

Environmental Assessment

Santee National Wildlife Refuge Spatial Habitat and Species Management Plan August 2026

Prepared by Santee National Wildlife Refuge
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U.S. Department of Interior
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Region 4 (Southeast Region)
Santee National Wildlife Refuge
Clarendon County, South Carolina



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Executive Summary

This environmental assessment evaluates the action alternative and a no action alternative. The selected action will implement the Spatial Habitat and Species Management Plan (SHSP) at the Santee National Wildlife Refuge (NWR) in accordance with the Santee NWR Comprehensive Conservation Plan (CCP) (USFWS 2008).

Management of the refuge was outlined and evaluated in the Santee NWR Comprehensive Conservation Plan (CCP)/Environmental Assessment (EA)/Finding of No Significant Impact (FONSI) (USFWS 2008a, b) located in Clarendon County in the upper coastal plain region of South Carolina. The Service is updating and refining habitat and species management of the 15,095-acre refuge with the SHSP (Section A and MapSheets), including management of grassland and upland cropland, managed wetland, and forest habitat. The Selected Action will refine and update existing refuge management objectives to serve refuge purposes and goals and adapt management over time. Resources of concern established through the Natural Resource Prioritization Process (USFWS 2022) and articulated in the SHSP for the refuge include the:

- Painted bunting (*Passerina ciris ciris*) and wood thrush (*Hylocichla mustelina*)
- Sandhill crane (*Grus canadensis*)
- Wintering grassland birds-such as Henslow's sparrow (*Centronyx henslowii*), LeConte's sparrow (*Ammospiza leconteii*)
- Wintering dabbling ducks such as green-winged teal (*Anas carolinensis*), wood duck (*Aix sponsa*)
- Wood Stork (*Mycteria americana*)

The SHSP in Section A was fully developed for implementation based on the Selected Action, including MapSheets i, 1.1 through 1.4. Section A and are incorporated herein by reference.

The no action alternative will continue to management without implementing the SHSP. If adopted, the SHSP will step down the Refuge's existing Comprehensive Conservation Plan (CCP) (USFWS 2008a, b).

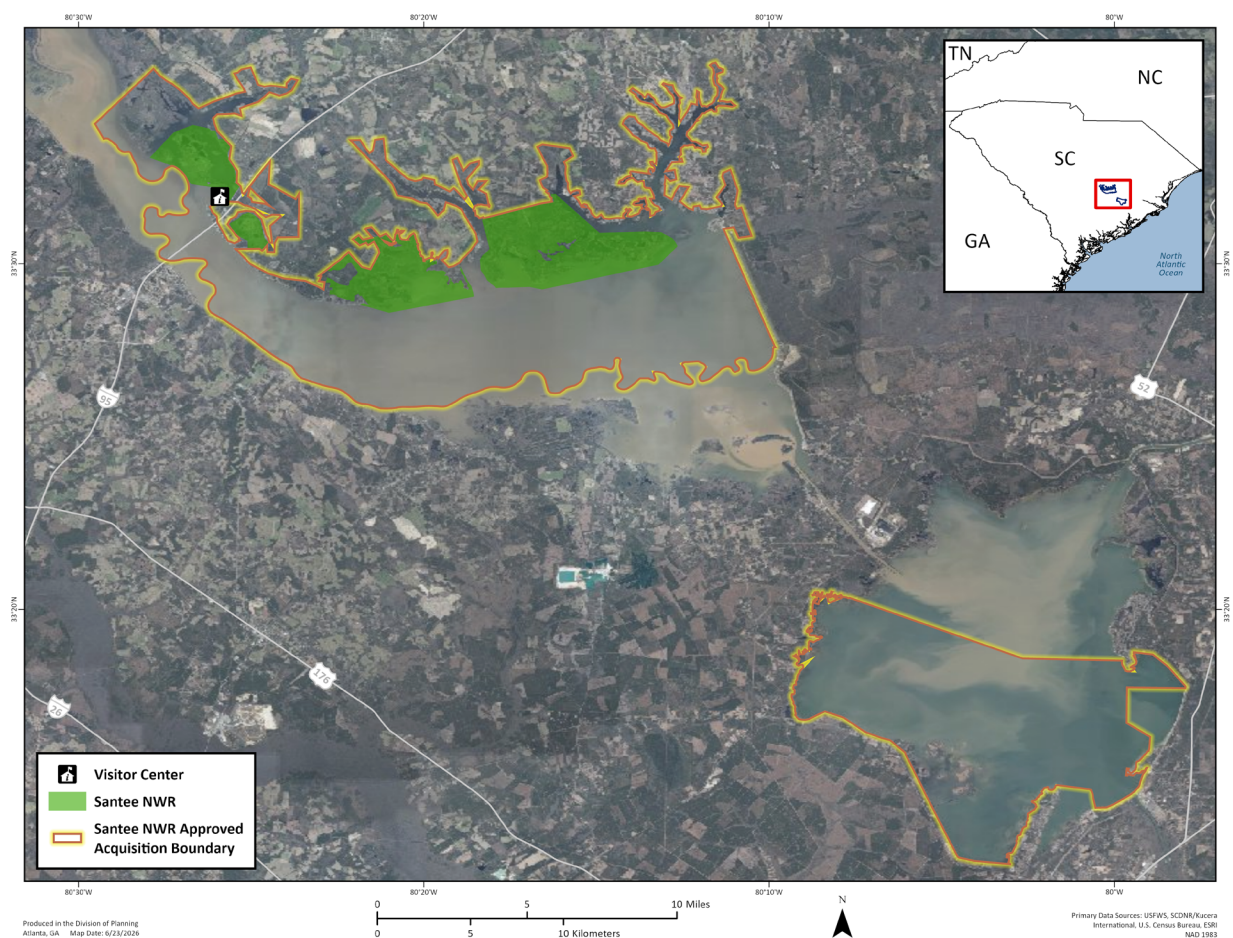
This Environmental Assessment (EA) was prepared by the U.S. Fish and Wildlife Service (Service, USFWS) to evaluate the potential environmental impacts associated with the Selected Action, implementing the 2026 Spatial Habitat and Species Management for Santee NWR (NWR, refuge; Figure 1), and complies with the National Environmental Policy Act (NEPA), Department of the Interior NEPA regulations and policy (43 CFR 46; 516 DM 1), the U.S. Fish and Wildlife Service's (Service) NEPA policy (550 FW 3) and other relevant regulations and policies. NEPA

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requires examination of the effects of proposed actions on the natural and human environment. Appendix A outlines all laws and Executive Orders evaluated through this EA.

The following resources were analyzed in the environmental assessment: Habitat and Vegetation; Candidate, Threatened and Endangered Species; Special Status Species; Geology and Soils; Economic Effects and Effects on the Quality of Life of the American People; Management and Operations; and Visitor Use and Experience (see Chapter 4 for more information). The U.S. Fish and Wildlife Service initially considered impacts to several other resources but ultimately dismissed from further analysis because neither the selected action nor its alternatives will have the potential to result in impacts on these resources.

Figure 1. Location of Santee NWR.



Chapter 1: Introduction

1.1 Background

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System, the purposes of an individual refuge, federal laws and executive orders, U.S. Fish and Wildlife Service policy, and international treaties. Relevant guidance includes but is not limited to the National Wildlife Refuge Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 United States Code [U.S.C.] 668dd et seq.); the Refuge Recreation Act of 1962; and selected portions of the CFR and the U.S. Fish and Wildlife Service manual.

The mission of the National Wildlife Refuge System, as outlined by the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (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 NWRSA 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;
- 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.

Santee NWR was established in 1941, recognizing the high migratory bird benefits and recreational opportunities served by the lands and waters of Santee NWR, under the Migratory Bird Conservation Act thus outlining the primary purposes of these lands and waters:

“... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d (Migratory Bird Conservation Act)

“...to conserve and protect migratory birds...and other species of wildlife that are listed...as endangered species or threatened species and to restore or develop adequate wildlife habitat.” 16 U.S.C. 715i (Migratory Bird Conservation Act)

“... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...” 16 U.S.C. 460k-1 (Refuge Recreation Act, as amended)

“... the Secretary ... may accept and use ...real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ...” 16 U.S.C. 460k-2 (16 U.S.C. 460k-460k-4, Refuge Recreation Act, as amended).

Serving NWRS mandates, and refuge purposes, the SHSP will support multiple refuge management goals and objectives articulated in the CCP (USFWS 2008a, b), including those listed.

CCP Supporting Goals (USFWS 2008)

Goal 1. Threatened and Endangered Species

Conserve, protect, and enhance populations of rare, threatened, and endangered species of plants and animals at existing or increased levels on the refuge and conserve, protect, manage, and restore native South Carolina coastal plain habitats occurring on the refuge to contribute to recovery goals.

Goal 2. Migratory Birds

Maintain and actively manage refuge wetlands and uplands primarily to contribute to migratory bird priorities of the refuge and South Carolina coastal plain physiographic area, while providing consistency with state, regional, and national goals.

Goal 4. Wildlife and Habitat Diversity

Protect, manage, and enhance the natural diversity of fish, wildlife, and habitats and the important landscapes of the refuge’s coastal plain habitats to ensure that fish and wildlife populations remain naturally self-sustaining.

Goal 5. Forests

Maintain and manage for high-quality oak-pine mixed woodland and edge habitats on Santee NWR to support Neotropical songbirds, such as the painted bunting, and other resident wildlife within the South Carolina Coastal Plain Physiographic Area.

Goal 6. Exotic, Invasive, and Nuisance Species

Control and eliminate, where feasible, exotic, invasive, and nuisance species on the refuge to maintain and enhance the biological integrity of the refuge's native South Carolina coastal plain habitats.

Threatened and Endangered Species

The refuge provides habitat for two Federally candidate or proposed species (monarch butterfly and tricolored bat). Also as outlined above, another four Federally listed species could potentially occur on or around the refuge (West Indian Manatee, Canby's dropwort, American chaffseed, and Red-cockaded woodpecker). The manatee has never documented.

From 2020 to 2022, Species Status Assessment reports were completed for the monarch butterfly (USFWS 2020b), tricolored bat (USFWS 2021b), and Northern long-eared bat (USFWS 2022b). The recent Programmatic Biological Opinion: Implementation of Forest Habitat Management Practices on National Wildlife Refuges in the Southeast Region for Tree Roosting Bats (PBO) prescribed fire and forestry practices will be utilized to minimize impacts, including reducing fire intensity within forest units and avoiding known bat roosts and retaining or creating snags during mulching/thinning operations, will be utilized to address conflicting management actions (USFWS 2024). Additionally, habitat enhancements through these forestry practices are likely to benefit tree roosting bats long-term.

Further, the refuge supports multiple birds of management concern, including migrating and breeding populations. Many migratory birds are facing threats and declines, including habitat quality and habitat availability. As outlined in the North American Bird Conservation Initiative's State of the Birds 2020 Report, three billion birds have been lost from the United States and Canada, including one in 4 breeding birds; 70 bird species are on the tipping point of being lost; and birds across the United States are showing downward trends in every habitat except wetlands (North American Bird Conservation Initiative 2022). Over time, changing conditions in the landscape are occurring.

Table 2. Listed Species and Designated Critical Habitat on or adjacent to Santee NWR

SPECIES/CRITICAL HABITAT Species Common Name (Scientific Name)	STATUS¹
Tricolored Bat (<i>Perimyotis subflavus</i>)	PE
West Indian Manatee (<i>Trichechus manatus</i>)	T
Red-cockaded Woodpecker (<i>Picoides borealis</i>)	E
Monarch Butterfly (<i>Danaus plexippus</i>)	C
American Chaffseed (<i>Schwalbea Americana</i>)	E
Canby's Dropwort (<i>Oxypolis canbyi</i>)	E

¹STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species

Of the species in Table 1, species known or likely to occur on the refuge is the tricolored bat and monarch butterfly. There are no critical habitats.

In conjunction with Santee SHSP (Section A) and the associated Draft EA (Section B), the Draft SHSP process includes a draft Compatibility Determination, and an intra-Service Section 7 Consultation to fulfill the requirements of the Endangered Species Act (ESA); which are incorporated herein by reference. The ESA provides a program for conserving threatened and endangered plants and animals and their habitats, including critical habitat. An ESA Intra-Service Section 7 Consultation was also completed for the 2008 CCP; it is also incorporated herein by reference (USFWS 2008a, b). The PBO for the implementation of forest habitat management practices for tree roosting bats, prescribed fire and forestry practices also applies to this action in order to minimize impacts include reducing fire intensity within forest units and avoiding known bat roosts and retaining or creating snags during mulching/thinning operations (USFWS 2024). This ESA Programmatic Biological Opinion: Implementation of Forest Habitat Management Practices on National Wildlife Refuges in the Southeast Region for Tree Roosting Bats is incorporated herein by reference (USFWS 2024). Additionally, habitat enhancements through these forestry practices are likely to benefit tree roosting bats long-term.

1.2 Selected Action

The U.S. Fish and Wildlife Service (Service, USFWS) put forth a Spatial Habitat and Species Plan (SHSP) for Santee National Wildlife Refuge (NWR) located in Clarendon County, SC. Management of the refuge was outlined and evaluated in the Santee NWR Comprehensive

Conservation Plan (CCP) / Environmental Assessment (EA) / Finding of No Significant Impact (FONSI), which included a Section 7 biological evaluation that had findings of no effect and not likely to adversely affect (USFWS 2008a). Furthering management outlined in the Refuge's CCP(USFWS 2008), the Service is updating and refining habitat and species management of the 15,095-acre refuge with the SHSP, including management of the Santee NWR forests, wetlands, fields, open water, and a rare Carolina Bay (Dingle Pond). Management actions may include prescribed fire, wildfire management, grassland restoration, mowing, herbicide applications, forest thinning, and mulching.

The Selected Action will refine and update refuge management objectives to serve refuge purposes and goals and adapt management over time. A proposed action is an initial proposal and may evolve during the development of alternatives, the impact analysis, and public involvement. The lead federal agency may determine that there is other, better, or less impactful ways to address the purpose and need, resulting in a different preferred alternative. The proposed action and alternatives may change during the NEPA process as the agency refines its proposal and gathers feedback from the public, federally recognized tribes and tribal entities, and other agencies or organizations. Therefore, the final preferred selected alternative may differ from the initial proposed action and has been finalized at the conclusion of the public comment period after incorporating all substantive comments. A decision to implement a selected action will not be made until the environmental review process is complete.

1.3 Purpose and Need for Action

The purpose of the development of the SHSP is to refine implementation of the CCP for Santee NWR to address changing landscape and natural resource conditions, enhance and adapt refuge habitat and species management, and better serve refuge purposes and management goals.

The need is supported by multiple factors, including addressing management activities, recent updates to information for key resources of concern, changing conditions in the landscape, and limited refuge staff time. Further, the CCP/EA/FONSI for the refuge was finalized in 2008, which was over 17 years ago (USFWS 2008a, b). Changes in conditions, species status, and other factors necessitated review and amendment of the CCP through preparation of the SHSP.

Chapter 2: Consultation and Coordination

2.1 Public Involvement

This Environmental Assessment has been made available for public review and comment concurrent with the publication of the SHSP and Compatibility Determination. The public review period was for 30 days. Members of the public were notified of the availability of these documents and how to submit comments via the Refuge or website. Public comments were accepted through the review process either electronically or via US mail. Any comments,

concerns, and suggestions or other feedback requiring a substantive response has been incorporated into the final EA.

2.2 State, Federal, and Local Agency Coordination

To serve shared visions, missions, goals, and objectives, the Service and states continue to work closely together to conserve and manage the fish and wildlife resources of the nation under a variety of laws, regulations, and policies. The Service contacted the state with a letter to request comments on the EA, CD and SHSP on June 26th, 2026.

2.3 Tribal Consultation

The Service and Tribal Nations recognize the need for strong, healthy communication and relationships so that we can work together to improve and enhance conservation of fish and wildlife resources and shared natural and cultural resource goals and objectives. The Service's engagement with and responsibilities to Native American Tribes are guided primarily by doctrines of reserved rights, statutes, treaties, judicial mandates, Executive Orders, Presidential proclamations, and Secretary's Orders. The United States' trust responsibility is a well-established legal obligation that originates from the unique, historical relationship between the United States and Native American Tribes. The trust responsibility consists of the highest moral obligations that the United States must meet to ensure the protection of Tribal and individual Indian lands, assets, resources, and treaty and similarly recognized rights.

The federal government recognizes the valuable contributions of the Indigenous Knowledge (also called Indigenous Traditional Knowledge, Traditional Knowledge, Traditional Ecological Knowledge, and Native Science) that Tribal Nations and Indigenous Peoples have gained and passed down from generation to generation. Indigenous Knowledge combines observations, oral and written knowledge, innovations, practices, and beliefs over long terms and spanning generations, interweaving biological, physical, social, cultural, and spiritual systems. The federal government's consideration and inclusion of Indigenous Knowledge is guided by respect for the sovereignty and self-determination of Tribal Nations, the Nation-to-Nation relationship between the United States and Tribal Nations and the United States' trust responsibility, and the need for the consent of and honest engagement with Tribal Nations and Indigenous Peoples.

For any particular effort, the Tribal Nation(s) or Indigenous People(s) involved clearly drive whether or not to share Indigenous Knowledge and whether or not their Indigenous Knowledge should be applied in federal contexts; the federal government respects these decisions. Indigenous Knowledge offers critical insight into the historic and scientific significance of an area, providing an important foundation for understanding, analysis, and decision making. Consultation and collaboration with Tribal Nations and Indigenous Peoples are critical to ensuring that Indigenous Knowledge is considered and applied in a manner that respects Tribal sovereignty and achieves mutually beneficial outcomes. Indigenous Knowledge can play a key role in relation to the federal government's planning, analysis, decision making, and compliance

under a variety of laws, regulations, and policies, importantly the Endangered Species Act (16 USC §§1531-1544), National Environmental Policy Act (42 USC §§4321 et seq. and 40 CFR Chapter V Subchapter A), Marine Mammal Protection Act (16 USC Chapter 31), Magnuson-Stevens Fishery Conservation and Management Act (16 USC Chapter 38), National Historic Preservation Act (Title 54 USC), and Native American Graves Protection and Repatriation Act (25 USC §§3001-3013).

The Service initially requested consultation and input on changes to the refuge land management program on June 26, 2026 to:

- Absentee Shawnee Tribe
- Catawba Indian Nation
- Shawnee Tribe
- Eastern Shawnee Tribe of Oklahoma

Tribes and tribal members were welcome to provide comment during the public comment period. No comments were submitted.

Chapter 3: Alternatives

3.1 Decision Framework

Following completion of the EA, the Regional Director in the Southeast Region (Region 4) of the U.S Fish and Wildlife Service has determined if the selected alternative is a major federal action that will significantly affect the quality of the human environment and, require preparation of an environmental impact statement or, alternatively, determine if there is no significant effects to the human environment and complete a Finding of No Significant Impact (FONSI). It was determined that there are no significant effects to the human environment and a Finding of No Significant Impact (FONSI) was completed after the public review period.

3.2 Alternatives

Alternative A – Continue Current Management (No Action Alternative)

Under this alternative, the status quo will be maintained, and refuge management will continue on Santee NWR as outlined in the 2008 CCP and EA for Santee NWR (USFWS 2008a, b). Refuge management will continue as outlined in the CCP (USFWS 2008a, b). Under Alternative A, passive management of the existing 1,200 acres of forest will continue. Management will continue on 50 acres of cropland and 1,135 acres to provide supplemental wildlife food (USFWS 2008a, b). Active management of the existing 1,200 acres in existing grassland management units will continue for the long-term.

Alternative B Implement the Spatial Habitat and Species Plan (Selected Action; Preferred Alternative) Under Alternative B, the Service will implement the SHSP, as detailed in the SHSP Supplemental Document in Section A and the listed MapSheets, which are incorporated herein by reference.

MapSheet i: Landscape Level Overview

MapSheet 1.1: Santee NWR Overview

MapSheet 1.2: Santee NWR Forest Habitat

MapSheet 1.3: Santee NWR Grassland and Upland Cropland Habitat

MapSheet 1.4: Santee NWR Managed Wetlands Habitat

While contributing to other national, regional, and state goals to protect and restore habitats and species, refuge management will focus on the achievement of refuge migratory bird purposes, specifically to protect and conserve resources of concern on the refuge, such as the eastern painted bunting, wood thrush, sandhill crane, wintering grassland birds, and wintering dabbling ducks including green-winged teal; and to further the mission of the National Wildlife Refuge System, including to ensure the biological diversity and integrity of Santee NWR, including all federally listed threatened and endangered species.

Alternative B will refine, update, and replace certain objectives or portions of objectives from the refuge's CCP (USFWS 2008a, b). Existing CCP goals will remain unchanged (See Background Section Above).

Alternative B will implement the SHSP, which steps down and provides specifics for several of the identified goals and objectives outlined in the CCP without changing the original intent. The focus under this alternative is to manage, maintain, restore, and protect the refuge's habitats and wildlife species. Wildlife and plant monitoring and inventory activities will be initiated and/or maintained to obtain the biological information needed to continue current and implement new priority management programs on the refuge. The Santee NWR SHSP MapSheets depict future habitat management on the refuge: Overview, Grassland and Upland Cropland Habitat, Managed Wetland Habitat, and Forest Habitat. Active management of portions of the existing 1,200 acres of grassland, 50 acres of cropland, 1,135 acres of managed wetlands, and 1,200 acres of forest will occur under Alternative B.

Opportunities for wildlife-dependent recreation activities such as hunting, wildlife observation and photography, and environmental education and interpretation will continue to be provided.

SHSP Objectives

Stepping down from the CCP and serving goals, objectives, and recommendations from the CCP (USFWS 2008), the Santee SHSP articulates future habitat management objectives to provide further refinement, as listed (tables and figures reference MapSheets).

Forest Objective 1 (Stepped down from CCP Goals 1, 2, 5, 6 and Associated Objectives

(USFWS 2008)): On a rotational basis (every 2-4 years), maintain and manage up to 1,200 acres of longleaf, mixed hardwood/pine, and pine stands to support desired stand structure (Table 1), utilizing fire, mechanical, chemical, and biological strategies across the Bluff, Cuddo, Pine Island, and Dingle Pond Units (Figure 1-5). This is part of a larger upland landscape characterized by a mosaic of open forest, scrub-shrub, and grassy patches with the following desired conditions for the painted bunting:

- Pine-oak canopy cover less than 75 percent, and/or canopy tree stocking at a basal area less than 50 feet per acre.
- Mid-story comprised of 20 to 50 percent woody shrubs, less than 20 feet tall and including fleshy fruit-bearing shrubs, such as wax myrtle and yaupon.
- Over time convert loblolly to longleaf pine.

Forest Objective 2 (Stepped down from CCP Goals 1, 2, 5, 6 and Associated Objectives (USFWS 2008)): As appropriate and possible, manage bottomland hardwood, green tree reservoirs, and cypress/tupelo stands in the Bluff, Cuddo, Pine Island, Dingle Pond Units (Figures 1-5) to support desired forest conditions (Table 2).

Grassland Objective (Stepped down from CCP Goals 1, 2, 4, 6 and Associated Objectives

(USFWS 2008)): On an annual basis, maintain and manage up to 1,200 acres (See Figure 1 and Table 1) of grassland-dominated, early successional habitat across the Bluff, Cuddo, and Pine Island Units, as part of a larger upland landscape characterized by a mosaic of open forest, scrub-shrub, and grassland patches with the following desired conditions for breeding and migrant painted buntings, and wintering grassland birds:

- One hundred acre or more grassland patches of greater than 50 percent native warm-season grasses, such as broomsedge (*Andropogon virginicus*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), and switch grass (*Panicum virgatum*).
- Interspersed, 2-to-10-acre patches or edge habitat of 3-to-18-feet-tall native woody shrubs including wax myrtle (*Myrica cerifera*), yaupon (*Ilex vomitoria*), American beautyberry (*Callicarpa americana*), Eastern red cedar (*Juniperus virginiana*), Ironwood (*Ostrya virginiana*), American holly (*I. opaca*), Elderberry (*Sambucus nigra*), and Sumac (*Rhus spp.*), with a grassy understory.

- Less than 30 percent encroachment by woody species, such as sweet gum (*Liquidambar styraciflua*) and groundsel tree (*Baccharis halimifolia*).

Upland Agriculture Objective (Stepped down from CCP Goals 1 , 2, 4, 6 and Associated Objectives (USFWS 2008)) Annually, manage up to 50 acres of croplands among Fields A, B, and C in the Bluff Unit (Figure 2, 5, and Table 2) for grain crops such as milo, corn, or millet to create a minimum of 237,500 Waterfowl Energy Days to benefit sandhill cranes and other native wildlife.

Managed Wetland Objective (Stepped down from CCP Goals 1 , 2, 4, 6 and Associated Objectives (USFWS 2008)): Maintain, improve, and/or restore up to 1,135 acres of managed wetlands including moist-soil, permanent, green-tree, and agricultural impoundments (Figures 1-4A-D and Table 1) for the following desired conditions to contribute toward the foraging habitat needs (4,385,097 Waterfowl Energy Days) for 60,895 migrating and wintering (October to March) dabbling ducks, including the green-winged teal, wood duck, Northern shoveler (*Spatula clypeata*), Northern pintail (*Anas acuta*), gadwall (*Mareca strepera*), and American widgeon (*Mareca americana*), and provide high-quality habitat resources for wading birds, such as the wood stork:

- Manage up to 770 wetland acres across the Bluff, Cuddo, Pine Island, and Dingle Pond Units for 70 to 80 percent emergent vegetative cover, such as softstem bulrush (*Schoenoplectus tabernaemontani*), native sedges (*Carex spp.*), duck potato (*Sagittaria latifolia*), spike rush (*Eleocharis palustris*), and native millet (*Panicum decompositum*), 20 percent or less invasive species such as giant salvinia (*Salvinia molesta*), alligatorweed (*Alternanthera philoxeroides*), water hyacinth (*Pontederia crassipes*), and parrot feather (*Myriophyllum aquaticum*), and a range of water depths of 6 to 24 inches from November to March.
- Annually manage up to 15 acres in Bluff (Millet Field) Unit and 65 acres in the Cuddo (Upper Tier and Lower Tier of Timber Island Field) Units for grain crops such as Japanese millet, flooded to water depths of 18 inches or less beginning late summer through the fall to provide 380,000 Waterfowl Energy Days towards the Refuge objective.
- Annually, manage up to 60 acres in the Cuddo Unit (Upper Tier and Lower Tier of Timber Island Field) and 25 acres in the Pine Island Unit (Maidencane, Savannah A, B, and C, and Rail Fields) for grain crops, such as rice, flooded to water depths of 18 inches or less, during cultivation (April -August) and during winter sanctuary (November – February) to provide up to 387,600 Waterfowl Energy Days towards the Refuge objective.
- Annually manage up to 120 acres of green-tree reservoirs in the Cuddo and Pine Island Units to maintain a range of water depths of 6 to 24 inches from November to March for wintering wood ducks and other dabbling ducks.

- Foraging, nesting, and brood-rearing wood ducks.
- Late spring or early summer flooded wetlands and beaver ponds with emergent and scrub-shrub vegetation such as smartweed, fall panicum, wild millet, alder, and willow
- Forested wetland landscapes with a composition of greater than 25 percent hard mast trees per acre, including oak and hickory species, and multiple large cavity trees or snags with diameter at breast height greater than or equal to 12 inches with four small cavities (entrance diameters 3.5 to 10 inches) per acre and one large cavity (entrance diameter greater than 10 inches) per 10 acres.

The recent programmatic biological opinion for the implementation of forest habitat management practices for tree roosting bats, prescribed fire and forestry practices will be utilized to minimize impacts, including reducing fire intensity within forest units and avoiding known bat roosts and retaining or creating snags during mulching/thinning operations, will be utilized to address conflicting management actions (USFWS 2024). Additionally, habitat enhancements through these forestry practices are likely to benefit tree roosting bats long-term.

The scope and timeline to meet habitat and species management objectives are outlined in each MapSheet; however, these activities can be adjusted accordingly to ensure feasibility within existing constraints. Therefore, a reduction in resources may prompt the refuge manager to re-evaluate any habitat or species objectives, including cropland conversion, thus implementation of selected actions will be contingent upon the availability of resources and Full-Time Equivalents. The scope and timeline of these activities will be adjusted accordingly to ensure feasibility within existing constraints.

Features Common to all Alternatives

Although the alternatives may differ, there are similarities among them as well. These common features are listed below to reduce the length and redundancy of the individual alternative descriptions.

Compatible Uses

The NWRS Administration Act of 1966, as amended by the NWRS Improvement Act of 1997, states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be compatible. A compatible use "...will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge." Wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety." Compatibility determinations also include stipulations to ensure compatibility. These include measures to minimize disturbance to sensitive, threatened, and endangered species,

minimize damage to habitat, and reduce the likelihood of introduction of invasive species. For example: "All commercial forest management operations will be subject to stipulations set forth in a Special Use Permit (SUP). Stipulations for each individual project will be dependent upon the goals and objectives of the timber harvest, individual site characteristics, and other resource concerns. Stipulations set forth in the SUP will minimize adverse impacts on resources, maximize desired silvicultural results, and ensure the operation is compatible with the mission of the Refuge System and the goals and objectives of Santee NWR." The compatibility determinations (CDs) included in the CCP (USFWS 2008a, b) are incorporated herein by reference, as is a Commercial Tree Harvesting CD (USFWS 2026).

Candidate, Threatened and Endangered Species

Any timber sales, logging decks, or temporary forestry roads necessary to implement thinning under the SHSMP are part of the Selected Action and analyzed at a programmatic level. Site-specific prescriptions will undergo Section 7 review with BMPs. If future actions exceed the scope analyzed here or introduce new effects, additional NEPA will be required.

Visitor use and experience

The refuge provides opportunities for hunting, wildlife observation, photography, hiking, and biking, which will continue under either alternative. Hunting on the refuge is allowed within specific dates listed in the refuge's hunt brochure and as regulated by CFR. Refuge management activities under either alternative will continue to support refuge management goals and objectives in the CCP including visitor use and experience.

Other Management

Under either alternative, all management activities that could affect natural resources, including subsurface mineral reservations, soil, water, and air, or that could affect utility lines and easements, will be managed to comply with all laws and regulations.

Cultural Resources

Under both alternatives, the Service is responsible for managing archaeological and historical sites found on refuge lands. Since cultural resource surveys on the refuge have been limited, additional surveys will be conducted prior to any new construction or excavation on refuge lands to fully satisfy provisions of the National Environmental Policy Act of 1969, and all applicable cultural resource laws and policies. Any potentially negative impacts from habitat management will require review by the Service's Regional Archaeologist and consultation with the State Historic Preservation Office, as mandated by Section 106 of the National Historic Preservation Act. The Service's policy is to preserve these cultural resources in the public trust and avoid any adverse effects wherever possible. Determining whether a particular management action has the potential to affect cultural resources is an on-going process that will occur during the detailed planning stages of every project.

The Service has a legal responsibility to consider the effects of its actions on cultural resources. Under all alternatives, the Service will manage these resources in accordance with public law and agency policy. Individual projects could require additional consultation with the Advisory Council on Historic Preservation and the State of South Carolina Historic Preservation Office. Additional consultation, surveys, and clearance will be required where project development is conducted on the refuge or when activities will affect properties that are listed or eligible for listing on the National Register of Historic Places.

Land Acquisition

Service acquisition of tracts adjacent to Service owned lands, will be given priority. Conservation easements and leases can be used to obtain interests necessary to satisfy refuge objectives. The Service can negotiate management agreements with local, state, and federal agencies, and accept conservation easements. The acquisition of private lands is entirely contingent on the landowners and their willingness to participate. Any future land acquisition will be the same under either alternative.

Monitoring Applicable to All Alternatives

Continued annual biological monitoring of both resident and migratory wildlife and their habitats is done on the refuge in conjunction with our partners. In addition, the refuge will stay apprised of the status of threatened and endangered species on the refuge through consultation and local monitoring. The refuge follows recovery plan guidelines for the management of federally threatened and endangered species. The final ESA has been completed at the same time as the EA is finalized and the analysis will be consistent with the Section 7 consultation. See the section on threatened and endangered species for more details. If needed, the refuge may take additional actions to mitigate any potential impacts to threatened and endangered species.

Chapter 4: Affected Environment and Environmental Consequences

This section is organized by affected resource categories. Each affected resource section discusses the existing environmental baseline in the impact zone (potential area of impact of any of the alternatives) and the effects of the alternatives on each resource. Effects from the selected action or alternatives are reasonably foreseeable changes to the human environment, whether adverse or beneficial as compared to the environmental baseline for the no action alternative. The impact analysis directly follows the description of the affected environment for a resource and is organized by alternative.

The impact analysis will evaluate various criteria, as defined below, to describe the context and intensity of impacts on affected resources; these are not required terms but they are commonly used in NEPA documents and may be referenced in the subsequent sections.

Table 1 identifies those resources that either don't exist within the project area or will either

not be affected or only negligibly affected by the Selected Action and those resources that may have greater than negligible impacts. Those resources for which the action is not applicable or for which no or negligible impacts are anticipated are not further analyzed in this EA.

Table 1. Impacts to Resources Summary Table.

Resource	Not Applicable: Resource does not exist in project area	No / Negligible Impacts: Exists but no or negligible impacts	Greater than Negligible Impacts: Impacts analyzed in this EA
Habitat and Vegetation	☐	☐	☒
Floodplains:	☐	☒	☐
Vegetation of special management concern:	☒	☐	☐
Fish and Wildlife Species	☐	☐	☒
Candidate, Threatened and Endangered Species and Critical Habitat	☐	☐	☒
Special Status Species	☐	☐	☒
Air Quality	☐	☐	☒
Climate Change	☐	☐	☒
Geology and Soils	☐	☐	☒
Land use	☐	☒	☐
Soundscape	☐	☒	☐
Special Land Status Designations	☒	☐	☐
Water Resources	☐	☒	☐
Historic Properties	☐	☒	☐
Archeological Resources	☐	☒	☐
Architectural Resources	☒	☐	☐

Resource	Not Applicable: Resource does not exist in project area	No / Negligible Impacts: Exists but no or negligible impacts	Greater than Negligible Impacts: Impacts analyzed in this EA
Economic Effects and Effects on the Quality of Life of the American People	☐	☐	☒
Public Health and Safety	☐	☒	☐
Aesthetics	☐	☒	☐
Administration	☒	☒	☐
Management and Operations	☐	☐	☒
Land Use and Planning	☐	☒	☐
Visitor Use and Experience	☐	☐	☒

Resources evaluated and dismissed from further analysis:

Floodplains (EO 11988): The land management activities do not affect water flows or other factors relevant to flooding and floodplain landscapes. Therefore, no effects to floodplains are expected because of proposed regulations changes to land management activities on the refuge. Additionally, no modifications will be made that will increase the floodplain elevation or negatively impact its function and value and thus there are no impacts to E.O. 11988 – Floodplain Management.

Benthic organisms: The selected action does not involve dredging, substrate disturbance, or any activity that will affect benthic habitats. Therefore, no impacts to benthic organisms are anticipated.

Soundscape: While land management activities may introduce intermittent noise from firearms and human activity, these sounds are localized, seasonal, and short in duration. Wildlife in the area is likely habituated to such disturbances. As a result, impacts to the soundscape are expected to be negligible.

Special land status designation: The refuge does not include special land designations.

Archeological resources: Management actions will not affect the Santee Indian Mound/Fort Watson site because all selected activities will avoid the cultural resource area. Existing protection including restrictions on ground-disturbing equipment, continued monitoring, and law-enforcement oversight ensure the site remains undisturbed.

Architectural resources: No architectural resources exist on the refuge.

Public health and safety: The selected action does not introduce new hazards or risks to public health and safety. Activities will be conducted under existing state and federal regulations, with appropriate safety measures in place. Therefore, no significant impacts are anticipated.

Vegetation of special management concern: There is no vegetation of special management concern on the refuge.

Land Use: The selected action is consistent with the existing land use designation of the refuge as a wildlife conservation and public use area. No changes to land use or zoning are proposed.

Aesthetics, viewsheds and visual resources: The selected action does involve construction, and or temporary land clearing, that could alter the visual character of the refuge, however, the change will be negligible. Therefore, no impacts to aesthetics, scenic viewsheds, or visual resources are anticipated, and this resource was excluded from detailed analysis.

4.1 General Description of Affected Environment Applicable to All Affected Resources

Santee National Wildlife Refuge (NWR, refuge) is located in Summerton, South Carolina. Santee National Wildlife Refuge, encompassing approximately 15,000 acres, was established in 1942 and is located in the upper Atlantic Coastal Plain region of South Carolina. The refuge is superimposed on the lands and waters of the 110,600-acre Lake Marion reservoir in Clarendon County.

The South Carolina Public Service Authority, a.k.a. Santee Cooper, created Lake Marion as a hydroelectric project on the Santee River. Santee NWR benefits migratory waterfowl, neo-tropical songbirds and other birds, and terrestrial and aquatic wildlife in this ecosystem. The refuge contains a wide diversity of habitats including mixed hardwoods, mixed pine hardwoods, pine plantations, marsh, croplands, old fields, ponds, impoundments, and open water. For more information regarding and the general characteristics of the Refuge's environment, please see Chapter 2 of the [Santee NWR CCP](#) which are incorporated by reference.

The Southeast Conservation Blueprint: Grassland & Savanna Restoration Indicator (SECAS 2025) from the Southeast Conservation Blueprint, uses a set of natural and cultural resource indicators to produce its main conservation priority categories. SECAS is a regional conservation initiative covering the Southeastern United States and the Caribbean. Established in 2011 by the Southeastern Association of Fish and Wildlife Agencies and the Southeast Natural Resource Leaders Group, SECAS unites state and federal agencies, nonprofits, private landowners and businesses, tribes, partnerships, and universities around a shared conservation vision.

SECAS also tracks regional metrics of ecosystem health, function, and connectivity to report annual progress toward its goal: achieving a 10% or greater improvement in the health, function, and connectivity of Southeastern ecosystems by 2060. According to the Southeast

Conservation Blueprint (2025), 100% of the current Santee NWR boundary is identified as a priority area for regional conservation efforts. This designation reflects the refuge's importance within broader landscape-scale conservation planning. The Blueprint also shows that 100% of the Refuge boundary lies within a designated connectivity corridor and contributes to several large intact habitat cores.

Although Santee NWR already occupies a highly connected portion of the regional landscape, additional land protection and restoration that expand or link intact habitat patches could further reduce fragmentation and support long-term ecological connectivity (Figure 2). Their grassland and savanna restoration indicator represents potential restoration opportunities for grasslands and savannas within their historic ranges. The classes represent areas from highest to very low indicating their restoration potential. Santee NWR contains over 500 acres of land that has highest restoration potential.

4.2 Natural Resources

Habitat and Vegetation: Affected Environment

Tree harvesting and other land management activities can alter habitats by trampling vegetation, compacting soils, and increasing the potential of erosion. Soil compaction makes root penetration more difficult, making it harder for seedlings to become established. In moderate cases of soil compaction, plant cover and biomass is decreased. In highly compacted soils, plant species abundance and diversity is reduced in the long-term as only the most resistant species survive. Walking may impact vegetation succession as disturbance of vegetation not only results in an alteration of vegetation but also a change in light and moisture and topographical changes that can reduce ground and shrub-nesting avian species. Nesting success of ground-nesting birds is also influenced by vegetation cover and disturbance (Blakesly and Reese 1988). The reduction of the vegetation's physical structure and diversity due to over browsing by deer also can negatively impact landbirds. Casey and Hein (1983) have found greatly reduced bird species diversity in areas with long-term, high-density populations of deer. These changes were mainly attributed to habitual landscape alteration with pronounced browse line and sparse cover caused by over browsing.

Repeated visitation to any particular locale at the Refuge could cause damage to vegetation and therefore, wildlife habitat. Substantial, widespread habitat degradation could through time result in negative effects to wildlife by reducing available cover, food, nesting habitat, etc., along heavily used access routes.

People can be vectors for invasive plants when seeds or other propagules are moved from one area to another. Once established, invasives can out-compete native plants, thereby altering habitats and impacting wildlife. The threat of invasive plant establishment will always be an issue requiring annual monitoring, and when necessary, treatment. In the event new

undesirable invasive species are found on the Refuge, staff will work to eradicate the weeds.

Habitat and Vegetation: Environmental Consequences

Alternative A

Some minor effect to vegetation is expected from trampling, but slightly less than Alternative B because of slightly a smaller number of activities. Damage to vegetation including vegetation trampling, littering, minor surface damage on roads/trails from motor vehicles, spread of invasive species can result due to land management activities, but less than Alternative B because of the lower number of activities and acres involved.

Alternative B

Under the Preferred Alternative, some minor effect is expected to vegetation from trampling and spread of invasive species on the new acreage as under Alternative A. The number of users is not expected to be significantly greater than Alternative A. The slight increase in land management activities will be dispersed over a much larger area than in Alternative A and impacts to vegetation are expected to be negligible, and vegetation will respond within the growing season that diminishes the effects of disturbance.

Forest management operations may have negative impacts on both water quantity and quality. Data from experimental forested watersheds in the eastern United States indicate that the leaching of nutrients after timber harvesting, especially clear cutting, tends to increase (Bormann et al. 1968; Bormann et al. 1974), and the increases in stream water temperature are highest where revegetation of cutover areas is delayed (deMaynadier and Hunter 1995; Cullen 2001). These factors may have detrimental effects on stream organisms, including fish, invertebrates, and amphibians (Campbell and Doeg 1989). Maintaining forested buffers near streams and other aquatic resources minimizes impacts on water resources and water quality (Osborne and Kovacic 1993; Castelle et al. 1994; Wilkerson et al. 2006; Bennett 2010). The activities will not entail activities that will drain wetlands, fill wetlands or change the hydrology of the landscape. Road improvements, skid trail planning, harvest operations, and interaction with surface and groundwater hydrology will follow best management practices outlined by the state's forestry agency to minimize water quality impacts. Selective thinning, not clearcutting, will be the primary harvest method.

Commercial tree harvesting for forest management can have several localized and broader impacts on wildlife-related components of forests, including damage to understory vegetation (Scheller and Mladenoff 2002), alterations of microhabitat environments (deMaynadier and Hunter 1995), and changes in the abundance and type of coarse woody debris (deMaynadier and Hunter 1995; Siitonen 2001).

Harvesting may also leave the remaining trees more susceptible to wind throw (Ruel 1995), facilitate the spread of invasive plants (Sakai et al. 2001), and temporarily disturb wildlife (DeMaynadier and Hunter 1995, Campbell et al. 2007; Holmes and Pitt 2007). Impacts will be

minimized through careful planning and implementation. Selective logging methods, equipment with reduced ground disturbing capabilities, and time of year and soil-moisture restrictions will be implemented to minimize disturbance to wildlife and understory vegetation. Pre-harvest multi-resource surveys, strategic layout of skid trails, and clear designation of no-cut zones will also help to protect the wildlife and habitat.

Positive impacts are expected from tree harvesting. In a study conducted in the bottomland hardwood forests at Tensas River National Wildlife Refuge, treated stands resulted in greater community-wide bird diversity in comparison to untreated stands (Twedt and Somershoe 2009).

Fish and Wildlife Species: Affected Environment

The Refuge supports a diverse assemblage of game and nongame wildlife species typical of northern South Carolina, including fish, reptiles, amphibians, invertebrates, and numerous mammalian species. This biodiversity is sustained by the variety of habitat types present across Santee National Wildlife Refuge, which offer abundant food resources and cover.

Approximately 40 mammal species are known or expected to occur within the refuge acquisition area (USFWS 1997). These include wide-ranging species such as black bear (*Ursus americanus*), typically associated with upland forests connected by extensive forested wetland corridors. The area also supports seven species of bats, including two state-listed species of concern, Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) and southeastern myotis (*Myotis austroriparius*), which utilize the refuge for both roosting and foraging. Common forested wetland mammals include white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), mink (*Neogale vison*), river otter (*Lontra canadensis*), marsh rabbit (*Sylvilagus palustris*), and squirrel (*Sciurus* sp.).

The floodplain forests of the South Atlantic Coastal Region provide important breeding habitat for a rich assemblage of bird species, more than half of which are neotropical migratory birds. Approximately 200 bird species have been recorded within the refuge acquisition area. Coastal plain wetlands in South Carolina serve an essential role for migrating and wintering waterfowl by providing staging and wintering areas. Since 1970, South Carolina has wintered substantial proportions of several species within the Atlantic Flyway, including an average of 54 percent of American green-winged teal (*Anas crecca carolinensis*), 50 percent of northern shoveler (*Spatula clypeata*), 35 percent of mallard (*Anas platyrhynchos*), 32 percent of northern pintail (*Anas acuta*) and American wigeon (*Mareca americana*), and 31 percent of gadwall (*Mareca strepera*).

The refuge and surrounding areas support a variety of reptile and amphibian species expected in coastal plain wetland systems. Common aquatic salamanders include the greater siren (*Siren lacertina*), eastern lesser siren (*Siren intermedia*), two-toed amphiuma (*Amphiuma means*),

dwarf waterdog (*Necturus punctatus*), and broken-striped newt (*Notophthalmus perstriatus*). Terrestrial salamanders such as the marbled salamander (*Ambystoma opacum*) and South Carolina slimy salamander (*Plethodon variolatus*) are also present. Frequently encountered frog species include bullfrog (*Lithobates catesbeianus*), southern leopard frog (*Lithobates sphenoccephalus*), and green treefrog (*Hyla cinerea*). The American alligator (*Alligator mississippiensis*) is the largest reptile occurring within the refuge.

Fish and Wildlife Species: Environmental Consequences

Alternative A

Impacts are similar to those described in Alternative B. Under No Action alternative, land management will continue at current levels and operations, and the disturbance will be similar to past conditions.

Alternative B

The combination of human presence, noise associated with heavy equipment and motorized hand tool operation may disturb wildlife, including birds. Birds exhibit various behavioral and physiological responses to disturbance. Physiological responses include the release of stress hormones (Müllner et al. 2004, Thiel et al. 2008) and increased heart rate (Weimerskirch et al. 2002). Behavioral responses include increased vigilance (Frid and Dill 2002), altered singing behavior (Gutz Wilder et al. 1994), and flushing (Ikuta and Blumstein 2003, Beale and Monaghan 2004, Pease et al. 2005, Livezey et al. 2016). Disturbance can also cause birds to discontinue or avoid foraging (Burger and Gochfield 1998, Thomas et al. 2003, Yasue 2005, Martín et al. 2015) and instead spend more time displaying avoidance behaviors. These physiological and behavioral responses to human activity cause birds to expend energy (Bélanger and Bédard 1990, Weimerskirch et al. 2002) that will otherwise be used for survival, migration, and reproduction.

Amphibians and reptiles may be negatively impacted through various mechanisms. Falling trees could crush amphibians and reptiles, killing them. Ectotherm species are susceptible to short-term changes in microclimates, which should be considered when harvesting to limit adverse impacts (Currylow et al. 2012). For example, tree harvesting can increase sunlight penetration to the forest floor, reducing soil moisture and increasing soil temperatures. Removing trees from the forest can result in fewer large-diameter logs and detritus accumulating on the ground, which could negatively impact plants, soil, amphibians, invertebrates, and other wildlife species that inhabit the forest floor. These microclimate changes can cause cold-blooded animals to overheat and make amphibians vulnerable to desiccation. Further, heavy equipment can introduce or spread invasive species and crush small animals.

Tree harvesting can have long-term localized and broad impacts on wildlife and their habitats, including damage to understory vegetation (Scheller and Mladenoff 2004), alteration of microhabitat environments (deMaynadier and Hunter Jr. 1995), changes in the abundance and type of coarse woody debris (deMaynadier and Hunter 1995, Siitonen 2001), and removal of snags used by wildlife. Depending on their life history characteristics, these impacts can have positive and negative long-term effects on wildlife populations. For example, birds that prefer early successional and shrubby habitats may benefit from tree harvesting, while birds that prefer mature, old-growth forests may decline (Campbell et al. 2007, Holmes and Pitt 2007). Other wildlife, such as amphibians, invertebrates, reptiles, and mammals, may also be affected differently based on their life history traits (Fredericksen et al. 2000).

Using tree harvesting to mimic natural disturbance and improve wildlife habitats relies on creating appropriately timed disturbances similar in size and intensity to historical disturbance regimes (Seymour et al. 2002). Because wildlife species have differing requirements for cover, food, and nesting sites, it is not possible to use tree harvesting to provide high-quality habitat for all species in the same stand. Management actions will be expected to have positive impacts on the habitat, fish and wildlife, including federally listed species populations. The cooperative farming program potential impacts will be minimized by all fertilizer, soil amendment, and pesticide applications following strict requirements, including the approved PUPs' conditions and restrictions, Cooperative Agriculture Agreement and special use permit conditions and restrictions, label and application restrictions, and BMPs.

Some plants and animals may respond more positively to less intense tree harvesting, while others may respond more positively to more intense tree harvesting. Further, disturbance-dependent species may be positively impacted immediately following tree harvesting but may decline long-term (Cahall et al. 2013). To maximize the positive effects of tree harvesting and minimize harm, the Service will aim to mimic the size and intensity of historical disturbance regimes. The Service will also implement rotational tree harvesting to create a complex habitat matrix with various successional stages while maintaining unthinned areas for species negatively impacted by thinning.

Burning or mowing fields to keep them in a perpetual grassland state will exclude upland species that prefer later successional stages (e.g., shrubland and forestland) from using these fields. However, the refuge provides a variety of successional stage habitats, with grasslands being just one component of a complex habitat matrix. While no single date is best for every species, it is generally agreed that reducing prescribed fire and mowing from April to August allows the majority of bird species to nest and fledge at least one brood (Birckhead et al. 2013, Bollinger et al. 1990, Dechant 2007, Perlut et al. 2006, USDA 2009, Warner and Etter 1989). Additionally, mortality can be reduced from mowing or burning by leaving unmanaged strips within or around the edge of a field (Allen et al. 2019, Tyler et al. 1998).

The major effects of prescribed burning on wildlife are mostly indirect yet change in the structure and composition of vegetation impacts availability of food and cover, which directly influences the health, abundance, and diversity of wildlife (USDA 2012). Direct mortality of wildlife from prescribed burning is rare; prescribe burning will continue to be scheduled during periods that are not critical to reproduction and survival of wildlife.

Prescribed fire does not necessarily benefit aquatic organisms, but it should not have adverse effects when implemented properly (USDA 2012). Waterways are often used as firebreaks, and when fire enters into a riparian zone, it should not be detrimental since fire is often not carried very well in these moist and humid environments. Plowed or disked areas, roads, and levees also act as firebreaks. Adequate buffers will continue to be maintained between the firebreak and riparian zone to prevent possible sedimentation, which is much more likely to result from a plowed or disked firebreak than under burning in the riparian zone. Indeed, the positive effects of prescribed burning on vegetation and associated wildlife are just as applicable in a riparian zone as in the uplands.

Within grassland habitats, fields that are mowed or burned annually or bi-annually will continue to provide habitat for short grass preferring species at the expense of species that prefer less disturbed grassland habitats. Grasslands that are mowed or burned less than annually (e.g., once every two or three years) have taller grasses and more residual material (litter) during years when no mowing or burning takes place. Rotating management of a given tract will continue to keep litter available for species that require it. Some bird species prefer to nest in grasslands with little to no litter, while others prefer areas with more litter (Morgan and Burger 2008). The refuge will continue to provide suitable habitat for both short and tall grass preferring species. This spatial and temporal disturbance interspersions is important for providing a variety of grassland cover types across the refuge landscape and ensures that there will be newly managed areas and undisturbed areas within the same habitat mosaic each season (Harper 2007, Herkert et al. 1996). Likewise, using prescribed fire to reach desired forest conditions moves closer to achieving desired habitat conditions for all species on the refuge and increased management will help increase populations of priority resources of concern.

Targeted removal of pests and predators from portions of the refuge will reduce the negative impacts these species have on ecosystem functions. Pest and predator species control has been documented to provide a variety of ecological benefits, including prevention and alleviation of habitat degradation, facilitation of habitat and wildlife restoration, dampening of disease transmission and severity of disease outbreaks among wildlife and between wildlife and humans, maintaining the integrity of infrastructure, and the conservation and enhancement of biological and genetic diversity (Bogges et al. 1990, Organ et al. 1996).

Candidate, Threatened and Endangered Species and Critical Habitat: Affected Environment

The Refuge utilizes the Information for Planning and Consultation (IPaC) tool and the

Environmental Conservation Online System (ECOS) databases to identify threatened and endangered species that may be present within the Refuge and the specific project area for the purpose of completing biological evaluations. It is important to note that these databases are updated regularly, approximately every 90 days. As a result, the list of threatened and endangered species identified as potentially present on or near the Refuge may change between the time of review and the finalization of this document. This is used in conjunction with knowledge of refuge staff and cooperating partners regarding presence of these species or habitats on the refuge.

Six federally threatened and endangered (includes two proposed) species are known to or identified in IPaC as potentially occurring on the refuge. Federally listed threatened and endangered Species that have been documented to potentially occur within the acquisition boundary of the refuge are; the tricolored bat (*Perimyotis subflavus*), proposed endangered, West Indian Manatee (*Trichechus manatus*), threatened, Red-cockaded Woodpecker (*Dryobates borealis*), threatened, monarch butterfly (*Danaus plexippus*) candidate, American Chaffseed (*Schwalbea americana*), endangered, and Canby's Dropwort (*Oxypolis canbyi*), endangered. No critical habitat is designated within the refuge area.

The tricolored bat and monarch butterfly occur on Santee NWR. Manatee have occasionally been documented in the 110,000-acre Lake Marion, but there are no records of them occurring on the refuge. The Red-cockaded Woodpecker has not been observed on the refuge since 1994. There are no historical records that American chaffseed or Canby's dropwort has ever been documented on the refuge.

No significant adverse impacts from the Selected Action are expected to any of the above listed threatened, endangered, and other special status species.

Candidate, Threatened and Endangered Species and Critical Habitat: Environmental Consequences

Alternative A

A consultation pursuant to Section 7 of the Endangered Species Act was conducted for the 2008 CCP based on the then current known locations of feeding, nesting, spawning, or physical locations of threatened or endangered species on or adjacent to refuge lands. It was determined that the selected actions are not likely to adversely affect these species. There have been no known impacts from land management activity on the refuge to these species.

Alternative B

The refuge management implementation was designed to be sustainable and minimize impacts, including to threatened and endangered species and other special status species. It is the policy of the Service to protect and preserve all native species of fish, amphibians, reptiles, birds, mammals, invertebrates, and plants, which are designated threatened or endangered, including their habitats. Management actions are expected to have positive impacts on the federally

listed species populations.

Habitat management and monitoring activity under the Preferred Alternative is not expected to conflict with recovery or protection of Federally listed and candidate species and there have been no reported/documented issues. A intra-service consultation was completed pursuant to Section 7 of the Endangered Species Act as part of this EA and the SHSP Supplemental (Section A) and is incorporated herein by reference (USFWS 2026) resulting in a determination of “May affect but not likely to adversely affect” for red-cockaded woodpecker, and not likely to jeopardize determination for the tricolored bat, and monarch butterfly, and “no effect” for West Indian Manatee, Canby’s dropwort, and American chaffseed as the selected alternative is likely to cause insignificant, discountable effects to the species. West Indian Manatee (*Trichechus manatus*), threatened, American Chaffseed (*Schwalbea americana*), endangered, and Canby’s Dropwort (*Oxypolis canbyi*) have never been documented on the refuge. The Section 7 consultation was prepared and completed after public review and comment.

The refuge will modify activities if unusual concentrations of threatened and endangered species are known to be present and will be threatened by land management activities.

Tricolored Bat

This nocturnal insectivore, with high potential to occur on the refuge, roosts in trees during summer and hibernates in caves or mines during winter. The primary factors influencing the tricolored bat’s viability include white-nose syndrome, wind related mortality, effects from climate change, habitat loss, and conservation efforts (USFWS 2021). Tricolored bats have decreasing population trends (USFWS 2019, 2022b).

The tricolored bat is one of the smallest bats that is native to North America. The once common species is wide-ranging across the eastern and central United States and portions of southern Canada, Mexico, and Central America. During the winter, tricolored bats are found in caves and mines, although in the southern United States, where caves are sparse, tricolored bats are often found roosting in road-associated culverts. During the spring, summer and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves.

White-nose syndrome is also the predominant threat to this bat. This bat species is quite common and was detected on the refuge during mobile acoustic surveys in 2012 – 2019 (USFWS 2019). Management activities will be designed to minimize adverse impacts on resources (e.g., erosion, rutting, wildlife disturbance, smoke), while maximizing the desired silvicultural results, such as forest health improvements and native understory regeneration to benefit wildlife. Therefore, the Selected Action is not likely to adversely affect these species.

Roosting bats are not usually roused without major disturbance. While noise from construction vehicles and or activities might flush bats or disturb feeding, they are more likely to remain in place. There could potentially be some adverse effects on individual bats through herbicide use, mulching, or prescribed fire operations. However, the long-term benefits provided by forest thinning and habitat enhancements are expected to benefit multiple species. Prescribed fire in

or adjacent to forest habitat could have the potential to affect bats. Bats can be sensitive to the timing and intensity to fire. High intensity fire in or adjacent to forest habitat and conducted during summer bat roosting has potential to disturb or harm bats and their roosts (Boyles and Aubrey 2006). Likewise, mulching and woody plant reduction near potential roost trees will be minimized within the active season (April 1 to November 15). Pesticides will be used for the purposes of cropland management, cropland restoration, and woody plant reduction. Although known environmentally harmful pesticides such as organochlorines are no longer used, the use of modern insecticides could potentially impact local food sources for bats (Torquetti et al. 2021). However, little information exists on the effects of indirect application of pesticides, specifically those targeting undesirable plants. Although pesticides will be applied during diurnal periods and not directly to bat roosting habitat, there may be possible unknown indirect effects.

Minimizing prescribed fire operations and forest management operations outside of the non-active winter periods (November-March) within forest units will reduce any potential impacts caused by these management activities. Because Northern long-eared bats roost underneath bark and under crevices in both live trees and snags during the active season (March-November), fire and forestry practices will avoid or minimize activities in these habitats. Prescribed fire and forestry practices that can be implemented to minimize impacts include reducing fire intensity within forest units, avoiding known bat roosts, and retaining or creating snags during mulching/thinning operations.

Under the recent programmatic biological opinion for the implementation of forest habitat management practices for tree roosting bats, prescribed fire and forestry practices that are recommended to minimize impacts include reducing fire intensity within forest units and avoiding known bat roosts and retaining or creating snags during mulching/thinning operations (USFWS 2024). Additionally, habitat enhancements through these forestry practices are likely to benefit tree roosting bats long-term. Any effects are expected to be insignificant.

Tree harvesting has the potential to disturb and displace bats during and after harvesting operations. Specifically, Northern long-eared bat (NLEB) and Tri-colored bat (TCB) are tree roosting bats and will be considered during these operations. Tree harvest such as thinning is likely beneficial to forest-dwelling bats. However, when removing trees from suitable bat habitat, there is the immediate risk of removing trees utilized by bats. The retention of snags and cavity trees as part of the harvest help to reduce adverse effects and long-term negative impacts and this practice should be beneficial to tree roosting bats. This and other best forest management habitat practices will be implemented to minimize adverse impacts to bats (USFWS, 2024). Therefore, tree harvesting is not likely to adversely affect bat species.

While Santee NWR is in the general range of NLEB, this species has not been detected on the refuge. Based on this current scenario, NLEB are not likely to be adversely affected by timber harvesting on the refuge. TCB is common and has been detected on the refuge. The TCB is a migratory species that may remain active year-round in South Carolina. Minimizing disturbance

to summer bat habitat is essential to ensure bats have access to diurnal roosting sites and nocturnal foraging areas. Tree harvesting can alter suitable habitat depending on multiple factors, including the species of bat and habitat requirements across all life stages.

However, requiring harvest activities to occur between November 15 and March 31 will reduce impacts on habitats used by bats during the summer.

Red-cockaded Woodpecker (RCW)

The species historical range included Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Texas, Virginia. Red-cockaded woodpecker historically inhabited the Refuge from the 1970's through the 1980's. A high count of 31 trees were tagged as being active between 1972 and 1977. By 1982, the number of active colonies had declined to four. There were an estimated eight birds in 1987 and 1988 prior to Hurricane Hugo which occurred on September 21, 1989. A few birds (no more than three) were observed in the colony following the hurricane. The hurricane destroyed six of nine active cavity trees. Of the three remaining trees, two had been inactive for the past several years. The last bird was observed in 1994. Management activities are designed to minimize adverse impacts on resources (e.g., erosion, rutting, wildlife disturbance, smoke), while maximizing the desired silvicultural results, such as forest health improvements and native understory regeneration to benefit wildlife.

RCWs are not documented on the refuge or within its acquisition boundary, likely due to the absence of preferred upland, open-growth pine forests over 70 years old. However, The RCW may recolonize the refuge with improved habitat conditions from actions utilized from SHSP. The refuge lies mainly within the Santee floodplain. Even if present, land management programs/ activities on other refuges with RCWs have not shown documented impacts. Human activity noise can disrupt breeding (April–July), but any potential disturbance from this plan is expected to be discountable or insignificant. Construction noise might flush woodpeckers, but they typically remain in place with intermittent noise. Flushing does not result in mortality or take. The refuge's current land management activities have had no documented disturbances. Any effects are expected to be insignificant.

Monarch Butterfly

Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. In many regions where monarchs are present, monarchs breed year-round. Individual monarchs in temperate climates, such as eastern and western North America, undergo long-distance migration, and live for an extended period of time. In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. This migration can take monarchs distances of over 3,000 km and last for over two months. In early spring (February–March), surviving monarchs break diapause and mate at the overwintering sites before dispersing. The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and

their offspring start the cycle of generational migration over again.

Monarch butterflies are commonly seen on the refuge during the summer and fall, within grassland/early successional habitats and in the visitor center butterfly garden. Breeding has been documented on the refuge. Management and restoration efforts in these habitats will benefit pollinators including monarch butterflies. The refuge follows REGIONAL DIRECTOR'S ORDER NO. R4 M-25-05 and applies the associated monarch butterfly and pollinator habitat standards in all applicable land management activities. To ensure that refuge actions actively mitigate potential impacts to monarchs, all habitat restoration and management work as appropriate, will adhere to the following minimum requirements:

Seed mixes will contain at least nine species of native flowering plants, including a minimum of three species blooming in each period: April–June, June–July, and August–October, to provide continuous nectar resources throughout the monarch's lifecycle.

Seed mixes will be free of invasive or aggressive non-native species that could inhibit plant diversity or reduce habitat quality.

When milkweed is included, only regionally appropriate native milkweed species will be used, and tropical milkweed and other non-native species will be strictly avoided to prevent ecological or physiological risks to monarchs.

Beyond these foundational standards, the refuge will, where appropriate, implement additional best management practices to avoid, minimize, and mitigate any potential adverse effects to monarchs and other pollinators. These measures include strategic timing of management actions, protection of existing high-quality nectar and host plant patches, and adaptive management adjustments informed by ongoing monitoring. Where appropriate, land management activities should incorporate the following monarch-supportive practices:

- **Increase native floral diversity** by maximizing the variety of flowering plants across all seasonal bloom periods.
- **Time mowing strategically** to support and extend the availability of nectar resources.
- **Use regionally tailored guidance** and source seed locally when possible, considering future climate conditions.
- **Control invasive and noxious plants** through targeted removal methods such as selective herbicide use or prescribed fire.
- **Apply ecological forestry principles** by creating variable-sized canopy openings that promote herbaceous understory growth, and using prescribed fire in pine or oak systems to sustain conditions important for monarchs and other pollinators.
- **Enhance transition zones** by maintaining infrequently mowed buffer areas along forest–road edges and establishing native plant communities.

- **Limit insecticide exposure** through Integrated Pest Management and adherence to approved Pesticide Use Permits.

Special Status Species: Affected Environment

Bald eagles, although delisted under the Endangered Species Act, remain protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (16 U.S.C. 668a–d). The Eagle Act prohibits the “take” of eagles, including disturbance that interferes with essential breeding, feeding, or sheltering behaviors. Bald eagles are regularly present on the refuge, and four known nests have been documented. Refuge habitats provide suitable foraging and nesting opportunities, and existing management practices already incorporate avoidance and minimization measures to prevent disturbance during sensitive periods.

Golden eagles have not been documented nesting within the refuge boundary, but both species are included under the same federal protections and are therefore addressed together as Special Status Species.

Wood Stork

Wood storks are present on the refuge primarily during late summer through early fall (August–October), coinciding with low water levels and prey concentration in managed wetlands. Although nesting has not been documented on the refuge, more than 20 wood stork rookeries occur statewide, and the refuge lies within the regional foraging range used by birds during the nesting season. Wood storks rely on managed wetlands and flooded forested wetlands for efficient foraging, particularly during chick-rearing, when hydrology strongly influences prey availability. Current water-level management on the refuge provides seasonal habitat conditions that benefit wood storks by creating concentrated foraging zones. While wood storks also use refuge wetlands for loafing, all documented use to date has been non-breeding in nature.

Special Status Species: Environmental Consequences

Alternative A

Under Alternative A, current land management activities will remain unchanged. Under Alternative A, no changes will be made to existing land management practices. Current protections under the MBTA and the Eagle Act will continue to be implemented for bald and golden eagles. Because management activities, staffing levels, and operational timing will remain unchanged, no new direct, indirect, or cumulative impacts to any Special Status Species are anticipated.

For bald eagles, continued implementation of existing spatial buffers, activity timing restrictions, and monitoring will ensure that nesting pairs are not disturbed. For wood storks,

ongoing water-level management will maintain current foraging opportunities. No additional disturbance or habitat alteration will occur, and thus overall effects on Special Status Species under Alternative A will remain neutral. No additional impacts to any special status species are anticipated under this alternative.

Alternative B

Alternative B will implement additional habitat improvement strategies identified in the Spatial Habitat and Species Management Plan. These actions may include enhanced vegetation management, wetland hydrology refinements, and targeted habitat restoration. While these measures are intended to improve ecological conditions, implementation requires consideration of Special Status Species.

Bald and Golden Eagles

If management actions occur near known bald eagle nests or potential nesting structures, the refuge will apply established protection parameters, including implementation of seasonal and spatial buffers, activity restrictions during the breeding season, and avoidance of high-disturbance actions within recommended distances. These measures ensure compliance with the Eagle Act and prevent disturbance that could constitute “take.” Habitat improvements may yield long-term benefits by supporting prey availability and maintaining suitable nesting and roosting conditions.

Wood Stork

Because wood storks regularly forage on the refuge, habitat enhancement activities in managed wetlands must consider seasonal hydrology and disturbance. Potential short-term disturbances (e.g., noise from equipment, vehicular presence, temporary vegetation trampling) may occur during implementation. However, these effects are localized, brief, and mitigated through timing and spatial avoidance strategies. If habitat work occurs near potential rookery locations, the Service will apply protective buffers consistent with regional guidance, even though nesting has not been documented on-refuge.

Long term, improved wetland management, habitat structure, and hydrologic control under Alternative B are expected to enhance foraging efficiency for wood storks during their late-summer use of the refuge. Given mitigation measures and the absence of documented nesting, no adverse impacts are expected, and beneficial effects are likely.

Climate Change/Air Quality-Affected Environment –

Air quality within and around Santee National Wildlife Refuge is generally good, with no major stationary emission sources on-refuge and limited industrial activity in the surrounding rural landscape. The refuge is located within an area that meets National Ambient Air Quality

Standards (NAAQS). Under existing operations, the primary contributors to localized, temporary air emissions include prescribed fires, routine vehicle use, and operation of small equipment for habitat management.

Prescribed burns conducted under the Fire Management Plan occur on a limited number of acres annually, generating short-duration smoke that disperses rapidly under selected burn-window conditions. Smoke management techniques including appropriate fuel moisture, wind direction, transport winds, and dispersion indices are used to minimize smoke impacts on nearby communities, roadways, and sensitive receptors.

With respect to climate change, the refuge experiences the same regional trends observed across the southeastern coastal plain, including more variable precipitation, increased frequency of intense rainfall, longer growing seasons, and periodic drought. These changes influence hydrology, vegetation growth, and habitat conditions within wetland, forest, and grassland systems. No measurable greenhouse gas (GHG) emissions originate from industrial activity on the refuge; emissions arise only from small-scale management operations.

Climate Change/Air Quality Environmental Consequences

Alternative A

Under the No Action Alternative, current management patterns will continue, and air emissions will remain low and temporary. Prescribed fire will still occur at current intervals, producing short-term smoke that is localized and managed under established burn protocols. Equipment use (e.g., tractors, ATVs, pumps, trucks) will continue at presently low levels, resulting in minor combustion emissions with no long-term air-quality implications.

Greenhouse gas emissions under this alternative will remain minimal and consistent with ongoing refuge operations. Climate change will continue to influence the refuge environment, but the refuge will have limited capacity to adapt forest and grassland structures under present management levels, potentially reducing the system's long-term resilience to climatic shifts. Overall, no significant air-quality or climate-related impacts occur under Alternative A.

Environmental Consequences – Alternative B

Implementation of the SHSMP will result in slightly increased prescribed fire acreage, periodic forest-management operations, and expanded use of equipment needed to carry out thinning, mowing, water-management adjustments, and invasive species control. These activities will generate minor, short-term increases in combustion emissions including particulates, carbon monoxide, nitrogen oxides, and carbon dioxide.

However, all activities will continue to occur at the refuge scale, under established burn plans, and with Best Management Practices (BMPs) designed to minimize smoke, reduce drift, and

ensure favorable dispersion conditions. Smoke impacts will remain temporary, localized, and similar to emissions produced under Alternative A, though occurring on a slightly larger annual footprint. These emissions will remain small relative to regional transportation and industrial sources and will not cause or contribute to a violation of air quality standards.

The land management activities including prescribed fire, mechanical vegetation treatments, limited herbicide use, and operation of refuge equipment will generate minor, short-term greenhouse gas (GHG) emissions. These emissions primarily come from combustion of diesel and gasoline during equipment use and from prescribed burning conducted under approved burn plans. Prescribed burns are expected to occur on limited acreages in any given year and are implemented under conditions that minimize smoke production, including moisture, wind, and dispersion parameters.

Although GHG emissions will occur at small, episodic scales, the Selected Action will not meaningfully contribute to regional or national greenhouse gas inventories. Refuge activities occur at a landscape scale small relative to statewide wildfire emissions, transportation, energy production, or industrial sectors. In addition, several components of the Selected Action will support long-term climate resilience:

- Forest thinning and longleaf pine restoration increase stand health, reduce fuel loading, and improve resilience to drought, pests, and severe wildfire.
- Managed wetland improvements can enhance water retention and stabilize seasonal habitat conditions under variable precipitation regimes
- Native grassland restoration contributes to improved soil structure and potential increases in below-ground carbon storage over time.

Geology and Soils:-Affected Environment

Santee National Wildlife Refuge is situated within the South Carolina Coastal Plain, an area underlain by the Santee Limestone formation. While this limestone is exposed at the surface primarily along the Santee River valley and its surrounding counties, its influence is evident in the region's distinctive karst topography. Notable features such as sinkholes, caves, disappearing streams, and solution valleys are present in nearby Santee State Park, reflecting the landscape's development through groundwater activity over geologic time. The limestone itself is composed of limey sands, lime muds, and shell-hash layers, with fossil-rich oyster beds marking the remnants of a shallow continental shelf that existed some 40 million years ago. These geological characteristics contribute to the unique physical landscape and hydrologic dynamics of the refuge and surrounding areas (USFWS 2008a,b).

The soils within the refuge acquisition area are predominantly poorly drained and acidic, often featuring a perched water table due to a subsurface clayey hardpan. Surface soils are generally

sandy to loamy, while subsoils range from silty to clayey textures. The primary soil types include Levy (silty clay loam, very poorly drained), Hobonny (muck, very poorly drained), Lakeland (sand, excessively drained), Rutlege (loamy sand, very poorly drained), Chastain (loam, poorly drained), and Johnston (mucky loam, very poorly drained). These soils support a diversity of wetland and upland habitats, providing essential substrate for the refuge's varied plant communities and wildlife habitat.

Geology and Soils:-Environmental Consequences

Alternative A

Under Alternative A, the refuge will continue implementing all current land management practices identified in the existing Comprehensive Conservation Plan (CCP). Because no new ground-disturbing actions, facility construction, vegetation treatments, or operational changes are proposed, no additional impacts to geology or soils are anticipated beyond those already occurring under existing management.

The refuge's geologic setting including underlying substrates, landforms, and geomorphic processes will remain unchanged. Current management practices do not alter bedrock, geomorphic stability, or landscape-level soil formation processes; therefore, geologic resources will be maintained in their present condition.

Similarly, soil resources will not be modified under the No Action Alternative. Rates of erosion, compaction, sediment transport, and soil disturbance will continue at levels associated with ongoing activities such as routine refuge operations and established visitor use. Because no new activities are proposed that will increase soil exposure, alter drainage, or introduce heavy equipment beyond current patterns, no measurable direct, indirect, or cumulative effects on soils are expected. Existing conditions and ongoing management activities will continue without change, and the physical landscape will remain stable under the current management framework.

Alternative B

Soil disturbance due to restoration and habitat management activities are expected to be minor and of short duration. To further reduce potential impacts, the refuge will use BMPs to minimize the erosion of soils, as well as seasonal restrictions. The increased use and ongoing maintenance of roads, creation of logging decks, and the operation of heavy equipment may impact soil, causing rutting and erosion (Helfrich et al. 1998; Wiest 1998; Cullen 2001). To minimize potential impacts and erosion, timber harvesting operations will follow the best management practices as recommended by the South Carolina Forestry Commission. Timber harvesting will occur during dry periods or colder months to reduce soil erosion, compaction, and rutting. Active forest management will occur when site-specific soil conditions are appropriate.

Tree harvesting can have long-term impacts on soil chemistry, with impact intensity based on

the harvest method. Whole tree harvesting, or the practice of cutting the entire above-ground portion of a tree and removing it from the forest, typically has the most severe effects and has been documented to increase soil acidity, decrease soil saturation, and alter nutrient concentrations (Vanguelova et al. 2010, Brandtberg and Olsson 2012). Soil disturbance following timber harvest may increase the export of particulate matter and soil nutrients. To reduce the possibility of negatively impacting soil, the Service will conduct timber harvesting during the fall and winter when conditions are driest and when cold temperatures reduce soil compaction and erosion. The Service will apply extra caution when performing management in areas with hydric, steep, shallow, or easily erodible soils.

Heavy equipment could be required for tree harvesting, depending on the magnitude of the harvesting operation. Heavy equipment can damage uncut trees, creating entry points for invasion by insects or disease (Nichols et al. 1994). The construction and maintenance of roads and landings and heavy equipment operation may impact soil, causing rutting and erosion (Helfrich et al. 1998, Wiest 1998). The consequences of compacted soil include increased soil temperatures, reduced moisture (Marion et al. 2016), reduced soil biota (Liddle 1997), and resistance to seed germination and penetration by plant roots (Alessa and Earnhart 2000). Best management practices will be used to protect refuge resources from being damaged by heavy equipment.

The interaction of many factors determines the impact of fire on soil, but most evidence indicates that low-intensity prescribed fires have few, if any, adverse effects. Prescribed fires affect soil by both heat transfer and changes in soil physical properties. The most important soil physical characteristic affected by fire is soil structure because organic matter can be lost at relatively low temperatures. Loss of soil structure can increase bulk density and reduce porosity, thereby reducing soil productivity and making the soil more vulnerable to post-fire runoff and erosion. Prescribed burning in the South normally causes little or no detectable change in amount of organic matter in surface soils. In fact, slight increases have been reported on some burned areas. Some minor extent of soil surface contamination could occur from fuel or other engine fluids, or pesticide spillage, but operators will continue to be cautious about preventing spillage.

Water Resources:-Affected Environment

The hydrology of Santee National Wildlife Refuge is dominated by the presence of Lake Marion, a 110,600-acre reservoir created between 1939 and 1942 as part of a hydroelectric project. This reservoir, together with Lake Moultrie, forms the Santee-Cooper Lake System, one of the largest drainage basins on the East Coast. The Santee River, originating at the confluence of the Congaree and Wateree Rivers, supplies most of the inflow, supplemented by seasonal precipitation averaging 43 inches annually. The creation of Lake Marion inundated extensive floodplain and bottomland forests, fundamentally altering the region's natural hydrology and converting vast tracts of forested wetlands into open water and managed impoundments.

Water levels in Lake Marion are managed primarily for hydroelectric power generation and recreation, resulting in seasonal fluctuations that often conflict with optimal water management for wildlife habitat within the refuge. High summer lake levels impede gravity drainage from managed impoundments, necessitating the use of pumps to maintain desired water levels for moist-soil vegetation and greentree reservoirs. Conversely, low lake levels in fall and winter can limit the ability to flood impoundments when needed for waterfowl habitat. The permeability of soils and dikes, particularly in the Bluff Unit, further complicates water retention and management. Additionally, the porous limestone aquifer underlying the region is highly susceptible to contamination, making groundwater protection a critical concern for both the refuge and the surrounding community. The maintenance of water quality and the integrity of wetland systems are essential for sustaining the refuge's ecological functions and supporting its diverse assemblage of aquatic and terrestrial species

Water Resources -Environmental Consequences

Alternative A

Under Alternative A, the refuge will continue implementing the existing land management techniques and operational practices identified in the current Comprehensive Conservation Plan (CCP). Because no new actions, projects, or management changes are proposed, no additional impacts on water resources are anticipated beyond those previously analyzed and already occurring under current management. Hydrologic conditions including surface water flow patterns, groundwater interactions, wetland hydrology, and floodplain function will remain consistent with existing baselines. Current management activities have been in place long enough to establish a predictable pattern of water movement, sedimentation, and hydrologic response across the refuge. Continuing these same practices will therefore not introduce new disturbances, alter drainage features, or modify existing water retention or flow regimes.

Alternative B

Research has shown that tree harvesting can affect water quality. For example, several studies have suggested that total mercury and methylmercury leach into the water from tree harvesting areas (Munthe and Hultberg 2004, Porvari et al., 2003, Sørensen et al. 2009). All forest management measures, including harvesting, can increase sediment and nutrient export into the watershed (Ahtiainen and Huttunen 1999, Laurén et al. 2005, Miettinen et al. 2012). Although tree harvesting can cause increases in nutrient concentrations in the watershed, implementing best management practices can minimize these increases (Wynn et al. 2000).

Road construction, skid trail planning, harvest operation, and stream crossings will, at a minimum, follow the best management practices from the State's forestry agency to minimize hydrological alterations and siltation impacts on water quality. Harvesting will use existing forest roads whenever possible; construction of new roads will occur only when necessary. The

decommission of forestry roads will be standard practice after all forest management is completed. The use of vegetative buffers along field edges will continue to provide cover for wildlife and reduces erosion and sedimentation in streams, and along with cautious pesticide/fertilizer application, reduces nutrient and chemical runoff.

4.3 Economic Effects and Effects on the Quality of Life of the American People- Affected Environment

The refuge contributes meaningfully to the economic vitality and quality of life of surrounding communities. As documented in the Comprehensive Conservation Plan (CCP) and supported by recent Conservation Design (CD) analyses, National Wildlife Refuges function as important economic engines in rural areas by attracting visitors, sustaining local recreational spending, and reinforcing the cultural and natural-resource identity of the region.

Santee National Wildlife Refuge provides diverse opportunities for wildlife-dependent recreation including wildlife observation, photography, hunting, fishing, environmental education, and interpretation which together contribute to a steady stream of regional visitation. These activities support local businesses such as lodging, food services, gas stations, outdoor outfitters, and guide services. The refuge also enhances the overall quality of life for residents by protecting scenic open space, preserving ecosystem services, and offering accessible public lands for outdoor recreation, which is an increasingly important driver of community well-being.

The refuge's ecological health, maintained through the CCP and refined in the SHSMP, supports the region's recreational appeal by protecting wetland, forest, and open-water habitats that attract birdwatchers, anglers, photographers, and hunters. As a result, the refuge plays an essential role in sustaining both the economic base and cultural traditions of the surrounding rural communities.

Outdoor recreation including the Service's "Big Six" wildlife-dependent activities of hunting, fishing, wildlife observation, photography, environmental education, and interpretation forms a major economic pillar in South Carolina. These activities generate substantial spending on travel, equipment, lodging, fuel, and recreational supplies, directly supporting rural economies and indirectly reinforcing conservation funding at the state and national level.

National Wildlife Refuges, including Santee NWR, draw visitors from across the Southeast and abroad due to the area's high biodiversity, iconic birdwatching opportunities, and abundant public-land access. Rural recreation counties dependent on outdoor recreation consistently demonstrate higher-than-average economic growth rates, and public lands such as Santee NWR help anchor this growth. The refuge also improves regional quality of life by providing clean water, aesthetic landscapes, climate resilience, and accessible recreation on public lands, elements increasingly recognized as essential to social well-being and local workforce retention

Economic Effects and Effects on the Quality of Life of the American People: Environmental Consequences

Alternative A

Under Alternative A, current land management and visitor-use levels described in the CCP will continue without modification. Because no changes will occur in available public uses, habitat quality, or access opportunities, economic contributions associated with refuge visitation will remain similar to existing levels. Local spending on food, fuel, lodging, and recreation equipment will continue at present rates, with no anticipated increase or decrease tied to refuge operations.

Quality-of-life benefits associated with open-space preservation, outdoor recreation access, and cultural heritage activities will also remain unchanged. Therefore, Alternative A will result in no additional economic impacts and no change to the quality of life of the American people beyond those currently provided.

Alternative B

Under Alternative B, implementation of habitat improvement actions and strategic forest and wetland management outlined in the SHSMP is expected to enhance wildlife-dependent recreation opportunities, particularly wildlife observation, photography, and potentially expanded hunting access. Incremental increases in visitation are anticipated as habitat conditions improve, bird and wildlife viewing opportunities expand, and communication and outreach efforts increase public awareness of refuge offerings.

These increases, though modest, are expected to enhance local economic activity through additional spending in nearby rural communities including small businesses, lodging providers, gas stations, and sporting-goods retailers. Even minor increases in visitation can generate meaningful cumulative economic benefits over time, particularly in rural areas where outdoor recreation serves as a cornerstone of community identity and economic stability.

In addition, the Selected Action supports improved quality of life by maintaining healthy ecosystems, improving scenic and wildlife-viewing conditions, offering expanded educational and recreational opportunities, and reinforcing traditional outdoor uses valued by local residents. Although Alternative B is not expected to produce large or sudden economic impacts, it is fully consistent with Service-wide objectives to expand nature-based recreation, support rural economies, and strengthen the long-term social value of public lands.

4.4 Refuge Resources

Management and Operations: Affected Environment

The Refuge Manager, Wildlife Biologist and Equipment Operator all assist with various aspects of the administration of the Land Management programs. Funds are available to meet the

conditions set forth in the Refuge Recreation Act from operating funds. It is anticipated that funding and staffing will continue to be sufficient to maintain the program in the future. If staffing levels are reduced further, the administration of the existing program will be re-evaluated and changes implemented.

Refuge officers primarily carry out the enforcement of refuge regulations. Occasionally officers from nearby Refuges are called to assist. USFWS officers provide for visitor safety and compliance and Service officers work closely with State enforcement officers to ensure compliance with Refuge and State regulations and to address any conflicts with adjoining landowners.

Management and Operations: Environmental Consequences

Alternative A

No additional increase in costs for administration, law enforcement, biological monitoring, or annual maintenance is anticipated for Alternative A.

Alternative B

The refuge manager, in consultation with the regional forester and relevant staff, will develop silvicultural prescriptions and oversee all forest-related activities on the refuge. The costs associated with commercial forest management will vary depending on the scope, goals, and objectives of the operation. With existing staff capacity, periodic and small-scale timber harvests can be administered properly and safely, and in a manner that does not materially interfere with or detract from achieving the refuge's purposes or the mission of the National Wildlife Refuge System. Most forest management activities will be conducted using contract labor or through timber sales to forest products companies that employ or subcontract professional logging crews, reducing the need for specialized equipment or refuge-owned infrastructure.

An initial investment of approximately \$14,000 will be required to complete the forest management plan and to develop signage and informational brochures prior to implementing on-the-ground forest management actions. Following plan development, the average annual cost to support forest management activities at Santee NWR is estimated at \$6,500. These recurring costs include posting required signage and administering and overseeing contractual work. Revenue generated through permit fees or timber sale receipts will not offset management expenses, as such funds are deposited into general accounts rather than being returned to the refuge for local use.

Visitor Use and Experience: Affected Environment

The Refuge is open to all six-priority wildlife dependent public uses; hunting, fishing, wildlife observation, photography, environmental education and interpretation. With the 605 units of

the National Wildlife Refuge System (NWRS), the U.S. Fish and Wildlife Service (USFWS) manages public lands in all 50 states and 5 U.S. territories and within an hour's drive of 100 major cities. This varied and abundant network of public lands and waters generates many individual and societal benefits. These include, but are not limited to, fish and wildlife conservation, open space, science and education, water quality improvement and flood resilience. The thriving fish and wildlife populations of the Refuge System also attract millions of recreational users. Some visitors take part in heritage sports such as hunting and fishing (consumptive). Others enjoy hiking, paddling, wildlife viewing or nature photography (non-consumptive). This report focuses on economic contributions associated with recreational visitation. As a result, these are conservative estimates and do not represent the refuge's total social and environmental contributions.

This report examines the local economic contributions of recreational visits to 162 national wildlife refuges in 47 states and 1 territory for the fiscal year (FY) 2017 (October 1, 2016 - September 30, 2017). Furthermore, this report utilizes the individual refuge results to estimate the local economic contributions of the entire Refuge System. Findings of this study include: For FY 2017, the National Wildlife Refuge System estimated 53.6 million visitors to national wildlife refuges. Trip-related spending by recreational visits generated \$3.2 billion of economic output in local economies. As this spending flowed through the economy, it supported over 41,000 jobs and generated about \$1.1 billion in employment income. About 86 percent of total recreation-related expenditures are generated by non-consumptive activities on refuges. Fishing accounted for 10 percent and hunting 4 percent of expenditures. On average, local visitors accounted for 17 percent of expenditures while visitors traveling more than 50 miles accounted for 83 percent of expenditures. Refuge recreational spending generated about \$229 million in tax revenue at the local, county, and state.

Visitor Use and Experience: Environmental Consequences

Alternative A

Under this alternative, current Refuge visitor use opportunities will continue across the Refuge. Status quo. The Refuge will continue historical land management activities and to serve as habitat for fish and wildlife, as well as provide outdoor recreational opportunities for all six-priority wildlife dependent public uses; hunting, fishing, wildlife observation, photography, environmental education and interpretation.

Alternative B

All other public uses on the Refuge will not change and will continue to be managed as described in current plans. Overall, land management impacts to visitor services or other recreation opportunities are considered short-term, minor, and local since other parts of the Refuge are available for use. Impacts between land management activities and visitors are

anticipated to be similar to the impacts between other user groups (eg. hikers and photographers) and will be negligible. The Refuge could employ time and space zoning measures to separate and reduce the likelihood of conflict. The noise associated with tree harvesting could disturb visitors and impact their safety. To ensure visitor safety, areas of the refuge where tree harvesting occurs may be temporarily closed. Signage will be utilized to inform visitors of land management activities as appropriate and necessary.

4.5 Minimization Measures to Avoid Negative Impacts

Continuing to employ appropriate BMPs, the Selected Action Alternative will refine and update current refuge management activities to respond to changing conditions in the landscape, enhance refuge habitat and species management activities, and serve refuge purposes and goals.

The Service, and other partners will continue to coordinate to minimize impacts to the refuge, including minimizing access to pertinent management and monitoring activities to times when impacts will be minimized and restricting public access.

Before conducting forest management projects such as thinning operations or applying prescribed fire, a site-specific prescription will be developed in accordance with the PBO for Bats (USFWS 2024). The management prescription will minimally identify the refuge's resources of concern and any management constraints (e.g., cultural resources, ESA), describe the forest's current condition, outline the forest's desired future condition, and identify the processes and treatment(s) required to shift toward desired conditions. Additionally, a Section 106 (cultural resources review) and Section 7 (ESA intra-service consultation and use of USFWS 2024) will be completed before the prescription is approved for implementation. Finally, as applicable (e.g., for a Service contractor conducting forest thinning for the refuge), a Service Special Use Permit will outline necessary stipulations required for the activity to remain compatible and meet refuge objectives. The Refuge Manager will ensure project implementation that specifically supports refuge plans and compliance documents (e.g., CCP, SHSP, Fire Management Plan, Cooperative Agriculture Agreement, Forest Management Prescription, and Compatibility Determination), meets applicable laws and policies, and includes appropriate conservation measures and BMPs.

Should previously unrecorded cultural resources or human remains be discovered on refuge land, activities will be halted and the Regional Archaeologist and Refuge Manager contacted at once.

Monitoring

The Service will continue to work with partners, to monitor resources of management concern. The Selected Action will apply adaptive management, specific survey, inventory, and

monitoring protocols as necessary. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. If monitoring and evaluation indicate undesirable effects for target, non-target species, and/or communities, then adaptations to the management strategies will be made.

4.6 Reasonably Foreseeable Effects: Affected Environment

The terminology “reasonably foreseeable effects” is used throughout this EA and refers to effects that are sufficiently likely to occur and that encompass both the direct and indirect effects of the action as well as effects of the action when combined with other potential past, present, and future effects." For an EA, the reasonably foreseeable effects analysis is done only to a sufficient level to allow the decision-maker to make a determination of significance for the selected action, as stated in the Service Manual (550 FW 1).

Under both the No Action and Action Alternatives, the refuge will continue to experience reasonably foreseeable external pressures such as regional development, landscape fragmentation, altered hydrology, and climate-driven changes. The way each alternative positions the refuge’s forests and wildlife to cope with those pressures differs substantially.

Under the No Action Alternative, forest stands will continue aging without density reduction or structural restoration. Over time, overstories will close further, understory conditions will degrade, and mixed pine-hardwood habitats will drift farther from desired ecological conditions needed to support refuge priority species. Without periodic thinning or regeneration harvests, the refuge’s ability to mimic natural disturbance regimes will decline, resulting in reduced wildlife habitat quality and lower ecological resistance to storm events, drought, and pest/disease outbreaks; pressures that are reasonably foreseeable and likely to intensify.

Heavy canopy closure could also decrease understory light availability, slowing natural regeneration and reducing long-term resilience of key habitat types, particularly longleaf pine and mixed hardwood-pine systems. Changes to microhabitats, reductions in coarse woody debris quality, and slower recruitment of high-value habitat structures will diminish the refuge’s ability to support amphibians, invertebrates, and species reliant on a mosaic of successional stages.

The No Action Alternative will also provide less protection to aquatic resources. Without targeted thinning and BMP-directed operational restrictions, unmanaged aging stands may become increasingly susceptible to windthrow and storm damage, leading to pulses of sediment, woody debris, and nutrient loading into streams during extreme events, which are expected to occur more frequently under climate-driven conditions. The refuge’s ability to buffer watershed impacts from surrounding land-use growth will therefore be reduced. In contrast, the No Action Alternative allows known and likely pressures such as climate change,

adjacent development, and hydrological alteration to degrade forest health, wildlife habitat quality, and overall adaptive capacity over time.

Under the Action Alternative, continued commercial forest management using selective thinning, shelterwood, and seed tree harvests will actively shift forest structure toward desired future conditions described in the SHMP, including conversion of loblolly pine to longleaf pine and improved mixed hardwood-pine structure.

Managed disturbance will maintain canopy openings, promote understory regeneration, and mimic natural processes such as fire, allowing habitats to retain greater structural diversity and ecological function even as climate conditions shift.

These conditions increase resilience to storm damage, drought, disease outbreaks, and invasive species spread by reducing stand density, improving light penetration, and maintaining spatial heterogeneity. The Action Alternative also reduces the likelihood that aging, overstocked stands become more vulnerable to windthrow, pest outbreaks, or catastrophic habitat loss during extreme weather events, which are reasonably foreseeable under changing climate conditions.

Wildlife dependent on early-successional or structurally diverse forest such as Neotropical songbirds, painted bunting, and species that benefit from increased understory productivity will retain or improve habitat suitability under this alternative. Managed thinning also improves conditions for bat species by retaining snags and cavity trees while reducing clutter and increasing foraging space, improving their ability to persist despite projected environmental shifts.

Aquatic systems, which are susceptible to nutrient pulses, sedimentation, and thermal changes, remain better protected under a BMP-guided harvest regime that maintains forested buffers, limits soil disturbance, and reduces hydrological impacts in a future where nutrient loading and altered streamflow may increase due to regional development patterns.

Overall, the Action Alternative positions the refuge to better maintain species and habitat resilience under reasonably foreseeable environmental change by proactively shaping forest structure, maintaining disturbance-dependent habitat conditions, and reducing vulnerabilities associated with unmanaged stand maturation.

The activities selected are standard refuge management practices supported by BMPs and the Programmatic Biological Opinion (PBO) for bats. Effects are well-understood and not characterized by substantial scientific controversy or uncertainty. The Selected Action incorporates avoidance and minimization measures identified through Section 7 consultation

and the PBO and effects on listed species are expected to remain minimal and within previously evaluated thresholds. Cumulative effects when considered with past, present, and reasonably foreseeable future actions, are expected to remain minor, localized, and not cumulatively significant.

4.7 Summary of Analysis

Alternative A – Continue Current Management – No Action Alternative

As described above, land management on the Refuge will be maintained at current levels with no significant changes. Under Alternative A, impacts to threatened and endangered species and other special status species are expected to continue to be negligible to minor beneficial. Impacts to habitat and vegetation under Alternative A are expected to be minor adverse to minor beneficial. Minor beneficial impacts are expected for hydrology. No impacts are anticipated for geology. Negligible to minor effects are expected to soils and soil formation processes with continued farming activities. Negligible to minor adverse impacts are anticipated for water quality, and negligible impacts are anticipated for air quality. No impacts are anticipated for land use on and around the refuge. Refuge management activities will remain substantially similar to past management. There is not likely to be an adverse effect on endangered or threatened species.

Alternative B – Implement the 2026 Santee NWR Spatial Habitat and Species Management Plan – Preferred Alternative

Alternative B implements the Spatial Habitat and Species Plan (Selected Action) which steps down and provides specifics to several of the identified goals and objectives outlined in the CCP without changing the original intent. The focus under this alternative will be to manage, maintain, restore, and protect the refuge's habitats and wildlife species.

While minor adverse temporary impacts could be expected during habitat management and restoration activities under the Selected Action, overall, minor beneficial impacts to wildlife and aquatic species, threatened and endangered species, and other special status species are expected. Under the Selected Action, more active restoration, habitat management, and monitoring will occur. Minor beneficial impacts are expected for habitat and vegetation under Alternative B. The SHSP adds slightly increased prescribed fire acreage and periodic equipment use, resulting in minor, short-term greenhouse gas and smoke emissions. These activities remain small relative to regional emissions sources. Long-term, habitat improvements (forest health, wetland resilience, grassland restoration) enhance ecosystem resilience to climate variability. No significant climate or air-quality impacts will occur.

Comparison of Alternatives

Table 2 summarizes the level of impact for each alternative under each affected resource analyzed. The level of impacts described in the table includes a summary of the intensity of the impact. Intensity describes the severity of the impact and includes both positive and negative effects as well as the net effect. When assessing significance, both context and intensity must be considered to determine whether potential impacts are “significant” under NEPA and the level of review. Context describes the geographic, biophysical, and social setting where effects will occur and can be found in the appropriate affected resource section.

Table 2. Comparison of Alternatives of Actions

Affected Resource	Alternative A: No Action	Alternative B: 2026 Spatial Habitat and Species Management Plan (Preferred Alternative)
Habitat and Vegetation	Negative short-term localized impacts	Negative short-term localized impacts similar to Alternative A but negligible increase, albeit spread over a larger geographical area. Minor beneficial long term impacts.
Fish and Wildlife Species	Negligible short-term and localized impacts	Negligible short-term and localized impacts. Minor beneficial long term impacts.
Candidate, Threatened and Endangered Species and Critical Habitat:	Overall impacts are considered less than significant	Overall impacts are considered less than significant Minor beneficial long term impacts.
Special Species Status	Negligible overall potential impacts	Negligible overall potential impacts Minor beneficial long term impacts.
Climate Change/Air Quality	Negative short-term localized impacts	Negligible overall potential impacts Minor beneficial long term

		impacts.
Geology and Soils	Negative short-term localized impacts	Negligible overall potential impacts Minor beneficial long term impacts.
Water Resources	Negative short-term localized impacts	Negligible overall potential impacts Minor beneficial long term impacts.
Economic Effects and Effects on the Quality of Life of the American People	Positive impacts	Positive impacts
Management and Operations	Negligible overall potential impacts	Compared to alternative A, there is a slight increase in potential expenditures
Visitor Use and Experience	Negligible overall potential impacts	Compared to alternative A, there is a slight increase in visitor use, albeit spread over a larger geographical area. Minor beneficial long term impacts.

Conclusion

Based on the above analyses, the Service expects that none of the alternatives considered above will have any significant adverse or beneficial impacts on the human environment. No significant adverse or beneficial long-term or foreseeable impacts are anticipated under either of the alternatives. As outlined and analyzed above, Alternative B (Selected Action) best meets the stated purpose and need.

Chapter 5: List of Preparers and Sources

5.1 List of Preparers

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5.2 State /Federal Coordination

- South Carolina Department of Administration State Clearinghouse

5.3 Tribal Consultation

- Absentee Shawnee Tribe
- Catawba Indian Nation
- Shawnee Tribe
- Eastern Shawnee Tribe of Oklahoma

Chapter 6: Certification and Determination

The Services prepared this EA pursuant to the NEPA (42 U.S.C. 4321 et seq.), the DOI NEPA Implementing Regulations (43 CFR 46), the DOI Handbook of NEPA Implementing Procedures (516 DM 1) and other applicable Federal and state laws and regulations.

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Appendix A: Applicable Statutes and Executive Orders

This appendix provides a summary of other applicable laws, regulations, statutes, policies, executive orders and/or other rules that apply to the selected action or project and any additional steps taken by the service to comply with these laws.

The following laws, regulations, statutes, policies, executive orders and/or other rules apply to the selected action or project. A description of how compliance is being met for each applicable law or regulation is under the appropriate affected resources section.

Fish and Wildlife

- Bald and Golden Eagle Protection Act, as amended, 16 U.S.C. 668-668c, 50 CFR 22 is applicable to this project and compliance is addressed in the section on special status species.
- Endangered Species Act of 1973, as amended, 16 U.S.C. 1531-1544; 36 CFR Part 13; 50 CFR Parts 10, 17, 23, 81, 217, 222, 225, 402, and 450 is applicable to this project and compliance is addressed in the candidate, threatened and endangered species section the Refuge has documented an internal informal consultation stating the expected impacts from the proposed project to these species.
- Fish and Wildlife Coordination Act, as amended in 1964, 15 U.S.C. § 661 et seq. Requires that all federal agencies consult with NMFS, U.S. Fish and Wildlife Service, and state wildlife agencies when proposed actions might result in modification of a natural stream or body of water. Federal agencies must consider effects that these projects will have on fish and wildlife development and provide for improvement of these resources. The Fish and Wildlife Coordination Act allows these agencies to provide comments to the lead federal action agency (the Refuge) during their review of the proposed project. The Refuge has consulted and coordinated with all relevant fish and wildlife agencies to reduce adverse impacts to migratory, estuarine, and marine fisheries and their habitats. Correspondence is noted in Chapter 5, State and Federal Coordination, and any comments received and any responses made to comments, are summarized in Appendix.
- Migratory Bird Treaty Act, as amended, 16 U.S.C. 703-712; 50 CFR Parts 10, 12, 20, and 21 and Executive Order 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds, 66 Fed. Reg. 3853 (2001), Migratory Bird Conservation Act (1929), Migratory Bird Hunting and Conservation Stamp Act (1934) is applicable and is addressed in the sections on special status species and fish and wildlife species. The preferred alternative is consistent because the EA evaluates the effects of agency actions, including proposed action, on migratory birds.

Cultural and Historic Preservation

- Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, is

applicable. An invitation for the option to consult letter and provide comments on the proposed changes to the program was sent to 4 tribal government leaders who have made known that they have an interest related to cultural, and historic locations in Santee NWR. Additional details on tribal government coordination can be found in that section of the assessment.

- Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa – 470mm; 18 CFR Part 1312; 32 CFR Part 229; 36 CFR Part 296; 43 CFR Part 7, could apply if infrastructure projects supporting the use occur. Compliance with the law will be completed if and when a more detailed project location is available for a supporting use. Projects of this nature are not expected to impact the preservation of historical and archaeological data (including relics and specimens), which might otherwise be irreparably lost or destroyed.

Regulatory and Planning Framework

- National Environmental Policy Act (NEPA) as amended 42 U.S.C. § 4321 et seq. This EA was prepared pursuant to Department of Interior (DOI) regulations implementing NEPA, which requires federal agencies to assess, consider, and disclose to the public the impacts that their actions may have on the environment before taking major federal actions.
- National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, is applicable. This assessment and associated step-down plan allow for implementation of the CCP for the refuge. This assessment and plan allow for the refuge to manage wildlife, their habitat and ensure the biological integrity, diversity, and environmental health of refuge is maintained. The activity of implementing a new land management plan has a compatibility determination.
- Refuge Recreation Act of 1962, as amended, Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System, and Executive Order 13563 – Improving Regulation and Regulatory Review (2011) are applicable and evaluated through the compatibility determination associated with this full compliance package. It has preliminarily been determined to be compatible uses and not interfere with the primary purpose for which the refuge was established. Compatibility Determinations are available in Appendix.

Environmental Protection and Conservation

- Federal Noxious Weed Act of 1990 Executive Order 13112 – Invasive Species, 64 Fed. Reg. 6183 (1999), Executive Order 13751 (2016) — Safeguarding the Nation from the Impacts of Invasive Species and Executive Order 11987, Exotic Organisms, are applicable as there implementation of activities to treat invasive species and they could be transportation of invasive species from site to site by users. Staff treat for any invasive plant species through the habitat management program and promote educational campaigns to make recreational users aware of the potential to spread invasives species and is discussed in Habitat and Vegetation: Affected Environment and Environmental Consequences section.

- Lacey Act, as amended, 16 U.S.C. 3371 et seq.; 15 CFR Parts 10, 11, 12, 14, 300, and 904 is applicable as we must comply with state and federal regulations that mitigate the importation, exportation, transportation, sale or purchase of fish, wildlife or plants to participate in the activity on the refuge. Laws and regulations are enforced by refuge law enforcement and state conservation officers.

The following statutes do not apply to this project area because the nexus for protection does not occur within the project area, or the affected resource associated with the statute has been determined to not be affected or only negligibly affected by the selected action. Any resources that will not be more than negligibly impacted by the action have been dismissed from further analysis. The following statutes are not applicable:

Cultural and Historic Preservation

- American Indian Religious Freedom Act (1978) , as amended, 42 U.S.C. 1996 – 1996a; 43 CFR Part 7
- Antiquities Act of 1906, 16 U.S.C. 431-433; 43 CFR Part
- Archaeological and Historic Preservation Act (1974)
- Executive Order 11593 – Protection and Enhancement of the Cultural Environment, 36 Fed. Reg. 8921 (1971)
- Executive Order 13007 – Indian Sacred Sites, 61 Fed. Reg. 26771 (1996)
- National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470x-6; 36 CFR Parts 60, 63, 78, 79, 800, 801, and 810
- Native American Graves Protection and Repatriation Act, 1990, 25 U.S.C. 3001-3013; 43 CFR Part 10
- Paleontological Resources Protection Act (2009), 16 U.S.C. 470aaa – 470aaa-11

Environmental Protection and Conservation

- Clean Air Act, 1970, as amended, 42 U.S.C. 7401-7671q; 40 CFR Parts 23, 50, 51, 52, 58, 60, 61, 82, and 93; 48 CFR Part 23
- Federal Water Pollution Control Act of 1972 (commonly referred to as Clean Water Act), 33 U.S.C. 1251 et seq.; 33 CFR Parts 320-330; 40 CFR Parts 110, 112, 116, 117, 230-232, 323, and 328Clean Water Act (1972)
- Coastal Barrier Resources Act (1982)
- Coastal Zone Management Act of 1972, 16 U.S.C. as amended1451 et seq.; 15 CFR Parts 923, 930, 933"
- Emergency Wetlands Resources Act (1986)

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- Farmland Protection Policy Act (1981)
- Federal Cave Resources Protection Act (1988)
- Noise Control Act of 1972 42 U.S.C. § 4901 et seq
- Resource Conservation and Recovery Act (1976)
- Safe Drinking Water Act of 1974, 42 U.S.C. 300f et seq.; 40 CFR Parts 141-148
- Water Resources Planning Act (1965)
- Executive Order 11988 – Floodplain Management, 42 Fed. Reg. 26951 (1977)
- Wetlands (Executive Order 11990)

Fish and Wildlife Conservation

- Fish and Wildlife Act of 1956, 16 U.S.C. 742 a-m
- Magnuson-Stevens Fishery Conservation and Management Act (1976)
- Marine Mammal Protection Act (1972)

Public Access and Land Use

- Wild and Scenic Rivers Act, 1968, 16 U.S.C. 1271 et seq.
- Wilderness Act, 16 U.S.C. 1131 et seq.
- Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.; 33 CFR Parts 114, 115, 116, 321, 322, and 333 is not applicable as infrastructure is not being built or modified on rivers or navigable waterways.
- Americans with Disabilities Act (ADA) of 1990

Appendix B: Acronyms and Abbreviations

- **Administration Act** – National Wildlife Refuge System Administration Act of 1966
- **CCP** – Comprehensive Conservation Plan
- **Improvement Act** – National Wildlife Refuge System Improvement Act of 1977
- **CD** – Compatibility Determination
- **CFR** – Code of Federal Regulations
- **EA** – Environmental Assessment
- **ESA** – Endangered Species Act
- **FONSI** – Finding of No Significant Impacts
- **LDWF** – Louisiana Department of Wildlife and Fisheries
- **NEPA** – National Environmental Policy Act
- **NWR / Refuge** – National Wildlife Refuge
- **NWRS** – National Wildlife Refuge System
- **NWRSAA** – National Wildlife Refuge System Administration Act
- **U.S.C.** – United States Code
- **USFWS / Service** – U.S. Fish and Wildlife Service

Appendix C: Terms

Adverse Effects – Negative or detrimental impacts to a resource.

Beneficial Effects – Positive impacts to a resource.

Direct Effects – Effects caused by the action that occur at the same time and place (40 C.F.R. §1508.1[i][1]).

Indirect Effects – Effects caused by the action that occur later in time or are farther removed in distance but are still reasonably foreseeable (40 C.F.R. §1508.1[i][2]).

Irreversible Effects – Impacts that cannot be undone or altered.

Irretrievable Effects – Impacts that result in the permanent loss of resources, which cannot be regained, recovered, or repaired.

Major Effects – Impacts that are obvious and result in substantial local or broader-scale consequences to the resource.

Moderate Effects – Impacts that are readily detectable and may have temporary effects on populations or resources at a broader scale, but do not cause substantive declines or increases.

Minor Effects – Impacts that are detectable but small, with limited consequences that do not affect populations or resources on a large scale.

Negligible Effects – Impacts that are so minimal they are not detectable or observable.

No Effect – The resource is not affected by the proposed action.

Reasonably Foreseeable Effects – Effects that are sufficiently likely to occur and include both direct and indirect impacts, as well as cumulative effects from past, present, and future actions.

Short-Term Effects – Impacts occurring over a relatively brief period.

Long-Term Effects – Impacts occurring over an extended period.

Unavoidable Effects – Impacts that cannot be prevented or avoided; considered inevitable.

Santee National Wildlife Refuge Public Comment Analysis Report and Response to Comments2026 Spatial Habitat and Species Management Plan

Summary of Public Comment Period

On June 26, 2026, the Service released the draft Environmental Assessment, compatibility determinations (CDs), and Spatial Habitat and Species Management plan for public review of proposed changes to the management at Santee NWR. Santee NWR is administered as part of the Low-Country NWR Complex. These analyses were included as supporting documents in the finalization for Santee NWR's 2026 Spatial Habitat and Species Management Plan published on the refuge website on June 26, 2026 (NEPA Unique Identifier: 2024-0039049-NEPA-001).

Members of the public were notified of the availability of the draft documents through the Federal Register and information posted on the Refuge's website. This public comment period for the proposed 2026 Spatial Habitat and Species Management Plan at Santee NWR started on June 26, 2026, and was open for 30 days. The public was encouraged to submit comments regarding the draft documents directly to refuge staff via mail or email.

Nature of Public Comments Received

Only one email was received by staff from a member of the public with detailed comments on several topics relevant to the plan.

Response to Public Comments Received

As defined in the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act, comments are considered substantive if they:

- Question, with reasonable basis, the accuracy of the information in the document
- Question, with reasonable basis, the adequacy of the environmental analysis
- Present reasonable alternatives other than those presented in the environmental assessment
- Cause changes or revisions in the proposal

Substantive comments are organized by topic and further consolidated into concern statements or new information. Comments have been summarized and paraphrased.

Mapping – Need for Labeled Habitat Maps

A request for labeled maps of the habitats being managed was suggested to better associate management activities with the sites in the field.

Our Response:

We agreed and referenced the associated map sheets that were generated as part of the SHSP acknowledging that they were made publicly available on the Refuge's website along with the EA, CD, and SHSP.

Managed Wetlands and Invasive Species (Aquatic Invasive Plants & Feral Hogs)

Suggestions were made regarding potential pump filtrations and aquatic invasive plant exclusion for water delivery systems, as well as invasive species management for both aquatic invasive plants and for feral hogs.

Our Response:

The suggestion regarding methods of invasive plant exclusion for water delivery systems were noted and forwarded to refuge operations staff for consideration. We also noted that the SHSP already identifies aging infrastructure in water control systems as a constraint on effective water management and calls for a comprehensive wetland management plan to upgrade these systems. It was also noted the level of detailed information regarding invasive species management for aquatic invasive plants and for feral hogs while relevant falls outside the scope of this plan and is better suited to annual work plans for each.

Wood Duck Nest Boxes

A comment about the state of the Wood Duck Nest Box program was made concerning frequency of maintenance of the boxes.

Our Response:

The concern is relevant, as the managed wetlands section of the plan identifies Wood Ducks as a priority resource of concern and supports investment in nesting infrastructure as part of broader Wood Duck habitat management. We also identify in the plan the number of active nesting boxes currently compared to the historical high, and note the documented observations of disrepair will help inform prioritization of maintenance for implementation.

Biological Surveys and Monitoring

One comment was made about the potential for partnerships with universities and colleges for inventory and monitoring efforts.

Our Response:

The suggestion of forming partnerships with universities and colleges for inventory and monitoring efforts aligns well with the adaptive management framework described in this plan. We acknowledge in the SHSP that inventory and monitoring are essential to informed

management and reference the Santee NWR Inventory and Monitoring Plan as a companion document. The refuge and staff continue to be open to participating with other groups and specialists for monitoring needs.

Grassland Habitat and Early Successional Species

Suggestions were made on potential management activities with specific sizes, frequencies, and species for planting for grassland habitat and early successional species.

Our Response:

The suggestion of creating rotating successional plots within the managed fields to benefit Painted Buntings, Prairie Warblers, and Blue Grosbeaks is consistent with the mosaic management approach described in the Grassland Objective of this SHSP. We note that Grassland Objective covers up to 1,200 acres across the Bluff, Cuddo, and Pine Island Units, and the plan calls for interspersed shrub patches and rotational management precisely to support these species and address the conflicting habitat needs of different grassland birds. The specific proposal regarding plot size, rotation interval, and planting species will be noted for consideration against this total acreage during annual work planning.

Waterfowl Population Estimates

There was a concern regarding a figure of 60,895 ducks cited from the Managed Wetland Objective.

Our Response:

This figure represents the refuge's contribution target toward regional waterfowl energy day goals derived from Atlantic Flyway planning objectives, not necessarily a single observed count. Survey methodology and data supporting population objectives are part of the monitoring framework referenced in the SHSP and the companion Inventory and Monitoring Plan which informs the adaptive management of the refuge.

Approved Acquisition Boundary

A comment on the acquisition boundary and the impact to management capacity was made in regard to the Approved Acquisition Boundary shown in the plan's map.

Our Response:

As described in the EA, any future land acquisition is entirely contingent on willing sellers and would be subject to separate environmental review. The acquisition boundary does not represent the current property lines of the refuge. The acquisition boundary represents areas

where the Service is authorized to pursue voluntary land protection, not a commitment to assume jurisdiction over those lands or waters.

Landscape-Level Context

Many comments made were related to species and habitat.

Our Response:

Several of the comments related to species and habitat were combined and addressed in a landscape-level context. Several of the species and habitats noted in the comments; painted buntings, grassland birds, and wetland-dependent waterfowl, are identified as regionally significant in the Southeast Conservation Blueprint (2025). This blueprint prioritizes 100 percent of the Santee NWR boundary for shared conservation action and identifies over 500 acres of the refuge as having the highest grassland/savanna restoration potential in the region. This landscape-level prioritization reinforces the SHSP's emphasis on these resources and provides additional context for the value of the strategies that were recommended.

The following comments, while detailed, valid, and appreciated, fall outside the scope of the SHSP and have been directed to refuge management through appropriate channels: law enforcement staffing and access violations, community engagement, contractor/volunteer conduct, boardwalk and infrastructure maintenance schedules, nest box relocation, and the abandoned sailboat reported in July.

After reviewing, no changes were made to the Spatial Habitat and Species management plan for Santee NWR as a result of these comments.