

UNITED STATES FISH AND WILDLIFE SERVICE

ENVIRONMENTAL ACTION STATEMENT

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the proposed Hunting Plan for Waccamaw National Wildlife Refuge in Horry, Georgetown and Marion County, South Carolina:

Check One:

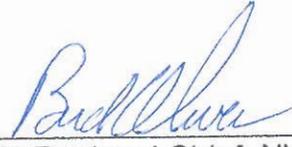
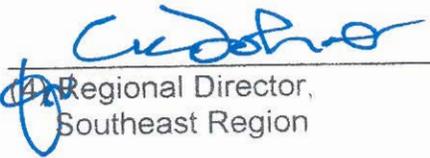
- _____ is a categorical exclusion as provided by 516 DM 2, Appendix 1 and 516 DM 6, Appendix 1, Section 1.4 A (4). No further NEPA documentation will therefore be made.
- X _____ is found not to have significant environmental effects as determined by the attached Environmental Assessment and Finding of No Significant Impact.
- _____ is found to have significant effects and, therefore, further consideration of this action will require a notice of intent to be published in the Federal Register announcing the decision to prepare an EIS.
- _____ is not approved because of unacceptable environmental damage, or violation of Fish and Wildlife Service mandates, policy, regulations, or procedures.
- _____ is an emergency action within the context of 40 CFR 1 506.1 1. Only those actions necessary to control the immediate impacts of the emergency will be taken. Other related actions remain subject to NEPA review.

Other Supporting Documents:

Endangered Species Act, Section 7 Consultation, 2007
Compatibility Determination, 2003

Signature Approval:

	04-09-07		04/19/07
(1) Originator	Date	(2) Regional Environmental Coordinator	Date

	4/19/2007		4/24/07
(3) Regional Chief, NWRS, Southeast Region	Date	(4) Regional Director, Southeast Region	Date

Recreational Hunting
Decision Document Package
for
WACCAMAW NWR

Contents

2. EA

Environmental Assessment

2007 Recreational Hunt Plan

on

WACCAMAW NATIONAL WILDLIFE REFUGE
Horry and Georgetown Counties, South Carolina

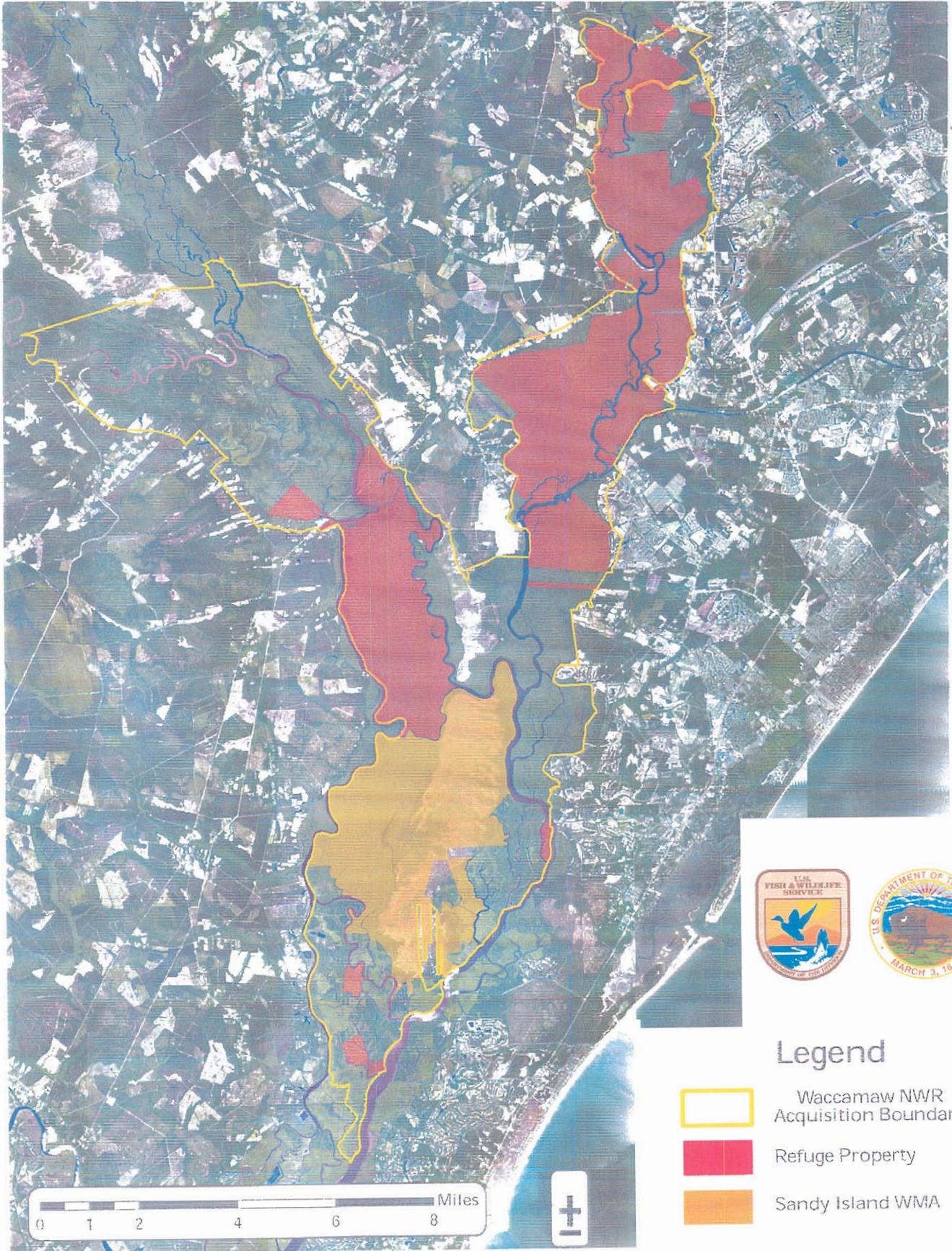
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Prepared by:
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Georgetown, South Carolina
April 2007

TABLE OF CONTENTS

Chapter 1	PURPOSE AND NEED FOR ACTION	5
Chapter 2	ALTERNATIVES INCLUDING THE PROPOSED ACTION	5
Chapter 3	AFFECTED ENVIRONMENT	7
Chapter 4	ENVIRONMENTAL CONSEQUENCES.....	21
Chapter 5	CONSULTATION AND COORDINATION WITH OTHERS	40
Appendix	LITERATURE REFERENCES.....	41
Appendix	RESPONSE TO PUBLIC COMMENTS.....	44

Waccamaw National Wildlife Refuge

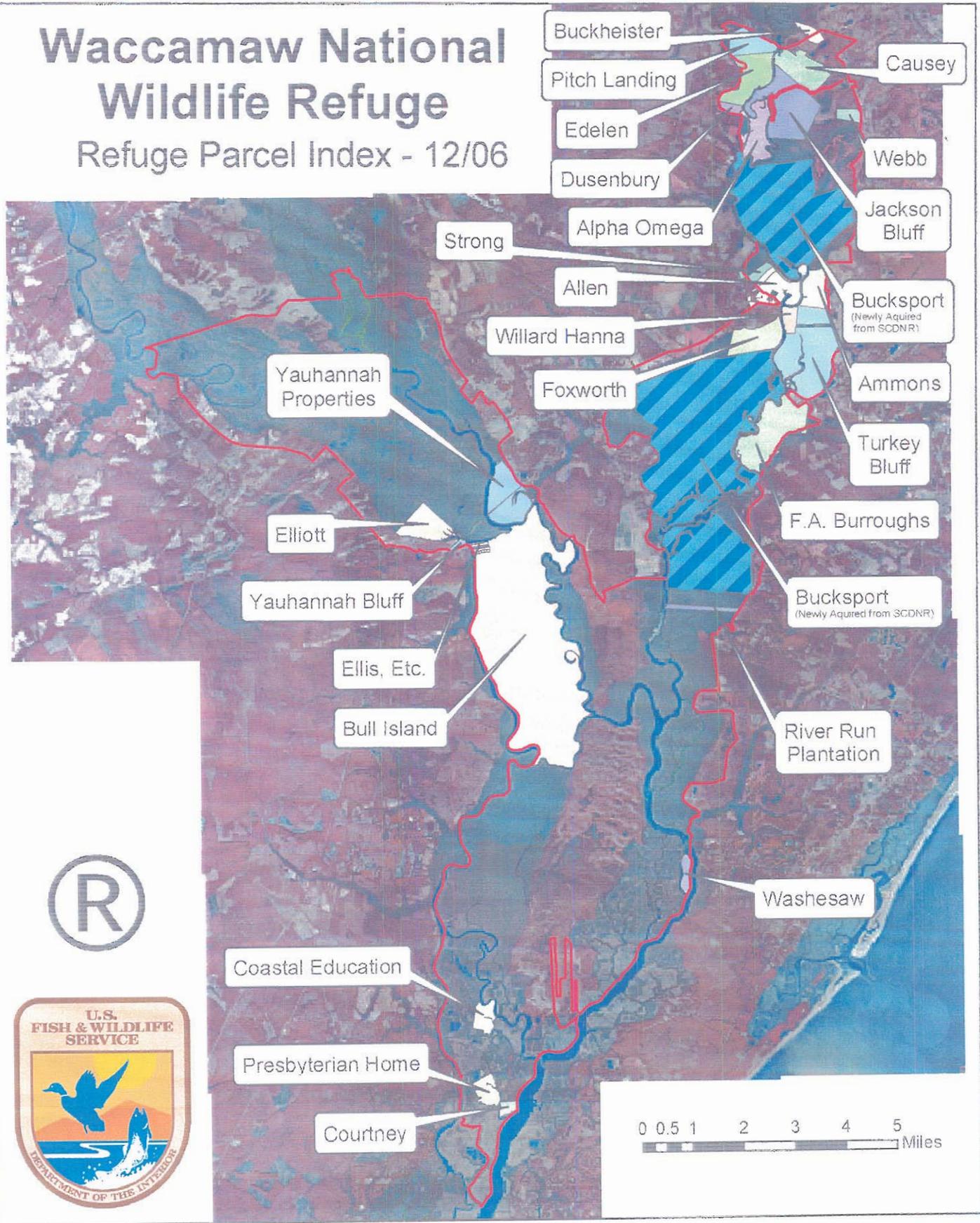


Legend

-  Waccamaw NWR Acquisition Boundary
-  Refuge Property
-  Sandy Island WMA

Waccamaw National Wildlife Refuge

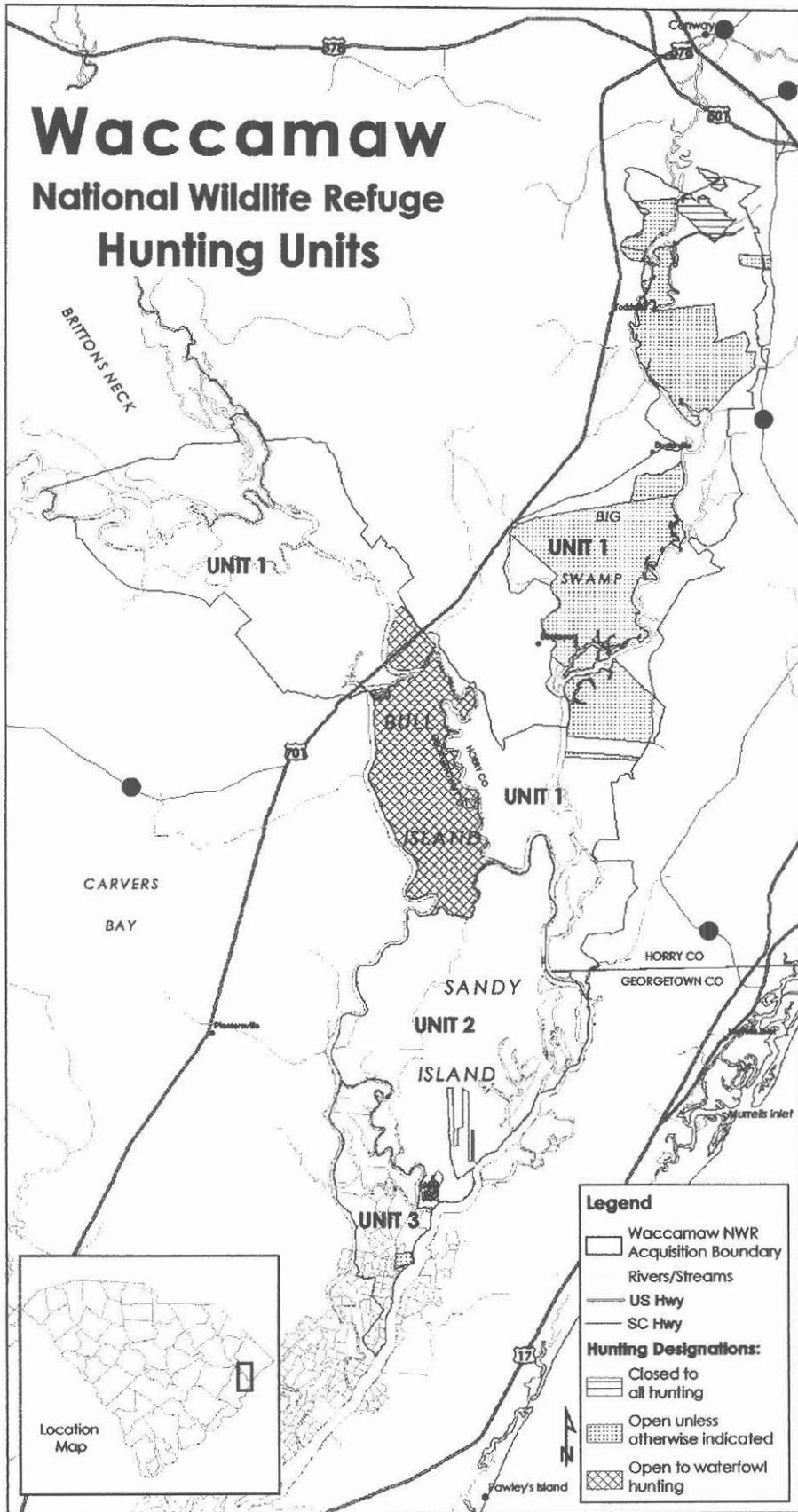
Refuge Parcel Index - 12/06



Waccamaw

National Wildlife Refuge

Hunting Units



Legend

- Waccamaw NWR
- Acquisition Boundary
- Rivers/Streams
- US Hwy
- SC Hwy

Hunting Designations:

- Closed to all hunting
- Open unless otherwise indicated
- Open to waterfowl hunting



Chapter 1 Purpose and Need for Action

The federally legislated purposes for which Waccamaw National Wildlife Refuge (NWR) was established are “(1) protect and manage diverse habitat components within and important coastal river ecosystem for the benefit of endangered and threatened species, freshwater and anadromous fish, migratory birds, and forest wildlife ,including a wide array of plants and animals associated with bottomland hardwood habitats; and (2) provide compatible wildlife-dependent recreational activities including hunting, fishing, wildlife observation, photography, and environmental education and interpretation for the enjoyment of present and future generations.”

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.) provides authority for the Service to manage the Refuge and its wildlife populations. In addition it declares that compatible wildlife-dependent public uses are legitimate and appropriate uses of the Refuge System that are to receive priority consideration in planning and management. There are six wildlife-dependent public uses: hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation. It directs managers to increase recreational opportunities including hunting on National Wildlife Refuges when compatible with the purposes for which the Refuge was established and the mission of the National Wildlife Refuge System.

The purpose of this Environmental Assessment is to evaluate the feasibility of opening Waccamaw National Wildlife Refuge to hunting on lands which were opened to hunting in 2003 through a Refuge hunt plan (see attached 2007 Refuge Hunt Plan). In response to a 2003 lawsuit filed by the Fund for Animals, the U.S. Fish and Wildlife Service (Service) will amend or rewrite environmental assessments that describe hunting programs at twenty-three national wildlife Refuges located in the Southeast Region. The new environmental assessments will address the cumulative impacts of hunting at all Refuges which were named in or otherwise affected by the lawsuit. This document addresses the hunting programs at Waccamaw National Wildlife Refuge in Horry and Georgetown Counties, South Carolina.

The proposed action is needed to implement the 2007 Recreational Hunting Plan for Waccamaw NWR which would provide the public with a high quality recreational experience and provide the Refuge with a wildlife management tool to promote the biological integrity of the Refuge.

Chapter 2 Alternatives Including the Proposed Action

This chapter discusses the alternatives considered for hunting on Waccamaw National Wildlife Refuge. These alternatives are the 1) no action which continues with current management of the hunt program and 2) proposed action which implements the Refuge’s 2007 Recreational Hunting Management Plan.

2.1 No Action Alternative:

The Council on Environmental Quality's regulations for implementing the National Environmental Policy Act requires all environmental assessments to include the alternative of taking no action. Under this alternative, the Service would not open Refuge owned lands to any form of hunting. Under this alternative, the lease agreement between the South Carolina Department of Natural Resources for the 7661 acre Bucksport WMA would be terminated due to lease terms mandating that no net loss of hunting opportunities occur if these lands become part of the Waccamaw NWR.

This action would also result in the loss of a compatible public recreational opportunity and consequently one of the Refuge's primary purposes for which it was established would be greatly diminished.

2.2 Limited Hunting (Proposed Action): 2007 Recreational Hunting Plan for Waccamaw NWR

The proposed action will allow limited public hunting for migratory game birds and resident game species on 17,889 acres of Waccamaw NWR with minimal, to no disturbance to the federally listed species present. The Refuge hunting season framework will be consistent with all State statutes as determined by the South Carolina Department of Natural Resources within the applicable Game Zones and further regulated by Refuge regulations according to U.S. Fish and Wildlife Service policy. Refuge management goals and objectives may require occasional modifications to the hunting program as harvest data, public use pressure, and Refuge programs are developed. Use of quota hunt for special management purposes may be necessary to meet Refuge specific objectives. All or parts of the refuge may be closed to hunting at any time if necessary for public safety, to provide wildlife sanctuary, or for administrative reasons.

Refer to 2007 Recreational Hunting Plan for Waccamaw NWR for specific regulations.

2.3 Unlimited Hunting

This action would allow unrestricted hunting during the entire length of the state hunting season on 17,889 acres of Waccamaw NWR. Due to the length of some state seasons (up to five months for deer), this action would conflict with other Refuge objectives such as waterfowl and endangered species management and other public use programs.

Chapter 3 Affected Environment

The Waccamaw National Wildlife Refuge was established in December 1997 to provide and protect habitats for a natural diversity of wetland dependent wildlife associated with the Waccamaw and the Great and Little Pee Dee River flood plain basins. Located in portions of Horry, Georgetown, and Marion Counties, Waccamaw NWR's acquisition boundary spans over 55,000 acres and includes large sections of the Waccamaw and Great Pee Dee Rivers and a small section of the Little Pee Dee River. The Refuge area was first identified in the early 1980s as containing critically an important migratory bird habitat that should be preserved. It was included in the U.S. Fish and Wildlife Service's (Service) Atlantic -Eastern Gulf Coast Migratory Bird Preservation Plan (USFWS 1982) and the Preservation of Black Duck Wintering Habitat Plan (USFWS 1985a). In addition, the Refuge area was identified as one of the top priorities for protection in the Service's Southeast Regional Wetlands Concept Plan (USFWS 1992a), which was prepared as part of the National Wetlands Priority Conservation Plan that was developed at the request of congress in the emergency Wetlands Resources Act of 1986. The Refuge area is also located in heart of the Winyah Bay Focus Area, an important conservation priority of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan. The Winyah Bay Focus Area encompasses 525,000 acres in the lower drainage of the Black, Great and Little Pee Dee, Sampit, and Waccamaw Rivers and has gained national attention for the conservation partnerships which have afforded permanent protection on more than 65,000 acres within the focus area.

The wetland diversity of this Refuge is what sets it apart from most others found along the east coast. Wetland habitats range from historic, tidal ricefields, to black water and alluvial flood plain forested wetlands of the Waccamaw and Great Pee Dee Rivers. These tidal freshwater wetlands are some of the most diverse freshwater wetland systems found in North America and they offer many important habitats for migratory birds, fish and resident wildlife. Avian species such as the swallow-tailed kite, osprey, white ibis, prothonotary warbler, and many species of waterfowl can be observed on a seasonal basis. Additionally, the diversity of these wetland habitats provide important habitats for numerous species of large and small mammals, reptiles and fish species.

The approved acquisition boundary is divided into three management units. Each unit is defined by a dominant habitat type and consequently may require unit-specific management goals and objectives. Unit 1 is approximately 34,800 acres and is made up entirely of alluvial and black water floodplain forested wetlands. Unit 2 is 9,144 acres and is made of approximately 6,166 acres of upland longleaf pine forest, located on Sandy Island, and the remaining acreage being made up primarily of tidal forested and emergent wetlands. Unit 3 is 9,144 acres and is made up of historic tidal ricefields many of which remain intact and are managed today for wintering waterfowl.

The US Fish and Wildlife Service is actively acquiring lands within this acquisition boundary from willing sellers and presently Refuge lands purchased total 10,590 acres. Funding and authorization for Refuge land acquisition was provided through the Land

and Water Conservation Fund Act of 1965. An additional 7,661 acres is leased from the South Carolina Department of Natural Resources (formerly Bucksport WMA) bringing the total acreage of lands administered by Waccamaw NWR to 18,256 acres. One of the primary objectives for this lease agreement was to promote more consistency of regulations between the Refuge and Bucksport WMA particularly as they relate to non consumptive public uses such as camping, fires, and night use(s), none of which the Refuge permits. One principal requirement of the lease was that the Refuge maintain the same level of hunting as was permitted by SCDNR as part of Bucksport WMA. Because the Refuge has a more restrictive policy on the hunting of migratory birds a compromise was reached by allowing more hunting opportunities for species such as feral hogs.

3.1 Physical Environment

Wetlands dominate the landscape of the Refuge Acquisition Boundary. Within the 54,490 acre acquisition boundary, nearly 84 percent (46,196 acres) are wetland habitats, broken down as follows: managed wetlands, 629 acres; freshwater marsh, 2,923 acres; and wetland forest, 46,644 acres. The remaining lands (8,226 acres, or 15 percent of the acquisition boundary) are classified as upland forests.

Geographically, the Refuge is situated in a coastal zone within the primary floodplains of the Great Pee Dee and Waccamaw Rivers in Georgetown, Horry, and Marion Counties, South Carolina. The southern portion of the Refuge consists of emergent tidal wetlands. The central and northern portions are mostly hardwood-forested wetlands. Elevations range from near sea level to 76 feet above mean sea level, the highest point in Georgetown County located on Sandy Island.

Three major rivers--the Waccamaw, Great Pee Dee, and Little Pee Dee--are the major sources of freshwater inflow to the Refuge acquisition boundary. The varied origins of these rivers and their different paths to the coast result in each having its own pattern of seasonal water flow and chemistry that interact with the physical and geological features of the landscape.

Two of the rivers, the Waccamaw and Little Pee Dee, are classified as blackwater rivers. They are termed "blackwater" because of the tea-colored water, the result of tannin leached from vegetation within the extensive bottomland hardwood wetlands adjoining the rivers. Blackwater rivers originate in the Coastal Plain, are typically acidic, low in suspended sediments, and support a diversity of native animal species. In contrast, alluvial rivers, like the Great Pee Dee, originate in the Piedmont and carry high sediment loads. Within the study area, these rivers and their tributaries combine to form an incredibly diverse wetland landscape that supports many species of plant and animal life.

The Great Pee Dee River Basin originates in North Carolina and covers 2,350 square miles through its course in South Carolina, draining 7.6 percent of the state's land area (Beasley et al. 1988). Within South Carolina, the basin consists of five sub-basins or watersheds bounded by its principal rivers: the Black, Lynches, Great Pee Dee, Little Pee

Dee, and Waccamaw. The Lynches River sub-basin traverses both the Piedmont and Atlantic Coastal Plain provinces; the Great Pee Dee River sub-basin is located almost entirely within the Atlantic Coastal Plain, with its northwestern tip extending into the North Carolina Piedmont; and the Waccamaw, Little Pee Dee, and Black River sub-basins lie entirely within the Atlantic Coastal Plain.

The Refuge acquisition boundary encompasses portions of the Great Pee Dee, Little Pee Dee, and Waccamaw River sub-basins. The Little Pee Dee flows into the Great Pee Dee just inside the northern acquisition boundary; the Lynches River flows into the Great Pee Dee approximately 27 river miles above the northern Refuge acquisition boundary; and the Waccamaw River flows through the Refuge acquisition boundary. Flow data for the rivers within the study area are not available; however, U.S. Geological Survey (USGS) discharge monitoring stations are located on each of the rivers upstream of the area.

USGS water discharge records are available for the Great Pee Dee River near the town of Pee Dee in Marion County; the Lynches River at Effingham in Florence County; the Little Pee Dee River at Galivants Ferry at the Marion-Horry County Line; and the Waccamaw River near Longs in Horry County (U.S. Geological Survey 1995). Approximate drainage areas, periods of record (POR), 1993 and 1994 annual mean flows, and POR annual mean flows for each of these stations are shown in Table 1 (all flow data are given in cubic feet per second--cfs).

Table 1. Water discharge rates for the Great Pee Dee, Lynches, Little Pee Dee, and Waccamaw Rivers.

River	Drainage Area (mi ²)*	Period of Record (POR)	1993/1994 Annual Mean Flows (cfs)	POR Annual Mean Flows (cfs)
Gr. Pee Dee	8,830	1938 – 1994	12,630/10,260	9,957
Lynches	1,030	1929 – 1994	1,183/888	1,044
Little Pee Dee	2,790	1942 – 1994	2,904/2,715	3,096
Waccamaw	1,110	1950 – 1994	1,225/664	1,191

*Includes drainage area located in North Carolina.

The flows of each river fluctuate considerably from month to month and year to year. However, long-term discharge records show consistent seasonal flow patterns for all of them. The lowest average flows typically occur from September through November, with the highest flows occurring from February through April. Overbank flooding is common during the high flow periods. The highest and lowest annual mean and monthly mean discharges of the Great Pee Dee, Lynches, Little Pee Dee, and Waccamaw Rivers (based on the periods of record from the recording stations given above) are shown in Table 3 (all values are given in cubic feet per second--cfs).

Table 2. Highest and lowest annual mean and monthly mean discharges of the Great Pee Dee, Lynches, Little Pee Dee, and Waccamaw Rivers.

River	Highest Annual Mean Flow (Year)	Lowest Annual Mean Flow (Year)	Highest Monthly Mean Flow (Month)	Lowest Monthly Mean Flow (Month)
Gr. Pee Dee	16,470 (1960)	5,392 (1981)	17,800 (March)	6,576 (Sept.)
Lynches	1,823 (1960)	451 (1934)	1,952 (March)	*597 (June)
Little Pee Dee	5,947 (1965)	1,371 (1951)	5,856 (March)	1,780 (Nov.)
Waccamaw	2,418 (1960)	439 (1952)	2,556 (March)	525 (Nov.)

*Not significantly different than the September, October, and November flows of 684 cfs, 685 cfs, and 689 cfs, respectively.

The water regimes throughout the Refuge acquisition boundary depend on a complex of closely integrated and dynamic variables. These variables include daily tidal fluctuations, as well as periodic flooding related to the seasonal high volume flows of the Great and Little Pee Dee and Waccamaw Rivers. Depending on the site, the mean high tides can fluctuate as much as two feet. The effects of seasonal flooding may be more or less dramatic. On the lower end of the Refuge acquisition boundary, a deltaic fan accommodates high volume flows; whereas the upper reaches of the floodplain are less extensive and experience prolonged flooding during high flows. These distinguishing features have separate ecologically significant functions that contribute to the diversity of wetland habitats on the Refuge. Other notable factors that influence the area's hydrology include varying states of dike disrepair, bed elevations, and channelization; varying stages of successional encroachment by aquatic plants; the presence or lack thereof of spoil disposal sites; past and present forestry and agricultural practices; alterations in runoff caused by man-made developments; and natural phenomena such as hurricanes, tropical storms, and heavy rains.

Climate within the Refuge acquisition boundary is influenced by the coastal waters of the Atlantic Ocean. At Georgetown, the average winter temperature is 47 degrees Fahrenheit, with an average daily minimum of 38 degrees. In summer, the average temperature is 81 and the average daily maximum is 90 (National Climatic Center, Asheville, N.C., personal communication).

The total average annual precipitation is 53 inches. Of this, 60 percent usually falls in April through September, which includes the growing season for most crops. Thunderstorms occur on about 50 days each year, and most occur in summer.

Snowfall is rare. In 90 percent of the winters, there is no measurable snowfall. In 10 percent, the snowfall, usually of short duration, is little more than a trace. The heaviest 1-day snowfall on record in the area was more than 11 inches.

The average relative humidity in mid-afternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 70 percent of the time in summer and 60 percent in winter. The prevailing wind is from the south-southwest. Average wind speed is highest, 10 miles per hour, in spring. The project area is subject to the effects of tropical storms and hurricanes from June through September.

3.2 Vegetation

The Waccamaw NWR acquisition boundary is divided into three management units. Each unit is defined by a dominant habitat type and consequently may require unit-specific management goals and objectives. Unit 1 is approximately 34,800 acres and is made up entirely of alluvial and black water flood plain forested wetlands. Unit 2 is 9,144 acres and is made of approximately 6,166 acres of upland longleaf pine forest, located on Sandy Island, and the remaining acreage being made up primarily of tidal forested and emergent wetlands. Unit 3 is 9,144 acres and is made up of historic tidal rice fields many of which remain intact and are managed today for wintering waterfowl.

General wildlife and habitat characteristics of the Refuge area are broken down in more detail as follows:

Open Water: This category includes all unvegetated freshwater bodies. Among these are bays, lakes, ponds, and rivers. Approximately 2,430 acres of open water occur in the Refuge acquisition boundary. Most of the open water is regulated by the State of South Carolina.

Freshwater Marsh: This category includes freshwater wetlands dominated by emergent vegetation. The majority of this habitat type is tidally influenced. Freshwater marshes remain flooded or saturated except during extremely dry weather cycles. Most of the freshwater marshes are criss-crossed with abandoned dikes and canals that were constructed for rice cultivation during the 18th and 19th Centuries. Plant diversity is greater here than within any other wetland habitat type in the Refuge area. Among the most common species are giant cutgrass, pickerelweed, sawgrass, jewelweed, water parsnip, yellow pond-lily, water hemlock, arrowhead, rose mallow, soft-stem bulrush, cattail, loosestrife, white water lily, and alligator weed. Woody vegetation, such as tag alder, bald-cypress, buttonbush, tupelo, and black gum, may be interspersed on the old rice field levees. Approximately 2,923 acres of this habitat occur within the Refuge acquisition area.

Managed Wetlands: This category includes former rice field areas impounded by dikes or levees, where the hydrology is usually manipulated for the purpose of promoting plant species that are beneficial to waterfowl. The hydrological regimes are controlled by the impoundment managers. Most impoundments are managed for emergent vegetation,

including waterfowl foods such as smartweed, fall panicum, wild millet(s), Asiatic and dayflower. Cultivated grains may be also planted during drawdown periods. Approximately 629 acres of managed wetlands occur within the southernmost portions of the Refuge acquisition boundary.

Deciduous Forested Wetlands- Temporarily and Seasonally Flooded Tidal: These areas remain flooded or saturated throughout most years except during extreme drought periods. Water depth may periodically fluctuate as a result of tidal influences. Plant community composition is relatively homogeneous. Dominant species include swamp tupelo, bald-cypress, green ash, water tupelo, and red maple. Approximately 25,077 acres of this habitat type occur in the Refuge acquisition area.

Deciduous Forested and Shrub Wetlands- Regularly Flooded Tidal: These areas remain flooded or saturated throughout most years. Water depths fluctuate daily with tides. Tree species composition is very similar to the immediately preceding habitat type. Shrub-dominated habitats within this habitat type include species such as swamp privet, buttonbush, and tag alder. The Refuge acquisition area contains approximately 5,780 acres of this habitat type.

Deciduous Forested and Shrub Wetlands- Temporarily Flooded or Saturated: These areas normally remain flooded or saturated throughout the winter and for brief periods during the spring. Diurnal tides have little or no influence on the hydrology of this wetland type. This habitat usually occurs at the higher elevations within the flood plain. Typical plant species include swamp chestnut oak, water oak, cherrybark oak, loblolly pine, several species of hickories, white oak, tulip poplar, ironwood, sycamore, and sweetgum. Only about 461 acres of this habitat type is present within the Refuge acquisition area.

Deciduous Forested and Shrub Wetlands - Seasonally and Semipermanently Flooded: These areas are flooded for very long periods during the growing season to almost continuously throughout the year. Diurnal tides have little or no influence on the hydrology of this wetland type. Typical species in the drier zones of this habitat range include diamond-leaf oak, green ash, American elm, and sweetgum. In wetter zones, overcup oak, water hickory, water tupelo, swamp tupelo, and bald-cypress predominate. Approximately 2,719 acres of this habitat type occur within the Refuge acquisition area.

Evergreen Forested and Shrub Wetlands: Most of these areas are rarely flooded but may be periodically saturated to the surface. This type usually occurs at the very highest elevations within the flood plain and on poorly drained flats and in depressions outside of the floodplain. Within the flood plain, these areas are at the driest end of the wetland spectrum and are vegetated by species such as loblolly pine, spruce pine, live oak, and American holly. Outside of the floodplain these areas are commonly called bay swamps, pine savannahs, or wet pine flatwoods and are vegetated by pond pine, loblolly bay, sweet bay, red bay, titi, fetter-bush, wax myrtle, zenobia, and sweet gallberry. The Refuge acquisition area contains approximately 1,167 acres of this habitat type.

Upland Forests: This category includes any area that does not meet the definition of wetland or deep water habitat as classified by Cowardin et al. (1979). Approximately 6,166 acres of upland forest occur within the Refuge acquisition boundary. The majority of these uplands occur on Sandy Island. The natural plant communities of Sandy Island were described by Aulbach-Smith (1993). The upland plant communities on Sandy Island are highly diverse and include a maritime sandhill community, longleaf pine savannahs, and flatwoods with intermittent inclusions of small evergreen and deciduous depressions, pocosins, freshwater depression meadows, broad-leafed deciduous swamps, and pond pine woodlands. The maritime sandhill community on Sandy Island appears to be the only known site of this type in the state (WBFA Task Force Draft Plan 1994). The predominant vegetative community on Sandy Island is the longleaf pine/ turkey oak type typically found within the Lakeland Fine Sand Ridges and covers approximately 3,000 acres. This is a natural pine stand that is developing into a mature forest community. Many of the longleaf pines are well in excess of 100 years old (Winyah Bay Focus Area Task Force Draft Plan 1994). Longleaf pine forests and savannahs, such as those on Sandy Island, were recently identified as a nationally critically endangered ecosystem (Noss et al. 1995). Of the 74 million acres that once existed, less than four million acres exist now in scattered remnants, and not many of these contain the entire components of the ecosystem (Frost 1993). Most of the other upland acreage within the Refuge acquisition area is pine forestlands under silvicultural management within Unit 1.

3.3 Wildlife Resources

Mammals: Temporarily flooded bottomland forests provide ideal habitat for many species of mammals. Food and cover are abundant and diverse, and a variety of mammalian species are present. About 40 species of mammals potentially inhabit the Refuge acquisition area. They include the largest omnivore native to South Carolina, the black bear, which is primarily associated with upland forests joined by extensive forested wetland corridors. On the smallest end of the mammalian size scale is the least shrew, which inhabits the marshes and open grass-covered areas. Seven species of bats may also be found throughout the watershed. Additionally, the acquisition area likely contains roosting and foraging habitat for at least two rare bats: the Rafinesque's big-eared bat and the southern myotis. Both species hold state-listed rankings of concern throughout their ranges, and are known to use mature forested wetlands (Mary K. Clark, personal communication). Other mammals associated with this watershed include forest wetland inhabitants such as deer, bobcat, raccoon, beaver, mink, river otter, marsh rabbit, and squirrel. Because of the diversity of habitat types throughout the watershed, the mammalian species composition varies from site to site.

Waterfowl: Coastal South Carolina has long been noted for its abundance of diverse and quality overwintering habitats and their significance to migratory waterfowl. The Winyah Bay drainage area which includes the entire Refuge acquisition boundary, stands out as one of the most extensive, intact wetland complexes in the southeastern United States. The wetland habitats in the Refuge acquisition area range from forested, riverine floodplains to an extensive freshwater deltaic fan. The deltaic fan, in turn, contains a diversity of habitats such as managed wetlands, abandoned and unmanaged tidal

ricefields, creeks, and flats. Acre for acre, the managed wetlands of the Winyah Bay Focus Area winter more ducks than any comparable habitat in South Carolina (Winyah Bay Focus Area Draft Plan 1994.) In addition to overwintering habitats, the Great Pee Dee and Waccamaw serve as flight corridors for waterfowl migrating along the coastal wetland wintering grounds. The forested wetlands where mature trees are present also provide important nesting habitat for wood ducks and hooded mergansers.

Neotropical Migratory Birds: The Refuge acquisition area presently contains extensive, contiguous flood plain forested wetlands interspersed with a diversity of habitat components such as isolated hummocks, remnant dikes and a natural ridge and swale topography. This mosaic of habitats along with a specialized flora composition associated with each component, have a direct bearing on specific breeding nongame birds, particularly Neotropical migrants, and their presence and use of existing habitats. Point count surveys conducted within the Refuge acquisition area have further demonstrated the importance of this wetland habitat diversity to several high priority species such as Swainson's warblers and swallow-tailed kites. Additionally, contiguous forested wetland ecosystems such as represented within the Great Pee Dee and Waccamaw watersheds undoubtedly serve as important habitat for other temperate migrant and resident species.

Wildlife species likely found at Waccamaw National Wildlife Refuge.

Mammals

Big brown bat	Longtail weasel
Red bat	Beaver
Seminole bat	Gray fox
Hoary bat	Southern flying squirrel
Evening bat	Eastern gray squirrel
Silver-haired bat	Eastern fox squirrel
Eastern pipistrel	Golden mouse
Rafinesque's big-eared bat	Eastern woodrat
Southeastern myotis	Rice rat
Whitetail deer	Hispid cotton rat
Bobcat	Meadow vole
Raccoon	Pine vole
Opossum	Norway rat
Eastern cottontail	Black rat
Marsh rabbit	Shorttail shrew
River otter	Eastern mole
Mink	Black bear

Birds

Common loon	Pied-billed grebe
Brown pelican	Double-crested cormorant
Anhinga	American bittern
Least bittern	Great blue heron

Great egret
Little blue heron
Cattle egret
Black-crowned night heron
White ibis
Wood stork
Tundra swan
Canada goose
Green-winged teal
Mottled duck
Northern pintail
Northern shoveler
American wigeon
Redhead
Greater scaup
Common goldeneye
Hooded merganser
Red breasted merganser
Black Vulture
Osprey
Mississippi kite
Northern harrier
Cooper's hawk
Broad-winged hawk
American kestrel
Peregrine falcon
Northern bobwhite
Clapper rail
Virginia rail
Purple gallinule
American coot
Greater yellowlegs
Spotted sandpiper
American woodcock
Ring-billed gull
Caspian tern
Sandwich tern
Least tern
Mourning dove
Yellow-billed cuckoo
Eastern screech owl
Barred owl
Chuck-will's-widow
Chimney swift
Belted kingfisher
Red-bellied woodpecker
Downy woodpecker
Red-cockaded woodpecker
Pileated woodpecker
Acadian flycatcher
Great crested flycatcher

Snowy egret
Tricolored heron
Green heron
Yellow-crowned night heron
Glossy ibis
Fulvous whistling-duck
Snow goose
Wood duck
American black duck
Mallard
Blue-winged teal
Gadwall
Canvasback
Ring-necked duck
Lesser scaup
Bufflehead
Common merganser
Ruddy duck
Turkey vulture
American Swallow-tailed kite
Bald eagle
Sharp-shinned hawk
Red-shouldered hawk
Red-tailed hawk
Merlin
Wild turkey
Black rail
King rail
Sora
Common moorhen
Killdeer
Lesser yellowlegs
Common snipe
Laughing gull
Herring gull
Royal tern
Forster's tern
Rock dove
Common ground-dove
Common barn owl
Great horned owl
Common nighthawk
Whip-poor-will
Ruby-throated hummingbird
Red-headed woodpecker
Yellow-bellied sapsucker
Hairy woodpecker
Northern flicker
Eastern wood-pewee
Eastern phoebe
Eastern kingbird

Purple martin
N. rough-winged swallow
Blue jay
Fish crow
Tufted titmouse
Brown-headed nuthatch
Sedge wren
Marsh wren
Ruby-crowned kinglet
Eastern bluebird
Swainson's thrush
Wood thrush
Gray catbird
Brown thrasher
Cedar waxwing
European starling
Solitary vireo
Northern parula
Black-throated green warbler
Black-throated gray warbler
Pine warbler
Palm warbler
American redstart
Swainson's warbler
Northern waterthrush
Common yellowthroat
Yellow-breasted chat
Scarlet tanager
Blue grosbeak
Painted bunting
Chipping sparrow
Henslow's sparrow
Savannah sparrow
Seaside sparrow
Swamp sparrow
Bobolink
Eastern meadowlark
Boat-tailed grackle
Brown-headed cowbird
Purple finch
House sparrow

Tree swallow
Barn swallow
American crow
Carolina chickadee
White-breasted nuthatch
Carolina wren
House wren
Golden-crowned kinglet
Blue-gray gnatcatcher
Veery
Hermit thrush
American robin
Northern mockingbird
Water pipit
Loggerhead shrike
White-eyed vireo
Red-eyed vireo
Black-throated blue warbler
Yellow-rumped warbler
Yellow-throated warbler
Prairie warbler
Black and white warbler
Prothonotary warbler
Ovenbird
Kentucky warbler
Hooded warbler
Summer tanager
Northern cardinal
Indigo bunting
Rufous-sided towhee
Field sparrow
Vesper sparrow
Sharp-tailed sparrow
Song sparrow
White-throated sparrow
Red-winged blackbird
Rusty blackbird
Common grackle
Orchard oriole
American goldfinch

3.4 Threatened and Endangered Species

Eight federally listed endangered or threatened species are known to occur or potentially occur within the proposed boundary of the Refuge. These include four species of birds, one species of fish, and three species of plants. They are as follows:

American peregrine falcon (*Falco peregrinus anatum*)-Endangered. This subspecies of peregrine falcon, once eliminated from the eastern United States, has partially recovered due to the ban on DDT and an active reintroduction program (U.S. Fish and Wildlife Service 1992b). In addition to the endangered to the endangered American peregrine falcon, any other subspecies of the peregrine falcon which may seasonally occur within the Refuge acquisition boundary are considered endangered due to similarity of appearance with the endangered subspecies.

Bald eagle (*Haliaeetus leucocephalus*) - Threatened. The number of occupied breeding areas for bald eagles in South Carolina was at a low of 13 in 1977 when studies began and has increased to 181 in 2003 and fledging 224 young (Murphy, SCDNR personal corresp. 2003). The bald eagle is primarily associated with coasts, rivers, and lakes, usually nesting near bodies of water where it feeds (U. S. Fish and Wildlife Service 1992b). There is one documented nest within in Unit 1 of the Refuge acquisition boundary. Additionally, eagles have been documented feeding and roosting in the area and migratory bald eagles have been noted moving through the area.

Red-cockaded woodpecker (*Picoides borealis*) - Endangered. Red-cockaded woodpeckers are known to nest in the Refuge acquisition boundary, with the principal population residing in the mature pine forest of Sandy Island. Specific data on this population and its status are lacking because the area was privately owned until recently and access to conduct surveys was not provided.

Wood stork (*Mycteria americana*) - Endangered. Although no nesting has been observed within the Refuge acquisition boundary, the contiguous mature blocks of wetland ecosystems provide suitable habitat for wood storks to nest, forage, and roost. Wood storks have been observed foraging and loafing within the Refuge acquisition boundary but nesting has not been documented.

Shortnose sturgeon (*Acipenser brevirostrum*) - Endangered. The shortnose sturgeon is found in the rivers and creeks.

Pondberry (*Lindera melissifolia*)- Endangered. Although not known to occur in the Refuge acquisition boundary, potential habitat is present on Sandy Island and in other pineland areas.

Canby's dropwort (*Oxypolis canbyi*)- Endangered. Although not known to occur in the Refuge acquisition boundary, potential habitat is present on Sandy Island and in other pineland areas.

American chaffseed (*Schwalbea americana*) - Endangered. Although not known to occur in the Refuge acquisition boundary, potential habitat is present on Sandy Island and in other pineland areas.

Species of Concern: Ten species of plants and animals, considered by the Service to be Species of Concern, are known to occur or potentially occur within the Refuge

acquisition boundary. Species of concern are those species for which available data suggest that a proposal to list the species may be appropriate, but conclusive data on vulnerability and threat are not currently available to support listing action. These species include the Bachman's sparrow (*Aimophila aestivalis*); Rafinesque's big-eared bat (*Plecotus rafinesquii*); Southeastern myotis bat (*Myotis austroriparius*); Carolina pygmy sunfish (*Elassoma boehlkei*); Eulophia (*pteroglossapis ecristata*); Sarvis holly (*Ilex amelanchar*); Pondspice (*Listea aestivalis*); Carolina birds-in-a-nest (*Macbridea caroliniana*); Carolina grass-of-parnassus (*Parnassia caroliniana*); and Well's pixie moss (*Pyxidantha barbulata* var. *brevifolia*).

3.6 Cultural Resources

The body of federal historic preservation laws has grown dramatically since the enactment of the Antiquities Act of 1906. Several themes recur in these laws, their promulgating regulations, and more recent Executive Orders. They include: 1) each agency is to systematically inventory the historic properties on their holdings and to scientifically assess each property's eligibility for the National Register of Historic Places; 2) federal agencies are to consider the impacts to cultural resources during the agencies' management activities and seek to avoid or mitigate adverse impacts; 3) the protection of cultural resources from looting and vandalism are to be accomplished through a mix of informed management, law enforcement efforts, and public education; and 4) the increasing role of consultation with groups, such as Native American tribes, in addressing how a project or management activity may impact specific archaeological sites and landscapes deemed important to those groups. The U.S. Fish and Wildlife Service, like other federal agencies, are legally mandated to inventory, assess, and protect cultural resources located on those lands that the agency owns, manages, or controls. The Service's cultural resource policy is delineated in 614 FW 1-5 and 126 FW 1-3. In the FWS's Southeast Region, the cultural resource review and compliance process is initiated by contacting the Regional Historic Preservation Officer/Regional Archaeologist (RHPO/RA). The RHPO/RA will determine whether the proposed undertaking has the potential to impact cultural resources, identify the "area of potential effect," determine the appropriate level of scientific investigation necessary to ensure legal compliance, and initiates consultation with the pertinent State Historic Preservation Office (SHPO) and federally recognized Tribes.

There is currently one recorded historic property located on Waccamaw National Wildlife Refuge located on the Yauhannah Bluff Tract. The Yauhannah Bluff site was first identified by Richard Polhemus in 1972. A portion of this site was examined by Bill Weeks and Jim Michie of Coastal Carolina University in the early to mid 1990s through the excavation of shovel tests and test units. In 2002, New South Associates shovel tested the entire tract at a 65 foot interval using the permanent datum established by Jim Michie. In 2006 the USFWS contracted New South associates to perform a data recovery survey on the area closest to the Great Pee Dee River in order to mitigate any impacts to archeological resources that might be impacted during the construction of an environmental education center (*Archeological Investigations at the Yourhaney Plantation (38GE18) Yauhannah Bluff, Waccamaw National Wildlife Refuge*,

3.7 Socio Economic

Three primary urban centers are associated with the study area: the cities of Georgetown, Conway, and Myrtle Beach. The major area of growth is the Grand Strand, a 60-mile stretch of coastline between the Atlantic Ocean and the Waccamaw River in Georgetown and Horry Counties.

The Grand Strand is one of the nation's top vacation destinations (Myrtle Beach Area Chamber of Commerce 1995). It stretches from Pawley's Island north to the town of Little River near the South Carolina-North Carolina state line. It is characterized by linear resort, residential, and commercial development along the Atlantic Ocean and Waccamaw River. Growth, in Conway, Myrtle Beach and Georgetown, has radiated from the business centers outward along established transportation routes.

The area has both a large resident population (Table 1) and a large tourist population. Both population components are rapidly growing. While the state's resident population increased 35% between 1970 and 1990, Horry County's population more than doubled with an increase of 108%. Within Horry County, the Myrtle Beach area has experienced the greatest increase, from 21,211 to 57,908, or 173% while the resident population of the Conway area increased 42.8%, from 18,665 to 26,648. During the same period, Georgetown County's population increased 38%. Within Georgetown County, the Georgetown area increased 25.2%, from 15,638 to 19,578. Future population projections for both counties indicate that the population densities will continue to increase through the year 2030 (Table 2).

Although much of the Refuge acquisition boundary remains in a semi rural state, urban sprawl is quickly changing the land uses which have traditionally been limited to forestry and agriculture. Hunting has been a principal traditional form of outdoor recreation for many of the residents and land owners within the rural portions of Horry and Georgetown Counties. It is because of hunting that much of this land has remained in private ownership often with permanent protection though perpetual conservation easements. This has changed dramatically in the past five years however, due to the selling of large tracts of commercial timber lands for residential development, often displacing hunt clubs which had leased these lands for uninterrupted time periods of up to fifty years. Many of these hunters struggle to find land to continue the traditional sport of hunting which has also affected the support industry that relies on their business. Public hunting programs may be the only way for residents of the counties who are not land owners to continue to participate in the traditional use.

Table 1. Resident population trends for Horry County, Georgetown County, and South Carolina.

YEAR	POPULATION					
	Horry County	Percent Increase	Georgetown County	Percent Increase	State of South Carolina	Percent Increase
1970	69,992	--	33,500	--	2,590,713	--
1980	101,419	+45%	42,461	+27%	3,122,814	+21%
1990	145,300	+43%	46,302	+9%	3,486,703	+12%
SOURCES: U.S. Bureau of the Census, 1996. South Carolina State Data Center, 1991. Waccamaw Regional Planning and Development Council, 1993.						

Of the counties in the area, Horry County has maintained the highest per capita income and ranks 15th in the state. In all, the region's median family income increased by 73.5% from 1980-1990. The largest increase occurred in Horry County, which went from \$15,249 per annum in 1980 to \$28,959 in 1990.

Table 2. Resident population projections for Horry and Georgetown Counties, South Carolina.

YEAR	POPULATION			
	Horry County	Percent Increase	Georgetown County	Percent Increase
1990	145,300	--	46,500	--
2000	209,200	+44%	57,000	+23%
2010	296,000	+41%	69,300	+22%
2020	381,100	+29%	83,400	+21%
2030	470,100	+23%	99,300	+20%
SOURCES: U.S. Bureau of the Census, 1996. South Carolina State Data Center, 1991. Waccamaw Regional Planning and Development Council, 1993.				

Chapter 4 Environmental Consequences

This chapter describes the foreseeable environmental consequences of implementing the two management alternatives in Chapter 2. When detailed information is available, a scientific and analytic comparison between alternatives and their anticipated consequences is presented, which is described as “impacts” or “effects.” When detailed information is not available, those comparisons are based on the professional judgment and experience of Refuge staff and Service and State biologists

4.1 Effects Common to all Alternatives

4.1.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment. This assessment has not identified any adverse or beneficial effects for either alternative unique to minority or low-income populations in the affected area. Neither alternative will disproportionately place any adverse environmental, economic, social, nor health impacts on minority or low-income populations.

4.1.2 Public Health and Safety

Each alternative would have similar effects or minimal to negligible effects on human health and safety.

4.1.3 Refuge Physical Environment

Impacts of each alternative on the Refuge physical environment would have similar minimal to negligible effects. The Refuge would limit access to foot access minimizing habitat degradation and disturbance to surface soils, topography. Hunting would benefit vegetation as it is used to keep many resident wildlife populations in balance with the habitat’s carrying capacity.

Impacts to the natural hydrology would have negligible effects. The Refuge expects

impacts to air and water quality to be minimal and only due to Refuge visitors' automobile and boat emissions on creeks and rivers adjacent to Refuge lands. The effect of these Refuge-related activities on overall air and water quality in the region are anticipated to be relatively negligible. Existing State water quality criteria and use classifications are adequate to achieve desired on-Refuge conditions; thus, implementation of the proposed action would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws.

Impacts associated with solitude are expected to be minimal given the limited time allotments for modern weapons and access issues which will preclude many visitors from accessing areas open to hunting. Although some public use areas such as trails might be temporarily closed during Refuge hunts, there are two significant public use areas which are closed year-round to hunting to help prevent conflicts during Refuge hunts.

4.1.5 Cultural Resources

Under each alternative, hunting, regardless of method or species targeted, is a public use activity that does not pose any threat to historic properties on and/or near the Refuge. Additionally, the removal of feral hogs through hunting would be a significant measure against the destruction of significant archeological resources by feral hog rooting and wallowing.

4.1.5. Facilities

The Service defines facilities as: "Real property that serves a particular function(s) such as buildings, roads, utilities, water control structures, raceways, etc." Annual maintenance or improvement(s) of existing facilities (i.e. parking areas, roads, trails, boat ramps and buildings) may cause minimal short term impacts to localized soils and waters, and, may cause some wildlife disturbances and damage to vegetation. Facility maintenance and improvement activities described are periodically conducted to accommodate daily refuge management operations and general public uses such as wildlife observation and photography. When these activities are necessary, they will be conducted at times (seasonal and/or daily) to cause the least amount of disturbance to wildlife. Siltation barriers will be used to minimize soil erosion, and all disturbed sites will be restored to as natural a condition as possible.

Waccamaw NWR currently has no facilities that would be used by or impacted by a hunting program. ATVs and other land conveyance vehicles are not allowed on Refuge roads or trails. Under the proposed action the only facilities that will be utilized by hunters are: parking areas and boat ramps that are public facilities which are open year-round and maintained by the county or state. Due to the number of boat landings adjacent to the Refuge, there should be minor increases in public use of these facilities during Refuge hunts. Almost all of the existing Refuge maintained parking areas, roads and trails are located on two Refuge tracts which will be closed year-round to hunting.

4.2 Summary of Effects

4.2.1 Impacts to Habitat

No Action Alternative

Under this alternative, hunting would not be opened to the public on Waccamaw NWR. Negative impacts to Refuge habitats would be expected based on studies showing negative impacts to wildlife habitat and population interrelationships caused by deer over abundance. For example, allowing the Refuge deer herd to expand uncontrolled could result in significant negative impacts on other plant and animal species. When habitat carrying capacity is exceeded, competition for limited food resources results in overbrowsing by deer (2002 Cape Romain NWR Annual Narrative). Severe overbrowsing alters plant species composition, distribution, and abundance, and reduces understory structural diversity. These changes may have a deleterious impact on local animal communities which depend on healthy vegetative systems for food and cover (Ellingwood and Caturano 1988).

A separate category of negative impacts that must be considered is the economic impacts to adjoining landowners. In the case of Waccamaw NWR, approximately one half of the Refuge acquisition boundary adjoins urban to suburban residential areas. High population densities of deer and feral hogs can lead to increased automobile collisions, property damage, and nuisance complaints. In the more rural portions of the Refuge, increased crop damage and degradation to dikes, roads and levies can result. High deer numbers are also implicated in the rapid increase in the incidence of Lyme's disease in humans. Additionally, under the No Action alternative, Refuge law enforcement responsibilities would increase considerably because of the attraction to wildlife poachers as a result of the sanctuary status.

Limited Public Hunting (Proposed Action) Alternative

Under this alternative, hunting would be opened to the public on a limited basis on Waccamaw NWR. Impacts to Refuge habitats would be reduced due in part to the management of the deer population and a Refuge policy that prohibits the use of land vehicles including ATVs for Refuge hunts.

Ecological benefits derived from regulated hunting include protection of wildlife habitats from overbrowsing (Behrend et al. 1976), protection of species diversity of flora and fauna that may be negatively impacted by deer and hog overpopulation, and the maintenance of healthy, viable deer populations (McCullough 1979). Hunting pressure on private lands within and adjacent to the Refuge acquisition boundary has historically been a significant factor in influencing seasonal wildlife immigration to Refuge lands. By providing limited hunting on the Refuge these seasonal population swings can provide opportunities to positively impact the overall population thus influencing herd health and wildlife habitats both on the Refuge and on adjoining private lands.

Unlimited Hunting Alternative

Under this alternative, unlimited hunting would be opened to the public on Waccamaw NWR in accordance with the State of South Carolina hunting regulations. Many of the beneficial impacts of this alternative would be the same as those listed in the Limited Hunting (preferred action) Alternative, however the degree of effect would differ. Habitat management objectives such as waterfowl and endangered species programs might be compromised both directly and indirectly due to administrative costs to implement this alternative. Furthermore, hunter success and the quality of outdoor experience would be greatly reduced.

This alternative would overburden Refuge staff and also diminish the Refuge's ability to collect necessary habitat data or to perform habitat management operations such as winter mowing, prescribe fire, or reforestation treatments.

4.2.2 Impacts to Hunted Wildlife

No Action Alternative

Under this alternative, hunting would not be opened to the public on Waccamaw NWR. Additional mortality of individual hunted animals would not occur under this alternative. Disturbance by hunters to hunted wildlife would not occur; however, other public uses that cause disturbance, such as hiking, wildlife observation and photography, would still be permitted.

In the absence of regulated hunting, wildlife populations on Refuge owned lands would become unbalanced favoring more adaptive and opportunistic species such as feral hogs, white-tailed deer, raccoons and squirrels. Due to the decline or lack of natural predators, these populations would expand beyond the biological carrying capacity of the land causing environmental and health threats. For example feral hog populations can increase by 300% in one year without any measure of predatory control. Sexual maturity in wild hogs is generally reached before the end of the first year of life (Sweeney 1970, Barrett 1978) and in the South hogs are sexually active and will breed throughout the year. Feral hogs can harbor several infectious diseases, some of which can be fatal to native wildlife. Additionally, feral hogs compete directly for food with deer, bears, turkeys, squirrels and many other birds and mammals.

Deer herd densities can double in one year (McCullough 1979) and depending on habitat quality can increase to levels exceeding the carrying capacity as quickly as two to three years. Deer herds at upper density limits consist of deer in relatively poor health (Dasmann 1981). High density herds are prone to cyclic population fluctuations and catastrophic losses (McCullough 1979). Dickinson (1983) reported white-tail deer harvested from New York's Bear Mountain-Harriman State Park, following a 71 year history of no hunting, were the poorest physical specimens ever recorded in New York and possibly in the northeast. The likelihood of starvation and diseases, such as bluetongue and EHD in deer and distemper and rabies in raccoon and opossum, would increase as would vehicle-deer collisions.

Limited Hunting (Proposed Action) Alternative

Under this alternative, hunting would be opened to the public on a limited basis on Waccamaw NWR. Regulated hunting has been proven to be an effective deer population management tool (Hesselton et al. 1965). In addition, it has been shown to be the most efficient and least expensive technique for removing deer (Palmer et. al 1980). For feral hogs, regulated hunting may not reduce hog populations to desired levels however, it will contribute to the ongoing efforts of the Refuge to control this invasive species. Reduction of the hog population would also decrease risk of transmitting fatal diseases by hogs to other wildlife species. Fewer hogs would decrease competition for food with native wildlife, such as deer, bear, turkey, and squirrel. The hunting season structure will be based on hunter success, and sex-age-kill ratios. Special hunting seasons for hogs may be implemented to further reduce populations beyond those taken during the prescribed deer seasons. Hunting seasons may be adjusted annually to take into consideration changes indicated in herd quality by other biological monitoring (APC's, body weights, age ratios, antler size, and reproductive rates). The likelihood of starvation and diseases, such as bluetongue and EHD in deer would be decreased as would deer-vehicle collisions.

Public waterfowl hunting provides an economical means for statistical data collection. Random checks of hunters can provide kill ratios, population composition, and bird habit data as well as the possibility of organ collection (gizzards, etc.) for various studies. However, wildlife disturbance associated with waterfowl hunting does impact diurnal and nocturnal use of an area by waterfowl (Cronan 1957, McNeil et al. 1992, Paulus, 1984). Because most of the Refuge is bisected by a multitude of navigable, public waterways which the Refuge has no management authority over, disturbance by public hunting on the creeks and rivers will exist with or without a Refuge waterfowl hunt. Disturbance associated with a Refuge hunt may have an additive effect on reducing waterfowl use within the hunt area however it will be minimal in areas where unrestricted public hunting already occurs in nearby public waters. There are, however, management tools that can be used to minimize and/or mitigate disturbance and the interruption of use of Refuge habitats by wintering waterfowl. Afternoon closure of hunting reduces disturbance (Gordon et al. 1989) as well as reduces the total take of waterfowl (Kirby et al.1983). Unhunted managed wetlands provide areas that are utilized as resting and feeding areas when adjacent areas are hunted (Gordon et al. 1989, Paulus 1984). Privately owned managed wetlands as well as natural bays, ponds, oxbows and tidal marshes within or adjacent to the Refuge acquisition boundary that are permanently set aside for waterfowl sanctuary are few and far between. The areas that have been set aside are heavily used by waterfowl during the day as resting/loafing areas. Many of these areas are now being impacted by land use changes as commercial development continues to grow throughout the region. As Refuge tracts are acquired, consideration will be given to closing isolated water areas to provide additional waterfowl rest sites on the Refuge. Additionally, other mitigation measures will be incorporated into the Refuge hunt program such as noon closure to waterfowl hunting, and opening no more than 60% of the Refuge to waterfowl hunting.

For upland/small game species, negative impacts of this alternative will be minimal. Studies show that there are only small differences in density and/or mortality rates in squirrels and rabbits on hunted versus non-hunted populations (Mosby 1969, Rose 1977). As a result, limited hunting mortality does not affect the overall status of these species however it would help to lower the risk of diseases such as rabies and distemper that can plague many small game species. Additionally, hunting of these species will cause only minimal disturbance to other wildlife populations. Everett (1982), monitored movements of wild turkeys before, during and after squirrel, deer and turkey hunts and found no permanent movement out of established ranges which could be attributed to hunting.

Furthermore, even during the Refuge turkey hunts, disturbance to target and non target species should be minimal due to the nature of turkey hunting itself. Throughout the Refuge acquisition boundary, many adjoining landowners manage intensively for wild turkey and consequently, turkey populations on Refuge owned tracts often fluctuate as the turkey flocks move back and forth between federally owned and private property. Additionally, because of the difficulty of physical accessing many tracts and due to seasonal habitat availability related to river levels, turkey hunting will be physically restrictive and should have minimal impacts, direct and/or indirect on the resident wild turkey population.

Unlimited Hunting Alternative

Under this alternative, unlimited hunting would be opened to the public on Waccamaw NWR in accordance with the State of South Carolina hunting regulations. Many of the beneficial impacts of this alternative would be the same as those listed in the Limited Hunting (preferred action) Alternative. Beneficial impacts of this alternative would be the reduction of deer and hog populations to levels that would be below the carrying capacity, thus reducing damage to the Refuge habitats and other associated wildlife species. It would also allow for a maximum amount of direct, consumptive recreational opportunities.

Conversely, this alternative would also result in significant adverse impacts to the overall Refuge objectives. Under the Unlimited Hunting alternative, hunting would be allowed during the seasonal framework set by the South Carolina Department of Natural Resources which typically runs from August 15 through May 1. Under this alternative, increased conflicts would occur between the various hunting interests as well as other Refuge public use and management interests.

This alternative would also diminish the Refuge's ability to collect necessary harvest data to maintain a sufficient level of population monitoring in order to manage Refuge natural resources responsibly.

4.2.3 Impacts to Non-hunted Wildlife

No Action Alternative

Under this alternative, hunting would not be opened to the public on Waccamaw NWR. Increased disturbance to non-hunted wildlife would not occur on the Refuge however, non-consumptive users would still be permitted to access this land, which might cause equal disturbance to wildlife.

Ground and shrub nesting birds, reptiles, and amphibians are subject to high egg and offspring depredation rates if raccoon, coyotes, and opossum populations are not kept in check through harvest. In North Louisiana, research conducted on one population of alligator snapping turtles has shown that raccoons are responsible for depredating 93% of turtle nests (USFWS 2002). The likelihood of inter-specific disease outbreaks such as distemper and rabies would affect all mammalian species including rare bats that inhabit Refuge habitats. Based on Refuge monitoring prior to the establishment of a Refuge hunt program, feral hog populations would increase dramatically under this alternative. Prior to a Refuge hunting program, illegal introduction of feral hogs became a law enforcement challenge as poachers would release female hogs on Refuge lands so that they would be protected until they needed them to for illegal sale and release on private game farms. Prior to feral hog management efforts, habitat destruction and impacts to other wildlife reached epidemic proportions on several Refuge tracts.

Limited Hunting Proposed Action Alternative

Under this alternative, hunting would be opened to the public on a limited basis on Waccamaw NWR. Populations of raccoon, coyotes, and opossum would be decreased through hunting. Depredation rates of songbirds, turkeys, turtles and their nests would decrease. Feral hog populations would be reduced thereby decreasing predation of reptiles, ground and cavity nesting birds, deer fawns, turkeys and small mammals.

Disturbance to non-hunted wildlife could possibly increase slightly. However, significant disturbance would be unlikely for the following reasons. Refuge access for hunting is primarily restricted to alluvial ridges and hammocks fronting the river. Boat access is required for these areas and this alone precludes many hunters from participating in Refuge hunts. Additionally, the broad spans of forested floodplain wetlands along the Great Pee Dee and Waccamaw Rivers, allows most wildlife species, including those species permitted to be hunted, to escape quickly into impenetrable swamps. Disturbance to the daily wintering activities, such as feeding and resting, of birds might occur, but would be transitory as hunters traverse habitats along the rivers edge.

Other wildlife disturbances associated with the Refuge hunting program will be minimized by the implementation of Refuge specific regulations which will be structured to reduce these impacts. Closure to the use of all-terrain vehicles, restrictions on use of dogs, weapons, and access are some regulations used to limit wildlife disturbance.

Unlimited Hunting Alternative

Under this alternative, unlimited hunting would be opened to the public on Waccamaw NWR in accordance with the State of South Carolina hunting regulations. Many of the

beneficial impacts of this alternative would be the same as those listed in the Limited Hunting (preferred action) Alternative. Under the Unlimited Hunting alternative, hunting would be allowed during the seasonal framework set by the South Carolina Department of Natural Resources which typically runs from August 15 through May 1. Beneficial impacts of this alternative would be a greater reduction of deer and hog populations to levels that would be below the carrying capacity, thus reducing damage to the Refuge habitats and other associated wildlife species including non game species.

Under the unlimited hunting alternative, big and small game hunting would occur throughout most of the waterfowl season and increased disturbance to wintering waterfowl might result. Additional negative impacts to non game species includes significantly interrupting other wildlife management programs such as research, banding / monitoring programs, prescribe fire, mowing, forest management, and law enforcement for non consumptive public use activities.

4.2.4 Impacts to Endangered and Threatened Species

No Action Alternative

Eight federally listed endangered or threatened species are known to occur or potentially occur within the proposed boundary of the Refuge. These include four species of birds, one species of fish, and three species of plants (listed in Section 3.4). With the exception of the bald eagle use of Refuge lands by all other threatened and endangered species typically occurs after all Refuge hunting seasons with the exception of turkey season. Resident bald eagles typically nest during the late winter in South Carolina. If Bald eagle nesting activity occurs on, or nearby Refuge lands, closed areas will be established to buffer the nesting area from any human disturbance and/or activity associated with a permitted public use. This would be the same with or without hunting. As with the potential for bald eagle nesting areas, if a wood stork rookery is established, a closed area will be established to buffer the area from any human activity. Because of seasonal use parameters listed above and the legal authority that Refuges have to close areas to public access when necessary, under the no action alternative, there would be no significant decreases of adversely affecting threatened and endangered species than under the limited hunting or unlimited hunting alternatives.

Limited Hunting (Proposed Action) Alternative

An Intra-Service Section 7 Evaluation Consultation has been completed in April 2007 for the Waccamaw NWR Recreational Hunt Plan (preferred alternative). Based on the current known locations of feeding, nesting, spawning, or physical locations of threatened or endangered species on or adjacent to Refuge lands, it has been determined that the proposed action is not likely to adversely affect these species (Refer to 2007 Section 7 Evaluation for Recreational Hunt Plan on Waccamaw NWR).

Unlimited Hunting Alternative

Under this alternative, a new Intra-Service Section 7 Evaluation Consultation would have to be completed to fully evaluate and adverse affects to threatened or endangered species that might occur from an extended hunting season.

4.2.5 Impacts to Refuge Facilities (roads, trails, parking lots, levees)

No Action Alternative

Under the No Action Alternative all Refuge roads and trails would be open year-round to foot traffic access only. Under this alternative additional maintenance such as mowing would be required to accommodate a wider spectrum of public interest groups. This added maintenance would add additional burdens on the limited staff resources as well as increase habitat and wildlife impacts on the Refuge.

Limited Hunting (Proposed Action) Alternative

Refuge roads, trails, and other public use facilities are closed year-round to land conveyance vehicles including the use of ATVs. Impacts to existing facilities such as the few trails that will be accessed by hunters will have minimal affects on these facilities. Compared to impacts to these facilities during other period of the year when regular mowing is required for non consumptive user groups, hunter impacts will be significantly less if not almost negligible.

Unlimited Hunting Alternative

Same as Limited Hunting (proposed action) Alternative.

4.2.6 Impacts to Wildlife Dependant Recreation

No Action Alternative

The public would not have the opportunity to harvest a renewable resource, participate in wildlife-oriented recreation which is one of the primary purposes for which the Refuge was established. Additionally, the public interest in a Refuge hunt program has increased significantly since Refuge establishment and consequently it has increased the public awareness of Waccamaw NWR and the National Wildlife Refuge System more so than almost every other program. Through this public support which has evolved principally through hunters and fisherman, Waccamaw NWR has received significant private donations from local sporting goods outlets which have now been matched with grants and dedicated to building facilities for non-consumptive public uses. These facilities include boardwalks, docks, weather shelters, environmental education outposts, overlooks, and nature trails.

Additionally, many remote areas within the Refuge would not be experienced as often by the public nor would these areas gain first-hand experience in developing community support for protection against destructive proposals for new roads, water and sewer lines and other infrastructure that one day will target these areas.

Limited Hunting Proposed Action Alternative

Under the Limited Hunting (proposed action) Alternative the public would also have the opportunity to harvest a renewable resource in a traditional manner, which is culturally important to the local community. This alternative would allow youth the opportunity to experience a wildlife-dependant recreation, instill an appreciation for and understanding of wildlife, the natural world and the environment and promote a land ethic and environmental awareness. Within this alternative a careful balance of hunting seasons has been fully examined to ensure that hunting interests do not overlap, nor are there more than two week spans of any big game hunting seasons to allow for other public use groups to have adequate access in between the Refuge hunts. This alternative would also allow the public to enjoy hunting at no or little cost in a region where private land is leased for hunting, often costing a person \$500-\$3000/year for membership.

As public use levels expand across time, unanticipated conflicts between user groups may occur. These conflicts can be mitigated by providing competing interests groups with alternative access opportunities as well as special interest outreach forums. For example, Waccamaw NWR is developing an environmental education center along with a recreation area on a Refuge tract with multi conveyance access (ie. boat, car, bike or foot). Both facilities will be closed to hunting and as they are developed, will provide Refuge visitors with a spectacular opportunity to see Refuge habitats on a year-round basis.

Hunters also play a significant role in helping with law enforcement activities. Because Refuge staff resources is very limited, hunters provide vital tips that often lead to the conviction of poachers, illegal wildlife and plant possession, trespassing, wildlife disease, and public hazards.

Unlimited Hunting Alternative

Under this alternative, a significant increase in opportunities for the public to harvest a renewable resource in a traditional manner would be afforded to the public. This alternative would have an increased affect on managing some wildlife populations however it could also lead to an increase in conflicts between other wildlife dependent uses including limiting other hunting opportunities and/or other non-consumptive uses such as hiking, photography, and environmental education.

4.3 Cumulative Impacts Analysis

4.3.1 Anticipated Direct and Indirect Impacts of Proposed Action on Wildlife Species.

4.3.1.1 Migratory Birds

NEPA considerations by the Service for hunted migratory game bird species are addressed by the programmatic document, "Final Supplemental Environmental Impact

Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88-14),” filed with the Environmental Protection Agency on June 9, 1988. We published Notice of Availability in the Federal Register on June 16, 1988 (53 FR 22582), and our Record of Decision on August 18, 1988 (53 FR 31341). Annual NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment, “Duck Hunting Regulations for 2006-07,” and an August 24, 2006, Finding of No Significant Impact. Further, in a notice published in the September 8, 2005, Federal Register (70 FR 53376), the Service announced its intent to develop a new Supplemental Environmental Impact Statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, Federal Register notice (71 FR 12216). More information may be obtained from: Chief, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NWR, Washington, DC 20240.

The U.S. Fish and Wildlife Service, working with partners, annually prescribe frameworks, or outer limits, for dates and times when hunting may occur and the number of birds that may be taken and possessed. These frameworks are necessary to allow State selections of season and limits for recreation and sustenance; aid Federal, State, and tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which States may select season dates, bag limits, shooting hours, and other options for the each migratory bird hunting season. The frameworks are essentially permissive in that hunting of migratory birds would not be permitted without them. Thus, in effect, Federal annual regulations both allow and limit the hunting of migratory birds.

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any ... bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose. These regulations are written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, and are updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the U.S. Fish and Wildlife Service as the lead federal agency for managing and conserving migratory birds in the United States. Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four Flyways for the primary purpose of managing migratory game birds. Each Flyway (Atlantic, Mississippi, Central, and Pacific) has a Flyway Council, a formal organization generally composed of one member from each State and Province in that Flyway. Waccamaw NWR is within the Atlantic Flyway.

The process for adopting migratory game bird hunting regulations, located in 50 CFR part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rule making process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. Because the Service is required to take abundance of migratory birds and other factors into consideration, the Service undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, State and Provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of State and Federal Governments. After Service establishment of final frameworks for hunting seasons, the States may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks but never more liberal. Season dates and bag limits for National Wildlife Refuges open to hunting are never longer or larger than the State regulations. In fact, based upon the findings of an environmental assessment developed when a National Wildlife Refuge opens a new hunting activity, season dates and bag limits may be more restrictive than the State allows.

Under the proposed action, opening Waccamaw National Wildlife Refuge to hunting should not have significant cumulative impacts on migratory birds. It is estimated that a maximum additional 100 wood ducks would be harvested each year on the Refuge. This harvest impact represents 0.001% of South Carolina's four-year average harvest of 80,440 wood ducks (USFWS Waterfowl Harvest and Population Data July 2006). Waterfowl hunting will only be allowed until noon one day per week throughout the season, which is more restrictive than regulations set forth by the South Carolina Department of Natural Resources (SCDNR).

Additionally, Waccamaw NWR entered into a long-term lease agreement in fiscal year 2006 with the South Carolina Department of Natural Resources which allowed the 7,661 acre Bucksport WMA to be combined with other fee title refuge lands. By adding this significant block of land, the refuge is now able to better manage important riverine habitats as well as provide a more consistent set of regulations for the visiting public. One primary condition of the lease agreement is that there be no net loss of hunting opportunities now that these lands are administered under the National Wildlife Refuge System. To meet this lease agreement, the refuge proposes to offer waterfowl hunting on a more restricted basis than was previously allowed on Bucksport WMA. To make up lost waterfowl hunting days and overall reduction in hunting opportunities, the refuge proposes to offer additional hunting opportunities through hog hunts and the youth turkey hunt. Equally as important as uniform management throughout the refuge acquisition boundary, by adding the Bucksport WMA to the refuge the refuge was able to create a

contiguous 12,323 acre waterfowl sanctuary along the Waccamaw River. This area has now become an important resource for protecting wood duck populations in an area of the refuge where state or private sanctuaries do not exist.

Although woodcock are showing declines in numbers on their breeding grounds, habitat loss is considered to be the culprit, not hunting. This assertion was tested in a study conducted by the U.S. Geological Patuxent Wildlife Research Center in 2005 (McAuley *et al.* 2005). Results showed no significant differences in woodcock survival between hunted and non-hunted areas. Furthermore, the authors concluded that hunting was not having a considerable impact on woodcock numbers in the Northeast (McAuley *et al.* 2005).

Woodcock was one of the species of migratory birds that was permitted to be hunted on Bucksport WMA prior to the long-term lease agreement between SCDNR and Waccamaw NWR. Because there are no concentrations of woodcock found throughout the refuge, a decision was made to offer snipe hunting in place of woodcock hunting which would help maintain a no net loss of hunting opportunities, a primary condition on the lease agreement.

Snipe hunting is proposed for only the tidal wetland marshes in Unit 3 and on a much more restricted basis (two days a week for one month of the season or approximately eight days) than allowed by South Carolina state regulations. In addition to restricted hunting days, non toxic shot is required to be used by hunters. This refuge restriction further restricts hunters, possibly even more than days open, due to the lack of availability of smaller shot sizes in non toxic shot. Other factors such as weather, daily tidal cycles, and private lands which are rarely hunted for snipe, will have additive impacts on hunter success.

Based on the U.S. Fish and Wildlife Service Harvest Report, snipe harvest estimates for South Carolina for 2004 and 2005 were 9,800 and 23,600 respectively. Hunter's total season harvest average for both seasons were 3.2 / hunter in 2004 and 13.5/ hunter in 2005. Total harvest of snipe for the Atlantic Flyway was 45,700 in 2004 and 50,200 in 2005. Although flyway harvest did not vary significantly between 2004 and 2005, seasonal harvest variations for South Carolina demonstrate how weather may be a significant factor in hunter success throughout the state.

4.3.1.2 Resident Big Game

4.3.1.2.1 Deer

Home range size in mammals often decreases as population density increases (Sanderson 1966). Bridges (1968) and Smith (1970) both observed a threefold increase in home-range size following a die-off in a Florida deer population. Adult bucks generally have larger home ranges than does and these ranges can vary in size due to many environmental factors. In Florida, minimum home ranges averaged 622.8 hectares (1,539 acres) for two mature bucks, and 153.0 hectares (606 acres) for two does, and 153.0 hectares (378 acres) for a buck fawn (Smith 1970). Deer hunting does not have regional

population impacts due to restricted home ranges of white tailed deer. Therefore, only local impacts are likely to occur from deer hunting on the Refuge.

Deer herd health checks are conducted every 5 years on most National Wildlife Refuges by the Southeast Cooperative Wildlife Disease Study at the University of Georgia. In 2005, the health check report stated that “Although continuation of current herd density may result in declines in herd health or higher rates of disease-induced mortality, the data suggests that some level of covert mortality may be present. These losses will predominantly affect younger animals, 4-12 month of age, mainly during winter and early spring, and will be associated with parasitism by stomach worms (*Haemonchus contortus*) and lungworms (*Dictyocaulus viviparus*). Any significant increase in density likely would result in declines in population health from this density-dependent parasitism/malnutrition syndrome.” The 18,251 acres of Refuge lands currently open to deer hunting for have averaged less than 15 deer harvested per season.

Harvest and survey data confirm that decades of deer hunting on surrounding private lands (using bait and a longer season) have not had a local cumulative adverse effect on the deer population. The South Carolina Department of Natural Resources estimates that 14,028,896 deer were harvested in South Carolina in 2005 (SCDNR Harvest Records 2005). Harvest records by each county indicate that Georgetown County harvested 3,464 deer in 2005. This total harvest also computes to 115.4 acres / deer or 5.5 deer/ Square mile. For Horry County, 4,113 deer were harvested in 2005 which also computes to 129.7 acres / deer or 4.9 deer / square mile (SCDNR 2005). These harvest records fluctuate year to year and are down somewhat from a peak in 2002. Harvest rates on Refuge lands have been significantly lower than private lands adjoining the Refuge due to the allowance of baiting, longer seasons and no restrictions of method of take on private lands. Hunting deer on Waccamaw National Wildlife Refuge should not have cumulative impacts on the deer herd.

4.3.1.2.2 Feral Hogs

Feral hogs are an extremely invasive introduced non-native species and are not considered a game species by the State of South Carolina. No bag limits are established for feral hogs. Hunting of feral hogs provides the Refuge with another management tool in reducing this detrimental species, and at the same time, is widely enjoyed by local hunters. Cumulative effects to an exotic, invasive species should not be of concern because the Refuge would like to extirpate this species on Refuge lands. Hunting of hogs is not considered detrimental to the biological integrity of the Refuge, is not likely to create conflict with other public uses and is within the wildlife dependant public uses to be given priority consideration. Since hogs are exotic, they are a priority species for Refuge management only in terms of their negative impacts on Refuge biota and need for eradication. Georgetown County, South Carolina ranked ninth in the state for overall hog harvest in 2005 and increase over all previous years surveyed (SCDNR Hog Harvest Report 2005). This harvest trend indicates an increasing population and a need for increasing the overall annual harvest. They are a popular game species, and the public interest would best be served by allowing this activity on the Refuge. However, even with hunting, feral hogs are likely to always be present because they are prolific breeders.

4.3.1.2.3 Wild Turkey

Turkeys are non-migratory and therefore hunting only impacts the local population. Because the Refuge turkey hunts are restricted to Refuge tracts along the Great Pee Dee, frequent flooding along with many other environmental circumstances often further impedes hunter success. Proposed turkey hunting on the Refuge would be limited to a half-day hunt for four youths during the spring. Based on harvest data from six South Carolina Department of Natural Resources six youth turkey hunts, the overall harvest rates were less than 40% unless accompanied by a professional guide (personal communications with SCDNR Biologist). These data indicate that the local turkey population has withstood hunting on surrounding private lands for several years without significant cumulative effects on turkeys. Therefore the Refuge should not cumulatively impact the population by providing a half-day hunt for 10 youth that could harvest a maximum of 10 turkeys.

4.3.1.3 Small Game (Squirrel, Raccoon, Opossum,)

Squirrels, rabbit, raccoon, and opossum cannot be affected regionally by Refuge hunting because of their limited home ranges. Only local effects will be discussed. Opossum and raccoon are hunted primarily at night. Raccoon are more sought after than opossum by the public. Hunting helps regulate opossum and raccoon populations; however, unless the popularity of this type of hunting increases, raccoons and opossums numbers will always be higher than desired. When these species become extremely overabundant, diseases such as distemper and rabies reduce the populations. However, waiting for disease outbreak to regulate their numbers can be a human health hazard. Cumulative adverse impacts to raccoon and opossum are unlikely considering they reproduce quickly, are difficult to hunt due to their nocturnal habits, and are not as popular for hunting as other game species.

Studies have been conducted within and outside of South Carolina to determine the effects of hunting on the population dynamics of small game. Results from studies have consistently shown that small game, such as rabbits and squirrels, are not affected by hunting, but rather are limited by food resources. Refuge staff consulted with biologists at the South Carolina Department of Natural Resources (SCDNR) in association with this assessment on the cumulative impacts of hunting squirrel, raccoons and opossum. Although overall state harvest data was unavailable for South Carolina for these species, the Refuge hunt program is not expected to have any significant impact even on local populations of these species due to limited Refuge access, and frequent flood events. Under the proposed action, the Refuge estimates a maximum additional 50 squirrels would be harvested. Gray squirrels are prolific breeders and their populations have never been threatened by hunting in South Carolina even prior to the passing of hunting regulations as we know them today.

4.3.1.4 Non-hunted Wildlife

Non-hunted wildlife would include non-hunted migratory birds such as songbirds, wading birds, raptors, and woodpeckers; small mammals such as voles, moles, mice, shrews, and bats; reptiles and amphibians such as snakes, skinks, turtles, lizards, salamanders, frogs and toads; and invertebrates such as butterflies, moths, other insects and spiders. Except for migratory birds and some species of migratory bats, butterflies and moths, these species have very limited home ranges and hunting could not affect their populations regionally; thus, only local effects will be discussed.

Disturbance to non-hunted migratory birds could have regional, local, and flyway effects. Regional and flyway effects would not be applicable to species that do not migrate such as most woodpeckers, and some songbirds including cardinals, titmice, wrens, chickadees, etc. The cumulative effects of disturbance to non-hunted migratory birds under the proposed action are expected to be negligible for the following reasons. Hunting season would not coincide with the nesting season. Long-term future impacts that could occur if reproduction was reduced by hunting are not relevant for this reason. Disturbance to the daily wintering activities, such as feeding and resting, of birds might occur. Disturbance to birds by hunters would probably be commensurate with that caused by non-consumptive users.

The cumulative effects of disturbance to bats under the proposed action are expected to be negligible for the following reasons. However, disturbance would be unlikely for the following reasons. Small mammals, including bats, are inactive during winter when hunting season occurs. These species are also nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Hibernation or torpor by cold-blooded reptiles and amphibians also limits their activity during the hunting season when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season. Encounters with reptiles and amphibians in the early fall are few and should not have cumulative negative effects on reptile and amphibian populations. Invertebrates are also not active during cold weather and would have few interactions with hunters during the hunting season. The Refuge has estimated current hunter density on peak days to be no more than 1 hunter per 1000 acres. During the vast majority of the hunting season, hunter density is much lower (1 hunter/3,000 acres). Refuge regulations further mitigate possible disturbance by hunters to non-hunted wildlife. Vehicles and ATVs are prohibited on Refuge roads and the harassment or taking of any wildlife other than the game species legal for the season is not permitted.

Although ingestion of lead-shot by non-hunted wildlife could be a cumulative impact, it is not relevant to Waccamaw NWR because the use of lead shot would not be permitted on the Refuge for any type of hunting.

Some species of bats, butterflies and moths are migratory. Cumulative effects to these species at the “flyway” level should be negligible. These species are in torpor or have completely passed through South Carolina by peak hunting season in Nov-Jan. Some hunting occurs during September and October when these species are migrating; however, hunter interaction would be commensurate with that of non-consumptive users.

4.3.1.5 Endangered Species

Eight federally listed endangered or threatened species are known to occur or potentially occur within the proposed boundary of the Refuge. These include four species of birds, one species of fish, and three species of plants (listed in Section 3.4). With the exception of the bald eagle, use of Refuge lands by all other threatened and endangered species typically occurs after all Refuge hunting seasons with the exception of turkey season. Resident bald eagles typically nest during the late winter in South Carolina. If Bald eagle nesting activity occurs on, or nearby Refuge lands, closed areas will be established to buffer the nesting area from any human disturbance and/or activity associated with a permitted public use. This would be the same with or without hunting. As with the potential for bald eagle nesting areas, if a wood stork rookery is established, a closed area will be established to buffer the area from any human activity. Because of seasonal use parameters listed above and the legal authority that Refuges have to close areas to public access when necessary, under the no action alternative, there would be no significant decreases of adversely affecting threatened and endangered species than under the limited hunting or unlimited hunting alternatives.

An Intra-Service Section 7 Evaluation Consultation has been completed in April 2007 for the Waccamaw NWR Recreational Hunt Plan (preferred alternative). Based on the current known locations of feeding, nesting, spawning, or physical locations of threatened or endangered species on or adjacent to Refuge lands, it has been determined that the proposed action is not likely to adversely affect these species (Refer to 2007 Section 7 Evaluation for Recreational Hunt Plan on Waccamaw NWR).

4.3.2 Anticipated Direct and Indirect Impacts of Proposed Action on Refuge Programs, Facilities, and Cultural Resources.

4.3.2.1 Wildlife-Dependant Recreation

As public use levels expand over time, unanticipated conflicts between competing user groups may occur. The Refuge's visitor use programs would be adjusted as needed to eliminate or minimize each problem and provide quality wildlife-dependent recreational opportunities. Experience has proven that time and space zoning (e.g., establishment of separate use areas, use periods, and restrictions on the number of users) is an effective tool in eliminating conflicts between user groups. The Waccamaw NWR has focused more resources on establishing public use areas that are closed year-round to hunting than it has on hunting programs throughout the remaining 17,889 acres of Refuge lands.

The level of recreation use and ground-based disturbance from visitors would be largely concentrated at trails and the Refuge's office and maintenance areas. This use should remain the same or increase as interests grows at the same rate with or without hunting. Access to more areas will remain a Refuge priority however the lay of the land will preclude most areas from increased visitor access. However, the hunting season (except for the limited turkey hunt) is during the winter and not during most birds' nesting period. It is unlikely that bald eagles would establish nests near developed facilities or during the hunting season.

The opportunities for hunting would remain the same under the proposed action. High deer, feral hog, and raccoon numbers are recognized as a problem causing crop damage, reducing some forest understory species, and reducing reforestation seedling survival. Hunting would be used to keep these populations as well as other resident wildlife in balance with the habitat's carrying capacity, resulting in long-term positive impacts on wildlife habitat.

The Refuge prohibits all land conveyance vehicle access for any public use on the Refuge to minimize wildlife disturbance and habitat degradation. Some areas, such as waterfowl sanctuaries, would be closed seasonally to hunting to minimize disturbance to wintering waterfowl.

4.3.2.2 Refuge Facilities

The Service defines facilities as: "Real property that serves a particular function(s) such as buildings, roads, utilities, water control structures, raceways, etc." Under the proposed action those facilities most utilized by hunters are: roads, parking lots, trails and boat launching ramps. Because hunters are permitted to access the Refuge by foot only, no additional maintenance or improvements of existing facilities will be required.

4.3.2.3 Cultural Resources

Hunting, regardless of method or species targeted, is a consumptive activity that does not pose any threat to historic properties on and/or near the Refuge. In fact, hunting meets only one of the two criteria used to identify an "undertaking" that triggers a federal agency's need to comply with Section 106 of the National Historic Preservation Act. These criteria, which are delineated in 36 CFR Part 800, state:

- 1- an undertaking is any project, activity, or program that can alter the character or use of an archaeological or historic site located within the "area of potential effect;" and
- 2- the project, activity, or program must also be either funded, sponsored, performed, licenses, or have received assistance from the agency.

Consultation with the pertinent State Historic Preservation Office and federally recognized Tribes are, therefore, not required.

4.3.2.4 Anticipated Impacts of Proposed Hunt on Refuge Environment and Community.

The Refuge expects no sizeable adverse impacts of the proposed action on the Refuge environment which consists of soils, vegetation, air quality, water quality and solitude. Hunting would benefit vegetation as it is used to keep many resident wildlife populations in balance with the habitat's carrying capacity. The Refuge would also control access to minimize habitat degradation.

The Refuge expects impacts to air and water quality to be minimal and only due to boat emissions traveling to and from Refuge lands. The effect of these Refuge-related activities, as well as other management activities, on overall air and water quality in the region are anticipated to be relatively negligible, compared to the contributions of industrial centers, power plants, and non-Refuge vehicle traffic. Existing State water quality criteria and use classifications are adequate to achieve desired on-Refuge conditions; thus, implementation of the proposed action would not impact adjacent landowners or users beyond the constraints already implemented under existing State standards and laws.

Impacts associated with solitude are expected to be minimal given time and space zone management techniques, such as seasonal access and area closures, used to avoid conflicts among user groups.

The Refuge would work closely with State, Federal, and private partners to minimize impacts to adjacent lands and its associated natural resources; however, no indirect or direct impacts are anticipated. The Refuge hunts would result in a net gain of public hunting opportunities positively impacting the general public, nearby residents, and Refuge visitors. The Refuge expects increased visitation and tourism to bring additional revenues to local communities but not a significant increase in overall revenue in any area. Through these direct and indirect economic impacts community support has increased significantly for Refuge land acquisition and public use opportunity funding. For example in the past year, a \$35,000 donation was made by a national hunting / fishing equipment distributor to help fund and to be used as matches for additional grants to establish Waccamaw NWR's first nature trail system. To date, this and other donations now total over \$100,000.

4.3.2.5 Other Past, Present, Proposed, and Reasonably Foreseeable Hunts and Anticipated Impacts

Cumulative effects on the environment result from incremental effects of a proposed action when these are added to other past, present, and reasonably foreseeable future actions. While cumulative effects may result from individually minor actions, they may, viewed as a whole, become substantial over time. The proposed hunt plan has been designed so as to be sustainable through time given relatively stable conditions. Changes in Refuge conditions, such as sizeable increases in Refuge acreage or public use, are likely to change the anticipated impacts of the current plan and would trigger a new hunt planning and assessment process.

The past Refuge hunting program has been very similar to the proposed action in season lengths, species hunted, and bag limits. Changes to the hunt program in the past decade have been made to open hunting on more land within the Refuge. These lands were usually those that had been recently acquired. The Refuge does not foresee any changes to the proposed action in the way of increasing the intensity of hunting in the future.

4.3.2.6 Anticipated Impacts if Individual Hunts are Allowed to Accumulate

National Wildlife Refuges, including Waccamaw NWR, conduct hunting programs within the framework of State and Federal regulations. Waccamaw NWR is more restrictive than most State Wildlife Management Areas (WMA). By maintaining hunting regulations that are as, or more, restrictive than the State regulation on private lands and / or State WMAs, individual Refuges ensure that a better diversity of management option exists upon which statewide and regional management implications can be better assessed. The proposed hunt plan has been reviewed and is supported by the South Carolina Department of Natural Resources. Additionally, South Carolina NWRs coordinate with SCDNR annually to maintain regulations and programs that are consistent with the State management program.

Chapter 5 Consultation and Coordination with Others

The South Carolina Department of Natural Resources concurs and fully supports the regulated consumptive public use of the natural resources associated with the Waccamaw NWR (Refer to Letters of Concurrence). Furthermore the long-term lease agreement between SCDNR and the USFWS for the incorporation of the Bucksport WMA onto the National Wildlife Refuge System as part of Waccamaw NWR requires that there be no net loss of hunting opportunities. The Fish and Wildlife Service also provided an in depth review by the Regional Office personnel and staff biologists. Numerous contacts were made throughout the area of the Refuge soliciting comments, views, and ideas into the development of the accompanying hunting plan.

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U.S. Fish and Wildlife Service. 2006. Waterfowl population status, 2006. Division of Migratory Bird Management, Laurel, Maryland, 60 pp.

Winyah Bay Focus Area Task Force. 1994 (unpubl.) Draft project plan: Winyah Bay Focus Area, an Atlantic Coast Joint Venture project of the North American Waterfowl Management Plan. Winyah Bay Focus Area Task Force, Georgetown, South Carolina. 18pp.

Personal Communications

Mary K. Clark, North Carolina State Museum of Natural Sciences, Raleigh, North Carolina.

Tom Murphy, 2003. South Carolina Department of Natural Resources, Charleston, South Carolina.

Appendix Response to Public Comments

The Service solicited public comment for the 2007 Recreation Hunting Plan and associated Environmental Assessment. The 30-day review period began March 8, 2007 and ended on April 5, 2007. Copies of the document were made available to the public through the refuge headquarters and news releases announcing its availability for comment were placed in a local newspaper.

We received 2 comment letters on our draft EA one of which was against hunting on National Wildlife Refuges, and the other was in favor of the Proposed Action to implement the 2007 Recreational Hunt Plan which would open hunting on 17,892 acres of Waccamaw NWR.

We received a letter from the Humane Society of the United States that contained comments related to hunting on the National Wildlife Refuge System as a whole and containing elements related to litigation filed in 2003 by the Fund for Animals against the Service. These comments were not specific to this draft EA and are noted but not responded to here.

Recreational Hunting
Decision Document Package
for
WACCAMAW NWR

Contents

3. FONSI

FINDING OF NO SIGNIFICANT IMPACT

2007 Recreational Hunting Plan for Waccamaw National Wildlife Refuge

The U.S. Fish and Wildlife Service proposes to open 17,889 acres to hunting by on Waccamaw NWR. Hunting activities will be permitted, but administratively limited to those areas specified in the refuge-specific regulations. All or parts of the refuge may be closed to hunting at any time if necessary for public safety, to provide wildlife sanctuary, or for other reasons. Alternatives considered included: proposed action and no action.

The Service has analyzed the following alternatives to the proposal in an Environmental Assessment (copy attached):

No action alternative - Under this alternative, the Service would not open Refuge owned lands to any form of hunting.

Limited Hunting Alternative (Proposed action) -Under this alternative, the Service would allow limited public hunting migratory game birds and resident game species on 17,889 acres of Waccamaw NWR.

Unlimited Hunting Alternative – Under this alternative, the Service would allow unrestricted hunting during the entire length of the state hunting season on 17,889 acres of Waccamaw NWR.

The preferred alternative was selected over the other alternatives because:

1. The preferred alternative would allow the refuge to manage wildlife populations, allow the public to harvest a renewable resource, promote a wildlife-oriented recreational opportunity, increase awareness of Waccamaw NWR and the National Wildlife Refuge System, and meet public demand.
2. The preferred alternative allows the Refuge to meet all of the lease requirements between the USFWS and the South Carolina Department of Natural Resources for the addition of Bucksport WMA to Waccamaw NWR.
3. The preferred alternative is compatible with general Service policy regarding the establishment of hunting on National Wildlife Refuges.
4. The preferred alternative is compatible with the purpose for which Waccamaw NWR was established.
5. This proposal does not initiate widespread controversy or litigation.
6. There are no conflicts with local, state, regional, or federal plans or policies.

Therefore, it is my determination that the proposal does not constitute a major Federal action significantly affecting the quality of the human environment under the meaning of section 102(2)(c) of the National Environment Policy Act of 1969 (as amended). As such, an environmental impact statement is not required. This determination is based on the following factors (40 CFR 1508.27):

1. Both beneficial and adverse effects have been considered and this action will not have a significant effect on the human environment (EA, page 22-26)
2. The actions will not have a significant effect on public health and safety (EA, page 21).
3. The project will not significantly effect any unique characteristics of the geographic area such as proximity to historical or cultural resources, wild and scenic rivers, or ecologically critical areas (EA, page 18, 22, 28, 37).
4. The effects on the quality of the human environment are not likely to be highly controversial (EA, page 19, 20).
5. The actions do not involve highly uncertain, unique, or unknown environmental risks to the human environment (EA, page 21, 22).
6. The actions will not establish a precedent for future actions with significant effects nor does it represent a decision in principle about a future consideration (EA, pages 38, 39).
7. There will be no cumulative significant impacts on the environment. Cumulative impacts have been analyzed with consideration of other similar activities on adjacent lands, in past action, and in foreseeable future actions (EA, pages 30-40).
8. The actions will not significantly affect any site listed in, or eligible for listing in, the National Register of Historic Places, nor will they cause loss or destruction of significant scientific, cultural, or historic resources (EA, pages 22, 38).
9. The actions are not likely to adversely affect endangered or threatened species, or their habitats (Intra-Service Section 7 Biological Evaluation Form attached to EA).
10. The actions will not lead to a violation of federal, state, or local laws imposed for the protection of the environment (EA, pages 40).

Implementation of the agency's decision would be expected to result in the following environmental, social, and economic effects:

1. The refuge could better manage wildlife populations.
2. This would allow the public to harvest a renewable resource.
3. The public would have increased opportunity for wildlife-oriented recreation.
4. Local businesses would benefit from hunters visiting from surrounding parishes.
5. The Service will be perceived as a good steward of the land by continuing traditional uses of land in South Carolina and by allowing youth an opportunity to learn about hunting.

Measures to mitigate and/or minimize adverse effects have been incorporated into the proposal. These measures include:

1. Youth turkey hunt will be limited to 4 adult/youths for ½ day each in a limited area of the refuge
2. Baiting for any wildlife will be prohibited. Deer hunting will be limited to two week intervals beginning with an emphasis on archery and muzzle loader hunts. The overall duration of all hunts will be reduced considerably from the corresponding state seasons.
3. Waterfowl hunting will be limited to 12:00 noon Saturdays only.
4. The refuge law enforcement program and closely regulated hunting season will ensure hunt regulation compliance and will protect refuge resources.

The proposal is not expected to have any significant adverse effects on wetlands and flood plains, pursuant to Executive Orders 11990 and 11988 because this area has historically had a high use of recreational hunting with no detrimental long-term effect on wetlands.

The proposal has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include:

- § U.S. Fish and Wildlife Service, Division of Ecological Services, Charleston, SC
- § South Carolina Department of Natural resources, Chief of Wildlife Division

Copies of the Environmental Assessment are available by writing:

Waccamaw National Wildlife Refuge
PO Box 1439
Georgetown, SC 29440

References: Environmental Assessment of 2007 Recreational Hunt Plan for Waccamaw NWR, Hunting Plan, Compatibility Determination, Letters of Concurrence, Refuge-specific Regulations, Intra-Service Section 7 Evaluation

Chris J. Jones
Regional Director

4/24/07
Date