

DRAFT LAND PROTECTION PLAN AND ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED ESTABLISHMENT OF **MOUNTAIN BOGS NATIONAL WILDLIFE REFUGE**

Alleghany, Ashe, Avery, Clay, Graham, Henderson, Jackson, Macon, Transylvania, Watauga, and Wilkes Counties, North Carolina, and Carter and Johnson Counties, Tennessee



Southeast Region

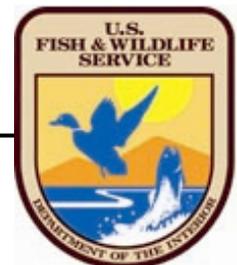


TABLE OF CONTENTS

DRAFT LAND PROTECTION PLAN

I.	INTRODUCTION AND PURPOSE.....	1
	Project Description	1
	Refuge Purpose(s)	1
II.	RESOURCES.....	5
	Resources To Be Protected	5
	Vegetative Communities	5
	Bog Habitats.....	6
	Fish and Wildlife.....	7
	Threatened, Endangered, and Candidate Species	8
	Threats	10
	Habitat Loss Through Land Conversion.....	10
	Nonnative Plants	10
	Climate Change	10
	Relationship of Project to Landscape Conservation Goals and Objectives.....	11
	Partnership Efforts/Related Resources	12
III.	LAND PROTECTION STRATEGY	13
	Action and Objectives.....	13
	Authorities for Establishing the Refuge	13
	Land Use.....	13
	Land Protection Priorities	13
	Land Protection Options	18
	Option 1. Management or Land Protection by Others	18
	Option 2. Less-than-fee-title Acquisition by the service.....	18
	Option 3. Fee-title Acquisition by the service	19
	Land Protection Methods.....	20
	Purchase	20
	Cooperative Agreements	20
	Donations.....	20
	Service Land Acquisition Policy.....	21
	Funding.....	21
IV.	COORDINATION	23
	Informational Meetings with Bog Conservation Partners.....	23
	Elected official Contacts	23
	Public Outreach	23

DRAFT ENVIRONMENTAL ASSESSMENT

I.	PURPOSE AND NEED FOR ACTION.....	25
	Introduction.....	25
	Purpose and Need.....	26
	Habitat Loss Through Land Use Conversion	29
	Background	30

Proposed Action.....	30
Coordination and Consultation.....	31
Public Participation.....	31
Public Scoping.....	31
II. AFFECTED ENVIRONMENT.....	33
Physical Environment.....	33
Topography and Geology.....	33
Climate and Climate Change.....	36
Air Quality.....	37
Water Quality.....	40
Hydrology and water quantity.....	42
Noise.....	42
Biological Environment.....	42
Vegetative Communities.....	43
Bog Habitats.....	44
Nonnative Plants.....	46
Exotic Pests.....	47
Fish and Wildlife.....	47
<i>Empidonax alnorum</i>	48
Threatened, Endangered, and Candidate Species.....	49
Related Resources.....	53
Socioeconomic Environment.....	54
Population.....	55
Employment and Income.....	58
Tourism.....	61
Wildlife-dependent Recreation.....	62
Land Use and Management Status.....	65
Transportation Facilities and Utility Corridors.....	69
Cultural Resources.....	69
Cherokee Heritage.....	70
Agricultural Heritage.....	71
III. ALTERNATIVES, INCLUDING THE PROPOSED ACTION.....	73
Introduction.....	73
Description of Alternatives.....	75
Alternative A – No Action.....	75
Alternative B – Proposed Action.....	77
Summary.....	81
IV. ENVIRONMENTAL CONSEQUENCES.....	83
Alternative A: No Action Alternative.....	83
Effects on the Physical Environment.....	84
Effects on the Biological Environment.....	88
Effect on Socioeconomic Environment.....	91
Effects on Cultural Resources.....	95

Alternative B: Proposed Action.....	95
Effects on the Physical Environment.....	95
Effects on the Biological Environment.....	100
Effects on Socioeconomic Environment.....	103
Effects on Cultural Resources.....	106
Cumulative Effects.....	107
Physical Resources.....	107
Biological Resources.....	108
Socioeconomic Environment.....	110
Cultural Resources.....	111
Unavoidable Adverse Effects.....	111
Relationship between Short-term Uses of the Human Environment and Enhancement of Long-term Productivity.....	111
Potential Irreversible and Irretrievable Commitments of Resources.....	111
Environmental Justice.....	112
Summary of Effects.....	112
Summary.....	115
Recommendation.....	115
Glossary.....	116
References.....	119

APPENDICES

APPENDIX A. DRAFT CONCEPTUAL MANAGEMENT PLAN.....	133
Introduction.....	133
Purpose of Conceptual Management Plan.....	133
Mission of the Service and the National Wildlife Refuge System.....	134
Background and Rationale for the Establishment of the Proposed Mountain Bogs NWR.....	136
Laws Guiding the National Wildlife Refuge System.....	137
Purpose of Establishment and Land Acquisition Authority.....	138
Vision for the Proposed Mountain Bogs National Wildlife Refuge.....	139
Goals of the Proposed Mountain Bogs National Wildlife Refuge.....	139
Administration.....	148
Partnerships.....	150
Management of Mountain Bogs National Wildlife Refuge.....	151
References.....	158
APPENDIX B. INTERIM APPROPRIATENESS FINDINGS AND INTERIM COMPATIBILITY DETERMINATIONS.....	161
Appropriate Use Findings.....	161
Compatibility Determinations.....	164
References.....	176
APPENDIX C. INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION.....	177
APPENDIX D. INTERIM RECREATION ACT FUNDING ANALYSIS.....	181
APPENDIX E. PUBLIC INVOLVEMENT.....	183
APPENDIX F. INFORMATION ON PREPARERS.....	185

LIST OF FIGURES

Figure 1.	Location map of conservation partnership areas.....	2
Figure 2.	Conservation partner protected lands	14
Figure 3a.	Potential CPAs proposed for inclusion in the proposed Mountain Bogs NWR.....	27
Figure 3b.	Potential CPAs proposed for inclusion in the proposed Mountain Bogs NWR.....	28
Figure 4.	Blue Ridge Ecoregion Area of Influence.....	34
Figure 5.	Projected changes in average annual temperatures in the region during the next 40 years	38
Figure 6.	Projected changes in average annual precipitation in the region during the next 40 years	39
Figure 7.	Area conservation lands	57
Figure 8a.	Land use in the AOI.....	67
Figure 8b.	Land use in the AOI.....	68
Figure 9a.	Existing area conservation lands and proposed CPAs.....	78
Figure 9b.	Existing area conservation lands and proposed CPAs.....	79

LIST OF TABLES

Table 1.	Federally listed and candidate species found in mountain bog habitats	9
Table 2.	Land use in the conservation partnership areas, 2006	15
Table 3.	CPAs for the proposed establishment of Mountain Bogs NWR	16
Table 4.	Soil types within the CPA's	35
Table 5.	Land cover within the CPAs	43
Table 6.	Priority migratory bird species associated with mountain bogs and adjacent habitats	48
Table 7.	Federally listed, candidate, and federal species of concern found in mountain bog habitats	49
Table 8.	State listed species known to occur in the CPAs	51
Table 9.	Local and regional population estimates, characteristics, and trends (2000 - 2010)	55
Table 10.	National and state population trends (2000–2030)	58
Table 11.	Percent full and part-time employment in 2010 by industry for counties in the AOI	59
Table 12.	Income, unemployment, and poverty estimates	60
Table 13.	Tourism-based revenue for North Carolina counties in the AOI	61
Table 14.	Tourism-based revenue for Tennessee counties in the AOI for 2010	62
Table 15.	Economics of wildlife-dependent recreation in North Carolina during 2006	63
Table 16.	Economics of wildlife-dependent recreation in Tennessee during 2006	63
Table 17.	Land cover in the CPAs and surroundings	66
Table 18.	Summary of potential environmental effects analyzed under Alternatives A and B	112

DRAFT LAND PROTECTION PLAN

I. Introduction and Purpose

The Fish and Wildlife Service (Service) proposes to protect and manage rare and severely threatened wetlands in the southern Appalachian Mountains of eastern Tennessee and western North Carolina through the establishment of Mountain Bogs National Wildlife Refuge (NWR). The land being proposed for protection includes a diverse system of bog and fen wetlands and surrounding upland buffers, including high-mountain grasslands, spruce-fir forests, and hardwood forests. This proposal represents an unprecedented opportunity to protect one of the rarest wetland community types and most imperiled habitat types in the southeastern United States (Noss et al. 1995 and references therein; Richardson and Gibbons 1993 and references therein), while also affording permanent protection and management of a number of federal trust species. Protection of mountain bogs is directly aligned with the Service's national priorities of threatened and endangered species recovery, migratory bird conservation, landscape-level conservation, and connecting people with nature. Protection of mountain bog habitats is likewise identified as a priority action in the Service's Strategic Plan for the Southern Appalachian Ecosystem, the Strategic Plan for the Asheville Ecological Services Field Office, and in the recovery plans for each of those federally listed species which occur within mountain bog habitats. Furthermore, many of the species that would be offered additional protection through this proposal have been identified in North Carolina and Tennessee state wildlife action plans.

The protection and management of these resources in western North Carolina and eastern Tennessee can be achieved through a combination of fee-title purchases from willing sellers and leases, conservation easements, cooperative agreements from willing landowners, and other options (e.g., donations). All land and water acquired would be managed by the Service or in partnership with other conservation organizations as the Mountain Bogs National Wildlife Refuge.

PROJECT DESCRIPTION

Mountain bogs are relatively isolated from one another and spread across the landscape. The proposed establishment of the Mountain Bogs NWR defines 30 Conservation Partnership Areas (CPA) encompassing approximately 42,250 acres as depicted in Figure 1. These CPAs provide an area within which the Service would have the authority to acquire up to 23,478 acres, in fee title or easements from willing sellers, scattered across as many as 30 sites. All lands acquired, up to 23,478 acres, would be contained within the boundary of the proposed Mountain Bogs NWR.

REFUGE PURPOSE(S)

It is envisioned that the proposed refuge would:

- Protect some of the last remaining examples of Appalachian Mountain bogs;
- Protect and maintain habitat for a diversity of fish, wildlife and plant species;
- Provide habitat for nongame neotropical migratory birds;

Figure 1. Location map of conservation partnership areas



-
- Conserve habitat for 13 federally listed species including the bog obligate mountain sweet pitcher plant, green pitcher plant, bunched arrowhead, swamp pink and bog turtle; and 83 state listed species;
 - Provide breeding, wintering, and migration habitat for the American woodcock;
 - Provide opportunities for environmental education, interpretation, and wildlife-dependent recreation;

Four overarching goals were developed for the proposed Mountain Bogs NWR, as follows:

Goal 1. Protect, Restore, and Manage Habitats for Fish and Wildlife. The proposed Mountain Bogs NWR would conserve rare mountain bog habitat and associated species as well as adjacent upland habitats. The proposed refuge would aid in the recovery of 13 federally listed species and one candidate species and benefit many other state listed and imperiled species, including migratory birds and southern Appalachian brook trout.

Goal 2. Provide Landscape-Level Conservation. The proposed Mountain Bogs NWR, which would be within the Appalachian Landscape Conservation Cooperative, would contribute to a more connected and functional conservation landscape by reducing habitat fragmentation, and protecting and restoring a network of exceptionally rare wetland types and their surrounding landscapes. This proposed refuge would also protect and enhance water quality and quantity within multiple watersheds, benefiting both humans and wildlife.

Goal 3. Connect People with Nature. Visitors of all abilities to the proposed Mountain Bogs NWR would enjoy opportunities for compatible hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of southern Appalachian Mountain bogs.

Goal 4. Promote Conservation Partnerships. Collaboration in science, education, and research would strengthen and develop partnerships with bog conservation organizations, private landowners, government agencies, and others to help inform land management decisions and encourage continued responsible stewardship of mountain bogs and other associated natural resources.

Additional Goal detail is provided in Appendix A.

II. Resources

RESOURCES TO BE PROTECTED

The Southern Blue Ridge Ecoregion (Ecoregion) is one of the most biologically significant ecoregions in the United States due to its unique geology, topography, and floristics (TNC and SAFC 2000). At least 136 natural terrestrial communities have been identified in the region and more than 90 percent of these are considered endemic or limited to the Ecoregion. There are nearly 400 rare plant species while the forests are some of the most diverse in the United States. The Ecoregion is the center of the world's salamander diversity and has the highest number of terrestrial snail species of any Ecoregion in the United States. A high diversity of bird species breed and winter in the Appalachian Mountains and the region is very important for birds during migration. Additionally, the freshwater systems are exceptionally rich in species diversity, with 66 at-risk aquatic species occurring in the Ecoregion, 20 of which are federally listed as threatened or endangered (The Nature Conservancy and Southern Appalachian Forest Coalition 2000).

The following section describes vegetative communities; bog habitats; general fish and wildlife diversity; threatened, endangered, and imperiled species; and nonnative plants and animals found in the CPAs.

VEGETATIVE COMMUNITIES

This section provides a broad overview of the vegetative communities across the CPAs. For the purposes of this proposal, vegetative communities or ecological systems as defined by NatureServe were used (NatureServe 2007), which were mapped using Southeast Gap Analysis Project (SEGAP) land-cover data (U.S. Geological Survey and North Carolina State University 2010).

The CPAs included more than 20 different vegetative communities, which are further detailed in Chapter II (Affected Environment) of the Draft Environmental Assessment. Several of the dominant native vegetative types found in the CPAs are summarized below.

Southern and Central Appalachian Oak Forest

This is the largest vegetative community within the CPA and makes up 19,201 acres (45 percent) of the CPA's land cover. It consists primarily of dry-mesic forests occurring on open and exposed topography at lower- to mid-elevations. Typically, the vegetation consists of forests dominated by oaks, especially chestnut oak (*Quercus prinus*), white oak (*Q. alba*), red oak (*Q. rubra*), and scarlet oak (*Q. coccinea*), with varying amounts of hickories (*Carya* spp.), red maple (*Acer rubrum*), and other species. Successional communities within these forests are dominated by tuliptree (*Liriodendron tulipifera*), pines (*Pinus* spp.), and black locust (*Robinia pseudoacacia*), many of which have been impacted by logging or agriculture (NatureServe 2007). Selected priority species that utilize this habitat include Cooper's and sharp-shinned hawks (*Accipiter cooperii* and *A. striatus*), black-billed cuckoo (*Coccyzus erythrophthalmus*), cerulean warbler (*Dendroica cerulea*), golden-winged warbler (*Vermivora chrysoptera*), least weasel (*Mustela nivalis*), timber rattlesnake (*Crotalus horridus*), and tellico salamander (*Plethodon aureolus*) (North Carolina Wildlife Resources Commission/NCWRC 2005, Tennessee Wildlife Resources Agency/TWRA 2005).

Southern and Central Appalachian Cove Forest

Cove forests comprise about 4,597 acres (11 percent of the CPA's coverage), and are characterized by hardwoods or hemlock-hardwoods located in sheltered topographic positions, typically on concave slopes that promote moist conditions. Characteristic species in the canopy include yellow buckeye (*Aesculus flava*), sugar maple (*Acer saccharum*), American ash (*Fraxinus americana*), American basswood (*Tilia americana*), tuliptree, Carolina silverbell (*Halesia tetraptera*), eastern hemlock (*Tsuga canadensis*), American beech (*Fagus grandifolia*) and magnolias (*Magnolia acuminata* and *M. fraseri*) (NatureServe 2007). A developing threat to this community is the spread of the nonnative hemlock woolly adelgid (*Adelges tsugae*), which could cause substantial changes in the structure and function of this habitat (Ford et al. 2007, Spaulding and Rieske 2010). Examples of priority species supported by this habitat include yellow-bellied sapsucker (*Sphyrapicus varius*), woodland jumping mouse (*Napaeozapus insignis*), smoky shrew (*Sorex fumeus*), eastern hog-nosed snake (*Heterodon platirhinos*), seepage salamander (*Desmognathus aeneus*), and pigmy salamander (*D. wrighti*) (North Carolina Wildlife Resources Commission 2005, Tennessee Wildlife Resources Agency 2005).

Central and Southern Appalachian Montane Oak Forest

These forest types cover about 3,005 acres or 7 percent of the total CPA cover. These high-elevation deciduous forests occur on exposed sites, mostly between 3,000-4,500 feet in elevation. They are dominated by oaks, most commonly red and white, with trees often stunted or wind-flagged. American chestnut (*Castanea dentate*) sprouts are also common, but this species has been dramatically reduced by chestnut blight decades ago. Mountain holly (*Ilex montana*) and early azalea (*Rhododendron prinophyllum*) are characteristic shrubs. Major threats include fire suppression and gypsy moth (*Lymantria dispar*) (NatureServe 2007). This habitat supports many priority bird species also found in other oak-dominated forests. In addition, over 10 imperiled salamander species are found here (NCWRC 2005, TWRA 2005).

Central and Southern Appalachian Northern Hardwood Forest

These hardwood forests are found at higher elevation, generally above 4,500 feet. Comprising 2,336 acres (6 percent) of the CPAs, they are dominated by yellow birch, American beech, yellow buckeye, and sugar maple on mesic sites and northern red oak on drier sites. This vegetative community is rare as these high elevations are uncommon regionally (NatureServe 2007). Priority species found in this habitat include northern saw-whet owl (*Aegolius acadicus*), rose-breasted grosbeak (*Pheucticus ludovicianus*), northern flying squirrel (*Glaucomys sabrinus*), Appalachian cottontail (*Sylvilagus obscurus*), and Weller's salamander (*Plethodon welleri*) (NCWRC 2005, TWRA 2005).

BOG HABITATS

Bogs can be found embedded in a variety of vegetative communities. In addition, their relatively small size generally makes it difficult for them to be resolved at the scale used for SEGAP land cover data. Hence, a more detailed description of the diversity of bog habitats is provided below.

Throughout the southern Appalachians, the terms “bog,” “fen,” or “seep” are variously applied to mountain wetlands. This document adopts this common usage, and that of the North Carolina State Wildlife Action Plan (NCWRC 2005) in referring to a variety of mountain wetland habitats as “mountain bogs.” Specifically included here are swamp forest-bog complexes, southern Appalachian bogs and fens, hillside and low mountain seepage bogs, high and low elevation seeps, and meadow bogs as classified by the North Carolina Natural Heritage Program (Weakley and Schafale 1994; Schafale and Weakley 1990).

Mountain bogs are widely accepted as among the rarest and most imperiled habitat types in the southeastern United States (Noss et al. 1995 and references therein; Richardson and Gibbons 1993 and references therein). These habitats are typically small (most are less than 20 acres, and many are less than 2 acres) and can be isolated from more extensive wetland systems; features which have contributed to their having been mostly overlooked by larger scale wetland classification systems (e.g., Cowardin et al. 1979) and in the interpretation of remotely sensed imagery (e.g., Landsat imagery, National Wetlands Inventory Maps). As a result of climate fluctuations since the last glacial retreat, southern Appalachian Mountain bogs may contain disjunct or relict species of northern and Coastal Plain origin (Weakley and Schafale 1994). Several authors have acknowledged a role for logging, fire, grazing, and beaver activity in the creation or maintenance of these habitats (Weakley and Schafale 1994).

Mountain bog vegetation is variable within the CPAs, and many bogs contain a diverse mixture of herbaceous and woody plants. The vegetative community is influenced by hydrology, soils, topography, disturbance history, and current land use activities. Each site can be quite different floristically from one to the next. Sphagnum is thought to be a keystone species in many mountain wetlands because it maintains the hydrology of the site by holding and slowly releasing water, and prevents soils from drying out during periods of drought. Many of the rare species associated with these habitats, including the bog turtle, four-toed salamander, orchids, and pitcher plants, live in or reproduce in this moss.

Some of the rare plants that can be found in bogs include cinnamon fern, royal fern, bog laurel, golden club, cranberry, carnivorous plants, beak rush, bulrushes, and sedges. Trees associated with bogs may include red maple, white pine, hemlock, pitch pine, river birch, and occasionally red spruce. Shrubs such as rhododendron, alder, poison sumac and bog rose are often found in and around bogs. Herbaceous vegetation may include many species of sedges and rushes, and mountain wildflowers (herbs).

Mountain bogs are recognized hotspots for biodiversity and endemism, containing numerous rare and declining plant species (Weakley and Schafale 1994). Of these species, 17 are either federally listed under the Endangered Species Act or recognized by the Service as federal species of concern. In addition, several plant species listed by the North Carolina Plant Conservation Program (NCPCP) are found in mountain bogs. Another 41 plant species associated with mountain bog species have been proposed for state listing by NCPCP. Numerous rare plants associated with bogs in the Blue Ridge Mountains have also been identified by Tennessee's Natural Heritage Program (2012). As in many parts of the country, rare plants are at risk from development, invasive plants, poaching, and other threats. Even if a site is protected from development, plants sought after by collectors can be at risk. For example, several endangered bunched arrowhead plants were recently removed from a protected site in South Carolina, one of the few locations worldwide that supports these imperiled plants (South Carolina Department of Natural Resources 2012).

FISH AND WILDLIFE

General Wildlife Diversity

A variety of wildlife species use the diverse habitats within the CPAs. Common game species are described in Chapter II of the Draft EA.

Mammals

Mammal species include many of those commonly found in the eastern United States, including raccoon, mink, muskrat, river otter, and beaver and a variety of small mammals. Several species of bats breed and hibernate in the area, and the Blue Ridge Mountains serve as a major avenue for migrating bats.

Birds

Mountain bogs and adjacent habitats provide important habitat for a variety of bird species. In addition to many resident and short-distance migratory species, these habitats are important to many neotropical migratory songbirds, providing breeding and wintering habitat and serving as stopover sites during migration. In southern Appalachian wetlands, habitat succession ranges from open, early-successional grasslands to late-successional, forested bogs; thus, these wetlands may provide important breeding habitats for both early- and late-successional breeding species, some of which are undergoing the greatest rates of population decline (Bullock and Rowe 2006). A list of several imperiled avian species often associated with mountain bogs can be found in Chapter II of the Draft EA.

Amphibians and Reptiles

The area provides habitat for many generalist and opportunistic amphibian and reptile species. In addition, several rare reptile species are supported, including timber rattlesnake (*Crotalus horridus*) and coal skink (*Eumeces anthracinus*). Common reptile species often found in mountain wetlands include queen snake, Eastern kingsnake, and Eastern box turtle. The Blue Ridge Ecoregion has the highest diversity of salamanders in the world (Hicks and Pearson 2003). Species found within the CPAs include seepage salamander (*Desmognathus aeneus*), shovel-nose salamander (*Desmognathus marmoratus*), green salamander (*Aneides aeneus*), and Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*). Priority salamander species associated with bogs include mole salamander (*Ambystoma talpoideum*), marbled salamander (*Ambystoma opacum*), four-toed salamander (*Hemidactylium scutatum*), three-lined salamander ([*Eurycea guttolineata*](#)), and spotted salamander ([*Ambystoma maculatum*](#)).

Fish and Other Aquatic Animals

Commonly known species of fish include bluegill (*Lepomis macrochirus*), muskellunge (*Esox masquinongy*) large- and small-mouth bass (*Micropterus salmoides* and *M. dolomieu*), and brook trout (*Salvelinus fontinalis*). Less well-known species include redlip shiner (*Notropis chiliticus*), golden redhorse (*Moxostoma erythrurum*), and rosyside dace (*Clinostomus funduloides*). In addition to fish, the area supports a variety of mussels, crayfish, and other invertebrate species. A number of these aquatic invertebrates are rare and imperiled.

THREATENED, ENDANGERED, AND CANDIDATE SPECIES

Federally Listed Species

Habitat within the CPAs supports at least 13 threatened and endangered species, and one candidate species. Six of these are bog obligate species and are listed in Table 1.

Table 1. Federally listed and candidate species found in mountain bog habitats

Common name	Scientific name
<i>Endangered</i>	
Bunched arrowhead*	<i>Sagittaria fasciculata</i>
Mountain sweet pitcher plant*	<i>Sarracenia rubra</i> ssp. <i>jonesii</i>
Green pitcher plant*	<i>Sarracenia oreophila</i>
Rock gnome lichen	<i>Gymnoderma lineare</i>
Roan Mountain bluet	<i>Houstonia Montana</i>
Spreading avens	<i>Geum radiatum</i>
Virginia big-eared bat	<i>Corynorhinus townsendii virginianus</i>
Carolina northern flying squirrel	<i>Glaucomys sabrinus coloratus</i>
<i>Threatened</i>	
Swamp pink*	<i>Helonias bullata</i>
Small whorled pogonia	<i>Isotria medeoloides</i>
Heller's blazing-star	<i>Liatris helleri</i>
Virginia spiraea	<i>Spiraea virginiana</i>
Bog turtle* (T(S/A))^a	<i>Glyptemys muhlenbergii</i>
<i>Candidate</i>	
White fringeless orchid*	<i>Platanthera integrilabia</i>

^a The southern population of the bog turtle is listed as Threatened due to Similarity of Appearance (T(S/A)) with the northern population of the bog turtle.

*Bog obligate species

In addition, 36 federal species of concern can also be found within the CPAs, including Eastern hellbender, golden-winged warbler, gray's lily, and Cuthbert's turtlehead.

State Listed Species

The study area supports hundreds of state listed and priority species. The CPAs support at least 20 state (North Carolina, Tennessee, or both) threatened and endangered designations. These and additional state species of concern are outlined in Chapter II of the Draft EA.

THREATS

HABITAT LOSS THROUGH LAND CONVERSION

It is estimated that bog habitats have been reduced by some 80-90 percent (Noss et al. 1995; Weakley and Schafale 1994). Most of this habitat loss is the result of decades of land use conversion undertaken in support of agricultural, industrial, commercial, or residential development and disruption of normal hydrologic processes. Currently, the single greatest threat to mountain bogs is the loss and alteration of habitat resulting from development.

Another threat, often indirectly associated with increasing urbanization, is an increase in woody vegetation that shades out rare bog plants. It is believed that vegetative succession is occurring at an accelerated rate at remaining bog sites because historical disturbance regimes (grazing, browsing, beaver activity, and fire) have been eliminated or drastically reduced across the landscape (North Carolina Wildlife Resources Commission 2005). In human-modified landscapes, the elimination or reduction in these disturbance regimes not only degrades existing sites, but often precludes the formation of new bogs, further compounding the problem (Smith 1993).

NONNATIVE PLANTS

Nonnative plants are known to occur across southern Appalachian forests, accounting for 15-20 percent of the documented flora. While not all nonnative species are known to disrupt native ecosystems, of particular concern are those that are successful at invading and rapidly spreading through natural habitats, resulting in changes in the native vegetative community. A list of some of the more problematic nonnative plants that invade bog habitats can be found in Chapter II of the Draft EA.

CLIMATE CHANGE

Chapter II of the Draft EA includes a more detailed discussion on climate change. Overall, the effects of climate change are expected to have a negative effect on mountain bogs, as summarized below (excerpt taken from Draft North Carolina Ecosystem Response to Climate Change: DENR Assessment of Effects and Adaptation Measures; NC Department of Environment and Natural Resources/NC DENR 2010).

“The effect of an expected increase in both droughts and intense rainfall events may be particularly important for these systems. Many bogs are located in bottomland locations that do not regularly flood, but which would flood in extreme events. Besides stream flooding, overland runoff from adjacent uplands during severe storms would be a problem in many bogs. The nutrient input and potential scouring of severe floods would be detrimental to bog communities. While plants in bogs are probably never

truly limited by moisture, droughts would have significant effects on competitive relationships among species and on the community as a whole. Droughts in the present climate appear to have exacerbated the ongoing invasion of upland and generalist wetland plants in some bogs.”

RELATIONSHIP OF PROJECT TO LANDSCAPE CONSERVATION GOALS AND OBJECTIVES

The proposed Mountain Bogs NWR, within the Appalachian Landscape Conservation Cooperative (LCC), would contribute to a more connected and functional conservation landscape by reducing habitat fragmentation, and protecting and restoring a network of exceptionally rare wetland types and their surrounding landscapes. This refuge would also protect and enhance water quality and quantity within multiple watersheds, benefiting both humans and wildlife.

The Service would work with public and private partners to restore and maintain habitat connectivity throughout the landscape in part by working to reduce habitat fragmentation by connecting and buffering lands that are already protected. Many bog sites are hydrologically connected and these connections support important movement corridors for wildlife from one small site to another, thus creating local populations of particular species not associated with a single site, but a larger complex of sites within the drainage (NCWRC 2005). Populations of plants and animals are becoming increasingly isolated as more wetlands are destroyed. This proposed refuge would work to connect disjunct populations by protecting corridors. It is vital to recreate and retain these connections to facilitate movement of wildlife and gene flow between populations. Connections to nearby streams and forests would help maintain/create healthy populations and would also allow certain species to migrate and adapt to changes in habitats such as those that might result from climate change. Furthermore, this proposed refuge would work to buffer existing bogs and associated streams to improve water quality/quantity not only for the bogs and associated flora and fauna, but also for wildlife and humans downstream. These efforts would allow for a more intact and functional landscape.

Proposed management would complement the management of adjacent and nearby conserved lands, both public and private, thus enhancing the Service’s wildlife management contribution to the region and helping to create a more functional conservation landscape.

The proposed refuge would contribute to many landscape conservation goals and objectives, as well as partner efforts, including the Appalachian Landscape Conservation Cooperative (USFWS 2011); conservation and mitigation banks; and international, national, and regional conservation plans and initiatives. Several of these are listed below.

International:

Partners in Flight (PIF) North American Landbird Bird Conservation Plan (Rich et al. 2004)

National:

America’s Great Outdoors (AGO) Initiative (AGO 2011)

Wetlands Reserve Program (WRP) of the Natural Resources Conservation Service (NRCS 2011)

Partners for Fish and Wildlife (USFWS 2007)

Forest Stewardship Program (USDA Forest Service 2011)

Strategic Plan for Responding to Accelerating Climate Change (USFWS 2009)

Regional:

Partners in Flight Bird Conservation Plan for the Southern Blue Ridge (Hunter et al. 1999)
Threatened and Endangered Species Recovery Plans (USFWS 2012)
Southern Blue Ridge Ecoregional Conservation Plan (The Nature Conservancy and Southern Appalachian Forest Coalition 2000)
Blue Ridge National Heritage Area (BRNHA) Management Plan (BRNHA 2008)
Southern Blue Ridge Fire Learning Network (2012)

State:

North Carolina Wildlife Action Plan (NCWRC 2005)
North Carolina Department of Environment and Natural Resources 2009-2013 Strategic Plan (NCDENR 2009)
Tennessee's Comprehensive Wildlife Conservation Strategy (TWRA 2005)
Climate Change and Potential Impacts to Wildlife in Tennessee (TWRA 2009)
North Carolina's Blue Ridge Forever (Conservation Trust for North Carolina 2012)

County:

Henderson County 2020 Comprehensive Plan (Henderson County 2008)
Growing with Green in our Minds: Strategies for Land Conservation in Jackson County (Jackson County 2008)
Citizens' Plan for Watauga (Watauga County 2010)

PARTNERSHIP EFFORTS/RELATED RESOURCES

Several state and federal agencies are among the partners in this landscape, including the North Carolina Wildlife Resources Commission (NCWRC), North Carolina Forest Service, North Carolina Natural Heritage Program, Tennessee Wildlife Resources Agency (TWRA) North Carolina Division of Parks and Recreation, North Carolina Department of Transportation, USDA Forest Service, USDA's Natural Resources Conservation Service (NRCS), and National Park Service.

The proposed Mountain Bogs NWR would provide local and regional benefits to wildlife by working in concert with existing conservation areas and partners, including Nantahala, Pisgah and Cherokee National Forests, The Nature Conservancy, North Carolina Wildlife Resources Commission, North Carolina Plant Conservation Program, North Carolina State Parks, and area land trusts. Restoration and management activities would assist in accomplishing the goal of providing landscape-level conservation by contributing to ecological resiliency across the landscape.

Figure 2 depicts current conservation lands and waters within the study area. Many of our partners already own or have future plans to protect lands in the project area through conservation or agricultural easements. Still others have completed on-the-ground habitat restoration projects throughout the area. Taken together, the efforts have aided the protection of state and federal listed threatened and endangered species, mountain forests, farmlands, and recreational areas that contribute to the long-term ecological health, economy, and way of life of the region. The Service's proposed refuge provides an overarching level of protection which complements and enhances the partnership efforts in the area and takes the protection of these valuable resources to a new level.

III. Land Protection Strategy

ACTION AND OBJECTIVES

AUTHORITIES FOR ESTABLISHING THE REFUGE

Based on the refuge purposes, a refuge could be established under the following statutory authorities:

1. National Wildlife Refuge System Administration Act; (16 U.S.C. 668dd(b))
2. Endangered Species Act of 1973 (16 U.S.C. 1534)
3. Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3921-3923);
4. Fish and Wildlife Act of 1956 (16 U.S.C. 742a); and
5. Migratory Bird Treaty Act (16 U.S.C. 703-712).

LAND USE

Land use has similarities to land cover, but is often used to show anthropogenic uses of an area. For the purposes of this Draft Land Protection Plan (Draft LPP), the National Land Cover Dataset (NLCD) was used to portray land use. The majority of the lands in the CPAs is considered to be in “open” or undeveloped land uses and most parcels are in private ownership (Fry et al. 2011). Table 2 summarizes the general types of land cover of the entire area contained in the CPAs. In general, the land is a mix of forested and non-forested wetlands, forested uplands, and agricultural lands. Deciduous forest is the dominant land cover type (over 73 percent), followed by planted/cultivated land, evergreen forest, and mixed forest. All other land use classes each contributed less than 5 percent of the total cover.

LAND PROTECTION PRIORITIES

The Service’s proposed action (Alternative B) would result in the establishment of Mountain Bogs NWR through the protection of up to 23,478 acres, including critically rare mountain bogs and surrounding wildlife habitats. This would be accomplished through a combination of fee-title purchases from willing sellers and less-than-fee-title purchases (e.g., conservation easements and cooperative agreements) from willing participants. The Service believes these are the minimum interests necessary to conserve and protect the fish and wildlife resources associated with mountain bogs and other habitats in the proposed area.

Much of the land included in the CPAs currently has (or could have, upon restoration) important resource values and high potential for helping support a range of bog-dependent species, in accordance with fulfilling the purpose of the refuge. Lands included in the CPAs also have high potential for ensuring habitat connectivity between the proposed refuge and surrounding conservation lands and in providing corridors between individual bog sites.

Figure 2. Conservation partner protected lands

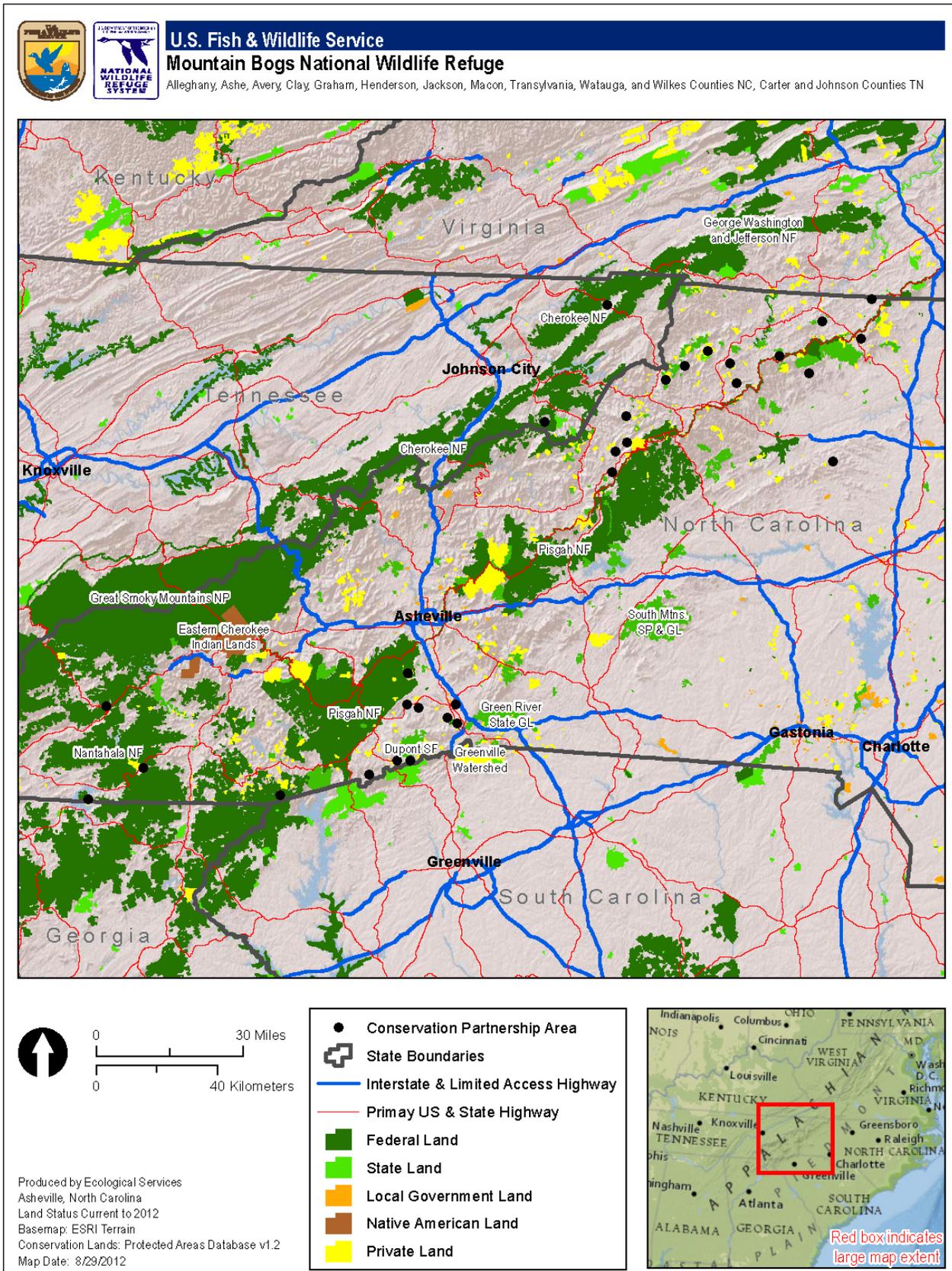


Table 2. Land use in the conservation partnership areas, 2006

Land Use Class	Conservation Partnership Area	
	Acres	Percent
Deciduous Forest	30,888	73.1
Planted/Cultivated	4,776	11.3
Evergreen Forest	2,977	7.0
Developed	1,214	2.9
Mixed Forest	899	2.1
Shrub/Scrub	578	1.4
Grassland/Herbaceous	414	1.0
Woody Wetlands	385	0.9
Open Water	120	0.3
Totals	42,250	100

Source: Fry et al. 2011

¹Includes "Barren Areas"

Key: Deciduous Forest - dominated by trees > 25 ft tall, > 20% of total cover, and where 75% of the trees are hardwoods. Planted/Cultivated – hay, pasture, row crops. Evergreen Forest - dominated by trees > 25 ft tall, > 20% of total cover, and where 75% of the trees keep their leaves. Developed - characterized by a high percentage (30% or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc.). Mixed Forest - dominated by trees > 25 ft tall, > 20% of total cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover. Shrub/Scrub - dominated by shrubs; < 25 ft tall with shrub canopy typically greater than 20% of cover, includes true shrubs, includes young or stunted trees. Grassland/Herbaceous - dominated by graminoid/herbaceous vegetation, > 80% of total vegetation. Woody Wetlands - forest or shrubland vegetation comprise > 20% of cover and the soil/substrate is periodically saturated/covered with water. Open Water – lakes/ rivers, with < 25% covered by ground or vegetation.

When initially proposed in the mid-1990s, the Mountain Bogs NWR focused on three main components. Fourteen bog sites in North Carolina were originally selected because they were: (1) Considered to be a nationally significant bog by the North Carolina Natural Heritage Program, (2) contained either federally listed and/or federal candidate species, and (3) the biotic community was relatively intact and contributed significantly to conservation of biodiversity. In 2009, the proposal was updated to include 25 sites selected by their ability to protect the highest quality mountain bog habitat, with an emphasis on those sites with nationally significant bog habitat and/or potential to afford significant conservation benefit to federal trust resources.

During detailed planning for the proposed Mountain Bogs NWR, a review of bog sites was conducted to ensure that all important bog sites were included in the refuge proposal. Service biologists first investigated the North Carolina Natural Heritage Program database of known bog sites and species element occurrences to see if any significant changes to bog sites had occurred since original site selection. Next, Service biologists referenced a list of bog recommendations submitted to the Service following a meeting of representatives from the North Carolina Wildlife Resources Commission, the North Carolina Natural Heritage Program, and the North Carolina Division of Parks and Recreation. The state agency staff met to discuss the proposed list of sites included in the Mountain Bogs NWR preliminary project proposal and make additional recommendations based on bog size, ownership, connectivity to other mountain bog habitats, and the relative size of bog turtle populations. Where Service biologist felt it was appropriate and necessary, additional sites were added to the proposal. Service biologists feel these sites identify the highest quality mountain bog sites not under state or federal ownership in the southern Appalachians.

From these bog-specific sites, CPAs were delineated by land ownership parcels, taking into consideration existing land ownership, existing parcel development, land use and land cover, proximity to existing conservation lands, and plant and wildlife element occurrence. CPAs strive to protect the bogs themselves, protect the bog watershed, and connect with other bog sites and existing conservation lands. In total, 30 CPAs have been identified. Table 3 summarizes the CPS for the proposed establishment of Mountain Bogs NWR.

Table 3. CPAs for the proposed establishment of Mountain Bogs NWR

CPA Name	County*	Number of Parcels	Acres	Protected Acres	Percent Protected
Cherry	Alleghany	78	2,182.62	23.15	1.06
Sparta	Alleghany	9	588.84	309.53	52.57
Stateline	Alleghany	29	1,003.95	47.75	4.76
Bluff	Ashe	33	4,078.67	2,286.80	56.07
Othello	Ashe	14	167.19	0.00	0.00
Transou	Ashe	59	1,283.66	5.40	0.42
Yates	Ashe	54	1,125.63	0.00	0.00
Flattop	Avery	1	182.03	0.00	0.00
Montezuma	Avery	24	504.95	87.48	17.32

CPA Name	County*	Number of Parcels	Acres	Protected Acres	Percent Protected
Snakeden	Avery	22	251.26	76.71	30.53
Chestnut	Carter, TN	1	739.54	3.92	5.30
Garland	Clay	9	111.48	11.45	10.27
Nolton	Graham	1	228.80	228.72	99.97
Bryson	Henderson	1	159.62	2.54	1.59
Butt	Henderson	17	367.45	16.50	4.49
Jackson	Henderson	12	236.94	15.85	6.69
Pine Knob	Henderson	27	120.14	9.01	7.50
Riverbend	Henderson	19	433.95	14.88	3.43
Rutledge	Henderson	8	197.85	32.86	16.50
Mulkey	Jackson	17	148.89	39.02	26.21
Holston	Johnson, TN	67	1,379.82	254.26	18.43
Firescald	Macon	34	1,403.58	84.07	5.99
Blue Ridge	Transylvania	20	1,368.82	0.00	0.00
Burnt	Transylvania	99	3,851.09	48.65	1.26
East Fork	Transylvania	16	7,372.76	0.00	0.00
Long Hope	Watauga	14	4,808.68	8.51	0.18
Pinnacle	Watauga	27	410.88	121.93	29.68
Three Peaks	Watauga	73	3,919.61	1,179.86	30.10
Old Gilreath	Wilkes	47	1,068.61	0.00	0.00
Widow	Wilkes	86	2,552.37	0.00	0.00
Total		918	42249.67	4908.84	

**All counties are in North Carolina, except where noted.*

LAND PROTECTION OPTIONS

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

We will use the following options to implement this Land Protection Plan, if approved:

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

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

OPTION 1. MANAGEMENT OR LAND PROTECTION BY OTHERS

Bogs have long been recognized for their biological importance, and the Service has worked since the early 1990s in conjunction with federal, state, and non-governmental partners and private landowners to develop a coordinated restoration and protection strategy for mountain bogs in the southern Appalachians. A portion of the land adjacent and ecologically important to the proposed project is already owned by our partners or managed by our partners through conservation easements. Protection of these sites fits well into a large landscape scale bog protection effort in the area. Management and protection of lands by others would continue, and this proposed project would complement and expand on those efforts.

The following partners provide assistance to manage or own property in or that are ecologically associated with the project area:

- The Carolina Mountain Land Conservancy
- Blue Ridge Conservancy
- U.S. Highlands Biological Foundation
- North Carolina Department of Environment and Natural Resources Division of Parks and Recreation
- North Carolina Department of Agriculture Forest Service
- North Carolina Department of Agriculture Plant Conservation Program
- North Carolina Department of Transportation
- North Carolina Wildlife Resources Commission
- The Conservation Fund
- The Nature Conservancy

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

Under Option 2, we would protect and manage land by purchasing only a partial interest, typically in the form of a conservation easement. This option leaves the parcel in private ownership, while

allowing us control over the land use in a way that enables us to meet our goals for the parcel or that provides adequate protection for important adjoining parcels and habitats. The structure of such easements would provide permanent protection of existing wildlife habitats while also allowing habitat management or improvements and access to sensitive habitats, such as those important to endangered species or migratory birds. It would also allow for public use where appropriate. We would determine, on a case-by-case basis, and negotiate with each landowner, the extent of the rights we would be interested in buying. Those may vary, depending on the configuration and location of the parcel, the current extent of development, the nature of wildlife activities in the immediate vicinity, the needs of the landowner, and other considerations.

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

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

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

OPTION 3. FEE-TITLE ACQUISITION BY THE SERVICE

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

Generally, the lands we would purchase require more than passive management (e.g., controlling invasive species, mowing or prescribed burning, planting, or managing for the six priority public uses). We only propose fee-title acquisition when adequate land protection is not assured under other ownerships, active land management is required, or we determined the current landowner would be unwilling to sell a partial interest like a conservation easement.

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

LAND PROTECTION METHODS

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

PURCHASE

The preferred acquisition methods for protecting land within the CPAs are fee-title acquisition and conservation easements; however, the method ultimately used depends partly on the wishes of the landowners.

Fee-Title Purchase

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

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

Easement Purchase

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

- Development rights (agricultural, residential, etc.);
- Alteration of the area's natural topography (unless for restoration);
- Uses adversely affecting the area's floral and faunal communities;
- Private hunting and fishing leases;
- Excessive public access and use; and
- Alteration of the natural water regime.

COOPERATIVE AGREEMENTS

Management control on privately owned lands could be obtained by entering into cooperative agreements with the landowners.

DONATIONS

We encourage donations in fee title or conservation easement in the approved areas. We are not aware currently of any formal opportunities to accept donations of parcels within the proposed CPA boundary.

SERVICE LAND ACQUISITION POLICY

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

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

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

FUNDING

The source of appropriated dollars for the purpose of land acquisition is the Land and Water Conservation Fund (LWCF). The primary source of income to this fund is fees paid by companies drilling offshore for oil and gas, as well as oil and gas lease revenues from federal lands. Additional sources of income include the sale of surplus federal real estate and taxes on motorboat fuel. The Service would seek appropriations from the LWCF for fee-title acquisition and conservation easements, if the proposed project is approved. Establishment of a national wildlife refuge in the southern Appalachians would build upon and strengthen the Service's work in this ecosystem, and would enable the Service to implement a landscape-level conservation program centered on the globally imperiled mountain bog ecosystem.

During planning for this refuge the Service identified 42,250 acres within 30 CPAs, which span 11 counties in western North Carolina and 2 counties in eastern Tennessee. Of these 42,250 acres, the Service is seeking authority to acquire up to 23,478 acres by fee-title, conservation easement, lease, cooperative agreement, or donation. The estimated cost to acquire in fee title the entire 23,478 acres for the proposed Mountain Bogs NWR is \$58.7 million. The cost-per-acre values used in this rough estimation are based on actual sales data derived from recent land sales (2008 - 2012) from the 13 counties in the project area, as well as data obtained from 2010 county assessment parcel data. For this exercise, we extrapolated a high-to-low range of values.

Because the method of acquisition would be determined on a case-by-case basis, for each landowner, it is impossible to pre-determine how many acres would be acquired in fee title and how many would be in a conservation easement, so we have provided a high range based on the fee-title acquisition of all 23,478 acres, and a low range based on the acquisition of conservation easements on all 23,478 acres. This range in value is affected by the following factors:

- The per-acre value is affected by the various land uses within the CPAs. There are approximately 5,000 acres in agricultural use and 1,200 being affected by development. Of the remaining acreage, there are approximately 200 acres in open water with the majority of the area being categorized as a variety of forested habitats.

-
- The size of the tracts within the CPAs range from less than one acre to more than 8,000 acres.

Our total estimated cost to acquire in fee title all 23,478 acres is \$58,695,000 at \$2,500 per acre. This is based on an average per-acre-cost of all size tracts and various land uses. Our total estimated cost to acquire conservation easements on 23,478 acres is \$28,173,600 at \$1,200 per acre. This is also based on an average per-acre-cost of all size tracts and various land uses. This provides us with a high/low range of value for acquisition of the entire acreage.

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

IV. Coordination

INFORMATIONAL MEETINGS WITH BOG CONSERVATION PARTNERS

In the past, southern Appalachian bog conservation has involved a number of partners and the proposal to protect bogs via a national wildlife refuge is but one of numerous endeavors to protect and manage these sites. During the early stages of outreach, several meetings were held to brief our conservation partners on our intentions to move ahead with developing the proposed refuge, including the refuge establishment process, and conservation priorities. Partners in attendance included:

- The Conservation Fund
- North Carolina Wildlife Resources Commission
- North Carolina Department of Parks and Recreation
- The Nature Conservancy
- North Carolina Department of Environment and Natural Resources
- Carolina Mountains Land Conservancy
- North Carolina Museum of Natural Sciences
- Project Bog Turtle and University of North Carolina
- North Carolina Plant Conservation Program

ELECTED OFFICIAL CONTACTS

Contact was made with congressional offices representing the affected areas (North Carolina 11th, 10th, and 5th Congressional Districts, Tennessee's 1st Congressional District, and the four senators from the two states). The offices were contacted via e-mail or telephone and we offered to personally brief their staffs, which was done for two senate staffers (one from Senator Burr's office and one from Senator Hagan's office). Additionally, congressional staff received copies of the letters the Service sent to private landowners, as well as the press release we distributed announcing the project. Tennessee staffs of U.S. Senators' Lamar Alexander and Bob Corker, and U.S. Representative Chuck Fleischmann were briefed by Service staff in January 2013.

Additionally, state and county elected representatives from the affected areas were mailed letters describing the project and we offered to meet personally with the representatives to brief them on the proposed project.

PUBLIC OUTREACH

Other methods of outreach to private landowners, state and elected officials, other state and federal natural resource agencies, natural resource non-governmental organizations, and the general public included direct mailings, e-mails, digital media (a dedicated project website and by Facebook), a press release distributed on June 6, 2012, and by open houses.

Four open houses, each lasting two hours, provided the public with an opportunity to interact individually with Service experts in real estate, bog biology, private land stewardship, and refuge creation. All events were held in the early evening at local libraries. These open houses were

announced in the press release concerning the project, as well as in letters and e-mails sent to CPA landowners, state and local elected officials, bog conservation partners, and other state and federal natural resource agencies. Open house dates were:

- June 26, 2012 – Hendersonville, North Carolina
- June 27, 2012 – West Jefferson, North Carolina
- July 10, 2012 – Franklin, North Carolina
- July 11, 2012 – Boone, North Carolina

The purpose of public scoping was to seek input from the public regarding the proposed establishment of Mountain Bogs NWR and to identify the issues that needed to be addressed in the planning process. These issues/comments are documented in Appendix E.

DRAFT ENVIRONMENTAL ASSESSMENT

I. Purpose and Need for Action

INTRODUCTION

The Fish and Wildlife Service (Service) proposes to protect and manage a series of rare and severely threatened wetlands and adjacent uplands in the southern Appalachian mountains of eastern Tennessee and western North Carolina through the proposed establishment of Mountain Bogs National Wildlife Refuge (NWR) (Figures 3a and 3b). The land being proposed for protection includes a diverse system of bog and fen wetlands and surrounding upland buffers, including high-mountain grasslands, spruce-fir forests, and hardwood forests. This proposal represents an unprecedented opportunity to protect one of the rarest wetland community types in the Service's Southeast Region, while also affording permanent protection and management to a number of federal and state listed species. Protection of mountain bogs is directly aligned with the Service's national priorities of threatened and endangered species recovery, migratory bird conservation, landscape-level conservation, and connecting people with nature. Protection of mountain bog habitats is likewise identified as a priority action in the Service's Strategic Plan for the Southern Appalachian Ecosystem, the Strategic Plan for the Asheville Ecological Services Field Office, and in the recovery plans for each of those federally listed species which occur within mountain bog habitats.

The Service proposes to acquire, protect, and manage certain land in western North Carolina and eastern Tennessee through a combination of fee-title purchases from willing sellers, conservation easements, cooperative agreements, or other conservation mechanisms with interested landowners. Lands and waters that could be purchased outright (fee-title purchase) or less-than-fee-title purchase (e.g., easement) would become part of the proposed Mountain Bogs NWR. The four overarching goals of the proposed refuge would be to: (1) Protect, restore, and manage habitats for fish and wildlife; (2) provide landscape-level conservation; (3) connect people with nature; and (4) promote conservation partnerships.

The mission of the National Wildlife Refuge System is:

“to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Improvement Act of 1997).

National wildlife refuges provide important habitat for native plants and many species of mammals, birds, fish, insects, amphibians, and reptiles. They also play a vital role in conserving threatened and endangered species. Refuges offer a wide variety of wildlife-dependent recreational opportunities and many have visitor centers, wildlife trails, and environmental education programs. Nationwide, about 25 million visitors annually hunt, fish, observe, and photograph wildlife, or participate in educational and interpretive activities on refuges.

Refuge lands can be acquired under various legislative and administrative authorities for specified purposes. Establishment of the proposed Mountain Bogs NWR would be authorized by the National Wildlife Refuge System Improvement Act, Endangered Species Act, Emergency Wetlands Resources Act, Fish and Wildlife Act, and Migratory Bird Treaty Act. The purposes of a refuge are derived from legislative authorities that established the refuge.

The scope of this draft environmental assessment (Draft EA) is limited to the proposed acquisition, in fee-title and in less-than-fee-title, of lands for the establishment of the Mountain Bogs NWR. For the purposes of this Draft EA, the AOI, within which the environmental analysis is conducted, encompasses the Tennessee and North Carolina portions of the Blue Ridge Ecoregion. This Draft EA is not intended to cover the development and/or implementation of detailed, specific programs for the administration and management of those lands. A conceptual management plan (Appendix A) and interim compatibility determinations (Appendix B) are included to provide general outlines on how the proposed lands would be managed. The appendices are provided as general information for the public in its review of this Draft EA. If the proposed refuge is established and the needed lands or interests in lands are acquired, the Service would develop a Comprehensive Conservation Plan, a 15-year management plan, and needed “step-down” management plans (habitat management plan, public use plan, etc.). These plans would be developed and reviewed in accordance with Department of the Interior requirements of the National Environmental Policy Act.

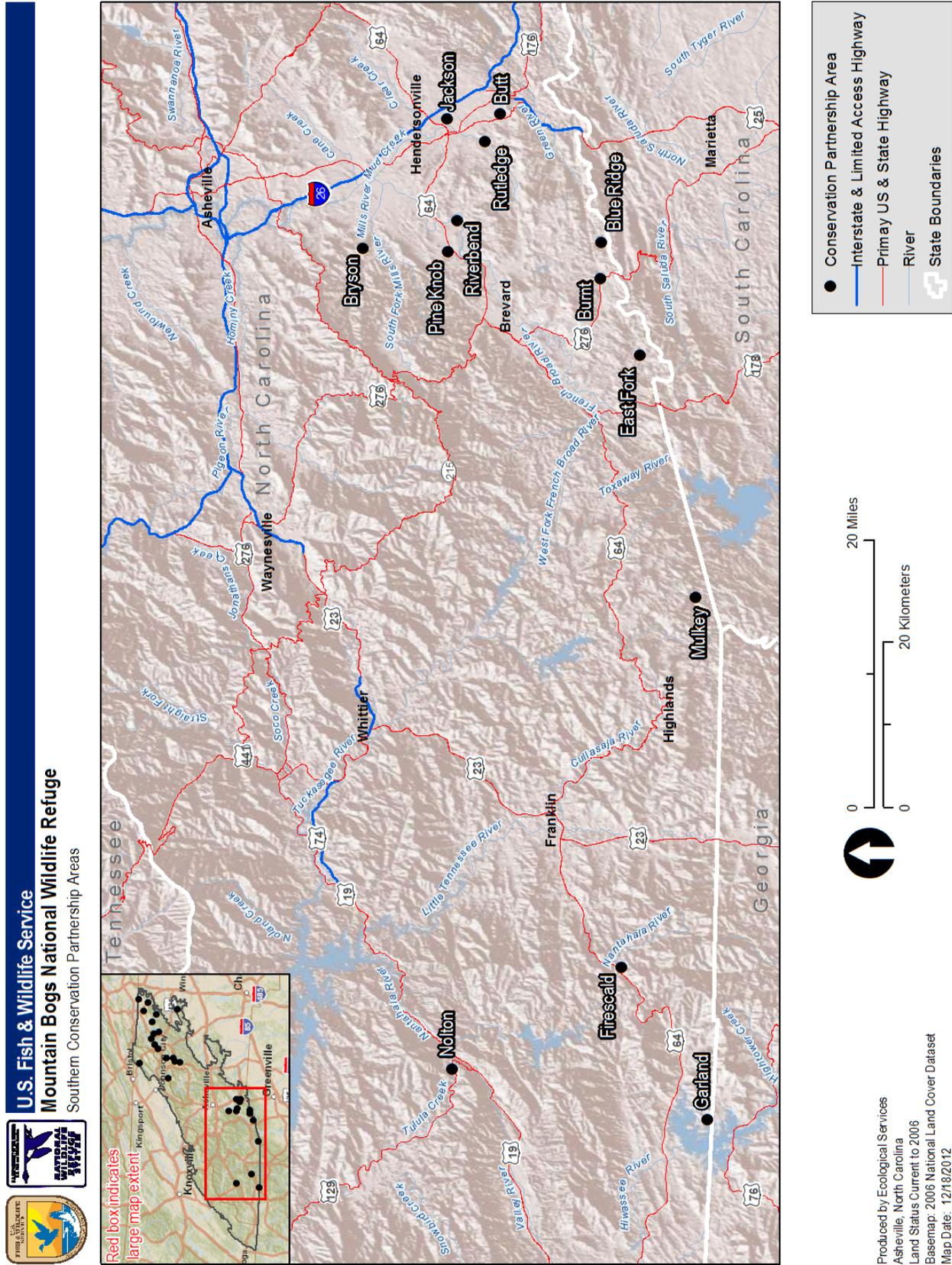
The following is the vision for the Mountain Bogs NWR, if approved:

The Mountain Bogs National Wildlife Refuge will conserve critically endangered southern Appalachian Mountain bogs and portions of their surrounding landscapes for current and future generations. Refuge lands and waters will be managed for fish and wildlife populations with an emphasis on the management of imperiled federal trust species, including 13 federally listed plants and animals, and will help protect and improve water quality and water quantity within the watersheds surrounding the refuge. As part of a system of public and private conservation lands, the refuge will expand outdoor recreational and educational opportunities, helping to support local economies.

PURPOSE AND NEED

Mountain bogs are widely accepted as among the rarest and most imperiled habitat types in the southeastern United States (Noss et al. 1995 and references therein; Richardson and Gibbons 1993 and references therein). These habitats are typically small (most are less than 20 acres, and many are less than 2 acres) and can be isolated from more extensive wetland systems; features which have contributed to their having been mostly overlooked by larger scale wetland classification systems (e.g., Cowardin et al. 1979) and in the interpretation of remotely sensed imagery (e.g., Landsat imagery, National Wetlands Inventory Maps). As such, the Service believes that it can play a role in further protecting mountain bogs. In 2010, the Service approved the PPP, allowing us to move forward with the development of the Draft LPP and required NEPA planning. This Draft EA presents a proposal for protection of up to 23,478 acres of additional wildlife habitat in Alleghany, Ashe, Avery, Clay, Graham, Henderson, Jackson, Macon, Transylvania, Watauga, and Wilkes Counties, North Carolina, and Carter and Johnson Counties, Tennessee, through the establishment of the Mountain Bogs NWR.

Figure 3b. Potential CPAs proposed for inclusion in the proposed Mountain Bogs NWR



Our approach to the protection and conservation of mountain bogs is through the use of CPAs. In this proposal, CPAs outline areas that the Service believes contain mountain bogs and adjacent upland habitat in need of further protection and/or conservation. The proposed CPAs encompass approximately 42,250 acres and are depicted in Figure 3. Within the CPA boundaries, the Service seeks to protect up to 23,478 acres in fee title or conservation easements.

Inside the CPAs, the Service may consider negotiations with willing owners for acquisition of an interest in land. The Service would work with interested landowners to establish a legal interest such as a management agreement, easement, lease, donation, or purchase. Lands are not subject to any refuge regulations or jurisdiction unless and until an interest is acquired. Any landowner that is within the CPA boundary, even though the surrounding parcels may have been purchased by the Service, retains all the rights, privileges, and responsibilities of private land ownership. This includes, but is not limited to, the right to access, hunting, vehicle use, control of trespass; the right to sell the property to any other party; and the responsibility to pay local real estate or property taxes. It is the Service's policy to work with willing sellers to acquire fee-title or less-than-fee-title interest in property. (Additional information regarding the Service's land acquisition policy is provided in Section A.

The purpose of the proposed refuge would be to contribute to the mission and goals of the National Wildlife Refuge System (Refuge System) by:

- Protecting, restoring, and managing rare mountain bog habitats and associated species as well as adjacent upland habitats, thereby aiding in the recovery of federally listed species and benefiting numerous state-listed and imperiled species.
- Contributing to a more connected and functional conservation landscape by reducing habitat fragmentation.
- Protecting and enhancing water quality and quantity within multiple watersheds, benefiting both humans and wildlife.
- Providing additional wildlife-dependent public use opportunities, including compatible hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation; actions which would help increase knowledge of and support for conservation of southern Appalachian Mountain bogs and the Refuge System.
- Collaborating in science, education, and research, with the aim of strengthening and developing a range of partnerships to assist managers in making informed decisions, and encouraging continued responsible stewardship of mountain bogs and other associated natural resources.

There is a need for increased resource protection in these parts of North Carolina and Tennessee, as various growing threats are likely to continue to put natural resources at risk. Currently, the primary threats to bogs are habitat loss and alteration resulting from development. Other threats include nonnative plants and possibly climate change, which are discussed further in Chapter II of this Draft EA.

HABITAT LOSS THROUGH LAND USE CONVERSION

Historical trends (changes in acreage) in these small, isolated habitats are often lacking from larger level assessments of change in wetland acreage (e.g., Dahl 2006). Some authors have speculated that mountain bogs may have existed historically in every mountain county of the South (Richardson and Gibbons 1993), and others have estimated that this habitat type has been reduced by some 80-90 percent (Noss et al. 1995; Weakley and Schafale 1994). Most of this habitat loss is the result of decades of land use conversion undertaken in support of agricultural, industrial, commercial, or

residential development and disruption of normal hydrologic processes. The majority of remaining mountain bog sites, most of which are highly degraded and in need of restoration and management, occurs in North Carolina (Weakley and Schafale 1994).

Vegetation succession is a threat to remaining bog sites, and many practitioners believe it is occurring at accelerated rates at remaining sites because historical disturbance regimes (grazing, browsing, beaver activity, and even fire) have been eliminated or drastically reduced across the landscape (North Carolina Wildlife Resources Commission 2005). In human-modified landscapes, the elimination or reduction in these disturbance regimes not only degrades existing sites, but precludes the formation of new bogs, further compounding the problem (Smith 1993).

BACKGROUND

The proposed refuge would be located in Alleghany, Ashe, Avery, Clay, Graham, Henderson, Jackson, Macon, Transylvania, Watauga, and Wilkes Counties, North Carolina, as well as Carter and Johnson Counties, Tennessee. The mountains within the region support some of the few remaining mountain bog communities in the eastern United States. These wetland communities host a number of rare, threatened, and endangered species. This proposal represents an opportunity to protect one of the rarest wetland community types, while also affording permanent protection and management to a number of state and federal priority species.

Within this landscape, the Service proposes to focus conservation efforts on protecting important habitats, including swamp forest-bog complexes, southern Appalachian bogs and fens, hillside and low mountain seepage bogs, high and low elevation seeps, and meadow bogs. This proposal would support the recovery of several federally listed or candidate species, including bunched arrowhead (*Sagittaria fasciculata*), Mountain sweet pitcher plant (*Sarracenia rubra* ssp. *Jonesii*), green pitcher plant (*Sarracenia oreophila*), swamp pink (*Helonias bullata*), bog turtle (*Glyptemys muhlenbergii*), and white fringeless orchid (*Platanthera integrilabi*). In addition, the proposal would increase protection of 36 federal species of concern and 17 priority migratory bird species.

PROPOSED ACTION

The Service proposes to acquire, protect, and manage through fee-title purchases, leases, donations, conservation easements, and/or cooperative agreements from willing sellers. All lands and waters acquired would be managed by the Service as the Mountain Bogs NWR. The overall goals of the proposed refuge would be to: (1) Protect, restore, and manage habitats for fish and wildlife, (2) provide landscape-level conservation, (3) connect people with nature, and (4) promote conservation partnerships, as further detailed in the Conceptual Management Plan (Appendix A).

It is anticipated that funding for this proposal would be provided primarily through the Land and Water Conservation Fund (LWCF), among others. The authority for the use of these funds for land acquisition include: Migratory Bird Conservation Act of 1929; Fish and Wildlife Act of 1956; Endangered Species Act of 1973; Emergency Wetlands Resources Act of 1986; and National Wildlife Refuge System Improvement Act of 1997.

COORDINATION AND CONSULTATION

During the planning process, the Service coordinated and consulted with several governmental entities with interest in the region, including:

- North Carolina Wildlife Resources Commission
- North Carolina Natural Heritage Program
- North Carolina Division of Parks and Recreation
- North Carolina Department of Environment and Natural Resources
- North Carolina Museum of Natural Sciences
- Tennessee Department of Environment and Conservation
- Tennessee Wildlife Resources Agency
- USDA Forest Service

These partners were keys in the development of the proposal. Native American tribes are also important partners in the watershed. The Service works with the tribes to ensure timely and effective cooperation and collaboration.

Contact was made with congressional offices representing the affected areas (North Carolina's 11th, 10th, and 5th Congressional Districts, Tennessee's 1st Congressional District, and the four senators from the two states). Staff were contacted via e-mail or telephone call and were offered the opportunity to brief the staff in person, which was done for two Senate staffers (one each from Senator Burr's and Senator Hagan's Offices). Additionally, congressional staff received copies of the letters the Service sent to private landowners as well as the press release we distributed announcing the project. The Tennessee staffs of U.S. Senators Lamar Alexander and Bob Corker and U.S. Representative Chuck Fleischmann were briefed by Service staff in January 2013.

Additionally state and county-level elected representatives from the affected areas were mailed letters describing the project and offered the opportunity to meet personally with Service staff.

The Service also reported to the Transylvania County Commissioners (upon request) on potential impacts of this proposal on property tax revenues.

PUBLIC PARTICIPATION

PUBLIC SCOPING

Public scoping can help the Service identify issues and concerns, potential alternatives, and scientific information regarding the need to increase conservation efforts aimed at protecting mountain bogs.

As part of its outreach efforts, the Service used a variety of tools, including direct mailings (to landowners, elected officials, and natural resource non-governmental organizations), digital media, press releases, four public open houses, and radio commentaries. Furthermore, at least 10 media outlets are known to have reported on the Service's intentions. Additional details regarding the public scoping effort can be found in Appendix E.

More than 85 public scoping comments were submitted through various means. At least 14 comments were submitted in writing at the open houses mentioned above. The remaining comments were submitted via e-mail, U.S. postal mail, and via telephone.

Public scoping comments were categorized into five main categories (i.e., Wildlife and Habitat, Resource Protection, Recreation, Administration, and General), with appropriate subcategories, including the following:

- Wildlife and habitat
 - Listed plants found on private property
 - Additional bog sites not currently on CPA list
 - Questions about habitat management
 - Protection of metapopulations
 - Concerns about herbicides on rights-of-way affecting bogs
- Resource Protection
 - Land acquisition/protection in general
 - Interested sellers
 - Other (than selling land title/rights) methods of conservation
 - Easements
 - Wetlands protection
 - Specific properties/sites
 - Specific boundary for the proposed refuge
- Recreation
 - Environmental education
- Administration
 - Concern about effect on property tax base
- General
 - Economy
 - Development patterns/pressure

II. Affected Environment

This section describes the environment that would be affected by the implementation of the No Action Alternative or the Proposed Alternative. It is organized under the following four major topics: physical resources (i.e., topography, soils, climate, and air and water quality), biological resources (i.e., habitats and fish and wildlife species), cultural resources, and socioeconomic conditions.

The CPAs lie in the Blue Ridge Ecoregion (Omerik 1987), an area that spans several states. For the purposes of this Draft EA, we limited the affected environment to the portion of the Blue Ridge Ecoregion that contains North Carolina and Tennessee. This AOI is the area within which we analyzed the potential environmental consequences of the No Action Alternative and Proposed Alternative, further detailed in Chapter IV of this Draft EA. The AOI occupies about 6.85 million acres in western North Carolina and eastern Tennessee. Figure 4 shows this area relative to its major landmarks.

PHYSICAL ENVIRONMENT

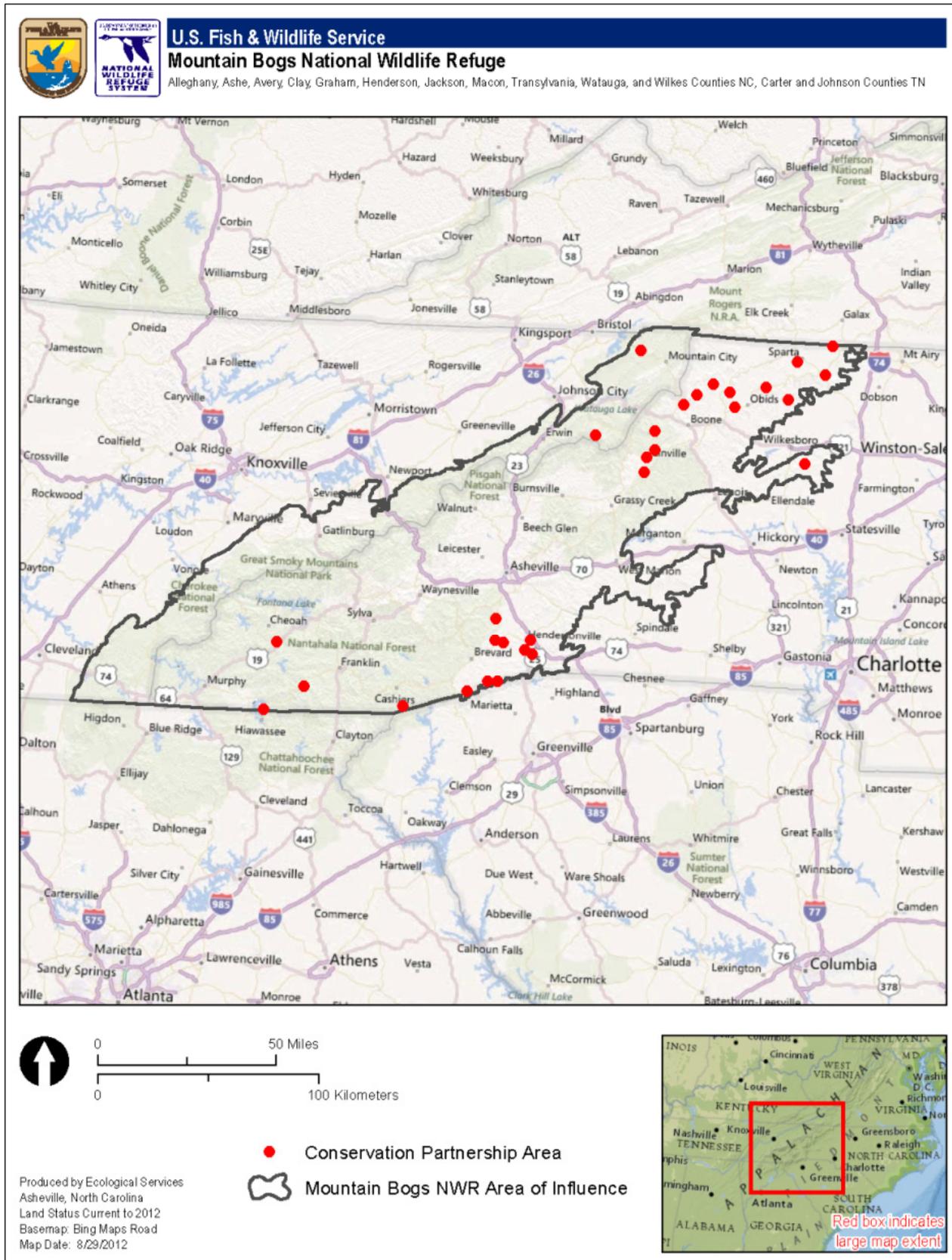
TOPOGRAPHY AND GEOLOGY

The AOI lies in the western mountains of North Carolina and eastern Tennessee within the Blue Ridge Ecoregion. Geographically, it includes the southern part of the Appalachian Mountains, which extend from Alabama to Virginia. This area is within the Appalachian Highlands physiographic region, and includes portions of both of the Blue Ridge and Piedmont physiographic provinces.

The rocks at the core of the southern Appalachian Mountains formed more than a billion years ago, and this range is the oldest on the continent. Today, these mountains contain metamorphic, sedimentary, and igneous rocks. Most of the rocks formed as sediments or volcanic rocks on ocean floors, islands, and continental plates. Igneous rocks formed when crustal plates collided, beginning about 450 million years ago. After the collision between the ancestral North American and African continental plates ended (about 270 million years BP), the continents began to be stretched. As a result, fractures opened throughout the crust, and these fractures were later filled with sediment. For the past 100 million years, forces of erosion have carved away the mountains, leaving their cores standing in the ridges seen today. The southern Appalachian Mountains remained free from glaciers during the four continental ice-sheet advancements of the past 2-3 million years. The orientation of the ridges and valleys of the Appalachian Highlands trends from a southwest to northeast direction. The AOI contains the highest peaks within the entire range, the highest being Mount Mitchell (6,684 feet).

The headwaters of many rivers are found within the southern Appalachian Mountains, and there is a high density of small- to medium-sized perennial streams within their basins. In the AOI, these include the Middle Tennessee - Hiwassee, Savannah, Upper Tennessee, French Broad-Holston, Santee, Upper Pee Dee, and Kanawha Basins. Rivers within these basins, whose headwaters include the CPA's, are the Hiwassee, Cheoah, Nantahala, Chattooga, French Broad, Mills, Doe, Holston, South Yadkin, New, and Watauga. Within the AOI, streams are of high-to-moderate gradients, containing bedrock, boulder, cobble and gravel substrates. They are typically cool and clear. Isolated areas in some locations are wet all year as a result of seeps (U.S. Forest Service 1994, U.S. Geological Survey 2012).

Figure 4. Blue Ridge Ecoregion Area of Influence



Soils

The dominant soil order in the AOI and CPAs is the Inceptisol, which consists of relatively young soils that lack horizons of accumulated illuvial clay (argillic horizons). Most have weak-to-moderate profile differentiation (U.S. Department of Agriculture 2012). Within the Blue Ridge Ecoregion, the main Great Groups within this dominant soil order are Dystrudepts and Humaquepts, which formed from mica gneiss and schist. Ultisols (red clay soils), particularly Hapludults and Kanhapludults, also occur in the CPAs. Entisols occur only within the New River Plateau CPA. Within the CPAs, Chester-Ashe soils are the dominant type, comprising 36 percent of the soils. These soils are well-drained, as are most of the soils in the AOI. See Table 4 for a listing of soils and acreages in the CPA's.

Some mountain bogs may be of ancient origin, and several that have been cored show peat, sediment, or pollen accumulations dating to 10,000 – 12,000 years (BP) (Weakley and Schafale 1994). As a result of climate fluctuations since the last glacial retreat, southern Appalachian Mountain bogs may contain disjunct or relict species of northern and coastal plain origins (Weakley and Schafale 1994). Most mountain bogs generally contain shallow, organic-rich, mineral soils of varying depth and origin overlying mafic or felsic rock (Weakley and Schafale 1994). The pH of bog soils generally ranges from about 4.5 to 6.5 and seepage water is acidic and nutrient-poor (Weakley and Schafale 1994). These wetland soils are generally saturated and may contain standing water in depressions. Cowardin et al. (1979) classifies these wetlands as Palustrine. Most of these wetlands may be subject to periodic flooding, as well as receiving year-round spring or seep water.

Table 4. Soil types within the CPA's

Soil Type	Acreage	Percent
Chester-Ashe	15,196	36
Tusquitee-Porters-Codorus-Chester	7,512	18
Tusquitee-Porters-Fannin-Evard-Brevard-Ashe	6,151	15
Hayesville-Codorus-Bradson	3,027	7
Wayah-Tanasee-Porters	1,905	5
Watauga-Clifton-Chandler	1,790	4
Evard-Clifton-Braddock	1,699	4
Hayesville	1,538	4
Hayter	1,343	3
Tusquitee-Edneyville	782	2
Clifton-Chester	544	1
Toxaway-Rosman-Delanco	359	1
Tsali-Spivey-Santeetlah-Junaluska	227	1
Saluda-Hayesville-Evard-Brevard-Bradson	111	<1

Soil Type	Acreage	Percent
Tate-Maymead-Ditney	36	<1
Talladega-Fannin-Evard	28	<1
Stecoah-Spivey-Porters-Edneyville-Chestnut	1	<1
Jefferson-Hayter	<1	<1
Total	42,250	

CLIMATE AND CLIMATE CHANGE

Continental arctic air masses from the north and tropical air masses from the Gulf of Mexico and Atlantic Ocean largely influence the climate of the AOI, and the climate is classified as moist subtropical. Latitude, elevation, and vegetation result in considerable variation of climate in the AOI. Average precipitation is 40 to 50 inches, but ranges up to 70 to 100 inches on the highest peaks and in portions of southwestern North Carolina and east Tennessee. Transylvania County, North Carolina, records the highest annual rainfall amounts in the AOI. July is generally the wettest month, and November, the driest (North Carolina State University 2012). Mean annual temperature is 50 to 62 degrees F and ranges from 38 degrees F in January to 76 degrees F in July. The growing season lasts 150 to 220 days, but varies according to elevation and the influence of local topography. Average annual snowfall varies in this area from 4 to 24 inches (snow and sleet) (NOAA 2009).

Climate Change

Secretarial Order 3226 (Amendment 1) requires that climate change impacts be considered and analyzed when planning or making decisions within the Department of the Interior (U.S. Secretary of the Interior 2009). This order serves as an opportunity for the Service to incorporate climate change impacts into its conservation planning activities. Additionally, this proposal would contribute to the climate adaptation goals and objectives laid out in the Service's Strategic Plan for Responding to Accelerated Climate Change, "Rising to the Urgent Challenge" (USFWS 2009).

The Intergovernmental Panel on Climate Change (IPCC) has concluded that earth's climate system is changing at an accelerating rate, and attributes many of these changes to human influence (IPCC 2007). More importantly, the 4th assessment report of the IPCC concluded that some 20-30 percent of plant and animal species assessed to date will be at increased risk of extinction if increases in global average temperature exceed 1.5-2.5°C (Backlund et al. 2008). The effect of climate change on wildlife and habitats is expected to be variable and species specific, with a predicted general trend of ranges shifting northward and to higher elevations (Shugart et al. 2003). Nonnative species will likely increase (Walther et al. 2002). Figures 5 and 6 show the projected changes in temperature and precipitation, respectively, for the area over the next 40 years (The Nature Conservancy, University of Washington, and University of Southern Mississippi 2012).

Despite the increasing robustness of global climate change models, most have yet to be stepped down to the regional or local scales necessary for a meaningful evaluation of impacts to specific landscapes or habitat types (Boyles 2009, USFWS 2008a). Across the southeastern United States,

prevailing global climate models uniformly project increased maximum and average annual temperatures, but are less consistent in their projections relating to precipitation patterns (Karl et al. 2009). While these realities significantly impede site-specific risk assessments, significant changes in water availability (whether in volume, seasonality, or duration) and temperatures are likely to alter the hydrology of southern Appalachian wetlands. Overall, the effects of climate change are expected to have a negative effect on mountain bogs, as summarized below (excerpt taken from Draft North Carolina Ecosystem Response to Climate Change: DENR Assessment of Effects and Adaptation Measures; North Carolina Department of Environment and Natural Resources 2010).

“The effect of an expected increase in both droughts and intense rainfall events may be particularly important for these systems. Many bogs are located in bottomland locations that do not regularly flood, but which would flood in extreme events. Besides stream flooding, overland runoff from adjacent uplands during severe storms would be a problem in many bogs. The nutrient input and potential scouring of severe floods would be detrimental to bog communities. While plants in bogs are probably never truly limited by moisture, droughts would have significant effects on competitive relationships among species and on the community as a whole. Droughts in the present climate appear to have exacerbated the ongoing invasion of upland and generalist wetland plants in some bogs.”

AIR QUALITY

The Clean Air Act of 1970 (as amended in 1990 and 1997), required the U.S. Environmental Protection Agency (EPA) to implement air quality standards to protect public health and welfare. National Ambient Air Quality Standards (NAAQS) were established based on protecting health (primary standards) and preventing environmental and property damage (secondary standards) (EPA 2011x). Criteria air pollutants in North Carolina include carbon monoxide (CO), lead, nitrogen dioxide (NO₂), ozone (O₃), particulate pollution (PM: PM_{2.5} and PM₁₀ ug/m³), and sulfur dioxide (SO₂). Primary sources of air pollutants are emissions from vehicles, power plants, and industrial activities. These pollutants are monitored by a network of monitoring stations throughout each state and analyzed in order to better understand general air quality trends and to locate exceedances. In the latter half of the twentieth century, pollution produced in regions as far away as the Ohio River Valley affected the region, resulting in acid rain and significant degradation of air quality. Evidence has shown that forest health has been weakened by the decline in air quality, particularly due to increased levels of ozone (SAMAB 1996b). Moreover, acid rain is considered as one of the sources contributing to the decline of the spruce-fir forests at high elevations (The Nature Conservancy and Southern Appalachian Forest Coalition 2000).

Figure 5. Projected changes in average annual temperatures in the region during the next 40 years

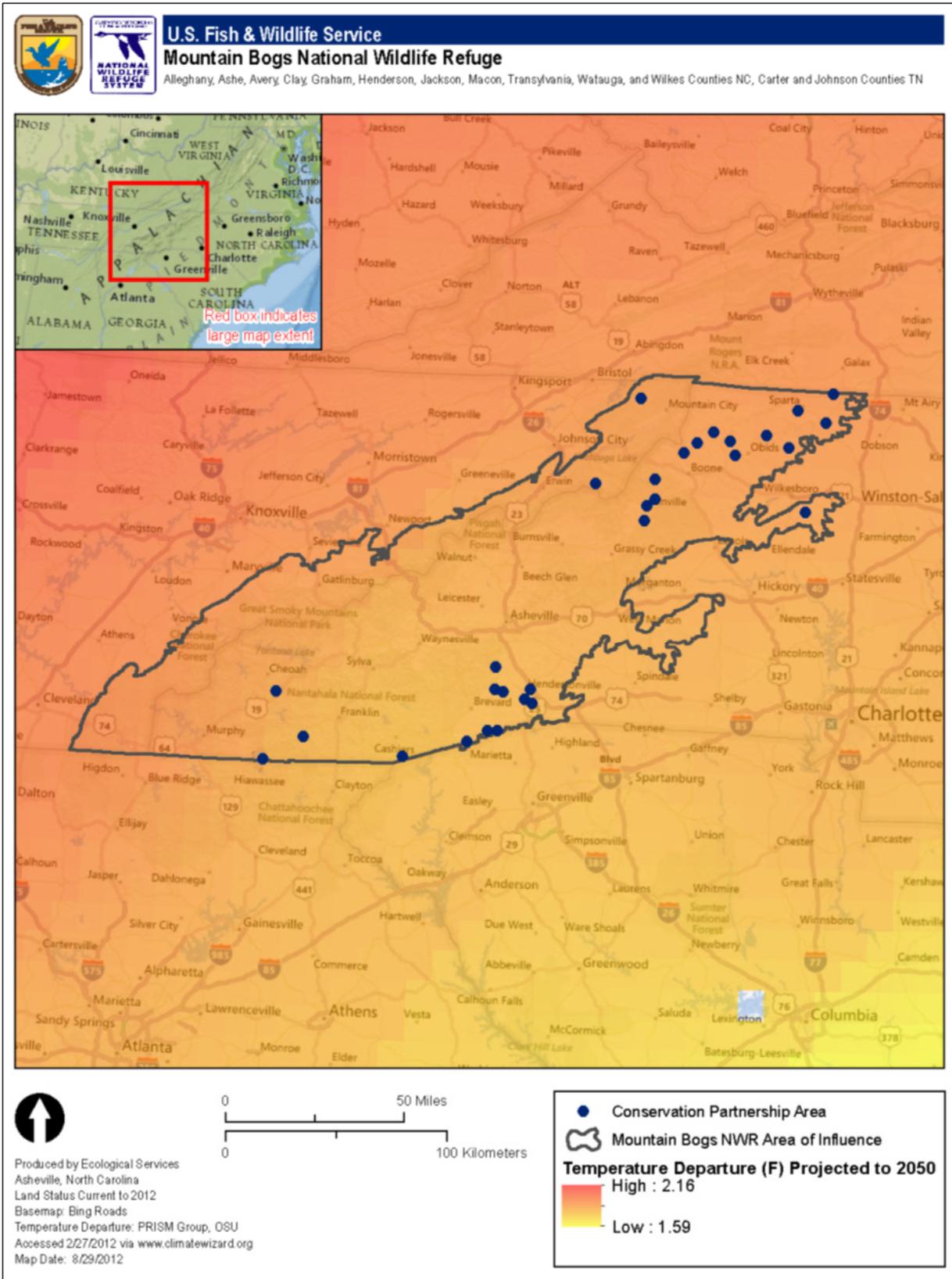
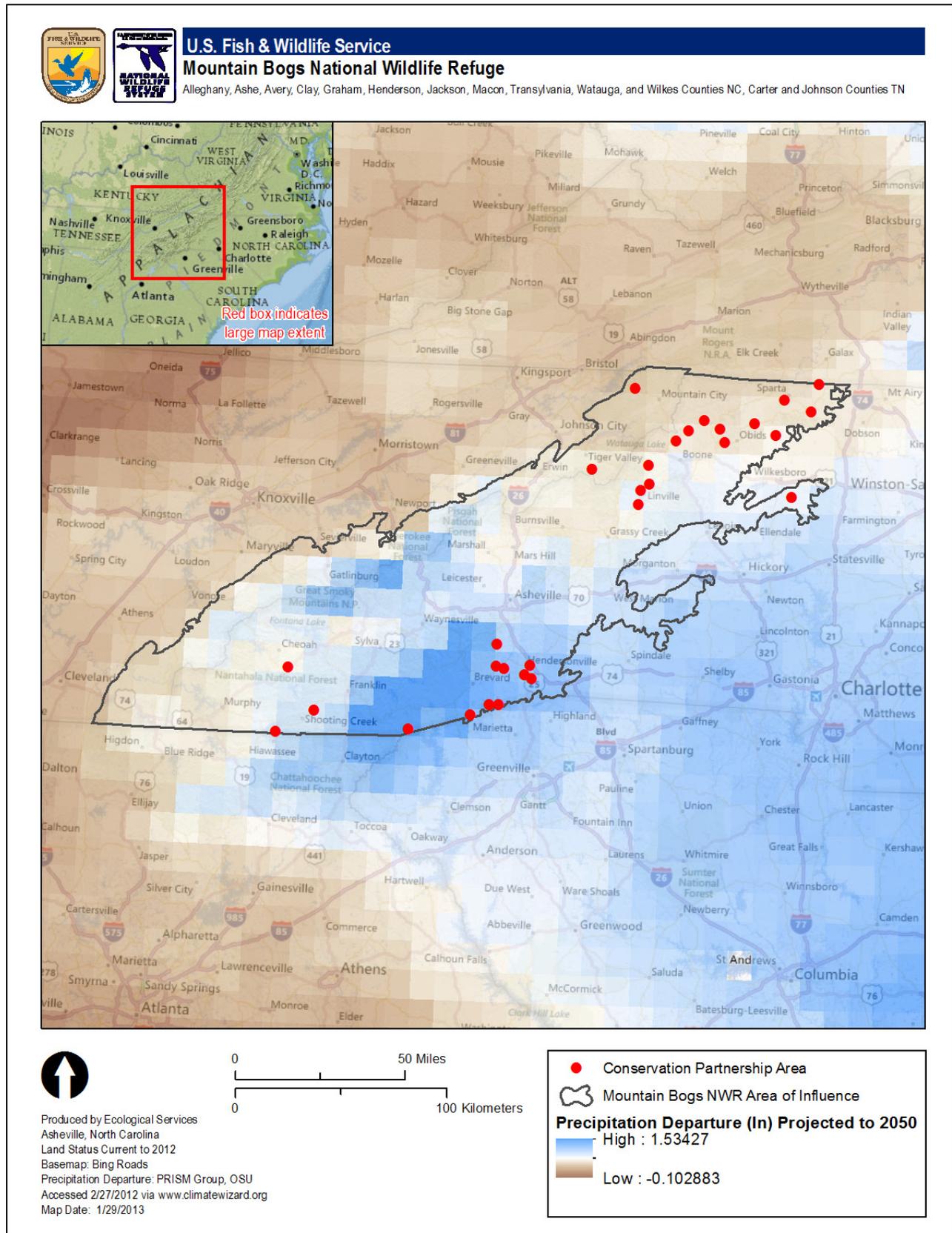


Figure 6. Projected changes in average annual precipitation in the region during the next 40 years



The following excerpt was taken from the National Park Service's Blue Ridge Parkway webpage on air quality (National Park Service 2012):

“Over the last 50 years the visibility in the Southern Appalachians has decreased 40 percent in the winter and 80 percent in the summer because of man-made pollutants. Most of the pollution is caused by power plants, industry, and automobiles. These pollutants come from both within and outside the southern Appalachians, often traveling hundreds of miles. As the winds bring the pollutants to the Blue Ridge, the mountains trap and concentrate them. Acid rain is probably the most familiar type of air pollution problem for most people. Acid rain is just one type of acid deposition, or the introduction of acid from the atmosphere to the ground. It is made up of sulfuric acid, nitric acid, and ammonia, which are made from sulfur dioxides (SO₂), nitrogen oxides (NO_x), and ammonium (NH₃), which, in turn, are emitted from burning fossil fuels, primarily as emissions from electric utilities and motor vehicles, and from agricultural activities. In addition to acid rain, acids are brought to the ground as snow, dry particles, clouds, and fog. Studies in the Great Smoky Mountains National Park have found that average rainfall there is 5-10 times more acidic than normal rain and that clouds covering the mountain tops are often 100 times more acidic still. Several problems result from this acidification of the Blue Ridge and other areas in the eastern United States. There is increasing evidence that soils are being altered in many areas. So much nitrogen is being deposited that soils are becoming nitrogen saturated. This leads to the loss of calcium in the soil, which affects plant nutrition, and the release of aluminum which can be toxic to plants, fish, and other organisms. The accumulation of sulfur and nitrogen in the soil also leads to acidification of streams and lakes as they leach out with flowing water. Acidification can also cause stress on vegetation resulting in poor crown condition, reduced tree growth, and high levels of tree death. Acid deposition has been linked with the decline in red spruce trees, leaching calcium from the tree's needles and making them more susceptible to freezing. Increased aluminum in the soil may limit a spruce tree's ability to take up water and nutrients through its roots. Ozone is another pollutant that the winds carry to the Blue Ridge Parkway. Ground level ozone is created when the nitrogen oxides mix with hydrocarbons in sunlight. Ozone levels at ridgetops in the Smokies have been found to be twice the levels found in Atlanta and Knoxville. In addition to causing health problems in humans, ozone is also harmful to vegetation. Leaves of many species are damaged after exposure to high levels of ozone, with increased damage at higher elevations.”

WATER QUALITY

The Clean Water Act (CWA) of 1972 (as amended) authorizes the EPA, in partnership with the states, to regulate discharges of pollutants into the waters of the United States and set quality standards for surface waters. Since its implementation almost 40 years ago, the CWA has significantly improved water quality in the United States, primarily as a result of controlling municipal and industrial point-source pollution (Andreen 2004). Point source pollution includes specific discharges from a factory or sewage treatment plant. Non-point source pollution (NPSP) comes from many sources and typically makes its way into waterbodies via surface runoff. It includes a range of materials, including fertilizers, oil, bacteria, road salt, sediment, and pesticides (EPA 2011). NPSP is currently the largest cause of water quality degradation in the United States.

Management of water resources has traditionally focused on two main components, surface water and groundwater. Nearly all surface-water features interact with groundwater. Surface-water bodies gain water and solutes from groundwater systems, and surface water is a source of groundwater recharge and can cause changes in groundwater quality (USGS 1998). About 46 percent of the annual discharge of Blue Ridge and Piedmont streams in the eastern United States originates as

groundwater (Rutledge and Mesko 1996). The groundwater carries not only naturally occurring dissolved constituents to the surface water but, in contaminated areas, also has the potential to carry contaminants to surface waters.

Several surface-water quality studies have been conducted at the watershed-scale. Price and Leigh (2006a) investigated the role of land use on water quality of the upper Little Tennessee River. They found that even modest reductions in forest cover (18-20 percent) had substantial effects on the water quality of local streams. Streams that flowed through more agricultural and urban areas had significantly more dissolved solids, suspended sediments, and nitrates than those that were located in forested areas. These findings reflect similar water quality impacts associated with urban and agricultural land use in the Coweeta Creek watershed (Bolstad and Swank 1997). Based on this study, pastures, pavement, compacted unpaved roads, and other developed areas increased overland waterflow, coupled with fertilizer amendments, animal waste, and human-caused soil disturbance and led to increased inputs resulting in elevated levels of nitrogen, sediments, and fecal coliform bacteria.

The North Carolina Division of Water Quality (NCDWQ) and the Tennessee Division of Water Pollution Control are the agencies responsible for conducting surface-water quality assessments in their respective states and compiling the waters identified on the 303(d) list (Division of Water Pollution Control 2012, Division of Water Quality 2012). Section 303(d) of the federal Clean Water Act was enacted by Congress in 1972, requiring states, territories, and authorized tribes to identify and establish a priority ranking for waterbodies for which technology-based effluent limitations required by Section 301 are not stringent enough to attain and maintain applicable water quality standards, establish total maximum daily loads (TMDLs) for the pollutants causing impairment in those waterbodies, and submit the list of impaired waterbodies and TMDLs to the EPA.

Within the AOI, there are approximately 850 river miles identified as 303(d) waters. The reasons for being included on the list include metals contamination, poor aquatic life biodiversity, fecal coliform, high pH, low dissolved oxygen, turbidity, and others. Both Tennessee and North Carolina are actively working towards solutions to reduce the amount of waters listed on the 303(d) list.

In addition to the abundant surface-water resources within the AOI, roughly one-third of the total human population is supplied by groundwater (Harden et al. 2009). Analysis of data from a network of groundwater wells located throughout the AOI collected from 1997 to 2008 provides a description of water-quality conditions of bedrock aquifers (Harden et al. 2009). The vast majority of well sites met applicable state and federal water-quality standards. Those constituents and properties that exceeded drinking-water standards for at least one well include: aluminum, iron, lead, manganese, and zinc. The most common exceedances of drinking water criteria occurred for radon and pH; however, these exceedances appeared to reflect ambient groundwater conditions. At some sites, surface-derived contaminants were localized to shallow portions of the bedrock aquifer or were present in multiple fracture zones distributed within hundreds of feet within the bedrock well. More pronounced changes in water quality occurred in the anionic composition of the groundwater in response to anthropogenic effects, such as nutrient inputs from local land use.

HYDROLOGY AND WATER QUANTITY

Hydrology

The hydrology of the AOI is dominated by a network of streams and rivers. Within this area there are 7 river basins – four of which flow to the Gulf of Mexico via the Tennessee, Ohio, and Mississippi Rivers and three of which flow to into the Atlantic Ocean. In general, streams within the AOI are of a higher purity than elsewhere in Tennessee or North Carolina, due primarily to the large amounts of forested habitats in the area. There are four designated Wild and Scenic Rivers--12 miles of the Chattooga River, 4 miles of the Horsepasture River, 27 miles of the New River, and 23 miles of Wilson Creek.

At higher elevations, gradients are steeper, with correspondingly strong stream flows. Stream substrates are characterized by exposed bedrock, larger cobbles, gravel, and coarse sand. Low elevation streams tend to be wider and deeper, with smaller-sized sediments than upstream reaches. Generally, forested areas exhibit sub-surface water flow, and overland flow does not occur except during unusually heavy rains. Changes in land-use patterns have been shown to alter the hydrology of streams in the Blue Ridge Mountains. A study of tributaries to the upper Little Tennessee River watershed showed that streams in areas where forest cover was replaced with agricultural productions and urban land use had increased stream flow during rainfall events. In addition, streams in less-forested areas were narrower, deeper, and had less riffle habitat than streams that drained more heavily forested lands (Price and Leigh 2006b). In less forested areas, more frequent overland water flow is likely contributing to increased stream flow rates, resulting in altered stream hydrology and morphology.

Mountain bogs exist because of very specific hydrological, biological, geological, chemical, and climatic conditions. If any of these conditions change, so do the mountain bogs. Alteration of the watershed resulting from inputs of nutrients, water pollution, reduction or increase of water flows, and reduction of water clarity can have significant impact on the status and health of bogs or result in the degradation or outright destruction of the bog. For surface-water fed bogs, maintaining watershed health is of primary importance, for groundwater fed fens and seeps, maintaining aquifer and groundwater health is necessary.

NOISE

Although noise studies are not known to have been conducted in the region, it is expected that the soundscape is relatively undisturbed. The rural nature and low-density population are unlikely to cause significant noise levels in the area. Primary sources of noise are likely from highway traffic.

BIOLOGICAL ENVIRONMENT

The southern Blue Ridge Ecoregion (Ecoregion), which includes parts of Alabama, Georgia, North Carolina, Tennessee, and Virginia, is one of the most biologically significant ecoregions in the United States due to its unique geology, topography, and floristics (The Nature Conservancy and Southern Appalachian Forest Coalition 2000). At least 136 natural terrestrial communities have been identified in the region and over 90 percent of these are considered endemic or limited to the Ecoregion. There are nearly 400 rare plant species and the forests are some of the most diverse in the United States. The Ecoregion is the center of the world's salamander diversity and has the highest number of terrestrial snail species of any ecoregion in the United States. Additionally, the freshwater systems are exceptionally rich in species diversity, with 66 at-risk

aquatic species occurring in the Ecoregion, 20 of which are federally listed as threatened or endangered (The Nature Conservancy and Southern Appalachian Forest Coalition 2000).

The following section describes vegetative communities; bog habitats; general fish and wildlife diversity; threatened, endangered, and imperiled species; and nonnative plants and animals found in the CPAs and surrounding landscape.

VEGETATIVE COMMUNITIES

This section provides a broad overview of the vegetative communities across the AOI and CPA. Vegetative communities are shaped by local climate, topography, geology, and a host of other factors. Generally, each vegetative community has a unique set of dominant plant species (often trees in forest communities) that are accompanied by various shrubs, grasses, and other low-growing plants. Vegetative communities can be used to delineate areas that have similar ecological characteristics, each providing a different type of habitat for wildlife. For the purposes of this Draft EA, vegetative communities or ecological systems as defined by NatureServe, were used (NatureServe 2007), which were mapped using Southeast Gap Analysis Project (SEGAP) land-cover data (U.S. Geological Survey and North Carolina State University 2010). In addition to native vegetative communities, the land-cover data also include descriptions and the spatial extent of anthropogenic areas (developed, agricultural, tree farms, etc). Table 5 shows the acreages and percentages of the land cover within the CPAs. In a subsequent section, a more detailed description of bog habitats is provided.

Table 5. Land cover within the CPAs

Land Cover	Percent
Southern and Central Appalachian Oak Forest	45
Pasture/Hay	11
Southern and Central Appalachian Cove Forest	11
Central and Southern Appalachian Montane Oak Forest	7
Central and Southern Appalachian Northern Hardwood Forest	6
Appalachian Hemlock-Hardwood Forest	5
South-Central Interior Small Stream and Riparian	3
Developed Open Space	3
Evergreen Plantations or Managed Pine	2
Successional Scrub/Shrub (Utility Swath)	2
Southern Appalachian Montane Pine Forest and Woodland	1
Other – Herbaceous	1
Row Crop	1

Land Cover	Percent
Southern Appalachian Low Mountain Pine Forest	1
South-Central Interior Large Floodplain	<1
Open Water (Fresh)	<1
Developed	<1
Southern Ridge and Valley Dry Calcareous Forest	<1
Grassland/Herbaceous	<1
Southern Piedmont Dry Oak-(Pine) Forest	<1
Southern Appalachian Rocky Summit	<1
Southern Appalachian Grass and Shrub Bald	<1
Southern and Central Appalachian Bog and Fen ^a	<1
South-Central Interior Large Floodplain	<1
Southern Piedmont Dry Oak-(Pine) Forest	<1
Southern Appalachian Montane Cliff	<1
Central and Southern Appalachian Spruce-Fir Forest	<1
Total	100

Source: U.S. Geological Survey and North Carolina State University 2010

^aBogs can be found embedded in a variety of vegetative communities. In addition, their relatively small size generally makes it difficult for them to be resolved at the scale used for SEGAP land cover data.

Several of the native vegetative types found in the CPAs are summarized below.

BOG HABITATS

Bogs can be found embedded in a variety of vegetative communities. In addition, their relatively small size generally makes it difficult for them to be resolved at the SEGAP land-cover data scale. A more detailed description of the diversity of bog habitats is provided in this section.

Throughout the southern Appalachians, the terms “bog,” “fen,” or “seep” are variously applied to mountain wetlands. This document adopts this common usage, and that of the North Carolina State Wildlife Action Plan (NCWRC 2005) in referring to a variety of mountain wetland habitats as “mountain bogs.” Specifically included here are swamp forest-bog complexes, southern Appalachian bogs and fens, hillside and low mountain seepage bogs, high- and low-elevation seeps, and meadow bogs as classified by the North Carolina Natural Heritage Program (Weakley and Schafale 1994; Schafale and Weakley 1990).

Mountain bogs are widely accepted as among the rarest and most imperiled habitat types in the southeastern United States (Noss et al. 1995 and references therein; Richardson and Gibbons 1993 and references therein). These habitats are typically small (most are less than 20 acres, and many are less than 2 acres) and can be isolated from more extensive wetland systems; features which have contributed to their having been mostly overlooked by larger scale wetland classification systems (e.g., Cowardin et al. 1979) and in the interpretation of remotely sensed imagery (e.g., Landsat imagery, National Wetlands Inventory Maps).

Mountain bog vegetation is variable within the CPAs, and many contain a diverse mixture of herbaceous and woody vegetation. The vegetation community is influenced by hydrology, soils, topography, disturbance history, and land-use activities, among others. Each site can be quite different floristically from the next. Sphagnum is thought to be a keystone species in many mountain wetlands, because it maintains the hydrology of the site by holding and slowly releasing water, and prevents soils from drying out during periods of drought. Many of the rare species associated with these habitats, including the bog turtle, four-toed salamander, orchids, and pitcher plants, live in or reproduce in this moss.

Some plants that can be found in bogs include cinnamon fern, royal fern, bog laurel, golden club, cranberry, carnivorous plants, beak rush, bulrushes, and sedges. Trees associated with bogs may include red maple, white pine, hemlock, pitch pine, river birch, and occasionally red spruce. Shrubs such as rhododendron, alder, poison sumac, and bog rose are often found in and around bogs. Herbaceous vegetation may include many species of sedges and rushes, and mountain wildflowers (herbs).

Mountain bogs are recognized hotspots for biodiversity and endemism, containing numerous rare and declining plant species (Weakley and Schafale 1994). Seventeen of these species are either federally listed under the Endangered Species Act or recognized by the Service as federal species of concern. In addition, 21 plant species listed by the North Carolina Plant Conservation Program (NCPCCP) are found in mountain bogs. Another 41 plant species associated with mountain bog species have been proposed for state listing by NCPCCP. Numerous rare plants that are associated with bogs in the Blue Ridge Mountains have also been identified by Tennessee's Natural Heritage Program (2012). As in many parts of the country, rare plants are at risk from development, invasive plants, poaching, and other threats. Even if a site is protected from development, plants sought after by collectors can be at risk. For example, several endangered bunched arrowhead plants were recently removed from a site in South Carolina, one of the few locations worldwide that supports these imperiled plants (South Carolina Department of Natural Resources 2012).

Southern and Central Appalachian Oak Forest

This vegetative community consists primarily of dry-mesic forests occurring on open and exposed topography at lower- to mid-elevations. Typically, the vegetation consists of forests dominated by oaks, especially chestnut oak (*Quercus prinus*), white oak (*Q. alba*), red oak (*Q. rubra*), and scarlet oak (*Q. coccinea*), with varying amounts of hickories (*Carya* spp.), red maple (*Acer rubrum*), and other species. Successional communities within these forests are dominated by tuliptree (*Liriodendron tulipifera*), pines (*Pinus* spp.), and black locust (*Robinia pseudoacacia*), many of which have been impacted by logging or agriculture (NatureServe 2007). Selected priority species that utilize this habitat include Cooper's and sharp-shinned hawks (*Accipiter cooperii* and *A. striatus*), black-billed cuckoo (*Coccyzus erythrophthalmus*), cerulean warbler (*Dendroica cerulea*), golden-winged warbler (*Vermivora chrysoptera*), least weasel (*Mustela nivalis*), timber rattlesnake (*Crotalus horridus*), and tellico salamander (*Plethodon aureolus*) (North Carolina Wildlife Resources Commission 2005, Tennessee Wildlife Resources Agency 2005).

Southern and Central Appalachian Cove Forest

Cove forest are characterized by hardwoods or hemlock-hardwoods located in sheltered topographic positions, typically on concave slopes that promote moist conditions. Characteristic species in the canopy include yellow buckeye (*Aesculus flava*), sugar maple (*Acer saccharum*), American ash (*Fraxinus americana*), American basswood (*Tilia americana*), tuliptree (*Liriodendron tulipifera*), Carolina silverbell (*Halesia tetraptera*), eastern hemlock (*Tsuga canadensis*), American beech (*Fagus grandifolia*), and magnolias (*Magnolia acuminata* and *M. fraseri*) (NatureServe 2007). A developing threat to this community is the spread of the nonnative hemlock woolly adelgid (*Adelges tsugae*), which could cause substantial changes in the structure and function of this habitat (Ford et al. 2007, Spaulding and Rieske 2010). Examples of priority species supported by this habitat include, yellow-bellied sapsucker (*Sphyrapicus varius*), woodland jumping mouse (*Napaeozapus insignis*), smoky shrew (*Sorex fumeus*), eastern hog-nosed snake (*Heterodon platirhinos*), seepage salamander (*Desmognathus aeneus*), and pigmy salamander (*D. wrighti*) (North Carolina Wildlife Resources Commission 2005, Tennessee Wildlife Resources Agency 2005).

Central and Southern Appalachian Montane Oak Forest

These high-elevation deciduous forests occur on exposed sites, mostly between 3,000-4,500 feet elevation. They are dominated by oaks, most commonly red and white, with trees often stunted or wind-flagged. American chestnut (*Castanea dentate*) sprouts are also common, but this species has been dramatically reduced by chestnut blight decades ago. Mountain holly (*Ilex montana*) and early azalea (*Rhododendron prinophyllum*) are characteristic shrubs. Major threats include fire suppression and gypsy moth (*Lymantria dispar*) (NatureServe 2007). This habitat supports many priority bird species also found in other oak-dominated forests. In addition, over 10 imperiled salamander species are found here (North Carolina Wildlife Resources Commission 2005, Tennessee Wildlife Resources Agency 2005).

Central and Southern Appalachian Northern Hardwood Forest

These hardwood forests are found at higher elevation, generally above 4,500 feet. They are dominated by northern red oak or various other hardwoods with similar soil-moisture requirements. This vegetative community is rare as these high elevations are uncommon regionally (NatureServe 2007). Priority species found in this habitat include northern saw-whet owl (*Aegolius acadicus*), rose-breasted grosbeak (*Pheucticus ludovicianus*), northern flying squirrel (*Glaucomys sabrinus*), Appalachian cottontail (*Sylvilagus obscurus*), and Weller's salamander (*Plethodon welleri*) (North Carolina Wildlife Resources Commission 2005, Tennessee Wildlife Resources Agency 2005).

NONNATIVE PLANTS

Nonnative invasive species are reported to be the second-most critical threat to conservation of biodiversity (Wilcove et al. 1998). Nonnative plants are known to occur across southern Appalachian forests, accounting for 15 - 20 percent of the documented flora. While not all nonnative species are known to disrupt native ecosystems, of particular concern are those that are successful at invading and rapidly spreading through natural habitats, resulting in changes in the native vegetative community (U.S. Forest Service 2003 and 2009). Some examples of exotic plants that invade bogs and adjacent habitats include:

- Oriental bittersweet (*Celastrus orbiculatus*)
- Princess tree (*Paulownia tomentosa*)
- Japanese meadowsweet (*Spiraea japonica*)
- Japanese knotweed (*Polygonum cuspidatum*)
- Japanese stiltgrass or Nepalese browntop (*Microstegium vimineum*)

-
- Chinese/European privet (*Ligustrum sinense/vulgare*)
 - Chinese silver grass (*Miscanthus sinensis*)
 - Multiflora rose (*Rosa multiflora*)
 - Japanese honeysuckle (*Lonicera japonica*)
 - Kudzu (*Pueraria Montana*)
 - English ivy (*Hedera helix*)

EXOTIC PESTS

The spread of nonnative or exotic species represents one of the most serious threats to biodiversity nationwide, undermining the ecological integrity of native habitats and pushing rare species to the edge of extinction. Often, introduced species lack predators for control or simply out-compete native species. Once established, many exotic species are virtually impossible to eradicate. They have been implicated in the decline of nearly half the imperiled species in the United States (Defenders of Wildlife 2006).

There are numerous exotic or nonnative invasive species within the AOI. High elevation spruce-fir forests have been decimated in certain locations primarily by the balsam wooly adelgid, another exotic pest introduced a couple of decades ago (Hoffard et al. 1995). Other exotic pests that have contributed to the decline of the forests include the beech bark disease, butternut canker, dogwood anthracnose, gypsy moth, hemlock woolly adelgid, and red oak decline (The Nature Conservancy and Southern Appalachian Forest Coalition 2000). Feral hogs (*Sus scrofa*) are expanding their range, damaging native plants and exacerbating soil erosion.

FISH AND WILDLIFE

General Wildlife Diversity

A variety of wildlife species use the diverse habitats within the AOI. Common game species are described in the socioeconomic section.

Mammals

Mammal species include many of those commonly found in the eastern United States (e.g., raccoon, mink, muskrat, river otter, and beaver and a variety of small mammals). Several species of bats breed and hibernate in the area, and the Blue Ridge Mountains serve as a major avenue for migrating bats.

Birds

In addition to many common species, the CPAs support several priority migratory birds, many of which are associated with mountain bog habitats. See Table 6 for a list of some of the priority bird species found in the CPAs

Table 6. Priority migratory bird species associated with mountain bogs and adjacent habitats

Common Name	Scientific Name	Conservation Action Category ^a	AMJV Priority Tier ^b
Acadian flycatcher	<i>Empidonax virescens</i>	V	High
Alder flycatcher	<i>Empidonax alnorum</i>	V	Moderate
American woodcock	<i>Scolopax minor</i>	-	Highest
Bewick's wren	<i>Thryomanes bewickii</i>	I	Highest
Blackburnian warbler	<i>Dendroica fusca</i>	III	Moderate
Canada warbler	<i>Wilsonia Canadensis</i>	IV	High
Field sparrow	<i>Spizella pusilla</i>	V	High
Golden-winged warbler	<i>Vermivora chrysoptera</i>	II	Highest
Kentucky warbler	<i>Geothlypis Formosa</i>	V	Highest
Louisiana waterthrush	<i>Parkesia motacilla</i>	V	High
Northern saw-whet owl	<i>Aegolius acadicus</i>	I	Moderate
Red crossbill	<i>Loxia curvirostra</i>	III	High
Scarlet tanager	<i>Piranga olivacea</i>	IV	Moderate
Swainson's warbler	<i>Limnothlypis swainsonii</i>	III	High
Willow flycatcher	<i>Empidonax traillii</i>	-	Moderate
Wood thrush	<i>Hylocichla mustelina</i>	IV	Highest
Yellow bellied sapsucker	<i>Sphyrapicus varius</i>	I	High

^a Partners in Flight Bird Conservation Plan for the Southern Blue Ridge [1999], Partners in Flight Conservation Plan Categories:

I – Crisis recovery.

II – Immediate management and/or policy action needed for population stabilization.

III – Management to reverse, stabilize, or increase populations in the physiographic area.

IV – Long-term planning and responsibility in the physiographic area.

V – Investigations to better determine status or level of threat.

^b Implementation Plan for the Appalachian Mountains Joint Venture: A Foundation for All-Bird Conservation in the Region [2007] Appendix II – Highest, High, Moderate.

Amphibians and Reptiles

The area provides habitat for many generalist and opportunistic amphibian and reptile species. In addition, several rare reptile species are supported, including timber rattlesnake (*Crotalus horridus*) and coal skink (*Eumeces anthracinus*). Common reptile species often found in mountain wetlands include queen snake, Eastern kingsnake, and Eastern box turtle. The Blue Ridge Ecoregion has the highest diversity of salamanders in the world (Hicks and Pearson 2003). Species found within the CPAs include seepage salamander (*Desmognathus aeneus*), shovel-nose salamander (*Desmognathus marmoratus*), green salamander (*Aneides aeneus*), and Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*). Priority salamander species associated with bogs include mole salamander, marbled salamander, four-toed salamander, three-lined salamander, and spotted salamander.

Fish and Other Aquatic Animals

Commonly known species of fish include bluegill (*Lepomis macrochirus*), muskellunge (*Esox masquinongy*), largemouth and smallmouth bass (*Micropterus salmoides* and *M. dolomieu*), and brook trout (*Salvelinus fontinalis*). Less well-known species include redlip shiner (*Notropis chiliticus*), golden redhorse (*Moxostoma erythrurum*), and rosyside dace (*Clinostomus funduloides*). In addition to fish, the area supports a variety of mussels, crayfish, and other invertebrate species. A number of these aquatic invertebrates are rare and imperiled.

THREATENED, ENDANGERED, AND CANDIDATE SPECIES

Federal Listed Species

The CPAs and surrounding areas support at least thirteen threatened and endangered species and one candidate species, as listed in Table 7. In addition, there are at least 12 federal species of concern which are also found in bog habitats.

Table 7. Federally listed, candidate, and federal species of concern found in mountain bog habitats^a

Common Name	Scientific Name
<i>Endangered</i>	
Bunched arrowhead*	<i>Sagittaria fasciculata</i>
Carolina northern flying squirrel	<i>Glaucomys sabrinus coloratus</i>
Green pitcher plant*	<i>Sarracenia oreophila</i>
Mountain sweet pitcher plant*	<i>Sarracenia rubra</i> ssp. <i>jonesii</i>
Roan Mountain bluet	<i>Houstonia Montana</i>
Rock gnome lichen	<i>Gymnoderma lineare</i>
Spreading avens	<i>Geum radiatum</i>
Virginia big-eared bat	<i>Corynorhinus townsendii virginianus</i>

Common Name	Scientific Name
Threatened	
Bog turtle* (T(S/A)) ^b	<i>Glyptemys muhlenbergii</i>
Heller's blazing-star	<i>Liatris helleri</i>
Small whorled pogonia	<i>Isotria medeoloides</i>
Swamp pink*	<i>Helonias bullata</i>
Virginia spiraea	<i>Spiraea virginiana</i>
Candidate	
White fringeless orchid*	<i>Platanthera integrilabia</i>
Federal Species of Concern	
Appalachian Bewick's wren	<i>Thryomanes bewickii altus</i>
Bog bluegrass	<i>Poa paludigena</i>
Cuthbert's turtlehead	<i>Chelone cuthbertii</i>
French Broad heartleaf	<i>Hexastylis rhombiformis</i>
Golden-winged warbler	<i>Vermivora chrysoptera</i>
Gray's lily	<i>Lilium grayi</i>
Large leaf grass of Parnassus	<i>Parnassia grandiflora</i>
Large-flowered Barbara's buttons	<i>Marhsallia grandiflora</i>
New Jersey rush	<i>Juncus ceasariensis</i>
Piedmont meadow-rue	<i>Thalictrum macrostylum</i>
Red crossbill – Southern Appalachian population	<i>Loxia curvirostra</i> pop. 1
Seepage salamander	<i>Desmognathus aeneus</i>

^a This document uses a broad definition of mountain bogs that includes some wetland sites of the North Carolina Piedmont (e.g. hillside seepage bogs per the North Carolina Natural Heritage Program).

^b The southern population of the bog turtle is listed as Threatened due to Similarity of Appearance (T(S/A)) with the northern population of the bog turtle.

*Bog obligate species

State Listed Species

The region supports hundreds of state listed (threatened and endangered) and priority species. Table 8 shows selected state listed species.

Table 8. State listed species known to occur in the CPAs

Common Name	Scientific Name	State Status	
		NC	TN
Plants			
American speedwell	<i>Veronica americana</i>	T	S
Bog featherbells	<i>Stenanthium gramineum</i> var. <i>robustum</i>	T	NL
Bog fern	<i>Thelypteris simulata</i>	E	E-P
Bog rose	<i>Arethusa bulbosa</i>	E	NL
Fen orchid	<i>Liparis loeselii</i>	E	T
Cranberry	<i>Vaccinium macrocarpon</i>	T	T
Long-bracted Frog Orchid	<i>Coeloglossum viride</i> var. <i>virescens</i>	E	E
Gray's lily	<i>Lilium grayi</i>	T	E
Large purple-fringed orchid	<i>Platanthera grandiflora</i>	T	E
Large-leaved grass-of-Parnassus	<i>Parnassia grandifolia</i>	T	S
Linear-leaved willow-herb	<i>Epilobium leptophyllum</i>	NL	T
Littleleaf sneezeweed	<i>Helenium brevifolium</i>	E	E
Marsh-marigold	<i>Caltha palustris</i>	E	E
Mountain watercress	<i>Cardamine rotundifolia</i>	T	S
Northern Cup-plant	<i>Silphium perfoliatum</i>	T	NL
Robin runaway	<i>Rubus dalibarda</i>	E	NL

Common Name	Scientific Name	State Status	
		NC	TN
Tall larkspur	<i>Delphinium exaltatum</i>	E	E
Tufted hairgrass	<i>Deschampsia cespitosa ssp. glauca</i>	T	NL
Invertebrates			
High mountain supercoil	<i>Paravitrea andrewsae</i>	S	NL
Spike	<i>Elliptio dilatata</i>	S	NL
Spiral coil	<i>Helicodiscus bonamicus</i>	S	S
Velvet covert	<i>Inflectarius subpalliatu</i>	S	NL
Fish			
Kanawha minnow	<i>Phenacobius teretulus</i>	S	NL
Sharpnose darter	<i>Percina oxyrhynchus</i>	S	NL
Amphibians			
Four-toed salamander	<i>Hemidactylium scutatum</i>		
Green salamander	<i>Aneides aeneus</i>	E	S
Mole salamander	<i>Ambystoma talpoideum</i>	S	NL
Reptiles			
Bog turtle	<i>Glyptemys muhlenbergii</i>	T	T
Timber rattlesnake	<i>Crotalus horridus</i>	S	NL
Birds			
Appalachian Bewick's wren	<i>Thryomanes bewickii altus</i>	E	E
Brown creeper	<i>Certhia americana</i>	S	NL

Common Name	Scientific Name	State Status	
		NC	TN
Northern saw-whet owl	<i>Aegolius acadicus</i>	T	T
Mammals			
Allegheny woodrat	<i>Neotoma magister</i>	S	S
Eastern small-footed bat	<i>Myotis leibii</i>	S	S
Key: E=endangered, NL=not listed, P=possibly extirpated, S=special concern species, T=threatened Sources: North Carolina Natural Heritage Program 2010a&b, Tennessee Division of Natural Areas 2012			

RELATED RESOURCES

Sections B and C of Chapter II in the Draft LPP provide an overview of related resources in this landscape, including landscape conservation goals and objectives, as well as partner efforts. The proposed refuge would contribute to many of these including the Appalachian Landscape Conservation Cooperative (USFWS 2011); conservation and mitigation banks; and international, national, and regional conservation plans and initiatives. Several of these are listed below.

International

Partners in Flight (PIF) North American Landbird Bird Conservation Plan (Rich et al. 2004)

National

America's Great Outdoors (AGO) Initiative (AGO 2011)
Wetlands Reserve Program (WRP) of the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) (USDA 2011)
Partners for Fish and Wildlife (USFWS 2007)
Forest Stewardship Program (USFS 2011)
Strategic Plan for Responding to Accelerating Climate Change (USFWS 2009)

Regional

Partners in Flight Bird Conservation Plan for the Southern Blue Ridge (Hunter et al. 1999)
Threatened and Endangered Species Recovery Plans (USFWS 2012)
Southern Blue Ridge Ecoregion Conservation Plan (The Nature Conservancy and Southern Appalachian Forest Coalition 2000)
Blue Ridge National Heritage Area (BRNHA) Management Plan (BRNHA 2008)
Southern Blue Ridge Fire Learning Network (2012)

State

North Carolina Wildlife Action Plan (NCWRC 2005)
North Carolina Department of Environment and Natural Resources 2009-2013 Strategic Plan (NCDENR 2009)
Tennessee's Comprehensive Wildlife Conservation Strategy (TWRA 2005)
Climate Change and Potential Impacts to Wildlife in Tennessee (TWRA 2009)
North Carolina's Blue Ridge Forever (Conservation Trust for North Carolina 2012)

County

Henderson County 2020 Comprehensive Plan (Henderson County 2008)
Growing with Green in our Minds: Strategies for Land Conservation in Jackson County (Jackson County 2008)
Citizens' Plan for Watauga (Watauga County 2010)

Several state and federal agencies serve as key partners in this landscape, including the North Carolina Wildlife Resources Commission, Tennessee Wildlife Resources Agency, North Carolina Division of Parks and Recreation, North Carolina Department of Transportation, USDA Forest Service, Natural Resources Conservation Service, and National Park Service. During this planning process, the Service contacted the Eastern Band of Cherokee Indians.

Figure 7 depicts current conservation lands and waters within the area. Many of our partners already own or have future plans to protect lands in the project area through conservation or agricultural easements. Still others have completed on-the-ground habitat restoration projects throughout the area. Taken together, the efforts have aided the protection of state and federal listed threatened and endangered species, mountain forests, farmlands, and recreational areas that contribute to the long-term ecological health, economy, and way of life of the region.

SOCIOECONOMIC ENVIRONMENT

This section summarizes population, employment, income, tourism, and wildlife-dependent recreational data and trends for counties in the AOI, the area potentially affected by the proposed action and, where applicable, state and national levels.

The AOI comprises a landscape that is largely rural, with education and health services; trade, transportation, and utilities; and outdoor recreation/tourism being among the more important economic drivers of the area of interest (from the Bureau of Labor Statistics – the graph on employment and income section). Over 2 million people are located within a one to two hour drive of the AOI (U.S. Census Bureau 2012). For the purposes of this Draft EA, selected demographic and economic data for the following North Carolina counties (those containing CPAs for the proposed refuge) were summarized: Alleghany, Ashe, Avery, Clay, Graham, Henderson, Jackson, Macon, Transylvania, Watauga, and Wilkes. Similar types of data for Carter and Johnson Counties, Tennessee, are also included.

POPULATION

Recent Population Trends: 2000-2010

Human population characteristics for the AOI are shown in Table 12. Data from 2000 are compared to 2010 data, and the general trend is that the population has continued to rise in all the counties. The 13-county area added more than 40,000 people between 2000 and 2010, the size of a small city. The average 10-year growth rate for all counties was almost 13 percent. At 1.2 percent, Carter County had the lowest growth rate. Jackson and Clay Counties grew the fastest, with growth rates over 20 percent, which is comparable to the statewide growth rate for North Carolina of 18.5 percent during

the same timeframe. Tennessee's growth rate during those 10 years was 11.5 percent, which was substantially higher than the growth rates of Carter and Johnson Counties during that timeframe.

Changes in population density (persons-per-square-mile) can be used to predict future land use, with growing population densities indicative of an urbanizing landscape. Population densities increased for all counties (Table 9). Henderson County was the most densely populated county in 2010, with 286 persons per-square-mile followed by Carter, Watauga, and Transylvania Counties.

Table 9. Local and regional population estimates, characteristics, and trends (2000 - 2010)

Demographic Unit	Population Characteristics in 2000		Population Characteristics in 2010		Population Change (2000 to 2010)
	Residents	Persons per Square Mile	Residents	Persons per Square Mile	
North Carolina	8,049,313	166	9,535,483	196	18.5%
Alleghany County	10,677	47	11,155	48	4.5%
Ashe County	24,384	57	27,281	64	11.9%
Avery County	17,167	69	17,797	72	3.7%
Clay County	8,775	41	10,587	49	20.6%
Graham County	7,993	27	8,861	30	10.9%
Henderson County	89,173	239	106,740	286	19.7%
Jackson County	33,121	67	40,271	82	21.6%
Macon County	29,811	58	33,922	66	13.8%

Demographic Unit	Population Characteristics in 2000		Population Characteristics in 2010		Population Change (2000 to 2010)
	Residents	Persons per Square Mile	Residents	Persons per Square Mile	
Transylvania County	29,334	77	33,090	87	12.8%
Watauga County	42,695	136	51,079	163	19.6%
Wilkes County	65,632	87	69,340	92	5.6%
Tennessee	5,689,283	135	6,346,105	151	11.5%
Carter County	56,742	166	57,424	168	1.2%
Johnson County	17,499	59	18,244	61	4.3%

Source: U.S. Census Bureau 2012

Projected Population Trends: 2000-2030

As was discussed above, the population of North Carolina rose during the past 10 years and is expected to do so for the next 20 years. By 2030, it is estimated that North Carolina's population will reach over 12 million, a rise of almost 52 percent compared to 2000 (Table 13; U.S. Census Bureau 2005). This is double the rate of growth projected for the United States. The projections developed in 2005 may have underestimated future growth rates for the state. For example, population growth estimates made in 2005 predicted that in 2010, North Carolina would have 9.3 million people. However, based on 2010 census data, the actual population size for North Carolina that year was 9.5 million, a difference of about 200,000 people or 2 percent. If these current actual growth rates continue, North Carolina's population may approach 13 million people by 2030.

At 30 percent, Tennessee’s population growth is not as fast as North Carolina and largely mirrors the nation’s rate of 29 percent. Between 2000 and 2010, Tennessee added over a million people. By 2030, the state is expected to have over seven million residents (Table 10).

Table 10. National and state population trends (2000–2030)

Demographic Unit	2000	2010	2020	2030	Percent Population Change (2000 to 2030)
U.S.	281,421,906	308,745,538	335,614,503	363,394,392	29%
North Carolina	8,049,313	9,345,823	10,709,289	12,227,739	52%
Tennessee	5,689,283	6,346,105	6,887,930	7,380,634	30%

Source: U.S. Census Bureau 2005

EMPLOYMENT AND INCOME

Employment and income data were summarized for the counties that are part of the AOI, as well as North Carolina and Tennessee (Tables 14 and 15).

Employment data for the all the industry categories are summarized for 2010 in Table 11. Generally, the counties were relatively similar in terms of the relative importance that each industry category was in providing employment opportunities. Natural resource and mining jobs were relatively few in all counties. The same was true for financial services, information, other services (i.e., automotive repair, personal care), and public administrative jobs. Construction and professional/business services were of medium importance in terms of jobs provided. Manufacturing jobs made up a large component of the total jobs in Alleghany, Ashe, Carter, Graham, Henderson, Jackson, and Wilkes Counties. Trade, transportation, and utilities jobs were a major component of the total jobs in all counties. The same was true for education/health and leisure/hospitality jobs.

Table 11. Percent full and part-time employment in 2010 by industry for counties in the AOI

Industry	Alleghany	Ashe	Avery	Carter	Clay	Graham	Henderson	Jackson	Johnson	Macon	Transylvania	Watauga	Wilkes
Natural resources and mining	8	3	2	<1	N D	N D	3	1	<1	1	<1	<1	1
Construction	6	10	7	8	13	17	5	7	N D	8	6	6	5
Manufacturing	20	21	2	11	N D	N D	15	2	23	7	5	3	18
Trade, transportation, and utilities	14	26	19	26	35	17	20	19	39	20	24	24	19
Information	1	2	<1	1	1	N D	1	3	1	1	1	1	1
Financial activities	3	5	4	4	4	3	3	4	6	4	4	5	4
Professional and business services	3	6	4	4	3	7	9	9	2	11	6	8	12
Education and health services	29	12	27	23	30	36	26	28	17	22	32	23	22
Leisure and hospitality	15	12	23	12	10	15	11	23	9	15	17	22	8
Other services	2	3	5	3	1	N D	3	3	2	4	3	2	3
Public administration	<1	<1	7	6	3	4	5	<1	1	8	1	5	7

ND – no data

Source: Bureau of Labor Statistics 2012a

National, state, and county income, unemployment and poverty estimates for 2000 and 2010 data are shown in Table 15. Average annual incomes rose in all counties included in the area of interest, following patterns seen at state and national levels. However, average annual pay was below the state average in all counties in 2010. Henderson, Jackson, and Watauga Counties had the highest average salaries in 2010, while the counties with the lowest annual pay included Alleghany, Clay, and Graham. Carter and Johnson Counties had among the lowest average annual salaries in 2000. However, salaries in these two Tennessee counties generally rose faster than those in North Carolina, and by 2010 they had surpassed five other counties.

The effects of the economic downturn in recent years can be seen in the comparison between 2001 and 2010 unemployment and poverty (2000) data (Table 12). In all counties, unemployment levels rose sharply between 2001 and 2010. As would be expected, county poverty rates also increased during the 2000-2010 period, as a result of rising unemployment levels. Generally, poverty rates increased several percentage points during the 2000-2010 timeframe. Poverty rates in Alleghany, Clay, and Watauga Counties in 2010 were well above the average for North Carolina. Henderson and Transylvania Counties had the lowest poverty rates, slightly below the state average, in 2010. The poverty rates for Carver and Johnson Counties were above the Tennessee average in 2010.

Table 12. Income, unemployment, and poverty estimates

Demographic Unit	Average Annual Pay (US Dollars)		Percent* Unemployment		Percent of Persons Below Poverty Line	
	2001	2010	2001	2010	2000	2010
United States	\$41,994	\$51,425	3.7	9.0	12.4	15.3
North Carolina	\$31,380	\$40,500	6.3	10.9	12.3	15.5
Alleghany County	\$21,872	\$25,952	8.7	11.5	17.2	26.2
Ashe County	\$22,688	\$28,909	8.1	12.3	13.5	17.8
Avery County	\$20,338	\$27,900	4	8.8	13.5	18.1
Clay County	\$22,490	\$26,714	5.0	11.1	11.4	21.4
Graham County	\$22,679	\$27,783	6.6	16.1	16.2	19.3
Henderson County	\$28,201	\$33,790	4.4	8.4	9.7	12.7
Jackson County	\$26,358	\$35,422	2.9	10.1	12	17.2
Macon County	\$23,927	\$29,520	4.7	11.0	12.6	16.9
Transylvania County	\$28,412	\$29,339	5.1	9.8	9.5	14.0
Watauga County	\$23,544	\$31,580	3.7	8.0	17.9	24.8
Wilkes County	\$27,027	\$31,297	3.6	12.2	12.3	18.3
Tennessee	\$31,520	\$41,572	3.5	9.7	13.5	17.8
Carter County	\$21,650	\$28,452	4.9	10.3	15.2	22.3
Johnson County	\$21,946	\$32,115	6.8	12.6	19.8	28.8

*Annual averages

Sources: Bureau of Labor Statistics 2001 and 2012, Southern Rural Development Center. 2012, U.S. Census Bureau 2000 and 2012

TOURISM

Tourism is an important part of North Carolina's economy, with over 36 million people visiting the state in 2010. Visitors to and throughout North Carolina spent a record \$17 billion that year. This spending directly supported nearly 185,000 jobs for North Carolina residents and generated approximately \$1.5 billion in state and local tax revenues for reinvestment within local communities (North Carolina Department of Commerce 2010).

Tourism is also an important economic driver in Tennessee, contributing \$23.1 billion in revenue in 2010. State-wide domestic and international traveler expenditures supported 278,400 jobs that year (Tennessee Department of Tourism Development, 2011a).

Regionally, the Blue Ridge area is an important tourist destination. Approximately 11.3 million visitors made 21.5 million visits to the region in 2004. Spending from tourism contributed over \$2.8 billion to the economy of the area that year. This spending accounted for the creation of approximately 46,000 jobs in the region. In addition, over 1,300 businesses directly associated with tourism existed at the time of the study serving these visitors (BRNHA 2008).

Specifically to the AOI, tourism spending is generally a significant and growing economic force, though most prevalent in Avery, Watauga, and Henderson Counties. Tourism-based revenue (direct visitor expenditures), per county, for 2011 is noted in Table 13 below.

Table 13. Tourism-based revenue for North Carolina counties in the AOI

County	2001	2011
Alleghany	13,880,000	21,620,000
Ashe	30,080,000	45,340,000
Avery	74,640,000	98,380,000
Clay	8,310,000	11,650,000
Graham	17,060,000	23,730,000
Henderson	157,970,000	209,390,000
Jackson	50,130,000	66,790,000
Macon	81,130,000	126,150,000
Transylvania	60,860,000	77,320,000
Watauga	146,920,000	197,560,000
Wilkes	49,460,000	62,330,000

Source: North Carolina Department of Commerce 2012.

While historical data for Tennessee was not readily available for this Draft EA, 2010 data (Table 14) demonstrate the economic impact of travel in Carter and Johnson Counties, Tennessee, which is lower than nearly all of the North Carolina counties in the AOI.

Table 14. Tourism-based revenue for Tennessee counties in the AOI for 2010

County	Direct visitor expenditures
Carter	28,600,000
Johnson	9,050,000

Source: Tennessee Department of Tourist Development 2011b

WILDLIFE-DEPENDENT RECREATION

Fish and wildlife are economically important nationwide. According to the report, “Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation,” approximately 34.8 million people visited national wildlife refuges in Fiscal Year 2006, generating almost \$1.7 billion in total economic activity and creating almost 27,000 private sector jobs, producing about \$542.8 million in employment income. Additionally, recreational spending on refuges generated nearly \$185.3 million in tax revenue at the local, county, state, and federal levels (Carver and Caudill 2007). In 2006, nearly 71 million people 16 years and older spent \$45.7 billion and generated \$122.6 billion while fishing, hunting, or observing wildlife (Leonard 2008). As land development continues and the number of places left to enjoy wildlife decreases, refuge lands may become even more important to the local community. It can benefit the community directly by providing recreational and employment opportunities for the local population and indirectly by attracting tourists from outside the area to generate additional dollars for the local economy.

In North Carolina, there were over 4.2 million participants engaged in one or more of three wildlife-dependent recreational activities (e.g., fishing, hunting, wildlife watching) during 2006, as shown Table 15 (USFWS and U.S. Census Bureau 2006). Most participants, over 2.6 million, engaged in wildlife watching, followed by fishing (about 1.2 million), and hunting (approximately 304,000). In the survey results, wildlife-associated expenditures were segregated into trip-related expenses and money spent on equipment and supplies. Combined, participants engaged in wildlife-dependent recreation spent over \$2 billion in North Carolina during 2006. Total expenditures (trip-related and equipment/supplies) were the highest for fishing, followed by hunting and wildlife watching. The average expenditures per participant were the highest for hunters (\$1,315) and the lowest for wildlife watchers (\$336).

Table 15. Economics of wildlife-dependent recreation in North Carolina during 2006

Activity	Number of Participants	Expenditures			
		Trip-related	Equipment & Supplies	Total	Average Per Participant
Fishing	1,263,000	\$692,977,000	\$431,297,000	\$1,124,274,000	\$849
Hunting	304,000	\$89,979,000	\$340,583,000	\$430,562,000	\$1,315
Wildlife Watching	2,641,000	\$246,906,000	\$670,000,000	\$916,907,000	\$336
Total	4,208,000	\$1,029,862,000	\$1,441,880,000	\$2,471,743,000	

Source: USFWS and U.S. Census Bureau 2006

Throughout Tennessee, over 3.5 million participants engaged in one or more of three wildlife-related recreation activities (e.g., fishing, hunting, wildlife watching) during 2006, as shown Table 16 (USFWS and U.S. Census Bureau 2006). The majority of participants, over 2.3 million, engaged in wildlife watching, followed by fishing (about 871,000), and hunting (approximately 329,000). Expenditures were the highest for wildlife watchers (almost \$1 billion), followed by anglers (approximately \$600 million), and hunters (about \$500 million). Together, participants engaged in wildlife-dependent recreation spent over \$2 billion in Tennessee during 2006. The average expenditures per participant were the highest for hunting (\$867), followed by fishing (\$623) and wildlife watching (\$400).

Table 16. Economics of wildlife-dependent recreation in Tennessee during 2006

Activity	Number of Participants	Expenditures			
		Trip-related	Equipment & Supplies	Total	Average Per Participant
Fishing	871,000	\$290,424,000	\$309,259,000	\$599,683,000	\$623
Hunting	329,000	\$109,447,000	\$378,973,000	\$488,420,000	\$867
Wildlife Watching	2,362,000	\$327,240,000	\$665,126,000	\$992,365,000	\$400
Total	3,562,000	\$727,111,000	\$1,353,358,000	\$2,080,468,000	

Source: USFWS and U.S. Census Bureau 2006

Trout fishing, a popular outdoor recreational activity in the AOI, has been shown to have an important economic impact, at least in North Carolina. In 2008, trout anglers spent \$146 million in the state (North Carolina Wildlife Resources Commission 2009).

Recreational Activities and Trends

Still largely rural, the AOI provides a variety of opportunities for outdoor recreation, including hunting, fishing, wildlife viewing, hiking, biking, horseback riding, camping, and off-roading. For the purposes of this Draft EA, the focus of our discussion on recreational opportunities will be on those that are wildlife-dependent.

In the AOI, various federal, state, and privately managed lands are accessible to the public for a variety of recreational activities. Conservation lands within the AOI that are generally open to the public include:

- Blue Ridge Parkway (NPS)
- Buffalo Cove Game Land (NCWRC)
- Carl Sandburg Home National Historic site (NPS)
- Dupont State Forest (NCAGR)
- Elk Knob State Park (NCDENR)
- Gorges State Park (NCDENR)
- Grandfather Mountain State Park (NCDENR)
- Green River Game Land (NCWRC)
- Holmes Educational State Forest (NCAGR)
- Kerr Scott Game Land (USACOE)
- Mitchell River Game Land (NCWRC)
- Mount Jefferson State Park (NCDENR)
- Nantahala National Forest (USFS)
- Needmore Game Land (NCWRC)
- New River State Park (NCDENR)
- North Cherokee National Forest and WMA (TWRA and USDA Forest Service)
- Pisgah National Forest (USFS)
- Pond Mountain Game Land (NCWRC)
- Stone Mountain State Park (NCDENR)
- Three Top Mountain Game Land (NCWRC)
- Toxaway Game Land (NCWRC)

Hunting

The variety of upland and wetland habitat found in the AOI supports a diversity of game species, including black bear, deer, hog, turkey, waterfowl, dove, quail, and a variety of small game. Many of these species attract sport and game enthusiasts to the area. Several of the game species hunted in the AOI are further discussed below. The NCWRC Game Lands Program has been highly instrumental in providing quality hunting opportunities to North Carolina. With over 100 Game Lands statewide, NCWRC currently has 2,021,745 acres in the Game Lands Program. These are lands that are owned or leased by NCWRC. Cooperative agreements with the landowners are also used to provide public hunting opportunities (NCWRC 2007).

Hunting is an important outdoor recreational activity in Tennessee as well. TWRA Wildlife Management Areas, numbering nearly 100, have been highly instrumental in providing quality hunting opportunities in Tennessee. They vary in size from 53 to 625,000 acres, and all WMAs are available to the public for hunting and trapping, although certain regulations do apply. Currently, WMAs in Tennessee total over 1,250,000 acres.

Fishing

The vast and varied water resources of North Carolina provide numerous opportunities for saltwater and freshwater fishing. North Carolina has 1,500 lakes of 10 acres or more in size and 37,000 miles of freshwater streams and rivers. According to a 2006 survey, over 1.2 million resident and visiting freshwater anglers fished inland waters in North Carolina. Major species include crappie, sunfish, white/striped bass, black bass, trout, walleye, pike, and various catfish (USFWS and U.S. Census Bureau 2006). The Mountain Region of the state is well-known for its trout fishing opportunities.

Fishing is also an important pastime in Tennessee. Water resources of Tennessee include 60,000 miles of rivers and streams and approximately 536,000 acres of ponds, lakes, and reservoirs. According to a 2006 survey, over 8.7 million resident and visiting freshwater anglers fished in Tennessee. Major species fished include crappie, sunfish, white/striped bass, black bass, walleye, northern pike, trout, and various catfish (USFWS and U.S. Census Bureau 2006).

Wildlife Viewing

Wildlife viewing comprises the largest group of people engaged in wildlife-dependent recreational activities. During 2006, over 2.6 million participants engaged in wildlife watching in North Carolina, more than hunters and anglers combined (USFWS and U.S. Census Bureau 2006). Although hunting and fishing have seen declines in participation rates in recent years (Aiken 2010), wildlife watching continued to grow in popularity nationally and in North Carolina between 1991 and 2006, based on survey data (Aiken 2009). Opportunities for wildlife watching in the AOI are provided by trails on game lands, national forests, and national parks, among others.

In Tennessee, over 2.3 million participants engaged in wildlife watching during 2006, more than hunters and anglers combined (USFWS and U.S. Census Bureau 2006). Hunting and fishing have seen declines in participation rates in recent years (Aiken 2009), but wildlife watching continued to grow in popularity nationally in Tennessee between 1991 and 2006, based on survey data (Aiken 2009). In the AOI, opportunities for wildlife watching in the AOI are provided by trails on WMAs and TNC lands, among others.

LAND USE AND MANAGEMENT STATUS

Land use has similarities to land cover, but it is often used to show anthropogenic uses of an area, hence its placement in the Socioeconomic section. Understanding land use and ownership is important for assessing the social and economic impacts of conservation actions, including the potential establishment of a refuge. For the purposes of this Draft EA, the National Land Cover Dataset was used to portray land use. A more detailed land cover dataset was used to portray vegetative communities (i.e., wildlife habitats), which is further described in a previous section (Biological Environment). The majority of the lands in the AOI are considered to be in "open" or undeveloped land uses and most parcels are in private ownership (Figures 8a and 8b). The relative surface areas of the various land cover categories are generally similar between the CPAs and AOI. Two differences that stand out are planted/cultivated areas, which cover a higher percentage in the

CPAs than AOI, 11 and 8 percent, respectively. In addition, the AOI has a higher percentage of developed areas compared to the CPAs, 6 and 3 percent, respectively (Table 17).

Table 17. Land cover in the CPAs and surroundings

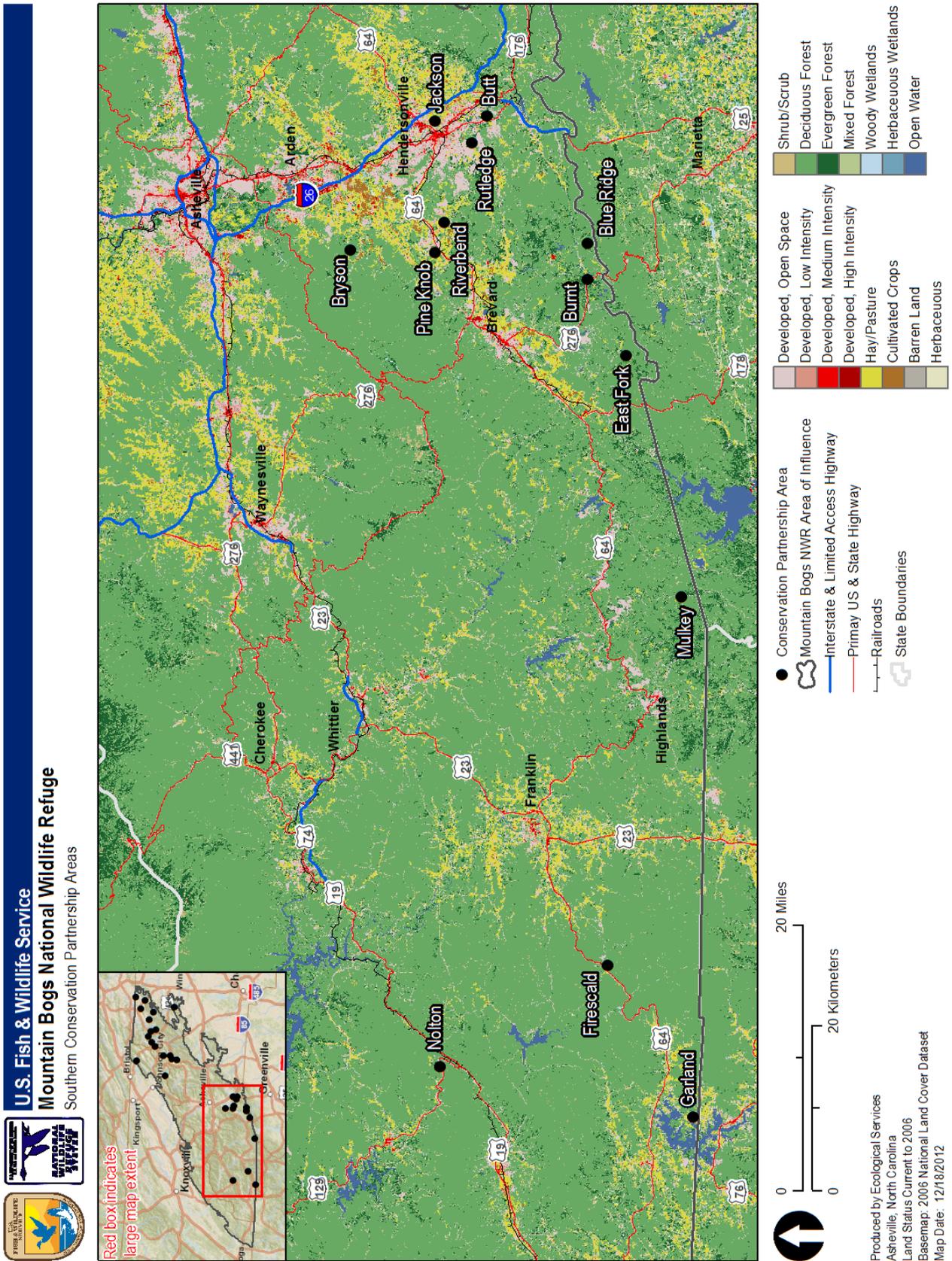
Land Cover (2006)	CPAs		Area of Influence	
	Acres	Percent	Acres	Percent
Deciduous Forest	30,888	73	4,995,829	73
Planted/Cultivated	4,776	11	568,093	8
Evergreen Forest	2,977	7	453,850	7
Developed ¹	1,214	3	419,954	6
Mixed Forest	899	2	233,972	3
Shrub/Scrub	578	1	70,784	1
Grassland/Herbaceous	414	1	58,128	1
Woody Wetlands	385	1	7,597	<1
Open Water	120	<1	43,261	1
Total	42,250	100	6,851,467	100

Source: Fry et al. 2011

¹Includes "Barren Areas"

Key: Deciduous Forest - dominated by trees > 25 ft tall, > 20% of total cover, and where 75% of the trees are hardwoods. Planted/Cultivated – hay, pasture, row crops. Evergreen Forest - dominated by trees > 25 ft tall, > 20% of total cover, and where 75% of the trees keep their leaves. Developed - characterized by a high percentage (30% or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc.). Mixed Forest - dominated by trees > 25 ft tall, > 20% of total cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover. Shrub/Scrub - dominated by shrubs; < 25 ft tall with shrub canopy typically greater than 20% of cover, includes true shrubs, includes young or stunted trees. Grassland/Herbaceous - dominated by graminoid/herbaceous vegetation, > 80% of total vegetation. Woody Wetlands - forest or shrubland vegetation comprise > 20% of cover and the soil/substrate is periodically saturated/covered with water. Open Water – lakes/ rivers, with < 25% covered by ground or vegetation.

Figure 8b. Land use in the AOI



TRANSPORTATION FACILITIES AND UTILITY CORRIDORS

Transportation facilities within the AOI include roadways and highways, airports, railroads, and utility lines. Utility corridors include high-voltage transmission lines.

Roads and Highways

Relatively few major roads traverse the AOI. Only two interstate highways (U.S. Highways 26 and 40) cross the area, connecting Asheville to other metropolitan areas. U.S. highways include 19, 23, 64, 70, 74, and 441.

Airports

Asheville Regional Airport is the largest airport in the AOI. Smaller county airports include Henderson-Winkler, Avery County, Jackson County, Macon County, Andrews-Murphy, and Shiflet Field.

Railroad Lines

Railroad corridors include passenger and commercial cargo lines. The Great Smoky Mountains Railroad runs from Bryson City through the Nantahala Gorge. Commercial cargo lines include CSX, which has several corridors that go through the area.

Utility Corridors

Several high-voltage lines connect power plants in Henderson and Macon Counties to cities and towns throughout the AOI.

CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966, as amended, and Section 14 of the Archaeological Resources Protection Act require the Service to evaluate the effects of any of its actions on cultural resources (e.g. historic, architectural and archaeological) that are listed or eligible for listing in the National Register of Historic Places (NRHP). In accordance with these regulations, the Service has coordinated the review of this proposal with the North Carolina and Tennessee State Historic Preservation Offices.

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 its holdings and to scientifically assess each property's eligibility for the NRHP; (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 Service, like other federal agencies, is 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 Service's Southeast Region, the cultural resource review and compliance process is initiated by contacting the Regional Archaeologist (RA). The RA would 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 initiate consultation with the pertinent State Historic Preservation Office and federally recognized tribes. The Service believes that the proposed acquisition of lands would have no adverse effect on any known or yet-to-be identified NRHP-eligible cultural resources. However, in the future, if the Service plans or permits any actions that might affect eligible cultural resources, it would carry out appropriate site identifications, evaluations, and protection measures as specified in the regulations and in Service directives and manuals.

All of the following material (from the section on Cherokee Heritage through Agricultural Heritage was taken from: Blue Ridge Natural Heritage Area, Management Plan and Environmental Assessment (National Park Service 2008).

CHEROKEE HERITAGE

The Cherokee people, unlike most other people living in the southern Appalachians, believe they have always been here. Their myths and legends mention Pilot Knob in the Shining Rock Wilderness near the Blue Ridge Parkway as the home of Kanati and Selu, the first man and woman, and they refer to the Kituwah mound site near Bryson City as the location of the mother town of the Cherokee people. Even to outsiders, it is clear that members of the Eastern Band of Cherokee Indians are descendants of people who have been in the region for a very long time. The archaeological record reveals a period of human habitation in the southern Appalachians dating back more than 11,000 years. According to linguists, the Cherokee language, part of the Iroquoian language family, evolved as a separate language by at least 1500 B.C., and by 1000 A.D., a distinctively Cherokee way of life had emerged. By that point, Cherokee people had established cultural patterns that continue to influence their communities: permanent villages, cornfields and gardens, dances, games, ceremonies, the sacred fire, council houses, social organizations based on the clan system, and a well-developed system of beliefs and practices. Europeans entered the outskirts of their territory as early as 1540, when Hernando de Soto’s expedition passed through the area. By the 18th century, increasing contact between Europeans and the Cherokees had given rise to extensive trade and cultural exchange, but had also resulted in the decimation of the Cherokee population by smallpox epidemics, the destruction of many of their towns by military campaigns, and the loss of much of their ancestral territory through treaties. Between 1759 and 1839, a period that historians refer to as the Cherokee Renaissance, the Cherokees made a remarkable recovery from defeat and devastation. They became a civilization with written language, schools, churches, farms, business enterprises, a written constitution, representative government, and a bilingual newspaper. However, none of those accomplishments protected them from removal. In 1838, federal and state militia began moving most of the Cherokee Nation to Indian Territory in Oklahoma. Only about 1,000 managed to avoid removal and remained in North Carolina: those who had successfully applied for citizenship, and others who hid in the mountains. A few others escaped from the Trail of Tears or walked back to the mountains from Oklahoma. Today, approximately 10,000 members of the Eastern Band of Cherokee Indians live on the Qualla Boundary, where they maintain their rich cultural traditions and greatly contribute to the identity of the Blue Ridge Natural Heritage Area.

More than 50 historic Cherokee towns or villages are located within the area. Settlements typically were established along the banks of the major rivers near the confluence with key tributaries. The “Middle Towns,” located in what is now Macon County were located largely in the Little Tennessee River watershed. The “Valley Towns,” located now in Clay and Cherokee Counties, were located largely in the Hiwassee River drainage. The “Out Towns” were located in Jackson County and in the current Qualla Boundary along the Tuckesegee River and key tributaries. Often, mounds were associated with these towns or villages. Some of the more prominent mounds in the area include the Nikwasi Mound in Franklin on the banks of the Little Tennessee River; the Cowee Mound

downstream on the Little Tennessee River; and the Peachtree and Spikebuck Mounds located on the banks of the Hiwassee River. Kituwah, located on the banks of the Tuckesegee River, is acknowledged by the Cherokee of today as the first Cherokee village. According to legend, the Kituwah Mound is the center of the Cherokee world and their place of origin.

The Rutherford Trace and the Trail of Tears are but two unfortunate historical campaigns undertaken by the American government designed to exterminate or remove the Cherokee people and their culture from the southern Appalachians. Each of these events has left its mark on the landscape and the Cherokee people themselves.

Rutherford Trace

The Rutherford Trace was an expedition initiated in 1776 during the American Revolution and undertaken by General Griffith Rutherford to punish the Cherokee for their alliance with the British government and their attacks on colonial settlements in this frontier region. Rutherford's forces killed many men, women, and children during their destruction of at least 36 Cherokee towns and villages and their fields and livestock. Historical markers along many state highways in the Blue Ridge Natural Heritage Area document and remind us of this event. Rutherford's Trace passed through each of present day Rutherford, McDowell, Buncombe, Haywood, Jackson, Macon, Clay, Cherokee, Graham, and Swain Counties and the Qualla Boundary.

Trail of Tears

President Andrew Jackson's forced relocation to Oklahoma in 1838 of roughly 16,000 Cherokee people from present day western North Carolina, east Tennessee, and north Georgia has come to be known nationwide as the Cherokee "Trail of Tears." A large portion of present day Macon, Jackson, Swain, Clay, Cherokee, and Graham Counties and the Qualla Boundary were affected by this event. Five forts established in the region to control the Indian population were used to facilitate this forced relocation along the old Unicoi Turnpike (now the Joe Brown Highway). Those included Fort Hembree (Clay County), Fort Butler and Fort Delaney (Cherokee County), Fort Montgomery (Graham County), and Fort Lindsay (Swain County). While the sites of these forts are known and some artifacts have been collected from them, none of these forts exist at this time. The NPS has partnered with multiple federal, state, and local interests to designate and administer a Trail of Tears National Historic Trail, though it has yet to include affected portions of western North Carolina. Currently, the trail consists of 2,200 miles of land and water routes across portions of nine states.

AGRICULTURAL HERITAGE

The agricultural heritage of the region dates back to the Cherokee Indians, who farmed the fertile bottomlands along streams and rivers where the soil was enriched by periodic flooding. The men burned forested areas to open up small clearings and fertilize the soil. Women were the primary farmers, planting corn, beans and squash together in large mounds or hills of earth. This provided good drainage during wet months, simplified weeding and allowed uniform spacing of crops. In the late 1700s, English, German, Scots- Irish, French, Welsh and African settlers adopted the agricultural practices of the Cherokees and introduced their cultural patterns of raising livestock for both food and trade.

There are still approximately 12,000 working farms in the region. Agriculture is not a thing of the past to be depicted in a museum – it is a living, breathing sector of western North Carolina's culture. Today's farmers are exploring a combination of strategies including diversifying crops, preserving farmland, and increased marketing to the regional community. Vegetable crops, ornamentals, Christmas trees, mushroom and trout farming, viticulture, and medicinal herbs have become

increasingly important parts of the diversification. The region contains the largest number of specialty crop farms in North Carolina. Farming for the region's future will be a cultural evolution and the heritage of working the land in the region will continue. Generally speaking, the main cash crops historically raised in the mountains of North Carolina have been burley tobacco, Christmas trees, and apples. The bottomlands of Buncombe, Madison, and Yancey Counties are notable for their ability to produce fine quality burley tobacco. The alpine environment encountered on the high side slopes and mountain peaks of primarily Mitchell, Avery, Ashe, and Watauga Counties are noteworthy as a fine place to grow America's favorite Christmas tree – the Fraser fir. And Henderson and Wilkes Counties have been leaders nationwide in apple production for decades. Many a mountain farm family has earned a good living from the land raising cattle and trees, cattle and apples, or cattle and tobacco or a combination of them all. Market forces and other external dynamics are placing pressures on the agricultural landscape. Grapes are proving to be an alternative crop, particularly in the Yadkin River basin in Allegheny, Surry, Wilkes, and Yadkin Counties.

III. Alternatives, Including the Proposed Action

INTRODUCTION

This chapter presents the alternatives for the proposed Mountain Bogs NWR within the Blue Ridge Mountains, including the Proposed Action, which the Service believes best meets the outlined purposes, vision, and goals. The vision for the proposed refuge is as follows:

The Mountain Bogs National Wildlife Refuge will conserve critically endangered southern Appalachian Mountain bogs and portions of their surrounding landscapes for current and future generations. Refuge lands and waters will be managed for fish and wildlife populations, with an emphasis on the management of imperiled federal trust species, including thirteen federally listed plants and animals, and will help protect and improve water quality and water quantity within the watersheds surrounding the refuge. As part of a system of public and private conservation lands, the refuge will expand outdoor recreational and educational opportunities, helping to support local economies.

Several purposes were identified to further the vision for the refuge, as follows:

"conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans" 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997).

"to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants..." 16 U.S.C. 1534 (Endangered Species Act of 1973).

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

"for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude" 16 U.S.C. 742f(b)(1) "for the development, advancement, management, conservation, and protection of fish and wildlife resources" 16 U.S.C. 742f(a)(4), (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956).

"for the protection of migratory birds . . . or any part, nest, or egg of any such bird" [Migratory Bird Treaty Act (16 U.S.C. 703)].

Four overarching goals were developed for the proposed refuge and CPAs. The goals are intentionally broad, descriptive statements of the desired future conditions. They provide the management direction to support the proposed refuge purposes and the proposed vision statement. Descriptions of the two alternatives address the goals, and offer an explanation of how each alternative addresses the proposed refuge's goals. The Proposed Action (Alternative B) is addressed in more detail in the conceptual management plan (Appendix A) and interim compatibility determinations (Appendix B). These documents would provide interim management direction for the proposed refuge until a more

detailed comprehensive conservation plan (CCP) could be developed. If the refuge is approved, the Service would develop a CCP within 15 years of approval. The goals established for this proposed refuge address habitat for fish and wildlife; landscape-level conservation, connecting people with nature (e.g., public use), and conservation partnerships, as listed.

Goal 1. Protect, Restore, and Manage Habitats for Fish and Wildlife. The proposed Mountain Bogs NWR would conserve rare mountain bog habitat and associated species as well as adjacent upland habitats. The proposed refuge would aid in the recovery of 13 federally listed species and one candidate species and benefit many other state listed and imperiled species, including migratory birds and southern Appalachian brook trout.

Goal 2. Provide Landscape-Level Conservation. The proposed Mountain Bogs NWR, which would be within the Appalachian Landscape Conservation Cooperative, would contribute to a more connected and functional conservation landscape by reducing habitat fragmentation, and protecting and restoring a network of exceptionally rare wetland types and their surrounding landscapes. This proposed refuge would also protect and enhance water quality and quantity within multiple watersheds, benefiting both humans and wildlife.

Goal 3. Connect People with Nature. Visitors of all abilities to the proposed Mountain Bogs NWR would enjoy opportunities for compatible hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of southern Appalachian Mountain bogs.

Goal 4. Promote Conservation Partnerships. Collaboration in science, education, and research would strengthen and develop partnerships with bog conservation organizations, private landowners, government agencies, and others to help inform land management decisions and encourage continued responsible stewardship of mountain bogs and other associated natural resources.

Under NEPA, the Service developed and evaluated a reasonable range of alternatives. The Proposed Action defines what the Service plans to do or recommend, but cannot implement without considering other reasonable, environmentally sensitive alternatives. Other reasonable alternatives to the Proposed Action that could also be viewed as fulfilling the proposed purposes of the refuge are described in this Draft EA, thereby offering the Service and the reviewing public an opportunity to consider a range of reasonable alternatives for the Proposed Action, and thus fulfilling one of the key tenets of NEPA.

The Service developed and evaluated a reasonable range of alternatives based on the issues raised during internal and public scoping by the Service, the public, other federal agencies, Native American tribal governments, state and local governmental agencies, organizations, and local businesses. Alternatives describe complementary management approaches for achieving the missions of the Service and Refuge System, the purposes for which the refuge would be established, and its vision and goals, while responding to issues and opportunities identified during the planning process.

Based on this process to identify and evaluate alternatives, the Service selected two alternatives, including the NEPA-required No Action Alternative, to provide a baseline for comparing the action alternative. The two alternatives evaluated in detail are listed.

- Alternative A. No Refuge (No Action Alternative)
- Alternative B. Proposed Refuge

DESCRIPTION OF ALTERNATIVES

In addition to the No Action alternative (Alternative A), one action alternative (Alternative B) was developed. Within each CPA, the Service identified lands which would be of high conservation value, based on criteria such as bog habitat, imperiled species, and other parameters. The process by which the CPAs were selected is detailed in this Draft LPP/EA. The description for each alternative also includes the possible management activities that would help meet each of the four overarching goals of the proposed Mountain Bogs NWR. Maps are used to illustrate lands that could be included under each alternative.

To help explain the alternatives, definitions for several terms are listed below.

Conservation Partnership Area: Defines the area within which the Service would have the authority to purchase in fee title or easement from willing sellers. Under Alternative B, the proposed Conservation Partnership Area (CPA) would be approximately 42,250 acres.

Refuge Boundary: Defines the management boundary of an approved refuge. Generally comprised of Service-owned property, it can include other properties through some sort of agreement with the landowner (e.g., management agreement, lease, and easement). Under Alternative B, the proposed Refuge Boundary would be approximately 23,478 acres.

Area of Influence: Defines a generalized area which contains CPAs and within which the Service would analyze environmental impacts of the proposed action. For the purposes of this Draft EA, the Area of Influence (AOI) for this project was limited to the North Carolina and Tennessee Blue Ridge Ecoregion in order to evaluate impacts to most abiotic resources (i.e., water quality, air quality, and climate) and biological resources. For socioeconomic impacts, the AOI was limited to the counties. The AOI does not convey authority to establish rules and regulations, and is only used to study the effects of this proposal on the human environment, including abiotic, biological, socioeconomic, and cultural resources.

ALTERNATIVE A – NO ACTION

The No Action Alternative required by NEPA serves as a baseline to which any other alternatives are compared. In this alternative, the Service would not approve any CPAs and a new refuge would not be established; there would be no comprehensive land conservation effort to protect mountain bogs and their immediate surrounding upland habitats. Under this alternative, the Service would continue activities it has pursued over the last several years, including partnership programs to restore rare habitats, control or eradicate invasive plants, and reestablish populations of globally imperiled plants. Habitat protection and management would continue by existing organizations and government programs. Hence, a comprehensive and landscape-level effort centered on protecting and managing mountain bog habitats and associated watershed buffers for the conservation of mountain bogs is unlikely to be achieved in the foreseeable future.

The role of Alternative A in terms of its ability to meet each of the four overarching conservation goals is detailed below.

Goal 1. Protect, Restore, and Manage Habitats for Fish and Wildlife

Under this alternative, efforts to conserve bog habitats and adjacent watershed buffer areas would likely continue at current levels. The Service would continue to work with the natural resource agencies, non-profit organizations, universities, and others to leverage site-specific grants for bog restoration and protection and offer management guidance for federally listed species. The Service would continue to participate in outreach and educational opportunities at select sites involving universities, school groups, and special interest groups; and would work to identify funding for and continue projects involving monitoring and research associated with bog habitats, flora, and fauna.

Additionally, several non-profit conservation organizations having been actively working with interested landowners to protect, restore, and manage habitats on several bogs. Efforts include controlling invasive plants, using prescribed fire, restoring hydrology, working with law enforcement to address poaching, and providing exclusion fencing and alternate water sources for livestock.

Goal 2. Provide Landscape-Level Conservation

Conservation lands in this landscape would continue to be managed by their respective agencies and organizations under the No Action Alternative, but a comprehensive, Service-led approach at the proposed scale to protect bogs would likely not occur in the foreseeable future. Within the AOI, there are about 229 known bog sites (North Carolina Natural Heritage Program 2012 and Tennessee Natural Heritage Inventory Program 2012). Of these, about 146 sites (63 percent) are offered some level of conservation protection, through government-managed lands (tribal, federal, state, and local government), non-profit conservation organizations, and private landowners (e.g., easements). Many of these 146 sites were part of past, larger land protection efforts not specifically focused on conserving bogs.

In more recent times, the State of North Carolina and others have worked specifically to include bogs in their overall conservation efforts. Over the past decade, North Carolina has acquired about 10 bogs and adjacent watershed buffers through the North Carolina Natural Heritage and North Carolina Clean Water Management Trust Funds (NHTF 2012 and North Carolina Clean Water Management Trust Fund 2010). Combined, these projects have acquired or otherwise protected about 250 acres of bogs and adjacent lands (NHTF 2012). Statewide, there is a growing need for a range of land protection efforts, and although NHTF funding has increased since 1996, NHTF has been unable to keep pace with appreciating land costs and with the amount of open space on the market. Typically, NHTF receives twice the number of applications that it can fund and since 2008, funding has declined (NHTF 2012).

Although state agencies and private organizations provide an ability to assist in the protection of bogs and associated watershed buffers of the area, they are unlikely to provide increased long-term protection from the anticipated changes in land use in this part of the Blue Ridge ecoregion. The current rate of urbanization in the area is likely to continue, with resulting conversion of land, changes in the hydrology, and other impacts as further detailed in Chapter IV.

Goal 3. Connect People with Nature

The Service seeks opportunities to promote appropriate and compatible wildlife-dependent recreation on national wildlife refuges. There would be no refuge-based recreational opportunities under the No Action alternative. A number of wildlife-dependent recreational activities exists within the landscape and would

continue. Hunting and fishing occur under regulations administered by state agencies. Public hunting occurs on several state-managed lands within the area. Hunting also occurs on private lands.

Fishing is recreationally important to the local population and draws visitors from afar. The region is also known for its trout fishing. Areas throughout the watershed would continue to provide recreational fishing opportunities.

Other outdoor wildlife-dependent recreation and educational opportunities abound. Federal and state agencies, as well as private organizations, provide biking, hiking, and equestrian trails. The Blue Ridge Parkway provides opportunities to photograph and observe wildlife. Kayaking and canoeing occur on the water resources found in the area. State agencies sponsor fishing events, various workshops, youth camps, and other outdoor wildlife-dependent programs and activities. These wildlife-dependent activities would continue under the No Action Alternative.

Goal 4. Promote Conservation Partnerships

Although there is management occurring on sites by state staff and non-governmental organizations, depending on staff levels and funding, there currently is no agency or non-governmental organization focusing only and specifically on bog conservation. There is neither an individual nor a team identified as a leader for this effort.

ALTERNATIVE B – PROPOSED ACTION

Under the proposed action, 30 CPAs would be authorized, within which up to 23,478 acres of fee-title or less-than-fee-title lands (such as easements) would be approved for the establishment of the Mountain Bogs NWR (Figures 9a and 9b). If this proposal were to be approved, lands would be added to the Refuge System, depending on factors such as willing landowners, funding, etc. The acquisition process could take years before the majority of the 23,478 acres were to be realized. However, each tract protected would be a needed component to the overall conservation of mountain bogs. Furthermore, the protection of the entire proposed acreage to be protected would represent a very important effort to providing long-term, landscape-level conservation of these vulnerable and rare wetlands.

Figure 9a. Existing area conservation lands and proposed CPAs

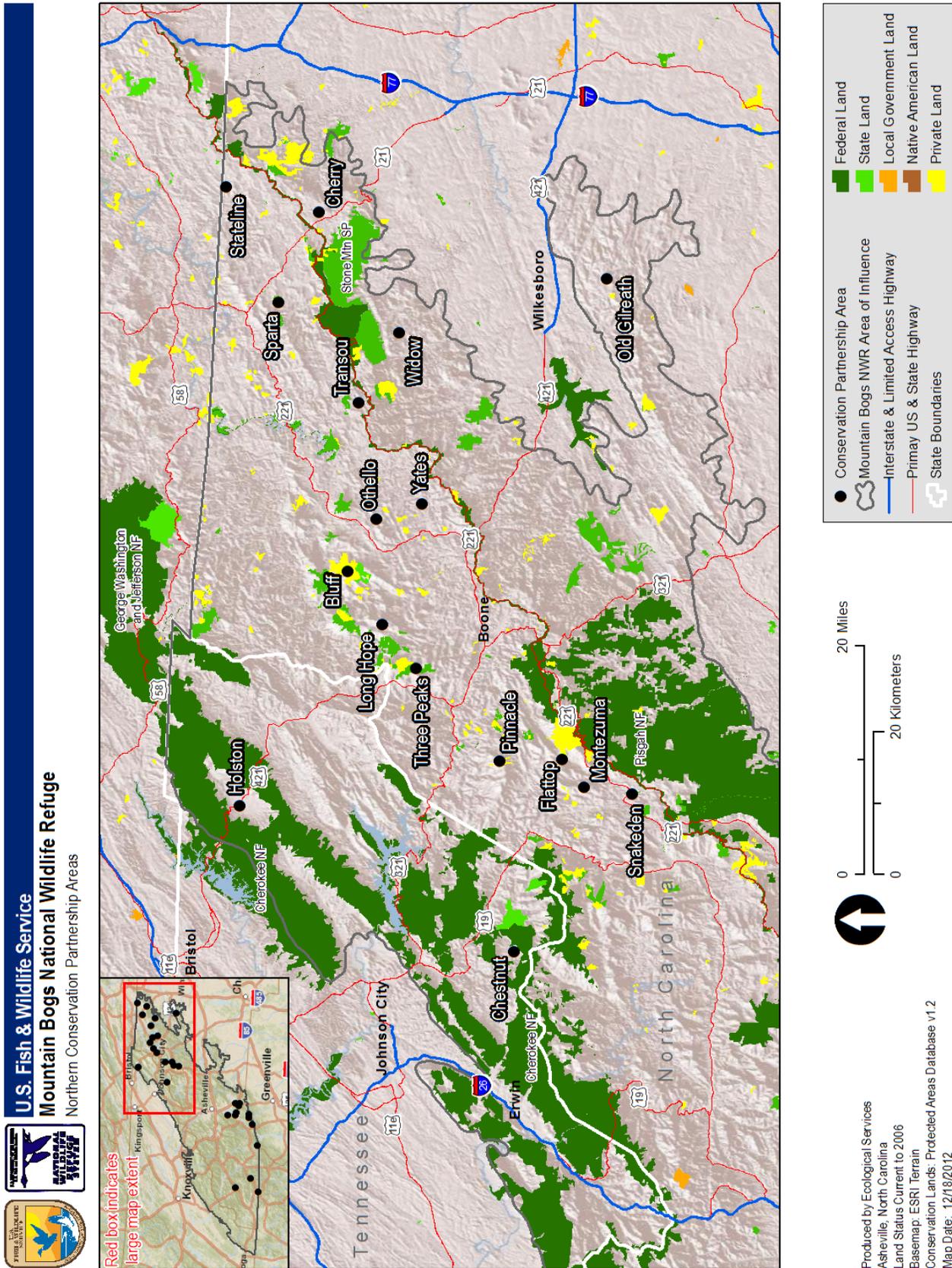
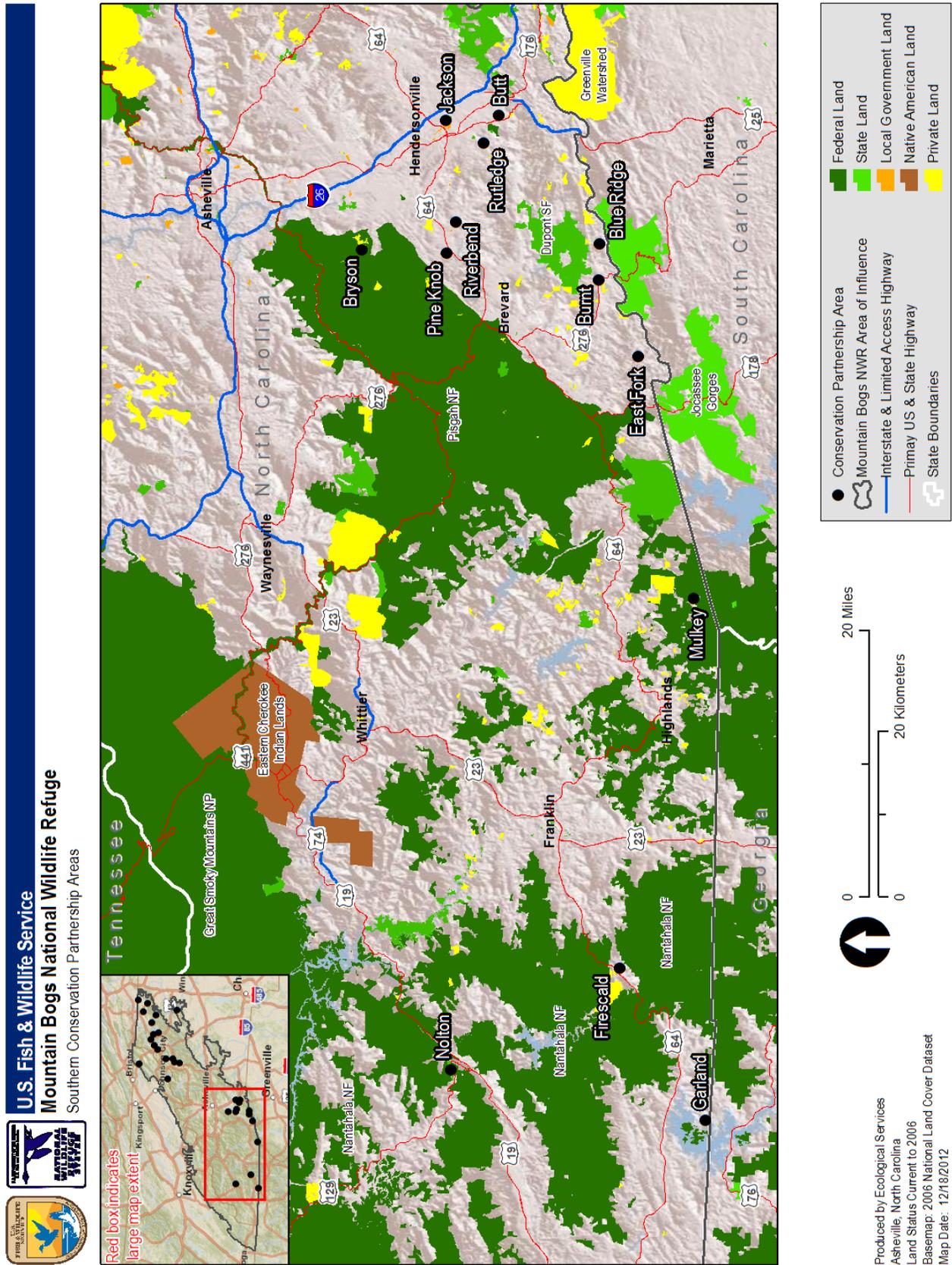


Figure 9b. Existing area conservation lands and proposed CPAs



Goal 1. Protect, Restore, and Manage Habitats for Fish and Wildlife

Compared to the No Action Alternative, Alternative B would substantially increase opportunities to conserve bog habitats and the imperiled species dependent on them. If approved, this proposal would authorize the Service to work with willing landowners to purchase, outright or as easements, lands and waters within the CPAs. On fee-title interest tracts, where the Service would become the land manager, bog habitats would be restored and managed, with a focus towards land management improving overall habitat conditions, including those for federally listed plants as well as state listed and rare plants.

Working with partners and with landowner permission, the refuge would conduct a baseline inventory and habitat assessment on each bog and their surrounding tracts included within the CPAs, to document species present, existing habitat conditions, and restoration and management needs. For each CPA, a management plan would be developed to ensure the protection and recovery of trust species and other rare species within the sites, and restoration and management needs would be addressed, with a focus on hydrology and vegetation. Types of potential restoration would include restoring bog hydrology by plugging ditches that drain portions of bog sites and controlling nonnative invasive plants. Long-term management may include setting back succession by controlling native woody vegetation through herbivory, mechanical and chemical means, and prescribed fire. Establishment and protection of a forested buffer around sites would protect sites from pesticide drift, runoff containing nutrients, and nonnative invasive plants.

Working with partners, the refuge would work to protect the following trust species: green pitcher plant (*Sarracenia oreophila*), bunched arrowhead (*Sagittaria fasciculata*), mountain sweet pitcher plant (*Sarracenia jonesii*), swamp pink (*Helonias bullata*), Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), rock gnome lichen (*Gymnoderna lineare*), white fringeless orchid (*Platanthera integrilabia*), and bog turtle (*Glyptemys muhlenbergii*). Activities would be implemented on refuge lands to help safeguard rare species from poachers. Such activities could include law enforcement and involvement and education of neighboring landowners. For areas in need of surveys, we would work with partners to inventory and monitor species of concern.

Goal 2. Provide Landscape-Level Conservation

Under this alternative, the refuge would contribute to the landscape-level conservation of mountain bogs by helping to protect a series of bogs, stretching from western North Carolina into eastern Tennessee. The selection criteria used to generate the list of CPAs included the need to connect with or bridge existing conservation lands. Currently, about 38 percent (2.6 million acres) of the landscape within the AOI is protected through various federal, state, non-governmental, and private ownerships and management (Figure 11). We would work with the Appalachian LCC to incorporate this LCC's landscape goals into refuge planning efforts.

Water resources important to sustaining bogs would be further protected and enhanced under this alternative. For each CPA where a bog is acquired, the refuge would develop plans addressing protection, restoration, and management of water quality and quantity. We would also conduct public outreach and education efforts, including those aimed at reducing runoff volume and pollutants and encourage voluntary landowner action to restore and protect the surrounding hydrology. Establishing and restoring a forested landscape, especially surrounding bogs and within stream corridors, would aid in the protection of habitat and hydrology at bog sites and would aid in establishing wildlife movement corridors between sites established or corridors for bog turtle metapopulations.

Goal 3. Connect People with Nature

Under this alternative, opportunities for wildlife-dependent recreation would be increased, helping to connect people with nature, with the aim of promoting a conservation ethic and stewardship. While some of the parcels proposed for acquisition may be unsuitable for public access due to the potential for poaching of the rare species found there, other sites would be well-suited to these activities. The Service would work cooperatively with its conservation partners to determine what areas are suitable to provide public use opportunities, including interpretive and educational programs. Where needed and appropriate, we would initiate development of facilities to engage the public in these activities. More specific management plans would be developed to address all aspects of outdoor wildlife-dependent recreation identified in the interim compatibility determinations. We would develop opportunities for volunteer involvement in refuge management and outreach efforts, and would work with school districts and teachers to develop an environmental education program featuring unique species or communities on the refuge.

Goal 4. Promote Conservation Partnerships

This alternative would increase and strengthen our collaborative efforts with conservation partners focused on improving an understanding of bog habitat and associated species, and their related drivers and stressors. This would increase knowledge and understanding of how best to manage these sites to ensure their long-term protection and continued existence. Together with partners, we would take a leadership role in development of the Bog Learning Network, where researchers, educators, and managers can share resources and information about southern Appalachian bog management and research. We would also work to foster better communication between the Service and neighboring landowners, and provide them with information on how to manage their lands for the benefit of bog habitat and associated species. The creation of the refuge would provide opportunities for the Service to become a leader in bog conservation, which could help focus the efforts of other partners towards strategic habitat conservation (SHC). Using the SHC model, the establishment of Mountain Bogs NWR would coordinate and link actions that various programs and partners perform at individual sites, so that their combined effects would achieve conservation of species and their habitats on a landscape-level scale. In addition, this leadership role would assist with collaboration among partners to learn from one another.

SUMMARY

Compared to the No Action Alternative, the Service believes that implementing Alternative B (Proposed Action) would provide a more collaborative, comprehensive, landscape-level approach to the conservation of mountain bogs. This alternative would help increase the protection and restoration of those imperiled habitats, benefitting numerous priority species, including those that are state and federal listed, or that are rare and declining. Additionally, if implemented, this proposal would increase wildlife-dependent recreational opportunities in the area, helping to foster a greater appreciation for the natural resources of the region, while increasing support for the Refuge System.

IV. Environmental Consequences

This chapter analyzes and discusses the potential environmental effects on the resources outlined in Chapter II. Environmental effects include those that are direct, indirect, and cumulative. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Alternative B, if approved, is generally believed to have indirect effects since the majority of lands are not expected to be protected immediately. Cumulative impacts are effects on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects are discussed in a separate section following the analysis of Alternatives A and B.

Potential effects or impacts, either positive (beneficial) and negative (adverse), to resources resulting from the implementation of the two alternatives were identified and placed into one of the listed categories, where possible.

- None - no effects expected
- Minimal - impacts are not expected to be measurable, or are too small to cause any discernible degradation to the environment
- Minor - impacts would be measurable, but not substantial, because the impacted system is capable of absorbing the change
- Moderate - effects would be measurable, but could be reduced through appropriate mitigation
- Major - impacts would be measurable and individually or cumulatively significant; an Environmental Impact Statement would be required to analyze these impacts

For the purposes of this Draft EA, the North Carolina and Tennessee portions of the Blue Ridge ecoregion delimit the AOI. The AOI is used solely to analyze the potential effects resulting from the No Action and Proposed Action to the environment (physical, biological, socioeconomic, and cultural resources). The effects of this proposal on visual resources are not addressed in this Draft EA. The CPAs are relatively small and many are embedded in a landscape that has already been altered by roads, tall towers, and other structures that have changed the aesthetics of the landscape from its former state. This AOI covers approximately 6.9 million acres (Figure 4). Within the AOI, approximately 2.6 million acres (38 percent) are currently in the public domain, with some type of conservation protection. The proposed refuge, if fully realized, would equal about 23,487 acres or less than one percent of the AOI.

ALTERNATIVE A: NO ACTION ALTERNATIVE

Under this alternative, the Service would take no action to acquire, protect, and manage any lands and Mountain Bogs NWR would not be established.

Although protection and conservation efforts by the Service's Asheville Ecological Services Office and bog conservation partners would continue, future habitat protection under existing laws and regulations and with existing resources would likely be insufficient to prevent significant degradation of the area's fish and wildlife resource values. Federal executive orders involving the protection of wetlands and floodplains only apply to federal agencies. They do not apply to habitat alterations by non-federal entities, which receive no federal funds.

The primary deterrent against the loss of wetland resource values is the U.S. Army Corps of Engineers' Section 404 permit program, which is administered under the authority of the Clean Water Act. This program requires permits for most types of work in wetlands. However, few of the mountain bogs would be protected through Clean Water Act regulations due to their small size. The states have regulatory authority over their respective areas and would not permit any developments that would violate water quality standards. However, these rules are unlikely to offer substantial protection to most bogs that are embedded in an increasingly urbanized landscape where the hydrology is being altered. Additionally, there is no assurance that the protection offered by these regulations would be consistent with protection of the area's fish and wildlife resources. The regulatory programs are designed to accomplish different objectives. Furthermore, these programs are subject to changes in the law and to varying definitions and interpretations, often to the detriment of wetlands. The Corps regulatory authority provides for the issuance of Section 10 and/or Section 404 permits when it is not contrary to the public interest to do so and provided other conditions are met. Fish and wildlife conservation is only one of several public interest factors that are considered in permit issuance decisions. If fish and wildlife conservation is outweighed by other factors, permits that would alter the wetlands in the proposed CPAs could be issued.

The desired fish and wildlife protection objectives, therefore, cannot be achieved to any degree under this alternative. Specifically, implementation of "No Action" would adversely impact the area's mountain bog habitats, listed plants, bog turtles, migratory birds, and other species associated with these rare wetlands.

EFFECTS ON THE PHYSICAL ENVIRONMENT

This section discusses potential effects to physical resources (e.g., topography, soils, water resources, etc.) under the No Action alternative.

Topography and Geology

Beneficial

Under this alternative, positive impacts with regard to the topography and geology in the AOI are not anticipated.

Adverse

Currently, there are at least 27 quarries (granite, mica, feldspar, etc.) and other mines in the AOI (NCDENR 2012) and more could be opened in the future. Open-pit mining is typically used, which can result in entire hills being leveled, resulting in a dramatically altered topography and geology at the local level. Mining and other operations that can alter the topography or geology are usually not considered appropriate or compatible uses on wildlife refuges. Hence, in the absence of a new refuge, the topography and geology on approximately 23,487 acres of land could potentially be affected. However, any adverse impacts to these resources would be minimal. The underlying geologic formations beneath CPAs are unlikely to contain mineral or energy resources currently of interest. Furthermore, the CPAs are relatively small compared to the AOI. Hence, it is unlikely that this proposal would have any significant effect on curbing the opening of new mines across the region.

Soils

Beneficial

No beneficial impacts to soils in the AOI are expected under the No Action alternative.

Adverse

In unprotected areas, soils would continue to be lost and degraded, leading to erosion and sedimentation as a result of various land use practices, including commercial logging, agricultural operations, road-building, and the construction of buildings, parking lots, and other infrastructure needed to support expanding human settlements. Natural soil-formation processes would no longer occur in areas covered by impervious surfaces (e.g., roads, parking lots, buildings). Soil compaction is also expected at sites where construction occurs. Additionally, soils would continue to be degraded by various contaminants resulting from the application of agricultural chemicals and run-off from roads and urban areas. Additionally, there would be no opportunity for the Service to protect or restore roads, trails, or other existing sites within the CPAs, thus soil impacts from development or unmanaged use of those lands would continue and likely would increase over the long term. However, adverse impacts to soils in the absence of a refuge would be minor, because the total area that could theoretically be protected under this proposal is relatively small compared to the entire AOI.

Climate Change

Beneficial

Under this alternative, fewer areas in the AOI are expected to remain or become carbon sinks, and positive impacts with regard to climate change are not anticipated.

Adverse

Vegetation, alive or dead, is an important carbon stock, and ecosystems in the United States contain approximately 66,600 million tons of carbon (Heath and Smith 2004). According to the U.S. Climate Change Science Program, the size of the carbon sink in U.S. forests appears to be declining, based on inventory data from 1952 to 2007 (Birdsey et al. 2007). The carbon density (the amount of carbon stored per unit of land area) is highly variable, as it is directly correlated to the amount of biomass in an ecosystem or plant community. The total carbon in an ecosystem also includes the organic component of soil, which can be substantial, depending on the vegetation cover type and other factors (Bruce et al. 1999). The total carbon stored in temperate forests (which are expected to be similar to the “deciduous forests” that comprise most of the land cover in the AOI) is about 70 tons per acre. Forests go through a cycle of growth and death, and consequently, sequester and release carbon dioxide. The timeframe and magnitude of these cycles of carbon storage and release varies with the size and type of forest, among other factors. However, when land is cleared of vegetation, carbon dioxide that was stored in plant material and soil is released relatively quickly into the atmosphere through such processes as decomposition, burning, and soil oxidation. Additionally, without vegetation, the ability of the land to sequester or store carbon is reduced to minimal levels. The exact extent of unprotected natural lands that would eventually be converted to agricultural or urban use is unknown. However, even in the unlikely event that an area equaling the proposed refuge (23,478 acres) were cleared of all forests (and assuming it was completely forested) in the AOI, it would represent a fraction of the over 9 billion tons of global carbon entering the atmosphere yearly. Impacts to climate change under this alternative are expected to be minimal.

Air Quality

Beneficial

Positive effects on air quality in the AOI are not expected under this alternative.

Adverse

Under this alternative, unprotected lands that are currently in a natural state would continue to be converted to commercial forests, and agricultural and urban areas. Air quality declines tend to be correlated to increasing urbanization, due to higher levels of traffic, increases in air pollution from point sources, and reductions in vegetated areas (Song et al. 2008). Trees have been shown to reduce the concentration of ozone (O₃), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), and particulate matter less than 10 and 2.5 microns in diameter (PM₁₀ and PM_{2.5}), primarily through direct uptake and adhesion to stems and leaves (Escobedo et al. 2007). Some tree species naturally produce volatile organic compounds that can convert to ozone under certain atmospheric conditions, such as high temperatures and stagnant air (Chameides et al. 1988). However, because vegetated areas also remove ozone and other air pollutants from the atmosphere, there tends to be net reduction in air quality as areas become increasingly developed and forests are lost (Song et al. 2008). The proposed refuge acreage, even if it were fully urbanized, is small relative to the AOI. Hence, we expect the No Action alternative to have a minimal impact on air quality across the AOI.

Water Quality

Beneficial

Under the No Action alternative, benefits to water quality are not anticipated in the AOI.

Adverse

Under this alternative, water quality is expected to generally be adversely affected in the AOI. Land use directly affects water quality, and in undeveloped areas, the natural physical, chemical, and biological processes interact to recycle most of the materials found in storm-water runoff. However, as natural vegetated lands are converted to farms or urban use, these natural processes are disrupted. As a result of everyday human activities, materials such as leaves, animal wastes, oil, greases, heavy metals, fertilizers, pesticides, and other materials are washed off by rainfall and are carried by storm water to rivers and wetlands. These materials can create high pollutant loadings of sediment, nutrients, heavy metals, petroleum hydrocarbons, and coliform bacteria and viruses (Gill et al. 2005). Overall, water quality in the AOI is likely to continue to be adversely affected by expanding urban land use, commercial logging, agricultural operations, and mining. Increased management efforts by state agencies and non-governmental partners to encourage low-impact development and the use of agricultural best management practices (e.g., controlled grazing, livestock exclusion fencing, stream buffer plantings) would help reduce water quality degradation. However, it is expected that urban growth would continue to cause declines in water quality across the AOI. Relative to the size of the watersheds, we expect this impact to be moderate.

Hydrology and Water Quantity

Beneficial

This alternative is not expected to result in positive impacts to the hydrology and water quantity of the area.

Adverse

The flow of water and water availability on most unprotected lands in the AOI would continue to be altered as a result of the land use changes, including urbanization, agribusiness, industry, mining, fracking, etc. Urbanization often requires the construction of drainage ditches, roads, and other impervious surfaces. Impervious surfaces associated with urbanized areas reduce the area available for rainwater to percolate into the soil. This generally has two direct consequences when it rains: (1) There is less water available for recharging the local surficial aquifer, while at the same time the amount of runoff that flows into low-lying areas increases; and (2) low-impact development and storm water best management practices required or promoted by state and federal regulatory agencies and local governments (e.g.; rain gardens, storm-water bio-retention ponds, green roofs, permeable pavement installation) would help mitigate some of the impacts associated with impervious surfaces. However, extreme rainfall events would likely exceed the capacity of most storm water systems, and some runoff would be transported to area waters. At a more local level, increased storm water volumes and peak discharge rates associated with urbanization can produce drastic changes in stream channels, resulting in eroded banks and more frequent flooding that can cause damage to adjacent property, homes, and wildlife habitat. Increased surface run-off associated with urban areas would also have regional effects, with excess surface water flows from local watersheds making their way to larger rivers and associated reservoirs. Hence, large pulses of water would increasingly tax water management of reservoirs, whose water has to be maintained at specific levels for the purposes such as supplying water to urban areas, minimizing flood risk, providing recreational opportunities, etc. Conversely, developed areas also tend to exacerbate periods of water shortage. Because impervious surfaces limit the amount of water that seeps into the ground, less water is stored in subsurface areas. Subsurface water plays an important part in the hydrology of an area by providing streams and rivers with a steady supply of water during droughts. As more lands are urbanized, the water-storage ability of an area is reduced, limiting water supplies needed for wildlife and human uses.

As with hydrology, water quantity in the AOI is expected to continue to be negatively affected under this alternative. Growing human settlements increase the demand for water. Expanding agricultural, industrial, mining, and other economic sectors are also expected to compete for limited water resources. The amount of water available for wildlife, native habitats, and wildlife-dependent recreational opportunities would likely decline, as more water would be diverted to support increasing needs elsewhere.

Overall, the negative consequences on hydrology and water quality in the AOI are expected to constitute a moderate impact under the No Action alternative.

Noise

Beneficial

The soundscape of the AOI is not expected to benefit under the No Action alternative.

Adverse

Although noise from various sources currently affects rural lands in the AOI, substantial tracts of land remain where anthropogenic noise levels are relatively low. Without protection, additional lands in the AOI would continue to be converted to agricultural and urban use. Noise levels associated with farm equipment, road traffic, and industrial operations would increase. Increases in the intensity and frequency of noise associated with a growing population would alter the soundscape of the area. National Park Service (NPS) research shows that the effects of human-induced sounds on the overall park experience are cause for concern. In a 1998 survey conducted by the NPS, 72 percent of visitors stated that one of the most important reasons for having national parks was to provide opportunities to experience the natural quiet and sounds of nature. According to the NPS, uncharacteristic sounds or sound levels affect visitors' perceptions of solitude and tranquility and can generate high levels of annoyance (NPS 2009). Furthermore, there is evidence that human-induced noise can interfere with various aspects of animal behavior including preventing predator warning signals, disrupting breeding behavior, and discouraging birds from singing during the day when noise levels are highest (Brown 2001). There is currently no specific information about the impacts of noise on the soundscape in the AOI, but human-induced sounds and noise on wildlife and visitors should not be underestimated, especially at local scales. Taken together, the impact of increased noise levels across the AOI within the No Action alternative is expected to constitute a minimal impact.

EFFECTS ON THE BIOLOGICAL ENVIRONMENT

This section discusses potential effects on biological resources (e.g., habitats, wildlife, and federal and state listed species) under the No Action alternative.

Habitats

Beneficial

Under the No Action alternative, benefits to this resource are not expected. Given past actions and land use trends, it is anticipated that human population growth, development, and other land use changes would continue. Within the AOI, native habitats and natural systems would continue to be converted to developed lands and other uses, resulting in continued loss of these resources and further fragmenting remaining natural lands and waters. Over 80 percent of mountain bogs have already been lost, and it is expected that a steady decline would continue under this alternative.

Adverse

Existing native habitats, including bogs, would likely be lost to residential and agricultural development. The water resources within the AOI would be impacted by increased storm-water runoff from the growth in impervious surfaces (e.g., roads, parking lots), leading to a deterioration of water quality of the area waterbodies. Water levels in wetlands, streams, and rivers would likely fluctuate more, thereby altering their ecology. The loss of groundwater recharge (due to increased impervious surfaces) and the rise in residential, agricultural, industrial, and mining-related water consumption would increase the frequency of drying events of these wetlands and water bodies,

affecting many aquatic and semi-aquatic species. Currently, the percentage of three broad forest types (deciduous, evergreen, and mixed) in protected areas (versus those in unprotected) is relatively high, ranging between 76 percent (evergreen and mixed) and 97 percent (deciduous) (Table 17). The majority of these forests occur on public lands. Ecologically healthy forest habitats that are not protected would become increasingly fragmented, with negative consequences to various wildlife and watersheds. An increase in forest edges would promote the invasion of exotic plants. Compared to forests, other natural habitats on protected lands, such as woody wetlands, make up a relatively small percentage (28) compared to what is found in unprotected areas (Table 17).

Without a refuge, up to 23,478 acres of habitat could go unprotected. If this area were to be converted to other land uses (urban, agriculture, industrial), it would comprise approximately 0.5 percent of the land currently unprotected in the AOI. However, because all the CPAs (from which the proposed refuge lands would be selected) contain bogs, this scenario would likely also mean that a large percentage of the remaining bog habitat would be lost or seriously affected, constituting a moderate impact.

Wildlife

Beneficial

Under the No Action alternative, there would be no benefits to native fish or wildlife populations with the possible exception of those species that can tolerate or thrive in urbanized, agricultural, or otherwise altered environments. Examples of such species include deer, coyote, raccoon, gray squirrel, blue jay, mocking bird, and various fish species that can live in low-quality waters.

Adverse

As native and natural habitats continue to decline in quality and spatial extent, and as habitat patches become more fragmented, the animal species that use these habitats would decline in numbers or fitness. The No Action alternative would exacerbate this decline in the area's unique flora and fauna, and because some of these species are endemic or greatly restricted in their distribution, it may contribute to the future listing of species under the Endangered Species Act. Nuisance species that prefer forest edges would increase, such as the brown-headed cowbird, raccoon, fox, and opossum. These species are predators on other wildlife and increases in their populations would cause further disruption of native ecosystems. Nonnative aquatic species would also likely increase. Depending on the rarity of the native species affected that are likely to occur in the CPAs, this consequence is expected to be moderate.

Federal/State Listed and Priority Species

Beneficial Effects

Under the No Action alternative, there would be no benefits to at least thirteen federally listed (threatened or endangered) and one candidate species that are known to occur on some of the CPAs, including:

- Bunched arrowhead
- Mountain sweet pitcher plant
- Green pitcher plant
- Rock gnome lichen

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- Roan Mountain bluet
 - Spreading avens
 - Virginia big-eared bat
 - Carolina northern flying squirrel
 - Swamp pink
 - Small whorled pogonia
 - Heller's blazing-star
 - Virginia spiraea
 - Bog turtle
 - White fringeless orchid

Likewise, at least 36 federal species of concern would also not benefit under this alternative.

At least 83 state-listed species occur within the CPAs and there are likely more within the AOI. These include Appalachian Bewick's wren, Northern saw-whet owl, bog rose, cranberry, mole salamander, eastern small-footed bat, and sharpnose darter, to name a few. Additionally, there are dozens of species that are identified as state priorities in the North Carolina and Tennessee state wildlife action plans.

Adverse Effects

Federally listed species that require bog habitats would be negatively affected under this alternative. There currently are several conservation efforts underway at select sites aimed at protecting these vulnerable plants and the bog turtle. However, it is believed that the scale and intensity of the threats (e.g., habitat loss, changes in water resources) are of such a magnitude that without a larger, more comprehensive effort to protect bog habitats and adjacent watershed buffers, several of these wetland plants and bog turtle populations would be extirpated within the AOI. Other federally listed species that are not bog obligates, but occur within the CPAs and potentially use bogs, would not benefit from the protection of these habitats. Under this alternative, impacts are expected to be moderate.

Similarly, federal/state priority and state listed species are generally not expected to benefit under this alternative.

Nonnative Species

Beneficial

Given the Service's policy that most exotic species are undesirable, there would be no positive consequences under this alternative.

Adverse

Many exotic species often thrive in habitats that have been disturbed (Byers 2002). In addition, increased human access (new settlements, roads, etc.) increases the opportunities for exotic species to spread. The opportunity for expanded urbanization and other land uses that are expected to occur under the No Action alternative could allow for the continued proliferation of numerous exotic species, furthering the disruption of the native ecosystems. As exotic species gain a greater foothold in the AOI, they colonize and negatively alter rare habitats and the native species associated with these areas. The impacts resulting from exotic species are expected to increase under this alternative;

however, the size of the area (23,478 acres) that would likely not receive substantial additional management is relatively small compared to the AOI.

EFFECT ON SOCIOECONOMIC ENVIRONMENT

This section discusses potential effects to socioeconomic resources (e.g., local tax revenues, wildlife-dependent economics, refuges and local real estate values, ecosystem services, and land use patterns) under the No Action alternative.

Local Tax Revenues

The effects, both beneficial and adverse, of Service lands on local tax revenues depends on several factors (federal government appropriations, land value trends, etc), further described below.

The Refuge Revenue Sharing Act of June 15, 1935 (16 U.S.C. 715s) offsets the loss of local tax revenues from federal land ownership through payments to local taxing authorities. The refuge provides annual payments to taxing authorities, based on the acreage and value of refuge lands located within their jurisdiction. Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources, and from congressional appropriations, which are intended to make up the difference between the net receipts from the Refuge Revenue Sharing fund and the total amount due to local taxing authorities. The actual Refuge Revenue Sharing payment does vary from year-to-year, because Congress may or may not appropriate sufficient funds to make full payment. The exact amount of the annual payment depends on the congressional appropriation, which in recent years has tended to be less than the amount to fully fund the authorized level of payments.

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

In areas that are rapidly urbanizing and the land values are rising Refuge Revenue Sharing payments may be less than local tax rates. However, it is expected that these losses may be off-set by cost-savings to communities. Refuges can reduce costs to local communities because they require minimal infrastructure. Maintaining a system of open spaces, such as a refuge, is one important way to control the operating costs of local government. Land conservation is often less expensive for a local government than a suburban-style residential development. In general, refuges and other open spaces put little demand on the infrastructure of a municipality and should be considered in assessing the financial impact on the municipality. Conserving open space has the long-term benefit of avoiding future costs. Increasingly, communities and counties are finding that single-family residential tax rate tables do not cover the costs of municipal services, community infrastructure and local schools. Studies show that for every dollar collected in taxes, residential development costs between \$1.04 and \$1.67 in services. Furthermore, these costs continue into the future, generally increasing over time. Even including the initial cost of acquisition, open space is less costly to taxpayers over both the short term and long term than development of the same parcel, while the major public costs to conserve natural areas are finite (East Amwell Agricultural Advisory Board 1994, Mendham Township

Committee 1994, Pinelands Commission 1994, Burlington County Farmland Preservation Program 1996, Madsen et al. 2004).

Under this alternative (no new refuge), it is difficult to determine what the overall effects would be on local tax revenues. Generally, the area is experiencing population growth, but there are more localized areas where this is not the case. These trends could change over time. At this point in time, we are unable to predict (if the proposal were to be authorized) where and when refuge lands would be purchased within the CPAs.

Economics of Wildlife-dependent Recreation

Beneficial

Economic benefits associated with wildlife-dependent recreation would not be realized under this alternative.

Adverse

Without a new refuge, few new lands that offer wildlife-dependent activities are likely to be established in the foreseeable future. Refuges can contribute to the region's economy in several ways. First, a segment of the visiting public would spend its money at area hotels and restaurants. Second, visitors would locally buy some equipment and supplies associated with public uses such as hunting, fishing, and wildlife-watching/photography. A recent study by the University of Tennessee found that the economic activity generated by Tennessee state parks had a substantial impact on Tennessee's economy and created thousands of jobs in many rural areas of the state where jobs are needed most. In 2008-2009, an estimated 16.9 million people visited Tennessee state parks, resulting in \$725.2 million in direct expenditures. For every dollar spent on trips to Tennessee state parks, an additional \$1.11 of economic activity was generated throughout the state. When the direct and indirect expenditures were combined, the impact of Tennessee state parks to the state's economy was \$1.5 billion in total industry output. The \$725 million in direct expenditures supported almost 12,000 jobs across Tennessee, while associated industry output (i.e., indirect or secondary economic activity) supported over 18,600 jobs throughout the state (Fly et al. 2010). Wildlife-related activities are also important in North Carolina. Outdoor activities and beaches are among the main reasons people visit North Carolina. In 2001, outdoor recreation was the primary reason for 11 percent of all tourist travel to the state. Among all visitors, visiting beaches (15 percent) and outdoor activities (15 percent) were more popular than any activity but shopping (Madsen et al. 2004).

Hence, without a new refuge, these associated, additional economic activities would likely not be realized.

Effect of Refuges on Nearby Property Values

Beneficial

There would be no benefits to property values resulting from this alternative.

Adverse

A new study released by the Service, "Amenity Values of Proximity to National Wildlife Refuges," shows that in urban areas across three regions of the country, owning a home near a national wildlife refuge increases home value and helps support the surrounding community's tax base (Taylor et al.

2012). According to the study, homes located within half a mile of a refuge and within eight miles of an urban center were found to have higher home values of roughly:

- Seven to nine percent in the southeast
- Four to five percent in the northeast; and
- Three to six percent in the California/Nevada regions.

Hence, under this alternative, property values would not benefit from a nearby refuge and would rise only according to regional factors.

Ecosystem Services

Beneficial

Under this alternative, there would be no benefits to local communities associated with ecosystem services, and no cost savings to local communities would result from functioning natural systems, such as those provided by a refuge.

Adverse

Under this alternative, local communities would not benefit from an array of potential “ecosystem services” (McConnell and Walls 2005). Refuges and other open spaces can provide additional economic benefits, in terms of ecosystem services, which are the cost savings provided by functioning natural systems. These include all the functions performed by nature that provide benefits to humans, such as clean drinking water, reductions in storm-water runoff (i.e., flood prevention), air-pollution reduction, and reduced costs of government services. Several studies have been conducted to quantify the financial benefits that open spaces provide to local communities. For example, a 2010 study found that Long Island’s parks and open space provided quantifiable economic benefits worth over \$2.74 billion a year (The Trust for Public Land 2010). It must be noted that the agricultural lands were included in the analysis, and had a combined estimated worth of \$288 million annually, slightly more than 10 percent of the total cost benefit. Nationwide, these cost-savings are substantial. It is estimated that within the contiguous 48 states, the total value of ecosystem services provided by wildlife refuge lands was estimated at over \$32 billion annually (Ingraham and Foster 2008). Cost savings associated with flood prevention and mitigation provided by wetlands and other open space are among the most important of all array of ecosystem services. For example, a study by American Forests (2003) determined that the forested open space in Mecklenburg County (NC) provided 935 million cubic feet of storm-water retention capacity. The group estimated that replacing this capacity with man-made infrastructure would cost approximately \$1.9 billion. Another study, conducted by the Minnesota Department of Natural Resources, showed that it would cost approximately \$370 to replace each acre-foot of flood storage capacity naturally provided by a wetland with artificial flood controls (Floodplain Management Association 1994).

Land Use Patterns

Beneficial

Under the No Action alternative, lands trusts, national parks, Natural Resources Conservation Service, North Carolina and Tennessee state agencies, and other conservation land managers would continue to protect some of the lands in the AOI. North Carolina and Tennessee have a history of funding land protection efforts. The North Carolina Natural Heritage Trust Fund (NHTF) provides

financial support for the purchase of natural lands for recreation, forestry, fish and wildlife habitat, and wilderness. In 1987, the General Assembly created the NHTF to protect the state's natural and historic places from rapid development. Since then, over 264,459 acres of game lands, state parks and forests, and other natural and historic places of interest have been protected (North Carolina Natural Heritage Trust Fund 2007). In addition, over 100,000 acres have been set aside through private and non-profit efforts. However, the rate of land protection has declined substantially since 2006. For example, in 2006, approximately 120,000 acres were protected statewide, but in 2011 it was just over 20,000 acres. Meanwhile, loss of open space continues. Between 1997 and 2007, North Carolina added more than 1.1 million acres of developed land, while losing a roughly equivalent amount of cropland, pastures, and forests (Land for Tomorrow 2012).

In Tennessee, the Heritage Conservation Trust Fund, Wetlands and State Parks Acquisition Funds, and Natural Areas Preservation Act have acquired and protected over 379,000 acres since the 1970s. However, compared with years leading up to the economic downturn, states have recently seen relatively large reductions in land acquisition activities due to declining budgets. Even if the proposed refuge lands are acquired over the next several decades, lands in the AOI would be left unprotected and remain at risk from urban development, row-crop agriculture (including biofuel production), industry, mining, and other land uses generally deemed incompatible with natural resource protection efforts. Hence, in terms of conservation, which is an integral component of the Service's mission, there would be no beneficial impacts to land use under this alternative.

Adverse

North Carolina's and Tennessee's populations are likely to continue to rise during the next 50 years, with current decadal growth rates approximately 16 and 11 percent, respectively (U.S. Census Bureau 2012). With continued population growth, land use is likely to change, and areas currently covered by intact deciduous forests could be converted to commercial pine forests, urban use, and agriculture. According to a 2009 study of land use trends in western North Carolina (Kirk 2009), agricultural lands have declined, and are being replaced primarily by developed areas. It predicts that by 2030, agricultural areas and forests will decline by 12 and 4.8 percent, respectively. In Tennessee, farmland and other open space (including wildlife habitat and areas used for outdoor recreation) are also being converted to urban use. Based on a report prepared for the Tennessee Advisory Commission on Intergovernmental Relations (Thurmann et al. 2011), developed lands increased from about 7 percent in 1982 to over 12 percent in 2007, corresponding to a loss of about 25 percent of croplands during the same period. As expected, there were differences between the rates of urban land conversion (e.g., developed lands comprised about 4 percent in Hardeman County compared to about 36 percent in Blount County (Thurmann et al. 2011). Another land-cover study conducted in southern Tennessee showed that forest cover declined by 14 percent between 1981 and 2000. In addition, the rate of forest loss increased. Between 1981 and 1997, intact native forest area decreased at a rate of 3,012 acres per year, whereas between 1997 and 2000 the rate of decrease was almost two times greater at 5,823 acres annually (Reid et al. 2008). The replacement of open spaces (e.g., farmland, wildlife habitat, outdoor recreation areas) in the AOI by developed areas would continue to have potential negative consequences to people and wildlife. Impacts would be to clean and dependable supplies of water, local food/fiber production, outdoor recreation, etc. These effects are expected to be moderate, given the acreage of the refuge relative to the size of the AOI and potential mitigating circumstances (local/regional planning, etc.).

EFFECTS ON CULTURAL RESOURCES

This section discusses potential effects to cultural (e.g., archaeological, historical) resources under the No Action alternative.

Beneficial

No positive impacts to archeological and historic resources are expected under the No Action alternative.

Adverse

The No Action alternative could have a negative effect on the protection of historical and archaeological resources in the AOI. Without additional protection, cultural resources, whether listed or not, tend to be vulnerable to development, disturbance, take, and vandalism. Without a refuge, fewer lands would be managed by the Service and its partners, which have a clear responsibility for protection of cultural resources.

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

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

ALTERNATIVE B: PROPOSED ACTION

Under this alternative, the Service would authorize a 42,250-acre conservation partnership area (CPA) from within which up to approximately 23,478 acres of lands and waters could be acquired as part of Mountain Bogs NWR. Proposed methods of acquisition are summarized in Section A.

EFFECTS ON THE PHYSICAL ENVIRONMENT

This section discusses potential effects to physical resources (e.g., topography, soils, water resources) under the Proposed Action.

Topography and Geology

Beneficial

Under this alternative, mining would not be permitted within the 23,478-acre proposed refuge, and the topography and geology would be protected from mining and other activities that could substantially

alter the landscape. As discussed under the “Topography and Geology” section under the No Action alternative, current mining operations are changing these resources at selected sites within the AOI. Given that the CPAs contain few mineral or energy resources currently of interest, they are unlikely to be targeted for these activities. Furthermore, the CPAs cover a small area compared to the AOI. Therefore, we expect there to be a minimal benefit with regards to topography and geology.

Adverse

If Mountain Bogs NWR were to be established, no construction activities would occur that would affect these resources. Any possible new construction (e.g., facilities to support refuge operations and visitor services) is not expected to result in adverse impacts to the topography or geology.

Soils

Beneficial

Under this alternative, there would be a minor benefit to soils within the proposed refuge. Within the refuge, this resource would largely be protected from disturbance and degradation associated with development, agriculture, mining, etc. The “Soils” section under the No Action alternative provides a more detailed discussion on how these land uses can affect soils.

Adverse

Within the proposed refuge, some soils would be disturbed due to the construction of one or more potential buildings, parking lots, and other infrastructure needed to support refuge visitors and operations. Natural soil-formation processes would no longer occur in areas covered by impervious surfaces (e.g., roads, parking lots, buildings). Soil compaction is also expected at sites where construction occurs. Best management practices would be used to minimize these impacts. Additional environmental analyses would be conducted in association with any substantial (e.g., roads, parking lots, buildings) construction projects, per Service policy. Although the exact acreage needed for any new refuge infrastructure is unknown at this point, it is believed it would be a small percentage of the total refuge area. The impacts to soils resulting from the alternative are expected to be minimal.

Climate Change

Beneficial

Under this alternative, there would be assurances that the approximately 23,478 acres of proposed refuge lands would continue to act as carbon sinks, resulting in a positive impact with regard to climate change. As further detailed in the “Climate Change” section under the No Action alternative, many natural areas have the ability to store carbon (live and dead vegetation, soil). Habitats differ in their ability to store carbon, depending on the amount of vegetation they support and other factors. Some habitats such as certain wetlands, although they store carbon, also produce methane (Bridgham et al. 2007), which is a powerful greenhouse gas (NOAA 2011). It is believed that the proposed refuge lands would provide a net reduction in greenhouse gases, even with potential anthropogenic sources (see discussion of Adverse Effects below) of these gases taken into account. Overall, this benefit would be minimal. Due to the comparatively small size of the proposed refuge, its carbon sequestration ability would likely not be measureable compared to the volume of Earth’s atmosphere.

Adverse

Under this alternative, refuge operations and facilities, public visitation, and habitat management would contribute greenhouse gases to the atmosphere.

The amount of carbon that would potentially be released through refuge operations (e.g., combustion engines, electrical equipment use) was not estimated for this Draft EA. However, the proposed refuge would aim to minimize its carbon emissions. As the Refuge System works to implement many of the strategies for achieving Service-wide carbon neutrality by 2020 (USFWS 2011: "Strategic Plan for Climate Change"), refuge energy use is expected to decline. These actions would include use of hybrid vehicles, building energy efficient facilities, video-conferencing (to reduce travel-related energy use), and green purchasing. These strategies, combined with those of other Service offices and the Federal Government in general, would likely result in a beneficial reduction in the rate of greenhouse gas emissions nationally.

Refuge visitation would be associated with a number of vehicles on the refuge. The low rate of speed necessitated would minimize emissions. In addition, the number of vehicles on the refuge at any given time would not be expected to create a significant impact to greenhouse gas emissions.

Prescribed burning would be a valuable habitat management tool within several habitats of the proposed refuge. The primary gases released during prescribed fire include CO₂, CO, and water vapor, with other gases present in trace amounts (EPA 2011). Most of these are greenhouse gases. However, it has been shown that prescribed fires can decrease the risk of wildfires, which typically release greater amounts of greenhouse gases (National Science Foundation 2010). Wildfires tend to burn entire habitats including mature trees, whereas prescribed fires are aimed at reducing groundcover and low-growing shrubs. The amount of greenhouse gases contributed to the atmosphere as a result of prescribed fires on the proposed refuge is expected to be minimal.

Air Quality

Beneficial

A positive effect on air quality is anticipated as a result of this alternative. With the establishment of the proposed refuge, sources of air pollution resulting from urbanization, agricultural operations, industry, etc., would be halted within 23,478 acres. This benefit is expected to be minor, given that the proposed refuge would cover a relatively small percentage of the total AOI.

Adverse

Under this alternative, refuge operations and facilities, public visitation, and habitat management would contribute some pollutants to the atmosphere, affecting air quality.

Some air pollutants would be released through refuge operations (e.g., combustion engines, electrical equipment use). However, the proposed refuge would aim to minimize its emissions from vehicles as well as the indirect emissions associated with electrical energy use. As the Refuge System works to implement many of the strategies for achieving Service-wide carbon neutrality by 2020 (USFWS 2011: Strategic Plan for Climate Change), refuge energy use is expected to decline. These actions would include use of hybrid vehicles, building energy efficient facilities, video-conferencing, and green purchasing. These strategies, combined with those of other Service offices and the Federal Government in general, would likely result in a beneficial reduction air pollutants.

Refuge visitation would be associated with a number of vehicles on the refuge. The low rate of speed necessitated would minimize emissions of air pollutants. In addition, the number of vehicles on the refuge at any given time would not be expected to create a significant impact to air quality.

Prescribed burning would be a valuable habitat management tool within several habitats of the proposed refuge. Prescribed burning releases several air pollutants, including CO and particulate matter. The proposed refuge would work with its partners to reduce smoke-related issues in adjacent areas resulting from prescription fires. The risk of wildfires would be minimized through a fire management program. One positive consequence of prescribed fire is the reduction in the frequency and intensity of wildfires, which tend to release larger amounts of air pollutants (National Science Foundation 2010).

Overall, the negative consequences to air quality associated with this alternative are expected to be minor.

Water Quality

Beneficial

This alternative is expected to result in benefits to water quality in the AOI. The establishment of the proposed refuge would protect 23,478 acres from future urbanization, expanded agricultural operations, growing industries, etc. These land uses are typically associated with declines in water quality, as further detailed in the “Water Quality” section under the No Action alternative. Conservation lands, such as the proposed refuge, tend to improve water quality downstream as vegetated areas reduce run-off and sedimentation, while also absorbing some nitrogen and phosphorus. Installation of agricultural and storm water best management practices and the use of low impact development methods on refuge lands are expected to improve water quality within portions of the AOI. Sedimentation, excess nutrients, and other water pollutants are further discussed in the section on “Water Quality” under the No Action alternative. The positive impacts to water quality are expected to be moderate under the Proposed Action.

Adverse

Under this alternative, there would be some impacts to water quality resulting from new construction, refuge operations, and visitor use on the proposed refuge.

The construction of office and visitor use buildings, parking areas, trails, and other facilities and infrastructure needed for refuge operations and public use programs would cause some vegetation clearing, soil disturbance, and associated runoff. Low impact development methods and best management practices would be used to minimize these effects. Runoff from roads and parking lots would cause some oil, grease, and other materials from vehicles to leach into soils or be carried as runoff into low-lying areas. Storm-water wetlands and retention ponds, for example, would help mitigate many of the water quality impacts associated with runoff. The North Carolina Department of Environment and Natural Resources, Division of Water Quality, Storm-water BMP Design Manual (NCDWQ 2007) methods would be used as a reference during construction, and BMPs outlined within this manual would be employed to minimize impacts from refuge-associated development.

Prescribed fires and clearing of nonnative plants would cause some vegetation to be removed, leaving soils exposed to runoff and erosion. In general, it is expected that runoff would be buffered by vegetated areas and would likely not contaminate waterbodies. If nonnative plant removal operations were to occur in riparian zones, BMPs would help ensure that impacts to water quality

were kept to a minimum. Use of approved herbicides for controlling nonnative plants could cause some of these chemicals to leach into the groundwater or make their way into surface waters. Adherence to product usage guidelines and Service requirements would keep any of these adverse effects to water quality at a minimum. Herbicide use would likely be much less than occurs on farms and in developed areas.

Public use on the proposed refuge would include hunting (which, by its very nature, is off-trail), with some associated trampling of vegetation. This is expected to be a minimal impact, given that hunter densities would likely be sufficiently low to reduce the chances of foot paths (i.e., sources of erosion) from becoming established. Erosion associated with wildlife watching would be minimized by limiting these activities to trails, and possibly, overlooks and observation towers. For anglers, some improved access (e.g., boardwalks) to fishing areas might be constructed, which would minimize erosion to shorelines.

In general, it is believed that any negative consequences to water quality resulting from the proposed refuge would be minimal.

Hydrology and Water Quantity

Beneficial

This alternative is expected to result in positive impacts to the hydrology and water quantity of the area. About 23,487 acres of proposed refuge lands would be protected from the construction of extensive drainage ditches, roads, and large areas of impervious surfaces associated with development that would otherwise alter the hydrology. See the "Hydrology and Water Quantity" section under the No Action alternative for a discussion on the impacts of various structures on water flow and quantity. The benefit to these resources is expected to be moderate under the Proposed Action. Furthermore, the refuge would restore the hydrology where needed, which would be beneficial to refuge lands and areas outside of the refuge.

Adverse

Under this alternative, there would be some impacts to hydrology and water quantity resulting from construction projects on the proposed refuge. Infrastructure such as visitor and office facilities, paved areas, and landscaped areas would alter, to some degree, the local hydrology and amount of water available to down-stream areas. Specific site plans for public use building(s) and refuge offices have not yet been developed (where possible, existing structure would be evaluated to determine if they could serve refuge needs), so the amounts of impervious surfaces are unknown at this time. However, impervious surfaces, such as roads, sidewalks, and buildings, reduce the area available for rainwater to percolate into the soil. This generally has two direct consequences when it rains: there is less water available for recharging the local surficial aquifer, while at the same time the amount of runoff that flows into low-lying area increases. Low impact development methods and best management practices would be used to minimize these effects. Storm-water wetlands and retention ponds, rain gardens, and rooftop rainwater harvesting, for example, would help mitigate many of the water quantity impacts associated with impervious surfaces. The North Carolina Department of Environment and Natural Resources, Division of Water Quality, Storm-water BMP Design Manual (NCDWQ 2007) methods would be used as a reference during construction, and BMP's outlined within this manual would be employed to minimize impacts from refuge-associated development. Although additional environmental studies would likely be conducted in association with any future construction, it is not believed that there would be significant impacts to the hydrology or water quantity resulting from the proposed refuge. Overall, the negative effects on hydrology and water quantity are believed to be minimal under this alternative.

Noise

Beneficial

The soundscape of the areas in which the refuge is proposed would benefit under this alternative. Sources of noise from heavy traffic, farm machinery, and industrial operations would not occur within the refuge boundary, providing minimal benefits to this resource.

Adverse

Some noise would be associated with use of vehicles by refuge staff and the visiting public on the refuge. Because high levels of speed would not be permitted, associated noise levels would be kept to a minimum. Hunting would cause some noise disturbance at some CPAs, but the frequency and duration would be at levels that would keep it at minimal levels. Overall, it is expected that the proposed refuge would have a minimal impact on this resource.

EFFECTS ON THE BIOLOGICAL ENVIRONMENT

This section discusses potential effects to biological resources (e.g., habitats, wildlife, federal/state-listed species, and exotic species) under the Proposed Action.

Habitats

Beneficial

With the implementation of Alternative B, bog habitats and adjacent uplands and stream habitats would be afforded additional protection, and we expect moderate benefits to natural habitats. From within the larger CPAs (42,250 acres), up to 23,478 acres would be conserved under this proposal. At this time, we cannot predict the relative amounts of different habitats that would eventually make up the refuge, but it would conceivably have similar ratios to what is found in the CPAs. In any event, the refuge would include bog habitats and adjacent watershed buffers.

Protecting the adjacent buffer areas would be critical to the long-term conservation of mountain bogs. These vegetated areas help protect water resources that are important to the bogs. Forests, for instance, can absorb and slowly release water; providing a flow of water that sustains bogs down-slope, even during some droughts. Conversely, vegetated lands upstream of bogs help prevent sedimentation and limit flash floods.

Adverse

Based on the information presented “North Carolina Natural Heritage Trust Fund: Celebrating 20 Years of Conservation” (North Carolina Trust Fund 2007), approximately 100,000 acres of forests, farmland, and other open space were converted to residential/urban land uses in 2007. Within parts of the AOI, Vogler et al. (2009) predicted that an additional 47,489 acres of forested and agricultural lands would be developed by 2030 at an average rate of 5.9 acres per day, with Buncombe and Henderson Counties accounting for the majority of the anticipated growth, contributing 22,101 and 18,381 acres, respectively. Henderson County was expected to undergo the greatest change in total developed land relative to county area in the region, with the total number of developed acres comprising 13.2 percent of the county in 2006 and 21.3 percent by 2030 (Vogler et al. 2009).

We anticipate that existing natural habitats would still be lost to urban development under Alternative B. This would fragment remaining natural lands and waters. However, we expect that the distribution of these impacts might change if Alternative B was implemented. For example, Alternative B would protect up to 23,478 acres from further agricultural or residential development, but it may also attract development to its periphery. A frequent real estate selling point is the ability to own land where there are fewer neighbors and some people may desire to live adjacent to a refuge or other protected natural area. This could entice residential development around the Alternative B Units on lands not already protected. In this event, the periphery of these Units could be affected by adjacent landowners (human disturbance) and wildlife connectivity could be reduced. In the interim, the price for these adjacent lots may also increase due to their anticipated desirability. That increase in cost, may make it more difficult for the Service or other conservation agencies or entities to buy additional lands or easements in those areas. In general, we expected impacts to habitats under this alternative to be minor.

Wildlife

Beneficial

There are hundreds of non-listed species including fish, mussels, amphibian, reptile, bird, and mammals potentially present in the AOI. The area is a center of biodiversity for salamanders and terrestrial snails. Numerous migratory birds utilize the forests and other habitats for breeding, wintering and as a stop-over location during their migration. Under this alternative, the habitats protected would benefit a range of species. Furthermore, on refuge lands, the mortality caused by high towers, roads, and other structures associated with expanding human settlements would be reduced.

Adverse

There could potentially be some minimal impacts to non-listed species resulting from the establishment of a refuge. Although pre-work surveys and best management practices would be used, restoration projects could temporarily displace or possibly kill individuals of some species in the short term. However, mitigation efforts would reduce those effects to a minimum and over the long term, impacts would be beneficial. Various wildlife-dependent public use opportunities (e.g. wildlife observation, hunting, etc.) could cause disturbance to vulnerable species (e.g. nesting birds, etc.) possibly resulting in reduced reproductive output or survival of individuals. Rare plants could get trampled or otherwise disturbed. These risks would be off-set by possibly limiting access during certain times of the year to particular sites, making some sites off-limits to the public, and other mitigating measures. These measures are described in more detail in Appendix B: Interim Appropriateness and Interim Compatibility Determinations.

Impacts to game species would include take by anglers and hunters, but this is already occurring in the area. Generally, hunting and fishing on sites where these activities would be permitted would be regulated according to state guidelines. In some cases and on specific sites, additional restrictions could be warranted (see Appendix B for further details). Overall, adverse effects on game species are expected to be minimal.

Federal/State Listed and Priority Species

Beneficial Effects

Under Alternative B, there would be benefits to at least thirteen federally listed (endangered or threatened) species and one candidate species that are known to occur on some of the CPAs:

- Bunched arrowhead
- Mountain sweet pitcher plant
- Green pitcher plant
- Rock gnome lichen
- Roan Mountain bluet
- Spreading avens
- Virginia big-eared bat
- Carolina northern flying squirrel
- Swamp pink
- Small whorled pogonia
- Heller's blazing-star
- Virginia spiraea
- Bog turtle
- White fringeless orchid

There are several conservation efforts underway at select sites aimed at protecting these vulnerable plants and the bog turtle. We believe that under this alternative, through the additional protection and conservation of bogs and watershed buffers, several of these wetland plants and bog turtle populations would benefit greatly and the establishment of a refuge is expected to contribute to their recovery. Under this alternative, these positive effects are expected to be moderate.

In addition, 36 federal species of concern can also be found within the CPAs, including Eastern hellbender, golden-winged warbler, Gray's lily and Cuthbert's turtlehead. The study area supports hundreds of state-listed and priority species with the CPAs supporting at least 20 state (North Carolina, Tennessee or both) threatened and endangered designations. These and additional state species of concern are outlined in Chapter 2 of the EA.

Adverse Effects

Impacts to federally/state listed and priority species are expected to be minimal. Bog restoration efforts could potentially have localized, short-term consequences to some of the plants or bog turtles, but the long-term benefits (e.g. increasing suitable habitat, growing population size of listed species, etc.) would outweigh those impacts. Best management practices and limiting public access on highly vulnerable sites would further reduce (to minimal levels) any negative effects associated with refuge operations and visitor use. In addition, residential development patterns could shift slightly towards refuge lands if people view it as a desirable recreational area. This could fragment adjacent unprotected habitats.

Invasive Species/Diseases/Pathogens

Beneficial

In our global society, invasive species, wildlife diseases and pathogens are an ever increasing threat to ecosystems and wildlife. We anticipate that exotic invasive plant species would be controlled under Alternative B, and regular assessment of wetlands and the surrounding areas included within the CPA's would be needed to control these threats. It might also be possible to control some plant diseases, such as hemlock wooly adelgid. Additionally, establishment of a refuge would provide good opportunities to educate the public about these threats and to serve as an example on how to minimize our impacts. Finally, the health of wildlife and plants could be monitored, which could help detect outbreaks. We envision that a management plan will be developed for each CPA, and this plan will include monitoring and control of these threats.

Adverse

The designation of bog sites as part of a National Wildlife Refuge will likely mean visitation by more people at some locations. High visitation can increase the risk of spreading diseases, pathogens and invasive plants. For example, ranavirus and chytrid fungi are two wildlife diseases that have devastated populations of amphibians and reptiles in certain regions. These two diseases can easily hitchhike a ride on the boots of visitors or biologists visiting these sites, as can seeds from invasive plants. A plan should be in place for decontamination by people entering different bog sites to minimize the chance of spreading invasive species, diseases and pathogens within and between bog sites, which will serve to minimize and reduce impacts from these threats.

EFFECTS ON SOCIOECONOMIC ENVIRONMENT

This section discusses potential effects to socioeconomic resources (e.g. local tax revenues, wildlife-dependent economics, refuges and local real estate values, ecosystem services, and land use patterns) under the Proposed Action.

Local Tax Revenues

The effects, both beneficial and adverse, of Service lands on local tax revenues depends on several factors (federal government appropriations, land value trends, etc), further described below.

The Refuge Revenue Sharing Act of June 15, 1935 (16 U.S.C. §715s) offsets the loss of local tax revenues from federal land ownership through payments to local taxing authorities. The refuge provides annual payments to taxing authorities, based on the acreage and value of refuge lands located within their jurisdiction. Money for these payments comes from the sale of oil and gas leases, timber sales, grazing fees, the sale of other Refuge System resources, and from Congressional appropriations, which are intended to make up the difference between the net receipts from the Refuge Revenue Sharing Fund and the total amount due to local taxing authorities. The actual Refuge Revenue Sharing payment does vary from year to year, because Congress may or may not appropriate sufficient funds to make full payment. The exact amount of the annual payment depends on the Congressional appropriation, which in recent years have tended to be less than the amount to fully fund the authorized level of payments.

The Refuge Revenue Sharing payments are based on one of three different formulas, whichever results in the highest payment to the local taxing authority. The payments are based on three-quarters of 1 percent of the appraised fair market value (or the purchase price of a property until the

property is reappraised). The Service reappraises the value of refuge lands every five years, and the appraisals are based on the land's highest and best use. Refuge Sharing payments typically benefit local communities in areas where wetlands and formerly farmland-assessed properties make up a larger component of the landscape. On these types of lands, full entitlements Refuge Revenue Sharing payments sometimes exceed the real estate tax; in other cases, Refuge Revenue Sharing payments may be less than the local real estate tax.

In areas that are rapidly urbanizing and land-values are rising, Refuge Revenue sharing payments may be less than local tax rates. However, it is expected that these losses may be off-set by cost-savings to communities. Refuges can reduce costs to local communities because they require minimal infrastructure. Maintaining a system of open spaces, such a refuge, system is one important way to control the operating costs of local government. Land conservation is often less expensive for a local government than a suburban-style residential development. In general, refuges and other open spaces put little demand on the infrastructure of a municipality and should be considered in assessing the financial impact on the municipality. Preserving open space has the long-term benefit of avoiding future costs. Increasingly, communities and counties are finding that single-family residential tax rate tables do not cover the costs of municipal services, community infrastructure and local schools. Studies show that for every \$1.00 collected in taxes, residential development, costs between \$1.04 to \$1.67 in services. Furthermore, these costs continue into the future, generally increasing over time. Even including the initial cost of acquisition, open space is less costly to taxpayers over both the short and long term than development of the same parcel, while the major public costs to preserve natural areas are finite (East Amwell Agricultural Advisory Board 1994, Mendham Township Committee 1994, Pinelands Commission 1994, Burlington County Farmland Preservation Program 1996, Madsen et al. 2004).

Under this alternative (establishment of a new refuge), it is difficult to determine what the overall effects will be on local tax revenues. Generally, the area is experiencing population growth, but there are more localized areas where this is not the case. These trends could change over time. At this point in time, we are unable to predict (if the proposal were to be authorized) where and when refuge lands would be purchased within the CPAs.

Economics of Wildlife-dependent Recreation

Beneficial

We expect the establishment of a new refuge to have some positive economic effect. Refuges can contribute to the region's economy in several ways. First, a segment of the visiting public would spend its money at area hotels, restaurants, gas stations, etc. Secondly, visitors would locally buy some equipment and supplies associated with public uses such as hunting, fishing, and wildlife-watching/photography. Wildlife-related activities are important in North Carolina. Outdoor activities and beaches are among the main reasons people visit North Carolina. In 2001, outdoor recreation was the primary reason for 11 percent of all tourist travel to the state. Among all visitors, visiting beaches (15 percent) and outdoor activities (15 percent) were more popular than any activity but shopping (Madsen et al. 2004).

A recent study by the University of Tennessee found that the economic activity generated by Tennessee State Parks had a substantial impact on Tennessee's economy and creates thousands of jobs in many rural areas of the state where jobs are needed most. In 2008-2009, an estimated 16.9 million people visited Tennessee State Parks, resulting in \$725.2 million in direct expenditures. For every dollar spent on trips to Tennessee State Parks, an additional \$1.11 of economic activity was generated throughout the state. When the direct and indirect expenditures were combined, the

impact of Tennessee State Parks to the state's economy was \$1.5 billion in total industry output. The \$725 million in direct expenditures supported almost 12,000 jobs across Tennessee, while associated industry output (i.e. indirect or secondary economic activity) supported over 18,600 jobs throughout the State (Fly et al. 2010).

Adverse

Negative consequences could include additional congestion of area roads, for instance, resulting from an increase in refuge visitors. Heavy traffic and associated long delays could curb future visitation to the area. We expect this effect to be minimal.

Effect of Refuges on Nearby Property Values

Beneficial

A new study released by the U.S. Fish and Wildlife Service, "Amenity Values of Proximity to National Wildlife Refuges," shows that in urban areas across three regions of the country, owning a home near a national wildlife refuge increases home value and helps support the surrounding community's tax base (Taylor et al. 2012). According to the study, conducted for the U.S. Fish and Wildlife Service by economic researchers at North Carolina State University, homes located within half a mile of a refuge and within eight miles of an urban center were found to have higher home values of roughly:

- Seven to nine percent in the southeast
- Four to five percent in the northeast; and
- Three to six percent in the California/Nevada region.

Hence, under this alternative, property values could benefit from a nearby refuge.

Adverse

A rise in real estate values resulting from a nearby refuge could adversely affect some home owners with fixed or declining incomes.

Ecosystem Services

Beneficial

Under this alternative, local communities could receive some benefits from an array of potential "ecosystem services" (McConnell and Walls 2005). Refuges and other open spaces can provide additional economic benefits, in terms of ecosystem services, which are the cost savings provided by functioning natural systems. These include all the functions performed by nature that provide benefits to humans, such as clean drinking water, reductions in stormwater runoff (i.e. flood prevention), air-pollution reduction, and reduced costs of government services. Several studies have been conducted to quantify the financial benefits that open spaces provide to local communities. For example, a 2010 study found that Long Island's parks and open space provided quantifiable economic benefits worth over \$2.74 billion a year (The Trust for Public Land 2010). It must be noted that the agricultural lands were included in the analysis, and had a combined estimated worth of \$288 million annually, slightly more than 10 percent of the total cost benefit. Nationwide, these cost-savings are substantial. It is estimated that within the contiguous 48 states, the total value of ecosystem services provided by wildlife refuge lands was estimated at over \$32 billion annually (Ingraham and Foster 2008). Cost savings associated with flood prevention and mitigation provided

by wetlands and other open space are among the most important of all array of ecosystem services. For example, a study by American Forests (2003) determined that the forested open space in Mecklenburg County (NC) provides 935 million cubic feet of storm-water retention capacity. The group estimated that replacing this capacity with man-made infrastructure would cost approximately \$1.9 billion. Another study, conducted by the Minnesota Department of Natural Resources, showed that it would cost approximately \$370 to replace each acre-foot of flood storage capacity naturally provided by a wetland with artificial flood controls (Floodplain Management Association 1994).

Adverse

None anticipated under this alternative.

Land Use Patterns

Beneficial

Under Alternative B, the total area of protected lands used for habitat and wildlife conservation and compatible wildlife-dependent recreation would increase in the AOI by approximately 23,478 acres. Approximately 2.6 million acres (38 percent) of the land in the AOI are protected, more than three times the amount found in North Carolina overall, where public conservation lands comprise about nine percent state-wide. Public conservation lands in Tennessee are about seven percent of the total state area (Alabama Forever Wild 2009). Still, unprotected lands would likely continue to be converted to development and other land uses (Reid et al. 2008, Kirk 2009, Thurmann et al. 2011), as further detailed in the Land Use Patterns section of Alternative A.

Adverse

Establishment of a refuge would prohibit or limit the future use of these areas to ones incompatible with the mission of the Refuge System (e.g. development, most forms of agriculture, etc.). However, because the total area of the refuge comprises less than one percent of the unprotected acreage in the AOI, the effect on land use patterns under this alternative is expected to be moderate.

EFFECTS ON CULTURAL RESOURCES

This section discusses potential effects to cultural (e.g. archeological, historical) resources under the Proposed Action.

Beneficial

Beneficial impacts to cultural resources would be anticipated from the implementation of Alternative B. The 23,478-acre refuge would help increase the preservation of any archaeological and historic sites on otherwise unprotected lands within the AOI. The Service, like other federal agencies, has several legally mandated responsibilities that include development of a cultural resource management plan, compliance with the Section 106 of the National Historic Preservation Act prior to any undertaking that possesses the potential to impact historic properties, archaeological inventory of its lands and subsequent National Register eligibility testing, research-directed testing or excavation, site protection, and interpretation. Critical to these efforts are the NC and TN State Historic Preservation Offices, the Eastern Band of Cherokee Indians, and a number of interested parties, such as nearby universities, adjacent landowners, and State resource agencies. The Service would, when possible, partner with the Eastern Band of Cherokee Indians and/or other interested Native American Tribes to facilitate archaeological and ecological investigations, protection, and

interpretation of sites deemed to have culturally and religiously significance for the Tribe(s). Protection of historic properties would be enhanced by incorporating concepts of site stewardship and ownership, where appropriate, into public use materials and interpretive panels. This effort would be further enhanced by providing advanced archaeological resource protection training to refuge law enforcement personnel.

Adverse

Minimal impacts to cultural resources could be anticipated under Alternative B. There could be some risk that refuge visitors may inadvertently or intentionally damage or disturb cultural resource sites; however, we would employ all means available to protect archaeological sites, historic structures, cemeteries, and historic landscapes through scientific investigations, public education, partnerships with tribal, state, and local governments, and law enforcement efforts.

CUMULATIVE EFFECTS

According to the Council on Environmental Quality NEPA implementing regulations in 40 CFR 1508.7, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. For the purposes of this EA, the cumulative effects on each resource are discussed in terms of the net positive or negative impact, if any.

PHYSICAL RESOURCES

Some minimal and minor impacts on physical resources are expected, under each of the alternatives, but none of these are anticipated to be cumulatively significant. Cumulative effects on individual physical resource categories are further discussed below.

Topography and Geology

The No Action alternative would have a minimal negative cumulative effect on the topography and geology of the AOI. CPAs generally do not overlay mineral or energy resources of interest, and extraction efforts would be unlikely to take place in those areas. Under Alternative B, no adverse cumulative effects are predicted to this resource.

Soils

Alternative A would likely result in minor negative cumulative impacts to soils in the AOI. Without protection, lands in the AOI would continue to be converted to urban use. Soil disturbance would result from the construction of buildings, roads, parking lots, and other infrastructure associated with development. Furthermore, an increase in impervious surfaces would alter natural soil formation processes. Alternative B is expected to have net beneficial effects on soils in the AOI as more lands would be protected from development.

Climate Change

Under alternative A (No Action), a minimal adverse cumulative impact on climate change is expected as land currently functioning as carbon sinks would likely become net sources of greenhouse gases. Conversely, lands protected under Alternative B would not have a significant cumulative negative

effect on climate change. Under this alternative, additional lands that are believed to function as net carbon sinks would be protected. Growing vegetation and natural soil formation processes would continue to sequester carbon.

Air Quality

Alternative A (No Action) would likely contribute to an acceleration of poor air quality, a minimal negative impact, over the long term due to the expected continued increases in development and its associated contributions to pollutant emissions. Alternative B is not expected to have significant cumulative adverse impacts on air quality, locally or regionally, since it would help retain vegetated areas within the proposed refuge. Some short-term, local deterioration in air quality would be expected from air emissions of motor vehicles used by refuge visitors and staff, as well as habitat management (e.g. prescribed burning).

Water Quality

The No Action alternative is expected to result in moderate adverse cumulative effects on water quality. Land conversion to development is likely to continue in unprotected areas, resulting in a deterioration of water quality. Overall, Alternatives B is predicted to have a net positive cumulative impact to water quality in the AOI as it would protect vegetated areas within the proposed refuge boundaries and help slow the flow of water, helping to improve water quality.

Hydrology and Water Quantity

Hydrology and water quantity would suffer moderate negative cumulative effects under the No Action alternative. Compared to the Service acquiring lands as proposed under Alternatives B, less lands would likely be protected from development and associated adverse impacts to these resources. Increased urbanization and associated changes in drainage patterns and declines in water availability would exacerbate current issues affecting these resources. As previously discussed, Alternatives B would result in net cumulative benefits to the hydrology and water quantity in the AOI by protecting vegetated areas.

Noise

Adverse cumulative effects on noise are anticipated to be minimal under the No Action. Increased urbanization and associated sources of noise would continue to negatively impact the soundscape of the AOI. Conversely, Alternative B would have a net beneficial effect on the area's soundscape by helping to maintain a more rural landscape.

BIOLOGICAL RESOURCES

Effects of Habitat Loss

Under both alternatives, there would be continued habitat loss in the AOI due to various land use changes. Some bogs would continue to be lost or degraded. In addition, habitat fragmentation would further impact species that require larger tracts of relatively intact habitat. An expanding network of roads and increased traffic resulting from a growing human population would likely result in increased road kills. As discussed above, water resources would continue to be degraded, affecting habitats and species. Overall, the cumulative effects on bogs resulting from habitat loss, fragmentation, and alteration are expected to be moderate. It is expected that the negative cumulative effects would be

greater under the No Action, compared to Alternative B. If fully realized, the proposed refuge would protect a relatively large number of mountain bogs, constituting a moderate cumulative benefit.

Hunting Impacts

Deer

Deer hunting on proposed refuge lands would not have regional population impacts due to restricted home ranges. In western North Carolina, deer home range are generally less than 400 acres (North Carolina Cooperative Extension Service. 2012). Therefore, only local impacts are expected to occur.

State-wide, roughly 180,000 deer were harvested in NC (2010 estimate) (NCWRC 2012). About the same number were taken in TN (2005 estimate) (TWRA 2011a). These annual totals represent approximately 16 and 20 percent of the total populations in North Carolina and Tennessee, respectively. Like many prey species, deer populations adjust to various harvest levels through a compensatory response. As deer densities are reduced through hunting (or predation), more forage is available for surviving deer, increasing their reproductive capacity. Additionally, white-tailed deer are adapted to and thrive in highly fragmented habitats (Nixon et al 2001) and their numbers are likely to remain at huntable levels even as the landscape becomes more urbanized. The proposed action would likely result in an increase in deer taken, as more lands that are currently closed to the public would be opened. Under Alternative B, deer hunting opportunities would increase compared to the No Action alternative, but it is not expected that local deer populations would be significantly affected. Overall, regulated hunting is not expected to have any significant cumulative effects on deer populations in the AOI.

Feral Hog (Swine)

Feral hog is an invasive, nonnative species. The discussion below only pertains to North Carolina sites, as it is illegal to hunt this species in TN. Hence, on TN sites, no hunting of feral hog would be allowed.

With regards to North Carolina sites, hunting of feral hogs on proposed lands would be considered a management tool in reducing this detrimental species, while providing recreational opportunities to hunters. This species is classified as a nuisance in NC, with no bag limit. Cumulative effects to an exotic, invasive species should not be of concern because the Service would likely work 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. Hence, Alternative B is expected to have a net positive effect through the reduction of feral hog. This would benefit any agricultural lands adjacent to the proposed lands, as feral hog can cause crop loss and other damage. Under the No Action alternative, feral hog numbers are unlikely to be controlled at minimal levels.

Wild Turkey

Turkey is a non-migratory species and therefore hunting only impacts the local population. Turkey populations in North Carolina have increased substantially since the 1970s, as evidenced by a state-wide distribution assessment conducted in recent years (see section on game species in Chapter 2: Affected Environment). In TN, it is also a huntable game species. Habitat loss, not hunting, appears to be the primary factor limiting their populations. Research has shown that in many cases hunters can remove a large portion of the gobblers from a population (up to 30 percent) and still have a

healthy turkey population (Vangiler 1992). The Alternative B could increase wild turkey hunting opportunities by opening up some land to the public. This alternative is not expected to have a significant cumulative effect on local wild turkey populations.

Hunted Migratory Game 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. Any hunting of migratory game birds on specific sites would not be expected to incur any significant negative cumulative effects on their populations.

Other Small Game

Squirrels, rabbit, raccoon, and opossum cannot be affected regionally by hunting on any proposed lands because of their limited home ranges. Therefore, only local effects will be discussed. Land use alterations and reductions in predators have contributed to increases in several small game species, particularly raccoon and opossum. Consequently, populations of these species sometimes become higher than optimal, with detrimental effects on other native wildlife (e.g. higher levels of predation on songbird eggs and nestlings), increased crop damage, and spread of diseases (e.g. rabies). Hunting can help regulate opossum and raccoon populations; however, unless the popularity of this type of hunting increases, the numbers of these species would likely be higher than desired. When these species become 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 under Alternatives B, considering their high reproductive quickly, are difficult to hunt due to their nocturnal habits, and are not as popular for hunting as other game species.

SOCIOECONOMIC ENVIRONMENT

There would be no expected long term, significant cumulative change in the local economy under Alternative A. Current development rates, tax revenues, and business revenues would remain subject to market influences. There could be some loss of economic opportunities associated with wildlife-dependent recreation (e.g. hunting, fishing, wildlife watching, etc.). Some property owners and local taxing authorities would benefit from a potential increase in real-estate values shown to occur if there was a refuge nearby. In addition, there could be increased costs to local communities associated with the loss of vegetated areas as urban sprawl continued on unprotected lands. Vegetated areas have been shown to reduce costs of providing clean water and air. Furthermore, vegetated lands help reduce stormwater runoff, providing additional cost savings (e.g. less frequent repairs to water control structures) to nearby communities. Alternative B would have some positive effects on socioeconomic resources. Wildlife-dependent recreation would provide additional direct

and indirect economic benefits to the region by drawing visitors. Increased opportunities for wildlife-associated recreational opportunities would further help improve the quality of life in the AOI, particularly as open space available to the public becomes increasingly scarce over the next decades. Further, no significant negative impacts would be anticipated to neighboring landowners from the implementation of Alternative B including from management and public use activities.

CULTURAL RESOURCES

There could be some moderate cumulative adverse impacts to cultural resources under the No Action alternative. Less land would be protected from development, increasing the risk of disturbance or destruction of cultural resources. Under Alternative B, beneficial effects would occur because of increased land protection. In addition, increased field surveys would likely be conducted on Service-owned lands to identify and protect any sites discovered.

UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects are the effects of those actions that could cause significant harm to the human environment and that cannot be avoided, even with mitigation measures. There would be some minor, localized unavoidable adverse effects under all the alternatives. The No Action Alternative would maintain the status quo for development and growth in the area, thus contributing to the unavoidable effects of such development (e.g. increased air emissions, increased impervious surface and stormwater runoff, increased noise). Under Alternative B, there could be, for example, localized adverse effects of building a new refuge headquarters and upgrading access roads. There would be property tax losses to towns and increased visitation that could be unavoidable effects in those years that revenue sharing payments are less than local property taxes. However, none of these effects rises to the level of significance. All would be mitigated, so there would be no significant unavoidable adverse impacts under the Proposed Action.

RELATIONSHIP BETWEEN SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The No Action alternative would be expected to diminish the long-term productivity and sustainability of natural resources in the AOI. In contrast, Alternative B would strive to maintain or enhance the long-term productivity and sustainability of natural resources on proposed refuge lands. This alternative would strive to conserve federal trust species and state-listed species and the habitats they depend on, as evidenced by management activities described in the Conceptual Management Plan. It also outlines outreach and environmental education activities that would encourage visitors to be better stewards of the environment.

POTENTIAL IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative A would have no long term effect on potential irreversible and irretrievable commitments of federal financial resources. Establishing a refuge, as described under Alternative B, may contribute to irreversible and irretrievable commitments of federal financial resources. For example, one would be the possible construction or modification of a refuge office and associated visitor facility and access road(s). These typically require long-term commitments of resources. Another irreversible commitment of resources impacting local communities is Service land acquisition. Once these lands become part of the refuge, it is unlikely they would revert back to private ownership.

ENVIRONMENTAL JUSTICE

Executive Order 12898 “ Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (February 11, 1994), requires that federal agencies consider as part of their action, any disproportionately high and adverse human health or environmental effects to minority and low income populations. Agencies are required to ensure that these potential effects are identified and addressed. The communities surrounding the refuge are relatively homogenous; minority groups do not represent a substantial portion of the affected community. No differential impacts based on minority status would therefore be anticipated under either of the alternatives.

SUMMARY OF EFFECTS

Table 18 summarizes the environmental effects, according to resource category.

Table 18. Summary of potential environmental effects analyzed under Alternatives A and B

Resource	Alternative A: No Action (No Refuge)	Alternative B: Proposed Action (Establishment of Mountain Bogs Refuge)
PHYSICAL RESOURCES		
Topography and Geology	<i>Beneficial:</i> none <i>Adverse:</i> minimal; CPAs generally do no overlay mineral or energy resources of interest	<i>Beneficial:</i> proposed lands protected from any future mining <i>Adverse:</i> none
Soils	<i>Beneficial:</i> none <i>Adverse:</i> minor; development, mining, agriculture would continue to disturb soils.	<i>Beneficial:</i> vegetative cover would continue to stabilize and form soils <i>Adverse:</i> some minimal impacts from infrastructure projects needed to support refuge operations and public uses
Climate Change	<i>Beneficial:</i> none <i>Adverse:</i> minimal; vegetative cover lost (net loss in carbon storage capacity). Emissions from agricultural operations, development (residential and commercial) would continue and likely increase over time.	<i>Beneficial:</i> net increase in vegetative cover (carbon sequestration) <i>Adverse:</i> minimal; emissions from refuge operations and visitor use
Air Quality	<i>Beneficial:</i> none <i>Adverse:</i> minimal; vegetative cover lost; wildfires; industry and traffic	<i>Beneficial:</i> net increase in vegetative cover <i>Adverse:</i> minor; prescribed fire, traffic associated with public use and refuge operations
Water Quality	<i>Beneficial:</i> none <i>Adverse:</i> moderate; development of unprotected lands would cause further declines in water quality	<i>Beneficial:</i> proposed lands remain vegetated, benefitting water quality; restoration activities would further improve water quality. <i>Adverse:</i> minimal effects on water quality from refuge operations and visitor uses

Resource	Alternative A: No Action (No Refuge)	Alternative B: Proposed Action (Establishment of Mountain Bogs Refuge)
Hydrology and Water Quantity	<i>Beneficial:</i> none <i>Adverse:</i> moderate; continued ditching, new roads and development on unprotected lands would alter hydrology and affect water quantity	<i>Beneficial:</i> some restoration of hydrology; vegetated areas would benefit hydrology and water quality <i>Adverse:</i> minimal impacts from refuge operations/visitor services
Noise	<i>Beneficial:</i> none <i>Adverse:</i> minimal; additional lands developed with higher associated noise levels	<i>Beneficial:</i> lands protected from urbanization and associated noise <i>Adverse:</i> minimal; some noise associated with refuge operations and visitor traffic
BIOLOGICAL RESOURCES		
Habitats	<i>Beneficial:</i> none <i>Adverse:</i> moderate; bog habitats and adjacent upland watershed buffers would continue to be lost or degraded due to development, lack of management, and spread of exotics.	<i>Beneficial:</i> bogs and adjacent upland areas would benefit from habitat protection, restoration and management (e.g., by protecting and improving hydrology) <i>Adverse:</i> some minor impacts from construction of refuge and public use infrastructure; public use (vegetation trampling)
Wildlife	<i>Beneficial:</i> none <i>Adverse:</i> moderate; land alterations and use would continue to reduce diversity, increased fragmentation would further isolate populations of some species	<i>Beneficial:</i> common species would be managed at more optimal levels; biodiversity would be maintained or increased. <i>Adverse:</i> minimal impacts resulting from some public uses
Federal and State Listed/Priority Species	<i>Beneficial:</i> none <i>Adverse:</i> moderate; listed/priority species would continue to suffer from habitat loss and degradation.	<i>Beneficial:</i> imperiled and T&E species would benefit from habitat protection/restoration/management. <i>Adverse:</i> none or minimal (localized, short term) impacts from habitat restoration, refuge operations/management, outweighed by long-term benefits to these listed species
Exotic Species	<i>Beneficial:</i> none <i>Adverse:</i> minor; continued degradation of natural habitats resulting from spread of exotics.	<i>Beneficial:</i> control of exotics would increase. <i>Adverse:</i> none
SOCIOECONOMICS		
Local Tax Revenues	Local tax revenues in the area would continue to be influenced by various market forces, population trends, etc.	Effects on local tax revenues could be positive or negative depending a factors such as congressional appropriations, local property values, etc.

Resource	Alternative A: No Action (No Refuge)	Alternative B: Proposed Action (Establishment of Mountain Bogs Refuge)
Economics of Wildlife-dependent Public Use	<i>Beneficial:</i> none <i>Adverse:</i> opportunities for appropriate and compatible wildlife-dependent uses would decline as more lands become developed, with a decline in associated economics	<i>Beneficial:</i> some local economic benefits associated with wildlife-dependent uses <i>Adverse:</i> none expected
Effect of Refuges on Nearby Property Values	<i>Beneficial:</i> none <i>Adverse:</i> local real estate values would not rise due to their proximity to a refuge	<i>Beneficial:</i> may benefit some homeowners and local taxing authorities <i>Adverse:</i> higher tax rates (associated with increase in property value) could negatively affect some property owners
Ecosystem Services	<i>Beneficial:</i> none <i>Adverse:</i> local communities would continue to see additional increases in costs associated with maintaining clean water, storm-water management, and other services otherwise provided by open spaces.	<i>Beneficial:</i> increased cost-savings to local communities with regards to maintaining clean water and reduced need for storm-water management infrastructure. <i>Adverse:</i> none
Land Use Patterns	<i>Beneficial:</i> lands available for development and agriculture <i>Adverse:</i> continued loss of natural areas through conversion to agriculture and developed areas; loss of lands open for public wildlife-appropriate and wildlife-compatible public use	<i>Beneficial:</i> additional lands open for public wildlife-appropriate and wildlife-compatible public use <i>Adverse:</i> potential for increased development pressure due to the desire to buy land adjacent to the refuge, leading to increased fragmentation of remaining lands, loss of some agricultural lands
CULTURAL RESOURCES		
Archaeological and Historic Resources	<i>Beneficial:</i> none <i>Adverse:</i> moderate; cultural resources on unprotected lands would continue to be at risk from development projects	<i>Beneficial:</i> cultural resources would be offered increased protection on refuge lands <i>Adverse:</i> risk from disturbance and damage caused refuge operations or public use would be minimal

Note: Potential impacts, positive (beneficial) and negative (adverse), to resources resulting from the implementation of the two alternatives were identified and placed into one of the listed categories, where possible.

- *None - no impacts expected*
- *Minimal - impacts are not expected to be measurable, or are too small to cause any discernible degradation to the environment)*
- *Minor - impacts would be measurable, but not substantial, because the impacted system is capable of absorbing the change*
- *Moderate - impacts would be measurable, but could be reduced through appropriate mitigation*
- *Major - impacts would be measurable and individually or cumulatively significant; an Environmental Impact Statement would be required to analyze these impacts*

SUMMARY

Based on the nature of the proposal, the location of the CPAs, and current land use, the Proposed Action would not have any significant adverse effects on the quality of the human environment including public health and safety. Further, because the purpose of the proposal is to protect, maintain, and where possible, enhance the natural habitat of the lands within the proposed acquisition area, the proposal is not expected to have any significant adverse effects on the area's wetlands and floodplains, pursuant to Executive Orders 11990 and 11988.

Implementation of the Proposed Action would not involve any highly uncertain, unique, unknown, or controversial effects on the human environment. The proposed action would not establish a precedent for future actions with significant effects, nor would it represent a decision in principle about a future consideration. No cumulatively significant impacts on the environment would be anticipated.

In addition, the proposal would not significantly affect any unique characteristic of the geographic area, such as historical or cultural resources, wild and scenic rivers, or ecologically critical areas. The proposal would not significantly affect any site listed in or eligible for listing in the National Register of Historic Places, nor would it cause loss or destruction of significant scientific, cultural, or historic resources. The area's cultural resources would be protected under the regulations of the National Historic Preservation Act of 1966, as amended, the Archaeological Resources Protection Act, and the Advisory Council on Historic Preservation (36 CFR 800). The NC and TN State Historic Preservation Offices would be contacted whenever any future management activities have the potential to affect cultural resource sites.

All tracts acquired by the Service in fee title would be removed from local real estate tax rolls because federal government agencies are not required to pay state or local taxes. However, the Service makes annual payments to local governments in lieu of real estate taxes, as required by the Refuge Revenue Sharing Act (Public Law 95-469). Payment for acquired land is computed on whichever of the following formulas is greatest: (1) three-fourths of 1 percent of the fair market value of the lands acquired in fee title; (2) 25 percent of the net refuge receipts collected; or (3) 75 cents per acre of the lands acquired in fee title. The estimated annual revenue-sharing payment that would be made to the individual county depending on the amount of acreage acquired in fee title. No actions would be taken that would lead to a violation of federal, state, or local laws imposed for the protection of the environment.

RECOMMENDATION

The Service recommends Alternative B as the Proposed Action because it better serves the outlined purpose and need, stated goals and objectives, and vision and purposes of the refuge. Through the establishment of a refuge as described in Alternative B, the Service would be able to fully participate with other conservation partners in the management and protection of the wildlife and habitats within the Conservation Partnership Areas. Threatened and endangered species would receive additional management attention. Connectivity between existing conservation lands would be enhanced, and movement corridors would be protected. Opportunities for wildlife oriented recreational activities would be increased. Further, any cultural resources found within the proposed refuge would be afforded protection by the Service.

GLOSSARY

Appropriate Use - a proposed or existing use on a refuge that meets at least one of the following three conditions:

1. The use is a wildlife-dependent use.
2. The use contributes to fulfilling the refuge purpose(s), the National Wildlife Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the National Wildlife Refuge System Improvement Act was signed into law.
3. The use has been determined to be appropriate as specified in section 1.11 of the National Wildlife Refuge System Improvement Act.

Area of Influence (AOI) - a generalized area which contains lands of interest to the USFWS and within which the agency will analyze environmental impacts of a proposed action. The AOI for this project was limited to the North Carolina and Tennessee portion of the Blue Ridge Ecoregion. The AOI does not convey authority to establish rules and regulations and is only used to study the effects of a proposal on the human environment, including abiotic, biological, socioeconomic, and cultural resources.

Biological Diversity (or Biodiversity) - the variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur

Biological Integrity - biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities

Bog - a poorly drained area rich in plant residues, usually surrounded by an area of open water, and having characteristic flora; a type of peatland.

Candidate Species - plants and animals for which the U.S. Fish and Wildlife Service (FWS) has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act (ESA), but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Categorical Exclusion - pursuant to the National Environmental Policy Act (NEPA), a category of federal agency actions that do not individually or cumulatively have a significant effect on the human environment [40 CFR 1508.4]

Compatible Use - "The term 'compatible use' means a wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director [of the U.S. Fish and Wildlife Service], will not materially interfere with or detract from the fulfillment of the mission of the [National Wildlife Refuge] System or the purposes of the refuge." - National Wildlife Refuge System Improvement Act of 1997 [Public Law 105-57; 111 Stat. 1253]

Compatibility Determination - the process in which a wildlife-dependent use or any other public use on a refuge is found to be compatible or incompatible with the fulfillment of the National Wildlife Refuge System mission or the purposes of the refuge. This determination is a requirement for wildlife-dependent uses or any other public uses on a refuge.

Compatibility Policy - “The refuge manager will not initiate or permit a new use of a national wildlife refuge or expand, renew, or extend an existing use of a national wildlife refuge unless the refuge manager has determined that the use is a compatible use.” [Service Manual 603 FW 2.3]

Comprehensive Conservation Plan (CCP) - Mandated by the National Wildlife Refuge System Improvement Act of 1997, a document that provides a description of the desired future conditions and long-range guidance for the refuge manager to accomplish purposes of the Refuge System and the refuge. CCPs establish management direction to achieve refuge purposes. [Public Law 105-57; Service Manual 602 FW 1.6]

Conservation Partnership Area (CPA) - a series of bogs and associated habitat buffers totaling about 42,250 acres. Up to 23,458 acres of proposed refuge lands, easements, etc. would be located within these CPAs.

Cumulative Impact - according to NEPA, the impact on the environment which results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Disjunct (populations) - populations with a *disjunct* distribution is one that has two or more groups that are related but widely separated from each other geographically.

Easement - an agreement by which landowners give up or sell one of their rights on their property (e.g. landowners may donate rights of way across properties). It is a non-possessory interest in a real property owned by another imposing limitations or affirmative obligations with the purpose of returning or protecting the property’s conservation values.

Endangered - the classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Environmental Assessment (EA) - a concise public document, prepared in compliance with the National Environmental Policy Act (NEPA), that discusses the purpose and need for an action, alternatives that were considered, and provides sufficient evidence and analysis of the action’s effects to determine whether it is necessary to prepare an Environmental Impact Statement (see immediately below) or a Finding of No Significant Impact (FONSI) [40 CFR 1508.9].

Environmental Impact Statement (EIS) - a detailed, written analysis of the environmental effects of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources [40 CFR 1508.1 1]

Fee Title - is a real estate term that means the type of ownership giving the owner the maximum interest in the land, and entitling the owner to use the property in any manner consistent with federal, state, and local laws and ordinances.

Fen - low land covered wholly or partially with water; boggy land; a marsh

Finding of No Significant Impact (FONSI) - supported by an environmental assessment, a document that briefly presents why a federal action will have no significant effect on the human environment, and for which an environmental impact statement, therefore, will not be prepared [40 CFR 1508.13]

Land Protection Plan (LPP) - a document that identifies and prioritizes lands for potential U.S. Fish and Wildlife Service acquisition from a willing seller, and also describes other methods of providing protection (e.g. easements). This document is released with environmental assessments.

Land and Water Conservation Fund (LWCF) - One of several federal funds that may be used to purchase refuge lands. The primary source of income to this fund is fees paid by companies drilling offshore for oil and gas, as well as oil and gas lease revenues from federal lands. Additional sources of income include the sale of surplus federal real estate and taxes on motorboat fuel.

National Environmental Policy Act of 1979 (NEPA) - requires all agencies, including the U.S. Fish and Wildlife Service, to examine the environmental impacts of their actions, incorporate environmental information, and utilize public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements and prepare appropriate NEPA documents to facilitate better environmental decision-making. NEPA requires federal agencies to review and comment on federal agency environmental plans and documents when the agency has jurisdiction by law or special expertise with respect to the environmental impacts involved (42 U.S.C. 4321-4327) (40 CFR 1500-1508).

National Wildlife Refuge (refuge) - A designated area of land, water, or an interest in land or water within the Refuge System, but does not include Coordination Areas (Service Manual 603 FW 2.5 N).

National Wildlife Refuge System (Refuge System) - "All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, coordination areas, and other areas for the protection and conservation of fish and wildlife including those that are threatened with extinction as determined in writing by the Director or so directed by Presidential or Secretarial order. The determination by the Director may not be delegated" (Service Manual 603 FW 2.5 I).

Relict (populations) - populations that once covered a larger range (e.g., during the last ice age) but have since declined and only remain as small, isolated populations in appropriate habitats.

Threatened - any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

REFERENCES

- Aiken, Richard. 2009. Wildlife Watching Trends: 1991-2006.** A Reference Report. Addendum to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. USFWS. Arlington, VA.
http://library.fws.gov/pubs/wildlifewatching_natsurvey06.pdf Accessed: March 2012.
- Alabama Forever Wild Land Trust Board of Trustees. 2009.** The Forever Wild Land Trust: An interim report to the citizens of Alabama — 1992 through 2009. M.B. Lawley and others.
<http://www.outdooralabama.com/public-lands/stateLands/foreverWild/ForeverWildReport.pdf>
Accessed: Aug 2012.
- American Forests. 2008.** Urban Ecosystem Analysis: Mecklenburg County and the City of Charlotte, North Carolina.
http://charmeck.org/city/charlotte/epm/Services/LandDevelopment/Documents/CharlotteMecklenburgUEA_lowres_final2.pdf Accessed: June 2012.
- America's Great Outdoors. 2011.** America's Great Outdoors: A Promise to Future Americans.
<http://americasgreatoutdoors.gov/> Accessed: December 2011.
- Anderson, M. 2009.** Conservation in a changing climate: the role of geophysical features. Abstract of oral presentation given at the conference "Ecology and Management of High-Elevation Forests of the Central and Southern Appalachian Mountains", May 14-15, 2009. Slatyfork, WV.
- Andreen, William L. 2004.** Water Quality Today - Has the Clean Water Act Been a Success?. Alabama Law Review, 55: 537-593. <http://ssrn.com/abstract=554803>
Accessed: December 2011.
- Backlund, P., A. Janetos, and D. Schimel (convening lead authors). 2008.** The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States. Synthesis and Assessment Product 4.3 Report by the U.S. Climate Change Science Program and the Subcommittee on Global Climate Change Research. U.S. Environmental Protection Agency, Washington, D.C. 362 pp.
- Birdsey, R.A., J.C. Jenkins, M. Johnston, E. Huber-Sannwald, B. Amero, B. de Jong, J.D.E. Barra, N. French, F. Garcia-Oliva, M. Harmon, L.S. Heath, V.J. Jaramillo, K. Johnsen, B.E. Law, E. Marín-Spiotta, O. Masera, R. Neilson, Y. Pan, and K.S. Pregitzer. 2007.** North American Forests. In: The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks (eds.)]. National Oceanic and Atmospheric Administration, National Climatic Data Center, Asheville, NC, USA, pp. 117-126.
<http://www.climate-science.gov/Library/sap/sap2-2/final-report/default.htm>
Accessed: February 2012.
- Blue Ridge National Heritage Area. 2008.** Blue Ridge National Heritage Area Management Plan and Environmental Assessment.
<http://www.blueridgeheritage.com/partners/management-plan/approved-plan>
Accessed: March 2012.

-
- Bolstad, Paul V. and Wayne T. Swank. 1997.** Cumulative impacts of landuse on water quality in a Southern Appalachian watershed. *Journal of the American Water Resources Association* 33(3): 519-533. <http://coweeta.uga.edu/publications/229.pdf> Accessed: February 2012.
- Boyles, R. 2009.** Climate change in North Carolina. Unpublished report prepared by the state climatologist, State Climate Office of North Carolina. http://www-nc-climate.ncsu.edu/climate/climate_change.html. Accessed: February 2012.
- Brown, L. 2001.** Overview of research on the effects of noise on wildlife. In *Proceedings of the Effects of Noise on Wildlife Conference, Happy Valley-Goose Bay, Labrador*. Institute for Environmental Monitoring and Research No. 2. Pages 10-14.
- Bruce, J.P., M. Frome, E. Haites, H. Janzen, R. Lal, and K. Paustian. 1999.** Carbon sequestration in soils. *J. Soil and Water Conserv.* 54:382-389.
- Bullock, J.A. and M.P. Rowe. 2006.** The use of Southern Appalachian wetlands by breeding birds, with a focus on neotropical migratory species. *The Wilson Journal of Ornithology* 118(3): 399-410.
- Buol, S.W.; ed. 1973.** Soils of the southern states and Puerto Rico. *Southern Cooperative Series Bulletin*. 174. 105 p.
- Bureau of Labor Statistics. 2001.** Occupational Employment Statistics: 2001 State Occupational Employment and Wage Estimates for North Carolina. U.S. Department of Labor. http://www.bls.gov/oes/2001/oes_nc.htm#b00-0000 Accessed: March 2012.
- Bureau of Labor Statistics. 2012a.** Quarterly Census of Employment and Wages. U.S. Department of Labor. <http://www.bls.gov/cew/data.htm> Accessed: March 2012.
- Bureau of Labor Statistics. 2012b.** Local Area Unemployment Statistics. U.S. Department of Labor. <http://www.bls.gov/lau/data.htm> Accessed: March 2012.
- Bureau of Labor Statistics. 2012c.** Quarterly Census of Employment and Wages. U.S. Department of Labor. <http://www.bls.gov/cew/data.htm> Accessed: March 2012.
- Burlington County Farmland Preservation Program, Draft Strategic Plan. 1996.** Section on benefits of farmland preservation includes cost of community services calculations.
- Byers, J. E. 2002.** Impact of non-indigenous species on natives enhanced by anthropogenic alteration of selection regimes. *Oikos*, 97: 449-458. <http://onlinelibrary.wiley.com/doi/10.1034/j.1600-0706.2002.970316.x/pdf> Accessed: Aug 2012.
- Carver, Erin and James Caudill. 2007.** Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation. Division of Economics, U.S. Fish and Wildlife Service. Washington, D.C. http://library.fws.gov/Refuges/EconBen_refuges06.pdf Accessed: March 2012.
- Chameides, W.L., Lindsay, R.W., Richardson, J. and Kiang, C.S. 1988.** The role of biogenic hydrocarbons in urban photochemical smog: Atlanta as a case study. *Science* 241: 1473-1475.

-
- Congressional Research Service. 2009.** Carbon Sequestration in Forests. CRS Report for Congress RL31432. R. Gorte. <http://www.fas.org/sqp/crs/misc/RL31432.pdf>
Accessed: Aug 2012.
- Conservation Trust for North Carolina. 2012.** A Shared Vision to Protect North Carolina's Mountains: The Blue Ridge Forever Coalition.
http://www.ctnc.org/site/PageServer?pagename=prot_brcollab Accessed: September 2012.
- Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979.** Classification of wetlands and deep-water habitats of the United States. Fish and Wildlife Service, U.S. Department of the Interior, FWS/OBS-79-31.
- Dahl, T.E. 2006.** Status and trends of wetlands in the conterminous United States 1998 to 2004. U.S. Department of the Interior; Fish and Wildlife Service, Washington, D.C. 112 pp.
- Delcourt, H.R. 1985.** Holocene vegetational changes in the southern Appalachian mountains, U.S.A. *Ecologia mediterranea* Tome XI (Fascicule 1): 9-15.
- East Amwell Agricultural Advisory Board. 1994.** Valerie Rudolph, "Cost of Community Services Study."
- Escobedo, F., Jennifer A. Seitz, and Wayne Zipperer. 2007.** Air Pollution Removal and Temperature Reduction by Gainesville's Urban Forest. FOR 216. Gainesville FL: School of Forest Resources and Conservation, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.
- Floodplain Management Association. 1994.** "Economic Benefits of Wetlands," FMA News: The Newsletter of the Floodplain Management Association.
- Ford, Chelcy R.; Vose, James M. 2007.** *Tsuga canadensis* (L.) Carr, mortality will impact hydrologic processes in southern Appalachian forest ecosystems. *Ecological Applications* 17(4): 1156-1167. <http://www.srs.fs.usda.gov/pubs/27657> Accessed: June 2012.
- Fly, J. Mark, Burton C. English, R. Jamey Menard, and Kim L. Jensen. 2010.** Economic Impacts of Tennessee State Parks Executive Summary, University of Tennessee Institute for Agriculture. http://tn.gov/environment/parks/economic_impact/pdf/econ_impact.pdf
Accessed: June 2012.
- Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J. 2011.** Completion of the 2006 National Land Cover Database for the Conterminous United States, PE&RS, Vol. 77(9):858-864.
<http://www.mrlc.gov/downloadfile2.php?file=September2011PERS.pdf> Accessed: June 2012.
- Gill, A.C., McPherson, A.K., and Moreland, R.S. 2005.** Water quality and simulated effects of urban land-use change in J.B. Converse Lake watershed, Mobile County, Alabama, 1990–2003: U.S. Geological Survey Scientific Investigations Report 2005–5171, 110 p.
<http://pubs.usgs.gov/sir/2005/5171/pdf/sir20055171.pdf> Accessed: February 2012.
- Harden, S.L., Chapman, M.J., and Harned, D.A., 2009,** Characterization of groundwater quality based on regional geologic setting in the Piedmont and Blue Ridge Physiographic Provinces, North Carolina: U.S. Geological Survey Scientific Investigations Report 2009–5149, 32 p.

-
- Heath, L.S. and J.E. Smith. 2004.** Criterion 5, indicator 26: total forest ecosystem biomass and carbon pool, and if appropriate, by forest type, age class and successional change. In: Data Report: A Supplement to the National Report on Sustainable Forests— 2003 [Darr, D.R. (coord.)]. FS-766A, U.S. Department of Agriculture, Washington, DC, 14 pp.
<http://www.fs.fed.us/research/sustain/contents.htm> Accessed: February 2012.
- Henderson County. 2008.** Henderson County 2020 Comprehensive Plan. Henderson County Planning Department. <http://ww2.hendersoncountync.org/planning/ccp/toc.html>
Accessed: April 2012.
- Hicks, N. G., and S. M. Pearson. 2003.** Salamander diversity and abundance in forests with alternative land use histories in the Southern Blue Ridge Mountains. *Forest Ecology and Management* 177:117-130.
- Highton, R. 2005.** Declines of Eastern North American Woodland Salamanders (Plethodon). Pages 34-46 in M. Lanoo, editor. *Amphibian Declines: Conservation Status of United States Species*. University of California Press, Berkeley.
- Hooper, Robert G. 1978.** Cove forests: bird communities and management options. In: DeGraaf, Richard M, technical coordinator. *Proceedings of the Workshop Management of Southern Forests for Nongame Birds; 1978 January 24 - January 26; Atlanta, GA*. Gen. Tech. Rep. SE-14. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station: 90-97.
- Hunter, Chuck, Robert Katz, David Pashley, and Bob Ford. 1999.** Partners in Flight Bird Conservation Plan for The Southern Blue Ridge (Physiographic Area 23)
http://www.partnersinflight.org/bcps/plan/pl_23_10.pdf Accessed: March 2012.
- Ingraham, M.W. and S.G. Foster. 2008.** The value of ecosystem services provided by the U.S. National Wildlife Refuge System in the contiguous U.S. *Ecological Economics* 67: 608-618.
- International Panel on Climate Change. 2007.** Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 976 pp.
http://www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html accessed: February 2012.
- Jackson County. 2008.** Growing with Green in our Minds: Strategies for Land Conservation in Jackson County.
http://planning.jacksonnc.org/Strategies_for_Land_Conservation_Report--FINAL.pdf
Accessed: April 2012.
- Karl, T.R., J.M. Melillo, and T.C. Peterson. 2009.** Global Climate Change Impacts in the United States. Cambridge University Press, 2009. U.S. Global Change Research Program.
<http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf>
Accessed: February 2012.
- Kirk, R.W. 2009.** Land Use and Terrestrial Carbon Storage in Western North Carolina from 1850-2030: A Historical Reconstruction and Simulation Study. Dissertation, University of Minnesota. <http://coweeta.uga.edu/publications/10380.pdf> Accessed: Aug 2012.

-
- Kunkel, K.E., P.D. Bromirski, H.E. Brooks, T. Cavazos, A.V. Douglas, D.R. Easterling, K.A. Emanuel, P.Ya. Groisman, G.J. Holland, T.R. Knutson, J.P. Kossin, P.D. Komar, D.H. Levinson, and R.L. Smith, 2008:** Observed changes in weather and climate extremes. In: Weather and Climate Extremes in a Changing Climate: Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands [Karl, T.R., G.A. Meehl, C.D. Miller, S.J. Hassol, A.M. Waple, and W.L. Murray (eds.)]. Synthesis and Assessment Product 3.3. U.S. Climate Change Science Program, Washington, DC, pp. 35-80.
<http://downloads.globalchange.gov/usimpacts/pdfs/National.pdf> Accessed: December 2011.
- Land for Tomorrow. 2012.** Securing North Carolina's Future: A Five-Year Plan for Investing in Our Land, Water and Quality of Life.
<http://www.environmentnorthcarolina.org/sites/environment/files/reports/Land-For-Tomorrow-2012-Report-final-Web-rev.pdf> Accessed: June 2012.
- Leonard, Jerry. 2008.** Wildlife Watching in the U.S.: The Economic Impacts on National and State Economies in 2006. Addendum to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Report 2006-1. Arlington: Wildlife and Sport Fish Restoration Programs, U.S. Fish & Wildlife Service, U.S. Department of the Interior.
http://library.fws.gov/pubs/nat_survey2006_economics.pdf Accessed: March 2012.
- Madsen, Travis, Dave Algozo, and Elizabeth Ouzts. 2004.** The Value of Open Space: How Preserving North Carolina's Natural Heritage Benefits Our Economy and Quality of Life. NCIPIRG Education Fund. <http://www.policyarchive.org/handle/10207/bitstreams/5175.pdf>
Accessed: June 2012.
- McConnell, Virginia and Margaret Walls. 2005.** The Value of Open Space: Evidence from Studies of Nonmarket Benefits. <http://www.rff.org/rff/documents/rff-report-open%20spaces.pdf>
Accessed: June 2012.
- McSwain, K.B., and J.C. Weaver. 2008.** Effects of the current drought on streamflow and groundwater conditions in North Carolina: Charlotte, NC, Geological Society of America Southeastern Section Meeting. <http://nc.water.usgs.gov/reports/abstracts/McS08Eff.html>
Accessed: February 2012.
- Mendham Township Committee. 1994.** "Report of the Financial Impact on Taxpayers for Acquisition of the Schiff Tract by Mendham Township," Costs of acquisition, future taxes.
- National Oceanographic and Atmospheric Administration. 2009.** North Carolina Climate. Presentation by P. Badgett, National Weather Service Raleigh, NC.
<ftp://ftp.etl.noaa.gov/.../NC%20Climate%20Overview%20Badgett.ppt>
- National Oceanographic and Atmospheric Administration. 2012.** Asheville Area Detailed Climate Information. National Weather Service Forecast Office.
<http://www.erh.noaa.gov/gsp/climate/avlcli.htm> Accessed: February 2012.
- National Park Service. 2008.** Blue Ridge Natural Heritage Area, Management Plan and Environmental Assessment Completed by Equinox Environmental Consultation and Design, Inc. for the Blue Ridge National Heritage Area. 173 pp.
<http://www.blueridgeheritage.com/partners/management-plan/approved-plan>
Accessed: Aug 2012.

-
- National Park Service. 2009.** Effects of Noise. <http://www.nature.nps.gov/naturalsounds/impacts/>
Accessed: February 2012.
- National Park Service. 2012.** Blue Ridge Parkway: Air Quality.
<http://www.nps.gov/blri/naturescience/airquality.htm> Accessed: Aug 2012.
- Natural Resource Conservation Service. 2011.** Wetlands Reserve Program (WRP).
U.S. Department of Agriculture
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands>
Accessed: December 2011.
- NatureServe. 2007.** International Ecological Classification Standard: Terrestrial Ecological
Classifications. NatureServe Central Databases. Arlington, VA, U.S.A.
http://www.basic.ncsu.edu/segap/datazip/region/se_lc_systems_descriptions.pdf
Accessed: June 2012.
- Nixon, C. M., L. P. Hansen, P. A. Brewer, J. E. Chelsvig, T. L. Esker, D. Etter, J. B. Sullivan, R.
G. Koerkenmeier, and P. C. Mankin. 2001.** Survival of white-tailed deer in intensively farmed
areas of Illinois. *Canadian Journal of Zoology* 79:581-588.
- North Carolina Clean Water Trust Funds. 2010.** 2009-2012 Grant Cycle: Funded Projects By
Type. <http://www.cwmf.net/QL/2010%20Cycle%20Summary%20by%20Project%20Type.pdf>
Accessed: Aug 2012.
- North Carolina Cooperative Extension Service. 2012.** Working with Wildlife: White-tailed Deer.
North Carolina State University College of Agriculture & Life Sciences College of Forest
Resources. <http://www.ces.ncsu.edu/forestry/pdf/www/www03.pdf> Accessed: Aug 2012.
- North Carolina Department of Commerce. 2010.** Annual Report. Division of Tourism,
Film and Sports Development. <http://annualreport.visitnc.com/> Accessed: March 2012.
- North Carolina Department of Commerce. 2012.** The Economic Impact Of Travel On North
Carolina Counties. A study prepared for the North Carolina Division of Tourism, Film and
Sports Development by the US Travel Association.
<http://www.nccommerce.com/tourism/research/economic-impact/teim> Accessed: Aug 2012.
- North Carolina Department of Environment and Natural Resources. 2009.** 2009-2013 Strategic
Plan. Office of the Secretary.
http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=68499&name=DLFE-17762.pdf Accessed: March 2012.
- North Carolina Department of Environment and Natural Resources. 2010.**
Draft North Carolina Ecosystem Response to Climate Change: DENR Assessment of Effects
and Adaptation Measures.
http://www.climatechange.nc.gov/pages/ClimateChange/Mountain_Bogs_and_Fens.pdf
Accessed: September 2012.
- North Carolina Department of Environment and Natural Resources.. 2012.** NC 2010 Integrated
Report Categories 4 and 5 Impaired Waters. Division of Water Quality, Raleigh,
http://portal.ncdenr.org/c/document_library/get_file?uuid=8ff0bb29-62c2-4b33-810c-2eee5afa75e9&groupId=38364 Accessed: Aug 2012
-

-
- North Carolina Department of Environment and Natural Resources. 2012.** Permitted Mines by County. Division of Land Resources. <http://portal.ncdenr.org/web/lr/mining>
Accessed: March 2012
- North Carolina Natural Heritage Program. 2010.** 2010 Natural Heritage Program List of the Rare Animal Species of North Carolina. <http://www.ncnhp.org/Pages/publications.html>
Accessed: May 2012.
- North Carolina Natural Heritage Program. 2010.** 2010 Natural Heritage Program List of the Rare Plant Species of North Carolina. <http://www.ncnhp.org/Pages/publications.html>
Accessed: May 2012.
- North Carolina Natural Heritage Program. 2011** Biotics Database. Department of Environment and Natural Resources, Raleigh, North Carolina.
<http://nhpweb.enr.state.nc.us/search/county.html> Accessed: February 2012.
- North Carolina Natural Heritage Program. 2012.** Element Occurrences. North Carolina Department of Environment & Natural Resources, Raleigh, North Carolina.
<http://www.ncnhp.org/Pages/heritagedata.html> Accessed: August 2012
- North Carolina Natural Heritage Trust Fund. 2007.** North Carolina Natural Heritage Trust Fund: Celebrating 20 Years of Conservation.
http://www.ncnhf.org/pages/OCCA_NHTF20yrReport-WEB.pdf Accessed: June 2012.
- North Carolina Natural Heritage Trust Fund. 2012.** Conserving Our State's Natural Heritage.
<http://www.ncnhf.org/> Accessed: Aug 2012.
- North Carolina State University. 2012.** Overview of North Carolina's Climatology by the State Climate Office of NC. <http://www.nc-climate.ncsu.edu/climate/ncclimate.html>
Accessed: Aug 2012.
- North Carolina Wildlife Resources Commission. 2005.** North Carolina Wildlife Action Plan.
<http://www.ncwildlife.org/plan.aspx> Accessed: March 2012.
- North Carolina Wildlife Resources Commission. 2007.** Hunting Heritage Program Strategic Plan.
http://216.27.39.103/Portals/0/Hunting/Documents/Hunting_Heritage_Program_Strategic_Plan_03072007.pdf Accessed: March 2012.
- North Carolina Wildlife Resources Commission. 2009.** The Economic Impact of Mountain Trout Fishing in North Carolina. A report prepared for NCWRC by Responsive Management and Southwick Associates for NCWRC. 62 pp
http://www.responsivemanagement.com/download/reports/NC_Econ_Trout_Report.pdf
Accessed: Aug 2012.
- North Carolina Wildlife Resources Commission. 2012X.** Harvest Statistics.
<http://www.ncwildlife.org/Hunting/SeasonsLimits/HarvestStatistics.aspx> Accessed: March 12.
- North Carolina Wildlife Resources Commission. 2012X.** North Carolina Species.
<http://www.ncwildlife.org/Learning/Species.aspx> Accessed: March 2012.

-
- Noss, R.F., E.T. LaRoe III and J.M. Scott. 1995.** Endangered Ecosystems of the United States : A Preliminary Assessment of Loss and Degradation. Biological Report 28. National Biological Service. United States Department of Interior. Washington , D.C.
- Omernik, J.M. 1987.** Ecoregions of the conterminous United States. Map (scale 1:7,500,000). *Annals of the Association of American Geographers* 77(1):118-125.
- Pinelands Commission. 1994.** "Comparison of Financial Statistics of Several Pinelands and non-Pinelands Municipalities" Comparisons of vacant land sales, per capita real estate taxes and recent farmland sales.
- Price, Katie and David S. Leigh. 2006a.** Comparative water quality of lightly-and moderately-impacted streams in the southern Blue Ridge Mountains, USA. *Environmental Monitoring and Assessment*, 120: 269-300. <http://www.srs.fs.usda.gov/pubs/28986>
Accessed: February 2012.
- Price, Katie and David S. Leigh. 2006b.** Morphological and sedimentological responses of streams to human impact in the southern Blue Ridge Mountains, USA. *Geomorphology*, 78: 142-160. <http://www.srs.fs.usda.gov/pubs/25406> Accessed: February 2012.
- Reid, J. L., J. P. Evans, J. K. Hiers, and J. B. C. Harris. 2008.** Ten years of forest change in two adjacent communities on the southern Cumberland Plateau. *Journal of the Torrey Botanical Society* 135:224-235.
- Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Iñigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004.** Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology. Ithaca , NY . 84 pp. http://www.partnersinflight.org/cont_plan/default.htm
Accessed: March 2012.
- Richardson, C.J. and J.W. Gibbons. 1993.** Pocosins, Carolina Bays, and Mountain Bogs. pp. 257-310 In: W.H. Martin, S.G. Boyce, and A.C. Echternacht (eds.), *Biodiversity of the Southeastern United States, Lowland Terrestrial Communities*. John Wiley and Sons.
- Rogers, Lynn L. and Allen, Arthur W. 1987.** Habitat suitability index models: Black bear, upper Great Lakes region. *Biol. Rep.* 82 (10.144). Washington D. C.: U.S. Department of the Interior, Fish and Wildlife Service. 54 p.
- Rutledge, A.T., and Mesko, T.O. 1996.** Estimated hydrologic characteristics of shallow aquifer systems in the Valley and Ridge, the Blue Ridge, and the Piedmont physiographic provinces based on analysis of streamflow recession and base flow: U.S. Geological Survey Professional Paper 1422-B, 58 p.
- Scott, J.M., B. Griffith, R.S. Adamcik, D.M. Ashe, B. Czech, R.L. Fishman, P. Gonzalez, J.J. Lawler, A.D. McGuire, and A. Pidgorna. 2008.** National Wildlife Refuges *in* Preliminary review of adaptation models for climate sensitive ecosystems and resources. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [S.H. Julius and J.M. West (eds.)]. U.S. Environmental Protection Agency, Washington, DC. pp 5-1 to 5-100.

-
- Shafer, D.S. 1988.** Late quaternary landscape evolution at Flat Laurel Gap, Blue Ridge Mountains, North Carolina. *Quaternary Research* 30:7-11.
- Shugart, H.H., R.A. Sedjo and B.L. Sohngen. 2003.** Forests and Global Climate Change: Potential Impacts on U.S. Forest Resources. Pew Center on Global Climate Change, Arlington, Virginia.
- Smith, A.B. 1993.** A Survey of Mountain Wetland Communities. Report to N.C. Natural Heritage Program, DENR, Raleigh, N.C.
- Song, Jihee, Alba Webb, Barbara Parmenter, David T. Allen, and Elena McDonald-Buller. 2008.** The Impacts of Urbanization on Emissions and Air Quality: Comparison of Four Visions of Austin, Texas. *Environ. Sci. Technol.*, 42 (19): 7294–7300.
- South Carolina Department of Natural Resources. 2012.** DNR News: \$500 reward offered in theft of endangered plants from Greenville preserve.
http://www.dnr.sc.gov/news/yr2012/april5/april5_plants.html Accessed: June 2012.
- Southern Appalachian Man and the Biosphere (SAMAB). 1996.** The Southern Appalachian Assessment Summary Report. Report 5 of 5. Atlanta: Department of Agriculture, Forest Service, Southern Region.
- Southern Blue Ridge Fire Learning Network. 2012.**
<http://www.conservationgateway.org/file/southern-blue-ridge-fln-landscapes>
Accessed: September 2012.
- Southern Rural Development Center. 2012. Community Data Center.
<http://srdc.msstate.edu/data/center/ncarolina.html> Accessed: April 2012.
- Spaulding, Heather L.; Rieske, Lynne K.. 2010. The aftermath of an invasion: Structure and composition of Central Appalachian hemlock forests following establishment of the hemlock woolly adelgid, *Adelges tsugae*. *Biol Invasions* 12:3135–3143.
<http://www.srs.fs.usda.gov/pubs/40505> Accessed: June 2012.
- Stahle, D.W., M.K. Cleaveland, and J.G. Hehr. 1988. North Carolina climate changes reconstructed from tree rings: A.D. 372 to 1985. *Science* 240:1517-1519.
- Stahle, D.W., and M. K. Cleaveland. 1992. Reconstruction and analysis of spring rainfall over the Southeastern U.S. for the past 1,000 years. *Bulletin of the American Meteorological Society* 73(12), 1947-1961.
- State Climate Office of North Carolina. 2009. Aspects of NC Climate.
http://www.nc-climate.ncsu.edu/climate/climate_change Accessed: February 2012.
- Taylor, Laura O., Xiangping Liu and Timothy Hamilton. 2012. Amenity Values of Proximity to National Wildlife Refuges.
<http://www.fws.gov/refuges/about/pdfs/NWRSAmenityReportApril2012withCovers8.pdf>
Accessed: June 2012.

-
- The Nature Conservancy and Southern Appalachian Forest Coalition. 2000.** Southern Blue Ridge Ecoregional Conservation Plan: Summary and Implementation Document. The Nature Conservancy: Durham, North Carolina.
- The Nature Conservancy, University of Washington, and University of Southern Mississippi. 2012.** ClimateWizard. <http://www.climatewizard.org/> Accessed: January 2012.
- Tennessee Department of Tourist Development. 2011a. The Economic Impact of Travel on Tennessee Counties 2011.** <http://www.tnvacation.com/industry/> Accessed: March 2012.
- Tennessee Department of Tourist Development. 2011b.** The Economic Impact of Travel on Tennessee Counties, 2011. Prepared by the Research Department of the U.S. Travel Association, Washington, D.C. for the Tennessee Department of Tourist Development. 81 pages. <http://www.tnvacation.com/industry/toolkits-research/> Accessed: Aug 2012.
- Tennessee Department of Environment and Conservation. 2012.** Year 2010 303(d) List. Division of Water Pollution Control, Nashville, Tennessee. http://www.tn.gov/environment/wpc/publications/pdf/2010_303d_final.pdf Accessed: Aug 2012.
- Tennessee Division of Natural Areas. 2012.** Rare species list by county. <http://tn.gov/environment/na/species/> Accessed: May 2012.
- Tennessee Natural Heritage Program. 2012.** Rare Plant List. Todd Crabtree. http://tn.gov/environment/na/pdf/plant_list.pdf Accessed: May 2012.
- Tennessee Natural Heritage Inventory Program. 2012.** Element Occurrences. Tennessee Department of Environment & Conservation, Nashville, Tennessee. <http://www.tn.gov/environment/na/nhp.shtml> Accessed: August 2012
- Tennessee Wildlife Resources Agency. 2005.** Tennessee's Comprehensive Wildlife Conservation Strategy. TWRA: Nashville, Tennessee. <http://www.tn.gov/twra/cwcs/tncwcs2005.pdf> Accessed: January 2012.
- Tennessee Wildlife Resources Agency. 2009.** Climate Change and Potential Impacts to Wildlife in Tennessee: An Update to Tennessee's State Wildlife Action Plan <http://www.tn.gov/twra/pdfs/tnclimatechange.pdf> Accessed: March 2012.
- The Nature Conservancy and Southern Appalachian Forest Coalition. 2000.** Southern Blue Ridge Ecoregional Conservation Plan: Summary and Implementation Plan. The Nature Conservancy: Durham, North Carolina. <http://east.tnc.org/east-file/51/SBR-V1.pdf> Accessed: March 2012.
- The Trust for Public Land. 2010.** The Economic Benefits and Fiscal Impact of Parks and Open Space in Nassau and Suffolk Counties, New York. A Report by The Trust for Public Land for the Long Island Community Foundation and the Rauch Foundation. <http://www.tpl.org/research/parks/economic-benefits-2.html> Accessed: June 2012.

-
- Thurman, Libby M.A., Bill Terry, AICP, Teresa Gibson, Harry A. Green, Ph.D.. 2011.** Land Use and Planning in Tennessee: A Tennessee Advisory Commission on Intergovernmental Relations (TACIR) Staff Report.
http://www.tn.gov/tacir/PDF_FILES/Other_Issues/LandUseAndPlanning.pdf
Accessed: Aug 2012.
- U.S. Census Bureau. 2000.** Population by Poverty Status in 1999 for Counties: 2000.
<http://www.census.gov/hhes/www/poverty/data/census/2000/poppvstat00.html>
Accessed: March 2012.
- U.S. Census Bureau. 2005.** State Interim Population Projections by Age and Sex: 2004-2030.
<http://www.census.gov/population/www/projections/projectionsagesex.html>
Accessed: March 2012.
- U.S. Census Bureau. 2009.** County Business Patterns. <http://www.census.gov/econ/cbp/index.html>
Accessed: January 2012.
- U.S. Census Bureau. 2012.** State and County QuickFacts.
<http://quickfacts.census.gov/qfd/states/37000.html> Accessed: March 2012.
- U.S. Department of Agriculture. 2012.** Official Soil Series Descriptions. National Resource Conservation Service Soil Survey Division.
<http://soils.usda.gov/technical/classification/orders/inceptisols.html> Accessed: May 2012.
- The Secretary of the Interior, Washington D.C., Order # 3226, Amendment No. 1, Signature Date, January 16, 2009, Subject: Climate Change and the Department of the Interior, SO#3226A1 1/16/09, Replaces SO#3226 1/19/01
- U.S. Department of Labor. 2012.** Quarterly Census of Employment and Wages. USDOL Bureau of Labor Statistics. <http://www.bls.gov/cew/data.htm> Accessed: January 2012.
- U.S. Environmental Protection Agency. 1999.** Climate Change and Tennessee. EPA Bulletin 236-F-99-002.
- U.S. Fish and Wildlife Service. 2007.** Asheville Field Office Strategic Plan.
http://www.fws.gov/asheville/pdfs/Asheville_FO_Strategic_Plan.pdf Accessed: March 2012.
- U.S. Fish and Wildlife Service. 2009.** Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change. Washington, D.C.
<http://www.fws.gov/home/climatechange/pdf/CCStrategicPlan.pdf> Accessed: December 2011.
- U.S. Fish and Wildlife Service. 2009.** Friends and Volunteers Annual Update FY 2009.
<http://www.fws.gov/volunteers/annReports.html> Accessed: October 2012.
- U.S. Fish and Wildlife Service. 2012.** Endangered Species Program.
<http://www.fws.gov/endangered/> Accessed: March 2012.
- U.S. Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. 2006** National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.
<http://www.census.gov/prod/2008pubs/fhw06-nc.pdf> Accessed: March 2012.

-
- U.S. Fish and Wildlife Service and U.S. Census Bureau. 2006.** 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation in Tennessee.
<http://www.census.gov/prod/2008pubs/fhw06-tn.pdf> Accessed: March 2012.
- U.S. Forest Service. 1994.** Ecological Subregions of the United States, Chapter 18, Section M221D: Blue Ridge Mountains.
<http://www.fs.fed.us/land/pubs/ecoregions/ch18.html#M221D> Accessed: Aug 2012.
- U.S. Forest Service. 2003.** Nonnative invasive plants of southern forests: a field guide for identification and control. By J. Miller. Gen. Tech. Rep. SRS-62. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 93p.<http://www.srs.fs.usda.gov/pubs/5424> Accessed: Aug 2012.
- U.S. Forest Service. 2009.** Non- Native Invasive Plant Environmental Assessment (EA) on the Nantahala and Pisgah National Forests (NPNFs).
http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/37293_FSPLT1_009020.pdf Accessed: February 2012.
- U.S. Forest Service. 2011.** Forest Stewardship Program.
<http://www.fs.fed.us/spf/coop/programs/loa/fsp.shtml> Accessed: December 2011.
- U.S. Geological Survey. 1998.** Ground Water and Surface Water A Single Resource. U.S. Geological Survey circular 1139. By Winter, T. C, Harvey, J. W., Franke, O. L., and W. M. Alley, Denver Colorado.
- U.S. Geological Survey. 2012.** Hazards » Earthquakes » Earthquakes Induced by Fluid Injection.
<http://www.usgs.gov/faq/index.php?action=show&cat=125> Accessed: Aug 2012.
- U.S. Geological Survey. 2012.** Birth of the Mountains: The Geologic Story of the Southern Appalachian Mountains. By Sandra B. Clark. <http://pubs.usgs.gov/gip/birth/birth.pdf> Accessed: Aug 2012.
- U.S. Geological Survey and North Carolina State University. 2010.** Southeast Gap Analysis Project. Biodiversity and Spatial Information Center, USGS North Carolina Cooperative Fish and Wildlife Research Unit, NC State University. <http://www.basic.ncsu.edu/seqap/index.html> Accessed: June 2012.
- Vangiler, L.D. 1992.** Population dynamics. pages 144-164 in J.G. Dickinson, Ed. The wild turkey: biology and management. Stackpole Books, Harrisburg, PA.
- Vogler, John B., Douglas A. Shoemaker, Monica Dorning, Ross K. Meentemeyer. 2009.** Mapping historical development patterns and forecasting urban growth in Western North Carolina: 1976-2030. The Center for Applied GIScience at UNC Charlotte.
<http://renci.uncc.edu/category/projects/urbangrowthmodel/> Accessed: Aug 2012.
- Walther, G.R., E. Post, P. Convey, A. Menzel, C. Parmesan, T.J.C. Beebee, J.M. Fromentin, O. Hoegh-Guldberg and F. Bairlein. 2002.** Ecological responses to recent climate change. Nature 416:389-395.

-
- Watauga County. 2010.** Citizens' Plan For Watauga.
http://www.wataugacounty.org/main/App_Pages/Dept/Planning/Forms/WataugaPlan.pdf
Accessed: April 2012.
- Weakley, A.S. and Schafale, M.P. 1994.** Non-alluvial wetlands of the southern Blue Ridge - diversity in a threatened ecosystem. *Water, Air, and Soil Pollution* 77, 359-383.
- Weaver, J.C. 2005.** The drought of 1998–2002 in North Carolina—Precipitation and hydrologic conditions: U.S. Geological Survey Scientific Investigations Report 2005–5053. 88pp.
<http://pubs.usgs.gov/sir/2005/5053/pdf/SIR2005-5053.pdf> Accessed: February 2012.
- Wigley, T.W. 2004.** The science of climate change: global and U.S. perspectives.
National Center for Atmospheric Research, Washington, D.C.
- Wilcove, D.S., D. Rothstein, J. Dublow, A. Phillips, and E. Losos. 1998.**
Quantifying threats to imperiled species in the United States. *Bioscience* 48:607-615.

Appendix A. Draft Conceptual Management Plan

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) proposes to protect southern Appalachian mountain bogs, one of the nation's rarest and most imperiled plant and wildlife habitats, through the creation of Mountain Bogs National Wildlife Refuge (NWR). This follows years of effort to conserve these areas on the part of the Service, other conservation organizations, and individual citizens. If established, a refuge would protect a diverse system of bog and fen wetlands and surrounding upland buffers, including high-mountain grasslands, spruce-fir forests, and hardwood forests. It would contribute to the recovery of 13 federally listed species, one candidate species and assist in the conservation of numerous state listed and imperiled species. Federal trust species that would benefit include: federally listed mountain sweet pitcher plant, green pitcher plant, bunched arrowhead, swamp pink, and the bog turtle, as well as many species of migratory birds. Should the proposed action to establish a refuge be fully realized, it would be comprised of 23,478 acres scattered across as many as 30 sites in Alleghany, Ashe, Avery, Clay, Graham, Henderson, Jackson, Macon, Transylvania, Wilkes, and Watauga Counties, North Carolina, and Carter and Johnson Counties, Tennessee. The Service would work with partners and willing landowners to protect habitat through several methods, including fee simple purchases, conservation easements, leases, and/or cooperative agreements.

This document, the Draft Conceptual Management Plan (Draft CMP), provides further detail on the Service's proposed action and how the lands identified therein would be administered should the Mountain Bogs NWR be established.

PURPOSE OF CONCEPTUAL MANAGEMENT PLAN

The Draft Land Protection Plan and Draft Environmental Assessment (Draft LPP/EA) for the proposed Mountain Bogs NWR examines the feasibility of establishing a national wildlife refuge in the Blue Ridge Mountains of North Carolina and Tennessee. In Chapter III of the Draft EA, Alternative B (potential new refuge) is presented as the Service's proposed action. This alternative would not be implemented until it has been officially reviewed and authorized.

If approved, the Alternative B would allow the Service to proceed in negotiations with interested landowners within 30 Conservation Partnership Areas (CPAs), totaling 42,250 acres across the North Carolina and Tennessee portions of the Blue Ridge Mountains landscape. Out of these 42,250 acres, the Service would be authorized to protect 23,478 acres through various fee-title and less-than-fee-title methods. The methodology used to delineate CPAs is described in the Draft LPP, and provides a decision support tool to assist with prioritizing acquisition of parcels. The CPAs serve to help focus land conservation efforts, while providing the Service flexibility to negotiate with willing sellers, maintain and strengthen existing partnerships, and develop new partnerships (Figure 1). The Service concludes that acquiring these lands over time would provide the needed protection of Appalachian mountain bogs and other rare and unique habitats in the Blue Ridge Ecoregion of North Carolina and Tennessee, and build on the existing coalition of organizations and individuals that advocate bog conservation in the region. It would also provide opportunities for wildlife-dependent recreation.

The Service developed this Draft CMP to describe the management direction for a proposed Mountain Bogs NWR, as defined in Alternative B, and outlines possible interim habitat management priorities and compatible public uses on newly acquired lands, should a refuge be approved. The

activities described in this Draft CMP would direct the way we pursue and manage acquisitions, conservation easements, and other land interests until a comprehensive conservation plan (CCP) is developed. By Service policy, a CCP must be developed within 15 years of the actual establishment of a refuge (i.e., acquisition of first land parcel). Any major changes in the activities described in this Draft CMP, any new activities, and our development of the CCP would be subject to public review and comment in accordance with the provisions of Service refuge planning policy (602 FW 1, 2, and 3) and Service and U.S. Department of the Interior policy implementing the National Environmental Policy Act (NEPA) of 1969 (Department of the Interior Manual 516, Appendix 1).

MISSION OF THE SERVICE AND THE NATIONAL WILDLIFE REFUGE SYSTEM

U.S. Fish and Wildlife Service

The Service is responsible for conserving, enhancing, and protecting fish and wildlife and their habitats for the continuing benefit of people through federal programs relating to wild birds, endangered species, certain marine mammals, fisheries, aquatic resources, and wildlife management activities.

As part of its mission, the Service manages 560 national wildlife refuges and other units of the National Wildlife Refuge System (Refuge System), covering 150 million acres (60.7 million ha). These areas comprise the Refuge System, the world's largest collection of lands and waters set aside specifically for fish and wildlife. The majority of these lands, 77 million acres (31 million ha), is in Alaska, while 54 million acres (21.8 million ha) are part of three marine national monuments in the Pacific Ocean. The remaining acres/hectares are spread across the other 49 states and several United States territories. In addition to refuges, the Service manages thousands of small wetlands, 37 wetland management districts, 70 national fish hatcheries, 65 fishery resource offices, and 81 ecological services field stations. The Service enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

National Wildlife Refuge System

The mission of the Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997 is:

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

The wildlife and habitat vision for national wildlife refuges stresses that wildlife comes first; that ecosystems, biodiversity, and wilderness are vital concepts in refuge management; that refuges must be healthy and growth must be strategic; and that the Refuge System serves as a model for habitat management with broad participation from others.

Actions were initiated in 1997 to comply with the direction of this new legislation, including an effort to complete CCPs for all refuges. These CCPs, which are completed with full public involvement, help guide the future management of refuges by establishing natural resource and recreation/education programs. Consistent with the Improvement Act, approved CCPs serve as the guidelines for refuge management for a 15-year period. The Improvement Act states that each refuge shall be managed to:

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of CCPs that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System;
- Recognize that wildlife-dependent recreation activities including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and
- Allow refuge managers authority to determine compatible public uses.

National wildlife refuges connect visitors to their natural resource heritage and provide them with an understanding and appreciation of fish and wildlife ecology to help them understand their role in the environment. Wildlife-dependent recreation on refuges also generates economic benefits to local communities. According to the report, *“Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation,”* approximately 35 million people visited national wildlife refuges in 2006, generating almost \$1.7 billion in total economic activity and creating almost 27,000 private sector jobs producing about \$543 million in employment income (Carver and Caudill 2007). Additionally, recreational spending on refuges generated nearly \$185.3 million in tax revenue at the local, county, state, and federal levels (Carver and Caudill 2007). As the number of visitors grows, significant economic benefits are realized by local communities. In 2006, 87 million people, 16 years and older, fished (30 million), hunted (12.5 million), or observed wildlife (71 million), generating \$120 billion (U.S. Fish and Wildlife Service and U.S. Census Bureau 2006). In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in 7 years. At the same time, the number of jobs generated in surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than \$2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana), the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to \$6.8 million per refuge, up 31 percent from \$5.2 million in 1995. For each federal dollar spent on the Refuge System, surrounding communities benefited with \$4.43 in recreation expenditures and \$1.42 in job-related income (Caudill and Laughland, unpublished data). Visitation is growing with 41 million visitors to national wildlife refuges in 2008.

Volunteers continue to be a major contributor to the success of the Refuge System. In 2009, 42,918 volunteers donated 1,611,388 hours. The value of their labor was \$32,630,607, the equivalent of 775 full-time employees. More than 200 Friends organizations support the work of the Service (USFWS 2009).

BACKGROUND AND RATIONALE FOR THE ESTABLISHMENT OF THE PROPOSED MOUNTAIN BOGS NWR

The land being proposed for protection includes a diverse system of bog and fen wetlands (here collectively termed “mountain bogs” or “bogs”) and adjacent habitats. This proposal represents an unprecedented opportunity to protect and restore one of the rarest wetland community types in the Service’s Southeast Region, while also affording permanent protection and management to a number of federal trust species. Protection of mountain bogs is directly aligned with the Service’s national priorities of threatened and endangered species recovery, migratory bird conservation, landscape-level conservation, and connecting people with nature. Protection of mountain bog habitat is likewise identified as a priority action in the Service’s Strategic Plan for the Southern Appalachian Ecosystem, the Strategic Plan for the Asheville, North Carolina, Ecological Services Field Office, and in the recovery plans for each of those federally listed species occurring within mountain bog habitats.

Historically, small wetlands were found throughout the southern Appalachian Mountains, but past land use practices and increasing development and disruption of normal hydrologic processes have resulted in the destruction of most of these sites, with an estimated loss of 80-90 percent (Noss et al. 1995; Weakley and Schafale 1994). Furthermore, it has been estimated that the amount of remaining mountain bogs in private ownership in North Carolina, where the majority of these habitats still exist, is greater than 60 percent (NCWRC 2005). Mountain bogs continue to be some of the most threatened habitats, because they are likely to be converted to other uses and are sensitive to hydrologic changes within the watershed.

Mountain bogs are recognized hotspots for biodiversity and contain numerous rare and declining plant and animal species. This project is expected to aid in the recovery of 13 federally listed species and one candidate species and support conservation efforts for 83 state listed species. Mountain bogs offer essential feeding, wintering, and nesting habitat for numerous migratory bird species; and provide food and shelter for many important game species, including furbearers such as mink, muskrat, raccoon, and beaver, and game birds such as rails, woodcock, ruffed grouse, turkey, and wood duck. Bogs are breeding habitat for many species of amphibians, especially salamanders, for which the southern Appalachians have the greatest diversity in the nation. They support an incredibly high diversity of plant species and are important to invertebrates.

In addition to providing specialized habitat for wildlife, bogs provide important services to humans and wildlife downstream. Like other wetlands, bogs possess a natural capacity for regulating water flow, holding floodwaters like giant sponges then slowly releasing the water to minimize the effects of droughts and floods. Bogs also contribute to water quality by removing excess nutrients and many chemical contaminants. Mountain wetlands play an important role in many aquatic food chains, and contribute to the productivity and good water quality needed by downstream fishes, including native brook trout.

Bogs have long been recognized for their biological importance and the Service’s Asheville Field Office in North Carolina has worked since the early 1990s, in conjunction with federal, state, and non-governmental partners and private landowners, to develop a coordinated restoration and protection strategy for the mountain bogs in western North Carolina. Despite accomplishments to date, land protection and active, long-term management are still needed at the majority of all remaining mountain bog sites. This refuge would restore and protect mountain bog sites and upland buffers and corridors between select sites in the AOI, as well as associated water quantity and quality. Furthermore, placement of these mountain bog sites under unified ownership would provide for a coordinated, strategic approach to the restoration of these habitats.

The Service also sees a need to provide additional opportunities for wildlife-dependent recreation and education. It is well recognized that many of our youth no longer have an attachment to the outdoors and outdoor activities (Louv 2006); so much so that the America's Great Outdoors initiative focuses on providing increased opportunities for our nation's youth and population in general to engage with the outdoors. Establishing a new national wildlife refuge in this landscape would provide these additional opportunities.

It is envisioned that the proposed refuge would:

- Protect some of the last remaining examples of Appalachian Mountain bogs;
- Protect and maintain habitat for a diversity of fish, wildlife, and plant species;
- Provide habitat for nongame neotropical migratory birds;
- Conserve habitat for 13 federally listed species including the bog obligate mountain sweet pitcher plant, green pitcher plant, bunched arrowhead, swamp pink, and the bog turtle; 1 candidate species and 83 state listed species;
- Provide breeding, wintering, and migration habitat for the American woodcock;
- Provide opportunities for environmental education, interpretation, and wildlife-dependent recreation;

LAWS GUIDING THE NATIONAL WILDLIFE REFUGE SYSTEM

A number of laws, policies, and regulations govern the acquisition and management of land in the Blue Ridge Ecoregion, including the National Wildlife Refuge System Improvement Act, the National Wildlife Refuge System Administration Act, Endangered Species Act, and Migratory Bird Treaty Act.

National Wildlife Refuge System Improvement Act of 1997 (Improvement Act)

This Act guides the development and operation of the Refuge System. It clearly identifies the mission of the Refuge System, requires the Secretary of the Interior to maintain the biological integrity, diversity, and environmental health of refuge lands, mandates a "wildlife first" policy on refuges, and requires comprehensive conservation planning. It also designates the following six wildlife-dependent recreational uses as priority public uses of the Refuge System: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. This Act amended the National Wildlife Refuge System Administration Act of 1966, which continues to serve as the parent legislation for the Refuge System.

National Wildlife Refuge System Administration Act of 1966

This Act defines the Refuge System, including refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, wildlife management areas, and waterfowl production areas. It also authorizes the Secretary of the Interior to permit any use of an area, provided the use is compatible with the major purposes for establishing the area.

Endangered Species Act of 1973 (as amended)

The Endangered Species Act directs all federal agencies to participate in endangered species conservation by protecting threatened and endangered species and restoring them to a secure status in the wild. Section 7 of the Act charges federal agencies to aid in the conservation of species listed as threatened or endangered under the Act, and requires federal agencies to ensure that their activities will not jeopardize the continued existence of listed species under the Act, or adversely modify designated, critical habitats.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act protects all migratory birds and their parts, including eggs, nests, and feathers, from illegal trade. The Migratory Bird Treaty Act is a domestic law that acknowledges the United States' involvement in four international conventions, Canada, Japan, Mexico, and Russia, for the protection of a shared migratory bird resource. The bird resource is considered shared because these birds migrate between countries at some point during their annual life cycle.

National Environmental Policy Act of 1969

The National Environmental Policy Act requires that all federal agencies consult fully with the public in planning any action that may significantly affect the quality of the human or natural environment.

Land and Water Conservation Fund Act

The Land and Water Conservation Fund uses monies from certain user fees, the proceeds from the disposal of surplus federal property, the federal tax on motor boat fuels, and oil and gas lease revenues (primarily Outer Continental Shelf oil monies) to fund matching grants to states for outdoor recreation projects and to fund land acquisition for various federal agencies.

Migratory Bird Conservation Act

The Migratory Bird Conservation Act provides for the acquisition of suitable habitats for use as migratory bird refuges, and the administration, maintenance, and development of these areas under the administration of the Secretary of the Interior.

Archaeological Resources Protection Act of 1979

This Archaeological Resources Protection Act provides protection for archaeological resources on public lands by prohibiting the "excavation, removal, damage, or defacing of any archaeological resource located on public or Indian lands," and sets up criminal penalties for those acts. It also encourages the increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having archaeological resources or data obtained before 1979.

National Historic Preservation Act of 1966

The National Historic Preservation Act requires all federal agencies to consider the effects of their undertaking on properties meeting criteria for the National Register of Historic Places, and ensures that historic preservation fully integrates into the ongoing programs and missions of federal agencies.

PURPOSE OF ESTABLISHMENT AND LAND ACQUISITION AUTHORITY

Refuge lands can be acquired under various legislative and administrative authorities for specified purposes. Establishment of and land acquisition for the proposed Mountain Bogs NWR would be authorized by the following: National Wildlife Refuge System Administration Act, Endangered Species Act, Emergency Wetlands Resources Act, and Fish and Wildlife Act, among others. The purposes of

a refuge guide its long-term management, prioritize future land acquisition, and play a key role in determining the compatibility of any public uses. The purposes of the proposed Mountain Bogs NWR are as follows:

"for the conservation, management, and...restoration of the fish, wildlife, and plant resources and their habitats... for the benefit of present and future generations of Americans" (16 U.S.C. 668dd(a)(2)); and the National Wildlife Refuge System Administration Act, as amended by the National Wildlife Refuge System Improvement Act of 1997);

"to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants" (16 U.S.C. 1534) (Endangered Species Act of 1973);

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

"for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude" (16 U.S.C. 742f (b)(1)); "for the development, advancement, management, conservation, and protection of fish and wildlife resources" (16 U.S.C. 742f(a)(4)); (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956);

"for the protection of migratory birds . . . or any part, nest, or egg of any such bird" (Migratory Bird Treaty Act (16 U.S.C. 703));

VISION FOR THE PROPOSED MOUNTAIN BOGS NATIONAL WILDLIFE REFUGE

The Mountain Bogs NWR will conserve critically endangered southern Appalachian Mountain bogs and portions of their surrounding landscapes for current and future generations. Refuge lands and waters will be managed for fish and wildlife populations, with an emphasis on the management of imperiled federal trust species, including 13 federally listed plants and animals, and will help protect and improve water quality and water quantity within the watersheds surrounding the refuge. As part of a system of public and private conservation lands, the refuge will expand outdoor recreational and educational opportunities, helping to support local economies.

GOALS OF THE PROPOSED MOUNTAIN BOGS NATIONAL WILDLIFE REFUGE

The following overarching goals were developed for the proposed Mountain Bogs NWR:

Goal 1. Protect, Restore, and Manage Habitats for Fish and Wildlife. The proposed Mountain Bogs NWR would conserve rare mountain bog habitat and associated species as well as adjacent upland habitats. The proposed refuge would aid in the recovery of 13 federally listed species and one candidate species and benefit many other state listed and imperiled species, including migratory birds and southern Appalachian brook trout.

Goal 2. Provide Landscape-Level Conservation. The proposed Mountain Bogs NWR, which would be within the Appalachian Landscape Conservation Cooperative, would contribute to a more connected and functional conservation landscape by reducing habitat fragmentation, and protecting and restoring a network of exceptionally rare wetland types and their surrounding landscapes. This

proposed refuge would also protect and enhance water quality and quantity within multiple watersheds, benefiting both humans and wildlife.

Goal 3. Connect People with Nature. Visitors of all abilities to the proposed Mountain Bogs NWR would enjoy opportunities for compatible hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of southern Appalachian Mountain bogs.

Goal 4. Promote Conservation Partnerships. Collaboration in science, education, and research would strengthen and develop partnerships with bog conservation organizations, private landowners, government agencies, and others to help inform land management decisions and encourage continued responsible stewardship of mountain bogs and other associated natural resources.

How each goal would be achieved through the proposed Mountain Bogs NWR is summarized as follows:

Goal 1. Protect, Restore, and Manage Habitats for Fish and Wildlife

Habitats

The proposed Mountain Bogs NWR would strive to protect some of the last remaining examples of mountain bogs in the southern Appalachian Mountains through fee-title acquisition, less-than-fee-title acquisition, and conservation easements. In addition to mountain wetlands, this proposed refuge would also protect other important habitats that buffer and connect the bogs, including spruce-fir forests, various types of hardwood forests (e.g., northern hardwood forests, oak forests, cove forests), riparian habitats, and early successional habitats. A full description of many of the habitat types included in the CPAs can be found in the Affected Environment section of the Draft EA.

Restoration and management would be needed to conserve these habitats. Wetland restoration is defined as active rehabilitation of a degraded wetland or hydric soil area to recover its natural attributes, and ecological functions and values (Somers et al. 2000). Due in part to their location in flat, low-lying areas, nearly every remaining example of mountain bog habitat shows some evidence of human alteration. The bottomlands, valleys, and easily accessible plateaus where these habitats occur were the first to be cleared and settled by Native Americans and Europeans. Numerous sites have been ditched and drained or turned into ponds or lakes and many other bogs have been destroyed by intensive agriculture and overgrazing, residential and commercial development, road and reservoir construction, and intensive silviculture. Stream channelization, which ultimately results in a lowering of the stream bed elevation and associated water table, would dewater adjacent wetlands, resulting in a drying out of bog habitat and acceleration of shrub succession. These activities have occurred at many sites. Fortunately, great strides have been made in techniques to reverse some of these land use practices and restore wetland habitat. Restoration activities should be a priority for land managers where feasible and beneficial and would undoubtedly be important for some of the bogs identified for inclusion in the Mountain Bogs NWR.

All bogs would require management, in part because we have lost historical disturbance regimes that once maintained and created these sites across the landscape. Continued long-term management, both on- and off-site (watershed-wide), is crucial to maintaining proper functioning conditions of these wetlands and their associated ecological communities. Management actions would need to balance the needs of the various plants and animals that reside in bogs or use bogs during some portion of their life cycle. In general, some bogs support a mix of open and closed canopy, maintained by

hydrology, elevation, and other natural factors. Others may be open canopied (dominated by herbaceous vegetation) due to active management of vegetation or other land uses (grazing). Over time, freshwater wetlands in the southeast succeed toward a closed forest canopy and the sunny microhabitats required by many imperiled wetland species gradually disappear as the interior surface becomes shady. Ultimately, this would result in a loss of those species unless management activities can maintain a mosaic of microhabitats.

Fish and Wildlife

Mountain bogs are recognized hotspots for biodiversity and endemism, containing numerous rare and declining plant and animal species (Murdock 1996, Weakley and Schafale 1994). There are 13 federally listed wildlife species, one candidate species, and 83 state listed species either as endangered, threatened, or species of special concern found within the proposed CPAs. Many of these species are dependent on bog habitats for their survival, while others can also be found in the adjacent upland habitats. The proposed refuge would also provide habitat for migratory birds and is situated along the Atlantic Flyway, lying within the North American Bird Conservation Initiative's Bird Conservation Region 28 and the Appalachian Mountain Joint Venture. It also would serve to protect water quality for many aquatic species of concern including the endangered Appalachian elktoe mussel and the southern Appalachian brook trout.

Recovery of Threatened and Endangered Species

The following is a brief description of the federally listed species expected to benefit from the proposed Mountain Bogs NWR:

Bunched Arrowhead

Bunched arrowhead is known from only two counties in the entire world, with eleven remaining populations across those two counties. The recovery criteria for this species are to protect at least three colonies in each of four bunched arrowhead populations (USFWS 1983). This proposed project would make important strides in permanently protecting one colony in each of two North Carolina populations.

Green Pitcher Plant

Green pitcher plant is a carnivorous perennial herb with yellowish-green, hollow, pitcher-shaped leaves. The hollow leaves contain liquid and enzymes. When insects fall into the pitchers, they're digested and the nutrients in the bodies are incorporated into the plant's tissues. At one time, green pitcher plants were found in North Carolina, Tennessee, Georgia, and Alabama and in landscapes as diverse as the coastal plain and the ridge and valley. It has disappeared from Tennessee, and is only found at a single site in North Carolina near Lake Chatuge. The recovery criteria state that 18 viable populations representing the diversity of habitats and the geographic range should be protected. Of the 18 populations, at least three colonies should be located within the Lake Chatuge geographic area (USFWS 1994). This proposed project would help protect the lone North Carolina site and aid in recovering the species.

Mountain Sweet Pitcher Plant

Mountain sweet pitcher plant is a carnivorous perennial herb with tall, hollow pitcher-shaped leaves and red sweet-smelling flowers. The entire known distribution of this plant is in three southern Appalachian counties, with a total of 12 populations. Creation of the refuge would help protect five North Carolina populations.

Swamp Pink

Swamp pink is a perennial herb in the lily family with flower stalks up to 4.5 feet tall. Though its range stretches from Georgia to New Jersey, its actual habitat within that range is rare. North Carolina is home to 10 populations and this proposal would help protect habitat for six of those, which aids in the recovery criteria to stabilize the range-wide status of the species and ensure the long-term regulatory protection of these populations (USFWS 1991).

Roan Mountain Bluet

Roan Mountain bluet, found on exposed mountain-top habitat, is easily distinguished from other bluets by its relatively large reddish purple flowers, small oval leaves, and compact growth form. Roan Mountain bluet would be considered recovered when there are at least nine self-sustaining populations in protection (USFWS 1996). This proposed project would aid in the protection of two populations.

Rock Gnome Lichen

One of two lichens on the federal list of threatened and endangered species, rock gnome lichen is the only member of the genus *Gymnoderma* to live in North America. Rock gnome lichen occurs in dense colonies of narrow strap-like lobes in moist, open sites on rock faces. Rock gnome lichen would be considered for downlisting when there are at least 30 populations stable over 5 years and within protective ownership (USFWS 1997). This proposed project would aid in the protection of two populations.

Heller's Blazing Star

Heller's blazing star is a perennial herb in the Aster family. It has one or more erect or arcing stems arising from a tuft of narrow, grass-like, pale green basal leaves. Its flowering stems reach up to 16 inches (40.6 cm) in height and are topped by a showy 3- to 8-inch (7.6 to 20.3 cm) long spike of lavender flowers. Heller's blazing star would be considered recovered when there are at least nine self-sustaining populations in existence and in protection (USFWS 1999). This proposed project would aid in the protection of one population.

Bog Turtle

The bog turtle is North America's smallest turtle. It lives in several different types of mountain wetlands, including fens, wet meadows and open swamps, and seems to prefer spring-fed wetlands with saturated soils and modest amounts of running water. These sites are typically sedge-dominated with little or no canopy. The southern Appalachians form the heart of the range for the southern population of the bog turtle. The turtle faces serious threats from habitat loss and destruction and poaching to fuel an illegal pet trade. The proposed Mountain Bogs NWR would protect 15 of the best bog turtle sites in the southeast, including several that are part of a larger bog complex or metapopulation. Establishment of a refuge would also enable the Service to expand anti-poaching efforts for this and other species.

Carolina Northern Flying Squirrel

Carolina northern flying squirrels are endemic to the southern Appalachians and inhabit spruce-fir and northern hardwood forests primarily above 4,000 feet in elevation. There are currently nine Geographic Recovery Areas (GRAs) listed in the recovery plan for the squirrel (USFWS 1990).

One GRA, Long Hope Valley, currently has no protections. The refuge seeks to offer some protection to this important site. Flying squirrels are also believed to utilize a number of other bogs sites in separate GRAs. In addition, the landscape-level approach of this proposed refuge could help protect habitat corridors between some GRAs. This is important to the recovery of the squirrel, given that many of the populations are isolated from one another. One recovery objective for the squirrel requires that GRAs be managed in perpetuity to ensure sufficient habitat for population maintenance/expansion and habitat corridors, where appropriate elevations exist to permit migration among GRAs (USFWS 1990).

Virginia Big-eared Bat

Several of the proposed bog sites lie in close proximity to known Virginia big-eared bat hibernacula in North Carolina and a Virginia big-eared bat was captured during the summer at one of these sites. Given the propensity for big-eared bats to forage in open areas and the proximity of known hibernacula to several of the proposed bog sites, these areas could provide important foraging habitat for this species. The Virginia big-eared bat recovery plan identifies the need to protect foraging habitat for the species (USFWS 1984). Establishment of a refuge would also afford opportunities for research on this and other bat species. Due to White-nose Syndrome, additional species (eastern small-footed bat, northern long-eared bat, and little brown bat) have been petitioned or proposed for listing and this proposed refuge could also offer foraging and roosting habitat for those species.

Conserving Migratory Birds in Decline

A high diversity of bird species breed and winter in the Appalachian Mountains and the region is very important for birds during migration. Mountain bogs, associated streams, and adjacent uplands provide important habitat for many of these species. Breeding birds associated with these wetlands include golden-winged warbler, alder flycatcher, willow flycatcher, and Canada warbler. Game birds such as American woodcock, ruffed-grouse, Virginia rail, wild turkey, and wood duck can also be found utilizing these habitats. These species and others have been identified as priorities in national and regional bird plans and in state wildlife action plans (Hunter et al. 1999, Rich et al. 2004, NCWRC 2005, TNWRA 2005). Nearly all of the proposed refuge sites fall within either golden-winged warbler focal areas or Audubon Important Bird Areas.

Establishment of a refuge would protect several habitat types important to conserving migratory birds in decline including high-elevation forests, early successional habitat, and riparian woodlands. Priority species dependent on riparian habitats include cerulean warbler and Swainson's warbler. Riparian areas also serve as optimal habitat for transient neotropical migratory birds. Some of the higher elevation sites support several at-risk species, including red crossbill, blackburnian warbler, and northern saw-whet owl. Many of the species that utilize bogs and surrounding lands are early successional species; a suite of birds that have been declining. One of the main objectives for early successional species is to protect, maintain, and where necessary, restore sensitive early successional habitats, such as mountain wetlands and high elevation balds (Hunter et al. 1999). Given the distribution of refuge sites, the establishment of a refuge would also address several landscape-scale objectives for many of the species it poses to protect.

Several CPAs currently provide habitat for breeding golden-winged warblers and additional CPAs might also provide habitat or could provide habitat with appropriate management. The basis for the breeding grounds conservation strategy for golden-winged warblers is the delineation of focal areas where stabilizing and ultimately restoring golden-winged warbler populations would occur. These are areas where the conservation community has recommended targeting conservation actions and where the maintenance of core populations would be important for sustaining and growing the current

distribution (Roth et al. 2012). Ten of the CPAs occur within golden-winged warbler focal areas. The acquisition of habitat in these CPAs would contribute to goals outlined in the Golden-winged Warbler Conservation Plan of maintaining 3,000 pairs of golden-winged warblers in southwestern North Carolina, plus an additional 500 pairs in west-central and northwestern North Carolina through acquisition and management.

Other Wildlife

These habitats also provide habitat for small mammals including bats such as eastern small-footed myotis, which utilize wetlands for foraging and drinking, and meadow voles, which build nests from grasses along the margins of wet areas. Fur-bearing mammals such as mink, muskrat, raccoon and beaver also utilize bogs.

There are 50 species of salamanders in western North Carolina, twenty of which are listed as priority species (NCWRC 2005). Priority salamander species associated with bogs include mole salamander, marbled salamander, four-toed salamander, three-lined salamander and spotted salamander. These salamanders require pools of water for breeding purposes and bogs often contain appropriate pools. Green salamander and hellbender, both federal species of concern, and likely many other species of salamanders, would also benefit from the protection of additional habitat types found adjacent to the bogs (e.g., forests, rock outcrops, streams). Common reptile species often found in these wetlands include queen snake, eastern kingsnake, and eastern box turtle.

Mountain bogs support high plant diversity. Twenty-one plant species associated with mountain bogs are listed by NCPCH, with another 41 plant species proposed for state listing. Almost one-fifth of the 722 rare plant species monitored by the North Carolina Natural Heritage Program occur in bogs, fens, and other non-alluvial mountain wetlands, and most of them are limited to these habitat types (Murdock 1994).

Plant diversity of these sites translates into a high diversity of invertebrates including pollinators. Some important butterflies found in bogs include the Baltimore checkerspot, regal fritillary, two-spotted skipper, and Monarch butterfly. It is important to note that systematic faunal surveys for rare species in these habitat types are needed, particularly for invertebrates. Additional surveys are also needed to document occurrences of reptiles, amphibians, small mammals, and birds at these sites.

Goal 2. Provide Landscape-Level Conservation

Mountain Bogs NWR, within the Appalachian Landscape Conservation Cooperative, would contribute to a more connected and functional conservation landscape by reducing habitat fragmentation, and protecting and restoring a network of exceptionally rare wetland types and their surrounding landscapes. This proposed refuge would also protect and enhance water quality and quantity within multiple watersheds, benefiting both humans and wildlife.

The Service would work with the public and private partners to restore and maintain habitat connectivity throughout the landscape in part by working to reduce habitat fragmentation by connecting and buffering lands that are already protected. Many bog sites are hydrologically connected, and these connections support important movement corridors for wildlife from one small site to another, thus creating local populations of particular species not associated with a single site, but a larger complex of sites within the drainage (NCWRC 2005). Populations of plants and animals are becoming increasingly isolated as more wetlands are destroyed. This proposed refuge would work to connect disjunct populations by protecting corridors. It is vital to retain and recreate these connections to facilitate movement of wildlife and gene flow between populations. Connections to

nearby streams and forests would help maintain/create healthy populations and would also allow certain species to migrate and adapt to changes in habitats such as those that might result from climate change. Furthermore, this proposed refuge would work to buffer existing bogs and associated streams to improve water quality/quantity not only for the bogs and associated flora and fauna, but also for wildlife and humans downstream. These efforts would allow for a more intact and functional landscape.

Proposed management would complement the management of adjacent and nearby conserved lands, both public and private, thus enhancing the Service's wildlife management contribution to the region and helping to create a more functional conservation landscape. The proposed Mountain Bogs NWR would provide local and regional benefits to wildlife by working in concert with existing conservation areas and partners, including Nantahala, Pisgah and Cherokee National Forests, The Nature Conservancy, North Carolina Wildlife Resources Commission, (NCWRC), North Carolina Plant Conservation Program, North Carolina State Parks, and area land trusts. Restoration and management activities at degraded sites would assist in accomplishing the goal of providing landscape-level conservation by making sites more resilient and contributing to ecological resiliency across the landscape.

Goal 3. Connect People with Nature

Refuge visitors of all abilities would enjoy opportunities for compatible hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of southern Appalachian Mountain bogs.

Creation of the proposed Mountain Bogs NWR would increase wildlife-dependent recreation and education opportunities. While some of the parcels proposed for acquisition may be unsuitable for public access due to the potential for poaching of the rare species found there, other sites would be well-suited to these activities. The Service would work cooperatively with NCWRC, TWRA, and other partners to provide public hunting and fishing opportunities and interpretive and educational programs. Elevated boardwalks could be used to enable public entry at sites where trampling of sphagnum mats or other sensitive habitat is a concern. The proximity of several of the proposed sites to Asheville, Hendersonville, and Boone would make these sites easily accessible to the general public and their proximity to numerous area schools would make them ideal for educational opportunities targeting younger children.

The Improvement Act established six priority public uses on refuges. Those priority uses depend on the presence, or the expectation of the presence, of wildlife. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Although these priority uses must receive consideration in planning for public use, they also must be compatible with the purposes for which a refuge is established and the mission of the Refuge System. One additional use, research, would also be considered. Compatibility determinations, which evaluate the effects of a particular use or activity in the context of species or habitats on a refuge, aid in making those decisions. If refuge lands were acquired, compatibility determinations would be used to decide which, where, and how public use opportunities would be permitted.

Public use opportunities contribute to the long-term protection of wildlife resources by promoting understanding, appreciation, and support for wildlife conservation. The six priority public uses and research would be accommodated to the maximum extent possible, where they would not have significant negative effects on wildlife or habitat. All of the proposed public use activities are contingent upon availability of staff and funding to develop and implement these programs. The Service would promote opportunities for volunteers and develop community interpretive materials and

programs to enhance awareness of and appreciation for the area's resources. School and other group programs would be considered. If a refuge is established, an increase in public use would be expected from new facilities and programs such as new hunts, new trails, new parking areas, new fishing access, new interpretive overlooks, and new observation platforms that would potentially be a part of a new refuge. The Service would allow public access for day use on many newly acquired lands, provided there are no expected negative effects on sensitive species (e.g., federally listed species) or habitats, and would consider overnight access as a component of other public use activities (e.g., hunting in remote locations). See Appendix B for the interim compatibility determinations for the proposed action.

Hunting and Fishing

Where appropriate, the Service would open newly acquired lands for hunting and fishing; biologically, ecologically, and safely accommodating these activities within the state's regulation framework. The Service would work with NCWRC, TWRA, and others to develop an understanding of hunting and fishing activities for a particular site during the acquisition process and regarding the co-management opportunities of the hunting and fishing activities associated with this proposal. If possible, the Service would provide Americans with Disabilities Act (ADA)-compliant and youth hunting opportunities. Generally, the Service would allow hunting, based on state hunting seasons and consistent with the refuge's CCP and Hunt Plan (once developed).

Wildlife Observation, Wildlife Photography, Environmental Education and Interpretation, and Research

Beyond hunting and fishing, the proposed refuge would also provide opportunities for wildlife observation, wildlife photography, environmental education and interpretation, and research (see Appendix B for the interim compatibility determinations addressing these uses).

Environmental education and interpretation would incorporate on-site, off-site, and distance-learning materials, activities, programs, and products that address the audience's course of study, the mission of the Refuge System, and the management purposes of the proposed refuge. The goal of environmental education is to promote an awareness of the basic ecological foundations of the interrelationship between human activities and natural systems. Through curriculum-based environmental education, refuge staff, educators, and partners hope to motivate students and other persons interested in learning about bogs and associated wildlife; and the role of management in the maintenance of healthy ecosystems, working landscapes, and conservation of our fish and wildlife resources

President Obama launched the America's Great Outdoors (AGO) Initiative to develop a 21st Century conservation and recreation agenda for our nation. AGO takes as its premise that lasting conservation solutions should rise from the American people – that the protection of our natural heritage is a non-partisan objective shared by all Americans. The vision of the AGO Initiative involves connecting Americans to the great outdoors and conserving and restoring America's great outdoors. AGO seeks to empower all Americans—citizens, young people, and representatives of community groups; the private sector; nonprofit organizations; and local, state, and tribal governments—to share in the responsibility to conserve, restore, and provide better access to our lands and waters in order to leave a healthy, vibrant outdoor legacy for generations to come. The proposed refuge serves the conservation initiative outlined by the AGO Initiative and one of the CPAs is also an AGO site. (For more information about the AGO Initiative, please visit: <http://americasgreatoutdoors.gov/>.)

For years, national wildlife refuges have been connecting children with the land and with the agencies' conservation mission. It is now apparent that such connections are of immense importance. New information shows that instead of being outdoors enjoying self discovery of wild things, most children spend their time indoors glued to their televisions, video games, computers, and cell phones, rather than experiencing nature. Author Richard Louv's (2005) book, Last Child in the Woods: Saving Our Children from Nature Deficit Disorder, documents this trend. In his book, Louv argues that increased urbanization, parental anxiety, residential development restrictions, and structured play have kept children inside rather than out (Louv 2005). This separation from the natural world can result in a host of physical and mental ailments Louv warns, from childhood obesity to Attention Deficit Hyperactivity Disorder, and can erode future support for conservation (Louv 2005). As the nation's primary conservation agency, the Service has a role in addressing this concern.

The Service would attempt to work with school districts and teachers to develop environmental education programs featuring unique species and communities of the proposed refuge and the Blue Ridge Mountains. The Service would work with the partners to promote environmental education, thereby maximizing the use of resources and time commitments for each partner organization. The Service would also consider the role of the proposed refuge in other potential opportunities such as small habitat restoration projects through the use of our Partners for Fish and Wildlife program, docent-led trail walks, birding festivals, guest lectures, youth hunting and fishing efforts, and even simple monitoring of various forms of wildlife on and off the refuge.

Important research and monitoring projects are already underway at several of the sites recommended for inclusion in the proposed refuge (e.g., hydrology study, bog turtle monitoring/research, and rare plant monitoring/research). These research projects are expected to continue and the Service would promote and support additional research that contributes to refuge goals and objectives, increases understanding of refuge resources, and/or facilitates resource management.

Goal 4. Promote Conservation Partnerships

Collaboration in science, education, and research would strengthen and develop partnerships with bog conservation organizations, private landowners, government agencies, and others to help inform land management decisions and encourage continued responsible stewardship of mountain bogs and other associated natural resources.

The Service is proposing a partnership approach to help protect mountain bogs within 13 counties in western North Carolina and eastern Tennessee. The Service would work with the public and private partners to restore and maintain key habitat connections throughout the landscape; restore and maintain native habitat for resident and migratory species; and promote and protect the historical, cultural, and active farming community in this area. This conservation effort would entail land acquisition and administration/operation of sites by some or all parties in the partnership. Most lands acquired by the Service would be included in the Mountain Bogs NWR; however, as appropriate, other acquired lands could be evaluated and proposed as coordination areas and administered/ managed by other partners. Some lands within the CPAs are already owned, administered, and managed by other partners, at least some of which is unlikely to be transferred to the Service, and these could also be evaluated and proposed as coordination areas where the Service could assist with management.

The Service is fortunate to already have strong partnerships in the bog conservation community. The proposed Mountain Bogs NWR would assist in strengthening these partnerships and creating new partnerships. The Service is currently working with The Nature Conservancy and other partners to

establish a Bog Learning Network modeled after the successful Fire Learning Network. This would promote collaboration efforts between partners, particularly in management. This network of bog managers and subject matter experts (e.g., hydrologists, biologists, ecologists) would share information and experiences and provide bog managers with the knowledge and resources they need to manage bogs in the best possible way for a diversity of species.

The importance of working with local landowners cannot be overstated. Without the stewardship of local landowners, the opportunity to conserve the multiple species and habitats found in this landscape would likely not exist today. A large percentage of remaining southern Appalachian bogs are on private lands. Neighbors of an established refuge could assist in buffering bogs, maintaining habitat on their own property and serving as eyes to watch for unlawful activities such as poaching. The Service would strive to work closely with and assist private landowners in their conservation efforts through our Partners for Fish and Wildlife program and through the work of other agencies and non-governmental organization conservation partners. This partnership approach to conserving the habitat and wildlife resources described above is a key to successfully meeting this goal and is fundamental to the philosophy of how the Service envisions the management of the proposed Mountain Bogs NWR.

ADMINISTRATION

Initially, the proposed refuge would be managed by the area supervisor for the Refuge System from the Service's Regional Office in Atlanta, Georgia, until funding for a refuge manager is identified. Once funding is identified and a refuge manager is hired, the new manager would report to the area supervisor. The proposed refuge may be managed as a stand-alone refuge or as part of a refuge complex. Generally, a stand-alone refuge has a dedicated staff and equipment and is managed locally. As part of a complex, the proposed Mountain Bogs NWR could likely have less on-site staff initially and would share staff and equipment with one or more other refuges. Sometimes, refuges initially are part of a complex, but as they grow in size and complexity, are then separated to become stand-alone refuges. Under the refuge complex scenario, the refuge staff of a sub-complex would have the responsibility for managing the newly established refuge. During the interim period, the Service would seek funding for refuge staff within the project boundary. Initially, staff would likely consist of a refuge manager, refuge biologist, and law enforcement officer. Other staff such as maintenance workers and visitor service specialists would be phased in over time. In the long term, the Service's Southeast Regional Office would evaluate the need for additional full-time staff based on management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff when justified. The ability to fill staff positions would depend on availability of funds and regional priorities.

Throughout the remainder of this document the reader will be introduced to several terms, including "compatibility" and "compatible uses." A "compatible use" is a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, would not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the proposed refuge. The refuge manager would not initiate or permit a new use of a national wildlife refuge or expand, renew, or extend an existing use of a national wildlife refuge unless it had been determined that the use was consistent with the mission of the Refuge System and the purposes of each specific refuge. Further, the same use may be deemed compatible on some refuges, but not on others due to refuge-specific differences. (See Appendix B for the interim compatibility determinations that outline the uses authorized to occur during the interim period between acquisition of a property and the development of appropriate management plan(s) for a particular property.)

Facilities

Because no actual lands have been acquired as of yet, it is difficult to discuss specifics of facilities and improvements that may be appropriate to effectively manage the proposed refuge. This document will discuss general approaches adopted elsewhere when establishing a new refuge, as well as unique partnership opportunities that may present themselves in this landscape. As such, the Service may opt for the listed facilities when and where compatible.

The proposed Mountain Bogs NWR would have good access via state and local roads. Existing access roads on acquired properties would be evaluated for use depending on access needs, presence of sensitive species and/or habitats, public use, and other potential future needs. Conversion of existing trails and farm roads to public use and/or refuge management access corridors may occur. Such roads may also be abandoned to limit access to sensitive habitats and protected species. Legal access to inholdings and homes would be maintained. Roads and trails may only be open during certain times of year, or may have other restrictions to protect wildlife resources or to provide access for visitor programs, such as hunting activities. Vehicle access to refuge resources would only be allowed on designated roads and trails.

Because of the potential wide geographic distribution of proposed refuge lands across this landscape, one or more facilities obtained through land acquisition may be converted to another use. Other potential future on-site improvements, including additional trails, improved access roads, observation platforms, photography blinds, and parking areas may be discussed in a future CCP. The construction of new facilities or conversion of existing structures is contingent upon availability of funds and acquisition of appropriate land. In the unlikely event facility construction, operation, or maintenance conflicts with the conservation of federally listed species, appropriate measures (e.g., buffers and seasonal restrictions) would be identified and implemented to avoid adverse effects. This would be done in consultation with the Service's Endangered Species Program.

Generally, public use areas would be open from dawn to dusk and habitat management areas would be closed to the public and others (except for emergency, fire, and police response). Special use permits would be issued to researchers, educational groups, and others on an as needed basis, provided that the activities would be compatible with refuge purposes, goals, and objectives and contribute to the ecological understanding, biological survey, or baseline data needs. Habitat management areas, although normally closed to public access, may at times be opened to meet refuge goals. Hunting, environmental education, and interpretive walks are some examples of activities that may be allowed in these areas.

Funding

We would maintain a current inventory of management needs in appropriate Service database(s) and update the associated costs and priorities annually. Those databases provide a mechanism for each unit of the Refuge System to identify its essential staffing, mission-critical projects, and major needs and form a realistic assessment of the funding needed to meet each refuge's goals, objectives, and strategies.

Since this refuge is only proposed and is not yet approved, no funding has been identified to support management activities and no budget has been developed and approved. Any funding for the proposed refuge would be dependent upon a variety of factors, including Southeast Region budget priorities and allocations.

Staffing

As mentioned above, the staffing situation on national wildlife refuges is based on a number of factors, including refuge size and complexity, proximity to other refuges, and funding. Based on these and other factors, the proposed refuge may be managed as a stand-alone refuge or as a unit of a refuge complex. A stand-alone refuge has a dedicated staff and equipment and is managed locally, whereas a unit of a complex of refuges would share staff and equipment with other refuge units. Typically, as new refuges are established, they operate as a unit of the complex until such time that sufficient land has been acquired to warrant a dedicated staff. At this time, it is difficult to delineate staffing specifics for the proposed refuge because of the uncertainties associated with its size, complexity, resource issues, funding, and other factors. Because of this uncertainty, two staffing models that depict both staffing scenarios have been evaluated to better illustrate how these variables interact to determine levels of staffing (see description below). These models may serve to guide how this proposed refuge may grow in staff over time. Initially, however, the proposed refuge would likely be managed as a unit under the supervision and management of the nearest refuge.

Refuge Complex Staffing Strategy

The initial staffing strategy for the proposed refuge under the refuge complex scenario identifies three new positions. A refuge manager would provide direction, supervision, and coordination for all management activities and ensure the effective oversight and community outreach for the successful management of acquisitions and easements. A law enforcement officer would ensure the safety of the visiting public and assure that wildlife laws are enforced to protect an ever-increasing federal interest. A biologist would assist in delivering the full range of wildlife conservation and restoration projects on public land, provide technical assistance, assist in the restoration and management of new acquisitions, and monitor and inventory wildlife and habitat use and conditions. All other refuge functions, such as law enforcement, outreach, or prescribed fire, would be provided by the overlying refuge complex staff.

Refuge Stand-alone Staffing Strategy

As refuge lands would be acquired, an independent, stand-alone refuge staff would build upon the refuge complex staffing strategy. An administrative office assistant would also be required to handle an increasing budget and work load. A visitor services staff (park ranger) would provide the needed link with local community educational institutions for wildlife-dependent education and oversee plans for any public use activities, such as the implementation of a hunting program. A maintenance worker would assure that management projects are completed, such as invasive species control, mowing, maintaining fence, and other general maintenance activities. An assistant refuge manager and private lands program biologist would be hired. Additionally, collaborative staffing, such as a co-located multi-agency/organization visitor services facility and program, would also be under the direction of the refuge manager. In the long term, the Service's Southeast Regional Office would evaluate the need for additional full-time staff based on management needs, project loads, public use activities, and other factors, and could move forward with providing additional staff, if justified.

PARTNERSHIPS

Partnerships would be a vital component of the proposed Mountain Bogs NWR. The Service is fortunate to already have strong partnerships with the bog conservation community and we would utilize these and establish new partnerships to assist with the administration of this proposed refuge. Examples of partnership activities include management, law enforcement, and monitoring. The Service would work with the refuge zone officer to establish formal, cooperative agreements with local

law enforcement agencies, the county sheriffs' departments, and NCWRC/TWRA to assist with protection and appropriate law enforcement response for the proposed refuge. Conservation law enforcement personnel from the Service and NCWRC/TWRA would also likely patrol intermittently and monitor hunting, fishing, and other public use activities. There may also be the opportunity to work with state agencies to identify and manage lands that the Service might acquire as game lands in North Carolina or wildlife management areas in Tennessee.

We recognize the inability of any one organization to solve the problems of habitat fragmentation and land acquisition. Therefore, we would work to combine our efforts with those of many partners including NCWRC, North Carolina Plant Protection Program, The Nature Conservancy, area land trusts, North Carolina Natural Heritage Program, Project Bog Turtle, USDA Forest Service, National Park Service, as well as numerous other partners yet to be identified. Staff would also look for opportunities to work with farmers and other landowners to manage the land in ways that benefit the goals and interests of the refuge and its neighbors.

MANAGEMENT OF MOUNTAIN BOGS NATIONAL WILDLIFE REFUGE

The previously listed goals are intentionally broad, descriptive statements of the desired resource condition of proposed refuge land in the Blue Ridge Mountain area. They were developed to support the proposed refuge purposes, and the proposed vision statement. They provide general, interim management direction for a new refuge until a considerably more detailed comprehensive conservation plan is developed and approved.

Goals are descriptive, open-ended, and broad statements of desired future conditions. More descriptive statements related to the goals are termed objectives. Objective statements contain the distinctive characteristics of being specific, measurable, achievable, realistic, and time sensitive. The following organizes goal statements with their respective objectives, and provides the rationale used in their development. The listed objectives would be revisited and revised during the planning process to develop a comprehensive conservation plan, if the refuge were to be approved.

Goal 1. Protect, Restore, and Manage Habitats for Fish and Wildlife. The proposed Mountain Bogs NWR would conserve rare mountain bog habitat and associated species as well as adjacent upland habitats. The proposed refuge would aid in the recovery of 13 federally listed species and one candidate species and benefit many other state listed and imperiled species, including migratory birds and southern Appalachian brook trout.

Objectives:

- Complete baseline inventory and document degraded and high-quality habitat necessary for trust species on all refuge and easement lands within 10 years of acquisition.
- Create a restoration management plan for the restoration of bog hydrology and vegetation for each bog on refuge or easement lands within 5 years of acquisition.
- Initiate restoration and management activities (e.g., plugging ditches that drain portions of bog sites, eradicating nonnative invasive vegetation, setting back succession by removing native woody vegetation) within 5 years of refuge establishment.
- Where appropriate, create (if not already present) a forested buffer around bog sites to protect sites from pesticide drift, runoff containing nutrients, and nonnative invasive plants within 5 years of refuge establishment.
- Protect and manage the only extant North Carolina population of the federally endangered green pitcher plant (*Sarracenia oreophila*).

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- Protect four North Carolina colonies (three populations) of the federally endangered bunched arrowhead (*Sagittaria fasciculata*).
 - Protect five of five extant North Carolina populations of the federally endangered mountain sweet pitcher plant (*Sarracenia jonesii*).
 - Protect six of ten extant North Carolina populations of the federally threatened swamp pink (*Helonias bullata*).
 - Protect one of nine geographic recovery areas for the federally endangered Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*).
 - Protect one population of the federally endangered rock gnome lichen (*Gymnoderna lineare*).
 - Protect 15 North Carolina and Tennessee populations of the federally threatened bog turtle (*Glyptemys muhlenbergii*).
 - Protect one extant North Carolina population of the federally threatened small whorled pogonia (*Isotria medeoloides*).
 - Protect one extant North Carolina population of the federally threatened Virginia spirea (*Spirea virginiana*).
 - Protect one extant North Carolina population of the federally endangered spreading avens (*Geum radiatum*).
 - Implement activities to protect rare species from poaching on refuge lands as soon as the refuge is established.
 - Where surveys are needed, work with partners to inventory and monitor species of concern.

Rationale:

Although the existing conservation lands are well-surveyed, we have not documented the quality of all available habitats on all proposed CPAs. Much of what is known of wetland restoration potential on private land is derived from aerial photography. As properties come into ownership, initial evaluations would be required to document restoration opportunities and design restoration activities.

Many southern Appalachian Mountain bogs have been degraded by landowners draining the bogs or through the construction of dams which turn the bogs into ponds or lakes. The initiation of restoration activities would take the history of the site into account when making management decisions.

Vegetation succession is a significant threat to the bog sites remaining in the southern Appalachian Mountains. Historical disturbance regimes (e.g., grazing, browsing, beaver activity, fire) have been eliminated or reduced across the landscape. Bog wetlands may have been maintained by Pleistocene herbivores in the distant past and by American elk and bison prior to the 18th century when they were extirpated from eastern North America. Setting back succession in bogs through the removal of woody vegetation would reduce evapotranspiration within the system, leading to an increase in soil saturation. Some tools for managing woody wetland vegetation would be through fire, the introduction of grazers and browsers, and the mechanical and chemical removal of woody vegetation.

Goal 2. Provide Landscape-Level Conservation. The proposed Mountain Bogs NWR, which would be within the Appalachian Landscape Conservation Cooperative, would contribute to a more connected and functional conservation landscape by reducing habitat fragmentation, and protecting and restoring a network of exceptionally rare wetland types and their surrounding landscapes. This proposed refuge would also protect and enhance water quality and quantity within multiple watersheds, benefiting both humans and wildlife.

Objectives:

- Work with the Appalachian Landscape Conservation Cooperative (LCC), within which the proposed refuge would occur, to develop a plan for the refuge that would coincide with the Appalachian LCC's landscape scale goals within 2 years of refuge establishment.
- Create a watershed management plan that would address nonpoint source pollution and the restoration of water quantity for each CPA on refuge or easement lands within 5 years of acquisition.
- Create a public outreach and education plan to reduce nonpoint source pollution and encourage voluntary landowner action to restore and protect surrounding hydrology within 5 years of refuge establishment.
- Initiate a public outreach and education plan to reduce nonpoint source pollution and encourage voluntary landowner action to restore and protect surrounding hydrology within 2 years of refuge establishment.
- Create (if not already present) a forested buffer within the proposed refuge and easement land located along the streams that connect bog sites within 5 years.
- Work to conserve a minimum of one corridor for wildlife movement between bogs within 5 years of refuge establishment, with particular emphasis on the bog turtle where metapopulations are likely to exist.

Rationale:

The Appalachian LCC is a science and management partnership to protect the valued resources and biological diversity of the Appalachian region, sustain the benefits provided by healthy and resilient ecosystems to human communities, and help natural systems adapt to large landscape-level stressors and those stressors that may be magnified by the changing climate.

Within the bog watershed, protection of water quality and quantity is essential to long-term conservation of these sites. Watershed management for the bog sites should address public outreach and education to reduce nonpoint source pollution and encourage voluntary landowner action to restore and protect water quantity (e.g., rain gardens, rain barrels, using native vegetation in landscaping, construction of green roofs on buildings, water conservation, and a reduction in impervious cover).

A riparian buffer along the streams that connect bog sites would serve as habitat for wildlife as well as corridors for species that have had their habitat fragmented by various land uses.

Goal 3. Connect People with Nature. Visitors of all abilities to the proposed Mountain Bogs NWR would enjoy opportunities for compatible hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while increasing knowledge of and support for conservation of southern Appalachian Mountain bogs.

Objectives:

- Within 2 years of any land acquisition, identify up to two sites appropriate for outdoor recreation and education programs and initiate development of facilities to engage the public in these activities if needed/appropriate.
- Within 3 years of refuge establishment, develop step-down management plans to address all aspects of outdoor wildlife-dependent recreation identified in the interim compatibility determinations.

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- Develop opportunities for volunteer involvement in refuge management and outreach efforts within 3 years of refuge establishment
 - Work with school districts and teachers to develop an environmental education program featuring unique species or communities within 5 years of refuge establishment.

Rationale:

Public use opportunities contribute to the long-term protection of wildlife resources by promoting understanding, appreciation, and support for wildlife conservation. Public uses would be accommodated where they do not have a significant negative impact on wildlife. All proposed public use activities are contingent upon availability of staff and funding to develop and implement these programs. We would promote opportunities for volunteers and develop community appreciation and public support for the proposed refuge. We would work with school districts and teachers to develop an environmental education program which would feature unique species or communities. We would open any newly acquired lands for hunting if they can biologically, ecologically, and safely accommodate hunting within state guidelines.

Goal 4. Promote Conservation Partnerships. Collaboration in science, education, and research would strengthen and develop partnerships with bog conservation organizations, private landowners, government agencies, and others to help inform land management decisions and encourage continued responsible stewardship of mountain bogs and other associated natural resources.

Objectives:

- Develop a Bog Learning Network within 5 years of refuge establishment where researchers, educators, and managers can share resources and information about southern Appalachian bog management and research.
- Reach out to neighboring private landowners within one year of land acquisition to educate the landowners about the ecosystem and what they can do to assist with conservation and management activities, as well as to allow for better communication between the Service and neighboring landowners.

Rationale:

The Service is working with partners to establish the Bog Learning Network, with the goal of providing southern Appalachian Mountain bog managers with the knowledge and resources they need to do the best possible job at managing their bogs. The network would bring together bog managers with subject matter experts, such as hydrologists, biologists, and ecologists, once a year to address a particular management issue. Beyond this annual meeting, the intention is that bog managers would form a community to support each other in their approach to the management topic at hand. Additionally, the subject matter experts would make themselves available to the bog managers as questions and issues arise.

Acquisition Management

Protection of lands would be accomplished by targeting 23,478 acres in fee-title interest or conservation easements within the 42,250-acre CPA. The reader is referred to Section A for more specific details regarding the Service's land acquisition program.

Public Use Management

The initial decision-making process a refuge manager follows when first considering whether or not to allow a proposed use on a refuge involves an evaluation of the appropriateness of a given activity on a national wildlife refuge. The refuge manager must find a use to be appropriate before undertaking a compatibility review of the use. If a proposed use is not found to be appropriate, the refuge would not allow the use and would not prepare a compatibility determination. By screening out proposed uses that are not appropriate to the refuge, the refuge manager avoids unnecessary compatibility reviews. By following the process for finding the appropriateness of a use, we strengthen and fulfill the Refuge System mission. The collection of interim appropriateness reviews for this proposed project can be found in Appendix B.

The Improvement Act establishes six priority public uses on refuges. Those priority uses depend on the presence, or the expectation of the presence, of wildlife. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. A seventh use, research, would be evaluated for appropriateness and compatibility. Although these priority uses must receive our consideration in planning for public use, they also must be compatible with the purposes for which a refuge is established and the mission of the Refuge System. Compatibility determinations, which evaluate the impacts of a use that has been determined to be appropriate in the context of species or habitats, aid in making those decisions. As lands are acquired for the proposed Mountain Bogs NWR, compatibility determinations would be used to decide what public use opportunities are compatible and can be permitted. The interim compatibility determinations for these priority public uses, which would allow existing uses to continue until such time that a more comprehensive management plan is developed, can be found in Appendix B.

Table 1. Interim public uses

Public Use Activity	Would this use be provided during the interim phase?
Hunting	Yes, but limited by available hunting areas and potentially by wildlife management area restrictions.
Fishing	Yes, but limited by available fishing areas and potentially by wildlife management area restrictions.
Environmental Education	Yes, but limited due to refuge staffing, partnership development, and refuge facilities.
Interpretation	Yes, but limited due to refuge staffing, partnership development, and refuge facilities.
Wildlife Observation	Yes, but limited due to refuge staffing, partnership development, and refuge facilities.
Wildlife Photography	Yes, but limited due to refuge staffing, partnership development, and refuge facilities.
Research	Yes, but limited due to refuge staffing, partnership development, and refuge facilities.

Hunting

Hunting is a popular and traditional activity for many residents of and visitors to the AOI. Hunting on private lands within the AOI is typically limited to those with hunting leases or reserved by family members for their own hunting activities, thus largely limiting public hunting access. Select and appropriate lands that become part of the refuge would likely be open for public hunting as part of the gamelands/wildlife management area program administered by NCWRC/TWRA. Once an adequate, manageable land base is acquired, the Service would conduct a more detailed hunt program beyond the initial interim effort. Beyond the interim compatibility determinations, the Service would work with partners and the public to develop long-term plans to provide opportunities for hunting on the proposed Mountain Bogs NWR.

Fishing

The cold mountain waters of the southern Appalachians support several fisheries including an important trout fishery. The Service, likely working through programs administered by NCWRC/TWRA, would provide fishing opportunities compatible with the reasons for which the proposed refuge would be established. The Service would work with partners and the public to develop long-term plans to evaluate and provide opportunities for fishing on the proposed Mountain Bogs NWR.

Environmental Education

The Service would work with local schools and conservation groups to create environmental education opportunities. Until a detailed visitor services plan is written and based on the interim compatibility determination, environmental education would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land. The Service would work with partners and the public to develop long-term plans to provide opportunities for environmental education on the proposed Mountain Bogs NWR.

Interpretation

The Service would work with local schools and conservation groups to create interpretation opportunities. Until a detailed visitor services plan is written, and based on the interim compatibility determination, interpretation would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land. The Service would work with partners and the public to develop long-term plans to provide opportunities for interpretation on the proposed Mountain Bogs NWR.

Wildlife Observation

The southern Appalachian Mountains provide a wealth of opportunities for wildlife observation; however, safe viewing opportunities are limited by state and county roads that do not provide adequate pull-offs. Until such time as better wildlife observation opportunities can be provided and a detailed visitor services plan can be written, and based on the interim compatibility determinations, wildlife observation would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land. Beyond the interim compatibility determinations, the Service would work with partners and the public to develop long-term plans to provide opportunities for wildlife observation on the proposed Mountain Bogs NWR.

Wildlife Photography

Until such time as better wildlife photography opportunities can be provided and a detailed public use plan can be written, and based on the interim compatibility determination, wildlife photography would be allowed to continue on an interim basis on parcels acquired by the Service at the same level of activity that existed prior to Service acquisition of the land. Beyond the interim compatibility determinations, the Service would work with partners and the public to develop long-term plans to provide opportunities for photography on the proposed Mountain Bogs NWR.

Research

The refuge would likely host research from a variety of research institutions, including various universities, Native American tribes, and private research groups. All research activities, whether conducted by governmental agencies, public research entities, universities, private research groups, or any other entity, would be required to obtain special use permits from the refuge. Where any of the priority public uses may conflict with the conservation of federally listed threatened and/or endangered species, appropriate measures would be identified and implemented to avoid adverse effects. This would be done in consultation with the Service's Endangered Species program. Additionally, research use must pass the same standards of appropriateness, compatibility, and planning.

Operations and Planning

Refuges are managed according to an annual work plan that summarizes goals and objectives for the upcoming year. Specific actions for on the ground work, such as operation procedures, wildlife inventory plans, habitat management actions, public use, and other management activities are covered in detail in specific management plans. An annual work plan may generally state, for example, that 1,000 acres of invasive plant species would be controlled on the refuge, thus setting a target and goal for invasive species, control methods, timing of control, monitoring of effectiveness of the application, retreating areas, monitoring, and other actions for the year. Long-term planning, outlined earlier, includes the preparation of a CCP. A CCP describes the desired future conditions of a refuge and provides long-range guidance and management direction to achieve its purposes.

Conclusion

Should the proposal for the Mountain Bogs NWR go forward, the Service would work towards achieving the overarching goals outlined in this Draft LPP/EA. Partnerships with landowners; neighbors; conservation organizations; and local, state, tribal, and other federal government agencies would be a crucial component of the proposed Mountain Bogs NWR.

REFERENCES

- Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979.** Classification of wetlands and deep-water habitats of the United States. Fish and Wildlife Service, U.S. Department of the Interior, FWS/OBS-79-31.
- Hunter, Chuck, Robert Katz, David Pashley, and Bob Ford. 1999.** Partners in Flight Bird Conservation Plan for The Southern Blue Ridge (Physiographic Area 23). Atlanta, GA.
- Murdock, N.A. 1994.** Rare and endangered plants and animals of the southern Appalachian wetlands. *Water, Air and Soil Pollution* 77: 385-405.
- North Carolina Wildlife Resources Commission. 2005.** North Carolina Wildlife Action Plan. Raleigh, NC.
- Noss, R.F., E.T. LaRoe III, and J.M. Scott. 1995.** Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. Biological Report 28, USDI national Biological Service, Washington, D.C., USA.
- Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustray, J.S. Wendt, T.C. Will. 2004.** Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.
- Roth, A.M., R.W. Rohrbaugh, T. Will, and D.A. Buehler, editors. 2012.** Golden-winged Warbler Status Review and Conservation Plan.
- Schafale, M. P. and A. S. Weakley. 1990.** The Classification of Natural Communities of North Carolina. Third Approximation. North Carolina Natural Heritage Program, Raleigh, NC.
- Somers, A.B., K.A. Bridle, D.W. Herman and A.B. Nelson. 2000.** The Restoration & Management of Small Wetlands of the Mountains & Piedmont in the Southeast: A Manual Emphasizing Endangered & Threatened Species Habitat with a Focus on Bog Turtles. The Watershed Science and Wetland Science Institutes of the Natural Resources Conservation Service, the University of North Carolina at Greensboro, and the Pilot View Resource Conservation and Development, Inc.
- Tennessee Wildlife Resources Agency. 2005.** Tennessee's Comprehensive Wildlife Conservation Strategy. Nashville, TN.
- U.S. Fish and Wildlife Service. 1983.** Bunched Arrowhead Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, GA. 37 pp.
- U.S. Fish and Wildlife Service. 1984.** A Recovery Plan for the Ozark Big-eared bat and the Virginia Big-eared bat. Fort Snelling, MN. 119pp.
- U.S. Fish and Wildlife Service. 1990.** Appalachian Northern Flying Squirrels (*Glaucomys sabrinus fuscus* and *Glaucomys sabrinus coloratus*) Recovery Plan. Newton Corner, MA. 53pp.

U.S. Fish and Wildlife Service. 1990. Mountain Sweet Pitcher Plant Recovery Plan. Atlanta, GA. 39 pp.

U.S. Fish and Wildlife Service. 1991. Swamp Pink (*Helonias bullata*) Recovery Plan. Newton Corner, MA. 56 pp.

U.S. Fish and Wildlife Service. 1994. Green Pitcher Plant Recovery Plan. U.S. Fish and Wildlife Service, Jackson, MS. 23 pp.

U.S. Fish and Wildlife Service. 1996. Roan Mountain Bluet Recovery Plan. Atlanta, GA. 46 pp.

U.S. Fish and Wildlife Service. 1997. Recovery Plan for Rock Gnome Lichen (*Gymnoderma lineare*) (Evans) Yoshimura and Sharp. Atlanta, GA. 30 pp.

U.S. Fish and Wildlife Service. 1999. Recovery Plan for *Liatris helleri* Porter (Heller's Blazing Star). First Revision. Atlanta, GA. 25 pp.

Weakley, A.S. and Schafale, M.P. 1994. Non-alluvial wetlands of the southern Blue Ridge - diversity in a threatened ecosystem. *Water, Air, and Soil Pollution* 77, 359-383.

Appendix B. Interim Appropriateness Findings and Interim Compatibility Determinations

APPROPRIATE USE FINDINGS

An appropriate use finding is the initial decision-making process a refuge manager follows when considering whether to allow a proposed use on a refuge. An interim appropriate determination is used between when land is first acquired and until such time, no later than 15 years, when either a comprehensive conservation plan or step down management plan is developed. The refuge manager must find that a use is appropriate before undertaking a compatibility review of the use. This process clarifies and expands on the compatibility determination process by describing when refuge managers should deny a proposed use without determining compatibility. If a proposed use is not appropriate, it will not be allowed and a compatibility determination will not be undertaken.

Except for the uses noted below, the refuge manager must decide if a new or existing use is an appropriate refuge use. If an existing use is not appropriate, the refuge manager will eliminate or modify the use as expeditiously as practicable. If a new use is not appropriate, the refuge manager will deny the use without determining compatibility. Uses that have been administratively determined to be appropriate are:

- Six wildlife-dependent recreational uses - As defined by the National Wildlife Refuge System Improvement Act of 1997, the six wildlife-dependent recreational uses (i.e., hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation) are determined to be generally appropriate for refuges. However, a refuge manager must still determine if these uses are compatible on a particular refuge.
- Take of fish and wildlife under state regulations - States have regulations concerning the take of wildlife that includes hunting, fishing, and trapping. The Service considers take of wildlife under such regulations appropriate. However, the refuge manager must determine if the activity is compatible before allowing it on a refuge.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: **Proposed Mountain Bogs National Wildlife Refuge**

Use: **Research**

This form is not required for wildlife-dependent recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	✓	
(c) Is the use consistent with applicable executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ["no" to (a)], there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ["no" to (b), (c), or (d)] may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. **Yes** ✓ **No** ___

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate _____

Appropriate ✓

Refuge Manager: _____

Date: _____

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use. If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence. If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

COMPATIBILITY DETERMINATIONS

Introduction: The U.S. Fish and Wildlife Service reviewed several uses for compatibility during the development of the proposal to establish the Mountain Bogs NWR. The descriptions, anticipated impacts, and approval of each use are addressed separately. These interim compatibility determinations are used during the time period when land is first acquired and continuing until such time, no later than 15 years, when a comprehensive conservation plan and/or when an appropriate step-down management plan is/are developed, so that public use activities can occur during this interim. If the proposal were to be approved and during the acquisition of a particular property, the Service would develop an understanding of the types, conditions, and levels of use that previously occurred on that property to determine which uses would continue to occur under these interim compatibility determinations.

Uses: Several uses were evaluated to determine their compatibility with the mission of the National Wildlife Refuge System and the purposes of the proposed refuge: hunting, fishing, environmental education and interpretation, wildlife observation and photography, and research.

Proposed Refuge Name: Mountain Bogs NWR

Date Established: Currently Proposed

Establishing and Acquisition Authorities:

Endangered Species Act of 1973 (16 U.S.C. 1534, Endangered Species Act)
National Wildlife Refuge System Improvement Act of 1997 [16 U.S.C. 668dd (a)(2), National Wildlife Refuge System Administration Act of 1966]

Proposed Refuge Purposes:

"conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans" 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act of 1966).

"to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants" 16 U.S.C. 1534 (Endangered Species Act of 1973)

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

"for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude" 16 U.S.C. 742f (b)(1), "for the development, advancement, management, conservation, and protection of fish and wildlife resources" 16 U.S.C. 742f(a)(4), (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956).

"suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened specie" 16 U.S.C. 460k-1. "the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors" 16 U.S.C. 460k-2 [Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended].

National Wildlife Refuge System Mission: The mission of the System, as defined by the National Wildlife Refuge System Improvement Act of 1997, is:

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

Other Applicable Laws, Regulations, and Policies:

- Antiquities Act of 1906 (34 Stat. 225)
- Migratory Bird Treaty Act of 1918 (15 U.S.C. 703-711; 40 Stat. 755)
- Migratory Bird Conservation Act of 1929 (16 U.S.C. 715r; 45 Stat. 1222)
- Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-178h; 48 Stat. 451)
- Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
- Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat.1119)
- Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4; 76 Stat. 653)
- Wilderness Act of 1964 (16 U.S.C. 1131-1136; 78 Stat. 890)
- Land and Water Conservation Fund Act of 1964
- National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.; 80 Stat. 915)
- National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd, 668ee; 80 Stat. 927)
- National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq; 83 Stat. 852)
- Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 10989)
- Endangered Species Act of 1973 (16 U.S.C. 1531 et seq; 87 Stat. 884)
- Refuge Revenue Sharing Act of 1935, as amended in 1978 (16 U.S.C. 715s; 92 Stat. 1319)
- The Property Clause of the U.S. Constitution Article IV 3, Clause 2
- The Commerce Clause of the U.S. Constitution Article 1, Section 8
- The National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, U.S.C.668dd)
- Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System, March 25, 1996

Definitions:

Appropriate Use - A proposed or existing use on a refuge that meets at least one of the listed four following conditions:

1. The use is a wildlife-dependent recreational use as identified in the Improvement Act.
2. The use contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.
3. The use involves the take of fish and wildlife under state regulations.
4. The use has been found to be appropriate as specified in 603 FW 1 1.11.

Native American - American Indians in the conterminous United States and Alaska Natives (including Aleuts, Eskimos, and Indians) who are members of federally recognized tribes.

Priority General Public Use - A compatible wildlife-dependent recreational use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Quality - The criteria used to determine a quality recreational experience include:

- Promotes safety of participants, other visitors, and facilities.
- Promotes compliance with applicable laws and regulations and responsible behavior.
- Minimizes or eliminates conflicts with fish and wildlife population or habitat goals or objectives in a plan approved after 1997.
- Minimizes or eliminates conflicts with other compatible wildlife-dependent recreation.
- Minimizes conflicts with neighboring landowners.
- Promotes accessibility and availability to a broad spectrum of the American people.
- Promotes resource stewardship and conservation.
- Promotes public understanding and increases public appreciation of America's natural resources and the Service's role in managing and protecting these resources.
- Provides reliable/reasonable opportunities to experience wildlife.
- Uses facilities that are accessible and blend into the natural setting.
- Uses visitor satisfaction to help define and evaluate programs.

Wildlife-Dependent Recreational Use - As defined by the Improvement Act, a use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

Compatibility Determinations for the Proposed Refuge:

Compatibility determinations for each use listed were considered separately. Although the preceding sections from "Uses" through "Definitions" and the final signatures are only written once within the plan, they are part of each descriptive use and become part of each compatibility determination.

Description of Use: Hunting (big game, upland game, and waterfowl)

This pre-acquisition compatibility determination serves as our commitment to allow hunting activities, where possible, on lands that would be acquired by the Service, should the refuge proposal go forward.

Hunting is a traditional use in this landscape. Hunting has been identified as a priority wildlife-dependent activity under the Improvement Act. With the implementation of the Land Protection Plan, the Service, in cooperation with the state, would take the steps necessary (e.g., develop needed regulations and publish the appropriate *Federal Register* notice) to open the refuge to upland hunting for deer, feral hog, turkey, waterfowl, and other small game in accordance with state regulations. Hunting may consist of refuge-sponsored sponsored or State-managed Game Land (in North Carolina) and Wildlife Management Area (in Tennessee) hunts. Any or all hunt programs may be administered as part of the State Wildlife Management Area program and would be in accordance with state regulations.

Availability of Resources: The cost of administering a hunt program is unknown at this time, but revenue may be generated from fees collected from hunters. Refuge law enforcement, public use, administrative, managerial, and biological staff may allocate a portion of their time to support this program (e.g., with existing staff from existing refuges). Maintenance of roads and potential building of hunt check stations also are costs that could be absorbed within the refuge operating budget. There is the potential for the Service to partner with the North Carolina Wildlife Resources Commission (NCWRC) and the Tennessee Wildlife Resources Agency (TWRA) to share responsibilities of administering the hunt program as part of the State's Wildlife Management Area program or through some similar management agreement.

Anticipated Impacts of the Use: By policy, all activity addressed by this interim compatibility determination would not exceed the current use occurring on the land. Therefore there would be no additional anticipated impacts. Existing impacts would be identified and evaluated based on best professional judgment and published scientific papers. Many of the impacts associated with small game hunting are similar to those considered for other public use activities, such as waterfowl hunting and wildlife viewing and photography, with the exception of direct mortality to game species, short-term changes in the distribution and abundance of game species, and unrestricted travel through the hunt area. Direct mortality can impact isolated, resident game species populations by reducing breeding populations to a point where the isolated population can no longer be sustained. This can result in localized extirpation of isolated populations. The structure and length of hunt seasons can minimize or eliminate these anticipated impacts.

Removal of feral hogs on proposed refuge lands would help support NCWRC's/TWRA's statewide eradication efforts. The harvest of feral hogs on the refuge may have a beneficial impact to native wildlife and habitat, since hogs compete for mast; destroy native plants; and prey upon bird nests, small vertebrates, and invertebrates. Deer hunting can maintain herd size and sex ratios at a healthy population level commensurate with available habitat. Spring turkey hunting can disrupt nesting. Impacts of recreational small game hunting include harvest of target species, such as gray squirrels, rabbits, and raccoons. In addition to the harvest of legal game, killing of non-target species, such as snakes, is known to occur. Other impacts of hunting may include littering, disturbing wildlife, trampling vegetation, and removing dead/down wood.

Determination (check one below):

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Hunting would be in accordance with applicable state regulations and would not exceed the scope of current hunting activity until such time as a refuge Hunt Plan or CCP is developed. Hunting would avoid sensitive sites and threatened or endangered wildlife and plant populations (establishing buffer zones that minimize disturbance around sensitive areas and establishing no-entry zones during refuge approved events and opportunities would help minimize impacts). Hunting programs may be administered as a State-managed Wildlife Management Area unit or a refuge-sponsored management program. For all hunts, weapon restrictions would be in accordance with NCWRC/TWRA regulations. Vehicles would be restricted to existing designated roads and trails. All-terrain vehicle use may be allowed for access along designated roads and trails. Camping may be allowed to access remote areas during the hunting season. All hunts would be designed in cooperation with state biologists and managers to provide quality user opportunities based upon estimated wildlife population levels and biological parameters. Hunt season dates and bag limits would be adjusted to meet current hunter densities and activities, and may be adjusted as needed to achieve balanced population levels within carrying capacities, regardless of impacts to user opportunities. As additional data are collected and a Hunt Plan or CCP is developed, additional refuge-specific regulations or changes to the game lands and/or wildlife management areas could be implemented. These refuge-specific regulations could include, but may not be limited to, season dates that differ from those in surrounding state zones; refuge permit requirements; and closed areas on a permanent or seasonal basis to reduce disturbance to specific wildlife species or habitats, such as bird rookeries, wintering waterfowl, or threatened or endangered species, as well as to provide for public safety.

Justification: Under the Improvement Act, hunting is a priority public use. Hunting is an acceptable form of wildlife-dependent recreation compatible with the purposes for which the refuge would be established. The harvest of surplus animals is one tool used to maintain wildlife populations at a level compatible with habitat. Overabundance of animals, such as hogs and deer, can have detrimental impacts to native habitats. In addition to recreational opportunities, hunting to control populations of feral hogs and deer would be beneficial to native species and habitats, and would therefore be considered compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:

Description of Use: Fishing

This pre-acquisition compatibility determination serves as our commitment to allow fishing activities, where possible, on lands that would be acquired by the Service, should the refuge proposal go forward.

Fishing is a traditional use in this landscape. Fishing has been identified as a priority wildlife-dependent activity under the Improvement Act and is a traditional use on refuges. Recreational freshwater fishing may be allowed on refuge lakes, rivers, and/or ponds. The refuge would not have jurisdiction over state navigable waters, thus boating and access to navigable waters would continue according to state regulations. There may be the potential for visitors to fish from the banks of the refuge or by boat. This wildlife-dependent recreational use is supported by boating; therefore, boating impacts which are associated with fishing are also considered in this review. Boating activities support fishing. The Service would work with the TWRA, NCWRC, and others to develop an understanding of fishing activities for a particular site during the acquisition process.

Availability of Resources:

The cost of administering a fishing program is unknown, but revenue may be generated from potential access fees. Refuge law enforcement, public use, administrative, managerial, and biological staff may allocate a portion of their time to this program (e.g., with existing staff from existing refuges).

Anticipated Impacts of the Use:

The primary impacts of this use are disturbance to and the taking of non-target wildlife species, vandalism (e.g., removal of stoplogs from water control structures), littering, and habitat disturbance (e.g., trampling of bank vegetation). Some wildlife may be injured or killed by discarded fishing lines and hooks.

Determination (check one below):

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Fishing within state navigable waters would continue. Fishing would adhere to state fishing laws and regulations should help maintain fish populations at a healthy, sustainable level. Fishing programs may be administered as a component of a State-managed Wildlife Management Area unit or a refuge-sponsored management program.

Justification:

Fishing is a priority public use under the Improvement Act and a wildlife-dependent activity that would be compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:*Description of Uses: Environmental Education and Interpretation*

This pre-acquisition compatibility determination serves as our commitment to allow environmental education and interpretation activities, where possible, on lands that would be acquired by the Service, should the refuge proposal go forward.

Formal and informal environmental education and interpretation continue to occur in this landscape. Environmental education and interpretation comprise a variety of activities and facilities that seek to increase the public's knowledge and understanding of wildlife and to promote wildlife conservation. These are tools used to inform the public of resource values and issues. Examples of environmental education activities include staff or teacher-led events, student and teacher workshops, and nature studies. Interpretive programs and facilities could include special events, visitor center displays, interpretive trails, visitor contact stations, auto tour routes, and signs.

Environmental education and interpretation consist primarily of youth and adult education and interpretation of the natural resources of the refuge. Activities may include on-site refuge-led or refuge-approved environmental education programs; teacher workshops; and interpretation of wildlife, habitat, other natural features, and/or management activities occurring on the refuge. These activities seek to increase the public's knowledge and understanding of wildlife and their habitats and to contribute to wildlife conservation and support of the refuge. Environmental education and interpretation were identified in the Improvement Act as priority public uses on national wildlife refuges, provided they are appropriate and compatible with the purposes for which the refuge was established.

Environmental education and interpretation programs may be conducted by the Service or by a Service-approved provider. Any non-Service environmental education and interpretation activities must be reviewed and approved by the Service through a special use permit issued by the refuge. These permits would contain conditions to minimize impacts and ensure compatibility. The Service would work with the local schools and others to develop an understanding of existing environmental education and interpretation activities for particular sites during the acquisition process.

Availability of Resources:

Annual refuge operation and maintenance funds provided for the refuge would be used to support the visitor services programs, including environmental education and interpretation opportunities, during planned programs and events.

Facilities, such as visitor centers, trails, and environmental education shelters would require funding to build and staff to maintain them, but they are a necessary expense to carry-out the refuge's mission. The management of a volunteer program would be essential to implement environmental education and interpretation programs.

Anticipated Impacts of the Use:

Disturbance promulgated by refuge specific, limited programs, managed through and with direct oversight by refuge or refuge-approved members would be considered short-term and discrete disturbances due to the low anticipated frequency of use; the utility of existing infrastructure, such as fire lines and unimproved access roads; and the ability to move sites to new areas if the habitat shows signs of impact. It is anticipated that by utilizing existing resources and guiding all aspects of use, vegetation trampling, alteration of structure and species composition, and temporal wildlife impacts to species would be minimal. The minimal impact associated with conducting limited environmental educational and interpretation programs is generally determined to be acceptable. Specific sites would be evaluated on a case-by-case basis following acquisition.

The use of the refuge for on-site, hands-on, action-oriented activities by large groups to accomplish environmental education objectives may impose low-level impacts on the sites used for the activities. Impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate use area. Such impacts would not be permanent or long-lasting. Most of the interpretive activities would be self-guiding and would pose minimal threat to wildlife and habitat.

Determination (check one below):

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

While the anticipated impacts are expected to be minimal, stipulations are required to ensure that wildlife resources are adequately protected. The environmental education program and interpretation activities would avoid sensitive sites and vulnerable wildlife and plant populations. Environmental education and interpretation programs and activities would be held and conducted at or near disturbed areas, including, but not limited to fire lines and unimproved access roads where impacts can be minimized.

Activities would be held on sites where minimal impact would occur. Establishing buffer zones that minimize disturbance around sensitive areas and establishing no-entry zones during refuge-approved events and opportunities would help minimize impacts. Periodic evaluation of the sites and programs would be conducted to assess whether the program objectives are being met and whether resources are being degraded. If adverse impacts become evident, environmental education and interpretation activities may need to be rotated or moved. Certain areas of the refuge may be restricted seasonally for breeding or nesting purposes or to protect habitat.

As long as stipulations to ensure compatibility are followed, the programs should remain compatible with the purposes of the proposed refuge. The refuge would modify or eliminate any use that results in unacceptable impacts.

Justification: Environmental education and interpretation represent two priority wildlife-dependent recreational activities under the Improvement Act. Environmental education and interpretation are key components of the Service's initiative to connect children with nature and are used to encourage all citizens to act responsibly in protecting natural resources. Both would be compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:

Description of Uses: Wildlife Observation and Photography

This pre-acquisition compatibility determination serves as our commitment to allow wildlife observation and photography activities where possible on lands that would be acquired by the Service, should the refuge proposal go forward.

Wildlife observation and photography are traditional uses in this landscape. For the purposes of this compatibility determination, non-consumptive wildlife observation uses include wildlife watching and nature photography. Foot travel would generally be allowed on refuge roads, levees, and trails.

Wildlife observation and photography are considered simultaneously in this compatibility determination. Wildlife observation and photography have been identified in the Improvement Act as priority wildlife-dependent recreational uses provided they are compatible with the purposes of the refuge. This compatibility determination applies only to personal photography and videography and not to commercial photography or videography. If allowed, these would be covered under a separate Commercial Services compatibility determination (not being considered at this time) and would require a special use permit issued by the refuge and would contain specific restrictions. The Service would develop an understanding of wildlife observation and photography activities for a particular site during the acquisition process.

Availability of Resources: Annual refuge operation and maintenance funds provided for the refuge would be used to support the visitor services program, including wildlife observation and photography opportunities.

Anticipated Impacts of the Use: The purpose of this section is to critically and objectively evaluate the potential effects that wildlife observation and photography could have on wildlife and habitat based on available information and best professional judgment. Each activity has the potential to have impacts, but the focus is to minimize impacts to levels within acceptable limits. This would be based on the impacts at the projected levels of use.

Even the most controlled wildlife observation and photography programs designed in-part to limit wildlife disturbance have the potential for disturbing wildlife species. In general, activities that occur outside of vehicles tend to increase the disturbance potential for most wildlife species (Klein 1993; Gabrielson and Smith 1995; Burger 1981; Pease et al. 2005) as compared to similar activities conducted within vehicles. Refuge-led visitors or refuge-approved visitors would typically access refuge habitats on foot via fire lines and/or unimproved roads and foot trails. Although this type of access could potentially disturb wildlife, it is expected to be minimal as a result of the limited and controlled character of such events and opportunities. Among wetland habitats, out-of-vehicle approaches can reduce wildlife foraging times and can cause water birds to avoid foraging habitats adjacent to the out-of-vehicle disturbance (Klein 1993). One possible reason for this result is that vehicle activity is usually brief, while walking requires a longer period of time to cover the same distance. Similarly, walking on wildlife observation trails tends to displace birds and can cause localized declines in the richness and abundance of wildlife species (Riffell et al. 1996). Wildlife photographers tend to have the largest disturbance impacts (Klein 1993; Morton 1995; Dobb 1998). While wildlife observers frequently stop their vehicles to view wildlife, wildlife photographers are much more likely to leave their vehicles and approach wildlife on foot (Klein 1993). Even a slow approach by wildlife photographers tends to have behavioral consequences to wildlife (Klein 1993). Other impacts include the potential for photographers to remain close to wildlife for extended periods of time (Dobb 1998) and the tendency of casual photographers with low power lenses to get much closer to their subject than other activities would require (Morton 1995).

Determination (check one below):

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

By design, wildlife observation and photography should have minimal species and habitat impacts. Nonetheless, as use increases, species impacts are more likely to occur. Wildlife observation and photography would avoid sensitive sites and threatened or endangered wildlife and plant populations. Evaluation of the sites and programs would be conducted annually to determine if objectives are being met, if habitat impacts are minimized, and if wildlife populations are being adversely affected. If evidence of unacceptable impacts begins to appear, it may be necessary to change the activity or the program, relocate the activity or program, or eliminate the program.

Stipulations that may be employed include:

- Providing limited refuge-led and/or refuge-approved wildlife observation and photography opportunities during refuge events and/or through special use permit would lessen species impacts.
- Providing access only on designated roads and trails would lessen species impacts.
- Vegetation that effectively conceals visitors and provides cover for birds can help minimize impacts of people in busy areas.
- Establishing buffer zones that minimize disturbance around sensitive areas and establishing no-entry zones during refuge approved events and opportunities would help minimize impacts.
- Rerouting, modifying, or eliminating activities which have demonstrated direct species impacts should be employed.
- Education is critical for making visitors aware that their actions can have negative impacts on plants and wildlife.

Justification:

Wildlife observation and photography are priority public uses of the National Wildlife Refuge System. Providing quality, appropriate, and compatible opportunities for these activities help fulfill the provisions of the Improvement Act. Wildlife observation and photography would provide excellent forums for promoting increased awareness, understanding, and support of refuge resources relative to wildlife/human interactions. The stipulations outlined above should minimize potential impacts relative to wildlife/human interactions. Under a controlled level of limited visitation, these wildlife-dependent uses would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge and would be determined to be compatible with proposed refuge purposes.

Mandatory 15-year Re-evaluation Date:

Description of Use: Research

This pre-acquisition compatibility determination serves as our commitment to allow research activities, where possible, on lands that would be acquired by the Service, should the refuge proposal go forward.

Research is the planned, organized, and systematic gathering of data to discover or verify facts. In principle, research conducted on the refuge by universities, cooperative units, non-profit organizations, partners, and other research entities furthers refuge management and serves the purposes, vision, and goals of the refuge. The refuge would likely host research from a variety of research institutions, including various universities, Native American tribes, and private research groups. All research activities, whether conducted by governmental agencies, public research entities, universities, private research groups, or any other entity, would be required to obtain special use permits from the refuge. Approved refuge special use permits would contain conditions under which researchers must operate to help minimize negative impacts to refuge resources. All research activities would be overseen by the wildlife biologist/botanist, refuge manager, or refuge staff member as assigned by the refuge manager or designee. Projects that are fish and wildlife management-oriented, which would provide needed information to refuge operation and management, would receive priority consideration and may even be

solicited. A research policy would be established to provide guidance for the refuge's research program. The types of research activities conducted on the refuge might cover wildlife, habitat, climate change, water resources, cultural resources, and/or public use activities. The Service would work with area researchers and others to develop an understanding of the research activities associated with a particular site during the acquisition process.

Availability of Resources:

Other than the administration of associated special use permits, no refuge resources are generally required for this use. The refuge may provide some type of housing for researchers if resources were available.

Anticipated Impacts of the Use:

Generally, adverse impacts from research are minimal. An anticipated method of accessing research sites throughout the refuge may include all-terrain vehicles (ATVs) or similar vehicles. A critical and objective evaluation of the potential effects that ATVs could have on wildlife and habitat would be based on the most current information available and best professional judgment. Although ATVs have the potential to impact refuge resources, the focus is to minimize their negative effects. This would be based on the impacts at the existing and projected levels of use. Occasionally, slight or temporary wildlife or habitat disturbances may occur (e.g., minor trampling of vegetation may occur when researchers access monitoring plots). However, these impacts are not considerable, nor are they permanent. Also, a small number of individual plants or animals might be collected for further scientific study, but these collections would be anticipated to have minimal impact on the populations from which they came. All collections would adhere to the Service's specimen collection policy (Director's Order 109, March 28, 2005) and have all requisite permits.

Determination (check one below):

Use is Not Compatible

Use is Compatible with Following Stipulations

Stipulations Necessary to Ensure Compatibility:

All research conducted on the refuge must further the purposes of the refuge and the mission of the National Wildlife Refuge System. All research would adhere to established refuge policy on research and policy on collecting specimens (Directors Order Number 109). To ensure that research activities are compatible, the refuge would require that a special use permit be obtained before any research activity may occur. Research proposals and/or research special use permit applications would be required to be submitted in advance of the activity to allow for review by refuge staff to ensure minimal impacts to the resources, staff, and programs of the refuge. Each special use permit may contain conditions under which the research would be conducted. Each special use permit holder would submit annual reports or updates to the refuge on research activities, progress, funding, and other information. Further, each special use permit holder would provide copies of findings, final reports, publications, and/or other documentation at the end of each project. Limiting use of ATVs primarily to designated trails and roads would minimize anticipated impacts. The refuge would deny permits for research proposals that are determined

to not serve the purposes of the refuge and mission of the Refuge System. The refuge would also deny permits for research proposals that are determined to negatively impact resources or that materially interfere with or detract from the purposes of the refuge. All research activities would be subject to the conditions of their respective permits.

Justification:

Research activities provide benefits to the refuge and to the natural resources supported by the refuge. Research conducted on the refuge can lead to new discoveries, new facts, verified information, and increased knowledge and understanding of resource management, as well as track current trends in fish and wildlife habitat and populations to enable better management decisions. Research has the potential to further the proposed purposes and goals of the refuge and the mission of the Refuge System.

Mandatory 10-year Re-evaluation Date:

REFERENCES

- Burger, J. 1981.** The effects of human activity on birds at a coastal bay. *Biological Conservation*. 21: 231-241.
- Dobb, E. 1998.** Reality check: the debate behind the lens. *Audubon*, January-February 1998.
- Gabrielson, G.W. and E.N. Smith. 1995.** Physiological responses of wildlife to disturbance. Pages 95-107 in R. L. Knight and K. J. Gutzwiller, eds., *Wildlife and Recreationists: Coexistence through Management and Research*. Island Press, Washington, D.C. 372 pp.
- Klein, M.L. 1993.** Waterbird behavior responses to human disturbances. *Wildlife Society Bulletin* 21: 31-39.
- Morton J.M. 1995.** Management of human disturbance and its effects on waterfowl. Pages F59-F86 in W. R. Whitman, T. Strange, L. Widjeskog, R. Whittemore, P. Kehoe and L. Roberts, eds., *Waterfowl Habitat Restoration, Enhancement and Management in the Atlantic Flyway*. Third Edition. Environmental Management Committee, Atlantic Flyway Council Technical Section, and Delaware Division of Fish and Wildlife. Dover, Delaware. 1114 pp.
- Pease, M.L., R.K. Rose and M.J. Butler. 2005.** Effects of human disturbances on the behavior of wintering ducks. *Wildlife Society Bulletin* 33(1): 103-112. Riffell, S.K., J. Gutzwiller and S.H. Anderson. 1996. Does repeated human intrusion cause cumulative declines in avian richness and abundance? *Ecological Applications* 6(2): 492-505.
- Riffell, S.K., K.J. Gutzwiller and S.H. Anderson. 1996.** Does repeated human intrusion cause cumulative declines in avian richness and abundance? *Ecol. Appl.* 6:492-505.

Appendix C. Intra-Service Section 7 Biological Evaluation

Intra-Service Section 7 Biological Evaluation has been initiated and will run concurrently with the public review and comment period for the Draft LPP/EA.

SOUTHEAST REGION INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

[Federally endangered, threatened, and candidate species]

[Note: This form provides the outline of information needed for intra-Service consultation. If additional space is needed, attach additional sheets, or set up this form to accommodate your responses.]

Originating Person: _____

Telephone Number: _____ E-Mail: _____

Date: _____

PROJECT NAME (Grant Title/Number): Proposed Mountain Bogs National Wildlife Refuge and Conservation Partnership Area

I. Service Program:

II.

- Ecological Services
- Federal Aid
 - Clean Vessel Act
 - Coastal Wetlands
 - Endangered Species Section 6
 - Partners for Fish and Wildlife
 - Sport Fish Restoration
 - Wildlife Restoration
- Fisheries
- Refuges/Wildlife

II. State/Agency: N/A

III. Station Name: Mountain Bogs National Wildlife Refuge, NC

IV. Description of Proposed Action:

The Service is proposing to establish the Mountain Bogs National Wildlife Refuge (NWR) and Conservation Partnership Area (CPA) in order to protect and conserve southern Appalachian Mountain bogs. If established, this refuge would protect a diverse system of bog and fen wetlands and surrounding upland buffers, including high-mountain grasslands, spruce-fir forests, and hardwood forests. It would contribute to the recovery of 13 federally listed species, one candidate species and assist in the conservation of numerous state listed and imperiled species. The Service is

evaluating a proposal to acquire fee-title purchases and conservation easements of up to approximately 24,000 acres within an approximately 43,000-acre CPA, all from willing sellers. The scope of the Draft LPP/EA is limited to the proposed acquisition, in fee-title and in less-than-fee-title, of lands for the establishment of the Mountain Bogs NWR and CPA. The Draft LPP/EA is not intended to cover the development and/or implementation of detailed, specific programs for the administration and management of those lands. If the refuge is established and the needed lands or interests in lands are acquired, the Service would develop a comprehensive conservation plan, a 15-year management plan, and needed step-down management plans. These plans would be developed and reviewed in accordance with the Departmental requirements of the National Environmental Policy Act. Intra-Service biological evaluations or assessments (under Section 7 of the Endangered Species Act) for individual management activities, or groups of activities, would be conducted at the time those activities would be proposed.

V. Pertinent Species and Habitat:

- A. Include species/habitat occurrence map:
- B. Complete the following table:

Table 1. Listed/proposed species/critical habitat that occur or may occur within the project area:

Species	Status
Plants	
<i>Geum radiatum</i>	E
<i>Gymnoderma lineare</i>	E
<i>Houstonia Montana</i>	E
<i>Sagittaria fasciculata</i>	E
<i>Sarracenia jonesii</i>	E
<i>Sarracenia oreophila</i>	E
<i>Helonias bullata</i>	T
<i>Isotria medeoloides</i>	T
<i>Liatris helleri</i>	T
<i>Spirea virginiana</i>	T
<i>Platanthera integrilabia</i>	C
Mammals	
<i>Glaucomys sabrinus coloratus</i>	E
<i>Corynorhinus townsendii virginianus</i>	E
Reptiles	
<i>Glyptemys muhlenbergii</i>	T(S/A)

Key: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species, T(S/A)=threatened due to similarity of appearance

Appendix D. Interim Recreation Act Funding Analysis

Proposed Refuge Name: Mountain Bogs National Wildlife Refuge

Date Established: Currently Proposed

Purpose(s) for Which the Refuge is Proposed to be Established:

"conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans" 16 U.S.C. 668dd(a)(2) (National Wildlife Refuge System Administration Act of 1966).

"to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants" 16 U.S.C. 1534 (Endangered Species Act of 1973).

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

"for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude" 16 U.S.C. 742f(b)(1); "for the development, advancement, management, conservation, and protection of fish and wildlife resources" 16 U.S.C. 742f(a)(4); (Secretarial powers to implement laws related to fish and wildlife) (Fish and Wildlife Act of 1956)

"suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species" 16 U.S.C. 460k-1; "the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors" 16 U.S.C. 460k-2 [Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended].

Recreational Use(s) Evaluated: (1) Recreational hunting of resident game (e.g., deer, turkey, and small game) and migratory birds (i.e., waterfowl) in accordance with federal and North Carolina and Tennessee regulations, (2) recreational fishing of freshwater fish species (e.g., trout, largemouth bass, bream, catfish, and crappie) in accordance with North Carolina and Tennessee regulations, (3) environmental education and interpretation, (4) wildlife observation and photography, and (5) research.

Funding Required to Administer and Manage the Proposed Recreational Uses: The Service would use existing staff from nearby refuges, where feasible. Funding to support the proposed refuge and conservation area would be made available to implement initial protection activities, hunt implementation, data collection, and non-consumptive uses. The Service would also cooperate with NCWRC/TWRA to support initial public use activities on the proposed refuge, including the provision of law enforcement support. The Service would continue discussions with FWC regarding opportunities for State Wildlife Management Area designation(s) and management, co-management, and joint activities.

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

Project Leader: _____
Signature/Date

Refuge Supervisor: _____
Signature/Date

**Chief, National
Wildlife Refuge
System, Southeast
Region:** _____
Signature/Date

Appendix E. Public Involvement

Direct mailings

- CPA landowner letters (approximately 620) mailed May 29-30, 2012
- State and local elected official and county manager letters mailed May 29-30, 2012
- Natural resource non-governmental organizations; local, state, and federal natural resources agency letters mailed May 29-30, 2012

E-mails

- Traditional bog conservation partners (various state natural resource agency employees, non-profit conservation organizations, and others that the Service has worked in partnership with to protect bogs) 5/30/2012

Digital media

- Web site uploaded May 29, 2012
- Posted to National Wildlife Refuge System Facebook page June 7, 2012
- Posted to USFWS Southeast (R4) webpage, June 7, 2012
- Posted to USFWS Washington Headquarters (R9) webpage, June 7, 2012

Press release

- Distributed June 6, 2012

Open houses

These events, each two hours, provided the public with an opportunity to interact individually with Service experts in real estate, bog biology, private land stewardship, and refuge creation. All events were held in the early evening at the local library. These were announced in the press release announcing the project, as well as in letters and e-mails sent to Conservation Partnership Area landowners, state and local elected officials, bog conservation partners, and other state and federal natural resource agencies.

- July 11, 2012 - Boone
- July 10, 2012 - Franklin
- June 26, 2012 - Hendersonville
- June 27, 2012 - West Jefferson

Radio commentaries

Broadcast on WNCW.

- Commentary on refuge proposal aired in June 2012
- Commentary on poaching threats aired in August 2012

Known media coverage (listed by outlet) related to the projects includes:

- Hendersonville Times-News
Nathaniel H. Axtell
“Mountain bogs could be preserved in Henderson, Transylvania”
7/12/2012 at 4:30 a.m.
- CarolinaOutdoorsGuide.com
“Mountain Bogs National Wildlife Refuge Proposed”
- Watauga Democrat
“New wildlife refuge proposed for Western NC”
Kellen Moore
6/22/12
- The Naturalist Corner
(blog and published in Smoky Mountain News)
Don Hendershot
6/14/2012
- Broadcast Media: WLOS
6/20/2012
Viewable at <http://www.youtube.com/watch?v=nK9gknesLdA>
- Homagetoappalachia.wordpress.com
Blog
7/12/2012
- High Country Press
“Proposed Mountain Bogs Refuge Encompasses High Country; Open House at Watauga Library on July 11”
Jesse Wood
6/25/2012
- MountainXpress.com
“Feds seek to protect Southern Appalachian bogs, need public input”
Margaret Williams
6/8/12
- Hendersonville Times-News
“Wildlife Service wants to improve management of bogs”
Diane Norman
6/10/2012 at 4:30 a.m.
- WUNC 91.5 (public radio)
“New Wildlife Refuge Proposed for Western NC”
Asma Khalid
6/12/2012
Viewable at <http://wunc.org/programs/news/archive/SAK061212.mp3/view>

Appendix F. Information on Preparers

Contributors to the documents:

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- Richard Warner, NEPA Coordinator, Southeast Region, USFWS

DRAFT LAND PROTECTION PLAN AND
ENVIRONMENTAL ASSESSMENT FOR
THE PROPOSED ESTABLISHMENT OF
MOUNTAIN BOGS NATIONAL WILDLIFE REFUGE

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