at 47.9% (Table 6). Each of the five counties have significantly higher shares of minorities than the national average of 39.3%. All counties have large Black/African American communities (Table 6).

EA Table 6. Share of individuals identifying as minorities and as Black or African American alone in Martin, Bertie, Halifax, Northampton, and Washington Counties, as well as the United States overall (U.S. Department of Commerce 2020).

	Martin	Bertie	Halifax	Northampton	Washington	United States
Total Minority Population (%)	**47.9**	**65.4**	**61.6**	**61.3**	**55.6**	**39.3**
Black or African American alone (%)	**42.1**	**61.6**	**52.8**	**56.4**	**47.5**	**12.7**

Description of Environmental Trends and Planned Actions

Between 2010 and 2019, the share of families in poverty across the five counties decreased by only 0.3 percentage points. Halifax and Northampton County saw increases of 1.9 and 2.3 percentage points, respectively, while the shares of families in poverty in Martin, Bertie, and Washington County decreased, resulting in little net change (U.S. Department of Commerce 2020).

The Service is unaware of any other trends or planned actions affecting local and regional economies related to land protection activities.

Impacts on Affected Resource

Alternative A

Under this No Action Alternative, the refuge would be limited to expansion within its current approved acquisition boundary. Access to hunting and fishing opportunities would be largely restricted to those with sufficient financial resources, limiting local community access. Clear-cut logging and development could deteriorate environmental conditions, resulting in negative impacts on surrounding minority and low-income populations (See Air Quality and Water Quality sections, above).

Alternative B
Under this alternative, the proposed LPP and CPA would increase opportunities for equal access to public lands for hunting, fishing, and recreation. Much of the surrounding lands are private, with expensive, restricted access. Up to 50,000 acres could be protected in fee-title Service lands and evaluated for additional public recreation opportunities. Conservation lands would benefit local environmental health, resulting in benefits to the surrounding minority and low-income populations (See Air Quality and Water Quality sections, above).

Alternative C
Same as Alternative B.

Alternative D
Same as Alternative B.

MONITORING
Upon acquisition of fee-title parcels, addenda would be developed to incorporate new acquisitions into the existing refuge Habitat Management and Inventory and Monitoring Plans. Current refuge monitoring includes monitoring of forest health, reptiles and amphibians, hydrology, neotropical migrants, and bats; for more information, see the refuge Inventory and Monitoring Plan (Richter et al. 2019).

SUMMARY OF ANALYSIS
Alternative A – No Action Alternative
As described above, under this alternative, major adverse impacts would occur to wildlife, threatened and endangered species, and habitat and vegetation. Existing native habitats in the region would continue to be converted to commercial pine plantations, agricultural fields, and residential development, reducing the total area of native habitat and fragmenting and degrading remaining habitat. Forest interior species, particularly birds, would likely continue to decline. If large scale clear-cutting operations continue, populations of some vulnerable wildlife species will not be able to persist. Wildlife moving westward from sea level rise would not have a corridor of protected lands to provide habitat. In addition, adequate buffers along the river's mainstem would likely not persist, increasing rates of erosion and nonpoint source pollution that negatively affect aquatic species and habitats, including several federally endangered and threatened species.

Ongoing development would continue throughout the region, contributing to negative impacts on geology and soils, water quality, and floodplains. Private developers would have no mandate to protect cultural resources, putting them at higher risk of destruction or vandalism. There would continue to be a limited amount of public recreational opportunities in the region.

Tax revenues in the area would continue to be influenced by various market forces, population trends, and other factors. The region would not be protected from development that could harm nearby property values, nor would it receive any additional economic benefits from ecosystem services and wildlife-dependent recreation. The commercial agriculture and forestry industries would continue their practices unchanged.

With the future challenges facing fish and wildlife species and their habitats mentioned above, this alternative would fail to fully satisfy the purposes and need stated above.

Alternative B – Establish Full Conservation Partnership Area
As described above, Alternative B would have beneficial impacts to wildlife, habitat and vegetation, and recreational opportunities. Under this alternative, large tracts of floodplain forest would be protected, benefiting wildlife, especially forest interior species, aquatic species, and those fleeing sea level rise to the east. These protected lands would serve as buffers along the river corridor, providing benefits to floodplains; air quality; water quality; and aquatic life, including threatened and endangered species.

These protected lands would also provide socioeconomic benefits through ecosystem services, expansion of recreational opportunities, and ecotourism. Impacts to commercial agriculture from land preservation would be minimized by prioritizing forested lands for protection. Acquired fee-title lands would not be taxed; however, the System would provide payments to counties to help offset the loss of local tax revenues through the Refuge Revenue Sharing program. This alternative helps meet the purpose and need above because it would protect large tracts of floodplain forest for the benefit of people and wildlife.

Alternative C – 35,000 cfs Core River Area, Cashie River, and Wildlife Corridor CPA
As described above, Alternative C would have beneficial impacts to wildlife, habitat and vegetation, and recreational opportunities. Under this alternative, large tracts of floodplain forest would be protected, benefiting wildlife, especially forest interior species, aquatic species, and those fleeing sea level rise to the east. These protected lands would serve as buffers along the river corridor, providing benefits to floodplains; air quality; water quality; and aquatic life, including threatened and endangered species. These protected lands would also provide socioeconomic benefits through ecosystem services, expansion of recreational opportunities, and ecotourism. Impacts to commercial agriculture from land preservation would be minimized by prioritizing forested lands for protection. This proposed CPA includes less agricultural land than in Alternative B, limiting potential impacts to a smaller area. Acquired fee-title lands would not be taxed; however, the System would provide payments to counties to help offset the loss of local tax revenues through the Refuge Revenue Sharing program.

Many of the impacts of this alternative would be similar to those of Alternative B; however, because this alternative does not include the upland portions of tracts crossed

by the 35,000 cfs line, the area eligible for protection would be smaller, and many of the benefits to wildlife, threatened and endangered species, and habitats would be less extensive than Alternative B.

This alternative fulfills the purpose and need as described above, but to a lesser extent than Alternative B.

Alternative D – Northern Reaches and Wildlife Corridor CPA
As described above, Alternative D would have beneficial effects on wildlife, habitat and vegetation, and recreational opportunities. Under this alternative, large tracts of floodplain forest would be protected, benefiting wildlife, especially forest interior species, aquatic species, and those fleeing sea level rise to the east. These protected lands would serve as buffers along the river corridor, providing benefits to floodplains; air quality; water quality; and aquatic life, including threatened and endangered species. These protected lands would also provide socioeconomic benefits through ecosystem services, expansion of recreational opportunities, and ecotourism. Impacts to commercial agriculture from land preservation would be minimized by prioritizing forested lands for protection. Acquired fee-title lands would not be taxed; however, the System would provide payments to counties to help offset the loss of local tax revenues through the Refuge Revenue Sharing program.

Many of the impacts of this alternative would be similar to those of Alternative B; however, because this alternative does not include the areas along the Cashie River and along the Roanoke River below Williamston, wildlife, threatened and endangered species, and habitats in those areas would continue to be affected by the effects of development in the region. The area eligible for protection would be smaller than Alternative B, and many of the benefits to wildlife, threatened and endangered species, and habitats would be less extensive than Alternative B.

This alternative fulfills the purpose and need as described above, but to a lesser extent than Alternative B.

LIST OF SOURCES, AGENCIES AND PERSONS CONSULTED

Building on previous efforts from the early 2000s to expand the acquisition boundary of the Roanoke River NWR, the Service incorporated issues identified during the 2016 public scoping meetings and addressed comments brought up during meetings with county, state and conservation partners.

As part of its outreach efforts, a variety of tools were used. Direct mailings were sent to landowners that had land within the proposed expansion area. In-person meetings were held with U.S. congressional staffers, conservation planners with the NC Chapter of The Nature Conservancy, and senior staff with the NCWRC. Service Planners and Refuge Staff gave in-person presentations on the proposed expansion plan at county

commissioner meetings in all five counties and letters were sent to those federal and state representatives and senators whose districts fell within the proposed CPA. The Service coordinated with the following:

- Elected County Commissioners in the Five Counties of the CPA
- CPA Landowners
- Martin County Tourism Department
- NC State Elected Senators and Representatives for the Area
- NC Wildlife Resources Commission
- U.S. Army Corps of Engineers
- NC Natural Heritage Program
- Roanoke River Mayors Association
- Federal Elected Senators and Representatives for the Area
- The Nature Conservancy
- The Conservation Fund
- Affected Tribes including Catawba Indian Nation and Tuscarora Nation of New York
- Rick Kanaski, Regional Archaeologist, Southeast Region, USFWS

List of Preparers

Jean Richter, Wildlife Biologist, Roanoke River NWR

Matt Connolly, Refuge Manager, Roanoke River NWR

Sarah Toner, Wildlife Refuge Specialist, Coastal North Carolina NWR Complex

State Coordination

On August 13, 2013, Refuge Manager Matt Connolly presented the expansion plan to the Director of the NCWRC Gordon Meyers and his assistant, Mallory Martin. Prior to the meeting, Mr. Meyers and Mr. Martin had been given an overview of the proposed expansion plan by Tommy Hughes, NCWRC Coastal Plain Regional Biologist. The NCWRC did not have any issues with the plan as it stood. All state representatives and senators whose districts fell within the CPA were contacted by letter.

Tribal Consultation

The Service's Regional Archaeologist will coordinate any cultural resource investigations involving Native American sites with the Catawba Indian Nation and Tuscarora Nation of New York pursuant to the National Historic Preservation Act of 1966, as amended.

Public Outreach

Methods of outreach to private landowners, state and federal elected officials, other state and federal natural resource agencies, nongovernmental conservation organizations, and the general public included direct mailings, e-mails, digital media (a link on the Roanoke River NWR website) and press releases to local media.

For public scoping, the Service held five open houses on each evening of the week of January 23-27, 2017. Each two-hour open house provided the public with an opportunity to interact individually with Service experts in fish and wildlife management, recreational opportunities, real estate, aquatic biology, private land stewardship, and refuge planning. The open house meetings were announced in advance through a press release, as well as in letters and e-mails sent to CPA landowners, state and local elected officials, and other state and federal natural resource agencies. A total of approximately 108 people attended the meetings over the 5 days. The purpose of public scoping was to seek input regarding the expansion of Roanoke River NWR and to identify the issues that needed to be addressed in the planning process. The public scoping period was from January 1 through March 3, 2017. The issues and comments identified during the scoping process helped guide revisions of this LPP and EA.

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Appendix A. Draft Conceptual Management Plan and Compatibility Determinations

The Comprehensive Conservation Plan (CCP) for Roanoke River NWR (USFWS 2005) has been completed along with compatibility determinations. These proposed lands covered under this Environmental Assessment would be brought into the National Wildlife Refuge System and would be managed as current lands on Roanoke River NWR under the current CCP (USFWS 2005; https://ecos.fws.gov/ServCat/DownloadFile/1492). Lands purchased to expand Roanoke River NWR have the following uses already found appropriate and compatible: hunting, fishing, wildlife observation, photography, environmental education, interpretation, trapping of selected furbearers for nuisance animal management, forest management program, and refuge resource research studies (USFWS 2005; https://ecos.fws.gov/ServCat/DownloadFile/1492).

Appendix B. Intra-Service Section 7 Biological Evaluation

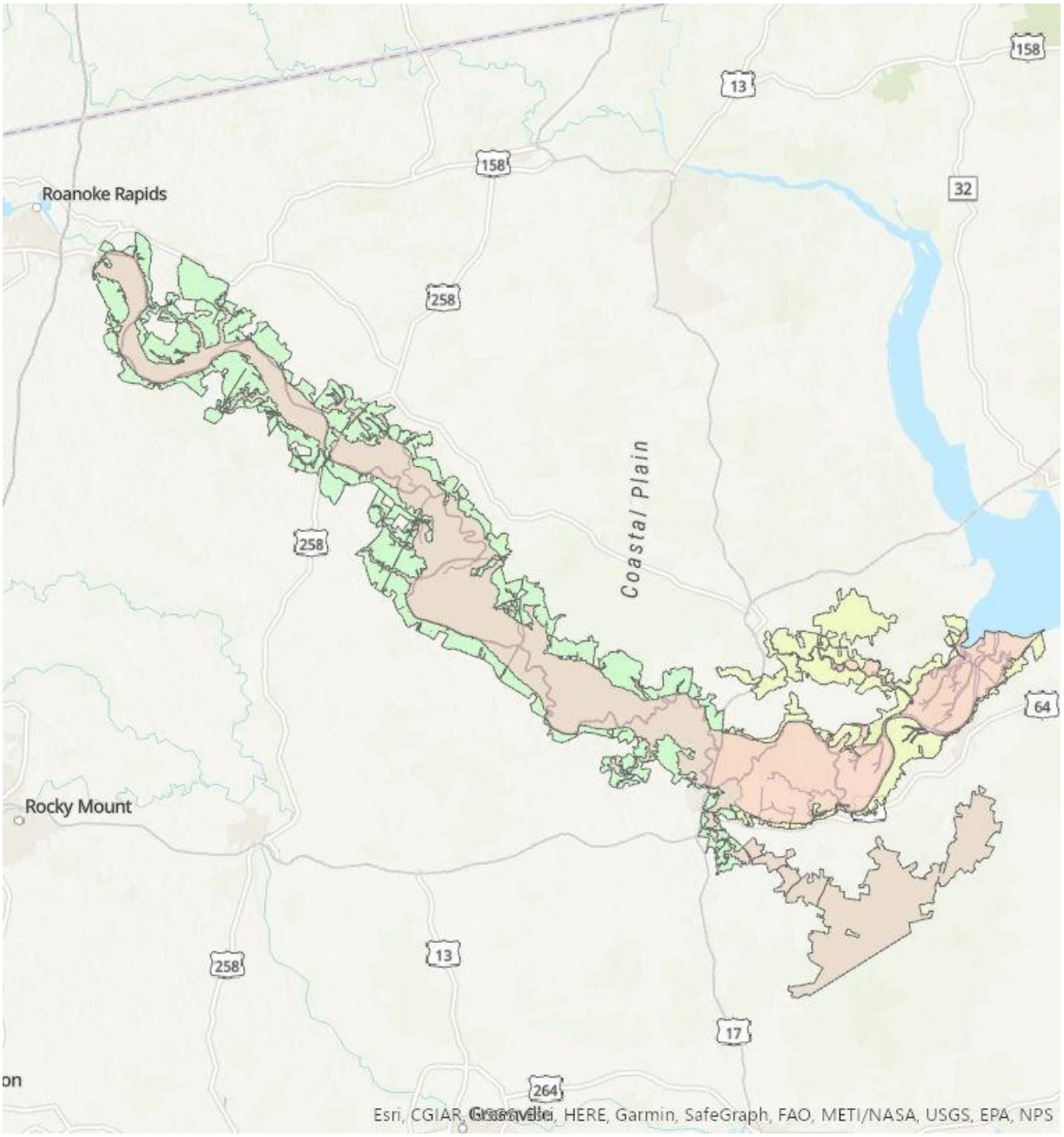
Originating Person: Jean Richter
Date Submitted: June 30, 2022
Telephone Number: 252-794-3808

I. **Service Program and Geographic Area or Station Name:** Roanoke River NWR, Windsor, NC

II. **Flexible Funding Program**: N/A

III. **Location:**

The action area includes lands within a defined Cooperative Partnership Area (CPA) located in the five counties (Washington, Martin, Halifax, Northampton, Bertie) surrounding the lower Roanoke River in eastern North Carolina. See Map 1 on next page.



Map 1. Conservation Partnership Area (CPA) of the Roanoke River NWR expansion plan. The expansion boundary was set by rules outlined in the Environmental Assessment for the Roanoke River NWR Proposed Expansion Plan. The map below shows the footprint of the proposed alternative. The rules which govern this alternative are outlined. Rule 1: Everything within the 35,000 cfs footprint plus the Sweetwater Creek corridor that extends towards Pocosin Lakes NWR. Rule 2: all the parcels that touch the 35000 cfs line and as per the rules does not break parcels, it contains lands outside the 35000 cfs (shown as light green on map). Rule 3: Tracts along the Cashie River southeast of Windsor.

IV. **Species/Critical Habitat:** List federally endangered, threatened, proposed, and candidate species or designated or proposed critical habitat that may occur within the action area.

Endangered
Red-cockaded Woodpecker (*Picoides borealis*)
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)
Shortnose Sturgeon (*Acipenser brevirostrum*)
Red Wolf (*Canis rufus*) - Non-Essential Experimental Population
Northern Long-Eared Bat (*Myotis septentrionalis*)

Candidate
Monarch Butterfly (*Danaus plexippus*)
Green Floater (*Lasmigona subviridis*) under review

Proposed Endangered N/A

Proposed Threatened N/A

V. **Project Description:**

The U.S. Fish and Wildlife Service (Service) is proposing to protect and manage up to an additional 150,000 acres in Bertie, Washington, Martin, Northampton and Halifax Counties in North Carolina, through the expansion of the Roanoke River National Wildlife Refuge (NWR, refuge) in accordance with the refuge's Comprehensive Conservation Plan (CCP; U.S. Fish and Wildlife Service 2005). In accordance with Service policy and the National Environmental Policy Act, a draft Land Protection Plan and Environmental Assessment have been prepared describing the strategy of establishing a 287,090-acre Conservation Partnership Area along the Roanoke River from Weldon to the Albemarle Sound, with authority to acquire up to 50,000 acres in fee title and 100,000 acres in conservation easements and conservation partnerships as part of Roanoke River NWR. Acquisitions would fall within Bertie, Washington, Martin, Halifax and Northampton Counties, North Carolina. The plan outlines the options and methods used to provide the minimum interests necessary to preserve and protect the area's fish, wildlife, and plant resources.

VI. **Determination of Effects:**

A. **Description of Effects:**

Beneficial effects to listed or candidate species are expected to improve habitat for listed and candidate species.

The Red-cockaded Woodpecker (*Picoides borealis*) are not on the refuge, but potential acquisitions in the expanded CPA could include suitable longleaf pine or pond pine pocosin habitats. The Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) and Shortnose Sturgeon (*Acipenser brevirostrum*) are found in the river's mainstem of the CPA. Atlantic sturgeon spawning in the river was confirmed in fall of 2012. The federally endangered shortnose sturgeon (*Acipenser brevirostrum***)** also historically resided in the area. The last shortnose sturgeon sighting was in 1998 in Western Albemarle Sound. Protecting more land within the CPA would improve water quality improving spawning and nursery habitat. The threatened Northern Long-Eared Bat (*Myotis septentrionalis*) has been found on the refuge and is likely located throughout much of the CPA. The candidate Monarch Butterfly (*Danaus plexippus*) has been documented on the refuge; while the refuge's hardwood swamps do not provide much pollinator habitat, potential acquisitions in the expanded CPA could include suitable habitat or could be restored with pollinator food sources. Red wolves in eastern North Carolina use a wide variety of habitats; however, besides Washington County, the lands proposed for inclusion in the CPA are outside of the defined Red Wolf Non-Essential Experimental Population Area. No red wolves are released outside of the Non-Essential Experimental Population Area, and there are no plans to release red wolves on Roanoke River NWR.

VII. **Effect Determination and Response Requested:** Determine the anticipated effects of the proposed project on species and critical habitat lists in item IV. Check all applicable boxes and list the species (or attach a list) associated with each determination.

	Determination
No Effect: This determination is appropriate when the proposed project will not directly or indirectly affect (neither negatively nor beneficially) individuals of listed/proposed/candidate species or designated/proposed critical habitat of such species. **No concurrence from FIELD OFFICE required.** **All species and critical habitat identified in section IV**	
May Affect but Not Likely to Adversely Affect: This determination is appropriate when the proposed project is likely to cause insignificant, discountable, or wholly beneficial effects, to individuals of listed species and/or designated critical habitat. **Concurrence from FIELD OFFICE required.** **All species and critical habitat identified in section IV**	**X**
May Affect but Likely to Adversely Affect: This is determination is appropriate when the proposed project is	

likely to adversely effect individuals of listed species and/or designated critical habitat. **Formal consultation with FIELD OFFICE required.**	
May Affect but Not Likely to Jeopardize candidate or proposed species or adversely modify proposed critical habitat: This determination is appropriate when the proposed project may affect, but is not expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. **Concurrence from FIELD OFFICE optional. SPECIES NAME**	
Likely to Jeopardize candidate or proposed species/adversely modify critical habitat: This determination is appropriate when the proposed project is reasonably expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. **Concurrence from FIELD OFFICE required.**	

Signature: _____ Date _____
[Supervisor at originating station]
Reviewing Ecological Services Office Evaluation (check all that apply):

A. Concurrence _____ Nonconcurrence _____

Explanation of nonconcurrence:

B. Formal Consultation Required _____
List species or critical habitat unit:

C. Effects are addressed in the Programmatic Consultation _____
On Region's Recovery Program – no further consultation needed

D. Conference required _____
List species or critical habitat unit:

Name of Reviewing ES Official: _____

Signature: _____ Date _____

Appendix C. Interim Recreation Act Funding Analysis

INTERIM RECREATION ACT FUNDING ANALYSIS

Station Name: Roanoke River NWR

Date Refuge Established: 1991

Purposes for which the Refuge was Established:

The purpose of Roanoke River National Wildlife Refuge, as reflected in the refuge's authorizing legislation, is to protect and conserve migratory birds, and other wildlife resources through the protection of wetlands, in accordance with the following laws:

> "...the conservation of wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..." (16 U.S.C., Sec. 3901(b), 100 Stat. 3583) (Emergency Wetlands Resources Act of 1986);
>
> "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds..." (16 U.S.C. Sec. 664) (Migratory Bird Conservation Act of 1929);
>
> "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." (6 U.S.C. Sec 742f(a)4); and
>
> "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services..." (16 U.S.C. Sec. 742f(b)1) (Fish and Wildlife Act of 1956).

(1) Recreational uses evaluated for the proposed expansion of Roanoke River NWR: Recreational hunting of resident game and migratory birds in accordance with federal and state regulations; recreational fishing of freshwater fish species in accordance with state regulations; wildlife observation; photography; environmental education; and interpretation.

(2) Funding required for management of the recreational uses: The Service will use existing staff at the refuge to administer recreational uses. The refuge hunt program is administered by the North Carolina Wildlife Resources Commission permit hunt program and requires minimal staff time.

(3) Availability of funding: Based on a review of the refuge budget allocated for recreational use management, I certify that funding is adequate to ensure compatibility and to administer and manage the recreational uses.

Project Leader: _____

Refuge Supervisor: _____

Chief, National

Wildlife Refuge System,

Southeast Region: _____

Appendix D. Rare Animal Species Recorded in the Roanoke River Floodplain

Adapted from A Natural Heritage Inventory of the Roanoke River Floodplain, North Carolina (LeGrand and Hall 2014).

Explanation of Status and Rank Codes for Animals

Global Rank:

- G1 = Critically imperiled globally because of extreme rarity or because of some factor making it especially vulnerable to extinction throughout its range. Typically 5 or fewer occurrences globally.
- G2 = Imperiled globally because of rarity or because of some factor making it very vulnerable to extinction throughout its range. Typically 6-20 occurrences globally.
- G3 = Either vulnerable and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range.
- Typically 21-100 occurrences.
- G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5 = Secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- T = The rank of a subspecies or variety. As an example, G4T1 would apply to a subspecies or variety of a species with an overall rank of G4, with the subspecies or variety warranting a rank of G1.
- ? = Unranked, or rank uncertain.
- GNR = Not Ranked. Global rank of the species or subspecies not yet assessed.

State Rank:

- S1 = Critically imperiled in North Carolina because of extreme rarity or because of some factor making it especially vulnerable to extirpation from the state. Typically 1-5 populations.
- S2 = Imperiled in North Carolina because of rarity or because of some factor making it very vulnerable to extirpation from the state. Typically 6-20 populations.
- S3 = Vulnerable in North Carolina. Typically 21-100 populations.
- S4 = Apparently secure in North Carolina, with many occurrences.
- An S or G rank involving two numbers indicates uncertainty of rank. For example, a G2G3 rank indicates that the species appears to warrant either a G2 or a G3 ranking, but that existing data do not allow that determination to be made.
- SU = Currently unrankable in the state due to lack of information or substantially conflicting information about status or trends. Need more information.

- B = Rank of the breeding population in the state. Used for migratory species only.
- N = Rank of the non-breeding population in the state. Used for migratory species only.

U.S. Status:

- E = Endangered. An animal that is in danger of extinction throughout all or a significant portion of its range.
- T = Threatened. An animal that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- FSC = Federal Species of Concern. A species under consideration for listing, for which there is insufficient information to support listing at this time. "...The Service remains concerned about these species, but further biological research and field study are needed to resolve the conservation status of these taxa. Many species of concern will be found not to warrant listing, either because they are not threatened or endangered or because they do not qualify as species under the definition in the [Endangered Species] Act. Others may be found to be in greater danger of extinction than some present candidate taxa. Such species are the pool from which future candidates for listing will be drawn." (Federal Register, February 28, 1996).
- U.S. Status is determined by the U.S. Fish and Wildlife Service and the U.S. National Marine Fisheries Service in accordance with the U.S. Endangered Species Act of 1973, as amended (U.S. ESA). Plants and plant varieties, (including fungi and lichens), animal species and subspecies, and vertebrate populations are considered for Endangered or Threatened status according to the criteria established under the U.S. ESA. Consult the Asheville or Raleigh Ecological Services Field Offices for more information.

State Status:

- E = Endangered. Any native or once-native species of wild animal whose continued existence as a viable component of the State's fauna is determined by the Wildlife Resources Commission to be in jeopardy or any species of wild animal determined to be an 'endangered species' pursuant to the Endangered Species Act. (Article 25 of Chapter 113 of the General Statutes; 1987).
- T = Threatened. Any native or once native species of wild animal which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, or one that is designated as a threatened species pursuant to the Endangered Species Act. (Article 25 of Chapter 113 of the General Statutes 1987).
- SC = Special Concern. Any species of wild animal native or once-native to North Carolina which is determined by the Wildlife Resources Commission to require monitoring but which may be taken under regulations adopted under the provisions of this Article. (Article 25 of Chapter 113 of the General Statutes 1987).

- SR = Significantly Rare. Any species which has not been listed by the North Carolina Wildlife Resources Commission as an Endangered, Threatened, or Special Concern species, but which exists in the state (or recently occurred in the state) in small numbers and has been determined by the North Carolina Natural Heritage Program to need monitoring. (This is a North Carolina Natural Heritage Program designation.) Significantly Rare species include "peripheral" species, whereby North Carolina lies at the periphery of the species' range (such as hermit thrush, *Catharus guttatus*), as well as species of historical occurrence with some likelihood of re-discovery in the state.
- Species considered extirpated in the state, with little likelihood of re-discovery, are given no State Status (unless already listed by the North Carolina Wildlife Resources Commission as E, T, or SC).
- WL = Watch List. Any other species believed to be rare and of conservation concern in the state, but not warranting active monitoring at this time. (This is a North Carolina Natural Heritage Program designation.)
- D = Depleted

Table 1. Table of Rare Animal Species of the Roanoke River Floodplain.

Taxonomic Group	Scientific Name	Common Name	Global Element Rank	State Element Rank	Federal Status	State Status	IPaC*
MAMMALS	*Corynorhinus rafinesquii macrotis*	Rafinesque's Big-eared Bat – Coastal Plain Population	G3G4 TNR	S3	FSC	SC	
MAMMALS	*Myotis austroriparius*	Southeastern Myotis	G3G4	S2	FSC	SC	
MAMMALS	*Myotis septentrionalis*	Northern Long-Eared			E		X
MAMMALS	*Perimyotis subflavus*	Tricolored Bat	G2G3		C		
MAMMALS	*Sciurus niger*	Eastern Fox Squirrel	G5	S3	-	WL	
BIRDS	*Ammodramus savannarum*	Grasshopper Sparrow	G5	S3B, S1N	-	WL	
BIRDS	*Anhinga anhinga*	Anhinga	G5	S3B	-	WL	
BIRDS	*Euphagus carolinus*	Rusty Blackbird [winter season only]	G4	S3N	-	WL	X
BIRDS	*Haliaeetus leucocephalus*	Bald Eagle	G5	S3B, S3N	-	T	
BIRDS	*Lanius ludovicianus*	Loggerhead Shrike	G4	S3B, S3N	-	WL, SC	
BIRDS	*Nyctanassa violacea*	Yellow-crowned Night-Heron	G5	S2B	-	SR	

Taxonomic Group	Scientific Name	Common Name	Global Element Rank	State Element Rank	Federal Status	State Status	IPaC*
BIRDS	*Setophaga cerulea*	Cerulean Warbler	G4	S2B	FSC	SC	
BIRDS	*Vireo gilvus*	Warbling Vireo	G5	S2B	-	SR	
BIRDS	*Picoides borealis*	Red-cockaded Woodpecker	G3	S2	E	E	X
REPTILES	*Virginia valeriae*	Smooth Earth Snake	G5	S3	-	WL	
FISHES	*Carpiodes cyprinus*	Quillback	G5	S2?	-	SR	
FISHES	*Etheostoma vitreum*	Glassy Darter	G4G5	S3	-	WL	
FISHES	*Alosa aestivalis*	Blueback herring	W		FSC	D	
FISHES	*Acipenser oxyrinchus*	Atlantic sturgeon	G3		E	E	
MUSSELS	*Alasmidonta undulata*	Triangle Floater	G4	S2	-	T	
MUSSELS	*Anodonta implicata*	Alewife Floater	G5	S1	-	T	
MUSSELS	*Elliptio roanokensis*	Roanoke Slabshell	G3	S1	-	T	
MUSSELS	*Fusconaia masoni* *	Atlantic Pigtoe	G2	S1	FSC	E	
MUSSELS	*Lampsilis cariosa*	Yellow Lampmussel	G3G4	S1	FSC	E	
MUSSELS	*Lampsilis radiata*	Eastern Lampmussel	G5	S1S2	-	T	
MUSSELS	*Lasmigona subviridis*	Green Floater	G3	S1	FSC	E	
MUSSELS	*Leptodea ochracea*	Tidewater Mucket	G3G4	S1	-	T	

Taxonomic Group	Scientific Name	Common Name	Global Element Rank	State Element Rank	Federal Status	State Status	IPaC*
MUSSELS	*Ligumia nasuta*	Eastern Pondmussel	G4	S1	-	T	
MUSSELS	*Succinea unicolor*	Squatty Ambersnail	G3G4	S1S2	-	SR	
MUSSELS	*Xolotrema caroliniense*	Blunt Wedge	G4	S3?	-	WL	
CRUSTACEANS	*Orconectes virginiensis*	Chowanoke Crayfish	G3	S3	-	SC	
DRAGONFLIES	*Arigomphus villosipes*	Unicorn Clubtail	G5	S3	-	WL	
DRAGONFLIES	*Gomphus dilatatus*	Blackwater Clubtail	G5	S3?	-	WL	
DRAGONFLIES	*Gomphus hybridus*	Cocoa Clubtail	G4	S3	-	WL	
DRAGONFLIES	*Stylurus amnicola*	Riverine Clubtail	G4	S3	-	WL	
KATYDIDS	*Montezumina modesta*	Montezuma Katydid	GU	SU	-	WL	
BUTTERFLIES	*Amblyscirtes carolina*	Carolina Roadside-Skipper	G3G4	S3S4	-	WL	
BUTTERFLIES	*Danaus plexippus*	Monarch Butterfly			C		X
MOTHS	*Acrapex relicta*	a canebrake moth	G4	S3	-	WL	
MOTHS	*Anacamptodes cypressaria*	an inchworm moth	G2G4	SU	-	SR	
MOTHS	*Apameine new genus 2 sp. 3*	an undescribed cane moth	GNR	S2S3	-	SR	
MOTHS	*Argillophora furcilla*	a cane moth	G3G4	S2S3	-	WL	

Taxonomic Group	Scientific Name	Common Name	Global Element Rank	State Element Rank	Federal Status	State Status	IPaC*
MOTHS	*Caripeta aretaria*	Southern Pine Looper	G4	S3S4	-	WL	
MOTHS	*Catocala lincolnana*	Lincoln Underwing	G3	S2S3	-	SR	
MOTHS	*Catocala marmorata*	Marbled Underwing	G3G4	S1S3	-	SR	
MOTHS	*Catocala orba*	Orb Underwing	G4	S2S3	-	SR	
MOTHS	*Cerma cora*	a bird-dropping moth	G3G4	S2S3	-	SR	
MOTHS	*Cisthene kentuckiensis*	Kentucky Lichen Moth	G4	SU	-	WL	
MOTHS	*Gondysia smithii*	Smith's Darkwing	G4	S3?	-	WL	
MOTHS	*Hypomecis longipectinaria*	a wave moth	G2G4	S3S4	-	WL	
MOTHS	*Idaea scintillularia*	Diminutive Wave	GNR	SU	-	WL	
MOTHS	*Leucania calidior*	Cane Wainscot	G2G4	S1S2	-	SR	
MOTHS	*Lithacodia sp. 1*	a bird-dropping moth	G1G3	S1S3	-	WL	
MOTHS	*Lithacodia sp. 2*	a bird-dropping moth	G1G3	S1S3	-	WL	
MOTHS	*Orgyia detrita*	a tussock moth	G3G4	S2S3	-	WL	
MOTHS	*Papaipema araliae*	Aralia Shoot Borer Moth	G3G4	S2S4	-	WL	
MOTHS	*Papaipema sp. 3*	Southeastern Cane Borer Moth	G4	S3S4	-	WL	

Taxonomic Group	Scientific Name	Common Name	Global Element Rank	State Element Rank	Federal Status	State Status	IPaC*
MOTHS	*Properigea tapeta*	an owlet moth	GNR	SU	-	WL	
MOTHS	*Rivula stepheni*	Stephen's Grass Moth	GNR	SU	-	WL	
MOTHS	*Tornos abjectarius*	a gray moth	GNR	S2S4	-	WL	
MOTHS	*Tripudia flavofasciata*	an owlet moth	GNR	SU	-	WL	
MOTHS	*Zale sp. 3 nr. buchholzi*	an owlet moth	G3G4	S2S3	-	WL	
MOTHS	*Zanclognatha atrilineella*	an owlet moth	GU	S1S3	-	WL	
PLANTS	*Lysimachia asperulaefolia*	Rough-leaved Lossestrife	G3	S3x	E	E	X
PLANTS	*Aeschomene virginica*	Sensitive Joint-vetch	G2	SH	E	E	X

- IPAC- Information for Planning and Consultation (IPaC) is a project planning tool that streamlines the USFWS environmental review process.

Table 2. Major species guilds found along the coastal plain reach of the Roanoke River with an abbreviated list of wildlife species associated with each. Column 4 lists the priority species that are referenced in the respective conservation plan(s) footnoted at the end of the table. Focal species are identified along with the landowner constituency that can provide a significant amount of habitat for a given guild.

Taxa	Species Guild	Species (Examples)	Priority Species Within Guild	Focal Species	Stakeholder Contribution to Resources of Concern
Avian	Ground, Near ground Nesters, and Ground Foragers	Northern bobwhite, wild turkey, Kentucky warbler, Swainson's warbler, ovenbird	[1,6,7]Kentucky warbler, [1,2,6,7]Swainson's warbler, [6] ovenbird, [1,2,6] American Woodcock	Swainson's Warbler	USFWS, NCWRC, TNC, private
Avian	Forest Interior	Worm-eating warbler, Wood thrush, Cerulean warbler, Scarlet tanager, Acadian flycatcher, Hooded warbler, Yellow-throated vireo, American redstart,	[1,2] Worm-eating warbler, [1,2,6,7] Wood thrush, [1,2,6,7] Cerulean warbler, [6] Scarlet tanager, [6] Acadian flycatcher, [1,2,6] Hooded warbler, [6] Yellow-throated vireo, [2,6,7]	Wood thrush, Cerulean warbler	USFWS, NCWRC, TNC, private (less likely to sustain)

		Eastern wood peewee, Northern parula warbler, Yellow-throated warbler	Northern parula warbler, [2] Yellow-throated warbler, [1] Eastern woodpewee		
Avian	Cavity Nesters	Woodpeckers: red bellied, pileated, red-headed, downy, hairy; northern flicker; Wood duck; Hooded merganser; Great crested flycatcher; Prothonotary warbler; Carolina chickadee; Barred owl	[1] Red-headed woodpecker, [1] Hairy woodpecker, [3] Wood duck, [3,6] Hooded merganser, [2,6,7] Prothonotary warbler, [1] Northern flicker	Wood duck	USFWS, NCWRC, TNC, private (less likely to sustain)
Avian	Edge Species	Indigo bunting, Blue grosbeak, White-eyed vireo, Summer tanager, Common yellowthroat warbler, Eastern	[2] Eastern towhee	N/A - River corridor and agricultural edges provide abundant edge habitat along 138 miles of river	USFWS, NCWRC, TNC, private

		towhee, Brown thrasher			
Avian	Open woodland	Mississippi kite, Yellow-billed cuckoo, Orchard oriole	[2(local)] Mississippi kite, [1]Yellow-billed cuckoo, [1,7] Orchard oriole	N/A - Sufficient habitat is available in surrounding area.	USFWS, NCWRC, TNC, private
Avian	Early succession, scrub-shrub	Yellow-breasted chat, Prairie warbler, Indigo bunting, White-eyed vireo, American woodcock	[1,2] Prairie warbler, [2] White-eyed vireo	N/A-Surrounding lands will support in the long term. Spot analysis of regional early successional habitat for next 15 years indicates that of the 850K acres of habitat in LRR Basin, 250K is early successional.	USFWS (less likely to sustain), NCWRC (less likely to sustain), TNC (less likely to sustain), private
Avian	Swamp	Rusty blackbird (winter), Prothonotary warbler, Yellow-crowned night heron, Great	[2,6,7] Rusty blackbird (winter), [1(local)] Yellow-crowned night heron, [6]Louisiana	Yellow-crowned night heron (spring/summer) Rusty black bird (winter)	USFWS, NCWRC, TNC, private (less likely to sustain)

		egret, Green heron, Louisiana waterthrush, Wood duck, Hooded merganser	waterthrush, [2,6,7] Prothonotary warbler, [3] Wood duck		
	Flooded Forest (winter and spring)	Wintering American black duck, Mallard, American wigeon, Ring-necked duck, Gadwall, Green-winged teal, Wood duck (year-round)	[2,3] American black duck (winter), [2,3] Wood duck (year-round), [2,3] Mallard (winter), [2,] Ring-necked duck (winter),	Wood duck (spring) and American black duck (winter)	USFWS, NCWRC, TNC, private (less likely to sustain)
Avian	Riverine	Bald eagle, Osprey, Spotted sandpiper (nonbreeding), Louisiana waterthrush	[1,7] Bald eagle, [6] Louisiana waterthrush	N/A - habitat in great abundance	USFWS, NCWRC, TNC, private
Aquatic	Migratory fish (floodplain utilizers)	American eel, Blueback herring, Alewife,	[5]American eel, [5] River herring (Blueback/ Alewife),	River herring	USFWS, NCWRC, TNC,

		Hickory shad, Striped bass	[5] Hickory shad, [5] Striped bass		private (less likely to sustain)
Aquatic	Resident fish (floodplain utilizers)	Black crappie, Bluegill, Warmouth, Largemouth bass, Yellow bullhead, Bowfin, Long-nose gar, Creek chubsucker, Flier, Mosquito fish,		N/A - species guild covered by migratory fish and swamp guild	USFWS, NCWRC, TNC, private
Resident Wildlife Non- Avian	Downed woody debris with seasonally flooded water body nearby	Salamanders: Marbled, Slimy, Mud, Eastern newt; Spadefoot toad, Green tree frog, Squirrel tree frog, Gray tree frog	[1] Marbled salamander, [1] Slimy salamander, [1] Spadefoot toad,	Marbled salamander	USFWS, NCWRC, TNC, private (less likely to sustain)
Resident Wildlife Non- Avian	Standing water	Spotted turtle, Green frog, Eastern cottonmouth, Crayfish sp.	[1]Spotted turtle,	N/A - species covered by swamp guild	USFWS, NCWRC, TNC, private
Resident Wildlife Non- Avian	Flooded and nonflooded woodlands	Golden mouse, Short-tailed shrew,	[1] Golden mouse, [1] Marsh rabbit,	N/A-species covered by several avian guilds	USFWS, NCWRC,

		Marsh rabbit, White-footed mouse			TNC, private
Resident Wildlife Non- Avian	Cavity dwellers	Black bear, Southeastern myotis bat, Rafinesque's big-eared bat,	1(NC species of concern) Southeastern myotis, 1 (NC threatened) Rafinesque's big-eared bat	Rafinesque's big-eared bat	USFWS, NCWRC, TNC, private (less likely to sustain)

[1]***North Carolina Wildlife Action Plan (NCWRC 2005) -*** *identified if species was listed as a priority or higher.*

[2]***South Atlantic Coastal Plain Partners In Flight Bird Conservation Plan (Hunter et. al. 2001) -*** *identified if species is of high or extremely high priority.*

[3] ***Atlantic Coast Joint Venture (Atlantic Coast Joint Venture 2004) -*** *identified if species is of moderately high to high priority.*

[4]***Southeast United States Regional Waterbird Conservation Plan (Hunter et al. 2006) -*** *identified if species of immediate or high management concern.*

[5]***Atlantic States Marine Fisheries, Fisheries Management Reports (ASMFC 1999, 2000, and 2003) -*** *identified if management plan has been developed.*

[6]***North Carolina Bird Species Assessment, Coastal Plain of NC (Johns 2006) -*** *identified if species of moderate to extremely high conservation concern within the South Atlantic Coastal Plain physiographic region.*

N/A - habitat within this guild is in great abundance or there is adequate protection of the habitat for species within the guild by focal species designated in other guilds.